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Availability
In confidence

Report type
F

Report number
IFE/KR/F-99/106

Date
1999-08-02

Report title
Vitrinite Reflectance Well 34/11-4 and 34/11-4T2
Offshore Norway
(IFE project no. 2.3.126.99)

Date of last revision

Client
Den norske stats oljeselskap

Revision number

Client reference

Number of pages

Number of issues
9

Summary

Distribution

Statoil (3)
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Keywords:

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Reviewed by	Tom Pedersen	1999-08-02	Tom Pedersen
Approved by	Tor Bjørnstad	1999-08-02	Tor Bjørnstad

1 Introduction

This report gives the result of routine vitrinite reflectance analyses of 24 samples from well 34/11-4 and 4T2 offshore Norway.

2 Material

The material was provided from the client as 22 cuttings samples and 2 core samples. Information on stratigraphy in well 34/11-4 was not provided from the client.

3 Analytical techniques

3.1 Preparation

The sample material was embedded in an epoxy resin to make briquettes, ground flat and polished using 0.25 micron diamond paste and magnesium oxide as the two final steps.

3.2 Analysis

The analytical equipment being used was a Zeiss MPM 03 photometer microscope equipped with an Epiplan-Neofluar 40/0.90 oil objective. The sensitive measuring spot was kept constant for all measurements at about 2.5 micron in diameter. The measurements were made through a green band pass filter (546 nm) and in oil immersion (refractive index 1.515 at 18°C). The readings were made without a polarizer and using a stationary stage. This procedure is called measurement of random reflectance (%Rm). The photometer is calibrated daily against a standard of known reflectance (%Rm= 0.588) and routinely (daily) checked against two other standards of significant different reflectances (%Rm=0.879 and 1.696). A deviation from these values of less than ±0.01 and ±0.02 respectively is considered as acceptable. The calibration is routinely checked during the course of measurements at least every hour, and a deviation of less than ±0.005 is considered as acceptable.

For each sample at least 20 points were measured if possible, and quality ratings are given to various important aspects which may affect the measurements. These aspects are abundance of vitrinite, uncertainties in the identification of indigenous vitrinite, type of vitrinite, particle size, particle surface quality and abundance of pyrite.

3.3 Presentation of results

The raw data from the measurements are presented in appendix for each sample both as tabulated data and histograms. A true vitrinite population is selected among the readings based on observations made during the measurements, and arithmetic mean values and standard deviation are calculated for this population and other populations. A quality rating is given to the true population. The results are listed in table 1. Figure 1 shows a vitrinite reflectance versus depth plot.

4 Results

Most of the samples were poor in vitrinite. Bulk samples preparation lead to difficult preparation and lowered polish quality. Due to two high quality coal samples at 4158.65m and 4194.45m, it has been possible to establish a fairly reliable vitrinite reflectance towards depth trend for well 34/11-4 and 4T2.

Table 1. Vitrinite reflectance data table well 34/11-4 and 4T2.

Analysis type:	Vitrinite reflectance
Well:	34/11-4 (samples 991241-991258)
Well:	34/11-4T2 (samples 991259-991262)
Number of samples:	24
Time period for analysis:	jul-99
Analysis performed by:	Kristine Aasgaard, Institutt for energiteknikk
Analysis ordered by:	Statoil

IFE sample code	Depth (m)	Sample type	Lithology	Vitr. refl. (%Rm)	Stand. dev.	Number of readings	Sample description	Sample quality	Sample prep.
991241	1230	DC	clyst/sst	0.19	0.01	4	-oo--o	P	bulk
991242	1370	DC	clyst/sst	0.26	0.03	20	ooo--o	M	bulk
991243	1500	DC	clyst/sst	0.29	0.05	17	-oo--o	M	bulk
991244	1650	DC	clyst/sst	0.28	0.03	8	-oo--o	P	bulk
991245	1790	DC	clyst/sst	0.27	0.05	4	-oo--o	P	bulk
991246	1950	DC	clyst/sst	0.35	0.06	10	-oo--o	P	bulk
991247	2100	DC	clyst/sst	0.42	0.01	2	-oo--o	P	bulk
991248	2250	DC	clyst/sst	barren	-	-	-	-	bulk
991249	2400	DC	clyst/sst	barren	-	-	-	-	bulk
991250	2470	DC	clyst/sst	0.53	0.02	2	-oo--o	P	bulk
991251	2600	DC	clyst/sst	barren	-	-	-	-	bulk
991252	2750	DC	clyst/sst	0.53	0.03	7	-oo--o	P	bulk
991253	2900	DC	clyst/sst	0.50	0.05	4	-oo--o	P	bulk
991254	3050	DC	clyst/sst	0.62	0.03	5	-oo--o	P	bulk
991255	3200	DC	clyst/sst	barren	-	-	-	-	bulk
991256	3350	DC	clyst/sst	0.75	0.06	10	-oo--o	P	bulk
991257	3500	DC	clyst/sst	0.73	0.08	7	-±o--o	P	bulk
991258	3770	DC	sst/clyst	0.81	0.06	3	-±±--o	P	bulk
991259	3945	DC	sst/clyst	barren	-	-	-	-	bulk
991260	4050	DC	sst/clyst	barren	-	-	-	-	bulk
991267	4158.65	CORE	coal	0.88	0.02	25	oooooo	G	bulk
991268	4194.45	CORE	coal	0.98	0.03	25	oooooo	G	bulk
991261	4320	DC	sst/clyst	barren	-	-	-	-	bulk
991262	4413	DC	clyst/sst	1.06	0.07	20	ooo--o	M	bulk

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Availability: In Confidence

Report type	IFE/KR/F-99/116
Date	1999-08-11
Report title	DATAREPORT ON MOLECULAR AND STABLE ISOTOPE COMPOSITION OF GAS SAMPLES FROM WELL 34/11-4-T3 (ref. IFE no 2.3.128.99)
Date of last revision	
Client	Statoil
Revision number	
Client reference	Jorun Johannesen
Number of pages	5
Number of issues	15

Summary

Two gas samples from well 34/11-4-T3; MDT GA-152, 4151.0m and MDT 969, 4194.8m, are analysed for gas and isotopic composition.

The work is done in accordance with «The Norwegian Industry Guide to Organic Geochemical Analyses», third edition 1993.

Distribution

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Reviewed by	Harald Johansen	1999-08-11	Harald Johansen
Approved by	Bjørg Andresen	1999-08-11	Bjørg Andresen

1 Introduction

Two gas samples from well 34/11-4-T3; MDT GA-152, 4151.0m and MDT 969, 4194.8m, are analysed for gas and isotopic composition.

On the samples C_1 - C_5 and CO_2 are quantified. The $\delta^{13}C$ value is measured on methane, ethane, propane, the butanes and CO_2. In addition the δD value is measured on methane.

2 Analytical procedures

Aliquots of 0.2 ml are sampled with a syringe for analysis on a Poraplot Q column connected with flame ionisation (FID) and thermal conductivity (TCD) detectors. The detection limit for the hydrocarbon gas components is 0.001 µl/ml, for CO_2 0.05 µl/ml.

For the isotope analysis 5-10 ml of the gas is sampled with a syringe and then separated into the different gas components by a Carlo Erba 4200 gas chromatograph. The hydrocarbon gas components are oxidised in separate CuO-ovens in order to prevent cross contamination. The combustion products CO_2 and H_2O are frozen into collection vessels and separated.

The combustion water is reduced with zinc metal in sealed quarts tubes to prepare hydrogen for isotopic analysis. The isotopic measurements are performed on a Finnigan MAT 251 and a Finnigan Delta mass spectrometer.

IFEs value on NBS 22 is -29.77 ± .06‰ PDB.

The analytical procedures are tested with a laboratory gas standard mixture. Based on repeated analysis of the gas standard, the reproducibility in the $\delta^{13}C$ value is better than 0.5‰ PDB for all components. The reproducibility in the δD value is likewise better than 10‰.

3 Results

The normalised volume composition of the gas samples is shown in Table 1. The stable isotope composition is shown in Table 2.

The molecular composition related to the carbon isotope variations in methane from the samples are plotted in Figure 1 (Schoell, 1983), the carbon and hydrogen variations in methane are plotted in Figure 2 (Schoell, 1983) and the carbon isotope variation in ethane related to the carbon isotope variations in methane in Figure 3 (Schoell, 1983).

Table 1 Volume composition of gas samples (normalised values) from well 34/11-4-T3

Sample	Sample Depth m	IFE no GEO	C_1 %	C_2 %	C_3 %	iC_4 %	nC_4 %	iC_5 %	nC_5 %	CO_2 %	ΣC_1- C_5 %	Wet-ness	iC_4/ nC_4
MDT GA-152	4151.0	991280	83.6	7.1	3.6	0.37	0.79	0.16	0.15	4.3	95.7	0.13	0.47
MDT 969	4194.8	991281	79.4	8.0	5.2	0.68	1.6	0.32	0.36	4.4	95.6	0.17	0.41

Table 2 Isotopic composition of gas samples from well 34/11-4-T3

Sample	Sample Depth m	IFE no GEO	C_1 $\delta^{13}C$ ‰ PDB	C_1 δ D ‰ SMOW	C_2 $\delta^{13}C$ ‰ PDB	C_3 $\delta^{13}C$ ‰ PDB	iC_4 $\delta^{13}C$ ‰ PDB	nC_4 $\delta^{13}C$ ‰ PDB	CO_2 $\delta^{13}C$ ‰ PDB	CO_2 $\delta^{18}O$ ‰ PDB
MDT GA-152	4151.0	991280	-41.9	-209	-30.8	-27.8	-26.8	-27.1	-1.4	-17.5
MDT 969	4194.8	991281	-42.6	-208	-31.2	-28.3	-29.5	-28.0	-3.0	-14.1

4 Literature

Schoell, M. (1983). Genetic characterisation of natural gases. *The American Association of Petroleum Geologists Bulletin*, **67**,2225-2238.

LGC Geochemistry

Geochemical Analysis of Sediment Samples, Drillling Mud Extracts and Hydrocarbon Fluids from 34/11-4, 34/11-4T2 and 34/11-4T3, offshore Norway

September, 1999

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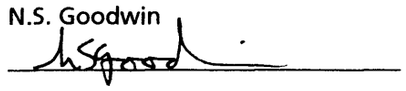


Date: 9th September 1999

LGC/1999 LFX/228/160

Contents

Summary

This report contains geochemical data for source rock cuttings, reservoir cores, MDT test fluids and mud samples from the wells 34/11-2S, 34/11-4, -4T2 and –4T3 offshore Norway (Table 1), provided by Statoil, Stavanger.

Samples were analysed using the method specified in the NPD NIGOGA-3 guide and data are provided in the specified formats. The NPD standard samples NSO-1 and SR-1 were analysed with the samples and results are given in data Appendix-F.

Table-2 shows the analytical programme requested by Statoil. Source rock screening (TOC, REv and PyGC) was performed on washed, dried and ground cuttings for the WBM samples and on washed, dried, ground and pre-extracted (Soxhtec - dichloromethane) cuttings where OBM had been used. Rock Eval screening, where requested, was performed on un-extracted reservoir core material. Bulk composition of the oils and extracts was determined by Iatroscan (saturate, aromatic, residue and asphaltene %) and HPLC was used to prepare fractions for gas chromatography and stable ^{13}C isotope studies. GCMS was performed on deasphaltened oils and extracts at high resolution (MS-166ppm), to achieve complete MS resolution of both the hydrocarbon and heteroatomic ion species. Owing to the high level of OBM contamination, extract samples were analysed twice; once to monitor abundant low molecular weight species eluting before 30mins (naphthalenes, biphenyls, phenanthrenes, benzothiophenes) and a second more concentrated analysis to monitor the biological markers (steranes, terpanes, aromatic steranes), which elute after 30mins. The data are combined in the result tables. Owing this combined analysis method, ion signals should not be compared between data collected in the first and second analysis (e.g. ratioing phenanthrenes to steranes), additional data for this can be provided if necessary.

While the well 34/11-4 was drilled with water based mud (WBM), oil based mud (OBM) was used in 34/11-T2 causing significant contamination of cuttings samples. Owing to the level of OBM contamination, evident from the saturate and aromatics fraction GC's, ^{13}C isotope studies were only performed on the WBM samples and the oils.

Data are reported in Appendices A to F subdivided by sample type (see Contents). A key to the abbreviations, annotations and molecular parameters used is provided below in the Key Appendix.

In most cases, data for the NPD standard samples were in agreement with the accepted values, the only notable exception was:

The oil density for NSO-1 (0.8644, Appendix-F) was outside the NPD permissible range (0.858-0.862). This density determination was performed by our subcontractor who is a UKCAS accredited laboratory. They report that they calibrate the instrument daily and check daily with an in-house standard, agreed by approx. 15+ other laboratories worldwide who perform oil density measurements for BP Amoco. To substantiate their result they re-calibrated a second instrument and another analyst repeated the measurement. This gave the same result. The sample was also analysed by whole oil GC at LGC, which indicated that no deterioration (evaporation) of the sample had taken place compared with the standard NPD chromatogram. At present we cannot explain the discrepancy between our subcontractors results and the NPD published limits.

Table 1 - Sample List

Sample No.	Sample Depth (m)	Sample Type	Batch Code
34/11-4 (WBM)	3909	cutt	9907SED009S001
34/11-4 (WBM)	3924	cutt	9907SED009S002
34/11-4 (WBM)	3938	cutt	9907SED009S003
34/11-4T2 (OBM)	3960	cutt	9907SED008S001
34/11-4T2 (OBM)	3972	cutt	9907SED008S002
34/11-4T2 (OBM)	3984	cutt	9907SED008S003
34/11-4T2 (OBM)	3996	cutt	9907SED008S004
34/11-4T2 (OBM)	4008	cutt	9907SED008S005
34/11-4T2 (OBM)	4017	cutt	9907SED008S006
34/11-4T2 (OBM)	4029	cutt	9907SED008S007
34/11-4T2 (OBM)	4041	cutt	9907SED008S008
34/11-4T2 (OBM)	4053	cutt	9907SED008S009
34/11-4T2 (OBM)	4065	cutt	9907SED008S010
34/11-4T2 (OBM)	4077	cutt	9907SED008S011
34/11-4T2 (OBM)	4089	cutt	9907SED008S012
34/11-4T2 (OBM)	4101	cutt	9907SED008S013
34/11-4T2 (OBM)	4119	cutt	9907SED008S014
34/11-4T2 (OBM)	4140	cutt	9907SED008S015
34/11-4T2 (OBM)	4150.1	core	9906SED008S001
34/11-4T2 (OBM)	4152.7	core	9906SED008S002
34/11-4T2 (OBM)	4156.3	core	9906SED008S003
34/11-4T2 (OBM)	4157.95	core	9906SED008S004
34/11-4T2 (OBM)	4162.15	core	9906SED008S005
34/11-4T2 (OBM)	4164.15	core	9906SED008S006
34/11-4T2 (OBM)	4165.85	core	9906SED008S007
34/11-4T2 (OBM)	4168.75	core	9906SED008S008
34/11-4T2 (OBM)	4170.55	core	9906SED008S009
34/11-4T2 (OBM)	4172.55	core	9906SED008S010
34/11-4T2 (OBM)	4176.85	core	9906SED008S011
34/11-4T2 (OBM)	4181.85	core	9906SED008S012
34/11-4T2 (OBM)	4184.95	core	9906SED008S013
34/11-4T2 (OBM)	4185.8	core	9906SED008S014
34/11-4T2 (OBM)	4188.85	core	9906SED008S015
34/11-4T2 (OBM)	4195.15	core	9906SED008S016
34/11-4T2 (OBM)	4196.15	core	9906SED008S017
34/11-4T2 (OBM)	4197.2	core	9906SED008S018
34/11-4T2 (OBM)	4198.2	core	9906SED008S019
34/11-4T2 (OBM)	4199.2	core	9906SED008S020
	Test fluids (liquids and gases)		
34/11-2S	4142.5	DST2	9907OIL004S001
34/11-4T3 (WBM)	4194.8	MDT	9907OIL004S002
34/11-4T3 (WBM)	4151	MDT	9907OIL004S005
Dead Oil	Oil sample		9907OIL004S003
	Muds		
34/11-4T2 (OBM)	3948m		9907OIL007S001
34/11-4T2 (OBM)	4148m		9907OIL007S002
34/11-4T2 (OBM)	4204m		9907OIL007S003

WBM - Water Based Mud
OBM - Oil Based Mud

Table 2. Analytical Programme: 34/11-4

Sample no.	Sample depth	Sample type	Lithology	Table 5 TOC	Table 5 Rock Eval	Table 6 TE-GC	Table 6 Py-GC	Table 7 Kerogen description	Table 8 Bulk composition	Table 9 GC sats	Table 9 GC arom	Table 10 Carbon isotopes of.... kerogen	Table 10 Carbon isotopes of.... oil/EOM	Table 10 Carbon isotopes of.... fractions	Table 11 GCMS sats	Table 12 CMS aroms	Table 13 Light HCs
34/11-4 (WBM)	3909	cutt	clst	✓	✓												
34/11-4 (WBM)	3924	cutt	clst	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
34/11-4 (WBM)	3938	cutt	clst	✓	✓												
4/11-4T2 (OBM)	3960	cutt	clst	✓	✓		✓	✓	✓	✓	✓	☒	☒	☒	✓	✓	
4/11-4T2 (OBM)	3972	cutt	clst	✓	✓												
4/11-4T2 (OBM)	3984	cutt	clst	✓	✓												
4/11-4T2 (OBM)	3996	cutt	clst	✓	✓		✓	✓	✓	✓	✓	☒	☒	☒	✓	✓	
4/11-4T2 (OBM)	4008	cutt	clst	✓	✓												
4/11-4T2 (OBM)	4017	cutt	clst	✓	✓				✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4029	cutt	clst	✓	✓												
4/11-4T2 (OBM)	4041	cutt	clst	✓	✓		✓	✓	✓	✓	✓	☒	☒	☒	✓	✓	
4/11-4T2 (OBM)	4053	cutt	clst	✓	✓												
4/11-4T2 (OBM)	4065	cutt	clst	✓	✓		✓	✓	✓	✓	✓	☒	☒	☒	✓	✓	
4/11-4T2 (OBM)	4077	cutt	clst	✓	✓												
4/11-4T2 (OBM)	4089	cutt	clst	✓	✓		✓	✓	✓	✓	✓	☒	☒	☒	✓	✓	
4/11-4T2 (OBM)	4101	cutt	clst	✓	✓												
4/11-4T2 (OBM)	4119	cutt	clst	✓	✓				✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4140	cutt	clst	✓	✓												
4/11-4T2 (OBM)	4150.1	core	sst		✓												
4/11-4T2 (OBM)	4152.7	core	sst		✓				✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4156.3	core	sst		✓												
4/11-4T2 (OBM)	4157.95	core	sst		✓				✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4162.15	core	sst		✓												
4/11-4T2 (OBM)	4164.15	core	sst		✓												
4/11-4T2 (OBM)	4165.85	core	sst		✓				✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4168.75	core	sst		✓												
4/11-4T2 (OBM)	4170.55	core	sst		✓												
4/11-4T2 (OBM)	4172.55	core	sst		✓												
4/11-4T2 (OBM)	4176.85	core	sst		✓				✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4181.85	core	sst		✓												
4/11-4T2 (OBM)	4184.95	core	sst		✓												
4/11-4T2 (OBM)	4185.8	core	sst		✓												
4/11-4T2 (OBM)	4188.85	core	sst		✓												
4/11-4T2 (OBM)	4195.15	core	sst		✓				✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4196.15	core	sst		✓				✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4197.2	core	sst		✓												
4/11-4T2 (OBM)	4198.2	core	sst		✓				✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4199.2	core	sst		✓												
	Test fluids (liquids and gases)																
4/11-4T3 (WBM)	4151	MDT							✓	✓	✓		✓	✓	✓	✓	✓
4/11-4T3 (WBM)	4194.8	MDT							✓	✓	✓		✓	✓	✓	✓	✓
	Oil sample								✓	✓	✓		✓	✓	✓	✓	✓
	34/11-2S								✓	✓	✓		✓	✓	✓	✓	✓
	Muds																
4/11-4T2 (OBM)	3948m								✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4148m								✓	✓	✓		☒	☒	✓	✓	
4/11-4T2 (OBM)	4204m								✓	✓	✓		☒	☒	✓	✓	
	Total			18	38		6	6	22	22	22	6	22	22	22	22	4

APPENDIX - KEY

KEY TO TERMS USED

TABLE OF ABBREVIATIONS

Lithological Abbreviations

ANHYD	Anhydrite
BIT	Bitumen
BULK	Bulked
CALCMDST	Calc Mudstone
CARB	Carbonaceous
CHALK	Chalk
CHT	Chert
CL	Clay
CLST	Claystone
COAL	Coal
CONG	Conglomerate
DIAT	Diatomite
DOL	Dolomite
EVAP	Evaporite
EXTRU	Extrusives
GRAVEL	Gravel
GYP	Gypsym
HAL	Halite
INTRU	Intrusives
LIGN	Lignite
LST	Limestone
MDST	Mudstone
META	Metamorphic
NP	Not Picked
PHOS	Phosphate
QTZ	Quartz
QUARTZIT	Quartzite
RES	Resin
SNDY	Sandy
SILT	Silt
SLTY	Silty
SLTST	Siltstone
SND	Sand
SST	Sandstone
TARSAND	Tar Sand
TUFF	Tuff
VOLC	Volcanics

Colour Abbreviations

BK	Black
BLU	Blue
GN	Green
GY	Grey
OR	Orange
RD	Red
WH	White
Y	Yellow

Texture Abbreviations

FN	Fine
M	Medium

Pyrolysis

GOGI= (C1 to C5)/(C6-Cn)
PI=S1/(S1+S2)
PP=S1+S2

KEY TO GCMS COMPOUND IDENTIFICATION AND CALCULATED PARAMETERS

Calculated molecular parameters based on peak heights of components listed in the Detected Peaks List.
Formulae for the calculations are shown in the Calculation List.
Components in the Calculation List formulae are denoted by their assigned "No" in the Detected Peaks List.
See notes at the top of the Calculation List for further explanation.
Brit. Petrol. and NPD Peak identification letters used on GCMS mass chromatograms are also listed in the Detected Peaks List (BP: NPD)

DETECTED PEAKS LIST

METH - RETENTION TIME CALIBRATION DATA VERSION= 3.20

METHOD FILE=NSACARO.TIM EQUATION FILE=NSACARO.EQN

NO	TIME	ION	RRF	PTYP	NAME	NO
1	35:54	219.1174	1.00	-	2-TBA	1
2	23:39	127.1487	1.00	-	PRISTANE	2
3	27:04	127.1487	1.00	-	PHYTANE	3
4	30:28	191.1799	1.20	-	C19 TRICYCLIC TERPANE(19/3)	4
5	33:01	191.1799	1.20	-	C20 TRICYCLIC TERPANE(20/3)	5
6	35:43	191.1799	1.20	-	C21 TRICYCLIC TERPANE(21/3)	6
7	38:14	191.1799	1.20	-	C22 TRICYCLIC TERPANE(22/3)	7
8	41:06	191.1799	1.20	#	C23 TRICYC TERPANE(T5:23/3)	8
9	42:41	191.1799	1.20	-	C24 TRICYC TERPANE (24/3)	9
10	45:44	191.1799	1.20	-	C25 TRICYC TERPANE (25/3)	10
11	47:18	191.1799	1.20	-	C24 TETRACYC TERP ($:24/4)	11
12	47:58	191.1799	1.20	-	C26 TRICYCLIC TERPANE(26/3)	12
13	48:12	191.1799	1.20	-	C26 TRICYCLIC TERP 2 (26/3)	13
14	52:58	191.1799	1.20	-	C28 TRICYCLIC TERPANE(28/3)	14
15	53:20	191.1799	1.20	-	C28 TRICYCLIC TERP 2 (28/3)	15
16	54:24	191.1799	1.20	-	C29 TRICYCLIC TERPANE(29/3)	16
17	54:54	191.1799	1.20	-	C29 TRICYCLIC TERP 2 (29/3)	17
18	55:15	191.1799	1.20	-	C27 18A HOPANE (Ts:27Ts)	18
19	56:07	191.1799	1.20	S	C27 17A HOPANE (Tm:27Tm)	19
20	57:03	191.1799	1.20	-	C30 TRICYCLIC TERPANE(30/3)	20
21	57:31	191.1799	1.20	-	C30 TRICYCLIC TERP 2 (30/3)	21
22	56:55	177.1643	1.20	-	25-TRISNORm/z177(25nor28ab)	22
23	58:19	191.1799	1.20	-	C28 BISNORHOPANE (X:28ab)	23
24	58:52	177.1643	1.20	-	25-NOR m/z177 (Y:25nor30ab)	24
25	58:51	191.1799	1.20	D	25-NORHOPANE (Y:25nor30ab)	25
26	59:19	191.1799	1.20	S	C29 HOPANE (D:29ab)	26
27	59:26	191.1799	1.20	D	C29 18A NORHOPANE (D2:29Ts)	27
28	59:55	191.1799	0.60	-	C30 C30 DIAHOPANE (PI:30d)	28
29	1:00:22	191.1799	1.20	-	C29 NORMORETANE (A:29ba)	29
30	1:00:57	191.1799	0.60	-	C30 18A OLEANANE (B:30O)	30
31	1:01:13	191.1799	0.60	#	C30 HOPANE (G:30ab)	31
32	1:01:26	191.1799	1.20	S	NOR-GAMMACERANE? (G2)	32
33	1:02:02	191.1799	0.60	-	C30 MORETANE (K:30ba)	33
34	1:03:24	191.1799	1.20	-	C31 22S HOPANE (N:31abS)	34
35	1:03:44	191.1799	1.20	-	C31 22R HOPANE (O:31abR)	35
36	1:03:24	205.1956	1.20	-	C31 22S M/Z205 (N205)	36
37	1:03:40	205.1956	1.20	P	C31 22R M/Z205 (O205)	37
38	1:03:44	191.1799	0.60	D	C30 GAMACERANE (S:30G)	38
39	1:04:09	191.1799	0.60	S	C30 17B 21B HOPANE (P)	39
40	1:05:09	191.1799	1.20	-	C32 22S HOPANE (U:32abS)	40
41	1:05:30	191.1799	1.20	-	C32 22R HOPANE (V:32abR)	41
42	1:07:08	191.1799	1.20	-	C33 22S HOPANE(Alpha:32abS)	42
43	1:07:37	191.1799	1.20	-	C33 22R HOPANE (Beta:32abR)	43
44	1:09:10	191.1799	1.20	-	C34 22S HOPANE(Gamma:34abS)	44
45	1:09:46	191.1799	1.20	-	C34 22R HOPANE(Delta:34abR)	45
46	1:11:11	191.1799	1.20	-	C35 22S HOP (Epsilon:35abS)	46
47	1:11:56	191.1799	1.20	-	C35 22R HOPANE (Zeta:35abR)	47
48	38:27	217.1956	1.88	-	C21 STERANE	48
49	50:23	217.1956	1.88	-	C27 20S DIASTER (10:27dbS)	49
50	51:17	217.1956	1.88	-	C27 20R DIASTER (11:27dbR)	50
51	54:10	217.1956	1.88	P	C27 20S AAA STER (20:27aaS)	51
52	54:24	217.1956	1.88	P	C29 20S DIASTER (21A:29dbS)	52
53	54:20	218.2033	1.88	P	C27 20R ISOST218(21B:27bbR)	53
54	54:32	218.2033	1.88	D	C27 20S ISOST218 (22:27bbS)	54
55	54:24	217.1956	1.88	P	C27 20R ISOSTER 217 (27bbR)	55

56	54:33	217.1956	1.88	D	C27 20S ISOSTER 217 (27bbS)	56
57	55:02	217.1956	1.88	P	C27 20R AAA STER (25:27aaR)	57
58	55:25	217.1956	1.88	P	C29 20S DIASTER (27:29dbR)	58
59	56:41	218.2033	1.88	P	C28 20R ISOST218(33A:28bbR)	59
60	56:54	218.2033	1.88	D	C28 20S ISOST218 (34:28bbS)	60
61	56:41	217.1956	1.88	P	C28 20R ISOSTER 217 (28bbR)	61
62	56:54	217.1956	1.88	D	C28 20S ISOSTER 217 (28bbS)	62
63	57:30	217.1956	1.88	-	C28 20R AAA STER (36:28aaR)	63
64	58:15	217.1956	1.88	S	C29 20S AAA STER (39:29aaS)	64
65	58:38	218.2033	1.88	P	C29 20R ISOST218 (40:29bbR)	65
66	58:48	218.2033	1.88	D	C29 20S ISOST218 (41:29bbS)	66
67	58:38	217.1956	1.88	P	C29 20R ISOSTER217 (29bbR)	67
68	58:48	217.1956	1.88	D	C29 20S ISOSTER217 (29bbS)	68
69	59:34	217.1956	1.88	-	C29 20R AAA STER (42:29aaR)	69
70	1:00:16	218.2033	1.88	P	C30 20R ISOSTER218 (30bbR)	70
71	1:00:22	218.2033	1.88	D	C30 20S ISOSTER218 (30bbS)	71
72	1:01:15	217.1956	1.88	-	C30 4-METHYL STERANE (46)	72
73	10:39	142.0782	1.00	-	2-ME NAPHTHALENE	73
74	10:58	142.0782	1.00	-	1-ME NAPHTHALENE	74
75	13:07	168.0939	1.00	-	2-ME BIPHENYL	75
76	15:23	168.0939	1.00	-	3-ME BIPHENYL	76
77	15:38	168.0939	1.00	D	4-ME BIPHENYL	77
78	24:05	178.0782	0.97	#	PHENANTHRENE	78
79	27:51	192.0938	1.58	S	3-ME PHENANTHRENE	79
80	27:59	192.0938	1.58	D	2-ME PHENANTHRENE	80
81	28:32	192.0938	1.40	S	9-ME PHENANTHRENE	81
82	28:41	192.0938	1.40	D	1-ME PHENANTHRENE	82
83	23:11	184.0347	1.00	-	DIBENZOTHIOPHENE	83
84	26:31	198.0503	1.00	#	4-ME DIBENZOTHIOPHENE	84
85	27:08	198.0503	1.00	-	3+2-ME DIBENZOTHIOPHENE	85
86	27:46	198.0503	1.00	-	1-ME DIBENZOTHIOPHENE	86
87	36:15	253.1955	1.00	S	C21 MA STERANE (F22:A1)	87
88	38:36	253.1955	1.00	S	C22 MA STERANE (F23:B1)	88
89	48:41	253.1955	1.00	S	C27 20S 5B DM MA-ST(F2:C1)	89
90	48:52	253.1955	1.00	S	C27 20S 10B DM MA-DIA (C1)	90
91	50:24	253.1955	1.00	S	C27 20R 5B DM MA-ST(F3:D1)	91
92	50:32	253.1955	1.00	D	C27 20S 5A DM MA-ST(F4:D1)	92
93	50:54	253.1955	1.00	S	C28 20S 5B DM MA-ST(F5:E1)	93
94	51:29	253.1955	1.00	S	C27 20S 5A DM MA-DS(:F1)	94
95	52:22	253.1955	1.00	-	C27 20R 5A DM MA-ST(F6:G1)+	95
96	52:22	253.1955	0.00	D	C28 20S 5A DM MA-ST(F7:G1)	96
97	52:36	253.1955	1.00	S	C28 20R 5B DM MA-ST(F8:G1)	97
98	52:41	253.1955	1.00	D	C29 20S 5B DM MA-ST(F9:G1)	98
99	54:02	253.1955	1.00	S	C29 20S 5A DM MA-ST(F10:H1)	99
100	54:21	253.1955	1.00	S	C28 20R 5A DM MA-ST(F11:H1)	100
101	54:29	253.1955	1.00	D	C29 20R 5B DM MA-ST(F12:H1)	101
102	56:10	253.1955	1.00	S	C29 20R 5A DM MA-ST(F13:I1)	102
103	43:38	231.1173	1.00	S	C20 ME TA-STER(F14:a1)	103
104	46:08	231.1173	1.00	S	C21 ME TA-STER(F15:b1)	104
105	55:49	231.1173	1.00	-	C26 20S ME TA-STER(F16:c1)	105
106	57:26	231.1173	1.00	-	C26 20R ME TA-STER(F17:d1)+	106
107	57:26	231.1173	0.00	D	C27 20S ME TA-STER(F18:d1)	107
108	58:48	231.1173	1.00	-	C28 20S ME TA-STER(F19:e1)	108
109	59:27	231.1173	1.00	-	C27 20R ME TA-STER(F20:f1)	109
110	1:01:08	231.1173	1.00	-	C28 20R ME TA-STER(F21:g1)	110
111	36:22	217.1956	1.88	-	?C21 20S DIASTER	111
112	36:53	217.1956	1.88	-	?C21 20R DIASTER	112
113	38:27	217.1956	1.88	-	?C21 AAA+ABB	113
114	38:36	217.1956	1.88	D	?C22 DIASTER	114
115	41:35	217.1956	1.88	-	?C22 AAA+ABB	115
116	53:20	191.1799	1.20	-	9-DDPA	116

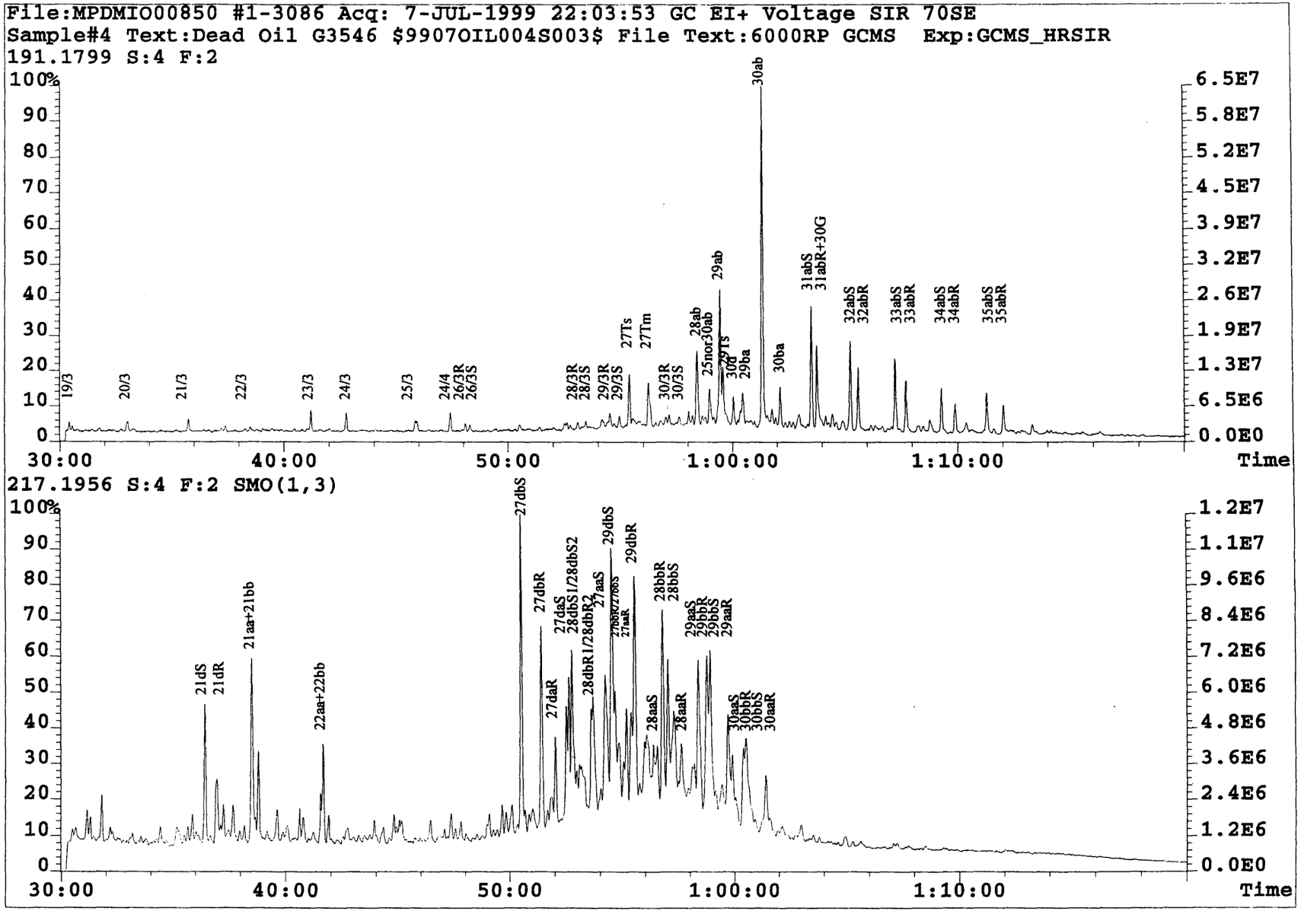
CALCULATION LIST

```
[] REPRESENTS A PEAK AREA, {} REPRESENTS A PEAK AREA TIMES RESPONSE FACTOR
(LISTED IN DETECTED PEAKS LIST). "" SURROUND TEXT THAT WILL APPEAR IN OUTPUT,
'......' SURROUND ACTIVE EQUATIONS
ALL OTHER TEXT IGNORED BY PROGRAM.

USUAL ARITHMETIC OPERATORS PLUS
T i.e.   5T10 IS SUM 5+6+7+8+9+10 AREAS
S IS START SUMMATION IDENTIFIED AND UNIDENTIFIED
i.e. 5S20 = SUM ALL PEAKS WHICH ELUTE BETWEEN PEAK 5 AND 20 (INCL)


NSACAROQ.EQN NEW WHOLE OIL FOR NOWEGIAN FMT + QUAN 26-JUL-1999 09:09:58
ASSUMES (AROMATICS F8+F9 split OR F9 NOT FOUND IN .BI)
ASSUMES (AROMATICS F11+F12 split OR F12 NOT FOUND IN .BI)
#HSRUN  IS THE VAX FIELD NAME FOR THIS DATA
"H1     C32 HOPANES 22S/(22S+22R)"
      '[40]/([40]+[41])'
"H2     C31 HOPANES 22S/(22S+22R) M/Z205"
      '[36]/([36]+[37])'
"H3     C30: HOPANE/(HOPANE+MORETANE)"
      '[31]/([31]+[33])'
"H4     C30: BB HOPANE / C30 HOPANE AS %"
      '100*[39]/[31]'

"H5_0   C29 HOPANE AS % C30"
      '100*[26]/[31]'
"H5_1   HOPANE DISTRIBUTION RELATIVE TO C30"
      '1*100'
"H5_2   C31 HOPANES AS % OF C30 (205 CORRECTED)"
      '100*([34]+([37]/[36]*[34]))/[31]'
"H5_3   C32 HOPANES"
      '100*([40]+[41])/[31]'
"H5_4   C33 HOPANES"
      '100*([42]+[43])/[31]'
"H5_5   C34 HOPANES"
      '100*([44]+[45])/[31]'
"H5_6   C35 HOPANES"
      '100*([46]+[47])/[31]'

"H6     C27 HOPANES TS/(TS+TM)"
      '[18]/([18]+[19])'
"H7     C33 HOPANES 22S/(22S+22R)"
      '[42]/([42]+[43])'
"H11    C23 TRICYCLIC/C30 HOPANE AS %"
      '100*[8]/[31]'
"H12    C24 TETRACYCLIC/C30 HOPANE AS %"
      '100*[11]/[31]'
"H13    28,30 BISNORHOPANE/HOPANE AS %"
      '100*[23]/[31]'
"H14    C30 DIAHOPANE PI/HOPANE AS %"
      '100*[28]/[31]'
"H15    OLEANANE/HOPANE AS %"
      '100*[30]/[31]'
"H16    GAMMACERANE/HOPANE AS % (205 BACK CALCULATED)"
      '100*([35]-(([37]/[36])*[34]))/[31]'
"H17    HOPANE INDEX C35/(C35+C34) %"
      '100*([46]+[47])/([44]+[45]+[46]+[47])'
"H18    25-NORHOPANE(Y)/HOPANE AS % G"
        '100*[25]/[31]'
"H19    C29 18A-NORHOPANE D2/C30 HOPANE AS %"
        '100*[27]/[31]'
```

```
"S1      C29 STERANES 20S/(20S+20R)"
       '[64]/([64]+[69])'
"S2      C29 STERANES m/z218 ABB/(ABB+AAA)"
       '([65]+[66])/([64]+[65]+[66]+[69])'

"S3_1    STERANE DISTRIBUTION AAA C27 %"
       '100*[57]/([57]+[63]+[69])'
"S3_2                           C28 %"
       '100*[63]/([57]+[63]+[69])'
"S3_3                           C29 %"
       '100*[69]/([57]+[63]+[69])'

"S4_1    STERANE DISTRIBUTION ABB C27 %"
       '100*([53]+[54])/([53]+[54]+[59]+[60]+[65]+[66])'
"S4_2                           C28 %"
       '100*([59]+[60])/([53]+[54]+[59]+[60]+[65]+[66])'
"S4_3                           C29 %"
       '100*([65]+[66])/([53]+[54]+[59]+[60]+[65]+[66])'

"S5      BA DIASTERANES/(BA DIASTERANES+AAA+ABB STERANES) %"
       '100*(([49]+[50])/[57]*[69])/((([49]+[50])/[57]*[69])+(64T66)+[69])'
"S7      STERANE INDEX C27/(C27+C29) % FROM S3"
       '100*[57]/([57]+[69])'
"S8      C30 4-ME STERANE AS % OF C29 20R AAA"
       '100*[72]/[69]'

"M4      SUM C27 TO C35 HOPANES/(SAME+C27 TO C29 STERANES)"
'100*(18T19+26T27+[31]+34T35+39T47)/(18T19+26T27+[31]+34T35+39T47+49S69)'

"PR/PH   PRISTANE/PHYTANE RATIO ESTIMATE"
        '1.5*[2]/[3]'
```

```
"M2      PHENANTHRENES  (3ME+2ME) / (9ME+1ME)"
      '({79}+{80})/({81}+{82})'
"M3      MPI1 PHENANTHRENES (3ME+2ME) / (9ME+1ME+PHEN) * 1.5"
      '({79}+{80})/({81}+{82}+{78})*1.5'

"A1      ARO STERANES: C28 20R TRI/(SAME+C29 20R 5A&B MONO 12)"
      '[110]/([102]+(([100]+[101])-(([109]/[110])*[102]))+[110])'
"A2      ARO STERANES: SUM TRI/(SAME+SUM MONO)(F9&F12split)"
      '(103T110-[107])/((103T110-[107])+(87T102-[96]-[94]))'
"A3      TRI ARO STERANES: C20/(C20+C28 20R)"
      '[103]/([103]+[110])'
"A4      TRI ARO STERANES: (C20+C21)/(SAME+SUM C26 TO C28)"
      '([103]+[104])/(103T110-[107])'
"A5      TRI ARO STERANES: C26 20S / C28 20S"
      '[105]/[108]'
"A6      TRI ARO STERANES: C27 20R / C28 20R"
      '[109]/[110]'

"MDR     4-ME DIBENZOTHIOPHENE / 1-ME DIBENZOTHIOPHENE"
      '[84]/[86]'

"MBP     3-METHYLBIPHENYL / 2-METHYLBIPHENYL"
      '[76]/[75]'

"MNR     2-ME NAPTHALENE/1-ME NAPHTHALENE"
      '[73]/[74]'

"SMN     (2-ME NAPTH+1-ME NAPTH)/C23 TRICYCLIC"
      '([73]+[74])/[8]'

"DBTP    DIBENZOTHOIOPHENE(MZ184)/PHENANTHRENE(MZ178)"
      '[83]/[78]'
```

```
"T19     C19 TRICYCLIC/C23 TRICYCLIC %"
         '100*[4]/[8]'
"T20     C20 TRICYCLIC/C23 TRICYCLIC %"
         '100*[5]/[8]'
"T21     C21 TRICYCLIC/C23 TRICYCLIC %"
         '100*[6]/[8]'
"T22     C22 TRICYCLIC/C23 TRICYCLIC %"
         '100*[7]/[8]'
"T23     C23 TRICYCLIC/C23 TRICYCLIC %"
         '100*[8]/[8]'
"T24     C24 TRICYCLIC/C23 TRICYCLIC %"
         '100*[9]/[8]'
"T25     C25 TRICYCLIC/C23 TRICYCLIC %"
         '100*[10]/[8]'
"T26     C26 TRICYCLICS/C23 TRICYCLIC %"
         '100*([12]+[13])/[8]'
"T28     C28 TRICYCLICS/C23 TRICYCLIC %"
         '100*([14]+[15])/[8]'
"T29     C29 TRICYCLICS/C23 TRICYCLIC %"
         '100*([16]+[17])/[8]'
"T30     C30 TRICYCLICS/C23 TRICYCLIC %"
         '100*([20]+[21])/[8]'

"19/23   C19 TRICYCLIC/C23 TRICYCLIC AS %"
         '100*[4]/[8]'
"20/21   C20 TRICYCLIC/C21 TRICYCLIC AS %"
         '100*[5]/[6]'
"22/21   C22 TRICYCLIC/C21 TRICYCLIC AS %"
         '100*[7]/[6]'
"24/23   C24 TRICYCLIC/C23 TRICYCLIC AS %"
         '100*[9]/[8]'
"26/25   C26 TRICYCLICS/C25 TRICYCLIC AS %"
         '100*([12]+[13])/[10]'
"244_24  C24 TETRACYCLIC/C24 TRICYCLIC AS %"
         '100*[11]/[9]'
"TET_23  C24 TETRACYCLIC/C23 TRICYCLIC AS %"
         '100*[11]/[8]'
```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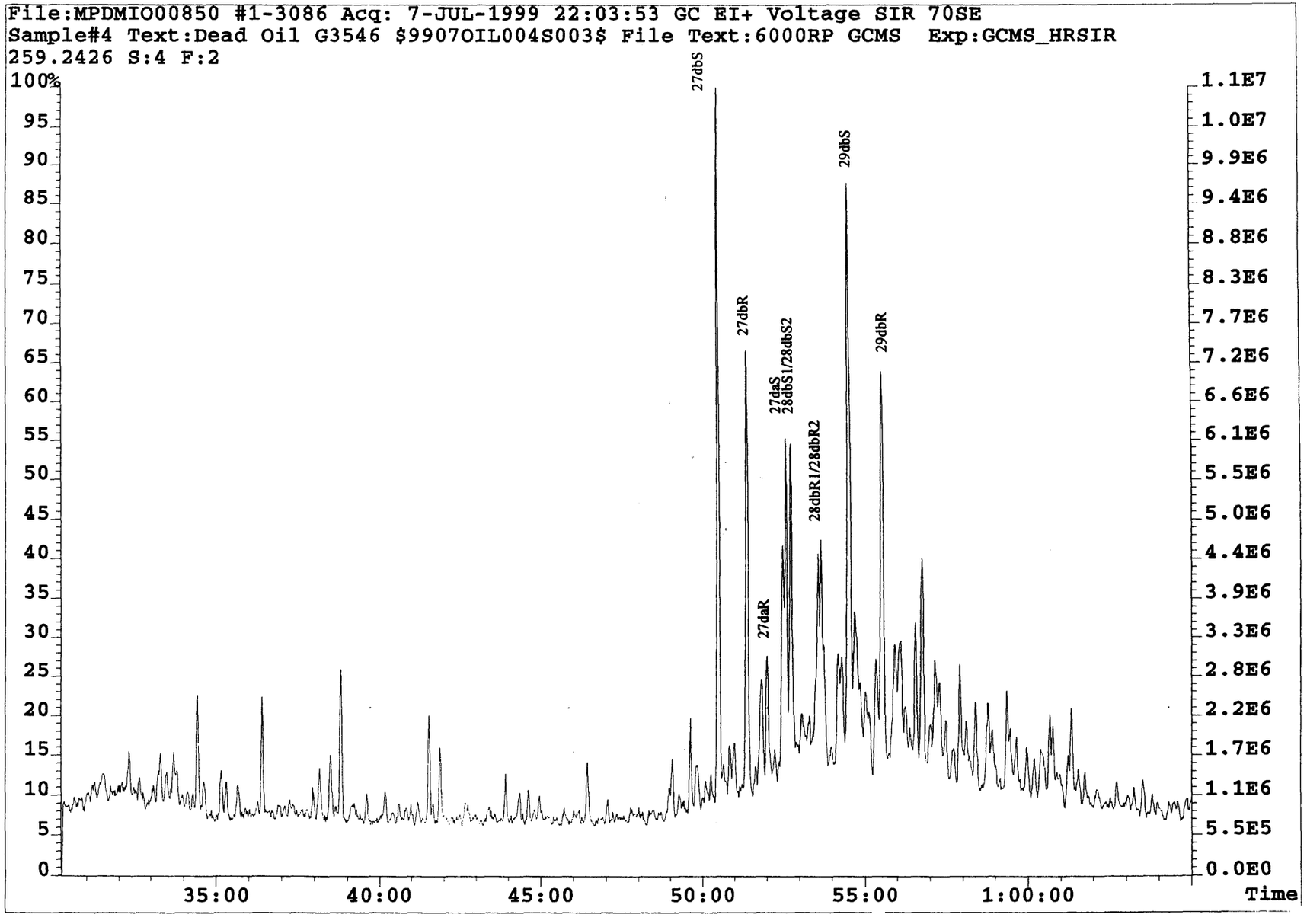
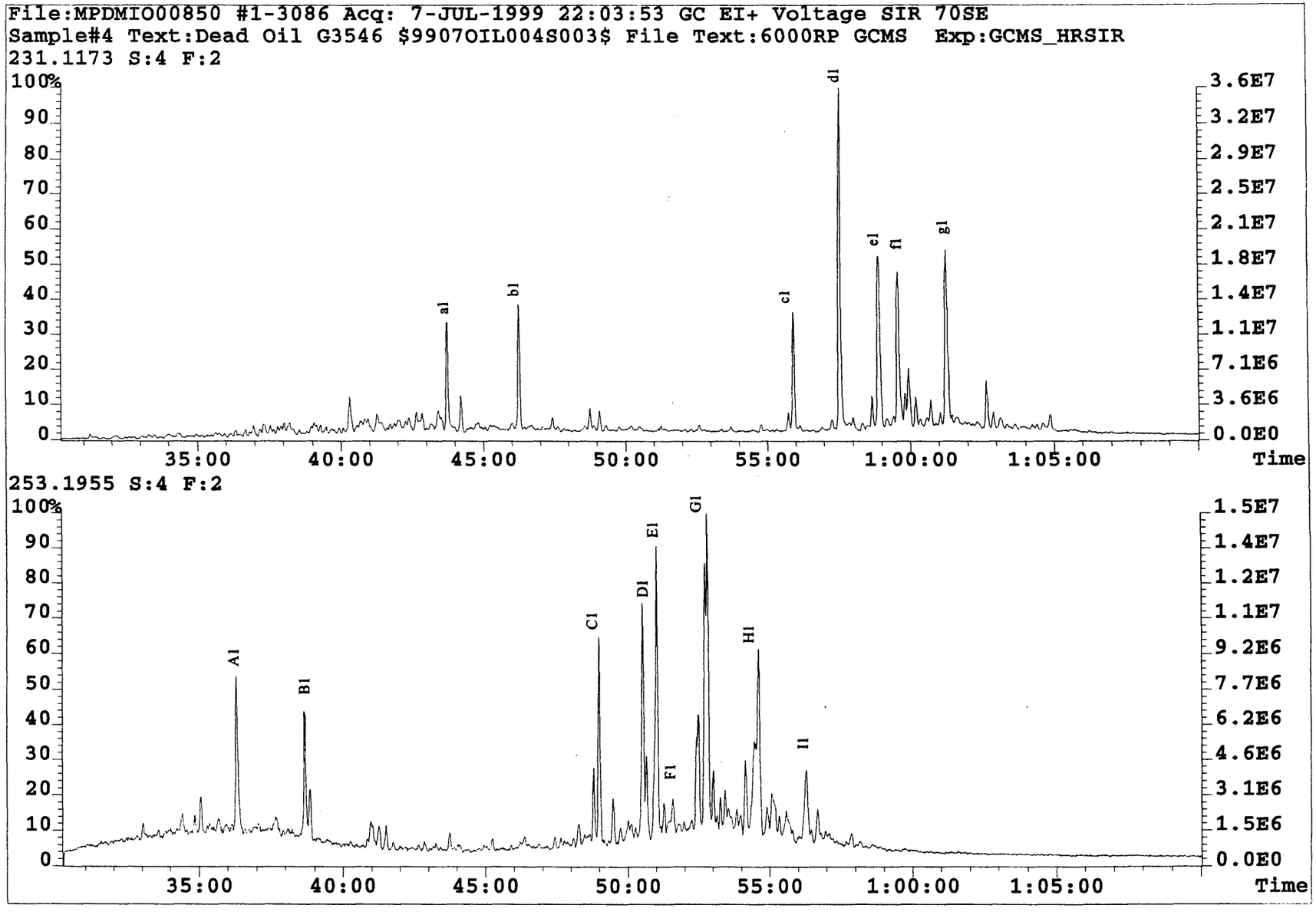
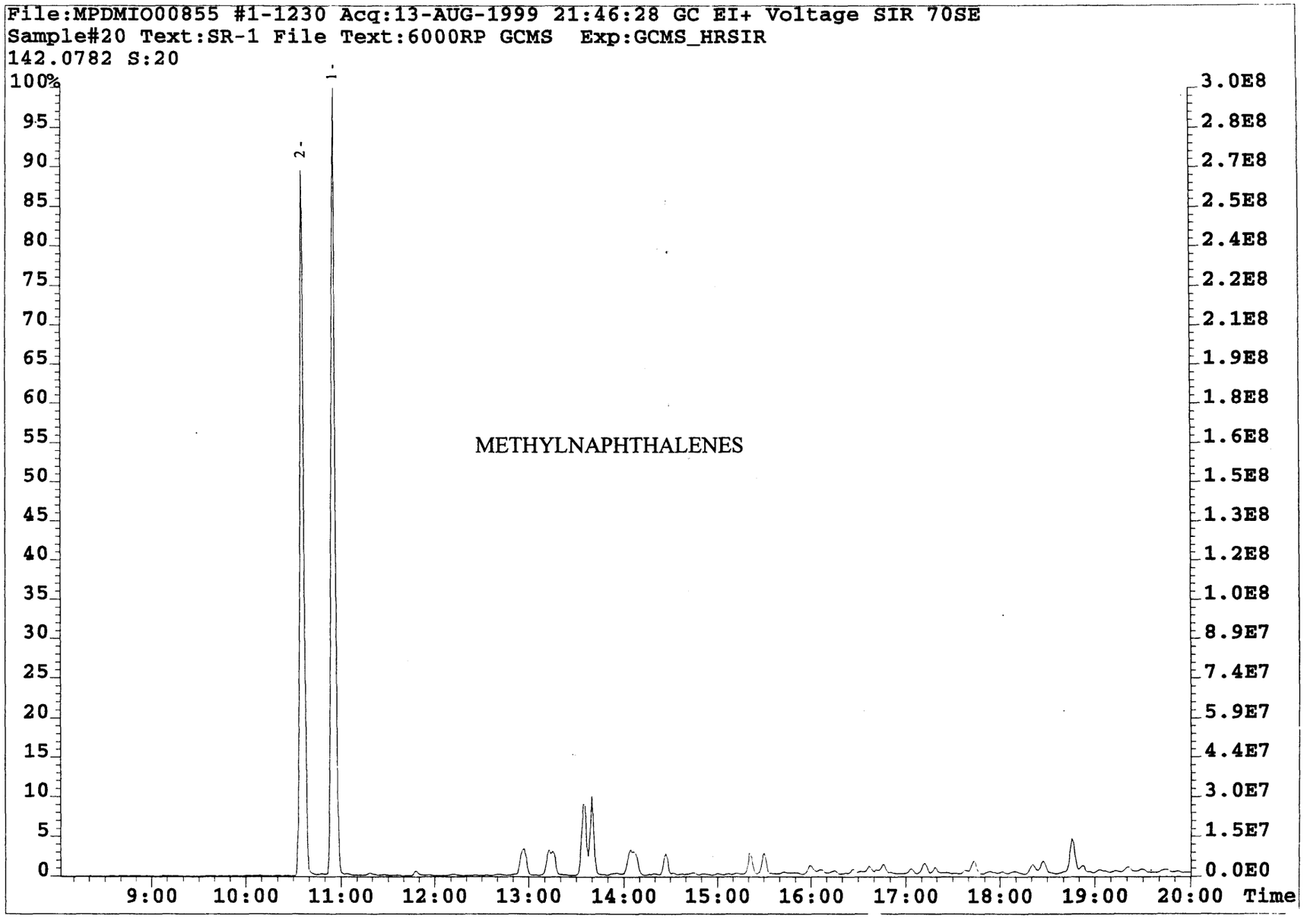
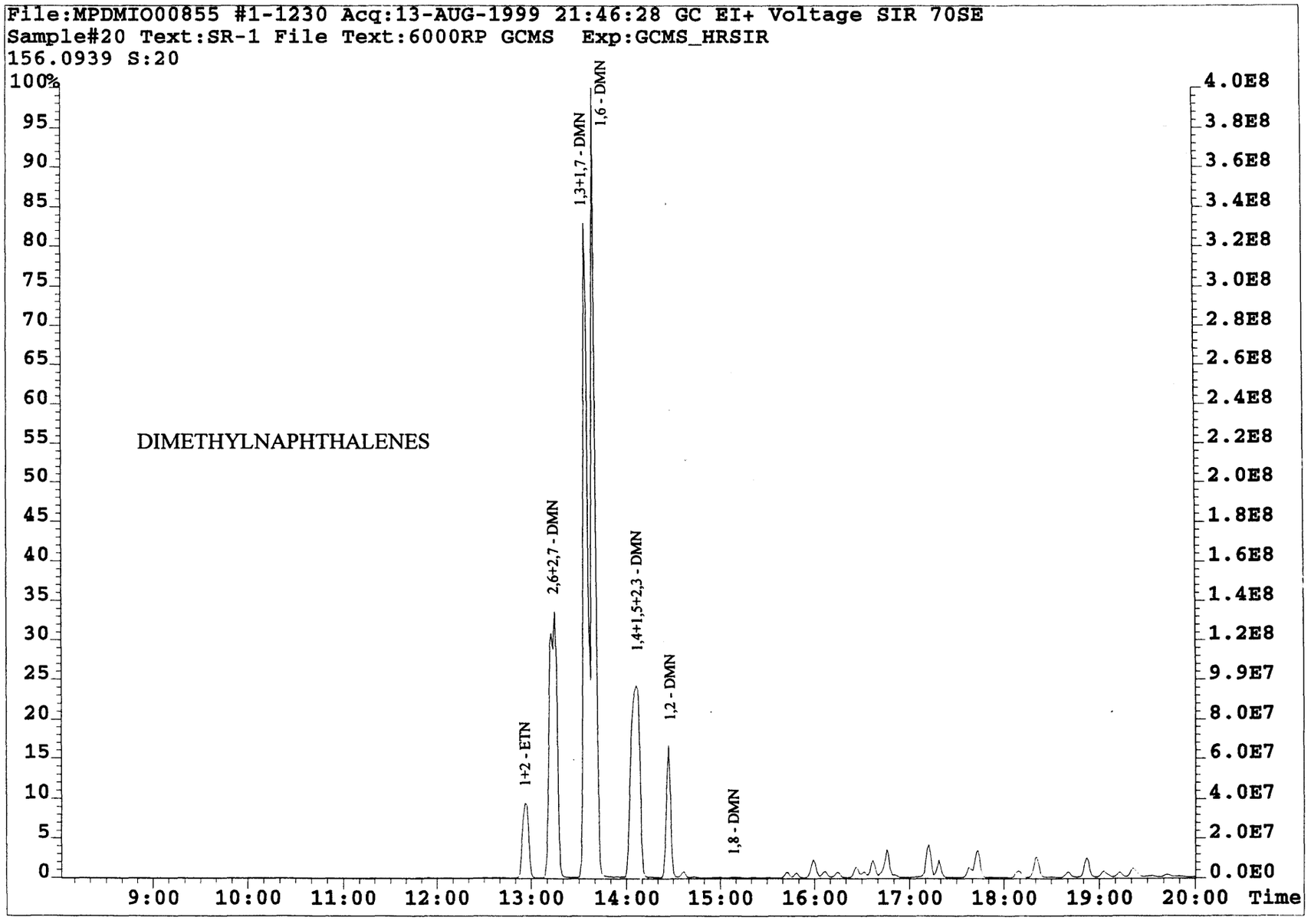
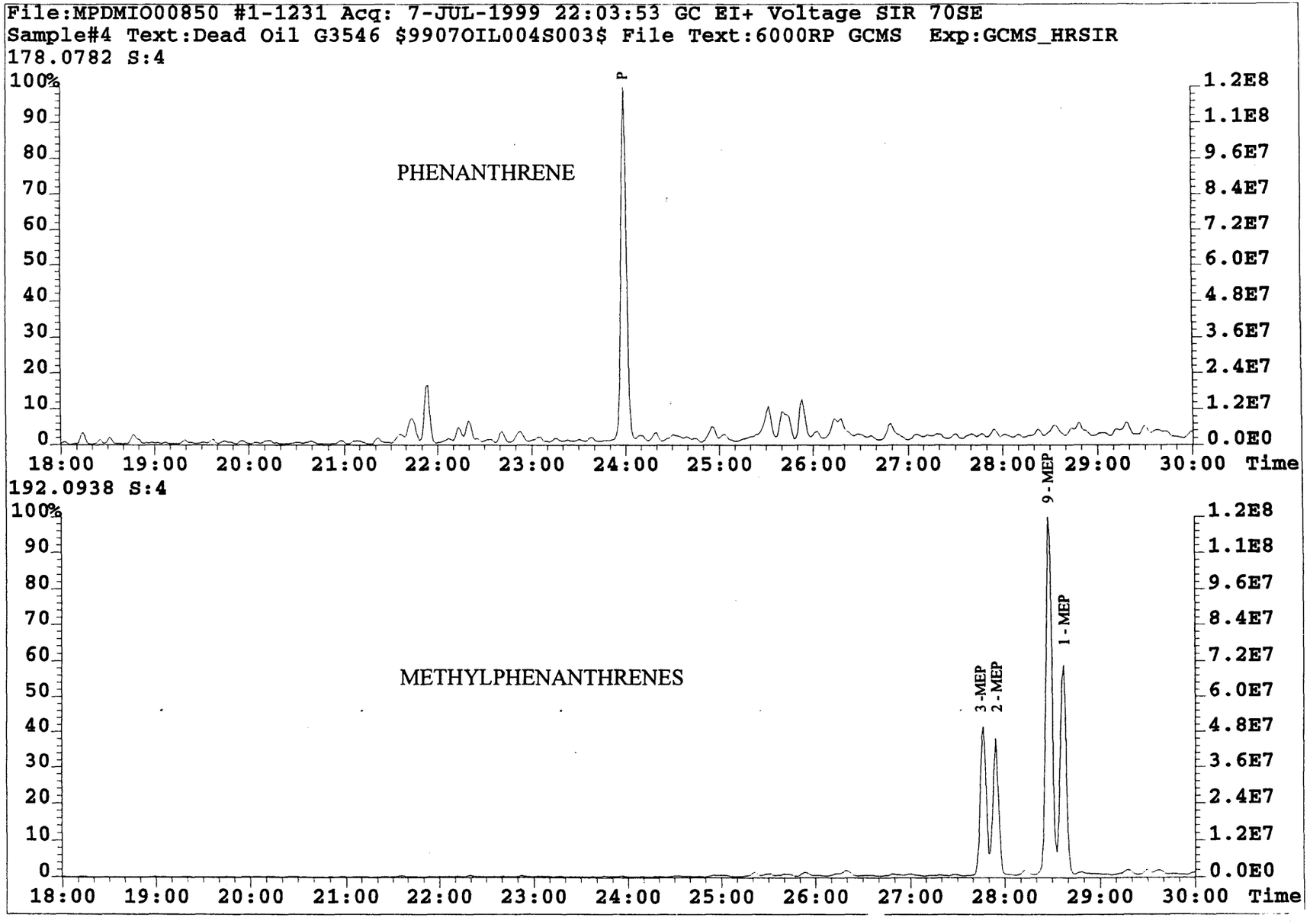
191.1799 S:4 F:2
19/3
20/3
21/3
22/3
23/3
24/3
25/3
24/4
26/3R
26/3S
28/3R
28/3S
29/3R
29/3S
27Ts
27Tm
30/3R
30/3S
28ab
25nor30ab
29ab
29Ts
30d
29ba
30ab
30ba
31abS
31abR+30G
32abS
32abR
33abS
33abR
34abS
34abR
35abS
35abR
6.5E7
5.8E7
5.2E7
4.5E7
3.9E7
3.2E7
2.6E7
1.9E7
1.3E7
6.5E6
0.0E0
100%
90
80
70
60
50
40
30
20
10
0
30:00
40:00
50:00
1:00:00
1:10:00
Time
217.1956 S:4 F:2 SMO(1,3)
21dS
21dR
21aa+21bb
22aa+22bb
27dbS
27dbR
27daR
27daS
28dbS1/28dbS2
28dbR1/28dbR2
27aaS
29dbS
29dbR
28aaS
28bbR
28bbS
28aaR
29aaS
29bbR
29bbS
29aaR
30aaS
30bbR
30bbS
30aaR
1.2E7
1.1E7
9.6E6
8.4E6
7.2E6
6.0E6
4.8E6
3.6E6
2.4E6
1.2E6
0.0E0
100%
90
80
70
60
50
40
30
20
10
0
30:00
40:00
50:00
1:00:00
1:10:00
Time

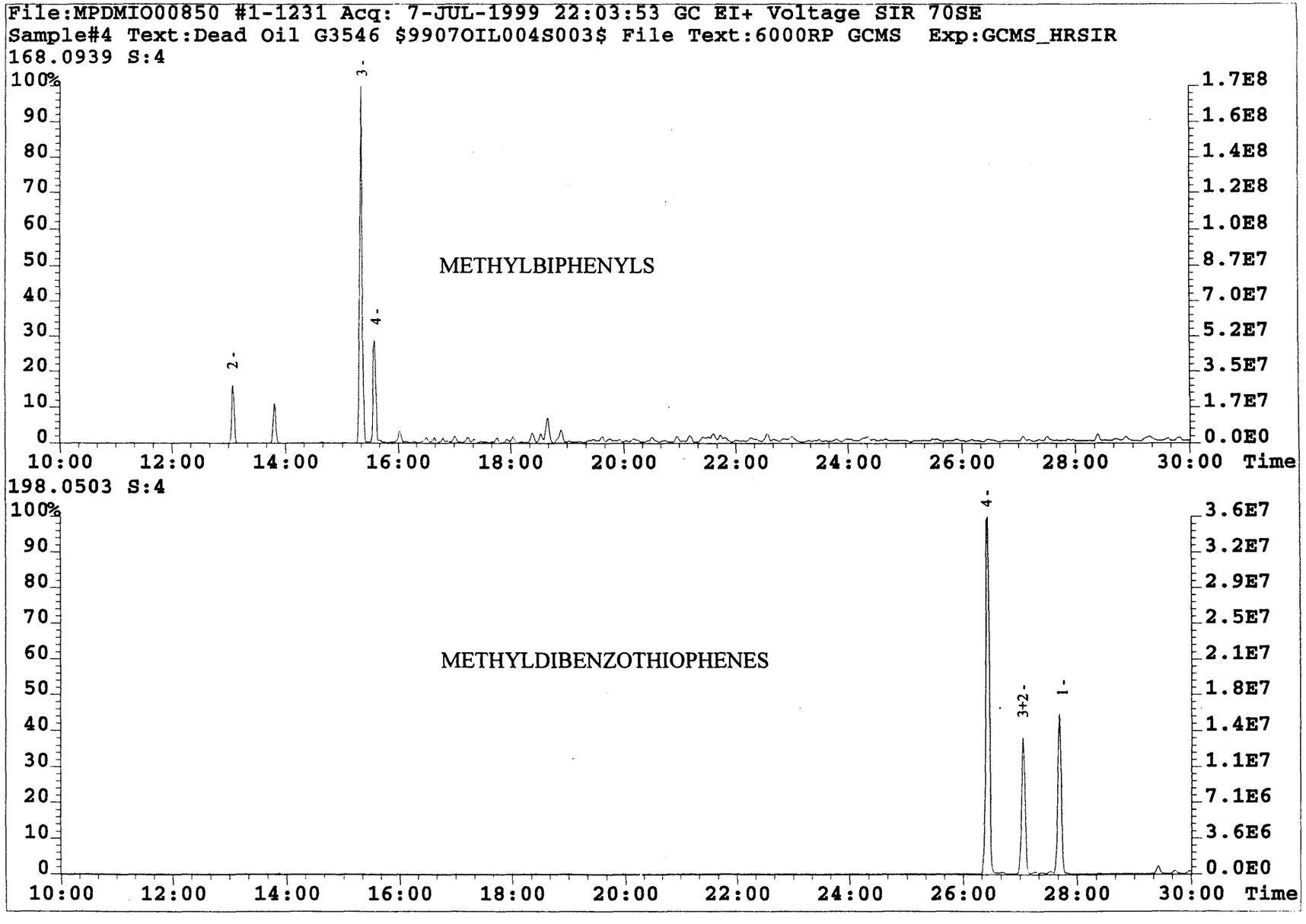

File:MPDMIO00850 #1-3086 Acq: 7-JUL-1999 22:03:53 GC EI+ Voltage SIR 70SE
Sample#4 Text:Dead Oil G3546 $9907OIL004S003$ File Text:6000RP GCMS Exp:GCMS_HRSIR
259.2426 S:4 F:2
27dbS
27dbR
27daS
28dbS1/28dbS2
28dbR1/28dbR2
27daR
29dbS
29dbR
100%
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1.1E7
1.0E7
9.9E6
9.4E6
8.8E6
8.3E6
7.7E6
7.2E6
6.6E6
6.1E6
5.5E6
5.0E6
4.4E6
3.9E6
3.3E6
2.8E6
2.2E6
1.7E6
1.1E6
5.5E5
0.0E0
35:00
40:00
45:00
50:00
55:00
1:00:00
Time


File:MPDMIO00850 #1-3086 Acq: 7-JUL-1999 22:03:53 GC EI+ Voltage SIR 70SE
Sample#4 Text:Dead Oil G3546 $9907OIL004S003$ File Text:6000RP GCMS Exp:GCMS_HRSIR
231.1173 S:4 F:2
100%
90
80
70
60
50
40
30
20
10
0
a1
b1
c1
d1
e1
f1
g1
3.6E7
3.2E7
2.9E7
2.5E7
2.1E7
1.8E7
1.4E7
1.1E7
7.1E6
3.6E6
0.0E0
35:00
40:00
45:00
50:00
55:00
1:00:00
1:05:00
Time
253.1955 S:4 F:2
100%
90
80
70
60
50
40
30
20
10
0
A1
B1
C1
D1
E1
F1
G1
H1
I1
1.5E7
1.4E7
1.2E7
1.1E7
9.2E6
7.7E6
6.2E6
4.6E6
3.1E6
1.5E6
0.0E0
35:00
40:00
45:00
50:00
55:00
1:00:00
1:05:00
Time


File:MPDMIO00855 #1-1230 Acq:13-AUG-1999 21:46:28 GC EI+ Voltage SIR 70SE
Sample#20 Text:SR-1 File Text:6000RP GCMS Exp:GCMS_HRSIR
142.0782 S:20
100%
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
2-
1-
METHYLNAPHTHALENES
3.0E8
2.8E8
2.7E8
2.5E8
2.4E8
2.2E8
2.1E8
1.9E8
1.8E8
1.6E8
1.5E8
1.3E8
1.2E8
1.0E8
8.9E7
7.4E7
5.9E7
4.4E7
3.0E7
1.5E7
0.0E0
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
Time


File:MPDMIO00855 #1-1230 Acq:13-AUG-1999 21:46:28 GC EI+ Voltage SIR 70SE
Sample#20 Text:SR-1 File Text:6000RP GCMS Exp:GCMS_HRSIR
156.0939 S:20
DIMETHYLNAPHTHALENES
1+2 - ETN
2,6+2,7 - DMN
1,3+1,7 - DMN
1,6 - DMN
1,4+1,5+2,3 - DMN
1,2 - DMN
1,8 - DMN
100%
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
4.0E8
3.8E8
3.6E8
3.4E8
3.2E8
3.0E8
2.8E8
2.6E8
2.4E8
2.2E8
2.0E8
1.8E8
1.6E8
1.4E8
1.2E8
9.9E7
8.0E7
6.0E7
4.0E7
2.0E7
0.0E0
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
Time


File:MPDMIO00850 #1-1231 Acq: 7-JUL-1999 22:03:53 GC EI+ Voltage SIR 70SE
Sample#4 Text:Dead Oil G3546 $9907OIL004S003$ File Text:6000RP GCMS Exp:GCMS_HRSIR
178.0782 S:4
P
PHENANTHRENE
192.0938 S:4
9-MEP
1-MEP
3-MEP
2-MEP
METHYLPHENANTHRENES
100%
90
80
70
60
50
40
30
20
10
0
1.2E8
1.1E8
9.6E7
8.4E7
7.2E7
6.0E7
4.8E7
3.6E7
2.4E7
1.2E7
0.0E0
18:00 19:00 20:00 21:00 22:00 23:00 24:00 25:00 26:00 27:00 28:00 29:00 30:00 Time


File:MPDMIO00850 #1-1231 Acq: 7-JUL-1999 22:03:53 GC EI+ Voltage SIR 70SE
Sample#4 Text:Dead Oil G3546 $9907OIL004S003$ File Text:6000RP GCMS Exp:GCMS_HRSIR
168.0939 S:4
100%
90
80
70
60
50
40
30
20
10
0
2-
3-
4-
1.7E8
1.6E8
1.4E8
1.2E8
1.0E8
8.7E7
7.0E7
5.2E7
3.5E7
1.7E7
0.0E0
10:00
12:00
14:00
16:00
18:00
20:00
22:00
24:00
26:00
28:00
30:00
Time
METHYLBIPHENYLS
198.0503 S:4
100%
90
80
70
60
50
40
30
20
10
0
4-
3+2-
1-
3.6E7
3.2E7
2.9E7
2.5E7
2.1E7
1.8E7
1.4E7
1.1E7
7.1E6
3.6E6
0.0E0
10:00
12:00
14:00
16:00
18:00
20:00
22:00
24:00
26:00
28:00
30:00
Time
METHYLDIBENZOTHIOPHENES

APPENDIX - A

SOURCE ROCK SCREENING DATA

LITHOLOGY, TOC AND STRATIGRAPHY
WELL NAME : 34/11-4

SAMPLE NUMBER	DEPTH (M)	LITHOLOGY	PICKED LITHOLOGY	SAMPLE TYPE	TOC %wt
9907SED009S001	3909	MDST-m gy 40%:MDST-dk gy 60%	Mudstone	CUT	2.53
9907SED009S002	3924	MDST-dk gy 100%	Mudstone	CUT	4.85
9907SED009S003	3938	MDST-dk gy 100%	Mudstone	CUT	4.72

LITHOLOGY, TOC AND STRATIGRAPHY
WELL NAME : 34/11-4T2

SAMPLE NUMBER	DEPTH (M)	LITHOLOGY	PICKED LITHOLOGY	SAMPLE TYPE	TOC %wt
9907SED008S001	3960	MDST-m/dk gy 90%:SST-lt bn/gy 10%	Mudstone	CUT	5.84
9907SED008S002	3972	MDST-dk gy 100%	Mudstone	CUT	3.81
9907SED008S003	3984	MDST-m/dk gy 100%	Mudstone	CUT	5.70
9907SED008S004	3996	MDST-m/dk gy 100%	Mudstone	CUT	5.96
9907SED008S005	4008	MDST-m/dk gy 100%	Mudstone	CUT	5.57
9907SED008S006	4017	MDST-m/dk gy 100%	Mudstone	CUT	7.39
9907SED008S007	4029	MDST-m/dk gy 50%:SLTST-lt-m gy 50%	Mudstone	CUT	3.63
9907SED008S008	4041	MDST-m/dk gy 50%:SLTST-lt-m gy 50%	Mudstone	CUT	3.10
9907SED008S009	4053	MDST-lt-m gy 50%:SLTST-lt-m gy 50%:MDST-dk gy Tr	Mudstone	CUT	2.08
9907SED008S010	4065	MDST-lt-m gy 60%:SLTST-lt-m gy 40%	Mudstone	CUT	2.06
9907SED008S011	4077	MDST-lt-m gy 30%:SLTST-lt-m gy 70%	Mudstone	CUT	1.81
9907SED008S012	4089	MDST-lt-m gy 30%:SLTST-lt-m gy 70%	Mudstone	CUT	2.18
9907SED008S013	4101	MDST-m gy 100%	Mudstone	CUT	2.57
9907SED008S014	4119	MDST-m gy 100%	Mudstone	CUT	3.35
9907SED008S015	4140	MDST-m gy 100%	Mudstone	CUT	2.71
9906SED008S001	4150.1	SST-m bn micaceous m grain 100%	Sandstone	CORE	n.d.
9906SED008S002	4152.7	SST-dk bn m grain 100%	Sandstone	CORE	n.d.
9906SED008S003	4156.3	SST-dk bn m grain 100%	Sandstone	CORE	n.d.
9906SED008S004	4157.95	SST-dk bn m grain 100%	Sandstone	CORE	n.d.
9906SED008S005	4162.15	SST-dk bn micaceous m grain 100%	Sandstone	CORE	n.d.
9906SED008S006	4164.15	SST-dk bn micaceous m grain 100%	Sandstone	CORE	n.d.
9906SED008S007	4165.85	SST-m bn micaceous m grain 100%	Sandstone	CORE	n.d.
9906SED008S008	4168.85	SST-m bn micaceous m grain 100%	Sandstone	CORE	n.d.
9906SED008S009	4170.55	SST-lt-m bn micaceous m grain 100%	Sandstone	CORE	n.d.
9906SED008S010	4172.55	SST-lt-m bn micaceous m grain 100%	Sandstone	CORE	n.d.
9906SED008S011	4176.85	SST-lt-m bn micaceous m grain 100%	Sandstone	CORE	n.d.
9906SED008S012	4181.85	SST-lt-m bn micaceous slty 100%	Sandstone	CORE	n.d.
9906SED008S013	4184.95	SST-dk bn/gy micaceous slty 100%	Sandstone	CORE	n.d.
9906SED008S014	4185.8	SST-m-dk bn micaceous slty 100%	Sandstone	CORE	n.d.

LITHOLOGY, TOC AND STRATIGRAPHY
WELL NAME : 34/11-4T2

SAMPLE NUMBER	DEPTH (M)	LITHOLOGY	PICKED LITHOLOGY	SAMPLE TYPE	TOC %wt
9906SED008S015	4188.85	SST-m-dk bn micaceous slty 100%	Sandstone	CORE	n.d.
9906SED008S016	4195.15	SST-m-dk bn micaceous m grain 100%	Sandstone	CORE	n.d.
9906SED008S017	4196.15	SST-m-dk bn micaceous m grain 100%	Sandstone	CORE	n.d.
9906SED008S018	4197.2	SST-dk bn m grain 100%	Sandstone	CORE	n.d.
9906SED008S019	4198.2	SST-dk bn m grain 100%	Sandstone	CORE	n.d.
9906SED008S020	4199.2	SST-dk bn coarse grain 100%	Sandstone	CORE	n.d.

n.d. Not Determined

OPTICAL MATURITY PARAMETERS
WELL NAME : 34/11-4

Batch Code	Depth (m)	SCI	Kerogen Type (%)				Mean Ro%	No.	Std Dev	Comments
			I	II	III	IV				
9907SES009S002	3924	6-7?		5	55	40	0.67	4	0.02	No fluorescence

OPTICAL MATURITY PARAMETERS
WELL NAME : 34/11-4T2

Batch Code	Sample (m)	SCI	Kerogen Type (%) I	II	III	IV	Mean Ro%	No.	Std Dev	Comments
9907SED008S001	3960	n.d.			30	70	-	-	-	Very small amount of kerogen
9907SED008S004	3996	n.d.		Tr	50	50	0.67	3	0.05	Contains Colletelinite. No fluorescence
9907SED008S008	4041	n.d.		Tr	40	60	0.8	10	0.07	Good angular fragments of colletelinite - reliable for maturity. No fluorescence
9907SED008S010	4065	n.d.		Tr	20	80	0.66	2	0	
9907SED008S012	4089	n.d.		Tr	30	70	0.76	6	0.08	

TOC & PYROLYSIS DATA
WELL NAME : 34/11-4

SAMPLE NUMBER	DEPTH (M)	PICKED LITHOLOGY	S1 (kg/t)	S1 (mg/gC)	S2 (kg/t)	TOC (%)	TMAX deg C	HI	PP	PI	GOGI	CARBT (%)	S (%)
9907SED009S001	3909	Mudstone	1.67	66.0	5.66	2.53	437	224	7.33	0.23		9.3	4.39
9907SED009S002	3924	Mudstone	3.86	79.6	10.71	4.85	437	221	14.57	0.26	0.29	6.3	4.68
9907SED009S003	3938	Mudstone	3.97	84.1	8.76	4.72	437	186	12.73	0.31		6.3	3.62

TOC & PYROLYSIS DATA
WELL NAME : 34/11-4T2

Sample Code	DEPTH (M)	PICKED LITHOLOGY	S1 (kg/t)	S1 (mg/gC)	S2 (kg/t)	TOC (%)	TMAX deg C	HI	PP	PI	GOGI	CARBT (%)	S (%)
9907SED008S001	3960	Mudstone	1.13	19.3	12.42	5.84	438	213	13.55	0.08	0.24	4.2	5.15
9907SED008S002	3972	Mudstone	1.26	33.1	8.84	3.81	430	232	10.10	0.12		7.6	4.96
9907SED008S003	3984	Mudstone	1.36	23.9	6.68	5.70	433	117	8.04	0.17		4.1	7.76
9907SED008S004	3996	Mudstone	0.9	15.1	7.78	5.96	438	131	8.68	0.10	0.31	3.3	7.30
9907SED008S005	4008	Mudstone	0.82	14.7	5.99	5.57	440	108	6.81	0.12		11.3	6.79
9907SED008S006	4017	Mudstone	0.93	12.6	8.41	7.39	448	114	9.34	0.10		4.0	6.97
9907SED008S007	4029	Bulked	0.46	12.7	5.68	3.63	438	156	6.14	0.07		40.8	4.07
9907SED008S008	4041	Bulked	0.33	10.6	5.32	3.10	436	172	5.65	0.06	0.31	21.8	3.79
9907SED008S009	4053	Bulked	0.26	12.5	3.63	2.08	413	175	3.89	0.07		42.0	3.10
9907SED008S010	4065	Bulked	0.42	20.4	4.52	2.06	444	219	4.94	0.09	0.32	43.2	2.81
9907SED008S011	4077	Bulked	0.32	17.7	4.35	1.81	428	240	4.67	0.07		35.8	2.52
9907SED008S012	4089	Bulked	0.33	15.1	4.65	2.18	427	213	4.98	0.07	0.38	44.3	2.15
9907SED008S013	4101	Mudstone	0.39	15.2	4.41	2.57	448	172	4.80	0.08		13.3	2.78
9907SED008S014	4119	Mudstone	0.4	11.9	5.14	3.35	442	153	5.54	0.07		17.4	2.63
9907SED008S015	4140	Mudstone	0.37	13.7	3.85	2.71	434	142	4.22	0.09		49.3	3.23
9906SED008S001	4150.1	Sandstone	4.8		0.76	n.d.			5.56	0.86		n.d.	n.d.
9906SED008S002	4152.7	Sandstone	7.54		0.71	n.d.			8.25	0.91		n.d.	n.d.
9906SED008S003	4156.3	Sandstone	7.18		0.77	n.d.			7.95	0.90		n.d.	n.d.
9906SED008S004	4157.95	Sandstone	7.58		0.56	n.d.			8.14	0.93		n.d.	n.d.
9906SED008S005	4162.15	Sandstone	5.7		0.65	n.d.			6.35	0.90		n.d.	n.d.
9906SED008S006	4164.15	Sandstone	1.17		0.78	n.d.			1.95	0.60		n.d.	n.d.
9906SED008S007	4165.85	Sandstone	4.57		0.9	n.d.			5.47	0.84		n.d.	n.d.
9906SED008S008	4168.85	Sandstone	4.44		0.33	n.d.			4.77	0.93		n.d.	n.d.
9906SED008S009	4170.55	Sandstone	5.28		2.44	n.d.			7.72	0.68		n.d.	n.d.
9906SED008S010	4172.55	Sandstone	4.49		0.69	n.d.			5.18	0.87		n.d.	n.d.
9906SED008S011	4176.85	Sandstone	4.68		0.91	n.d.			5.59	0.84		n.d.	n.d.
9906SED008S012	4181.85	Sandstone	5.82		1.18	n.d.			7.00	0.83		n.d.	n.d.
9906SED008S013	4184.95	Sandstone	4.23		0.84	n.d.			5.07	0.83		n.d.	n.d.
9906SED008S014	4185.8	Sandstone	6.45		0.59	n.d.			7.04	0.92		n.d.	n.d.
9906SED008S015	4188.85	Sandstone	3.15		0.27	n.d.			3.42	0.92		n.d.	n.d.
9906SED008S016	4195.15	Sandstone	6.53		0.79	n.d.			7.32	0.89		n.d.	n.d.
9906SED008S017	4196.15	Sandstone	7.6		0.87	n.d.			8.47	0.90		n.d.	n.d.

TOC & PYROLYSIS DATA
WELL NAME : 34/11-4T2

Sample Code	DEPTH (M)	FORMATION	PICKED LITHOLOGY	S1 (kg/t)	S1 (mg/gC)	S2 (kg/t)	TOC (%)	TMAX deg C	HI	PP	PI	GOGI	CARBT (%)	S (%)
9906SED008S018	4197.2	-	Sandstone	4.79		0.63	n.d.			5.42	0.88		n.d.	n.d.
9906SED008S019	4198.2	-	Sandstone	7.28		0.78	n.d.			8.06	0.90		n.d.	n.d.
9906SED008S020	4199.2	-	Sandstone	4.67		0.36	n.d.			5.03	0.93		n.d.	n.d.

n.d. Not Determined

PYROLYSIS-GC DATA
WELL NAME : 34/11-4

SAMPLE NUMBER	DEPTH m	C1-C2 %	C3-C5 %	C6-C14 %	C15+ %	GOGI	PICKED LITHOLOGY	SAMPLE TYPE
9907SED009S002	3924	7	15.8	37.8	39.3	0.29	Mudstone	CUTTINGS

PYROLYSIS-GC DATA
WELL NAME : 34/11-4T2

SAMPLE NUMBER	DEPTH m	C1-C2 %	C3-C5 %	C6-C14 %	C15+ %	GOGI	PICKED LITHOLOGY	SAMPLE TYPE
9907SED008S001	3960	7.8	11.6	45.2	35.3	0.24	Mudstone	CUTTINGS
9907SED008S004	3996	11	12.6	54	22.2	0.31	Mudstone	CUTTINGS
9907SED008S008	4041	10.4	13.5	45.4	30.5	0.31	Mudstone	CUTTINGS
9907SED008S010	4065	14.1	10.4	51.1	24.2	0.32	Mudstone	CUTTINGS
9907SED008S012	4089	13.9	13.9	48.4	23.5	0.38	Mudstone	CUTTINGS

APPENDIX - B

CUTTINGS EXTRACTS DATA

BULK COMPOSITION OF EXTRACTS

34/11-4 Cuttings Extracts

Sample code	Depth (m)	Wt Ext (g)	EOM (mg)	TSE %wt	Saturates %wt	Aromatics %wt	Residue %wt	Asph %wt	HC %wt	NonHC %wt
9907SED009S002	3924	0.05228	52.28	1.060	36.25	50.9	12.71	0.15	87.2	12.7

EXTRACTION DATA 1
34/11-4 Cuttings Extracts

Sample code	Depth (m)	Rock (g)	EOM (mg)	EOM (mg/Kg rock)	Sat/EOM %	Aro/EOM %	Pol/EOM %	Asph/EOM %	HC/EOM %	NON HC/EOM %
9907SED009S002	3924	4.932	52.28	10600	36.25	50.9	12.71	0.15	87.2	12.7

EXTRACTION DATA 2

34/11-4 Cuttings Extracts

Sample code	Depth (m)	Rock (g)	TOC %	EOM/TOC (mg/g TOC)	Sat (mg/g TOC)	Aro (mg/g TOC)	Pol (mg/g TOC)	Asph (mg/g TOC)	100*Sat/Aro %	100*HC/NON HC %
9907SED009S002	3924	4.932	4.85	2.19	1.52	2.13	0.53	0.01	71	686

SATURATE GC

34/11-4 Cuttings Extracts	9907SED009S002
Depth (m)	3924m
Saturates Fraction GC Analysis	Area
Component	[µV·s]
N-C12	0
N-C13	351.58
N-C14	30631.5
N-C15	152325.91
N-C16	296449.7
N-C17	317115.21
PRISTANE	158187.39
N-C18	290478.32
PHYTANE	125720.94
N-C19	307239.78
N-C20	240265.6
N-C21	202160.4
N-C22	186097.1
N-C23	166636
N-C24	151457.2
N-C25	129294.1
N-C26	110248.17
N-C27	96946
N-C28	86688.4
N-C29	77845.6
N-C30	50416
N-C31	56185
N-C32	46758.2
N-C33	40817.6
N-C34	41240.8
N-C35	18214.6
N-C36	14461.2
TOTAL	3394232.3
Batch Code	9907SED009S002
CPI (24 to 32)	1.06
Pr/Ph Ratio	1.26
Pr/n-C17	0.50
Ph/n-C18	0.43
Alkane Index (C17/(C17+C27)%	76.59
R22 Index 2*C22/(C21+C23)	1.01
(Pr/n-C17)/(Ph/n-C18)	1.152552903

Note: -1 denotes not calculated