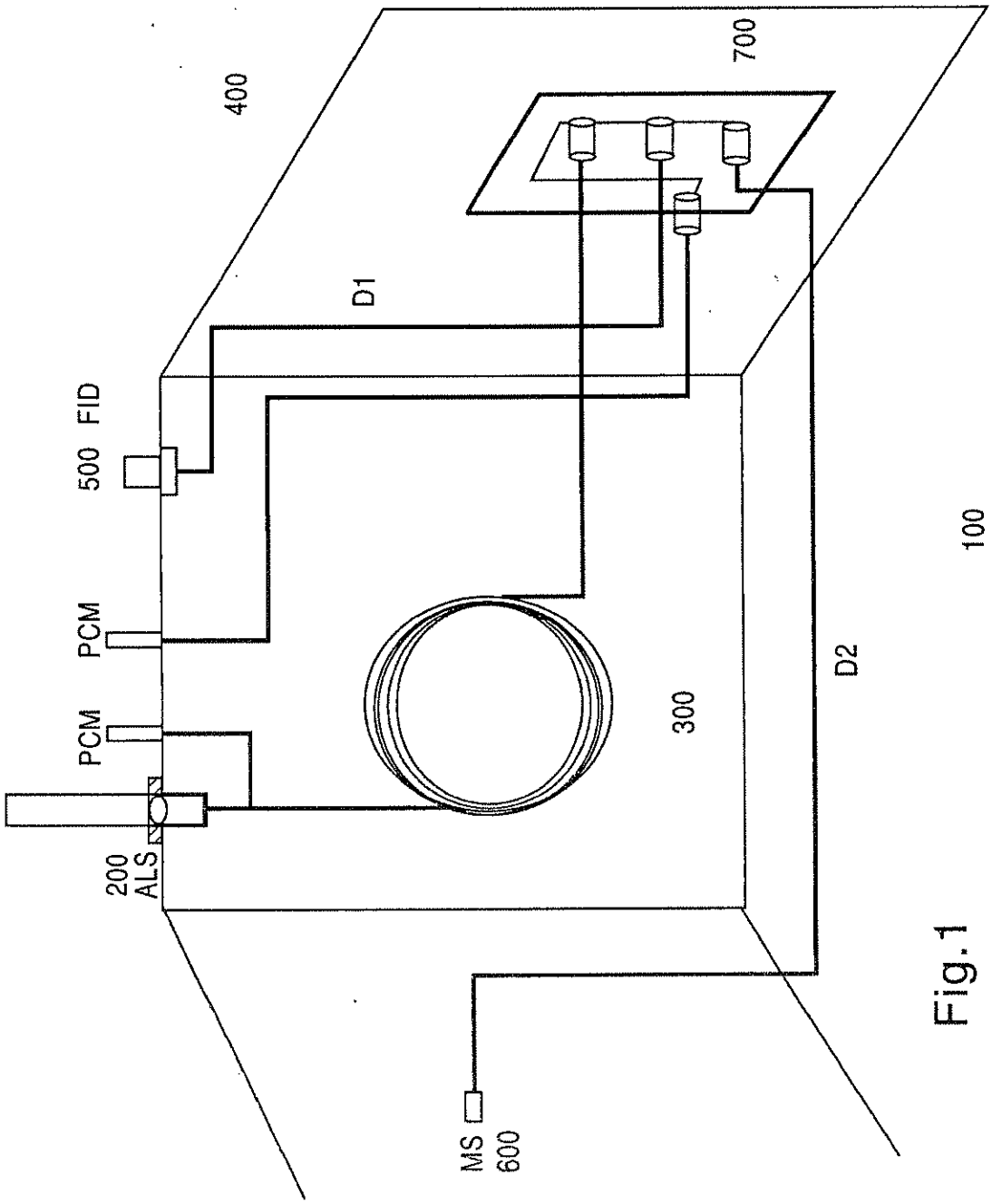


Fig.1

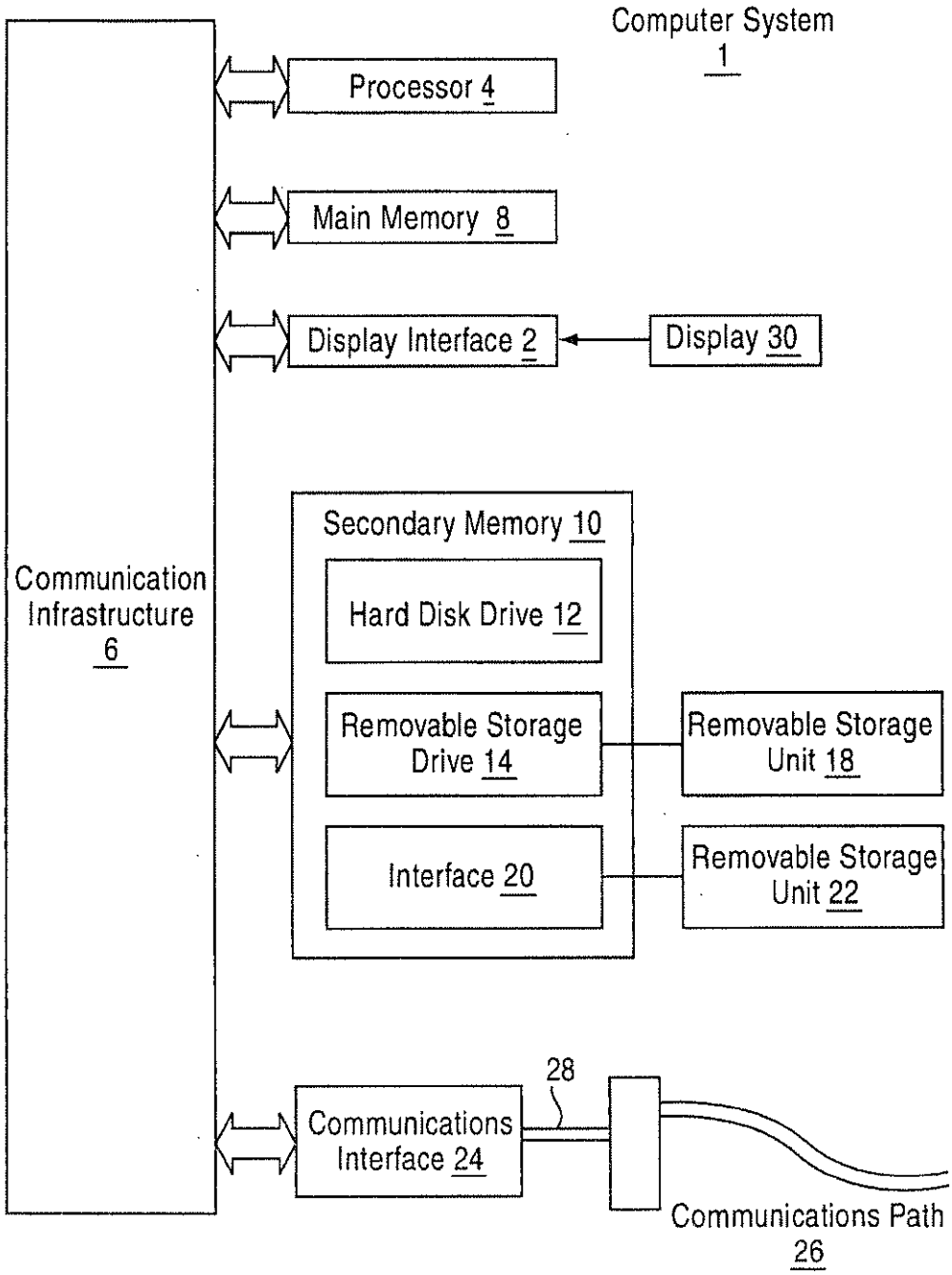
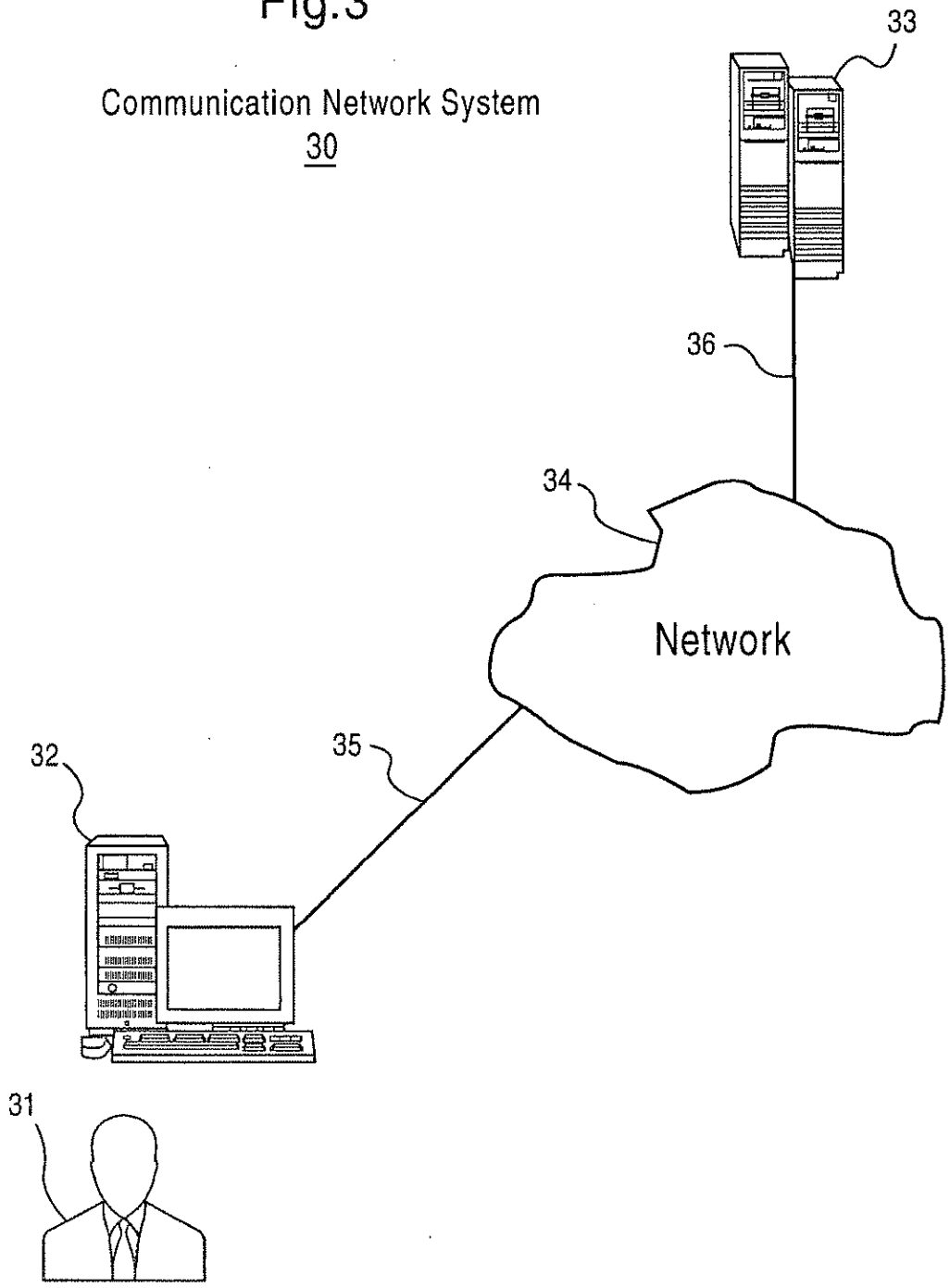

Computer System
1
Processor 4
Main Memory 8
Display Interface 2
Display 30
Secondary Memory 10
Hard Disk Drive 12
Removable Storage Drive 14
Removable Storage Unit 18
Interface 20
Removable Storage Unit 22
Communication Infrastructure
6
28
Communications Interface 24
Communications Path
26

Fig.2

Fig.3



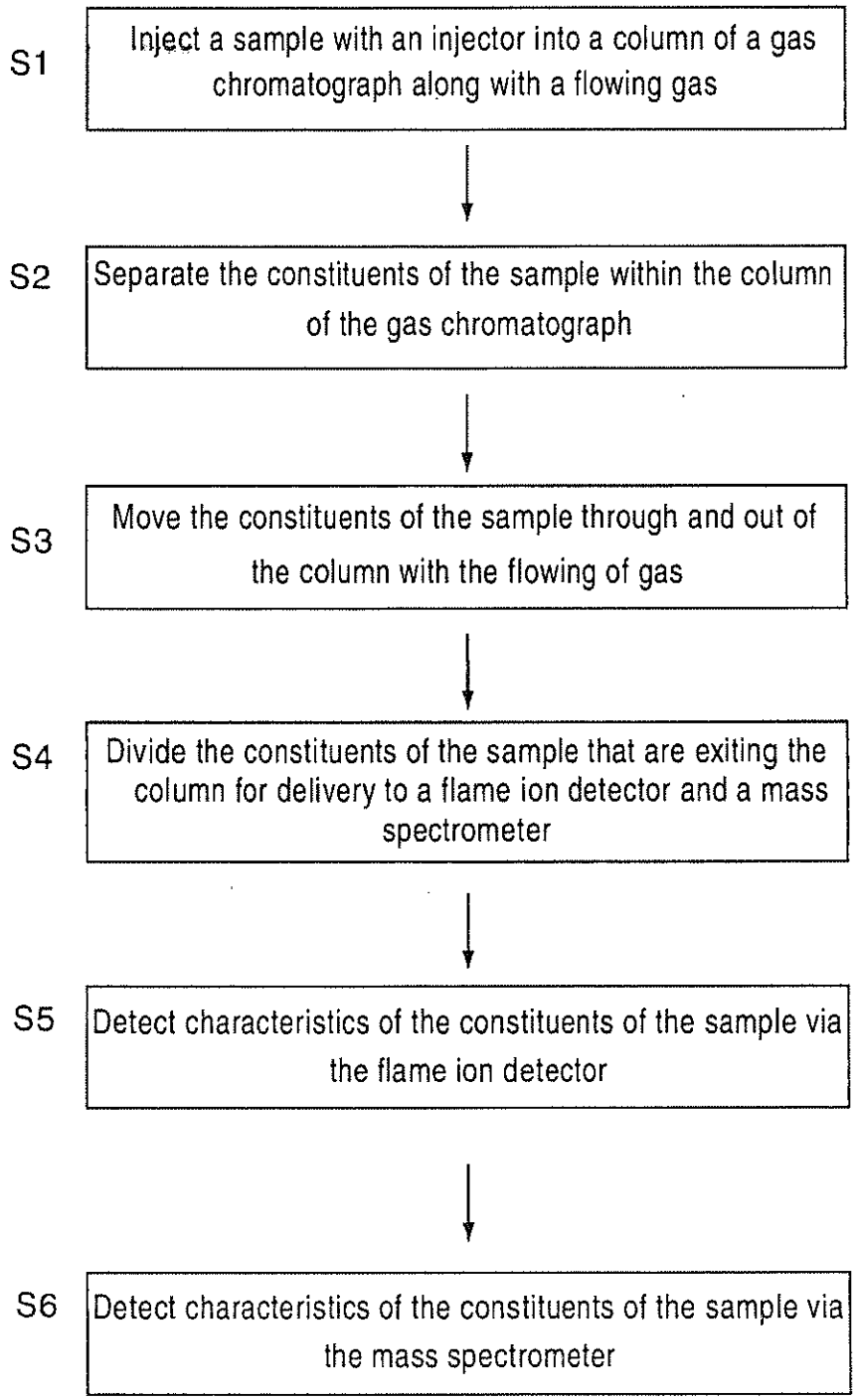

S1
Inject a sample with an injector into a column of a gas chromatograph along with a flowing gas
S2
Separate the constituents of the sample within the column of the gas chromatograph
S3
Move the constituents of the sample through and out of the column with the flowing of gas
S4
Divide the constituents of the sample that are exiting the column for delivery to a flame ion detector and a mass spectrometer
S5
Detect characteristics of the constituents of the sample via the flame ion detector
S6
Detect characteristics of the constituents of the sample via the mass spectrometer

Fig.3B

Fig.4

Experimental Results

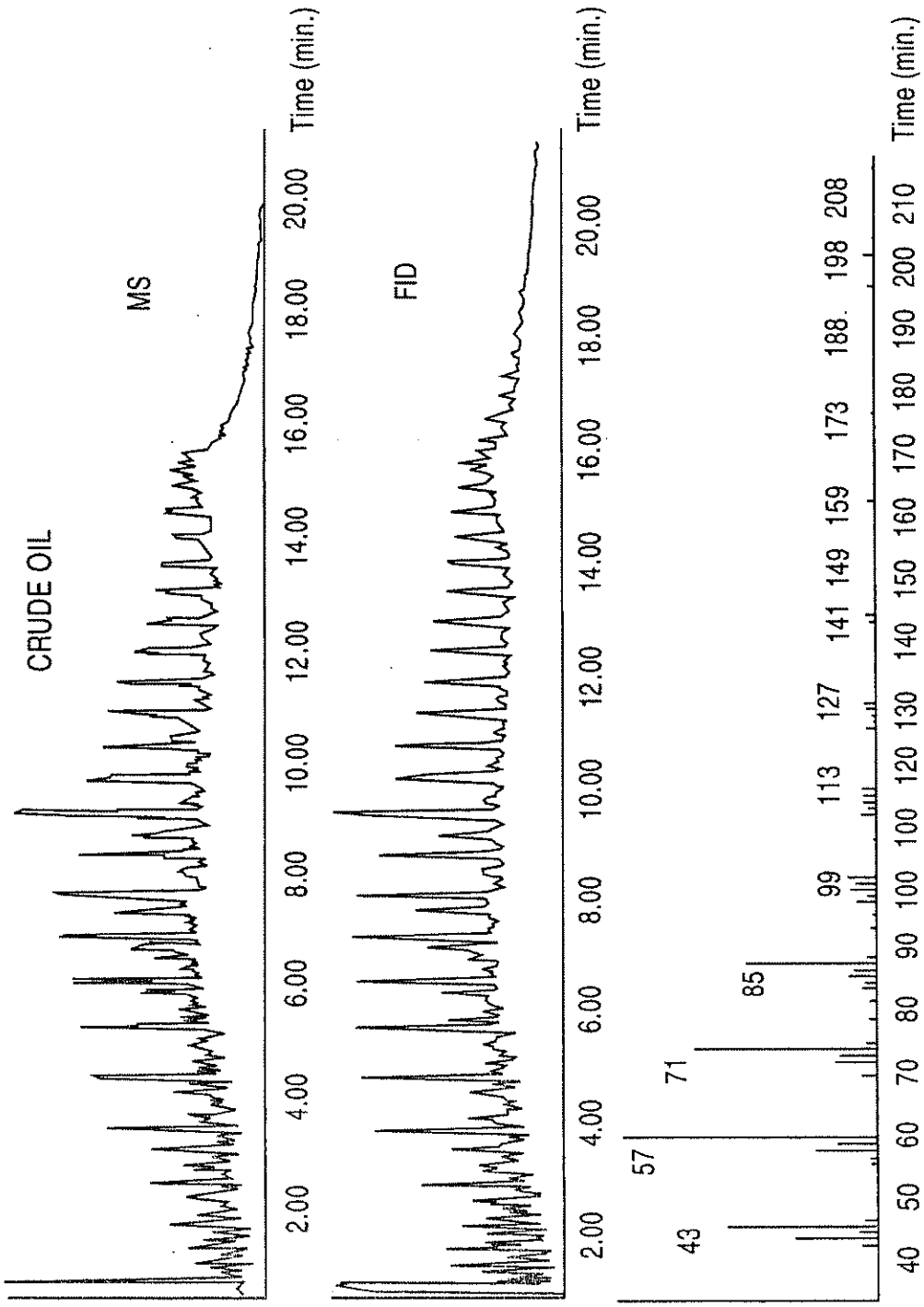
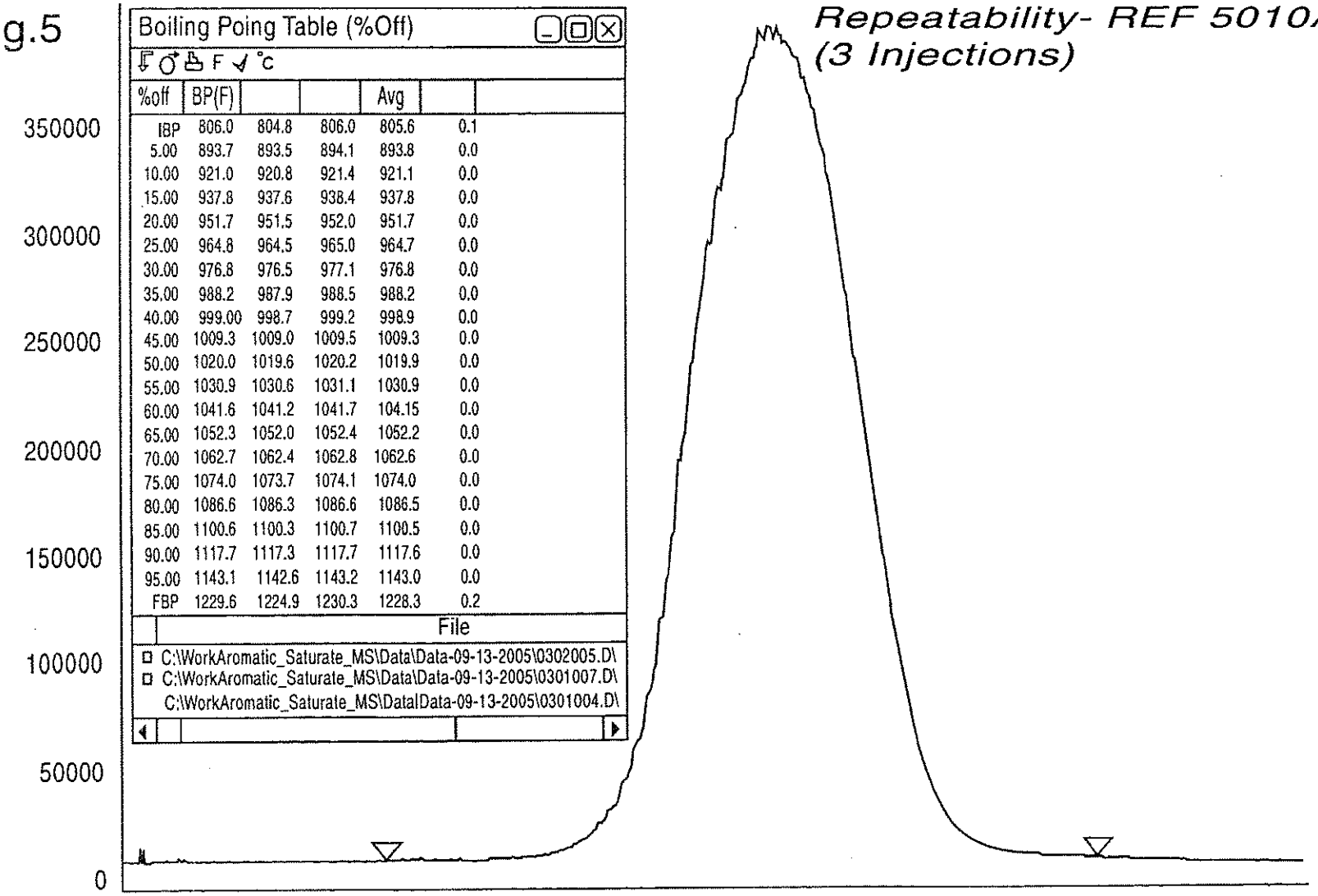


Fig.5



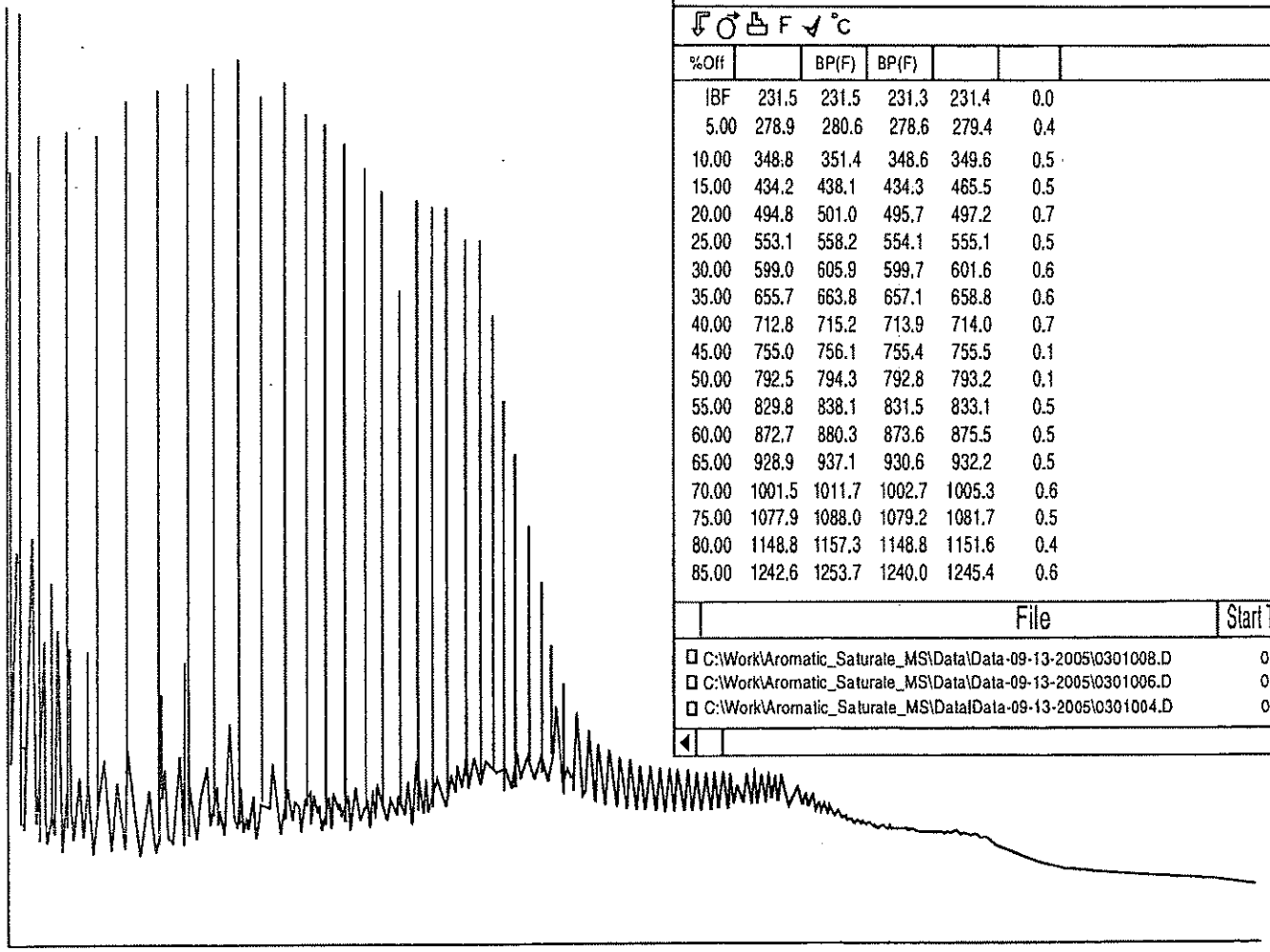
Boiling Poing Table (%Off)

%off	BP(F)			Avg	
IBP	806.0	804.8	806.0	805.6	0.1
5.00	893.7	893.5	894.1	893.8	0.0
10.00	921.0	920.8	921.4	921.1	0.0
15.00	937.8	937.6	938.4	937.8	0.0
20.00	951.7	951.5	952.0	951.7	0.0
25.00	964.8	964.5	965.0	964.7	0.0
30.00	976.8	976.5	977.1	976.8	0.0
35.00	988.2	987.9	988.5	988.2	0.0
40.00	999.00	998.7	999.2	998.9	0.0
45.00	1009.3	1009.0	1009.5	1009.3	0.0
50.00	1020.0	1019.6	1020.2	1019.9	0.0
55.00	1030.9	1030.6	1031.1	1030.9	0.0
60.00	1041.6	1041.2	1041.7	104.15	0.0
65.00	1052.3	1052.0	1052.4	1052.2	0.0
70.00	1062.7	1062.4	1062.8	1062.6	0.0
75.00	1074.0	1073.7	1074.1	1074.0	0.0
80.00	1086.6	1086.3	1086.6	1086.5	0.0
85.00	1100.6	1100.3	1100.7	1100.5	0.0
90.00	1117.7	1117.3	1117.7	1117.6	0.0
95.00	1143.1	1142.6	1143.2	1143.0	0.0
FBP	1229.6	1224.9	1230.3	1228.3	0.2

File

C:\WorkAromatic_Saturate_MS\Data\Data-09-13-2005\0302005.D\
C:\WorkAromatic_Saturate_MS\Data\Data-09-13-2005\0301007.D\
C:\WorkAromatic_Saturate_MS\DataIData-09-13-2005\0301004.D\

Fig.6 *Repeatability - Paraffinic Crude (3 Injections)*



Boiling Point Table (%Off)

%Off		BP(F)	BP(F)		
IBF	231.5	231.5	231.3	231.4	0.0
5.00	278.9	280.6	278.6	279.4	0.4
10.00	348.8	351.4	348.6	349.6	0.5
15.00	434.2	438.1	434.3	465.5	0.5
20.00	494.8	501.0	495.7	497.2	0.7
25.00	553.1	558.2	554.1	555.1	0.5
30.00	599.0	605.9	599.7	601.6	0.6
35.00	655.7	663.8	657.1	658.8	0.6
40.00	712.8	715.2	713.9	714.0	0.7
45.00	755.0	756.1	755.4	755.5	0.1
50.00	792.5	794.3	792.8	793.2	0.1
55.00	829.8	838.1	831.5	833.1	0.5
60.00	872.7	880.3	873.6	875.5	0.5
65.00	928.9	937.1	930.6	932.2	0.5
70.00	1001.5	1011.7	1002.7	1005.3	0.6
75.00	1077.9	1088.0	1079.2	1081.7	0.5
80.00	1148.8	1157.3	1148.8	1151.6	0.4
85.00	1242.6	1253.7	1240.0	1245.4	0.6

File	Start Time	End Time	%Recovery
C:\Work\Aromatic_Saturate_MS\Data\Data-09-13-2005\0301008.D	0.000	29.645	87.85
C:\Work\Aromatic_Saturate_MS\Data\Data-09-13-2005\0301006.D	0.000	29.645	87.85
C:\Work\Aromatic_Saturate_MS\Data\Data-09-13-2005\0301004.D	0.000	29.645	88.08

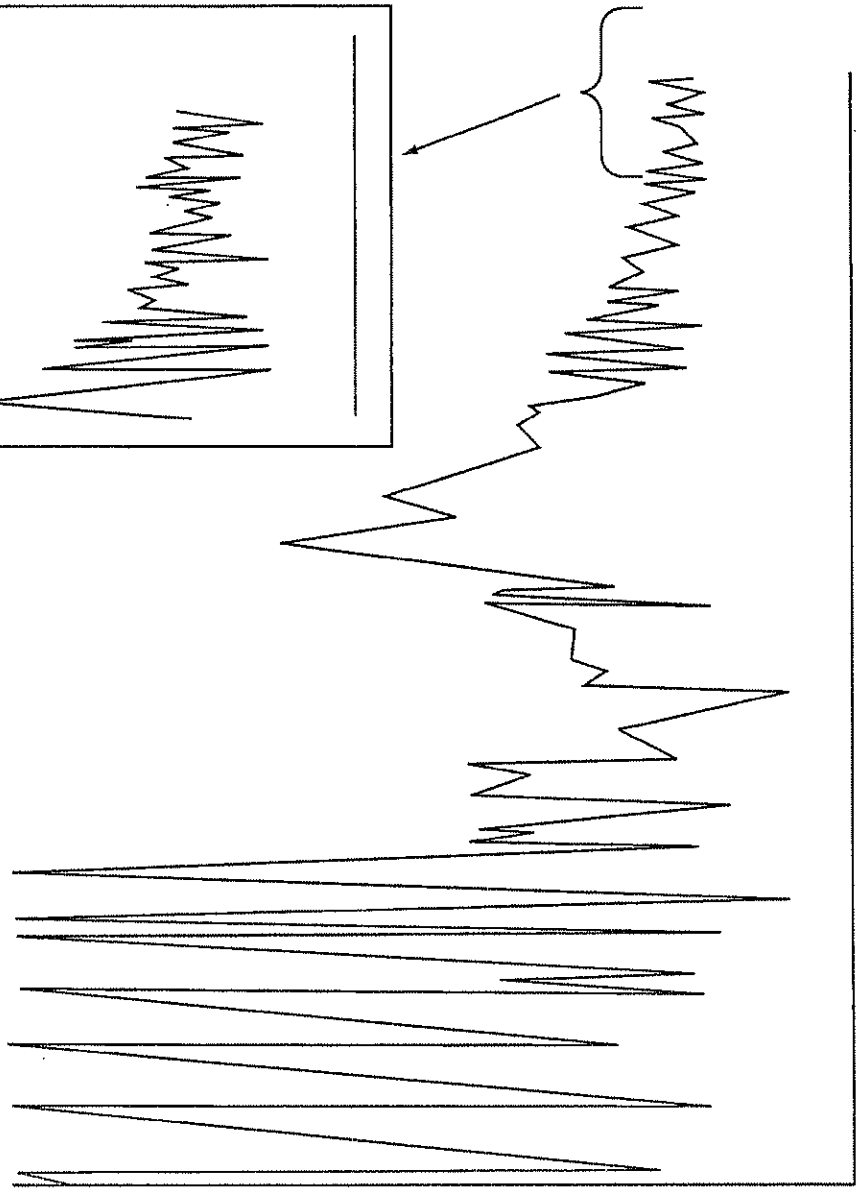


Fig.7 *ASTM D 7169-2005 Retention Time Standard*

Fig.8 *Crude Oil With Boiling Point Calibration Curve*

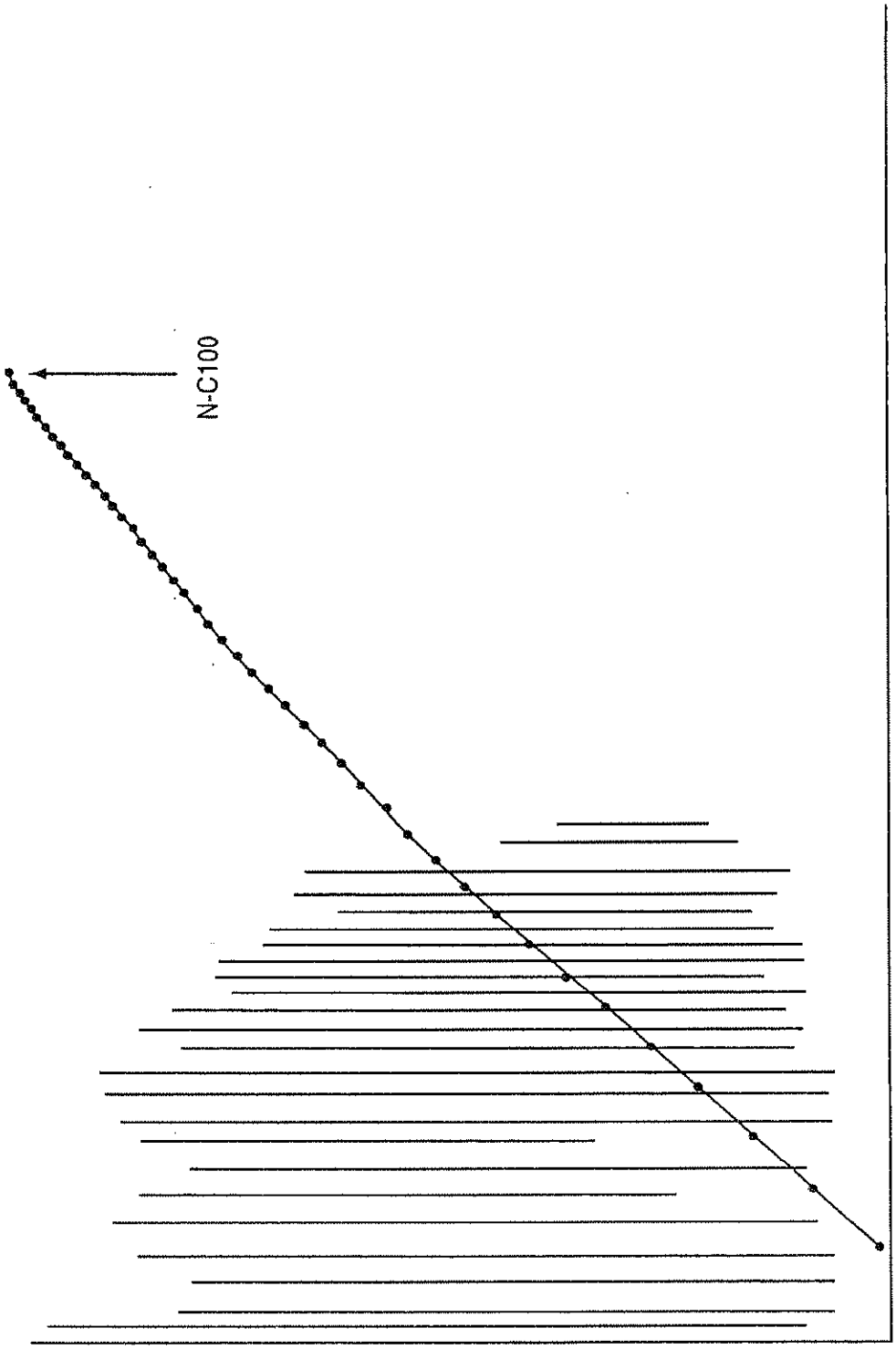
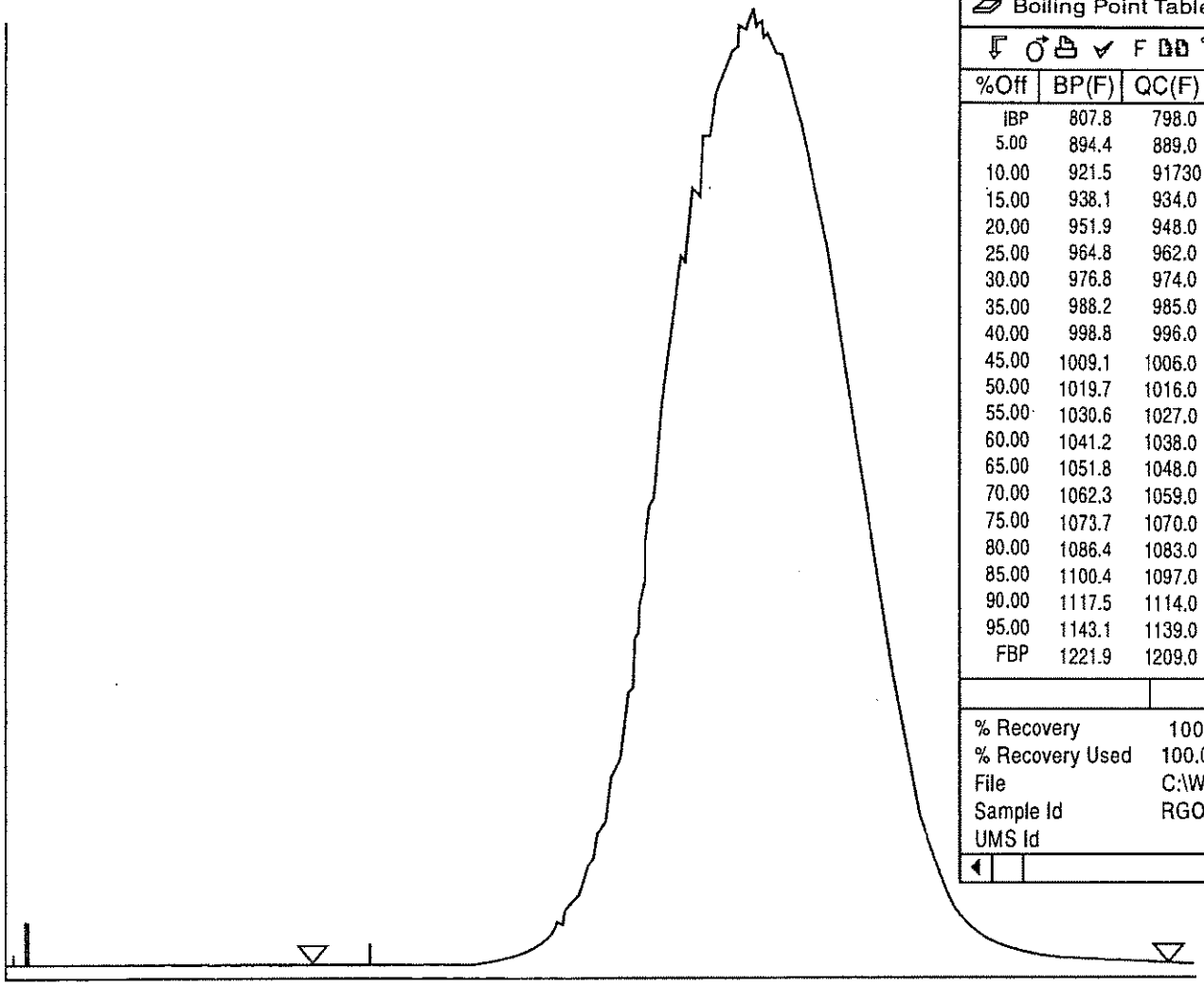


Fig.9 *Reference Material 5010-A*



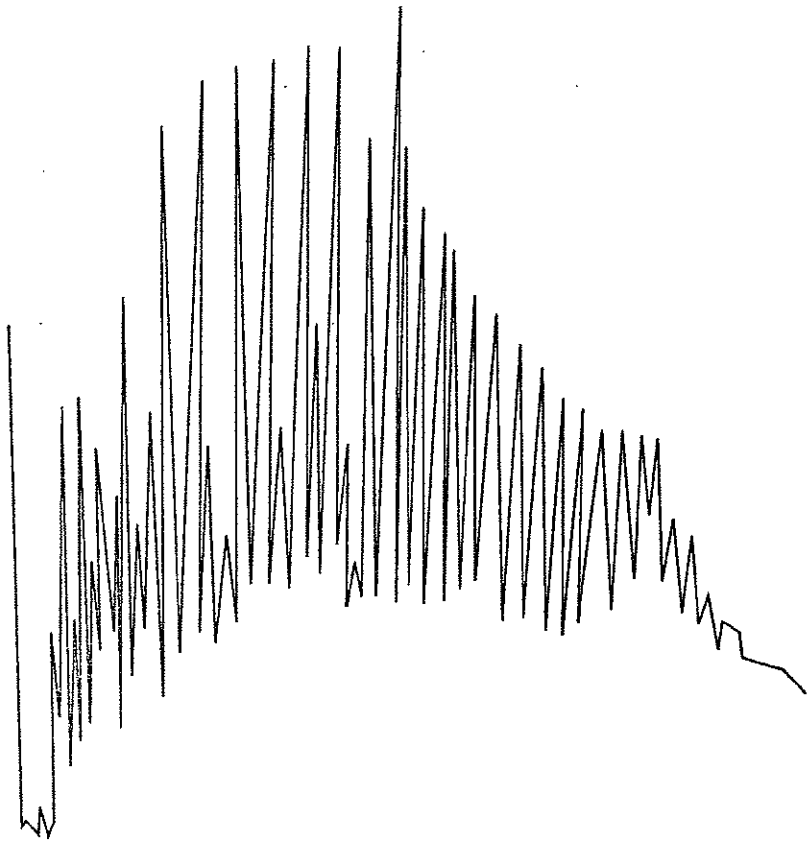
Boiling Point Table (%Off)

%Off	BP(F)	QC(F)	(-)	Limit
IBP	807.8	798.0	9.8	70.7
5.00	894.4	889.0	5.4	13.0
10.00	921.5	91730	4.5	10.2
15.00	938.1	934.0	4.1	9.0
20.00	951.9	948.0	3.9	9.0
25.00	964.8	962.0	2.8	9.0
30.00	976.8	974.0	2.8	8.5
35.00	988.2	985.0	3.2	8.5
40.00	998.8	996.0	2.8	8.6
45.00	1009.1	1006.0	3.1	8.6
50.00	1019.7	1016.0	3.7	9.2
55.00	1030.6	1027.0	3.6	9.2
60.00	1041.2	1038.0	3.2	9.2
65.00	1051.8	1048.0	3.8	9.2
70.00	1062.3	1059.0	3.3	10.4
75.00	1073.7	1070.0	3.7	10.4
80.00	1086.4	1083.0	3.4	11.2
85.00	1100.4	1097.0	3.4	11.2
90.00	1117.5	1114.0	3.5	15.1
95.00	1143.1	1139.0	4.1	20.6
FBP	1221.9	1209.0	12.9	54.9

% Recovery	100.00@1362.3F
% Recovery Used	100.00
File	C:\Work\Aromatic_Saturate_
Sample Id	RGO5010A$S
UMS Id	

Fig.10

Crude Oil



Boiling Point Table (%Off)

%Off	BP (F)
57.00	794.6
58.00	804.2
59.00	812.4
60.00	821.4
61.00	829.3
62.00	838.4
63.00	848.3
64.00	858.5
65.00	870.7
66.00	883.1
67.00	896.1
68.00	910.5
69.00	925.4
70.00	939.8
71.00	956.0
72.00	973.9
73.00	993.1
74.00	1012.7
75.00	1034.8
76.00	1056.5
77.00	1078.4
78.00	1100.7
79.00	1123.2
80.00	1147.6
81.00	1173.6
82.00	1202.6
83.00	1237.1
84.00	1277.5

% Recovery	84.84 @1313.0F
% Recovery Used	84.84
File	C:\Work\Aromatic_Saturate_MS\Data\Data-09-13-20
Sample Id	CRUDEA$A
LIMS Id	
Parameter File	MS-CRUDE
Injection Dater	AUG 09,2005-20:11:41

Fig.11

	The Algorithm:
AROMATICS	SATURATES
Σ78+...91+...-mono	Σ43 - paraffins
Σ104+...117+...-Clase II	Σ55 - cycloparaffins
Σ130+...129+...-Clase III	Σ81 - dicycloparaffins
Σ128+...141+...-Clase IV	Σ93 - tricycloparaffins
Σ154+...167+...-Clase V	
Σ166+...179+...-Clase VI	
Σ178+...191+...-Clase VII	

Fig.12

Group Type Analysis

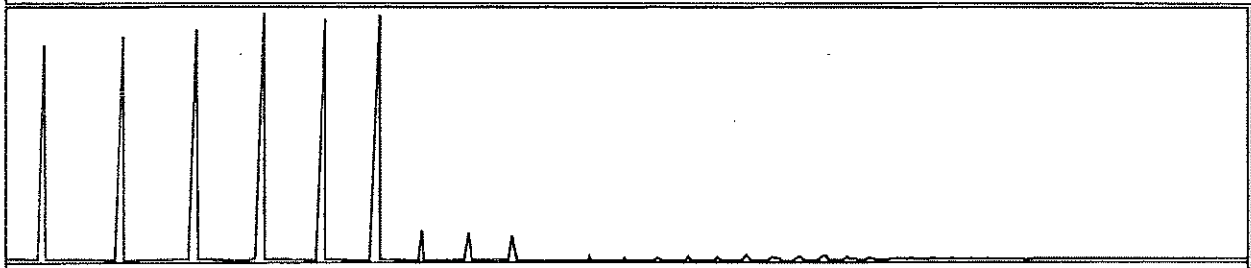
Compound	Class	Type	z-Series	Group
Alkylbenzenes	I	0	-6	Monoaromatics
Benzothiophenes	I	1	-10S	Thiophenoaromatics
Naphthenephenantrenes	I	2	-20	Triaromatics
Naphthenebenzenes	II	0	-8	Monoaromatics
Pyrenes	II	1	-22	Tetraaromatics
Unidentified	II	2		Unidentified
Dinaphthenebenzenes	III	0	-10	Monoaromatics
Chrysenes	III	1	-24	Tetraaromatics
Unidenitifed	III	2		Unidentified
Naphtalenes	IV	0	-12	Diaromatics
Dibenzothiophenes	IV	1	-16S	Thiophenoaromatics
Unidentified	IV	2		Unidentified
Acenaphthenes+ Dibenzofurans	V	0	-14-160	Diaromatics
Perylenes	V	1	-28	Pentaaromatics
Unidentified	V	2		Unidentified
Fluorenes	VI	0	-16	Diaromatics
Dibenzanthracenes	VI	1	-30	Pentaaromatics
Unidentified	VI	2		Unidentified
Phenanthrenes	VII	0	-18	Triaromatics
Naphthobenzothiophenes	VII	1	-22S	Thiophenoaromatics
Unidentified	VII	2		Unidentified

Fig.13

Retention Time Calibration Standard

Analysis

C:\Work\Aromatic_Saturate_MS\Data\Data-09-08-2005\RTimeD\RTime_MScdt
SS3E-06ST
300
20650908155000-0500
240 Minutes
29.90 Minutes



Mass	Intensity
41	4681776.00
42	248218.00
43	11071210.00
44	516681.00
55	2267200.00
56	1952616.00
57	18474630.00
69	757926.00
70	164774.00
71	12795932.00
76	224176.00
83	147176.00
84	432616.00
85	9145472.00

	Intensity	%Volume	%Weight
Saturates	62180077	100.00	100.00
Paraffins	62180077	100.00	100.00
Monocycloparaffins	0	0.00	0.00
Dicycloparaffins	0	0.00	0.00
Trocycloparaffins+	0	0.00	0.00
Aromatics	0	0.00	0.00
Monoaromatics	0	0.00	0.00
Diaromatics	0	0.00	0.00
Triaromatics	0	0.00	0.00
Tetraaromatics	0	0.00	0.00
Pentaaromatics	0	0.00	0.00
Thiopheno Aromatics	0	0.00	0.00
Unidentified Aromatics	0	0.00	0.00

Total | Saturates | Aromatics

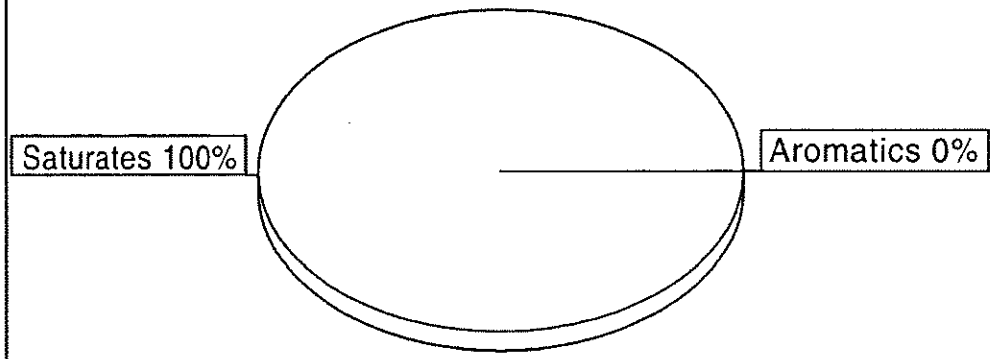
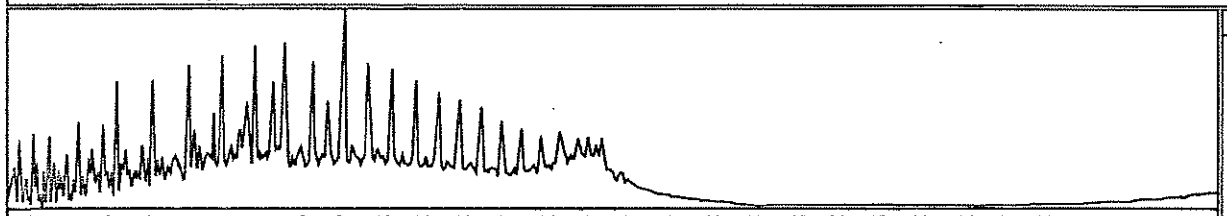


Fig.14

Whole Crude Analysis

Analysis

C:\Work\Aromatic_Saturate_MS\DataIData-09-08-2005\CrudeD\Crude_MScdt
CRUDEA$A
254
20050908201100-0500
054 Minutes
30 C4 Minutes



Mass	Intensity
41	1464712.00
42	41964.00
43	2783816.00
55	2537823.00
56	623953.00
57	5183910.00
64	6686.00
67	67341.00
69	1659181.00
70	587563.00

	Intensity	%Volume	%Weight
Saturates	22751532	92.46	91.63
Paraffins	16064050	65.28	63.48
Monocyloparaffins	5554595	22.57	23.08
Dicycloparaffins	817659	3.32	3.60
Tricyclopraffins+	315228	1.28	1.47
Aromatics	1856410	7.54	8.37
Monoaromatics	1331200	5.41	5.82
Diaromatics	525210	2.13	2.55
Triaromatics	0	0.00	0.00
Tentraaromatics	0	0.00	0.00
Pentaaromatics	0	0.00	0.00
Thiopheno Aromatics	0	0.00	0.00
Unidentified Aromatics	0	0.00	0.00

Total | Saturates | Aromatics

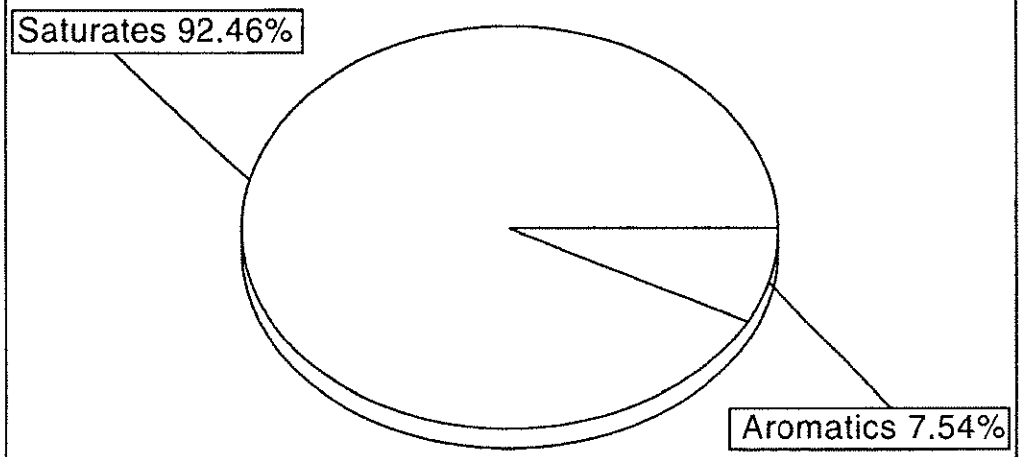


Fig.15

....*Experimental Results*

Fraction 480-600°F

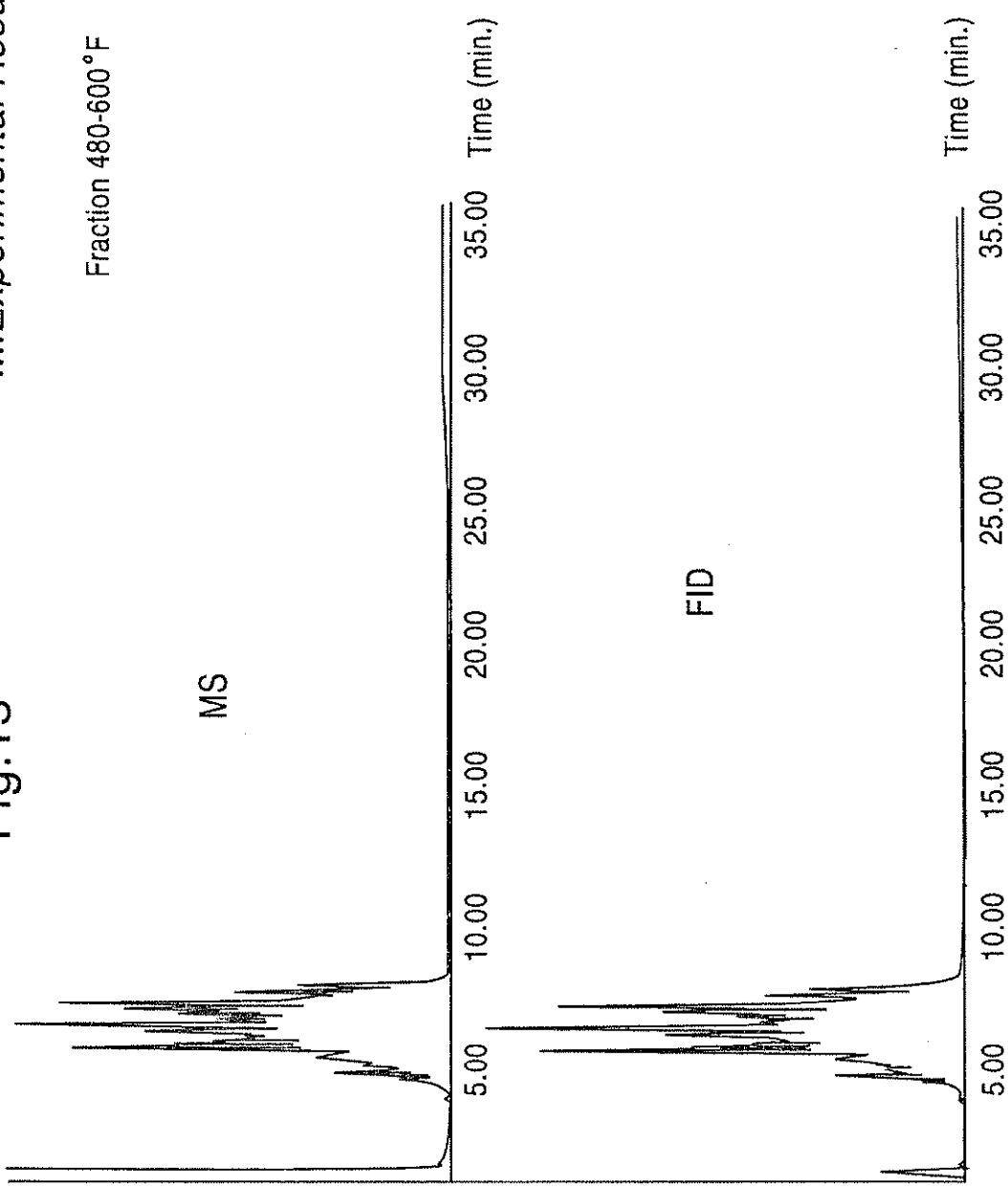


Fig.16 *Signal Overlapping*

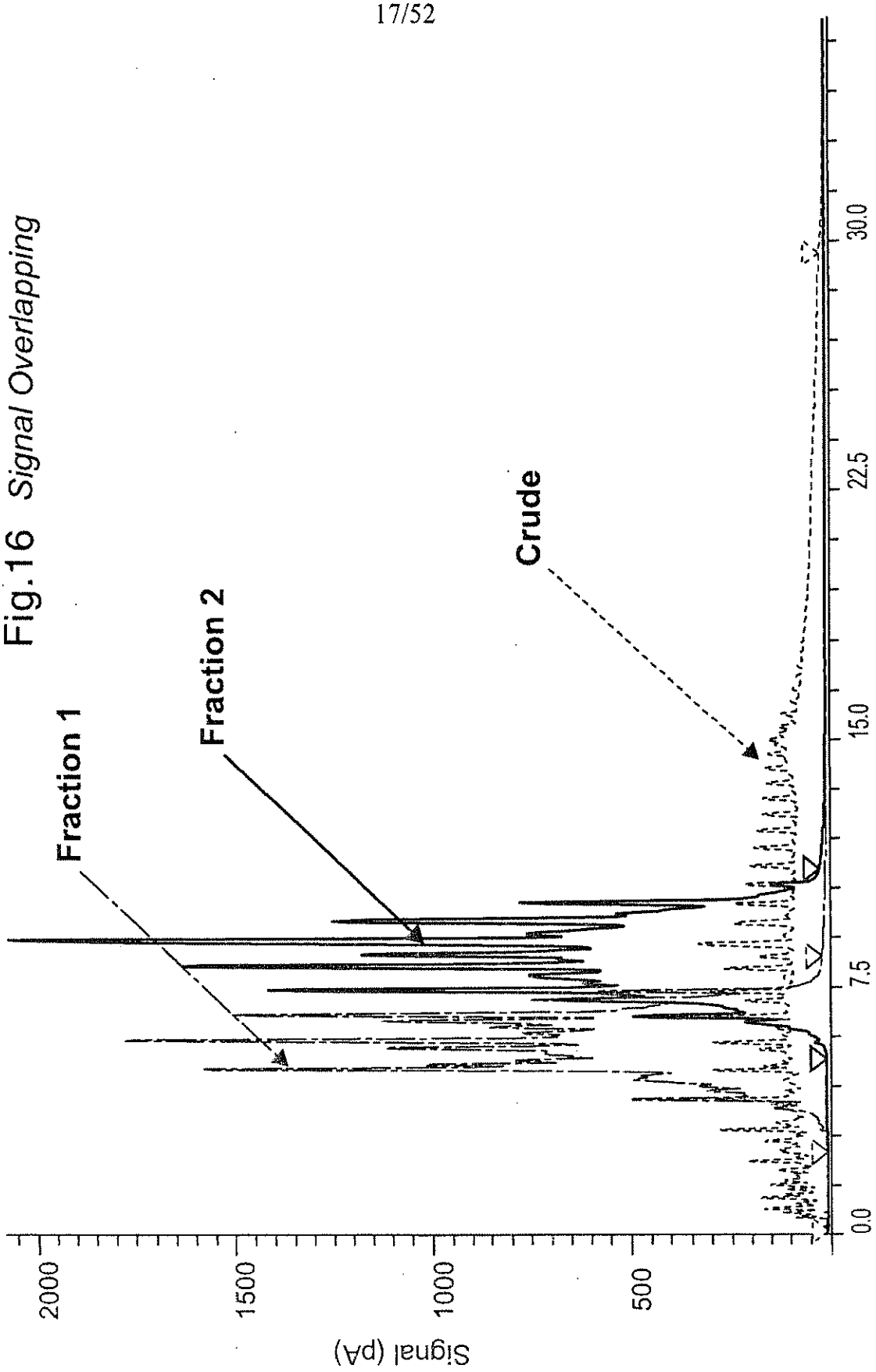
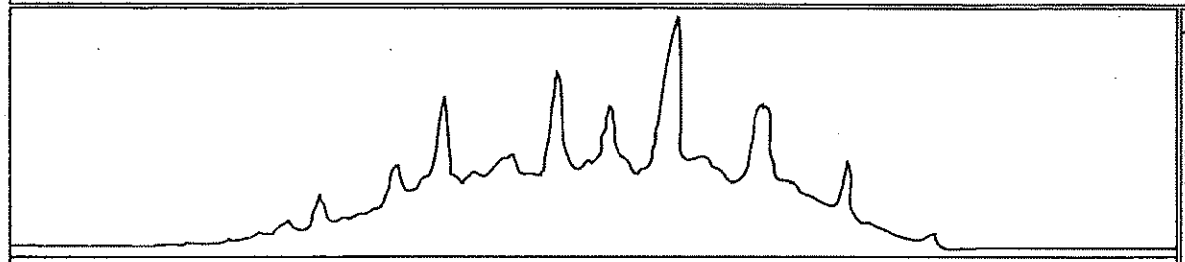


Fig.17

Fraction #1 Analysis

Analysis

C:\Work\Aromatic_Saturate_MS\Data\Data-09-08-2005-B\Fraction1-D_MS.cdt
FRACTION1SA
220
2005909025300-0500
461 Minutes
12.06 Minutes



Mass	Intensity
41	4011252.00
42	62086.00
43	6327669.00
55	5923504.00
56	1241436.00
57	12909018.00
69	4990869.00
70	108232.00
71	9518632.00
72	20626.00
81	1195259.00
82	314832.00
83	3865673.00
84	396683.00

	Intensity	%Volume	%Weight
Saturates	73551440	99.45	99.32
Paraffins	48008245	64.91	63.16
Monocycloparaffins	19072493	25.79	26.49
Dicycloparaffins	6405973	8.66	9.56
Tricycloparaffins	64729	0.09	0.10
Aromatics	405180	0.55	0.68
Monoaromatics	334	0.00	0.00
Diaromatics	404847	0.55	0.68
Triaromatics	0	0.00	0.00
Tetraaromatics	0	0.00	0.00
Pentaaromatics	0	0.00	0.00
Thiopheno Aromatics	0	0.00	0.00
Unidenified Aromatics	0	0.00	0.00

Total | Saturates | Aromatics

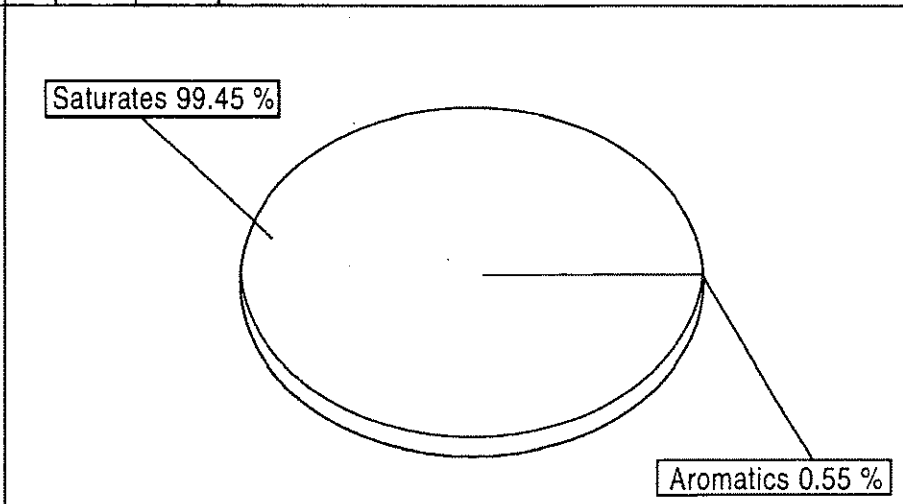
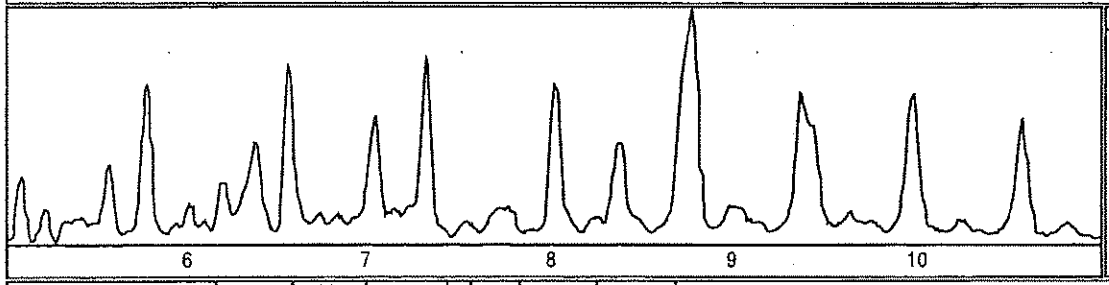


Fig.18

Analysic Of Fraction #1 Cut In Whole Crude

Analysis

C:\Work\Aromatic_Saturate_MS_Data\Data-09-08-2005\Crude_MS.cdt
CRUDEA$A
220
20050908201100-0500
5 03 Minutes
11 00 Minutes



Mass	Intensity
41	808316.00
42	2424.00
43	1489295.00
55	1266728.00
56	292177.00
57	3026272.00
69	872114.00
70	220074.00
71	2159420.00
81	21133.00
82	36690.00
83	413415.00
84	46882.00

	Intensity	%Volume	%Weight
Saturates	3549839	95.60	94.53
Paraffins	10639603	75.07	73.25
Monocycloparaffins	2671951	18.85	19.42
Dicycloparaffins	236100	1.67	1.84
Tricycloparaffins	2185	0.02	0.02
Aromatics	623904	4.40	5.47
Monoaromatics	111136	0.78	0.93
Diaromatics	512768	3.62	4.54
Triaromatics	0	0.00	0.00
Tetraaromatics	0	0.00	0.00
Pentaaromatics	0	0.00	0.00
Thiopheno Aromatics	0	0.00	0.00
Unidenified Aromatics	0	0.00	0.00

Total | Saturates | Aromatics

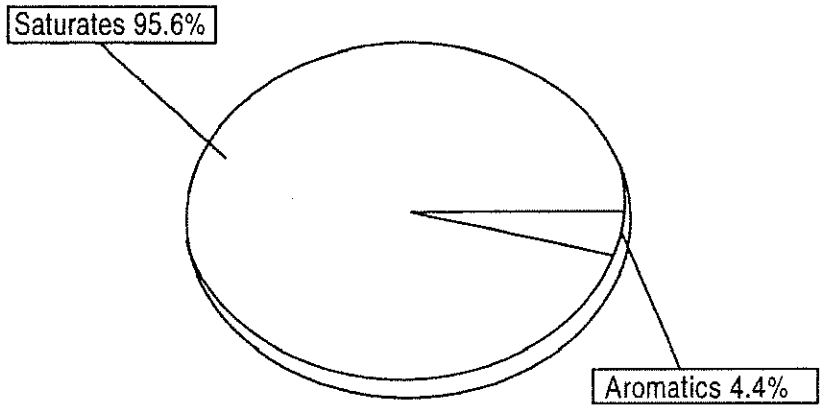


Fig.19

Experimental Results

Paraffinic Light Crude Oil

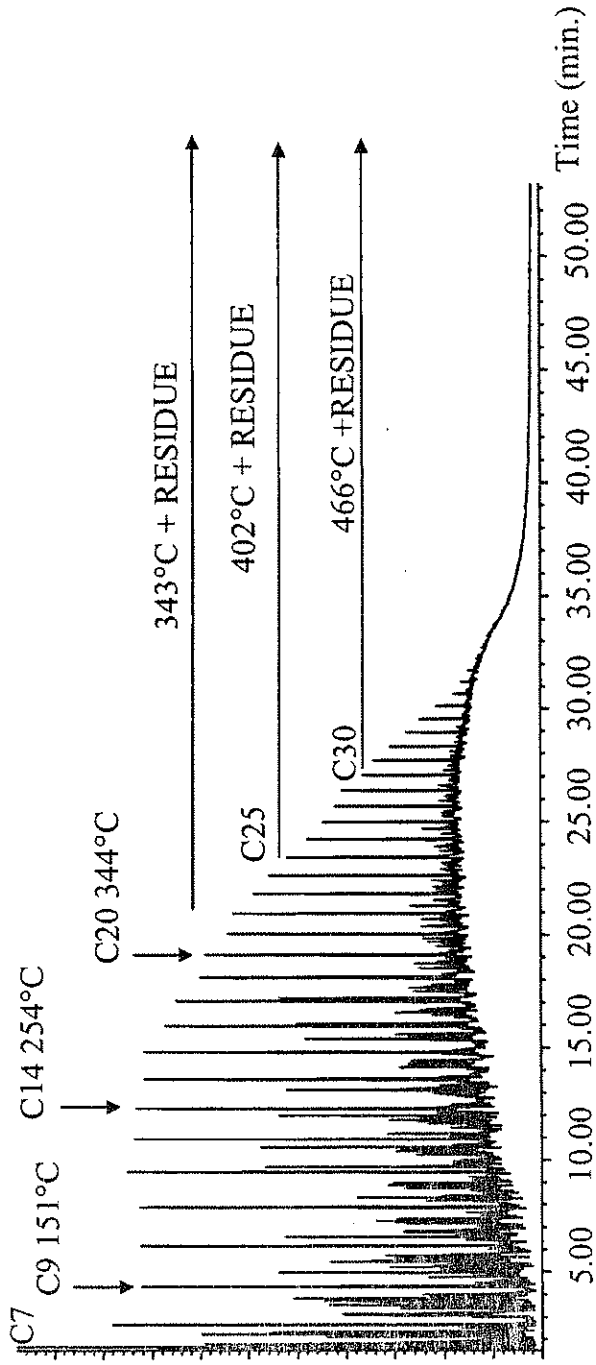
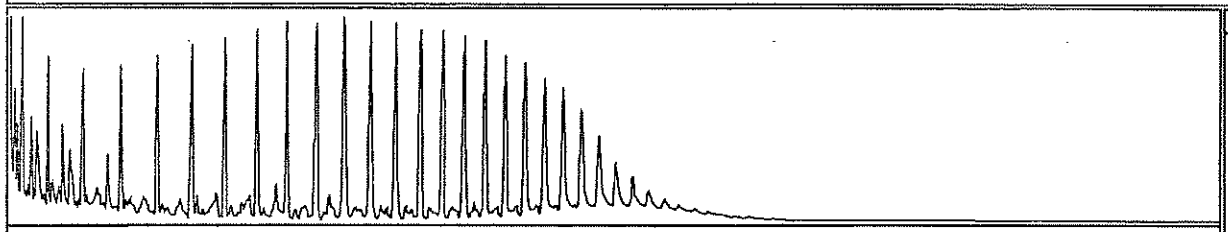


Fig.20

Paraffinic Crude

Analysis

C:\Work\Aromatic_Saturate_MS\Data\Data-09-12-2005\UtahD\4001006_MS.cdt
UTAHSA
230
20050912194600-0500
0 43 Minutes
29 25 Minutes



Mass	Intensity
40	63275.00
41	1783146.00
42	293626.00
43	4581893.00
44	120319.00
41	6605.00
55	1507864.00
56	990185.00
47	8456140.00
63	4623.00
64	307703.00

	Intensity	%Volume	%Weight
Saturates	32123106	95.47	94.89
Paraffins	30467081	90.55	89.73
Monocycloparaffins	1656025	4.92	5.15
Dicycloparaffins	0	0.00	0.00
Tricycloparaffins	0	0.00	0.00
Aromatics	1524581	4.53	5.11
Monoaromatics	1303381	3.87	4.28
Diaromatics	221200	0.66	0.83
Triaromatics	0	0.00	0.00
Tetraaromatics	0	0.00	0.00
Pentaaromatics	0	0.00	0.00
Thiopheno Aromatics	0	0.00	0.00
Unidenified Aromatics	0	0.00	0.00

Total | Saturates | Aromatics

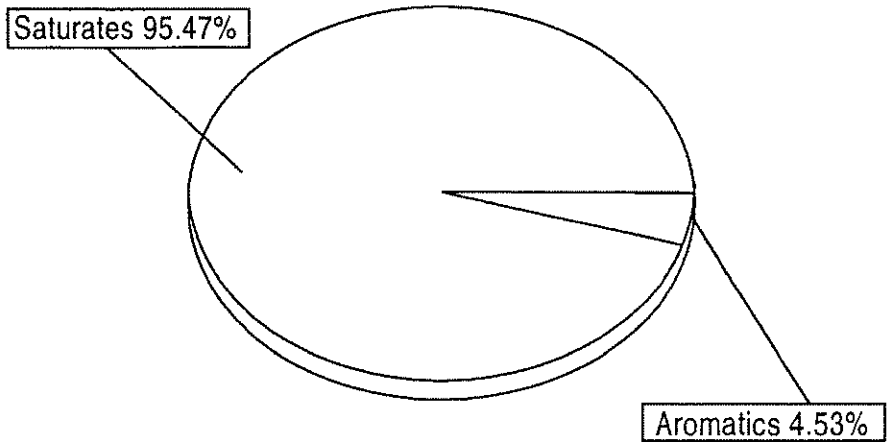


Fig.21

.....Experimental Results

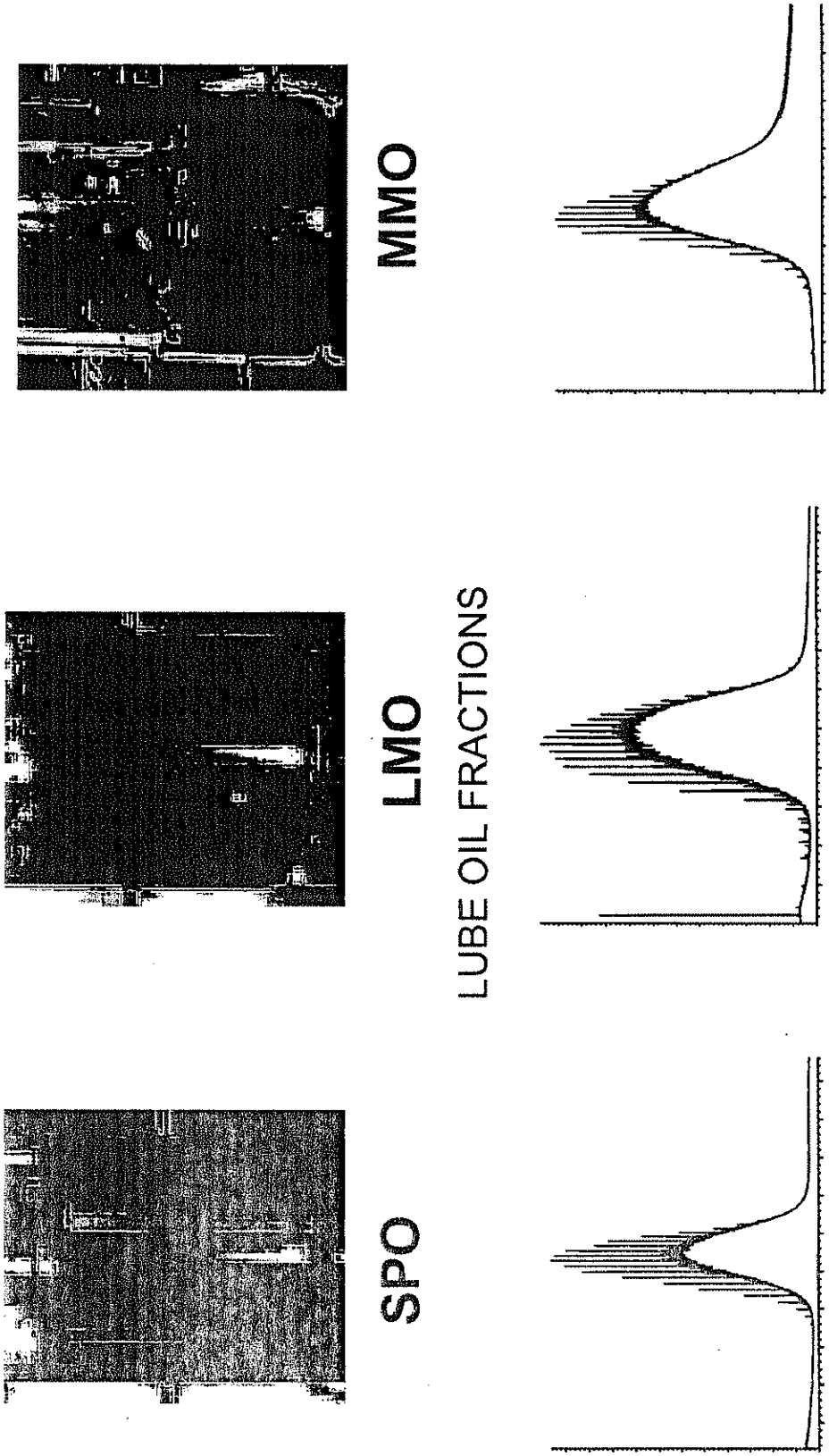


Fig.22

Hydrocarbon Type Analysis (From the Whole Crude)

SP	O Time interval 21 – 33 min.	LMO Time interval 24 – 42 min.	MMO Time interval 28 – 56 min
- **Total Saturates, %p**	**76.0 (75.3)**	**69.2 (69.5)**	**54.2 (53.6)**
Paraffins	42.7 (39.7)	33.5 (27.2)	20.2 (17.4)
Monocycloparaffins	14.3 (13.1)	13.8 (14.2)	12.2 (13.4)
Dicycloparaffins	10.4 (7.2)	10.9 (12.6)	9.4 (10.3)
Tricycloparaffins+	8.6 (15.4)	11.0 (15.4)	12.3 (12.6)
- **Total Aromatics, %p**	**24.0 (24.7)**	**30.8 (30.5)**	**45.8 (46.4)**
Monoaromatics	10.8 (10.5)	11.9 (12.9)	20.7 (21.0)
Benzenes	3.8 (3.3)	3.8 (4.0)	7.1 (7.0)
Naphthenebenzenes	3.2 (3.4)	3.7 (4.0)	6.3 (6.5)
Dinaphthenebenzenes	3.9 (3.7)	4.4 (4.9)	7.2 (7.4)
- **Diaromatics**	**4.0 (5.2)**	**5.4 (3.5)**	**7.6 (6.9)**
Naphthalenes	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Acenaphthenes, Dibenzofurans	1.4 (2.5)	1.9 (0.8)	1.8 (2.0)
Fluorenes	2.6 (2.7)	3.5 (2.7)	5.7 (4.9)
- **Triaromatics**	**2.7 (1.9)**	**3.8 (2.2)**	**1.7 (3.0)**
Phenanthrenes	2.0 (1.1)	2.4 (1.0)	1.2 (1.6)
Naphthenophenanthrenes	0.7 (0.9)	1.4 (1.2)	0.6 (1.4)
- **Tetraaromatics**	**1.7 (2.1)**	**3.1 (4.3)**	**4.7 (3.4)**
Pyrenes	1.4 (1.60	2.2 (2.7)	2.7 (1.8)
Chrysenes	0.3 (0.5)	1.0 (1.6)	1.9 (1.6)
- **Pentaaromatics**	**0.0 (0.6)**	**0.3 (0.5)**	**0.8 (1.3)**
Perylenes	0.0 (0.6)	0.2 (0.4)	0.5 (1.1)
Dibenzanthracenes	0.0 (0.0)	0.1 (0.1)	0.3 (0.2)
- **Thiophenes**	**4.7 (4.2)**	**6.2 (6.8)**	**7.3 (6.8)**
Benzothiophenes	2.4 (2.1)	2.5 (2.3)	2.6 (2.4)
Dibenzothiophenes	2.1 (2.1)	3.2 (2.9)	3.6 (3.2)
Naphthobenzothiophenes	0.2 (0.0)	0.5 (1.6)	1.1 (1.2)
Unidentified Aromatics	**0.0 (0.0)**	**0.1 (0.3)**	**3.1 (4.1)**
Class II	0.0 (0.0)	0.1 (0.0)	0.3 (1.1)
Class III	0.0 (0.0)	0.0 (0.0)	0.3 (0.4)
Class IV	0.0 (0.0)	0.0 (0.3)	2.3 (2.2)
Class V	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

Fig.23

Hydrocarbon Type Analysis (From the Whole Crude)			
	SPO Time interval 21-33 mins.	MMO Time interval 24-42 min.	LMO Time interval 28-56 mins.
Unidentified Aromatics	0.0 (0.0)	0.1 (0.3)	3.1 (4.1)
Class II	0.0 (0.0)	0.1 (0.0)	0.3 (1.1)
Class III	0.0 (0.0)	0.0 (0.0)	0.3 (0.4)
Class IV	0.0 (0.0)	0.0 (0.3)	2.3 (2.2)
Class V	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Class VI	0.0 (0.0)	0.0 (0.0)	0.0 (0.1)
Class VII	0.0 (0.0)	0.0 (0.0)	0.1 (0.3)

Fig.24

COMPARATIVE STUDY OF MIDDLE HYDROCARBON SAMPLES		
	TOTAL AROMATICS CONTENT %w	
SAMPLE	SFC ASTM D 5186	MS Group Type
	Mono	Mono
Low Sulphur Diesel	23.8	27.27
Jet Fuel	14.57	12.19
Light Catalytic Gas Oil	30.51	33.74

*- Poliolefins matrix interference

Fig.25

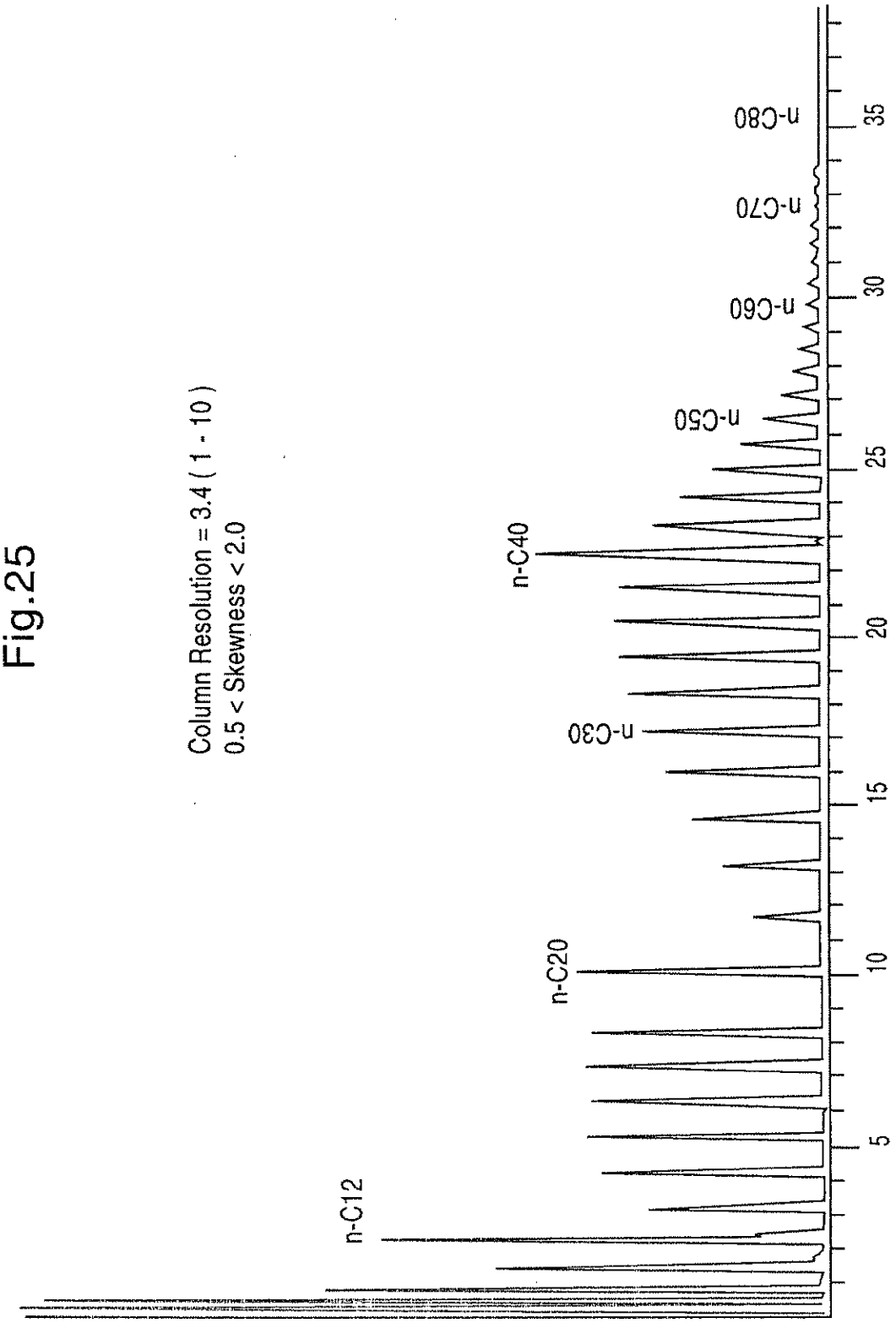

Column Resolution = 3.4 (1 - 10)
0.5 < Skewness < 2.0
n-C12
n-C20
n-C30
n-C40
n-C50
n-C60
n-C70
n-C80
5
10
15
20
25
30
35

Fig.26

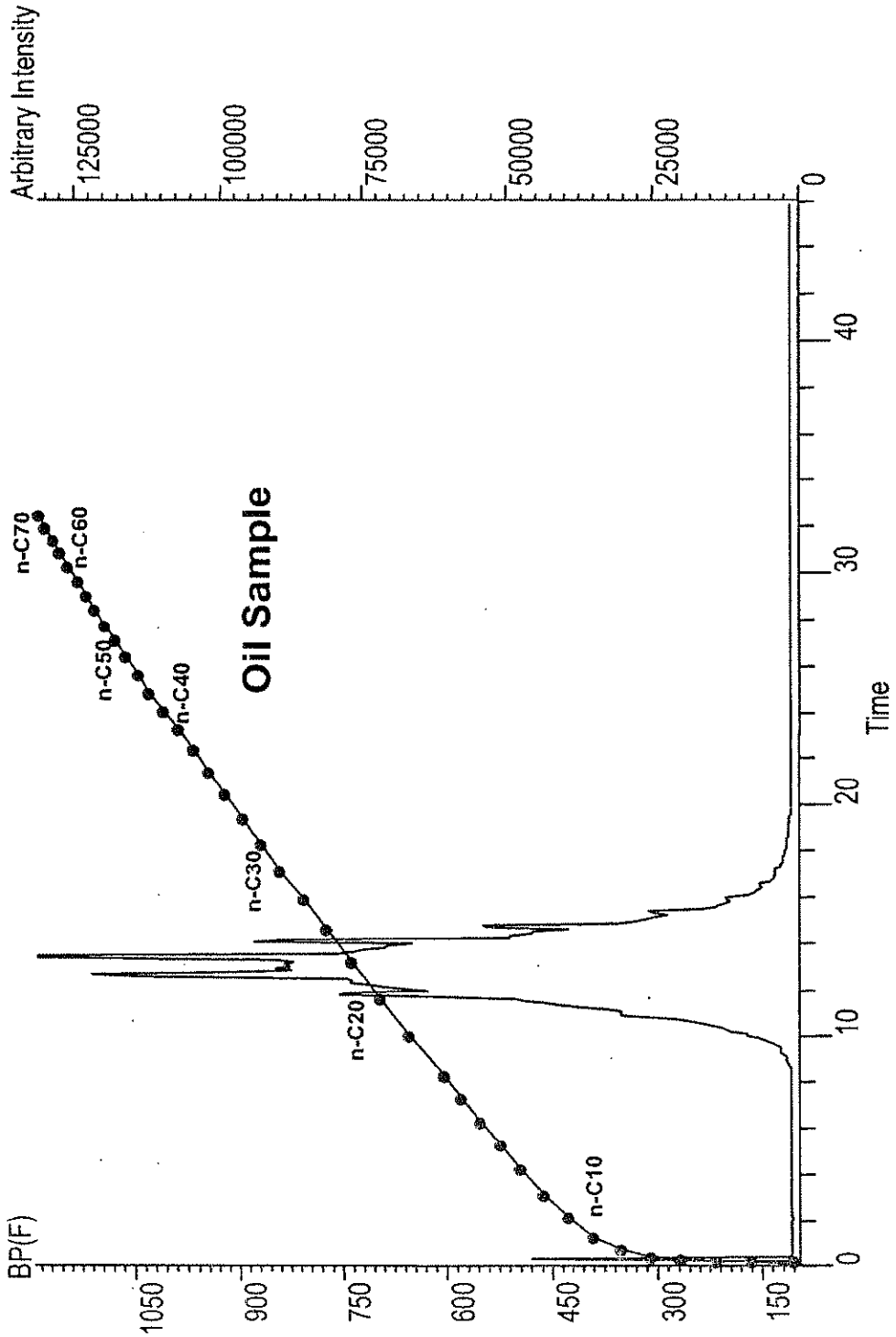

Oil Sample
BP(F)
1050
900
750
600
450
300
150
Arbitrary Intensity
125000
100000
75000
50000
25000
0
Time
0
10
20
30
40
n-C10
n-C20
n-C30
n-C40
n-C50
n-C60
n-C70

Fig.27

Quantitative Analysis for groups

AROMATIC

78+...91+... - mono

104+...117+... -Clase II

130+...129+...- Clase III

128+...141+... -Clase IV

154+...167+... -Clase V

166+...179+... -Clase VI

178+...191+... -Clase VII

SATURATED

43 - paraffins

55 - cycloparaffins

81 - dicycloparaffins

93 - tricycloparaffins

C.J. Robinson. Analytical Chemistry, vol. 43, 11,1971

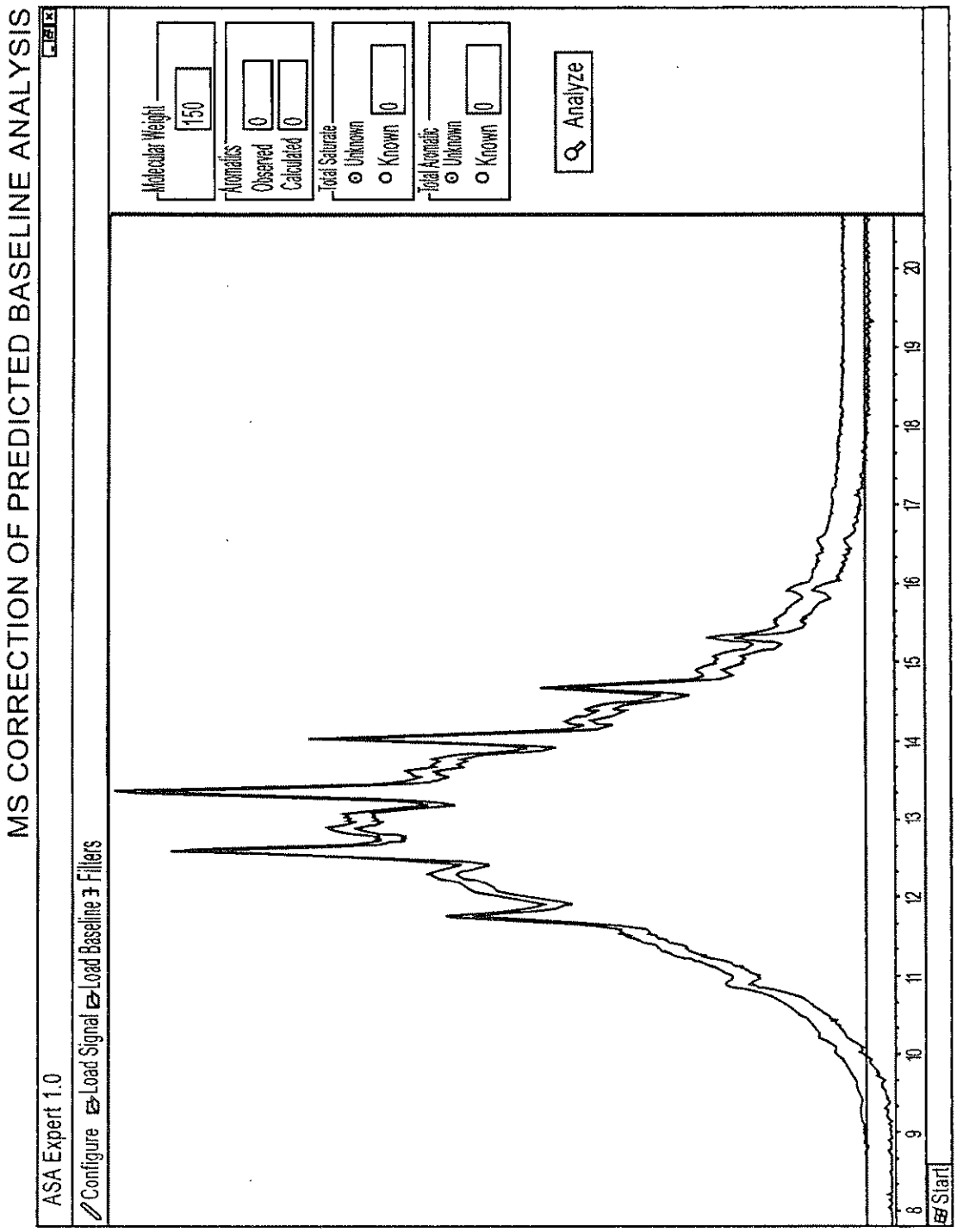

MS CORRECTION OF PREDICTED BASELINE ANALYSIS
ASA Expert 1.0
Configure
Load Signal
Load Baseline
Fillers
Molecular Weight
150
Aromatics
Observed
0
Calculated
0
Total Saturate
Unknown
Known
0
Total Aromatic
Unknown
Known
0
Analyze
8
9
10
11
12
13
14
15
16
17
18
19
20
Start

Fig.28

Fig.29 SIM DIS FID / MS Analysis

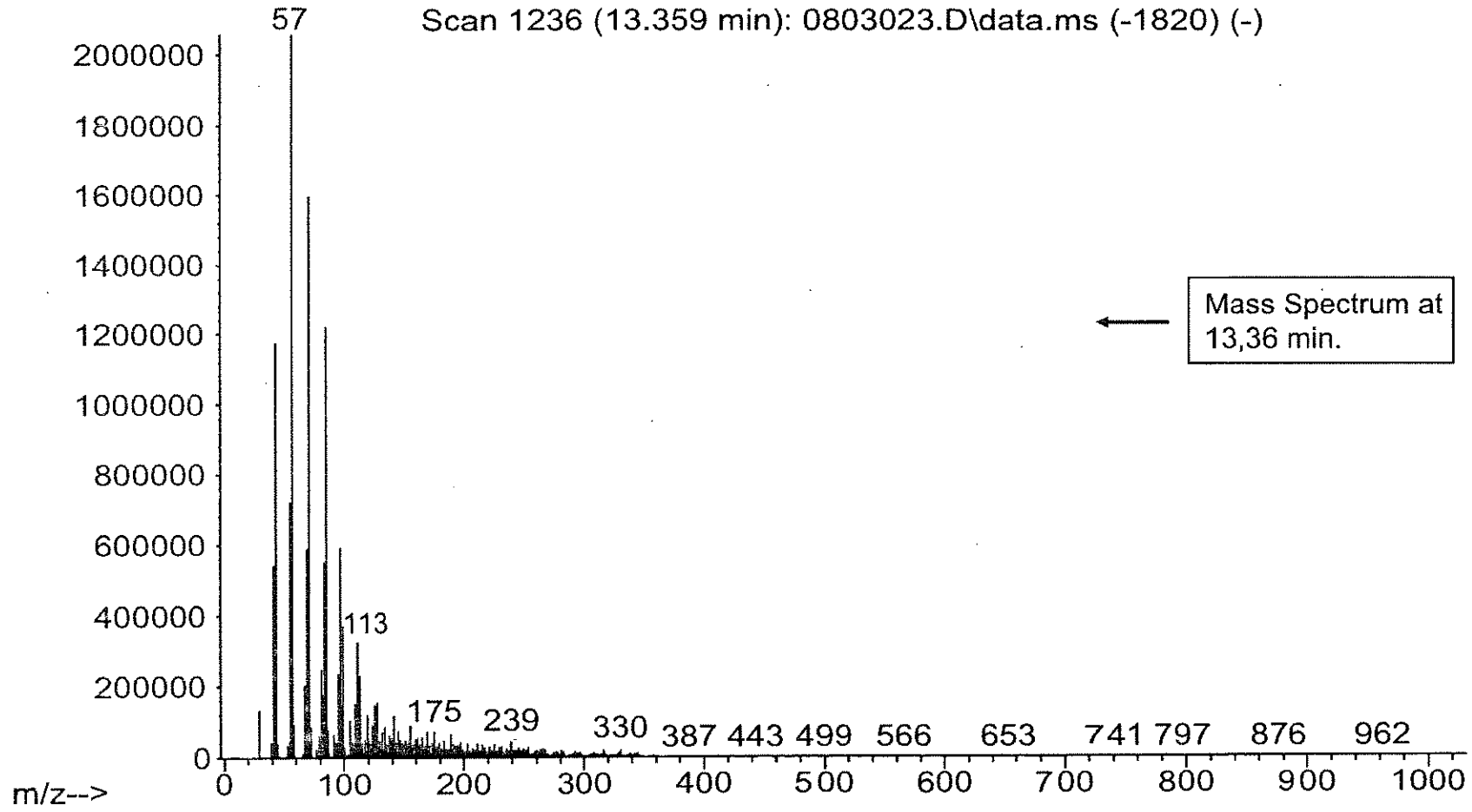


Fig.30

Typical Report

- Total Ariomatics %p	24.0 (24.7)
Monoaromatics	10.8 (10.5)
benzenes	3.8 (3.3)
naphthenebenzenes	3.2 (3.4)
Dinaphthenebenzenes	3.9 (3.7)
Diaromatics	**4.0 (5.2)**
Naphthalenes	0.0 (0.0)
Acenaohthenes, Dibenzothiophenes	1.4 (2.5)
Fluorenes	2.6 (2.7)
Triaromatics	**2.7 (1.9)**
Phenanthrenes	2.0 (1.1)
naphthenephenantrenes	0.7 (0.9)
tetraaromatics	**1.7 (2.1)**
pyrenes	1.4 (1.60)
chrysenes	0.3 (0.5)
pentaaromatics	**0.0 (0.6)**
preylenes	0.0 (0.6)
dibenzofurans	0.0 (0.0)
-thiophenoaromatics	**4.7 (4.2)**
benzothiophenes	2.4 (2.1)
dibenzothiophenes	2.1 (2.1)
naphthobenzothioph	0.2 (0.0)
Unidentified Aromatics	**0.0 (0.0)**

-Total Saturated %p	76.0 (75.3)
Paraffins	42.7 (39.7)
Monoparaffins	14.3 (13.1)
dicycloparaffins	10.4 (7.2)
Tricycloparaffins+	8.6 (15.4)

Fig.31

COMPARATIVE STUDY OF MEDIUM DISTILLATIONS

Total Aromatics %w

	Mono	Total	Mono	Total
Diesel	23.18	33.23	27.27	36.64
Jet Fuel	14.57	18.38	12.19	16.90
Gas Oil	30.51	75.25	33.74	87.26*

Fig.32

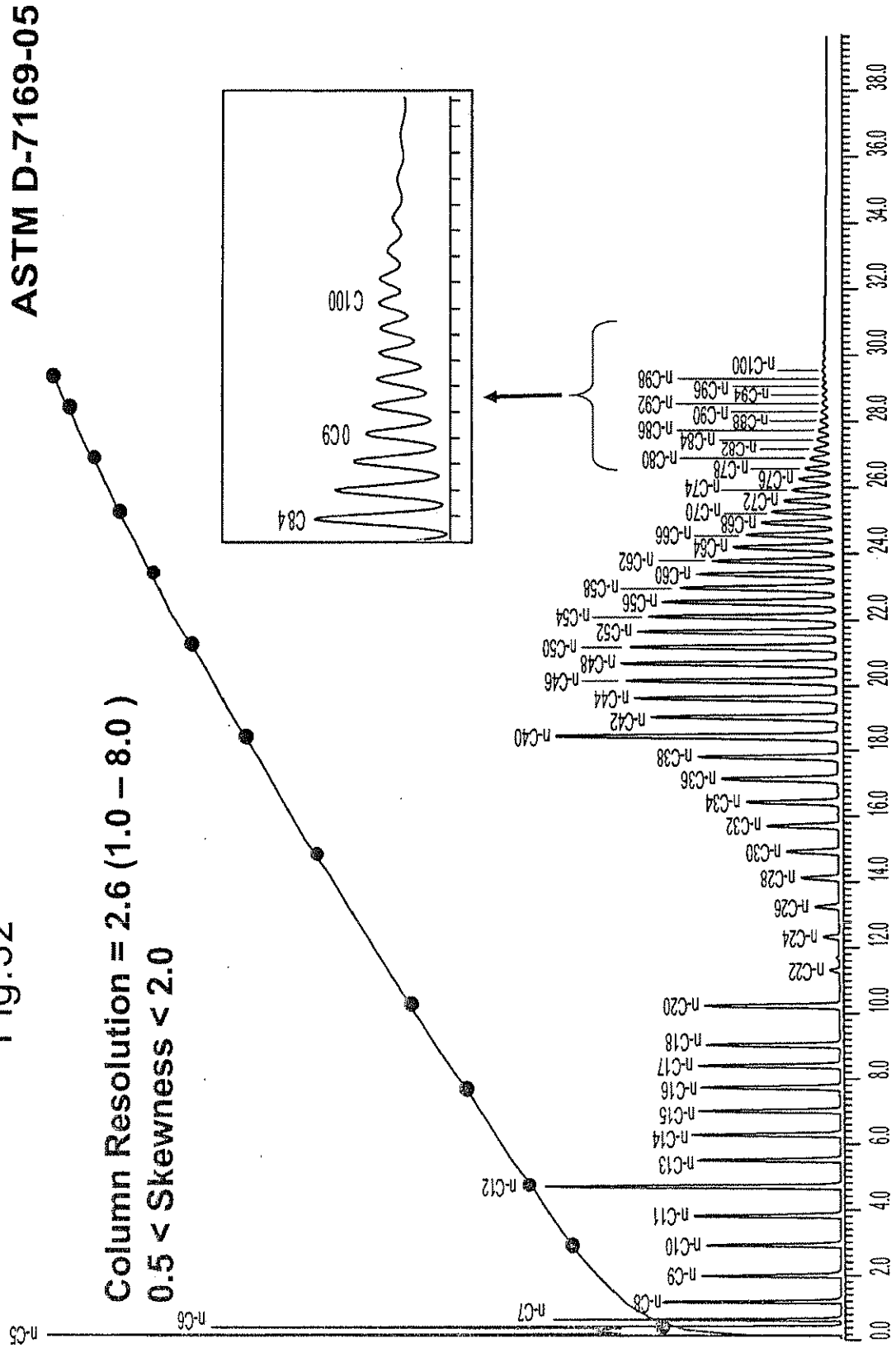
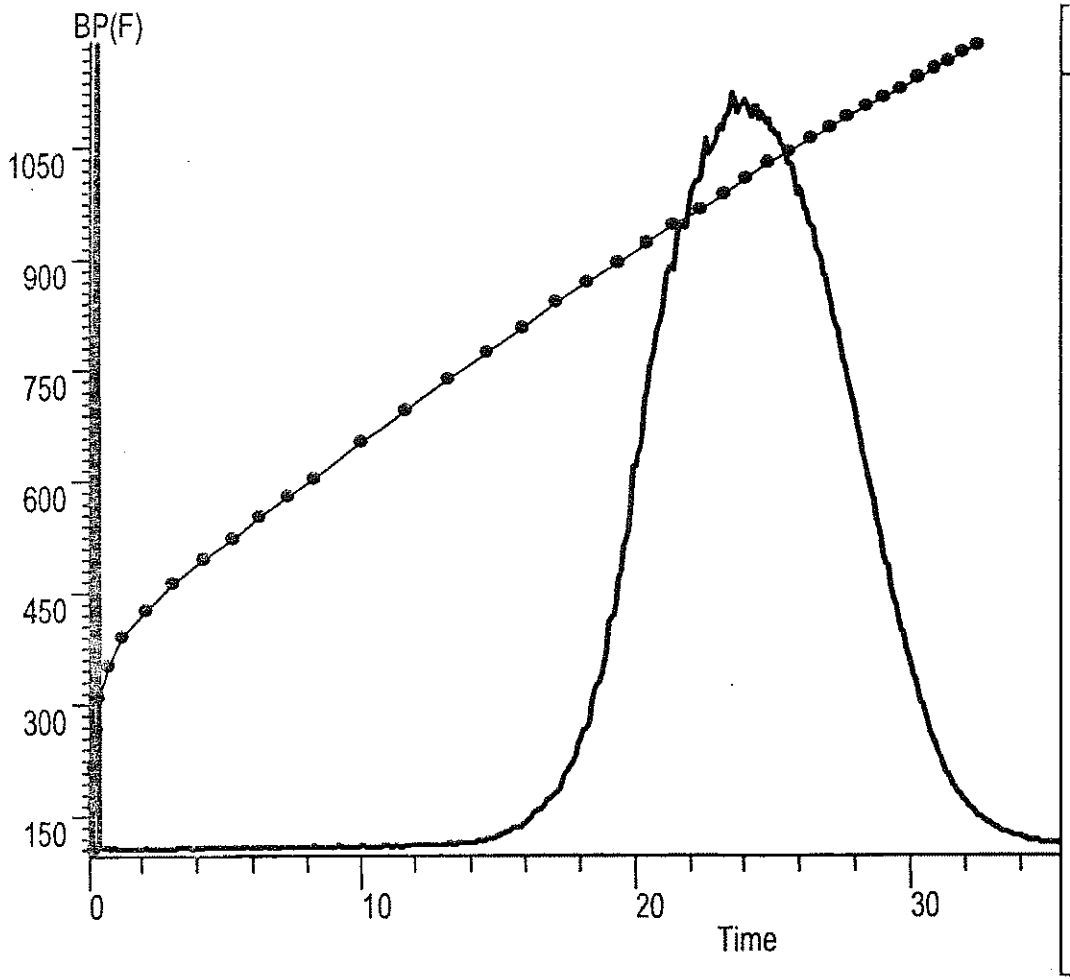

ASTM D-7169-05
Column Resolution = 2.6 (1.0 – 8.0)
0.5 < Skewness < 2.0
n-C5
n-C6
n-C7
n-C8
n-C9
n-C10
n-C11
n-C12
n-C13
n-C14
n-C15
n-C16
n-C17
n-C18
n-C20
n-C22
n-C24
n-C26
n-C28
n-C30
n-C32
n-C34
n-C36
n-C38
n-C40
n-C42
n-C44
n-C46
n-C48
n-C50
n-C52
n-C54
n-C56
n-C58
n-C60
n-C62
n-C64
n-C66
n-C68
n-C70
n-C72
n-C74
n-C76
n-C78
n-C80
n-C82
n-C84
n-C86
n-C88
n-C90
n-C92
n-C94
n-C96
n-C98
n-C100
C84
C99
C100
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0
30.0
32.0
34.0
36.0
38.0

Fig.33



Curve Calibration and RGO

%Off	BP(C)	QC(C)	(-)	Limited
IBP	429.0	427.2	1.7	8.9
5.00	476.2	477.2	-1.0	2.8
10.00	491.3	492.2	-0.9	2.8
15.00	500.9	502.2	-1.3	2.8
20.00	508.4	510.0	-1.6	3.3
25.00	515.7	517.2	-1.5	3.3
30.00	522.4	523.9	-1.5	3.9
35.00	528.9	530.6	-1.7	3.9
40.00	535.0	536.7	-1.6	4.4
45.00	540.8	542.2	-1.4	4.4
50.00	546.7	548.3	-1.6	4.4
55.00	552.8	554.4	-1.6	4.4
60.00	559.0	560.0	-1.0	4.4
65.00	565.1	566.1	-1.0	4.4
70.00	571.0	572.2	-1.2	4.4
75.00	577.4	578.3	-0.9	5.0
80.00	584.6	585.6	-0.9	4.4
85.00	592.6	592.8	-0.1	3.9
90.00	602.3	602.2	0.1	4.4
95.00	616.9	615.6	1.4	3.9
FBP	659.5	656.1	3.4	17.8

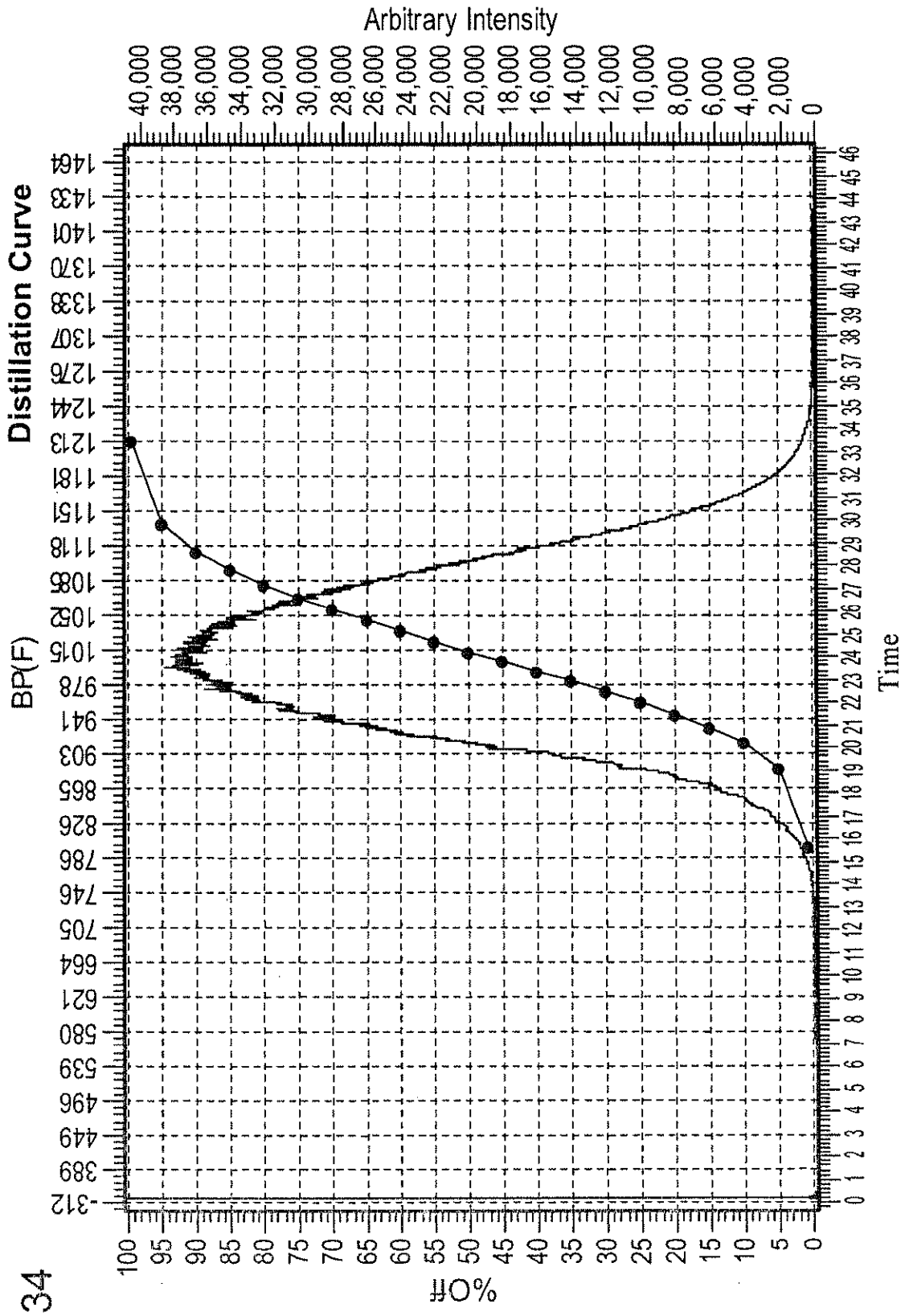

Arbitrary Intensity
40,000
38,000
36,000
34,000
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Distillation Curve
BP(F)
-312
389
449
496
539
580
621
664
705
746
786
826
865
903
941
978
1015
1052
1085
1118
1151
1181
1213
1244
1276
1307
1338
1370
1401
1433
1464
Time
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
%Off
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0

Fig.34

Fig.35

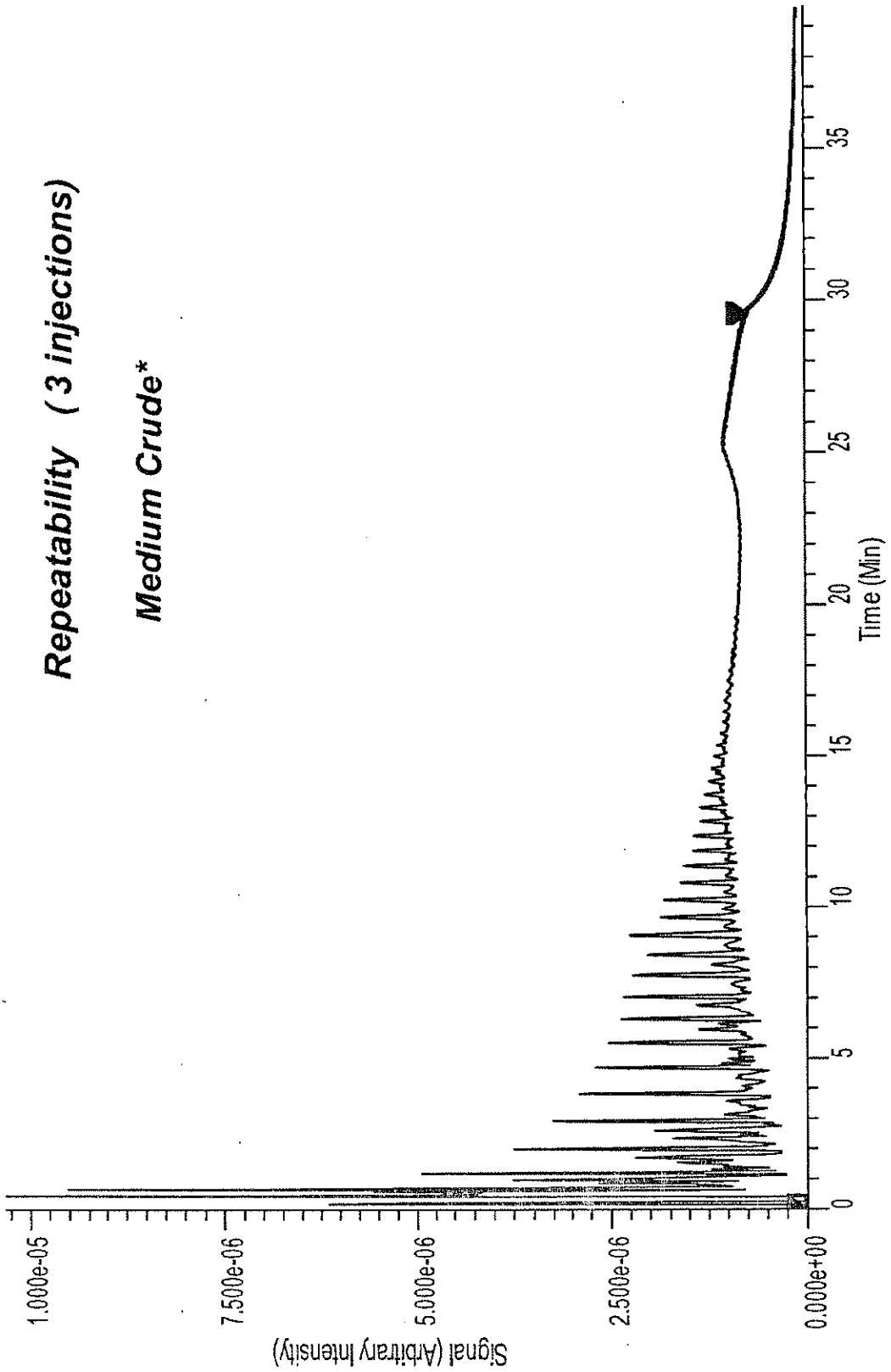

Repeatability (3 injections)
Medium Crude*
Signal (Arbitrary Intensity)
1.000e-05
7.500e-06
5.000e-06
2.500e-06
0.000e+00
0
5
10
15
20
25
30
35
Time (Min)

Fig.36

Medium Crude

Repeatability (3 Injections)

Boiling Point Table (%Off)

F °C

%Off	BP(F)	BP(F)	BP(F)	Avg	%SDV
IBP	260.1	260.1	260.1	260.1	0.0
5.00	354.9	354.7	355.5	355.0	0.1
10.00	453.9	453.5	454.6	454.0	0.1
15.00	532.8	532.3	534.0	533.1	0.2
20.00	604.7	604.4	605.6	604.9	0.1
35.00	677.8	677.4	679.3	678.2	0.1
30.00	751.0	750.7	752.5	751.4	0.1
45.00	818.4	818.2	819.8	818.8	0.1
40.00	886.6	886.3	888.2	887.0	0.1
55.00	957.6	957.2	959.4	958.1	0.1
60.00	1033.8	1033.3	1035.7	1034.3	0.1
65.00	1107.7	1107.3	1109.7	1108.3	0.1
70.00	1175.0	1174.8	1176.8	1175.5	0.1
5.00	1232.3	1231.1	1232.8	1232.0	0.1
0.00	1297.0	1294.2	1295.0	1295.4	0.1

Boiling Point Table

File	Sample Id	Start Time	End Time	%Recovery	%Recovery Used
C:\msdchem\1\DATA\MEXICO\05230608.D\05230608_FID.cdf	CrudoMedianoI			72.28	72.28
C:\msdchem\1\DATA\MEXICO\05230609.D\05230609_FID.cdf	CrudoMedianoII			72.61	72.61
C:\msdchem\1\DATA\MEXICO\05230610.D\05230610_FID.cdf	CrudoMedianoIII			72.59	72.59

Fig.37

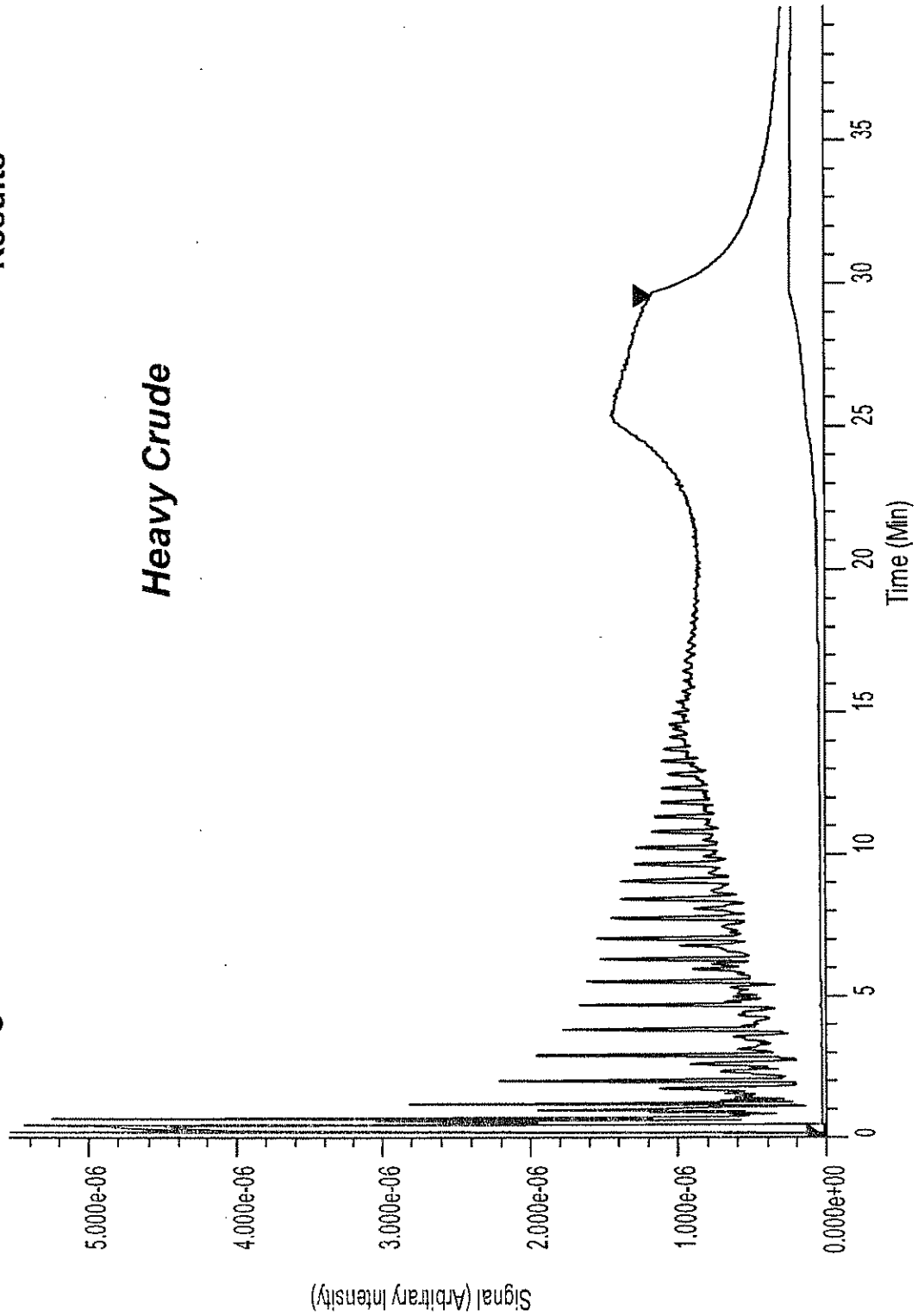

Results
Heavy Crude
Signal (Arbitrary Intensity)
5.000e-06
4.000e-06
3.000e-06
2.000e-06
1.000e-06
0.000e+00
0
5
10
15
20
25
30
35
Time (Min)

Fig.38

Heavy Crude

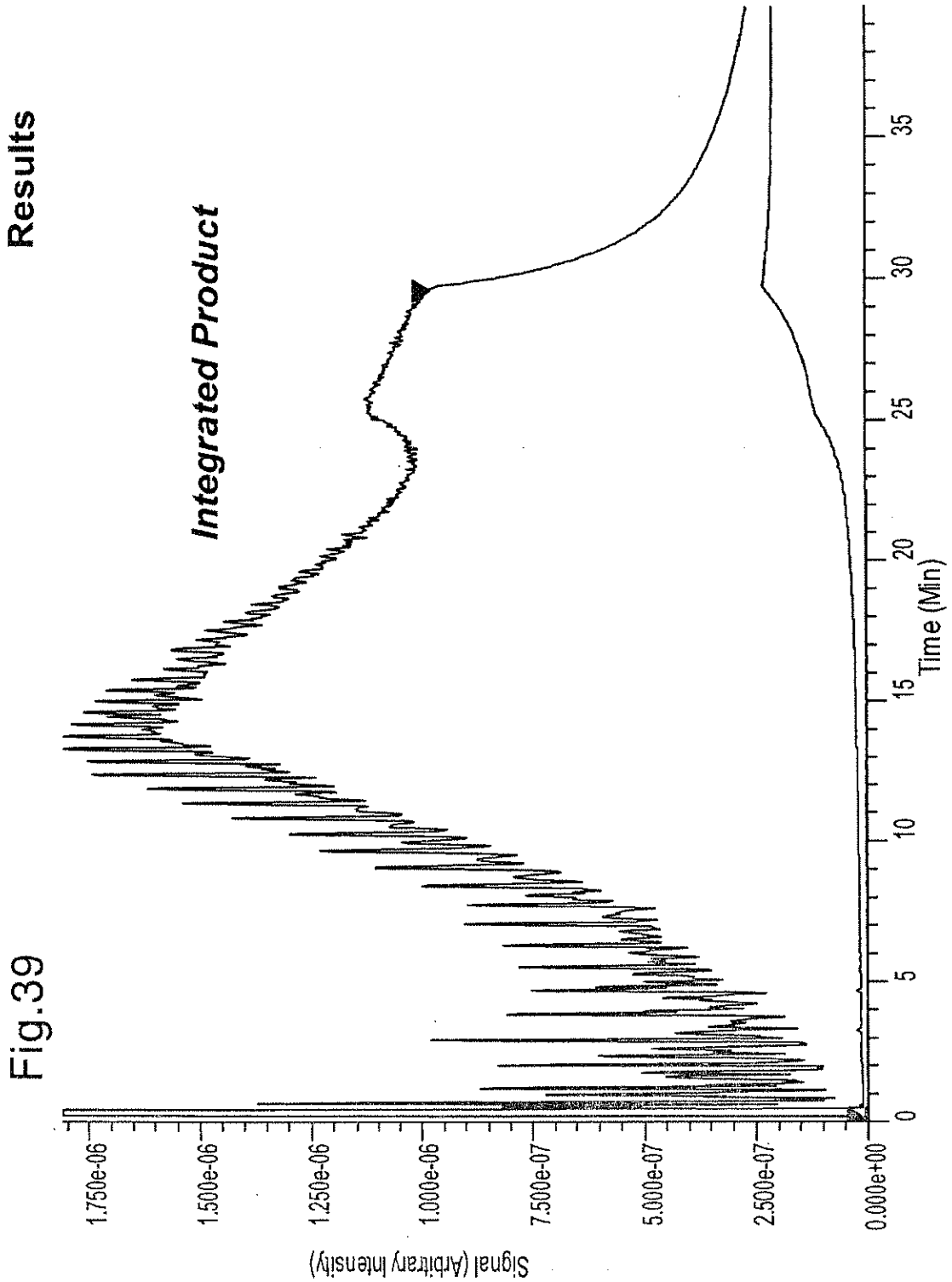
Boiling Point Table (%Off)

%Off	BP(F)
IBP	175.1
5.00	362.9
10.00	495.6
15.00	598.6
20.00	688.6
25.00	773.8
30.00	848.4
35.00	922.8
40.00	997.3
45.00	1070.9
50.00	1135.5
55.00	1185.9
60.00	1226.6
65.00	1273.9
70.00	1319.8

Boiling Point Table

%Recovery	70.81 @ 1328.0F
%Recovery Used	70.81
File	C:\msdchem\1\DATA\MEXICO\05230615.D\05230615_FID.cdf
Sample Id	Crudo Pesadol
LIMS Id	
Parameter File	SIMDISMFCRYO

Fig.39


Results
Integrated Product
Signal (Arbitrary Intensity)
1.750e-06
1.500e-06
1.250e-06
1.000e-06
7.500e-07
5.000e-07
2.500e-07
0.000e+00
0
5
10
15
20
25
30
35
Time (Min)

Integrated Product

Fig.40

Boiling Point Table (%Off)

F °C

%Off	BP(F)
IBP	259.1
5.00	489.4
10.00	609.9
15.00	686.8
20.00	745.3
25.00	794.0
30.00	840.4
35.00	885.5
40.00	933.0
45.00	982.5
50.00	1036.3
55.00	1091.6
60.00	1151.9
65.00	1208.8
70.00	1271.0

Boiling Point Table

%Recovery	74.57 @ 1328.0F
%Recovery Used	74.57
File	C:\msdchem\1\DATA\MEXICO\05230604.D\05230604_FID.cdf
Sample Id	Producto Integrado
LIMS Id	
Parameter File	SIMDISMFCRYO

Fig.41

Fraction Yield

Fraction	Yield %		
	Medium Crude	Heavy Crude	Integrated Product
Medium Distillation 420°F – 755°F	22.05	16.91	17.77
Lubricants 650°F – 1000°F	24.84	22.30	34.28

Fig.42

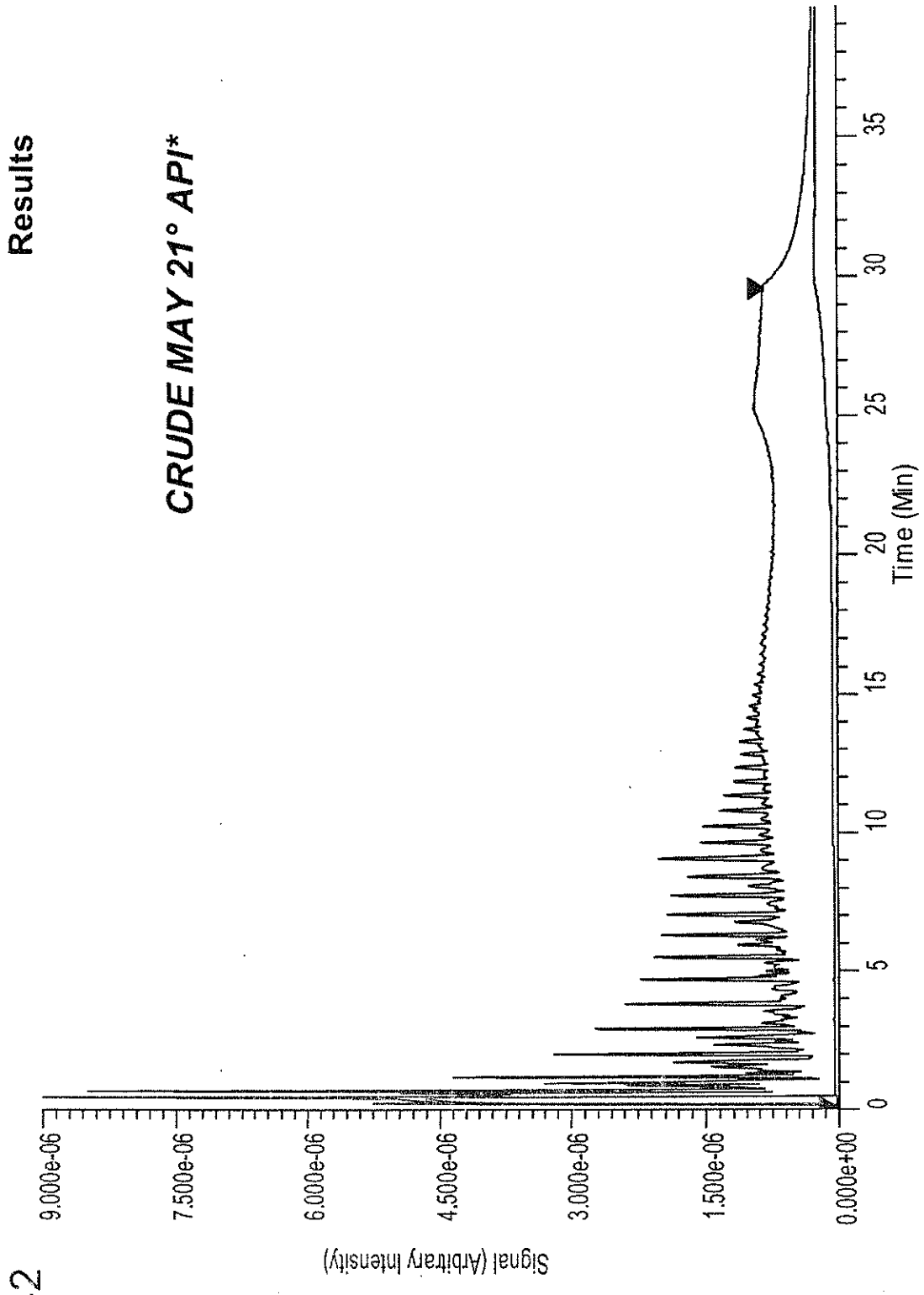

Results
CRUDE MAY 21° API*
Signal (Arbitrary Intensity)
9.000e-06
7.500e-06
6.000e-06
4.500e-06
3.000e-06
1.500e-06
0.000e+00
0
5
10
15
20
25
30
35
Time (Min)

Fig.43

CRUDE MAY

Boiling Point Table (%Off)

F °C

%Off	BP(F)
IBP	259.8
5.00	348.4
10.00	444.7
15.00	521.5
20.00	598.2
25.00	665.9
30.00	736.9
35.00	804.1
40.00	871.1
45.00	939.8
50.00	1012.6
55.00	1086.8
60.00	1156.7
65.00	1211.9
70.00	1273.8

Boiling Point Table

%Recovery	74.38 @ 1328.0F
%Recovery Used	74.38
File	C:\msdchem\1\DATAMEXICO\05230612.D\05230612_FID.cdf
Sample Id	Crudo Maya
LIMS Id	
Parameter File	SIMDISMFCRYO

Fig.44

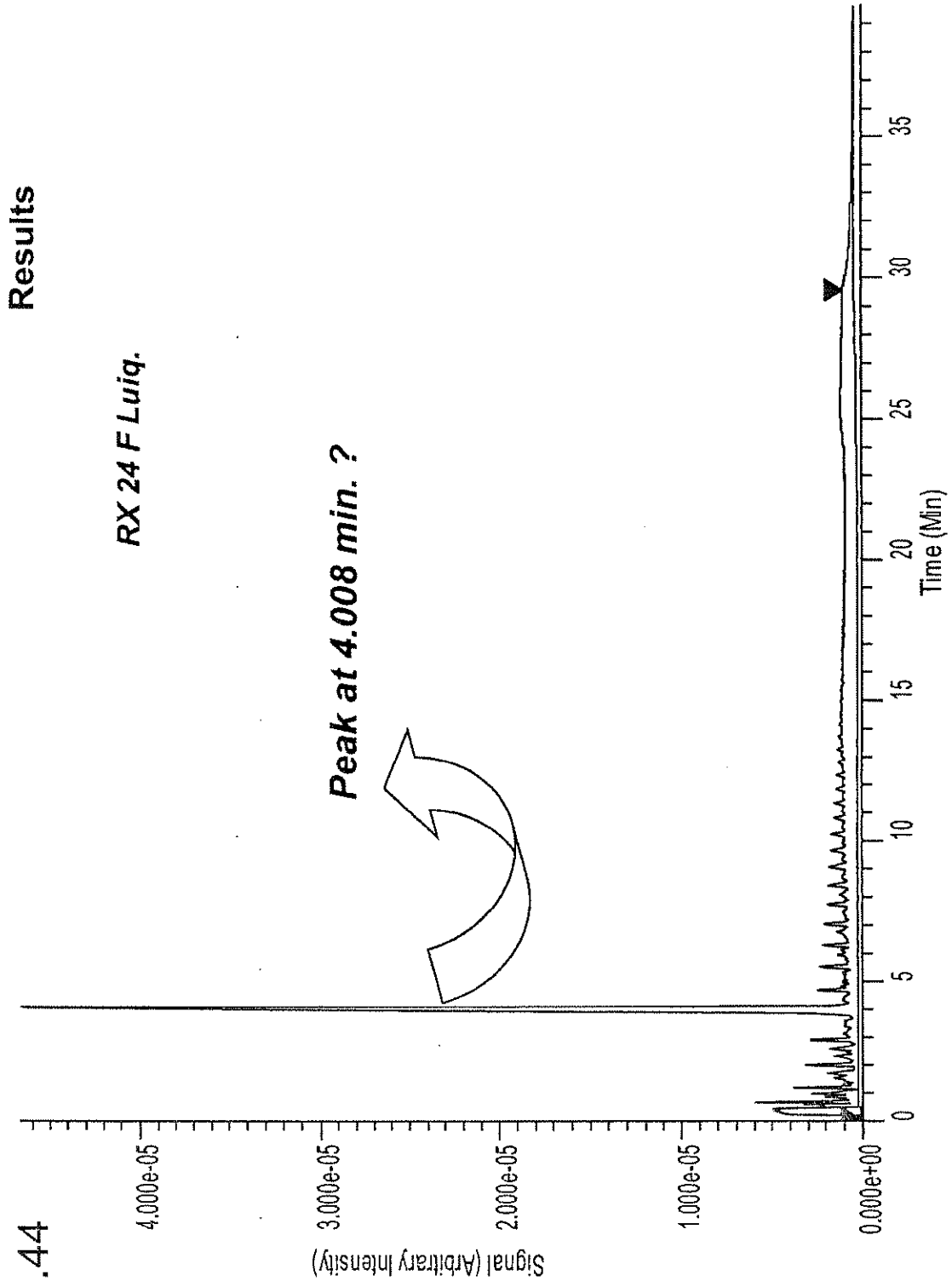

Results
RX 24 F Luiq.
Peak at 4.008 min. ?
Signal (Arbitrary Intensity)
4.000e-05
3.000e-05
2.000e-05
1.000e-05
0.000e+00
0
5
10
15
20
25
30
35
Time (Min)

Fig.45

RX 24 F.L.

Boiling Point Table (%Off)

Boiling Point Table

%Off	BP(F)
IBP	265.0
5.00	376.3
10.00	391.4
15.00	393.5
20.00	396.7
25.00	489.6
30.00	578.2
35.00	662.8
40.00	747.3
45.00	826.2
50.00	906.7
55.00	991.9
60.00	1080.5
65.00	1162.8
70.00	1228.6
75.00	1302.6

%Recovery	76.61 @ 1328.0F
%Recovery Used	76.61
File	C:\msdchem\1\DATAMEXICO\05230614.D\05230614_FID.cdf
Sample Id	RX 24
LIMS Id	
Parameter File	SIMDISMFCRYO

Fig.46

Identification of Peak at 4.008 min

RX 24 F Luiq.

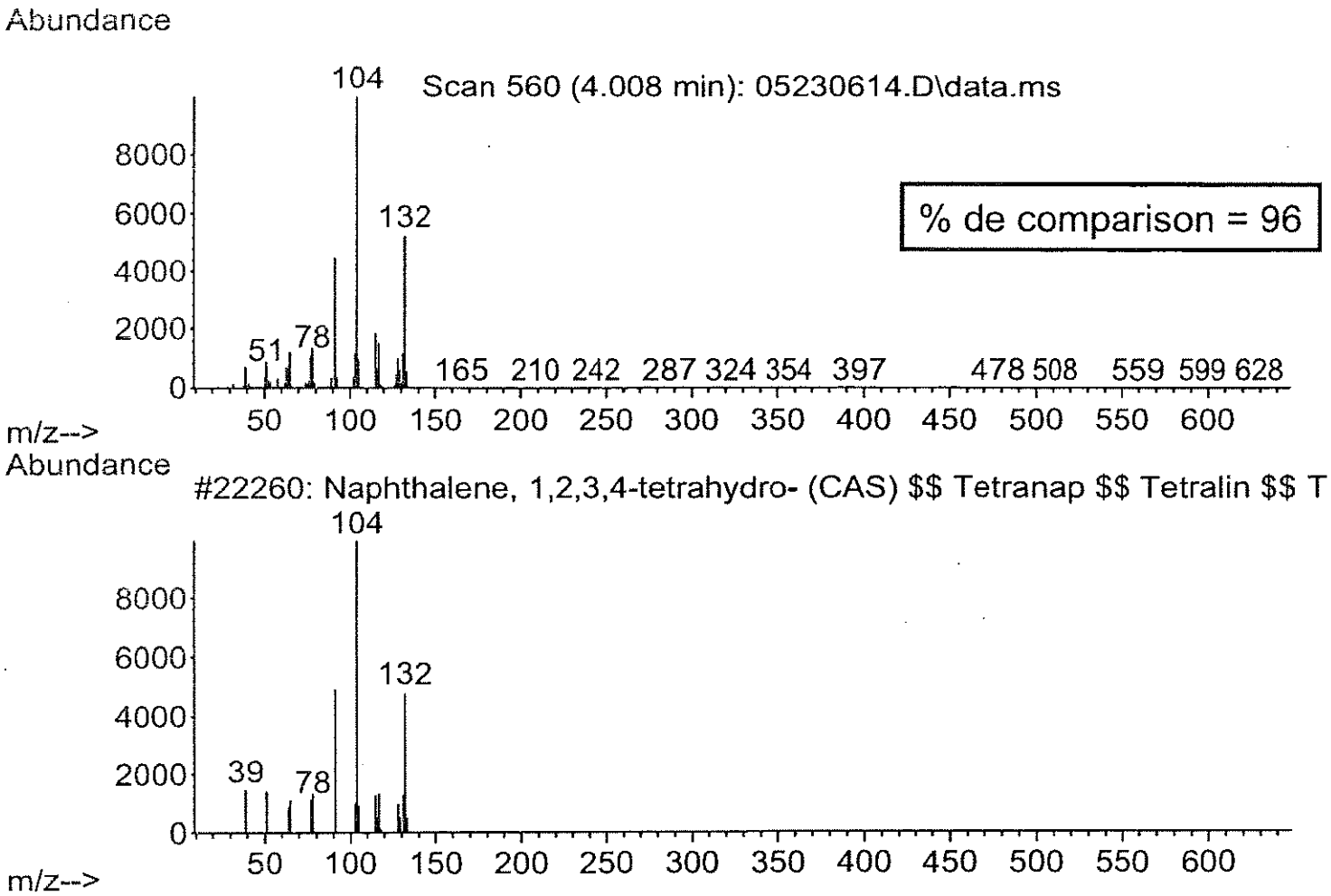


Fig.47

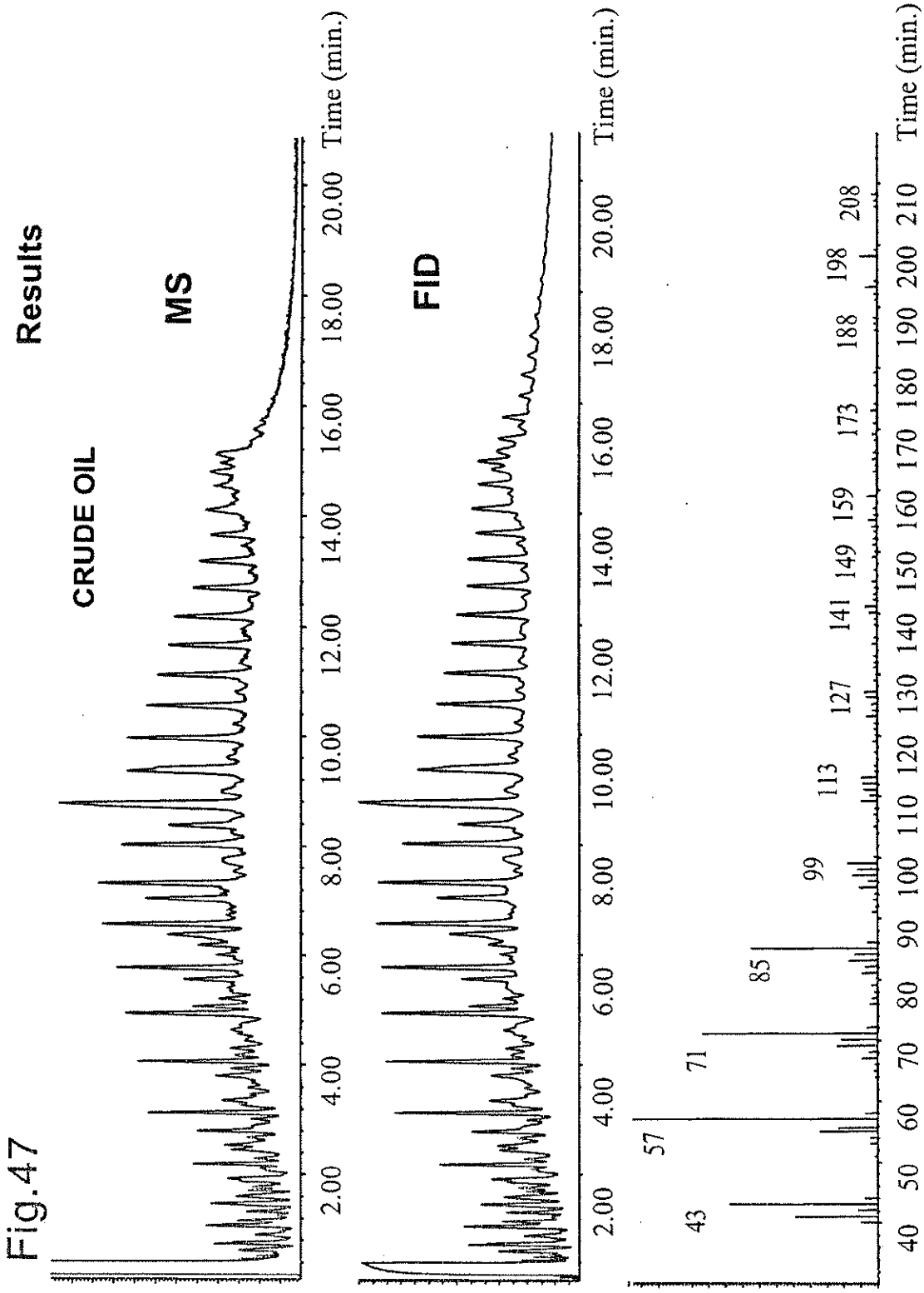

Results
CRUDE OIL
MS
FID
Time (min.)
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
43
57
71
85
99
113
127
141
149
159
173
188
198
208

Fig.48

BIOMARKERS

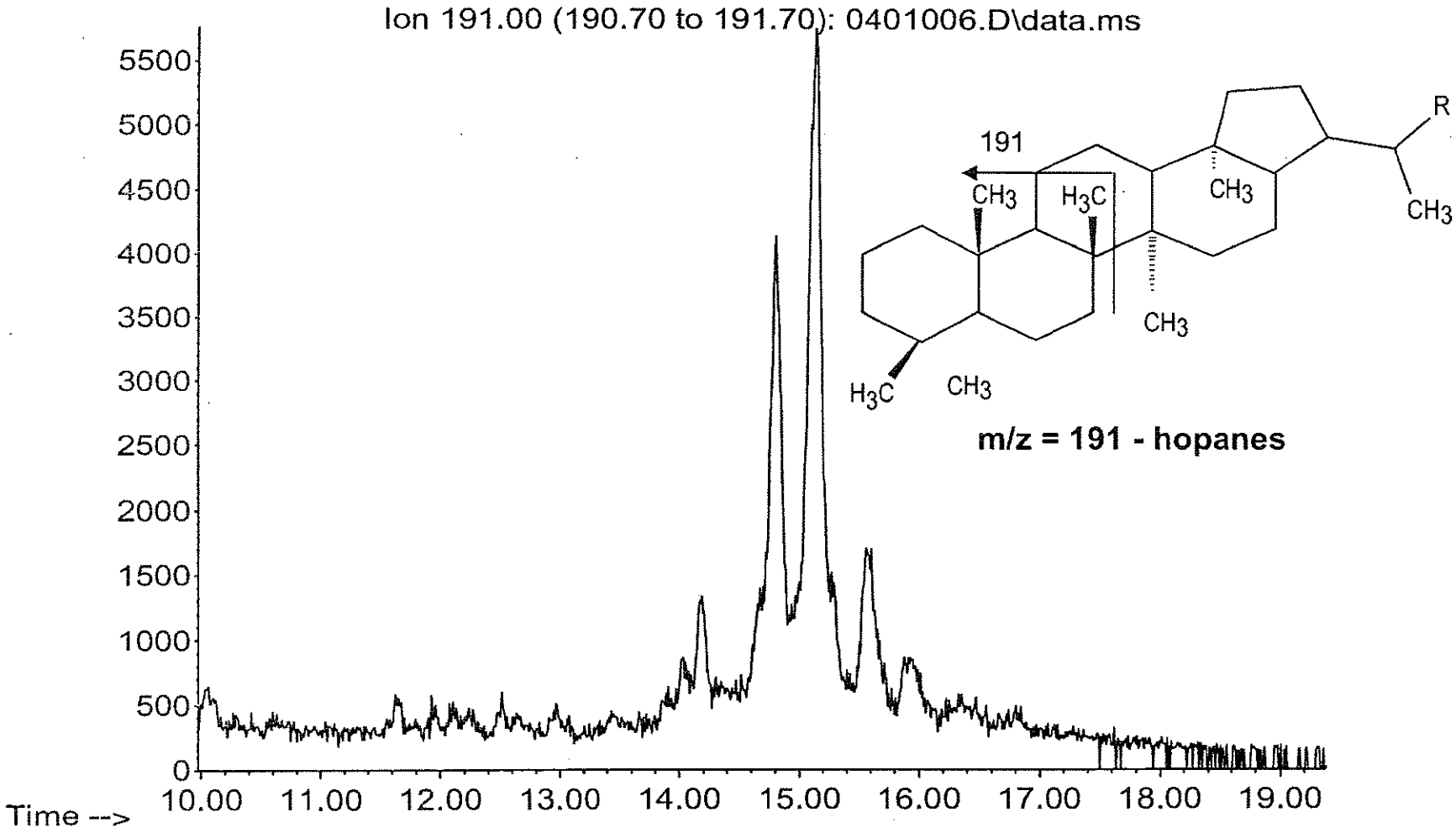


Fig.49

Analysis of the Remaining Total Crude

ASA Expert 1.0 6/14/2006

File: C:\msdchem\1\DATAMEXICO\05230608.D\05230608_MS.cdf
Sample ID: CrudoMedianol
Molecular Wieght: 640
Injection Date: 2006052304200-0500
From: 0.12 Minutes
To: 20.68 Minutes

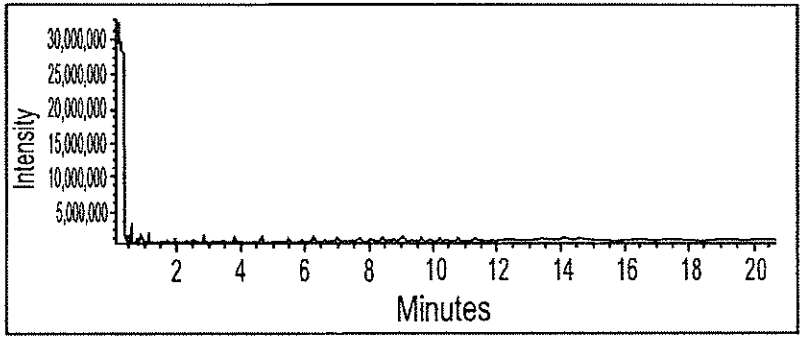
Aromatic and Saturate Analysis By Mass Spectrometry

	Intensity	%Volume	%Weight
Saturates	3.4505016E8	70.76	69.61
Paraffins	2.0070667E8	41.16	39.35
Monocycloparaffins	84110966	17.25	16.69
Dicycloparaffins	55096935	11.30	11.46
Tricycloparaffins	5135663	1.05	1.11
Aromatics	1.4259445E8	29.24	31.39
Monoaromatics	829140D1	17.00	17.24
Benzenes	41931229	6.60	8.52
Naphtenebenzenes	29313909	6.01	6.24
Dinaphtenebenzenes	11668863	2.39	2.48
Diaromatics	20568029	4.22	4.51
Naphthalenes	16714625	3.43	3.64
Acenaphthenes, Dibenzofurans	649203	0.13	0.14
Flourenes	3205200	0.66	0.73
Triaromatics	7390619	1.52	1.70
Phenanthrenes	7390619	1.52	1.70
Naphthenopheranthenes	0	0.00	0.00
Tetraaromatics	1173182	0.24	0.28
Pyrenes	1173182	0.24	0.28
Chrysenes	0	0.00	0.00
Pentaaromatics	0	0.00	0.00
Perylenes	0	0.00	0.00
Dibenzanthrecenes	0	0.00	0.00
Thiophena Aromatics	30548621	6.26	7.68
Benzothiaphenes	13164189	2.70	3.12
Dibenzothiophenes	16540828	3.39	4.31
Naphthabenzothiophenes	823603	0.17	0.22
Unidentified Aromatics	0	0.00	0.00
Class II	0	0.00	0.00
Class III	0	0.00	0.00
Class IV	0	0.00	0.00
Class V	0	0.00	0.00
Class VI	0	0.00	0.00
Class VII	0	0.00	0.00

ASA Expert 1.0

File: C:\msdchem\1\DATAMEXICO\05230608.D\05230608_MS.cdf
Sample ID: CrudoMedianol
Molecular Weight: 640
Injection Date: 20060523204200-0500
From: 0.12 Minutes
To: 20.68 Minutes

Aromatic and Saturate Analysis By Mass Spectrometry



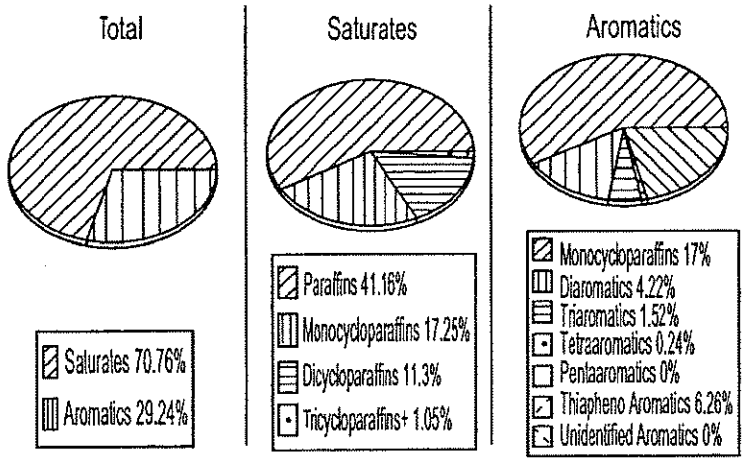


Fig.50

Jet Fuels, Diesel, and Medium Distillations

ASA Expert 1.0 6/14/2006

File: C:\msdchem\1\DATAMEXICO\05230508.D\05230608_MS.cdf
Sample ID: CrudoMedianol
Molecular Weight: 260
Injection Date: 200652304200-0500
From: 4.42 Minutes
To: 12.82 Minutes

Aromatic and Saturate Analysis
By Mass Spectrometry

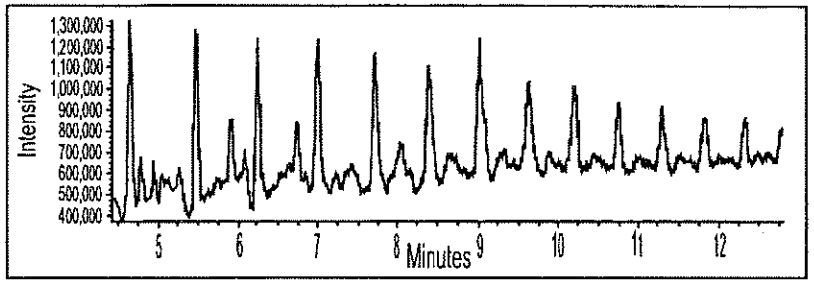
	Intensity	%Volume	%Weight
Saturates	2.49445E8	65.02	60.69
Paraffins	1.3117945E8	34.19	30.63
Monocycloparaffins	58564368	15.27	14.37
Dicycloparaffins	49908791	13.01	13.00
Tricycloparaffins	9792394	2.55	2.70
Aromatics	1.3420417E8	34.98	39.31
Monoaromatics	63044382	16.43	16.69
Benzenes	37639043	9.81	9.69
Baphtonebenzenes	16276759	4.24	4.48
Dioaphtenebenzenes	9128580	2.38	2.51
Diaromatics	26116772	6.81	7.62
Naphthalenes	19752217	5.15	5.64
Aconaphthenes, Dibenzoforans	1505206	0.39	0.45
Flubrenes	4859348	1.27	1.53
Triaromatics	3574291	0.93	1.18
Phenanthrenes	3574297	0.93	1.18
Naphthenaphenanthrenes	0	0.00	0.00
Tetraaromatics	1194753	0.31	0.44
Pyrenes	1194753	0.31	0.44
Chrysenes	0	0.00	0.00
Pentaaromatics	0	0.00	0.00
Perylenes	0	0.00	0.00
Oibenzanthracenes	0	0.00	0.00
Thiopheno Aromatics	40273974	10.50	13.37
Benzothiophenes	26713627	6.96	6.46
Dibenzothiophenes	13259282	3.46	4.80
Naphthobenzothiophenes	301065	0.08	0.11
Unidentified Aromatics	0	0.00	0.00
Class II	0	0.00	0.00
Class III	0	0.00	0.00
Class IV	0	0.00	0.00
Class V	0	0.00	0.00
Class VI	0	0.00	0.00
Class VII	0	0.00	0.00

Analysis of the Fraction 420 – 755°F

ASA Expert 1.0 6/14/2006

File: C:\msdchem\1\DATAMEXICO\05230508.D\05230608_MS.cdf
Sample ID: CrudoMedianol
Molecular Weight: 260
Injection Date: 200652304200-0500
From: 4.42 Minutes
To: 12.82 Minutes

Aromatic and Saturate Analysis
By Mass Spectrometry



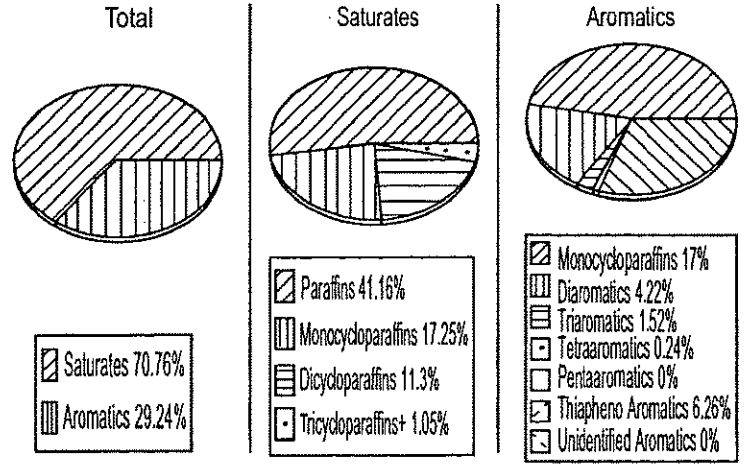


Fig.51 Base Lubricants

ASA Expert 1.0 6/14/2006

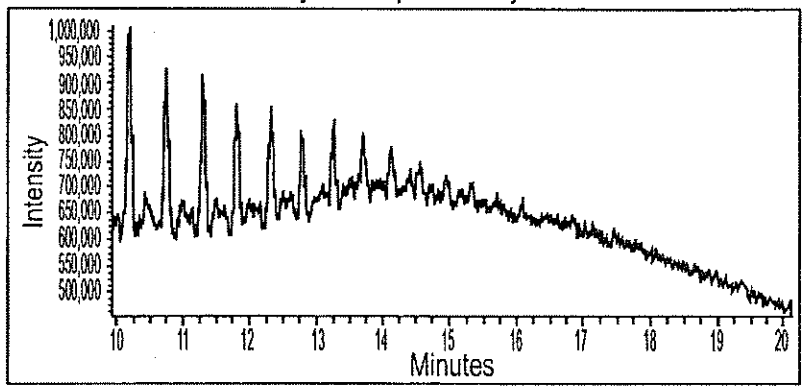
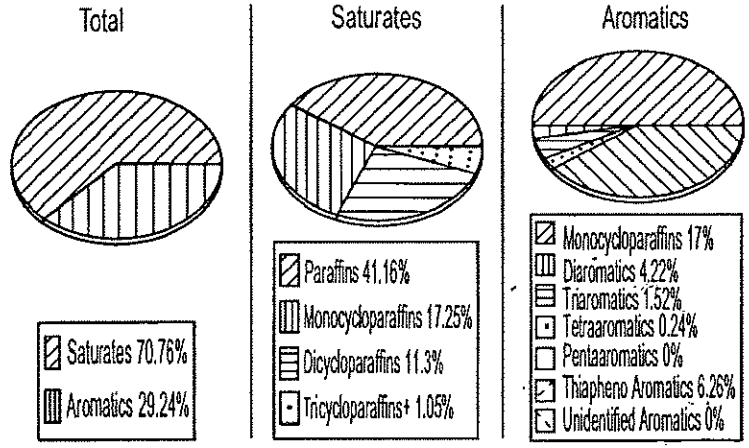
File: C:\msdchem\1\DATAMEXICO\05230609.D\05230608_MS.cdf
Sample ID: CrudoMedianol
Molecular Weight: 450
Injection Date: 20060523204200-0500
From: 9.95 Minutes
To: 20.14 Minutes

Aromatic and Saturate Analysis By Mass Spectrometry

	Intensity	%Volume	%Weight
Saturates	1.5141924E8	62.88	60.05
Paraffins	61115355	25.38	23.48
Monocycloparaffins	43010476	17.86	16.93
Dicycloparaffins	38269844	15.89	15.79
Tricycloparaffins'	9023564	3.75	3.85
Aromatics	89390559	37.12	39.95
Monoaromatics	44994344	18.69	18.46
Benzenes	28002168	11.63	11.29
Naphtenebenzenes	9844475	4.09	4.15
Dinaphtenabenzenes	7147700	2.97	3.02
Diaromatics	2809044	1.17	0.26
Naphthalenes	0	0.00	0.00
Acenaphthenes, Dibenzofurans	757395	0.31	0.34
Flourenes	4051649	0.82	0.92
Triaromatics	2892232	1.62	1.79
Phenanthrenes	3892232	1.62	1.79
Naphthenophenanthrenes	0	0.00	0.00
Tetraaromatics	2329502	0.97	1.14
Pyrenes	2329502	0.97	1.14
Chrysenes	0	0.00	0.00
Pentaaromatics	0	0.00	0.00
Perylenes	0	0.00	0.00
Dibenzanthracenes	0	0.00	0.00
Thiophena Aromatics	35365438	14.69	17.31
Benzothraphenes	24479240	10.18	11.61
Dibenzothiophenes	9999246	4.15	5.22
Naphthabenzothiophenes	887952	0.37	0.48
Unidentified Aromatics	0	0.00	0.00
Class II	0	0.00	0.00
Class III	0	0.00	0.00
Class IV	0	0.00	0.00
Class V	0	0.00	0.00
Class VI	0	0.00	0.00
Class VII	0	0.00	0.00

Analysis of the Fractions 650 – 1000°F

ASA Expert 1.0 6/14/2006

File: C:\msdchem\1\DATAMEXICO\05230609.D\05230608_MS.cdf
Sample ID: CrudoMedianol
Molecular Weight: 450
Injection Date: 20060523204200-0500
From: 9.95 Minutes
To: 20.14 Minutes

Aromatic and Saturate Analysis By Mass Spectrometry