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TITLE: FORMALDEHYDE TEST RESULTS
FOR PRESS VENTS AND DRYER STACKS
AT LOUISIANA PACIFIC
KIRBY FOREST INDUSTRIES
SILSBEE, TEXAS

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FIELD TEAM: John A. Sokash and Jay C. Morgan

PREPARED FOR: Daniel G. Russell
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SECTION 1

INTRODUCTION

Emission testing for formaldehyde using BIF Method 0011 was conducted at the Louisiana Pacific Corporation, Kirby Forest Industries - Oriented Strand Board Plant, located in Silsbee, Texas. The testing was performed from February 27 through March 6, 1992, under the direction of Dr. James T. Boswell, Environmental Affairs Officer for Louisiana Pacific Corporation; Mr. Ed Knight, plant manager at Kirby Forest Industries; and Mr. Daniel G. Russell of Environmental Monitoring Laboratories (EML). The formaldehyde testing was observed by Mr. Al P. Bander, National Enforcement Officer and Mr. Philip C. Schwindt, Environmental Engineer of the U. S. Environmental Protection Agency.

The purpose of this testing by Industrial and Environmental Analysts (IEA) was to determine formaldehyde emissions from five Oriented Strand Board (OSB) wood chip dryers and five press vents. Testing for particulate emissions and continuous emission monitoring for volatile organic hydrocarbons and carbon monoxide was performed by EML under the direction of Mr. Daniel G. Russell. PM_{10} emission testing was conducted by Armstrong Environmental, Inc. under the direction of Mr. Russell. This report presents only the results of the formaldehyde tests.

Members of the IEA sampling team were Mr. John A. Sokash and Mr. Jay Morgan. Preparation of the formaldehyde absorbing solutions and subsequent ion chromatographic analysis was performed by Dr. Jimmy Pau of Mercury Research Laboratories of Cary, North Carolina.

IEA extends its appreciation to Mr. Daniel G. Russell, Dr. James T. Boswell and Mr. Ed Knight for their assistance and cooperation throughout the test program.

SECTION 2

SUMMARY OF RESULTS

2.1 General Summary

Table 2.1 presents a summary of the total formaldehyde results measured during the test program conducted on the press vents and dryer stacks. All mass emissions are based on volumetric flow rates that were corrected to standard temperature and pressure (528°R and 29.92 inches Hg).

A copy of the formaldehyde testing and analytical procedure is attached in Appendix A. Chain-of-custody documentation and field logs are contained in Appendix B. Formaldehyde field test data sheets for the press vents and dryer stacks are presented in Appendices C and D, respectively. Laboratory data is presented in Appendix E. Equipment calibrations and certifications are included in Appendix F. Project participants are listed in Appendix G.

2.2 Press Vent Data

Tables 2.2.1 - 2.2.5 present the individual results from the formaldehyde emission tests performed on the press vents. The formaldehyde concentration from Press Vent #1 was determined to be 2.2 ppm resulting in an average emission rate of 0.53 lb/hr.

The formaldehyde concentration from Press Vent #2 was determined to be 1.6 ppm resulting in an average emission rate of 0.40 lb/hr.

The formaldehyde concentration from Press Vent #3 was determined to be 3.0 ppm resulting in an average emission rate of 0.73 lb/hr.

The formaldehyde concentration from Press Vent #4 was determined to be 2.1 ppm resulting in an average emission rate of 0.54 lb/hr.

The formaldehyde concentration from Press Vent #5 was determined to be 1.6 ppm resulting in an average emission rate of 0.39 lb/hr.

2.3 Dryer Stack Data

Tables 2.3.1 - 2.3.5 present the individual results from the formaldehyde emission tests performed on the dryer stacks. The formaldehyde concentration from Dryer Stack #1 was determined to be 1.2 ppm resulting in an average emission rate of 0.16 lb/hr.

The formaldehyde concentration from Dryer Stack #2 was determined to be 1.5 ppm resulting in an average emission rate of 0.22 lb/hr.

The formaldehyde concentration from Dryer Stack #3 was determined to be 2.8 ppm resulting in an average emission rate of 0.39 lb/hr. The sample from Run #3 was broken during packaging. A fourth run was performed on Dryer Stack #3 to substitute for that test. The results from Run #3 have not been compiled or included in the data. Copies of the data sheets from Run #3 are included in Appendix D.

The formaldehyde concentration from Dryer Stack #4 was determined to be 3.5 ppm resulting in an average emission rate of 0.50 lb/hr.

The formaldehyde concentration from Dryer Stack #5 was determined to be 2.4 ppm resulting in an average emission rate of 0.35 lb/hr.

TABLE 2.1
SUMMARY OF FORMALDEHYDE EMISSIONS
PRESS VENTS AND DRYER STACKS
LOUISIANA PACIFIC
SILSBEE, TEXAS

SOURCE	FORMALDEHYDE CONCENTRATION (ppm)	FORMALDEHYDE EMISSION RATE (lb/hr)
PRESS VENT #1	2.2	0.53
PRESS VENT #2	1.6	0.40
PRESS VENT #3	3.0	0.73
PRESS VENT #4	2.1	0.54
PRESS VENT #5	1.6	0.39
AVERAGE	**2.1**	**0.52**
DRYER STACK #1	1.2	0.16
DRYER STACK #2	1.5	0.22
DRYER STACK #3	2.8	0.39
DRYER STACK #4	3.5	0.50
DRYER STACK #5	2.4	0.35
AVERAGE	**2.3**	**0.32**

TABLE 2.2.1
PRESS VENT #1
FORMALDEHYDE TEST SUMMARY
LOUISIANA PACIFIC - SILSBEE, TEXAS

SYMBOL	PARAMETER	RUN 1 02/27/92 0833-0944	RUN 2 02/27/92 1040-1145	RUN 3 02/27/92 1236-1340	AVERAGE
	MEASURED DATA				
(Y)	Meter Box Y	0.999	0.999	0.999	0.999
	Avg Delta H, inches H2O	1.81	2.03	2.00	1.95
(Bp)	Barometric Pressure, inches Hg	30.20	30.20	30.20	30.20
(Vm)	Meter Volume, cf	46.025	48.995	45.463	46.828
(Tm)	Avg Meter Temp, deg F	66.0	76.1	80.3	74.1
(Pg)	Static Pressure, inches H2O	-0.35	-0.35	-0.35	-0.35
(Ts)	Avg Stack Temp, deg F	85.0	94.6	99.0	92.9
(Vlc)	Water Collected, ml	8.9	5.6	11.4	8.6
(CO2)	Carbon dioxide, %	0.0	0.0	0.0	0.0
(O2)	Oxygen, %	20.9	20.9	20.9	20.9
	Avg Sqrt Delta P, (inches H2O) ^ 1/2	0.726	0.772	0.769	0.76
(0)	Sample Time, min	65	65	60	63
(Dn)	Nozzle Diameter, inches	0.235	0.235	0.235	0.235
(Ds)	Stack Diameter, inches	62	62	62	62
(Mf)	Total Formaldehyde, ug	3489	3489	3832	3603
	CALCULATED DATA				
(Vmstd)	Standard Meter Volume, dscf	46.772	48.879	44.999	46.883
(Ps)	Stack Pressure, inches Hg	30.17	30.17	30.17	30.17
(%Bws)	Moisture (from impingers), %	0.9	0.5	1.2	0.9
(%Bws)	Moisture (at saturation), %	4.0	5.4	5.4	4.9
(Ms)	Molecular Weight-wet, lb/lb-mole	28.7	28.8	28.7	28.7
(Vs)	Velocity, ft/s	41.3	44.3	44.4	43.3
(As)	Stack Area, sq ft	20.97	20.97	20.97	20.97
(Qa)	Volumetric flow, acfm	5.20E+04	5.57E+04	5.58E+04	5.45E+04
(Qs)	Volumetric flow, dscfm	5.03E+04	5.32E+04	5.25E+04	5.20E+04
(I)	Isokinetic Rate, %	99.5	98.4	99.4	99.1
(Cf)	**Formaldehyde Concentration, ug/dscf**	**74.6**	**71.4**	**85.2**	**77.0**
(Cppm)	**Formaldehyde Concentration, ppm**	**2.11**	**2.02**	**2.41**	**2.18**
(ER)	**Formaldehyde Emission Rate, lb/hr**	**0.50**	**0.50**	**0.59**	**0.53**

TABLE 2.2.2
PRESS VENT #2
FORMALDEHYDE TEST SUMMARY
LOUISIANA PACIFIC - SILSBEE, TEXAS

SYMBOL	PARAMETER	RUN 1 02/26/92 1126-1232	RUN 2 02/26/92 1357-1501	RUN 3 02/26/92 1615-1718	AVERAGE
	MEASURED DATA				
(Y)	Meter Box Y	0.999	0.999	0.999	0.999
	Avg Delta H, inches H2O	2.10	2.10	2.20	2.13
(Bp)	Barometric Pressure, inches Hg	30.10	30.10	30.10	30.10
(Vm)	Meter Volume, cf	44.959	45.942	46.104	45.668
(Tm)	Avg Meter Temp, deg F	55.0	60.0	62.0	59.0
(Pg)	Static Pressure, inches H2O	-0.37	-0.37	-0.37	-0.37
(Ts)	Avg Stack Temp, deg F	85.4	89.0	87.0	87.1
(Vlc)	Water Collected, ml	8.0	9.1	9.4	8.8
(CO2)	Carbon dioxide, %	0.0	0.0	0.0	0.0
(O2)	Oxygen, %	20.9	20.9	20.9	20.9
	Avg Sqrt Delta P, (inches H2O) ^ 1/2	0.807	0.798	0.804	0.80
(0)	Sample Time, min	60	60	60	60
(Dn)	Nozzle Diameter, inches	0.235	0.235	0.235	0.235
(Ds)	Stack Diameter, inches	62	62	62	62
(Mf)	Total Formaldehyde, ug	2337	2654	2703	2565
	CALCULATED DATA				
(Vmstd)	Standard Meter Volume, dscf	46.544	47.104	47.101	46.916
(Ps)	Stack Pressure, inches Hg	30.07	30.07	30.07	30.07
(%Bws)	Moisture (from impingers), %	0.8	0.9	0.9	0.9
(%Bws)	Moisture (at saturation), %	4.1	4.6	4.3	4.3
(Ms)	Molecular Weight-wet, lb/lb-mole	28.7	28.7	28.7	28.7
(Vs)	Velocity, ft/s	46.0	45.7	45.9	45.9
(As)	Stack Area, sq ft	20.97	20.97	20.97	20.97
(Qa)	Volumetric flow, acfm	5.79E+04	5.75E+04	5.78E+04	5.77E+04
(Qs)	Volumetric flow, dscfm	5.58E+04	5.50E+04	5.55E+04	5.55E+04
(I)	Isokinetic Rate, %	96.7	99.3	98.4	98.2
(Cf)	**Formaldehyde Concentration, ug/dscf**	**50.2**	**56.3**	**57.4**	**54.6**
(Cppm)	**Formaldehyde Concentration, ppm**	**1.42**	**1.59**	**1.62**	**1.55**
(ER)	**Formaldehyde Emission Rate, lb/hr**	**0.37**	**0.41**	**0.42**	**0.40**

TABLE 2.2.3
PRESS VENT #3
FORMALDEHYDE TEST SUMMARY
LOUISIANA PACIFIC - SILSBEE, TEXAS

SYMBOL	PARAMETER	RUN 1 02/28/92 1255-1400	RUN 2 02/28/92 1440-1546	RUN 3 02/28/92 1622-1728	AVERAGE
	MEASURED DATA				
(Y)	Meter Box Y	0.999	0.999	0.999	0.999
	Avg Delta H, inches H2O	2.00	2.15	2.11	2.09
(Bp)	Barometric Pressure, inches Hg	30.18	30.18	30.18	30.18
(Vm)	Meter Volume, cf	44.725	47.625	46.819	46.390
(Tm)	Avg Meter Temp, deg F	87.0	94.2	92.1	91.1
(Pg)	Static Pressure, inches H2O	-0.36	-0.36	-0.36	-0.36
(Ts)	Avg Stack Temp, deg F	104.0	105.0	103.8	104.3
(Vlc)	Water Collected, ml	16.8	15.4	9.4	13.9
(CO2)	Carbon dioxide, %	0.0	0.0	0.0	0.0
(O2)	Oxygen, %	20.9	20.9	20.9	20.9
	Avg Sqrt Delta P, (inches H2O) ^ 1/2	0.762	0.783	0.774	0.77
(0)	Sample Time, min	60	60	60	60
(Dn)	Nozzle Diameter, inches	0.235	0.235	0.235	0.235
(Ds)	Stack Diameter, inches	62	62	62	62
(Mf)	Total Formaldehyde, ug	4376	4862	4919	4719
	CALCULATED DATA				
(Vmstd)	Standard Meter Volume, dscf	43.698	45.943	45.333	44.991
(Ps)	Stack Pressure, inches Hg	30.15	30.15	30.15	30.15
(%Bws)	Moisture (from impingers), %	1.8	1.6	1.0	1.4
(%Bws)	Moisture (at saturation), %	7.2	7.4	7.2	7.3
(Ms)	Molecular Weight-wet, lb/lb-mole	28.6	28.7	28.7	28.7
(Vs)	Velocity, ft/s	44.2	45.5	44.8	44.8
(As)	Stack Area, sq ft	20.97	20.97	20.97	20.97
(Qa)	Volumetric flow, acfm	5.56E+04	5.72E+04	5.64E+04	5.64E+04
(Qs)	Volumetric flow, dscfm	5.15E+04	5.30E+04	5.27E+04	5.24E+04
(I)	Isokinetic Rate, %	98.4	100.6	99.9	99.6
(Cf)	**Formaldehyde Concentration, ug/dscf**	**100.1**	**105.8**	**108.5**	**104.8**
(Cppm)	**Formaldehyde Concentration, ppm**	**2.83**	**2.99**	**3.07**	**2.96**
(ER)	**Formaldehyde Emission Rate, lb/hr**	**0.68**	**0.74**	**0.76**	**0.73**

TABLE 2.2.4
PRESS VENT #4
FORMALDEHYDE TEST SUMMARY
LOUISIANA PACIFIC - SILSBEE, TEXAS

SYMBOL	PARAMETER	RUN 1 02/27/92 1437-1625	RUN 2 02/27/92 1717-1822	RUN 3 02/28/92 0910-1018	AVERAGE
	MEASURED DATA				
(Y)	Meter Box Y	0.999	0.999	0.999	0.999
	Avg Delta H, inches H2O	2.11	2.11	2.25	2.16
(Bp)	Barometric Pressure, inches Hg	30.20	30.20	30.18	30.19
(Vm)	Meter Volume, cf	46.067	45.740	46.722	46.176
(Tm)	Avg Meter Temp, deg F	84.9	80.0	76.7	80.5
(Pg)	Static Pressure, inches H2O	-0.36	-0.36	-0.36	-0.36
(Ts)	Avg Stack Temp, deg F	96.6	93.9	90.1	93.5
(Vlc)	Water Collected, ml	9.0	7.6	11.9	9.5
(CO2)	Carbon dioxide, %	0.0	0.0	0.0	0.0
(O2)	Oxygen, %	20.9	20.9	20.9	20.9
	Avg Sqrt Delta P, (inches H2O) ^ 1/2	0.784	0.787	0.809	0.79
(0)	Sample Time, min	60	60	60	60
(Dn)	Nozzle Diameter, inches	0.235	0.235	0.235	0.235
(Ds)	Stack Diameter, inches	62	62	62	62
(Mf)	Total Formaldehyde, ug	3403	3432	3432	3422
	CALCULATED DATA				
(Vmstd)	Standard Meter Volume, dscf	45.224	45.310	46.553	45.696
(Ps)	Stack Pressure, inches Hg	30.17	30.17	30.15	30.17
(%Bws)	Moisture (from impingers), %	0.9	0.8	1.2	1.0
(%Bws)	Moisture (at saturation), %	5.8	5.3	4.7	5.3
(Ms)	Molecular Weight-wet, lb/lb-mole	28.7	28.8	28.7	28.7
(Vs)	Velocity, ft/s	45.1	45.2	46.3	45.5
(As)	Stack Area, sq ft	20.97	20.97	20.97	20.97
(Qa)	Volumetric flow, acfm	5.67E+04	5.68E+04	5.83E+04	5.73E+04
(Qs)	Volumetric flow, dscfm	5.37E+04	5.42E+04	5.57E+04	5.45E+04
(I)	Isokinetic Rate, %	97.7	97.1	97.0	97.3
(Cf)	**Formaldehyde Concentration, ug/dscf**	**75.2**	**75.7**	**73.7**	**74.9**
(Cppm)	**Formaldehyde Concentration, ppm**	**2.13**	**2.14**	**2.08**	**2.12**
(ER)	**Formaldehyde Emission Rate, lb/hr**	**0.53**	**0.54**	**0.54**	**0.54**

TABLE 2.2.5
PRESS VENT #5
FORMALDEHYDE TEST SUMMARY
LOUISIANA PACIFIC - SILSBEE, TEXAS

SYMBOL	PARAMETER	RUN 1 02/29/92 1018-1122	RUN 2 02/29/92 1201-1304	RUN 3 02/29/92 1336-1440	AVERAGE
	MEASURED DATA				
(Y)	Meter Box Y	0.999	0.999	0.999	0.999
	Avg Delta H, inches H2O	2.10	2.18	2.31	2.20
(Bp)	Barometric Pressure, inches Hg	30.14	30.14	30.14	30.14
(Vm)	Meter Volume, cf	46.168	47.735	49.120	47.674
(Tm)	Avg Meter Temp, deg F	96.0	108.6	112.6	105.7
(Pg)	Static Pressure, inches H2O	-0.36	-0.36	-0.36	-0.36
(Ts)	Avg Stack Temp, deg F	100.0	108.1	110.8	106.3
(Vlc)	Water Collected, ml	11.4	11.6	10.6	11.2
(CO2)	Carbon dioxide, %	0.0	0.0	0.0	0.0
(O2)	Oxygen, %	20.9	20.9	20.9	20.9
	Avg Sqrt Delta P, (inches H2O) ^ 1/2	0.773	0.783	0.799	0.79
(0)	Sample Time, min	60	60	60	60
(Dn)	Nozzle Diameter, inches	0.235	0.235	0.235	0.235
(Ds)	Stack Diameter, inches	62	62	62	62
(Mf)	Total Formaldehyde, ug	2534	2514	2337	2462
	CALCULATED DATA				
(Vmstd)	Standard Meter Volume, dscf	44.330	44.827	45.820	44.992
(Ps)	Stack Pressure, inches Hg	30.11	30.11	30.11	30.11
(%Bws)	Moisture (from impingers), %	1.2	1.2	1.1	1.2
(%Bws)	Moisture (at saturation), %	6.4	8.1	8.8	7.8
(Ms)	Molecular Weight-wet, lb/lb-mole	28.7	28.7	28.7	28.7
(Vs)	Velocity, ft/s	44.7	45.6	46.6	45.6
(As)	Stack Area, sq ft	20.97	20.97	20.97	20.97
(Qa)	Volumetric flow, acfm	5.62E+04	5.74E+04	5.86E+04	5.74E+04
(Qs)	Volumetric flow, dscfm	5.27E+04	5.30E+04	5.40E+04	5.32E+04
(I)	Isokinetic Rate, %	97.7	98.2	98.5	98.1
(Cf)	**Formaldehyde Concentration, ug/dscf**	**57.2**	**56.1**	**51.0**	**54.7**
(Cppm)	**Formaldehyde Concentration, ppm**	**1.62**	**1.59**	**1.44**	**1.55**
(ER)	**Formaldehyde Emission Rate, lb/hr**	**0.40**	**0.39**	**0.36**	**0.39**

TABLE 2.3.1
DRYER STACK #1
FORMALDEHYDE TEST SUMMARY
LOUISIANA PACIFIC - SILSBEE, TEXAS

SYMBOL	PARAMETER	RUN 1 03/03/92 1307-1445	RUN 2 03/03/92 1550-1700	RUN 3 03/03/92 1728-1832	AVERAGE
	MEASURED DATA				
(Y)	Meter Box Y	0.999	0.999	0.999	0.999
	Avg Delta H, inches H2O	1.30	1.69	1.68	1.56
(Bp)	Barometric Pressure, inches Hg	30.13	30.13	30.13	30.13
(Vm)	Meter Volume, cf	37.094	41.338	41.384	39.939
(Tm)	Avg Meter Temp, deg F	88.1	87.8	83.1	86.3
(Pg)	Static Pressure, inches H2O	-0.75	-0.75	-0.75	-0.75
(Ts)	Avg Stack Temp, deg F	182.3	183.6	180.5	182.1
(Vlc)	Water Collected, ml	145.9	146.5	147.6	146.7
(CO2)	Carbon dioxide, %	2.0	2.0	2.0	2.0
(O2)	Oxygen, %	19.0	19.0	19.0	19.0
	Avg Sqrt Delta P, (inches H2O) ^ 1/2	1.094	1.260	1.258	1.20
(0)	Sample Time, min	60	60	60	60
(Dn)	Nozzle Diameter, inches	0.196	0.196	0.196	0.196
(Ds)	Stack Diameter, inches	41.5	41.5	41.5	41.5
(Mf)	Total Formaldehyde, ug	2591	1347	924	1621
	CALCULATED DATA				
(Vmstd)	Standard Meter Volume, dscf	36.048	40.233	40.625	38.969
(Ps)	Stack Pressure, inches Hg	30.07	30.07	30.07	30.07
(%Bws)	Moisture (from impingers), %	16.0	14.6	14.6	15.1
(%Bws)	Moisture (at saturation), %	53.3	54.9	51.2	53.1
(Ms)	Molecular Weight-wet, lb/lb-mole	27.3	27.5	27.5	27.4
(Vs)	Velocity, ft/s	69.5	79.9	79.6	76.3
(As)	Stack Area, sq ft	9.39	9.39	9.39	9.39
(Qa)	Volumetric flow, acfm	3.92E+04	4.50E+04	4.48E+04	4.30E+04
(Qs)	Volumetric flow, dscfm	2.72E+04	3.17E+04	3.17E+04	3.02E+04
(I)	Isokinetic Rate, %	99.2	94.9	95.7	96.6
(Cf)	**Formaldehyde Concentration, ug/dscf**	**71.9**	**33.5**	**22.7**	**42.7**
(Cppm)	**Formaldehyde Concentration, ppm**	**2.03**	**0.95**	**0.64**	**1.21**
(ER)	**Formaldehyde Emission Rate, lb/hr**	**0.26**	**0.14**	**0.10**	**0.16**

TABLE 2.3.2
DRYER STACK #2
FORMALDEHYDE TEST SUMMARY
LOUISIANA PACIFIC - SILSBEE, TEXAS

SYMBOL	PARAMETER	RUN 1 03/02/92 1621-1740	RUN 2 03/02/92 1829-1940	RUN 3 03/03/92 0916-1022	AVERAGE
	MEASURED DATA				
(Y)	Meter Box Y	0.999	0.999	0.999	0.999
	Avg Delta H, inches H2O	1.60	1.64	1.66	1.63
(Bp)	Barometric Pressure, inches Hg	30.19	30.19	30.13	30.17
(Vm)	Meter Volume, cf	40.273	40.660	41.088	40.674
(Tm)	Avg Meter Temp, deg F	83.0	82.5	83.0	82.8
(Pg)	Static Pressure, inches H2O	-0.75	-0.75	-0.75	-0.75
(Ts)	Avg Stack Temp, deg F	183.0	181.5	183.4	182.6
(Vlc)	Water Collected, ml	159.7	143.5	162.0	155.1
(CO2)	Carbon dioxide, %	3.0	3.0	3.0	3.0
(O2)	Oxygen, %	18.0	18.0	18.0	18.0
	Avg Sqrt Delta P, (inches H2O) ^ 1/2	1.233	1.241	1.248	1.24
(0)	Sample Time, min	60	60	60	60
(Dn)	Nozzle Diameter, inches	0.196	0.196	0.196	0.196
(Ds)	Stack Diameter, inches	41.5	41.5	41.5	41.5
(Mf)	Total Formaldehyde, ug	1702	921	3947	2190
	CALCULATED DATA				
(Vmstd)	Standard Meter Volume, dscf	39.612	40.034	40.340	39.995
(Ps)	Stack Pressure, inches Hg	30.13	30.13	30.07	30.11
(%Bws)	Moisture (from impingers), %	15.9	14.4	15.9	15.4
(%Bws)	Moisture (at saturation), %	54.0	52.3	54.6	53.6
(Ms)	Molecular Weight-wet, lb/lb-mole	27.4	27.6	27.4	27.5
(Vs)	Velocity, ft/s	78.1	78.3	79.2	78.5
(As)	Stack Area, sq ft	9.39	9.39	9.39	9.39
(Qa)	Volumetric flow, acfm	4.40E+04	4.41E+04	4.46E+04	4.43E+04
(Qs)	Volumetric flow, dscfm	3.06E+04	3.13E+04	3.09E+04	3.09E+04
(I)	Isokinetic Rate, %	96.8	95.6	97.4	96.6
(Cf)	**Formaldehyde Concentration, ug/dscf**	**43.0**	**23.0**	**97.8**	**54.6**
(Cppm)	**Formaldehyde Concentration, ppm**	**1.22**	**0.65**	**2.77**	**1.54**
(ER)	**Formaldehyde Emission Rate, lb/hr**	**0.17**	**0.10**	**0.40**	**0.22**

TABLE 2.3.3
DRYER STACK #3
FORMALDEHYDE TEST SUMMARY
LOUISIANA PACIFIC - SILSBEE, TEXAS

SYMBOL	PARAMETER	RUN 1 03/02/92 0909-1025	RUN 2 03/02/92 1118-1235	* RUN 4 03/06/92 1011-1117	AVERAGE
	MEASURED DATA				
(Y)	Meter Box Y	0.999	0.999	0.999	0.999
	Avg Delta H, inches H2O	1.60	1.68	1.65	1.64
(Bp)	Barometric Pressure, inches Hg	30.19	30.19	29.92	30.10
(Vm)	Meter Volume, cf	40.217	39.442	41.290	40.316
(Tm)	Avg Meter Temp, deg F	77.0	87.7	87.1	83.9
(Pg)	Static Pressure, inches H2O	-0.75	-0.75	-0.75	-0.75
(Ts)	Avg Stack Temp, deg F	177.0	179.0	175.0	177.0
(Vlc)	Water Collected, ml	165.4	155.1	163.2	161.2
(CO2)	Carbon dioxide, %	2.0	2.0	2.0	2.0
(O2)	Oxygen, %	19.0	19.0	19.0	19.0
	Avg Sqrt Delta P, (inches H2O) ^ 1/2	1.218	1.233	1.244	1.23
(0)	Sample Time, min	60	60	60	60
(Dn)	Nozzle Diameter, inches	0.196	0.196	0.196	0.196
(Ds)	Stack Diameter, inches	41.5	41.5	41.5	41.5
(Mf)	Total Formaldehyde, ug	5291	3804	2460	3852
	CALCULATED DATA				
(Vmstd)	Standard Meter Volume, dscf	39.999	38.470	39.954	39.474
(Ps)	Stack Pressure, inches Hg	30.13	30.13	29.86	30.04
(%Bws)	Moisture (from impingers), %	16.3	16.0	16.1	16.1
(%Bws)	Moisture (at saturation), %	47.3	49.5	45.6	47.5
(Ms)	Molecular Weight-wet, lb/lb-mole	27.3	27.3	27.3	27.3
(Vs)	Velocity, ft/s	77.0	78.0	78.9	77.9
(As)	Stack Area, sq ft	9.39	9.39	9.39	9.39
(Qa)	Volumetric flow, acfm	4.34E+04	4.40E+04	4.44E+04	4.39E+04
(Qs)	Volumetric flow, dscfm	3.03E+04	3.07E+04	3.09E+04	3.07E+04
(I)	Isokinetic Rate, %	98.6	93.5	96.6	96.2
(Cf)	**Formaldehyde Concentration, ug/dscf**	**132.3**	**98.9**	**61.6**	**97.6**
(Cppm)	**Formaldehyde Concentration, ppm**	**3.74**	**2.80**	**1.74**	**2.76**
(ER)	**Formaldehyde Emission Rate, lb/hr**	**0.53**	**0.40**	**0.25**	**0.39**

* Run 3 sample was broken; Run 4 was performed to repeat the test

TABLE 2.3.4
DRYER STACK #4
FORMALDEHYDE TEST SUMMARY
LOUISIANA PACIFIC - SILSBEE, TEXAS

SYMBOL	PARAMETER	RUN 1 03/05/92 1420-1522	RUN 2 03/05/92 1700-1804	RUN 3 03/06/92 0822-0927	AVERAGE
	MEASURED DATA				
(Y)	Meter Box Y	0.999	0.999	0.999	0.999
	Avg Delta H, inches H2O	1.68	1.62	1.80	1.70
(Bp)	Barometric Pressure, inches Hg	29.88	29.88	29.92	29.89
(Vm)	Meter Volume, cf	41.527	40.613	41.846	41.329
(Tm)	Avg Meter Temp, deg F	85.4	86.1	81.0	84.2
(Pg)	Static Pressure, inches H2O	-0.75	-0.75	-0.75	-0.75
(Ts)	Avg Stack Temp, deg F	170.1	169.0	175.0	171.4
(Vlc)	Water Collected, ml	187.0	188.5	183.8	186.4
(CO2)	Carbon dioxide, %	1.0	1.0	1.0	1.0
(O2)	Oxygen, %	19.5	19.5	19.5	19.5
	Avg Sqrt Delta P, (inches H2O) ^ 1/2	1.253	1.232	1.285	1.26
(0)	Sample Time, min	60	60	60	60
(Dn)	Nozzle Diameter, inches	0.196	0.196	0.196	0.196
(Ds)	Stack Diameter, inches	41.5	41.5	41.5	41.5
(Mf)	Total Formaldehyde, ug	3632	5491	5634	4919
	CALCULATED DATA				
(Vmstd)	Standard Meter Volume, dscf	40.257	39.316	40.964	40.179
(Ps)	Stack Pressure, inches Hg	29.82	29.82	29.86	29.84
(%Bws)	Moisture (from impingers), %	17.9	18.4	17.4	17.9
(%Bws)	Moisture (at saturation), %	40.9	39.8	45.6	42.1
(Ms)	Molecular Weight-wet, lb/lb-mole	27.0	26.9	27.0	27.0
(Vs)	Velocity, ft/s	79.6	78.3	81.9	79.9
(As)	Stack Area, sq ft	9.39	9.39	9.39	9.39
(Qa)	Volumetric flow, acfm	4.49E+04	4.41E+04	4.61E+04	4.51E+04
(Qs)	Volumetric flow, dscfm	3.07E+04	3.01E+04	3.16E+04	3.08E+04
(I)	Isokinetic Rate, %	97.8	97.6	96.9	97.4
(Cf)	**Formaldehyde Concentration, ug/dscf**	**90.2**	**139.7**	**137.5**	**122.5**
(Cppm)	**Formaldehyde Concentration, ppm**	**2.55**	**3.95**	**3.89**	**3.46**
(ER)	**Formaldehyde Emission Rate, lb/hr**	**0.37**	**0.56**	**0.58**	**0.50**

TABLE 2.3.5
DRYER STACK #5
FORMALDEHYDE TEST SUMMARY
LOUISIANA PACIFIC - SILSBEE, TEXAS

SYMBOL	PARAMETER	RUN 1 03/05/92 0917-1021	RUN 2 03/05/92 1111-1216	RUN 3 03/05/92 1245-1350	AVERAGE
	MEASURED DATA				
(Y)	Meter Box Y	0.999	0.999	0.999	0.999
	Avg Delta H, inches H2O	1.60	1.59	1.60	1.60
(Bp)	Barometric Pressure, inches Hg	29.88	29.88	29.88	29.88
(Vm)	Meter Volume, cf	40.730	41.002	41.260	40.997
(Tm)	Avg Meter Temp, deg F	83.0	84.0	89.6	85.5
(Pg)	Static Pressure, inches H2O	-0.75	-0.75	-0.75	-0.75
(Ts)	Avg Stack Temp, deg F	168.0	166.6	168.2	167.6
(Vlc)	Water Collected, ml	163.2	161.6	159.0	161.3
(CO2)	Carbon dioxide, %	1.0	1.0	1.0	1.0
(O2)	Oxygen, %	20.0	20.0	20.0	20.0
	Avg Sqrt Delta P, (inches H2O) ^ 1/2	1.236	1.241	1.261	1.25
(0)	Sample Time, min	60	60	60	60
(Dn)	Nozzle Diameter, inches	0.196	0.196	0.196	0.196
(Ds)	Stack Diameter, inches	41.5	41.5	41.5	41.5
(Mf)	Total Formaldehyde, ug	3318	3489	3260	3356
	CALCULATED DATA				
(Vmstd)	Standard Meter Volume, dscf	39.652	39.845	39.686	39.728
(Ps)	Stack Pressure, inches Hg	29.82	29.82	29.82	29.82
(%Bws)	Moisture (from impingers), %	16.2	16.0	15.9	16.0
(%Bws)	Moisture (at saturation), %	38.9	37.7	39.1	38.6
(Ms)	Molecular Weight-wet, lb/lb-mole	27.2	27.2	27.2	27.2
(Vs)	Velocity, ft/s	78.1	78.3	79.6	78.7
(As)	Stack Area, sq ft	9.39	9.39	9.39	9.39
(Qa)	Volumetric flow, acfm	4.40E+04	4.41E+04	4.49E+04	4.44E+04
(Qs)	Volumetric flow, dscfm	3.09E+04	3.11E+04	3.16E+04	3.12E+04
(I)	Isokinetic Rate, %	95.9	95.7	93.8	95.1
(Cf)	**Formaldehyde Concentration, ug/dscf**	**83.7**	**87.6**	**82.1**	**84.5**
(Cppm)	**Formaldehyde Concentration, ppm**	**2.37**	**2.48**	**2.32**	**2.39**
(ER)	**Formaldehyde Emission Rate, lb/hr**	**0.34**	**0.36**	**0.34**	**0.35**

SECTION 3

PROCESS DESCRIPTION

Louisiana Pacific Corporation's Kirby Forest Industries subsidiary operates an Oriented Strand Board (OSB) production line in Silsbee, Texas. Southern yellow pines are locally harvested and delivered to the plant, where they are debarked and shredded (or "waferized") into wood chips. These wood wafer chips are conveyed into the dryer building and dried in rotary dryers to a predetermined moisture level. The dryers are fired by wood scraps and/or fuel oil. The moisture laden gas from the dryers is channeled through multi-cyclones to remove particulate matter and exhausted to the atmosphere through the dryer stacks which extend through the roof line. After removal from the dryers, the wood chips are spread on a wide conveyor belt to a preset height, soaked with a resin glue and formed into strand board by the press machine using heat and pressure. The press process at this plant is operated in the batch mode.

After a preset time interval the press machine then releases the completed strand board which is sent down the production line to the trim saws. Fumes from the press area are vented from the building by the press vent axial fans located on the roof. Short (~4 feet) stacks sit above the vent fans. The press area is vented by a total of 5 vent stacks.

SECTION 4

SAMPLING AND ANALYTICAL PROCEDURES

All sampling procedures used in this formaldehyde testing are contained in Boilers and Industrial Furnaces Test Method 0011 and EPA 40 CFR Part 60, Appendix A. Table 4.1 lists the test parameters, sampling method citations, and corresponding analytical instrumentation. Figure 4-1 shows a diagram of the sampling train.

Analysis of the recovered samples for formaldehyde was performed by Mercury Research Laboratories using the procedures outlined in BIF Method 0011.

4.1 Sample Collection

The sampling port locations on the dryer stacks met all EPA Method 1 (Sample Velocity Traverses) criteria. The number of sample points and sampling point locations were determined according to EPA Method 1. Due to access problems in sampling the press exhaust vents, test points were chosen that did not meet the Method 1 criteria. Approval was obtained from the EPA prior to sampling these locations. Sample points are listed in Appendices C and D.

A preliminary velocity traverse was used to set up parameters for the first isokinetic test run. EPA Method 2 (Stack Gas Velocity and Volumetric Flow Rate) procedures were followed during each test run to measure stack gas velocity head or Δp. A Type-S pitot tube was used in conjunction with an inclined oil gauge manometer to measure the individual Δp's at each sample point.

A Fyrite analyzer was used to determine the oxygen and carbon dioxide concentrations from the Dryer Stacks. A Fyrite analyzer was also used to confirm the presence of ambient concentrations of oxygen and carbon dioxide from the press vents. Stack gas moisture content was measured using EPA Method 4 (Moisture Content of Stack Gases) procedures as part of the isokinetic test runs.

Formaldehyde concentrations in the stack gas were determined using EPA Method 5 (Determination of Particulate Emissions from Stationary Sources) and BIF Method 0011 procedures. The stack sample was withdrawn isokinetically from the source with emissions collecting in the heated probe and in a series of chilled impingers. The probe was glass coupled to a glass nozzle with a 5/8" Teflon union. No silicon grease was used on any of the connecting glassware. Initial and final leak check rates, recovery data, and all train operation parameters for each test run were recorded on the field data sheets in Appendix B.

Impingers one and two each contained 100 ml of aqueous acidic 2,4-dinitrophenyl-hydrazine (DNPH). Formaldehyde present in the emissions reacts with the 2,4-dinitrophenyl-hydrazine to form the formaldehyde dinitrophenylhydrazone derivative. The dinitrophenylhydrazone derivative is extracted, solvent-exchanged, concentrated, and then analyzed by high performance

TABLE 4-1
SUMMARY OF TEST PROCEDURES

PARAMETER	SAMPLING METHOD	ANALYTICAL INSTRUMENT
Volumetric Flow	EPA 40 CFR Part 60 App A Method 2	Pitot Tube/Inclined Manometer
Oxygen	EPA 40 CFR Part 60 App A Method 3	Fyrite Analyzer
Carbon Dioxide	EPA 40 CFR Part 60 App A Method 3	Fyrite Analyzer
Moisture	EPA 40 CFR Part 60 App A Method 4	Analytical Balance (+/- 0.1 g)
Formaldehyde	BIF Method 0011	HPLC

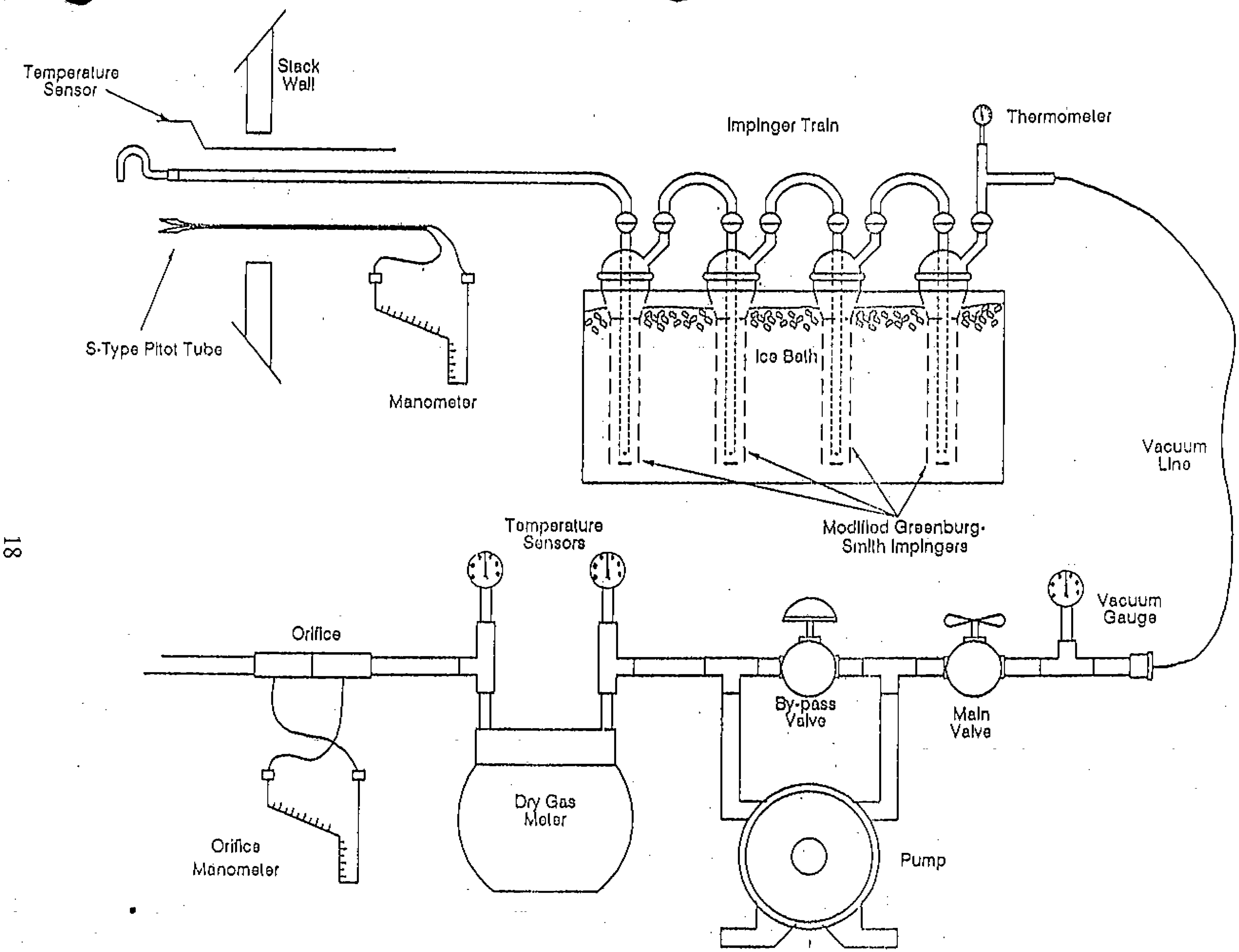


FIGURE 4-1 FORMALDEHYDE SAMPLING TRAIN

4.2 Sample Recovery Procedure

Upon completion of the sample run for formaldehyde, the train was carefully removed from the stack, leak-checked, and moved to the clean-up area. The probe and connecting glassware were rinsed with methylene chloride and distilled water. The probe was scrubbed with a teflon brush and then rinsed with methylene chloride while being rotated to insure complete sample collection. This rinse was captured in a flask modified with a ball socket to prevent sample loss. The sample was then transferred to a uniquely identified glass sample container. The collection flask was then rinsed and combined with the sample rinse.

The impinger collection contents were volumetrically determined to calculate the moisture percentage. A rinse of the impingers was performed with methylene chloride and water to insure complete sample collection. Impingers and connecting glassware were washed until no remaining residue was visible. The impinger contents and rinses were combined with the probe rinse. The containers were sealed and liquid levels were marked for transportation to the laboratory. Representative blank samples of the DNPH solution, methylene chloride, and distilled water were prepared as a check against potential contamination.

4.3 Analytical Procedure

Analysis of the samples collected was in accordance to the procedures outlined in Method 0011A. This protocol is a high performance liquid chromatographic (HPLC) method optimized for the determination of formaldehyde in aqueous environmental matrices, including stack samples collected by Method 0011.

The entire sample train is extracted with methylene chloride and the methylene chloride extract is brought to a known volume. An aliquot of the extract is solvent exchanged and concentrated or diluted as necessary. The estimated minimum detection limit (MDL) for this procedure is 171 micrograms per liter (ug/L). The MDL is subject to matrix interferences common to the source being tested and the amount of sample used in the procedure.

The operating conditions for the HPLC as defined in the method are:

Column type	Reverse phase C18 column 250 nm x 4.6 mm, 5um particle size
Mobile phase	isocratic elution using methanol/water (75:25, v/v)
Flow rate	1.0 mL/minute
UV Detector	360 nm
Injection Volume	20 uL

The extraction is summarized as follows:

Measure the final volume of the sample prior to extraction. Pour the sample into a separatory funnel and drain the methylene chloride into a volumetric flask. Extract the aqueous solution with three aliquots of methylene chloride. Add the methylene chloride to the volumetric flask. Fill the flask to volume with methylene chloride. Mix well and remove an aliquot.

If high levels of formaldehyde are present, the sample can be diluted with mobile phase. The sample may also be concentrated if low levels are anticipated. Prior to the HPLC analysis, the sample must be solvent exchanged to methanol.

Standards are prepared from stock solutions at concentrations of 50, 20 and 10 ug/mL. Additional concentrations were prepared from these solutions at the following concentrations: 5, 0.5, 2, 0.2, 1 and 0.1 ug/mL. The calibration curve must be verified on each working day to demonstrate agreement within 10%.

Results of recovery, percentages, blanks, and spikes are included in Appendix E.

SECTION 5

QA/QC PROCEDURES AND RESULTS

The objective of a quality assurance/quality control (QA/QC) program is to assure that the precision and accuracy of all environmental data generated by IEA, Inc. are commensurate with data quality objectives (DQOs). DQOs are based on common understanding of the intended end use of the data, the measurement process, and the availability of resources. Once DQOs are established, formally or informally, QC protocol can be defined for the measurements.

The data quality objectives in this project are to obtain reasonably sound data from complex sampling locations. The final data users will be Louisiana Pacific Corporation and U.S. EPA.

The goal of a QA/QC program is that data generated and used for decision-making are scientifically sound, of known quality, and documented to be "in control." To accomplish this goal, standardized methods or procedures are used whenever possible. They must be validated for their intended use, rigorously followed, and data reported with quality indicators (precision, accuracy, completeness, etc.).

Two basic concepts used in a QC program are to:

1) Control errors, and
2) Verify that the entire S&A method is operating within acceptable performance limits.

Use of qualified personnel, reliable and well-maintained equipment, appropriate calibrations and standards, and close supervision of all operations are important components of the QC system. QC in this test program included the use and documentation of calibrated sampling and analytical instruments, use of EPA validated methods (EPA methods 1 - 5 and BIF 0011) adherence to established protocol, method blanks as a check against possible contamination, sample chain-of-custody documentation, and redundant data calculation with checking.

All of the equipment used calibrated according to procedures outlined in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, EPA-600/4-77-027b. Table 5.1 presents a summary of the equipment calibration results. Actual calibration data sheets are given in Appendix F.

5.1 Barometer

Daily barometric pressure values for the testing period were recorded from the National Weather Service observation from the nearest municipal airport in Beaumont, Texas (20 miles distant over flat terrain).

5.2 Probe Nozzle

The probe nozzles used in this test were calibrated initially by the manufacturer and thereafter by the field sampling crew by checking for dimension roundness. This was done by making three separate measurements using alternative inside diameters and calculating the average. A micrometer with a minimum tolerance of 0.001 inch was used. If a deviation of more than 0.004 inch is found between any measurements, the nozzle is either discarded or repaired and remeasured. Nozzle calibration sheets are presented in Appendix F.

5.3 Pitot Tubes

Each pitot tube used in sampling meets the design specifications for type-S pitot tubes in EPA method 2. Therefore in accordance with method 2 procedures, a baseline coefficient (C_p) of 0.84 is assigned to each pitot tube. Calibration at the manufacturer for pitot face-opening alignment included measuring the external tubing diameter (dimension D_t), the base-to-opening plane distance (dimensions P_a and P_b), and the face opening misalignment angles, with all terms as described in Figures 2-2 and 2-3 of EPA method 2. Pitot tubes were visually inspected at the completion of the test to insure structural integrity. Pitot tube inspection sheets are presented in Appendix F.

5.4 Calibration meter and Metering System

The dry gas metering system was initially calibrated by the manufacturer and thereafter by IEA. The calibration set-up for the dry gas metering system using the secondary reference meter in lieu of the wet test meter is given in Figure 5.5 of EPA Method 5. A leak check of the metering system before calibration was performed as shown in Figure 5.4 of EPA method 5. The metering system's pump is operated for 5 minutes at an orifice manometer setting of 0.5 inches H_2O to heat up the pump and system to stabilize the meter inlet and outlet temperature. Values for the orifice setting (delta H), volume (V_w), corresponding dry test meter volume (V_d), dry test meter inlet and outlet gas temperatures (t_{di} and t_{dn}), and time are recorded for the initial calibration. The ratio of the secondary reference meter to the dry test meter (gamma) and the orifice pressure differential that equates to 0.75 cfm at standard conditions (delta H@) are then calculated. A copy of the calibration is in Appendix F.

5.5 Post-Test Meter Calibration Check

Post-test meter calibrations were made on the dry gas meters used during the test to check their accuracy against the original pre-test calibration. This post-test calibration was made using the average orifice setting obtained during each test run and setting the vacuum at the maximum value obtained during each test run. These test runs were made against IEA's secondary reference dry gas meter which was calibrated against an EPA preliminary reference spirometer located in Research Triangle Park, NC . A copy of the calibration is in Appendix F.

5.6 Thermocouples and Digital Indicators

Thermocouples are calibrated by comparing them against an ASTM-3F mercury-in-glass thermometer at approximately 32°F (ice water), ambient temperature and approximately 212°F (boiling water). Each thermocouple is calibrated against temperature ranges to which it is typically exposed during test conditions, and they must agree within 1.5 percent (expressed in °R) of the reference thermometer though the entire calibration range.

Digital indicators are checked by introducing a series of millivolt signal strengths to the input and comparing the indicator reading with the actual signal strength. Acceptable calibration error must not exceed 0.5 percent when temperature are expressed in °R. Copies of the calibrations are presented in Appendix F.

5.7 Field Analytical Balance

The field analytical balance was calibrated by comparing its reading against NIST Class-P standard weights.

5.8 Blanks

Blanks and spiked blanks of Dinitrophenyl Hydrazine absorbing solution were prepared and analyzed along with the samples from the tests. This data is included with the analytical data in Appendix E.

5.9 Calibration Curves

Pre- and post-sample analysis calibration data for the instrumentation are provided by the laboratory. These are included in Appendix E.

APPENDIX A

SAMPLING FOR ALDEHYDE AND KETONE EMISSIONS FROM STATIONARY SOURCES (METHOD 0011)

3.5 Sampling for Aldehyde and Ketone Emissions from Stationary Sources (Method 0011)

3.5.1 Scope and Application

This method is applicable to the determination of Destruction and Removal Efficiency (DRE) of formaldehyde, CAS Registry number 50-00-0, and possibly other aldehydes and ketones from stationary sources as specified in the regulations. The methodology has been applied specifically to formaldehyde; however, many laboratories have extended the application to other aldehydes and ketones. Compounds derivatized with 2,4-dinitrophenyl-hydrazine can be detected as low as 6.4×10^{-8} lbs/cu ft (1.8 ppbv) in stack gas over a 1 hr sampling period, sampling approximately 45 cu ft.

3.5.2 Summary of Method

3.5.2.1 Gaseous and particulate pollutants are withdrawn isokinetically from an emission source and are collected in aqueous acidic 2,4-dinitrophenyl-hydrazine. Formaldehyde present in the emissions reacts with the 2,4-dinitrophenyl-hydrazine to form the formaldehyde dinitrophenylhydrazone derivative. The dinitrophenylhydrazone derivative is extracted, solvent-exchanged, concentrated, and then analyzed by high performance liquid chromatography.

3.5.3 Interferences

3.5.3.1 A decomposition product of 2,4-dinitrophenyl-hydrazine, 2,4-dinitroaniline, can be an analytical interferant if concentrations are high. 2,4-Dinitroaniline can coelute with 2,4-dinitrophenylhydrazone of formaldehyde under high performance liquid chromatography conditions, which may be used for the analysis. High concentrations of highly-oxygenated compounds, especially acetone, that have the same retention time or nearly the same retention time as the dinitrophenylhydrazone of formaldehyde, and that also absorb at 360 nm, will interfere with the analysis.

Formaldehyde, acetone, and 2,4-dinitroaniline contamination of the aqueous acidic 2,4-dinitrophenyl-hydrazine (DNPH) reagent is frequently encountered. The reagent must be prepared within five days of use in the field and must be stored in an uncontaminated environment both before and after sampling in order to minimize blank problems. Some concentration of acetone contamination is unavoidable, because acetone is ubiquitous in laboratory and field operations. However, the acetone contamination must be minimized.

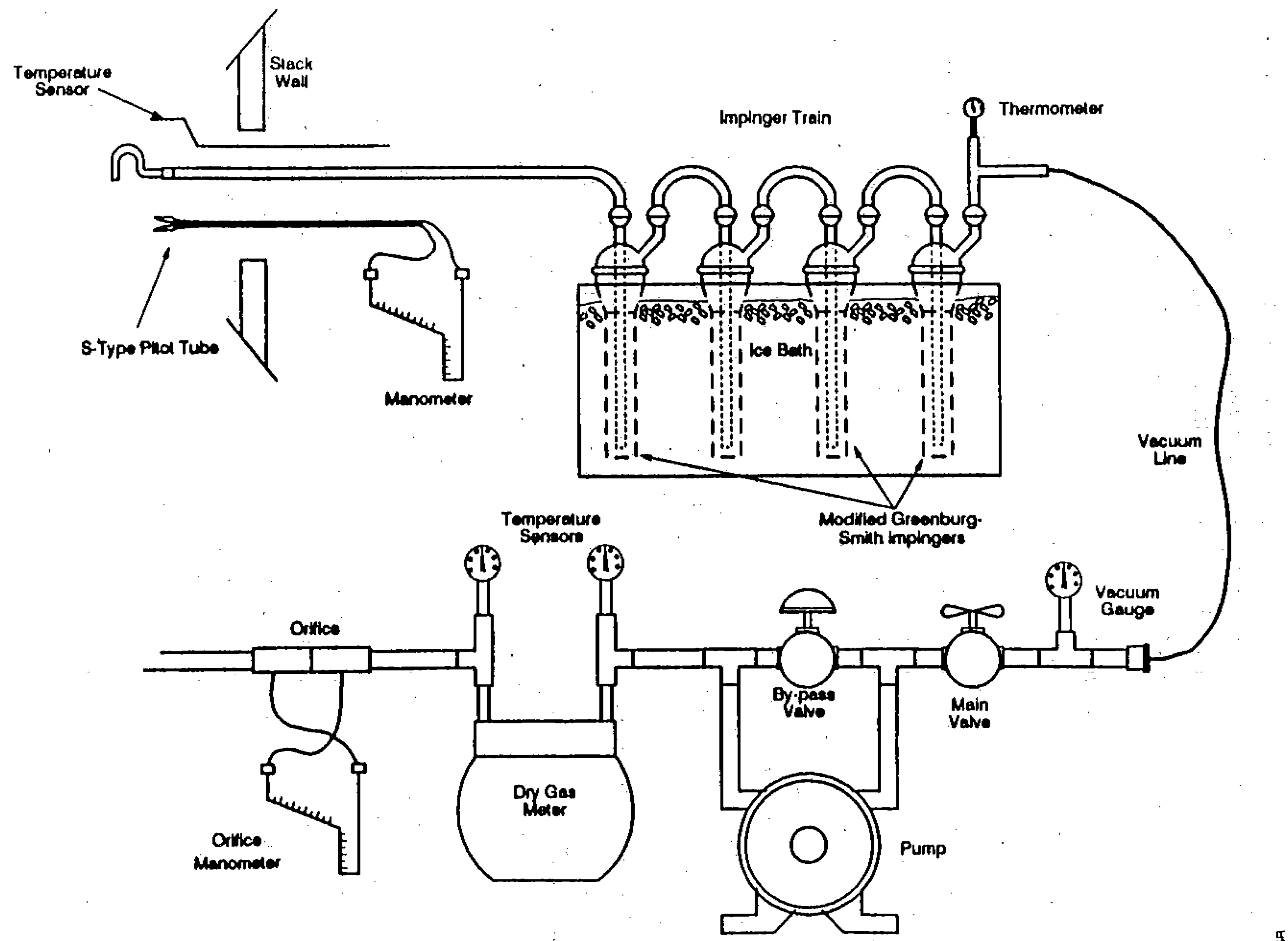
3.5.4 Apparatus and Materials

3.5.4.1 A schematic of the sampling train is shown in Figure 3.5-1. This sampling train configuration is adapted from EPA Method 4 procedures. The sampling train consists of the following components: Probe Nozzle, Pitot Tube, Differential Pressure Gauge, Metering System, Barometer, and Gas Density Determination Equipment.

3.5.4.1.1 Probe Nozzle: Quartz or glass with sharp, tapered (30° angle) leading edge. The taper shall be on the outside to preserve a constant inner diameter. The nozzle shall be buttonhook or elbow design. A range of nozzle sizes suitable for isokinetic sampling should be available in increments of 0.15 cm(1/16 in), e.g., 0.32 to 1.27 cm (1/8 to 1/2 in), of larger if higher volume sampling trains are used. Each nozzle shall be calibrated according to the procedures outlined in Section 3.5.8.1

3.5.4.1.2 Probe Liner: Borosilicate glass or quartz shall be used for the probe liner. The tester should not allow the temperature in the probe to exceed 120 $\pm$ 14°C (248 $\pm$ 25°F).

3.5.4.1.3 Pitot Tube: The Pitot tube shall be Type S, as described in Section 2.1 of EPA Method 2, or any other appropriate device. The pitot tube shall be attached to the probe to allow constant monitoring of the stack gas velocity. The impact (high pressure) opening plane of the pitot tube shall be even with or above the nozzle entry plan (see EPA Method 2, Figure 2-6b) during sampling. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in Section 4 of EPA Method 2.



Formaldehyde Sampling Train

Figure 3.5-1

3.5.4.1.4 Differential Pressure Gauge: The differential pressure gauge shall be an inclined manometer or equivalent device as described in Section 2.2 of EPA Method 2. One manometer shall be used for velocity-head reading and the other for orifice differential pressure readings.

3.5.4.1.5 Impingers: The sampling train requires a minimum of four impingers, connected as shown in Figure 3.5-1, with ground glass (or equivalent) vacuum-tight fittings. For the first, third, and fourth impingers, use the Greenburg-Smith design, modified by replacing the tip with a 1.3 cm inside diameter (1/2 in) glass tube extending to 1.3 cm (1/2 in) from the bottom of the flask. For the second impinger, use a Greenburg-Smith impinger with the standard tip. Place a thermometer capable of measuring temperature to within 1°C (2°F) at the outlet of the fourth impinger for monitoring purposes.

3.5.4.1.6 Metering System: The necessary components are a vacuum gauge, leak-free pump, thermometers capable of measuring temperature within 3°C (5.4°F), dry-gas meter capable of measuring volume to within 1%, and related equipment as shown in Figure 3.5-1. At a minimum, the pump should be capable of 4 cfm free flow, and the dry gas meter should have a recording capacity of 0-999.9 cu ft with a resolution of 0.005 cu ft. Other metering systems may be used which are capable of maintaining sample volumes to within 2%. The metering system may be used in conjunction with a pitot tube to enable checks of isokinetic sampling rates.

3.5.4.1.7 Barometer: The barometer may be mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in Hg). In many cases, the barometric reading may be obtained from a nearby National Weather Service Station, in which case the station value (which is the absolute barometric pressure) is requested and an adjustment for elevation differences between the weather station and sampling point is applied at a rate of minus 2.5 mm Hg (0.1 in Hg) per 30 m (100 ft) elevation increases (vice versa for elevation decrease).

3.5.4.1.8 Gas Density Determination Equipment: Temperature sensor and pressure gauge (as described in Sections 2.3 and 2.3 of EPA Method 2), and gas analyzer, if necessary (as described in EPA Method 3). The temperature sensor ideally should be permanently attached to the pitot tube or sampling probe in a fixed configuration such that the tip of the sensor extends beyond the leading edge of the probe sheath and does not touch any metal. Alternatively, the sensor may be attached just prior to use in the field. Note, however, that if the temperature sensor is attached in the field, the sensor must be placed in an interference-free arrangement with respect to the Type S pitot openings (see EPA Method 2, Figure 2-7). As a second alternative, if a difference of no more than 1% in the average velocity measurement is to be introduced, the temperature gauge need not be attached to the probe or pitot tube.

3.5.4.2 Sample Recovery

3.5.4.2.1 Probe Liner: Probe nozzle and brushes; Teflon bristle brushes with stainless steel wire handles are required. The probe brush shall have extensions of stainless steel, Teflon, or inert material at least as long as the probe. The brushes shall be properly sized and shaped to brush out the probe liner, the probe nozzle, and the impingers.

3.5.4.2.2 Wash Bottles: Three wash bottles are required. Teflon or glass wash bottles are recommended; polyethylene wash bottles should not be used because organic contaminants may be extracted by exposure to organic solvents used for sample recovery.

3.5.4.2.3 Graduate Cylinder and/or Balance: A graduated cylinder or balance is required to measure condensed water to the nearest 1 ml or 1 g. Graduated cylinders shall have division not >2 ml. Laboratory balances capable of weighing to $\pm$0.5 g are required.

3.5.4.2.4 Amber Glass Storage Containers: One-liter wide-mouth amber flint glass bottles with Teflon-lined caps are required to store impinger water samples. The bottles must be sealed with Teflon tape.

3.5.4.2.5 Rubber Policeman and Funnel: A rubber policeman and funnel are required to aid in the transfer of material into and out of containers in the field.

3.5.4.3 Reagent Preparation

3.5.4.3.1 Bottles/Caps: Amber 1- or 4-L bottles with Teflon-lined caps are required for storing cleaned DNPH solution. Additional 4-L bottles are required to collect waste organic solvents.

3.5.4.3.2 Large Glass Container: At least one large glass (8 to 16 L) is required for mixing the aqueous acidic DNPH solution.

3.5.4.3.3 Stir Plate/Large Stir Bars/Stir Bar Retriever: a magnetic stir plate and large stir bar are required for the mixing of aqueous acidic DNPH solution. A stir bar retriever is needed for removing the stir bar from the large container holding the DNPH solution.

3.5.4.3.4 Buchner Filter/Filter Flask/Filter Paper: A large filter flask (2-4 L) with a buchner filter, appropriate rubber stopper, filter paper, and connecting tubing are required for filtering the aqueous acidic DNPH solution prior to cleaning.

3.5.4.3.5 Separatory Funnel: At least one large separatory funnel (2 L) is required for cleaning the DNPH prior to use.

3.5.4.3.6 Beakers: Beakers (150 ml, 250 ml, and 400 ml) are useful for holding/measuring organic liquids when cleaning the aqueous acidic DNPH solution and for weighing DNPH crystals.

3.5.4.3.7 Funnels: At lease one large funnel is needed for pouring the aqueous acidic DNPH into the separator funnel.

3.5.4.3.8 Graduated Cylinders: At least one large graduated cylinder (1 to 2 L) is required for measuring organic-free reagent water and acid when preparing the DNPH solution.

3.5.4.3.9 Top-Loading Balance: A one-place top loading balance is needed for weighing out the DNPH crystals used to prepare the aqueous acidic DNPH solution.

3.5.4.3.10 Spatulas: Spatulas are needed for weighing out DNPH when preparing the aqueous DNPH solution.

3.5.4.4 Crushed Ice: Quantities ranging from 10-50 lb may be necessary during a sampling run, depending upon ambient temperature. Samples which have been taken must be stored and shipped cold; sufficient ice for this purpose must be allowed.

3.5.5 <u>Reagents</u>

3.5.5.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

3.5.5.2 Organic-free reagent water: All references to water in this method refer to organic-free reagent water, as defined in Chapter One.

3.5.5.3 Silica Gel: Silica gel shall be indicating type, 6-16 mesh. If the silica gel has been used previously, dry at 175°C (350°F) for 2 hours before using. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used.

3.5.5.4 2,4-dinitrophenylhydrazine (DNPH), $[2,4\text{-}(O_2N)_2C_6H_3]NHNH_2$ - The quantity of water may vary from 10 to 30%.

3.5.5.4.1 The 2,4-dinitrophenylhydrazine reagent must be prepared in the laboratory within five days of sampling use in the field. Preparation of DNPH can also be done in the field, with consideration of appropriate procedures required for safe handling of solvent in the field. When a container of prepared DNPH reagent is opened in the field, the contents of the opened container should be used within 48 hours. All laboratory glassware must be washed with detergent and water and rinsed with water, methanol, and methylene chloride prior to use.

NOTE: DNPH crystals or DNPH solution should be handled with plastic gloves at all times with prompt and extensive use of running water in case of skin exposure.

3.5.5.4.2 Preparation of Aqueous Acidic DNPH Derivatizing Reagent: Each batch of DNPH reagent should be prepared and purified within five days of sampling, according to the procedures described below.

NOTE: Reagent bottles for storage of cleaned DNPH derivatizing solution must be rinsed with acetonitrile and dried before use. Baked glassware is not essential for preparation of DNPH reagent. The glassware must not be rinsed with acetone or an unacceptable concentration of acetone contamination will be introduced. If field preparation of DNPH is performed, caution must be exercised in avoiding acetone contamination.

3.5.5.4.2.1 Place an 8 L container under a fume hood on a magnetic stirrer. Add a large stir bar and fill the container half full of organic-free reagent water. Save the empty bottle from the organic-free reagent water. Start the stirring bar and adjust the stir rate to be as fast as possible. Using a graduated cylinder, measure 1.4 Liters ~~ml~~ of concentrated hydrochloric acid. Slowly pour the acid into the stirring water. Fumes may be generated and the water may become warm. Weight the DNPH crystals on a one-place balance (see Table 3.5-1 for approximate amounts) and add to the stirring acid solution. Fill the 8-L container to the 8-L mark with organic-free reagent water and stir overnight. If all of the DNPH crystals have dissolved overnight, add additional DNPH and stir for two more hours. Continue the process of adding DNPH with additional stirring until a saturated solution has been formed. Filter the DNPH solution using vacuum filtration. Gravity filtration may be used, but a much longer time is required. Store the filtered solution in an amber bottle at room temperature.

3.5.5.4.2.2 Within five days of proposed use, place about 1.6 L of the DNPH reagent in a 2-L separatory funnel. Add approximately 200 ml of methylene chloride and stopper the funnel. Wrap the stopper of the funnel with paper towels to absorb any leakage. Invert and vent the funnel. Then shake vigorously for 3 minutes. Initially, the funnel should be vented frequently (every 10 -15 sec). After the layers have separated, discard the lower (organic) layer.

3.5.5.4.2.3 Extract the DNPH a second time with methylene chloride and finally with cyclohexane. When the cyclohexane layer has separated from the DNPH reagent,the cyclohexane layer will be the top layer in the separatory funnel. Drain the lower layer (the cleaned extract DNPH reagent solution) into an amber bottle that has been rinsed with acetonitrile and allowed to dry.

3.5.5.4.3 Quality Control: Take two aliquots of the extracted DNPH reagent. The size of the aliquots is dependent upon the exact sampling procedure used, but 100 ml is reasonably representative. To ensure that the background in the reagent is acceptable for field use, analyze one aliquot of the reagent according to the procedure of Method 8315. Save the other aliquot of aqueous acidic DNPH for use as a method blank when the analysis is performed.

3.5.5.4.4 Shipment to the Field: Tightly cap the bottle containing extracted DNPH reagent using a Teflon-lined cap. Seal the bottle with Teflon

Table 3.5-1

APPROXMIATE AMOUNT OF CRYSTALLINE DNPH USED
TO PREPARE A SATURATED SOLUTION

Amount of Moisture in DNPH	Weight Required per 8 L of Solution
10 weight percent	31 g
15 weight percent	33 g
30 weight percent	40 g

Table 3.5-2

INSTRUMENT DETECTION LIMITS AND REAGENT CAPACITY
FOR FORMALDEHYDE ANALYSIS[1]

Analyte	Detection Limit, ppbv[2]	Reagent Capacity, ppmv
Formaldehyde	1.8	66
Acetaldehyde	1.7	70
Acrolein	1.5	75
Acetone/Propionaldehyde	1.5	75
Butyraldehyde	1.5	79
Methyl ethyl ketone	1.5	79
Valeraldehyde	1.5	84
Isovaleraldehyde	1.4	84
Hexaldehyde	1.3	88
Benzaldehyde	1.4	84
o-/m-/p-Tolualdehyde	1.3	89
Dimethylbenzaldehyde	1.2	93

[1]Oxygenated compounds in addition to formaldehyde are included for comparison with formaldehyde; extension of the methodology to other compounds is possible.

[2]Detection limits are determined in solvent. These values therefore represent the optimum capability of the methodology.

tape. After the bottle is labeled, the bottle may be placed in a friction-top can (paint can or equivalent) containing a 1-2 inch layer of granulated charcoal and stored at ambient temperature until use.

3.5.5.4.4.1 If the DNPH reagent has passed the Quality Control criteria, the reagent may be packaged to meet necessary shipping requirements and sent to the sampling area. If the Quality Control criteria are not met, the reagent solution may be re-extracted or the solution may be re-prepared and the extraction sequence repeated.

3.5.5.4.4.2 If the DNPH reagent is not used in the field within five days of extraction, an aliquot may be taken and analyzed as described in Method 0011A. If the reagent meets the Quality Control requirements, the reagent may be used. If the reagent does not meet the Quality Control requirements, the reagent must be discarded and new reagent must be prepared and tested.

3.5.5.4.5 Calculation of Acceptable Concentrations of Impurities in DNPH Reagent: The acceptable impurity concentration (AIC, μg/ml) is calculated from the expected analyte concentration in the sampled gas (EAC, ppbv), the volume of air that will be sampled at standard conditions (SVOL, L), the formula weight of the analyte (FW, g/mol), and the volume of DNPH reagent that will be used in the impingers (RVOL, ml):

$$AIC = 0.1 \times [EAC \times SVOL \times FW/22.4 \times (FW + 180)/FW](RVOL \times 1,000)$$

where:

0.1 is the acceptable contaminant concentration,
22.4 is a factor relating ppbv to g/L,
180 is a facto relating underivatized to derivatized analyte
1,000 is a unit conversion factor.

3.5.5.4.6 Disposal of Excess DNPH Reagent: Excess DNPH reagent may be returned to the laboratory and recycled or treated as aqueous waste for disposal purposes. 2,4-dinitrophenylhydrazine is a flammable solid when dry, so water should not be evaporated from the solution of the reagent.

3.5.5.5 Field Spike Standard Preparation: To prepare a formaldehyde field spiking standard at 4.01 mg/ml, use a 500 μl syringe to transfer 0.5 ml to 37% by weight of formaldehyde (401 mg/ml) to a 50 ml volumetric flask containing approximately 50 ml of methanol. Dilute to 50 ml with methanol.

3.5.5.6 Hydrochloric Acid, HCL: Reagent grade hydrochloric acid (approximately 12N) is required for acidifying the aqueous DNPH solution.

3.5.5.7 Methylene Chloride, CH_2Cl_2: Methylene chloride (suitable for residue and pesticide analysis, GC/MS, HPLC, GC, Spectrophotometry or equivalent) is required for cleaning the aqueous acidic DNPH solution, rinsing glassware, and recovery of sample trains.

3.5.5.8 Cyclohexane, C_6H_{12}: Cyclohexane (HPLC grade) is required for cleaning the aqueous acidic DNPH solution.

NOTE: Do not use spectroanalyzed grades of cyclohexane if this sampling methodology is extended to aldehydes and ketones with four or more carbon atoms.

3.5.5.9 Methanol, CH_3OH: Methanol (HPLC grade or equivalent) is required for rinsing glassware.

3.5.5.10 Acetcnitrile, CH_3CN: Acetonitrile (HPLC grade or equivalent) is required for rinsing glassware.

3.5.5.11 Formaldehyde, HCHO: Analytical grade or equivalent formaldehyde is required for preparation of standards. If other aldehydes or ketones are used, analytical grade or equivalent is required.

3.5.6 Sample Collection, Preservation, and Handling

3.5.6.1 Because of the complexity of this method, field personnel should be trained in and experienced with the test procedures in order to obtain reliable results.

3.5.6.2 Laboratory Preparation:

3.5.6.2.1 All the components shall be maintained and calibrated according to the procedure described in APTD-0576, unless otherwise specified.

3.5.6.2.2 Weigh several 200 to 300 g portions of silica gel in airtight containers to the nearest 0.5 g. Record on each container the total weight of the silica gel plus containers. As an alternative to preweighing the silica gel, it may instead be weighed directly in the impinger or sampling holder just prior to train assembly.

3.5.6.3 Preliminary Field Determinations:

3.5.6.3.1 Select the sampling site and the minimum number of sampling point according to EPA Method 1 or other relevant criteria. Determine the stack pressure, temperature, and range of velocity heads using EPA Method 2. A leak-check of the pitot lines according to EPA Method 2, Section 3.1, must be performed. Determine the stack gas moisture content using EPA Approximation Method 4 or its alternatives to establish estimates of isokinetic sampling-rate settings. Determine the stack gas dry molecular weight, as described in EPA Method 2, Section 3.6. If integrated EPA Method 3 sampling is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the sample run.

3.5.6.3.2 Select a nozzle size based on the range of velocity heads so that is not necessary to change the nozzle size in order to maintain isokinetic sampling rates below 28 L/min (1.0 cfm). During the run, do not change the nozzle. Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see Section 2.2. of EPA Method 2).

3.5.6.3.3 Select a suitable probe liner and probe length so that all traverse points can be sampled. For large stacks, to reduce the length of the probe, consider sampling from opposite sides of the stack.

3.5.6.3.4 A minimum of 45 ft^3 of sample volume is required for the determination of the Destruction and Removal Efficiency (DRE) of formaldehyde from incineration systems (45 ft^3 is equivalent to one hour of sampling at 0.75 dscf). Additional sample volume shall be collected as necessitated by the capacity of the DNPH reagent and analytical detection limit constraints. To determine the minimum sample volume required, refer to sample calculations in Section 10.

3.5.6.3.5 Determine the total length of sampling time needed to obtain the identified minimum volume by comparing the anticipated average sampling rate with the volume requirement. Allocate the same time to all traverse points defined by EPA Method 1. To avoid timekeeping errors, the length of time sampled at each traverse point should be an integer or an integer plus 0.5 min.

3.5.6.3.6 In some circumstances (e.g., batch cycles) it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas-volume samples. In these cases, careful documentation must be maintained in order to allow accurate calculation of concentrations.

3.5.6.4 Preparation of Collection Train:

3.5.6.4.1 During preparation and assembly of the sampling train, keep all openings where contamination can occur covered with Teflon film or aluminum foil until just prior to assembly or until sampling is about to begin.

3.5.6.4.2 Place 100 ml of cleaned DNPH solution in each of the first two impingers, and leave the third impinger empty. If additional capacity is required for high expected concentrations of formaldehyde in the stack gas, 200 ml of DNPH per impinger may be used or additional impingers may be used for sampling. Transfer approximately 200 to 300 g of pre-weighed silica gel from its container to the fourth impinger. Care should be taken to ensure that the silica gel is not entrained and carried out from the impinger during sampling. Place the silica gel container in a clean place or later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

3.5.6.4.3 With a glass or quartz liner, install the selected nozzle using a Viton-A O-ring with stack temperatures are <260°C (500°F) and a woven glass-fiber gasket when temperatures are higher. See APTD-0576 (Rom, 1972) for details. Other connection systems utilizing either 316 stainless steel or Teflon ferrules may be used. Mark the probe with heat-resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

3.5.6.4.4 Assemble the train as shown in Figure 3.5-1. During assembly, do not use any silicone grease on ground-glass joints upstream of the impingers. Use Teflon tape, if required. A very light coating of silicone grease may be used on ground-glass joints downstream of the impingers, but the silicone grease should be limited to the outer portion (see APTD-0576) of the ground-glass joints to minimize silicone grease contamination. If necessary, Teflon tape may be used to seal leaks. Connect all temperature sensors to an appropriate potentiometer/display unit. Check all temperature sensors at ambient temperatures.

3.5.6.4.5 Place crushed ice all around the impingers.

3.5.6.4.6 Turn on and set the probe heating system at the desired operating temperature. Allow time for the temperature to stabilize.

3.5.6.5 Leak-Check Procedures:

3.5.6.5.1 Pre-test Leak Check

3.5.6.5.1.1 After the sampling train has been assembled, turn on and set the probe heating system at the desired operating temperature. Allow time for the temperature to stabilize. If a Viton-A O-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak check the train at the sampling site by plugging the nozzle and pulling a 381 mm Hg (15 in Hg) vacuum.

NOTE: A lower vacuum may be used, provided that the lower vacuum is not exceeded during the test.

3.5.6.5.1.2 If an asbestos string is used, do not connect the probe to the train during the leak check. Instead, leak-check the train by first attaching a carbon-filled leak check impinger to the inlet and then plugging the inlet and pulling a 381 mm Hg (15 in Hg) vacuum. (A lower vacuum any be used if this lower vacuum is not exceeded during the test.) Next connect the probe to the train and leak-check at about 25 mm Hg (1 in Hg) vacuum. Alternatively, leak-check the probe with the rest of the sampling train in one step at 381 mm Hg (15 in Hg) vacuum. Leakage rates in excess of (a) 4% of the average sampling rate or (b) >0.00057 m^3/min (0.02 cfm), are unacceptable.

3.5.6.5.1.3 The following leak check instructions for the sampling train descried in ADPT-0576 and APTD-0581 may be helpful. Start the pump with the fine-adjust valve fully open and coarse-valve completely closed. Partially open the coarse-adjust valve and slowly close the fine-adjust valve until the desired vacuum is reached. Do <u>not</u> reverse direction of the fine-adjust valve, as liquid will back up into the train. If the desired vacuum is exceeded, either perform the leak check at this higher vacuum or end the leak check, as shown below, and start over.

3.5.6.5.1.4 When the leak check is completed, first slowly remove the plug from the inlet to the probe. When the vacuum drops to 127 mm (5 in) Hg or less, immediately close the coarse-adjust valve. Switch off the pumping system and reopen the fine-adjust valve. Do not reopen the fine-adjust valve until the coarse-adjust valve has been closed to prevent the liquid in the impingers from being forced backward in the sampling line and silica gel from being entrained backward into the third impinger.

3.5.6.5.2 Leak Checks During Sampling Run:

3.5.6.5.2.1 If, during the sampling run, a component change (i.e., impinger) becomes necessary, a leak check shall be conducted immediately after the interruption of sampling and before the change is made. The leak check shall be done according to the procedure described in Section 3.5.6.5.1, except that is shall be done at a vacuum greater than or equal to the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm or 4% of the average sampling rate (whichever is less), the results are acceptable. If a higher leakage rate is obtained, the tester must void the sampling run.

NOTE: Any correction of the sample volume by calculation reduces the integrity of the pollutant concentration data generated and must be avoided.

3.5.6.5.2.2 Immediately after a component change and before sampling is reinitiated, a leak check similar to a pre-test leak check must also be conducted.

3.5.6.5.3 Post-test Leak Check:

3.5.6.5.3.1 A leak check is mandatory at the conclusion of each sampling run. The leak check shall be done with the same procedures as the pre-test leak check, except that the post-test leak check shall be conducted at a vacuum greater than or equal to the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057

m^3/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable. If, however, a higher leakage rate is obtained, the tester shall record the leakage rate and void the sampling run.

3.5.6.6 Sampling Train Operation:

3.5.6.6.1 During the sampling run, maintain an isokinetic sampling rate to within 10% of true isokinetic, below 20 L/min (1.0 cfm). Maintain a temperature around the probe of 120°C (248° ± 25°F).

3.5.6.6.2 For each run, record the data on a data sheet such as the one shown in Figure 3.5-2. Be sure to record the initial dry-gas meter reading. Record the dry-gas meter readings at the beginning and end of each sampling time increment, when changes in flow rates are made, before and after each leak check, and when sampling is halted. Take other readings required by Figure 2 at least once at each sample point during each time increment and additional readings when significant adjustments 20% variation in velocity head readings) necessitate additional adjustments in flow rate. Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

3.5.6.6.3 Clean the stack access ports prior to the test run to eliminate the change of sampling deposited material. To begin sampling, remove the nozzle cap, verify that the filter and probe heating systems are at the specified temperature, and verify that the pitot tube and probe are properly positioned. Position the nozzle at the first traverse point, with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs, which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations, are available. These nomographs are designed for use when the Type S pitot tube coefficient is 0.84 ± 0.02 and the stack gas equivalent density (dry molecular weight) is equal to 29 ± 4. APTD-0576 details the procedure for using the nomographs. If the stack gas molecular weight and the pitot tube coefficient are outside the above ranges, do not use the nomographs unless appropriate steps are taken to compensate for the deviations.

Plant ______________________

Location ______________________

Operator ______________________

Date ______________________

Run No. ______________________

Sample Box No. ______________________

Meter Box No. ______________________

Meter H@ ______________________

C Factor ______________________

Pitot Tube Coefficient C_p ______________________

Schematic of Stack Cross Section

Ambient Temperature ______________________

Barometric Pressure ______________________

Assumed Moisture % ______________________

Probe Length, m(ft) ______________________

Nozzle Identification No. ______________________

Average Calibrated Nozzle Diameter, cm (in) ______________________

Probe Heating Setting ______________________

Leak Rate, m^3/min. (cfm) ______________________

Probe Liner Material ______________________

Static Pressure, mm Hg (in. Hg) ______________________

Filter No. ______________________

Traverse Point Number	Sampling Time (θ) Min.	Vacuum mm Hg (in. Hg)	Stack Temperature (T_s) °C (°F)	Velocity Head (P_s) mm (in) H_2O	Pressure Differential Across Orifice Meter mm (H_2O) (in H_2O)	Gas Sample Volume m^3 (ft^3)	Gas Sample Temp. at Dry Gas Meter		Filter Holder Temperature °C(°F)	Temperature of Gas Leaving Last Impinger °C(°F)
							Inlet °C(°F)	Outlet °C(°F)		
Total							Avg.	Avg.		
Average										

3404345R

Figure 3.5-2 Field Data Sheet

3.5.6.6.4 When the stack is under significant negative pressure (equivalent to the height of the impinger stem), take care to close the coarse-adjust valve before inserting the probe into the stack in order to prevent liquid from backing up through the train. If necessary, the pump may be turned on with the coarse-adjust valve closed.

3.5.6.6.5 When the probe is in position, block off the openings around the probe and stack access port to prevent unrepresentative dilution of the gas stream.

3.5.6.6.6 Traverse the stack cross section, as required by EPA Method 1, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe through the access port, in order to minimize the chance of extracting deposited material.

3.5.6.6.7 During the test run, make periodic adjustments to keep the temperature around the probe at the proper levels. Add more ice and, if necessary, salt, to maintain a temperature of <20°C (68°F) at the silica gel outlet. Also, periodically check the level and zero of the manometer.

3.5.6.6.8 A single train shall be used for the entire sampling run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or in cases where equipment failure necessitates a change of trains. An additional train or additional trains may also be used for sampling when the capacity of a single train is exceeded.

3.5.6.6.9 When two or more trains are used, separate analyses of components from each train shall be performed. If multiple trains have been used because the capacity of a single train would be exceeded, first impingers from each train may be combined, and second impingers from each train may be combined.

3.5.6.6.10 At the end of the sampling run, turn off the coarse-adjust valve, remove the probe and nozzle from the stack, turn off the pump, record the final dry gas meter reading, and conduct a post-test leak check. Also, leak check the pitot lines as described in EPA Method 2. The lines must pass this leak check in order to validate the velocity-head data.

3.5.6.6.11 Calculate percent isokineticity (see Method 2) to determine whether the run was valid or another test should be made.

3.5.7 Sample Recovery

3.5.7.1 Preparation:

3.5.7.1.1 Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool. When the probe can be handled safely, wipe off all external particulate matter near the tip of the probe nozzle and place a cap over the tip to prevent losing or gaining particulate matter. Do not cap the probe tip tightly while the sampling train is cooling because a vacuum will be created, drawing liquid from the impingers back through the sampling train.

3.5.7.1.2 Before moving the sampling train to the cleanup site, remove the probe from the sampling train and cap the open outlet, being careful not to lose any condensate that might be present. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used, let any condensed water or liquid drain into the impingers. Cap off any open impinger inlets and outlets. Ground glass stoppers, Teflon caps or caps of other inert materials may be used to seal all openings.

3.5.7.1.3 Transfer the probe and impinger assembly to an area that is clean and protected from wind so that the chances of contaminating or losing the sample are minimized.

3.5.7.1.4 Inspect the train before and during disassembly, and note any abnormal conditions.

3.5.7.1.5 Save a portion of all washing solution (methylene chloride, water) used for cleanup as a blank. Transfer 200 ml of each solution directly from the wash bottle being used and place each in a separate, prelabeled sample container.

3.5.7.2 Sample Containers:

3.5.7.2.1 Container 1: Probe and Impinger Catches. Using a graduated cylinder, measure to the nearest ml, and record the volume of the solution in the first three impingers. Alternatively, the solution may be weighed to the nearest 0.5 g. Include any condensate in the probe in this determination. Transfer the impinger solution from the graduated cylinder into the amber flint glass bottle. Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, clean all surfaces to which the sample is exposed (including the probe nozzle, probe fitting, probe liner, first impinger, and impinger connector) with methylene chloride. Use less than 500 ml for the entire wash (250 ml would be better, if possible). Add the washing to the sample container.

3.5.7.2.1.1 Carefully remove the probe nozzle and rinse the inside surface with methylene chloride from a wash bottle. Brush with a Teflon bristle brush, and rinse until the rinse shows no visible particles or yellow color, after which make a final rinse of the inside surface. Brush and rinse the inside parts of the Swagelok fitting with methylene chloride in a similar way.

3.5.7.2.1.2 Rinse the probe liner with methylene chloride. While squirting the methylene chloride into the upper end of the probe, tilt and rotate the probe so that all inside surfaces will be wetted with methylene chloride. Let the methylene chloride drain from the lower end into the sample container. The tester may use a funnel (glass or polyethylene) to aid in transferring the liquid washes to the container. Follow the rinse with a Teflon brush. Hold the probe in an inclined position, and squirt methylene chloride into the upper end as the probe brush is being pushed with a twisting action through the probe. Hold the sample container underneath the lower end of the probe, and catch any methylene chloride, water, and particulate matter that is brushed from the probe. Run the brush through the probe three times or more. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since there may be small crevices in which particulate matter can be entrapped. Rinse the brush with methylene chloride or water, and quantitatively collect these washing in the sample container. After the brushing, make a final rinse of the probe as described above.

NOTE: Two people should clean the probe in order to minimize sample losses. Between sampling runs, brushes must be kept clean and free from contamination.

3.5.7.2.1.3 Rinse the inside surface of each of the first three impingers (and connecting tubing) three separate times. Use a small portion of methylene chloride for each rinse, and brush each surface to which the sample is exposed with a Teflon bristle brush to ensure recovery of fine particulate matter. Water will be required for the recovery of the impingers in addition to the specified quantity of methylene chloride. There will be at least two phases in the impingers. This two-phase mixture does not pour well, and a significant amount of the impinger catch will be left on the walls. The use of water as a rinse makes the recovery quantitative. Make a final rinse of each surface and of the brush, using both methylene chloride and water.

3.5.7.2.1.4 After all methylene chloride and water washing and particulate matter have been collected in the sample container, tighten the lid so the solvent, water, and DNPH reagent will not leak out when the container is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Seal the container with Teflon tape. Label the container clearly to identify its contents.

3.5.7.2.1.5 If the first two impingers are to be analyzed separately to check for breakthrough, separate the contents and rinses of the two impingers into individual containers. Care must be taken to avoid physical carryover from the first impinger to the second. The formaldehyde hydrazone is a solid which floats and froths on top of the impinger solution. Any physical carryover of collected moisture into the second impinger will invalidate a breakthrough assessment.

3.5.7.2.2 Container 2: Sample Blank. Prepare a blank by using an amber flint glass container and adding a volume of DNPH reagent and methylene chloride equal to the total volume in Container 1. Process the blank in the same manner as Container 1.

3.5.7.2.3 Container 3: Silica Gel. Note the color of the indicating silica gel to determine whether it has been completely spent and make a notation of its condition. The impinger containing the silica gel may be used as a sample transport container with both ends sealed with tightly fitting caps or plugs. Ground-glass stoppers or Teflon caps maybe used. The silica gel impinger should then be labeled, covered with aluminum foil, and packaged on ice for transport to the laboratory. If the silica gel is removed from the impinger, the tester may use a funnel to pour the silica gel and a rubber policeman to remove the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use water or other liquids to transfer the silica gel. If a balance is available in the field, the spent silica gel (or silica gel plus impinger) maybe weighed to the nearest 0.5 g.

3.5.7.2.4 Sample containers should be placed in a cooler, cooled by (although not in contact with) ice. Sample containers must be placed vertically and, since they are glass, protected from breakage during shipment. Samples should be cooled during shipment so they will be received cold at the laboratory.

3.5.8 Calibration

3.5.8.1 Probe Nozzle: Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the inside diameter of the nozzle to the nearest 0.025 mm (0.001 in). Make measurements at three separate places across the diameter and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in). when the nozzles become nicked or corroded, they shall be replaced and calibrated before use. Each nozzle must be permanently and uniquely identified.

3.5.8.2 Pitot Tube: The Type S pitot tube assembly shall be calibrated according to the procedure outlined in Section 4 of EPA Method 2, or assigned a nominal coefficient of 0.84 if it is not visibly nicked or corroded and if it meets design and intercomponent spacing specifications.

3.5.8.3 Metering System

3.5.8.3.1 Before its initial use in the field, the metering system shall be calibrated according to the procedure outlined in APTD-0576. Instead of physically adjusting the dry-gas meter dial readings to correspond to the wet-test meter readings, calibration factors may be used to correct the gas meter dial readings mathematically to the proper values. Before calibrating the metering system, it is suggested that a leak check be conducted. For metering systems having diaphragm pumps, the normal leak check procedure will not detect leakages with the pump. For these cases, the following leak check procedure will apply: make a ten-minute calibration run at 0.00057 m^3/min (0.02 cfm). At the end of the run, take the difference of the measured wet-test and dry-gas meter volumes and divide the difference by 10 to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.02 cfm).

3.5.8.3.2 After each field use, check the calibration of the metering system by performing three calibration runs at a single intermediate orifice setting (based on the previous field test). Set the vacuum at the maximum value reached during the test series. To adjust the vacuum, insert a valve between the wet-test meter and the inlet of the metering system. Calculate the average value of the calibration factor. If the calibration has changed by more the 5%, recalibrate the meter over the full range of orifice settings, as outlined in APTD-0576.

3.5.8.3.3 Leak check of metering system: The portion of the sampling train from the pump to the orifice meter (see Figure 1) should be leak checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. Use the following procedure: Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing attached into the orifice exhaust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13 - 18 cm (5 - 7 in) water column by blowing into the rubber tubing. Pinch off the tubing and observe the manometer for 1 min. A loss of pressure on the manometer indicates a leak in the meter box. Leaks must be corrected.

NOTE: If the dry-gas-meter coefficient values obtained before and after a test series differ by >5%, either the test series must be voided or calculations for test series must be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

3.5.8.4 Probe Heater: The probe heating system must be calibrated before its initial use in the field according to the procedure outlined in APTD-0576. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used.

3.5.8.5 Temperature gauges: Each thermocouple must be permanently and uniquely marked on the casting. All mercury-in-glass reference thermometers must conform to ASTM E-1 63C or 63F specifications. Thermocouples should be calibrated in the laboratory with and without the use of extension leads. If extension leads are used in the field, the thermocouple readings at the ambient air temperatures, with and without the extension lead, must be noted and recorded. Correction is necessary if the use of an extension lead produces a change >1.5%.

3.5.8.5.1 Impinger and dry-gas meter thermocouples: For the thermocouples used to measure the temperature of the gas leaving the impinger train, three-point calibration at ice water, room air, and boiling water temperatures is necessary. Accept the thermocouples only if the readings at all three temperatures agree to ±2C (3.6°F) with those of the absolute value of the reference thermometer.

3.5.8.5.2 Probe and stack thermocouple: for the thermocouples used to indicate the probe and stack temperatures, a three-point calibration at ice water, boiling water, and hot oil bath temperatures must be performed. Use of a point at room air temperature is recommended. The thermometer and thermocouple must agree to within 1.5% at each of the calibration points. A calibration curve (equation) may be constructed (calculated) and the data extrapolated to cover the entire temperature range suggested by the manufacturer.

3.5.8.6 Barometer: Adjust the barometer initially and before each test series to agree to within ±2.5 mm Hg (0.1 in Hg) of the mercury barometer or the correct barometric pressure value reported by a nearby National Weather Service Station (same altitude above sea level).

3.5.8.7 Triple-beam balance: Calibrate the triple-beam balance before each test series, using Class S standard weights. The weights must be within ±0.5% of the standards, or the balance must be adjusted to meet these limits.

3.5.9 Calculations

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculations.

3.5.9.1 Calculation of Total Formaldehyde: To determine the total formaldehyde in mg, use the following equation:

$$\text{Total mg formaldehyde} = C_d \times V \times DF \times \frac{[\text{g/mole aldehyde}]}{[\text{g/mole DNPH derivative}]} \times 10^3 \text{ mg}/\mu\text{g}$$

where:

C_d = measured concentration of DNPH - formaldehyde derivative, μg/ml
V = organic extract volume ml
DF = dilution factor

3.5.9.2 Formaldehyde concentration in stack gas:

Determine the formaldehyde concentration in the stack gas using the following equation:

C_f = K [total formaldehyde, mg] $V_{m(std)}$

where:

K = 35.31 ft^3/m^3 if $V_{m(std)}$ is expressed in English units
= 1.00 m^3/m^3 if $V_{m(std)}$ is expressed in metric units
$V_{m(std)}$ = volume of gas sample a measured by dry gas meter, corrected to standard conditions, dscm (dscf)

3.5.9.3 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop are obtained from the data sheet.

3.5.9.4 Dry Gas Volume: Calculate $V_{m(std)}$ and adjust for leakage, if necessary, using the equation in Section 6.3 of EPA Method 5.

3.5.9.5 Volume of Water Vapor and Moisture Content: Calculate the volume of water vapor and moisture content from equations 5-2 and 5-3 of EPA Method 5.

3.5.10 <u>Determination of Volume to be Sampled</u>

To determine the minimum sample volume to be collected, use the following sequence of equations.

3.5.10.1 From prior analysis of the waste feed, the concentration of formaldehyde (FORM) introduced into the combustion system can be calculated. The degree of destruction and removal efficiency that is required is used to determine the amount of FORM allowed to be present in the effluent. This amount may be expressed as:

Max FORM Mass = [(WF) (FORM conc) (100 - %DRE)] /100

where:

WF = mass flow rate of waste feed per h, g/h (lb/h)

FORM = concentration of FORM (wt %) introduced into the combustion process

DRE = percent Destruction and Removal Efficiency required

Max FORM = mass flow rate (g/h [lb/]) of FORM emitted from the combustion sources

3.5.10.2 The average discharge concentration of the FORM in the effluent gas is determined by comparing the Max FORM with the volumetric flow rate being exhausted from the source. Volumetric flow rate data are available as a result of preliminary EPA Method 1 - 4 determinations:

$$\text{Max FORM conc} = [\text{Max FORM Mass}] / DV_{eff(std)}$$

where:

$DV_{eff(std)}$ = volumetric flow rate of exhaust gas, dscm (dscf)

FORM conc = anticipated concentration of the FORM in the exhaust gas stream, g/dscm (lb/dscf)

3.5.10.3 In making this calculation, it is recommended that a safety margin of at least ten be included.

$$[LDL_{FORM} \times 10 / \text{FORM conc}] = V_{tbc}$$

where:

LDL_{FORM} = detectable amount of FORM in entire sampling train

V_{tbc} = minimum dry standard volume to be collected at dry-gas meter

3.5.10.4 The following analytical detection limits and DNPH Reagent Capacity (based on a total volume of 200 ml in two impingers) must also be considered in determining a volume to be sampled.

3.5.11 Quality Control

3.5.11.1 Sampling: See EPA Manual 600/4-77-02b for Method 5 quality control.

3.5.11.2 Analysis: The quality assurance program required for this method includes the analysis of the field and method blanks, procedure validations, and analysis of field spikes. The assessment of combustion data and positive identification and quantitation of formaldehyde are dependent on the integrity of the samples received and the precision and accuracy of the analytical methodology. Quality assurance procedures for this method are designed to monitor the performance of the analytical methodology and to provide the required information to take corrective action if problems are observed in laboratory operations or in field sampling activities.

3.5.11.2.1 Field Blanks: Field blanks must be submitted with the samples collected at each sampling site. The field blanks include the sample bottles containing aliquots of sample recovery solvents, methylene chloride and water, and unused DNPH reagent. At a minimum, one complete sampling train will be assembled in the field staging area, taken to the sampling are, and leak-checked at the beginning and end of the testing (or for the same total number of times as the actual sampling train). The probe of the blank train must be heated during the sample test. The train will be recovered as if it were an actual test sample. No gaseous sample will be passed through the blank sampling train.

3.5.11.2.2 Method Blanks: A method blank must be prepared for each set of analytical operations, to evaluate contamination and artifacts that can be derived from glassware, reagents, and sample handling in the laboratory.

3.5.11.2.3 Field Spike: A field spike is performed by introducing 200 μL of the Field Spike Standard into an impinger containing 200 ml of DNPH solution. Standard impinger recovery procedures are followed and the spike is used as a check on field handling and recovery procedures. An aliquot of the field spike standard is retained in the laboratory for derivatization and comparative analysis.

3.5.12 Method Performance

3.5.12.1 Method performance evaluation: The expected method performance parameters for precision, accuracy, and detection limits are provided in Table 3.5-3.

Addition of a Filter to the Formaldehyde Sampling Train

As a check on the survival of particulate material through the impinger system, a filter can be added to the impinger train either after the second impinger or after the third impinger. Since the impingers are in an ice bath, there is no reason to heat the filter at this point.

Any suitable medium (e.g., paper, organic membrane) may be used for the filter if the material conforms to the following specifications:

1) the filter has at least 95% collection efficiency (<5% penetration) for 3 μm dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM standard method D2986-71. Test data from the supplier's quality control program are sufficient for this purpose.

2) the filter has a low aldehyde blank value (<0.015 mg formaldehyde/cm^2 of filter area). Before the test series, determine the average formaldehyde blank value of at least three filters (from the lot to be used for sampling) using the applicable analytical procedures.

Table 3.5-3

EXPECTED METHOD PERFORMANCE FOR FORMALDEHYDE

Parameter	Precision[1]	Accuracy[2]	Detection Limit[3]
Matrix: Dual trains	±15% RPD	±20%	1.5×10^{-7} lb/ft^3 (1.8 ppbv)

[1]Relative percent difference limit for dual trains.

[2]Limit for field spike recoveries.

[3]The lower reporting limit having less than 1% probability of false positive detection.

Recover the exposed filter into a separate clean container and return the container over ice to the laboratory for analysis. If the filter is being analyzed for formaldehyde, the filter may be recovered into a container or DNPH reagent for shipment back to the laboratory. If the filter is being examined for the presence of particulate material, the filter may be recovered into a clean dry container and returned to the laboratory.

3.6 Analysis for Aldehydes and Ketones by High Performance Liquid Chromatography (HPLC) (Method 0011A)

3.6.1 Scope and Application

3.6.1.1 Method 0011A covers the determination of free formaldehyde in the aqueous samples and leachates and derived aldehydes/ketones collected by Method 0011.

Compound Name	CAS No.*
Formaldehyde	50-00-0
Acetaldehyde	75-07-0

* Chemical Abstract Services Registry Number

3.6.1.2 Method 0011A is a high performance liquid chromatographic (HPLC) method optimized for the determination of formaldehyde and acetaldehyde in aqueous environmental matrices and leachates of solid samples and stack samples collected by Method 0011. When this method is used to analyze unfamiliar sample matrices, compound identification should be supported by at least one additional qualitative technique. A gas chromatograph/mass spectrometer (GC/MS) may be used for the qualitative confirmation of results from the target analytes, using the extract produced by this method.

3.6.1.3 The method detection limits (MDL) are listed in Tables 3.6-1 and 3.6-2. The MDL for a specific sample may differ from that listed, depending upon the nature of interferences in the sample matrix and the amount of sample used in the procedure.

3.6.1.4 The extraction procedure for solid samples is similar to that specified in Method 1311 (1). Thus, a single sample may be extracted to measure the analytes included in the scope of other appropriate methods. The analyst is allowed the flexibility to select chromatographic conditions

Table 3.6-1

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY CONDITIONS AND METHOD DETECTION LIMITS USING SOLID SORBENT EXTRACTION

Analyte	Retention Time (minutes)	MDL (μg/L)*
Formaldehyde	7.1	7.2

HPLC conditions: Reverse phase C18 column, 4.6 x 250 mm; isocratic elution using methanol/water (75:25, v/v); flow rate 1.0 mL/min.; detector 360 nm.

* After correction for laboratory blank.

Table 3.6-2

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY CONDITIONS AND METHOD DETECTION LIMITS USING METHYLENE CHLORIDE EXTRACTION

Analyte	Retention Time (minutes)	MDL (μg/L)*
Formaldehyde	7.1	7.2
Acetaldehyde	8.6	171*

HPLC conditions: Reverse phase C18 column, 4.6 x 250 mm; isocratic elution using methanol/water (75:25, v/v); flow rate 1.0 mL/min.; detector 360 nm.

* These values include reagent blank concentrations of approximately 13 μg/L formaldehyde and 130 μg/L acetaldehyde.

appropriate for the simultaneous measurement of contaminations of these analytes.

3.6.1.5 This method is restricted to use by, or under the supervision of analysts experienced in the use of chromatography and in the interpretation of chromatograms. Each analyst must demonstrate the ability to generate acceptable results with this method.

3.6.1.6 The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. The laboratory is responsible for maintaining a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this method. A reference file of material safety data sheets should also be made available to all personnel involved in the chemical analysis. Additional references to laboratory safety are available.

3.6.1.7 Formaldehyde has been tentatively classified as a known or suspected, human or mammalian carcinogen.

3.6.2 Summary of Method

3.6.2.1 Environmental Liquids and Solid Leachates

3.6.2.1.1 For wastes comprised of solids or for aqueous wastes containing significant amounts of solid material, the aqueous phase, if any, is separated from the solid phase and stored for later analysis. If necessary, the particle size of the solids in the waste is reduced. The solid phase is extracted with an amount of extraction fluid equal to 20 times the weight of the solid phase of the waste. A special extractor vessel is used when testing for volatiles. Following extraction, the aqueous extract is separated from the solid phase by filtration employing 0.6 to 0.8 μm glass fiber filters.

3.6.2.1.2 If compatible (i.e., multiple phases will not form on combination), the initial aqueous phase of the waste is added to the aqueous extract, and these liquids are analyzed together. If incompatible, the liquids are analyzed separately and the results are mathematically combined to yield a volume weighted average concentration.

3.6.2.1.3 A measured volume of aqueous sample or an appropriate amount of solids leachate is buffered to pH 5 and derivatized with 2,4-dinitrophenylhydrazine (DNPH), using either the solid sorbent or the methylene derivatization/extraction option. If the solid sorbent option is used, the derivative is extracted using solid sorbent cartridges, followed by elution with ethanol. If the methylene chloride option is used, the derivative is extracted with methylene chloride. The methylene chloride extracts are concentrated using the Kuderna-Danish (K-D) procedure and solvent exchanged into methanol prior to HPLC analysis. Liquid chromatographic conditions are described which permit the separation and measurement of formaldehyde in the extract by absorbance detection at 360 nm.

3.6.2.2 Stack Gas Samples Collected by Method 0011

3.6.2.2.1 The entire sample returned to the laboratory is extracted with methylene chloride and the methylene chloride extract is brought up to a known volume. An aliquot of the methylene chloride extract is solvent exchanged and concentrated or diluted as necessary.

3.6.2.2.2 Liquid chromatographic conditions are described that permit the separation and measurement of formaldehyde in the extract by absorbance detection at 360 nm.

3.6.3 <u>Interferences</u>

3.6.3.1 Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the chromatograms. All of these materials must be routinely demonstrated to be free from interferences under the conditions of the analysis by analyzing laboratory reagent blanks.

3.6.3.1.1 Glassware must be scrupulously cleaned. Clean all glassware as soon as possible after use by rinsing with the last solvent used. This should be followed by detergent washing with hot water, and rinses with tap water and distilled water. It should then be drained, dried, and heated in a laboratory oven at 130°C for several hours before use. Solvent rinses with methanol may be substituted for the oven heating. After drying and cooling, glassware should be stored in a clean environment to prevent any accumulation of dust or other contaminants.

3.6.3.1.2 The use of high purity reagents and solvents helps to minimize interference problems. Purification of solvents by distillation in all-glass systems may be required.

3.6.3.2 Analysis for formaldehyde is especially complicated by its ubiquitous occurrence in the environment.

3.6.3.3 Matrix interferences may be caused by contaminants that are coextracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature and diversity of the matrix being sampled. No interferences have been observed in the matrices studied as a result of using solid sorbent extraction as opposed to liquid extraction. If interferences occur in subsequent samples, some additional cleanup may be necessary.

3.6.3.4 The extent of interferences that may be encountered using liquid chromatographic techniques has not been fully assessed. Although the HPLC conditions described allow for a resolution of the specific compounds covered by this method, other matrix components may interfere.

3.6.4 Apparatus and Materials

3.6.4.1 Reaction vessel - 250 ml Florence flask.

3.6.4.2 Separatory funnel - 205 ml, with Teflon stopcock

3.6.4.3 Kuderna-Danish (K-D) apparatus.

3.6.4.3.1 Concentrator tube - 10 ml graduated (Kontes K-570050-1025 or equivalent). A ground glass stopper is used to prevent evaporation of extracts.

3.6.4.3.2 Evaporation flask - 500 ml (Kontes K-570001-500 or equivalent). Attach to concentrator tube with springs, clamps, or equivalent.

3.6.4.3.3 Snyder column - Three ball macro (Kontes K-503000-0121 or equivalent).

3.6.4.3.4 Snyder column - Two ball macro (Kontes K-569001-0219 or equivalent).

3.6.4.3.5 Springs - 1/2 inch (Kontes K-662750 or equivalent).

3.6.4.4 Vials - 10, 25 ml, glass with Teflon lined screw caps or crimp tops.

3.6.4.5 Boiling chips - Solvent extracted with methylene chloride, approximately 10/40 mesh (silicon carbide or equivalent).

3.6.4.6 Balance - Analytical, capable of accurately weighing to the nearest 0.0001 g.

3.6.4.7 pH meter - Capable of measuring to the nearest 0.01 units.

3.6.4.8 High performance liquid chromatograph (modular)

3.6.4.8.1 Pumping system - Isocratic, with constant flow control capable of 1.00 ml/min.

3.6.4.8.2 High pressure injection valve with 20 μL loop.

3.6.4.8.3 Column - 250 mm x 4.6 mm ID, 5 μm particle size, C18 (or equivalent).

3.6.4.8.4 Absorbance detector - 360 nm.

3.6.4.8.5 Strip-chart recorder compatible with detector - Use of a data system for measuring peak areas and retention times is recommended.

3.6.4.9 Glass fiber filter paper.

3.6.4.10 Solid sorbent cartridges - Packed with 500 mg C18 (Baker or equivalent).

3.6.4.11 Vacuum manifold - Capable of simultaneous extraction of up to 12 samples (Supelco or equivalent).

3.6.4.12 Sample reservoirs - 60 ml capacity (Supelco or equivalent).

3.6.4.13 Pipet - Capable of accurately delivering 0.10 ml solution (Pipetman or equivalent).

3.6.4.14 Water bath - Heated, with concentric ring cover, capable of temperature control (($\pm$) 2°C). The bath should be used under a hood.

3.6.4.15 Volumetric Flasks - 250 or 500 ml.

3.6.5 Reagents

3.6.5.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

3.6.5.2 Organic-free water - All references to water in this method refer to organic-free reagent water, as defined in Chapter I SW-846.

3.6.5.3 Methylene chloride, CH_2Cl_2 - HPLC grade or equivalent.

3.6.5.4 Methanol, CH_3OH - HPLC grade or equivalent.

3.6.5.5 Ethanol (absolute), CH_3CH_2OH - HPLC grade or equivalent.

3.6.5.6 2,4-Dinitrophenylhydrazine (DNPH) (70% (W/W)), $[2,4-(O_2N)_2C_6H_3]NHNH_2$, in organic-free reagent water.

3.6.5.7 Formalin (37.6 percent (w/w)), formaldehyde in organic-free reagent water.

3.6.5.8 Acetic acid (glacial), CH_3CO_2H.

3.6.5.9 Sodium hydroxide solutions NaOH, 1.0 N and 5 N.

3.6.5.10 Sodium chloride, NaCl.

3.6.5.11 Sodium sulfite solution, Na_2SO_3, 0.1 M.

3.6.5.12 Hydrochloric Acid, HCl, 0.1 N.

3.6.5.13 Extraction fluid - Dilute 64.3 ml of 1.0 N NaOH and 5.7 ml glacial acetic acid to 900 ml with organic-free reagent water. Dilute to 1 liter with organic-free reagent water. The pH should be 4.93 ± 0.02.

3.6.5.14 Stock standard solutions

3.6.5.14.1 Stock formaldehyde (approximately 1.00 mg/ml) - Prepare by diluting 265 μl formalin to 100 ml with organic-free reagent water.

3.6.5.14.1.1 Standardization of formaldehyde stock solution - Transfer a 25 ml aliquot of a 0.1 M Na_2SO_3 solution to a beaker and record the pH. Add a 25.0 ml aliquot of the formaldehyde stock solution (Section 3.6.5.14.1) and record the pH. Titrate this mixture back to the original pH using 0.1 N HCl. The formaldehyde concentration is calculated using the following equation:

Concentration (mg/ml) = 30.03 x (N HCl) x (ml HCl) 25.0

where:

N HCl = Normality of HCl solution used

ml HCl = ml of standardized HCl solution used

30.03 = MW of formaldehyde

3.6.5.14.2 Stock formaldehyde and acetaldehyde - Prepare by adding 265 μL formalin and 0.1 g acetaldehyde to 90 ml of water and dilute to 100 ml. The concentration of acetaldehyde in this solution is 1.00 mg/ml. Calculate the concentration of formaldehyde in this solution using the results of the assay performed in Section 3.6.5.14.1.1.

3.6.5.14.3 Stock standard solutions must be replaced after six months, or sooner, if comparison with check standards indicates a problem.

3.6.5.15 Reaction Solutions

3.6.5.15.1 DNPH (1.00 μg/L) - Dissolve 142.9 mg of 70% (w/w) reagent in 100 ml absolute ethanol. Slight heating or sonication may be necessary to effect dissolution.

3.6.5.15.2 Acetate buffer (5 N) Prepare by neutralizing glacial acetic acid to pH 5 with 5 N NaOH solution. Dilute to standard volume with water.

3.6.5.15.3 Sodium chloride solution (saturated) Prepare by mixing of the reagent grade solid with water.

3.6.6 Sample Collection, Preservation, and Handling

3.6.6.1 See the introductory material to this Chapter, Organic Analytes, Section 4.1 of SW-846.

3.6.6.2 Environmental liquid and leachate samples must be refrigerated at 4°C, and must be derivatized within 5 days of sample collection and analyzed within 3 days of derivatization.

3.6.6.3 Stack gas samples collected by Method 0011 must be refrigerated at 4°C. It is recommended that samples be extracted within 30 days of collection and that extracts be analyzed within 30 days extraction.

3.6.7 Procedure

3.6.7.1 Extraction of Solid Samples

3.6.7.1.1 All solid samples should be homogeneous. When the sample is not dry, determine the dry weight of the sample, using a representative aliquot.

3.6.7.1.1.1 Determination of dry weight - In certain cases, sample results are desired based on a dry weight basis. When such data is desired, or required, a portion of sample for dry weight determination should be weighed out at the same time as the portion used for analytical determination.

WARNING: The drying oven should be contained in a hood or vented. Significant laboratory contamination may result from drying a heavily contaminated hazardous waste sample.

3.6.7.1.1.2 Immediately after weighing the sample for extraction, weigh 5-10 g of the sample into a tared crucible. Determine the % dry weight of the sample by drying overnight at 105°C. Allow to cool in a desiccator before weighing:

$$\% \text{ dry weight} = \frac{\text{g of dry sample}}{\text{g of sample}} \times 100$$

3.6.7.1.2 Measure 25 g of solid into a 500 ml bottle with a Teflon lined screw cap or crimp top, and add 500 ml of extraction fluid (Section 3.6.5.13). Extract the solid by rotating the bottle at approximately 30 rpm for 18 hours. Filter the extract through glass fiber paper and store in sealed bottles at 4°C. Each ml of extract represents 0.050 g solid.

3.6.7.2 Cleanup and Separation

3.6.7.2.1 Cleanup procedures may not be necessary for a relatively clean sample matrix. The cleanup procedures recommended in this method have been used for the analysis of various sample types. If particular circumstances demand the use of an alternative cleanup procedure, the analyst must determine the elution profile and demonstrate that the recovery of formaldehyde is no less then 85% of recoveries specified in Table 3.6-3. Recovery may be lower for samples which form emulsions.

3.6.7.2.2 If the sample is not clean, or the complexity is unknown, the entire sample should be centrifuged at 2500 rpm for 10 minutes. Decant the supernatant liquid from the centrifuge bottle, and filter through glass fiber filter paper into a container which can be tightly sealed.

3.6.7.3 Derivatization

3.6.7.3.1 For aqueous samples, measure a 50 to 100 ml aliquot of the sample. Quantitatively transfer the sample aliquot to the reaction vessel (Section 3.6.4.1).

3.6.7.3.2 For solid samples, 1 to 10 ml of leachate (Section 3.6.7.1) will usually be required. The amount used for a particular sample must be determined through preliminary experiments.

Table 3.6-3

SINGLE OPERATOR ACCURACY AND PRECISION
USING SOLID SORBENT EXTRACTION

Analyte	Matrix Type	Average Percent Recovery	Standard Deviation Percent	Spike Range ($\mu g/L$)	Number of Analyses
Formaldehyde	Reagent Water	86	9.4	15-1430	39
	Final Effluent	90	11.0	46.8-1430	16
	Phenol formaldehyde Sludge	93	12.0	457-1430	15

Note: For all reactions, the total volume of the aqueous layer should be adjusted to 100 ml with water.

3.6.7.3.3 Derivatization and extraction of the derivative can be accomplished using the solid sorbent (Section 3.6.7.3.4) or methylene chloride option (Section 3.6.7.3.5).

3.6.7.3.4 Solid Sorbent Option

3.6.7.3.4.1 Add 4 ml of acetate buffer and adjust the pH to 5.0 ± 0.1 with glacial acetic acid or 5 N NaOH. Add 6 ml of DNPH reagent, seal the container, and place on a wrist-action shaker for 30 minutes.

3.6.7.3.4.2 Assemble the vacuum manifold and connect to a water aspirator or vacuum pump. Assemble solid sorbent cartridges containing a minimum of 1.5 g of C18 sorbent, using connectors supplied by the manufacturer, and attach the sorbent train to the vacuum manifold. Condition each cartridge by passing 10 ml dilute acetate buffer (10 ml 5 N acetate buffer dissolved in 250 ml water) through the sorbent cartridge train.

3.6.7.3.4.3 Remove the reaction vessel from the shaker and add 10 ml saturated NaCl solution to the vessel.

3.6.7.3.4.4 Add the reaction solution to the sorbent train and apply a vacuum so that the solution is drawn through the cartridges at a rate of 3 to 5 ml/min. Release the vacuum after the solution has passed through the sorbent.

3.6.7.3.4.5 Elute each cartridge train with approximately 9 ml of absolute ethanol, directly into a 10 ml volumetric flask. Dilute the solution to volume with absolute ethanol, mixed thoroughly, and place in a tightly sealed vial until analyzed.

3.6.7.3.5 Methylene Chloride Option

3.6.7.3.5.1 Add 5 m of acetate buffer and adjust the pH to 5.0 ± 0.5 with glacial acetic acid or 5 N NaOH. Add 10 ml of DNPH reagent, seal the container, and place on a wrist-action shaker for 1 hour.

3.6.7.3.5.2 Extract the solution with three 20 ml portions of methylene chloride, using a 250 ml separatory funnel, and combine the methylene chloride layers. If an emulsion forms upon extraction, remove the entire emulsion and centrifuge at 2000 rpm for 10 minutes. Separate the layers and proceed with the next extraction.

3.6.7.3.5.3 Assemble a Kuderna-Danish (K-D) concentrator by attaching a 10 ml concentrator tube to a 500 ml evaporator flask. Wash the K-D apparatus with 25 ml of extraction solvent to complete the quantitative transfer.

3.6.7.3.5.4 Add one to two clean boiling chips to the evaporative flask and attach a three ball Snyder column. Preset the Snyder column by adding about 1 ml methylene chloride to the top. Place the K-D apparatus on a hot water bath (80-90°C) so that the concentrator tube is partially immersed in the hot water and the entire lower rounded surface of the flask is bathed with hot vapor. Adjust the vertical position of the apparatus and the water temperature, as required, to complete the concentration in 10-15 min. At the proper rate of distillation the balls of the column will actively chatter, but the chambers will not flood with condensed solvent. When the apparent volume of liquid reaches 10 ml, remove the K-D apparatus and allow it to drain and cool for a least 10 min.

3.6.7.3.5.5 Prior to liquid chromatographic analysis, the solvent must be exchanged to methanol. The analyst must ensure quantitative transfer of the extract concentrate. The exchange is performed as follows:

3.6.7.3.5.5.1 Following K-D concentration of the methylene chloride extract to < 10 ml using the macro Snyder column, allow the apparatus to cool and drain for at least 10 minutes.

3.6.7.3.5.5.2 Momentarily remove the Snyder column, add 5 ml of the methanol, a new glass bed, or boiling chip, and attach the micro Snyder column. Concentrate the extract using 1 ml of methanol to prewet the Snyder column. Place the K-D apparatus on the water bath so that the concentrator tube is partially immersed in the hot water. Adjust the vertical position of the apparatus and the water temperature, as required, to complete concentration. At the proper rate of distillation the balls of the column will actively chatter, but the chambers will not flood. When the apparent volume of liquid reaches < 5 ml, remove the K-D apparatus and allow it to drain and cool for at least 10 minutes.

3.6.7.3.5.5.3 Remove the Snyder column and rinse the flask and its lower joint with 1-2 ml of methanol and add to concentrator tube. A 5-ml syringe is recommended for this operation. Adjust the extract volume to 10 ml. Stopper the concentrator tube and store refrigerated at 4°C if further processing will not be performed immediately. If the extract will be stored longer than two days, it should be transferred to a vial with a Teflon-lined screw cap or crimp top. Proceed with liquid chromatographic analysis if further cleanup is not required.

3.6.7.4 Extraction of Stack Gas Samples Collected by Method 0011

3.6.7.4.1 Measure the aqueous volume of the sample prior to extraction (for moisture determination in case the volume was not measured in the field). Pour the sample into a separatory funnel and drain the methylene chloride into a volumetric flask.

3.6.7.4.2 Extract the aqueous solution with two or three aliquots of methylene chloride. Add the methylene chloride extracts to the volumetric flask.

3.6.7.4.3 Fill the volumetric flask to the line with methylene chloride. Mix well and remove an aliquot.

3.6.7.4.4 If high levels of formaldehyde are present, the extract can be diluted with mobile phase, otherwise the extract must be solvent exchanged as described in Section 3.6.7.5.3.3. If low levels of formaldehyde are present, the sample should be concentrated during the solvent exchange procedure.

3.6.7.5 Chromatographic Conditions

Column:	C18, 250 mm x 4.6 mm ID, 5 μm particle size
Mobile Phase:	methanol/water, 75:25 (v/v), isocratic
Flow Rate:	1.0 ml/min
UV Detector:	360 nm
Injection Volume:	20 μl

3.6.7.6 Calibration

3.6.7.6.1 Establish liquid chromatographic operating parameters to produce a retention time equivalent to that indicated in Table 3.6-1 for the solid sorbent options, or in Table 3.6-2 for methylene chloride option. Suggested chromatographic conditions are provided in Section 3.6.7.5. Prepare derivatized calibration standards according to the procedure in Section 3.6.7.6.1.1. Calibrate the chromatographic system using the external standard technique (Section 3.6.7.6.1.2).

3.6.7.6.1.1 Preparation of calibration standards

3.6.7.6.1.1.1 Prepare calibration standard solutions of formaldehyde and acetaldehyde in water from the stock standard (Section 3.6.5.14.2). Prepare these solutions at the following concentrations (in μg/ml) by serial dilution of the stock standard solution: 50, 20, 10. Prepare additional calibration standard solutions at the following concentrations, by dilution of the appropriate 50, 20, or 10 μg/ml standard: 5, 0.5, 2, 0.2, 1, 0.1.

3.6.7.6.1.1.2 Process each calibration standard solution through the derivatization option used for sample processing (Section 3.6.7.3.4 or 3.6.7.3.5).

3.6.7.6.1.2 External standard calibration procedure

3.6.7.6.1.2.1 Analyze each derivatized calibration standard using the chromatographic conditions listed in Tables 3.6-1 and 3.6-2, and tabulate peak area against concentration injected. The results may be used to prepare calibration curves for formaldehyde and acetaldehyde.

3.6.7.6.1.2.2 The working calibration curve must be verified on each working day by the measurement of one or more calibration standards. If the response for any analyte varies from the previously established responses by more the 10%, the test must be repeated using a fresh calibration standard after it is verified that the analytical system is in control. Alternatively, a new calibration curve may be prepared for that compound. If an autosampler is available, it is convenient to prepare a calibration curve daily by analyzing standards along with test samples.

3.6.7.7 Analysis

3.6.7.7.1 Analyze samples by HPLC, using conditions established in Section 3.6.7.6.1. Tables 3.6-1 and 3.6-2 list the retention times and MDLs that were obtained under these conditions. Other HPLC columns, chromatographic conditions, or detectors may be used if the requirements for Section 3.6.8.1 are met, or if the data are within the limits described in Tables 3.6-1 and 3.6-2.

3.6.7.7.2 The width of the retention time window used to make identifications should be based upon measurements of actual retention time variations of standards over the course of a day. Three times the standard deviation of a retention time for a compound can be used to calculate a suggested window size; however, the experience of the analyst should weigh heavily in the interpretation of the chromatograms.

3.6.7.7.3 If the peak area exceeds the linear range of the calibration curve, a smaller sample volume should be used. Alternatively, the final solution may be diluted with ethanol and reanalyzed.

3.6.7.7.4 If the peak area measurement is prevented by the presence of observed interferences, further cleanup is required. However, none of the 3600 method series have been evaluated for this procedure.

3.6.7.8 Calculations

3.6.7.8.1 Calculate each response factor as follows (mean value based on 5 points):

$$RF = \frac{\text{concentration of standard}}{\text{area of the signal}}$$

$$\text{mean} = RF = \overline{RF} = \frac{\left(\sum_{i}^{5} RF_i\right)}{5}$$

3.6.7.8.2 Calculate the concentration of formaldehyde and acetaldehyde as follows:

$$\mu g/ml = (\overline{RF})\ (\text{area of signal})\ (\text{concentration factor})$$

where:

$$\text{concentration factor} = \frac{\text{Final volume of extract}}{\text{Initial sample (or leachate) volume}}$$

NOTE: For solid samples, a dilution factor must be included in the equation to account for the weight of the sample used.

3.6.7.8.3 Calculate the total weight of formaldehyde in the stack gas sample as follows:

$$\text{total } \mu g/ml = (RF)\ (\text{area of signal})\ (\text{concentration factor})$$

where:

$$\text{concentration factor} = \frac{\text{Final Volume of Extract}}{\text{Initial Extract Volume}}$$

3.6.8 Quality Control

3.6.8.1 Refer to Chapter One of SW-846 for guidance on quality control procedures.

3.6.9 Method Performance

3.6.9.1 The MDL concentrations listed in Table 3.6-1 were obtained using organic-free water and solid sorbent extraction. Similar results were achieved using a final effluent and sludge leachate. The MDL concentrations listed in Table 3.6-2 were obtained using organic-free water and methylene chloride extraction. Similar results were achieved using representative matrices.

3.6.9.2 This method has been tested for linearity of recovery from spiked organic-free water and has been demonstrated to be applicable over the range from 2 x MDL to 200 x MDL.

3.6.9.3 In a single laboratory evaluation using several spiked matrices, the average recoveries presented in Tables 3.6-3 and 3.6-4 were obtained using solid sorbent and methylene chloride extraction, respectively. The standard deviations of the percent recovery are also included in Tables 3.6-3 and 3.6-4.

3.6.9.4 A representative chromatogram is presented in Figure 3.6-1.

3.6.10 References

1. Federal Register, 1986, 51, 40643-40652; November 7.

2. EPA Methods 6010, 7000, 7041, 7060, 7131, 7421, 7470, 7740, and 7841, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW-846, Third Edition. September 1988. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C. 20460.

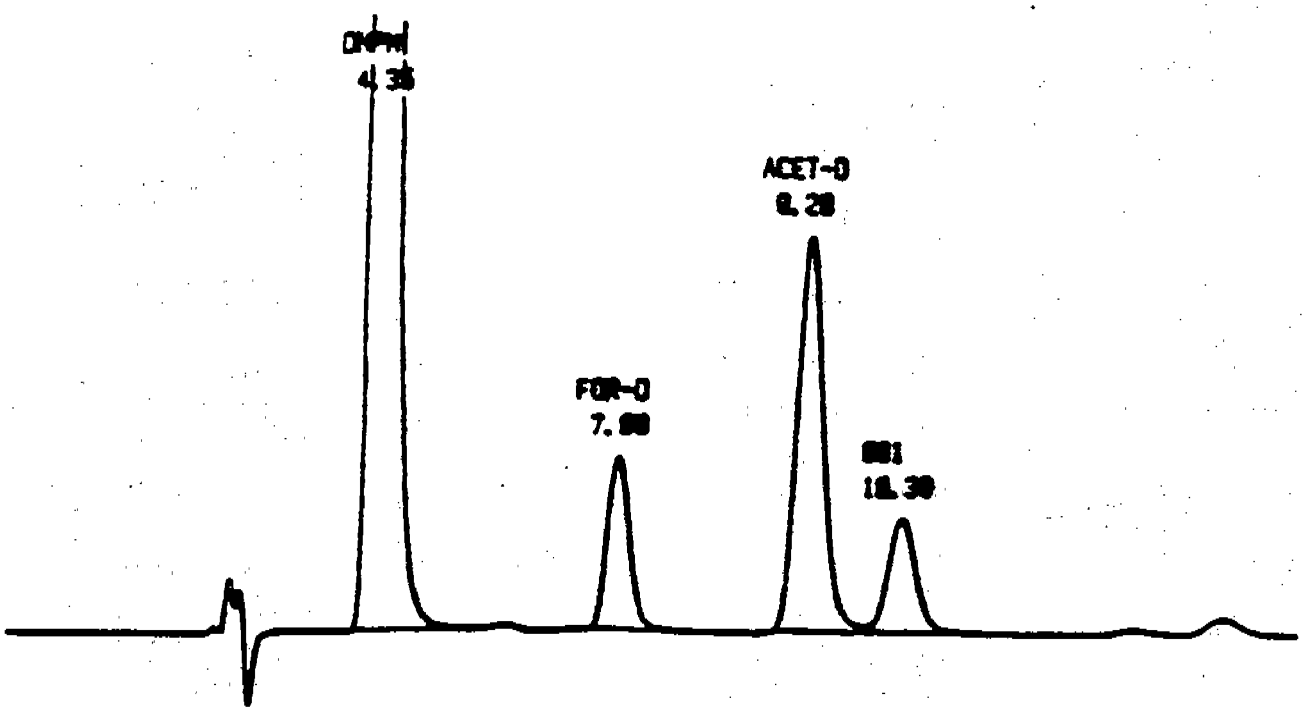
Table 3.6-4

SINGLE OPERATOR ACCURACY AND PRECISION
USING METHYLENE CHLORIDE EXTRACTION

Analyte	Matrix Type	Average Percent Recovery x	Standard Deviation Percent p	Spike Range (µg/L)	Number of Analyses
Formaldehyde	Reagent Water	91	2.5	50-1000	9
	Ground-water	92.5	8.2	50	6
	Liquids	69.6	16.3	250	12
Acetaldehyde	Reagent Water	60.3	3.2	50-1000	9
	Ground-water	63.6	10.9	50	12
	Liquids (2 types)	44.0	20.2	250	12
	Solids	58.4	2.7	0.10-1.0[a]	12

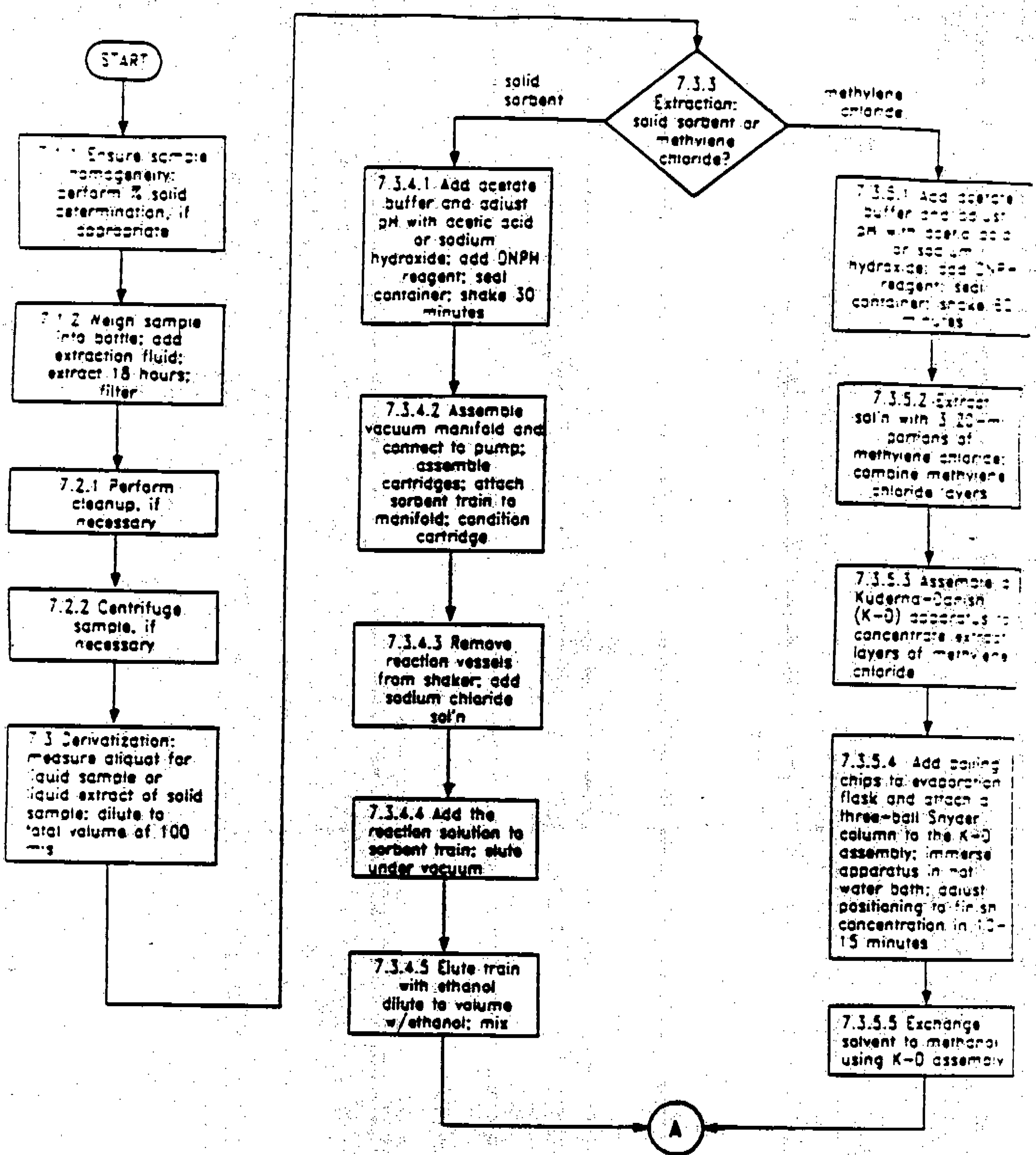
[a] Spike range in units of mg/g.
x - Average recovery expected for this method
p - Average standard deviation expected for this method.

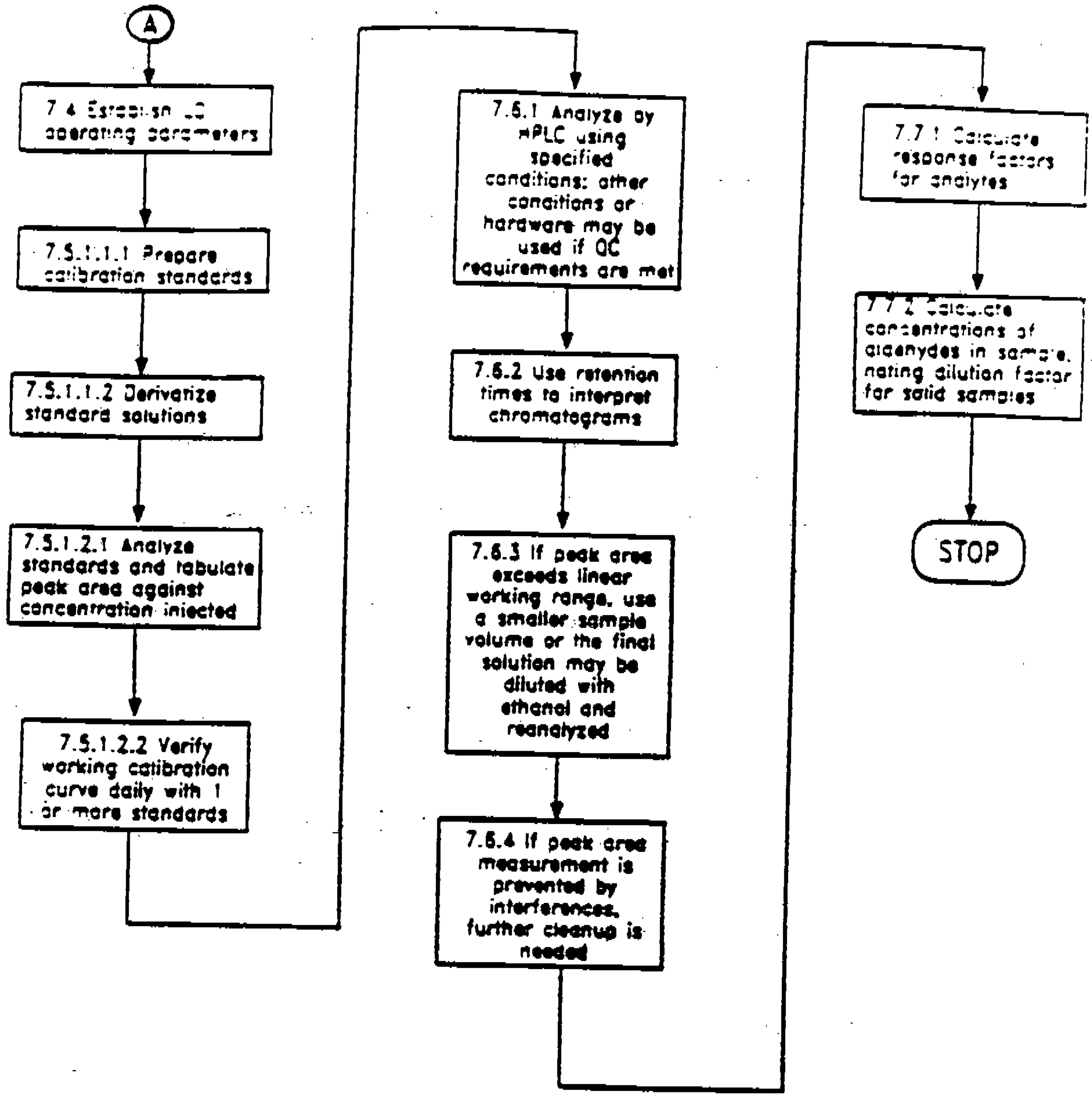
Figure 3.6-1
REPRESENTATIVE CHROMATOGRAM OF A 50 μg/L SOLUTION OF FORMALDEHYDE



FOR-D = Formaldehyde derivative
ACET-D = Acetaldehyde derivative

FORMALDEHYDE BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC)




A
7.4 Establish LC operating parameters
7.5.1.1.1 Prepare calibration standards
7.5.1.1.2 Derivatize standard solutions
7.5.1.2.1 Analyze standards and tabulate peak area against concentration injected
7.5.1.2.2 Verify working calibration curve daily with 1 or more standards
7.6.1 Analyze by HPLC using specified conditions: other conditions or hardware may be used if QC requirements are met
7.6.2 Use retention times to interpret chromatograms
7.6.3 If peak area exceeds linear working range, use a smaller sample volume or the final solution may be diluted with ethanol and reanalyzed
7.6.4 If peak area measurement is prevented by interferences, further cleanup is needed
7.7.1 Calculate response factors for analytes
7.7.2 Calculate concentrations of aldehydes in sample, noting dilution factor for solid samples
STOP

APPENDIX B

CHAIN-OF-CUSTODY DOCUMENTATION AND FIELD LOGS

iea an environmental testing company
3000 WESTON PKWY.
CARY, N.C. 27513

CHAIN OF CUSTODY RECORD

NO: 20038

89

REGULATORY CLASSIFICATION - PLEASE SPECIFY

☐ NPDES ☐ DRINKING WATER ☐ RCRA ☐ OTHER ______

PROJECT #	PROJECT NAME
1423-002	Louisiana Pacific / EML

SAMPLERS: (SIGNATURE)
TASchaal / Jay Morgan

SAMPLE I.D.	DATE	TIME	COMP	GRAB	STATION LOCATION	# OF CONTAINERS	MATRIX SOIL	MATRIX WATER	Formaldehyde Particulates 0011												
PV1R1	2/92								✓												
PV1R2																					
PV1R3																					
PV2 R1																					
PV2 R2																					
PV2 R3																					
PV3 R1																					
PV3 R2																					
PV3 R3																					
PV4 R1																					
PV4 R2									✓												

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY	DATE	TIME
TASchaal	3/9	10AM			
RELINQUISHED BY (SIGNATURE)	**DATE**	**TIME**	**RECEIVED FOR LAB BY**	**DATE**	**TIME**
			Cheng Pau		

IEA QUOTE NO.	IEA RUSH NO.
PROJECT MANAGER (PLEASE PRINT)	**P.O. NO.**

IEA REMARKS	FIELD REMARKS
Silsbee TX Job Page 1 of 4	

iea an environmental testing company
3000 WESTON PKWY.
CARY, N.C. 27513

CHAIN OF CUSTODY RECORD

NO: 20046

REGULATORY CLASSIFICATION - PLEASE SPECIFY

☐ NPDES ☐ DRINKING WATER ☐ RCRA ☐ OTHER ______

PROJECT #	PROJECT NAME
1423-002	Louisiana Pacific / EML

SAMPLERS: (SIGNATURE) D Solcank / Jay Morgan

SAMPLE I.D.	DATE	TIME	COMP	GRAB	STATION LOCATION	# OF CONTAINERS	SOIL	WATER	Formaldehyde BIF method 0011											
PV4 R3	2/92								✓											
Lot 1 DNPH Blank - PV1 and 2																				
Lot 2 DNPH Blank - PV 3 4 5																				
Lot 2 Spiked DNPH Blank - PV 3, 4, 5																				
DS1 R1																				
DS1 R2																				
DS1 R3																				
DS2 R1																				
DS2 R2																				
DS2 R3																				
DS3 R1									✓											

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY	DATE	TIME
D Solcank	3/9	10AM	Cherry Day		
RELINQUISHED BY (SIGNATURE)	**DATE**	**TIME**	**RECEIVED FOR LAB BY**	**DATE**	**TIME**

IEA QUOTE NO.	IEA RUSH NO.
PROJECT MANAGER (PLEASE PRINT)	**P.O. NO.**

IEA REMARKS

Silsbee TX Job page 2 of 4

FIELD REMARKS

iea an environmental testing company
3000 WESTON PKWY.
CARY, N.C. 27513

CHAIN OF CUSTODY RECORD

NO: 20047

REGULATORY CLASSIFICATION - PLEASE SPECIFY

☐ NPDES ☐ DRINKING WATER ☐ RCRA ☐ OTHER ____

PROJECT #	PROJECT NAME
1423-002	Louisiana Pacific / EML

SAMPLERS: (SIGNATURE) DSchuh / Tly Morgan

REQUESTED PARAMETERS: Formaldehyde BIF method 0011

SAMPLE I.D.	DATE	TIME	COMP	GRAB	STATION LOCATION	# OF CONTAINERS	SOIL	WATER	Formaldehyde BIF method 0011
OS 3 R2									✓
~~OS3~~ OS 3 R3	—				Do not analyze unless OS'3 R4 Gives Bad Results				
ONPH Blank Lot 3 OS 1, 2, 3									
spiked DNPH Lot 3 OS 1, 2, 3									
OS 4 R1									
OS 4 R2									
OS 4 R3									
OS 5 R1									
OS 5 R2									
OS 5 R3									✓
OS 3 R4	—	See above comment* OS3-R3							✓

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY	DATE	TIME
DASchuh	3/9/92	10 AM	Cherry Dau		

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY	DATE	TIME

IEA QUOTE NO.	IEA RUSH NO.

PROJECT MANAGER (PLEASE PRINT)	P.O. NO.

IEA REMARKS	FIELD REMARKS
Silsbee TX job — Page 3 of 4	

iea an environmental testing company
3000 WESTON PKWY.
CARY, N.C. 27513

CHAIN OF CUSTODY RECORD

NO: 20037

REGULATORY CLASSIFICATION - PLEASE SPECIFY

☐ NPDES ☐ DRINKING WATER ☐ RCRA ☐ OTHER ______

PROJECT #	PROJECT NAME
1423-002	Louisiana Pacific / EMR

SAMPLERS: (SIGNATURE) TA Sohack / Ray Morgan

SAMPLE I.D.	DATE	TIME	COMP	GRAB	STATION LOCATION	# OF CONTAINERS	SOIL	WATER	Formaldehyde 181F method 0011	REQUESTED PARAMETERS
ONPOH Blank LOT 5	→		DS		4 and 5 and DS 3-R4	—	—		✓	— Needs to be split w/ Spike aliquot
P V5 R1									✓	
DV5 R2									✓	
PV5 R3									✓	
Spiked ONPOH Blank					LOT 5				✓	

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY	DATE	TIME
TA Sohack	3/9/92	10Am	Cherry Dan		
RELINQUISHED BY (SIGNATURE)	**DATE**	**TIME**	**RECEIVED FOR LAB BY**	**DATE**	**TIME**

IEA QUOTE NO.	IEA RUSH NO.
PROJECT MANAGER (PLEASE PRINT)	**P.O. NO.**

IEA REMARKS: Silsbee TX Job P. 4 of 4

FIELD REMARKS: Total ~~39~~ 37 Samples + Blanks

EMISSION TESTING
FIELD PROJECT SUMMARY LOG

CLIENT EML - Louisiana Pacific - Silsbee TX PROJECT NO. 1423-002
PLANT OSB - Plant CITY Silsbee STATE TX

DATE/TIME	ACTION TAKEN
Mon 2/24	in Vicinity of 60' Ladder to Ground from Roof vents @ Peak
Cont'd	(6) JAS meets w/ LP-OSB Shop personnel Requesting
	Electric Power to Roof and Crane for equipment
~1000 HRS	- Electrician Rig Power - Crane to East end of Bldg -
↓	Truck unloaded - Equipment lifted to Roof JAS/JM experience S.T.F.
~1200 HRS	All Iea equipment to Roof - Stack extension and
↓	Scaffolding arrive By crane. - Hoisted up to Roof
~1400	JAS/JM leave site For lunch & to Hardware Store
↓	For Rope, plywood sheets (2x4) ~~etc~~. Tarp etc.
~1530	JAS/JM Return w/ materials - taken to Roof.
↓	OSB Shop personnel in process of Rigging scaffolding
↓	as per EML directions. - Steady Light Rain since 1400 HRS
1830 HRS	JAS/JM leave site FOR Day after taking preliminary
	Velocity/Temperature. - Heavy Rains in area overnight
	as Front moves Through area.
2/25/92	JAS/JM to plant @ 0750 HRS - 24 HR delay anticipated
Tue.	due to Prep problems w/ DNPH solution. - Time spent - Preliminary PV#2
and	preparing Run sheets with ~~and~~ final preparations of trains
	as weather (Rain) permitted. left Plant @ 1250 HRS
	DNPH solution Shipped By T. Pun Mercury Labs Fed Exp P.1

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EMISSION TESTING
FIELD PROJECT SUMMARY LOG

CLIENT FML - Louisiana Pacific - Silsbee TX PROJECT NO. 1423-006
PLANT OSB Plant CITY Silsbee STATE TX

DATE/TIME	ACTION TAKEN
Week 2/17-2/21	Prep work For Job - Glassware Critical cleaned
	w/ Soap Hot water Rinse - DI Rinse - MeCl2 Rinse
	Equipment & Materials Packed For Job
SAT 2/22/92	Truck HP-1 leaves RTP NC for TX - JM Morgan
Sun 2/23/92	JM continues drive Mississippi to TX TAS Flys
	RDU → DFW → BPT in Evening - JM/TAS meet @ Beaumont airport.
Mon 2/24/92	TAS & JM to Louisiana Pacific Orientated Strand
	Board Plant @ 0800 CDT (0900 Eastern) - Met w/ Ed
	Knight - Plant Manager. - Hwy 96 North Side of Silsbee TX.
	0830-0900 TAS & JM to top of Bldg for original
	Site assessment - Access to Roof Via 60' ladder w/cage
	(See Drawings attached) - Immediate Problems noted
	① Roof is Galvanized Sheet Steel @~30° angle from
	edge upward to Roof Peak vent - Surface is difficult
	to negotiate ② Sawdust all over Roof Makes
	Walking Surface in Vicinity of 60' ladder Treacherous
	③ lifting of equipment to Roof location for testing
	Press vents difficult given sloping Roof - Best to use
	Crane ④ AM weather cloudy w/ Potential for some weather
	during afternoon. ⑤ Strong recommendation to rig safety lines

Page 1 of 6 SIGNATURE T A Schenk

(See diagram on Back of Page)

done 2/24/92 in afternoon

projsum.wk1

EMISSION TESTING
FIELD PROJECT SUMMARY LOG

CLIENT LP - EML - Silsbee TX PROJECT NO. 1423-002

PLANT OSB Plant CITY Silsbee STATE Texas

DATE/TIME	ACTION TAKEN
	for delivery on 2/26/92
2/26/92	JAB/JM to plant 0800 HRS — FedExp Deliver DNPH ~1100 HRS
Wed	tested Press Vent #2 — 3 Runs all within 150K limits
	Prepped Trains for 2/27 — left plant 1900 HRS.
2/27/92	to plant 0800 HRS — Tested Press Vent 1 — 3 Runs
Thursday	and Press Vent 4 — Runs 1 & 2 (total 5 Runs)
	left plant 1900 HRS
2/28/92	to plant 0800 HRS — tested Press Vent #4 — 3rd run
Friday	and Press Vent #3 — 3 Runs (~~total~~ 4 Runs)
	left plant 1900 HRS — Made up lost time
	~~from~~ problems w/ set-up and missed delivery
	of DNPH from Clayton Labs.
~~SAT~~ 2/29/92	tested Press Vent #5 — 3 Runs — moved equipment
	to Dryer Stacks — Problem w/ 100' umbilical pitot lines found
	~~after~~ Leak problem on main Hose of 60' umbilical — ended up using Both 100' + 60' umbilicals
Sun 3/1/92	to plant to Prep Trains and finish setup on Dryer Stacks to Seal
	Dryer Stacks — Structure Built (tarp + scaffolding)
	to protect cleanup + meter Box between DS 2/3 and 4/5

Page 3 of 6 SIGNATURE [signature]

projsum.wk1

EMISSION TESTING
FIELD PROJECT SUMMARY LOG

CLIENT LP - EML - Silsbee TX PROJECT NO. 1423-002

PLANT OSB Plant CITY Silsbee STATE Texas

DATE/TIME	ACTION TAKEN
Monday 3/2/92	Tested Dryer Stack #3 — 3 runs but 3rd run Bottle
	broke and 90% of Sample 3 lost. 10% saved.
	also 2 runs on D.S. #2. (not given 4 runs)
Tue 3/3/92	— 1st attempt at Run 3 on D.S. #2 Thrown out —
@ Plant	Plant did not Dryer operating properly. — Restarted
@ 0730 Hrs	Run 3 on DS#2 after consultation with Burner
	control room — Plans are agreed to w/ Plant
	to test DS#4 and #5 next. — AT 11 PM
	plant decided to run 1/4" pase board and
	did not need to run DS#4 and #5 —
	Consequently Had to take down monorails from
	DS#5 and move equipment to DS#1.
	Plant informed of Problems of Having to
	move Through The Armstrong testing team (PM10)
	on unit #3. to get to DS #1 — Plant
	Supplied 200' of 1/4" O.D. polypro to repair 100' umbilical
	to test #1 D.S. — 3 runs completed on D.S. #1
	4th & 5th DNPH shipments arrive @ Plant
	↳ Lost - Broke in Federap - Memphis TN ↳ Repacked By Federap in Drum.

Page 4 of 6 SIGNATURE [signature]

projsum.wk1

EMISSION TESTING
FIELD PROJECT SUMMARY LOG

CLIENT CP-EMI- Silsbee TX PROJECT NO. 1423-002

PLANT OSB Plant CITY Silsbee STATE Texas

DATE/TIME	ACTION TAKEN
Wed 3/4/92	— No testing today — Plant Down for
	maintenance — also Very Heavy T-Storm in
8 HRS X 2	area — locally 3 to 8" Rain in 24 HR period
delay	7 Runs to finish project (OS#4-3 OS#5-3
charges to be added	and 1 on OS#3 to replace lost sample.
Thursday 3/5/92	— to plant ~0745 HRS — 3 Runs of OS #5
	and 2 Runs on OS #4. — total 5 Runs.
	No incidents — Amstrong team (PMCO) completes
	work and departs.
Friday 3/6/92	— to plant ~0730 HRS — 1 Run (3rd and LAST) on OS#4
	— move equipment and get 1 Run (4th and last) on
	OS#3 to make up for broken sample of Run 3 OS3.
	Finished testing ~1130 HRS — Removed
	equipment w/ Bucket and Crane and departed
	Silsbee Plant ~1330 HRS — BACK to Motel
	to Shower — JHS dropped JM @ Jefferson
	county air port JHS left Beaumont area
	~1600 HRS — drove to Mobile Alabama

Page 5 of 6 SIGNATURE John H. Sshank

projsum.wk1

EMISSION TESTING
FIELD PROJECT SUMMARY LOG

CLIENT IP - LML - Silsbee TX PROJECT NO. 1423-002

PLANT OSB Plant CITY Silsbee Texas STATE TX

DATE/TIME	ACTION TAKEN
SAT 3/7/92	OAS continued drive from Mobile Alabama
	w/ samples — left Truck HP1 @ Columbus GA
	airport for next Job in Clayton Alabama.
	TM to fly into Columbus GA Sunday night
	and get truck. OAS got rental car
	and transferred samples — Continued
	drive to RDU area — Arrive 2200 HRS
Mon 3/9/92	— Samples to T. Parr @ Mercury Labs.

Page 6 of 6 SIGNATURE ____________________

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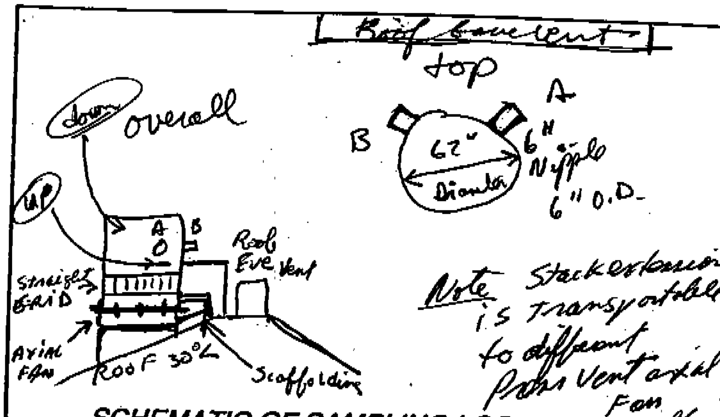
APPENDIX C

PRESS VENTS
FORMALDELYDE FIELD TEST DATA SHEETS, SKETCHES
AND DATA SUMMARY CALCULATIONS

iea

EPA METHOD 1 STACK Extension #1
TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Louisiana Pacific - EML
CITY Silsbee STATE TX
SAMPLING LOCATION Press Vent #1
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 68" - 6 = 62" ID
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 6"
NEAREST UPSTREAM DISTURBANCE less than 0.25 dia
DISTURBANCE Straightening Vanes
NEAREST DOWNSTREAM DISTURBANCE less than 0.5 dia
DISTURBANCE Stack exit
SAMPLER TDS / JM DATE 2/26/92



SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.021	62"	1.3	6"	7.30
2	.067		4.15		10.15
3	.118		7.32		13.32
4	.177		10.97		16.97
5	.250		15.5		21.5
6	.356		22.10		28.10
7	.644		39.9		45.9
8	.750		46.5		52.5
9	.823		51.0		57.0
10	.882		54.70		60.70
11	.933		57.85		63.85
12	.979		60.7		66.7

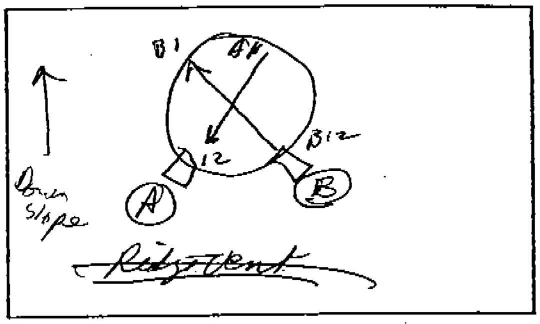
NOT less Than 1" to Walls.

Note — Does Not Meet EPA M1

epa1circ.wk1

PRELIMINARY VELOCITY TRAVERSE
EPA METHOD 2

PLANT/CLIENT LP-Silsbee TX
SOURCE Press Vent #1
DATE 2/26/92 wed
STACK I.D. (inches) 62"
BAROMETRIC PRESSURE (in. Hg) 30.10
STACK GAUGE PRESSURE (in. H2O) -0.29
OPERATORS [signatures]
PITOT NO. PT 12 | TYPE S-type | COEFF 0.84



TRAVERSE POINT LAYOUT SCHEMATIC

TRAVERSE POINT NUMBER	VELOCITY HEAD (in. H2O)	STACK TEMP (°F)
A 1	0.58	90
2	0.75	81
3	0.66	80
4	0.80	79
5	0.43	78
6	0.38	82
7	0.59	80
8	0.86	77
9	0.77	76
10	0.34	77
11	0.27	78
12	0.27	78
AVERAGE	SQRT 0.7335	79.7

TRAVERSE POINT NUMBER	VELOCITY HEAD (in. H2O)	STACK TEMP (°F)
B 1	0.43	82
2	0.55	81
3	0.60	81
4	0.70	81
5	0.46	78
6	0.27	77
7	0.35	76
8	0.42	75
9	0.82	76
10	0.67	76
11	0.45	77
12	0.31	76
AVERAGE	SQRT 0.6996	78.0

POST PITOT LEAK CHECK PASSED [✓] FAILED [ ]

MEASUREMENT DEVICE
MICROMETER [ ]
0-10" MANOMETER [ ]
MAGNEHELIC [ ]
OTHER [ ] EXPLAIN:

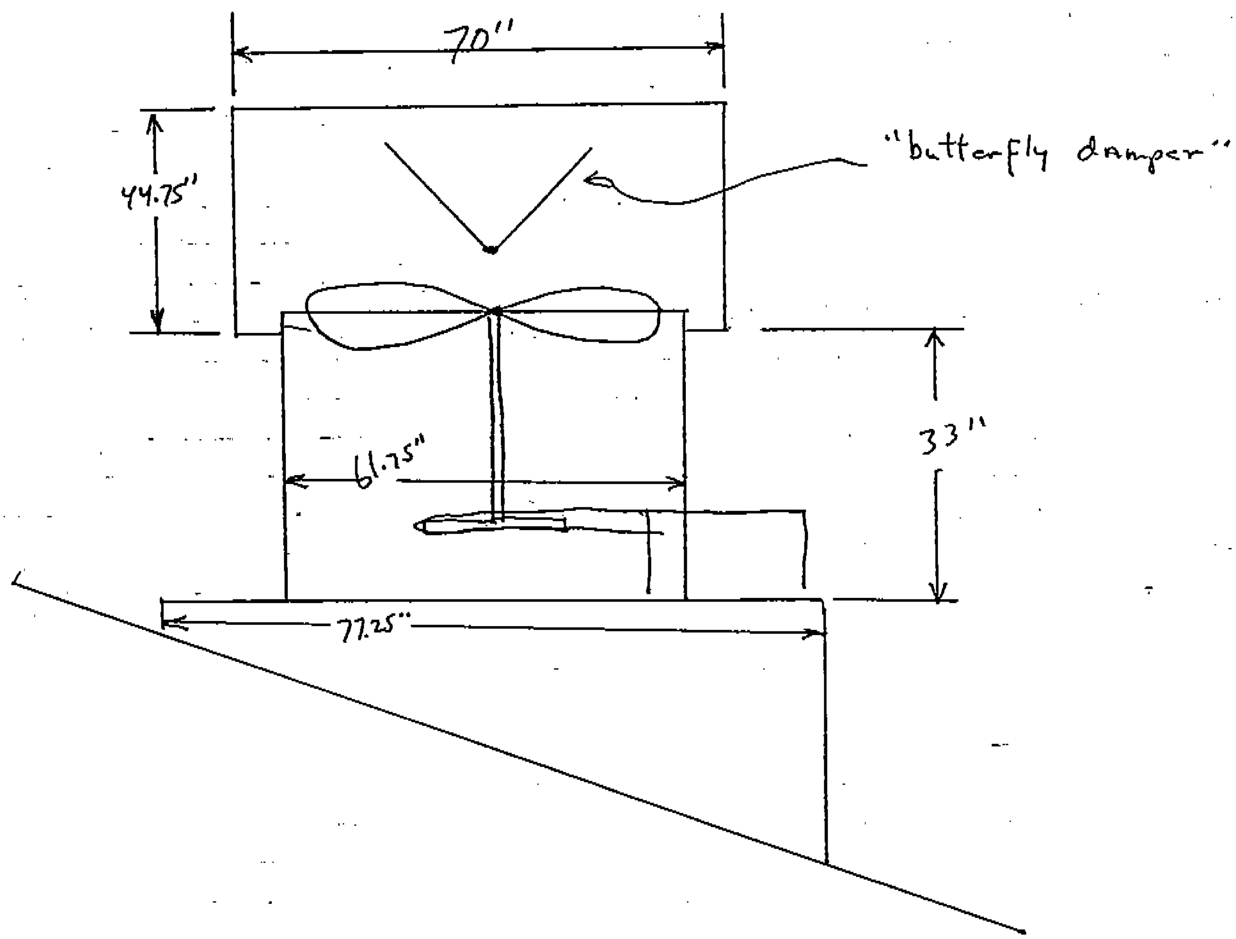
Meter Box M-4

Grand AVG sqrt = 0.7167
T_s = 78.83°F

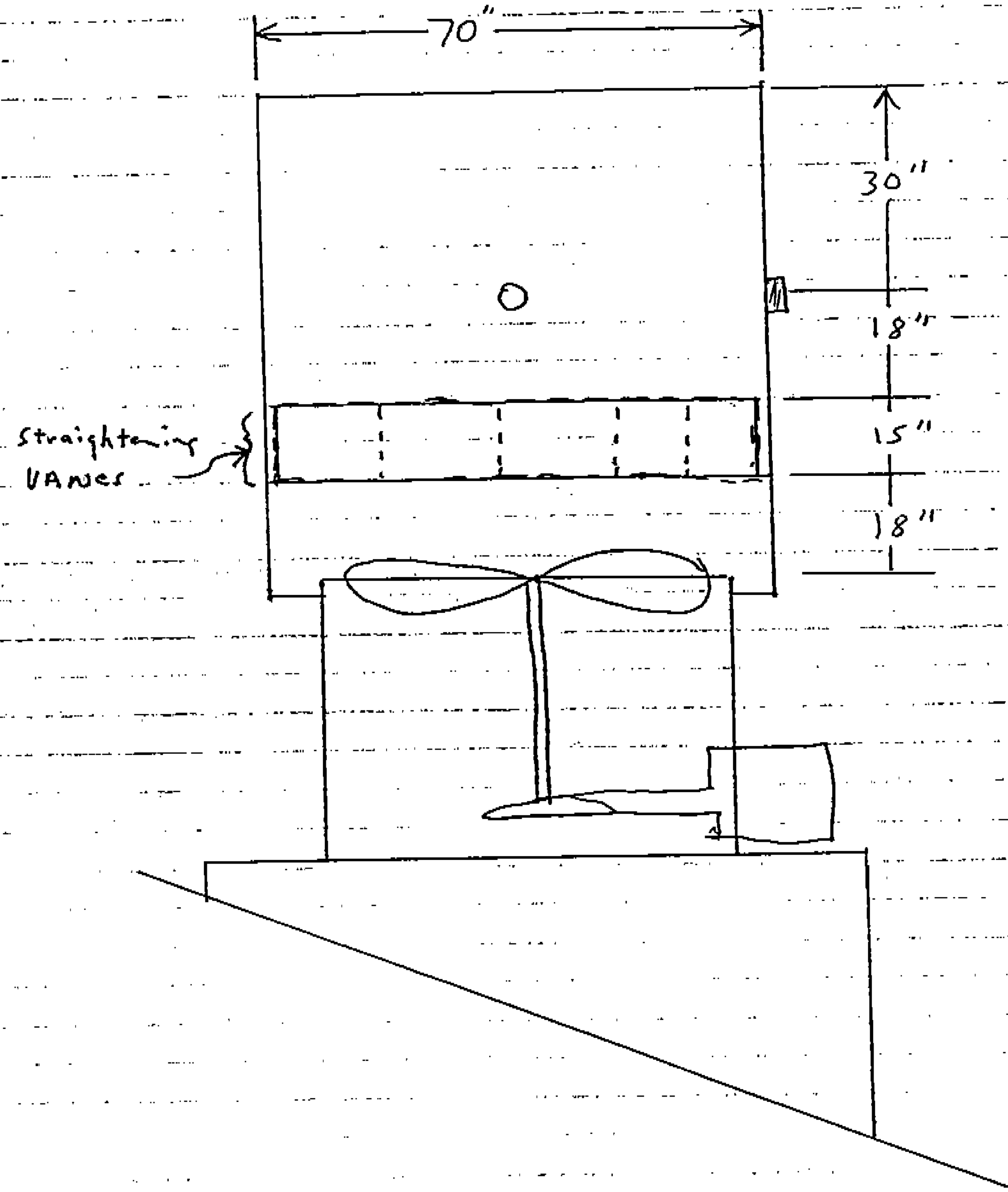
P. Bar 30.10

Nozzle N-25
1 - .235
2 - .235
3 - .235

prevelo.wk1



Existing Roof Vent



Modified Roof Vent

Preliminary

EPA METHOD 2
STACK GAS VELOCITY CALCULATION

Plant LP-Silsbee TX-FMC Project No. Press Vent #1

Date 2/26/92 Calc By V Bsolah Run No. A1-3

Area of stack (ft^2) $= A =$ ~~84~~ 20.97 sqft

note $A = \pi r^2$ when r is in ft 62"/2 =31
or $A = \pi(r/12)^2$ when r is in inches

Pitot tube coefficient, type S $= C_p =$ 0.84

Absolute temperature (avg) of stack ($^oF+460$) $= T_s =$ 78.8+460 = 538.8

Avg of square root of velocity head (in $H_2O)^{1/2}$ $=\sqrt{\Delta p} =$ 0.7167

Absolute pressure of stack gas (in. Hg) $= P_s =$ 30.10 + $\frac{-0.29}{13.6}$ or 30.08

note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Water vapor in gas stream, volume fraction $= B_{ws} =$ est 3.8% (From 2/25 data Press Vent 2

Molecular weight of stack gas (lb/lb mole) $= M_s =$ 28.43 (From 2/25 data Press vent 2

note $M_s = M_d(1 - B_{ws}) + 18\ B_{ws}$

V_s = stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(538.8)}{(30.08) \times (28.43)}} \times (0.7167)$$

V_s = 40.852 ft/s

Q_{sd} = volumetric flow rate (dscfm)

$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$

$$Q_{sd} = 60 \times (1 \overset{.962}{-0.038}) \times (40.852) \times (\cancel{84}\ 20.97\ sqft) \times (\frac{528}{538.8}) \times (\frac{30.08}{29.92})$$

Q_{sd} = ~~195,140.2~~ 48,714.8 dscfm

EPA2CALC.SHT 5/90

ied

DIAMETER OF SAMPLING NOZZLE CALCULATION WORKSHEET

Plant LP - Silsbee TX / EML Location Sampled Pen Vent #1 Runs 1-3

Date 2/26/92 Calculated By [illegible] / [illegible] Morgan

REQUIRED INPUT DATA

Pitot tube coefficient (usually 0.84)	$= C_p$	= 0.84
Barometric pressure (in. Hg) (measured at stack level)	$= P_{bar}$	= 30.10
Stack gas temperature, average (°R = 460+°F) (from past data or preliminary velocity traverse)	$= T_s$	= 538.8 °R
Dry gas meter temperature, average (°R) (usually ambient temp + 20°F + 460°)	$= T_m$	= 530
Velocity head, average (in. H_2O) (use $[(\sqrt{\Delta p})_{avg}]^2$ for this value from past data or preliminary velocity traverse)	$= \Delta p_{avg}$	= 0.7167
Stack gas static pressure (in. H_2O) (measured or past data)	$= P_g$	= -0.29
Dry gas molecular weight (lb/lb-mole) (measured, or past data, or use 29.0 for combustion sources)	$= M_d$	= 28.84
Stack gas moisture (%) (measured by EPA Method 4, or wet bulb dry bulb estimate, or past data)	$= \%B_{ws}$	= 3.78%
Orifice pressure differential, avg (in. H_2O) (use past data or DGM's $\Delta H_@$ value)	$= \Delta H_{avg}$	= 1.9277 For Box MY
Sampling rate through DGM desired (cfm) (typically 0.75, but calculate the cfm needed based on minimum gas volume for test and total sampling run time)	$= Q_m$	= 0.75

CALCULATED INPUT DATA

Absolute stack gas pressure (in. Hg) = $P_s = P_{bar} + (P_g/13.6)$

$$P_s = (30.10) + [(-.29)/13.6]$$

P_s = 30.08 in. Hg

Wet gas molecular weight (lb/lb-mole) = M_s

$$M_s = M_d(1-(\%B_{ws}/100)) + 18(\%B_{ws}/100)$$

$$M_s = [(28.84)(1 - (3.78)/100)] + (18(3.78)/100)$$

M_s = 28.43 lb/lb-mole

NOZCALC.SHT 8/91

LP - Scrubber
Vent #1
Run 1-3
done 2/26/92

Absolute dry gas meter pressure (in. Hg) = $P_m = P_{bar} + (\Delta H_{avg}/13.6)$

$$P_m = (\ 30.10\ ) + [(\ 1.9277\ )/13.6]$$

P_m = 30.24 in. Hg

CALCULATION OF SAMPLING NOZZLE DIAMETER

$$D_{n(est)} = \sqrt{\frac{0.0358\ Q_m\ P_m}{T_m\ C_p\ (1-\%B_{ws}/100)} \sqrt{\frac{T_s\ M_s}{P_s\ \Delta p_{avg}}}}$$

$$D_{n(est)} = \sqrt{\frac{(0.0358)(\ 0.75\ )(\ 30.24\ )}{(\ 530\ )(\ 0.84\ )(1-(\ 3.78\ )/100)} \sqrt{\frac{(\ 538.8\ )(\ 28.43\ )}{(\ 30.08\ )(\ 0.7167\ )}}}$$

$D_{n(est)}$ = 0.225 inches

Actual D_n = 0.235 inches

K-FACTOR CALCULATION

Isokinetic rate DGM orifice pressure differential (in. H_2O) = ΔH

$$\Delta H = \left[846.872\ D^4_{n(act)}\ \Delta H_@\ C_p^2\ (1-\%B_{ws}/100)^2\ \frac{M_d\ T_m\ P_s}{M_s\ T_s\ P_m} \right] \Delta p$$

where [....] = K-Factor

$$K = \frac{(846.872)(0.235)^4(1.9277)(\ 0.84\ )^2(1-(3.78)/100)^2(\ 28.84\ )(\ 530\ )(\ 30.08\ )}{(\ 28.43\ )(\ 538.8\ )(\ 30.24\ )}$$

K = 3.228

For ~~Paper~~ ~~Stack~~ Vents #1 to 5

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EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/12/92	Vent #1 Rem #1	Method 0011	Run 1 / Vent #1

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
A Schenk / T Morgan	30.2	-0.35	56	N/A	62	0.84	Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	6C	GI1	N/A	15	0.001	7	0.001	3.28/3.32

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	FINAL
Collection Method	Grab	%O2	21	Ambient air				✓	✓
Analysis Method	Fyrite	%CO2	0						

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A1	0	0833	713.158	0.76	2.5	83	250	248	51	55		4
A2	2.5		715.20	0.76	2.5	87	248	252	52	~~60~~ 55		4
A3	5.0		717.31	0.65	2.1	84	247	246	50	~~61~~ 56		3
A4	7.5		719.24	0.72	2.4	83	250	256	50	59		4
A5	10.0		721.28	0.53	1.7	85	243	252	50	60		3
A6	12.5		723.02	0.23	0.75	82	251	249	50	61		2
A7	15.0		724.25	0.55	1.8	82	252	255	49	62		3
A8	17.5		726.02	0.83	2.7	82	252	259	49	63		4
A9	20.0		728.10	0.65	2.1	83	251	255	49	64		3
A10	22.5		730.10	0.29	0.95	84	248	248	50	65		2
A11	25.0		731.40	0.23	0.76	84	247	247	50	65		2
A12	27.5		732.63	0.23	0.76	86	243	260	50	65		2
END	30.0											

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: [signature] Date 3/92

iea

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/4/92	Silsbee TX Vent #1 / Run 1	Method 0011	Run 1 Vent #1

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX TEMP (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30.0	0909	733.814	0.42	1.4	89	249	249	53	64		3
B2	32.5		735.39	0.62	2.1	89	250	254	49	66		4
B3	35.0		737.30	0.59	2.0	89	247	256	48	68		4
B4	37.5		739.18	0.66	2.2	87	248	256	49	69		4
B5	40.0		741.15	0.38	1.3	88	249	250	50	69		2
B6	42.5		742.72	0.20	0.66	85	250	250	51	70		2
B7	45.0		743.90	0.36	1.2	83	251	258	51	69		3
B8	47.5		745.32	0.74	2.3	84	251	254	51	70		4
B9	50.0		747.36	0.89	3.0	83	250	249	50	71		4
B10	52.5		749.66	0.65	2.2	86	246	251	51	71		4
B11	55.		751.71	0.44	1.5	85	248	249	51	72		2
B12	57.5		753.42	0.44	1.5	86	249	249	51	71		3
B11 ~~End~~	60		755.10	~~0.59~~	~~2.0~~	~~86~~	~~251~~	~~250~~	~~51~~	~~72~~	~~nm~~	~~3~~
B10	62.5		756.99	0.86	2.9	84	242	253	52	72		4
End	65		759.183									
			65 minute run	.7259	1.8	85				66		

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	65	46.025	.7259	1.81	85	66

$I_{\%OS} = 99.59$

$\sqrt{P_S T_S} = 16.946$

Sheet Checked By: ____________ Date ______

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific – EML **Sample Date:** 2/29/92

Sample Location: Press Vent #1 Silsbee TX **Recovery Date:** 2/29/92

Recovered By: [signature]

Run No.: Run #1 Vent #1

B Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	568.0	574.0	462.0	726.2	grams
Initial Weight	569.0	572.8	462.0	717.5	grams
Net Weight	-1.0	+1.2	0	+8.7	grams

Description of impinger water ______ 8K % spent

______ Sil Gel Color

Total Moisture 8.9 g. grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

LP

EPA METHOD 5 CALCULATIONS

Plant Sealee TX Location Sampled Vent #1 Run 1

Date 2/27/92 Run No. 1 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ 0.999

Volume of gas at meter conditions (ft^3) $= V_m =$ 46.025

Average meter temperature ($^{o}F + 460)^{o}R$ $= T_m =$ 66 + 460

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.20

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 1.8

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(0.999)(17.64)(46.025)[(30.2)+(1.8)/13.6]}{(526)}$$

$V_{m(std)} =$ 46.77 dscf

Total volume of water collected (mL) $= V_{1c} =$ 8.9 ml

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)(8.9) =$ 0.4189

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(\cancel{8.9}\ .4189)}{(46.77) + (\cancel{8.9}\ .4189)}$$

$B_{ws} =$ .0089

Percent moisture $= (100)(B_{ws}) = 100$ (.0089)

Percent moisture = 0.89 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 -$ (.0089)

MF = .9911

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 21 %
Percent CO by volume dry basis = CO = 0 %
Percent CO_2 by volume dry basis = CO_2 = 0 %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$$

$$N_2 = \underline{79}\ \%$$

Molecular weight of dry gas (lb/lb-mole) = M_d

$$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$$

$$M_d = 0.44\ (\ 0\ ) + 0.32\ (\ 21\ ) + 0.28\ (\ 79 + 0\ )$$

$$M_d = \underline{28.84}\ \text{lb/lb-mole}$$

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$$

$$M_s = (\ 28.84\ )\ [1 - (\ .0089\ )] + 18\ (\ .0089\ )$$

$$M_s = \underline{28.74}\ \text{lb/lb-mole}$$

Percent excess air (%) = % EA

$$\%\ EA = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\%\ EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) = T_s = 85+460 = 545

Avg of sq root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = .7259

Absolute pressure of stack gas (in. Hg) = P_s = $30.2 + \frac{-.35}{13.6} = 30.18$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = .84

V1R1

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(545)}{(30.17) \times (28.74)}} \times (.7259)$$

V_s = 41.328 ft/s

Area of stack (ft^2) 62"/24 = = A = 20.966

Testing time (min) = θ = 65

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .0089) \times (41.328) \times (20.966) \times (\frac{528}{545}) \times (\frac{30.17}{29.92})$$

Q_{sd} = 50,336 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

$A_n = (0.005454)(.235)^2$ = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (545)[0.00267(8.9) + ((46.025)(.999)/(526))((30.2) + (1.8)/13.6)]}{60\ (41.328)(30.17)(.000301)(65)}$$

I = 99.61 %

ied

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific – Silsbee, TX	2/11/92	Vent #1 Run #2	Method 0011	Run 2 Vent 1

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
THS/JM	30.2	-0.35	70	N/A	62	0.84	6ft Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	6C	6C	NA	10	0.01	6	0.18	3.3

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT
Collection Method	Fyrite	%O2	21	Ambient air			
Analysis Method	Grab	%CO2	0				

PITOT SYSTEM LEAK CHECK INIT	FINAL
✓	✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
A1	0.0	1040	759.443	0.79	2.6	95	243	252	60	69		3
A2	2.5		761.60	0.95	3.2	95	249	252	55	71		4
A3	5.0		763.92	0.77	2.5	94	249	247	57	72		3
A4	7.5		766.02	0.95	3.1	91	243	262	57	72		4
A5	10.0		768.38	0.67	2.2	94	251	250	57	74		3
A6	12.5		770.45	0.47	1.6	92	250	254	58	75		3
A7	15.0		772.18	0.51	1.8	90	244	259	59	75		3
A8	17.5		774.98	0.72	2.4	91	250	250	59	75		3
A9	20.0		776.02	0.60	2.0	92	249	247	59	75		3
A10	22.5		777.92	0.38	1.3	94	251	258	60	76		2
A11	25.0		779.51	0.26	0.86	93	245	260	59	76		2
A12	27.5		780.79	0.25	0.83	94	243	250	59	76		2
END	30.		782.029									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: THS Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY				DATE	SAMPLING LOCATION			SAMPLE TYPE		RUN NUMBER			
Louisiana Pacific –Silsbee, TX				2/[illegible]/92	Silsbee TX Vent 1 Run 2			Method 0011		Run 2 Vent #1			
TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)	
B1	30.0	1115	782.029	0.47	1.6	101	244	248	63	75		2	
B2	32.5		783.75	0.61	2.0	98	246	253	58	75		2	
B3	35.0		785.63	0.61	2.0	100	244	258	57	77		2	
B4	37.5		787.53	0.69	2.3	96	248	253	56	77		3	
B5	40.0		789.51	0.44	1.5	96	247	251	58	77		2	
B6	42.5		791.20	0.27	.89	96	251	253	60	78		2	
B7	45.0		793.53	0.45	1.5	93	251	256	59	78		2	
B8	47.5		794.07	0.59	1.9	93	250	249	58	78		3	
B9	50.0		796.97	0.90	3.0	94	250	248	57	79		4	
B10	52.5		798.18	0.77	2.5	95	247	257	57	79		3	
B11	55		800.33	0.61	2.0	95	248	255	56	80		3	
B12	57.5		802.23	0.58	1.9	95	249	255	56	80		3	
B11	~~60~~ 60		804.09	0.71	2.3	96	243	248	58	80		3	
B10	62.5		806.12	0.93	3.1	96	247	256	57	80		4	
End	65		808.438										

804.443

Run Totals	TOTAL TIME		DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	65		48.995	0.7723	2.03	94.6	78.1

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - CWL
Sample Date: 2/28/92

Sample Location: Press Vent #1 - Silsbee TX
Recovery Date: 2/28/92

Recovered By: [signature]

Run No.: Run #2 Vent #1

A train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	587.0	583.0	482.8	713.6	grams
Initial Weight	589.2	582.2	482.2	707.2	grams
Net Weight	-2.2	+0.8	+0.6	+6.4	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture +5.6 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP Silsbee TX   Location Sampled Vent #1 Run 2

Date 2/27/92   Run No. 2   Calc By [illegible]

Dry gas meter calibration factor $= Y = .999$

Volume of gas at meter conditions (ft^3) $= V_m = 48.995$

Average meter temperature (^oF + 460)^oR $= T_m = 76.1+460 = 536.1$

Barometric pressure absolute (in. Hg) $= P_{bar} = 30.2$

Average orifice pressure drop (in. H_2O) $= \Delta H = 2.03$

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(48.995)[(30.2)+(2.03)/13.6]}{(536.1)}$$

$V_{m(std)} = 48.88$ dscf

Total volume of water collected (mL) $= V_{1c} = 5.6$ ml.

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)(5.6) = .2658$

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.2658)}{(48.88) + (.2658)}$$

$B_{ws} = .00541$

Percent moisture = $(100)(B_{ws})$ = 100 (.00541)

Percent moisture = .541 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (.00541)

MF = .9946

EPA5CALC.SHT

DVI R2

Percent O_2 by volume dry basis = O_2 = ______ %
Percent CO by volume dry basis = CO = ______ %
Percent CO_2 by volume dry basis = CO_2 = ______ %

Percent N_2 by volume dry basis = 100 - (O_2 + CO + CO_2)

N_2 = 100 - [( )+( )+( )]

N_2 = ______ %

Std air

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

M_s = (28.84) [1 - (.00541)] + 18 (.00541)

M_s = 28.78 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) 94.6 = T_s = 554.6

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = 0.7723

Absolute pressure of stack gas (in. Hg) = P_s = 30.2 + -.35/13.6 = 30.17

note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = .84

DVI R2

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.84) \times \sqrt{\frac{(554.6)}{(30.17) \times (28.78)}} \times (.7723)$$

V_s = 44.324 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 65

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .00541) \times (44.324) \times (20.966) \times \left(\frac{528}{554.6}\right) \times \left(\frac{30.17}{29.92}\right)$$

Q_{sd} = 53,237 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235 $)^2$ = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{1c} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (554.6)[0.00267(5.6) + ((48.595)(.999)/(536.1))((30.2) + (2.03)/13.6)]}{60\ (44.324)(30.17)(.000301)(65)}$$

I = 98.42 %

iea

EMISSION TESTING FIELD DATA

Page 1 of 2

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/4/92	Vent #1 Run #3	Method 0011	Run 3 Vent 1

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
TAS / JTM	30.2	-0.35	75	N/A	62	0.84	Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	6C	6C	N/A	10	0.01	7	0.004	3.3

EPA METHOD 3
Collection Method: grab
Analysis Method: fyrite

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	21	Amb air			
%CO2	0				

PITOT SYSTEM LEAK CHECK INIT	FINAL
✓	✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
A1	0	1236	808.915	0.72	2.4	102	242	246	64	75		3
A2	2.5		810.99	0.86	2.8	100	249	260	55	76		4
A3	5.0		813.25	0.91	3.0	103	243	257	56	78		4
A4	7.5		815.60	0.86	2.8	100	244	250	58	79		4
A5	10.0		817.85	0.60	2.0	99	250	260	60	80		3
A6	12.5		819.90	0.40	1.3	100	243	264	56	80		3
A7	15.0		821.43	0.456	1.8	97	244	251	54	81		3
A8	17.5		823.14	0.57	1.9	97	250	257	53	81		3
A9	20.0		825.05	0.70	2.3	98	247	259	53	81		4
A10	22.5		827.13	0.38	1.3	97	249	254	53	81		3
A11	25.0		828.74	0.36	1.2	99	245	254	53	81		3
A12	27.5		830.24	0.31	1.0	98	249	256	54	81		3
	END 30		831.628									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: [signature] Date 3/92

iea

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/19/92	Vent #1 Run # 3	Method 0011	Run # 3 Vent #1

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30.0	1310	831.628	0.71	2.3	102	61	248	254	79		3
B2	32.5		833.64	0.77	2.5	100	249	252	52	81		3
B3	35.0		835.84	0.55	1.8	98	250	252	51	81		3
B4	37.5		837.54	0.71	2.3	100	260	251	52	81		3
B5	40.0		839.68	0.38	1.3	98	242	251	53	81		3
B6	42.5		841.28	0.25	0.83	100	243	249	53	81		2
B7	45.0		842.53	0.46	1.5	96	242	249	53	81		2
B8	47.5		844.15	0.85	2.8	98	249	250	53	81		4
B9	50.0		846.34	0.86	2.8	98	250	250	53	82		4
B10	52.5		848.63	0.73	2.4	99	245	258	55	82		3
B11	55.0		850.73	0.55	1.8	99	249	250	56	82		3
B12	57.5		852.54	0.55	1.8	99	247	253	56	82		3
	End 60		854.378									

853.915

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	45.463	.7693	2.0	99.0	80.3

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - EML Sample Date: 2/28/92
Sample Location: Press Vent #1 - Slicker 7 Recovery Date: 2/28/92
Recovered By: [illegible]

Run No.: Run 3 Vent #1

C Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	593.0	604.5	485.6	699.9	grams
Initial Weight	592.8	602.6	485.0	691.2	grams
Net Weight	+0.2	+1.9	0.6	+8.7	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture +11.4 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP Schaeffer Location Sampled Vent 1 Run 3

Date 2/25/92 Run No. 3 Calc By [signature]

Dry gas meter calibration factor $= Y =$ .999

Volume of gas at meter conditions (ft^3) $= V_m =$ 45.463

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 80.3+460= 540.3

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.2

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 2.0

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\ (17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(\cancel{30.2}\ 45.463)[(30.2)+(2)/13.6]}{(540.3)}$$

$V_{m(std)} =$ 44.999 dscf

Total volume of water collected (mL) $= V_{1c} =$ 11.4

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)($ 11.4 $) =$ .5366

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.5366)}{(44.999) + (.5366)}$$

$B_{ws} =$ .0118

Percent moisture $= (100)(B_{ws}) = 100\ (\quad)$

Percent moisture = 1.18 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 - ($.0118$)$

MF = .9882

EPA5CALC.SHT

N1B3

Percent O_2 by volume dry basis = O_2 = ______ %
Percent CO by volume dry basis = CO = ______ %
Percent CO_2 by volume dry basis = CO_2 = ______ %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.0118)] + 18\ (.0118)$

M_s = 28.71 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) = T_s = 99+460 = 559

Avg of sq root of velocity head (in H_2O)$^{1/2}$ = $\sqrt{\Delta p}$ = .7693

Absolute pressure of stack gas (in. Hg) = P_s = $30.2 + \left(\frac{-.35}{13.6}\right) = 30.174$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

pV1 R3

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.84) \times \sqrt{\frac{(559)}{(30.17) \times (28.71)}} \times (.7693)$$

V_s = 44.38 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .0118) \times (44.38) \times (20.966) \times (\frac{528}{559}) \times (\frac{30.17}{29.92})$$

Q_{sd} = 52,545 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) $(.235)^2$ = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (559)[0.00267(11.4) + ((45.463)(.999)/(540.3))((30.2) + (2.0)/13.6)]}{60\ (44.38)(30.17)(.000301)(60)}$$

I = 99.46 %

Stack extension #2 used on PV 2 + 4

EPA METHOD 1
TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT CP-EMC- Silsbee TX
CITY Silsbee STATE TX
SAMPLING LOCATION Prewenter #2+4
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A) 68-6=62"
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B) 6"
(A) NEAREST UPSTREAM DISTURBANCE less than 0.25 dia
DISTURBANCE Straightening Vane.
(B) NEAREST DOWNSTREAM DISTURBANCE less than 0.5 dia
DISTURBANCE Stack ex. 7
SAMPLER [illegible] DATE 2/25/92

See Diagram Stack extension #1 Same As Stack extension 2

SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.021	62"	1.3	6"	7.30
2	.067		4.2		10.2
3	.118		7.3		13.3
4	.177		11.0		17.0
5	.250		15.5		21.5
6	.356		22.1		28.1
7	.644		39.9		45.9
8	.750		46.5		52.5
9	.823		51.0		57.0
10	.882		54.7		60.7
11	.933		57.9		63.9
12	.979		60.7		66.7

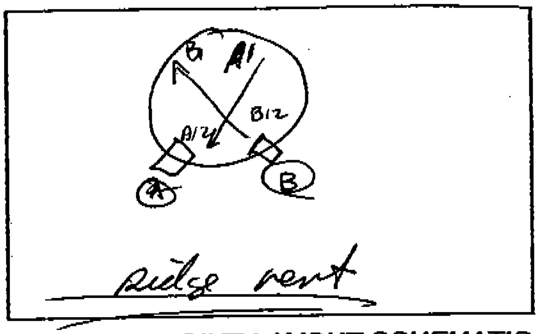
epa1circ.wk1

Note - Does not meet EPA criteria

PRELIMINARY VELOCITY TRAVERSE
EPA METHOD 2

iea

PLANT/CLIENT: CP-EML-Scotch 84
SOURCE: ~~[illegible]~~ vent #2 ~~Stack extension #2~~
DATE: 2/25/92
STACK I.D. (inches): 62"
BAROMETRIC PRESSURE (in. Hg): 29.85"
STACK GAUGE PRESSURE (in. H2O): -0.14"
OPERATORS: AS/DM
PITOT NO.: PT12 | TYPE: Standard type. | COEFF: 0.84



TRAVERSE POINT LAYOUT SCHEMATIC

A

TRAVERSE POINT NUMBER	VELOCITY HEAD (in. H2O)	STACK TEMP (°F)
1	0.63	86
2	0.76	85
3	0.63	85
4	0.65	85
5	0.49	85
6	0.27	86
7	0.28	86
8	0.57	88
9	0.76	92
10	0.66	94
11	0.52	97
12	0.35	95
AVERAGE	SQRT 0.7305	88.67

B

TRAVERSE POINT NUMBER	VELOCITY HEAD (in. H2O)	STACK TEMP (°F)
1	0.61	82
2	0.77	82
3	0.72	82
4	0.73	83
5	0.44	84
6	0.29	84
7	0.55	85
8	0.72	89
9	0.78	90
10	0.48	90
11	0.47	92
12	0.31	90
AVERAGE	SQRT 0.7476	86.08

POST PITOT LEAK CHECK — PASSED [✓] FAILED [ ]

MEASUREMENT DEVICE

- MICROMETER [ ]
- 0–10" MANOMETER [ ]
- MAGNEHELIC [ ]
- OTHER [✓] EXPLAIN:

MS console #4 used

Wet Bulb Temp = 70.2°F

Fyrite = 20.9% O2, 0% CO2

Grand avg 24 sqrts ⇒ 0.7391

Grand avg temp 24 ⇒ 87.38

prevelo.wk1

EPA METHOD 2

STACK GAS VELOCITY CALCULATION

Plant LP-GML-Silsbee TX Project No. ______

Date 2/25/92 Calc By VHS Run No. PressVent 2

Area of stack (ft^2) $\frac{62''}{2} = 31''$ $(31/12)^2 \times \pi \Rightarrow 20.966$ = A = 20.966

note $A = \pi r^2$ when r is in ft
or $A = \pi (r/12)^2$ when r is in inches

Pitot tube coefficient, type S = C_p = 0.84

Absolute temperature (avg) of stack (^oF+460) = T_s = 547.4°R

Avg of square root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = 0.7391

Absolute pressure of stack gas (in. Hg) = P_s = -0.14/13.6 + 29.85

note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6] ⇒ 29.84"

Water vapor in gas stream, volume fraction = B_{ws} = 0.0378

Molecular weight of stack gas (lb/lb mole) = M_s = 28.43

note $M_s = M_d(1 - B_{ws}) + 18\ B_{ws}$

Ambair 78% N_2
21% O_2
28.84 = dry

V_s = stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(547.4)}{(29.84) \times (28.43)}} \times (0.7391)$$

V_s = ______ ft/s

Q_{sd} = volumetric flow rate (dscfm)
$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$

$$Q_{sd} = 60 \times (1 - .0378) \times (42.63) \times (20.966) \times (\frac{528}{547.4}) \times (\frac{29.84}{29.92})$$

Q_{sd} = 49,637.1 dscfm

EPA METHOD 4

MOISTURE IN STACK GAS BY WET BULB-DRY BULB MEASUREMENT

Plant LP-EML-Silsbee TX Location Sampled Press Vent #2
Date 2/25/92 Run No. Press vent #2 Runs 1-3 Calc By VPS / NM

Barometric pressure (in. Hg)	$= P_{bar}$	=	29.85
Stack static pressure (in. H_2O)	$= P_g$	=	-0.14"
Absolute pressure of stack $P_{bar} \pm (P_g/13.6)$	$= P_s$	=	29.84
Wet bulb temperature (°F)	$= T_w$	=	70.2
Dry bulb temperature (°F)	$= T_d$	=	87.4
Temperature Difference (T_d-T_w)	$= \triangle T$	=	17.2
Vapor pressure of H_2O (from T_d and table below)	= VP	=	~~0.8849~~ 1.3098

Partial pressure of H_2O = PP

$$PP = (VP) - \frac{(P_s - VP)(\triangle T)}{2800 - (1.3)(T_w)}$$

$$PP = (\cancel{0.8849}\ 1.3098) - \frac{[(29.84) - (\cancel{0.8849}\ 1.3098)]\,(17.2)}{2800 - (1.3)(70.2)} = 1.1286$$

% Moisture by volume = M

$$M = \frac{PP}{P_s}(100) = \frac{(1.1286)}{(29.84)}(100) = 3.78\ \%\ \text{moisture}$$

or 0.0378

VAPOR PRESSURES OF WATER																					
°F	in.Hg	°F	in.Hg	°F	in.Hg	°F	in.Hg	°F	in.Hg	°F	in.Hg	°F	in.Hg	°F	in.Hg	°F	in.Hg	°F	in.Hg	°F	in.Hg
0	0.0376	33	0.1878	53	0.4052	73	0.8183	93	1.561	113	2.829	133	4.900	153	8.150	173	13.07	193	20.27		
2	0.0417	34	0.1955	54	0.4203	74	0.8462	94	1.610	114	2.911	134	5.031	154	8.351	174	13.37	194	20.70		
4	0.0463	35	0.2035	55	0.4359	75	0.8750	95	1.660	115	2.995	135	5.165	155	8.557	175	13.67	195	21.14		
6	0.0517	36	0.2118	56	0.4520	76	0.9046	96	1.712	116	3.081	136	5.302	156	8.767	176	13.98	196	21.59		
8	0.0571	37	0.2203	57	0.4696	77	0.9352	97	1.765	117	3.169	137	5.442	157	8.981	177	14.30	197	22.05		
10	0.0631	38	0.2292	58	0.4858	78	0.9666	98	1.819	118	3.259	138	5.585	158	9.200	178	14.62	198	22.52		
12	0.0696	39	0.2383	59	0.5035	79	0.9989	99	1.875	119	3.351	139	5.732	159	9.424	179	14.96	199	22.99		
14	0.0768	40	0.2470	60	0.5218	80	1.032	100	1.932	120	3.446	140	5.861	160	9.652	180	15.29	200	23.47		
16	0.0846	41	0.2576	61	0.5407	81	1.066	101	1.992	121	3.543	141	6.034	161	9.885	181	15.63	201	23.96		
18	0.0932	42	0.2677	62	0.5601	82	1.102	102	2.052	122	3.642	142	6.190	162	10.12	182	15.98	202	24.46		
20	0.1025	43	0.2782	63	0.5802	83	1.138	103	2.114	123	3.744	143	6.350	163	10.36	183	16.34	203	24.97		
22	0.1127	44	0.2891	64	0.6009	84	1.175	104	2.178	124	3.848	144	6.513	164	10.61	184	16.70	204	25.48		
24	0.1248	45	0.3004	65	0.6222	85	1.213	105	2.243	125	3.954	145	6.680	165	10.86	185	17.07	205	26.00		
26	0.1370	46	0.3120	66	0.6442	86	1.253	106	2.310	126	4.063	146	6.850	166	11.12	186	17.44	206	26.53		
27	0.1429	47	0.3240	67	0.6669	87	1.293	107	2.379	127	4.174	147	7.024	167	11.38	187	17.82	207	27.07		
28	0.1502	48	0.3364	68	0.6903	88	1.335	108	2.449	128	4.289	148	7.202	168	11.65	188	18.21	208	27.62		
29	0.1567	49	0.3493	69	0.7144	89	1.378	109	2.521	129	4.406	149	7.384	169	11.92	189	18.61	209	28.18		
30	0.1647	50	0.3626	70	0.7392	90	1.422	110	2.596	130	4.525	150	7.569	170	12.20	190	19.01	210	28.75		
31	0.1716	51	0.3764	71	0.7648	91	1.467	111	2.673	131	4.647	151	7.759	171	12.48	191	19.42	211	29.33		
32	0.1802	52	0.3906	72	0.7912	92	1.513	112	2.749	132	4.772	152	7.952	172	12.77	192	19.84	212	29.92		

87.4 ≈ 1.3098

DIAMETER OF SAMPLING NOZZLE
CALCULATION WORKSHEET

Plant LP- GMI- Silsbee TX Location Sampled Press Vent #2

Date 2/25/92 Calculated By [signature]

REQUIRED INPUT DATA

Pitot tube coefficient (usually 0.84) $= C_p$ = 0.84

Barometric pressure (in. Hg) (measured at stack level) $= P_{bar}$ = 29.85

Stack gas temperature, average (°R = 460+°F) (from past data or preliminary velocity traverse) $= T_s$ = 547.4

Dry gas meter temperature, average (°R) (usually ambient temp + 20°F + 460°) $= T_m$ = at 60°F + 20 + 460 For 540°R

Velocity head, average (in. H_2O) (use $[(\sqrt{\Delta p})_{avg}]^2$ for this value from past data or preliminary velocity traverse) $= \Delta p_{avg}$ = 0.7391^2 =

Stack gas static pressure (in. H_2O) (measured or past data) $= P_g$ = -0.14"

Dry gas molecular weight (lb/lb-mole) (measured, or past data, or use 29.0 for combustion sources) $= M_d$ = 28.84

Stack gas moisture (%) (measured by EPA Method 4, or wet bulb dry bulb estimate, or past data) $= \%B_{ws}$ = 3.78% or 0.0378 Fraction

Orifice pressure differential, avg (in. H_2O) (use past data or DGM's $\Delta H_@$ value) $= \Delta H_{avg}$ = 1.9277 For Box M4

Sampling rate through DGM desired (cfm) (typically 0.75, but calculate the cfm needed based on minimum gas volume for test and total sampling run time) $= Q_m$ = 0.75

CALCULATED INPUT DATA

Absolute stack gas pressure (in. Hg) = $P_s = P_{bar} + (P_g/13.6)$

P_s = (29.85) + [(-0.14)/13.6]

P_s = 29.84 in. Hg

Wet gas molecular weight (lb/lb-mole) = M_s

$$M_s = M_d(1-(\%B_{ws}/100)) + 18(\%B_{ws}/100)$$

M_s = [(28.84)(1 - (0.0378) ~~/100~~)] + (18(3.78)/100)

M_s = 28.43 lb/lb-mole

NOZCALC.SHT 8/91

LP-EML-Silsbee
Process Vent #2

Absolute dry gas meter pressure (in. Hg) = $P_m = P_{bar} + (\Delta H_{avg}/13.6)$

$$P_m = (\ 29.85\ ) + [(\ 1.9277\ )/13.6]$$

$$P_m = \underline{\ 29.99\ } \text{ in. Hg}$$

CALCULATION OF SAMPLING NOZZLE DIAMETER

$$D_{n(est)} = \sqrt{\frac{0.0358\ Q_m\ P_m}{T_m\ C_p\ (1-\%B_{ws}/100)}\sqrt{\frac{T_s\ M_s}{P_s\ \Delta p_{avg}}}}$$

$$D_{n(est)} = \sqrt{\left(\frac{(0.0358)(\ 0.75\ )(\ 29.99\ )}{(\ 540°R\ )(\ 0.84\ )(1-(\ 3.78\ )/100)}\right)\sqrt{\frac{(\ 547.4\ )(\ 28.43\ )}{(\ 29.84\ )(\ .7391^2\ )}}}$$

$$D_{n(est)} = \underline{\ 0.2388\ } \text{ inches}$$

$$\text{Actual } D_n = \underline{\ 0.235\ } \text{ inches}$$

K-FACTOR CALCULATION

Isokinetic rate DGM orifice pressure differential (in. H_2O) = ΔH

$$\Delta H = \left[846.872\ D^4_{n(act)}\ \underset{\text{For M-4 Box}}{\Delta H_@}\ C_p^2\ (1-\%B_{ws}/100)^2\ \frac{M_d\ T_m\ P_s}{M_s\ T_s\ P_m} \right] \Delta p$$

where [....] = K-Factor

$$K = \frac{(846.872)(\ 0.235\ )^4(\ 1.9277\ )(\ 0.84\ )^2(1-(\ 3.78\ )/100)^2(\ 28.84\ )(\ 540\ )(\ 29.84\ )}{(\ 28.43\ )(\ 547.4\ )(\ 29.99\ )}$$

$$K = \underline{\ 3.2385\ }$$

ied

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific – Silsbee, TX	2/26/92	Press vent #2	Method 0011	Run 1 – PV2

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS / JTM	30.10	-0.37	50	N/A	62"	0.84	6 ft Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
3.8	M4	1.927	0.999	~~6ST69~~	~~6PT~~ PT-12	6I1	N/A	15	0.004	5	0.002	3.12

EPA METHOD 3
Collection Method: amb air
Analysis Method

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	21%				
%CO2	0%				

amb air measured by Fyrite Grab

PITOT SYSTEM LEAK CHECK INIT	FINAL
✓	✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
1	0	1126	574.203	0.74	2.3	80	245	248	57	52		3
2	2.5		576.16	0.88	2.8	81	246	243	56	53		3
3	5.0		578.38	0.94	3.0	80	250	258	56	53		3
4	7.5		580.65	1.0	3.2	80	247	252	57	54		3
5	10.0		582.94	0.43	1.4	82	244	240	55	53		2
6	12.5		584.53	0.30	.95	83	250	258	55	54		2
7	15.0		585.85	0.55	1.7	83	254	252	53	54		2
8	17.5		587.53	0.74	2.3	86	243	245	53	54		3
9	20.0		589.55	0.95	3.0	86	249	258	53	55		3
10	22.5		591.74	0.55	1.7	86	243	249	53	55		2
11	25.0		593.43	0.50	1.6	89	250	249	53	55		2
12	27.5		595.16	0.48	1.5	87	250	248	53	55		
END	30.		596.744									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

(A)

Sheet Checked By: [signature] Date 2/26/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/2492	Press Vent #2	Method 0011	Run 1 P. Vent #2

(B)

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	1202	596.744	0.60	1.9	~~248~~ 87	248 ~~255~~	255	56	55		2
2	32.5		598.55	0.90	2.8	86	248	250	53	55		3
3	35		600.70	0.85	2.7	87	247	246	51	55		3
4	37.5		602.90	0.99	3.1	85	245	247	51	54		3
5	40		605.15	0.67	2.1	85	248	259	53	55		2
6	42.5		607.05	0.48	1.5	84	246	251	54	56		2
7	45		608.65	0.31	0.98	84	249	246	54	56		2
8	47.5		610.00	0.60	1.9	85	259	249	54	56		2
9	50		611.77	0.78	2.5	90	253	250	54	56		3
10	52.5		613.79	0.70	2.2	89	249	249	54	56		3
11	55.0		615.78	0.55	1.7	92	241	252	55	57		2
12	57.5		617.52	0.52	1.6	92	251	257	56	57		2
END	60		619.162									
				0.8045	2.1	85				55		

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	44.959	0.8065	2.10	85.4	55

Sheet Checked By: [signature] Date 2/26/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP- EMC- Silsbee TX **Sample Date:** 2/26/92

Sample Location: Press Vent #2 - Run 1 **Recovery Date:** 2/26/92

using stack extension #2 **Recovered By:** [illegible]

Run No.: Run 1- PV#2

Imp train A Cold Box C4

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	577.0	585.7	482.0	699.0	grams
Initial Weight	580.5g	583.7	481.5	690.0	grams
Net Weight	-2.5	2.0	0.5	9.0	grams

Description of impinger water See Below

est 10% **% spent**

Blue **Sil Gel Color**

Total Moisture 8 **grams**

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

~~Container~~ Imp No: 1 - yellow/orange **Liquid level**

blank **Marked/Sealed** ✓

~~Container~~ Imp No: 2 - yellow. **Liquid level**

blank **Marked/Sealed** ✓

~~Container~~ Imp No: 3 - clear. **Liquid level**

blank **Marked/Sealed** No signifi cant moisture or color

Samples stored and locked By [illegible] 2/26/92

Remarks:

Relinquished by: **Date**

EPA METHOD 5 CALCULATIONS

Plant LP- GMC- Celebes TX Location Sampled Press Vent 2

Date 2/26/92 Run No. Run #1 Calc By VRSchah

Dry gas meter calibration factor = Y = 0.999

Volume of gas at meter conditions (ft^3) = V_m = 44.959

Average meter temperature (^oF + 460)^oR = T_m = 515

Barometric pressure absolute (in. Hg) = P_{bar} = 30.10

Average orifice pressure drop (in. H_2O) = ΔH = 2.1

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(0.999)(17.64)(44.959)[(30.10)+(2.1)/13.6]}{(515)}$$

$V_{m(std)}$ = 46.5438 dscf

Total volume of water collected (mL) = V_{lc} = 8.0

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(8.0) = 0.376560$

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(0.3766)}{(46.5438) + (0.3766)}$$

B_{ws} = .008026

Percent moisture = $(100)(B_{ws})$ = 100 (.008026

Percent moisture = 0.8026 %

Mole fraction of dry gas = MF = 1 − (B_{ws}) = 1 − (.008026)

MF = .99197

EPA5CALC.SHT

NV2 R1

...rcent O_2 by volume dry basis = O_2 = ______ %
Percent CO by volume dry basis = CO = ______ %
Percent CO_2 by volume dry basis = CO_2 = ______ %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

N_2 = 79 %

Amb air

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.008026)] + 18\ (.008026)$

M_s = 28.753 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature ($^{o}F+460$) = T_s = 545.4

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = .8065

Absolute pressure of stack gas (in. Hg) = P_s = 30.073
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

pv2R1

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})\text{avg}$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(545.4)}{(30.073) \times (28.753)}} \times (.8065)$$

V_s = 45.997 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .008026) \times (45.997) \times (20.966) \times \left(\frac{528}{545.4}\right) \times \left(\frac{30.073}{29.92}\right)$$

Q_{sd} = 55,851 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235)^2 = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (545.4)[0.00267(8) + ((44.96)(.999)/(515))((30.10) + (2.1)/13.6)]}{60\ (45.997)(30.073)(.000301)(60)}$$

I = 96.78 %

ied

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/24/92	Press Vent #2	Method 0011	Run 2 PV#2

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JBS/MK	30.1	-0.37	57	N/A	62	0.84	6ft glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
~~3.2%~~ 1%	M4	1.927	0.999	6C	PT-12	6I1	NA	10	0.02	8	0.02	3.25

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	PITOT SYSTEM LEAK CHECK FINAL
Collection Method	ambair	%O2	21%	Fyrite Grab				✓	✓
Analysis Method		%CO2	0%						

A

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	0	1357	619.312	0.70	2.3	85	249	250	60	59		3
2	2.5		621.30	0.99	3.2	84	249	248	57	59		4
3	5		623.63	0.69	2.2	86	244	251	51	59		4
4	7.5		625.65	0.85	2.8	87	251	258	53	60		4
5	10		627.85	0.54	1.8	89	250	250	54	61		3
6	12.5		629.63	0.24	0.78	89	243	250	54	61		2
7	15		630.86	0.55	1.8	87	248	256	53	60		3
8	17.5		632.63	0.79	2.6	89	246	250	50	60		4
9	20		634.78	0.97	3.2	89	252	248	50	60		4
10	22.5		637.02	0.41	1.3	92	246	252	51	61		3
11	25		638.77	0.42	1.4	92	243	254	52	61		3
12	27.5		640.37	0.55	1.8	92	250	248	54	61		3
END	30		642.098									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JBS Date 3/9/2

ieo

EMISSION TES[illegible]G FIELD DATA

(B)

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/24/92	Prim Vent 2 Run 2	Method 0011	Run 2 Prim Vent 2

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX TEMP (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	1431	642.098	0.68	2.2	87	244	253	60	60		3
2	32.5		643.95	0.90	2.9	86	253	243	51	60		5
3	35		646.20	0.93	3.0	86	243	246	51	60		5
4	37.5		648.49	0.93	3.0	86	248	246	52	61		5
5	40.0		650.79	0.53	1.7	85	254	246	52	60		3
6	42.5		652.63	0.27	0.88	85	249	247	53	60		2
7	45		653.91	0.39	1.3	86	243	255	54	60		2
8	47.5		655.42	0.78	2.5	90	258	242	53	60		4
9	50		657.50	0.85	2.8	91	248	253	52	60		4
10	52.5		659.70	0.72	2.3	93	245	250	53	61		4
11	55		661.73	0.52	1.7	96	260	250	53	60		3
12	57.5		663.45	0.56	1.8	92	251	250	53	60		3
End	60		665.254									
				.7980	2.1	89						

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	45.942	.7980	2.1	89	60

Sheet Checked By: [illegible] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP-EMI-Silsbee TX
Sample Location: Run 2 Press Vent #2
Run No.: Run 2 PV2

Sample Date: 2/26/92
Recovery Date: 2/26/92
Recovered By: T. A. Soltesh

B Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	574.5	577.5	462.0	717.5	grams
Initial Weight	577.7	575.0	461.5	708.2	grams
Net Weight	-3.2	2.5	0.5	9.3	grams

Description of impinger water ______

0 % spent
Blue Sil Gel Color

Total Moisture 9.1 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level
______ blank Marked/Sealed ______

See Run 1 color of DNPH solution

Container No: ______ Liquid level
______ blank Marked/Sealed ______

Container No: ______ Liquid level
______ blank Marked/Sealed ______

Samples stored and locked ______
Remarks: ______
Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP EMI - Silsbee TX Location Sampled Press Vent #2

Date 2/26/92 Run No. Run 2 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ 0.999

Volume of gas at meter conditions (ft^3) $= V_m =$ 45.942

Average meter temperature (^oF + 460)^oR $= T_m =$ 520

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.10

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 2.1

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(45.942)[(30.10)+(2.1)/13.6]}{(520)}$$

$V_{m(std)} =$ 47.1042 dscf

Total volume of water collected (mL) $= V_{1c} =$ 9.1

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)(9.1) =$ .4283

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.4283)}{(47.1042) + (.4283)}$$

$B_{ws} =$ .009011

Percent moisture = $(100)(B_{ws})$ = 100 (.009011)

Percent moisture = .9011 %

Mole fraction of dry gas = MF = 1 − (B_{ws}) = 1 − (.009011)

MF = .99099

EPA5CALC.SHT

PV2R2

Percent O_2 by volume dry basis $= O_2 =$ ____ %
Percent CO by volume dry basis $= CO =$ Amb air %
Percent CO_2 by volume dry basis $= CO_2 =$ ____ %

Percent N_2 by volume dry basis $= 100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

$N_2 =$ 28.84 molwt %

Molecular weight of dry gas (lb/lb-mole) $= M_d$

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

$M_d =$ 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) $= M_s$

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.009011)] + 18\ (.009011)$

$M_s =$ 28.74 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) + [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ____

Average stack temperature (^{o}F+460) $= T_s =$ 89+460 = 549

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p} =$ 0.7980

Absolute pressure of stack gas (in. Hg) $= P_s =$ $30.10 + \left(\frac{-.37}{13.6}\right) = 30.073$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S $= C_p =$ 0.84

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (\ 0.84\ ) \times \sqrt{\frac{(\ 549\ )}{(30.073) \times (28.74)}} \times (.7980)$$

V_s = 45.672 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .09011) \times (45.672) \times (20.966) \times (\frac{528}{549.}) \times (\frac{30.073}{29.92})$$

Q_{sd} = 55,038 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235)^2 = .0003011 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (549)[0.00267(9.1) + ((45.942)(.999)/(520))((30.10) + (2.1)/13.6)]}{60\ (45.672)(30.073)(.0003011)(60)}$$

I = ~~[illegible]~~ 99.40 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific – Silsbee, TX	2/26/92	Press vent #2 Run 3	Method 0011	Run 3 Press vent 2

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
AS / TM	30.1	-0.37	58	N/A	62	0.84	6ft Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.972	0.999	6C	PT12			11	0.008	5	0.005	3.25

EPA METHOD 3
Collection Method
Analysis Method — amb air

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	21%				
%CO2	0%				

ambair by fyrite grab

PITOT SYSTEM LEAK CHECK INIT	FINAL
✓	✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
1	0	1615	666.771	0.68	2.2	83	243	258	57	62		2
2	2.5		668.72	0.94	3.1	83	243	248	56	62		2
3	5		671.00	0.91	3.0	83	243	256	52	63		3
4	7.5		673.30	0.84	2.7	83	248	252	51	63		2
5	10		675.45	0.42	1.4	84	246	254	52	63		2
6	12.5		677.02	0.27	0.88	84	251	250	52	62		2
7	15.0		678.35	0.64	2.1	88	250	248	51	62		2
8	17.5		680.15	0.84	2.7	88	251	258	50	62		2
9	20.0		682.30	0.87	2.8	89	249	253	50	62		2
10	22.5		684.60	0.52	1.7	91	248	251	51	62		2
11	25.0		686.31	0.52	1.7	91	242	259	52	62		2
12	27.5		688.03	0.47	1.5	91	250	252	52	62		2
END	30		689.668									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		46.104				

A

Sheet Checked By: [signature] Date 3/92

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EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/24/92	Press Vent #2 Run 3	Method 0011	Run 3 Press Vent #2

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	1648	689.668	0.62	2.0	82	249	248	55	61		2
2	32.5		691.52	0.88	2.9	85	248	259	52	62		3
3	35		693.70	0.84	2.7	84	251	258	51	62		3
4	37.5		695.88	0.94	3.1	84	243	249	52	62		3
5	40		698.20	0.50	1.6	83	251	254	53	62		2
6	42.5		699.90	0.29	0.94	83	245	258	54	63		2
7	45		701.25	0.39	1.3	86	247	253	54	62		2
8	47.5		702.76	0.78	2.5	89	244	247	53	62		3
9	50		704.82	0.87	2.8	91	247	254	54	63		3
10	52.5		707.20	0.75	2.4	94	245	256	55	63		3
11	55		709.16	0.56	1.8	96	248	253	55	63		2
			710.95	0.60	2.0	94	247	249	55	63		2
			712.875									
				0.8040	2.2	87						

Press Vent R3

```
OL MTR STD = 47.108
TK PRES ABS = 30.07
OL HOH GAS = 0.42
 MOISTURE = 0.89
OL DRY GAS = 0.991
 NITROGEN = 79.
OL WT DRY = 28.8
OL WT WET = 28.7
VELOCITY FPS = 
STACK AREA = 20.
STACK ACFM = 57,6
STACK DSCFM = 55,610
% ISOKINETIC = 98.33

ND OF FIELD DATA
```

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		46.104	0.8040	2.2	87	62

2.16

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP - GMC - Silsbee TX　　**Sample Date:** 2/24/92

Sample Location: Press Vent 2 Run 3　　**Recovery Date:** 2/26/92

Recovered By: DA Schuck

Run No.: Run 3 Press Vent #2

A Train Cold Box C4

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	577.9	572.1	482.2	707.2	grams
Initial Weight	580	569.0	482.0	699.0	grams
Net Weight	-2.1	+3.1	+0.2	+8.2	grams

Description of impinger water ____________　　20% **% spent**

80% Blue **Sil Gel Color**

Total Moisture 9.4 **grams**

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ____________ **Liquid level**

____ **blank**　　**Marked/Sealed** ____

color of DNPH sol. Same as Run 1

Container No: ____________ **Liquid level**

____ **blank**　　**Marked/Sealed** ____

Container No: ____________ **Liquid level**

____ **blank**　　**Marked/Sealed** ____

Samples stored and locked ____________

Remarks: ____________

Relinquished by: ____________　　**Date** ____

EPA METHOD 5 CALCULATIONS

Plant LP-EMC Silsbee TX Location Sampled Press Vent 2

Date 2/26/92 Run No. Run 3 PV2 Calc By DAS

Dry gas meter calibration factor $= Y =$ .994

Volume of gas at meter conditions (ft^3) $= V_m =$ 46.104

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 62+460

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.10

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 2.16

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.994)(17.64)(46.104)[(30.10)+(2.16)/13.6]}{(522)}$$

$V_{m(std)} =$ 47.096 dscf

Total volume of water collected (mL) $= V_{lc} =$ 9.4

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)($ 9.4 $) =$ .44246

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.44246)}{(47.096) + (.44246)}$$

$B_{ws} =$ .009307

Percent moisture $= (100)(B_{ws}) = 100\ (.009307)$

Percent moisture = .9307 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 - (.009307)$

MF = .9907

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = ______ %
Percent CO by volume dry basis = CO = ______ %
Percent CO_2 by volume dry basis = CO_2 = ______ %

Percent N_2 by volume dry basis = 100 - (O_2 + CO + CO_2)

N_2 = 100 - [( )+( )+( )]

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

M_d = 0.44 (CO_2) + 0.32 (O_2) + 0.28 (N_2 + CO)

M_d = 0.44 ( ) + 0.32 ( ) + 0.28 (+)

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

M_s = (M_d) (1 - B_{ws}) + 18 (B_{ws})

M_s = (28.84) [1 - (.009307)] + 18 (.009307)

M_s = 28.739 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5 (\% CO)]}{[0.264 (\% N_2)] - (\% O_2) - [0.5 (\% CO)]} \times 100$$

$$\% EA = \frac{( ) - [0.5 ( )]}{[0.264 ( )] - ( ) - [0.5 ( )]} \times 100$$

% EA = ______

Average stack temperature (°F+460) = T_s = 87+460 = 547

Avg of sq root of velocity head (in H_2O)$^{1/2}$ = $\sqrt{\Delta p}$ = 0.8040

Absolute pressure of stack gas (in. Hg) = P_s = $30.10 + \left(\frac{-0.37}{13.6}\right) = 30.073$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

PV2R3

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(547)}{(30.073) \times (28.739)}} \times (.8040)$$

V_s = 45.933 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .009307) \times (45.933) \times (20.966) \times (\frac{528}{547}) \times (\frac{30.073}{29.92})$$

Q_{sd} = 55,538 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235)^2 = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (547)[0.00267(9.4) + ((46.104)(.999)/(522))((30.10) + (2.16)/13.6)]}{60\ (45.933)(30.073)(.000301)(60)}$$

I = 96.39 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/28/92	Press Vent # 3 A-1	Method 0011	Run #1 PV 3

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS/JM	30.18	-0.36	79	N/A	Ø62	0.84	6ft Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	P1 ~~6C~~	62	N/A	10	0.008	5	0.005	3.3

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	FINAL
Collection Method	Grab	%O2	21					✓	✓
Analysis Method		%CO2	0	ambient air					

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A 1	0	1255	994.485	0.85 ~~0.83~~	2.5	108	246	252	62	82		3
2	2.5		996.62	0.93	3.1	106	251	257	57	82		4
3	5		998.97	0.78	2.6	106	250	259	57	82		3
4	7.5		001.18	0.95	3.1	104	246	251	57	83		4
5	10		3.52	0.50	1.7	104	251	251	59	83		3
6	12.5		5.25	0.34	1.1	104	251	247	60	84		2
7	15		6.75	0.48	1.6	102	249	254	54	85		2
8	17.5		8.40	0.68	2.2	101	250	254	53	85		3
9	20		10.39	0.86	2.8	103	247	247	53	85		3
10	22.5		12.53	0.37	1.2	~~240~~ 101	248	250	53	85		~~3~~ 2
11	25		14.08	0.25	0.83	103	250	249	54	86		2
12	27.5		15.33	0.23	0.76	105	244	257	54	86		2
END	30.0		16.536									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: [signature] Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/4/92	Press Vent #3 Run 1	Method 0011	Run 1 Press Vent #3

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	1330	16.536	0.65	2.1	105	245	250	65	87		3
2	32.5		18.50	0.72	2.4	109	253	251	55	87		3
3	35		20.58	0.64	2.1	106	245	248	55	88		3
4	37.5		22.53	0.84	2.8	107	250	257	55	89		3
5	40		24.77	0.57	1.9	107	254	259	57	89		3
6	42.5		26.65	0.25	0.83	105	246	252	57	89		2
7	45		27.97	0.40	1.3	104	246	257	57	90		2
8	47.5		29.43	0.55	1.8	102	255	255	57	90		3
9	50		31.22	0.74	2.4	101	247	257	57	91		3
10	52.5		33.34	0.65	2.1	101	248	257	57	91		3
11	55		35.28	0.62	2.0	104	247	248	58	92		3
12	57.5		37.23	0.67	2.2	105	247	250	58	93		3
End	60		39.210									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		44.725	0.7618	2.0	104	87

ΣP.5- 18.0917

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX **Sample Date:** 2/28/92

Sample Location: Press vent #3 R-1 **Recovery Date:** 2/28/92

Recovered By: [signature]

Run No.: Run 1 PV#3 → Stack extension #1

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	568.0	566.4	482.3	697.0	grams
Initial Weight	567.0	562.5	481.0	686.4	grams
Net Weight	+1.0	+3.9	+1.3	+10.6	grams

Description of impinger water ______________ ______________ **% spent**

______________ ______________ **Sil Gel Color**

Total Moisture +16.8 **grams**

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________ **Liquid level**

______ **blank** **Marked/Sealed** ______

Container No: ______________ **Liquid level**

______ **blank** **Marked/Sealed** ______

Container No: ______________ **Liquid level**

______ **blank** **Marked/Sealed** ______

Samples stored and locked ______________

Remarks: ______________

Relinquished by: ______________ **Date** ______

iea

EPA METHOD 5 CALCULATIONS

Plant LP-EMC Siltbeo ?? Location Sampled P. Vent 3

Date 2/28/92 Run No. Run 1 PV3 Calc By ??

Dry gas meter calibration factor = Y = .999

Volume of gas at meter conditions (ft^3) = V_m = 44.725

Average meter temperature (^oF + 460)^oR = T_m = 87+460=547

Barometric pressure absolute (in. Hg) = P_{bar} = 30.18

Average orifice pressure drop (in. H_2O) = ΔH = 2.0

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(44.725)[(30.18)+(2.0)/13.6]}{(547)}$$

$V_{m(std)}$ = 43.698 dscf

Total volume of water collected (mL) = V_{lc} = 16.8

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(16.8) =$ .7908

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.7908)}{(43.698) + (.7908)}$$

B_{ws} = .0178

Percent moisture = $(100)(B_{ws})$ = 100 (.0178)

Percent moisture = 1.78% %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (.0178)

MF = .9822

EPA5CALC.SHT

Percent O_2 by volume dry basis $= O_2 =$ ______ %
Percent CO by volume dry basis $= CO =$ ______ %
Percent CO_2 by volume dry basis $= CO_2 =$ ______ %

Percent N_2 by volume dry basis $= 100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

$N_2 =$ ______ %

Molecular weight of dry gas (lb/lb-mole) $= M_d$

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

$M_d =$ 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) $= M_s$

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.0178)] + 18\ (.0178)$

$M_s =$ 28.647 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) 104+460 $= T_s =$ 564

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p} =$ .7618

Absolute pressure of stack gas (in. Hg) $= P_s =$ 30.18 + −0.35/13.6 = 30.15
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S $= C_p =$ 0.84

DV3R1

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.84) \times \sqrt{\frac{(564)}{(30.15) \times (28.647)}} \times (.7618)$$

V_s = 44.207 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .0178) \times (44.207) \times (20.966) \times (\frac{528}{564}) \times (\frac{30.15}{29.92})$$

Q_{sd} = 51,527 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) $(.235)^2$ = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (564)[0.00267(.0178)+((44.725)(.994)/(547))((30.18)+(2)/13.6)]}{60\ (44.207)(.000301)(30.15)(60)}$$

I = 96.74 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/28/92	Press vent #3 R-2	Method 0011	Run 2 PVT# 3

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS/JMM	30.18	-0.36	89	N/A	62	0.84	6ft Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	P-12	G	NA	15	Ø	7	Ø	3.38

EPA METHOD 3
Collection Method
Analysis Method fyrite

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2 / %CO2	NA	fyrite	Grab	21% O2	0% CO2

PITOT SYSTEM LEAK CHECK INIT	FINAL
✓	✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
A 1	0	1440	039.412	0.83	2.8	108	250	247	72	91		5
2	2.5		41.78	0.82	2.8	110	246	256	73	91		5
3	5		44.03	0.74	2.5	107	250	247	62	92		4
4	7.5		46.23	0.95	3.2	106	244	256	57	92		5
5	10		48.63	0.53	1.8	106	252	257	56	92		3
6	12.5		50.45	0.35	1.2	105	245	252	57	93		2
7	15		51.92	0.47	1.6	104	250	555	58	94		2
8	17.5		53.73	1.0	3.4	104	245	259	58	94		5
9	20		56.20	0.95	3.2	106	248	250	57	95		5
10	22.5		58.72	0.58	2.0	105	250	252	56	96		3
11	25		60.61	0.29	0.98	106	253	246	57	96		2
12	27.5		62.00	0.29	0.98	106	262	247	59	96		
END	30	1510	63.352									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JAG Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2 ~~28~~92	Preavent 3 R-2	Method 0011	Run 2 PU #3

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP (F)	SAMPLE TRAIN VAC (In. Hg)
B1	30	1516	63.352	0.54	1.8	107	250	240	69	94		3
2	32.5		65.14	0.77	2.6	107	250	246	58	96		3
3	35		67.33	0.57	1.9	108	244	250	58	96		3
4	37.5		69.27	0.64	2.2	107	248	248	58	96		3
5	40		71.30	0.38	1.3	105	247	260	55	95		2
6	42.5		72.97	0.22	0.74	106	246	248	57	96		2
7	45		74.24	0.54	1.8	103	255	260	57	96		3
8	47.5		76.10	0.78	2.6	101	245	257	55	95		4
9	50		78.25	0.85	2.9	101	246	254	54	94		5
10	52.5		80.55	0.85	2.9	101	246	248	54	94		5
11	55		82.91	0.62	2.1	101	253	249	59	93		3
12	57.5		84.93	0.67	2.3	101	249	261	60	93		3
END	60		87.037									
				~~.7552~~								

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	47.625	0.7829	2.15	105.0	94.2

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX

Sample Date: 2/28/92

Sample Location: Press Vent #3 Run 2

Recovery Date: 2/28/92

Recovered By: [signature]

Run No.: Run 2 PV#3

B Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	577.8	584.5	461.9	737.1	grams
Initial Weight	576.1	582.4	461.0	726.4	grams
Net Weight	+1.7	2.1	+0.9	+10.7	grams

Description of impinger water ______________ ______________ % spent

______________ ______________ Sil Gel Color

Total Moisture +15.4 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________ Liquid level

______ blank Marked/Sealed ______

Container No: ______________ Liquid level

______ blank Marked/Sealed ______

Container No: ______________ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______________

Remarks: ______________

Relinquished by: ______________ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP-EML Selabee TX Location Sampled Press Vent 3A2

Date 2/28/92 Run No. Run 2PV3 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ 0.999

Volume of gas at meter conditions (ft^3) $= V_m =$ 47.625

Average meter temperature ($^{o}F + 460)^{o}R$ $= T_m =$ 94.2+460=

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.18

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 2.15

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(0.999)(17.64)(47.625)[(30.18)+(2.15)/13.6]}{(554.2)}$$

$V_{m(std)} =$ 45.9431 dscf

Total volume of water collected (mL) $= V_{1c} =$ 15.4

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)($ 15.4 $) =$ .7249

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.7249)}{(45.9431) + (.7249)}$$

$B_{ws} =$ .01553

Percent moisture $= (100)(B_{ws}) = 100\,($.01553$)$

Percent moisture = 1.553 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 - ($.01553$)$

MF = .9845

EPA5CALC.SHT

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX **Sample Date:** 2/28/92

Sample Location: Press Vent 3 Run 3 **Recovery Date:** 2/28/92

Recovered By: [signature]

Run No.: Run 3 Press Vent #3

C Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	587.0	602.7	485.4	714.6	grams
Initial Weight	586.4	601.0	484.7	708.2	grams
Net Weight	+0.6	+1.7	+0.7	+6.4	grams

Description of impinger water ______________ ______________ **% spent**

______________ ______________ **Sil Gel Color**

Total Moisture +9.4 **grams**

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________ **Liquid level**

______________ **blank** **Marked/Sealed** ______________

Container No: ______________ **Liquid level**

______________ **blank** **Marked/Sealed** ______________

Container No: ______________ **Liquid level**

______________ **blank** **Marked/Sealed** ______________

Samples stored and locked ______________

Remarks: ______________

Relinquished by: ______________ **Date** ______________

EPA METHOD 5 CALCULATIONS

Plant LP-EML-Silsbee TX Location Sampled Press Vent 3R3

Date 2/28/92 Run No. Run 3 PV3 Calc By [signature]

Dry gas meter calibration factor $= Y =$ 0.999

Volume of gas at meter conditions (ft^3) $= V_m =$ 46.819

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 92.1 + 460 = 552.1

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.18

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 2.11

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\ (17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(0.999)(17.64)(46.819)[(30.18)+(2.11)/13.6]}{(552.1)}$$

$V_{m(std)}$ = 45.333 dscf

Total volume of water collected (mL) $= V_{lc} =$ 9.4

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)($ 9.4 $) =$ .4425

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.4425)}{(45.333) + (.4425)}$$

$B_{ws} =$ .00967

Percent moisture $= (100)(B_{ws}) = 100$ (.00967)

Percent moisture = .967 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 -$ (.00967)

MF = .9903

EPA5CALC.SHT

PV3R3

Percent O_2 by volume dry basis = ~~$\%O_2$~~ = ________ %
Percent CO by volume dry basis = ~~$\%CO$~~ = ________ %
Percent CO_2 by volume dry basis = ~~$\%CO_2$~~ = ________ %

ambient

Percent N_2 by volume dry basis = 100 − (O_2 + CO + CO_2)

N_2 = 100 − [(   )+(   )+(   )]

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

M_d = 0.44 (   ) + 0.32 (   ) + 0.28 (+   )

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.00967)] + 18\ (.00967)$

M_s = 28.735 lb/lb-mole

Percent excess air (%) = % EA

$$\%\ EA = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\%\ EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ________

Average stack temperature (°F+460) = T_s = ~~97.1~~ 103.8 + 460 = 563.8

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = 0.7736

Absolute pressure of stack gas (in. Hg) = P_s = $30.18 + \left(\frac{-0.36}{13.6}\right) = 30.154$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

PV3R3

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(563.8)}{(30.154) \times (28.735)}} \times (0.7736)$$

V_s = 44.812 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .00967) \times (44.812) \times (20.966) \times \left(\frac{528}{563.8}\right) \times \left(\frac{30.154}{29.92}\right)$$

Q_{sd} = 52,691 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235)^2 = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (563.8)[0.00267(9.4) + ((46.819)(.999)/(552.1))((30.18) + (2.11)/13.6)]}{60\ (44.812)(30.154)(.000301)(60)}$$

I = 99.92 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/27/92	Prevent #4 R1	Method 0011	Run 1 PV 4

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
RBS/GM	30.2	-0.36	85	N/A	62	0.84	Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6CC	6C	6C	N/A	12	0.008	7	0.006	3.35

EPA METHOD 3
Collection Method — Ambient Grab
Analysis Method

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	21	ambient			
%CO2	0				

PITOT SYSTEM LEAK CHECK: INIT ✓ FINAL ✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX TEMP (F)	SAMPLE TRAIN VAC (in. Hg)
A1	0	1437	854.535	0.72	2.4	96	247	257	67	83		3
2	2.5		856.62	0.94	3.1	99	250	255	57	84		4
3	5		858.94	0.80	2.6	100	256	248	56	84		4
4	7.5	*1447/	861.13	0.84	2.8	99	256	250	56	85		4
5	10	/1529	863.10	0.39	1.3	98	248	249	60	83		3
6	12.5		864.92	0.29	0.97	98	242	245	58	84		2
7	15		866.30	0.70	2.3	98	242	257	56	84		3
8	17.5		868.26	0.97	3.2	101	251	253	55	84		4
9	20		870.63	0.87	2.9	99	250	256	55	84		4
10	22.5		872.91	0.37	1.2	99	245	246	56	85		2
11	25		874.41	0.37	1.2	98	245	245	55	85		2
12	27.5		875.89	0.37	1.2	98	243	261	56	84		2
END	30		877.355									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

* Shutdown while LP changed other stack extensions

Sheet Checked By: [signature] Date 3/9/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/4/92	Press vent 4 R1	Method 0011	Run 1 Press vent 4

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	1555	877.355	0.60	2.0	91	247	251	57	84		3
2	32.5		879.27	0.65	2.2	89	251	257	58	85		3
3	35		881.25	0.86	2.9	90	247	255	57	85		4
4	37.5		883.60	0.86	2.9	91	248	250	57	85		4
5	40		885.83	0.54	1.8	91	247	250	59	86		3
6	42.5		887.61	0.30	1.0	91	246	258	60	86		2
7	45		889.03	0.25	0.84	96	251	254	60	86		2
8	47.5		890.31	0.61	2.0	96	245	250	59	86		3
9	50		892.14	0.70	2.3	99	252	261	58	86		3
10	52.5		894.28	0.83	2.8	100	245	252	58	86		4
11	55		896.42	0.72	2.4	101	242	250	58	86		4
12	57.5		898.52	0.70	2.3	101	245	256	60	87		3
END	60		900.602									

899.535

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	46.067	.7835	2.11	96.6	84.9

Sheet Checked By: [signature] Date 3/9

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX **Sample Date:** 2/27/92

Sample Location: Press Vent 4 R1 **Recovery Date:** 2/27/92

Recovered By: [signature]

Run No.: Run 1 Press Vent 4

Using Stack extension #2

B Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	590.2	576.5	462.5	736.0	grams
Initial Weight	592.0	576.0	462.0	726.2	grams
Net Weight	-1.8	+0.5	+0.5	+9.8	grams

Description of impinger water ____________ ____________ % spent

____________ ____________ Sil Gel Color

Total Moisture ~~+9.0~~ grams

+9.0 g

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ____________ Liquid level

____________ blank Marked/Sealed ____________

Container No: ____________ Liquid level

____________ blank Marked/Sealed ____________

Container No: ____________ Liquid level

____________ blank Marked/Sealed ____________

Samples stored and locked ____________

Remarks: ____________

Relinquished by: ____________ Date ____________

EPA METHOD 5 CALCULATIONS

Plant LP- EML - Silsbee TX Location Sampled Pos Vnt 4

Date 2/27/92 Run No. Run 1 PV4 Calc By DAS

Dry gas meter calibration factor $= Y =$ .999

Volume of gas at meter conditions (ft^3) $= V_m =$ 46.067

Average meter temperature ($^oF + 460$)^oR $= T_m =$ 544.9

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.2

Average orifice pressure drop (in. H_2O) $= \Delta H =$ +2.11

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(46.067)[(30.2)+(2.11)/13.6]}{(544.9)}$$

$V_{m(std)} =$ 45.224 dscf

Total volume of water collected (mL) $= V_{lc} =$ 9

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)($ 9 $) =$ .4236

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.4236)}{(45.224) + (.4236)}$$

$B_{ws} =$ .0093

Percent moisture = $(100)(B_{ws})$ = 100 (.0093)

Percent moisture = .93 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (.0093)

MF = .9907

EPA5CALC.SHT

Percent O_2 by volume dry basis $= O_2 =$ ______ %
Percent CO by volume dry basis $= CO =$ ______ %
Percent CO_2 by volume dry basis $= CO_2 =$ ______ %

Percent N_2 by volume dry basis $= 100 - (O_2 + CO + CO_2)$

Ambient

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

$N_2 =$ ______ %

Molecular weight of dry gas (lb/lb-mole) $= M_d$

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

$M_d =$ 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) $= M_s$

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.0093)] + 18\ (.0093)$

$M_s =$ 28.739 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^{o}F+460) $= T_s =$ 556.6

Avg of sq root of velocity head (in H_2O)$^{1/2} = \sqrt{\Delta p} =$ .7835

Absolute pressure of stack gas (in. Hg) $= P_s =$ $30.2 + \left(\frac{-0.36}{13.6}\right) = 30.174$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S $= C_p =$ 0.84

DVH-R1

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (\ 0.84\ ) \times \sqrt{\frac{(\ 556.6\ )}{(30.174) \times (28.739)}} \times (.7835)$$

V_s = 45.077 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .0093) \times (45.077) \times (20.966) \times \left(\frac{528}{556.6}\right) \times \left(\frac{30.174}{29.92}\right)$$

Q_{sd} = 53,744 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235)^2 = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (556.6)[0.00267(\ 9\ )+((46.067)(.999)/(544.9))((30.2)+(2.11)/13.6)]}{60\ (45.077)(30.174)(.000301)(60)}$$

I = 97.73 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific – Silsbee, TX	2/17/92	Press Vent 4 A2	Method 0011	Run 2 PV4

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS/AM	30.2	-0.36	80	N/A	62	0.84	Glass	H25	0.235

ASSUMED MOIST (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	GC	GC	GC	NA	12	0.008	6	0.005	3.35

EPA METHOD 3
Collection Method — Fyrite
Analysis Method — Grab

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2 / %CO2	Amb air 21% O2 / 0% CO2				

PITOT SYSTEM LEAK CHECK INIT	FINAL
✓	✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A1	0	1717	901.220	0.70	2.3	~~29~~ 91	248	255	62	79		3
2	2.5		903.20	0.77	2.6	92	247	252	54	80		3
3	5		905.36	0.79	2.6	93	249	252	54	81		3
4	7.5		907.51	0.89	3.0	93	248	254	54	81		3
5	10		909.82	0.56	1.9	93	250	254	53	81		3
6	12.5		911.65	0.37	1.2	93	250	251	53	81		2
7	15		913.13	0.70	2.3	98	242	255	53	81		3
8	17.5		915.22	1.0	3.4	99	246	255	52	81		4
9	20		917.50	1.0	3.4	99	250	250	52	81		4
10	22.5		920.00	0.45	1.5	100	246	257	53	81		3
11	25		921.62	0.53	1.8	97	243	254	54	81		3
12	27.5		923.45	0.54	1.8	97	244	247	55	81		3
End	30		925.200									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JAS Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/27/92	Press vent 4 R2	Method 0011	Run 2 PV4

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	1752	925.200	0.55	1.8	88	250	250	63	79		3
2	32.5		927.02	0.69	2.2	88	250	250	58	80		3
3	35		928.94	0.57	1.9	88	246	260	58	80		3
4	37.5		930.70	0.72	2.4	88	250	248	57	80		3
5	40		932.80	0.55	1.8	88	248	249	56	80		3
6	42.5		934.62	0.25	0.84	89	249	248	56	80		2
7	45		935.90	0.26	0.87	92	250	261	57	79		2
8	47.5		937.18	0.69	2.3	94	247	248	57	79		3
9	50		939.08	0.73	2.4	95	246	254	57	79		3
10	52.5		941.160	0.82	2.7	97	251	258	58	79		3
11	55		943.37	0.49	1.6	98	249	251	60	79		2
12	57.5		945.19	0.64	2.1	100	249	249	60	78		3
END	60		946.960									

944.22

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	45.740	.7866	2.11	93.9	80.0

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee TX **Sample Date:** 2/27/92

Sample Location: Press Vent 4 - Run 2 **Recovery Date:** 2/27/92

Recovered By: [illegible]

Run No.: Run 2 P.V. 4

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	580.3	569.0	482.0	723.0	grams
Initial Weight	583.5	567.0	482.8	713.6	grams
Net Weight	-3.2	+2.0	-0.8	+9.6	grams

Description of impinger water ________ ________ % spent

________ ________ Sil Gel Color

Total Moisture +7.6 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ________ Liquid level

________ blank Marked/Sealed ________

Container No: ________ Liquid level

________ blank Marked/Sealed ________

Container No: ________ Liquid level

________ blank Marked/Sealed ________

Samples stored and locked ________

Remarks: ________

Relinquished by: ________ Date ________

EPA METHOD 5 CALCULATIONS

Plant LP-EMC-Silsbee TX Location Sampled PressVent 4 R2

Date 2/27/92 Run No Run 2 PV4 Calc By [signature]

Dry gas meter calibration factor = Y = 0.999

Volume of gas at meter conditions (ft^3) = V_m = 45.740

Average meter temperature (^oF + 460)^oR = T_m = 80+460

Barometric pressure absolute (in. Hg) = P_{bar} = 30.20

Average orifice pressure drop (in. H_2O) = ΔH = 2.11

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(0.999)(17.64)(45.740)[(30.20)+(2.11)/13.6]}{(540.0)}$$

$V_{m(std)}$ = 45.310 dscf

Total volume of water collected (mL) = V_{lc} = 7.6

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(7.6) =$ ______

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.3577)}{(45.310) + (.3577)}$$

B_{ws} = .00783

Percent moisture = $(100)(B_{ws})$ = 100 (.00783)

Percent moisture = .783 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (.00783)

MF = .99217

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = ambient air %
Percent CO by volume dry basis = CO = %
Percent CO_2 by volume dry basis = CO_2 = %

Percent N_2 by volume dry basis = 100 - (O_2 + CO + CO_2)

N_2 = 100 - [(   )+(   )+(   )]

N_2 = 79% %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

M_d = 0.44 (   ) + 0.32 (   ) + 0.28 (+   )

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

M_s = (28.84) [1 - (.00783)] + 18 (.00783)

M_s = 28.755 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

% EA = (   ) - [0.5 (   )] / [0.264 (   )] - (   ) - [0.5 (   )] x 100

% EA = ______

Average stack temperature (^oF+460) = T_s = 93.9+460=553.9

Avg of sq root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = .7866

Absolute pressure of stack gas (in. Hg) = P_s = 30.2+(-.36/13.6) = 30.174
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

N4R2

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(553.9)}{(30.174) \times (28.755)}} \times (.7866)$$

V_s = 45.133 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .00783) \times (45.133) \times (20.966) \times (\frac{528}{553.9}) \times (\frac{30.174}{29.92})$$

Q_{sd} = 54,152 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235)^2 = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (553.9)[0.00267(7.6)+((45.740)(.999)/(540))((30.2)+(2.11)/13.6)]}{60\ (45.133)(30.174)(.000301)(60)}$$

I = 97.17 %

Percent O_2 by volume dry basis = O_2 = ______ %
Percent CO by volume dry basis = CO = ______ %
Percent CO_2 by volume dry basis = CO_2 = ______ %

air

Percent N_2 by volume dry basis = 100 − (O_2 + CO + CO_2)

N_2 = 100 − [( )+( )+( )]

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.01553)] + 18\ (.01553)$

M_s = 28.672 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) + [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) = T_s = 105 + 460 = 565

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = .7829

Absolute pressure of stack gas (in. Hg) = P_s = 30.18 + (−.36/13.6) = 30.15

note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

PV3 R2

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(565)}{(30.15) \times (28.672)}} \times (.7829)$$

V_s = 45.452 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .0153) \times (45.452) \times (20.966) \times \left(\frac{528}{565}\right) \times \left(\frac{30.15}{29.92}\right)$$

Q_{sd} = 53,007 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235 $)^2$ = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (\cancel{564}\ 565.0)[0.00267(15.4) + ((47.625)(.999)/(554.2))((30.18) + (2.15)/13.6)]}{60\ (45.452)(30.15)(.000301)(60)}$$

I = 100.7 %

EPA5CALC.SHT 5/90

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/20/92	Prexivent 3 Run 3	Method 0011	Run 3 Prexivent 3

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
RS/TM	30.18	-0.36	91	N/A	62	0.84	6 ft Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	B-12	G-2	N/A	15	0.002	6	0	3.38/3.35

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	PITOT SYSTEM LEAK CHECK FINAL
Collection Method	Fyrite	%O2	Ambient 21% O2					✓	✓
Analysis Method	Grab	%CO2	0% CO2						

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A1	0	1622	87.269	0.69	2.3	109	252	256	64	92		3
2	2.5		89.40	0.90	3.0	108	253	256	55	93		3
3	5		91.73	0.83	2.8	107	250	259	55	93		3
4	7.5		94.00	0.97	3.3	105	246	250	56	94		4
5	10		96.43	0.51	1.7	104	249	252	57	94		2
6	12.5		98.28	0.44	1.5	103	245	260	57	94		2
7	15		100.00	0.70	2.4	103	251	257	56	93		3
8	17.5		102.12	1.0	3.4	103	251	249	55	93		4
9	20		104.60	0.97	3.3	105	244	259	57	93		4
10	22.5		107.08	0.27	0.91	104	246	258	59	94		2
11	25		108.46	0.24	0.81	105	245	255	58	93		2
12	27.5		109.70	0.22	0.74	106	248	254	57	93		2
End	30		110.922									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: RS Date 3/92

iea

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/12/92	Pressvent #3 R 3	Method 0011	Run 3 PV 3

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	1658	110.922	0.59	2.0	105	246	257	65	91		3
2	32.5		112.85	0.68	2.3	108	246	259	58	91		3
3	35		114.92	0.61	2.1	105	249	250	56	91		3
4	37.5		116.92	0.63	2.1	105	253	253	56	91		3
5	40		118.90	0.33	1.1	104	247	261	55	91		2
6	42.5		120.40	0.20	0.67	104	246	256	55	91		2
7	45		121.56	0.51	1.7	100	254	249	56	91		2
8	47.5		123.32	0.82	2.7	100	245	255	58	91		3
9	50		125.55	0.76	2.5	100	254	259	57	91		3
10	52.5		127.71	0.77	2.6	99	253	260	59	91		3
11	55		129.93	0.66	2.2	99	249	249	59	91		3
12	57.5		132.01	0.71	2.4	100	254	253	59	91		3
END	60		134.088									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	46.819	0.7736	2.11	103.8	92.1

Sheet Checked By: [signature] Date 2/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX

Sample Date: 2/28/92

Sample Location: Press Vent 3 Run 3

Recovery Date: 2/28/92

Recovered By: [signature]

Run No.: Run 3 Press Vent #3

C Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	587.0	602.7	485.4	714.6	grams
Initial Weight	586.4	601.0	484.7	708.2	grams
Net Weight	+0.6	+1.7	+0.7	+6.4	grams

Description of impinger water ____________ ____________ % spent

____________ ____________ Sil Gel Color

Total Moisture +9.4 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ____________ Liquid level

____________ blank Marked/Sealed ____________

Container No: ____________ Liquid level

____________ blank Marked/Sealed ____________

Container No: ____________ Liquid level

____________ blank Marked/Sealed ____________

Samples stored and locked ____________

Remarks: ____________

Relinquished by: ____________ Date ____________

EPA METHOD 5 CALCULATIONS

Plant LP-EML-Silsbee TX Location Sampled PressVent 3R3

Date 2/28/92 Run No. Run 3 PV3 Calc By [illegible]

Dry gas meter calibration factor $= Y = $ 0.999

Volume of gas at meter conditions (ft^3) $= V_m = $ 46.819

Average meter temperature ($^oF + 460)^oR$ $= T_m = $ 92.1+460=552.1

Barometric pressure absolute (in. Hg) $= P_{bar} = $ 30.18

Average orifice pressure drop (in. H_2O) $= \Delta H = $ 2.11

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(0.999)(17.64)(46.819)[(30.18)+(2.11)/13.6]}{(552.1)}$$

$V_{m(std)} = $ 45.333 dscf

Total volume of water collected (mL) $= V_{lc} = $ 9.4

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(9.4) = $ .4425

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.4425)}{(45.333) + (.4425)}$$

$B_{ws} = $ .00967

Percent moisture $= (100)(B_{ws}) = 100\ (.00967)$

Percent moisture = .967 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 - (.00967)$

MF = .9903

EPA5CALC.SHT

Percent O_2 by volume dry basis = $\%O_2$ = ________ %
Percent CO by volume dry basis = $\%CO$ = ________ %
Percent CO_2 by volume dry basis = $\%CO_2$ = ________ %

ambient

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.00967)] + 18\ (.00967)$

M_s = 28.735 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ________

Average stack temperature (^oF+460) = T_s = ~~971~~ 103.8 + 460 = 563.8

Avg of sq root of velocity head (in H_2O)$^{1/2}$ = $\sqrt{\Delta p}$ = 0.7736

Absolute pressure of stack gas (in. Hg) = P_s = $30.18 + \left(\frac{-0.36}{13.6}\right) = 30.154$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

PV3R3

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(563.8)}{(30.154) \times (28.735)}} \times (0.7736)$$

V_s = 44.812 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .00967) \times (44.812) \times (20.966) \times \left(\frac{528}{563.8}\right) \times \left(\frac{30.154}{29.92}\right)$$

Q_{sd} = 52,691 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) $(.235)^2$ = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (563.8)[0.00267(9.4) + ((46.819)(.999)/(552.1))((30.18) + (2.11)/13.6)]}{60\ (44.812)(30.154)(.000301)(60)}$$

I = 99.92 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/27/92	Pressvent #4 R1	Method 0011	Run 1 PV 4

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
RBS/JM	30.2	-0.36	85	N/A	62	0.84	Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6CC	6C	6C	N/A	12	0.008	7	0.006	3.35

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	FINAL
Collection Method	Tedlar Grab	%O2	21	Ambient				✓	✓
Analysis Method		%CO2	0						

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX TEMP (F)	SAMPLE TRAIN VAC (in. Hg)
A1	0	1437	854.535	0.72	2.4	96	247	257	67	83		3
2	2.5		856.62	0.94	3.1	99	250	255	57	84		4
3	5		858.94	0.80	2.6	100	256	248	56	84		4
4	7.5	*1447/	861.13	0.84	2.8	99	256	250	56	85		4
5	10	/1529	863.10	0.39	1.3	98	248	249	60	83		3
6	12.5		864.92	0.29	0.97	98	242	245	58	84		2
7	15		866.30	0.70	2.3	98	242	257	56	84		3
8	17.5		868.26	0.97	3.2	101	251	253	55	84		4
9	20		870.63	0.87	2.9	99	250	256	55	84		4
10	22.5		872.91	0.37	1.2	99	245	246	56	85		2
11	25		874.41	0.37	1.2	98	245	245	55	85		2
12	27.5		875.89	0.37	1.2	98	243	261	56	84		2
END	30		877.355									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

* Shutdown while LP changed other stack extensions

Sheet Checked By: [signature] Date 3/9/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/4/92	Press vent 4 R1	Method 0011	Run 1 Press vent 4

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	1555	877.355	0.60	2.0	91	247	251	57	84		3
2	32.5		879.27	0.65	2.2	89	251	257	58	85		3
3	35		881.25	0.86	2.9	90	247	255	57	85		4
4	37.5		883.60	0.86	2.9	91	248	250	57	85		4
5	40		885.83	0.54	1.8	91	247	250	59	86		3
6	42.5		887.61	0.30	1.0	91	246	258	60	86		2
7	45		889.03	0.25	0.84	96	251	254	60	86		2
8	47.5		890.31	0.61	2.0	96	245	250	59	86		3
9	50		892.14	0.70	2.3	99	252	261	58	86		3
10	52.5		894.28	0.83	2.8	100	245	252	58	86		4
11	55		896.42	0.72	2.4	101	242	250	58	86		4
12	57.5		898.52	0.70	2.3	101	245	256	60	87		3
END	60		900.602									

899.535

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	46.067	.7835	2.11	96.6	84.9

Sheet Checked By: [signature] Date 3/9[illegible]

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX

Sample Date: 2/27/92

Sample Location: Press Vent 4 R1

Recovery Date: 2/27/92

Recovered By: [illegible]

Run No.: Run 1 Press Vent 4

Using Stack extension #2

B Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	590.2	576.5	462.5	736.0	grams
Initial Weight	592.0	576.0	462.0	726.2	grams
Net Weight	-1.8	+0.5	+0.5	+9.8	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture ~~[illegible]~~ grams

+9.0 g

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP- EML - Silbee TX Location Sampled Pos Vent 4

Date 2/27/92 Run No. Run 1 PV4 Calc By DAS

Dry gas meter calibration factor $= Y =$ .999

Volume of gas at meter conditions (ft^3) $= V_m =$ 46.067

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 544.9

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.2

Average orifice pressure drop (in. H_2O) $= \Delta H =$ +2.11

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(46.067)[(30.2)+(2.11)/13.6]}{(544.9)}$$

$V_{m(std)} =$ 45.224 dscf

Total volume of water collected (mL) $= V_{lc} =$ 9

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(\ 9\ ) =$ .4236

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.4236)}{(45.224) + (.4236)}$$

$B_{ws} =$ .0093

Percent moisture = $(100)(B_{ws})$ = 100 (.0093)

Percent moisture = .93 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (.0093)

MF = .9907

EPA5CALC.SHT

Percent O_2 by volume dry basis $= O_2 =$ ______ %
Percent CO by volume dry basis $= CO =$ ______ %
Percent CO_2 by volume dry basis $= CO_2 =$ ______ %

Percent N_2 by volume dry basis $= 100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [($ $)+($ $)+($ $)]$

$N_2 =$ ______ %

Ambient

Molecular weight of dry gas (lb/lb-mole) $= M_d$

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

$M_d =$ 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) $= M_s$

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.0093)] + 18\ (.0093)$

$M_s =$ 28.739 lb/lb-mole

Percent excess air (%) = % EA

$$\%\ EA = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\%\ EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) $= T_s =$ 556.6

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p} =$ .7835

Absolute pressure of stack gas (in. Hg) $= P_s =$ $30.2 + \left(\frac{-0.36}{13.6}\right) = 30.174$

note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S $= C_p =$ 0.84

DV4-R1

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (\ 0.84\ ) \times \sqrt{\frac{(\ 556.6\ )}{(30.174) \times (28.738)}} \times (.7835)$$

V_s = 45.077 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .0093\ ) \times (45.077) \times (20.966\ ) \times (\frac{528}{556.6}) \times (\frac{30.174}{29.92})$$

Q_{sd} = 53,744 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235)^2 = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (556.6)[0.00267(\ 9\ )+((46.067)(.999\ )/(544.9))((30.2)+(\ 2.11\ )/13.6)]}{60\ (45.077)(\ 30.174\ )(.000301)\ (60)}$$

I = 97.73 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific - Silsbee, TX	2/17/92	Press Vent 4 A2	Method 0011	Run 2 PV4

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
TBS/HM	30.2	-0.36	80	N/A	62	0.84	Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	6C	6C	NA	.12	0.008	6	0.005	3.35

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	PITOT SYSTEM LEAK CHECK FINAL
Collection Method	Fyrite	%O2	Ambient 21% O2 / 0% CO2					✓	✓
Analysis Method	Grab	%CO2							

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX TEMP (F)	SAMPLE TRAIN VAC (In. Hg)
A1	0	1717	901.220	0.70	2.3	99 (29)	248	255	62	79		3
2	2.5		903.20	0.77	2.6	92	247	252	54	80		3
3	5		905.36	0.79	2.6	93	249	252	54	81		3
4	7.5		907.51	0.89	3.0	93	248	254	54	81		3
5	10		909.82	0.56	1.9	93	250	254	53	81		3
6	12.5		911.65	0.37	1.2	93	250	251	53	81		2
7	15		913.13	0.70	2.3	98	242	255	53	81		3
8	17.5		915.22	1.0	3.4	99	246	255	52	81		4
9	20		917.50	1.0	3.4	99	250	250	52	81		4
10	22.5		920.00	0.45	1.5	100	246	257	53	81		3
11	25		921.62	0.53	1.8	97	243	254	54	81		3
12	27.5		923.45	0.54	1.8	97	244	247	55	81		3
End	30		925.200									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: [signature] Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/27/92	Dryer Vent 4 R2	Method 0011	Run 2 PV4

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	1752	925.200	0.55	1.8	88	250	250	63	79		3
2	32.5		927.02	0.69	2.2	88	250	250	58	80		3
3	35		928.94	0.57	1.9	88	246	260	58	80		3
4	37.5		930.70	0.72	2.4	88	250	248	57	80		3
5	40		932.80	0.55	1.8	88	248	249	56	80		3
6	42.5		934.62	0.25	0.84	89	249	248	56	80		2
7	45		935.90	0.26	0.87	92	250	261	57	79		2
8	47.5		937.18	0.69	2.3	94	247	248	57	79		3
9	50		939.08	0.73	2.4	95	246	254	57	79		3
10	52.5		941.160	0.82	2.7	97	251	258	58	79		3
11	55		943.37	0.49	1.6	98	249	251	60	79		2
12	57.5		945.19	0.64	2.1	100	249	249	60	78		3
END	60		946.960									

946.22

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	45.740	.7866	2.11	93.9	80.0

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee TX Sample Date: 2/27/92

Sample Location: Press Vent 4 - Run 2 Recovery Date: 2/27/92

Recovered By: [illegible]

Run No.: Run 2 P.V. 4

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	580.3	569.0	482.0	723.0	grams
Initial Weight	583.5	567.0	482.8	713.6	grams
Net Weight	-3.2	+2.0	-0.8	+9.6	grams

Description of impinger water ____________ ____________ % spent

____________ ____________ Sil Gel Color

Total Moisture +7.6 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ____________ Liquid level

____________ blank Marked/Sealed ____________

Container No: ____________ Liquid level

____________ blank Marked/Sealed ____________

Container No: ____________ Liquid level

____________ blank Marked/Sealed ____________

Samples stored and locked ____________

Remarks: ____________

Relinquished by: ____________ Date ____________

EPA METHOD 5 CALCULATIONS

Plant LP-EMC-Silsbee TX Location Sampled Press Vent 4 R 2

Date 2/27/92 Run No Run 2 PV4 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ 0.999

Volume of gas at meter conditions (ft^3) $= V_m =$ 45.740

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 80+460

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.20

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 2.11

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(0.999)(17.64)(45.740)[(30.20)+(2.11)/13.6]}{(540.0)}$$

$V_{m(std)} =$ 45.310 dscf

Total volume of water collected (mL) $= V_{lc} =$ 7.6

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(7.6) =$ ______

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.3577)}{(45.310) + (.3577)}$$

$B_{ws} =$ .00783

Percent moisture $= (100)(B_{ws}) = 100\,(.00783)$

Percent moisture = .783 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 - (.00783)$

MF = .99217

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = ____ %
Percent CO by volume dry basis = CO = ____ %
Percent CO_2 by volume dry basis = CO_2 = ____ %

Ambient air

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

N_2 = 79% %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.00783)] + 18\ (.00783)$

M_s = 28.755 lb/lb-mole

Percent excess air (%) = % EA

$$\% \text{ EA} = \cancel{\frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]}} \times 100$$

$$\% \text{ EA} = \cancel{\frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]}} \times 100$$

% EA = ____

Average stack temperature (^oF+460) = T_s = 93.9+460=553.9

Avg of sq root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = .7866

Absolute pressure of stack gas (in. Hg) = P_s = $30.2 + \left(\frac{-.36}{13.6}\right) = 30.174$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

N4R2

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(553.9)}{(30.174) \times (28.755)}} \times (.7866)$$

V_s = 45.133 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .00783) \times (45.133) \times (20.966) \times (\frac{528}{553.9}) \times (\frac{30.174}{29.92})$$

Q_{sd} = 54,152 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235 $)^2$ = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (553.9)[0.00267(7.6)+((45.740)(.999)/(540))((30.2)+(2.11)/13.6)]}{60\ (45.133)(30.174)(.000301)(60)}$$

I = 97.17 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/28/92	Press Vent #4 R3	Method 0011	Run 3 PV4

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS/Jm	30.18	-0.36	69	N/A	62	0.84	6ft Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	6C	6C	N/A	10	0.004	7	0	~3.3

EPA METHOD 3
Collection Method: Ambient v.V
Analysis Method: Fyrite grab

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	21				
%CO2	0				

PITOT SYSTEM LEAK CHECK INIT	FINAL
✓	✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A1	0	0910	947.553	0.78	2.6	86	252	256	58	66		3
2	2.5		949.70	0.75	2.5	86	253	258	54	68		3
3	5		951.67	0.66	2.2	87	252	250	54	69		3
4	7.5		953.64	0.77	2.6	86	244	250	55	71		3
5	10		955.75	0.46	1.5	87	244	251	55	72		2
6	12.5		957.35	0.30	1.0	86	248	250	56	73		2
7	15		958.20	0.73	2.4	90	248	247	55	74		3
8	17.5		960.57	0.95	3.2	92	247	252	54	75		4
9	20		962.90	0.96	3.2	92	247	254	54	76		4
10	22.5		965.42	0.70	2.3	93	244	246	55	77		3
11	25		967.28	0.48	1.6	92	247	250	55	78		2
12	27.5		968.88	0.48	1.6	94	251	251	55	78		2
END	30		970.593									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JAS Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2 28 92	Press Vent 4 R 3	Method 0011	Run 3 PV 4

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	0948	970.593	0.55	1.8	247	252	87	60	77		2
2	32.5		972.38	0.74	2.5	251	243	89	54	79		3
3	35		974.45	0.92	3.1	247	261	87	54	79		3
4	37.5		976.77	0.86	2.9	88	245	251	54	80		3
5	40		979.02	0.57	1.9	87	246	255	56	80		3
6	42.5		980.87	0.33	1.1	89	253	250	57	88		2
7	45		982.30	0.30	1.0	90	244	249	60	81		2
8	47.5		983.66	0.69	2.3	92	253	259	58	81		3
9	50		985.66	0.79	2.7	92	245	258	58	82		3
10	52.5		987.82	0.88	3.0	95	248	250	59	82		4
11	55		990.11	0.73	2.5	97	250	250	59	83		3
12	57.5		992.23	0.71	2.4	98	249	255	60	83		3
END	60	1018	994.275									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		46.722	0.8090	2.25	90.1	76.7

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX

Sample Date: 2/28/92

Sample Location: Press Vent #4 R3

Recovery Date: 2/28/92

Recovered By: [illegible]

Run No.: Run 3 PV 4

C Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	570.4	584.4	484.7	708.2	grams
Initial Weight	569.3	581.0	485.6	699.9	grams
Net Weight	+1.1	+3.4	-0.9	+8.3	grams

Description of impinger water ______________________ ______________ % spent

______________________________________ ______________ Sil Gel Color

Total Moisture +11.9 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________________ Liquid level

__________ blank Marked/Sealed __________

Container No: ______________________ Liquid level

__________ blank Marked/Sealed __________

Container No: ______________________ Liquid level

__________ blank Marked/Sealed __________

Samples stored and locked ______________________

Remarks: ______________________

Relinquished by: ______________________ Date __________

EPA METHOD 5 CALCULATIONS

Plant LP - EML - Silsbee TX Location Sampled Process Vent 4 Run 3

Date 2/28/92 Run No. Run 3 PV4 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ 0.999

Volume of gas at meter conditions (ft^3) $= V_m =$ 46.722

Average meter temperature ($^{o}F + 460$)^{o}R $= T_m =$ 76.9+460

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.18

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 2.25

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(0.999)(17.64)(46.722)[(30.18)+(2.25)/13.6]}{(536.9)}$$

$V_{m(std)} =$ 46.536 dscf

Total volume of water collected (mL) $= V_{lc} =$ 11.9

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(11.9) =$ .560

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(.560)}{(46.536) + (.560)}$$

$B_{ws} =$ .01189

Percent moisture $= (100)(B_{ws}) = 100\ (.01189)$

Percent moisture = 1.19 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 - (.01189)$

MF = .9881

EPA5CALC.SHT

PV4 R3

Percent O_2 by volume dry basis = O_2 = ________ %
Percent CO by volume dry basis = CO = ________ %
Percent CO_2 by volume dry basis = CO_2 = ________ %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

N_2 = 79 %

air

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.01189)] + 18\ (.01189)$

M_s = 28.711 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ________

Average stack temperature (°F+460) = T_s = 550.1

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = .8090

Absolute pressure of stack gas (in. Hg) = P_s = $30.18 + \left(\frac{-.36}{13.6}\right) = 30.15$

note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

EPA5CALC.SHT 5/90

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(550.1)}{(30.15) \times (28.711)}} \times (.8090)$$

V_s = 46.312 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .0189) \times (46.312) \times (20.966) \times (\frac{528}{550.1}) \times (\frac{30.15}{29.92})$$

Q_{sd} = 55,678 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) $(.235)^2$ = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (550.1)[0.00267(11.9) + ((46.722)(.999)/(536.9))((30.18) + (2.25)/13.6)]}{60\ (46.312)(30.15)(.000301)(60)}$$

I = 97.07 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	2/4/92	Press Vent 5 A-1	Method 0011	Run 1 Press Vent 5

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
[illegible] / [illegible]	30.14	-0.36	82	N/A	62	0.84	6 ft Glass	#25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	P-12	62	NA	15	0.01	7	0.005	3.39/3.42

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	FINAL
Collection Method	Fyrite	%O2	21	Ambient				✓	
Analysis Method	Grab	%CO2	0						

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A1	0	1018	134.364	0.78	2.6	96	250	248	71	85		3
2	2.5		136.45	0.76	2.6	95	253	252	60	86		3
3	5		138.63	0.73	2.5	95	250	258	59	87		3
4	7.5		140.98	0.76	2.6	96	250	248	60	88		3
5	10		143.02	0.35	1.2	95	250	249	57	90		2
6	12.5		144.58	0.33	1.1	96	259	247	58	91		2
7	15		146.01	0.46	1.6	97	255	248	57	92		2
8	17.5		147.68	0.91	3.1	99	250	257	57	93		3
9	20		150.09	0.83	2.8	98	249	254	57	95		3
10	22.5		152.32	0.56	1.9	100	246	259	58	95		3
11	25		154.28	0.51	1.7	100	252	255	58	96		3
12	27.5		155.95	0.53	1.8	99	246	249	57	96		
END	30.0		157.775									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: [signature] Date 3/92

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EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/29/92	Preswent 5 R1	Method 0011	Run 1 Preswent 5

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	1052	157.775	0.47	1.6	103	250	249	70	98		2
2	32.5		159.50	0.62	2.1	102	252	256	67	99		3
3	35		161.33	0.59	2.0	100	254	260	60	98		3
4	37.5		163.37	0.80	2.7	102	245	249	57	100		4
5	40		165.56	0.55	1.9	103	246	254	56	100		3
6	42.5		167.43	0.33	1.1	101	254	260	56	101		2
7	45		168.90	0.43	1.5	102	254	255	56	100		2
8	47.5		170.55	0.58	2.0	102	245	244	56	103		3
9	50		172.42	0.86	2.9	101	250	253	55	103		3
10	52.5		174.53	0.71	2.4	105	~~249~~ 249	259	56	104		3
11	55		176.67	0.58	2.0	106	246	254	55	105		3
12	57.5		178.58	~~0.55~~ 0.60	~~1.8~~ 2.1	~~99~~ 99	246	250	56	105		3
	60		180.532									
				0.7732	~~2.2~~ 2.1	100				96		

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	46.168	0.7732	2.1	100	96

$\sqrt{\Delta P_s} = .18.2972$

Sheet Checked By: [signature] Date 3/9/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX

Sample Date: 2/29/92

Sample Location: Press vent 5 Run 1

Recovery Date: 2/29/92

Recovered By: [signature]

Run No.: Run 1 PV 5

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	597.8	580.2	482.7	704.2	grams
Initial Weight	596.8	577.4	482.3	697.0	grams
Net Weight	+1.0	+2.8	+0.4	+7.2	grams

Description of impinger water ______________ ______________ % spent

______________ ______________ Sil Gel Color

Total Moisture +11.4 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Samples stored and locked ______________

Remarks: ______________

Relinquished by: ______________ Date ______________

EPA METHOD 5 CALCULATIONS

Plant LP- EMI-Silsbee TX Location Sampled Press Vent 5

Date 2/29 Run No. Run 1 PV5 Calc By [illegible]

Dry gas meter calibration factor = Y = 0.999

Volume of gas at meter conditions (ft^3) = V_m = 46.168

Average meter temperature (^oF + 460)^oR = T_m = 556

Barometric pressure absolute (in. Hg) = P_{bar} = 30.14

Average orifice pressure drop (in. H_2O) = ΔH = 2.1

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\ (17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999\ )(17.64)(46.168\ )[(\ 30.14\ )+(\ 2.1\ )/13.6]}{(\ 556\ )}$$

$V_{m(std)}$ = 44.33 dscf

Total volume of water collected (mL) = V_{lc} = 11.4

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(\ 11.4\ ) = .5366$

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(\ .5366\ )}{(\ 44.33\ ) + (\ .5366\ )}$$

B_{ws} = .0120

Percent moisture = (100)(B_{ws}) = 100 (.0120)

Percent moisture = 1.20 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (.012)

MF = 0.988

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = ______%
Percent CO by volume dry basis = CO = ______%
Percent CO_2 by volume dry basis = CO_2 = ______%

Percent N_2 by volume dry basis = 100 − (O_2 + CO + CO_2)

N_2 = 100 − [( )+( )+( )]

N_2 = ______

Ambient air

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

M_d = 0.44 ( ) + 0.32 ( ) + 0.28 (+)

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

M_s = (28.84) [1 − (.012)] + 18 (.012)

M_s = 28.71 lb/lb-mole

Percent excess air (%) = % EA

$$\%\ EA = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\%\ EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) = T_s = 560

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = .7732

Absolute pressure of stack gas (in. Hg) = P_s = 30.14 + (−0.36/13.6) = 30.11
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

PV5R1

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.84) \times \sqrt{\frac{(560)}{(30.11) \times (28.71)}} \times (.7732)$$

V_s = 44.690 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .0120) \times (44.690) \times (20.966) \times \left(\frac{528}{560}\right) \times \left(\frac{30.11}{29.92}\right)$$

Q_{sd} = 52,371 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = $A_n = 54.54E\text{-}4\ (d_n)^2$

$A_n = (0.005454)\ (.235)^2$ = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

A_n: .000301 For PV; .000210 For DS

$$I = \frac{100\ (560)[0.00267(11.4) + ((46.168)(.999)/(556))((30.14) + (2.1)/13.6)]}{60\ (44.69)(30.11)(.000301)(60)}$$

I = 97.68 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	1/?/92	Press vent 5 R2	Method 0011	Run 2 PV.5

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS/KM	30.14	-0.36	109	N/A	62	0.84	Glass	#25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	P-12	G2	NA	15	0.001	7	0	3.45

EPA METHOD 3
Collection Method: Fugitive
Analysis Method: Grab

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	21	Ambient Air			
%CO2	0				

PITOT SYSTEM LEAK CHECK INIT	FINAL
✓	✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A1	0	1201	180.760	0.75	2.6	107	247	258	83	108		4
2	2.5		182.93	0.88	3.0	107	248	260	60	107		5
3	5		185.28	0.87	3.0	106	245	251	58	107		5
4	7.5		187.67	0.81	2.8	107	246	252	54	107		5
5	10		189.95	0.32	1.1	108	251	259	54	107		2
6	12.5		191.48	0.25	0.86	107	252	254	54	106		2
7	15		192.77	0.59	2.0	106	245	249	54	106		3
8	17.5		194.64	0.95	3.3	108	248	252	53	106		5
9	20		197.10	0.95	3.3	109	253	256	53	107		5
10	22.5		199.60	0.63	2.2	108	251	258	55	107		4
11	25		201.63	0.50	1.7	109	248	255	56	108		3
12	27.5		203.43	0.50	1.7	110	245	250	56	108		3
END	30		205.190									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JAS Date 3/92

iea

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/28/92	Press Vent 5 R 2	Method 0011	Run 2 PV 5

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B 1	30	1234	205.190	0.51	1.8	104	245	250	70	108		3
2	32.5		207.08	0.75	2.6	109	248	247	60	109		4
3	35		209.16	0.65	2.2	108	250	258	60	109		4
4	37.5		211.23	0.65	2.2	107	255	249	56	109		4
5	40		213.26	0.40	1.4	109	245	247	56	110		3
6	42.5		214.90	0.23	0.79	109	253	252	57	110		2
7	45		216.12	0.45	1.6	107	254	260	58	110		3
8	47.5		217.80	0.69	2.4	108	245	258	57	111		4
9	50		219.82	0.77	2.7	110	253	249	56	111		4
10	52.5		222.08	0.82	2.8	110	247	252	57	111		4
11	55		224.52	0.61	2.1	110	249	251	58	112		4
12	57.5		226.44	0.64	2.2	112	245	253	58	112		4
END	60		228.495									
				0.7833								

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		47.735	0.7833	2.18	108.1	108.6

Sheet Checked By: [signature] Date 3/9/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX **Sample Date:** 2/29/92

Sample Location: Press Vent #5 Run 2 **Recovery Date:** 2/29/92

Recovered By: [illegible]

Run No.: Run 2 PV 5

B Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	571.9	556.9	462.7	745.8	grams
Initial Weight	571.1	555.6	461.9	737.1	grams
Net Weight	+0.8	+1.3	+0.8	+8.7	grams

Description of impinger water ______________ ______ **% spent**

______________________________ ______ **Sil Gel Color**

Total Moisture +11.6 **grams**

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________ **Liquid level**

______ **blank** **Marked/Sealed** ______

Container No: ______________ **Liquid level**

______ **blank** **Marked/Sealed** ______

Container No: ______________ **Liquid level**

______ **blank** **Marked/Sealed** ______

Samples stored and locked ______________

Remarks: ______________

Relinquished by: ______________ **Date** ______

EPA METHOD 5 CALCULATIONS

Plant LP- EMC- Silsbee TX Location Sampled Press Vent 5 R2

Date 2/28/92 Run No. Run 2 PVS Calc By [illegible]

Dry gas meter calibration factor $= Y =$ 0.999

Volume of gas at meter conditions (ft^3) $= V_m =$ 47.735

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 568.6

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.14

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 2.18

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(0.999)(17.64)(47.735)[(30.14)+(\cancel{30.14}\ 2.18)/13.6]}{(568.6)}$$

$V_{m(std)} =$ 44.827 dscf

Total volume of water collected (mL) $= V_{1c} =$ 11.6

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)($ 11.6 $) =$ 0.5460

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(0.5460)}{(44.827) + (.5460)}$$

$B_{ws} =$ .01203

Percent moisture $= (100)(B_{ws}) = 100$ (   )

Percent moisture = 1.20 % %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 - (.01203)$

MF = 0.98798

EPA5CALC.SHT

DV5R2

Percent O_2 by volume dry basis $= O_2 =$ 21 %
Percent CO by volume dry basis $= CO =$ %
Percent CO_2 by volume dry basis $= CO_2 =$ %

Percent N_2 by volume dry basis $= 100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

$N_2 =$ 21 %

amb air

Molecular weight of dry gas (lb/lb-mole) $= M_d$

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\quad) + 0.32\ (\quad) + 0.28\ (\quad + \quad)$

$M_d =$ 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) $= M_s$

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.84)\ [1 - (.01203)] + 18\ (.01203)$

$M_s =$ 28.709 lb/lb-mole

Percent excess air (%) = % EA

$$\% \text{ EA} = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\% \text{ EA} = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ________

Average stack temperature (^oF+460) $= T_s =$ 108.1+460

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p} =$ .7833

Absolute pressure of stack gas (in. Hg) $= P_s =$ $30.14 + \left(\frac{-.36}{13.6}\right) \Rightarrow$ 30.114
note P_s = barometric pressure (in. Hg) $\pm$ [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S $= C_p =$ 0.84

PV5 R2

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(568.1)}{(30.114) \times (28.709)}} \times (.7833)$$

V_s = 45.598 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .01203) \times (45.598) \times (20.966) \times \left(\frac{528}{568.1}\right) \times \left(\frac{30.114}{29.92}\right)$$

Q_{sd} = 53,011 dscfm

Diameter of sampling nozzle (in.) = d_n = .235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.235)^2 = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (568.1)[0.00267(11.6)+((47.735)(.999)/(568.6))((30.14)+(2.18)/13.6)]}{60\ (45.598)(30.114)(.000301)(60)}$$

I = 98.21 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	2/29/92	Prevent 5 Run 3	Method 0011	Run 3 PV #5

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS / VM	30.14	-0.36	113	N/A	62	0.84	6 ft Glass	H25	0.235

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
1	M4	1.927	0.999	6C	P-12	612	N/A	16	0.001	6	0.0	3.45

EPA METHOD 3
Collection Method
Analysis Method

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	21				
%CO2	0				

Ambient air

PITOT SYSTEM LEAK CHECK INIT.	FINAL
ok	ok

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A1	0	1336	228.712	0.95	3.3	113	254	248	80	113		4
2	2.5		231.14	1.0	3.5	112	246	259	67	113		4
3	5		233.71	1.0	3.5	113	253	252	60	113		4
4	7.5		236.26	0.70	2.4	111	246	254	59	114		3
5	10		238.34	0.33	1.1	112	252	258	60	114		2
6	12.5		239.83	0.17	0.59	113	250	250	58	114		2
7	15		241.03	0.55	1.9	110	254	257	59	114		2
8	17.5		242.88	0.75	2.6	109	253	256	57	114		3
9	20		245.11	0.93	3.2	113	253	257	56	114		3
10	22.5		247.62	0.64	2.2	111	245	249	55	113		3
11	25		249.68	0.44	1.5	109	249	252	56	112		2
12	27.5		251.37	0.44	1.5	112	254	259	57	111		2
END	30		253.037									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: Date 3/92

iea

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	21 /92	Prevent 5 Run 3	Method 0011	Run 3 Prevent 5

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B 1	30	1410	253.037	0.83	2.9	106	252	251	68	110		3
2	32.5		255.35	0.92	3.2	109	246	252	55	110		3
3	35		257.90	0.95	3.3	109	248	250	56	111		4
4	37.5		260.31	0.92	3.2	108	254	261	56	112		3
5	40		262.70	0.38	1.3	109	249	261	57	112		2
6	42.5		264.29	0.17	0.59	109	253	250	66	112		2
7	45		265.57	0.45	1.6	112	257	252	68	112		2
8	47.5		267.15	0.70	2.4	108	251	261	60	113		3
9	50		269.28	0.76	2.6	113	249	249	57	113		3
10	52.5		271.47	0.82	2.8	113	254	253	58	113		3
11	55		273.81	0.60	2.1	113	249	254	59	113		2
12	57.5		275.81	0.61	2.1	113	253	257	59	113		3
END	60		277.832									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	49.120	0.79875	2.31	110.83	112.6

Sheet Checked By: [signature] Date 9/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX
Sample Date: 2/29/92
Sample Location: Press vent 5 Run # 3
Recovery Date: 2/29/92
Recovered By: [signature]

Run No.: Run 3 PV5

C Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	605.2	603.5	486.3	721.8	grams
Initial Weight	605.0	602.2	484.8	714.2	grams
Net Weight	+0.2	+1.3	+1.5	+7.6	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture +10.6 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP-EMC-Silsbee TX Location Sampled Pass Vent 5 Run 3

Date 2/26/92 Run No. Run 3 PV5 Calc By [illegible]

Dry gas meter calibration factor = Y = .999

Volume of gas at meter conditions (ft^3) = V_m = 49.120

Average meter temperature ($^{\circ}F + 460)^{\circ}R$ = T_m = 572.6

Barometric pressure absolute (in. Hg) = P_{bar} = 30.14

Average orifice pressure drop (in. H_2O) = ΔH = 2.31

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(49.120)[(30.14)+(2.31)/13.6]}{(572.6)}$$

$V_{m(std)}$ = 45.820 dscf

Total volume of water collected (mL) = V_{lc} = 10.6

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(10.6) =$ .4989

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(0.4989)}{(45.820) + (0.4989)}$$

B_{ws} = .01077

Percent moisture = $(100)(B_{ws})$ = 100 (.01077)

Percent moisture = 1.077 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - ( )

MF = .9892

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = ______ %
Percent CO by volume dry basis = CO = ______ %
Percent CO_2 by volume dry basis = CO_2 = ______ %

Percent N_2 by volume dry basis = 100 - (O_2 + CO + CO_2)

N_2 = 100 - [(   )+(   )+(   )]

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d amb air

M_d = 0.44 (CO_2) + 0.32 (O_2) + 0.28 (N_2 + CO)

M_d = 0.44 (   ) + 0.32 (   ) + 0.28 (+   )

M_d = 28.84 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

M_s = (M_d) (1 - B_{ws}) + 18 (B_{ws})

M_s = (28.84) [1 - (.01077)] + 18 (.01077)

M_s = 28.723 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5 (\% CO)]}{[0.264 (\% N_2)] - (\% O_2) - [0.5 (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5 (\quad)]}{[0.264 (\quad)] - (\quad) - [0.5 (\quad)]} \times 100$$

% EA = ______

Average stack temperature (°F+460) = T_s = 510.8

Avg of sq root of velocity head (in H_2O)$^{1/2}$ = $\sqrt{\Delta p}$ = .79875

Absolute pressure of stack gas (in. Hg) = P_s = $30.14 + \left(\frac{-0.36}{13.6}\right) \Rightarrow 30.114$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

Run No.

PV5 R3

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(570.8)}{(30.114) \times (\cancel{30.114})\ 28.723}} \times (.79875)$$

V_s = 46.596 ft/s

Area of stack (ft^2) = A = 20.966

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1077) \times (46.596) \times (20.966) \times \left(\frac{528}{570.8}\right) \times \left(\frac{30.114}{29.92}\right)$$

Q_{sd} = 53,985 dscfm

Diameter of sampling nozzle (in.) = d_n = 0.235

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) $(.235)^2$ = .000301 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (570.8)[0.00267(10.6)+((49.120)(.999)/(572.6))((30.14)+(2.31)/13.6)]}{60\ (46.596)(30.114)(.000301)(60)}$$

I = 98.57 %

APPENDIX D

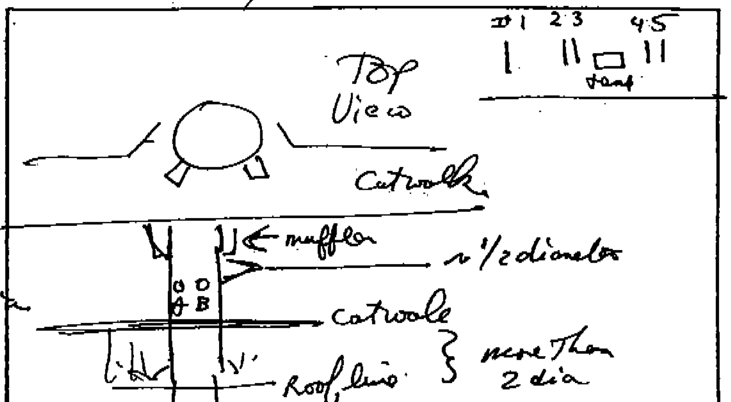
DRYER STACKS
FORMALDELYDE FIELD TEST DATA SHEETS, SKETCHES
AND DATA SUMMARY CALCULATIONS

iea

EPA METHOD 1
TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Oryal Stacks   Side View of plant

PLANT: L-P OSB Facility
CITY: Silsbee   STATE: TX
SAMPLING LOCATION:
INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE A): 46
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE, (DISTANCE B): 4.5   ID 41.5
NEAREST UPSTREAM DISTURBANCE DISTURBANCE: below roofline more than 2 dia
NEAREST DOWNSTREAM DISTURBANCE DISTURBANCE: muffler expansion ~1 diameter
SAMPLER: VTH / VTM   DATE: 3-1-92



SCHEMATIC OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	.021	41.5	(0.87) = 1"	4.5	5.5
2	.067		2.78		7.28
3	.118		4.90		9.40
4	.177		7.35		~~3~~ 11.85
5	.250		10.38		14.88 ~~4 19.28~~
6	.356		14.78		19.28
7	.644		26.73		31.23
8	.750		31.13		35.63
9	.823		34.15		38.65
10	.882		36.60		41.10
11	.933		38.72		43.22
12	.979		(40.63) = 40.5		45.0

PRELIMINARY VELOCITY TRAVERSE
EPA METHOD 2

iea

Dryer Stacks

PLANT/CLIENT Louisiana Pacific
SOURCE OSB Silsbee Plant
DATE 3/1/92
STACK I.D. (inches) 41.5
BAROMETRIC PRESSURE (in. Hg) 30.14
STACK GAUGE PRESSURE (in. H2O) -0.73
OPERATORS DAS/JM

PITOT NO.		TYPE		COEFF 0.84

See previous page.

TRAVERSE POINT LAYOUT SCHEMATIC

TRAVERSE POINT NUMBER	VELOCITY HEAD (in. H2O)	STACK TEMP (°F)
A 1	1.3	170
2	1.3	170
3	1.5	172
4	1.6	173
5	1.7	173
6	1.7	173
7	1.5	174
8	1.5	173
9	1.3	173
10	1.1	173
11	1.0	173
12	0.91	172
AVERAGE	~~SQRT~~ 1.37	

TRAVERSE POINT NUMBER	VELOCITY HEAD (in. H2O)	STACK TEMP (°F)
B 1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
AVERAGE	SQRT	

POST PITOT LEAK CHECK PASSED [ ] [ ] FAILED

MEASUREMENT DEVICE
MICROMETER [ ]
0–10" MANOMETER [X]
MAGNEHELIC [ ]
OTHER [ ] EXPLAIN:

W/B - 136

Fyrite
O_2 - 19
CO_2 - 2

Nozzle cal check
.197
.196
.196
3 direction w/ caliper

% H_2O = 16.4
Cal Nozzle size .2085

prevelo.wk1

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/13/92	Dryer Stack Run 1	Method 0011	Run 1 05 1

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
TAS / JM	30.13	-0.75	78°F	N/A	41.5"	0.84	Glass	.H19	.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
	MY	1.927	.999					15	.005	15	.005	1.08

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	PITOT SYSTEM LEAK CHECK FINAL
Collection Method	Fyrite 19%	%O2						✓	✓
Analysis Method	~~Grab~~ 2%	%CO2							

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	0	1807	542.472	0.92	0.99	182	at 248	251	69	84		1"
2	2.5		543.800	0.94	1.61	182	248	256	58	84		2"
3	5.0		545.170	0.95	1.02	182	248	238	56	85		2"
4	7.5		546.530	1.1	1.19	183	249	252	55	85		3"
5	10		547.980	1.1	1.19	183	248	258	55	86		3"
6	12.5		549.41	1.05	1.13	183	248	246	55	86		3"
7	15		550.835	0.98	1.06	184	248	259	55	87		3"
8	17.5		at 551 –	0.85	0.92	183	248	252	56	87		5"
9	20		553.440	0.8	0.86	181	248	256	56	87		5"
10	22.5		554.72	0.86	0.94	180	248	252	56	87		10"
11	25	(temp stop)	556.032/557.150	0.86	0.94	179	248	243	59	86		15"
12	27.5	1415	558.70	1.3	1.4	181	248	238	0.68	85		3
END	30		560.45									

Sil Gel Plugged

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		~~556.740~~	11.8264	12.65	2183	1029

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A

EMISSION TESTING FIELD DATA

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B

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	1 /92	Dryer Stack # Run 1	Method 0011	Run 1 OS # 1

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	30		560.45	1.3	1.4	182	248	250	59	89		3
2	32.5		562.24	1.3	1.4	183	248	258	58	90		3
3	35		563.77	1.3	1.4	183	248	246	58	90		3
4	37.5		565.36	1.3	1.4	183	248	255	58	90		3
5	40		567.01	1.4	1.5	183	248	251	58	90		3
6	42.5		568.67	1.4	1.5	184	248	249	60	90		3
7	45		570.33	1.7	1.8	184	248	258	59	91		3
8	47.5		572.12	1.7	1.8	185	248	253	58	91		4
9	50		573.92	1.6	1.7	182	248	251	60	91		4
10	52.5		575	1.6	1.7	182	248	252	59	91		4
11	55		577.50	1.4	1.5	182	248	254	59	91		3
12	57.5		579.06	1.4	1.5	180	248	249	58	91		3
END 60			580.684									
			37.094	1.094	1.3	182				88		
				27.7195								

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		37.094	1.0941	1.302	182.3	88.1

145.9

SPS 69.6

ISO 100.46

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP-EML-Silsbee OP

Sample Date: 3/3/92

Sample Location: Dryer Stack #1 Run 1

Recovery Date: 3/3/92

Recovered By: [illegible]

Run No.: Run 1 DS #1

B train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	696.3	582.0	463.2	758.5	grams
Initial Weight	574.3	568.4	462.0	749.4	grams
Net Weight	122.0	13.6	+1.2	9.1	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture 145.9 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant L-P-OSB Facility Slaber Location Sampled Dryer Stack 1

Date 3/12/92 Run No. Run 1 Calc By [illegible]

Dry gas meter calibration factor = Y = .999

Volume of gas at meter conditions (ft^3) = V_m = 37.094

Average meter temperature (^oF + 460)^oR 88.1 = T_m = 548.1

Barometric pressure absolute (in. Hg) = P_{bar} = 30.13

Average orifice pressure drop (in. H_2O) = ΔH = 1.3

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\ (17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(37.094)[(30.13)+(1.3)/13.6]}{(548.1)}$$

$V_{m(std)}$ = 36.048 dscf

Total volume of water collected (mL) = V_{1c} = 145.9 ml.

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)(145.9) =$ 6.867

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(6.867)}{(36.048) + (6.867)}$$

B_{ws} = .1600

Percent moisture = $(100)(B_{ws})$ = 100 (.16)

Percent moisture = 16% %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (   )

MF = .84

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 19 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 2 %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(19)+(0)+(2)]$

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (2) + 0.32\ (19) + 0.28\ (79 + 0)$

M_d = 29.08 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (29.08)\ [1 - (.16)] + 18\ (.16)$

M_s = 27.307 lb/lb-mole

Percent excess air (%) = % EA

$$\% \ EA = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\% \ EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) 182.3 = T_s = 642.3

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = 1.0941

Absolute pressure of stack gas (in. Hg) = P_s = $30.13 + \left(\frac{-.75}{13.6}\right) = 30.075$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

051-A1

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(642.3)}{(30.075) \times (27.307)}} \times (1.0941)$$

V_s = 69.483 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1600) \times (69.483) \times (9.393) \times \left(\frac{528}{642.3}\right) \times \left(\frac{30.075}{29.92}\right)$$

Q_{sd} = 27,180 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

$A_n = (0.005454)(.196)^2$ = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (642.3)[0.00267(145.9)+((37.094)(.999)/(548.1))((30.13)+(1.3)/13.6)]}{60\ (69.483)(30.075)(.000210)(60)}$$

I = 98.92 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/3/92	Dryer Stack #1	Method 0011	Run 2 Dryer Stack #1

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
TAS AM	30.13	-0.75	88	N/A	41.5	0.84	6 ft Glass	H 19	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999				N/A	10	0.005	15	0.002	1.08

EPA METHOD 3
Collection Method: Grab
Analysis Method: Fyrite

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	19				
%CO2	2				

PITOT SYSTEM LEAK CHECK: INIT ✓ FINAL ✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
1	0	1550	580.940	1.6	1.7	185	238	239	66	86		4
2	2.5		582.65	1.6	1.7	183	248	247	55	87		5
3	5		584.43	1.6	1.7	183	248	248	56	88		5
4	7.5		586.12	1.6	1.7	183	248	257	56	88		5
5	10		587.92	1.6	1.7	183	246	246	56	88		6
6	12.5		589.40	~~1.7~~ 1.6	~~1.8~~ 1.7	183	248	248	56	89		7
7	15		591.20	1.7	1.8	185	248	257	57	89		8
8	17.5		592.92	1.7	1.8	185	248	241	57	89		8
9	20		594.79	1.6	1.7	185	248	238	58	89		7
10	22.5		596.23	1.6	1.7	185	248	241	59	89		8
11	25		598.14	1.6	1.7	185	248	244	59	89		9
12	27.5		599.86	1.6	1.7	184	248	236	59	88		9
END	30		601.628 / —									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

A

Sheet Checked By: [signature] Date 3/92

(B)

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	1 /92	Dryer Stack # B2	Method 0011	Run 2 DS01

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	1630	601.628	1.4	1.5	181	248	250	68	85		2
2	32.5		603.26	1.4	1.5	182	248	257	60	87		2
3	35		604.89	1.4	1.5	183	248	250	58	87		2
4	37.5		606.61	1.5	1.6	183	248	259	56	87		2
5	40		608.30	1.6	1.7	183	248	246	56	88		2
6	42.5		610.03	1.6	1.7	183	248	255	58	88		2
7	45		611.78	1.6	1.7	184	248	251	58	87		2
8	47.5		613.53	1.6	1.7	184	248	257	58	88		2
9	50		615.30	1.7	1.8	185	248	255	57	88		2
10	52.5		617.03	1.7	1.8	184	248	254	60	88		2
11	55.0		618.82	1.6	1.7	183	248	246	60	88		2
12	57.5		620.55	1.6	1.7	182	248	252	60	87		2
End	60	1200	622.278									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	41.338	1.26	1.69	183.6	87.8

Sheet Checked By: AS Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP - EMC - Silsbee TX

Sample Date: 3/3/92

Sample Location: Dryer Stack #1 Run 2

Recovery Date: 3/3/92

Recovered By: VASchach

Run No.: Run 2 DS ~~#~~1

C Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	693.3	621	487.6	682.5	grams
Initial Weight	568.0	604.0	486.0	679.9	grams
Net Weight	125.3	17	1.6	2.6	grams

Description of impinger water ______________ ______________ % spent

______________ ______________ Sil Gel Color

Total Moisture 146.5 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Samples stored and locked ______________

Remarks: ______________

Relinquished by: ______________ Date ______________

EPA METHOD 5 CALCULATIONS

Plant LP-EML-Silsbee TX Location Sampled Dryer Stack 1

Date 3/3/92 Run No. Run 2 DS1 Calc By [illegible]

Dry gas meter calibration factor = Y = .999

Volume of gas at meter conditions (ft^3) = V_m = 41.338

Average meter temperature ($^{O}F + 460)^{O}R$ = T_m = 547.8

Barometric pressure absolute (in. Hg) = P_{bar} = 30.13

Average orifice pressure drop (in. H_2O) = ΔH = 1.69

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(41.338)[(30.13)+(1.69)/13.6]}{(547.8)}$$

$V_{m(std)}$ = 40.233 dscf

Total volume of water collected (mL) = V_{1c} = 146.5

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)(146.5) =$ 6.896

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(6.896)}{(40.233) + (6.896)}$$

B_{ws} = .1463

Percent moisture = $(100)(B_{ws})$ = 100 (.1463)

Percent moisture = 14.63 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (   )

MF = 0.8537

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 19 %
Percent CO by volume dry basis = CO = – %
Percent CO_2 by volume dry basis = CO_2 = 2 %

Percent N_2 by volume dry basis = 100 − (O_2 + CO + CO_2)

N_2 = 100 − [( )+( )+( )]

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

M_d = 0.44 (CO_2) + 0.32 (O_2) + 0.28 (N_2 + CO)

M_d = 0.44 (2) + 0.32 (19) + 0.28 (79 + 0)

M_d = 29.08 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

M_s = (M_d) (1 − B_{ws}) + 18 (B_{ws})

M_s = (29.08) [1 − (.1463)] + 18 (.1463)

M_s = 27.459 lb/lb-mole

Percent excess air (%) = % EA

$$\% \text{ EA} = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\% \text{ EA} = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (°F+460) 183.6 = T_s = 643.6

Avg of sq root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = 1.26

Absolute pressure of stack gas (in. Hg) = P_s = $30.13 + \left(\frac{-.75}{13.6}\right)$ = 30.075
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

DS1-R2

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(643.6)}{(30.075) \times (27.459)}} \times (1.26)$$

V_s = 79.878 ft/s

Area of stack (ft^2) $41.5''/12 \times 2$ = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1463) \times (79.878) \times (9.393) \times (\frac{528}{643.6}) \times (\frac{30.075}{29.92})$$

Q_{sd} = 31,692 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

$A_n = (0.005454)(.196)^2$ = ~~.196~~ .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (643.6)[0.00267(146.5)+((41.338)(.999)/(547.8))((30.13)+(1.69)/13.6)]}{60\ (79.878)(30.075)(.000210)(60)}$$

I = 94.68 %

A

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific – Silsbee, TX	3/3/92	Dryer Stack Run 3	Method 0011	Run 3 D.5.1

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JH / JMM	30.13	-0.75	81	N/A	41.5	0.84	6 ft Glass	H19	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999				N/A	12	0	5	Ø	1.08

EPA METHOD 3
Collection Method: Fyrite frob
Analysis Method

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	19				
%CO2	2				

PITOT SYSTEM LEAK CHECK INIT	PITOT SYSTEM LEAK CHECK FINAL
ok	ok

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	0	1728	622.405	1.4	1.5	179	248	239	69	81		2
2	2.5		624.06	1.4	1.5	179	248	239	57	83		2
3	5.0		625.71	1.4	1.5	179	248	251	55	83		2
4	7.5		627.33	~~1.4~~ 1.5	~~1.5~~ 1.6	179	248	249	55	84		2
5	10		628.99	1.4	1.5	178	248	255	56	84		2
6	12.5		630.66	1.6	1.7	179	248	243	55	84		2
7	15		632.42	1.6	1.7	180	248	253	55	84		2
8	17.5		634.17	1.6	1.7	180	248	251	56	84		2
9	20		635.91	1.6	1.7	181	248	254	56	84		2
10	22.5		637.65	1.7	1.8	181	248	250	56	84		2
11	25.0		639.45	1.7	1.8	181	248	249	56	84		2
12	27.5		641.26	1.7	1.8	182	248	255	56	84		2
END	30		643.034									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JRS Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/3/92	Dryer Stack ~~$~~ Run 3	Method 0011	Run 3 DS ~~$~~ 1

(B)

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	1802	643.034	1.7	1.8	179	248	257	62	82		2
2	32.5		644.82	1.7	1.8	181	248	245	56	82		2
3	35		646.62	1.7 ~~646.~~	1.8	181	248	256	54	83		2
4	37.5		648.39	1.7	1.8	182	248	248	55	83		2
5	40		650.16	1.7	1.8	182	248	248	55	83		2
6	42.5		651.91	1.6	1.7	182	248	244	55	83		2
7	45		653.63	1.6	1.7	183	248	254	55	83		2
8	47.5		655.37	1.6	1.7	182	248	245	56	83		2
9	50		657.11	1.5	1.6	182	248	251	56	83		2
10	52.5		658.75	1.5	1.6	181	248	254	56	83		2
11	55		660.41	1.6	1.7	180	248	252	56	82		2
12	57.5		662.14	1.5	1.6	180	248	244	56	82		2
END	60	1832	663.789									
				1.2576	1.7							

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	41.384	1.2576	1.683	180.5	83.1

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP - EMI - Silsbee DP

Sample Date: 3/3/92

Sample Location: Dryer Stack ~~#~~ 1 R-3

Recovery Date: 3/3/92

Recovered By: V A Schaal

Run No.: Run 3 Dryer Stack ~~#~~ 1

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	695.2	575.2	483.5	751.4	grams
Initial Weight	568.5	559.7	483.5	746.0	grams
Net Weight	126.7	15.5	0	5.4	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture 147.6 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant IP - GMC - Silsbee TX Location Sampled Dryer Stack #1 R3

Date 3/3/92 Run No. Run 3 DS1 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ .999

Volume of gas at meter conditions (ft^3) $= V_m =$ 41.384

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 83.1 + 460 = 543.125

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.13

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 1.683

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(41.384)[(30.13)+(1.683)/13.6]}{(543.125)}$$

$V_{m(std)} =$ 40.6234 dscf

Total volume of water collected (mL) $= V_{lc} =$ 147.6

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)($ 147.6 $) =$ 6.9475

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(6.9475)}{(40.6234) + (6.9475)}$$

$B_{ws} =$ .14605

Percent moisture = $(100)(B_{ws})$ = 100 (.14605)

Percent moisture = 14.605 %

Mole fraction of dry gas = MF = 1 − (B_{ws}) = 1 − (   )

MF = 0.85396

EPA5CALC.SHT

OS1R3

Percent O_2 by volume dry basis = O_2 = 19 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 2 %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (2) + 0.32\ (19) + 0.28\ (79 + —)$

M_d = 29.08 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (29.08)\ [1 - (.14605)] + 18\ (.14605)$

M_s = 27.462 lb/lb-mole

Percent excess air (%) = % EA

$$\% \ EA = \frac{(\% \ O_2) - [0.5\ (\% \ CO)]}{[0.264\ (\% \ N_2)] - (\% \ O_2) - [0.5\ (\% \ CO)]} \times 100$$

$$\% \ EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) = T_s = 640.5

Avg of sq root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = 1.2576

Absolute pressure of stack gas (in. Hg) = P_s = $30.13 + \left(\frac{-0.75}{13.6}\right) = 30.075$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

Run No. DS1-R3

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(640.5)}{(30.075) \times (27.462)}} \times (1.2576)$$

V_s = 79.529 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .14605) \times (79.529) \times (9.393) \times \left(\frac{528}{640.5}\right) \times \left(\frac{30.075}{29.92}\right)$$

Q_{sd} = 31,716 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{1c} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (640.5)[0.00267(147.6)+((41.389)(.999)/(543.1))((30.13)+(1.683)/13.6)]}{60\ (79.529)(30.075)(.000210)(60)}$$

I = 95.54 %

EPA5CALC.SHT 5/90

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	7/1/92	Dryer Stack 2 A1	Method 0011	Run 1 Dryer Stack 2

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS / DM	30.19	-0.75	81	N/A	41.5	0.84	6 ft Glass	419	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16.3	M4	1.927	0.999	6C	P-12	G-12	N/A	15	0.002	8	Ø	1.06

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	PITOT SYSTEM LEAK CHECK FINAL
Collection Method	Fyrite 18%	%O2						✓	
Analysis Method	Grab 3%	%CO2							

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A1	0	1621	402.686	1.4	1.5	184	245	250	69	81		9
2	2.5		404.33	1.4	1.5	183	245	250	61	81		9
3	5		405.87	1.4	1.5	184	245	249	59	82		9
4	7.5		407.46	1.4	1.5	183	243	250	57	83		9
5	10		408.92	1.5	1.6	184	240	248	58	83		13
6	12.5		410.71	1.5	1.6	184	237	259	58	83		13
7	15		412.38	1.6	1.7	185	238	252	55	84		16
8	17.5		414.13	1.6	1.7	184	238	253	57	83		16
9	20		415.88	1.6	1.7	184	234	253	57	84		16
10	22.5		417.57	1.6	1.7	184	235	245	58	84		16
11	25		419.27	1.5	1.6	184	238	250	57	83		15
12	27.5		420.93	1.5	1.6	184	230	255	58	83		17
End	30		422.547									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sil gel plug unlossed w/ tube leak & kept going

Sheet Checked By: [signature] Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/2/92	Dryer Stack 2 R1	Method 0011	Run 1 Dryer Stack 2

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP (F)	SAMPLE TRAIN VAC (in. Hg)
B 1	30	1710*	~~422.547~~ 422.85 423.083	1.4	1.5	182	236	253	64	81		2
2	32.5		424.70	1.4	1.5	182	262	256	60	82		2
3	35		426.55	1.4	1.5	182	255	252	58	83		2
4	37.5		428.02	1.6	1.7	183	248	249	57	84		2
5	40		429.65	1.7	1.8	183	239	258	56	84		2
6	42.5		431.49	1.7	1.8	184	227	254	57	84		2
7	45		433.22	1.6	1.7	184	227	252	57	85		2
8	47.5		434.91	1.7	1.8	184	229	257	58	85		2
9	50		436.74	1.5	1.6	183	231	250	59	85		2
10	52.5		438.42	1.5	1.6	183	222	252	59	85		2
11	55		440.13	1.5	1.6	183	221	258	58	85		2
12	57.5		441.80	1.5	1.6	183	224	255	58	85		2
6	60	1740	443.495									
				1.2326	1.6	183				83		
					~~26.55000~~ 31.2546							

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		40.273	1.2326	1.6	183	83

* ReLeak-checked between ports (ok)
Bad sample head

Sheet Checked By: [signature] Date 3/9/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsby, TX
Sample Date: 3/2/92
Sample Location: Dryer Stack 2 Run 1
Recovery Date: 3/2/92
Recovered By: [illegible]

Run No.: Run 1 DS 2

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	703.3	569.2	483.5	735.5	grams
Initial Weight	571.0	555.0	481.8	722.0	grams
Net Weight	132.3	12.2	1.7	13.5	grams

Description of impinger water ______________ ______________ % spent

______________ ______________ Sil Gel Color

Total Moisture 159.7 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________ Liquid level

______ blank Marked/Sealed ______

Container No: ______________ Liquid level

______ blank Marked/Sealed ______

Container No: ______________ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______________

Remarks: ______________

Relinquished by: ______________ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP-EML-Silsbee TX Location Sampled Dryer Stack 2 R1

Date 3/2/92 Run No. R1-DS2 Calc By [illegible]

Dry gas meter calibration factor = Y = .999

Volume of gas at meter conditions (ft^3) = V_m = 40.273

Average meter temperature (^oF + 460)^oR 83 = T_m = 543

Barometric pressure absolute (in. Hg) = P_{bar} = 30.19

Average orifice pressure drop (in. H_2O) = ΔH = 1.6

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\ (17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(40.273)[(30.19)+(1.6)/13.6]}{(543)}$$

$V_{m(std)}$ = 39.612 dscf

Total volume of water collected (mL) = V_{lc} = 159.7

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(159.7) =$ 7.517

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(7.517)}{(39.612) + (7.517)}$$

B_{ws} = .1595

Percent moisture = $(100)(B_{ws})$ = 100 (.1595)

Percent moisture = 15.95 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (.1595)

MF = .8405

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 18 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 3 %

Percent N_2 by volume dry basis = 100 - (O_2 + CO + CO_2)

N_2 = 100 - [(18)+(–)+(3)]

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

M_d = 0.44 (3) + 0.32 (18) + 0.28 (79 + 0)

M_d = 29.20 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

M_s = (29.20) [1 - (.1595)] + 18 (.1595)

M_s = 27.414 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) 183 = T_s = 643

Avg of sq root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = 1.2326

Absolute pressure of stack gas (in. Hg) = P_s = $30.19 + \left(\frac{-0.75}{13.6}\right) = 30.13$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

0512R1

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.84) \times \sqrt{\frac{(643)}{(30.13) \times (27.414)}} \times (1.2326)$$

V_s = 78.097 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1595) \times (78.097) \times (9.393) \times (\frac{528}{643}) \times (\frac{30.13}{29.92})$$

Q_{sd} = 30,541 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (643)[0.00267(159.7)+((40.273)(.999)/(543))((30.19)+(1.6)/13.6)]}{60\ (78.097)(30.13)(.000210)(60)}$$

I = 96.58 %

ea

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	3/2/92	Dryer Stack 2 R2	Method 0011	Run 2 OS 2

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
SB/VM	30.19	-0.75	80	N/A	41.5	0.84	6ft Glass	H19	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999	6e	P-12	G-2	N/A	17	Ø	6	Ø	1.06

EPA METHOD 3
Collection Method: Grab
Analysis Method: Fyrite

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	18				
%CO2	3				

PITOT SYSTEM LEAK CHECK INIT	FINAL
ok	ok

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX TEMP (F)	SAMPLE TRAIN VAC (In. Hg)
A1	0	1829	443.737	1.4	1.5	180	236	246	68	80		3
2	2.5		445.35	1.4	1.5	180	227	254	62	81		3
3	5		447.00	1.4	1.5	180	234	255	60	81		3
4	7.5		448.57	1.4	1.5	180	238	259	58	82		3
5	10		450.22	1.4	1.5	181	229	248	57	82		3
6	12.5		451.96	1.6	1.7	182	231	257	56	83		3
7	15		453.54	1.6	1.7	183	232	248	56	83		3
8	17.5		455.28	1.6	1.7	183	234	257	58	84		3
9	20		457.00	1.5	1.6	183	231	252	57	84		3
10	22.5		458.68	1.5	1.6	183	233	245	58	84		3
11	25		459.99	1.4	1.5	181	228	237	57	84		3
12	27.5		461.03	1.4	1.5	181	227	250	57	84		3
			463.632									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JAS Date 3/92

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EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific --Silsbee, TX	/ /92	Dryer Stack 2 B2	Method 0011	Run 2 PS 2

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	1810	463.632	1.7	1.8	181	230	252	60	81		3
2	32.5		465.55	1.7	1.8	181	233	252	58	81		3
3	35		467.23	1.7	1.8	181	230	256	56	81		3
4	37.5		66	1.7	1.8	181	235	250	56	82		3
5	40		470.87	1.7	1.8	181	237	245	56	82		3
6	42.5		472.53	1.6	1.7	182	235	255	56	82		3
7	45		474.21	1.6	1.7	182	230	255	57	82		3
8	47.5		475.97	1.5	1.6	182	233	249	58	83		3
9	50		477.60	1.5	1.6	182	230	250	57	83		3
10	52.5		479.48	1.5	1.6	182	230	252	56	83		3
11	55		481.00	1.6	1.7	182	233	248	57	84		3
12	57.5		482.66	1.6	1.7	182	230	257	58	84		3
	60		484.397									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	40.660	1.2408	1.642	181.5	83.5

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsby, TX

Sample Date: 3/2/92

Sample Location: Dryer Stack #2 R2

Recovery Date: 3/2/92

Recovered By: OA Soloak

Run No.: Run 2 DS2

B Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	681.9	567.3	463.0	762.0	grams
Initial Weight	564.7	554.8	461.9	749.3	grams
Net Weight	117.2	12.5	1.1	12.7	grams

Description of impinger water ______________ ______________ % spent

______________ ______________ Sil Gel Color

Total Moisture 143.5 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Samples stored and locked ______________

Remarks: ______________

Relinquished by: ______________ Date ______________

EPA METHOD 5 CALCULATIONS

Plant LP-EMI-Silsbee TX Location Sampled Dry Stak 2 R2

Date 3/2/92 Run No. 2-DS2 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ .999

Volume of gas at meter conditions (ft^3) $= V_m =$ 40.660

Average meter temperature (^oF + 460)^oR $= T_m =$ 82.5+460=

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.19

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 1.642

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\ (17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(\ .999\ )(17.64)(40.660)[(\ 30.19\ )+(1.642)/13.6]}{(\ 542.5\ )}$$

$V_{m(std)} =$ 46.034 dscf

Total volume of water collected (mL) $= V_{lc} =$ 143.5

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)($ 143.5 $) =$ 6.755

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(6.755)}{(\ 40.034\ ) + (\ 6.755\ )}$$

$B_{ws} =$ .1444

Percent moisture = $(100)(B_{ws})$ = 100 (.1444)

Percent moisture = 14.44 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (   )

MF = 0.8556

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 18 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 3 %

Percent N_2 by volume dry basis = 100 - (O_2 + CO + CO_2)

N_2 = 100 - [( )+( )+( )]

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (3) + 0.32\ (18) + 0.28\ (79 + —)$

M_d = 29.20 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (29.20)\ [1 - (.1444)] + 18\ (.1444)$

M_s = 27.583 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ________

Average stack temperature (°F+460) = T_s = 181.5+460

Avg of sq root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = 1.2404

Absolute pressure of stack gas (in. Hg) = P_s = 30.19 + (-.75/13.6) = 30.135
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

EPA5CALC.SHT 5/90

D512 R2

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.84) \times \sqrt{\frac{(641.5)}{(30.135) \times (27.583)}} \times (1.2408)$$

V_s = 78.278 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1444) \times (78.278) \times (9.393) \times \left(\frac{528}{641.5}\right) \times \left(\frac{30.135}{29.92}\right)$$

Q_{sd} = 31,291 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \Theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (641.5)[0.00267(143.5)+((40.660)(.999)/(542.5))((30.19)+(1.642)/13.6)]}{60\ (78.278)(30.135)(.000210)(60)}$$

I = 95.42 %

EPA5CALC.SHT 5/90

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	3/3/92	Dryer Stack 2 R3	Method 0011	Run 3 Dryer Vent 2

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
DS / VM	30.13	-0.75	75	N/A	41.5	0.84	6ft Glass	H19	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999	6C	P-12	G-12	N/A	16	0.010	10	0.004	1.06

EPA METHOD 3
Collection Method: Grab
Analysis Method: Fyrite

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	18%				
%CO2	3%				

PITOT SYSTEM LEAK CHECK: INIT ✓ FINAL ✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
A 1	0	0916	501.150	1.4	1.5	180	240	253	60	75		2
2	2.5		503.52	1.4	1.5	180	245	250	58	77		2
3	5		505.17	1.4	1.5	181	250	255	57	78		2
4	7.5		506.84	1.4	1.5	181	245	253	56	~~78~~ 79		2
5	10		508.29	1.4	1.5	182	248	248	56	80		2
6	12.5		509.87	1.6	1.7	183	250	252	55	81		2
7	15		511.55	1.6	1.7	184	251	258	56	81		2
8	17.5		513.21	1.7	1.8	184	249	250	57	82		3
9	20		514.98	1.6	1.7	184	245	249	58	82		3
10	22.5		516.63	1.6	1.7	184	240	259	59	83		3
11	25		518.17	1.6	1.7	184	250	253	60	83		4
12	27.3		519.99	1.7	1.8	184	248	261	60	84		4
End	30	0946	521.689									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: [signature] Date 3/4/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/3/92	Dryer Stack 2 Run 3	Method 0011	Run 3 DS 2

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B 1	30	0952	521.689	1.6	1.7	183	254	260	60	82		8
2	32.5		523.10	1.6	1.7	184	255	253	60	84		2
3	35		525.11	1.5	1.6	184	245	254	58	84		2
4	37.5		526.71	1.6	1.7	184	240	259	60	85		2
5	40		528.51	1.7	1.8	185	245	254	59	85		2
6	42.5		529.99	1.7	1.8	185	249	253	58	86		3
7	45		532.12	1.6	1.7	185	253	256	58	86		3
8	47.5		533.76	1.6	1.7	185	250	255	58	87		3
9	50		535.49	1.6	1.7	185	245	251	58	87		3
10	52.5		537.22	1.5	1.6	184	245	249	58	87		3
11	55		538.89	1.5	1.6	183	248	258	59	87		3
12	57.5		540.60	1.5	1.6	183	250	256	58	87		3
END	60		542.238									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	41.066	1.2477	1.658	183.4	83

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX **Sample Date:** 3/3/92

Sample Location: Dryer Stack #2 13R **Recovery Date:** 3/3/92

Recovered By: [illegible]

Run No.: ~~Run~~ Dryer Stack Restart of Run 3 DS2

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	704.4	580.4	485.9	746.0	grams
Initial Weight	576.0	559.7	483.5	735.5	grams
Net Weight	128.4	20.7	2.4	10.5	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture 162 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP- EMC -Silsbee TX Location Sampled Dryer Stack 2 R3

Date 3/3/92 Run No. Run 3 DS2 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ .999

Volume of gas at meter conditions (ft^3) $= V_m =$ 41.088

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 83 +460

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.13

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 1.658

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(41.088)[(30.13)+(1.658)/13.6]}{(543)}$$

$V_{m(std)} =$ 40.340 dscf

Total volume of water collected (mL) $= V_{lc} =$ 162

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(162) =$ 7.625

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(7.625)}{(40.340) + (7.625)}$$

$B_{ws} =$ .1590

Percent moisture $= (100)(B_{ws}) = 100\ (.1590)$

Percent moisture = 15.90 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 - (\quad)$

MF = .8410

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 18 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 3 %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (3) + 0.32\ (18) + 0.28\ (79 + \quad)$

M_d = 29.20 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (29.20)\ [1 - (.1590)] + 18\ (.1590)$

M_s = 27.419 lb/lb-mole

Percent excess air (%) = % EA

$$\%\ EA = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\%\ EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ________

Average stack temperature (^oF+460) = T_s = 183.4 + 460 = 643.4

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = 1.2477

Absolute pressure of stack gas (in. Hg) = P_s = $30.13\left(\frac{-.75}{13.6}\right)$ = 30.075

note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = .84

D82B3

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.84) \times \sqrt{\frac{(643.4)}{(30.075) \times (27.419)}} \times (1.2477)$$

V_s = 79.144 ft/s

Area of stack (ft^2) = A = ~~60~~ 9.393

Testing time (min) = Θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1590) \times (79.144) \times (9.393) \times \left(\frac{528}{643.4}\right) \times \left(\frac{30.075}{29.92}\right)$$

Q_{sd} = 30,943 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \Theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (643.4)[0.00267(162) + ((41.086)(.994)/(543))((30.13) + (1.658)/13.6)]}{60\ (79.144)(30.075)(.000210)(60)}$$

I = 97.23 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	3/12/92	Dryer Stack 3 Run 1	Method 0011	Run 1 Dryer Stack 3

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
AB / DM	30.19	-0.75	70	N/A	41.5	0.84	Glass	H19	0.196

ASSUMED MOIST (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16.5	M4	1.927	0.999	6C	P-12	G-2	N/A	15	0.002	12	0.	1.05

EPA METHOD 3			RUN 1	RUN 2	RUN 3	AVG	AMBIENT
Collection Method	Grab	%O2	19				21
Analysis Method	Fyrite	%CO2	2				0

PITOT SYSTEM LEAK CHECK INIT	FINAL
✓	

A

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	0	0909	278.097	1.35	1.46	176	244	251	61	68		2
2	2.5		279.72	1.5	1.6	176	248	256	59	68		2
3	5.0		281.38	1.5	1.6	176	257	256	58	70		3
4	7.5		283.07	1.5	1.6	177	251	256	57	71		5
5	10.0		284.61	1.6	1.7	177	249	252	58	72		5
6	12.5		286.01	1.6	1.7	178	250	253	58	73		7
7	15.0		287.89	1.6	1.7	178	241	252	58	73		9
8	17.5		289.82	1.5	1.6	177	241	250	58	73		
9	20.0	929	292.112	1.4	1.5	177	246	247	59	73		2
10	22.5		293.68	1.4	1.5	176	248	255	58	75		2
11	25.0		295.32	1.4	1.5	176	248	255	59	76		2
12	27.5		296.91	1.5	1.6	176	249	249	60	77		2
End	30		298.592									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

14.69285

Sheet Checked By: [signature] Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/2/92	Dryer Stack 3 Run 1	Method 0011	Run 1 05 3

B

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	0955	298.592	1.4	1.5	175	243	251	59	77		2
2	32.5		300.17	1.4	1.5	176	239	258	58	79		2
3	35		301.77	1.4	1.5	177	240	250	58	79		2
4	37.5		303.38	1.5	1.6	178	248	240	57	80		3
5	40		305.04	1.4	1.5	178	242	261	58	81		2
6	42.5		306.67	1.6	1.7	179	246	255	59	82		3
7	45		308.40	1.6	1.7	179	246	247	58	82		3
8	47.5		310.11	1.5	1.6	178	245	256	60	83		2
9	50		311.80	1.4	1.5	178	234	248	*66	84		2
10	52.5		313.42	1.5	1.6	178	236	249	67	84		2
11	55.0		315.08	1.4	1.5	177	235	256	67	84		2
12	57.5		316.72	1.5	1.6	178	233	259	68	85		2
END	60		318.314									
				1.2175 ✓	1.6 ✓	177				77		

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		40.217	1.2175			

$\sqrt{\Delta P_s}$ = 30.7283

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP-EMC- Silsbee TX

Sample Date: 3/2/92

Sample Location: Dryer Stack 3 Run 1

Recovery Date: 3/2/92

Recovered By: [signature]

Run No.: Run 1 Dryer Stack 3

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	724.3	601.0	484.3	713.9	grams
Initial Weight	584.6	578.7	480.5	714.3	grams
Net Weight	139.7	22.3	3.8	-0.4	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture 165.4 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP-EMI-Silsbee TX Location Sampled Dryer Stack 3 R 1

Date 3/2/92 Run No. Run 1 DS3 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ .999

Volume of gas at meter conditions (ft^3) $= V_m =$ 40.217

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 77+460 = 537

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 30.19

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 1.6

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(40.217)[(30.19)+(1.6)/13.6]}{(537)}$$

$V_{m(std)} =$ 39.999 dscf

Total volume of water collected (mL) $= V_{lc} =$ 165.4

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)($ 165.4 $) =$ 7.785

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(7.785)}{(39.999) + (7.785)}$$

$B_{ws} =$ .1629

Percent moisture $= (100)(B_{ws}) = 100\,($ .1629 $)$

Percent moisture = 16.29 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 - (\quad)$

MF = .8371

EPA5CALC.SHT

DS3RM

Percent O_2 by volume dry basis = O_2 = 19 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 2 %

Percent N_2 by volume dry basis = 100 − (O_2 + CO + CO_2)

N_2 = 100 − [( )+~~( )~~+( )]

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (2) + 0.32\ (19) + 0.28\ (79 + \quad)$

M_d = 29.08 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (29.08)\ [1 - (.1629)] + 18\ (.1629)$

M_s = 27.275 lb/lb-mole

Percent excess air (%) = % EA

$$\% \text{ EA} = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\% \text{ EA} = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (°F+460) = T_s = 177+460 = 637

Avg of sq root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = 1.2175

Absolute pressure of stack gas (in. Hg) = P_s = $30.19 + \left(-.75/13.6\right)$ = 30.135
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = .84

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (\ .84\ ) \times \sqrt{\frac{(\ 637\ )}{(30.135) \times (27.275)}} \times (1.2175)$$

V_s = 76.969 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1629) \times (76.969) \times (9.393) \times \left(\frac{528}{637}\right) \times \left(\frac{30.135}{29.92}\right)$$

Q_{sd} = 30,315 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (637)[0.00267(165.4)+((40.217)(.999)/(537))((30.19)+(1.6)/13.6)]}{60\ (76.969)(30.135)(.000210)(60)}$$

I = 98.42 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	3/2/92	Dryer Stack 3 Run 2	Method 0011	Run 2 DS 3

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JPS / JM	30.19	-0.75	84	N/A	41.5	0.84	Glass	1419	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16.3	M4	1.927	0.999	6C	P-12	G-12	N/A	17	0.003	16	0.0	1.05

EPA METHOD 3
Collection Method: Grab
Analysis Method: Fyrite

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	19				
%CO2	2				

PITOT SYSTEM LEAK CHECK INIT	FINAL
ok	ok

A

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
1	0	1118	318.768	1.5	1.6	178	232	250	72	82		3
2	2.5		320.62	1.5	1.6	178	235	250	62	83		3
3	5.0		322.06	1.6	1.7	178	240	248	58	84		3
4	7.5		323.56	1.7	1.8	179	237	258	56	85		4
5	10		325.28	1.7	1.8	179	241	250	56	86		4
6	12.5		327.23	1.7	1.8	179	239	255	56	86		4
7	15		329.00	1.7	1.8	180	238	248	56	87		4
8	17.5		330.73	1.5	1.6	179	234	253	56	87		4
9	20		332.40	1.5	1.6	179	236	252	56	88		4
10	22.5		334.10	1.4	1.5	179	242	250	56	88		4
11	25		335.64	1.4	1.5	180	240	257	55	88		4
12	27.5		337.21	1.4	1.5	180	238	253	56	88		
END	30	1148	338.768									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: ____________ Date ______

iea

EMISSION TESTING FIELD DATA

(B)

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific – Silsbee, TX	1 /92	Dryer Stack 3 Run 2	Method 0011	Run 2 DS 3

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	1154	338.768	1.4	1.5	179	245	246	59	89		5
2	32.5		340.29	1.4	1.5	179	241	248	57	89		6
3	35		341.91	1.4	1.5	179	242	263	57	89		8
4	37.5		343.56	1.5	1.6	179	241	258	56	89		10
5	40		3455.01	1.5	1.6	179	240	254	56	90		10
6	42.5		346.97	1.5	1.6	179	237	258	56	90		10
7	45		348.40	1.5	1.6	178	236	248	57	90		12
8	47.5		349.98	1.5	1.6	178	240	248	58	90		14
9	50		351.64	1.5	1.6	178	232	247	57	90		15
10	52.5		* 353.160/353.~~96~~	1.6	1.7	180	234	250	58	88		8
11	55.0		355.19	1.6	1.7	181	235	256	58	89		10
12	57.5		356.91	1.5	1.6	181	235	257	58	89		10
END	60	1235	358.546									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	39.442	1.2326	1.68	179.	89.7

* fixed monorail and leak checked

Sheet Checked By: ____________ Date ______

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP- EML- Silsbee TX **Sample Date:** 3/2/92

Sample Location: Dryer Stack 3 R2 **Recovery Date:** 3/2/92

Recovered By: [illegible]

Run No.: Run 2 DS 3

BTran

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	669.0	590.0	493.5 ~~486.2~~	749.4	grams
Initial Weight	570.0	569.7	461.3	745.8	grams
Net Weight	99	20.3	32.2	3.6	grams

Description of impinger water ______________ ______________ % spent

______________ ______________ Sil Gel Color

Total Moisture 155.1 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Container No: ______________ Liquid level

______________ blank Marked/Sealed ______________

Samples stored and locked ______________

Remarks: ______________

Relinquished by: ______________ Date ______________

EPA METHOD 5 CALCULATIONS

Plant LP-GMI-Silsbee TX Location Sampled Dryer Stack 3 Run 2

Date 5/2/92 Run No. Run 2 053 Calc By [signature]

Dry gas meter calibration factor = Y = .999

Volume of gas at meter conditions (ft^3) = V_m = 39.442

Average meter temperature ($^{O}F + 460$)^{O}R 87.7 = T_m = 547.7

Barometric pressure absolute (in. Hg) = P_{bar} = 30.19

Average orifice pressure drop (in. H_2O) = ΔH = 1.68

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(39.442)[(30.19) + (1.68)/13.6]}{(547.7)}$$

$V_{m(std)}$ = 38.47 dscf

Total volume of water collected (mL) = V_{1c} = 155.1

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)(155.1) =$ 7.30

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(7.30)}{(7.30) + (38.47)}$$

B_{ws} = .1595

Percent moisture = $(100)(B_{ws})$ = 100 (.1595)

Percent moisture = 15.95 %

Mole fraction of dry gas = MF = 1 − (B_{ws}) = 1 − (   )

MF = .8405

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 19 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 2 %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\ 19\ ) + (\ —\ ) + (\ 2\ )]$

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\ 2\ ) + 0.32\ (\ 19\ ) + 0.28\ (\ 79 + —\ )$

M_d = 29.08 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (\ 29.08\ )\ [1 - (\ .1595\ )] + 18\ (\ .1595\ )$

M_s = 27.313 lb/lb-mole

Percent excess air (%) = % EA

$$\%\ EA = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\%\ EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) 179 = T_s = ~~623~~ 639°R

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = 1.2326

Absolute pressure of stack gas (in. Hg) = P_s = $30.19 + \left(\frac{-.75}{13.6}\right) = 30.13$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

D8'3R2

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.81) \times \sqrt{\frac{(639)}{(30.13) \times (27.313)}} \times (1.2326)$$

V_s = 77.998 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1595) \times (77.998) \times (9.393) \times (\frac{528}{639}) \times (\frac{30.13}{29.92})$$

Q_{sd} = 30,743 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{1c} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (639)[0.00267(155.1)+((39.442)(.999)/(547.7))((30.19)+(1.68)/13.6)]}{60\ (77.998)(30.13)(.000210)(60)}$$

I = 93.33 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific - Silsbee, TX	3/2/92	Dryer Stack 3 Run 3	Method 0011	Run 3 DS 3

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS / TM	30.19	-0.75	86	N/A	41.5	0.84	Glass	H19	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16.3	M4	1.927	0.999	OC	P-12	G-2	N/A	17	0.011	5	0.008	1.06

EPA METHOD 3
Collection Method ______
Analysis Method ______

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	18	18		18	
%CO2	3	3		3	

PITOT SYSTEM LEAK CHECK INIT	FINAL

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
A 1	0	~~0930~~ 1330	359.054	1.6	1.7	180	238	250	67	87		2
2	2.5		360.78	1.6	1.7	178	228	257	67	87		2
3	5		362.51	1.5	1.6	178	239	246	60	88		2
4	7.5		364.28	1.5	1.6	177	232	253	58	88		2
5	10		365.87	1.7	1.8	177	230	255	56	89		2
6	12.5		367.65	1.7	1.8	178	230	245	56	89		2
7	15		369.48	1.6	1.7	179	232	258	56	89		2
8	17.5		371.16	1.5	1.6	179	228	250	57	90		2
9	20		372.87	1.5	1.6	179	234	251	58	90		2
10	22.5		374.51	1.5	1.6	178	232	255	57	90		2
11	25.0		376.18	1.5	1.6	179	230	248	57	90		2
12	27.5		377.86	1.5	1.6	180	230	255	57	90		2
END	30	~~0200~~ 1400	379.531									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

See note next page!

Sheet Checked By: JAS Date ______

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EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/2/92	Dryer Stack 3 Run 3	Method 0011	Run 3 DS 3

B

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	1404	379.531	1.3	1.4	178	235	255	65	89		2
2	32.5		381.08	1.3	1.4	179	235	247	60	89		2
3	35		382.63	1.3	1.4	178	238	252	58	89		2
4	37.5		384.18	1.3	1.4	177	233	250	57	90		2
5	40		385.67	1.4	1.5	178	224	251	57	90		2
6	42.5		387.31	1.5	1.6	178	220	255	57	89		2
7	45		389.00	1.6	1.7	178	228	246	57	89		2
8	47.5		392.41	1.6	1.7	1.77	230	253	58	89		2
9	50		392.41	1.6	1.7	1.77	226	255	58	89		2
10	52.5		394.17	1.6	1.7	177	228	253	57	89		2
11	55		395.90	1.6	1.7	177	230	251	58	89		2
12	57.5		397.62	1.6	1.7	177	230	252	57	89		2
END	60	1434	399.336									

90% Sample lost when Tor Broke

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		40.282				

Sheet Checked By: [signature] Date

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP- EML- Silsbee TX

Sample Date: 3/2/92

Sample Location: Dryer Stack 3 Run 3

Recovery Date: 3/2/92

Recovered By: [illegible]

Run No.: Run 3 DS 3

C Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	717.5	607.2	485.3	672.1	grams
Initial Weight	578.9	593.0	484.1	660	grams
Net Weight	+138.6	+14.2	+1.2	+12.1	grams

Description of impinger water ______ ______ % spent

______ Sil Gel Color

90% Sample lost when Sample Bottle Broke

Total Moisture +166.1 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	3/6/92	Dryer Stack 3 Run 4	Method 0011	Run 4 053

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JHS/JM	29.92	-0.75	73	N/A	41.5	0.84	6 ft Glass	H19	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999					15	Ø	15	0.001	1.08

EPA METHOD 3		RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	PITOT SYSTEM LEAK CHECK FINAL
Collection Method	19 %O2						ok	ok
Analysis Method	2 Fyrite %CO2	Grab						

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
A 1	0	1011	914.495	1.6	1.7	174	248	242	61	83		4
2	2.5		916.20	1.6	1.7	177	248	247	52	84		4
3	5		918.10	1.6	1.7	177	248	258	52	85		6
4	7.5		919.62	1.6	1.7	177	248	250	53	85		10
5	10		921.37	1.6	1.7	176	248	256	56	85		2
6	12.5		923.08	1.6	1.7	176	248	250	56	86		2
7	15		924.81	1.4	1.5	176	248	258	55	86		2
8	17.5		926.45	1.4	1.5	176	248	247	55	87		2
9	20		928.07	1.2	1.3	174	248	255	54	87		2
10	22.5		929.57	1.2	1.3	173	248	249	55	87		3
11	25		931.15	1.2	1.3	173	248	248	55	87		3
12	27.5		932.71	1.3	1.4	173	248	251	55	88		4
	30		934.340									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JHS Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/6/92	Dryer Stack 3 Run 4	Method 0011	Run 4 Dryer Stack 3

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B 1	30	1047	934.340	~~1.4~~ 1.5	~~1.5~~ 1.6	171	248	257	59	86		4
2	32.5		936.04	1.7	1.8	175	248	248	55	87		5
3	35		937.85	1.5	1.6	175	248	250	54	88		5
4	37.5		939.58	1.5	1.6	175	248	247	55	88		5
5	40		941.30	1.7	1.8	175	248	248	55	88		6
6	42.5		943.21	1.8	1.9	175	248	256	55	89		7
7	45		944.99	1.9	2.0	176	248	251	55	89		8
8	47.5		946.87	1.9	2.0	176	248	248	56	89		8
9	50		948.75	1.5	1.6	176	248	256	56	89		8
10	52.5		950.55	1.8	1.9	175	248	258	56	89		8
11	55		952.27	1.7	1.8	175	248	246	56	89		8
12	57.5		954.10	1.5	1.6	175	248	256	56	89		8
	60		955.785									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	41.290	1.2441	1.65	175.	87.1

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: EMC - LP - Silsbee TX
Sample Date: 3/6/92
Sample Location: Dryer Stack 3 Run 4
Recovery Date: 3/6/92
Recovered By: [illegible]

Run No.: Run 4 DS 3

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	725.8	593.6	483.5	718.5	grams
Initial Weight	589.5	575.6	482.5	710.6	grams
Net Weight	+136.3	+18.0	+1.0	+7.9	grams

Description of impinger water ______

~~163.2~~ % spent

+163.2g. Sil Gel Color

Total Moisture ______ grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

iea

EPA METHOD 5 CALCULATIONS

Plant LP-EMI-Selsbee TP Location Sampled Dryer Stack 3 Run 4 (extra hydrolases DS3-R3)

Date 3/6/92 Run No. Run 4 DS 3 Calc By [signature]

Dry gas meter calibration factor $= Y =$ .999

Volume of gas at meter conditions (ft^3) $= V_m =$ 41.29

Average meter temperature ($^oF + 460$)^oR $= T_m =$ 547.1

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 29.92

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 1.65

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\ (17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(41.290)[(29.92)+(1.65)/13.6]}{(547.1)}$$

$V_{m(std)} =$ 39.954 dscf

Total volume of water collected (mL) $= V_{lc} =$ 163.2

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(163.2) =$ 7.682

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(7.682)}{(39.954) + (7.682)}$$

$B_{ws} =$ .1613

Percent moisture $= (100)(B_{ws}) = 100$ (.1613)

Percent moisture = 16.13 %

Mole fraction of dry gas = MF = 1 − (B_{ws}) = 1 − (   )

MF = .8387

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 19 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 2 %

Percent N_2 by volume dry basis = 100 − (O_2 + CO + CO_2)

N_2 = 100 − [( )+( )+( )]

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (2) + 0.32\ (19) + 0.28\ (79 + —)$

M_d = 29.08 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (29.08)\ [1 - (.1613)] + 18\ (.1613)$

M_s = 27.293 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - \cancel{[0.5\ (\% CO)]}}{[0.264\ (\% N_2)] - (\% O_2) - \cancel{[0.5\ (\% CO)]}} \times 100$$

$$\% EA = \frac{(\quad) - \cancel{[0.5\ (\quad)]}}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ____________

Average stack temperature (°F+460) = T_s = 175+460

Avg of sq root of velocity head (in H_2O)$^{1/2}$ = $\sqrt{\Delta p}$ = 1.2441

Absolute pressure of stack gas (in. Hg) = P_s = 29.92+(−.75/13.6) = 29.865
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = .84

DS 3B4

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.84) \times \sqrt{\frac{(635)}{(29.865) \times (27.293)}} \times (1.2441)$$

V_s = 78.855 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1613) \times (78.855) \times (9.393) \times \left(\frac{528}{635}\right) \times \left(\frac{29.865}{29.92}\right)$$

Q_{sd} = 30,935 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{1c} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (635)[0.00267(163.2)+((41.290)(.999)/(547.1))((29.92)+(1.65)/13.6)]}{60\ (78.855)(29.865)(.000210)(60)}$$

I = 96.32 %

iea

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific – Silsbee, TX	3/5/92	Dryer Stack 4 Run 1	Method 0011	Run 1 DS 4

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS / JTM	29.88	-0.75	75	N/A	41.5	0.84	6 ft Glass.	419	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999					15	0.005	15	0.002	1.1

EPA METHOD 3
Collection Method
Analysis Method

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	19.5			19.5	
%CO2	1			1	

PITOT SYSTEM LEAK CHECK INIT	FINAL
L	

A

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	0	1420	788.905	1.7	1.8	171	248	235	67	86		2
2	2.5		790.74	1.6	1.7	172	248	243	63	87		2
3	5.0		792.48	1.7	1.8	172	248	249	63	87		2
4	7.5		794.30	1.7	1.8	172	248	247	60	88		2
5	10		796.11	1.7	1.8	172	248	247	60	88		3
6	12.5		797.90	1.7	1.8	172	248	257	60	88		3
7	15		799.55	1.6	1.7	172	248	259	59	88		5
8	17.5		801.39	1.6	1.7	171	248	249	58	88		5
9	20		802.93	1.4	1.5	171	248	256	58	88		5
10	22.5	1444/1558*	804.58	1.4	1.5	171	248	257	58	88		7
11	25		806.31	1.5	1.6	170	248	256	58	82		5
12	27.5		807.90	1.5	1.6	170	248	248	55	83		8
END	30		809.650									

Temp stop T. Storm in area lighting overhead. →

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

* Lightening in area

Sheet Checked By: [signature] Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific - Silsbee, TX	3/5/92	Dryer Stack 4 Run 1	Method 0011	Run 1 DS 4

B

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	1552	809.650	1.3	1.4	169	248	257	63	82		8
2	32.5		811.21	1.3	1.4	168	248	256	59	83		13
3	35		812.80	1.3	1.4	169	248	249	59	83		13
4	37.5		814.42	1.3	1.4	168	248	259	59	84		13
5	40		815.08	1.7	1.8	168	248	252	57	83		2
6	42.5		817.56	1.7	1.8	170	248	251	58	83		2
7	45		819.65	1.7	1.8	170	248	255	59	84		2
8	47.5		821.45	1.7	1.8	170	248	247	59	84		2
9	50		823.25	1.7	1.8	169	248	250	60	85		2
10	52.5		825.12	1.7	1.8	169	248	249	60	85		2
11	55.0		826.80	1.6	1.7	168	248	250	60	86		2
12	57.5		828.61	1.7	1.8	169	248	252	60	86		2
End	60		830.432									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	41.527	1.253	1.675	170.1	85.4

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LD - EMI - Salabee TX Sample Date: 3/5/92

Sample Location: Dryer Stack 4 Run 1 Recovery Date: 3/5/92

Recovered By: [illegible]

Run No.: R-1 Dryer Stack 4

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	725.4	591.5	483.6	710.6	grams
Initial Weight	565.2	577.0	482.3	699.6	grams
Net Weight	+160.2	+14.5	+1.3	+11.0	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture +187.0 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant IP-EML Silsbee TX Location Sampled Dryer Stack 4

Date 3/5/92 Run No. Run 1 DS4 Calc By DAS

Dry gas meter calibration factor = Y = 0.999

Volume of gas at meter conditions (ft^3) = V_m = 41.527

Average meter temperature (^oF + 460)^oR = T_m = 85.4+460 → 545.4

Barometric pressure absolute (in. Hg) = P_{bar} = 29.88

Average orifice pressure drop (in. H_2O) = ΔH = +1.675

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\ (17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(0.999)(17.64)(41.527)[(29.88)+(1.675)/13.6]}{(545.4)}$$

$V_{m(std)}$ = 40.26 dscf

Total volume of water collected (mL) = V_{lc} = 187

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(187) = 8.802$

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(8.802)}{(41.527) + (8.802)}$$

B_{ws} = 0.174891

Percent moisture = $(100)(B_{ws})$ = 100 (17.4891)

Percent moisture = 17.49 %

Mole fraction of dry gas = MF = 1 − (B_{ws}) = 1 − (.1749)

MF = 0.8251

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 19.5 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 1 %

Percent N_2 by volume dry basis = 100 − (O_2 + CO + CO_2)

N_2 = 100 − [(19.5)+(—)+(1)]

N_2 = 79.5 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\,(CO_2) + 0.32\,(O_2) + 0.28\,(N_2 + CO)$

M_d = 0.44 (1) + 0.32 (19.5) + 0.28 (79.5 + —)

M_d = 28.94 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\,(1 - B_{ws}) + 18\,(B_{ws})$

M_s = (28.94) [1 − (.17489)] + 18 (.17489)

M_s = 27.03 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\,(\% CO)]}{[0.264\,(\% N_2)] - (\% O_2) + [0.5\,(\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\,(\quad)]}{[0.264\,(\quad)] - (\quad) - [0.5\,(\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) = T_s = 170.1 + 460 = 630.1

Avg of sq root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = 1.253

Absolute pressure of stack gas (in. Hg) = P_s = 29.84 + $\left(-.75/13.6\right)$ = 29.78
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

DS4-R1

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(630.1)}{(29.78) \times (27.03)}} \times (1.253)$$

V_s = 79.6095 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1749) \times (79.6095) \times (9.393) \times \left(\frac{528}{630.1}\right) \times \left(\frac{29.78}{29.92}\right)$$

Q_{sd} = 30,876 dscfm

Diameter of sampling nozzle (in.) = d_n = 0.196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (0.196 $)^2$ = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s\left[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)\right]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (630.1)[0.00267(187) + ((41.527)(0.999)/(545.4))((29.88) + (1.675)/13.6)]}{60\ (79.61)(29.78)(.000210)(60)}$$

I = 97.78 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/5/92	Dryer Stack 4 R 2	Method 0011	Run 2 OS 4

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS / JM	29.88	-0.75	82	N/A	41.5	0.84	Glass	#19	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999	5A	5A		NA	15	0.004	13	0.002	1.1

EPA METHOD 3
Collection Method: Fyrite
Analysis Method: Grab

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	19.5				
%CO2	1				

PITOT SYSTEM LEAK CHECK INIT	FINAL

A

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	0	1700	830.734	1.6	1.7	171	248	228	63	83		3
2	2.5		832.49	1.6	1.7	171	248	229	55	84		3
3	5		834.20	1.6	1.7	171	248	239	56	85		3
4	7.5		835.94	1.6	1.7	171	248	242	58	85		3
5	10		837.67	1.7	1.8	171	248	244	59	86		3
6	12.5		839.45	1.7	1.8	170	248	248	60	86		3
7	15		841.24	1.5	1.6	171	248	252	58	87		3
8	17.5		842.94	1.5	1.6	170	248	256	58	87		3
9	20		844.57	1.5	1.6	169	248	246	58	87		3
10	22.5		846.24	1.3	1.4	168	248	257	59	88		3
11	25		847.81	1.3	1.4	167	248	244	59	88		4
12	27.5		849.40	1.3	1.4	167	248	249	59	88		5
End	30		850.914									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JHS Date 3/92

(B)

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/5/92	Dryer Stack 4 R2	Method 0011	Run 2 DS 4

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	1733	850.914	1.4	1.5	167	248	248	63	85		2
2	32.5		852.71	1.4	1.5	167	248	252	60	87		3
3	35		854.40	1.4	1.5	167	248	252	58	86		3
4	37.5		855.82	1.4	1.5	167	248	252	57	86		3
5	40		857.49	1.5	1.6	170	248	247	57	86		4
6	42.5		859.21	1.5	1.6	168	248	250	57	86		4
7	45		860.86	1.5	1.6	169	248	257	58	86		4
8	47.5		862.52	1.7	1.8	170	248	256	58	86		5
9	50		864.31	1.7	1.8	170	248	252	58	86		5
10	52.5		866.05	1.6	1.7	170	248	256	58	86		5
11	55		867.79	1.6	1.7	168	248	249	58	86		7
12	57.5		869.60	1.6	1.7	167	248	253	58	86		7
END	60	1804	871.347									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	40.613	1.2322	1.62	169	86.1

Sheet Checked By: VHS Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP - OSB - EMC Silsbee TX **Sample Date:** 3/5/ 92

Sample Location: Dryer Stack #4 Run 2 **Recovery Date:** 3/5/ 92

Recovered By: [illegible]

Run No.: Run 2 DS 4

B Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	737.1	568.3	463.6	779.5	grams
Initial Weight	575.2	553.0	462.5	769.3	grams
Net Weight	+161.9	+15.3	+1.1	+10.2	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture +188.50 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP - EMC - Stokes TP Location Sampled Dryer Stack 4 Run 2

Date 3/5/92 Run No. R2 DS4 Calc By [signature]

Dry gas meter calibration factor = Y = .999

Volume of gas at meter conditions (ft^3) = V_m = 40.613

Average meter temperature (^oF + 460)^oR = T_m = 546.1

Barometric pressure absolute (in. Hg) = P_{bar} = 29.88

Average orifice pressure drop (in. H_2O) = ΔH = 1.62

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(40.613)[(29.88)+(1.62)/13.6]}{(546.1)}$$

$V_{m(std)}$ = 39.316 dscf

Total volume of water collected (mL) = V_{1c} = 188.50

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)(188.5) = 8.873$

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(8.873)}{(39.316) + (8.873)}$$

B_{ws} = .1841

Percent moisture = (100)(B_{ws}) = 100 (.1841)

Percent moisture = 18.41 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - ( )

MF = 0.8159

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 19.5 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 1 %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\quad)+(\quad)+(\quad)]$

N_2 = 79.5 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (1) + 0.32\ (19.5) + 0.28\ (79 + —)$

M_d = 28.94 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (28.94)\ [1 - (.1841)] + 18\ (.1841)$

M_s = 26.926 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) = T_s = 629

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = 1.2322

Absolute pressure of stack gas (in. Hg) = P_s = $29.88 + \left(\frac{-.75}{13.6}\right)$ = 29.825
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

D54-R2

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.84) \times \sqrt{\frac{(629)}{(29.825) \times (26.926)}} \times (1.2322)$$

V_s = 78.311 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1841) \times (78.311) \times (9.393) \times (\frac{528}{629}) \times (\frac{29.825}{29.92})$$

Q_{sd} = 30,131 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (629)[0.00267(188.5) + ((40.613)(.999)/(546.1))((29.88) + (1.62)/13.6)]}{60\ (78.311)(29.825)(.000210)(60)}$$

I = 97.32 %

EPA5CALC.SHT 5/90

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific -Silsbee, TX	3/6/92	Dryer stack 4 A 3	Method 0011	Run 3 Ds 4

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
[illegible] / [illegible]	29.92	-0.75	74	N/A	41.5	0.84	6 ft Glass	H19	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999					15	0.003	10	ø	1.08

EPA METHOD 3		RUN 1	RUN 2	RUN 3	AVG	AMBIENT	PITOT SYSTEM LEAK CHECK INIT	PITOT SYSTEM LEAK CHECK FINAL
Collection Method Fyrite Grab	19.5 O2 %O2						ok	ok
Analysis Method	1 CO2 %CO2							

A

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	0	0822	872.330	1.6	1.7	180	248	250	62	74		2
2	2.5		874.02	1.6	1.7	179	248	253	55	75		2
3	5		875.75	1.6	1.7	180	248	252	54	75		3
4	7.5		877.48	1.6	1.7	180	248	251	54	77		3
5	10		879.12	2.5 ~~1.9~~	2.4 ~~2.8~~	179	248	247	55	78		3
6	12.5		881.17	2.4	2.5	178	248	250	55	78		3
7	15		883.37	2.4	2.5	178	248	250	55	79		7
8	17.5		885.40	1.9	2.0	178	248	255	57	79		8
9	20		887.27	1.5	1.6	176	248	246	58	79		8
10	22.5		888.91	1.4	1.5	175	248	256	58	79		8
11	25.0		890.62	1.4	1.5	176	248	254	58	80		9
12	27.5		892.11	1.2	1.3	175	248	250	58	80		10
END	30.		893.565									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: [signature] Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/6/92	Drying Stack 4 Run 3	Method 0011	Run 3 DS 4

B

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
1	30	0857	893.565	1.4 ~~1.5~~	~~1.6~~ 1.5	163	248	256	61	80		2
2	32.5		895.14	1.4	1.5	173	248	254	60	81		2
3	35		896.80	1.5	1.6	173	248	252	59	82		2
4	37.5		898.45	1.5	1.6	173	248	249	58	82		3
5	40		900.12	1.5	1.6	172	248	250	58	83		3
6	42.5		901.78	1.5	1.6	173	248	255	59	83		3
7	45		903.45	1.5	1.6	173	248	253	60	84		3
8	47.5		905.15	1.8	1.9	173	248	253	59	84		4
9	50		906.99	1.8	1.9	173	248	249	58	85		5
10	52.5		908.81	1.8	1.9	173	248	248	58	86		5
11	55.0		910.76	1.6	1.7	172	248	250	59	86		4
12	57.5		912.51	1.6	1.7	171	248	255	59	86		4
E10	60	0927	914.176									
				30.85 = 1.29	1.8	175				81		
			41.846									
				= 32.91								

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F		AVG DGM F
		41.846	1.2854	1.8	175	150 ml	81

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP - EMI - Silsbee TX **Sample Date:** 3/6/92

Sample Location: Dryer Stack 4 Run 3 **Recovery Date:** 3/6/92

Recovered By: V A Gerhard

Run No.: Run 3 DS4

C Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	724.0	611.0	487.7	695.7	grams
Initial Weight	576.3	592.8	485.5	680.0	grams
Net Weight	+147.7	+18.2	+2.2	+15.7	grams

Description of impinger water ________ ________ % spent

________ ________ Sil Gel Color

Total Moisture +183.8 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ________ Liquid level

________ blank Marked/Sealed ________

Container No: ________ Liquid level

________ blank Marked/Sealed ________

Container No: ________ Liquid level

________ blank Marked/Sealed ________

Samples stored and locked ________

Remarks: ________

Relinquished by: ________ Date ________

EPA METHOD 5 CALCULATIONS

Plant LP-GML- Silsbee TX Location Sampled Dryer Stack 4 Run 3

Date 3/6/92 Run No. 3 DS #4 Calc By [illegible]

Dry gas meter calibration factor = Y = .999

Volume of gas at meter conditions (ft^3) = V_m = 41.846

Average meter temperature (^oF + 460)^oR = T_m = 541

Barometric pressure absolute (in. Hg) = P_{bar} = 29.92

Average orifice pressure drop (in. H_2O) = ΔH = 1.8

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(41.846)[(29.92)+(1.8)/13.6]}{(541)}$$

$V_{m(std)}$ = 40.964 dscf

Total volume of water collected (mL) = V_{1c} = 183.8

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)(183.8) =$ 8.651

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(8.651)}{(40.964) + (8.651)}$$

B_{ws} = .1744

Percent moisture = $(100)(B_{ws})$ = 100 (.1744)

Percent moisture = 17.436 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (.1744)

MF = .8256

EPA5CALC.SHT

Percent O_2 by volume dry basis = O_2 = 19.5 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 1 %

Percent N_2 by volume dry basis = 100 - (O_2 + CO + CO_2)

N_2 = 100 - [( )+( )+( )]

N_2 = 79.5 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

M_d = 0.44 (1) + 0.32 (19.5) + 0.28 (79.5 +)

M_d = 28.94 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

M_s = (28.94) [1 - (.1744)] + 18 (.1744)

M_s = 27.03 lb/lb-mole

Percent excess air (%) = % EA

$$\% \text{ EA} = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\% \text{ EA} = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (^oF+460) = T_s = 635

Avg of sq root of velocity head (in $H_2O)^{1/2}$ = $\sqrt{\Delta p}$ = 1.2854

Absolute pressure of stack gas (in. Hg) = P_s = $29.92 + \left(\frac{-.75}{13.6}\right) \Rightarrow 29.865$

note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

D54 R3

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (.84) \times \sqrt{\frac{(635)}{(29.865) \times (27.03)}} \times (1.2854)$$

V_s = 81.868 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1744) \times (81.868) \times (9.393) \times (\frac{528}{635}) \times (\frac{29.865}{29.92})$$

Q_{sd} = 31,616 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (635)[0.00267(183.8)+((41.846)(.994)/(541))((29.92)+(1.8)/13.6)]}{60\ (81.868)(29.865)(.000210)(60)}$$

I = 96.64 %

EPA5CALC.SHT 5/90

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific – Silsbee, TX	3/5/92	Dryer Stack 5 R1	Method 0011	Run 1 DSS

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
AS/PM	29.88	-0.75	81	N/A	41.5	0.84	6 ft Glass	HZH19	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999				N/A	15	Ø	12	Ø	1.09

EPA METHOD 3
Collection Method: Grab
Analysis Method: Fyrite

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2				20	
%CO2				1	

PITOT SYSTEM LEAK CHECK INIT	FINAL
ok	ok

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A 1	0	0917	663.821	1.4	1.5	167	248	250	63	80		2
2	2.5		665.42	1.4	1.5	167	248	250	61	80		2
3	5		667.02	1.4	1.5	168	248	245	59	81		2
4	7.5		668.62	1.4	1.5	168	248	247	60	81		2
5	10		670.23	1.4	1.5	168	248	256	58	82		2
6	12.5		671.98	1.6	1.7	169	248	259	57	84		2
7	15		673.55	1.6	1.7	168	248	248	57	83		2
8	17.5		675.30	1.6	1.7	168	248	256	57	84		2
9	20		677.03	1.6	1.7	169	248	260	57	84		2
10	22.5		678.78	1.5	1.6	168	248	252	57	85		2
11	25		680.47	1.4	1.5	167	248	252	57	85		2
12	27.5		682.06	1.4	1.5	166	248	260	57	85		2
	30		683.705									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: AS Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/5/92	Dryer Stack 5 R1	Method 0011	Run 1 0855

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B 1	30	0951	683.705	1.5	1.6	166	248	8251	65	82		3
2	32.5		685.33	1.5	1.6	167	248	250	63	83		3
3	35		687.03	1.5	1.6	166	248	255	60	83		3
4	37.5		688.72	1.5	1.6	166	~~250~~ 248	250	58	83		5
5	40		690.45	1.5	1.6	167	248	249	58	83		6
6	42.5		692.10	1.5	1.6	167	248	247	58	82		7
7	45		693.80	1.7	1.8	167	248	249	58	82		7
8	47.5		695.62	1.7	1.8	166	248	249	59	82		8
9	50		697.40	1.6	1.7	167	248	251	60	82		7
10	52.5		699.18	1.6	1.7	167	248	247	60	82		7
11	55		700.92	1.7	1.8	167	248	255	60	82		8
12	57.5		702.77	1.7	1.8	168	248	250	60	82		8
	60	1021	704.551									
				1.2359	1.6	168				83		

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
	60	40.730	1.236	1.6	168	83

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: LP-EMC- Silsbee TX
Sample Date: 3/5/92
Sample Location: Dryer Stack 5 Run 1
Recovery Date: 3/5/92
Recovered By: [illegible]

Run No.: Run 1 DS5

A Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	698.8	591.7	485.0	701.6	grams
Initial Weight	569.7	570.7	483.2	690.3	grams
Net Weight	129.1	21.0	+1.8	11.3	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture: 163.2 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP-EML Silsbee TX Location Sampled Run 1 Dryer Stack 5

Date 3/5/92 Run No. R1-DS5 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ 0.999

Volume of gas at meter conditions (ft^3) $= V_m =$ 40.73

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 83+460 = 543

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 29.88

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 1.6

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\ (17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(40.73)[(29.88)+(1.6)/13.6]}{(543)}$$

$V_{m(std)} =$ 39.652 dscf

Total volume of water collected (mL) $= V_{1c} =$ 163.2

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)($ 163.2 $) =$ 7.6818

Mole fraction of water vapor $= B_{ws}$

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(7.6818)}{(39.652) + (7.6818)}$$

$B_{ws} =$ .1623

Percent moisture $= (100)(B_{ws}) = 100$ (.1623)

Percent moisture = 16.23 %

Mole fraction of dry gas $= MF = 1 - (B_{ws}) = 1 -$ (.1623)

MF = 0.8377

EPA5CALC.SHT

D95R1

Percent O_2 by volume dry basis = O_2 = 20 %
Percent CO by volume dry basis = CO = — %
Percent CO_2 by volume dry basis = CO_2 = 1 %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\ 20\ )+(\ -\ )+(\ 1\ )]$

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\ 1\ ) + 0.32\ (\ 20\ ) + 0.28\ (\ 79\ +\ -\ )$

M_d = 28.96 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (\ 28.96\ )\ [1 - (\ .1623\ )] + 18\ (\ .1623\ )$

M_s = 27.181 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature ($^{o}F+460$) = T_s = 168+460 = 628

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = 1.236

Absolute pressure of stack gas (in. Hg) = P_s = $29.88 + \left(\frac{-0.75}{13.6}\right) = 29.82$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

D$5R1

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(628)}{(29.82) \times (27.181)}} \times (1.236)$$

V_s = 78.13 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1623) \times (78.13) \times (9.393) \times (\frac{528}{628}) \times (\frac{29.82}{29.92})$$

Q_{sd} = 30,909 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (628)[0.00267(163.2)+((40.73)(.999)/(543))((29.88)+(1.6)/13.6)]}{60\ (78.13)(29.82)(.000210)(60)}$$

I = 95.68 %

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific – Silsbee, TX	3/13/92	Dryer Stack 5 R2	Method 0011	Run 2 Dryer Stack 5

OPERATORS	BAROM PRESS (In. Hg)	STATIC PRESS (In. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (In.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS / JM	29.88	-0.075	81	N/A	41.5	0.84	6 ft Glass	1119	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) In. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) In. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999				NA	15	0.008	10	0.002	1.08

EPA METHOD 3
Collection Method: Fyrite Grab
Analysis Method:

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	20				
%CO2	1				

PITOT SYSTEM LEAK CHECK INIT	PITOT SYSTEM LEAK CHECK FINAL
✓	✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (In. H2O)	H ORIFICE (In. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (In. Hg)
A 1	0	1111	705.896	1.5	1.6	162	248	258	65	83		2
2	2.5		707.63	1.6	1.7	1.67	248	250	60	84		2
3	5		709.30	1.5	1.6	167	248	247	52	84		2
4	7.5		711.00	1.6	1.7	168	248	254	55	85		2
5	10		712.71	1.6	1.7	168	248	247	56	85		2
6	12.5		714.44	1.6	1.7	168	249	250	57	85		2
7	15		716.40	1.6	1.7	169	248	252	58	85		2
8	17.5		717.92	1.6	1.7	168	248	248	56	86		2
9	20		719.68	1.6	1.7	168	248	258	57	86		2
10	22.5		721.42	1.4	1.5	166	248	259	57	85		2
11	25		724.65	1.3	1.4	166	248	251	58	85		2
12	27.5		724.65	1.3	1.4	166	248	255	58	85		2
End	30		726.27									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JAG Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/5/92	Dryer Stack #5 R2	Method 0011	Run 2 Dryer Stack #5

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	1146	726.27	1.4	1.5	167	248	251	69	83		3
2	32.5		727.90	1.5	1.6	167	248	258	59	84		3
3	35		729.57	1.5	1.6	167	248	255	56	84		3
4	37.5		731.28	1.5	1.6	166	248	253	55	84		3
5	40		733.00	1.5	1.6	166	248	247	55	83		3
6	42.5		734.65	1.5	1.6	166	248	246	56	83		3
7	45		736.34	1.6	1.7	166	248	258	56	83		3
8	47.5		738.08	1.7	1.8	167	248	255	57	83		3
9	50		739.85	1.7	1.8	167	248	245	57	83		4
10	52.5		741.62	1.7	1.8	168	248	260	58	82		4
11	55		743.40	1.6	1.7	165	248	252	62	82		6
12	57.5		745.11	1.6	1.7	166	248	246	61	83		6
END	60	1216	746.898									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		41.[illegible]02	1.2409	1.59	166.6	83.96

Sheet Checked By: [signature] Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee, TX Sample Date: 3/5/92

Sample Location: Dryer Stack #5 Run 2 Recovery Date: 3/5/92

Recovered By: [signature]

Run No.: Run 2 D.S. #5

B Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	710.4	573.0	460.5	770.7	grams
Initial Weight	574.6	556.3	462.5	~~764.8~~ 759.6	grams
Net Weight	+135.8	+16.7	-2.0	+11.1	grams

Description of impinger water ______________ ______________ % spent

______________ ______________ Sil Gel Color

Total Moisture 161.6 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______________ Liquid level

______ blank Marked/Sealed ______

Container No: ______________ Liquid level

______ blank Marked/Sealed ______

Container No: ______________ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______________

Remarks: ______________

Relinquished by: ______________ Date ______

EPA METHOD 5 CALCULATIONS

Plant LP-EML Silsbee TX Location Sampled Dryer Stack 5 R2

Date 3/5/92 Run No. 2 PSS Calc By VAS

Dry gas meter calibration factor = Y = .999

Volume of gas at meter conditions (ft^3) = V_m = 41.002

Average meter temperature (^oF + 460)^oR = T_m = 544

Barometric pressure absolute (in. Hg) = P_{bar} = 29.88

Average orifice pressure drop (in. H_2O) = ΔH = 1.59

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(41.002)[(29.88)+(1.59)/13.6]}{(544)}$$

$V_{m(std)}$ = 39.84 dscf

Total volume of water collected (mL) = V_{1c} = 161.6

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{1c}) = (0.04707)(161.6) = 7.6065$

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(7.6065)}{(39.84) + (7.6065)}$$

B_{ws} = .16032

Percent moisture = $(100)(B_{ws})$ = 100 (.16032)

Percent moisture = 16.03 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - ( )

MF = .83968

EPA5CALC.SHT

DS5R2

Percent O_2 by volume dry basis $= O_2 =$ 20 %
Percent CO by volume dry basis $= CO =$ — %
Percent CO_2 by volume dry basis $= CO_2 =$ 1 %

Percent N_2 by volume dry basis $= 100 - (O_2 + CO + CO_2)$

$N_2 = 100 - [(\ 20\ )+(\ \cancel{\ }\ )+(\ 1\ )]$

$N_2 =$ 79 %

Molecular weight of dry gas (lb/lb-mole) $= M_d$

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

$M_d = 0.44\ (\ 1\ ) + 0.32\ (\ 20\ ) + 0.28\ (\ 79\ +\ —\ )$

$M_d =$ 28.96 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) $= M_s$

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

$M_s = (\ 28.96\ )\ [1 - (\ .16032\ )] + 18\ (\ .16032\ )$

$M_s =$ 27.203 lb/lb-mole

Percent excess air (%) = % EA

$$\% EA = \frac{(\% O_2) - [0.5\ (\% CO)]}{[0.264\ (\% N_2)] - (\% O_2) - [0.5\ (\% CO)]} \times 100$$

$$\% EA = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ________

Average stack temperature (^oF+460) $= T_s =$ 626.6

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p} =$ 1.2409

Absolute pressure of stack gas (in. Hg) $= P_s =$ 29.82
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S $= C_p =$ 0.84

DS5R8

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(626.6)}{(29.82) \times (27.203)}} \times (1.2409)$$

V_s = 78.319 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1603) \times (78.319) \times (9.393) \times (\frac{528}{626.6}) \times (\frac{29.82}{29.92})$$

Q_{sd} = 31,127 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196)^2 = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{1c} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (626.6)[0.00267(161.6)+((41.002)(.999)/(544))((29.88)+(1.59)/13.6)]}{60\ (78.319)(29.82)(.000210)(60)}$$

I = 95.47 %

EPA5CALC.SHT 5/90

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific - Silsbee, TX	3/5/92	Dryer Stack S Run 3	Method 0011	Run 3 Dryer Stack S

OPERATORS	BAROM PRESS (in. Hg)	STATIC PRESS (in. H2O)	AMBIENT TEMP (F)	FILTER TYPE & FILTER NUMBER(S)	STACK ID (in.)	PITOT TUBE Cp	PROBE LENGTH AND LINER TYPE	NOZZLE I.D.	NOZZLE Diameter
JAS / JM	29.88	-0.75	80	N/A	41.5	0.84	6 ft Glass	H19	0.196

ASSUMED MOIST. (%)	DGM BOX NO.	DGM H@	DGM CAL FACTOR (Y)	STACK THERM NO.	STACK PITOT NO.	IMPINGER THERM NO.	ORSAT NO.	TRAIN LEAK CHECK (INITIAL) in. Hg	TRAIN LEAK CHECK (INITIAL) CFM	TRAIN LEAK CHECK (FINAL) in. Hg	TRAIN LEAK CHECK (FINAL) CFM	K FACTOR
16	M4	1.927	0.999					17	0.001	12	0.001	1.1

EPA METHOD 3
Collection Method: Fyrite
Analysis Method: Graf

	RUN 1	RUN 2	RUN 3	AVG	AMBIENT
%O2	20				
%CO2	1				

PITOT SYSTEM LEAK CHECK — INIT: ✓ FINAL: ✓

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN VAC (in. Hg)
A1	0	1245	747.275	1.6	1.7	157	248	237	68	83		2
2	2.5		749.02	1.6	1.7	169	248	249	61	85		2
3	5		750.75	1.6	1.7	169	248	248	60	86		2
4	7.5		752.48	1.6	1.7	170	248	250	58	87		2
5	10		754.21	1.7	1.8	171	248	249	58	88		2
6	12.5		756.01	1.7	1.8	170	248	259	59	89		2
7	15		757.76	1.7	1.8	170	248	259	59	89		2
8	17.5		759.52	1.7	1.8	171	248	249	60	90		3
9	20		761.29	1.5	1.6	171	248	250	65	91		3
10	22.5		762.98	1.5	1.6	170	248	256	60	91		3
11	25		764.71	1.5	1.6	170	248	255	59	92		3
12	27.5		766.41	1.5	1.6	169	248	247	59	92		3
END	30		768.063									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F

Sheet Checked By: JAG Date 3/92

EMISSION TESTING FIELD DATA

PLANT AND CITY	DATE	SAMPLING LOCATION	SAMPLE TYPE	RUN NUMBER
Louisiana Pacific –Silsbee, TX	3/5/92	Dryer Stack 5 Run 3	Method 0011	Run 3 Dryer Stack #5

TRAV. POINT NO.	ELAPSED TEST TIME (min)	CLOCK TIME (24-hr)	GAS METER READING Vm (ft3)	P VELOCITY HEAD (in. H2O)	H ORIFICE (in. H2O)	STACK TEMP (F)	PROBE TEMP (F)	FILTER OVEN TEMP (F)	SIL GEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP (F)	SAMPLE TRAIN VAC (in. Hg)
B1	30	1320	768.063	1.4	1.5	164	248	247	68	90		3
2	32.5		769.70	1.4	1.5	169	248	259	62	91		5
3	35		771.36	1.4	1.5	169	248	247	59	91		5
4	37.5		773.00	1.4	1.5	169	248	247	59	91		5
5	40		774.65	1.5	1.6	169	248	259	59	91		7
6	42.5		776.38	1.5	1.6	169	248	254	59	91		7
7	45		778.06	1.7	1.8	169	248	246	60	91		8
8	47.5		779.92	1.7	1.8	169	248	257	60	91		8
9	50		781.77	1.5	1.6	166	248	257	60	90		8
10	52.5		783.49	1.5	1.6	165	248	248	60	90		8
11	55		785.20	1.5	1.6	165	248	259	60	90		8
12	57.5		786.80	1.5	1.6	166	248	255	60	90		8
END	60	1350	788.535									

Run Totals	TOTAL TIME	DGM VOLUME	AVG SQRT P	AVG H	AVG STK F	AVG DGM F
		41.260	1.2608	1.6	168.2	89.6

Sheet Checked By: JAS Date 3/92

FORMALDEHYDE 0011 SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant: Louisiana Pacific - Silsbee
Sample Date: 3/5/92
Sample Location: Dryer Stack # 5 Run 3
Recovery Date: 3/5/92
Recovered By: [illegible]

Run No.: R 3 Dryer Stack 5

C Train

MOISTURE

Impingers	1	2	3	Silica Gel	
Final	712.1	606.5	487.1	680.0	grams
Initial Weight	577.8	590.4	485.6	672.9	grams
Net Weight	+134.3	+16.1	+1.5	+7.1	grams

Description of impinger water ______ ______ % spent

______ ______ Sil Gel Color

Total Moisture +159.0 grams

RECOVERED SAMPLE

Probe Rinse & Impinger Contents

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Container No: ______ Liquid level

______ blank Marked/Sealed ______

Samples stored and locked ______

Remarks: ______

Relinquished by: ______ Date ______

EPA METHOD 5 CALCULATIONS

Plant CP-EML Silsbee TX Location Sampled Dryer Stack 5 R 3

Date 3/5/92 Run No. 3 055 Calc By [illegible]

Dry gas meter calibration factor $= Y =$ 0.999

Volume of gas at meter conditions (ft^3) $= V_m =$ 41.26

Average meter temperature ($^oF + 460)^oR$ $= T_m =$ 89.6 + 460 = 549.6

Barometric pressure absolute (in. Hg) $= P_{bar} =$ 29.88

Average orifice pressure drop (in. H_2O) $= \Delta H =$ 1.6

$V_{m(std)}$ = Volume of gas sampled at the dry gas meter corrected to standard conditions (dscf)

$$V_{m(std)} = \frac{Y\,(17.64)(V_m)(P_{bar} + (\Delta H/13.6))}{(T_m)}$$

$$V_{m(std)} = \frac{(.999)(17.64)(41.26)[(29.88)+(1.6)/13.6]}{(549.6)}$$

$V_{m(std)} =$ 39.686 dscf

Total volume of water collected (mL) $= V_{lc} =$ 159

$V_{wc(std)}$ = volume of water vapor at standard conditions (scf)

$V_{wc(std)} = (0.04707)(V_{lc}) = (0.04707)(159) =$ 7.48413

Mole fraction of water vapor = B_{ws}

$$B_{ws} = \frac{V_{wc(std)}}{V_{m(std)} + V_{wc(std)}} = \frac{(7.48413)}{(39.686) + (7.48413)}$$

$B_{ws} =$ .15866

Percent moisture = $(100)(B_{ws})$ = 100 (.15866)

Percent moisture = 15.866 %

Mole fraction of dry gas = MF = 1 - (B_{ws}) = 1 - (.15866)

MF = 0.8413

EPA5CALC.SHT

D95R3

Percent O_2 by volume dry basis = O_2 = 20 %
Percent CO by volume dry basis = CO = – %
Percent CO_2 by volume dry basis = CO_2 = 1 %

Percent N_2 by volume dry basis = $100 - (O_2 + CO + CO_2)$

N_2 = 100 − [(20)+(–)+(1)]

N_2 = 79 %

Molecular weight of dry gas (lb/lb-mole) = M_d

$M_d = 0.44\ (CO_2) + 0.32\ (O_2) + 0.28\ (N_2 + CO)$

M_d = 0.44 (1) + 0.32 (20) + 0.28 (79 + –)

M_d = 28.96 lb/lb-mole

Molecular weight of wet stack gas (lb/lb-mole) = M_s

$M_s = (M_d)\ (1 - B_{ws}) + 18\ (B_{ws})$

M_s = (28.96) [1 − (.15866)] + 18 (.15866)

M_s = 27.221 lb/lb-mole

Percent excess air (%) = % EA

$$\% \text{ EA} = \frac{(\%\ O_2) - [0.5\ (\%\ CO)]}{[0.264\ (\%\ N_2)] - (\%\ O_2) - [0.5\ (\%\ CO)]} \times 100$$

$$\% \text{ EA} = \frac{(\quad) - [0.5\ (\quad)]}{[0.264\ (\quad)] - (\quad) - [0.5\ (\quad)]} \times 100$$

% EA = ______

Average stack temperature (°F+460) = T_s = 628.2

Avg of sq root of velocity head (in $H_2O)^{1/2} = \sqrt{\Delta p}$ = 1.2608

Absolute pressure of stack gas (in. Hg) = P_s = $29.88 + \left(\frac{-0.75}{13.6}\right) = 29.82$
note P_s = barometric pressure (in. Hg) ± [gauge pressure (in. H_2O)/13.6]

Pitot tube coefficient, type S = C_p = 0.84

D,35R3

V_s = average stack gas velocity (ft/s)

$$V_s = 85.49 \times C_p \times \sqrt{\frac{T_s}{P_s \times M_s}} \times (\sqrt{\Delta p})avg$$

$$V_s = 85.49 \times (0.84) \times \sqrt{\frac{(628.2)}{(29.82) \times (27.221)}} \times (1.2608)$$

V_s = 79.65 ft/s

Area of stack (ft^2) = A = 9.393

Testing time (min) = θ = 60

Volumetric gas flow rate in stack (dscfm) = Q_{sd}

$$Q_{sd} = 60 \times (1 - B_{ws}) \times V_s \times A \times (528/T_s) \times (P_s/29.92)$$

$$Q_{sd} = 60 \times (1 - .1587) \times (79.65) \times (9.393) \times (\frac{528}{628.2}) \times (\frac{29.82}{29.92})$$

Q_{sd} = 31,635 dscfm

Diameter of sampling nozzle (in.) = d_n = .196

Area of nozzle (ft^2) = A_n = 54.54E-4 $(d_n)^2$

A_n = (0.005454) (.196 $)^2$ = .000210 ft^2

Isokinetic sampling rate (%) = I

$$I = \frac{100\ T_s[0.002669\ V_{lc} + (V_m\ Y/T_m)(P_{bar} + \Delta H/13.6)]}{60\ \theta\ V_s\ P_s\ A_n}$$

$$I = \frac{100\ (628.2)[0.00267(159) + ((41.26)(.999)/(549.6))((29.88) + (1.6)/13.6)]}{60\ (79.65)(29.82)(.000210)\ (60)}$$

I = 93.56 %

APPENDIX E

LABORATORY DATA

MERCURY RESEARCH
LABORATORY, INC.

March 16, 1992

Mr. Jeff Burdett
Industrial & Environmental Analysis
P. O. Box 12846
Research Triangle Park
North Carolina 27709

RE: LOUISIANA PACIFIC, SILSBEE, TX
Your PO # 0024FS
Our Project No. 92-03-14

Dear Mr. Burdett:

On March 9, 1992, we received from Mr. John Sokash of your company, thirty-seven samples, related to the reference project. You requested that we determine the total amount of formaldehyde in these samples using high performance liquid chromatography (HPLC), and report our results to you.

The sample solutions were extracted separately with methylene chloride three times using a separatory funnel. The extracts were combined and evaporated to dryness under a vacuum system. Solid residues in the samples were reconstituted into acetonitrile. The final volumes of the acetonitrile for each sample were adjusted, and are listed in the attached Tables

A HPLC equipped with a UV detector set at 360 nm wavelength was used for the sample analysis. The analytical results, and the calibration curves are summarized in the attached Table.

Should there be any questions concerning this report please do not hesitate to contact us at your convenience.

Respectfully submitted,

Jimmy C. Pau

Mercury Research Laboratory, Inc.

1150-1 EXECUTIVE CIRCLE
P. O. BOX 996 • CARY, NORTH CAROLINA 27511 • (919) 467-8812

MERCURY RESEARCH LABORATORY, INC.

March 18, 1992

LOUISIANA PACIFIC/EML
Your Project No. 1473-002
Our Porject No. 92-03-14

Table FORMALDEHYDE , TOTAL UG IN SAMPLE

Sample #	Counts	ppm as Hydrazone	Final Volumne	total ug Hydrazone	total ug Formaldehyde
#1 (PV1-RUN 1)	11,952 11,980	122	200 mL	24,400	3,489
#2 (PV1-RUN 2)	11,933 12,074	122	200 mL	24,400	3,489
#3 (PV1-RUN 3)	13,070 13,182	134	200 mL	26,800	3,832
#4 (PV2-RUN 1)	8,036 7,984	81.7	200 mL	16,340	2,337
#5 (PV2-RUN 2)	9,079 9,134	92.8	200 mL	18,560	2,654
#6 (PV2-RUN 3)	9,270 9,273	94.5	200 mL	18,900	2,703
#7 (PV3-RUN 1)	15,160 14,777	153	200 mL	30,600	4,376
#8 (PV3-RUN 2)	16,668 16,683	170	200 mL	34,000	4,862
#9. (PV3-RUN 3)	16,848 16,882	172	200 mL	34,400	4,919
#10 (PV4-RUN 1)	11,725 11,705	119	200 mL	23,800	3,403
#11 (PV4-RUN 2)	11,793 11,784	120	200 mL	24,000	3,432
#12 (PV4-RUN 3)	11,806 11,799	120	200 mL	24,000	3,432

1150-1 EXECUTIVE CIRCLE
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MERCURY RESEARCH LABORATORY, INC.

March 18, 1992

LOUISIANA PACIFIC/EML
Your Project No. 1473-002
Our Porject No. 92-03-14

Table FORMALDEHYDE , TOTAL UG IN SAMPLE

Sample #	Counts	ppm as Hydrazone	Final Volumne	total ug Hydrazone	total ug Formaldehyde
#13 (DNPH LOT1)	393 371	3.9	20 mL	78	11
#14 (DNPH LOT2)	287 288	2.9	20 mL	58	8
#15 (LOT2 SPIKE)	4,592 4,602	46.9	200 mL	9,380 Recovery =	1,341 84%
#16 (DS1-RUN 1)	8,821 8,960	90.6	200 mL	18,120	2,591
#17 (DS1-RUN 2)	4,617 4,615	47.1	200 mL	9,420	1,347
#18 (DS1-RUN 3)	3,188 3,149	32.3	200 mL	6,460	924
#19 (DS2-RUN 1)	5,822 5,850	59.5	200 mL	11,900	1,702
#20 (DS2-RUN 2)	3,171 3,139	32.2	200 mL	6,440	921
#21 (DS2-RUN 3)	13,491 13,558	138	200 mL	27,600	3,947
#22 (DS3-RUN 1)	18,106 18,144	185	200 mL	37,000	5,291
#23 (DS3-RUN 2)	13,051 13,038	133	200 mL	26,600	3,804
#24 (DS3-RUN 3)	HOLD				
#25 (DNPH LOT3)	1,442 1,251	13.8	20 mL	276	39
#26 (LOT 3 SPIKE)	4,829 4,825	49.2	200 mL	9,841 Recovery =	1,407 88%

1150-1 EXECUTIVE CIRCLE
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MERCURY RESEARCH LABORATORY, INC.

March 18, 1992

LOUISIANA PACIFIC/EML
Your Project No. 1473-002
Our Porject No. 92-03-14

Table FORMALDEHYDE , TOTAL UG IN SAMPLE

Sample #	Counts	ppm as Hydrazone	Final Volumne	total ug Hydrazone	total ug Formaldehyde
#27 (DS4-RUN 1)	12,382 12,568	127	200 mL	25,400	3,632
#28 (DS4-RUN 2)	18,844 18,819	192	200 mL	38,400	5,491
#29 (DS4-RUN 3)	19,340 19,314	197	200 mL	39,400	5,634
#30 (DS5-RUN 1)	11,370 11,303	116	200 mL	23,200	3,318
#31 (DS5-RUN 2)	11,913 11,953	122	200 mL	24,400	3,489
#32 (DS5-RUN 3)	11,200 11,175	114	200 mL	22,800	3,260
#33 (DS3-RUN 4)	8,419 8,452	86.0	200 mL	17,200	2,460
#34 (DNPH LOT4)	366 571	4.8	20 mL	98	14
#35 (PV5-RUN 1)	8,682 8,699	88.6	200 mL	17,720	2,534
#36 (PV5-RUN 2)	8,649 8,605	87.9	200 mL	17,580	2,514
#37 (PV5-RUN 3)	7,993 8,028	81.7	200 mL	16,340	2,337
#38 (LOT4 SPIKE)	5,833 5,841	59.5	200 mL	11,900 Recovery =	1,702 106%

1150-1 EXECUTIVE CIRCLE
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Standard Curves

		Pre-Sample Run Cali.		Post-Sample Run Calib.	
5.0	ppm	491,	486,	487,	487.
10.0	ppm	974,	975,	974,	974
20.0	ppm	1,952,	1,953,	1,956,	1,963
50.0	ppm	4,936,	4,901,	4,955,	4,907
75.0	ppm	7,405,	7,413,	7,352,	7,457
100.0	ppm	9,882,	9,833,	9,788,	9,784

Sample Calculation

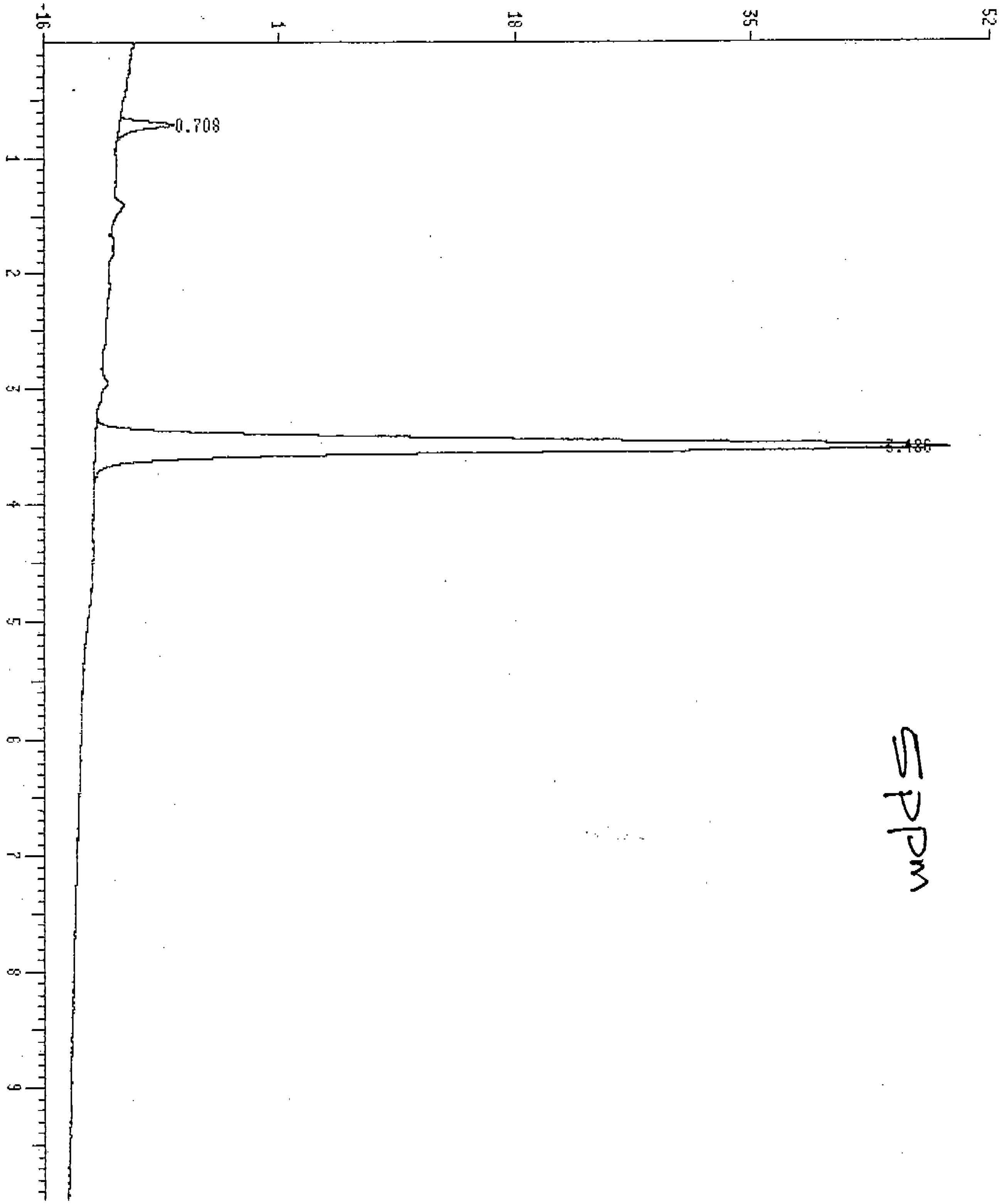
ppm of formaldehyde as hydrazone x final volume x .143

= Total number of ug of formaldehyde in sample

Sample #1

122 ug/mL as hydrazone x 200 mL x .143 (wt.% of formaldehyde in formaldehyde hydrazone) = 3,489 ug

1: LC A 360,4   550,100   of 0315A00A.D



End of plot. Time =   0.00 to   9.98 minutes   Chart speed =   2.00 cm/min

*** Area Percent ***

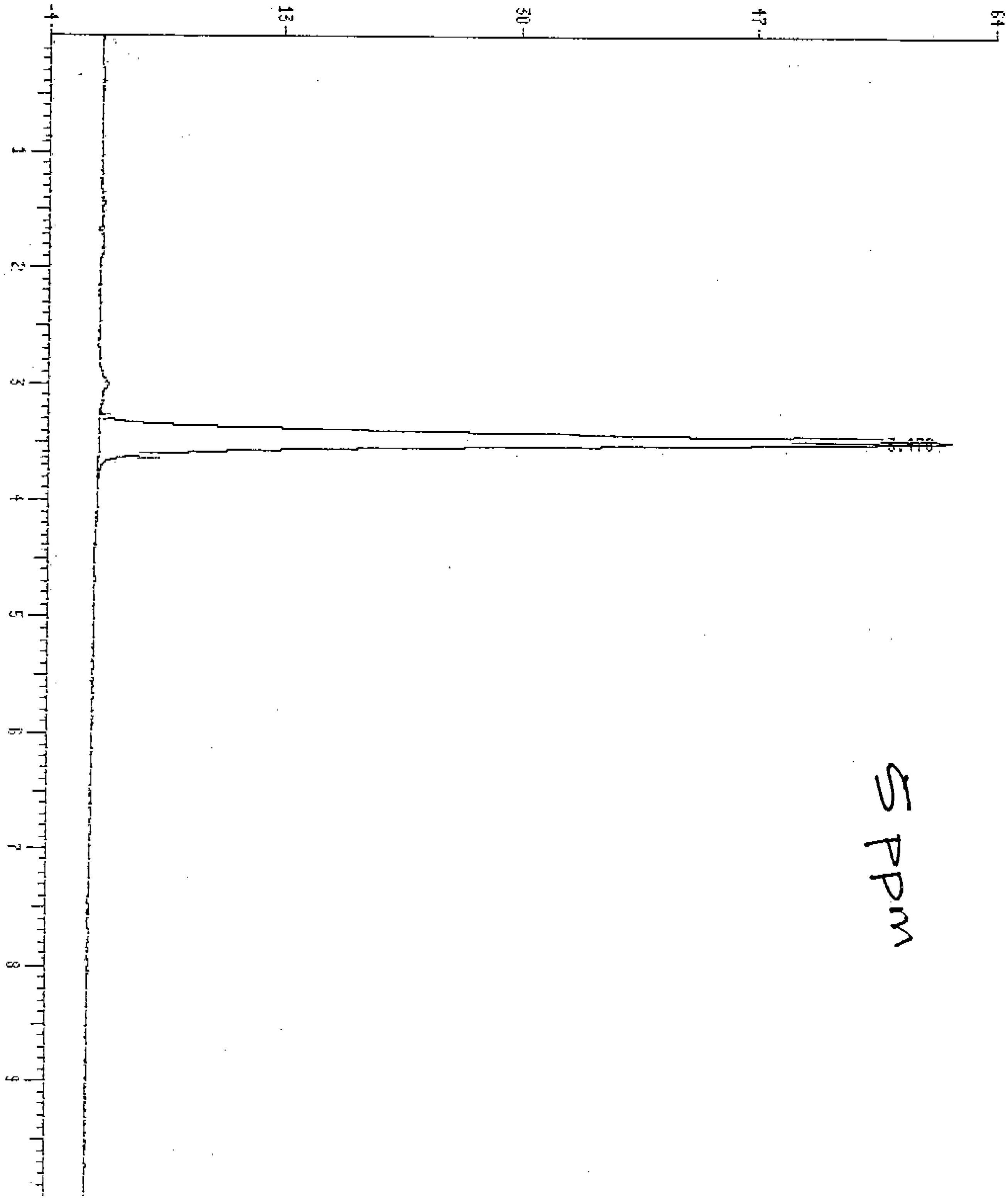
Report by Signal

Operator: 13 Mar 92 6:23 pm
Method File Name : DNPHIII.M
Sample Info : 5ppm
Misc Info:
Integration File Name : DATA:0315A00A.I
consisting of channels : 1. A 360,4 550,100 of 0315A00A.D
Sequence Index: 1 Bottle Number : 0 Repetition Number: 1

A 360,4 550,100 of 0315A00A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
0.708	BB	17.4989	3.8612	3.44	100.00	0.069	0.67
3.486	BB	491.46	61.4894	96.56	100.00	0.123	1.13

1: LC A 360,4   550,100   of 0315A00B.D



5 PPM

End of plot. Time =   0.00 to   9.98 minutes   Chart speed =   2.00 cm/min

*** Area Percent ***

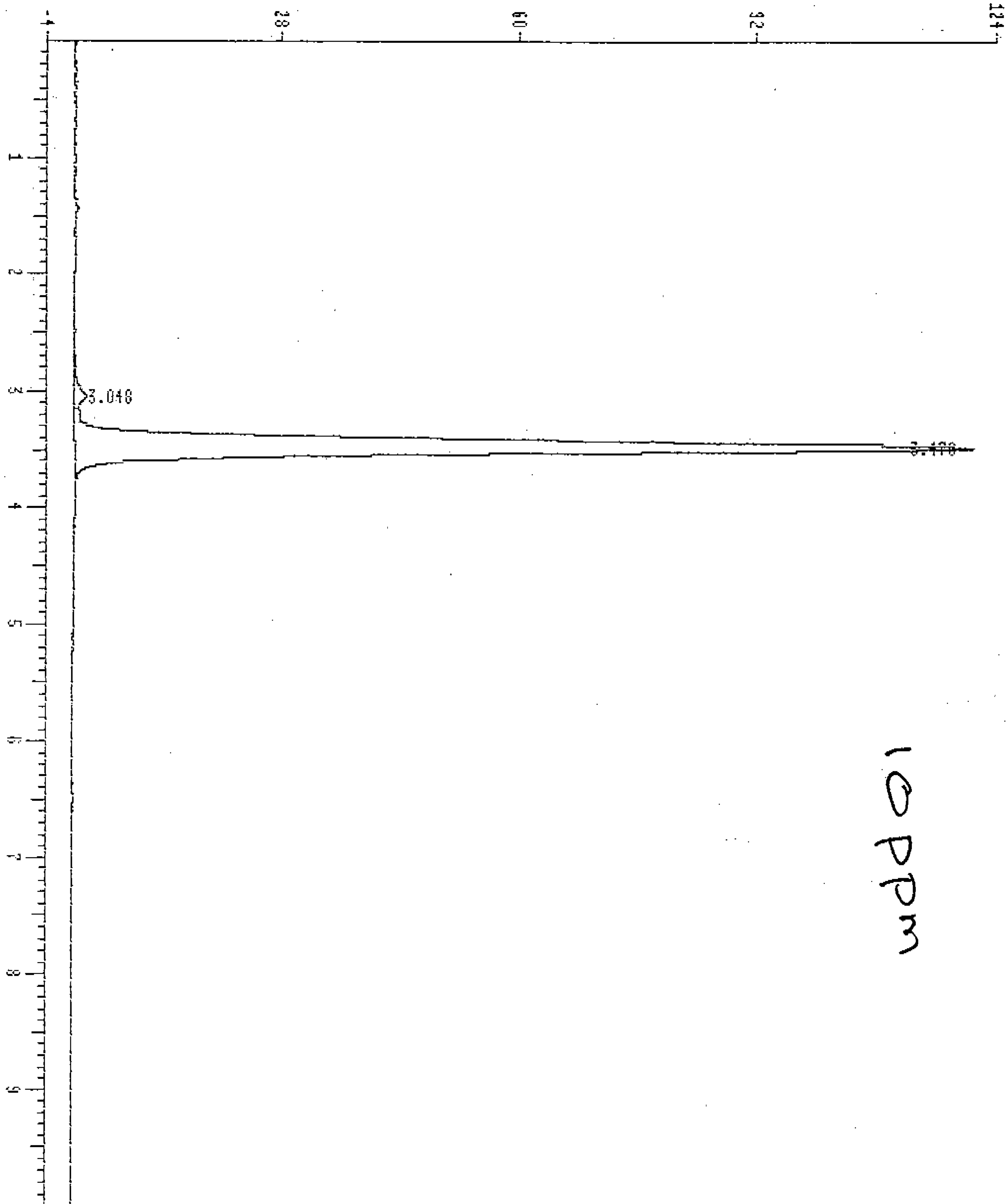
Report by Signal

Operator: 13 Mar 92 6:36 pm
Method File Name : DNPHIII.M
Sample Info : 5ppm
Misc Info:
Integration File Name : DATA:0315A00B.I
consisting of channels : 1. A 360.4 550.100 of 0315A00B.D
Sequence Index: 1 Bottle Number : 0 Repetition Number: 2

A 360.4 550.100 of 0315A00B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.470	BB	486.04	61.2842	100.00	100.00	0.123	1.13

1: LC A 360,4 550,100 of 0315A01A.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

Operator: 13 Mar 92 6:49 pm

Method File Name : DNPHIII.M

Sample Info : 10 ppm

Misc Info:

Integration File Name : DATA:0315A01A.I

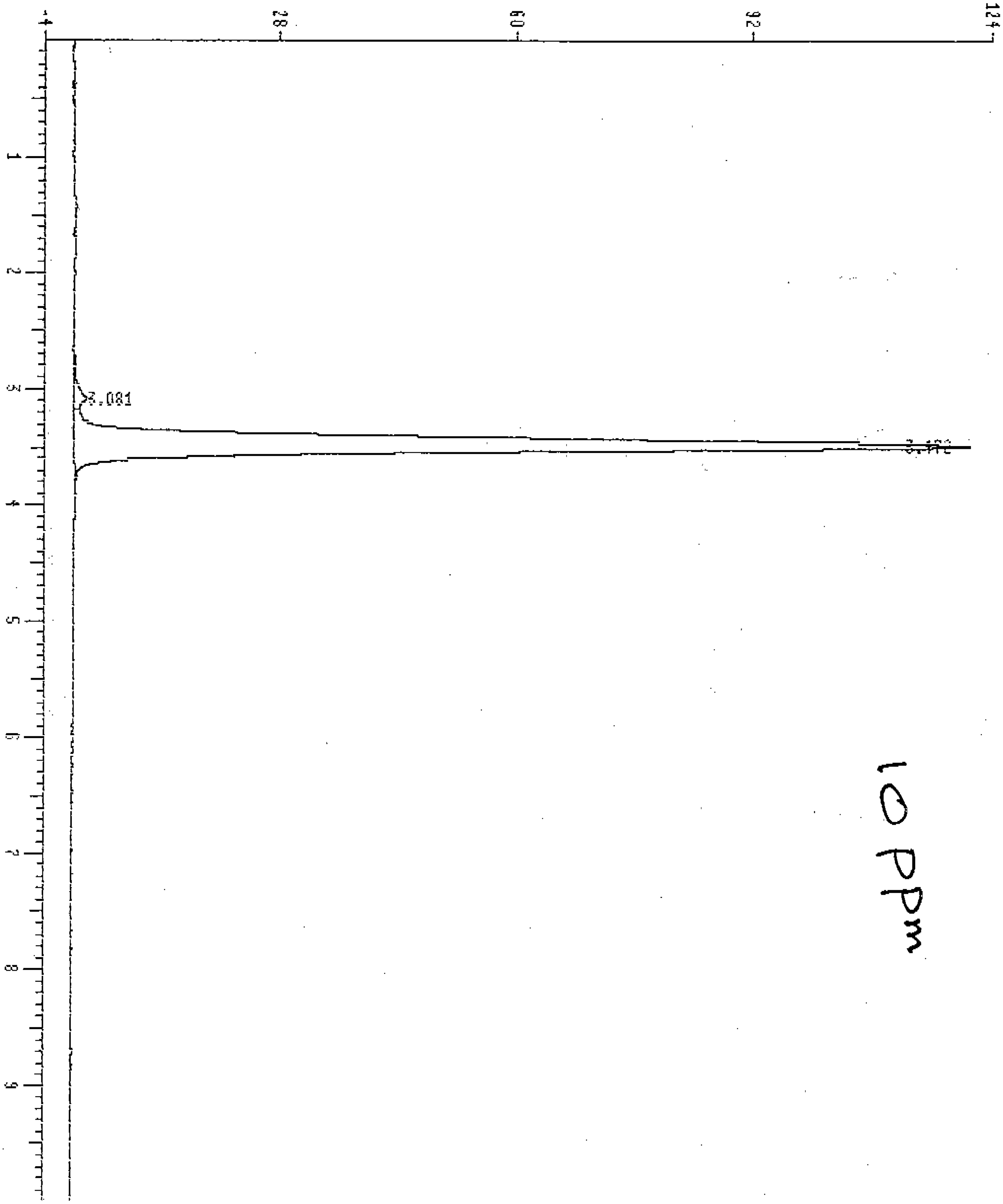
consisting of channels : 1. A 360.4 550.100 of 0315A01A.D

Sequence Index: 1 Bottle Number : 1 Repetition Number: 1

A 360.4 550.100 of 0315A01A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.048	BV	16.3972	1.5565	1.66	100.00	0.142	1.72
3.470	VB	973.60	121.34	98.34	100.00	0.124	1.15

1: LC A 360.4   550.100   of 0315A01B.D



10 PPm

End of plot. Time =   0.00 to   9.98 minutes   Chart speed =   2.00 cm/min

*** Area Percent ***

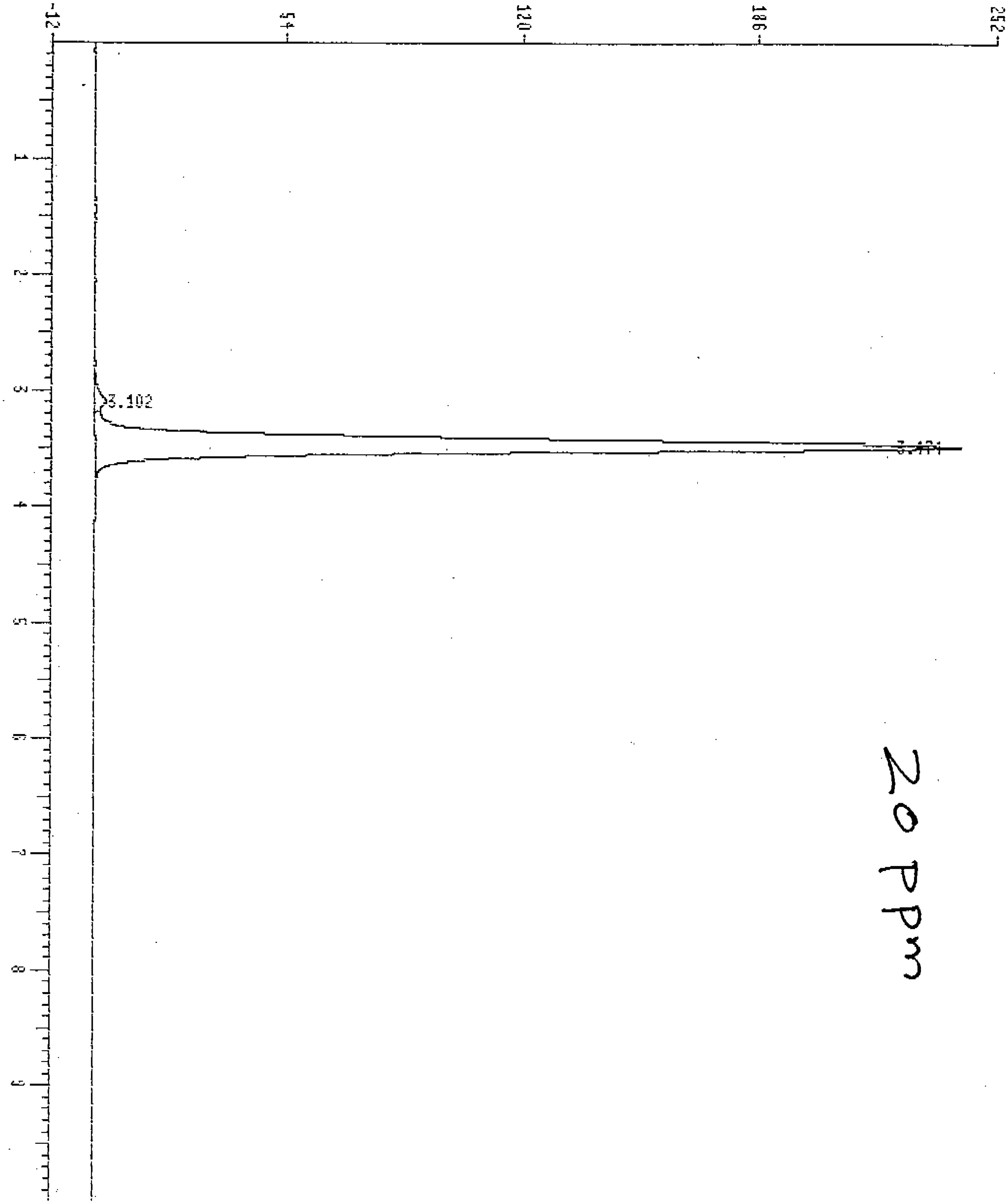
Report by Signal

Operator: 13 Mar 92 7:02 pm
Method File Name : DNPHIII.M
Sample Info : 10 ppm
Misc Info:
Integration File Name : DATA:0315A01B.I
consisting of channels : 1. A 360.4 550.100 of 0315A01B.D
Sequence Index: 1 Bottle Number : 1 Repetition Number: 2

A 360.4 550.100 of 0315A01B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.081	BV	18.7158	1.6970	1.88	100.00	0.149	1.93
3.472	VB	975.21	121.25	98.12	100.00	0.124	1.15

1: LC A 360.4   550.100   of 0315A02A.D



20 PPm

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

==

Operator: 13 Mar 92 7:15 pm

Method File Name : DNPHIII.M

Sample Info : 20 ppm

Misc Info:

Integration File Name : DATA:0315A02A.I

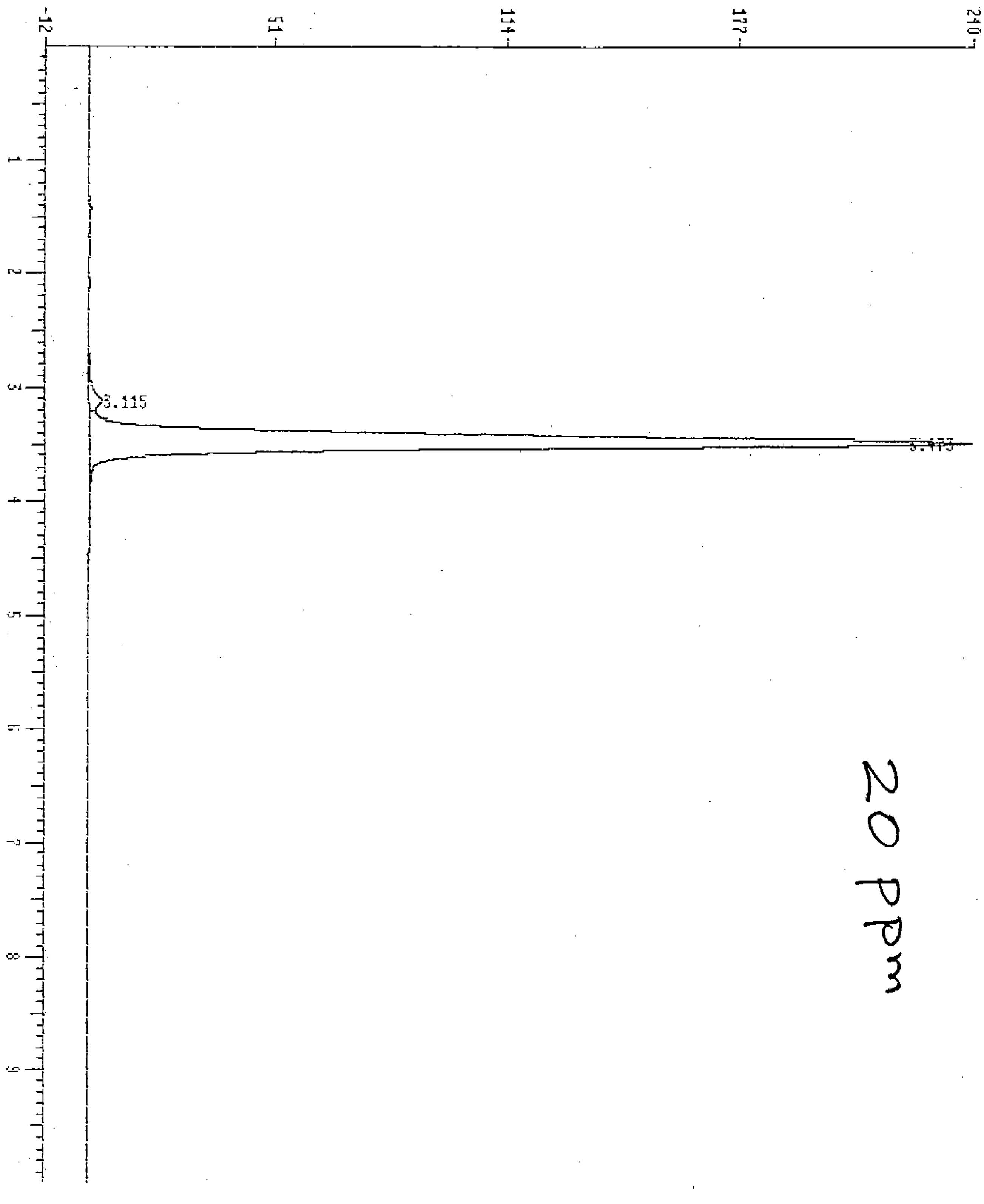
consisting of channels : 1. A 360.4 550.100 of 0315A02A.D

Sequence Index: 1 Bottle Number : 2 Repetition Number: 1

A 360.4 550.100 of 0315A02A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.102	BV	28.0045	3.2824	1.41	100.00	0.120	1.48
3.474	VB	1951.81	242.14	98.59	100.00	0.124	1.16

1: LC A 360,4   550.100   of 0315A02B.D



20 PPM

End of plot. Time =   0.00 to   9.98 minutes   Chart speed =   2.00 cm/min

*** Area Percent ***

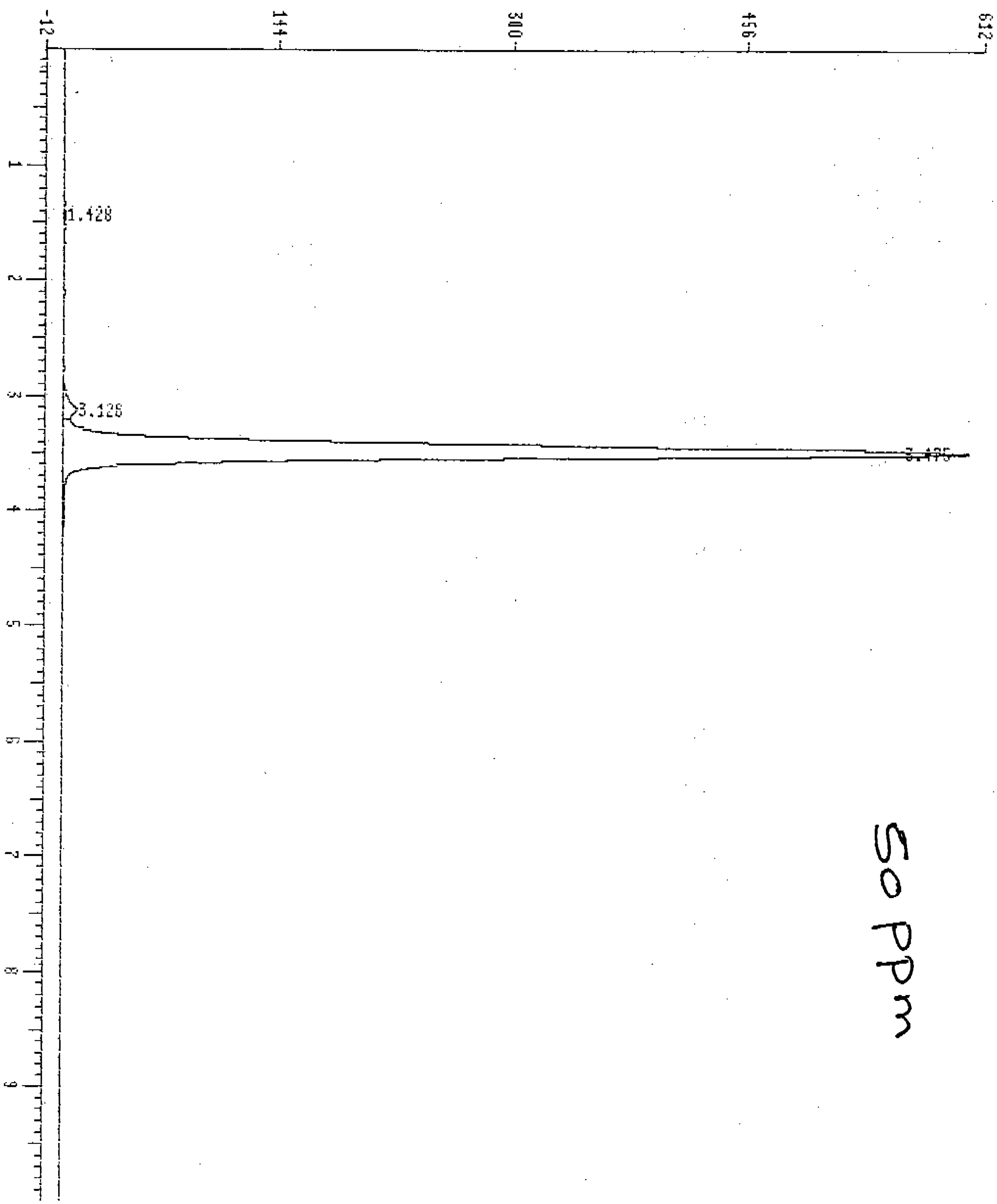
Report by Signal

Operator: 13 Mar 92 7:28 pm
Method File Name : DNPHIII.M
Sample Info : 20 ppm
Misc Info:
Integration File Name : DATA:0315A02B.I
consisting of channels : 1. A 360.4 550.100 of 0315A02B.D
Sequence Index: 1 Bottle Number : 2 Repetition Number: 2

A 360.4 550.100 of 0315A02B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.115	BV	35.3923	3.5150	1.78	100.00	0.137	1.91
3.473	VB	1953.44	239.73	98.22	100.00	0.126	1.18

1: LC A 360.4 550.100 of 0315A03A.D



End of plot. Time = 0.01 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

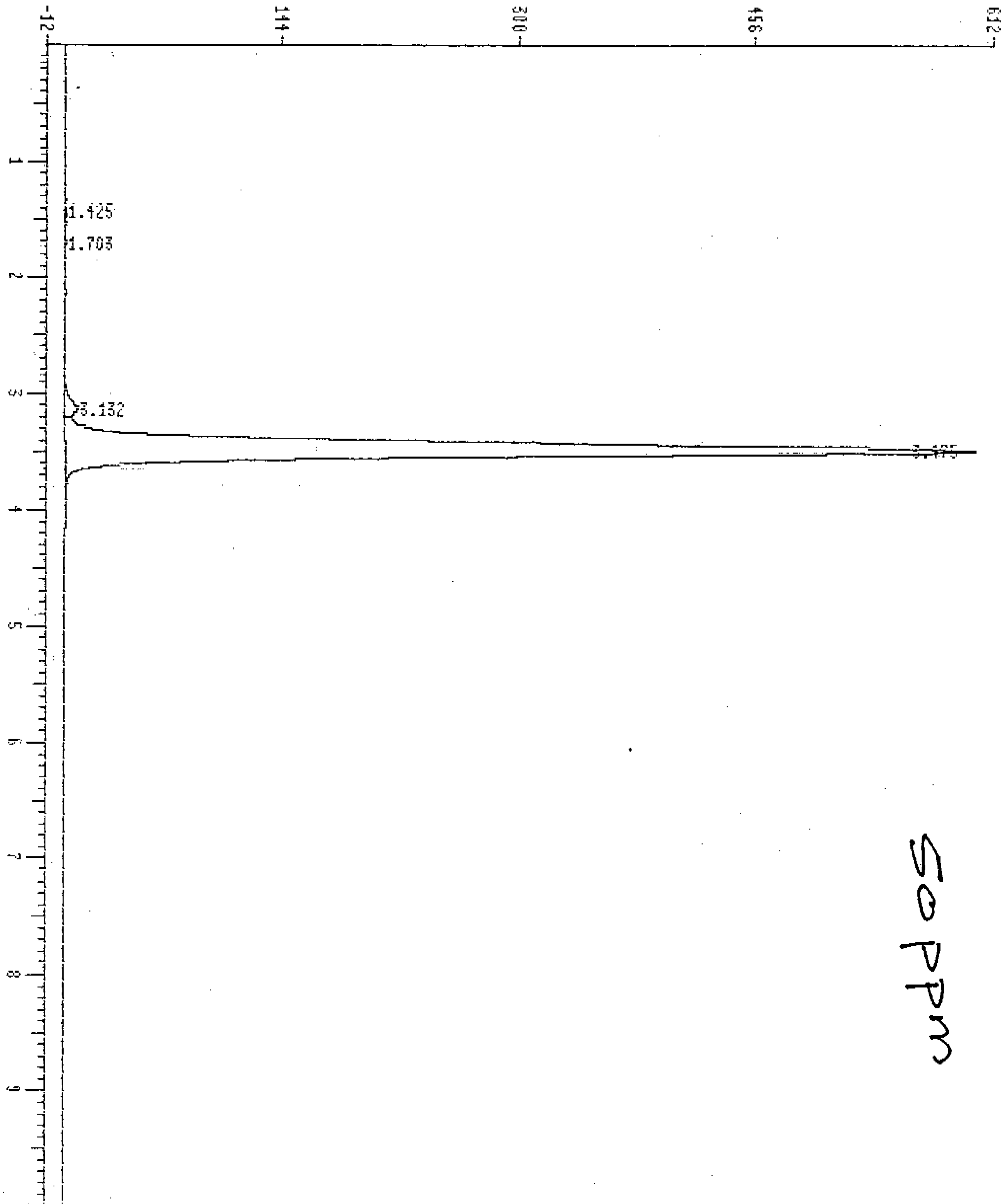
Report by Signal

Operator: 13 Mar 92 7:40 pm
Method File Name : DNPHIII.M
Sample Info : 50 PPm
Misc Info:
Integration File Name : DATA:0315A03A.I
consisting of channels : 1. A 360.4 550.100 of 0315A03A.D
Sequence Index: 1 Bottle Number : 3 Repetition Number: 1

A 360.4 550.100 of 0315A03A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.428	VV	3.4826	0.9841	0.07	100.00	0.056	0.87
3.126	VV	83.7955	9.0166	1.67	100.00	0.129	1.70
3.475	VB	4935.70	602.56	98.26	100.00	0.126	1.17

1: LC A 360.4   550.100   of 0315A03B.D



End of plot. Time =   0.00 to   9.98 minutes   Chart speed =   2.00 cm/min

*** Area Percent ***

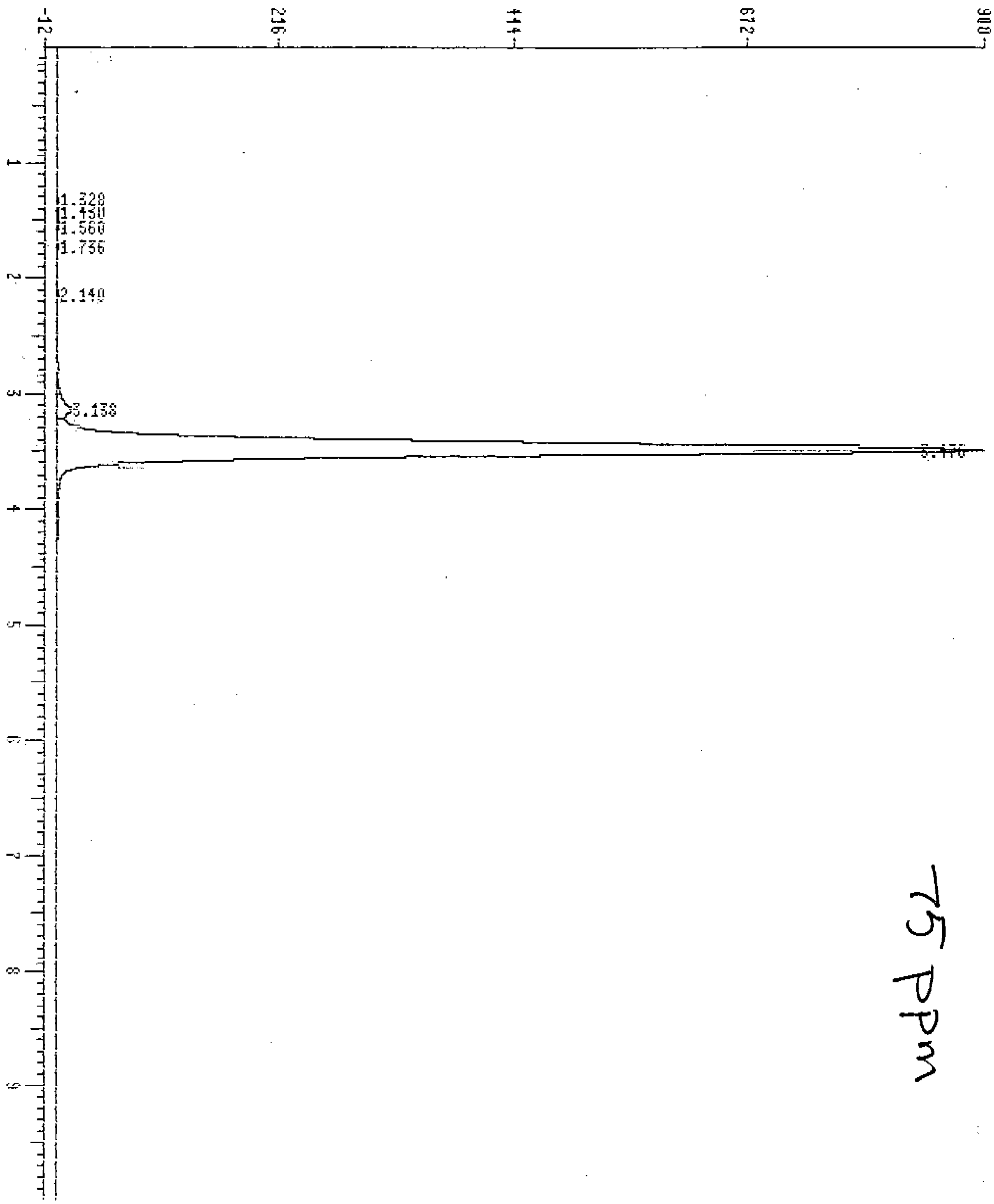
Report by Signal

Operator: 13 Mar 92 7:53 pm
Method File Name : DNPHIII.M
Sample Info : 50 ppm
Misc Info:
Integration File Name : DATA:0315A03B.I
consisting of channels : 1. A 360,4 550,100 of 0315A03B.D
Sequence Index: 1 Bottle Number : 3 Repetition Number: 2

A 360,4 550,100 of 0315A03B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.425	VV	6.8550	1.3490	0.14	100.00	0.097	0.72
1.703	PB	3.1575	1.0220	0.06	100.00	0.067	0.58
3.132	BV	73.5934	8.5943	1.48	100.00	0.121	1.58
3.475	VV	4901.14	601.13	98.32	100.00	0.125	1.18

1: LC A 360.4   550.100   of 0315A04A.D



End of plot. Time =   0.00 to   9.98 minutes   Chart speed =   2.00 cm/min

*** Area Percent ***

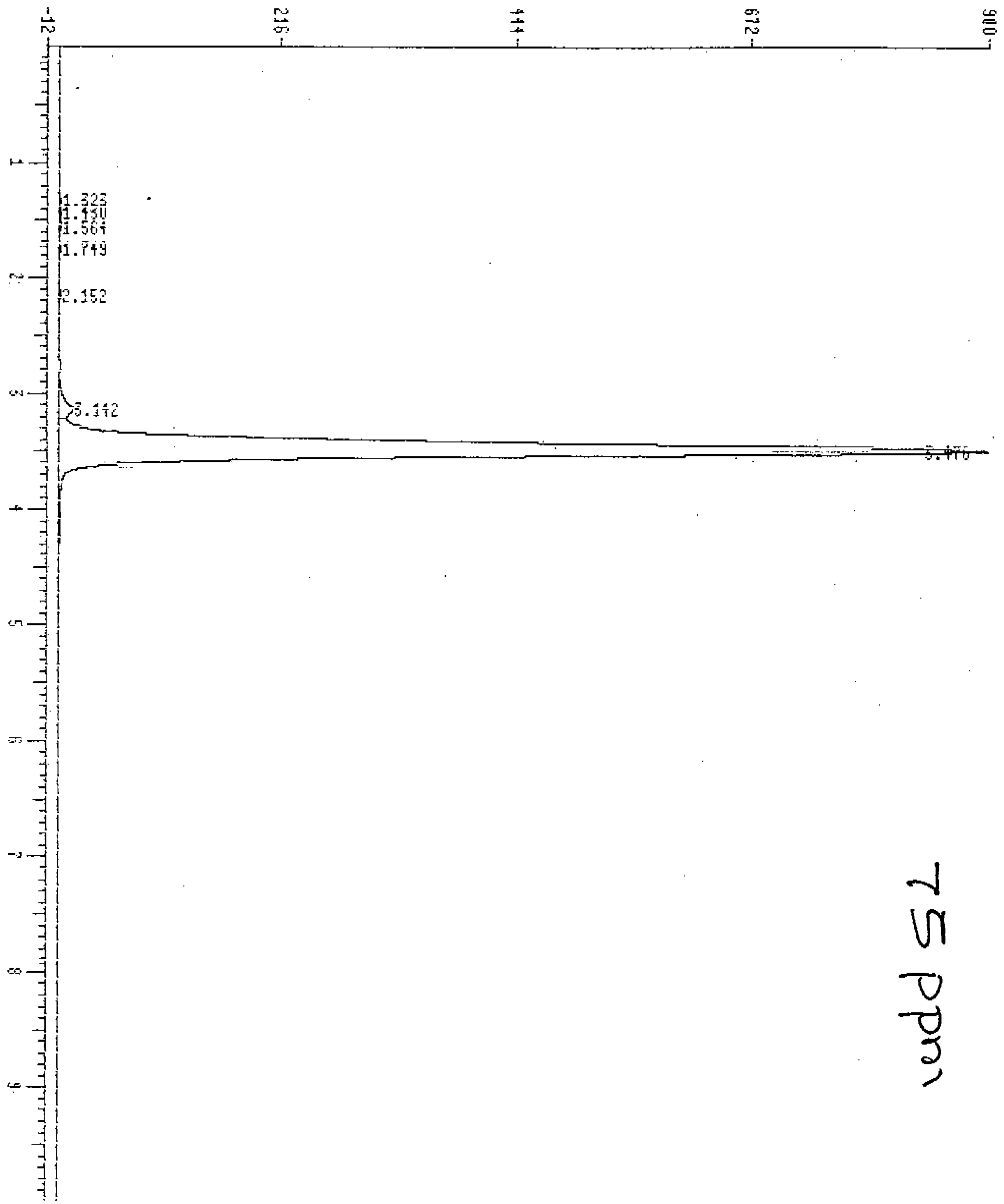
Report by Signal

Operator: 13 Mar 92 8:06 pm
Method File Name : DNPHIII.M
Sample Info : 75 ppm
Misc Info:
Integration File Name : DATA:0315A04A.I
consisting of channels : 1. A 360,4 550,100 of 0315A04A.D
Sequence Index: 1 Bottle Number : 4 Repetition Number: 1

A 360,4 550,100 of 0315A04A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.328	BV	3.7157	1.1946	0.05	100.00	0.048	0.81
1.430	VV	9.6686	1.7205	0.13	100.00	0.084	0.69
1.560	VV	6.1725	1.4213	0.08	100.00	0.061	1.09
1.736	PB	5.9792	1.7508	0.08	100.00	0.066	0.70
2.140	BB	6.8498	1.4419	0.09	100.00	0.069	1.44
3.138	VV	120.40	13.5485	1.59	100.00	0.124	1.70
3.476	VB	7405.38	900.26	97.98	100.00	0.126	1.16

1: LC A 360.4 550.100 of 0315A04B.D



End of plot. Time = 0.01 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

Operator: 13 Mar 92 8:19 pm

Method File Name : DNPHIII.M

Sample Info : 75 ppm

Misc Info:

Integration File Name : DATA:0315A04B.I

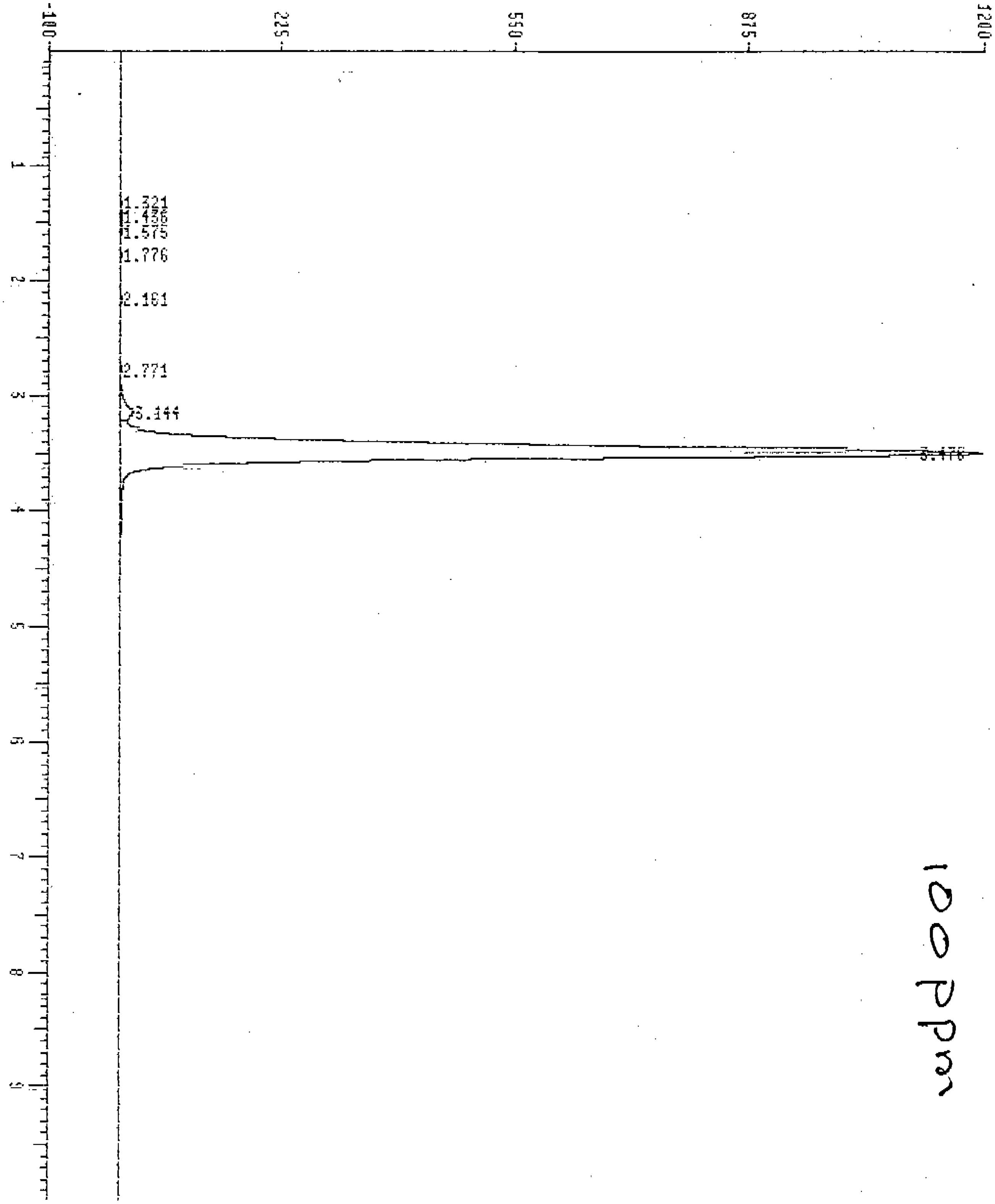
consisting of channels : 1. A 360.4 550.100 of 0315A04B.D

Sequence Index: 1 Bottle Number : 4 Repetition Number: 2

A 360.4 550.100 of 0315A04B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.323	BV	3.8509	1.1396	0.05	100.00	0.056	0.84
1.430	VV	9.7458	1.6542	0.13	100.00	0.089	0.71
1.564	VV	6.3772	1.4520	0.08	100.00	0.061	1.15
1.749	PB	5.8703	1.7166	0.08	100.00	0.074	0.80
2.152	BB	6.4806	1.4236	0.09	100.00	0.067	1.22
3.142	VV	119.10	13.4990	1.57	100.00	0.123	1.73
3.476	VB	7413.13	899.91	98.00	100.00	0.126	1.17

1: LC A 360.4 550.100 of 0315A05A.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

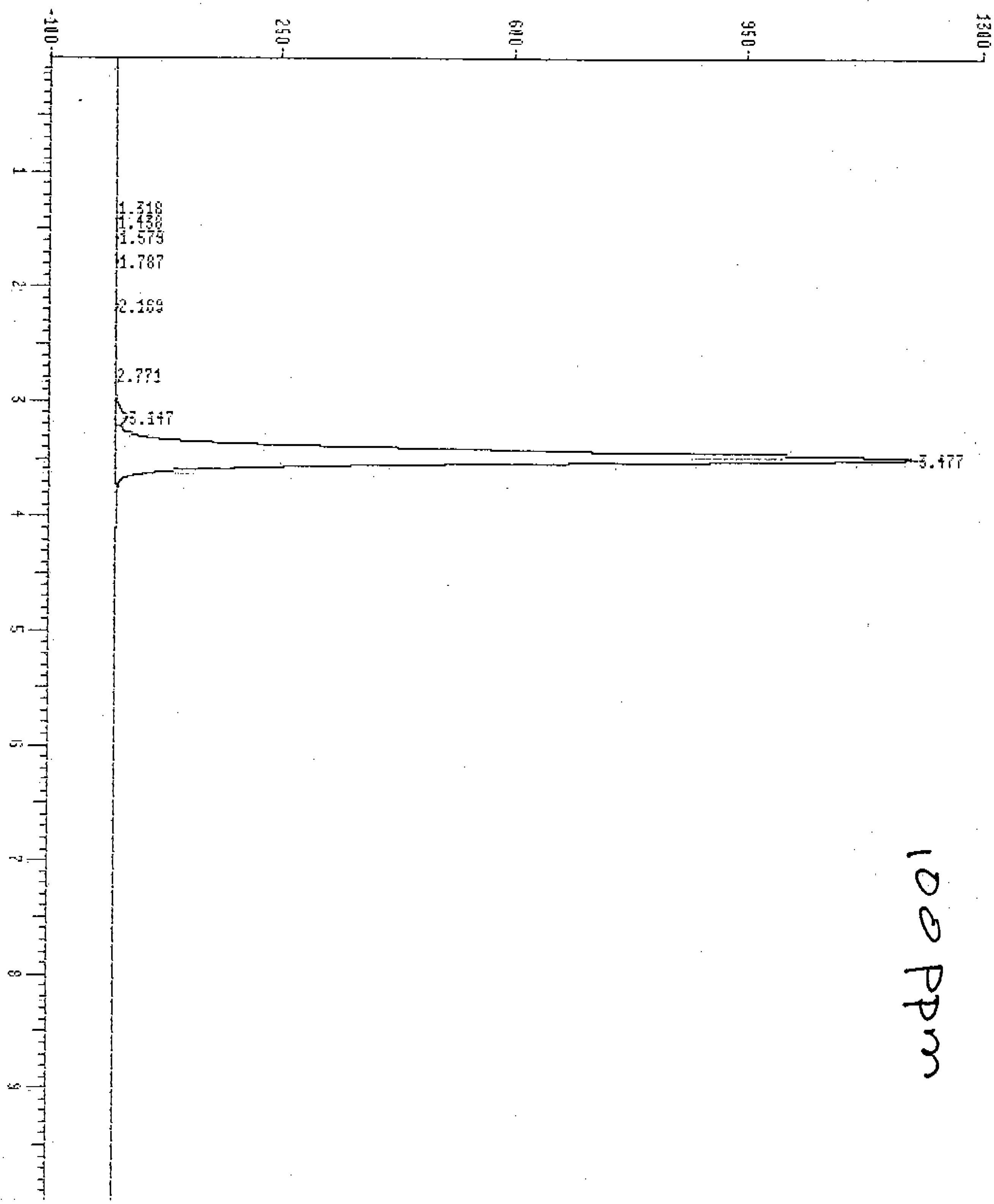
Report by Signal

Operator: 13 Mar 92 8:32 pm
Method File Name : DNPHIII.M
Sample Info : 100 ppm
Misc Info:
Integration File Name : DATA:0315A05A.I
consisting of channels : 1. A 360.4 550.100 of 0315A05A.D
Sequence Index: 1 Bottle Number : 5 Repetition Number: 1

A 360.4 550.100 of 0315A05A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.321	BV	4.9528	1.4072	0.05	100.00	0.059	0.63
1.436	VV	12.3359	2.0091	0.12	100.00	0.095	0.71
1.575	VV	8.1497	2.0251	0.08	100.00	0.069	1.24
1.776	PB	8.8324	2.4399	0.09	100.00	0.053	0.91
2.161	BB	9.2255	1.9876	0.09	100.00	0.068	1.46
2.771	BV	6.8816	1.1105	0.07	100.00	0.097	1.11
3.144	VV	156.71	17.9035	1.55	100.00	0.123	1.76
3.476	VB	9882.03	1199.09	97.95	100.00	0.126	1.16

1: LC A 360.4   550,100   of 0315A05B.D



End of plot. Time =   0.00 to   9.98 minutes   Chart speed =   2.00 cm/min

*** Area Percent ***

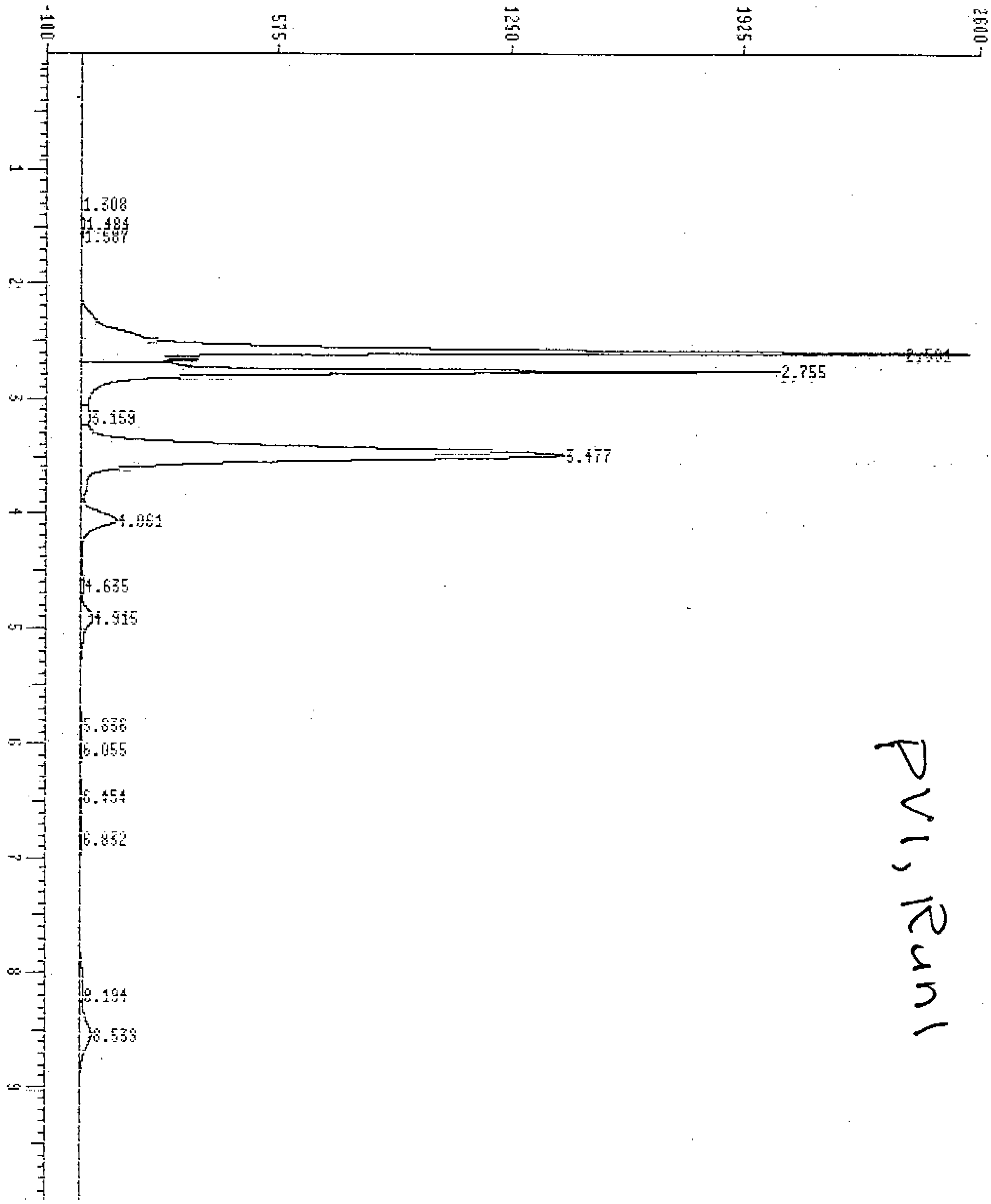
Report by Signal

Operator: 13 Mar 92 8:45 pm
Method File Name : DNPHIII.M
Sample Info : 100 ppm
Misc Info:
Integration File Name : DATA:0315A05B.I
consisting of channels : 1. A 360,4 550,100 of 0315A05B.D
Sequence Index: 1 Bottle Number : 5 Repetition Number: 2

A 360,4 550,100 of 0315A05B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.318	BV	5.2375	1.4332	0.05	100.00	0.061	0.75
1.438	VV	11.8218	1.8611	0.12	100.00	0.098	0.83
1.579	VV	8.0312	1.9564	0.08	100.00	0.058	1.47
1.787	PB	7.6080	2.3397	0.08	100.00	0.049	0.94
2.169	BV	9.4283	1.9900	0.09	100.00	0.069	1.33
2.771	BV	5.0462	0.8543	0.05	100.00	0.094	1.01
3.147	VV	141.48	17.1099	1.41	100.00	0.117	1.67
3.477	VV	9833.00	1203.25	98.12	100.00	0.125	1.18

1: LC A 360,4 550,100 of 0315A06A.D



PV1, Run1

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

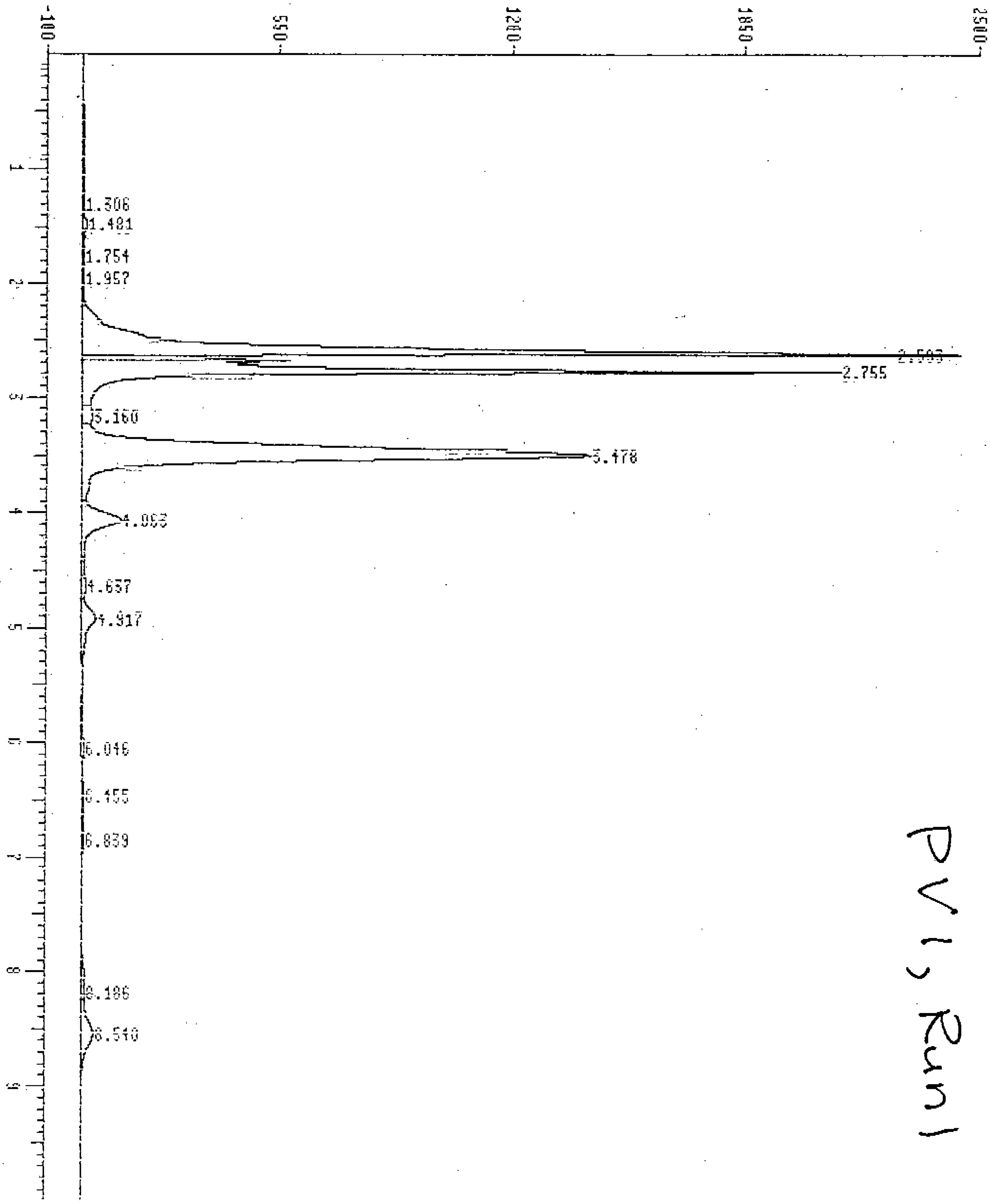
Report by Signal

Operator: 13 Mar 92 8:58 pm
Method File Name : DNPHIII.M
Sample Info : PV 1, Run 1
Misc Info:
Integration File Name : DATA:0315A06A.I
consisting of channels : 1. A 360,4 550,100 of 0315A06A.D
Sequence Index: 1 Bottle Number : 6 Repetition Number: 1

A 360,4 550,100 of 0315A06A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.308	BV	11.3588	3.1099	0.04	100.00	0.054	0.85
1.484	VV	69.2367	10.8282	0.22	100.00	0.099	1.08
1.587	VV	17.2241	5.1583	0.05	100.00	0.048	0.62
2.591	VV	10290	2431.07	32.19	100.00	0.072	1.61
2.755	VV	6412.50	1966.44	20.06	100.00	0.054	0.71
3.159	VV	256.20	29.0615	0.80	100.00	0.125	1.41
3.477	VV	11952	1405.42	37.39	100.00	0.129	1.14
4.061	VV	1102.77	108.60	3.45	100.00	0.154	0.95
4.635	VV	152.77	10.2388	0.48	100.00	0.206	2.02
4.915	VV	500.95	37.6623	1.57	100.00	0.195	0.69
5.836	VV	55.4432	3.3186	0.17	100.00	0.278	2.84
6.055	VV	64.7385	4.0426	0.20	100.00	0.218	0.88
6.454	VV	97.3930	5.2807	0.30	100.00	0.261	1.01
6.832	VB	117.19	6.4391	0.37	100.00	0.260	0.87
8.194	BV	198.94	9.4276	0.62	100.00	0.352	5.66
8.539	VB	666.01	34.2344	2.08	100.00	0.284	1.03

1: LC A 360.4 550.100 of 0315A06B.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

Operator: 13 Mar 92 9:11 pm

Method File Name : DNPHIII.M

Sample Info : PV 1, Run 1

Misc Info:

Integration File Name : DATA:0315A06B.I

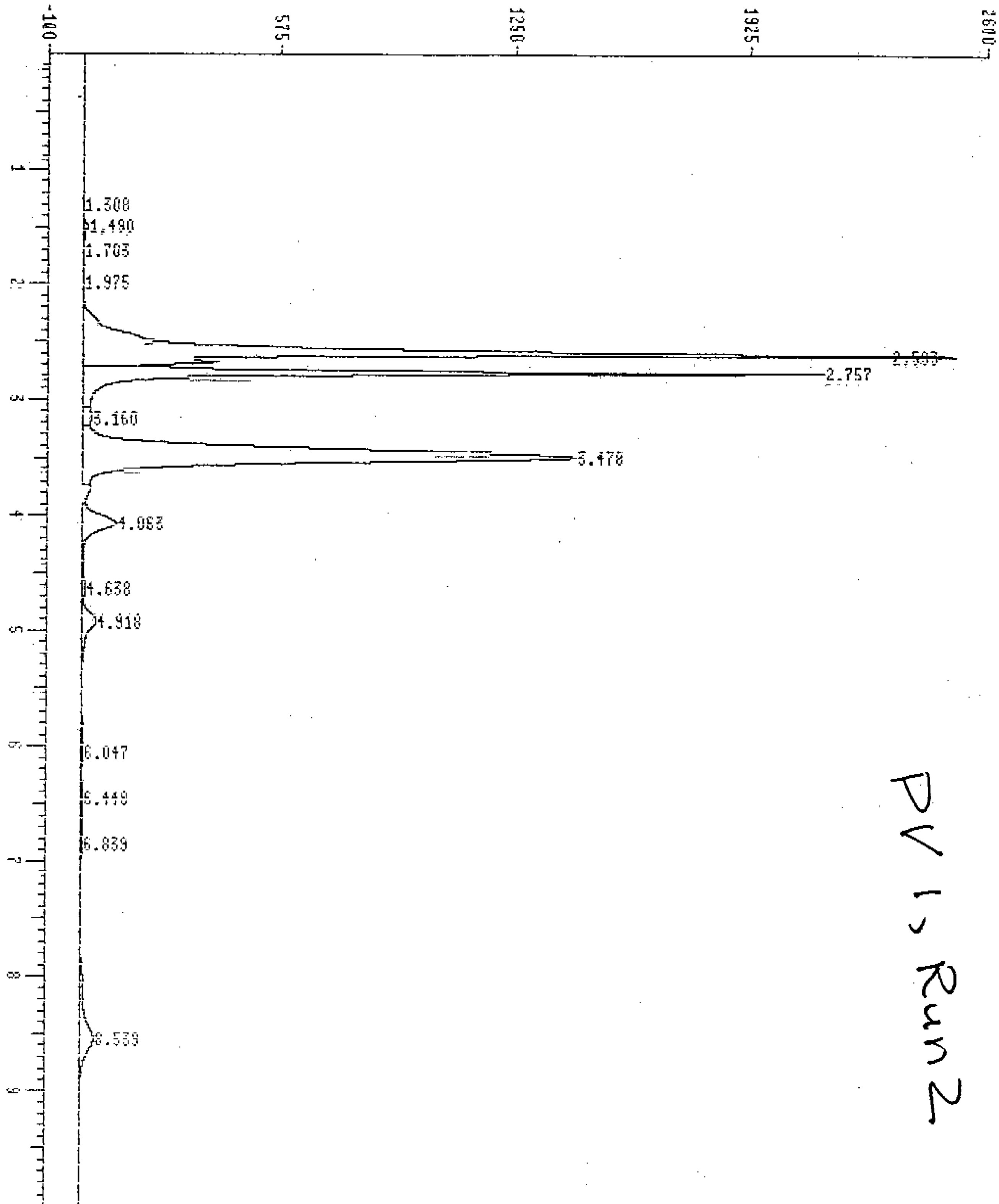
consisting of channels : 1. A 360.4 550.100 of 0315A06B.D

Sequence Index: 1 Bottle Number : 6 Repetition Number: 2

A 360.4 550.100 of 0315A06B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.306	BV	53.4809	3.9279	0.16	100.00	0.227	4.72
1.481	VV	95.8403	11.7368	0.29	100.00	-0.119	0.67
1.754	VV	19.8224	1.7200	0.06	100.00	0.165	0.82
1.957	VV	10.7581	1.7346	0.03	100.00	0.085	0.96
2.593	VV	9698.68	2366.72	28.90	100.00	0.072	2.47
2.755	VV	8258.26	2081.03	24.61	100.00	0.055	1.12
3.160	VV	258.58	29.2984	0.77	100.00	0.126	1.38
3.478	VV	11980	1417.13	35.70	100.00	0.128	1.12
4.063	VV	1115.05	109.98	3.32	100.00	0.154	0.93
4.637	VV	163.22	10.8598	0.49	100.00	0.206	2.02
4.917	VV	521.23	38.6582	1.55	100.00	0.197	0.67
6.046	VV	156.77	5.0942	0.47	100.00	0.398	2.37
6.455	VV	115.11	6.0652	0.34	100.00	0.269	1.03
6.839	VV	154.89	7.3560	0.46	100.00	0.298	0.72
8.186	VV	250.71	10.4002	0.75	100.00	0.302	6.23
8.540	VB	703.32	35.1376	2.10	100.00	0.289	1.00

1: LC A 360.4 550.100 of 0315A07A.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

Operator: 13 Mar 92 9:25 pm

Method File Name : DNPHIII.M

Sample Info : PV 1, Run 2

Misc Info:

Integration File Name : DATA:0315A07A.I

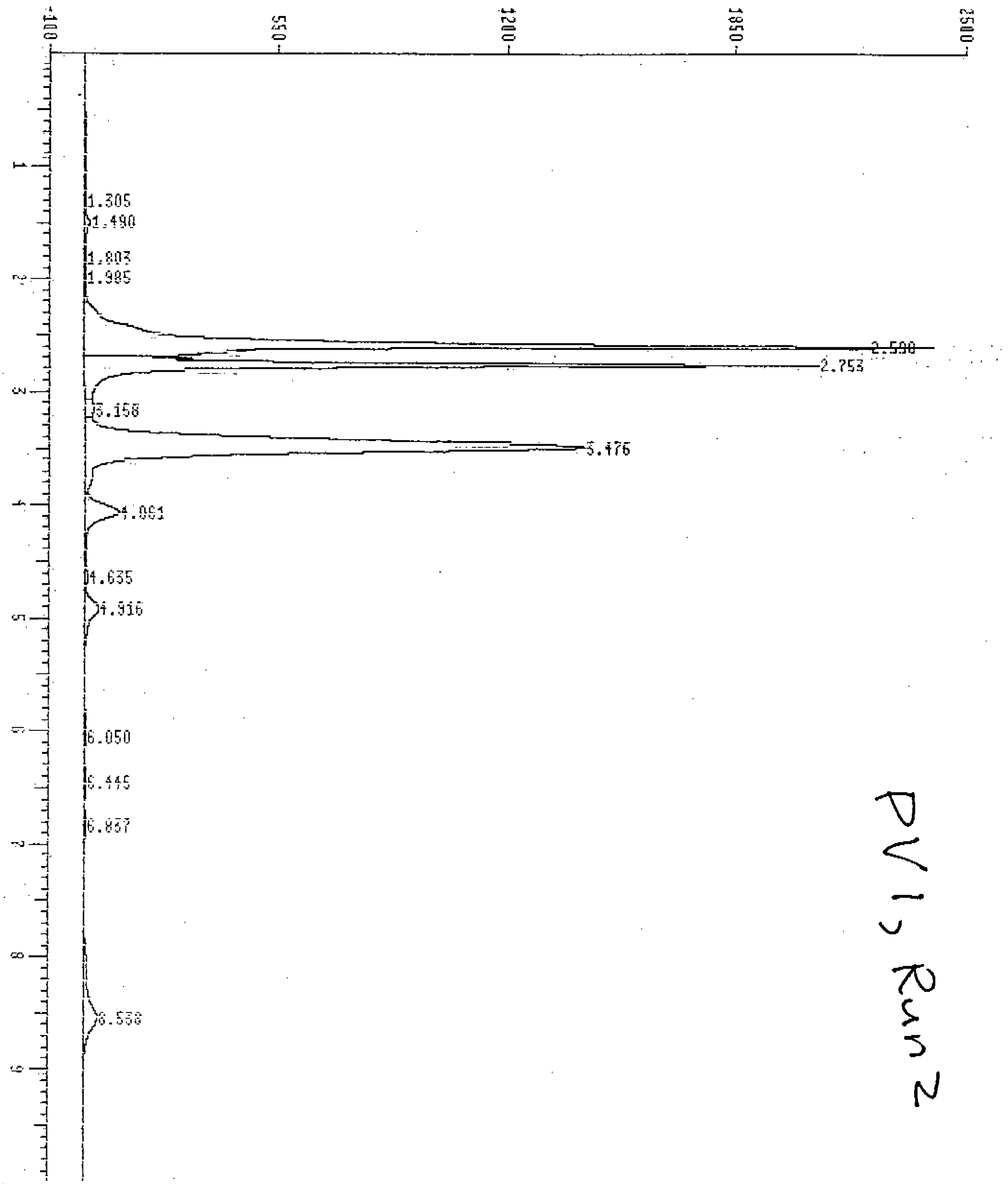
consisting of channels : 1. A 360,4 550,100 of 0315A07A.D

Sequence Index: 1 Bottle Number : 7 Repetition Number: 1

A 360,4 550,100 of 0315A07A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.308	BV	52.2473	3.9199	0.16	100.00	0.167	5.12
1.490	VV	107.14	16.4480	0.33	100.00	0.094	0.54
1.703	VV	9.6754	1.8943	0.03	100.00	0.085	0.76
1.975	VV	12.2554	2.0007	0.04	100.00	0.084	0.94
2.593	VV	10718	2338.04	33.02	100.00	0.063	1.44
2.757	VV	6120.85	1803.29	18.86	100.00	0.057	0.60
3.160	VV	244.19	27.9388	0.75	100.00	0.125	1.36
3.478	VV	11933	1424.92	36.77	100.00	0.127	1.16
4.063	VV	1046.53	102.07	3.22	100.00	0.155	0.93
4.638	VV	164.45	10.7838	0.51	100.00	0.211	2.12
4.918	VV	581.94	42.4515	1.79	100.00	0.200	0.66
6.047	VV	159.60	5.1975	0.49	100.00	0.391	2.40
6.448	VV	120.28	6.5116	0.37	100.00	0.264	0.98
6.839	VV	140.83	6.8010	0.43	100.00	0.293	0.72
8.539	VV	1044.60	39.8619	3.22	100.00	0.363	1.76

: LC A 360.4   550.100   of 0315A07B.D



PV1, Run 2

End of plot. Time =   0.00 to   9.98 minutes   Chart speed =   2.00 cm/min

*** Area Percent ***

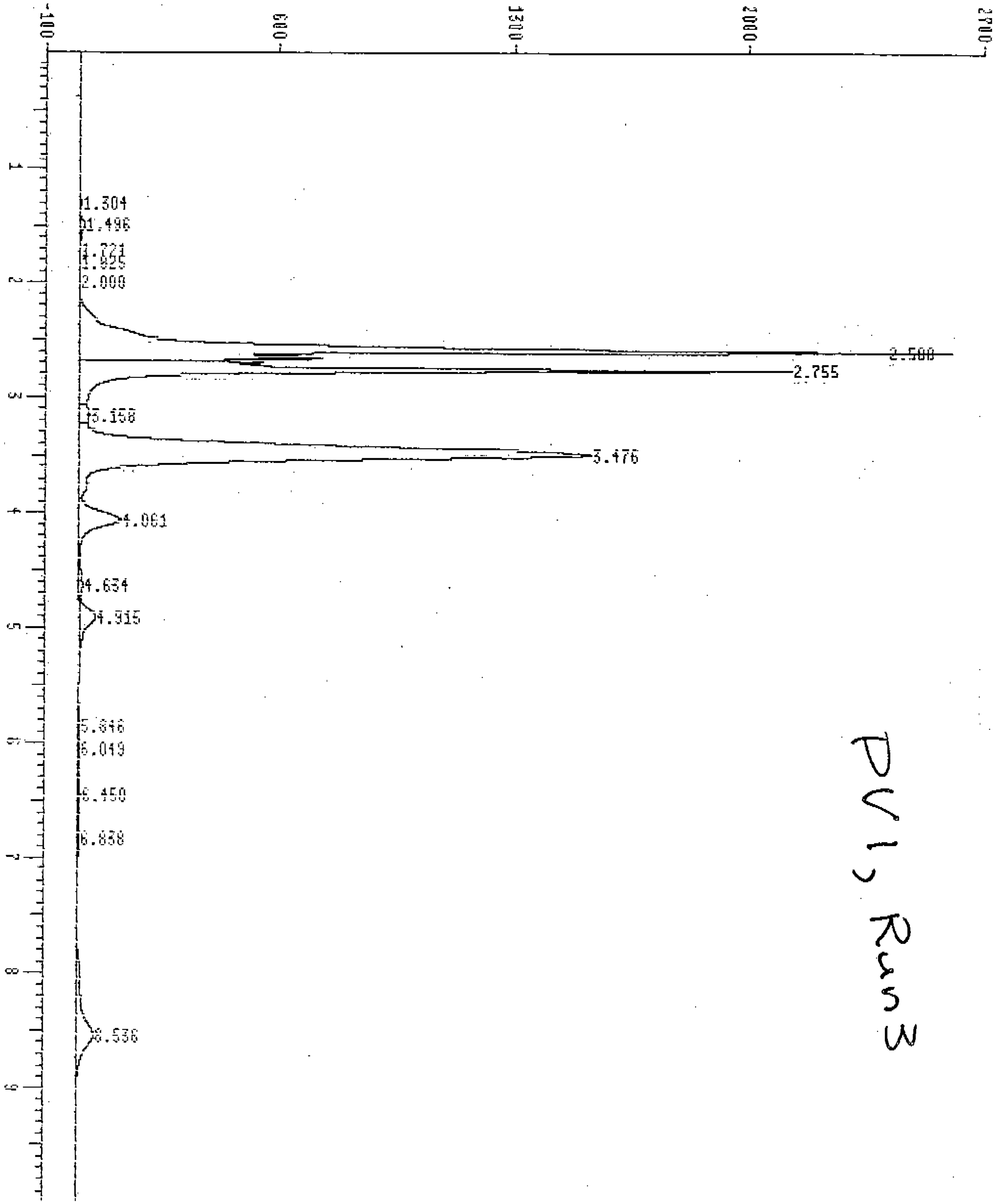
Report by Signal

Operator: 13 Mar 92 9:38 pm
Method File Name : DNPHIII.M
Sample Info : PV 1 Run 2
Misc Info:
Integration File Name : DATA:0315A07B.I
consisting of channels : 1. A 360.4 550.100 of 0315A07B.D
Sequence Index: 1 Bottle Number : 7 Repetition Number: 2

A 360.4 550.100 of 0315A07B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.305	BV	56.3818	3.9888	0.17	100.00	0.236	4.45
1.490	VV	114.66	15.8721	0.35	100.00	0.103	0.46
1.803	VV	12.9447	1.7463	0.04	100.00	0.107	0.53
1.985	VV	10.1442	1.8475	0.03	100.00	0.077	1.08
2.590	VV	10354	2279.07	31.79	100.00	0.062	1.55
2.753	VV	6611.84	1964.75	20.30	100.00	0.056	0.65
3.158	VV	241.48	27.5243	0.74	100.00	0.125	1.35
3.476	VV	12074	1421.21	37.07	100.00	0.129	1.12
4.061	VV	1030.81	101.33	3.16	100.00	0.154	0.93
4.635	VV	148.73	10.0993	0.46	100.00	0.203	2.02
4.916	VV	560.74	41.7837	1.72	100.00	0.196	0.67
6.050	VV	136.90	4.5904	0.42	100.00	0.381	2.47
6.445	VV	104.82	5.8388	0.32	100.00	0.259	0.93
6.837	VB	102.83	5.8732	0.32	100.00	0.262	0.89
8.538	BV	1012.03	39.5928	3.11	100.00	0.358	1.71

: LC A 360,4 550,100 of 0315A08A.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

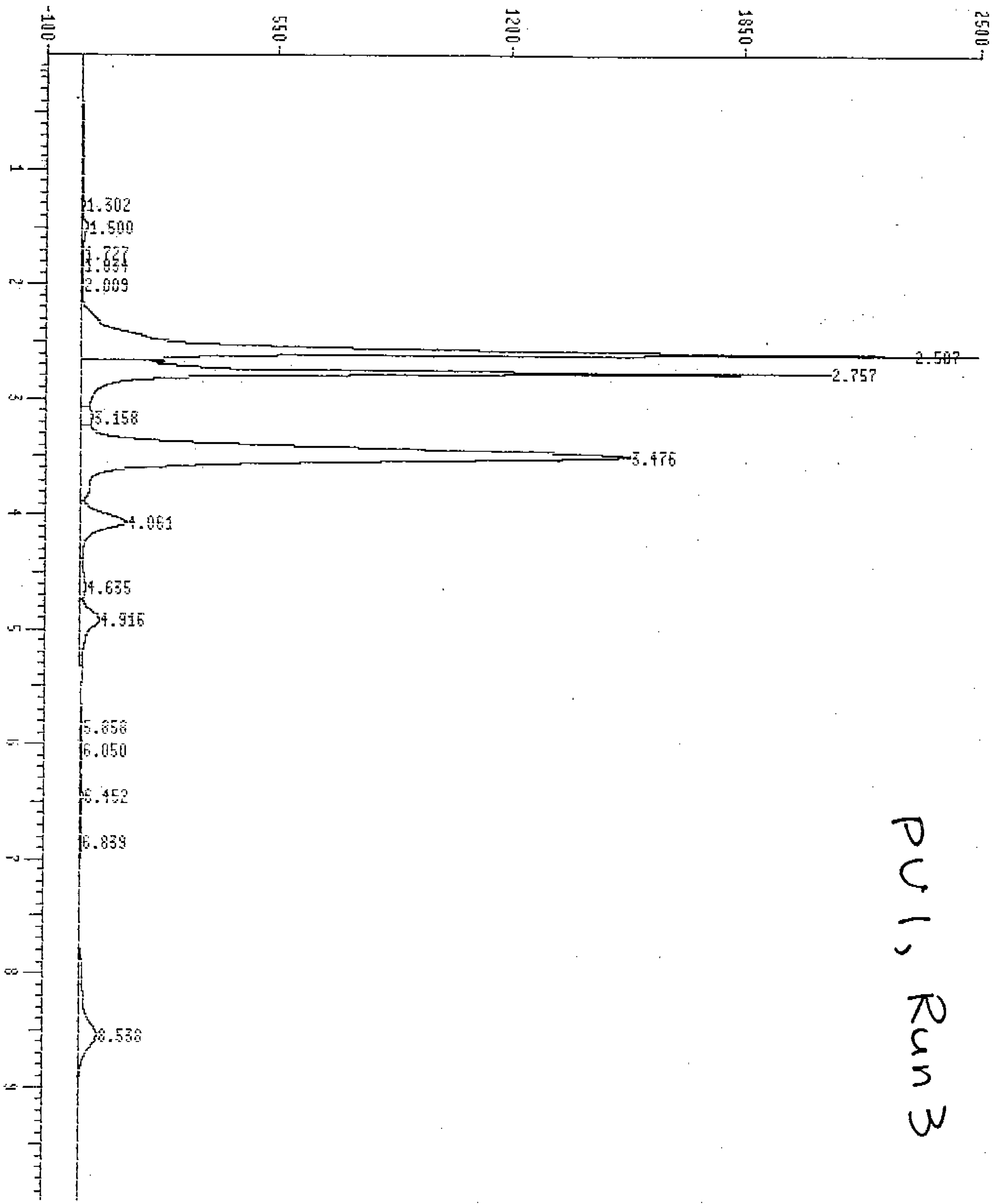
Report by Signal

Operator: 13 Mar 92 9:51 pm
Method File Name : DNPHIII.M
Sample Info : PV1, Run3
Misc Info:
Integration File Name : DATA:0315A08A.I
consisting of channels : 1. A 360.4 550.100 of 0315A08A.D
Sequence Index: 1 Bottle Number : 8 Repetition Number: 1

A 360.4 550.100 of 0315A08A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.304	BV	40.1749	4.6676	0.11	100.00	0.113	3.14
1.496	VV	108.99	14.4574	0.31	100.00	0.110	0.60
1.721	VV	6.5382	1.3448	0.02	100.00	0.081	0.66
1.825	VV	7.5044	1.3689	0.02	100.00	0.084	0.73
2.000	VV	5.2057	1.2377	0.01	100.00	0.070	0.92
2.588	VV	11357	2402.43	31.83	100.00	0.073	1.15
2.755	VV	7362.16	2065.95	20.63	100.00	0.059	0.85
3.158	VV	252.93	28.9546	0.71	100.00	0.124	1.37
3.476	VV	13070	1529.54	36.63	100.00	0.130	1.14
4.061	VV	1214.46	125.78	3.40	100.00	0.148	1.01
4.634	VV	128.99	9.8733	0.36	100.00	0.185	1.90
4.915	VV	579.57	49.1936	1.62	100.00	0.178	0.78
5.846	BV	28.3115	2.2674	0.08	100.00	0.208	1.69
6.049	VV	45.0612	3.2524	0.13	100.00	0.191	0.79
6.450	VV	101.95	6.2796	0.29	100.00	0.241	0.90
6.838	VV	100.18	6.0710	0.28	100.00	0.244	0.89
8.536	PV	1273.70	50.8705	3.57	100.00	0.351	1.68

: LC A 360.4   550.100   of 0315A08B.D



PU 1, Run 3

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

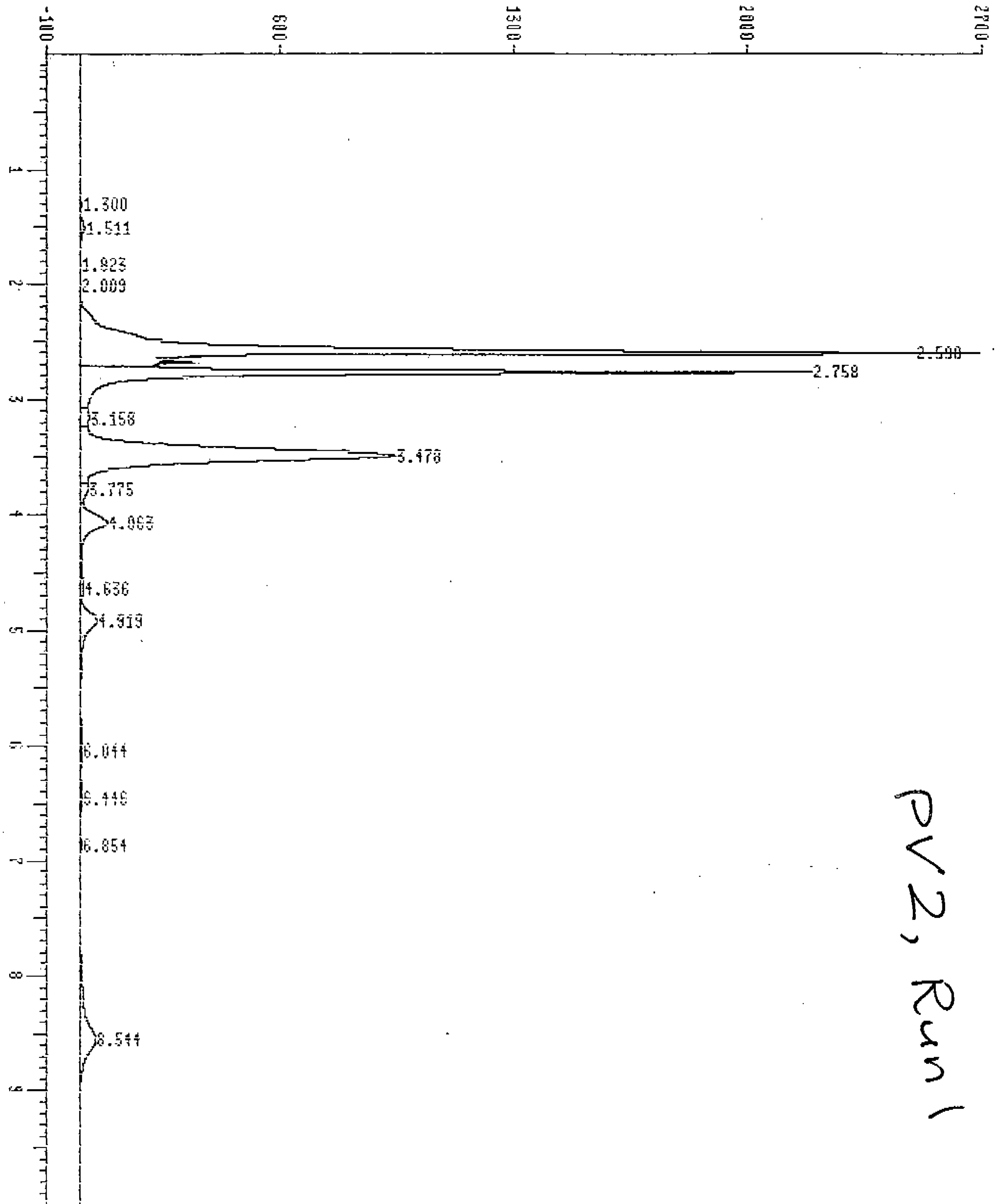
Report by Signal

Operator: 13 Mar 92 10:04 pm
Method File Name : DNPHIII.M
Sample Info : PV1, Run 3
Misc Info:
Integration File Name : DATA:0315A08B.I
consisting of channels : 1. A 360,4 550,100 of 0315A08B.D
Sequence Index: 1 Bottle Number : 8 Repetition Number: 2

A 360,4 550,100 of 0315A08B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.302	BV	71.7356	5.4366	0.21	100.00	0.167	4.31
1.500	VV	122.70	14.9571	0.36	100.00	0.118	0.65
1.727	VV	12.2166	2.3060	0.04	100.00	0.088	0.62
1.834	VV	16.5533	2.3339	0.05	100.00	0.103	0.55
2.009	VV	13.6884	2.4875	0.04	100.00	0.076	1.30
2.587	VV	9614.77	2415.20	28.04	100.00	0.067	1.94
2.757	VV	6779.22	2012.13	19.77	100.00	0.056	0.77
3.158	VV	271.67	30.9027	0.79	100.00	0.125	1.35
3.476	VV	13182	1533.63	38.45	100.00	0.130	1.13
4.061	VV	1322.07	129.49	3.86	100.00	0.155	0.95
4.635	VV	217.34	14.0485	0.63	100.00	0.213	2.17
4.916	VV	738.72	53.7291	2.15	100.00	0.200	0.67
5.858	VV	105.61	5.8238	0.31	100.00	0.302	3.14
6.050	VV	99.8516	6.4275	0.29	100.00	0.219	0.70
6.452	VV	160.54	8.7203	0.47	100.00	0.270	1.05
6.839	VV	173.67	8.0157	0.51	100.00	0.304	0.70
8.538	VV	1382.93	51.6264	4.03	100.00	0.371	1.80

: LC A 360.4 550.100 of 0315A09A.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

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Operator: 13 Mar 92 10:17 pm

Method File Name : DNPHIII.M

Sample Info : PVZ, Run 1

Misc Info:

Integration File Name : DATA:0315A09A.I

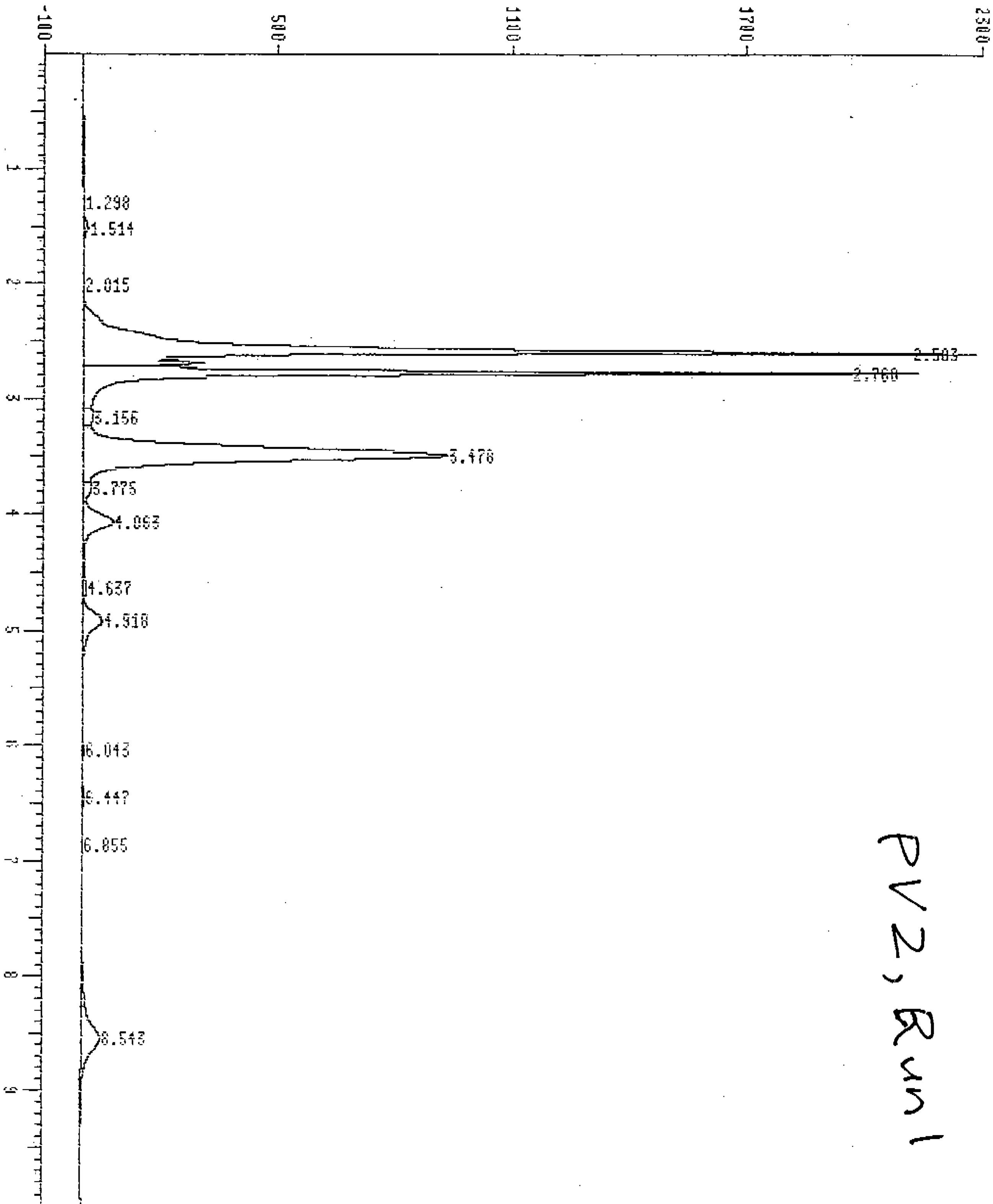
consisting of channels : 1. A 360,4 550,100 of 0315A09A.D

Sequence Index: 1 Bottle Number : 9 Repetition Number: 1

A 360,4 550,100 of 0315A09A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.300	BV	68.6546	4.6409	0.24	100.00	0.185	5.22
1.511	VV	119.12	13.5087	0.41	100.00	0.117	0.87
1.823	VV	11.1590	1.5912	0.04	100.00	0.117	0.45
2.009	VV	11.0217	1.8796	0.04	100.00	0.081	0.98
2.590	VV	10718	2482.60	37.21	100.00	0.078	1.40
2.758	VV	6344.58	1864.77	22.03	100.00	0.057	0.59
3.158	VV	232.98	26.6216	0.81	100.00	0.125	1.07
3.478	VV	8036.79	939.76	27.90	100.00	0.130	1.16
3.775	VV	186.24	23.3705	0.65	100.00	0.117	0.64
4.063	VV	851.73	81.9539	2.96	100.00	0.157	0.92
4.636	VV	147.77	10.1550	0.51	100.00	0.200	2.10
4.919	VV	695.52	52.1725	2.41	100.00	0.196	0.67
6.044	VV	118.06	4.0851	0.41	100.00	0.382	2.23
6.446	VV	83.5530	4.9813	0.29	100.00	0.240	0.96
6.854	VB	45.6259	2.5883	0.16	100.00	0.251	0.91
8.544	BV	1132.68	48.2405	3.93	100.00	0.331	1.50

: LC A 360,4 550,100 of 0315A09B.D



PV2, Run 1

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

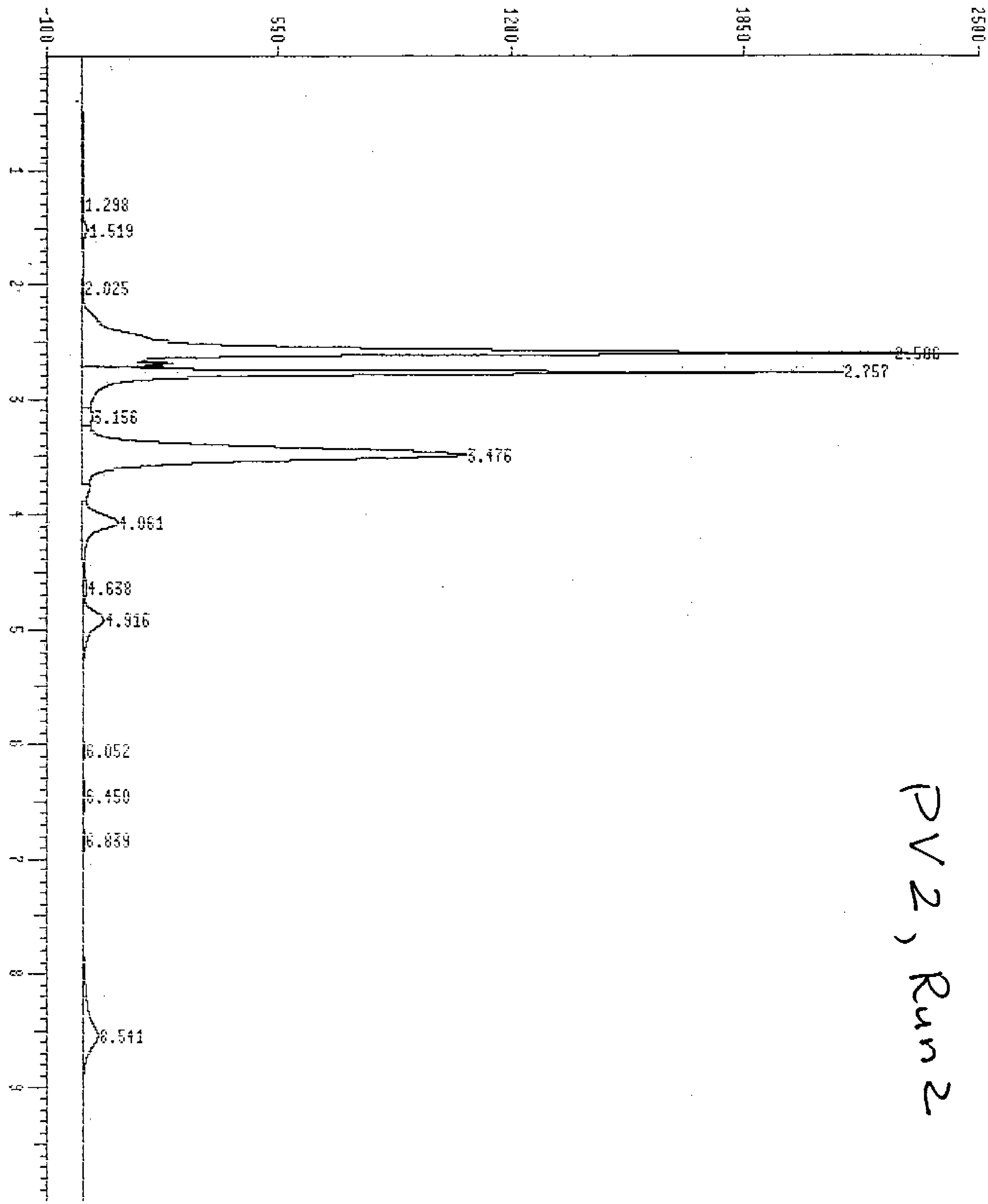
Report by Signal

Operator: 13 Mar 92 10:30 pm
Method File Name : DNPHIII.M
Sample Info : PV2, Run 1
Misc Info:
Integration File Name : DATA:0315A09B.I
consisting of channels : 1. A 360,4 550,100 of 0315A09B.D
Sequence Index: 1 Bottle Number : 9 Repetition Number: 2

A 360,4 550,100 of 0315A09B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.298	BV	29.6515	3.6386	0.11	100.00	0.107	3.22
1.514	VV	93.5710	12.5633	0.35	100.00	0.101	1.13
2.015	PV	4.2600	1.1099	0.02	100.00	0.064	0.82
2.583	VV	9788.87	2180.72	36.34	100.00	0.084	1.36
2.760	VV	5913.51	1828.92	21.95	100.00	0.054	0.60
3.156	VV	218.81	25.1402	0.81	100.00	0.125	1.06
3.478	VV	7984.54	933.09	29.64	100.00	0.130	1.17
3.775	VV	160.32	21.0269	0.60	100.00	0.112	0.63
4.063	VV	797.28	79.7609	2.96	100.00	0.153	0.97
4.637	VV	106.40	8.0396	0.39	100.00	0.185	2.05
4.918	VV	572.19	49.5122	2.12	100.00	0.175	0.83
6.043	BV	60.2284	2.7739	0.22	100.00	0.285	1.73
6.447	VV	64.6683	4.1755	0.24	100.00	0.220	0.94
6.855	VB	39.0816	2.3272	0.15	100.00	0.246	0.89
8.543	BV	1107.13	47.9487	4.11	100.00	0.327	1.45

: LC A 360.4   550.100   of 0315A10A.D



PV2, Run2

End of plot. Time =   0.00 to   9.98 minutes   Chart speed =   2.00 cm/min

*** Area Percent ***

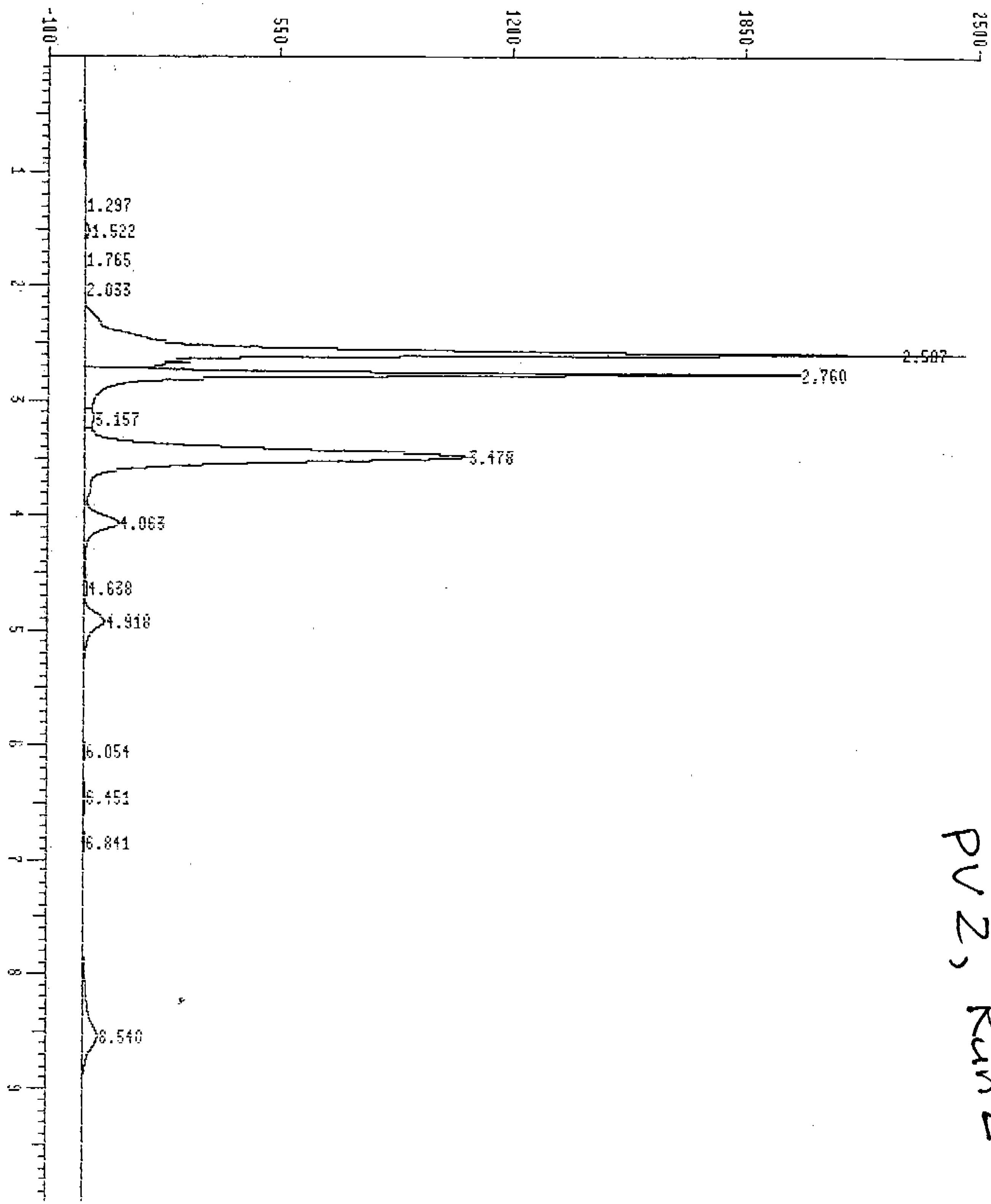
Report by Signal

Operator: 13 Mar 92 10:43 pm
Method File Name : DNPHIII.M
Sample Info : PVZ, Run 2
Misc Info:
Integration File Name : DATA:0315A10A.I
consisting of channels : 1. A 360.4 550.100 of 0315A10A.D
Sequence Index: 1 Bottle Number : 10 Repetition Number: 1

A 360.4 550.100 of 0315A10A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.298	BV	39.1228	3.1451	0.13	100.00	0.157	4.06
1.519	VV	107.84	14.5916	0.37	100.00	0.098	0.93
2.025	VV	10.7939	2.0252	0.04	100.00	0.074	1.25
2.586	VV	10331	2293.35	35.35	100.00	0.062	1.53
2.757	VV	5942.29	2057.53	20.33	100.00	0.042	0.46
3.156	VV	249.97	27.8756	0.86	100.00	0.128	1.12
3.476	VV	9079.89	1073.59	31.07	100.00	0.128	1.15
4.061	VV	1063.23	101.76	3.64	100.00	0.157	0.89
4.638	VV	157.58	11.1256	0.54	100.00	0.197	2.05
4.916	VV	763.79	60.0406	2.61	100.00	0.188	0.73
6.052	VV	138.60	4.6640	0.47	100.00	0.382	2.33
6.450	VV	126.71	7.0056	0.43	100.00	0.260	0.92
6.839	VV	114.64	5.3140	0.39	100.00	0.293	0.60
8.541	VB	1102.49	42.7297	3.77	100.00	0.358	1.71

LC A 360,4 550,100 of 0315A10B.D



PV 2, Run 2

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

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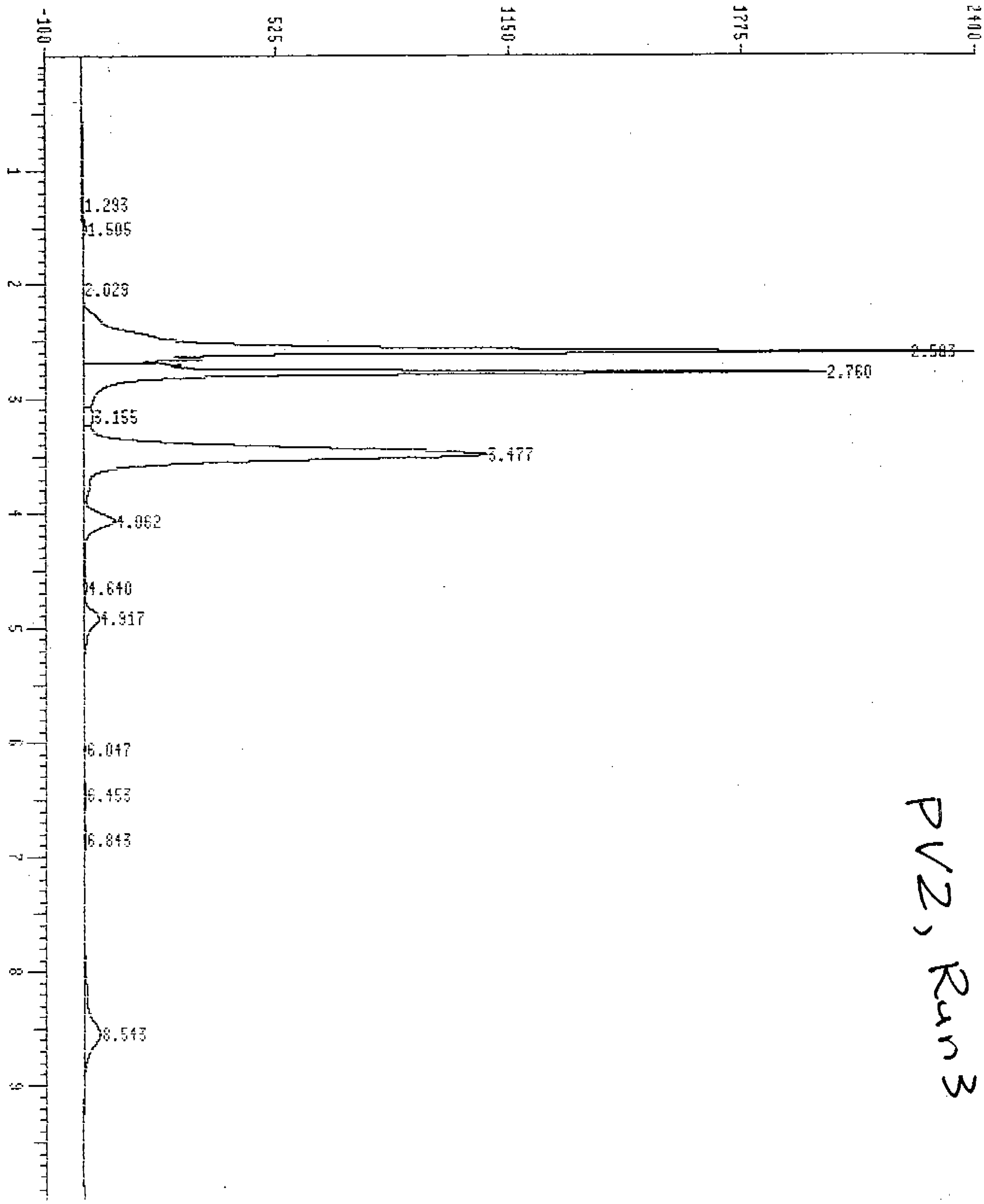
perator: 13 Mar 92 10:57 pm
Method File Name : DNPHIII.M
Sample Info : PV 2, Run 2
Misc Info:
Integration File Name : DATA:0315A10B.I
consisting of channels : 1. A 360.4 550.100 of 0315A10B.D
Sequence Index: 1 Bottle Number : 10 Repetition Number: 2

A 360.4 550.100 of 0315A10B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.297	BV	29.0788	2.8516	0.10	100.00	0.131	3.15
1.522	VV	99.6240	14.1474	0.35	100.00	0.094	0.98
1.765	VV	4.2811	0.7963	0.01	100.00	0.090	1.20
2.033	PV	3.9960	1.1277	0.01	100.00	0.054	1.08
2.587	VV	10436	2332.47	36.18	100.00	0.061	1.45
2.760	VV	5870.84	1929.30	20.35	100.00	0.051	0.57
3.157	VV	232.65	26.1260	0.81	100.00	0.128	1.13
3.478	VV	9134.48	1072.29	31.67	100.00	0.129	1.12
4.063	VV	984.28	99.4273	3.41	100.00	0.151	0.95
4.638	VV	101.68	8.1993	0.35	100.00	0.177	1.85
4.918	VV	651.88	56.9893	2.26	100.00	0.173	0.81
6.054	BV	59.4270	2.8290	0.21	100.00	0.289	1.74
6.451	VV	89.2883	5.4323	0.31	100.00	0.241	0.88
6.841	VV	65.8717	4.0650	0.23	100.00	0.249	0.82
8.540	PV	1081.97	42.5593	3.75	100.00	0.353	1.68

LC A 360.4 550.100 of 0315A11A.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

Operator: 13 Mar 92 11:10 pm

Method File Name : DNPHIII.M

Sample Info : PV Z, Run 3

Misc Info:

Integration File Name : DATA:0315A11A.I

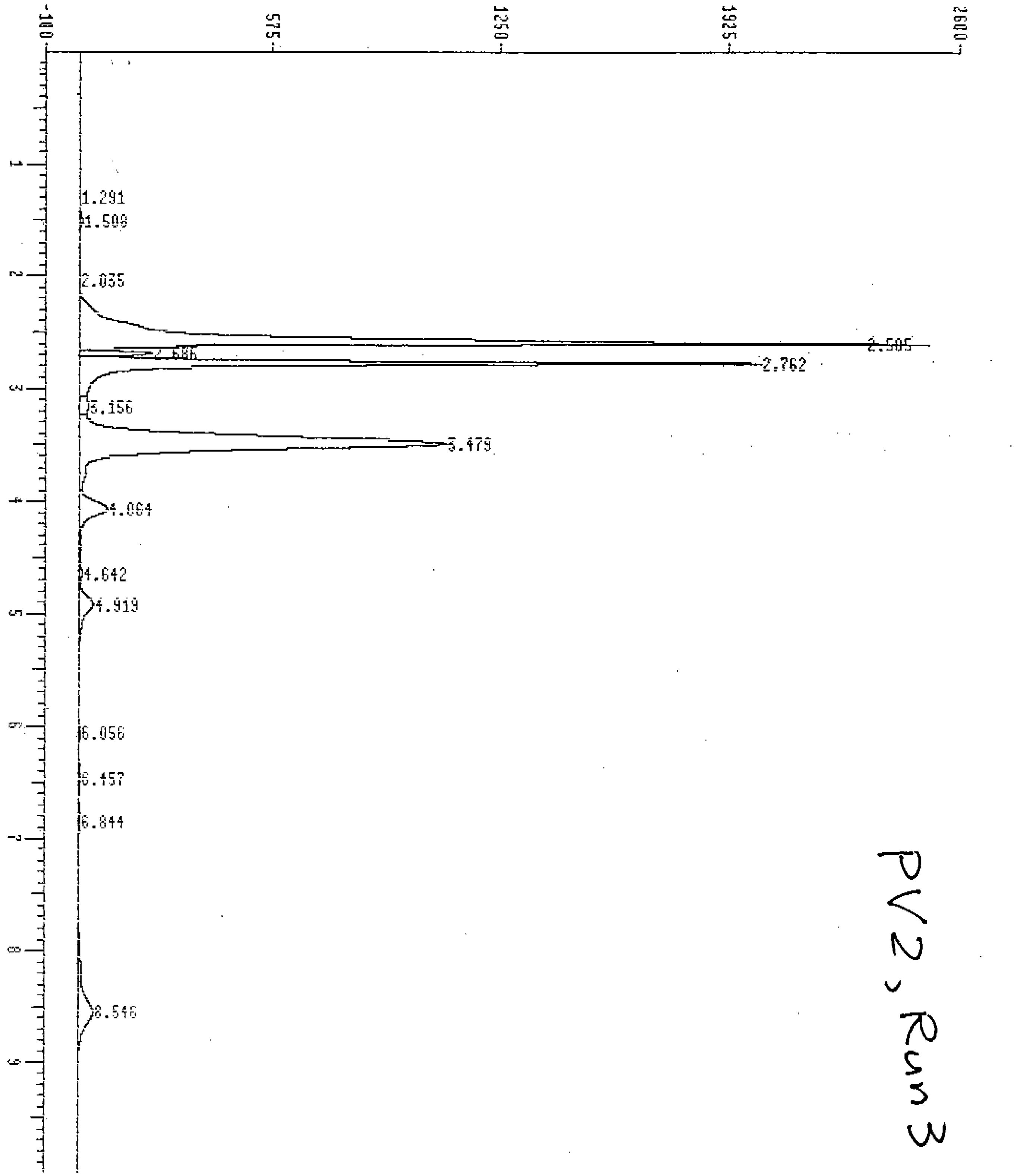
consisting of channels : 1. A 360.4 550.100 of 0315A11A.D

Sequence Index: 1 Bottle Number : 11 Repetition Number: 1

A 360.4 550.100 of 0315A11A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.293	BV	35.1389	3.3667	0.12	100.00	0.134	3.88
1.505	VV	88.4453	10.7812	0.31	100.00	0.110	1.02
2.029	PV	3.5941	1.0627	0.01	100.00	0.051	0.98
2.583	VV	9848.97	2304.39	34.48	100.00	0.059	1.79
2.760	VV	6434.33	1954.02	22.52	100.00	0.055	0.71
3.155	VV	227.41	26.0296	0.80	100.00	0.126	1.06
3.477	VV	9269.98	1086.97	32.45	100.00	0.129	1.13
4.062	VV	839.06	85.5253	2.94	100.00	0.150	0.98
4.640	VV	76.3713	6.2830	0.27	100.00	0.176	1.82
4.917	VV	470.80	41.1224	1.65	100.00	0.173	0.82
6.047	BV	51.3271	2.4234	0.18	100.00	0.276	1.69
6.453	VV	74.9936	4.6492	0.26	100.00	0.238	0.91
6.843	VB	81.0622	5.0284	0.28	100.00	0.237	0.98
8.543	BV	1066.60	44.9314	3.73	100.00	0.334	1.53

LC A 360,4 550,100 of 0315A11B.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

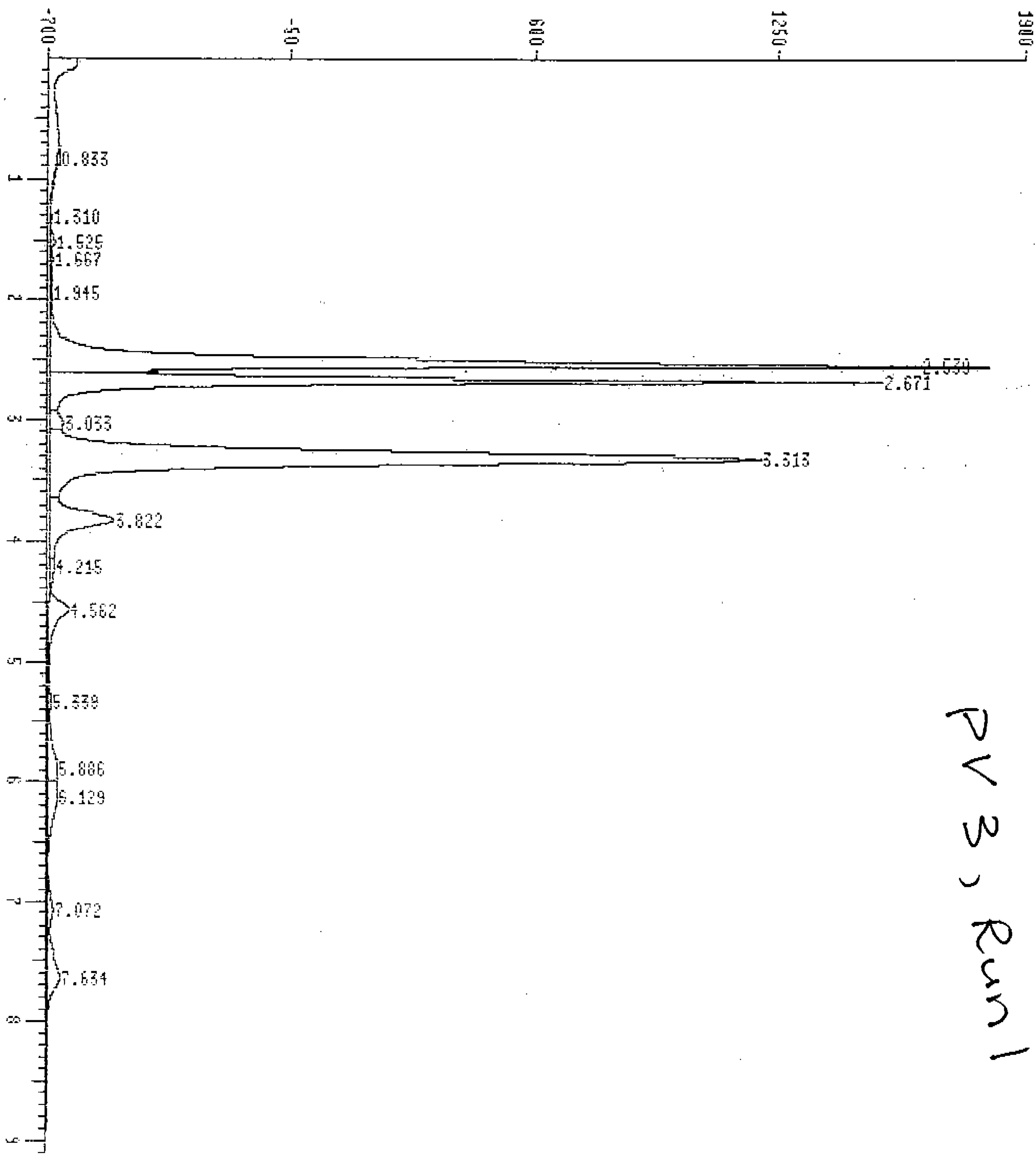
Report by Signal

.perator: 13 Mar 92 11:23 pm
'ethod File Name : DNPHIII.M
Sample Info : PV2, Run3
Misc Info:
Integration File Name : DATA:0315A11B.I
consisting of channels : 1. A 360.4 550.100 of 0315A11B.D
Sequence Index: 1 Bottle Number : 11 Repetition Number: 2

A 360.4 550.100 of 0315A11B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.291	BV	32.2450	3.3201	0.11	100.00	0.162	2.96
1.508	VV	88.6247	10.7470	0.32	100.00	0.111	1.01
2.035	PV	3.6313	1.0330	0.01	100.00	0.054	0.98
2.585	VV	9391.40	2327.50	33.38	100.00	0.056	2.28
2.686	VV	582.95	212.78	2.07	100.00	0.046	0.88
2.762	VV	5859.17	1959.45	20.83	100.00	0.050	0.56
3.156	VV	228.06	26.1205	0.81	100.00	0.125	1.07
3.479	VV	9272.88	1086.90	32.96	100.00	0.129	1.13
4.064	VV	837.08	85.4615	2.98	100.00	0.150	0.99
4.642	VV	76.1231	6.2346	0.27	100.00	0.173	1.82
4.919	VV	469.90	41.0667	1.67	100.00	0.174	0.81
6.056	BV	51.5316	2.4139	0.18	100.00	0.277	1.75
6.457	VV	75.5257	4.7158	0.27	100.00	0.230	0.94
6.844	VV	83.7943	5.1093	0.30	100.00	0.245	1.00
8.546	PV	1078.34	45.0396	3.83	100.00	0.337	1.54

1: LC A 360.4   550.100   of 0315A12A.D



PV 3, Run 1

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

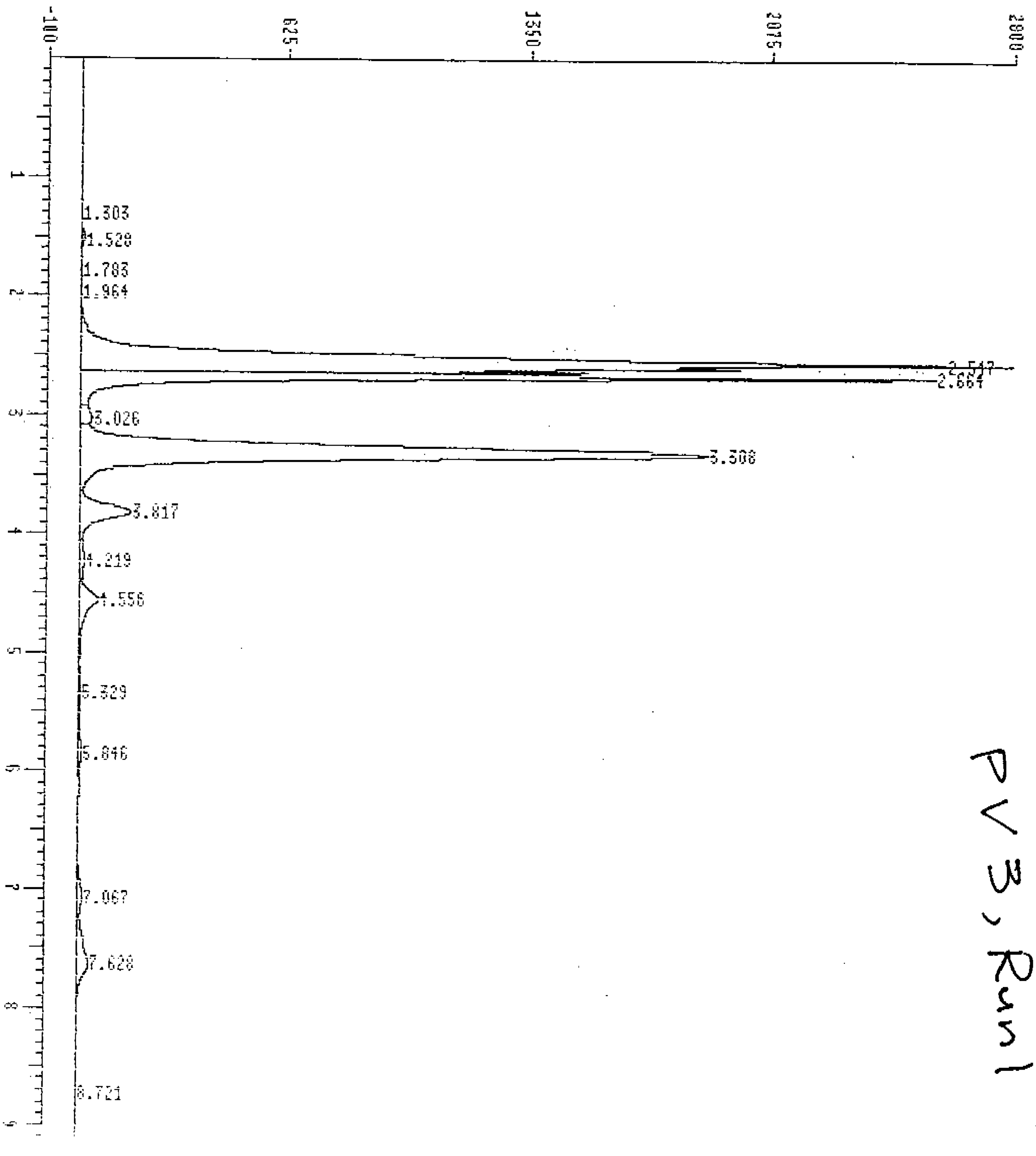
Report by Signal

Operator: 14 Mar 92 10:16 am
Method File Name : DNPHIII.M
Sample Info : PV 3, Run 1
Misc Info:
Integration File Name : DATA:0315A12A.I
consisting of channels : 1. A 360.4 550.100 of 0315A12A.D
Sequence Index: 1 Bottle Number : 12 Repetition Number: 1

A 360.4 550.100 of 0315A12A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
0.833	BV	43.4681	10.1636	0.11	100.00	0.089	1.04
1.310	PV	9.7611	3.3455	0.03	100.00	0.045	0.73
1.525	VV	77.7228	11.9620	0.20	100.00	0.087	1.51
1.667	VV	73.3241	6.6641	0.19	100.00	0.155	0.32
1.945	VV	20.2989	3.8494	0.05	100.00	0.075	1.11
2.539	VV	10644	2398.13	27.48	100.00	0.074	1.94
2.671	VV	7620.65	2034.19	19.68	100.00	0.062	0.85
3.033	VV	303.23	38.0076	0.78	100.00	0.114	1.87
3.313	VV	15160	1898.88	39.14	100.00	0.121	1.07
3.822	VV	1861.15	174.05	4.81	100.00	0.157	0.88
4.215	VV	168.80	14.0674	0.44	100.00	0.165	0.51
4.562	VV	671.62	54.7703	1.73	100.00	0.179	0.62
5.338	VV	89.6960	6.3294	0.23	100.00	0.204	1.51
5.886	VV	490.92	25.6472	1.27	100.00	0.272	2.07
6.129	VV	545.12	25.3845	1.41	100.00	0.306	0.50
7.072	VV	252.87	15.2401	0.65	100.00	0.241	1.32
7.634	VV	696.16	34.4633	1.80	100.00	0.281	1.56

1: LC A 360,4 550,100 of 0315A12B.D



PV3, Run1

9.821

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

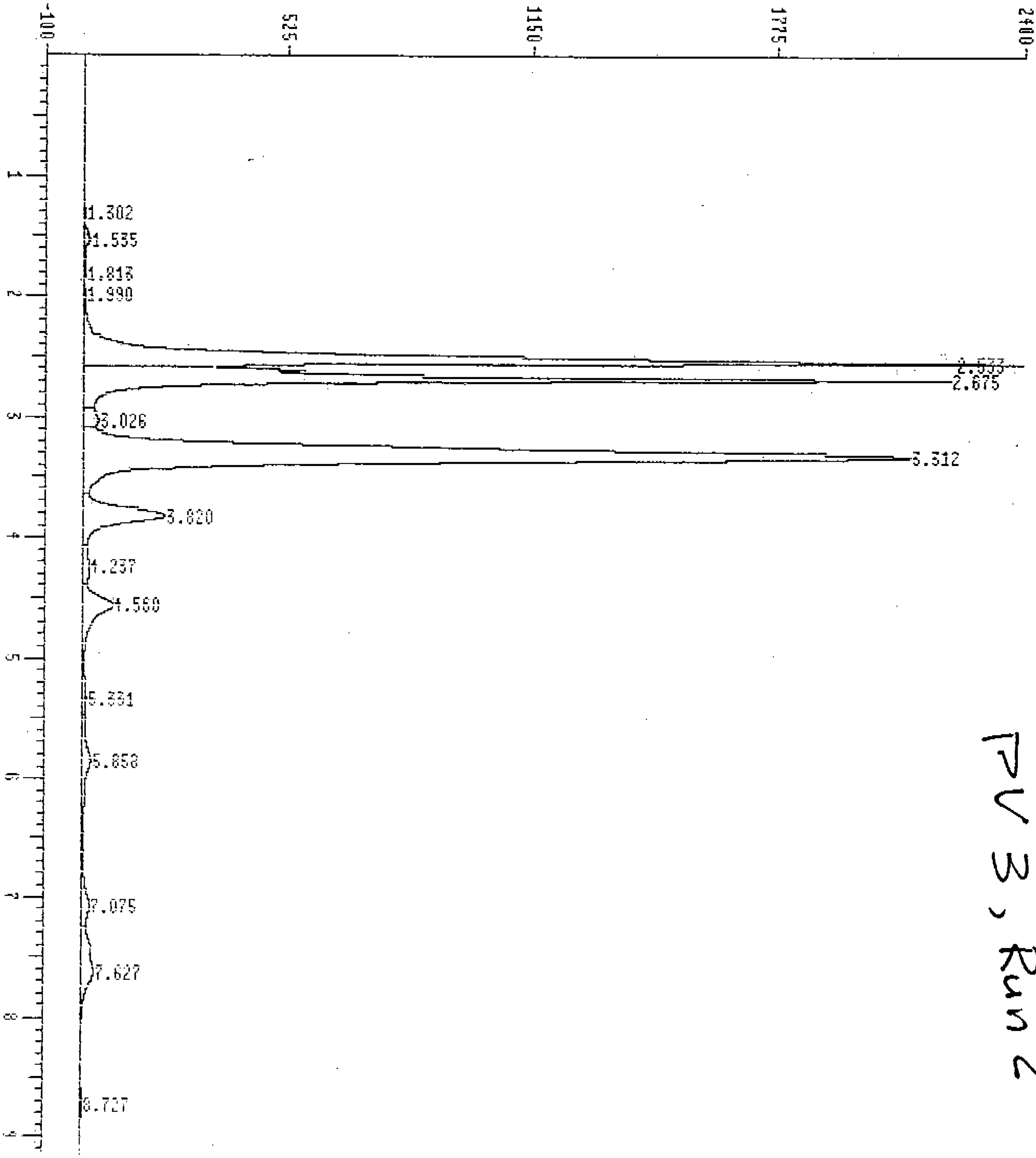
Report by Signal

Operator: 14 Mar 92 10:29 am
Method File Name : DNPHIII.M
Sample Info : PV 3, Run 1
Misc Info:
Integration File Name : DATA:0315A12B.I
consisting of channels : 1. A 360.4 550.100 of 0315A12B.D
Sequence Index: 1 Bottle Number : 12 Repetition Number: 2

A 360.4 550.100 of 0315A12B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.303	BV	14.6687	3.7421	0.03	100.00	0.057	0.78
1.528	VV	97.7002	12.3256	0.22	100.00	0.104	1.00
1.783	VV	11.2951	2.0393	0.03	100.00	0.079	0.58
1.964	VV	11.0005	2.5227	0.02	100.00	0.065	1.22
2.547	VV	17138	2674.89	38.56	100.00	0.089	0.98
2.664	VV	7887.47	2556.77	17.75	100.00	0.045	0.63
3.026	VV	304.57	37.3365	0.69	100.00	0.116	1.60
3.308	VV	14777	1885.41	33.25	100.00	0.119	1.08
3.817	VV	1480.20	159.63	3.33	100.00	0.140	0.94
4.219	VV	266.32	16.3091	0.60	100.00	0.216	0.95
4.556	VV	788.27	58.3328	1.77	100.00	0.193	0.57
5.329	VV	140.97	8.3720	0.32	100.00	0.236	1.47
5.846	VV	269.77	13.4367	0.61	100.00	0.282	1.69
7.067	VV	319.63	17.4678	0.72	100.00	0.261	1.42
7.628	VV	782.29	36.3798	1.76	100.00	0.296	1.53
8.721	VV	43.9419	1.8590	0.10	100.00	0.320	0.99
9.821	PBA	106.88	18.3378	0.24	100.00	0.135	1.15

1: LC A 360.4   550.100   of 0315A13A.D



PV 3, Run 2

9.832

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

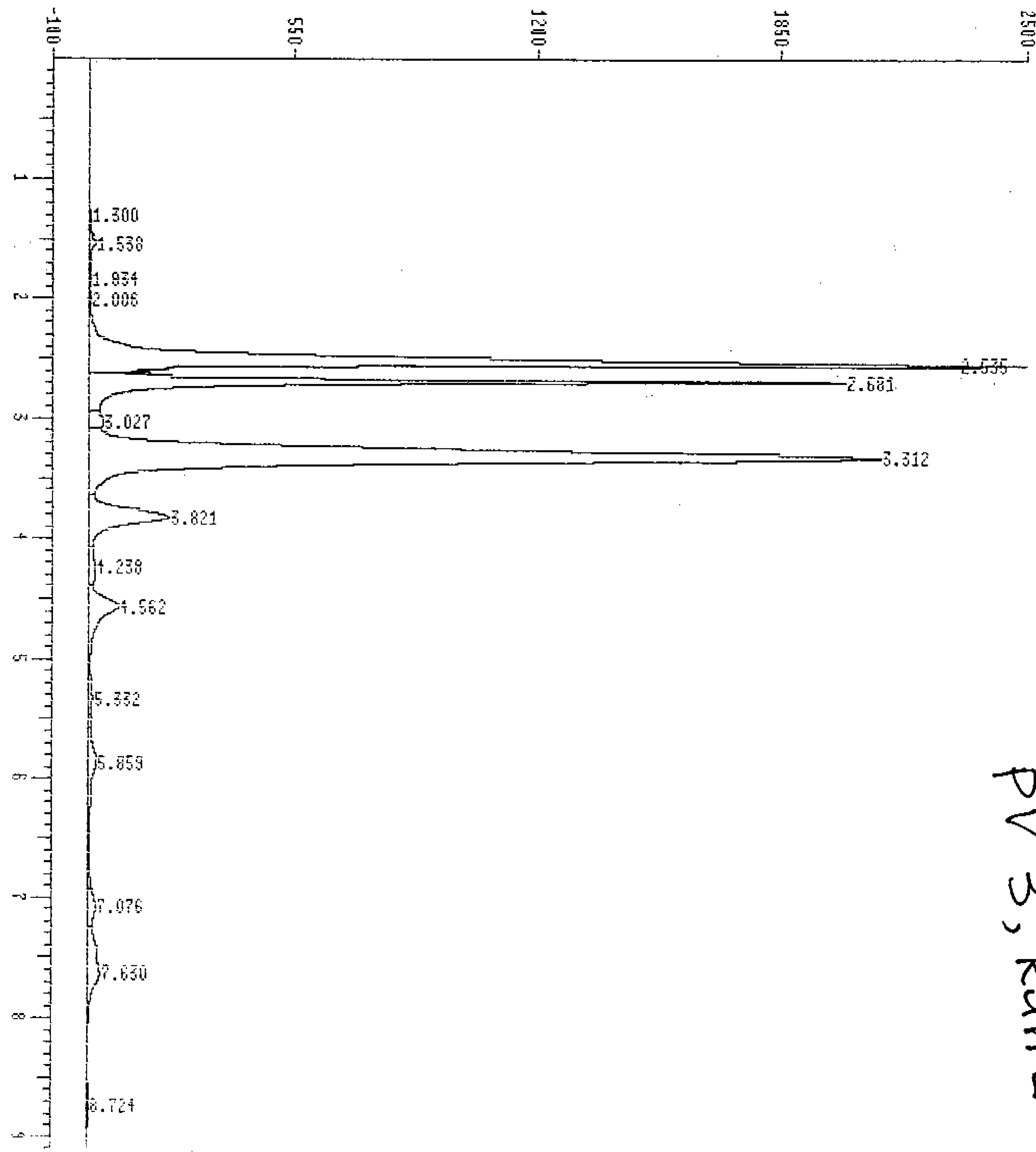
Report by Signal

Operator: 14 Mar 92 10:42 am
Method File Name : DNPHIII.M
Sample Info : PV 3, Run 2
Misc Info:
Integration File Name : DATA:0315A13A.I
consisting of channels : 1. A 360.4 550.100 of 0315A13A.D
Sequence Index: 1 Bottle Number : 13 Repetition Number: 1

A 360.4 550.100 of 0315A13A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.302	BV	17.6176	4.1959	0.04	100.00	0.070	0.75
1.535	VV	130.11	15.3922	0.32	100.00	0.114	0.94
1.813	VV	11.4776	2.0399	0.03	100.00	0.081	0.53
1.990	VV	16.9667	3.5333	0.04	100.00	0.070	1.36
2.533	VV	10105	2269.55	24.52	100.00	0.061	2.25
2.675	VV	8569.56	2150.92	20.79	100.00	0.066	1.01
3.026	VV	313.90	38.8231	0.76	100.00	0.115	1.55
3.312	VV	16668	2115.12	40.45	100.00	0.119	1.09
3.820	VV	1972.73	214.34	4.79	100.00	0.140	0.97
4.237	VV	261.08	15.1706	0.63	100.00	0.227	0.95
4.560	VV	1030.50	78.8019	2.50	100.00	0.188	0.60
5.331	VV	168.80	9.5400	0.41	100.00	0.240	1.76
5.858	VV	559.22	22.0162	1.36	100.00	0.346	0.88
7.075	VV	365.32	19.8209	0.89	100.00	0.260	1.51
7.627	VV	781.84	31.2583	1.90	100.00	0.334	1.82
8.727	PV	40.2754	1.7325	0.10	100.00	0.311	0.96
9.832	PBA	198.30	27.9273	0.48	100.00	0.152	1.02

1: LC A 360,4   550,100   of 0315A13B.D



PV 3, Run 2

9.835

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

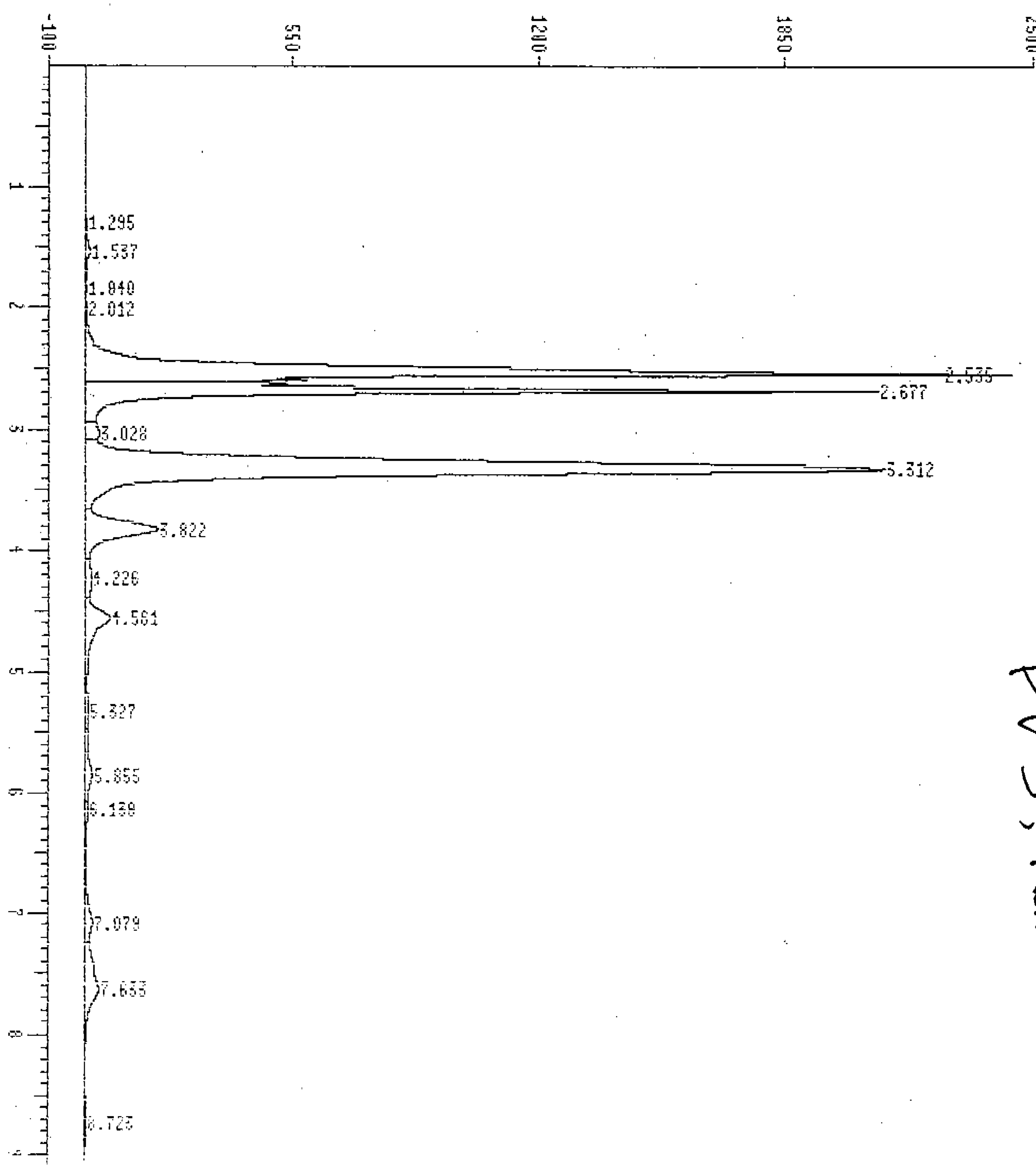
Report by Signal

Operator: 14 Mar 92 10:55 am
Method File Name : DNPHIII.M
Sample Info : PV 3, Run 2
Misc Info:
Integration File Name : DATA:0315A13B.I
consisting of channels : 1. A 360.4 550.100 of 0315A13B.D
Sequence Index: 1 Bottle Number : 13 Repetition Number: 2

A 360.4 550.100 of 0315A13B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.300	BV	28.4700	4.5185	0.07	100.00	0.105	1.27
1.538	VV	138.60	15.5765	0.36	100.00	0.121	0.90
1.834	VV	12.2495	2.0652	0.03	100.00	0.084	0.54
2.006	VV	18.9355	3.8948	0.05	100.00	0.070	1.41
2.535	VV	10465	2344.30	27.08	100.00	0.061	2.18
2.681	VV	5579.05	1675.80	14.44	100.00	0.055	0.58
3.027	VV	316.51	39.1481	0.82	100.00	0.115	1.55
3.312	VV	16683	2117.80	43.17	100.00	0.119	1.08
3.821	VV	1982.09	214.32	5.13	100.00	0.140	0.97
4.238	VV	263.34	15.4182	0.68	100.00	0.225	0.93
4.561	VV	1039.16	78.8838	2.69	100.00	0.190	0.59
5.332	VV	174.62	9.6654	0.45	100.00	0.246	1.65
5.859	VV	560.93	22.0793	1.45	100.00	0.347	0.87
7.076	VV	364.04	19.7173	0.94	100.00	0.263	1.54
7.630	VV	782.09	31.2805	2.02	100.00	0.335	1.83
8.724	PB	36.4322	1.7004	0.09	100.00	0.283	0.95
9.835	BBA	202.68	26.7044	0.52	100.00	0.155	0.88

1: LC A 360.4   550.100   of 0315A14A.D



PV 3, Run 3

9.834

nd of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

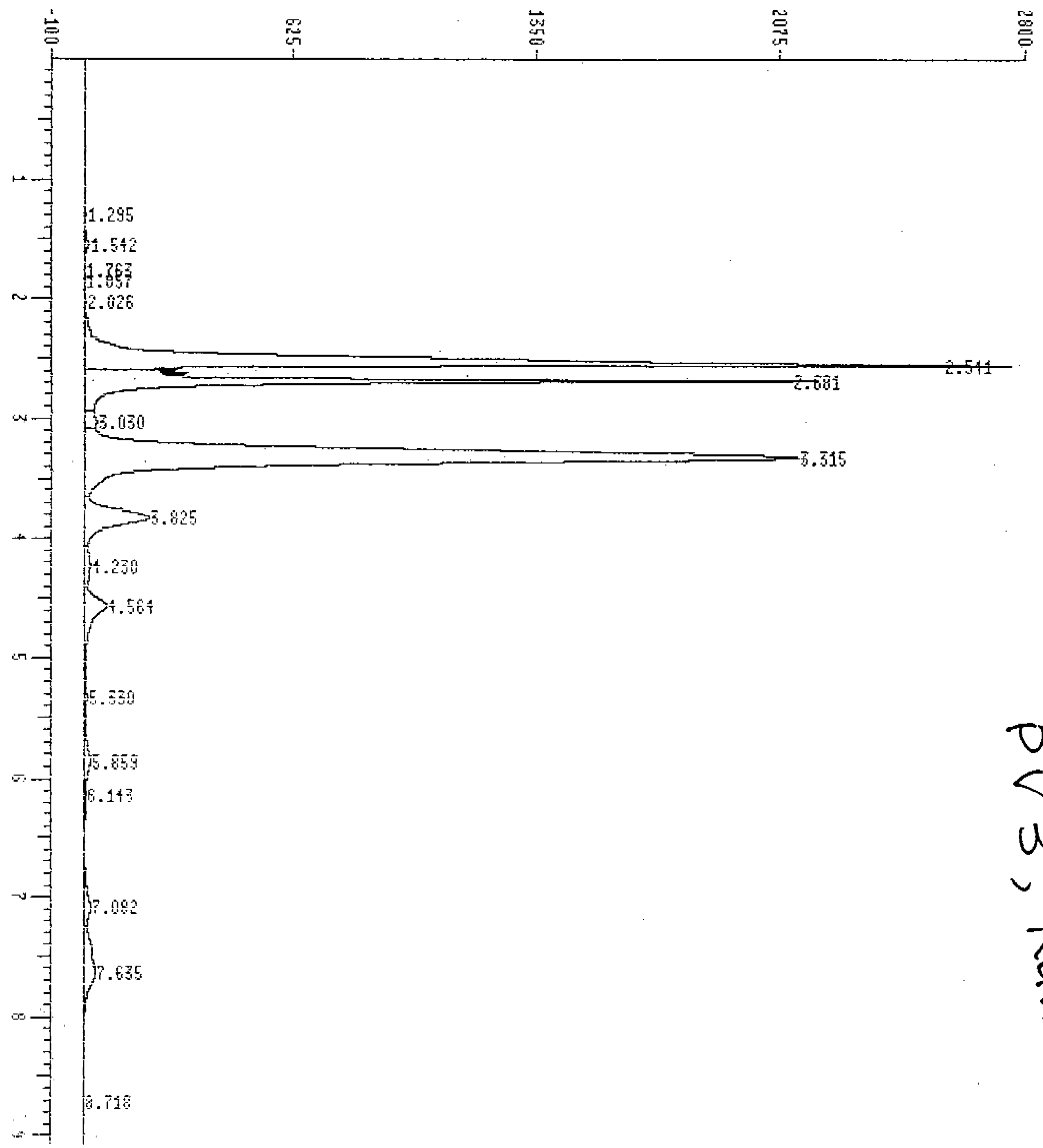
Report by Signal

Operator: 14 Mar 92 11:08 am
Method File Name : DNPHIII.M
Sample Info : PV3, Run 3
Misc Info:
Integration File Name : DATA:0315A14A.I
consisting of channels : 1. A 360.4 550.100 of 0315A14A.D
Sequence Index: 1 Bottle Number : 14 Repetition Number: 1

A 360.4 550.100 of 0315A14A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.295	BV	22.9858	4.2934	0.06	100.00	0.074	1.27
1.537	VV	114.04	13.0746	0.28	100.00	0.115	1.05
1.840	VV	9.9214	1.7700	0.02	100.00	0.081	0.71
2.012	VV	16.5695	3.4014	0.04	100.00	0.081	1.47
2.535	VV	11352	2400.54	27.79	100.00	0.075	1.54
2.677	VV	7161.85	2065.85	17.53	100.00	0.058	0.84
3.028	VV	300.28	37.8391	0.73	100.00	0.113	1.63
3.312	VV	16848	2116.54	41.23	100.00	0.120	1.07
3.822	VV	1834.58	196.49	4.49	100.00	0.141	0.94
4.226	VV	287.53	17.7317	0.70	100.00	0.215	0.93
4.561	VV	905.50	65.6318	2.22	100.00	0.197	0.56
5.327	VV	136.48	7.9920	0.33	100.00	0.231	1.53
5.855	VV	359.09	18.1101	0.88	100.00	0.281	1.59
6.138	VV	117.33	6.6832	0.29	100.00	0.245	0.29
7.079	VV	338.70	18.6127	0.83	100.00	0.261	1.56
7.633	VV	836.73	35.8014	2.05	100.00	0.317	1.72
8.723	PB	29.8366	1.4440	0.07	100.00	0.264	1.05
9.834	BBA	188.39	25.8290	0.46	100.00	0.151	0.88

1: LC A 360,4   550,100   of 0315A14B.D



PV3, Run3

of plot. Time = 0.01 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

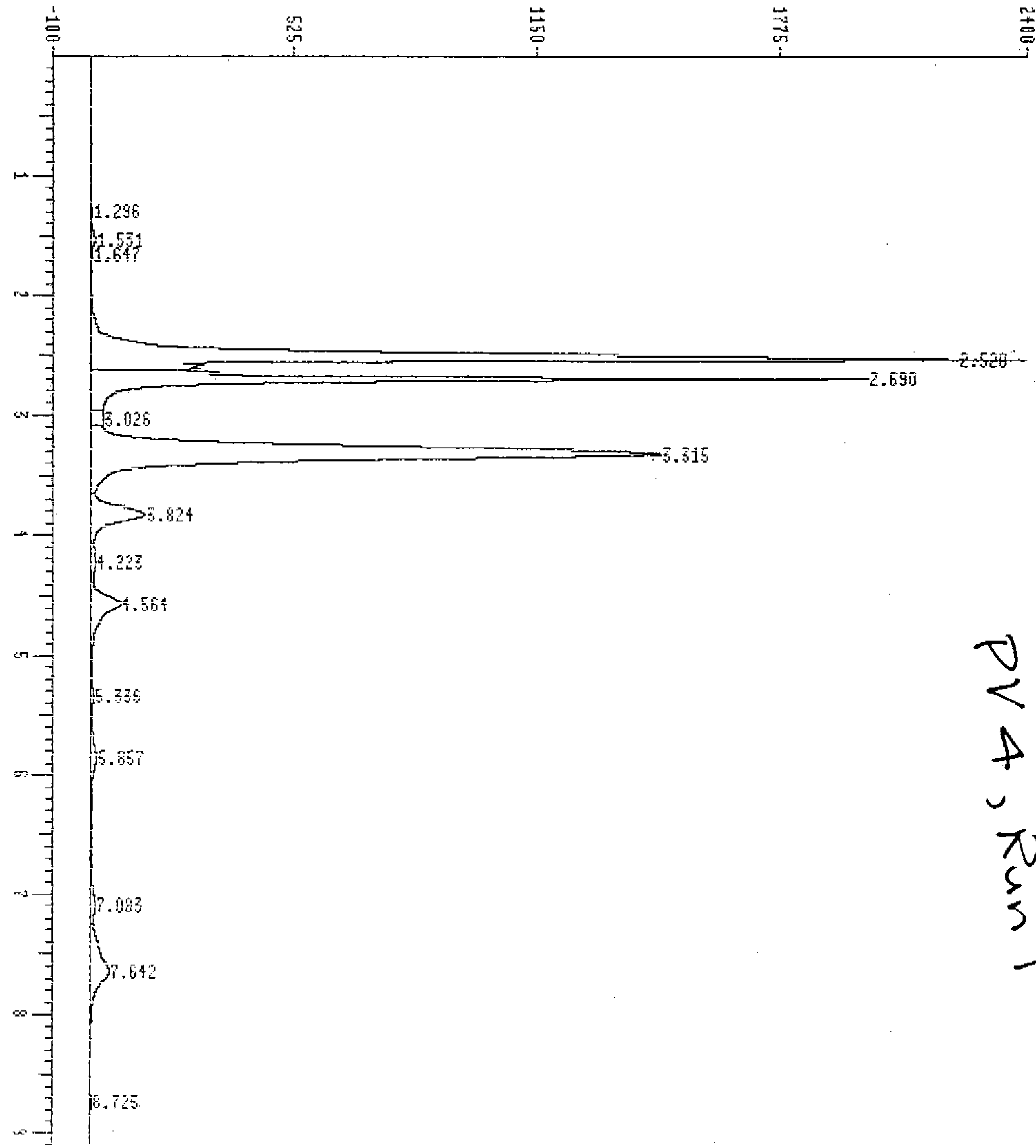
Report by Signal

Operator: 14 Mar 92 11:22 am
Method File Name : DNPHIII.M
Sample Info : PV 3, Run3
Misc Info:
Integration File Name : DATA:0315A14B.I
consisting of channels : 1. A 360,4 550,100 of 0315A14B.D
Sequence Index: 1 Bottle Number : 14 Repetition Number: 2

A 360,4 550,100 of 0315A14B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.295	BV	22.9478	4.1880	0.06	100.00	0.075	1.35
1.542	VV	105.02	12.9876	0.27	100.00	0.108	1.21
1.763	VV	7.7064	1.4877	0.02	100.00	0.071	1.36
1.857	VV	9.7950	1.7596	0.02	100.00	0.081	0.72
2.026	VV	16.8464	3.5122	0.04	100.00	0.069	1.63
2.541	VV	10564	2438.06	26.80	100.00	0.059	2.64
2.681	VV	6641.44	1802.62	16.85	100.00	0.061	0.80
3.030	VV	298.50	37.5506	0.76	100.00	0.113	1.59
3.315	VV	16882	2132.10	42.83	100.00	0.120	1.07
3.825	VV	1843.16	196.94	4.68	100.00	0.141	0.95
4.230	VV	288.83	17.8029	0.73	100.00	0.216	0.94
4.564	VV	906.19	65.6579	2.30	100.00	0.197	0.56
5.330	VV	135.61	7.9274	0.34	100.00	0.242	1.54
5.859	VV	357.76	18.0955	0.91	100.00	0.280	1.62
6.143	VV	123.22	6.7260	0.31	100.00	0.305	0.34
7.082	VV	343.86	18.6597	0.87	100.00	0.263	1.53
7.635	VV	837.81	35.8320	2.13	100.00	0.317	1.71
8.718	PV	31.7827	1.4083	0.08	100.00	0.286	0.96

1: LC A 360.4 550.100 of 0315A15A.D



PV 4, Run 1

9.838

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

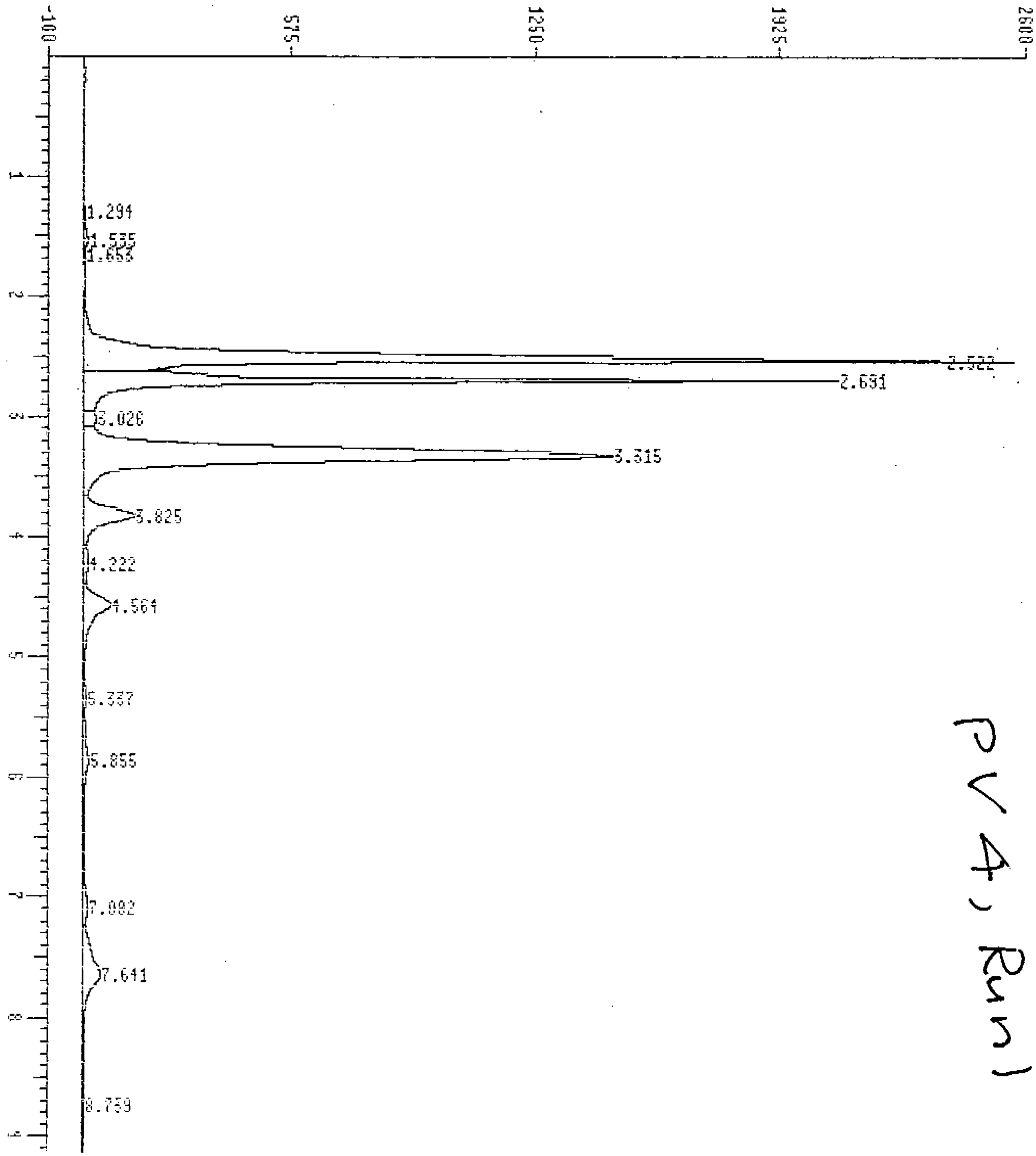
Report by Signal

Operator: 14 Mar 92 11:35 am
Method File Name : DNPHIII.M
Sample Info :
Misc Info: PV 4, Run 1
Integration File Name : DATA:0315A15A.I
consisting of channels : 1. A 360.4 550.100 of 0315A15A.D
Sequence Index: 1 Bottle Number : 15 Repetition Number: 1

A 360.4 550.100 of 0315A15A.D

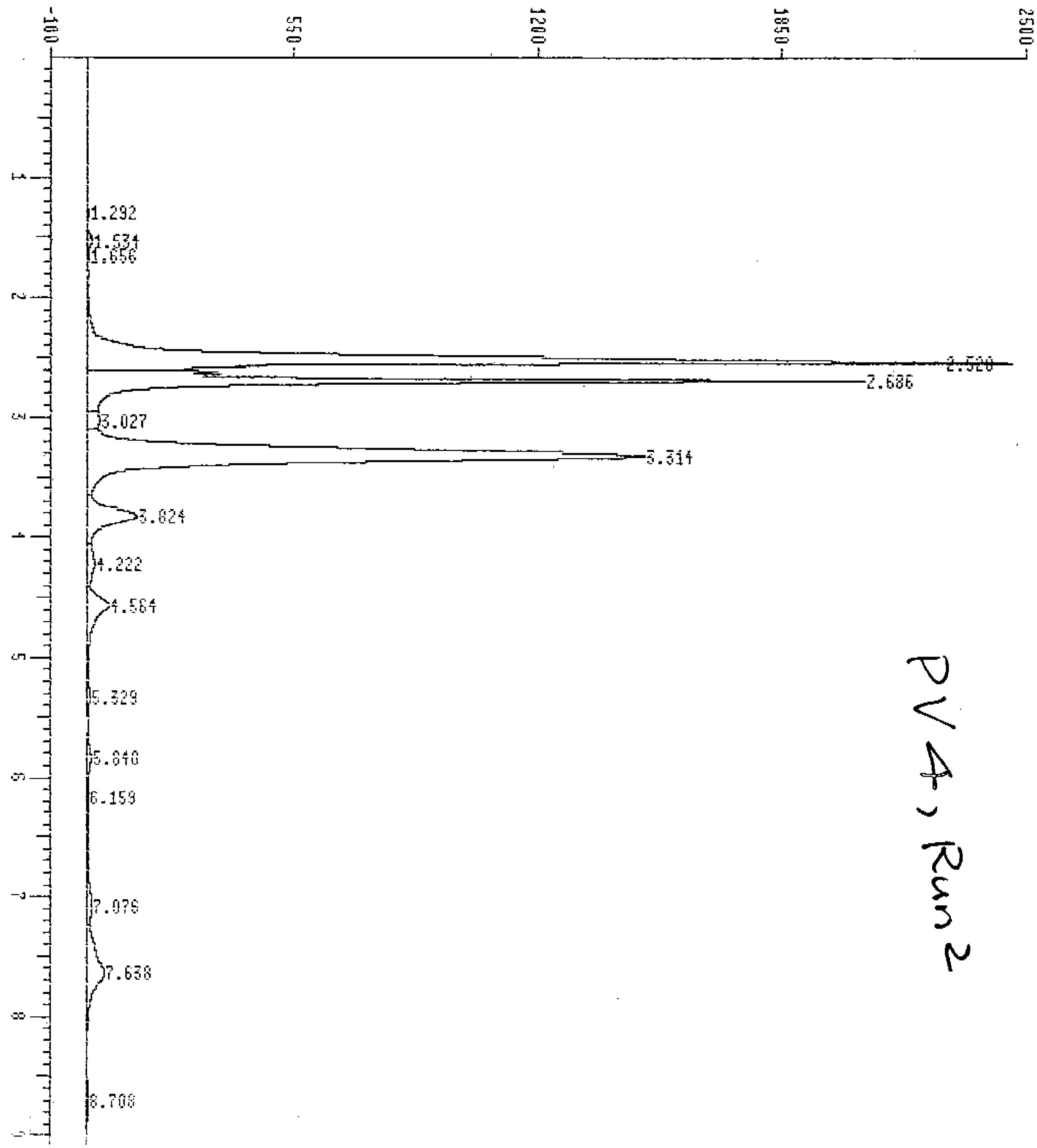
Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.296	BV	27.6929	4.7731	0.08	100.00	0.079	1.27
1.531	VV	97.4712	12.1206	0.29	100.00	0.112	1.50
1.647	VV	16.4030	3.7613	0.05	100.00	0.073	0.51
2.520	VV	10498	2280.95	31.52	100.00	0.064	1.69
2.690	VV	6358.77	1952.57	19.09	100.00	0.054	0.75
3.026	VV	247.42	33.6522	0.74	100.00	0.105	1.18
3.315	VV	11725	1465.62	35.21	100.00	0.121	1.07
3.824	VV	1339.17	141.13	4.02	100.00	0.143	0.94
4.223	VV	190.85	12.6646	0.57	100.00	0.203	0.99
4.564	VV	972.91	75.6821	2.92	100.00	0.186	0.61
5.336	VV	104.96	6.3363	0.32	100.00	0.224	1.78
5.857	VV	386.96	15.0868	1.16	100.00	0.351	0.87
7.083	VV	224.48	12.0970	0.67	100.00	0.264	1.69
7.642	VV	986.20	48.2511	2.96	100.00	0.284	1.41
8.725	PB	19.5207	1.0666	0.06	100.00	0.257	1.25
9.838	BBA	106.48	21.6585	0.32	100.00	0.124	1.51

1: LC A 360.4   550.100   of 0315A15B.D



PV 4, Run1

1: LC A 360,4 550,100 of 0315A16A.D



PV4, Run 2

of plot. Time = 0.01 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

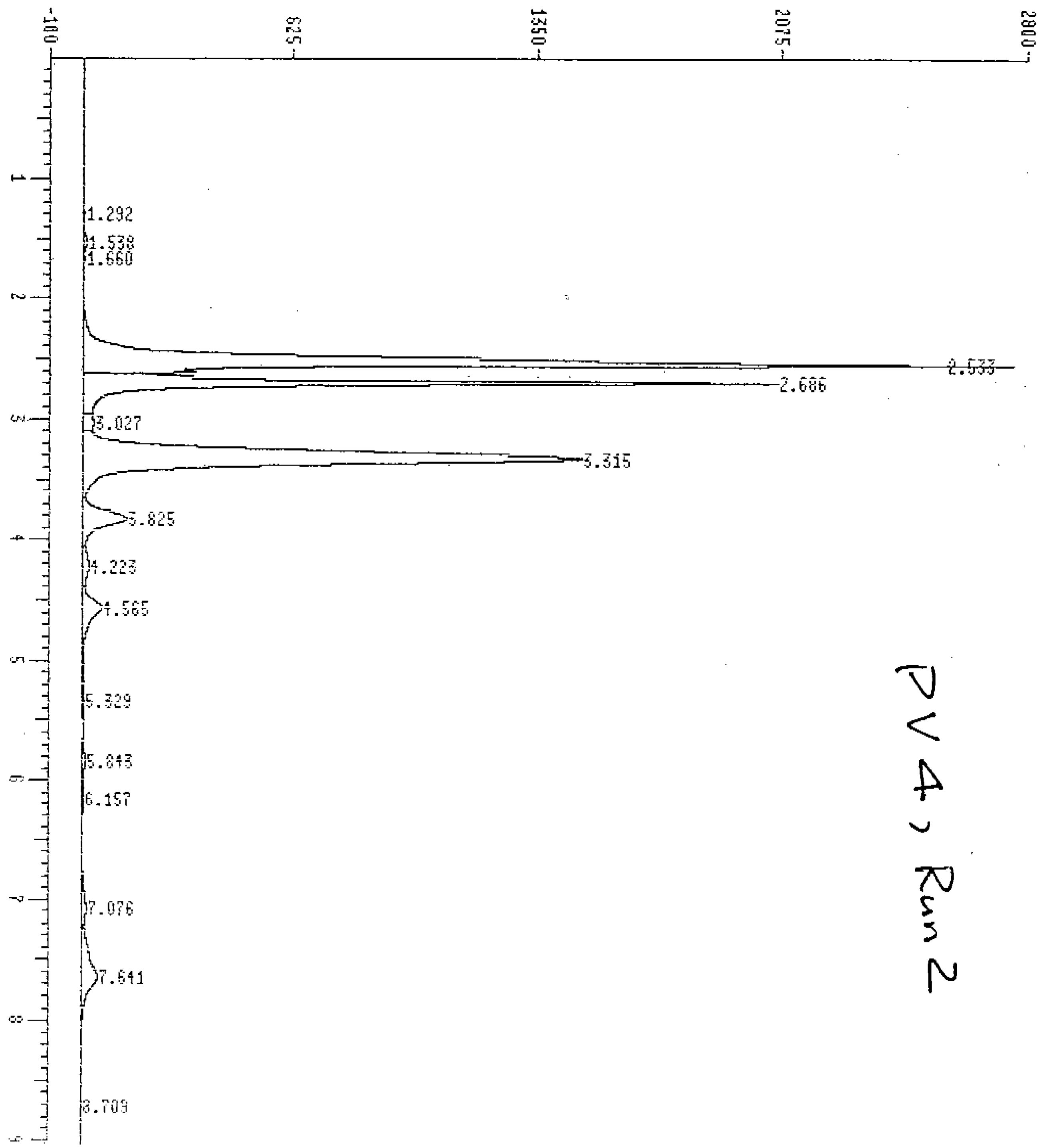
Report by Signal

Operator: 14 Mar 92 12:01 pm
Method File Name : DNPHIII.M
Sample Info : PV 4, Run 2
Misc Info:
Integration File Name : DATA:0315A16A.I
consisting of channels : 1. A 360.4 550.100 of 0315A16A.D
Sequence Index: 1 Bottle Number : 16 Repetition Number: 1

A 360.4 550.100 of 0315A16A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.292	BV	14.9733	3.5615	0.05	100.00	0.061	0.78
1.534	VV	84.2631	11.3373	0.25	100.00	0.104	1.26
1.656	VV	14.8733	3.6810	0.04	100.00	0.057	0.59
2.528	VV	10442	2327.41	31.56	100.00	0.062	1.86
2.686	VV	6521.36	1769.63	19.71	100.00	0.061	0.82
3.027	VV	260.79	33.1195	0.79	100.00	0.112	1.30
3.314	VV	11793	1481.65	35.64	100.00	0.120	1.08
3.824	VV	1277.30	134.73	3.86	100.00	0.143	0.94
4.222	VV	301.88	20.5042	0.91	100.00	0.201	1.11
4.564	VV	749.75	56.9721	2.27	100.00	0.189	0.60
5.329	VV	116.88	6.2521	0.35	100.00	0.262	1.63
5.840	VV	150.49	9.9011	0.45	100.00	0.223	1.00
6.159	VV	88.5470	4.3801	0.27	100.00	0.274	0.46
7.076	VV	256.84	13.4011	0.78	100.00	0.269	1.69
7.638	VV	978.78	47.2933	2.96	100.00	0.287	1.40
8.708	VV	33.5692	1.3858	0.10	100.00	0.326	0.97

1: LC A 360.4   550.100   of 0315A16B.D



PV4, Run 2

9.837

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

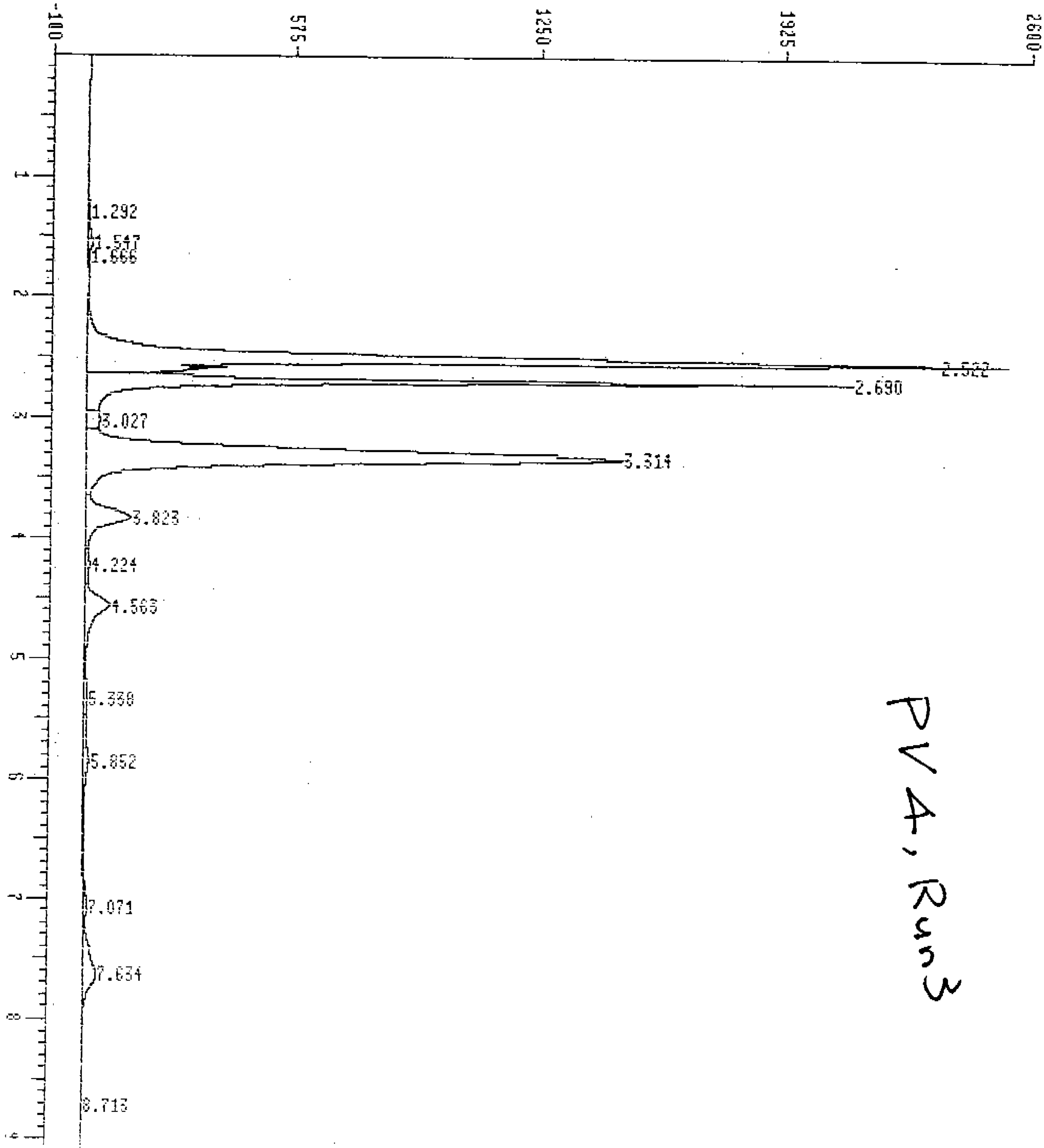
Report by Signal

Operator: 14 Mar 92 12:14 pm
Method File Name : DNPHIII.M
Sample Info :
Misc Info: PV4, Run2
Integration File Name : DATA:0315A16B.I
consisting of channels : 1. A 360.4 550.100 of 0315A16B.D
Sequence Index: 1 Bottle Number : 16 Repetition Number: 2

A 360.4 550.100 of 0315A16B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.292	BV	17.0085	3.6081	0.05	100.00	0.067	1.04
1.538	VV	84.7517	11.3062	0.25	100.00	0.106	1.30
1.660	VV	15.8236	3.7997	0.05	100.00	0.059	0.59
2.533	VV	11534	2558.76	33.90	100.00	0.075	1.65
2.686	VV	6267.72	1999.30	18.42	100.00	0.052	0.69
3.027	VV	262.93	33.4425	0.77	100.00	0.112	1.28
3.315	VV	11784	1481.85	34.64	100.00	0.120	1.08
3.825	VV	1269.05	134.27	3.73	100.00	0.142	0.94
4.223	VV	297.13	20.3287	0.87	100.00	0.200	1.10
4.565	VV	749.07	56.9731	2.20	100.00	0.189	0.60
5.329	VV	117.12	6.2595	0.34	100.00	0.256	1.67
5.843	VV	144.27	9.8569	0.42	100.00	0.218	1.05
6.157	VV	92.3047	4.3850	0.27	100.00	0.280	0.50
7.076	VV	249.40	13.2697	0.73	100.00	0.264	1.65
7.641	VV	969.28	47.0646	2.85	100.00	0.287	1.41
8.709	VB	24.8087	1.2383	0.07	100.00	0.268	0.94
9.837	BBA	139.76	21.8868	0.41	100.00	0.142	1.07

1: LC A 360.4   550.100   of 0315A17A.D



PV4, Run3

9.827

of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

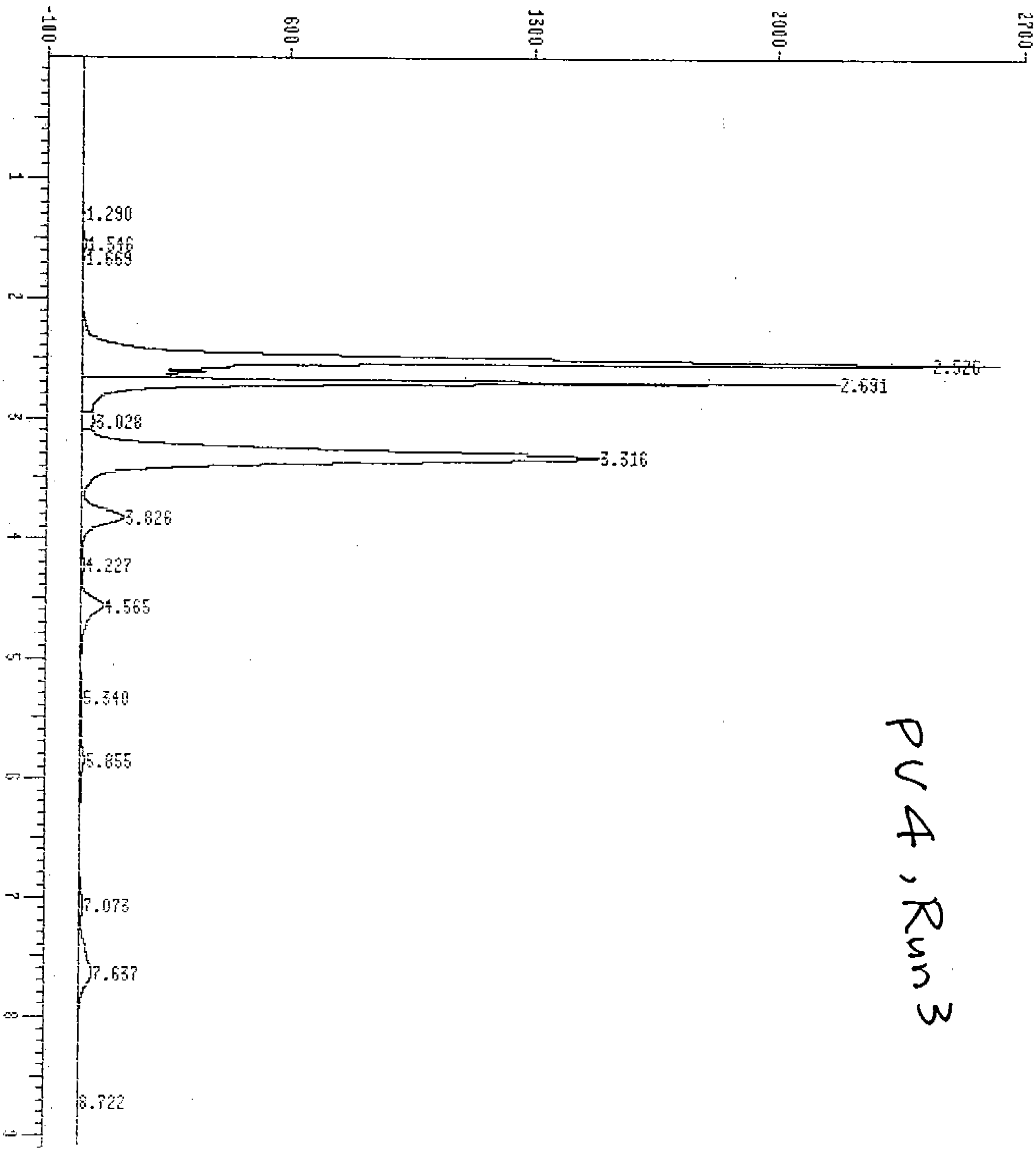
Report by Signal

Operator: 14 Mar 92 12:28 pm
Method File Name : DNPHIII.M
Sample Info : PV 4, Run 3
Misc Info:
Integration File Name : DATA:0315A17A.I
consisting of channels : 1. A 360,4 550,100 of 0315A17A.D
Sequence Index: 1   Bottle Number : 17   Repetition Number: 1

A 360,4 550,100 of 0315A17A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.292	BV	20.6373	4.3852	0.06	100.00	0.078	0.77
1.547	VV	105.64	12.4483	0.32	100.00	0.121	1.49
1.666	VV	18.2244	4.1874	0.05	100.00	0.062	0.51
2.522	VV	11311	2406.09	34.01	100.00	0.065	1.60
2.690	VV	5891.99	1740.19	17.72	100.00	0.056	0.65
3.027	VV	286.82	36.8831	0.86	100.00	0.111	1.19
3.314	VV	11806	1478.88	35.50	100.00	0.121	1.09
3.823	VV	1206.03	125.24	3.63	100.00	0.145	0.95
4.224	VV	145.99	9.4664	0.44	100.00	0.208	0.89
4.563	VV	854.60	66.6909	2.57	100.00	0.186	0.63
5.338	VV	127.97	7.1752	0.38	100.00	0.244	1.69
5.852	VV	358.05	13.5302	1.08	100.00	0.355	0.83
7.071	VV	225.44	11.7595	0.68	100.00	0.273	1.65
7.634	VV	839.71	38.8697	2.52	100.00	0.297	1.49
8.713	VV	26.7219	1.1237	0.08	100.00	0.327	0.98
9.827	PBA	34.1093	15.2906	0.10	100.00	0.037	-0.43

1: LC A 360,4 550,100 of 0315A17B.D



PV4, Run3

9.829

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

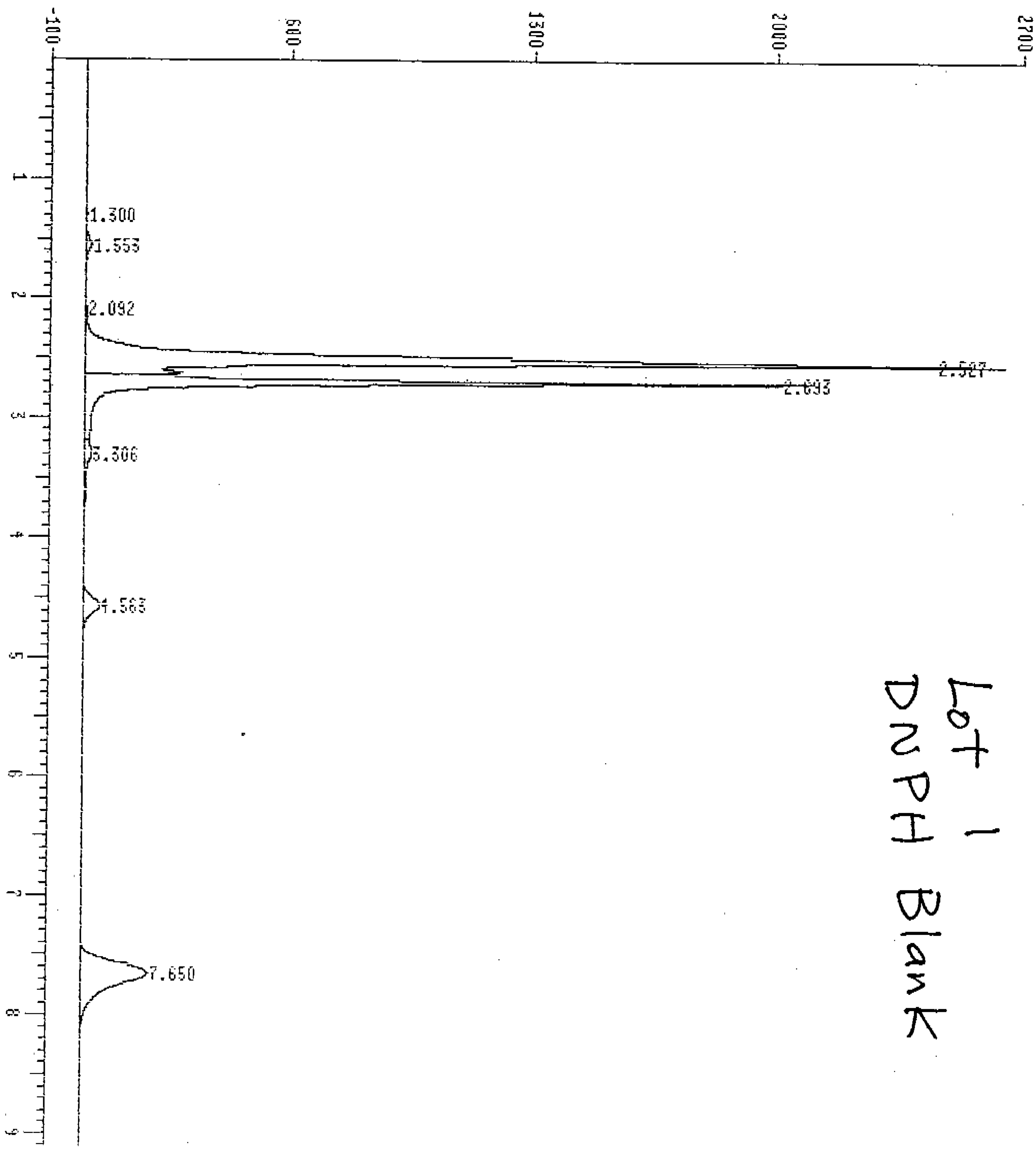
Report by Signal

Operator: 14 Mar 92 12:41 pm
Method File Name : DNPHIII.M
Sample Info :
Misc Info: PV4, Run3
Integration File Name : DATA:0315A17B.I
consisting of channels : 1. A 360,4 550,100 of 0315A17B.D
Sequence Index: 1 Bottle Number : 17 Repetition Number: 2

A 360,4 550,100 of 0315A17B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.290	BV	20.1609	4.4222	0.06	100.00	0.065	0.79
1.546	VV	107.00	12.5275	0.32	100.00	0.122	1.49
1.669	VV	20.1560	4.5303	0.06	100.00	0.062	0.52
2.526	VV	11842	2459.72	35.21	100.00	0.065	1.44
2.691	VV	5686.23	1833.60	16.91	100.00	0.052	0.55
3.028	VV	286.51	36.6150	0.85	100.00	0.112	1.17
3.316	VV	11799	1485.91	35.09	100.00	0.120	1.08
3.826	VV	1195.31	125.73	3.55	100.00	0.143	0.95
4.227	VV	148.04	9.4193	0.44	100.00	0.212	0.93
4.565	VV	856.05	66.9984	2.55	100.00	0.185	0.62
5.340	VV	130.12	7.3551	0.39	100.00	0.235	1.73
5.855	VV	369.20	13.8482	1.10	100.00	0.364	0.82
7.073	VV	229.86	12.0772	0.68	100.00	0.271	1.63
7.637	VV	851.85	39.1874	2.53	100.00	0.299	1.47
8.722	VV	32.7438	1.3330	0.10	100.00	0.322	1.04
9.829	PBA	53.3714	15.3042	0.16	100.00	0.058	-0.09

1: LC A 360.4 550.100 of 0315A18A.D



Lot 1
DNPH Blank

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

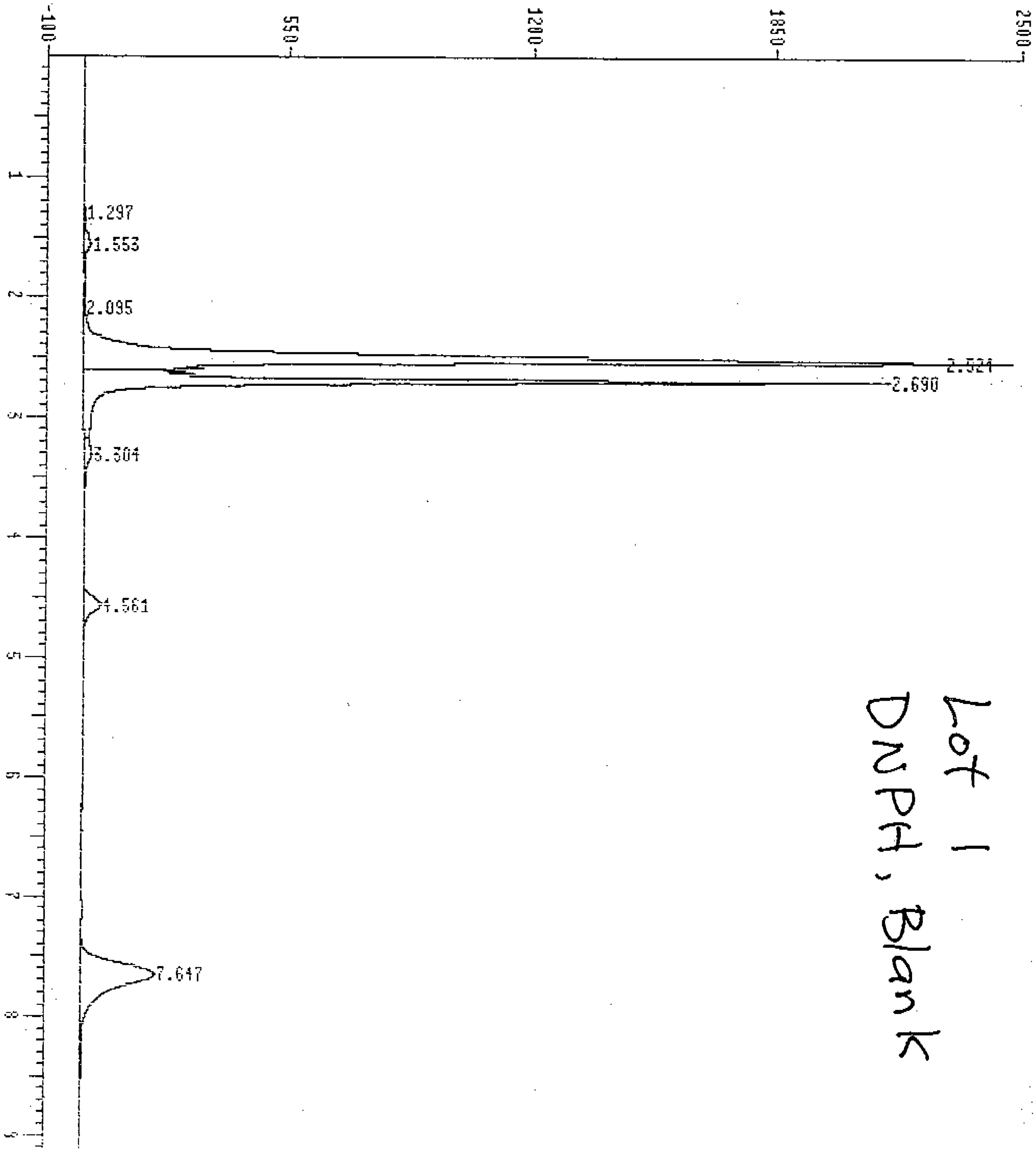
Report by Signal

Operator: 14 Mar 92 12:54 pm
Method File Name : DNPHIII.M
Sample Info : DNPH, Blank Lot 1
Misc Info:
Integration File Name : DATA:0315A18A.I
consisting of channels : 1. A 360,4 550,100 of 0315A18A.D
Sequence Index: 1 Bottle Number : 18 Repetition Number: 1

A 360,4 550,100 of 0315A18A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.300	BV	15.8594	4.1453	0.07	100.00	0.064	0.87
1.553	VV	148.68	17.7894	0.69	100.00	0.119	0.96
2.092	VV	22.6608	4.4138	0.11	100.00	0.086	2.41
2.527	VV	11412	2474.46	53.29	100.00	0.082	1.36
2.693	VV	6060.63	1803.08	28.30	100.00	0.146	0.44
3.306	VV	393.44	21.6575	1.84	100.00	0.240	0.45
4.563	VV	460.96	46.9867	2.15	100.00	0.151	0.90
7.650	PB	2898.89	196.92	13.54	100.00	0.222	0.72

1: LC A 360.4   550.100   of 0315A18B.D



Lot 1
DNPH, Blank

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

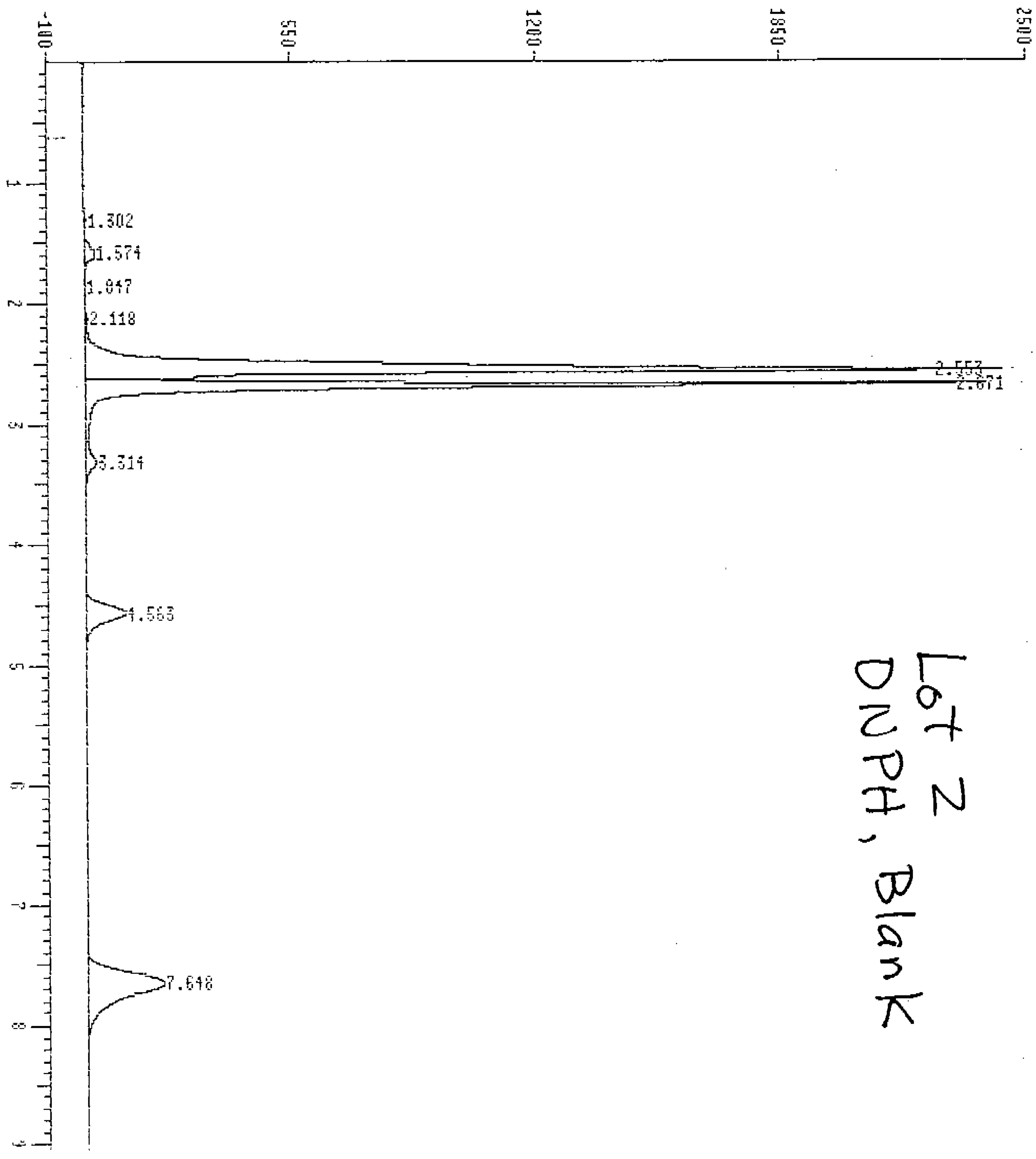
Report by Signal

Operator: 14 Mar 92 1:07 pm
Method File Name : DNPHIII.M
Sample Info : DNPH Lot 1, Blank Φ
Misc Info:
Integration File Name : DATA:0315A18B.I
consisting of channels : 1. A 360.4 550.100 of 0315A18B.D
Sequence Index: 1 Bottle Number : 18 Repetition Number: 2

A 360.4 550.100 of 0315A18B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.297	BV	14.0682	4.0030	0.07	100.00	0.059	0.79
1.553	VV	149.86	17.6695	0.70	100.00	0.121	0.96
2.095	VV	22.2087	4.3715	0.10	100.00	0.085	2.37
2.524	VV	10774	2441.32	50.67	100.00	0.061	1.71
2.690	VV	6572.51	1868.56	30.91	100.00	0.148	0.55
3.304	VV	371.55	21.2921	1.75	100.00	0.232	0.51
4.561	VV	463.57	46.9708	2.18	100.00	0.152	0.89
7.647	PB	2895.09	196.84	13.62	100.00	0.222	0.72

1: LC A 360.4   550.100   of 0315A19A.D



Lot 2
DNPH, Blank

of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

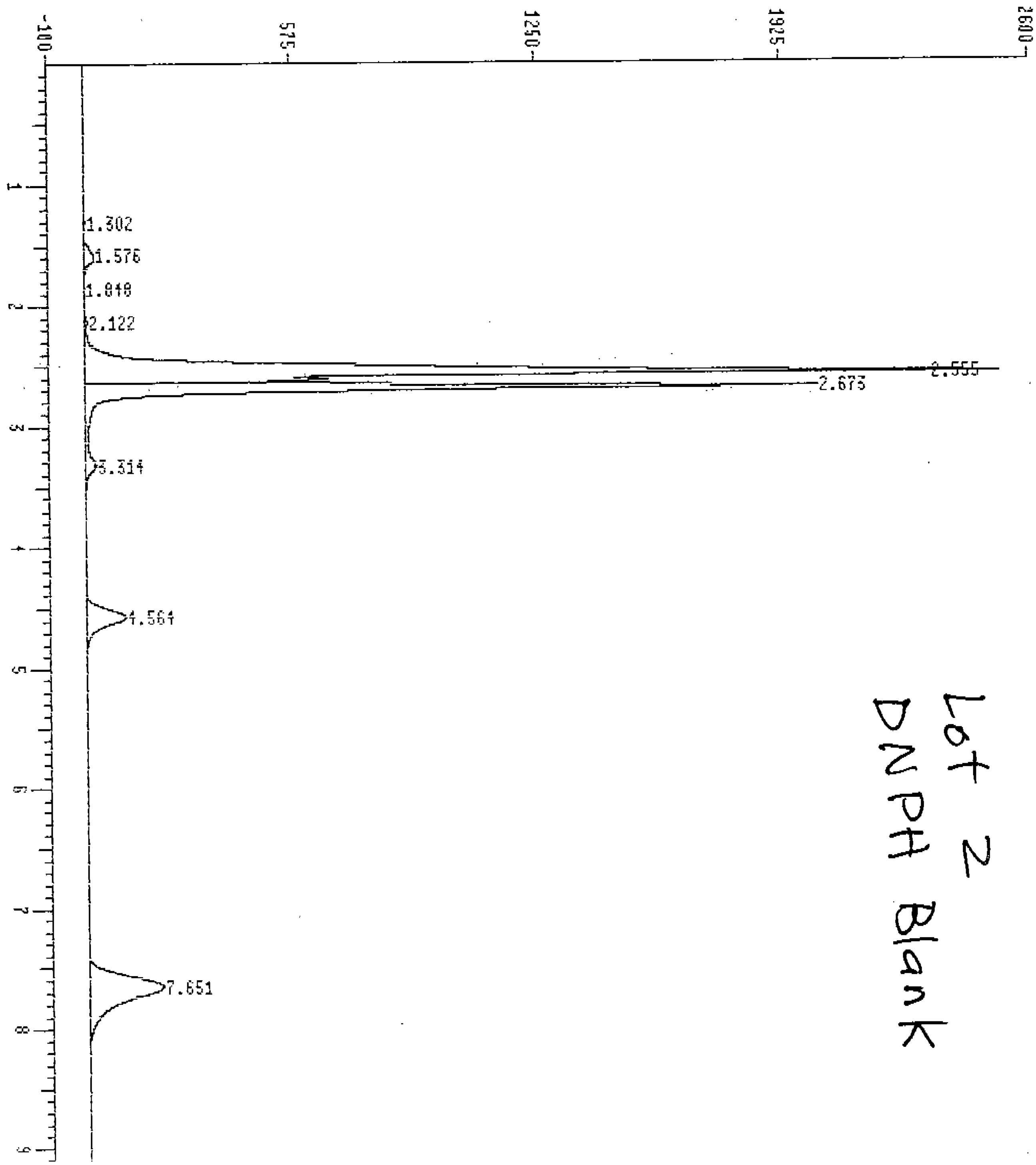
Report by Signal

Operator: 14 Mar 92   1:20 pm
Method File Name : DNPHIII.M
Sample Info : DNPH Lot 2, Blank
Misc Info:
Integration File Name : DATA:0315A19A.I
consisting of channels : 1. A 360.4 550.100 of 0315A19A.D
Sequence Index: 1   Bottle Number : 19   Repetition Number: 1

A 360.4 550.100 of 0315A19A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.302	BV	16.6396	4.3342	0.08	100.00	0.064	0.58
1.574	VV	250.30	28.5620	1.15	100.00	0.130	0.85
1.847	VV	3.5439	0.9240	0.02	100.00	0.058	0.64
2.118	VV	36.5869	7.9882	0.17	100.00	0.068	1.59
2.553	VV	10471	2268.56	48.26	100.00	0.064	2.05
2.671	VV	6504.14	2094.83	29.98	100.00	0.116	0.46
3.314	VV	287.16	28.5172	1.32	100.00	0.145	1.26
4.563	BB	1059.92	109.14	4.89	100.00	0.150	0.89
7.648	BV	3067.67	208.06	14.14	100.00	0.222	0.72

1: LC A 360.4   550.100   of 0315A19B.D



Lot 2
DNPH Blank

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

Operator: 14 Mar 92 1:33 pm
Method File Name : DNPHIII.M
Sample Info : DNPH, Lot 2, Blank
Misc Info:
Integration File Name : DATA:0315A19B.I
consisting of channels : 1. A 360.4 550.100 of 0315A19B.D
Sequence Index: 1 Bottle Number : 19 Repetition Number: 2

A 360.4 550.100 of 0315A19B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.302	BV	16.6116	4.2884	0.07	100.00	0.065	0.55
1.576	VV	250.05	28.5268	1.09	100.00	0.130	0.87
1.848	VV	4.0704	0.9310	0.02	100.00	0.073	0.92
2.122	VV	37.1301	8.0669	0.16	100.00	0.068	1.63
2.555	VV	11495	2350.97	50.01	100.00	0.075	1.62
2.673	VV	6771.17	2007.61	29.46	100.00	0.119	0.64
3.314	VV	288.03	28.4936	1.25	100.00	0.146	1.25
4.564	BB	1059.97	109.05	4.61	100.00	0.150	0.89
7.651	BB	3065.18	207.81	13.33	100.00	0.223	0.73

of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

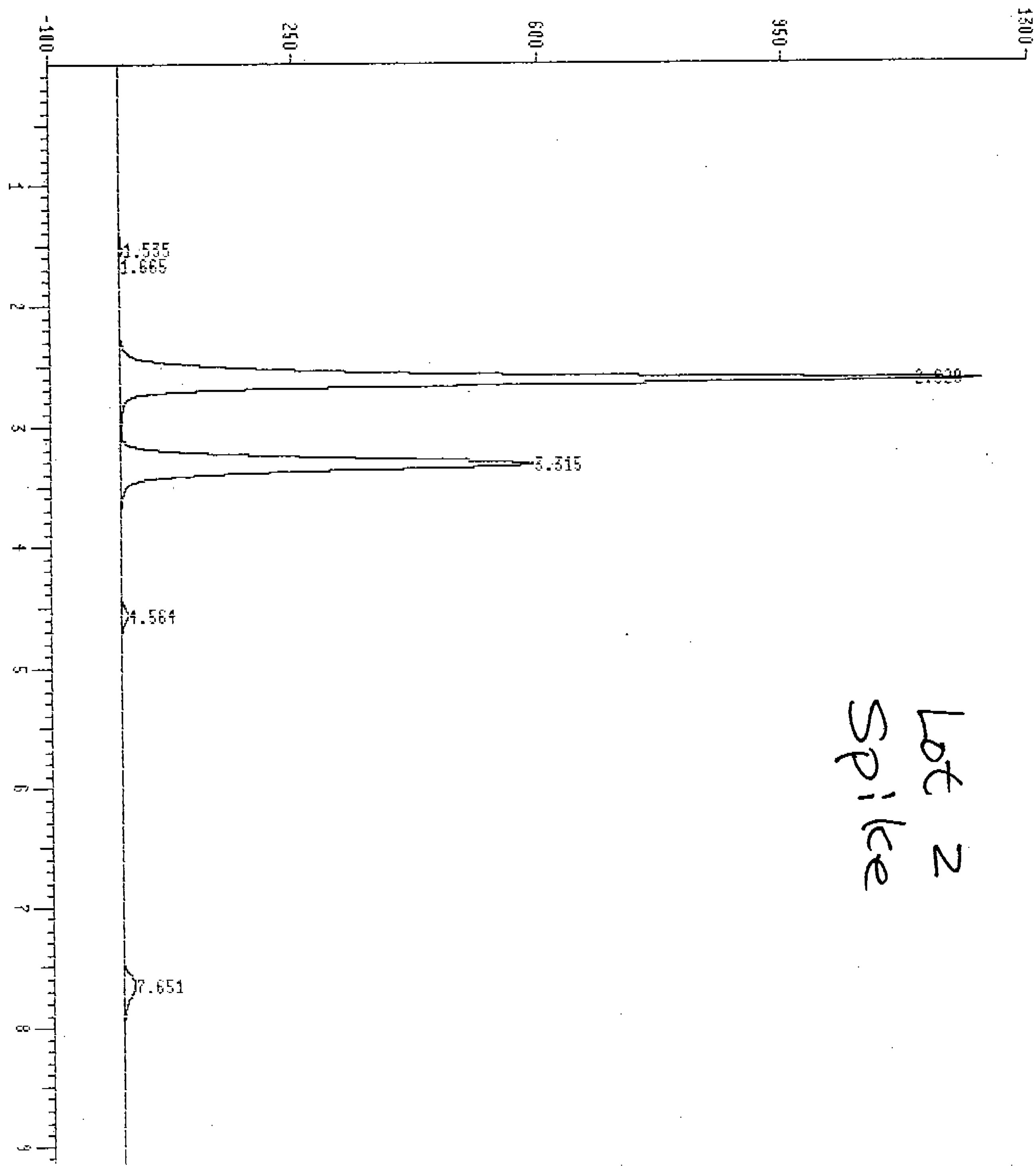
Report by Signal

Operator: 14 Mar 92 1:46 pm
Method File Name : DNPHIII.M
Sample Info : Lot Z, Spike
Misc Info:
Integration File Name : DATA:0315A20A.I
consisting of channels : 1. A 360.4 550.100 of 0315A20A.D
Sequence Index: 1 Bottle Number : 20 Repetition Number: 1

A 360.4 550.100 of 0315A20A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.534	VV	40.5636	4.6618	0.32	100.00	0.132	1.95
1.665	VB	9.6423	1.4749	0.08	100.00	0.090	0.44
2.080	BV	3.9558	1.0312	0.03	100.00	0.064	0.99
2.621	VV	7602.14	1235.82	60.30	100.00	0.089	1.36
3.316	VB	4591.50	591.19	36.42	100.00	0.118	1.08
4.565	BB	100.11	10.3039	0.79	100.00	0.150	0.87
7.651	BV	259.11	17.8355	2.06	100.00	0.218	0.75

1: LC A 360.4   550.100   of 0315A20B.D



Lot 2
Spike

of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

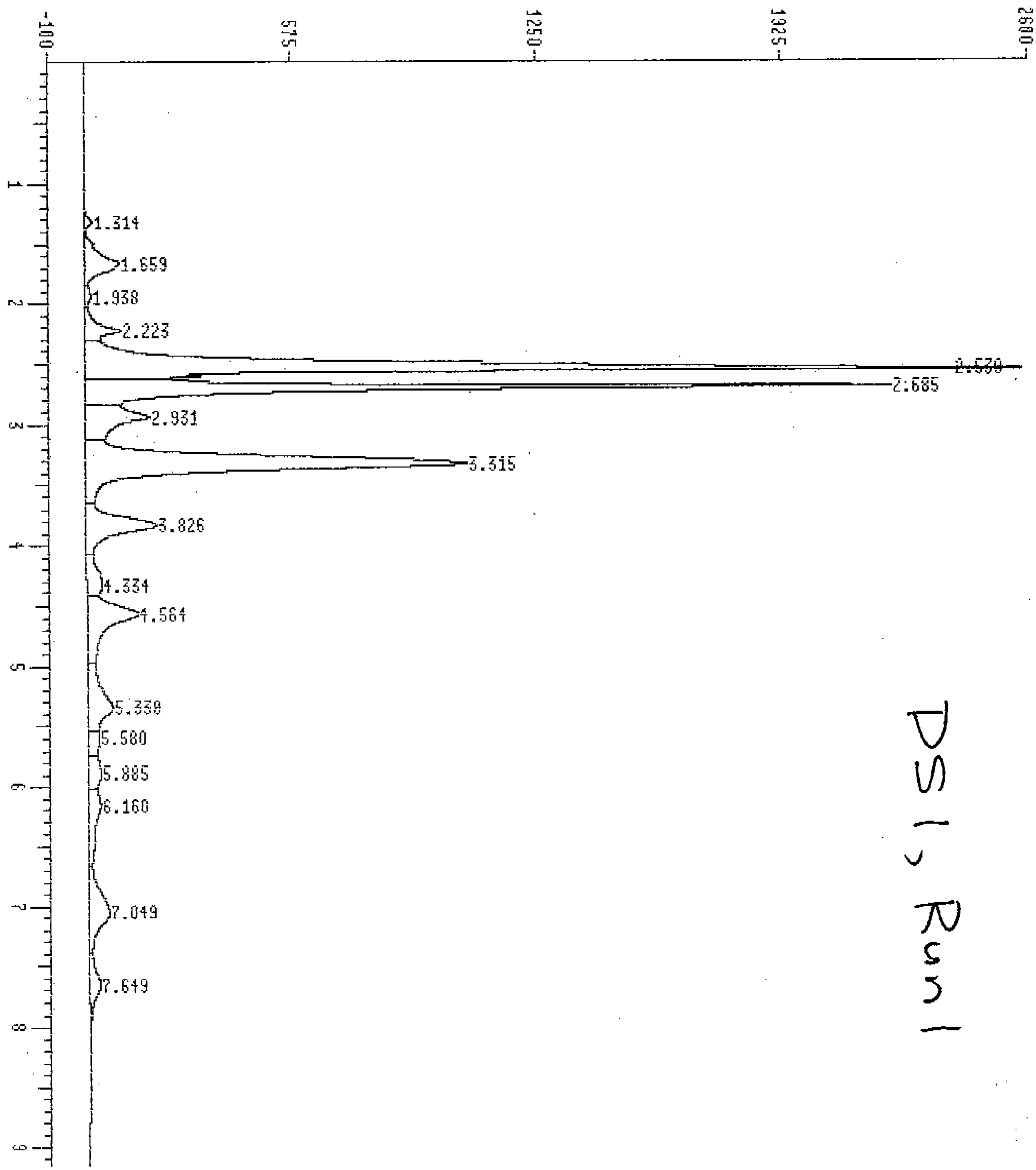
Report by Signal

Operator: 14 Mar 92 1:59 pm
Method File Name : DNPHIII.M
Sample Info : Lot 2, Spike
Misc Info:
Integration File Name : DATA:0315A20B.I
consisting of channels : 1. A 360,4 550,100 of 0315A20B.D
Sequence Index: 1 Bottle Number : 20 Repetition Number: 2

A 360,4 550,100 of 0315A20B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.535	VV	37.2135	4.3832	0.30	100.00	0.129	1.93
1.665	VB	4.8039	1.1668	0.04	100.00	0.062	0.90
2.620	VV	7587.82	1233.49	60.23	100.00	0.089	1.36
3.315	VV	4602.42	591.06	36.53	100.00	0.118	1.08
4.564	VB	106.73	10.4159	0.85	100.00	0.156	0.94
7.651	BB	259.60	17.8865	2.06	100.00	0.219	0.74

1: LC A 360.4   550.100   of 0315A21A.D



DS1, Run 1

9.839

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

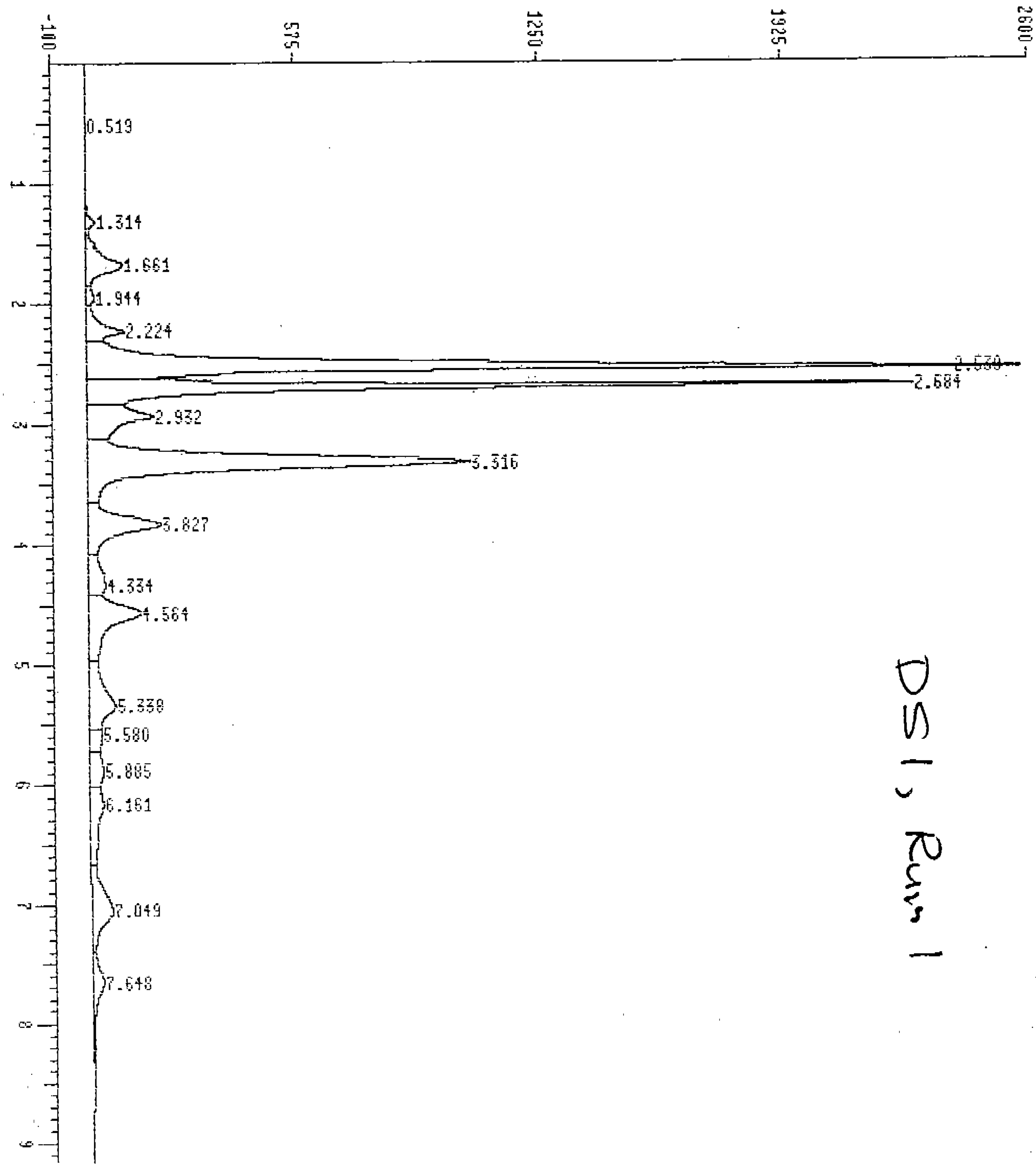
Report by Signal

Operator: 14 Mar 92 2:12 pm
Method File Name : DNPHIII.M
Sample Info : DS 1, Run 1
Misc Info:
Integration File Name : DATA:0315A21A.I
consisting of channels : 1. A 360,4 550,100 of 0315A21A.D
Sequence Index: 1 Bottle Number : 21 Repetition Number: 1

A 360,4 550,100 of 0315A21A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.314	BV	131.34	23.4401	0.32	100.00	0.082	1.02
1.659	VV	1083.64	98.4823	2.64	100.00	0.161	1.15
1.938	VV	149.12	19.0374	0.36	100.00	0.109	1.41
2.223	VV	670.12	100.75	1.63	100.00	0.091	1.55
2.539	VV	11567	2410.93	28.21	100.00	0.065	2.05
2.685	VV	7133.76	1961.90	17.40	100.00	0.061	0.64
2.931	VV	1795.35	178.96	4.38	100.00	0.137	0.68
3.315	VV	8821.43	1057.88	21.51	100.00	0.124	1.05
3.826	VV	2032.35	197.46	4.96	100.00	0.152	0.95
4.334	VV	671.14	41.9499	1.64	100.00	0.208	3.18
4.564	VV	2022.10	143.17	4.93	100.00	0.202	0.60
5.338	VV	1392.71	70.2019	3.40	100.00	0.267	1.68
5.580	VV	361.04	31.3523	0.88	100.00	0.158	0.37
5.885	VV	533.84	35.6086	1.30	100.00	0.210	1.26
6.160	VV	834.55	33.4576	2.04	100.00	0.340	0.41
7.049	VV	1228.23	56.5981	3.00	100.00	0.300	1.32
7.649	VV	543.80	29.2705	1.33	100.00	0.265	0.90
9.839	PBA	33.3159	6.2815	0.08	100.00	0.125	1.63

1: LC A 360.4   550.100   of 0315A21B.D



DS1, Run 1

9.838

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

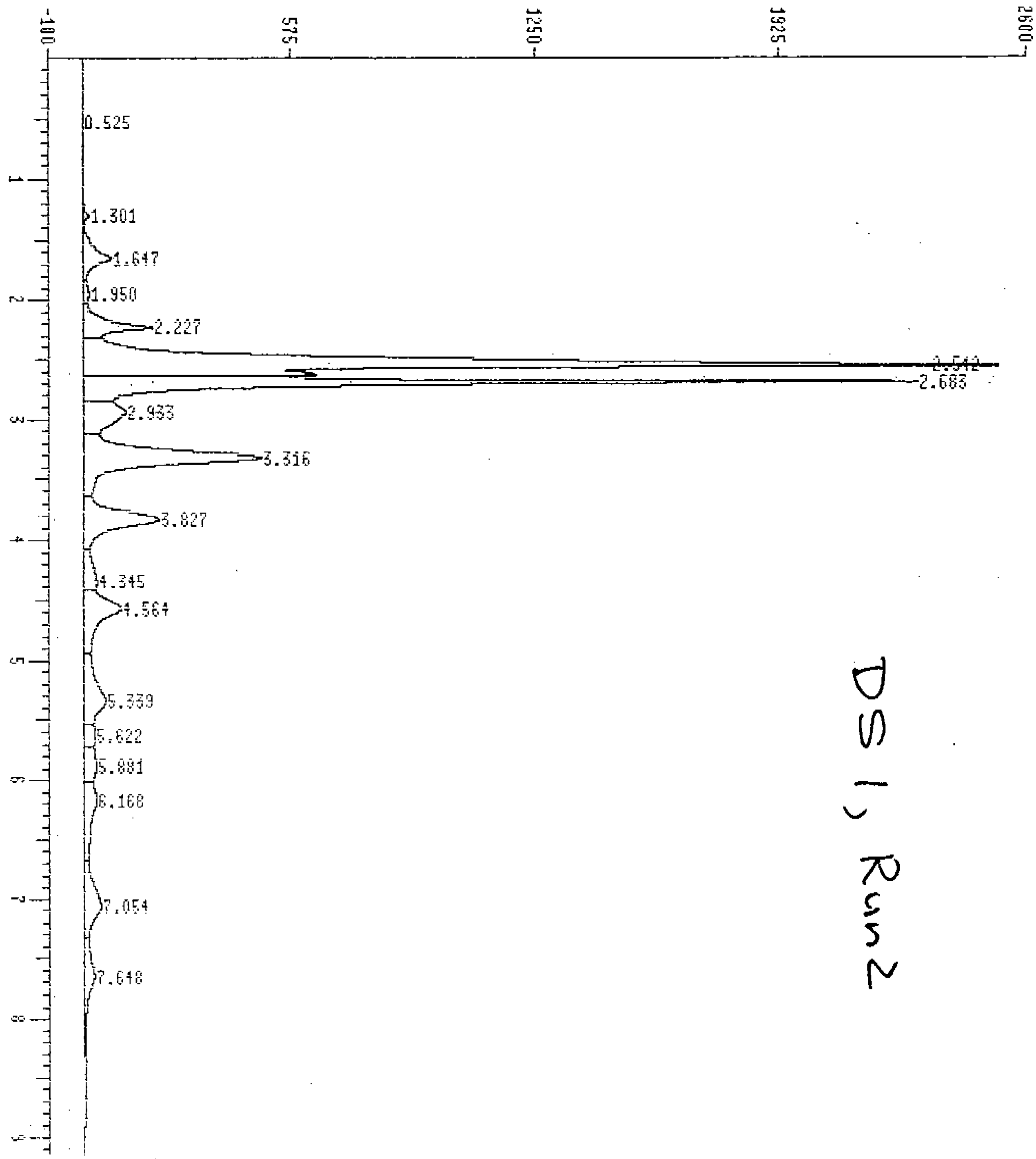
Report by Signal

Operator: 14 Mar 92 2:26 pm
Method File Name : DNPHIII.M
Sample Info : DS1 - Run 1
Misc Info:
Integration File Name : DATA:0315A21B.I
consisting of channels : 1. A 360.4 550.100 of 0315A21B.D
Sequence Index: 1   Bottle Number : 21   Repetition Number: 2

A 360.4 550.100 of 0315A21B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
0.519	BV	28.5780	1.4565	0.07	100.00	0.262	1.62
1.314	PV	171.16	25.2278	0.40	100.00	0.096	1.22
1.661	VV	1133.94	101.41	2.65	100.00	0.163	1.17
1.944	VV	177.74	21.7068	0.42	100.00	0.112	1.50
2.224	VV	768.97	107.87	1.80	100.00	0.097	1.62
2.539	VV	11552	2454.86	27.03	100.00	0.074	1.99
2.684	VV	7405.12	1965.43	17.33	100.00	0.063	0.63
2.932	VV	1888.87	184.56	4.42	100.00	0.139	0.67
3.316	VV	8960.32	1061.54	20.96	100.00	0.126	1.04
3.827	VV	2211.72	203.73	5.17	100.00	0.159	0.91
4.334	VV	762.44	46.1741	1.78	100.00	0.213	3.23
4.564	VV	2123.40	146.35	4.97	100.00	0.206	0.59
5.338	VV	1483.79	72.5239	3.47	100.00	0.274	1.67
5.580	VV	374.10	33.4547	0.88	100.00	0.154	0.32
5.885	VV	582.33	38.2185	1.36	100.00	0.213	1.26
6.161	VV	950.02	36.3370	2.22	100.00	0.354	0.39
7.049	VV	1379.19	59.8934	3.23	100.00	0.316	1.30
7.648	VV	752.71	32.9744	1.76	100.00	0.315	0.68
9.838	PBA	33.9621	6.4217	0.08	100.00	0.088	0.53

1: LC A 360.4   550.100   of 0315A22A.D



DS 1, Run 2

9.848

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

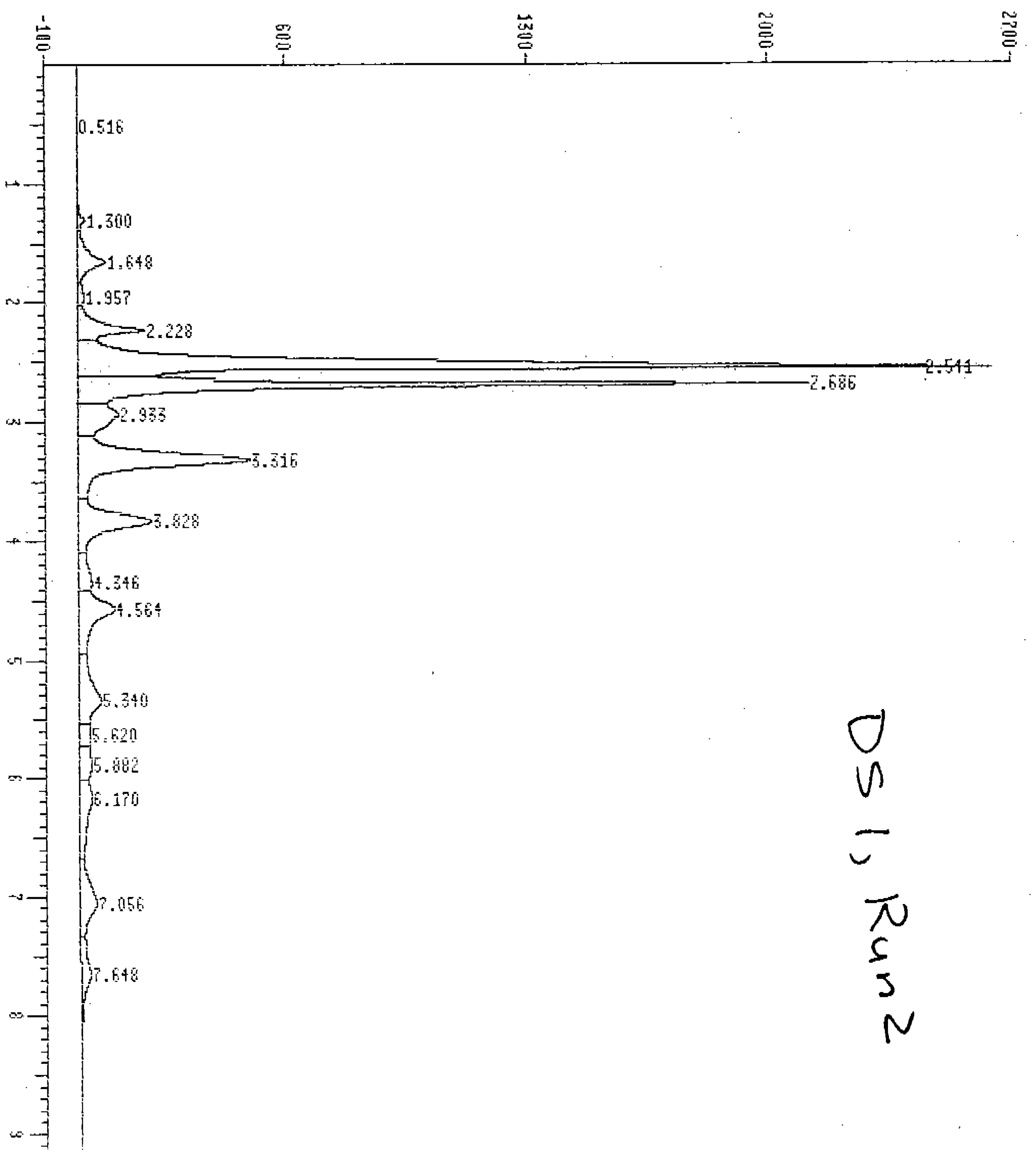
Report by Signal

Operator: 14 Mar 92 2:39 pm
Method File Name : DNPHIII.M
Sample Info : DS 1 - Run 2
Misc Info:
Integration File Name : DATA:0315A22A.I
consisting of channels : 1. A 360.4 550.100 of 0315A22A.D
Sequence Index: 1 Bottle Number : 22 Repetition Number: 1

A 360.4 550.100 of 0315A22A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
0.525	BV	24.6124	1.4215	0.06	100.00	0.244	0.85
1.301	PV	109.46	19.3350	0.28	100.00	0.078	1.25
1.647	VV	775.03	80.1479	2.01	100.00	0.131	1.30
1.950	VV	165.01	17.6263	0.43	100.00	0.131	1.74
2.227	VV	1243.27	195.32	3.22	100.00	0.088	1.53
2.542	VV	13503	2410.94	35.01	100.00	0.075	1.42
2.683	VV	7275.98	1951.01	18.87	100.00	0.062	0.66
2.933	VV	1454.40	122.33	3.77	100.00	0.158	0.55
3.316	VV	4617.15	498.89	11.97	100.00	0.135	1.02
3.827	VV	2202.88	213.17	5.71	100.00	0.153	0.93
4.345	VV	589.09	39.0894	1.53	100.00	0.199	3.38
4.564	VV	1587.95	105.99	4.12	100.00	0.212	0.61
5.339	VV	1350.25	63.3785	3.50	100.00	0.285	1.75
5.622	VV	337.42	30.2637	0.87	100.00	0.156	0.83
5.881	VV	548.00	36.3336	1.42	100.00	0.213	1.24
6.168	VV	911.79	37.0658	2.36	100.00	0.337	0.44
7.054	VV	1074.49	47.9995	2.79	100.00	0.307	1.41
7.648	VV	737.62	29.4021	1.91	100.00	0.340	0.95
9.848	PBA	60.0661	10.0581	0.16	100.00	0.137	1.48

1: LC A 360.4   550.100   of 0315A22B.D



9.850

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

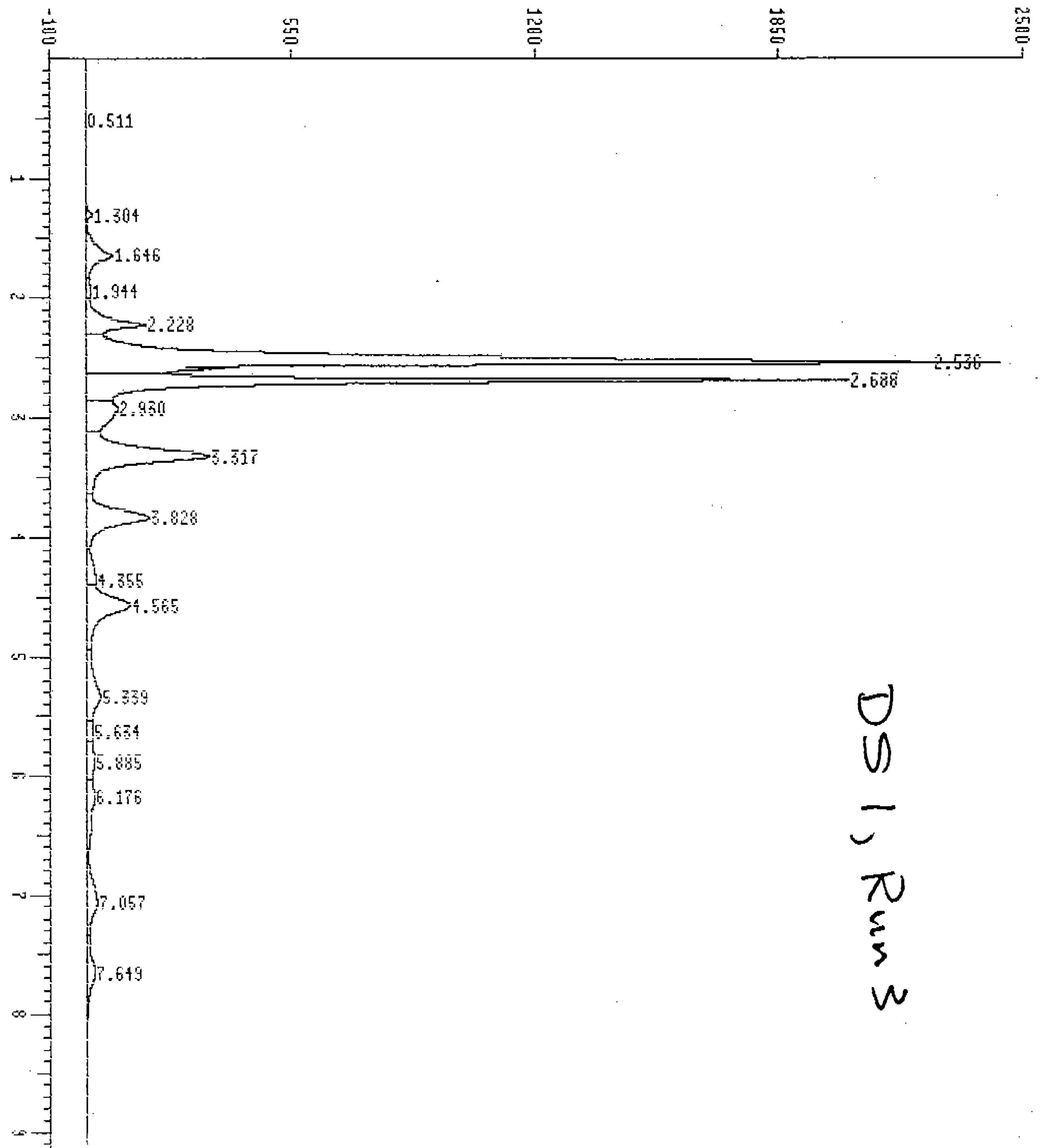
Report by Signal

Operator: 14 Mar 92 2:52 pm
Method File Name : DNPHIII.M
Sample Info : DS 1- Run2
Misc Info:
Integration File Name : DATA:0315A22B.I
consisting of channels : 1. A 360,4 550,100 of 0315A22B.D
Sequence Index: 1 Bottle Number : 22 Repetition Number: 2

A 360,4 550,100 of 0315A22B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
0.516	BV	27.4772	1.5855	0.08	100.00	0.242	0.98
1.300	PV	121.38	20.2313	0.34	100.00	0.082	1.26
1.648	VV	791.78	80.1705	2.19	100.00	0.139	1.26
1.957	VV	173.31	18.2027	0.48	100.00	0.132	1.82
2.228	VV	1243.01	196.34	3.44	100.00	0.088	1.51
2.541	VV	11525	2362.07	31.87	100.00	0.066	2.21
2.686	VV	6879.49	1790.47	19.03	100.00	0.064	0.69
2.933	VV	1420.21	119.77	3.93	100.00	0.158	0.54
3.316	VV	4614.85	499.32	12.76	100.00	0.135	1.03
3.828	VV	2207.99	213.48	6.11	100.00	0.153	0.94
4.346	VV	583.25	38.4994	1.61	100.00	0.200	3.48
4.564	VV	1575.43	105.70	4.36	100.00	0.211	0.62
5.340	VV	1348.28	63.3413	3.73	100.00	0.284	1.76
5.620	VV	327.92	30.1286	0.91	100.00	0.155	0.84
5.882	VV	549.94	36.0472	1.52	100.00	0.214	1.29
6.170	VV	901.65	36.8758	2.49	100.00	0.334	0.45
7.056	VV	1077.95	48.0780	2.98	100.00	0.307	1.41
7.648	VV	724.53	29.3092	2.00	100.00	0.334	0.97
9.850	PBA	64.9275	9.8451	0.18	100.00	0.142	1.23

1: LC A 360.4   550.100   of 0315A23A.D



9.847

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

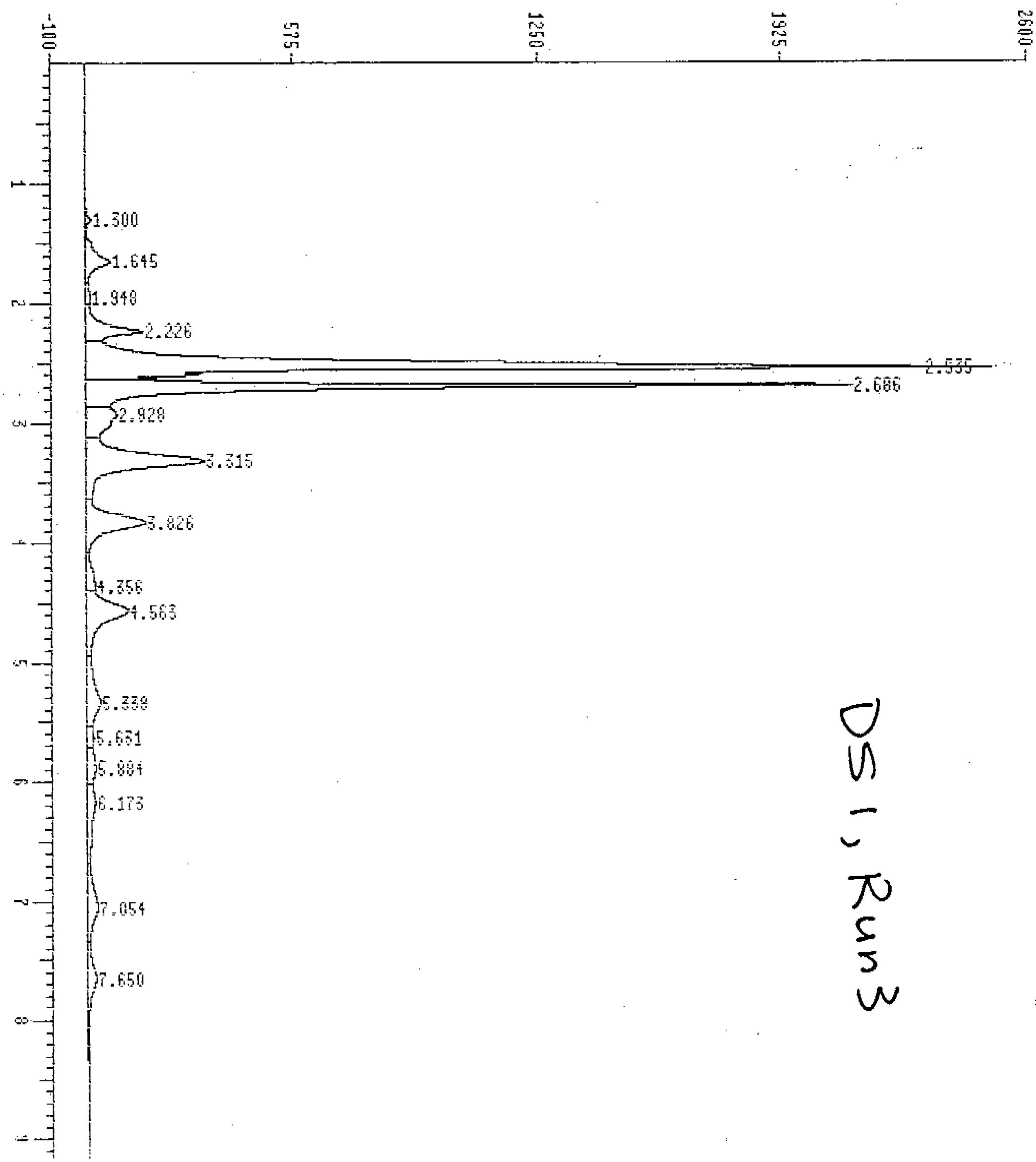
Report by Signal

Operator: 14 Mar 92 3:05 pm
Method File Name : DNPHIII.M
Sample Info : DS1 - Run 3
Misc Info:
Integration File Name : DATA:0315A23A.I
consisting of channels : 1. A 360,4 550,100 of 0315A23A.D
Sequence Index: 1 Bottle Number : 23 Repetition Number: 1

A 360,4 550,100 of 0315A23A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
0.511	BV	29.8119	1.6064	0.10	100.00	0.246	0.91
1.304	PV	112.63	18.6347	0.36	100.00	0.083	1.14
1.646	VV	703.89	72.4339	2.28	100.00	0.131	1.28
1.944	VV	140.77	15.0703	0.46	100.00	0.138	1.66
2.228	VV	1053.31	163.54	3.41	100.00	0.089	1.56
2.536	VV	11563	2325.07	37.45	100.00	0.068	1.71
2.688	VV	6175.24	1995.34	20.00	100.00	0.045	0.54
2.930	VV	1080.41	88.3268	3.50	100.00	0.162	0.45
3.317	VV	3187.88	333.19	10.32	100.00	0.139	1.05
3.828	VV	1713.04	170.19	5.55	100.00	0.150	0.95
4.355	VV	367.75	27.3361	1.19	100.00	0.178	5.02
4.565	VV	1547.97	118.65	5.01	100.00	0.190	0.74
5.339	VV	840.26	39.2184	2.72	100.00	0.286	1.73
5.634	VV	194.04	18.8294	0.63	100.00	0.172	1.19
5.885	VV	376.51	24.0495	1.22	100.00	0.220	1.34
6.176	VV	579.24	23.4131	1.88	100.00	0.337	0.43
7.057	VV	667.07	29.4802	2.16	100.00	0.316	1.36
7.649	VV	531.88	24.1977	1.72	100.00	0.304	0.89
9.847	PBA	12.1355	4.4264	0.04	100.00	0.046	-0.13

1: LC A 360,4   550,100   of 0315A23B.D



9.845

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

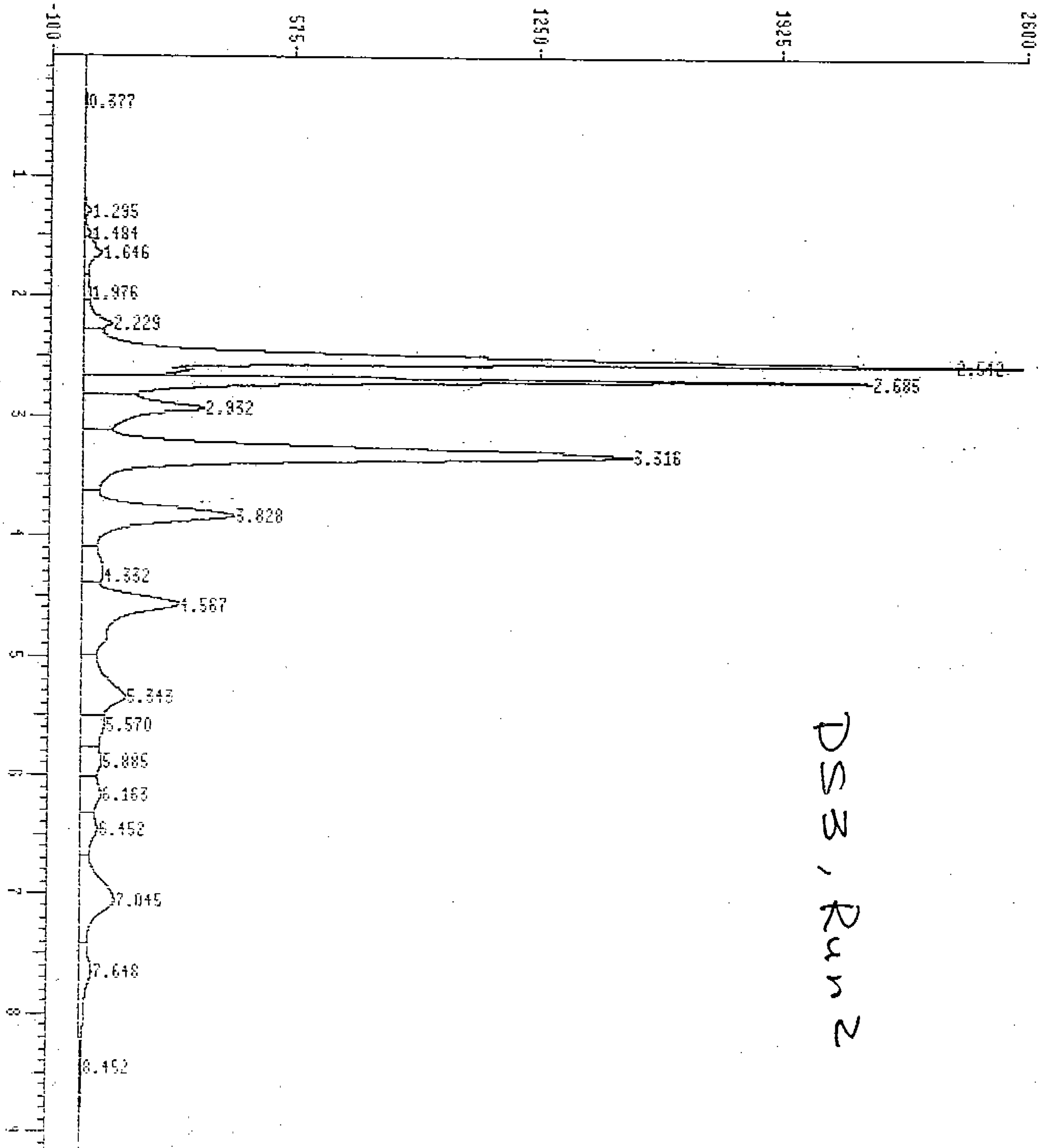
Report by Signal

Operator: 14 Mar 92 3:18 pm
Method File Name : DNPHIII.M
Sample Info : DS 1 - Run 3
Misc Info:
Integration File Name : DATA:0315A23B.I
consisting of channels : 1. A 360,4 550,100 of 0315A23B.D
Sequence Index: 1 Bottle Number : 23 Repetition Number: 2

A 360,4 550,100 of 0315A23B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.300	BV	81.8490	17.0730	0.27	100.00	0.069	0.95
1.645	VV	662.20	70.4270	2.20	100.00	0.127	1.27
1.948	VV	125.16	13.7100	0.42	100.00	0.129	1.68
2.226	VV	1023.95	162.49	3.40	100.00	0.087	1.51
2.535	VV	11220	2387.36	37.25	100.00	0.074	1.70
2.686	VV	6084.15	1833.62	20.20	100.00	0.055	0.59
2.928	VV	1052.28	86.6641	3.49	100.00	0.161	0.45
3.315	VV	3149.21	332.25	10.46	100.00	0.138	1.06
3.826	VV	1643.42	167.87	5.46	100.00	0.146	0.98
4.356	VV	332.56	25.5915	1.10	100.00	0.172	5.48
4.563	VV	1528.07	117.82	5.07	100.00	0.189	0.74
5.338	VV	843.17	39.2137	2.80	100.00	0.289	1.75
5.631	VV	197.93	19.1177	0.66	100.00	0.149	1.19
5.884	VV	381.65	24.1599	1.27	100.00	0.222	1.34
6.173	VV	583.72	23.6570	1.94	100.00	0.334	0.42
7.054	VV	665.74	29.4424	2.21	100.00	0.309	1.37
7.650	VV	534.70	24.1931	1.78	100.00	0.305	0.91
9.845	PBA	10.6504	4.5618	0.04	100.00	0.039	-0.29

1: LC A 360.4   550.100   of 0315A28A.D



DS3, Run 2

9.838

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

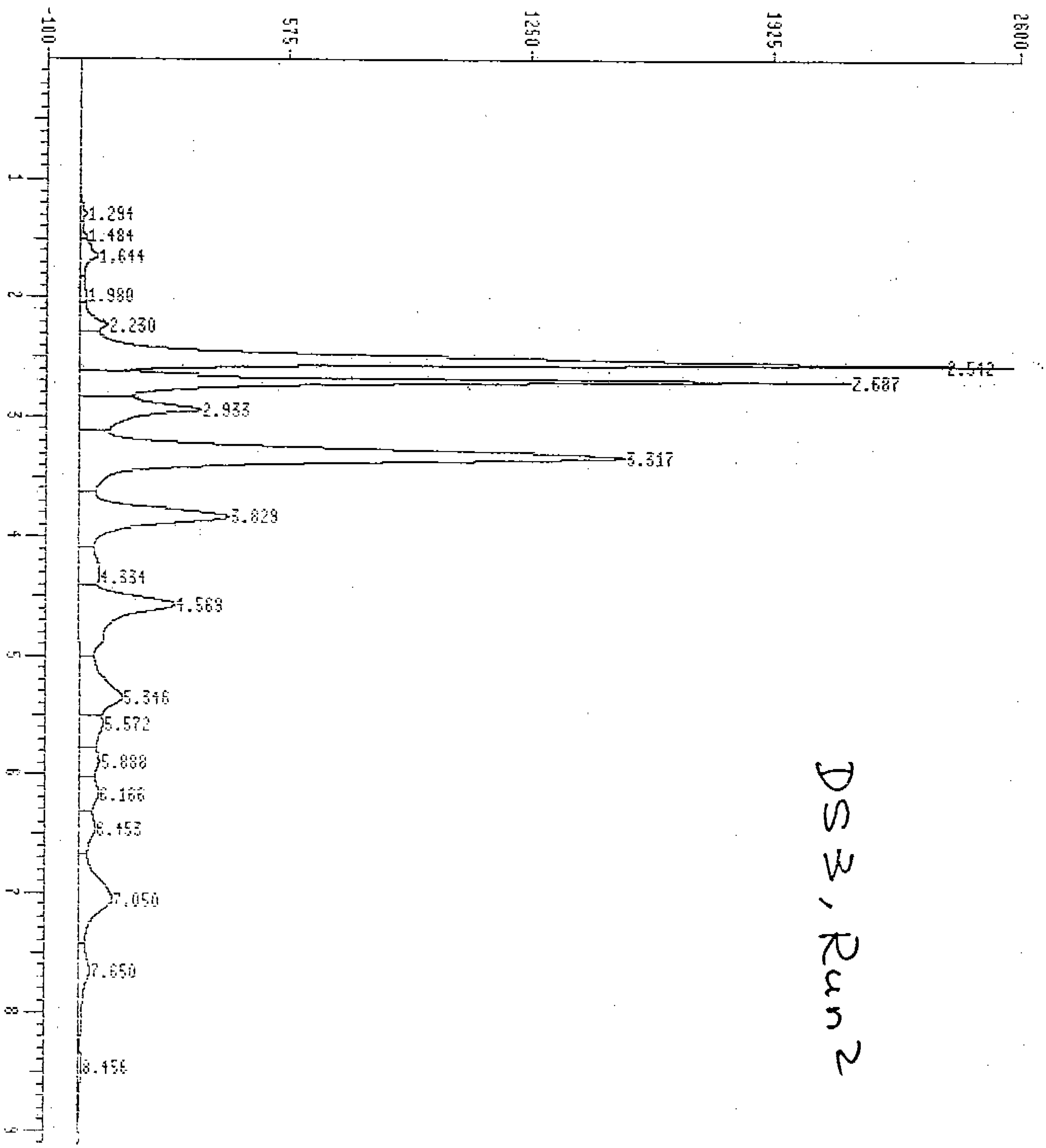
Report by Signal

Operator: 14 Mar 92 5:18 pm
Method File Name : DNPHIII.M
Sample Info : DS3 - Run 2
Misc Info:
Integration File Name : DATA:0315A28A.I
consisting of channels : 1. A 360.4 550.100 of 0315A28A.D
Sequence Index: 1 Bottle Number : 28 Repetition Number: 1

A 360.4 550.100 of 0315A28A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
0.377	BV	35.7530	2.0949	0.06	100.00	0.240	0.85
1.295	VV	97.7190	18.8360	0.18	100.00	0.072	1.40
1.484	VV	92.8070	18.6582	0.17	100.00	0.083	2.65
1.646	VV	498.43	48.0320	0.89	100.00	0.139	1.01
1.976	VV	198.78	19.2817	0.36	100.00	0.140	2.25
2.229	VV	609.14	80.9663	1.09	100.00	0.101	2.04
2.542	VV	12465	2422.28	22.34	100.00	0.069	1.84
2.685	VV	6872.86	1885.31	12.32	100.00	0.061	0.45
2.932	VV	3241.92	338.35	5.81	100.00	0.132	0.77
3.316	VV	13051	1515.94	23.39	100.00	0.128	1.03
3.828	VV	4459.83	420.63	7.99	100.00	0.156	0.92
4.332	VV	973.82	57.2670	1.75	100.00	0.217	3.71
4.567	VV	4052.00	268.89	7.26	100.00	0.212	0.53
5.343	VV	2380.35	122.18	4.27	100.00	0.263	1.76
5.570	VV	915.21	66.5699	1.64	100.00	0.191	0.35
5.885	VV	785.38	56.6782	1.41	100.00	0.196	0.98
6.163	VV	879.11	55.1221	1.58	100.00	0.236	1.00
6.452	VV	781.73	46.0331	1.40	100.00	0.240	0.71
7.045	VV	2259.09	94.2472	4.05	100.00	0.362	1.22
7.648	VV	844.19	31.2591	1.51	100.00	0.360	0.60
8.452	VV	249.08	8.3857	0.45	100.00	0.383	0.50
9.838	PBA	54.0365	9.4444	0.10	100.00	0.095	0.63

1: LC A 360,4   550,100   of 0315A28B.D



DS3, Run2

9.841

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

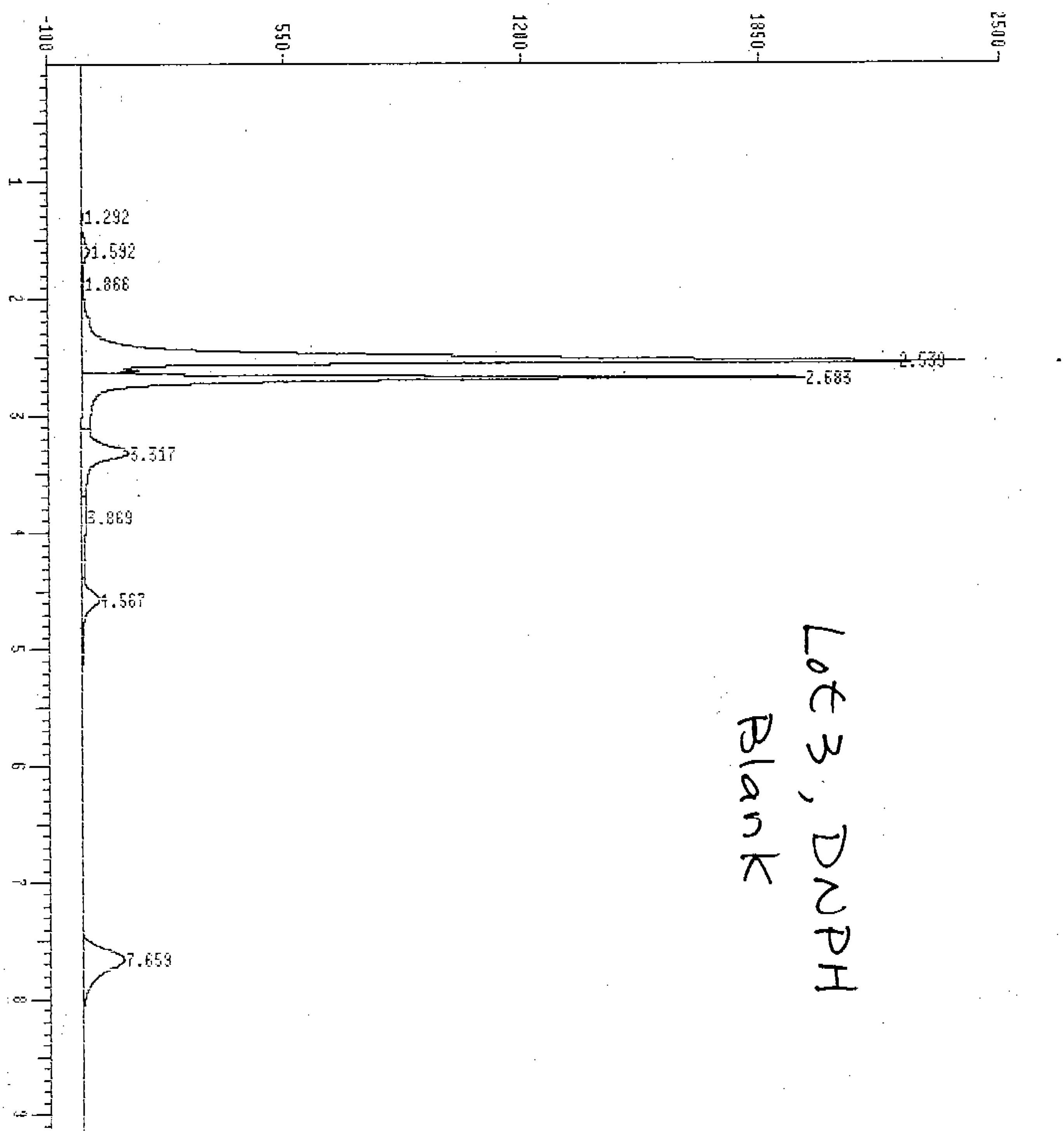
Report by Signal

Operator: 14 Mar 92 5:31 pm
Method File Name : DNPHIII.M
Sample Info : DS3 - Run 2
Misc Info:
Integration File Name : DATA:0315A28B.I
consisting of channels : 1. A 360,4 550,100 of 0315A28B.D
Sequence Index: 1 Bottle Number : 28 Repetition Number: 2

A 360,4 550,100 of 0315A28B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.294	PV	142.03	19.9067	0.26	100.00	0.095	2.13
1.484	VV	94.7356	18.9516	0.17	100.00	0.083	2.57
1.644	VV	492.66	48.4153	0.89	100.00	0.137	1.01
1.980	VV	185.71	18.1160	0.34	100.00	0.140	2.19
2.229	VV	588.91	80.3329	1.07	100.00	0.099	1.94
2.542	VV	11650	2429.09	21.08	100.00	0.080	2.17
2.687	VV	7220.84	1817.11	13.07	100.00	0.066	0.60
2.933	VV	3232.85	337.65	5.85	100.00	0.132	0.77
3.317	VV	13038	1516.60	23.60	100.00	0.128	1.04
3.829	VV	4448.57	419.93	8.05	100.00	0.156	0.92
4.334	VV	966.60	56.9154	1.75	100.00	0.217	3.72
4.569	VV	4054.93	268.92	7.34	100.00	0.212	0.53
5.346	VV	2381.10	122.41	4.31	100.00	0.262	1.77
5.572	VV	924.81	66.8378	1.67	100.00	0.191	0.35
5.888	VV	787.82	57.0017	1.43	100.00	0.197	0.99
6.166	VV	886.77	55.5660	1.60	100.00	0.236	1.01
6.453	VV	793.89	46.5058	1.44	100.00	0.243	0.70
7.050	VV	2278.34	94.5174	4.12	100.00	0.363	1.21
7.650	VV	813.13	30.9512	1.47	100.00	0.352	0.61
8.456	VV	238.38	7.8754	0.43	100.00	0.392	0.54
9.841	PBA	37.9556	8.6577	0.07	100.00	0.073	0.35

1: LC A 360.4 550.100 of 0315A29A.D



Lot 3, DNPH
Blank

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

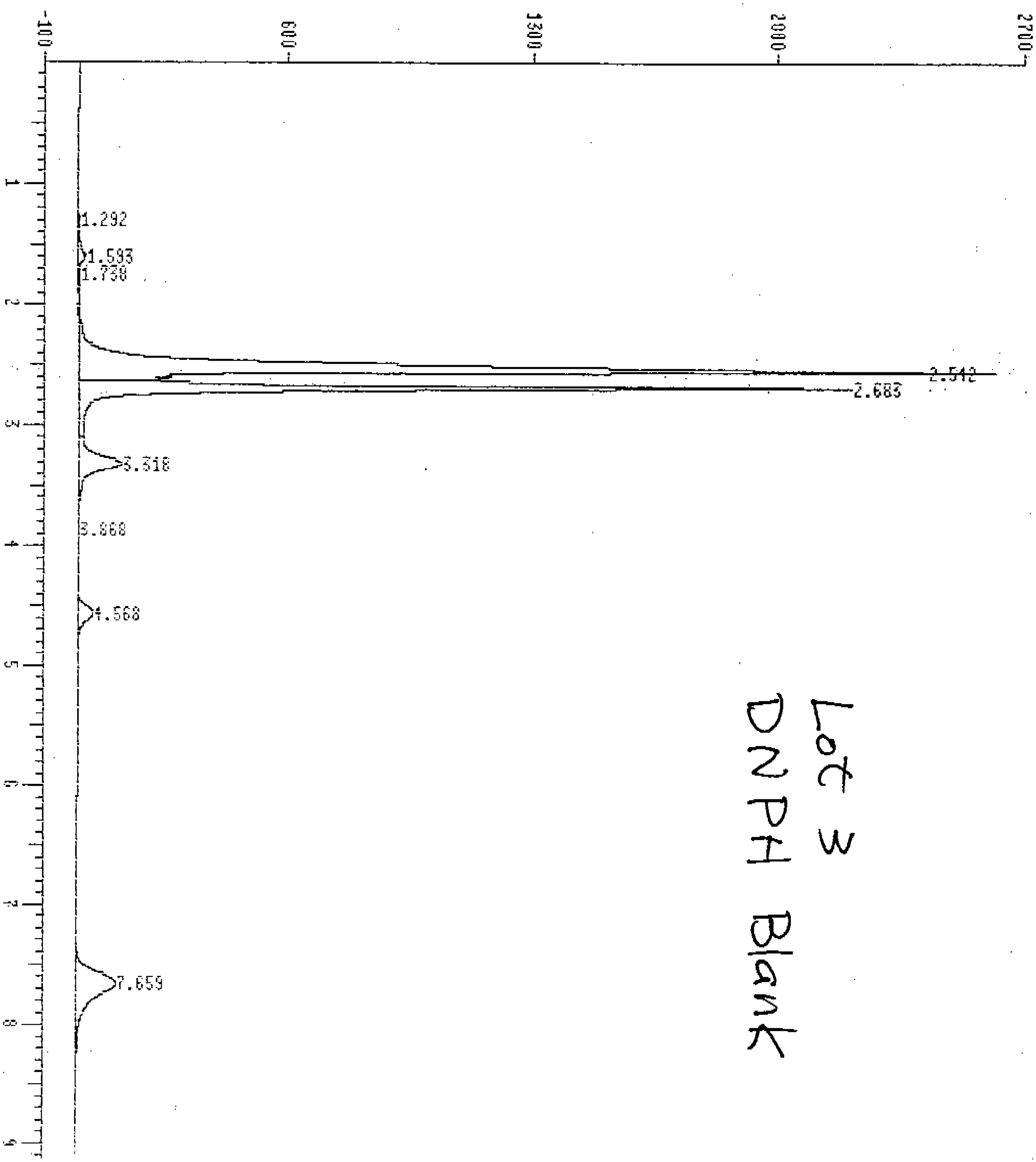
Report by Signal

Operator: 14 Mar 92 5:44 pm
Method File Name : DNPHIII.M
Sample Info : ~~DS-3 = Run 3~~ DNPH, Lot 3
Misc Info:
Integration File Name : DATA:0315A29A.I
consisting of channels : 1. A 360,4 550,100 of 0315A29A.D
Sequence Index: 1 Bottle Number : 29 Repetition Number: 1

A 360,4 550,100 of 0315A29A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.292	PV	78.6727	4.9372	0.38	100.00	0.198	2.67
1.592	VV	240.82	23.1451	1.15	100.00	0.140	0.84
1.866	VV	49.0638	7.0603	0.23	100.00	0.097	1.65
2.539	VV	10603	2270.91	50.64	100.00	0.064	2.38
2.683	VV	5905.90	1939.68	28.21	100.00	0.140	0.44
3.317	VV	1442.36	131.41	6.89	100.00	0.156	0.93
3.869	VV	371.78	12.3764	1.78	100.00	0.381	0.50
4.567	VV	546.93	47.0078	2.61	100.00	0.173	0.83
7.659	BB	1699.63	114.24	8.12	100.00	0.224	0.72

1: LC A 360,4 550,100 of 0315A29B.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

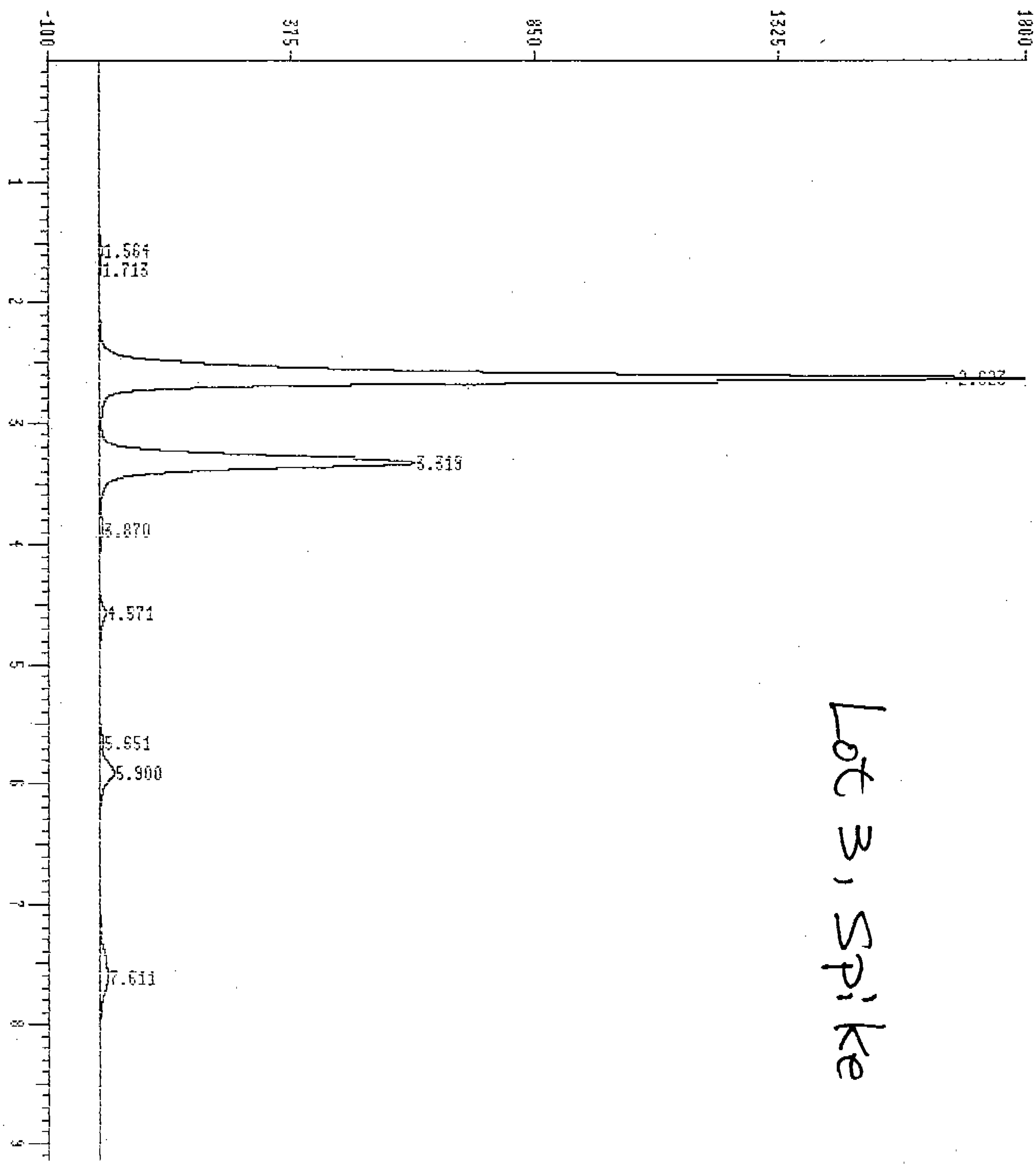
Report by Signal

Operator: 14 Mar 92 5:58 pm
Method File Name : DNPHIII.M
Sample Info : ~~DS3 - Run 3~~ DNPH Lot 3
Misc Info:
Integration File Name : DATA:0315A29B.I
consisting of channels : 1. A 360,4 550,100 of 0315A29B.D
Sequence Index: 1 Bottle Number : 29 Repetition Number: 2

A 360,4 550,100 of 0315A29B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.292	BV	8.0529	2.2906	0.04	100.00	0.053	0.72
1.593	VV	146.37	19.9304	0.72	100.00	0.106	1.28
1.738	VV	15.4664	2.7059	0.08	100.00	0.095	0.35
2.542	VV	10963	2424.33	53.61	100.00	0.078	1.96
2.683	VV	5899.45	1864.74	28.85	100.00	0.141	0.55
3.318	VV	1251.36	125.73	6.12	100.00	0.145	1.03
3.868	VB	45.0508	3.6829	0.22	100.00	0.168	1.11
4.568	BB	423.59	43.6705	2.07	100.00	0.150	0.90
7.659	BB	1698.50	114.10	8.31	100.00	0.224	0.72

1: LC A 360,4 550,100 of 0315A30A.D



End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

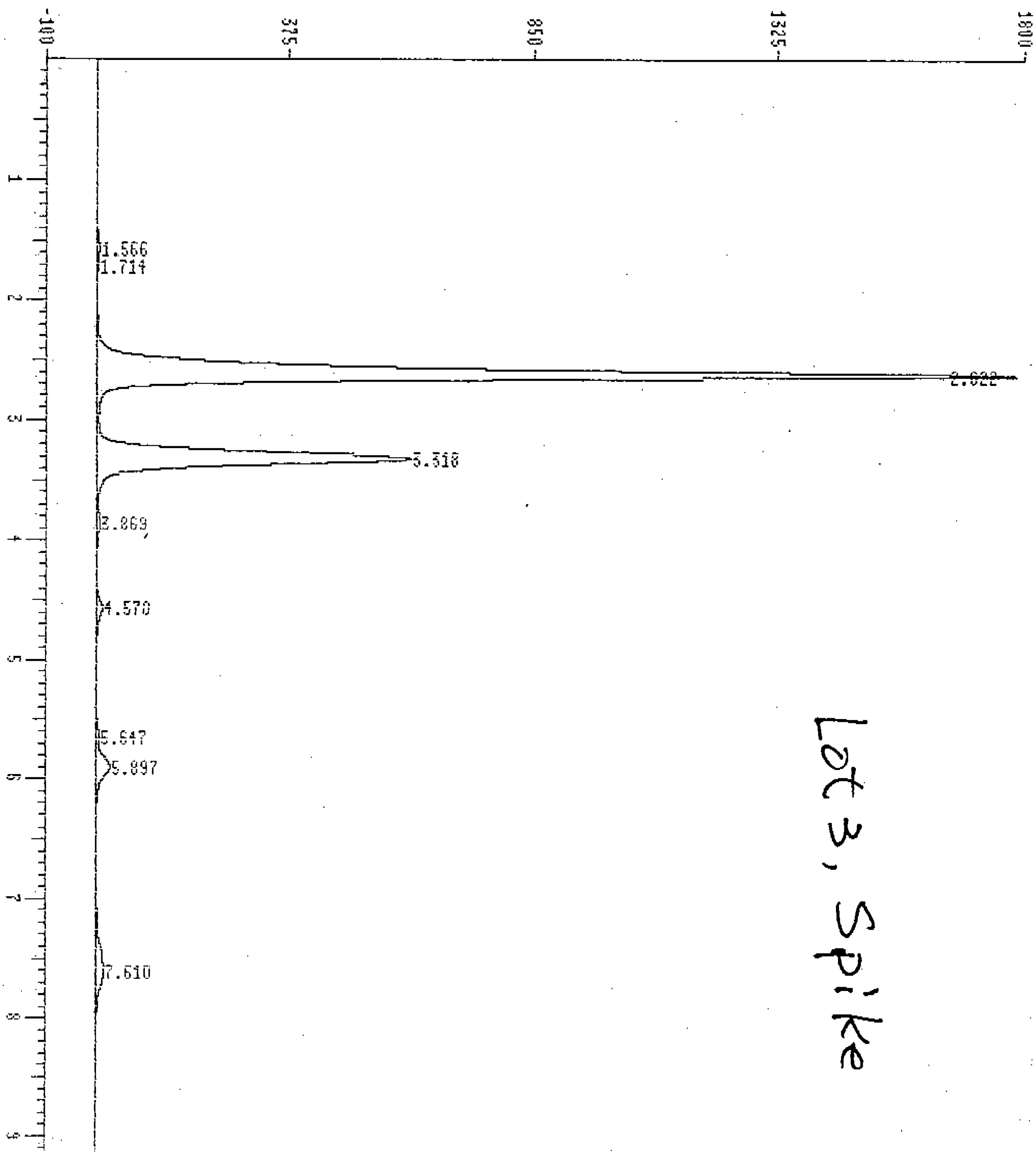
Report by Signal

Operator: 14 Mar 92 6:11 pm
Method File Name : DNPHIII.M
Sample Info : DNPH , Lot 3 Spike
Misc Info:
Integration File Name : DATA:0315A30A.I
consisting of channels : 1. A 360.4 550.100 of 0315A30A.D
Sequence Index: 1 Bottle Number : 30 Repetition Number: 1

A 360.4 550.100 of 0315A30A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.564	VV	44.5430	5.3645	0.26	100.00	0.116	1.91
1.713	VB	13.7357	1.8686	0.08	100.00	0.099	0.54
2.623	BV	11098	1802.56	65.53	100.00	0.089	1.36
3.319	VV	4829.05	613.66	28.52	100.00	0.119	1.08
3.870	VB	81.7850	6.2485	0.48	100.00	0.184	1.26
4.571	BB	115.91	11.0366	0.68	100.00	0.160	0.81
5.651	BV	48.2066	5.2810	0.28	100.00	0.143	1.88
5.900	VB	346.88	27.0405	2.05	100.00	0.195	0.93
7.611	BB	356.73	14.5286	2.11	100.00	0.344	1.42

1: LC A 360,4 550,100 of 0315A30B.D



Lot 3, Spike

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

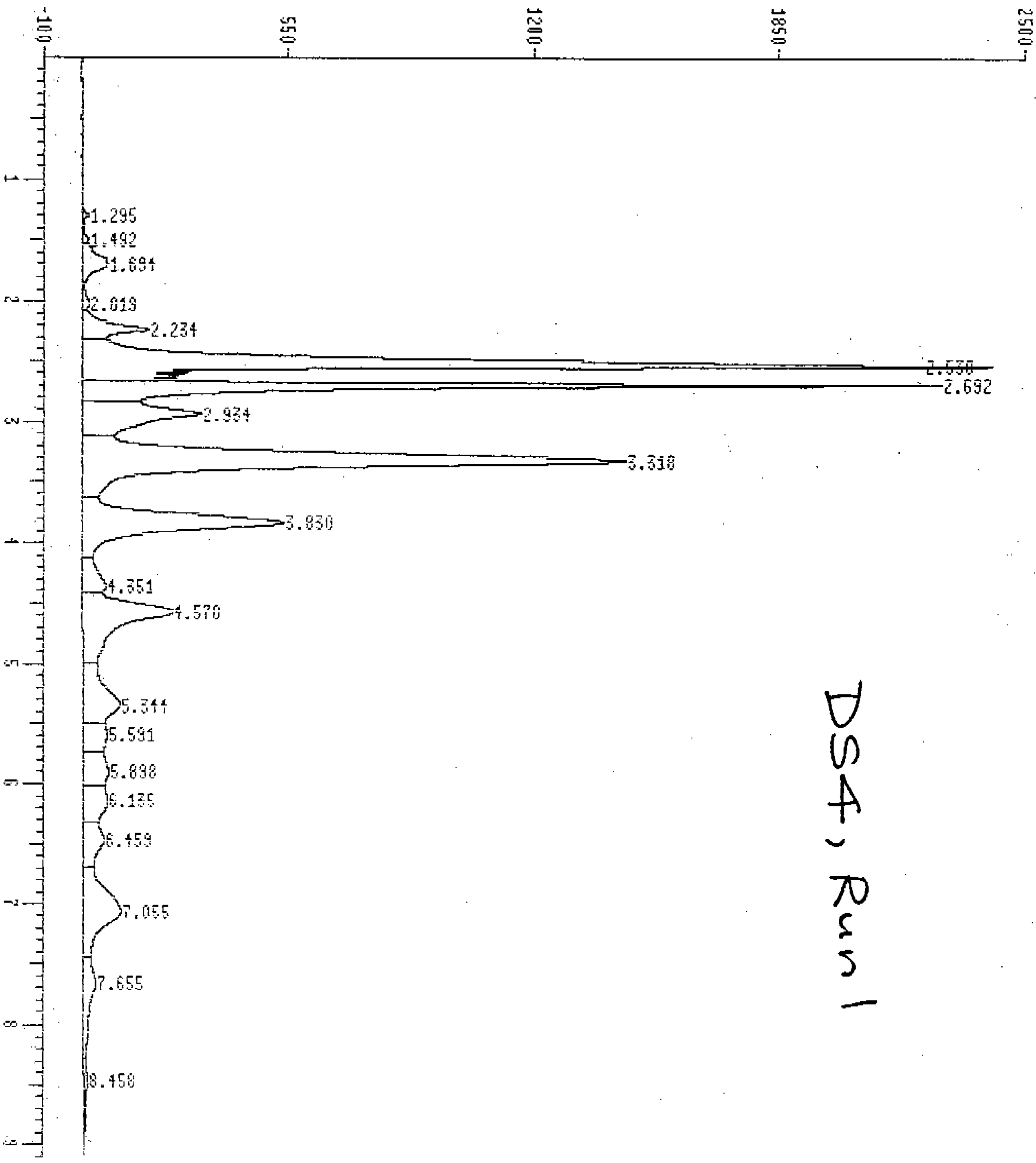
Report by Signal

Operator: 14 Mar 92 6:24 pm
Method File Name : DNPHIII.M
Sample Info : ~~DNPH~~ , Lot 3 Spike
Misc Info:
Integration File Name : DATA:0315A30B.I
consisting of channels : 1. A 360,4 550,100 of 0315A30B.D
Sequence Index: 1 Bottle Number : 30 Repetition Number: 2

A 360,4 550,100 of 0315A30B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.566	VV	47.0647	5.4594	0.28	100.00	0.121	1.69
1.714	VB	11.6954	1.8777	0.07	100.00	0.086	0.37
2.622	BV	11067	1790.42	65.51	100.00	0.089	1.38
3.318	VV	4824.66	610.14	28.56	100.00	0.120	1.09
3.869	VB	80.7581	6.1451	0.48	100.00	0.184	1.24
4.570	BB	114.18	10.9131	0.68	100.00	0.159	0.81
5.647	BV	47.0391	5.2901	0.28	100.00	0.138	1.81
5.897	VB	347.76	26.8993	2.06	100.00	0.196	0.92
7.610	BB	353.08	14.4562	2.09	100.00	0.340	1.44

1: LC A 360.4 550.100 of 0315A31A.D



DS4, Run 1

9.849

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

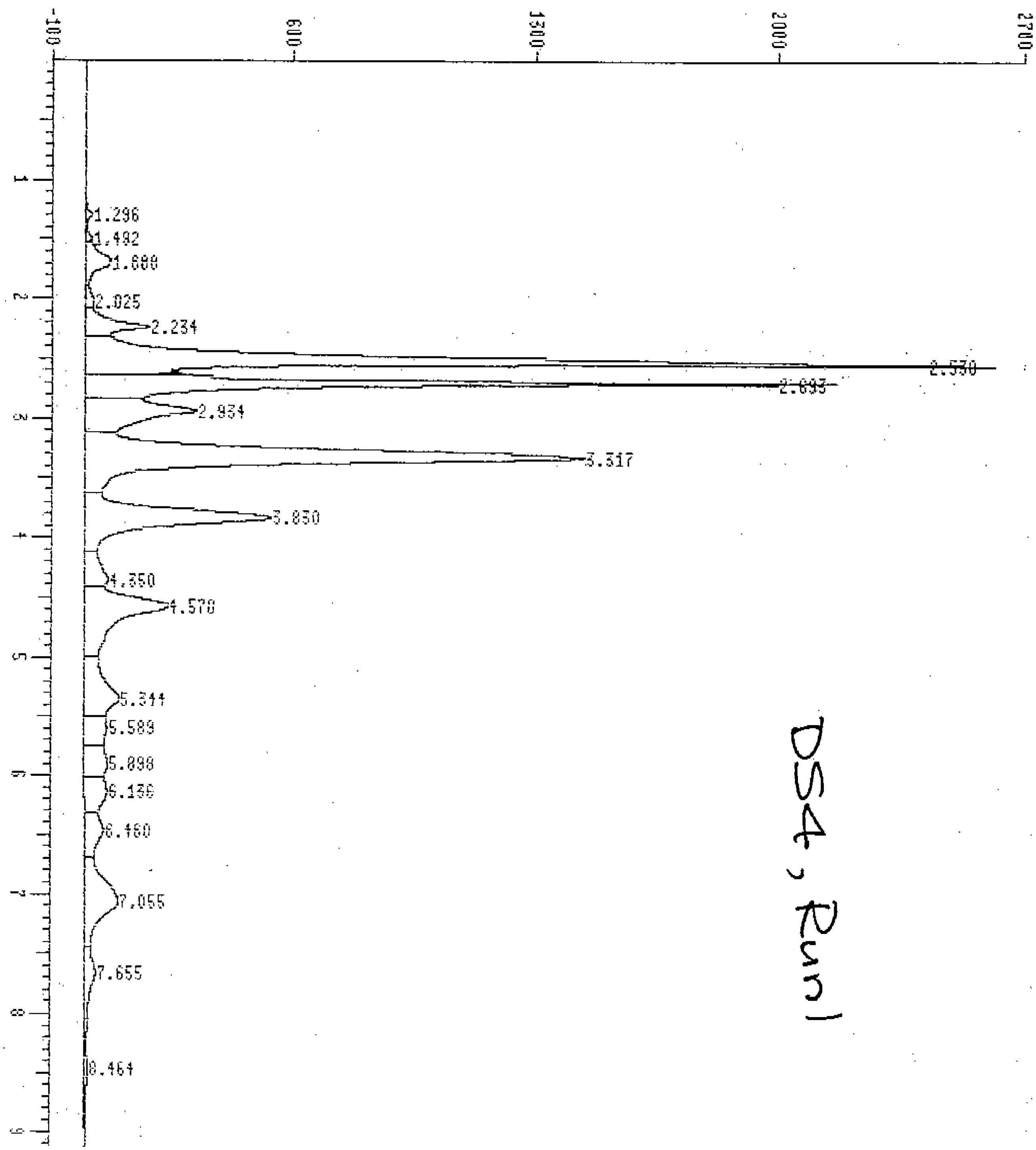
Report by Signal

Operator: 14 Mar 92 6:37 pm
Method File Name : DNPHIII.M
Sample Info : ~~Lot 3, Spike,~~ DS4-Run1
Misc Info:
Integration File Name : DATA:0315A31A.I
consisting of channels : 1. A 360,4 550,100 of 0315A31A.D
Sequence Index: 1 Bottle Number : 31 Repetition Number: 1

A 360.4 550.100 of 0315A31A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.295	BV	82.9682	17.8789	0.15	100.00	0.067	1.08
1.492	VV	76.2704	17.8428	0.14	100.00	0.071	2.15
1.694	VV	750.15	67.4290	1.33	100.00	0.149	1.37
2.019	VV	155.78	19.5518	0.28	100.00	0.112	1.92
2.234	VV	1085.66	180.05	1.93	100.00	0.084	1.28
2.530	VV	12195	2447.76	21.65	100.00	0.069	1.71
2.692	VV	7059.36	1981.92	12.53	100.00	0.059	0.47
2.934	VV	3225.83	317.83	5.73	100.00	0.138	0.66
3.318	VV	12382	1439.42	21.98	100.00	0.127	1.02
3.830	VV	5337.61	536.10	9.48	100.00	0.148	0.93
4.351	VV	804.48	63.2519	1.43	100.00	0.175	3.01
4.570	VV	3585.95	241.38	6.37	100.00	0.210	0.55
5.344	VV	1993.46	100.70	3.54	100.00	0.283	1.88
5.591	VV	899.06	64.9165	1.60	100.00	0.191	0.63
5.898	VV	1025.03	68.6131	1.82	100.00	0.209	1.38
6.135	VV	1055.06	64.8776	1.87	100.00	0.244	0.74
6.459	VV	965.80	56.1361	1.71	100.00	0.244	0.73
7.055	VV	2445.49	100.73	4.34	100.00	0.366	1.19
7.655	VV	888.21	33.2502	1.58	100.00	0.359	0.55
8.458	VV	285.49	8.9102	0.51	100.00	0.414	0.44
9.849	PBA	31.4165	8.9022	0.06	100.00	0.059	0.15

1: LC A 360.4 550.100 of 0315A31B.D



DS4, Run 1

9.848

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

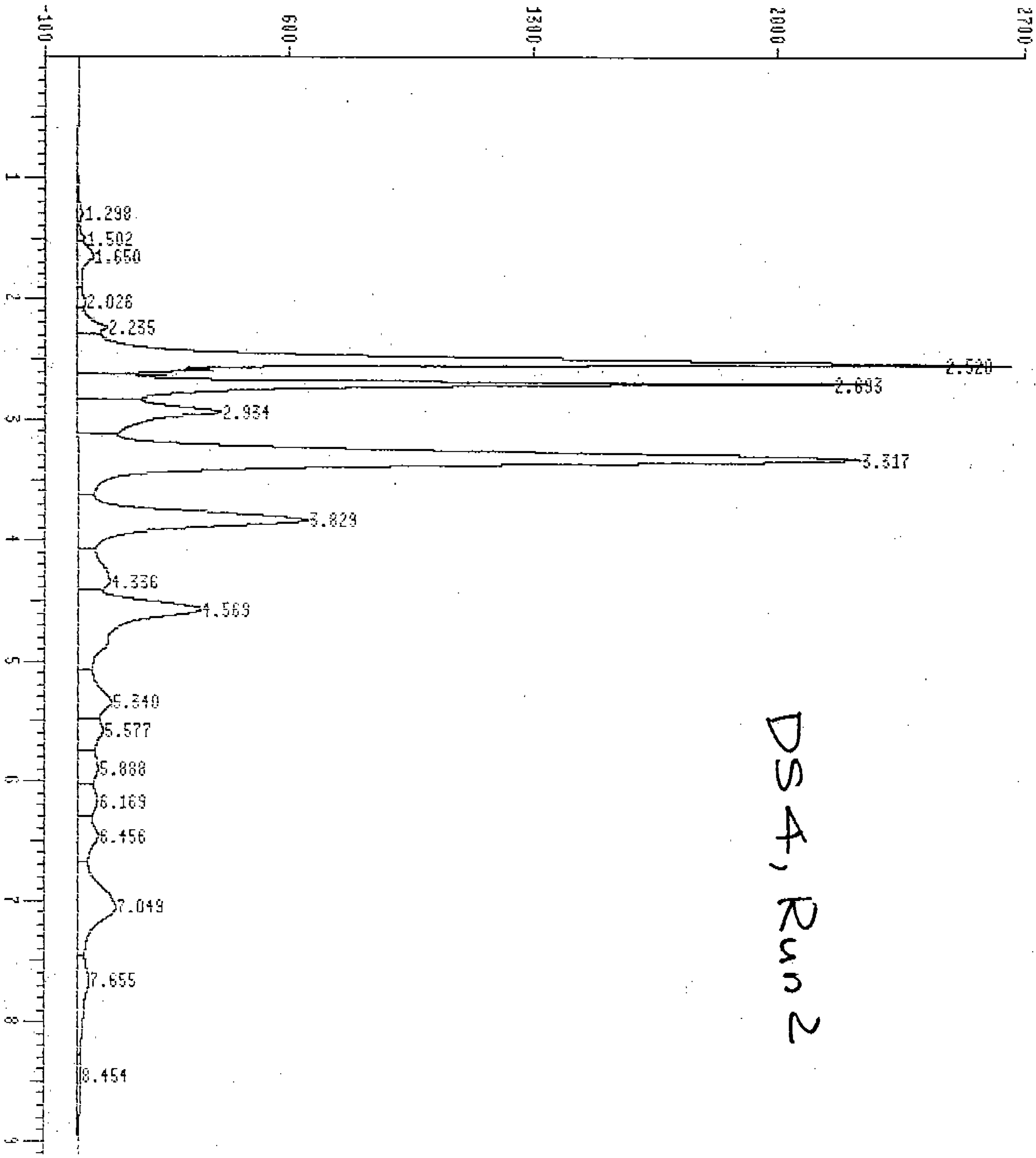
Report by Signal

Operator: 14 Mar 92 6:50 pm
Method File Name : DNPHIII.M
Sample Info : DS4- Run 1
Misc Info:
Integration File Name : DATA:0315A31B.I
consisting of channels : 1. A 360,4 550,100 of 0315A31B.D
Sequence Index: 1 Bottle Number : 31 Repetition Number: 2

A 360,4 550,100 of 0315A31B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.298	PV	121.67	19.5878	0.21	100.00	0.085	1.58
1.492	VV	90.0022	19.5522	0.16	100.00	0.077	2.33
1.688	VV	823.97	71.9241	1.43	100.00	0.155	1.13
2.025	VV	207.02	25.7580	0.36	100.00	0.112	2.24
2.234	VV	1213.11	189.07	2.10	100.00	0.089	1.36
2.530	VV	12067	2455.59	20.92	100.00	0.084	1.76
2.693	VV	7664.81	2007.97	13.29	100.00	0.064	0.59
2.934	VV	3385.02	327.37	5.87	100.00	0.140	0.65
3.317	VV	12568	1445.58	21.79	100.00	0.129	1.02
3.830	VV	5535.94	543.15	9.60	100.00	0.151	0.92
4.350	VV	906.19	67.5753	1.57	100.00	0.183	3.08
4.570	VV	3638.56	243.43	6.31	100.00	0.211	0.55
5.344	VV	2007.80	101.01	3.48	100.00	0.283	1.88
5.589	VV	899.85	64.6555	1.56	100.00	0.191	0.59
5.898	VV	1000.72	67.7615	1.74	100.00	0.206	1.35
6.136	VV	1045.74	64.4110	1.81	100.00	0.244	0.75
6.460	VV	949.76	55.4327	1.65	100.00	0.244	0.73
7.055	VV	2406.56	99.9831	4.17	100.00	0.363	1.19
7.655	VV	829.44	32.1331	1.44	100.00	0.349	0.57
8.464	VV	273.05	8.4763	0.47	100.00	0.418	0.50
9.848	PBA	34.5047	8.9948	0.06	100.00	0.064	0.24

1: LC A 360.4 550.100 of 0315A328.D



DSA, Run 2

9.842

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

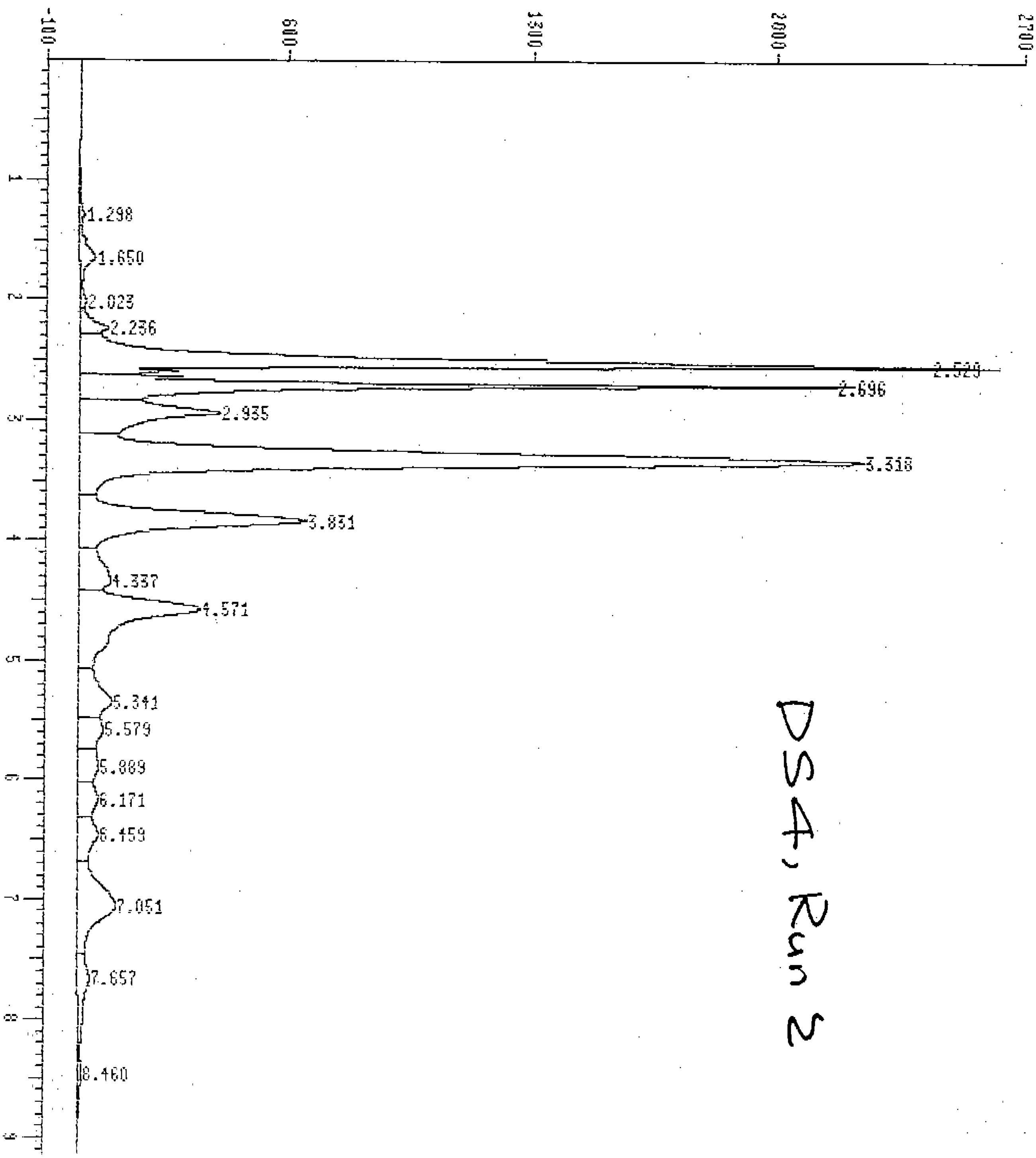
Report by Signal

Operator: 14 Mar 92 7:17 pm
Method File Name : DNPHIII.M
Sample Info : DS4- Run2
Misc Info:
Integration File Name : DATA:0315A32B.I
consisting of channels : 1. A 360,4 550,100 of 0315A32B.D
Sequence Index: 1 Bottle Number : 32 Repetition Number: 2

A 360.4 550.100 of 0315A32B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.298	PV	135.41	17.1879	0.20	100.00	0.104	2.00
1.502	VV	92.2475	20.1291	0.14	100.00	0.076	2.39
1.650	VV	527.29	46.5458	0.78	100.00	0.149	0.79
2.026	VV	176.68	20.6590	0.26	100.00	0.121	2.02
2.235	VV	593.00	86.8290	0.88	100.00	0.093	1.84
2.528	VV	12479	2524.14	18.46	100.00	0.067	2.02
2.693	VV	7867.03	1945.33	11.64	100.00	0.067	0.56
2.934	VV	4102.17	412.29	6.07	100.00	0.136	0.69
3.317	VV	18819	2243.72	27.83	100.00	0.125	1.07
3.829	VV	6527.96	656.77	9.65	100.00	0.148	0.95
4.336	VV	1526.54	93.2440	2.26	100.00	0.214	3.19
4.569	VV	5322.41	352.49	7.87	100.00	0.213	0.51
5.340	VV	1714.60	96.9973	2.54	100.00	0.257	1.72
5.577	VV	1042.55	73.0625	1.54	100.00	0.201	0.64
5.888	VV	891.54	58.5795	1.32	100.00	0.216	1.09
6.169	VV	865.36	57.5493	1.28	100.00	0.222	1.08
6.456	VV	995.15	59.4152	1.47	100.00	0.243	0.78
7.049	VV	2663.07	108.79	3.94	100.00	0.368	1.18
7.655	VV	930.97	33.5386	1.38	100.00	0.370	0.47
8.454	VV	292.14	9.9631	0.43	100.00	0.388	0.48
9.842	PBA	49.0892	9.4834	0.07	100.00	0.086	0.59

1: LC A 360.4   550.100   of 0315A32A.D



DS4, Run 2

9.844

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

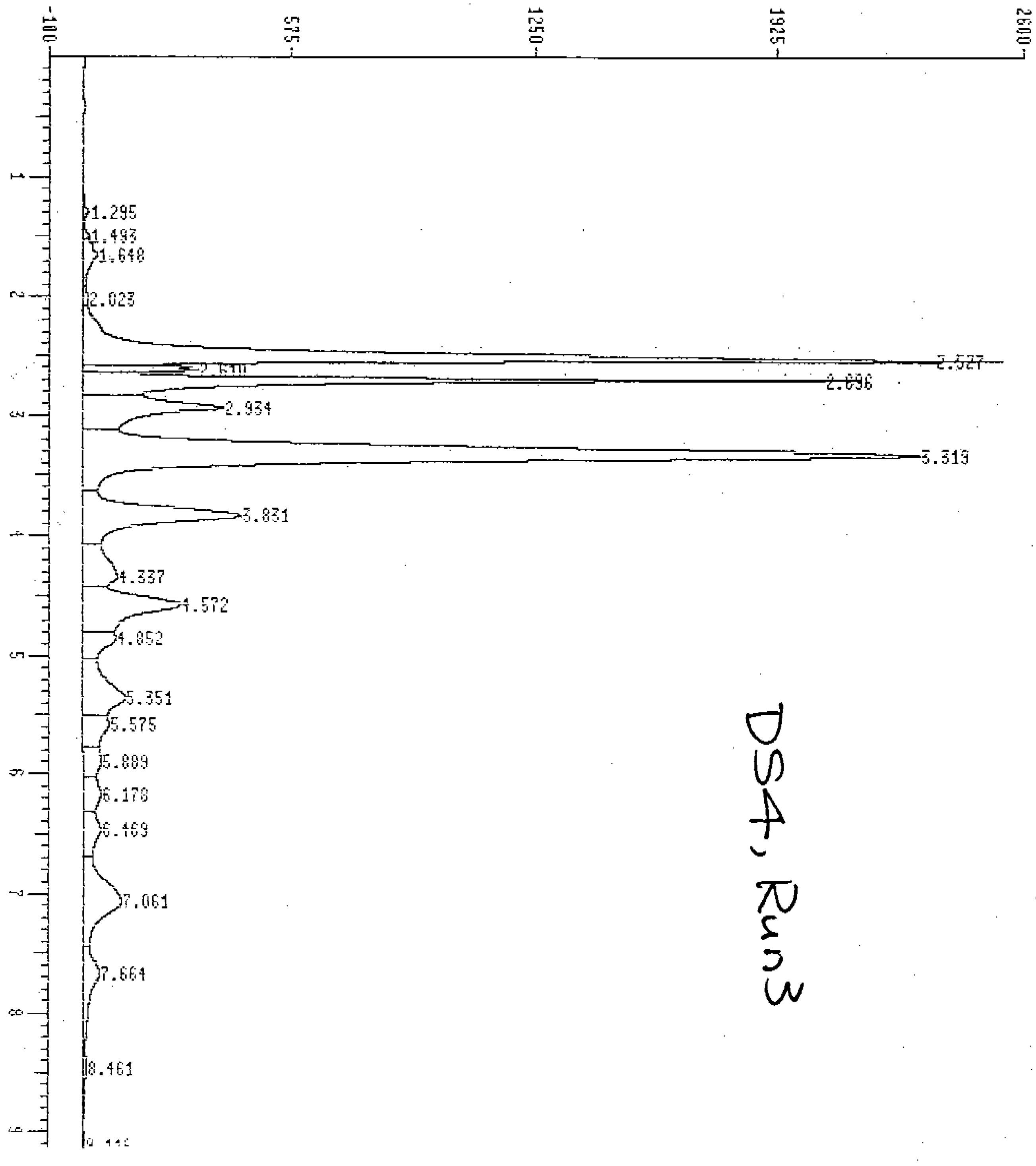
Report by Signal

Operator: 14 Mar 92 7:03 pm
Method File Name : DNPHIII.M
Sample Info :
Misc Info: DS4- Run 2
Integration File Name : DATA:0315A32A.I
consisting of channels : 1: A 360,4 550,100 of 0315A32A.D
Sequence Index: 1 Bottle Number : 32 Repetition Number: 1

A 360,4 550,100 of 0315A32A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.298	PV	109.17	16.2433	0.16	100.00	0.090	1.78
1.650	VV	590.02	45.7468	0.88	100.00	0.168	1.17
2.023	VV	157.54	18.6201	0.24	100.00	0.120	1.89
2.236	VV	565.37	84.9725	0.85	100.00	0.091	1.85
2.529	VV	12035	2495.87	18.00	100.00	0.066	2.15
2.696	VV	7764.39	1986.48	11.61	100.00	0.065	0.61
2.935	VV	4063.38	410.16	6.08	100.00	0.135	0.69
3.318	VV	18844	2253.68	28.19	100.00	0.125	1.07
3.831	VV	6507.31	656.12	9.73	100.00	0.148	0.95
4.337	VV	1511.07	92.7160	2.26	100.00	0.213	3.16
4.571	VV	5302.56	351.92	7.93	100.00	0.212	0.51
5.341	VV	1710.55	96.9109	2.56	100.00	0.256	1.73
5.579	VV	1041.98	72.9614	1.56	100.00	0.201	0.65
5.889	VV	891.49	58.3904	1.33	100.00	0.218	1.08
6.171	VV	853.66	56.9135	1.28	100.00	0.222	1.08
6.459	VV	986.78	58.0256	1.48	100.00	0.243	0.78
7.051	VV	2657.91	108.53	3.98	100.00	0.368	1.17
7.657	VV	929.03	33.6538	1.39	100.00	0.368	0.48
8.460	VV	285.40	9.7821	0.43	100.00	0.389	0.51
9.844	PBA	47.0964	9.2498	0.07	100.00	0.085	0.59

1: LC A 360.4   550.100   of 0315A33A.D



DS4, Run3

9.855

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

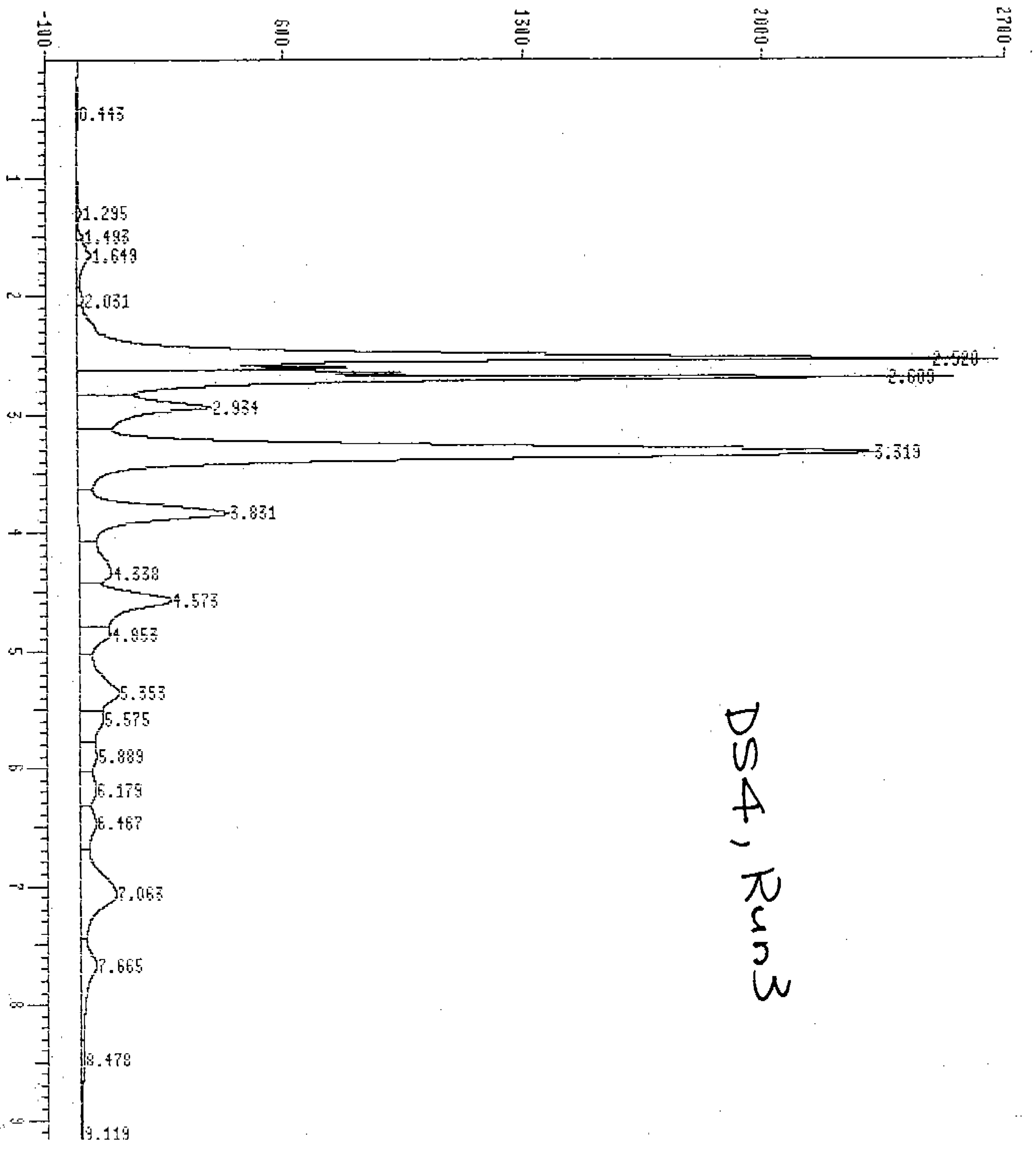
Report by Signal

Operator: 14 Mar 92 7:30 pm
Method File Name : DNPHIII.M
Sample Info : DS4, Run 3
Misc Info:
Integration File Name : DATA:0315A33A.I
consisting of channels : 1. A 360.4 550.100 of 0315A33A.D
Sequence Index: 1 Bottle Number : 33 Repetition Number: 1

A 360.4 550.100 of 0315A33A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.295	PV	124.18	15.7743	0.20	100.00	0.104	2.20
1.493	VV	80.4613	16.7029	0.13	100.00	0.080	2.52
1.648	VV	490.33	40.2139	0.78	100.00	0.158	0.69
2.023	VV	115.14	14.9038	0.18	100.00	0.110	1.93
2.527	VV	11659	2412.60	18.45	100.00	0.067	2.46
2.610	VV	1066.64	285.56	1.69	100.00	0.062	0.87
2.696	VV	6684.99	1831.86	10.58	100.00	0.061	0.51
2.934	VV	3713.37	391.68	5.88	100.00	0.130	0.75
3.319	VV	19340	2326.32	30.61	100.00	0.124	1.08
3.831	VV	4510.71	441.54	7.14	100.00	0.151	0.91
4.337	VV	1584.94	95.8623	2.51	100.00	0.218	2.91
4.572	VV	3432.95	270.49	5.43	100.00	0.184	0.71
4.852	VV	961.02	91.7247	1.52	100.00	0.149	0.40
5.351	VV	2173.88	118.42	3.44	100.00	0.252	1.64
5.575	VV	978.89	71.9460	1.55	100.00	0.191	0.40
5.889	VV	689.37	50.9916	1.09	100.00	0.193	0.90
6.178	VV	757.79	49.2585	1.20	100.00	0.228	1.13
6.469	VV	856.17	48.8027	1.35	100.00	0.249	0.76
7.061	VV	2544.77	108.07	4.03	100.00	0.356	1.22
7.664	VV	1107.73	47.3250	1.75	100.00	0.321	0.55
8.461	VV	236.16	8.3036	0.37	100.00	0.376	0.39
9.116	VV	58.1855	3.5749	0.09	100.00	0.252	1.05
9.855	PBA	21.6941	6.8088	0.03	100.00	0.053	0.12

1: LC A 360.4   550.100   of 0315A33B.D



9.858

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

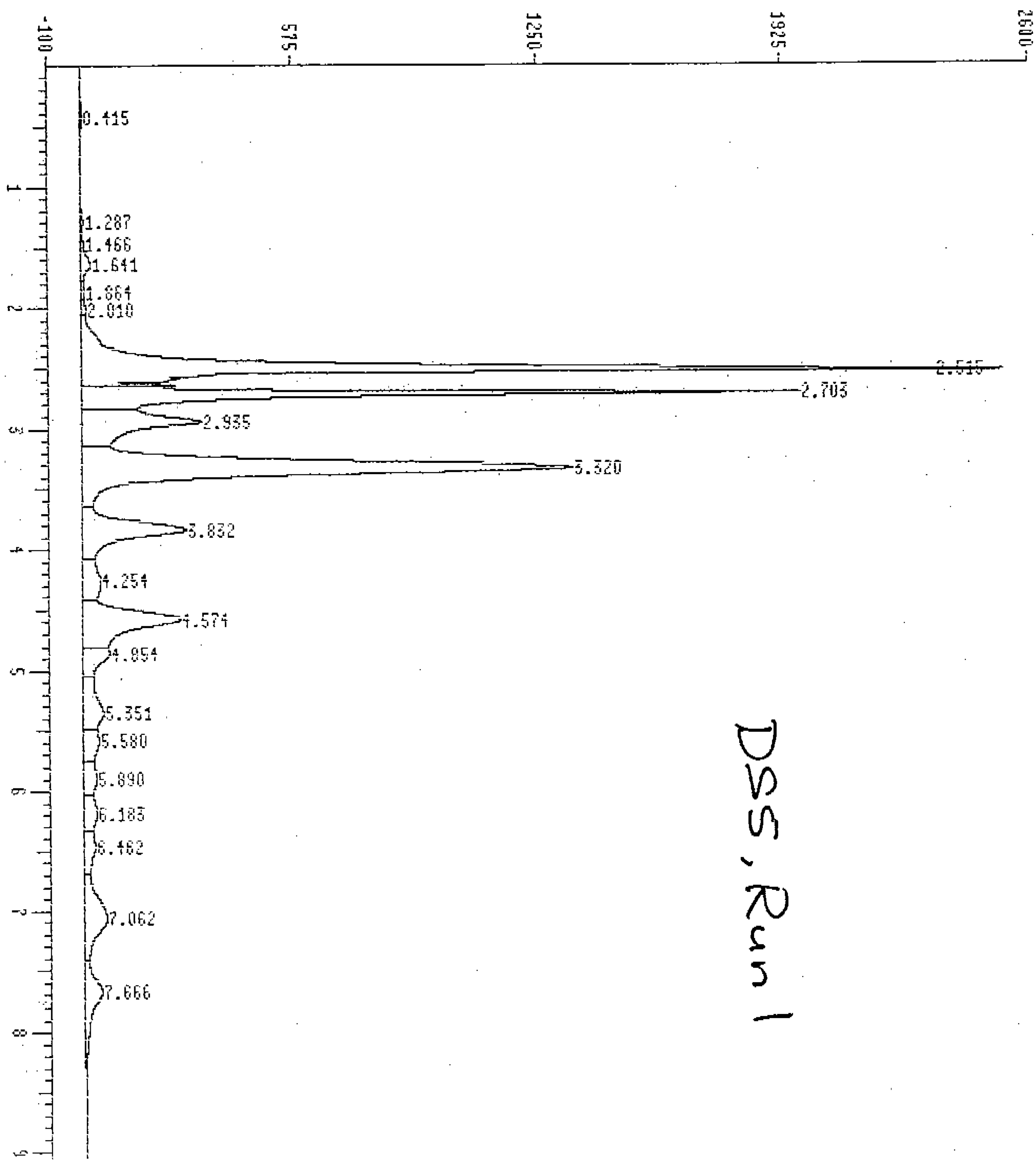
Report by Signal

Operator: 14 Mar 92   7:43 pm
Method File Name : DNPHIII.M
Sample Info : DS4, Run3
Misc Info:
Integration File Name : DATA:0315A33B.I
consisting of channels : 1. A 360.4 550.100 of 0315A33B.D
Sequence Index: 1   Bottle Number : 33   Repetition Number: 2

A 360.4 550.100 of 0315A33B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
0.443	BV	39.2801	2.3291	0.06	100.00	0.238	0.84
1.295	PV	107.26	14.8059	0.16	100.00	0.096	2.23
1.493	VV	76.0373	16.0346	0.11	100.00	0.079	2.42
1.649	VV	478.55	39.4406	0.71	100.00	0.157	0.68
2.031	VV	121.42	15.4708	0.18	100.00	0.112	2.19
2.528	VV	13580	2500.47	20.20	100.00	0.086	1.47
2.689	VV	9884.45	2191.40	14.70	100.00	0.075	0.88
2.934	VV	3707.94	391.83	5.52	100.00	0.130	0.75
3.319	VV	19314	2322.32	28.73	100.00	0.125	1.07
3.831	VV	4535.50	442.59	6.75	100.00	0.152	0.91
4.338	VV	1589.27	96.1279	2.36	100.00	0.217	2.90
4.573	VV	3435.66	270.60	5.11	100.00	0.184	0.71
4.853	VV	958.64	91.6389	1.43	100.00	0.149	0.40
5.353	VV	2165.03	118.04	3.22	100.00	0.254	1.65
5.575	VV	977.67	71.6491	1.45	100.00	0.191	0.40
5.889	VV	679.41	50.4893	1.01	100.00	0.193	0.88
6.179	VV	748.53	48.8416	1.11	100.00	0.227	1.14
6.467	VV	856.03	48.5395	1.27	100.00	0.248	0.76
7.063	VV	2542.72	108.10	3.78	100.00	0.356	1.21
7.665	VV	1109.81	47.4617	1.65	100.00	0.321	0.55
8.478	VV	238.12	8.1560	0.35	100.00	0.380	0.47
9.119	VV	59.4997	3.5873	0.09	100.00	0.259	1.10
9.858	PBA	17.7141	6.4830	0.03	100.00	0.046	-0.00

1: LC A 360.4 550.100 of 0315A34A.D



DSS, Run 1

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

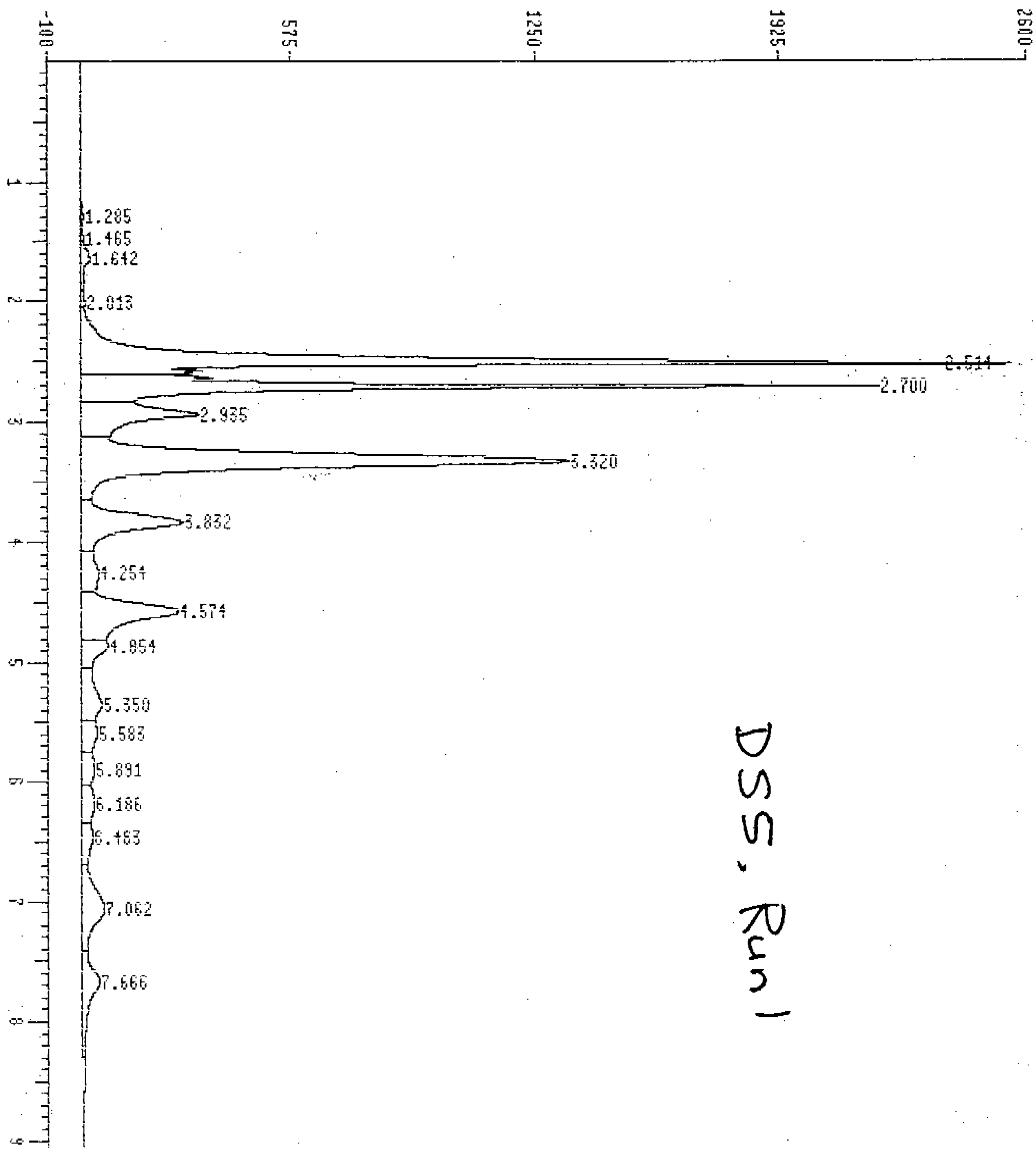
==

Operator: 14 Mar 92 7:57 pm
Method File Name : DNPHIII.M
Sample Info : DS 45, Run 1
Misc Info:
Integration File Name : DATA:0315A34A.I
consisting of channels : 1. A 360,4 550,100 of 0315A34A.D
Sequence Index: 1 Bottle Number : 34 Repetition Number: 1

A 360,4 550,100 of 0315A34A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
0.415	BV	38.1367	2.2836	0.08	100.00	0.256	0.91
1.287	PV	88.6580	10.6478	0.19	100.00	0.108	3.13
1.466	VV	56.7402	9.5973	0.12	100.00	0.099	2.81
1.641	VV	281.76	28.3232	0.60	100.00	0.133	1.31
1.864	VV	78.0653	9.1992	0.17	100.00	0.141	2.04
2.010	VV	96.1203	13.5262	0.20	100.00	0.101	2.03
2.515	VV	11834	2373.45	25.15	100.00	0.068	1.75
2.703	VV	6362.42	1942.03	13.52	100.00	0.055	0.59
2.935	VV	3176.40	330.79	6.75	100.00	0.132	0.75
3.320	VV	11370	1352.07	24.17	100.00	0.125	1.06
3.832	VV	2989.77	286.01	6.35	100.00	0.154	0.90
4.254	VV	840.28	48.8352	1.79	100.00	0.225	1.01
4.574	VV	3255.76	271.07	6.92	100.00	0.177	0.75
4.854	VV	765.54	73.6466	1.63	100.00	0.148	0.38
5.351	VV	1079.68	55.9026	2.29	100.00	0.274	1.99
5.580	VV	612.41	43.0786	1.30	100.00	0.200	0.63
5.890	VV	522.63	35.3663	1.11	100.00	0.210	1.10
6.183	VV	572.20	35.6639	1.22	100.00	0.232	1.07
6.462	VV	509.59	29.3873	1.08	100.00	0.244	0.66
7.062	VV	1501.07	61.9227	3.19	100.00	0.364	1.21
7.666	VV	1014.64	47.8535	2.16	100.00	0.297	0.63

1: LC A 360,4   550,100   of 0315A348.D



DSS, Run 1

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

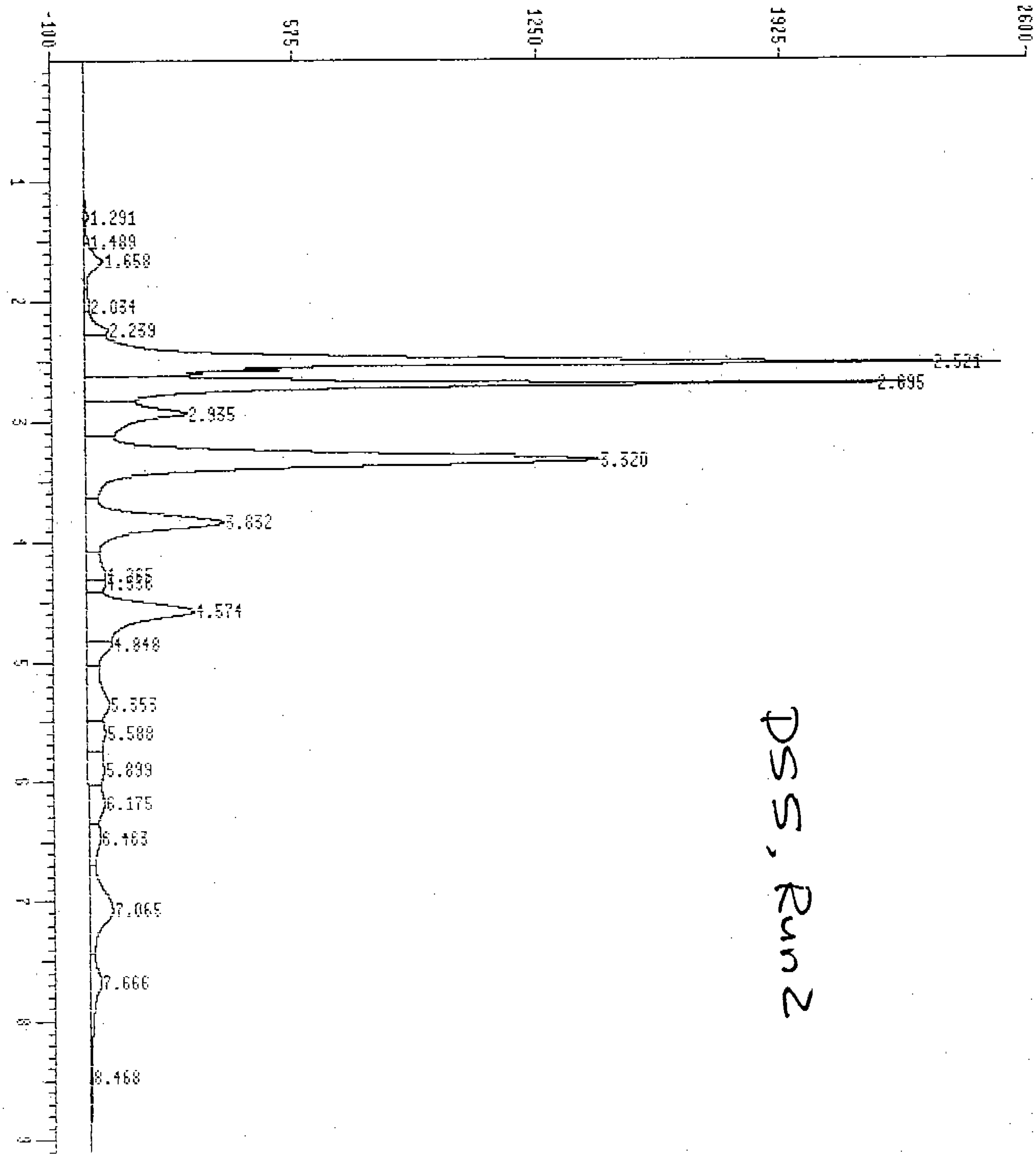
Report by Signal

Operator: 14 Mar 92 8:10 pm
Method File Name : DNPHIII.M
Sample Info : DSS, Run1
Misc Info:
Integration File Name : DATA:0315A34B.I
consisting of channels : 1. A 360,4 550,100 of 0315A34B.D
Sequence Index: 1 Bottle Number : 34 Repetition Number: 2

A 360,4 550,100 of 0315A34B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.285	PV	90.3059	10.3661	0.19	100.00	0.113	3.38
1.465	VV	51.5679	8.9794	0.11	100.00	0.096	2.60
1.642	VV	323.15	27.6620	0.68	100.00	0.153	0.86
2.013	VV	79.9889	11.3776	0.17	100.00	0.100	2.02
2.514	VV	11532	2390.42	24.15	100.00	0.066	1.88
2.700	VV	7713.02	1938.04	16.15	100.00	0.066	0.83
2.935	VV	3092.13	325.76	6.47	100.00	0.131	0.76
3.320	VV	11303	1349.02	23.67	100.00	0.125	1.06
3.832	VV	2924.01	283.26	6.12	100.00	0.153	0.90
4.254	VV	812.56	47.4717	1.70	100.00	0.224	1.01
4.574	VV	3248.78	270.43	6.80	100.00	0.177	0.75
4.854	VV	756.51	73.0498	1.58	100.00	0.148	0.38
5.350	VV	1078.11	55.8536	2.26	100.00	0.278	1.99
5.583	VV	612.60	43.2299	1.28	100.00	0.199	0.64
5.891	VV	529.91	35.3890	1.11	100.00	0.211	1.09
6.186	VV	570.67	35.6171	1.19	100.00	0.233	1.06
6.463	VV	509.57	29.5012	1.07	100.00	0.241	0.66
7.062	VV	1501.46	61.7763	3.14	100.00	0.365	1.21
7.666	VV	1029.39	48.1335	2.16	100.00	0.298	0.64

1: LC A 360.4 550.100 of 0315A35A.D



DSS, Run 2

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

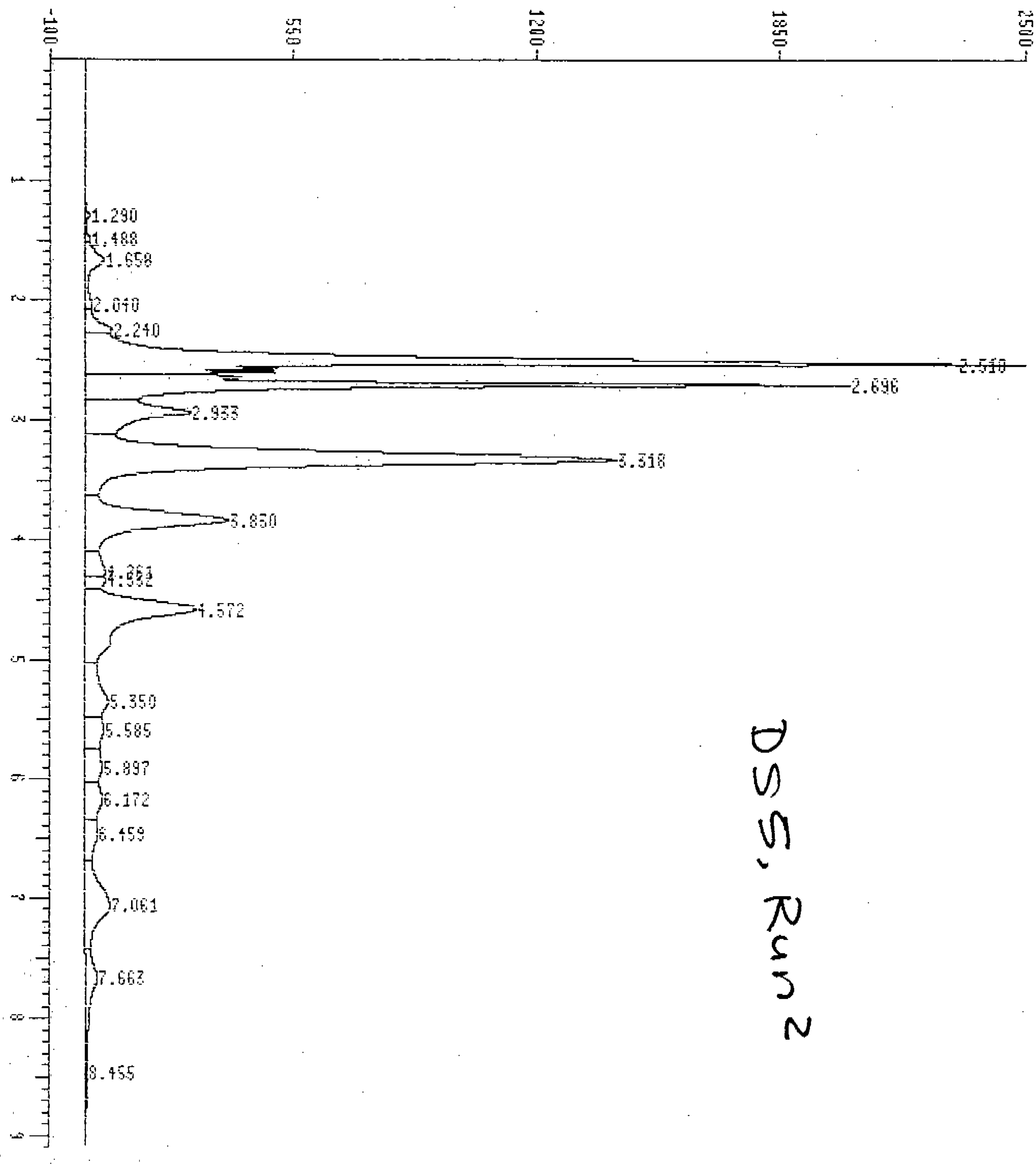
Report by Signal

Operator: 14 Mar 92 8:23 pm
Method File Name : DNPHIII.M
Sample Info : DS5, Run 2
Misc Info:
Integration File Name : DATA:0315A35A.I
consisting of channels : 1. A 360.4 550.100 of 0315A35A.D
Sequence Index: 1 Bottle Number : 35 Repetition Number: 1

A 360.4 550.100 of 0315A35A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.291	PV	107.68	13.7661	0.21	100.00	0.103	2.36
1.489	VV	66.3528	13.8512	0.13	100.00	0.080	2.46
1.658	VV	532.25	51.5449	1.03	100.00	0.151	0.82
2.034	VV	120.97	14.3048	0.23	100.00	0.126	2.76
2.239	VV	439.60	66.6949	0.85	100.00	0.110	2.37
2.521	VV	11932	2380.97	23.05	100.00	0.068	1.65
2.695	VV	8152.89	2030.99	15.75	100.00	0.067	0.77
2.935	VV	2790.30	283.24	5.39	100.00	0.135	0.71
3.320	VV	11913	1422.99	23.02	100.00	0.125	1.05
3.832	VV	3881.58	383.65	7.50	100.00	0.150	0.92
4.265	VV	576.71	51.8254	1.11	100.00	0.185	4.44
4.336	VV	319.52	52.0169	0.62	100.00	0.090	0.57
4.574	VV	3599.96	297.73	6.96	100.00	0.177	0.74
4.848	VV	665.82	68.1864	1.29	100.00	0.163	0.22
5.353	VV	1215.49	62.1604	2.35	100.00	0.266	2.11
5.588	VV	737.19	50.2199	1.42	100.00	0.204	0.66
5.899	VV	682.05	45.1858	1.32	100.00	0.213	1.20
6.175	VV	758.26	45.4487	1.47	100.00	0.245	0.95
6.463	VV	583.19	34.3601	1.13	100.00	0.238	0.61
7.065	VV	1649.75	66.5791	3.19	100.00	0.370	1.18
7.666	VV	841.52	33.9622	1.63	100.00	0.337	0.60
8.468	VV	192.07	6.3211	0.37	100.00	0.391	0.46

1: LC A 360.4   550.100   of 0315A35B.D



DSS, Run 2

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

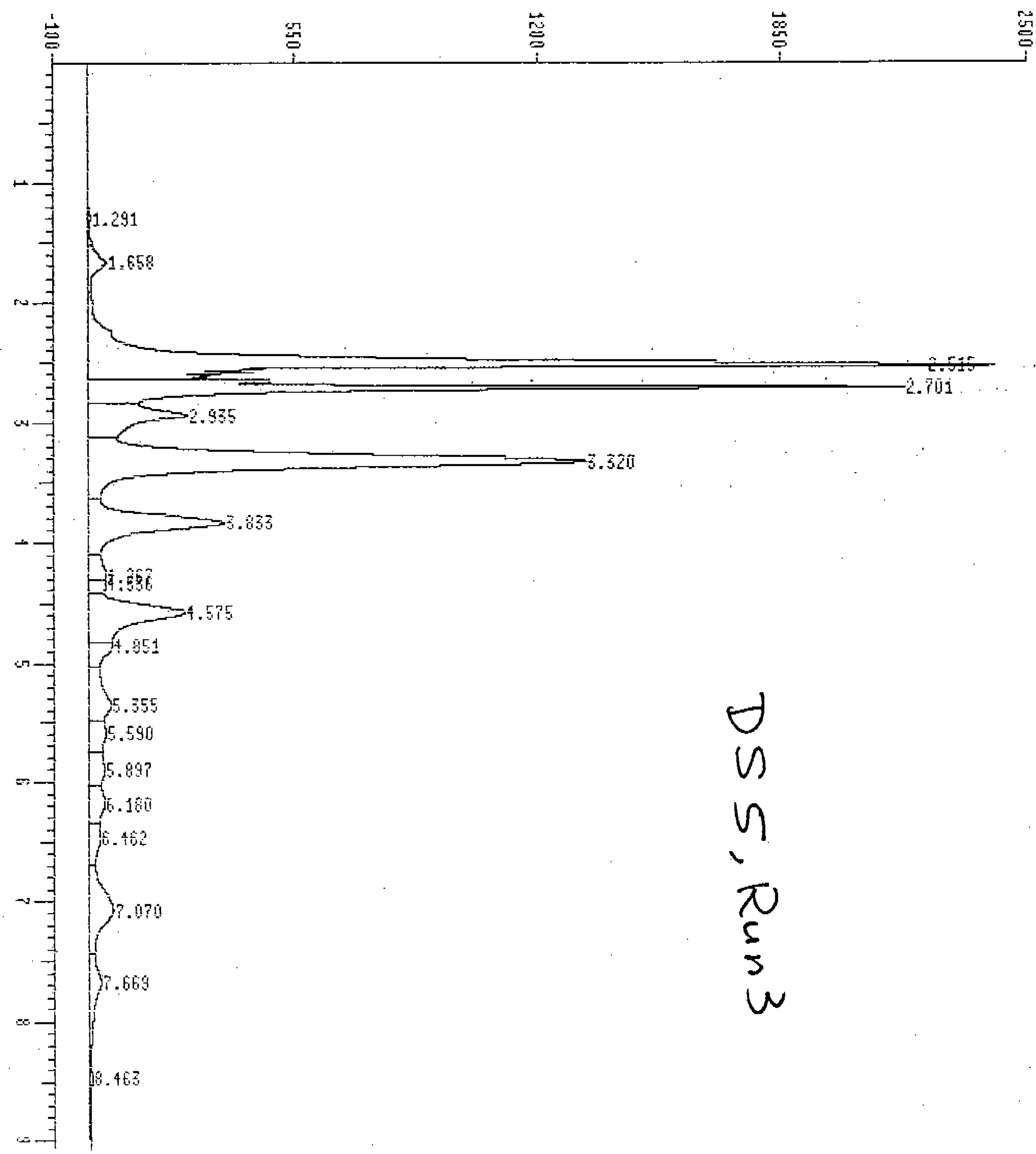
Report by Signal

Operator: 14 Mar 92 8:37 pm
Method File Name : DNPHIII.M
Sample Info : DSS, Run 2
Misc Info:
Integration File Name : DATA:0315A35B.I
consisting of channels : 1. A 360,4 550,100 of 0315A35B.D
Sequence Index: 1 Bottle Number : 35 Repetition Number: 2

A 360,4 550,100 of 0315A35B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.290	PV	103.29	13.7331	0.20	100.00	0.099	2.21
1.488	VV	65.6534	13.7532	0.13	100.00	0.080	2.42
1.658	VV	554.51	52.3608	1.08	100.00	0.154	0.76
2.040	VV	144.55	17.1594	0.28	100.00	0.140	3.30
2.240	VV	480.88	72.2698	0.94	100.00	0.111	2.71
2.518	VV	12144	2369.11	23.63	100.00	0.070	1.62
2.696	VV	7352.77	1825.80	14.31	100.00	0.067	0.77
2.933	VV	2805.32	282.99	5.46	100.00	0.136	0.71
3.318	VV	11953	1416.44	23.26	100.00	0.126	1.06
3.830	VV	3938.70	383.38	7.67	100.00	0.152	0.93
4.261	VV	604.55	52.8632	1.18	100.00	0.169	4.04
4.332	VV	318.52	52.6867	0.62	100.00	0.101	0.45
4.572	VV	4266.09	296.72	8.30	100.00	0.204	0.54
5.350	VV	1229.96	61.8601	2.39	100.00	0.269	2.17
5.585	VV	733.26	50.2383	1.43	100.00	0.203	0.67
5.897	VV	681.93	44.8148	1.33	100.00	0.214	1.25
6.172	VV	762.32	45.4605	1.48	100.00	0.246	0.95
6.459	VV	582.30	34.3617	1.13	100.00	0.237	0.61
7.061	VV	1650.70	65.7820	3.21	100.00	0.375	1.19
7.663	VV	831.96	33.6104	1.62	100.00	0.337	0.60
8.455	VV	181.20	6.1792	0.35	100.00	0.364	0.45

1: LC A 360.4   550.100   of 0315A36A.D



DSS, Run3

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

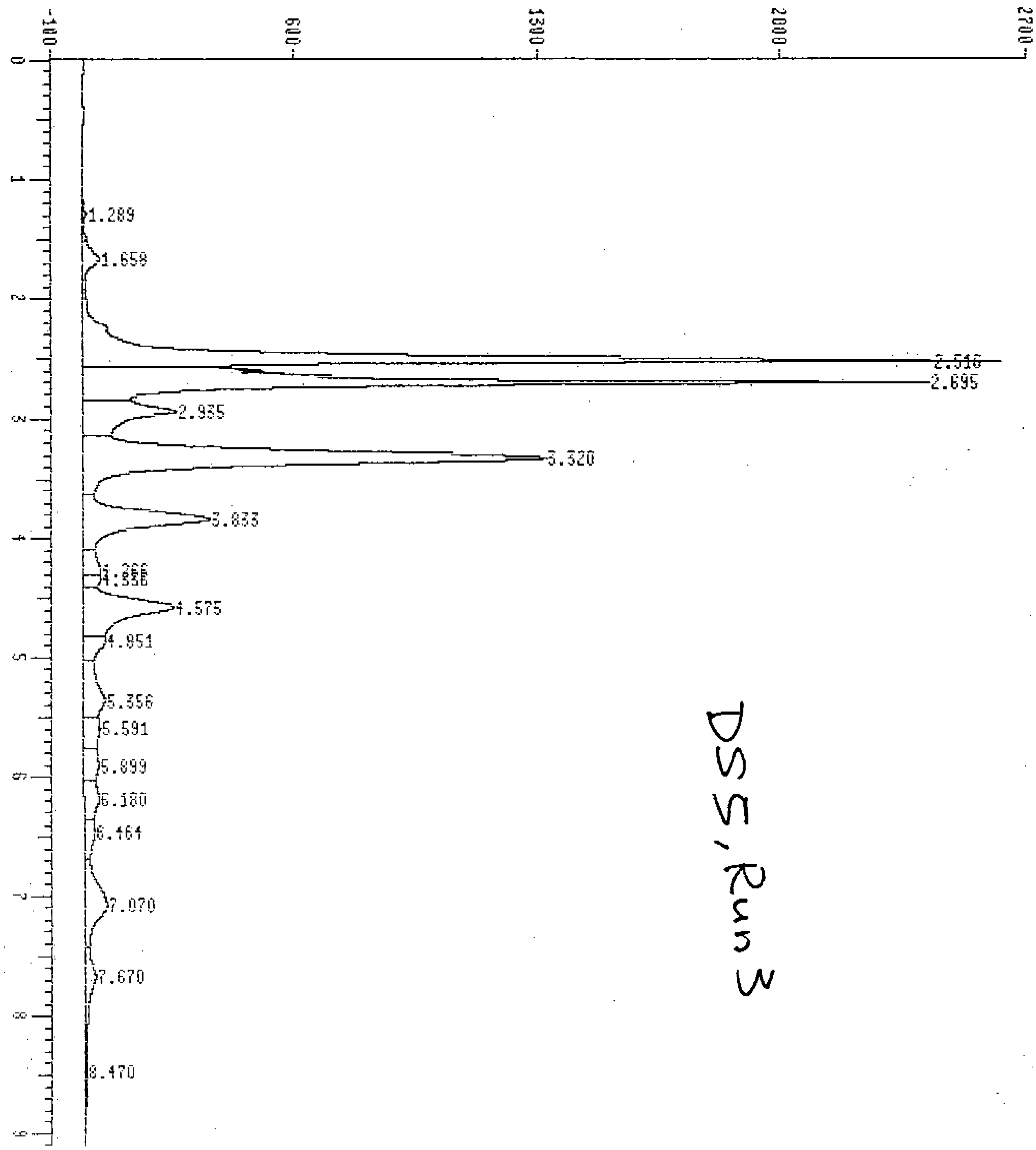
Report by Signal

Operator: 14 Mar 92 8:50 pm
Method File Name : DNPHIII.M
Sample Info : DS 5 , Run3
Misc Info:
Integration File Name : DATA:0315A36A.I
consisting of channels : 1. A 360,4 550,100 of 0315A36A.D
Sequence Index: 1 Bottle Number : 36 Repetition Number: 1

A 360,4 550,100 of 0315A36A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.291	PV	95.1437	11.7679	0.19	100.00	0.107	2.17
1.658	VV	594.13	51.1493	1.21	100.00	0.165	0.99
2.515	VV	12656	2441.34	25.74	100.00	0.070	1.73
2.701	VV	7342.44	2117.16	14.93	100.00	0.049	0.73
2.935	VV	2702.30	268.08	5.49	100.00	0.137	0.68
3.320	VV	11200	1333.26	22.77	100.00	0.125	1.05
3.833	VV	3733.57	367.30	7.59	100.00	0.151	0.92
4.267	VV	531.56	48.1916	1.08	100.00	0.184	4.85
4.336	VV	303.87	48.3545	0.62	100.00	0.092	0.55
4.575	VV	3161.89	259.71	6.43	100.00	0.178	0.74
4.851	VV	627.12	63.7876	1.28	100.00	0.141	0.26
5.355	VV	1200.42	61.3216	2.44	100.00	0.266	2.04
5.590	VV	663.03	45.8930	1.35	100.00	0.200	0.63
5.897	VV	631.65	42.2231	1.28	100.00	0.209	1.18
6.180	VV	712.15	42.7176	1.45	100.00	0.245	0.97
6.462	VV	504.58	30.4578	1.03	100.00	0.232	0.59
7.070	VV	1581.05	65.3483	3.21	100.00	0.366	1.24
7.669	VV	779.44	31.7201	1.58	100.00	0.333	0.64
8.463	VV	157.78	5.3897	0.32	100.00	0.382	0.40

1: LC A 360.4   550.100   of 0315A36B.D



DSS, Run 3

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

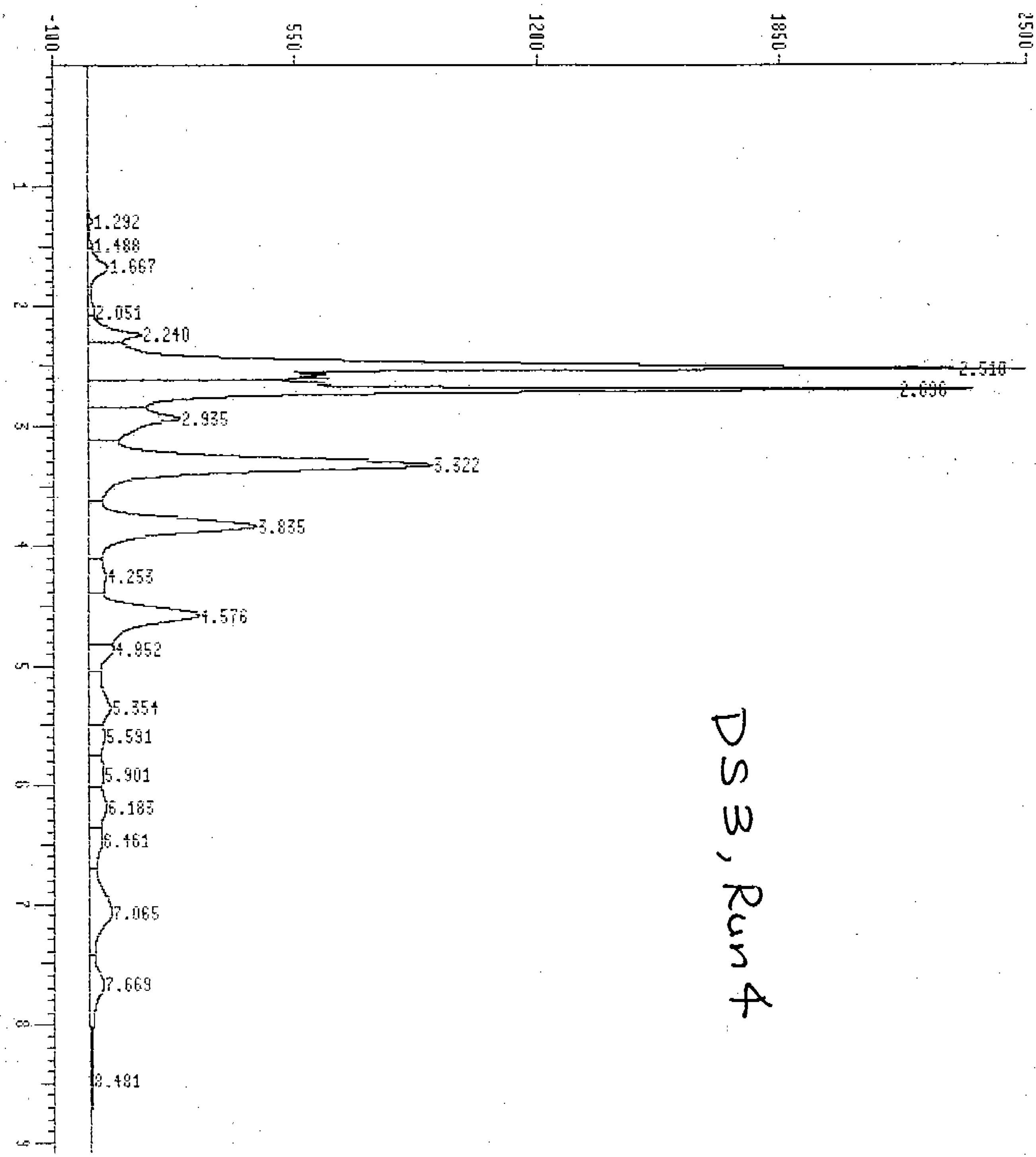
Report by Signal

Operator: 14 Mar 92 9:03 pm
Method File Name : DNPHIII.M
Sample Info : DS5, Run3
Misc Info:
Integration File Name : DATA:0315A36B.I
consisting of channels : 1. A 360,4 550,100 of 0315A36B.D
Sequence Index: 1 Bottle Number : 36 Repetition Number: 2

A 360,4 550,100 of 0315A36B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.289	PV	87.6881	11.7863	0.17	100.00	0.099	1.74
1.658	VV	577.78	50.4571	1.12	100.00	0.163	1.02
2.516	VV	11606	2442.19	22.49	100.00	0.079	2.75
2.695	VV	10868	2428.99	21.06	100.00	0.062	1.29
2.935	VV	2700.67	267.99	5.23	100.00	0.137	0.68
3.320	VV	11175	1329.31	21.66	100.00	0.125	1.05
3.833	VV	3712.65	365.99	7.20	100.00	0.150	0.92
4.266	VV	521.77	47.7288	1.01	100.00	0.182	4.81
4.336	VV	310.94	47.9527	0.60	100.00	0.094	0.55
4.575	VV	3157.80	259.54	6.12	100.00	0.178	0.74
4.851	VV	619.43	63.6732	1.20	100.00	0.139	0.26
5.356	VV	1210.28	61.4432	2.35	100.00	0.269	2.06
5.591	VV	670.74	46.1361	1.30	100.00	0.201	0.62
5.899	VV	630.89	42.3611	1.22	100.00	0.210	1.18
6.180	VV	708.92	42.8010	1.37	100.00	0.244	0.97
6.464	VV	506.46	30.4954	0.98	100.00	0.232	0.61
7.070	VV	1583.69	65.3011	3.07	100.00	0.365	1.23
7.670	VV	787.42	31.9064	1.53	100.00	0.336	0.65
8.470	VV	162.32	5.4970	0.31	100.00	0.378	0.45

1: LC A 360.4 550.100 of 0315A37A.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

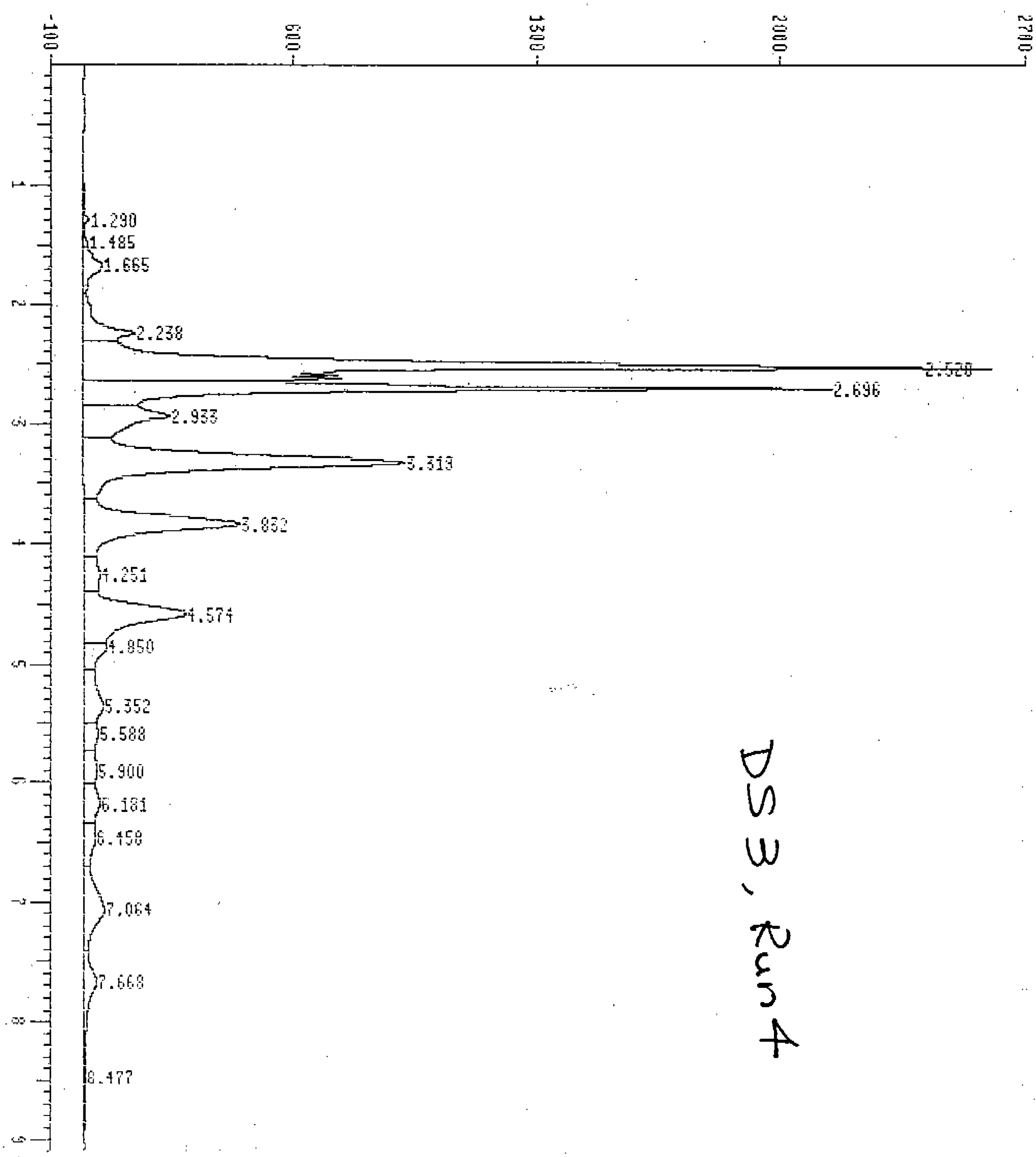
Report by Signal

Operator: 14 Mar 92 9:17 pm
Method File Name : DNPHIII.M
Sample Info : DS3, Run4
Misc Info:
Integration File Name : DATA:0315A37A.I
consisting of channels : 1. A 360,4 550,100 of 0315A37A.D
Sequence Index: 1 Bottle Number : 37 Repetition Number: 1

A 360,4 550,100 of 0315A37A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.292	PV	95.0696	16.0178	0.19	100.00	0.081	1.75
1.488	VV	65.1355	13.5954	0.13	100.00	0.080	2.17
1.667	VV	600.48	54.1508	1.19	100.00	0.162	0.75
2.051	VV	154.60	19.4812	0.31	100.00	0.132	3.32
2.240	VV	935.03	147.61	1.86	100.00	0.088	1.56
2.518	VV	12770	2339.71	25.34	100.00	0.083	1.17
2.696	VV	8930.14	2237.16	17.72	100.00	0.067	0.85
2.935	VV	2667.06	247.60	5.29	100.00	0.145	0.64
3.322	VV	8418.65	920.50	16.70	100.00	0.134	1.03
3.835	VV	4563.95	450.23	9.05	100.00	0.151	0.93
4.253	VV	741.67	45.9773	1.47	100.00	0.213	0.95
4.576	VV	3627.57	297.06	7.20	100.00	0.179	0.77
4.852	VV	662.00	66.1113	1.31	100.00	0.167	0.23
5.354	VV	1158.11	57.3930	2.30	100.00	0.276	1.99
5.591	VV	564.76	41.4474	1.12	100.00	0.191	0.66
5.901	VV	591.36	39.1529	1.17	100.00	0.212	1.47
6.183	VV	796.16	45.8063	1.58	100.00	0.257	1.06
6.461	VV	582.71	34.2000	1.16	100.00	0.240	0.58
7.065	VV	1478.45	58.9823	2.93	100.00	0.376	1.22
7.669	VV	830.05	37.5060	1.65	100.00	0.307	0.66
8.481	VV	170.79	5.5048	0.34	100.00	0.406	0.50

1: LC A 360.4 550.100 of 0315A37B.D



DS3, Run4

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

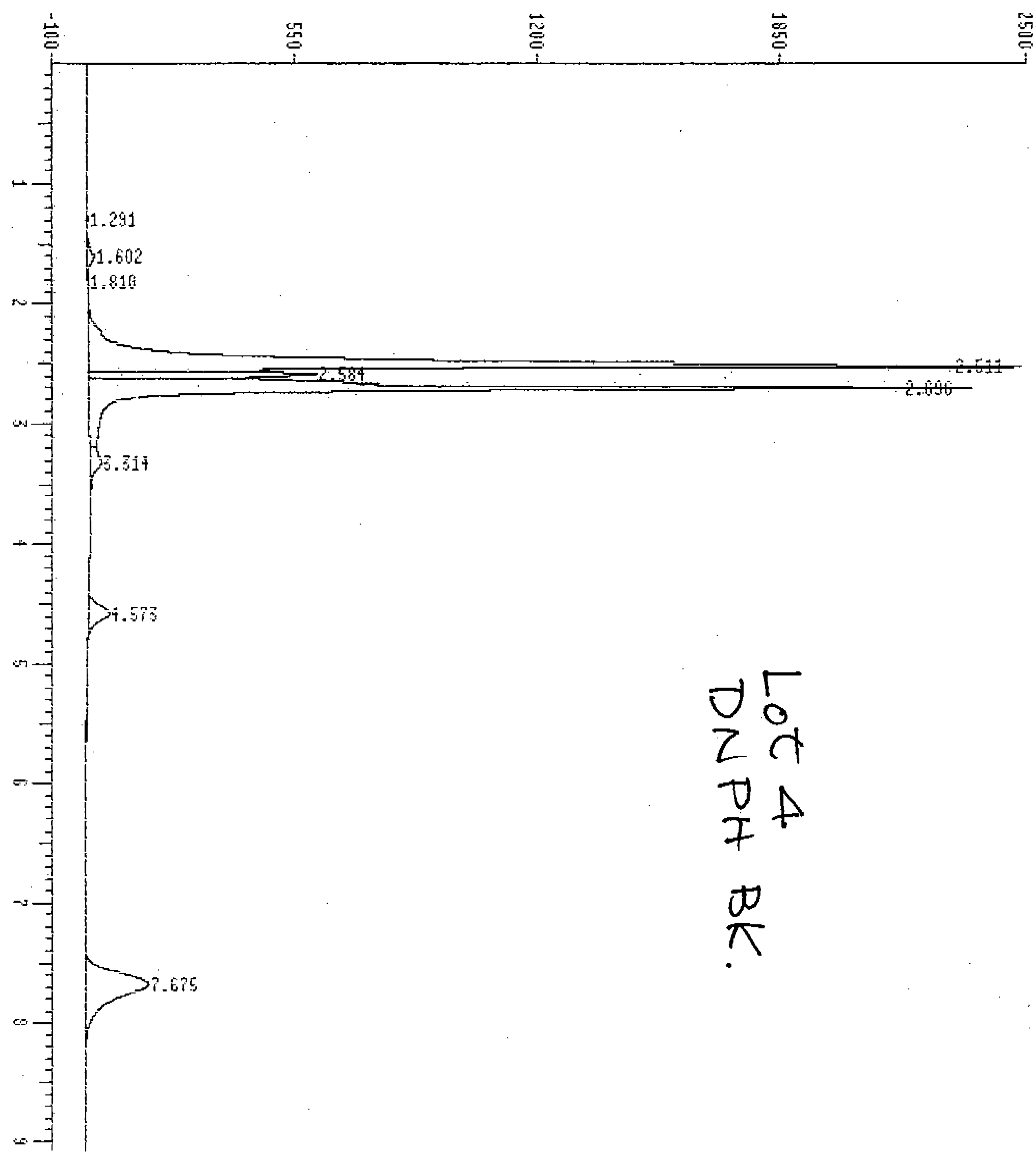
Report by Signal

Operator: 14 Mar 92 9:30 pm
Method File Name : DNPHIII.M
Sample Info : DS 3, Run 4
Misc Info:
Integration File Name : DATA:0315A37B.I
consisting of channels : 1. A 360,4 550,100 of 0315A37B.D
Sequence Index: 1 Bottle Number : 37 Repetition Number: 2

A 360,4 550,100 of 0315A37B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.290	PV	99.5934	15.9500	0.19	100.00	0.085	1.79
1.485	VV	64.6817	13.6453	0.13	100.00	0.079	2.09
1.665	VV	609.51	53.8809	1.18	100.00	0.165	0.71
2.238	VV	1140.52	149.85	2.21	100.00	0.103	2.00
2.520	VV	15000	2472.62	29.04	100.00	0.080	1.05
2.696	VV	7764.90	2131.72	15.03	100.00	0.051	0.69
2.933	VV	2686.77	248.97	5.20	100.00	0.145	0.65
3.319	VV	8452.78	922.68	16.37	100.00	0.135	1.03
3.832	VV	4614.17	451.97	8.93	100.00	0.151	0.92
4.251	VV	756.92	46.9333	1.47	100.00	0.212	0.93
4.574	VV	3616.08	297.04	7.00	100.00	0.179	0.77
4.850	VV	659.53	66.0092	1.28	100.00	0.142	0.22
5.352	VV	1162.94	57.2894	2.25	100.00	0.277	2.00
5.588	VV	563.09	41.3906	1.09	100.00	0.190	0.65
5.900	VV	589.73	39.0576	1.14	100.00	0.212	1.49
6.161	VV	798.58	45.8578	1.55	100.00	0.257	1.06
6.458	VV	583.40	34.3022	1.13	100.00	0.239	0.59
7.064	VV	1483.31	59.1235	2.87	100.00	0.376	1.23
7.668	VV	831.05	37.4475	1.61	100.00	0.307	0.68
8.477	VV	171.69	5.5628	0.33	100.00	0.414	0.51

1: LC A 360.4   550.100   of 0315A38A.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

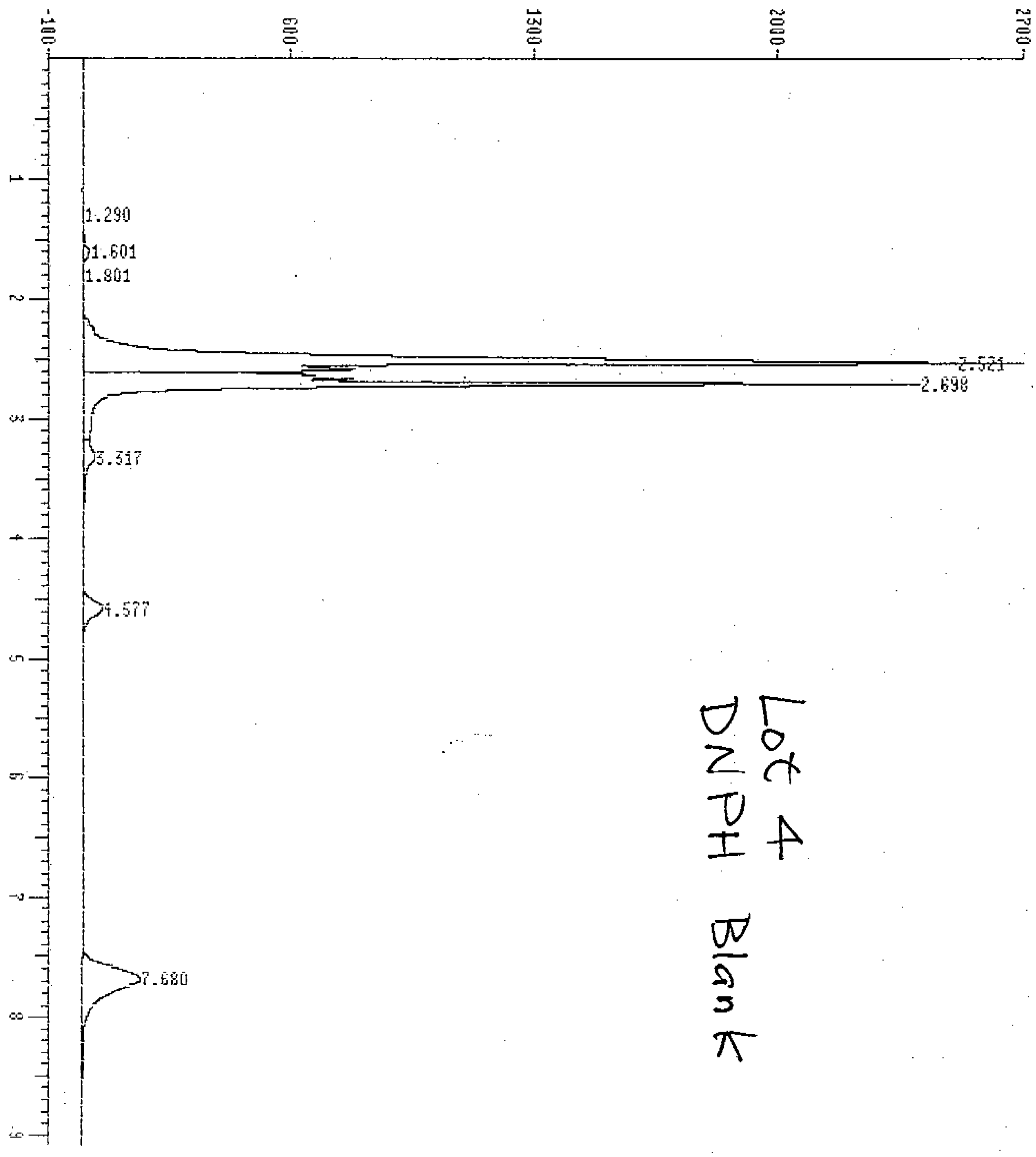
Report by Signal

Operator: 14 Mar 92 9:43 pm
Method File Name : DNPHIII.M
Sample Info : DNPH, LoT 4
Misc Info:
Integration File Name : DATA:0315A38A.I
consisting of channels : 1. A 360.4 550.100 of 0315A38A.D
Sequence Index: 1 Bottle Number : 38 Repetition Number: 1

A 360.4 550.100 of 0315A38A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.291	PV	14.7020	3.0046	0.06	100.00	0.068	3.25
1.602	PV	145.05	19.8256	0.61	100.00	0.097	0.96
1.810	VV	13.6499	2.0376	0.06	100.00	0.103	0.62
2.511	VV	10316	2325.06	43.14	100.00	0.074	2.16
2.584	VV	1665.42	609.73	6.96	100.00	0.040	0.82
2.696	VV	8462.81	1974.75	35.39	100.00	0.151	0.76
3.314	VB	366.43	31.3949	1.53	100.00	0.164	1.06
4.573	BV	450.12	55.4351	1.88	100.00	0.132	1.35
7.675	BB	2480.49	168.21	10.37	100.00	0.222	0.73

1: LC A 360.4 550.100 of 0315A38B.D



Lot 4
DNPH Blank

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

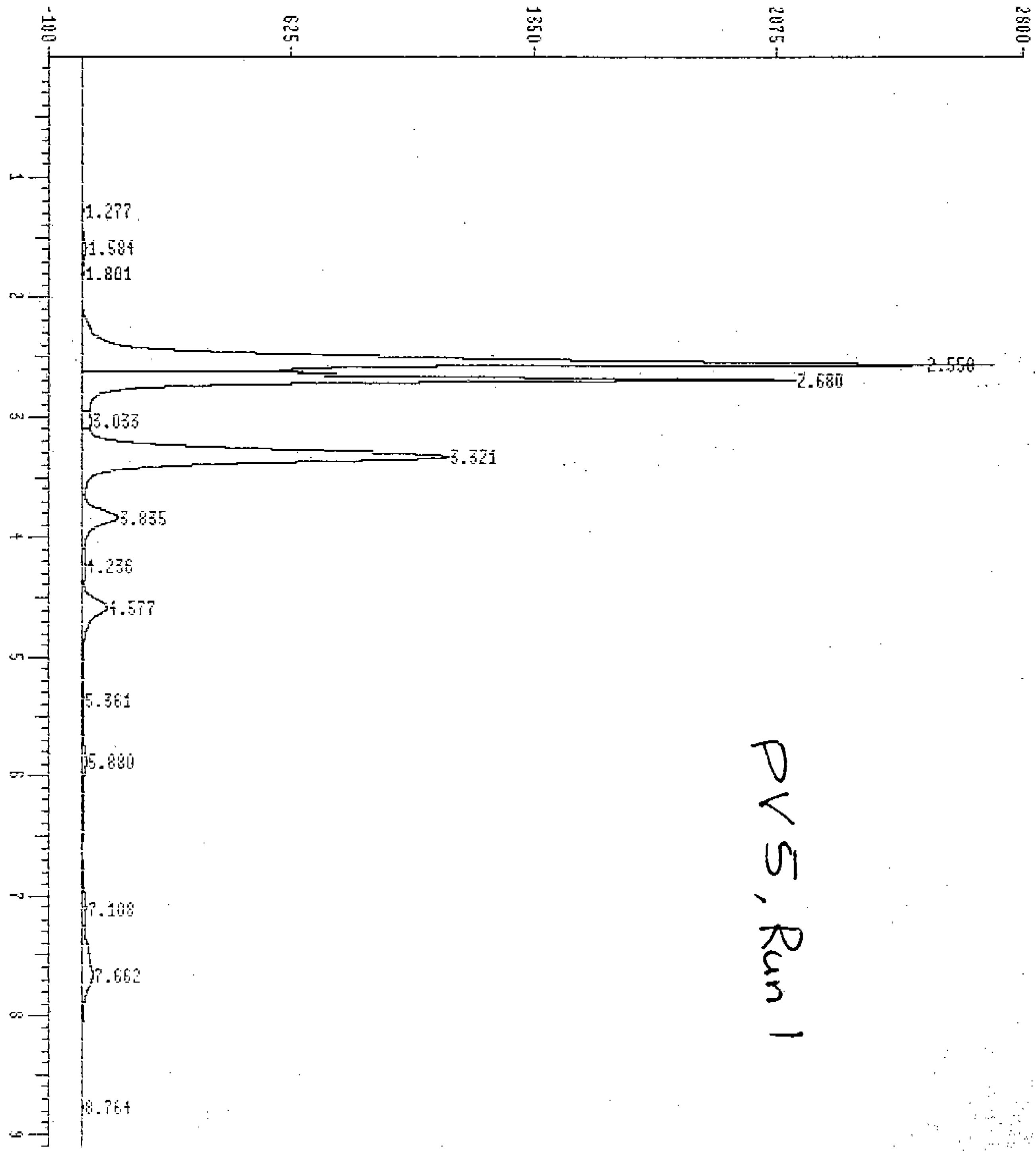
Report by Signal

Operator: 14 Mar 92 9:56 pm
Method File Name : DNPHIII.M
Sample Info : DNPH Lot 4
Misc Info:
Integration File Name : DATA:0315A38B.I
consisting of channels : 1. A 360,4 550,100 of 0315A38B.D
Sequence Index: 1 Bottle Number : 38 Repetition Number: 2

A 360,4 550,100 of 0315A38B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.290	BV	8.8079	3.1378	0.03	100.00	0.047	0.92
1.601	VV	160.93	20.7197	0.62	100.00	0.104	1.12
1.801	VV	13.2763	2.1398	0.05	100.00	0.088	0.55
2.521	VV	13374	2526.54	51.33	100.00	0.071	1.41
2.698	VV	8857.21	2015.32	33.99	100.00	0.153	0.89
3.317	VV	571.19	35.0242	2.19	100.00	0.219	0.62
4.577	VB	572.27	57.6938	2.20	100.00	0.152	0.89
7.680	BB	2497.23	169.00	9.58	100.00	0.223	0.72

1: LC A 360.4   550.100   of 0315A39A.D



PV5, Run 1

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

Operator: 14 Mar 92 10:09 pm

Method File Name : DNPHIII.M

Sample Info : PV 5, Run 1

Misc Info:

Integration File Name : DATA:0315A39A.I

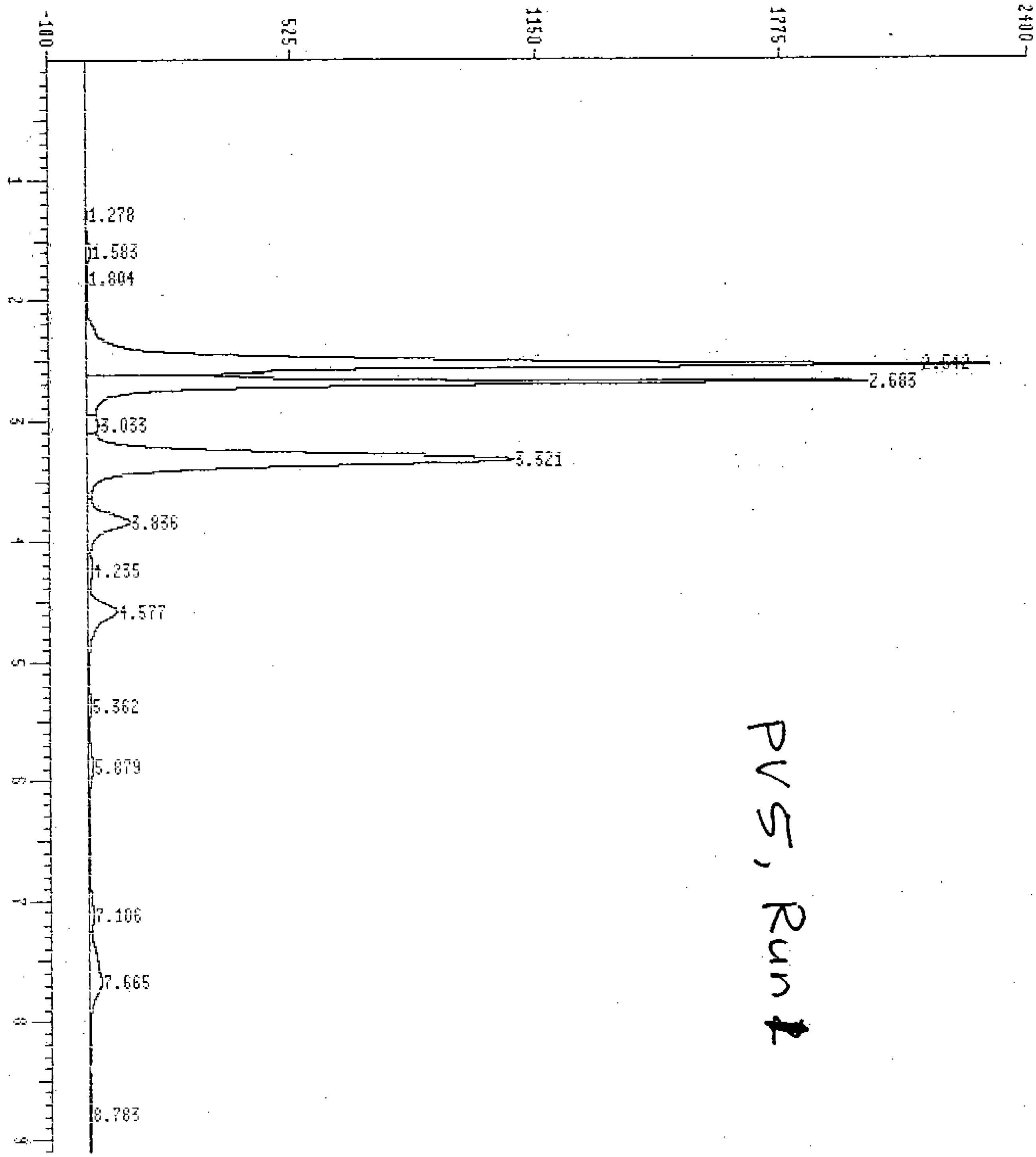
consisting of channels : 1. A 360.4 550.100 of 0315A39A.D

Sequence Index: 1 Bottle Number : 39 Repetition Number: 1

A 360.4 550.100 of 0315A39A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.277	BV	8.5806	2.4913	0.03	100.00	0.052	0.97
1.584	VV	110.98	11.4838	0.33	100.00	0.138	0.93
1.801	VV	14.1244	2.1196	0.04	100.00	0.093	0.47
2.550	VV	12673	2547.92	38.02	100.00	0.084	2.09
2.680	VV	8053.34	2161.81	24.16	100.00	0.054	0.93
3.033	VV	233.25	28.4481	0.70	100.00	0.117	1.35
3.321	VV	8682.82	1092.37	26.05	100.00	0.120	1.11
3.835	VV	1073.60	107.50	3.22	100.00	0.149	0.96
4.236	VV	148.03	10.0795	0.44	100.00	0.197	1.08
4.577	VV	909.50	74.0868	2.73	100.00	0.180	0.69
5.361	VV	113.65	5.9883	0.34	100.00	0.260	1.72
5.880	VV	327.48	11.9519	0.98	100.00	0.366	0.77
7.108	VV	214.87	10.9782	0.64	100.00	0.275	1.83
7.662	VV	735.95	31.4567	2.21	100.00	0.318	1.55
8.764	VV	34.3456	1.3447	0.10	100.00	0.325	0.97

1: LC A 360.4 550.100 of 0315A39B.D



PVS, Run 1

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

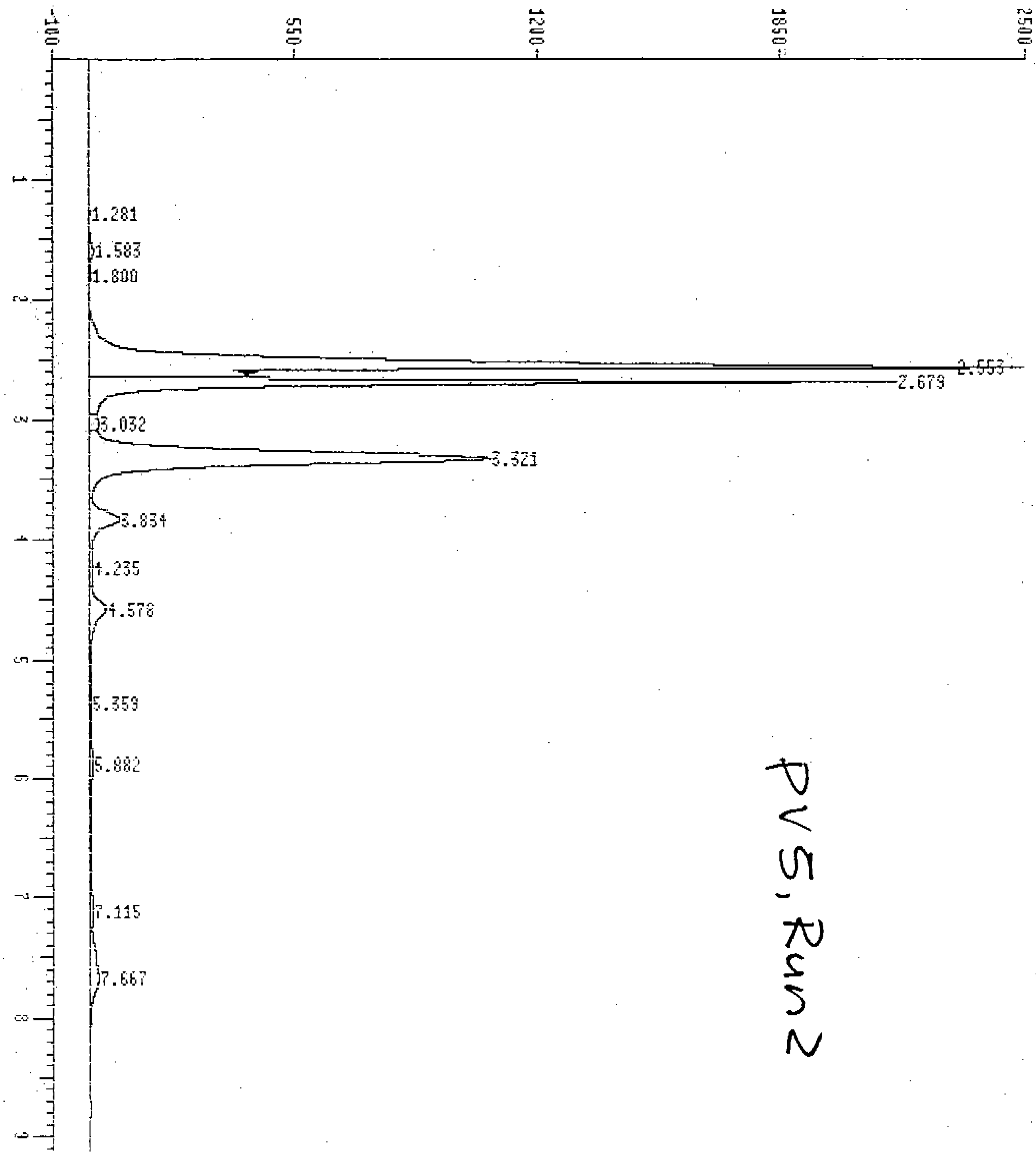
Report by Signal

Operator: 14 Mar 92 10:23 pm
Method File Name : DNPHIII.M
Sample Info : PV 5, Run 1
Misc Info:
Integration File Name : DATA:0315A39B.I
consisting of channels : 1. A 360,4 550.100 of 0315A39B.D
Sequence Index: 1 Bottle Number : 39 Repetition Number: 2

A 360,4 550,100 of 0315A39B.D

Ret.Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.278	BV	10.0770	2.5491	0.03	100.00	0.066	1.03
1.583	VV	106.77	11.1748	0.35	100.00	0.136	0.93
1.804	VV	12.8175	1.9506	0.04	100.00	0.091	0.50
2.542	VV	11200	2212.00	36.53	100.00	0.070	1.77
2.683	VV	6829.66	1999.67	22.27	100.00	0.057	0.76
3.033	VV	241.00	29.3190	0.79	100.00	0.117	1.33
3.321	VV	8699.67	1094.42	28.37	100.00	0.120	1.10
3.836	VV	1112.53	109.04	3.63	100.00	0.152	0.95
4.235	VV	158.19	10.7403	0.52	100.00	0.199	1.04
4.577	VV	903.07	74.2128	2.95	100.00	0.179	0.70
5.362	VV	121.81	5.9269	0.40	100.00	0.279	1.91
5.879	VV	313.34	11.7334	1.02	100.00	0.364	0.76
7.106	VV	207.16	10.7997	0.68	100.00	0.268	1.74
7.665	VV	717.83	31.1777	2.34	100.00	0.315	1.60
8.783	VV	28.4444	1.2106	0.09	100.00	0.304	0.97

1: LC A 360,4   550,100   of 0315A40A.D



PV5, Run2

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

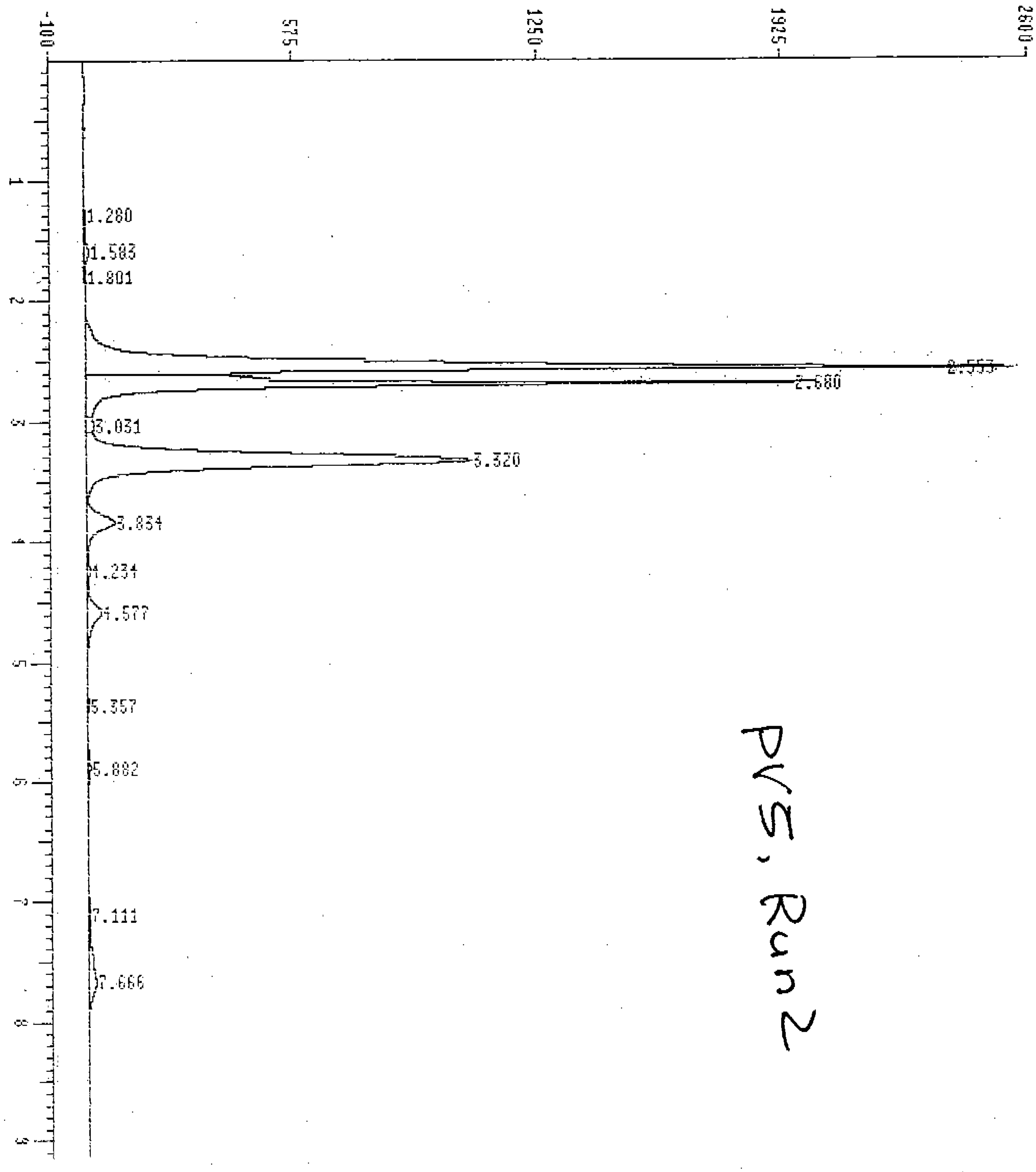
Report by Signal

Operator: 14 Mar 92 10:36 pm
Method File Name : DNPHIII.M
Sample Info : PV 5, Run 2
Misc Info:
Integration File Name : DATA:0315A40A.I
consisting of channels : 1. A 360,4 550,100 of 0315A40A.D
Sequence Index: 1   Bottle Number : 40   Repetition Number: 1

A 360,4 550,100 of 0315A40A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.281	BV	6.2744	1.7431	0.02	100.00	0.072	1.41
1.583	VV	99.8619	10.1638	0.34	100.00	0.142	0.96
1.800	VV	10.7134	1.6839	0.04	100.00	0.092	0.51
2.553	VV	11391	2327.93	39.11	100.00	0.066	1.89
2.679	VV	6184.64	1812.32	21.24	100.00	0.057	0.66
3.032	VV	181.33	24.6380	0.62	100.00	0.105	1.32
3.321	VV	8649.44	1071.94	29.70	100.00	0.121	1.10
3.834	VV	805.89	81.2856	2.77	100.00	0.148	0.94
4.235	VV	147.87	9.2423	0.51	100.00	0.217	1.05
4.578	VV	557.70	44.0029	1.91	100.00	0.185	0.67
5.359	VV	114.35	5.1847	0.39	100.00	0.285	2.13
5.882	VV	262.69	8.9862	0.90	100.00	0.395	0.76
7.115	VV	167.07	8.6581	0.57	100.00	0.280	1.81
7.667	VV	544.30	23.6689	1.87	100.00	0.315	1.57

1: LC A 360,4 550,100 of 0315A40B.D



PVS, Run 2

End of plot. Time = 0.01 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

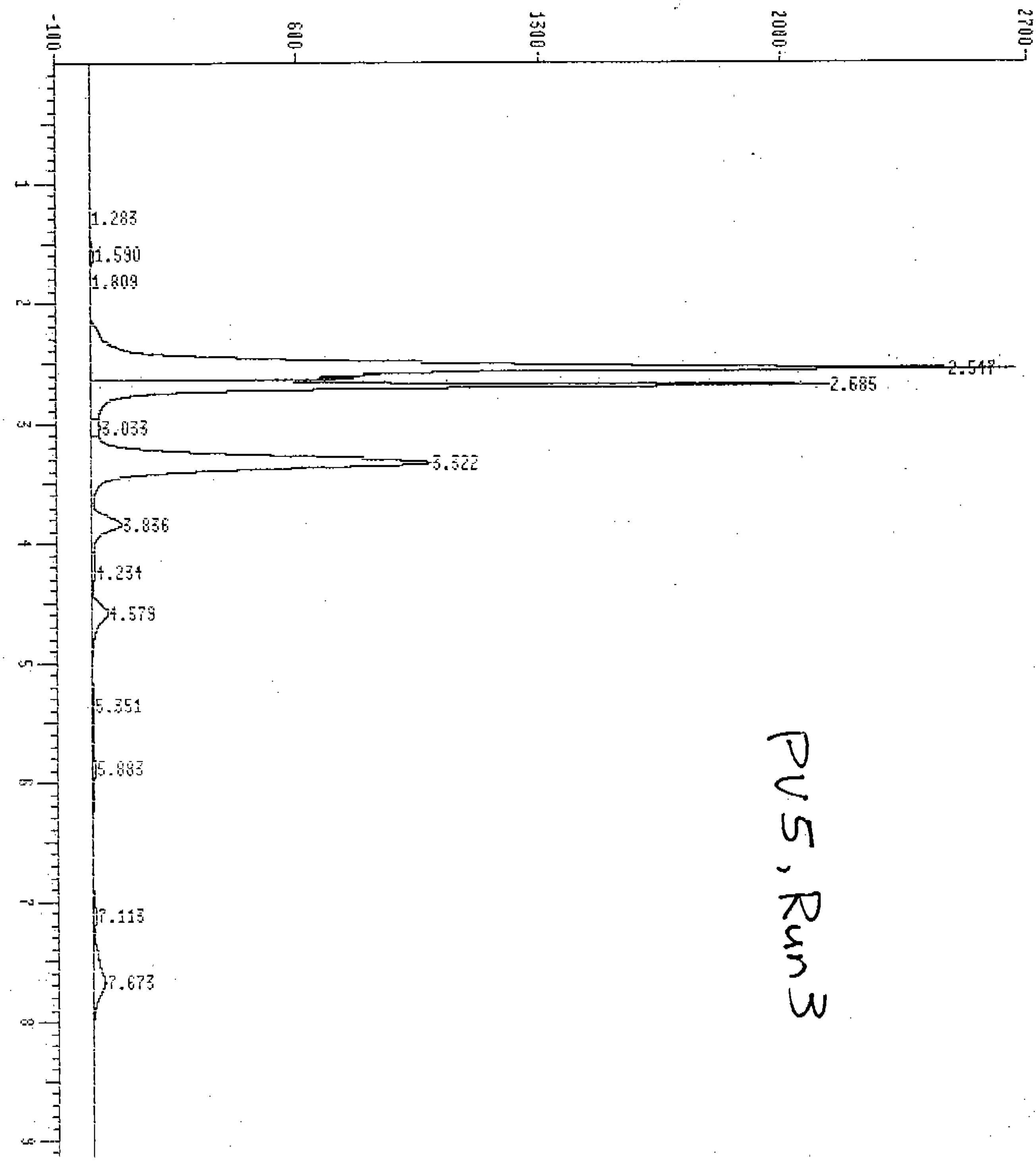
Report by Signal

Operator: 14 Mar 92 10:49 pm
Method File Name : DNPHIII.M
Sample Info : PVS, Run2
Misc Info:
Integration File Name : DATA:0315A40B.I
consisting of channels : 1. A 360,4 550,100 of 0315A40B.D
Sequence Index: 1 Bottle Number : 40 Repetition Number: 2

A 360,4 550,100 of 0315A40B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.280	BV	6.0580	1.6847	0.02	100.00	0.055	1.03
1.583	VV	96.7449	9.9378	0.34	100.00	0.141	0.96
1.801	VV	7.5297	1.4236	0.03	100.00	0.080	0.70
2.553	PV	10937	2372.00	38.28	100.00	0.077	2.49
2.680	VV	6641.67	1725.11	23.25	100.00	0.064	0.88
3.031	VV	170.94	23.3482	0.60	100.00	0.104	1.33
3.320	VV	8604.62	1069.82	30.12	100.00	0.121	1.10
3.834	VV	767.50	79.7307	2.69	100.00	0.145	0.95
4.234	VV	116.82	7.6856	0.41	100.00	0.204	1.11
4.577	VV	475.00	41.8068	1.66	100.00	0.169	0.75
5.357	VV	26.6587	2.1846	0.09	100.00	0.168	1.47
5.882	VV	77.5471	5.6806	0.27	100.00	0.216	1.48
7.111	BV	130.42	7.7856	0.46	100.00	0.248	1.43
7.666	VV	512.50	23.0534	1.79	100.00	0.306	1.65

1: LC A 360.4 550.100 of 0315A41A.D



PV5, Run3

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

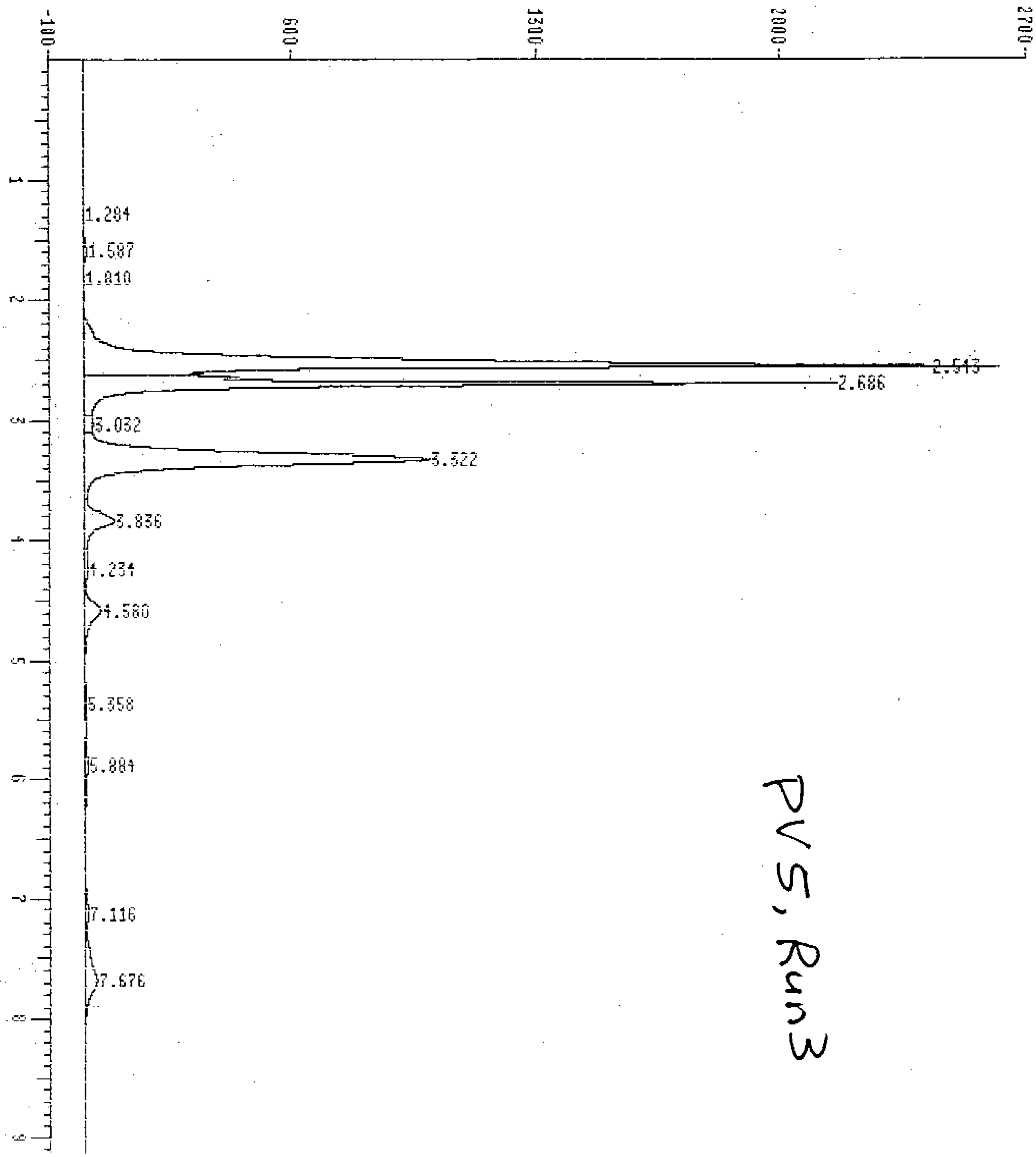
==

Operator: 14 Mar 92 11:02 pm
Method File Name : DNPHIII.M
Sample Info : PVS, Run 3
Misc Info:
Integration File Name : DATA:0315A41A.I
consisting of channels : 1. A 360,4 550,100 of 0315A41A.D
Sequence Index: 1   Bottle Number : 41   Repetition Number: 1

A 360,4 550,100 of 0315A41A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.283	BV	8.5387	2.1450	0.03	100.00	0.059	0.95
1.590	VV	112.89	11.7117	0.35	100.00	0.139	0.93
1.809	VV	10.4735	1.7212	0.03	100.00	0.088	0.55
2.547	VV	14578	2532.08	45.34	100.00	0.077	1.26
2.685	VV	6447.36	2035.91	20.05	100.00	0.053	0.63
3.033	VV	194.35	26.7847	0.60	100.00	0.104	1.24
3.322	VV	7992.72	982.59	24.86	100.00	0.122	1.10
3.836	VV	871.51	88.2732	2.71	100.00	0.148	0.94
4.234	VV	161.82	10.5160	0.50	100.00	0.206	1.13
4.579	VV	601.98	48.6935	1.87	100.00	0.181	0.69
5.351	VV	101.12	4.9704	0.31	100.00	0.274	1.96
5.883	VB	212.85	8.9600	0.66	100.00	0.332	0.97
7.113	BV	147.93	8.9042	0.46	100.00	0.245	1.43
7.673	VV	711.63	35.0309	2.21	100.00	0.284	1.43

1: LC A 360.4   550,100   of 0315A41B.D



PVS, Run3

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

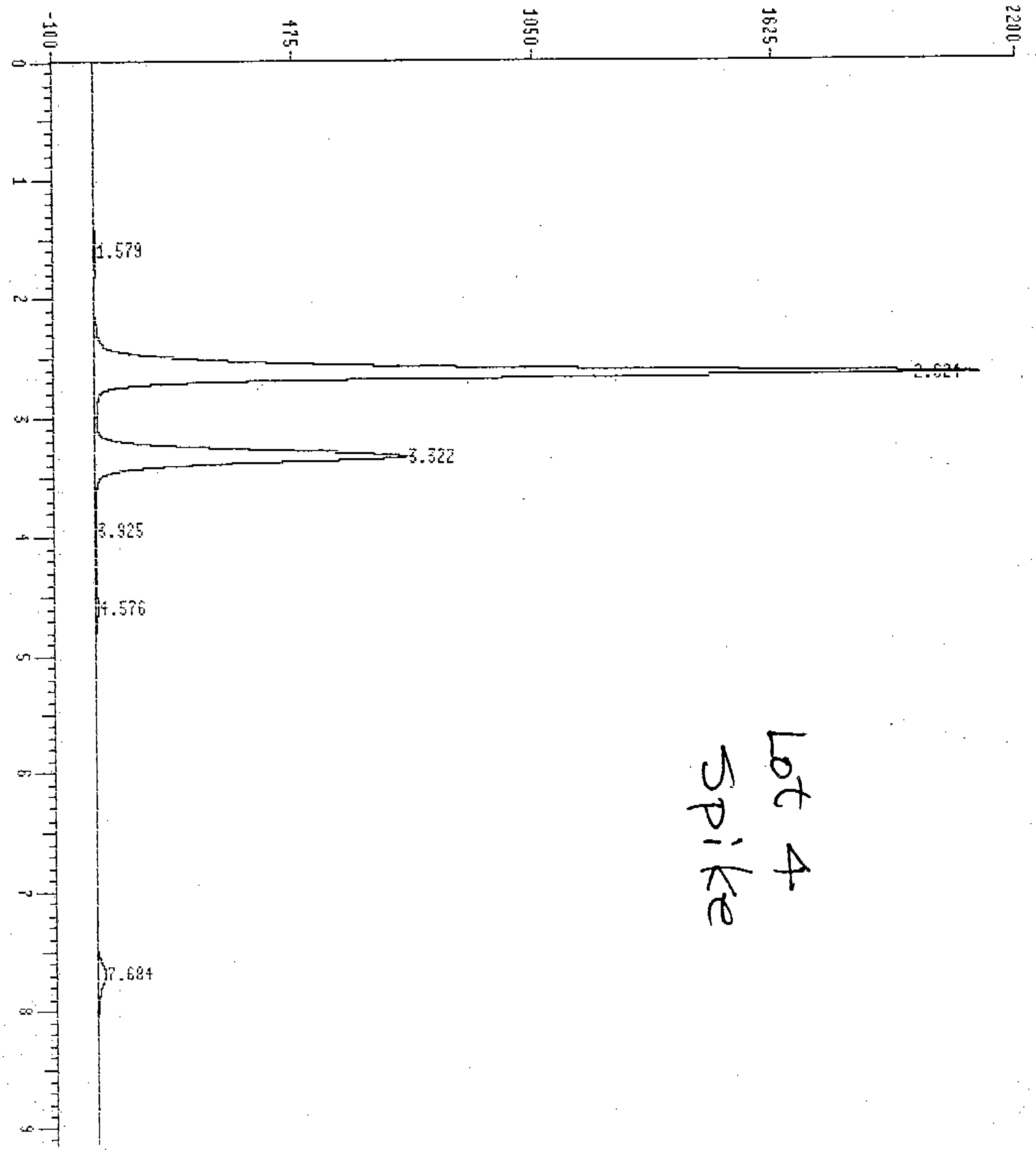
==

Operator: 14 Mar 92 11:15 pm
Method File Name : DNPHIII.M
Sample Info : PV 5, Run3
Misc Info:
Integration File Name : DATA:0315A41B.I
consisting of channels : 1. A 360.4 550,100 of 0315A41B.D
Sequence Index: 1 Bottle Number : 41 Repetition Number: 2

A 360.4 550,100 of 0315A41B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.284	BV	9.0834	2.2073	0.03	100.00	0.061	1.12
1.587	VV	116.13	11.8448	0.39	100.00	0.141	0.94
1.810	VV	11.7798	1.7998	0.04	100.00	0.095	0.48
2.543	VV	11305	2419.59	38.38	100.00	0.078	1.85
2.686	VV	6723.76	1804.62	22.83	100.00	0.062	0.81
3.032	VV	201.31	27.4092	0.68	100.00	0.105	1.19
3.322	VV	8028.95	991.38	27.26	100.00	0.122	1.09
3.836	VV	893.22	89.7161	3.03	100.00	0.148	0.91
4.234	VV	184.66	11.6524	0.63	100.00	0.213	1.09
4.580	VV	636.34	49.9105	2.16	100.00	0.185	0.66
5.358	VV	132.40	6.0516	0.45	100.00	0.318	2.01
5.884	VV	261.21	10.2802	0.89	100.00	0.353	0.51
7.116	VV	193.36	10.1829	0.66	100.00	0.269	1.71
7.676	VV	758.00	35.9749	2.57	100.00	0.292	1.38

1: LC A 360.4   550.100   of 0315A42A.D



Lot 4
Spike

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

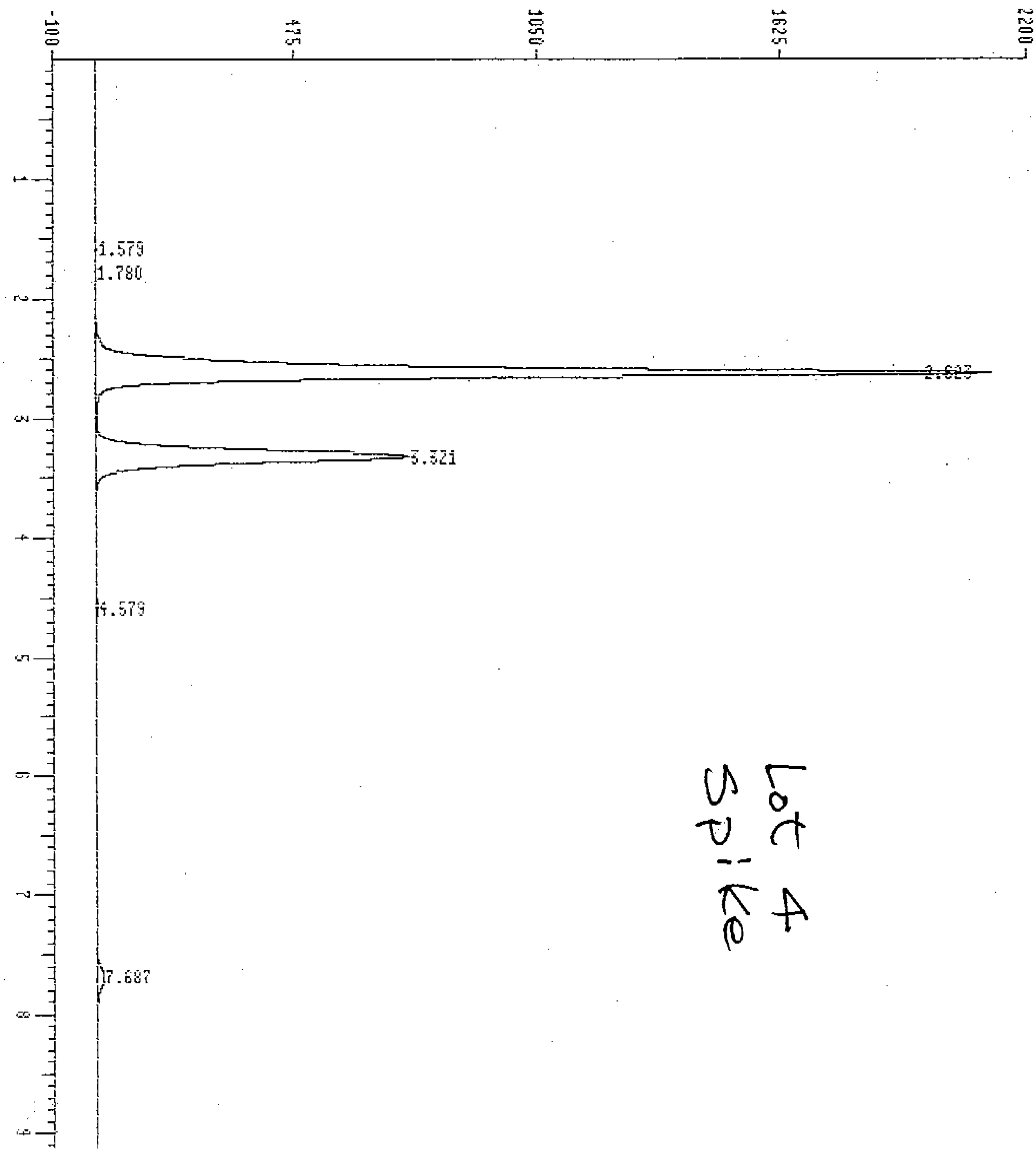
Report by Signal

Operator: 14 Mar 92 11:29 pm
Method File Name : DNPHIII.M
Sample Info : Lot 4, Spike
Misc Info:
Integration File Name : DATA:0315A42A.I
consisting of channels : 1. A 360,4 550,100 of 0315A42A.D
Sequence Index: 1 Bottle Number : 42 Repetition Number: 1

A 360,4 550,100 of 0315A42A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.579	VV	30.4167	3.2964	0.16	100.00	0.125	2.04
2.624	BV	13181	2118.47	67.56	100.00	0.090	1.39
3.322	VV	5832.96	743.44	29.90	100.00	0.119	1.11
3.925	VV	119.91	3.4298	0.61	100.00	0.432	0.59
4.576	VB	80.3014	7.1472	0.41	100.00	0.168	0.93
7.684	BB	266.03	18.0241	1.36	100.00	0.221	0.72

1: LC A 360,4   550,100   of 0315A42B.D



Lot 4
Spike

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

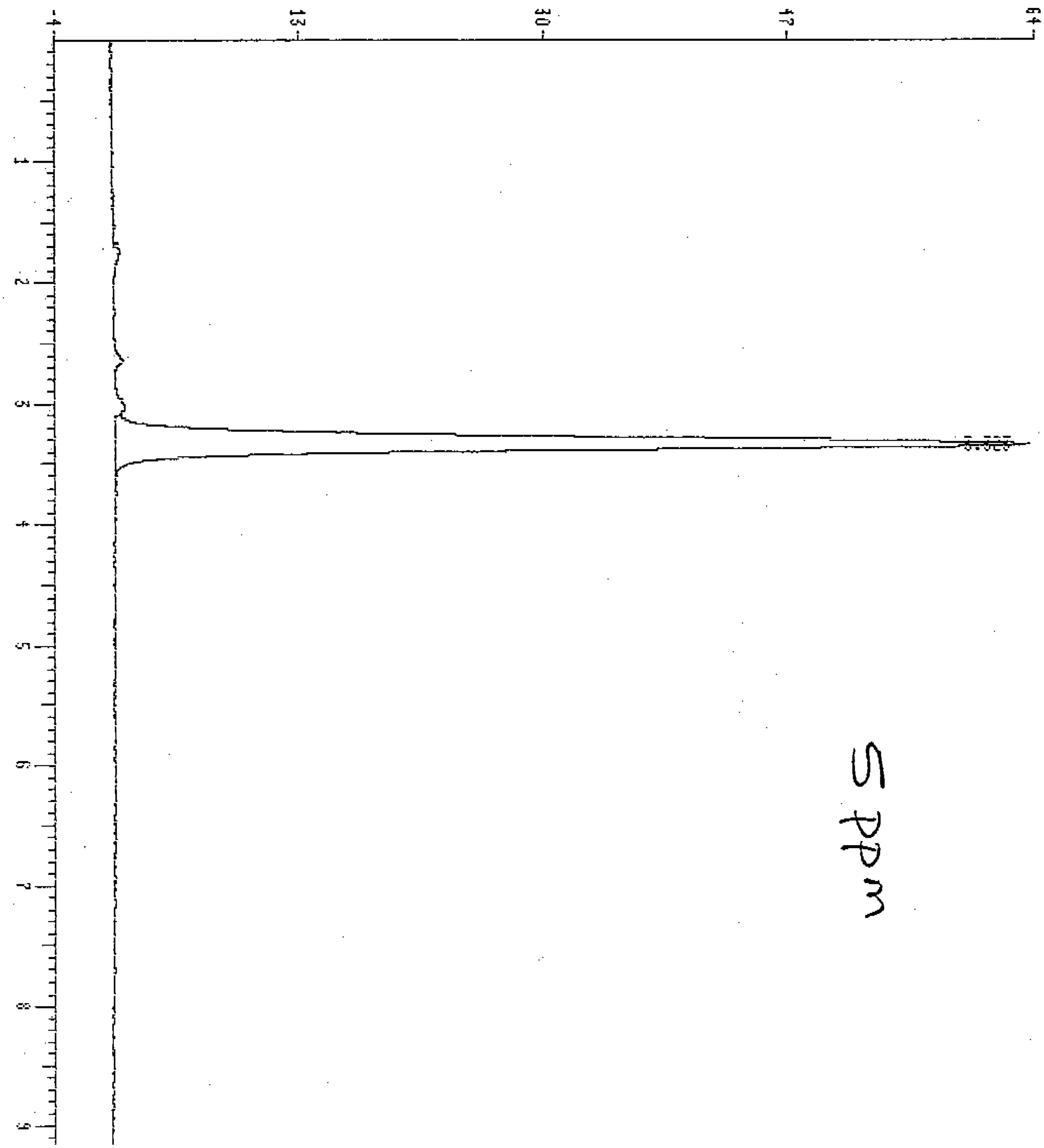
Report by Signal

Operator: 14 Mar 92 11:42 pm
Method File Name : DNPHIII.M
Sample Info : Lot 4, Spike
Misc Info:
Integration File Name : DATA:0315A42B.I
consisting of channels : 1. A 360,4 550,100 of 0315A42B.D
Sequence Index: 1 Bottle Number : 42 Repetition Number: 2

A 360,4 550,100 of 0315A42B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.579	VV	38.0245	3.6331	0.20	100.00	0.141	1.50
1.780	VB	6.2193	1.1119	0.03	100.00	0.079	0.52
2.623	BV	13167	2119.72	67.94	100.00	0.090	1.40
3.321	VV	5840.85	743.14	30.14	100.00	0.119	1.09
4.579	VB	63.6861	6.4481	0.33	100.00	0.151	0.96
7.687	BB	263.78	17.9162	1.36	100.00	0.222	0.73

1: LC A 360,4 550,100 of 0315A43A.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

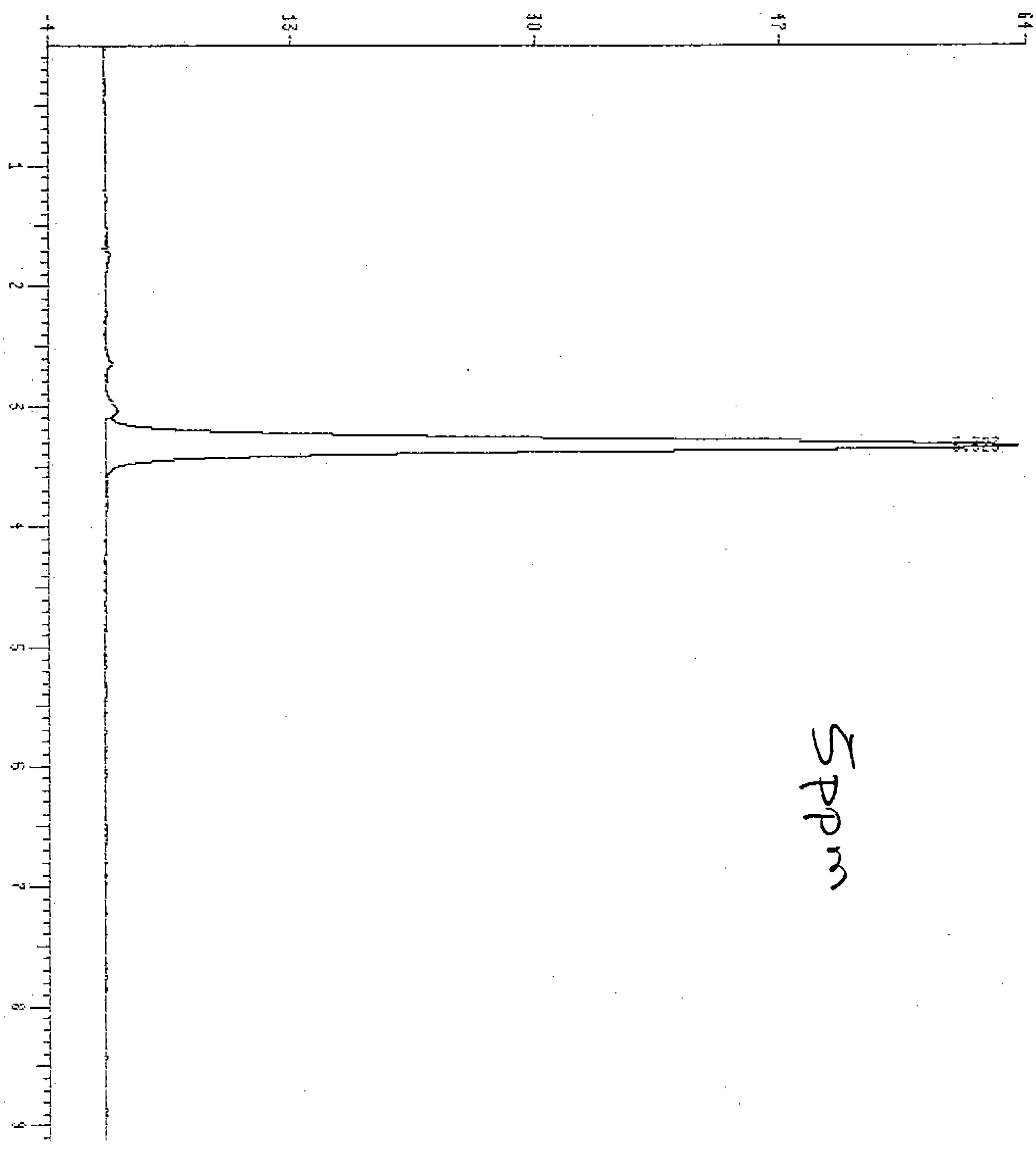
Report by Signal

Operator: 14 Mar 92 11:55 pm
Method File Name : DNPHIII.M
Sample Info :
Misc Info: 5 ppm
Integration File Name : DATA:0315A43A.I
consisting of channels : 1. A 360,4 550,100 of 0315A43A.D
Sequence Index: 1 Bottle Number : 43 Repetition Number: 1

A 360,4 550,100 of 0315A43A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.323	VV	487.09	63.6051	100.00	100.00	0.117	1.12

1: LC A 360.4   550.100   of 0315A43B.D



5 ppm

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

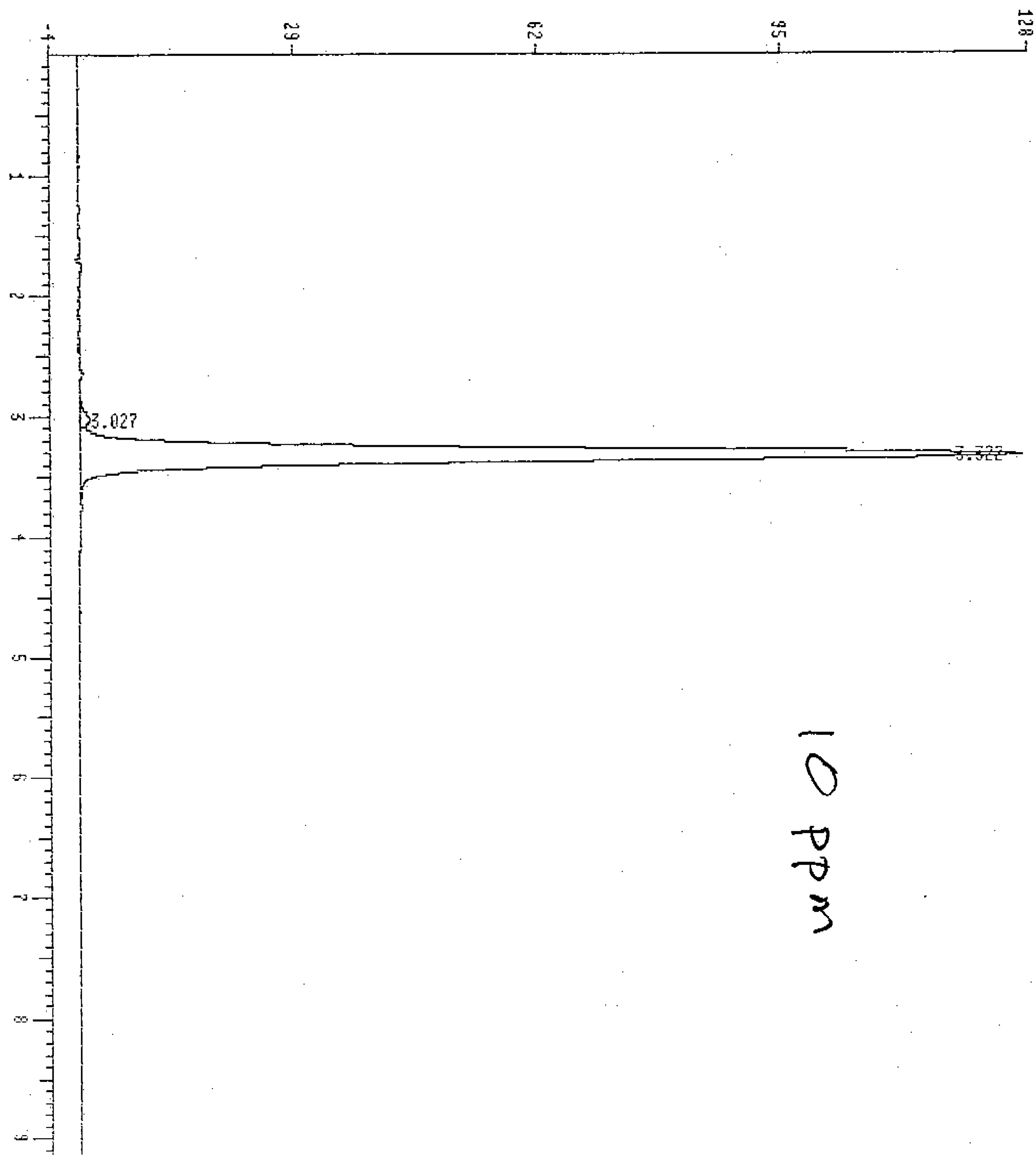
Report by Signal

Operator: 15 Mar 92 12:08 am
Method File Name : DNPHIII.M
Sample Info : 5 ppm
Misc Info:
Integration File Name : DATA:0315A43B.I
consisting of channels : 1. A 360,4 550,100 of 0315A43B.D
Sequence Index: 1 Bottle Number : 43 Repetition Number: 2

A 360,4 550,100 of 0315A43B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.323	VB	487.52	63.5343	100.00	100.00	0.117	1.12

1: LC A 360.4   550.100   of 0315A44A.D



10 ppm

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

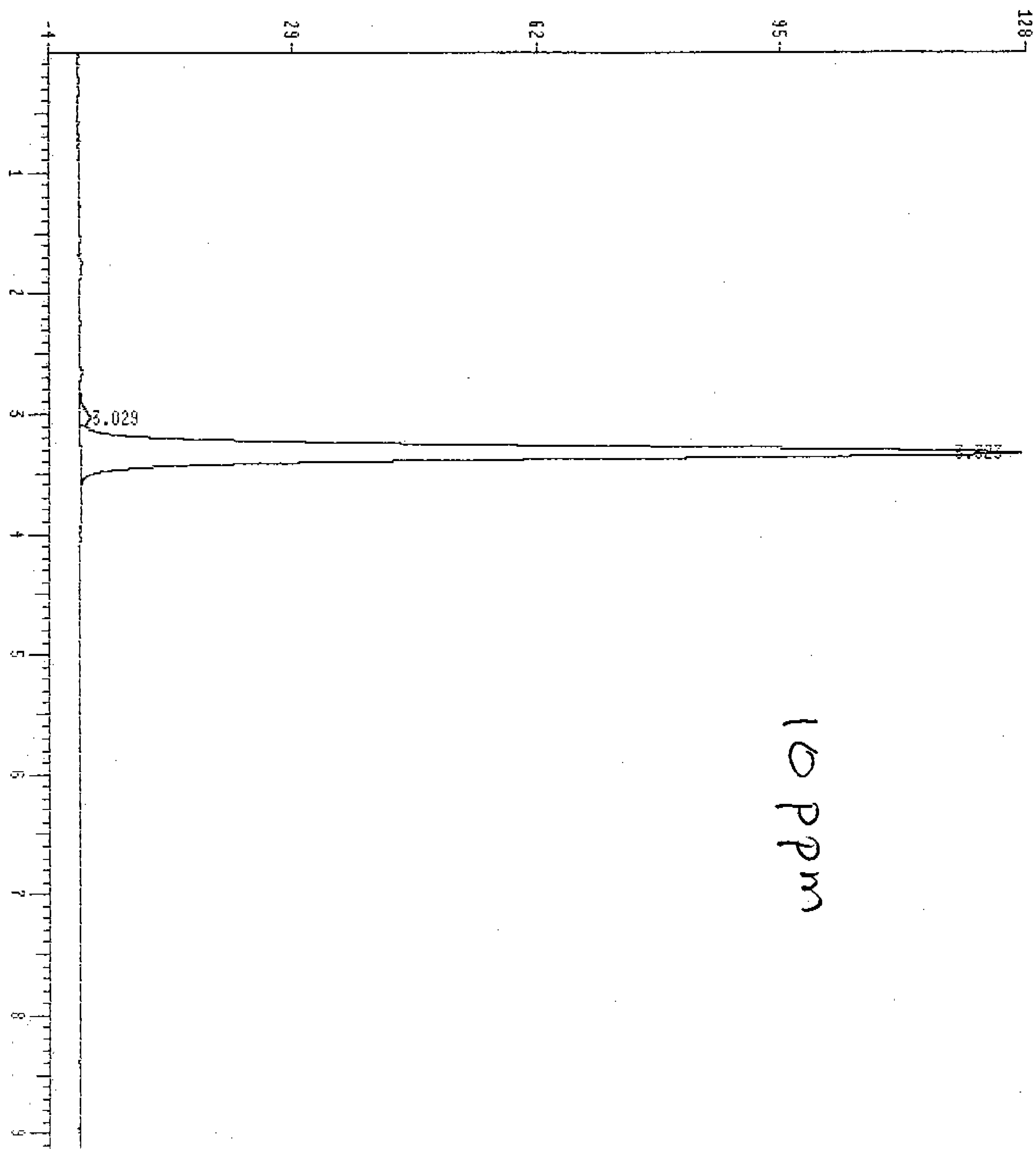
Report by Signal

Operator: 15 Mar 92 12:21 am
Method File Name : DNPHIII.M
Sample Info : 10 ppm
Misc Info:
Integration File Name : DATA:0315A44A.I
consisting of channels : 1. A 360.4 550.100 of 0315A44A.D
Sequence Index: 1 Bottle Number : 44 Repetition Number: 1

A 360.4 550.100 of 0315A44A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.027	BV	9.8751	1.3991	1.00	100.00	0.101	1.68
3.322	VB	973.51	127.13	99.00	100.00	0.117	1.13

1: LC A 360.4   550.100   of 0315A44B.D



10 ppm

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

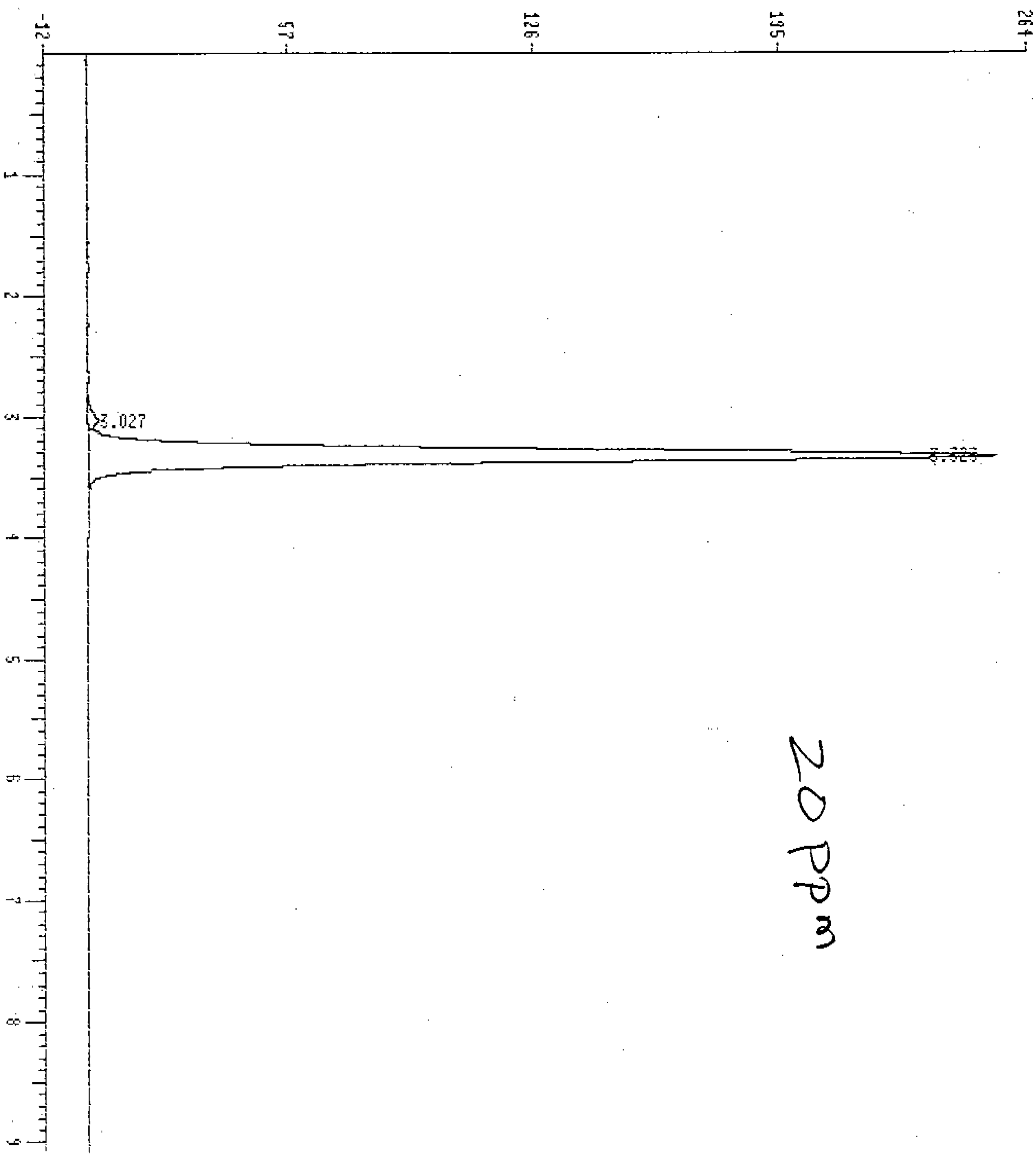
Report by Signal

Operator: 15 Mar 92 12:34 am
Method File Name : DNPHIII.M
Sample Info : 10 ppm
Misc Info:
Integration File Name : DATA:0315A44B.I
consisting of channels : 1. A 360,4 550,100 of 0315A44B.D
Sequence Index: 1 Bottle Number : 44 Repetition Number: 2

A 360,4 550,100 of 0315A44B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.029	BV	10.9286	1.4353	1.11	100.00	0.112	1.75
3.323	VB	974.00	127.14	98.89	100.00	0.117	1.13

1: LC A 360.4   550.100   of 0315A45A.D



20 ppm

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

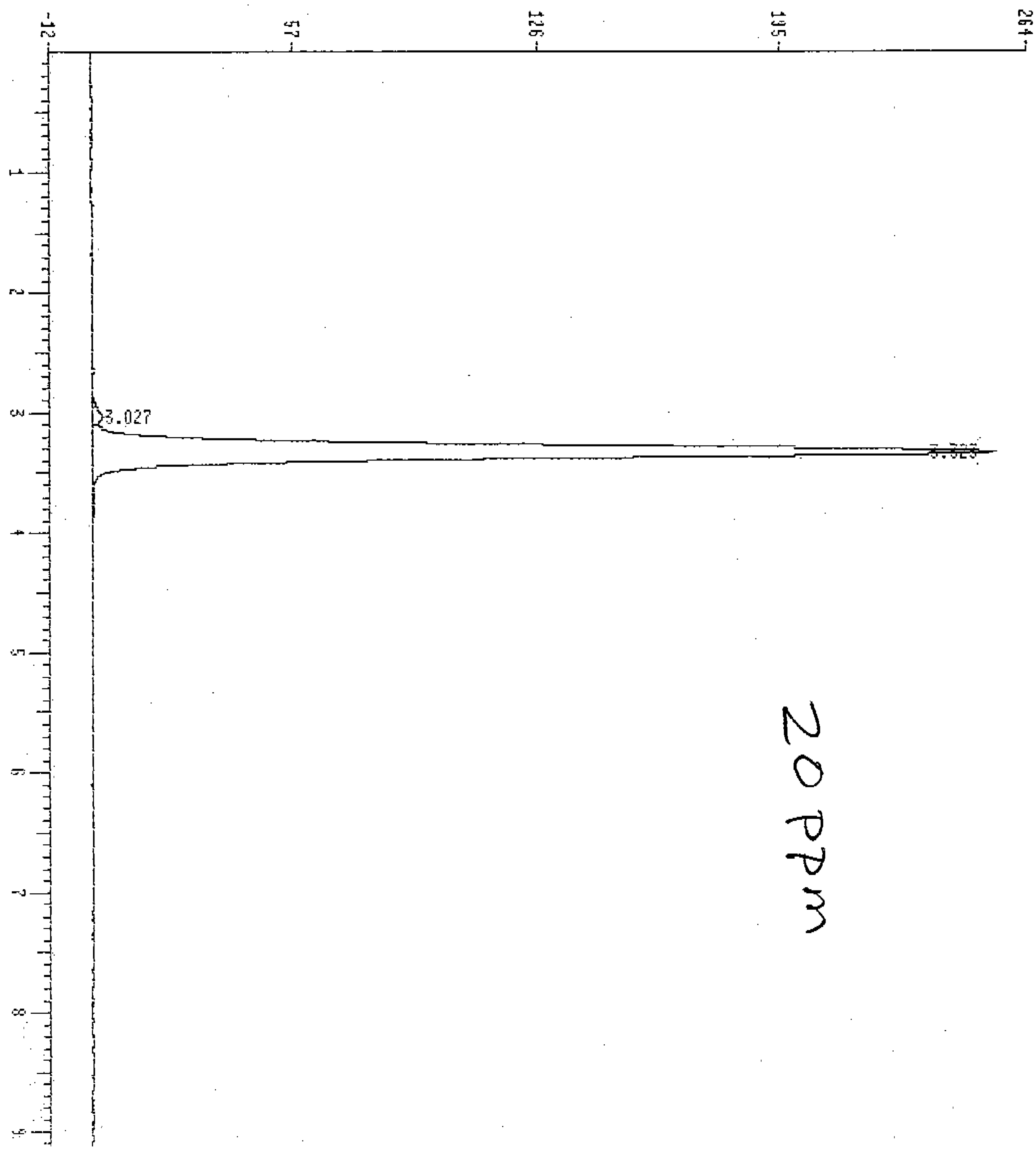
Report by Signal

Operator: 15 Mar 92 12:47 am
Method File Name : DNPHIII.M
Sample Info : 20 PPm
Misc Info:
Integration File Name : DATA:0315A45A.I
consisting of channels : 1. A 360,4 550,100 of 0315A45A.D
Sequence Index: 1 Bottle Number : 45 Repetition Number: 1

A 360,4 550,100 of 0315A45A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.027	BV	20.8646	2.8415	1.06	100.00	0.107	1.68
3.323	VV	1956.30	255.37	98.94	100.00	0.117	1.13

1: LC A 360.4   550.100   of 0315A45B.D



20 PPM

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

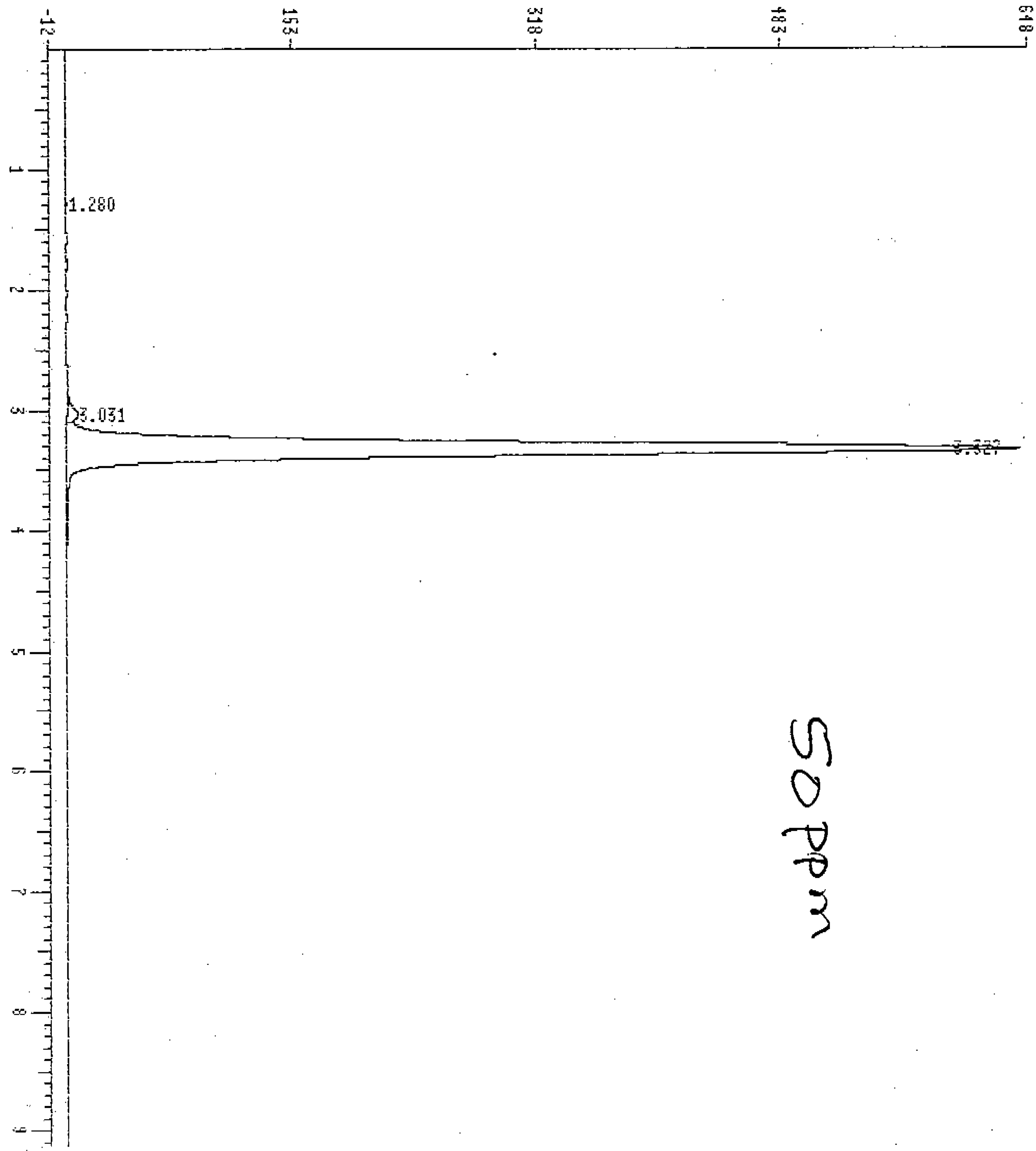
Report by Signal

Operator: 15 Mar 92 1:00 am
Method File Name : DNPHIII.M
Sample Info : 20 ppm
Misc Info:
Integration File Name : DATA:0315A45B.I
consisting of channels : 1. A 360,4 550,100 of 0315A45B.D
Sequence Index: 1 Bottle Number : 45 Repetition Number: 2

A 360,4 550,100 of 0315A45B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
3.027	BV	21.4730	2.9078	1.08	100.00	0.107	1.61
3.323	VB	1962.75	255.67	98.92	100.00	0.117	1.12

1: LC A 360.4   550.100   of 0315A46A.D



50 ppm

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

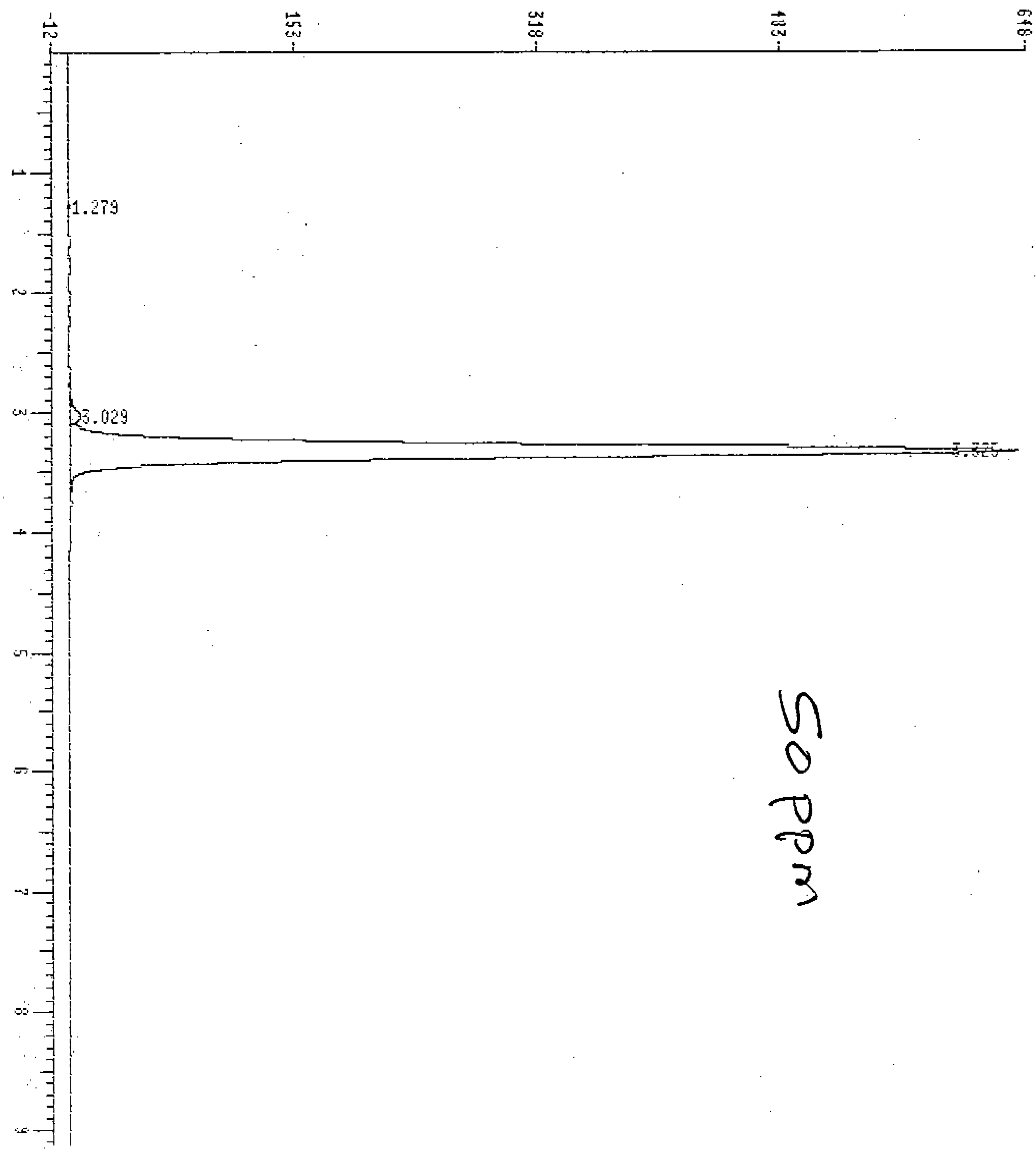
Report by Signal

Operator: 15 Mar 92 1:13 am
Method File Name : DNPHIII.M
Sample Info : 50 ppm
Misc Info:
Integration File Name : DATA:0315A46A.I
consisting of channels : 1. A 360.4 550.100 of 0315A46A.D
Sequence Index: 1 Bottle Number : 46 Repetition Number: 1

A 360.4 550.100 of 0315A46A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.280	BB	2.7063	1.0376	0.05	100.00	0.052	0.44
3.031	BV	56.2291	7.4885	1.12	100.00	0.109	1.67
3.327	VB	4955.11	642.92	98.82	100.00	0.117	1.11

1: LC A 360.4   550.100   of 0315A46B.D



End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

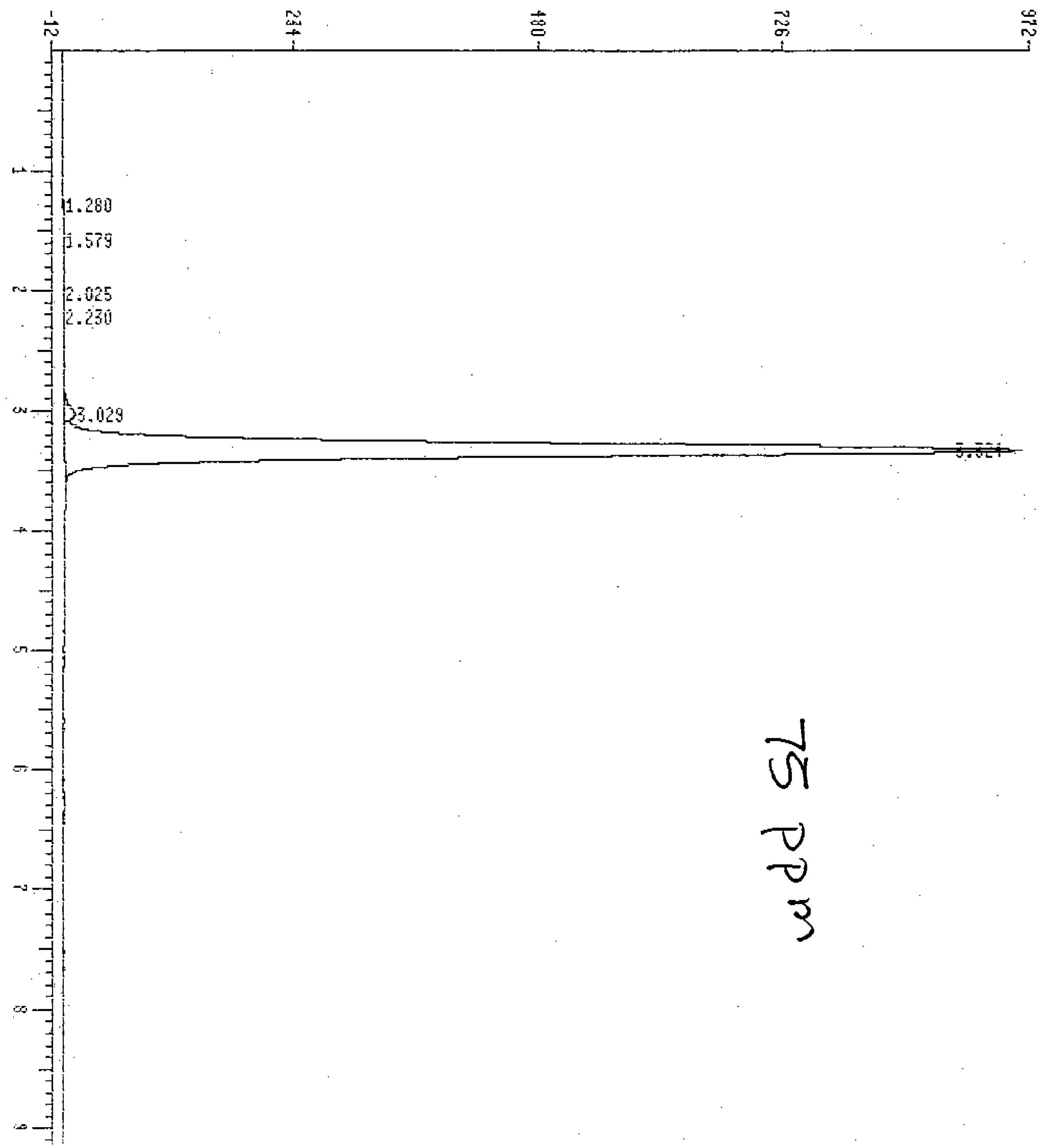
Report by Signal

Operator: 15 Mar 92 1:26 am
Method File Name : DNPHIII.M
Sample Info : 50 ppm
Misc Info:
Integration File Name : DATA:0315A46B.I
consisting of channels : 1. A 360,4 550,100 of 0315A46B.D
Sequence Index: 1 Bottle Number : 46 Repetition Number: 2

A 360,4 550,100 of 0315A46B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.279	BB	2.2026	0.9651	0.04	100.00	0.070	0.66
3.029	VV	53.7900	7.2656	1.08	100.00	0.106	1.69
3.325	VV	4906.81	642.39	98.87	100.00	0.116	1.13

1: LC A 360.4   550.100   of 0315A47A.D



75 ppm

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

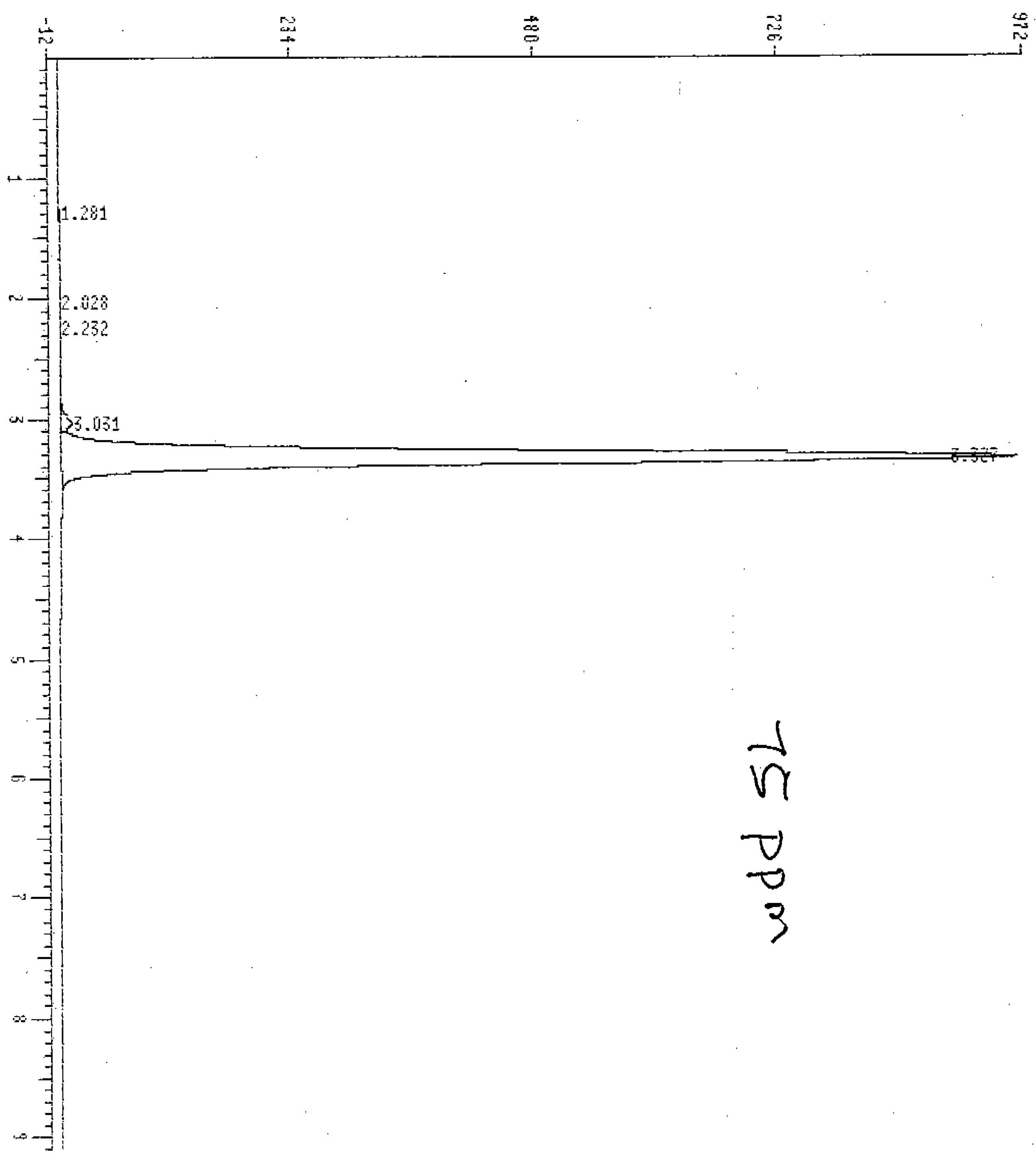
Report by Signal

Operator: 15 Mar 92 1:39 am
Method File Name : DNPHIII.M
Sample Info : 75 ppm
Misc Info:
Integration File Name : DATA:0315A47A.I
consisting of channels : 1. A 360,4 550,100 of 0315A47A.D
Sequence Index: 1 Bottle Number : 47 Repetition Number: 1

A 360,4 550,100 of 0315A47A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.280	BB	3.5225	1.4560	0.05	100.00	0.053	0.60
1.579	BV	6.1400	1.0735	0.08	100.00	0.092	1.08
2.025	PV	5.3259	1.0161	0.07	100.00	0.091	0.43
2.230	VV	5.5974	1.3370	0.08	100.00	0.063	1.37
3.029	PV	79.6480	10.9636	1.07	100.00	0.105	1.64
3.324	VV	7352.44	964.09	98.66	100.00	0.116	1.13

1: LC A 360,4 550,100 of 0315A47B.D



75 ppm

End of plot. Time = 0.00 to 9.98 minutes Chart speed = 2.00 cm/min

*** Area Percent ***

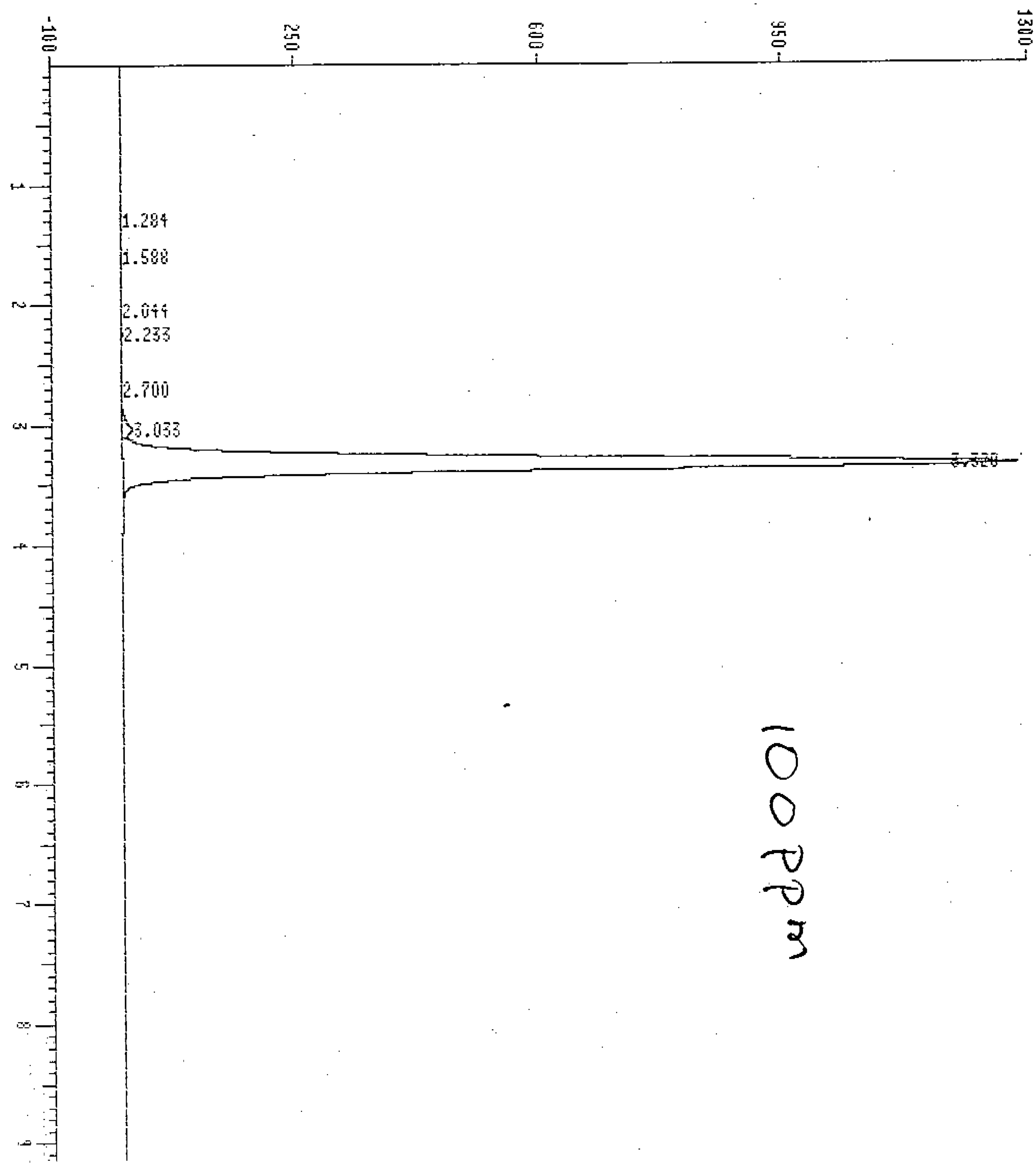
Report by Signal

Operator: 15 Mar 92 1:52 am
Method File Name : DNPHIII.M
Sample Info : 75 ppm
Misc Info:
Integration File Name : DATA:0315A47B.I
consisting of channels : 1. A 360,4 550,100 of 0315A47B.D
Sequence Index: 1 Bottle Number : 47 Repetition Number: 2

A 360,4 550,100 of 0315A47B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.281	BB	3.3508	1.4222	0.04	100.00	0.037	0.59
2.028	PV	4.4160	0.9630	0.06	100.00	0.076	0.54
2.232	VB	5.6102	1.3022	0.08	100.00	0.064	1.55
3.031	VV	82.2299	11.0581	1.10	100.00	0.107	1.71
3.327	VV	7357.28	965.03	98.72	100.00	0.116	1.13

1: LC A 360.4   550.100   of 0315A48A.D



100 PPm

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

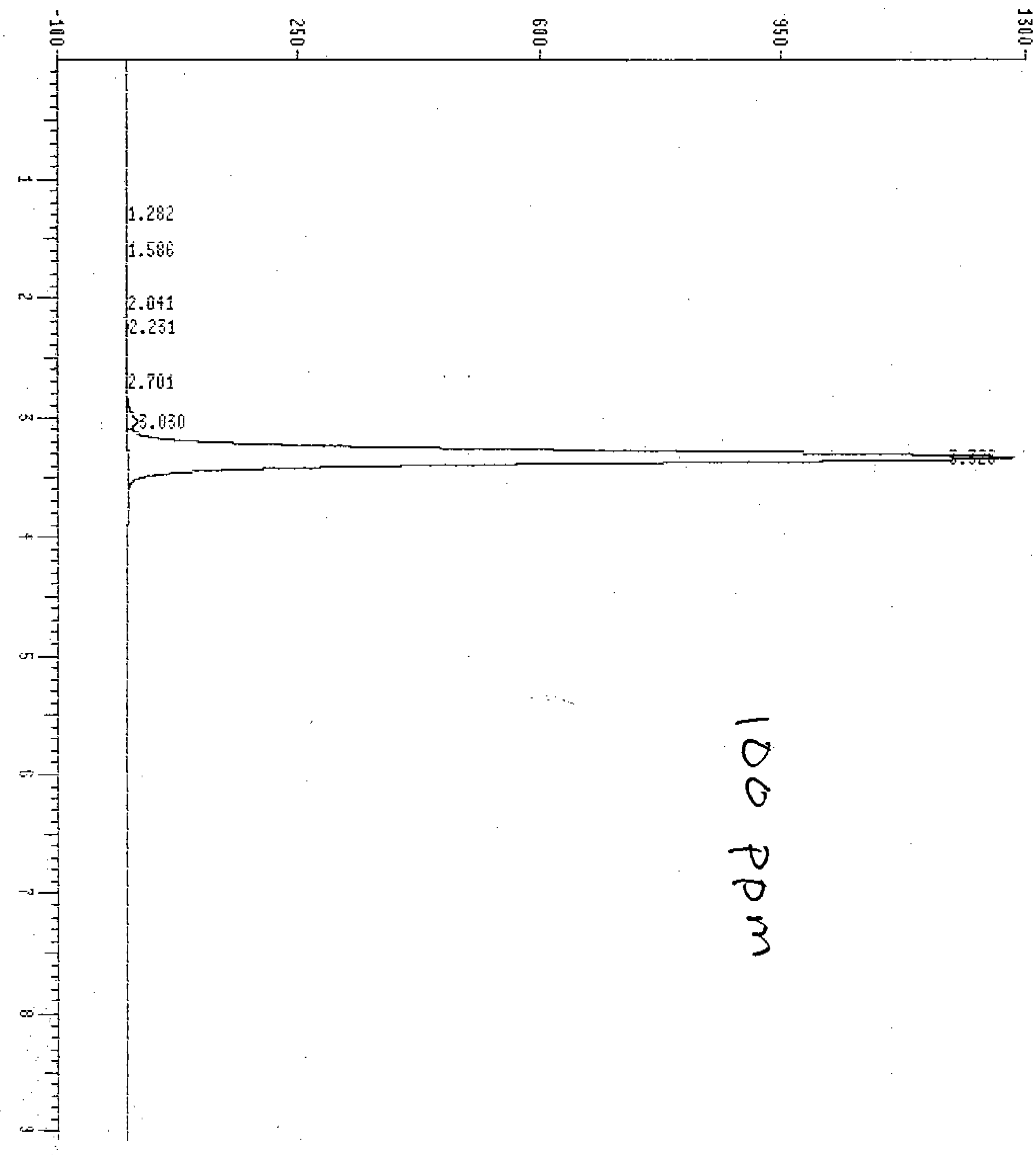
Report by Signal

Operator: 15 Mar 92 2:05 am
Method File Name : DNPHIII.M
Sample Info :
Misc Info: 100 PPM
Integration File Name : DATA:0315A48A.I
consisting of channels : 1. A 360,4 550,100 of 0315A48A.D
Sequence Index: 1 Bottle Number : 48 Repetition Number: 1

A 360,4 550,100 of 0315A48A.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.284	BB	5.2737	1.8075	0.05	100.00	0.059	0.44
1.588	BV	6.7782	1.1914	0.07	100.00	0.079	1.20
2.044	PV	6.9883	1.5131	0.07	100.00	0.075	0.37
2.233	VB	7.0247	1.8029	0.07	100.00	0.059	1.22
2.700	BV	3.1293	0.6874	0.03	100.00	0.081	1.22
3.033	VV	110.04	14.9637	1.11	100.00	0.106	1.69
3.328	VV	9788.20	1284.19	98.60	100.00	0.116	1.13

1: LC A 360.4 550.100 of 0315A48B.D



100 ppm

End of plot. Time = 0.00 to 9.98 minutes   Chart speed = 2.00 cm/min

*** Area Percent ***

Report by Signal

Operator: 15 Mar 92 2:16 am
Method File Name : DNPHIII.M
Sample Info : 100 PPm
Misc Info:
Integration File Name : DATA:0315A48B.I
consisting of channels : 1. A 360,4 550,100 of 0315A48B.D
Sequence Index: 1 Bottle Number : 48 Repetition Number: 2

A 360,4 550,100 of 0315A48B.D

Ret Time	Type	Area	Height	Area %	Ratio %	Width	Sym
1.282	BB	4.5422	1.7754	0.05	100.00	0.055	0.58
1.586	BV	6.0604	1.1455	0.06	100.00	0.082	1.14
2.041	PV	7.0626	1.5094	0.07	100.00	0.083	0.40
2.231	VB	7.7268	1.9014	0.08	100.00	0.061	1.21
2.701	BV	3.5464	0.6880	0.04	100.00	0.088	1.42
3.030	VV	110.52	14.9863	1.11	100.00	0.106	1.69
3.326	VV	9784.27	1282.78	98.59	100.00	0.116	1.13

APPENDIX F

EQUIPMENT CALIBRATION DATA

NuTech
CORPORATION

METER BOX
A-C

C A L I B R A T I O N   S H E E T

Customer : IEA Serial : 80321
Date : 05-22-90

CALCULATION DATA FOR RUN :	1	2	3
1. Barometric Pressure, P(B):	29.87	29.87	29.87
2. Orifice Setting, Delta H :	2.00	0.75	6.00
3. Finial Reading (Test) :	150.673	161.758	172.844
4. Initial Reading (Test) :	140.126	151.306	162.408
5. Volume, V(T) Cubic Feet :	10.547	10.452	10.436
6. Temp Initial T(T(I)) F :	69	69	69
7. Temp Finial T(T(F)) F :	70	70	69
8. Finial Reading (Box) :	65.772	76.909	87.962
9. Initial Reading (Box) :	55.202	66.403	77.550
10. Volume, V(B) Cubic Feet :	10.570	10.506	10.412
11. Temp Initial T(B(I)) F :	70	71	74
12. Temp Final T(B(F)) F :	73	74	78
13. Elapsed Time, Minutes :	14.0	22.0	8.0

Delta H(a) :	1.9728	1.8567	1.9536	$\overline{\Delta H}$ = 1.9277
Gamma :	0.9967	0.9987	1.0008	$\overline{\gamma}$ = 0.9987

Calibration Performed By : William A Ballard

NUTECH CORPORATION • P.O. BOX 12425 • RESEARCH TRIANGLE PARK, N.C. 27709 • 919/682-0402

DRY GAS METER POST–TEST CALIBRATION
USING REFERENCE METER

DATE: 1/30/92 METER BOX NO. M4

CALIBRATOR: MR BAROMETRIC PRESSURE (Pb) 29.83 in. Hg

INITIAL CALIBRATION Y: 0.999 ΔH@: 1.927

PLANT: Champion PROJECT NO.: 1419-001

AVERAGE ΔH DURING TESTING: 0.57 MAXIMUM VACUUM 24 in. Hg

Orifice manometer setting* ΔH in. H2O	Volume reference meter Vw ft3	Volume dry gas meter Vd ft3	Temperatures: Ref Meter Tw °F	Ref Meter Avg Tw °F	Dry gas meter Td °F	Dry gas meter Avg Td °F	Test duration Θ min	Vacuum setting ** in. Hg	Calibr Factor Y	ΔH@ in. H2O
0.57	start 584.737 stop 589.703 diff 4.966	545.366 550.410 5.044	start 71 stop 70	71.5	start 70 stop 72	71	12	24	0.9891	1.856
0.57	start 589.703 stop 594.629 diff 4.926	550.410 555.458 5.048	start 70 stop 70	70	start 72 stop 72	72	12	24	0.9850	1.872
0.57	start 600.181 stop 605.117 diff 4.936	561.155 566.196 5.041	start 69 stop 70	69.5	start 73 stop 73	73	12	24	0.9912	1.857
							Post–test Average***		0.9884	1.862

* To be the average ΔH used during test series.

** To be the highest vacuum used during test series.

*** Post–test Y must be within the range, pre–test Y +/– 5% OK? ☒

Post–test ΔH@ should be within the range of the initial or pre–test ΔH@ +/– 0.20 in. H2O. OK? ☒

$$Y = \frac{(1.004)(Vw)(Pbar)(Td + 460)}{(Vd)(Pbar + \Delta H / 13.6)(Tw + 460)}$$

$$\Delta H@ = \frac{(0.0317)(\Delta H)}{(Pbar)(Td + 460)}\left[\frac{(Tw + 460)(\Theta)}{(Vw)(1.004)}\right]^2$$

$$\text{Percent difference} = \frac{(\text{Avg initial } Y) - (\text{Post-test } Y)}{(\text{Avg initial } Y)}$$

dgmptcal.wk1

Meter Box 4

THERMOCOUPLE DIGITAL INDICATOR CALIBRATION DATA FORM

Date 2/19/92 Calibrator Name [illegible signature]

Indicator No. CC-300-2100F Serial No. 009

Calibration Device No. Temp Cal #1 Manufacturer Omega

Test Point No.	Millivolt Signal	Equivalent Temperature deg. F	Digital Indicator Temperature deg. F	Percent difference %
1		100	100	
2		500	502	
3		900	904	
4		1300	1305	
5		1700	1699	
6		zero	zero	
7		200	202	
8		400	400	
9		800	804	
10		1200	1203	

Percent difference must be less than or equal to 0.5%

Percent Difference:

$$\frac{(\text{Ref temp} + 460) - (\text{Test temp} + 460)}{(\text{Ref temp} + 460)} \times 100\% \text{ should be} < 0.5\%$$

NOZZLE CALIBRATION

Date 2/26/92 Calibrated by [illegible]

Nozzle identification number	D1, in.	D2, in.	D3, in.	D, in.	Davg
H25	.235	.235	.235	0	.235

Used on PreVents

where:

D1, D2, D3 = nozzle diameter measured on a different diameter, in.
Tolerance = measure within 0.001 in.

D = maximum difference in any two measurements, in.
Tolerance = 0.004 in.

Davg = average of D1, D2, and D3.

NOZZLE CALIBRATION

Date 3/1/92 Calibrated by [illegible]

Nozzle identification number	D1, in.	D2, in.	D3, in.	D, in.	Davg
H19	.197	.196	.196	.001	.196
	Used on Stack				
	Dupe				

where:

D1, D2, D3 = nozzle diameter measured on a different diameter, in.
Tolerance = measure within 0.001 in.

D = maximum difference in any two measurements, in.
Tolerance = 0.004 in.

Davg = average of D1, D2, and D3.

TEMPERATURE CALIBRATION DATA FORM

Date 2/21/92 Calibrator Name P. Slater

Ambient Temperature 72° F Barometric Pressure 30.02 in. Hg

Reference: Hg–in–glass

Other Fluke 52

Thermocouple No.	Source (specify)	Reference thermometer temperature °F	Thermocouple indicator temperature °F	Percent error %
6C used 13c 1h for PV + DS	Ambient	71.4	71.0	0.08
	Ice Bath	31.8	31.0	0.16
	Boiling H2O	214.2	213.8	0.06
5A	Ambient	71.2	71.4	0.04
	Ice Bath	31.6	31.8	0.04
	Boiling H2O	212.6	212.2	0.06
7B	Ambient	71.8	71.8	0.0
	Ice Bath	31.8	31.0	0.16
	Boiling H2O	212.6	212.8	0.04

Source: ice bath, ambient air, boiling H2O, hot oil

iea

$$\% \text{ error} = \frac{(\text{Ref temp} + 460) - (\text{Test temp} + 460)}{(\text{Ref temp} + 460)} \times 100\% \text{ should be} < 1.5\%$$

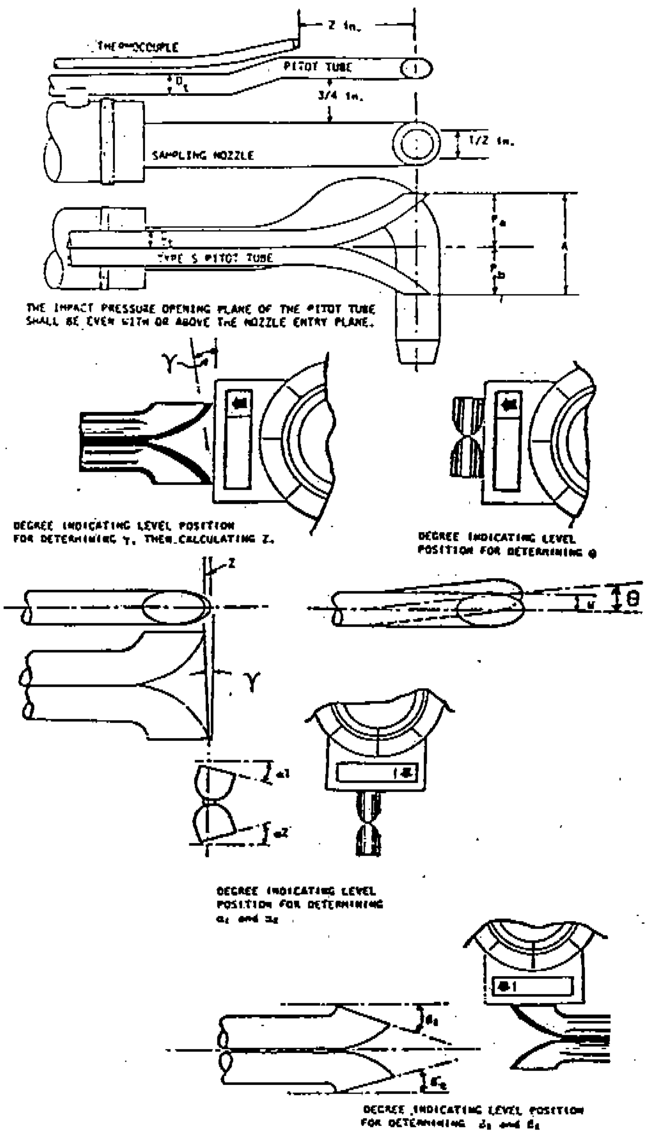
tempcal.wk1

PITOT TUBE INSPECTION DATA SHEET

Company Name: IeA

Pre-sample Date 2/21/92

Post Sample Date ______



Pre-sample		Post Sample
yes	level?	
NO	obstructions?	
NO	damaged?	
0	$-10° < \alpha_1 < +10°$	
0	$-10° < \alpha_2 < +10°$	
0	$-5° < \beta_1 < +5°$	
0	$-5° < \beta_2 < +5°$	
0	γ	
0	θ	
.92	A	
.46	$1.05\ D_t < P_a < 1.5\ D_t$	
.46	$1.05\ D_t < P_b < 1.5\ D_t$	
0.362	$3/16" \leq D_t \leq 3/8"$	
0	$A \tan \gamma < 0.125"$	
0	$A \tan \theta < 0.03125"$	
yes	$P_a = P_b$	

Comments: ______

Pitot tube/probe number 6C meets or exceeds all specifications criteria and/or applicable design features* and is hereby assigned a pitot tube calibration factor of 0.84.

Signature [signature]

Date 2/21/92

*See 40 CFR 60, Vol. 42, No. 160, Method 2. Verify the minimum 2 inch setback of the thermocouple and the minimum 3/4 inch separation between the pitot tube and the nozzle as shown at the top of this page.

APPENDIX G

PROJECT PARTICIPANTS

Louisiana Pacific Corporation

Dr. James T. Boswell, Environmental Affairs Officer
Mr. Ed Knight ; Plant Manager Kirby Forest Industries

Environmental Monitoring Laboratories

Mr. Daniel G. Russell

Industrial and Environmental Analysts, Inc.

Mr. Jeffrey Burdette; Program Manager
Mr. John A. Sokash; Project Coordinator, Author
Mr. Jay Morgan; Team Member

Mercury Research Laboratory

Dr. Jimmy C. Pau