U.S. POLYMERIC

HITCO MATERIALS DIVISION

FM 5834 TEST LOTS #1, 3, 4, 5

FINGERPRINT TEST DATA REPORT

NAS8-36298 COPY # 9

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NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 1

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 1

		SAMPLE			
1. Carbon Content, % QAI-5560		#1-1	#1-2	#1-3	
		99.17	99.10	99.12	
	NASA LOT# 1 AVERAGE			99.13	
2. Ash Content, % PTM-71B		.005	.000	.000	
		.009	.014	.005	
	AVG.	.007	.007	.003	
	NASA LOT# 1 AVERAGE			.006	
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)		#1-1	#1-2	#1-3	LOT#1 AVG.
	Na	3.0	2.0	1.5	2.2
	K	1.5	0.0	0.0	0.5
	Ca	0.0	0.0	0.0	0.0
	Mg	0.5	0.0	0.0	0.2
	Li	0.0	0.0	0.0	0.0
	TOTAL	5.0	2.0	1.5	2.8
3a. Moisture Content, % CTM-53B		.005	.010	.005	
		.019	.005	.005	
	AVG.	.010	.008	.005	
	NASA LOT# 1 AVERAGE			.008	
3b. Ash Content, % CTM-53B		0.000	0.000	0.000	
		0.000	0.000	0.005	
	AVG.	0.000	0.000	0.003	
	NASA LOT# 1 AVERAGE			0.001	
4. pH, Units ASTM D1512		4.85	4.85	4.95	
		4.90	4.90	5.05	
	AVG.	4.88	4.88	5.00	
	NASA LOT# 1 AVERAGE			4.92	
5. Particle Size, microns S.E.M. procedure (Average values are of 10 determinations)	AVG.	.45	.36	.38	
	Maximum	.65	.62	.85	
	Minimum	.22	.17	.22	
	Std. Dev	.08	.08	.08	
	NASA LOT# 1 AVERAGE SIZE			.40	
6a. TGA, °C at 50% Loss CTM-51		750	751	749	
	NASA LOT# 1 AVERAGE			750	

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700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

Filler Lot for NASA Lot# 1

6b. TGA
CTM-51

See Charts 6A-6C

7. Particle Size Distribution
CTM-72

See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#1-1	#1-2	#1-3
	.87	.88	.92
	.86	.95	.95
AVG.	.86	.92	.94

NASA LOT# 1 AVERAGE .91

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

Sample: 1-1
Size: 8.84 mg
Run No: MIR #12830 (13)
Date: JAN/31/86 12:59

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 35.DAT V2.1
Plotted: FEB/04/86 07:23

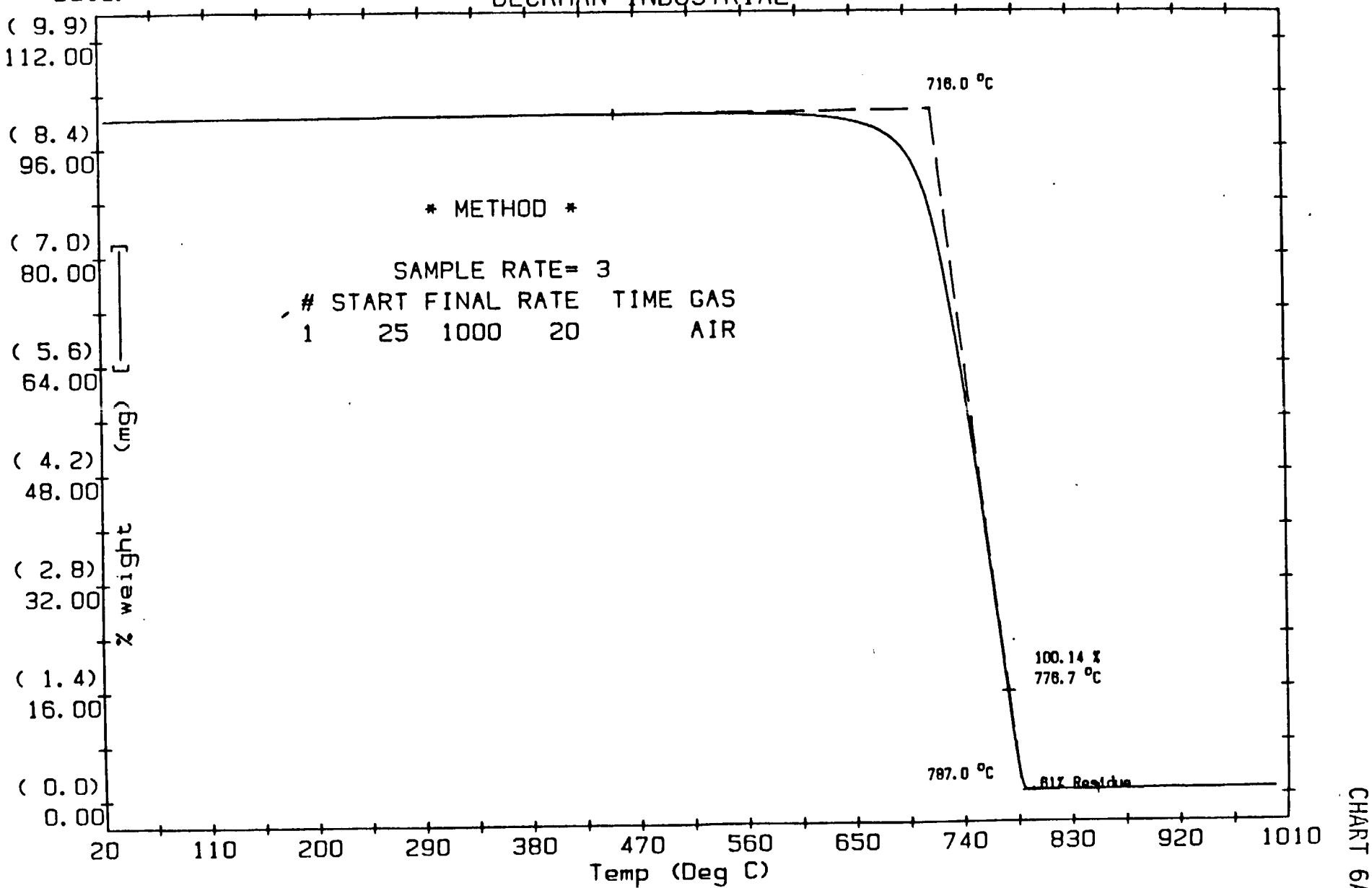

CHART 6A

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

Sample: 1-2
Size: 14.192 mg
Run No: MIR #12830 (13)
Date: FEB/03/86 07:13

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
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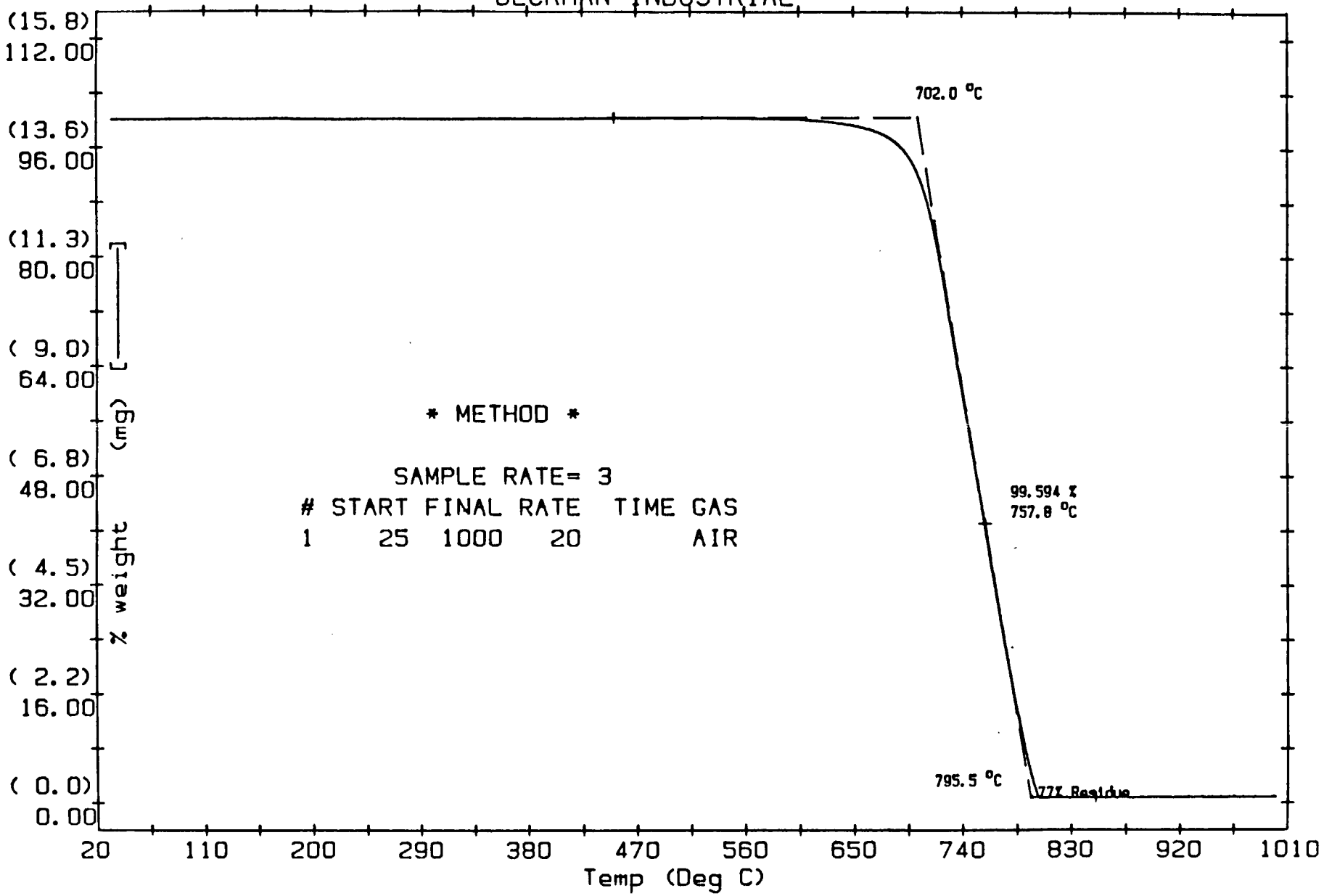


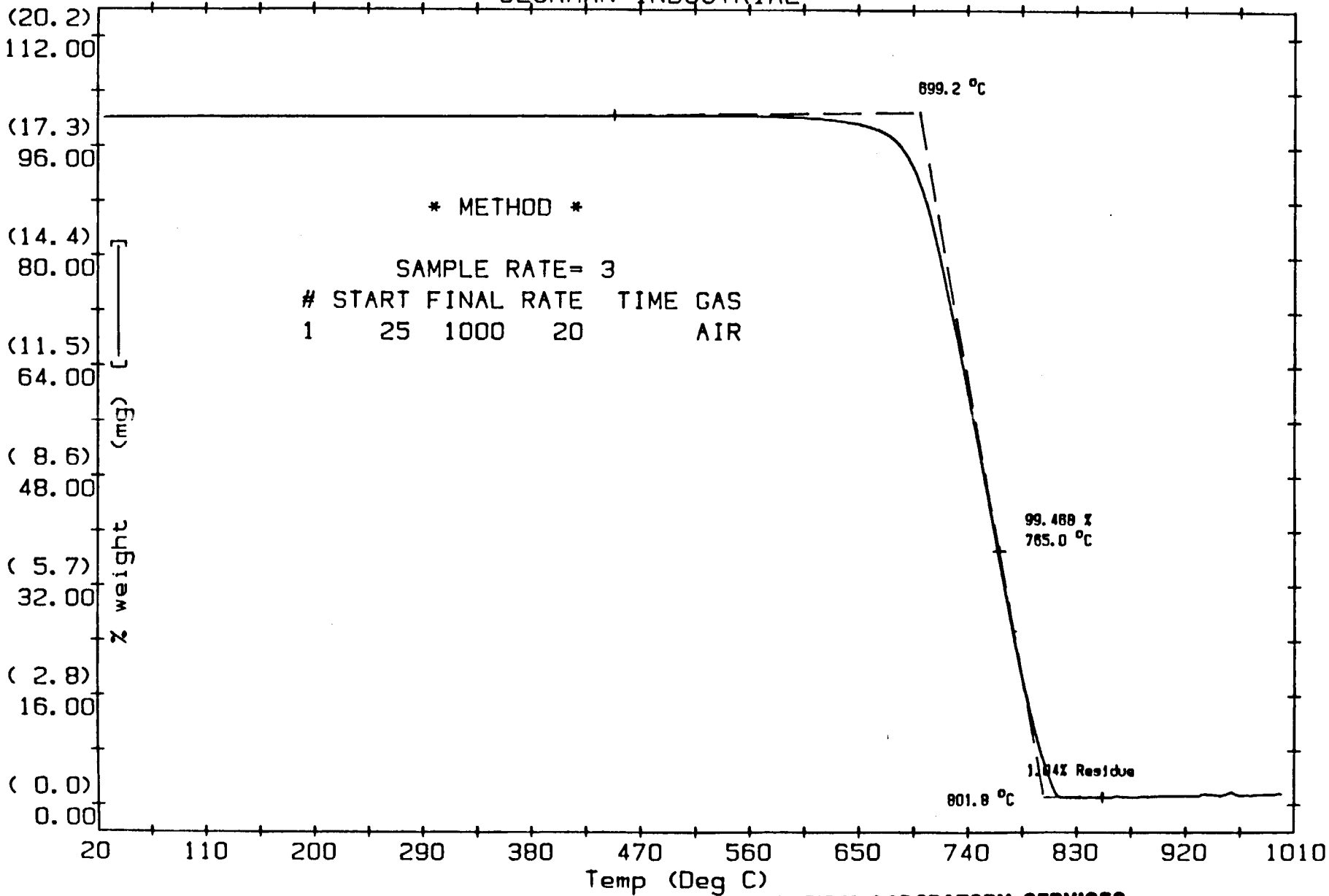
CHART 6B

Sample: 1-3
Size: 18.045 mg
Run No: MIR #12830 (I3)
Date: FEB/03/86 08:45

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 37.DAT V2.1
Plotted: FEB/04/86 07:36



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

CHART 6C

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-22-86
#1 SAMPLE NASA LOT#1-1
SOLVENT ETHYL GLYCOL
C=0.013 mg/ml

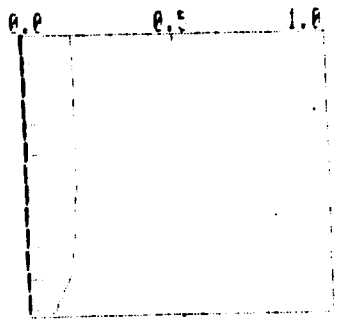
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

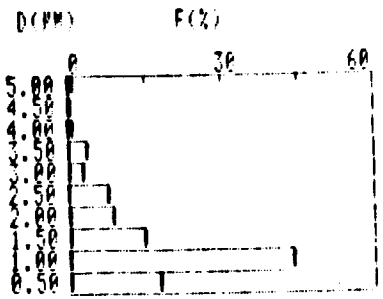


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.9	0.9
4.50-4.00	0.1	1.0
4.00-3.50	0.6	1.6
3.50-3.00	3.4	5.0
3.00-2.50	2.7	7.7
2.50-2.00	7.8	15.5
2.00-1.50	8.6	24.0
1.50-1.00	14.5	38.5
1.00-0.50	43.9	82.5
0.50-0.00	17.5	100.0

D(AVE) 0.87 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot # 1-1
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-22-86
#2 SAMPLE NASA LOT#1-1
SOLVENT ETHYL GLYCOL
C=0.013 mg/ml

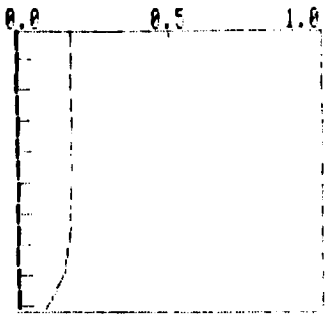
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

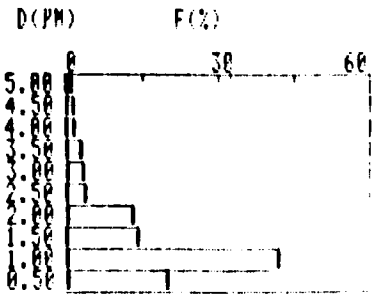


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.7	0.7
4.50-4.00	1.1	1.8
4.00-3.50	1.4	3.3
3.50-3.00	2.5	5.7
3.00-2.50	2.7	8.4
2.50-2.00	3.6	12.0
2.00-1.50	12.8	24.8
1.50-1.00	13.9	38.7
1.00-0.50	41.7	80.4
0.50-0.00	19.6	100.0

D(AVE) 0.86 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot # 1-1
Sample #2

CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#L-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

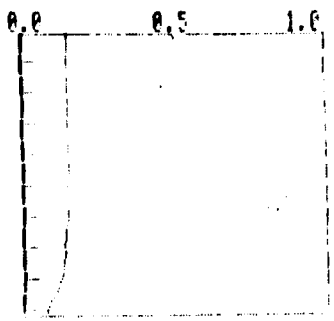
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

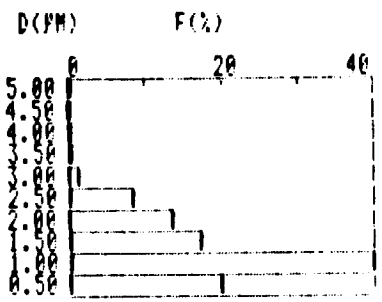


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	0.0	0.0
3.00-2.50	1.1	1.1
2.50-2.00	8.2	9.3
2.00-1.50	13.7	23.0
1.50-1.00	17.2	40.2
1.00-0.50	39.9	80.1
0.50-0.00	19.9	100.0

D(AVE) 0.88 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#1-2
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#L-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

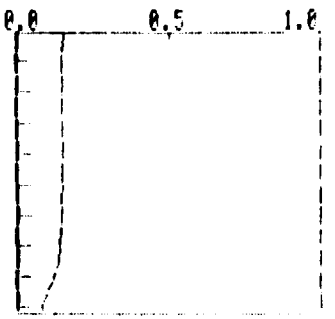
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

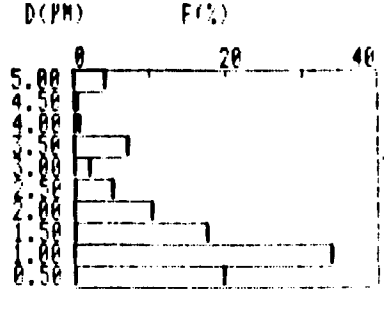


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	4.1	4.1
4.50-4.00	0.2	4.3
4.00-3.50	0.4	4.8
3.50-3.00	7.1	11.9
3.00-2.50	1.9	13.8
2.50-2.00	4.8	18.7
2.00-1.50	10.3	29.0
1.50-1.00	17.5	46.5
1.00-0.50	33.8	80.3
0.50-0.00	19.7	100.0

D(AVE) 0.95 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#1-2
Sample#2

CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#1 SAMPLE NASA LOT#1-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

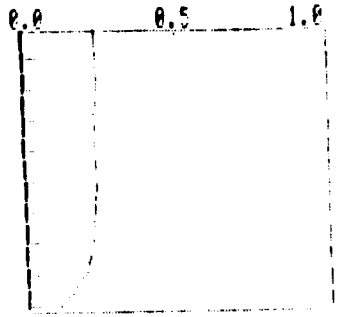
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

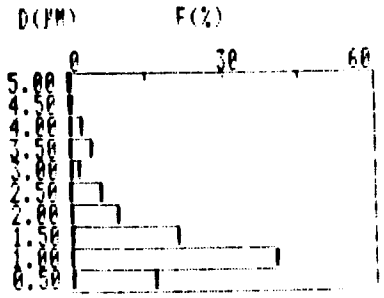


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	2.1	2.1
3.50-3.00	4.0	6.0
3.00-2.50	1.5	7.5
2.50-2.00	5.8	13.3
2.00-1.50	9.2	22.5
1.50-1.00	20.8	43.3
1.00-0.50	40.4	83.7
0.50-0.00	16.3	100.0

D(AVE) 0.92 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#1-3
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-24-86
#2 SAMPLE NASA LOT#1-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

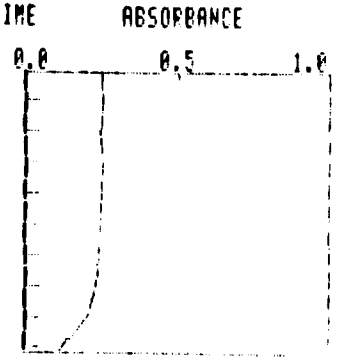
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

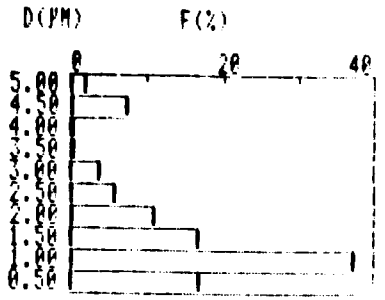


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	1.6	1.6
4.50-4.00	7.3	9.0
4.00-3.50	0.0	9.0
3.50-3.00	0.0	9.0
3.00-2.50	3.6	12.6
2.50-2.00	5.7	18.3
2.00-1.50	11.0	29.3
1.50-1.00	16.6	45.9
1.00-0.50	37.2	83.1
0.50-0.00	16.9	100.0

D(AVE) 0.95 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#1-3
Sample#2

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CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

91LD Resin Lot for NASA Lot# 1

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

91LD Resin Lot for NASA Lot# 1

		#1-1	#1-2	#1-3
1. Resin Solids, % PTM-7C		70.4	70.7	71.5
		70.9	69.9	70.9
		71.0	71.7	70.3
	AVG.	70.8	70.8	70.9
	LOT# 1 AVERAGE			70.8
2. Specific Gravity @ 25°C PTM-29C		1.137	1.136	1.137
	LOT# 1 AVERAGE			1.137
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-47B		1000	1000	1000
	LOT# 1 AVERAGE			1000
4. Gel Time, min:sec PTM-14C		3:24	3:20	3:22
	LOT# 1 AVERAGE			3:22

5. Atomic Absorption, ppm CTM-53B	#1-1	#1-2	#1-3	LOT1 AVG
Na	8	9	10	9.0
K	1	1	1	1.0
Ca	10	9	8	9.0
Mg	1	1	1	1.0
Li	0	0	0	0
AVG.	20	20	20	20.0

6. Volatiles, Gas Chromatography CTM-55 — See Charts 6A-6C

7. TGA, % Weight Loss at 500°C CTM-51 (AIR)	#1-1	#1-2	#1-3
	41.4	40.5	40.8
LOT# 1 AVERAGE			40.9

See Chart 7A-7C

8. DSC, temperature °C CTM-50A			
	187	182	183
LOT# 1 AVERAGE			184

See Chart 8A-8C

9. HPLC CTM-49A — See Chart 9A-9C

10. GPC, Average molecular wt. CTM-49A			
	1770	1816	1658
LOT# 1 AVERAGE			1748

See Chart 10A-10C

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

91LD Resin Lot for NASA Lot# 1

11. pH, units
CTM-1B

	#1-1	#1-2	#1-3
	8.4	8.3	8.3
	LOT# 1 AVERAGE		8.3

12. Phenol Content, %
CTM-55 Appendix 1

	11.05	12.15	11.85
	11.05	11.78	12.02
AVG.	11.05	11.96	11.93
	LOT# 1 AVERAGE		11.65

13. Chang's Index, ml.
CTM-5B

	23.6	23.8	23.8
	LOT# 1 AVERAGE		23.7

14. RDS, Minimum Viscosity, cps.
CTM-57A

	Min. Visc.	°C
#1-1	356	99
#1-2	194	104
#1-3	153	108
AVG.	234	104

See Charts 14A-14C

15. NMR
Vendor procedure

See Charts 15A-15C

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

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TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	Q.H.Z.	Date	12/10/86
Column		Detector	FID
Length	6 ft.	Voltage	
Dia.	1/4 in.	Sensit.	
Liquid Phase	AT-1000	Flow Rates, ml/min	
Wt. %	0.1	Hydrogen	60 Air 96
Support	GRAPHPAC	Scavenge	
Mesh	80/100	Split	
Carrier Gas	He	Temperature, °C	
Rotameter		Det.	220 Inj. 200
Inlet Press	60 psig	Column Initial	60
Rate	30 ml/min	Final	210
CHART SPEED		Rate	5°C/MIN
SAMPLE	914D,1-1	Solvent	THF
Size	0.1 µl	Concn.	0.0996 g/ml

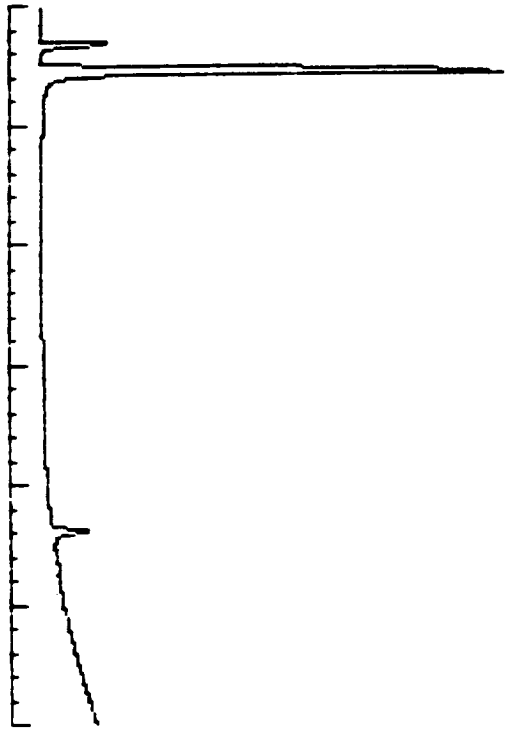
GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

STANDARD SOLVENT/MONOMER	RETENTION TIME (MINS.)
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: 91 LD 1-1
MISC.: C=0.09976 GMS/ML

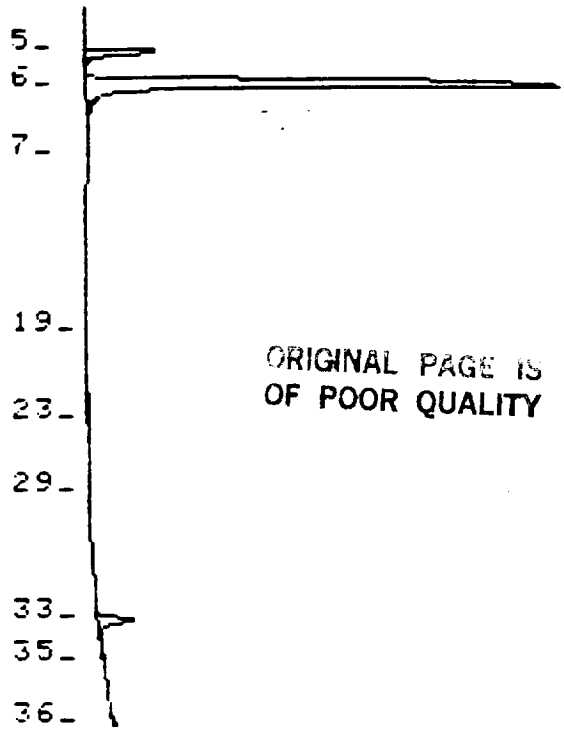
TIME: 8:39
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.48	1782	.084	2	243
3	.63	2116	.100	2	244
5	1.63	177020	8.334	2	12801
6	2.93	1802100	84.843	3	88912
7	5.43	1577	.074	4	102
19	11.70	1138	.054	2	55
23	14.90	9570	.451	2	193
29	17.48	1551	.073	1	69
33	21.98	116130	5.467	3	6607
35	23.50	8647	.407	2	319
36	25.70	2417	.114	1	109

TOTAL AREA= 2124047
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



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SAMPLE: 91 LD 1-1
MISC.: C=0.09976 GMS/ML

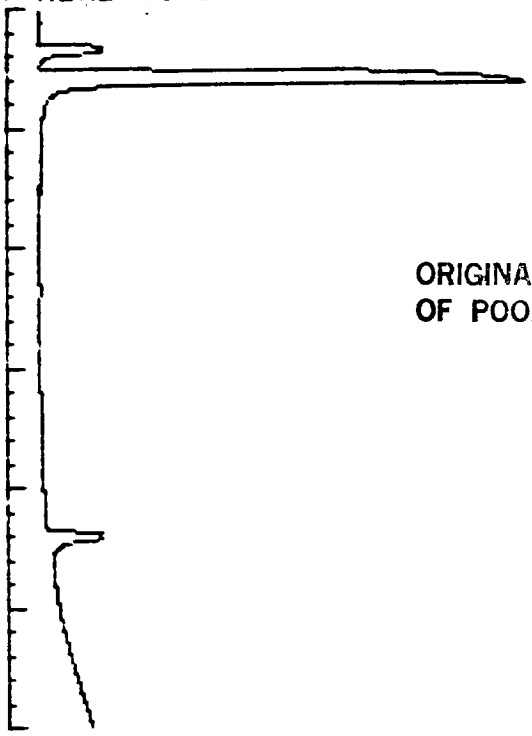
TIME: 8:39
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
5	1.63	177020	8.449	2	12801
6	2.93	1802100	86.009	3	88912
33	21.98	116130	5.543	3	6607

TOTAL AREA= 2095250
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 10000

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: 91 LD 1-2
MISC.: C=0.10038 GMS/ML

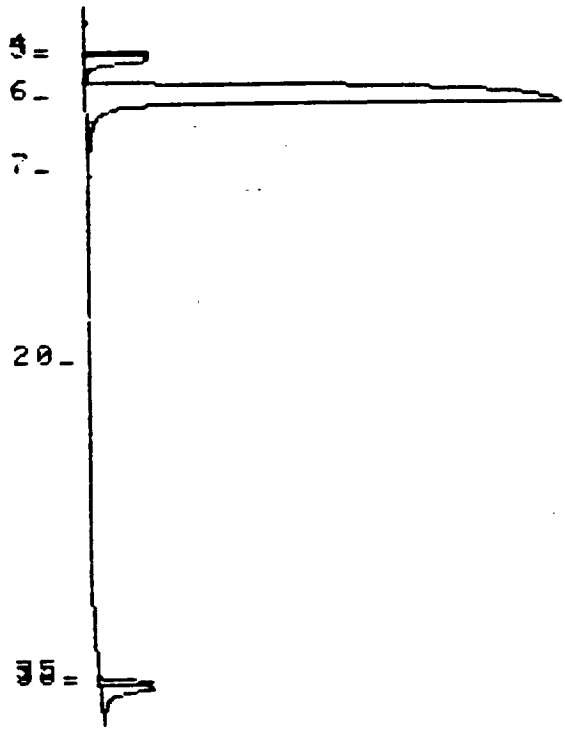
TIME: 10:03
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT
2	.63	4647	.117	1	480
4	1.65	94019	2.358	2	12190
5	1.85	222740	5.585	2	12322
6	3.28	3332000	83.551	3	93330
7	5.55	2614	.066	4	253
20	11.73	8087	.203	3	381
35	21.93	133490	3.347	2	10616
36	22.13	190400	4.774	2	10542

TOTAL AREA= 3987997
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR:1X



SAMPLE: 91 LD 1-2
MISC.: C=0.10038 GMS/ML

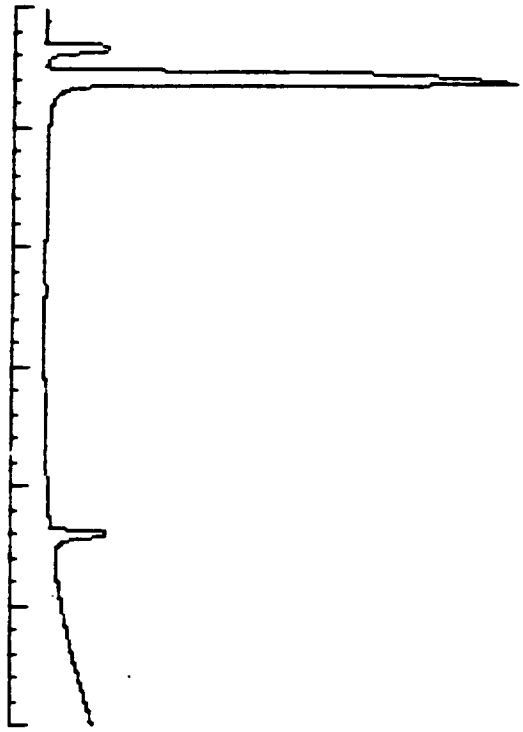
TIME: 10:03
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.65	94019	2.367	2	12190
5	1.85	222740	5.607	2	12322
6	3.28	3332000	83.874	3	93330
35	21.93	133490	3.360	2	10616
36	22.13	190400	4.793	2	10542

TOTAL AREA= 3972649
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 9000

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: 91 LD 1-3
MISC.: C=0.10171 GMS/ML

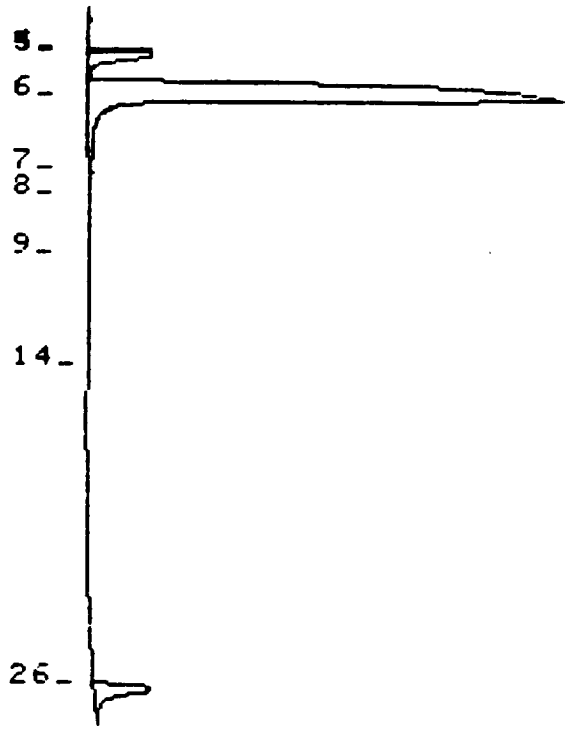
TIME: 11:03
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.63	3122	.084	1	415
4	1.65	87108	2.345	2	12047
5	1.80	206610	5.563	2	12134
6	3.23	3107700	83.669	3	90515
7	5.55	15030	.405	4	386
8	6.35	16422	.442	4	280
9	8.23	1731	.047	4	84
14	11.80	4421	.119	2	206
26	21.98	272120	7.326	1	10481

TOTAL AREA= 3714264
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: 91 LD 1-3
MISC.: C=0.10171 GMS/ML

TIME: 11:03
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.65	87108	2.371	2	12047
5	1.80	206610	5.624	2	12134
6	3.23	3107700	84.597	3	90515
26	21.98	272120	7.408	1	10481

TOTAL AREA= 3673538
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 17000

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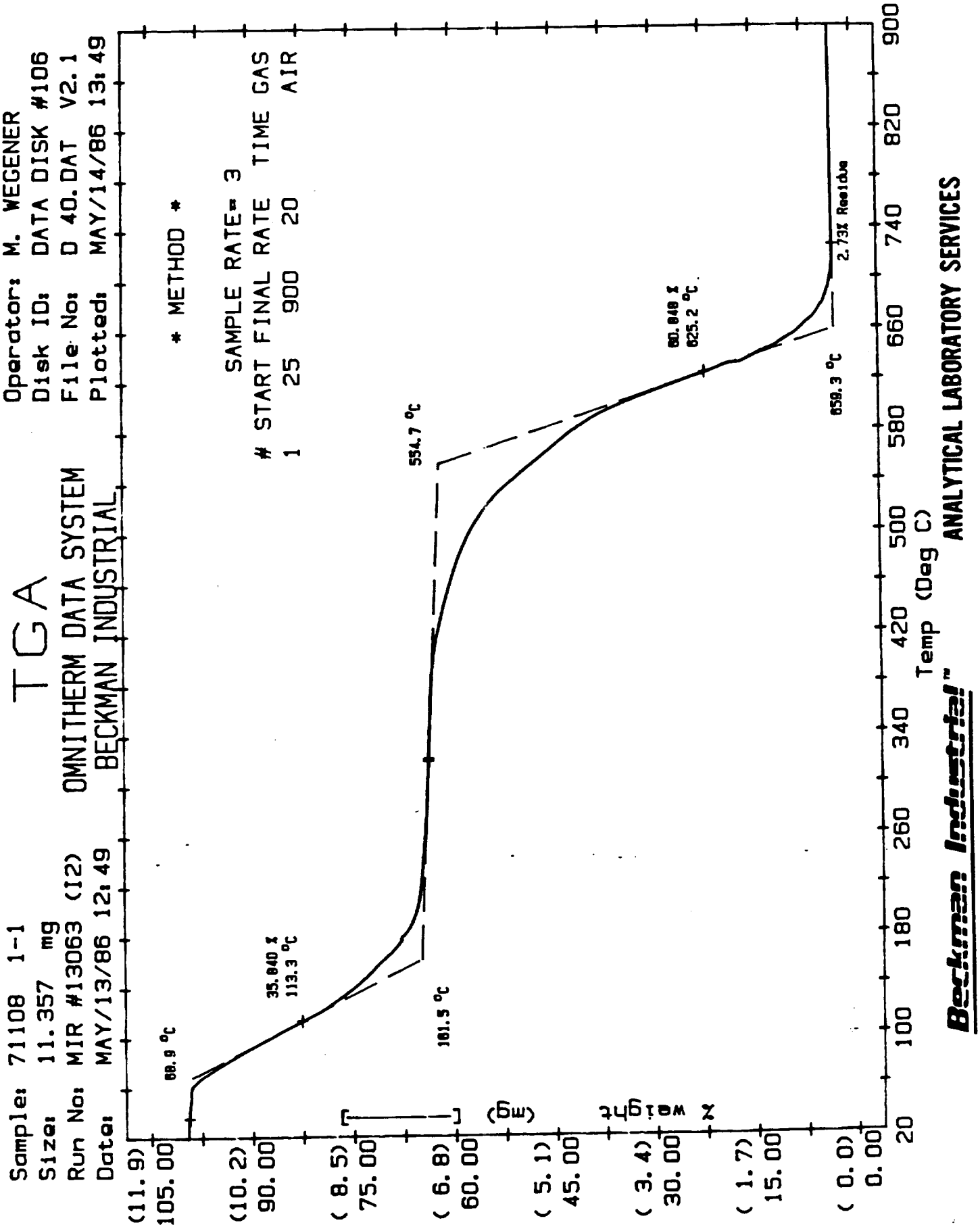
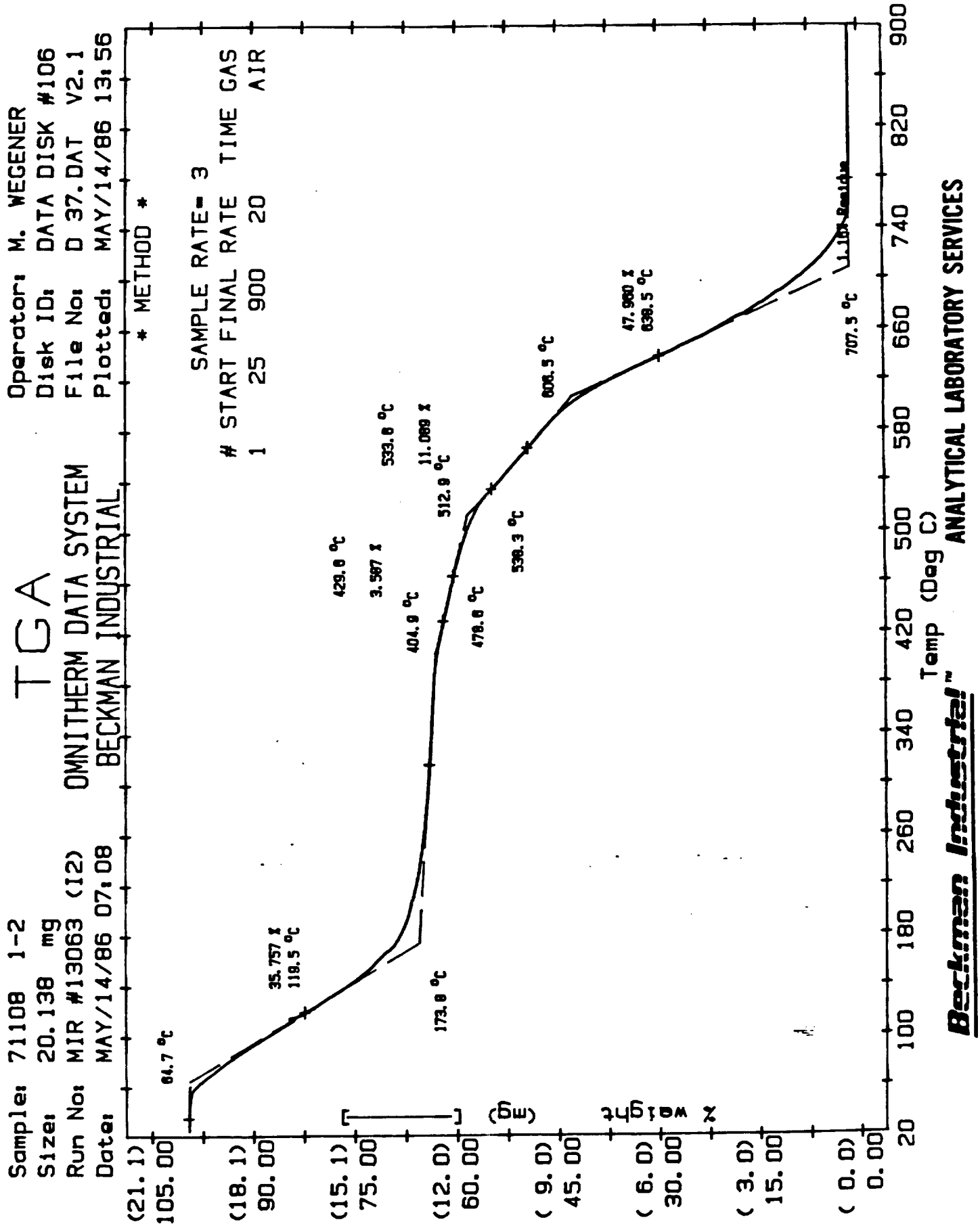


CHART 7B

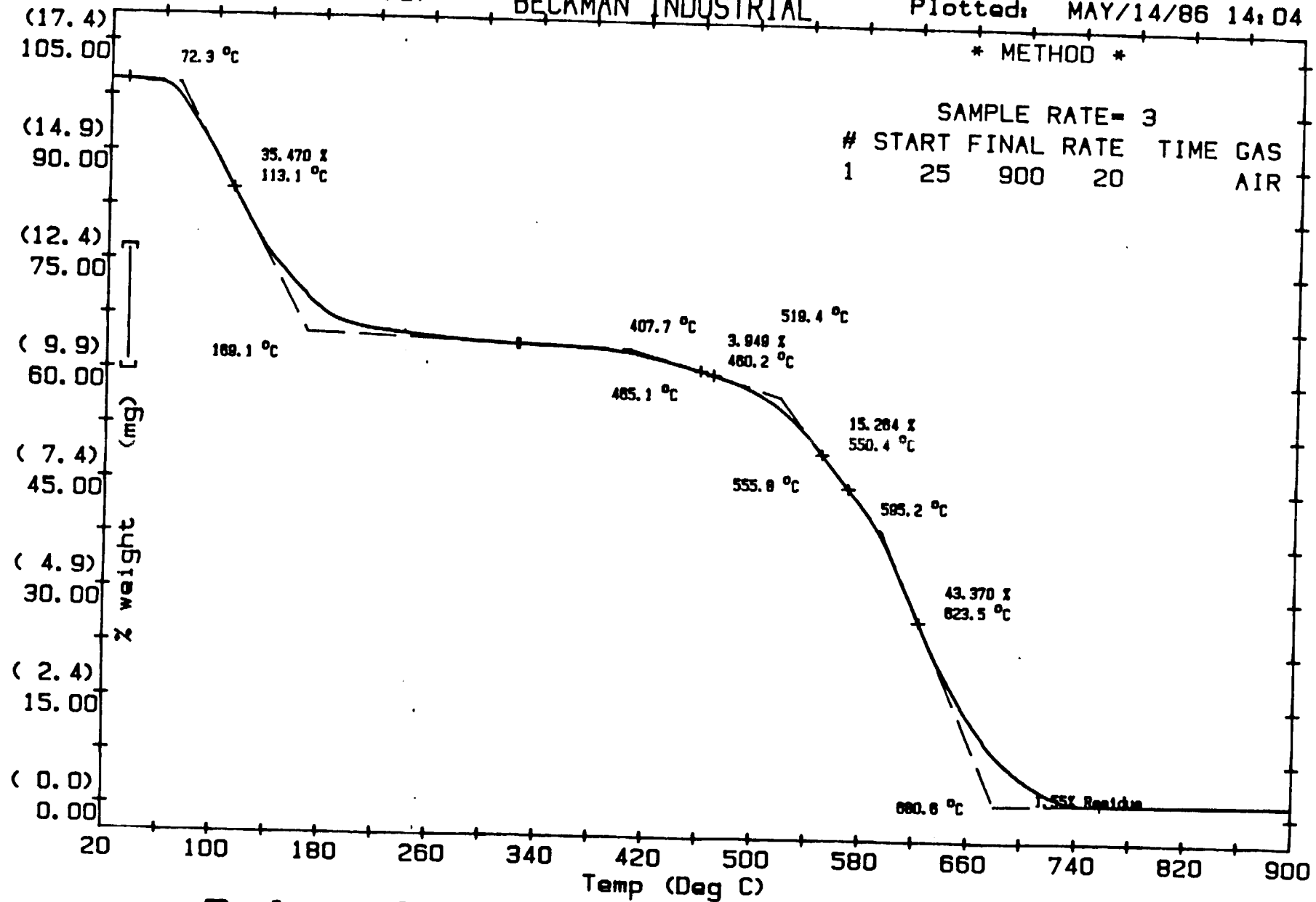


Sample: 71ud 1-3
Size: 16.619 mg
Run No: MIR #13063 (I2)
Date: MAY/14/86 08:27

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #106
File No: D 38.DAT V2.1
Plotted: MAY/14/86 14:04



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

CHART 7C

CHART 8A -

U.S. POLYMERIC DSC-2

Sample 911-D + ... Wt. ..... mg
Heat Rate ..... °C/min. Range ..... mcals/sec
Recorder Span ..... mV Chart speed ..... mm/min
Temp. Limits Lower ..... ° Upper ..... °
Mode: Hold/Autocool/Cycle Cooling Rate ..... °C/min.
Operator ..... Date .....

9-2-86 LAST CALIBRATION DATE
CALIBRATION DELTA °C

EXOTHERM

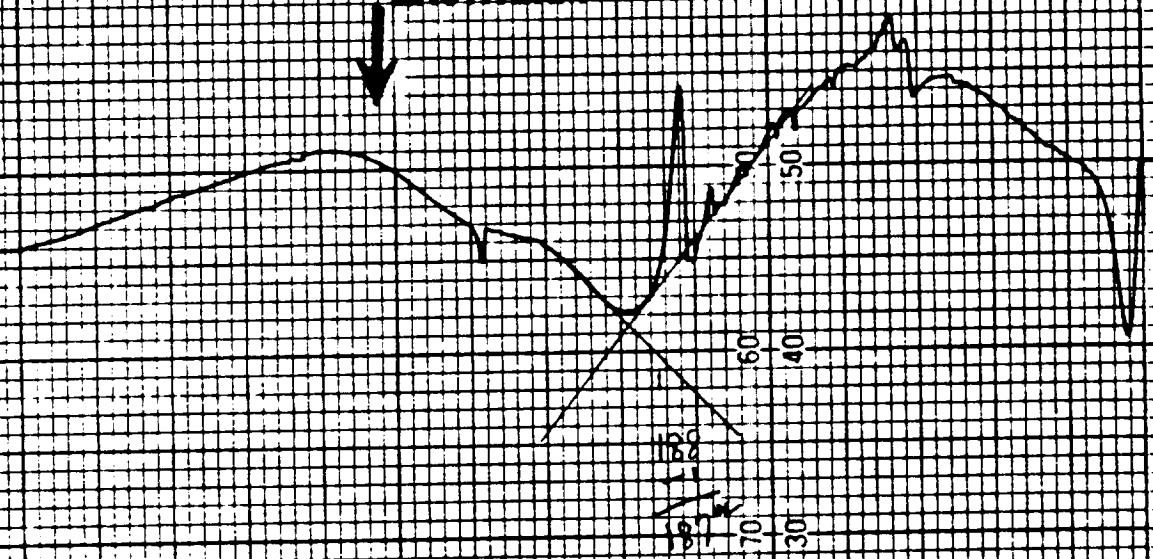


CHART 8B

U.S. POLYMERIC DSC-2

Sample 9112 Wt. 5.8 mg
Heat Rate: 20 °C/min. Range 2.0 mcals/sec
Recorder Span: 50 mV Chart speed 15 mm/min
Temp. Limits: Lower 50 ° Upper 350 °
Mode: Hold/Autocool/Cycle Cooling Rate 40 °C/min.
Operator A. Kaufelt Date 9-5-86

9-2-86 LAST CALIBRATION DATE
-1° CALIBRATION DELTA °C

EXOTHERM

185°
182.40°

50°C

(2900)

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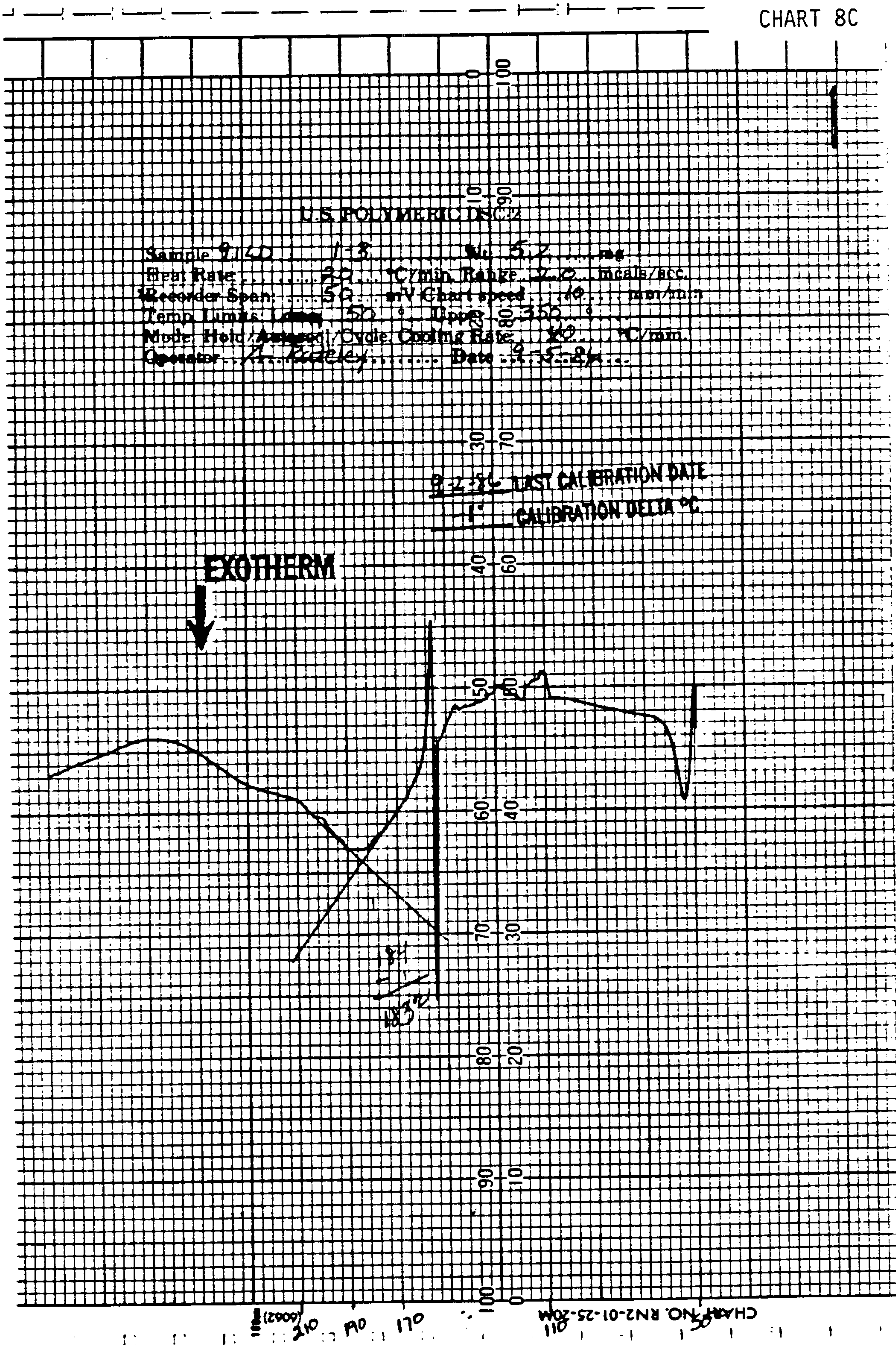
CHART 8C



A FILE A:PHEN042.HDR TAKEN 09-06-1986 09:18:14

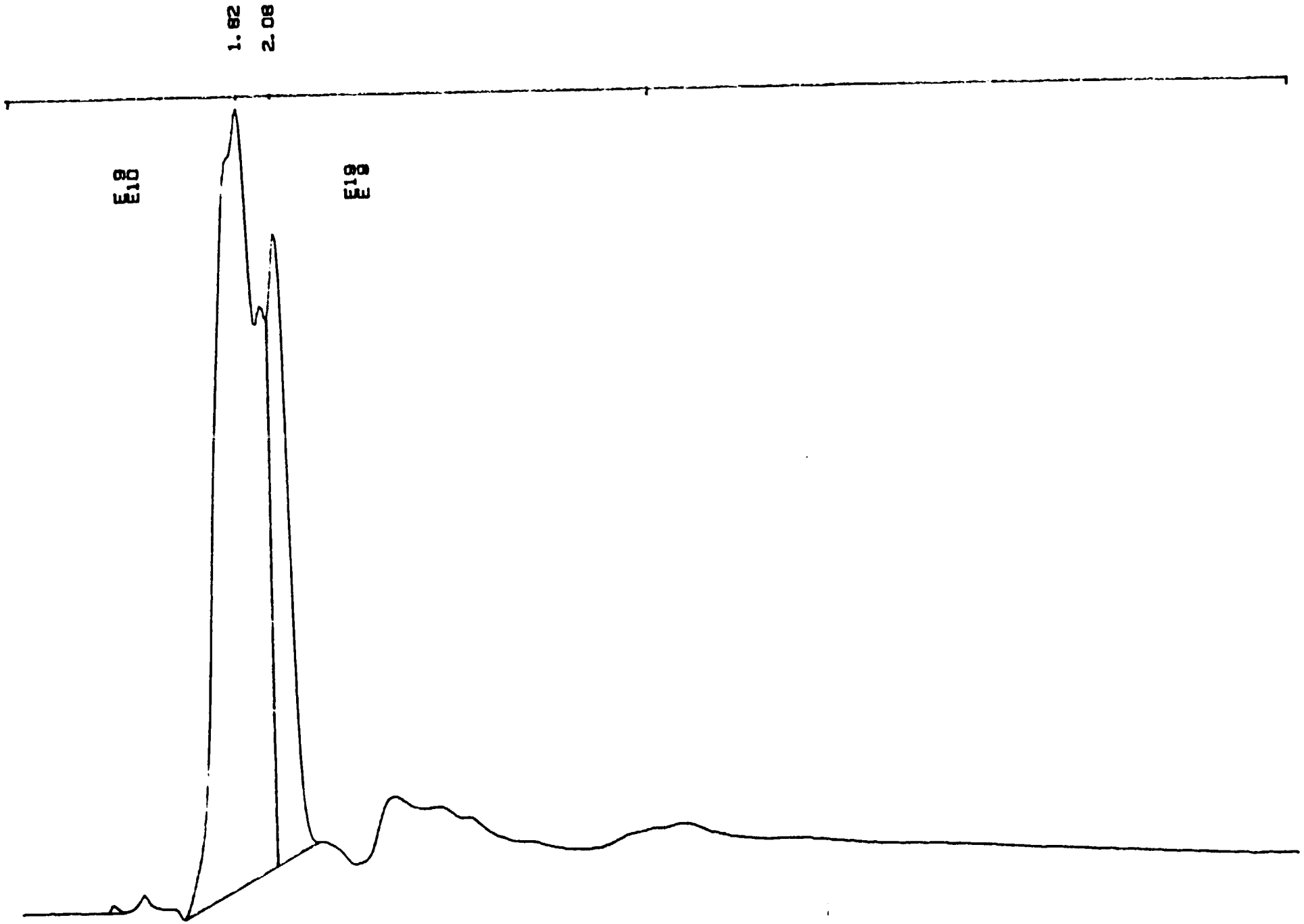
********* AREA PERCENT REPORT *********

```
* ************************************************************************ *
* Sample Name: 91LD,1-1,C=6.89                  Operator Initials: JGZ     *
* Date:  09-06-1986 09:18:14 Method:PHENOLIC    DATA FILE: A:PHEN042.PTS   *
* Interface: 4               Cycle#:  42        Channel#: 0   Vial#: N.A.  *
* Starting Peak Width:  10   Threshold:  .01                               *
************************************************************************ *
*  Instrument Type: BECKMAN HPLC          Column Type: MICROBONDAPAK C-18  *
*             Solvent Description: THF/WATER, 2:1 BY WEIGHT                *
*   Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN                        *
*            Detector 0: 220NM/.5AU          Detector 1:                   *
*     Misc. Information:  LENGTH=25                                        *
************************************************************************ *
Starting Delay:   0.00                      Ending Retention Time:   10.00
```

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.82	141349	75.8850	2	5927	100.000	23.8
3	2.08	44918	24.1150	2	4812	31.778	9.3

Total Area: 186267 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN042 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.406 Mv. HIGH SCALE= 11.628 Mv.
91 LD, 1-1, C=6.88 MG/ML, 9/5/86, JGZ



********* AREA PERCENT REPORT *********

Sample Name: 91LD,1-2,C=6.80
Operator Initials: JGZ
Date: 09-06-1986 08:54:02 Method:PHENOLIC
DATA FILE: A:PHENO41.PTS
Interface: 0
Cycle#: 41
Channel#: 0 Vial#: N.A.
Starting Peak Width: 10 Threshold: 1

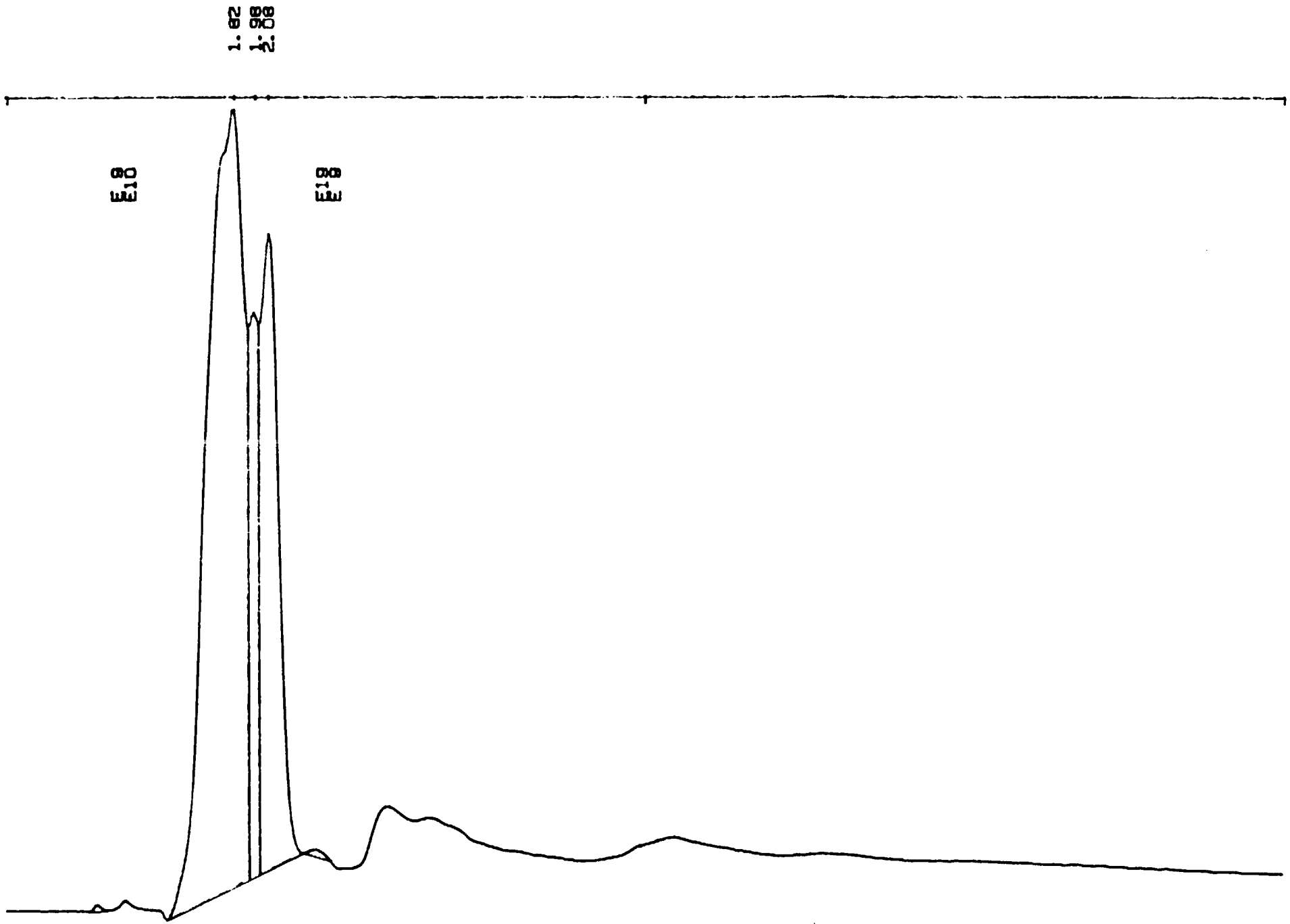
Instrument Type: BECKMAN HPLC
Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU
Detector 1:
Misc. Information: LENGTH=25

Starting Delay: 0.00
Ending Retention Time: 10.00

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.82	121318	64.1205	2	5979	100.000	20.3
3	1.98	21021	11.1102	2	4292	17.327	4.9
4	2.08	46864	24.7693	2	4890	38.629	9.6

Total Area: 189203 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN041 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.388 Mv. HIGH SCALE= 11.634 Mv.
91 LD, 1-2, C=6.80 MG/ML, 9/6/86, JGZ



******** AREA PERCENT REPORT ********

Sample Name: 91LD,1-3,C=6.97 Operator Initials: JGZ
Date: 09-06-1986 08:23:04 Method:PHENOLIC DATA FILE: A:PHEN040.PTS
Interface: 0 Cycle#: 40 Channel#: 0 Vial#: N.A.
Starting Peak Width: 10 Threshold: 1

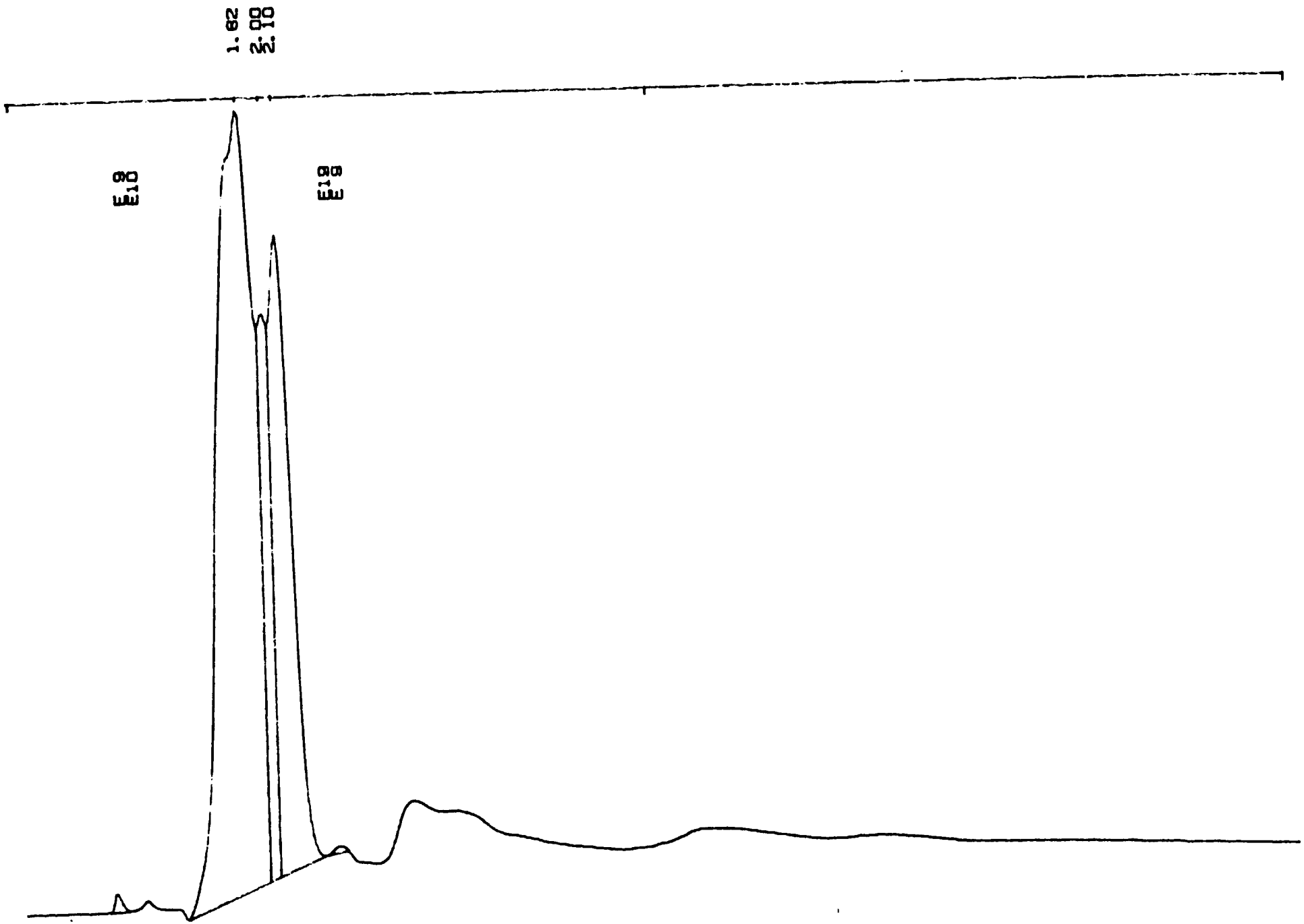
Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU Detector 1:
Misc. Information: LENGTH=25

Starting Delay: 0.00 Ending Retention Time: 10.00

Pk No	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.82	125139	64.2723	2	6105	100.000	20.5
3	2.00	21318	10.9492	2	4365	17.036	4.9
	2.10	48244	24.7785	2	4988	38.552	9.7

Total Area: 194701 Area Reject: 1000 One sample per 1.000 sec.

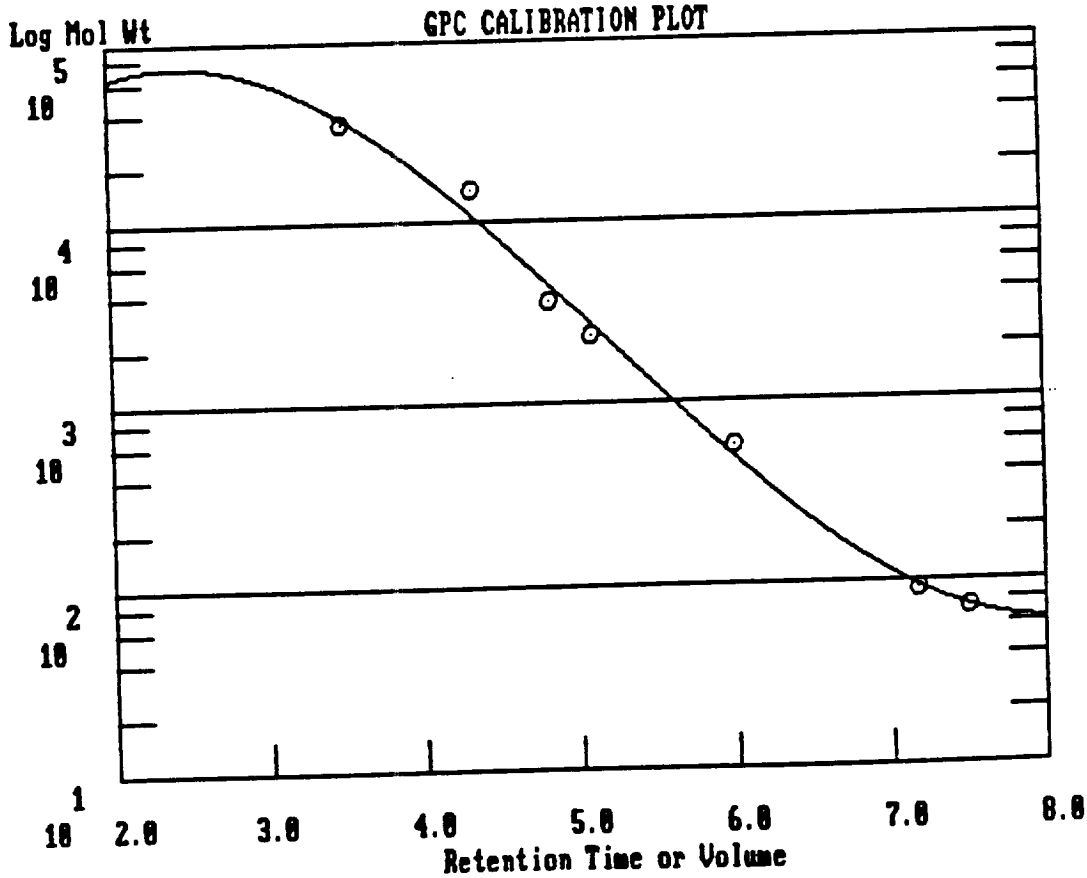
DATA FILE=PHEND40 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.397 Mv. HIGH SCALE= 11.741 Mv.
91 LD, 1-3, C=6.97 MG/ML, 9/6/86, JGZ



*** Calibration Data ***
Calibration Name:
Misc Information:

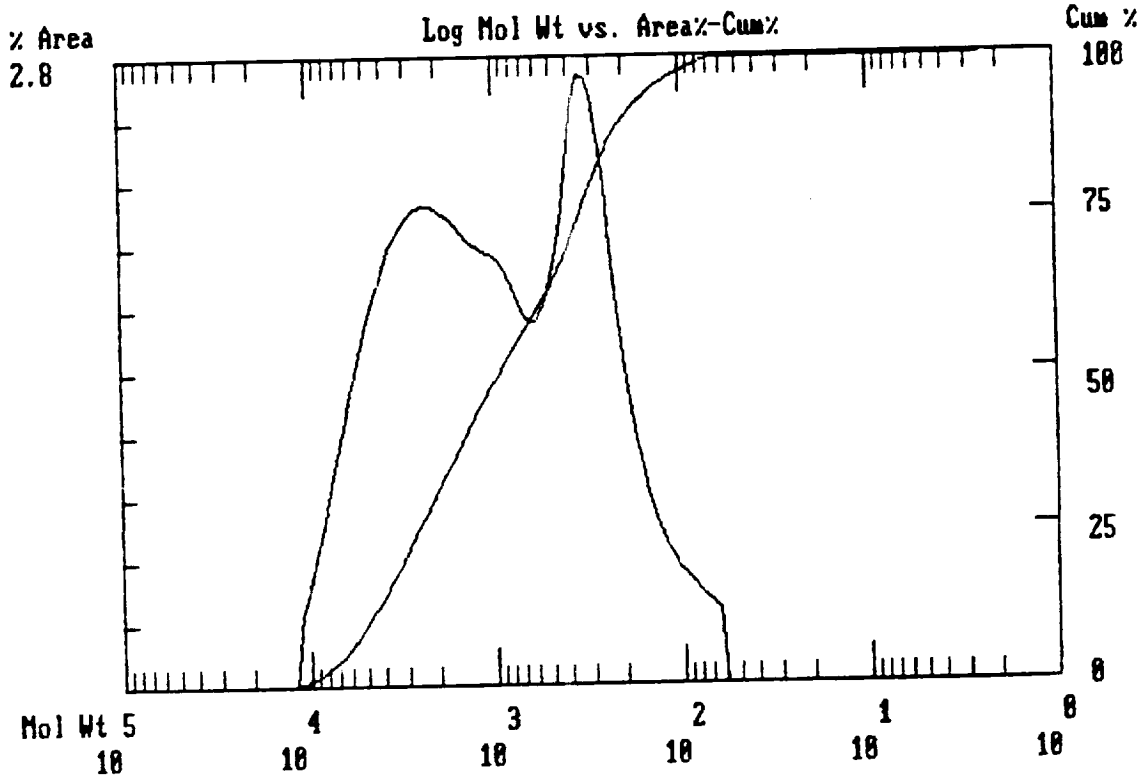
Fit Type: 3
Log Mol Wt = A + Bx + Cx^2 + Dx^3
A= 2.538977 B= 2.115815 C= -.5646824 D= 3.606432E-02
Coefficient of Determination: 0.9902

Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857



********** GPC REPORT **********

```
** ********************************************************************************
* Sample Name: 91LD 1-1 C=2.68                    Operator Initials: GBF          *
* Date:  08-05-1986 13:16:30 Method:              DATA FILE: B:GPC25   .PTS       *
* Interface: 5                  Cycle#:  25       Channel#: 0    Vial#: N.A.     *
* Starting Peak Width:  60   Threshold:  0                                       *
********************************************************************************
*  Instrument Type: HPLC/BECKMAN              Column Type: ULTRASTYRAGEL 500A     *
*              Solvent Description: THF                                          *
*   Operating Conditions: T=35C FLOWRATE=2.0ML/MIN                               *
*            Detector 0: 254NM/.1AU            Detector 1:                       *
*     Misc. Information: CALIBRATION/GPC                                         *
********************************************************************************
Starting Delay:    0.00                    Ending Retention Time:    10.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages
Baseline TIMES:    3.85 to   10.00   MW:      22295 to          2
Process  TIMES:    3.85 to   10.00   MW:      22295 to          2
Total Area:       153894
Mw=                 1770
Mn=                  462
Mw/Mn=            3.8293
Mz=                 4175
Mv=                 1555
```



******** GPC REPORT ********

```
** ********************************************************************************
* Sample Name: 91LD 1-2 C=2.68                    Operator Initials: GBF          *
* Date:  08-05-1986 13:32:38 Method:              DATA FILE: B:GPC26   .PTS        *
*  nterface: 5                Cycle#:  26         Channel#: 0    Vial#: N.A.      *
* Starting Peak Width:  60    Threshold:  0                                       *
********************************************************************************
*  Instrument Type: HPLC/BECKMAN              Column Type: ULTRASTYRAGEL 500A     *
*              Solvent Description: THF                                          *
*   Operating Conditions: T=35C FLOWRATE=2.0ML/MIN                               *
*             Detector 0: 254NM/.1AU            Detector 1:                      *
*     Misc. Information: CALIBRATION/GPC                                         *
********************************************************************************
Starting Delay:    0.00                    Ending Retention Time:    10.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages
Baseline TIMES:    3.85 to    10.00   MW:      22295 to          2
Process  TIMES:    3.85 to    10.00   MW:      22295 to          2
Total Area:       203454
Mw=                 1816
Mn=                  363
Mw/Mn=            4.9988
Mz=                 4423
                    1582
```

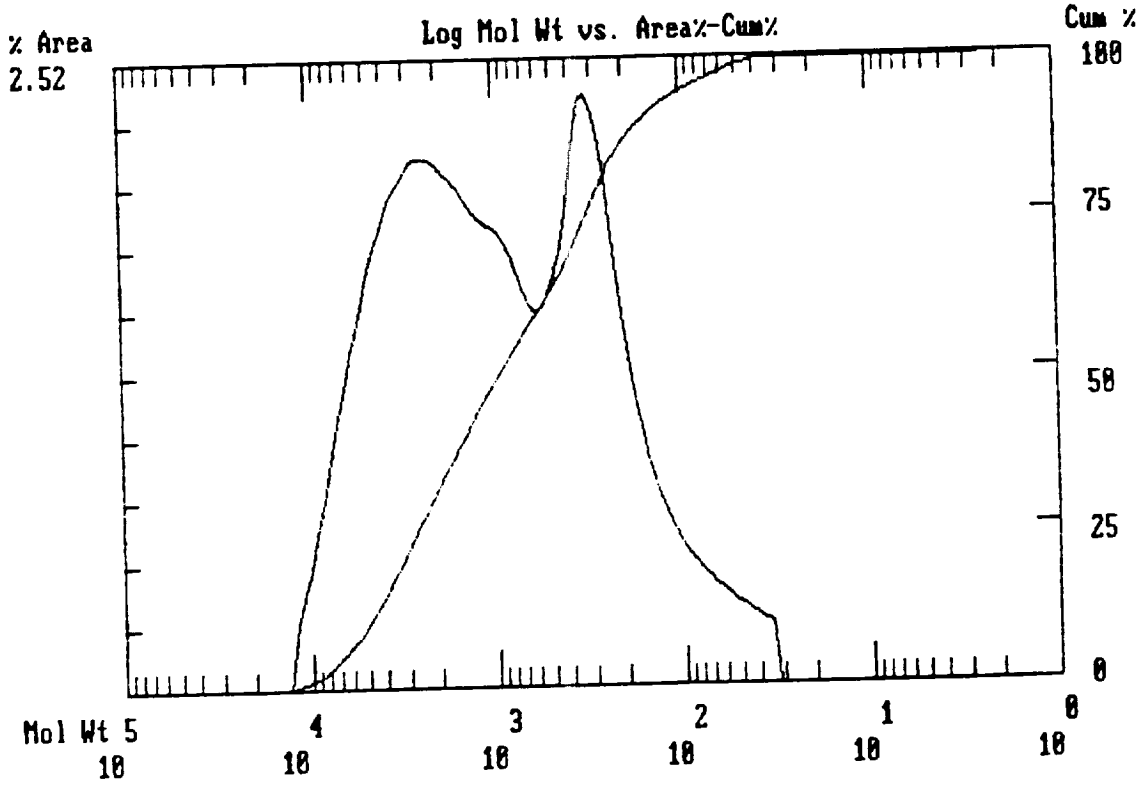


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CHART 10C

FILE B:GFC27 .HDR TAKEN 08-05-1986 17:08:04

********* GFC REPORT *********

```
*****************************************************************************************
 Sample Name: 91LD 1-3  =2.68                         Operator Initials: GBF          *
  ate:  08-05-1986 13:50:09 Method:                   DATA FILE: B:GFC27   .PTS       *
  nterface: 5               Cycle#:  27               Channel#: 0    Vial#: N.A.      *
 Starting Peak Width:  60   Threshold:  0                                             *
*****************************************************************************************
  Instrument Type: HPLC/BECKMAN              Column Type: ULTRASTYRAGEL 500A          *
            Solvent Description: THF                                                  *
   Operating Conditions: T=35C FLOWRATE=2.0ML/MIN                                     *
           Detector 0: 254NM/.1AU            Detector 1:                              *
     Misc. Information: CALIBRATION/GFC                                               *
*****************************************************************************************
                                            Ending Retention Time:   10.00
;t rting Delay:    0.00
;a ibration file: GFCPHEN
lolecular Weight Distribution Averages
;aseline TIMES:     3.85 to   10.00   MW:       22295 to       2
'r cess  TIMES:     3.85 to   10.00   MW:       22295 to       2
'o.al Area:       215493
1w=                 1658
1r                   265
1. Mn=            6.2422
1z=                 4186
                    1432
```

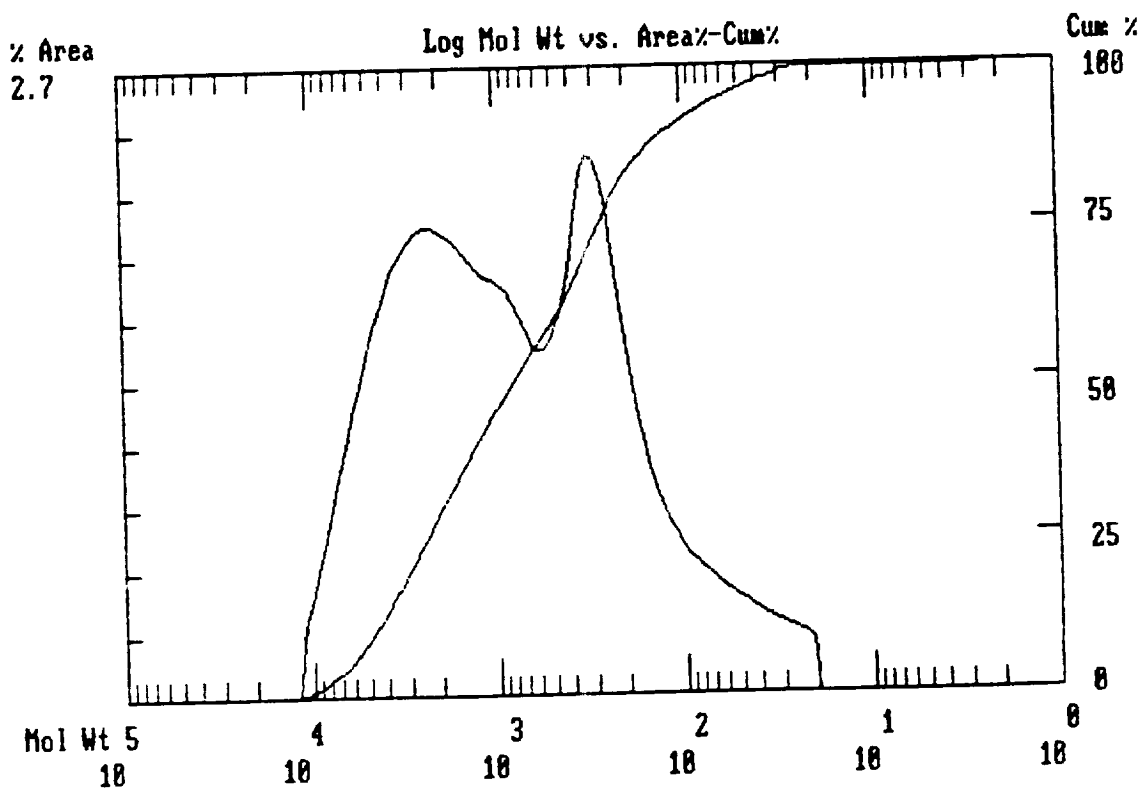
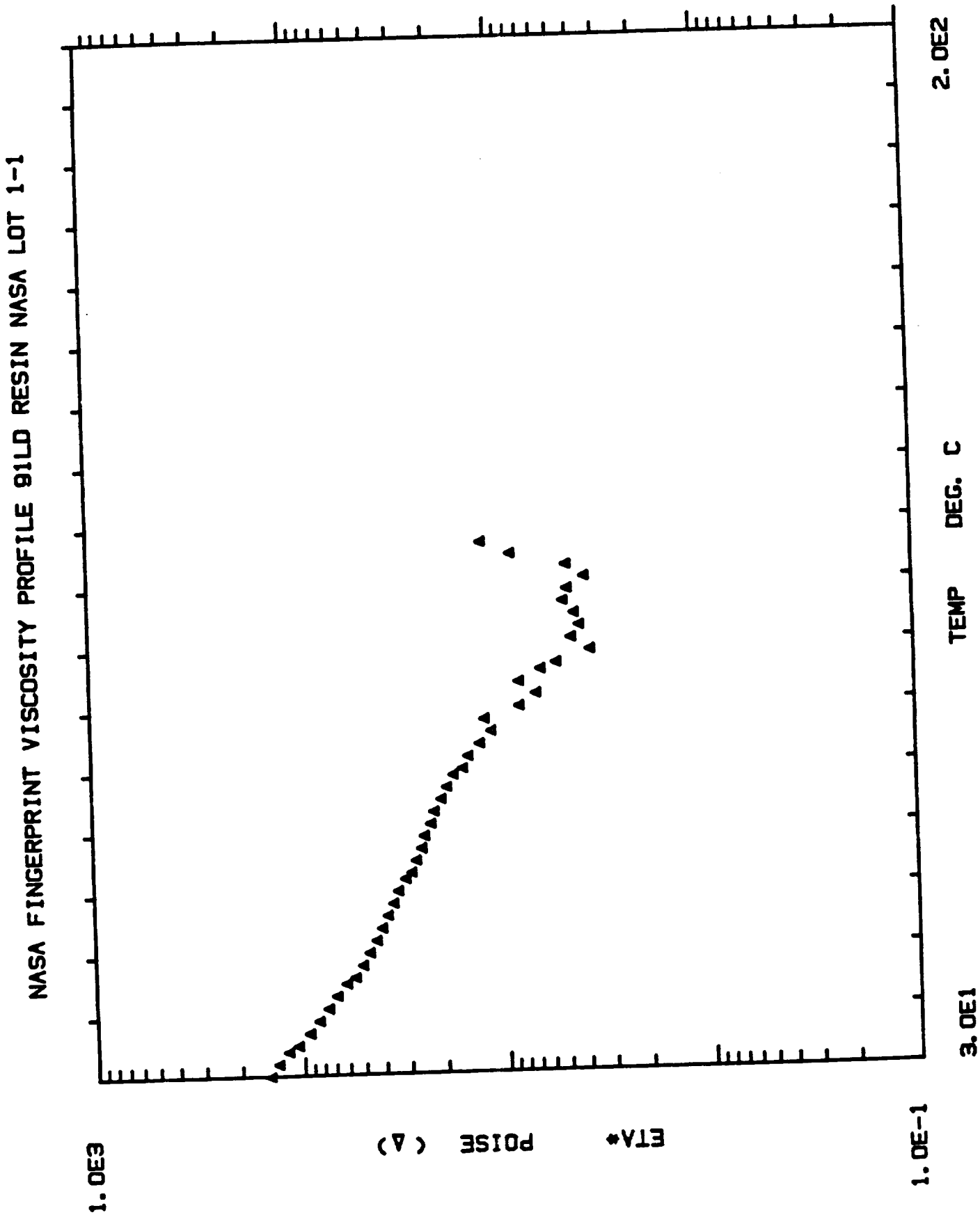


CHART 14A


NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT 1-1
ETA* POISE (▲)
TEMP DEG. C
1.0E3
1.0E-1
2.0E2
3.0E1

Rheometrics RECAP II

Experiment No. : 9 Sample No. : 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT 1-1

Operator : CP

Date and Time : Tuesday, August 19, 1986 - 09:14:18

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

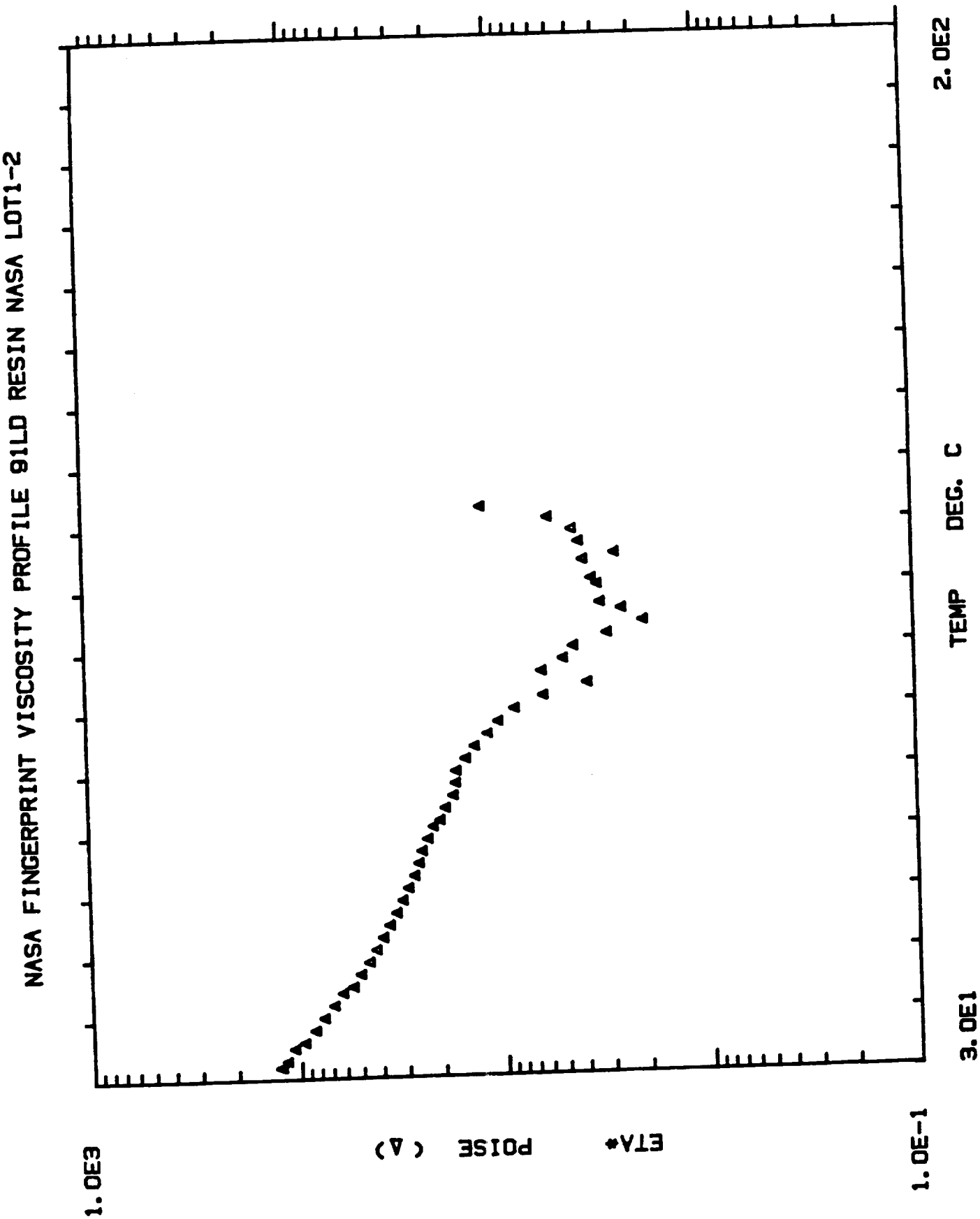
Notes :
STRAIN =50%
FREQUENCY =10 RAD/SEC

IA A FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT 1-1

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.578e+002	1.497e+002	4.990e+001	1.980e+001	2.000e-001	2.900e+001
2	1.423e+002	1.357e+002	4.303e+001	1.785e+001	1.000e+000	3.000e+001
3	1.296e+002	1.225e+002	4.224e+001	1.626e+001	2.000e+000	3.200e+001
4	1.160e+002	1.083e+002	4.153e+001	1.455e+001	3.000e+000	3.400e+001
5	1.037e+002	9.560e+001	4.030e+001	1.302e+001	4.000e+000	3.500e+001
6	9.127e+001	8.267e+001	3.869e+001	1.145e+001	5.000e+000	3.700e+001
7	8.163e+001	7.248e+001	3.755e+001	1.024e+001	6.000e+000	3.900e+001
8	7.320e+001	6.363e+001	3.620e+001	9.177e+000	7.000e+000	4.100e+001
9	6.627e+001	5.621e+001	3.509e+001	8.309e+000	8.000e+000	4.300e+001
0	5.932e+001	4.882e+001	3.369e+001	7.444e+000	9.000e+000	4.500e+001
1	5.373e+001	4.312e+001	3.205e+001	6.738e+000	1.000e+001	4.600e+001
12	4.920e+001	3.807e+001	3.116e+001	6.171e+000	1.100e+001	4.800e+001
3	4.546e+001	3.439e+001	2.973e+001	5.701e+000	1.200e+001	5.000e+001
4	4.186e+001	3.076e+001	2.839e+001	5.253e+000	1.300e+001	5.200e+001
15	3.926e+001	2.786e+001	2.767e+001	4.922e+000	1.400e+001	5.400e+001
16	3.668e+001	2.578e+001	2.609e+001	4.599e+000	1.500e+001	5.600e+001
7	3.434e+001	2.353e+001	2.502e+001	4.309e+000	1.600e+001	5.800e+001
18	3.247e+001	2.236e+001	2.354e+001	4.071e+000	1.700e+001	6.000e+001
19	2.981e+001	2.101e+001	2.114e+001	3.740e+000	1.800e+001	6.200e+001
20	2.779e+001	2.001e+001	1.928e+001	3.484e+000	1.900e+001	6.300e+001
21	2.632e+001	1.961e+001	1.755e+001	3.300e+000	2.000e+001	6.500e+001
22	2.465e+001	1.883e+001	1.590e+001	3.090e+000	2.100e+001	6.700e+001
23	2.383e+001	1.868e+001	1.479e+001	2.988e+000	2.200e+001	6.900e+001
24	2.213e+001	1.824e+001	1.254e+001	2.778e+000	2.300e+001	7.100e+001
25	2.132e+001	1.916e+001	1.117e+001	2.674e+000	2.400e+001	7.300e+001
26	1.963e+001	1.743e+001	9.026e+000	2.464e+000	2.500e+001	7.500e+001
27	1.834e+001	1.672e+001	7.535e+000	2.301e+000	2.600e+001	7.700e+001
28	1.701e+001	1.575e+001	6.425e+000	2.136e+000	2.700e+001	7.900e+001
29	1.538e+001	1.436e+001	5.215e+000	1.916e+000	2.800e+001	8.000e+001
30	1.433e+001	1.371e+001	4.175e+000	1.798e+000	2.900e+001	8.200e+001
31	1.259e+001	1.206e+001	3.616e+000	1.580e+000	3.000e+001	8.400e+001
32	1.102e+001	1.062e+001	2.946e+000	1.382e+000	3.100e+001	8.600e+001
33	1.187e+001	1.134e+001	3.507e+000	1.489e+000	3.200e+001	8.800e+001
34	8.015e+000	7.691e+000	2.255e+000	1.005e+000	3.300e+001	9.000e+001
35	6.613e+000	6.313e+000	1.968e+000	8.300e-001	3.400e+001	9.200e+001
36	8.006e+000	7.834e+000	1.653e+000	1.004e+000	3.500e+001	9.400e+001
37	6.245e+000	6.105e+000	1.313e+000	7.832e-001	3.600e+001	9.600e+001
38	5.230e+000	5.122e+000	1.055e+000	6.557e-001	3.700e+001	9.700e+001
39	3.560e+000	3.319e+000	1.285e+000	4.463e-001	3.800e+001	9.900e+001
40	4.391e+000	4.251e+000	1.098e+000	5.502e-001	3.900e+001	1.010e+002
41	3.994e+000	3.831e+000	1.129e+000	5.009e-001	4.000e+001	1.030e+002
42	4.228e+000	4.062e+000	1.174e+000	5.301e-001	4.100e+001	1.050e+002
43	4.784e+000	4.628e+000	1.212e+000	5.996e-001	4.200e+001	1.070e+002
44	4.547e+000	4.370e+000	1.256e+000	5.703e-001	4.300e+001	1.090e+002
45	3.738e+000	3.484e+000	1.356e+000	4.684e-001	4.400e+001	1.110e+002
46	4.588e+000	4.268e+000	1.681e+000	5.753e-001	4.500e+001	1.130e+002
47	8.586e+000	8.141e+000	2.728e+000	1.077e+000	4.600e+001	1.150e+002
48	1.188e+001	1.141e+001	3.317e+000	1.491e+000	4.700e+001	1.170e+002

PAGE TITLE

CHART 14B


NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT1-2
ETA* POISE (A)
1.0E3
1.0E-1
TEMP DEG. C
3.0E1
2.0E2

Rheometrics RECAP II

Experiment No. : 10 Sample No. : 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT1-2

Operator :CP

Date and Time : Tuesday, August 19, 1986 - 10:23:12

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

Notes :
STRAIN =50%
FREQUENCY =10 RAD/SEC

NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT1-2

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.231e+002	1.134e+002	4.783e+001	1.545e+001	2.000e-001	3.200e+001
2	1.209e+002	1.122e+002	4.456e+001	1.516e+001	1.000e+000	3.200e+001
3	1.142e+002	1.060e+002	4.239e+001	1.434e+001	2.000e+000	3.300e+001
4	1.050e+002	9.646e+001	4.155e+001	1.318e+001	3.000e+000	3.500e+001
5	9.392e+001	8.514e+001	3.964e+001	1.179e+001	4.000e+000	3.600e+001
6	8.297e+001	7.401e+001	3.751e+001	1.042e+001	5.000e+000	3.800e+001
7	7.472e+001	6.529e+001	3.634e+001	9.374e+000	6.000e+000	4.000e+001
8	6.679e+001	5.701e+001	3.480e+001	8.384e+000	7.000e+000	4.200e+001
9	6.040e+001	4.997e+001	3.393e+001	7.578e+000	8.000e+000	4.400e+001
10	5.379e+001	4.312e+001	3.216e+001	6.753e+000	9.000e+000	4.500e+001
11	4.911e+001	3.817e+001	3.090e+001	6.170e+000	1.000e+001	4.700e+001
12	4.467e+001	3.357e+001	2.947e+001	5.606e+000	1.100e+001	4.900e+001
13	4.114e+001	2.980e+001	2.836e+001	5.167e+000	1.200e+001	5.100e+001
14	3.796e+001	2.680e+001	2.688e+001	4.763e+000	1.300e+001	5.300e+001
15	3.517e+001	2.423e+001	2.550e+001	4.415e+000	1.400e+001	5.500e+001
16	3.250e+001	2.215e+001	2.379e+001	4.079e+000	1.500e+001	5.700e+001
17	3.031e+001	2.091e+001	2.194e+001	3.805e+000	1.600e+001	5.900e+001
18	2.832e+001	1.989e+001	2.017e+001	3.554e+000	1.700e+001	6.100e+001
19	2.640e+001	1.900e+001	1.833e+001	3.314e+000	1.800e+001	6.300e+001
20	2.502e+001	1.862e+001	1.672e+001	3.144e+000	1.900e+001	6.500e+001
21	2.412e+001	1.869e+001	1.526e+001	3.028e+000	2.000e+001	6.700e+001
22	2.253e+001	1.822e+001	1.326e+001	2.830e+000	2.100e+001	6.900e+001
23	2.115e+001	1.777e+001	1.146e+001	2.655e+000	2.200e+001	7.100e+001
24	1.964e+001	1.710e+001	9.666e+000	2.467e+000	2.300e+001	7.200e+001
25	1.844e+001	1.644e+001	8.344e+000	2.315e+000	2.400e+001	7.400e+001
26	1.687e+001	1.525e+001	7.209e+000	2.120e+000	2.500e+001	7.600e+001
27	1.637e+001	1.527e+001	5.895e+000	2.055e+000	2.600e+001	7.800e+001
28	1.619e+001	1.529e+001	5.326e+000	2.035e+000	2.700e+001	8.000e+001
29	1.459e+001	1.378e+001	4.591e+000	1.824e+000	2.800e+001	8.200e+001
30	1.312e+001	1.257e+001	3.754e+000	1.648e+000	2.900e+001	8.400e+001
31	1.133e+001	1.085e+001	3.282e+000	1.424e+000	3.000e+001	8.600e+001
32	1.004e+001	9.695e+000	2.599e+000	1.260e+000	3.100e+001	8.800e+001
33	8.349e+000	8.088e+000	2.072e+000	1.049e+000	3.200e+001	9.000e+001
34	6.039e+000	5.867e+000	1.429e+000	7.580e-001	3.300e+001	9.200e+001
35	3.680e+000	3.537e+000	1.015e+000	4.623e-001	3.400e+001	9.400e+001
36	6.117e+000	5.990e+000	1.242e+000	7.690e-001	3.500e+001	9.600e+001
37	4.804e+000	4.732e+000	8.250e-001	6.034e-001	3.600e+001	9.800e+001
38	4.255e+000	4.168e+000	8.522e-001	5.348e-001	3.700e+001	1.000e+002
39	2.911e+000	2.779e+000	8.654e-001	3.656e-001	3.800e+001	1.020e+002
40	1.943e+000	1.866e+000	5.382e-001	2.441e-001	3.900e+001	1.040e+002
41	2.467e+000	2.370e+000	6.835e-001	3.098e-001	4.000e+001	1.060e+002
42	3.132e+000	2.968e+000	9.984e-001	3.935e-001	4.100e+001	1.070e+002
43	3.218e+000	3.077e+000	9.418e-001	4.042e-001	4.200e+001	1.100e+002
44	3.423e+000	3.173e+000	1.283e+000	4.300e-001	4.300e+001	1.110e+002
45	3.748e+000	3.419e+000	1.536e+000	4.705e-001	4.400e+001	1.140e+002
46	2.625e+000	2.363e+000	1.143e+000	3.297e-001	4.500e+001	1.150e+002
47	3.913e+000	3.565e+000	1.613e+000	4.913e-001	4.600e+001	1.170e+002
48	4.217e+000	3.600e+000	2.197e+000	5.297e-001	4.700e+001	1.190e+002
49	5.504e+000	4.940e+000	2.426e+000	6.916e-001	4.800e+001	1.210e+002
50	1.163e+001	1.094e+001	3.950e+000	1.460e+000	4.900e+001	1.230e+002

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OF POOR QUALITY

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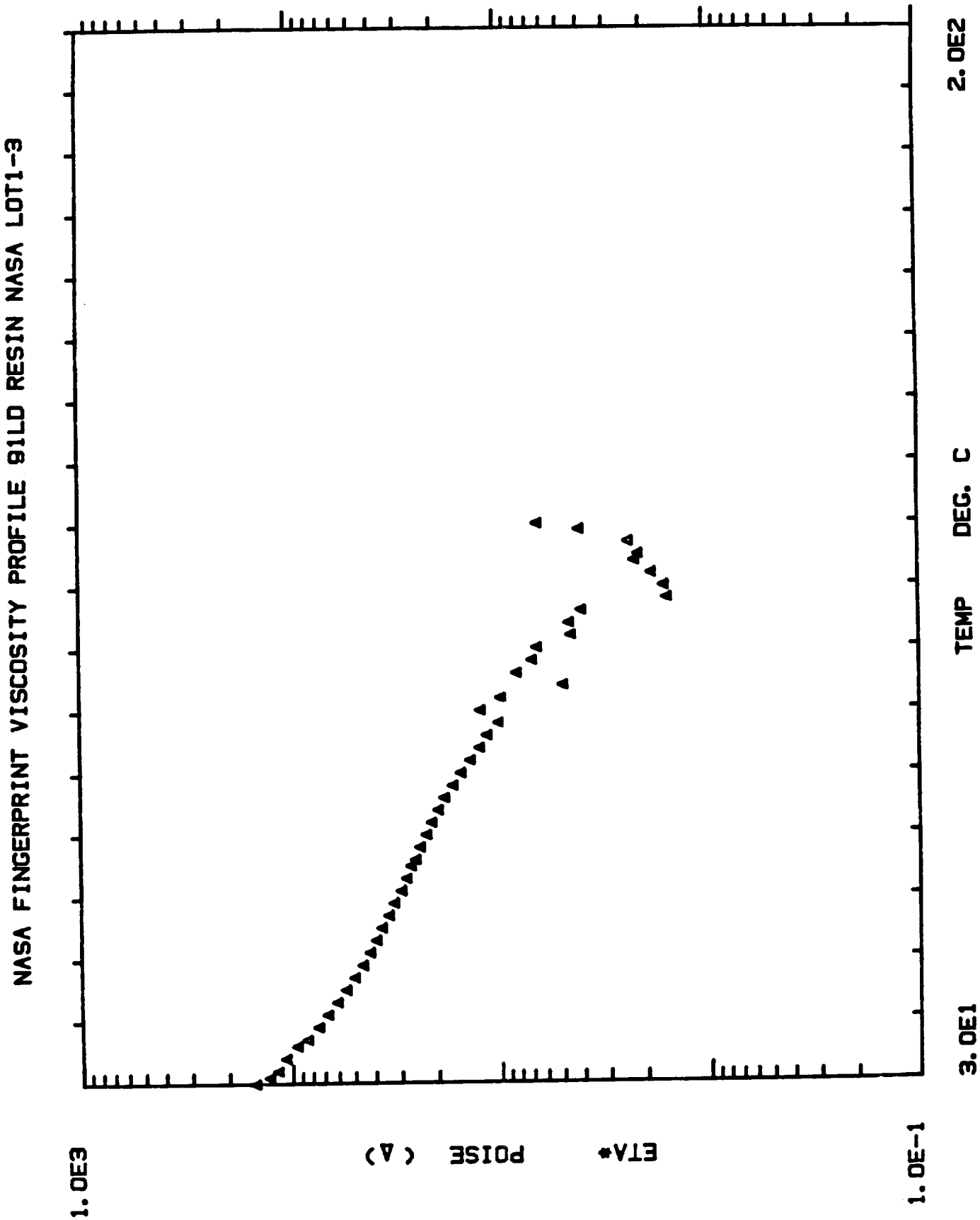

NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT1-3
ETA* POISE (A)
TEMP DEG. C
1.0E3
1.0E-1
3.0E1
2.0E2

Rheometrics RECAP II

xperiment No. : 11 Sample No. : 1

e:
FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT1-3

p ator :CP

ate and Time : Tuesday, August 19, 1986 - 12:08:02

p ating Mode : DYNAMIC

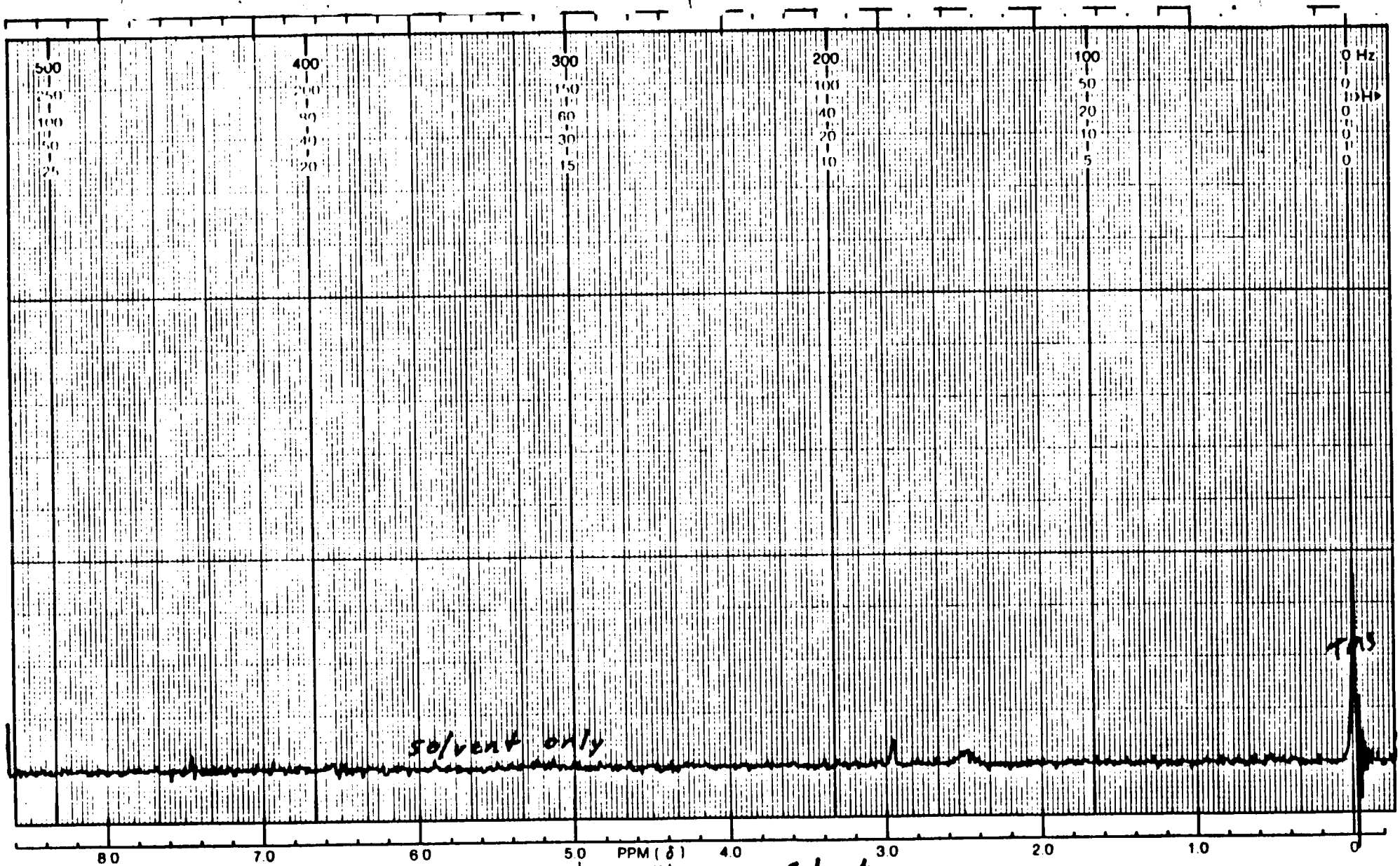
weep Type : CURE

eometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

s :
T AIN =50%
REQUENCY =10RAD/SEC

NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT1-3

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.471e+002	1.349e+002	5.847e+001	1.847e+001	2.000e-001	3.000e+001
2	1.259e+002	1.172e+002	4.595e+001	1.581e+001	1.000e+000	3.100e+001
3	1.148e+002	1.062e+002	4.348e+001	1.440e+001	2.000e+000	3.200e+001
4	1.046e+002	9.552e+001	4.271e+001	1.313e+001	3.000e+000	3.400e+001
5	9.263e+001	8.327e+001	4.057e+001	1.163e+001	4.000e+000	3.600e+001
6	8.269e+001	7.285e+001	3.912e+001	1.037e+001	5.000e+000	3.700e+001
7	7.314e+001	6.306e+001	3.704e+001	9.180e+000	6.000e+000	3.900e+001
8	6.589e+001	5.563e+001	3.531e+001	8.267e+000	7.000e+000	4.100e+001
9	5.923e+001	4.858e+001	3.389e+001	7.434e+000	8.000e+000	4.300e+001
10	5.370e+001	4.271e+001	3.255e+001	6.746e+000	9.000e+000	4.500e+001
1	4.883e+001	3.791e+001	3.079e+001	6.126e+000	1.000e+001	4.700e+001
2	4.458e+001	3.336e+001	2.957e+001	5.596e+000	1.100e+001	4.900e+001
13	4.110e+001	2.968e+001	2.843e+001	5.157e+000	1.200e+001	5.100e+001
14	3.834e+001	2.700e+001	2.722e+001	4.813e+000	1.300e+001	5.300e+001
5	3.601e+001	2.475e+001	2.616e+001	4.518e+000	1.400e+001	5.500e+001
16	3.331e+001	2.269e+001	2.438e+001	4.181e+000	1.500e+001	5.700e+001
17	3.137e+001	2.154e+001	2.281e+001	3.940e+000	1.600e+001	5.900e+001
8	2.890e+001	2.021e+001	2.066e+001	3.628e+000	1.700e+001	6.100e+001
9	2.730e+001	1.954e+001	1.906e+001	3.428e+000	1.800e+001	6.300e+001
20	2.601e+001	1.895e+001	1.780e+001	3.264e+000	1.900e+001	6.500e+001
21	2.474e+001	1.860e+001	1.632e+001	3.108e+000	2.000e+001	6.600e+001
22	2.352e+001	1.817e+001	1.494e+001	2.954e+000	2.100e+001	6.800e+001
23	2.191e+001	1.767e+001	1.296e+001	2.752e+000	2.200e+001	7.000e+001
24	2.068e+001	1.723e+001	1.143e+001	2.595e+000	2.300e+001	7.200e+001
25	1.923e+001	1.646e+001	9.939e+000	2.416e+000	2.400e+001	7.400e+001
26	1.798e+001	1.593e+001	8.339e+000	2.257e+000	2.500e+001	7.600e+001
27	1.633e+001	1.472e+001	7.077e+000	2.051e+000	2.600e+001	7.800e+001
28	1.497e+001	1.371e+001	6.005e+000	1.881e+000	2.700e+001	8.000e+001
29	1.346e+001	1.247e+001	5.062e+000	1.690e+000	2.800e+001	8.200e+001
30	1.216e+001	1.133e+001	4.436e+000	1.528e+000	2.900e+001	8.400e+001
31	1.119e+001	1.048e+001	3.941e+000	1.406e+000	3.000e+001	8.600e+001
32	9.831e+000	9.239e+000	3.361e+000	1.235e+000	3.100e+001	8.800e+001
33	1.202e+001	1.122e+001	4.301e+000	1.508e+000	3.200e+001	9.000e+001
34	9.617e+000	9.156e+000	2.937e+000	1.208e+000	3.300e+001	9.200e+001
35	4.823e+000	4.639e+000	1.319e+000	6.062e-001	3.400e+001	9.400e+001
36	8.066e+000	7.930e+000	1.477e+000	1.013e+000	3.500e+001	9.600e+001
37	6.802e+000	6.696e+000	1.198e+000	8.550e-001	3.600e+001	9.800e+001
38	6.423e+000	6.344e+000	9.988e-001	8.066e-001	3.700e+001	1.000e+002
39	4.400e+000	4.267e+000	1.076e+000	5.529e-001	3.800e+001	1.020e+002
40	4.481e+000	4.398e+000	8.549e-001	5.624e-001	3.900e+001	1.040e+002
41	3.917e+000	3.869e+000	6.140e-001	4.922e-001	4.000e+001	1.060e+002
42	1.527e+000	1.326e+000	7.579e-001	1.917e-001	4.100e+001	1.080e+002
43	1.580e+000	1.399e+000	7.330e-001	1.985e-001	4.200e+001	1.100e+002
44	1.811e+000	1.505e+000	1.007e+000	2.273e-001	4.300e+001	1.120e+002
45	2.179e+000	2.083e+000	6.388e-001	2.738e-001	4.400e+001	1.140e+002
46	2.089e+000	1.834e+000	9.966e-001	2.623e-001	4.500e+001	1.150e+002
47	2.322e+000	2.192e+000	7.836e-001	2.924e-001	4.600e+001	1.170e+002
48	3.996e+000	3.866e+000	1.009e+000	5.026e-001	4.700e+001	1.190e+002
49	6.370e+000	5.971e+000	2.219e+000	8.005e-001	4.800e+001	1.200e+002



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: —
SPINNING RATE (RPS): 30

MANUAL

SWEEP TIME (SEC): 30 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.30

AUTO ☐

(250)
(500)
(2)
(.05)

SAMPLE: Solvent
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS:

ORIGINAL PAGE IS
OF POOR QUALITY

SOLVENT ONLY SCAN

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

DATE: 3-21-86 OPERATOR DGW SPECTRUM NO. 1A of 7
solvent scan

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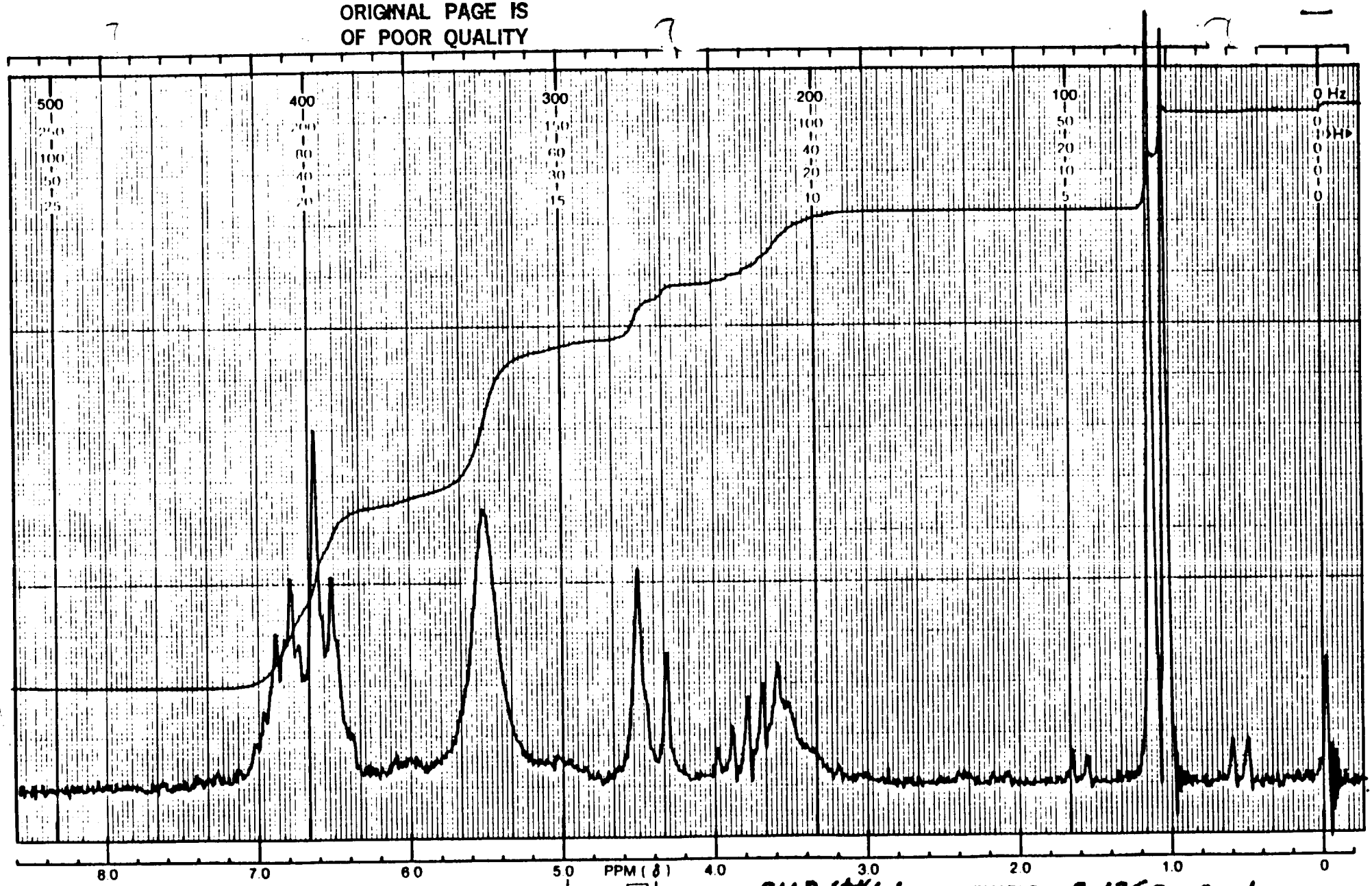

SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: 91LD Lot#1-1
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.135 gm sample
0.740 gm solvent

CHART 15A

NORELL, INC.
LANDISVILLE, N.J. 08326
TSO Phone: (609) 697-0020

DATE: 3-21-96

OPERATOR DGW

SPECTRUM NO. 1 of 9 91LL
Lot #1-1

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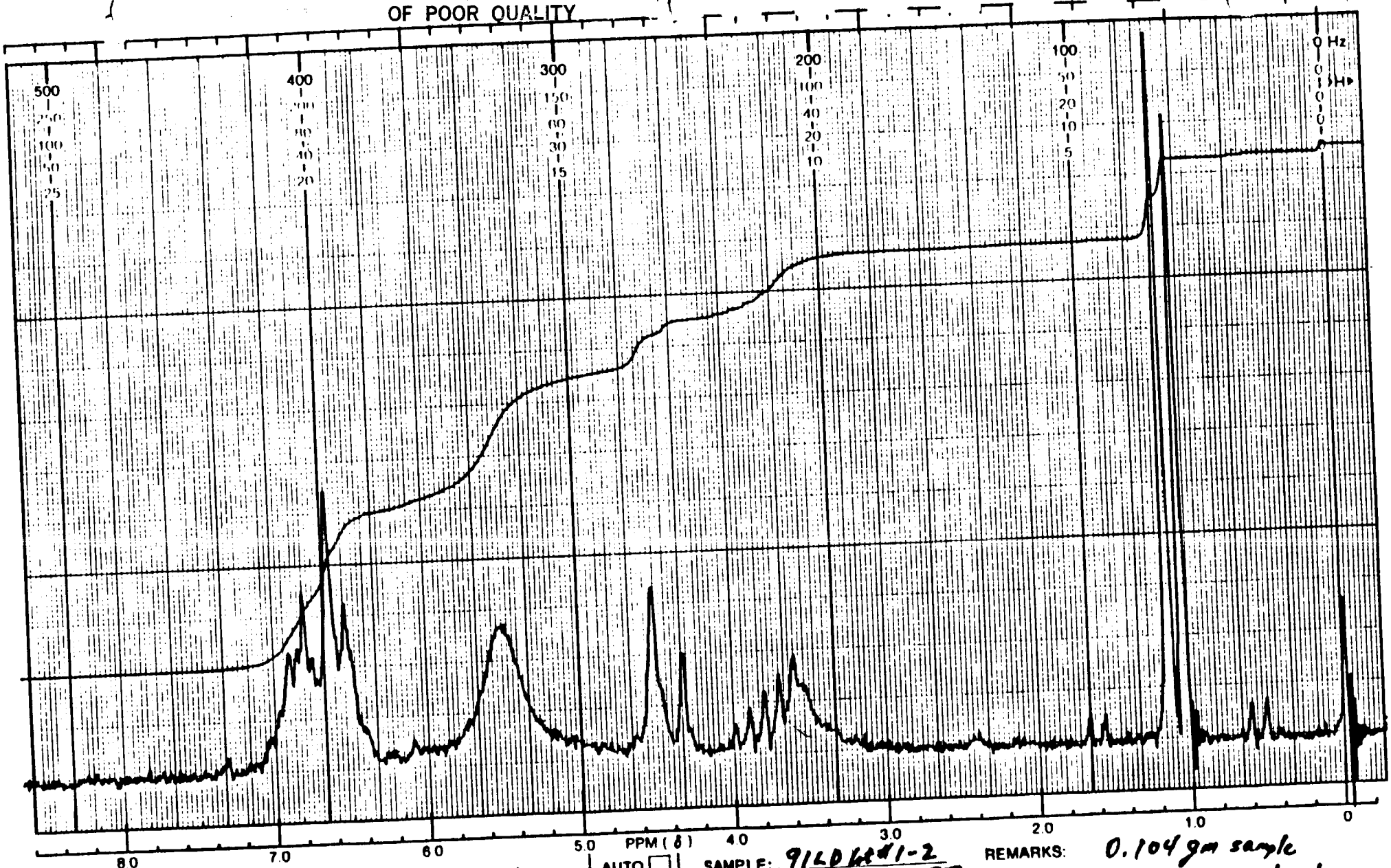

SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 30 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: 91LD Lot #1-2
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.104 gm sample
0.740 gm solvent

NORELL, INC.
LANDISVILLE, N.J. 08326

DATE: 3-21-86

OPERATOR DEW

SPECTRUM NO. 2 of 9 91LD Lot #1-2

CHART 15B

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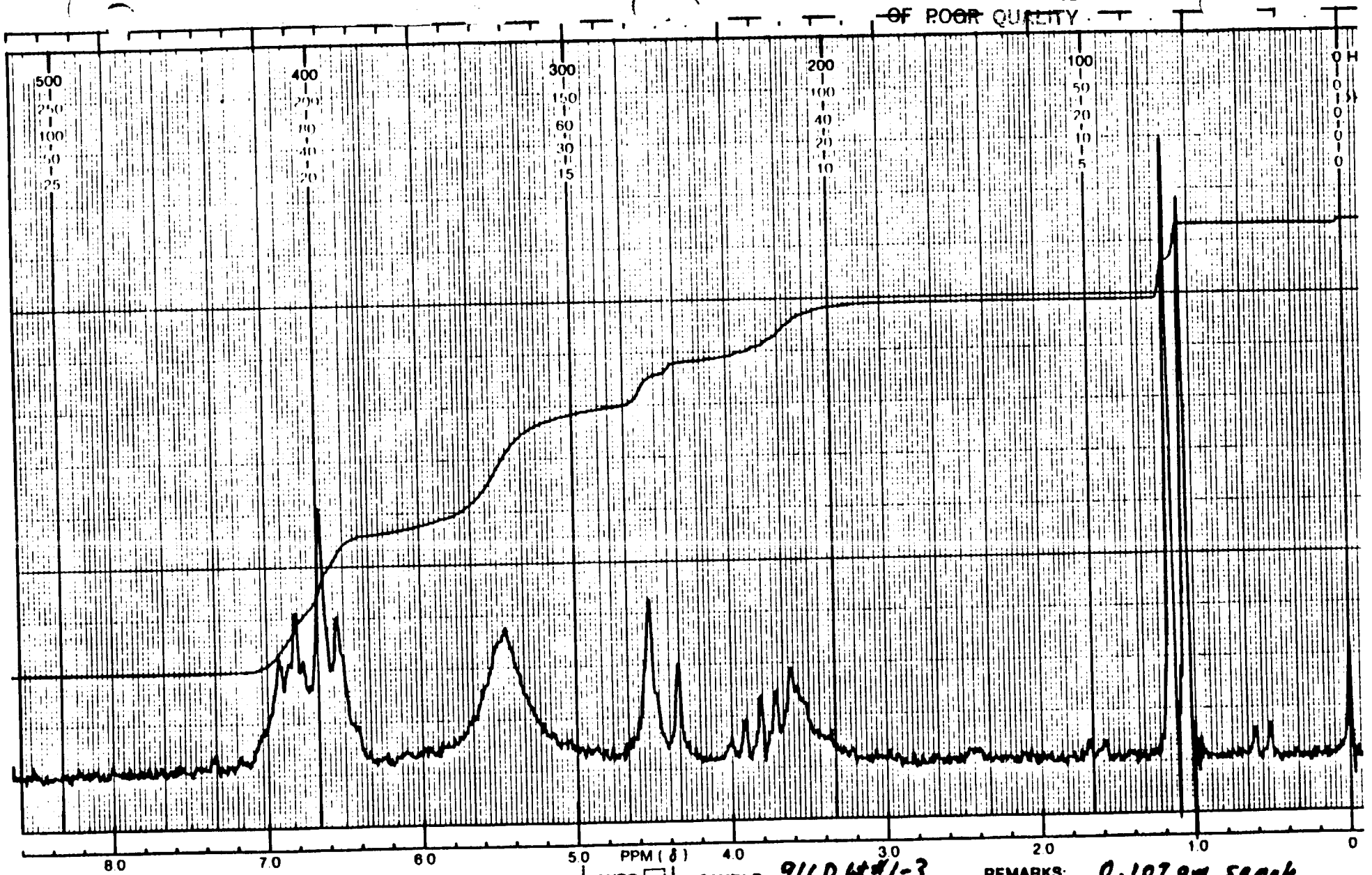


SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: 91LD Lt#1-3
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.107 gm sample
0.779 gm solvent

NORELL, INC.
LANDISVILLE, N.J. 08326

DATE: 3-21-86

OPERATOR DGW

SPECTRUM NO. 2 of 9 91LD Lt#1-3

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

SWB-8 Fabric for NASA Lot# 1

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

SWB-8 Fabric for NASA Lot# 1

		#1-1
1a. Breaking Strength, lbs/in, WARP (ASTM D1682)	PICK	52
	CENTER	54
	PLAIN	61
	AVG.	55.7
1b. Breaking Strength, lbs/in, FILL (ASTM D1682)	PICK	43
	CENTER	56
	PLAIN	49
	AVG.	49.3
2a. Carbon Assay, % (MDQAI 5560)	PICK	99.8
	CENTER	99.6
	PLAIN	99.3
	AVG.	99.57
2b. Hydrogen Assay, % (MDQAI 5560)	PICK	<0.01
	CENTER	<0.01
	PLAIN	0.04
	AVG.	EST .014
2c. Nitrogen Assay, % (MDQAI 5560)	PICK	<0.01
	CENTER	<0.01
	PLAIN	<0.01
	AVG.	EST 0.001
3. Visual Inspection (QCi-102)	See Chart 3A	
4. Specific Gravity, Units (PTM-84)		1.7347
		1.9531
		1.7134
	AVG.	1.800
5. pH, Units (CTM-24B)		7.2
		7.6
	AVG.	7.4
6. TGA, °C at 50% Weight Loss (CTM-51 (AIR))	SET UP #1	
	#1-1	903
	See Chart 6A	

SWB-8 Fabric for NASA Lot# 1

7a. Atomic Absorption, ppm
CTM-53B

	#1-1
Na	7
K	0
Ca	90
Mg	0
Li	0
AVG.	97

7b. Moisture Content, %
CTM-53B

0.029

7c. Ash Content, %
CTM-53B

0.059

8a. Filament diameter, microns, WARP
S.E.M. procedure
(diameters are an average
10 measurements)

	#1-1
AVERAGE	9.86
Minimum	8.50
Maximum	11.05
Std. Dev	0.75

8b. Filament diameter, microns, FILL
S.E.M. procedure
(diameters are an average
of 10 measurements)

	#1-1
AVERAGE	9.99
Minimum	9.00
Maximum	12.75
Std. Dev	1.27

9a. Thread Count, per inch, WARP
PTM-5A

#1-1
36
36
37
36
37
AVG. 36.4

9b. Thread Count, per inch, FILL
PTM-5A

33
32
33
33
33
AVG. 32.8

10a. Areal weight as received, gm/4x4
PTM-3A

LEFT	2.834
CENTER	2.798
RIGHT	2.766
AVG.	2.799

10b. Volatiles as received, %
PTM-3A

LEFT	0.46
CENTER	0.25
RIGHT	0.47
AVG.	0.39

SWB-8 Fabric for NASA Lot# 1

10c. Weight Change on Acetone Wash, %
PTM-3A

	#1-1
LEFT	0.04
CENTER	-0.21
RIGHT	-0.25
AVG.	-0.14

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

DATE 2/20/86

FABRIC SWB-8

Lot Lot # 1133-4 Stackpole Fibers

ROLL NO. 16-522

YARDS 41.0

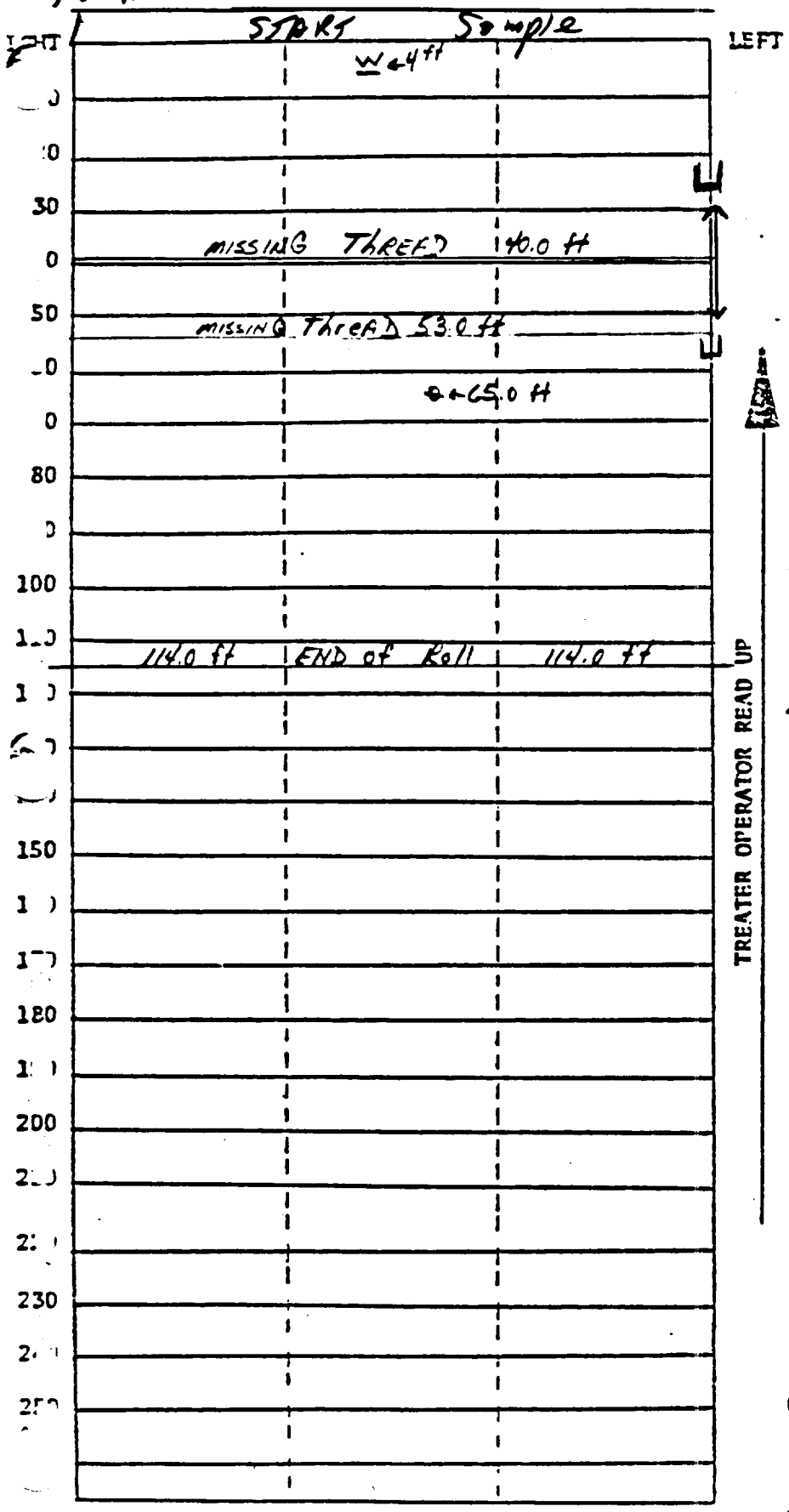
POUNDS 21.7

ORDER NO. 71108

SPECIFICATION STD Mfg Contr.

FILE # NASA 1-1

Footage...



SYMBOLS

- TEAR
- SPOTS OR STAINS
- FOLDS
- EDGE CURL
- TIGHT WEAVE OR SELVAGE
- WEAVE DISTORTION
- VISIBLE PUCKERS
- ONE PUCKER CREASING
- TWO OR MORE CREASINGS

REMARKS

W = Pulled Thread

}{ = Twin Edge

C = Hole

U = Bags

GRADE Group B

D. Engle

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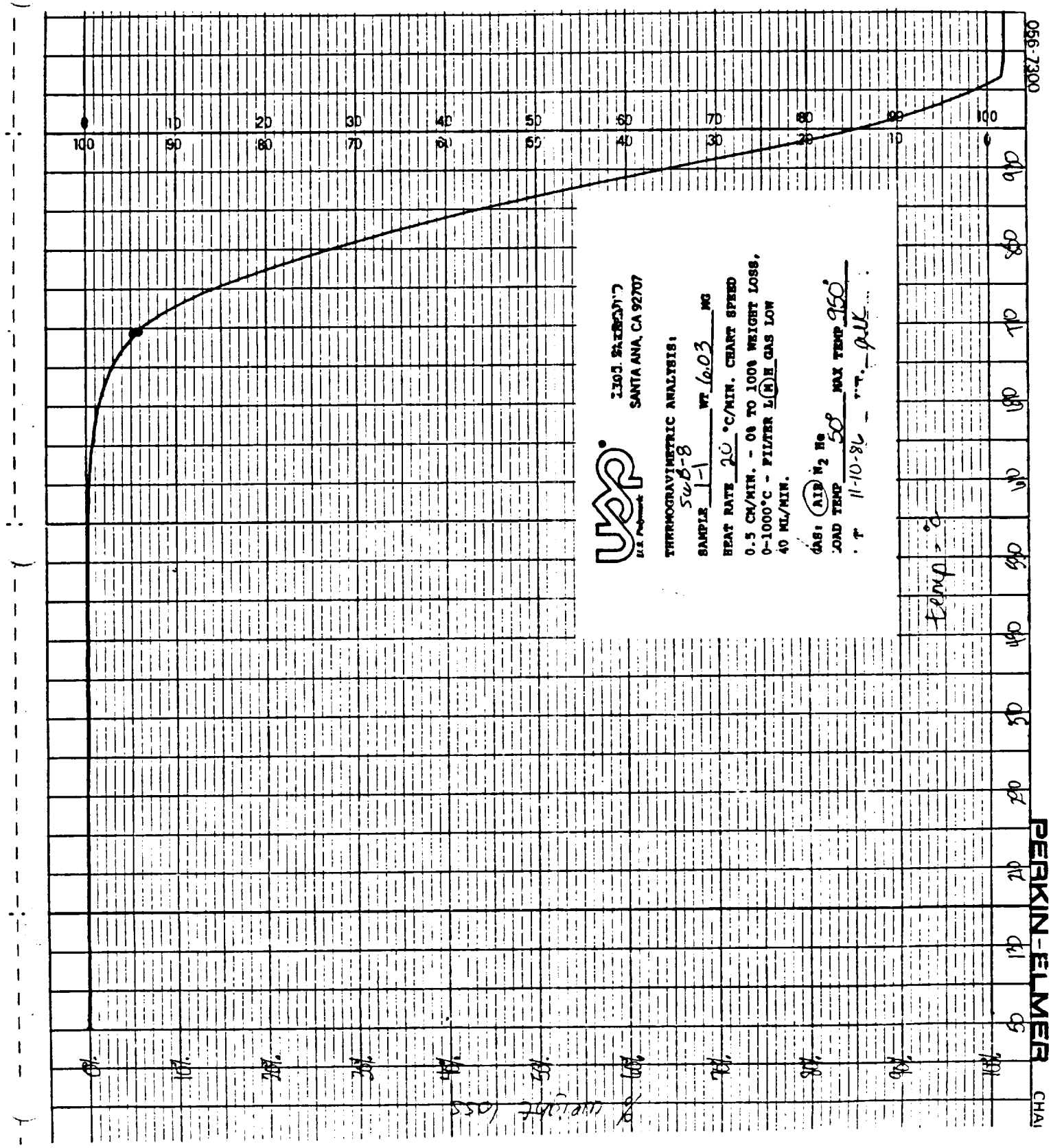

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PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5834 NASA LOT# 1 U.S.P. LOT# D09255

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5834 NASA LOT# 1 U.S.P. LOT# D09255

		ROLL#1-S	ROLL#2-S
1a. Resin Content, Soxhlet, % CTM-6D		36.2	35.8
		37.6	35.3
		36.7	34.6
	AVG.	36.8	35.2
	NASA LOT# 1 AVERAGE		36.0
1b. Filler Content, Soxhlet, % CTM-6D		15.0	14.8
		15.6	14.6
		15.2	14.3
	AVG.	15.3	14.6
	NASA LOT# 1 AVERAGE		14.9
1c. Cloth Content, Soxhlet, % CTM-6D		48.8	49.4
		46.8	50.1
		48.1	51.1
	AVG.	47.9	50.2
	NASA LOT# 1 AVERAGE		49.1
2. Volatile Content, % PTM-17B		4.5	4.6
		4.7	4.4
		4.2	4.7
	AVG.	4.5	4.6
	NASA LOT# 1 AVERAGE		4.5
3. Flow, % PTM-19G		18.1	18.7
		17.8	18.5
		17.8	17.9
	AVG.	17.9	18.4
	NASA LOT# 1 AVERAGE		18.1
4. Resin Content, Dry basis, % PTM 16F, Type II		41.3	40.8
		41.2	41.0
		41.6	40.6
	AVG.	41.4	40.8
	NASA LOT# 1 AVERAGE		41.1
5. Tack, lbs PTM-80		45	56
	NASA LOT# 1 AVERAGE		51
6. Gel Time, seconds PTM-20E		165	169
	NASA LOT# 1 AVERAGE		167

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FM 5834 NASA LOT# 1 U.S.P. LOT# D09255

7a. Atomic Absorption, ppm
CTM-53B

	ROLL#1-S	ROLL#2-S	LOT#1 AVG.
Na	22	18	20
K	2	3	3
Ca	33	27	30
Mg	1	2	2
Li	0	0	0
TOTAL	58	50	54

7b. Moisture Content, %
CTM-53B

	ROLL#1-S	ROLL#2-S
	3.52	3.48
NASA LOT# 1 AVERAGE		3.50

7c. Ash Content, %
CTM-53B

	0.08	0.07
NASA LOT# 1 AVERAGE		0.07

8. TGA, % Weight Loss at 500°C
CTM-51 (Nitrogen)

	7.7	7.7
NASA LOT# 1 AVERAGE		7.7

See chart 8A-8B

9. DSC, °C
CTM-50A

	ROLL#1-S	ROLL#2-S	LOT#1 AVG.
First Temp	177	180	179
Second Temp	239	240	240

See Chart 9A-9B

10. Infrared (IRZB) Baseline
CTM-21C

	1.14	1.14	1.14

See Chart 10A-10B

11. Environmental History

Date manufactured: 12 May 1986
Packaged in: Polyethylene bag
Date shipped: Test lot not shipped

12. Specific Gravity, Cured, Units
ASTM D792

	ROLL#1-S	ROLL#2-S
	1.523	1.519
	1.522	1.521
	1.520	1.515
AVG.	1.522	1.519
NASA LOT# 1 AVERAGE		1.520

13a. Tensile Strength, ksi, WARP
FTMS 406-1011

	34.17	24.94
	30.90	32.83
	33.07	29.04
	36.59	28.14
	32.68	30.17
AVG.	33.48	29.02
NASA LOT# 1 AVERAGE		31.25

FM 5834 NASA LOT# 1 U.S.P. LOT# D09255

	ROLL#1-B	ROLL#2-B
13b. Tensile Modulus, msi, WARP FTMS 406-1011	6.55	5.44
	6.63	6.32
	6.18	5.71
	6.32	5.90
	5.91	6.10
AVG.	6.32	5.89
NASA LOT# 1 AVERAGE		6.11
13c. Tensile Elongation, %, WARP FTMS 406-1011	.58	.46
	.55	.58
	.59	.49
	.64	.52
	.58	.54
AVG.	.59	.52
NASA LOT# 1 AVERAGE		.55
14a. Flexural Strength, ksi, WARP FTMS 406-1031	46.50	41.72
	45.70	40.96
	46.45	40.90
	45.85	42.65
	45.23	43.72
AVG.	45.95	41.99
NASA LOT# 1 AVERAGE		43.97
14b. Flexural Modulus, msi, WARP FTMS 406-1031	4.16	4.56
	5.58	4.42
	4.81	4.46
	4.85	4.35
	4.96	4.81
AVG.	4.87	4.52
NASA LOT# 1 AVERAGE		4.70
15a. Compressive Strength, ksi, WARP FTMS 406-1021	29.33	22.25
	25.19	23.73
	27.57	27.69
	27.08	24.51
	25.86	27.76
AVG.	27.01	25.19
NASA LOT# 1 AVERAGE		26.10
15b. Compressive Modulus, msi, WARP FTMS 406-1021	5.86	6.59
	6.29	7.01
	6.25	6.28
	6.18	6.16
	5.96	6.13
AVG.	6.11	6.43
NASA LOT# 1 AVERAGE		6.27

FM 5834 NASA LOT# 1 U.S.P. LOT# D09255

		ROLL#1-S	ROLL#2-S
16. Double Shear Strength, ksi FTMS 406-1041A		3.12	3.12
		2.41	2.89
		2.60	3.27
		2.36	3.24
		2.53	3.06
	AVG.	2.60	3.12
	NASA LOT# 1 AVERAGE		2.86
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)		69.0	70.9
	NASA LOT# 1 AVERAGE		70.0
18. Residual Volatiles, % PTM-98		2.36	2.14
		2.15	2.08
		2.35	2.21
	AVG.	2.29	2.14
	NASA LOT# 1 AVERAGE		2.22
19. Resin Content, Pyrolysis, % CTM-14B		34.13	33.59
		34.74	34.43
		33.70	34.09
	AVG.	34.19	34.04
	NASA LOT# 1 AVERAGE		34.11
20. Acetone Extraction, % CTM-18A		- .91	- .98
		- .45	-1.18
		- .92	- .45
	AVG.	- .76	- .87
	NASA LOT# 1 AVERAGE		- .81
21a. CTE, in/in °F with PLY PTM-61B		-2.17	-1.73
		-1.95	-2.42
	AVG.	-2.06	-2.08
	NASA LOT# 1 AVERAGE		-2.06
21b. CTE, in/in °F Cross PLY PTM-61B		13.02	12.66
		9.94	12.90
	AVG.	11.48	12.78
	NASA LOT# 1 AVERAGE		12.13

See Chart 21A-21B

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 8A

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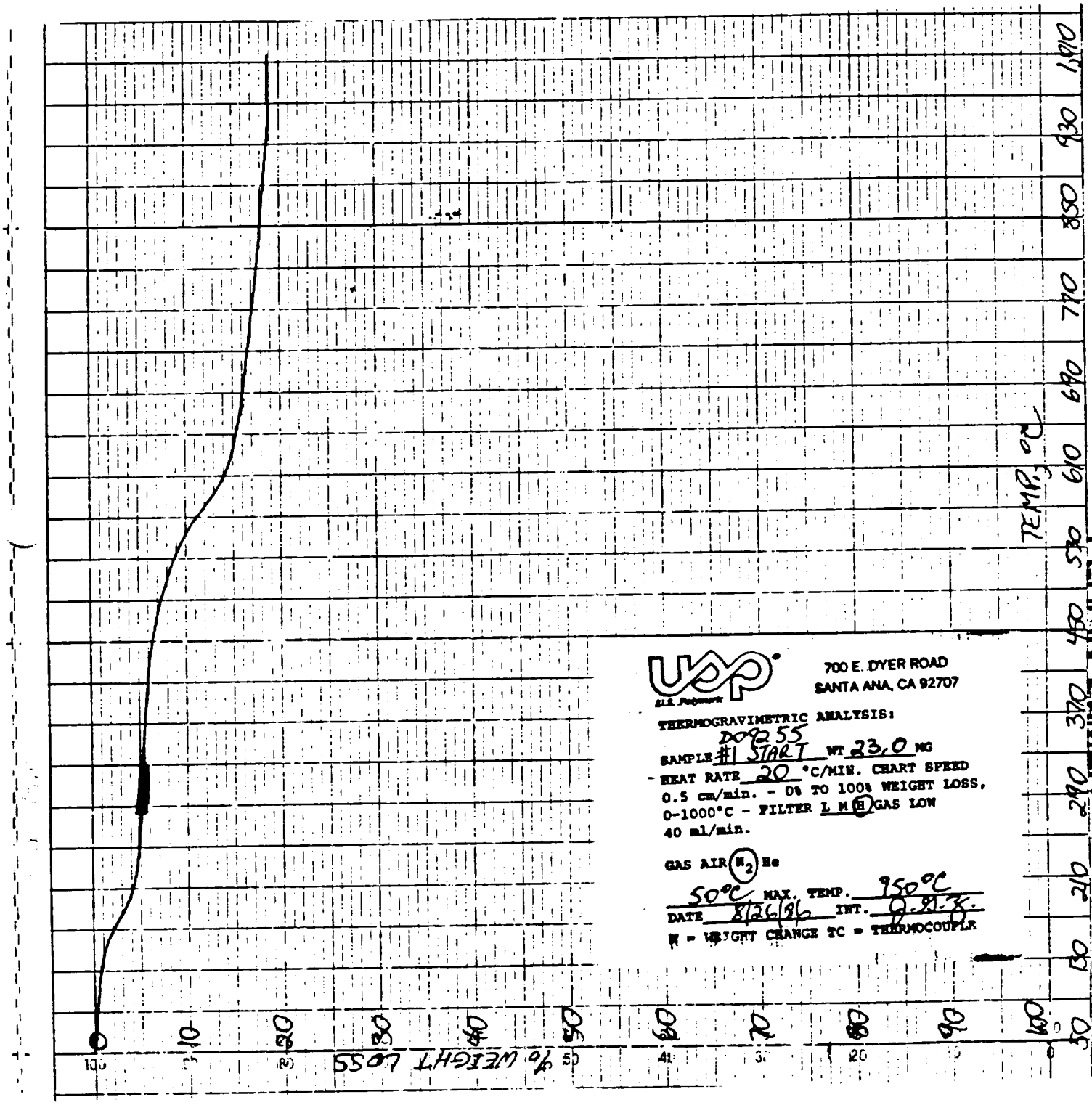

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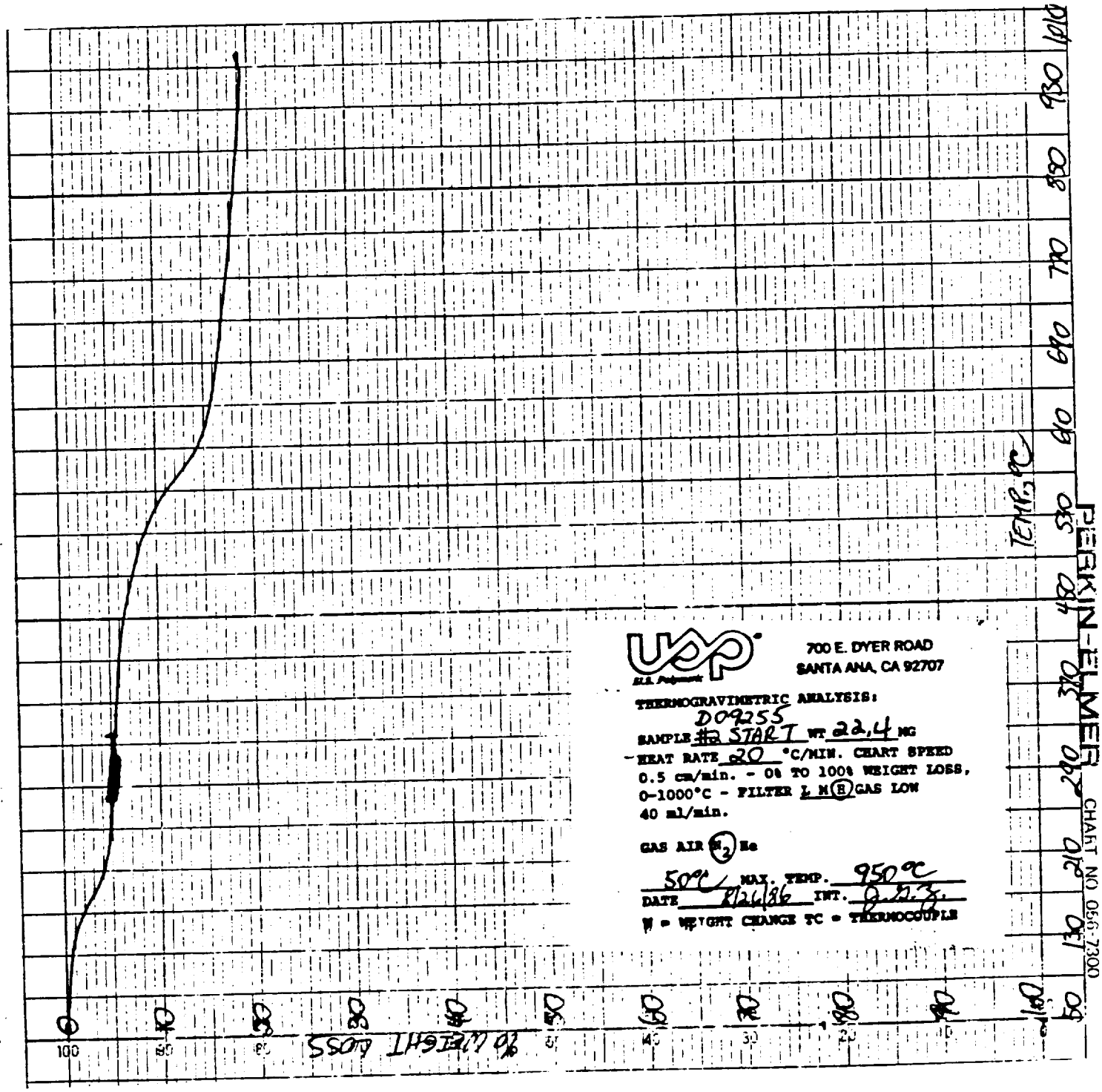

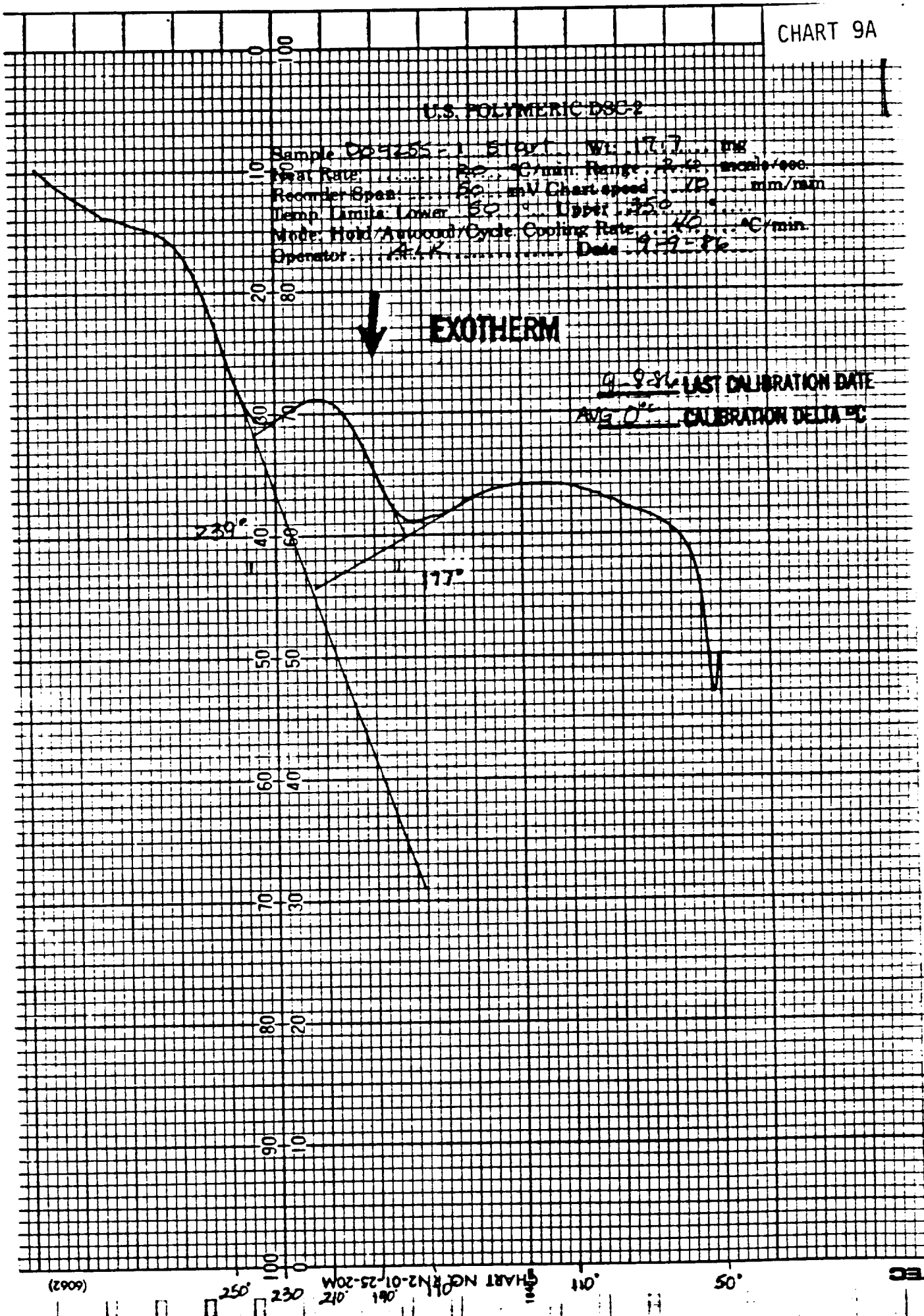

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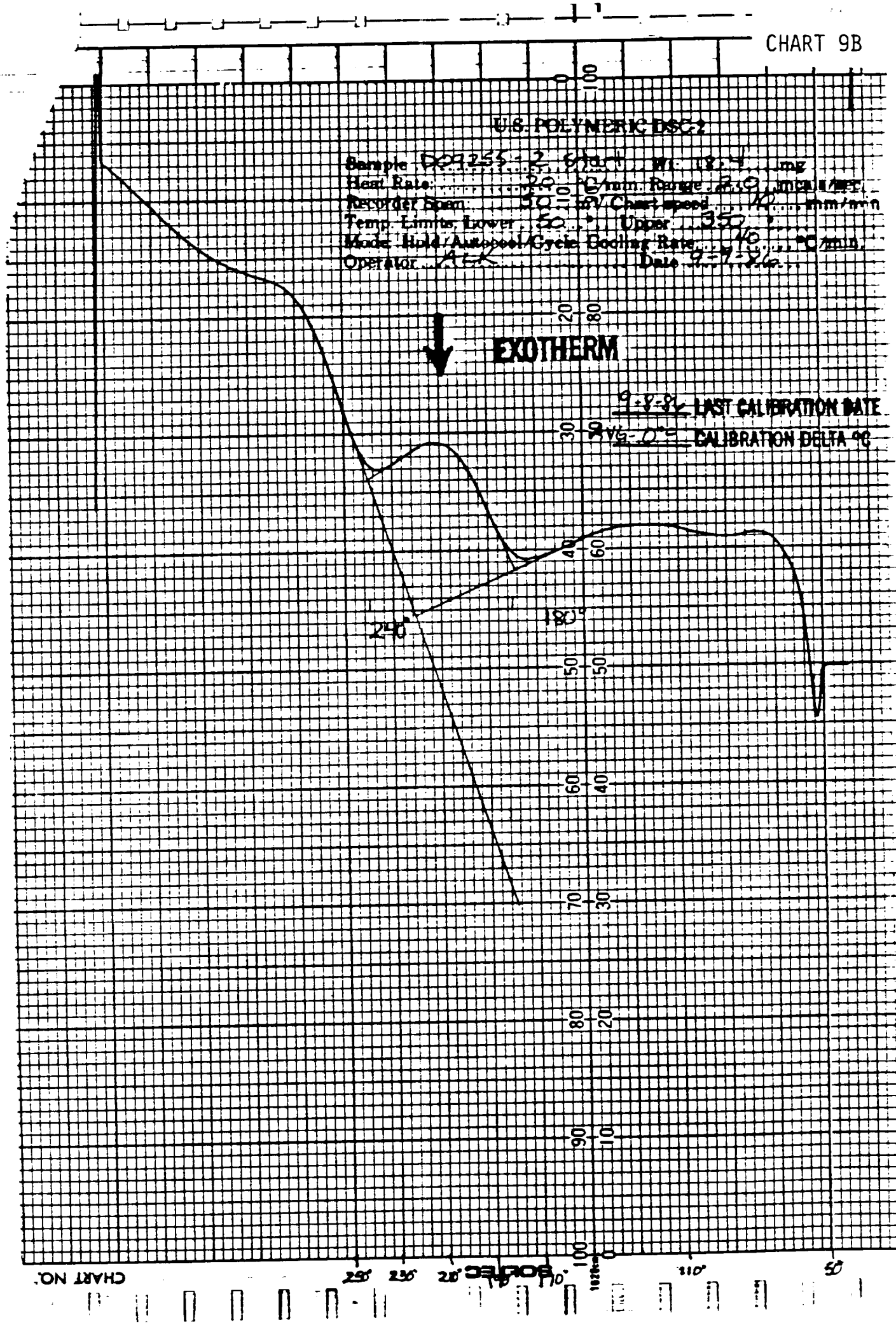
CHART 9B



SPECTRUM NO. 15205
DATE 7-08-86
SAMPLE FM 5834
D09255 # 5T-1

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%T
PHASE S
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

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CHART 10A

SPECTRUM NO. 15206

DATE 7-08-86

SAMPLE FM 5834
D09255 # ST-2

SOURCE

STRUCTURE

PATH 0.2 mm NACL

SOLVENT ACETONE

CONCENTRATION 30-50%T

PHASE 3

COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®

INFRARED
SPECTROPHOTOMETER

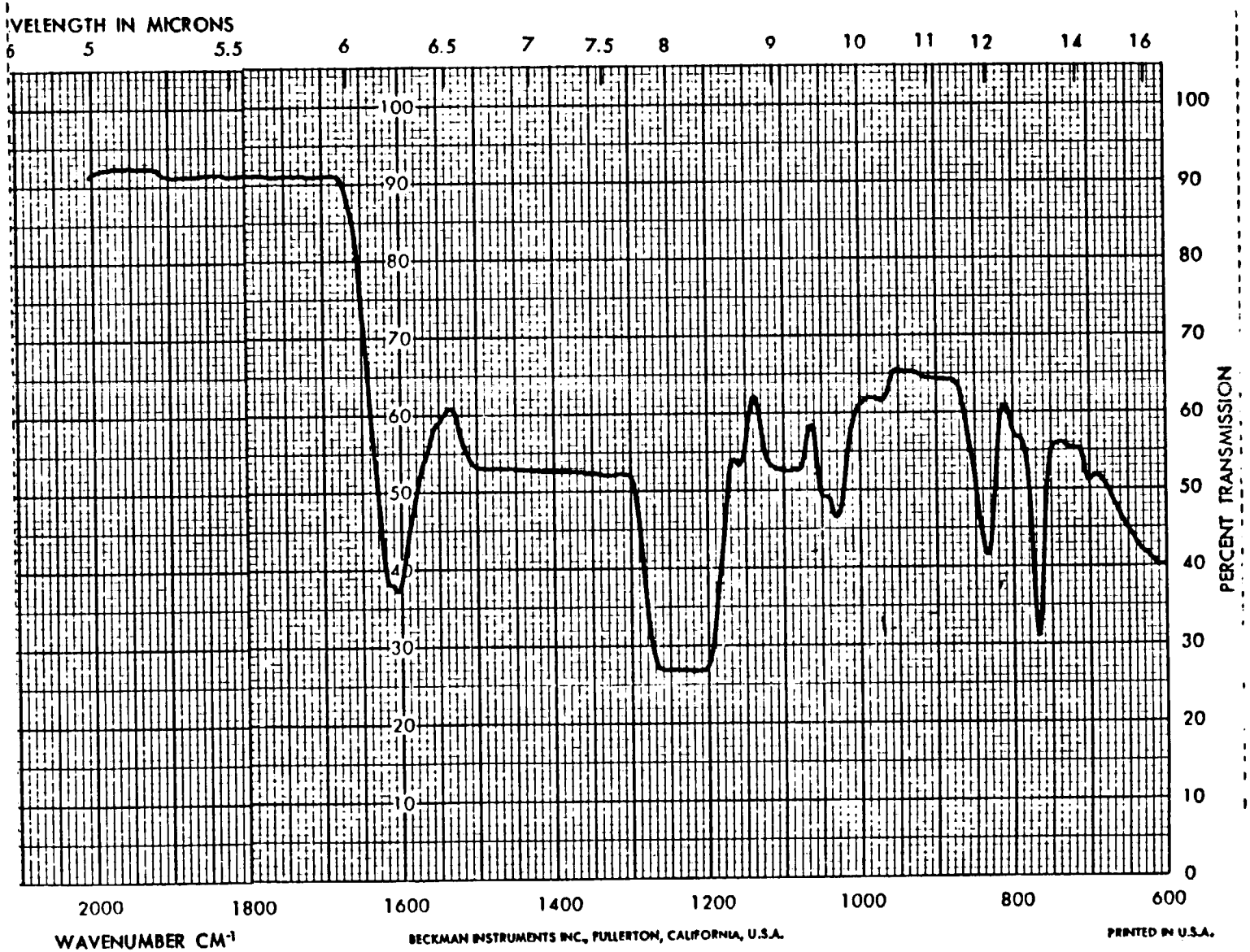

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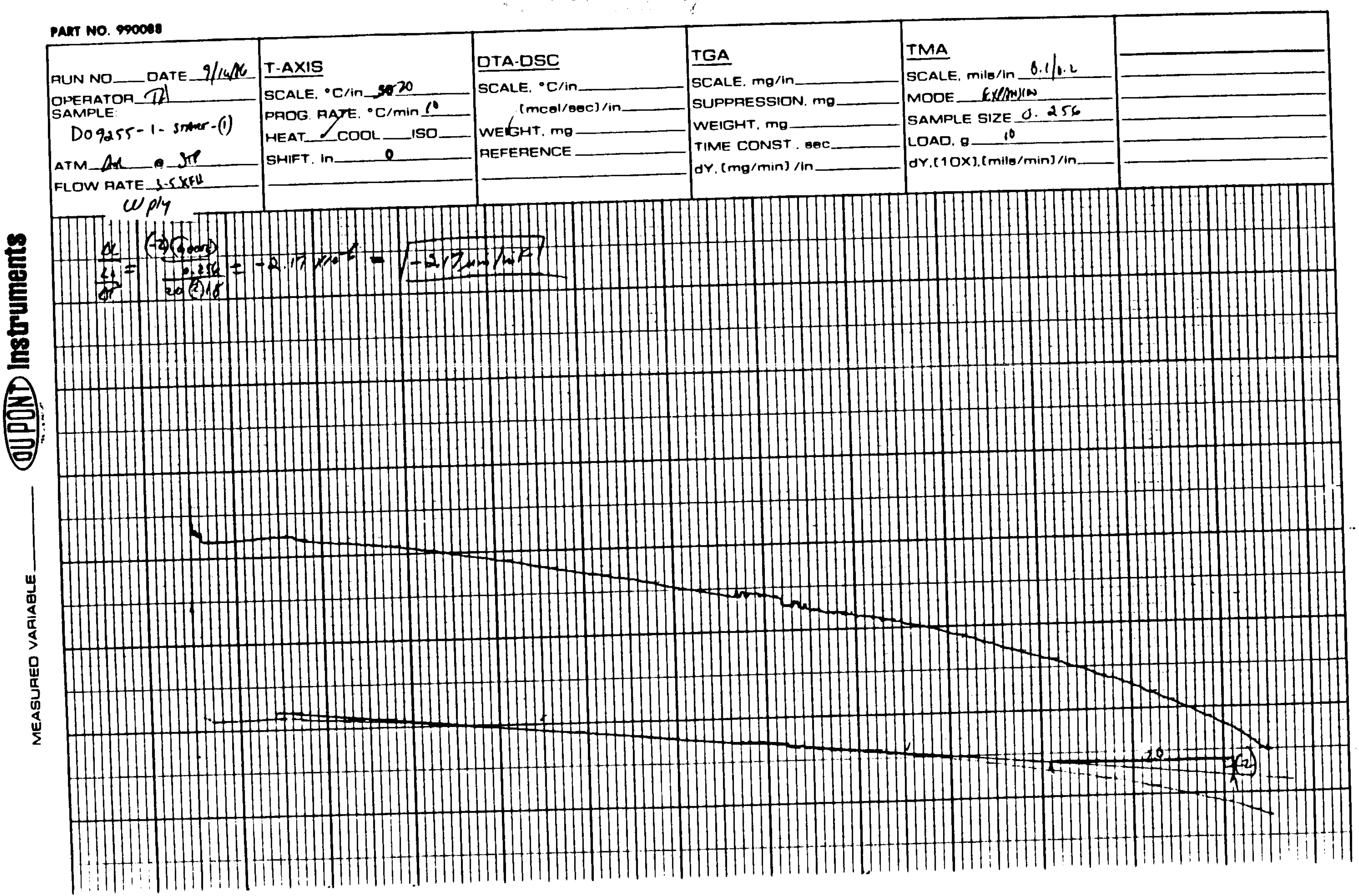
CHART 10B

Chart 21A1


PART NO. 990088
RUN NO____ DATE 9/14/86
OPERATOR
SAMPLE:
D09255-1-
ATM Air @ STP
FLOW RATE
T-AXIS
SCALE, °C/in 20
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0
DTA-DSC
SCALE, °C/in
(mcal/sec)/in
WEIGHT, mg
REFERENCE
TGA
SCALE, mg/in
SUPPRESSION, mg
WEIGHT, mg
TIME CONST., sec
dY, (mg/min)/in
TMA
SCALE, mils/in 0.1/0.2
SAMPLE SIZE 0.256
LOAD, g 10
dY, (10X), (mils/min)/in
DUPONT Instruments
MEASURED VARIABLE

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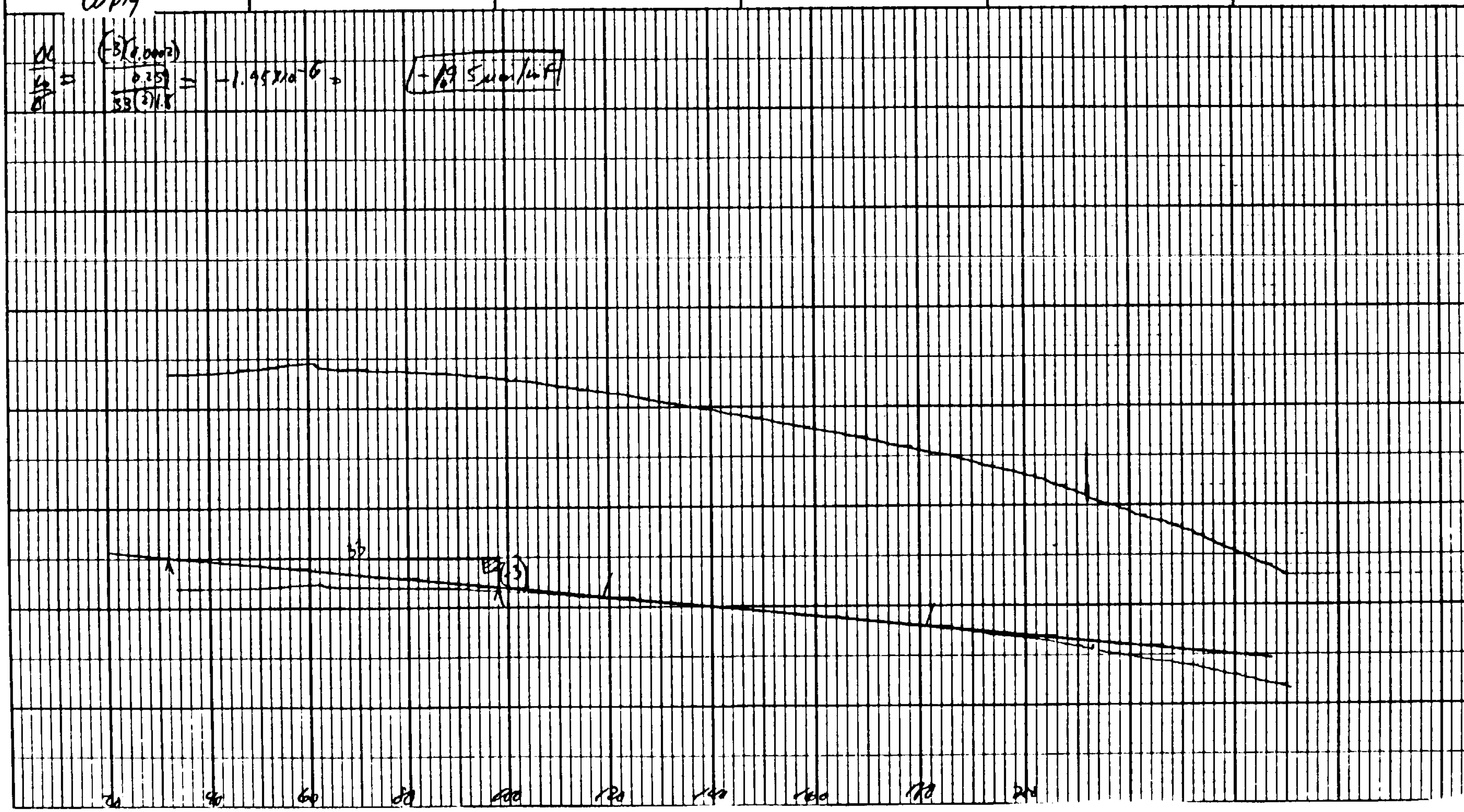
PART NO. 990088

RUN NO ___ DATE 9/16/86	**T-AXIS**	**DTA-DSC**	**TGA**	**TMA**	
OPERATOR TH	SCALE, °C/in 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in ___	
SAMPLE D09255-1-[illegible]-(2)	PROG RATE, °C/min 10	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE ___	
ATM ___ @ ___	HEAT / COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.259	
FLOW RATE ___	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g ___	
WP/4			dY, (mg/min)/in ___	dY, (10X), (mils/min)/in ___	



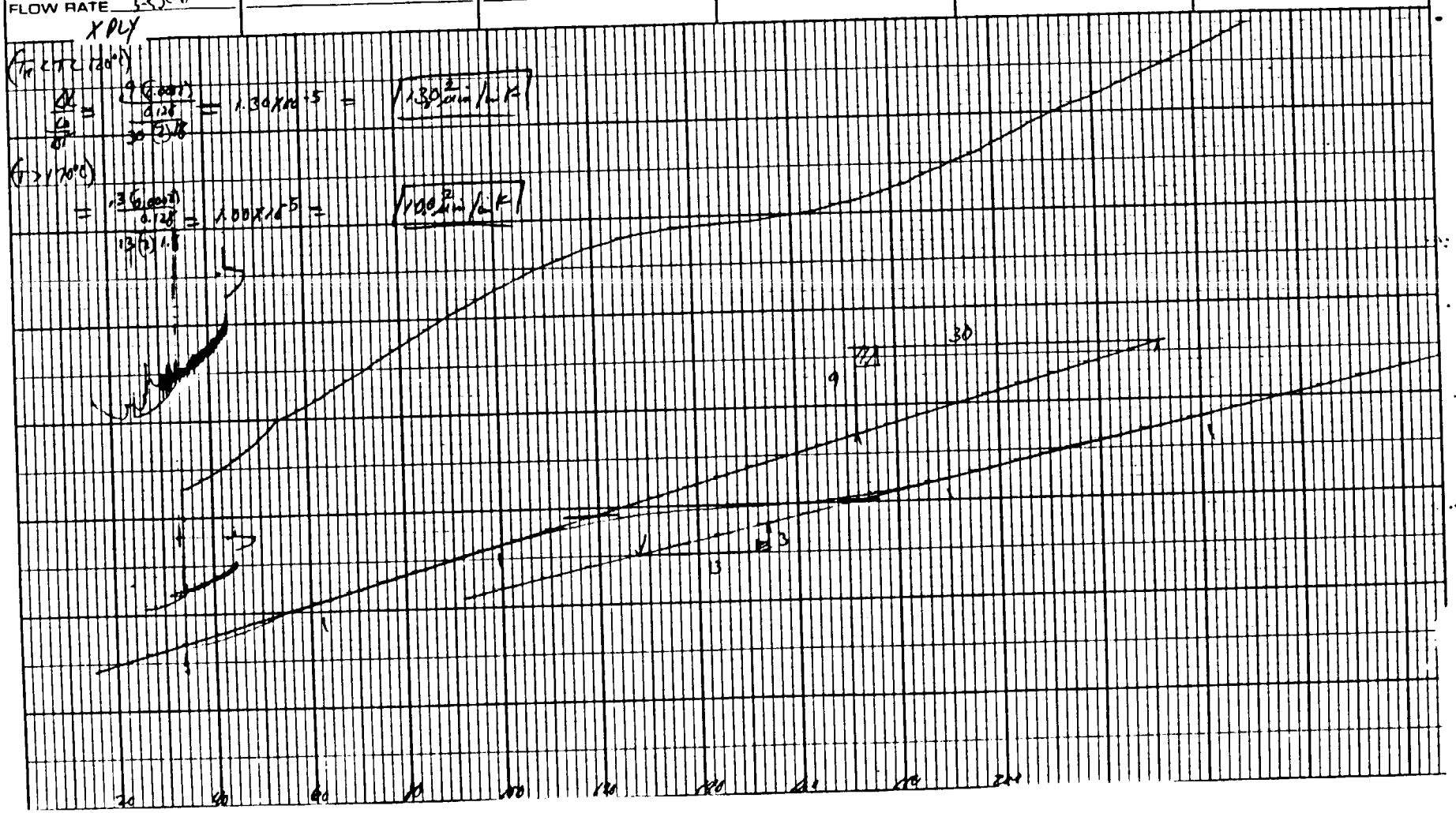
MEASURED VARIABLE

DUPONT Instruments

Chart 21A2

PART NO. 990096

RUN NO ___ DATE 9/15/90	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TJ	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1 0.2	
SAMPLE D09255-1-smear-(4)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
ATM Air @ XP	HEAT / COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.128	
FLOW RATE 3-5 (4)	SHIFT, in 0	REFERENCE	TIME CONST, sec	LOAD, g 10	
XPLY			dY, (mg/min) /in	dY, (10X), (mils/min)/in	



DUPONT Instruments

MEASURED VARIABLE

Chart 21A3

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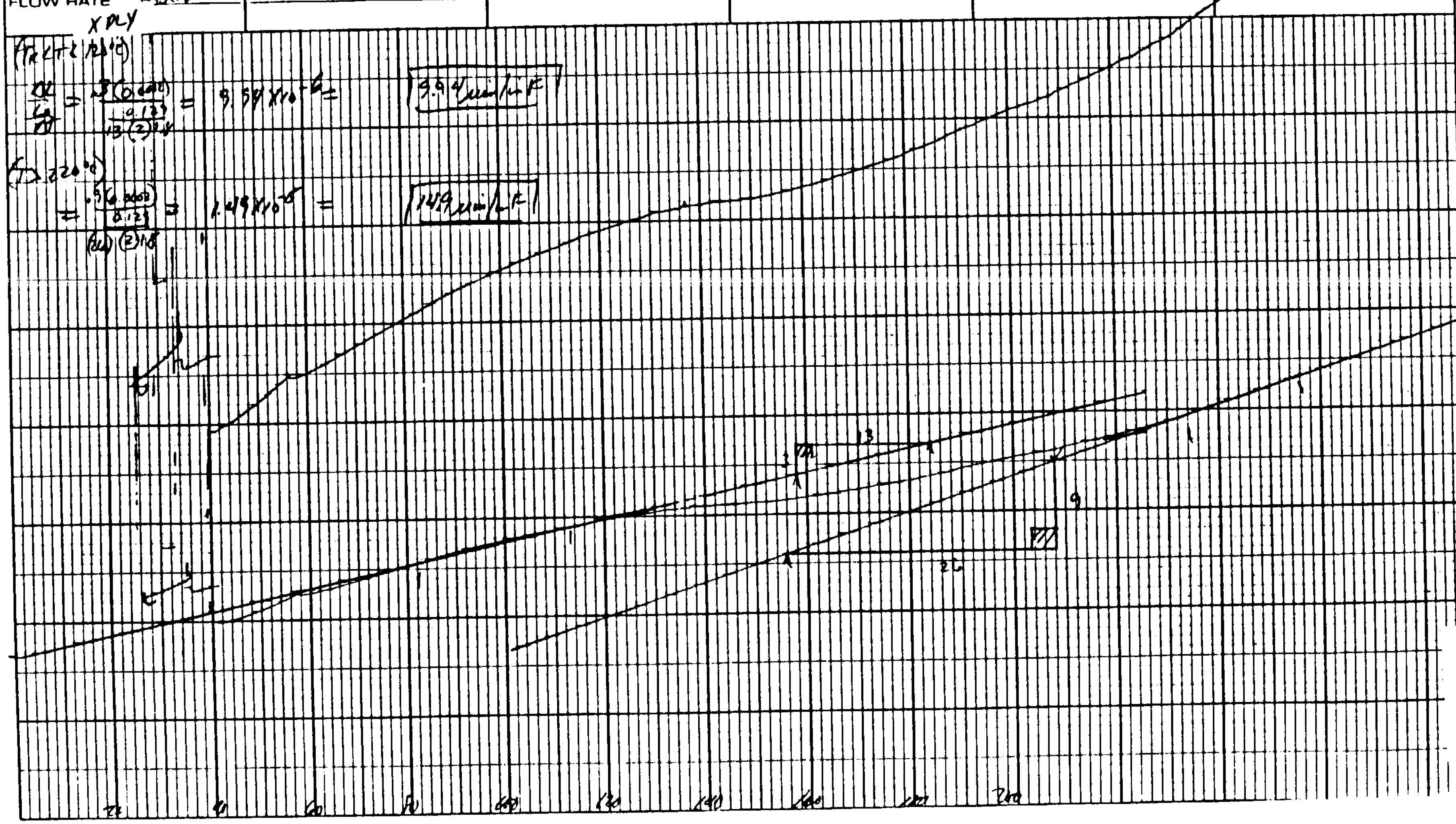
PART NO. 990088

RUN NO.____ DATE 5/15/86	**T-AXIS**	**DTA-DSC**	**TGA**	**TMA**
OPERATOR TJ	SCALE, °C/in 20	SCALE, °C/in____	SCALE, mg/in____	SCALE, mils/in 0.1/in
SAMPLE: DO 9255-1-START-(5)	PROG. RATE, °C/min 10	(mcal/sec)/in____	SUPPRESSION, mg____	MODE Exp(ansion)
ATM Air @ STP	HEAT ✓ COOL ____ ISO____	WEIGHT, mg____	WEIGHT, mg____	SAMPLE SIZE 0.129
FLOW RATE	SHIFT, in 0	REFERENCE____	TIME CONST., sec____	LOAD, g 10
			dY, (mg/min)/in____	dY, (10X), (mils/min)/in____



MEASURED VARIABLE

DUPONT Instruments

Chart 21A4

Chart 21B1

PART NO. 990088

RUN NO. ____ DATE 5/16/86
OPERATOR TTL
SAMPLE:
D09255-2-STRIP-(1)
ATM Air @ RT
FLOW RATE

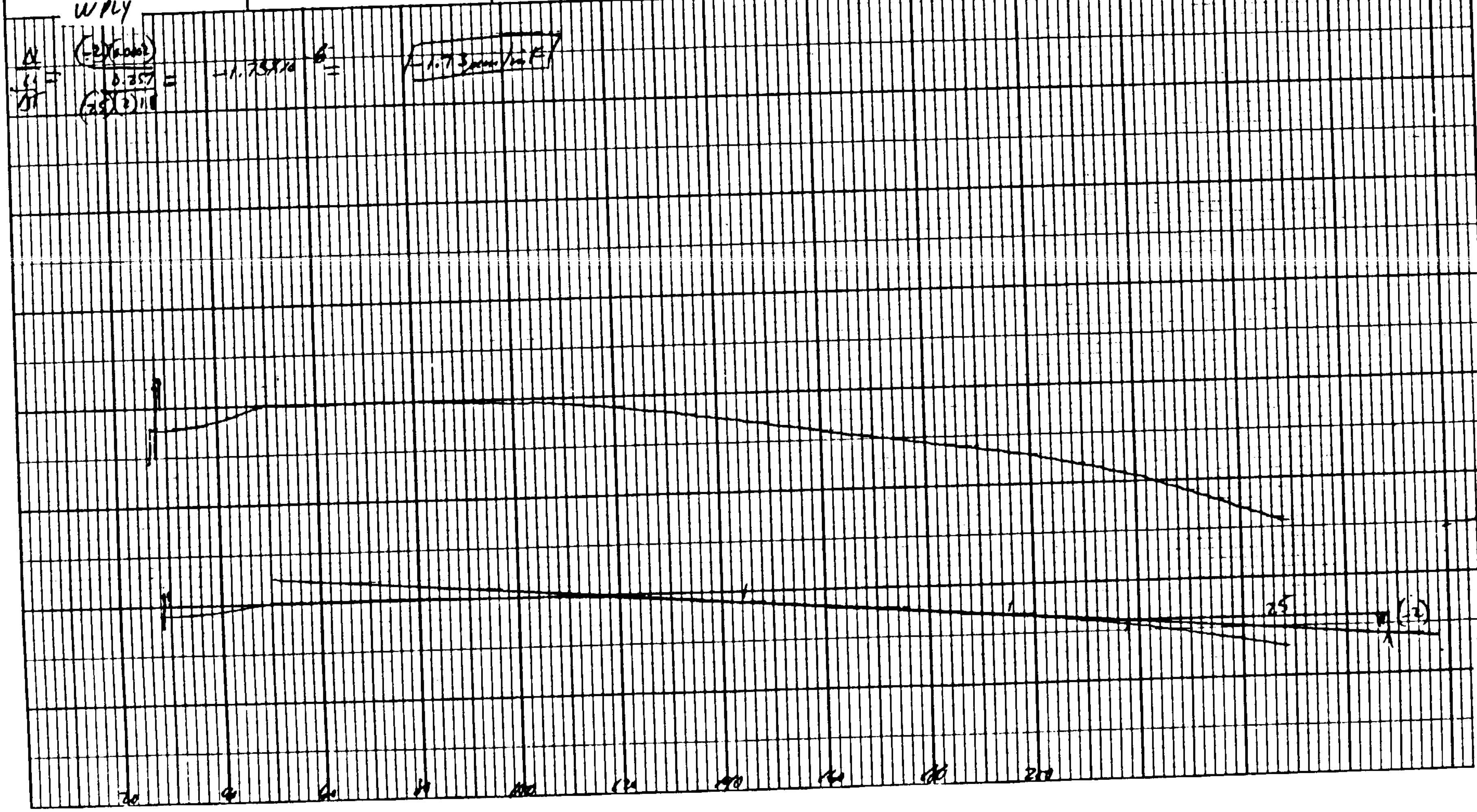
T-AXIS
SCALE, °C/in 20
PROG. RATE, °C/min 10
HEAT ____ COOL ____ ISO ____
SHIFT, in 0

DTA-DSC
SCALE, °C/in ____
(mcal/sec)/in ____
WEIGHT, mg ____
REFERENCE ____

TGA
SCALE, mg/in ____
SUPPRESSION, mg ____
WEIGHT, mg ____
TIME CONST., sec ____
dY, (mg/min)/in ____

TMA
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.257
LOAD, g 10
dY,(10X),(mils/min)/in ____

W PLY



MEASURED VARIABLE

DU PONT Instruments

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Chart 21B2

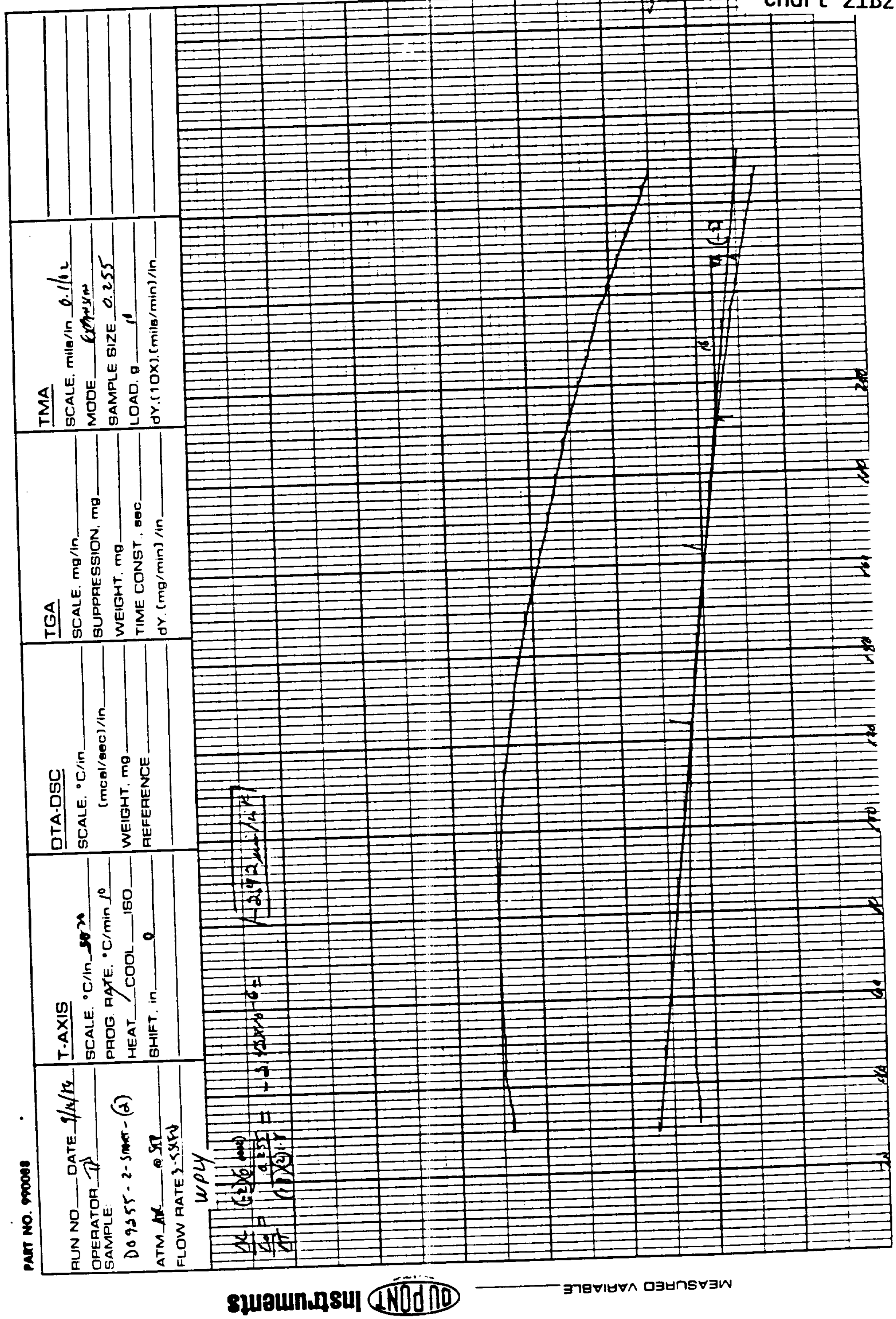

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Chart 21B3

PART NO. 990068

RUN NO. ____ DATE 9/14/94
OPERATOR TH
SAMPLE DO 9355-2-SMRT-(4)
ATM AM @ SM
FLOW RATE 3.55(11)
XPLY

T-AXIS
SCALE, °C/in 50 30
PROG. RATE, °C/min 10
HEAT / COOL ISO
SHIFT, in 0

DTA-DSC
SCALE, °C/in
(mcal/sec)/in
WEIGHT, mg
REFERENCE

TGA
SCALE, mg/in
SUPPRESSION, mg
WEIGHT, mg
TIME CONST., sec
dY/(mg/min)/in

TMA
SCALE, mils/in 0.1/1.2
MODE Expansion
SAMPLE SIZE 0.130
LOAD, g 10
dY/(10X)/(mils/min)/in

MEASURED VARIABLE

DUPONT instruments

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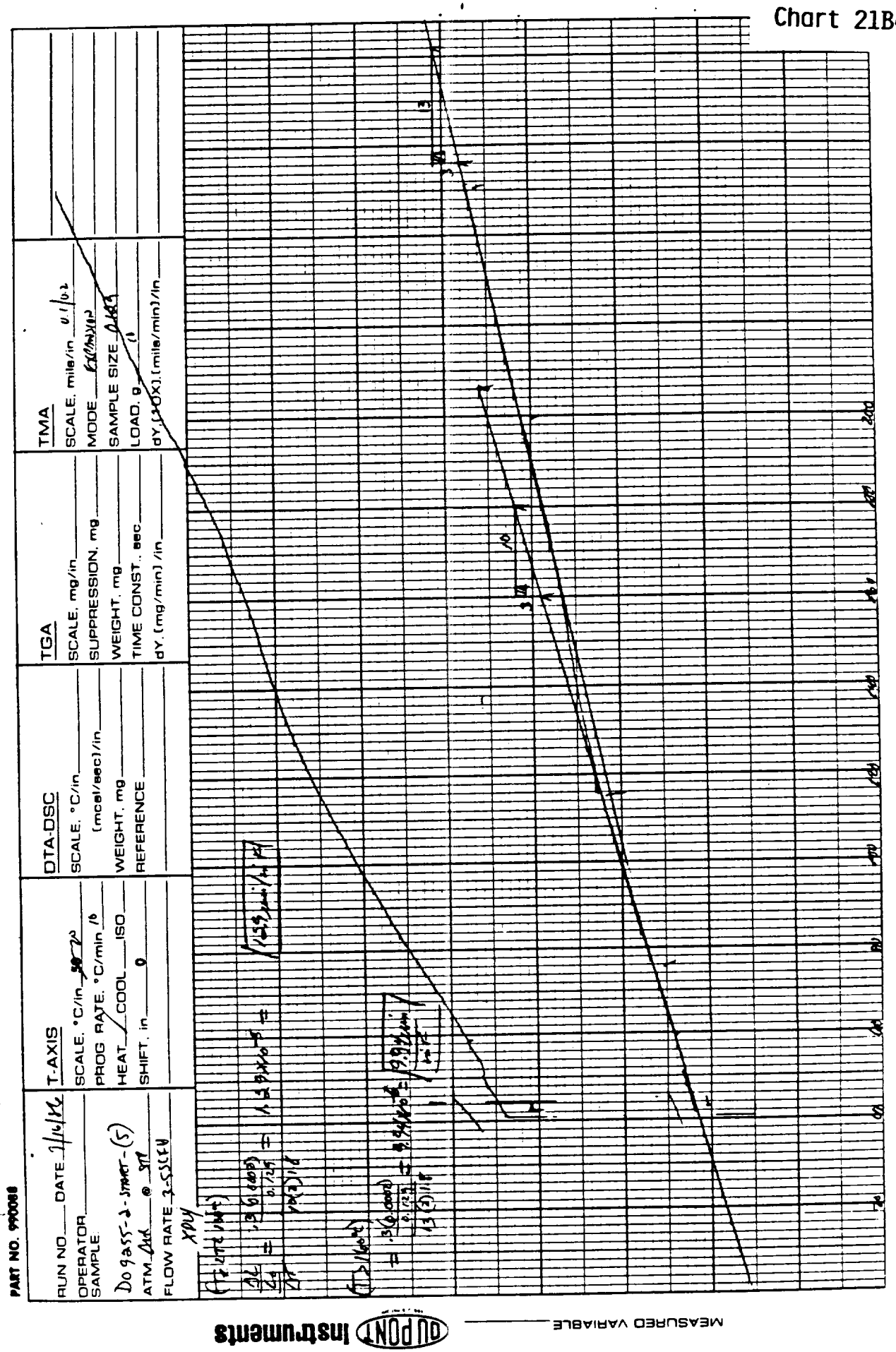
Chart 21B4



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FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 3

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 3

		SAMPLE			
1. Carbon Content, % QAI-5560		#3A-1	#3A-2	#3A-3	
		99.40	99.32	99.44	
	NASA LOT# 3 AVERAGE			99.39	
2. Ash Content, % PTM-71B		0.000	0.000	0.000	
		0.000	0.000	0.005	
	AVG.	0.000	0.000	0.002	
	NASA LOT# 3 AVERAGE			0.001	
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)		#3A-1	#3A-2	#3A-3	LOT#3 AVG.
	Na	6.0	6.0	6.0	6.0
	K	2.5	1.0	2.0	1.8
	Ca	2.5	2.5	2.0	2.3
	Mg	0.0	0.0	0.0	0.0
	Li	0.0	0.0	0.0	0.0
	TOTAL	11.0	9.5	10.0	10.2
3a. Moisture Content, % CTM-53B		.010	.015	0.000	
		.005	.020	0.000	
	AVG.	.008	.018	0.000	
	NASA LOT# 3 AVERAGE			.008	
3b. Ash Content, % CTM-53B		.025	.000	.000	
		.025	.010	.000	
	AVG.	.025	.005	.000	
	NASA LOT# 3 AVERAGE			.010	
4. pH, Units ASTM D1512		4.80	4.75	4.85	
		4.95	4.80	4.80	
	AVG.	4.88	4.78	4.82	
	NASA LOT# 3 AVERAGE			4.83	
5. Particle Size, microns S.E.M. procedure (Average values are of 20 determinations)	AVG.	.51	.51	.42	
	Maximum	.99	.88	.85	
	Minimum	.20	.18	.15	
	Std. Dev	.23	.20	.17	
	NASA LOT# 3 AVERAGE SIZE			.48	
6a. TGA, °C at 50% Loss CTM-51		864	860	850	
	NASA LOT# 3 AVERAGE			858	

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Filler Lot for NASA Lot# 3

6b. TGA
CTM-51 — See Charts 6A-6C

7. Particle Size Distribution
CTM-72 — See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#3A-1	#3A-2	#3A-3
	.89	.94	.89
	.94	.83	.86
AVG.	.92	.88	.88

NASA LOT# 3 AVERAGE .89

U.S. Polymeric

Hamid M. Qureishi

Hamid M. Qureishi, Manager
Quality Assurance Department

CHART 6A

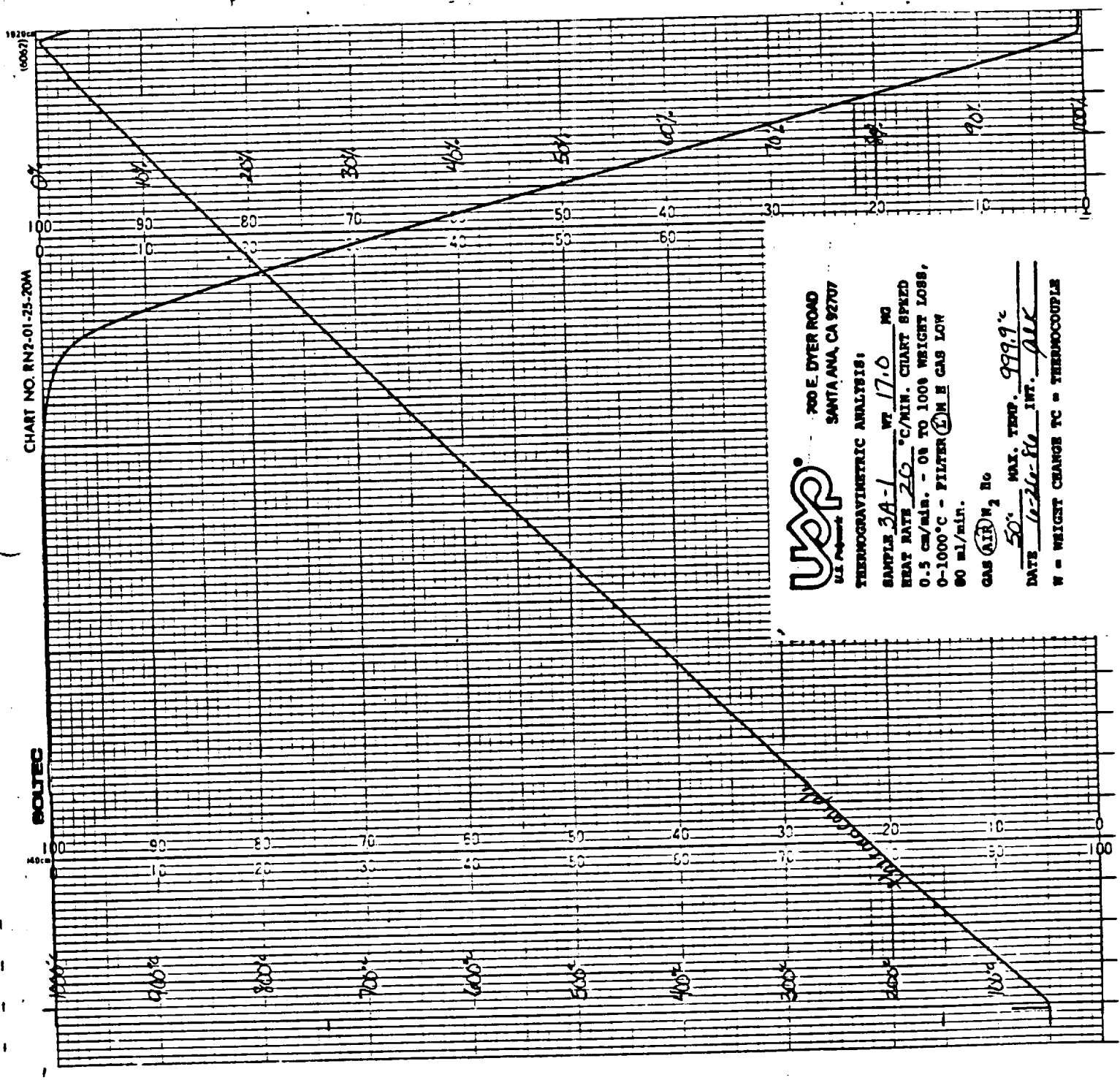


CHART 6B

ORIGINAL PAGE IS
OF POOR QUALITY

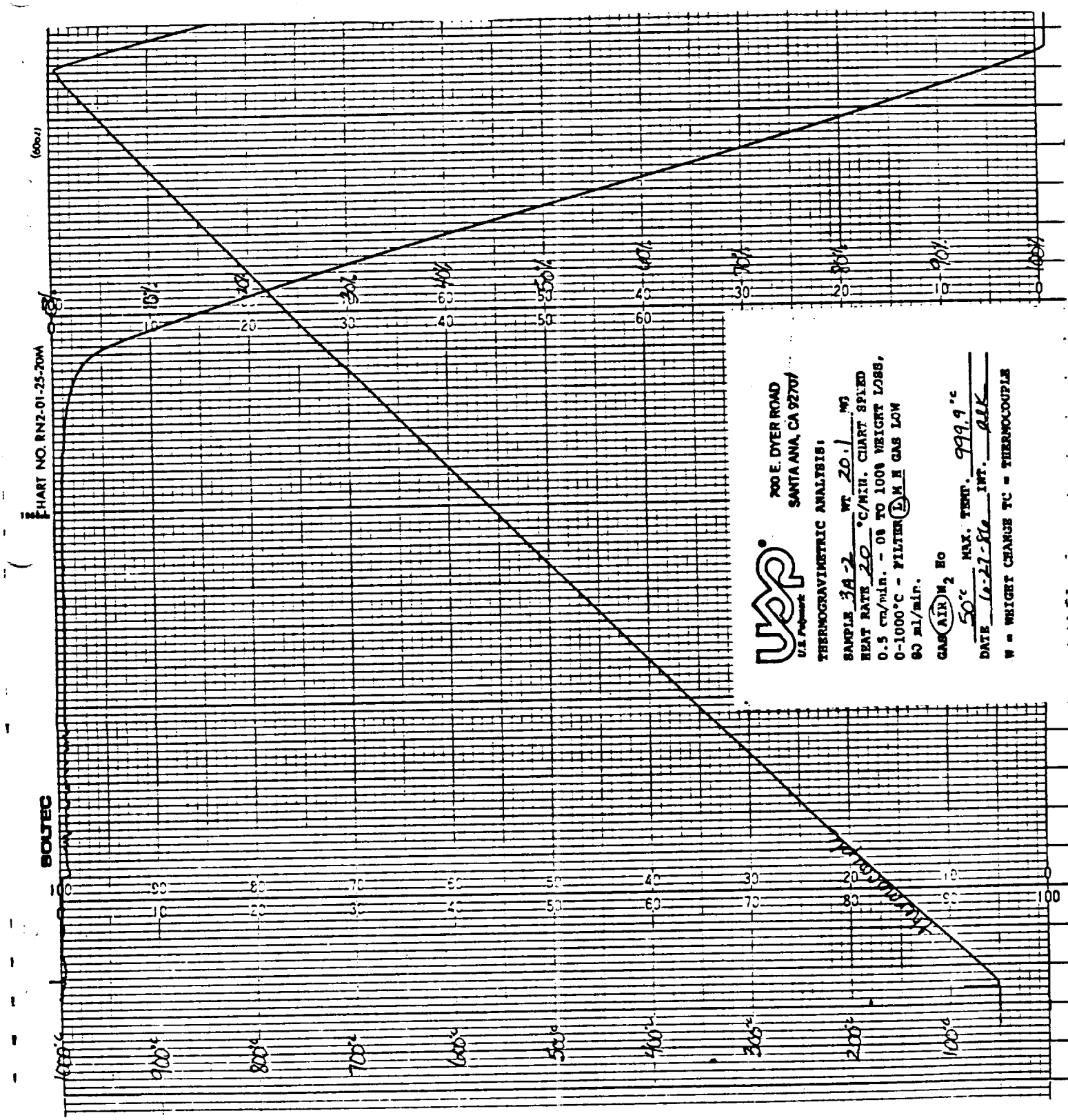
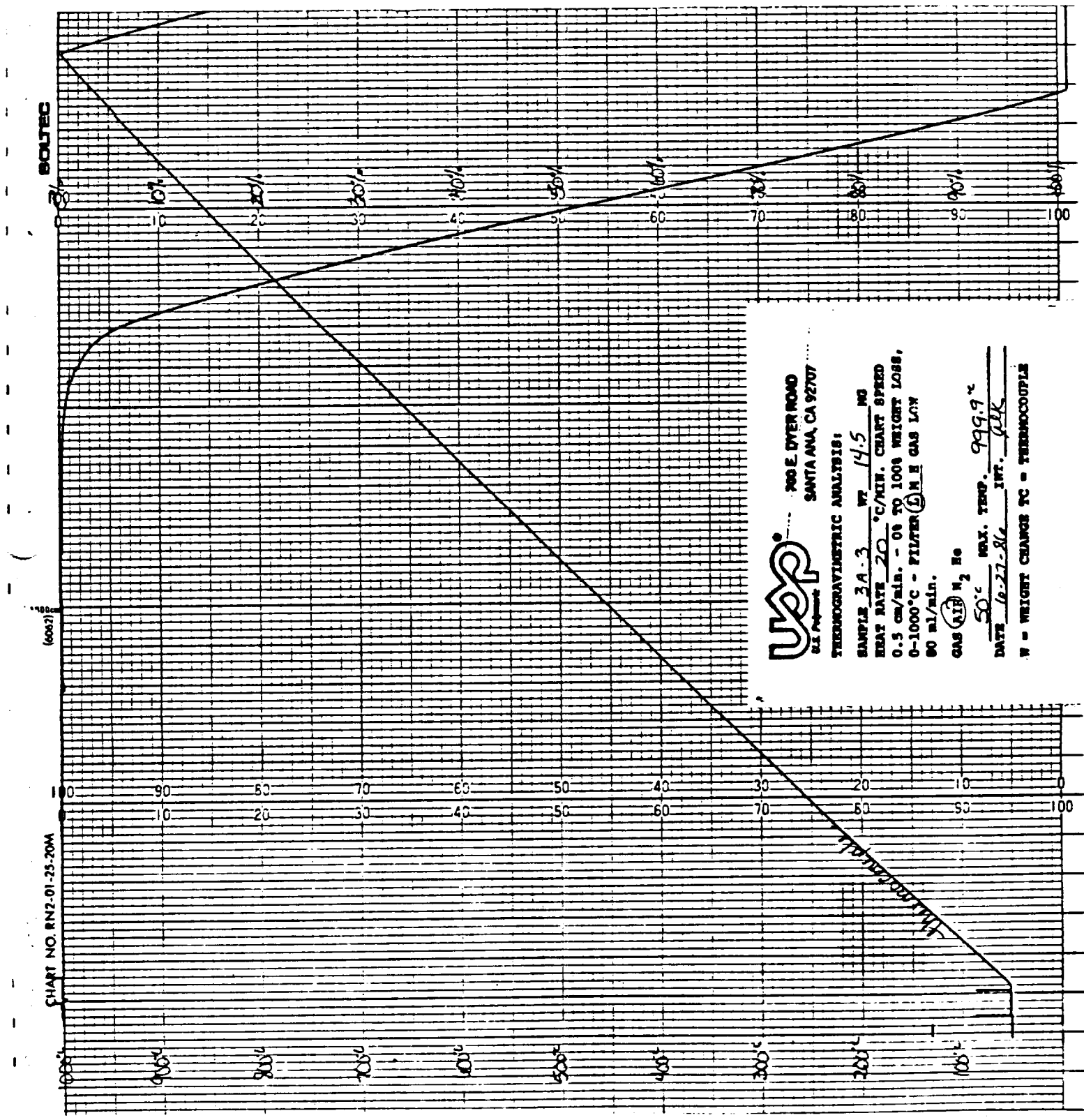


CHART 6C



HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT#3A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

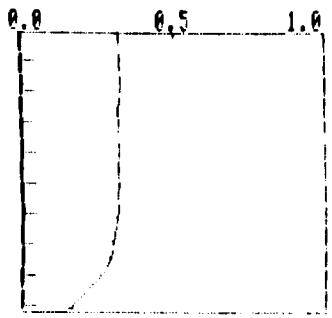
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

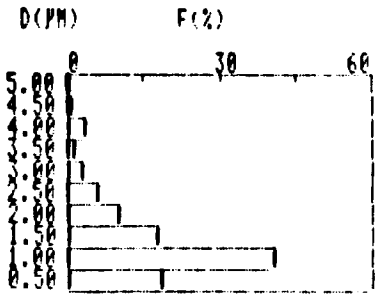


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.5	0.5
4.00-3.50	3.2	3.6
3.50-3.00	1.0	4.7
3.00-2.50	2.5	7.2
2.50-2.00	6.0	13.1
2.00-1.50	10.2	23.3
1.50-1.00	17.5	40.8
1.00-0.50	40.7	81.5
0.50-0.00	18.5	100.0

D(AVE) 0.89 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#3A-1
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT#3A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

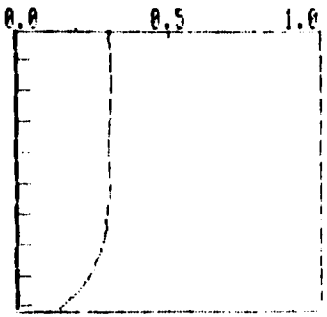
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

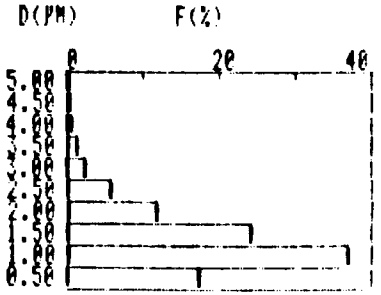


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.6	0.6
3.50-3.00	1.2	1.8
3.00-2.50	2.3	4.1
2.50-2.00	5.6	9.7
2.00-1.50	11.8	21.5
1.50-1.00	24.2	45.7
1.00-0.50	37.0	82.7
0.50-0.00	17.3	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot 3A-1
Sample#2

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CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-23-86
SAMPLE NASA LOT# 3A-2
#1 SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

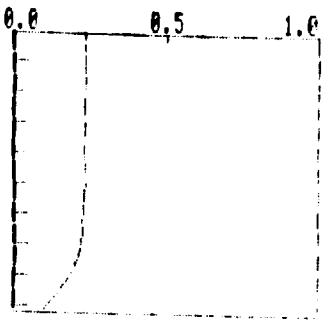
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

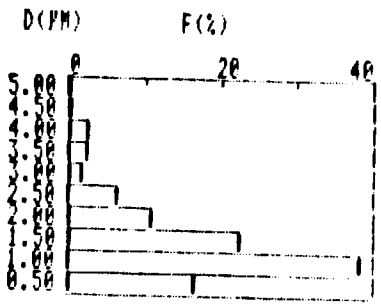


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	2.3	2.3
3.50-3.00	2.4	4.7
3.00-2.50	1.5	6.2
2.50-2.00	6.2	12.5
2.00-1.50	10.6	23.1
1.50-1.00	22.3	45.4
1.00-0.50	38.4	83.8
0.50-0.00	16.2	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#3A2
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-23-86
SAMPLE NASA LOT# 3A-2
#2 SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

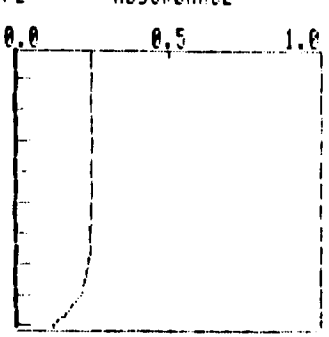
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

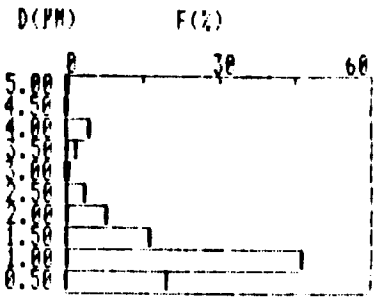


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	4.2	4.2
3.50-3.00	1.6	5.9
3.00-2.50	0.6	6.4
2.50-2.00	3.6	10.0
2.00-1.50	7.8	17.8
1.50-1.00	16.3	34.2
1.00-0.50	46.3	80.5
0.50-0.00	19.5	100.0

D(AVE) 0.83 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT#3A-2
Sample#2

CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-23-86
#1 SAMPLE NASA LOT#3A-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

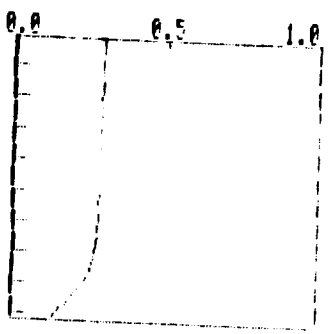
CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (UM)
D(MIN)	0.01(UM)
D(DIV)	0.50(UM)
SPEED	5000. (RPM)

IME 0 H 11 MIN 31 SEC

ATA

IME ABSORBANCE

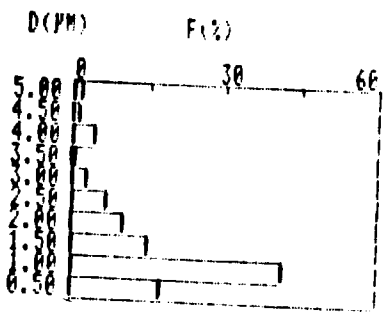


* DISTRIBUTION TABLE (BY VOL.)

D(UM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	1.4	1.4
4.50-4.00	0.9	2.3
4.00-3.50	4.2	6.5
3.50-3.00	0.3	6.9
3.00-2.50	2.5	9.4
2.50-2.00	6.5	15.9
2.00-1.50	10.0	25.9
1.50-1.00	14.8	40.7
1.00-0.50	41.7	82.3
0.50-0.00	17.7	100.0

D(AVE) 0.89 (UM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot# 3A-3
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-23-86
#2 SAMPLE NASA LOT#3A-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

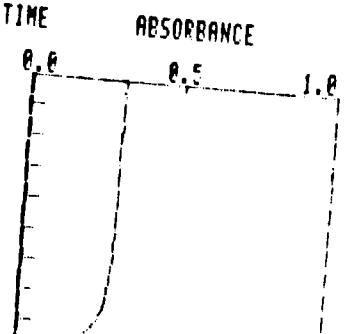
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (UM)
D(MIN)	0.01(UM)
D(DIV)	0.50(UM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

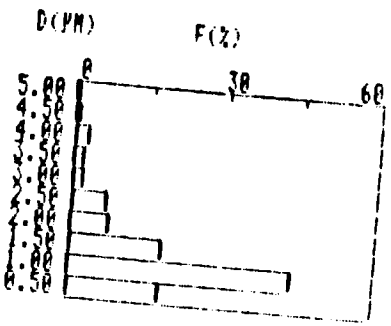


* DISTRIBUTION TABLE (BY VOL.)

D(UM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.5	0.5
4.00-3.50	2.3	2.8
3.50-3.00	1.8	4.5
3.00-2.50	1.8	6.3
2.50-2.00	6.6	12.9
2.00-1.50	7.5	20.3
1.50-1.00	17.8	38.1
1.00-0.50	44.0	82.1
0.50-0.00	17.9	100.0

D(AVE) 0.86 (UM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot # 3A-3
Sample #2

CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

91LD Resin Lot for NASA Lot# 3

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

91LD Resin Lot for NASA Lot# 3

		#3-1	#3-2	#3-3
1. Resin Solids, % PTM-7C		71.8	71.6	71.3
		71.4	71.8	72.3
		71.8	70.5	71.3
	AVG.	71.7	71.3	71.6
	Lot# 3 AVERAGE			71.5
2. Specific Gravity @ 25°C PTM-29C		1.129	1.131	1.128
	Lot# 3 AVERAGE			1.129
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C		1250	1375	1250
	Lot# 3 AVERAGE			1292
4. Gel Time, min:sec PTM-47B		3:40	3:38	3:33
	Lot# 3 AVERAGE			3:37

5. Atomic Absorption, ppm CTM-53B

	#3-1	#3-2	#3-3	LOT1 AVG
Na	8	14	14	12.0
K	0	0	0	0.0
Ca	5	5	5	5.0
Mg	1	1	1	1.0
Li	1	1	1	1.0
AVG.	15	21	21	19.0

6. Volatiles, Gas Chromatography CTM-55

See Charts 6A-6C

7. TGA, % Weight Loss at 500°C CTM-51 (AIR)	#3-1	#3-2	#3-3
	38.7	38.5	38.2
Lot# 3 AVERAGE			38.5

See Chart 7A-7C

8. DSC, temperature °C CTM-50A			
	178	183	185
Lot# 3 AVERAGE			182

See Chart 8A-8C

9. HPLC CTM-49A

See Chart 9A-9C

10. GPC, Average molecular wt. CTM-49A			
	1666	1751	1838
Lot# 3 AVERAGE			1752

See Chart 10A-10C

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

91LD Resin Lot for NASA Lot# 3

11. pH, units
CTM-1B

	#3-1	#3-2	#3-3
	8.5	8.5	8.55
	Lot# 3 AVERAGE		8.5

12. Phenol Content, %
CTM-55 Appendix 1

	12.22	11.92	11.72
	12.57	12.10	11.73
AVG.	12.39	12.01	11.72
	Lot# 3 AVERAGE		12.04

13. Chang's Index, ml.
CTM-5B

	24.8	24.6	25.2
	Lot# 3 AVERAGE		24.9

14. RDS, Minimum Viscosity, cps.
CTM-57A

	Min. Visc.	°C
#3-1	179	107
#3-2	212	115
#3-3	201	107
AVG.	197	110

See Charts 14A-14C

15. NMR
Vendor procedure

See Charts 15A-15C

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	G.D.B.	Date	12/10/86
Column		Detector	FID
Length	6ft.	Voltage	
Dia.	1/4 in.	Sensit.	
Liquid Phase	AT1000	Flow Rates, ml/min	
Wt. %	0.1	Hydrogen	60 Air 96
Support	GRAPHPAC	Scavenge	
Mesh	80/100	Split	
Carrier Gas	He	Temperature, °C	
Rotameter		Det.	220 Inj. 200
Inlet Press	60 psig	Column Initial	60
Rate	30 ml/min	Final	210
CHART SPEED		Rate	5°C/MIN
SAMPLE	9LD,3-1	Solvent	THF
Size	0.1 µl	Concn.	0.0994 gm/l

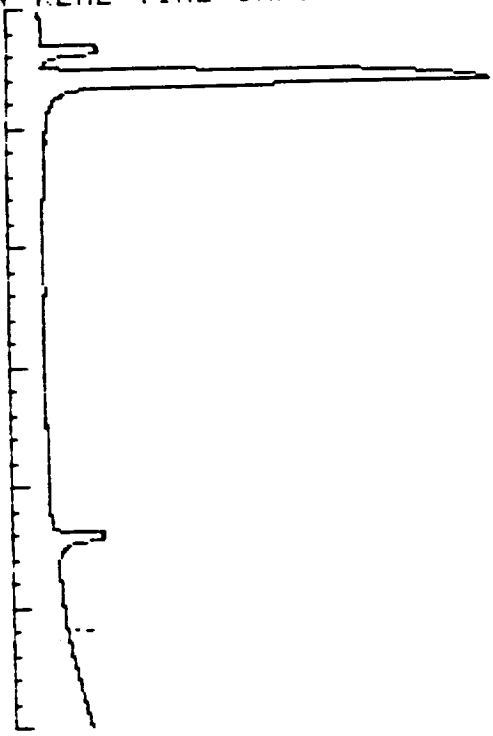
GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

STANDARD SOLVENT/MONOMER	RETENTION TIME (MINS.)
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: 91 LD 3-1
MISC.: C=0.09941 GMS/ML

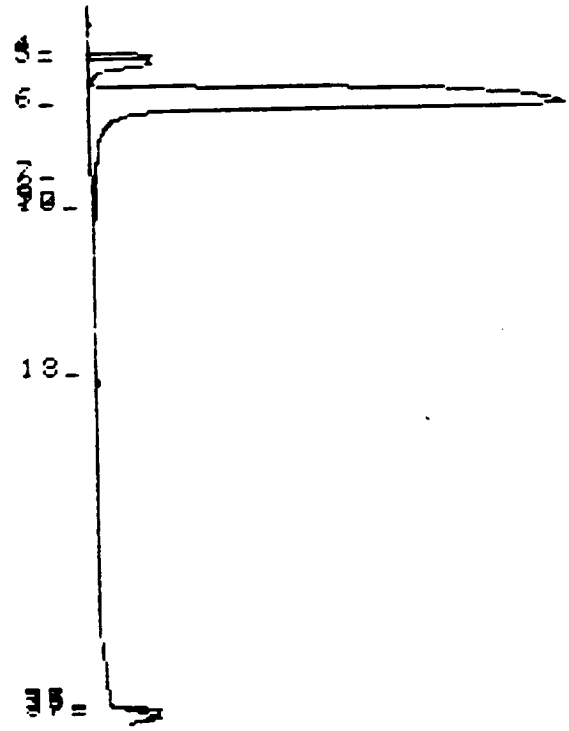
TIME: 17:40
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.63	3625	.091	1	433
4	1.63	115080	2.876	2	11211
5	1.88	215000	5.374	2	11219
6	3.33	3548900	88.707	3	86537
7	5.58	11738	.293	4	573
8	5.98	10483	.262	4	391
9	6.35	4501	.112	4	395
10	6.58	19617	.490	4	376
18	11.75	10886	.272	2	519
35	21.95	35525	.888	2	5295
36	22.08	12068	.302	2	1684
37	22.20	13296	.332	1	1675

TOTAL AREA= 4000718
THRESHOLD= 1
MIN PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR 1%



SAMPLE: 91 LD 3-1
MISC.: C=0.09941 GMS/ML

TIME: 17:40
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

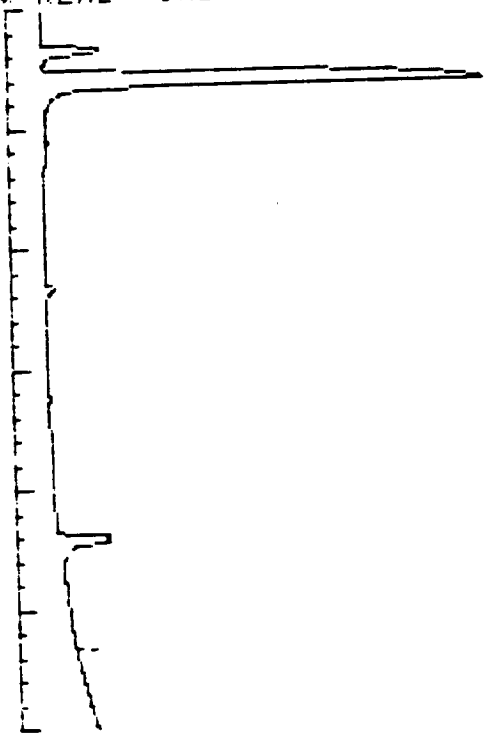
PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.63	115080	2.882	2	11211
5	1.88	215000	5.385	2	11219
6	3.33	3548900	88.887	3	86537
7	5.58	11738	.294	4	573
8	5.98	10483	.263	4	391
10	6.58	19617	.491	4	376
18	11.75	10886	.273	2	519
35	21.95	35525	.890	2	5295
36	22.08	12068	.302	2	1684
37	22.20	13296	.333	1	1675

TOTAL AREA= 3992593
THRESHOLD= 1
MIN PK.WIDTH= 15
AREA REJECT= 5000

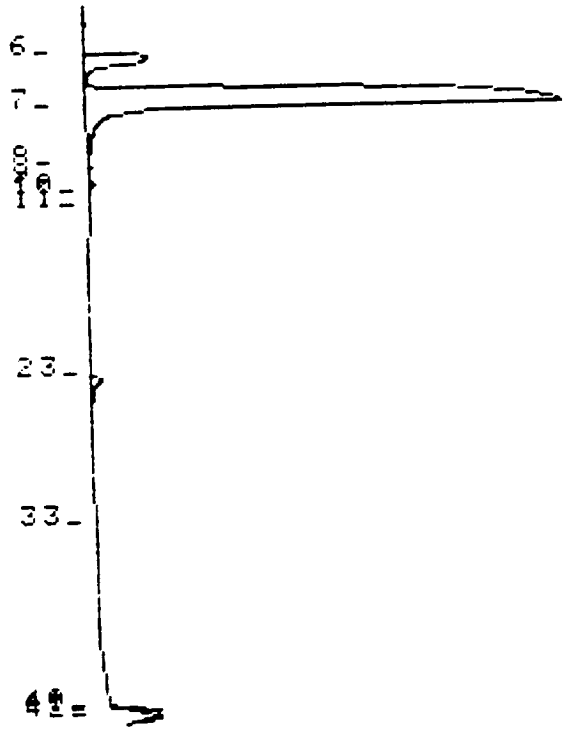
ORIGINAL PAGE IS
OF POOR QUALITY

CHART 6B

*** REAL TIME CHROMATOGRAM ***



VERTICAL SCALE FACTOR: 1X



FINAL FULL SCALE MV.=1000.00

SAMPLE: 91 LD 3-3
MISC.: C=0.10126 GMS/ML

TIME: 18:24
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
3	.63	1800	.053	1	276
6	1.70	250680	7.316	2	11092
7	3.30	3049400	88.991	3	84633
8	5.10	10194	.297	4	409
9	5.58	14229	.415	3	996
10	5.98	2416	.071	4	96
11	6.40	1369	.040	4	98
23	11.68	35297	1.030	3	1855
33	16.25	2731	.080	1	140
40	21.95	34535	1.008	2	5148
41	22.08	10786	.315	2	1570
42	22.20	13211	.386	1	1686

TOTAL AREA= 3426648
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

SAMPLE: 91 LD 3-3
MISC.: C=0.10126 GMS/ML

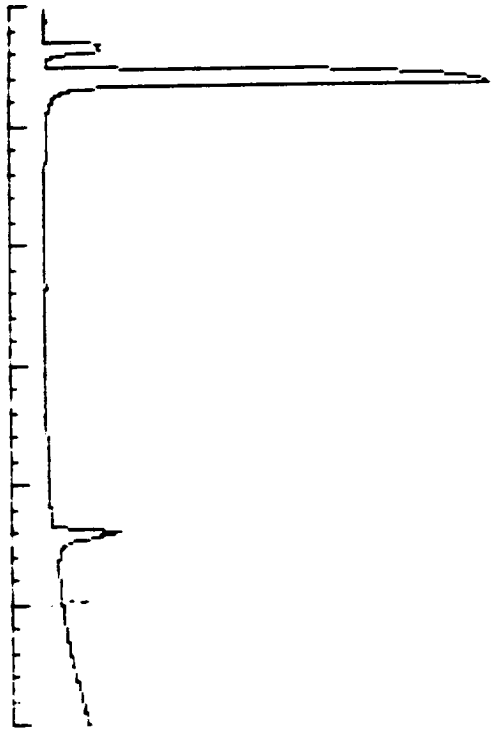
TIME: 18:24
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
6	1.70	250680	7.333	2	11092
7	3.30	3049400	89.207	3	84633
8	5.10	10194	.298	4	409
9	5.58	14229	.416	3	996
23	11.68	35297	1.033	3	1855
40	21.95	34535	1.010	2	5148
41	22.08	10786	.316	2	1570
42	22.20	13211	.386	1	1686

TOTAL AREA= 3418332
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 5000

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: 91 LD 3-3
MISC.: C=0.10052GMS/ML

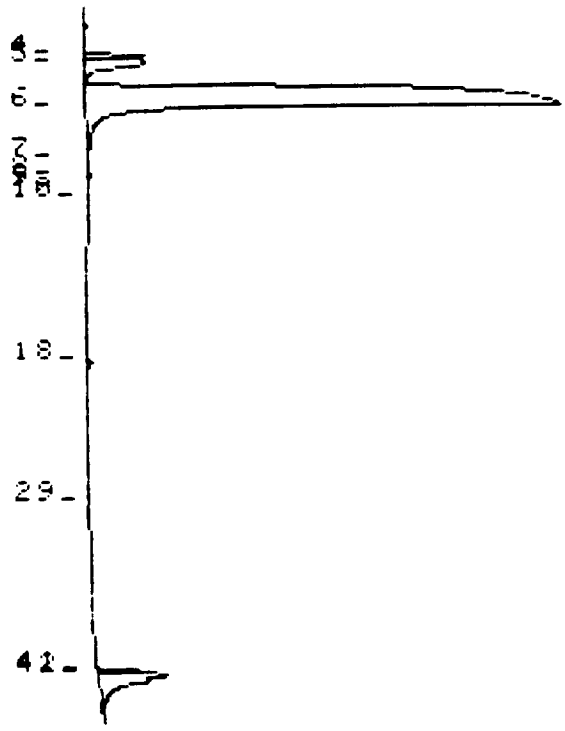
TIME: 19:08
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.63	5795	.135	2	579
4	1.63	77409	1.808	2	10929
5	1.90	241490	5.639	2	10997
6	3.40	3546900	82.826	3	85797
7	5.10	7286	.170	4	258
8	5.60	7111	.166	4	547
9	5.98	4081	.095	4	189
10	6.40	3260	.076	4	152
18	11.73	15339	.358	1	829
29	16.38	1188	.028	2	51
41	21.93	54630	1.276	2	9517
42	22.05	317880	7.423	3	12752

TOTAL AREA= 4282369
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR:1X



SAMPLE: 91 LD 3-3
MISC.: C=0.10052GMS/ML

TIME: 19:08
DATE: 12/10/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.63	77409	1.820	2	10929
5	1.90	241490	5.677	2	10997
6	3.40	3546900	83.385	3	85797
18	11.73	15339	.361	1	829
41	21.93	54630	1.284	2	9517
42	22.05	317880	7.473	3	12752

TOTAL AREA= 4253648
THRESHOLD= 1
MIN.PK.WIDTH= 15
AREA REJECT= 10000

Figure #4

Sample: 91-LD 71108/3-1
Size: 21.009 mg
Run No: MIR #13103 (I2)
Date: MAY/27/86 12:47

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #108
File No: D 6.DAT V2.1
Plotted: MAY/28/86 08:03

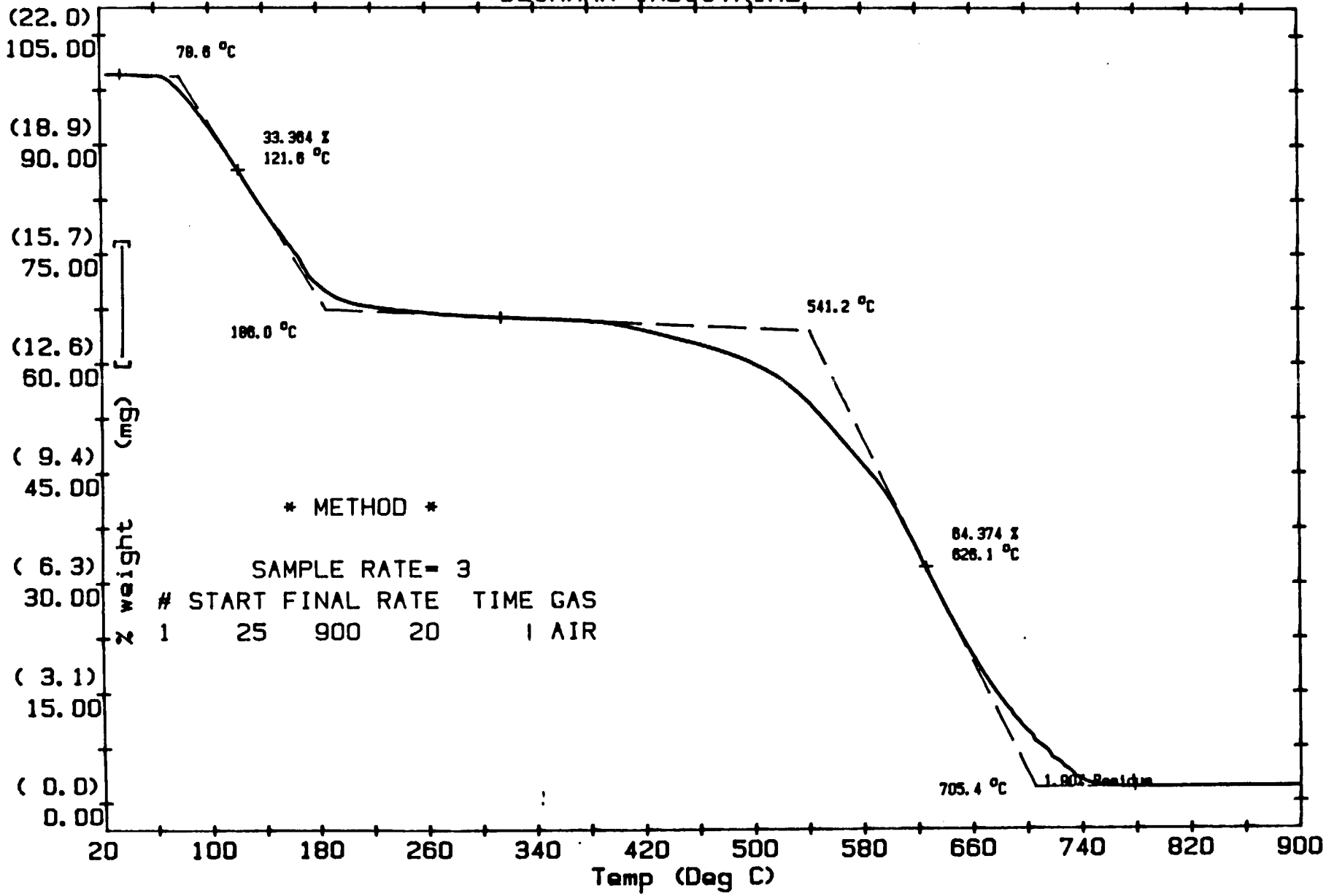


CHART 7A

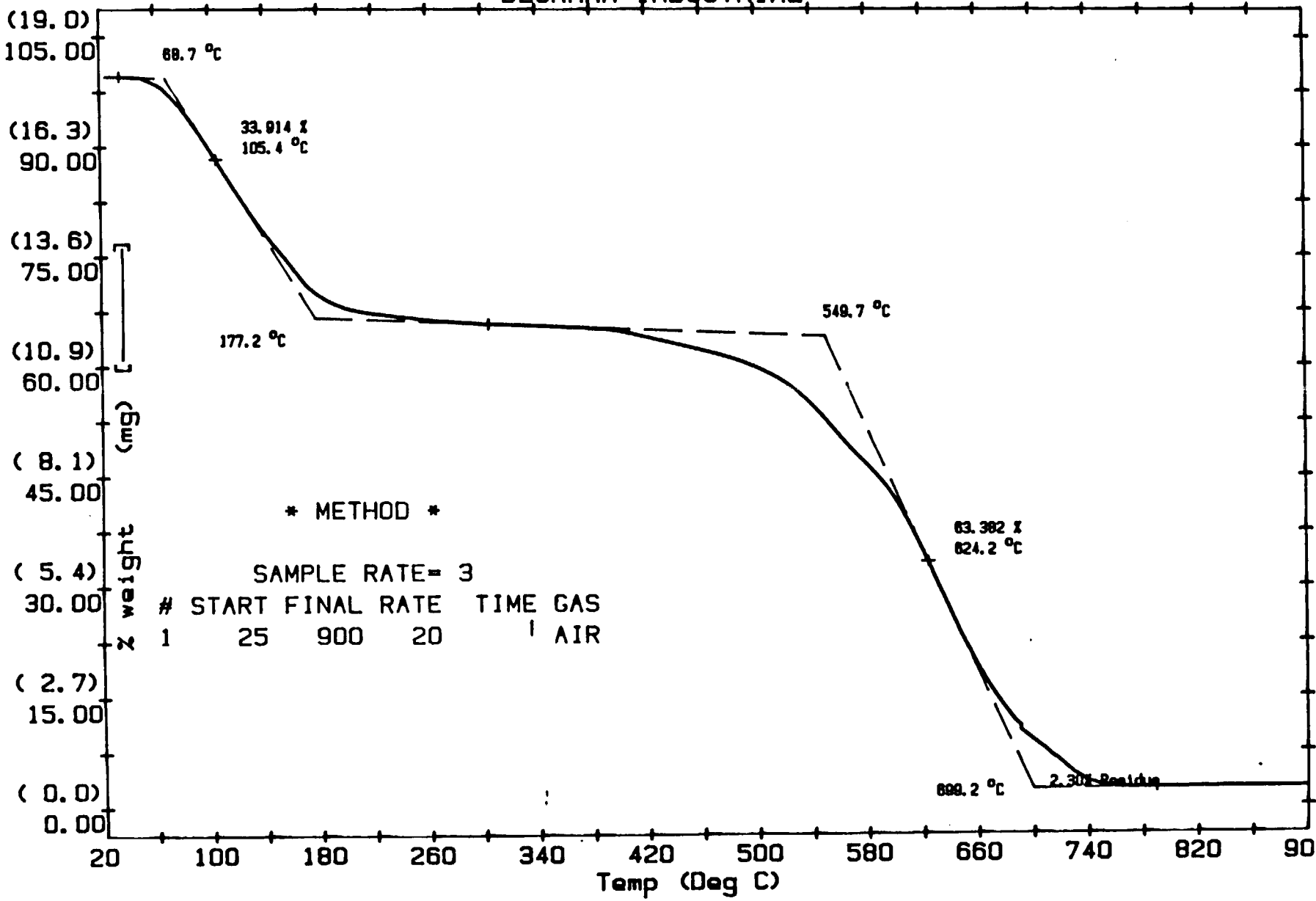
Figure 7

Sample: 91-LD 71108/3-2
Size: 18.179 mg
Run No: MIR #13103 (I2)
Date: MAY/27/86 14:00

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #108
File No: D 7.DAT V2.1
Plotted: MAY/28/86 08:11



Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

CHART 7B

Figure 6

Sample: 91-LD 71108/3-3
Size: 19.841 mg
Run No: MIR #13103 (I2)
Date: MAY/28/86 06:56

TGA

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #108
File No: D 8.DAT V2.1
Plotted: MAY/28/86 08:15

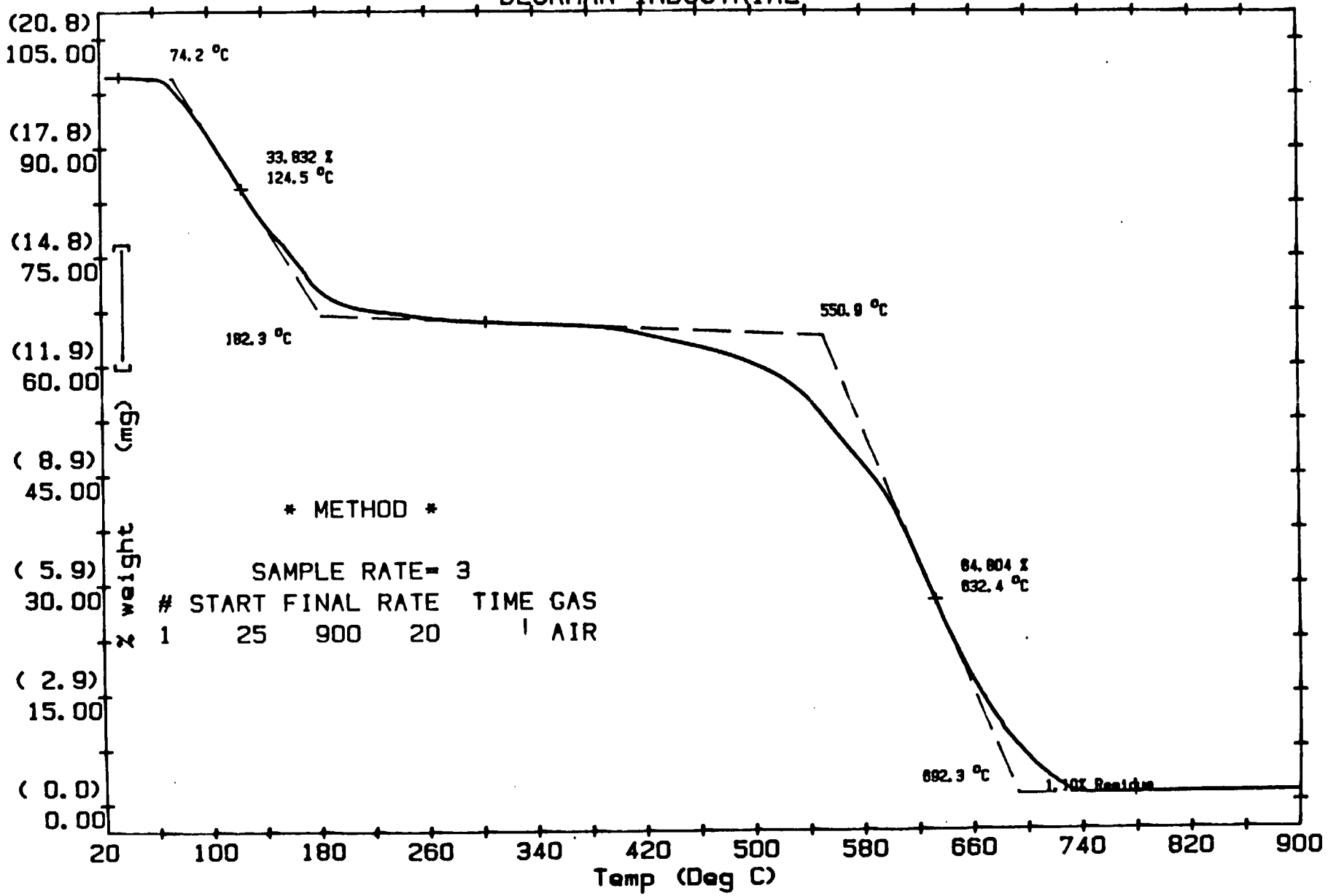


CHART 7C

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

CHART 8A

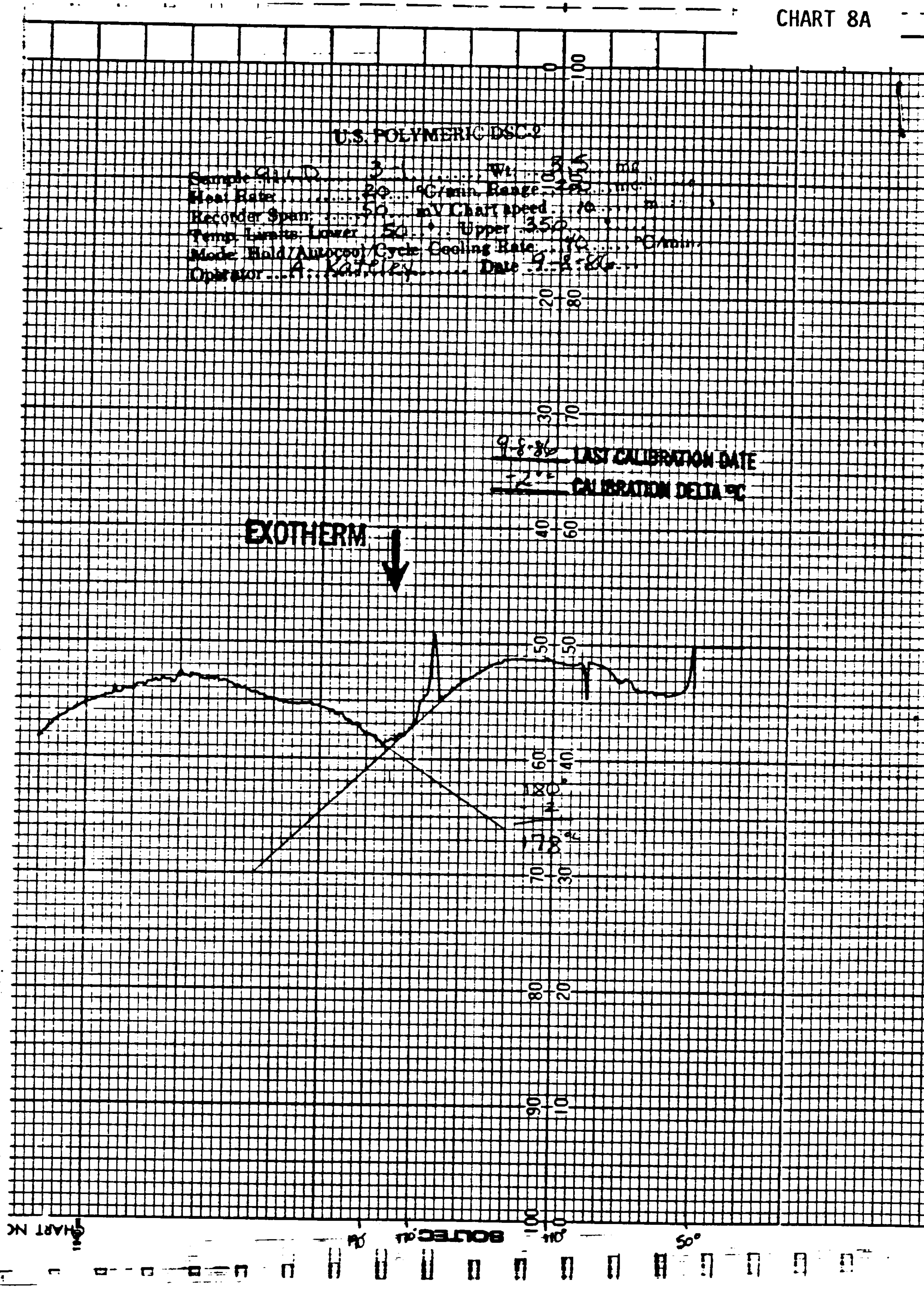


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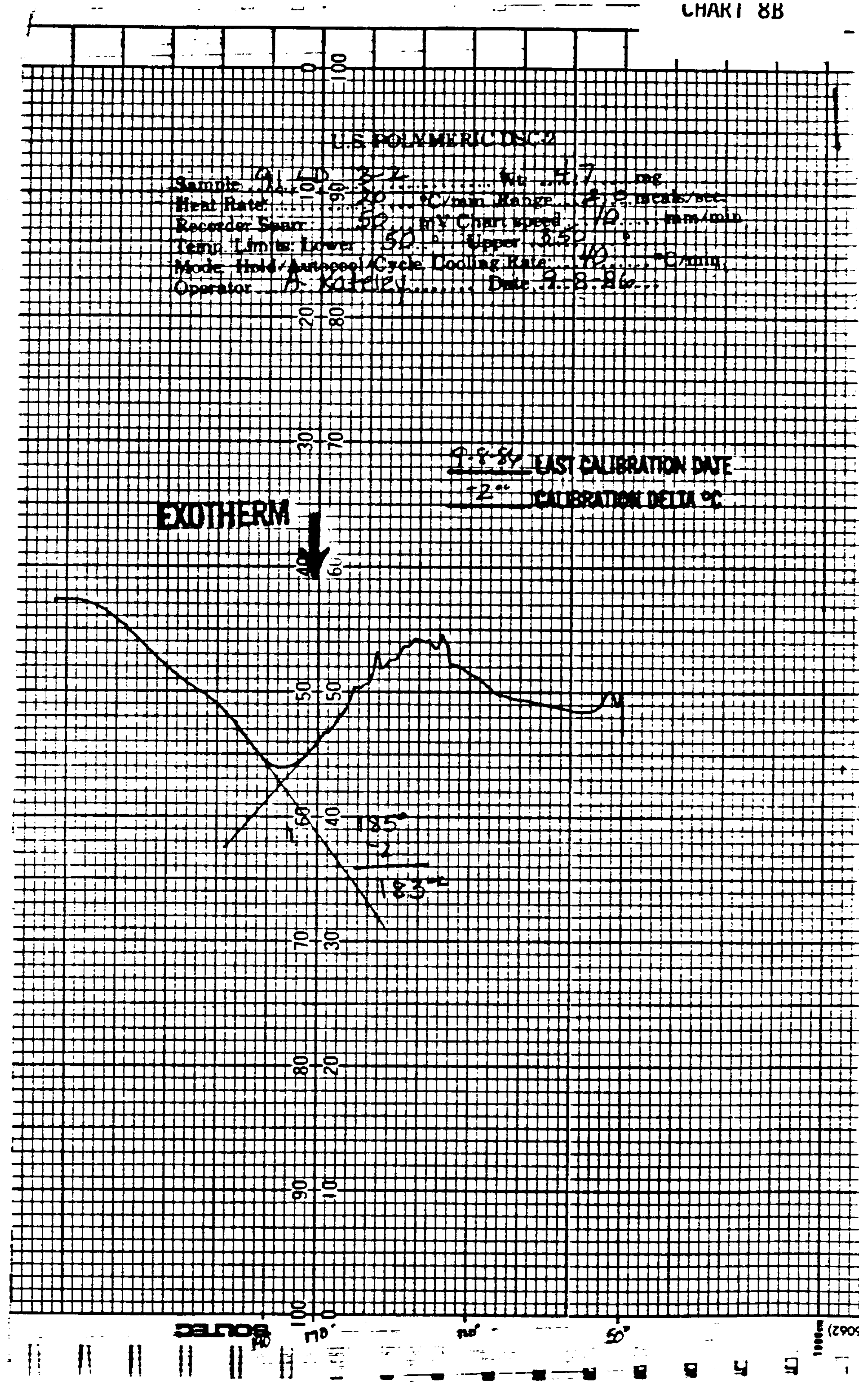
CHART 8B



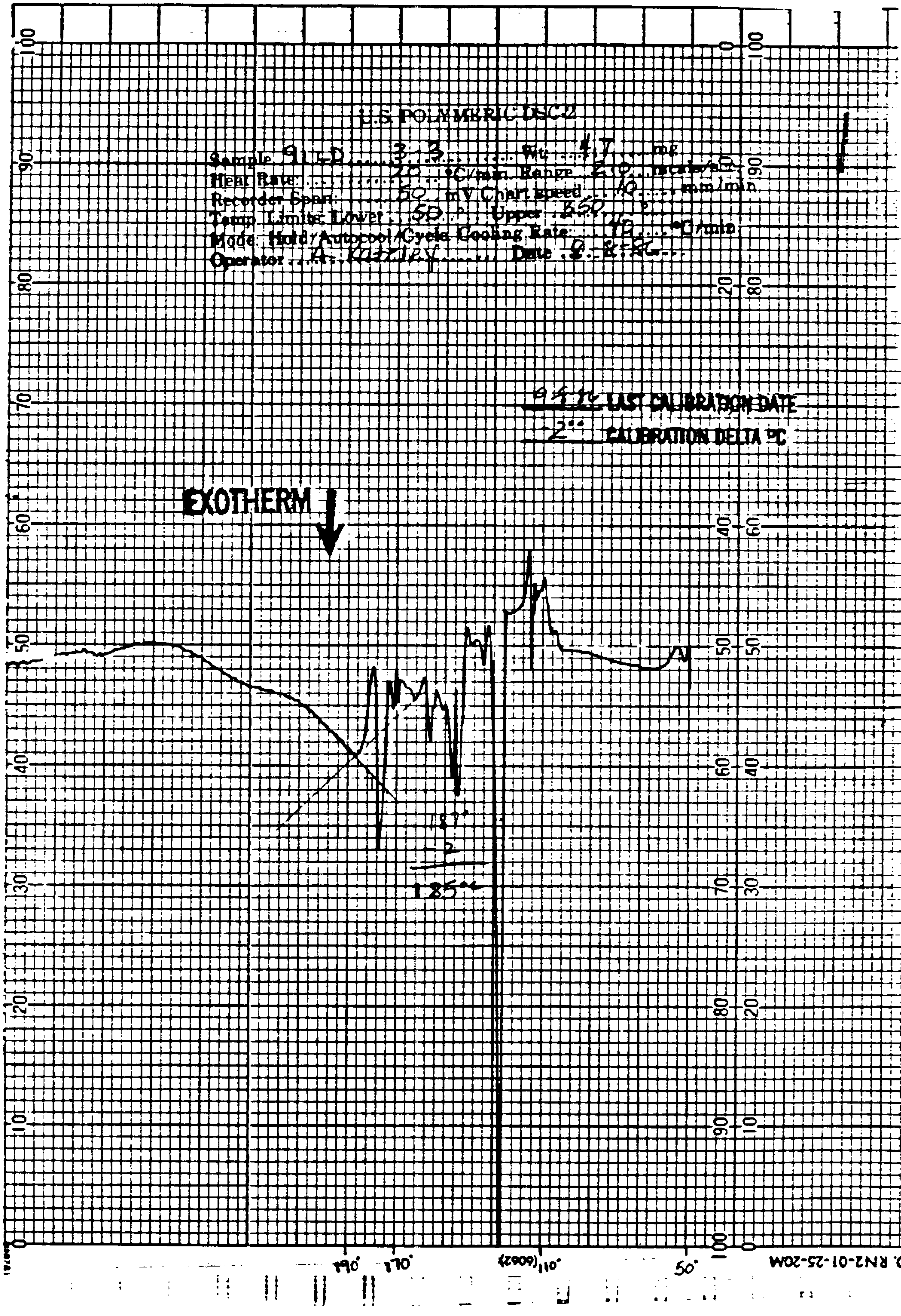

U.S. POLYMERIC DSC-2
Sample 91-D 3-3 Wt. 4.7 mg
Heat Rate 20 °C/min Range 2.0 mcal/sec
Recorder Span 50 mV Chart speed 10 mm/min
Temp. Limits: Lower 50 Upper 350
Mode: Hold/Autocool/Cycle Cooling Rate 40 °C/min
Operator Date
LAST CALIBRATION DATE
CALIBRATION DELTA °C
EXOTHERM
185
190° 170° 110° 50°

CHART 9A

ATA FILE A:PHEN036 HDR TAKEN 09-05-1986 15:49:05

******** AREA PERCENT REPORT ********

```
**********************************************************************
  ample Name: 91LD,3-1,C=6.76                Operator Initials: JGZ      *
  ate:  09-05-1986 15:49:05 Method:PHENOLIC  DATA FILE: A:PHEN036.PTS    *
 Interface: 4                 Cycle#:  36    Channel#: 0   Vial#: N.A.  *
 tarting Peak Width:  10      Threshold:  .01                           *
* ********************************************************************* *
  Instrument Type: BECKMAN HPLC          Column Type: MICROBONDAPAK C-18  *
             Solvent Description: THF/WATER, 2:1 BY WEIGHT               *
   Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN                       *
            Detector 0: 220NM/.5AU          Detector 1:                  *
     Misc. Information:  LENGTH=25                                       *
* ********************************************************************* *
t rting Delay:   0.00                      Ending Retention Time:   10.00
```

k lo	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.80	118498	73.6309	2	5085	100.000	23.3
	2.07	42437	26.3691	2	4223	35.813	10.1

Total Area: 160935 Area Reject: 1000 One sample per 1.000 sec.

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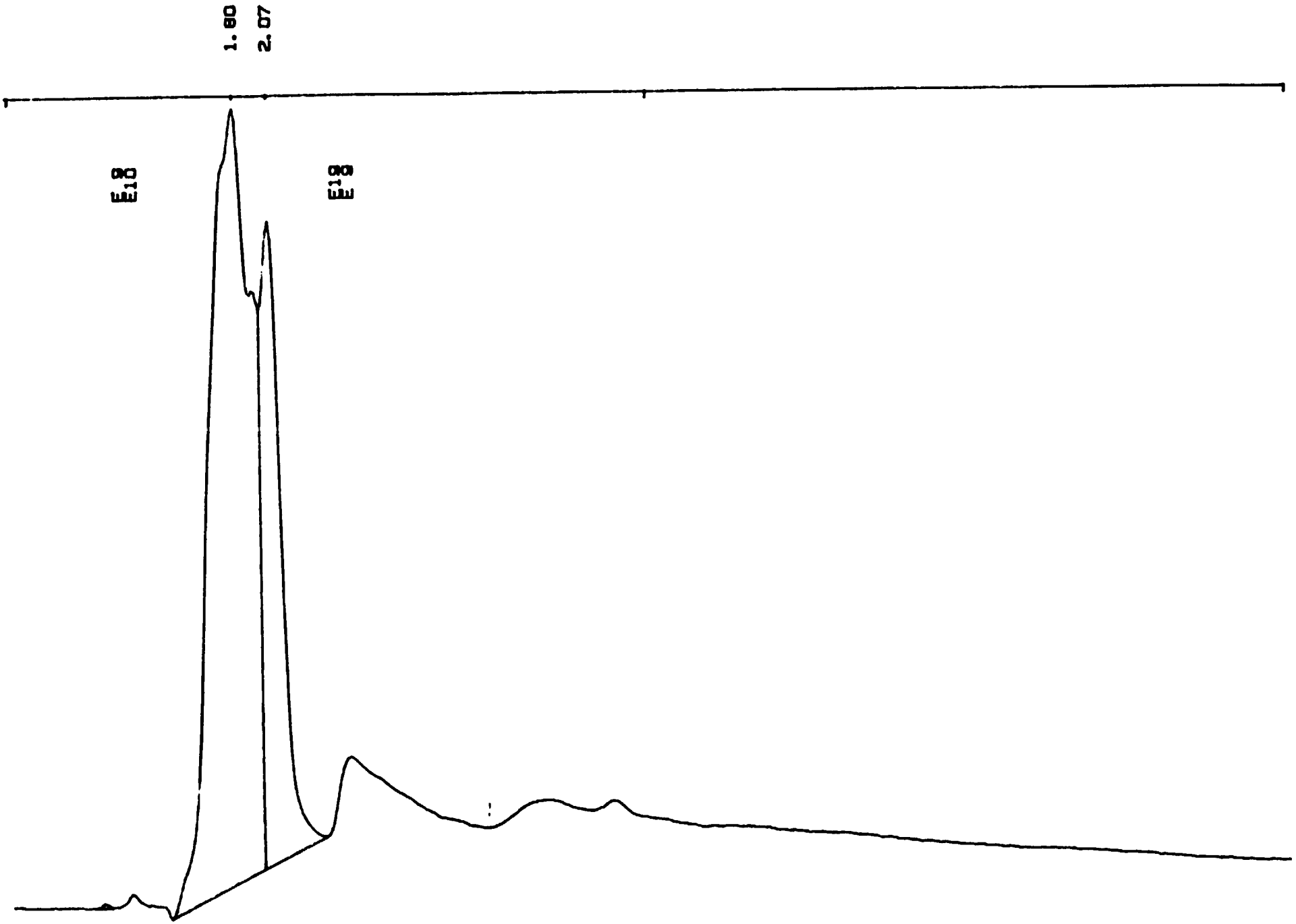
OF POOR QUALITY

DATA FILE=PHEN036 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.411 Mv. HIGH SCALE= 10.738 Mv.
81 LD. 3-1. C=6.76 MG/ML. 9/5/86. JGZ

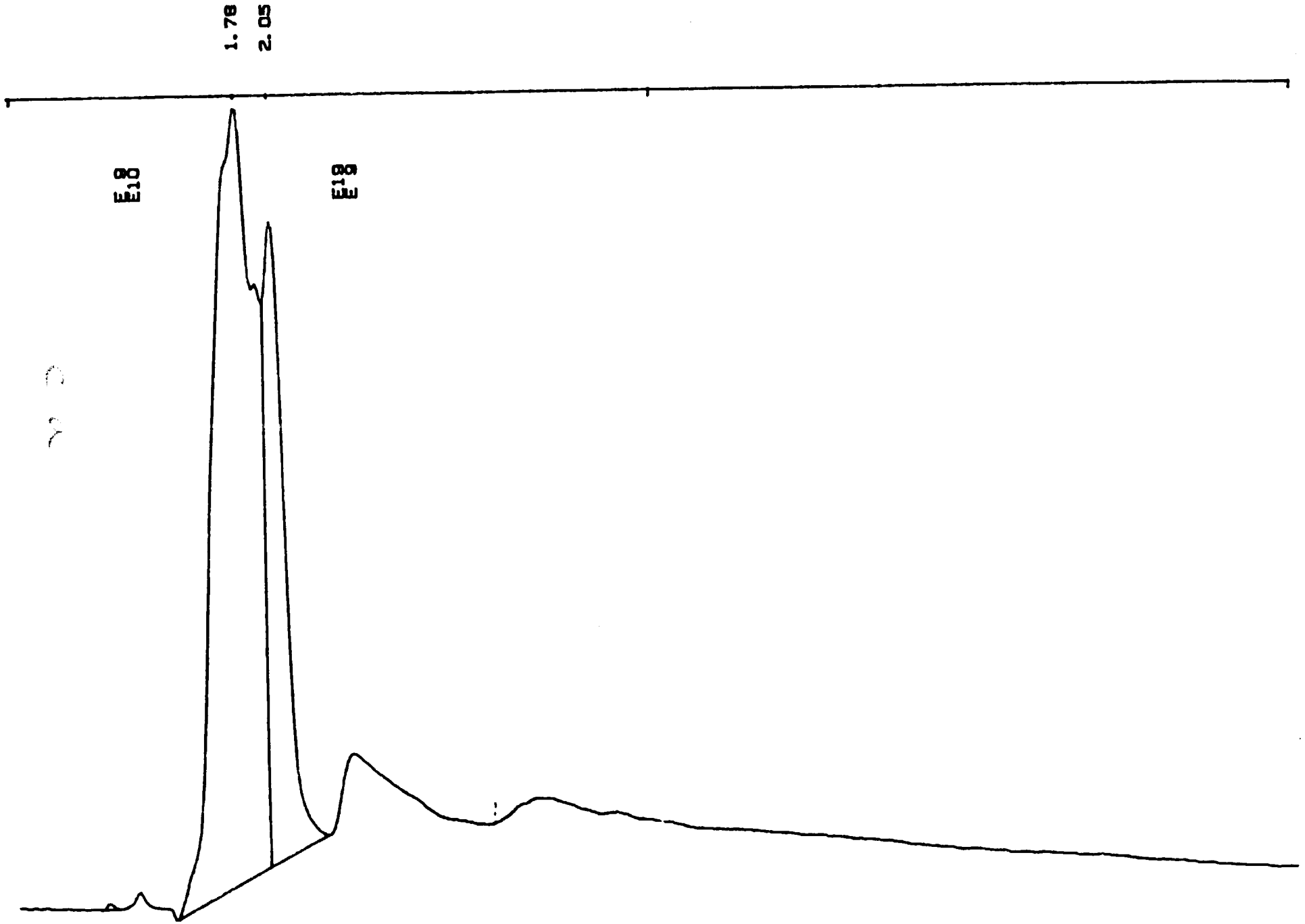


```
DATA FILE A:MB561.HDR TAKEN 09-05-1986 14:15:09
  A FILE A:PHENO35.HDR TAKEN 09-05-1986 15:28:08

 ********* AREA PERCENT REPORT *********

*************************************************************************
*                                           Operator Initials: JGZ      *
* Sample Name: 91LD,3-2,C=6.99                                          *
* Date:  09-05-1986 15:28:08 Method:PHENOLIC  DATA FILE: A:PHENO35.PTS  *
*  nterface: 4              Cycle#:  35       Channel#: 0   Vial#: N.A. *
* Starting Peak Width:  10  Threshold:  .01                             *
*************************************************************************
*  Instrument Type: BECKMAN HPLC       Column Type: MICROBONDAPAK C-18  *
*            Solvent Description: THF/WATER, 2:1 BY WEIGHT              *
*   Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN                     *
*            Detector 0: 220NM/.5AU          Detector 1:                *
*     Misc. Information:  LENGTH=25                                     *
*************************************************************************
Starting Delay:    0.00                  Ending Retention Time:    10.00
```

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.78	117907	74.0922	2	5029	100.000	23.4
3	2.05	41228	25.9078	2	4167	34.967	9.9

T :al Area: 159135 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN035 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.378 Mv. HIGH SCALE= 10.654 Mv.
91 LD. 3-2. C=6.99 MG/ML. 9/5/86. JGZ



ATA FILE A:PHEN034.HDR TAKEN 09-05-1986 15:07:23

******** AREA PERCENT REPORT ********

Sample Name: 91LD,3-3,C=6.67 — Operator Initials: JGZ
Date: 09-05-1986 15:07:23 Method:PHENOLIC — DATA FILE: A:PHEN034.PTS
Interface: 4 — Cycle#: 34 — Channel#: 0 — Vial#: N.A.
Starting Peak Width: 10 — Threshold: .01

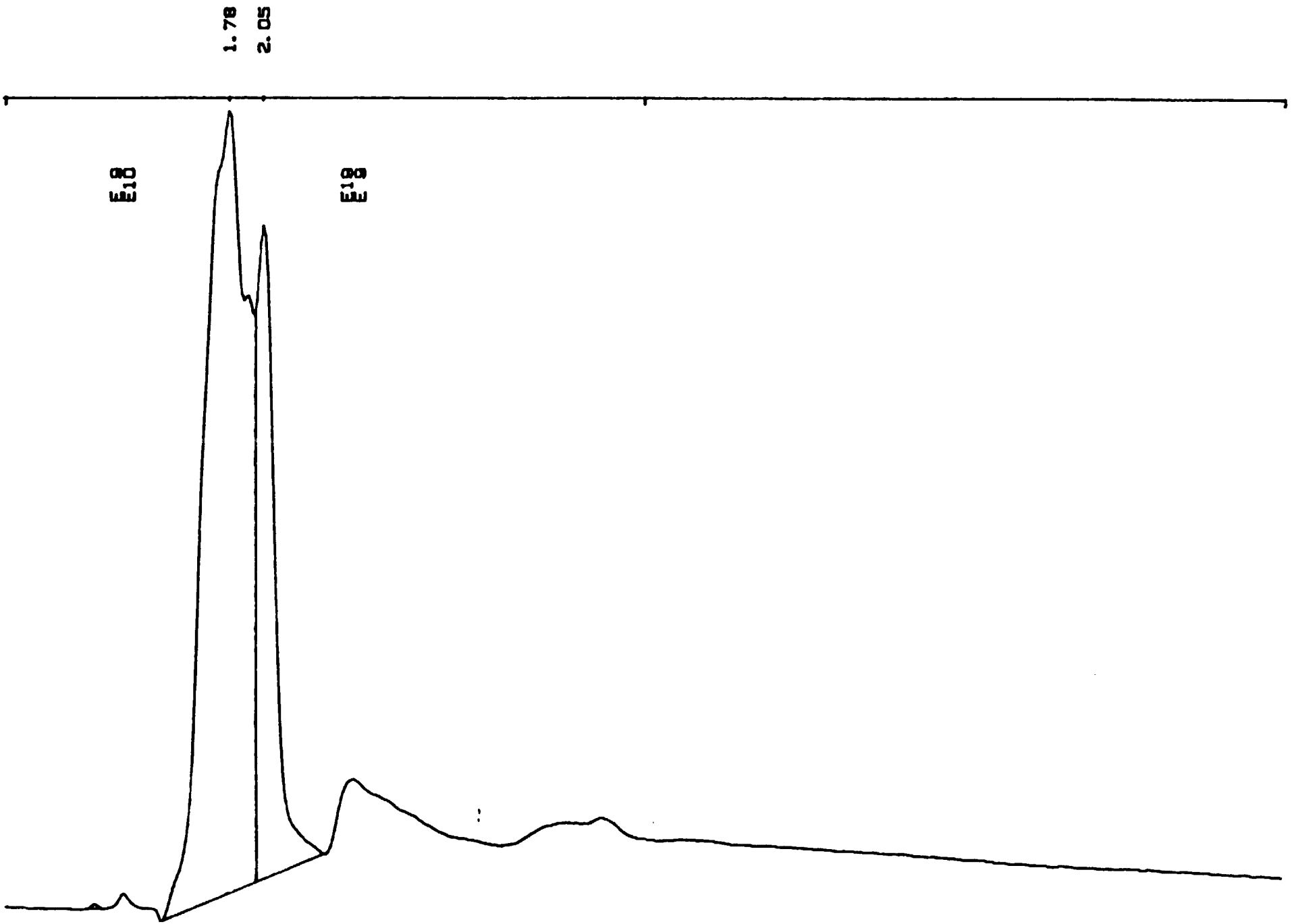
Instrument Type: BECKMAN HPLC — Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU — Detector 1:
Misc. Information: LENGTH=25

Starting Delay: 0.00 — Ending Retention Time: 10.00

Pk No	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
	1.78	118569	73.0817	2	5139	100.000	23.1
	2.05	43673	26.9184	2	4294	36.833	10.2

Total Area: 162242 — Area Reject: 1000 — One sample per 1.000 sec.

DATA FILE=PHEN034 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.410 Mv. HIGH SCALE= 10.735 Mv.
91 LD, 3-3, C=6.67 MG/ML, 8/5/86, JGZ



*** Calibration Data ***
Calibration Name:
Misc Information:

Fit Type: 3
Log Mol Wt = A + Bx + Cx^2 + Dx^3
A= 2.538977 B= 2.115815 C= -.5646824 D= 3.606432E-02
Coefficient of Determination: 0.9902

Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857

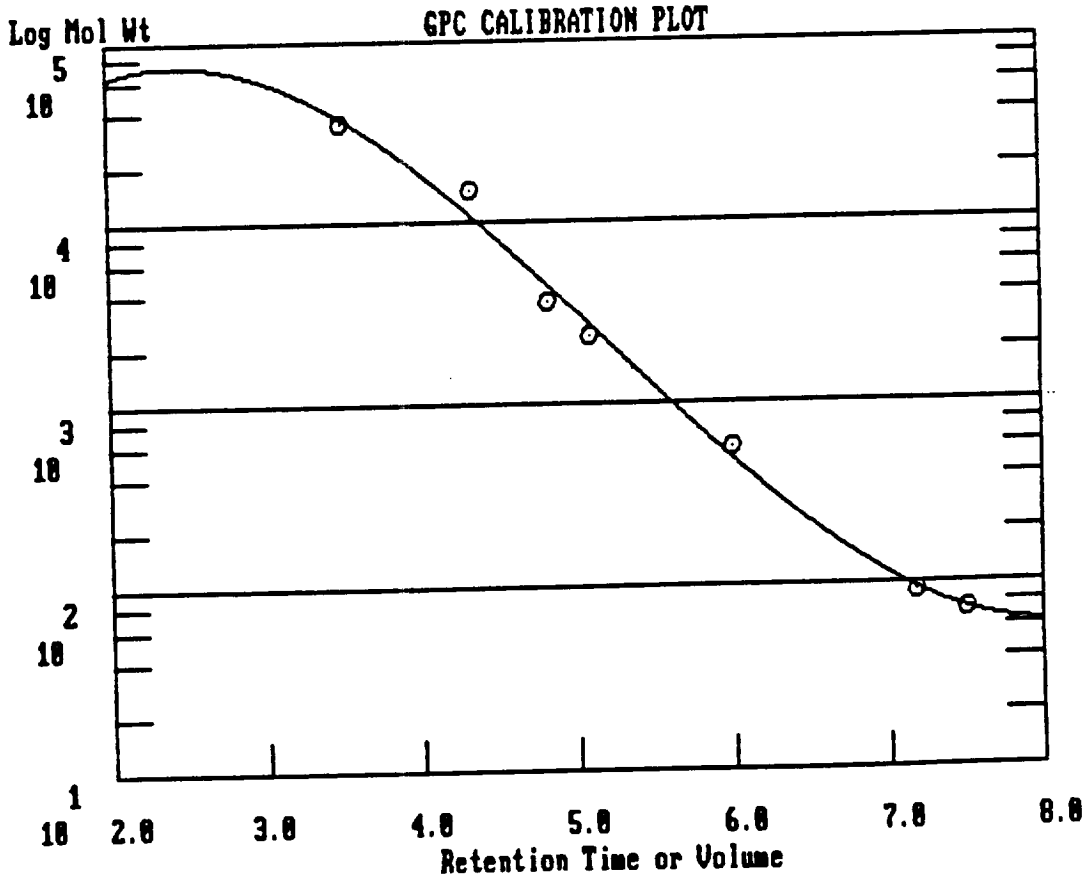


CHART 10A

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T^ FILE B:GPC21 .HDR TAKEN 08-05-1986 17:26:22

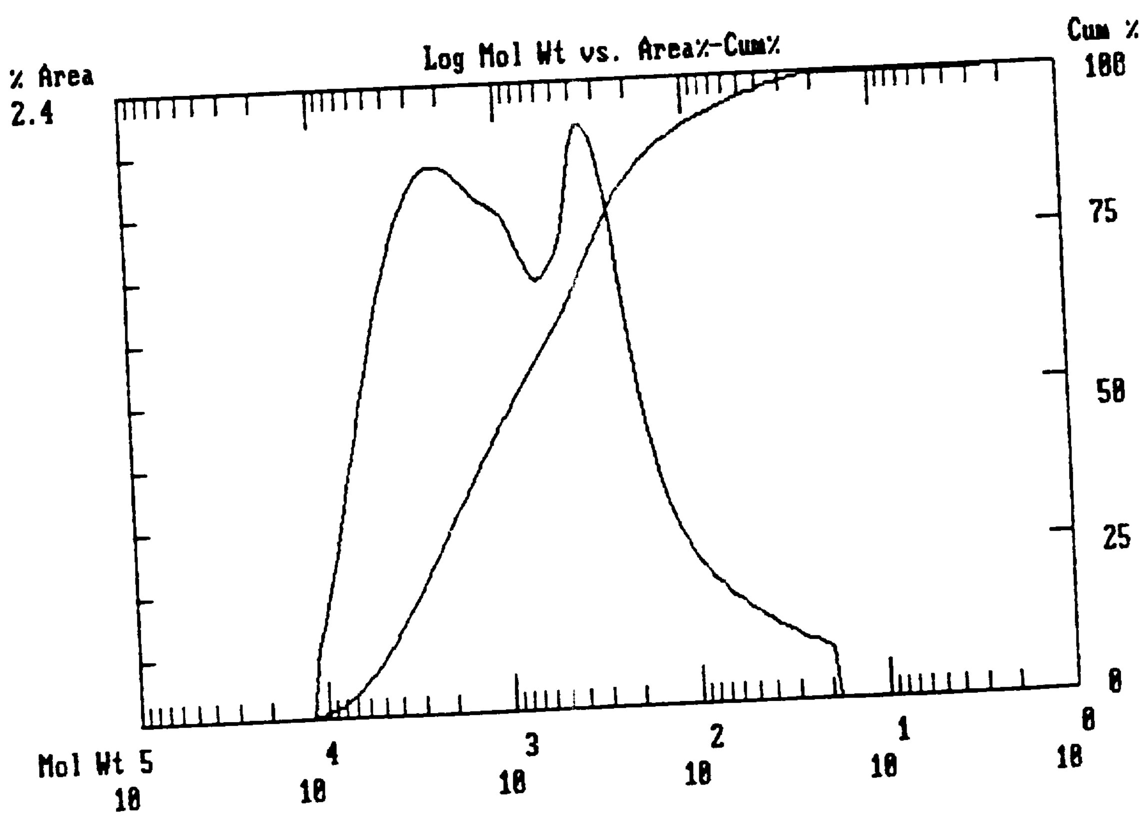
********* GPC REPORT *********

S mple Name: 91LD 3-1 C=2.68
Date: 08-05-1986 11:42:15 Method:
I terface: 5 Cycle#: 21
S arting Peak Width: 60 Threshold: 0

Operator Initials: GBF
DATA FILE: B:GPC21 .FTS
Channel#: 0 Vial#: N.A.

Instrument Type: HPLC/BECKMAN
Column Type: ULTRASTYRAGEL 500A
Solvent Description: THF
Operating Conditions: T=35C FLOWRATE=2.0ML/MIN
Detector 0: 254NM/.1AU
Detector 1:
Misc. Information: CALIBRATION/GPC

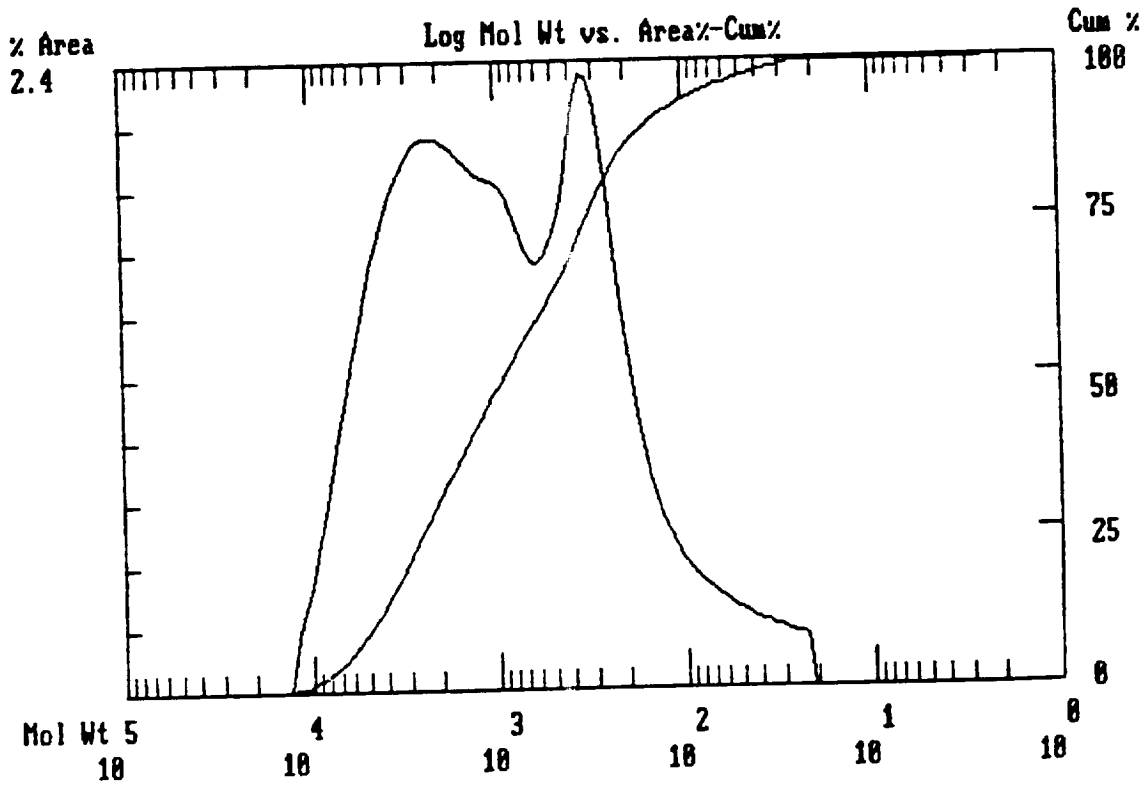
tarting Delay: 0.00
Ending Retention Time: 10.00
al bration file: GPCPHEN
ol ecular Weight Distribution Averages
aseline TIMES: 3.85 to 10.00 MW: 22295 to 2
rocess TIMES: 3.85 to 10.00 MW: 22295 to 2
o al Area: 256218
w 1666
n= 284
w Mn= 5.8652
z 4056
v= 1451



A^A FILE B:GPC23 .HDR TAKEN 08-05-1986 17:31:38

******** GPC REPORT ********

```
* ********************************************************************************
 Sample Name: 91LD 3-2 C=2.68                  Operator Initials: GBF          *
 Date:  08-05-1986 12:14:53 Method:            DATA FILE: B:GPC23   .FTS    *
  nterface: 5                 Cycle#:  23      Channel#: 0    Vial#: N.A.    *
 Starting Peak Width:  60     Threshold:  0                                  *
********************************************************************************
  Instrument Type: HPLC/BECKMAN              Column Type: ULTRASTYRAGEL 500A    *
              Solvent Description: THF                                        *
    Operating Conditions: T=35C FLOWRATE=2.0ML/MIN                            *
            Detector 0: 254NM/.1AU          Detector 1:                       *
      Misc. Information: CALIBRATION/GPC                                      *
* ********************************************************************************
Starting Delay:    0.00                      Ending Retention Time:    10.00
Ca ibration file: GPCPHEN
Mc ecular Weight Distribution Averages
Baseline TIMES:    3.85 to    10.00   MW:      22295 to          2
Process TIMES:     3.85 to    10.00   MW:      22295 to          2
Tc al Area:       251238
Mw=                 1751
Mn=                  322
Mv  Mn=           5.4277
Mz                  4258
Mv=                 1527
```



T/ FILE B:GPC24 .HDR TAKEN 08-05-1986 17:34:48

******** GPC REPORT ********

****

Sample Name: 91LD 3-3 C=2.68	Operator Initials: GBF
Date: 08-05-1986 12:29:38 Method:	DATA FILE: B:GPC24 .PTS
Cycle#: 24	Channel#: 0 Vial#: N.A.
Interface: 5	
Starting Peak Width: 60 Threshold: 0	

****

Instrument Type: HPLC/BECKMAN
Column Type: ULTRASTYRAGEL 500A
Solvent Description: THF
Operating Conditions: T=35C FLOWRATE=2.0ML/MIN
Detector 0: 254NM/.1AU
Detector 1:
Misc. Information: CALIBRATION/GPC

****

Ending Retention Time: 10.00
Starting Delay: 0.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages

Baseline TIMES:	3.85 to	10.00	MW:	22295 to	2
Process TIMES:	3.85 to	10.00	MW:	22295 to	2

Total Area: 243393
Mw= 1838
Mn= 369
Mw/Mn= 4.9751
Mz= 4370
Mv= 1608

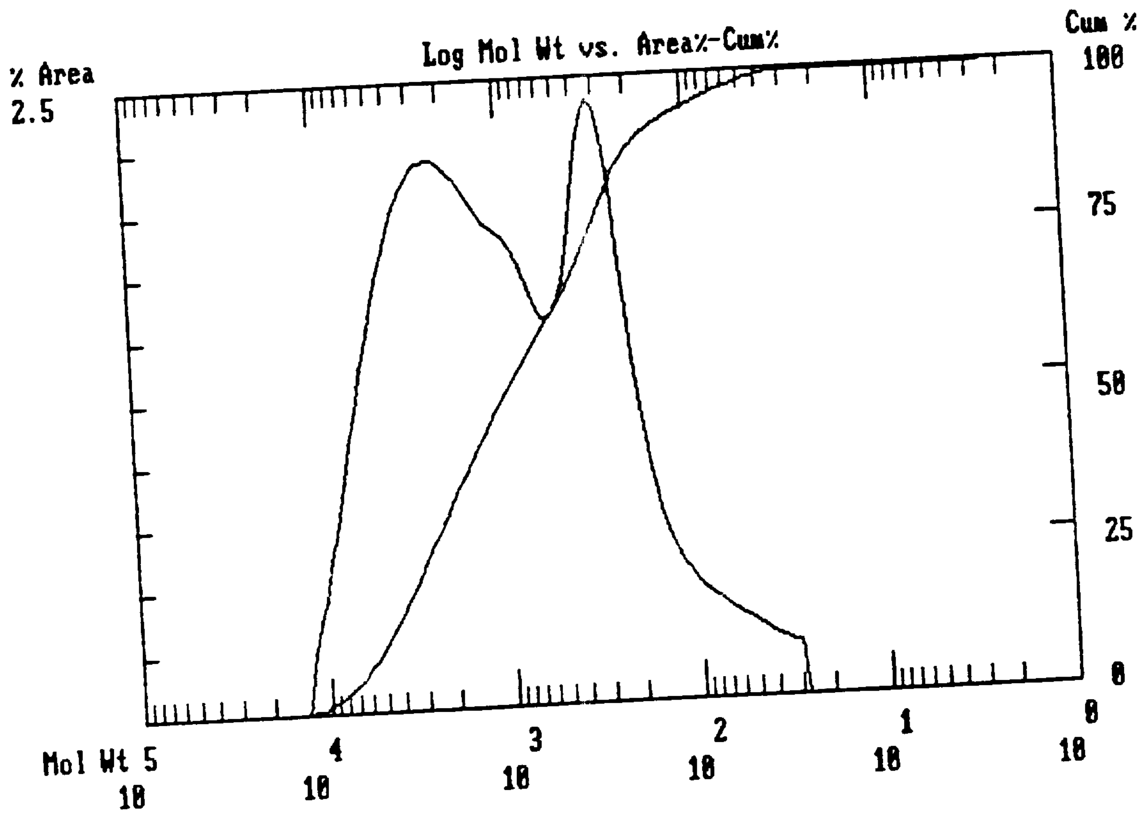
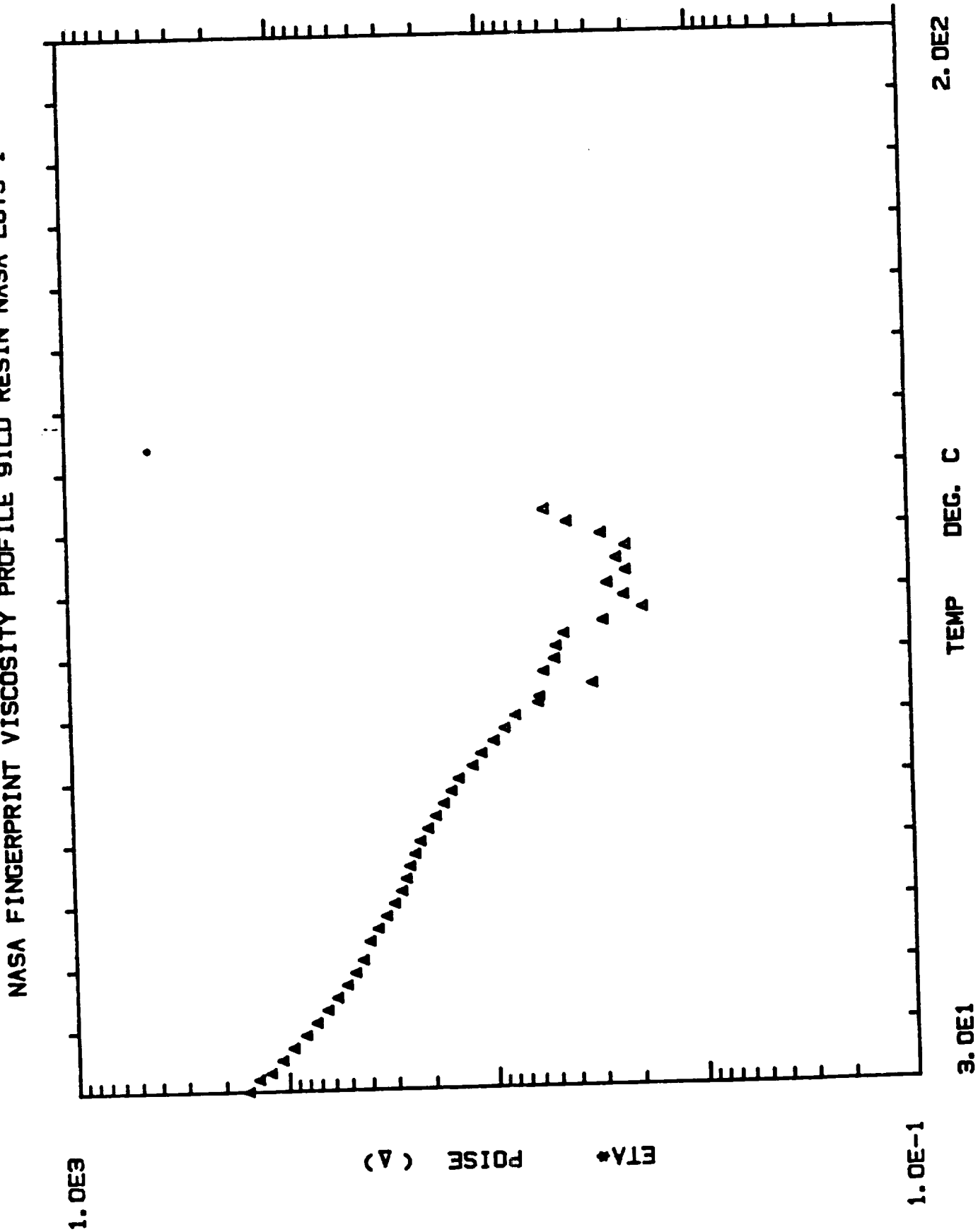


CHART 14A


NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT3-1
1.0E3
ETA* POISE (A)
1.0E-1
3.0E1
TEMP DEG. C
2.0E2

Rheometrics RECAP II

Experiment No. : 15 Sample No. = 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE WILD RESIN NASA 1013-1

Operator :CP

Date and Time : Wednesday, August 20, 1986 - 10:16:33

Operating Mode : DYNAMIC

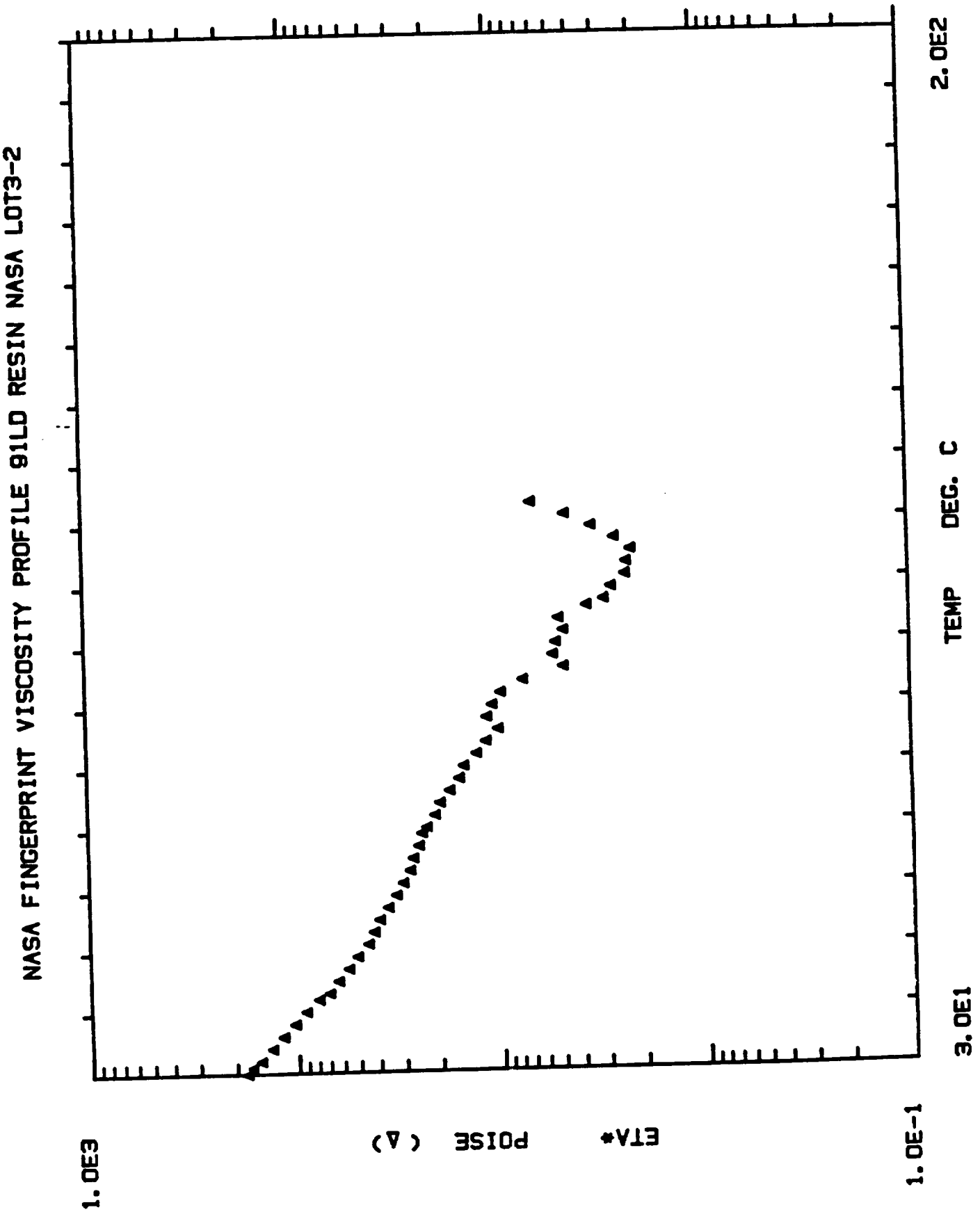
Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

Notes :
STRAIN =50%
FREQUENCY =10RAD/SEC

ASR FINGERPRINT VISCOSITY PROFILE FILE NAME:

NI	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.807e+002	1.753e+002	4.413e+001	2.264e+001	2.000e-001	2.700e+001
	1.686e+002	1.639e+002	3.980e+001	2.113e+001	1.000e+000	2.800e+001
3	1.529e+002	1.483e+002	3.713e+001	1.914e+001	2.000e+000	3.000e+001
4	1.359e+002	1.312e+002	3.551e+001	1.703e+001	3.000e+000	3.200e+001
5	1.190e+002	1.141e+002	3.386e+001	1.491e+001	4.000e+000	3.300e+001
6	1.048e+002	9.925e+001	3.352e+001	1.312e+001	5.000e+000	3.500e+001
7	9.230e+001	8.629e+001	3.275e+001	1.157e+001	6.000e+000	3.700e+001
8	8.016e+001	7.380e+001	3.130e+001	1.004e+001	7.000e+000	3.900e+001
9	7.122e+001	6.450e+001	3.020e+001	8.925e+000	8.000e+000	4.100e+001
10	6.291e+001	5.591e+001	2.886e+001	7.886e+000	9.000e+000	4.300e+001
11	5.630e+001	4.901e+001	2.771e+001	7.050e+000	1.000e+001	4.500e+001
12	5.041e+001	4.273e+001	2.675e+001	6.322e+000	1.100e+001	4.700e+001
13	4.588e+001	3.772e+001	2.612e+001	5.749e+000	1.200e+001	4.900e+001
14	4.195e+001	3.351e+001	2.524e+001	5.259e+000	1.300e+001	5.100e+001
15	3.873e+001	2.998e+001	2.453e+001	4.851e+000	1.400e+001	5.400e+001
16	3.532e+001	2.682e+001	2.299e+001	4.427e+000	1.500e+001	5.600e+001
17	3.208e+001	2.447e+001	2.075e+001	4.018e+000	1.600e+001	5.800e+001
18	2.935e+001	2.238e+001	1.898e+001	3.678e+000	1.700e+001	6.000e+001
19	2.697e+001	2.103e+001	1.689e+001	3.377e+000	1.800e+001	6.200e+001
20	2.559e+001	2.033e+001	1.554e+001	3.206e+000	1.900e+001	6.400e+001
21	2.449e+001	1.996e+001	1.420e+001	3.066e+000	2.000e+001	6.600e+001
22	2.308e+001	1.940e+001	1.250e+001	2.892e+000	2.100e+001	6.800e+001
23	2.176e+001	1.895e+001	1.070e+001	2.725e+000	2.200e+001	7.000e+001
24	1.990e+001	1.809e+001	8.286e+000	2.495e+000	2.300e+001	7.200e+001
25	1.822e+001	1.684e+001	6.946e+000	2.282e+000	2.400e+001	7.400e+001
26	1.667e+001	1.564e+001	5.770e+000	2.090e+000	2.500e+001	7.600e+001
27	1.525e+001	1.438e+001	5.067e+000	1.912e+000	2.600e+001	7.800e+001
28	1.407e+001	1.344e+001	4.138e+000	1.765e+000	2.700e+001	8.000e+001
29	1.203e+001	1.150e+001	3.531e+000	1.510e+000	2.800e+001	8.200e+001
30	1.090e+001	1.050e+001	2.956e+000	1.368e+000	2.900e+001	8.400e+001
31	9.522e+000	9.150e+000	2.635e+000	1.195e+000	3.000e+001	8.600e+001
32	8.399e+000	8.037e+000	2.438e+000	1.053e+000	3.100e+001	8.800e+001
33	7.470e+000	7.220e+000	1.916e+000	9.374e-001	3.200e+001	9.000e+001
34	5.769e+000	5.583e+000	1.451e+000	7.239e-001	3.300e+001	9.200e+001
35	5.678e+000	5.498e+000	1.418e+000	7.128e-001	3.400e+001	9.300e+001
36	3.158e+000	3.134e+000	3.857e-001	3.962e-001	3.500e+001	9.500e+001
37	5.398e+000	5.333e+000	8.347e-001	6.773e-001	3.600e+001	9.700e+001
38	4.775e+000	4.669e+000	9.992e-001	5.985e-001	3.700e+001	9.900e+001
39	4.679e+000	4.642e+000	5.860e-001	5.865e-001	3.800e+001	1.010e+002
40	4.276e+000	4.182e+000	8.925e-001	5.366e-001	3.900e+001	1.030e+002
41	2.767e+000	2.754e+000	2.753e-001	3.472e-001	4.000e+001	1.050e+002
42	1.787e+000	1.631e+000	7.296e-001	2.244e-001	4.100e+001	1.070e+002
43	2.198e+000	2.135e+000	5.214e-001	2.759e-001	4.200e+001	1.090e+002
44	2.635e+000	2.620e+000	2.782e-001	3.309e-001	4.300e+001	1.110e+002
45	2.138e+000	2.138e+000	5.196e-002	2.683e-001	4.400e+001	1.130e+002
46	2.367e+000	2.254e+000	7.212e-001	2.970e-001	4.500e+001	1.150e+002
47	2.131e+000	2.032e+000	6.398e-001	2.675e-001	4.600e+001	1.170e+002
48	2.789e+000	2.539e+000	1.154e+000	3.499e-001	4.700e+001	1.190e+002
49	4.053e+000	3.849e+000	1.271e+000	5.086e-001	4.800e+001	1.210e+002
50	5.206e+000	4.692e+000	2.255e+000	6.526e-001	4.900e+001	1.230e+002


NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT3-2
ETA* POISE (A)
1.0E3
1.0E-1
TEMP DEG. C
2.0E2
3.0E1

Rheometrics RECAP II

periment No. : 16 Sample No. : 1

SA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT3-2

er tor :CP

e and Time : Wednesday, August 20, 1986 11:46:31

er ting Mode : DYNAMIC

ee Type : CURE

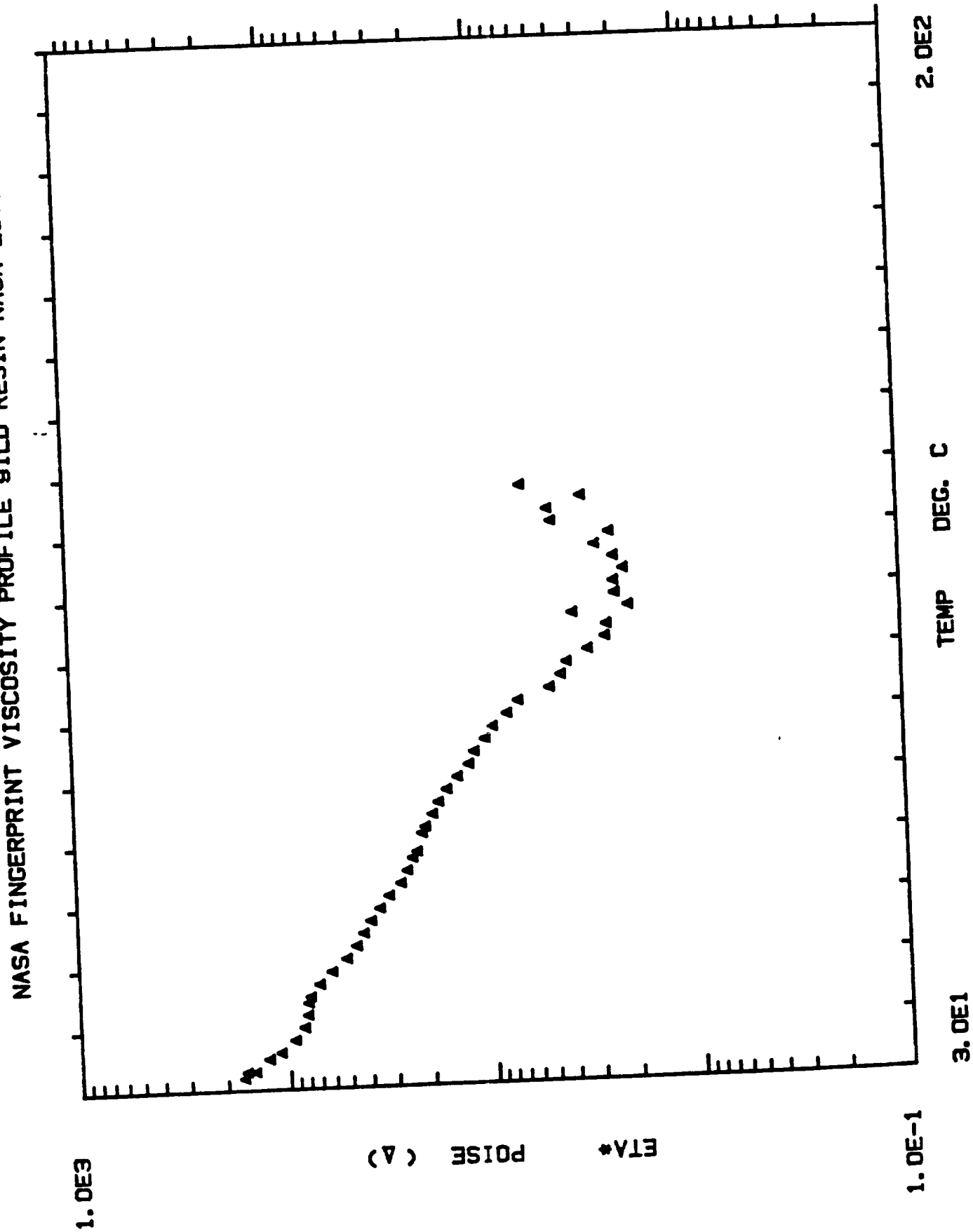
ometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

e :
RA N =50%
EQUENCY =10RAD/SEC

NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LDT3-2

No.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	1.750e+002	1.698e+002	4.214e+001	2.197e+001	2.000e-001	3.000e+001
2	1.643e+002	1.595e+002	3.929e+001	2.063e+001	1.000e+000	3.100e+001
3	1.486e+002	1.439e+002	3.709e+001	1.864e+001	2.000e+000	3.200e+001
4	1.307e+002	1.261e+002	3.441e+001	1.639e+001	3.000e+000	3.400e+001
5	1.152e+002	1.101e+002	3.403e+001	1.447e+001	4.000e+000	3.600e+001
6	1.008e+002	9.513e+001	3.343e+001	1.264e+001	5.000e+000	3.800e+001
7	8.867e+001	8.240e+001	3.277e+001	1.113e+001	6.000e+000	4.000e+001
8	7.711e+001	7.047e+001	3.130e+001	9.671e+000	7.000e+000	4.200e+001
9	6.830e+001	6.112e+001	3.048e+001	8.565e+000	8.000e+000	4.300e+001
10	6.164e+001	5.408e+001	2.958e+001	7.734e+000	9.000e+000	4.500e+001
11	5.460e+001	4.642e+001	2.875e+001	6.846e+000	1.000e+001	4.700e+001
12	4.943e+001	4.103e+001	2.755e+001	6.199e+000	1.100e+001	4.900e+001
13	4.357e+001	3.486e+001	2.613e+001	5.462e+000	1.200e+001	5.100e+001
14	4.084e+001	3.195e+001	2.543e+001	5.120e+000	1.300e+001	5.300e+001
15	3.825e+001	2.922e+001	2.468e+001	4.795e+000	1.400e+001	5.500e+001
16	3.460e+001	2.609e+001	2.272e+001	4.340e+000	1.500e+001	5.700e+001
17	3.154e+001	2.377e+001	2.072e+001	3.951e+000	1.600e+001	5.900e+001
18	2.914e+001	2.206e+001	1.904e+001	3.651e+000	1.700e+001	6.100e+001
19	2.687e+001	2.077e+001	1.705e+001	3.369e+000	1.800e+001	6.300e+001
20	2.587e+001	2.040e+001	1.591e+001	3.241e+000	1.900e+001	6.500e+001
21	2.422e+001	1.963e+001	1.419e+001	3.037e+000	2.000e+001	6.700e+001
22	2.338e+001	1.943e+001	1.300e+001	2.930e+000	2.100e+001	6.900e+001
23	2.207e+001	1.895e+001	1.130e+001	2.767e+000	2.200e+001	7.000e+001
24	2.007e+001	1.755e+001	9.736e+000	2.515e+000	2.300e+001	7.200e+001
25	1.897e+001	1.690e+001	8.606e+000	2.380e+000	2.400e+001	7.400e+001
26	1.696e+001	1.557e+001	6.724e+000	2.127e+000	2.500e+001	7.600e+001
27	1.521e+001	1.426e+001	5.293e+000	1.910e+000	2.600e+001	7.800e+001
28	1.444e+001	1.344e+001	5.284e+000	1.812e+000	2.700e+001	8.000e+001
29	1.248e+001	1.173e+001	4.278e+000	1.567e+000	2.800e+001	8.200e+001
30	1.118e+001	1.063e+001	3.477e+000	1.404e+000	2.900e+001	8.400e+001
31	9.738e+000	9.302e+000	2.879e+000	1.222e+000	3.000e+001	8.600e+001
32	1.107e+001	1.070e+001	2.823e+000	1.390e+000	3.100e+001	8.800e+001
33	1.038e+001	9.901e+000	3.117e+000	1.302e+000	3.200e+001	9.000e+001
34	9.424e+000	9.087e+000	2.495e+000	1.183e+000	3.300e+001	9.200e+001
35	7.320e+000	7.208e+000	1.276e+000	9.191e-001	3.400e+001	9.400e+001
36	4.630e+000	4.559e+000	8.080e-001	5.807e-001	3.500e+001	9.600e+001
37	5.220e+000	5.203e+000	4.206e-001	6.553e-001	3.600e+001	9.800e+001
38	5.032e+000	4.930e+000	1.008e+000	6.311e-001	3.700e+001	1.000e+002
39	4.606e+000	4.484e+000	1.052e+000	5.779e-001	3.800e+001	1.020e+002
40	4.843e+000	4.770e+000	8.349e-001	6.074e-001	3.900e+001	1.040e+002
41	3.510e+000	3.502e+000	2.337e-001	4.402e-001	4.000e+001	1.060e+002
42	2.902e+000	2.853e+000	5.302e-001	3.638e-001	4.100e+001	1.070e+002
43	2.663e+000	2.543e+000	7.924e-001	3.339e-001	4.200e+001	1.090e+002
44	2.271e+000	2.147e+000	7.413e-001	2.845e-001	4.300e+001	1.110e+002
45	2.235e+000	1.835e+000	1.276e+000	2.801e-001	4.400e+001	1.130e+002
46	2.124e+000	1.383e+000	1.612e+000	2.659e-001	4.500e+001	1.150e+002
47	2.549e+000	2.370e+000	9.395e-001	3.196e-001	4.600e+001	1.170e+002
48	3.300e+000	2.833e+000	1.691e+000	4.142e-001	4.700e+001	1.190e+002
49	4.442e+000	3.945e+000	2.042e+000	5.573e-001	4.800e+001	1.210e+002
50	6.473e+000	6.061e+000	2.272e+000	8.129e-001	4.900e+001	1.230e+002

CHART 14C


NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT3-3
1.0E3
ETA* POISE (A)
1.0E-1
3.0E1
TEMP DEG. C
2.0E2

Rheometrics RECAP II

Experiment No. : 17 Sample No. : 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT3-3

Operator : CP

Date and Time : Wednesday, August 20, 1986 - 13:21:49

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

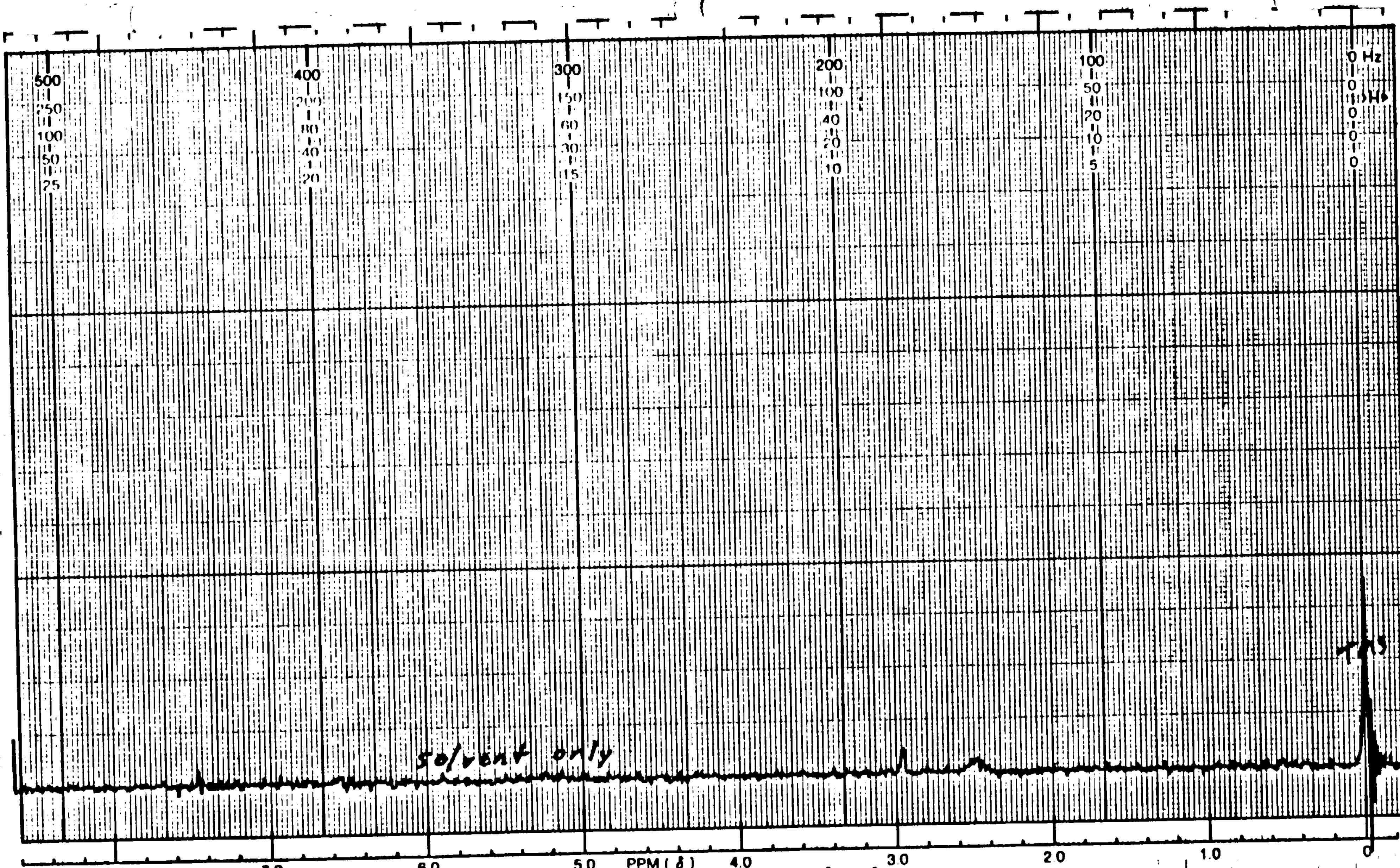
Notes :
STRAIN =50%
FREQUENCY =10 RAD/SEC

NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LDI3-3

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
	1.618e+002	1.588e+002	3.110e+001	2.033e+001	2.000e-001	3.300e+001
	1.672e+002	1.637e+002	3.380e+001	2.100e+001	1.000e+000	3.200e+001
3	1.478e+002	1.458e+002	2.440e+001	1.857e+001	2.000e+000	3.300e+001
	1.265e+002	1.252e+002	1.824e+001	1.588e+001	3.000e+000	3.500e+001
	1.105e+002	1.093e+002	1.647e+001	1.387e+001	4.000e+000	3.600e+001
6	9.431e+001	9.323e+001	1.425e+001	1.184e+001	5.000e+000	3.800e+001
7	8.468e+001	8.322e+001	1.570e+001	1.064e+001	6.000e+000	4.000e+001
8	8.108e+001	7.853e+001	2.018e+001	1.018e+001	7.000e+000	4.200e+001
9	8.018e+001	7.575e+001	2.628e+001	1.007e+001	8.000e+000	4.400e+001
10	7.819e+001	7.228e+001	2.982e+001	9.816e+000	9.000e+000	4.500e+001
1	7.045e+001	6.338e+001	3.078e+001	8.848e+000	1.000e+001	4.700e+001
2	6.104e+001	5.332e+001	2.971e+001	7.662e+000	1.100e+001	4.900e+001
13	5.157e+001	4.361e+001	2.754e+001	6.478e+000	1.200e+001	5.100e+001
4	4.594e+001	3.814e+001	2.560e+001	5.765e+000	1.300e+001	5.300e+001
5	4.231e+001	3.447e+001	2.452e+001	5.313e+000	1.400e+001	5.500e+001
16	3.889e+001	3.108e+001	2.337e+001	4.881e+000	1.500e+001	5.700e+001
17	3.506e+001	2.743e+001	2.184e+001	4.402e+000	1.600e+001	5.900e+001
8	3.154e+001	2.471e+001	1.959e+001	3.962e+000	1.700e+001	6.100e+001
19	2.753e+001	2.178e+001	1.684e+001	3.456e+000	1.800e+001	6.300e+001
20	2.550e+001	2.072e+001	1.486e+001	3.202e+000	1.900e+001	6.500e+001
1	2.394e+001	1.982e+001	1.343e+001	3.004e+000	2.000e+001	6.700e+001
2	2.274e+001	1.967e+001	1.140e+001	2.854e+000	2.100e+001	6.800e+001
23	2.140e+001	1.848e+001	1.078e+001	2.685e+000	2.200e+001	7.100e+001
4	2.057e+001	1.829e+001	9.422e+000	2.582e+000	2.300e+001	7.200e+001
5	1.891e+001	1.726e+001	7.724e+000	2.376e+000	2.400e+001	7.400e+001
26	1.763e+001	1.628e+001	6.775e+000	2.214e+000	2.500e+001	7.600e+001
7	1.601e+001	1.509e+001	5.365e+000	2.012e+000	2.600e+001	7.800e+001
8	1.417e+001	1.331e+001	4.871e+000	1.779e+000	2.700e+001	8.000e+001
29	1.245e+001	1.186e+001	3.806e+000	1.564e+000	2.800e+001	8.200e+001
30	1.168e+001	1.117e+001	3.399e+000	1.465e+000	2.900e+001	8.400e+001
1	1.032e+001	9.922e+000	2.823e+000	1.296e+000	3.000e+001	8.600e+001
2	9.434e+000	9.276e+000	1.721e+000	1.186e+000	3.100e+001	8.800e+001
33	7.995e+000	7.814e+000	1.691e+000	1.005e+000	3.200e+001	9.000e+001
4	7.045e+000	6.916e+000	1.343e+000	8.844e-001	3.300e+001	9.200e+001
5	4.942e+000	4.887e+000	7.392e-001	6.199e-001	3.400e+001	9.400e+001
36	4.341e+000	4.251e+000	8.808e-001	5.449e-001	3.500e+001	9.600e+001
37	4.037e+000	3.885e+000	1.096e+000	5.067e-001	3.600e+001	9.800e+001
8	3.181e+000	3.043e+000	9.275e-001	3.996e-001	3.700e+001	1.000e+002
9	2.623e+000	2.571e+000	5.188e-001	3.294e-001	3.800e+001	1.020e+002
40	2.561e+000	2.467e+000	6.893e-001	3.219e-001	3.900e+001	1.040e+002
1	3.734e+000	3.647e+000	8.011e-001	4.688e-001	4.000e+001	1.060e+002
2	2.005e+000	1.778e+000	9.256e-001	2.518e-001	4.100e+001	1.070e+002
43	2.323e+000	2.209e+000	7.162e-001	2.921e-001	4.200e+001	1.090e+002
44	2.343e+000	2.251e+000	6.491e-001	2.945e-001	4.300e+001	1.110e+002
5	2.096e+000	1.745e+000	1.162e+000	2.636e-001	4.400e+001	1.130e+002
46	2.325e+000	2.206e+000	7.362e-001	2.922e-001	4.500e+001	1.150e+002
47	2.853e+000	2.674e+000	9.930e-001	3.586e-001	4.600e+001	1.170e+002
8	2.416e+000	2.105e+000	1.185e+000	3.035e-001	4.700e+001	1.190e+002
9	4.607e+000	4.346e+000	1.530e+000	5.792e-001	4.800e+001	1.210e+002
50	4.769e+000	4.631e+000	1.139e+000	5.993e-001	4.900e+001	1.230e+002

IASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN NASA LOT3-3

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
	3.263e+000	3.117e+000	9.647e-001	4.097e-001	5.000e+001	1.250e+002
52	6.407e+000	5.688e+000	2.950e+000	8.050e-001	5.100e+001	1.270e+002



SOLVENT ONLY SCAN

MANUAL

SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: —
SPINNING RATE (RPS): 30

SWEEP TIME (SEC): 30 | 250 | 500 | 1000
SWEEP WIDTH (Hz): 25 | 50 | 100 | 250 | 500
FILTER: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8
RF POWER LEVEL: 0.30

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: Solvent
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS:

ORIGINAL PAGE IS OF POOR QUALITY

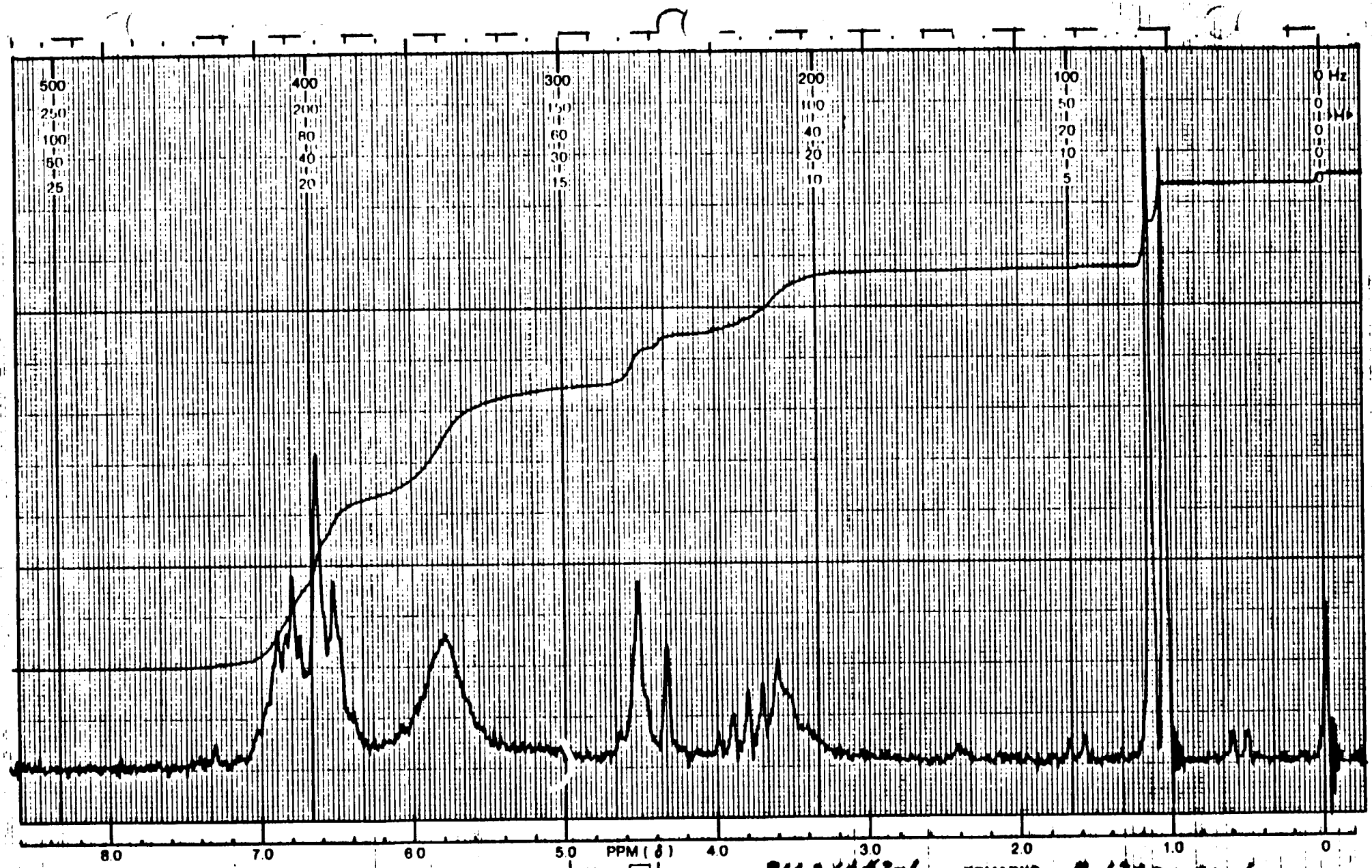
DATE: 3-21-86

OPERATOR: DGW

SPECTRUM NO. 1A of 7
solvent scan

NORELL, INC.
LANDISVILLE, N.J. 08326
Phone: (609) 697-0020

T60



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

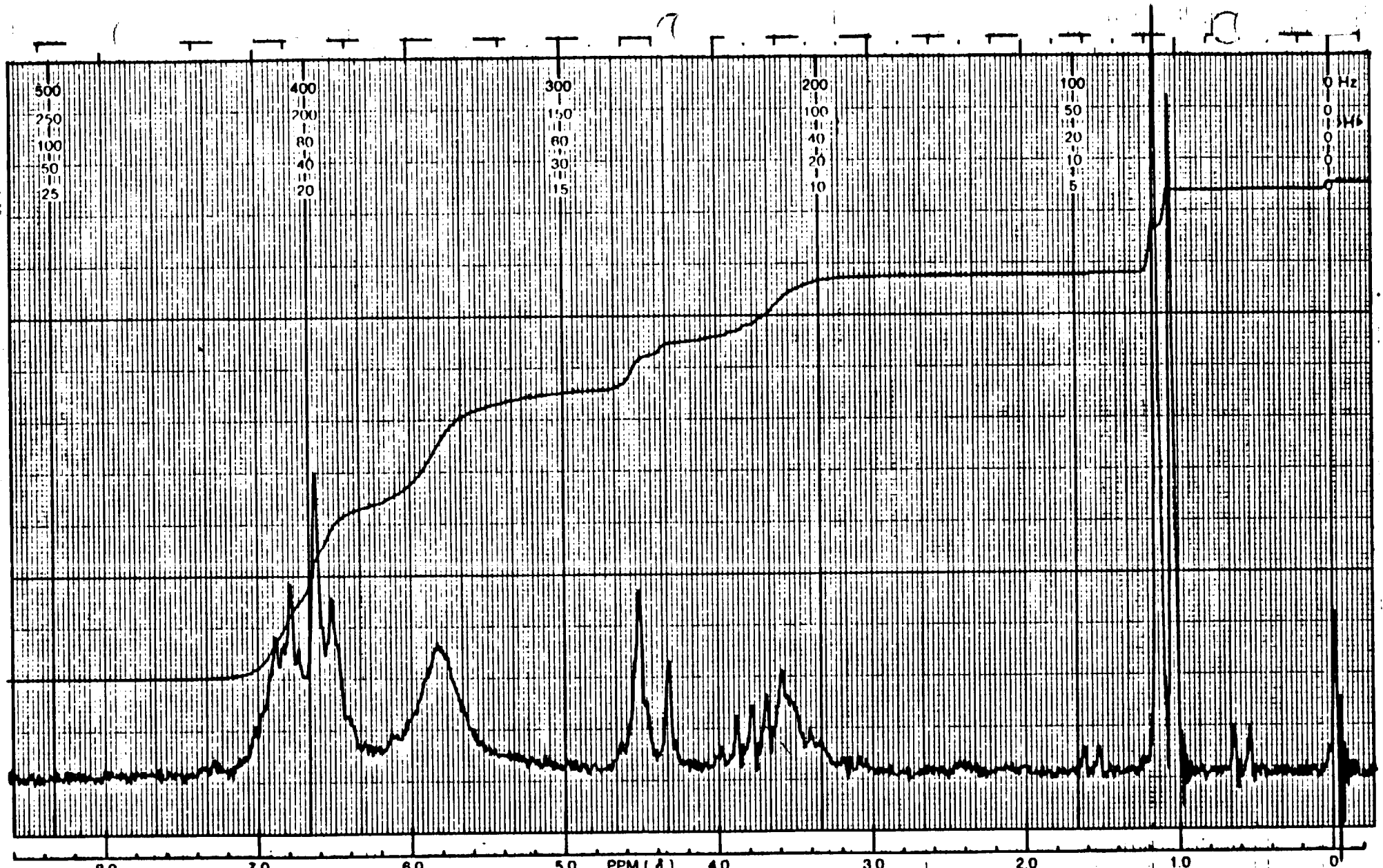
SAMPLE: 9LD Wt #3-1
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.130 gm sample
0.876 gm solvent

DATE: 3-21-86
OPERATOR DGW
SPECTRUM NO. 7 of 9 9LD Wt #3-1

CHART 15A

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 30 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: 9ILD Lot #3-2
SOLVENT: Unisol-d +0.5% TMS
DEC. LEVEL

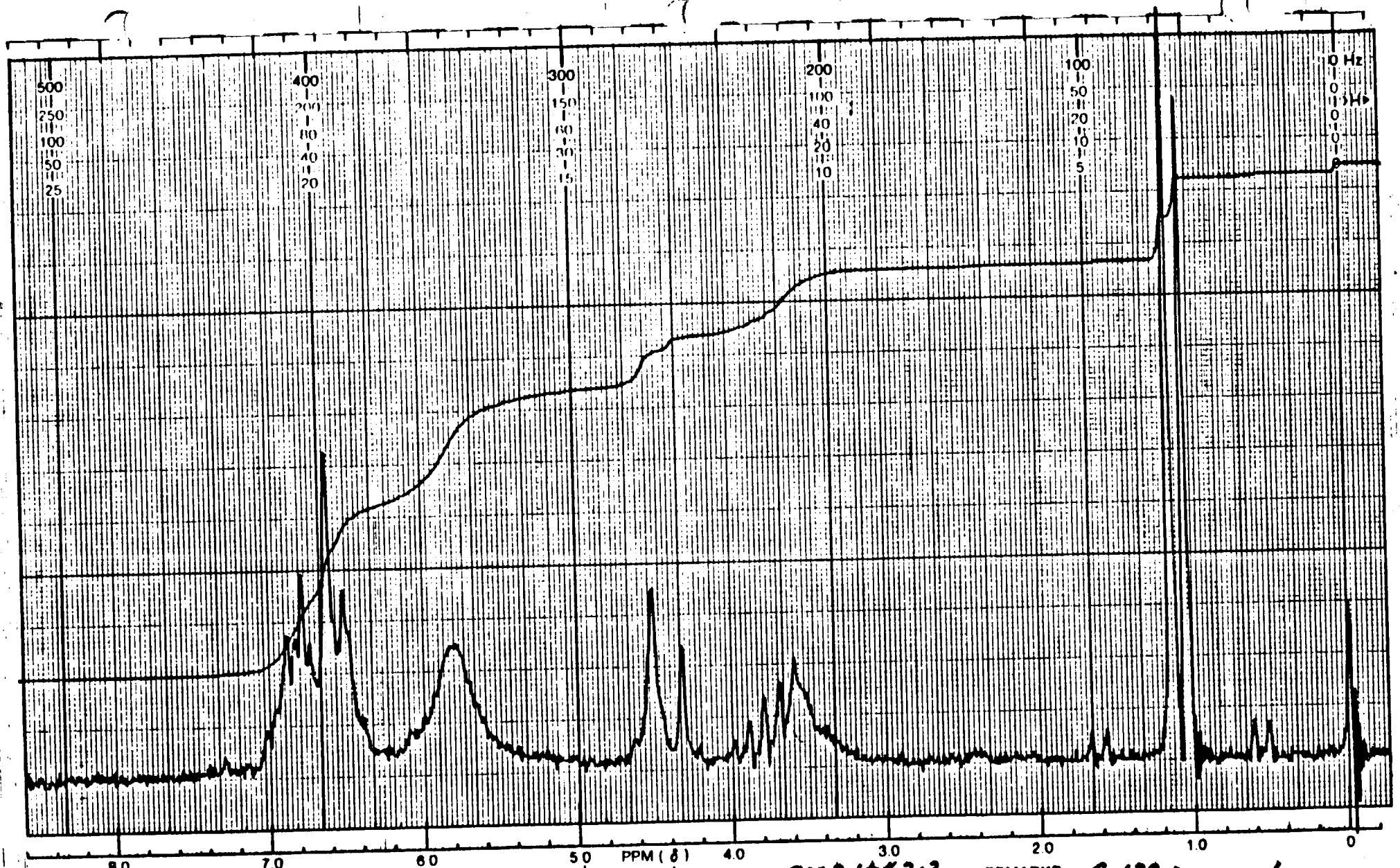
REMARKS: 0.142 gm sample
0.948 gm solvent

ORIGINAL PAGE IS
OF POOR QUALITY

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

DATE: 3-21-86 OPERATOR DGW SPECTRUM NO. 8 of 9 9ILD Lot #3-2

CHART 15B



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.25

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: 91cD Lt #3-3
SOLVENT: Unisol-d + 0.52 TMS
DEC. LEVEL

REMARKS: 0.139 gm sample
0.944 gm solvent

ORIGINAL PAGE IS
OF POOR QUALITY

DATE: 3-21-86

OPERATOR DEW

SPECTRUM NO. 9 of 9 91cD
Lt #3-3

CHART 15C

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

SWB-8 Fabric for NASA Lot# 3

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

SWB-8 Fabric for NASA Lot# 3

		#3-1
1a. Breaking Strength, lbs/in, WARP ASTM D1682	PICK	69
	CENTER	73
	PLAIN	89
	AVG.	77
1b. Breaking Strength, lbs/in, FILL ASTM D1682	PICK	35
	CENTER	23
	PLAIN	22
	AVG.	26.7
2a. Carbon Assay, % MDQAI 5560	PICK	99.9
	CENTER	99.9
	PLAIN	99.9
	AVG.	99.9
2b. Hydrogen Assay, % MDQAI 5560	PICK	<.01
	CENTER	<.01
	PLAIN	<.01
	AVG.	EST .001
2c. Nitrogen Assay, % MDQAI 5560	PICK	0.1
	CENTER	0.1
	PLAIN	0.1
	AVG.	0.1
3. Visual Inspection QCi-102		See Chart 3A
4. Specific Gravity, Units PTM-84		1.7060
		1.7116
		1.7664
	AVG.	1.728
5. pH, Units CTM-24B		9.0
		9.0
	AVG.	9.0
6. TGA, °C at 50% Weight Loss CTM-51 (AIR)		SET UP #2
		#3-1 794
		See Chart 6A

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

SWB-8 Fabric for NASA Lot# 3

			#3-1
7a.	Atomic Absorption, ppm CTM-53B	Na	7
		K	2
		Ca	146
		Mg	0
		Li	0
		AVG.	155
7b.	Moisture Content, % CTM-53B		0.000
7c.	Ash Content, % CTM-53B		0.030

			#3-1
8a.	Filament diameter, microns, WARP S.E.M. procedure (diameters are an average 10 measurements)	AVERAGE	9.79
		Minimum	8.05
		Maximum	11.45
		Std. Dev	1.11

			#3-1
8b.	Filament diameter, microns, FILL S.E.M. procedure (diameters are an average of 10 measurements)	AVERAGE	10.83
		Minimum	6.55
		Maximum	15.50
		Std. Dev	2.76

			#3-1
9a.	Thread Count, per inch, WARP PTM-5A		35
			36
			35
			34
			35
		AVG.	35.0
9b.	Thread Count, per inch, FILL PTM-5A		36
			37
			37
			37
			37
		AVG.	36.8

10a.	Areal weight as received, gm/4x4 PTM-3A	LEFT	2.935
		CENTER	2.942
		RIGHT	2.924
		AVG.	2.934
10b.	Volatiles as received, % PTM-3A	LEFT	.24
		CENTER	.37
		RIGHT	.44
		AVG.	.35

SWB-8 Fabric for NASA Lot# 3

10c. Weight Change on Acetone Wash, % PTM-3A		#3-1
	LEFT	-.34
	CENTER	-.24
	RIGHT	-.07
	AVG.	-.22

U.S. Polymeric

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

~~Left~~ Footage

	START	Sample
10		W 3 ft
		W 12 ft
		26 ft W
40		W 40 ft
		W 46 ft
60		
		W 67 ft
90		
10	W 100 ft	W 93 ft
110		
12	117 ft	END of Roll 117 ft
140		
15		
160		
17		
180		
190		
20		
210		
220		
3		
40		
5		

LEFT

TREATER OPERATOR READ UP

DATE 2/20/82

FABRIC SWB-8

~~BEG~~. Lot # 1154-3 Stackpole Fibers

ROLL NO. 16-566

~~YARDS~~ FEET 117.0

POUNDS

ORDER NO. 71108

SPECIFICATION Std mfg Coat.

~~CUST~~. FILE # NASA 3-1

SYMBOLS

- TEAR
- SPOTS OR STAINS
- FOLDS
- EDGE CURL
- TIGHT WEAVE OR SELVAGE
- WEAVE DISTORTION
- VISIBLE PUCKERS
- ONE PUCKER CREASING
- TWO OR MORE CREASINGS

REMARKS

W = Pulled Thread

= Turn Edge

= Hole

= Bags

GRADE Group B

D. Zimple

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CHART 6A

ORIGINAL PAGE IS
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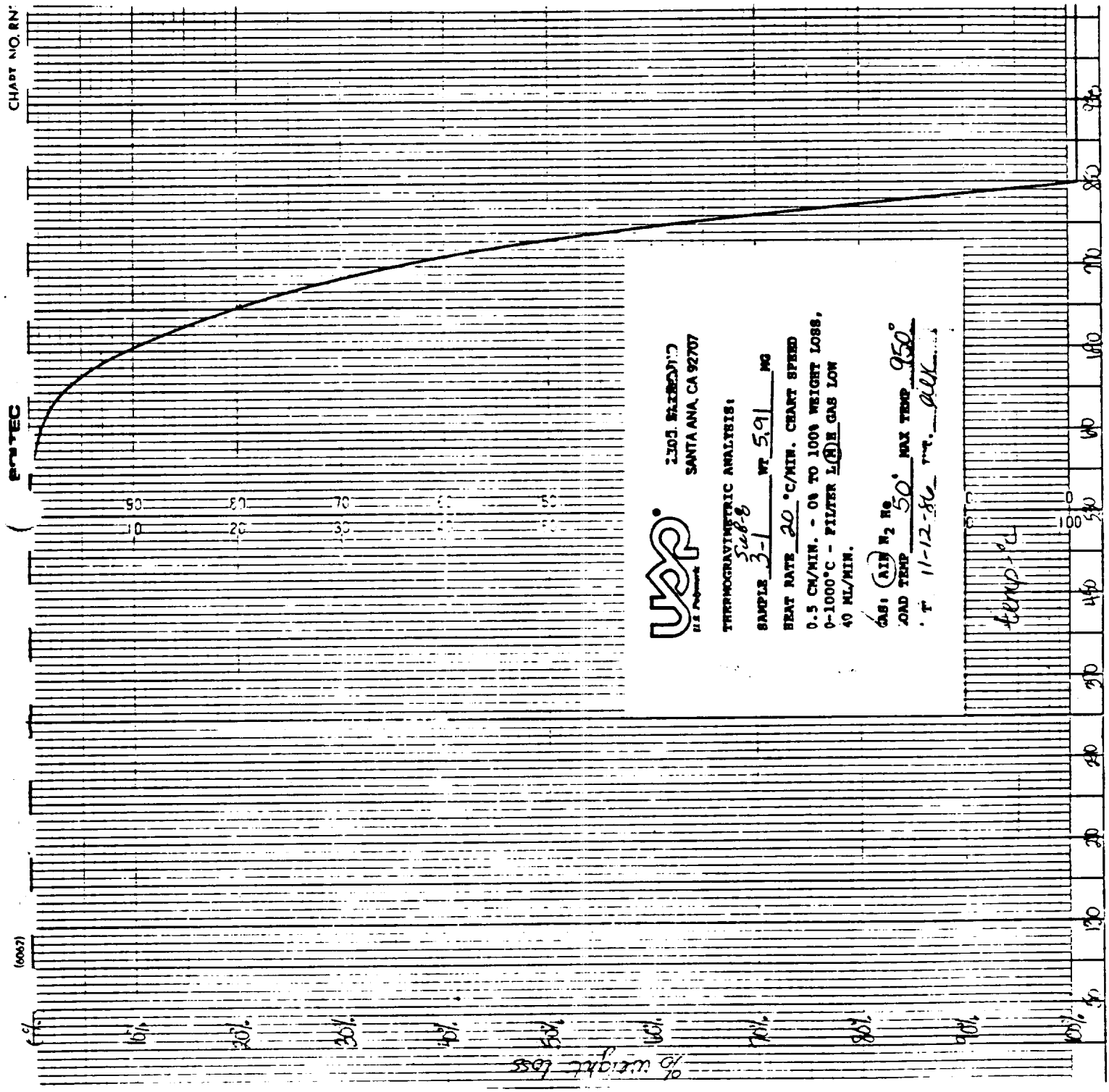

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PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5834 NASA LOT# 3 U.S.P. LOT# D09233

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5834 NASA LOT# 3 U.S.P. LOT# D09233

		ROLL#1-S	ROLL#2-S
1a. Resin Content, Soxhlet, % CTM-6D		35.9	37.6
		37.3	37.3
		37.1	36.9
	AVG.	36.8	37.3
	NASA LOT# 3 AVERAGE		37.0
1b. Filler Content, Soxhlet, % CTM-6D		15.1	15.8
		15.7	15.7
		15.6	15.5
	AVG.	15.5	15.7
	NASA LOT# 3 AVERAGE		15.6
1c. Cloth Content, Soxhlet, % CTM-6D		49.0	46.6
		47.0	47.0
		47.3	47.6
	AVG.	47.8	47.1
	NASA LOT# 3 AVERAGE		47.4
2. Volatile Content, % PTM-17B		3.3	5.3
		4.7	5.5
		4.7	4.5
	AVG.	4.2	5.1
	NASA LOT# 3 AVERAGE		4.7
3. Flow, % PTM-19G		15.3	14.5
		13.2	14.7
		12.1	12.8
	AVG.	13.5	14.0
	NASA LOT# 3 AVERAGE		13.8
4. Resin Content, Dry basis, % PTM-16F, Type II		38.9	39.3
		38.3	39.5
		39.1	39.0
	AVG.	38.8	39.3
	NASA LOT# 3 AVERAGE		39.0
5. Tack, lbs PTM-80		38	35
	NASA LOT# 3 AVERAGE		37
6. Gel Time, seconds PTM-20E		207	197
	NASA LOT# 3 AVERAGE		202

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FM 5834 NASA LOT# 3 U.S.P. LOT# D09233

7a. Atomic Absorption, ppm
CTM-53B

	ROLL#1-S	ROLL#2-S	LOT#3 AVG.
Na	12	18	15
K	2	2	2
Ca	12	19	16
Mg	1	1	1
Li	0	0	0
TOTAL	27	40	34

7b. Moisture Content, %
CTM-53B

	ROLL#1-S	ROLL#2-S
	2.90	2.84
NASA LOT# 3 AVERAGE		2.87

7c. Ash Content, %
CTM-53B

	.03	.06
NASA LOT# 3 AVERAGE		.04

8. TGA, % Weight Loss at 500°C
CTM-51 (Nitrogen)

	7.9	5.7
NASA LOT# 3 AVERAGE		6.8

See chart 8A-8B

9. DSC, °C
CTM-50A

	ROLL#1-S	ROLL#2-S	LOT#3 AVG.
First Temp	177	178	178
Second Temp	239	240	240

See Chart 9A-9B

10. Infrared (IRZB) Baseline
CTM-21C

	1.13	1.14	1.13

See Chart 10A-10B

11. Environmental History

Date manufactured: 30 April 1986
Packaged in: Polyethylene bag
Date shipped: Test lot not shipped

12. Specific Gravity, Cured, Units
ASTM D792

	ROLL#1-S	ROLL#2-S
	1.507	1.518
	1.513	1.518
	1.512	1.519
AVG.	1.511	1.518
NASA LOT# 3 AVERAGE		1.514

13a. Tensile Strength, ksi, WARP
FTMS 406-1011

	30.96	32.05
	31.06	31.34
	30.11	28.85
	30.00	32.67
	30.50	30.13
AVG.	30.53	31.01
NASA LOT# 3 AVERAGE		30.77

FM 5834 NASA LOT# 3 U.S.P. LOT# D09233

	ROLL#1-S	ROLL#2-S
13b. Tensile Modulus, msi, WARP FTMS 406-1011	5.89	6.49
	5.72	6.38
	5.91	6.26
	6.10	6.57
	6.00	6.37
AVG.	5.92	6.41
NASA LOT# 3 AVERAGE		6.17
13c. Tensile Elongation, %, WARP FTMS 406-1011	.61	.50
	.70	.52
	.60	.45
	.58	.54
	.60	.49
AVG.	.62	.50
NASA LOT# 3 AVERAGE		.56
14a. Flexural Strength, ksi, WARP FTMS 406-1031	41.31	44.22
	44.88	46.20
	44.58	47.34
	42.05	47.71
	45.52	47.47
AVG.	43.67	46.59
NASA LOT# 3 AVERAGE		45.13
14b. Flexural Modulus, msi, WARP FTMS 406-1031	4.83	5.16
	4.92	5.32
	4.62	5.69
	4.72	5.73
	4.95	5.59
AVG.	4.81	5.50
NASA LOT# 3 AVERAGE		5.15
15a. Compressive Strength, ksi, WARP FTMS 406-1021	30.96	23.95
	25.71	32.44
	33.69	33.45
	31.41	25.35
	27.82	28.80
AVG.	29.92	28.80
NASA LOT# 3 AVERAGE		29.36
15b. Compressive Modulus, msi, WARP FTMS 406-1021	5.92	6.14
	6.05	6.54
	5.92	6.98
	6.09	6.93
	6.56	7.39
AVG.	6.11	6.80
NASA LOT# 3 AVERAGE		6.45

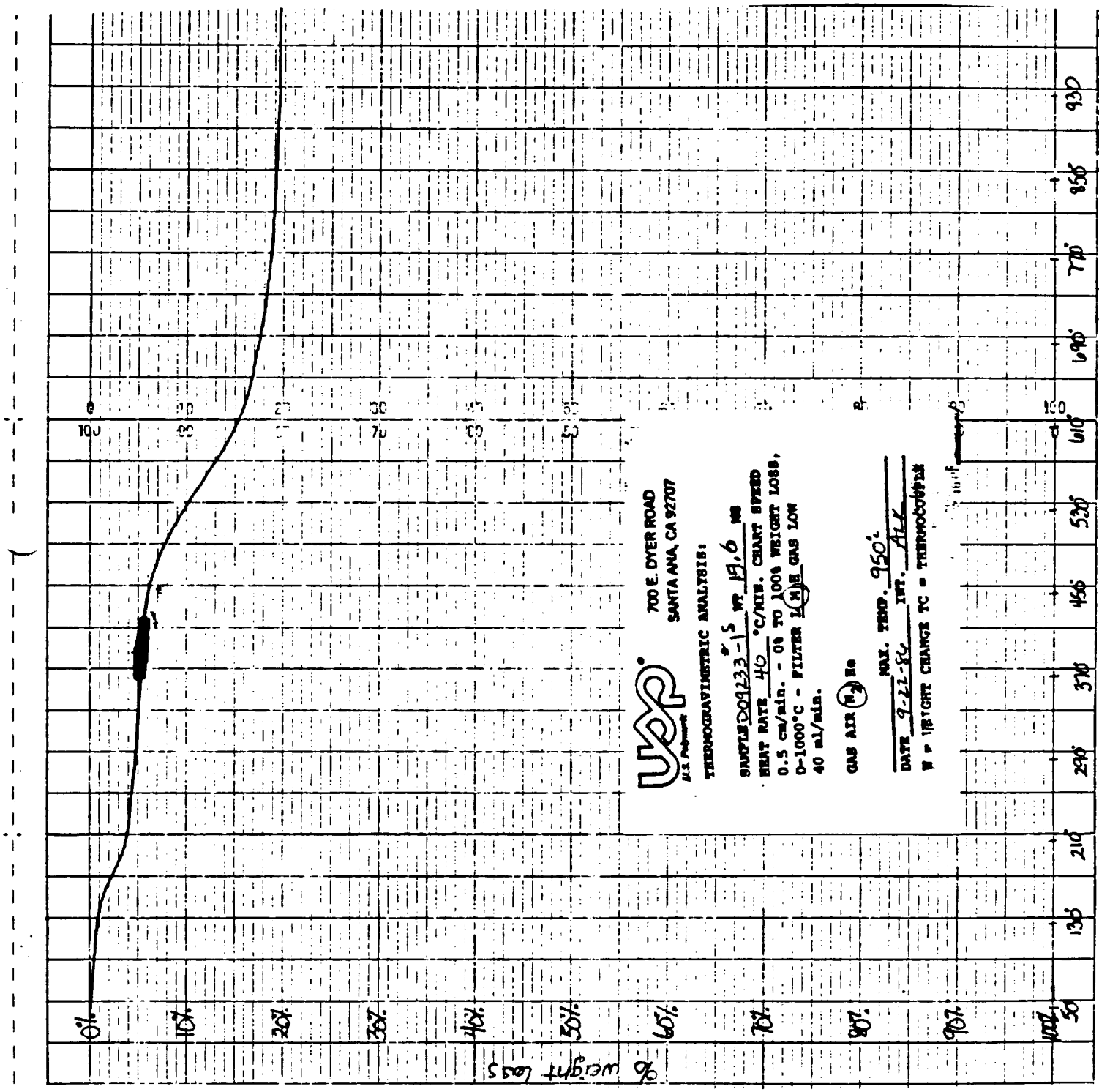
FM 5834 NASA LOT# 3 U.S.P. LOT# D09233

	ROLL#1-S	ROLL#2-S
16. Double Shear Strength, ksi FTMS 406-1041A	4.10	3.98
	4.01	3.81
	3.88	3.63
	3.30	4.21
	3.74	4.32
AVG.	3.80	3.99
NASA LOT# 3 AVERAGE		3.90
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)	73.1	73.0
NASA LOT# 3 AVERAGE		73.1
18. Residual Volatiles, % PTM-98	1.66	1.70
	1.73	1.71
	1.76	1.66
AVG.	1.72	1.69
NASA LOT# 3 AVERAGE		1.70
19. Resin Content, Pyrolysis, % CTM-14B	36.33	31.71
	35.34	31.71
	33.74	31.94
AVG.	35.14	31.78
NASA LOT# 3 AVERAGE		33.46
20. Acetone Extraction, % CTM-18A	1.06	1.02
	1.27	.77
	1.02	1.25
AVG.	1.11	1.01
NASA LOT# 3 AVERAGE		1.06
21a. CTE, in/in •F with PLY PTM-61B	1.03	.65
	.00	.00
AVG.	.52	.33
NASA LOT# 3 AVERAGE		.42
21b. CTE, in/in •F Cross PLY PTM-61B	9.64	8.61
	11.20	9.57
AVG.	10.42	9.09
NASA LOT# 3 AVERAGE		9.76

See Chart 21A-21B

U.S. Polymeric

Hamid M. Qureishi, Manager
Quality Assurance Department



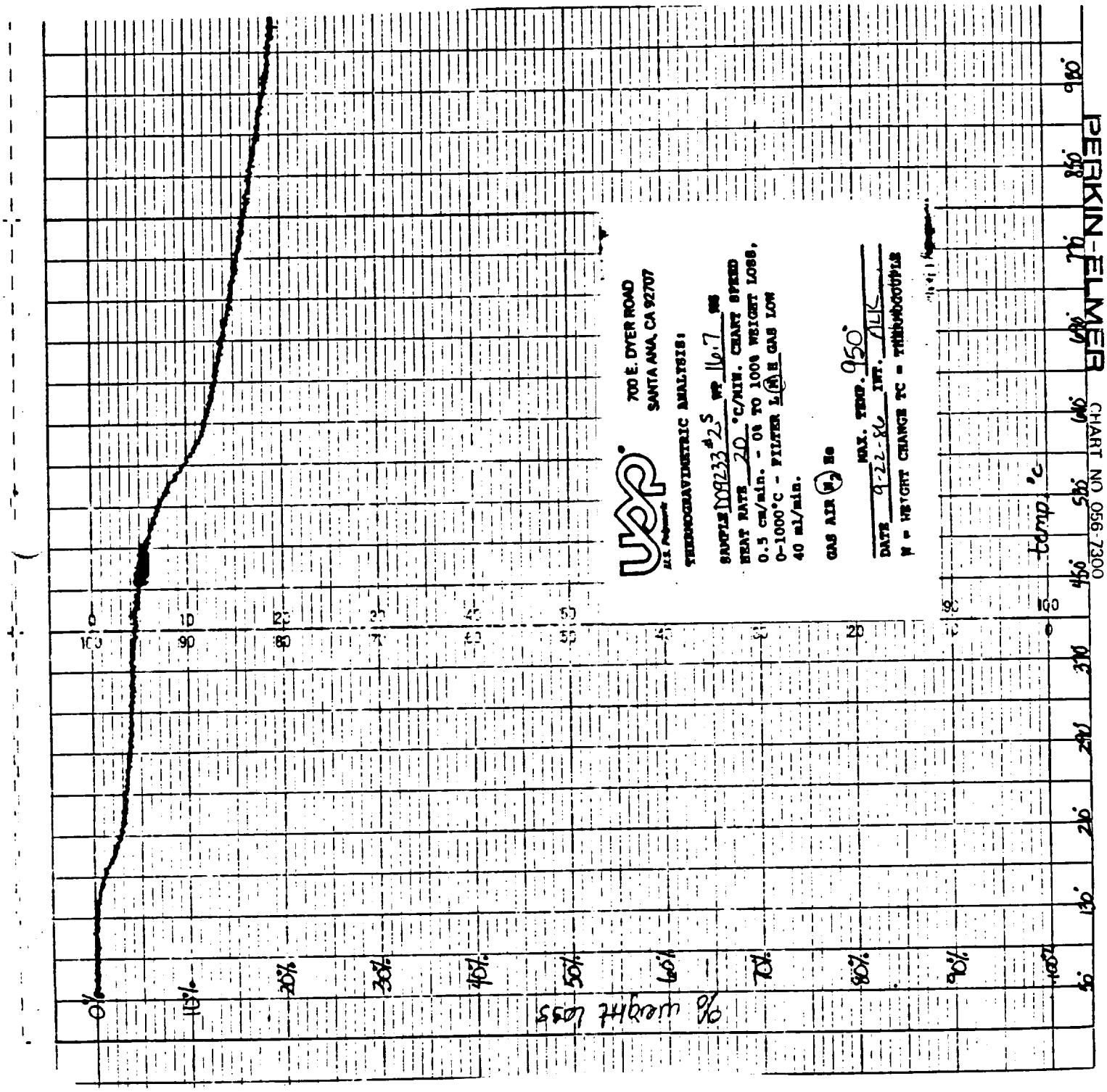


CHART 9A

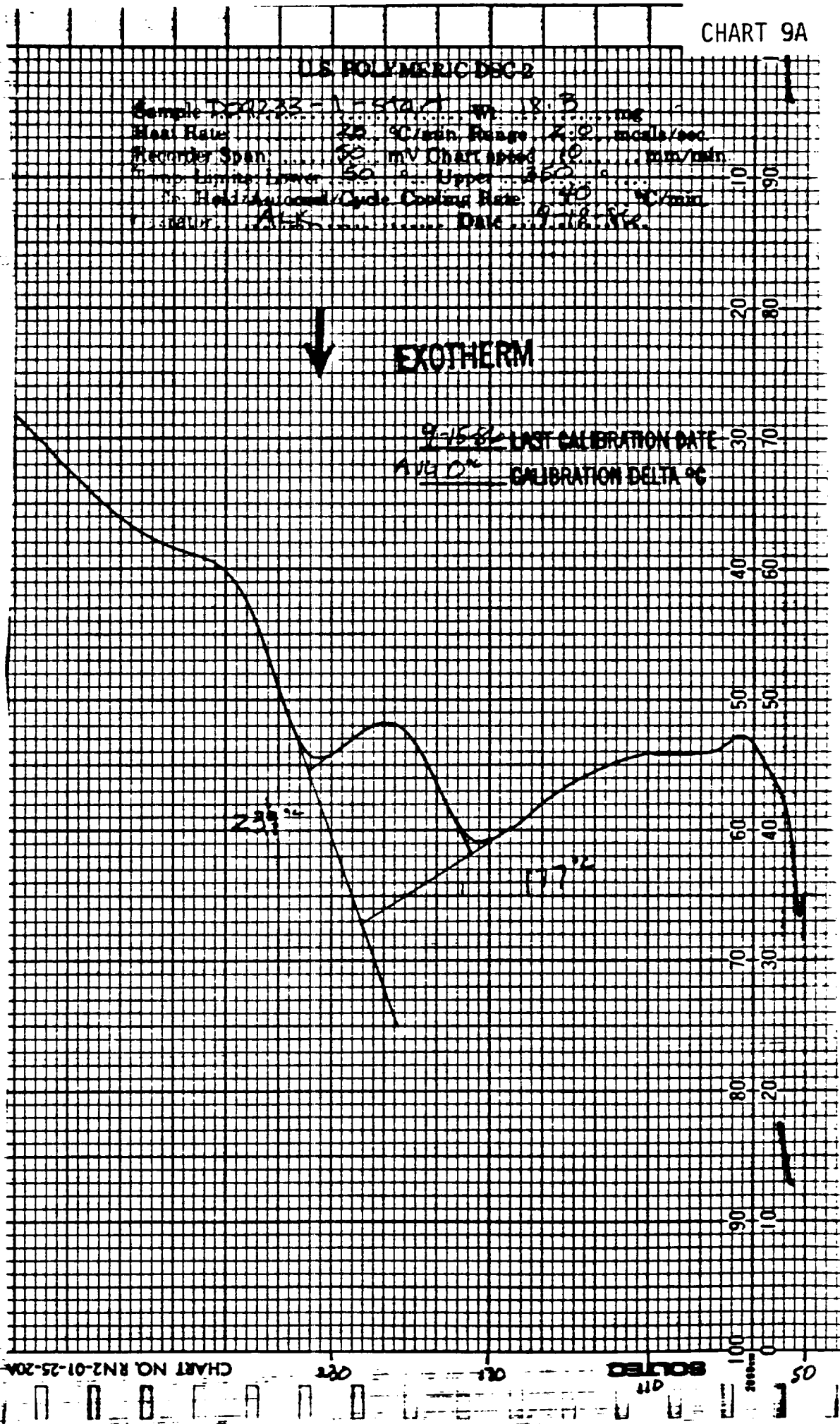
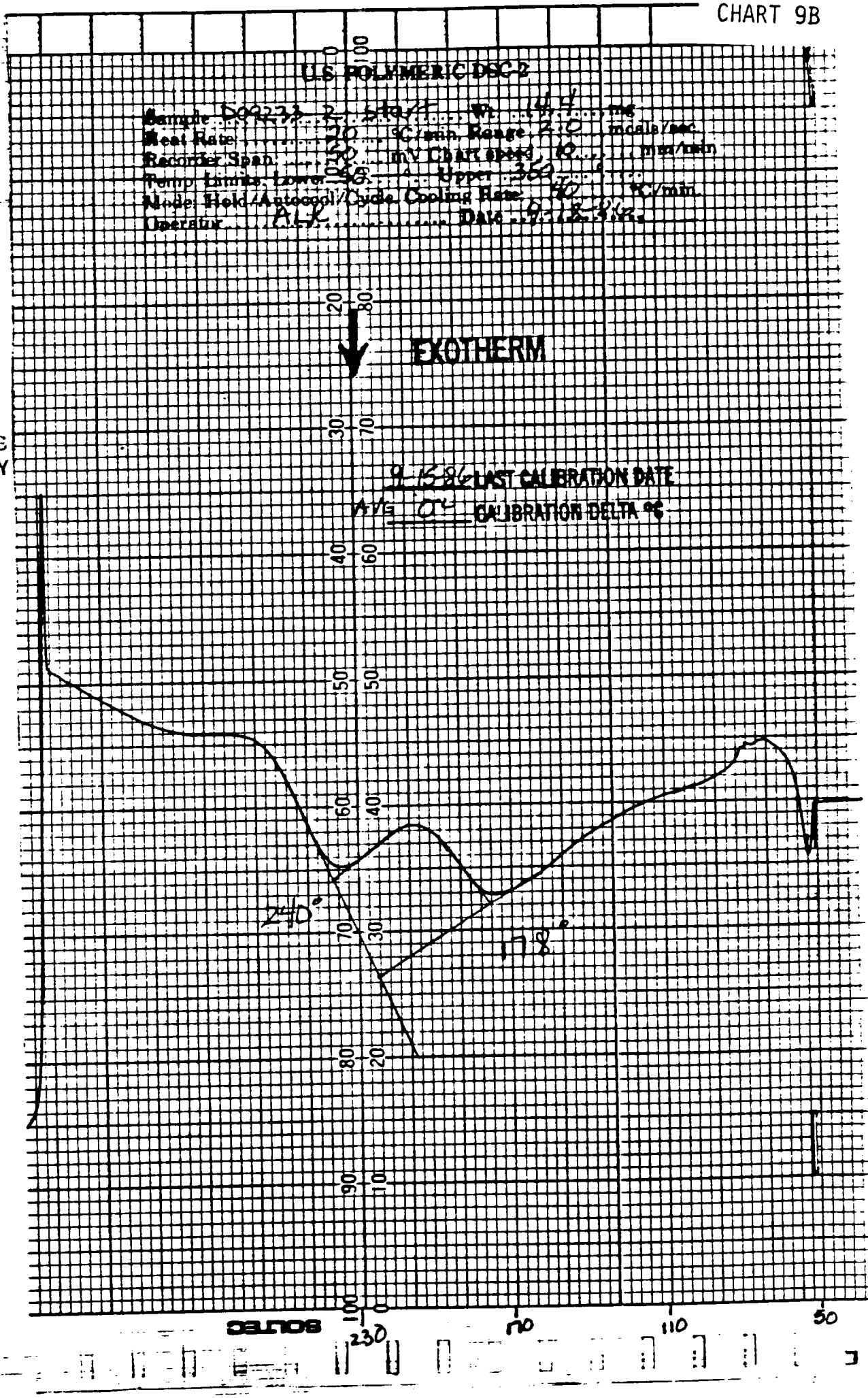


CHART 9B



SPECTRUM NO. 15203
DATE 7-08-86
SAMPLE FM 5834
D09233 # ST.-1

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%T
PHASE S
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

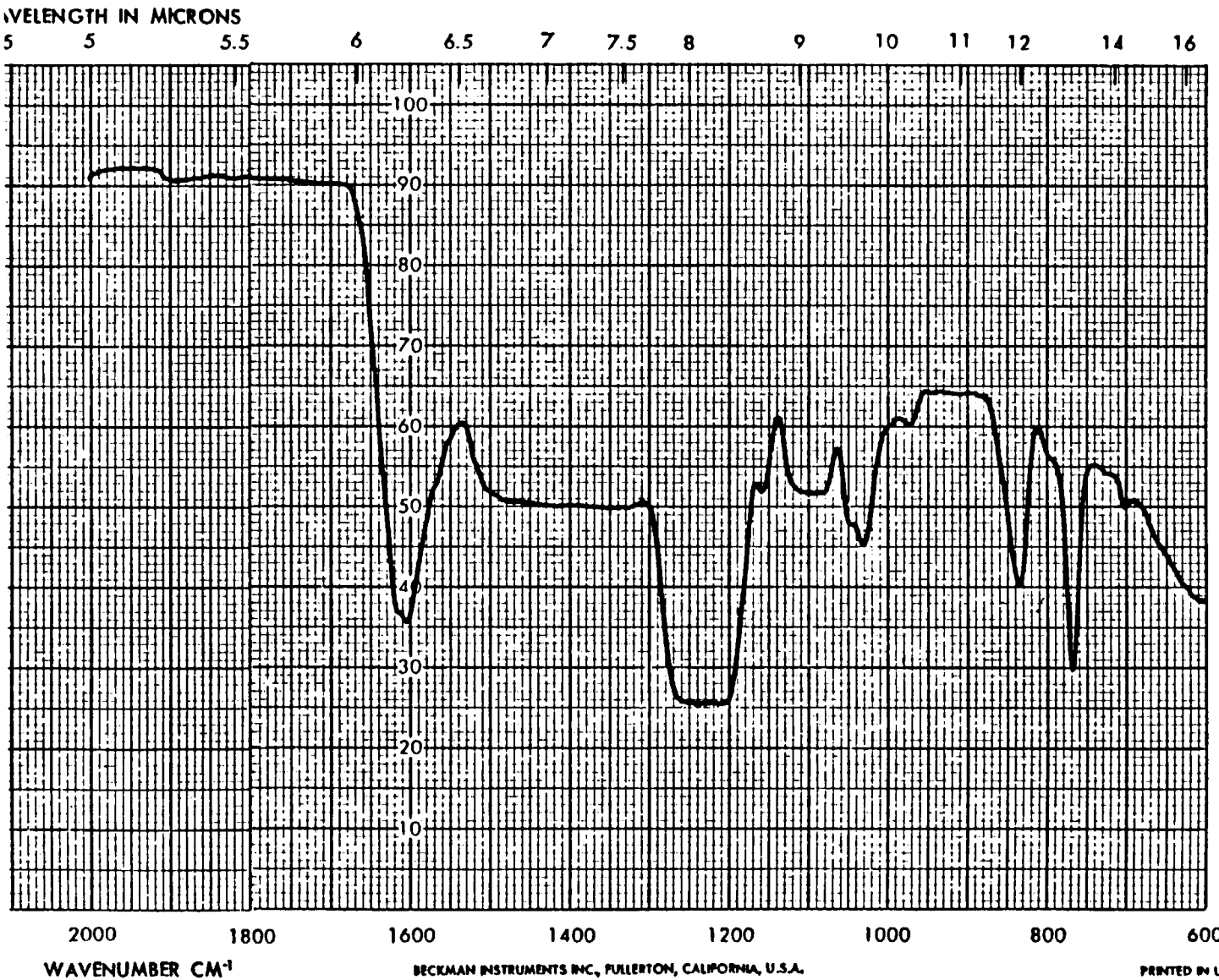


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CHART 10A

SPECTRUM NO. 15204
DATE 7-08-86
SAMPLE FM 5B34
D09233 # ST-2

SOURCE

STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

Beckman®
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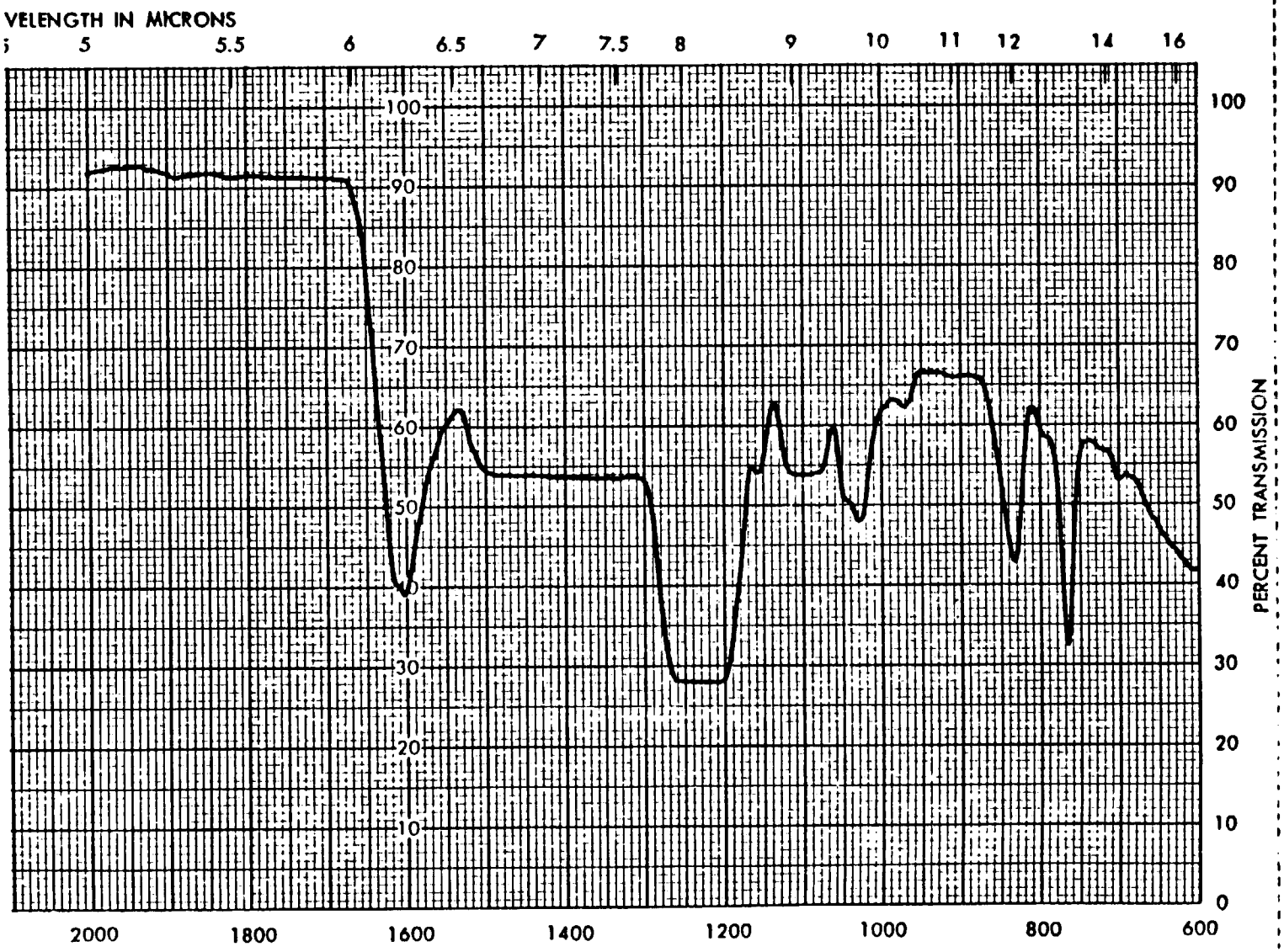

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CHART 10B

PART NO. 990088

RUN NO ___ DATE 9/11/96	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE:	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
Do9333 - Panel #1 - (1)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.25	
ATM Air @ 80P	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3-5 SCFH			dY, (mg/min) /in	dY, (10X), (mils/min) /in	

MEASURED VARIABLE

DUPONT Instruments

Chart 21A1

Chart 21A2

PART NO. 990088

RUN NO. ___ DATE 12/4/87
OPERATOR DJ
SAMPLE:
D9233 - Power #1 - (2)
ATM DN @ SPT
FLOW RATE N2 DSC
wpy

T-AXIS
SCALE, °C/in 50 20
PROG. RATE, °C/min 10
HEAT / COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec. ___
dY/dT (mg/min)/in ___

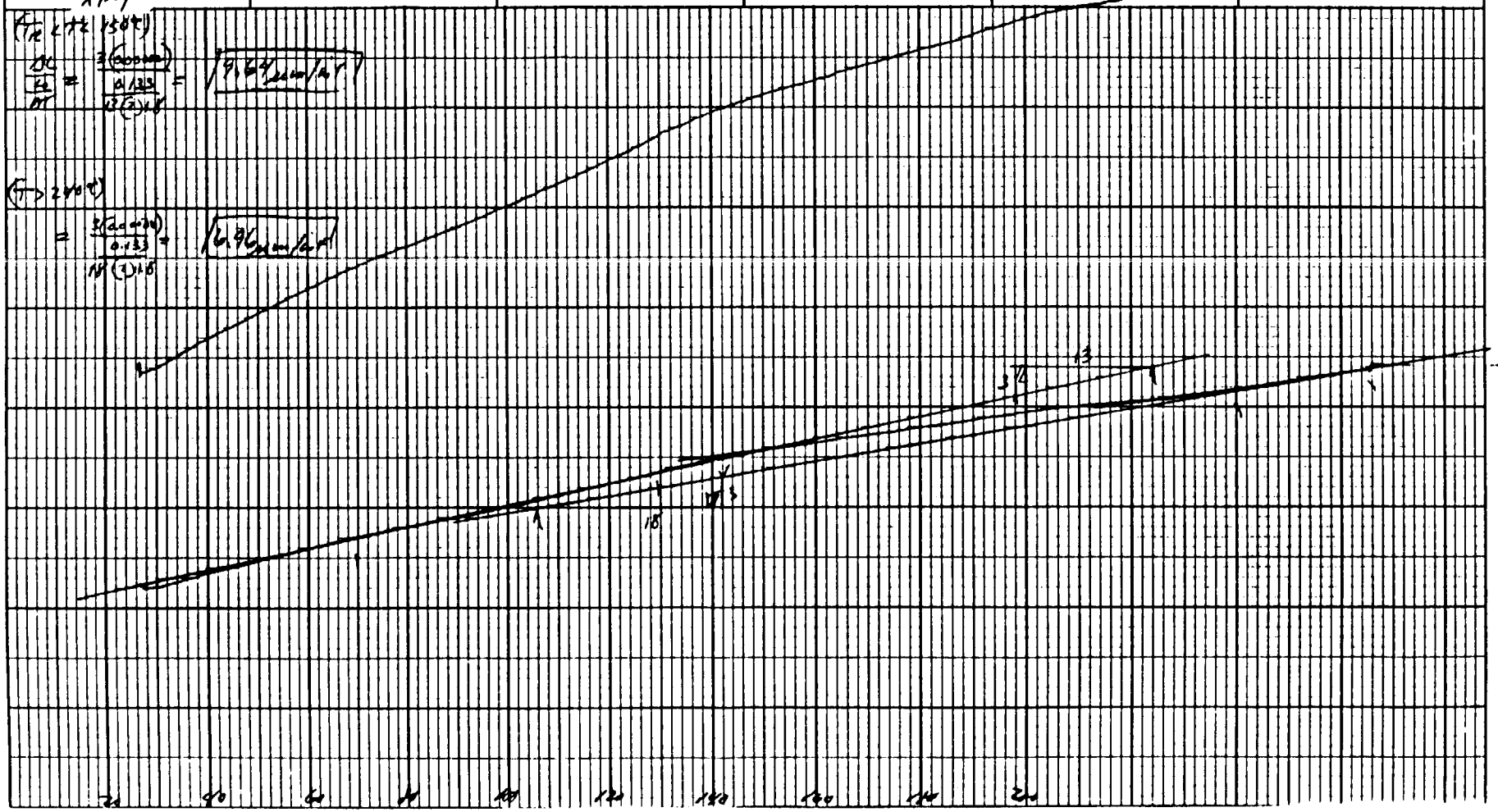
TMA
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.257
LOAD, g 1
dY/dT (10X) (mils/min)/in ___

DuPONT Instruments

MEASURED VARIABLE

PART NO. 990088

RUN NO.___ DATE 9/23/16	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TH	SCALE, °C/in 30 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE:	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
D09233-Panel 1-(3)	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.133	
ATM Air @ 80	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3-5SCFH			dY, (mg/min) /in	dY, (10X), (mils/min) /in	
XPLY					



MEASURED VARIABLE

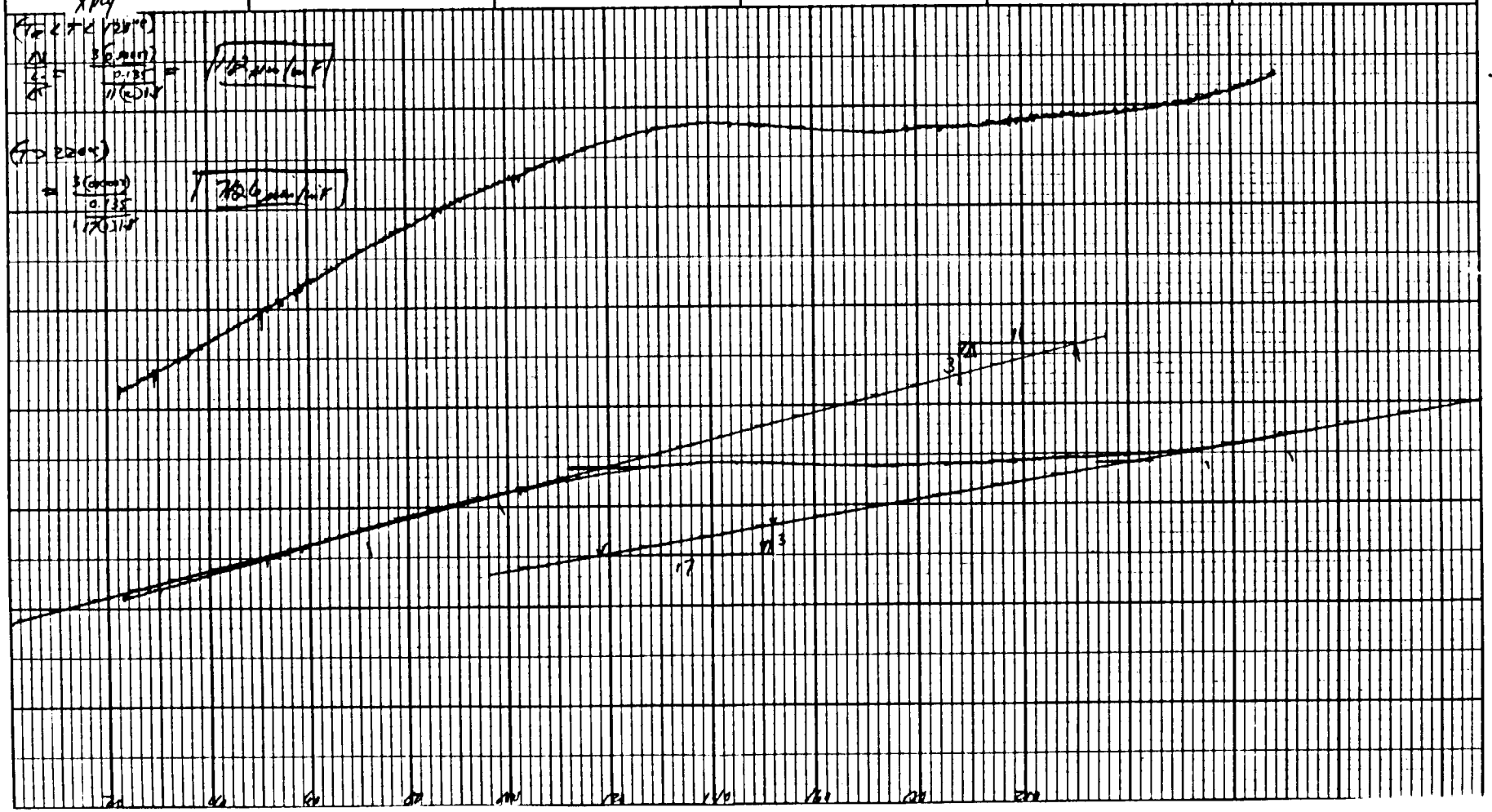
DUPONT Instruments

Chart 21A3

PART NO. 990088

RUN NO ___ DATE 9/24/14	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR DB	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE Expansion	
D09233 - Panel #1 - 40	HEAT / COOL ISO	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.135	
ATM Air @ 50	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 10	
FLOW RATE 3-5 SCFH			dY, (mg/min) /in	dY, (10X), (mils/min) /in	

XPM



DUPONT Instruments

MEASURED VARIABLE

Chart 21A4

Chart 21B1

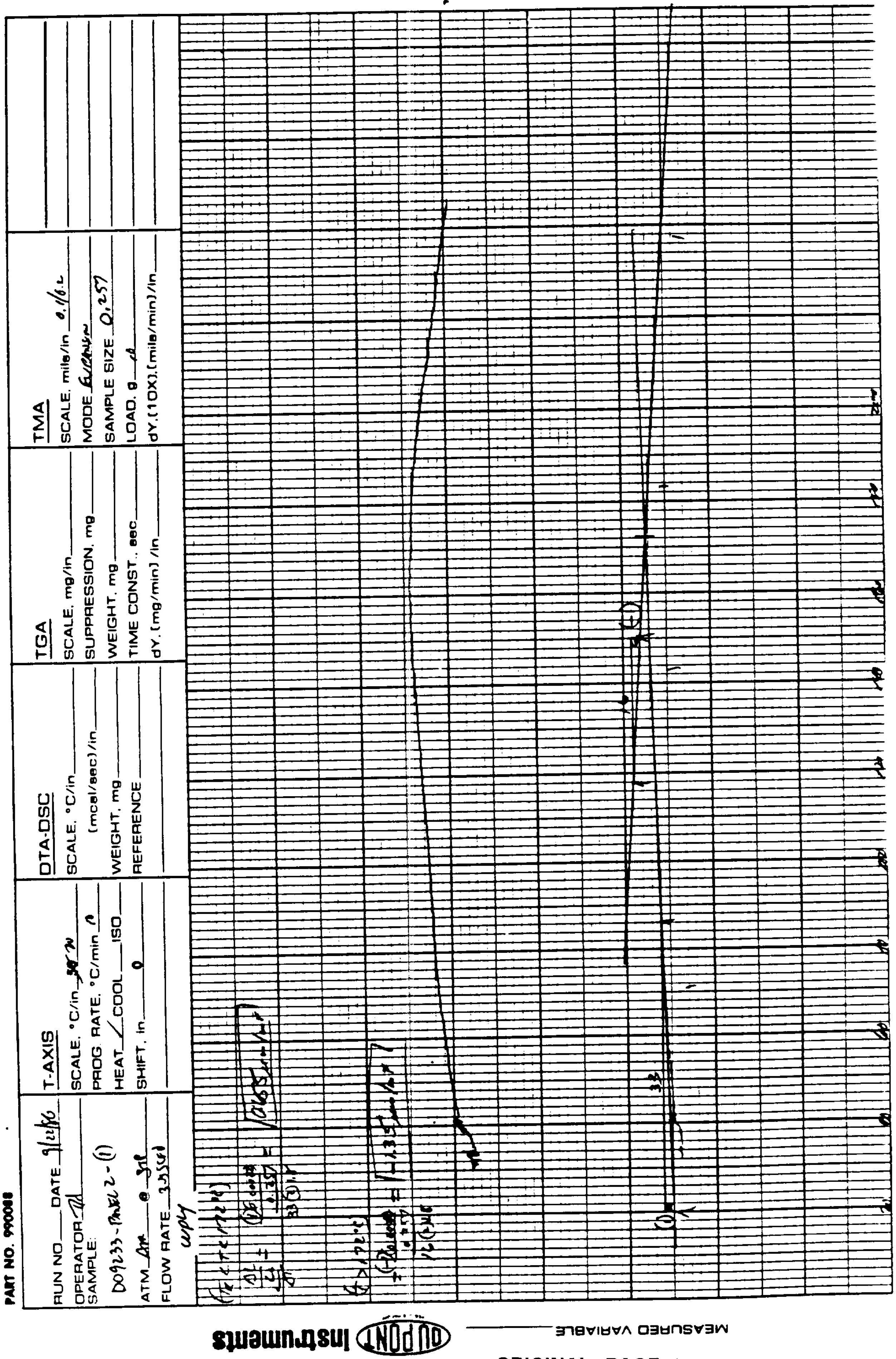


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Chart 21B2

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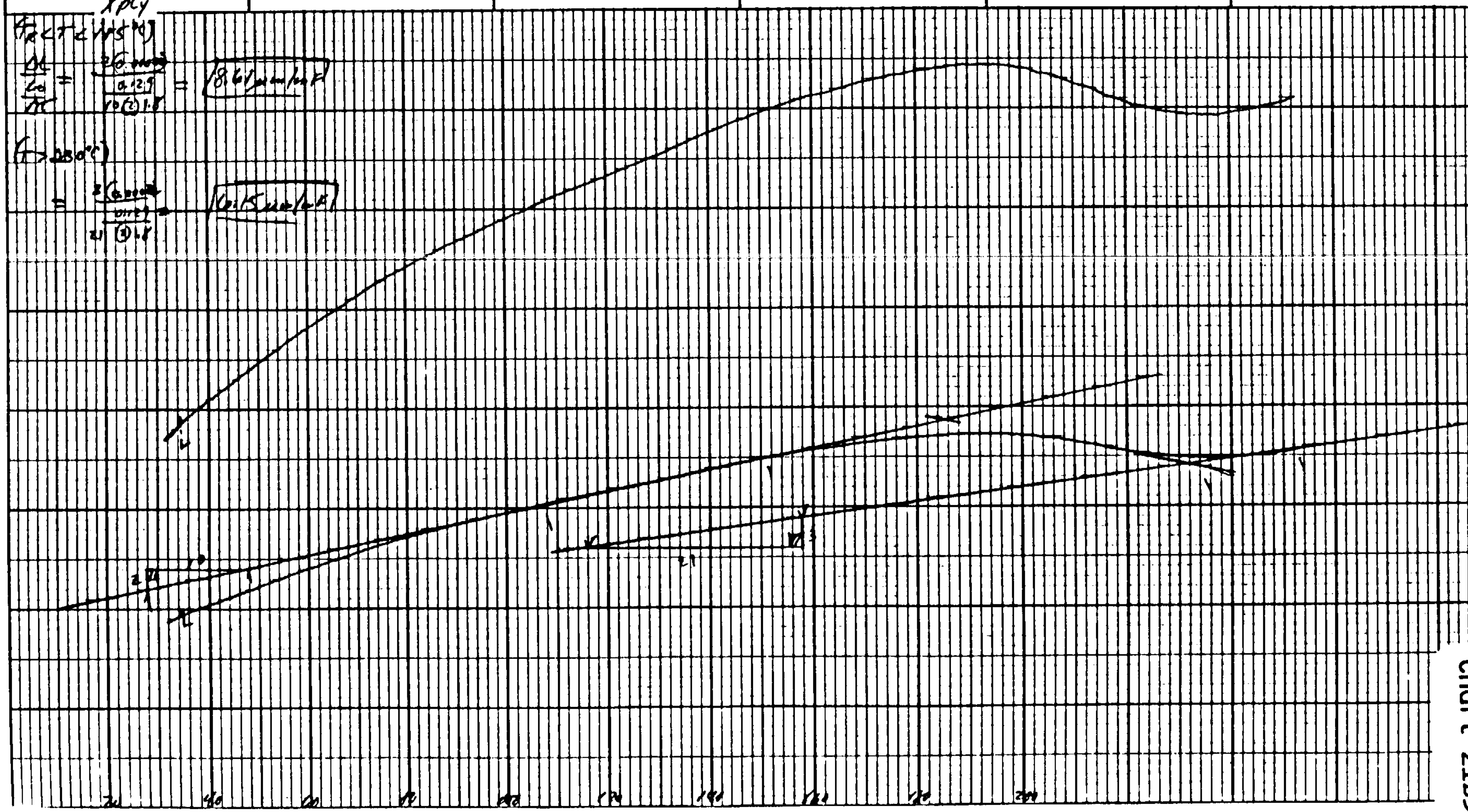
OF POOR QUALITY

Chart 21B3

PART NO. 990088

RUN NO ___ DATE 9/24/84	T-AXIS	DTA-DSC	TGA	TMA	
OPERATOR TK	SCALE, °C/in ~~50~~ 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/0.2	
SAMPLE: D09233 - Panel #2 - (3)	PROG. RATE, °C/min 10	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE Expansion	
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.129	
FLOW RATE 3-5 SCFH	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10	
			dY, (mg/min)/in ___	dY,(10X),(mils/min)/in ___	

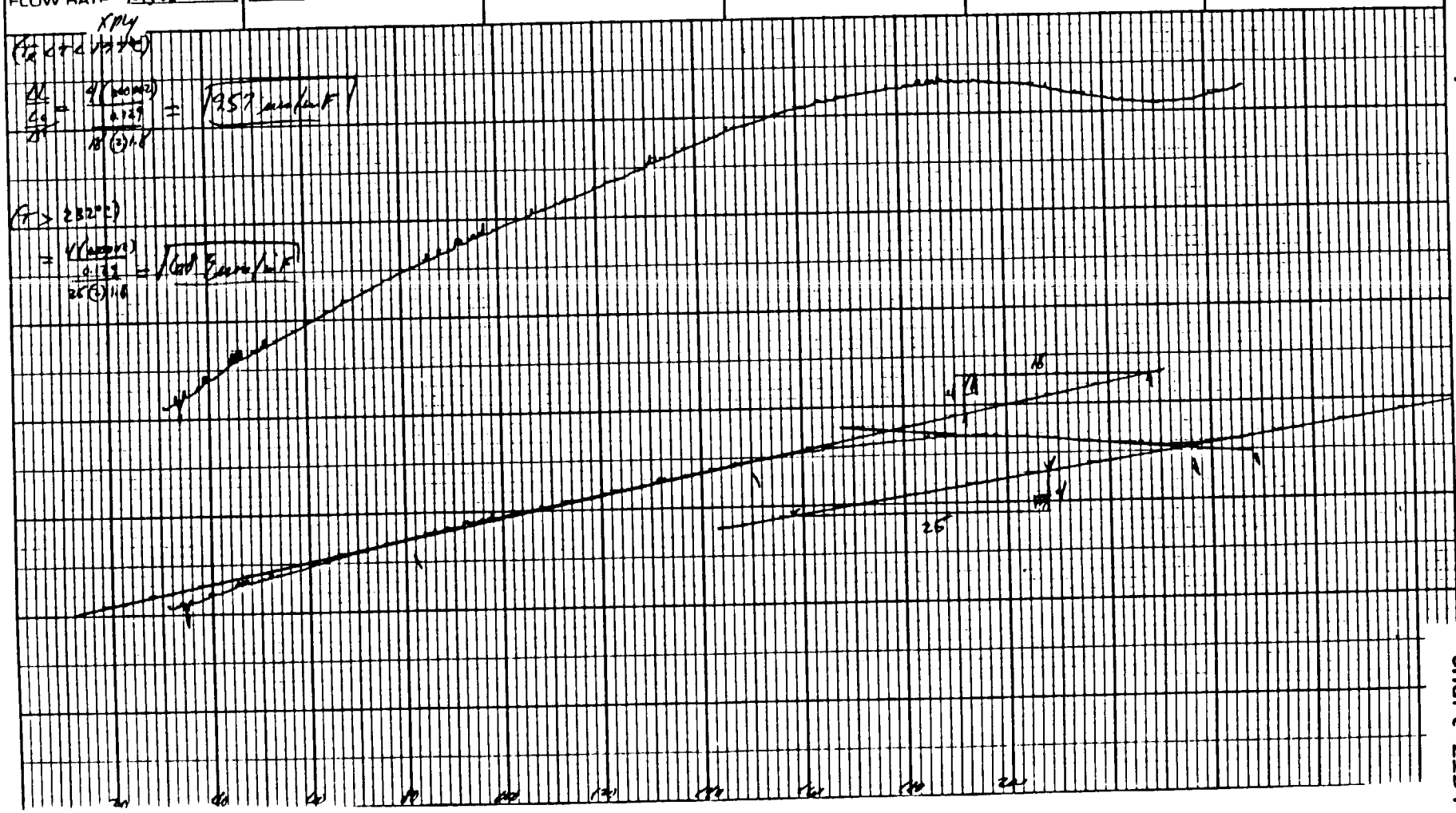


DUPONT Instruments

MEASURED VARIABLE

PART NO. 990088

RUN NO.___ DATE 9/29/94 OPERATOR TA SAMPLE: D09233 - Panel #2 - (4) ATM Air @ RT FLOW RATE 75cc/m	T-AXIS SCALE, °C/in 50 20 PROG. RATE, °C/min 10 HEAT ✓ COOL ___ ISO ___ SHIFT, in 0	DTA-DSC SCALE, °C/in ___ (mcal/sec)/in ___ WEIGHT, mg ___ REFERENCE ___	TGA SCALE, mg/in ___ SUPPRESSION, mg ___ WEIGHT, mg ___ TIME CONST., sec ___ dY, (mg/min)/in ___	TMA SCALE, mils/in 0.1/0.5 MODE Expansion SAMPLE SIZE 0.129 LOAD, g 1 dY, (10X), (mils/min)/in ___	



DUPONT Instruments

MEASURED VARIABLE ___

Chart 21B4

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FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 4

CHARTS

U.S. Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 4

		SAMPLE			
1. Carbon Content, % QAI-5560		#4-1	#4-2	#4-3	
		99.75	99.57	99.17	
		NASA LOT# 4 AVERAGE		99.50	
2. Ash Content, % PTM-71B		.005	.000	.010	
		.021	.015	.005	
	AVG.	.013	.008	.008	
		NASA LOT# 4 AVERAGE		.010	
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)		#4-1	#4-2	#4-3	LOT#4 AVG.
	Na	2.0	2.0	1.0	1.7
	K	1.5	2.0	1.0	1.5
	Ca	1.5	0.5	1.5	1.2
	Mg	1.0	1.0	0.0	0.7
	Li	0.0	0.0	0.0	0.0
	TOTAL	6.0	5.5	3.5	5.0
3a. Moisture Content, % CTM-53B		0.018	0.005	0.010	
		0.030	0.015	0.015	
	AVG.	0.024	0.010	0.013	
		NASA LOT# 4 AVERAGE		0.016	
3b. Ash Content, % CTM-53B		0.005	0.005	0.000	
		0.000	0.005	0.000	
	AVG.	0.003	0.005	0.000	
		NASA LOT# 4 AVERAGE		0.003	
4. pH, Units ASTM D1512		4.70	4.80	4.80	
		4.80	4.85	4.65	
	AVG.	4.75	4.82	4.72	
		NASA LOT# 4 AVERAGE		4.76	
5. Particle Size, microns S.E.M. procedure (Average values are of 10 determinations)	AVG.	.42	.38	.43	
	Maximum	.56	.73	.70	
	Minimum	.20	.20	.23	
	Std. Dev	.08	.05	.08	
		NASA LOT# 4 AVERAGE SIZE		.41	
6a. TGA, °C at 50% Loss CTM-51		701	688	697	
		NASA LOT# 4 AVERAGE		695	

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Filler Lot for NASA Lot# 4

6b. TGA
CTM-51

See Charts 6A-6C

7. Particle Size Distribution
CTM-72

See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#4-1	#4-2	#4-3
	.94	.79	.98
	.94	.82	.91
AVG.	.94	.80	.94

NASA LOT# 4 AVERAGE .89

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

Figure #4

TGA

Sample: 4-1
Size: 17.543 mg
Run No: MIR #12831 (12)
Date: FEB/04/86 07:06

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 44.DAT V2.1
Plotted: FEB/04/86 10:23

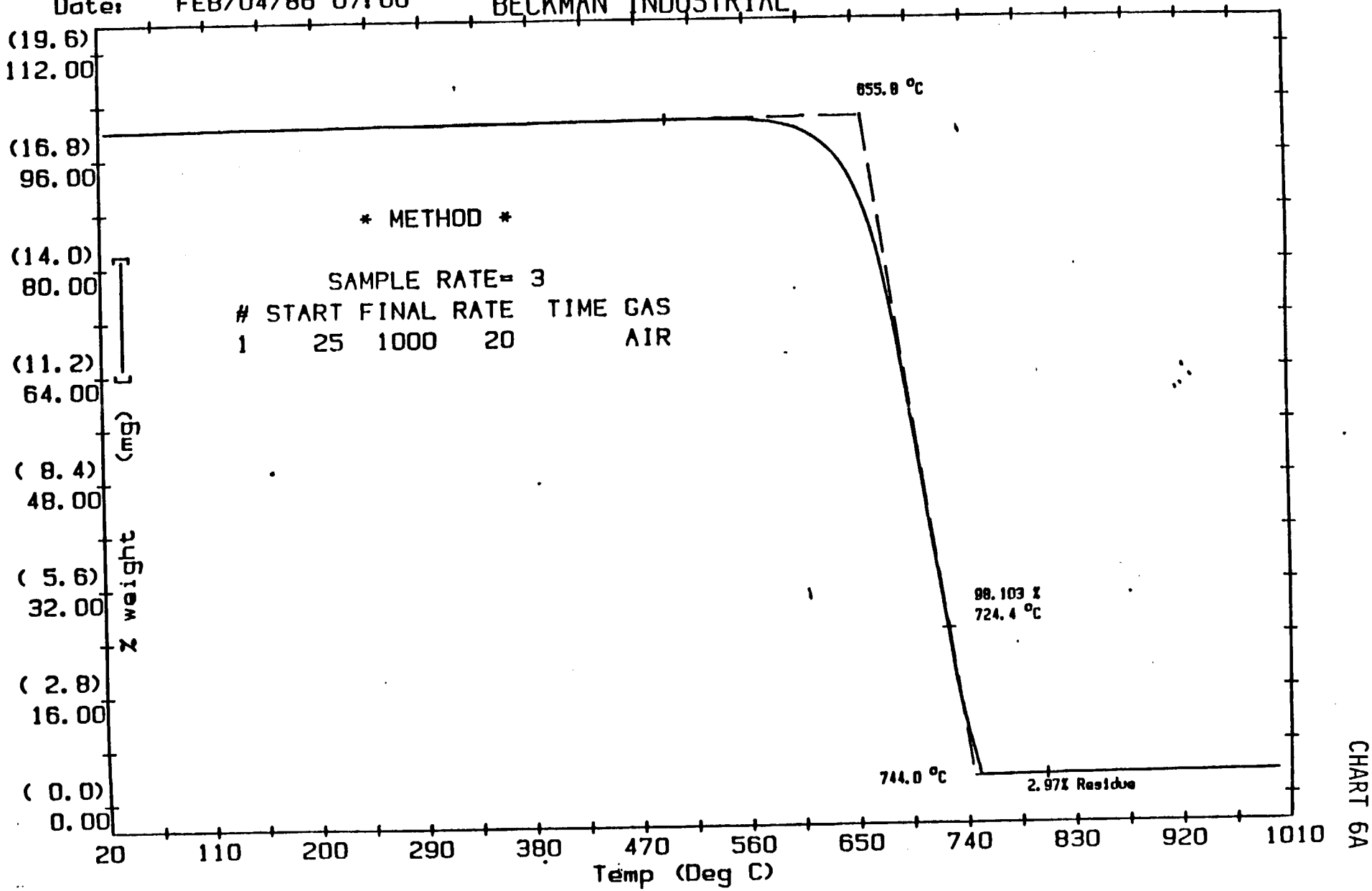


CHART 6A

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

Figure #7

TGA.

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Sample: 4-2
Size: 19.186 mg
Run No: MIR #12831 (12)
Date: FEB/04/86 08:21

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 45.DAT V2.1
Plotted: FEB/04/86 10:54

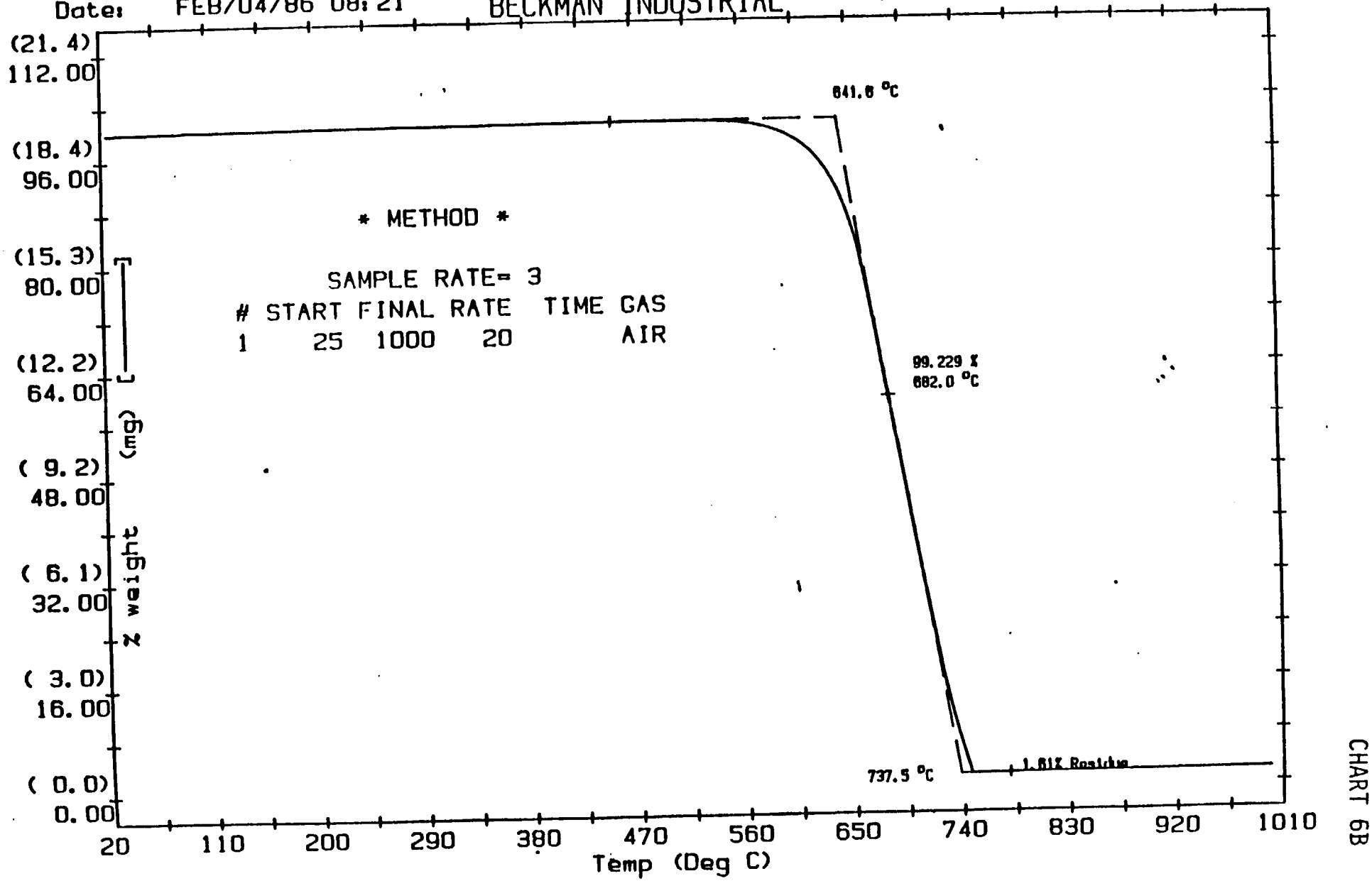


CHART 6B

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

Figure #4

Sample: 4-3
Size: 15.594 mg
Run No: MIR #12831 (12)
Date: FEB/04/86 10:14

TGA.

OMNITHERM DATA SYSTEM
BECKMAN INDUSTRIAL

Operator: M. WEGENER
Disk ID: DATA DISK #93
File No: D 46.DAT V2.1
Plotted: FEB/04/86 11:43

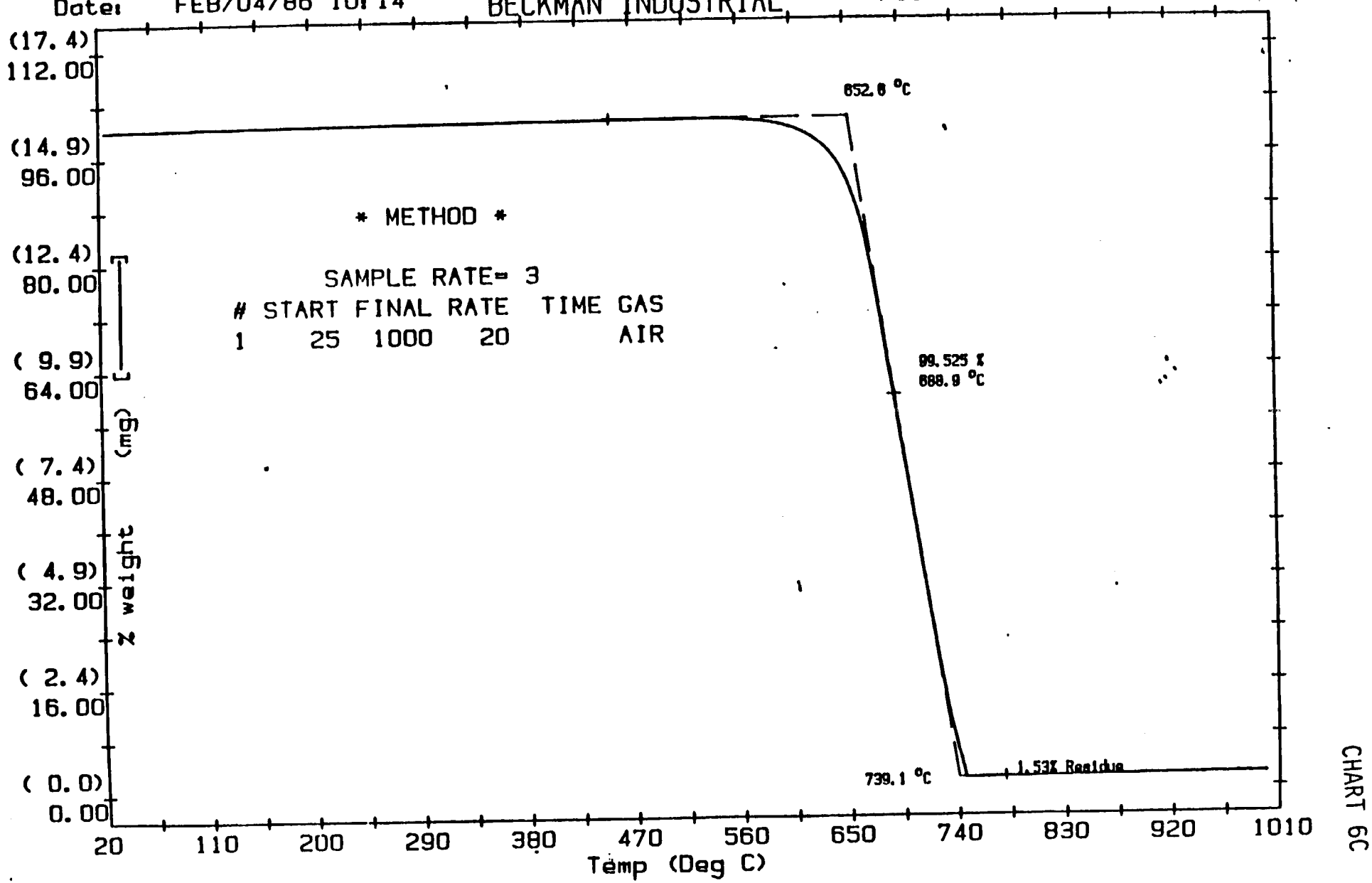


CHART 6C

Beckman Industrial™ ANALYTICAL LABORATORY SERVICES

HORIBA CAPA-500
PARTICLE ANALYZER

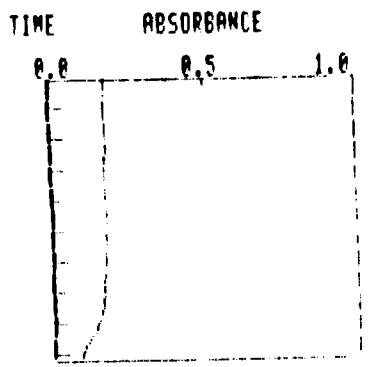
DATE 5-27-86
#1 SAMPLE NASA LOT#4-1
SOLVENT ETHYL.GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

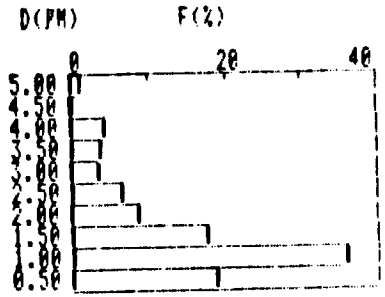


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	1.1	1.1
4.50-4.00	0.0	1.1
4.00-3.50	4.4	5.5
3.50-3.00	3.8	9.3
3.00-2.50	3.4	12.7
2.50-2.00	6.5	19.2
2.00-1.50	8.6	27.9
1.50-1.00	17.5	45.4
1.00-0.50	35.8	81.2
0.50-0.00	18.8	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-1
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

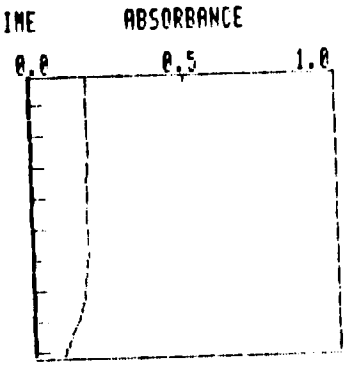
DATE 5-27-86
#2 SAMPLE NASA LOT#4-1
SOLVENT ETHYL.GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

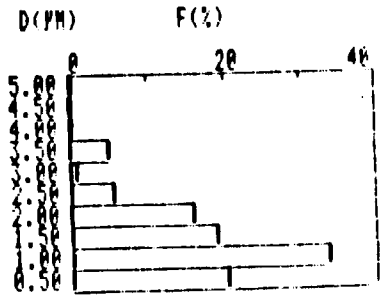


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	5.1	5.1
3.00-2.50	0.6	5.7
2.50-2.00	5.5	11.2
2.00-1.50	16.0	27.2
1.50-1.00	18.8	46.0
1.00-0.50	33.7	79.7
0.50-0.00	20.3	100.0

D(AVE) 0.94 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-1
Sample#2

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CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LoI#4-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

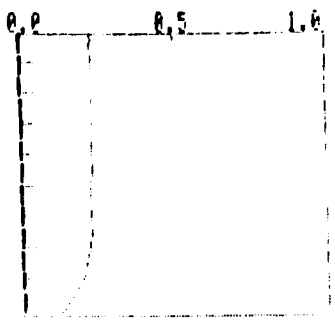
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

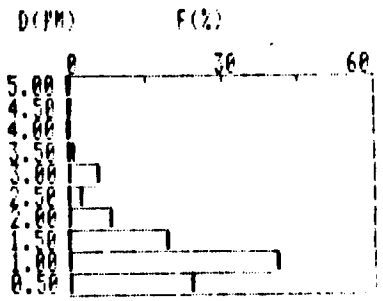


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	0.7	0.7
3.00-2.50	5.5	6.2
2.50-2.00	2.2	8.4
2.00-1.50	7.9	16.3
1.50-1.00	19.2	35.5
1.00-0.50	41.1	76.5
0.50-0.00	23.5	100.0

D(AVE) 0.82 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-2
Sample#2

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LoI#4-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

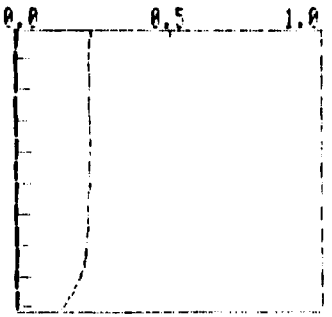
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

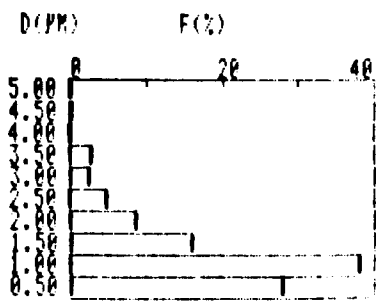


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	2.7	2.7
3.00-2.50	2.4	5.1
2.50-2.00	4.7	9.8
2.00-1.50	8.4	18.2
1.50-1.00	15.7	33.9
1.00-0.50	38.1	72.0
0.50-0.00	28.0	100.0

D(AVE) 0.79 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#4-2
Sample#1

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CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

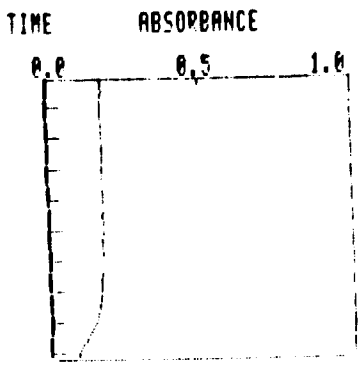
DATE 5-27-86
#1 SAMPLE NASA LOT#43
SOLVENT ETHYL.GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

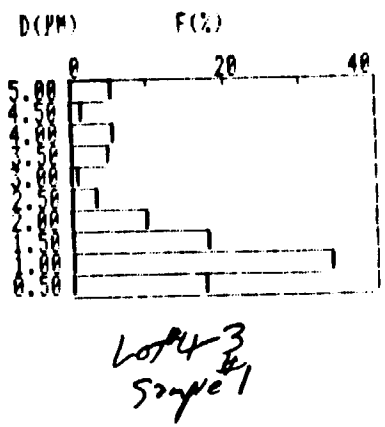


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	5.3	5.3
4.50-4.00	1.3	6.6
4.00-3.50	5.5	12.2
3.50-3.00	4.6	16.8
3.00-2.50	0.7	17.5
2.50-2.00	3.0	20.5
2.00-1.50	9.9	30.4
1.50-1.00	18.0	48.4
1.00-0.50	34.1	82.4
0.50-0.00	17.6	100.0

D(AVE) 0.98 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#43
Sample#1

HORIBA CAPA-500
PARTICLE ANALYZER

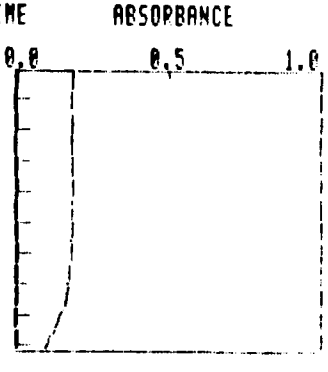
DATE 5-27-86
#2 SAMPLE NASA LOT#43
SOLVENT ETHYL.GLYCOL
C=0.01 mg/ml

* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

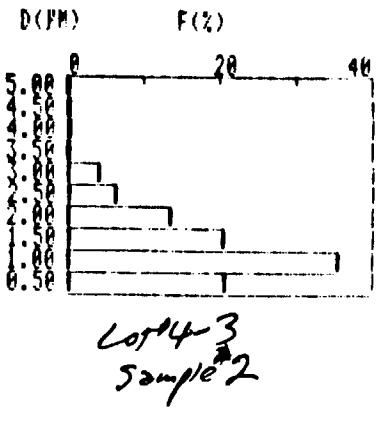


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	0.0	0.0
3.50-3.00	0.0	0.0
3.00-2.50	3.8	3.8
2.50-2.00	6.2	10.0
2.00-1.50	13.5	23.6
1.50-1.00	20.3	43.8
1.00-0.50	35.6	79.4
0.50-0.00	20.6	100.0

D(AVE) 0.91 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#43
Sample#2

CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

91LD Resin Lot for NASA Lot# 4

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

91LD Resin Lot for NASA Lot# 4

		#4-1
1. Resin Solids, % PTM-7C		70.6
		71.4
		70.8
	AVG.	70.9
2. Specific Gravity @ 25°C PTM-29C		1.140
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C		895
4. Gel Time, min:sec PTM-47B		3:10
5. Atomic Absorption, ppm CTM-53B	Na	13
	K	1
	Ca	2
	Mg	8
	Li	0
	AVG.	24
6. Volatiles, Gas Chromatography CTM-55		See Chart 6A
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)		8.1 (U.S.P.)
		See Chart 7A
8. DSC, temperature °C CTM-50A		186
		See Chart 8A
9. HPLC CTM-49A		See Chart 9A
10. GPC, Average molecular wt. CTM-49A		1964
		See Chart 10A
11. pH, units CTM-1B		8.2

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

91LD Resin Lot for NASA Lot# 4

12. Phenol Content, % CTM-55 Appendix 1		#4-1 11.57 11.69 AVG. 11.63	
13. Chang's Index, ml. CTM-5B		24.5	
14. RDS, Minimum Viscosity, cps. CTM-57A	#4-1	Min. Visc. 323	°C 105
	See Chart 14A		
15. NMR Vendor procedure	See Chart 15A		

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	Q.Z.Z.	Date	12/11/86
Column		Detector	FID
Length	6 ft.	Voltage	
Dia.	1/4 in.	Sensit.	
Liquid Phase	AT-1000	Flow Rates, ml/min	
Wt. %	9.1	Hydrogen	60 Air 96
Support	GRAPHPAC	Scavenge	
Mesh	80/100	Split	
Carrier Gas	He	Temperature, °C	
Rotameter		Det.	220 Inj. 200
Inlet Press	60 psig	Column Initial	60
Rate	30 ml/min	Final	210
CHART SPEED		Rate	5°C/MIN
SAMPLE	9/LD,4-1	Solvent	THF
Size	0.1 µl	Concn.	0.0028 g/ml

GAS CHROMATOGRAPHY STANDARD SOLVENT

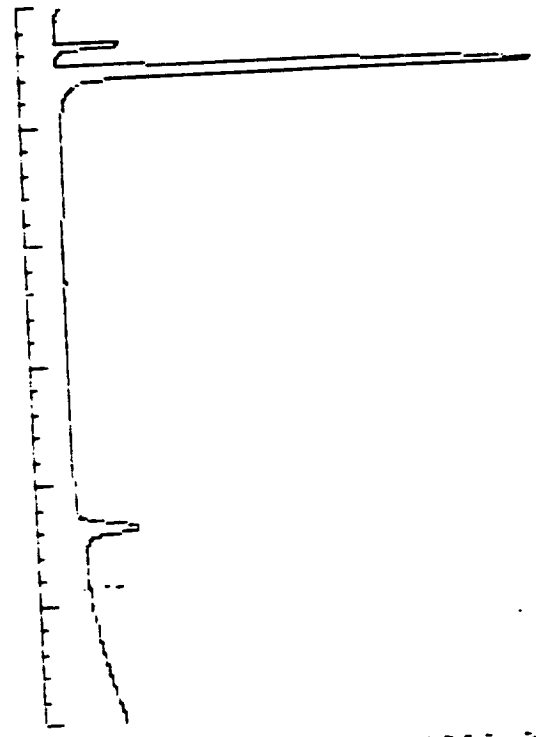
TEST METHOD CTM-55

STANDARD SOLVENT/MONOMER	RETENTION TIME (MINS.)
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

CHART 6A

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: 91 LD 4-1
MISC.: C=0 10026 GMS/ML

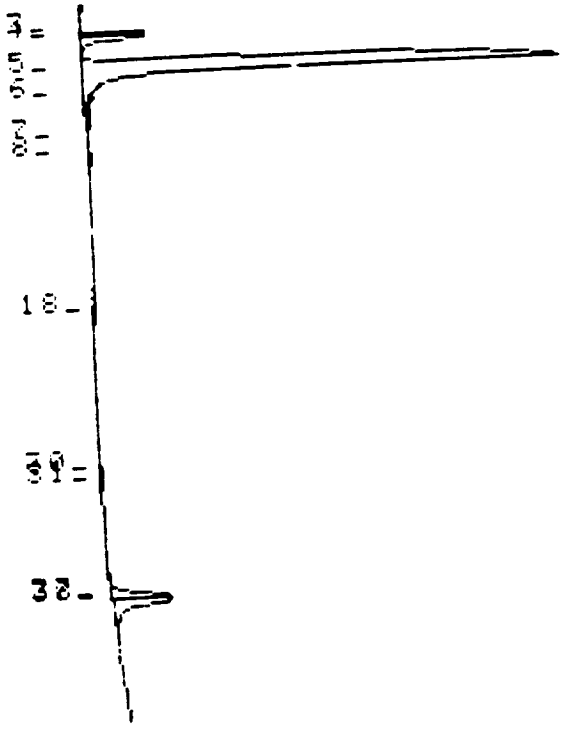
TIME: 8:08
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT
1	.60	3478	.115	1	529
3	1.58	70505	2.322	2	11919
4	1.70	147000	4.841	2	11935
5	3.00	2376300	78.256	3	91188
6	3.85	34523	1.137	4	956
7	5.40	2171	.072	4	173
8	5.98	7385	.243	2	203
18	11.60	5476	.180	2	274
30	17.35	4813	.159	2	143
31	17.70	1782	.059	3	92
37	21.83	176570	5.815	2	11090
38	21.95	206570	6.803	2	11029

TOTAL AREA= 3036575
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: 91 LD 4-1
MISC.: C=0 10026 GMS/ML

TIME 9:08
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT
3	1.58	70505	2.341	2	11919
4	1.70	147000	4.881	2	11935
5	3.00	2376300	78.908	3	91188
6	3.85	34523	1.146	4	956
37	21.83	176570	5.863	2	11090
38	21.95	206570	6.859	2	11029

TOTAL AREA= 3011466
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 10000

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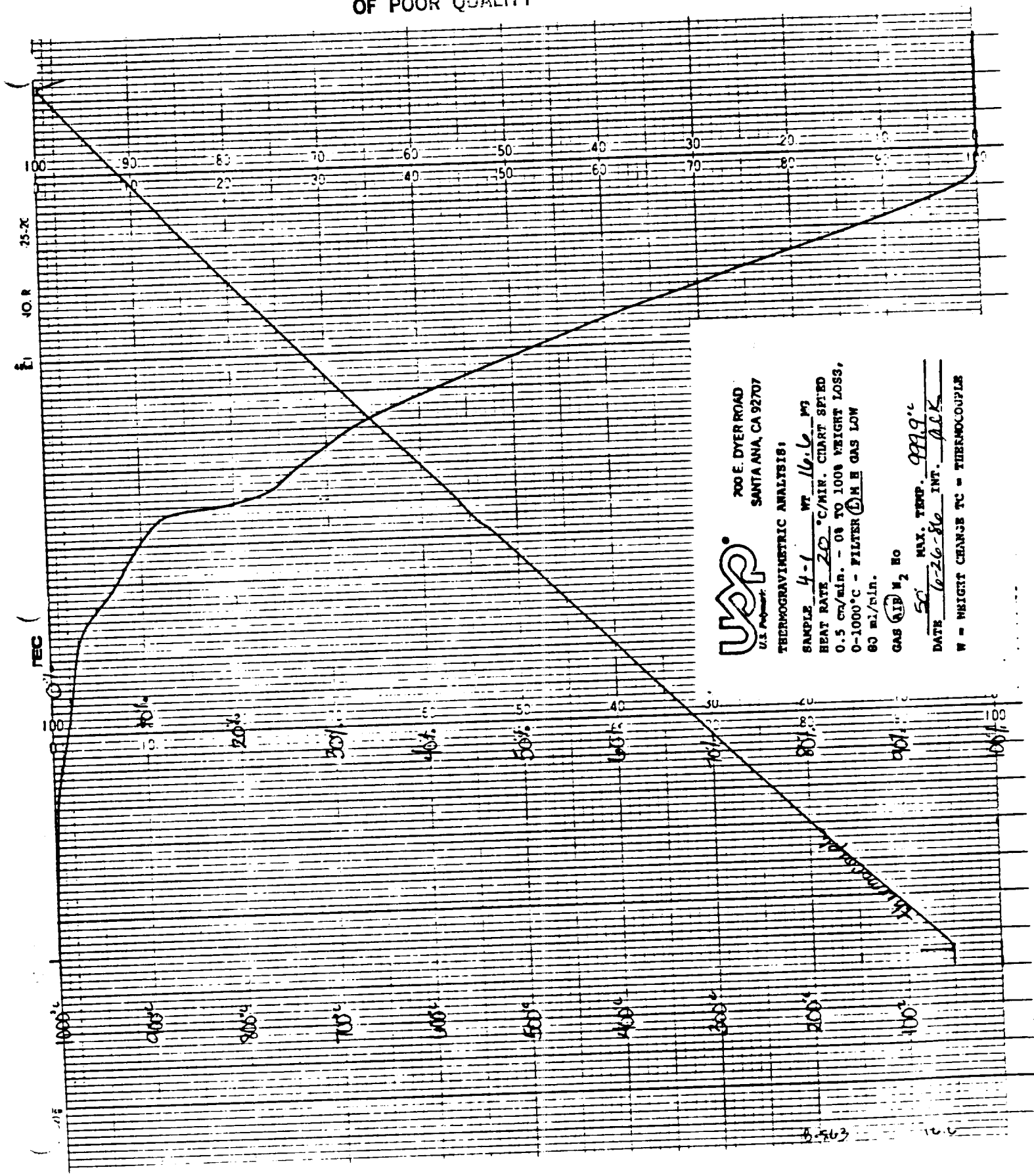
CHART 7A



PART NO. 990088

CHART 8A

RUN NO. ___ DATE 6-23-86
OPERATOR JLK
SAMPLE: 4-1
ATM N2 @ 1atm
FLOW RATE 40 ml/min

T-AXIS
SCALE, °C/in 50
PROG. RATE, °C/min 20°
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in 5.0 15x
(mcal/sec)/in ___
WEIGHT, mg 6.1
REFERENCE
1 alum seal

DUPONT Instruments

MEASURED VARIABLE

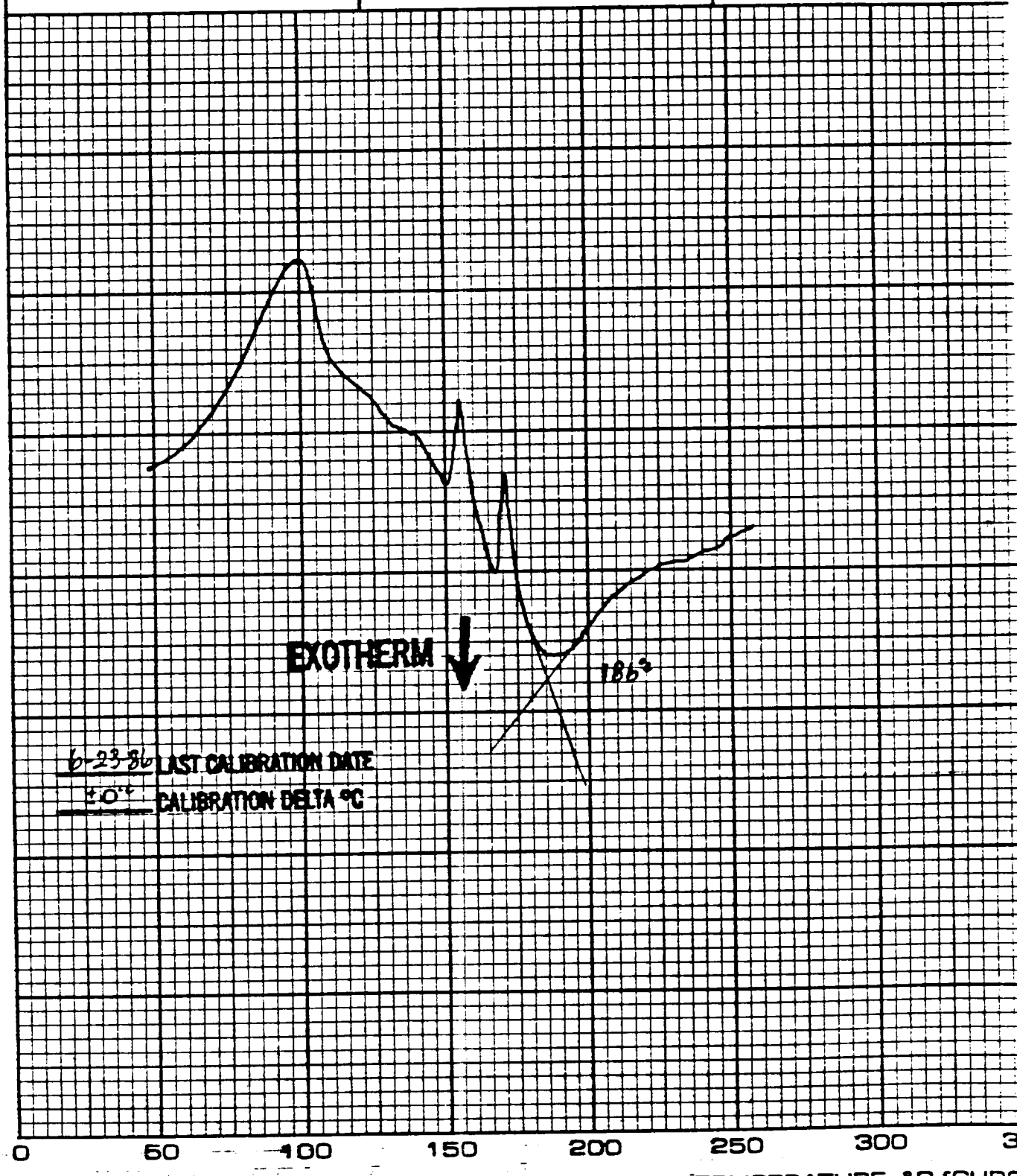


CHART 9A

FILE A:PHEN033.HDR TAKEN 09-05-1986 14:53:19

********* AREA PERCENT REPORT *********

Sample Name: 91LD,4-1,C=7.02 — Operator Initials: JGZ
Date: 09-05-1986 14:53:19 Method:PHENOLIC — DATA FILE: A:PHEN033.PTS
Interface: 4 — Cycle#: 33 — Channel#: 0 — Vial#: N.A.
Starting Peak Width: 10 — Threshold: .01

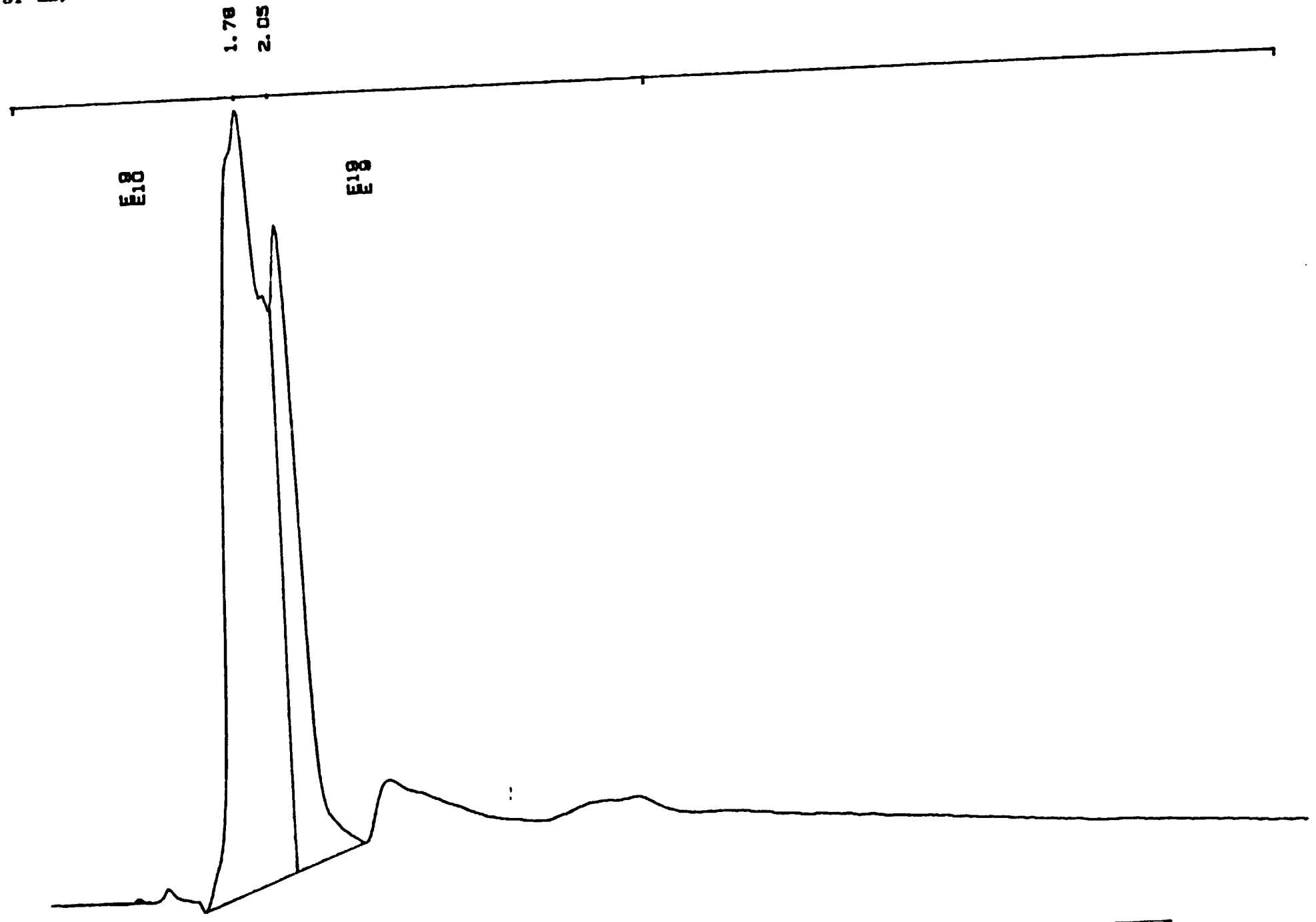
Instrument Type: BECKMAN HPLC — Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU — Detector 1:
Misc. Information: LENGTH=25

Starting Delay: 0.00 — Ending Retention Time: 10.00

Pk No	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
3	1.78	124818	73.2381	2	5258	100.000	23.7
4	2.05	45610	26.7619	2	4375	36.541	10.4

Total Area: 170428 — Area Reject: 1000 — One sample per 1.000 sec.

DATA FILE=PHEN033 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.401 Mv. HIGH SCALE= 10.837 Mv.
91 LD, 4-1, C=7.02 MG/ML, 9/5/86, JGZ



*** Calibration Data ***
Calibration Name:
Misc Information:

Fit Type: 3
Log Mol Wt = A + Bx + Cx^2 + Dx^3
A= 2.538977 B= 2.115815 C= -.5646824 D= 3.606432E-02
Coefficient of Determination: 0.9902

Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857

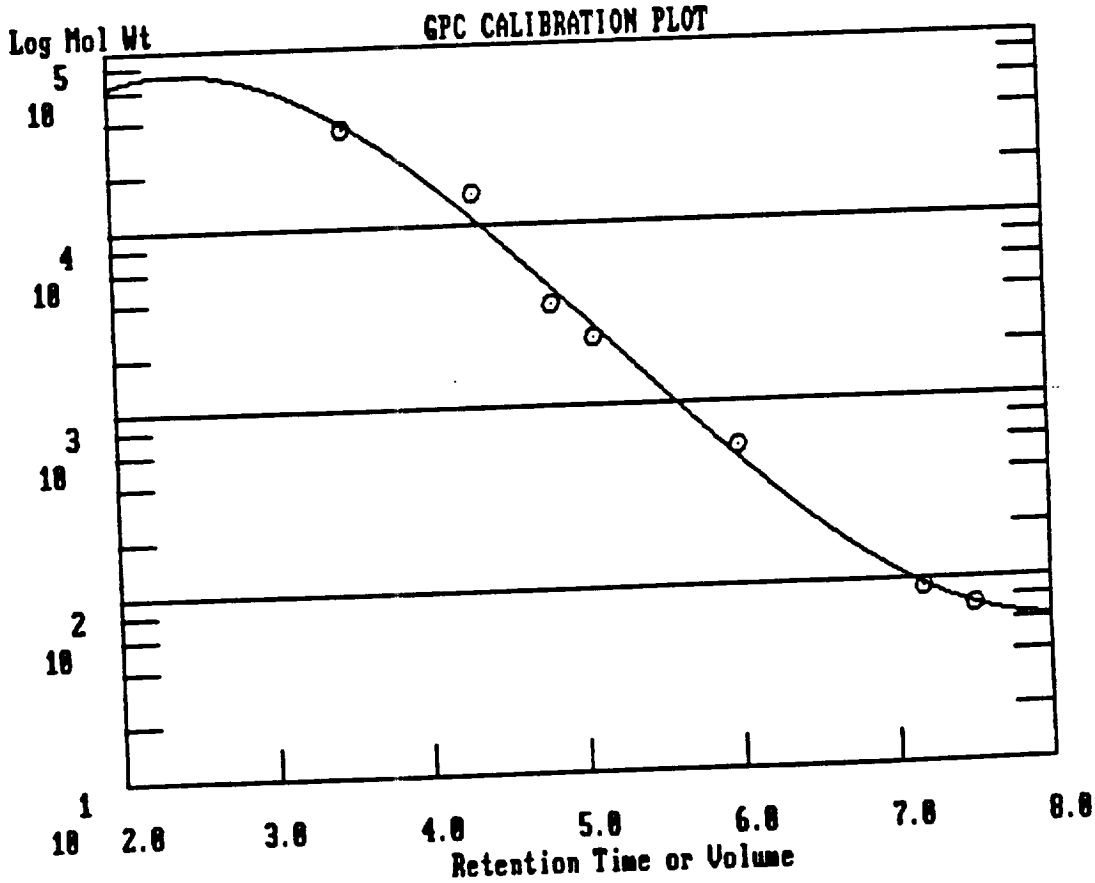


CHART 10A

A‾A FILE A:GPC38.HDR TAKEN 08-06-1986 13:14:48

********* GPC REPORT *********

****
-* ** Operator Initials: GBF *
- ample Name: 91LD 4-1 CIC DATA FILE: A:GPC38.FTS *
- Date: 08-06-1986 12:51:25 Method: Channel#: 0 Vial#: N.A. *
Cycle#: 38 *
nterface: 5
tarting Peak Width: 60 Threshold: 0 ***
-*** Column Type: ULTRASTYRAGEL 500A *
Instrument Type: HPLC/BECKMAN *
Solvent Description: THF *
Operating Conditions: T=35C FLOWRATE=2.0ML/MIN *
Detector 0: 254NM/.1AU Detector 1: *
Misc. Information: CALIBRATION/GPC ***
+* ** Ending Retention Time: 10.00

Starting Delay: 0.00
Ca ibration file: GPCPHEN
Mc ecular Weight Distribution Averages

Baseline TIMES:	3.85 to	10.00	MW:	22295 to		2
Process TIMES:	3.85 to	10.00	MW:	22295 to		2
Tc al Area:	154005					
Mw=	1964					
Mn=	248					
Mw Mn=	7.9074					
M: =	5285					
M =	1673					

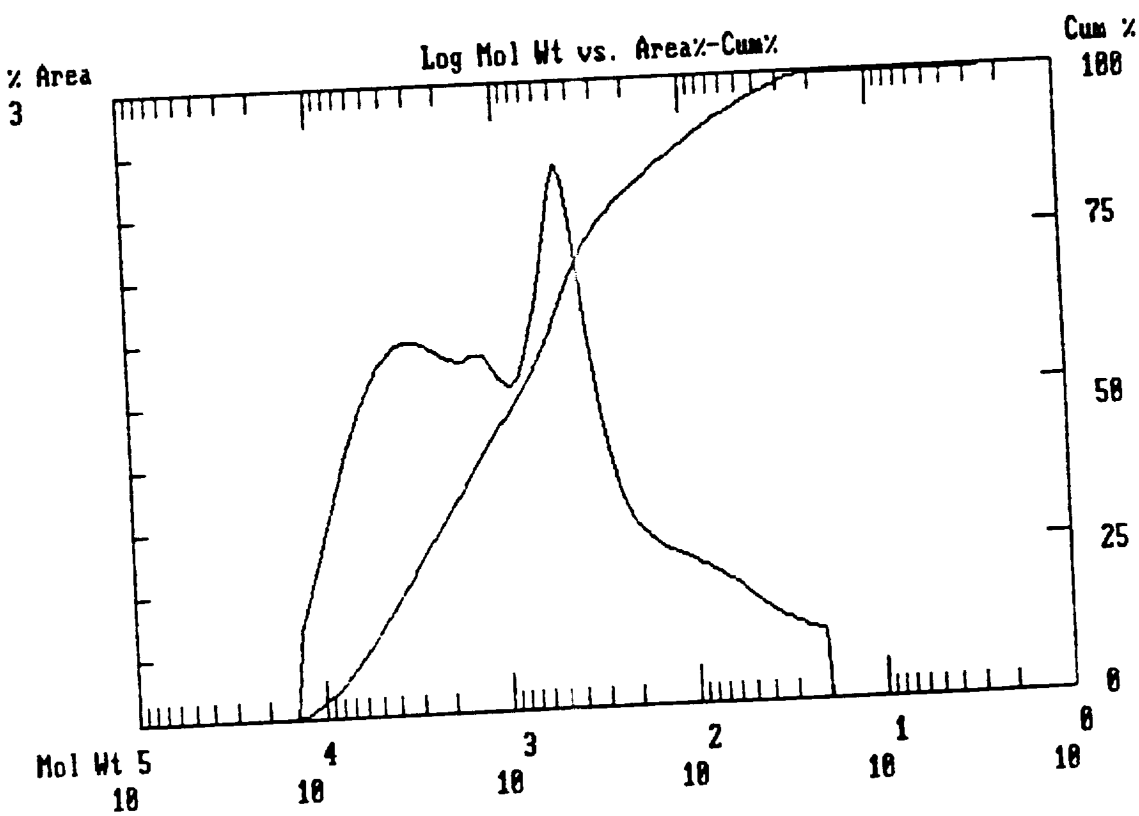


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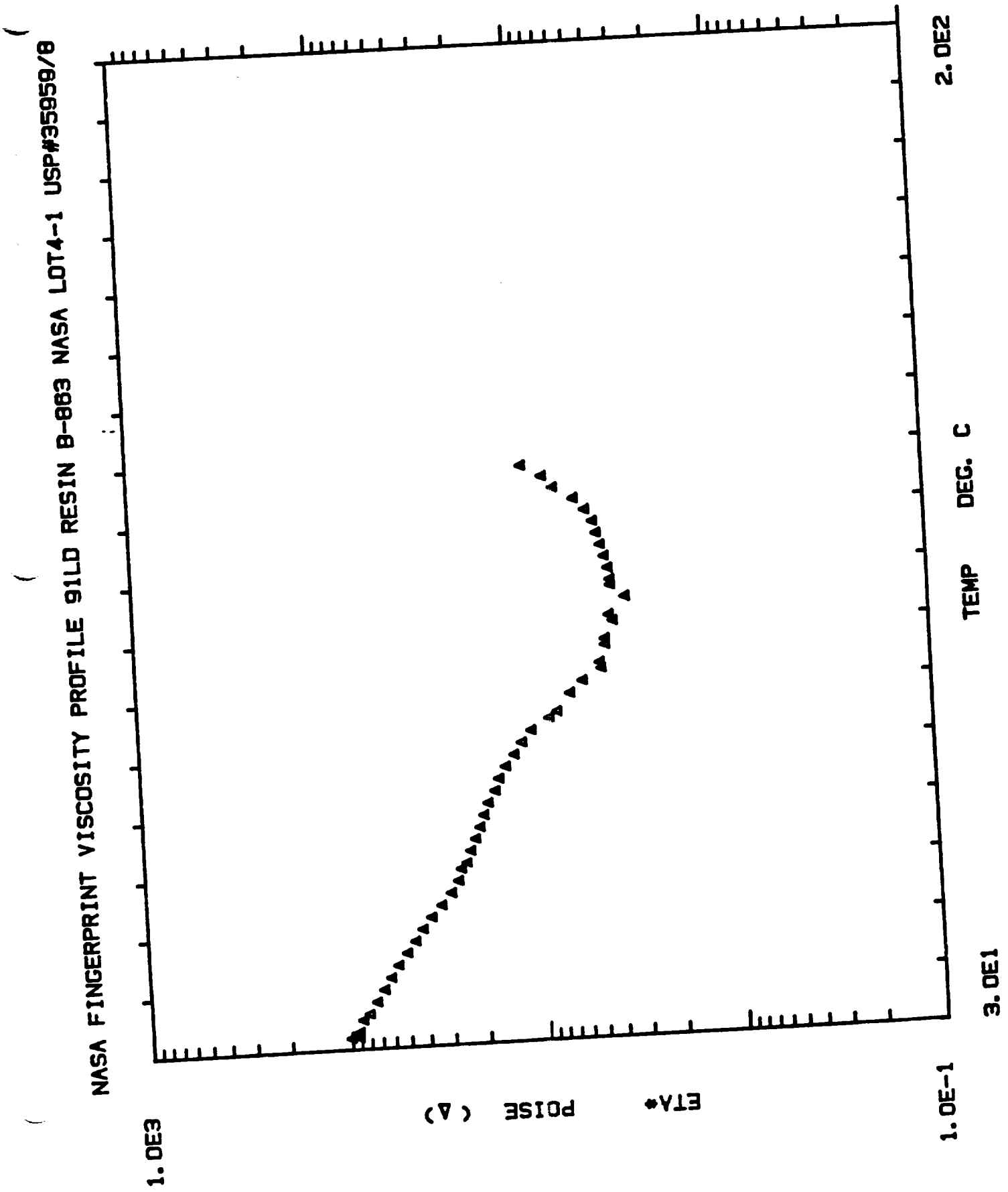
CHART 14A


NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN B-883 NASA LOT4-1 USP#35959/8
1.0E3
ETA* POISE (A)
1.0E-1
2.0E2
TEMP DEG. C
3.0E1

Rheometrics RECAP II

Experiment No. : 19 Sample No. : 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE WILD RESIN B-863 NASA LOT4-1 USP#35959/8

Operator : CRISTINA P

Date and Time : Wednesday, August 20, 1986 16:07:04

Operating Mode : DYNAMIC

Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

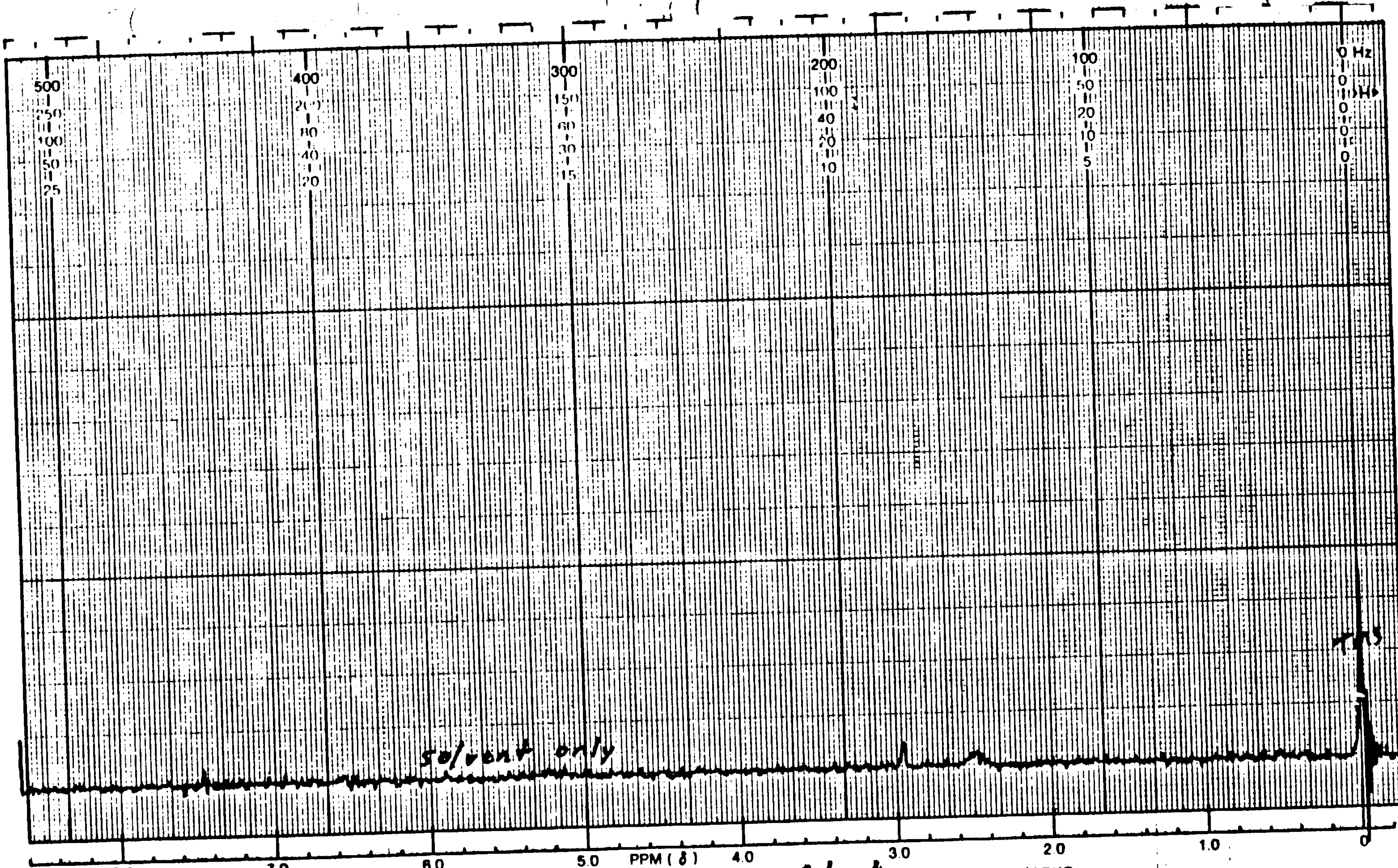
Notes :

NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN B-863 NASA LOT4-1 USP#35959/B

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	9.913e+001	8.597e+001	4.934e+001	1.245e+001	2.000e-001	3.200e+001
2	8.994e+001	8.011e+001	4.087e+001	1.130e+001	1.000e+000	3.200e+001
3	8.983e+001	8.072e+001	3.941e+001	1.129e+001	2.000e+000	3.300e+001
4	8.567e+001	7.718e+001	3.720e+001	1.075e+001	3.000e+000	3.500e+001
5	7.923e+001	7.136e+001	3.442e+001	9.947e+000	4.000e+000	3.600e+001
6	7.192e+001	6.472e+001	3.137e+001	9.028e+000	5.000e+000	3.800e+001
7	6.556e+001	5.843e+001	2.974e+001	8.228e+000	6.000e+000	4.000e+001
8	6.012e+001	5.282e+001	2.873e+001	7.550e+000	7.000e+000	4.200e+001
9	5.478e+001	4.705e+001	2.805e+001	6.876e+000	8.000e+000	4.400e+001
10	4.918e+001	4.102e+001	2.712e+001	6.175e+000	9.000e+000	4.600e+001
11	4.431e+001	3.562e+001	2.635e+001	5.567e+000	1.000e+001	4.800e+001
12	4.047e+001	3.139e+001	2.554e+001	5.081e+000	1.100e+001	5.000e+001
13	3.632e+001	2.784e+001	2.333e+001	4.563e+000	1.200e+001	5.200e+001
14	3.206e+001	2.429e+001	2.093e+001	4.025e+000	1.300e+001	5.400e+001
15	2.842e+001	2.211e+001	1.785e+001	3.570e+000	1.400e+001	5.600e+001
16	2.601e+001	2.053e+001	1.597e+001	3.266e+000	1.500e+001	5.800e+001
17	2.502e+001	2.043e+001	1.444e+001	3.142e+000	1.600e+001	6.000e+001
18	2.335e+001	1.889e+001	1.373e+001	2.931e+000	1.700e+001	6.100e+001
19	2.220e+001	1.853e+001	1.223e+001	2.786e+000	1.800e+001	6.300e+001
20	2.088e+001	1.799e+001	1.060e+001	2.621e+000	1.900e+001	6.500e+001
21	1.965e+001	1.727e+001	9.363e+000	2.466e+000	2.000e+001	6.700e+001
22	1.864e+001	1.676e+001	8.170e+000	2.338e+000	2.100e+001	6.900e+001
23	1.765e+001	1.618e+001	7.048e+000	2.215e+000	2.200e+001	7.100e+001
24	1.620e+001	1.494e+001	6.251e+000	2.032e+000	2.300e+001	7.300e+001
25	1.537e+001	1.461e+001	4.780e+000	1.929e+000	2.400e+001	7.500e+001
26	1.412e+001	1.351e+001	4.078e+000	1.771e+000	2.500e+001	7.700e+001
27	1.273e+001	1.232e+001	3.214e+000	1.596e+000	2.600e+001	7.900e+001
28	1.158e+001	1.121e+001	2.918e+000	1.454e+000	2.700e+001	8.100e+001
29	1.030e+001	1.003e+001	2.369e+000	1.293e+000	2.800e+001	8.300e+001
30	8.326e+000	8.113e+000	1.872e+000	1.045e+000	2.900e+001	8.500e+001
31	7.561e+000	7.467e+000	1.224e+000	9.496e-001	3.000e+001	8.600e+001
32	6.426e+000	6.290e+000	1.317e+000	8.064e-001	3.100e+001	8.900e+001
33	5.525e+000	5.410e+000	1.126e+000	6.935e-001	3.200e+001	9.100e+001
34	4.405e+000	4.377e+000	5.017e-001	5.527e-001	3.300e+001	9.300e+001
35	4.476e+000	4.376e+000	9.446e-001	5.618e-001	3.400e+001	9.400e+001
36	4.168e+000	4.095e+000	7.743e-001	5.228e-001	3.500e+001	9.700e+001
37	4.176e+000	4.168e+000	2.556e-001	5.243e-001	3.600e+001	9.800e+001
38	3.757e+000	3.720e+000	5.238e-001	4.714e-001	3.700e+001	1.010e+002
39	3.932e+000	3.904e+000	4.663e-001	4.936e-001	3.800e+001	1.020e+002
40	3.230e+000	3.215e+000	3.074e-001	4.052e-001	3.900e+001	1.050e+002
41	3.804e+000	3.794e+000	2.715e-001	4.777e-001	4.000e+001	1.070e+002
42	3.808e+000	3.804e+000	1.876e-001	4.786e-001	4.100e+001	1.080e+002
43	3.872e+000	3.842e+000	4.809e-001	4.862e-001	4.200e+001	1.100e+002
44	4.018e+000	4.013e+000	2.074e-001	5.047e-001	4.300e+001	1.120e+002
45	4.182e+000	4.181e+000	1.166e-001	5.250e-001	4.400e+001	1.140e+002
46	4.359e+000	4.337e+000	4.397e-001	5.477e-001	4.500e+001	1.160e+002
47	4.524e+000	4.486e+000	5.830e-001	5.679e-001	4.600e+001	1.180e+002
48	4.928e+000	4.878e+000	6.960e-001	6.190e-001	4.700e+001	1.200e+002
49	5.592e+000	5.551e+000	6.801e-001	7.024e-001	4.800e+001	1.220e+002
50	7.056e+000	6.983e+000	1.012e+000	8.862e-001	4.900e+001	1.240e+002

NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN B-863 NASA LOT4-1 USP#35959/8

No.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	7.970e+000	7.806e+000	1.609e+000	9.997e-001	5.000e+001	1.260e+002
2	1.009e+001	9.875e+000	2.057e+000	1.266e+000	5.100e+001	1.280e+002



SOLVENT ONLY SCAN

SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: —
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 | 250 | 500 | 1000
SWEEP WIDTH (Hz): 25 | 50 | 100 | 250 | 500
FILTER: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8
RF POWER LEVEL: 0.30

AUTO ☐
(250)
(500)
(2)
(.05)

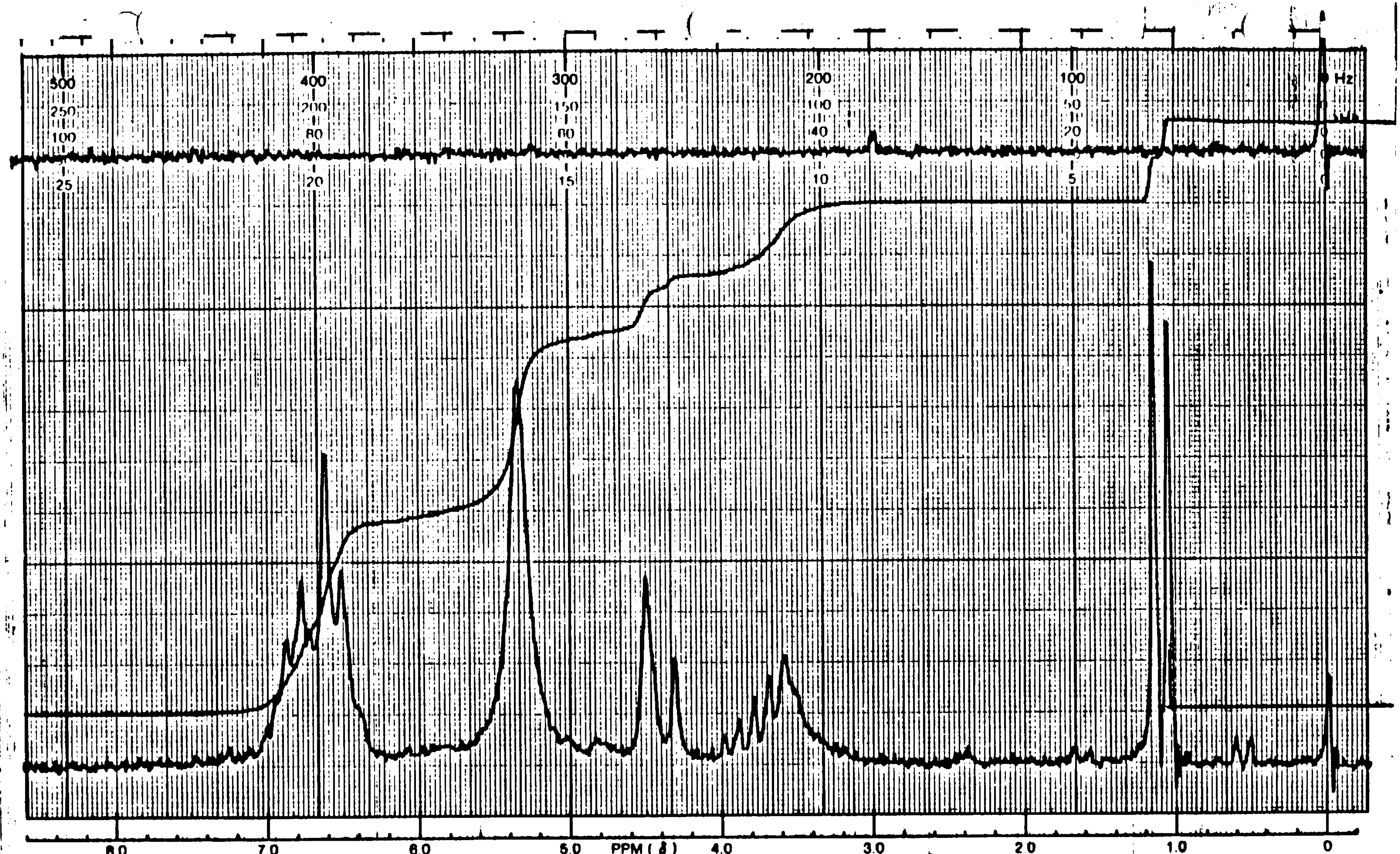
SAMPLE: Solvent
SOLVENT: Unisol-d + 0.5% TMS
DEC. LEVEL

REMARKS: ORIGINAL PAGE IS OF POOR QUALITY

DATE: 3-21-86
OPERATOR: DGW
SPECTRUM NO. 1A of 7
solvent scan

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

CHART 15A



MANUAL

SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

SWEEP TIME (SEC): 50 | 250 | 500 | 1000
SWEEP WIDTH (Hz): 25 | 50 | 100 | 250 | 500
FILTER: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8
RF POWER LEVEL: 0.30

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: 91 LD Lt 4-1
SOLVENT: dioxd-d + 0.5% TMS
DEC. LEVEL

REMARKS: 0.246 gm sample
1.256 gm solvent

ORIGINAL PAGE IS
OF POOR QUALITY

DATE: 6-19-86
OPERATOR DGW
SPECTRUM NO. 1 of 3
91 LD Lt 4-1

NORELL, INC.
LANDISVILLE, N.J. 08326
Phone: (609) 697-0020
T60

TABLE OF CONTENTS

FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

SWB-8 Fabric for NASA Lot# 4

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

SWB-8 Fabric for NASA Lot# 4

1a. Breaking Strength, lbs/in, WARP
ASTM D1682

	#4-1	#4-2	LOT4 AVG
PICK	71	66	68.5
CENTER	70	81	75.5
PLAIN	73	64	68.5
AVG.	71.3	70.3	70.8

1b. Breaking Strength, lbs/inch, FILL
ASTM D1682

PICK	45	28	36.5
CENTER	46	32	39.0
PLAIN	49	33	41.0
AVG.	46.7	31	38.8

2a. Carbon Assay, %
MDQAI 5560

PICK	99.9	99.6	99.75
CENTER	99.9	99.6	99.75
PLAIN	99.8	99.5	99.65
AVG.	99.87	99.57	99.72

2b. Hydrogen Assay, %
MDQAI 5560

PICK	<.01	.01	EST .006
CENTER	<.01	<.01	EST .001
PLAIN	<.01	<.01	EST .001
AVG.	EST .001	EST .004	EST .003

2c. Nitrogen Assay, %
MDQAI 5560

PICK	.1	.2	.15
CENTER	.1	.2	.15
PLAIN	.1	.2	.15
AVG.	.1	.2	.15

3. Visual Inspection
QCi-102

See Charts 3A-3B

4. Specific Gravity, Units
PTM-84

	1.6601	1.6328	1.6465
	1.6854	1.6741	1.6798
	1.6341	1.7502	1.6922
AVG.	1.660	1.686	1.673

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700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

SWB-8 Fabric for NASA Lot# 4

5. pH, Units
CTM-24B

	#4-1	#4-2	LOT4 AVG
	6.4	8.4	7.4
	6.2	8.4	7.3
AVG.	6.3	8.4	7.35

6. TGA, °C at 50% Weight Loss
CTM-51 (AIR)

SET UP# 1	SET UP# 2
#4-1 869	#4-2 652

See Chart 6A-6B

7a. Atomic Absorption, ppm
CTM-53B

	#4-1	#4-2	LOT4 AVG
Na	5	8	6.5
K	2	1	1.5
Ca	17	180	98.5
Mg	1	1	1.0
Li	0	0	0.0
AVG.	25	190	108

7b. Moisture Content, %
CTM-53B

	.010	.025	.017

7c. Ash Content, %
CTM-53B

	.025	.203	.114

8a. Filament diameter, microns, WARP
S.E.M. (Diameters are an average of 10 measurements)

AVERAGE	9.55	9.34	9.44
Minimum	7.85	6.90	6.90
Maximum	10.95	10.90	10.95
Std. Dev	0.95	1.19	1.06

8b. Filament diameter, microns, FILL
S.E.M. (Diameters are an average of 10 measurements)

AVERAGE	10.03
Minimum	8.00
Maximum	13.75
Std. Dev	1.75

9a. Thread Count, per inch, WARP
PTM-5A

	#4-1	#4-2	LOT4 AVG
	37	33	35.0
	38	33	35.5
	38	33	35.5
	37	33	35.0
	37	33	35.0
AVG.	37.4	33.0	35.2

SWB-8 Fabric for NASA Lot# 4

9b. Thread Count, per inch, FILL
PTM-5A

	#4-1	#4-2	LOT4 AVG
	39	35	37.0
	39	36	37.5
	39	35	37.0
	39	35	37.0
	37	35	36.0
AVG.	38.6	35.2	36.9

10a. Areal Weight as received, gm/4x4
PTM-3A

LEFT	3.195	2.798	2.997
CENTER	2.866	3.364	3.115
RIGHT	3.120	2.746	2.933
AVG.	3.060	2.969	3.015

10b. Volatiles as received, %
PTM-3A

LEFT	.31	.32	.32
CENTER	.38	.39	.39
RIGHT	.45	.55	.50
AVG.	.38	.42	.40

10c. Weight change on Acetone wash, %
PTM-3A

LEFT	-.31	-.50	-.41
CENTER	-.39	-.39	-.39
RIGHT	-.13	-.07	-.10
AVG.	-.28	-.32	-.30

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

DATE 2/20/86

FABRIC SWB-8

MFG. Lot # 1152-3 Stackpole-Fibers

ROLL NO. 16-563

YARDS 20.0

POUNDS 10.1

ORDER NO. 7108

SPECIFICATION Std Mfg Carb.

FILE # NASA4-1

FOOTAGE

START Sample

LEFT

w 3½ ft

20 ft w

MISSING 38 ft THREAD

48.0 ft END of Roll 48.0 ft

TREATER OPERATOR READ UP

SYMBOLS

- TEAR
- SPOTS OR STAINS
- FOLDS
- EDGE CURL
- TIGHT WEAVE OR SELVAGE
- WEAVE DISTORTION
- VISIBLE PUCKERS
- ONE PUCKER CREASING
- TWO OR MORE CREASINGS

REMARKS

w = Pulled Thread

= Turn Edge

= Hole

U = Bags

GRADE Group B

D. Temple

USP NO. CHART 3B

DATE 2/20/86

FABRIC SWB-8

Lot # 1152-3 Stackpole Fibers

ROLL NO. 16-559-B

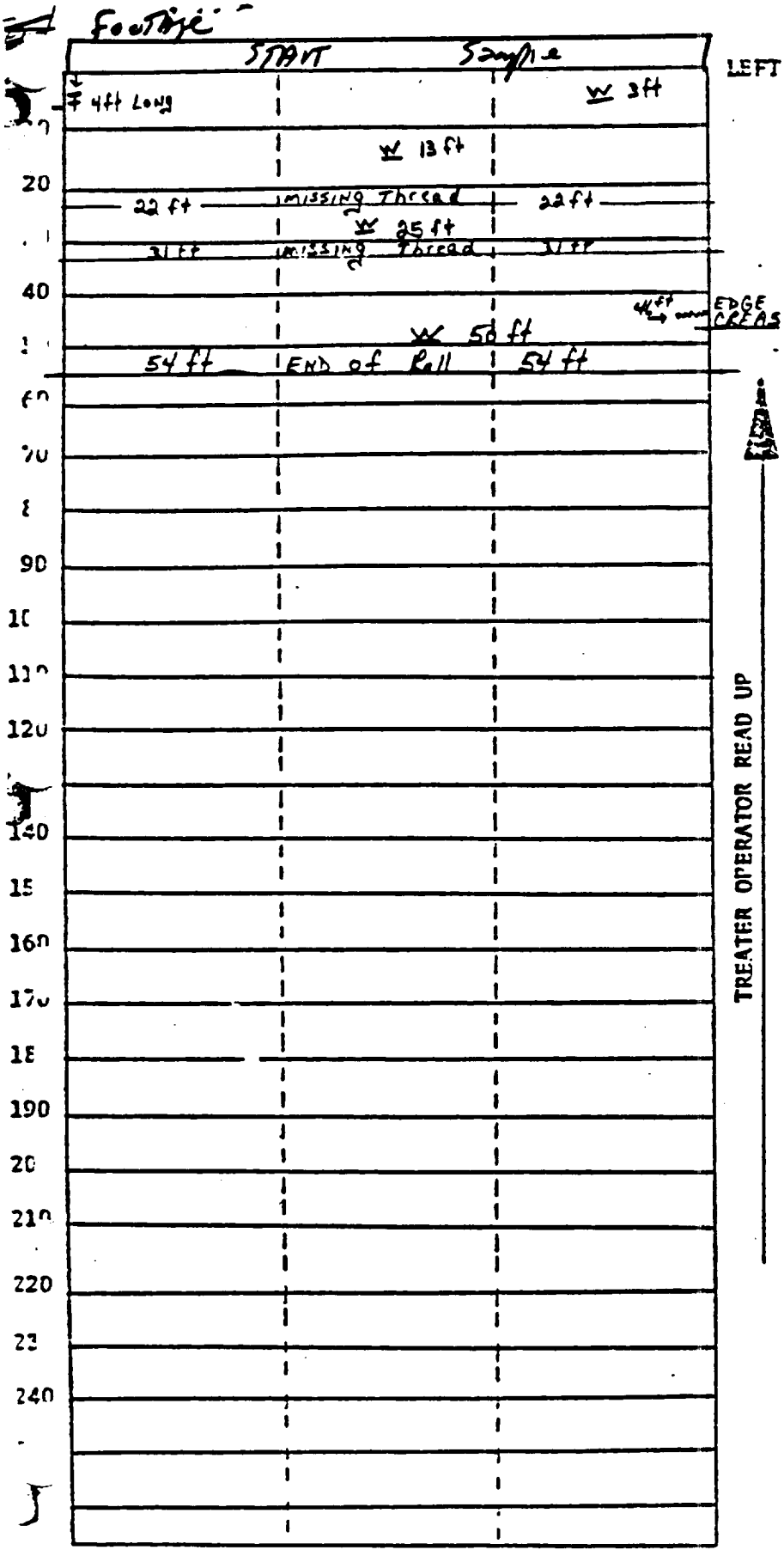
YARDS. 20.0

POUNDS 10.7

ORDER NO. 7108

SPECIFICATION Std MFG Cuts

FILE # NASA 4-2



SYMBOLS

- TEAR
- SPOTS OR STAINS
- FOLDS
- EDGE CURL
- TIGHT WEAVE OR SELVAGE
- WEAVE DISTORTION
- VISIBLE PUCKERS
- ONE PUCKER CREASING
- TWO OR MORE CREASINGS

REMARKS

W = Pulled Thread

}{ = Turn Edge

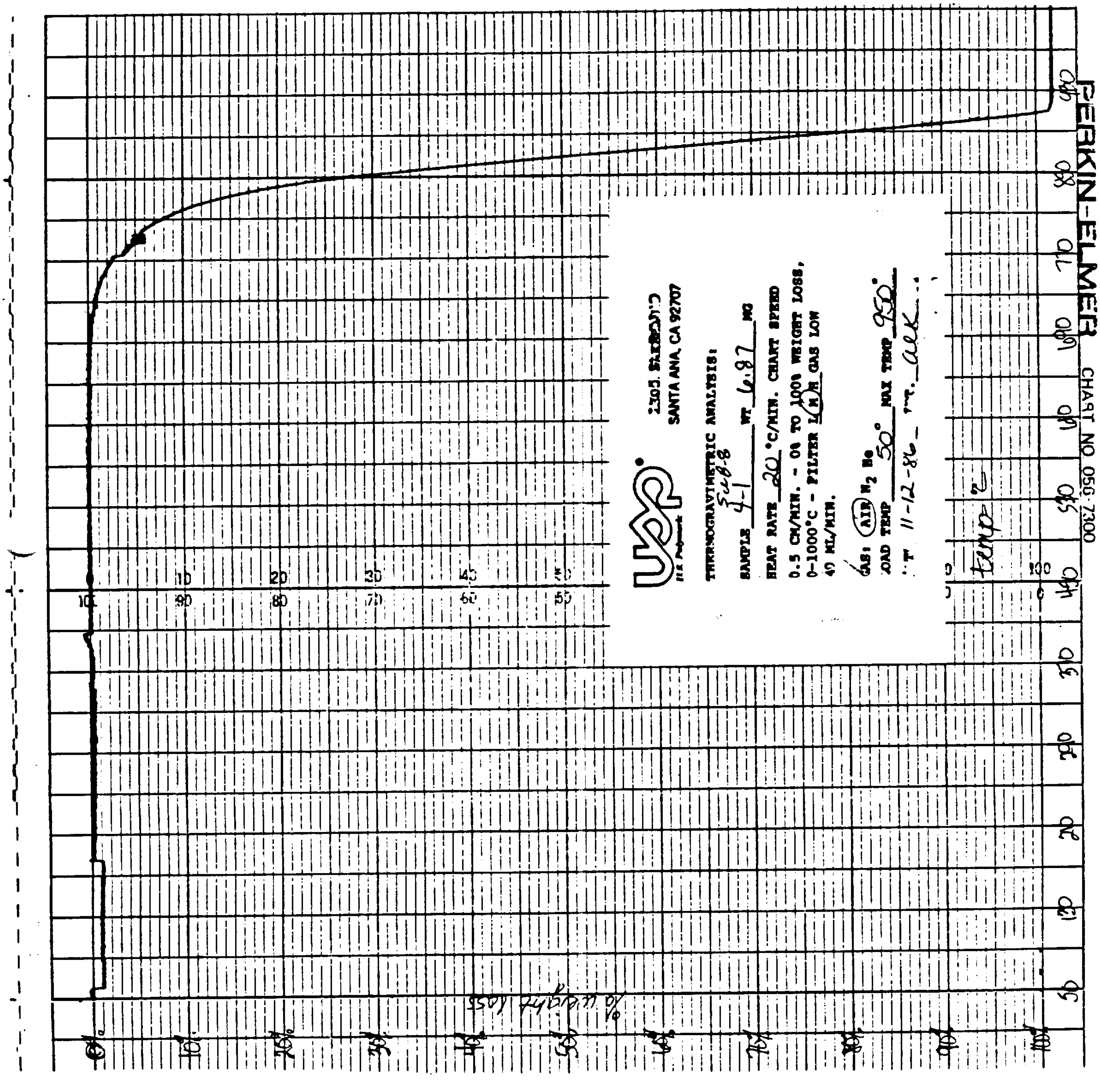
⊖ = Hole

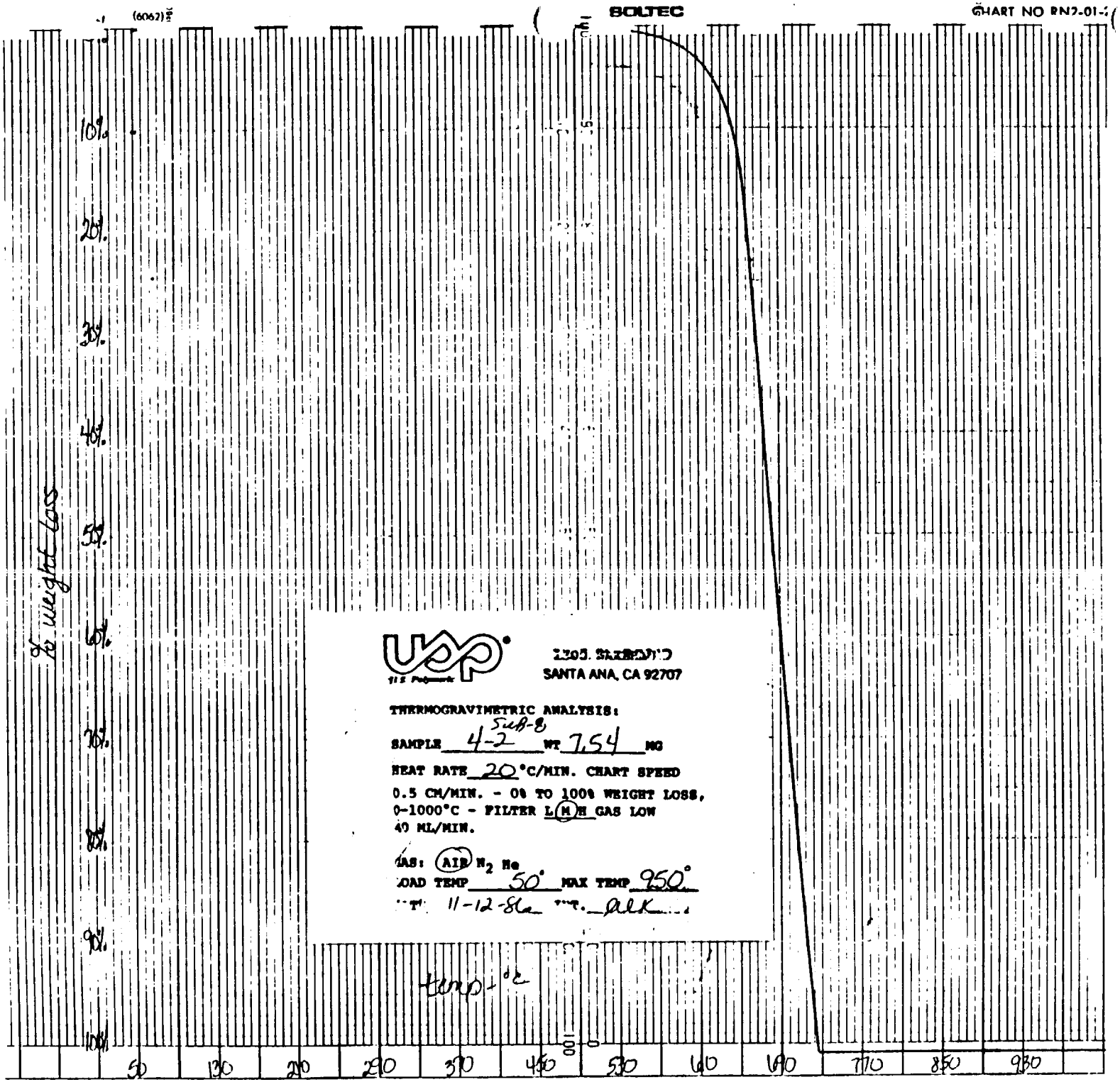
U = Bags

GRADE Group B

D. Fogg

CHART 6A


PERKIN-ELMER
CHART NO 056-7300
SANTA ANA, CA 92707
THERMOGRAVIMETRIC ANALYSIS:
SAMPLE 4-1 WT 6.87 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 CM/MIN. - 0% TO 100% WEIGHT LOSS,
0-1000°C - FILTER L M H GAS LOW
40 ML/MIN.
GAS: AIR N2 He
LOAD TEMP 50° MAX TEMP 950°
11-12-86
temp °C
% weight loss



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PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5834 NASA LOT# 4 U.S.P. LOT# D09314

CHARTS

U.S. Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5834 NASA LOT# 4 U.S.P. LOT# D09314

		ROLL#1-S	ROLL#2-S
1a. Resin Content, Soxhlet, % CTM-6D		40.0	31.1
		40.3	31.6
		41.2	32.1
	AVG.	40.5	31.6
	NASA LOT# 4 AVERAGE		36.1
1b. Filler Content, Soxhlet, % CTM-6D		17.6	13.7
		17.8	13.9
		18.2	14.2
	AVG.	17.9	13.9
	NASA LOT# 4 AVERAGE		15.9
1c. Cloth Content, Soxhlet, % CTM-6D		42.4	55.2
		41.9	54.5
		40.6	53.7
	AVG.	41.6	54.5
	NASA LOT# 4 AVERAGE		48.1
2. Volatile Content, % PTM-17B		4.2	3.5
		4.3	3.7
		4.4	3.8
	AVG.	4.3	3.7
	NASA LOT# 4 AVERAGE		4.0
3. Flow, % PTM-19G		16.7	10.6
		19.8	10.2
		19.0	10.9
	AVG.	18.5	10.6
	NASA LOT# 4 AVERAGE		14.5
4. Resin Content, Dry basis, % PTM 16F, Type II		38.3	31.4
		39.5	31.2
		39.3	32.5
	AVG.	39.0	31.7
	NASA LOT# 4 AVERAGE		35.4
5. Tack, lbs PTM-80		20	34
	NASA LOT# 4 AVERAGE		27
6. Gel Time, seconds PTM-20E		67	58
	NASA LOT# 4 AVERAGE		63

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FM 5834 NASA LOT# 4 U.S.P. LOT# D09314

7a. Atomic Absorption, ppm
CTM-53B

	ROLL#1-S	ROLL#2-S	LOT#4 AVG.
Na	11	9	10
K	3	2	3
Ca	42	148	95
Mg	1	1	1
Li	0	0	0
TOTAL	57	160	109

7b. Moisture Content, %
CTM-53B

	ROLL#1-S	ROLL#2-S
	3.30	3.11
NASA LOT# 4 AVERAGE		3.21

7c. Ash Content, %
CTM-53B

	.12	.09
NASA LOT# 4 AVERAGE		.11

8. TGA, % Weight Loss at 500°C
CTM-51 (Nitrogen)

	6.4	8.8
NASA LOT# 4 AVERAGE		7.6

See chart 8A-8B

9. DSC, °C
CTM-50A

	ROLL#1-S	ROLL#2-S	LOT#4 AVG.
First Temp	181	179	180
Second Temp	240	240	240

See Chart 9A-9B

10. Infrared (IRZB) Baseline
CTM-21C

1.15 1.15 1.15

See Chart 10A-10B

11. Environmental History

Date manufactured: 30 June 1986
Packaged in: Polyethylene bag
Date shipped: Test lot not shipped

12. Specific Gravity, Cured, Units
ASTM D792

	ROLL#1-S	ROLL#2-S
	1.487	1.479
	1.500	1.448
	1.508	1.469
AVG.	1.498	1.466
NASA LOT# 4 AVERAGE		1.482

13a. Tensile Strength, ksi, WARP
FTMS 406-1011

	31.51	28.60
	34.97	27.23
	31.51	24.11
	32.92	27.03
	35.03	27.80
AVG.	33.19	26.95
NASA LOT# 4 AVERAGE		30.07

FM 5834 NASA LOT# 4 U.S.P. LOT# D09314

	ROLL#1-S	ROLL#2-S
13b. Tensile Modulus, msi, WARP FTMS 406-1011	5.35	4.60
	5.06	4.78
	4.78	4.65
	4.84	4.62
	4.97	4.79
AVG.	5.00	4.69
NASA LOT# 4 AVERAGE		4.84
13c. Tensile Elongation, %, WARP FTMS 406-1011	.60	.70
	.73	.66
	.69	.57
	.69	.66
	.73	.64
AVG.	.69	.65
NASA LOT# 4 AVERAGE		.67
14a. Flexural Strength, ksi, WARP FTMS 406-1031	51.44	41.27
	52.66	42.60
	49.60	44.93
	47.30	42.82
	48.18	40.18
AVG.	49.84	42.36
NASA LOT# 4 AVERAGE		46.10
14b. Flexural Modulus, msi, WARP FTMS 406-1031	4.74	4.57
	4.70	4.84
	4.53	4.62
	4.65	4.69
	4.63	4.58
AVG.	4.65	4.66
NASA LOT# 4 AVERAGE		4.66
15a. Compressive Strength, ksi, WARP FTMS 406-1021	35.39	27.97
	32.90	28.64
	29.18	26.77
	31.58	28.78
	33.41	25.58
AVG.	32.49	27.55
NASA LOT# 4 AVERAGE		30.02
15b. Compressive Modulus, msi, WARP FTMS 406-1021	5.03	4.75
	5.35	4.80
	4.91	4.54
	5.04	4.77
	5.12	4.74
AVG.	5.09	4.72
NASA LOT# 4 AVERAGE		4.91

FM 5834 NASA LOT# 4 U.S.P. LOT# D09314

	ROLL#1-S	ROLL#2-S
16. Double Shear Strength, ksi FTMS 406-1041A	3.48	2.96
	3.28	3.14
	3.49	3.16
	3.33	3.04
	3.20	3.12
AVG.	3.36	3.08
NASA LOT# 4 AVERAGE		3.22
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)	70.2	71.1
NASA LOT# 4 AVERAGE		70.7
18. Residual Volatiles, % PTM-98	2.22	2.36
	2.21	2.44
	2.32	2.35
AVG.	2.25	2.38
NASA LOT# 4 AVERAGE		2.32
19. Resin Content, Pyrolysis, % CTM-14B	38.65	35.28
	37.14	35.96
	38.38	34.22
AVG.	38.06	35.15
NASA LOT# 4 AVERAGE		36.60
20. Acetone Extraction, % CTM-18A	4.77	5.23
	5.29	5.82
	5.63	5.48
AVG.	5.23	5.51
NASA LOT# 4 AVERAGE		5.37
21a. CTE, in/in °F with PLY PTM-61B	1.56	.00
	1.46	1.68
AVG.	1.51	.84
NASA LOT# 4 AVERAGE		1.18
21b. CTE, in/in °F Cross PLY PTM-61B	14.99	14.49
	8.98	11.42
AVG.	11.99	12.96
NASA LOT# 4 AVERAGE		12.47

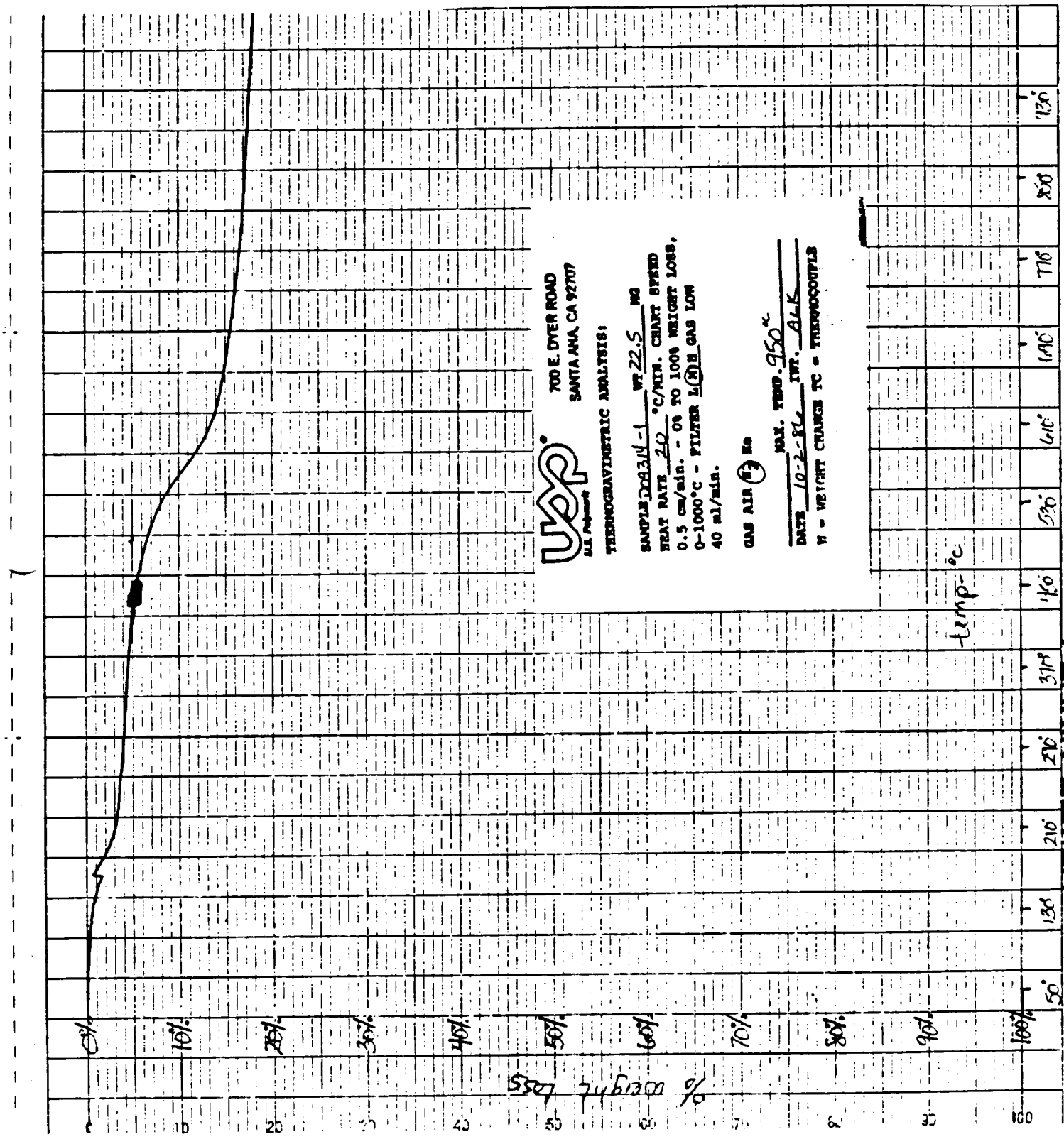
See Chart 21A-21B

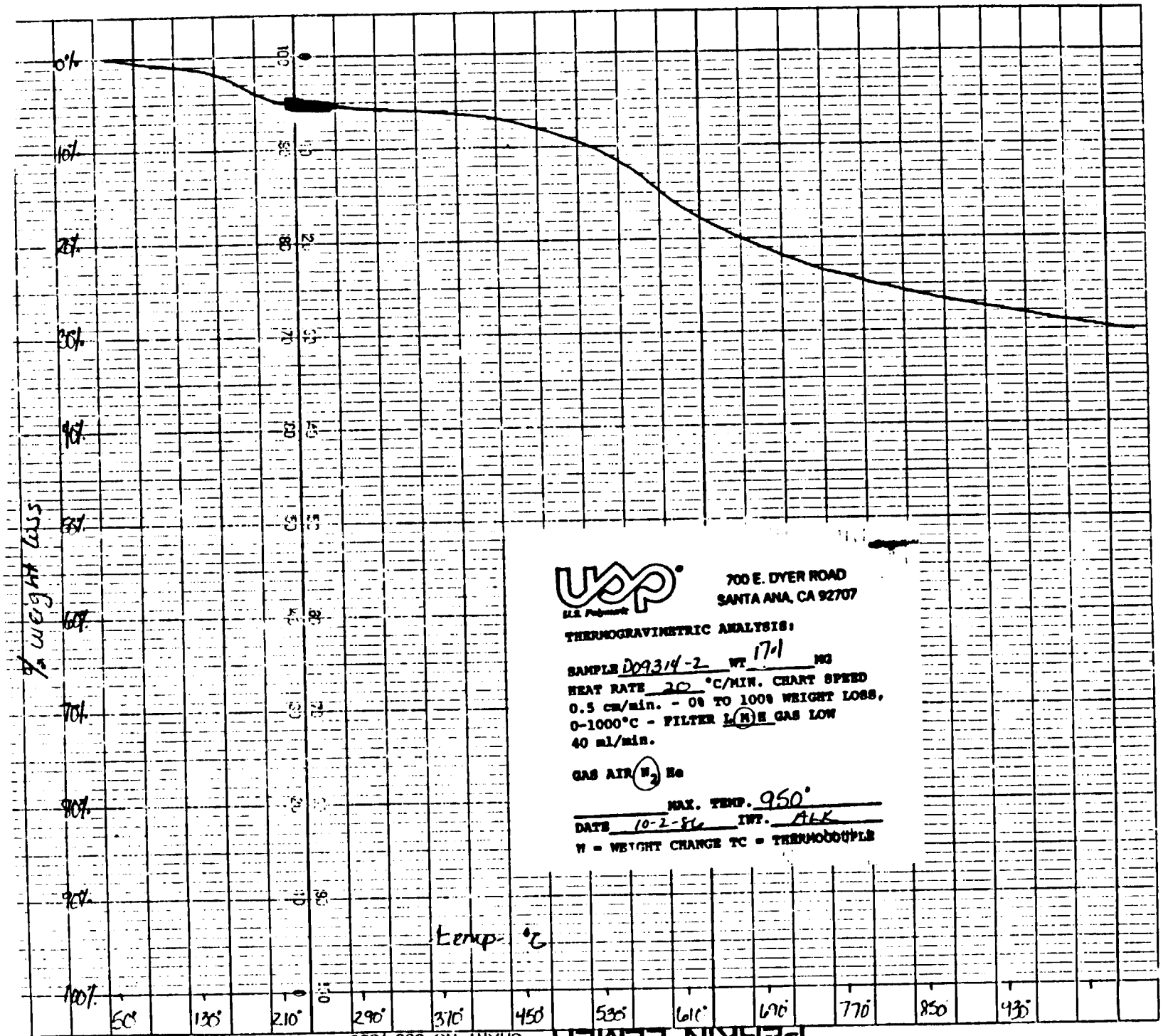
U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 8A





USP U.S. Pharmacopeia

700 E. DYER ROAD
SANTA ANA, CA 92707

THERMOGRAVIMETRIC ANALYSIS:

SAMPLE D09314-2 WT 17.1 MG
HEAT RATE 20 °C/MIN. CHART SPEED
0.5 cm/min. - 0% TO 100% WEIGHT LOSS,
0-1000°C - FILTER L(M)H GAS LOW
40 ml/min.

GAS AIR (N_2) He

MAX. TEMP. 950°
DATE 10-2-86 INT. ALK
W = WEIGHT CHANGE TC = THERMOCOUPLE

CHART 8B

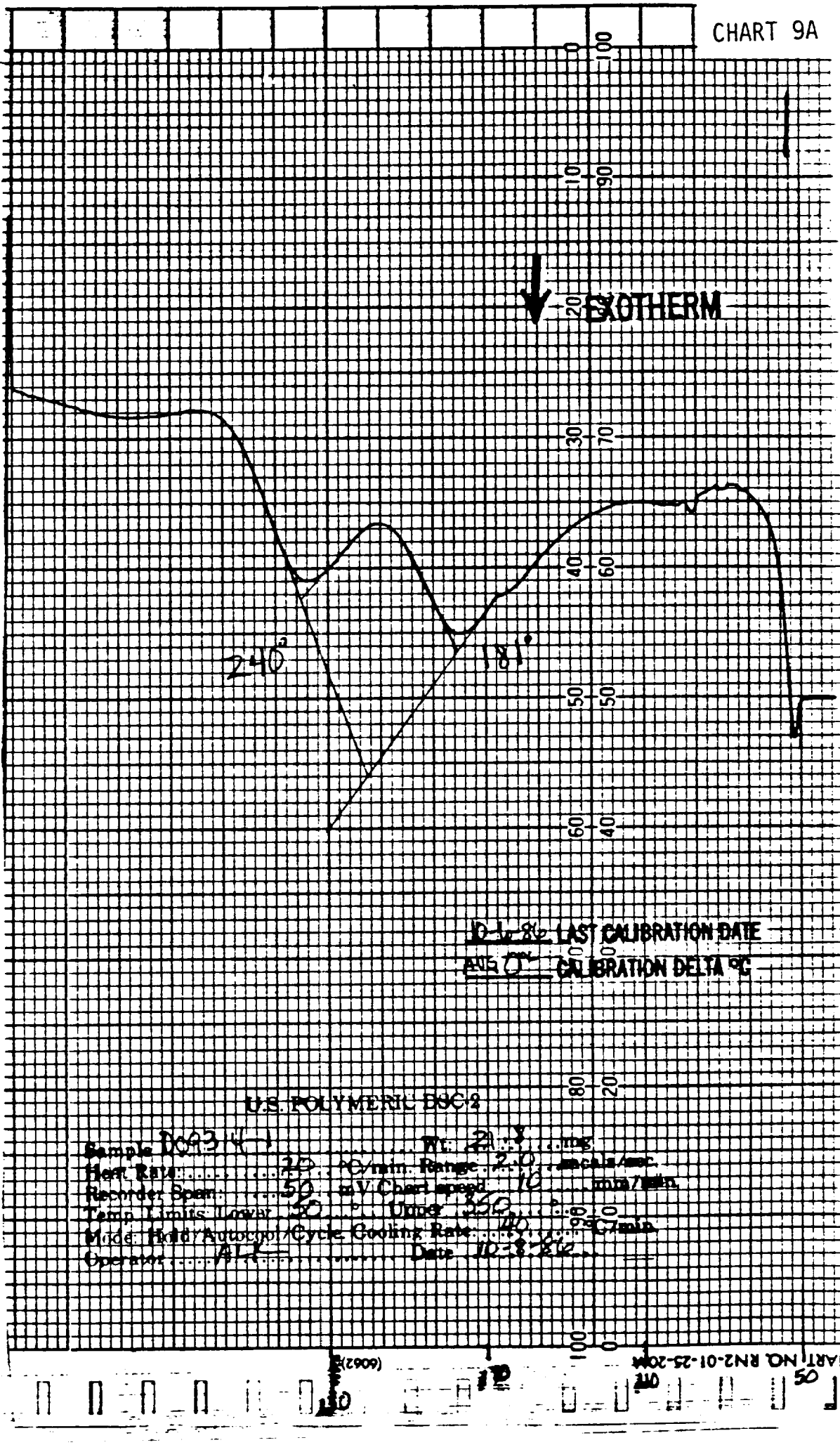
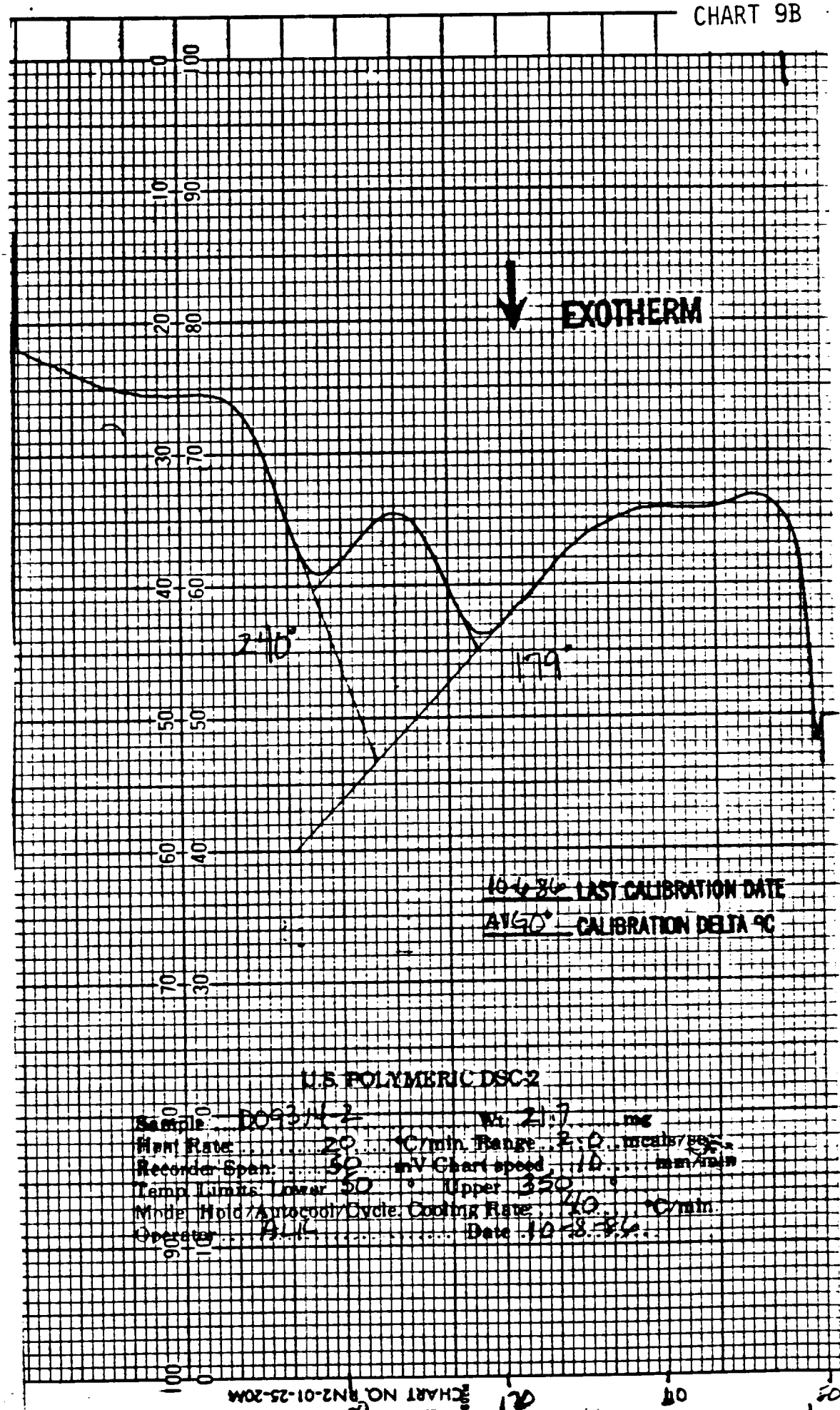


CHART 9B



SPECTRUM NO. 15257
DATE 7-08-86
SAMPLE FM 5834
D09314 # ST-1

SOURCE

STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%T
PHASE 3
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

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CHART 10A

SPECTRUM NO. 15259
DATE 7-08-86
SAMPLE FM 5834
DD9314 #ST-2

SOURCE
STRUCTURE

PATH .02 mm NACL
SOLVENT ACETONE
CONCENTRATION 30-50%
PHASE S
COMMENTS PRE-PREG
MATERIAL

ANALYST V. MIRANDA

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BECKMAN INSTRUMENTS INC., FULLERTON, CALIFORNIA, U.S.A.
PRINTED IN U.S.A.

CHART 10B

Chart 21A1

PART NO. 990088

RUN NO ____ DATE 11/15/96
OPERATOR TA
SAMPLE:
Dexfen-1-11
ATM Air @ SSP
FLOW RATE 2 scfm
wpfy

T-AXIS
SCALE, °C/in 50 "
PROG. RATE, °C/min 10
HEAT ✓ COOL 180
SHIFT, in 0

DTA-DSC
SCALE, °C/in
(mcal/sec)/in
WEIGHT, mg
REFERENCE

TGA
SCALE, mg/in
SUPPRESSION, mg
WEIGHT, mg
TIME CONST., sec
dY/(mg/min)/in

TMA (air/inert)
SCALE, mils/in 0.1/0.1
MODE Expansion
SAMPLE SIZE 0.254
LOAD, g 10
dY/(10X)/(mils/min)/in

MEASURED VARIABLE

DUPONT Instruments

Chart 21A2

PART NO. 990088

RUN NO ___ DATE 11/25/96
OPERATOR TH
SAMPLE
Dow 310 - 1 - (2)
ATM Air @ 50cc
FLOW RATE 2-SIMM
wpcy

T-AXIS
SCALE, °C/in 50 20
PROG. RATE, °C/min 20
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min)/in ___

TMA (Film/Fiber)
SCALE, mils/in auto.2
MODE Expansion
SAMPLE SIZE 0.253
LOAD, g 10
dY/dT (10X) (mils/min)/in ___

(Heating Rate)
10 °C/min
Isothermal (1) (Purge) = Helium @ 50cc/min
Isothermal (2) (Purge) = Air @ 50cc/min

MEASURED VARIABLE

DU PONT instruments

Chart 21A3

PART NO. 990088

RUN NO ___ DATE 11/26/K
OPERATOR DL
SAMPLE
D053.14.1 - (3)
ATM Air @ 50
FLOW RATE 3-5 (ml)
XPLY

T-AXIS
SCALE, °C/in 50
PROG. RATE, °C/min 20
HEAT ___ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY, (mg/min)/in ___

TMA (quartz)
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.117
LOAD, g ___
dY, (10X), (mils/min)/in ___

Tg = 126°C
Tf = 142°C

MEASURED VARIABLE

DUPONT instruments

Chart 21A4

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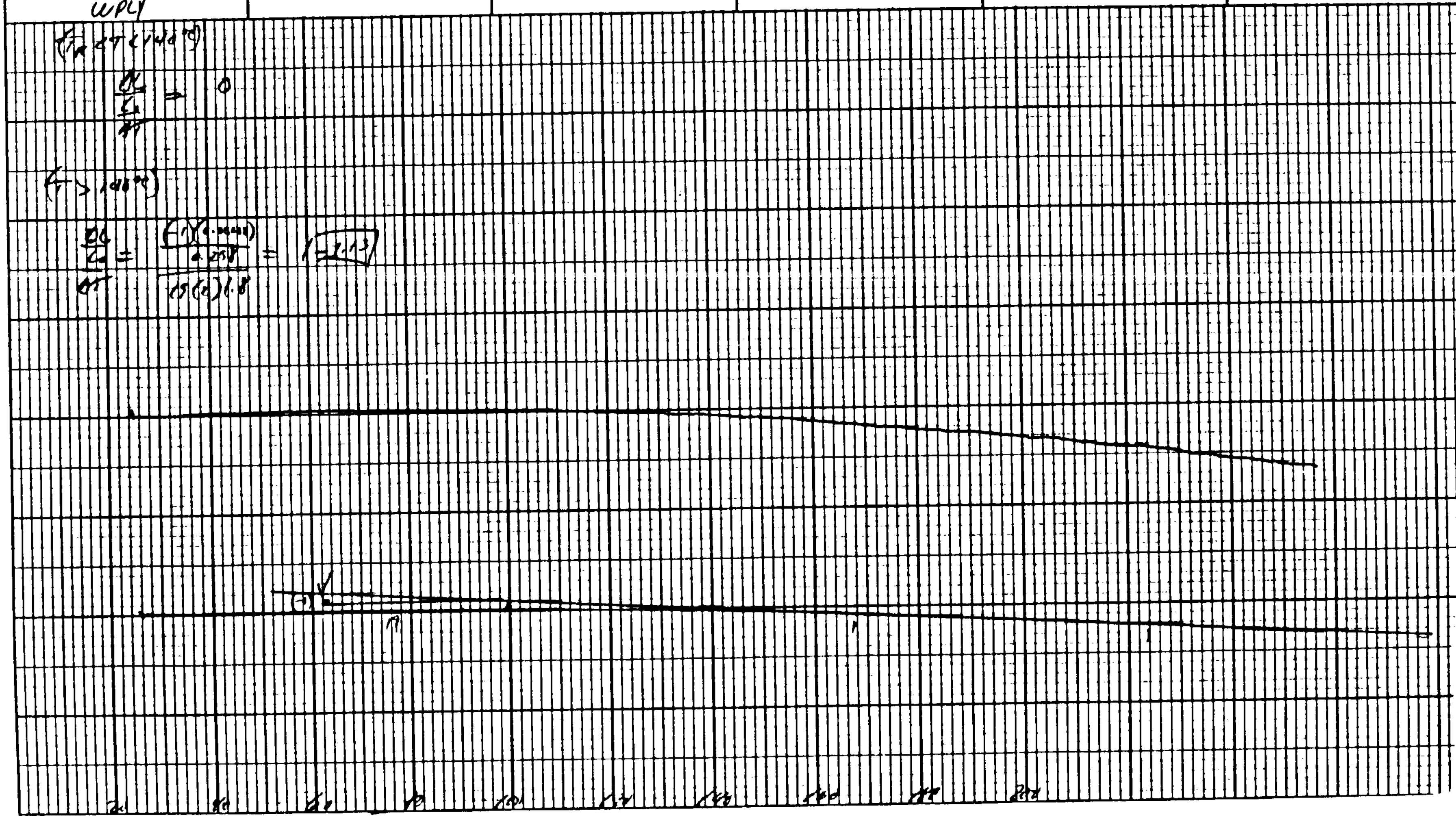
Chart 21B1

PART NO. 990088

RUN NO. ___ DATE 12/1/81	T-AXIS	DTA-DSC	TGA	TMA (μm/in°F)
OPERATOR TH	SCALE, °C/in 50 20	SCALE, °C/in ___	SCALE, mg/in ___	SCALE, mils/in 0.1/0.2
SAMPLE: D6931/4-2 (1)	PROG. RATE, °C/min 10	(mcal/sec)/in ___	SUPPRESSION, mg ___	MODE Expansion
ATM Air @ STP	HEAT ✓ COOL ___ ISO ___	WEIGHT, mg ___	WEIGHT, mg ___	SAMPLE SIZE 0.258
FLOW RATE 3-SYFH	SHIFT, in 0	REFERENCE ___	TIME CONST., sec ___	LOAD, g 10
WPLY			dY, (mg/min)/in ___	dY, (10X), (mils/min)/in ___



DUPONT Instruments

MEASURED VARIABLE ___

Chart 21B2

PART NO. 990088

RUN NO. ___ DATE 11/15/94
OPERATOR CH
SAMPLE
D05314-2-(2)
ATM Air @ 25°
FLOW RATE 2-3 scfm
Cycle

T-AXIS
SCALE, °C/in 50 20
PROG. RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT, (mg/min)/in ___

TMA (μin/min)
SCALE, mils/in 0.1/0.2
MODE Expans
SAMPLE SIZE 0.255
LOAD, g 10
dY/(10X), (mils/min)/in ___

MEASURED VARIABLE

DUPONT Instruments

Chart 21B3

Chart 21B4

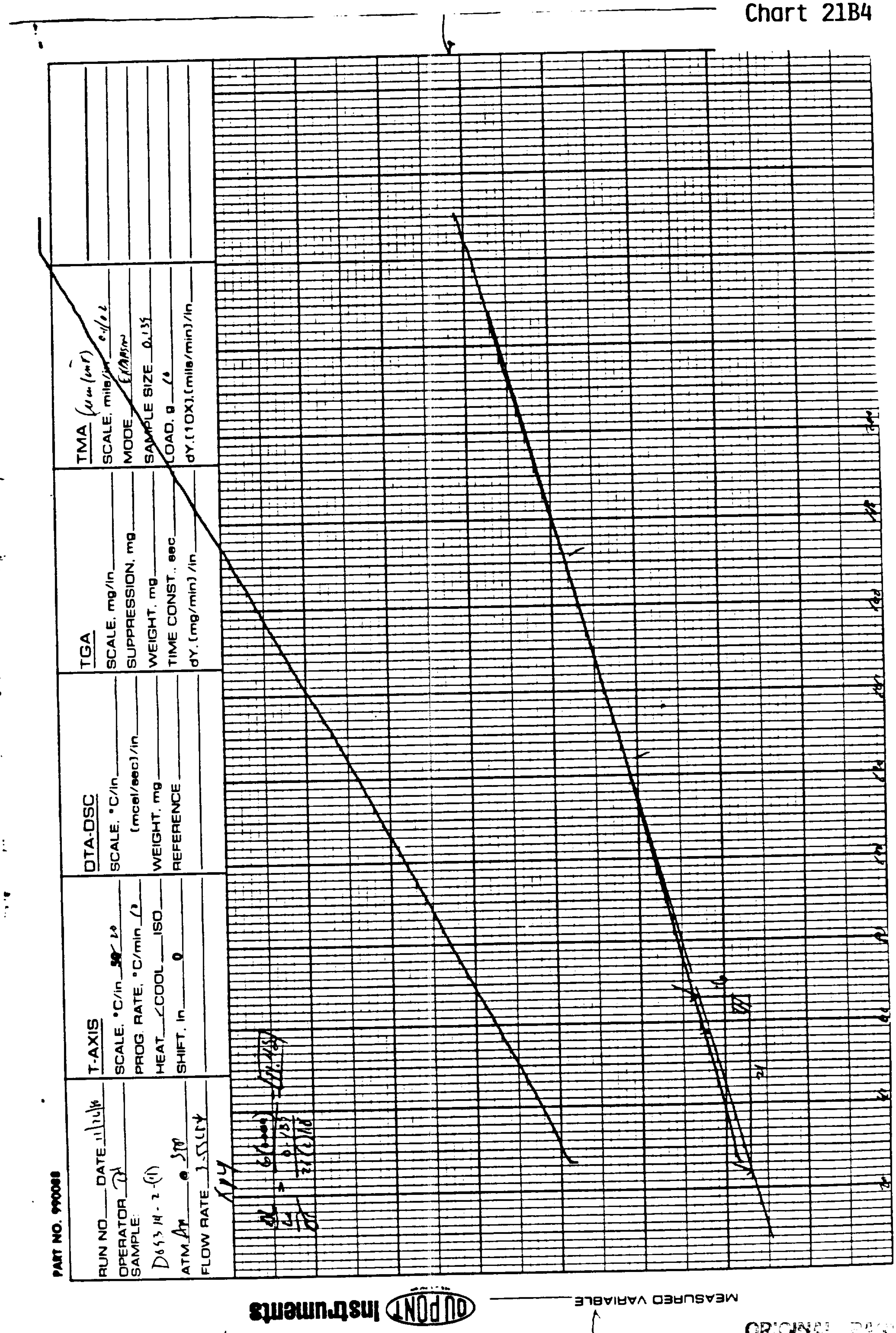


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TABLE OF CONTENTS

FILLER TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

Filler Lot for NASA Lot# 5

CHARTS

U.S Polymeric

FILLER TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

Filler Lot for NASA Lot# 5

		SAMPLE			
1. Carbon Content, % QAI-5560		#5A-1	#5A-2	#5A-3	
		99.27	99.36	99.28	
	NASA LOT# 5 AVERAGE			99.30	
2. Ash Content, % PTM-71B		0.000	0.011	0.005	
		0.000	0.005	0.020	
	AVG.	0.000	0.008	0.012	
	NASA LOT# 5 AVERAGE			0.007	
3. Atomic Absorption, ppm CTM-53B (Values are average of 2 determinations)		#5A-1	#5A-2	#5A-3	LOT#5 AVG.
	Na	18.5	18.0	19.0	18.5
	K	2.0	2.0	2.5	2.2
	Ca	2.0	2.0	2.0	2.0
	Mg	0.0	0.0	0.0	0.0
	Li	0.0	0.0	0.0	0.0
	TOTAL	22.5	22.0	23.5	22.7
3a. Moisture Content, % CTM-53B		.010	.000	.000	
		.021	.000	.000	
	AVG.	.016	.000	.000	
	NASA LOT# 5 AVERAGE			.005	
3b. Ash Content, % CTM-53B		0.000	0.010	0.025	
		0.015	0.015	0.010	
	AVG.	0.008	0.013	0.018	
	NASA LOT# 5 AVERAGE			0.013	
4. pH, Units ASTM D1512		5.25	5.55	5.55	
		5.40	5.50	5.60	
	AVG.	5.32	5.52	5.58	
	NASA LOT# 5 AVERAGE			5.47	
5. Particle Size, microns S.E.M. procedure (Average values are of 20 determinations)	AVG.	.50	.45	.50	
	Maximum	.99	.79	.88	
	Minimum	.16	.20	.20	
	Std. Dev	.27	.15	.19	
	NASA LOT# 5 AVERAGE SIZE			.48	
6a. TGA, °C at 50% Loss CTM-51		837	870	880	
	NASA LOT# 5 AVERAGE			862	

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

Filler Lot for NASA Lot# 5

6b. TGA
CTM-51

See Charts 6A-6C

7. Particle Size Distribution
CTM-72

See Charts 7A-7C

7a. Particle Size, microns
CTM-72

	#5A-1	#5A-2	#5A-3
	.90	.90	1.08
	1.00	.88	.98
AVG.	.95	.89	1.03

NASA LOT# 5 AVERAGE .96

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 6A

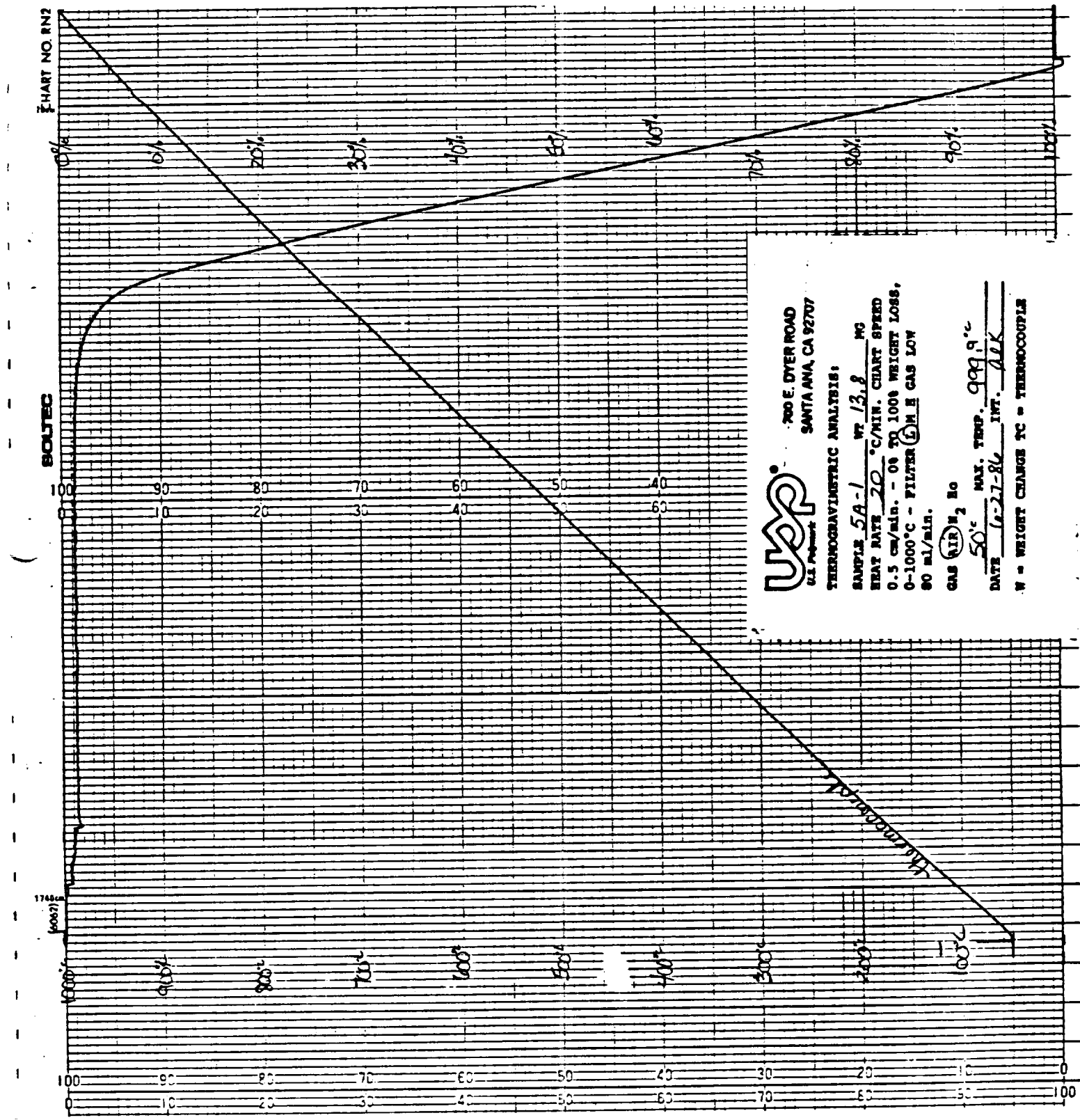

CHART 6B

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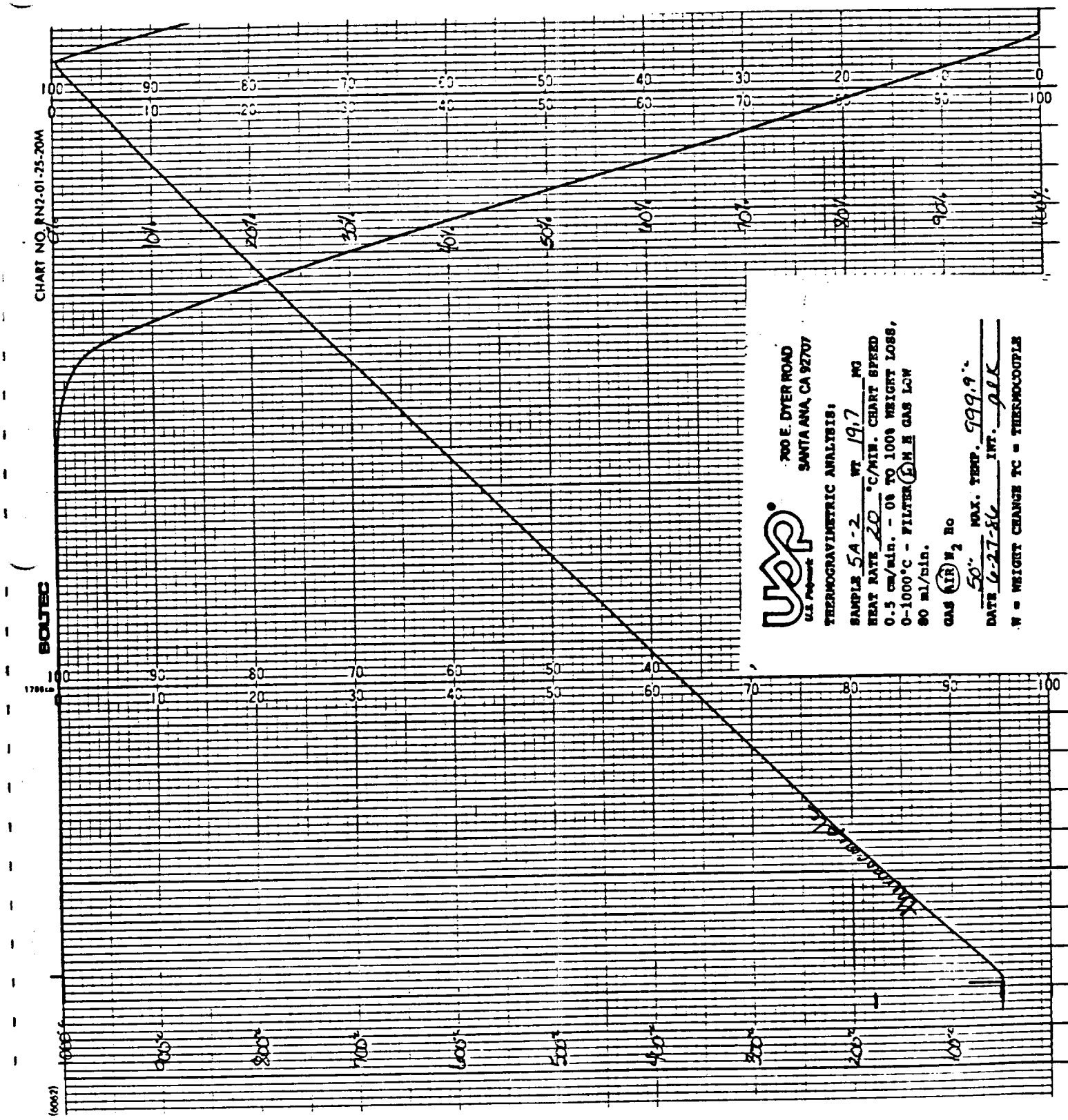

CHART 6C

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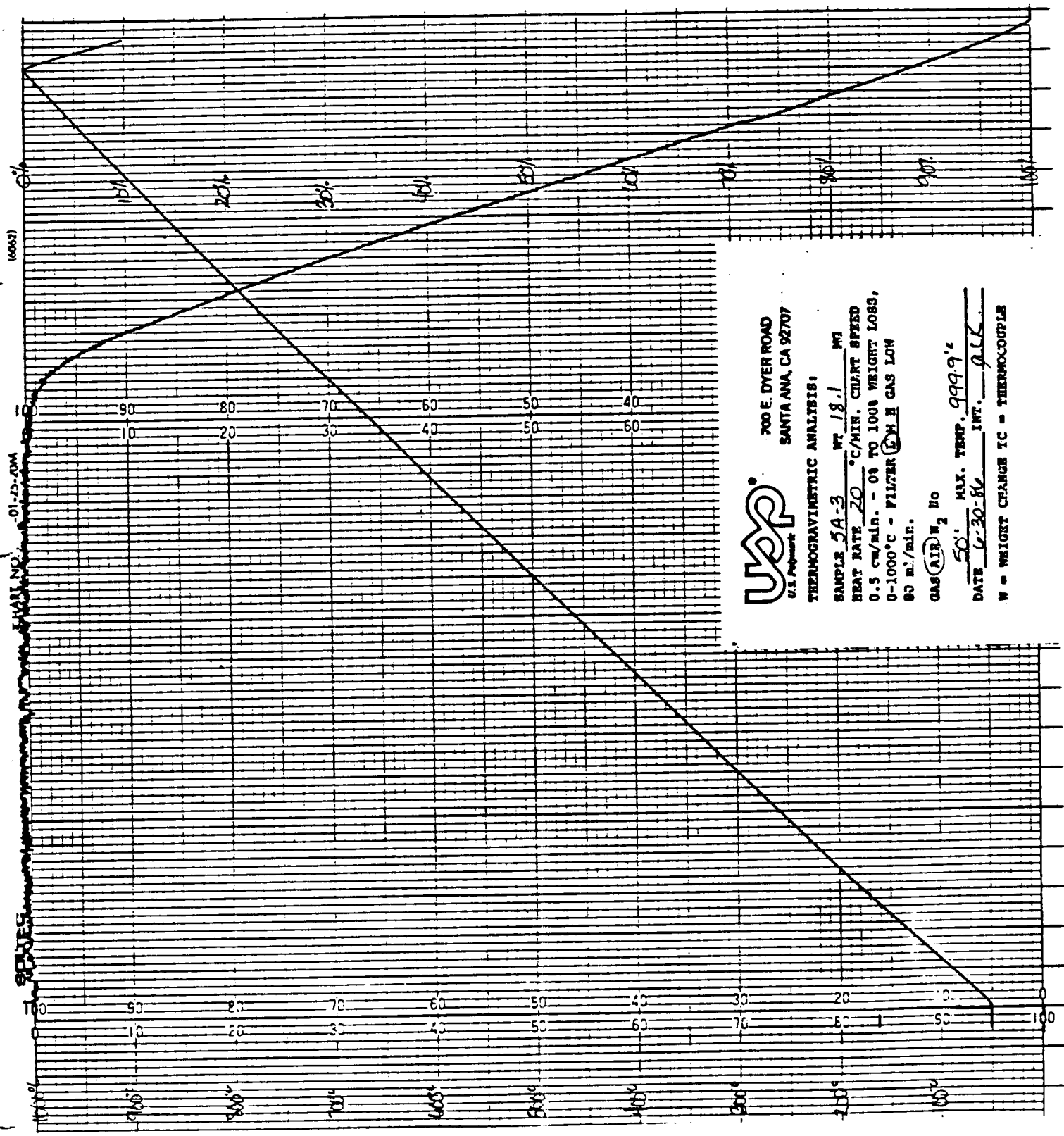


HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT#5A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

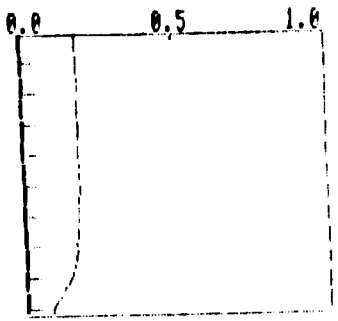
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

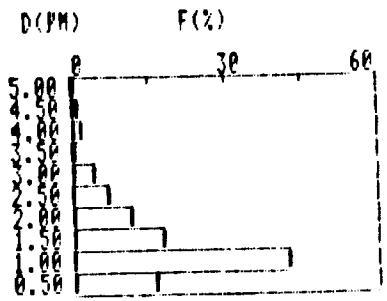


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.8	0.8
4.00-3.50	1.4	2.2
3.50-3.00	0.0	2.2
3.00-2.50	3.7	5.9
2.50-2.00	6.6	12.6
2.00-1.50	11.4	23.9
1.50-1.00	17.7	41.6
1.00-0.50	42.3	84.0
0.50-0.00	16.0	100.0

D(AVE) 0.90 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#"5A-1
Sample"1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT#5A-1
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

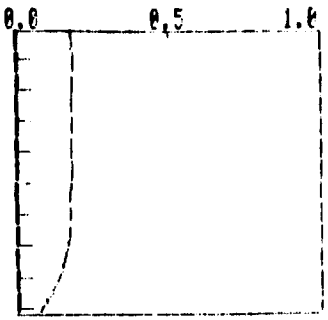
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

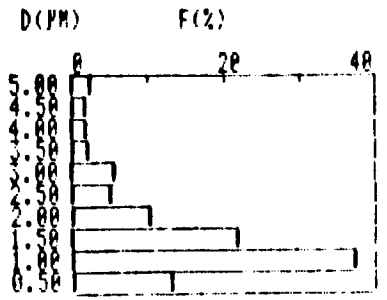


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	2.2	2.2
4.50-4.00	1.6	3.8
4.00-3.50	1.8	5.6
3.50-3.00	1.9	7.4
3.00-2.50	5.6	13.0
2.50-2.00	5.0	18.0
2.00-1.50	10.1	28.1
1.50-1.00	21.8	49.9
1.00-0.50	37.3	87.1
0.50-0.00	12.9	100.0

D(AVE) 1.00 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



Lot#"5A-1
Sample#2

CHART 7A

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT#5A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

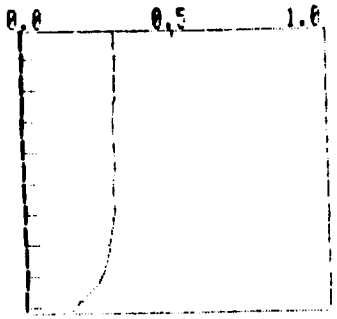
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

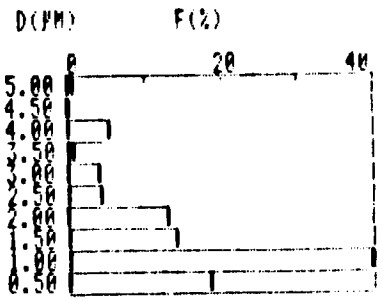


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.6	0.6
4.50-4.00	0.0	0.6
4.00-3.50	5.3	5.9
3.50-3.00	0.5	6.5
3.00-2.50	4.0	10.4
2.50-2.00	4.1	14.5
2.00-1.50	13.1	27.7
1.50-1.00	14.1	41.7
1.00-0.50	39.7	81.4
0.50-0.00	18.6	100.0

D(AVE) 0.90 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT# 5A-2
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT#5A-2
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

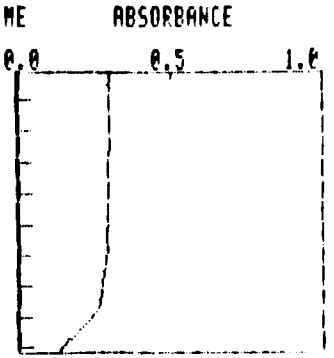
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

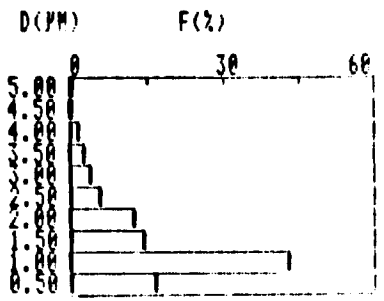


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	0.0	0.0
4.00-3.50	1.5	1.5
3.50-3.00	2.5	3.9
3.00-2.50	3.8	7.8
2.50-2.00	5.6	13.4
2.00-1.50	12.4	25.8
1.50-1.00	14.2	40.0
1.00-0.50	43.2	83.2
0.50-0.00	16.8	100.0

D(AVE) 0.88 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT# 5A-2
Sample #2

CHART 7B

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#1 SAMPLE NASA LOT #5A-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

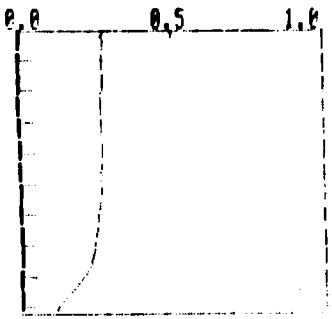
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

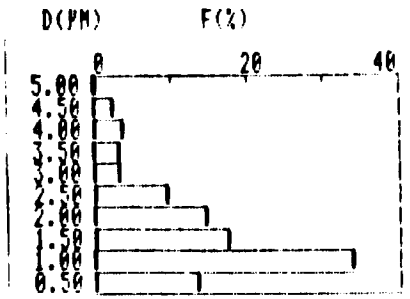


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	0.0	0.0
4.50-4.00	2.3	2.3
4.00-3.50	3.4	5.7
3.50-3.00	3.1	8.8
3.00-2.50	3.1	11.9
2.50-2.00	9.2	21.2
2.00-1.50	14.5	35.7
1.50-1.00	17.2	52.9
1.00-0.50	33.9	86.8
0.50-0.00	13.2	100.0

D(AVE) 1.00 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT #5A-3
Sample #1

HORIBA CAPA-500
PARTICLE ANALYZER

DATE 5-27-86
#2 SAMPLE NASA LOT #5A-3
SOLVENT ETHYL GLYCOL
C=0.01 mg/ml

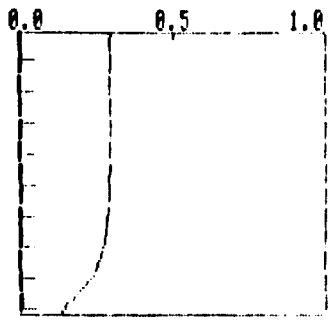
* CONDITIONS

SOLV.VISC	19.90(CP)
SOLV.DENS	1.11(G/CC)
SAMP.DENS	1.90(G/CC)
D(MAX)	5.0 (PM)
D(MIN)	0.01(PM)
D(DIV)	0.50(PM)
SPEED	5000. (RPM)

* TIME 0 H 11 MIN 31 SEC

* DATA

TIME ABSORBANCE

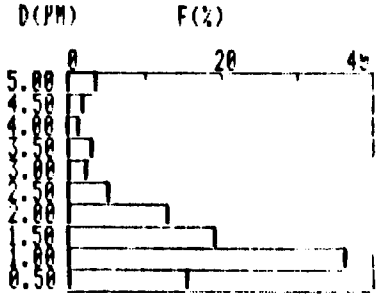


* DISTRIBUTION TABLE (BY VOL.)

D(PM)	F(%)	R(%)
5.00 <	0.0	0.0
5.00-4.50	3.5	3.5
4.50-4.00	1.7	5.3
4.00-3.50	1.2	6.5
3.50-3.00	3.0	9.5
3.00-2.50	2.1	11.6
2.50-2.00	5.1	16.6
2.00-1.50	12.6	29.3
1.50-1.00	19.1	48.4
1.00-0.50	36.3	84.7
0.50-0.00	15.3	100.0

D(AVE) 0.98 (PM)

* DISTRIBUTION GRAPH (BY VOL.)



LOT # 5A-3
Sample #2

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CHART 7C

TABLE OF CONTENTS

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

91LD Resin Lot for NASA Lot# 5

CHARTS

U.S. Polymeric

RESIN TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

91LD Resin Lot for NASA Lot# 5

(Note sample 5A was used for production. Sample 5-1 was tested, but not used for production).

		#5-A	#5-1
1. Resin Solids, % PTM-7C		70.7	72.0
		70.6	71.6
		70.7	71.6
	AVG.	70.7	71.7
2. Specific Gravity @ 25°C PTM-29C		1.138	1.139
3. Viscosity, Brookfield, cps. @ 22.8°C PTM-14C		1500	1500
4. Gel Time, min:sec PTM-47B		3:06	3:50
5. Atomic Absorption, ppm CTM-53B (Valves are averages of two determinations)	Na	3.5	4
	K	0.5	0
	Ca	2.5	0
	Mg	0.0	10
	Li	0.0	0
	TOTAL	6.5	14
6. Volatiles, Gas Chromatography CTM-55		See Charts 6A-6B	
7. TGA, % Weight Loss at 500°C CTM-51 (AIR)		--	8.4
		See Chart 7B	
8. DSC, temperature °C CTM-50A		171.5	188
		See Chart 8A-8B	
9. HPLC CTM-49A		See Chart 9A-9B	
10. GPC, Average molecular wt. CTM-49A		235?	1902
		See Chart 10A-10B	
11. pH, units CTM-1B		8.3	8.3

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2407

91LD Resin Lot for NASA Lot# 5

		#5-A	#5-1
12. Phenol Content, % CTM-55 Appendix 1		11.94	11.83
		11.74	11.86
	AVG.	11.84	11.84
13. Chang's Index, ml. CTM-5B		24.8	24.8

14. RDS, Minimum Viscosity, cps.
CTM-57A

	Min. Visc.	°C
#5-A	43	102
#5-1	60	109

See Charts 14A-14B

15. NMR
Vendor procedure

See Charts 15A-15B

U. S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

TYPICAL GAS CHROMATOGRAPH SET-UP

Operator	G.M.G.	Date	12/11/86
Column		Detector	FID
Length	6ft.	Voltage	
Dia.	1/4 in.	Sensit.	
Liquid Phase	SE-1000	Flow Rates, ml/min	
Wt. %	0.1	Hydrogen	60 Air 300
Support	GRAPHPAC	Scavenge	
Mesh	80/100	Split	
Carrier Gas	He	Temperature, °C	
Rotameter		Det.	220 Inj. 200
Inlet Press	60 psig	Column Initial	60
Rate	30 ml/min	Final	210
CHART SPEED		Rate	5°C/MIN
SAMPLE	91CD,35-1	Solvent	THF
Size	0.1ml	Concn.	0.1000 g/ml

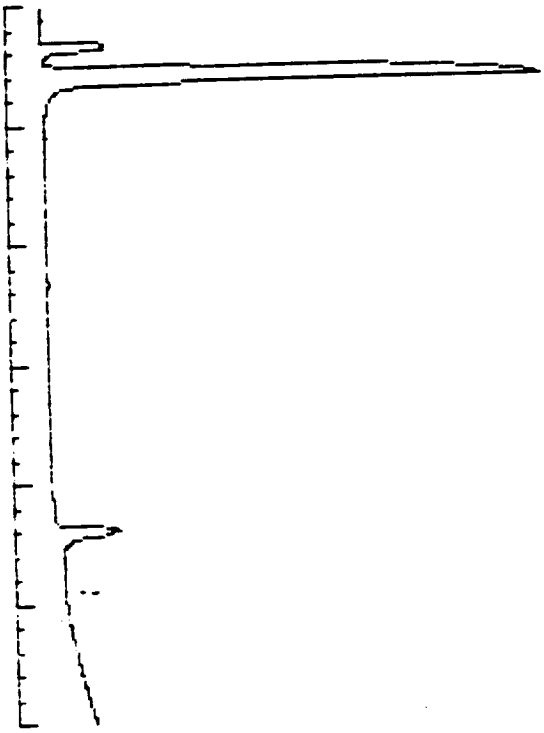
GAS CHROMATOGRAPHY STANDARD SOLVENT

TEST METHOD CTM-55

STANDARD SOLVENT/MONOMER	RETENTION TIME (MINS.)
MEOH	.6
ETHANOL	1.18
MECL2	1.28
ACETONE	1.45
IPA	1.83
THF	3.08
ACETONITRILE	3.2
CRESOL	4.03
MEK	4.08
FURFURAL	15.03
TOLUENE	17.98
CHLOROBENZENE	19.6
PHENOL	22.08

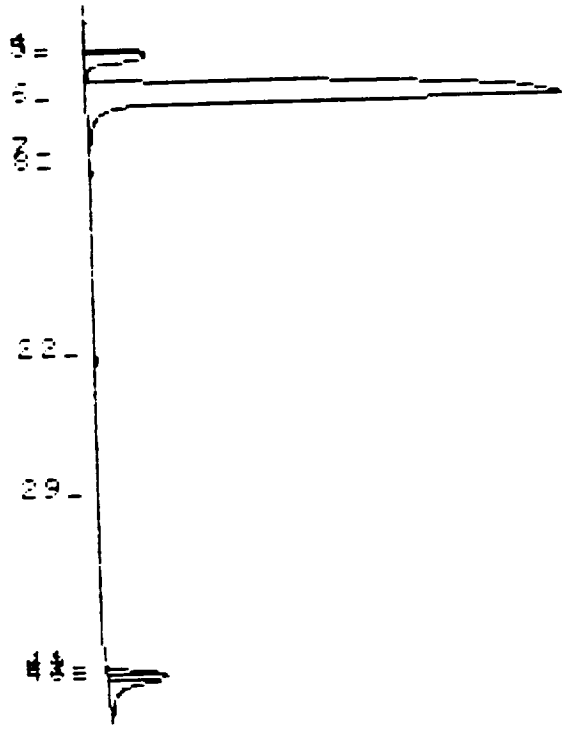
NOTE: THF WAS USED TO DILUTE THE RESIN SAMPLES.

** REAL TIME CHROMATOGRAM **



FINAL FULL SCALE MV.=1000.00

VERTICAL SCALE FACTOR: 1



SAMPLE: 91 LD 5A
MISC.: C=0.10136 GMS/ML

TIME: 9:45
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
2	.63	4009	.093	1	439
4	1.63	81207	1.881	2	11904
5	1.83	227690	5.275	2	11890
6	3.30	3598800	83.371	3	95752
7	5.03	5309	.123	4	214
8	5.55	4839	.112	3	457
22	11.65	19256	.446	2	964
29	16.23	1718	.040	2	70
41	21.85	69893	1.619	2	10336
42	21.98	124790	2.891	2	12126
43	22.15	179090	4.149	2	10216

TOTAL AREA= 4316600
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 1000

SAMPLE: 91 LD 5A
MISC.: C=0.10136 GMS/ML

TIME: 9:45
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT.
4	1.63	81207	1.888	2	11904
5	1.83	227690	5.294	2	11890
6	3.30	3598800	83.679	3	95752
22	11.65	19256	.448	2	964
41	21.85	69893	1.625	2	10336
42	21.98	124790	2.902	2	12126
43	22.15	179090	4.164	2	10216

TOTAL AREA= 4300726
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 10000

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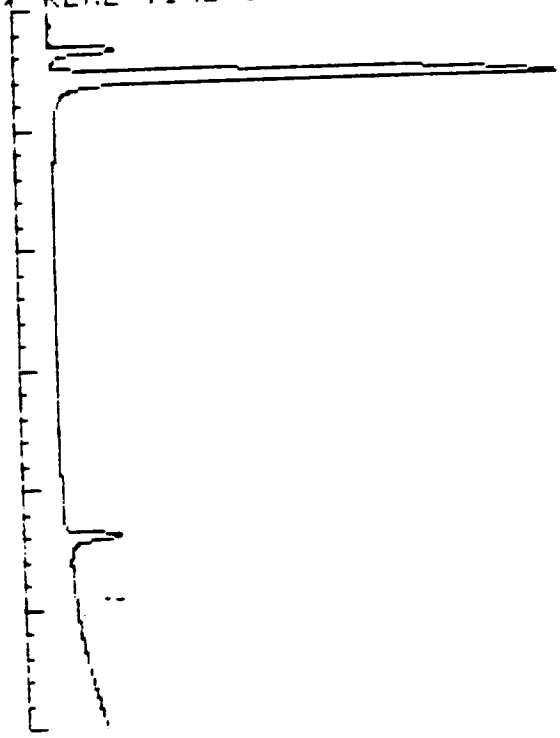
CHART 6B

*** REAL TIME CHROMATOGRAM ***



FINAL FULL SCALE MV.=1000.00

SAMPLE: 91 LD 5-1
MISC: C=0.10021 GMS/ML

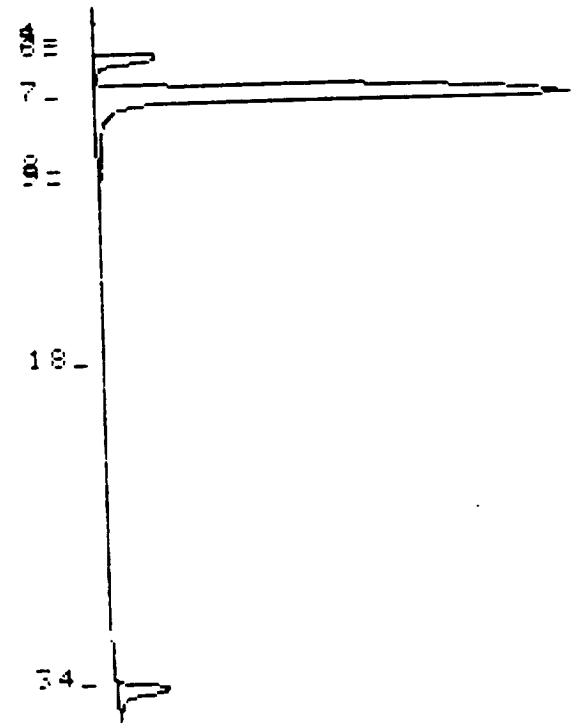
TIME: 8:49
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO.	RET TIME	PEAK AREA	AREA %	B L	PEAK HT
3	.63	3675	.103	2	327
4	1.25	2069	.058	2	96
5	1.43	1867	.052	2	186
6	1.65	267030	7.480	2	12299
7	3.15	2992500	83.822	3	97560
8	5.50	9460	.265	4	589
9	5.83	31392	.879	4	343
18	11.68	6164	.173	1	337
34	21.95	255890	7.168	1	10548

TOTAL AREA= 3570046
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 1000

VERTICAL SCALE FACTOR: 1X



SAMPLE: 91 LD 5-1
MISC: C=0.10021 GMS/ML

TIME: 8:49
DATE: 12/11/86
OPERATOR: JGZ

RUN TIME: 30.00 MINUTES
DELAY TIME: 0.00
CHAN: 0

PK NO	RET TIME	PEAK AREA	AREA %	B L	PEAK HT
6	1.65	267030	7.539	2	12299
7	3.15	2992500	84.372	3	97560
9	5.83	31392	.885	4	343
34	21.95	255890	7.215	1	10548

TOTAL AREA= 3546812
THRESHOLD= 1
MIN PK WIDTH= 15
AREA REJECT= 10000

CHART 7B

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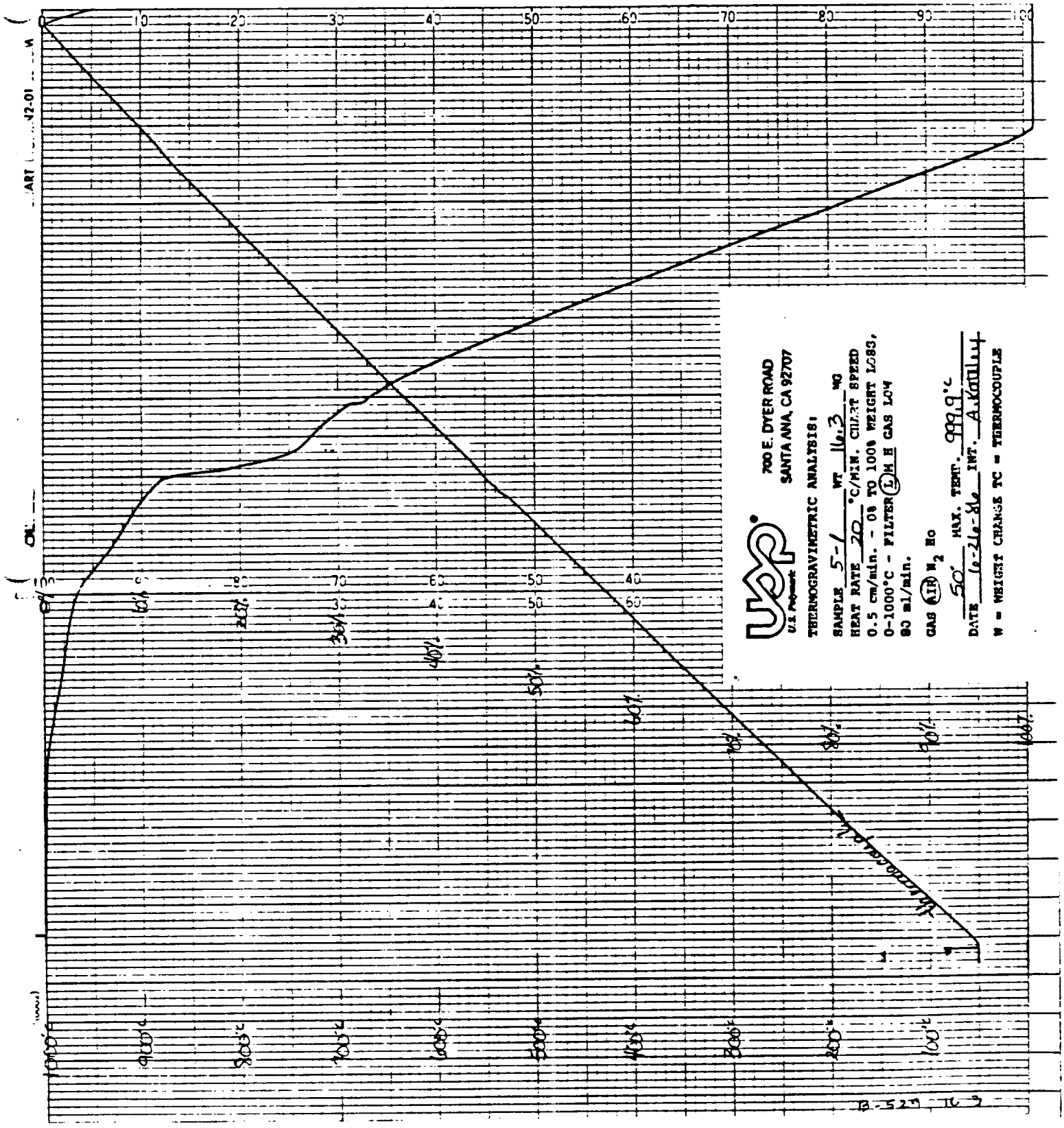
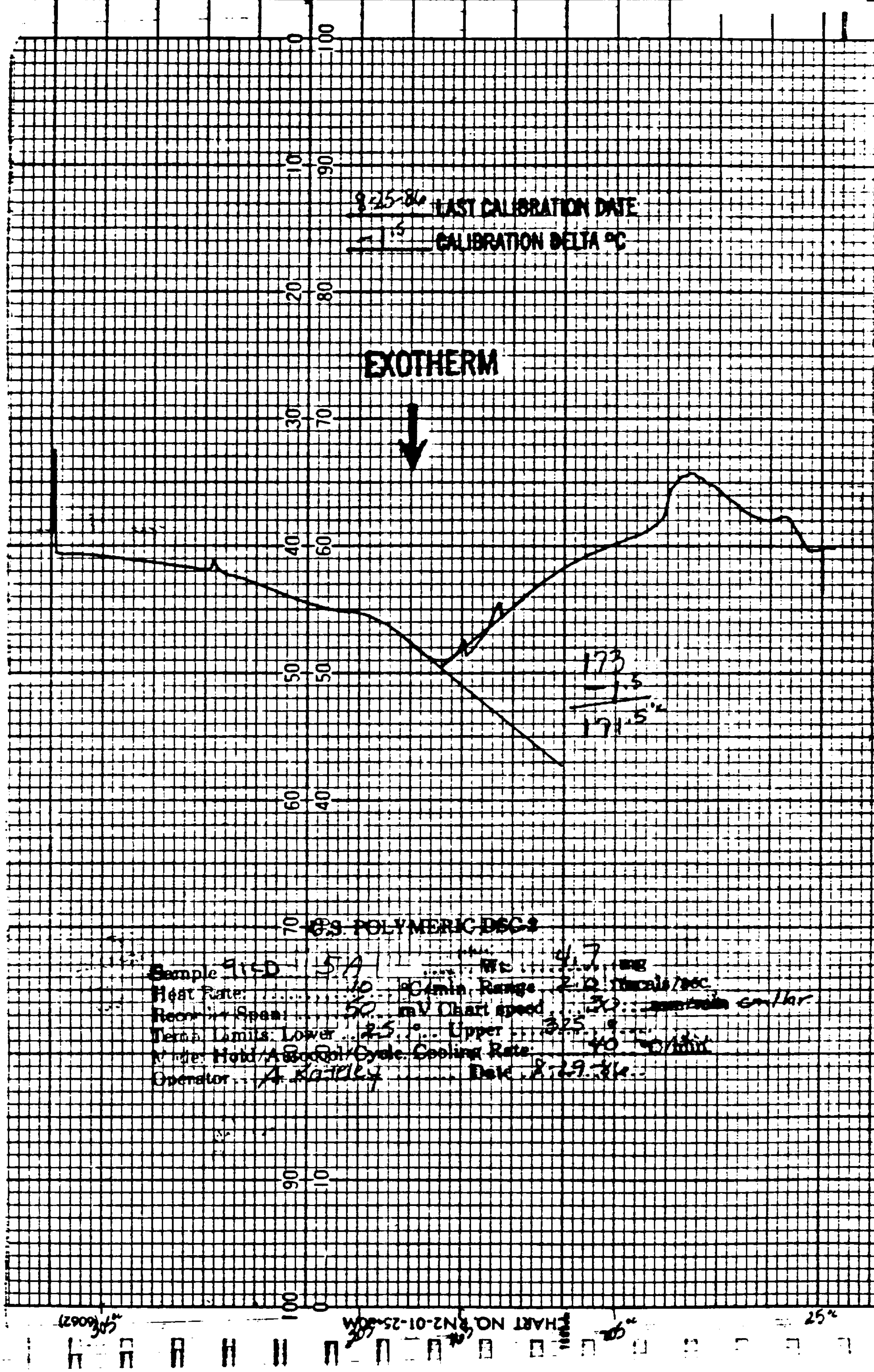


CHART 8A



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PART NO. 990088

CHART 8B

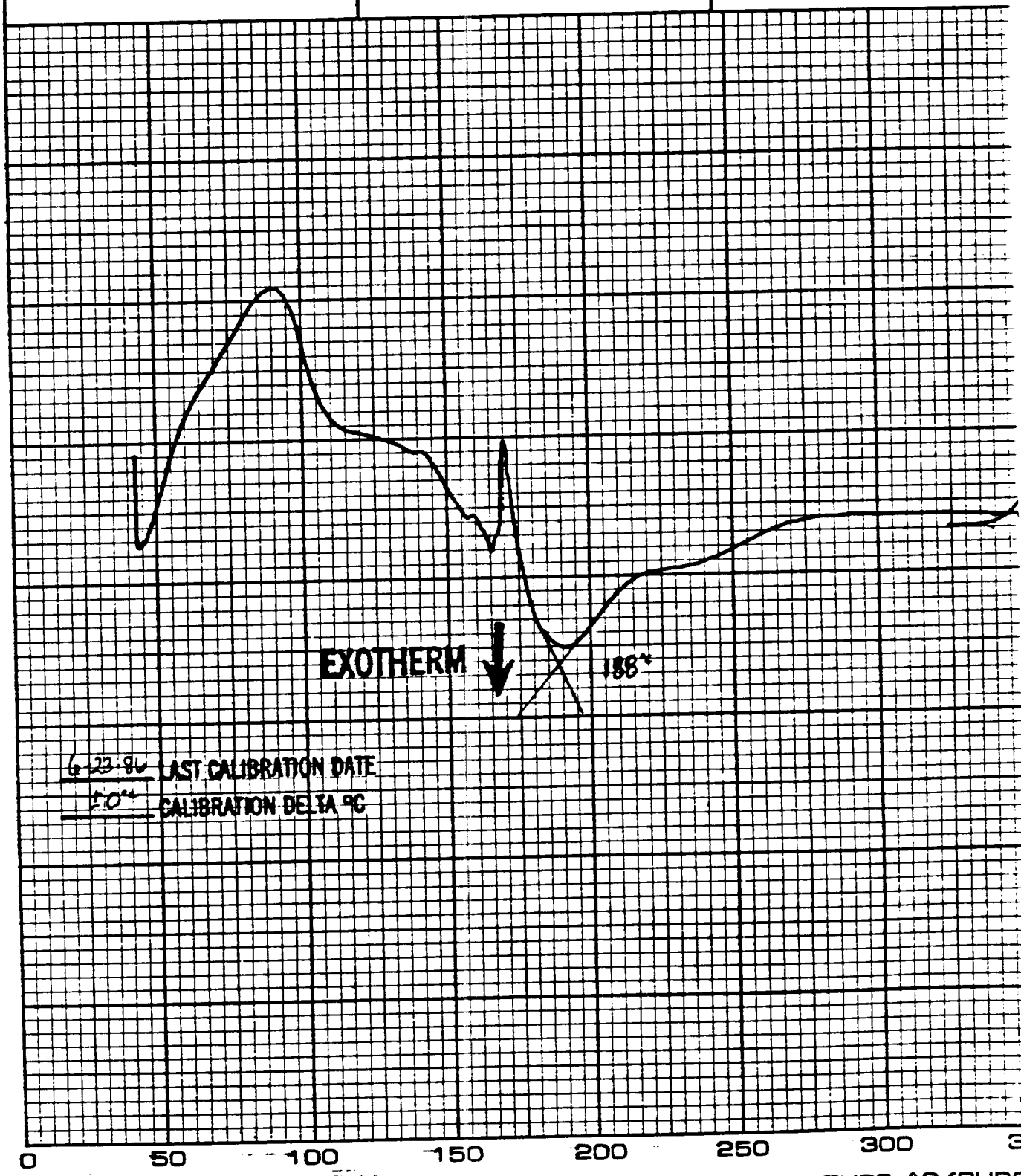
RUN NO ___ DATE 6-23-86
OPERATOR gwk
SAMPLE:
91-LD 5-1
ATM N2 @ 1atm
FLOW RATE 40 ml/min

T-AXIS
SCALE, °C/in 50
PROG. RATE, °C/min 20°
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in 5.0 15x
(mcal/sec)/in ___
WEIGHT, mg 5.8
REFERENCE ___
1 alum seal

DUPONT Instruments

MEASURED VARIABLE ___



6-23-86 LAST CALIBRATION DATE
+0° CALIBRATION DELTA °C

FILE A:PHENO31.HDR TAKEN 09-05-1986 14:03:53

******** AREA PERCENT REPORT ********

Sample Name: 91LD,5A,C=7.13 Operator Initials: JGZ
Date: 09-05-1986 14:03:53 Method:PHENOLIC DATA FILE: A:PHENO31.PTS
Interface: 4 Cycle#: 31 Channel#: 0 Vial#: N.A.
Starting Peak Width: 10 Threshold: .01

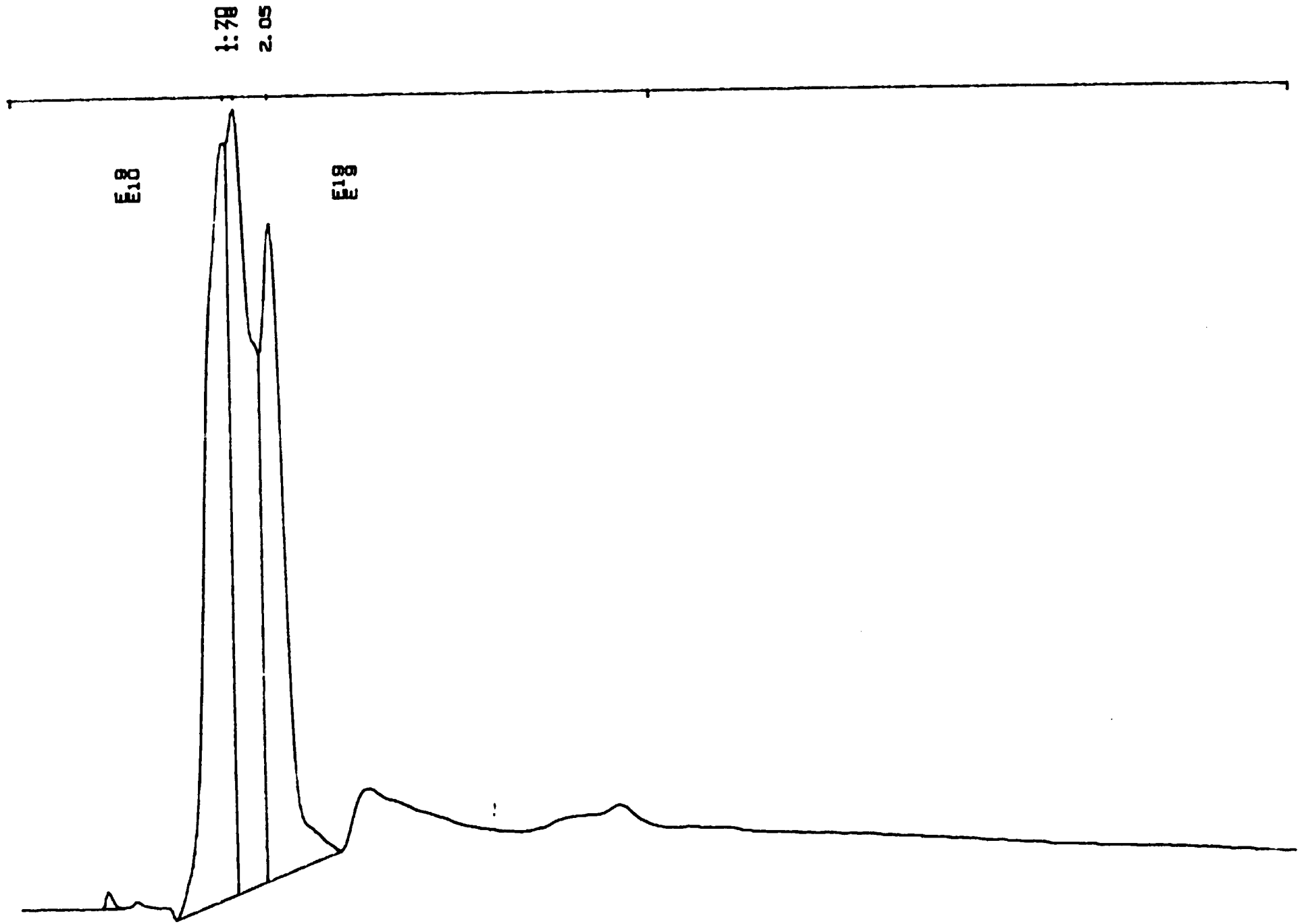
Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU Detector 1:
Misc. Information: LENGTH=25

Starting Delay: 0.00 Ending Retention Time: 10.00

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
	1.70	66122	36.4482	2	5215	100.000	12.7
3	1.78	65456	36.0814	2	5416	98.993	12.1
4	2.05	49835	27.4704	2	4528	75.368	11.0

Total Area: 181413 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN031 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.421 Mv. HIGH SCALE= 11.033 Mv.
91 LD, 5-A, C=7.13 MG/ML, 9/5/86, JGZ



FILE A:PHEN032.HDR TAKEN 09-05-1986 14:25:51

********* AREA PERCENT REPORT *********

Sample Name: 91LD,5-1,C=6.64 Operator Initials: JGZ
Date: 09-05-1986 14:25:51 Method:PHENOLIC DATA FILE: A:PHEN032.PTS
Interface: 4 Cycle#: 32 Channel#: 0 Vial#: N.A.
Starting Peak Width: 10 Threshold: .01

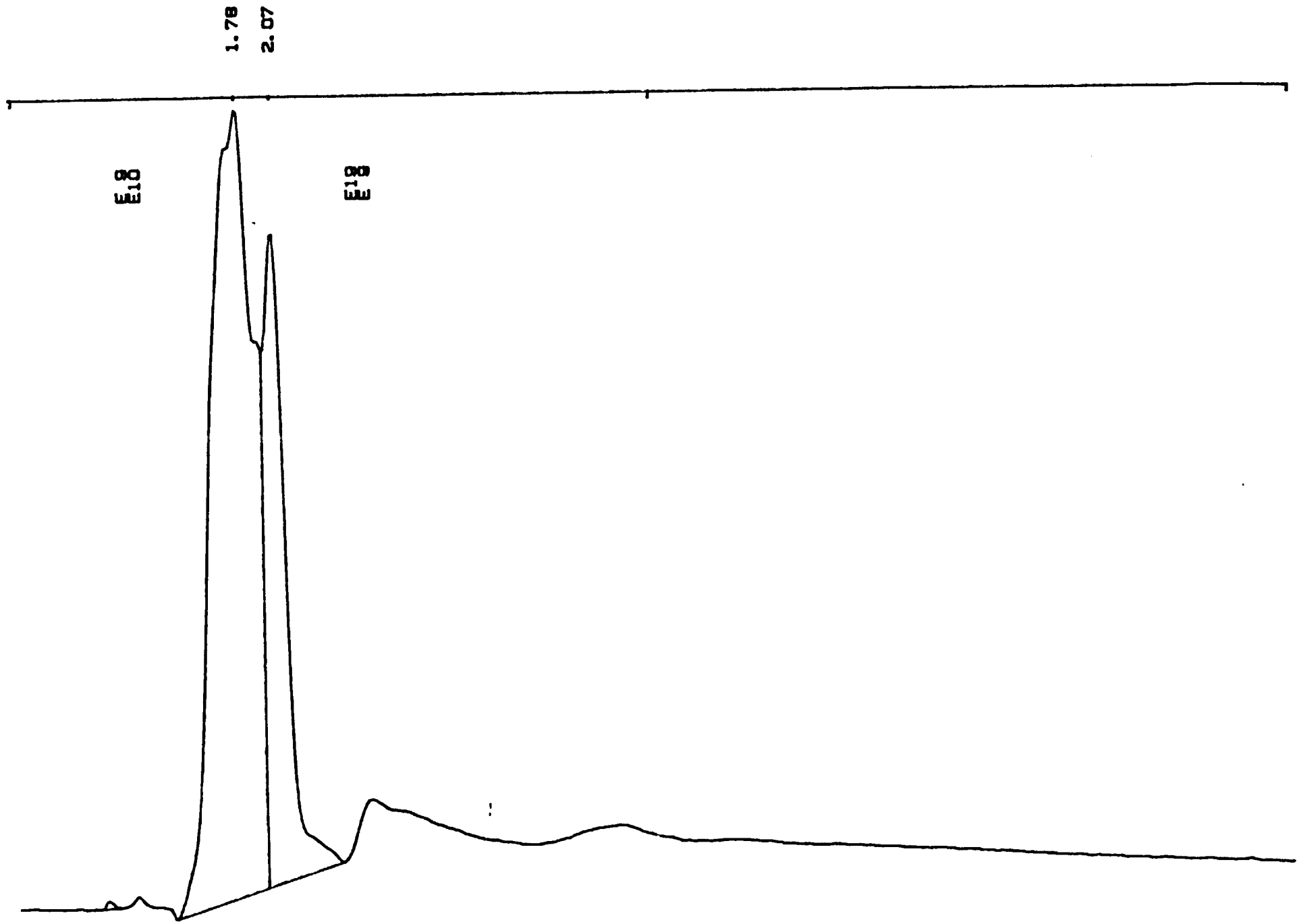
Instrument Type: BECKMAN HPLC Column Type: MICROBONDAPAK C-18
Solvent Description: THF/WATER, 2:1 BY WEIGHT
Operating Conditions: R.T., FLOWRATE=1.5 ML/MIN
Detector 0: 220NM/.5AU Detector 1:
Misc. Information: LENGTH=25

Starting Delay: 0.00 Ending Retention Time: 10.00

Pk No.	Ret Time	Peak Area	Area %	B L	Peak Ht.	Normalized %	Area/ Height
2	1.78	122964	72.5706	2	5196	100.000	23.7
3	2.07	46477	27.4294	2	4293	37.797	10.8

Total Area: 169441 Area Reject: 1000 One sample per 1.000 sec.

DATA FILE=PHEN032 FROM 0.00 MIN. TO 10.00 MIN. LOW SCALE= 5.404 Mv. HIGH SCALE= 10.750 Mv.
91 LD, 5-1, C=6.64 MG/ML, 9/5/86, JGZ



*** Calibration Data ***
Calibration Name:
Misc Information:

Fit Type: 3
Log Mol Wt = A + Bx + Cx^2 + Dx^3
A= 2.538977 B= 2.115815 C= -.5646824 D= 3.606432E-02
Coefficient of Determination: 0.9902

Ret Time	Molecular Weight	Log Mol Wt
3.50	35000	4.544
4.33	15000	4.176
4.83	3600	3.556
5.09	2350	3.371
6.00	570	2.756
7.17	92	1.964
7.50	72	1.857

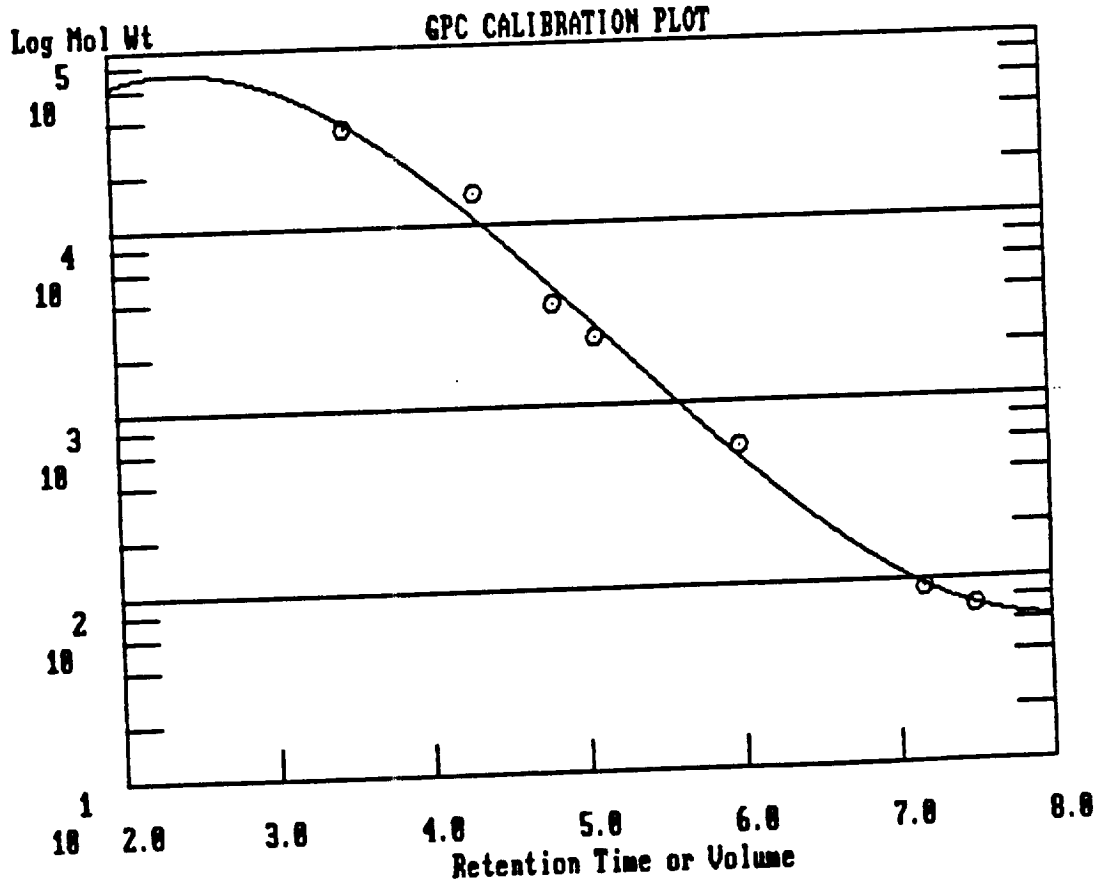


CHART 10A

********* GPC REPORT *********

```
**********************************************************************************
* Sample Name: 9/LD 5A                          Operator Initials: FCB           *
* Date:  10-03-1986 09:47:41 Method:            DATA FILE: A:GPC20.PTS           *
* Interface: 2                  Cycle#:  20     Channel#: 0    Vial#: N.A.       *
* Starting Peak Width:  60   Threshold:  0                                       *
**********************************************************************************
*  Instrument Type: HPLC BECKMAN 334        Column Type: ULTRASTYRAGEL 500A      *
*              Solvent Description: THF                                          *
*   Operating Conditions: R.T., FLOW RATE=2.0 ML/MIN                             *
*            Detector 0: 254NM/.1AU          Detector 1:                         *
*     Misc. Information: CALIBRATION/GPC                                         *
**********************************************************************************
Starting Delay:    0.00                    Ending Retention Time:    10.00
Calibration file: GPCMIX
Molecular Weight Distribution Averages
Baseline TIMES:    0.05 to   10.00   MW: %565381040000 to     353268
Process TIMES:     0.05 to   10.00   MW: %565381040000 to     353268
Total Area:        186951
M =                   235
M =                   128
Mw/Mn=             1.8398
M=                    408
```

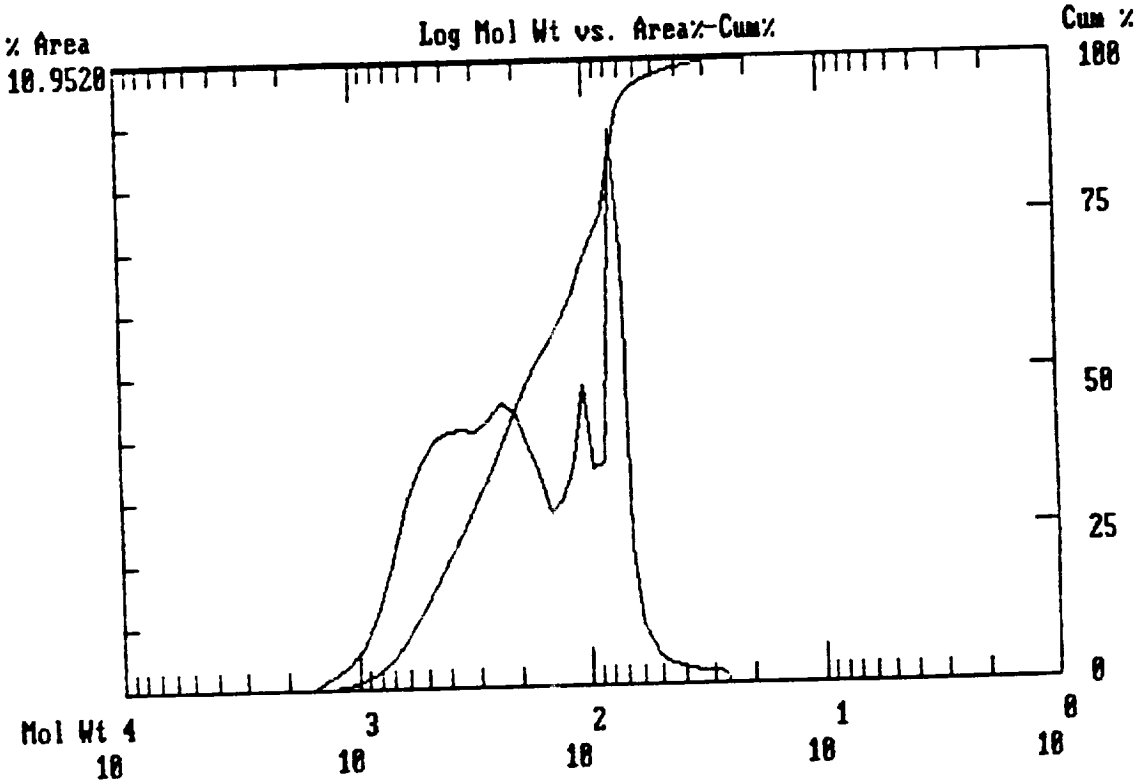


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CHART 10B

FILE A:GPC39.HDR TAKEN 08-06-1986 13:18:25

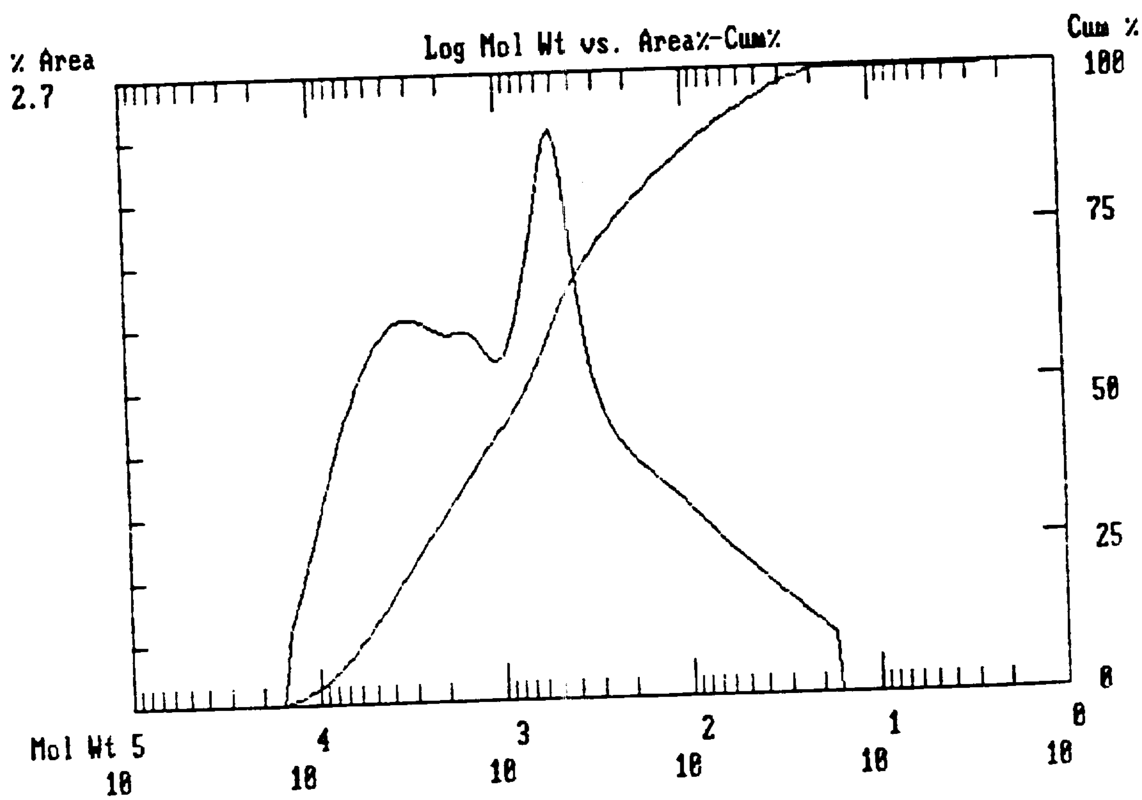
******** GPC REPORT ********

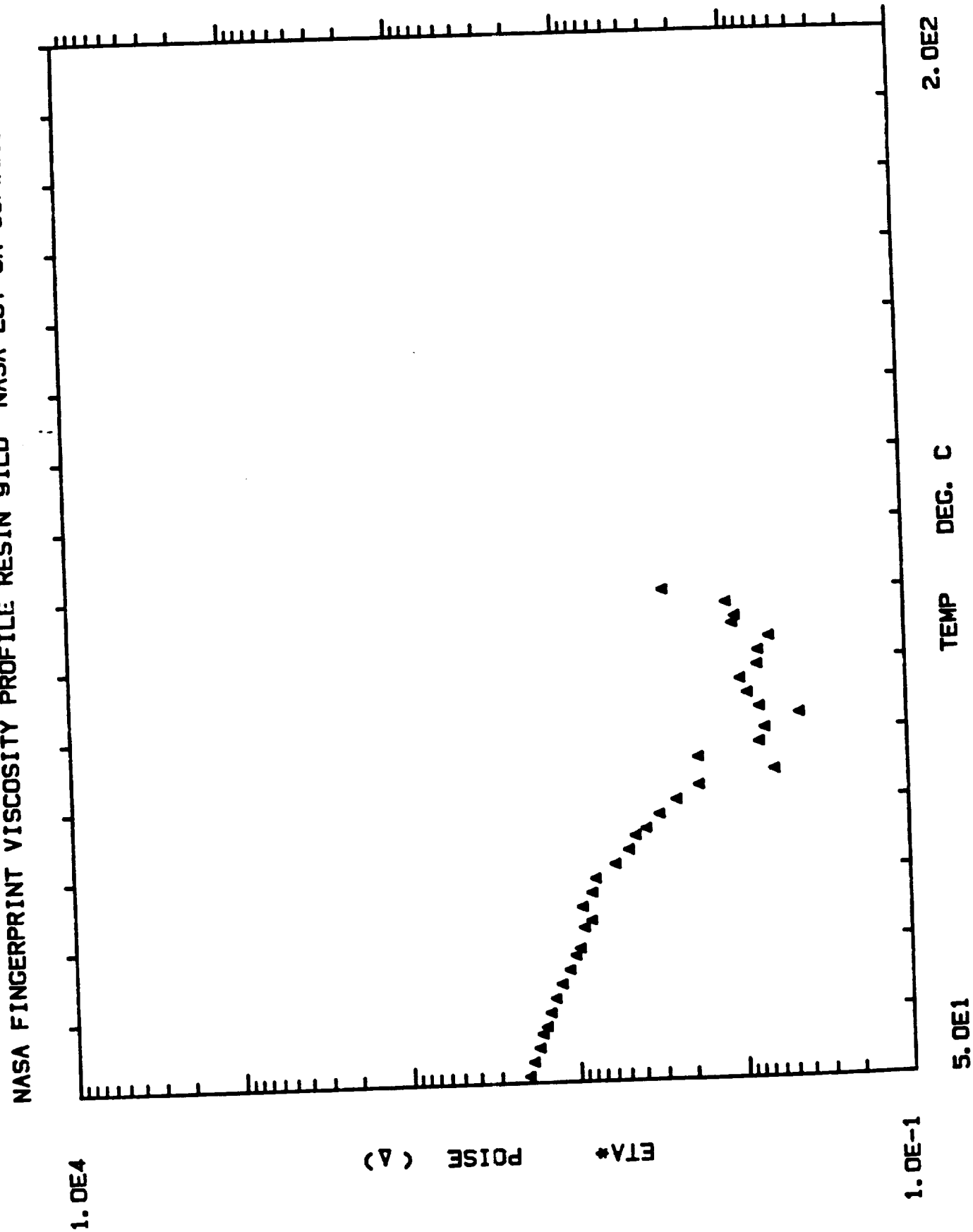
Sample Name: 91LD 5-1 CIC	Operator Initials: GBF
Date: 08-06-1986 13:09:02 Method:	DATA FILE: A:GPC39.PTS
Interface: 5 Cycle#: 39	Channel#: 0 Vial#: N.A.
Starting Peak Width: 60 Threshold: 0	

Column Type: ULTRASTYRAGEL 500A
Instrument Type: HPLC/BECKMAN
Solvent Description: THF
Operating Conditions: T=35C FLOWRATE=2.0ML/MIN
Detector 0: 254NM/.1AU Detector 1:
Misc. Information: CALIBRATION/GPC

Ending Retention Time: 10.00
Starting Delay: 0.00
Calibration file: GPCPHEN
Molecular Weight Distribution Averages

Baseline TIMES:	3.85	to	10.00	MW:	22295	to	2
Process TIMES:	3.85	to	10.00	MW:	22295	to	2
Total Area:	200232						
Mw=	1902						
Mn =	207						
Mw/Mn=	9.1879						
M	5518						
	1597						




NASA FINGERPRINT VISCOSITY PROFILE RESIN 91LD NASA LOT 5A USP#38255-19
ETA* POISE (A)
1.0E4
1.0E-1
TEMP DEG. C
5.0E1
2.0E2

A E TITLE

Rheometrics RECAP II

xneriment No. : 20 Sample No. : 1

i.le:
'ASA FINGERPRINT VISCOSITY PROFILE RESIN 91LD NASA LOT 5A USP#36255-19

p rator :cp

a'e and Time : Monday, August 25, 1986 - 12:55:38

perating Mode : DYNAMIC

w ep Type : CURE

eometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

lo es :
TRAIN =50%
REQUENCY =10 RAD/SEC

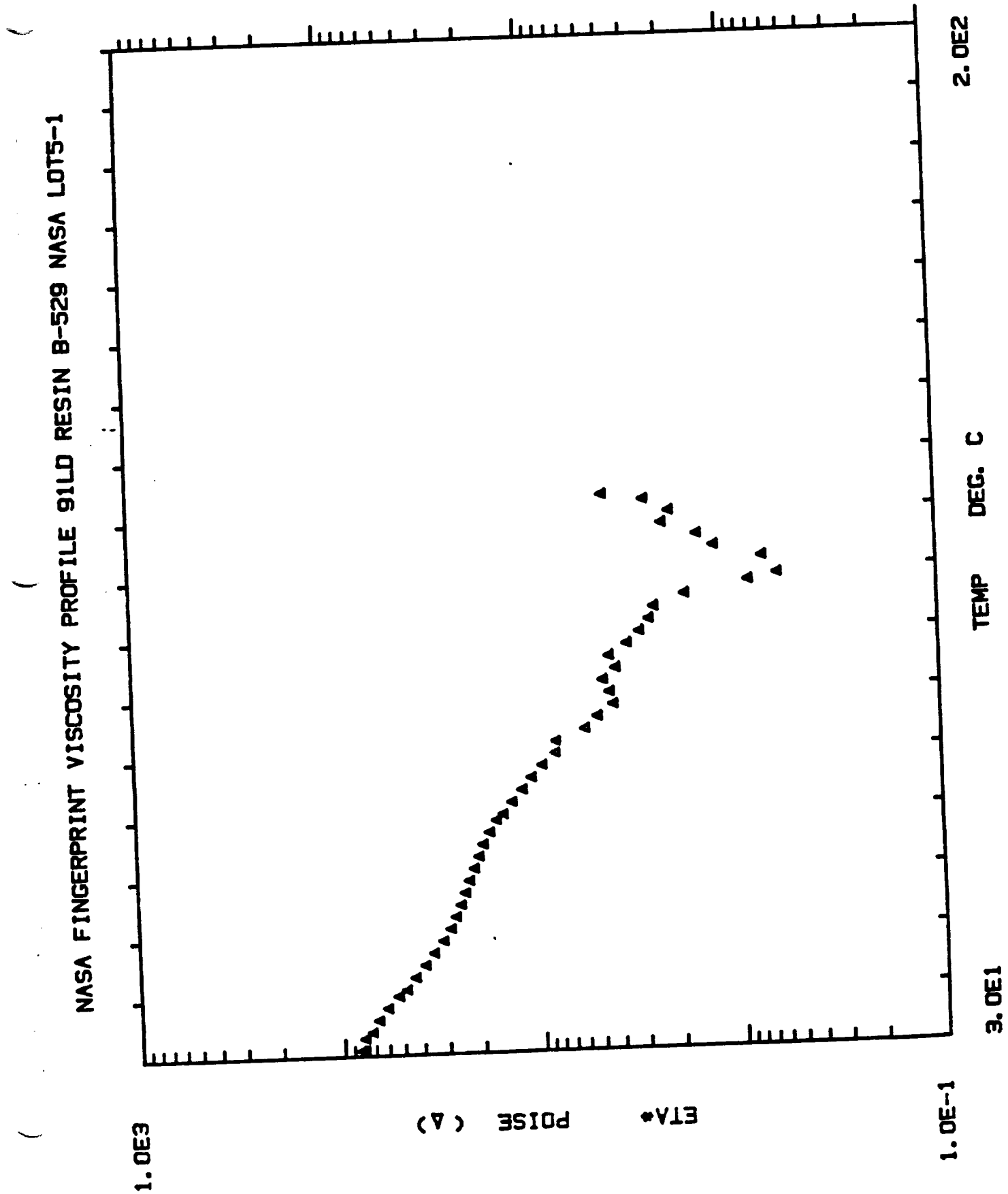
NASA FINGERPRINT VISCOSITY PROFILE RESIN 91LD NASA LOT 5A USP#36255-19

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
1	5.539e+001	4.719e+001	2.900e+001	6.953e+000	2.000e-001	3.000e+001
2	5.105e+001	4.393e+001	2.599e+001	6.411e+000	1.000e+000	3.000e+001
3	4.741e+001	4.138e+001	2.314e+001	5.952e+000	2.000e+000	3.200e+001
4	4.381e+001	3.841e+001	2.107e+001	5.502e+000	3.000e+000	3.300e+001
5	4.042e+001	3.539e+001	1.953e+001	5.077e+000	4.000e+000	3.500e+001
6	3.638e+001	3.218e+001	1.696e+001	4.570e+000	5.000e+000	3.600e+001
7	3.255e+001	2.885e+001	1.509e+001	4.088e+000	6.000e+000	3.800e+001
8	3.049e+001	2.721e+001	1.376e+001	3.831e+000	7.000e+000	4.000e+001
9	2.726e+001	2.381e+001	1.328e+001	3.421e+000	8.000e+000	4.200e+001
10	2.575e+001	2.250e+001	1.252e+001	3.234e+000	9.000e+000	4.300e+001
11	2.374e+001	2.063e+001	1.174e+001	2.983e+000	1.000e+001	4.500e+001
12	2.217e+001	1.952e+001	1.051e+001	2.785e+000	1.100e+001	4.700e+001
13	2.105e+001	1.881e+001	9.455e+000	2.645e+000	1.200e+001	4.900e+001
14	2.002e+001	1.794e+001	8.883e+000	2.514e+000	1.300e+001	5.100e+001
15	1.876e+001	1.711e+001	7.686e+000	2.357e+000	1.400e+001	5.300e+001
16	1.725e+001	1.612e+001	6.139e+000	2.166e+000	1.500e+001	5.500e+001
17	1.643e+001	1.540e+001	5.736e+000	2.064e+000	1.600e+001	5.700e+001
18	1.538e+001	1.456e+001	4.958e+000	1.932e+000	1.700e+001	5.800e+001
19	1.458e+001	1.383e+001	4.618e+000	1.831e+000	1.800e+001	6.000e+001
20	1.352e+001	1.286e+001	4.152e+000	1.699e+000	1.900e+001	6.200e+001
21	1.234e+001	1.186e+001	3.408e+000	1.550e+000	2.000e+001	6.400e+001
22	1.102e+001	1.048e+001	3.389e+000	1.384e+000	2.100e+001	6.600e+001
23	1.007e+001	9.051e+000	4.404e+000	1.264e+000	2.200e+001	6.800e+001
24	9.437e+000	9.125e+000	2.407e+000	1.185e+000	2.300e+001	6.900e+001
25	8.844e+000	8.528e+000	2.341e+000	1.112e+000	2.400e+001	7.200e+001
26	7.983e+000	7.804e+000	1.691e+000	1.003e+000	2.500e+001	7.300e+001
27	9.065e+000	8.948e+000	1.451e+000	1.139e+000	2.600e+001	7.500e+001
28	7.869e+000	7.745e+000	1.390e+000	9.886e-001	2.700e+001	7.700e+001
29	7.434e+000	7.373e+000	9.533e-001	9.343e-001	2.800e+001	7.900e+001
30	5.627e+000	5.536e+000	1.007e+000	7.069e-001	2.900e+001	8.100e+001
31	4.659e+000	4.595e+000	7.679e-001	5.857e-001	3.000e+001	8.300e+001
32	4.215e+000	4.163e+000	6.571e-001	5.302e-001	3.100e+001	8.500e+001
33	3.629e+000	3.556e+000	7.242e-001	4.561e-001	3.200e+001	8.600e+001
34	3.003e+000	2.996e+000	2.029e-001	3.776e-001	3.300e+001	8.800e+001
35	2.367e+000	2.350e+000	2.825e-001	2.974e-001	3.400e+001	9.000e+001
36	1.732e+000	1.726e+000	1.370e-001	2.176e-001	3.500e+001	9.200e+001
37	6.116e-001	5.750e-001	2.086e-001	0.768e-001	3.600e+001	9.400e+001
38	1.743e+000	1.614e+000	6.602e-001	2.191e-001	3.700e+001	9.600e+001
39	7.487e-001	6.929e-001	2.837e-001	0.941e-001	3.800e+001	9.800e+001
40	6.592e-001	6.876e-001	4.653e-002	0.865e-001	3.900e+001	1.000e+002
41	4.274e-001	2.164e-001	3.686e-001	5.366e-002	4.000e+001	1.020e+002
42	7.398e-001	7.377e-001	5.508e-002	0.929e-001	4.100e+001	1.030e+002
43	8.670e-001	8.670e-001	0.000e+000	1.089e-001	4.200e+001	1.050e+002
44	9.533e-001	9.520e-001	4.880e-002	1.196e-001	4.300e+001	1.070e+002
45	7.492e-001	7.322e-001	1.588e-001	0.940e-001	4.400e+001	1.090e+002
46	7.367e-001	5.965e-001	4.323e-001	0.925e-001	4.500e+001	1.110e+002
47	6.309e-001	4.684e-001	4.227e-001	0.792e-001	4.600e+001	1.130e+002
48	1.043e+000	9.408e-001	4.506e-001	1.310e-001	4.700e+001	1.150e+002
49	9.995e-001	9.819e-001	1.868e-001	1.255e-001	4.800e+001	1.160e+002
50	1.125e+000	7.700e-001	8.203e-001	1.413e-001	4.900e+001	1.180e+002

NASA FINGERPRINT VISCOSITY PROFILE RESIN 9ILD NASA LOT 5A USP#36255-19

NO.	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
51	2.676e+000	2.291e+000	1.399e+000	3.357e-001	5.000e+001	1.200e+002

CHART 14B


NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN B-529 NASA LOT5-1
1.0E3
ETA* POISE (A)
1.0E-1
2.0E2
TEMP DEG. C
3.0E1

Rheometrics RECAP II

Experiment No. : 1B Sample No. : 1

Title:
NASA FINGERPRINT VISCOSITY PROFILE 91LD RESIN B-529 NASA LOTS-1

Operator : CP

Date and Time : Wednesday, August 20, 1986 - 14:53:24

Operating Mode : DYNAMIC

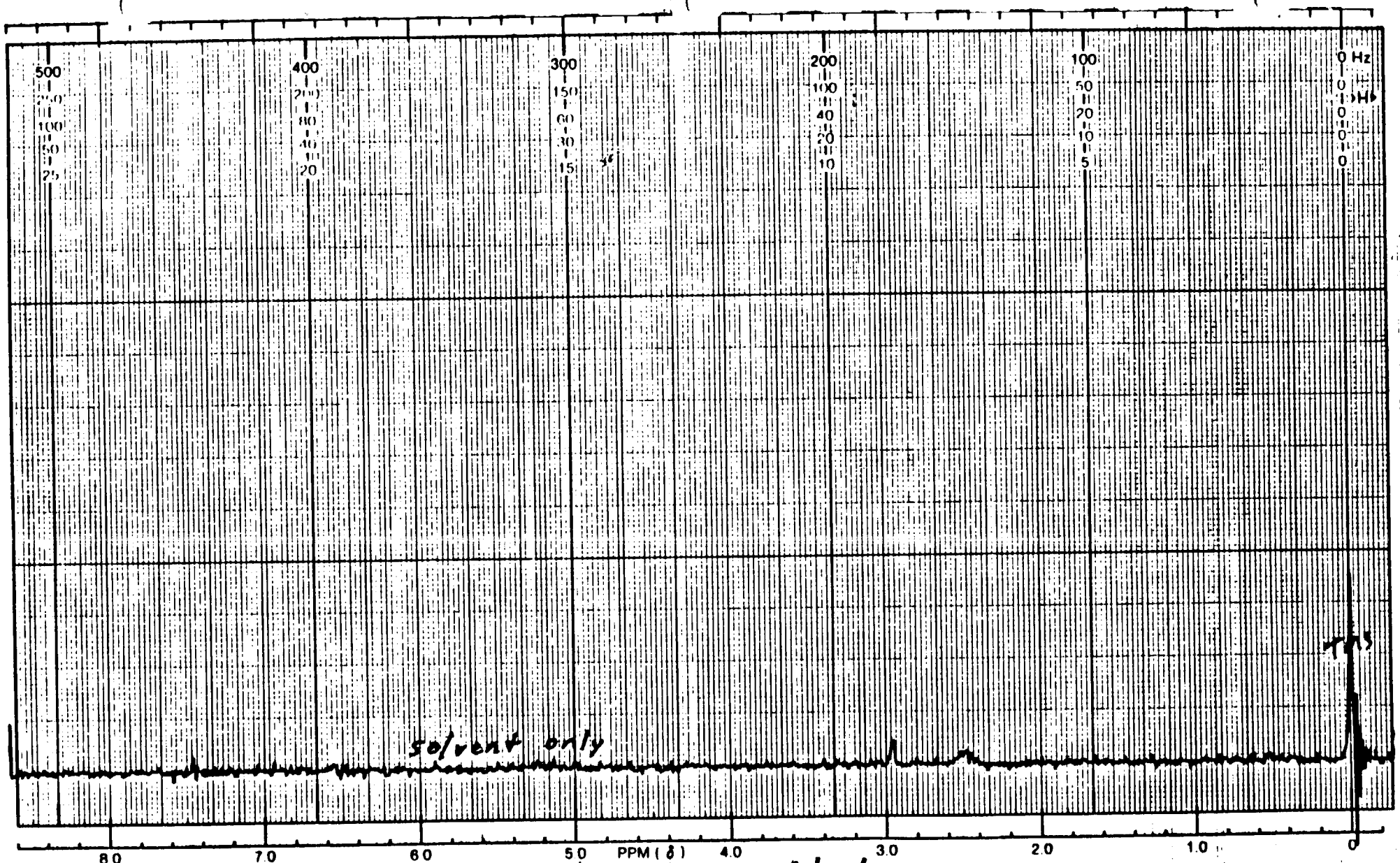
Sweep Type : CURE

Geometry : DISK & PLATE
RADIUS : 25.00
GAP : 0.50

Notes :
STRAIN =50%
FREQUENCY =1RAD/SEC

SH FINGERPRINT VISCOSITY PROFILE 91LD RESIN B-529 NASA LOT5-1

	ETA* POISE	ETA' POISE	ETA" POISE	TORQUE GRAMS-CM	TIME MIN.	TEMP DEG. C
	7.789e+001	6.991e+001	3.434e+001	9.784e+000	2.000e-001	3.100e+001
	8.077e+001	7.299e+001	3.459e+001	1.015e+001	1.000e+000	3.100e+001
3	7.750e+001	7.006e+001	3.313e+001	9.741e+000	2.000e+000	3.300e+001
4	7.097e+001	6.359e+001	3.151e+001	8.911e+000	3.000e+000	3.400e+001
	6.555e+001	5.776e+001	3.098e+001	8.228e+000	4.000e+000	3.600e+001
6	5.879e+001	5.079e+001	2.961e+001	7.385e+000	5.000e+000	3.800e+001
7	5.174e+001	4.347e+001	2.807e+001	6.498e+000	6.000e+000	4.000e+001
	4.707e+001	3.811e+001	2.763e+001	5.914e+000	7.000e+000	4.100e+001
	4.239e+001	3.371e+001	2.569e+001	5.316e+000	8.000e+000	4.300e+001
10	3.781e+001	2.959e+001	2.354e+001	4.744e+000	9.000e+000	4.500e+001
1	3.410e+001	2.624e+001	2.178e+001	4.276e+000	1.000e+001	4.700e+001
1	3.050e+001	2.337e+001	1.959e+001	3.828e+000	1.100e+001	4.900e+001
13	2.786e+001	2.142e+001	1.782e+001	3.499e+000	1.200e+001	5.100e+001
14	2.614e+001	2.055e+001	1.616e+001	3.283e+000	1.300e+001	5.300e+001
1	2.461e+001	1.969e+001	1.476e+001	3.088e+000	1.400e+001	5.500e+001
1	2.337e+001	1.889e+001	1.376e+001	2.935e+000	1.500e+001	5.700e+001
17	2.213e+001	1.821e+001	1.258e+001	2.780e+000	1.600e+001	5.900e+001
1	2.089e+001	1.774e+001	1.103e+001	2.622e+000	1.700e+001	6.100e+001
1	1.971e+001	1.706e+001	9.878e+000	2.476e+000	1.800e+001	6.300e+001
20	1.870e+001	1.673e+001	8.348e+000	2.347e+000	1.900e+001	6.500e+001
21	1.730e+001	1.577e+001	7.116e+000	2.173e+000	2.000e+001	6.700e+001
2	1.592e+001	1.469e+001	6.142e+000	1.999e+000	2.100e+001	6.900e+001
23	1.474e+001	1.381e+001	5.153e+000	1.849e+000	2.200e+001	7.000e+001
	1.324e+001	1.254e+001	4.263e+000	1.663e+000	2.300e+001	7.200e+001
	1.173e+001	1.116e+001	3.612e+000	1.473e+000	2.400e+001	7.400e+001
2	1.054e+001	1.018e+001	2.713e+000	1.324e+000	2.500e+001	7.600e+001
27	9.284e+000	8.903e+000	2.634e+000	1.166e+000	2.600e+001	7.800e+001
28	7.982e+000	7.796e+000	1.713e+000	1.002e+000	2.700e+001	8.000e+001
2	7.899e+000	7.618e+000	2.088e+000	9.915e-001	2.800e+001	8.200e+001
30	5.610e+000	5.556e+000	7.814e-001	7.046e-001	2.900e+001	8.400e+001
31	4.840e+000	4.720e+000	1.074e+000	6.085e-001	3.000e+001	8.600e+001
3	4.014e+000	3.918e+000	8.754e-001	5.043e-001	3.100e+001	8.800e+001
33	4.170e+000	4.055e+000	9.725e-001	5.238e-001	3.200e+001	9.000e+001
34	4.510e+000	4.388e+000	1.039e+000	5.660e-001	3.300e+001	9.200e+001
3	3.869e+000	3.830e+000	5.468e-001	4.860e-001	3.400e+001	9.400e+001
3	4.165e+000	4.151e+000	3.437e-001	5.228e-001	3.500e+001	9.600e+001
37	3.375e+000	3.375e+000	0.000e+000	4.240e-001	3.600e+001	9.800e+001
38	2.913e+000	2.853e+000	5.878e-001	3.657e-001	3.700e+001	1.000e+002
3	2.599e+000	2.564e+000	4.254e-001	3.265e-001	3.800e+001	1.020e+002
40	2.449e+000	2.422e+000	3.624e-001	3.073e-001	3.900e+001	1.040e+002
41	1.715e+000	1.668e+000	4.016e-001	2.154e-001	4.000e+001	1.060e+002
42	8.310e-001	8.087e-001	1.912e-001	1.044e-001	4.100e+001	1.080e+002
43	5.974e-001	5.924e-001	0.772e-001	0.750e-001	4.200e+001	1.090e+002
44	7.072e-001	3.329e-001	6.240e-001	0.889e-001	4.300e+001	1.120e+002
5	1.220e+000	7.795e-001	9.381e-001	1.531e-001	4.400e+001	1.140e+002
6	1.471e+000	1.185e+000	8.718e-001	1.848e-001	4.500e+001	1.160e+002
47	2.187e+000	1.749e+000	1.313e+000	2.744e-001	4.600e+001	1.180e+002
48	1.998e+000	1.963e+000	3.708e-001	2.509e-001	4.700e+001	1.200e+002
9	2.668e+000	2.504e+000	9.216e-001	3.348e-001	4.800e+001	1.220e+002
0	4.289e+000	4.132e+000	1.150e+000	5.386e-001	4.900e+001	1.230e+002



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 8.0
INTEGRAL AMPLITUDE: —
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 250 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.30

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: Solvent
SOLVENT: Unisol-d + 0.62 TMS
DEC. LEVEL

REMARKS:

ORIGINAL PAGE IS
OF POOR QUALITY

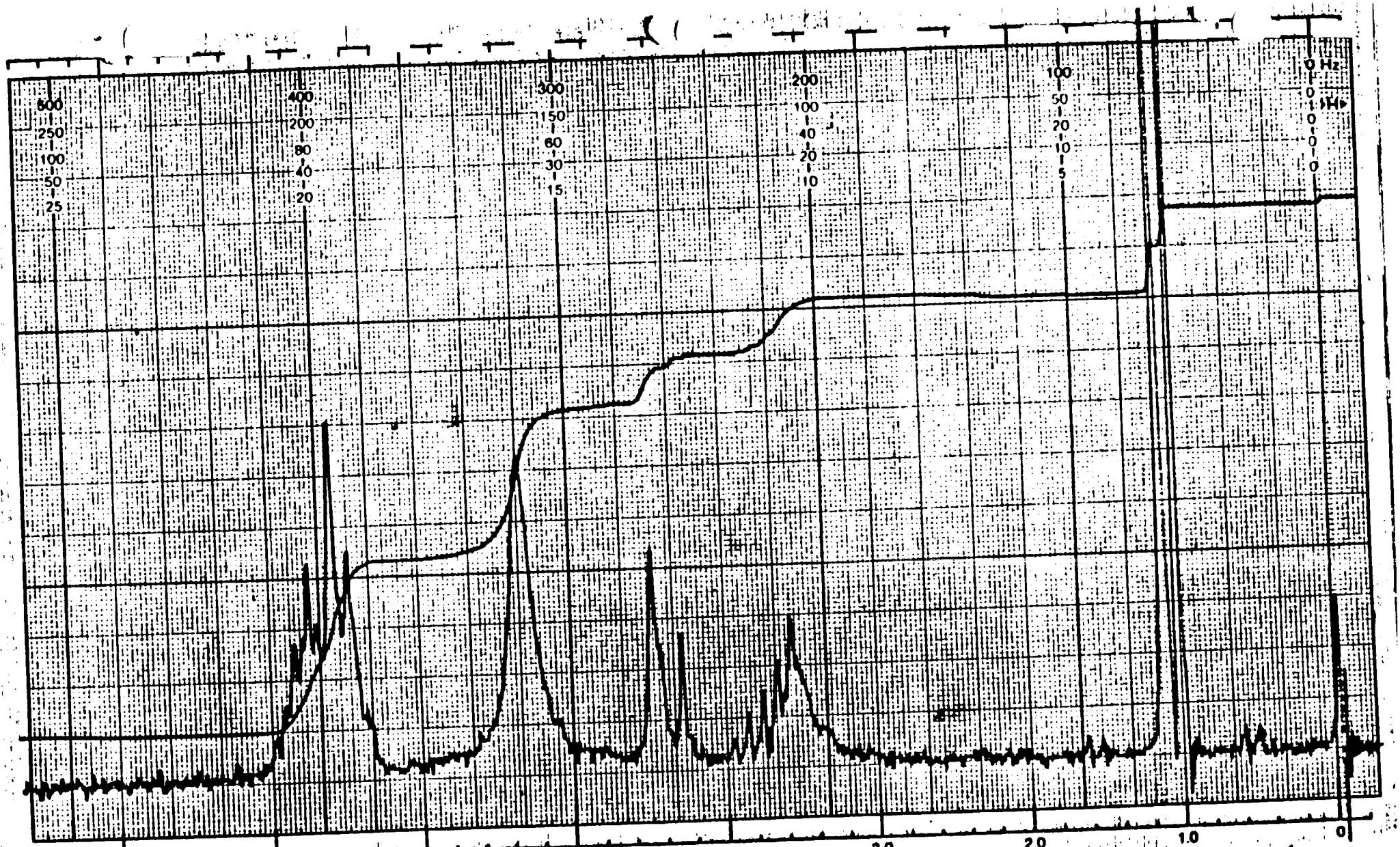
SOLVENT ONLY SCAN

NORELL, INC.
LANDISVILLE, N.J. 08326
Phone: (609) 697-0020

DATE: 3-21-86

OPERATOR DGW

SPECTRUM NO. 1A of 7
solvent scan



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 1.0
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 30 75 300 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.80

AUTO ☐
(250)
(500)
(2)
(.05)

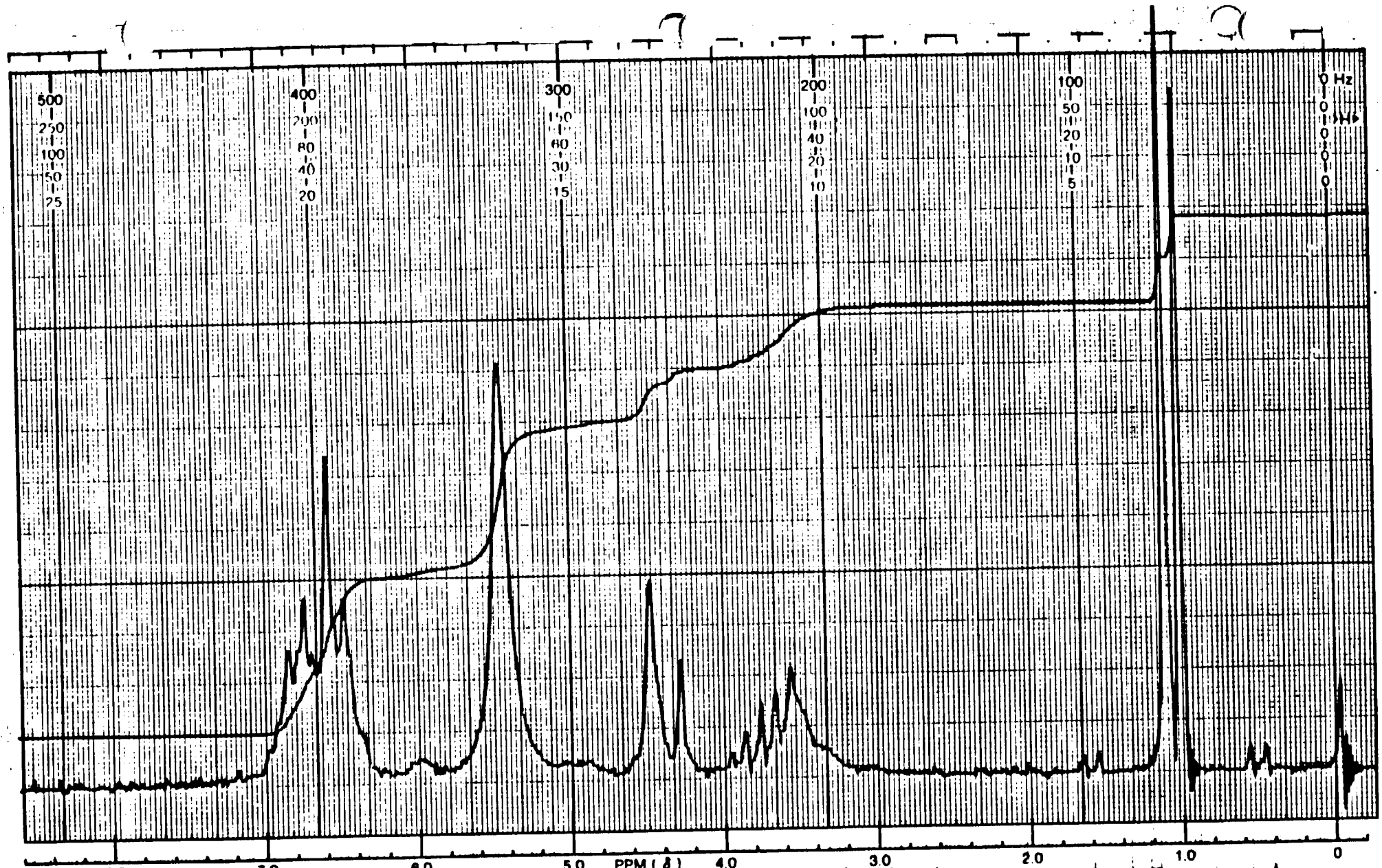
SAMPLE: 91LD 5A B-645 REMARKS: 0.160 gm sample
SOLVENT: Unisol-d + 0.5% TMS 0.985 gm solvent
DEC. LEVEL

ORIGINAL PAGE IS
OF POOR QUALITY

DATE: 8-6-96 OPERATOR DGW SPECTRUM NO. 1 of 1 91LD 5A B-645

CHART 15A

NORELL, INC.
LANDISVILLE, N.J. 08326
Phone: (609) 697-0020



SWEEP OFFSET (Hz): 0
SPECTRUM AMPLITUDE: 6.3
INTEGRAL AMPLITUDE: 5.0
SPINNING RATE (RPS): 30

MANUAL
SWEEP TIME (SEC): 50 200 500 1000
SWEEP WIDTH (Hz): 25 50 100 250 500
FILTER: 1 2 3 4 5 6 7 8
RF POWER LEVEL: 0.30

AUTO ☐
(250)
(500)
(2)
(.05)

SAMPLE: 9120 GFS-1
SOLVENT: dioxd-d+0.5% TMS
DEC. LEVEL

REMARKS: 0.155 gm sample
0.625 gm solvent

CHART 15B

ORIGINAL PAGE IS
OF POOR QUALITY

DATE: 6-19-86

OPERATOR DGW

SPECTRUM NO. 2 of 3
9120 GFS-1

NORELL, INC.
LANDISVILLE, N.J. 08326
T60 Phone: (609) 697-0020

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FABRIC TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

SWB-8 Fabric for NASA Lot# 5

CHARTS

U.S. Polymeric

FABRIC TESTING

NAS8-36298

U.S. POLYMERIC O.E. 71108

SWB-8 Fabric for NASA Lot# 5

			#5-1
1a.	Breaking Strength, lbs/in, WARP ASTM D1682	PICK	45
		CENTER	58
		PLAIN	41
		AVG.	48.0
1b.	Breaking Strength, lbs/in, FILL ASTM D1682	PICK	106
		CENTER	82
		PLAIN	73
		AVG.	87.0
2a.	Carbon Assay, % MDQAI 5560	PICK	99.5
		CENTER	99.3
		PLAIN	99.6
		AVG.	99.47
2b.	Hydrogen Assay, % MDQAI 5560	PICK	<.01
		CENTER	<.01
		PLAIN	.01
		AVG.	EST .004
2c.	Nitrogen Assay, % MDQAI 5560	PICK	.1
		CENTER	.1
		PLAIN	.2
		AVG.	.13
3.	Visual Inspection QCi-102	See Chart 3A	
4.	Specific Gravity, Units PTM-84		1.7055
			1.6549
			1.7169
		AVG.	1.692
5.	pH, Units CTM-24B		6.3
			6.2
		AVG.	6.25
6.	TGA, °C at 50% Weight Loss CTM-51 (AIR)	SET UP #1	
		#5-1 852	
		See Chart 6A	

HITCO MATERIALS DIVISION
700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

SWB-8 Fabric for NASA Lot# 5

			#5-1
7a. Atomic Absorption, ppm CTM-53B		Na	11
		K	1
		Ca	130
		Mg	1
		Li	0
		AVG.	143
7b. Moisture Content, % CTM-53B			0.000
7c. Ash Content, % CTM-53B			0.065
			#5-1
8a. Filament diameter, microns, WARP S.E.M. procedure (diameters are an average 10 measurements)		AVERAGE	10.17
		Minimum	8.10
		Maximum	11.55
		Std. Dev	1.06
			#5-1
8b. Filament diameter, microns, FILL S.E.M. procedure (diameters are an average of 10 measurements)		AVERAGE	10.43
		Minimum	9.05
		Maximum	11.90
		Std. Dev	1.00
			#5-1
9a. Thread Count, per inch, WARP PTM-5A			39
			40
			39
			41
			39
		AVG.	39.6
9b. Thread Count, per inch, FILL PTM-5A			36
			37
			36
			36
			37
		AVG.	36.4
10a. Areal weight as received, gm/4x4 PTM-3A		LEFT	3.470
		CENTER	3.353
		RIGHT	3.304
		AVG.	3.376
10b. Volatiles as received, % PTM-3A		LEFT	.26
		CENTER	.36
		RIGHT	.48
		AVG.	.37

SWB-8 Fabric for NASA Lot# 5

10c. Weight Change on Acetone Wash, PTM-3A	%	#5-1
	LEFT	-.40
	CENTER	-.27
	RIGHT	-.06
	AVG.	-.24

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

USP NO. CHART 3A

DATE 3/17/86

FABRIC GWB-8 33" FABRIC

MFG. STOCKPOLE FIBER CO. INC. LOT 1414-3

ROLL NO. 16-1489

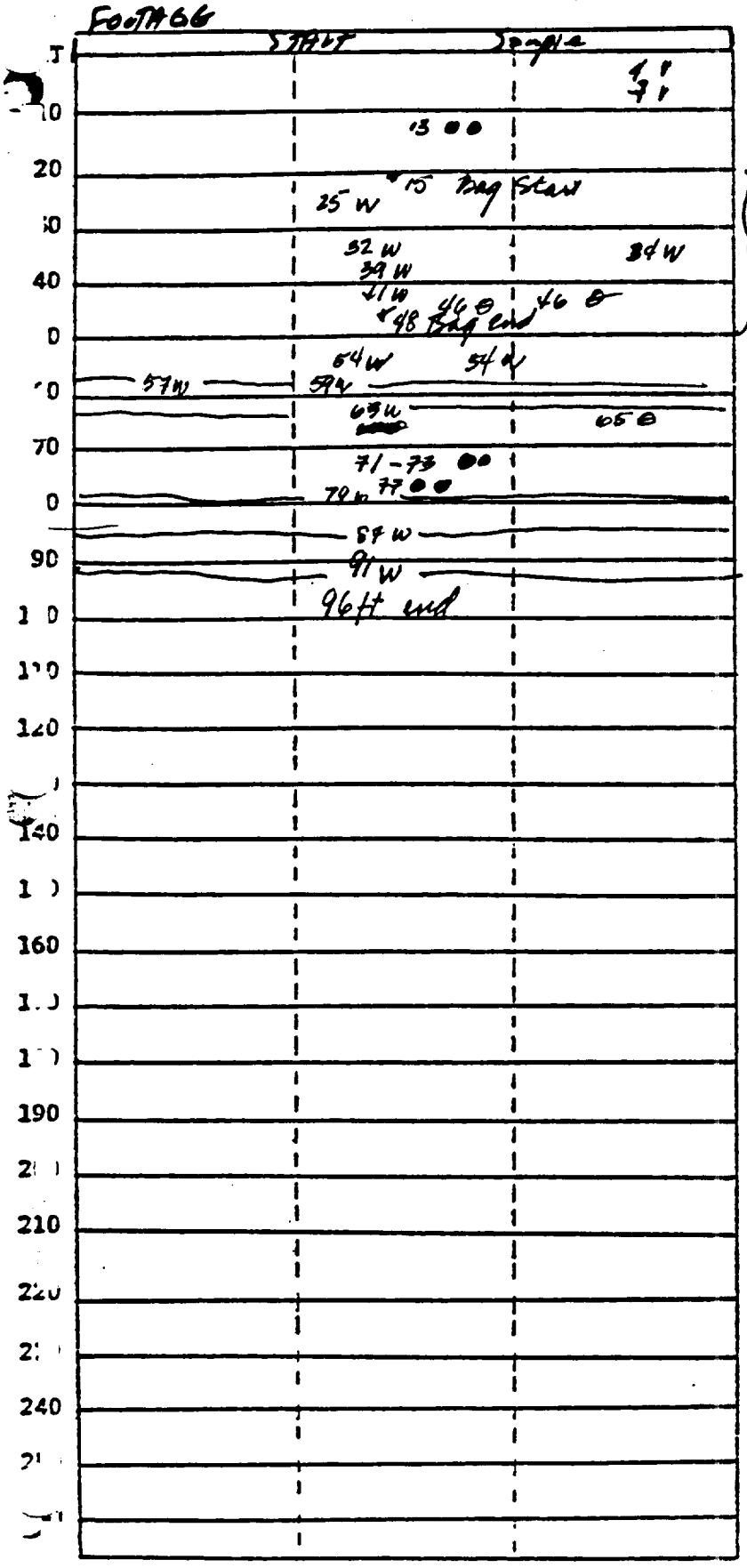
YARDS 350

POUNDS 19.3

ORDER NO. 71108

SPECIFICATION STD MFG. CERT

Q.C. FILE # NASA 5-1



SYMBOLS

- TEAR
- SPOTS OR STAINS
- FOLDS
- EDGE CURL
- TIGHT WEAVE OR SELVAGE
- WEAVE DISTORTION
- VISIBLE PUCKERS
- ONE PUCKER CREASING
- TWO OR MORE CREASINGS

REMARKS

GRADE Group C

GARCIA

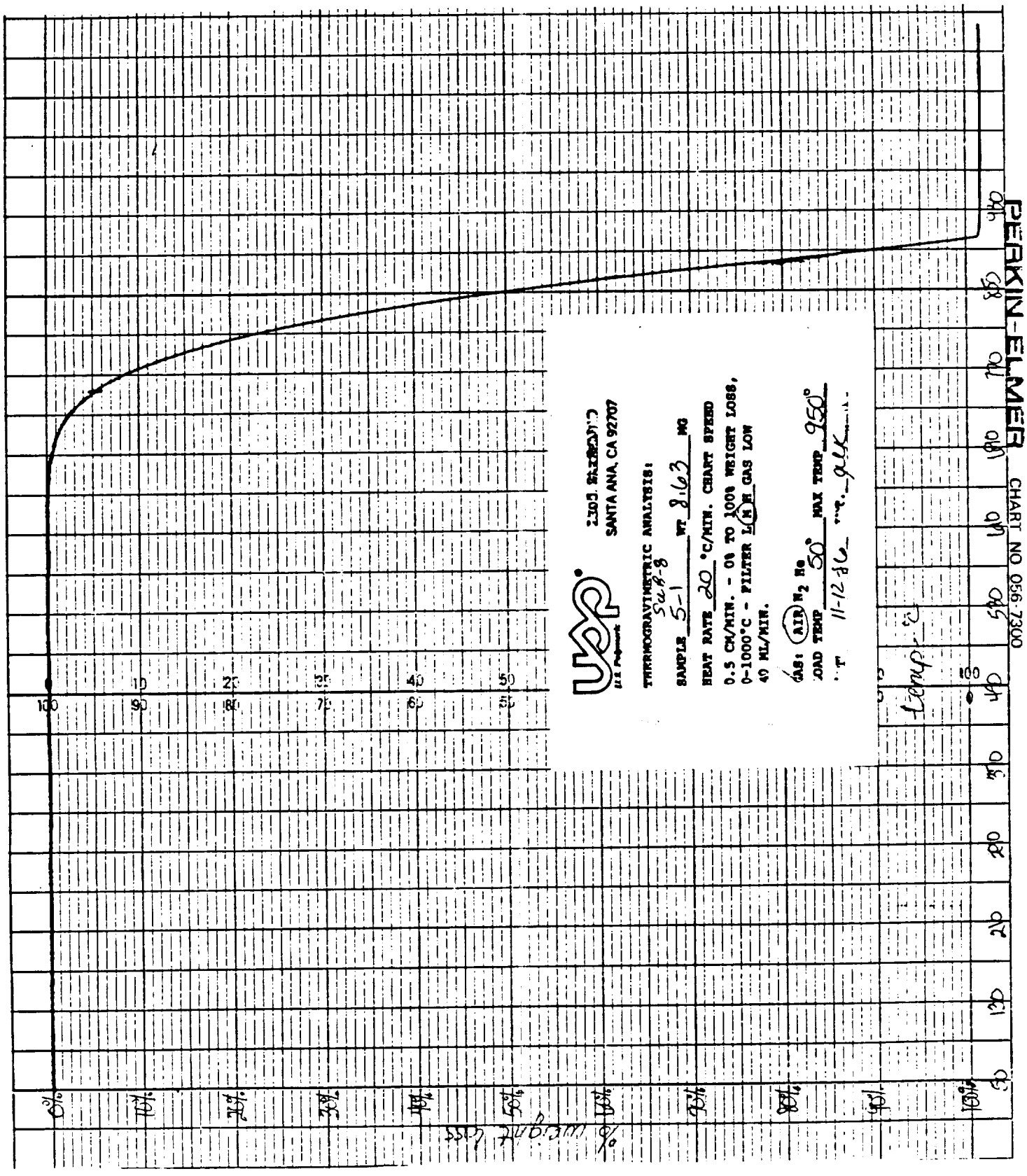


TABLE OF CONTENTS

PREPREG TESTING

NAS8-36298

U.S. Polymeric O.E. 71108

FM 5834 NASA LOT# 5 U.S.P. LOT# D09336

CHARTS

U.S Polymeric

PREPREG TESTING

NAS8-36298

U.S. POLYMERIC O.E.71108

FM 5834 NASA LOT# 5 U.S.P. LOT# D09336

		ROLL#1-S	ROLL#2-S
1a. Resin Content, Soxhlet, % CTM-6D		42.4	41.0
		42.5	39.4
		42.9	38.8
	AVG.	42.6	39.7
	NASA LOT# 5 AVERAGE		41.2
1b. Filler Content, Soxhlet, % CTM-6D		18.3	18.0
		18.4	17.0
		18.6	16.8
	AVG.	18.4	17.3
	NASA LOT# 5 AVERAGE		17.9
1c. Cloth Content, Soxhlet, % CTM-6D		39.3	41.0
		39.1	43.6
		38.5	44.4
	AVG.	39.0	43.0
	NASA LOT# 5 AVERAGE		41.0
2. Volatile Content, % PTM-17B		3.7	4.3
		4.1	4.3
		4.1	3.9
	AVG.	4.0	4.2
	NASA LOT# 5 AVERAGE		4.1
3. Flow, % PTM-19G		9.1	6.3
		10.0	12.3
		9.6	9.5
	AVG.	9.6	9.4
	NASA LOT# 5 AVERAGE		9.5
4. Resin Content, Dry basis, % PTM 16F, Type II		41.6	42.7
		43.5	43.5
		42.1	42.2
	AVG.	42.4	42.8
	NASA LOT# 5 AVERAGE		42.6
5. Tack, lbs PTM-80		26	39
	NASA LOT# 5 AVERAGE		33
6. Gel Time, seconds PTM-20E		68	81
	NASA LOT# 5 AVERAGE		75

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700 E. DYER ROAD, SANTA ANA, CALIFORNIA 92707 • (714) 549-1101 • TWX (910) 595-1130 • FAX # (714) 549-2858-5-2437

FM 5834 NASA LOT# 5 U.S.P. LOT# D09336

7a. Atomic Absorption, ppm
CTM-53B

	ROLL#1-S	ROLL#2-S	LOT#5 AVG.
Na	11	16	14
K	1	2	2
Ca	27	26	27
Mg	1	1	1
Li	0	0	0
TOTAL	40	45	43

7b. Moisture Content, %
CTM-53B

	ROLL#1-S	ROLL#2-S
	3.35	3.35
NASA LOT# 5 AVERAGE		3.35

7c. Ash Content, %
CTM-53B

	.04	.10
NASA LOT# 5 AVERAGE		.07

8. TGA, % Weight Loss at 500°C
CTM-51 (Nitrogen)

	6.4	7.3
NASA LOT# 5 AVERAGE		6.9

See chart 8A-8B

9. DSC, °C
CTM-50A

	ROLL#1-S	ROLL#2-S	LOT#5 AVG.
First Temp	179	182	181
Second Temp	242	243	243

See Chart 9A-9B

10. Infrared (IRZB) Baseline
CTM-21C

	1.03	1.03	1.03

See Chart 10A-10B

11. Environmental History

Date manufactured: 25 July 1986
Packaged in: Polyethylene bag
Date shipped: Test lot not shipped

12. Specific Gravity, Cured, Units
ASTM D792

	ROLL#1-S	ROLL#2-S
	1.498	1.503
	1.498	1.508
	1.497	1.503
AVG.	1.497	1.504
NASA LOT# 5 AVERAGE		1.501

13a. Tensile Strength, ksi, WARP
FTMS 406-1011

	29.67	27.61
	29.08	28.96
	29.48	28.35
	29.29	25.74
	25.64	28.75
AVG.	28.63	27.88
NASA LOT# 5 AVERAGE		28.26

FM 5834 NASA LOT# 5 U.S.P. LOT# D09336

	ROLL#1-S	ROLL#2-S
13b. Tensile Modulus, msi, WARP FTMS 406-1011	4.62	4.38
	4.53	4.80
	4.49	4.81
	4.37	4.47
	4.53	4.71
AVG.	4.51	4.63
NASA LOT# 5 AVERAGE		4.57
13c. Tensile Elongation, %, WARP FTMS 406-1011	.73	.64
	.73	.70
	.73	.69
	.73	.73
	.61	.68
AVG.	.71	.69
NASA LOT# 5 AVERAGE		.70
14a. Flexural Strength, ksi, WARP FTMS 406-1031	44.67	40.65
	40.86	39.32
	42.96	36.60
	43.79	36.85
	43.09	37.97
AVG.	43.07	38.28
NASA LOT# 5 AVERAGE		40.68
14b. Flexural Modulus, msi, WARP FTMS 406-1031	4.57	4.47
	4.50	4.76
	4.39	4.19
	4.60	3.96
	4.91	4.36
AVG.	4.59	4.35
NASA LOT# 5 AVERAGE		4.47
15a. Compressive Strength, ksi, WARP FTMS 406-1021	27.79	29.86
	32.96	24.73
	31.05	27.89
	31.28	28.23
	29.73	29.47
AVG.	30.56	28.03
NASA LOT# 5 AVERAGE		29.30
15b. Compressive Modulus, msi, WARP FTMS 406-1021	4.52	4.89
	5.07	4.46
	4.87	4.77
	4.91	4.96
	4.68	5.00
AVG.	4.81	4.82
NASA LOT# 5 AVERAGE		4.81

FM 5834 NASA LOT# 5 U.S.P. LOT# D09336

	ROLL#1-S	ROLL#2-S
16. Double Shear Strength, ksi FTMS 406-1041A	3.83	3.13
	3.78	3.43
	3.73	3.54
	3.40	2.77
	3.86	3.33
AVG.	3.72	3.24
NASA LOT# 5 AVERAGE		3.48
17. Barcol Hardness, Units ASTM D-2583 (Average of 10 determinations)	70.6	70.9
NASA LOT# 5 AVERAGE		70.8
18. Residual Volatiles, % PTM-98	2.22	2.29
	2.18	2.04
	2.22	2.00
AVG.	2.20	2.11
NASA LOT# 5 AVERAGE		2.16
19. Resin Content, Pyrolysis, % CTM-14B	37.29	39.41
	37.35	39.76
	38.13	35.46
AVG.	37.59	38.21
NASA LOT# 5 AVERAGE		37.90
20. Acetone Extraction, % CTM-18A	1.73	1.90
	1.76	1.01
	2.54	1.35
AVG.	2.01	1.42
NASA LOT# 5 AVERAGE		1.71
21a. CTE, in/in •F with PLY PTM-61B	.00	.83
	1.03	-1.23
AVG.	.52	-.20
NASA LOT# 5 AVERAGE		.16
21b. CTE, in/in •F Cross PLY PTM-61B	11.41	12.55
	11.69	4.58
AVG.	11.55	8.57
NASA LOT# 5 AVERAGE		10.06

See Chart 21A-21B

U.S. Polymeric

Hamid M. Quraishi

Hamid M. Quraishi, Manager
Quality Assurance Department

CHART 8A

ORIGINAL PAGE IS
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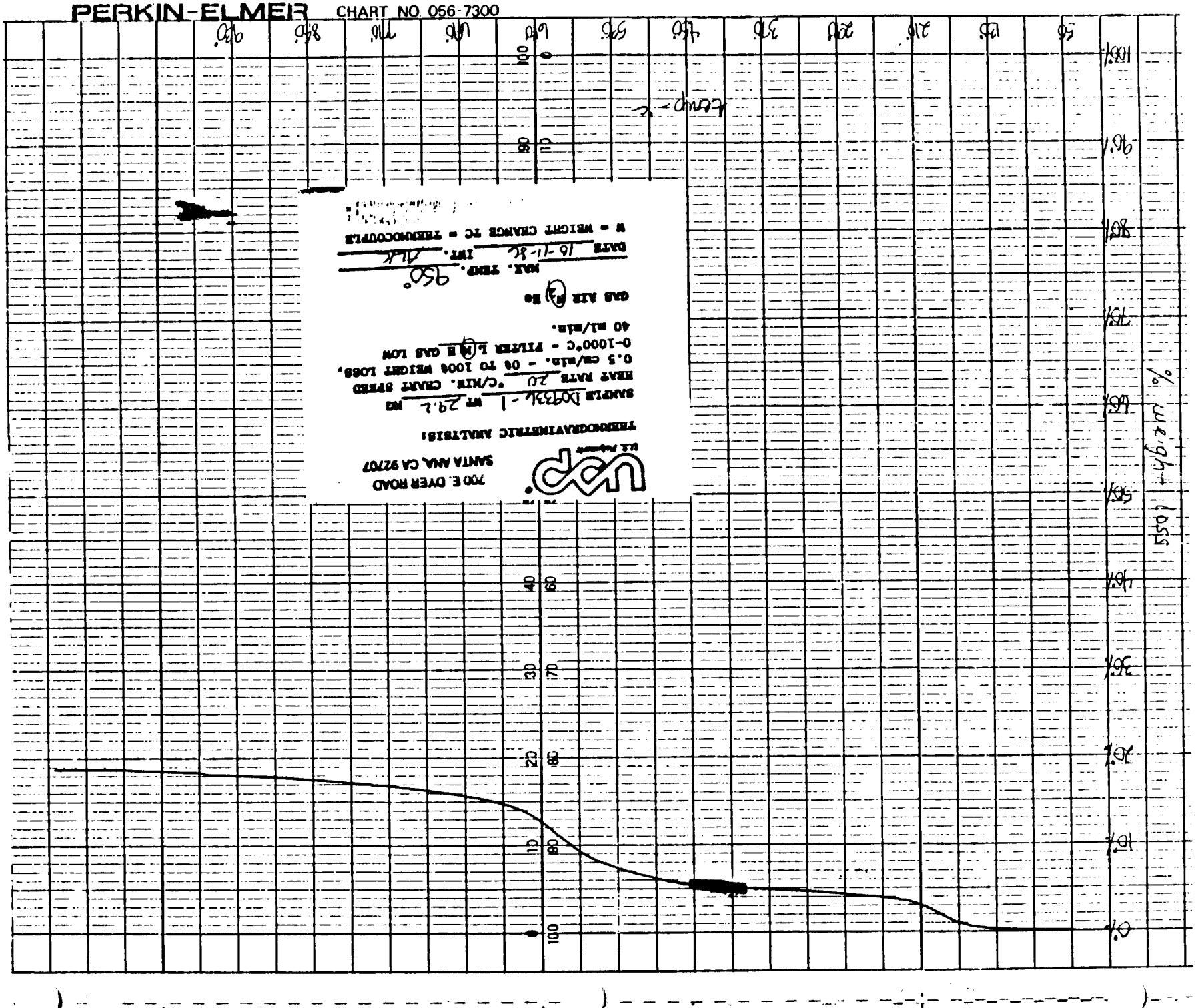

CHART 8B

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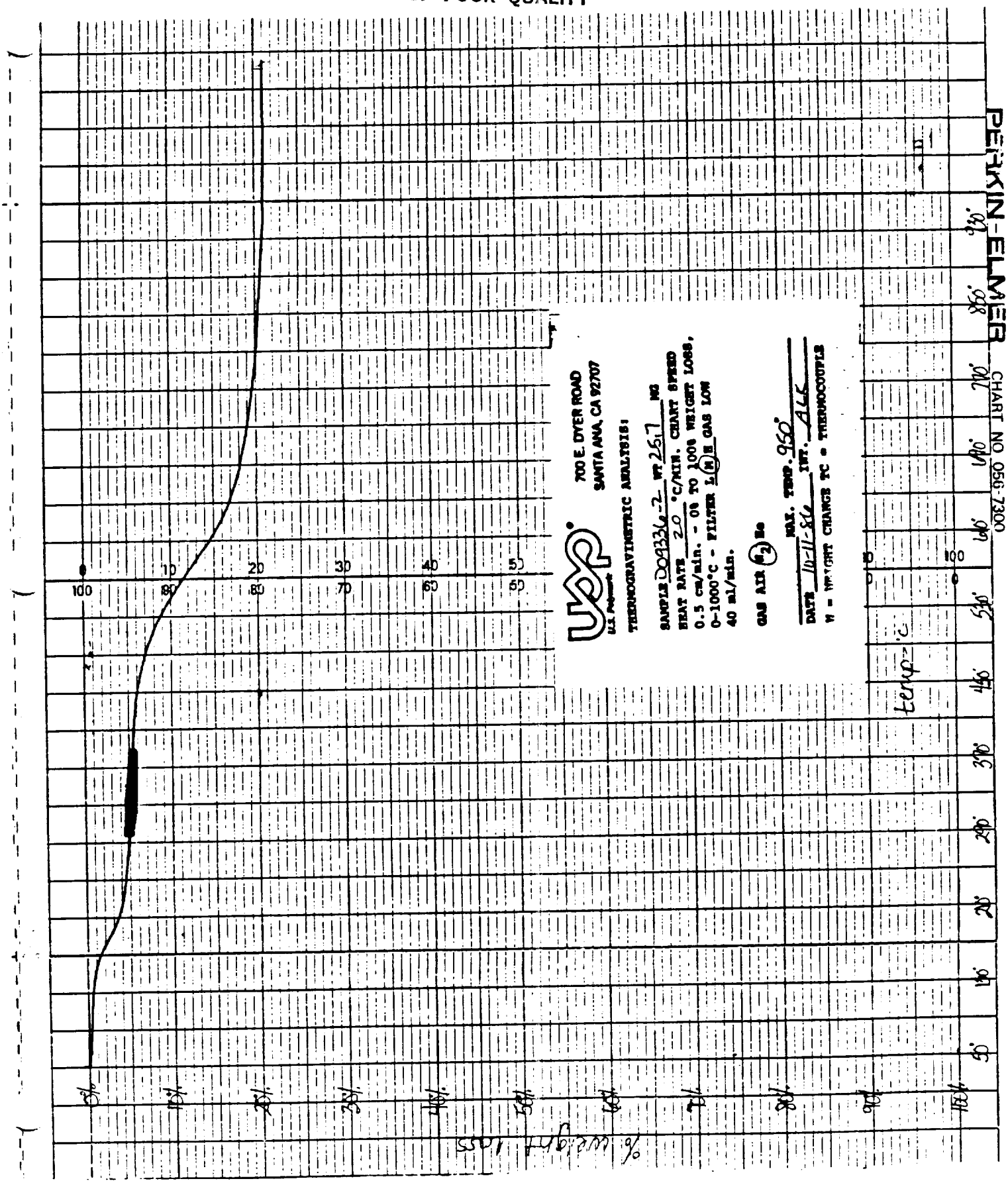
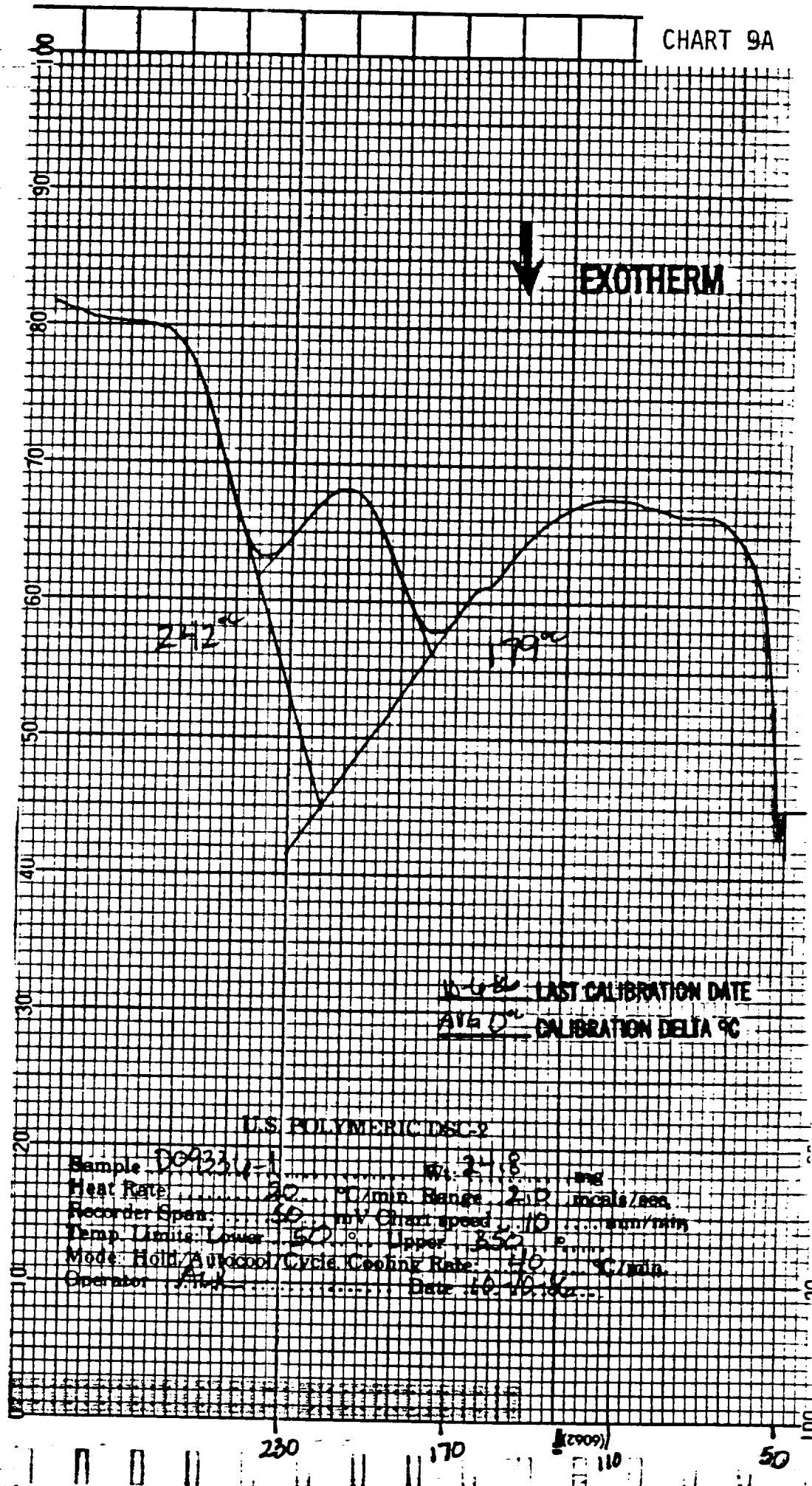
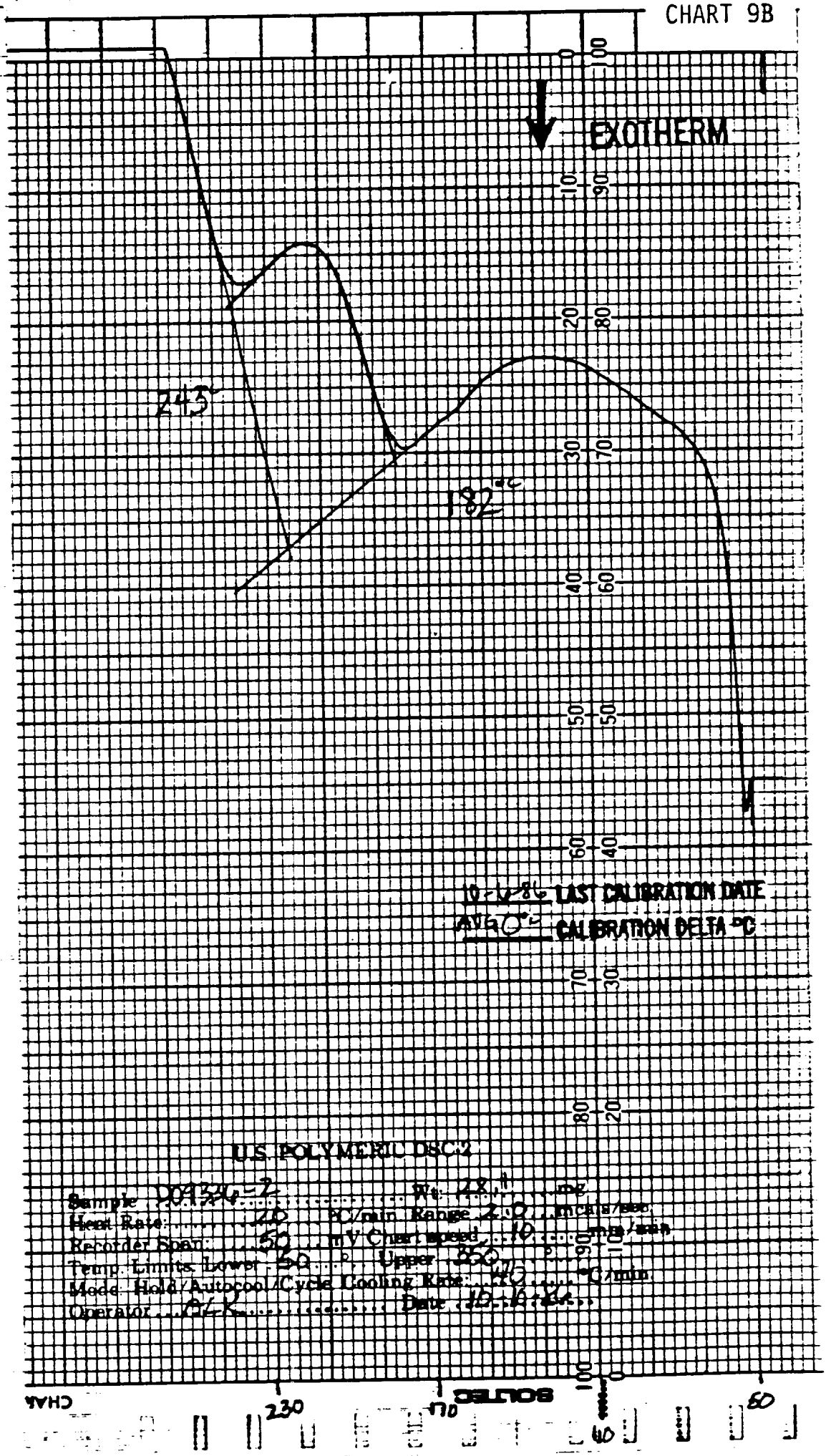


CHART 9A





SPECTRUM NO. 15302
DATE 8-08-86
SAMPLE FM 5834
D09336 # 1

SOURCE
STRUCTURE

PATH 0.2 mm NACL
SOLVENT ACETONE
CONCENTRATION 40-45%T
PHASE LIQUID
COMMENTS

ANALYST V. MIRANDA

Beckman®
INFRARED
SPECTROPHOTOMETER

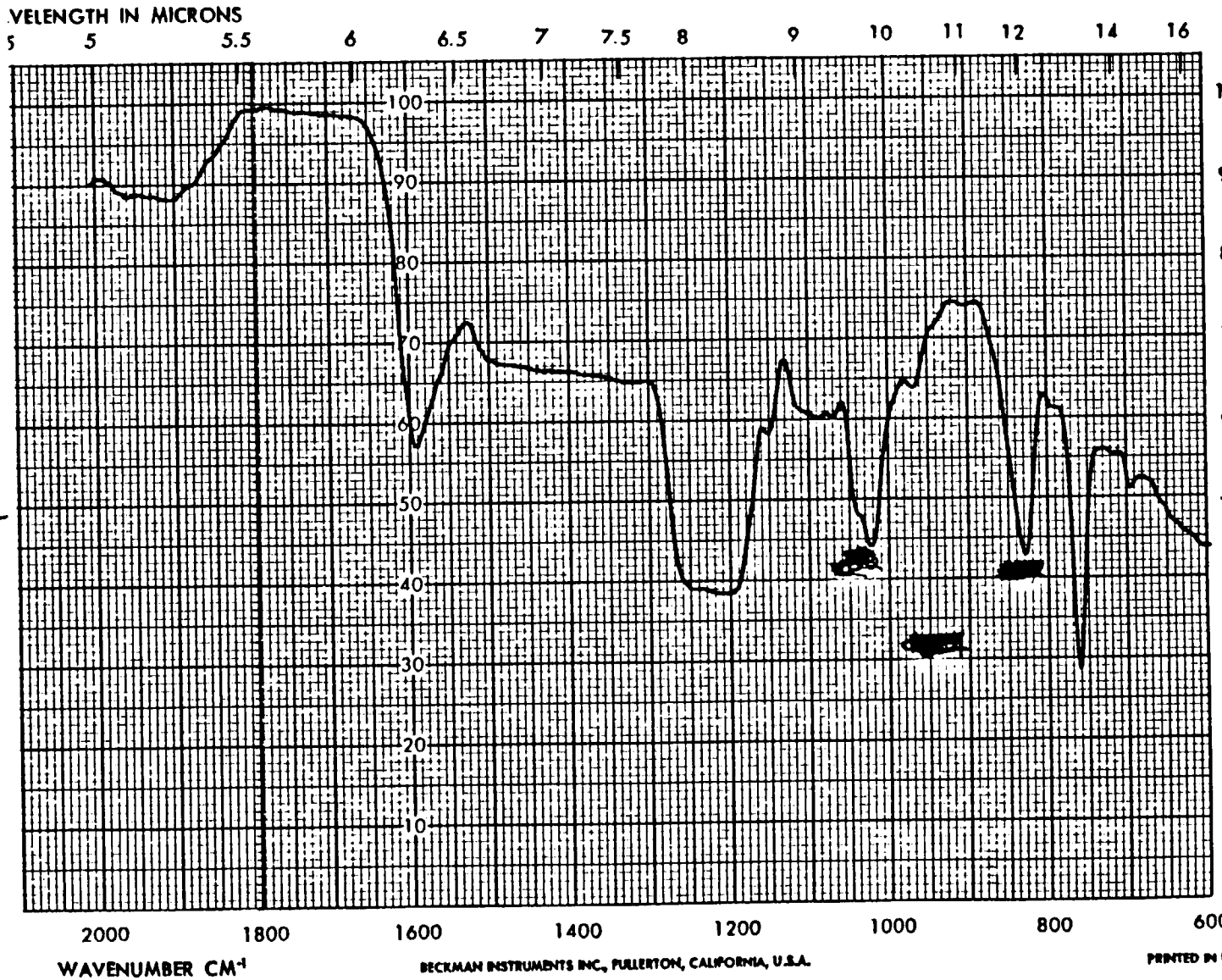


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CHART 10A

SPECTRUM NO. 15303

DATE 8-08-84

SAMPLE FM 5834

D09336 #2

SOURCE

STRUCTURE

PATH 0.2 mm NACL

SOLVENT ACETONE

CONCENTRATION 40-45%T

PHASE LIQUID

COMMENTS

ANALYST V. MIRANDA

Beckman®

INFRARED
SPECTROPHOTOMETER

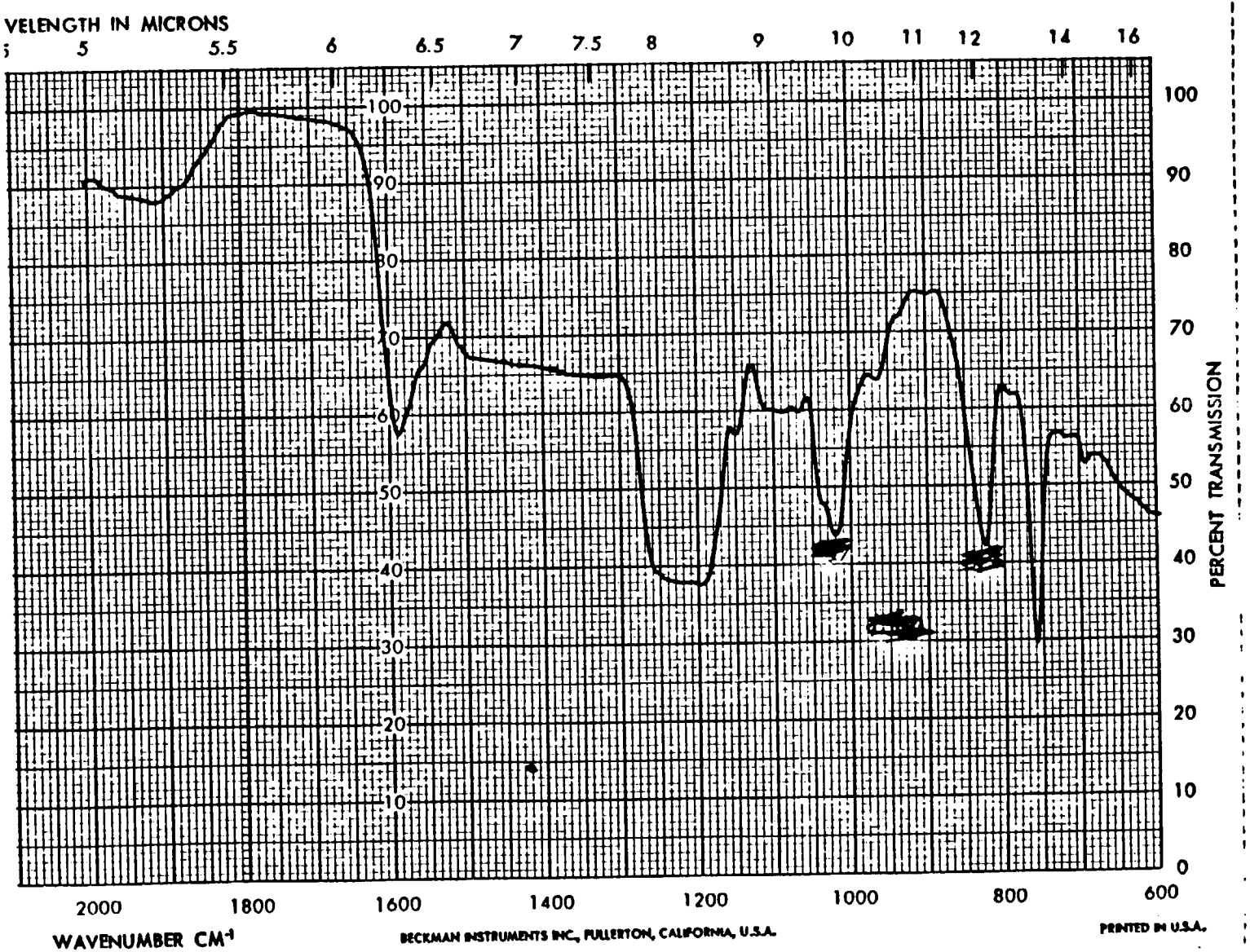


CHART 10B

Chart 21A1

PART NO. 990088

RUN NO. ___ DATE 4/15/86
OPERATOR TM
SAMPLE D6336-1-(1)
ATM Air @ 50cc
FLOW RATE 300cc/min
Wafer

T-AXIS
SCALE, °C/in 50 2x
PROG RATE, °C/min 10
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/(mg/min)/in ___

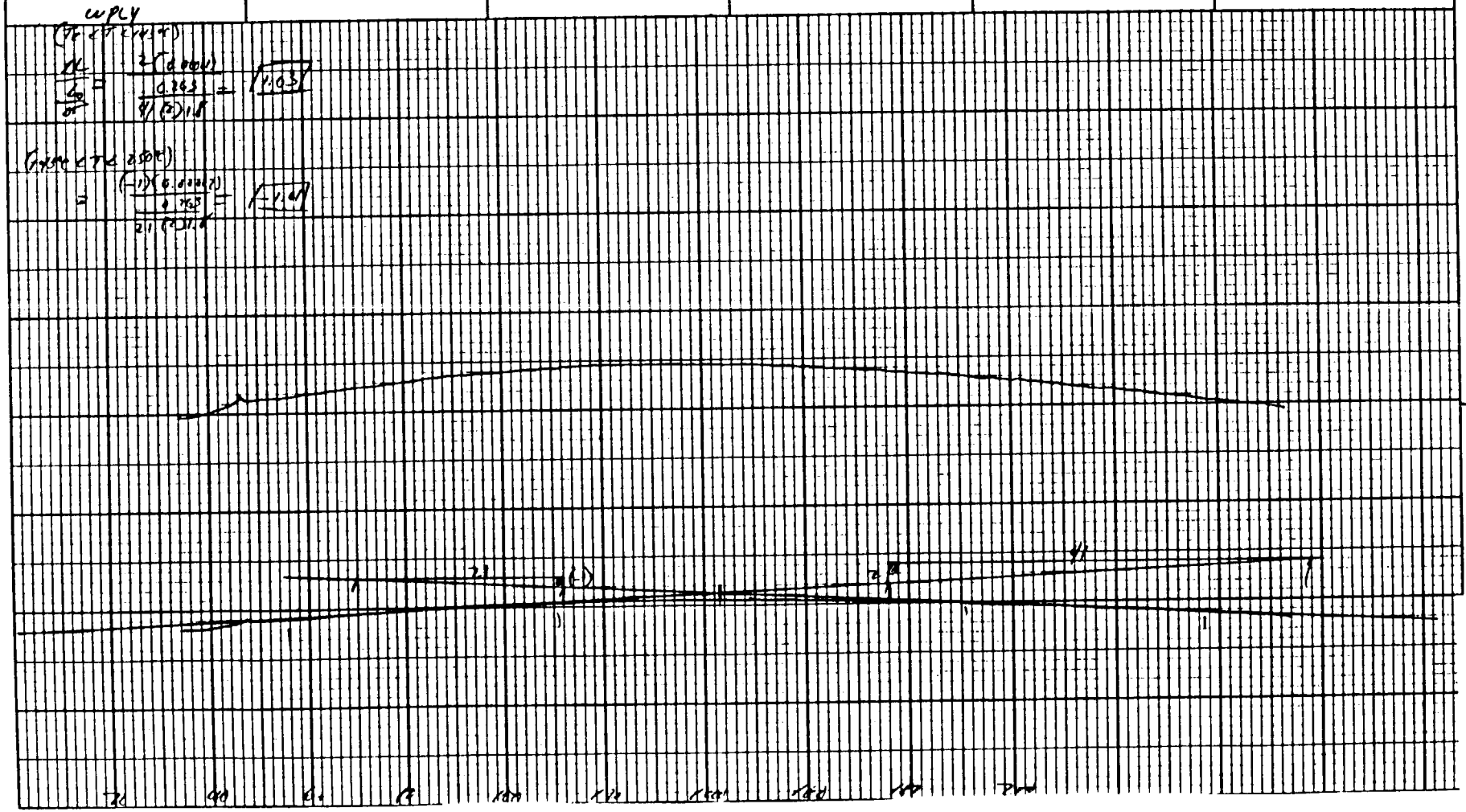
TMA 4mil/rad
SCALE, mils/in 0.1/0.2
MODE Expansion
SAMPLE SIZE 0.251
LOAD, g 10
dY/(10X)/(mils/min)/in ___

MEASURED VARIABLE

DUPONT instruments

PART NO. 990068

RUN NO.__ DATE 11/16/16	T-AXIS	DTA-DSC	TGA	TMA (Creep/Rel)	
OPERATOR DL	SCALE, °C/in 50 20	SCALE, °C/in	SCALE, mg/in	SCALE, mils/in 0.1/0.2	
SAMPLE: D69336-1-(2)	PROG. RATE, °C/min 10	(mcal/sec)/in	SUPPRESSION, mg	MODE EXPANSION	
ATM Air @ STP	HEAT ✓ COOL ISO	WEIGHT, mg	WEIGHT, mg	SAMPLE SIZE 0.263	
FLOW RATE 3.7 SCFH	SHIFT, in 0	REFERENCE	TIME CONST., sec	LOAD, g 20	
			dY, (mg/min) /in	dY, (10X), (mils/min) /in	



DUPONT Instruments

MEASURED VARIABLE

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Chart 21A3

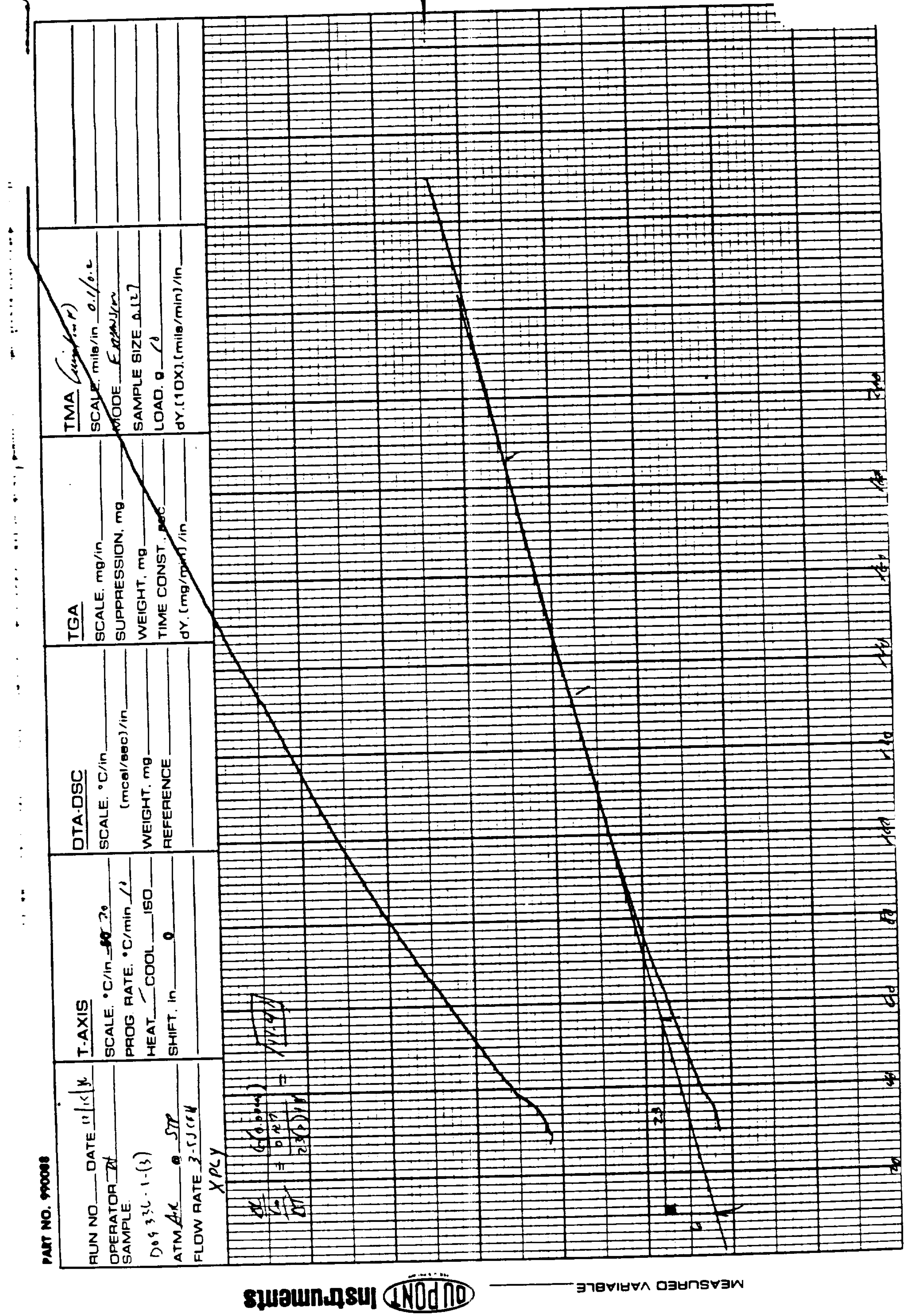
PART NO. 990088
RUN NO
DATE
OPERATOR
SAMPLE
ATM
FLOW RATE
T-AXIS
SCALE, °C/in
PROG. RATE, °C/min
HEAT COOL ISO
SHIFT, in 0
DTA-DSC
SCALE, °C/in
(mcal/sec)/in
WEIGHT, mg
REFERENCE
TGA
SCALE, mg/in
SUPPRESSION, mg
WEIGHT, mg
TIME CONST., sec
dY, (mg/min)/in
TMA
SCALE, mils/in
MODE
SAMPLE SIZE
LOAD, g
dY, (10X),(mils/min)/in
DUPONT Instruments
MEASURED VARIABLE

Chart 21A4

PART NO. 990088

RUN NO ___ DATE 11/15/94
OPERATOR TH
SAMPLE:
D65336-1-(4)
ATM Air @ 50
FLOW RATE 2-50 SCFM
XRAY

T-AXIS
SCALE, °C/in 50 2d
PROG RATE, °C/min 20
HEAT ✓ COOL ___ ISO ___
SHIFT, in 0

DTA-DSC
SCALE, °C/in ___
(mcal/sec)/in ___
WEIGHT, mg ___
REFERENCE ___

TGA
SCALE, mg/in ___
SUPPRESSION, mg ___
WEIGHT, mg ___
TIME CONST., sec ___
dY/dT (mg/min)/in ___

TMA (mils/min)
SCALE, mils/in 5/10/2
MODE Expansion
SAMPLE SIZE 0.128
LOAD, g 10
dY/dT (10X), (mils/min)/in ___

MEASURED VARIABLE

DUPONT Instruments

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Chart 21B1

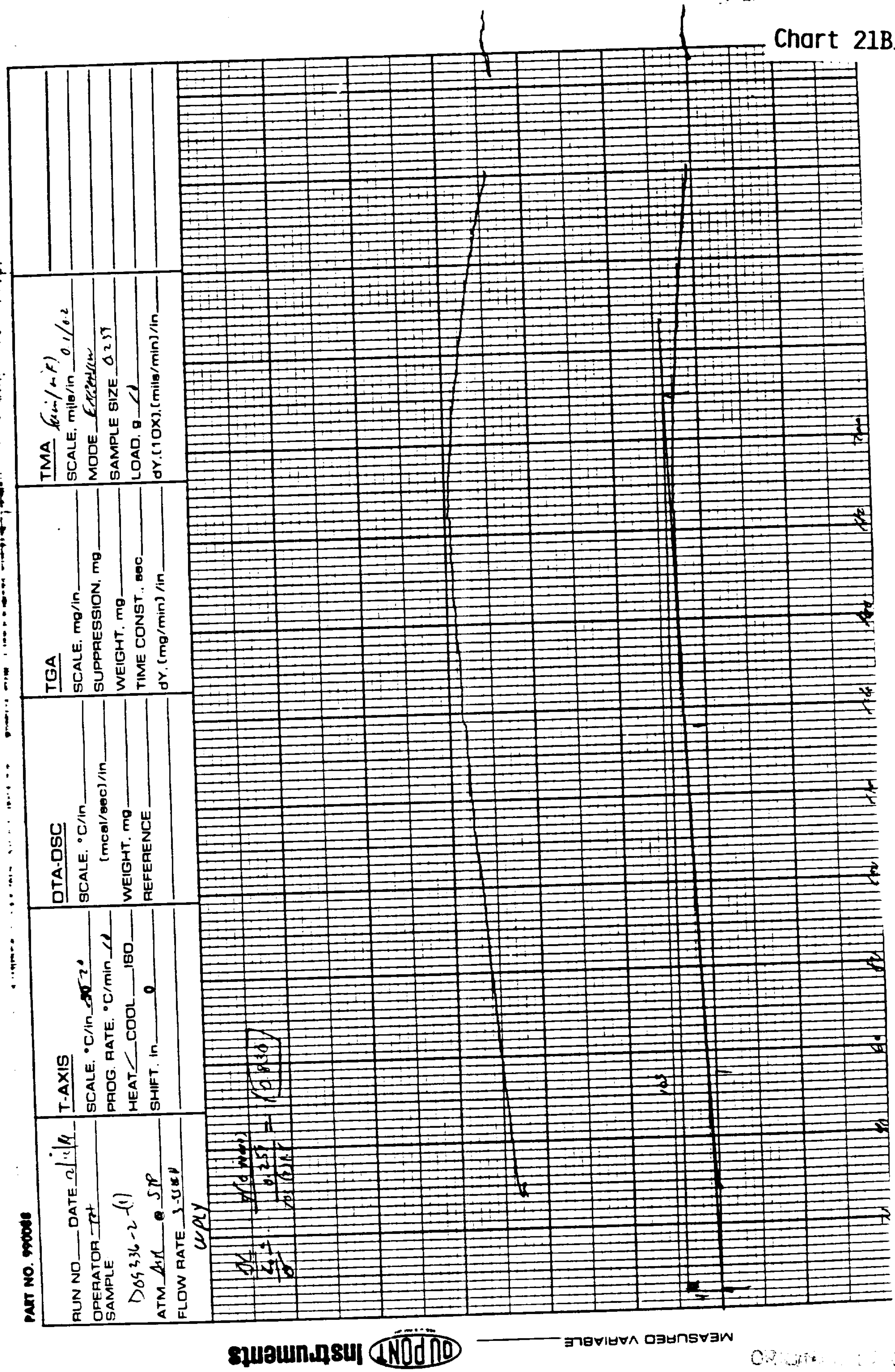

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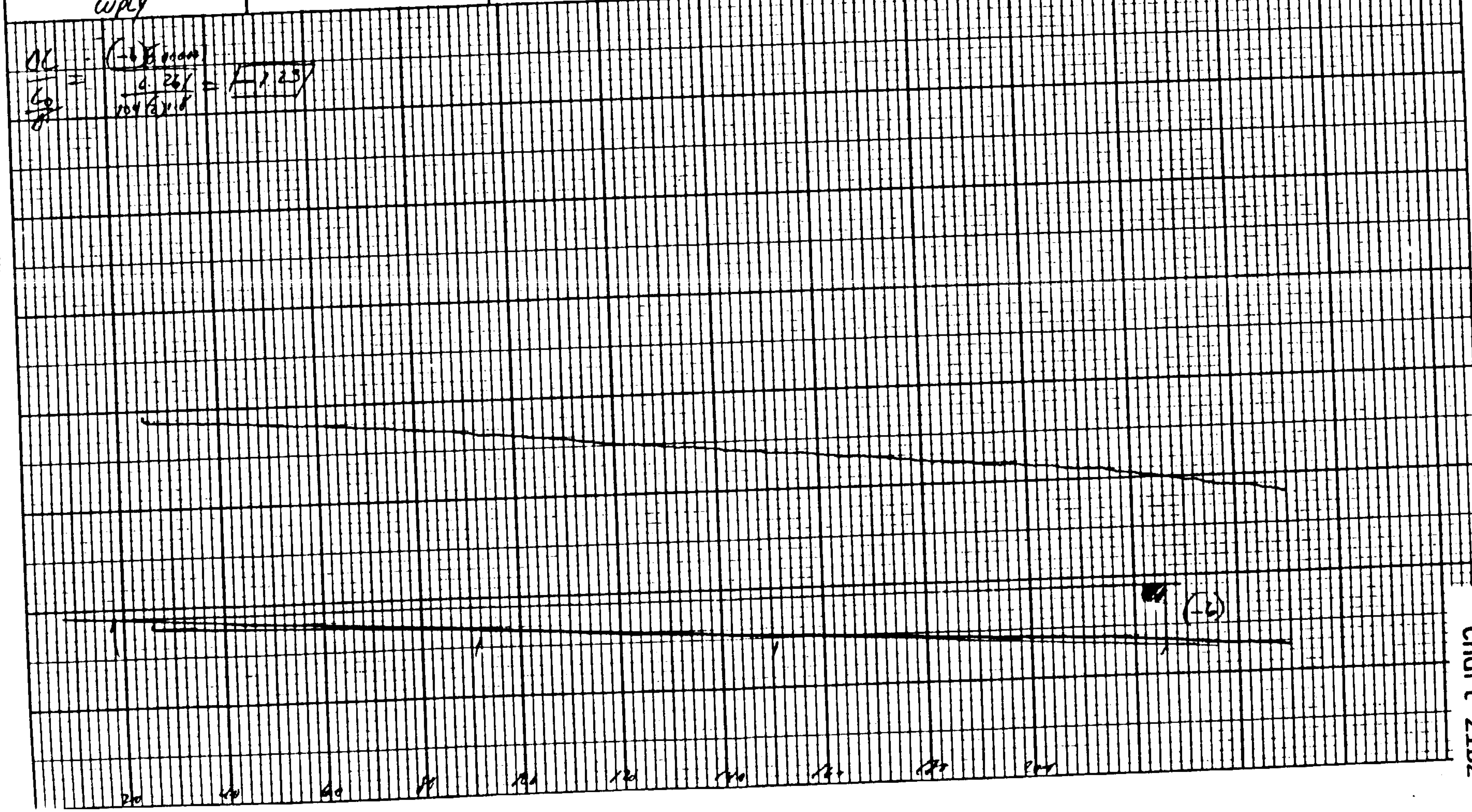
Chart 21B2

PART NO. 990088

	T-AXIS	DTA-DSC	TGA	TMA (min/mit)	
RUN NO.___ DATE 12/11/86	SCALE, °C/in. ~~50~~ 20	SCALE, °C/in.___	SCALE, mg/in.___	SCALE, mils/in. 0.1/0.2	
OPERATOR TL	PROG. RATE, °C/min 10	(mcal/sec)/in.___	SUPPRESSION, mg___	MODE Expansion	
SAMPLE: D05336-2-(2)	HEAT ✓ COOL___ ISO___	WEIGHT, mg___	WEIGHT, mg___	SAMPLE SIZE 0.261	
ATM Air @ 5?	SHIFT, in. 0	REFERENCE___	TIME CONST., sec___	LOAD, g 10	
FLOW RATE 3 SJ/FB WPLY			dY, (mg/min)/in.___	dY,(10X),(mils/min)/in.___	



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MEASURED VARIABLE

Chart 21B3

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Chart 21B4

PART NO. 990088

RUN NO ____ DATE 11/14/90

OPERATOR TJ

SAMPLE

D9338-2-(1)

ATM Air @ 200

FLOW RATE 35 SCFM

XPLY

T-AXIS

SCALE, °C/in 50 20

PROG RATE, °C/min 10

HEAT ✓ COOL ___ ISO

SHIFT, in 0

DTA-DSC

SCALE, °C/in ___

(mcal/sec)/in ___

WEIGHT, mg ___

REFERENCE ___

TGA

SCALE, mg/in ___

SUPPRESSION, mg ___

WEIGHT, mg ___

TIME CONST., sec ___

dY, (mg/min) /in ___

TMA (mm/min)

SCALE, mils/in Auto

MODE Extension

SAMPLE SIZE 0.146

LOAD, g 10

dY, (10X), (mils/min)/in ___

MEASURED VARIABLE

DUPONT Instruments