



**Geochemical Analysis of Core Samples
and Hydrocarbon Fluids
From Well 1/3-9**

December 1998

**by
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B199-35-1

14 JAN. 1999

REGISTRERT

OLJEDIREKTORATET

1/3-9 NOCS Iatroscan Data

Depth (m)	4273.3	4274.4	4275.4	4276.4	4276.75	4277.25	4277.75
Saturates mg/gm	19.64	20.15	17.80	17.93	8.35	20.03	19.03
Aromatics mg/gm	1.05	1.27	4.02	0.90	1.78	0.39	0.28
Resin A mg/gm	0.23	0.27	0.43	0.22	0.38	0.23	0.46
Resins B mg/gm	0.68	0.21	0.70	1.41	0.40	0.52	1.24
Total Extract mg/gm	21.60	21.90	22.95	20.46	10.91	21.17	21.02
Saturates %wt	90.92	91.98	77.58	87.62	76.51	94.58	90.56
Aromatics %wt	4.88	5.80	17.52	4.41	16.31	1.85	1.34
Resin A %wt	1.05	1.25	1.87	1.09	3.50	1.10	2.20
Resin B %wt	3.14	0.97	3.03	6.88	3.69	2.46	5.89

Depth (m)	4278.45	4279.4	4280.5	4281.5	4282.5	4283.5	4284.4
Saturates mg/gm	16.98	14.90	12.90	10.92	8.29	6.71	9.33
Aromatics mg/gm	0.57	2.22	0.90	2.58	1.21	1.13	1.30
Resin A mg/gm	0.39	0.43	0.32	0.40	0.28	0.37	0.53
Resins B mg/gm	3.87	1.09	0.74	0.61	0.33	0.46	0.69
Total Extract mg/gm	21.79	18.64	14.86	14.50	10.11	8.67	11.86
Saturates %wt	77.90	79.94	86.81	75.26	82.02	77.42	78.68
Aromatics %wt	2.59	11.90	6.03	17.82	11.98	12.98	10.99
Resin A %wt	1.78	2.33	2.16	2.74	2.78	4.23	4.50
Resin B %wt	17.73	5.83	4.99	4.17	3.22	5.36	5.83

Depth (m)	4285.5	4286.5	4287.5	4288.5	4289.5	4290.5	4291.5
Saturates mg/gm	15.79	11.57	15.03	10.67	17.69	17.29	12.84
Aromatics mg/gm	1.24	0.84	2.87	2.39	1.24	1.93	0.58
Resin A mg/gm	0.52	0.50	0.35	0.37	0.35	0.32	0.43
Resins B mg/gm	2.02	1.08	0.18	0.23	0.81	1.58	1.61
Total Extract mg/gm	19.57	13.98	18.43	13.66	20.09	21.13	15.46
Saturates %wt	80.67	82.72	81.56	78.12	88.07	81.84	83.06
Aromatics %wt	6.33	5.97	15.57	17.51	6.19	9.14	3.76
Resin A %wt	2.65	3.57	1.90	2.70	1.73	1.53	2.77
Resin B %wt	10.35	7.74	0.97	1.67	4.02	7.48	10.42

Table 1

1/3-9 NOCS Iatroscan Data

Depth (m)	4292.55	4293.5	4294.5	4295.5	4296.5	4297.5	4298.5
Saturates mg/gm	17.83	10.96	9.13	7.29	9.99	13.91	13.12
Aromatics mg/gm	0.84	1.33	1.52	1.04	0.94	0.84	1.26
Resin A mg/gm	0.73	0.49	0.23	0.57	0.35	0.49	0.49
Resins B mg/gm	4.75	0.89	0.25	1.16	0.47	1.57	1.60
Total Extract mg/gm	24.15	13.67	11.13	10.06	11.75	16.81	16.48
Saturates %wt	73.82	80.16	82.04	72.45	85.02	82.73	79.60
Aromatics %wt	3.49	9.72	13.65	10.38	7.96	5.02	7.66
Resin A %wt	3.03	3.58	2.03	5.62	2.98	2.94	3.00
Resin B %wt	19.67	6.54	2.27	11.56	4.03	9.32	9.73

Depth (m)	4299.5	4300.5	4301.5	4303	4303.25	4303.55	4303.65
Saturates mg/gm	10.73	12.67	10.23	13.96	9.79	11.69	7.63
Aromatics mg/gm	0.91	1.22	1.24	0.87	0.40	0.57	0.26
Resin A mg/gm	0.49	0.31	0.50	0.78	0.51	0.58	0.24
Resins B mg/gm	0.41	1.65	0.51	1.75	1.14	0.63	0.59
Total Extract mg/gm	12.54	15.85	12.48	17.36	11.83	13.47	8.72
Saturates %wt	85.56	79.91	81.99	80.45	82.73	86.76	87.52
Aromatics %wt	7.29	7.70	9.91	4.99	3.35	4.22	2.95
Resin A %wt	3.87	1.99	4.02	4.48	4.33	4.31	2.80
Resin B %wt	3.27	10.40	4.08	10.08	9.59	4.70	6.73

Depth (m)	4303.75	4304	4304.18	4304.5	4304.75	4305.22	4305.5
Saturates mg/gm	5.01	4.78	4.64	14.30	3.81	9.58	2.89
Aromatics mg/gm	0.17	0.75	0.38	0.97	0.23	0.24	0.52
Resin A mg/gm	0.16	0.25	0.30	0.38	0.19	0.16	0.54
Resins B mg/gm	0.37	0.48	1.71	2.28	0.86	4.30	0.52
Total Extract mg/gm	5.71	6.26	7.03	17.94	5.09	14.28	4.47
Saturates %wt	87.73	76.32	65.94	79.73	74.84	67.07	64.66
Aromatics %wt	3.01	11.99	5.46	5.43	4.47	1.66	11.54
Resin A %wt	2.74	3.97	4.27	2.13	3.77	1.15	12.09
Resin B %wt	6.52	7.72	24.33	12.72	16.93	30.12	11.71

Table 1 cont

1/3-9 NOCS Iatroscan Data

Depth (m)	4306.5	4310.5	4315.5	4318.5	4318.75	4325.5	4330.5
Saturates mg/gm	3.88	5.31	4.09	8.51	9.26	1.80	1.31
Aromatics mg/gm	0.77	0.69	0.63	0.41	0.26	0.30	0.25
Resin A mg/gm	0.21	0.27	0.27	0.35	0.34	0.28	0.10
Resins B mg/gm	1.05	1.43	0.91	1.51	1.30	0.27	0.33
Total Extract mg/gm	5.91	7.70	5.90	10.78	11.15	2.65	1.99
Saturates %wt	65.60	68.93	69.34	78.90	83.00	67.83	65.80
Aromatics %wt	13.08	8.90	10.69	3.78	2.30	11.39	12.53
Resin A %wt	3.52	3.57	4.50	3.29	3.06	10.43	5.20
Resin B %wt	17.81	18.60	15.47	14.03	11.65	10.35	16.47

Depth (m)	4335.5	4339.5	4340.5	4341.5	4342.5	4343.5	4343.6
Saturates mg/gm	2.13	7.30	10.26	8.59	10.86	12.22	13.79
Aromatics mg/gm	0.39	0.39	1.55	0.48	1.44	0.93	1.33
Resin A mg/gm	0.31	0.11	0.39	0.23	0.40	0.40	1.04
Resins B mg/gm	0.51	0.20	1.23	2.12	0.99	1.69	11.13
Total Extract mg/gm	3.33	7.99	13.43	11.42	13.70	15.23	27.29
Saturates %wt	63.91	91.29	76.39	75.21	79.25	80.22	50.55
Aromatics %wt	11.68	4.84	11.57	4.18	10.54	6.10	4.88
Resin A %wt	9.18	1.38	2.89	2.03	2.95	2.60	3.81
Resin B %wt	15.23	2.49	9.15	18.57	7.25	11.08	40.77

1/3-9 NOCS Iatroscan Data

Depth (m)	4344.5	4345.5	4346.5	4347.5	4348.5	4349.5	4350.5
Saturates mg/gm	10.83	10.67	6.85	11.24	10.51	12.01	8.80
Aromatics mg/gm	0.83	1.03	1.10	1.29	1.28	1.66	0.94
Resin A mg/gm	0.32	0.19	0.33	0.46	0.39	0.44	0.33
Resins B mg/gm	0.53	0.21	0.26	0.84	0.85	0.54	1.51
Total Extract mg/gm	12.52	12.11	8.54	13.83	13.04	14.65	11.59
Saturates %wt	86.52	88.13	80.25	81.24	80.64	81.92	75.97
Aromatics %wt	6.64	8.52	12.85	9.35	9.80	11.35	8.15
Resin A %wt	2.59	1.57	3.89	3.33	3.01	3.01	2.82
Resin B %wt	4.26	1.78	3.01	6.08	6.55	3.72	13.06

Depth (m)	4351.5	4352.5	4353.5	4354.5	4355.5	4356.5
Saturates mg/gm	7.27	18.52	19.54	9.39	14.61	6.44
Aromatics mg/gm	0.89	1.02	1.94	1.29	0.86	0.94
Resin A mg/gm	0.25	0.29	0.64	0.36	0.36	0.28
Resins B mg/gm	0.26	0.27	0.44	1.29	1.66	0.62
Total Extract mg/gm	8.68	20.10	22.56	12.33	17.48	8.28
Saturates %wt	83.76	92.17	86.62	76.18	83.57	77.74
Aromatics %wt	10.27	5.06	8.61	10.44	4.89	11.40
Resin A %wt	2.93	1.46	2.84	2.91	2.04	3.41
Resin B %wt	3.05	1.32	1.94	10.46	9.49	7.46

Oil Analysis

Well name : 1/3-9
Suite name : 1/3-9 Oil Residue Study
Country Of Origin : Norway
Depth (m) : 4279.5
Sample name : Residue ex MRSCDA-110
Test Number :
G number : G 3411
Lab Number : 9809OIL002S001

Inspection Properties

API :
Density @ 15 deg C :
Wax Content %wt :
Wax Melting Point deg C :
Pour Point deg C :
Viscosity cSt @ 20 deg C :
Total Acidity mg KOH/g :
Asphaltenes %wt (IP Method) :
Nitrogen ppm :
Sulphur %wt :
Nickel ppm :
Vanadium ppm :
Nickel/Vanadium :

Biomarker Ratios

H1 : 0.60	S1 : 0.66	M2 : 1.05
H2 : 0.37	S2 : 0.60	M3 : 0.97
H3 : 0.88	S3 : 59:14:26	M4 : 26.50
H4 : 0	S4 : 38:27:34	M5 :
H5 : 100:161:104:63:52:37	S5 : 48.45	A1 : 0.00
H6 : 0.47	S6 :	A2 : 0.00
H7 : 0.39	S7 : 69.46	A3 : 0.00
H8 :	S8 : 0.00	A4 : 0.00
H9 :	S9 :	A5 : 0.00
H10 :	S10 :	A6 : 0.00
H11 : 51.10		MDR : 8.10
H12 : 40.22		MBP : 7.73
H13 : 0.00		
H14 : 116.35		
H15 : 0.00		
H16 : 0.00		
H17 : 41.94		
H18 : 0.00		

HPLC

Saturates %wt :
Aromatics %wt :
Residues %wt :

Asphaltenes (Micro Method) %wt :

Saturates GC

Pristane/Phytane :
Pristane/nC17 :
Phytane/nC18 :
CPI :
ALKIND :
R22 :

Light Hydrocarbons

MCH % : 36.1
HER : 0.43
HXR : 0.58

Stable Carbon Isotopes

Saturates : -29.5
Total Oil : -29.5
Aromatics : -28.7
Residue :
Asphaltenes :

STANDARD: NBS22 -29.8

N.B. HER - Heptane/Heptane+Methylcyclohexane
 HXR - Hexane/Hexane+cyclohexane
 MCH% - Methylcyclohexane as Percentage of C7 Components

Oil Analysis

Well name : 1/3-9 ST2
Suite name : 1/3-9 Oil Residue Study
Country Of Origin : Norway
Depth (m) : 4346.5
Sample name : 4346.5mbrt MPSRBA-783
Test Number :
G number : G 3422
Lab Number: 9809OIL002S002

Inspection Properties

API :
Density @ 15 deg C :
Wax Content %wt :
Wax Melting Point deg C :
Pour Point deg C :
Viscosity cSt @ 20 deg C :
Total Acidity mg KOH/g :
Asphaltenes %wt (IP Method) :
Nitrogen ppm :
Sulphur %wt :
Nickel ppm :
Vanadium ppm :
Nickel/Vanadium :

Biomarker Ratios

H1 : 0.49	S1 : 0.53	M2 : 1.15
H2 : 0.54	S2 : 0.56	M3 : 1.05
H3 : 0.72	S3 : 30:24:44	M4 : 29.48
H4 : 0	S4 : 34:31:34	M5 :
H5 : 100:134:107:49:39:28	S5 : 70.53	A1 : 0.00
H6 : 0.45	S6 :	A2 : 0.00
H7 : 0.47	S7 : 40.79	A3 : 0.00
H8 :	S8 : 0.00	A4 : 0.00
H9 :	S9 :	A5 : 0.00
H10 :	S10 :	A6 : 0.00
H11 : 32.15		MDR : 8.22
H12 : 25.70		MBP : 8.29
H13 : 24.16		
H14 : 124.26		
H15 : 0.00		
H16 : 2.91		
H17 : 42.36		
H18 : 0.00		

HPLC

Saturates %wt :
Aromatics %wt :
Residues %wt :

Asphaltenes (Micro Method) %wt :

Saturates GC

Pristane/Phytane :
Pristane/nC17 :
Phytane/nC18 :
CPI :
ALKIND :
R22 :

Light Hydrocarbons

MCH % : 35.6
HER : 0.43
HXR : 0.59

Stable Carbon Isotopes

Saturates :
Total Oil :
Aromatics :
Residue :
Asphaltenes :

STANDARD:

N.B. HER - Heptane/Heptane+Methylcyclohexane
 HXR - Hexane/Hexane+cyclohexane
 MCH% - Methylcyclohexane as Percentage of C7 Components

Oil Analysis

Well name : 1/3-9 ST2
Suite name : 1/3-9 Oil Residue Study
Country Of Origin : Norway
Depth (m) :
Sample name : Drilling Mud Sample
Test Number :
G number : G 3423
Lab Number: 9809OIL002S003

HPLC

Saturates %wt :
Aromatics %wt :
Residues %wt :
Asphaltenes (Micro Method) %wt :

Inspection Properties

API :
Density @ 15 deg C :
Wax Content %wt :
Wax Melting Point deg C :
Pour Point deg C :
Viscosity cSt @ 20 deg C :
Total Acidity mg KOH/g :
Asphaltenes %wt (IP Method) :
Nitrogen ppm :
Sulphur %wt :
Nickel ppm :
Vanadium ppm :
Nickel/Vanadium :

Saturates GC

Pristane/Phytane :
Pristane/nC17 :
Phytane/nC18 :
CPI :
ALKIND :
R22 :

Light Hydrocarbons

MCH % :
HER :
HXR :

Stable Carbon Isotopes

Saturates :
Total Oil :
Aromatics :
Residue :
Asphaltenes :

STANDARD:

Biomarker Ratios

H1 : 0.75	S1 : 0.44	M2 : 0.84
H2 : 0.00	S2 : 0.37	M3 : 0.53
H3 : 0.91	S3 : 64:11:23	M4 : 0.00
H4 : 0	S4 : 26:37:36	M5 :
H5 : 0:0:0:0:0:0	S5 : 20.43	A1 : 0.00
H6 : 0.35	S6 :	A2 : 0.00
H7 : 0.00	S7 : 73.48	A3 : 0.00
H8 :	S8 : 0.00	A4 : 0.00
H9 :	S9 :	A5 : 0.00
H10 :	S10 :	A6 : 0.00
H11 : 103.18		MDR : 4.67
H12 : 31.95		MBP : 5.29
H13 : 14.28		
H14 : 0.00		
H15 : 0.00		
H16 : 0.00		
H17 : 0.00		
H18 : 0.00		

N.B. HER - Heptane/Heptane+Methylcyclohexane
 HXR - Hexane/Hexane+cyclohexane
 MCH% - Methylcyclohexane as Percentage of C7 Components

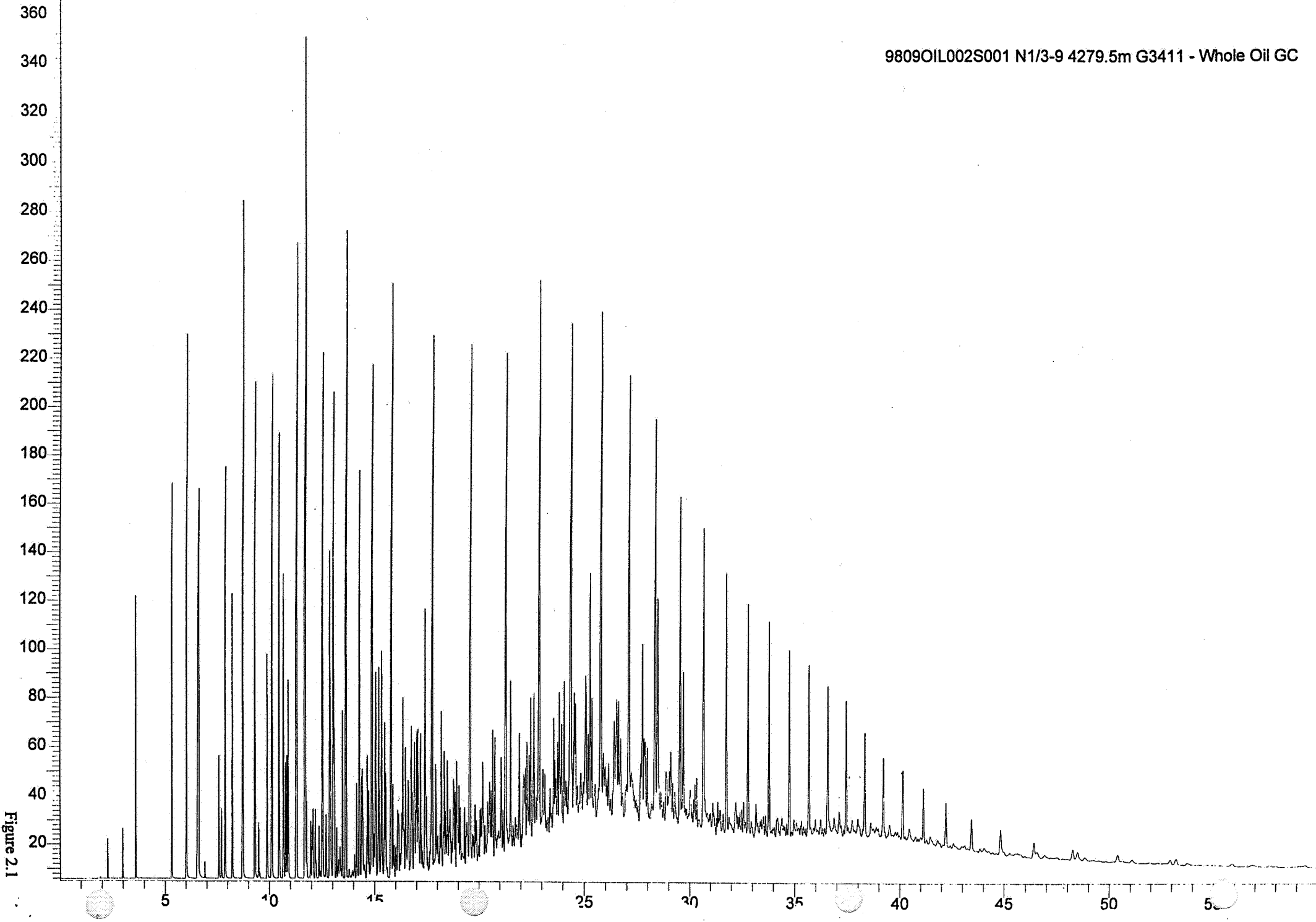


Figure 2.1

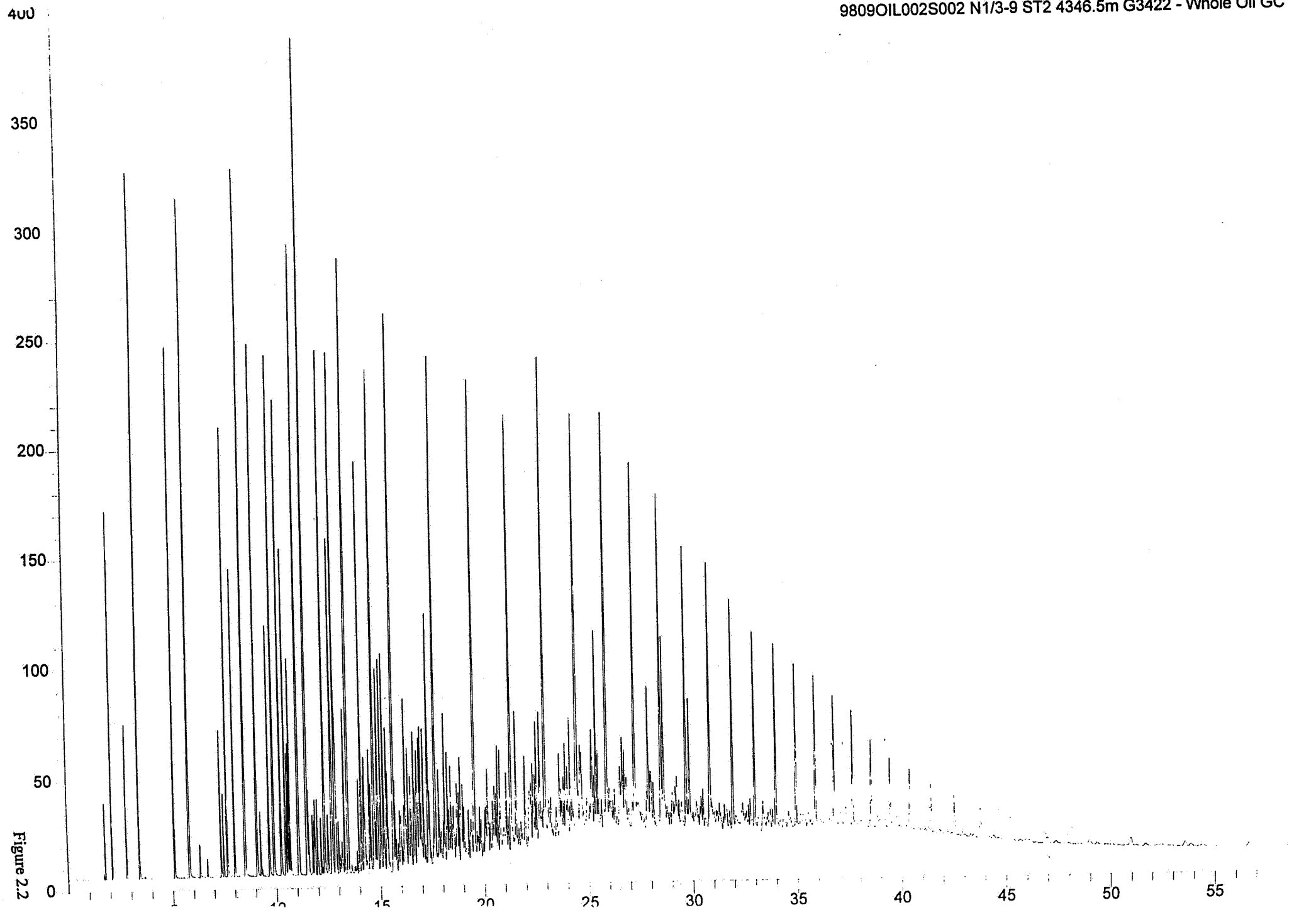


Figure 2.2

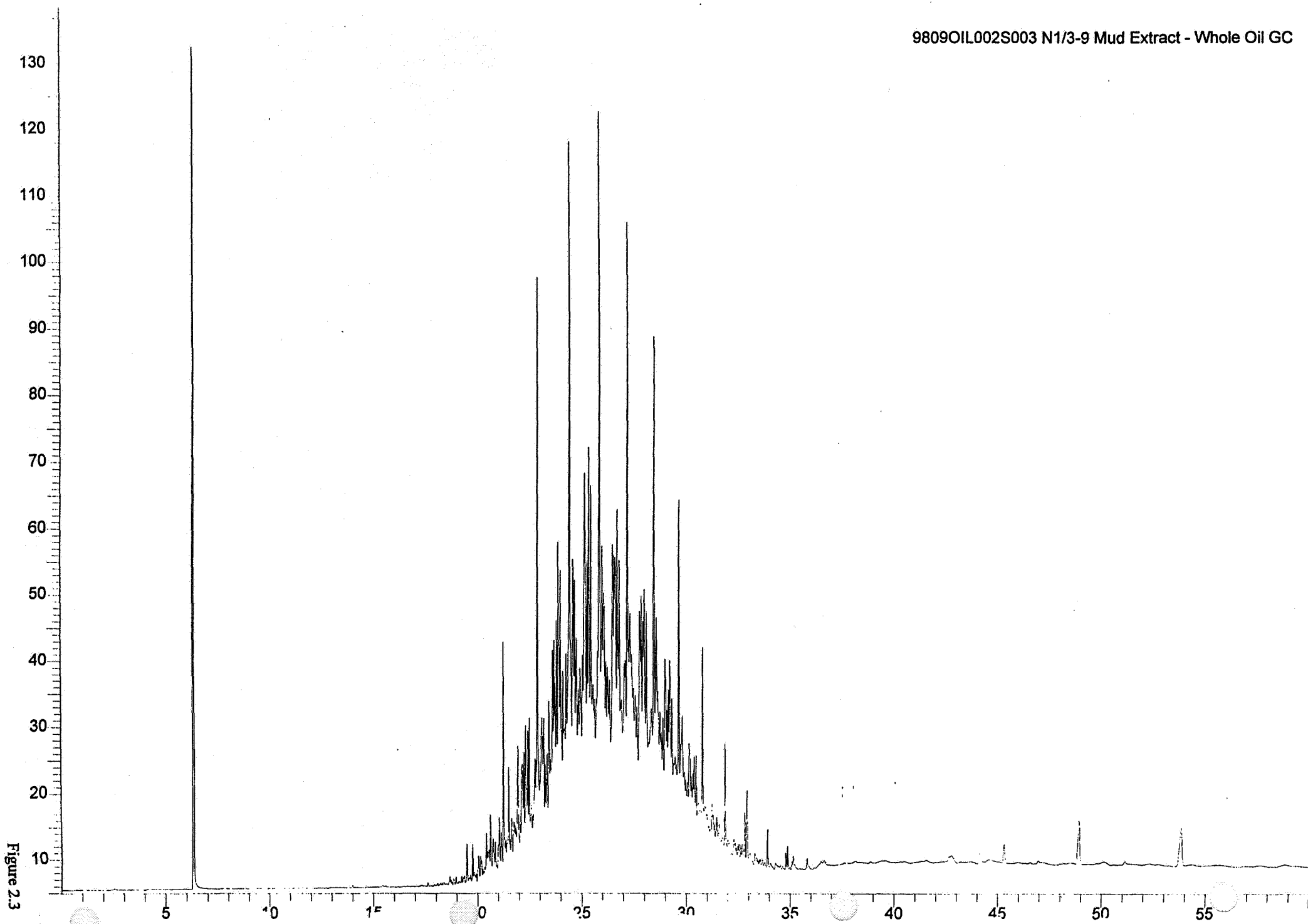


Figure 2.3

9809OIL002S001 N1/3-9 4279.5m G3411 - Light Hydrocarbon Dist.

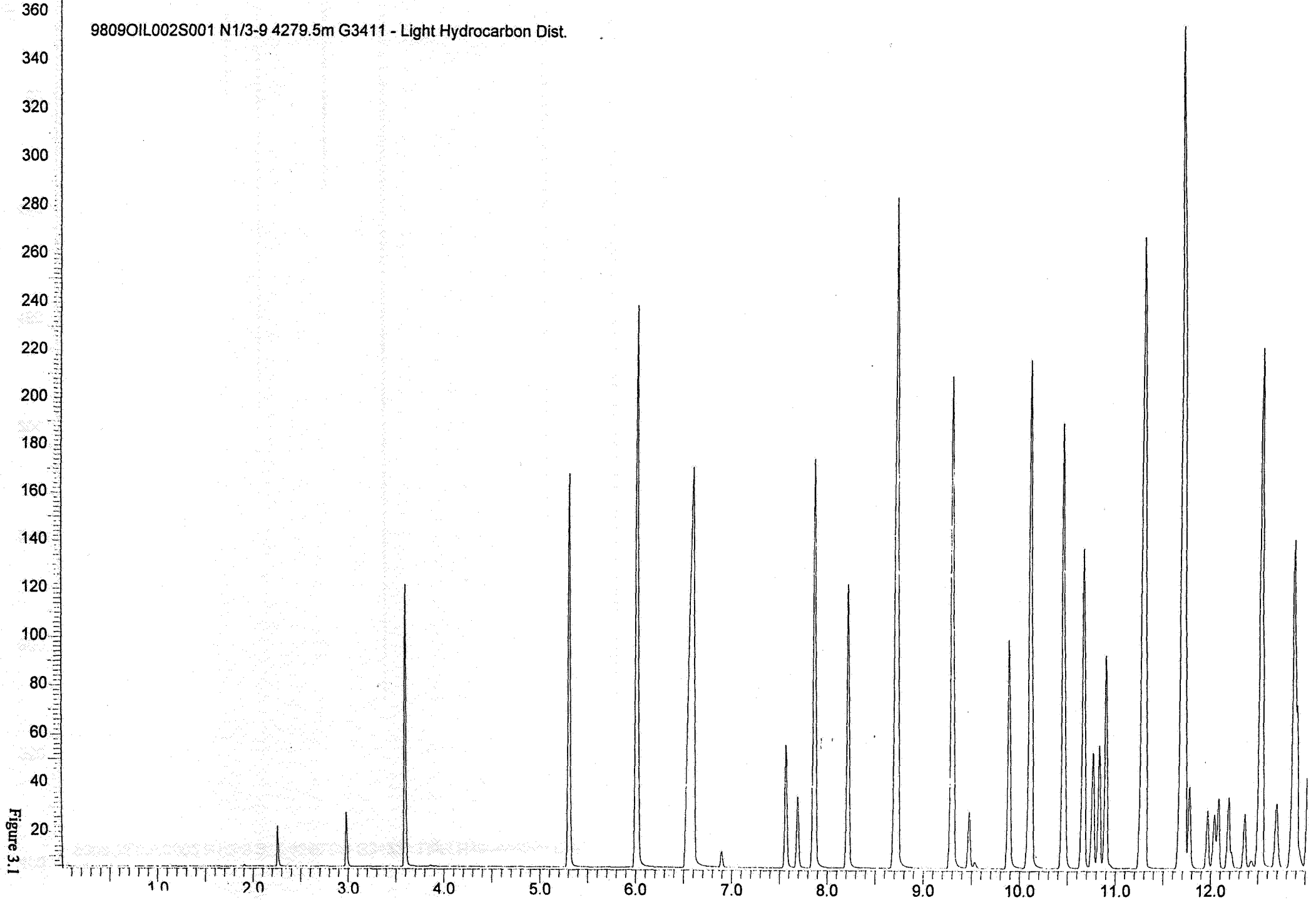


Figure 3.1

9809OIL002S002 N1/3-9 ST2 4346.5m G3422 - Light Hydrocarbon Dist.

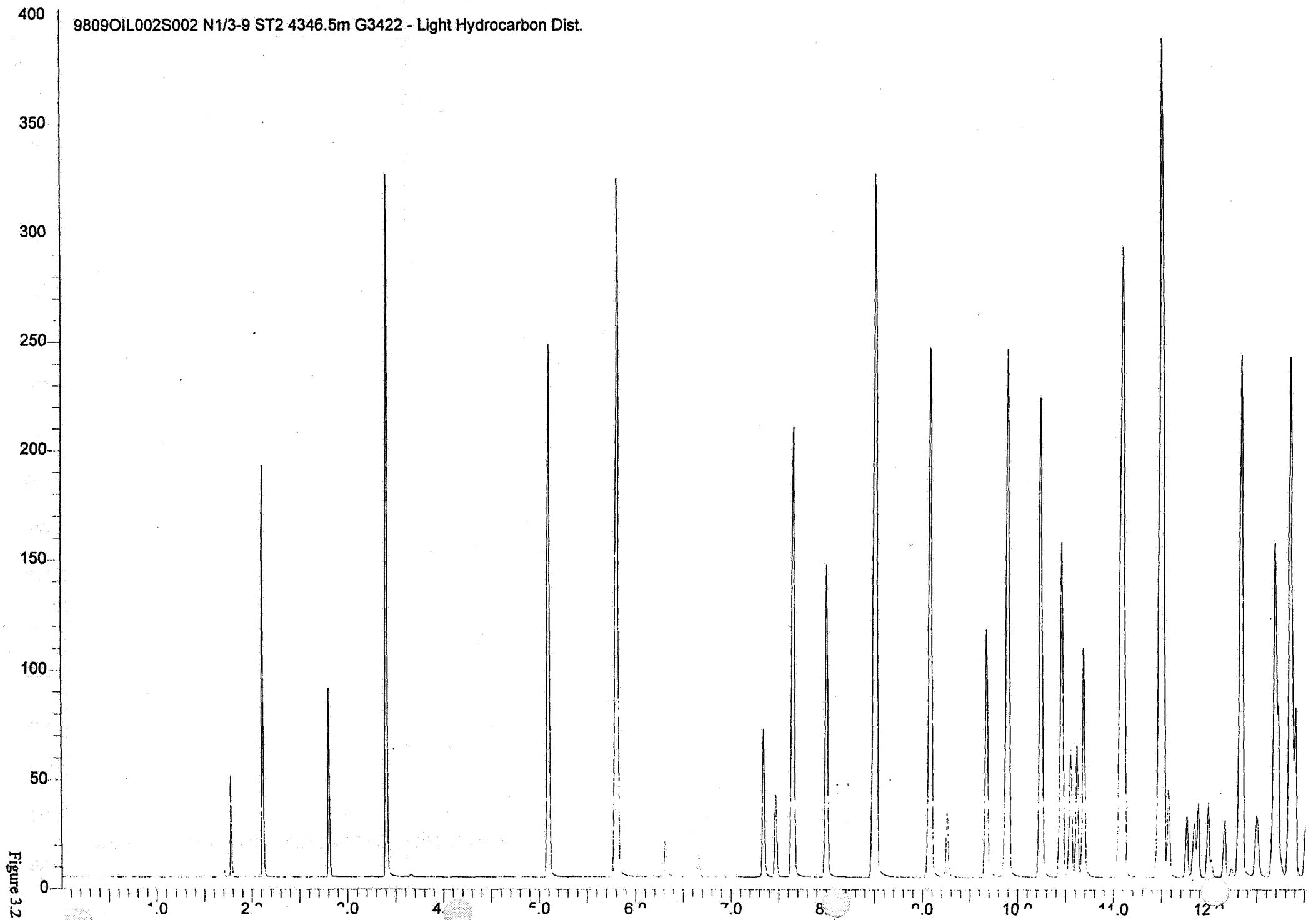
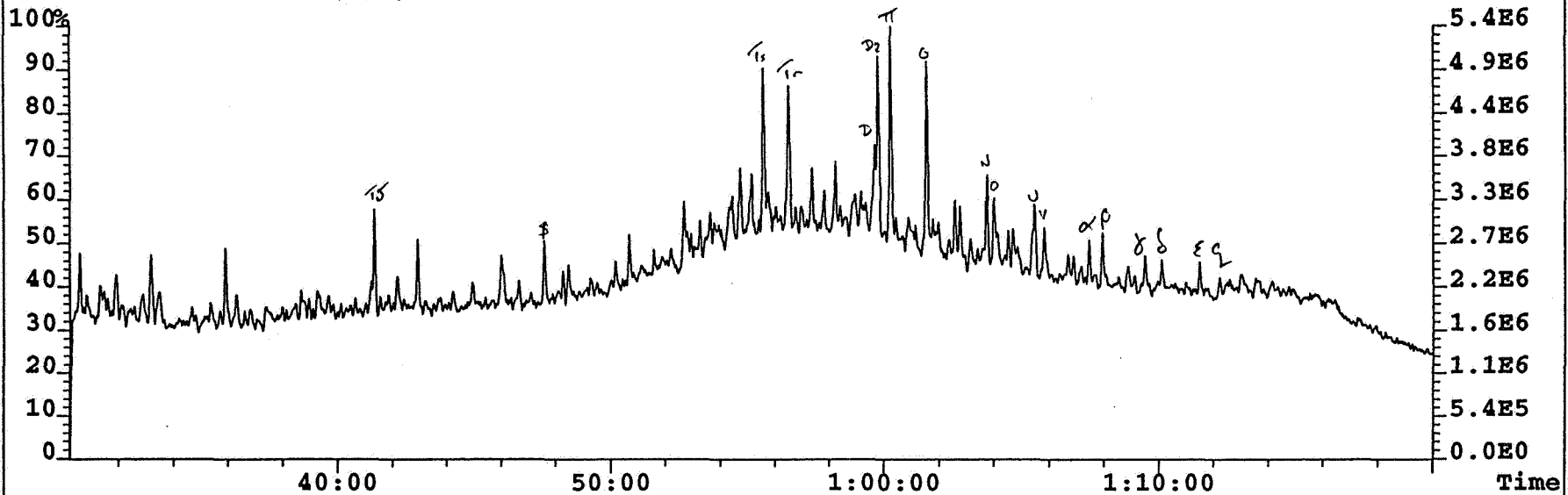


Figure 3.2

File:MPDMIO00781 #1-3086 Acq:22-SEP-1998 12:55:04 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 4279.5m G3411 \$9809OIL002S001\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
191.1799 S:2 F:2 SMO(1,3)



217.1956 S:2 F:2 SMO(1,3)

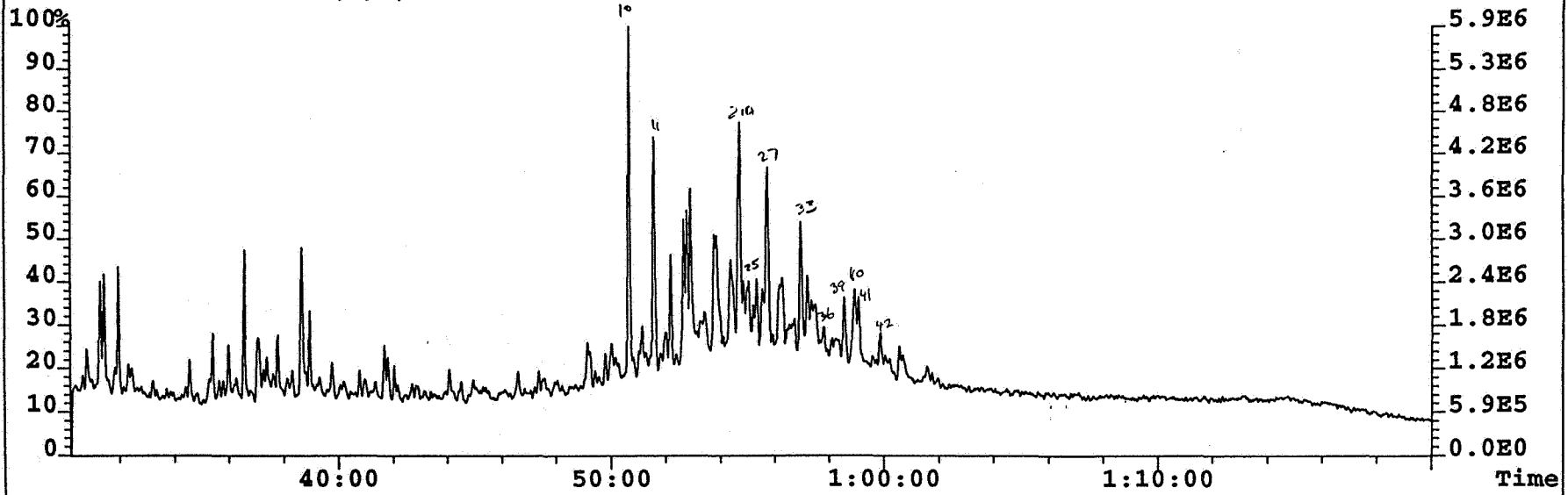


Figure 4.1

File:MPDMIO00781 #1-3086 Acq:22-SEP-1998 12:55:04 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 4279.5m G3411 \$9809OIL002S001\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
177.1643 S:2 F:2 SMO(1,3)

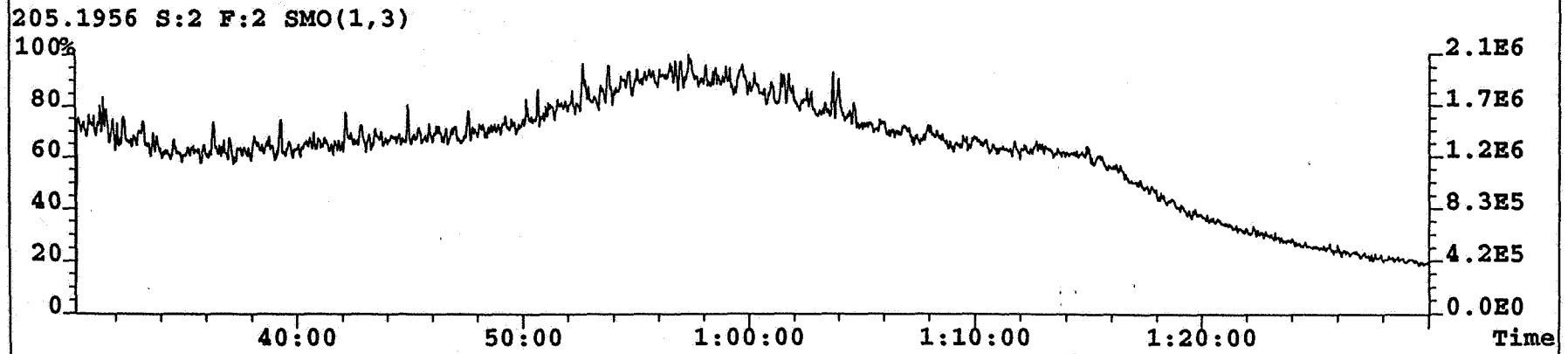
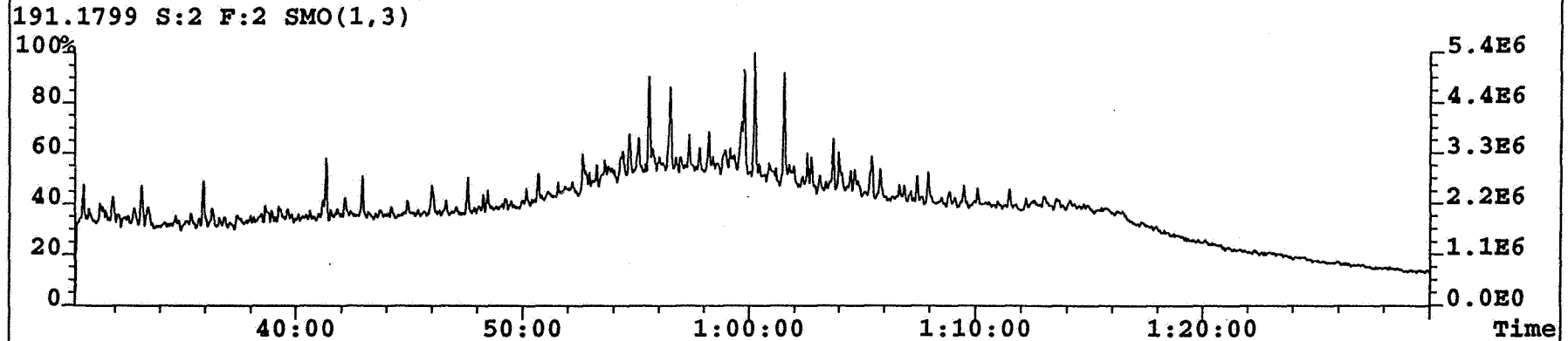
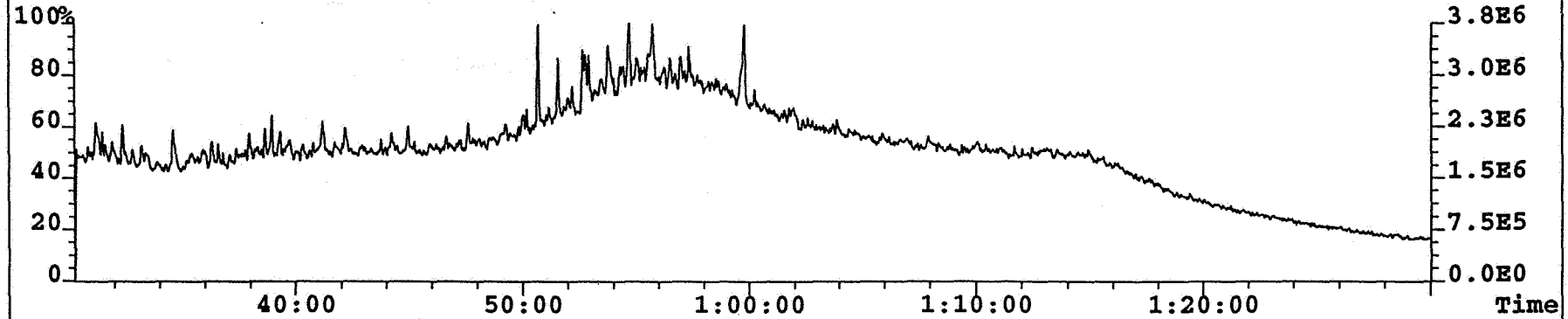
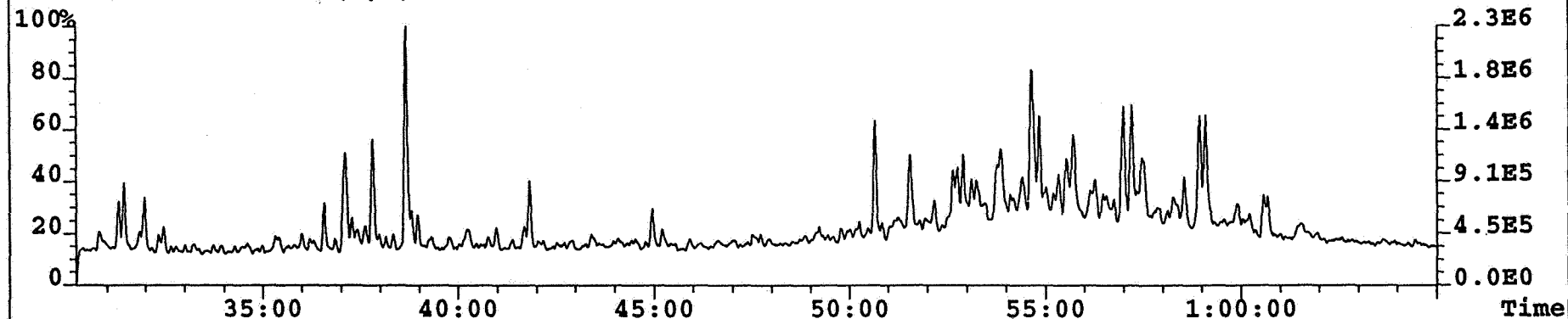
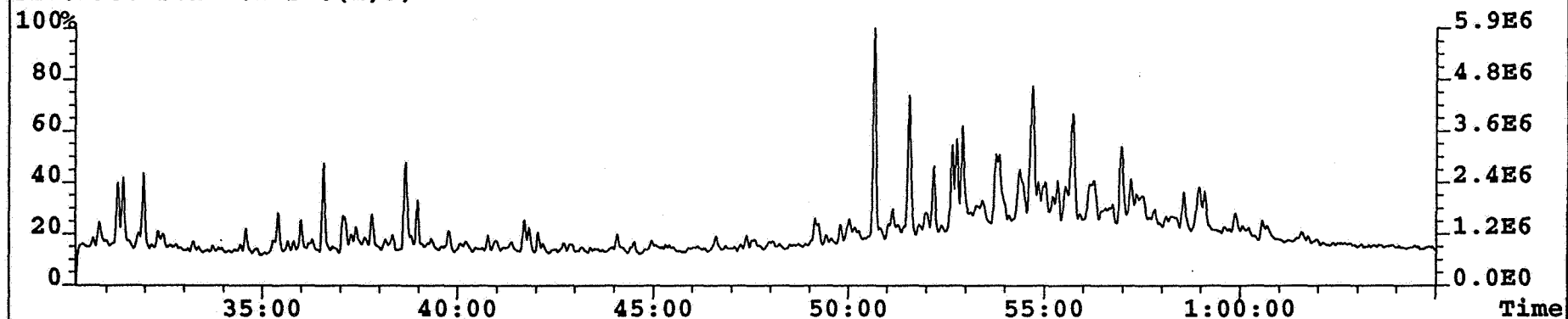


Figure 4.2

File:MPDMIO00781 #1-3086 Acq:22-SEP-1998 12:55:04 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 4279.5m G3411 \$9809OIL002S001\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
218.2033 S:2 F:2 SMO(1,3)



217.1956 S:2 F:2 SMO(1,3)



217.1956 S:2 F:2 SMO(1,3)

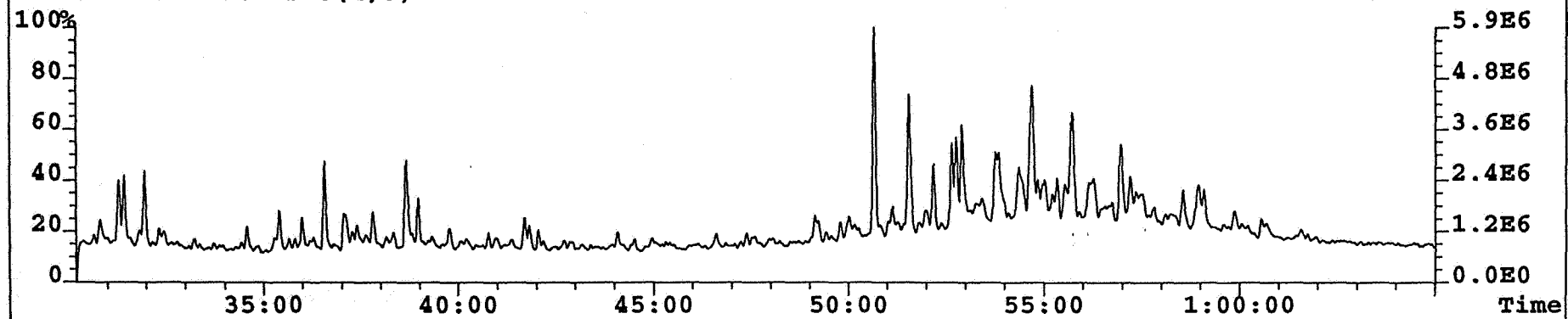
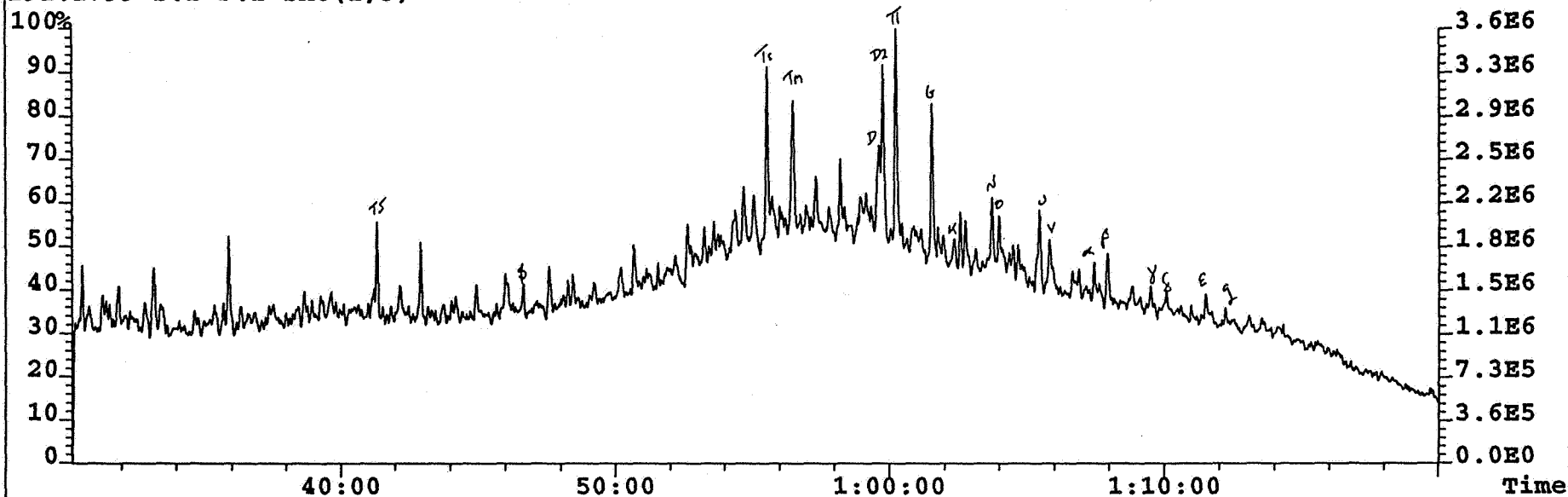


Figure 4.3

File:MPDMIO00790 #1-3087 Acq:16-OCT-1998 13:30:15 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 ST2 4346.5m G3422 \$9809OIL002S002\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
191.1799 S:2 F:2 SMO(1,3)



217.1956 S:2 F:2 SMO(1,3)

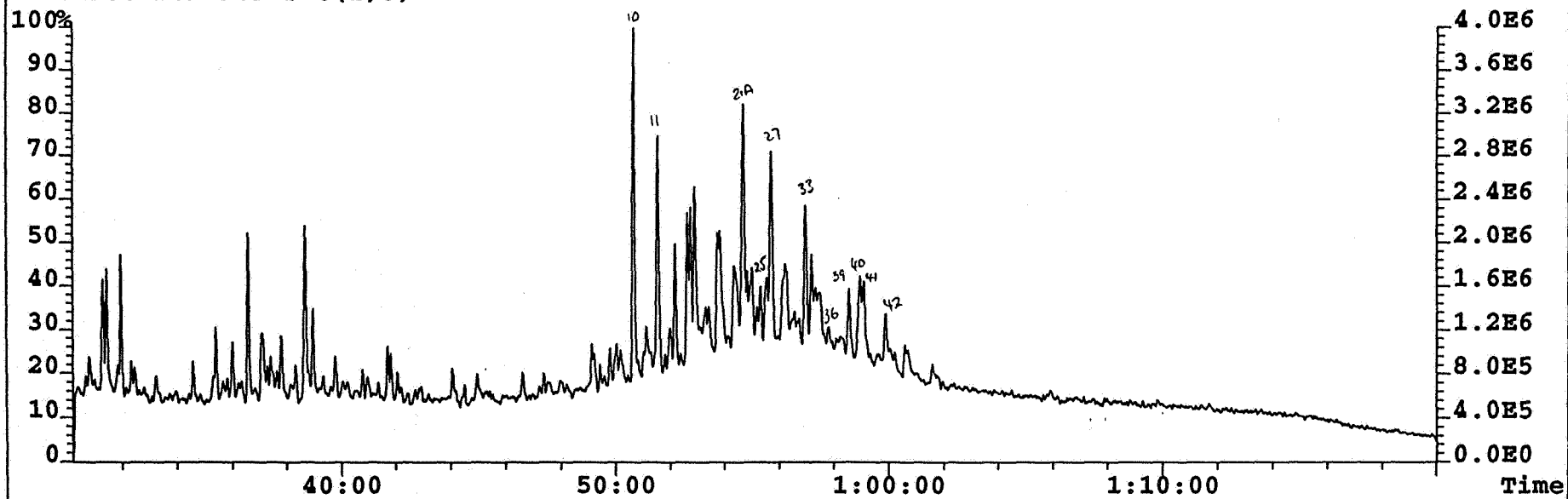
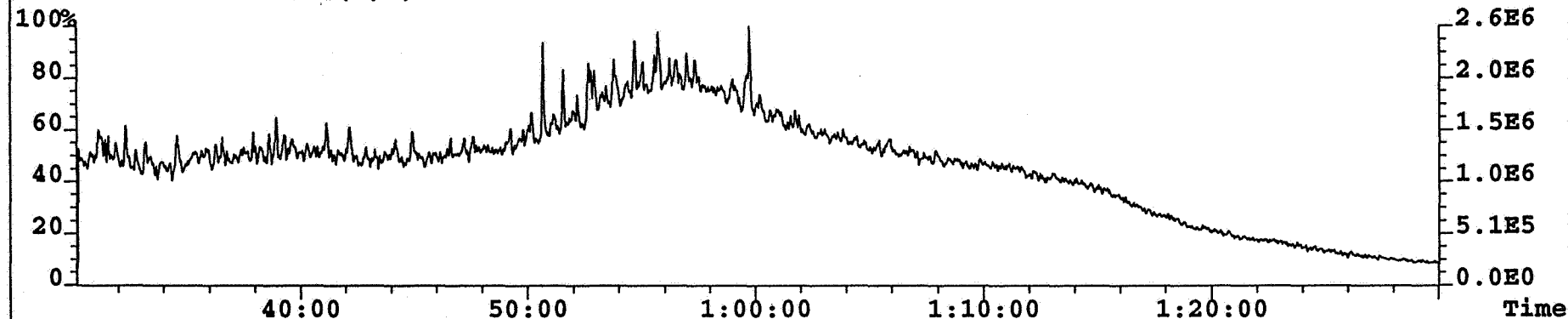
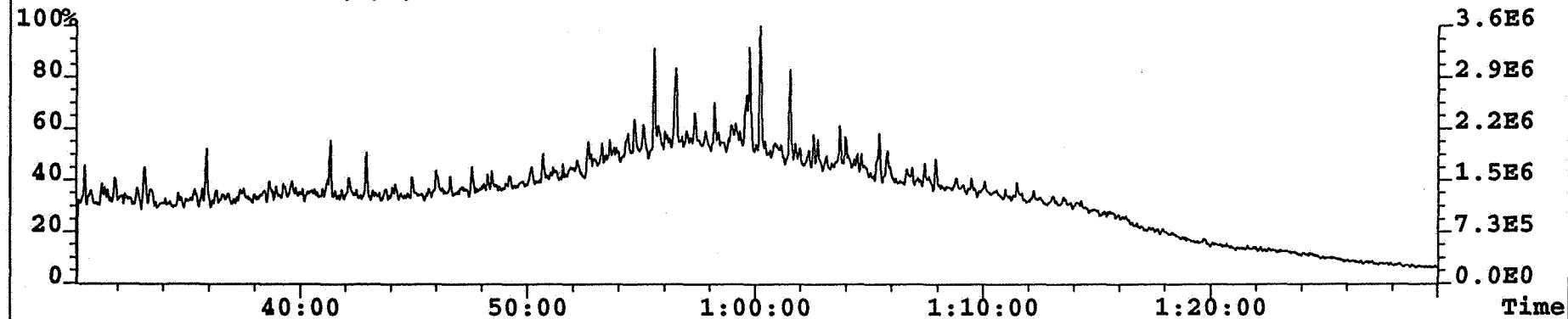


Figure 4.4

File:MPDMIO00790 #1-3087 Acq:16-OCT-1998 13:30:15 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 ST2 4346.5m G3422 \$9809OIL002S002\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
177.1643 S:2 F:2 SMO(1,3)



191.1799 S:2 F:2 SMO(1,3)



205.1956 S:2 F:2 SMO(1,3)

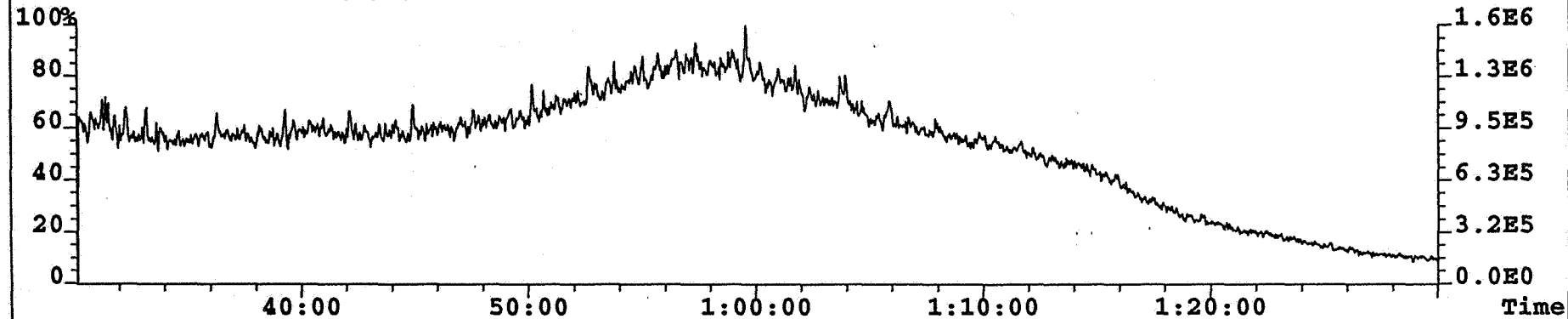
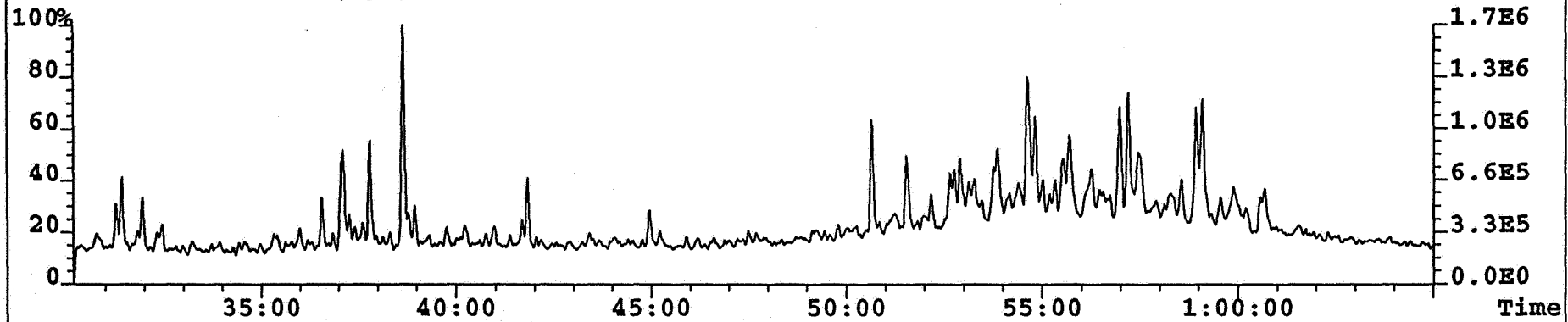
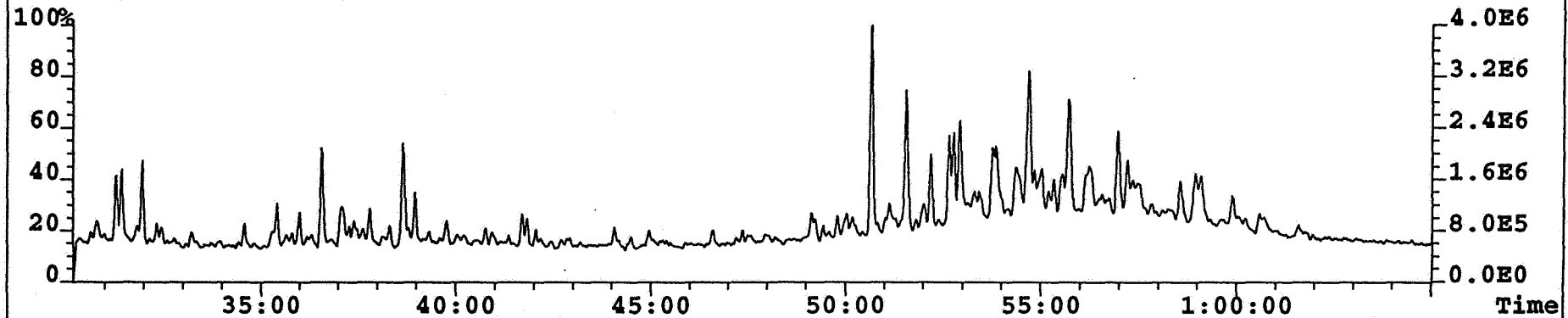


Figure 4.5

File:MPDMIO00790 #1-3087 Acq:16-OCT-1998 13:30:15 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 ST2 4346.5m G3422 \$9809OIL002S002\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
218.2033 S:2 F:2 SMO(1,3)



217.1956 S:2 F:2 SMO(1,3)



217.1956 S:2 F:2 SMO(1,3)

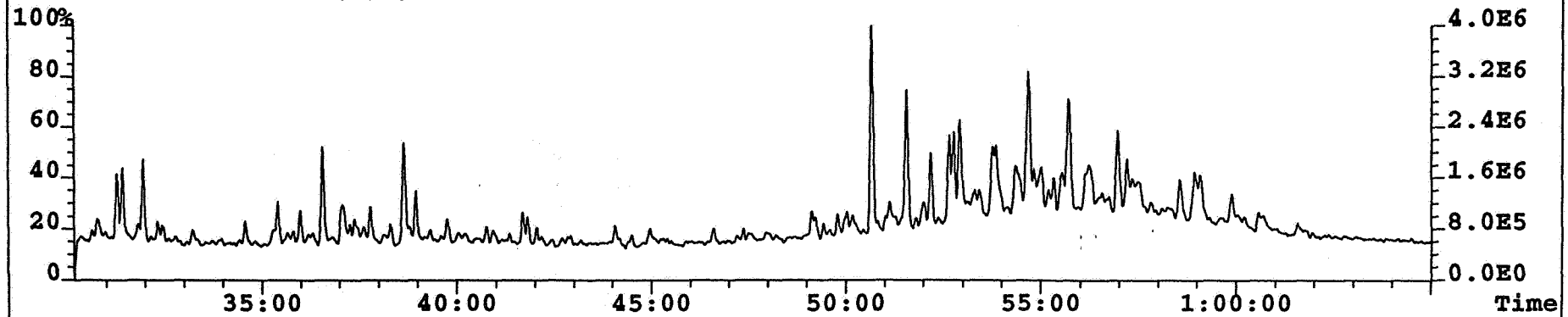
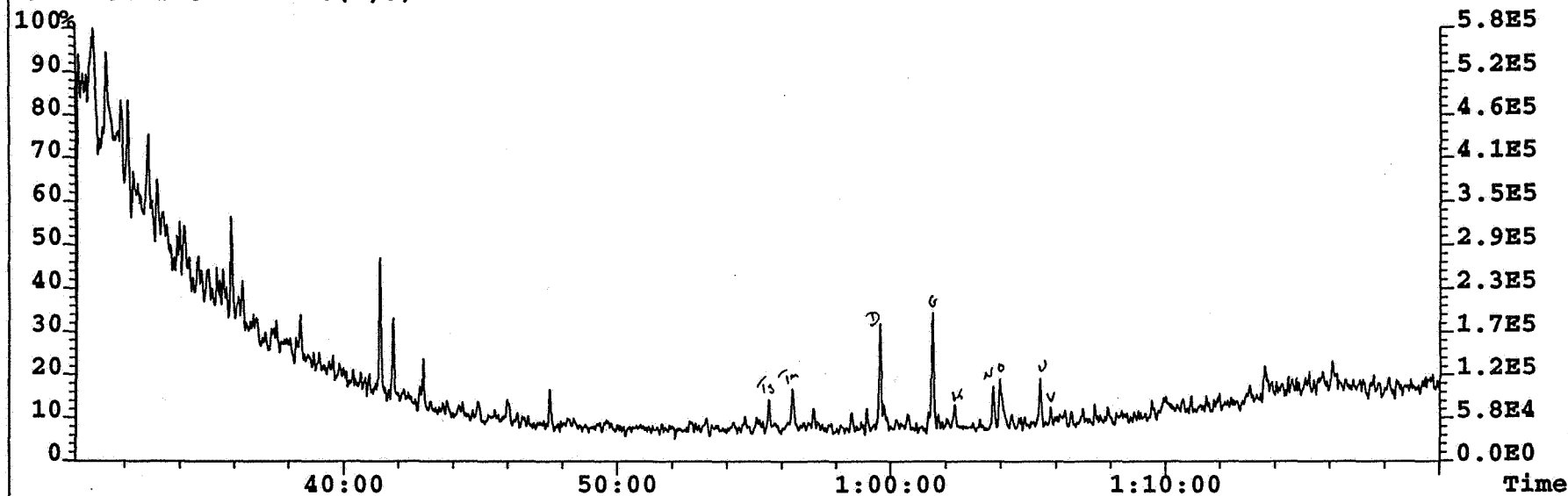


Figure 4.6

File:MPDMIO00790 #1-3087 Acq:16-OCT-1998 15:11:33 GC EI+ Voltage SIR 70SE
Sample#3 Text:N1/3-9 ST2 Mud Extract \$9809OIL002S003\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
191.1799 S:3 F:2 SMO(1,3)



217.1956 S:3 F:2 SMO(1,3)

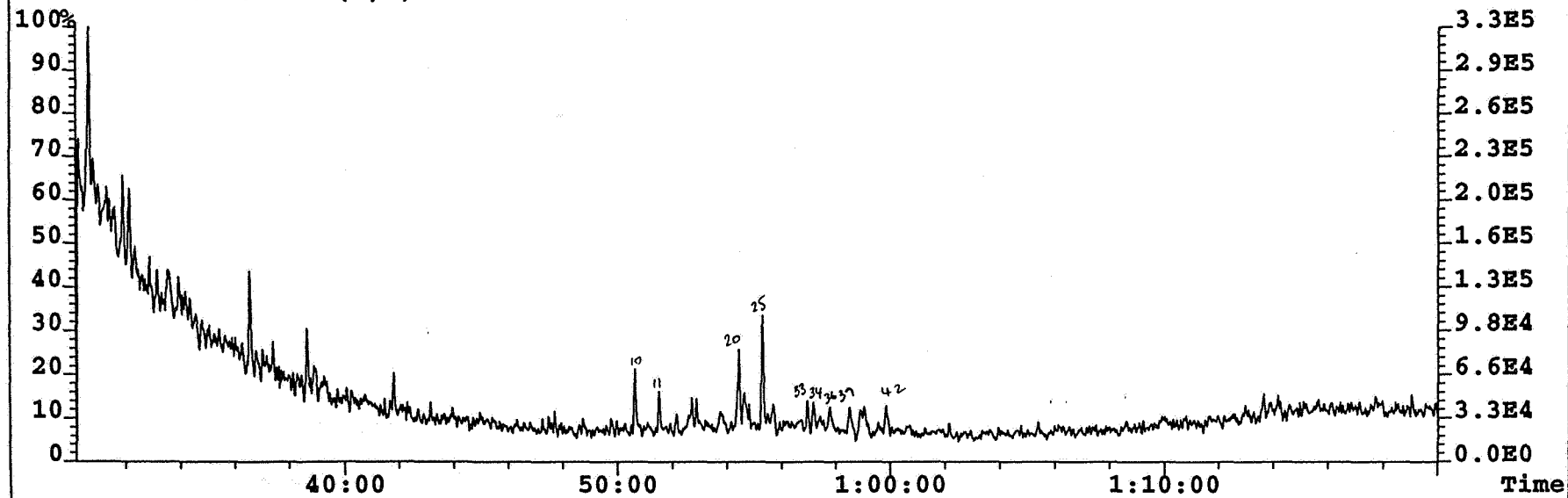
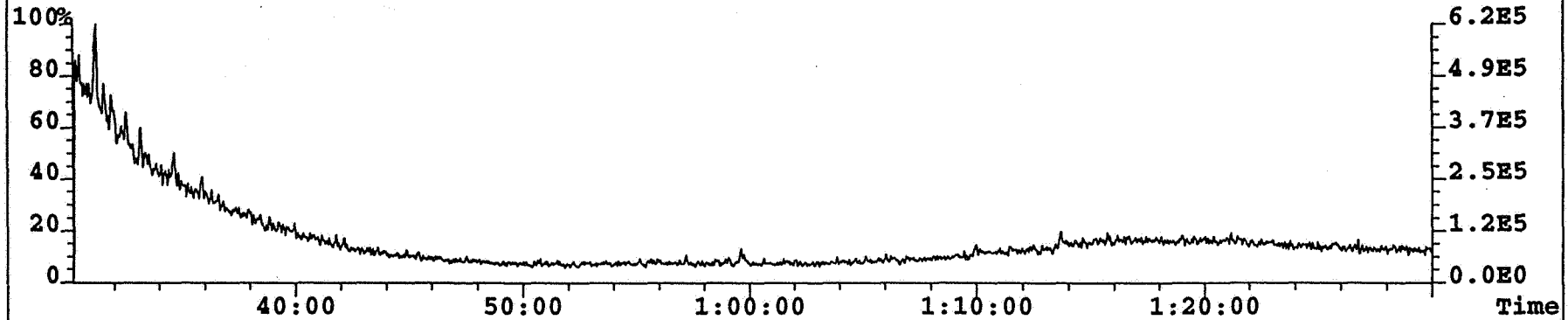
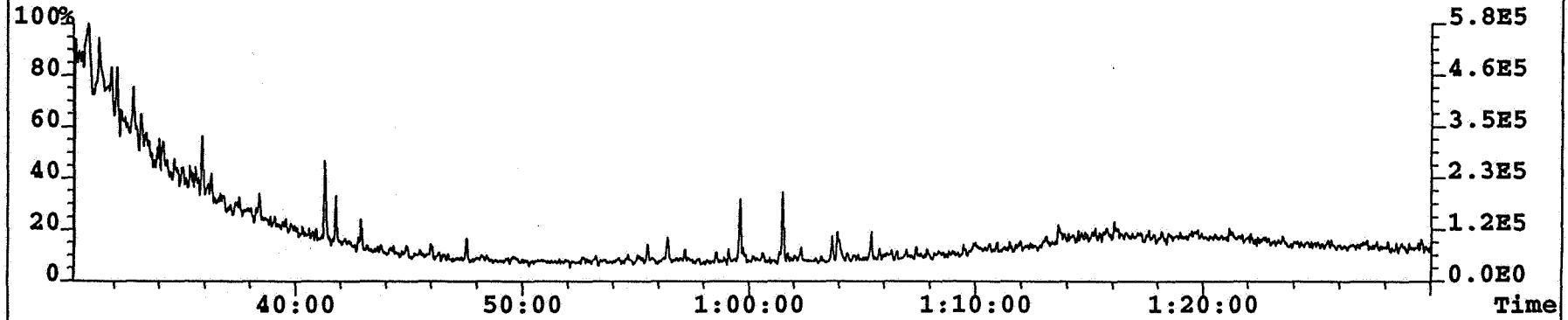


Figure 4.7

File:MPDMIO00790 #1-3087 Acq:16-OCT-1998 15:11:33 GC EI+ Voltage SIR 70SE
Sample#3 Text:N1/3-9 ST2 Mud Extract \$9809OIL002S003\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
177.1643 S:3 F:2 SMO(1,3)



191.1799 S:3 F:2 SMO(1,3)



205.1956 S:3 F:2 SMO(1,3)

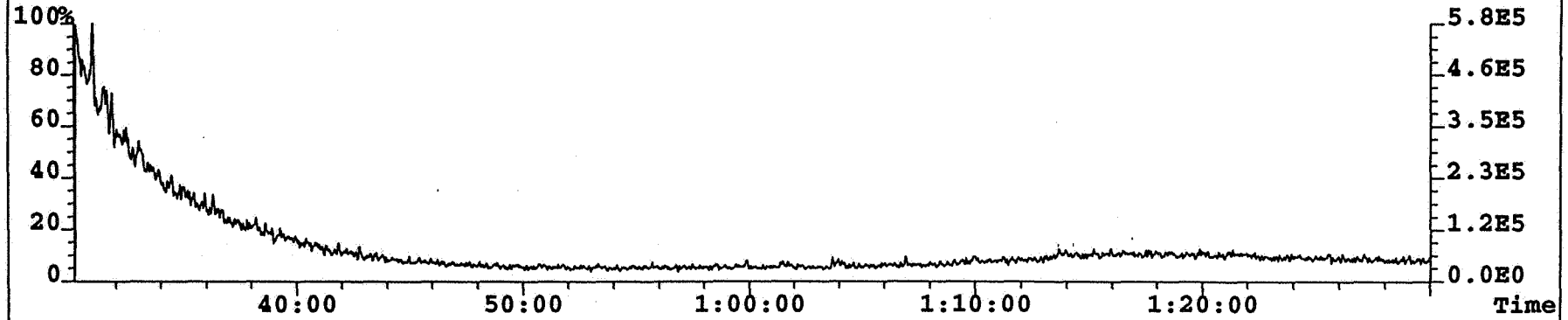
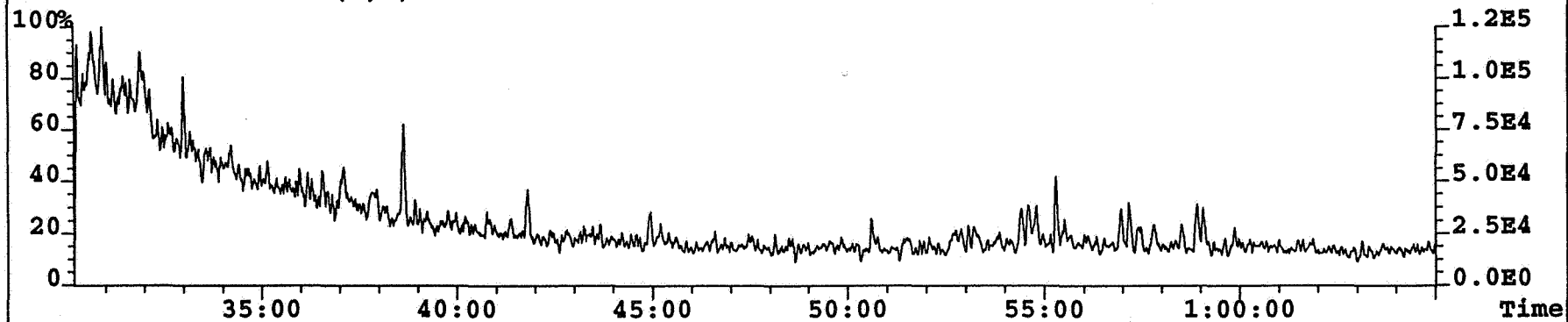
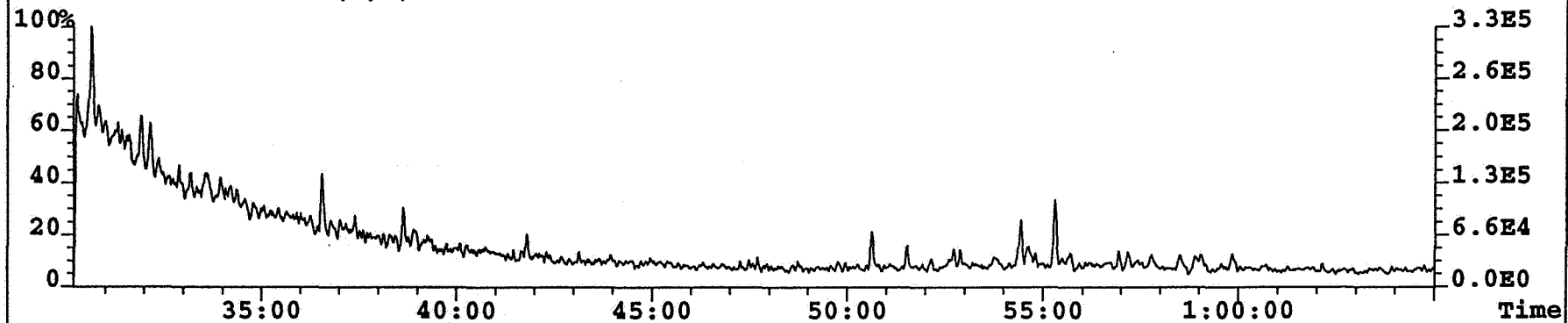


Figure 4.8

File:MPDMIO00790 #1-3087 Acq:16-OCT-1998 15:11:33 GC EI+ Voltage SIR 70SE
Sample#3 Text:N1/3-9 ST2 Mud Extract \$9809OIL002S003\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
218.2033 S:3 F:2 SMO(1,3)



217.1956 S:3 F:2 SMO(1,3)



217.1956 S:3 F:2 SMO(1,3)

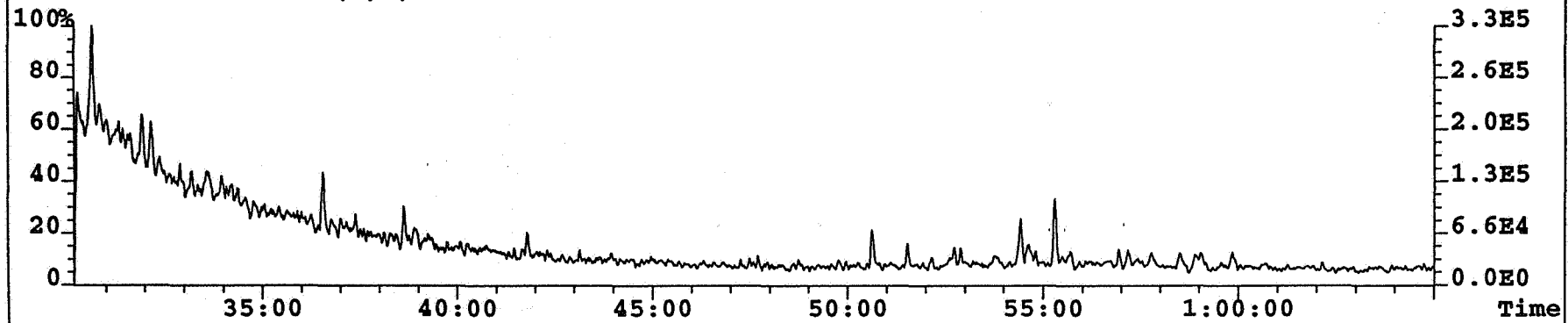
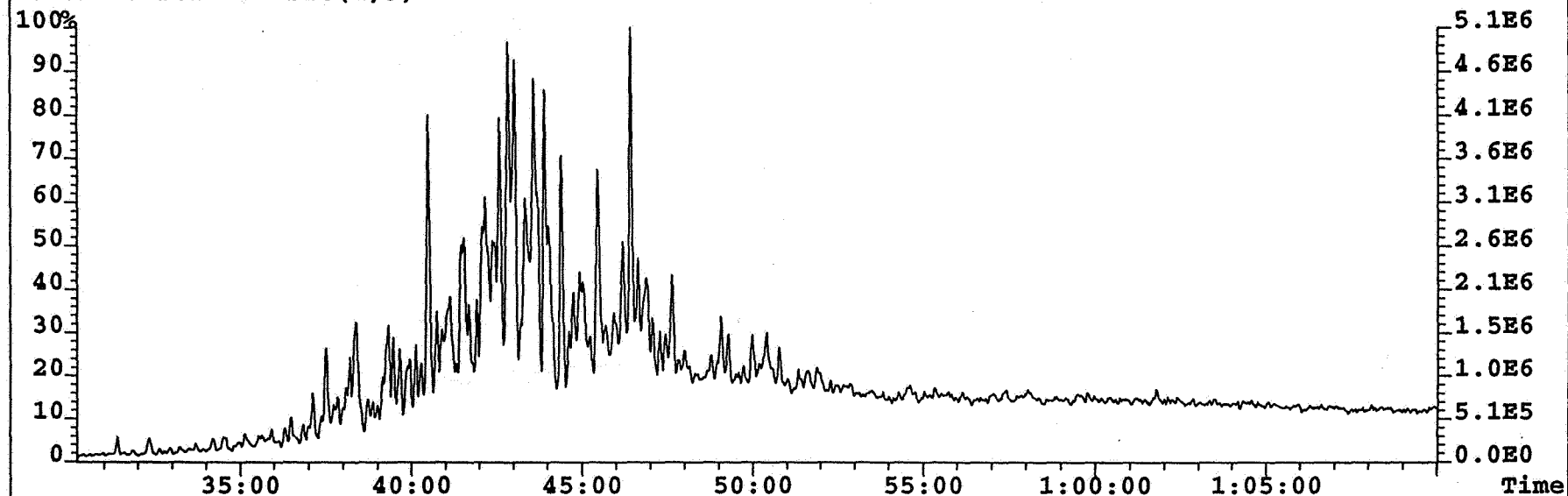


Figure 4.9

File:MPDMIO00781 #1-3086 Acq:22-SEP-1998 12:55:04 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 4279.5m G3411 \$9809OIL002S001\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
231.1173 S:2 F:2 SMO(1,3)



253.1955 S:2 F:2 SMO(1,3)

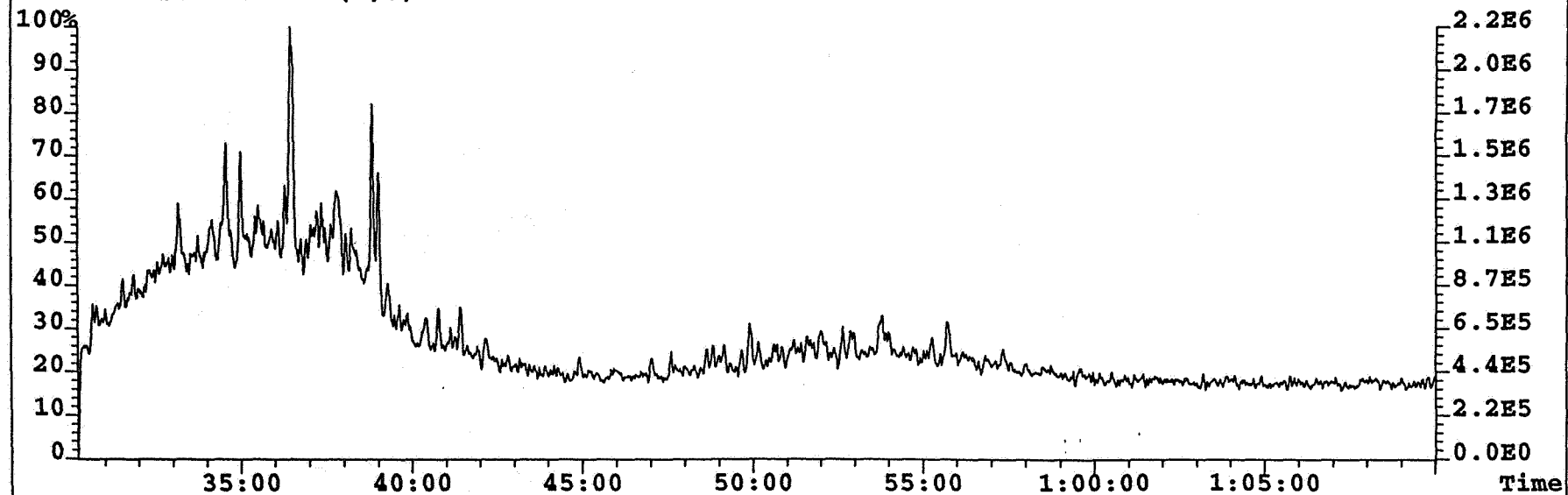


Figure 5.1

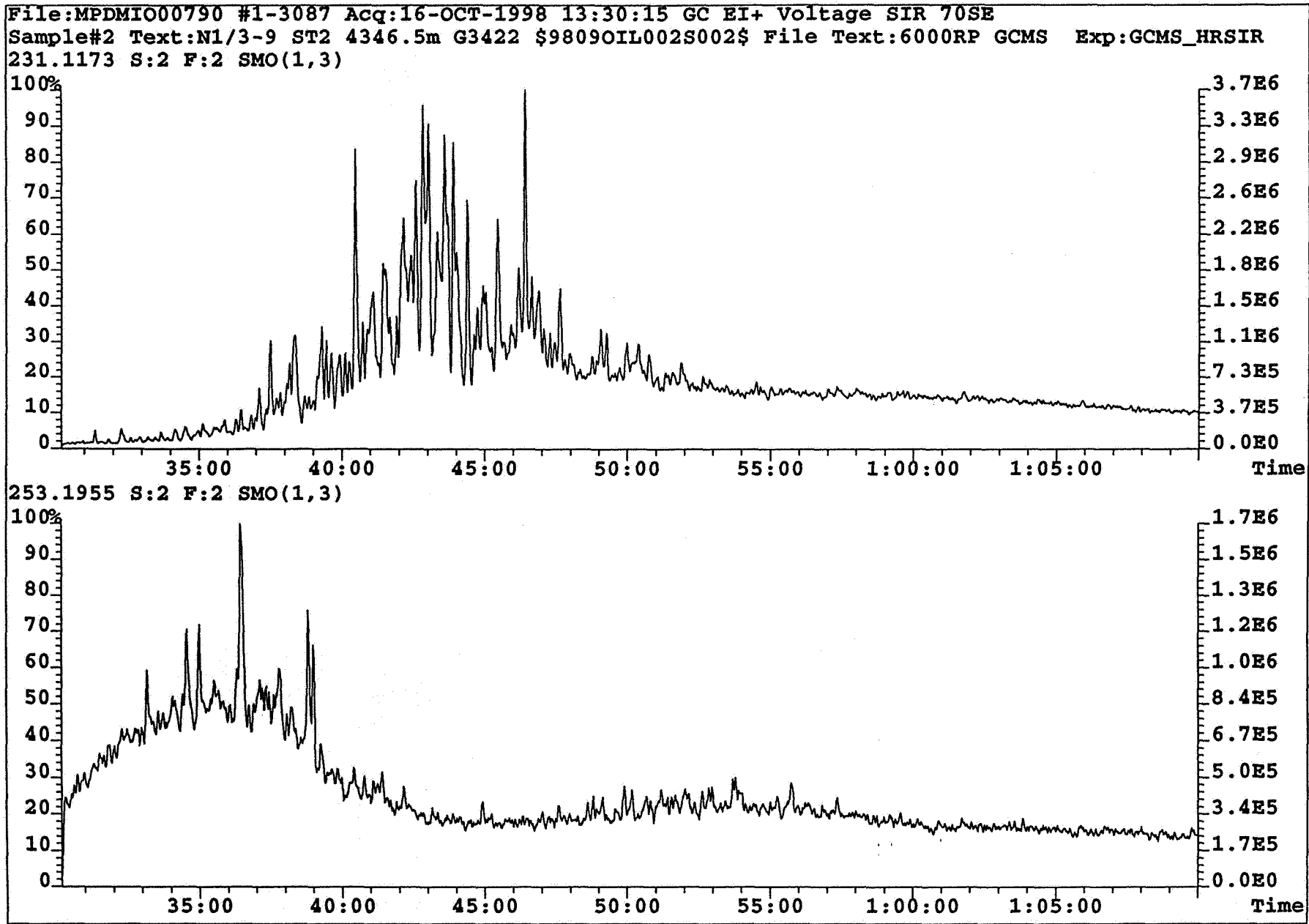
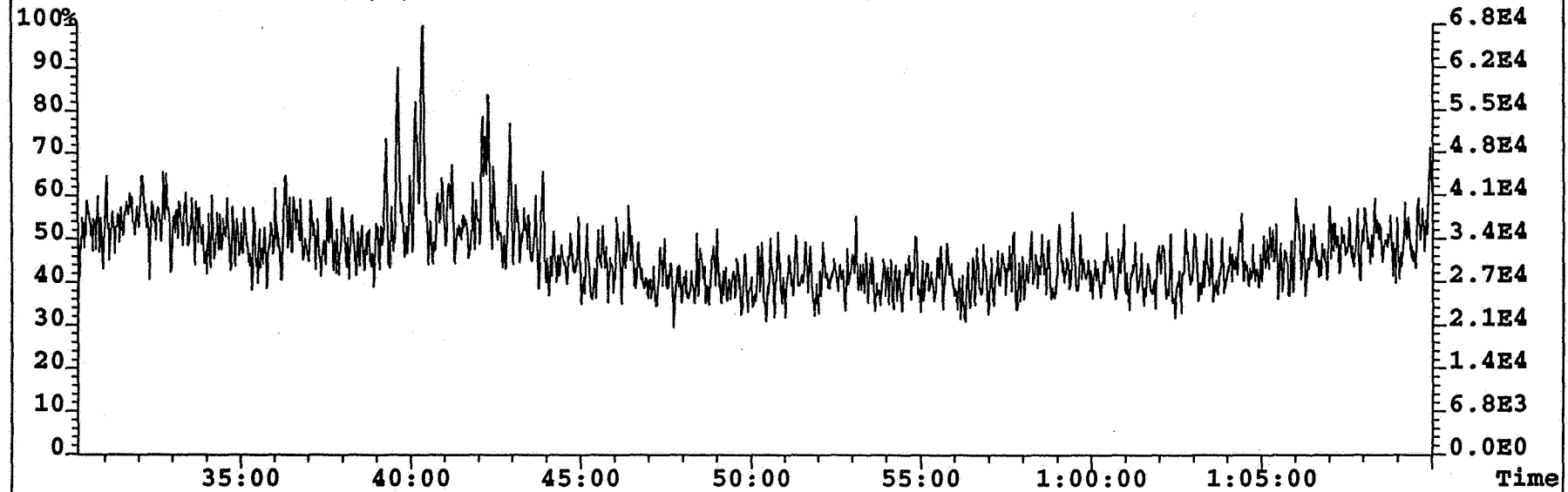


Figure 5.2

File:MPDMIO00790 #1-3087 Acq:16-OCT-1998 15:11:33 GC EI+ Voltage SIR 70SE
Sample#3 Text:N1/3-9 ST2 Mud Extract \$9809OIL002S003\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
231.1173 S:3 F:2 SMO(1,3)



253.1955 S:3 F:2 SMO(1,3)

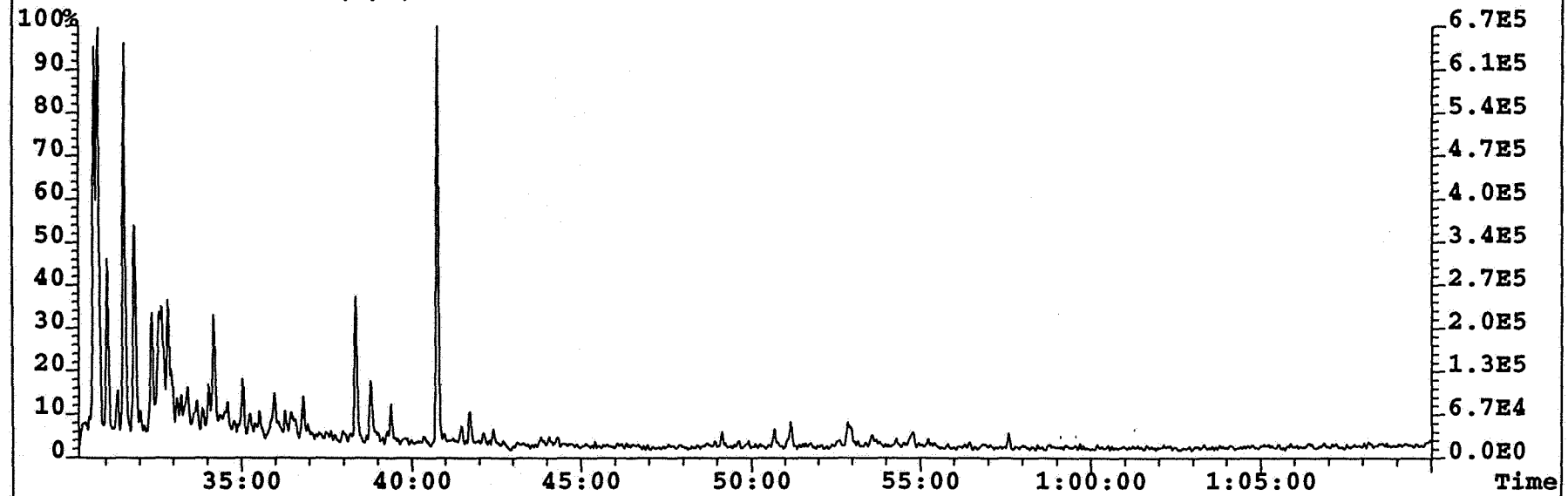
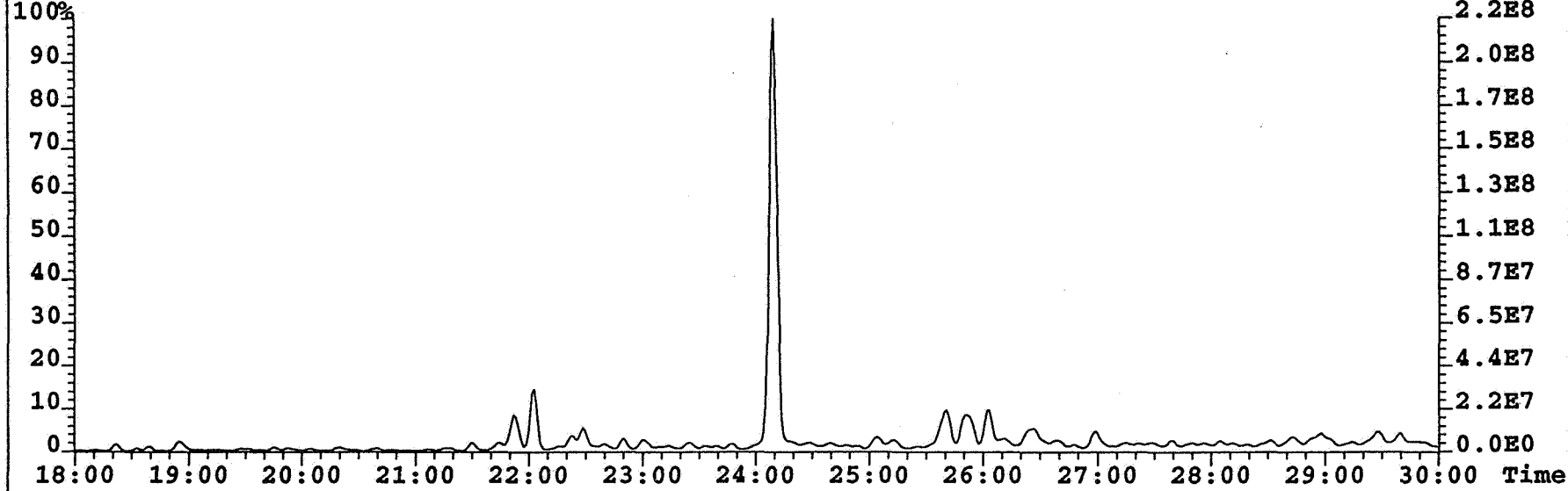


Figure 5.3

File:MPDMIO00781 #1-1230 Acq:22-SEP-1998 12:55:04 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 4279.5m G3411 \$9809OIL002S001\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
178.0782 S:2 SMO(1,3)



192.0938 S:2 SMO(1,3)

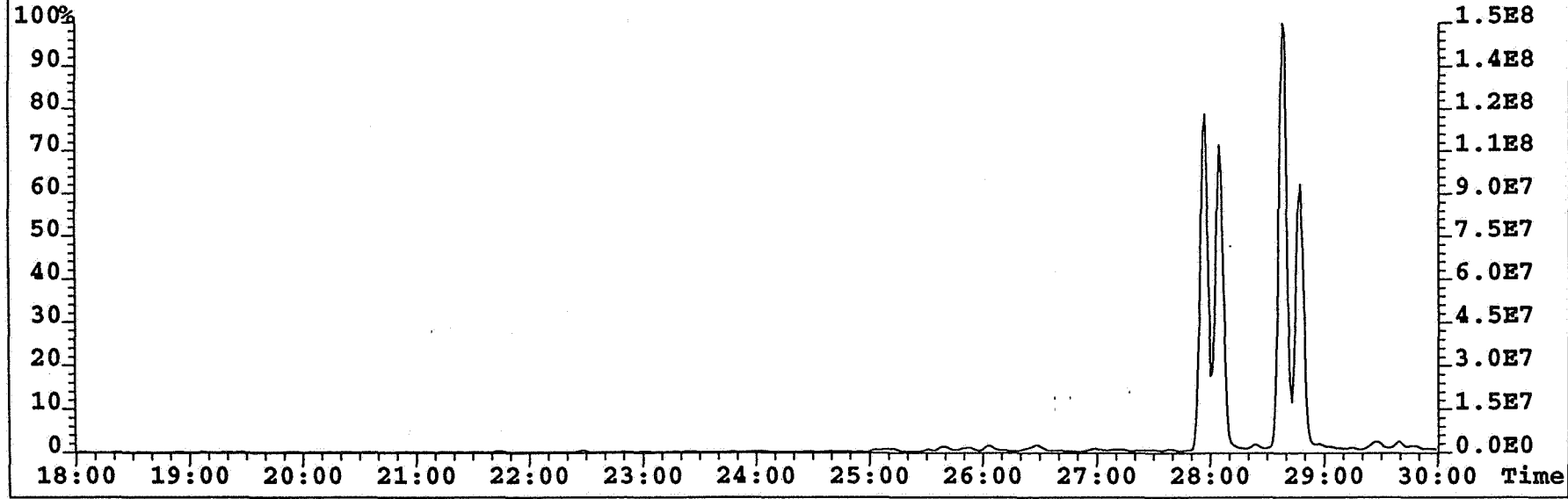


Figure 6.1

File:MPDMIO00790 #1-1231 Acq:16-OCT-1998 13:30:15 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 ST2 4346.5m G3422 \$9809OIL002S002\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
178.0782 S:2 SMO(1,3)

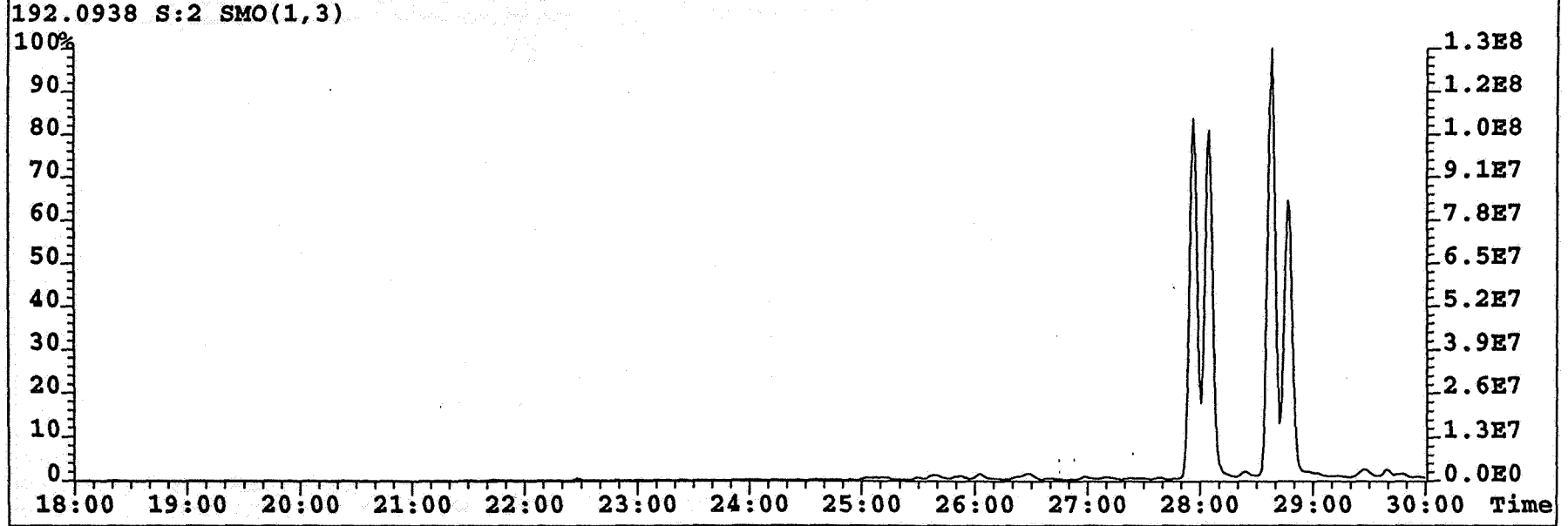
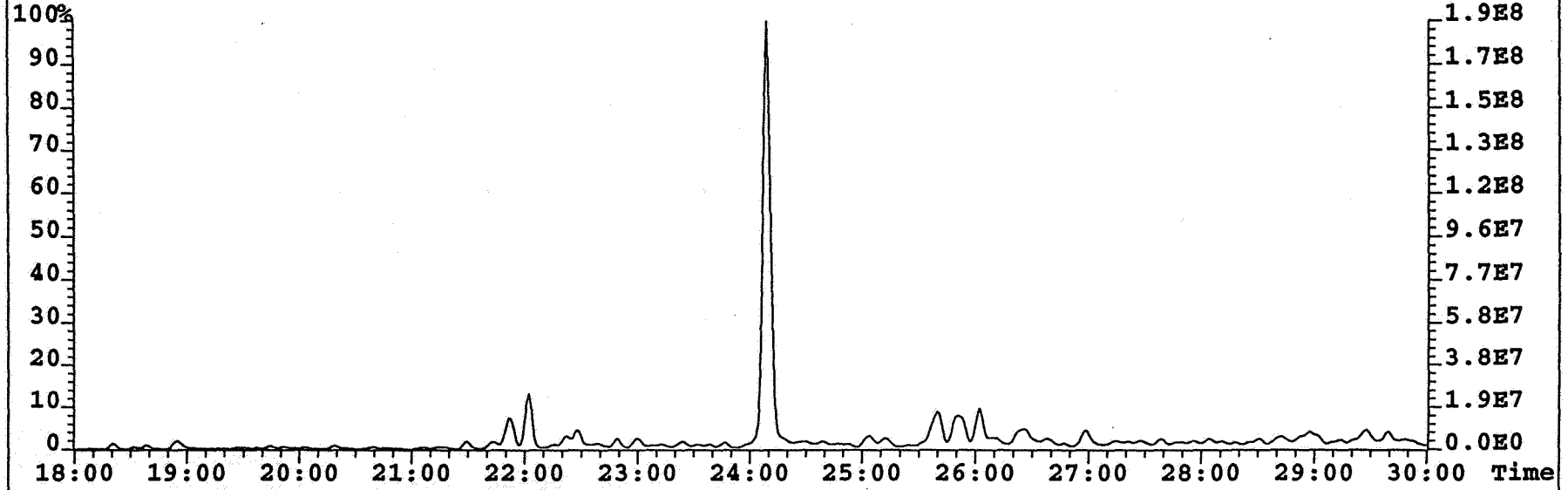
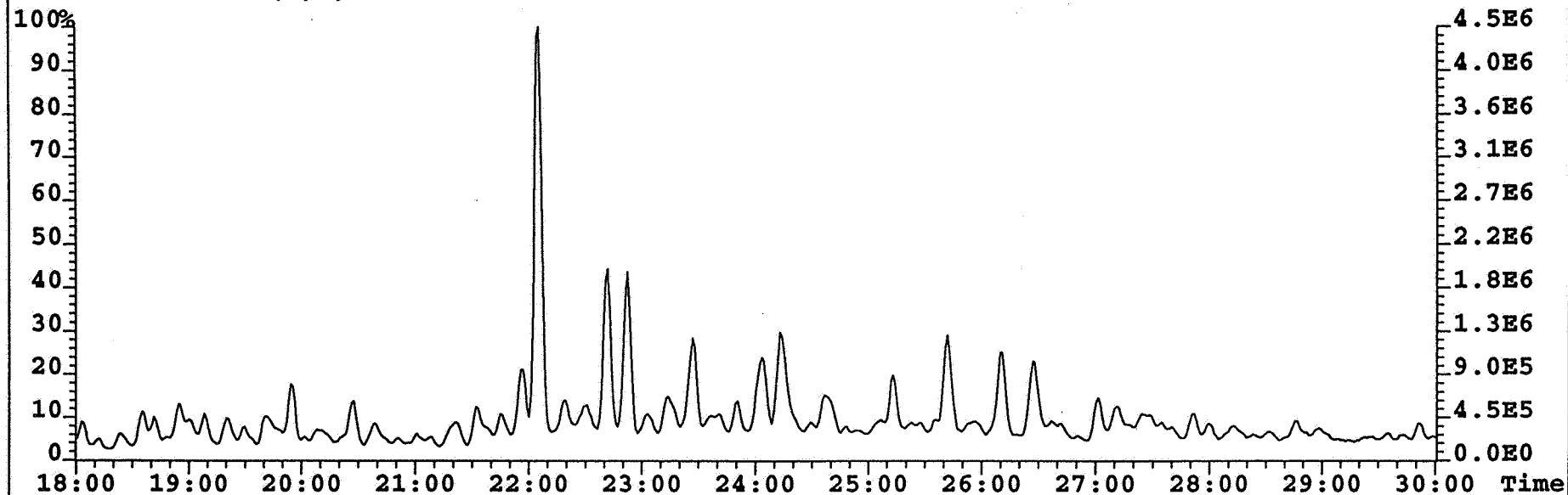


Figure 6.2

File:MPDMIO00790 #1-1230 Acq:16-OCT-1998 15:11:33 GC EI+ Voltage SIR 70SE
Sample#3 Text:N1/3-9 ST2 Mud Extract \$9809OIL002S003\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
178.0782 S:3 SMO(1,3)



192.0938 S:3 SMO(1,3)

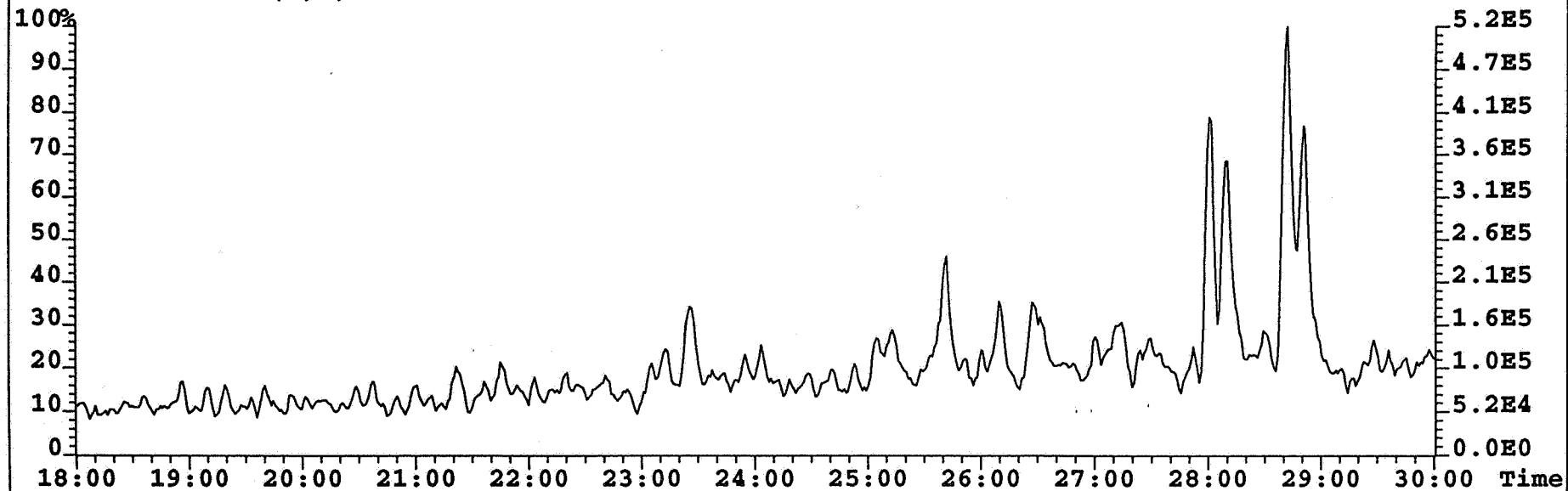
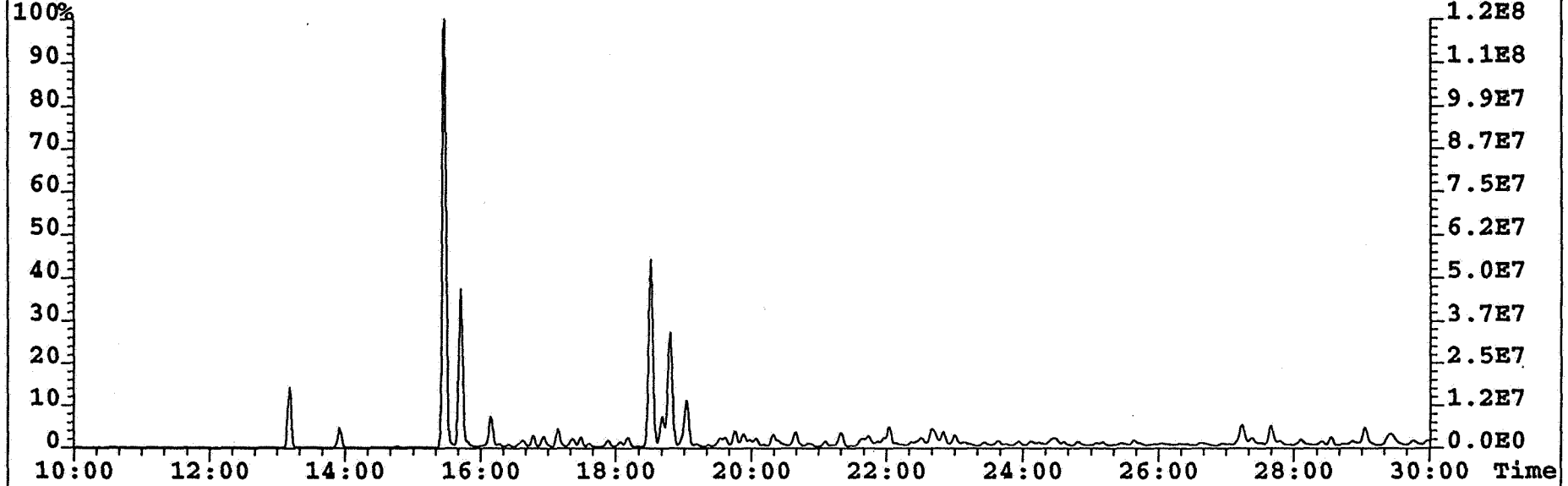


Figure 6.3

File:MPDMIO00781 #1-1230 Acq:22-SEP-1998 12:55:04 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 4279.5m G3411 \$9809OIL002S001\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
168.0939 S:2 SMO(1,3)



198.0503 S:2 SMO(1,3)

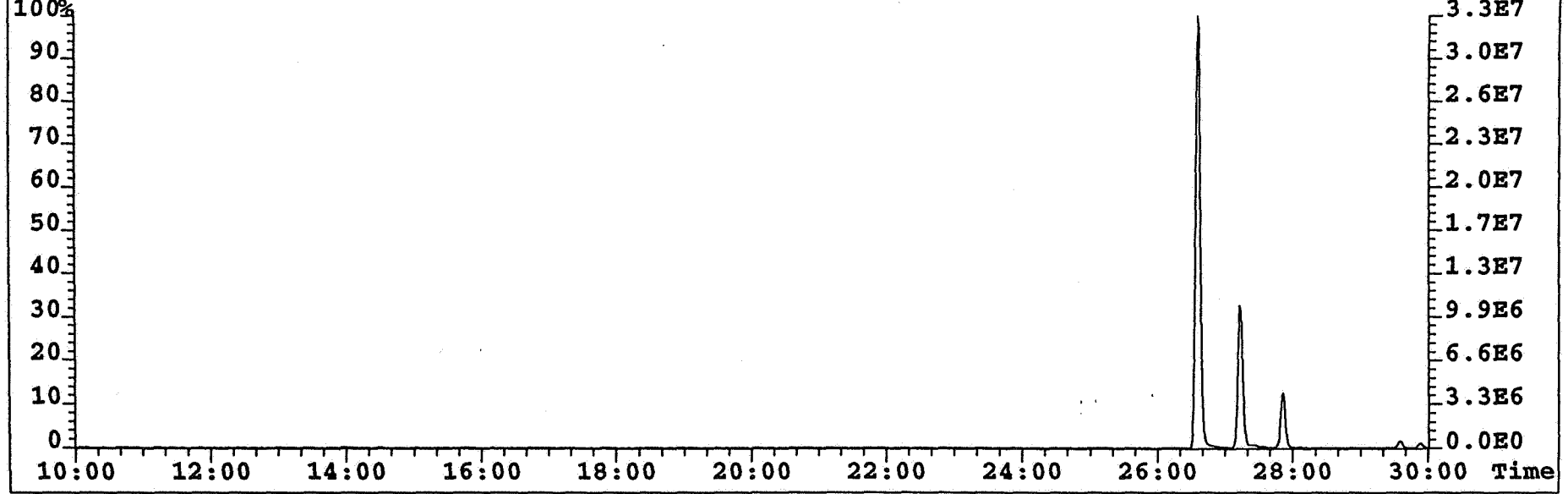


Figure 7.1

File:MPDMIO00790 #1-1231 Acq:16-OCT-1998 13:30:15 GC EI+ Voltage SIR 70SE
Sample#2 Text:N1/3-9 ST2 4346.5m G3422 \$9809OIL002S002\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
168.0939 S:2 SMO(1,3)

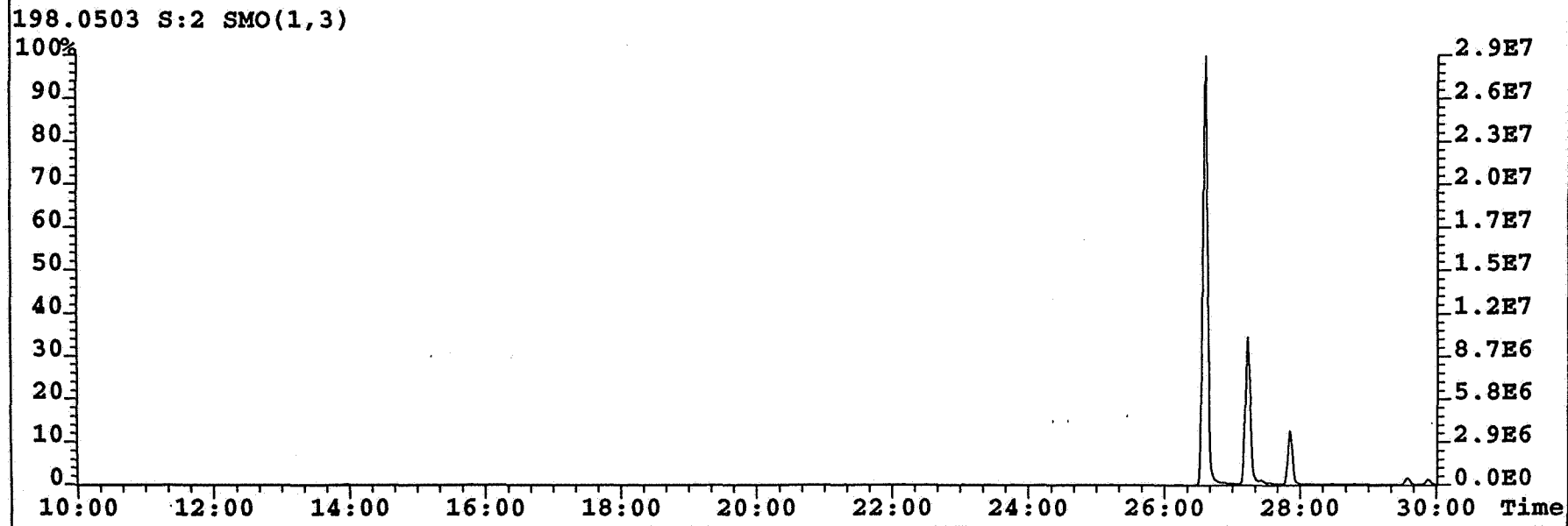
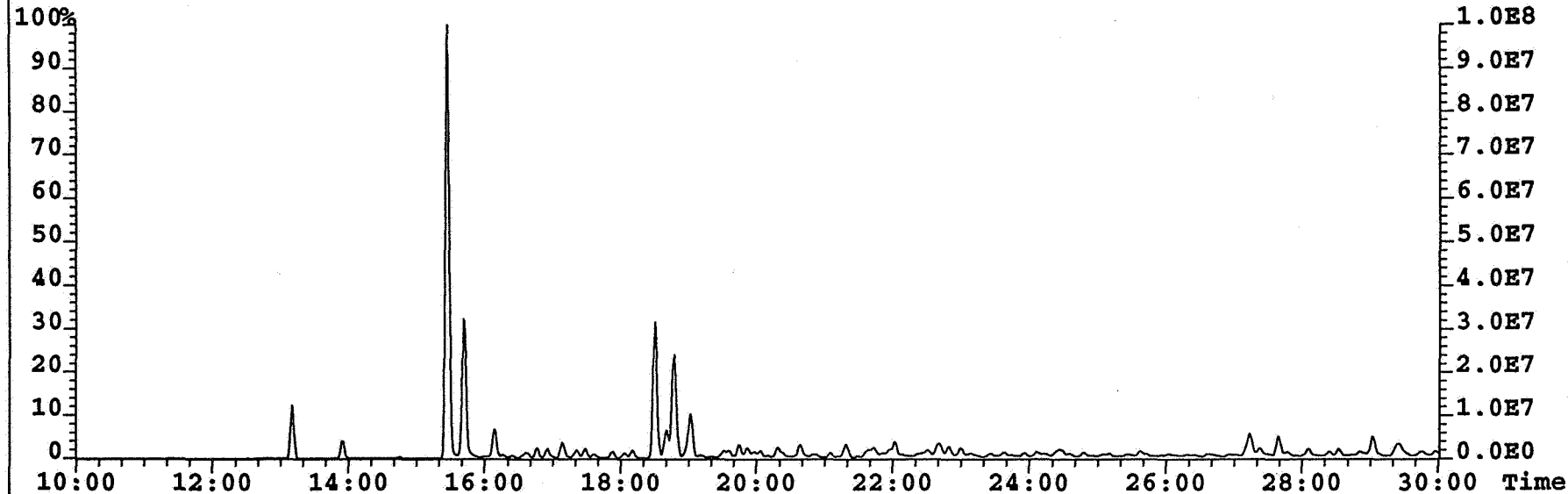
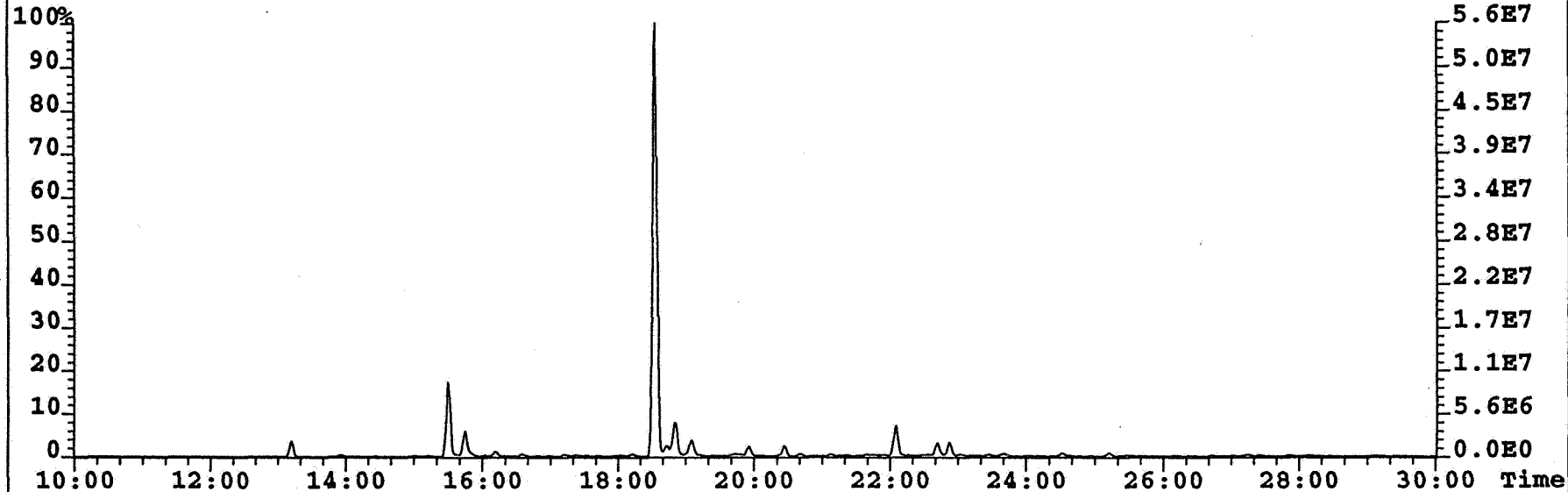


Figure 7.2

File:MPDMIO00790 #1-1230 Acq:16-OCT-1998 15:11:33 GC EI+ Voltage SIR 70SE
Sample#3 Text:N1/3-9 ST2 Mud Extract \$9809OIL002S003\$ File Text:6000RP GCMS Exp:GCMS_HRSIR
168.0939 S:3 SMO(1,3)



198.0503 S:3 SMO(1,3)

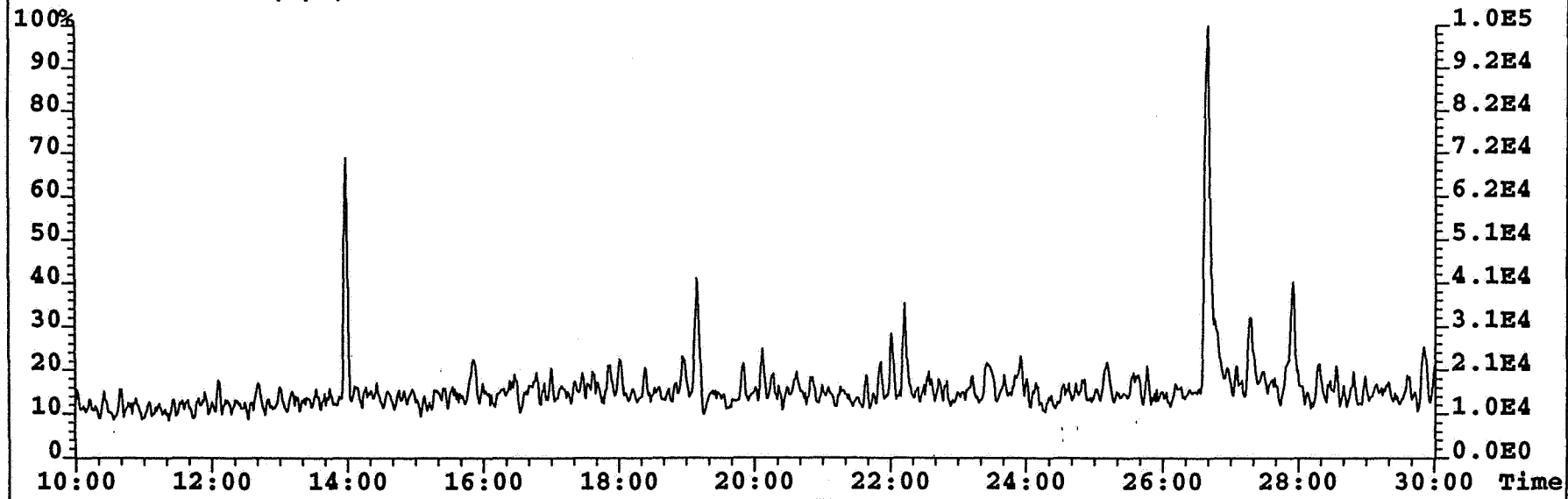


Figure 7.3

APPENDIX - A

WHOLE OIL GC AND GC-MS PEAK AREAS

Software Version: 4.1<OG07>
 Date: 16/10/98 15:43
 Sample Name: 9809OIL002S002 N13-9 4346.5M
 Data File: CA_DATA\B9809002\WOGC002.RAW Date: 16/10/98 13:21
 Sequence File: CA_DATA\B9809002\WOGC_2.SEQ Cycle: 2 Channel: A
 Instrument: WHOLE_OILS_GC Rack/Vial: 0 0 Operator: mpd
 Sample Amount: 1 ion Factor: 1

Whole Oil GC Analysis

Component Name	Time [min]	Area [μ V-s]	Amount [%]
Propane	2.109	164793.9	0.89
2-methylpropane	2.802	94953.9	0.51
n-butane	3.407	390988.8	2.12
2-methylbutane	5.105	396794.7	2.15
n-pentane	5.816	619934.3	3.36
DCM	6.408	0	0
2,2-dimethylbutane	6.665	12687.2	0.07
Cyclopentane	7.344	105454.5	0.57
2,3-dimethylbutane	7.471	58170.9	0.31
2-methylpentane	7.659	392689.6	2.13
3-methylpentane	8.004	245911.2	1.33
n-hexane	8.521	781745.1	4.23
methylcyclopentane	9.087	494375.2	2.68
2,4-dimethylpentane	9.257	46556.1	0.25
Benzene	9.672	209995.2	1.14
cyclohexane	9.904	542892.3	2.94
2-methylhexane + 1,2-DMP	10.248	435559.2	2.36
3-methylhexane	10.463	304828.1	1.65
1,3-cis-dimethylcyclopentane	10.55	97115.4	0.53
1,3-trans-dimethylcyclopentane	10.616	91173.1	0.49
1,2-trans-dimethylcyclopentane	10.686	166229.7	0.9
n-heptane	11.108	865314.4	4.68
methylcyclohexane	11.515	1132720	6.13
ethylcyclopentane	11.756	45541.2	0.25
Toluene	12.335	573330.4	3.1
n-Octane	13.474	885234.4	4.79
n-Nonane	15.659	768590.4	4.16
n-Decane	17.676	683979.8	3.7
n-C11	19.555	664205.3	3.6
n-C12	21.307	615586.6	3.33
n-C13	22.944	696215.1	3.77
n-C14	24.473	742531.7	4.02
n-C15	25.902	603331.2	3.27
n-C16	27.242	507704.2	2.75
n-C17	28.513	501673.1	2.72
Pristane	28.628	268749.8	1.45
n-C18	29.712	372154.6	2.01
Phytane	29.863	141681.4	0.77
n-C19	30.854	402366.3	2.18
n-C20	31.943	317069.8	1.72
n-C21	32.984	259621.3	1.41
n-C22	33.984	246218.8	1.33
n-C23	34.945	214220.4	1.16
n-C24	35.871	209020	1.13
n-C25	36.765	217315	1.18
n-C26	37.647	158173.8	0.86
n-C27	38.538	136847.4	0.74
n-C28	39.442	114374.4	0.62
n-C29	40.388	98886	0.54
n-C30	41.401	76573.6	0.41
n-C31	42.518	78171.99	0.42
n-C32	43.767	63612.98	0.34
n-C33	45.196	61539.6	0.33
n-C34	46.831	44551.98	0.24
n-C35	48.727	31371.64	0.17
n-C36	50.959	24051.9	0.13
		18475379	100

Batch Code 9809OIL002S002
 Data File CA_DATA\B9809002\WOGC002.RAW
 MCH (MeCyC6 as % all C7 alkanes) 35.56
 HER (Heptane/(Hp+MeCyC6)) 0.43
 HXR (Hexane/(Hx+CyC6)) 0.59
 Thompson's Heptane Ratio 23.80
 Thompson's Iso Heptane Index 2.09
 Note: -1 denotes not calculated

Software Version: 4.1<OG07>
 Date: 23/09/98 11:50
 Sample Name: 9809OIL002S001 N1/3-9 4279.5m
 Data File: CA_DATA\B9809002\WOGC001.RAW Date: 22/09/98 16:04
 Sequence File: CA_DATA\B9809002\WOGC_1.SEQ Cycle: 2 Channel: A
 Instrument: WHOLE_OILS_GC Rack/Vial: 0 Operator: mpd
 Sample Amount: 1 ion Factor: 1

Whole Oil GC Analysis

Component Name	Time [min]	Area [μ V·s]	Amount [%]
Propane	2.258	16058.8	0.09
2-methylpropane	2.98	25000.3	0.15
n-butane	3.595	140145.4	0.82
2-methylbutane	5.31	242809.2	1.42
n-pentane	6.02	411324.4	2.4
DCM	6.605	623695.4	3.64
2,2-dimethylbutane	6.895	9787.4	0.06
Cyclopentane	7.565	80845.2	0.47
2,3-dimethylbutane	7.689	46042.2	0.27
2-methylpentane	7.87	309976	1.81
3-methylpentane	8.217	198877.3	1.16
n-hexane	8.729	635681	3.71
methylcyclopentane	9.301	411932.3	2.41
2,4-dimethylpentane	9.471	38709.8	0.23
Benzene	9.886	173622.2	1.01
cyclohexane	10.117	462386.4	2.7
2-methylhexane + 1,2-DMP	10.455	369537.4	2.16
3-methylhexane	10.667	260129.2	1.52
1,3-cis-dimethylcyclopentane	10.761	82522.8	0.48
1,3-trans-dimethylcyclopentane	10.826	77241.3	0.45
1,2-trans-dimethylcyclopentane	10.894	146192.4	0.85
n-heptane	11.305	732061.6	4.28
methylcyclohexane	11.716	985868.2	5.76
ethylcyclopentane	11.959	39269.2	0.23
Toluene	12.527	507154.6	2.96
n-Octane	13.645	777281.8	4.54
n-Nonane	15.788	679129.8	3.97
n-Decane	17.753	638370.6	3.73
n-C11	19.577	649619	3.8
n-C12	21.279	611245.9	3.57
n-C13	22.878	743570.6	4.35
n-C14	24.381	825217.6	4.82
n-C15	25.789	676082.2	3.95
n-C16	27.111	517034.5	3.02
n-C17	28.368	491545.4	2.87
Pristane	28.482	225144	1.32
n-C18	29.553	417591.7	2.44
Phytane	29.705	174376.6	1.02
n-C19	30.685	360782.3	2.11
n-C20	31.766	322357.4	1.88
n-C21	32.8	265016.2	1.55
n-C22	33.793	249620.7	1.46
n-C23	34.746	213633	1.25
n-C24	35.666	192173.2	1.12
n-C25	36.554	201027.8	1.17
n-C26	37.418	160426.4	0.94
n-C27	38.297	138730.7	0.81
n-C28	39.185	114047.2	0.67
n-C29	40.112	100284.1	0.59
n-C30	41.101	79700.58	0.47
n-C31	42.19	73814.77	0.43
n-C32	43.409	56891.8	0.33
n-C33	44.797	51707.78	0.3
n-C34	46.385	35885.11	0.21
n-C35	48.228	25585.98	0.15
n-C36	50.374	17328.2	0.1
		17112093	100

Batch Code 9809OIL002S001
 Data File CA_DATA\B9809002\WOGC001.RAW
 MCH (MeCyC6 as % all C7 alkanes) 36.09
 HER (Heptane/(Hp+MeCyC6)) 0.43
 HXR (Hexane/(Hx+CyC6)) 0.58
 Thompson's Heptane Ratio 23.49
 Thompson's Iso Heptane Index 2.06
 Note: -1 denotes not calculated

Software Version: 4.1<OG07>
 Date: 16/10/98 15:45
 Sample Name: 9809OIL002S003 N1/3-9 Mud Extract
 Data File: C:_DATA\B9809002\WOGC003.RAW Date: 16/10/98 14:39
 Sequence File: C:_DATA\B9809002\WOGC_2.SEQ Cycle: 3 Channel: A
 Instrument: WHOLE_OILS_GC Rack/Vial: 0 Operator: mpd
 Sample Amount: 1 ion Factor: 1

Whole Oil GC Analysis

Component Name	Time [min]	Area [μ V-s]	Amount [%]
Propane	2.149	0	0
2-methylpropane	2.858	0	0
n-butane	3.47	0	0
2-methylbutane	5.182	0	0
n-pentane	5.896	0	0
DCM	6.408	0	0
2,2-dimethylbutane	6.765	0	0
Cyclopentane	7.415	0	0
2,3-dimethylbutane	7.543	0	0
2-methylpentane	7.724	0	0
3-methylpentane	8.072	0	0
n-hexane	8.585	0	0
methylcyclopentane	9.15	0	0
2,4-dimethylpentane	9.328	0	0
Benzene	9.745	0	0
cyclohexane	9.976	0	0
2-methylhexane + 1,2-DMP	10.316	0	0
3-methylhexane	10.528	0	0
1,3-cis-dimethylcyclopentane	10.619	0	0
1,3-trans-dimethylcyclopentane	10.684	0	0
1,2-trans-dimethylcyclopentane	10.754	0	0
n-heptane	11.176	0	0
methylcyclohexane	11.583	0	0
ethylcyclopentane	11.829	0	0
Toluene	12.402	0	0
n-Octane	13.55	0	0
n-Nonane	15.742	0	0
n-Decane	17.602	1371	0.08
n-C11	19.477	14928.64	0.86
n-C12	21.24	68288.6	3.95
n-C13	22.893	203520.1	11.78
n-C14	24.431	312965	18.12
n-C15	25.866	305697.8	17.7
n-C16	27.208	173874.7	10.07
n-C17	28.473	183212.1	10.61
Pristane	28.588	83863.9	4.86
n-C18	29.665	101422.6	5.87
Phytane	29.821	38521.13	2.23
n-C19	30.799	64750.15	3.75
n-C20	31.882	37522.64	2.17
n-C21	32.925	30059.8	1.74
n-C22	33.92	15002.89	0.87
n-C23	34.881	9461.46	0.55
n-C24	35.81	7408.8	0.43
n-C25	36.7	900.99	0.05
n-C26	37.589	536.9	0.03
n-C27	38.475	140.61	0.01
n-C28	39.378	362.1	0.02
n-C29	40.477	280.6	0.02
n-C30	41.547	923.1	0.05
n-C31	42.617	2607.41	0.15
n-C32	44.141	9495.2	0.55
n-C33	45.31	13732.6	0.8
n-C34	46.947	1741.8	0.1
n-C35	48.897	41578.2	2.41
n-C36	51.102	2940.6	0.17
		1727111	100

Batch Code 9809OIL002S003
 Data File C:_DATA\B9809002\WOGC003.RAW
 MCH (MeCyC6 as % all C7 alkanes) -1.00
 HER (Heptane/(Hp+MeCyC6)) -1.00
 HXR (Hexane/(Hx+CyC6)) -1.00
 Thompson's Heptane Ratio -1.00
 Thompson's Iso Heptane Index -1.00
 Note: -1 denotes not calculated

ANALYSIS=MPDMIO00781021.LIS

RT CAL=SACARO.TIM

Sample#2 Text:1/3-9 G3411 \$9809OIL002S001\$ File Text:6000RP GCMS Exp:GCMS_HRS

NO	E_TIME	P_TIME	F_TIME	DEL_S	PEAK AREA	PT	NAME
1	36:14	36:11	36:07	-4	45475400.	-	2-TBA
2	23:46	23:44	23:44	0	671926016.	-	PRISTANE
3	27:13	27:10	27:10	0	663587008.	-	PHYTANE
4	30:37	30:34	30:34	0	13497300.	-	C19 TRICYCLIC TERPANE(19/3)
5	33:14	33:11	33:11	0	6346640.	-	C20 TRICYCLIC TERPANE(20/3)
6	35:58	35:55	35:54	-1	6739890.	-	C21 TRICYCLIC TERPANE(21/3)
7	38:30	38:27	38:27	0	2315460.	-	C22 TRICYCLIC TERPANE(22/3)
8	41:23	41:20	41:20	0	6923100.	#	C23 TRICYC TERPANE(T5:23/3)
9	42:58	42:55	42:56	1	6345400.	-	C24 TRICYC TERPANE (24/3)
10	46:03	46:00	46:01	1	5782340.	-	C25 TRICYC TERPANE (25/3)
11	47:38	47:35	47:35	0	5449640.	-	C24 TETRACYC TERP (\$:24/4)
12	48:18	48:15	48:16	1	2478750.	-	C26 TRICYCLIC TERPANE(26/3)
13	48:30	48:27	48:28	1	3430550.	-	C26 TRICYCLIC TERP 2 (26/3)
14	53:18	53:15	53:16	1	1820250.	-	C28 TRICYCLIC TERPANE(28/3)
15	53:39	53:36	53:38	2	5453490.	-	C28 TRICYCLIC TERP 2 (28/3)
16	54:44	54:41	54:42	1	8220450.	-	C29 TRICYCLIC TERPANE(29/3)
17	55:09	55:06	55:06	0	11520000.	-	C29 TRICYCLIC TERP 2 (29/3)
18	55:35	55:32	55:33	1	14509600.	-	C27 18A HOPANE (Ts:27T)
19	56:29	56:26	56:30	4	16416400.	S	C27 17A HOPANE (Tm:27Tm)
20	57:24	57:21	57:21	0	6732910.	-	C30 TRICYCLIC TERPANE(30/3)
21	57:50	57:47	57:49	2	3482020.	-	C30 TRICYCLIC TERP 2 (30/3)
22	58:37	58:34	58:38	4	1677110.	-	C28 BISNORHOPANE (X:28ab)
23	00:01	00:01	00:01	0	-1.	D	25-NORHOPANE (Y:25nor30ab)
24	59:36	59:33	59:39	6	7739230.	-	C29 HOPANE (D:29ab)
25	59:44	59:47	59:46	-1	14090700.	D	C29 18A NORHOPANE (D:29Ts)
26	1:00:17	1:00:14	1:00:14	0	15764100.	-	C30 C30 DIAHOPANE (PI:30d)
27	1:00:42	1:00:39	00:01	-3640	-1.	-	C29 NORMORETANE (A:29ba)
28	1:01:17	1:01:14	1:01:09	-5	1974790.	-	C30 18A OLEANANE (B:300)
29	1:01:35	1:01:32	1:01:32	0	13548600.	#	C30 HOPANE (G:30ab)
30	1:01:48	1:01:45	1:01:46	1	793802.	S	NOR-GAMMACERANE? (G2)
31	1:02:24	1:02:21	1:02:21	0	1777130.	-	C30 MORETANE (K:30ba)
32	1:03:46	1:03:44	1:03:43	-1	8099080.	-	C31 22S HOPANE (N:31abS)
33	1:04:01	1:03:59	1:03:59	0	10695900.	-	C31 22R HOPANE (O:31abR)
34	1:03:46	1:03:44	1:03:43	-1	2292710.	-	C31 22S M/Z205 (N205)
35	1:04:01	1:03:59	1:04:00	1	3920310.	P	C31 22R M/Z205 (O205)
36	1:04:01	1:04:00	1:03:59	-1	10695900.	D	C30 GAMACERANE (S:30G)
37	1:04:23	1:04:21	1:04:23	2	2170300.	S	C30 17B 21B HOPANE (P)
38	1:05:30	1:05:28	1:05:27	-1	8525210.	-	C32 22S HOPANE (U:32abS)
39	1:05:51	1:05:49	1:05:49	0	5584930.	-	C32 22R HOPANE (V:32abR)
40	1:07:28	1:07:27	1:07:27	0	3337320.	-	C33 22S HOPANE(Alpha:32abS)
41	1:07:57	1:07:56	1:07:56	0	5307970.	#	C33 22R HOPANE (Beta:32abR)
42	1:09:31	1:09:30	1:09:29	-1	4572600.	-	C34 22S HOPANE(Gamma:34abS)
43	1:10:06	1:10:06	1:10:05	-1	2511520.	-	C34 22R HOPANE(Delta:34abR)
44	1:11:31	1:11:31	1:11:30	-1	2980540.	-	C35 22S HOP (Epsilon:35abS)
45	1:12:14	1:12:14	1:12:13	-1	2137760.	-	C35 22R HOPANE (Zeta:35abR)
46	38:43	38:40	38:40	0	14464400.	-	C21 STERANE
47	50:42	50:39	50:40	1	27349000.	-	C27 20S DIASTER (10:27dbS)
48	51:36	51:33	51:33	0	21314600.	-	C27 20R DIASTER (11:27dbR)
49	54:41	54:38	54:38	0	9892270.	P	C27 20R ISOST218(21B:27bbR)
50	54:52	54:49	54:50	1	5029150.	D	C27 20S ISOST218 (22:27bbS)
51	55:23	55:20	55:20	0	7014870.	P	C27 20R AAA STER (25:27aaR)
52	55:46	55:43	55:43	0	20608500.	P	C29 20S DIASTER (27:29dbR)
53	57:03	57:00	56:59	-1	5988010.	P	C28 20R ISOST218(33A:28bbR)
54	57:14	57:10	57:12	2	4646200.	D	C28 20S ISOST218 (34:28bbS)
55	57:51	57:48	57:50	2	1665420.	-	C28 20R AAA STER (36:28aaR)
56	58:36	58:33	58:33	0	6094050.	S	C29 20S AAA STER (39:29aaS)
57	58:59	58:56	58:56	0	6491070.	P	C29 20R ISOST218 (40:29bbR)
58	59:08	59:05	59:06	1	7099570.	D	C29 20S ISOST218 (41:29bbS)
59	59:56	59:53	59:53	0	3084280.	-	C29 20R AAA STER (42:29aaR)
60	1:01:38	1:01:35	1:01:34	-1	1747270.	-	C30 4-METHYL STERANE (46)

61	10:43	10:42	10:43	1	3961299968.	-	2-ME NAPHTHALENE
62	11:03	11:02	11:02	0	2629189888.	-	1-ME NAPHTHALENE
63	13:12	13:11	13:11	0	65256700.	-	2-ME BIPHENYL
64	15:29	15:28	15:28	0	504651008.	-	3-ME BIPHENYL
65	15:43	15:42	15:42	0	186347008.	D	4-ME BIPHENYL
66	23:18	23:16	23:16	0	68331600.	-	DIBENZOTHIOPHENE
67	24:11	24:09	24:09	0	1048070016.	#	PHENANTHRENE
68	27:59	27:56	27:57	1	543436032.	S	3-ME PHENANTHRENE
69	28:07	28:05	28:04	-1	533536000.	D	2-ME PHENANTHRENE
70	28:41	28:38	28:38	0	714656000.	S	9-ME PHENANTHRENE
71	28:50	28:47	28:47	0	439114016.	D	1-ME PHENANTHRENE
72	26:38	26:35	26:35	0	160421008.	#	4-ME DIBENZOTHIOPHENE
73	27:15	27:12	27:13	1	54353800.	-	3+2-ME DIBENZOTHIOPHENE
74	27:54	27:51	27:52	1	19794300.	-	1-ME DIBENZOTHIOPHENE
75	36:30	36:27	36:27	0	10544700.	S	C21 MA STERANE (F22:A1)
76	38:52	38:49	38:49	0	4651250.	S	C22 MA STERANE (F23:B1)
77	49:00	48:57	49:01	4	605072.	S	C27 20S 5B DM MA-ST(F2:C1)
78	49:12	49:09	49:09	0	897832.	S	C27 20S 10B DM MA-DIA (C1)
79	50:44	50:41	50:42	1	456668.	S	C27 20R 5B DM MA-ST(F3:D1)
80	50:52	50:50	50:51	1	697167.	D	C27 20S 5A DM MA-ST(F4:D1)
81	51:14	51:11	51:12	1	772497.	S	C28 20S 5B DM MA-ST(F5:E1)
82	52:42	52:39	52:40	1	1379300.	-	C27 20R 5A DM MA-ST(F6:G1)+
83	52:42	52:40	52:40	0	1379300.	D	C28 20S 5A DM MA-ST(F7:G1)
84	52:56	52:53	52:53	0	982844.	S	C28 20R 5B DM MA-ST(F8:G1)
85	53:01	52:58	52:58	0	673608.	D	C29 20S 5B DM MA-ST(F9:G1)
86	54:22	54:19	54:20	1	67933.	S	C29 20S 5A DM MA-ST(F10:H1)
87	54:50	54:47	54:49	2	283298.	S	C28 20R 5A DM MA-ST(F11:H1)
88	54:57	54:56	54:56	0	94649.	D	C29 20R 5B DM MA-ST(F12:H1)
89	56:30	56:27	56:29	2	169098.	S	C29 20R 5A DM MA-ST(F13:I1)
90	43:57	43:54	43:54	0	22053600.	S	C20 ME TA-STER(F14:a1)
91	46:28	46:25	46:25	0	28706700.	S	C21 ME TA-STER(F15:b1)
92	56:09	56:06	00:01	-3367	-1.	-	C26 20S ME TA-STER(F16:c1)
93	57:47	57:44	00:01	-3465	-1.	-	C26 20R ME TA-STER(F17:d1)+
94	57:47	00:01	00:01	0	-1.	D	C27 20S ME TA-STER(F18:d1)
95	59:08	59:05	00:01	-3546	-1.	-	C28 20S ME TA-STER(F19:e1)
96	59:49	59:46	59:46	0	514561.	-	C27 20R ME TA-STER(F20:f1)
97	1:01:30	1:01:27	00:01	-3688	-1.	-	C28 20R ME TA-STER(F21:g1)
98	53:39	53:36	53:38	2	5453490.	-	9-DDPA

REF WIN= 15 RT WIN= 10 DBLE WIN= 3 DEAD VOL= 1 RES= 6000.

ANALYSIS=MPDMIO00790031.LIS

RT CAL=NSACARO.TIM

Sample#3 Text:N1/3-9 ST2 Mud Extract \$9809OIL002S003\$ File Text:6000RP GCMS F

NO	E_TIME	P_TIME	F_TIME	DEL_S	PEAK AREA	PT	NAME
1	36:21	36:12	36:12	0	350256.	-	2-TBA
2	23:52	23:48	23:45	-3	400559008.	-	PRISTANE
3	27:17	27:13	27:09	-4	182519008.	-	PHYTANE
4	41:31	41:19	41:19	0	919423.	#	C23 TRICYC TERPANE(T5:23/3.
5	43:06	42:54	42:54	0	334698.	-	C24 TRICYC TERPANE (24/3)
6	46:11	45:59	45:59	0	199091.	-	C25 TRICYC TERPANE (25/3.
7	47:45	47:33	47:33	0	284655.	-	C24 TETRACYC TERP (\$:24/4)
8	48:26	48:14	00:01	-2895	-1.	-	C26 TRICYCLIC TERPANE(26/3
9	48:38	48:26	00:01	-2907	-1.	-	C26 TRICYCLIC TERP 2 (26/3)
10	55:43	55:32	55:31	-1	139596.	-	C27 18A HOPANE (Ts:27Ts
11	56:35	56:24	56:23	-1	263567.	S	C27 17A HOPANE (Tm:27Tm)
12	57:22	57:11	00:01	-3432	-1.	-	25-TRISNORM/z177(25nor28ab
13	58:44	58:33	58:35	2	127243.	-	C28 BISNORHOPANE (X:28ab)
14	59:19	59:08	00:01	-3549	-1.	-	25-NOR m/z177 (Y:25nor30ab'
15	59:19	00:01	00:01	0	-1.	D	25-NORHOPANE (Y:25nor30ab)
16	59:48	59:37	59:37	0	682512.	-	C29 HOPANE (D:29ab'
17	59:55	59:44	59:44	0	202658.	D	C29 18A NORHOPANE (D2:29Ts)
18	1:00:23	1:00:12	00:01	-3613	-1.	-	C30 C30 DIAHOPANE (PI:30
19	1:00:50	1:00:39	00:01	-3640	-1.	-	C29 NORMORETANE (A:29ba)
20	1:01:22	1:01:11	1:01:21	10	67555.	-	C30 18A OLEANANE (B:300'
21	1:01:41	1:01:30	1:01:30	0	891073.	#	C30 HOPANE (G:30ab,
22	1:02:00	1:01:49	00:01	-3710	-1.	S	NOR-GAMMACERANE? (G2)
23	1:02:29	1:02:18	1:02:19	1	92101.	-	C30 MORETANE (K:30ba,
24	1:03:53	1:03:42	1:03:43	1	263261.	-	C31 22S HOPANE (N:31labS)
25	1:04:07	1:03:56	1:03:57	1	426350.	-	C31 22R HOPANE (O:31labR,
26	1:03:53	1:03:42	1:03:43	1	108448.	-	C31 22S M/Z205 (N205)
27	1:04:07	1:03:56	00:01	-3837	-1.	P	C31 22R M/Z205 (O205.
28	1:04:07	00:01	00:01	0	-1.	D	C30 GAMACERANE (S:30G)
29	1:04:31	1:04:20	00:01	-3861	-1.	S	C30 17B 21B HOPANE (P.
30	1:05:35	1:05:24	1:05:25	1	277622.	-	C32 22S HOPANE (U:32abS)
31	1:05:56	1:05:45	1:05:47	2	94356.	-	C32 22R HOPANE (V:32abR)
32	1:07:35	1:07:24	1:07:25	1	109315.	-	C33 22S HOPANE(Alpha:32abS)
33	1:08:03	1:07:52	00:01	-4073	-1.	#	C33 22R HOPANE (Beta:32abR)
34	1:09:37	1:09:26	1:09:29	3	138138.	-	C34 22S HOPANE(Gamma:34abS)
35	1:10:13	1:10:02	00:01	-4203	-1.	-	C34 22R HOPANE(Delta:34abR)
36	1:11:36	1:11:25	1:11:29	4	83798.	-	C35 22S HOP (Epsilon:35abS)
37	1:12:20	1:12:10	00:01	-4331	-1.	-	C35 22R HOPANE (Zeta:35abR'
38	38:50	38:39	38:38	-1	197046.	-	C21 STERANE
39	50:50	50:38	50:38	0	191673.	-	C27 20S DIASTER (10:27dbS)
40	51:44	51:33	51:31	-2	117869.	-	C27 20R DIASTER (11:27dbR)
41	54:32	54:21	54:26	5	263982.	P	C27 20S AAA STER (20:27aaS'
42	54:52	54:41	54:39	-2	49757.	P	C29 20S DIASTER (21A:29dbS)
43	54:50	54:39	54:36	-3	68779.	P	C27 20R ISOST218(21B:27bbR'
44	55:00	54:46	54:49	3	44509.	D	C27 20S ISOST218 (22:27bbS,
45	54:52	54:41	54:39	-2	49757.	P	C27 20R ISOSTER 217 (27bbR'
46	55:03	54:50	00:01	-3291	-1.	D	C27 20S ISOSTER 217 (27bbS,
47	55:30	55:19	55:18	-1	431914.	P	C27 20R AAA STER (25:27aaR'
48	55:52	55:41	00:01	-3342	-1.	P	C29 20S DIASTER (27:29dbR,
49	57:08	56:57	56:58	1	82275.	P	C28 20R ISOST218(33A:28bbR)
50	57:21	57:11	57:10	-1	78708.	D	C28 20S ISOST218 (34:28bbS,
51	57:07	56:56	56:57	1	94656.	P	C28 20R ISOSTER 217 (28bbR)
52	57:21	57:11	00:01	-3432	-1.	D	C28 20S ISOSTER 217 (28bbS.
53	57:58	57:47	57:47	0	78059.	-	C28 20R AAA STER (36:28aaR)
54	58:42	58:31	58:31	0	120286.	S	C29 20S AAA STER (39:29aaS.
55	59:05	58:54	58:54	0	84034.	P	C29 20R ISOST218 (40:29bbR)
56	59:15	59:04	59:04	0	74954.	D	C29 20S ISOST218 (41:29bbS
57	59:05	58:54	00:01	-3535	-1.	P	C29 20R ISOSTER217 (29bbR)
58	59:14	00:08	00:01	-9	-1.	D	C29 20S ISOSTER217 (29bbS
59	1:00:02	59:51	59:51	0	155859.	-	C29 20R AAA STER (42:29aaR)
60	1:00:50	1:00:39	00:01	-3640	-1.	P	C30 20R ISOSTER218 (30bbR

61	1:00:57	00:06	00:01	-7	-1.	D	C30 20S ISOSTER218 (30bbs)
62	1:01:44	1:01:33	00:01	-3694	-1.	-	C30 4-METHYL STERANE (46)
63	10:47	10:45	10:43	-2	76669400.	-	2-ME NAPHTHALENE
64	11:06	11:04	11:03	-1	38448100.	-	1-ME NAPHTHALENE
65	13:15	13:13	13:12	-1	7867880.	-	2-ME BIPHENYL
66	15:33	15:30	15:29	-1	41617100.	-	3-ME BIPHENYL
67	15:47	15:43	15:44	1	16264500.	D	4-ME BIPHENYL
68	24:17	24:13	24:13	0	8823190.	#	PHENANTHRENE
69	28:05	28:00	28:00	0	1627070.	S	3-ME PHENANTHRENE
70	28:14	28:09	28:09	0	1699350.	D	2-ME PHENANTHRENE
71	28:47	28:42	28:42	0	2560380.	S	9-ME PHENANTHRENE
72	28:56	28:51	28:51	0	1920190.	D	1-ME PHENANTHRENE
73	26:44	26:40	26:40	0	360150.	#	4-ME DIBENZOTHIOPHENE
74	27:21	27:17	27:17	0	62171.	-	3+2-ME DIBENZOTHIOPHENE
75	28:00	27:55	27:55	0	77070.	-	1-ME DIBENZOTHIOPHENE
76	36:37	36:28	00:01	-2189	-1.	S	C21 MA STERANE (F22:A1)
77	39:00	38:49	38:47	-2	422539.	S	C22 MA STERANE (F23:B1)
78	49:08	48:56	00:01	-2937	-1.	S	C27 20S 5B DM MA-ST(F2:C1)
79	49:19	49:07	00:01	-2948	-1.	S	C27 20S 10B DM MA-DIA (C1)
80	50:51	50:39	00:01	-3040	-1.	S	C27 20R 5B DM MA-ST(F3:D1)
81	50:59	00:07	00:01	-8	-1.	D	C27 20S 5A DM MA-ST(F4:D1)
82	51:21	51:09	51:09	0	105552.	S	C28 20S 5B DM MA-ST(F5:E1)
83	51:55	51:44	00:01	-3105	-1.	S	C27 20S 5A DM MA-DS(F5:F1)
84	52:50	52:39	00:01	-3160	-1.	-	C27 20R 5A DM MA-ST(F6:G1)+
85	52:50	00:01	00:01	0	-1.	D	C28 20S 5A DM MA-ST(F7:G1)
86	53:03	52:52	52:52	0	68659.	S	C28 20R 5B DM MA-ST(F8:G1)
87	53:09	52:58	00:01	-3179	-1.	D	C29 20S 5B DM MA-ST(F9:G1)
88	54:29	54:18	00:01	-3259	-1.	S	C29 20S 5A DM MA-ST(F10:H1)
89	54:48	54:37	00:01	-3278	-1.	S	C28 20R 5A DM MA-ST(F11:H1)
90	54:54	00:05	00:01	-6	-1.	D	C29 20R 5B DM MA-ST(F12:H1)
91	56:38	56:27	00:01	-3388	-1.	S	C29 20R 5A DM MA-ST(F13:I1)
92	44:10	43:58	00:01	-2639	-1.	S	C20 ME TA-STER(F14:a1)
93	46:35	46:23	00:01	-2784	-1.	S	C21 ME TA-STER(F15:b1)
94	56:17	56:06	00:01	-3367	-1.	-	C26 20S ME TA-STER(F16:c1)
95	57:53	57:42	00:01	-3463	-1.	-	C26 20R ME TA-STER(F17:d1)+
96	57:53	00:01	00:01	0	-1.	D	C27 20S ME TA-STER(F18:d1)
97	59:15	59:04	00:01	-3545	-1.	-	C28 20S ME TA-STER(F19:e1)
98	59:55	59:44	00:01	-3585	-1.	-	C27 20R ME TA-STER(F20:f1)
99	1:01:35	1:01:24	00:01	-3685	-1.	-	C28 20R ME TA-STER(F21:g1)
100	53:44	53:33	00:01	-3214	-1.	-	9-DDPA

REF WIN= 15 RT WIN= 10 DBLE WIN= 3 DEAD VOL= 1 RES= 6000.

ANALYSIS=MPDMIO00790021.LIS

RT CAL=NSACARO.TIM

Sample#2 Text:N1/3-9 ST2 4346.5m G3422 \$9809OIL002S002\$ File Text:6000RP GCMS

NO	E_TIME	P_TIME	F_TIME	DEL_S	PEAK	AREA	PT	NAME
1	36:21	36:11	36:06	-5	33635200.	-	2-TBA	
2	23:52	23:44	23:43	-1	447283008.	-	PRISTANE	
3	27:17	27:09	27:09	0	429738016.	-	PHYTANE	
4	41:31	41:20	41:20	0	3949570.	#	C23 TRICYC TERPANE(T5:23/3,	
5	43:06	42:55	42:55	0	4141130.	-	C24 TRICYC TERPANE (24/3)	
6	46:11	46:01	46:00	-1	4748280.	-	C25 TRICYC TERPANE (25/3)	
7	47:45	47:35	47:34	-1	3158070.	-	C24 TETRACYC TERP (\$:24/4)	
8	48:26	48:16	48:06	-10	2021210.	-	C26 TRICYCLIC TERPANE(26/3	
9	48:38	48:28	48:27	-1	1892290.	-	C26 TRICYCLIC TERP 2 (26/3)	
10	55:43	55:34	55:33	-1	10680200.	-	C27 18A HOPANE (Ts:27Ts)	
11	56:35	56:26	56:30	4	13101300.	S	C27 17A HOPANE (Tm:27Tm)	
12	57:22	57:13	57:20	7	7413300.	-	25-TRISNORM/z177(25nor28ab	
13	58:44	58:36	58:37	1	2968300.	-	C28 BISNORHOPANE (X:28ab)	
14	59:19	59:11	59:07	-4	5195380.	-	25-NOR m/z177 (Y:25nor30ab	
15	59:19	59:07	59:08	1	7245070.	D	25-NORHOPANE (Y:25nor30ab)	
16	59:48	59:40	59:46	6	13829400.	-	C29 HOPANE (D:29ab)	
17	59:55	59:53	00:01	-3594	-1.	D	C29 18A NORHOPANE (D2:29Ts)	
18	1:00:23	1:00:15	1:00:13	-2	15267300.	-	C30 C30 DIAHOPANE (PI:30)	
19	1:00:50	1:00:42	1:00:39	-3	3135750.	-	C29 NORMORETANE (A:29ba)	
20	1:01:22	1:01:14	1:01:09	-5	4592860.	-	C30 18A OLEANANE (B:300)	
21	1:01:41	1:01:33	1:01:33	0	12286700.	#	C30 HOPANE (G:30ab)	
22	1:02:00	1:01:52	1:01:57	5	3992650.	S	NOR-GAMMACERANE? (G2)	
23	1:02:29	1:02:21	1:02:21	0	4855340.	-	C30 MORETANE (K:30ba)	
24	1:03:53	1:03:45	1:03:44	-1	8991310.	-	C31 22S HOPANE (N:31abS)	
25	1:04:07	1:03:59	1:03:58	-1	7949040.	-	C31 22R HOPANE (O:31abR)	
26	1:03:53	1:03:45	1:03:43	-2	3015070.	-	C31 22S M/Z205 (N205)	
27	1:04:07	1:03:59	1:03:57	-2	2545840.	P	C31 22R M/Z205 (O205)	
28	1:04:07	1:03:57	1:03:58	1	7949040.	D	C30 GAMACERANE (S:30G)	
29	1:04:31	1:04:23	1:04:21	-2	2410790.	S	C30 17B 21B HOPANE (P)	
30	1:05:35	1:05:27	1:05:27	0	6458820.	-	C32 22S HOPANE (U:32abS)	
31	1:05:56	1:05:48	1:05:50	2	6774220.	-	C32 22R HOPANE (V:32abR)	
32	1:07:35	1:07:27	1:07:26	-1	2844940.	-	C33 22S HOPANE(Alpha:32abS)	
33	1:08:03	1:07:55	1:07:55	0	3187430.	#	C33 22R HOPANE (Beta:32abR)	
34	1:09:37	1:09:29	1:09:29	0	1640290.	-	C34 22S HOPANE(Gamma:34abS)	
35	1:10:13	1:10:05	1:10:04	-1	3159700.	-	C34 22R HOPANE(Delta:34abR)	
36	1:11:36	1:11:28	1:11:29	1	2158420.	-	C35 22S HOP (Epsilon:35abS)	
37	1:12:20	1:12:12	1:12:13	1	1369630.	-	C35 22R HOPANE (Zeta:35abR)	
38	38:50	38:40	38:39	-1	11523900.	-	C21 STERANE	
39	50:50	50:40	50:40	0	19076600.	-	C27 20S DIASTER (10:27dbS)	
40	51:44	51:35	51:34	-1	14495900.	-	C27 20R DIASTER (11:27dbR)	
41	54:32	54:23	54:21	-2	9207120.	P	C27 20S AAA STER (20:27aaS)	
42	54:52	54:43	54:41	-2	16803300.	P	C29 20S DIASTER (21A:29dbS)	
43	54:50	54:41	54:39	-2	7171530.	P	C27 20R ISOST218(21B:27bbR)	
44	55:00	54:49	54:50	1	4187250.	D	C27 20S ISOST218 (22:27bbS)	
45	54:52	54:43	54:41	-2	16803300.	P	C27 20R ISOSTER 217 (27bbR)	
46	55:03	54:52	54:50	-2	3977780.	D	C27 20S ISOSTER 217 (27bbS)	
47	55:30	55:21	55:20	-1	2939500.	P	C27 20R AAA STER (25:27aaR)	
48	55:52	55:43	55:43	0	12772200.	P	C29 20S DIASTER (27:29dbR)	
49	57:08	56:59	56:59	0	4809820.	P	C28 20R ISOST218(33A:28bbR)	
50	57:21	57:12	57:12	0	5480890.	D	C28 20S ISOST218 (34:28bbS)	
51	57:07	56:58	56:57	-1	8940600.	P	C28 20R ISOSTER 217 (28bbR)	
52	57:21	57:11	57:12	1	5880090.	D	C28 20S ISOSTER 217 (28bbS)	
53	57:58	57:49	57:48	-1	2359210.	-	C28 20R AAA STER (36:28aaR)	
54	58:42	58:34	58:33	-1	4747460.	S	C29 20S AAA STER (39:29aaS)	
55	59:05	58:57	58:57	0	4803240.	P	C29 20R ISOST218 (40:29bbR)	
56	59:15	59:07	59:06	-1	6541290.	D	C29 20S ISOST218 (41:29bbS)	
57	59:05	58:57	58:57	0	6467600.	P	C29 20R ISOSTER217 (29bbR)	
58	59:14	59:06	59:05	-1	5899330.	D	C29 20S ISOSTER217 (29bbS)	
59	1:00:02	59:54	59:54	0	4266100.	-	C29 20R AAA STER (42:29aaR)	
60	1:00:50	1:00:42	1:00:40	-2	3134650.	P	C30 20R ISOSTER218 (30bbF)	

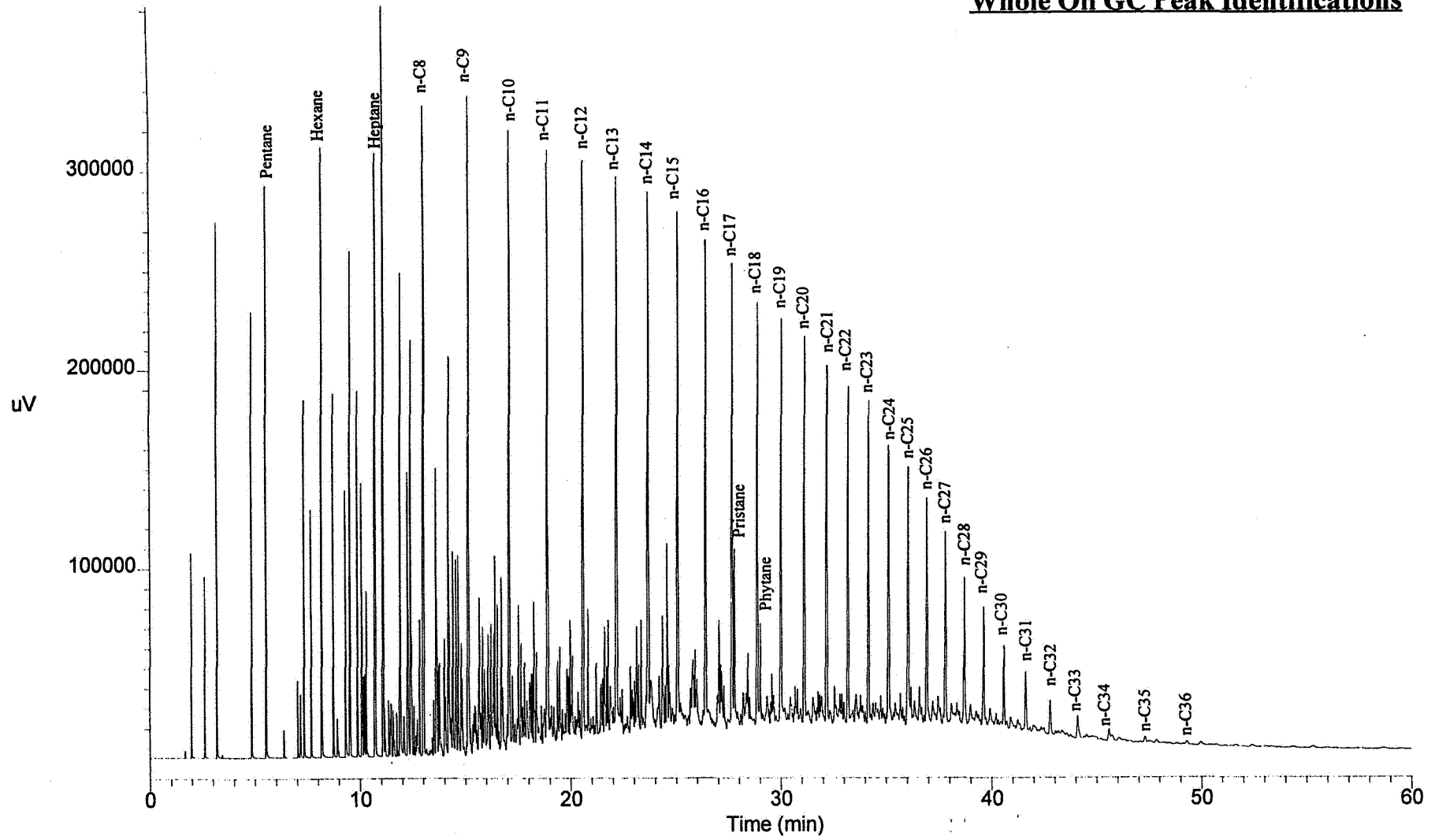
61	1:00:57	1:00:47	00:01	-3648	-1.	D	C30 20S ISOSTER218 (30bbs)
62	1:01:44	1:01:36	1:01:35	-1	946250.	-	C30 4-METHYL STERANE (46)
63	10:47	10:43	10:42	-1	3422569984.	-	2-ME NAPHTHALENE
64	11:06	11:02	11:02	0	1973289984.	-	1-ME NAPHTHALENE
65	13:15	13:11	13:10	-1	46921600.	-	2-ME BIPHENYL
66	15:33	15:28	15:27	-1	388948992.	-	3-ME BIPHENYL
67	15:47	15:41	15:41	0	136639008.	D	4-ME BIPHENYL
68	24:17	24:09	24:09	0	930590016.	#	PHENANTHRENE
69	28:05	27:57	27:56	-1	506192992.	S	3-ME PHENANTHRENE
70	28:14	28:05	28:05	0	515808992.	D	2-ME PHENANTHRENE
71	28:47	28:39	28:38	-1	593233024.	S	9-ME PHENANTHRENE
72	28:56	28:47	28:47	0	413371008.	D	1-ME PHENANTHRENE
73	26:44	26:36	26:36	0	144815008.	#	4-ME DIBENZOTHIOPHENE
74	27:21	27:13	27:13	0	53523700.	-	3+2-ME DIBENZOTHIOPHENE
75	28:00	27:52	27:51	-1	17607100.	-	1-ME DIBENZOTHIOPHENE
76	36:37	36:27	36:27	0	8847090.	S	C21 MA STERANE (F22:A1)
77	39:00	38:50	38:49	-1	4047700.	S	C22 MA STERANE (F23:B1)
78	49:08	48:58	48:56	-2	55833.	S	C27 20S 5B DM MA-ST(F2:C1)
79	49:19	49:09	49:10	1	420645.	S	C27 20S 10B DM MA-DIA (C1)
80	50:51	50:41	50:41	0	341798.	S	C27 20R 5B DM MA-ST(F3:D1)
81	50:59	50:49	50:50	1	446847.	D	C27 20S 5A DM MA-ST(F4:D1)
82	51:21	51:11	51:12	1	823160.	S	C28 20S 5B DM MA-ST(F5:E1)
83	51:55	51:46	51:41	-5	112933.	S	C27 20S 5A DM MA-DS(F5:F1)
84	52:50	52:41	52:38	-3	568092.	-	C27 20R 5A DM MA-ST(F6:G1)+
85	52:50	52:38	52:38	0	568092.	D	C28 20S 5A DM MA-ST(F7:G1)
86	53:03	52:54	52:52	-2	366176.	S	C28 20R 5B DM MA-ST(F8:G1)
87	53:09	52:58	52:59	1	353347.	D	C29 20S 5B DM MA-ST(F9:G1)
88	54:29	54:20	54:16	-4	64678.	S	C29 20S 5A DM MA-ST(F10:H1)
89	54:48	54:39	54:46	7	368712.	S	C28 20R 5A DM MA-ST(F11:H1)
90	54:54	54:52	00:01	-3293	-1.	D	C29 20R 5B DM MA-ST(F12:H1)
91	56:38	56:29	00:01	-3390	-1.	S	C29 20R 5A DM MA-ST(F13:I1)
92	44:10	43:59	44:01	2	14861600.	S	C20 ME TA-STER(F14:a1)
93	46:35	46:25	46:26	1	21204300.	S	C21 ME TA-STER(F15:b1)
94	56:17	56:08	00:01	-3369	-1.	-	C26 20S ME TA-STER(F16:c1)
95	57:53	57:44	00:01	-3465	-1.	-	C26 20R ME TA-STER(F17:d1)+
96	57:53	00:01	00:01	0	-1.	D	C27 20S ME TA-STER(F18:d1)
97	59:15	59:07	00:01	-3548	-1.	-	C28 20S ME TA-STER(F19:e1)
98	59:55	59:47	59:48	1	406223.	-	C27 20R ME TA-STER(F20:f1)
99	1:01:35	1:01:27	00:01	-3688	-1.	-	C28 20R ME TA-STER(F21:g1)
100	53:44	53:35	53:36	1	2592460.	-	9-DDPA

REF WIN= 15 RT WIN= 10 DBLE WIN= 3 DEAD VOL= 1 RES= 6000.

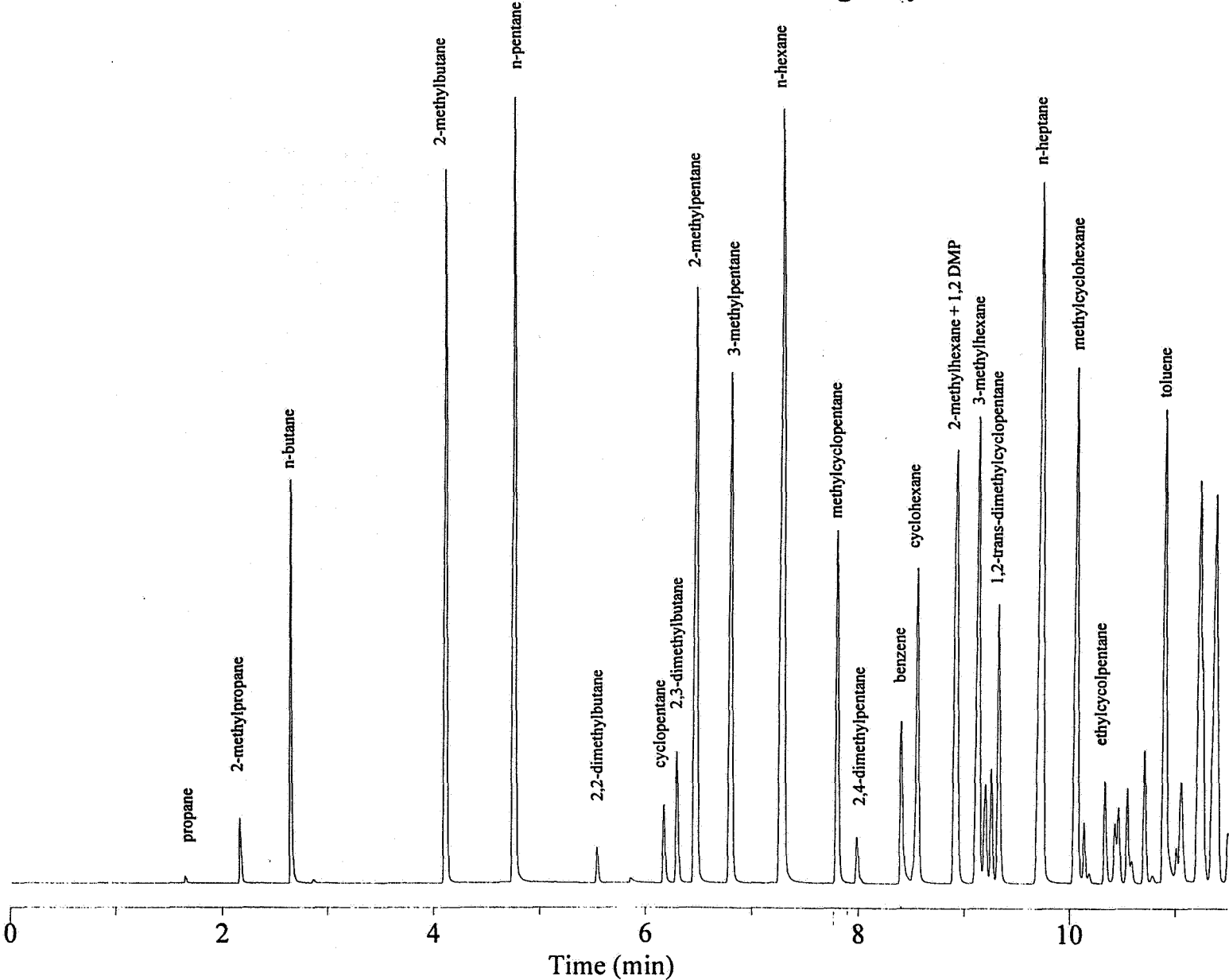
APPENDIX - B

LIGHT HYDROCARBON PEAK IDENTIFICATIONS

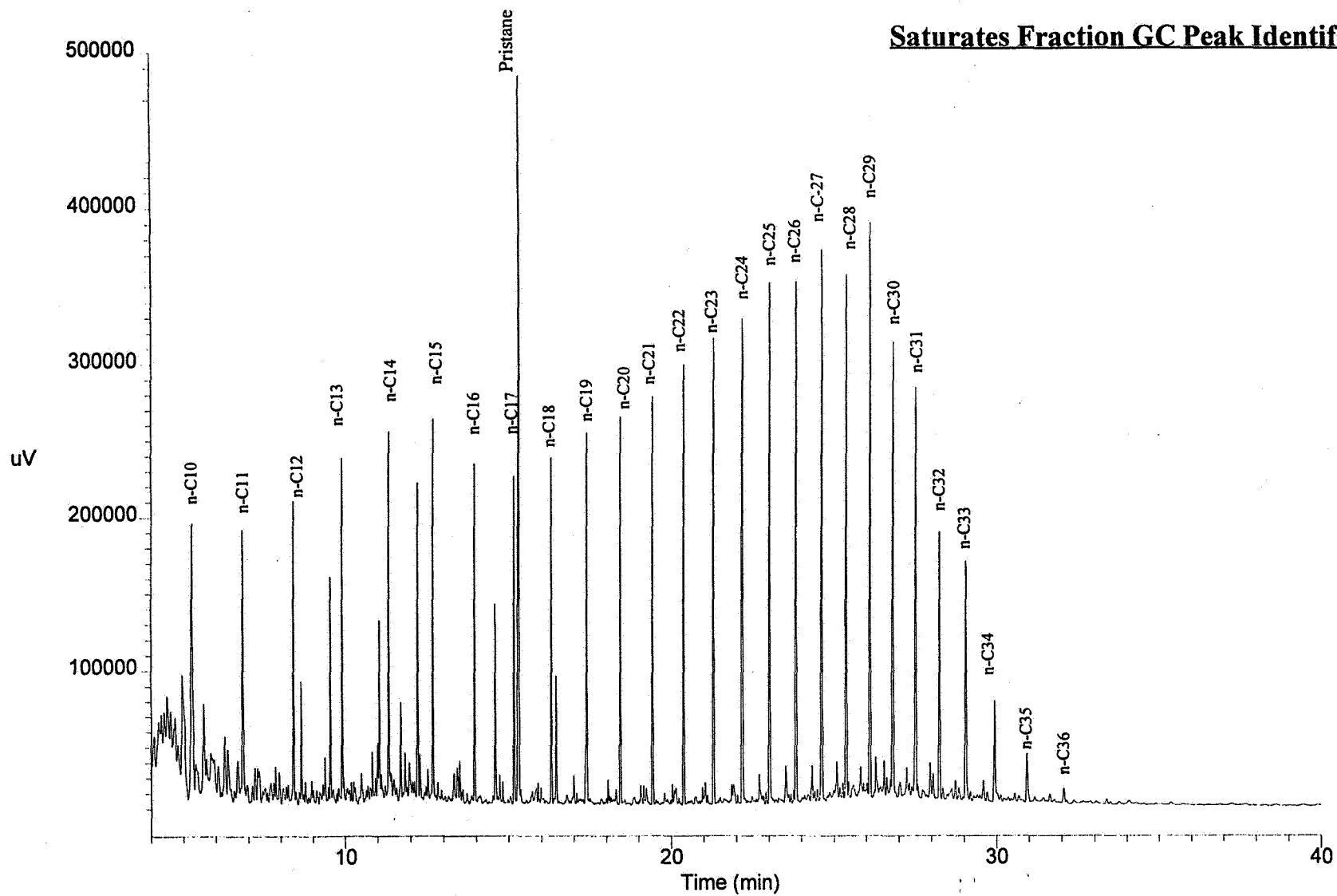
Whole Oil GC Peak Identifications



Light Hydrocarbon Peak Identifications



Saturates Fraction GC Peak Identifications



APPENDIX - C
MOLECULAR PARAMETER LIST

MOLECULAR PARAMETER LIST

LGC CODE	PARAMETER	USE
H1	C32 HOPANE 22S/(22S+22R)	M
H2	C31 HOPANE 22S/(22S+22R)	M
H3	C30 HOPANE/(C30 HOPANE+C30 MORETANE)	MS
H4	$\beta\beta$ HOPANES PRESENT/ABSENT	M
H5	C30:C31:C32:C33:C34:C35 HOPANE DISTRIBUTION	S
H6	C27 HOPANES Ts/(Ts+Tm)	MS
H7	C33 HOPANE 22S/(22S+22R)	M
H8	C34 HOPANE 22S/(22S+22R)	M
H9	C35 HOPANE 22S/(22S+22R)	M
H10	RESIN DITERPANES % RELATIVE TO C30 HOPANE (PEAK G)	S
H11	C23 EXT TRICYCLIC TERPANE % RELATIVE TO C30 HOPANE (PEAK G)	S
H12	C24 TETRACYCLIC TERPANE % RELATIVE TO C30 HOPANE (PEAK G)	S
H13	28,30 BISNORHOPANE (PEAK X) % RELATIVE TO C30 HOPANE (PEAK G)	S
H14	PENTACYCLANE II % RELATIVE TO C30 HOPANE (PEAK G)	S
H15	OLEANANE % RELATIVE TO C30 HOPANE (PEAK G)	S
H16	GAMMACERANE % RELATIVE TO (PEAK G)	S
H17	HOPANES C35/(C34+C35) %	S
H18	25-NORHOPANE/C30 HOPANE %	B
S1	C29 $\alpha\alpha\alpha$ STERANES 20S/(20S+20R)	M
S2	C29 STERANES $\alpha\beta\beta$ /($\alpha\beta\beta$ + $\alpha\alpha\alpha$)	M
S3	STERANES $\alpha\alpha\alpha$ C27:C28:C29	S
S4	STERANES $\alpha\beta\beta$ C27:C28:C29	S
S5	$\beta\alpha$ DIASTERANES/(SAME+ $\alpha\alpha\alpha$ + $\alpha\beta\beta$ STERANES) %	SM
S6	LOW MOLECULAR WEIGHT STERANES RELATIVE TO C29 STERANES	S
S7	STERANE INDEX C27/(C27+C29) % (FROM S3)	S
S8	4-ME C30 STERANE % RELATIVE TO C29 20R $\alpha\alpha\alpha$ STERANE (PEAK 42)	S
S9	4-ME STERANES INDEX C28/(C28+C30) %	S
S10	BICADINANES PRESENT/ABSENT	S
A1	C28 20R TRIAROM. STERANE/(SAME+C29 20R MONOAROM. STERANE)	M
A2	SUM TRIAROM. STERANES/(SAME+SUM MONOAROM. STERANES)	M
A3	C20 TRIAROM. STERANE/(SAME+C28 20R TRIAROM. STERANE)	M
A4	C20+C21 TRIAROM. STERANE/(SAME+SUM C26-C28 TRIAROM. STERANES)	M
A5	C26 20S TRIAROM. STERANE/C28 20S TRIAROM. STERANE	S
A6	C27 20R TRIAROM. STERANE/C28 20R TRIAROM. STERANE	S
M2	PHENANTHRENES (3ME+2ME)/(9ME+1ME)	M
M3	MPI [(3ME+2ME)/(PHENANTHRENE+9ME+1ME)] * 1.5	M
MBP	3-METHYL BIPHENYL/2-METHYL BIPHENYL	M
MDR	4-METHYLDIBENZOTHIOPHENE/1-METHYLDIBENZOTHIOPHENE	M
M4	SUM C27-C35 HOPANES/(SAME+ SUM C27-C29 STERANES) %	S
ALKIND	ALKANE INDEX n-C17/(n-C17+n-C27) %	S
R22	R22 INDEX (2 * n-C22)/(n-C21+n-C23)	SM

NOTES:

1. S=SOURCE PARAMETER, M=MATURITY PARAMETER.

2. TRIAROM. STERANE=MONOMETHYL TRIAROMATIC STERANES
 MONOAROM. STERANE=DIMETHYL MONOAROMATIC STERANES.

(13/11/92)

APPENDIX - D
BIOMARKER IDENTIFICATION

BIOMARKER IDENTIFICATION - PENTACYCLIC HYDROCARBONS

LGC
CODE

TENTATIVE ASSIGNMENT BASED ON MASS SPECTROMETRY (m/e 191)

I	9-DODECYLPERHYDROANTHRACENE [INTERNAL STANDARD]
Ts	18 α (H) -22, 29, 30-TRISNORNEOHOPANE
Tm	17A (H) -22, 29, 30-TRISNORHOPANE
Q	17 β (H) -22, 29, 30-TRISNORHOPANE
W	17A (H) -25, 30-BISNORHOPANE
X	17 α (H) , 18 α (H) , 21 β (H) -28, 30-BISNORHOPANE
Y	17 α (H) -25-NORHOPANE
D	17 α (H) , 21 β (H) -30-NORHOPANE
D2	18 α (H) -30-NORNEOHOPANE
π	17 α (H) , 15 α (Me) -27-NORHOPANE ("DIAHOPANE")
A	17 β (H) , 21 α (H) -30-NORMORETANE
B	18 α (H) -OLEANANE
G	17 α (H) , 21 β (H) -HOPANE
H	17 β (H) , 21 β (H) -30-NORHOPANE
K	17 β (H) , 21 α (H) -MORETANE
N	(22S) -17 α (H) , 21 β (H) -30-METHYLHOPANE
O	(22R) -17 α (H) , 21 β (H) -30-METHYLHOPANE
S	GAMMACERANE
P	17 β (H) , 21 β (H) -HOPANE
R	17 β (H) , 21 α (H) -30-METHYLMORETANE
U	(22S) -17 α (H) , 21 β (H) -30-ETHYLHOPANE
V	(22R) -17 α (H) , 21 β (H) -30-ETHYLHOPANE
J	17 β (H) , 21 β (H) -METHYLHOPANE
α	(22S) -17 α (H) , 21 β (H) -30-n-PROPYLHOPANE
β	(22R) -17 α (H) , 21 β (H) -30-n-PROPYLHOPANE
L	17 β (H) , 21 β (H) -ETHYLHOPANE
γ	(22S) -17 α (H) , 21 β (H) -30-n-BUTYLHOPANE
δ	(22R) -17 α (H) , 21 β (H) -30-n-BUTYLHOPANE
ϵ	(22S) -17 α (H) , 21 β (H) -30-n-PENTYLHOPANE
ζ	(22R) -17 α (H) , 21 β (H) -30-n-PENTYLHOPANE

BIOMARKER IDENTIFICATION - STERANES

LGC
CODE

TENTATIVE ASSIGNMENT BASED ON MASS SPECTROMETRY (m/e 217)

10 (20S) -13 β (H) , 17 α (H) -DIACHOLESTANE
11 (20R) -13 β (H) , 17 α (H) -DIACHOLESTANE
13 (20S) -13 α (H) , 17 β (H) -DIACHOLESTANE
14 (20R) -13 α (H) , 17 β (H) -DIACHOLESTANE
15 (24S/R) - (20S) -13 β (H) , 17 α (H) -24-METHYLDIACHOLESTANE
16 (24S/R) - (20S) -13 β (H) , 17 α (H) -24-METHYLDIACHOLESTANE
18 (24S/R) - (20R) -13 β (H) , 17 α (H) -24-METHYLDIACHOLESTANE
19 (24R/S) - (20R) -13 β (H) , 17 α (H) -24-METHYLDIACHOLESTANE
20A (24S/R) - (20S) -13 α (H) , 17 β (H) -24-METHYLDIACHOLESTANE
20B (20S) -5 α (H) , 14 α (H) , 17 α (H) -CHOLESTANE
21A (24R+S) - (20S) -13 β (H) , 17 α (H) -24-ETHYLDIACHOLESTANE
21B (20R) -5 α (H) , 14 β (H) , 17 β (H) -ISOCHOLESTANE
22 (20S) -5 α (H) , 14 β (H) , 17 β (H) -ISOCHOLESTANE
25 (20R) -5 α (H) , 14 α (H) , 17 α (H) -CHOLESTANE
27 (24S+R) - (20R) -13 β (H) , 17 α (H) -24-ETHYLDIACHOLESTANE
29 (24S+R) - (20S) -13 α (H) , 17 β (H) -24-ETHYLDIACHOLESTANE
33A (24S+R) - (20R) -5 α (H) , 14 β (H) 17 β (H) -24-METHYLISOCHOLESTANE
33B (24S+R) - (20R) -13 α (H) , 17 β (H) -24-ETHYLDIACHOLESTANE
34 (24S+R) - (20S) -5 α (H) , 14 β (H) , 17 β (H) -24-METHYLISOCHOLESTANE
36 (24S+R) - (20R) -5 α (H) , 14 α (H) , 17 α (H) -24-METHYLCHOLESTANE
39 (24S+R) - (20S) -5 α (H) , 14 α (H) , 17 α (H) -24-ETHYLCHOLESTANE
40 (24S+R) - (20S) -5 α (H) , 14 β (H) , 17 β (H) -24-ETHYLISOCHOLESTANE
41 (24S+R) - (20R) -5 α (H) , 14 β (H) , 17 β (H) -24-ETHYLISOCHOLESTANE
42 (24S+R) - (20R) -5 α (H) , 14 α (H) , 17 α (H) -24-ETHYLCHOLESTANE
46 (24S+R) - (20R) C₃₀ STERANE

BIOMARKER IDENTIFICATION - AROMATIC STEROIDAL HYDROCARBONS
(AROMATIC STERANES)

LGC
CODE

TENTATIVE ASSIGNMENT BASED ON MASS SPECTROMETRY
(m/e 253 mass fragmentogram)

F22 C₂₁ DIMETHYL MONOAROMATIC STEROID
F23 C₂₂ DIMETHYL MONOAROMATIC STEROID
F2 C₂₇ (20S) 5 β (H) DIMETHYL MONOAROMATIC STEROID
F3 C₂₇ (20R) 5 β (H) DIMETHYL MONOAROMATIC STEROID
F4 C₂₇ (20S) 5 α (H) DIMETHYL MONOAROMATIC STEROID
F5 C₂₈ (20S) 5 β (H) DIMETHYL MONOAROMATIC STEROID
F6 C₂₇ (20R) 5 α (H) DIMETHYL MONOAROMATIC STEROID
F7 C₂₈ (20S) 5 α (H) DIMETHYL MONOAROMATIC STEROID
F8 C₂₈ (20R) 5 β (H) DIMETHYL MONOAROMATIC STEROID
F9 C₂₉ (20S) 5 β (H) DIMETHYL MONOAROMATIC STEROID
F10 C₂₉ (20S) 5 α (H) DIMETHYL MONOAROMATIC STEROID
F11 C₂₈ (20R) 5 α (H) DIMETHYL MONOAROMATIC STEROID
F12 C₂₉ (20R) 5 β (H) DIMETHYL MONOAROMATIC STEROID
F13 C₂₉ (20R) 5 α (H) DIMETHYL MONOAROMATIC STEROID

(m/e 231 mass fragmentogram)

F14 C₂₀ METHYL TRIAROMATIC STEROID
F15 C₂₁ METHYL TRIAROMATIC STEROID
F16 C₂₆ (20S) METHYL TRIAROMATIC STEROID
F17 C₂₆ (20R) METHYL TRIAROMATIC STEROID
F18 C₂₇ (20S) METHYL TRIAROMATIC STEROID
F19 C₂₈ (20S) METHYL TRIAROMATIC STEROID
F20 C₂₇ (20R) METHYL TRIAROMATIC STEROID
F21 C₂₈ (20R) METHYL TRIAROMATIC STEROID

BIOMARKER IDENTIFICATION - NORHOPANES

LGC
CODE

TENTATIVE ASSIGNMENT BASED ON MASS SPECTROMETRY (m/e 177)

W 17 α (H) -25, 30-BISNORHOPANE
Y 17 α (H) -25-NORHOPANE
D 17 α (H) , 21 β (H) -30-NORHOPANE
C1 (22S) -17 α (H) -25-NOR-30-METHYLHOPANE
G 17 α (H) , 21 β (H) HOPANE
C2 (22R) -17 α (H) -25-NOR-30-METHYLHOPANE
C3 (22S) -17 α (H) -25-NOR-30-ETHYLHOPANE
C4 (22R) -17 α (H) -25-NOR-30-ETHYLHOPANE
C5 (22S) -17 α (H) -25-NOR-30-n-PROPYLHOPANE
C6 (22R) -17 α (H) -25-NOR-30-n-PROPYLHOPANE
C7 (22S) -17 α (H) -25-NOR-30-n-BUTYLHOPANE
C8 (22R) -17 α (H) -25-NOR-30-n-BUTYLHOPANE
C9 (22S) -17 α (H) -25-NOR-30-n-PENTYLHOPANE
C10 (22R) -17 α (H) -25-NOR-30-n-PENTYLHOPANE

APPENDIX - E
IATROSCAN ANALYSIS

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Appendix

Iatroscan Analysis

A small quantity of crushed rock (2-5gms) was extracted (10 minutes ultrasonic bath) with a dichloromethane/methanol mixture. An aliquot (0.5-1ul) was separated by Thin Layer Chromatography (TLC), in duplicate, on thin quartz rods coated with a layer of sintered silica gel. The sample was separated into hydrocarbon types using a three stage solvent development and drying sequence:

heptane - 60mls, 30minutes, 90% rod length, oven dried at 50°C for 2minutes

toluene - 60mls, 12 minutes 55% rod length, oven dried at 50°C for 3minutes

dichloromethane:methanol - 60mls (9:1 by volume), 4minutes 25% rod length, oven dried at 50°C for 2 minutes

Finally the eluted rods were directly scanned through the Iatroscan flame ionisation detector at 40sec/scan and the signal amplified to produce a chromatogram.

The four resolved peaks - saturate hydrocarbons, aromatic hydrocarbons, Resin A and Resin B (the latter equating to but not identical with n-heptane insoluble asphaltenes) - were identified and quantified with reference to a standard blend containing squalene (saturates), methylanthracene (aromatics) and 1-dodecanol (resins A and B)

Equipment

Instrument	Iatroscan TH-10 MkIV (series II)	
TLC rods	Chromarod-SIII (silica, pore diameter 60A, particle size 5um)	
Solvents	Extraction	Dichloromethane: methanol (93:7 vol%)
	Development	heptane
		toluene
		chloroform:methanol (9:1 vol)