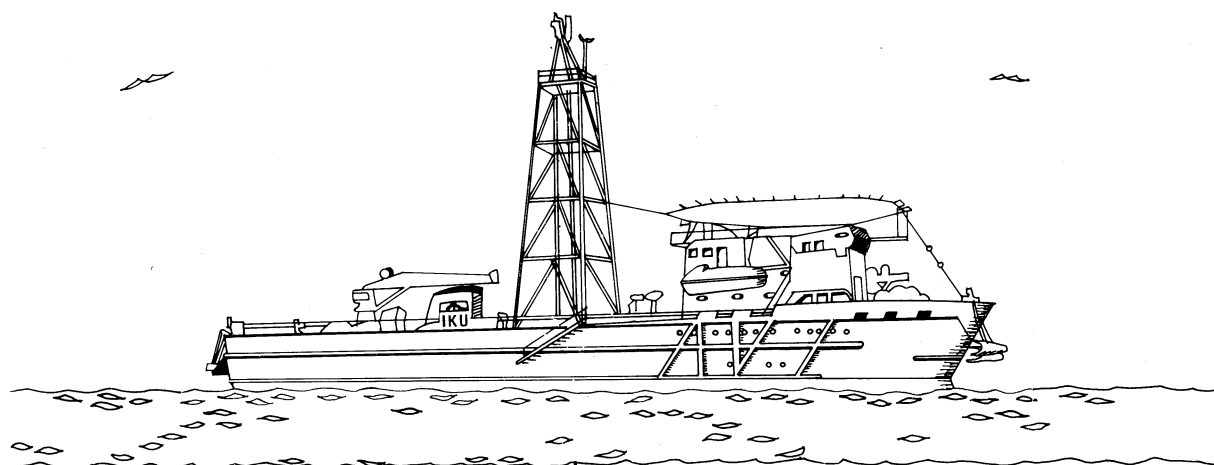
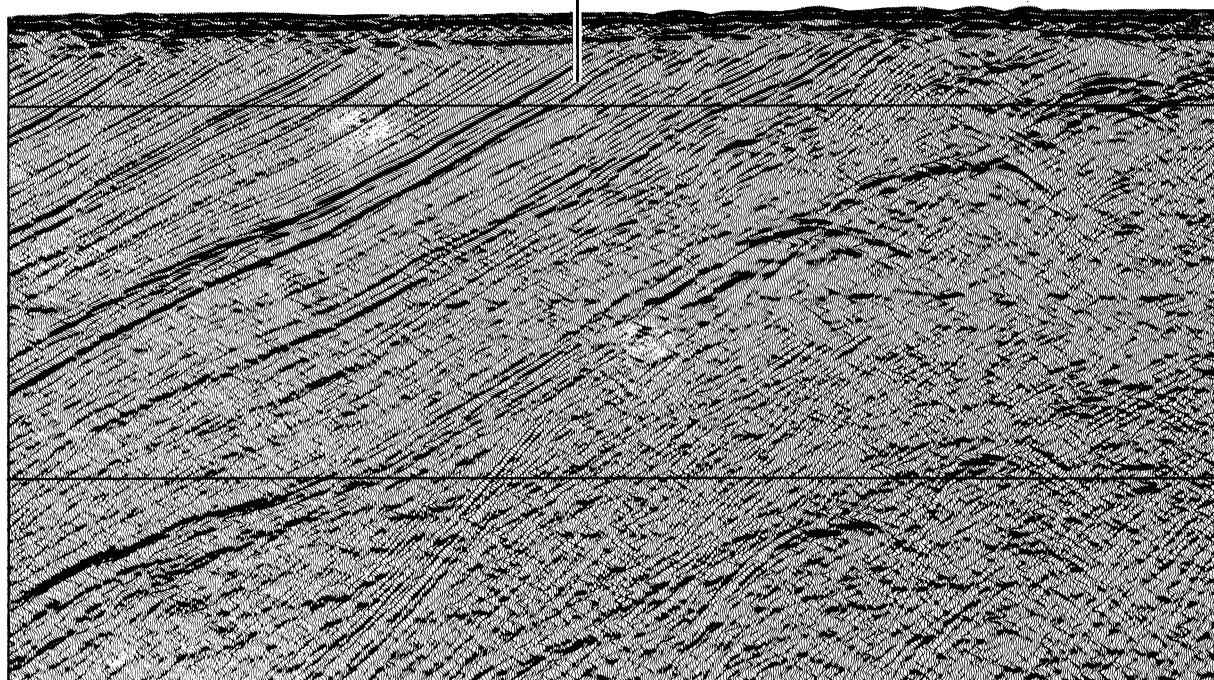




Shallow Drilling
Elf Aquitaine/Norsk Hydro/Statoil
Barents Sea 1987

Appendix to
Main data report:
Organic geochemical
data



REPORT

REG. NO.:

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Confidential

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SHALLOW DRILLING
 ELF AQUITAINE / NORSK HYDRO / STATOIL
 BARENTS SEA 1987
 Appendix to Main Data Report:
 Organic Geochemical Data

REPORT NO.: 21.3435.00/02/87

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CLIENT:

Elf Aquitaine Norge A/S, Norsk Hydro a.s, Statoil

SUMMARY:

This appendix contains:

- 1) Tables and figures of the geochemical data obtained from the core samples drilled by IKU in the Nordkapp Basin and at the Dia-Structure in 1987 (Chapter II).

The data are organised core by core, each section having its own table of contents. The text accompanying the data may be found in the main body of the report.

- 2) Data obtained from the artificial maturation of a claystone sample from core 7231/01-U-01 using hydrous pyrolysis. These data are accompanied by a descriptive text (Chapter I).
- 3) A description of the experimental methods and interpretation levels (Chapter III).

KEY WORDS:

Barents Sea	Source potential
Dia-Structure	Maturation
Nordkapp Basin	Hydrous pyrolysis

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CLAYSTONE SAMPLE FROM CORE
7231/01-U-01 USING HYDROUS
PYROLYSIS

II LABORATORY RESULTS

II.1 Core 7231/01-U-01

II.2 Core 7231/04-U-01

II.3 Core 7230/05-U-09

II.4 Core 7324/07-U-01

II.5 Core 7323/12-U-01

III ANALYTICAL METHODS AND
INTERPRETATION LEVELS

IV KEYS TO
MASS FRAGMENTOGRAMS

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I. ARTIFICIAL MATURATION OF A CLAYSTONE SAMPLE FROM CORE 7231/01-U-01 USING HYDROUS PYROLYSIS

One representative claystone sample from the organic-rich interval comprising Unit A was artificially matured using hydrous pyrolysis techniques in order to further investigate the source potential of these rocks.

The claystone, at 73.21 m, was characterised by an organic carbon content of 11.9 wt% and a Rock-Eval hydrogen index of 300 mg/g TOC (Table A.I.1). The kerogen in this rock was thermally immature, based on a Tmax value of 406°C. This was supported by vitrinite reflectance data from surrounding rocks, which indicated a reflectance value of around 0.35 %Ro for the kerogen in this core.

9.6 grammes of sample were artificially matured in a 52 ml bomb in the presence of water (15 ml) at a temperature of 340°C for 72 hours, at a pressure equivalent to water vapour pressure at that temperature. On completion of the hydrous pyrolysis procedure, the expelled hydrocarbon gas and fluid were collected, and the rock was extracted. Vitrinite reflectance data from the pyrolysed sample gave an average value of 1.09 %Ro.

The claystone yielded 230 ml of gas on artificial maturation (Table A.I.2). Hydrocarbons account for 36.4% of the gas, carbon dioxide accounting for the remaining gas. The hydrocarbon gas had a moderate gas wetness of 47%, and was largely dominated by methane and ethane. C₄₊ compounds were only present in trace amounts.

No droplets of expelled pyrolysate fluid were observed, and therefore the expelled pyrolysate fluid was recovered by rinsing the bomb interior and the rock with an organic solvent.

The most obvious difference in the extract/fluid samples before and after hydrous pyrolysis, was the increased percentage of hydrocarbon compounds in the pyrolysed samples, the highest hydrocarbon content of 60% being found in the expelled pyrolysate fluid (Tables A.I.4 - A.I.7). The extract of the pyrolysed rock contained twice the percentage of non-hydrocarbon compounds

in the expelled pyrolysate fluid. This was not unexpected, as non-hydrocarbon compounds tend to be less mobile, and are therefore less likely to be expelled.

The gas chromatogram of the unpyrolysed sample extract (Figure A.I.1) is similar to most of the other samples from Unit A, with prominent pristane and phytane peaks, and a slightly bimodal distribution of n-alkanes. In contrast, the gas chromatogram of the expelled pyrolysate fluid shows a thermally mature unimodal distribution of n-alkanes, with a mode at nC_{13} (Figure A.I.1). The contrast between these two samples is illustrated in Figure A.I.2. There is also a change in the isoprenoid composition of the samples, especially in the peaks representing pristane and phytane. This is reflected in the pristane/phytane ratios of 0.9 for the immature, pyrolysed rock extract, and 1.9 for the mature, expelled pyrolysate fluid (Table A.I.8).

The gas chromatogram of the pyrolysed rock extract shows a poor development of n-alkanes. This reflects the low concentration of saturated hydrocarbons recovered from this sample. The n-alkane distribution shows a slight decrease in peak height with increasing carbon number, although this trend is not as marked as is seen in the gas chromatogram of the expelled pyrolysate fluid.

The saturate fraction of the three samples was further analysed using gas chromatography-mass spectrometry (GC-MS), in order to investigate changes in the biomarker composition which occurred as a result of hydrous pyrolysis (Figures A.I.4 and A.I.5).

The original sample extract (D-1316) produced terpane and sterane mass fragmentograms which were similar to those previously described from the lower part of Unit A. The sterane (m/z 217) mass fragmentogram shows prominent C_{27} and C_{29} 5α 20R sterane peaks, and together with the relative prominence of the 22R isomer of the extended hopanes, suggest that the extract is that of a thermally immature rock.

The sterane and terpane mass fragmentograms of the expelled pyrolysate fluid and the extract of the pyrolysed rock are similar in appearance. The only difference in the terpane mass fragmentograms is the greater

prominence of the tricyclic terpane peaks in the mass fragmentogram of the expelled pyrolysate fluid. Otherwise, the mass fragmentograms show a rather restricted development of triterpane and moretane peaks in the m/z 191 mass fragmentogram, and a dominance of re-arranged steranes over regular steranes in the m/z 217 mass fragmentograms.

The mass fragmentograms of the two pyrolysate samples show the characteristics of greater thermal maturity than is seen in the mass fragmentogram of the unpyrolysed sample. This is illustrated by the increased $\alpha\beta/\alpha\beta+\beta\alpha$, %22S, % $\beta\beta$ and %20S ratios of the two pyrolysed samples (Tables A.I.9a and b).

In conclusion, hydrous pyrolysis of a representative claystone sample from the organic-rich Unit A of core 7231/01-U-01 suggests that the kerogen in the rocks of this unit may be largely gas-prone.

APPENDIX A.I: TABLE OF CONTENTS

Artificial maturation of a claystone sample from core 7231/01-U-01

TABLES

Table A.I.1:	Total organic carbon content and data from Rock-Eval pyrolysis.
Table A.I.2:	Yield and composition of hydrous pyrolysis gas.
Table A.I.3:	Amount of asphaltenes and polars in sediment/fluid.
Table A.I.4:	Weight of EOM/fluid and chromatographic fractions.
Table A.I.5:	Concentration of EOM/fluid and chromatographic fractions, related to rock weight.
Table A.I.6:	Concentration of EOM/fluid and chromatographic fractions, related to TOC weight.
Table A.I.7:	Composition of material extracted from the rock/fluid.
Table A.I.8:	Tabulation of data from the gas chromatograms.
Table A.I.9a:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity-characteristic ratios.
Table A.I.9b:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity- and source-characteristic ratios.
Table A.I.10:	Vitrinite reflectance data.

FIGURES

Figure A.I.1:	Saturated hydrocarbon gas chromatograms.
Figure A.I.2:	Variation and distribution of n-alkane peaks before and after hydrous pyrolysis.
Figure A.I.3:	Variation and distribution of isoprenoid peaks before and after hydrous pyrolysis.
Figure A.I.4:	Mass fragmentograms of m/z 191, 205, 163, 177 (terpanes) for rock extract, expelled pyrolysate fluid and pyrolysed sample extract.
Figure A.I.5:	Mass fragmentograms of m/z 217, 218, 231, 259 (steranes) for rock extract, expelled pyrolysate fluid and pyrolysed sample extract.
Figure A.I.6:	Vitrinite reflectance histogram.

Table A.I.1:

DATA FROM ROCK EVAL PYROLYSIS

I		:						HYDR. OXYGEN PETROLEUM PROD. TEMP. I					
I	IKU	DEPTH	:	S1	S2	S3	TOC	INDEX INDEX POTENTIAL INDEX MAX I					
I	No.	:									S1		I
I		:									-----		I
I		m/ft	:	(	mg/g ROCK	)	(%)	(	mg/g TOC)	S1+S2	S1+S2	(C)	I
I													I
I			:										I
I	C 1316	73.21	:	1.49	35.65	1.82	11.88	300	15	37.14	0.04	406	I
I			:										I

DATE : 14 - 12 - 87.

Table A.I.2: Yield and composition of hydrous pyrolysis gas
Sample D 1316

COMPOUND	GAS YIELD (µl gas /g dry rock) related to calibration standard	GAS COMPOSITION (% volume of listed HC + non-HC)	HC COMPOSITION (% volume of listed hydrocarbons)
Oxygen	0.0	0.00	--
Nitrogen	0.0	0.00	--
Carbon dio	6838.546	63.58	--
Methane	1921.406	17.86	49.05
Ethene	87.923	0.82	2.24
Ethane	1010.871	9.40	25.80
Propane	564.420	5.25	14.41
i-Butane	73.125	0.68	1.87
Butene	29.638	0.28	0.76
n-Butane	103.087	0.96	2.63
neo-C5	26.312	0.24	0.67
? RI= 418	15.796	0.15	0.40
? RI= 448	.713	0.01	0.02
? RI= 465	.000	0.00	0.00
i-Pentane	23.046	0.21	0.59
Pentene ?	2.131	0.02	0.05
Pentene ?	2.317	0.02	0.06
Pentene ?	2.334	0.02	0.06
n-Pentane	18.495	0.17	0.47
? RI= 506	6.030	0.06	0.15
? RI= 513	2.823	0.03	0.07
? RI= 517	4.067	0.04	0.10
neo-C6	.000	0.00	0.00
? RI= 542	.950	0.01	0.02
? RI= 549	1.516	0.01	0.04
? RI= 552	.162	0.00	0.00
? RI= 554	.132	0.00	0.00
Cyclo-C5	2.209	0.02	0.06
2,3-diMeC4	.000	0.00	0.00
2-MeC5	3.952	0.04	0.10
? RI= 574	.273	0.00	0.01
3-MeC5	1.238	0.01	0.03
? RI= 587	.496	0.00	0.01
? RI= 596	.154	0.00	0.00
n-Hexane	2.449	0.02	0.06
? RI= 602	.503	0.00	0.01
? RI= 604	.630	0.01	0.02
? RI= 606	.483	0.00	0.01
? RI= 609	.561	0.01	0.01
? RI= 614	.451	0.00	0.01
? RI= 619	.267	0.00	0.01
MeCyC5	2.286	0.02	0.06
2,4-diMeC5	.133	0.00	0.00
Benzene ?	.842	0.01	0.02
3,3-diMeC5	.163	0.00	0.00
? RI= 660	.159	0.00	0.00

Table A.I.2 (continued)

COMPOUND	GAS YIELD (μ l gas /g dry rock) related to calibration standard	GAS COMPOSITION (% volume of listed HC + non-HC)	HC COMPOSITION (% volume of listed hydrocarbons)
2-MeC6	.232	0.00	0.01
2,3-diMeC6	.098	0.00	0.00
3-MeC6	.349	0.00	0.01
DiMeCyC5	.170	0.00	0.00
DiMeCyC5	.191	0.00	0.00
DiMeCyC5	.289	0.00	0.01
? RI= 698	.087	0.00	0.00
n-Heptane	.558	0.01	0.01
? RI= 702	.203	0.00	0.01
? RI= 704	.000	0.00	0.00
? RI= 712	.138	0.00	0.00
MeCyC6	.138	0.00	0.00
2,4-diMeC6	.097	0.00	0.00
triMeC5	.167	0.00	0.00
Toluene	.105	0.00	0.00
triMeCyC5	.000	0.00	0.00
2-MeC7	.082	0.00	0.00
n-Octane	.000	0.00	0.00
SUMMATION:			
	10756.020	100.0	100.0
Non-hydrocarbons:			
	6838.545	63.6	0.0
Hydrocarbons:			
	3917.474	36.4	100.0
Values used for normalisation (ppm v/v):			
		448947.1	163512.0

Data corrected for air contamination and deadvolume of HyPy bomb.

Table A.I.3:

AMOUNT OF ASPHALTENES AND POLARS IN SEDIMENT/FLUID

IKU-No.	DEPTH (m)	Asphaltenes (mg)	Polar (mg)
D 1316	73.21	31.4	74.9
original sample			
D 7197	73.21	12.5	10.6
hy-py extract			
D 7196	73.21	2.6	8.9
hy-py fluid			

Project no.: 21.3437.23
Well ident.: 7231/01-01
DATE : 14 - 12 - 87.

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Table A.I.4:

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

I			:	Rock							I
I	IKU-No	DEPTH	:	Extr.	EOM	Sat.	Aro.	HC	Non HC	TOC	I
I			:								I
I		(m)	:	(g)	(mg)	(mg)	(mg)	(mg)	(mg)	(%)	I
I			:								I
I	D 1316	73.21	:	6.3	56.1	1.1	8.3	9.4	46.7	11.88	I
I	original sample		:								I
I	C 7197	73.21	:	3.7	41.3	0.2	10.7	10.9	30.4	11.12	I
I	hy-py extract		:								I
I	C 7196	73.21	:		80.0	15.1	33.2	48.3	31.7		I
I	hy-py fluid		:								I

Project no.: 21.3437.23
Well ident.: 7231/01-01
DATE : 14 - 12 - 87.

Table A.I.5:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
D 1316	73.21	8849	174	1309	1483	7366
original sample						
C 7197	73.21	11162	54	2892	2946	8216
hy-py extract						
C 7196	73.21					
hy-py fluid						

Project no.: 21.3437.23
Well ident.: 7231/01-01
DATE : 14 - 12 - 87.

Table A.I.6:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
D 1316	73.21	74.5	1.5	11.0	12.5	62.0
original sample						
C 7197	73.21	100.4	0.5	26.0	26.5	73.9
hy-py extract						
C 7196	73.21					
hy-py fluid						

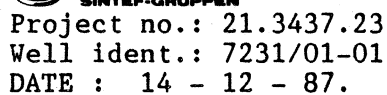


Table A.I.7:

COMPOSITION OF MATERIAL EXTRACTED FROM THE ROCK / FLUID

I			:	Sat	Aro	HC	SAT	Non HC	HC	I
I	IKU-No	DEPTH	:	---	---	---	---	---	---	I
I			:	EOM	EOM	EOM	Aro	EOM	Non HC	I
I		(m)	:	%	%	%	x 100	%	x 100	I
I			:							I
I	D 1316	73.21	:	2.0	14.8	16.8	13.3	83.2	20.1	I
I	original sample		:							I
I	C 7197	73.21	:	0.5	25.9	26.4	1.9	73.6	35.9	I
I	hy-py extract		:							I
I	C 7196	73.21	:	18.9	41.4	60.4	45.7	39.6	152.4	I
I	hy-py fluid		:							I

Table A.I.8:

TABULATION OF DATA FROM THE GASCHROMATOGRAMS

I		DEPTH	:	PRISTANE	PRISTANE	PHYTANE	A	n-C17		I
I	IKU No.		:	-----	A= -----	B= -----	---	-----	CPI	CPI
I		(m)	:	PHYTANE	n-C17	n-C18	B	n-C27	1	2
I			:							
I			:							
I	D 1316	73.21	:	0.9	2.8	3.9	0.7	1.6	1.4	1.3
I	original sample		:							
I	C 7197	73.21	:	1.1	0.7	0.5	1.2	1.0	1.2	1.2
I	hy-py extract		:							
I	C 7196	73.21	:	1.9	1.0	0.6	1.7	4.1	1.2	1.1
I	hy-py fluid		:							

DATE : 14 - 12 - 87.

Table A.I.9a: Molecular ratios from sterane and terpane mass chromatograms.
Maturity ratios.

IKU code	Depth (m)	$\alpha\beta/\alpha\beta+\beta\alpha^1)$	%22S ²⁾	% $\beta\beta^3)$	%20S ⁴⁾
D-1316 (original sample extract)	73.21	0.67	17.61	59.39	10.00
C-7196 (expelled pyrolysate fluid)	73.21	0.77	53.47	79.28	53.62
C-7197 (pyrolysed rock extract)	73.21	0.78	55.96	75.89	44.44

1) E/E+F in m/z 191

2) Average % distribution between first and second eluting isomers of extended hopanes (G-M in m/z 191)

3) $2(r+s)/(q+t+2(r+s))$ in m/z 217

4) $q/q+t$ in m/z 217

Table A.I.9b: Molecular ratios from terpane and sterane mass chromatograms.
 Maturity and source characteristic ratios.

IKU no.	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
D-1316 (original sample extract)	73.21	-	-	-	-	0.19
C-7196 (expelled pyrolysate fluid)	73.21	0.27	-	-	-	0.72
C-7197 (pyrolysed rock extract)	73.21	-	20.00	-	-	0.59

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191)

2) B/A in m/z 191

3) Relative abundance of unknown (X/E in m/z 191)

4) Relative abundance of bisnorhopane (Z/E in m/z 191)

5) Relative abundance of C₂₇ rearranged steranes (a/a+j in m/z 217)

Core number: 7231/01-U-01
Reference number: 21.3437.23
(1/1)

Table A.I.10:

VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
C-7197	-----	73.21	1.09 (11) 1.36 (19)	F R?	0.05 0.07	---

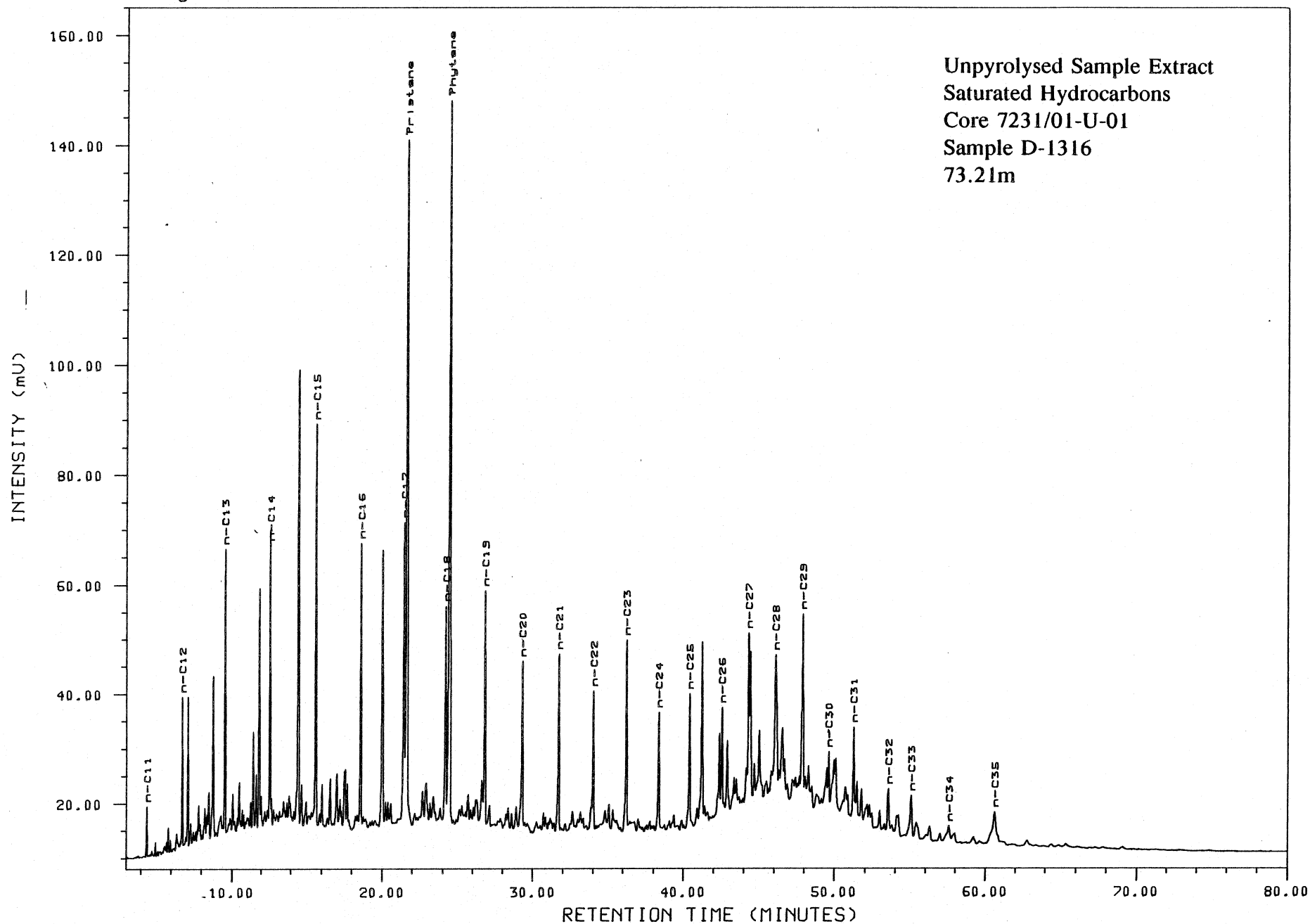
REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor
S = Stained; R = Reworked.

Figure A.I.1

Saturated hydrocarbon gas chromatograms

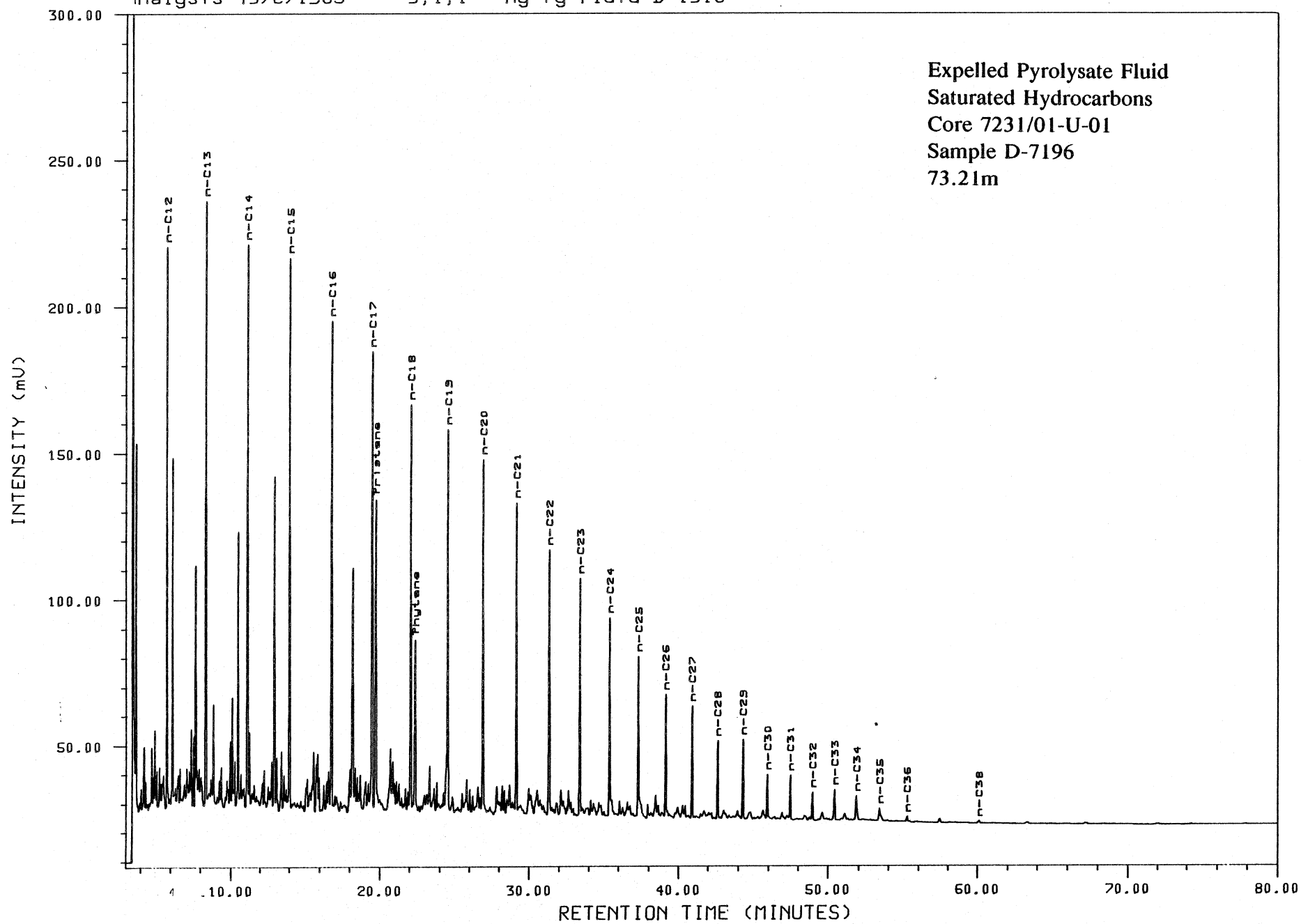
n-C ₁₅ etc.	- n-alkanes
Pr	- pristane
Ph	- phytane
*	- contamination (dioctylphthalate)

Analysis 437D1316S 2,1,1 7231/01-U-01 CORE



Analysis 43707196S

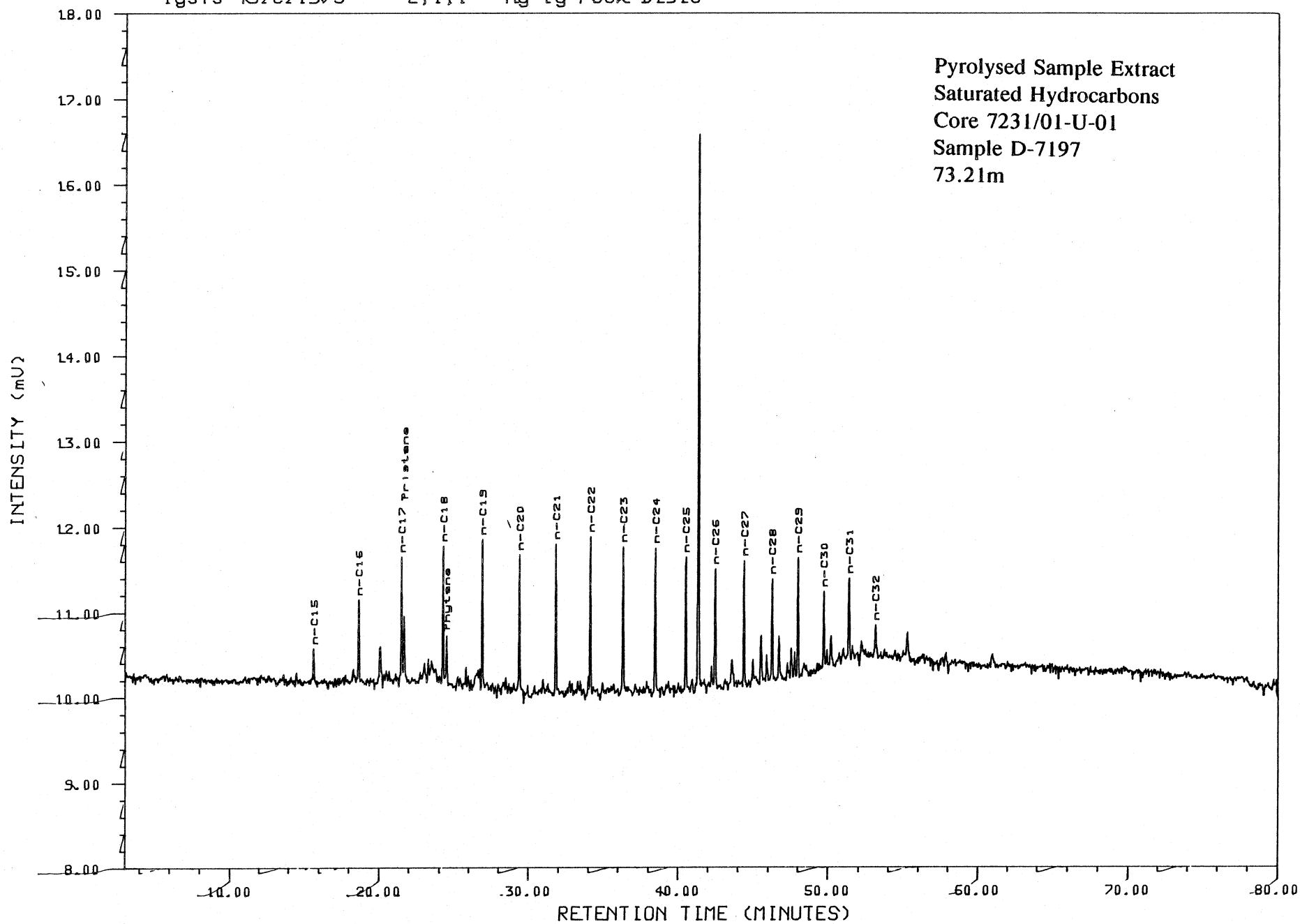
3,1,1 Hy-Py fluid D-1316



1995 437C2197S

2,1,1

Hy-Py rock D1316



VARIATION IN DISTRIBUTION OF N-ALKANE PEAKS BEFORE AND AFTER HYDROUS PYROLYSIS

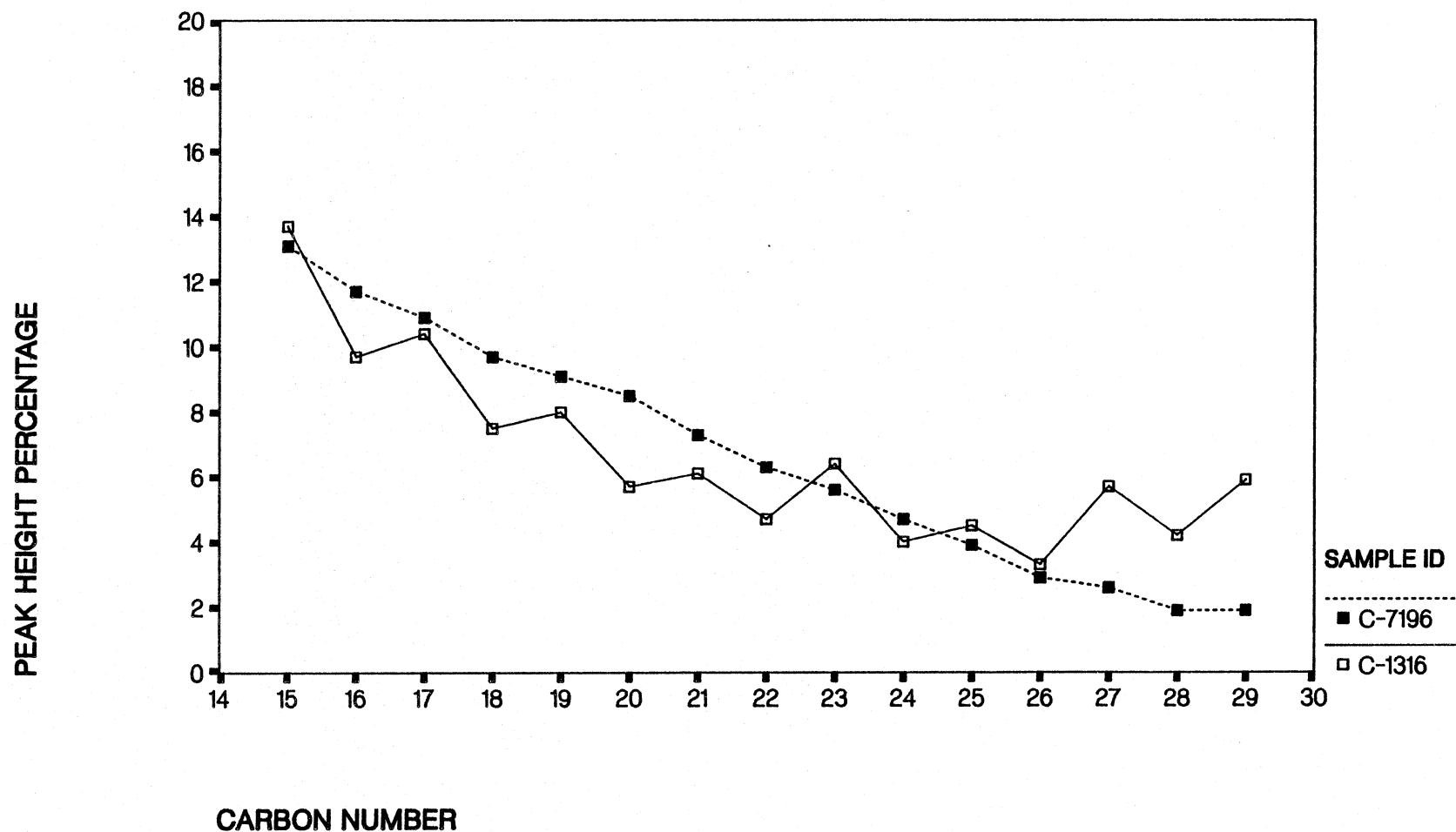


Figure A.I.2:

VARIATION IN DISTRIBUTION OF ISOPRENOID PEAKS BEFORE AND AFTER HYDROUS PYROLYSIS

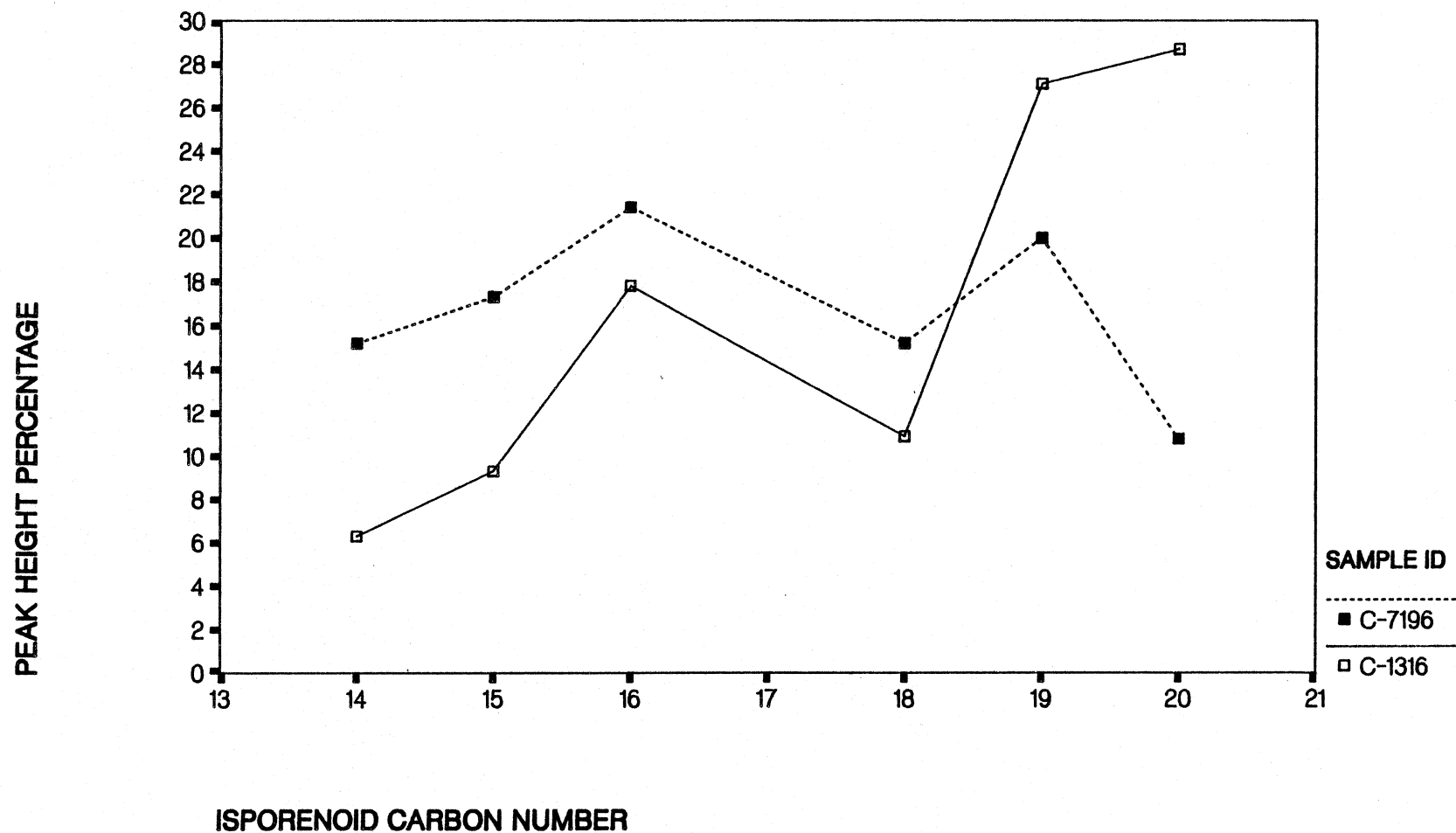


Figure A.I.3:

Figure A.I.4:

Mass fragmentograms of m/z 191, 205, 163, 177 (terpanes)
for rock extract, expelled pyrolysate fluid
and pyrolysed sample extract.



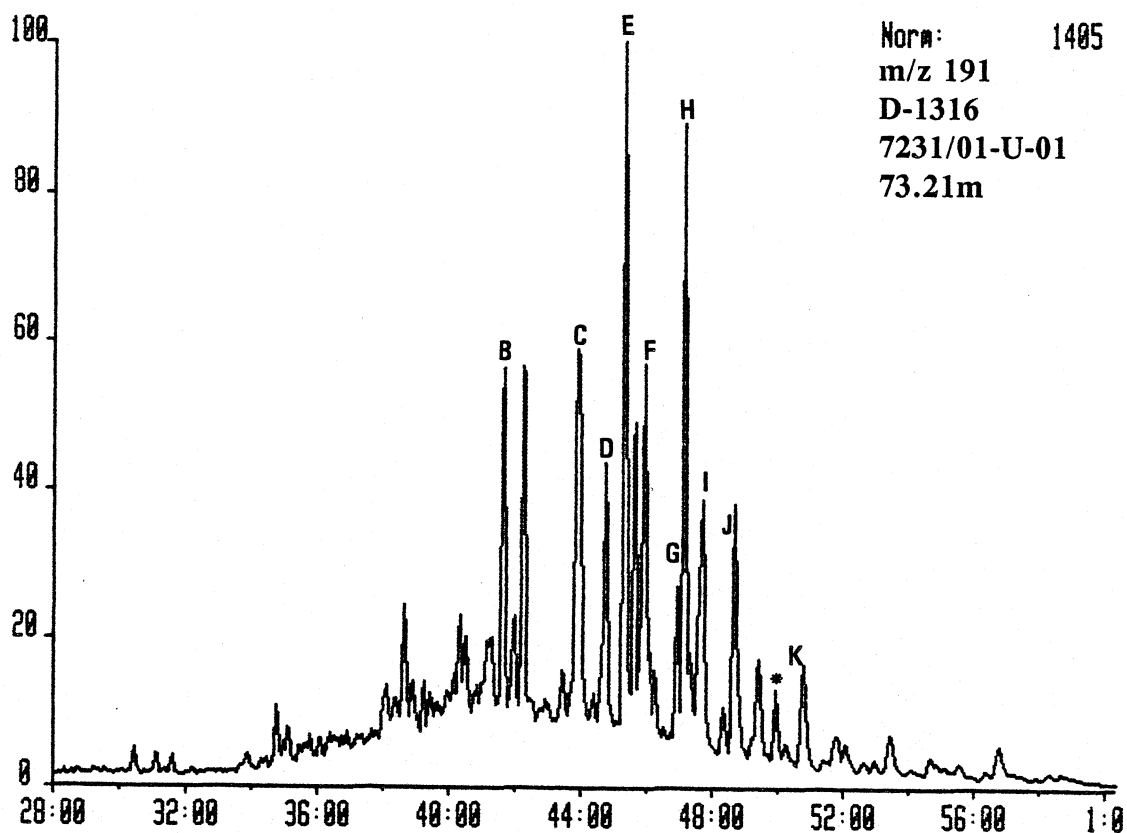
IKU
SINTEF GRUPPEN

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D1316SAT 14-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 191.1000

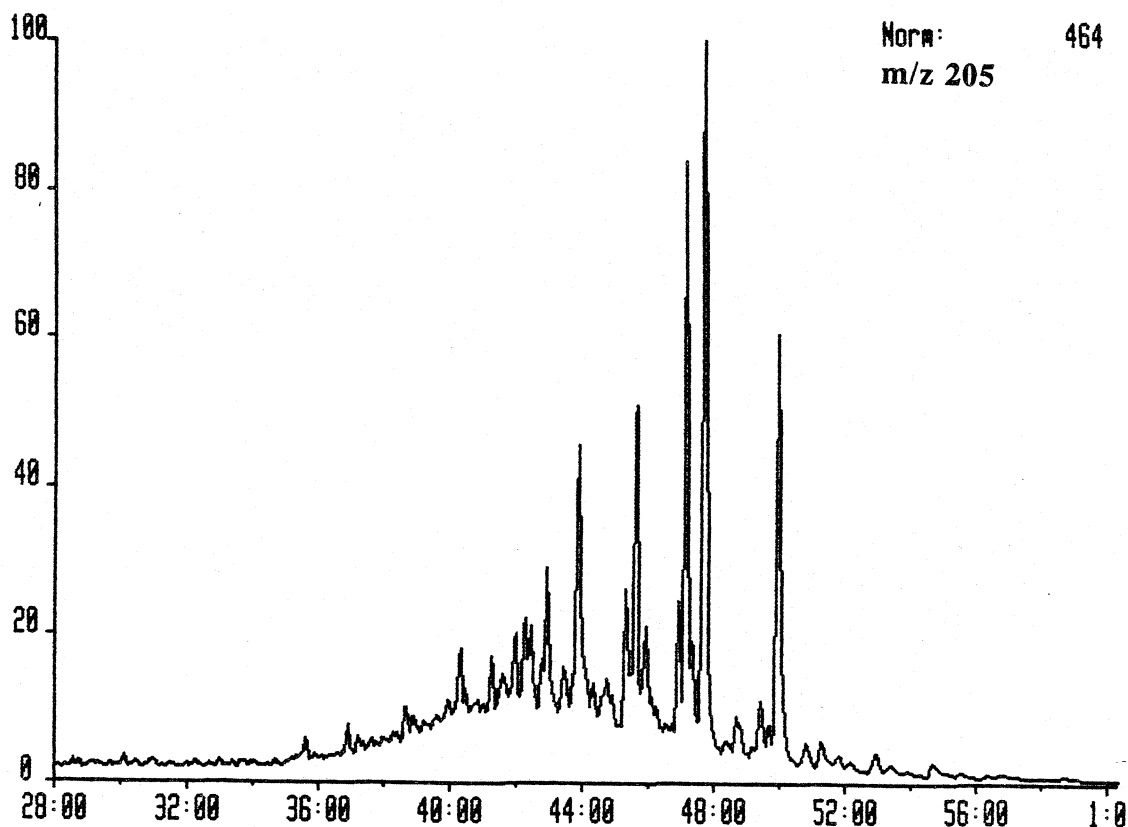
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Norm: 1405
m/z 191
D-1316
7231/01-U-01
73.21m

D1316SAT 14-DEC-87 Sir: Voltage 12-250 Acnt: IKU
Sample 1 Injection 1 Group 1 Mass 205.1000
Text:

System: QUADSAT



Norm: 464
m/z 205



IKU
SINTEF-GRUPPEN

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D1316SAT 14-DEC-87

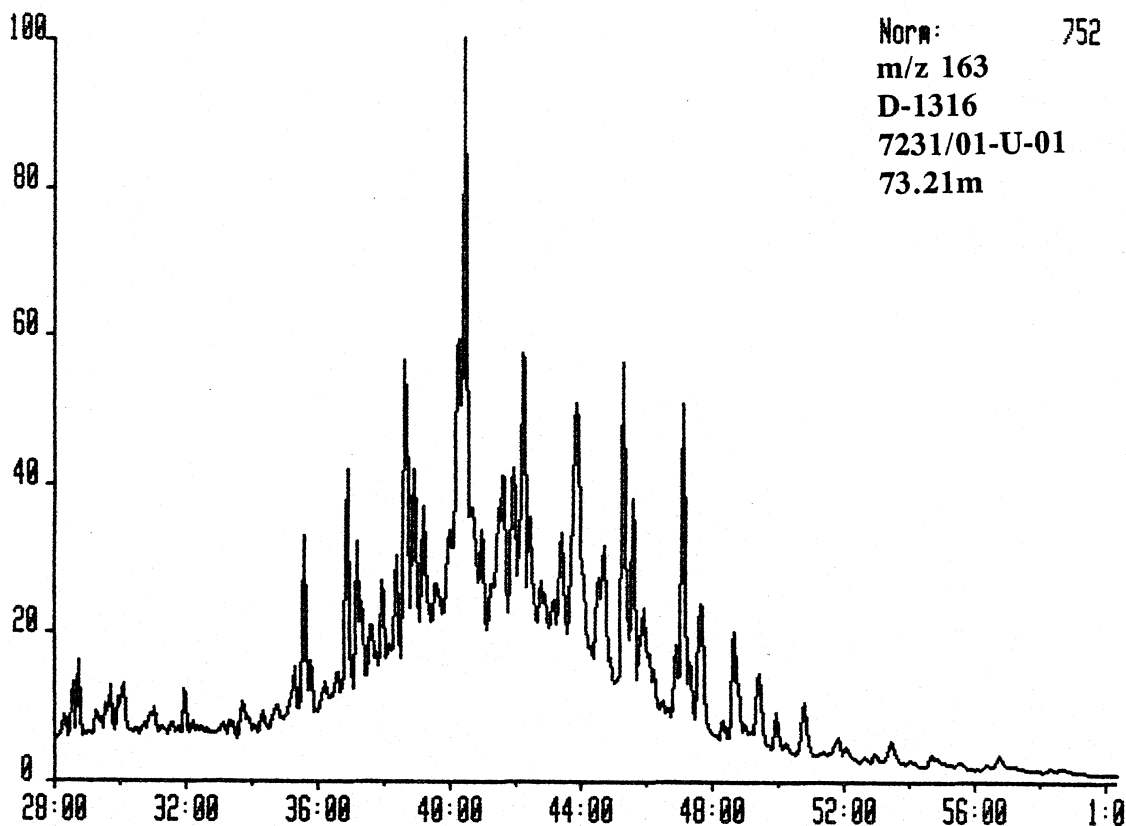
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

Group 1 Mass 163.1000

Text:



D1316SAT 14-DEC-87

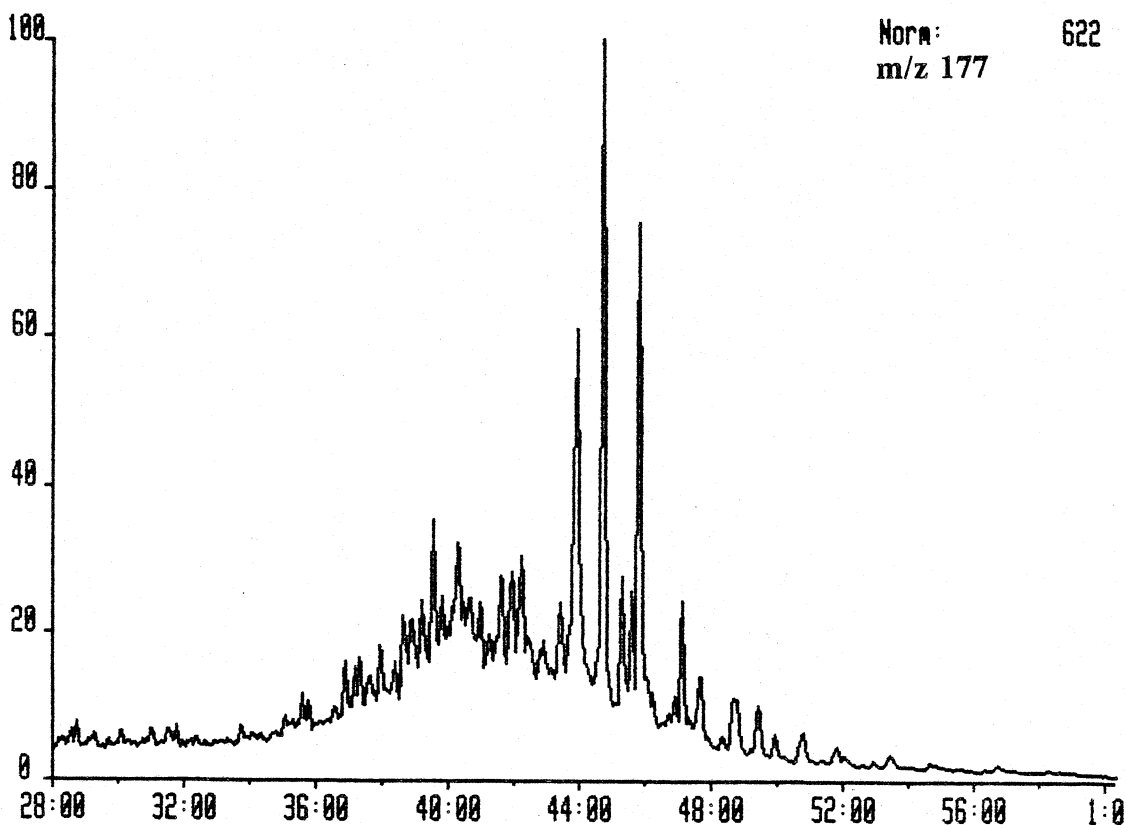
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System:QUADSAT

Sample 1 Injection 1

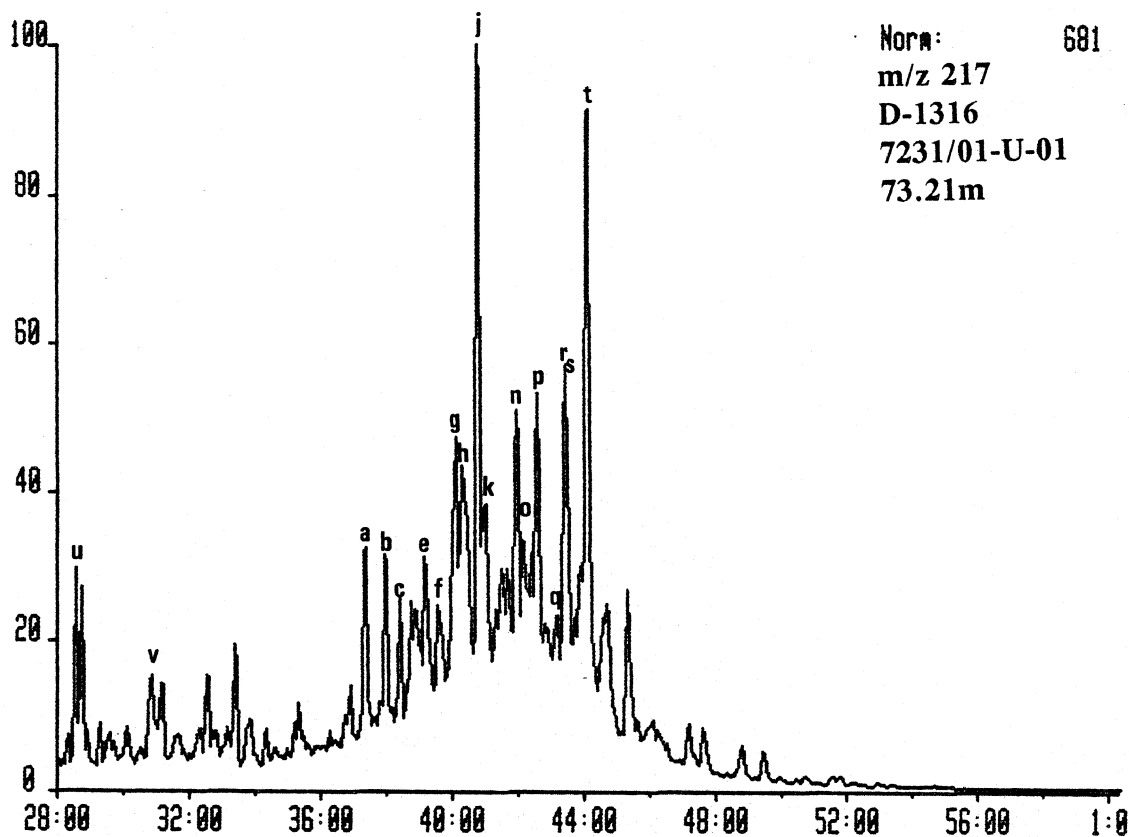
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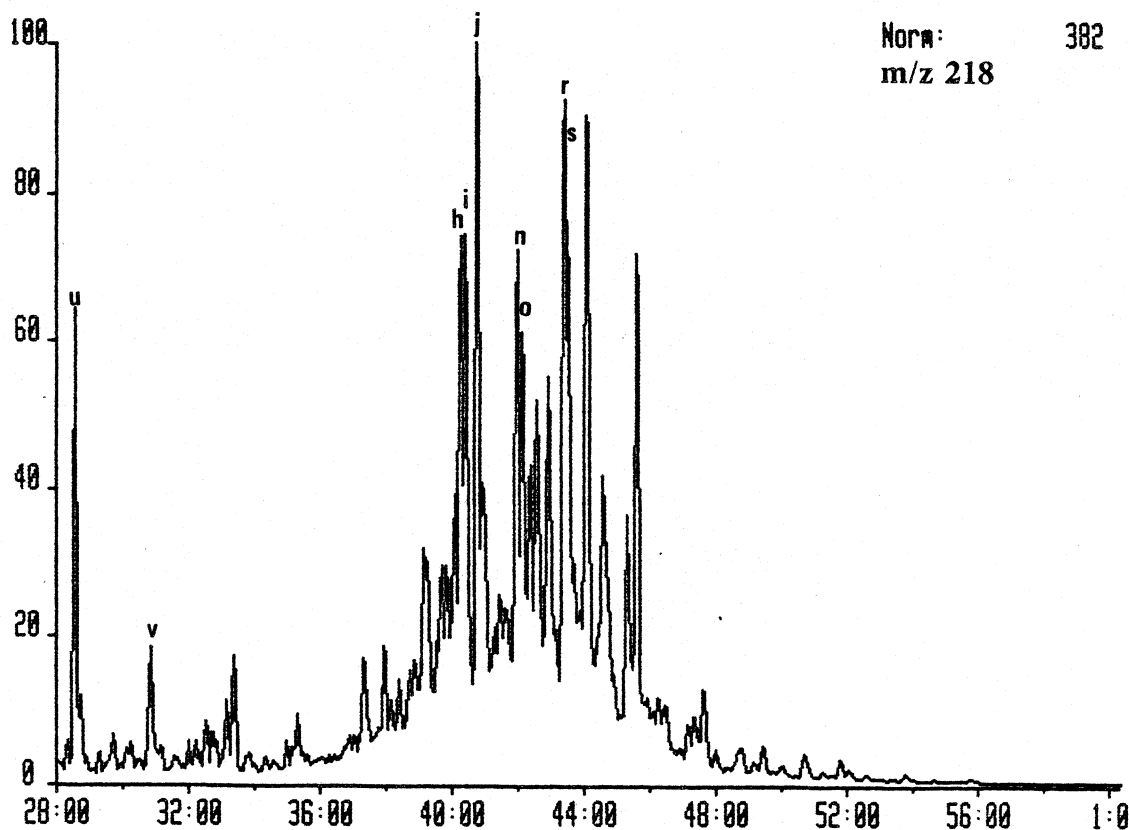
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Text:

System:QUADSAT



D1316SAT 14-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT





IKU

SINTEF-GRUPPEN

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D1316SAT 14-DEC-87

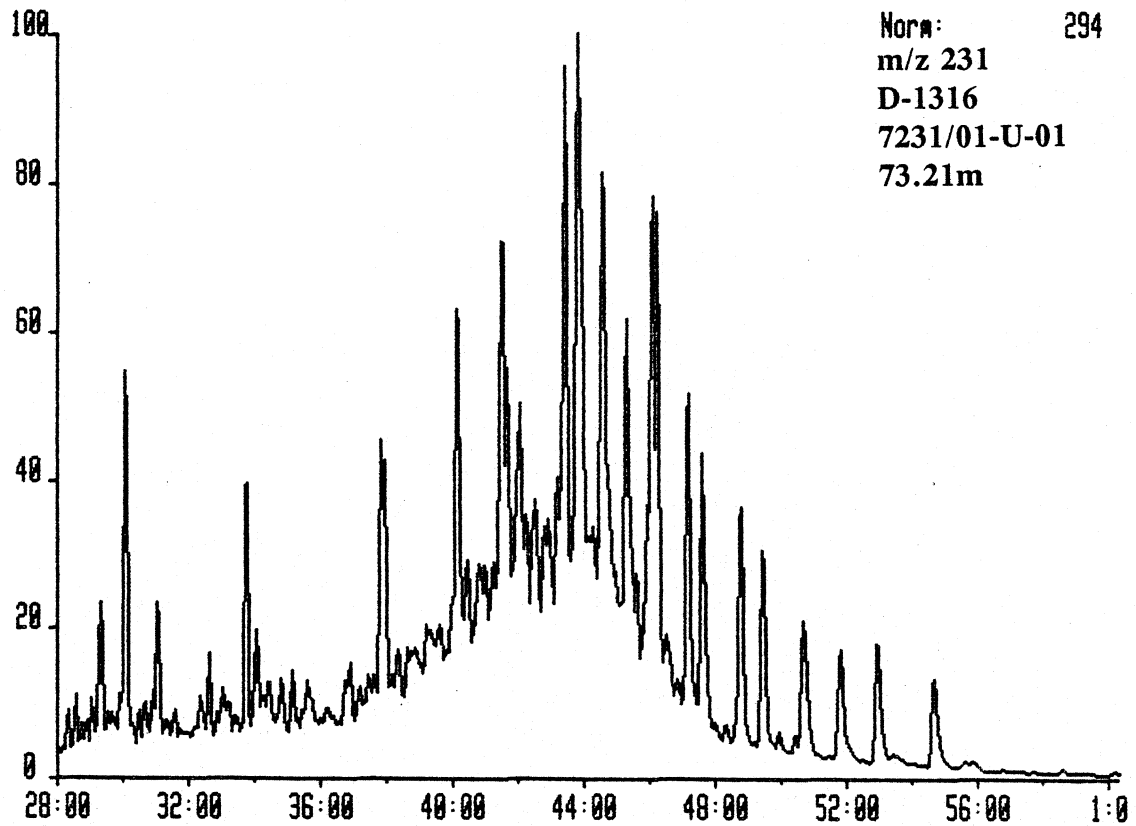
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 231.1000

Text:



Norm: 294
m/z 231
D-1316
7231/01-U-01
73.21m

D1316SAT 14-DEC-87

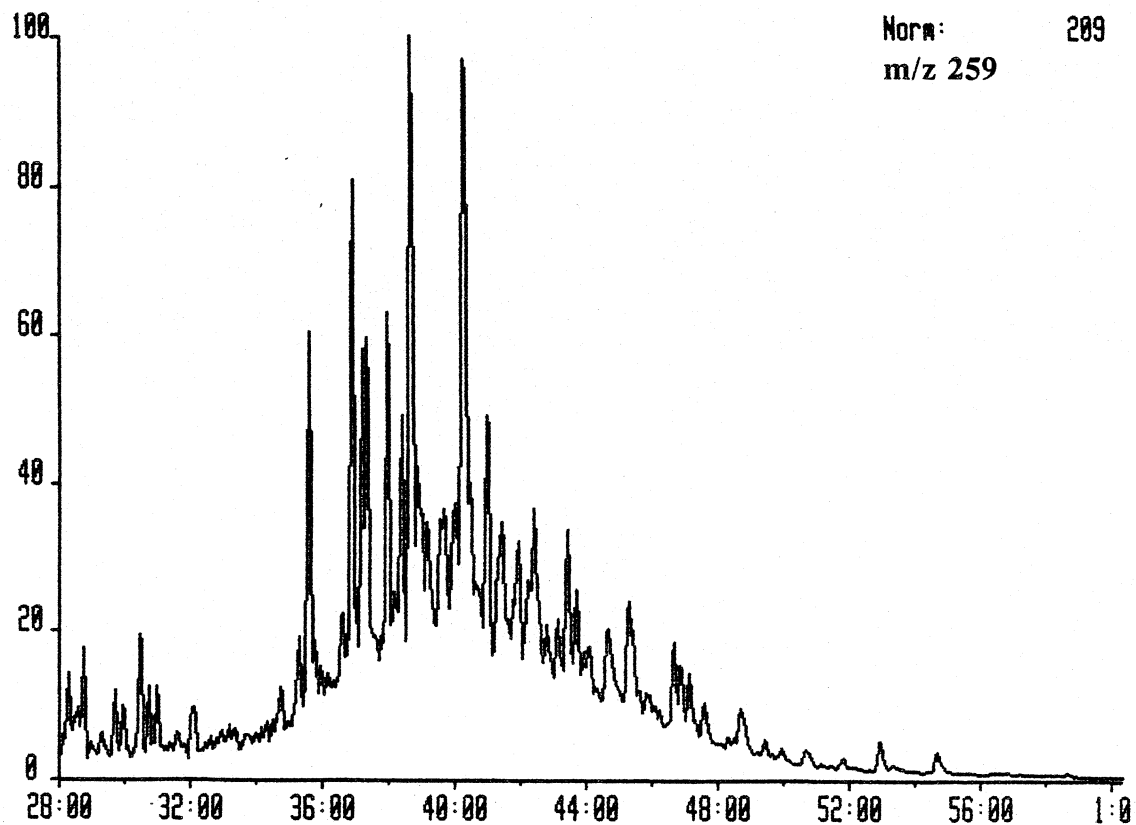
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 259.1000

Text:



Norm: 209
m/z 259



IKU

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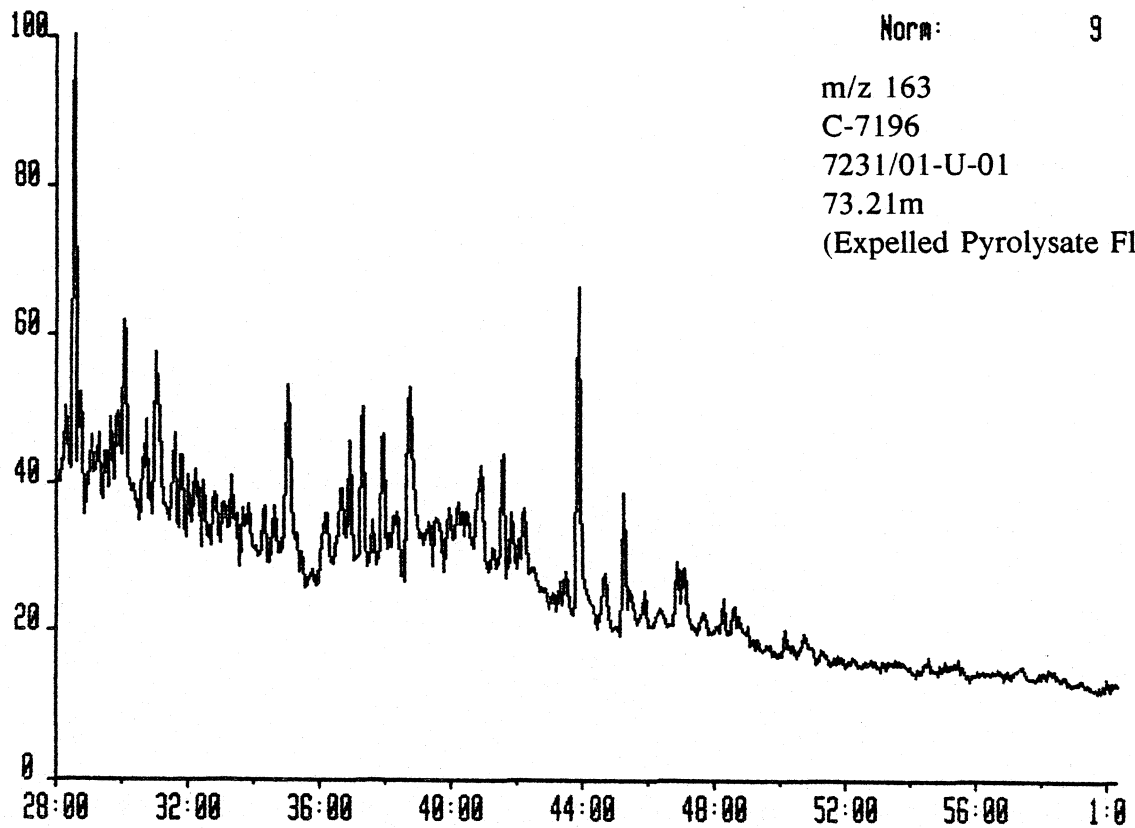
C7196SAT1 14-DEC-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1 Group 1 Mass 163.1000

Text:



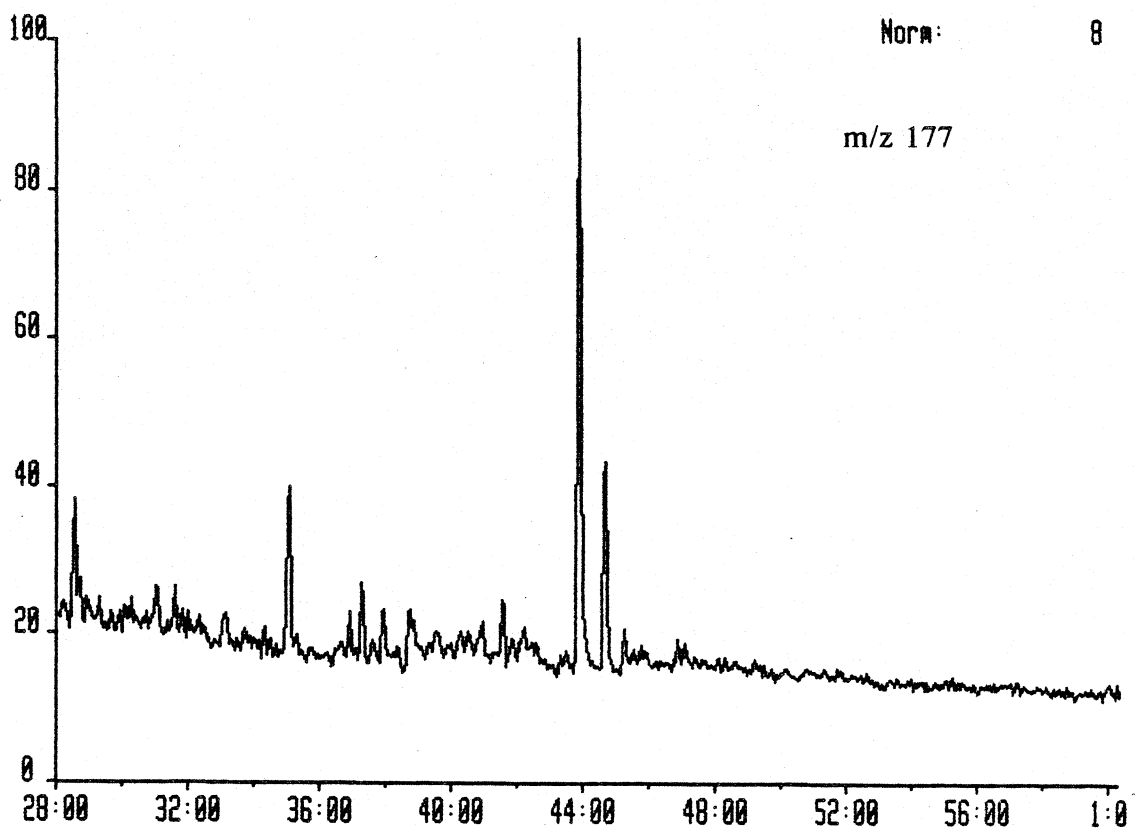
C7196SAT1 14-DEC-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

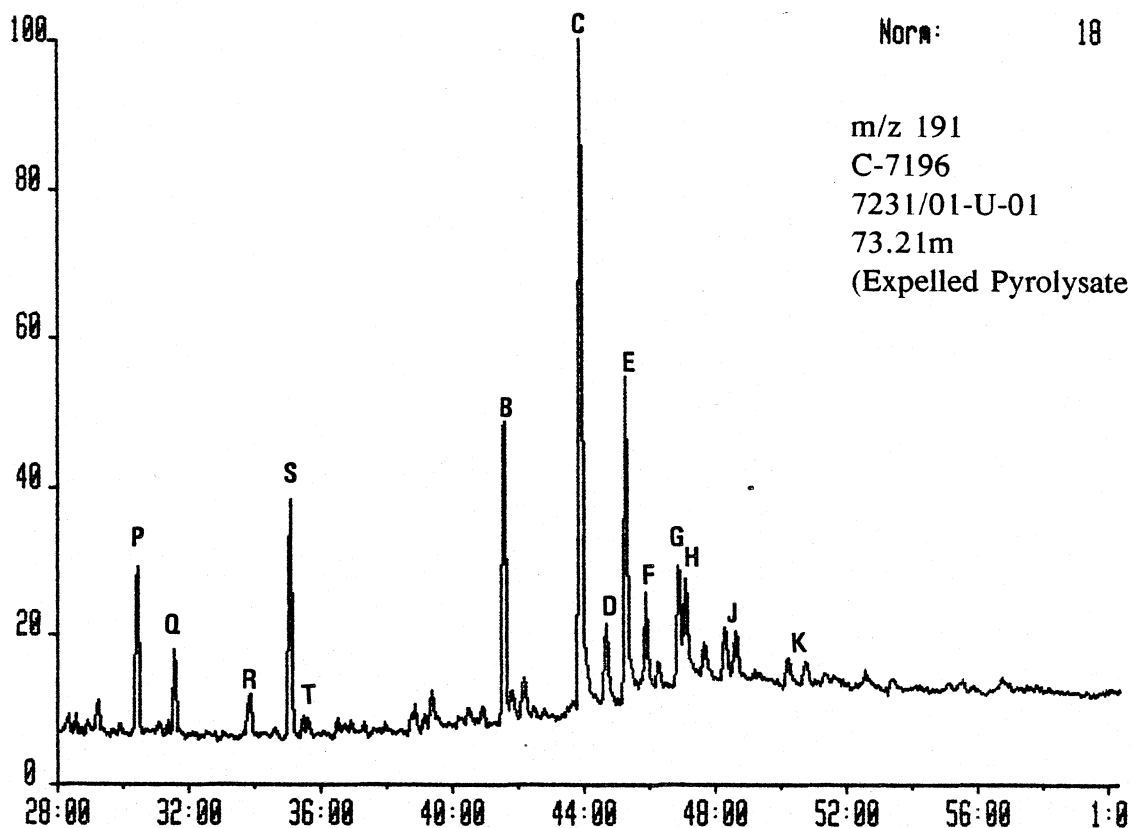
Sample 1 Injection 1 Group 1 Mass 177.1000

Text:



C7196SAT1 14-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 191.1000
Text:

System:QUADSAT

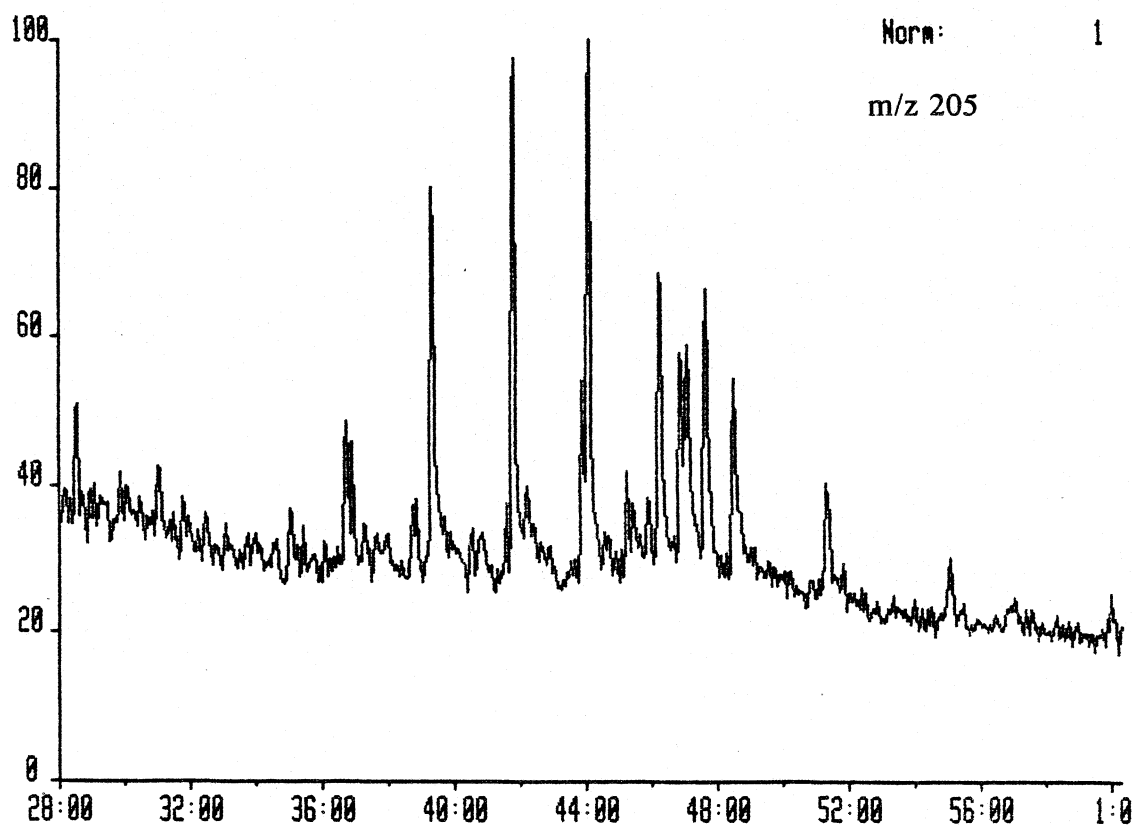


Norm: 18

m/z 191
C-7196
7231/01-U-01
73.21m
(Expelled Pyrolysate Fluid)

C7196SAT1 14-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 205.1000
Text:

System:QUADSAT



Norm: 1

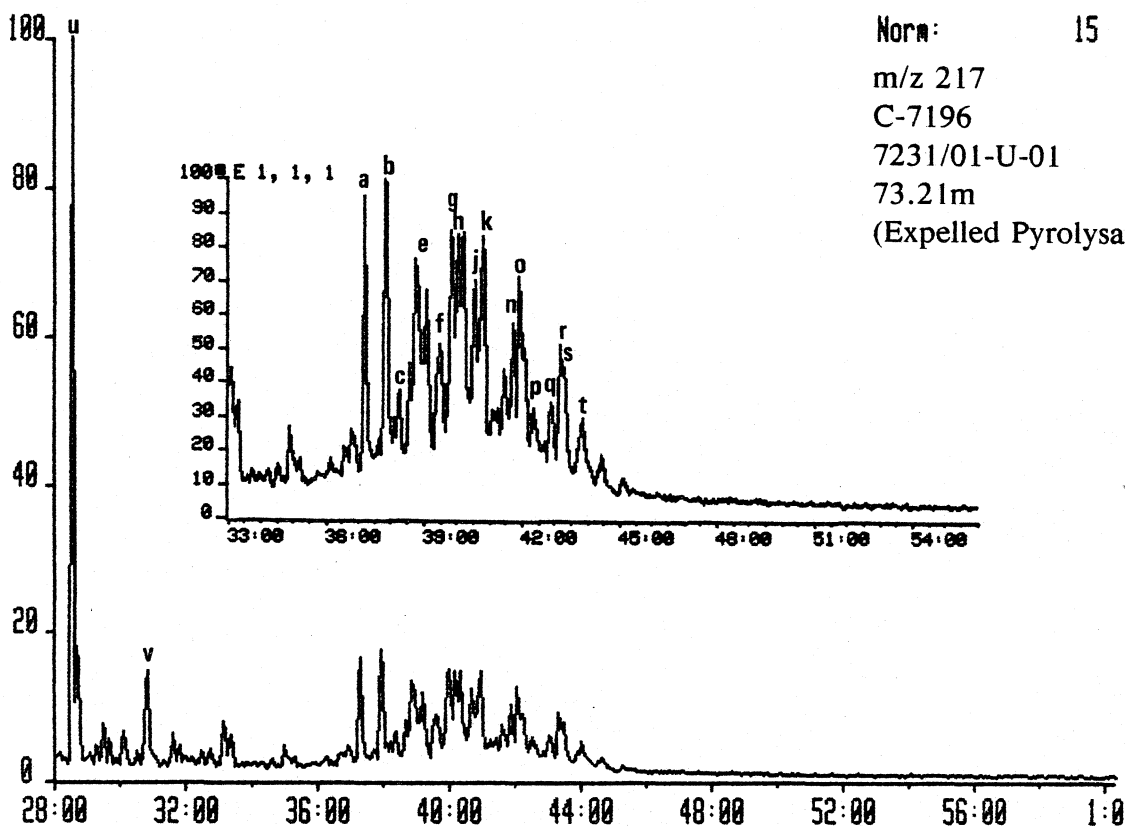
m/z 205

Figure A.I.5:

**Mass fragmentograms of m/z 217, 218, 231, 259 (steranes)
for rock extract, expelled pyrolysate fluid
and pyrolysed sample extract.**

C7196SAT1 14-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 217.1000
Text:

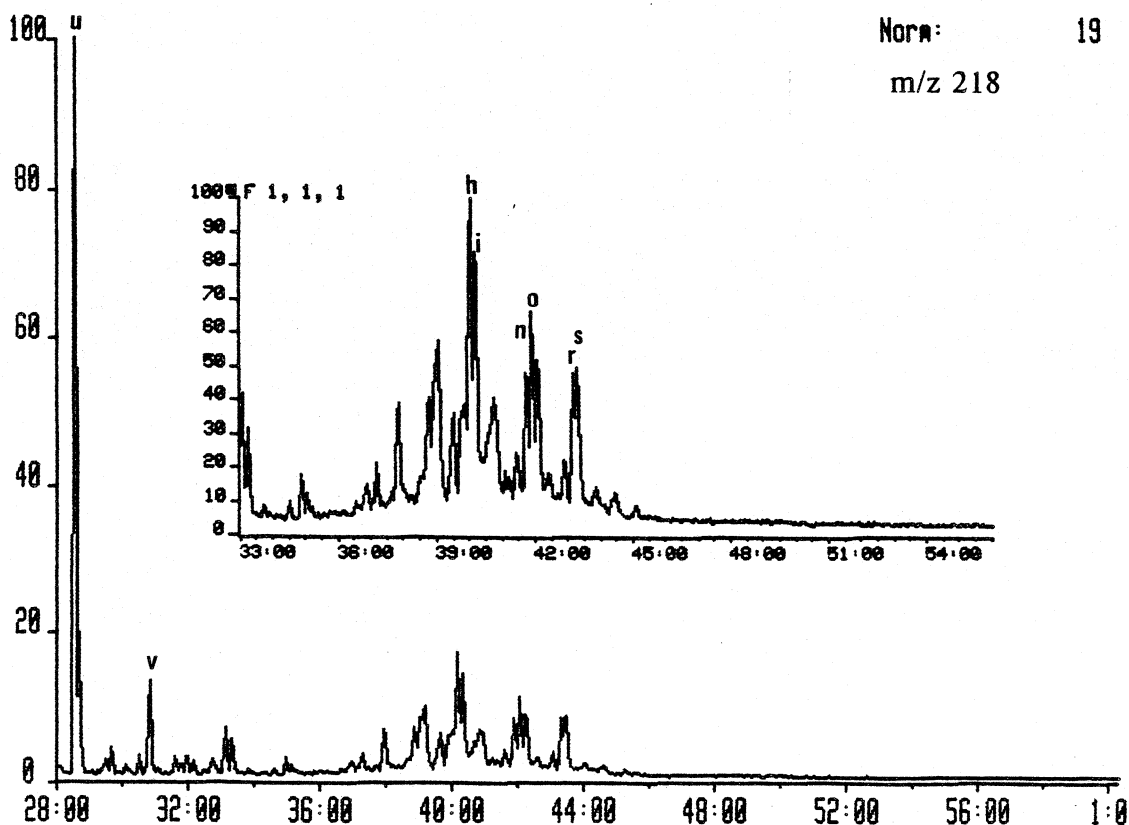
System:QUADSAT



Norm: 15
m/z 217
C-7196
7231/01-U-01
73.21m
(Expelled Pyrolysate Fluid)

C7196SAT1 14-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT

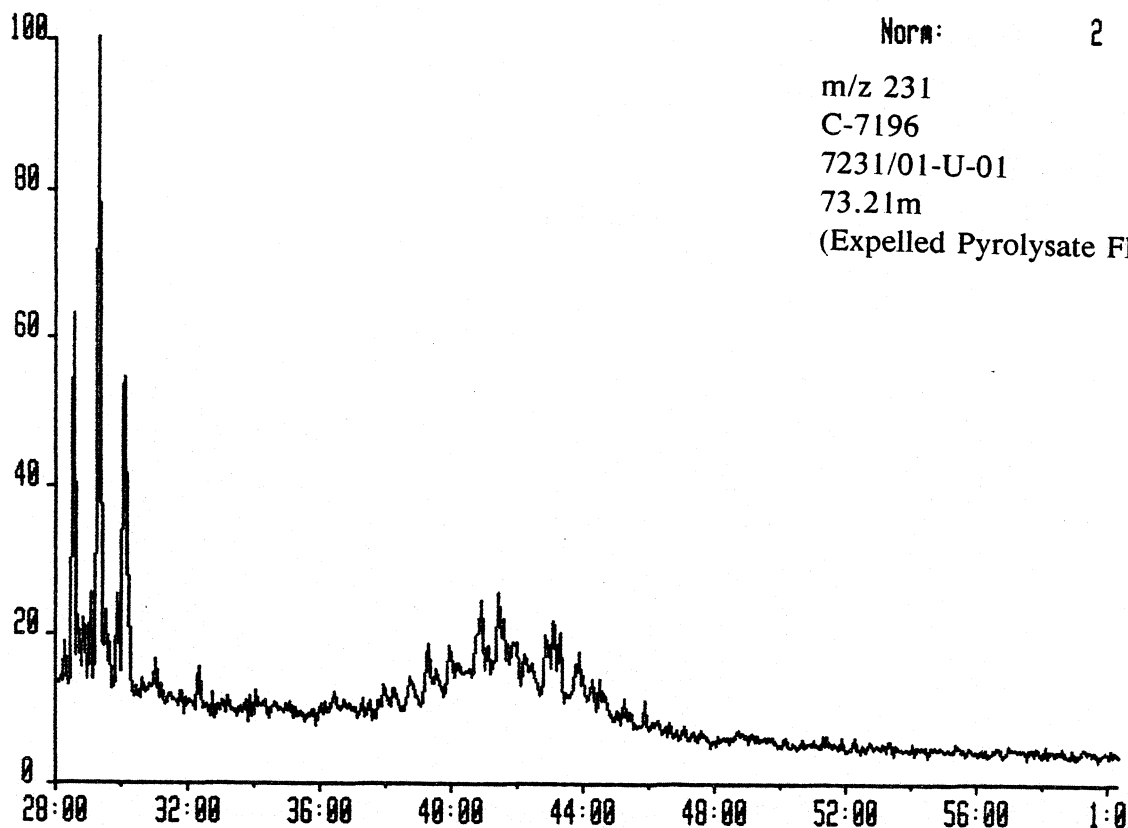


Norm: 19
m/z 218

C7196SAT1 14-DEC-87
Sample 1 Injection 1
Text:

Sir:Voltage 12-250 Acnt:IKU
Group 1 Mass 231.1000

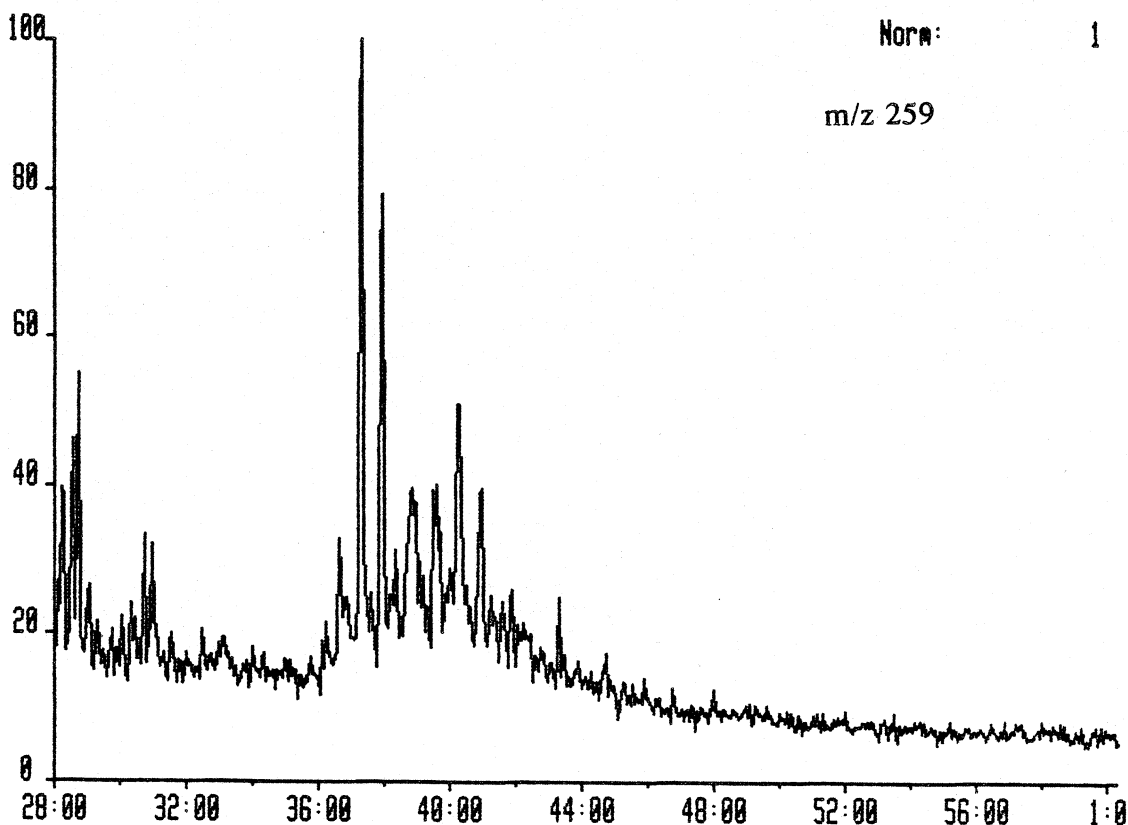
System:QUASAT



C7196SAT1 14-DEC-87
Sample 1 Injection 1
Text:

Sir:Voltage 12-250 Acnt:IKU
Group 1 Mass 259.1000

System:QUASAT



**IKU**

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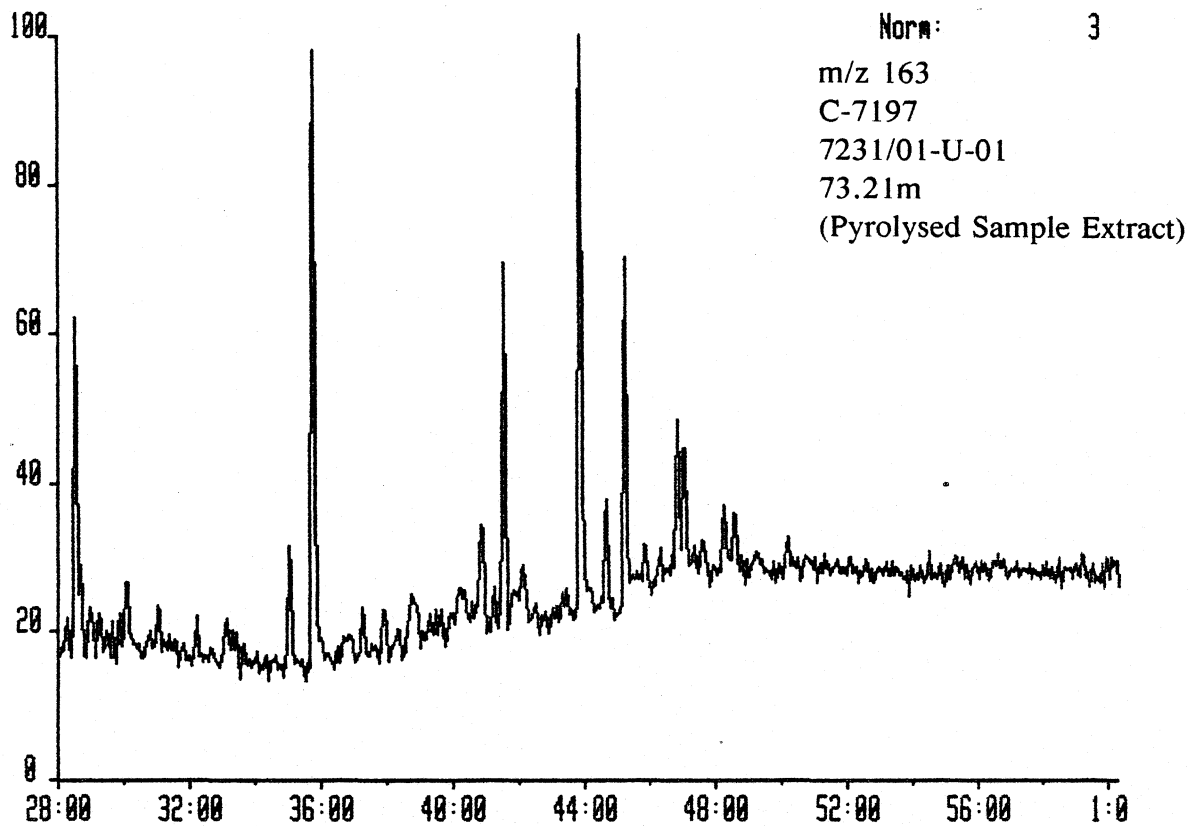
C7197SAT 14-DEC-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1 Group 1 Mass 163.1000

Text:



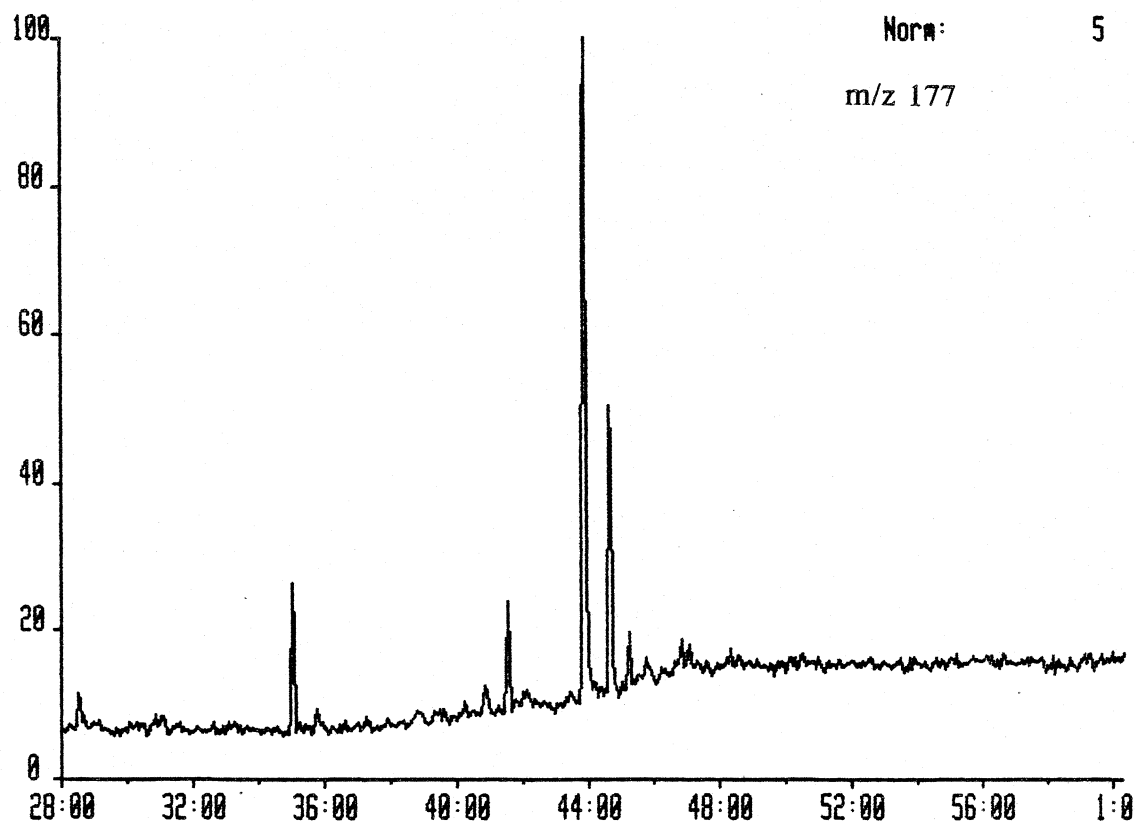
C7197SAT 14-DEC-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1 Group 1 Mass 177.1000

Text:



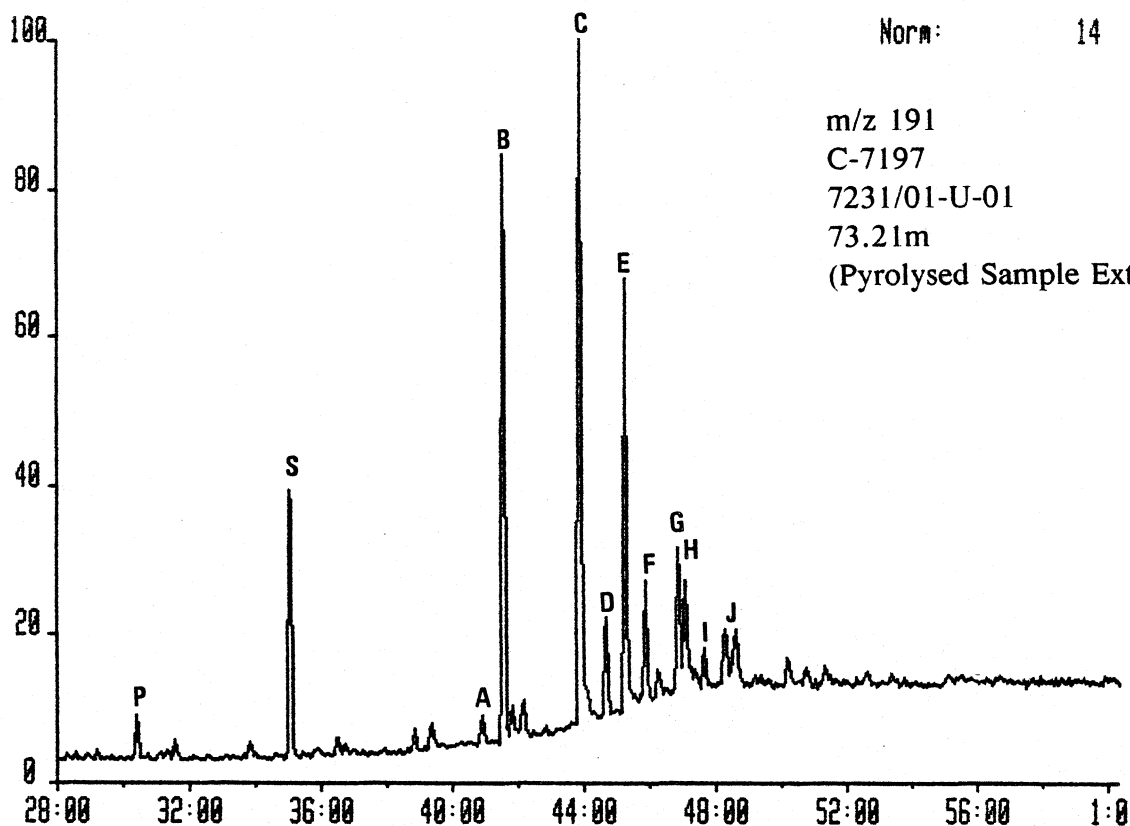


IKU
SINTEF-GRUPPEN

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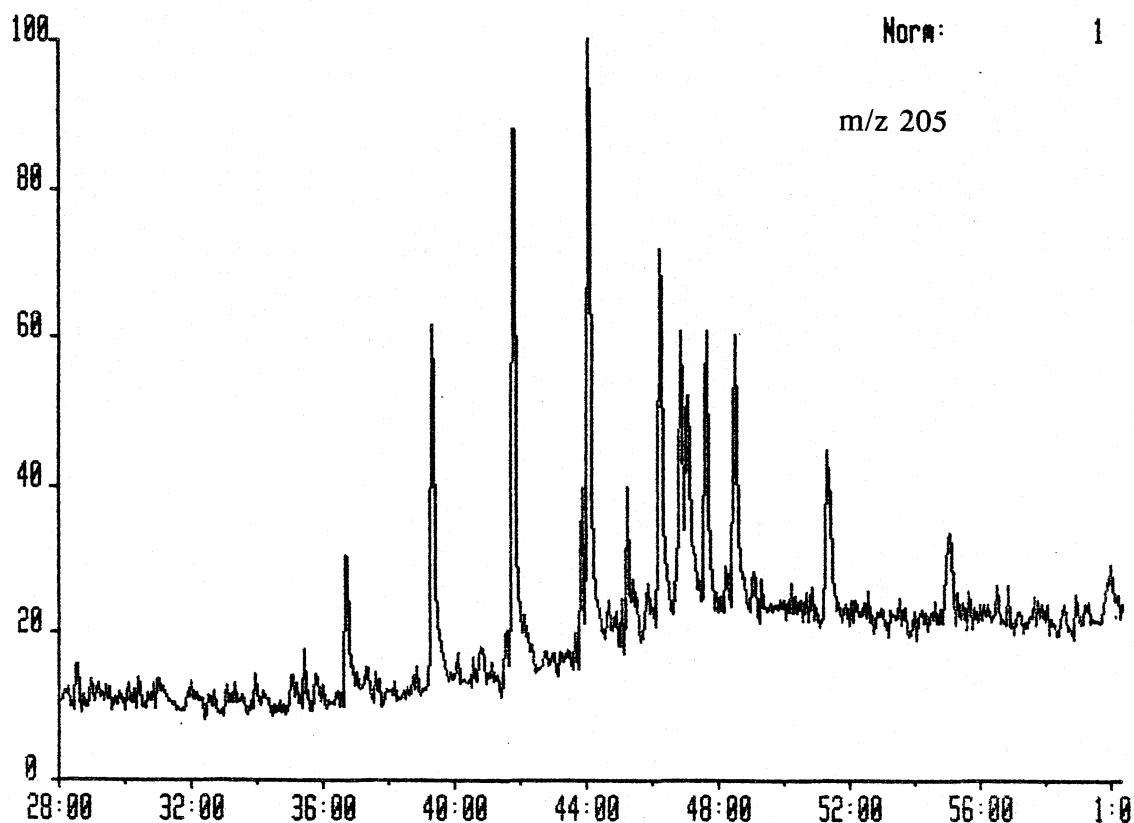
C7197SAT 14-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 191.1000
Text:

System:QUADSAT



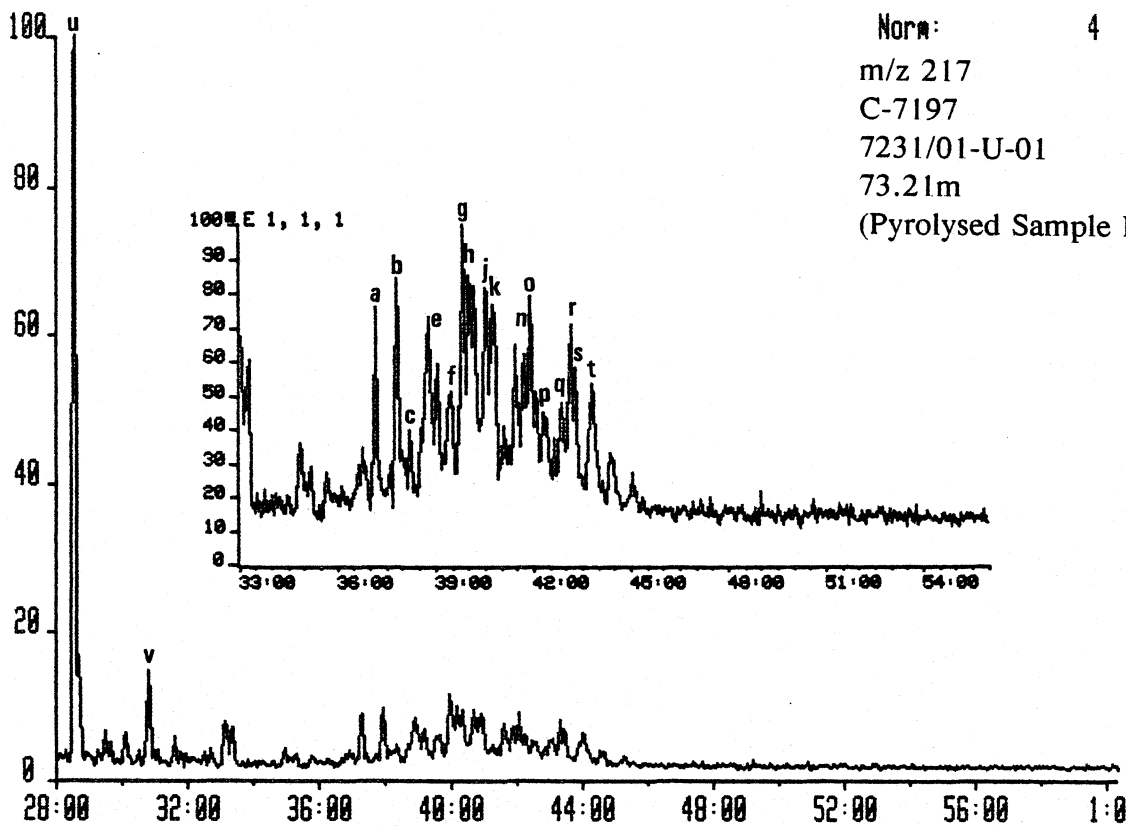
C7197SAT 14-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 205.1000
Text:

System:QUADSAT



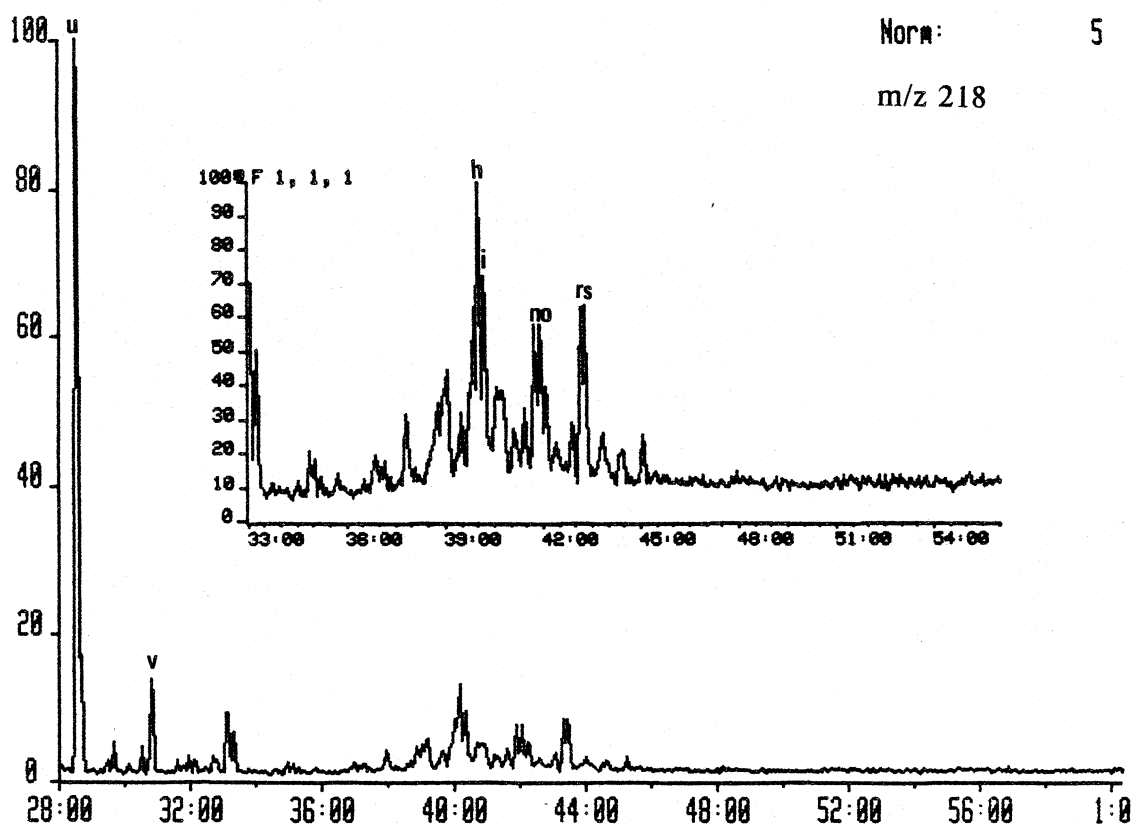
C7197SAT 14-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 217.1000
Text:

System:QUASAT



C7197SAT 14-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 218.1000
Text:

System:QUASAT





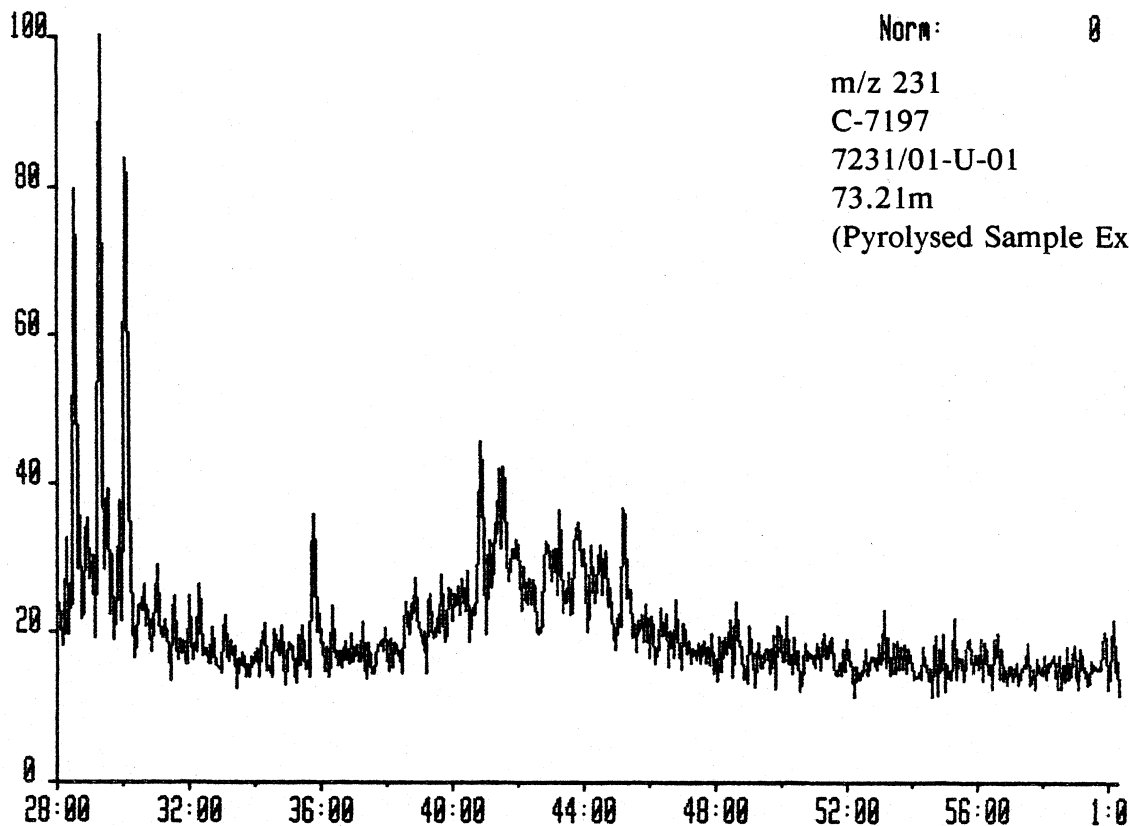
IKU
SINTEF-GRUPPEN

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C7197SAT 14-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 231.1000

System: QUADSAT



C7197SAT 14-DEC-87 Sir: Voltage 12-250 Acnt: IKU
Sample 1 Injection 1 Group 1 Mass 259.1000
Text:

System: QUADSAT

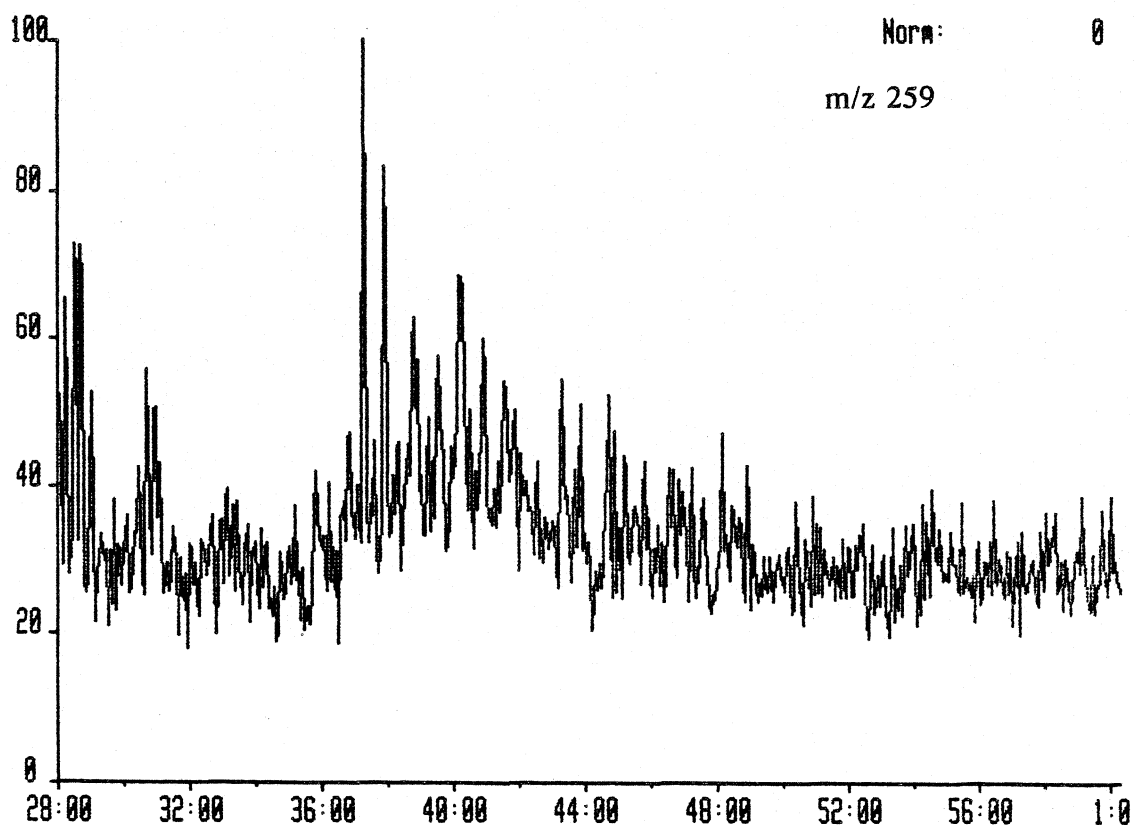


Figure A.I.6:

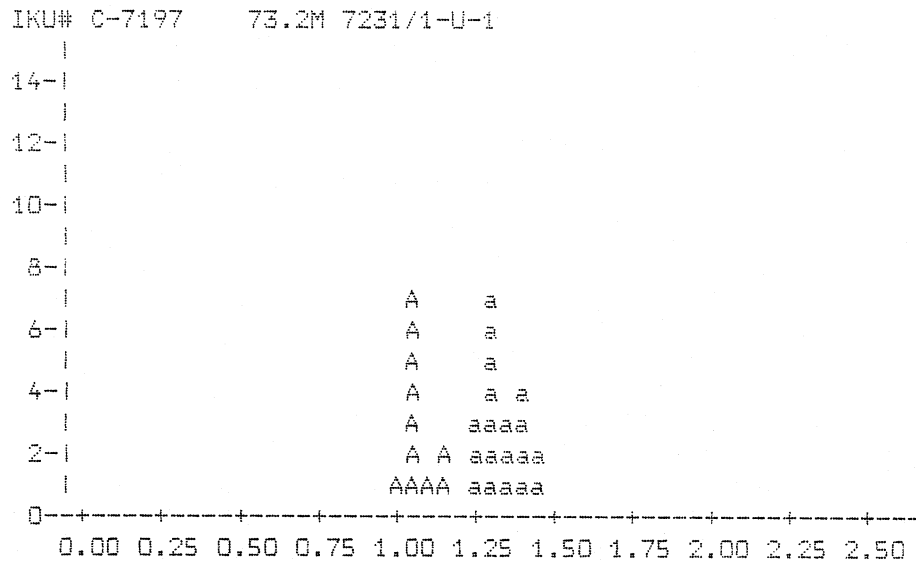
Vitrinite reflectance histograms.

Key:

A	= Grey-black-brown claystone.
	Upper case letters indicate values included in the main population. Lower case letters represent values in other population.
pp	= Statistical data population
	Y = Main population, not necessarily representative of sample maturity.
	N = Other populations.
LOW+HIGH	= Population limits.
VAL.	= Number of measurements in that population.

Lithology cross-reference table

A = Clst. gy
 B = Clst. dk gy
 C = Clst. dk gy
 D = Clst. gn
 E = Clst. bn
 F = Clst. rd
 G = Clst. carb.
 H = Shale
 I = Sandstone
 J = Limestone
 K = Coal
 L = Lignite
 M = Carbargillite
 N = Siltstone
 O = Bit
 P = X



PP LOW HIGH LIT #VAL MEAN STDV
Y 1.04 1.19 ALL 11 1.09 0.05
N 1.25 1.49 ALL 19 1.36 0.07
OVERALL 30 1.26 0.14

ORDERED VALUES FOLLOW:

1.04A 1.05A 1.06A 1.06A 1.06A 1.08A 1.09A 1.09A 1.14A 1.15A 1.18A
1.25a 1.26a 1.28a 1.30a 1.30a 1.33a 1.34a 1.34a 1.34a 1.34a 1.38a
1.38a 1.39a 1.41a 1.42a 1.43a 1.44a 1.45a 1.48a

Figure A.I.6: Vitrinite reflectance histogram.

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Table A.II.1.1a:

CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS IN HEADSPACE

IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 ----- nC4
no.	m										
D 1251	38.62									*****	*****
D 1255	41.37	4935		3				4938	3	0.07	*****
D 1259	44.09	7501	2					7503	2	0.02	*****
D 1264	44.51	8928	2					8930	2	0.02	*****
D 1268	50.08	35139	6	7	6	2		35161	22	0.06	2.56
D 1272	52.72	22305	4	2	2			22313	8	0.03	*****
D 1276	55.73	32024	4	2	5	2		32037	13	0.04	2.13
D 1280	56.97	31950	4	1	4	2		31959	9	0.03	2.18
D 1284	61.47	8650	3					8654	3	0.04	*****
D 1290	63.96	16229	2					16232	2	0.02	*****
D 1297	67.21	91124	71	3	10			91208	84	0.09	*****
D 1304	70.40	124685	498	180	27	17		125407	722	0.58	1.61
D 1309	73.77	150721	1614	480	52	35		152901	2181	1.43	1.47
D 1310	71.44									*****	*****
D 1318	76.77	150981	2351	437	67	41		153876	2895	1.88	1.64
D 1322	77.83	128581	4960	742	66	44	21	134393	5812	4.32	1.49
D 1325	80.08	165437	5322	816	78	51	33	171704	6266	3.65	1.53
D 1332	83.56	199522	3915	850	107	63	28	204457	4935	2.41	1.69
D 1338	84.63	108339	614	97	64	23		109137	798	0.73	2.85
D 1344	88.93	65175	405	182	64	37	16	65862	688	1.04	1.72
D 1350	90.65	121404	4521	870	121	67	31	126983	5579	4.39	1.79

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Table A.II.1.1b:

CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS IN OCLUDED

[illegible]

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Table A.II.1.1c:

CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS SUMMATION

I	I	I	I	I	I	I	I	I	I	I	I	I	I
	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	SUM	SUM	WET-	iC4	I
	no.	m							C1-C4	C2-C4	NESS	-----	I
											(%)	nC4	I
I	D 1251	38.62	97	10	9				116	19	16.08	*****	I
I	D 1255	41.37	5001	11	9				5021	20	0.40	*****	I
I	D 1259	44.09	10486	16	9				10512	25	0.24	*****	I
I	D 1264	44.51	11159	13	7				11179	20	0.18	*****	I
I	D 1268	50.08	37759	21	49	48	30	74	37907	148	0.39	1.59	I
I	D 1272	52.72	26524	22	36	27	19	98	26628	103	0.39	1.42	I
I	D 1276	55.73	37184	26	35	61	44	211	37351	167	0.45	1.39	I
I	D 1280	56.97	39832	21	15	54	33	242	39955	123	0.31	1.66	I
I	D 1284	61.47	12122	79	29	11		71	12241	119	0.97	*****	I
I	D 1290	63.96	18578	78	35	11	13	94	18716	138	0.74	0.85	I
I	D 1297	67.21	186586	1096	194	847	147	1017	188870	2285	1.21	5.76	I
I	D 1304	70.40	213497	4239	5648	1050	822	961	225256	11759	5.22	1.28	I
I	D 1309	73.77	254780	9385	8619	1136	892	867	274811	20032	7.29	1.27	I
I	D 1310	71.44	93725	3959	4772	1002	619	901	104077	10352	9.95	1.62	I
I	D 1318	76.77	248765	12688	6051	1077	761	669	269341	20577	7.64	1.42	I
I	D 1322	77.83	129510	5019	776	74	44	21	135424	5914	4.37	1.66	I
I	D 1325	80.08	260291	28081	11429	1340	975	835	302116	41825	13.84	1.37	I
I	D 1332	83.56	310965	18653	10259	1566	1014	919	342457	31493	9.20	1.54	I
I	D 1338	84.63	204358	3903	1822	1623	637	1012	212343	7986	3.76	2.55	I
I	D 1344	88.93	65358	416	193	70	37	16	66074	716	1.08	1.88	I
I	D 1350	90.65	211628	20739	13014	2473	1702	1486	249556	37928	15.20	1.45	I

Table A.II.1.2:

DATA FROM ROCK EVAL PYROLYSIS

I	I	I	I	I	I	I	I	I	I	I	I	I
I	IKU	DEPTH	:	S1	S2	S3	TOC	HYDR. INDEX	OXYGEN INDEX	PETROLEUM POTENTIAL	PROD. INDEX	TEMP. MAX
I	No.		:								S1	I
I		m/ft	:	(mg/g ROCK)		(%)	(mg/g TOC)			S1+S2	S1+S2	(C)
I			:									I
I	D 1252	38.28	:	0.07	0.82	4.88	1.33	62	367	0.89	0.08	436
I	D 1257	41.17	:	0.12	1.81	5.21	2.38	76	219	1.93	0.06	433
I	D 1261	43.97	:	0.07	0.71	4.68	1.76	40	266	0.78	0.09	433
I	D 1267	45.99	:	0.08	1.18	4.71	2.09	56	225	1.26	0.06	434
I	D 1271	48.40	:	0.07	0.84	0.99	1.73	49	57	0.91	0.08	436
I	D 1274	51.95	:	0.09	0.55	2.17	1.60	34	136	0.64	0.14	429
I	D 1278	56.16	:	0.20	0.66	1.54	1.23	54	125	0.86	0.23	426
I	D 1282	58.10	:	0.07	0.28	0.66	1.31	21	50	0.35	0.20	422
I	D 1285	59.13	:	0.15	0.38	0.31	1.10	35	28	0.53	0.28	446
I	D 1290	63.96	:	0.06	0.12	0.73	0.41	29	178	0.18	0.33	443
I	D 4000	64.39	:	0.02	0.00	0.21	0.44	0	48	0.02	1.00	423
I	D 4001	64.41	:	0.77	30.42	1.24	10.61	287	12	31.19	0.02	415
I	D 1292	64.53	:	1.55	47.14	1.67	12.26	385	14	48.69	0.03	416
I	D 1291	64.73	:	0.99	34.93	1.10	10.63	329	10	35.92	0.03	416
I	D 4002	65.05	:	0.96	35.19	1.33	9.63	365	14	36.15	0.03	416
I	D 1298	65.45	:	1.55	42.07	1.40	11.39	369	12	43.62	0.04	413
I	D 4003	65.97	:	1.07	37.49	1.19	10.29	364	12	38.56	0.03	413
I	D 1299	66.19	:	0.60	21.83	1.09	6.29	347	17	22.43	0.03	422
I	D 4004	66.70	:	0.32	13.63	1.00	4.57	298	22	13.95	0.02	423
I	D 1297	67.21	:	0.43	15.89	0.83	5.46	291	15	16.32	0.03	404
I	D 4005	67.70	:	0.38	13.11	0.57	3.94	333	14	13.49	0.03	419
I	D 4006	68.20	:	0.43	16.89	1.05	5.40	313	19	17.32	0.02	418

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Table A.II.1.2 (cont'd)

DATA FROM ROCK EVAL PYROLYSIS

IKU No.	DEPTH m/ft	S1 (mg/g ROCK)	S2 (mg/g ROCK)	S3 (mg/g ROCK)	TOC (%)	HYDR. INDEX (mg/g TOC)	OXYGEN INDEX	PETROLEUM POTENTIAL S1+S2	PROD. INDEX S1+S2	TEMP. MAX (C)
D 4007	68.70	0.31	11.74	1.19	4.15	283	29	12.05	0.03	421
D 4008	69.20	0.89	34.20	1.34	8.37	409	16	35.09	0.03	418
D 1305	69.71	0.68	19.47	1.26	7.43	262	17	20.15	0.03	418
D 1304	70.40	0.75	12.72	1.51	8.53	149	18	13.47	0.06	421
D 1306	70.65	0.97	24.40	1.24	9.57	255	13	25.37	0.04	414
D 1310	71.44	0.79	27.36	1.47	10.09	271	15	28.15	0.03	416
D 4009	71.95	1.00	33.10	1.48	11.43	290	13	34.10	0.03	413
D 4010	72.45	0.86	25.75	1.38	10.39	248	13	26.61	0.03	412
D 1317	73.02	1.50	32.73	1.54	11.34	289	14	34.23	0.04	410
D 1316	73.21	1.49	35.65	1.82	11.88	300	15	37.14	0.04	406
D 1309	73.77	0.64	23.20	2.11	9.20	252	23	23.84	0.03	415
D 1321	74	1.04	26.56	1.37	9.72	273	14	27.60	0.04	414
D 4011	74.50	1.03	31.35	1.33	10.80	290	12	32.38	0.03	412
D 4012	75.01	0.90	28.69	1.16	9.59	299	12	29.59	0.03	412
D 4013	75.50	0.95	29.49	1.18	9.29	317	13	30.44	0.03	411
D 4014	76	1.11	31.46	1.25	10.52	299	12	32.57	0.03	410
D 1318	76.77	1.21	31.49	2.51	12.33	255	20	32.70	0.04	407
D 4015	76.99	1.24	34.71	1.30	11.49	302	11	35.95	0.03	410
D 1324	77.65	1.85	36.42	1.74	11.97	304	15	38.27	0.05	406
D 1322	77.83	1.25	37.10	5.54	14.83	250	37	38.35	0.03	411
D 4016	78.41	0.13	2.83	1.38	1.56	181	88	2.96	0.04	408
D 1326	78.62	2.67	46.04	2.53	14.34	321	18	48.71	0.05	403

Table A.II.1.2 (cont'd)

DATA FROM ROCK EVAL PYROLYSIS

I	I	I	I	I	I	I	I	I	I	I	I	I
I	IKU	DEPTH	:	S1	S2	S3	TOC	HYDR. INDEX	OXYGEN INDEX	PETROLEUM POTENTIAL	PROD. INDEX	TEMP. MAX
I	No.		:								S1	
I		m/ft	:	(	mg/g ROCK	)	(%)	(	mg/g TOC	)	S1+S2	(C)
I			:								S1+S2	
I	D 1325	80.08	:	1.23	32.95	2.69	13.06	252	21	34.18	0.04	404
I	D 1331	80.80	:	2.61	46.91	1.63	14.90	315	11	49.52	0.05	402
I	D 4017	81.30	:	3.07	64.30	1.53	17.38	370	9	67.37	0.05	403
I	D 4018	81.80	:	2.50	57.38	1.91	16.81	341	11	59.88	0.04	402
I	D 1335	82.19	:	1.74	43.77	1.41	12.88	340	11	45.51	0.04	404
I	D 4019	82.69	:	2.93	67.74	1.99	17.63	384	11	70.67	0.04	403
I	D 1336	83.12	:	0.89	23.98	0.83	9.01	266	9	24.87	0.04	410
I	D 1332	83.56	:	1.94	43.27	2.88	13.37	324	22	45.21	0.04	404
I	D 4020	84	:	1.74	47.79	1.92	15.02	318	13	49.53	0.04	405
I	D 1338	84.63	:	1.23	39.29	2.36	12.43	316	19	40.52	0.03	405
I	D 1342	84.94	:	0.62	22.10	1.18	7.85	282	15	22.72	0.03	415
I	D 4021	85.45	:	0.50	20.00	1.20	7.33	273	16	20.50	0.02	414
I	D 4022	85.95	:	1.19	45.07	1.74	11.65	387	15	46.26	0.03	408
I	D 1343	86.79	:	2.90	57.97	2.16	13.52	429	16	60.87	0.05	397
I	D 1348	87.20	:	1.46	41.41	2.33	11.20	370	21	42.87	0.03	403
I	D 1349	87.95	:	2.17	48.51	2.22	12.86	377	17	50.68	0.04	402
I	D 4023	88.45	:	1.72	53.35	1.66	13.31	401	12	55.07	0.03	407
I	D 1344	88.93	:	1.82	47.67	3.22	14.51	329	22	49.49	0.04	406
I	D 1355	88.98	:	3.37	63.40	2.12	17.84	355	12	66.77	0.05	397
I	D 1350	90.65	:	1.07	35.18	2.90	10.02	351	29	36.25	0.03	409
I	D 4024	91.15	:	2.73	63.31	1.95	19.18	330	10	66.04	0.04	403
I	D 4025	91.65	:	1.59	47.06	1.72	15.29	308	11	48.65	0.03	406

Table A.II.1.2 (cont'd)

DATA FROM ROCK EVAL PYROLYSIS

I	I	I	I	I	I	I	I	I	I	I	I	I
I	IKU	DEPTH	:	S1	S2	S3	TOC	HYDR. INDEX	OXYGEN INDEX	PETROLEUM POTENTIAL	PROD. INDEX	TEMP. MAX
I	No.		:								S1	
I			:									
I		m/ft	:	(mg/g ROCK)	(%)	(mg/g TOC)		S1+S2			S1+S2	(C)
I			:									
I	D 4026	92.15	:	1.69	53.53	1.58	14.80	362	11	55.22	0.03	406
I			:									
I	D 1354	92.56	:	2.54	56.87	3.06	21.19	268	14	59.41	0.04	400
I			:									

DATE : 14 - 12 - 87.

Core number: 7231/01-U-01
Reference number: 21.3437.23
(1/1)

Table A.II.1.3:

VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
D-1257	-----	41.17	0.36 (28) 0.71 (2)	G R	0.08 0.16	2-4
D-1267	-----	45.99	0.35 (19) 0.61 (1)	G R	0.08 0.00	2-4
D-1305	-----	69.71	0.27 (8)	P	0.08	1-2
D-1306	-----	70.65	0.37 (5) 0.23 (5)	P S?	0.09 0.01	1-3
D-1321	-----	74.00	0.31 (6)	P	0.05	1-3
D-1342	-----	84.94	0.32 (14)	F	0.06	1-3

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor
S = Stained; R = Reworked.

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
D-1257	41.17	Am: 80-85% Lm: 5% W: 5-10% C: 5%	F-M-L	Fair-Good	3.0-3.5	Organic residue is dominated by finely dispersed, thin aggregates of amorphous material. The thin flakey aggregates are frequently specked with small woody/coaly fragments.
D-1274	51.95	Am: 75-80% Lm: 5% W: 10-15% C: 5%	F-M-L	Fair-Good	3.0-3.5	Similar to sample D-1257.
D-1292	64.53	Am: 80-85% Lm: 5% W: 5-10% C: 5%	F-M-L	Poor	?3.0-3.5	Organic residue dominated by thick "spongy-like" dark, degraded, amorphous phytoclasts of variable size.
D-1297	67.21	Am: 80-85% Lm: 5% W: 5-10% C: 5%	F-M-L	No palynomorphs observed	NPD	Dominated by amorphous matter, both thin flakey aggregates and finely dispersed material, as well as thick "spongy-like" fragments of variable size (i.e. intermediate between sample D-1257 and D-1292).

Abbreviations

Am Amorphous

Al Algal material
Lm Liptinitic material

W Woody material
C Coaly fragments

F Fine
M Medium
L Large

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
D-1306	70.65	Am: 85-90% Lm: >5% W: 5-10% C: >5%	F-M-L	Poor	?3.0-3.5	Organic residue dominated by thick, spongy-like, dark, degraded amorphous phytoclasts of variable size; together with more finely dispersed amorphous matter.
D-1321	74.00	Am: 85-90% Lm: >5% W: 5-10% C: >5%	F-M-L	Poor	?3.0-3.5	As for sample D-1306.
D-1324	77.65	Am: 85-90% Lm: >5% W: 5-10% C: >5%	F-M-L	Poor	?3.0-3.5	As for sample D-1306.
D-1331	80.80	Am: 80-85% Lm: >5% W: 10-15% C: >5%	F-M-L	Poor	?3.0-3.5	Similar to sample D-1306, but with a slight increase in the relative proportion of dark woody fragments.

Abbreviations

Am Amorphous

Al Algal material
Lm Liptinitic material

W Woody material
C Coaly fragments

F Fine
M Medium
L Large

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
D-1332	83.56	Am: 80-85% Lm: >5% W: 10-15% C: >5%	F-M-L	Poor	?3.0-3.5	As for sample D-1331.
D-1343	86.79	Am: 80-85% Lm: >5% W: 10-15% C: >5%	F-M-L	No palynomorphs recorded	NDP	As for sample D-1331.
D-1355	88.98	Am: 80-85% Lm: >5% W: 10-15% C: >5%	F-M-L	Fair	3.0-3.5	As for sample D-1331.
D-1354	92.56	Am: 80-85% Lm: >5% W: 10-15% C: >5%	F-M-L	Poor	?3.0-3.5	As for sample D-1331.

Abbreviations

Am Amorphous

Al Algal material
Lm Liptinitic material

W Woody material
C Coaly fragments

F Fine
M Medium
L Large

Table A.II.1.5:

AMOUNT OF ASPHALTENES AND POLARS IN SEDIMENT

I	I	I	I	I	I	I
I	IKU-No.	DEPTH	:	Asphaltenes	:	Polar
I		(m)	:	(mg)	:	(mg)
I						
I	I D 1278	56.16	:	4.6	:	1.4
I	I D 4000	64.39	:	3.5	:	4.3
I	I D 4001	64.41	:	20.3	:	5.6
I	I D 1292	64.53	:	51.9	:	23.0
I	I D 1297	67.21	:	5.8	:	6.6
I	I D 1304	70.40	:	10.8	:	5.8
I	I D 1317	73.02	:	60.7	:	16.2
I	I D 1322	77.83	:	71.5	:	22.8
I	I D 4016	78.41	:	7.0	:	1.1
I	I D 1325	80.08	:	17.2	:	9.6
I	I D 1332	83.56	:	6.4	:	8.0
I	I D 1344	88.93	:	28.2	:	5.5
I	I D 1354	92.56	:	101.6	:	34.0
I			:		:	

Table A.II.1.6:

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKU-No	DEPTH (m)	: Rock : Extr. : (g)	EOM (mg)	Sat. (mg)	Aro. (mg)	HC (mg)	Non HC (mg)	TOC (%)
D 1278	56.16	: 12.6	5.4	0.1	0.1	0.2	5.2	1.23
D 4000	64.39	: 5.2	7.1	0.6	0.5	1.1	6.0	0.44
D 4001	64.41	: 3.8	34.6	0.8	2.7	3.5	31.1	10.61
D 1292	64.53	: 11.0	84.4	1.9	9.2	11.1	73.3	12.26
D 1297	67.21	: 7.9	15.4	0.4	1.1	1.5	13.9	5.46
D 1304	70.40	: 3.4	14.8	0.2	0.5	0.7	14.1	8.53
D 1317	73.02	: 11.4	95.9	2.8	7.8	10.6	85.3	11.34
D 1322	77.83	: 12.6	104.7	4.2	6.6	10.8	93.9	14.83
D 4016	78.41	: 7.7	8.2	0.5	0.6	1.1	7.1	1.56
D 1325	80.08	: 6.1	30.6	1.2	1.7	2.9	27.7	3.06
D 1332	83.56	: 2.3	19.7	0.1	1.0	1.1	18.6	13.37
D 1344	88.93	: 3.1	37.6	0.2	1.1	1.3	36.3	14.51
D 1354	92.56	: 11.9	188.7	14.4	20.2	34.6	154.1	21.19

Table A.II.1.7:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
D 1278	56.16	427	8	8	16	411
D 4000	64.39	1358	115	96	210	1147
D 4001	64.41	9202	213	718	931	8271
D 1292	64.53	7687	173	838	1011	6676
D 1297	67.21	1944	51	139	189	1755
D 1304	70.40	4340	59	147	205	4135
D 1317	73.02	8442	246	687	933	7509
D 1322	77.83	8316	334	524	858	7458
D 4016	78.41	1070	65	78	144	927
D 1325	80.08	5050	198	281	479	4571
D 1332	83.56	8491	43	431	474	8017
D 1344	88.93	11975	64	350	414	11561
D 1354	92.56	15844	1209	1696	2905	12939

Table A.II.1.8:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS
(mg/g TOC)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
D 1278	56.16	34.7	0.6	0.6	1.3	33.4
D 4000	64.39	308.5	26.1	21.7	47.8	260.7
D 4001	64.41	86.7	2.0	6.8	8.8	78.0
D 1292	64.53	62.7	1.4	6.8	8.2	54.5
D 1297	67.21	35.6	0.9	2.5	3.5	32.1
D 1304	70.40	50.9	0.7	1.7	2.4	48.5
D 1317	73.02	74.4	2.2	6.1	8.2	66.2
D 1322	77.83	56.1	2.2	3.5	5.8	50.3
D 4016	78.41	68.6	4.2	5.0	9.2	59.4
D 1325	80.08	165.0	6.5	9.2	15.6	149.4
D 1332	83.56	63.5	0.3	3.2	3.5	60.0
D 1344	88.93	82.5	0.4	2.4	2.9	79.7
D 1354	92.56	74.8	5.7	8.0	13.7	61.1

Table A.II.1.9:

COMPOSITION OF MATERIAL EXTRACTED FROM THE ROCK

I	I	I	I	I	I	I	I	I	I	I
	IKU-No	DEPTH	:	Sat	Aro	HC	SAT	Non HC	HC	
			:	---	---	---	---	---	---	
		(m)	:	EOM	EOM	EOM	Aro	EOM	Non HC	
			:	%	%	%	x 100	%	x 100	
I	I	I	I	I	I	I	I	I	I	I
I	D 1278	56.16	:	1.9	1.9	3.7	100.0	96.3	3.8	I
I	D 4000	64.39	:	8.5	7.0	15.5	120.0	84.5	18.3	I
I	D 4001	64.41	:	2.3	7.8	10.1	29.6	89.9	11.3	I
I	D 1292	64.53	:	2.3	10.9	13.2	20.7	86.8	15.1	I
I	D 1297	67.21	:	2.6	7.1	9.7	36.4	90.3	10.8	I
I	D 1304	70.40	:	1.4	3.4	4.7	40.0	95.3	5.0	I
I	D 1317	73.02	:	2.9	8.1	11.1	35.9	88.9	12.4	I
I	D 1322	77.83	:	4.0	6.3	10.3	63.6	89.7	11.5	I
I	D 4016	78.41	:	6.1	7.3	13.4	83.3	86.6	15.5	I
I	D 1325	80.08	:	3.9	5.6	9.5	70.6	90.5	10.5	I
I	D 1332	83.56	:	0.5	5.1	5.6	10.0	94.4	5.9	I
I	D 1344	88.93	:	0.5	2.9	3.5	18.2	96.5	3.6	I
I	D 1354	92.56	:	7.6	10.7	18.3	71.3	81.7	22.5	I

Table A.II.1.10:

TABULATION OF DATA FROM THE GASCHROMATOGRAMS

I	DEPTH	:	PRISTANE	PRISTANE	PHYTANE	A	n-C17			I
I	IKU No.	:	-----	A =	B =	-----	-----	CPI	CPI	I
I	(m)	:	PHYTANE	n-C17	n-C18	B	n-C27	1	2	I
I	-----	-----	-----	-----	-----	-----	-----	-----	-----	I
I		:								I
I	D 1278	:	1.2	0.8	0.5	1.5	0.8	1.8	1.6	I
I		:								I
I	D 4000	:	0.8	0.9	0.6	1.5	0.3	1.1	1.0	I
I		:								I
I	D 4001	:	1.0	2.9	3.9	0.7	1.1	1.5	1.3	I
I		:								I
I	D 1292	:	1.0	3.5	6.0	0.6	1.6	1.1	0.9	I
I		:								I
I	D 1297	:	0.7	3.1	4.7	0.7	0.3	1.6	1.4	I
I		:								I
I	D 1304	:	0.9	2.9	3.4	0.9	0.3	1.3	1.2	I
I		:								I
I	D 1317	:	1.0	3.1	4.2	0.7	0.9	1.9	1.9	I
I		:								I
I	D 1322	:	0.7	4.6	8.9	0.5	0.4	1.7	1.7	I
I		:								I
I	D 4016	:	0.7	3.4	4.9	0.7	0.5	1.6	1.5	I
I		:								I
I	D 1325	:	0.9	3.2	3.4	0.9	0.2	1.2	1.1	I
I		:								I
I	D 1332	:	0.8	1.9	1.8	1.1	0.7	1.2	1.1	I
I		:								I
I	D 1344	:	1.0	2.7	2.7	1.0	0.3	1.2	1.1	I
I		:								I
I	D 1354	:	0.9	4.1	6.4	0.6	0.6	2.3	2.7	I
I		:								I

DATE : 11 - 12 - 87.

Table A.II.1.11a:

Molecular ratios from sterane and terpane mass chromatograms.

IKU code	Depth	$\alpha\beta/\alpha\beta+\beta\alpha$	%22S ²⁾	% $\beta\beta$ ³⁾	%20S ⁴⁾
<u>7231/01-U-01</u>					
D-1278	56.16	0.64	16.13	52.33	-
D-4000	64.39	0.89	53.17	76.86	28.57
D-4001	64.41	0.54	15.26	45.38	-
D-1292	64.53	0.57	12.01	41.67	-
D-1297	67.21	0.55	12.98	46.15	3.06
D-1304	70.40	0.56	12.70	46.06	2.25
D-1317	73.02	0.66	15.82	52.29	7.53
D-1322	77.83	0.71	22.41	63.73	17.57
D-4016	78.41	0.72	37.40	62.87	9.49
D-1325	80.08	0.66	26.06	63.97	10.67
D-1332	83.56	0.70	27.23	54.05	9.09
D-1344	88.93	0.70	26.01	52.46	8.05
D-1354	92.56	0.69	28.28	68.95	16.54

¹⁾ E/E+F IN M/Z 191.

²⁾ Average % distribution between first and second eluting isomers of extended hopanes (G-M in m/z 191).

³⁾ $2(r+s)/(q+t+2(r+s))$ in m/z 217.

⁴⁾ $q/q+t$ in m/z 217.

Table A.II.1.11b:

Molecular ratios from terpane and sterane mass chromatograms.

Maturity and source characteristic ratios.

IKU no.	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
<u>7231/01-U-01</u>						
D-1278	56.16	-	-	-	-	0.31
D-4000	64.39	0.42	1.31	-	-	0.62
D-4001	64.41	0.04	3.00	-	-	0.11
D-1292	64.53	0.05	6.80	-	-	0.11
D-1297	67.21	0.02	6.80	-	-	0.10
D-1304	70.40	-	-	-	-	0.11
D-1317	73.02	0.04	-	-	-	0.30
D-1322	77.83	-	-	-	-	0.50
D-4016	78.41	0.10	5.76	-	-	0.52
D-1325	80.08	-	-	-	-	0.48
D-1332	83.56	0.07	10.80	-	-	0.43
D-1344	88.93	-	-	-	-	0.37
D-1354	92.56	-	-	-	-	0.54

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191).

2) B/A in m/z 191.

3) Relative abundance of unknown (X/E in m/z 191).

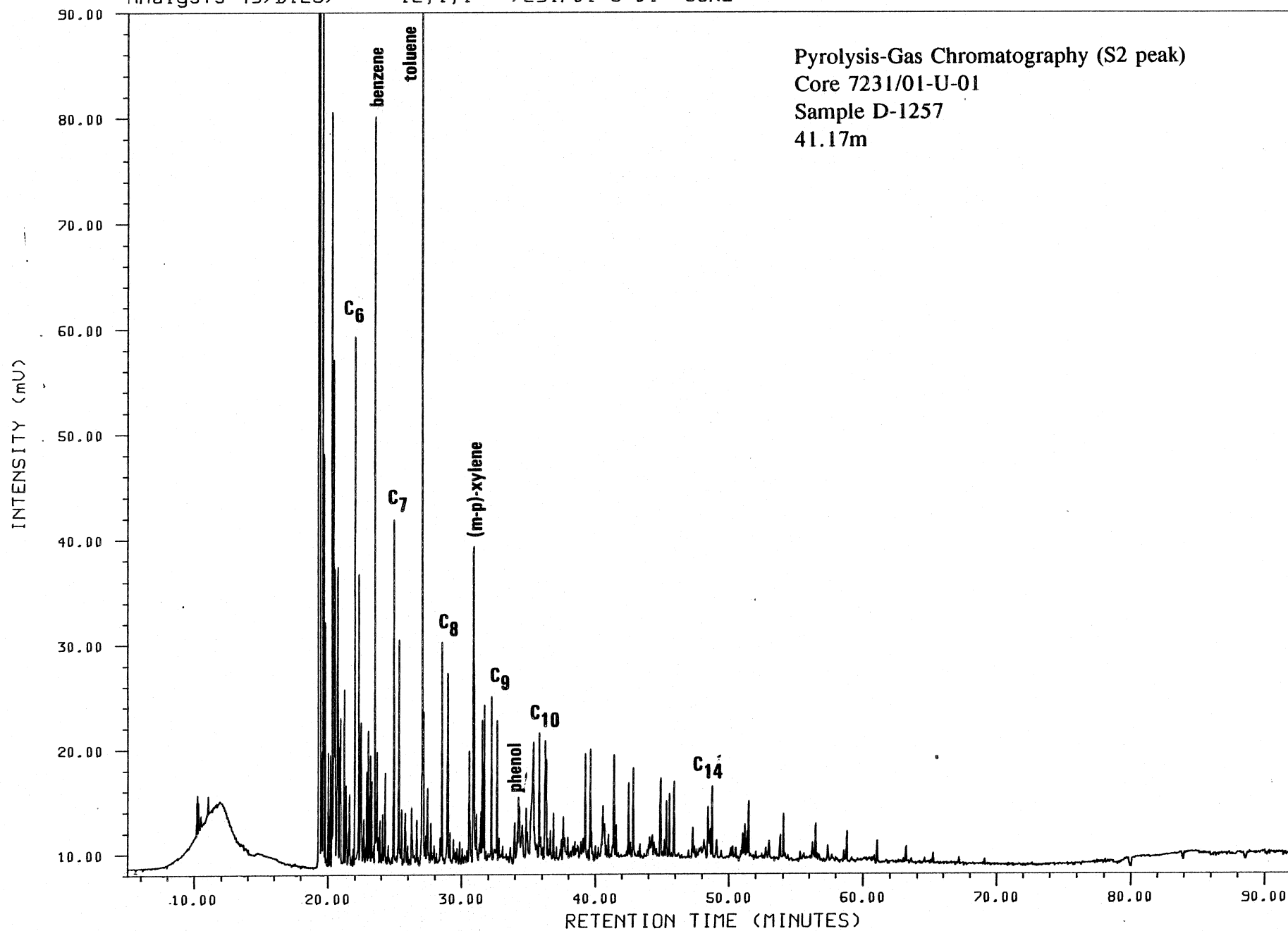
4) Relative abundance of bisnorhopane (Z/E in m/z 191).

 5) Relative abundance of C₂₇ rearranged steranes (a/a+j in m/z 217).

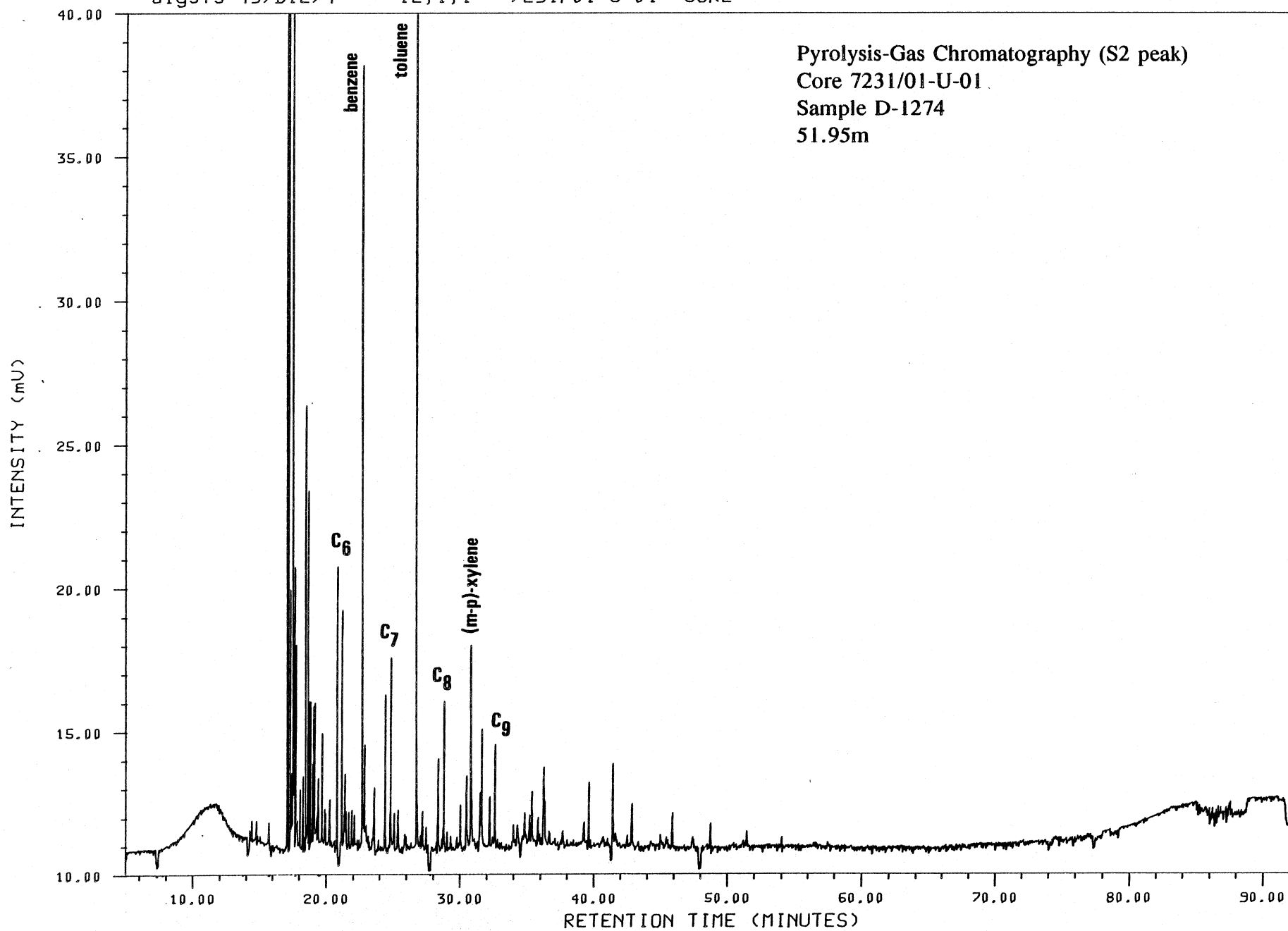
Figure A.II.1.1:

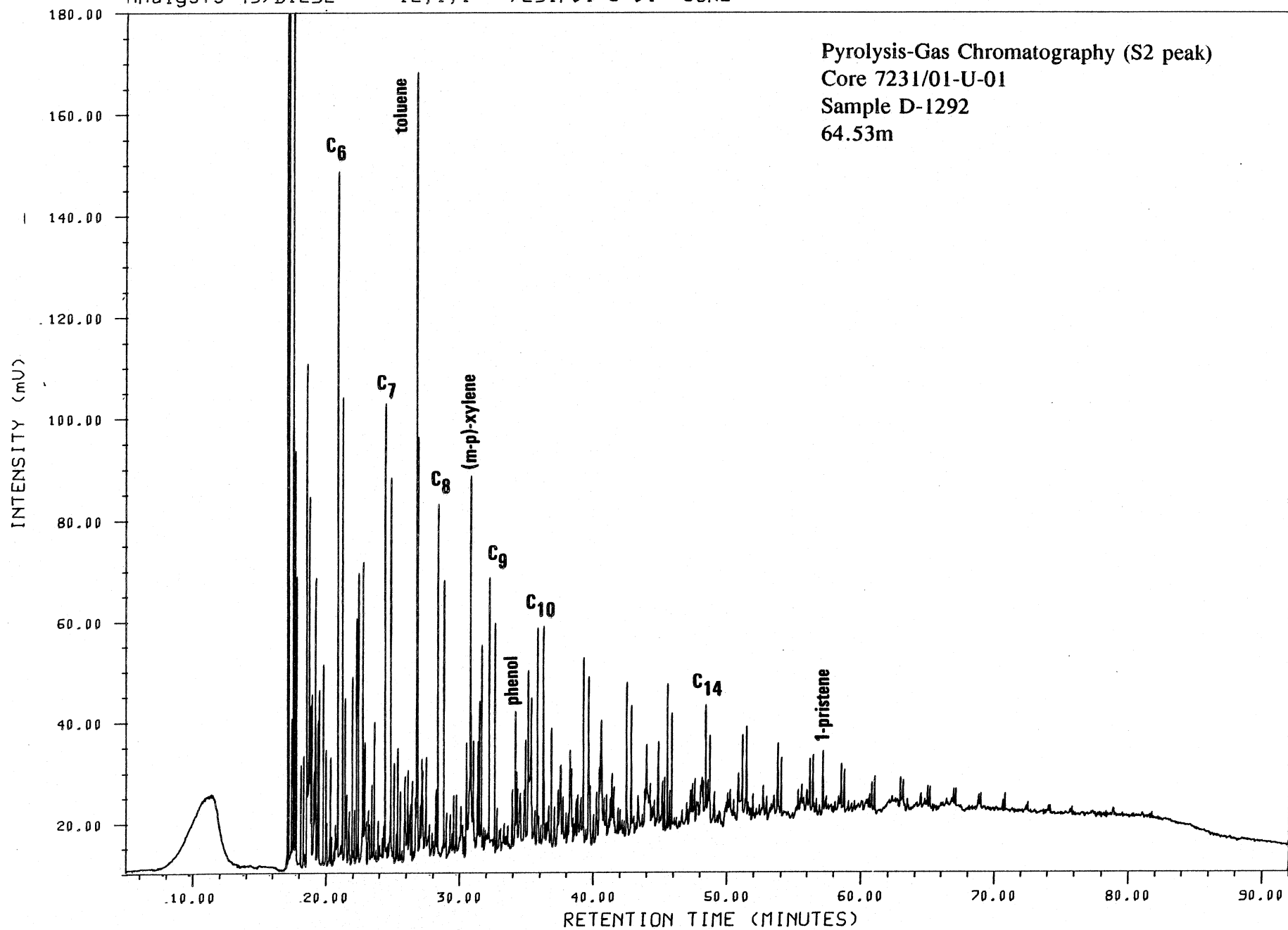
Pyrolysis-gas chromatograms (S2 peak)

Analysis 437D1257 12,1,1 7231/01-U-01 CORE

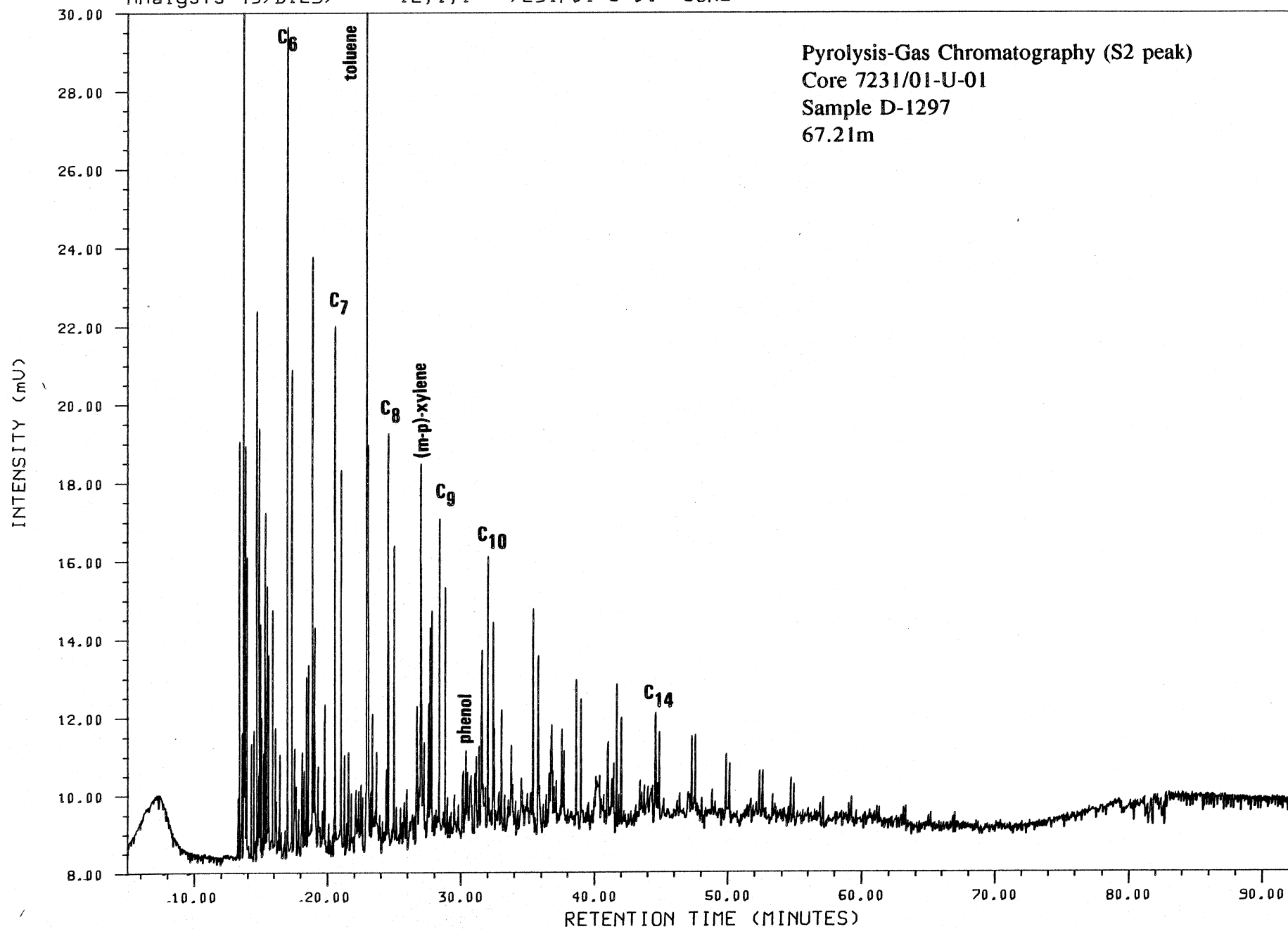


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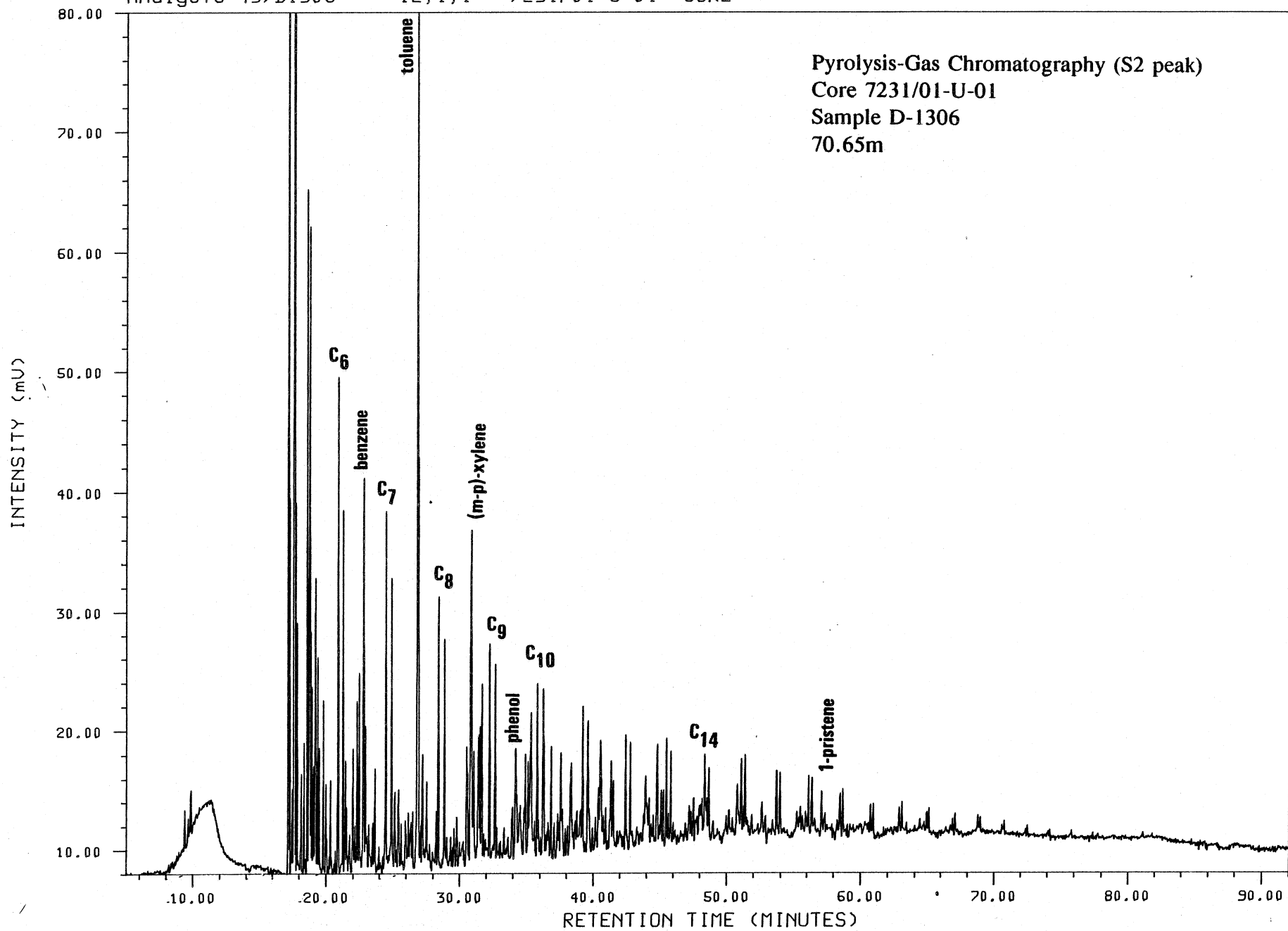




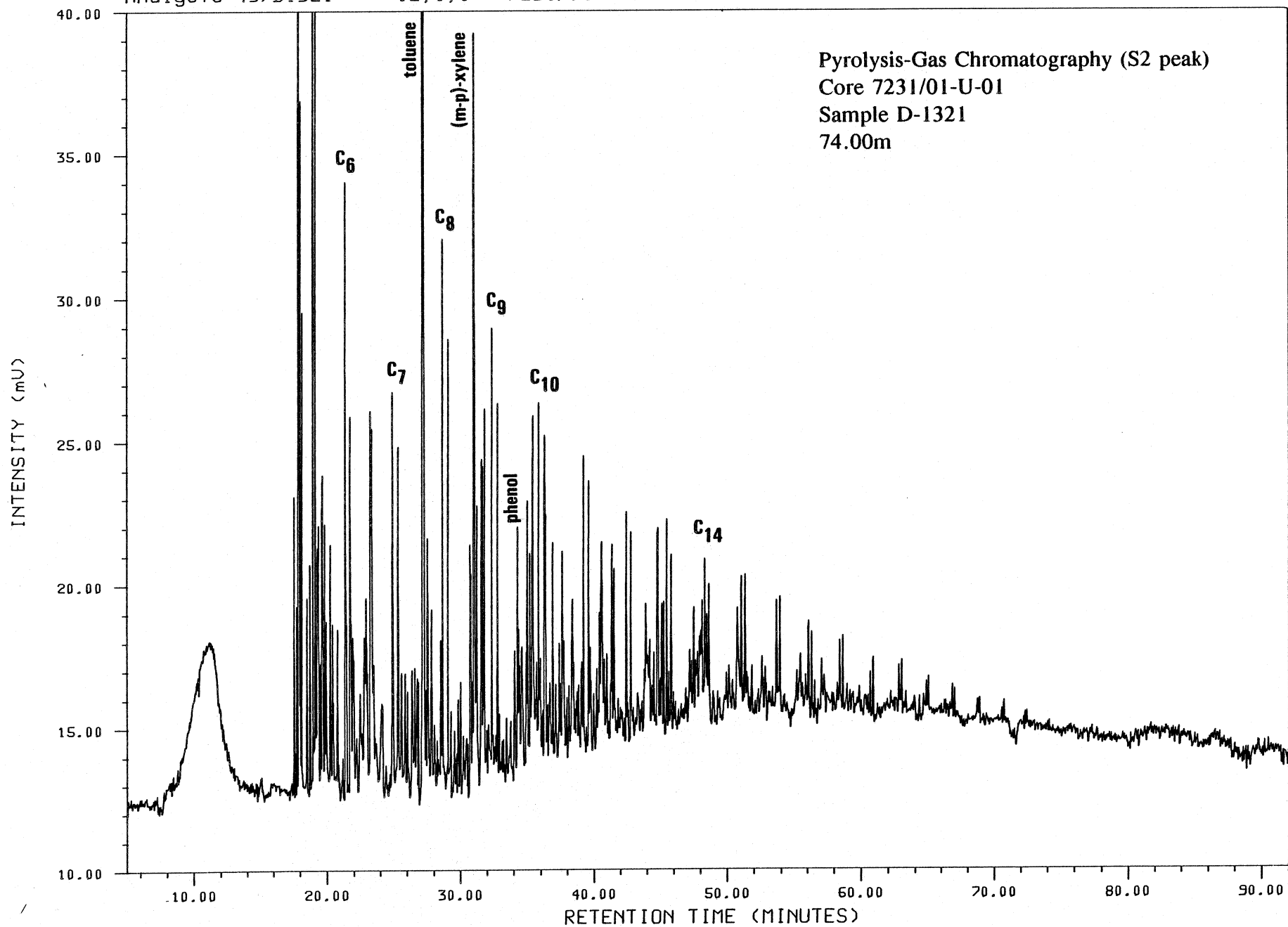
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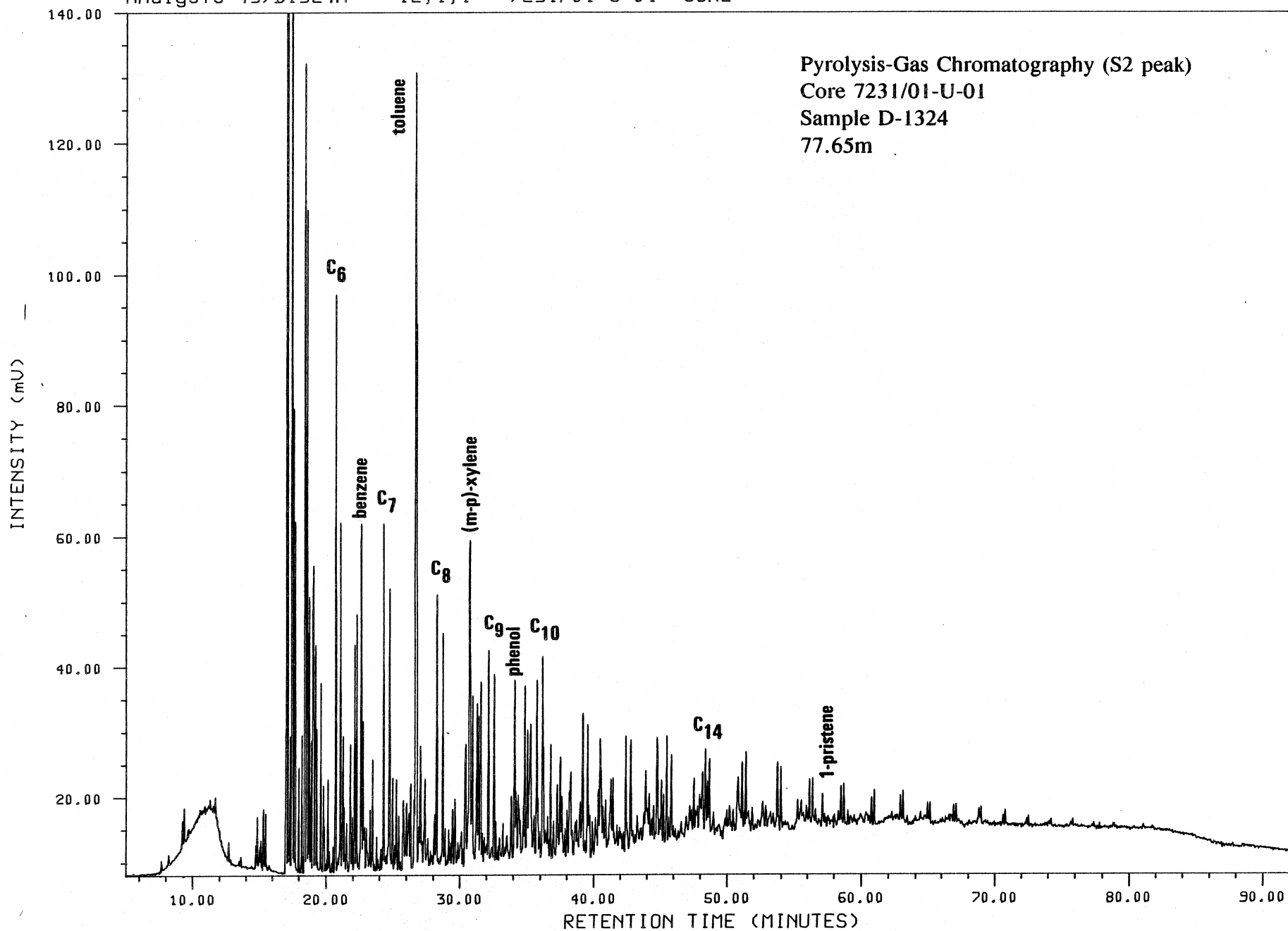
Analysis 437D1306 12,1,1 7231/01-U-01 CORE



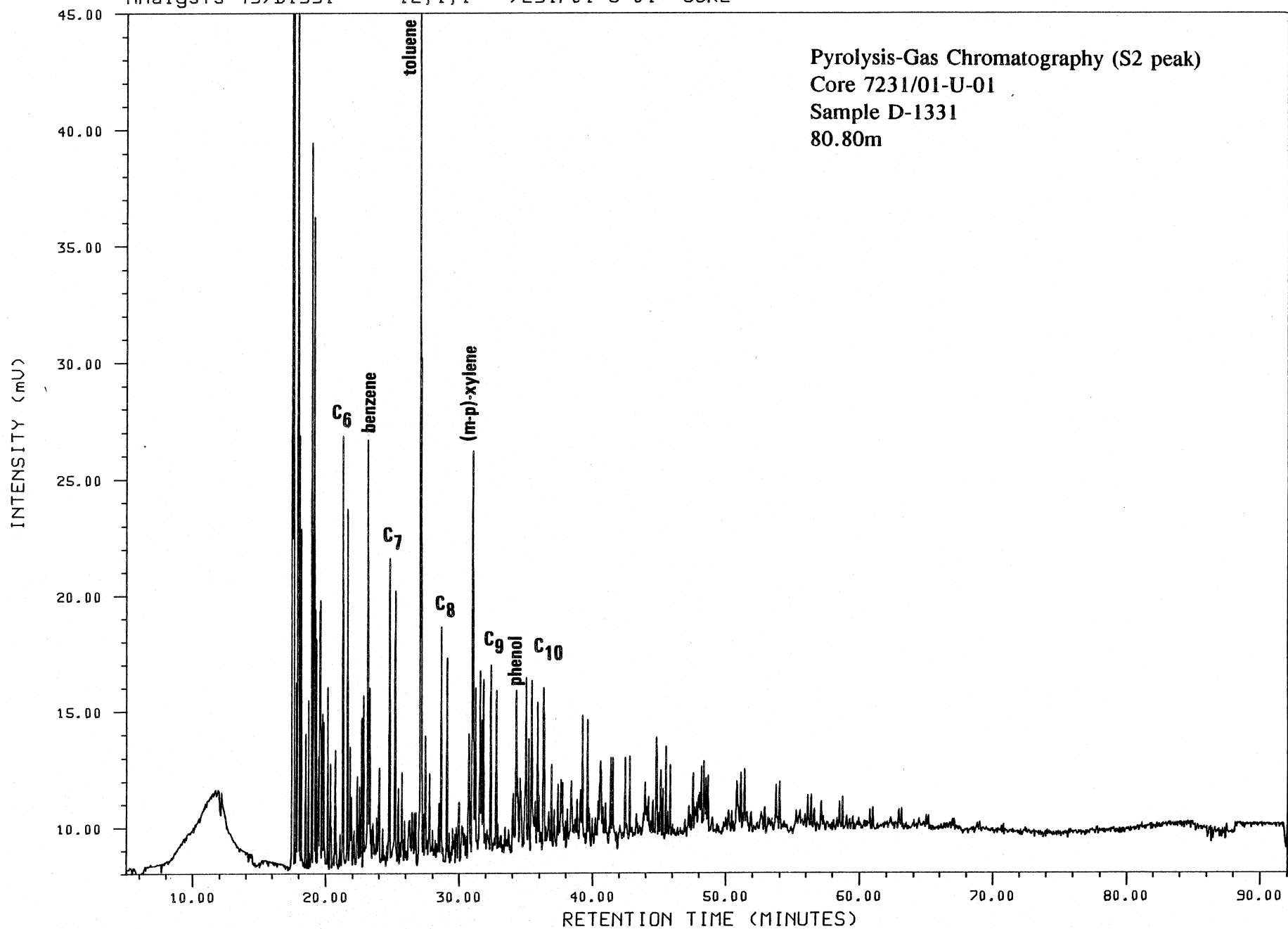
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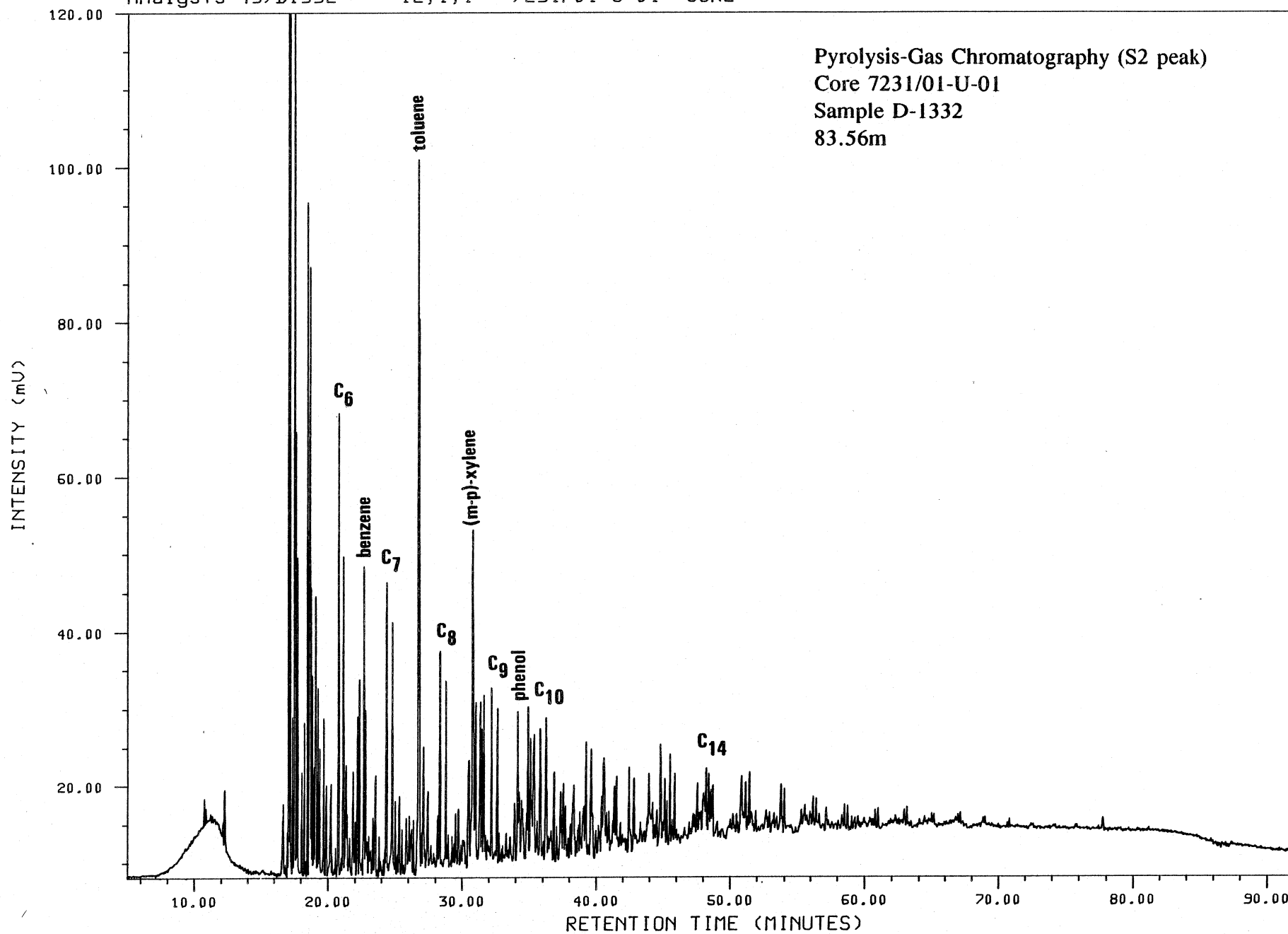
Analysis 437D1324A 12,1,1 7231/01-U-01 CORE



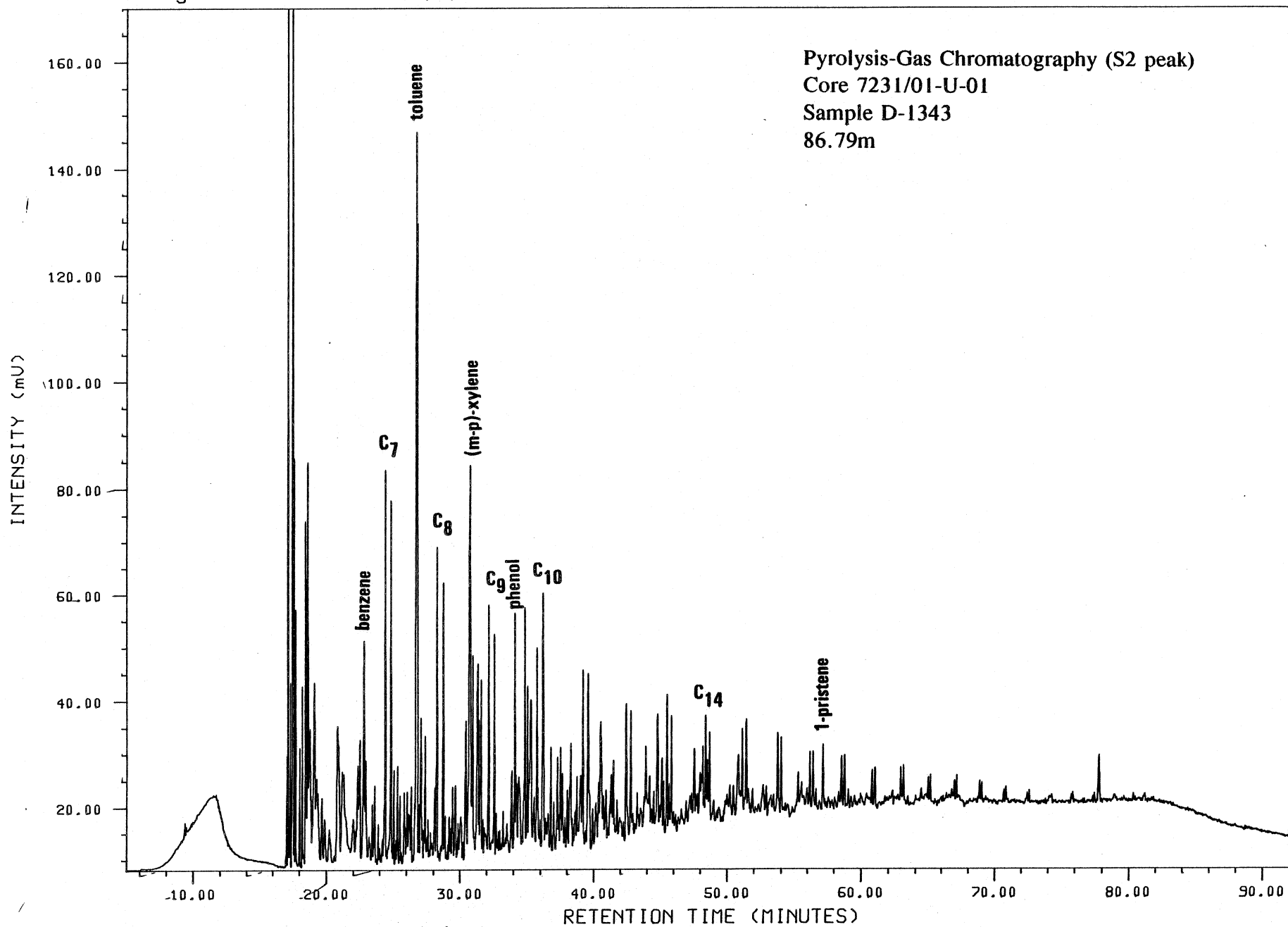
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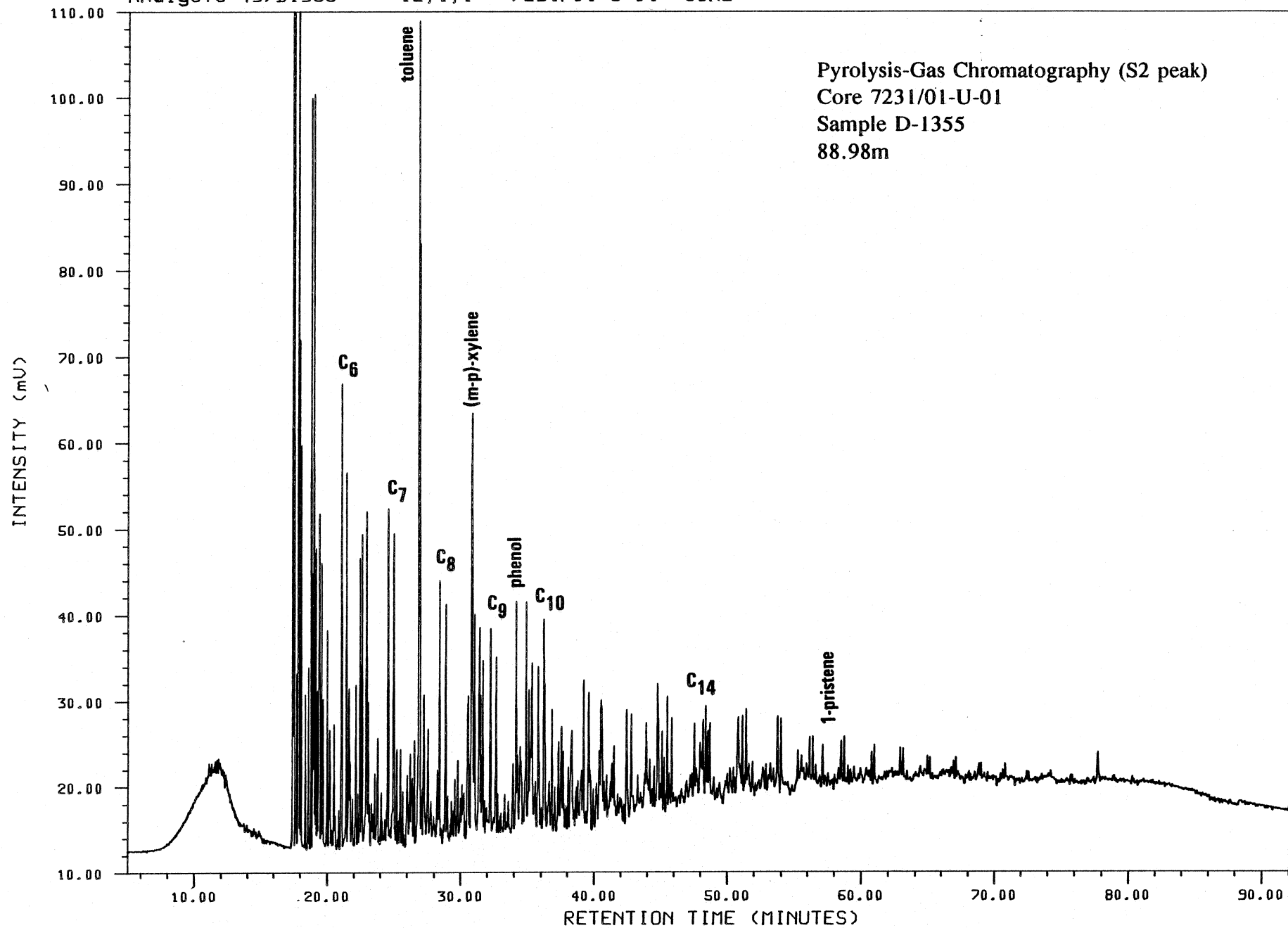
Analysis 437D1332 12,1,1 7231/01-U-01 CORE



Analysis 437D1343 12,1,1 7231/01-U-01 CORE



Analysis 437D1355 12,1,1 7231/01-U-01 CORE



Analysis 437D1354 12,1,1 7231/01-U-01 CORE

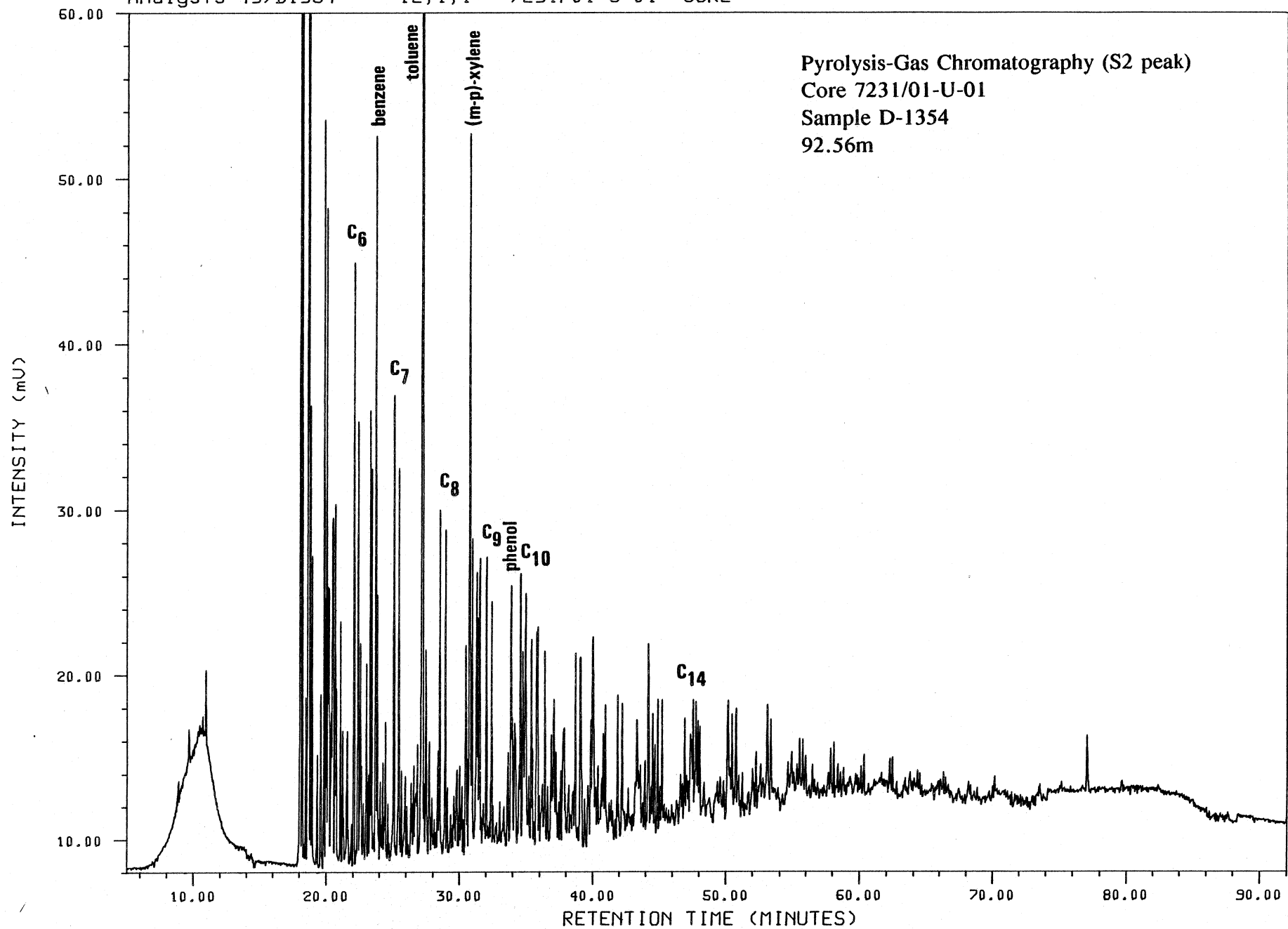
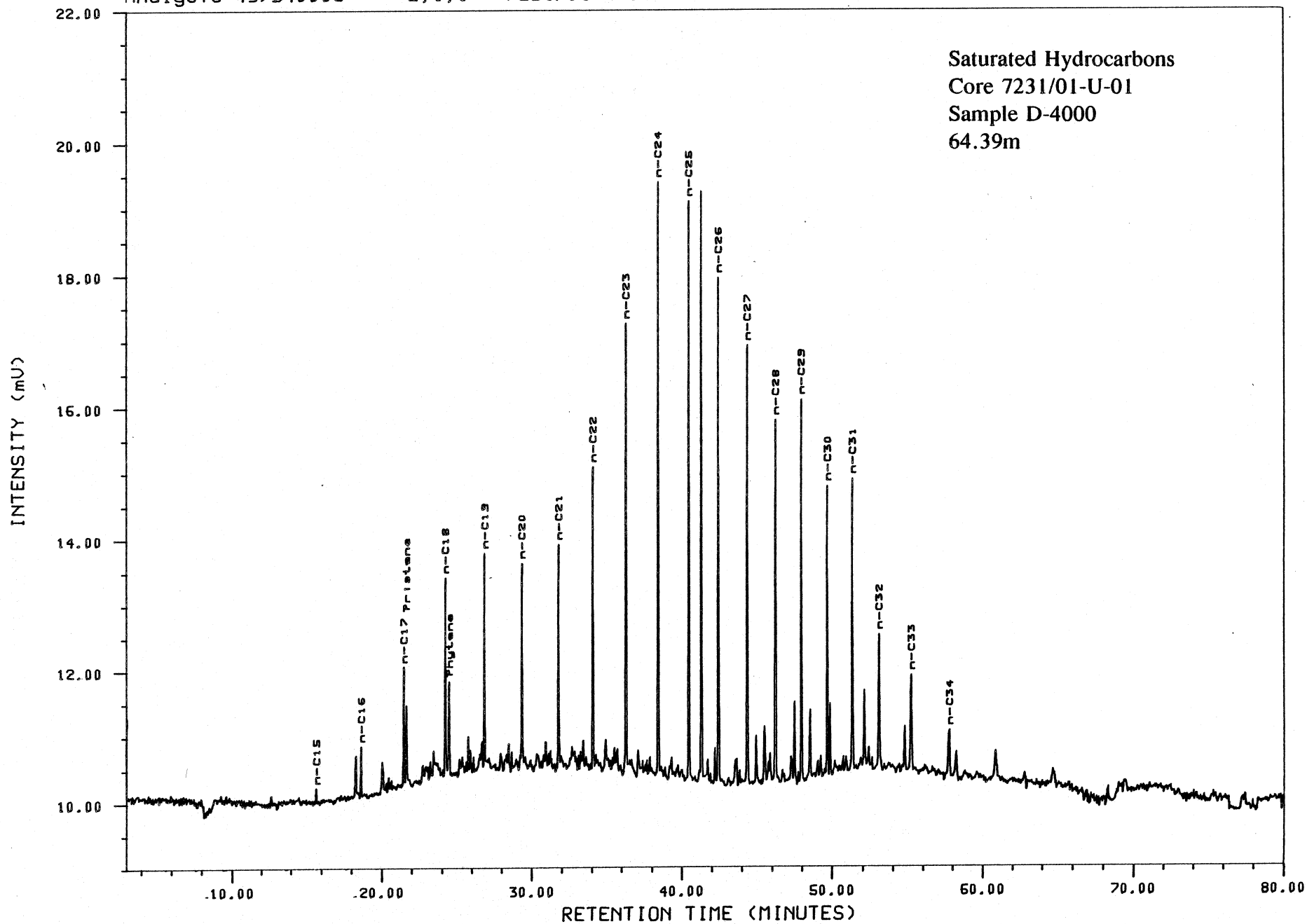


Figure A.II.1.2:

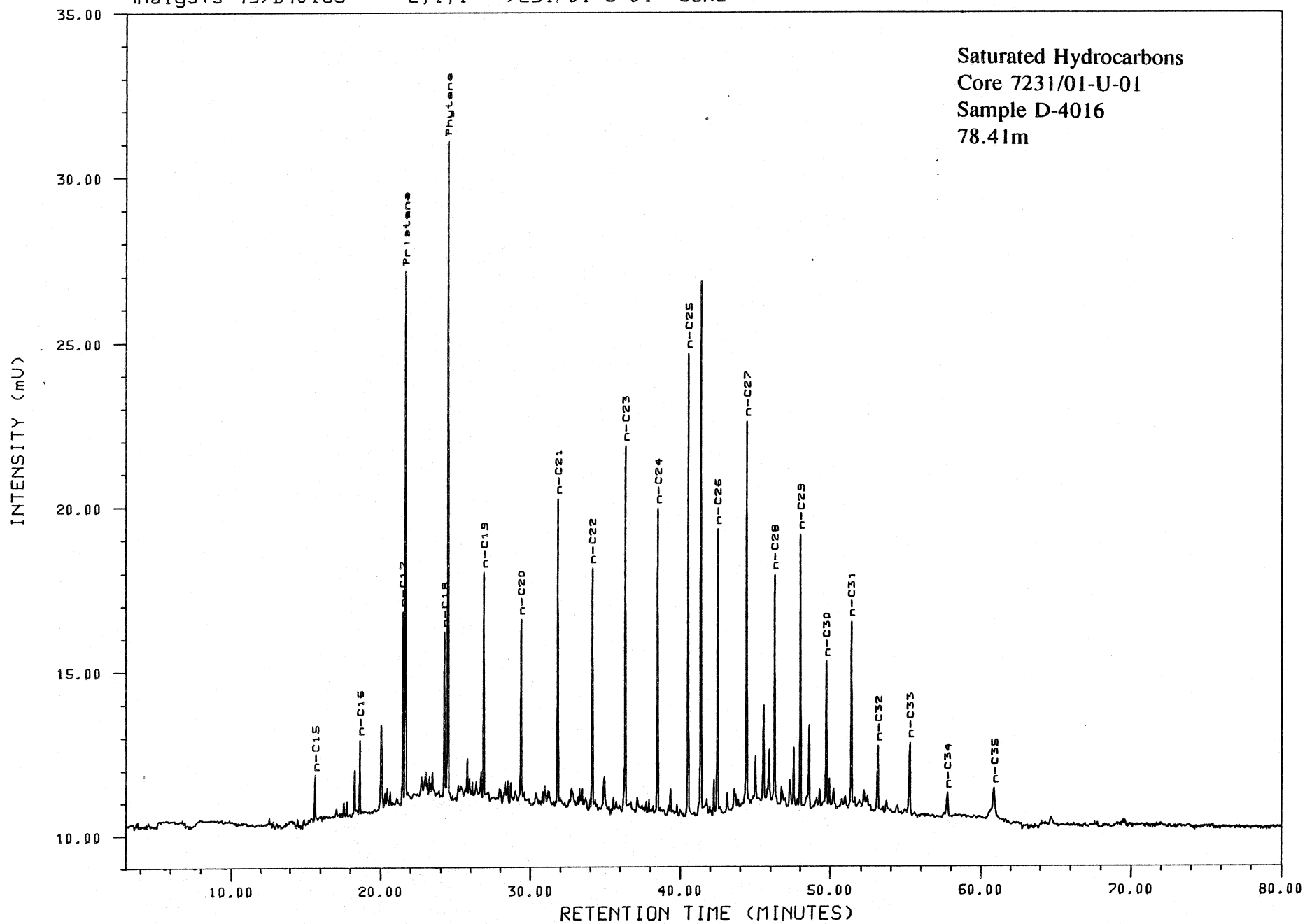
Saturated hydrocarbon gas chromatograms

- | | |
|------------------------|------------------------------------|
| n-C ₁₅ etc. | - n-alkanes |
| Pr | - pristane |
| Ph | - phytane |
| * | - contamination (dioctylphthalate) |

Analysis 437D4000S 2,1,1 7231/01-U-01 CORE



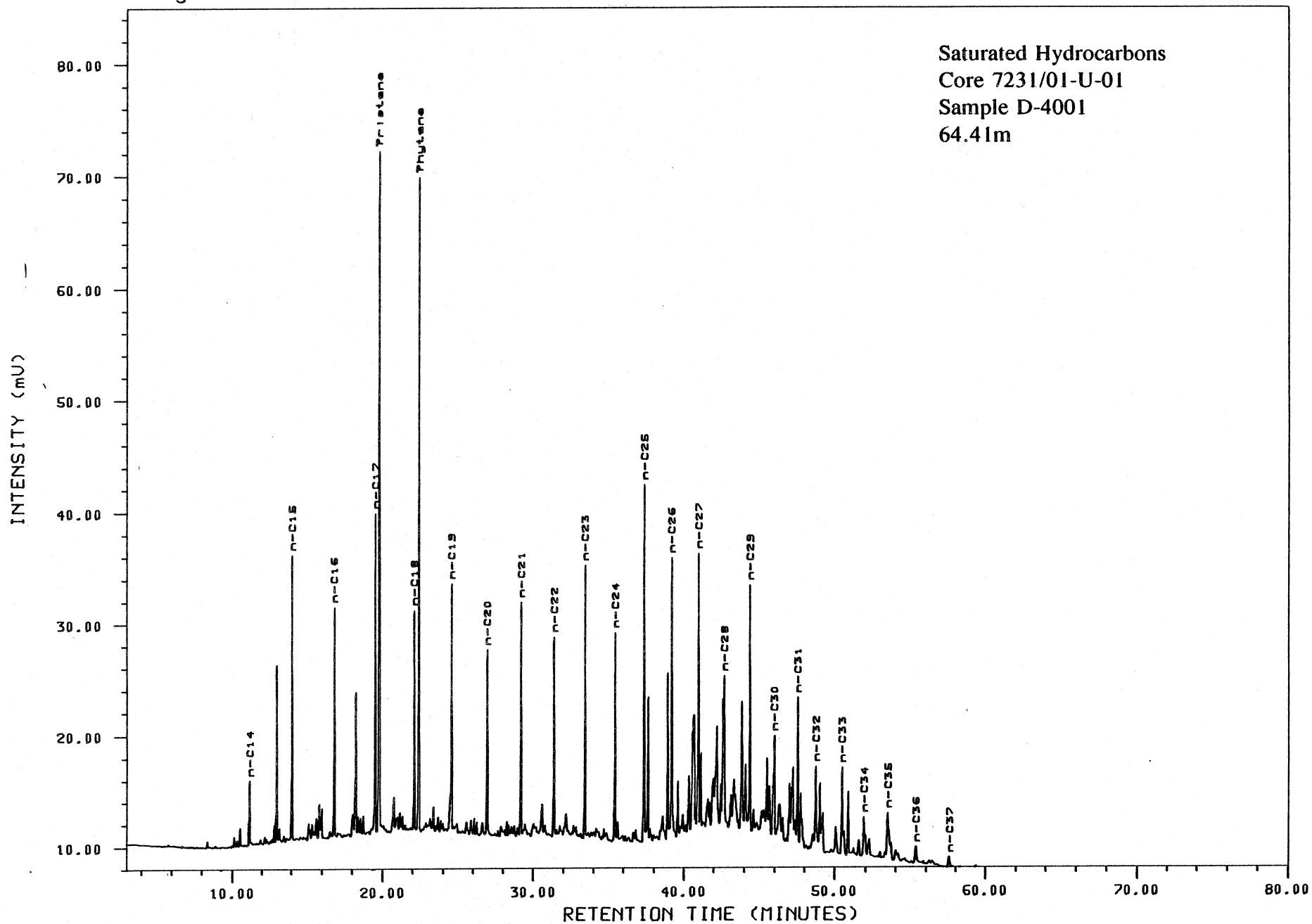
Analysis 437D4016S 2,1,1 7231/01-U-01 CORE



Analysis 437D4001S

3,1,1

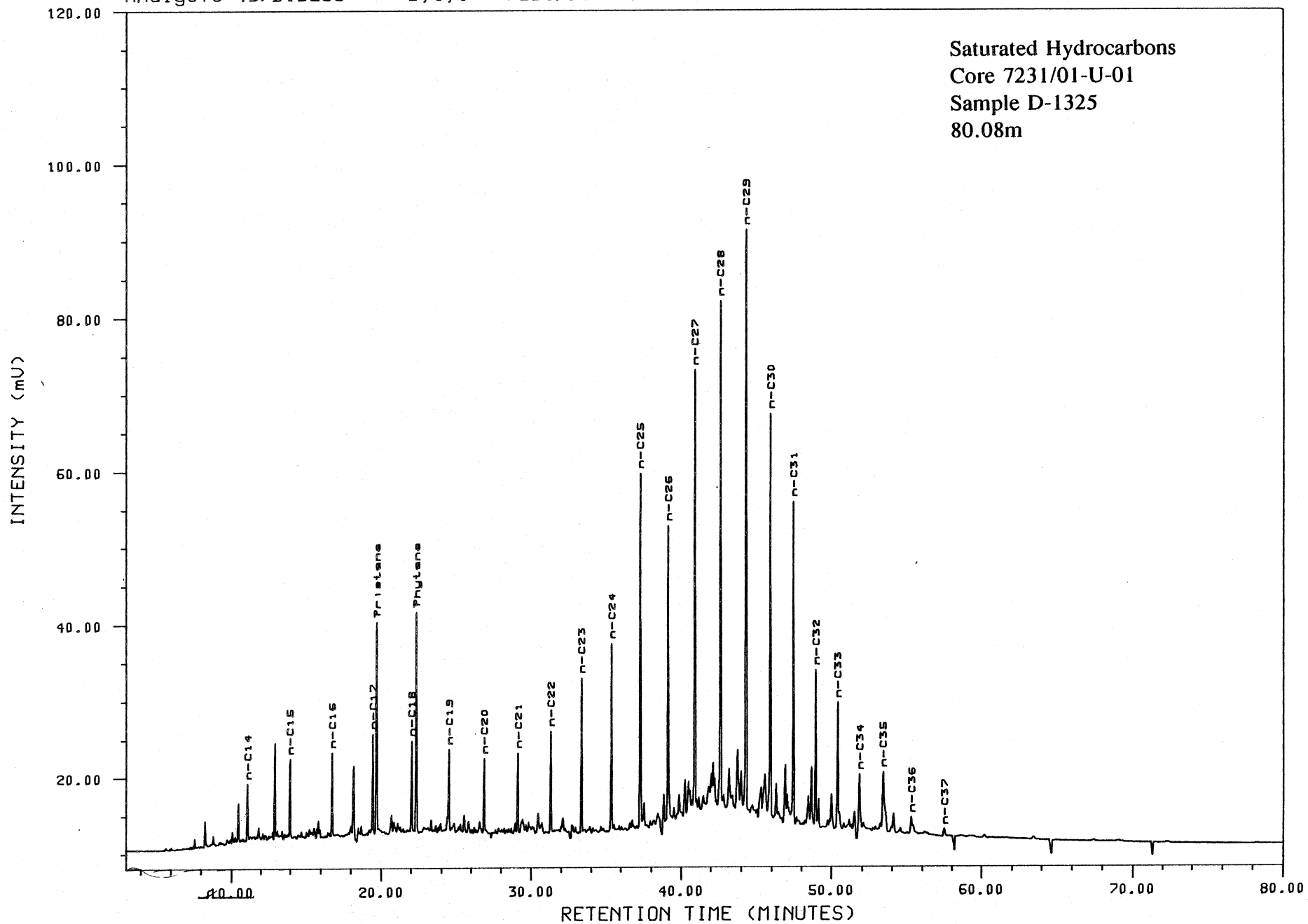
7231/01-U-01 SAT



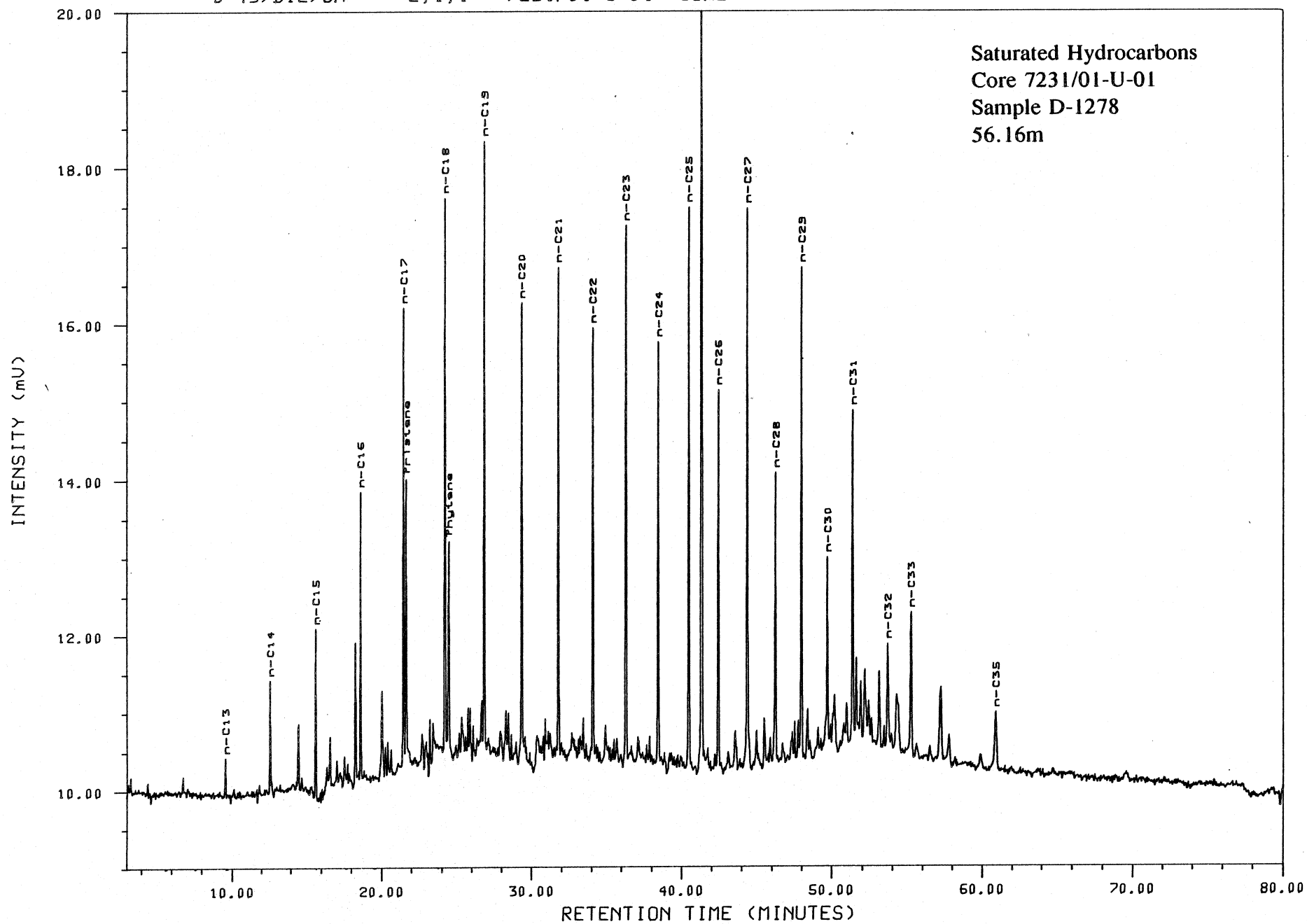
Analysis 437D1325S

3,1,1

7231/01-U-01 SAT



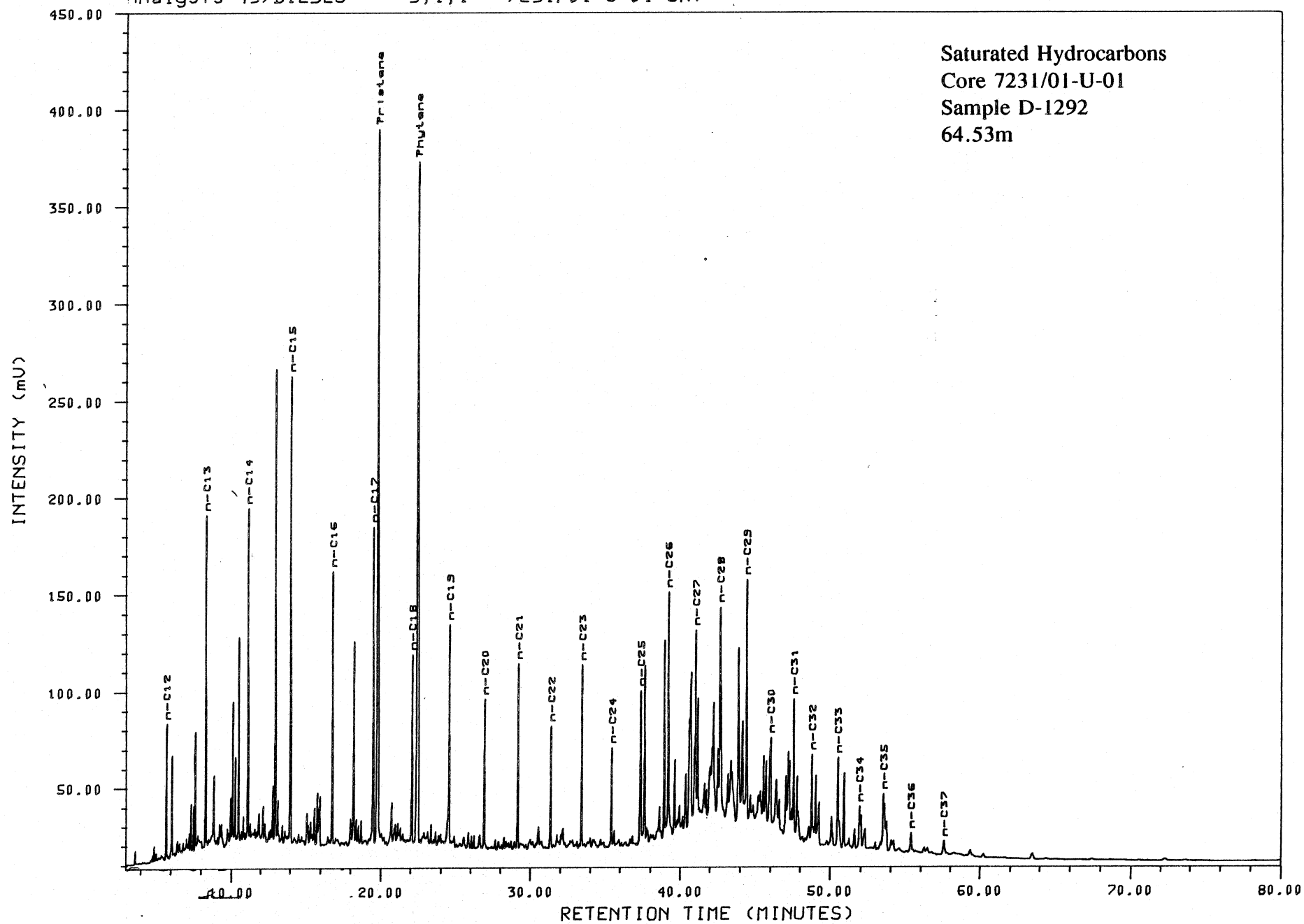
s 437D1278M 2,1,1 7231/01-U-01 CORE



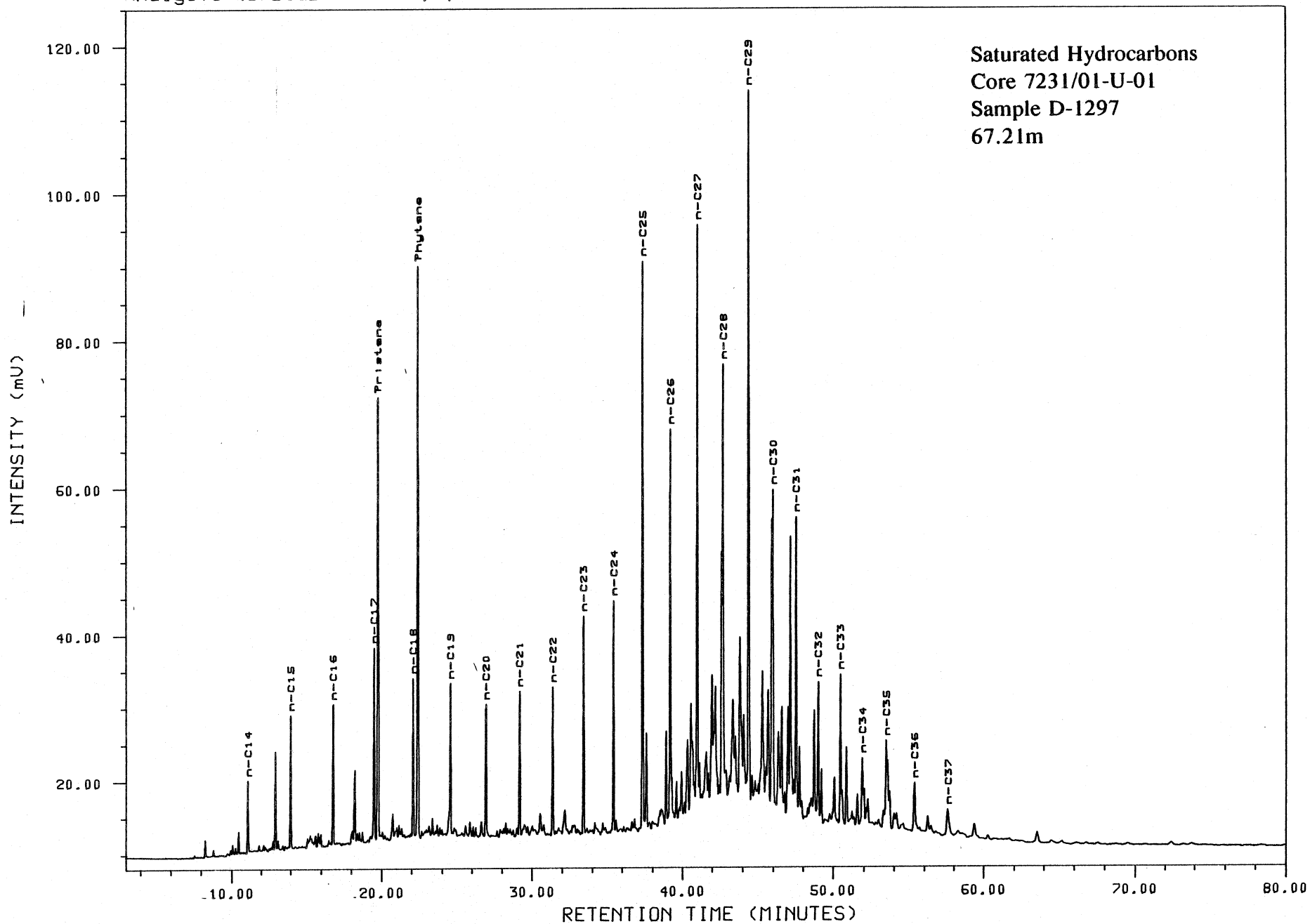
Analysis 437D1292S

3,1,1

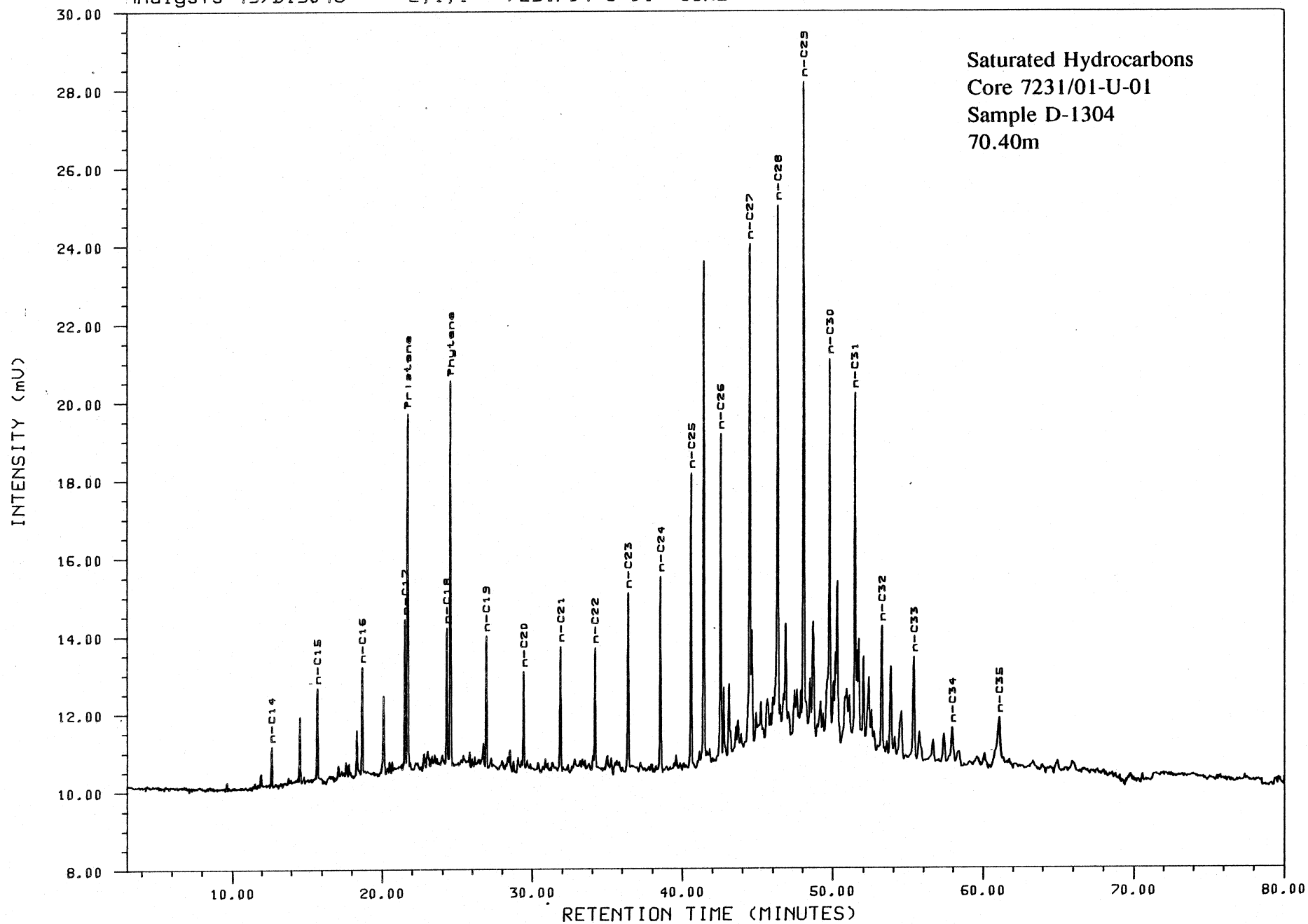
7231/01-U-01 SAT



Analysis 437D1297S 3,1,1 7231/01-U-01 SAT



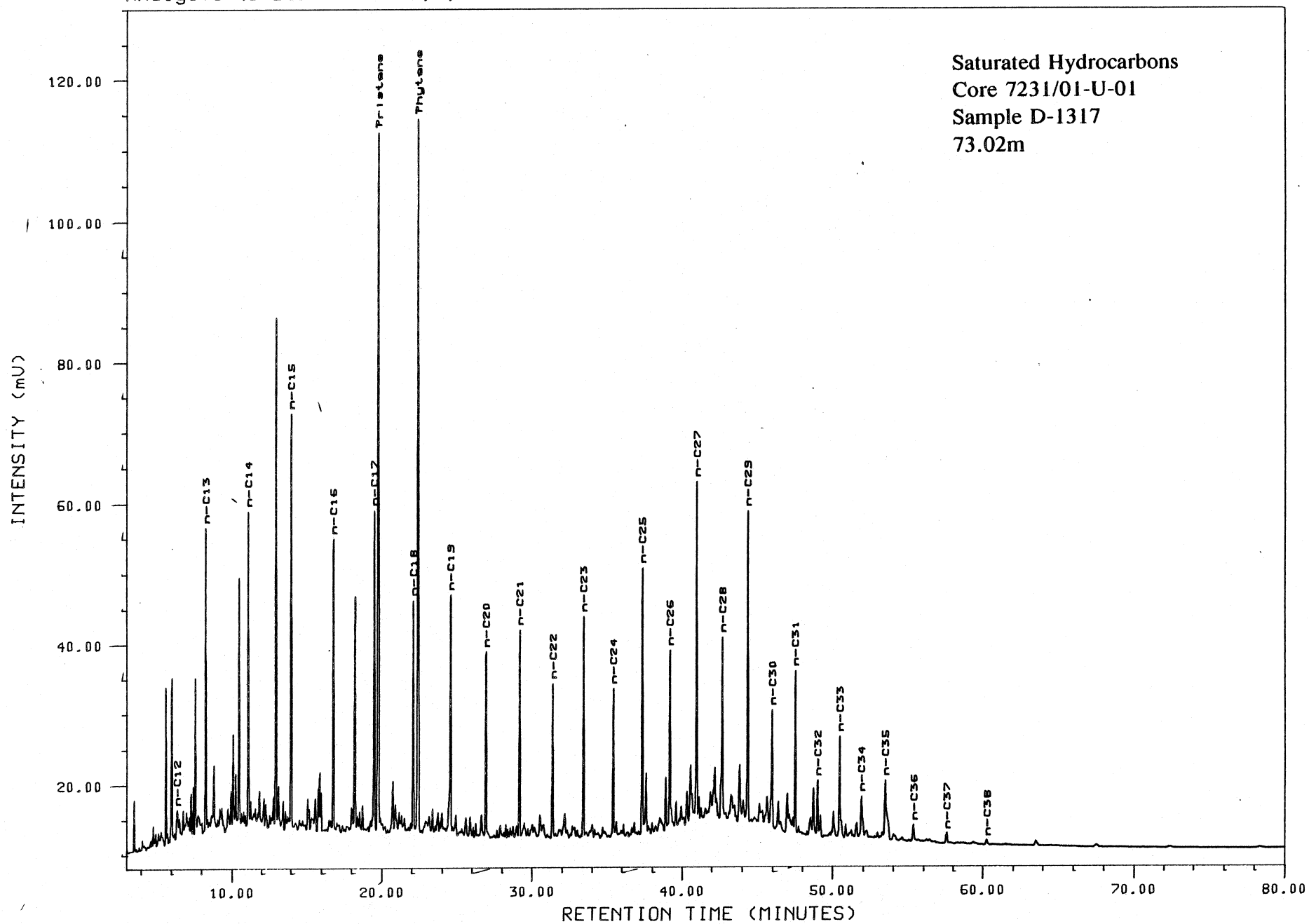
Analysis 437D1304S 2,1,1 7231/04-U-01 CORE



Analysis 437D1317S

3,1,1

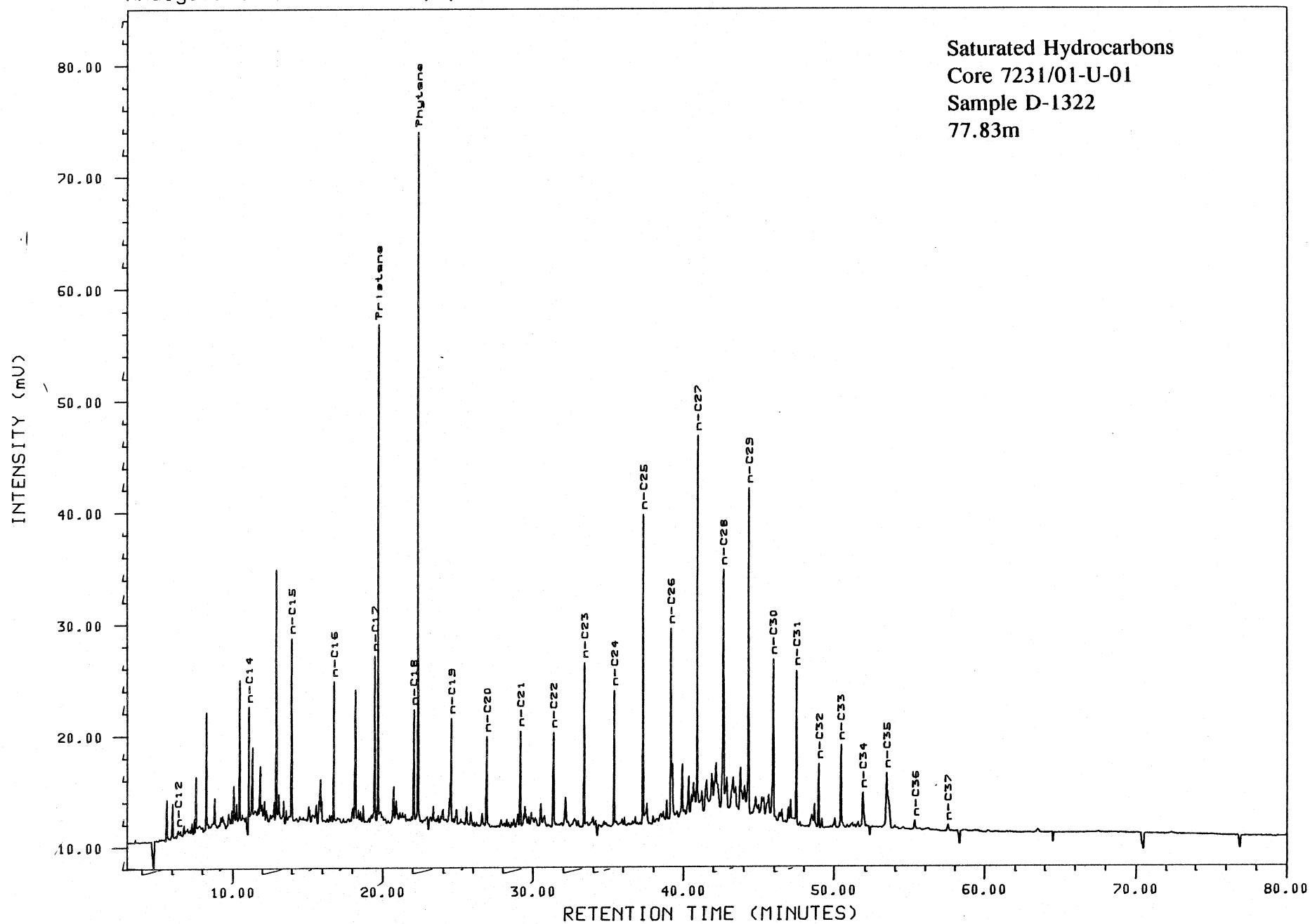
7231/01-U-01 SAT



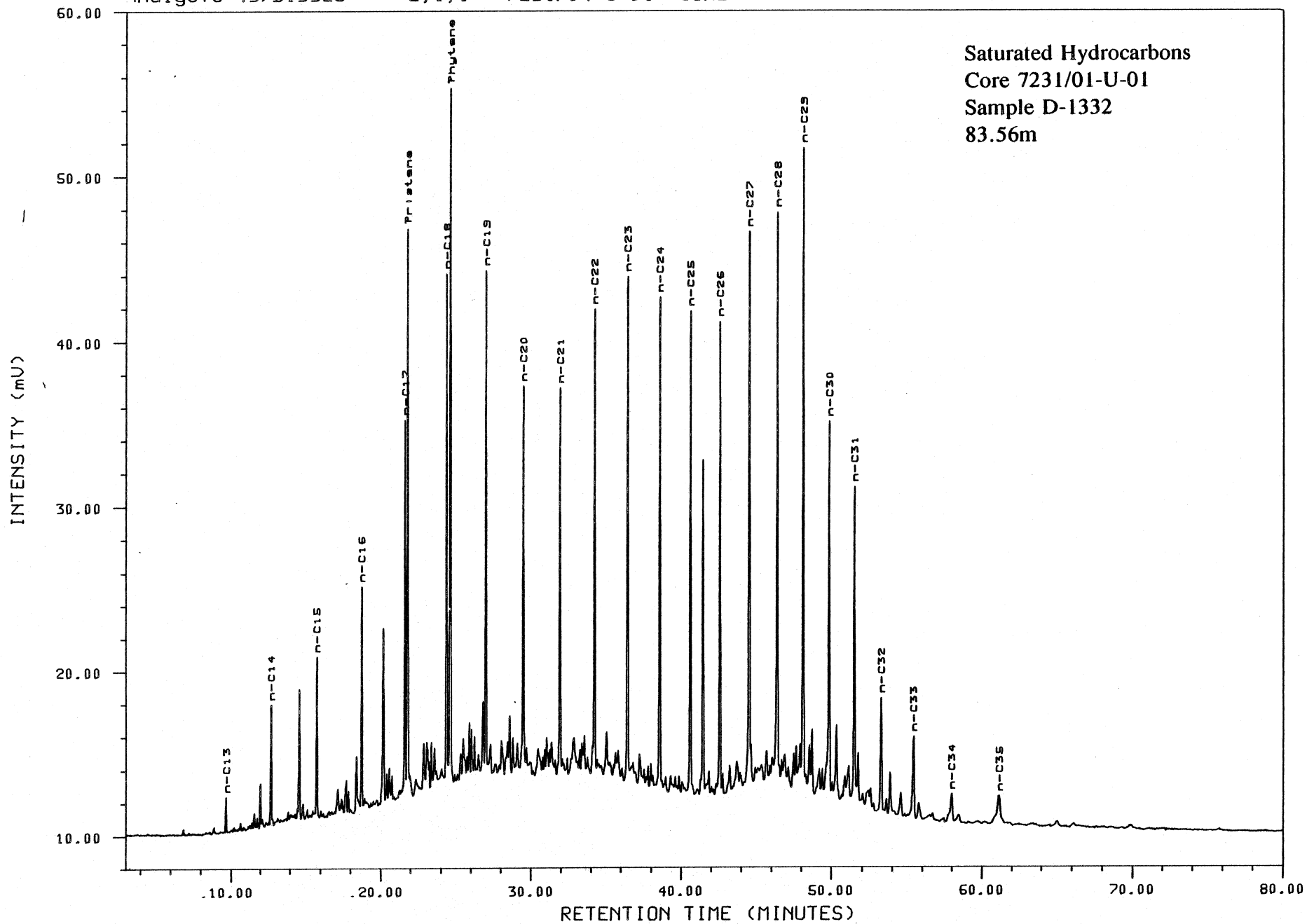
Analysis 437D1322S

3,1,1

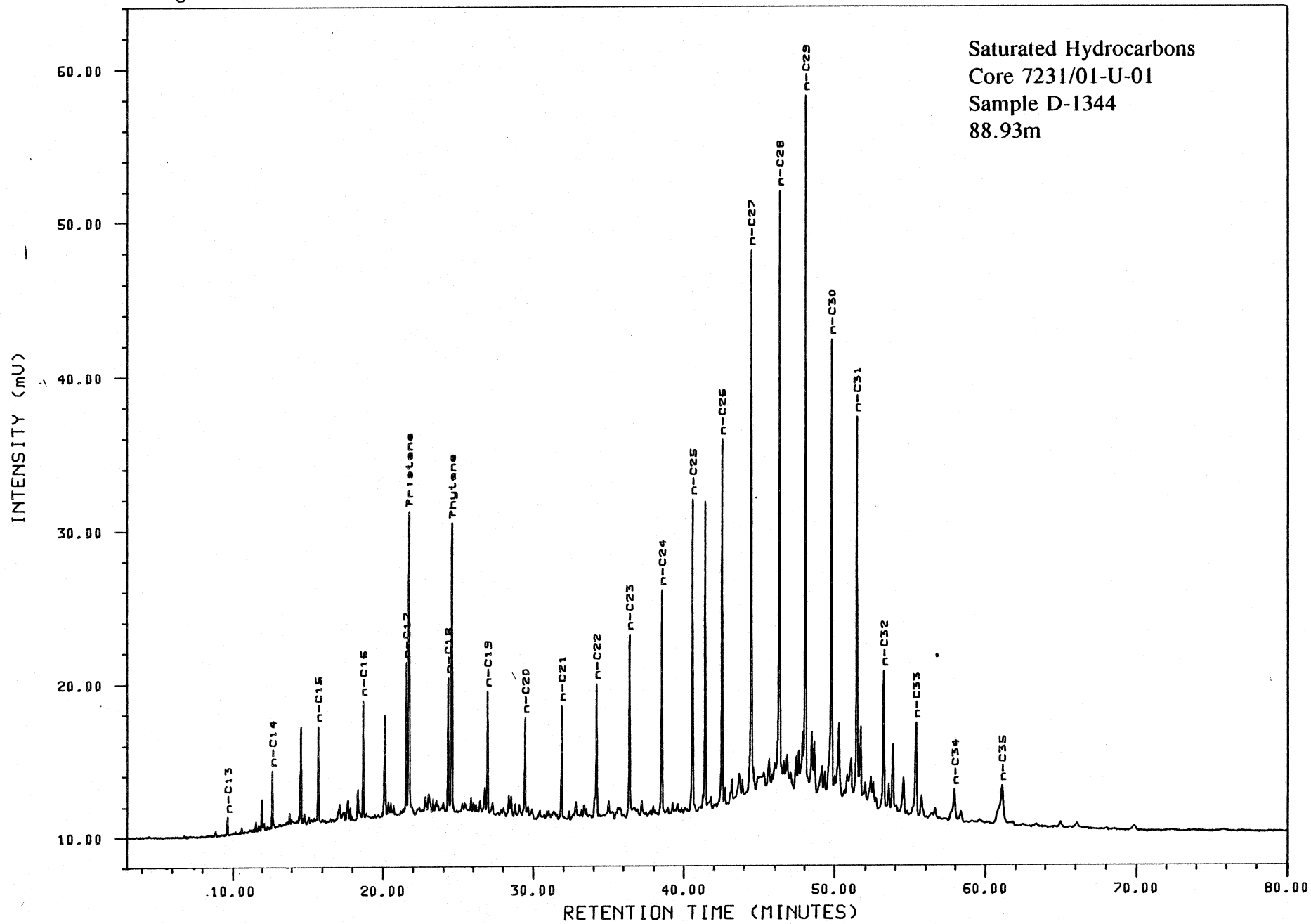
7231/01-U-01 SAT



Analysis 437D1332S 2,1,1 7231/04-U-01 CORE



Analysis 437D1344S 2,1,1 7231/01-U-01 CORE



Analysis 437D1354S

3,1,1

7231/01-U-01 SAT

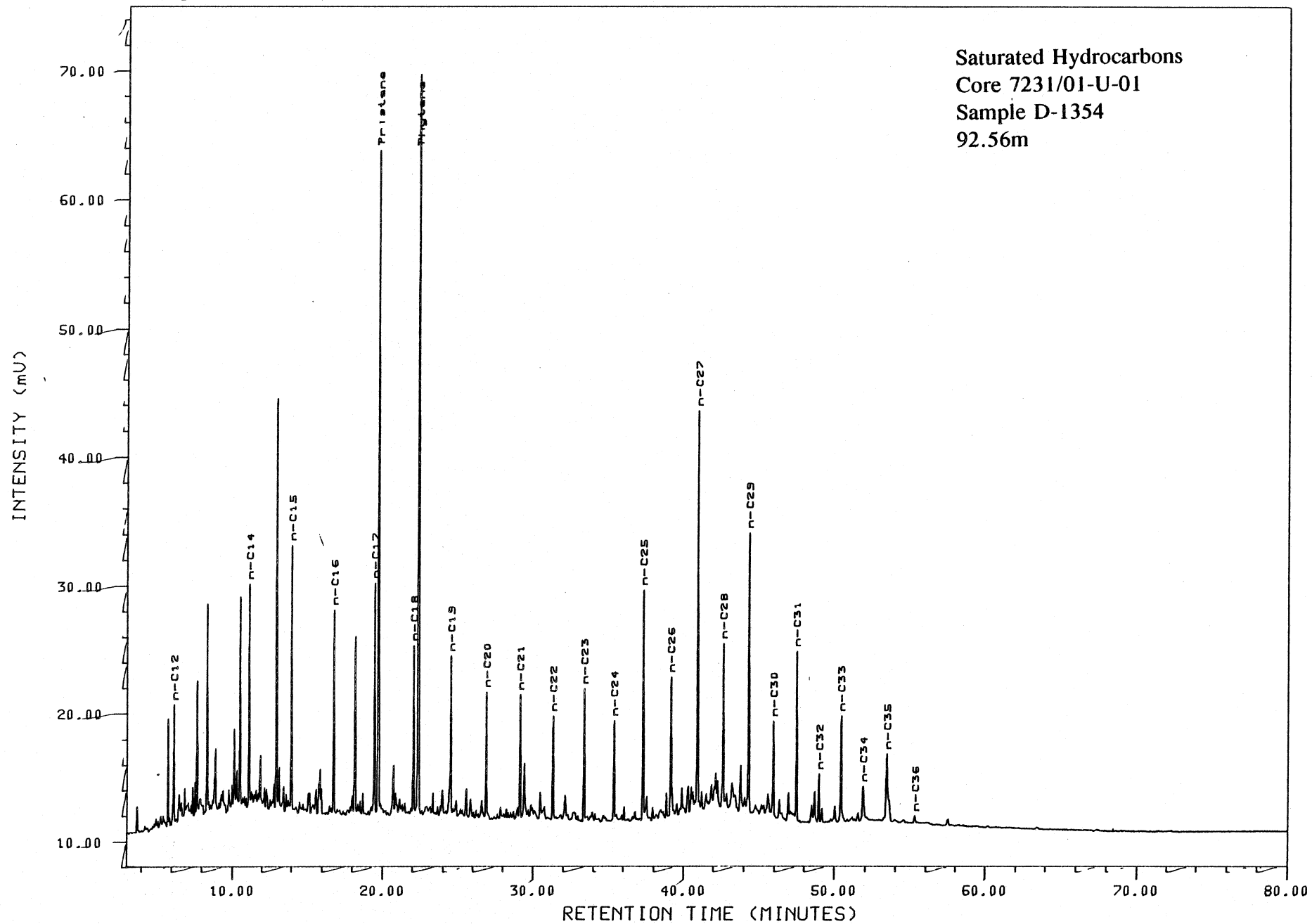


Figure A.II.1.3:

Mass fragmentograms of m/z 191, 205, 163, 177 (terpanes).



IKU
SINTEF GRUPPEN

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1304SAT 2-DEC-87

Sir: Voltage 12-250

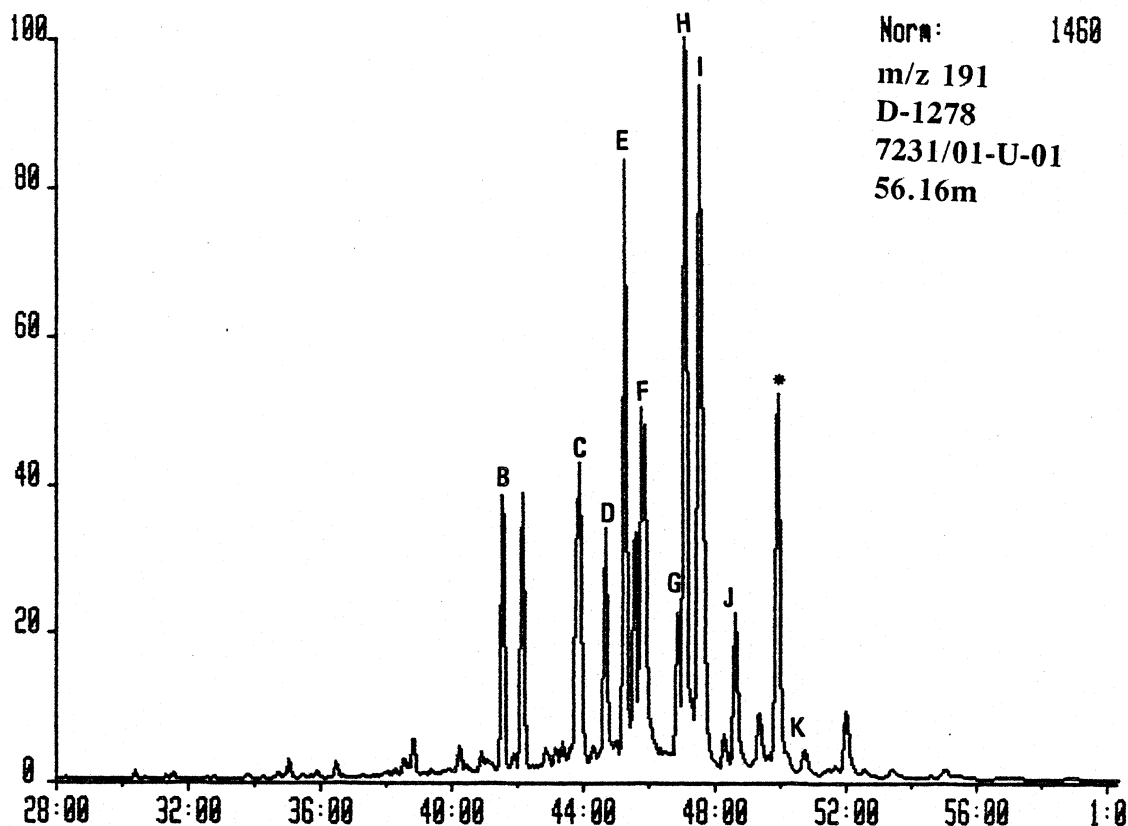
Acnt: IKU

System: QUADSAT

Sample 4 Injection 1

Group 1 Mass 191.1000

Text:



1304SAT 2-DEC-87

Sir: Voltage 12-250

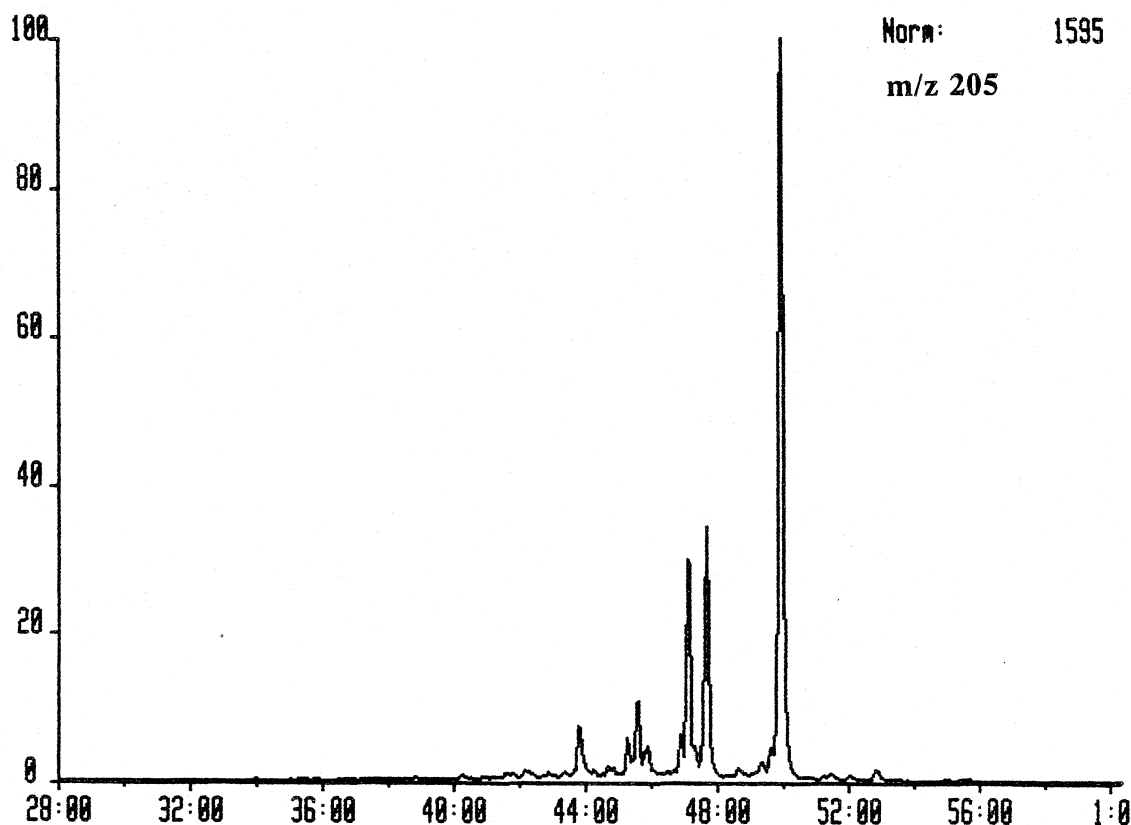
Acnt: IKU

System: QUADSAT

Sample 4 Injection 1

Group 1 Mass 205.1000

Text:



04000SAT 2-DEC-87

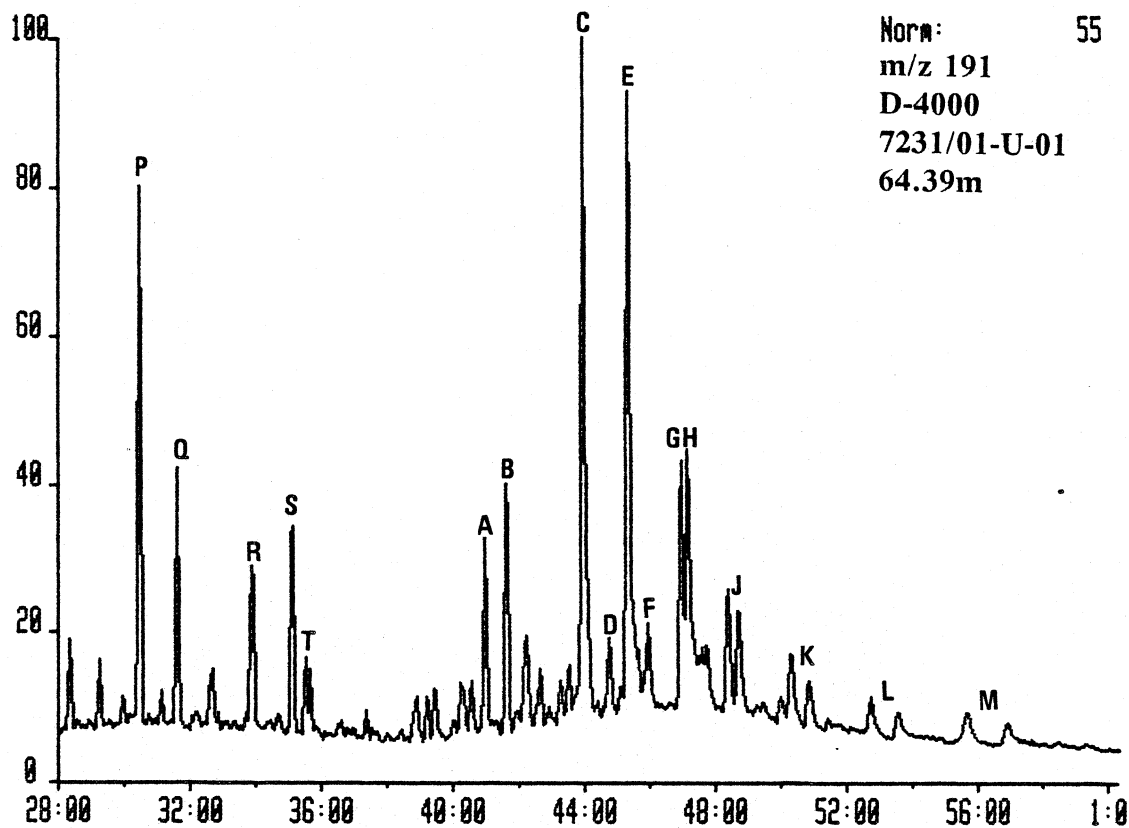
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 191.1000

Text:



04000SAT 2-DEC-87

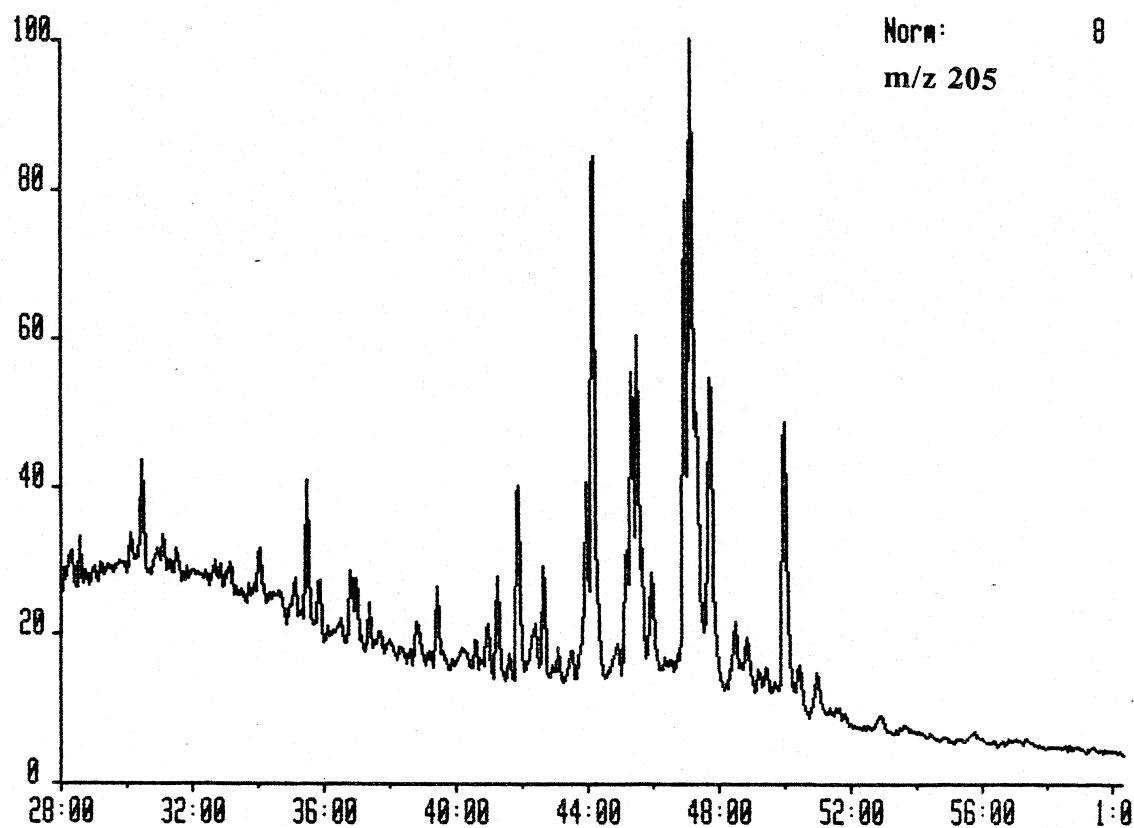
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 205.1000

Text:





IKU

SINTEF-GRUPPEN

- 91 -

D1292SAT 30-NOV-87

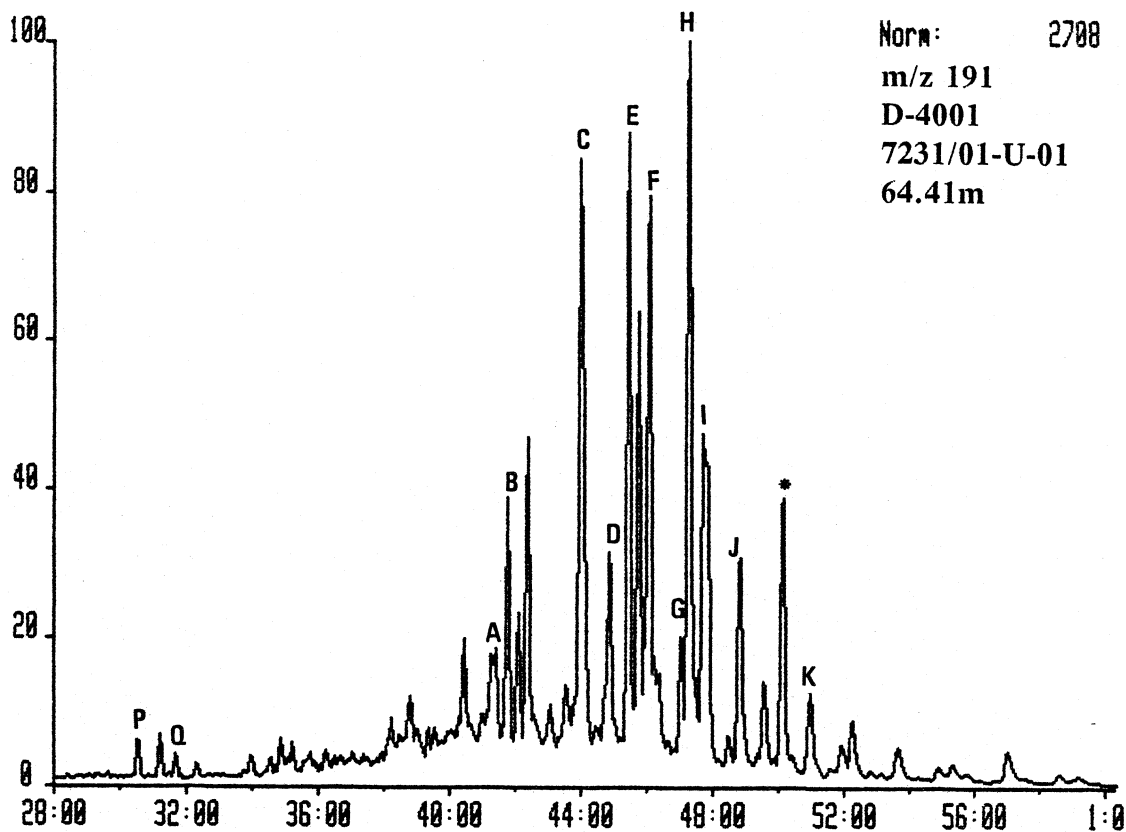
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 191.1000

Text:



D1292SAT 30-NOV-87

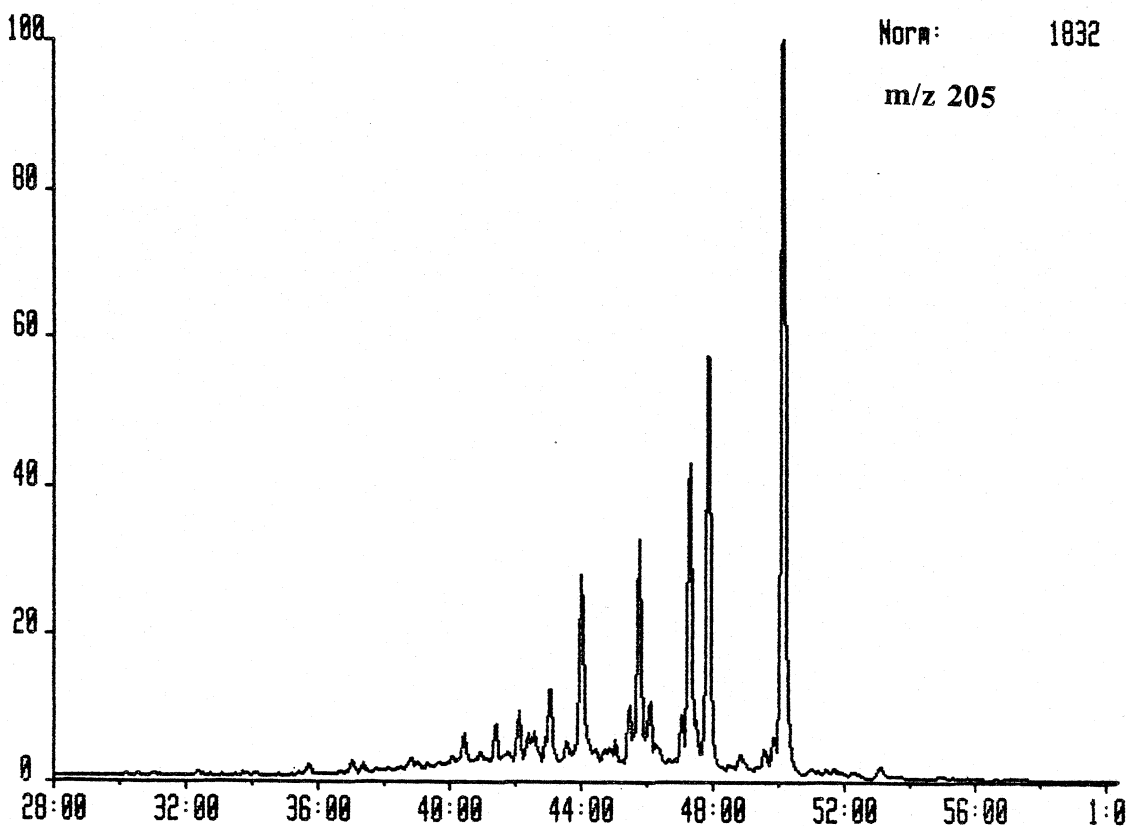
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 205.1000

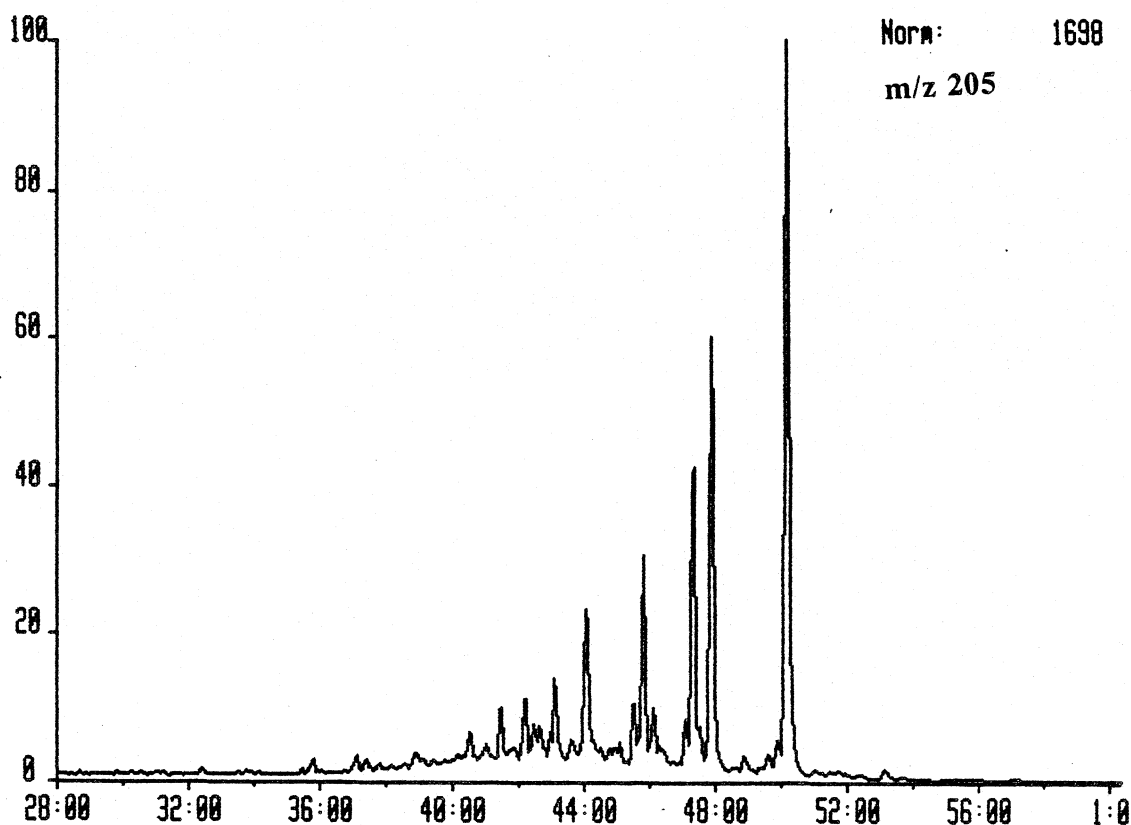
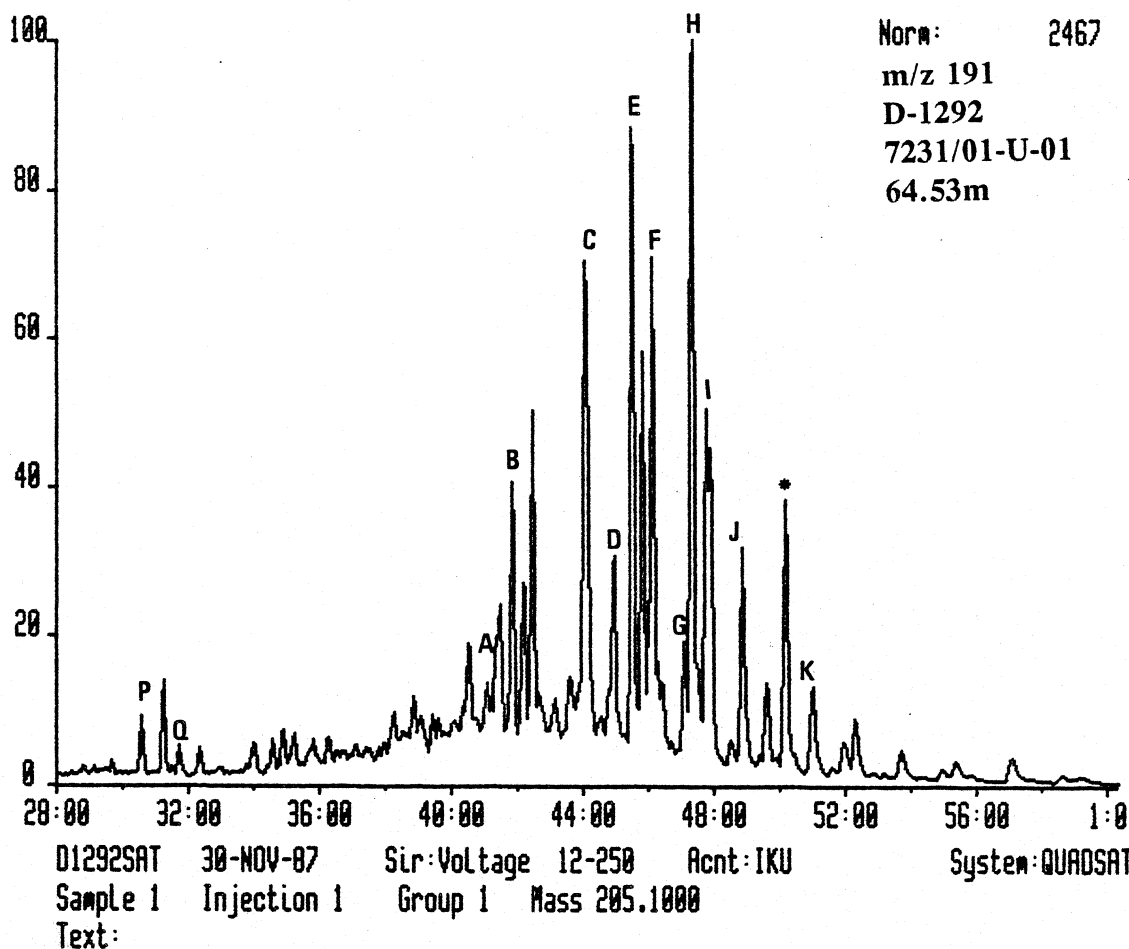
Text:



D1292SAT 30-NOV-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 191.1000

System: QUADSAT





IKU

SINTER-GRUPPEN

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D1241SAT 1-DEC-87

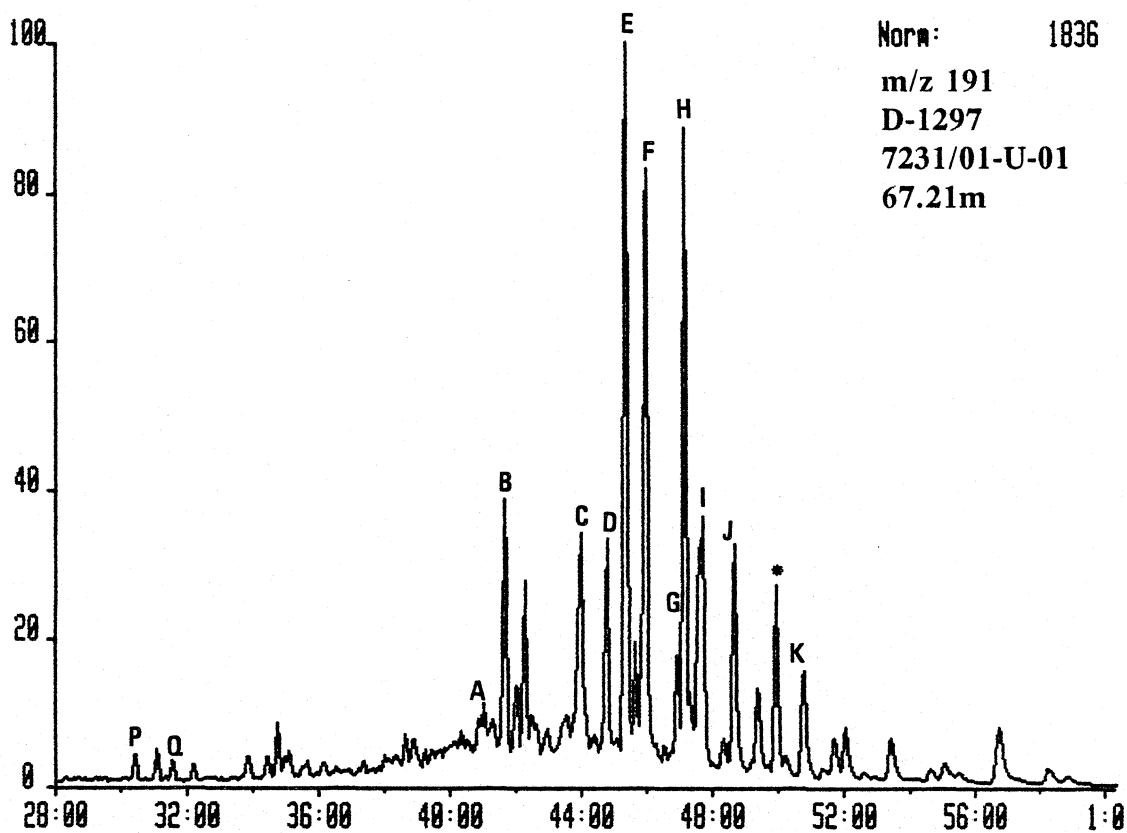
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 3 Injection 1

Group 1 Mass 191.1000

Text:



D1241SAT 1-DEC-87

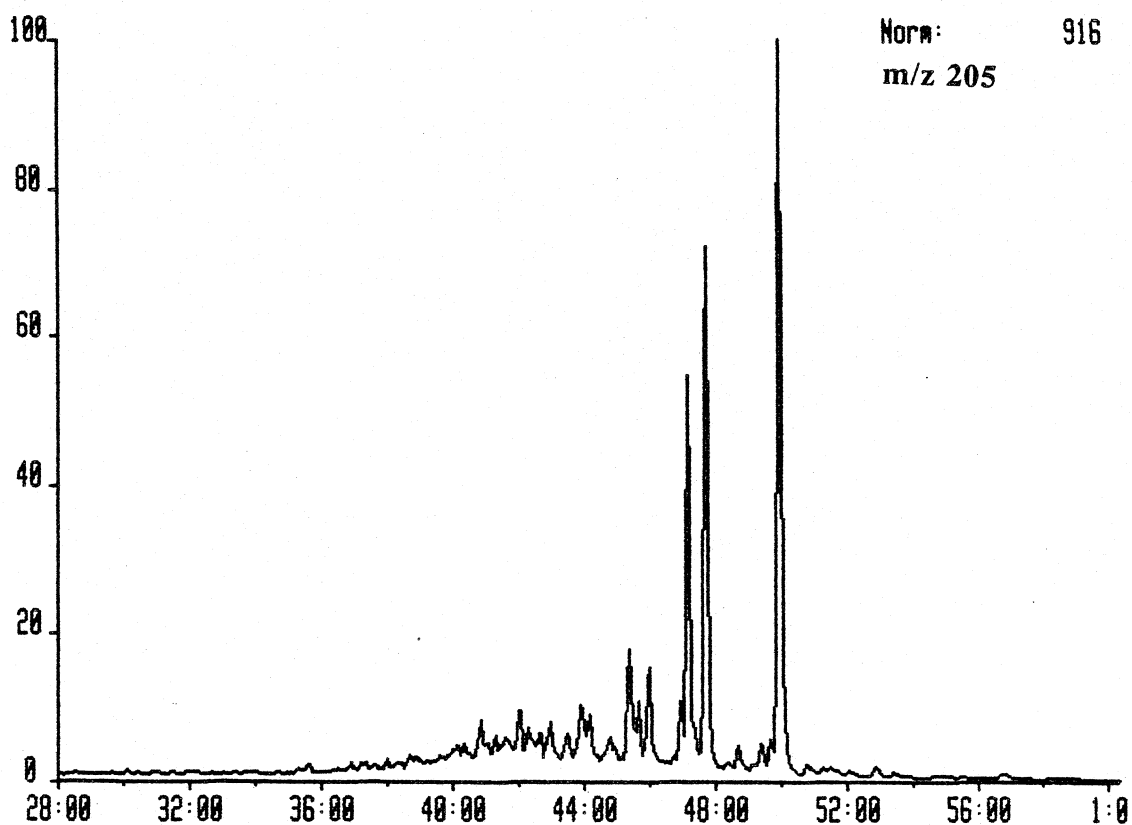
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 3 Injection 1

Group 1 Mass 205.1000

Text:





IKU

SINTEF-GRUPPEN

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1304SAT 2-DEC-87

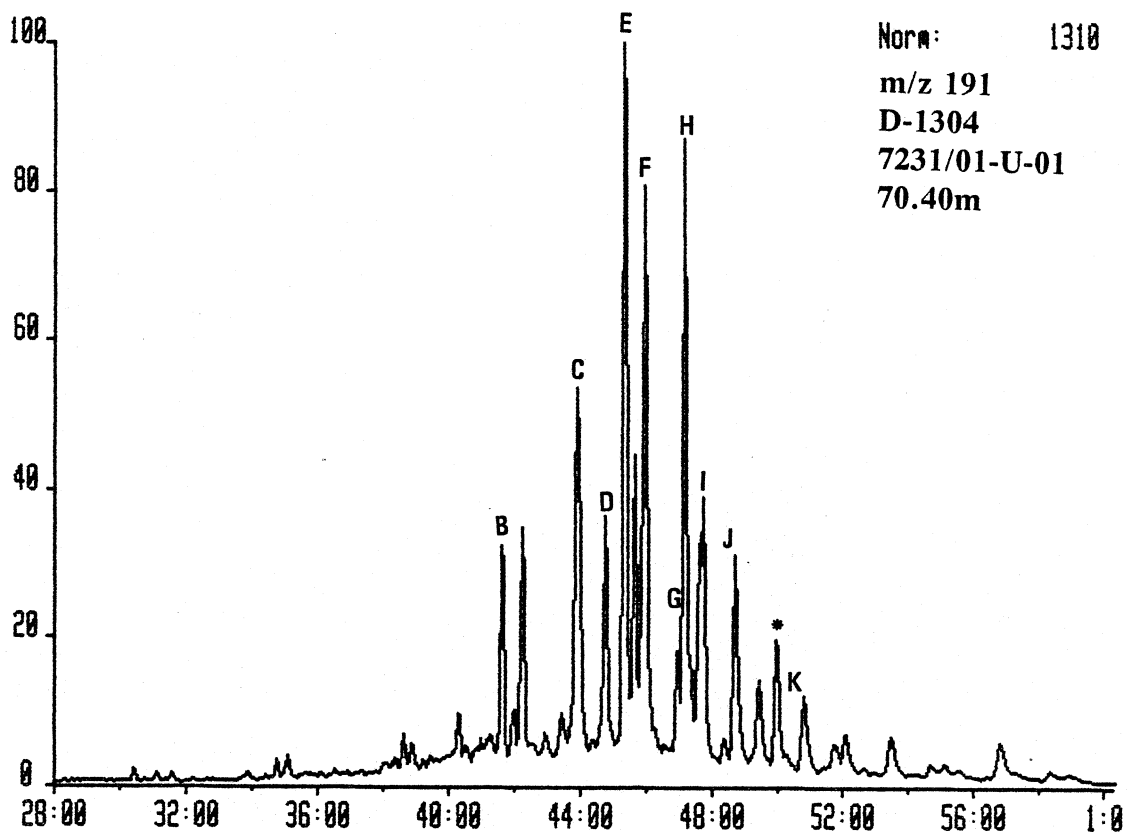
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 191.1000

Text:



Norm: 1310

m/z 191

D-1304

7231/01-U-01

70.40m

1304SAT 2-DEC-87

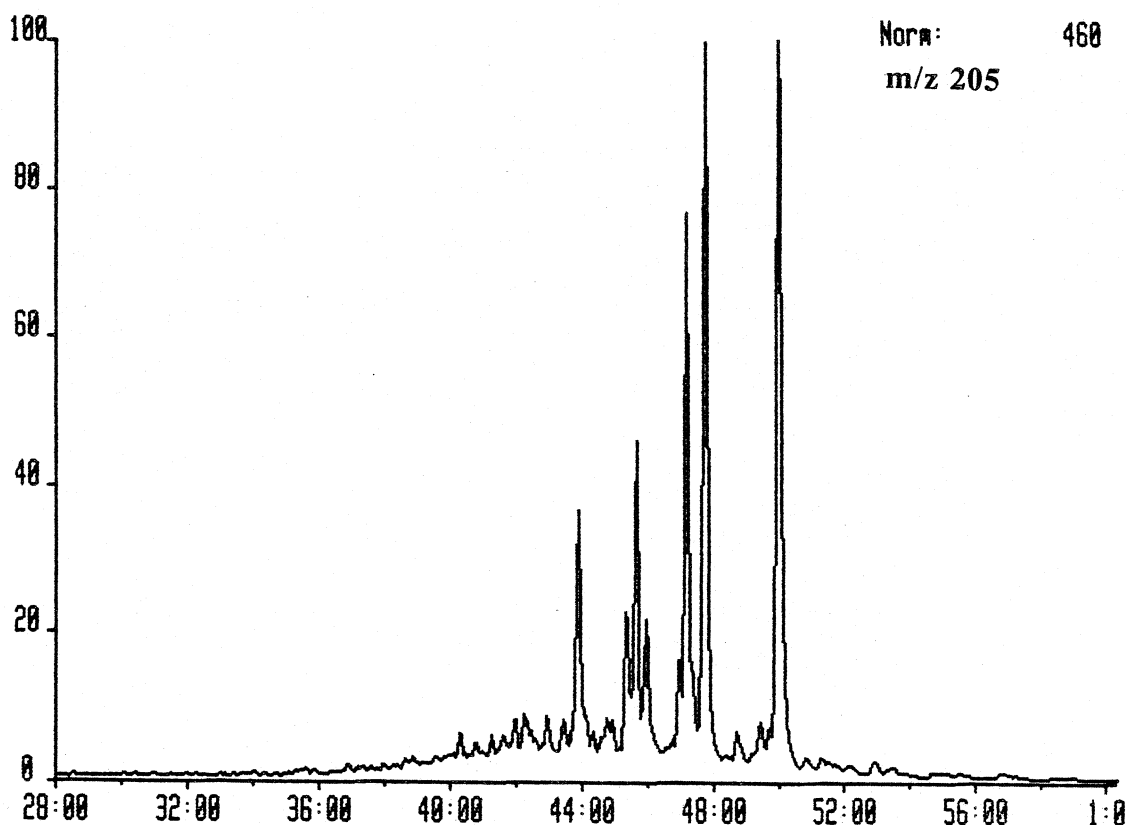
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 205.1000

Text:



Norm: 460

m/z 205



IKU

SINTEF-GRUPPEN

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D1317SAT 1-DEC-87

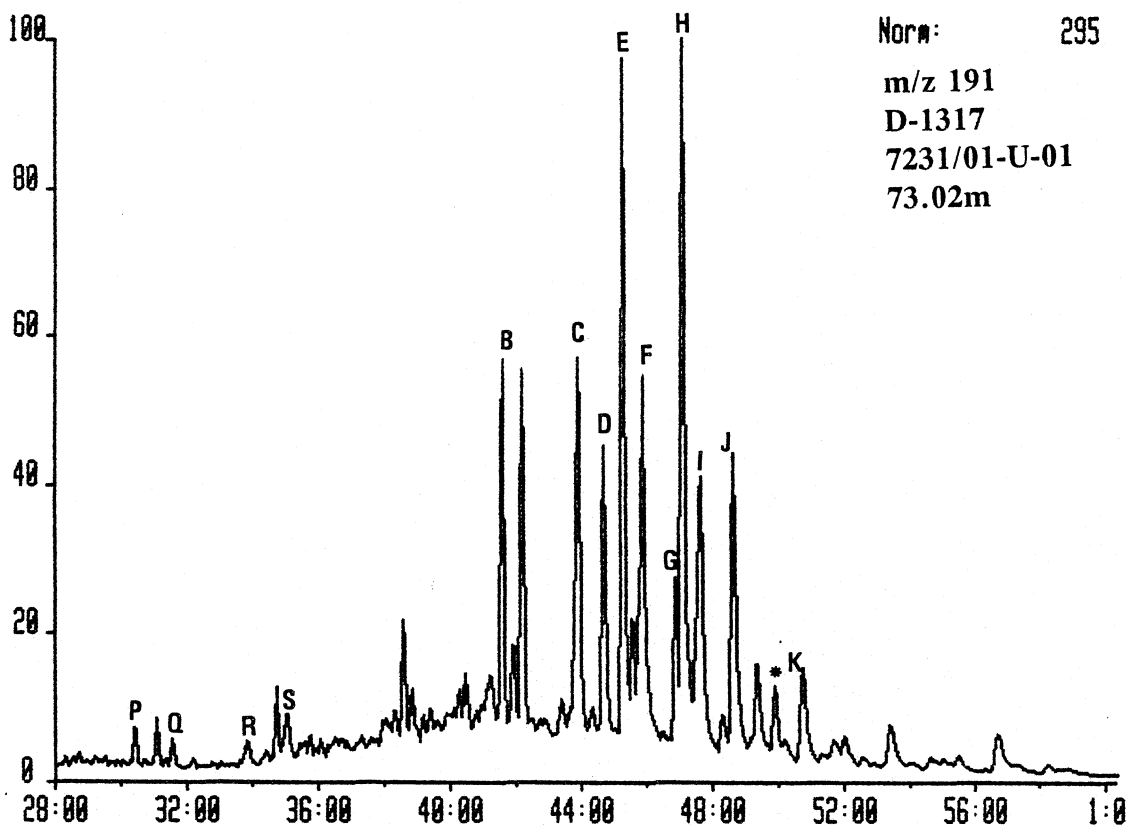
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

Group 1 Mass 191.1000

Text:



D1317SAT 1-DEC-87

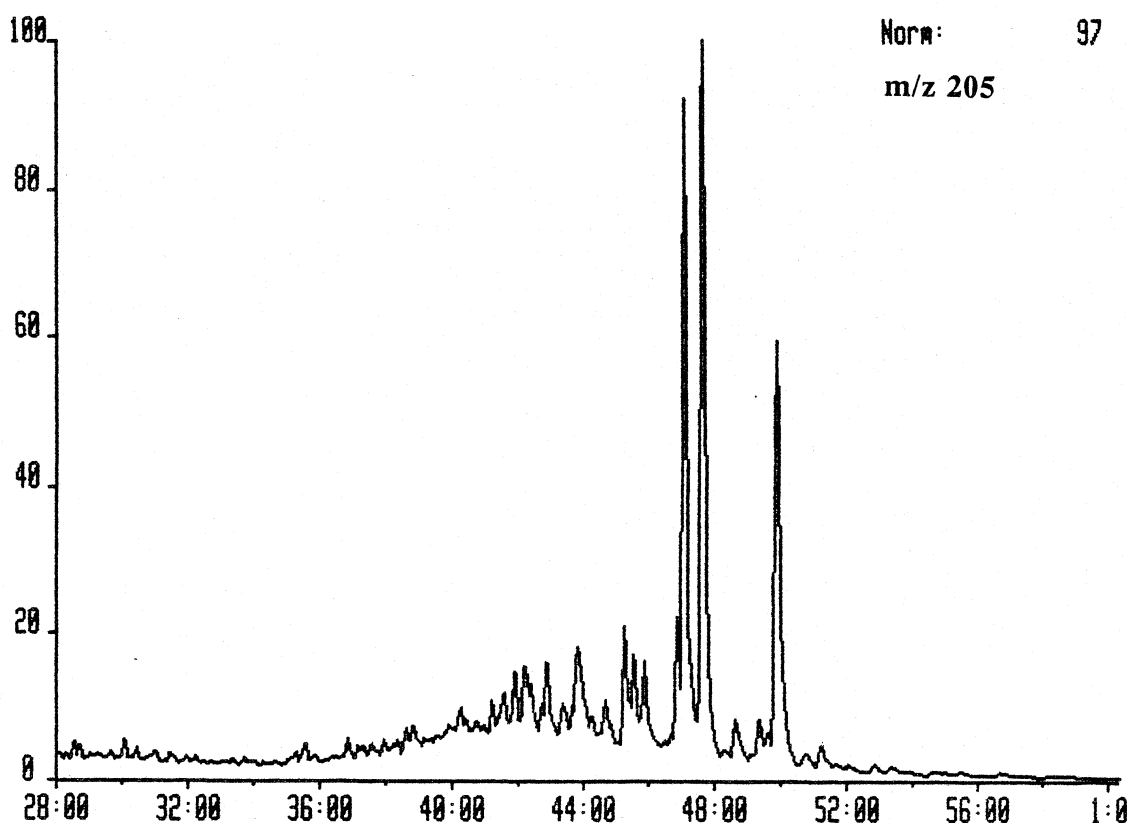
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

Group 1 Mass 205.1000

Text:





IKU

SINTEF-GRUPPEN

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D1317SAT 1-DEC-87

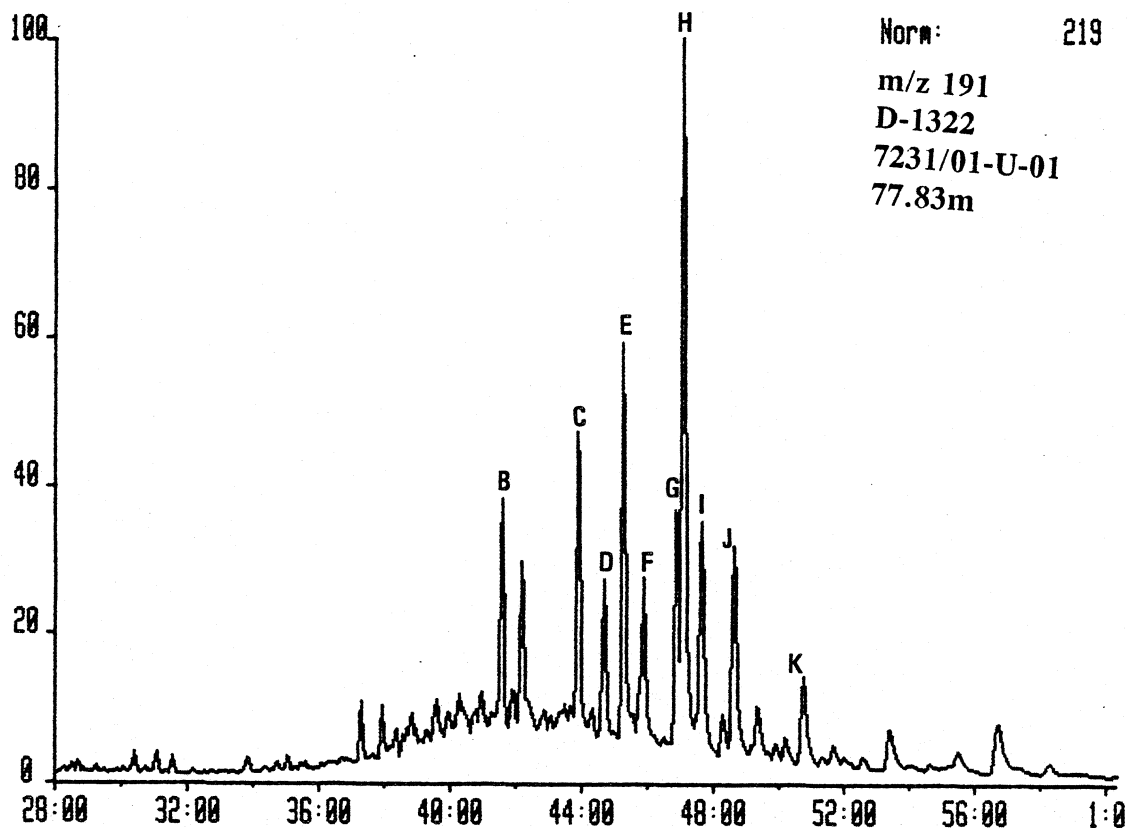
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 191.1000

Text:



D1317SAT 1-DEC-87

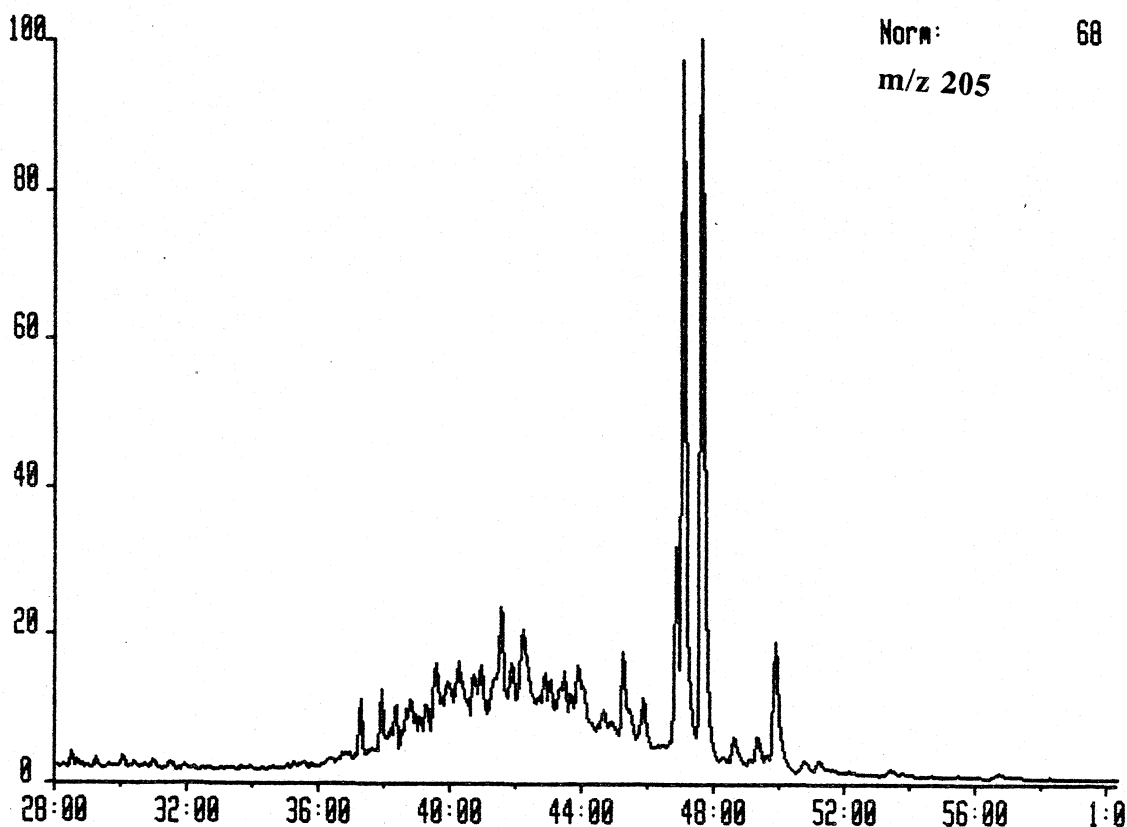
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 205.1000

Text:



D4000SAT 2-DEC-87

Sir:Voltage 12-250

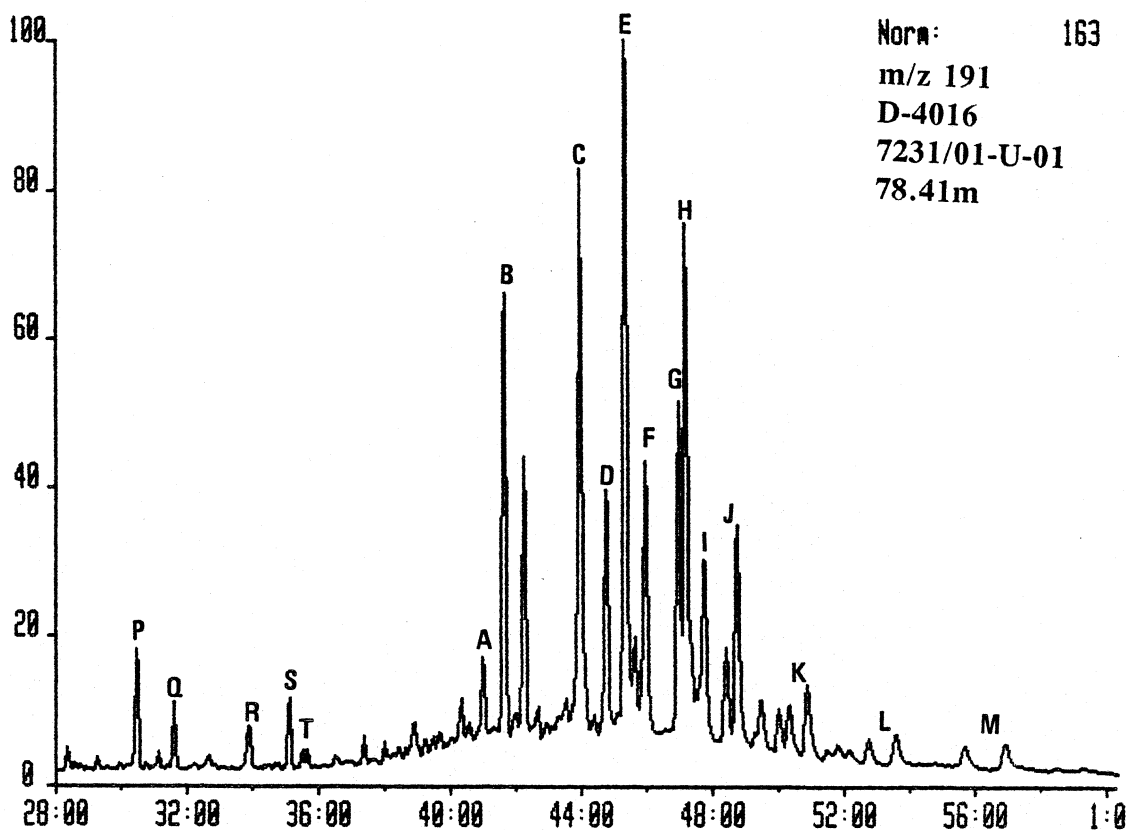
Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 191.1000

Text:



D4000SAT 2-DEC-87

Sir:Voltage 12-250

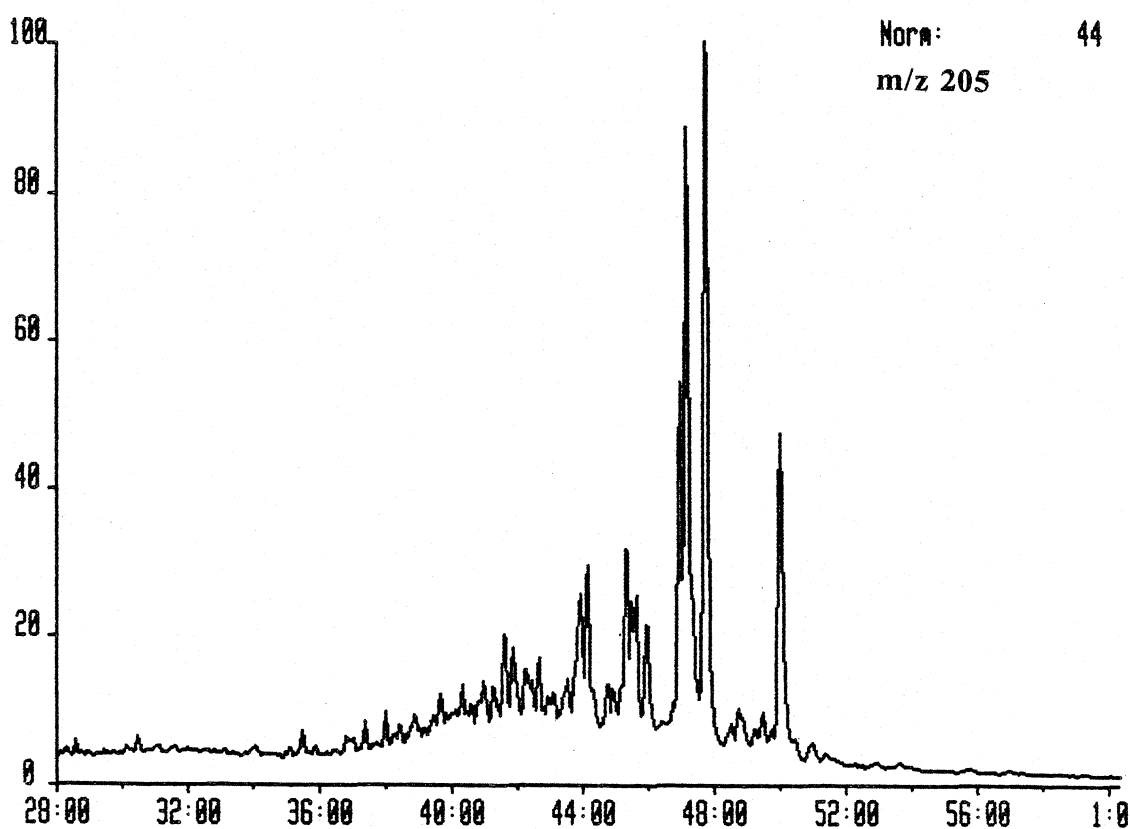
Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

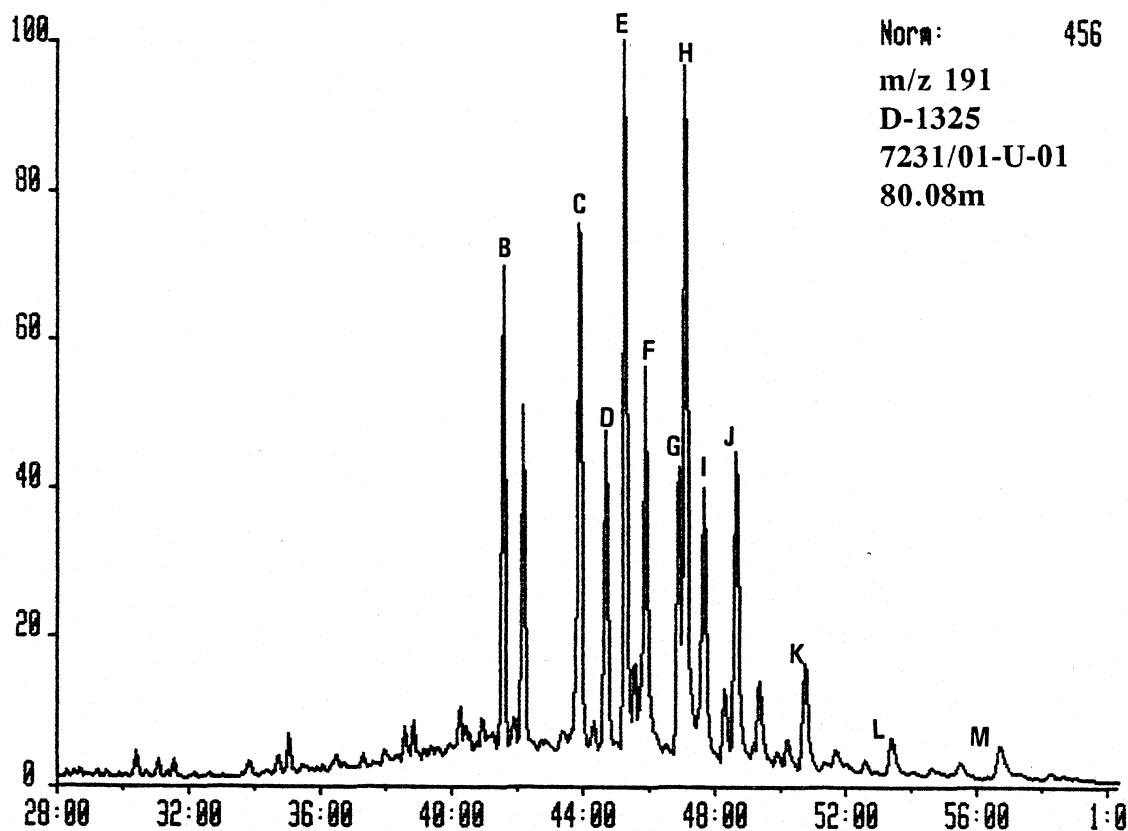
Group 1 Mass 205.1000

Text:



D1317SAT 1-DEC-87 Sir:Voltage 12-250 Rcnt:IKU
Sample 3 Injection 1 Group 1 Mass 191.1000
Text:

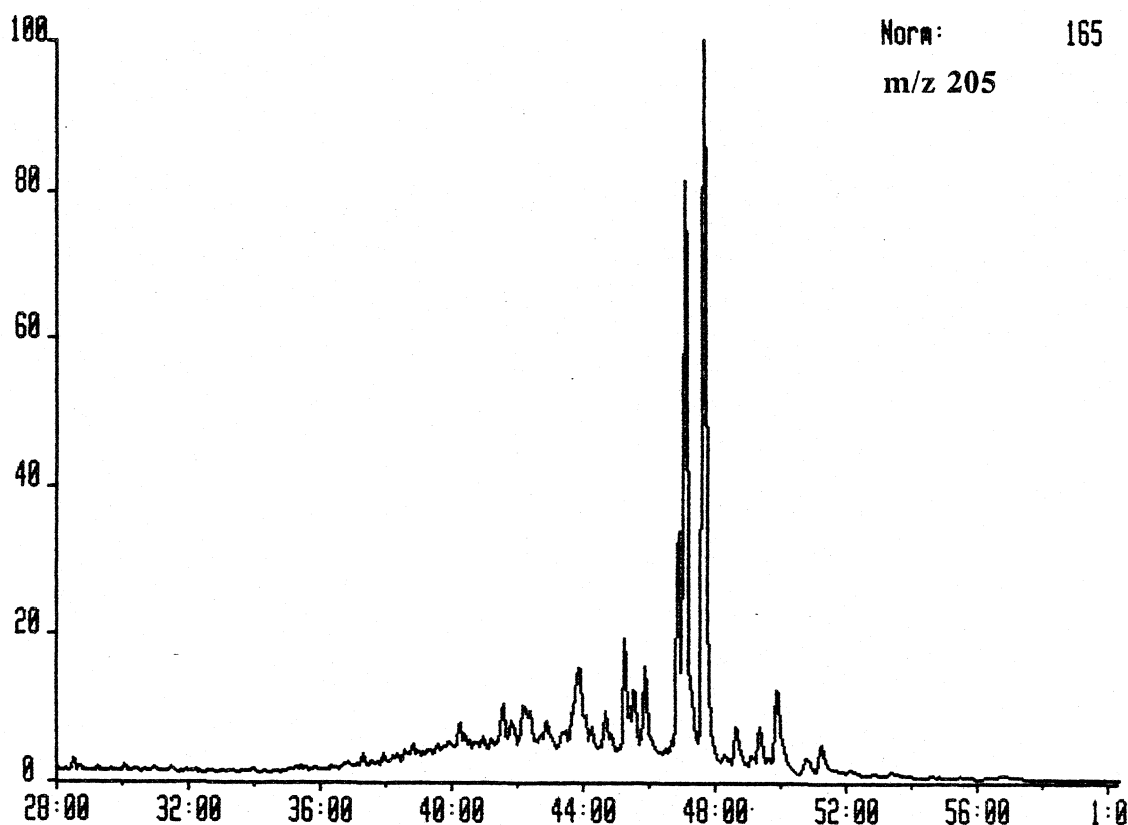
System:QUADSAT



Norm: 456
m/z 191
D-1325
7231/01-U-01
80.08m

D1317SAT 1-DEC-87 Sir:Voltage 12-250 Rcnt:IKU
Sample 3 Injection 1 Group 1 Mass 205.1000
Text:

System:QUADSAT



Norm: 165
m/z 205



IKU

SINTEF-GRUPPEN

- 99 -

1304SAT 2-DEC-87

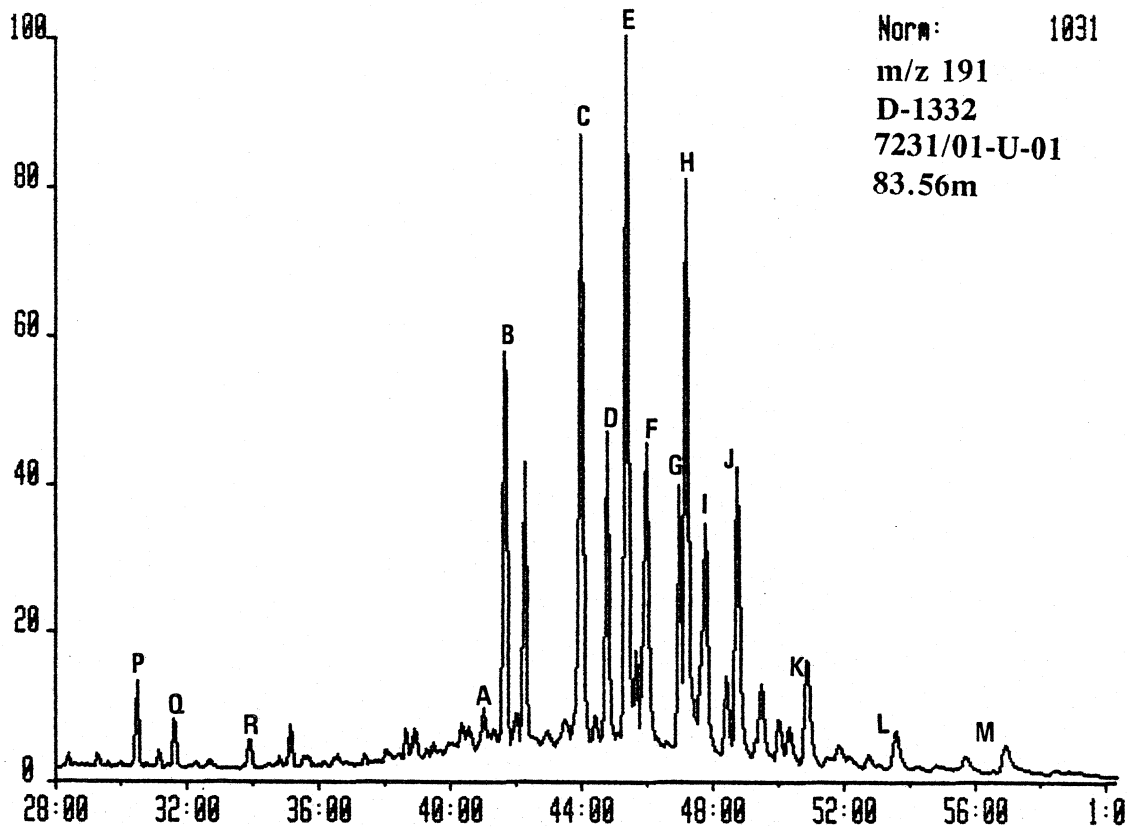
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 191.1000

Text:



1304SAT 2-DEC-87

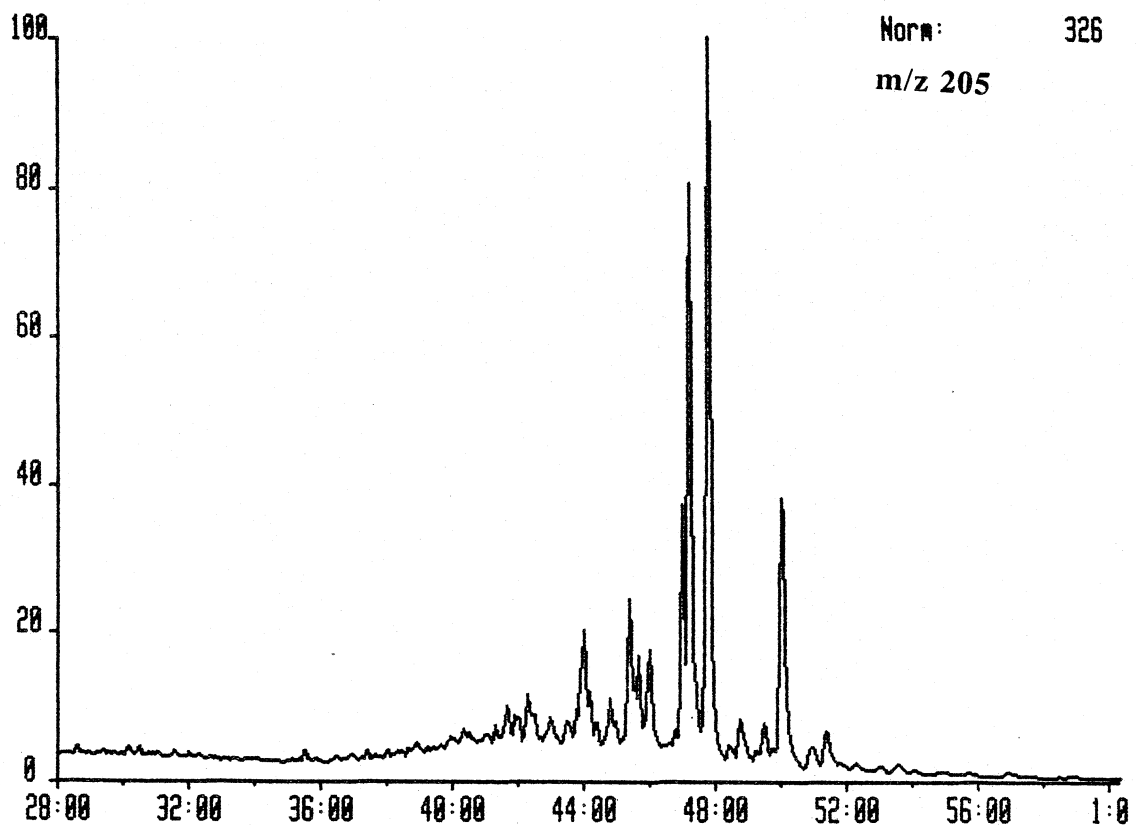
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 205.1000

Text:





IKU
SINTEF-GRUPPEN

- 100 -

1304SAT 2-DEC-87

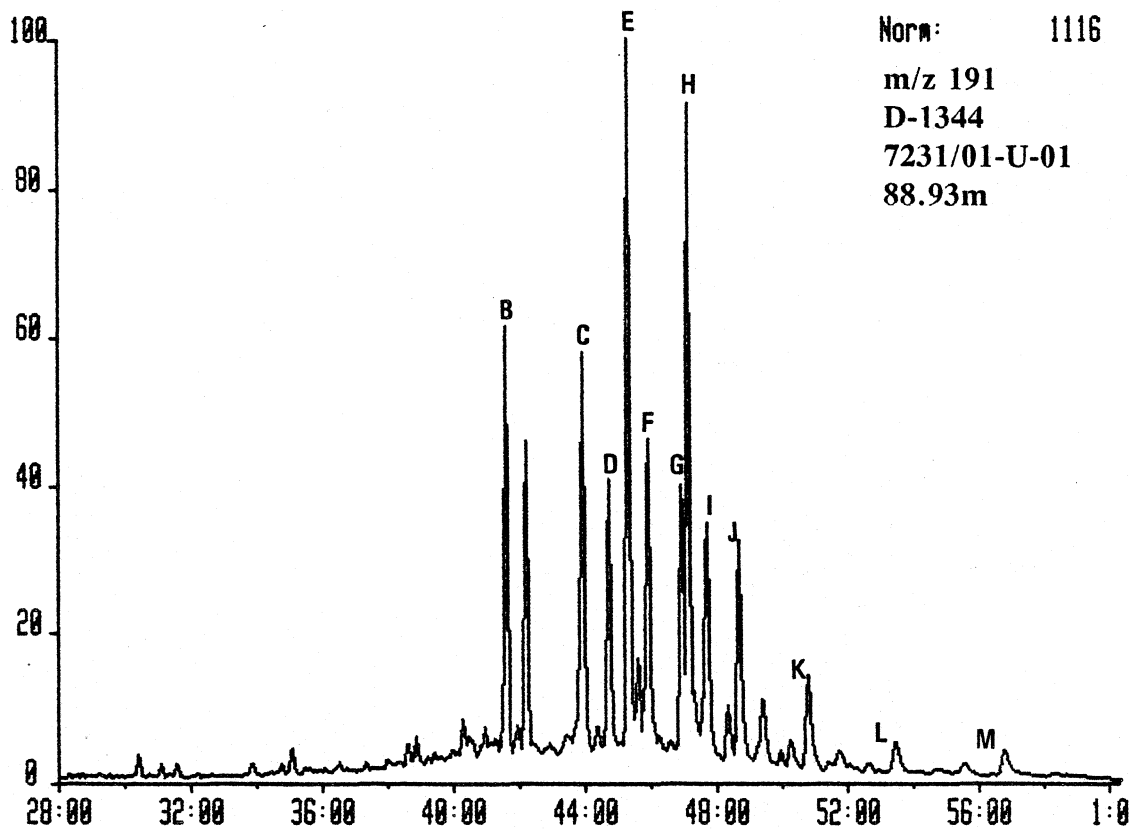
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 3 Injection 1

Group 1 Mass 191.1000

Text:



Norm: 1116

m/z 191

D-1344

7231/01-U-01

88.93m

1304SAT 2-DEC-87

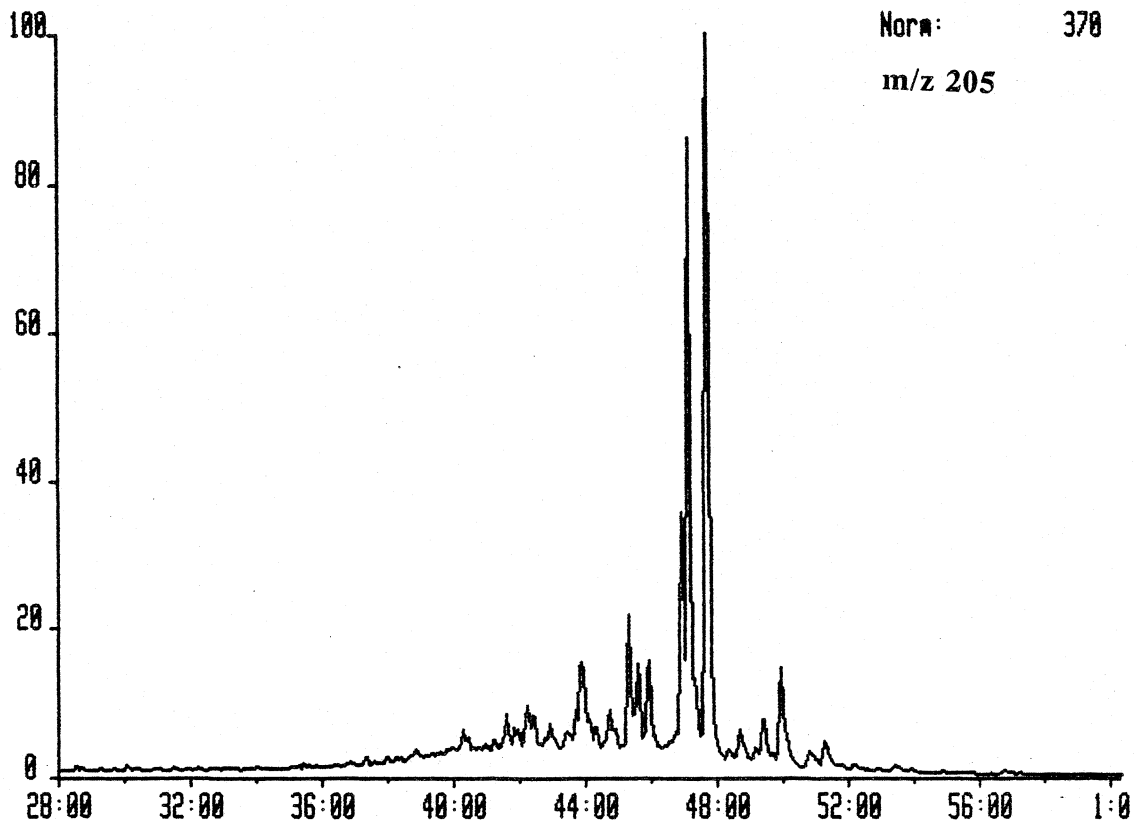
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 3 Injection 1

Group 1 Mass 205.1000

Text:



Norm: 370

m/z 205



IKU

SINTEF-GRUPPEN

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D1317SAT 1-DEC-87

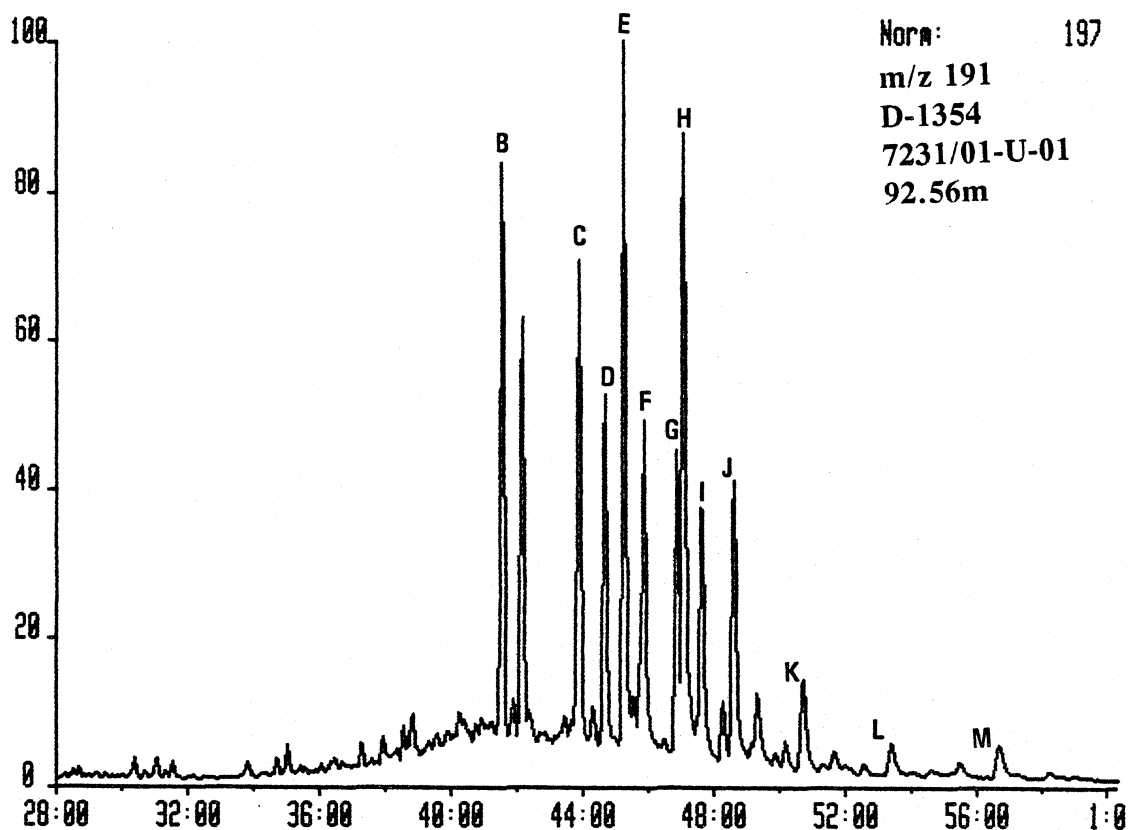
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 4 Injection 1

Group 1 Mass 191.1000

Text:



D1317SAT 1-DEC-87

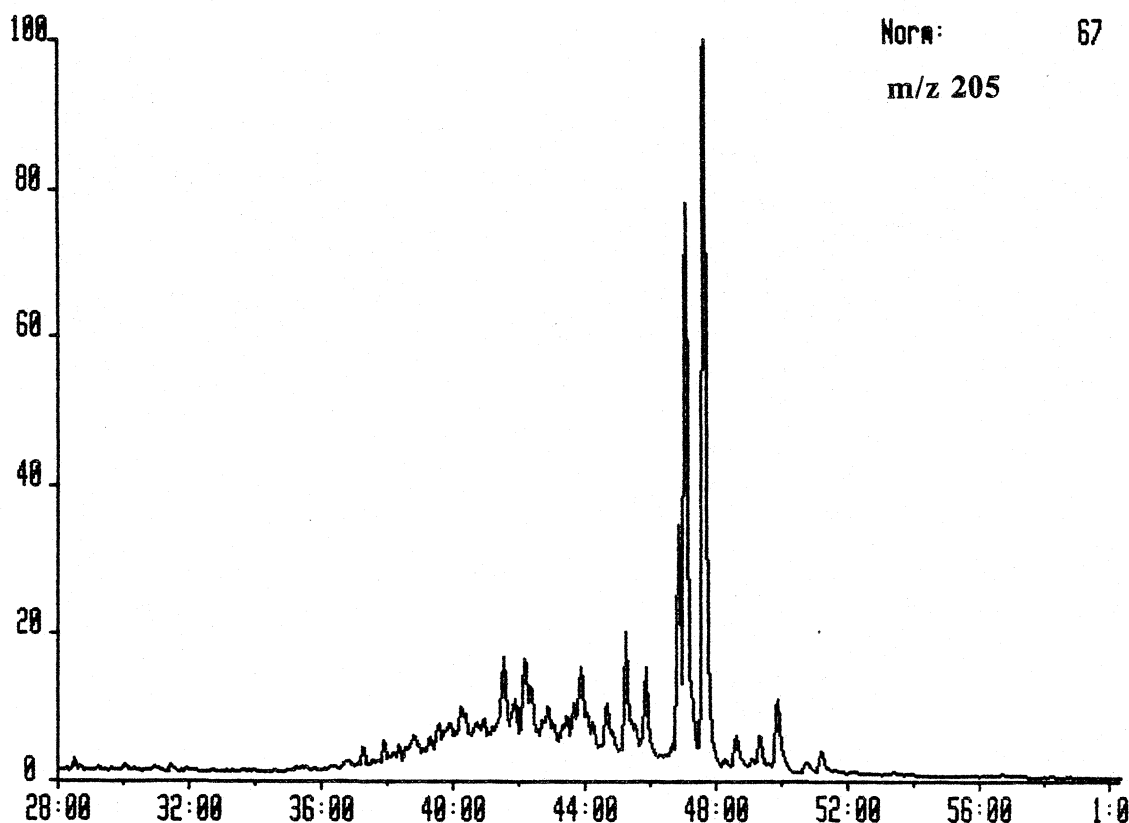
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 4 Injection 1

Group 1 Mass 205.1000

Text:



1304SAT 2-DEC-87

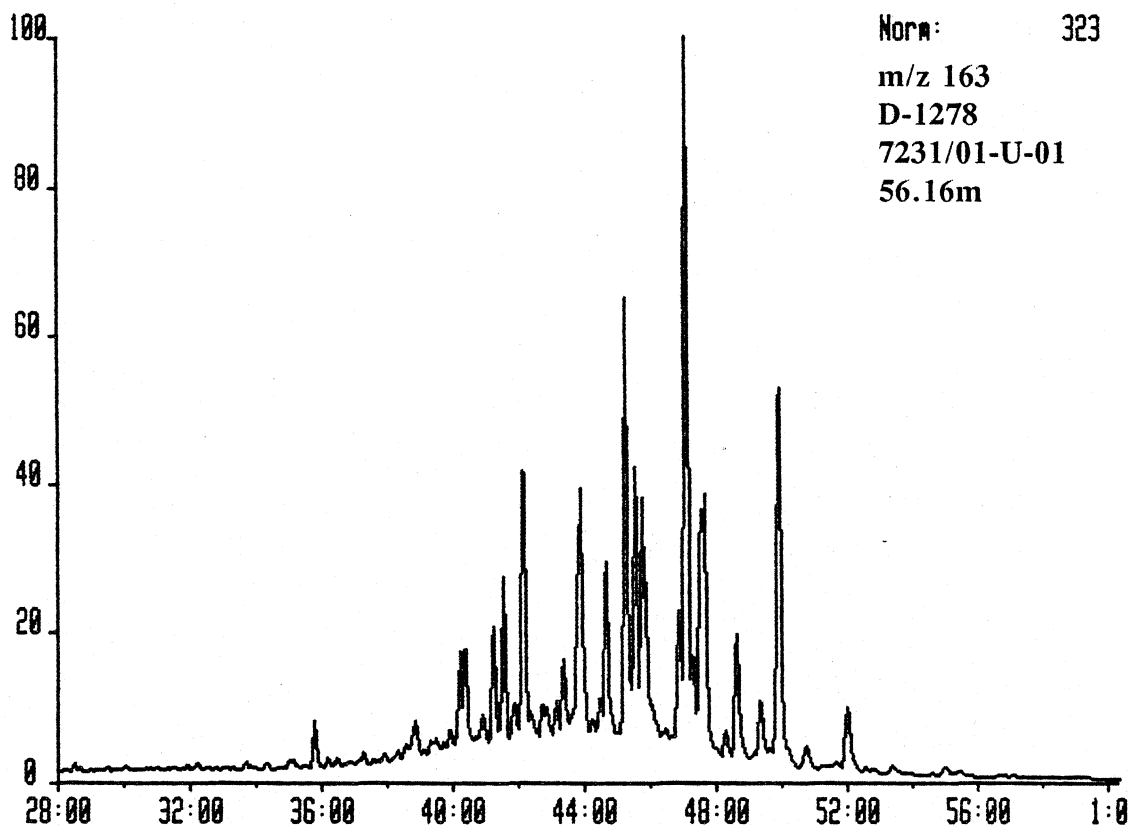
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 4 Injection 1

Group 1 Mass 163.1000

Text:



1304SAT 2-DEC-87

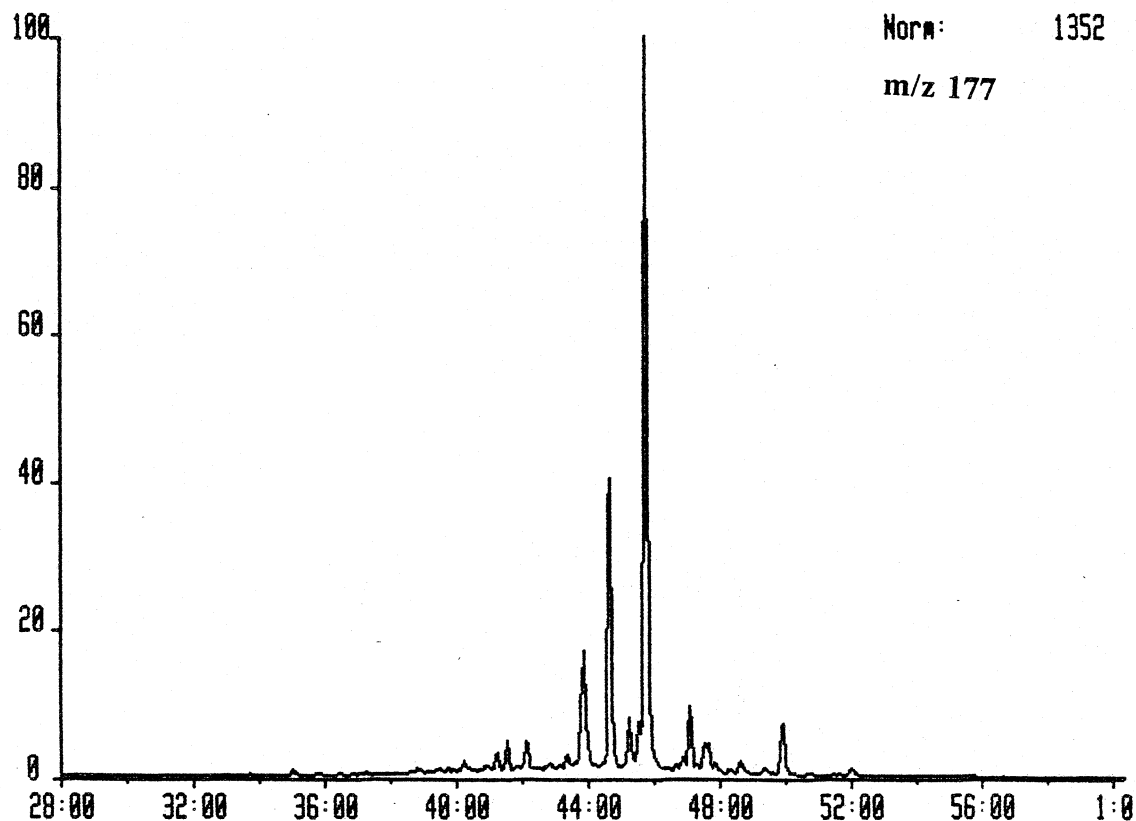
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 4 Injection 1

Group 1 Mass 177.1000

Text:





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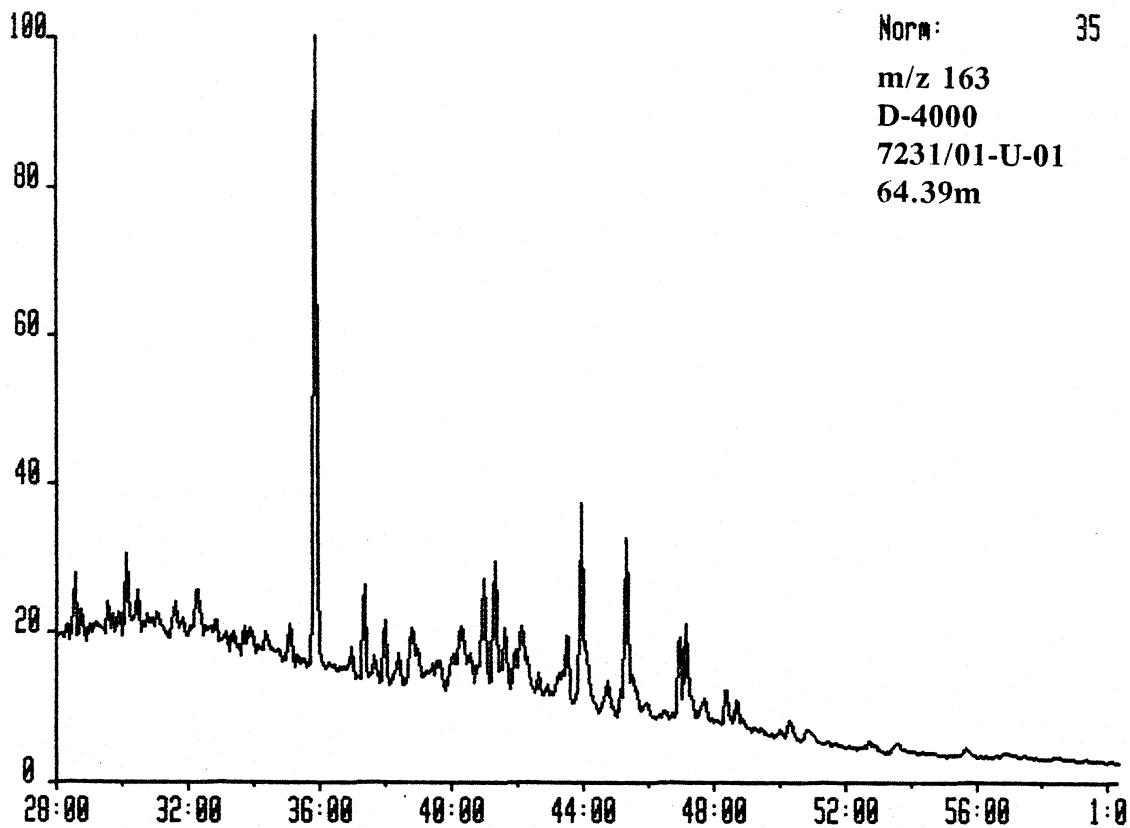
04000SAT 2-DEC-87

Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1 Group 1 Mass 163.1000

Text:



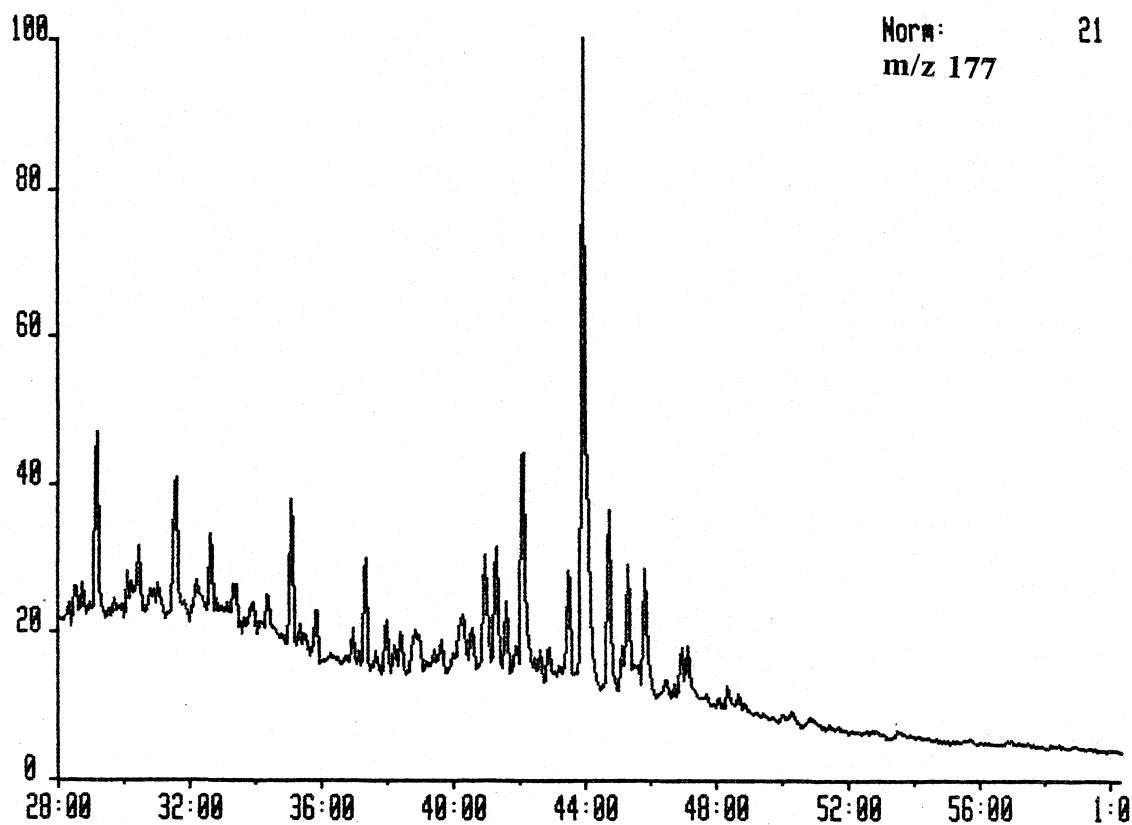
04000SAT 2-DEC-87

Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1 Group 1 Mass 177.1000

Text:



**IKU**

SINTEF-GRUPPEN

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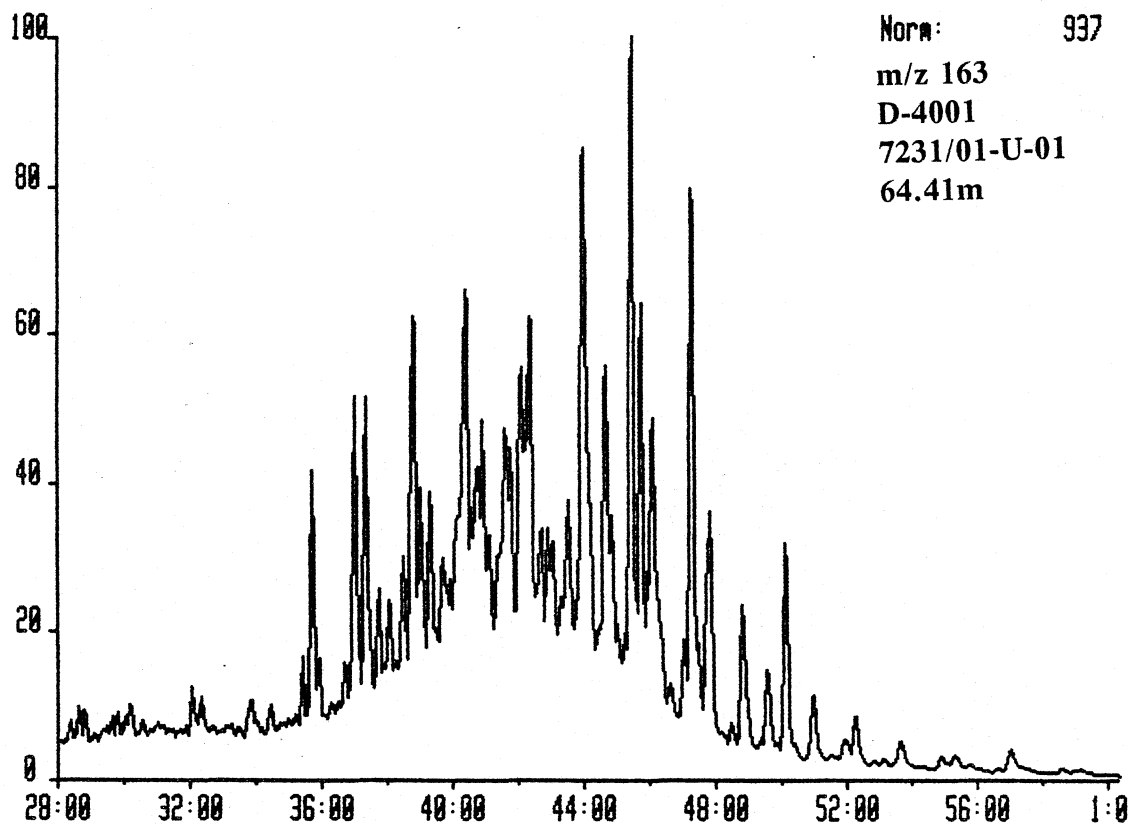
D1292SAT 30-NOV-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 2 Injection 1 Group 1 Mass 163.1000

Text:



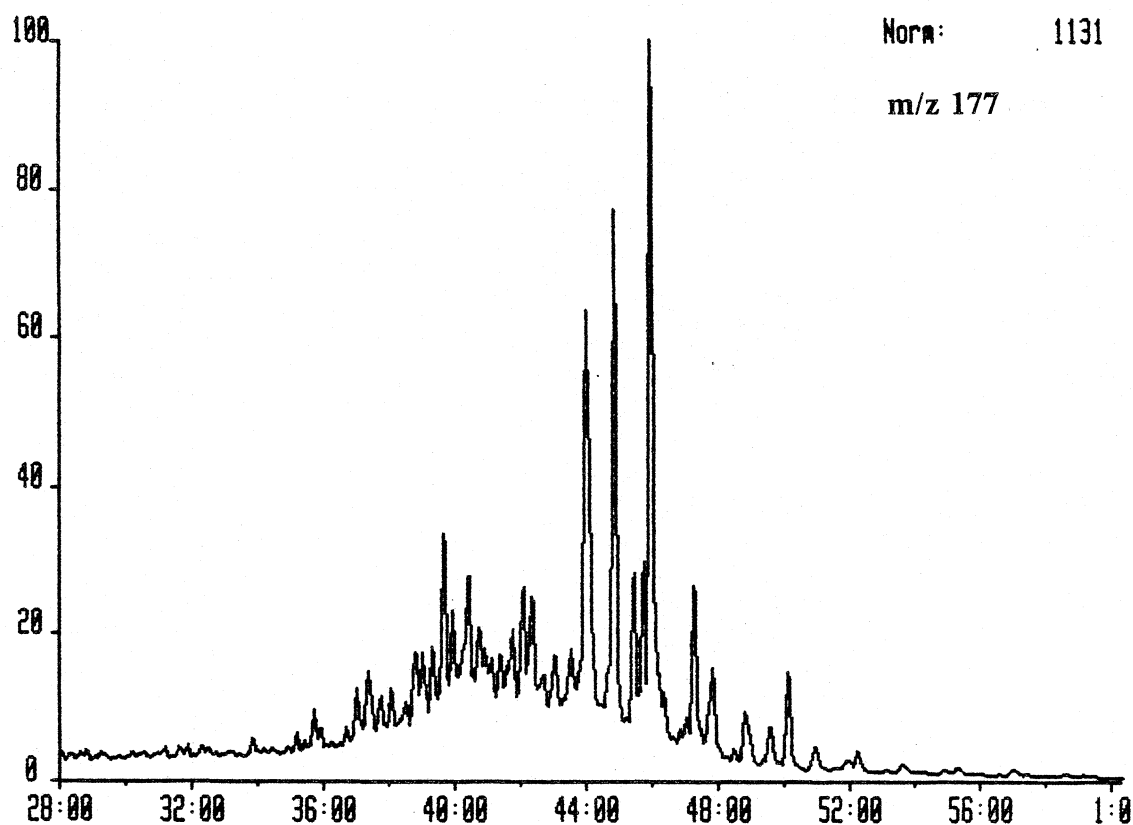
D1292SAT 30-NOV-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 2 Injection 1 Group 1 Mass 177.1000

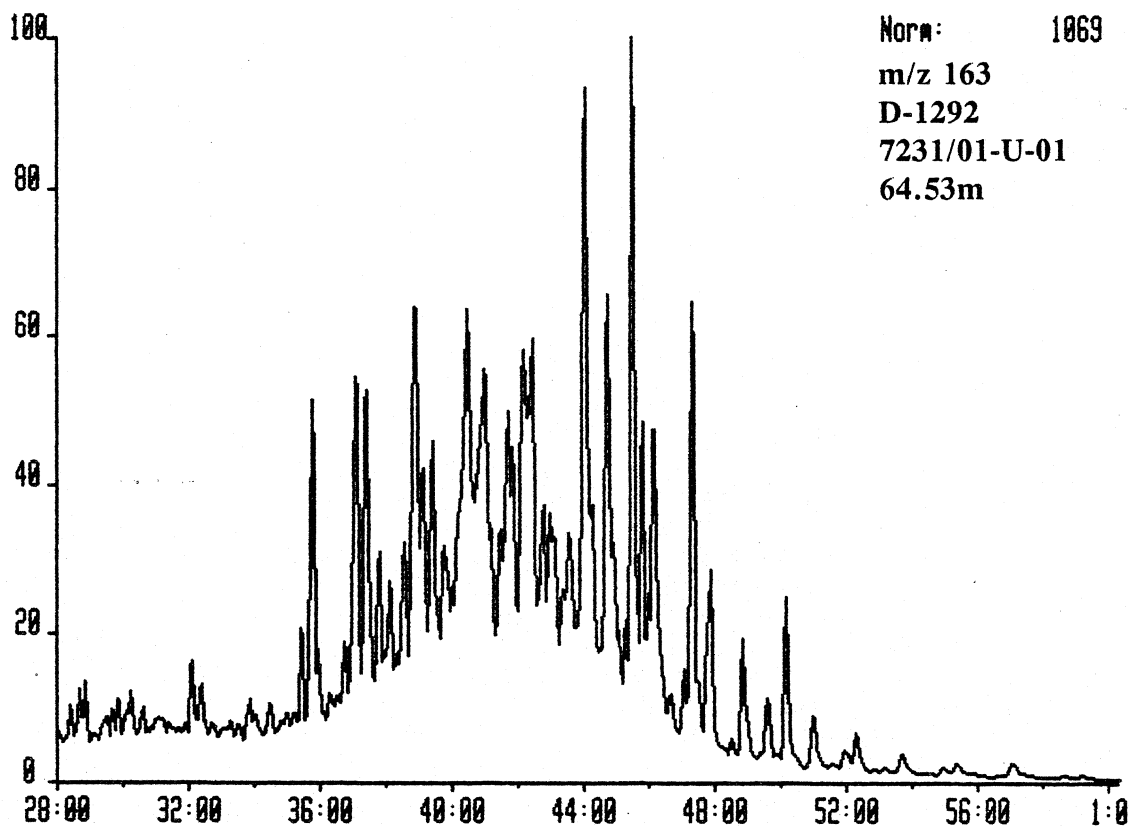
Text:



D1292SAT 30-NOV-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 163.1000

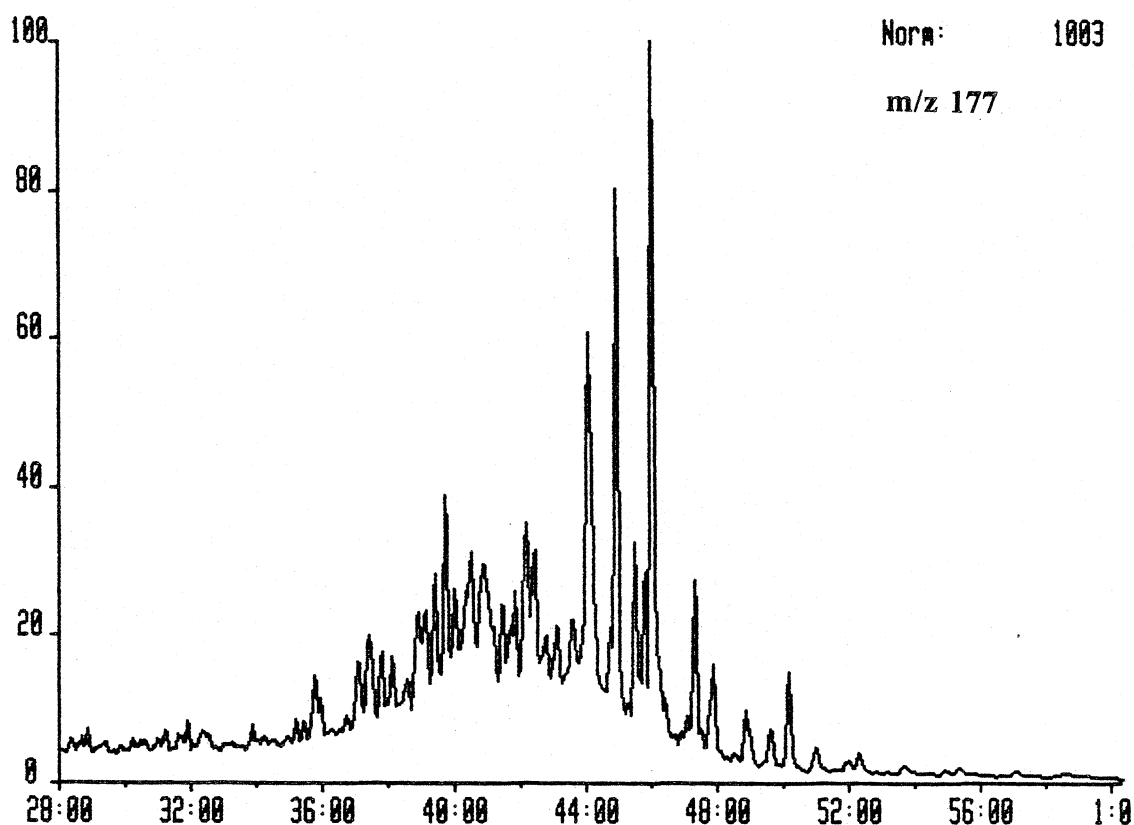
System: QUADSAT



D1292SAT 30-NOV-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 177.1000

System: QUADSAT





IKU
SINTEF-GRUPPEN

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D1241SAT 1-DEC-87

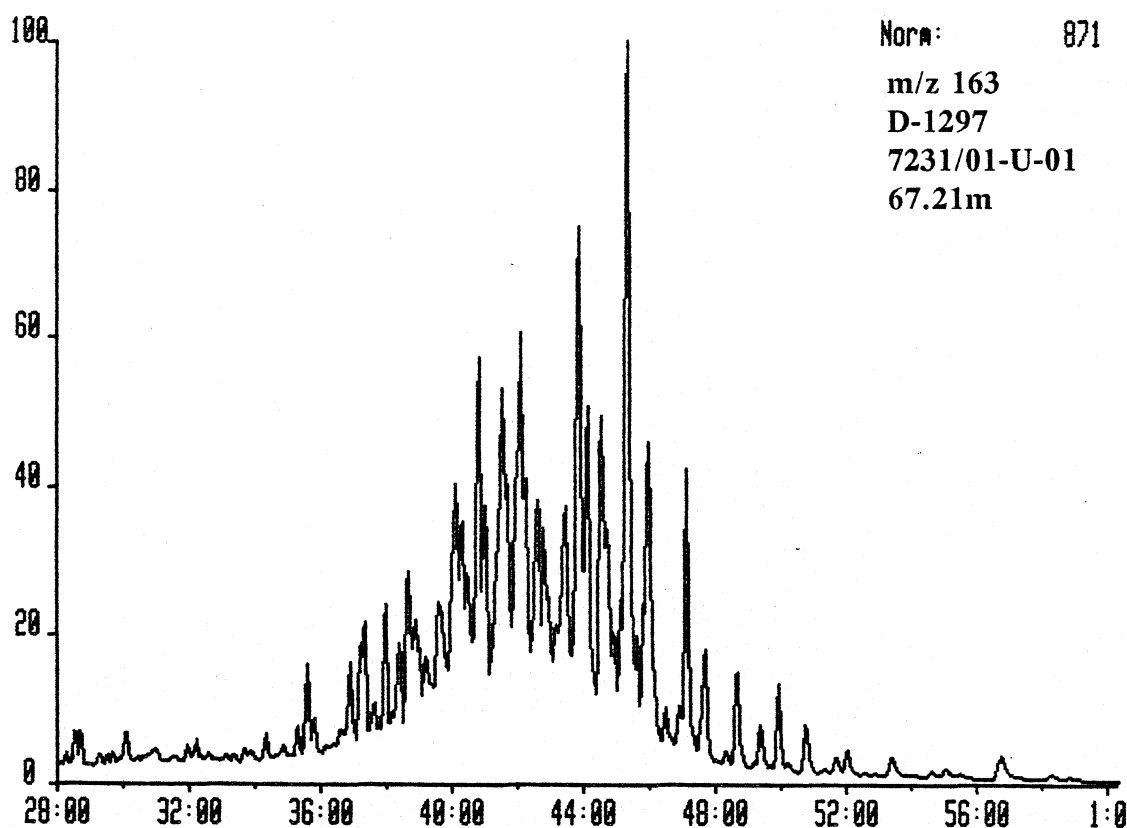
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 3 Injection 1

Group 1 Mass 163.1000

Text:



Norm: 871

m/z 163

D-1297

7231/01-U-01

67.21m

D1241SAT 1-DEC-87

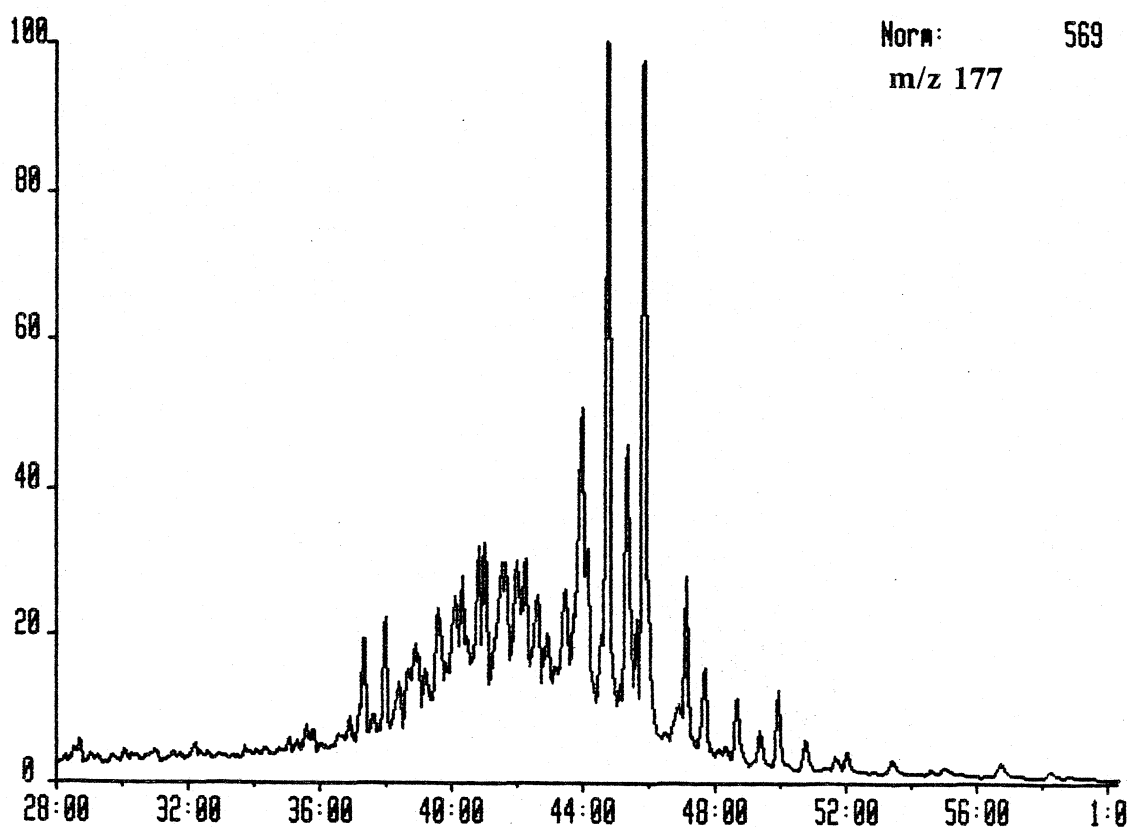
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 3 Injection 1

Group 1 Mass 177.1000

Text:

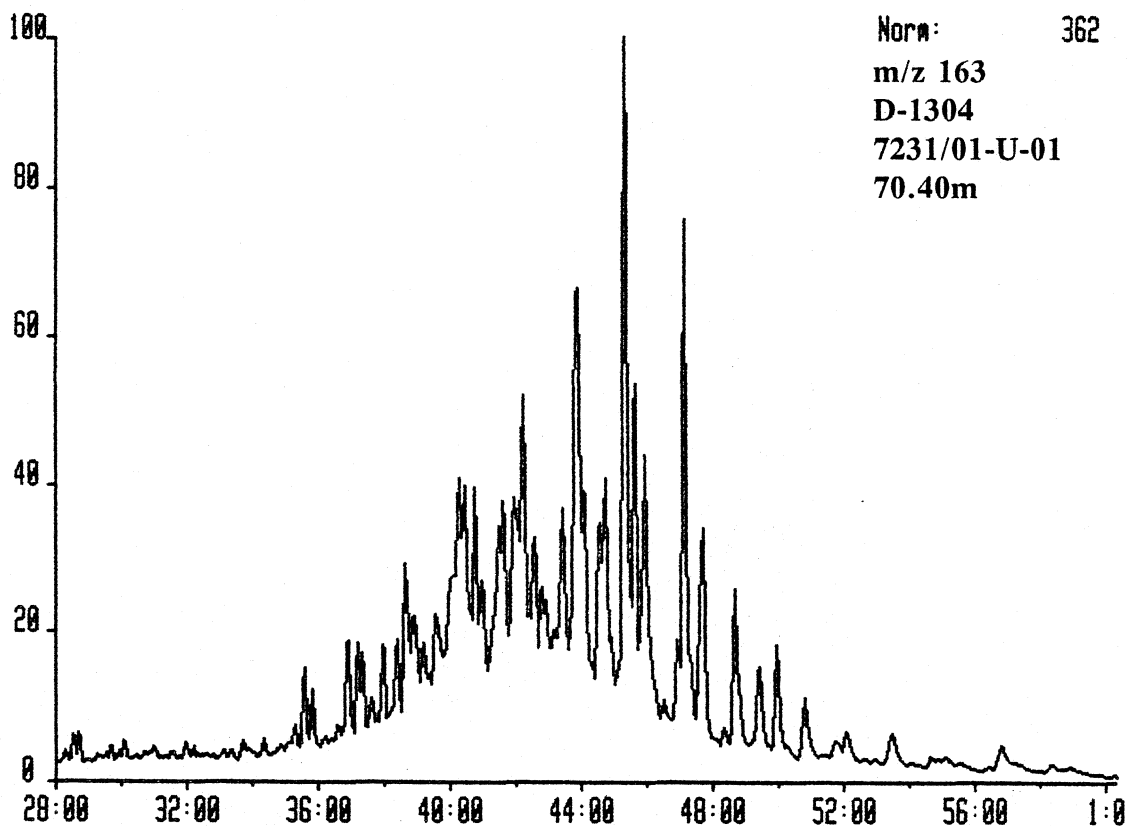


Norm: 569

m/z 177

1304SAT 2-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 163.1000
Text:

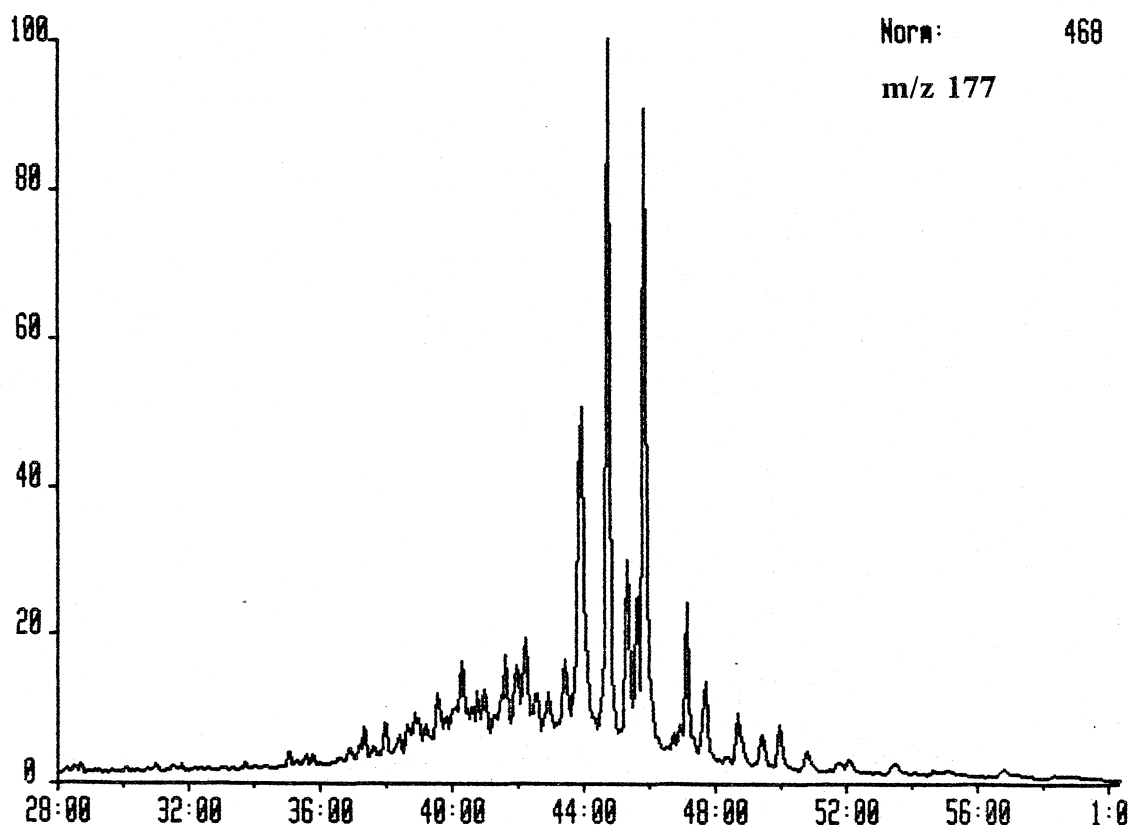
System:QUADSAT



Norm: 362
m/z 163
D-1304
7231/01-U-01
70.40m

1304SAT 2-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 177.1000
Text:

System:QUADSAT



Norm: 468
m/z 177

**IKU**

SINTEF-GRUPPEN

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D1317SAT 1-DEC-87

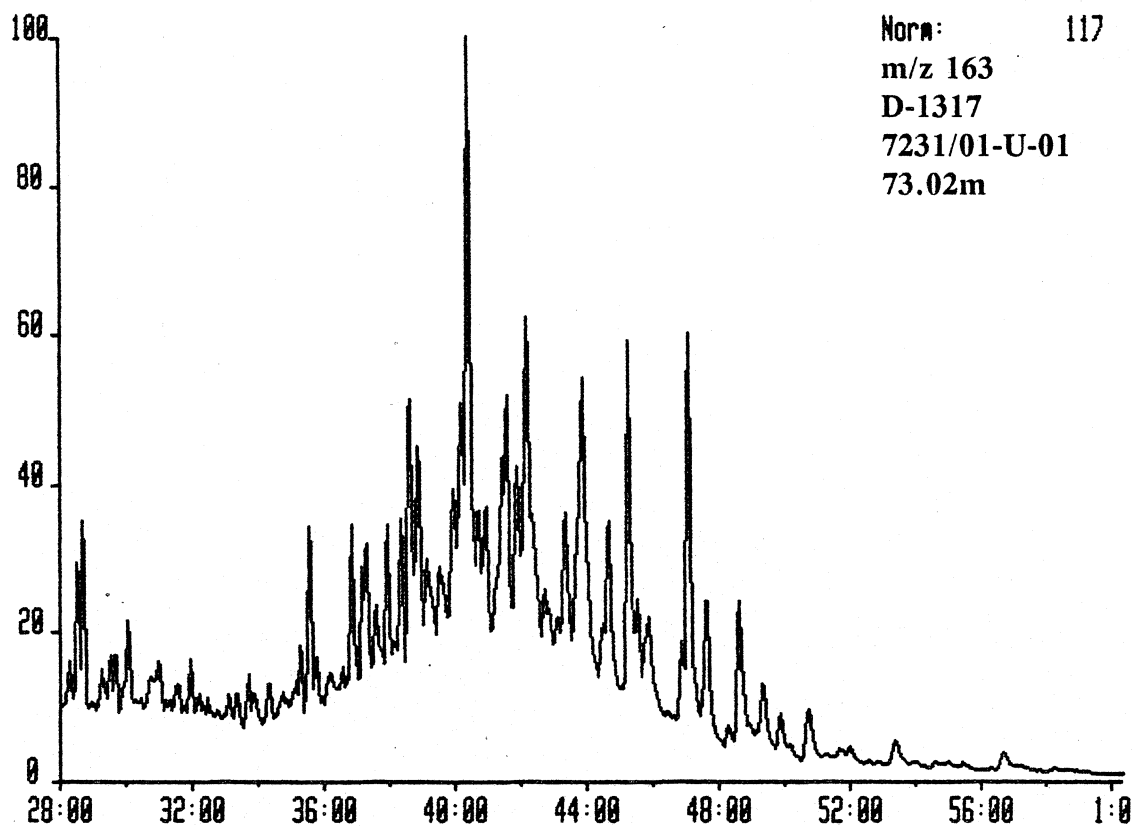
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

Group 1 Mass 163.1000

Text:



D1317SAT 1-DEC-87

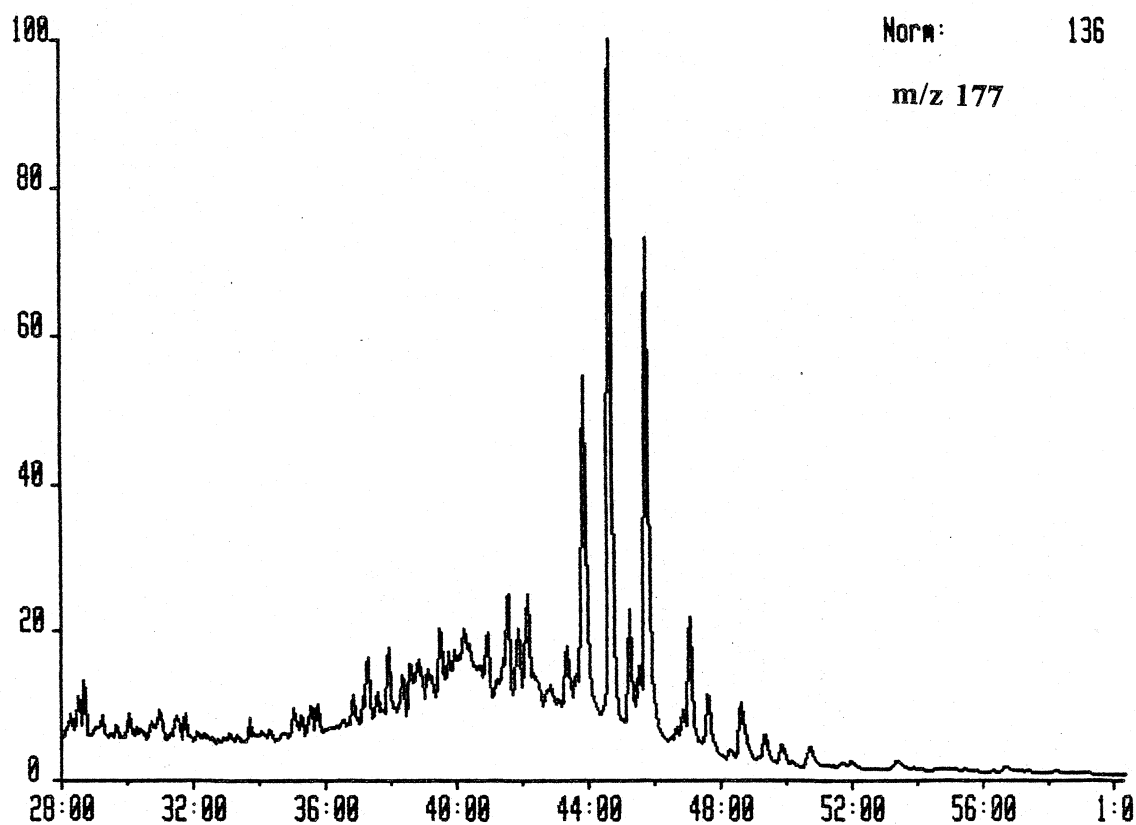
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

Group 1 Mass 177.1000

Text:



**IKU**

SINTEF-GRUPPEN

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D1317SAT 1-DEC-87

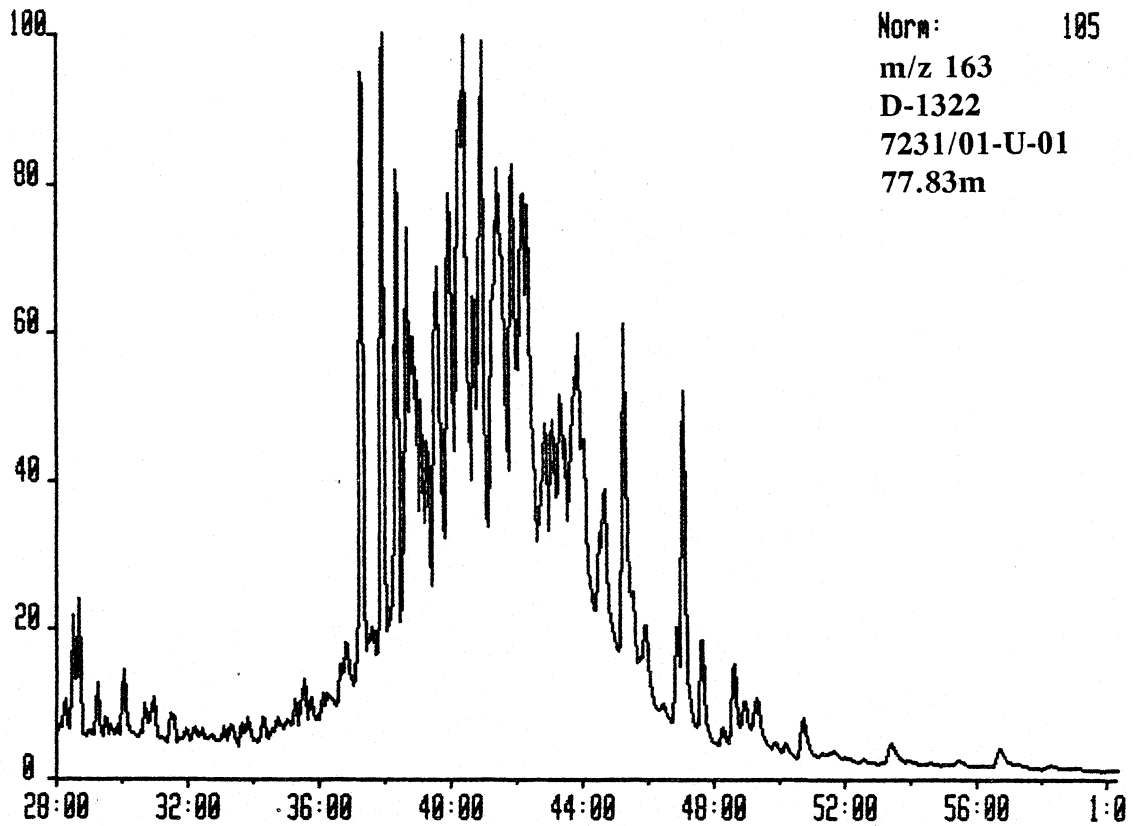
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 163.1000

Text:



D1317SAT 1-DEC-87

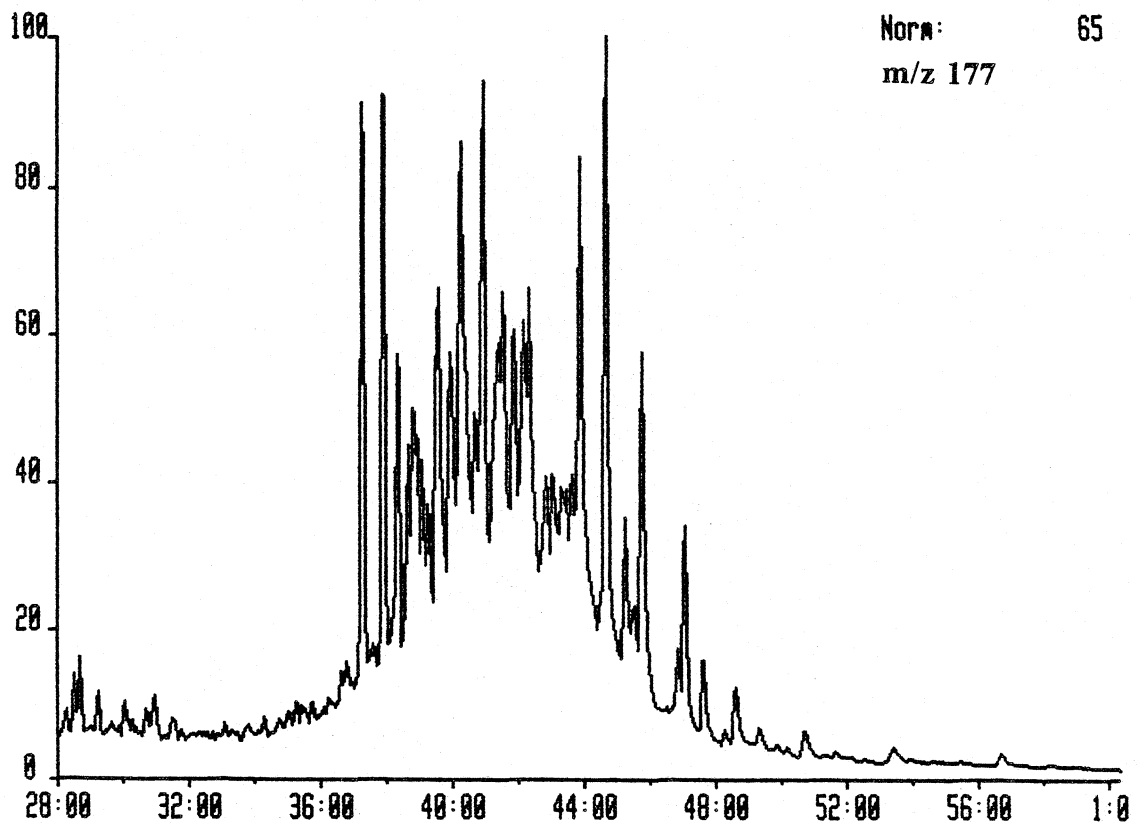
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 177.1000

Text:



**IKU**

SINTEF-GRUPPEN

- 110 -

D4000SAT 2-DEC-87

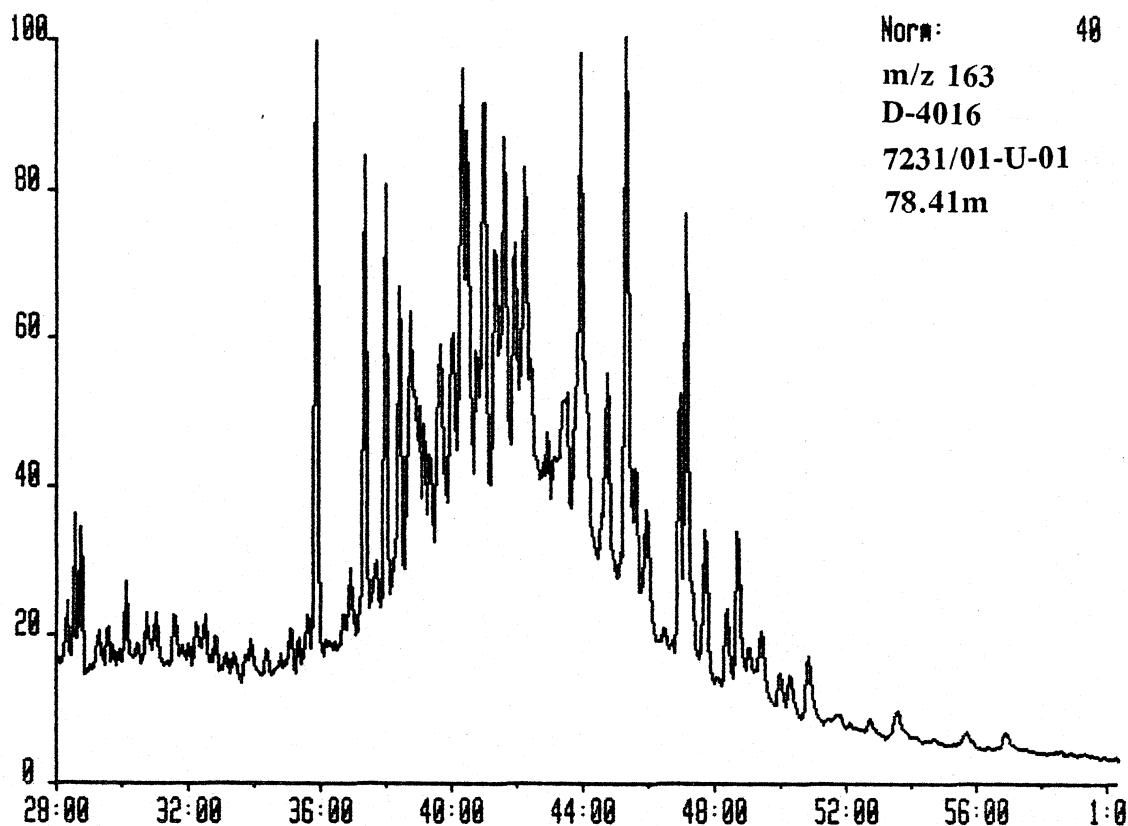
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 163.1000

Text:



D4000SAT 2-DEC-87

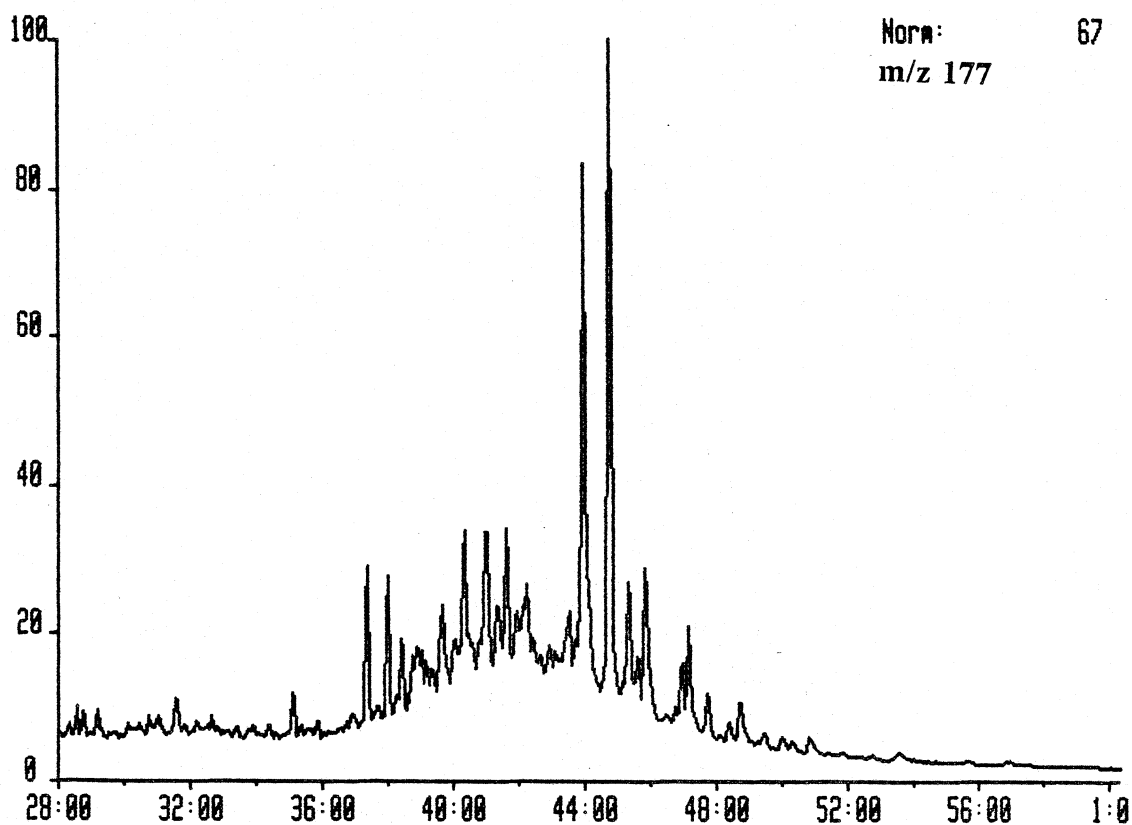
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 177.1000

Text:



**IKU**

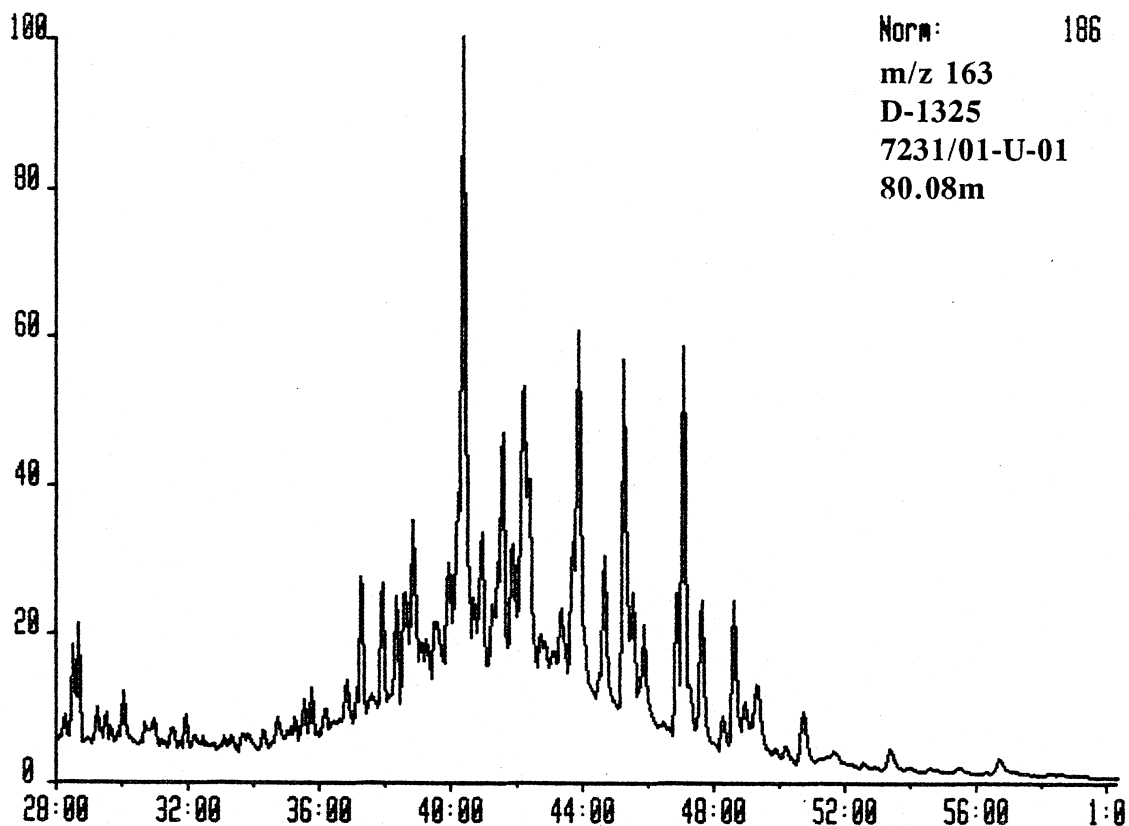
SINTEF-GRUPPEN

- 111 -

D1317SAT 1-DEC-87
Sample 3 Injection 1
Text:

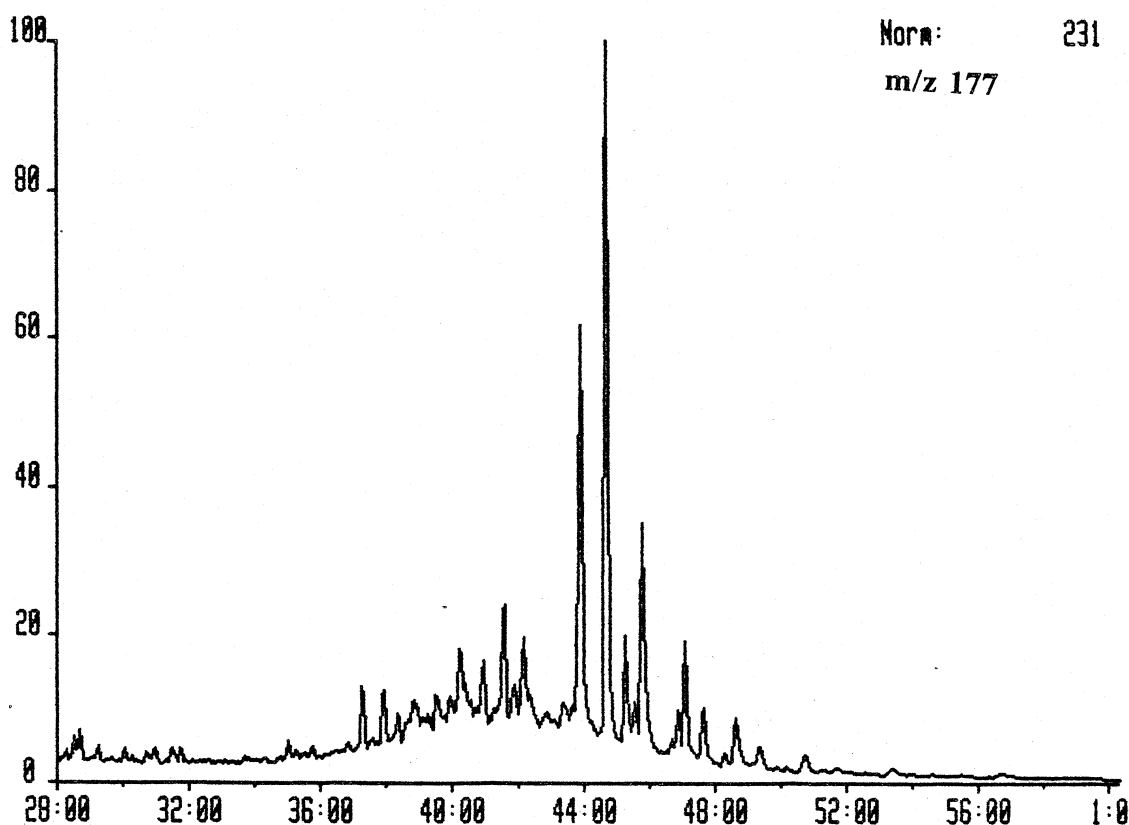
Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 163.1000

System: QUADSAT



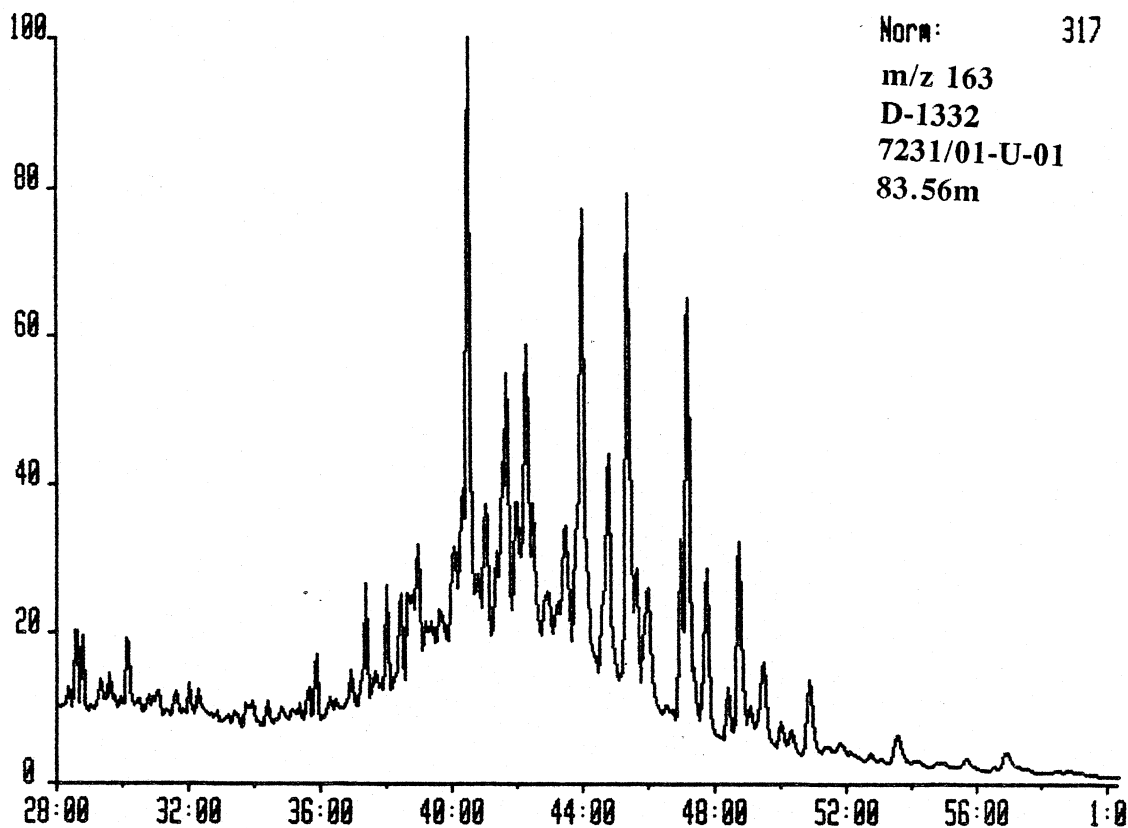
D1317SAT 1-DEC-87 Sir: Voltage 12-250 Acnt: IKU
Sample 3 Injection 1 Group 1 Mass 177.1000
Text:

System: QUADSAT



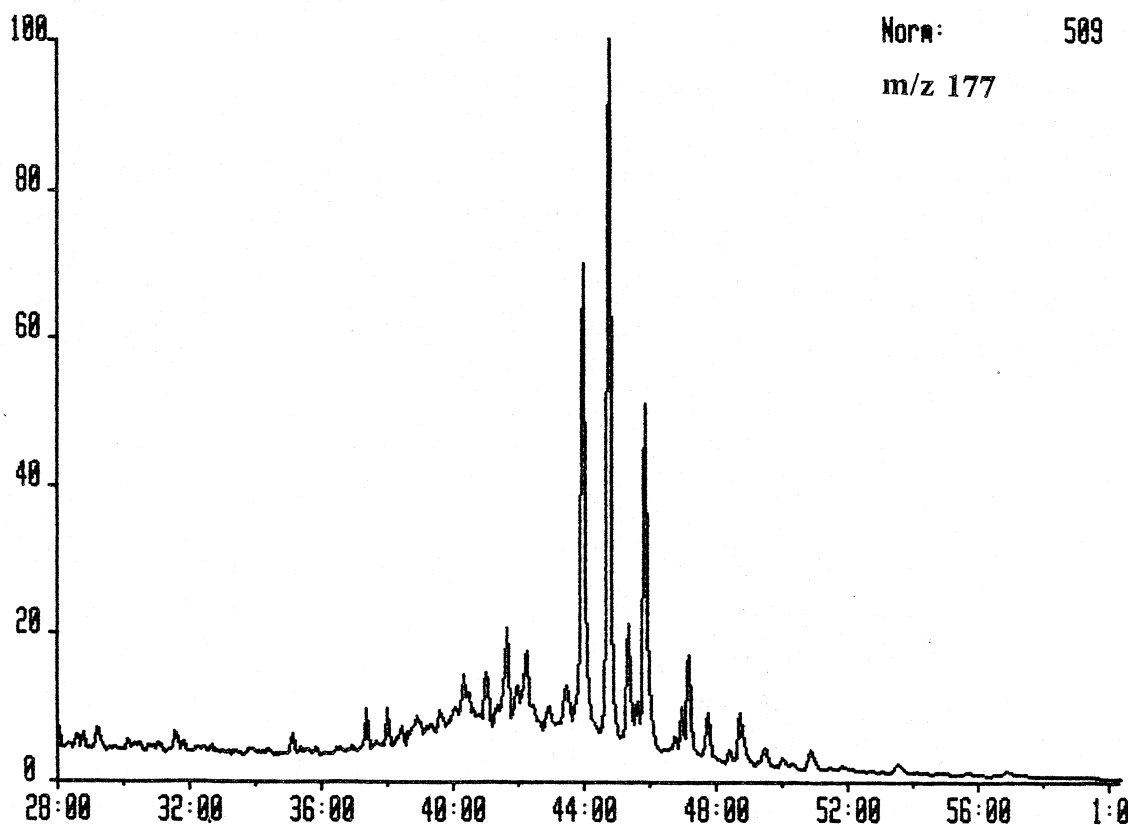
1304SAT 2-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 163.1000
Text:

System:QUADSAT



1304SAT 2-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 177.1000
Text:

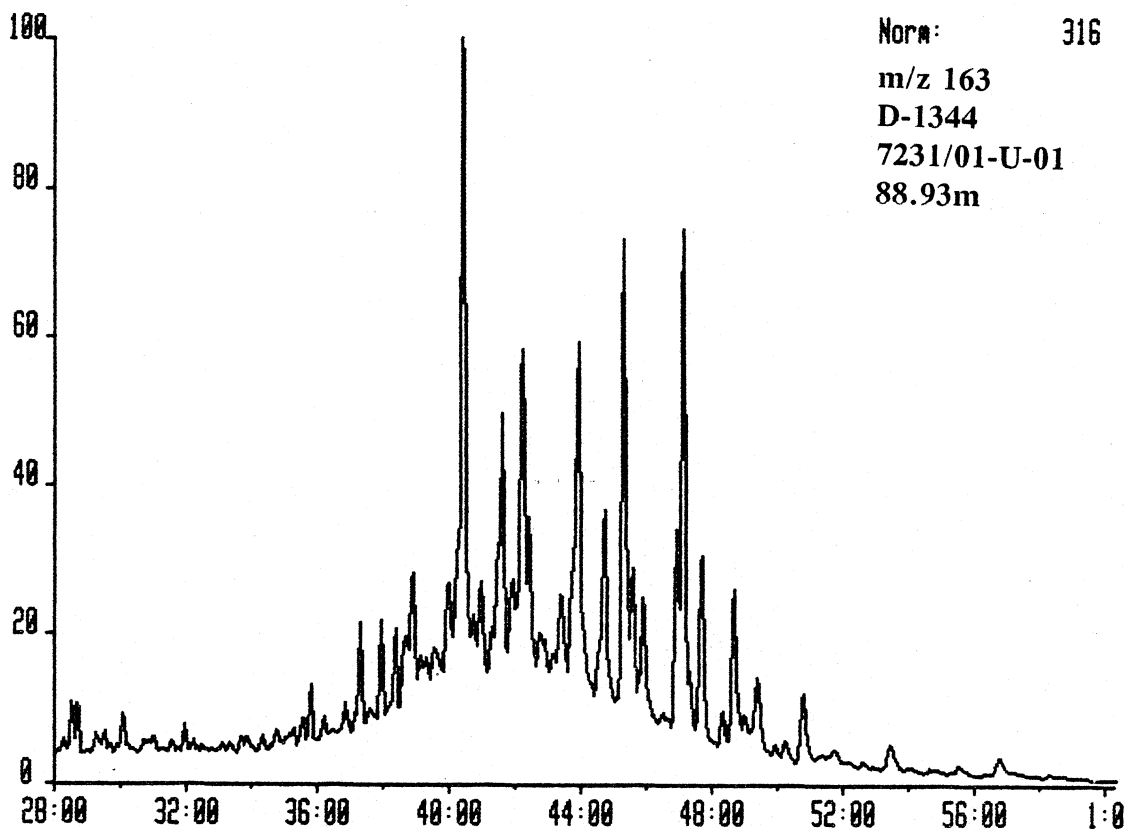
System:QUADSAT



1304SAT 2-DEC-87
Sample 3 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 163.1000

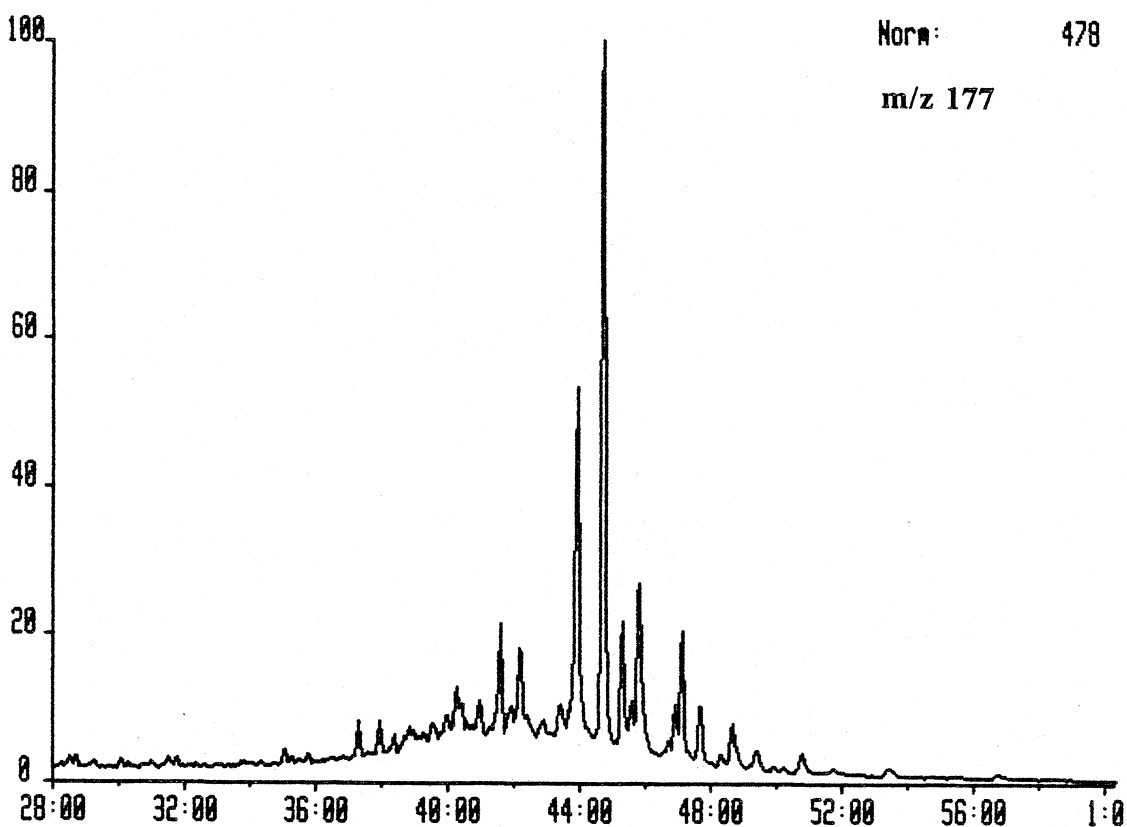
System: QUADSAT



1304SAT 2-DEC-87
Sample 3 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 177.1000

System: QUADSAT



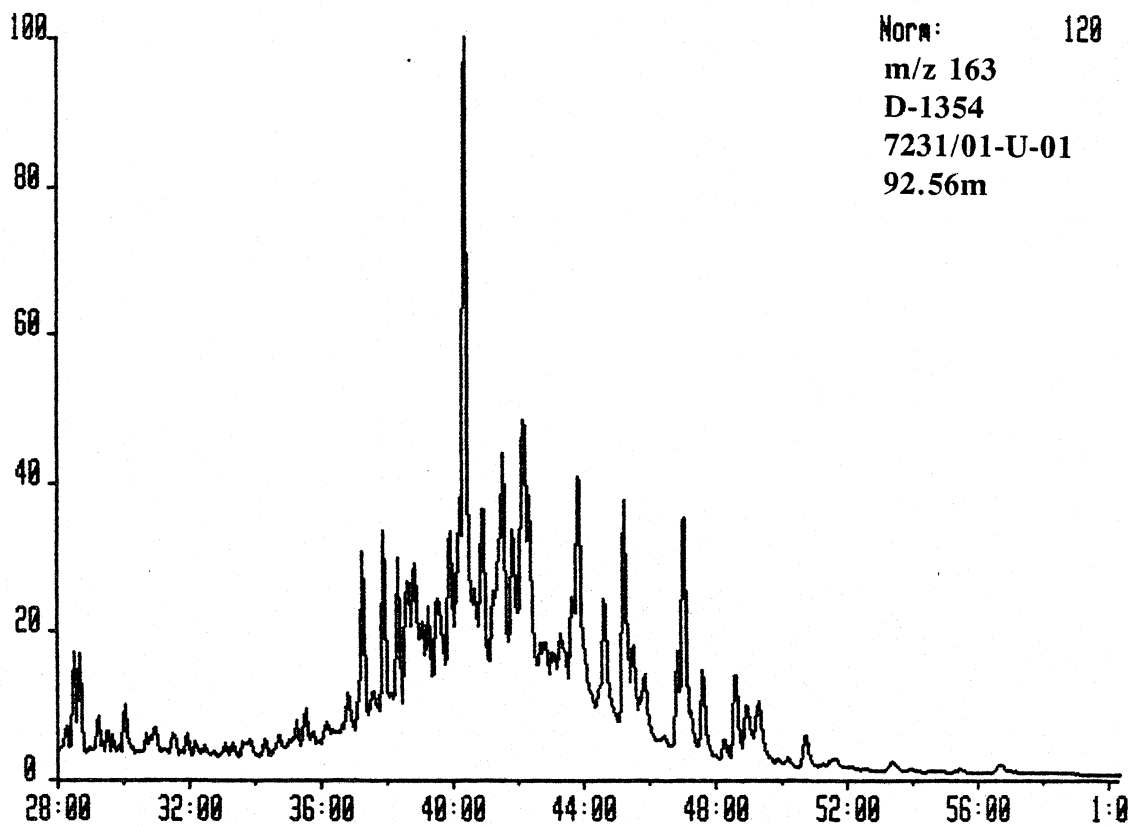


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D1317SAT 1-DEC-87
Sample 4 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 163.1000

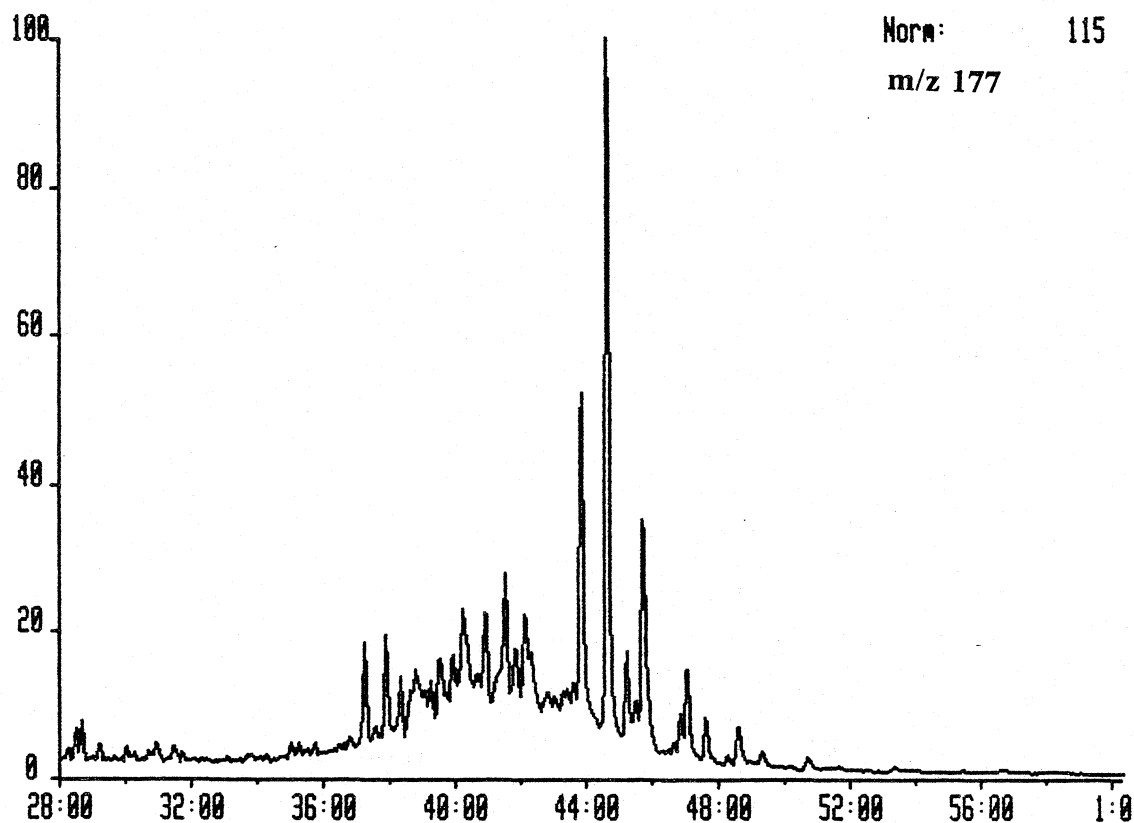
System: QUADSAT



Norm: 120
m/z 163
D-1354
7231/01-U-01
92.56m

D1317SAT 1-DEC-87 Sir: Voltage 12-250 Acnt: IKU
Sample 4 Injection 1 Group 1 Mass 177.1000
Text:

System: QUADSAT



Norm: 115
m/z 177

Figure A.II.1.4:

Mass fragmentograms of m/z 217, 218, 231, 259 (steranes)



IKU

SINTEF-GRUPPEN

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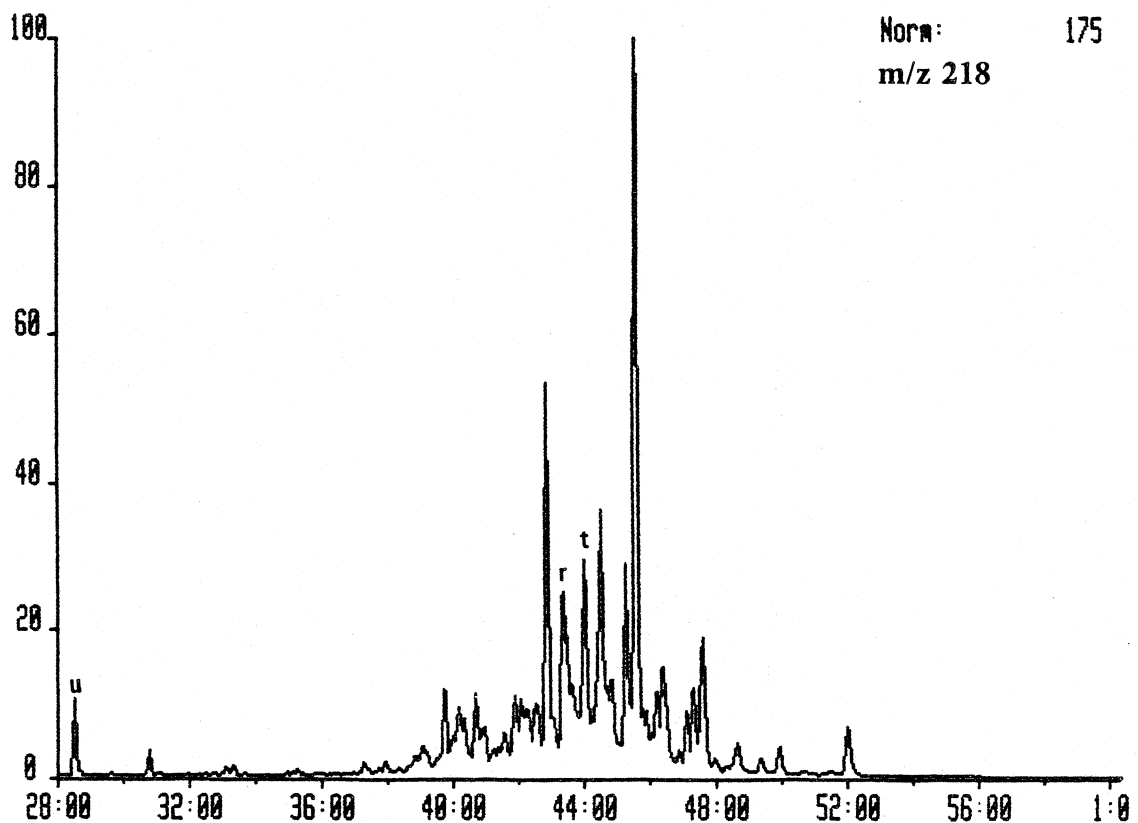
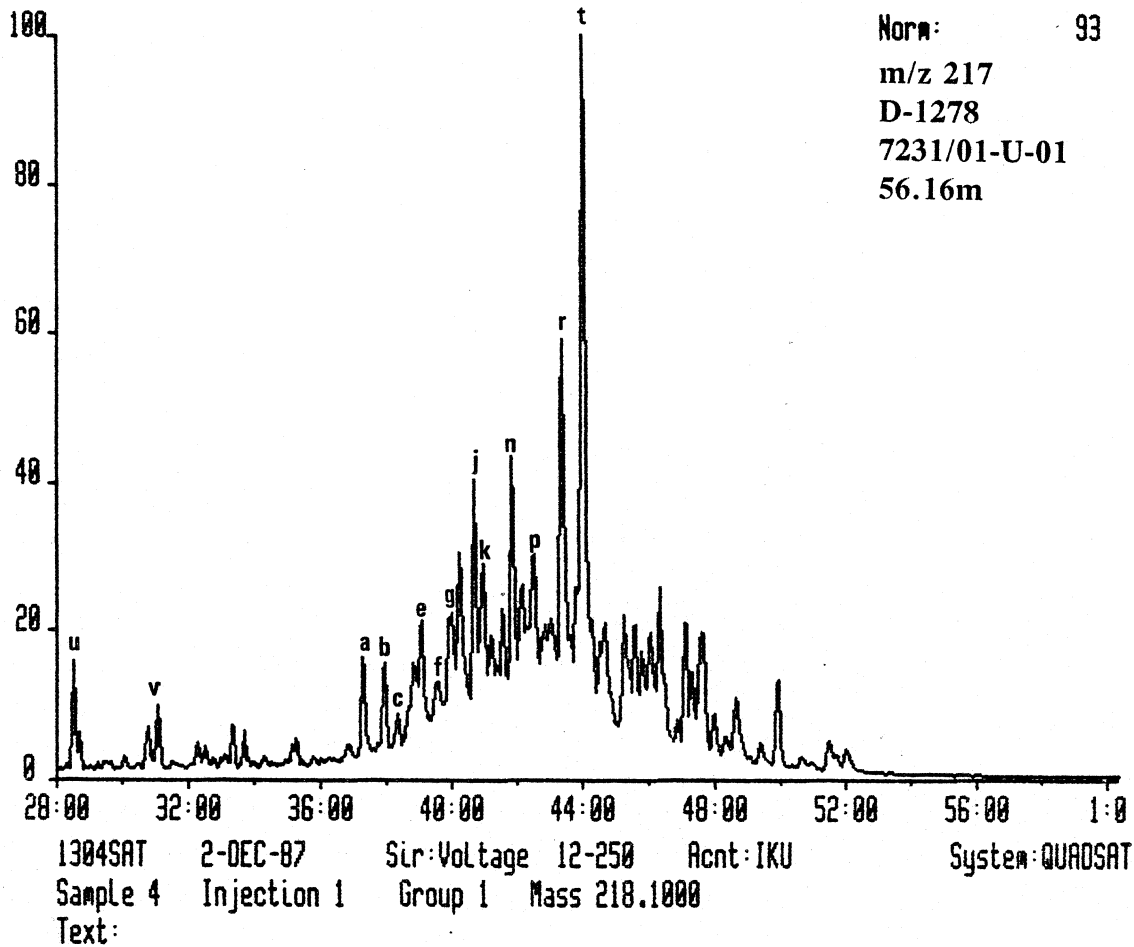
1304SAT 2-DEC-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 4 Injection 1 Group 1 Mass 217.1000

Text:





IKU
SINTEF-GRUPPEN

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04000SAT 2-DEC-87

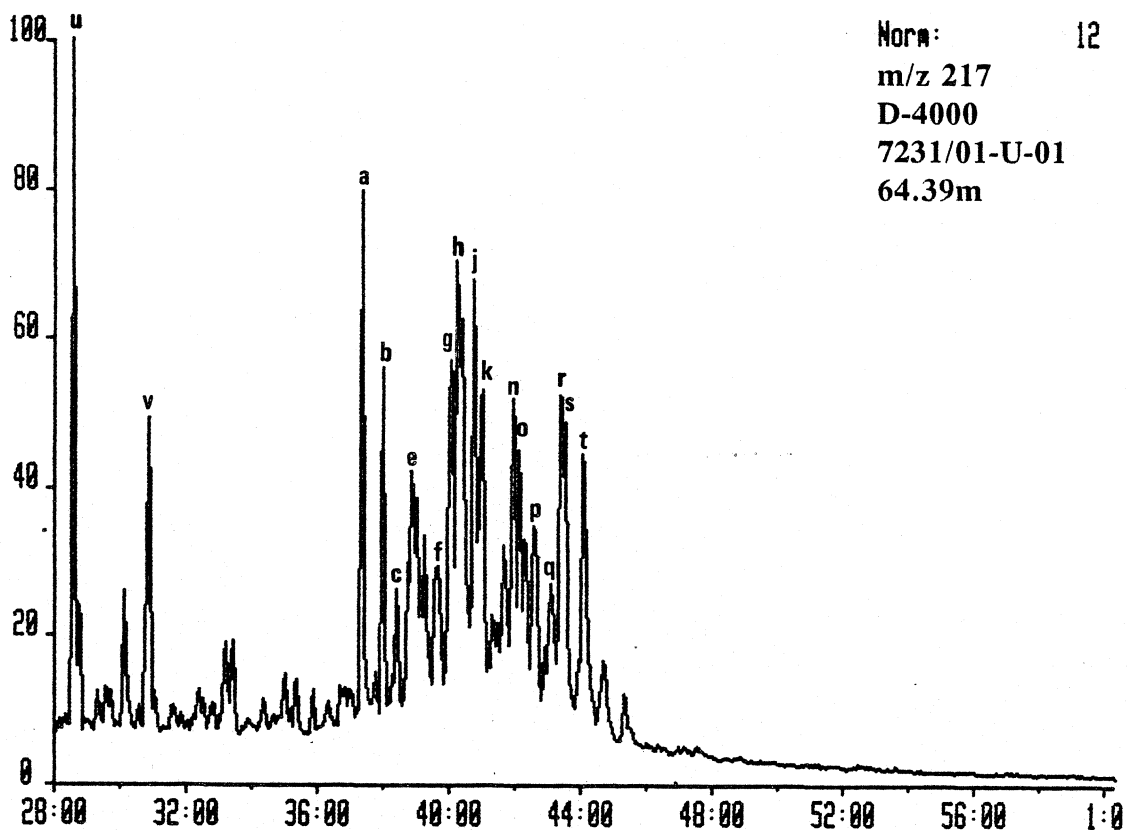
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 217.1000

Text:



Norm: 12
m/z 217
D-4000
7231/01-U-01
64.39m

04000SAT 2-DEC-87

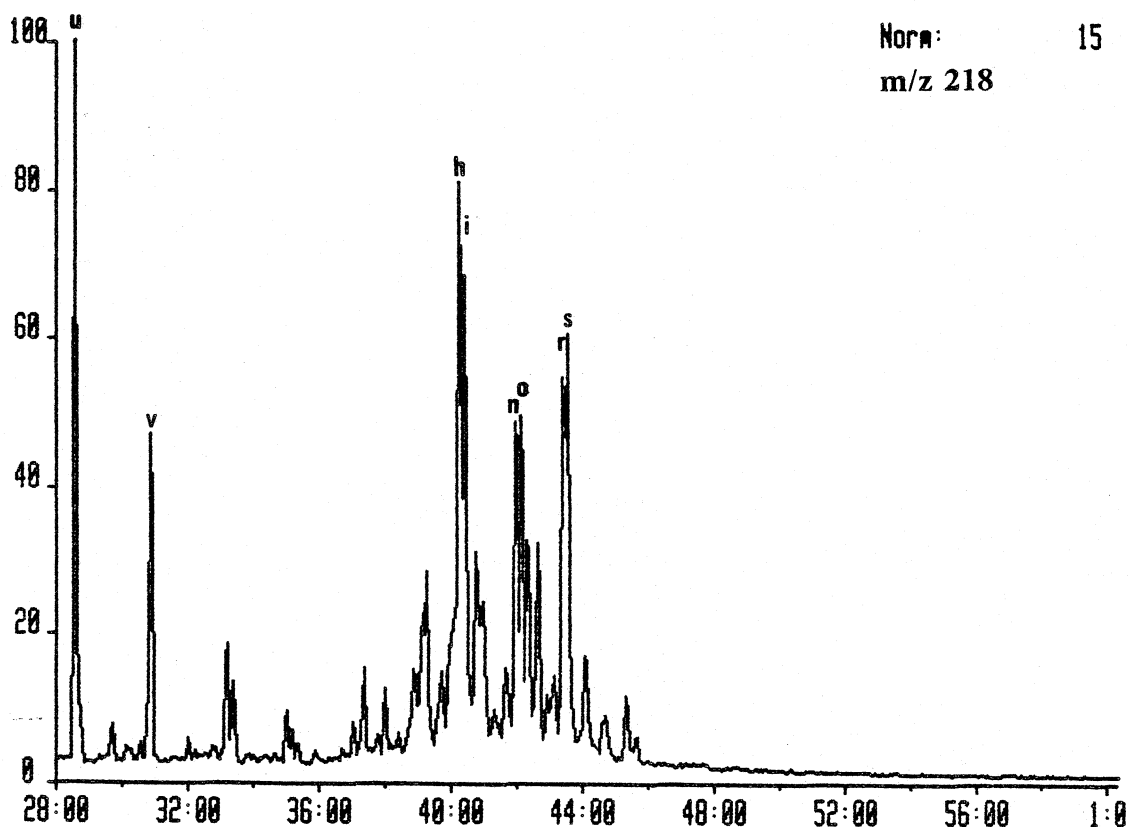
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 218.1000

Text:



Norm: 15
m/z 218



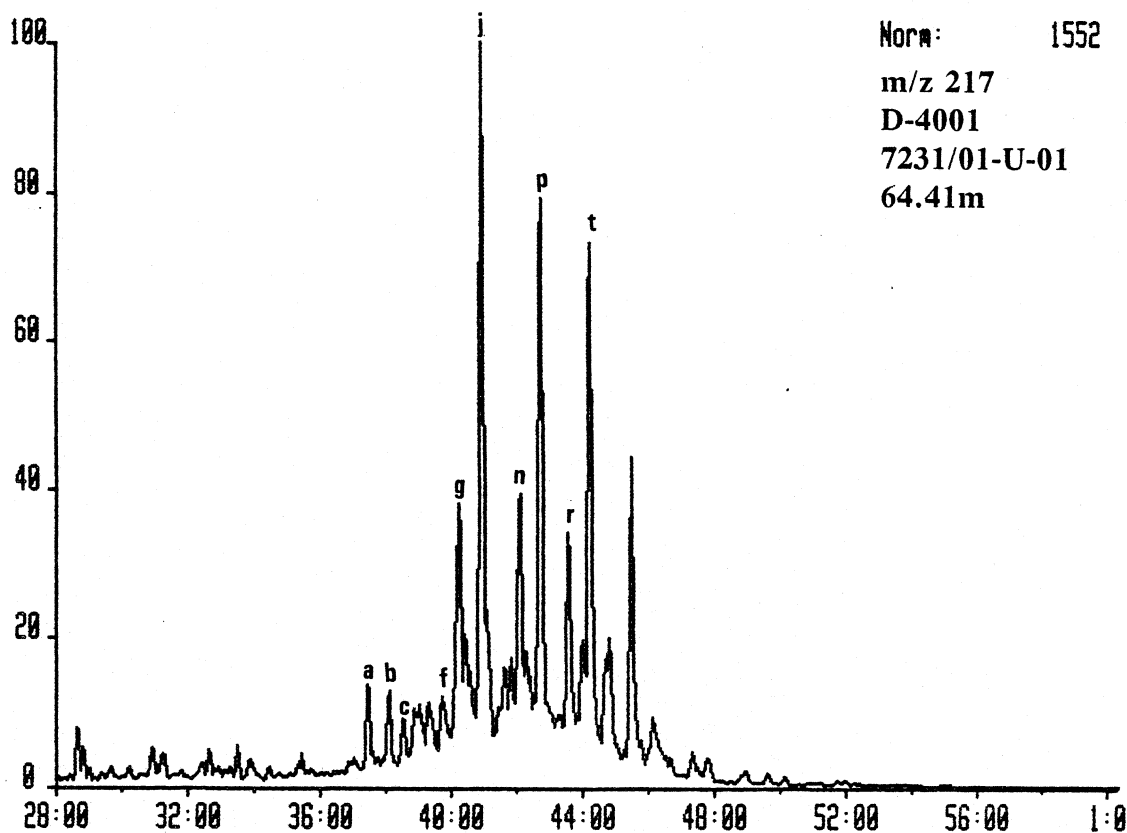
IKU
SINTEF-GRUPPEN

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D1292SAT 30-NOV-87
Sample 2 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 217.1000

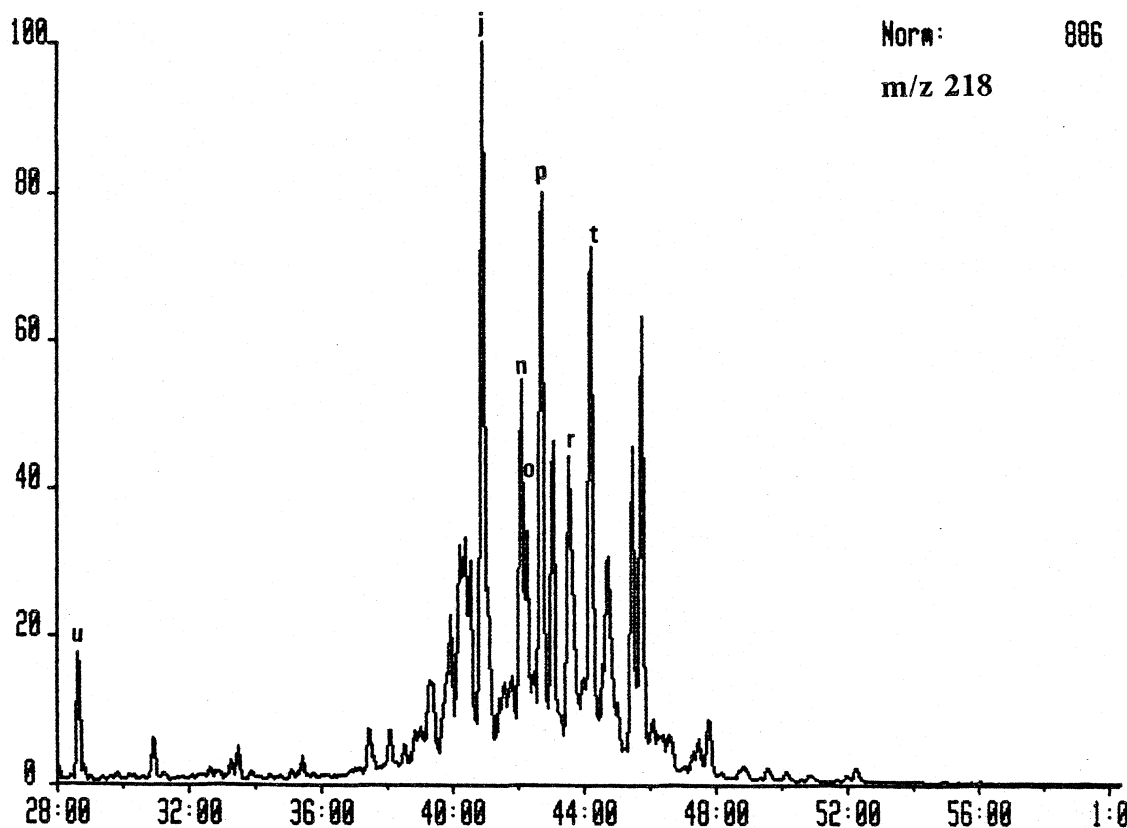
System: QUADSAT



Norm: 1552
m/z 217
D-4001
7231/01-U-01
64.41m

D1292SAT 30-NOV-87 Sir: Voltage 12-250 Acnt: IKU
Sample 2 Injection 1 Group 1 Mass 218.1000
Text:

System: QUADSAT



Norm: 886
m/z 218

D1292SAT 30-NOV-87

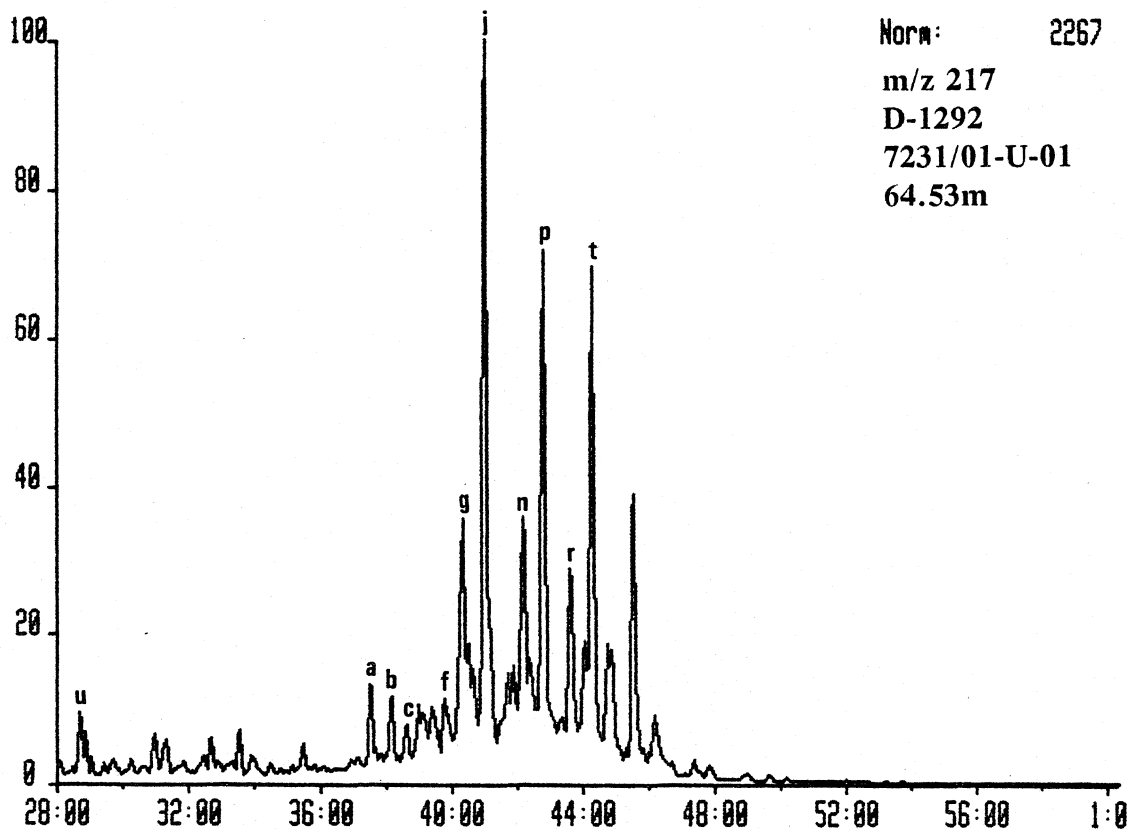
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

Group 1 Mass 217.1000

Text:



D1292SAT 30-NOV-87

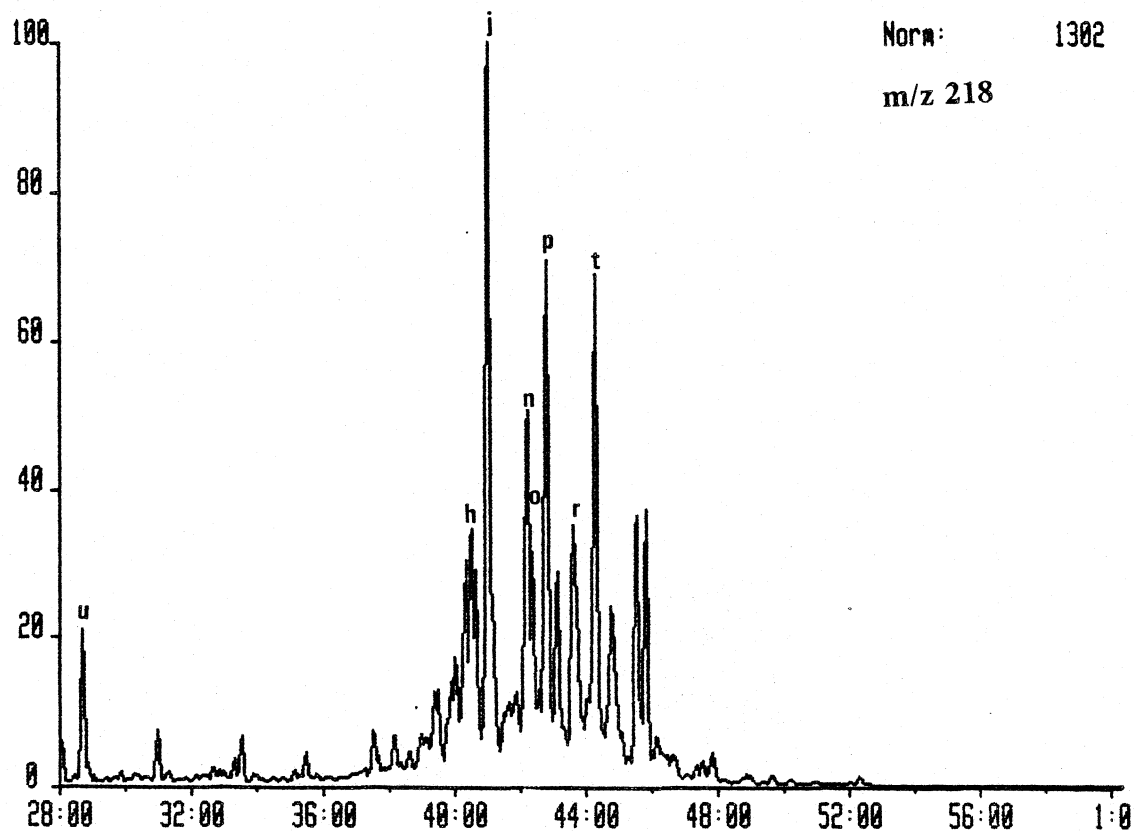
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

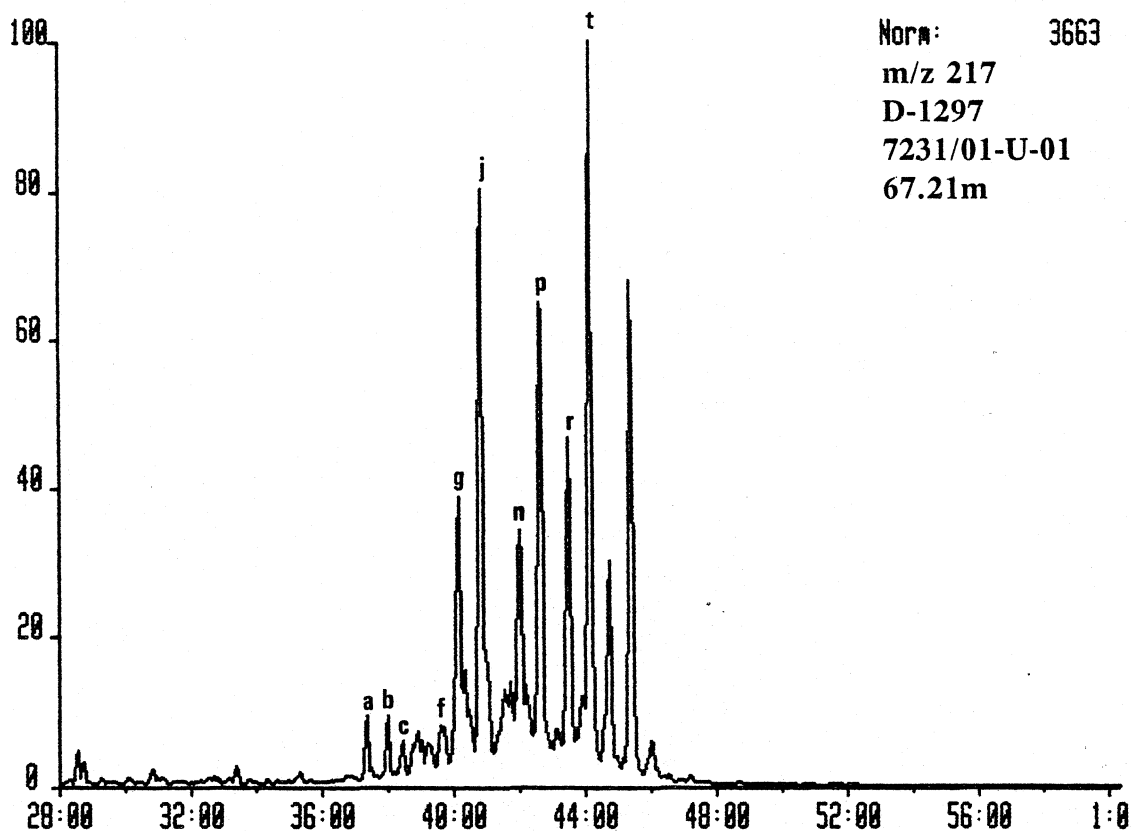
Group 1 Mass 218.1000

Text:



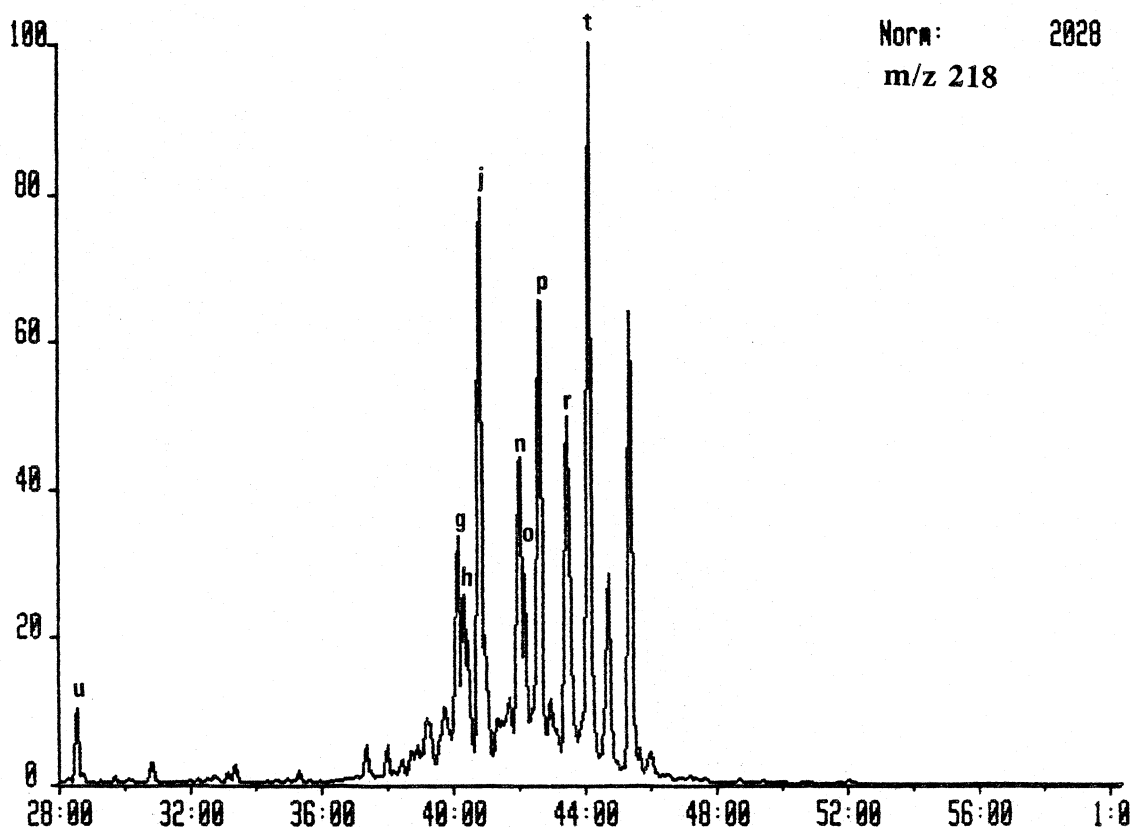
D1241SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 3 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



D1241SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 3 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT



**IKU**

SINTEF-GRUPPEN

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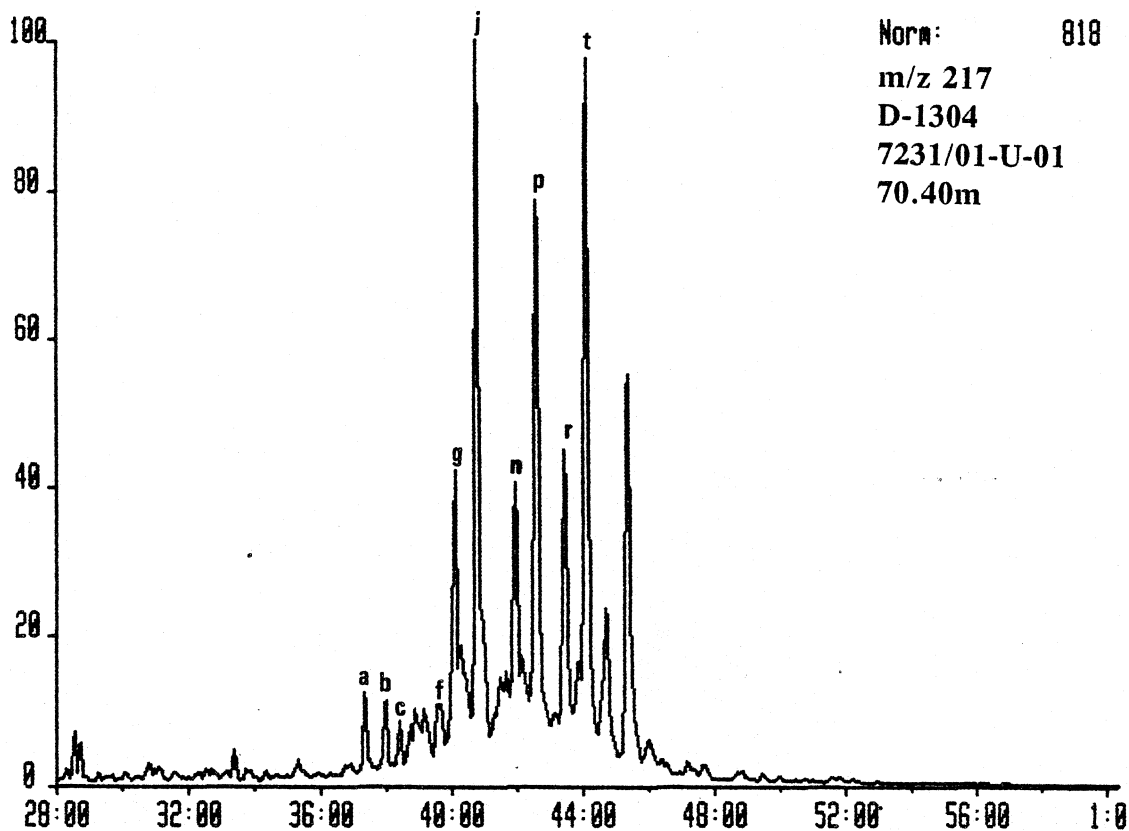
1304SAT 2-DEC-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1 Group 1 Mass 217.1000

Text:



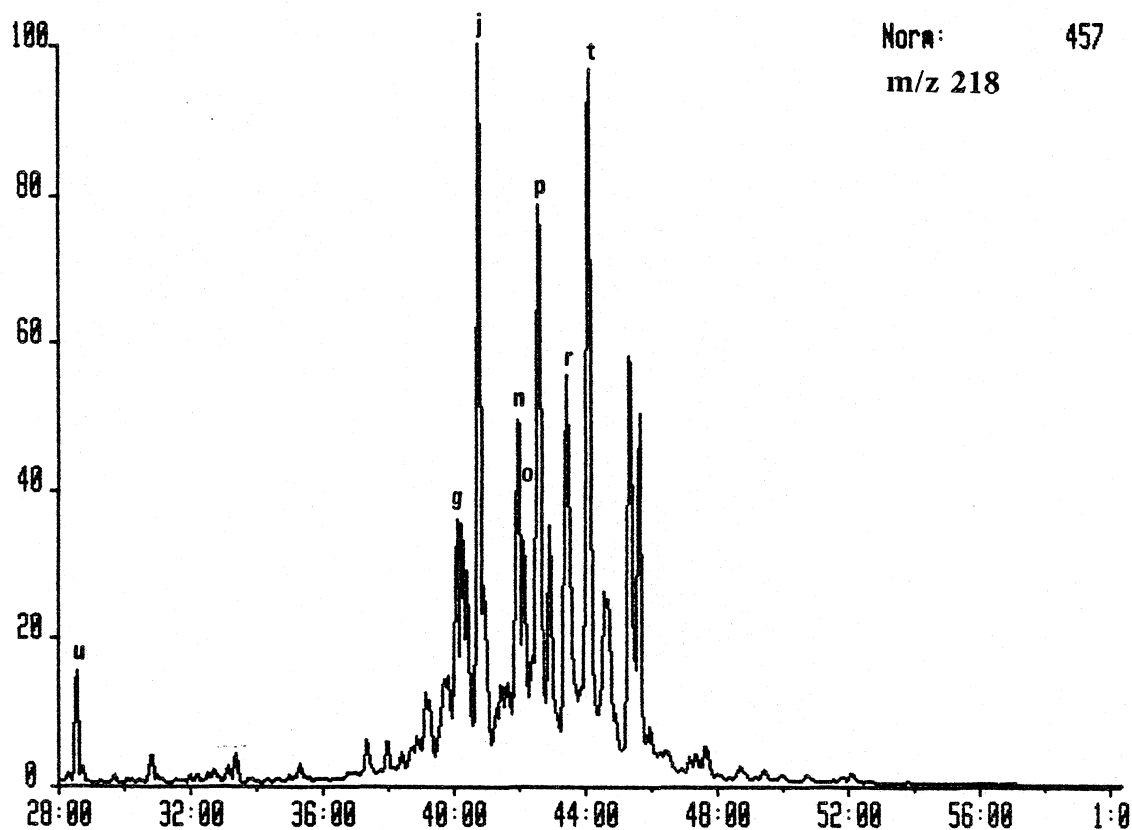
1304SAT 2-DEC-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

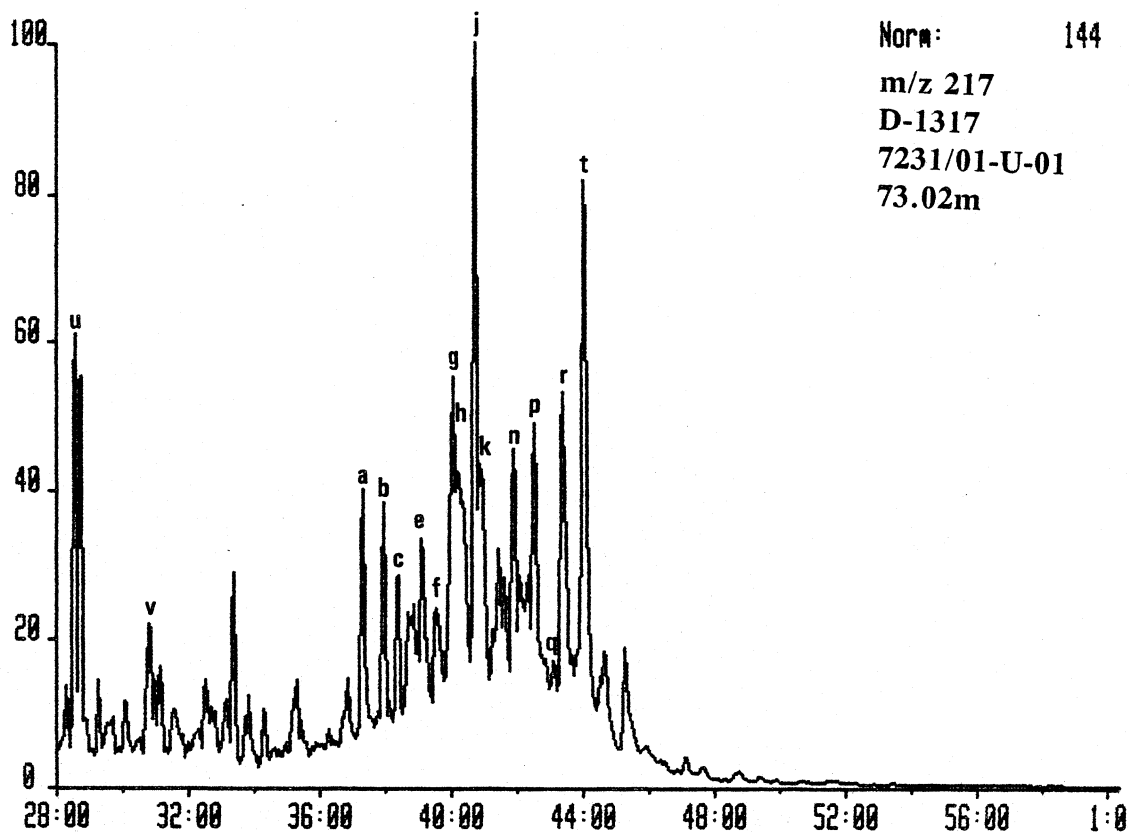
Sample 1 Injection 1 Group 1 Mass 218.1000

Text:



D1317SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 217.1000
Text:

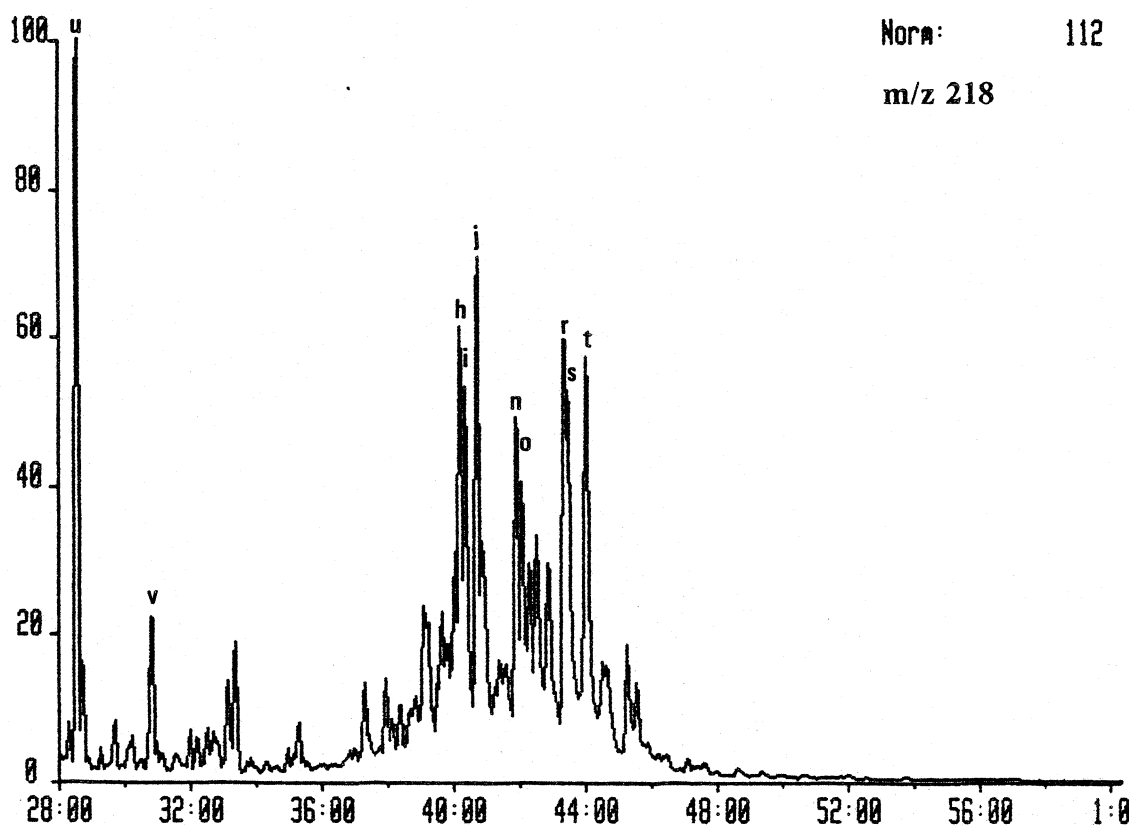
System:QUADSAT



Norm: 144
m/z 217
D-1317
7231/01-U-01
73.02m

D1317SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT



Norm: 112
m/z 218



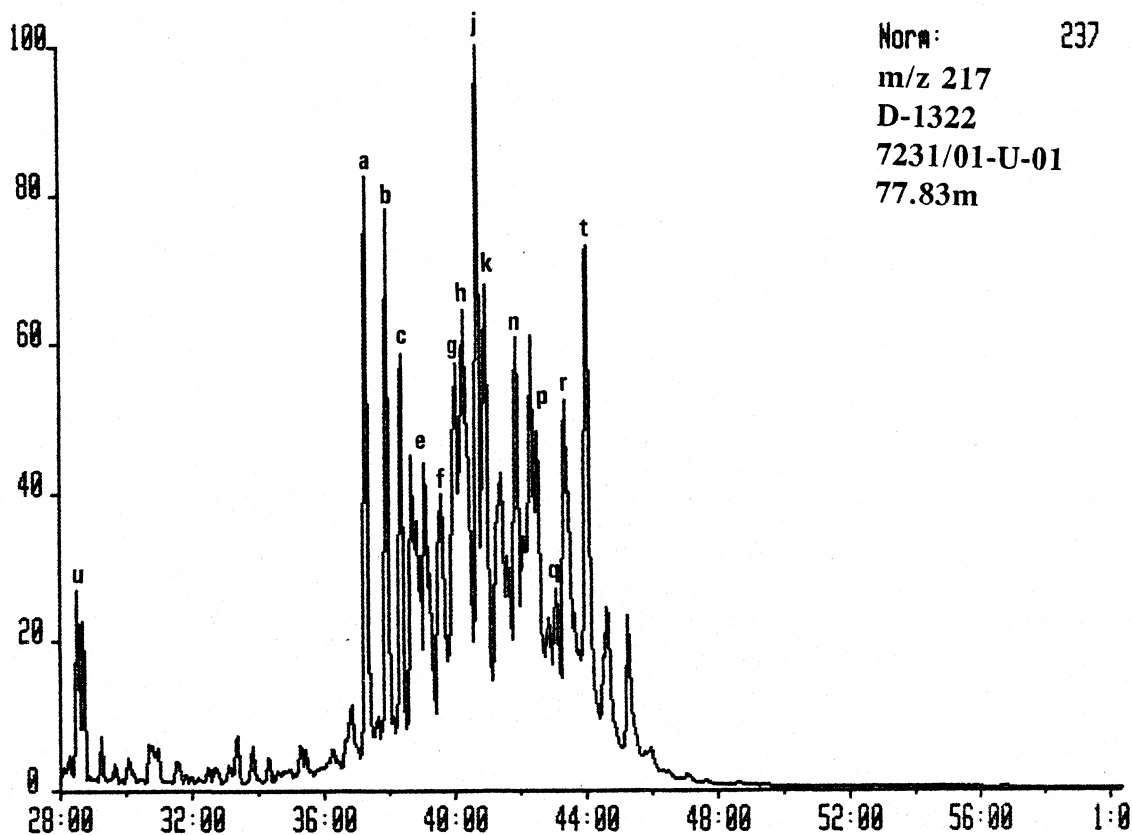
IKU

SINTEF GRUPPEN

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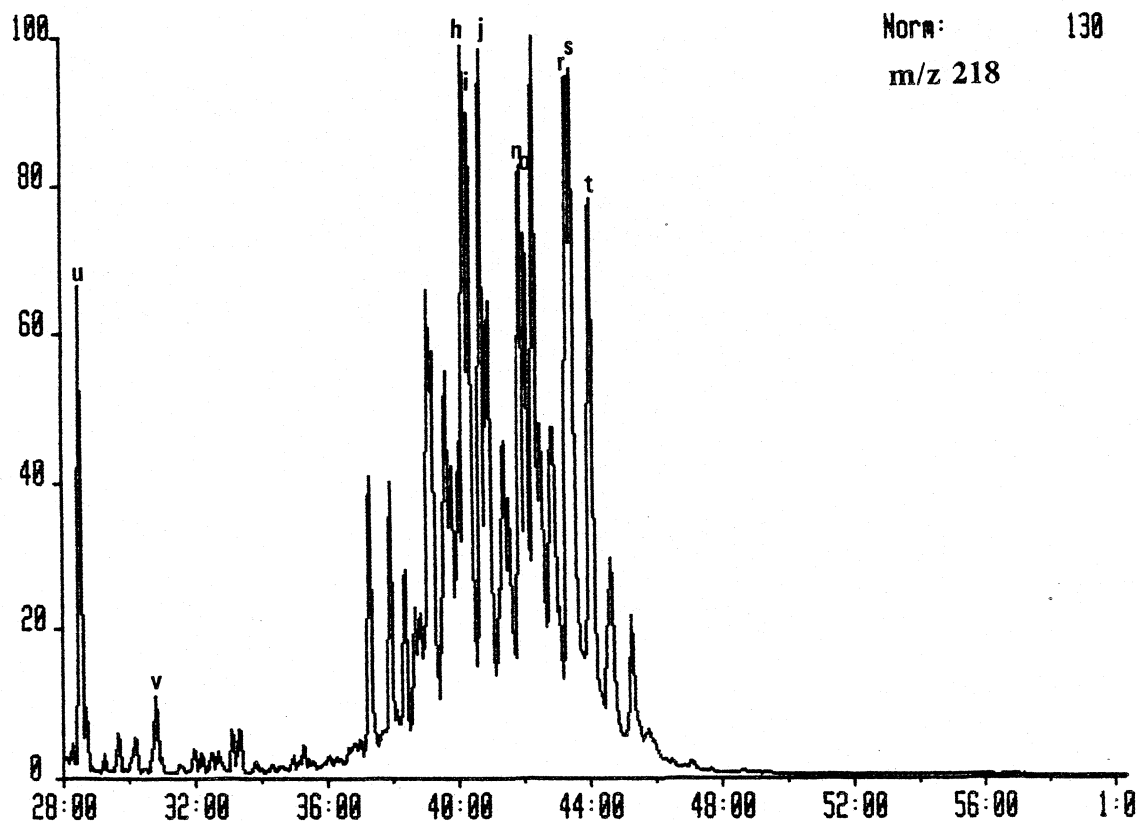
D1317SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



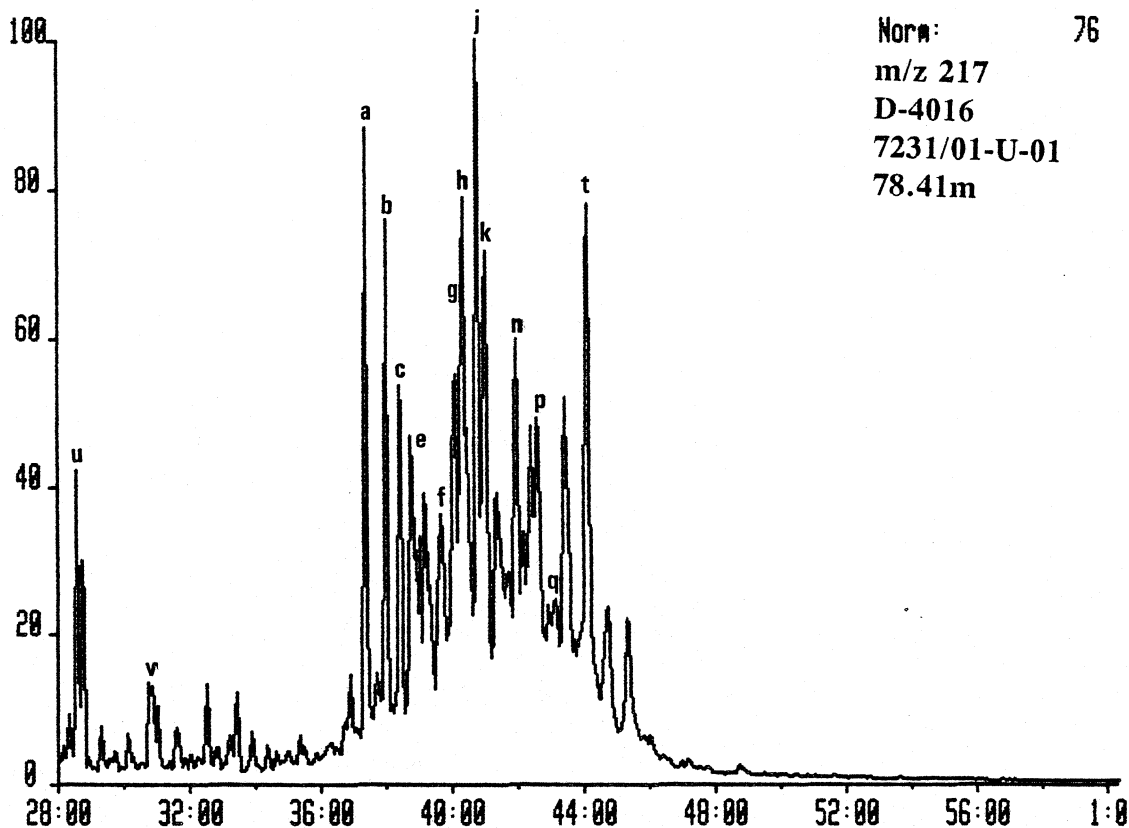
D1317SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT



04000SAT 2-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 217.1000
Text:

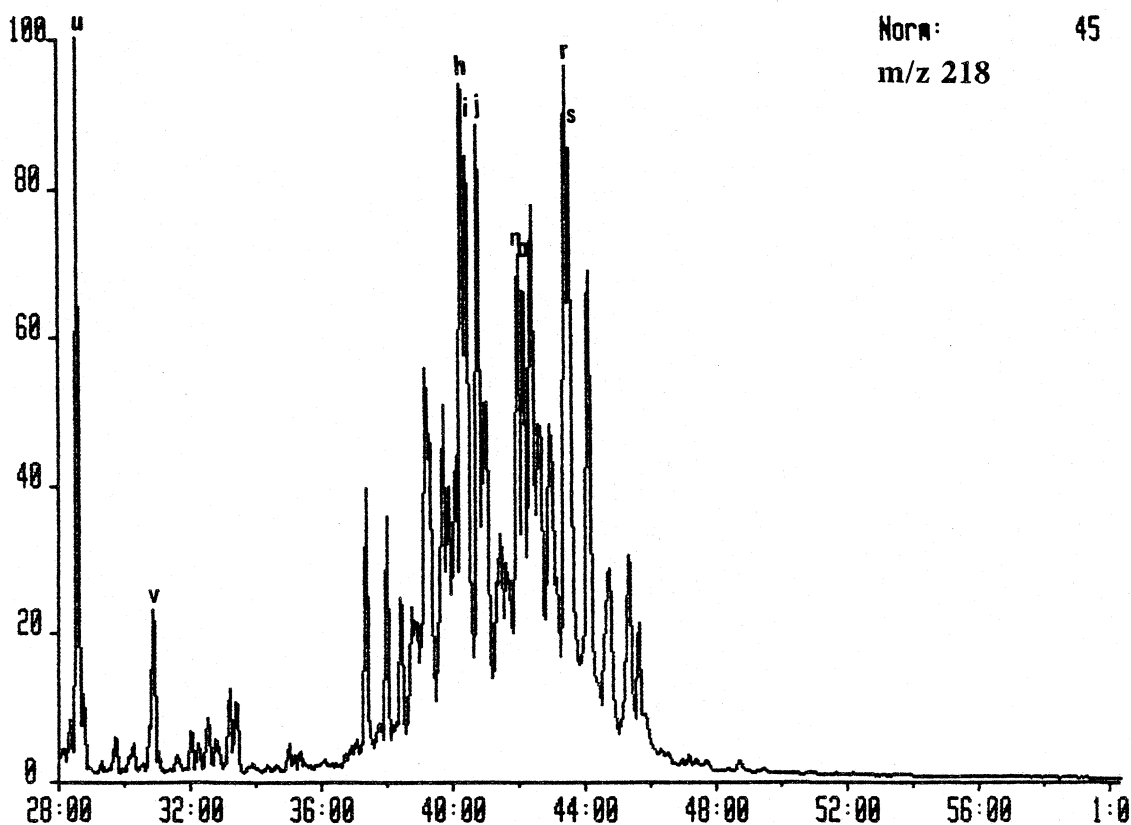
System:QUADSAT



Norm: 76
m/z 217
D-4016
7231/01-U-01
78.41m

04000SAT 2-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 218.1000
Text:

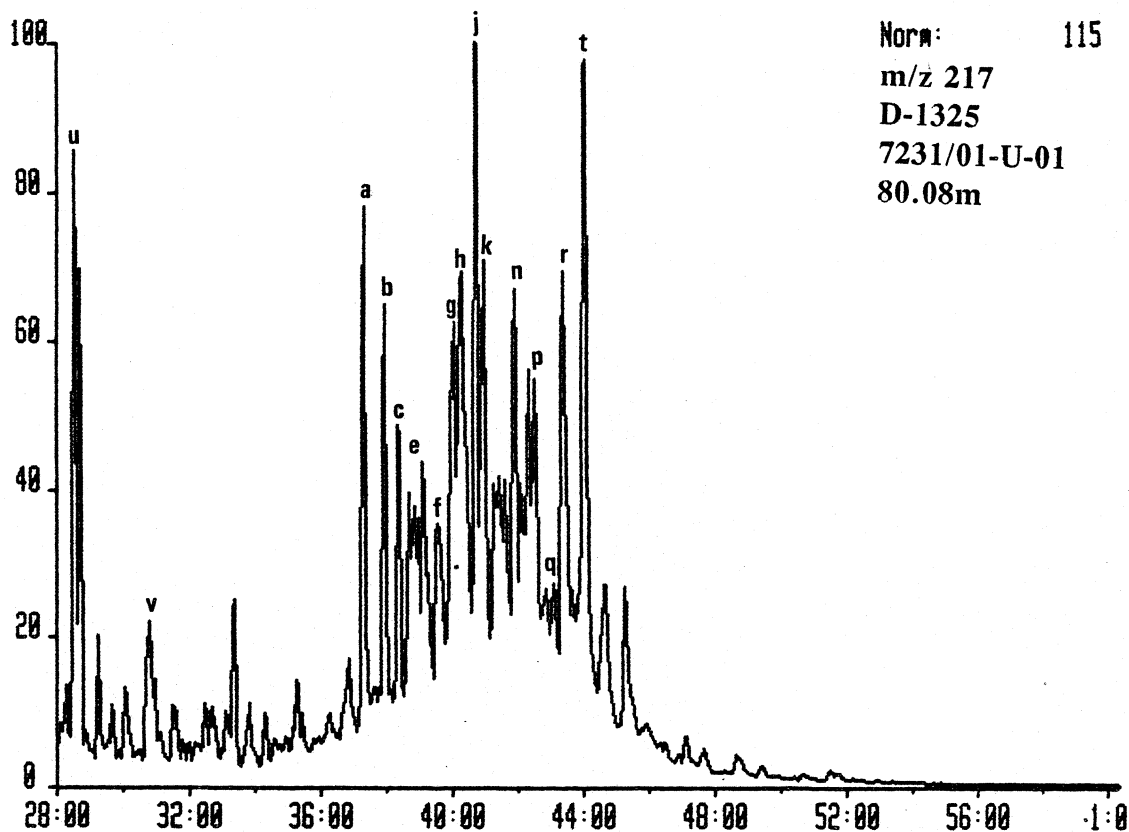
System:QUADSAT



Norm: 45
m/z 218

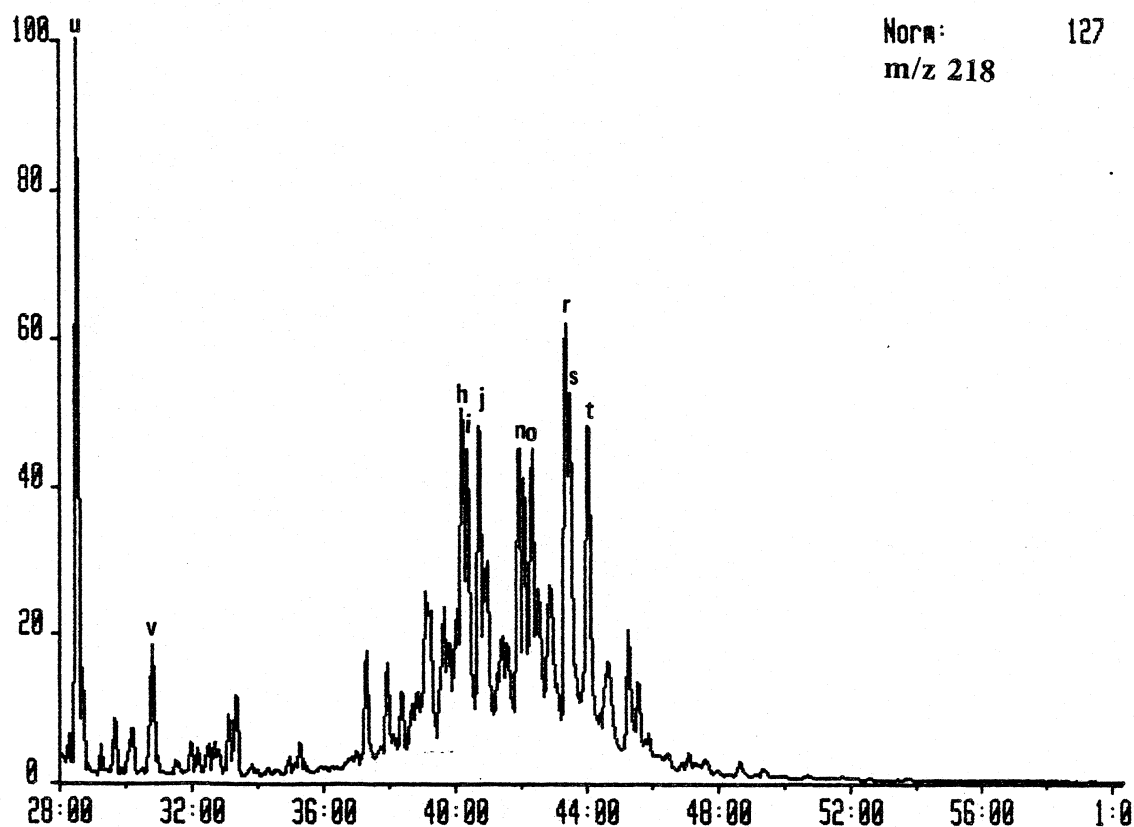
D1317SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 3 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



D1317SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 3 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT



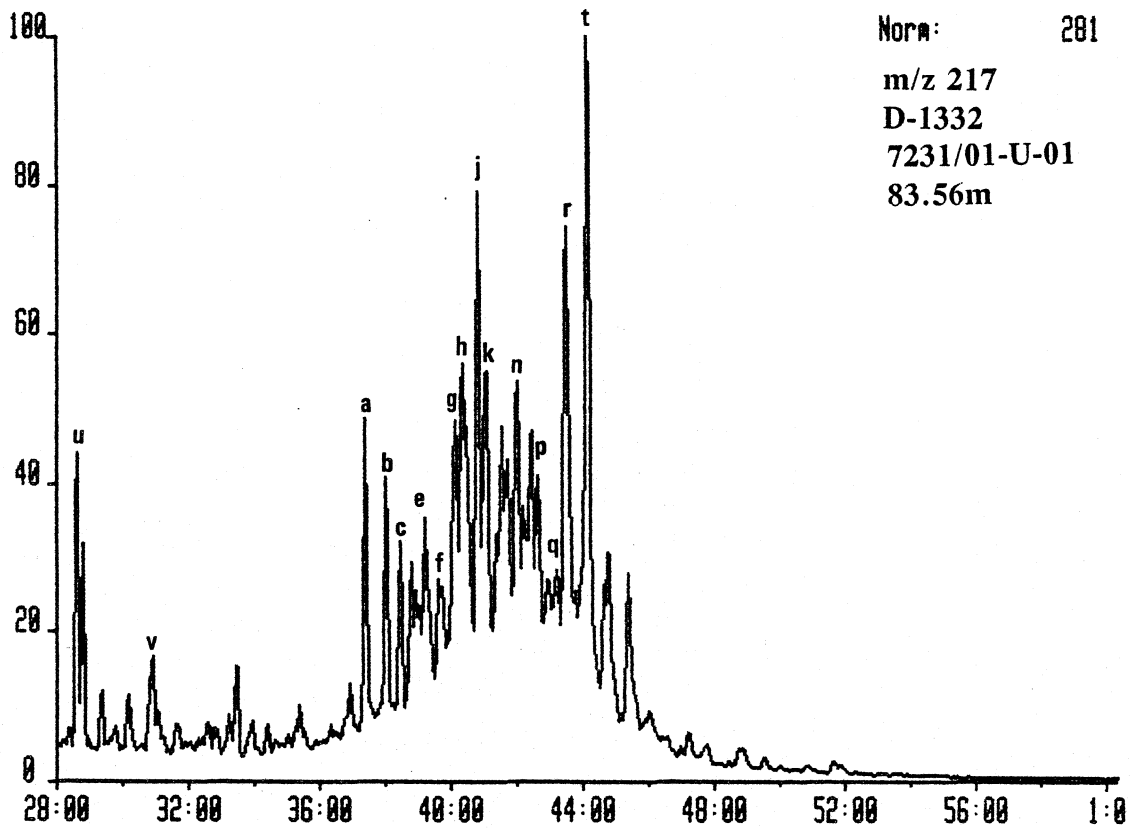


IKU
SINTEF-GRUPPEN

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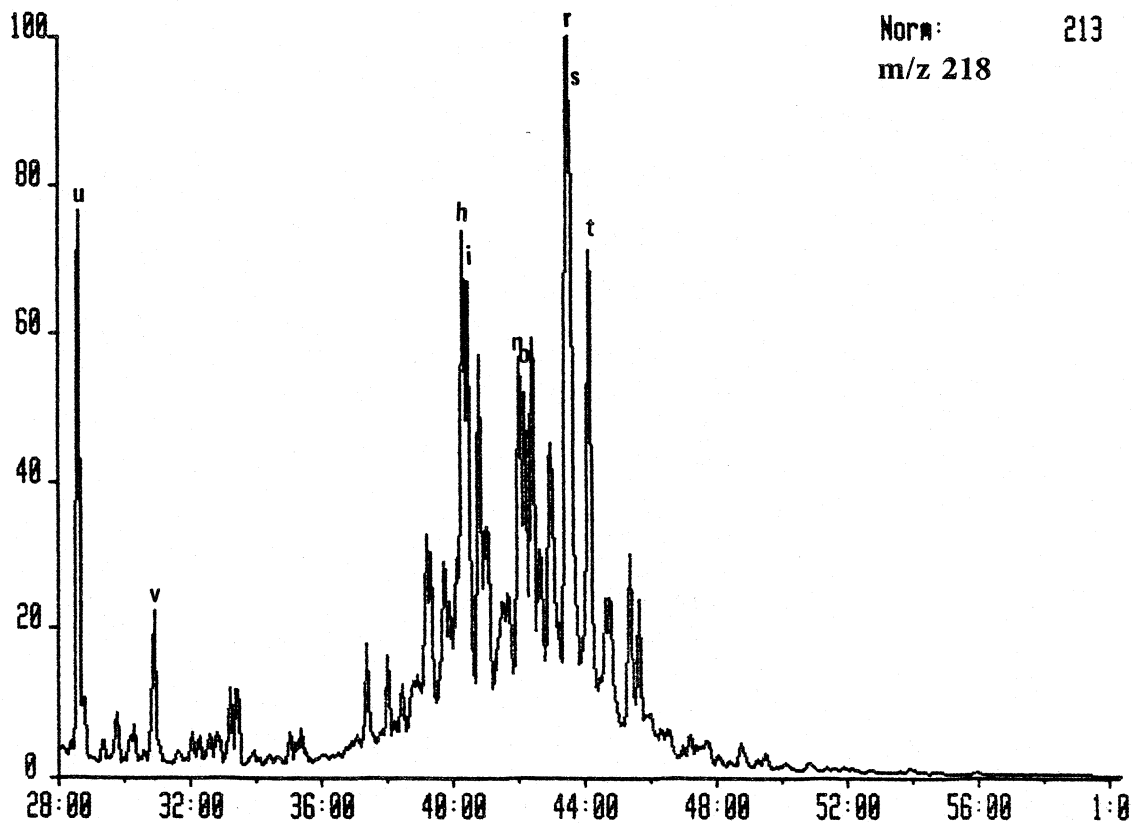
1304SAT 2-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



1304SAT 2-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT



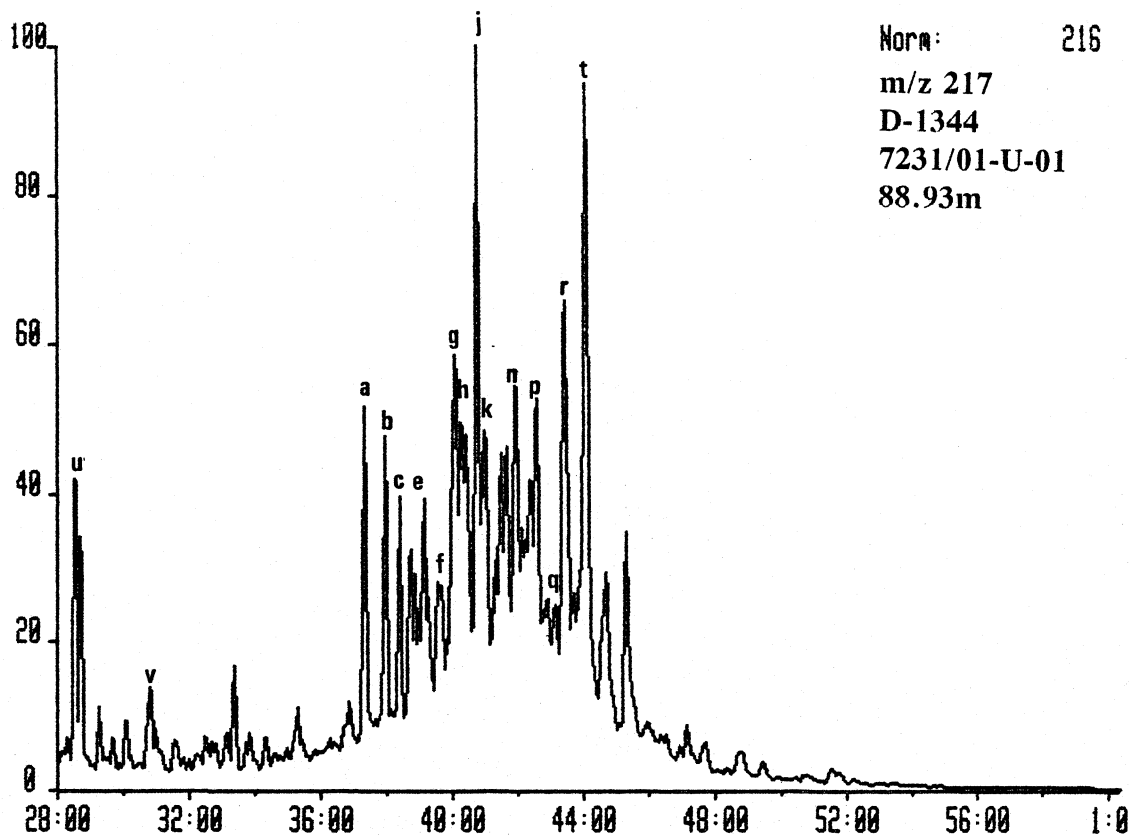


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1304SAT 2-DEC-87
Sample 3 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 217.1000

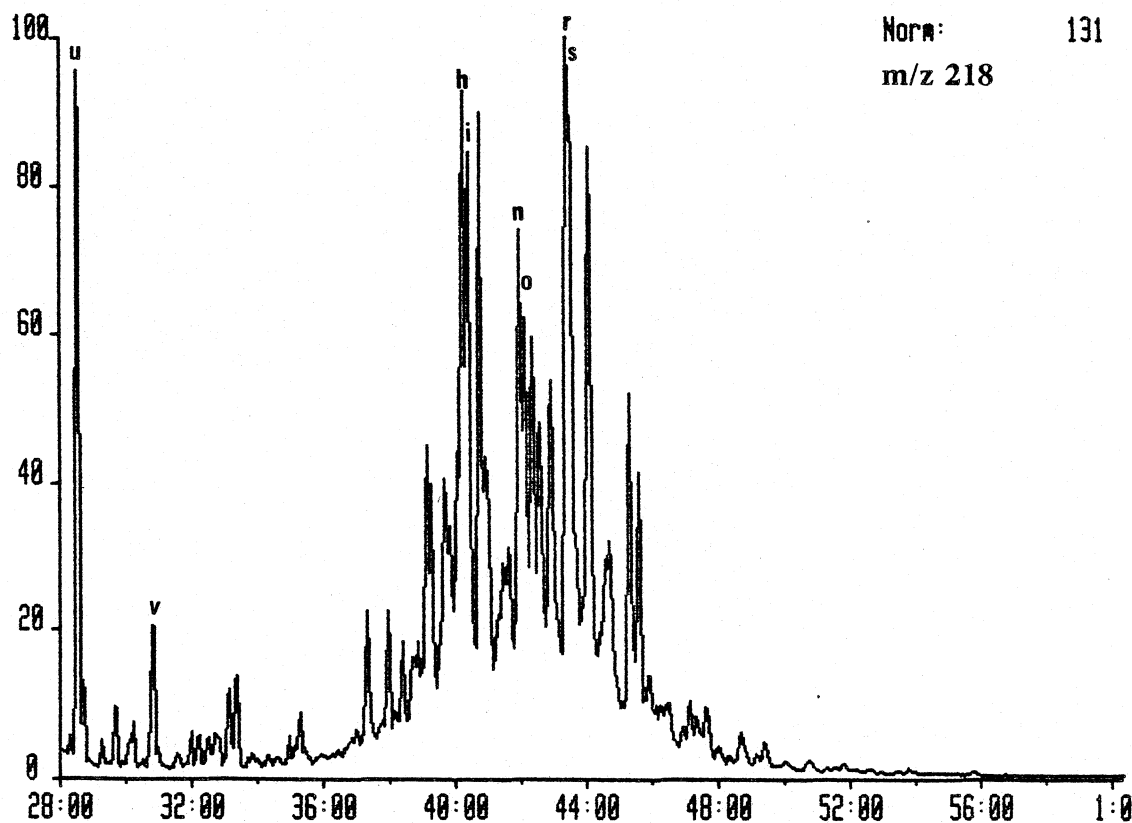
System: QUADSAT



1304SAT 2-DEC-87
Sample 3 Injection 1
Text:

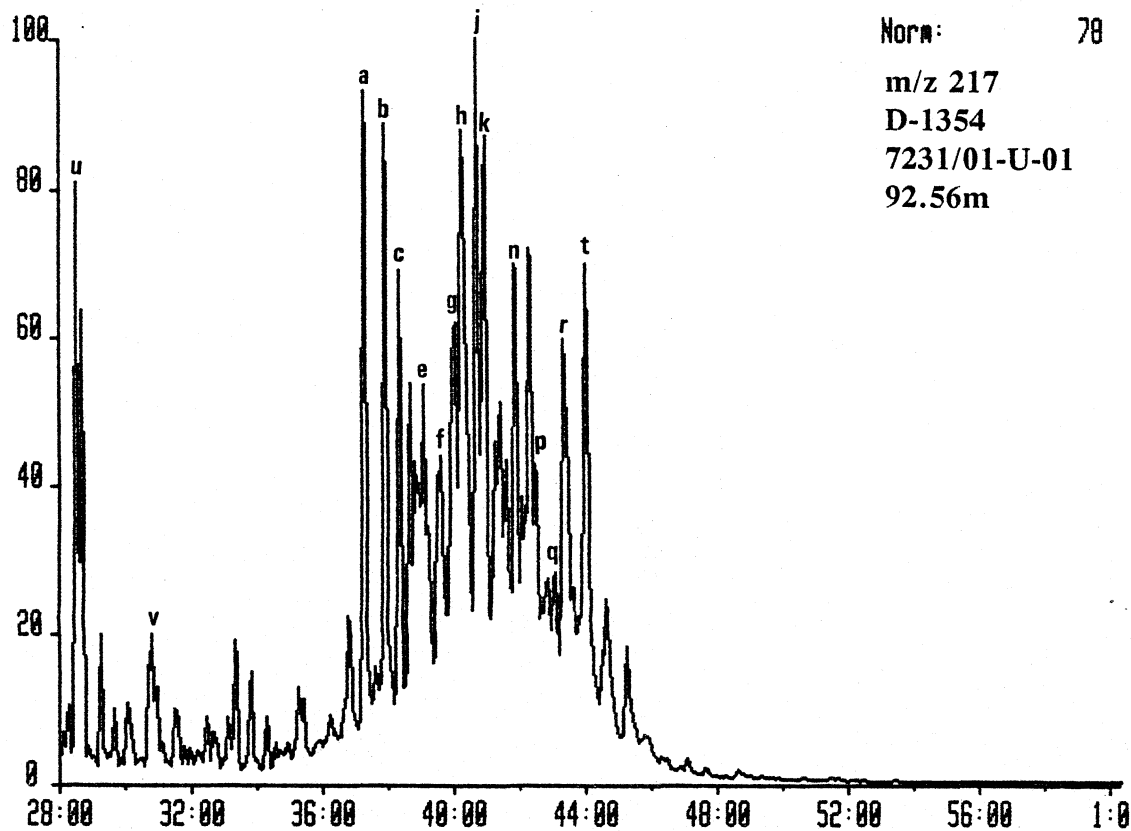
Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 218.1000

System: QUADSAT



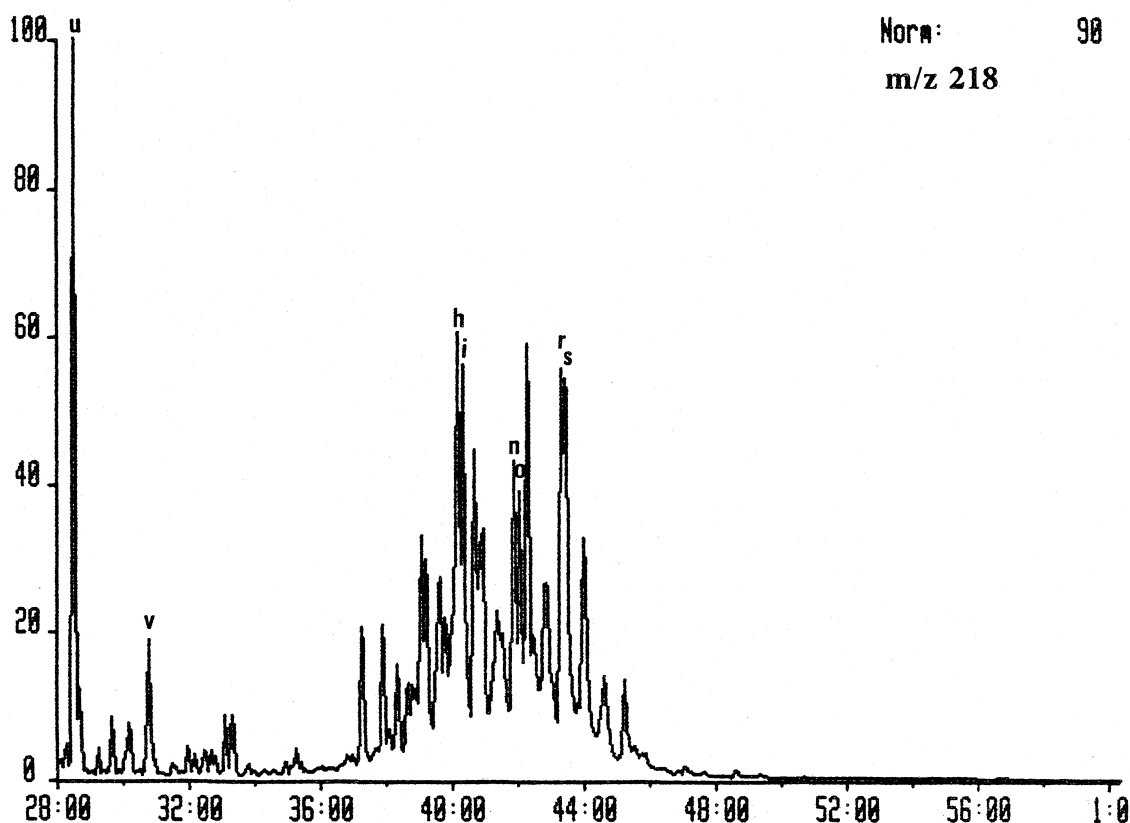
01317SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 4 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



01317SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 4 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT





IKU

SINTEF-GRUPPEN

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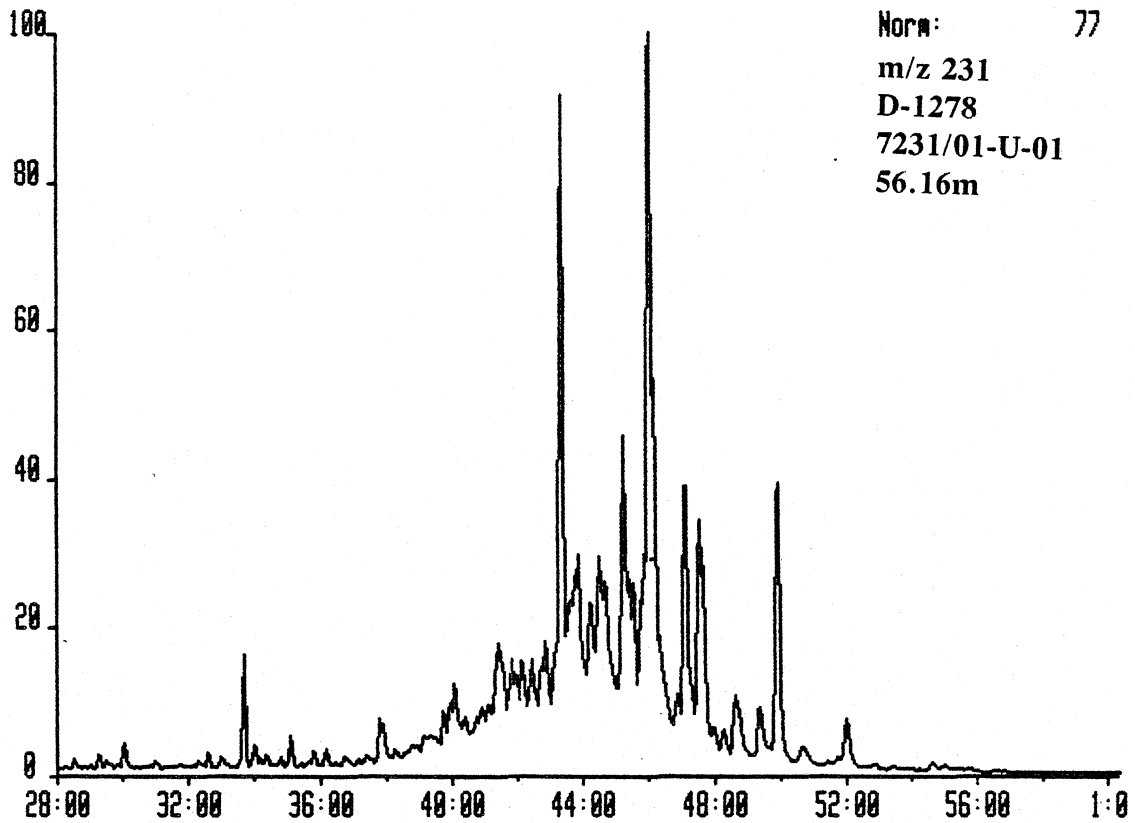
1304SAT 2-DEC-87

Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 4 Injection 1 Group 1 Mass 231.1000

Text:



Norm: 77

m/z 231

D-1278

7231/01-U-01

56.16m

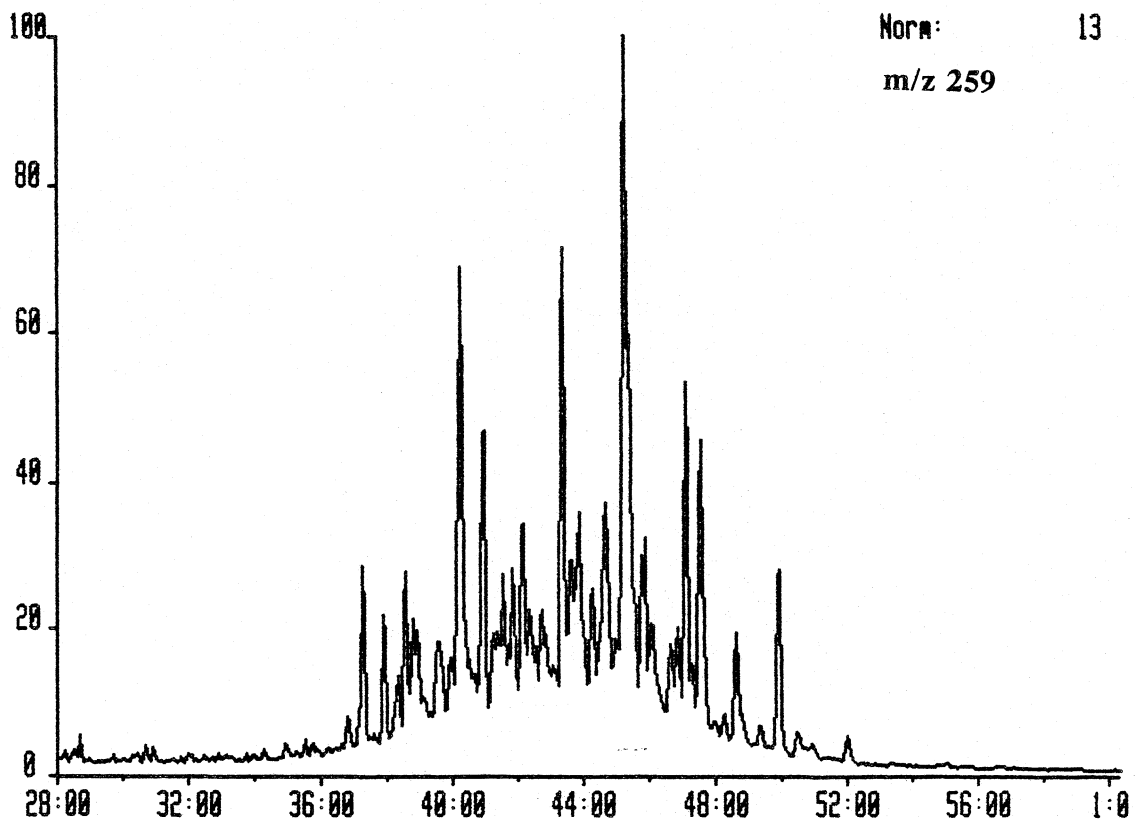
1304SAT 2-DEC-87

Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 4 Injection 1 Group 1 Mass 259.1000

Text:



Norm: 13

m/z 259

04000SAT 2-DEC-87

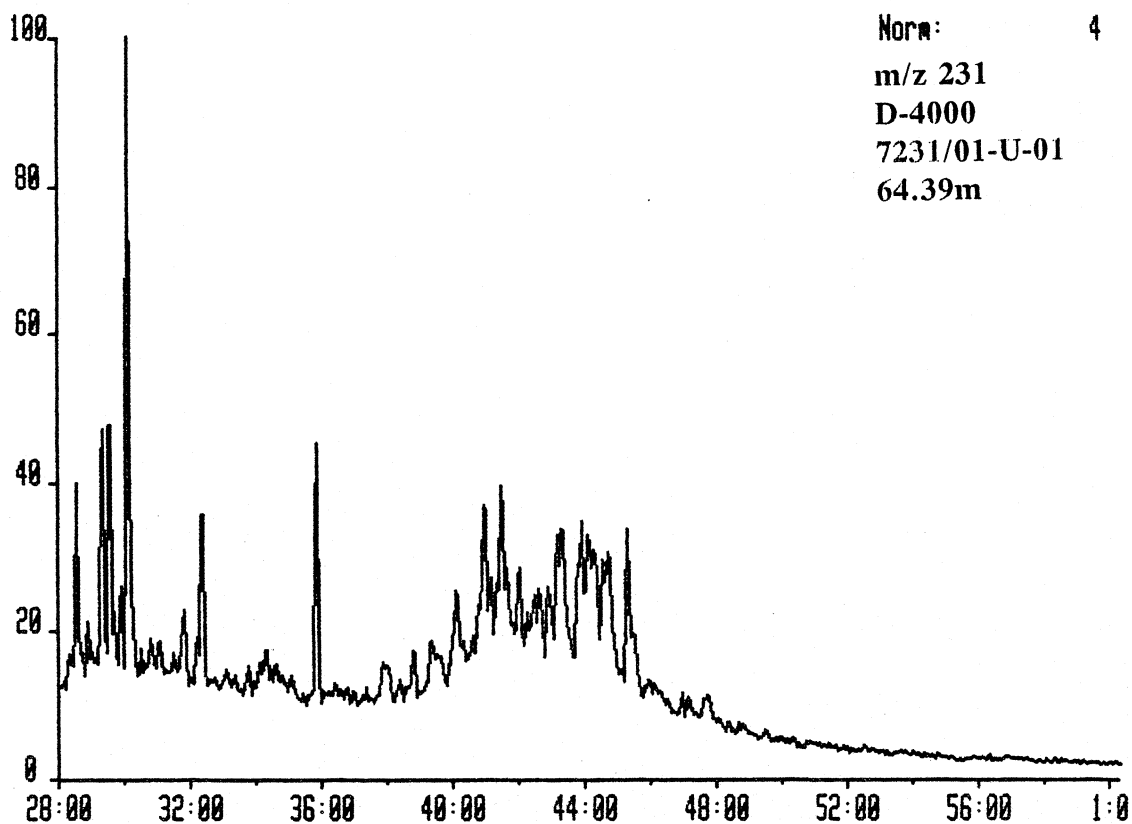
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

Group 1 Mass 231.1000

Text:



04000SAT 2-DEC-87

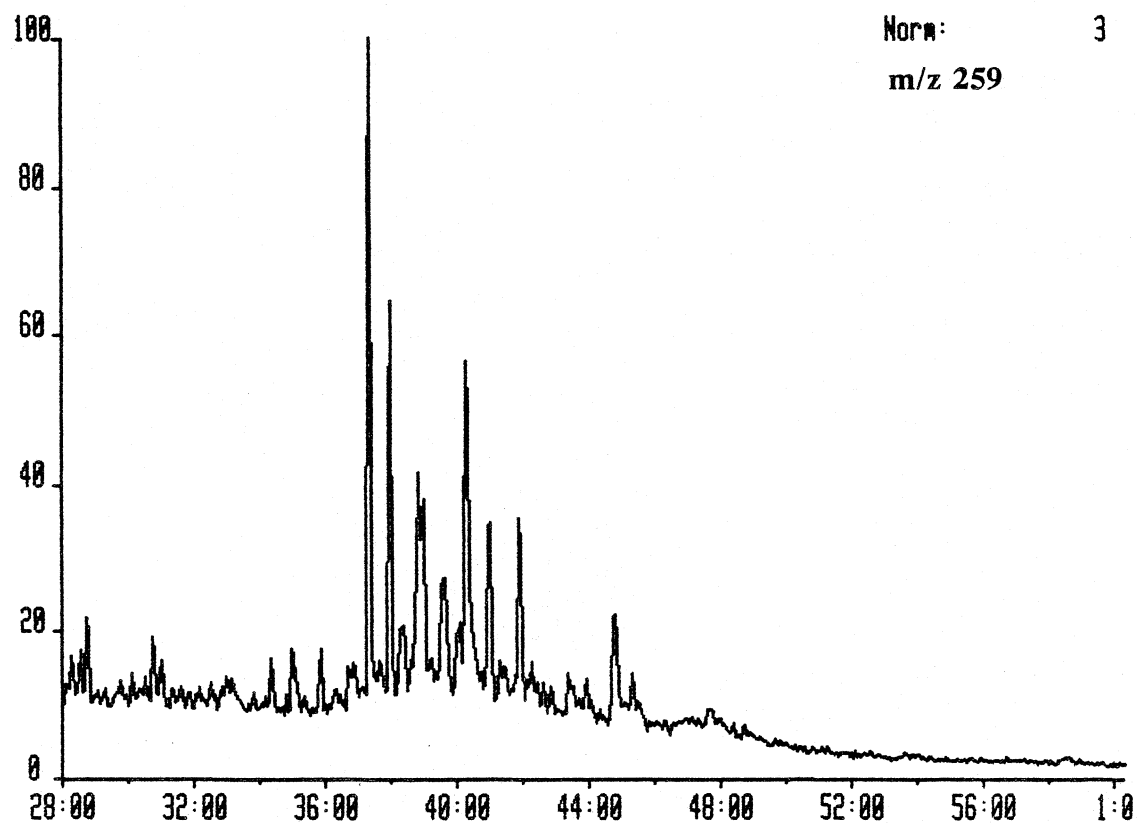
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

Group 1 Mass 259.1000

Text:





IKU

SINTEF-GRUPPEN

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D1292SAT 30-NOV-87

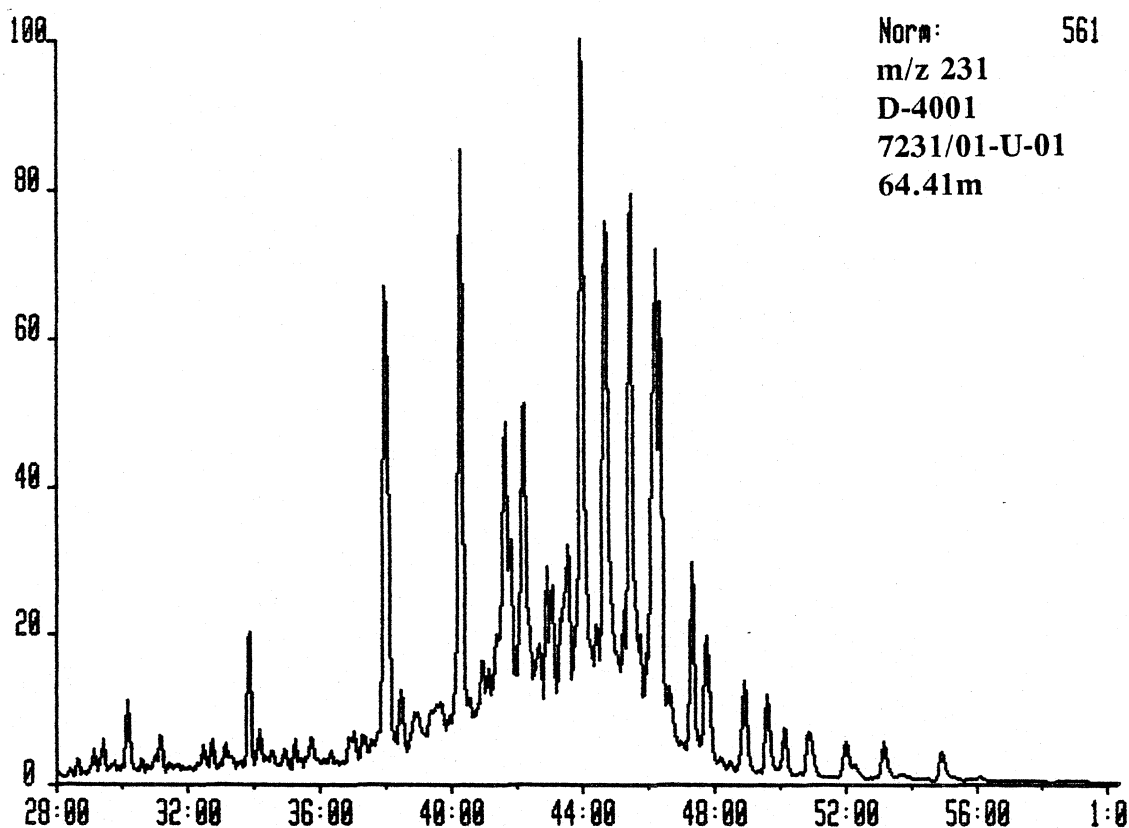
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 231.1000

Text:



Norm: 561

m/z 231

D-4001

7231/01-U-01

64.41m

D1292SAT 30-NOV-87

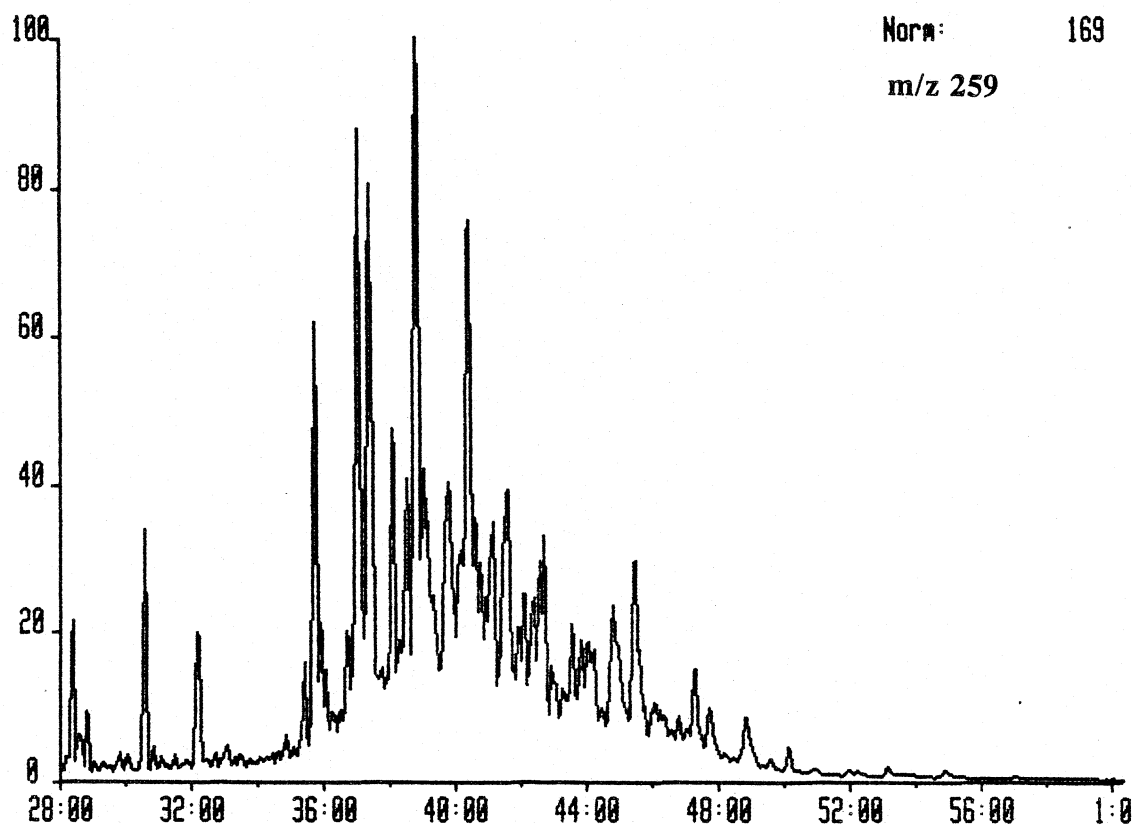
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 259.1000

Text:



Norm: 169

m/z 259

D1292SAT 30-NOV-87

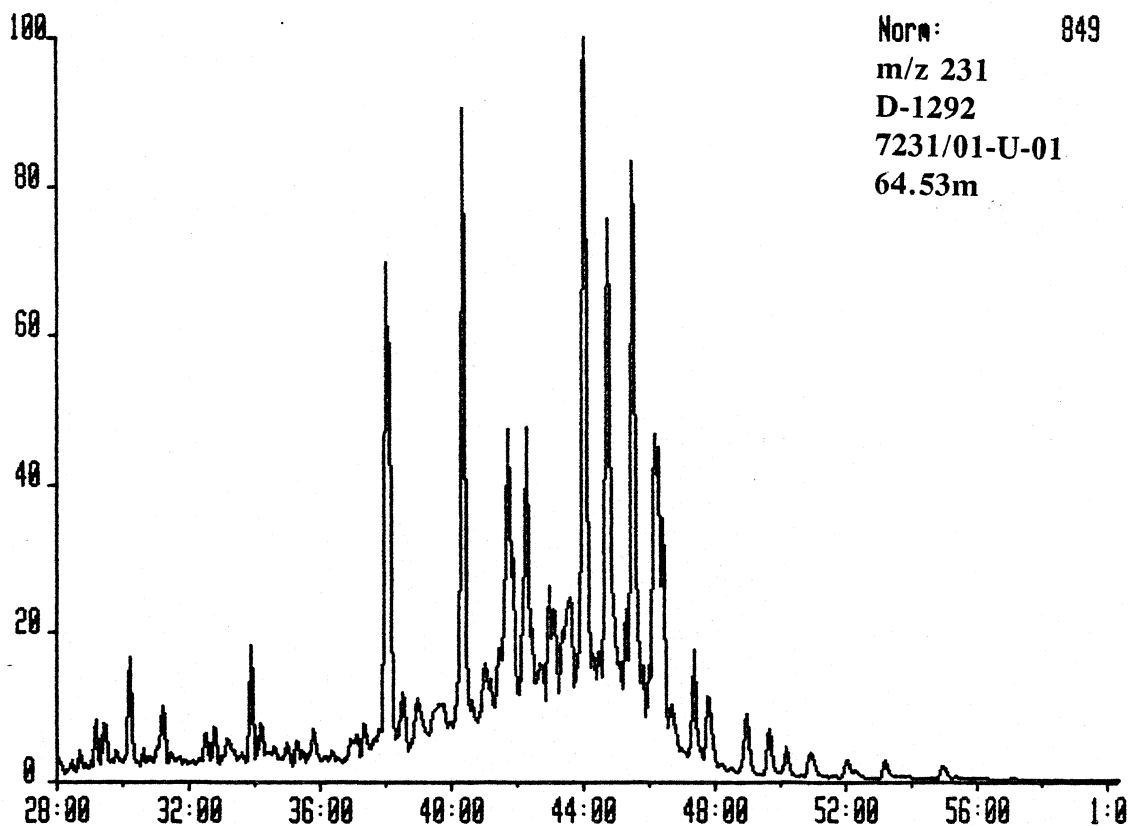
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 231.1000

Text:



D1292SAT 30-NOV-87

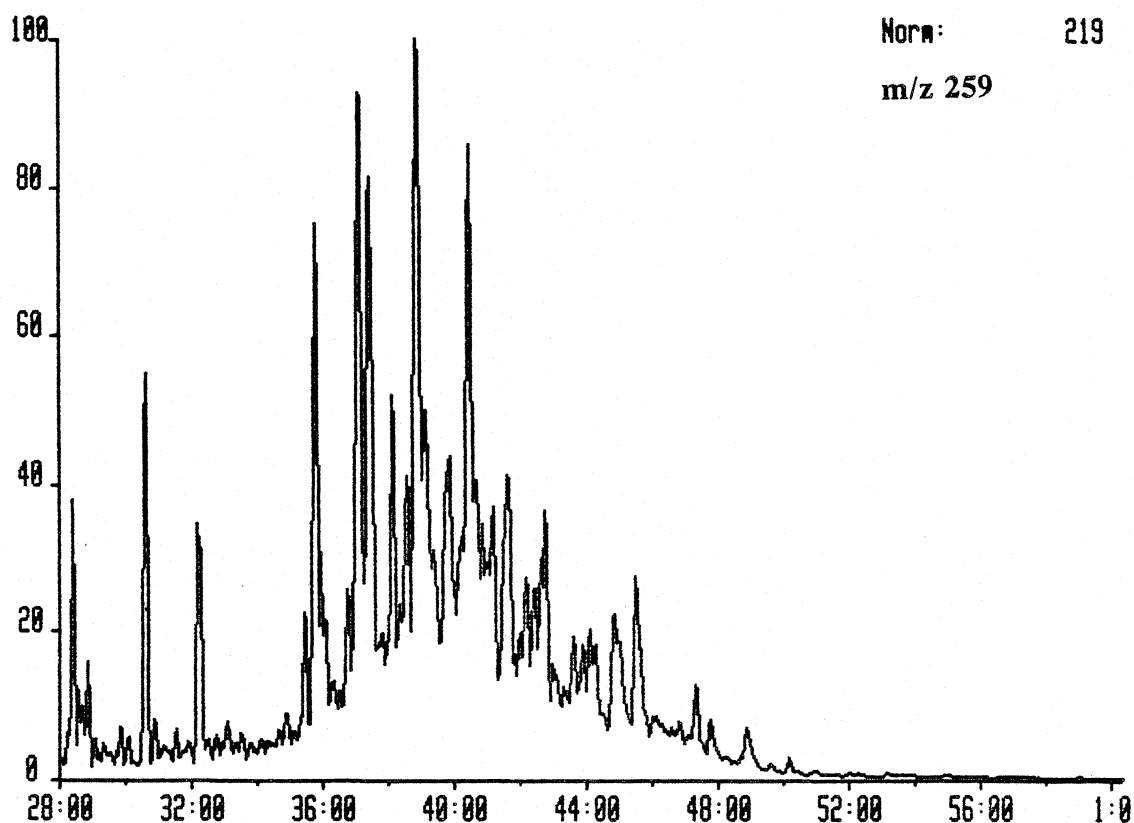
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 259.1000

Text:

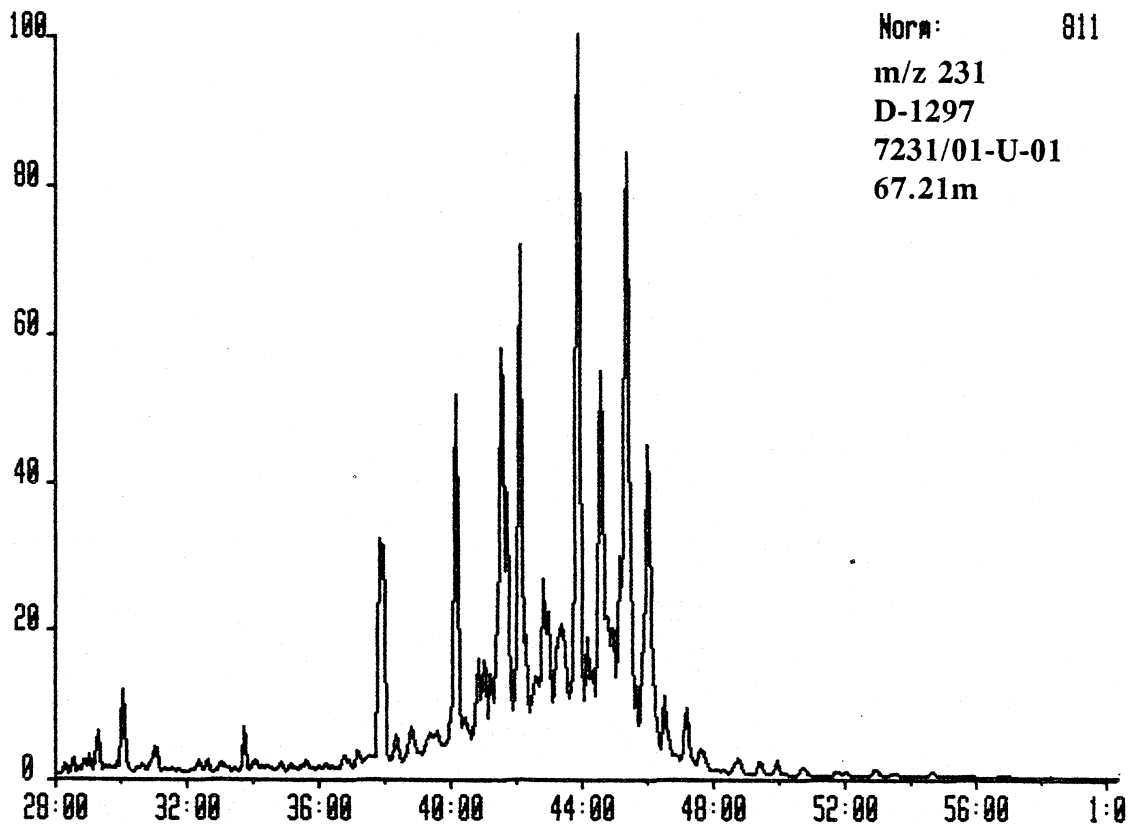




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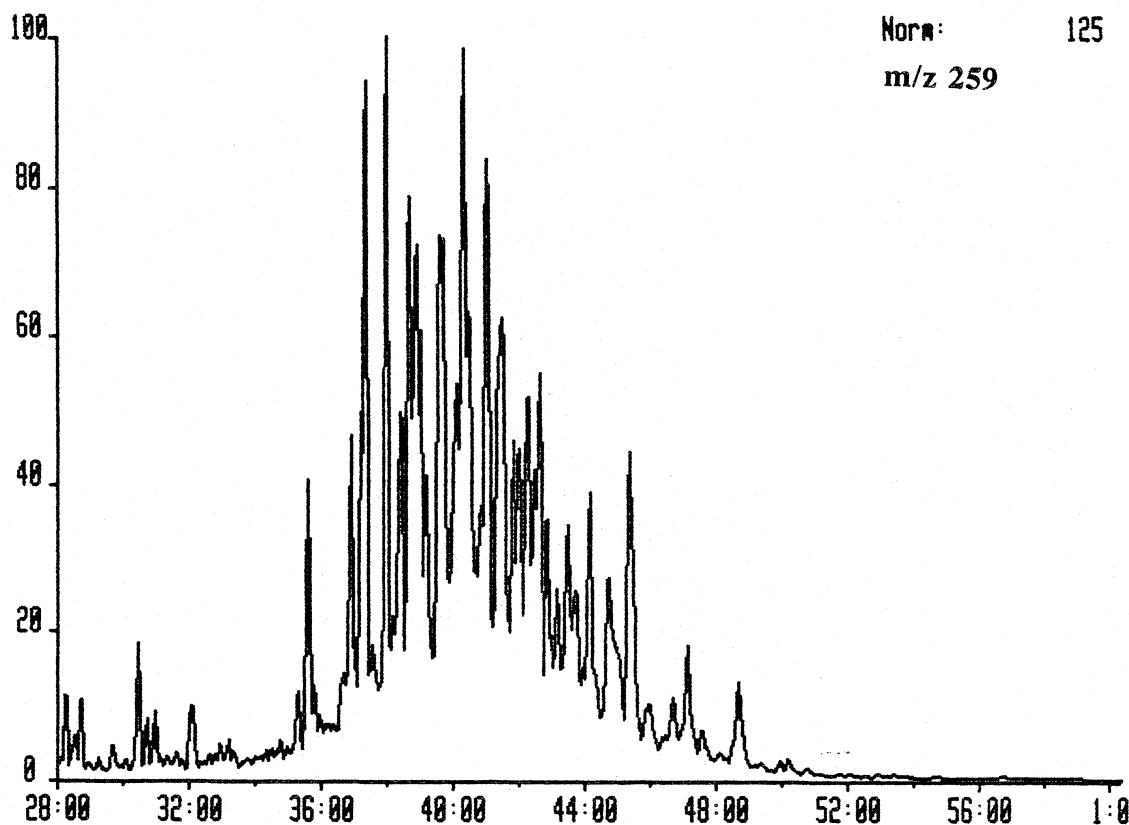
D1241SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 3 Injection 1 Group 1 Mass 231.1000
Text:

System:QUADSAT



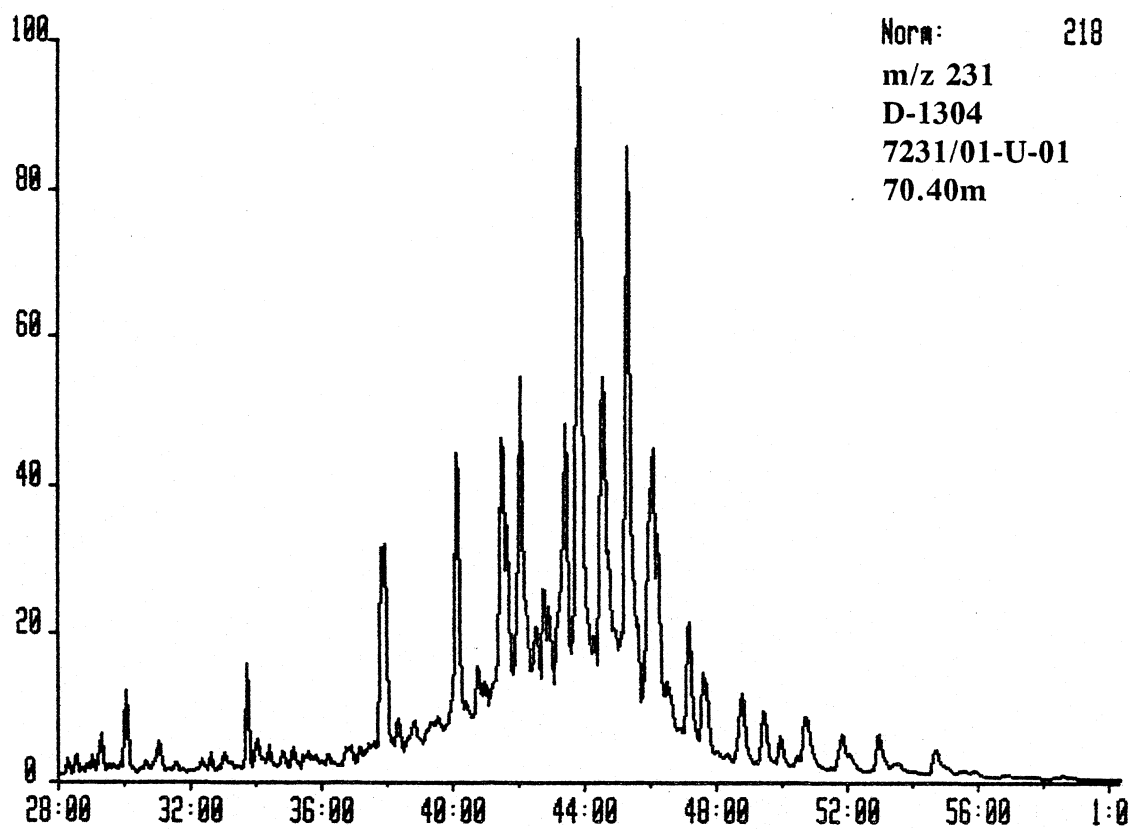
D1241SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 3 Injection 1 Group 1 Mass 259.1000
Text:

System:QUADSAT



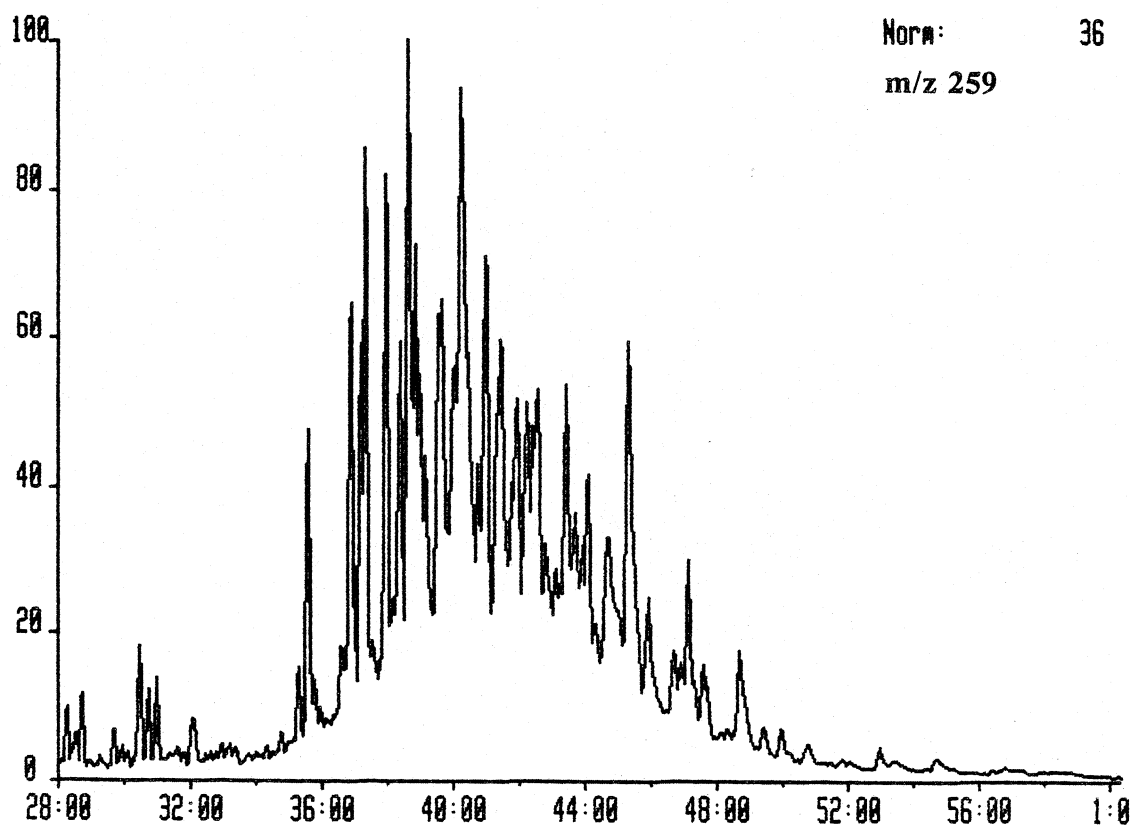
1304SAT 2-DEC-07 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:

System:GUARDSAT



1304SAT 2-DEC-07 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 259.1000
Text:

System:GUARDSAT





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01317SAT 1-DEC-87

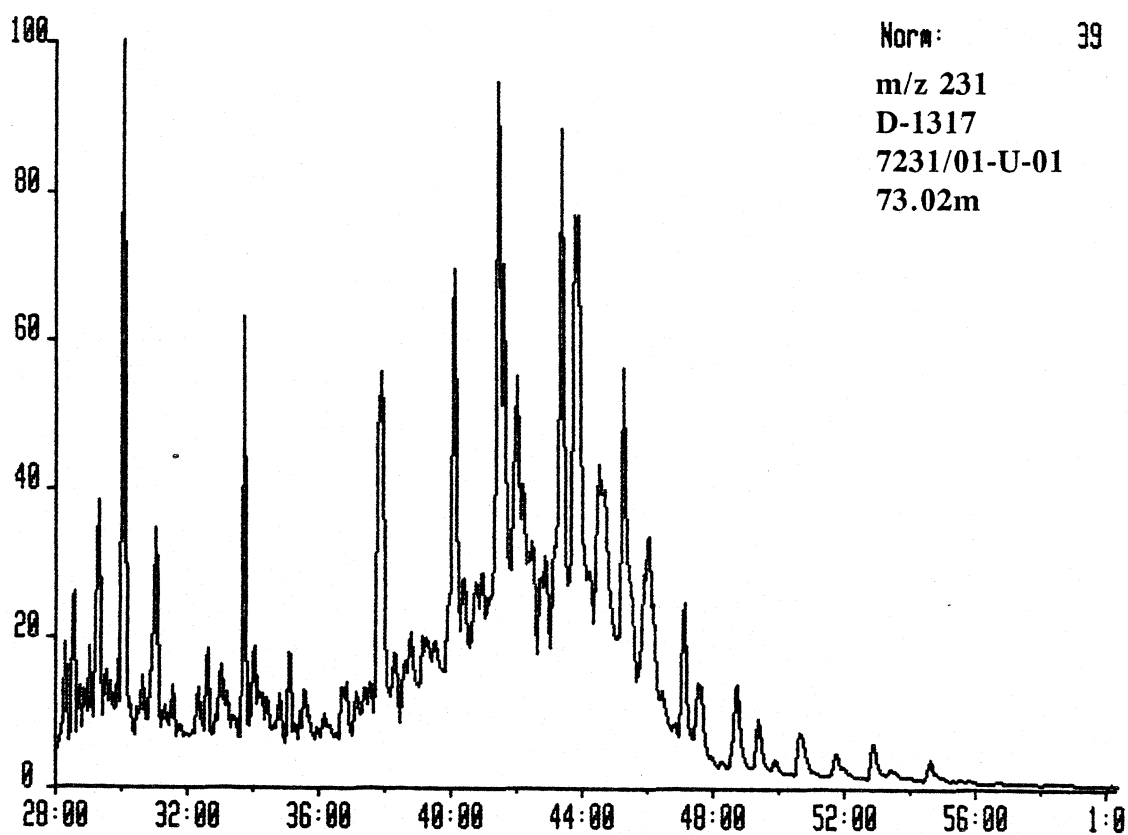
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 231.1000

Text:



01317SAT 1-DEC-87

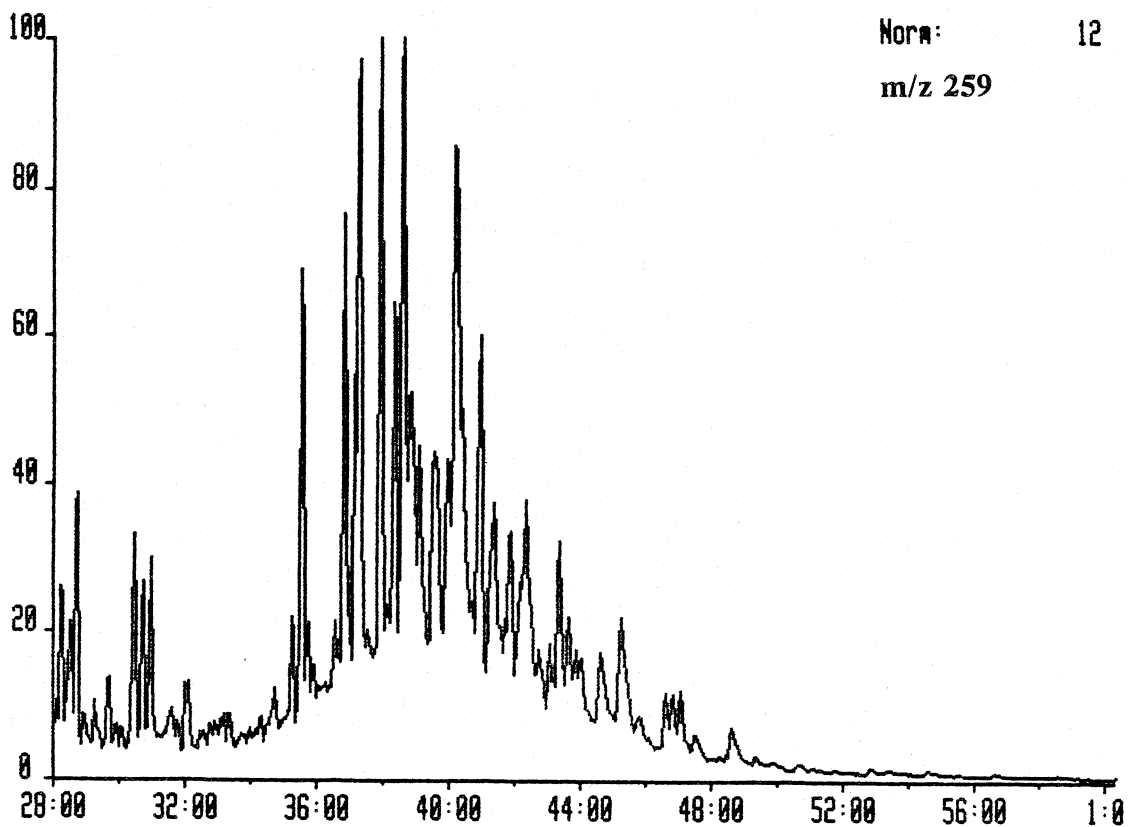
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 259.1000

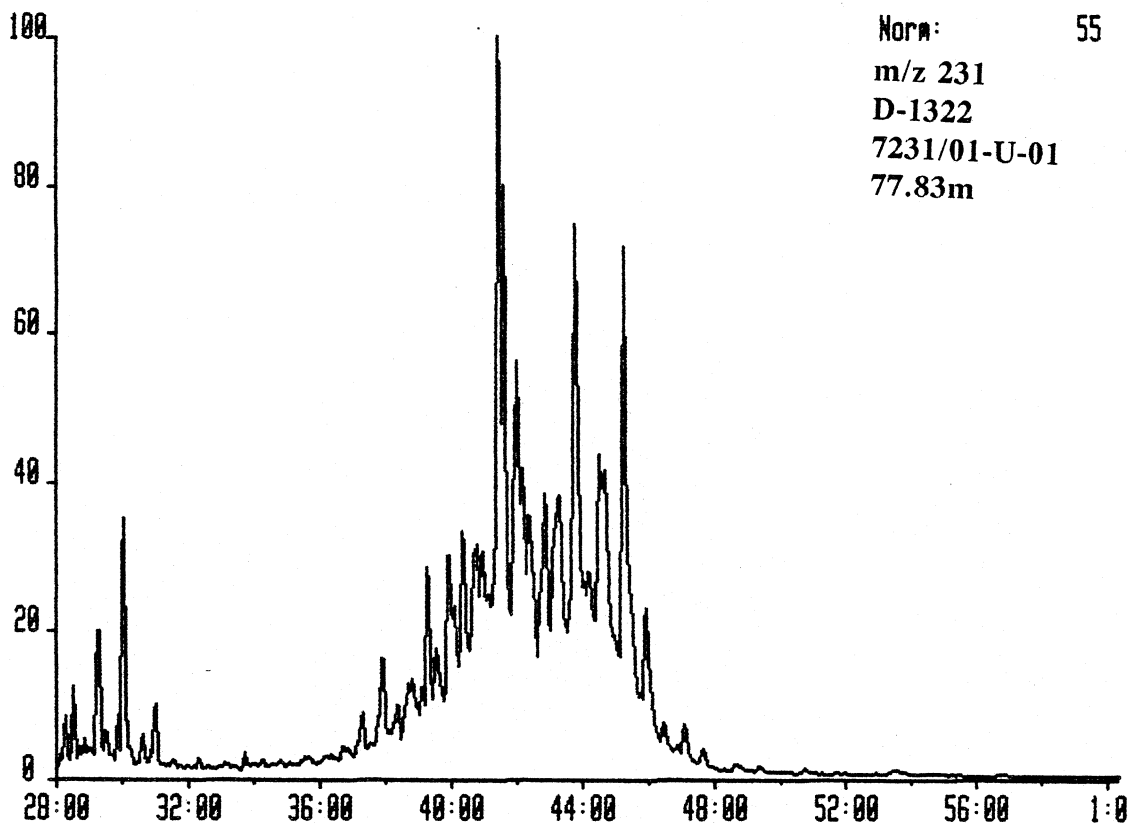
Text:



D1317SAT 1-DEC-87
Sample 2 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 231.1000

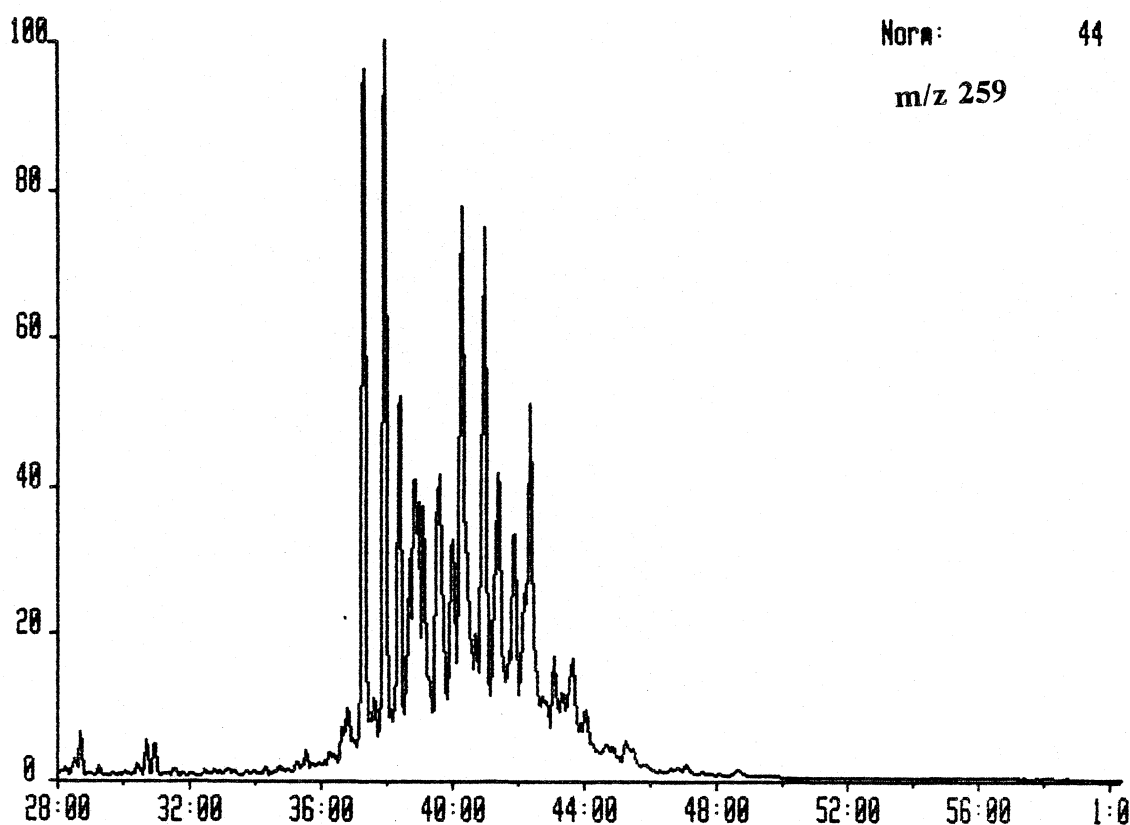
System: QUADSAT



D1317SAT 1-DEC-87
Sample 2 Injection 1
Text:

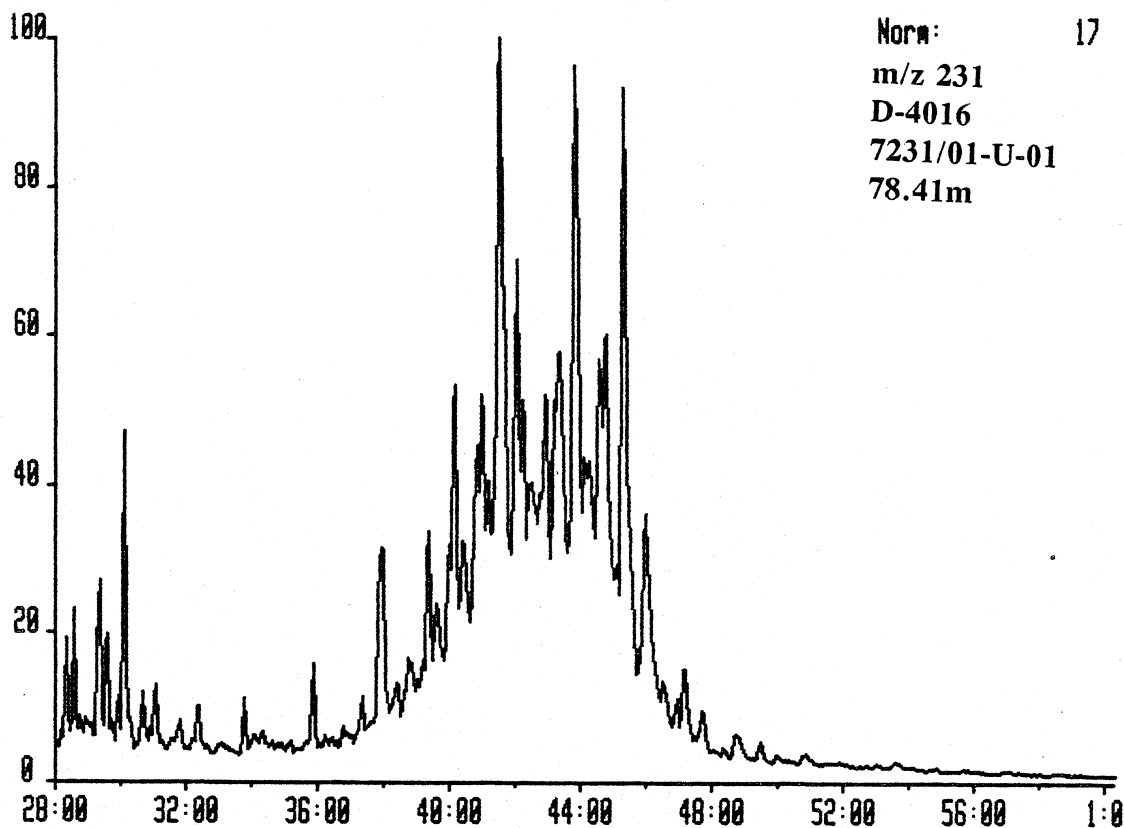
Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 259.1000

System: QUADSAT



D4000SAT 2-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 231.1000
Text:

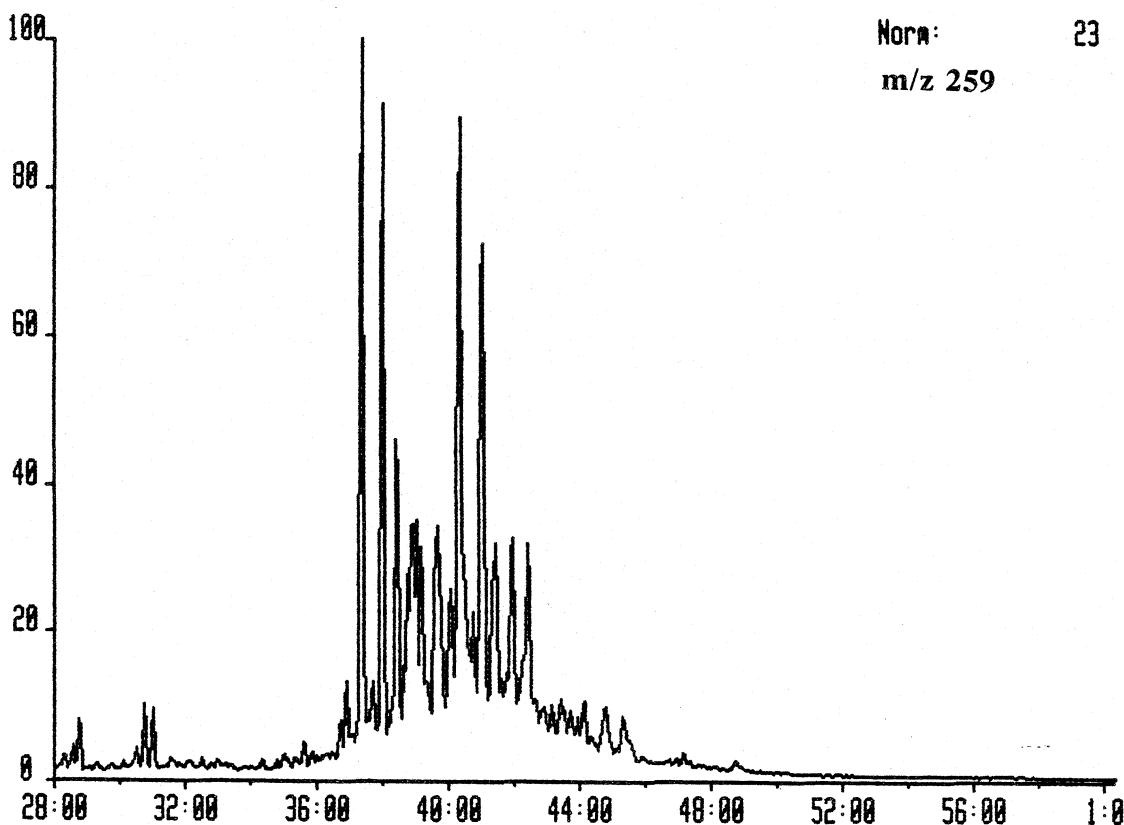
System:QUADSAT



Norm: 17
m/z 231
D-4016
7231/01-U-01
78.41m

D4000SAT 2-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 259.1000
Text:

System:QUADSAT



Norm: 23
m/z 259

D1317SAT 1-DEC-87

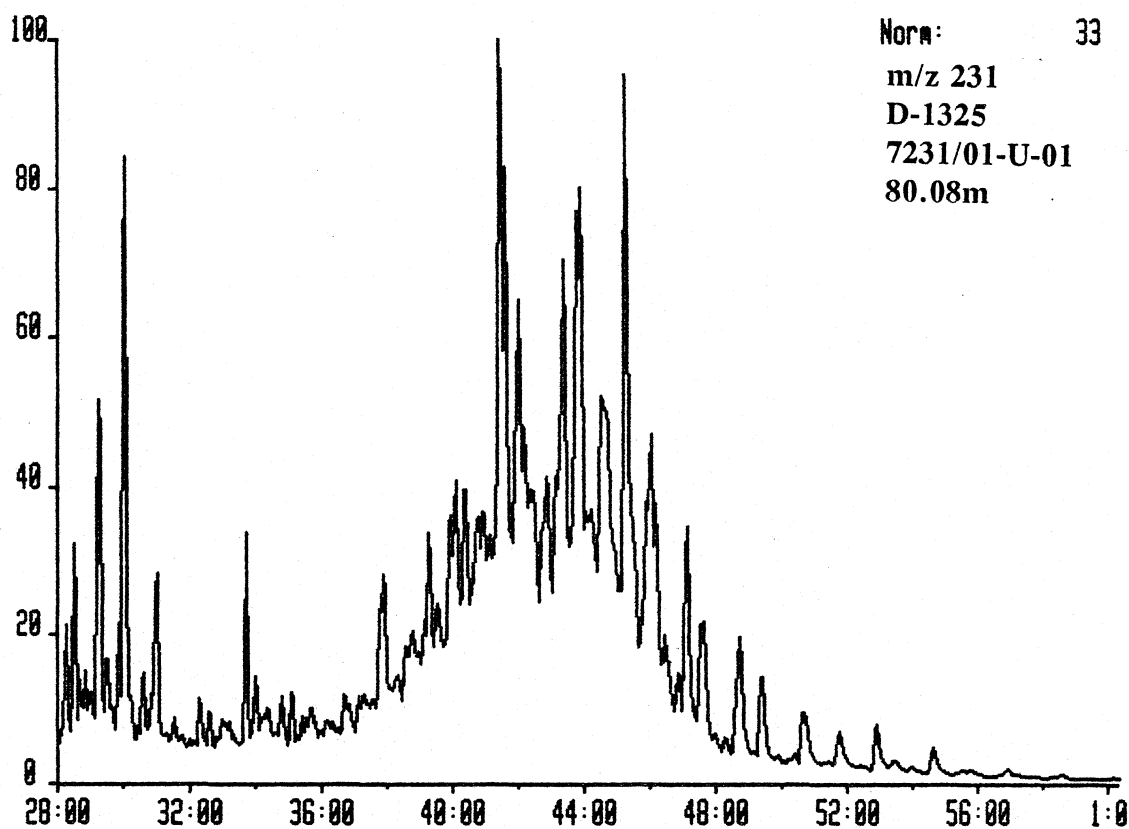
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 3 Injection 1

Group 1 Mass 231.1000

Text:



Norm: 33

m/z 231

D-1325

7231/01-U-01

80.08m

D1317SAT 1-DEC-87

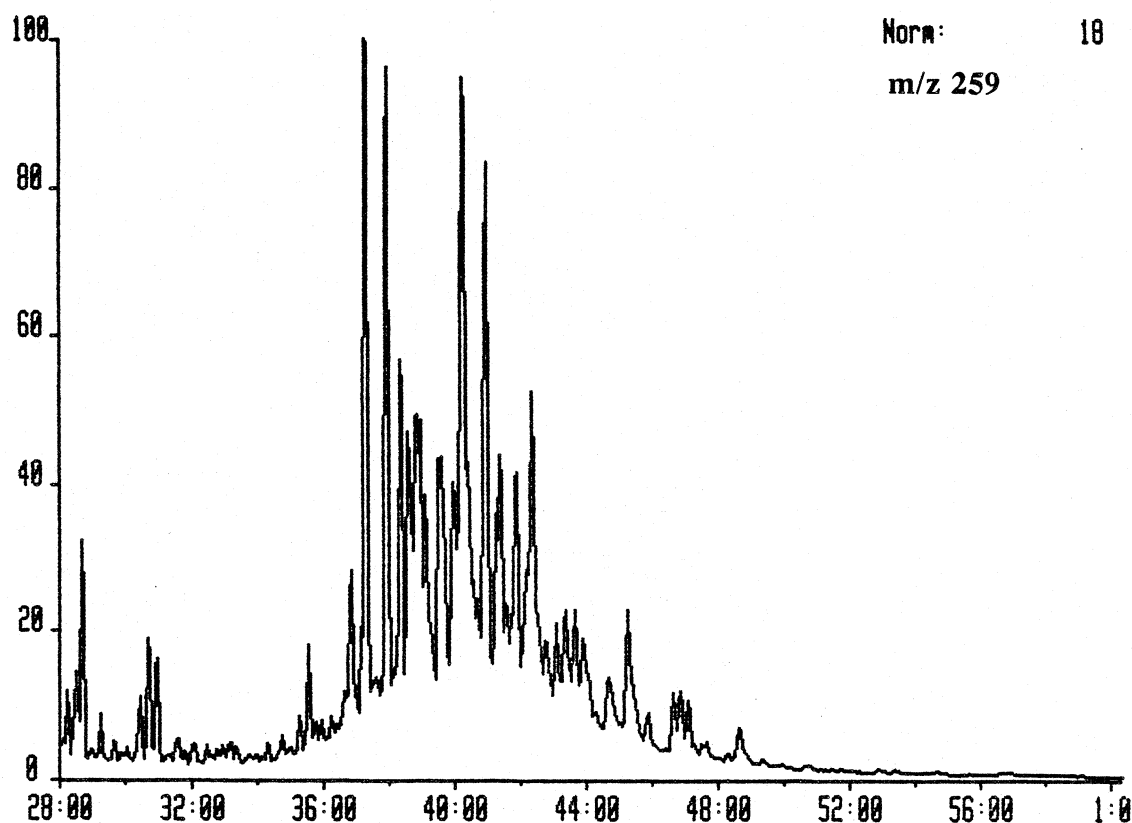
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 3 Injection 1

Group 1 Mass 259.1000

Text:



Norm: 18

m/z 259

1304SAT 2-DEC-87

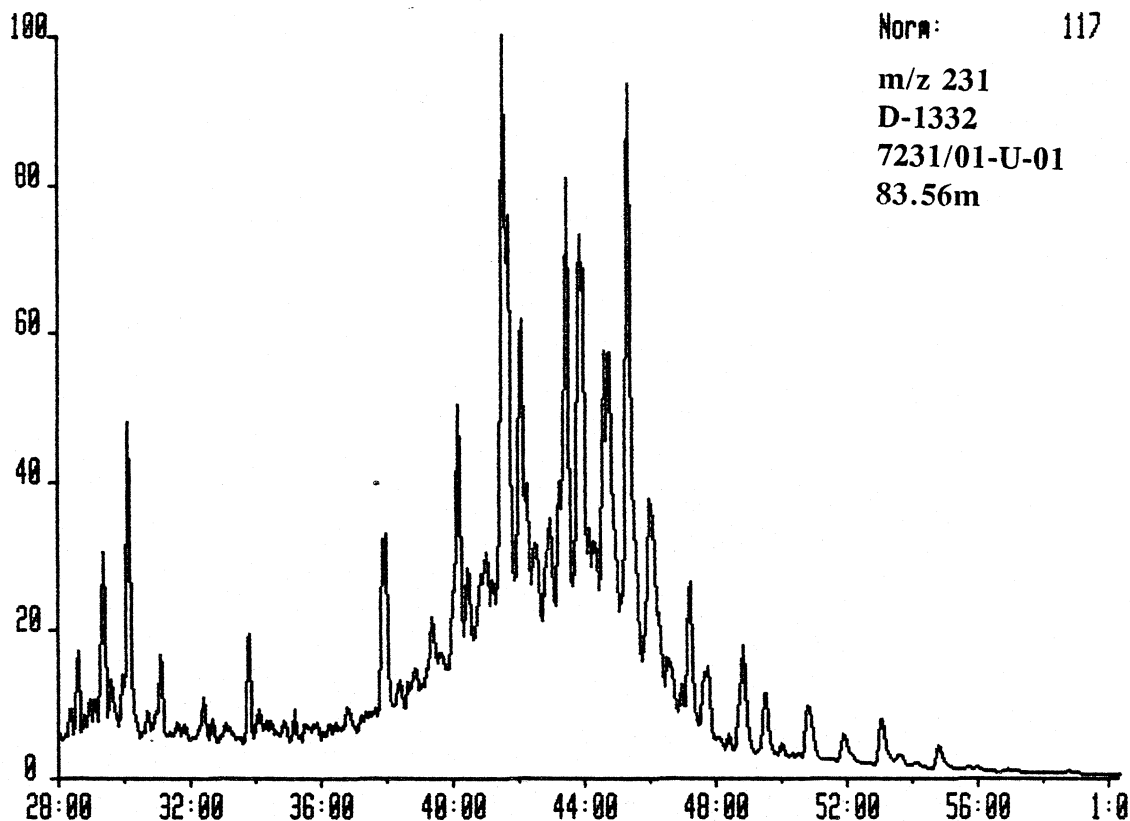
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 231.1000

Text:



1304SAT 2-DEC-87

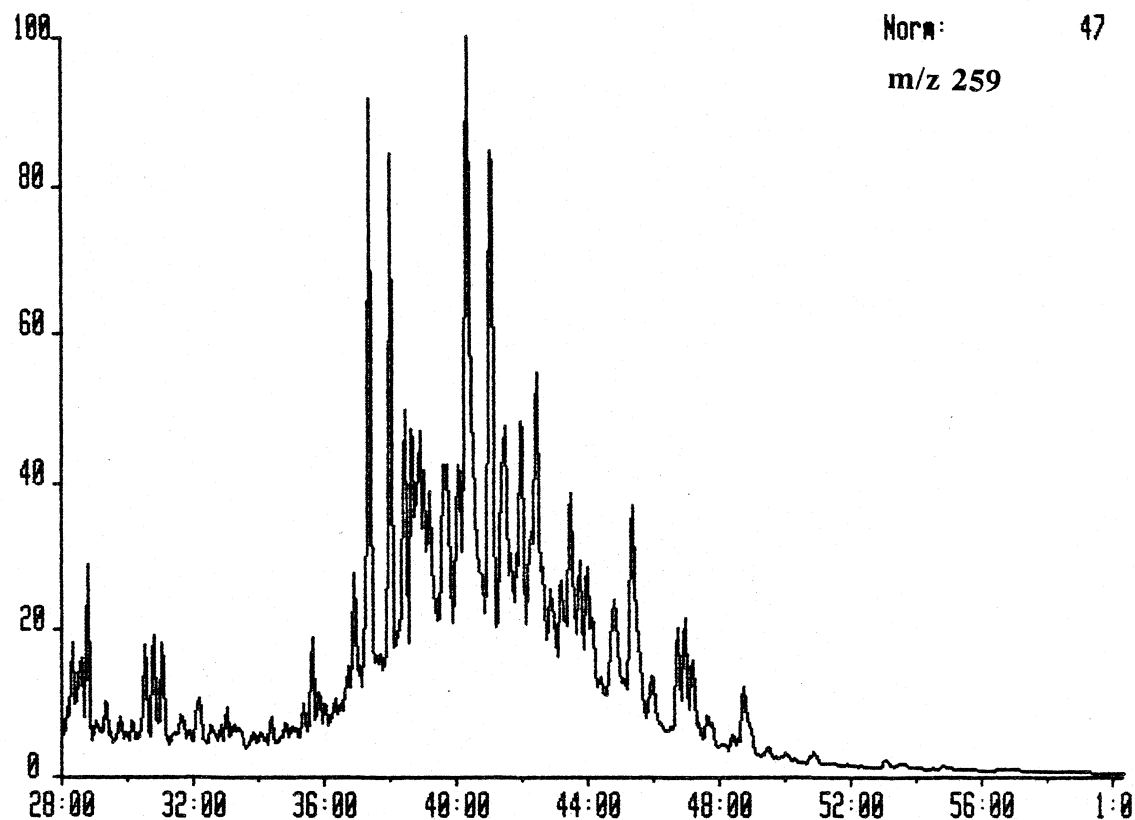
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 259.1000

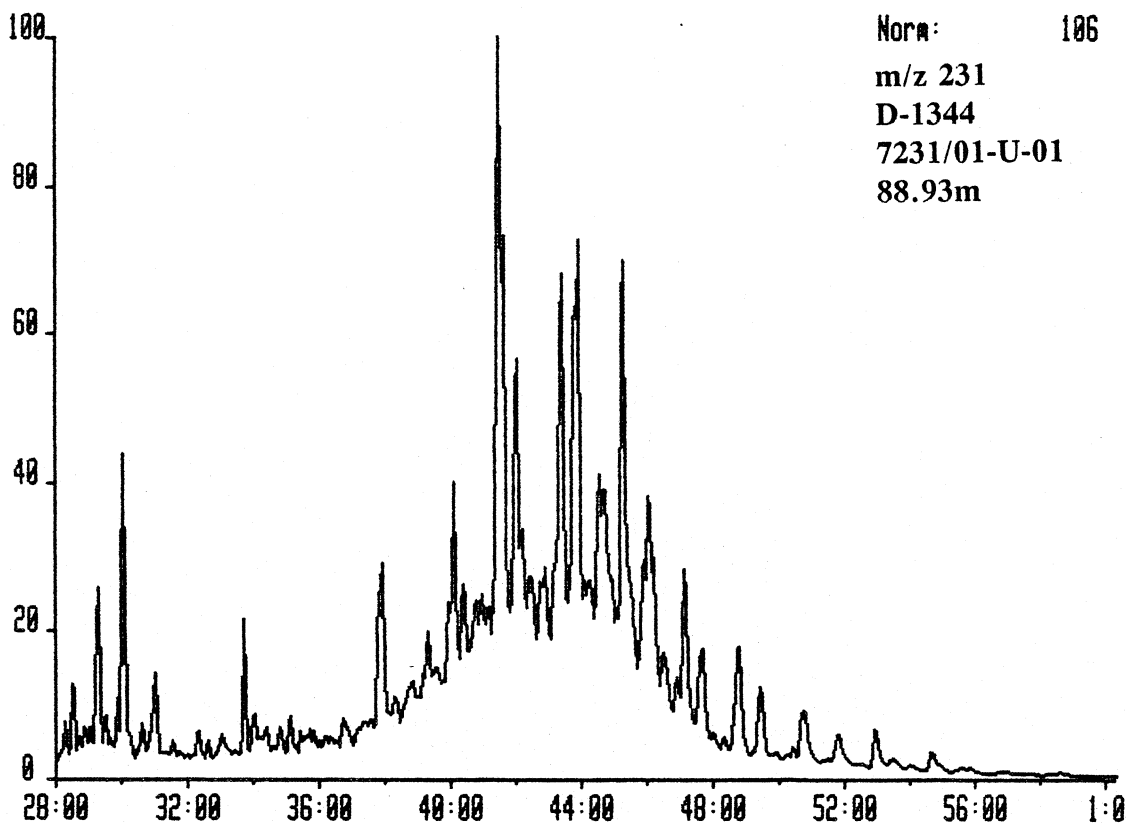
Text:



1304SAT 2-DEC-87
Sample 3 Injection 1
Text:

Sir:Voltage 12-250 Acnt:IKU
Group 1 Mass 231.1000

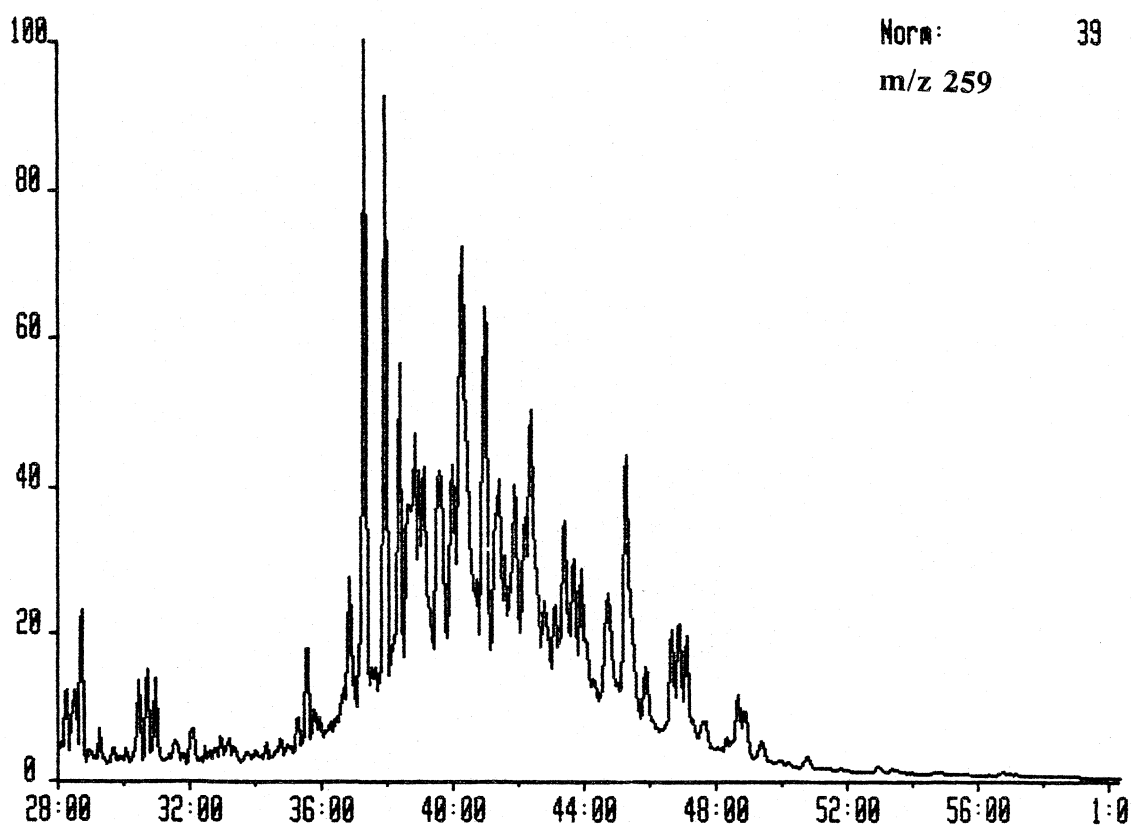
System:QUADSAT



1304SAT 2-DEC-87
Sample 3 Injection 1
Text:

Sir:Voltage 12-250 Acnt:IKU
Group 1 Mass 259.1000

System:QUADSAT





IKU

SINTEP-GRUPPEN

- 141 -

01317SAT 1-DEC-87

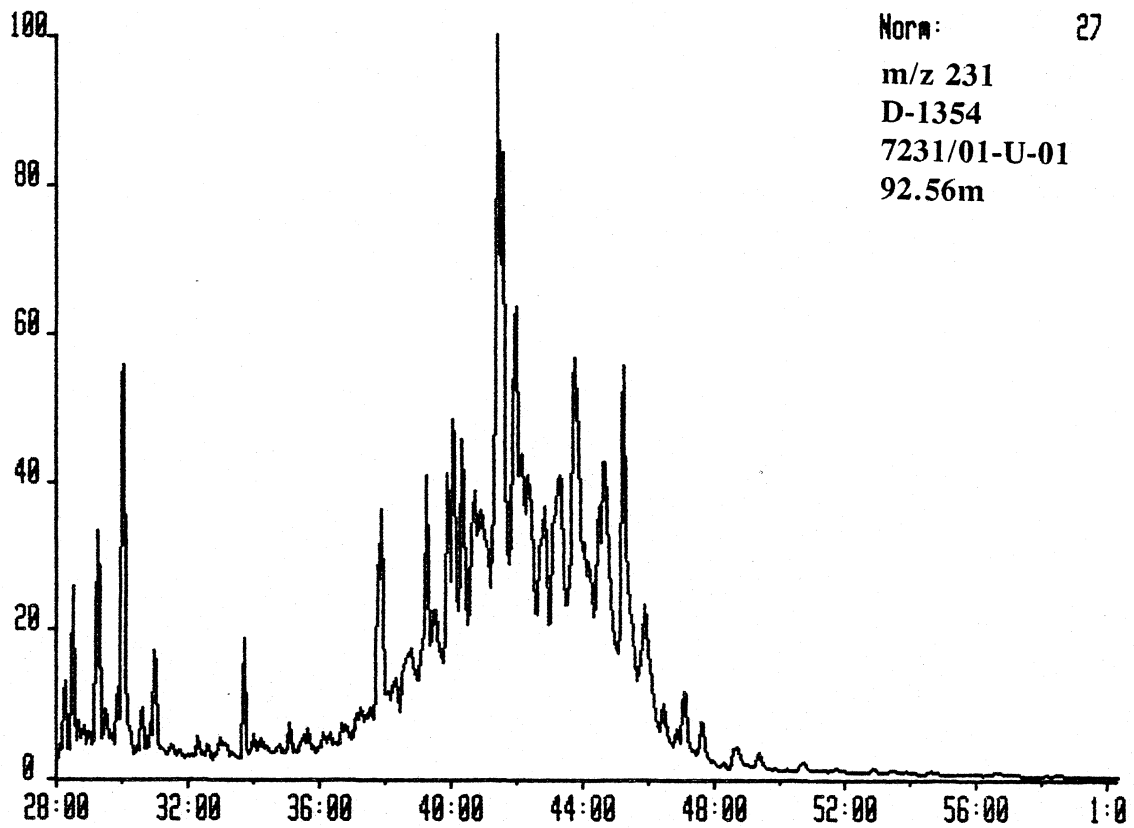
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 4 Injection 1

Group 1 Mass 231.1000

Text:



Norm: 27

m/z 231

D-1354

7231/01-U-01

92.56m

01317SAT 1-DEC-87

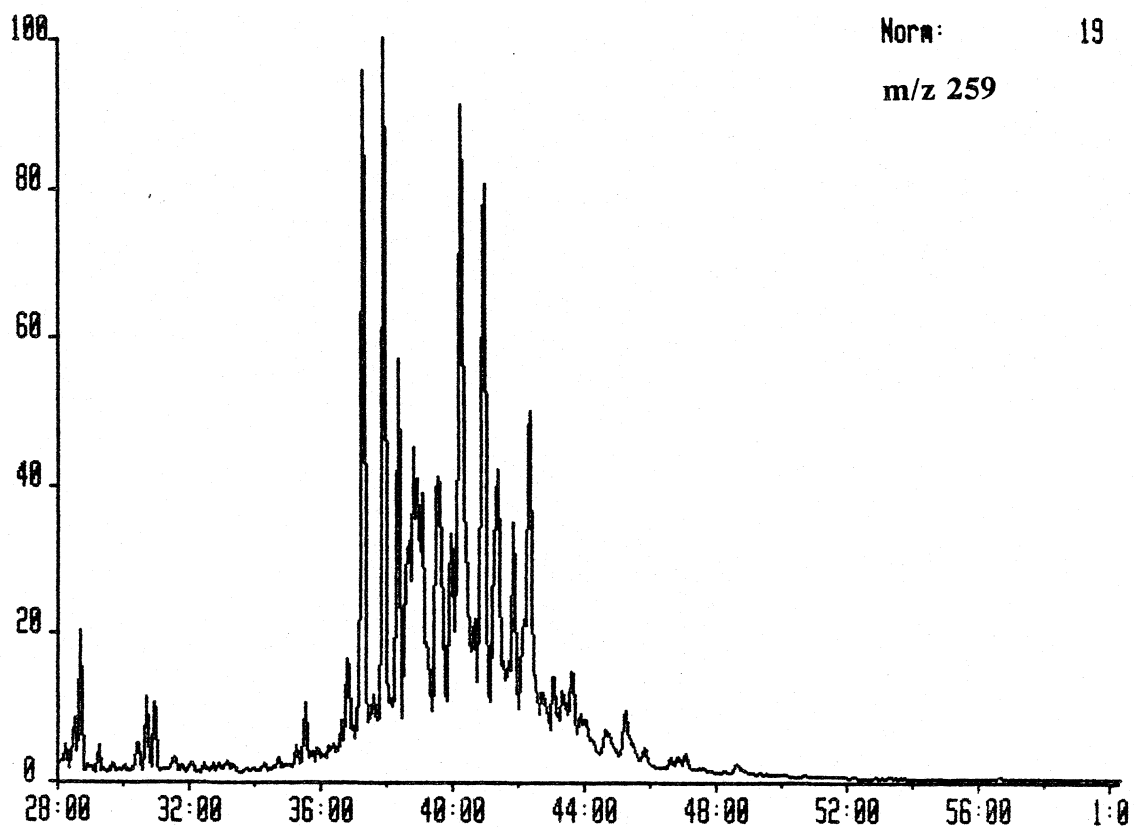
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 4 Injection 1

Group 1 Mass 259.1000

Text:



Norm: 19

m/z 259

Figure A.II.1.5:

CORE 7231/01-U-01
COMPOSITION OF C-27, C-28 AND C-29
5 α 20R STERANES (from m/z 217)

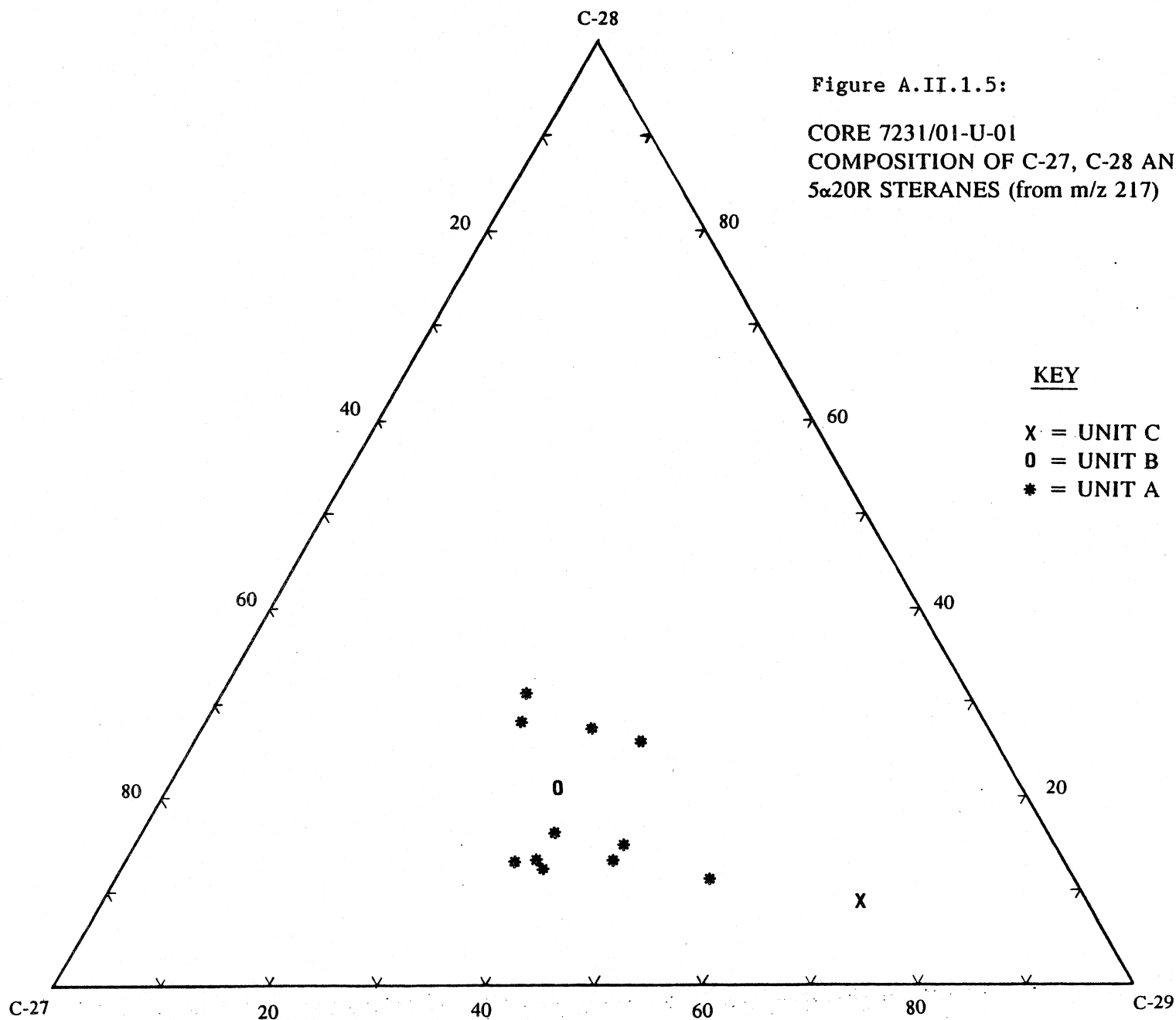


Figure A.II.1.6: Vitrinite reflectance histograms.

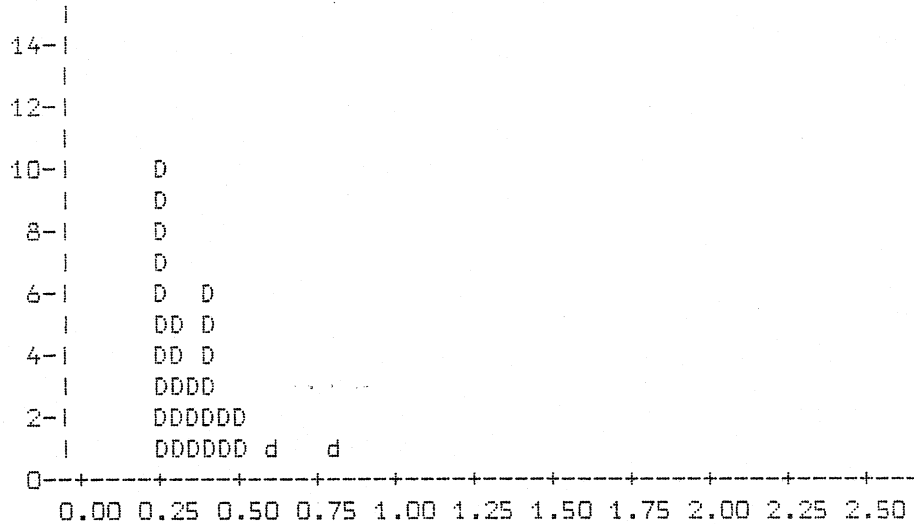
Key:

A	= Grey-black-brown claystone.
	Upper case letters indicate values included in the main population. Lower case letters represent values in other population.
pp	= Statistical data population
	Y = Main population, not necessarily representative of sample maturity.
	N = Other populations.
LOW+HIGH	= Population limits.
VAL.	= Number of measurements in that population.

Lithology cross-reference table

A = Clst. gy
 B = Clst. dk gy
 C = Clst. dk gy
 D = Clst. gn
 E = Clst. bn
 F = Clst. rd
 G = Clst. carb.
 H = Shale
 I = Sandstone
 J = Limestone
 K = Coal
 L = Lignite
 M = Carbargillite
 N = Siltstone
 O = Bit
 P = X

IKU# D-1257 41.2M 7231/1-U-1

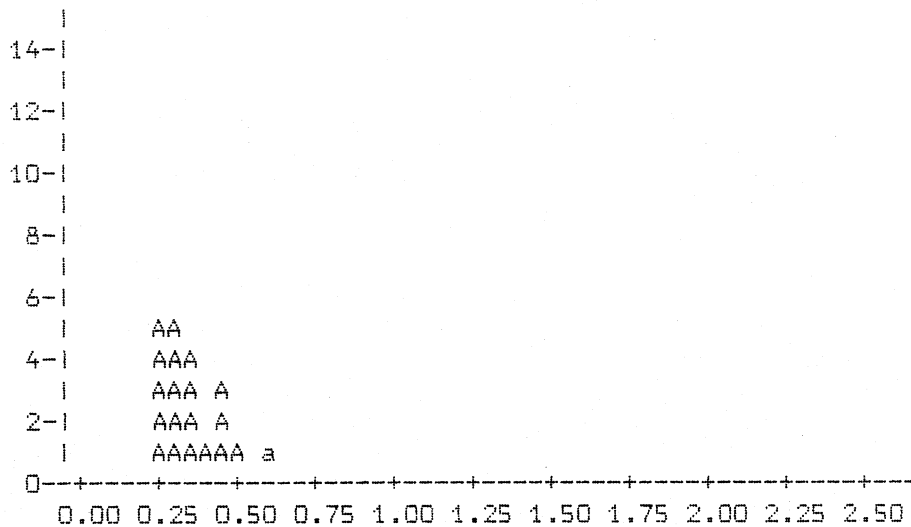


	PP	LOW	HIGH	LIT	#VAL	MEAN	STDV
Y	0.27	0.51	ALL	28	0.36	0.08	
N	0.60	0.83	ALL	2	0.71	0.16	
OVERALL					30	0.38	0.12

ORDERED VALUES FOLLOW:

0.27D	0.27D	0.27D	0.27D	0.27D	0.28D	0.28D	0.28D	0.28D	0.29D	0.30D	
0.32D	0.33D	0.33D	0.34D	0.35D	0.36D	0.39D	0.41D	0.44D	0.44D	0.44D	
0.44D	0.44D	0.46D	0.48D	0.50D	0.50D	0.60d	0.82d				

IKU# D-1267 46.0M 7231/1-U-1

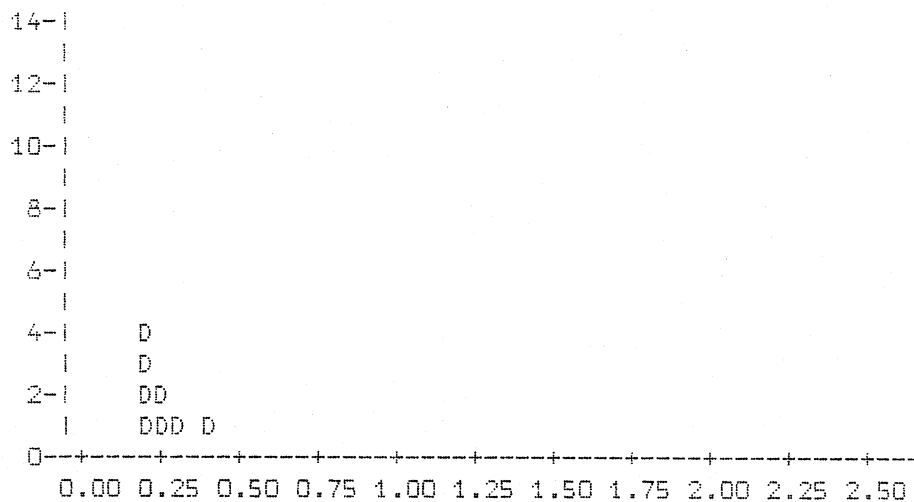


PP	LOW	HIGH	LIT	#VAL	MEAN	STDV
Y	0.25	0.52	ALL	19	0.35	0.08
N	0.61	0.62	ALL	1	0.61	0.00
				OVERALL	20	0.37 0.10

ORDERED VALUES FOLLOW:

0.25A	0.25A	0.27A	0.27A	0.29A	0.30A	0.32A	0.33A	0.33A	0.34A	0.35A
0.35A	0.35A	0.38A	0.44A	0.46A	0.46A	0.47A	0.51A	0.61a		

IKU# D-1305 69.7M 7231/1-U-1



PP LOW HIGH LIT #VAL MEAN STDV
 Y 0.22 0.45 ALL 8 0.27 0.08
 OVERALL 8 0.27 0.08

ORDERED VALUES FOLLOW:

0.220 0.220 0.220 0.230 0.250 0.250 0.300 0.440

IKU# D-1306 70.7M 7231/1-U-1

14-I

12-I

10-I

8-I

6-I

4-I d

2-I d

1 d

0 dD

0 dD DD D

0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50

PP LOW HIGH LIT #VAL MEAN STDV

Y 0.29 0.51 ALL 5 0.37 0.09

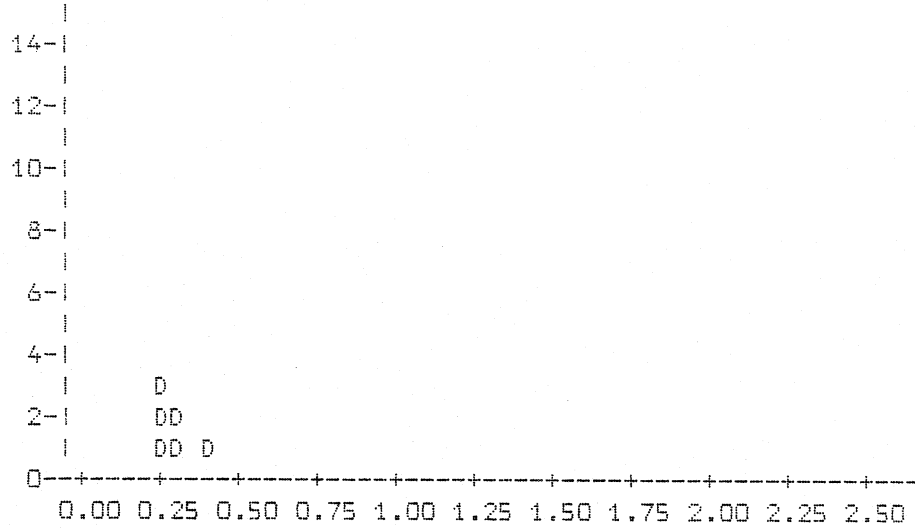
N 0.22 0.25 ALL 5 0.23 0.01

OVERALL 10 0.30 0.10

ORDERED VALUES FOLLOW:

0.22d 0.22d 0.23d 0.24d 0.24d 0.29d 0.29d 0.35d 0.43d 0.50d

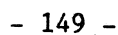
IKU# 0-1321 74.0M 7231/1-U-1



PP LOW HIGH LIT #VAL MEAN STDV
 Y 0.26 0.41 ALL 6 0.31 0.05
 OVERALL 6 0.31 0.05

ORDERED VALUES FOLLOW:

0.260 0.270 0.290 0.300 0.320 0.400



14-1

12-1

10-1

3-1

6-11

I D

4-1 DD

1 DDD

2-1 DDD

1 DDDDD

0

0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50

Y 0.24 0.45 ALL 14 0.32 0.06

OVERALL 14 0.32 0.06

ORDERED VALUES FOLLOW:

0.240 0.250 0.250 0.270 0.270 0.280 0.320 0.320 0.340 0.340 0.350
0.370 0.380 0.440

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Core 7231/04-U-01

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Table A.II.2.1a:

CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS IN HEADSPACE

I	I	I	I	I	I	I	I	I	I	I	I	I	I
	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	SUM	SUM	WET-	iC4	I
	no.	m							C1-C4	C2-C4	NESS	-----	I
											(%)	nC4	I
I	I	I	I	I	I	I	I	I	I	I	I	I	I
I	D 1137	39.20	71492	152	42	18	4	5	71708	216	0.30	4.94	I
I	D 1144	46.92	7						7		0.00	*****	I
I	D 1147	48.12	898						898		0.00	*****	I
I	D 1151	52.63	1136						1136		0.00	*****	I
I	D 1155	56.02	6632						6632		0.00	*****	I
I	D 1160	59.03	16867						16867		0.00	*****	I
I	D 1167	62.02	20687	2					20689	2	0.01	*****	I
I	D 1173	64.02	31052	3					31055	3	0.01	*****	I
I	D 1183	67.70	96719	18		6			96743	24	0.02	*****	I
I	D 1189	70.33	58						58		0.00	*****	I
I	D 1190	73.85	22581	5					22586	5	0.02	*****	I
I	D 1204	76.60	45446	10					45456	10	0.02	*****	I
I	D 1211	79.47	38862	12					38873	12	0.03	*****	I
I	D 1218	82.43	18966	20	2	3			18991	25	0.13	*****	I
I	D 1223	84.22	17255	25	5	4	1		17290	35	0.20	5.26	I
I	D 1227	86.46	26500	70	20	9	2		26601	100	0.38	4.47	I
I	D 1231	91.22	34520	123	37	12	3		34696	176	0.51	4.41	I
I	D 1235	93.64	29965	124	35	10	2		30137	172	0.57	4.14	I
I	D 1241	97.13	20842	120	28	8	2		20999	158	0.75	4.53	I

Table A.II.2.1b:

I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	SUM	SUM	WET-	iC4	I	
	no.	m							C1-C4	C2-C4	NESS	-----	I	
											(%)	nC4	I	
I													I	
I	D 1137	39.20	153	9	9				171	18	10.59	*****	I	
I	D 1144	46.92	116	7	5				128	12	9.34	*****	I	
I	D 1147	48.12	331	11	9				351	20	5.62	*****	I	
I	D 1151	52.63	1791	9	9				1809	18	0.99	*****	I	
I	D 1155	56.02	2974	11	1				2986	12	0.40	*****	I	
I	D 1160	59.03	1388	9					1397	9	0.65	*****	I	
I	D 1167	62.02	1602	10	11	4			1627	25	1.55	*****	I	
I	D 1173	64.02	6447	20	11	2		24	6480	33	0.51	*****	I	
I	D 1183	67.70	12						12		0.00	*****	I	
I	D 1189	70.33	6930	28	24	1			6983	53	0.76	*****	I	
I	D 1190	73.85	5228	25	28	5			5286	58	1.11	*****	I	
I	D 1204	76.60	5431	33	31	7			5502	71	1.29	*****	I	
I	D 1211	79.47	4851	35	32	6			4923	73	1.47	*****	I	
I	D 1218	82.43	8011	61	34	31	3		8140	129	1.58	9.67	I	
I	D 1223	84.22	8358	91	84	59	23	122	8616	257	2.99	2.57	I	
I	D 1227	86.46	8210	128	143	79	31	108	8591	381	4.43	2.54	I	
I	D 1231	91.22	7757	149	178	73	32	79	8188	431	5.26	2.29	I	
I	D 1235	93.64	6876	159	181	69	31	157	7317	440	6.02	2.26	I	
I	D 1241	97.13	8807	229	226	83	38	173	9382	576	6.13	2.18	I	

Table A.II.2.1c:

CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS SUMMATION

I									SUM	SUM	WET-	iC4	I
I	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	C1-C4	C2-C4	NESS	-----	I
I	no.	m									(%)	nC4	I
I													I
I	D 1137	39.20	71646	161	51	18	4	5	71880	234	0.33	4.94	I
I	D 1144	46.92	123	7	5				135	12	8.83	*****	I
I	D 1147	48.12	1229	11	9				1249	20	1.58	*****	I
I	D 1151	52.63	2927	9	9				2945	18	0.61	*****	I
I	D 1155	56.02	9606	11	1				9618	12	0.12	*****	I
I	D 1160	59.03	18255	9					18264	9	0.05	*****	I
I	D 1167	62.02	22289	12	11	4			22316	27	0.12	*****	I
I	D 1173	64.02	37499	23	11	2		24	37535	36	0.10	*****	I
I	D 1183	67.70	96731	18		6			96755	24	0.02	*****	I
I	D 1189	70.33	6988	28	24	1			7041	53	0.75	*****	I
I	D 1190	73.85	27809	30	28	5			27872	64	0.23	*****	I
I	D 1204	76.60	50877	43	31	7			50958	81	0.16	*****	I
I	D 1211	79.47	43712	46	32	6			43796	84	0.19	*****	I
I	D 1218	82.43	26977	81	37	34	3		27131	154	0.57	10.55	I
I	D 1223	84.22	25613	116	89	63	24	122	25906	293	1.13	2.66	I
I	D 1227	86.46	34711	198	162	88	33	108	35192	481	1.37	2.66	I
I	D 1231	91.22	42277	272	215	85	34	79	42883	606	1.41	2.46	I
I	D 1235	93.64	36842	284	216	80	33	157	37454	612	1.63	2.40	I
I	D 1241	97.13	29648	349	254	90	40	173	30381	733	2.41	2.28	I

Table A.II.2.2:

DATA FROM ROCK EVAL PYROLYSIS

IKU No.	DEPTH m/ft	S1 (mg/g ROCK)	S2 (mg/g ROCK)	S3 (mg/g ROCK)	TOC (%)	HYDR. INDEX (mg/g TOC)	OXYGEN INDEX	PETROLEUM POTENTIAL S1+S2	PROD. INDEX S1+S2	TEMP. MAX (C)
D 1146	45.87	0.07	0.05	0.23	0.68	7	34	0.12	0.58	426
D 1153	50.58	0.05	0.02	0.10	0.59	3	17	0.07	0.71	289
D 1157	55.98	0.06	0.06	0.12	0.72	8	17	0.12	0.50	311
D 1172	59.15	0.10	0.07	0.12	0.88	8	14	0.17	0.59	307
D 1173	64.02	0.06	0.34	0.21	1.62	21	13	0.40	0.15	429
D 1192	69.53	0.07	0.56	1.81	1.93	29	94	0.63	0.11	436
D 1208	74.39	0.08	0.38	0.36	1.83	21	20	0.46	0.17	435
D 1211	79.47	0.06	0.45	0.22	1.80	25	12	0.51	0.12	432
D 1218	82.43	0.16	2.13	2.73	3.67	58	74	2.29	0.07	430
D 1225	85.45	0.10	1.37	4.61	3.33	41	138	1.47	0.07	433
D 1230	88.84	0.12	0.86	0.59	2.70	32	22	0.98	0.12	434
D 1231	91.22	0.14	1.55	5.46	3.11	50	176	1.69	0.08	426
D 1238	94.20	0.09	0.79	3.28	3.82	21	86	0.88	0.10	432
D 1241	97.13	0.16	1.36	3.23	2.88	47	112	1.52	0.11	429

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Table A.II.2.3:

VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
D-1148	-----	48.42	0.55 (4)	R	0.07	---
D-1208	-----	74.39	0.42 (18) 0.59 (2)	F R	0.07 0.02	4,6-7
D-1225	-----	85.45	0.36 (16) 0.22 (2) 0.63 (2)	F S? R	0.08 0.01 0.01	2-4
D-1230	-----	88.84	0.40 (16) 0.61 (4)	F R	0.07 0.01	2-4

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor
S = Stained; R = Reworked.

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
D-1208	74.39	Am: 80% Lm: 5% W: 10%* C: 5%	F-M-L	Fair	3.5-4.0	Organic residue is dominated by finely dispersed amorphous matter, together with greyish, granular amorphous masses which are frequently specked with small dash woody/coaly fragments. * Sieved residue is dominated by dark brown and blocky, woody/coaly phytoclasts and contains fairly common palynomorphs.
D-1225	85.45	Am: 50-65% Lm: 5% W: 25-30% C: 5%	F-M-L	Fair	3.5-4.0	As for sample D-1208.
D-1230	88.84	Am: 65-70% Lm: 5% W: 20-25% C: 5%	F-M-L	Fair	3.5-4.0	As for sample D-1208.

Abbreviations

Am Amorphous

Al Algal material
Lm Liptinitic material

W Woody material
C Coaly fragments

F Fine
M Medium
L Large

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
D-1241	97.13	Am: 60-65% Lm: 5% W: 25-30% C: 5%	F-M-L	Fair-Poor	3.5-4.0	As for sample D-1208.

Abbreviations

Am Amorphous

Al Algal material
Lm Liptinitic material

W Woody material
C Coaly fragments

F Fine
M Medium
L Large

Table A.II.2.5:

AMOUNT OF ASPHALTENES AND POLARS IN SEDIMENT

I			:	Asphaltenes	:	Polar	I
I	IKU-No.	DEPTH	:		:		I
I		(m)	:	(mg)	:	(mg)	I
I	=====						I
I			:		:		I
I	D 1231	91.22	:	4.4	:	2.3	I
I			:		:		I
I	D 1241	97.13	:	1.8	:	3.7	I
I			:		:		I
	=====						

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Table A.II.2.6:

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

I	IKU-No	DEPTH	: Rock	EOM	Sat.	Aro.	HC	Non HC	TOC	I
I		(m)	: Extr.	(mg)	(mg)	(mg)	(mg)	(mg)	(%)	I
I			:							I
I	D 1231	91.22	:	7.5	8.5	2.6	0.1	2.7	5.8	3.11
I			:							I
I	D 1241	97.13	:	7.6	5.1	0.2	0.2	0.4	4.7	2.88
I			:							I

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Table A.II.2.7:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
D 1231	91.22	1135	347	13	360	774
D 1241	97.13	675	26	26	53	623

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Table A.II.2.8:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS
(mg/g TOC)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
D 1231	91.22	36.5	11.2	0.4	11.6	24.9
D 1241	97.13	23.5	0.9	0.9	1.8	21.6

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Table A.II.2.9:

COMPOSITION OF MATERIAL EXTRACTED FROM THE ROCK

I			:	Sat	Aro	HC	SAT	Non HC	HC	I
I	IKU-No	DEPTH	:	---	---	---	---	---	---	I
I			:	EOM	EOM	EOM	Aro	EOM	Non HC	I
I		(m)	:	%	%	%	x 100	%	x 100	I
I			:							I
I	D 1231	91.22	:	30.6	1.2	31.8	2600.0	68.2	46.6	I
I			:							I
I	D 1241	97.13	:	3.9	3.9	7.8	100.0	92.2	8.5	I
I			:							I

Table A.II.2.10:

TABULATION OF DATA FROM THE GASCHROMATOGRAMS

I	DEPTH	:	PRISTANE	PRISTANE	PHYTANE	A	n-C17		I
I	IKU No.	:	-----	A = -----	B = -----	-----	-----	CPI	CPI
I	(m)	:	PHYTANE	n-C17	n-C18	B	n-C27	1	2
I		:							
I		:							
I	D 1231	:	91.22	1.6	1.1	0.5	2.0	0.3	1.2
I		:							
I	D 1241	:	97.13	1.7	1.4	0.7	2.0	0.5	1.3
I		:							

DATE : 10 - 12 - 87.

Table A.II.2.11a:

Molecular ratios from sterane and terpane mass chromatograms.

IKU code	Depth	$\alpha\beta/\alpha\beta+\beta\alpha$	%22S ²⁾	% $\beta\beta$ ³⁾	%20S ⁴⁾
<u>7231/04-U-01</u>					
D-1231	91.22	0.63	21.08	51.24	6.21
D-1241	97.13	0.63	23.53	48.37	5.26

¹⁾ E/E+F IN M/Z 191.

²⁾ Average % distribution between first and second eluting isomers of extended hopanes (G-M in m/z 191).

³⁾ $2(r+s)/(q+t+2(r+s))$ in m/z 217.

⁴⁾ q/q+t in m/z 217.

Table A.II.2.11b:

Molecular ratios from terpane and sterane mass chromatograms.
 Maturity and source characteristic ratios.

IKU no.	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
---------	-----------	-------------------	---------------------	-------------------	-------------------	---------------------

7231/04-U-01

D-1231	91.22	-	7.33	-	-	0.40
D-1241	97.13	-	5.43	-	-	0.34

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191).

2) B/A in m/z 191.

3) Relative abundance of unknown (X/E in m/z 191).

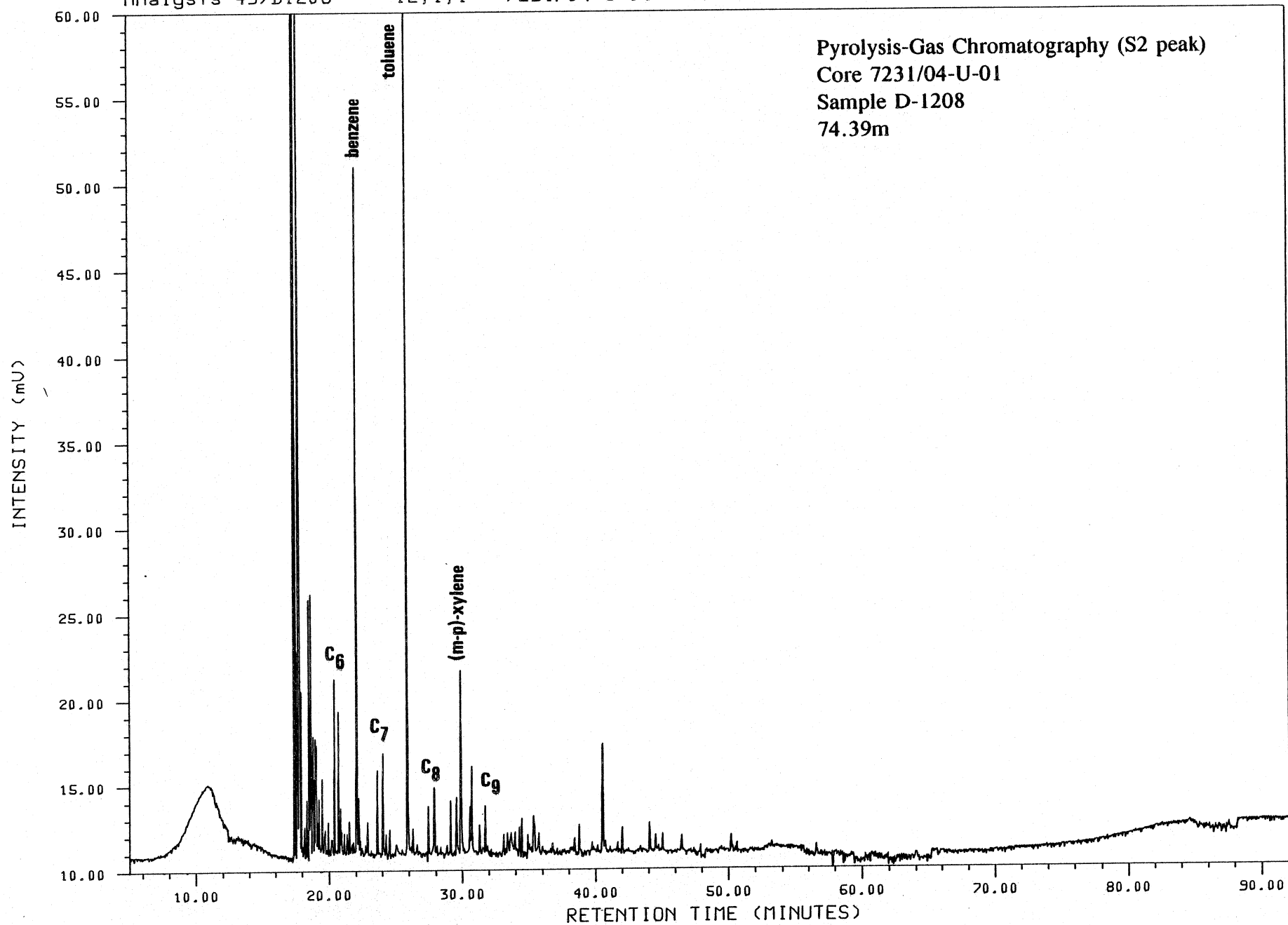
4) Relative abundance of bisnorhopane (Z/E in m/z 191).

5) Relative abundance of C₂₇ rearranged steranes (a/a+j in m/z 217).

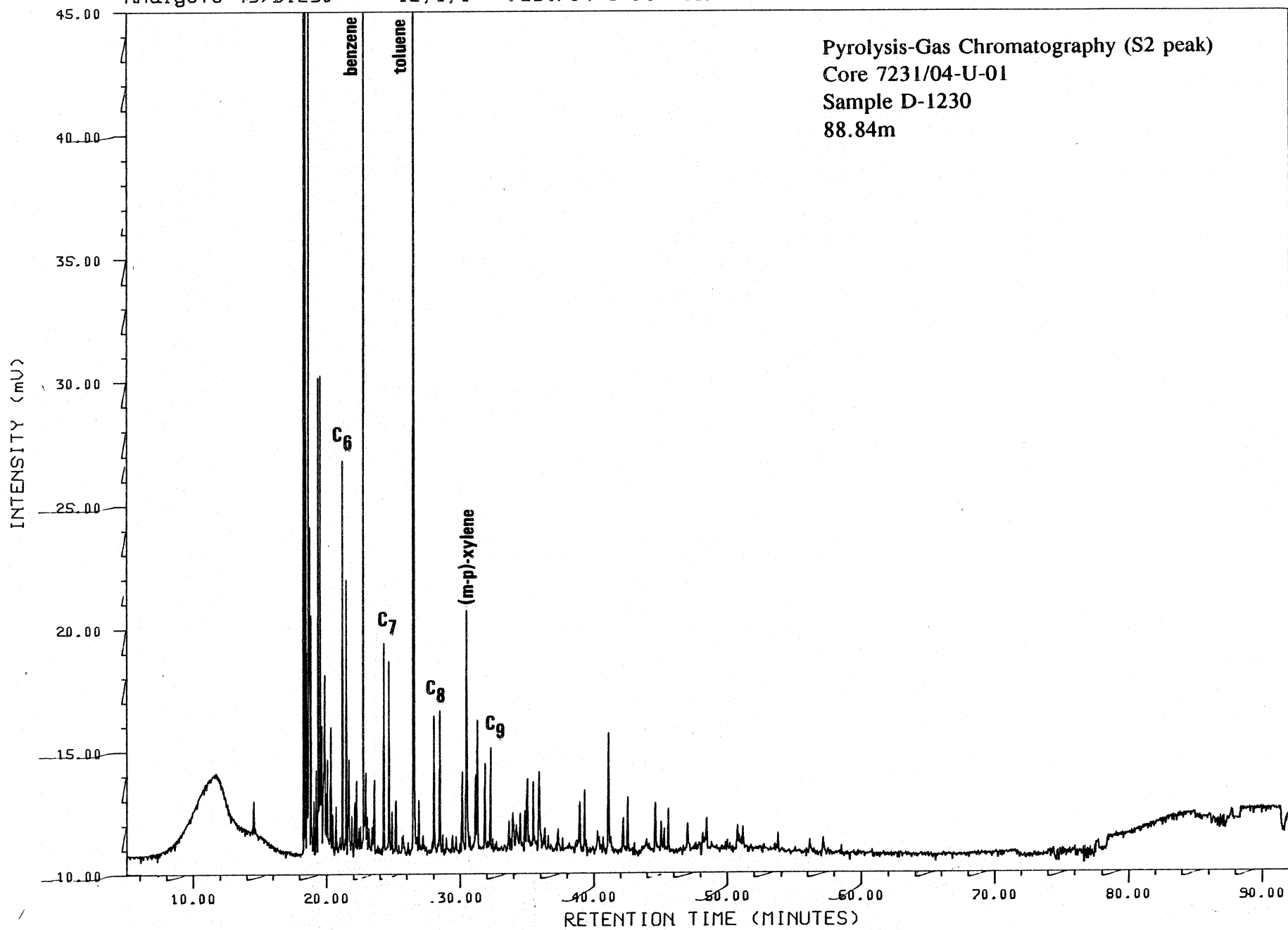
Figure A.II.2.1:

Pyrolysis-gas chromatograms (S2 peak)

Analysis 437D1208 12,1,1 7231/04-U-01 CORE



Analysis 437D1230 12,1,1 7231/04-U-01 CORE



Analysis 437D1241 12,1,1 7231/04-U-01 CORE

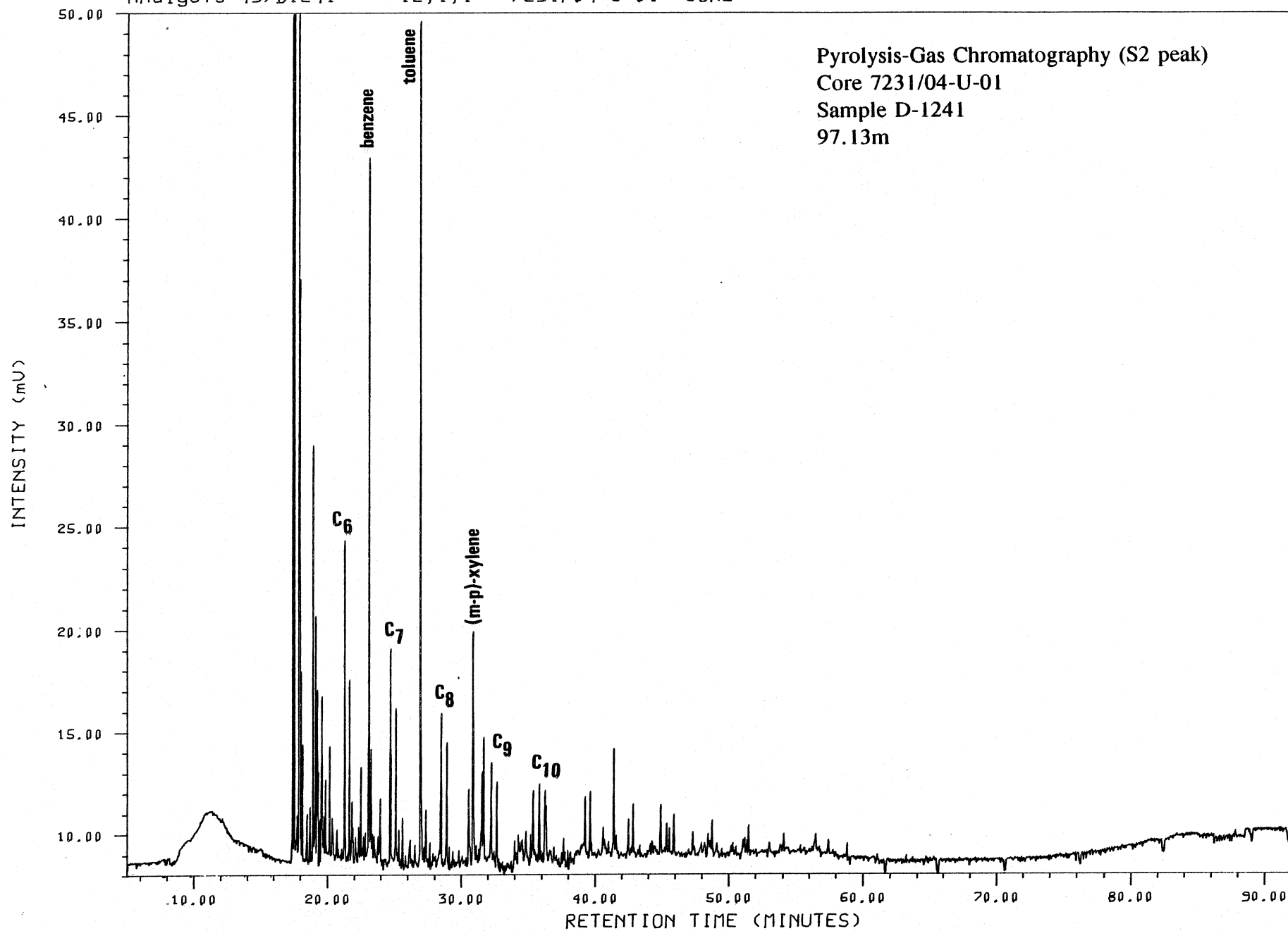
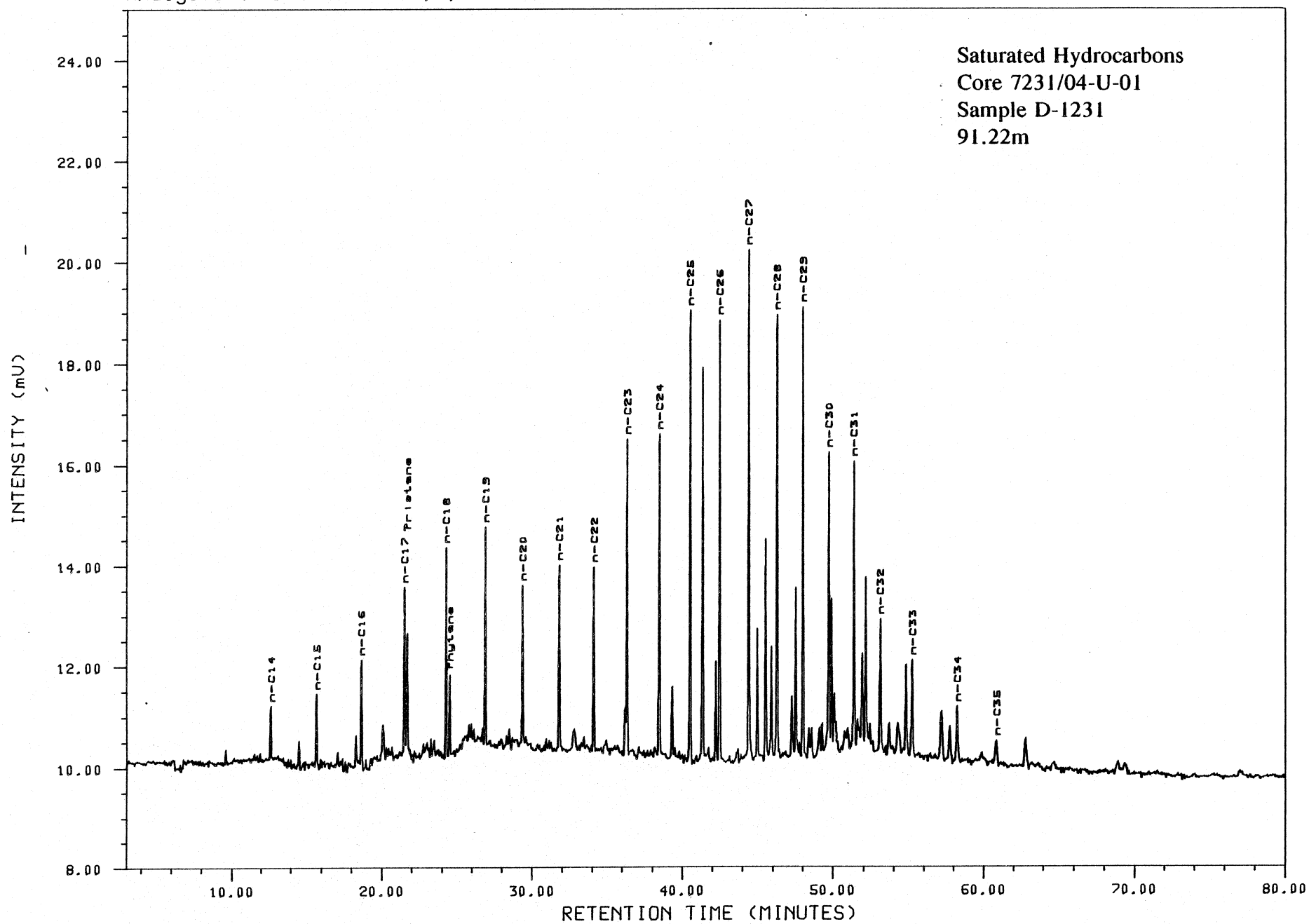


Figure A.II.2.2:

Saturated hydrocarbon gas chromatograms

n-C ₁₅ etc.	- n-alkanes
Pr	- pristane
Ph	- phytane
*	- contamination (dioctylphthalate)

Analysis 437D1231S 2,1,1 7231/04-U-01 CORE



jsls 437D1241S 2,1,1 7231/04-U-01 CORE

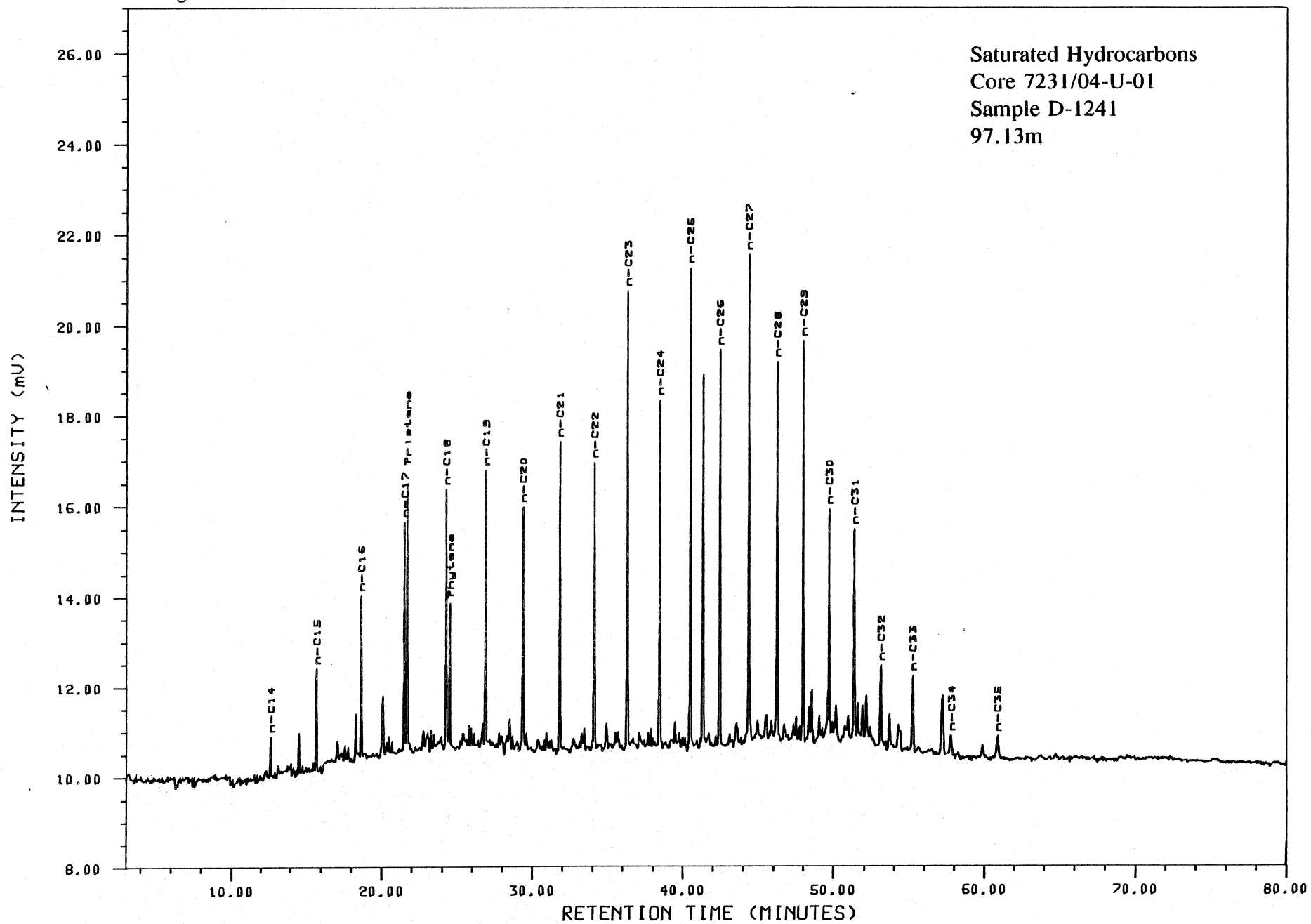


Figure A.II.2.3:

Mass fragmentograms of m/z 191, 205 (terpanes).



IKU
SINTEF-GRUPPEN

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01241SAT 1-DEC-87

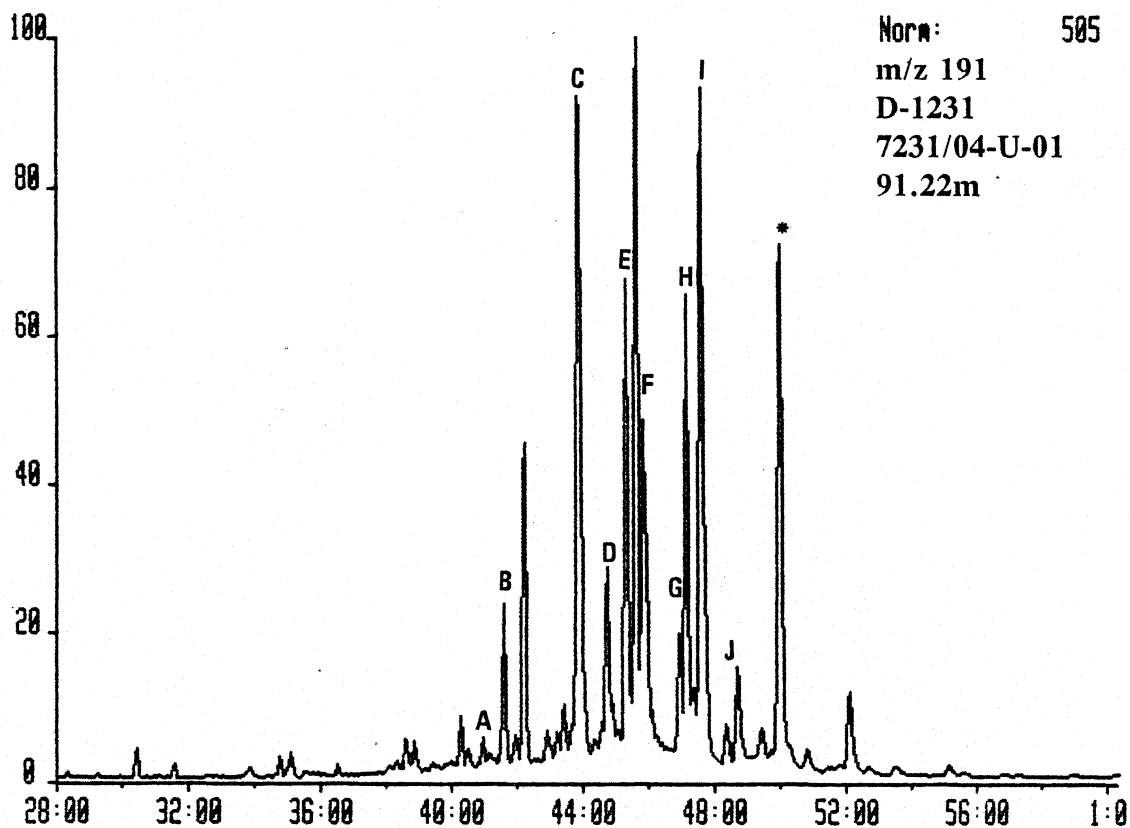
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 191.1000

Text:



01241SAT 1-DEC-87

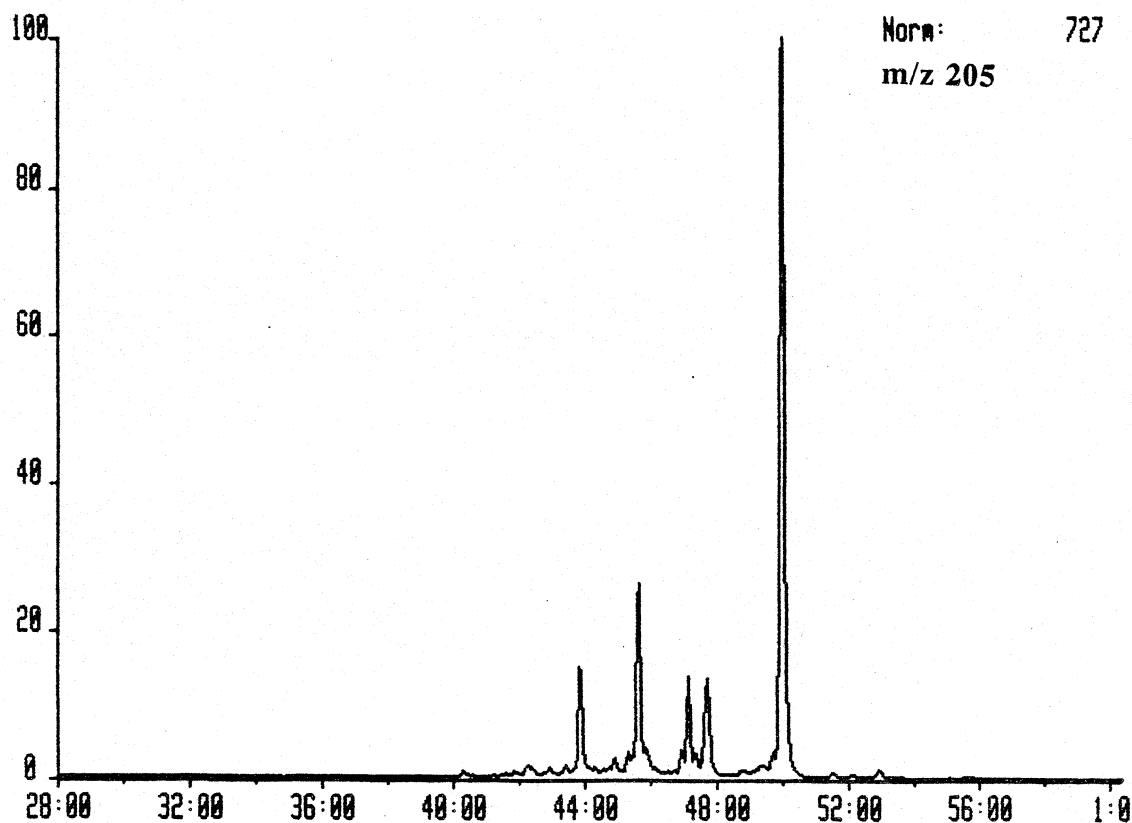
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 205.1000

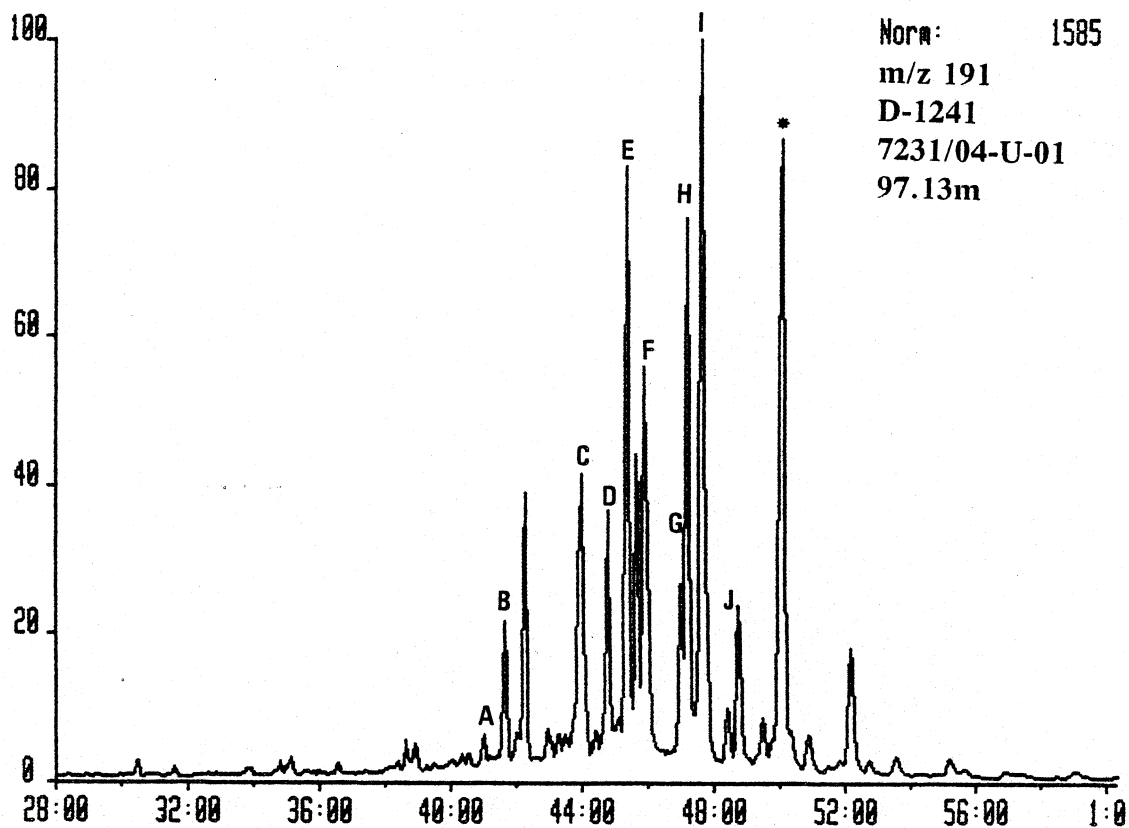
Text:



D1241SAT 1-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 191.1000

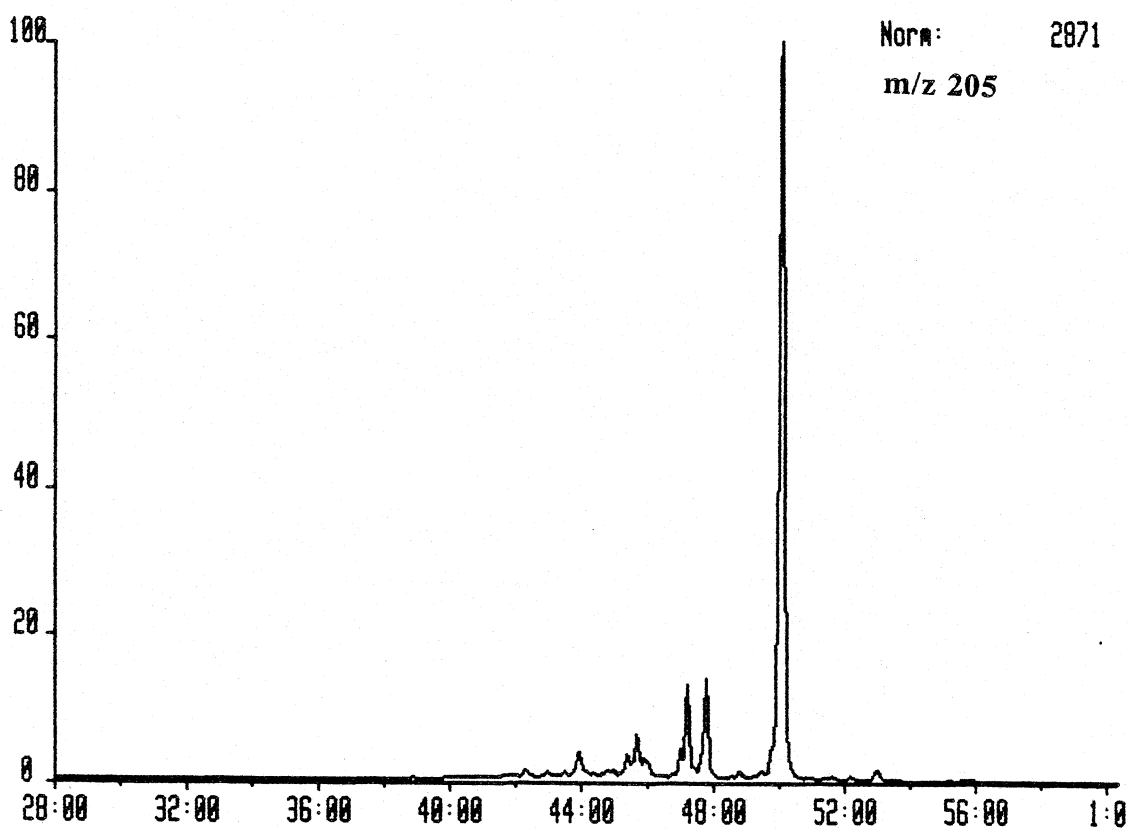
System: QUADSAT



D1241SAT 1-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 205.1000

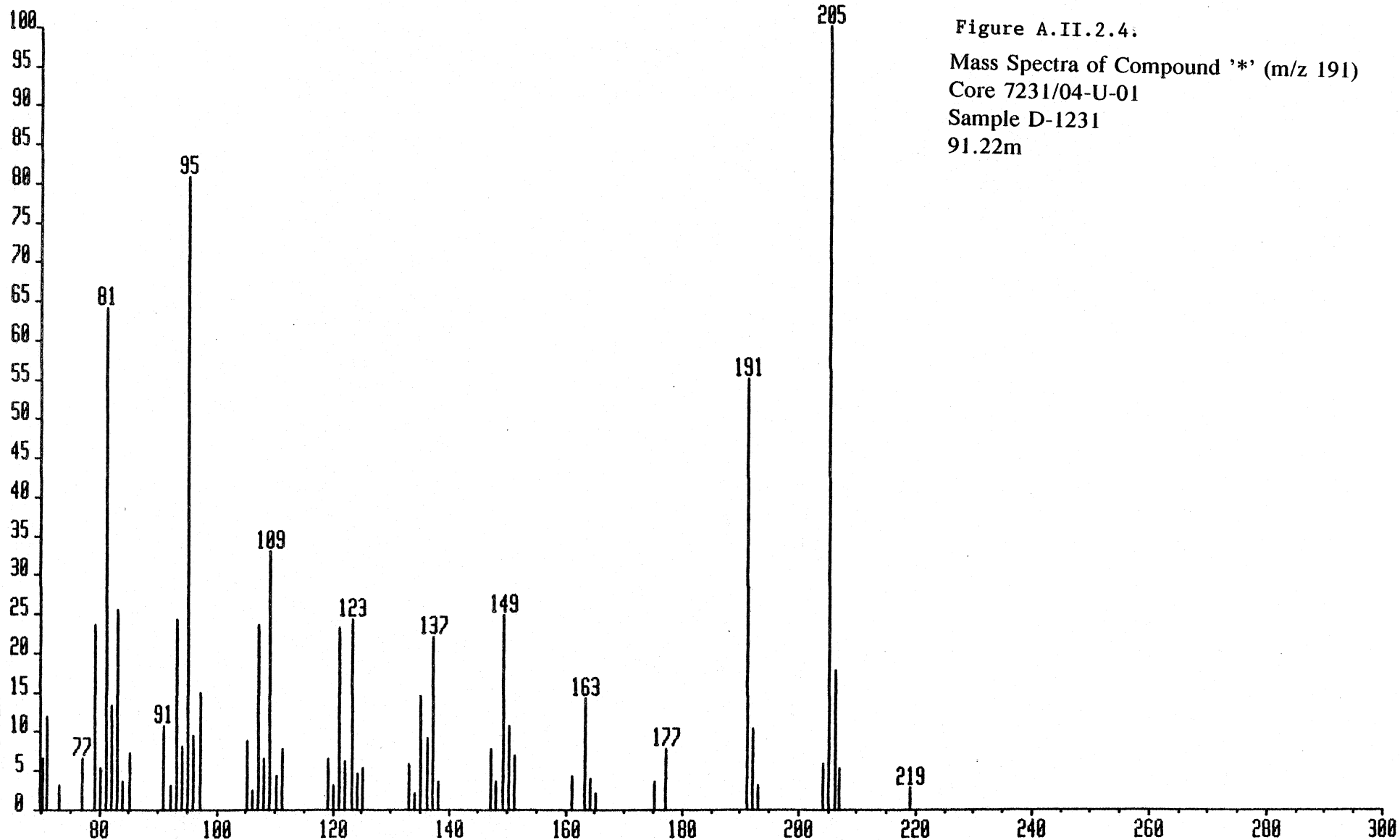
System: QUADSAT



D1231FS#2395 x1 Bgd=1911 4-DEC-87 07:56+1:00:24 12250
BpM=0 I=40mV Hm=0 TIC=2172000 Acnt: IKU
Text:

EI+
Sys: AROMATICS
Cal: CALB

HMR: 264000
MASS: 205



IKU
SINTEF-GRUPPEN



Figure A.II.2.5:

Mass fragmentograms of m/z 163, 177 (terpanes).

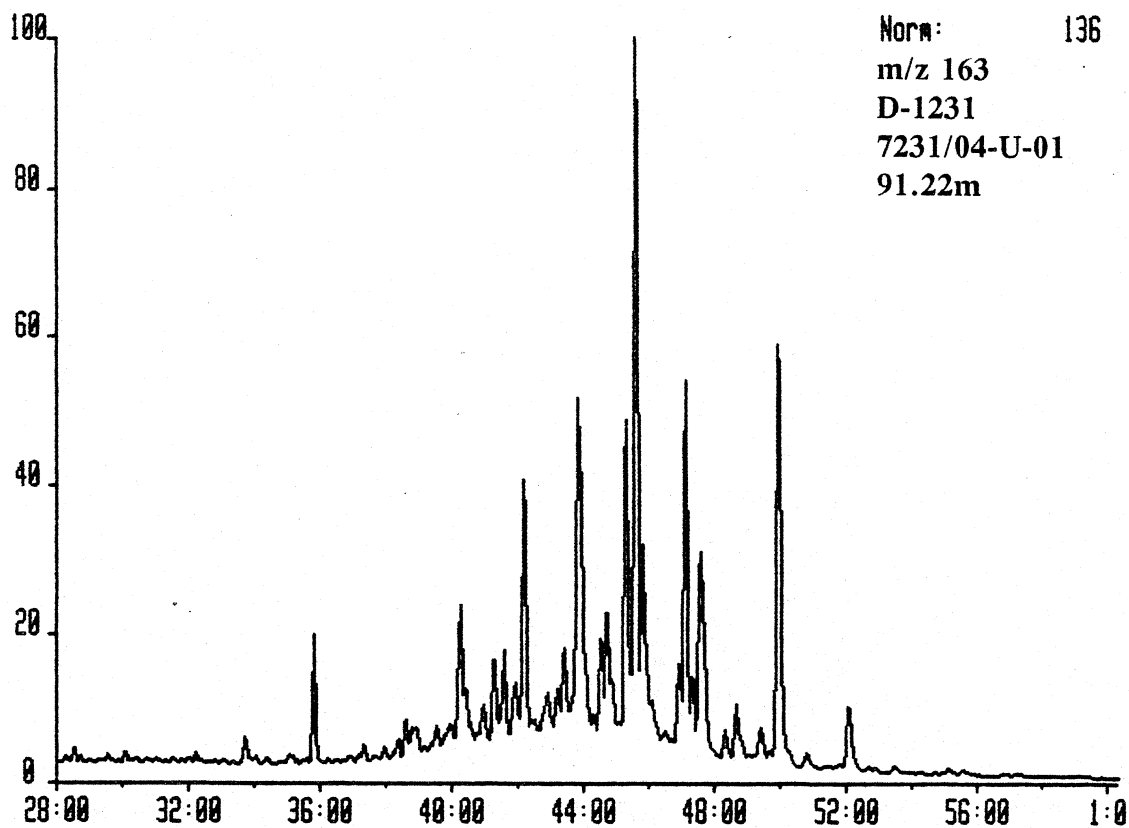


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D1241SAT 1-DEC-87
Sample 2 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 163.1000

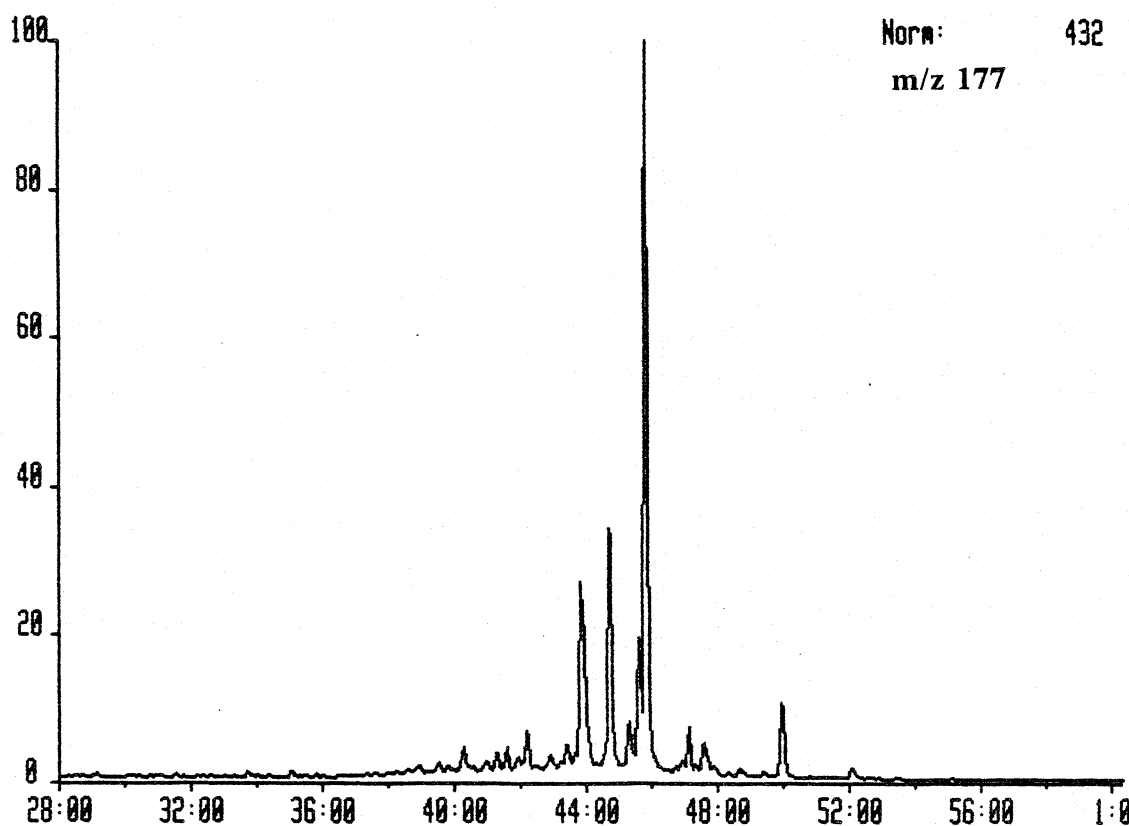
System: QUADSAT



D1241SAT 1-DEC-87
Sample 2 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 177.1000

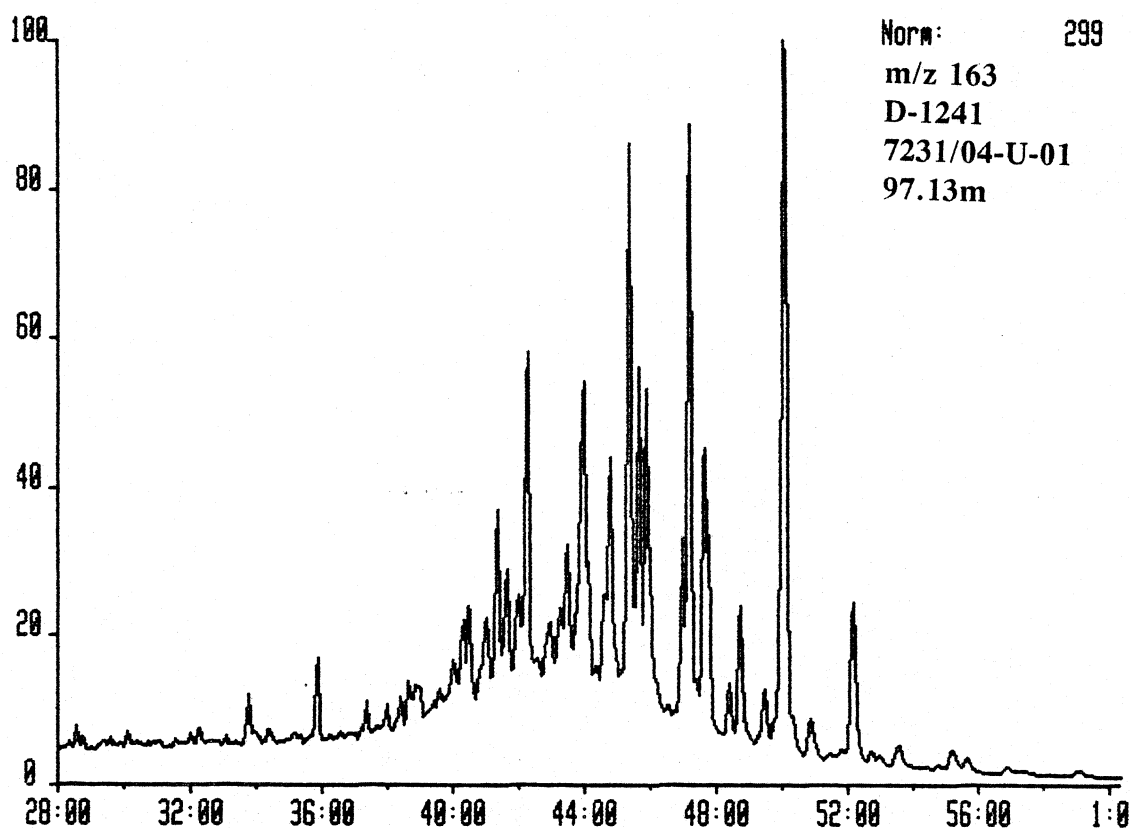
System: QUADSAT



D1241SAT 1-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 163.1000

System: QUADSAT



D1241SAT 1-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 177.1000

System: QUADSAT

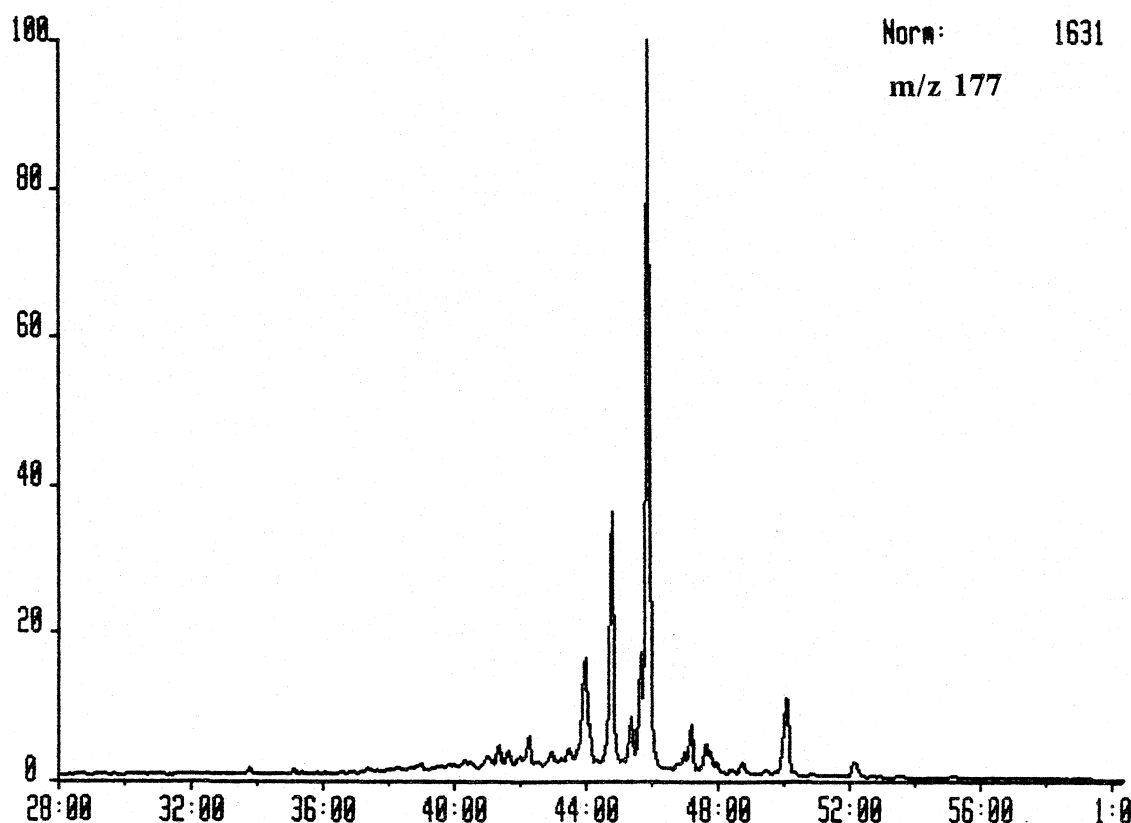
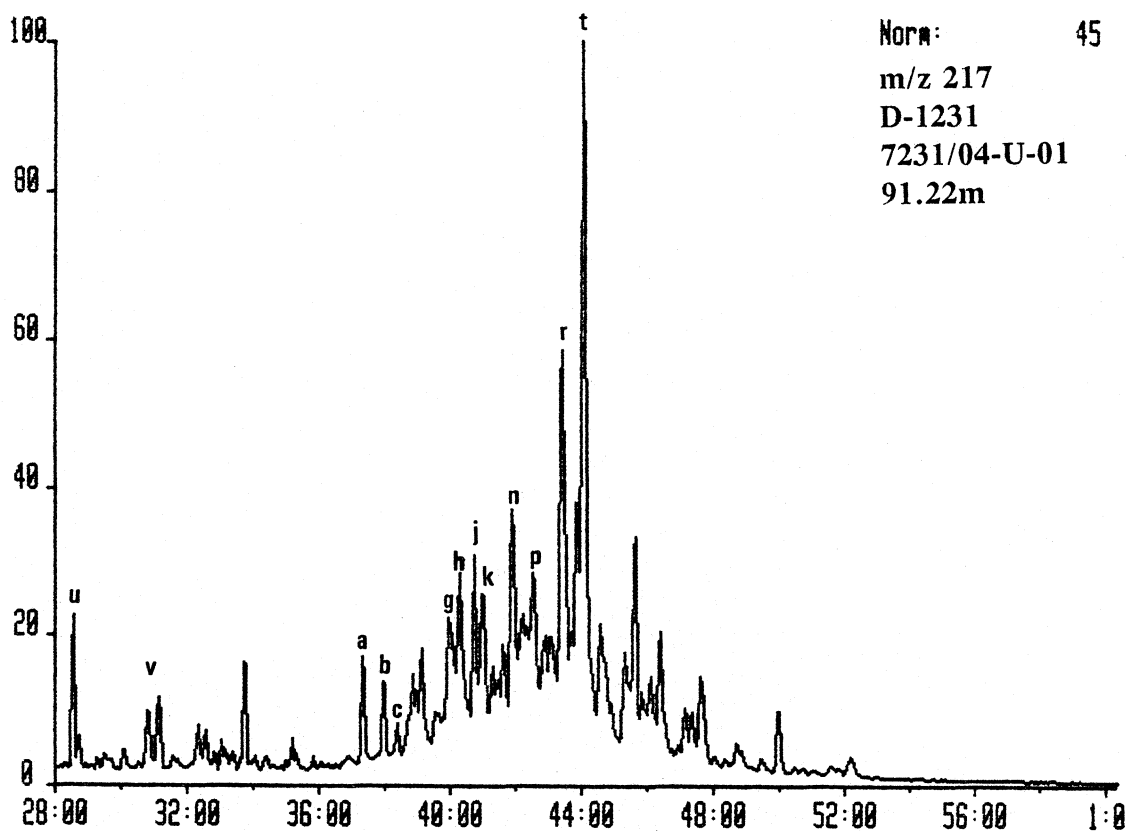


Figure A.II.2.6:

Mass fragmentograms of m/z 217, 218, 231, 259 (steranes)

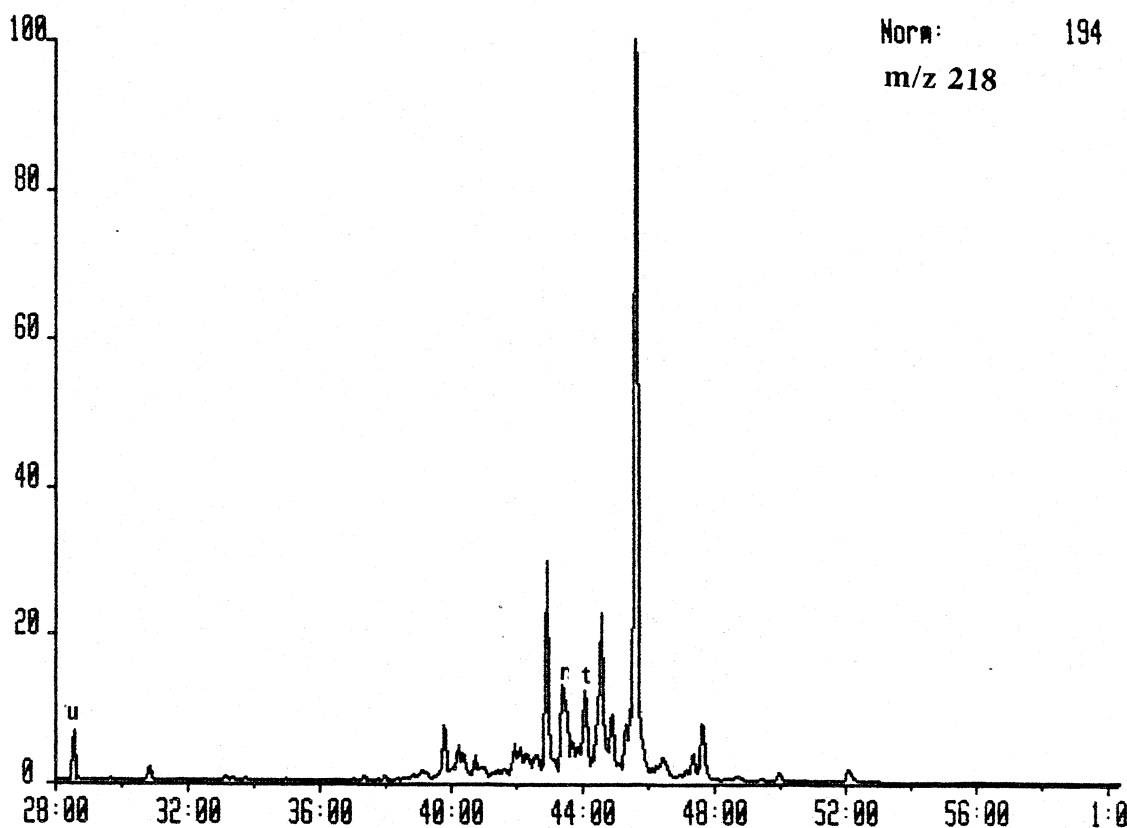
D1241SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



D1241SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT





IKU

SINTEF-GRUPPEN

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D1241SAT 1-DEC-87

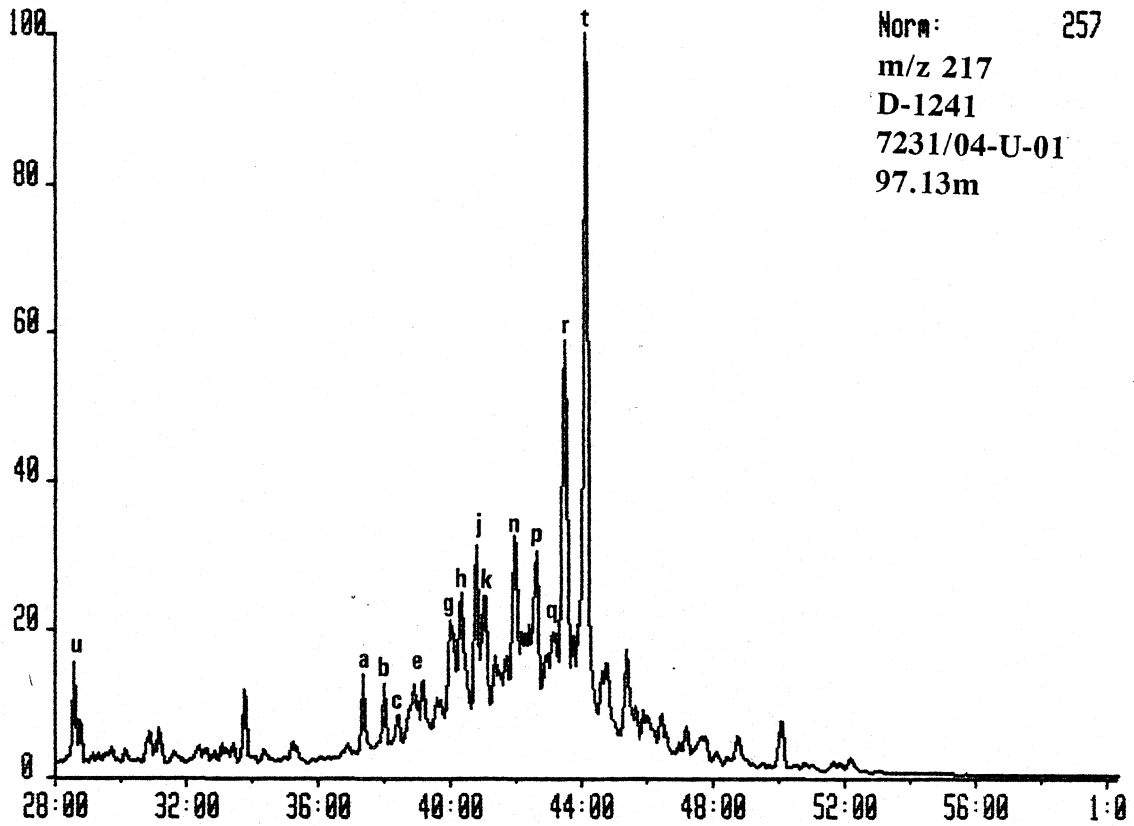
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 217.1000

Text:



D1241SAT 1-DEC-87

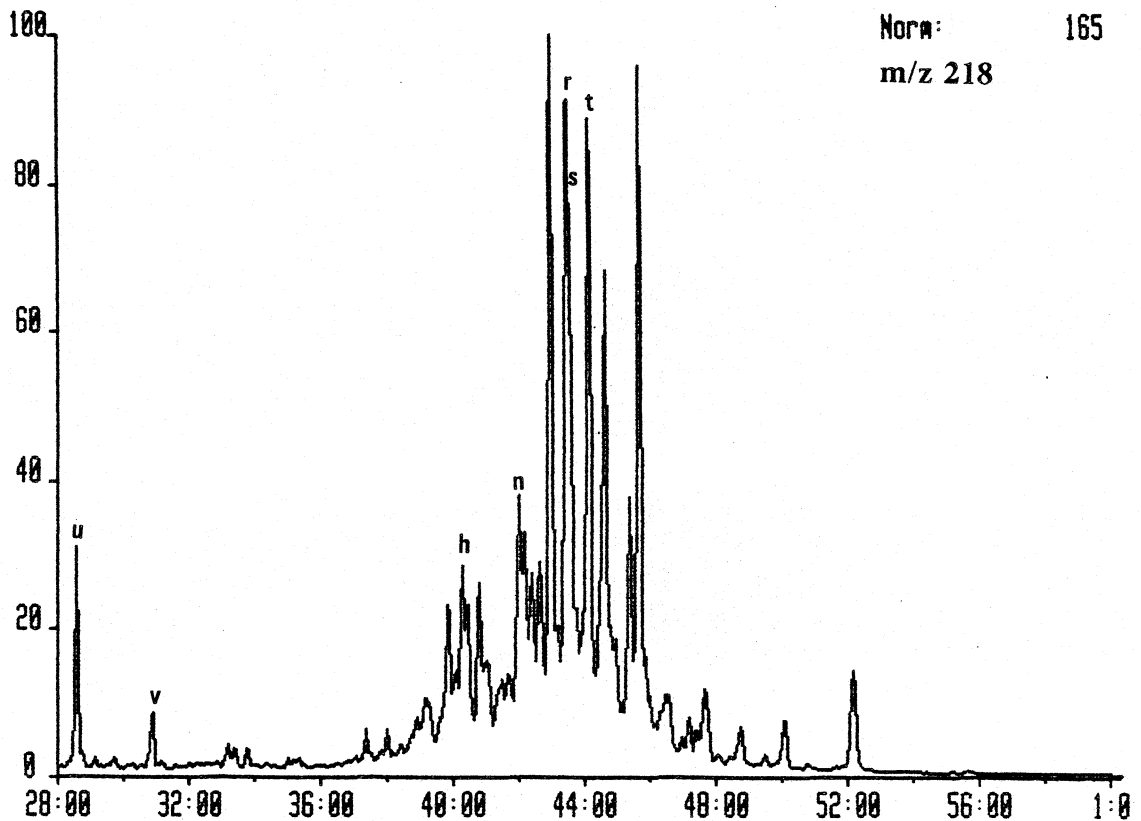
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

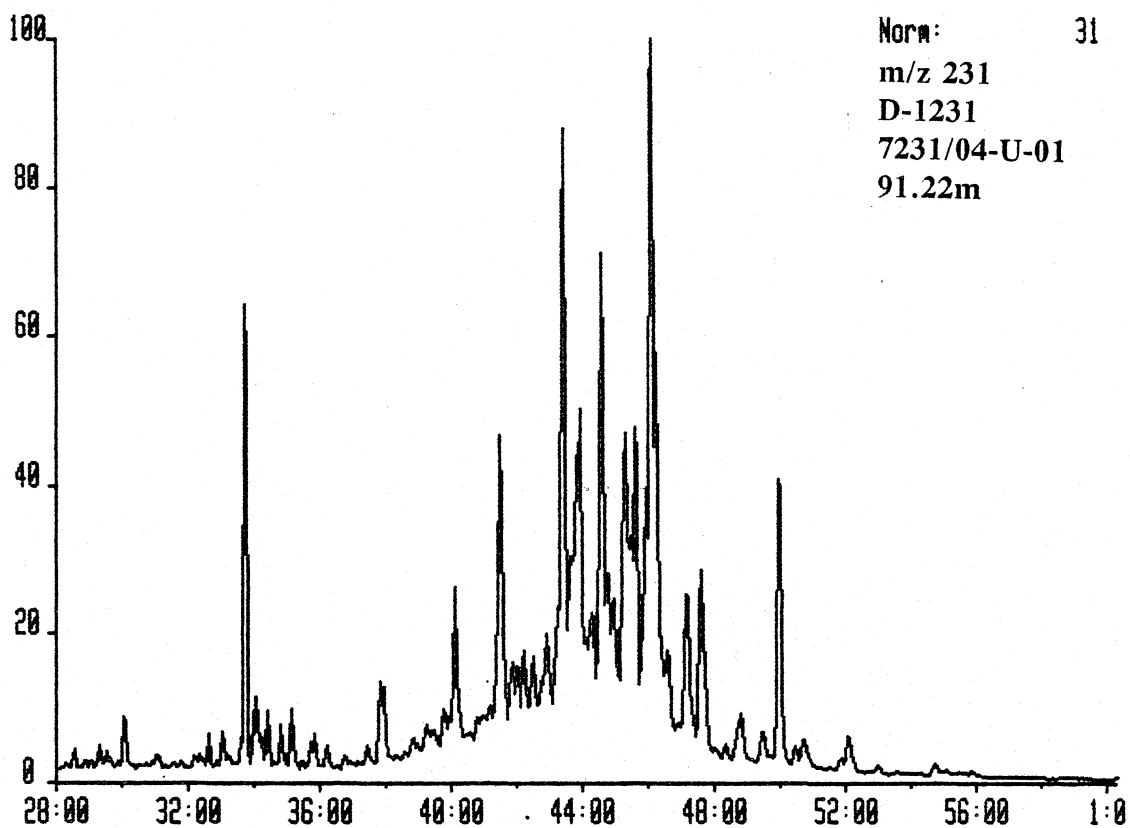
Group 1 Mass 218.1000

Text:



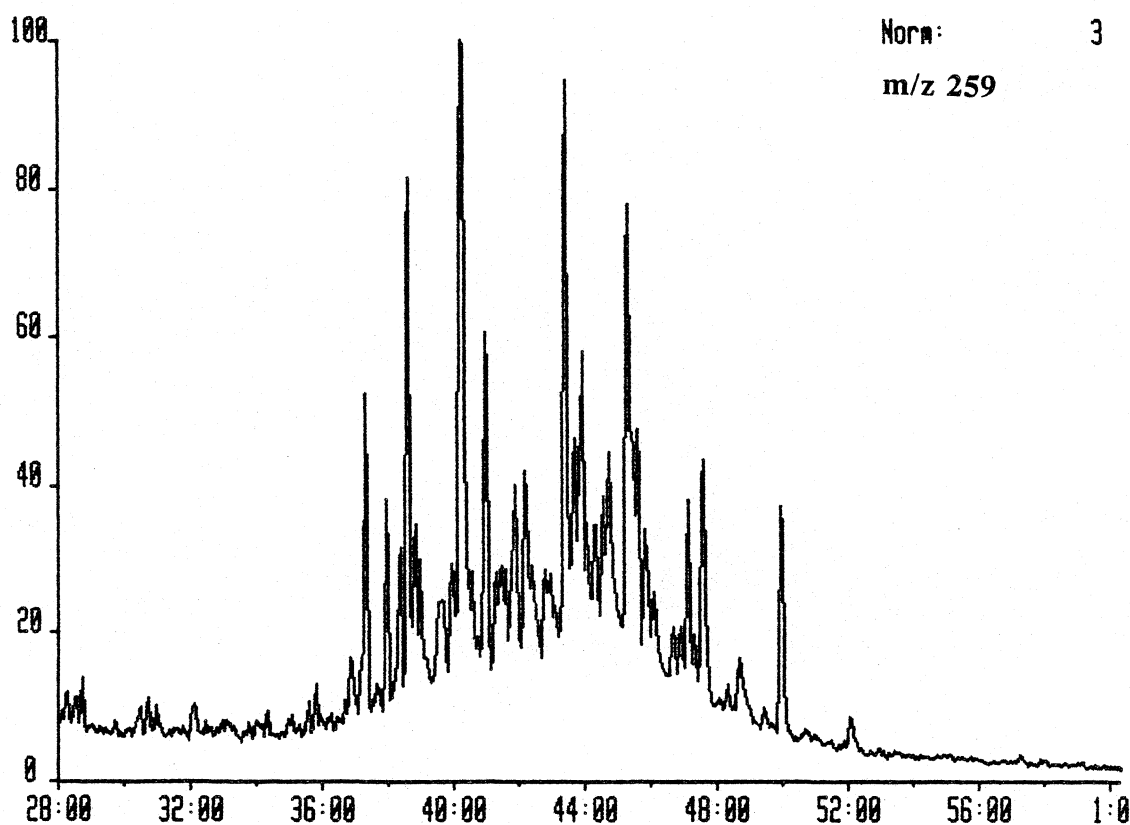
D1241SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 231.1000
Text:

System:QUASAT



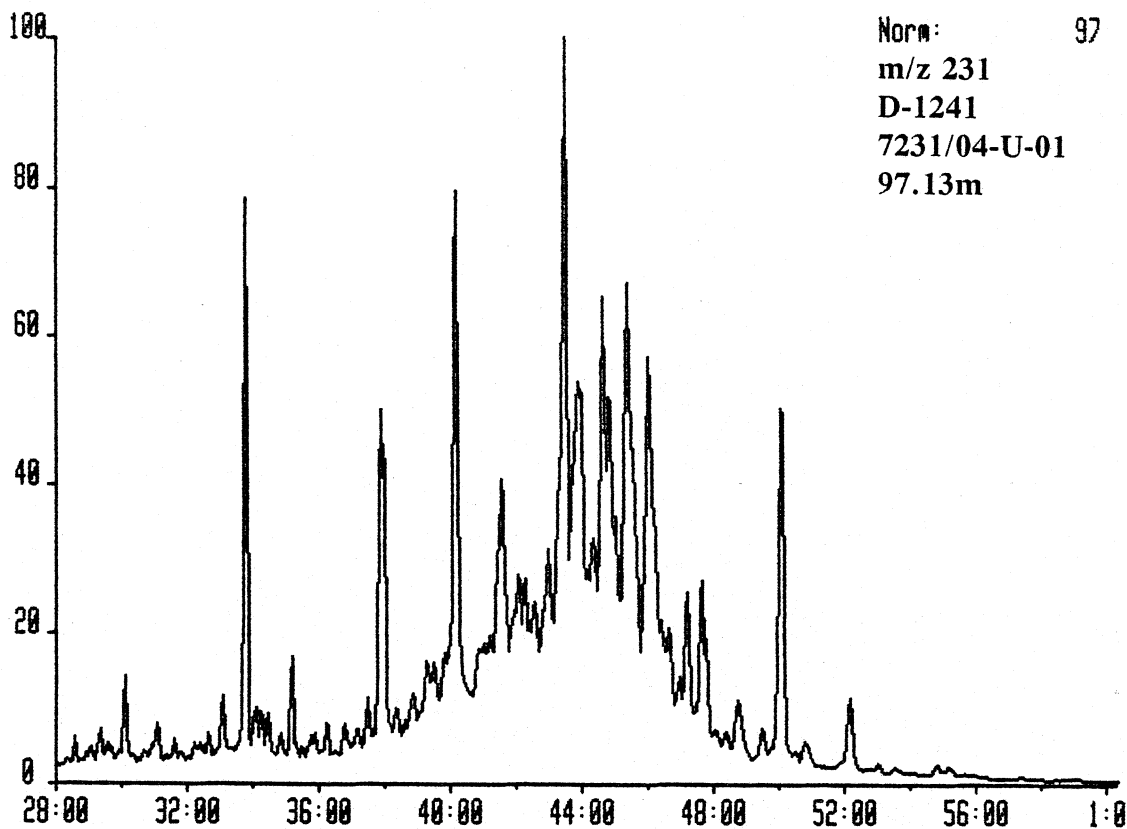
D1241SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 259.1000
Text:

System:QUASAT



D1241SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:

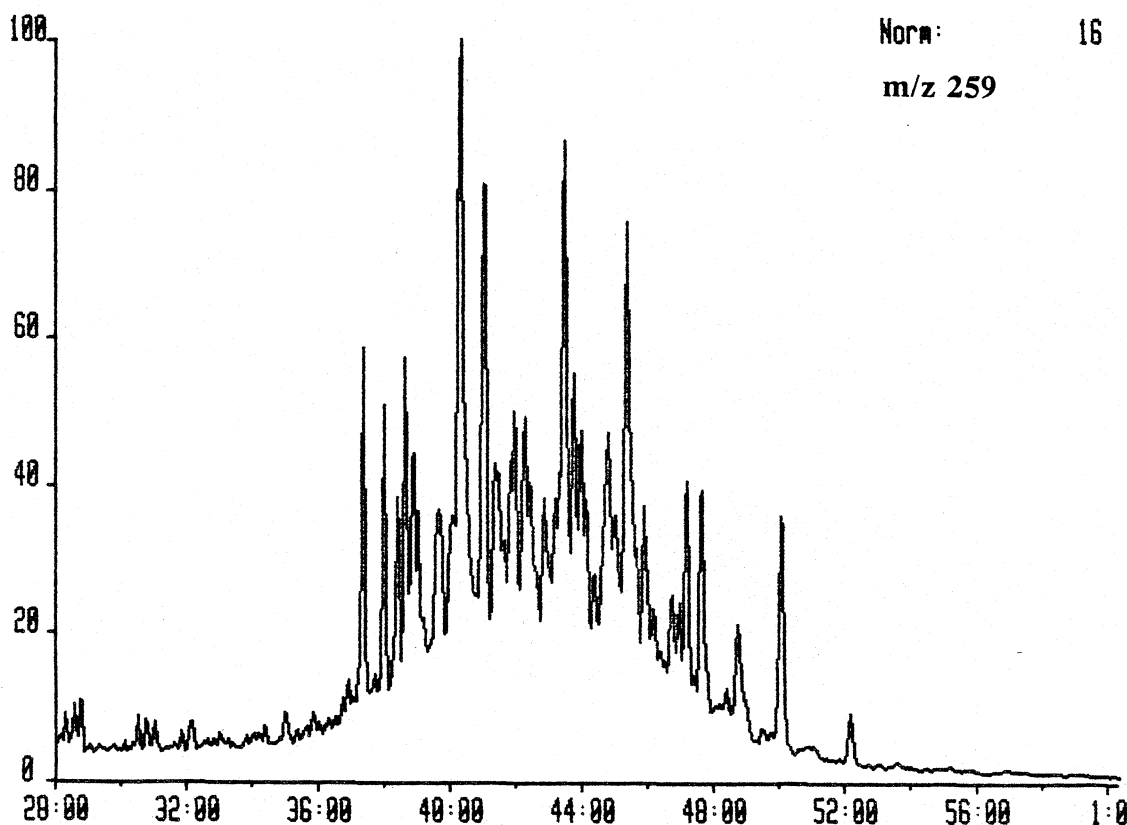
System:QUADSAT



Norm: 97
m/z 231
D-1241
7231/04-U-01
97.13m

D1241SAT 1-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 259.1000
Text:

System:QUADSAT



Norm: 16
m/z 259

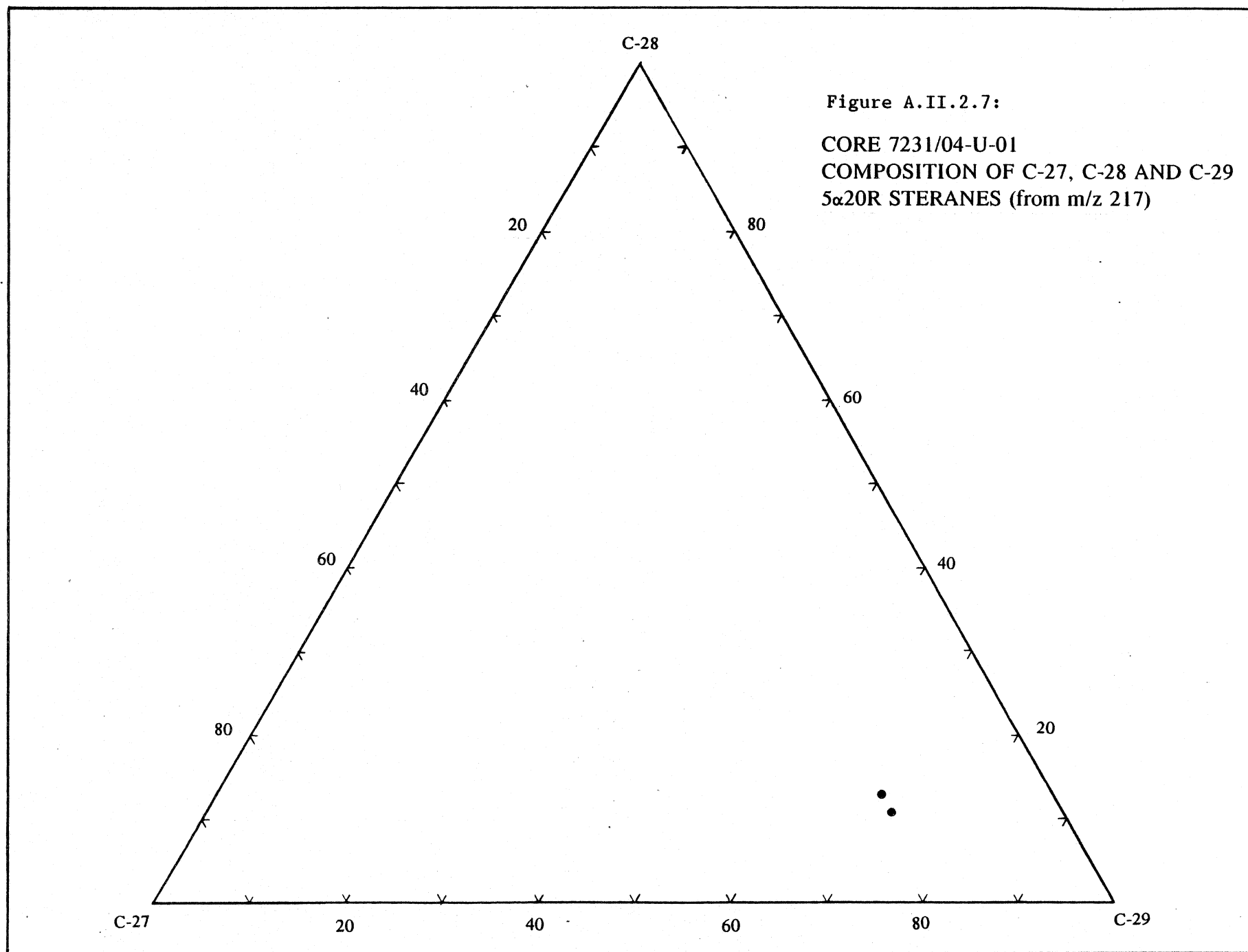


Figure A.II.2.8: Vitrinite reflectance histograms.

Key:

A	= Grey-black-brown claystone.
	Upper case letters indicate values included in the main population. Lower case letters represent values in other population.
pp	= Statistical data population
	Y = Main population, not necessarily representative of sample maturity.
	N = Other populations.
LOW+HIGH	= Population limits.
VAL.	= Number of measurements in that population.

Lithology cross-reference table

A = Clst. gy
 B = Clst. dk gy
 C = Clst. dk gy
 D = Clst. gn
 E = Clst. bn
 F = Clst. rd
 G = Clst. carb.
 H = Shale
 I = Sandstone
 J = Limestone
 K = Coal
 L = Lignite
 M = Carbargillite
 N = Siltstone
 O = Bit
 P = X

IKU# D-1148 48.4M 7231/4-U-1

14-|

12-|

10-|

8-|

6-|

4-|

2-|

0-|

nnnn

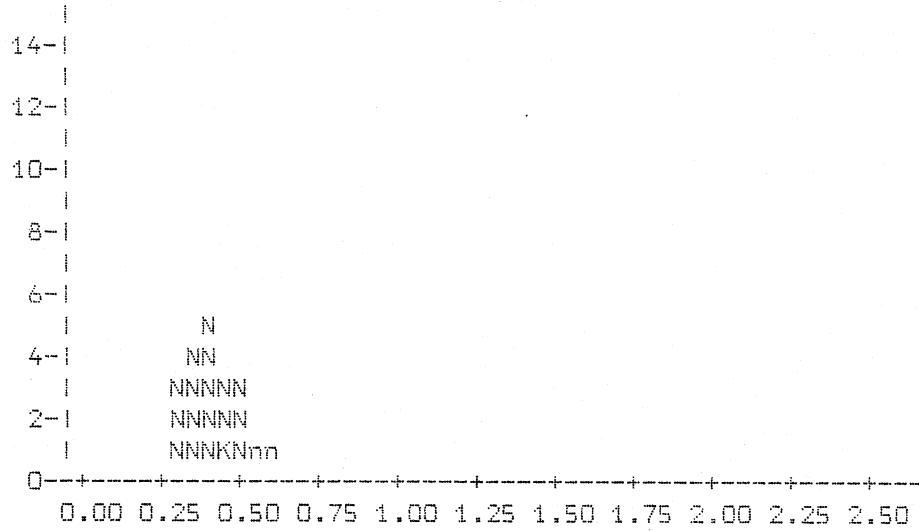
0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50

PP	LOW	HIGH	LIT	#VAL	MEAN	STDV
N	0.48	0.65	ALL	4	0.55	0.07
	OVERALL			4	0.55	0.07

ORDERED VALUES FOLLOW:

0.48n 0.50n 0.56n 0.64n

IKU# D-1208 74.3M 7231/4-U-1

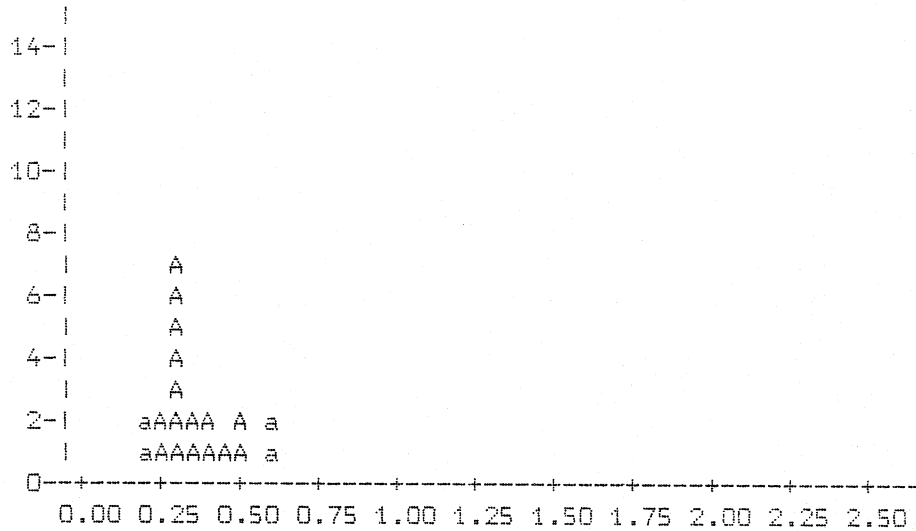


PP	LOW	HIGH	LIT	#VAL	MEAN	STDV
Y	0.31	0.55	ALL	18	0.42	0.07
N	0.57	0.61	ALL	2	0.59	0.02
OVERALL					20	0.44 0.08

ORDERED VALUES FOLLOW:

0.31N 0.32N 0.34N 0.35N 0.39N 0.39N 0.39N 0.40N 0.41N 0.42N 0.43N
 0.43N 0.46N 0.49K 0.49N 0.50N 0.53N 0.54N 0.57n 0.60n

IKU# D-1225 85.4M 7231/4-U-1

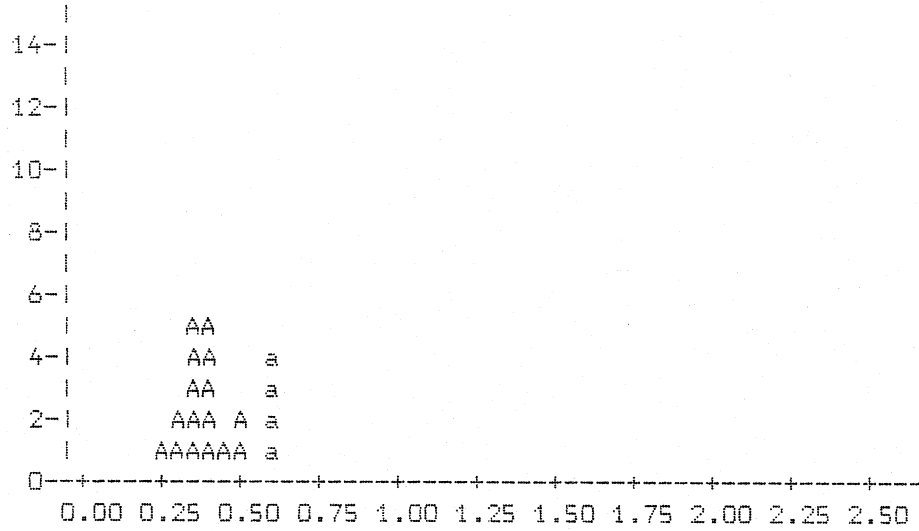


PP	LOW	HIGH	LIT	#VAL	MEAN	STDV
Y	0.25	0.53	ALL	16	0.36	0.08
N	0.21	0.24	ALL	2	0.22	0.01
N	0.62	0.65	ALL	2	0.63	0.01
OVERALL				20	0.38	0.12

ORDERED VALUES FOLLOW:

 0.21a 0.23a 0.25A 0.28A 0.30A 0.30A 0.30A 0.32A 0.33A 0.33A 0.34A
 0.35A 0.37A 0.42A 0.43A 0.46A 0.52A 0.52A 0.62a 0.64a

IKU# D-123D 88.8M 7231/4-U-1



PP LOW HIGH LIT #VAL MEAN STDV
 Y 0.29 0.53 ALL 16 0.40 0.07
 N 0.60 0.63 ALL 4 0.61 0.01
 OVERALL 20 0.44 0.10

ORDERED VALUES FOLLOW:

0.29A 0.30A 0.32A 0.35A 0.37A 0.39A 0.39A 0.39A 0.39A 0.40A 0.41A 0.43A
 0.43A 0.44A 0.49A 0.51A 0.52A 0.60a 0.60a 0.61a 0.62a

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Table A.II.3.3:	Vitrinite reflectance data.
Table A.II.3.4:	Weight of EOM and chromatographic fractions.
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Table A.II.3.1a

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CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS IN HEADSPACE GAS

I									SUM	SUM	WET-	iC4	I
I	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	C1-C4	C2-C4	NESS	-----	I
I	no.	m									(%)	nC4	I
I	D 1003	24.24									*****	*****	I
I	D 1004	28.49	6						6		0.00	*****	I
I	D 1008	30.57	6						6		0.00	*****	I
I	D 1015	31.67	9						9		0.00	*****	I
I	D 1020	36.11	153	6	5				163	11	6.46	*****	I
I	D 1026	39.37	37						37		0.00	*****	I
I	D 1033	42.60	24						24		0.00	*****	I
I	D 1040	44.65	5						5		0.00	*****	I
I	D 1047	47.66	20						20		0.00	*****	I
I	D 1055	50.66	32	1					33	1	3.43	*****	I
I	D 1063	53.81	32						32		0.00	*****	I
I	D 1070	56.86	7						7		0.00	*****	I
I	D 1081	61.77	8						8		0.00	*****	I
I	D 1085	63.30	3						3		0.00	*****	I
I	D 1091	66.32	3						3		0.00	*****	I
I	D 1098	71.27	6						6		0.00	*****	I
I	D 1103	74.75	20	1					20	1	2.92	*****	I

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Table A.II.3.1b

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CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS IN OCCLUDED GAS

I	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	SUM	SUM	WET-	iC4	I
I	no.	m							C1-C4	C2-C4	NESS	-----	I
I											(%)	nC4	I
I													I
I	D 1003	24.24	130	8	10	2			150	19	13.01	*****	I
I	D 1004	28.49	410	14	11				436	26	5.92	*****	I
I	D 1008	30.57	430	18	15	2			464	34	7.33	*****	I
I	D 1015	31.67	688	27	27			22	742	54	7.22	*****	I
I	D 1020	36.11	1214	47	57			63	1318	104	7.87	*****	I
I	D 1026	39.37	1022	37	43			26	1102	80	7.25	*****	I
I	D 1033	42.60	1119	44	54	12		39	1228	109	8.90	*****	I
I	D 1040	44.65	439	21	23	10			493	54	10.92	*****	I
I	D 1047	47.66	1047	39	22			36	1109	62	5.57	*****	I
I	D 1055	50.66	743	29	15			28	787	43	5.52	*****	I
I	D 1063	53.81	1038	42	24				1105	66	6.00	*****	I
I	D 1070	56.86	735	29	13	4		27	781	46	5.88	*****	I
I	D 1081	61.77	414	17	17				449	35	7.73	*****	I
I	D 1085	63.30	398	18	22				437	39	8.98	*****	I
I	D 1091	66.32	838	38	43			28	919	81	8.78	*****	I
I	D 1098	71.27	873	37	46	21		33	978	104	10.68	*****	I
I	D 1103	74.75	883	33	36			33	952	69	7.25	*****	I

Table A.II.3.1c

CORE 7230/05-U-09

CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS SUMMATION

[illegible]

Table A.II.3.2:

CORE 7230/05-U-09

DATA FROM ROCK EVAL PYROLYSIS

IKU No.	DEPTH m	S1 (mg/g ROCK)	S2 (mg/g ROCK)	S3 (mg/g ROCK)	TOC (%)	HYDR. INDEX (mg/g TOC)	OXYGEN INDEX (mg/g TOC)	PETROLEUM POTENTIAL S1+S2	PROD. INDEX S1+S2	TEMP. MAX (C)
D 1003	24.24	0.06	0.10	0.69	0.78	13	88	0.16	0.38	424
D 1004	28.47	****	****	****	0.23	*****	****	*****	*****	***
D 1013	29.47	****	****	****	0.24	*****	****	*****	*****	***
D 1008	30.57	****	****	****	0.24	*****	****	*****	*****	***
D 1015	31.67	****	****	****	0.21	*****	****	*****	*****	***
D 1017	31.78	0.05	0.03	4.55	0.31	10	1468	0.08	0.63	315
D 1024	34.01	****	****	****	0.18	*****	****	*****	*****	***
D 1020	36.11	****	****	****	0.17	*****	****	*****	*****	***
D 1028	37.71	****	****	****	0.28	*****	****	*****	*****	***
D 1026	39.37	****	****	****	0.21	*****	****	*****	*****	***
D 1033	42.60	****	****	****	0.18	*****	****	*****	*****	***
D 1044	44.05	0.04	0.11	0.36	0.62	18	58	0.15	0.27	439
D 1040	44.65	0.07	0.13	0.58	0.70	19	83	0.20	0.35	465
D 1049	46.24	0.03	0.13	0.51	0.94	14	54	0.16	0.19	426
D 1047	47.66	****	****	****	0.20	*****	****	*****	*****	***
D 1057	49.95	****	****	****	0.18	*****	****	*****	*****	***
D 1055	50.66	****	****	****	0.24	*****	****	*****	*****	***
D 1064	51.90	****	****	****	0.15	*****	****	*****	*****	***
D 1063	53.81	****	****	****	0.19	*****	****	*****	*****	***
D 1073b	56.46	****	****	****	0.18	*****	****	*****	*****	***
D 1073a	56.46	0.08	0.40	0.69	1.56	26	44	0.48	0.17	433
D 1070	56.86	****	****	****	0.51	*****	****	*****	*****	***

Legend: D 1073a claystone

D 1073b very fine-grained sandstone

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Table A.II.3.2 (cont'd)

CORE 7230/05-U-09

DATA FROM ROCK EVAL PYROLYSIS

IKU No.	DEPTH : m	S1 (mg/g ROCK)	S2	S3	TOC (%)	HYDR. INDEX (mg/g TOC)	OXYGEN INDEX	PETROLEUM POTENTIAL S1+S2	PROD. INDEX S1+S2	TEMP. MAX (C)
D 1076	57.22	0.07	0.28	0.43	1.32	21	33	0.35	0.20	421
D 1081	61.77	0.05	0.12	0.84	0.61	20	138	0.17	0.29	355
D 1085	63.30	0.09	0.07	1.06	0.61	11	174	0.16	0.56	324
D 1091	63.32	****	****	****	0.29	*****	****	*****	*****	***
D 1086	64.50	0.05	0.13	0.64	0.62	21	103	0.18	0.28	362
D 1089	65.78	1.05	0.26	0.89	0.97	27	92	1.31	0.80	415
D 1096	68.52	****	****	****	0.18	*****	****	*****	*****	***
D 1100	69.23	****	****	****	0.18	*****	****	*****	*****	***
D 1102	70.79	0.05	0.47	1.22	1.40	34	87	0.52	0.10	425
D 1098	71.27	****	****	****	0.26	*****	****	*****	*****	***
D 1103	74.75	****	****	****	0.17	*****	****	*****	*****	***
D 1105	75.00	0.03	0.04	0.20	1.72	2	12	0.07	0.43	402

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Reference number: 21.3435.23

Table A.II.3.3:

(1/1)

VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
D-1073a	-----	56.46	0.37 (29)	G	0.05	2-4
D-1076	-----	57.22	0.36 (8) 0.73 (1)	P R	0.06 0.00	1-5
D-1102	-----	70.79	0.39 (20)	G	0.09	1-2?

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor
S = Stained; R = Reworked.

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Table A.II.3.4:

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKU-No	DEPTH (m)	: Rock : Extr. : (g)	EOM (mg)	Sat. (mg)	Aro. (mg)	HC (mg)	Non HC (mg)	TOC (%)
D 1076	57.22	: 8.2	0.7	0.7	0.5	1.2	***	1.31
D 1089	65.78	: 7.6	2.7	0.2	0.5	0.7	2.0	0.97
D 1102	70.79	: 6.6	2.4	0.1	0.4	0.5	1.9	1.40

*** = not calculable. Determination of fraction weights at the level encountered is considered to be inaccurate and may lead to unreliable results.

Table A.II.3.5:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
D 1076	57.22	85	**	**	**	***
D 1089	65.78	358	26	66	93	265
D 1102	70.79	365	15	61	76	289

*** = Not calculated, because determination of fraction weights at the level encountered is considered to be inaccurate and may lead to unreliable results.

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Table A.II.3.6:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
D 1076	57.22	6.5	***	***	***	****
D 1089	65.78	36.9	2.7	6.8	9.6	27.3
D 1102	70.79	26.1	1.1	4.3	5.4	20.6

*** = Not calculated, because determination of fraction weights at the level encountered is considered to be inaccurate and may lead to unreliable results.

Table A.II.3.7:

COMPOSITION OF MATERIAL EXTRACTED FROM THE ROCK

IKU-No	DEPTH (m)	Sat EOM %	Aro EOM %	HC EOM %	SAT Aro x 100	Non HC EOM %	HC Non HC x 100
D 1076	57.22	100.0	****	****	****	****	****
D 1089	65.78	7.4	18.5	25.9	40.0	74.1	35.0
D 1102	70.79	4.2	16.7	20.8	25.0	79.2	26.3

*** = Not calculated, because determination of fraction weights at the level encountered is considered to be inaccurate and may lead to unreliable results.

Table A.II.3.8:

Core 7230/05-U-09

TABULATION OF DATA FROM THE GAS CHROMATOGRAMS

I	DEPTH	:	PRISTANE	PRISTANE	PHYTANE	A	n-C17		I
I	IKU No.	:	-----	A = -----	B = -----	-----	-----	CPI	CPI
I	(m)	:	PHYTANE	n-C17	n-C18	B	n-C27	1	2
I		:							
I	D 1076	:	1.0	0.8	0.6	1.3	0.0	1.4	1.4
I	D 1089	:	1.1	0.8	0.6	1.4	0.4	1.6	1.5
I	D 1102	:	1.2	0.8	0.6	1.4	0.1	2.6	2.6
I		:							

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Table A.II.3.9a:

Molecular ratios from sterane and terpane mass chromatograms.
Maturity-characteristic ratios.

Core 7230/05-U-09

IKU no.	Depth (m)	$\alpha\beta/(\alpha\beta+\beta\alpha)^{1)}$ hopanes	%22S ²⁾ ext.hop.	% $\beta\beta^3)$ ster.	%20S ⁴⁾ ster.
D 1076	57.22	0.36	9.32	34.78	7.69
D 1102	70.79	0.38	7.04	37.65	8.91

1) E/(E+F) in m/z 191

2) Average % distribution between first and second eluting isomers of extended hopanes (G...M in m/z 191, e.g. $100 \cdot G/(G+H)$).

3) $100 \cdot q/(q+t)$ in m/z 217

4) $100 \cdot 2(r+s)/[q+t+2(r+s)]$ in m/z 217

Table A.II.3.9b:

Molecular ratios from sterane and terpane mass chromatograms.
Maturity- and source-characteristic ratios.

Core 7230/05-U-09

IKU no.	Depth (m)	Q/E ¹⁾	T _m /T _s ²⁾	X/E ³⁾	Z/E ⁴⁾	C ₂₇ rearr. steranes ⁵⁾
D 1076	57.22	-	-	-	1.46	-
D 1102	70.79	-	-	-	1.48	-

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191)

2) B/A in m/z 191

3) Relative abundance of unknown (X/E in m/z 191)

4) Relative abundance of bisnorhopane (Z/E in m/z 191)

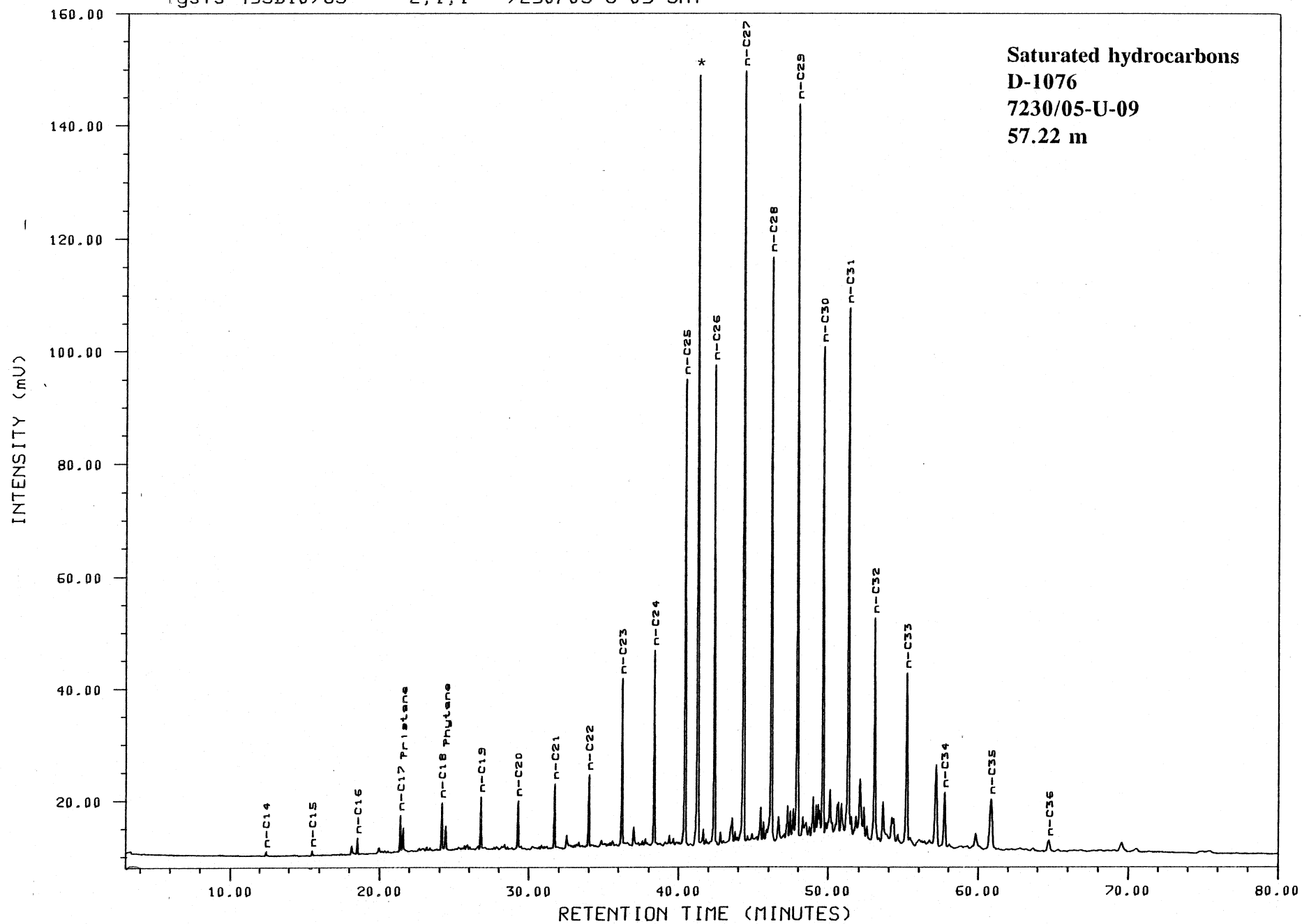
5) $100 \cdot a/(a+j)$ in m/z 217

Figure A.II.3.1:

Saturated hydrocarbon gas chromatograms

- | | |
|------------------------|------------------------------------|
| n-C ₁₅ etc. | - n-alkanes |
| Pr | - pristane |
| Ph | - phytane |
| * | - contamination (dioctylphthalate) |

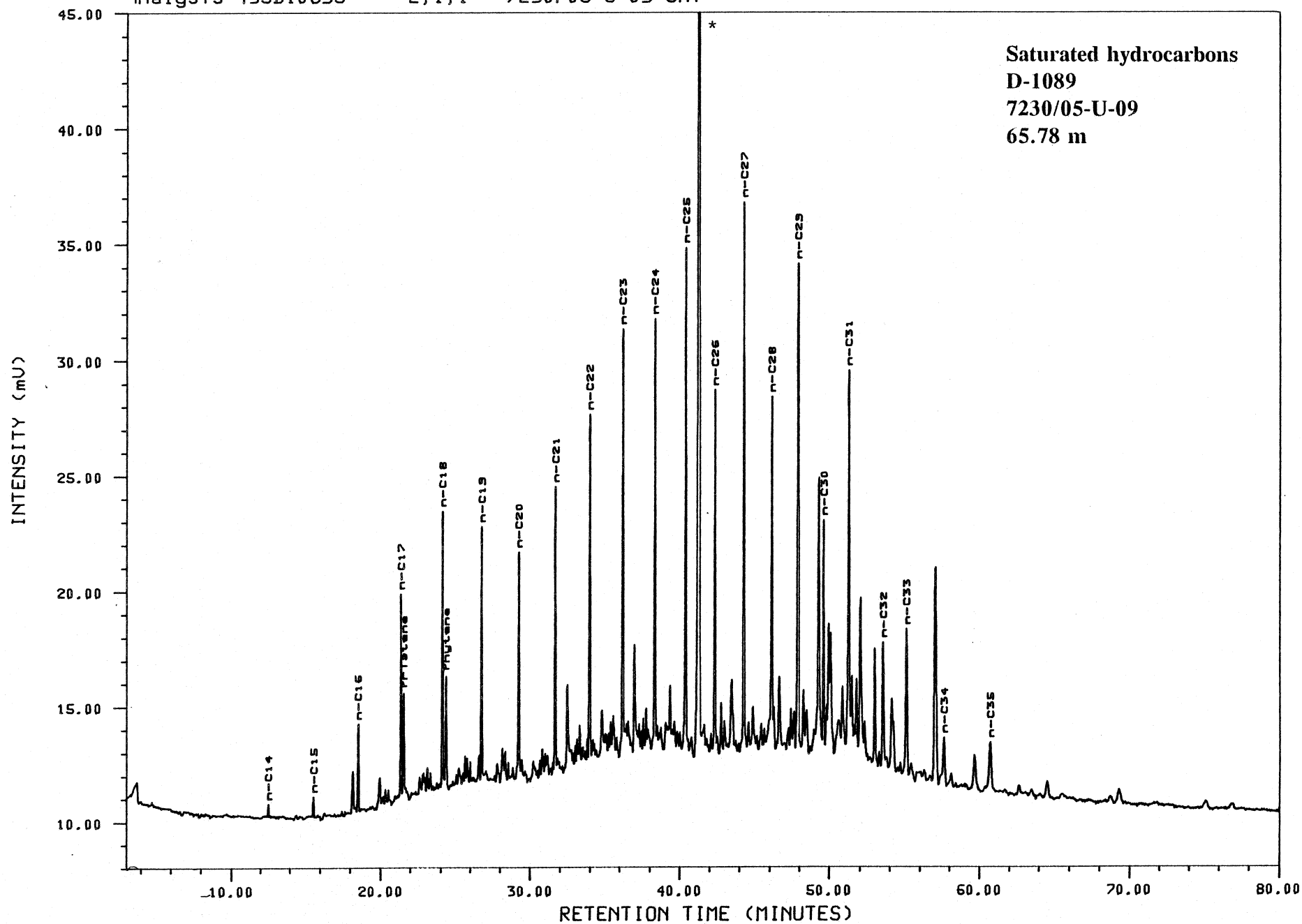
Analysis 435D1076S 2,1,1 7230/05-U-09 SAT



Analysis 435D1089S

2,1,1

7230/05-U-09 SAT



Analysis 435D1102S

2,1,1

7230/05-U-09 SAT

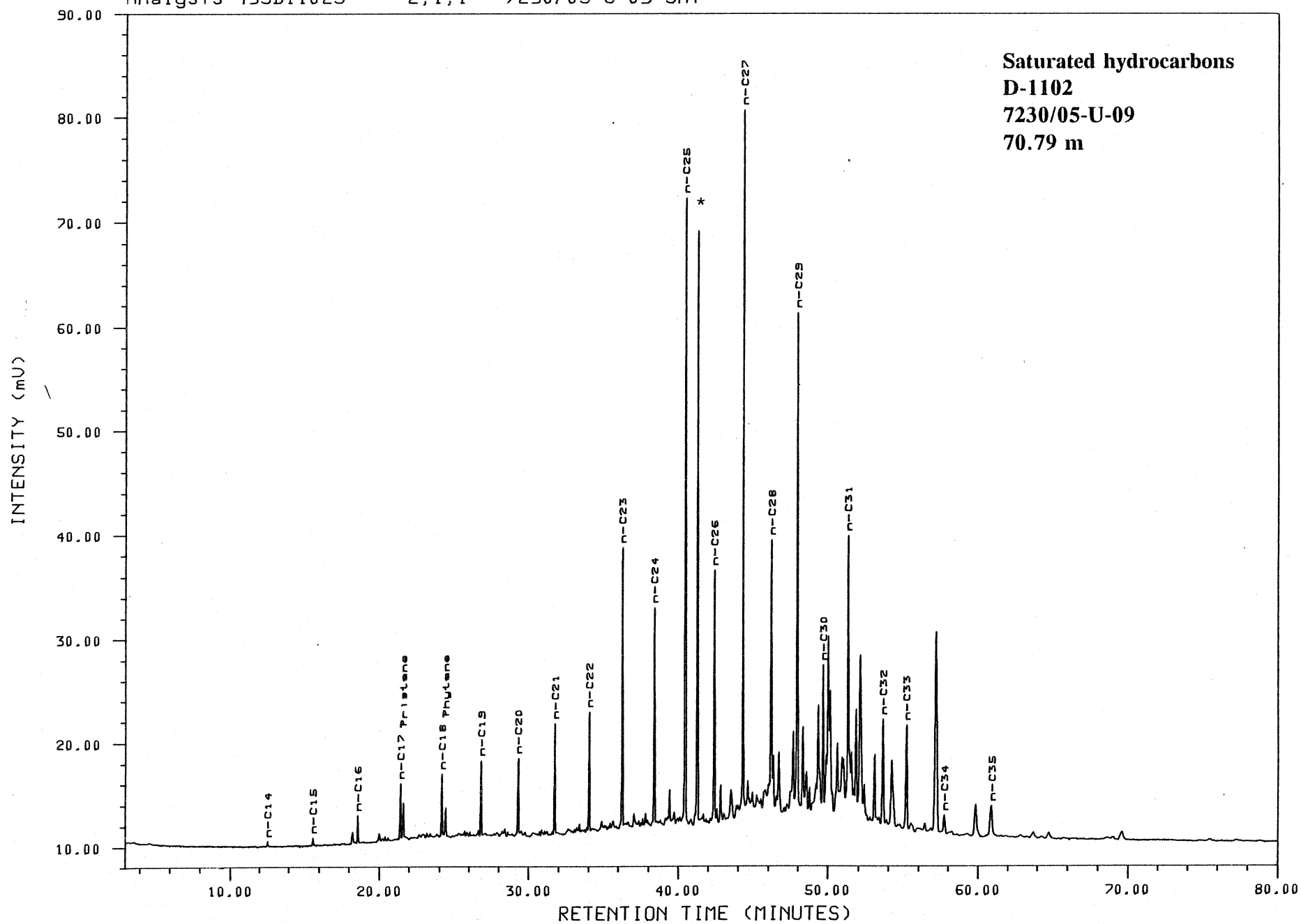
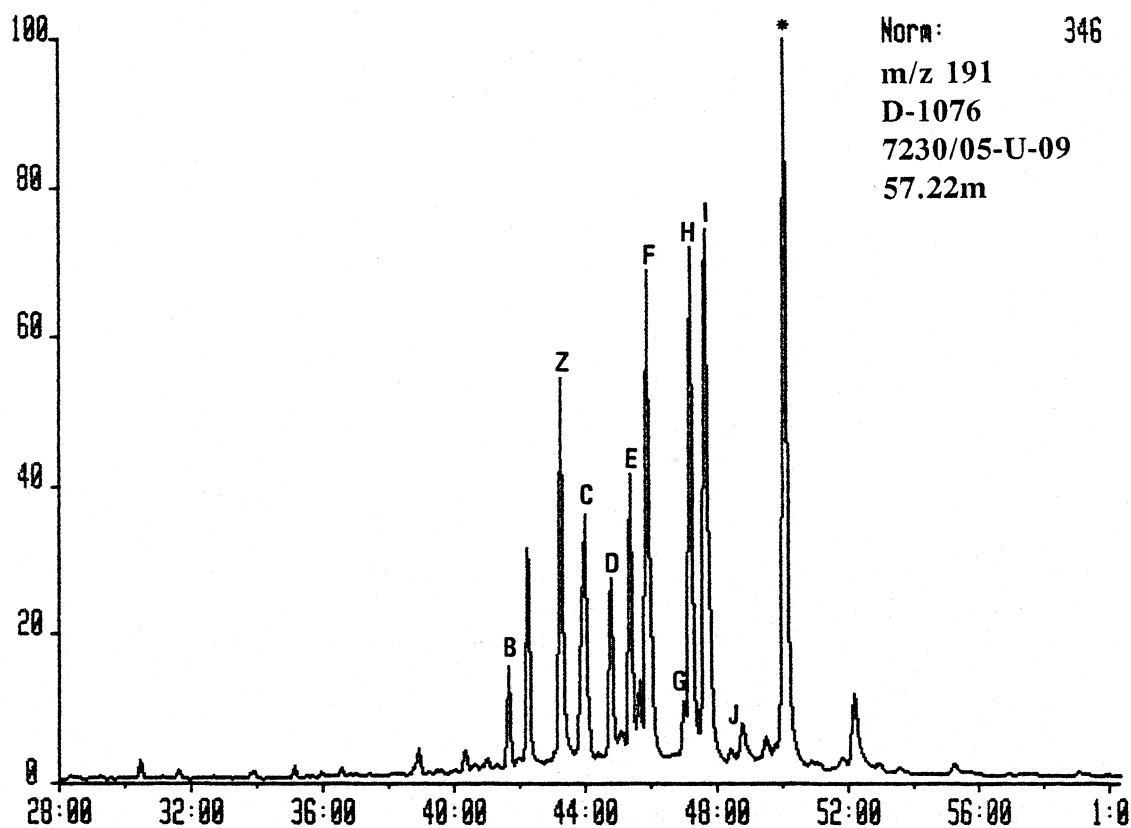


Figure A.II.3.2:

Mass fragmentograms of m/z 191, 205, 163, 177 (terpanes).

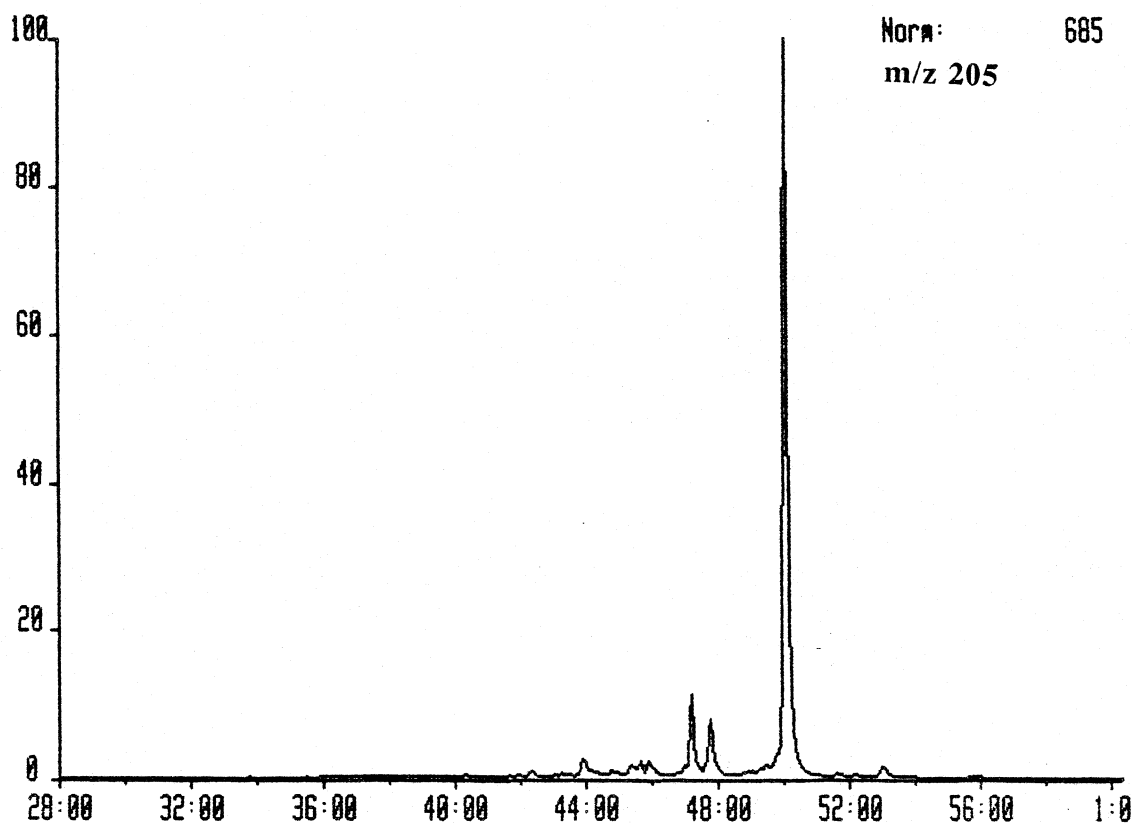
D1076SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 191.1000
Text:

System:QUADSAT



D1076SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 205.1000
Text:

System:QUADSAT



01076SAT 3-DEC-07

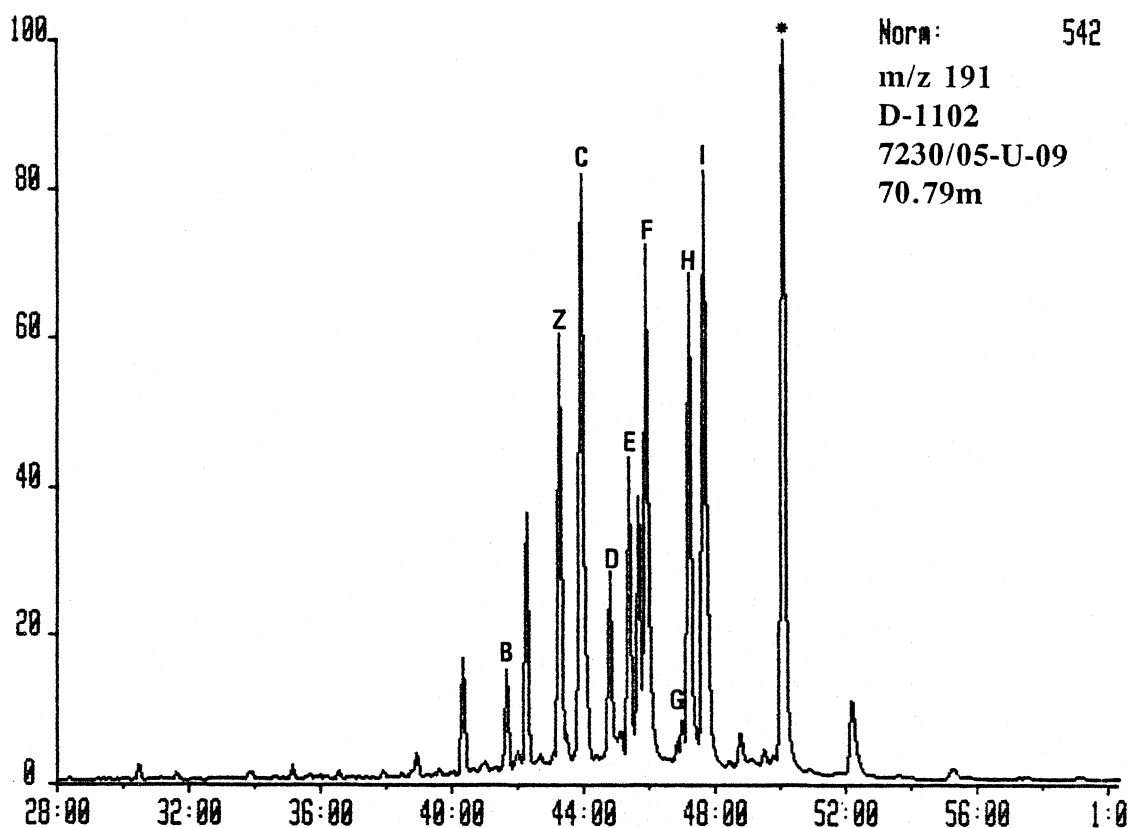
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 191.1000

Text:



01076SAT 3-DEC-07

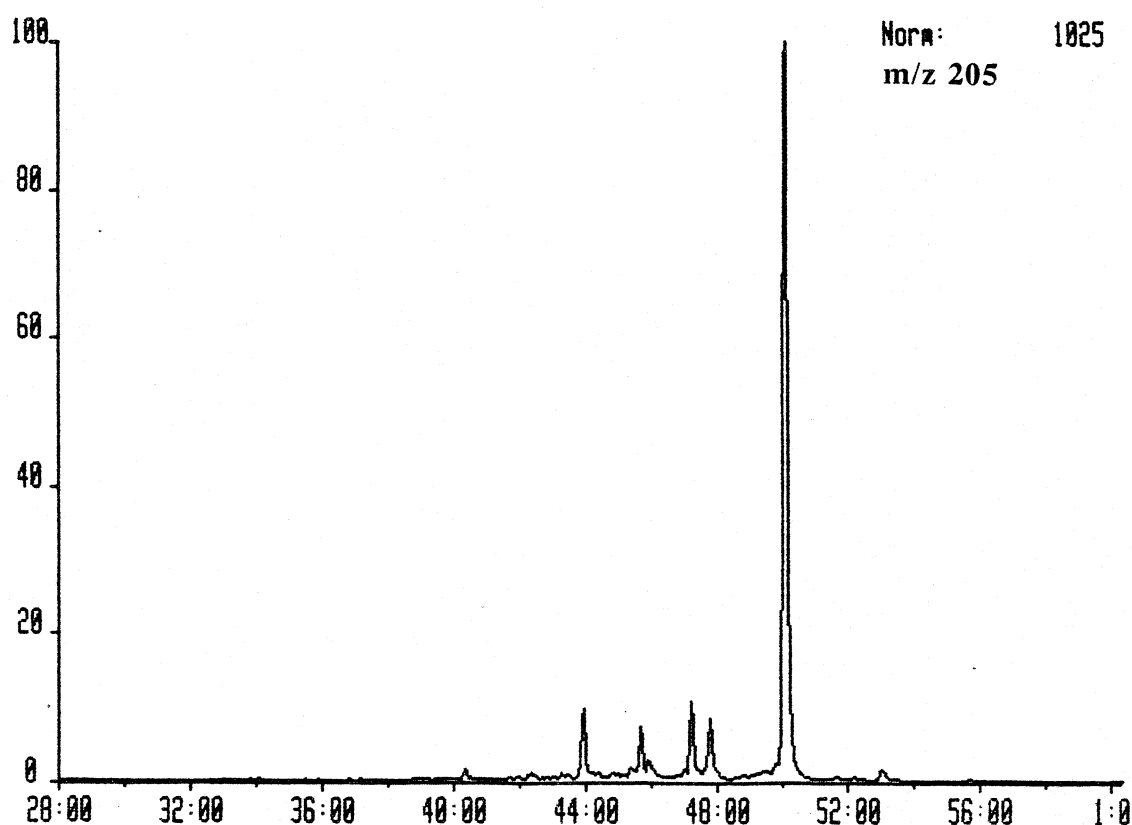
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 205.1000

Text:





IKU

SINTEF-GRUPPEN

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D1076SAT 3-DEC-07

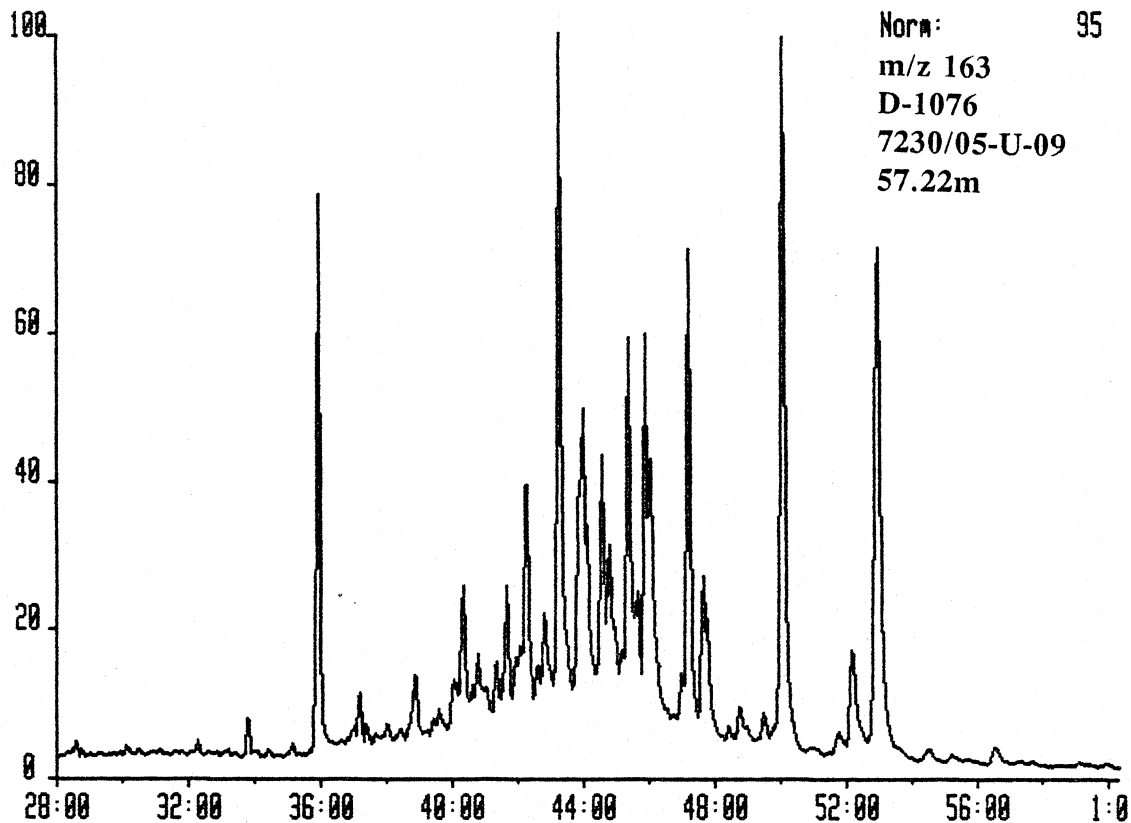
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

Group 1 Mass 163.1000

Text:



D1076SAT 3-DEC-07

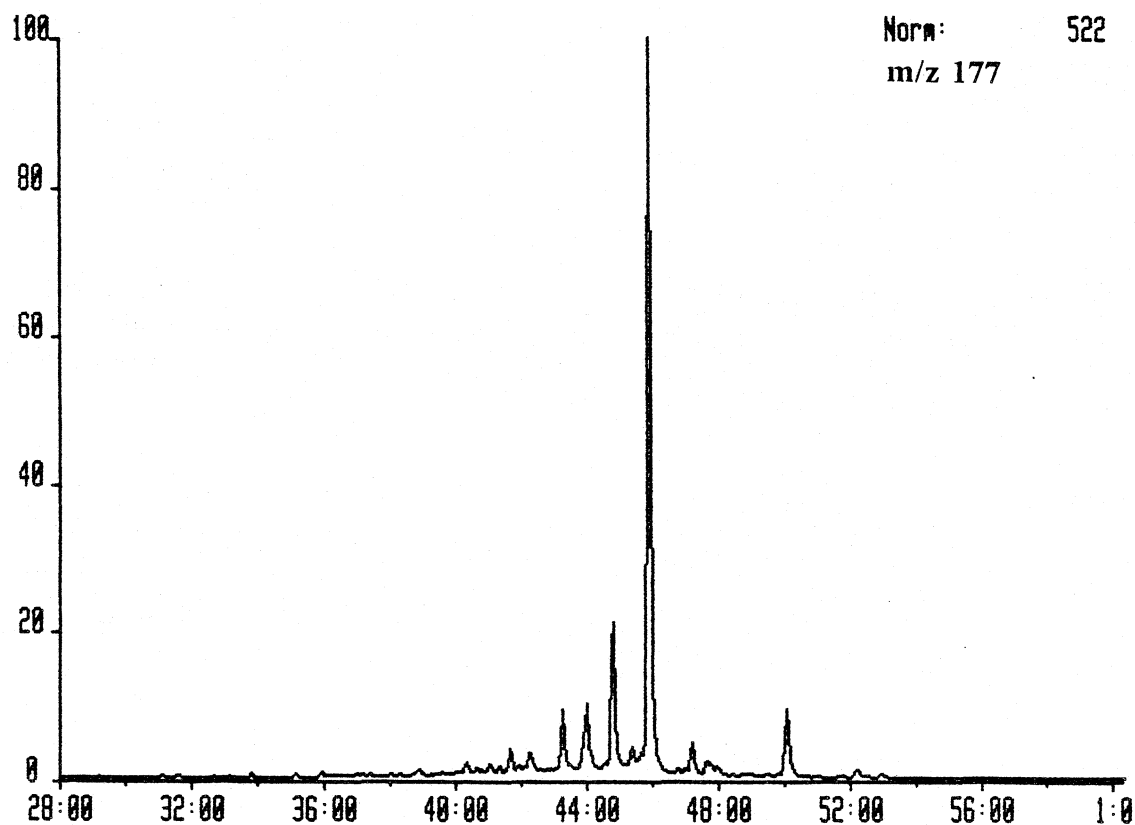
Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1

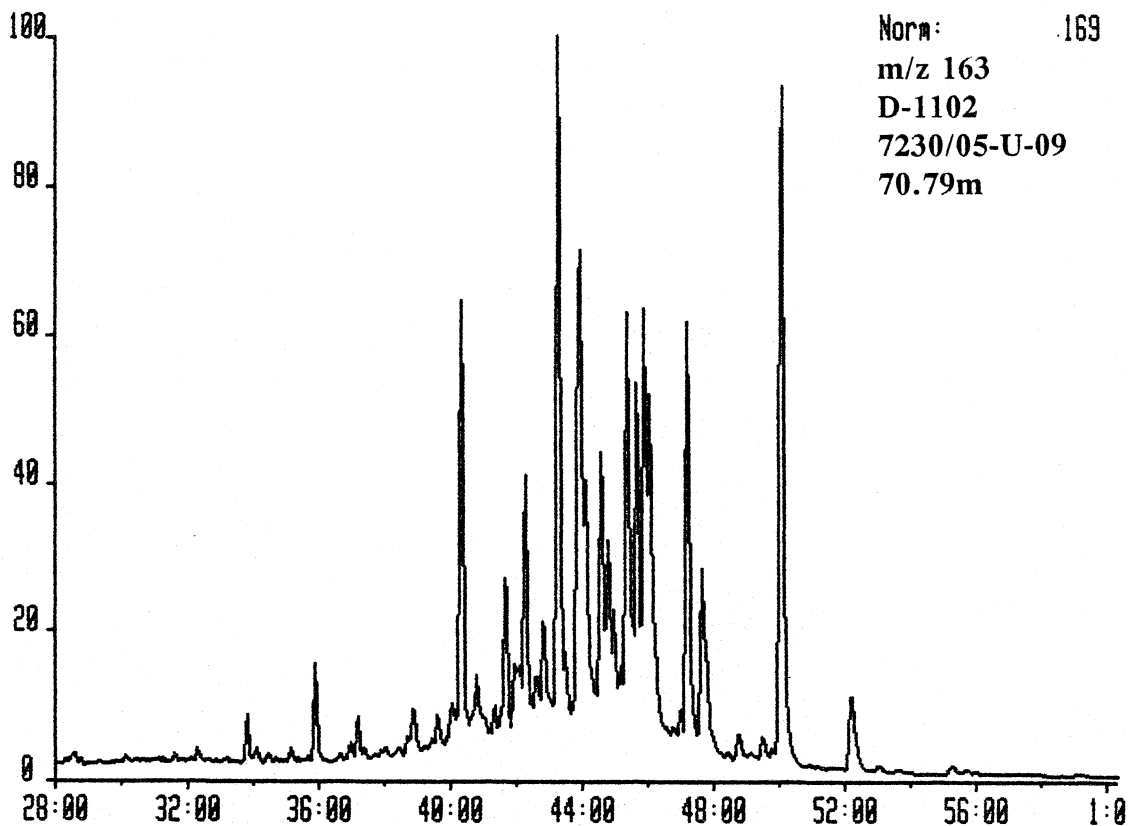
Group 1 Mass 177.1000

Text:



D1076SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 163.1000
Text:

System:QUADSAT



D1076SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 177.1000
Text:

System:QUADSAT

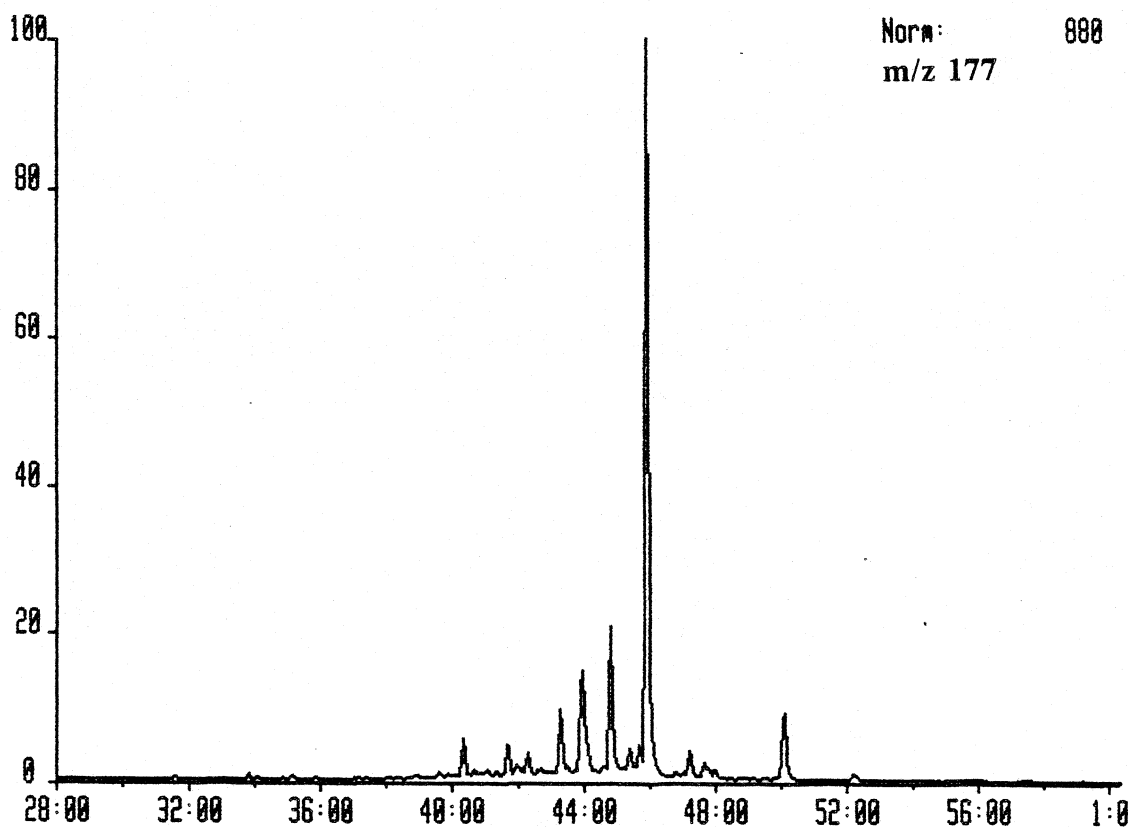


Figure A.II.3.3:

Mass fragmentograms of m/z 217, 218, 231, 259 (steranes)



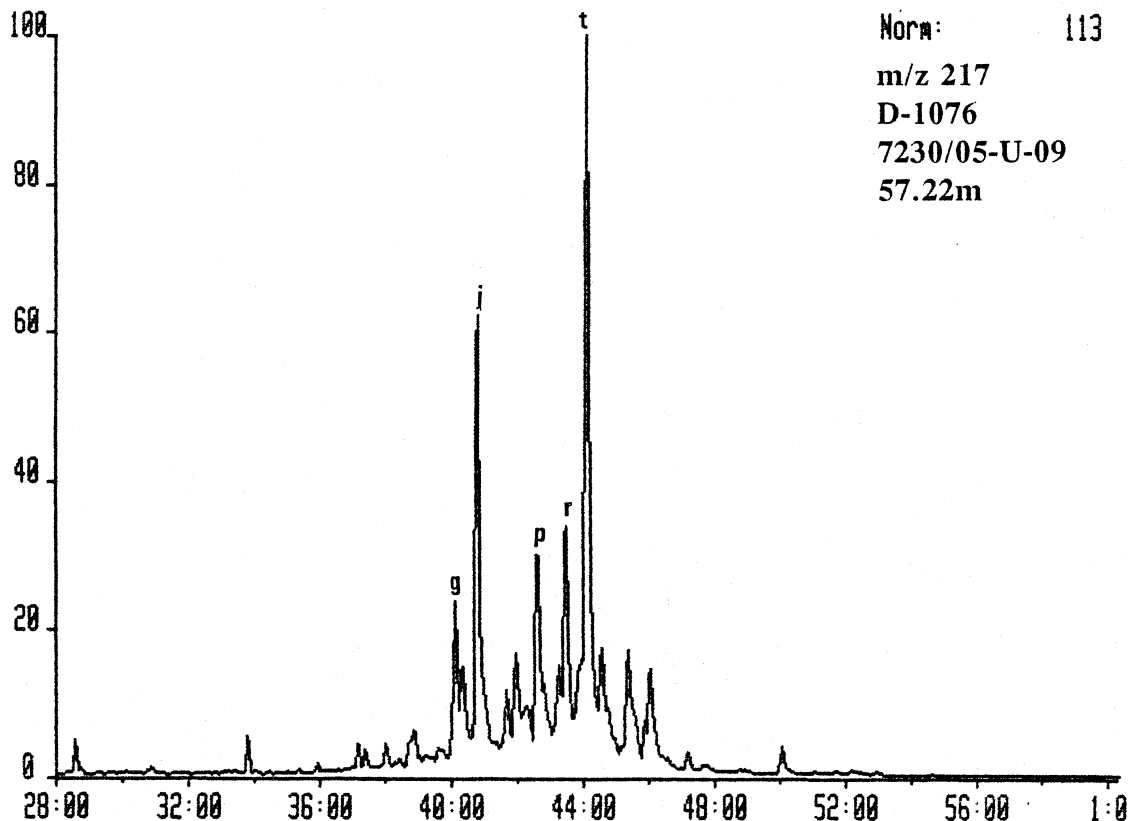
IKU

SINTEF-GRUPPEN

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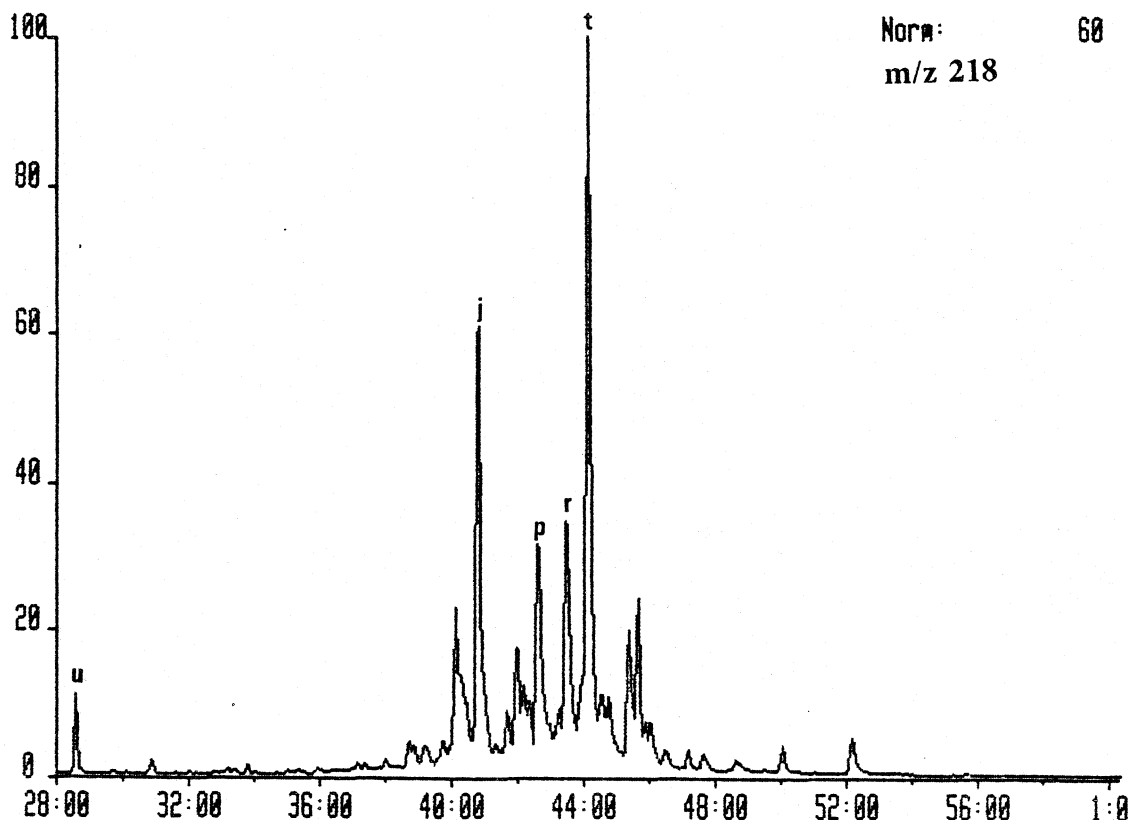
D1076SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



D1076SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT



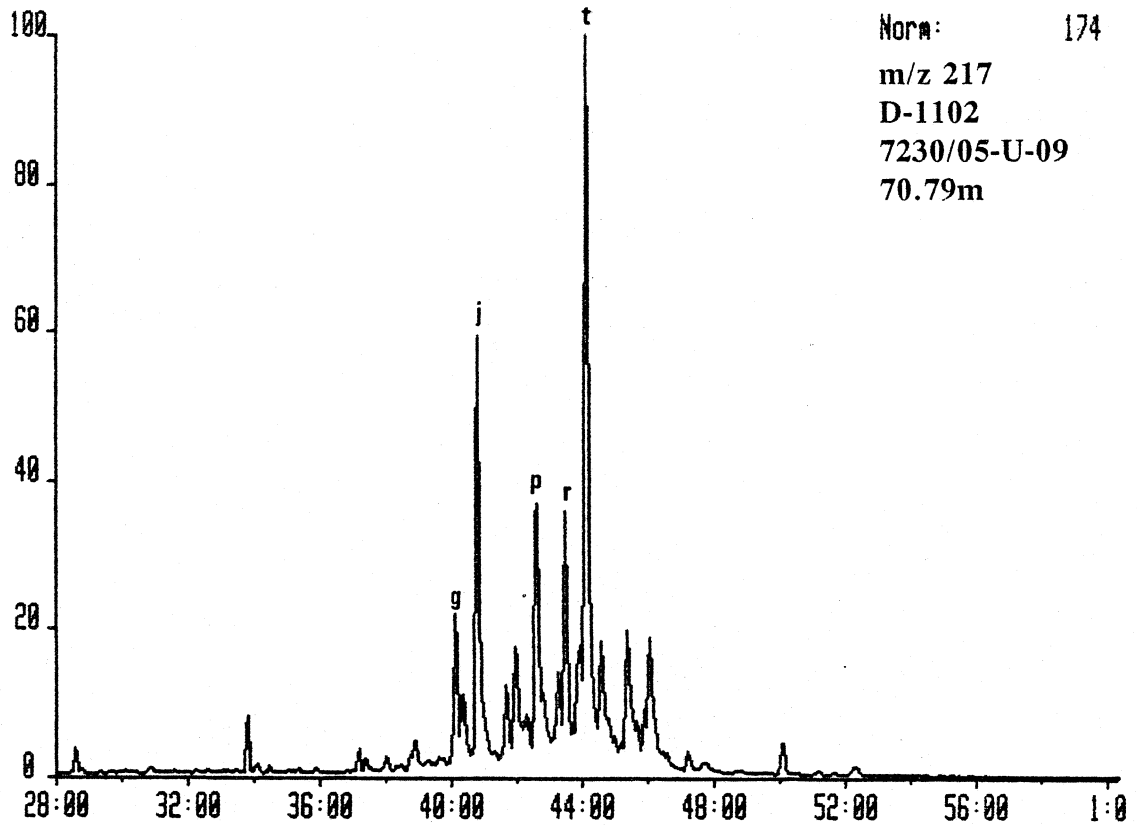


IKU
SINTEF-GRUPPEN

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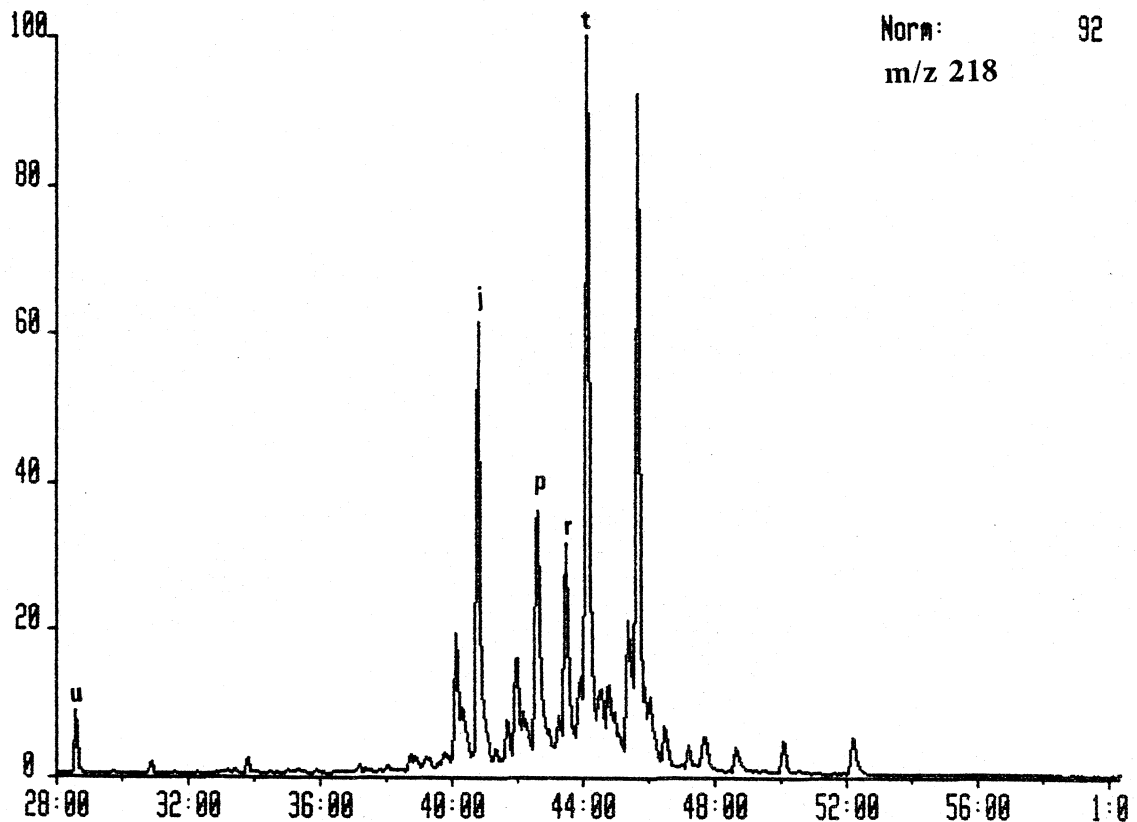
D1076SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



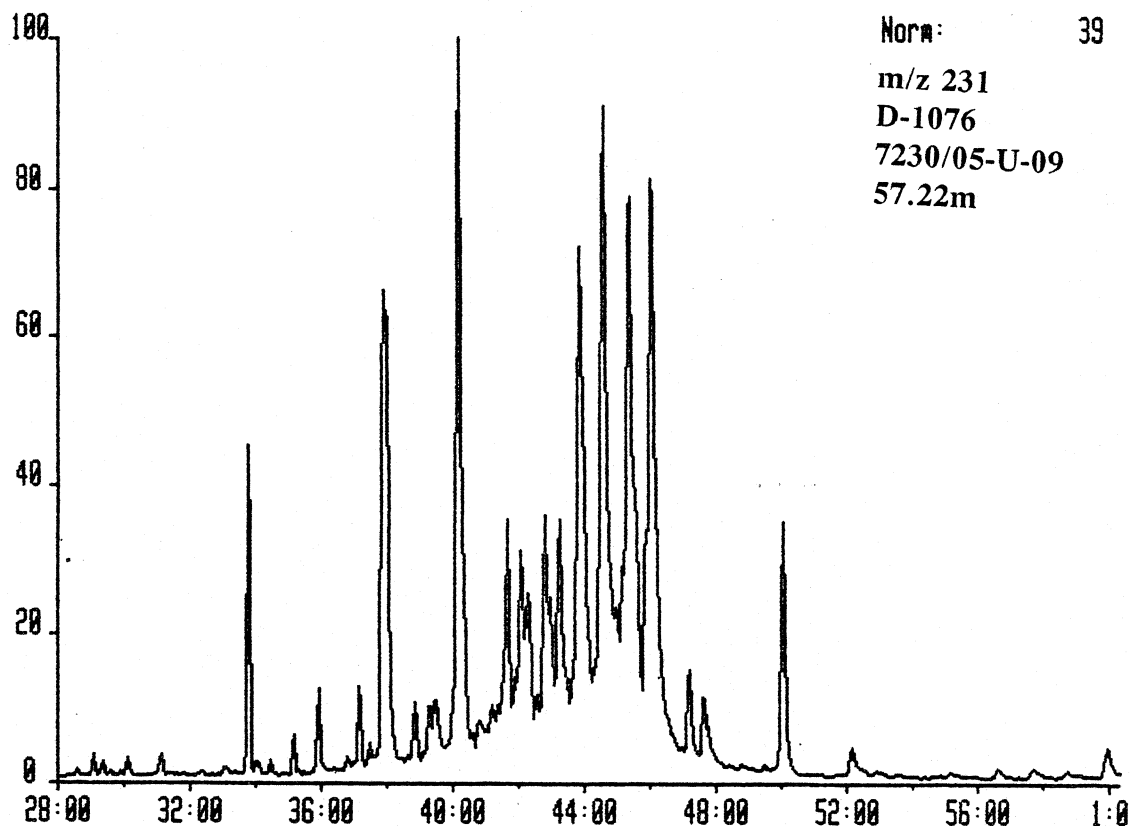
D1076SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT



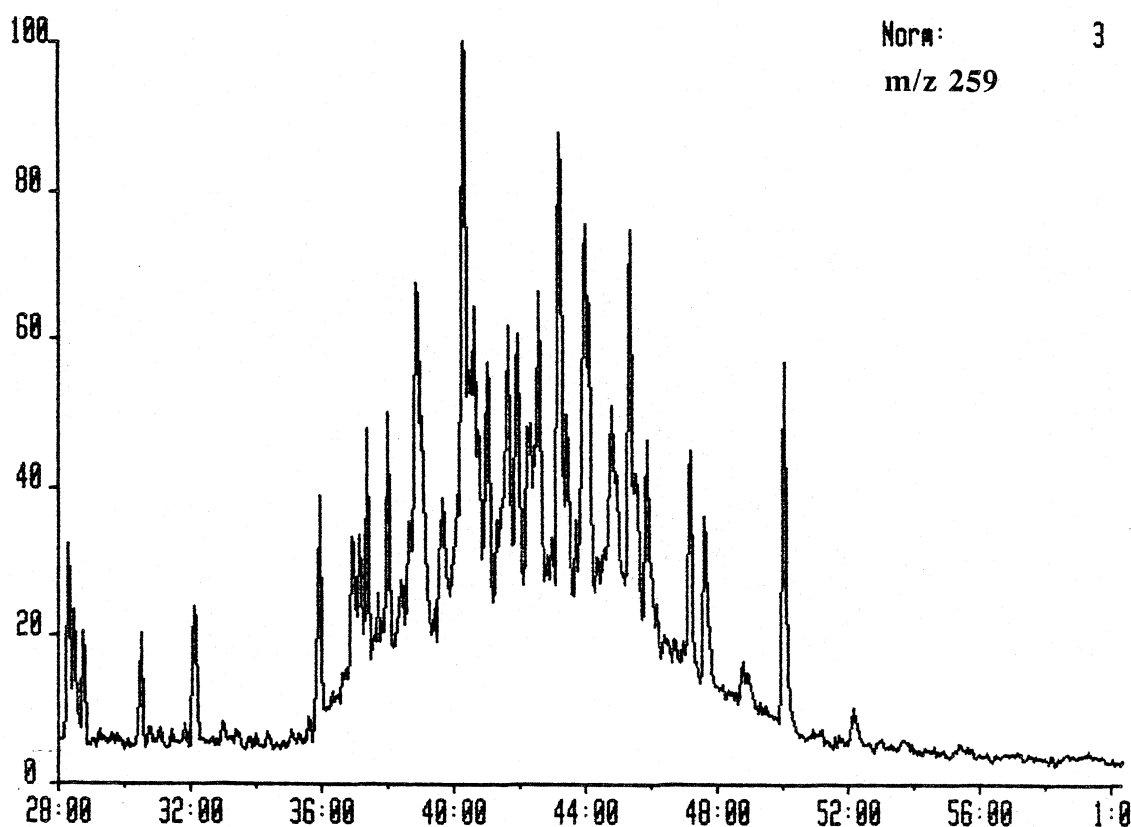
D1076SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:

System:QUADSAT



D1076SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 259.1000
Text:

System:QUADSAT





IKU

SINTEF-GRUPPEN

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01076SAT 3-DEC-87

Sir: Voltage 12-250

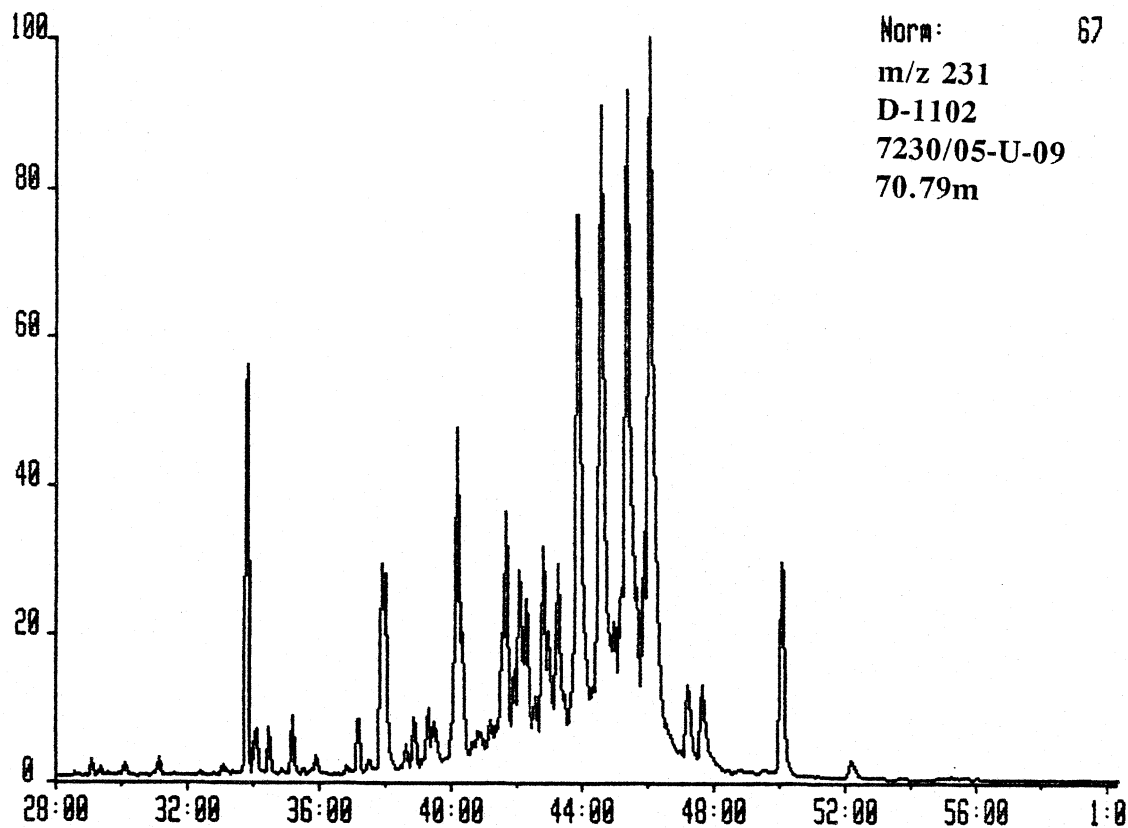
Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 231.1000

Text:



Norm: 67

m/z 231

D-1102

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70.79m

01076SAT 3-DEC-87

Sir: Voltage 12-250

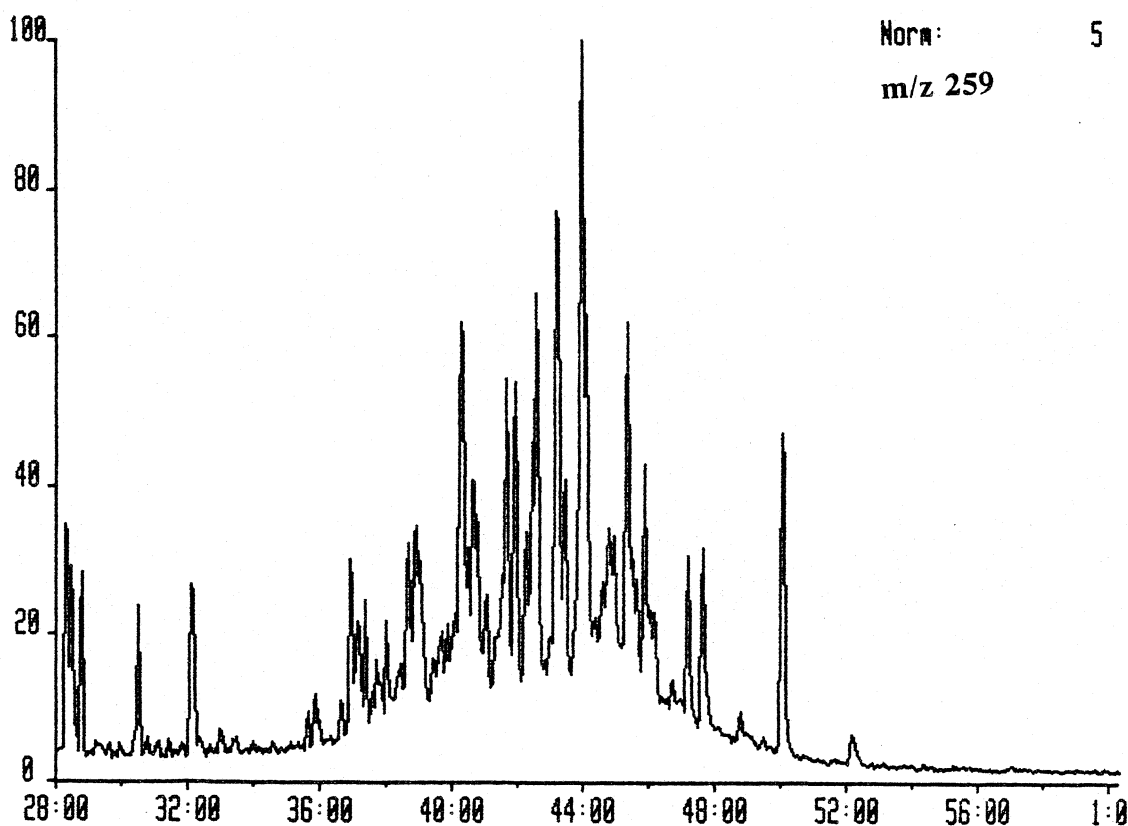
Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 259.1000

Text:



Norm: 5

m/z 259

Figure A.II.3.4: Vitrinite reflectance histograms.

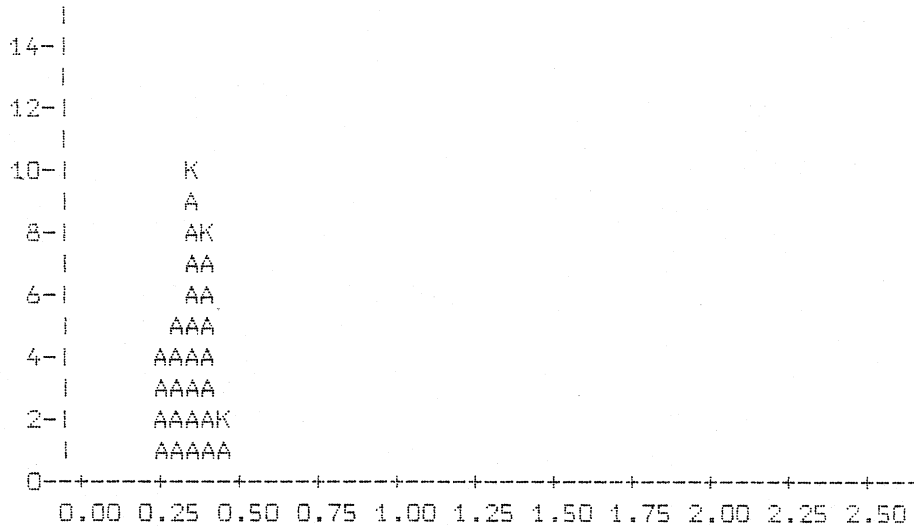
Key:

A	= Grey-black-brown claystone.
	Upper case letters indicate values included in the main population. Lower case letters represent values in other population.
pp	= Statistical data population
	Y = Main population, not necessarily representative of sample maturity.
	N = Other populations.
LOW+HIGH	= Population limits.
VAL.	= Number of measurements in that population.

Lithology cross-reference table

A = Clst. gy
 B = Clst. dk gy
 C = Clst. dk gy
 D = Clst. gn
 E = Clst. bn
 F = Clst. rd
 G = Clst. carb.
 H = Shale
 I = Sandstone
 J = Limestone
 K = Coal
 L = Lignite
 M = Carbargillite
 N = Siltstone
 O = Bit
 P = X

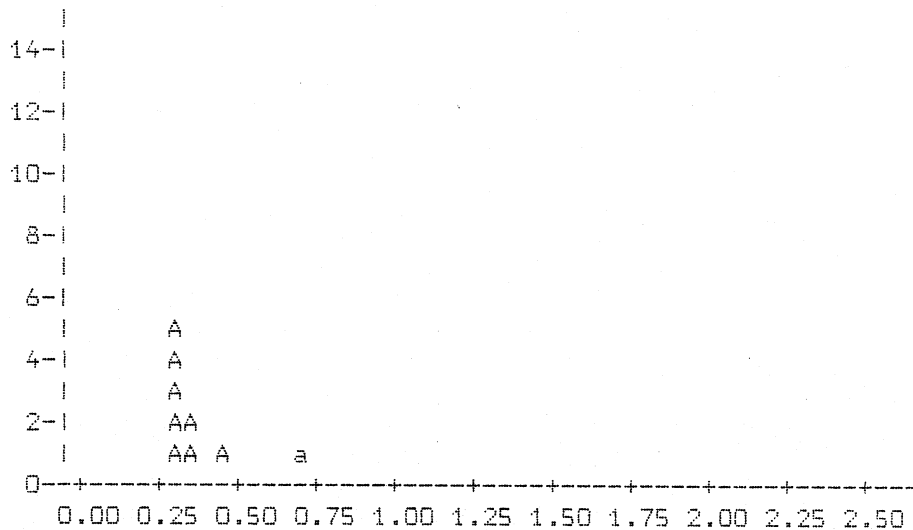
IKU# D1073a 56.5M 7230/5-U-9


 PP LOW HIGH LIT #VAL MEAN STDV
 Y 0.25 0.48 ALL 29 0.37 0.05
 OVERALL 29 0.37 0.05

ORDERED VALUES FOLLOW:

 0.28A 0.29A 0.29A 0.29A 0.30A 0.32A 0.33A 0.33A 0.34A 0.35A 0.35A
 0.36A 0.36A 0.36A 0.37K 0.37A 0.37A 0.39A 0.39A 0.40K 0.40A 0.40A
 0.40A 0.41A 0.42A 0.43A 0.44A 0.46A 0.47K

IKU# D-1076 57.2M 7230/5-U-9

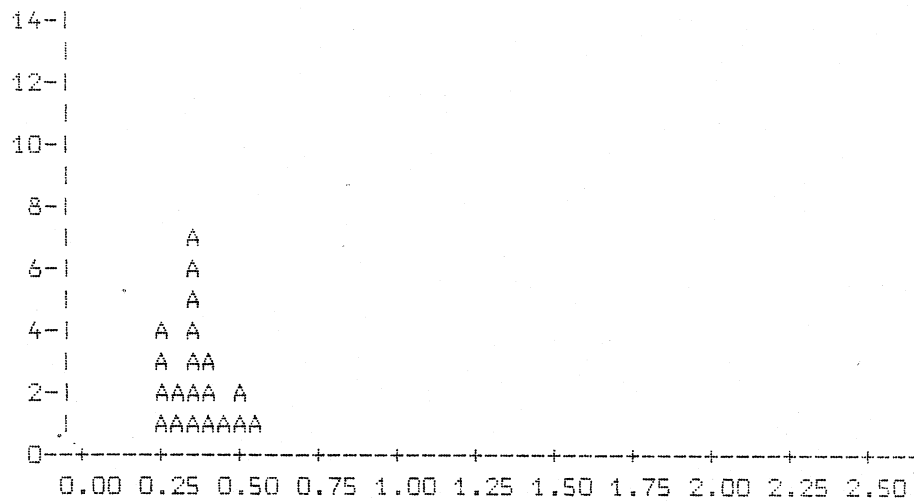


PP	LOW	HIGH	LIT	#VAL	MEAN	STDV
Y	0.31	0.49	ALL	8	0.36	0.06
N	0.73	0.74	ALL	1	0.73	0.00
OVERALL				9	0.40	0.14

ORDERED VALUES FOLLOW:

0.31A 0.32A 0.32A 0.33A 0.33A 0.39A 0.39A 0.48A 0.73a

IKU# D-1102 70.8M 7230/5-U-9



PP LOW HIGH LIT #VAL MEAN STDV
 Y 0.27 0.60 ALL 20 0.39 0.09
 OVERALL 20 0.39 0.09

ORDERED VALUES FOLLOW:

0.27A 0.27A 0.28A 0.28A 0.31A 0.33A 0.35A 0.35A 0.36A 0.38A 0.39A
 0.39A 0.39A 0.41A 0.43A 0.44A 0.46A 0.50A 0.52A 0.59A

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Core 7324/Q7-U-01

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Table A.II.4.1a

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CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS IN HEADSPACE GAS

I	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	SUM	SUM	WET-	iC4	I
I	no.	m							C1-C4	C2-C4	NESS	-----	I
I											(%)	nC4	I
I													I
I													I
I	D 1361	78.92	55059	15					55075	15	0.03	*****	I
I	D 1370	81.78	32037	10					32047	10	0.03	*****	I
I	D 1383	93.90	12831	577	72	12	5		13496	665	4.93	2.61	I
I	D 1388	96.57	27052	990	96	15	6		28160	1108	3.93	2.36	I
I	D 1397	102.35	21299	410	29	8	2		21748	450	2.07	3.62	I
I	D 1401	104.00	44318	609	49	14	4		44994	676	1.50	3.31	I
I	D 1404	105.79	67677	785	52	13	4		68530	854	1.25	3.50	I
I	D 1409	108.47	64015	1259	78	16	5		65372	1357	2.08	3.31	I
I	D 1413	111.47	41383	1166	124	16	9		42697	1315	3.08	1.76	I
I	D 1421	115.51	31217	1900	275	45	38	15	33475	2258	6.75	1.19	I
I	D 1425	118.34	59332	2520	289	30	14		62185	2853	4.59	2.06	I
I	D 1429	121.32	44673	2503	529	51	38		47794	3121	6.53	1.34	I
I	D 1433	124.36	7314	222	41	5	4		7587	273	3.60	1.24	I

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Table A.II.4.1b

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CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS IN OCCLUDED GAS

I	I	I	I	I	I	I	I	I	I	I	I	I	I
	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	SUM	SUM	WET-	iC4	I
	no.	m							C1-C4	C2-C4	NESS	-----	I
											(%)	nC4	I
I	I	I	I	I	I	I	I	I	I	I	I	I	I
I	D	1361	78.92	7146	25				7171	25	0.35	*****	I
I	D	1370	81.78	3713	27	1			3741	28	0.74	*****	I
I	D	1383	93.90	33552	6629	4139	1200	802	1424	46321	12769	27.57	1.50
I	D	1388	96.57	5582	1340	598	165	104	176	7790	2208	28.34	1.58
I	D	1397	102.35	5679	833	261	118	49	169	6941	1262	18.18	2.38
I	D	1401	104.00	6179	728	275	125	52	170	7359	1180	16.03	2.41
I	D	1404	105.79	6044	897	302	139	58	186	7440	1396	18.76	2.41
I	D	1409	108.47	5257	992	343	129	56	185	6777	1520	22.43	2.31
I	D	1413	111.47	3027	1601	891	208	172	291	5900	2872	48.69	1.20
I	D	1421	115.51	5907	2087	1386	407	520	634	10307	4400	42.69	0.78
I	D	1425	118.34	3423	1494	1171	357	461	563	6907	3483	50.43	0.78
I	D	1429	121.32	5846	2796	1774	364	427	477	11207	5361	47.84	0.85
I	D	1433	124.36	7658	578	275	51	62	88	8624	966	11.20	0.83

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Table A.II.4.1c

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CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS SUMMATION

I	I	I	I	I	I	I	I	I	I	I	I	I	I
	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	SUM	SUM	WET-	iC4	I
	no.	m							C1-C4	C2-C4	NESS	-----	I
											(%)	nC4	I
I	D 1361	78.92	62205	40					62246	40	0.06	*****	I
I	D 1370	81.78	35750	36	1				35788	37	0.10	*****	I
I	D 1383	93.90	46383	7206	4210	1212	806	1424	59817	13434	22.46	1.50	I
I	D 1388	96.57	32635	2330	695	180	111	176	35950	3316	9.22	1.63	I
I	D 1397	102.35	26978	1244	291	125	52	169	28689	1711	5.97	2.43	I
I	D 1401	104.00	50497	1337	324	139	56	170	52353	1856	3.53	2.48	I
I	D 1404	105.79	73721	1682	354	152	62	186	75970	2250	2.96	2.47	I
I	D 1409	108.47	69272	2251	421	145	61	185	72149	2877	3.99	2.39	I
I	D 1413	111.47	44410	2766	1016	224	181	291	48597	4187	8.62	1.23	I
I	D 1421	115.51	37124	3987	1661	452	558	649	43782	6658	15.21	0.81	I
I	D 1425	118.34	62755	4014	1460	387	475	563	69092	6336	9.17	0.81	I
I	D 1429	121.32	50519	5299	2303	415	465	477	59001	8482	14.38	0.89	I
I	D 1433	124.36	14971	800	316	57	67	88	16211	1239	7.65	0.85	I

Table A.II.4.2:

CORE 7324/07-U-01

DATA FROM ROCK EVAL PYROLYSIS

I	I	I	I	I	I	I	I	I	I	I	I	I
I	IKU	DEPTH :	S1	S2	S3	TOC	HYDR. INDEX	OXYGEN INDEX	PETROLEUM POTENTIAL	PROD. INDEX	TEMP. MAX	I
I	No.	:	:	:	:	:	:	:	:	S1	(C)	I
I		m :	(mg/g ROCK)			(%)	(mg/g TOC)		S1+S2	S1+S2		I
I												I
I	D 1372	73.19 :	0.08	0.24	0.95	1.13	21	84	0.32	0.25	419	I
I	D 1359	75.75 :	0.06	0.31	0.64	1.14	27	56	0.37	0.16	427	I
I	D 1363	77.49 :	0.06	0.39	0.34	1.17	33	29	0.45	0.13	429	I
I	D 1361	78.92 :	****	****	****	1.14	*****	****	*****	*****	***	I
I	D 1366	80.22 :	0.10	0.28	0.52	1.21	23	43	0.38	0.26	426	I
I	D 1370	81.78 :	****	****	****	1.08	*****	****	*****	*****	***	I
I	D 1376	84.73 :	****	****	****	1.05	*****	****	*****	*****	***	I
I	D 1377	85.97 :	0.07	0.21	1.05	0.93	23	113	0.28	0.25	424	I
I	D 1378	86.43 :	****	****	****	0.90	*****	****	*****	*****	***	I
I	D 1382	87.85 :	0.15	0.26	1.32	0.87	30	152	0.41	0.37	425	I
I	D 1381	89.46 :	0.06	0.32	0.46	1.03	31	45	0.38	0.16	425	I
I	D 1380	90.78 :	0.06	0.26	0.57	1.05	25	54	0.32	0.19	426	I
I	D 1386	92.97 :	0.07	0.28	0.51	1.08	26	47	0.35	0.20	425	I
I	D 1383	93.90 :	****	****	****	0.98	*****	****	*****	*****	***	I
I	D 1391	94.96 :	0.06	0.32	0.22	1.16	28	19	0.38	0.16	423	I
I	D 1388	96.57 :	****	****	****	1.12	*****	****	*****	*****	***	I
I	D 1395	98.13 :	0.07	0.33	0.31	1.15	29	27	0.40	0.17	427	I
I	D 1393	98.55 :	0.06	0.33	0.37	1.18	28	31	0.39	0.15	423	I
I	D 1400	100.85 :	0.13	0.39	0.26	1.23	32	21	0.52	0.25	425	I
I	D 1398	101.45 :	0.12	0.29	0.34	1.19	24	29	0.41	0.29	422	I
I	D 1397	102.35 :	****	****	****	1.18	*****	****	*****	*****	***	I
I	D 1403	103.88 :	0.10	0.44	0.73	1.22	36	60	0.54	0.19	427	I

DATE : 29 - 10 - 87.

Table A.II.4.2 (cont'd):

CORE 7324/07-U-01

DATA FROM ROCK EVAL PYROLYSIS

I	I	I	I	I	I	I	I	I	I	I	I	I
I	IKU	DEPTH :	S1	S2	S3	TOC	HYDR. INDEX	OXYGEN INDEX	PETROLEUM POTENTIAL	PROD. INDEX	TEMP. MAX	I
I	No.	:	:	:	:	:	:	:	:	S1	:	I
I	:	:	:	:	:	:	:	:	:	-----	:	I
I	m	:	(mg/g ROCK)	(%)	(mg/g TOC)	S1+S2	S1+S2	(C)				I
I	=====	I	=====	I	=====	I	=====	I	=====	I	=====	I
I	D 1401	104.00 :	****	****	****	1.21	*****	****	*****	*****	***	I
I	D 1404	105.79 :	****	****	****	1.23	*****	****	*****	*****	***	I
I	D 1409	108.47 :	****	****	****	1.28	*****	****	*****	*****	***	I
I	D 1415	110.12 :	0.12	0.40	0.64	1.27	31	50	0.52	0.23	433	I
I	D 1413	111.47 :	****	****	****	1.27	*****	****	*****	*****	***	I
I	D 1422	114.74 :	0.07	0.44	0.70	1.26	35	56	0.51	0.14	431	I
I	D 1421	115.51 :	****	****	****	1.22	*****	****	*****	*****	***	I
I	D 1426	117.65 :	0.10	0.47	1.07	1.23	38	87	0.57	0.18	432	I
I	D 1425	118.34 :	****	****	****	1.13	*****	****	*****	*****	***	I
I	D 1431	120.59 :	0.05	0.39	0.74	1.16	34	64	0.44	0.11	430	I
I	D 1429	121.32 :	****	****	****	1.15	*****	****	*****	*****	***	I
I	D 1435	122.59 :	0.08	0.23	0.21	1.10	21	19	0.31	0.26	425	I
I	D 1436	123.50 :	0.06	0.23	0.47	1.10	21	43	0.29	0.21	423	I
I	D 1433	124.36 :	****	****	****	0.67	*****	****	*****	*****	***	I
I		:										I
I	=====	I	=====	I	=====	I	=====	I	=====	I	=====	I

DATE : 29 - 10 - 87.

Core number: 7234/07-U-01
Reference number: 21.3435.23
(1/1)

Table A.II.4.3:

VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
D-1363	-----	77.49	0.38 (3) 0.61 (2) 0.81 (1)	P R R	0.04 0.01 0.00	2-5
D-1400	-----	100.85	0.41 (7) 0.68 (2)	P R	0.09 0.01	2-5
D-1426	-----	117.65	N.D.P.	-	----	2-5

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor
S = Stained; R = Reworked.

Project no.: 21.3435.23
Well ident.: 7324/07-U-01
DATE : 27 - 11 - 87.

Table A.II.4.4:

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKU-No	DEPTH (m)	: Rock : Extr. : (g)	EOM (mg)	Sat. (mg)	Aro. (mg)	HC (mg)	Non HC (mg)	TOC (%)
D 1366	80.22	: 1.0	0.9	0.1	0.7	0.8	0.1	1.21
D 1382	87.85	: 5.7	4.2	0.6	0.6	1.2	3.0	0.87
D 1400	100.85	: 8.1	5.9	0.2	0.8	1.0	4.9	1.23
D 1415	110.12	: 9.0	2.6	0.5	0.4	0.9	1.7	1.26
D 1426	117.65	: 10.4	7.4	0.2	1.0	1.2	6.2	1.23

Project no.: 21.3435.23
Well ident.: 7324/07-U-01
DATE : 27 - 11 - 87.

Table A.II.4.5:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
D 1366	80.22	928	103	722	825	103
D 1382	87.85	736	105	105	210	525
D 1400	100.85	725	25	98	123	602
D 1415	110.12	288	55	44	100	188
D 1426	117.65	713	19	96	116	597

Project no.: 21.3435.23
Well ident.: 7324/07-U-01
DATE : 27 - 11 - 87.

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Table A.II.4.6:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS
(mg/g TOC)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
D 1366	80.22	76.7	8.5	59.6	68.2	8.5
D 1382	87.85	84.5	12.1	12.1	24.2	60.4
D 1400	100.85	58.9	2.0	8.0	10.0	48.9
D 1415	110.12	22.9	4.4	3.5	7.9	15.0
D 1426	117.65	58.0	1.6	7.8	9.4	48.6

Project no.: 21.3435.23
 Well ident.: 7324/07-U-01
 DATE : 27 - 11 - 87.

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Table A.II.4.7:

COMPOSITION OF MATERIAL EXTRACTED FROM THE ROCK

IKU-No	DEPTH (m)	Sat EOM %	Aro EOM %	HC EOM %	SAT Aro x 100	Non HC EOM %	HC Non HC x 100
D 1366	80.22	11.1	77.8	88.9	14.3	11.1	800.0
D 1382	87.85	14.3	14.3	28.6	100.0	71.4	40.0
D 1400	100.85	3.4	13.6	16.9	25.0	83.1	20.4
D 1415	110.12	19.2	15.4	34.6	125.0	65.4	52.9
D 1426	117.65	2.7	13.5	16.2	20.0	83.8	19.4

Table A.II.4.8:

Core 7324/07-U-01

TABULATION OF DATA FROM THE GASCHROMATOGRAMS

I	DEPTH	: PRISTANE	PRISTANE	PHYTANE	A	n-C17			
I	IKU No.	: -----	A = -----	B = -----	-----	-----	CPI	CPI	
I	(m)	: PHYTANE	n-C17	n-C18	B	n-C27	1	2	
I									
I		:							
I	D 1366	80.22	0.7	0.8	0.6	1.3	0.6	1.7	1.4
I		:							
I	D 1382	87.85	1.2	1.1	0.6	1.7	1.0	1.9	1.5
I		:							
I	D 1400	100.85	1.4	1.1	0.7	1.7	0.3	2.1	2.3
I		:							
I	D 1415	110.12	1.3	1.0	0.5	1.8	0.2	1.4	1.4
I		:							
I	D 1426	117.65	1.4	0.8	0.4	1.9	0.2	1.9	2.0
I		:							

DATE : 8 - 12 - 87.

Table A.II.4.9a:

Molecular ratios from sterane and terpane mass chromatograms.
Maturity-characteristic ratios.

Core 7324/07-U-01

IKU no.	Depth (m)	$\alpha\beta/(\alpha\beta+\beta\alpha)^{1)}$ hopanes	%22S ²⁾ ext.hop.	% $\beta\beta^3)$ ster.	%20S ⁴⁾ ster.
D 1366	80.22	0.76	22.43	54.87	-
D 1400	100.85	0.67	12.31	45.39	-
D 1415	110.12	0.68	8.50	42.75	-
D 1426	117.65	0.64	14.61	49.57	-

¹⁾ E/(E+F) in m/z 191

²⁾ Average % distribution between first and second eluting isomers of extended hopanes (G...M in m/z 191, e.g. $100 \cdot G/(G+H)$).

³⁾ $100 \cdot q/(q+t)$ in m/z 217

⁴⁾ $100 \cdot 2(r+s)/[q+t+2(r+s)]$ in m/z 217

Table A.II.4.9b:

Molecular ratios from sterane and terpane mass chromatograms.
Maturity- and source-characteristic ratios.

Core 7324/07-U-01

IKU no.	Depth (m)	Q/E ¹⁾	T _m /T _s ²⁾	X/E ³⁾	Z/E ⁴⁾	C ₂₇ rearr. steranes ⁵⁾
D 1366	80.22	0.16	3.44	-	-	0.36
D 1400	100.85	-	-	-	-	0.10
D 1415	110.12	-	-	-	-	0.14
D 1426	117.65	-	-	-	-	0.11

¹⁾ Relative abundance of tricyclic terpanes (Q/E in m/z 191)

²⁾ B/A in m/z 191

³⁾ Relative abundance of unknown (X/E in m/z 191)

⁴⁾ Relative abundance of bisnorhopane (Z/E in m/z 191)

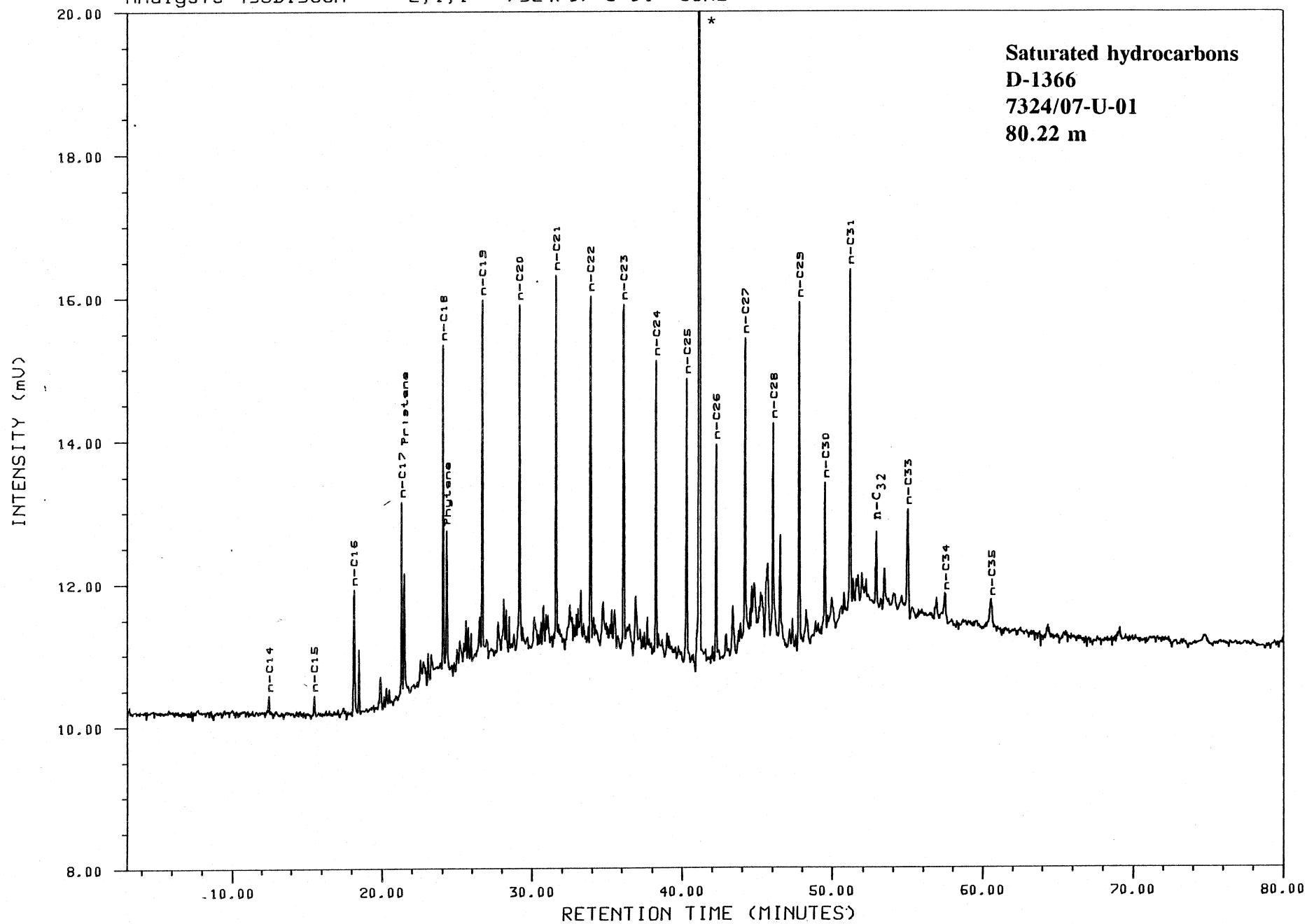
⁵⁾ $100 \cdot a/(a+j)$ in m/z 217

Figure A.II.4.1:

Saturated hydrocarbon gas chromatograms

n-C ₁₅ etc.	- n-alkanes
Pr	- pristane
Ph	- phytane
*	- contamination (dioctylphthalate)

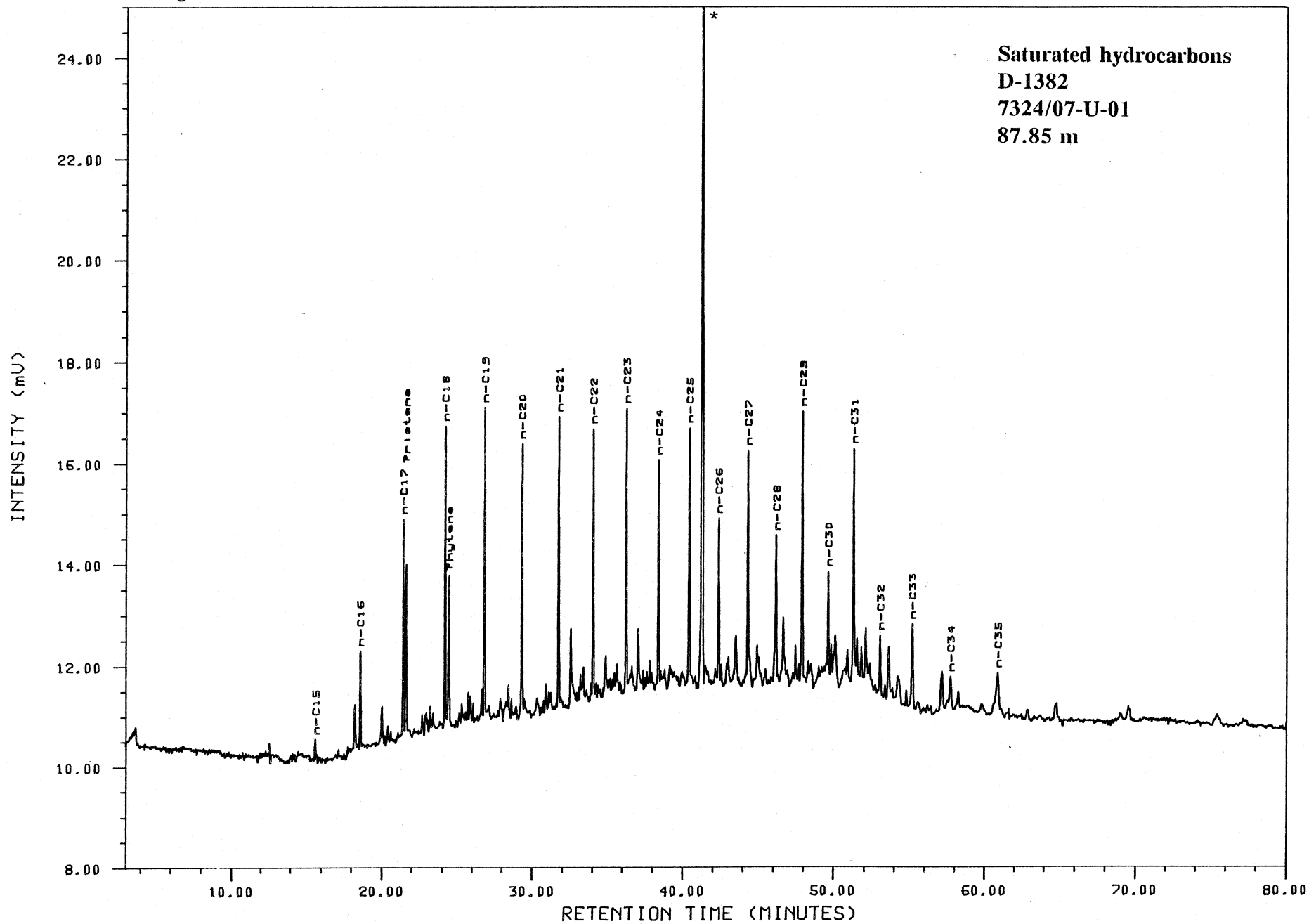
Analysis 435D1366M 2,1,1 7324/07-U-01 CORE



Analysis 435D1382S

2,1,1

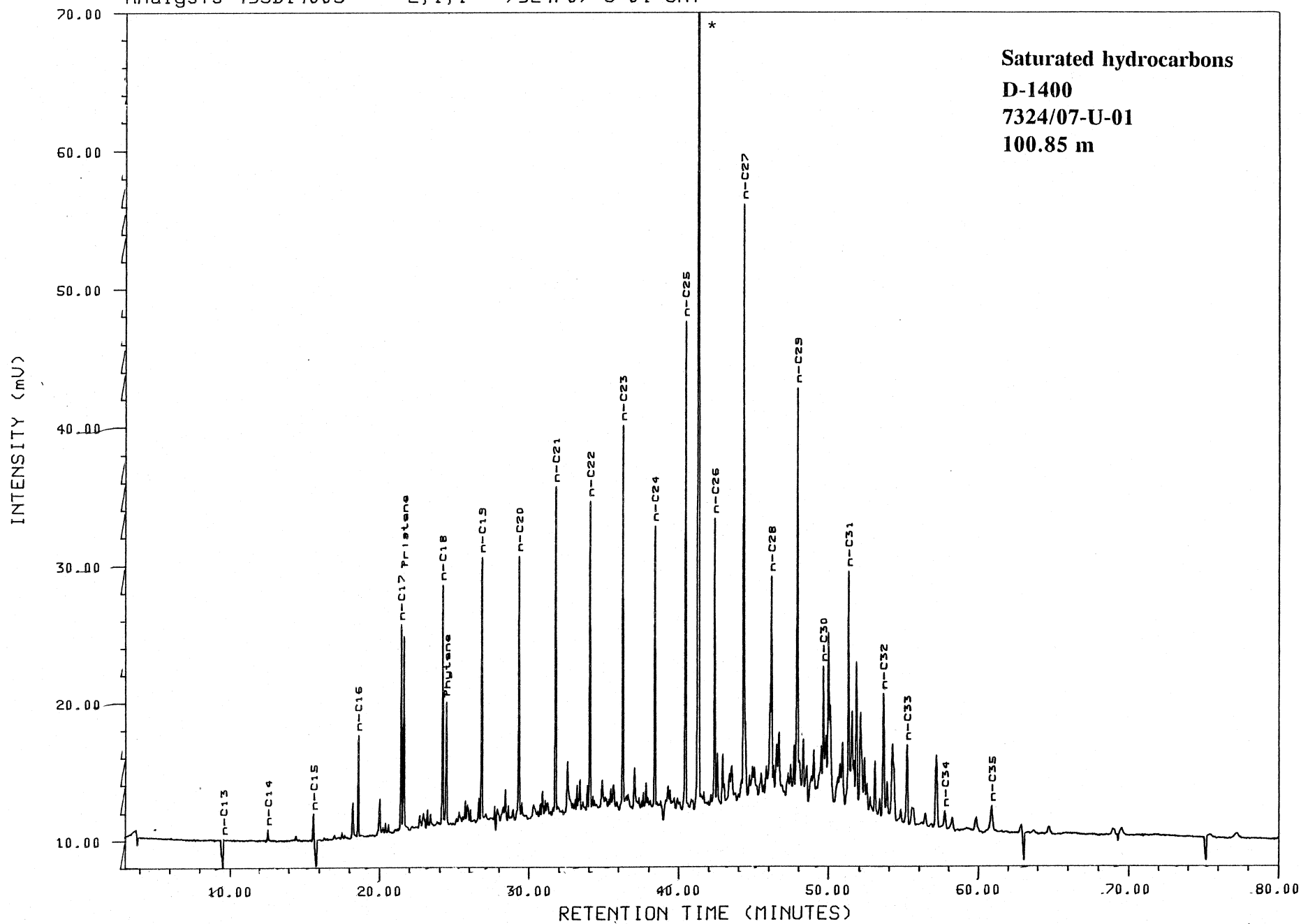
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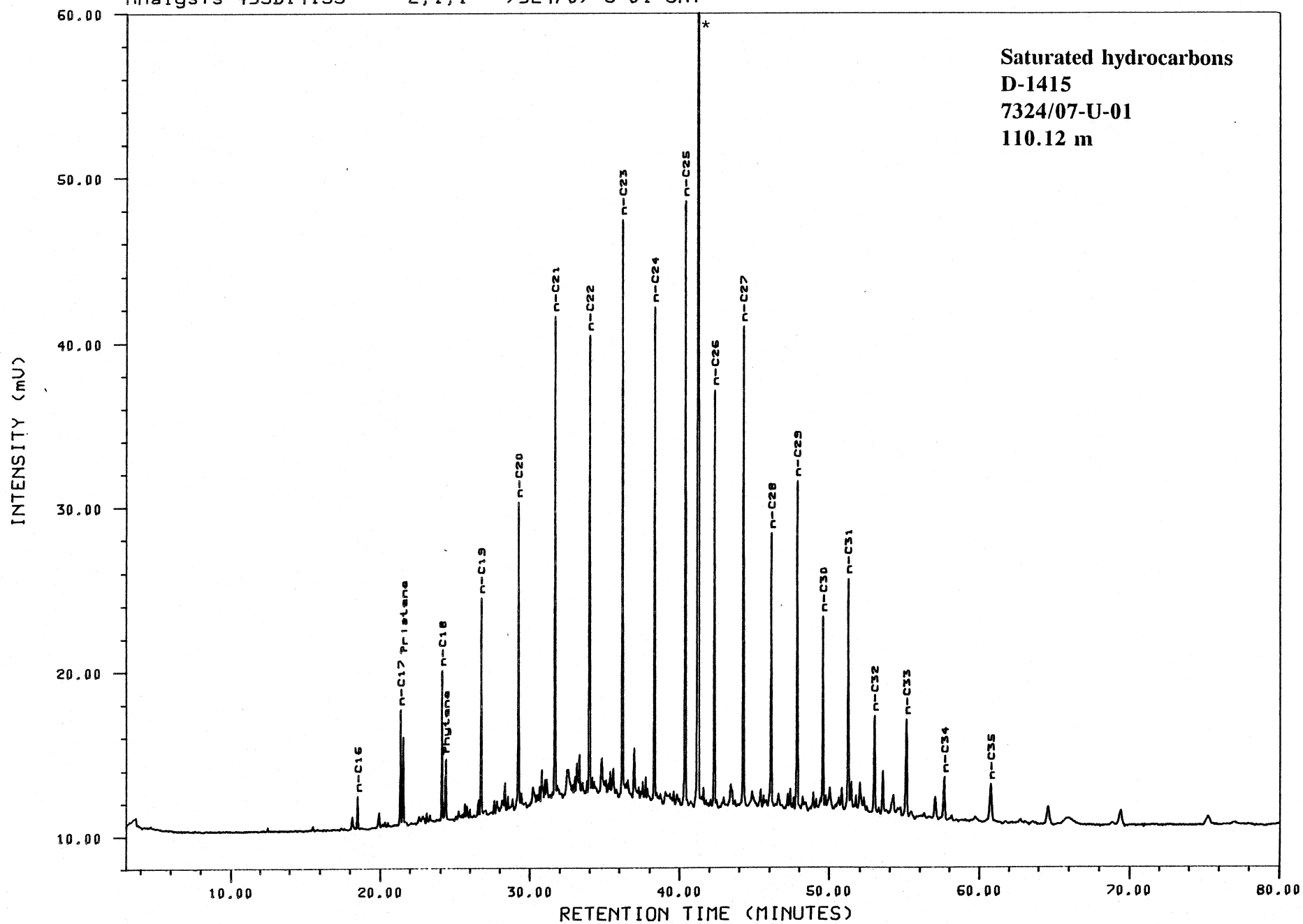
Analysis 435D1400S

2,1,1

7324/07-U-01 SAT



Analysis 435D1415S 2,1,1 7324/07-U-01 SAT



Analysis 435D1426S 2,1,1 7324/07-U-01 SAT

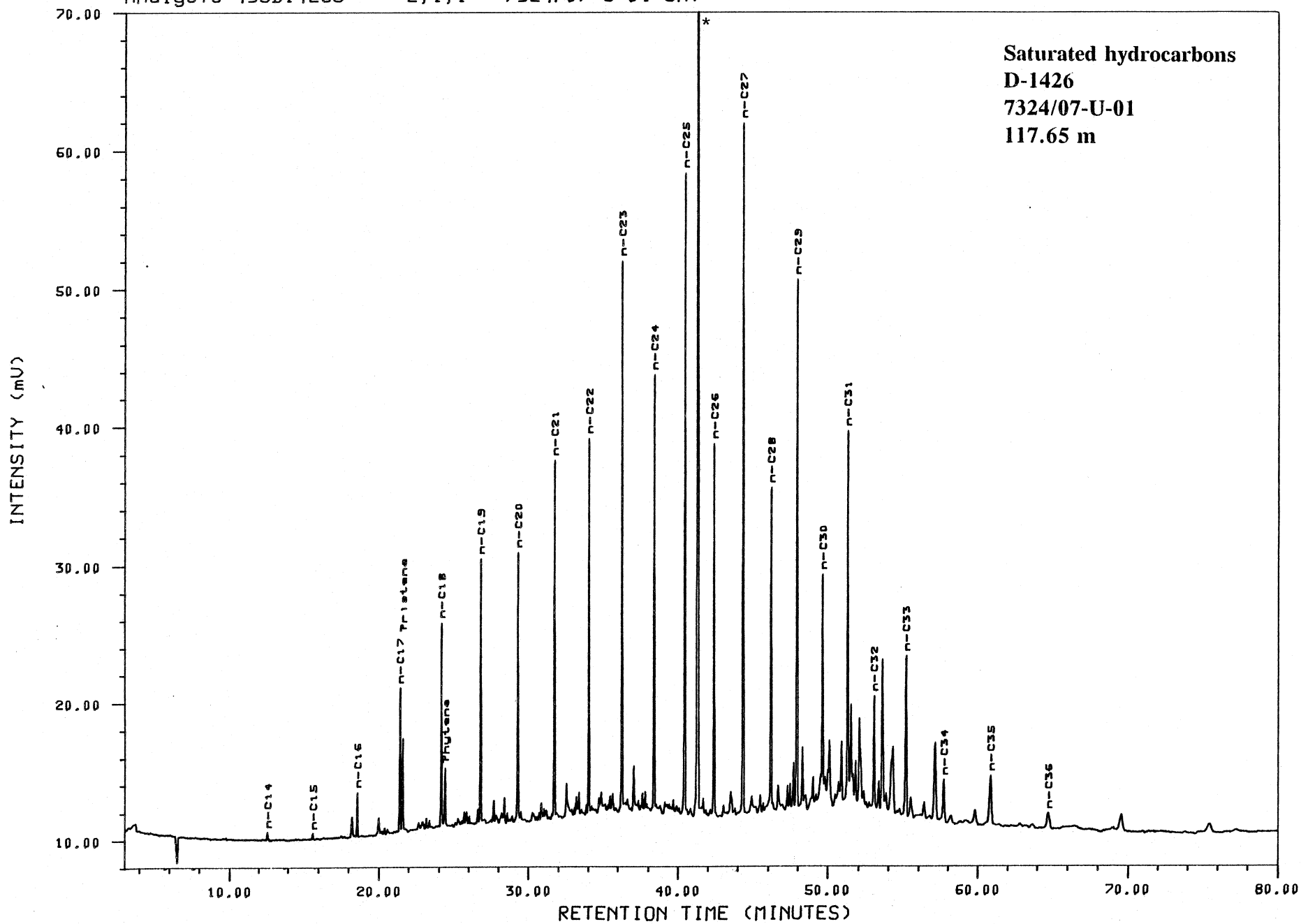


Figure A.II.4.2:

Mass fragmentograms of m/z 191, 205, 163, 177 (terpanes).



IKU
SINTEF-GRUPPEN

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D1426SAT 3-DEC-87

Sir:Voltage 12-250

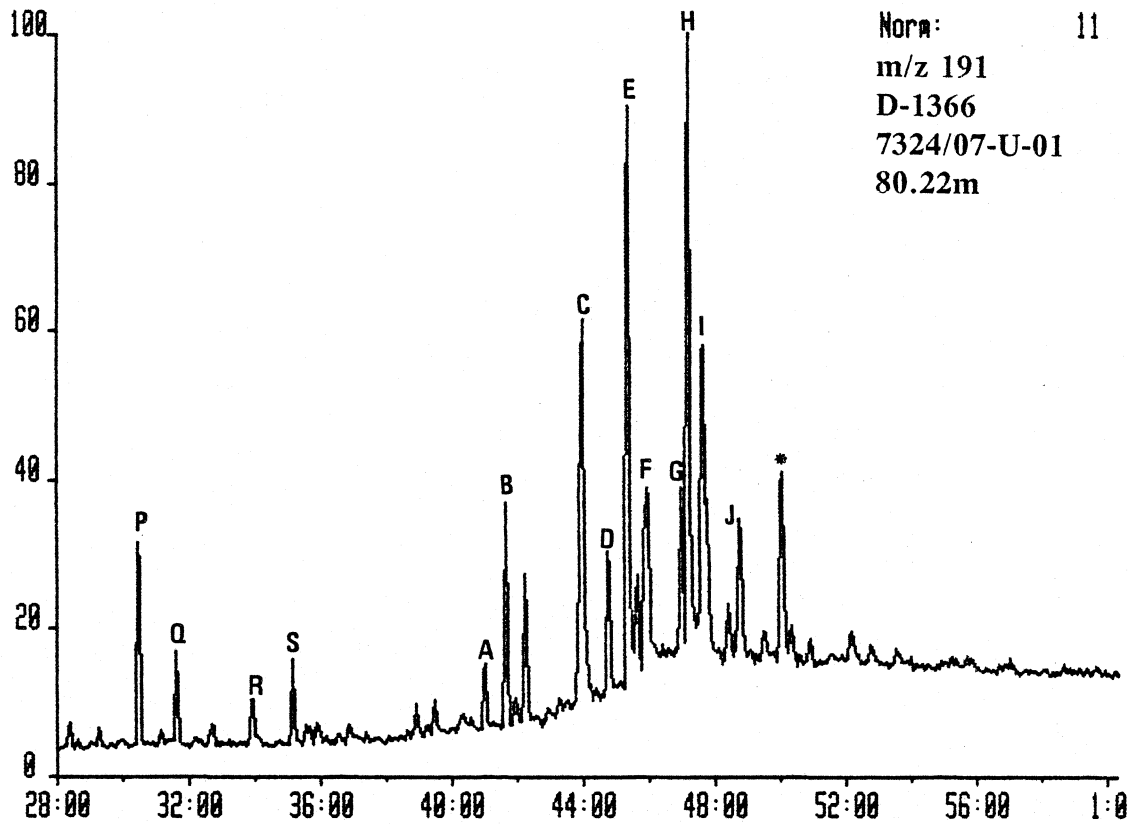
Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 191.1000

Text:



D1426SAT 3-DEC-87

Sir:Voltage 12-250

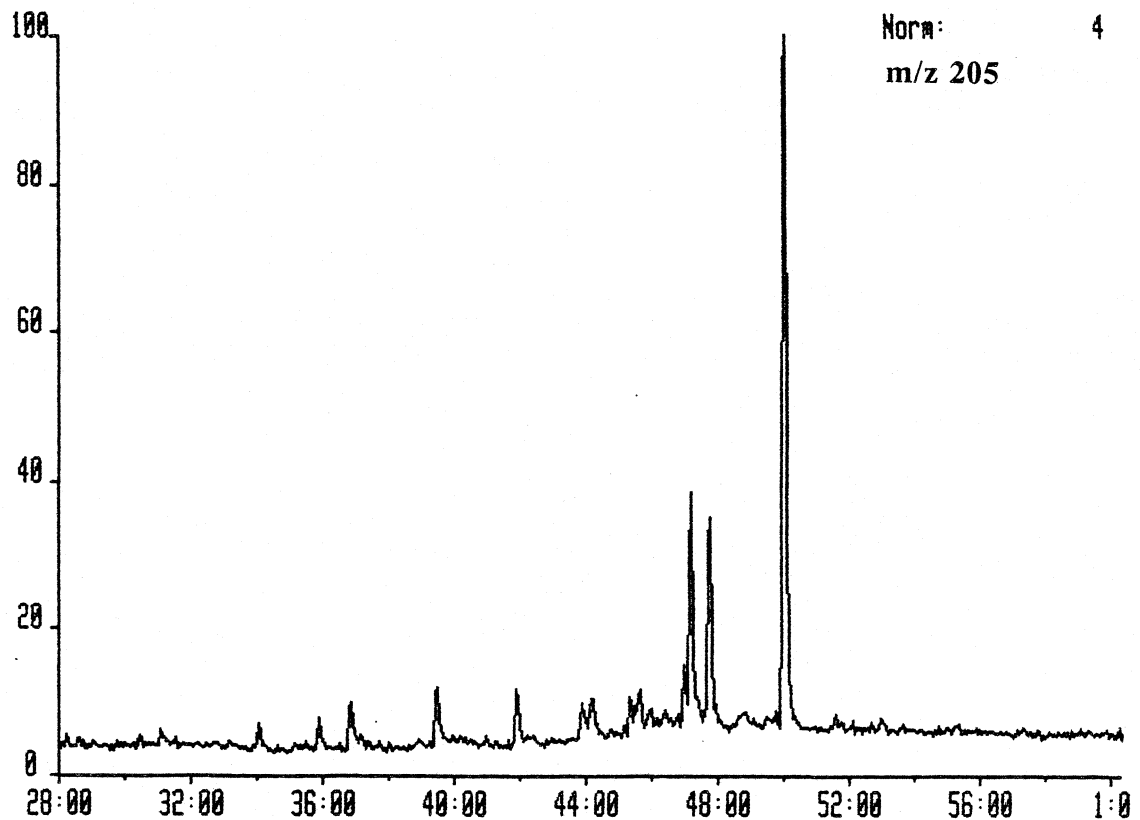
Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 205.1000

Text:



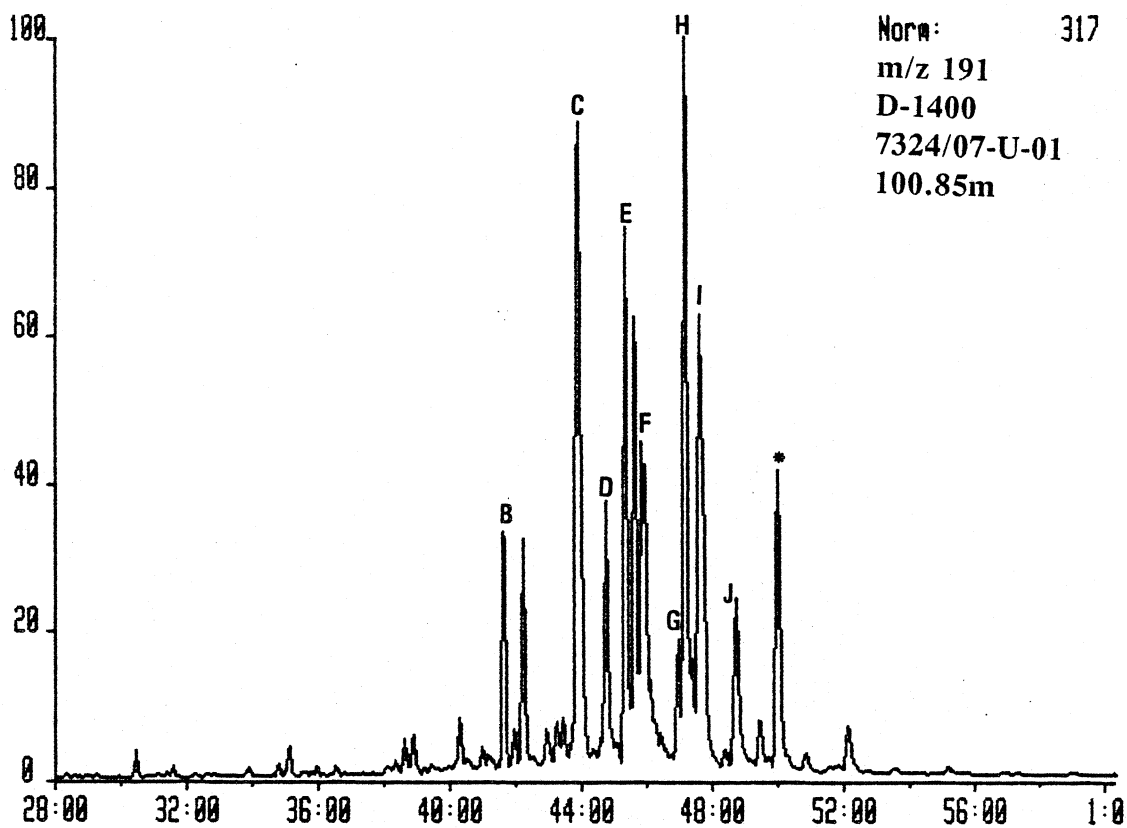


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D1400SAT 3-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 191.1000

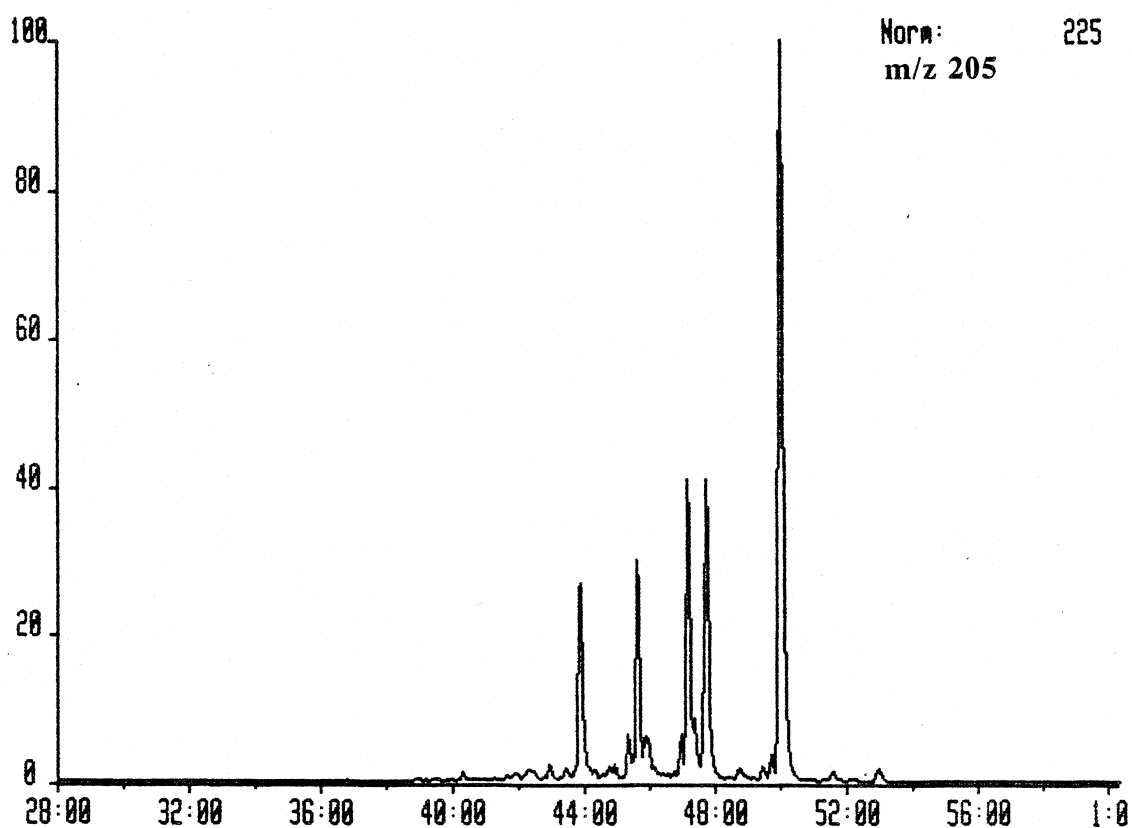
System: QUADSAT



D1400SAT 3-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 205.1000

System: QUADSAT





IKU
SINTEF-GRUPPEN

- 244 -

D1415SAT 8-DEC-87

Sir: Voltage 12-250

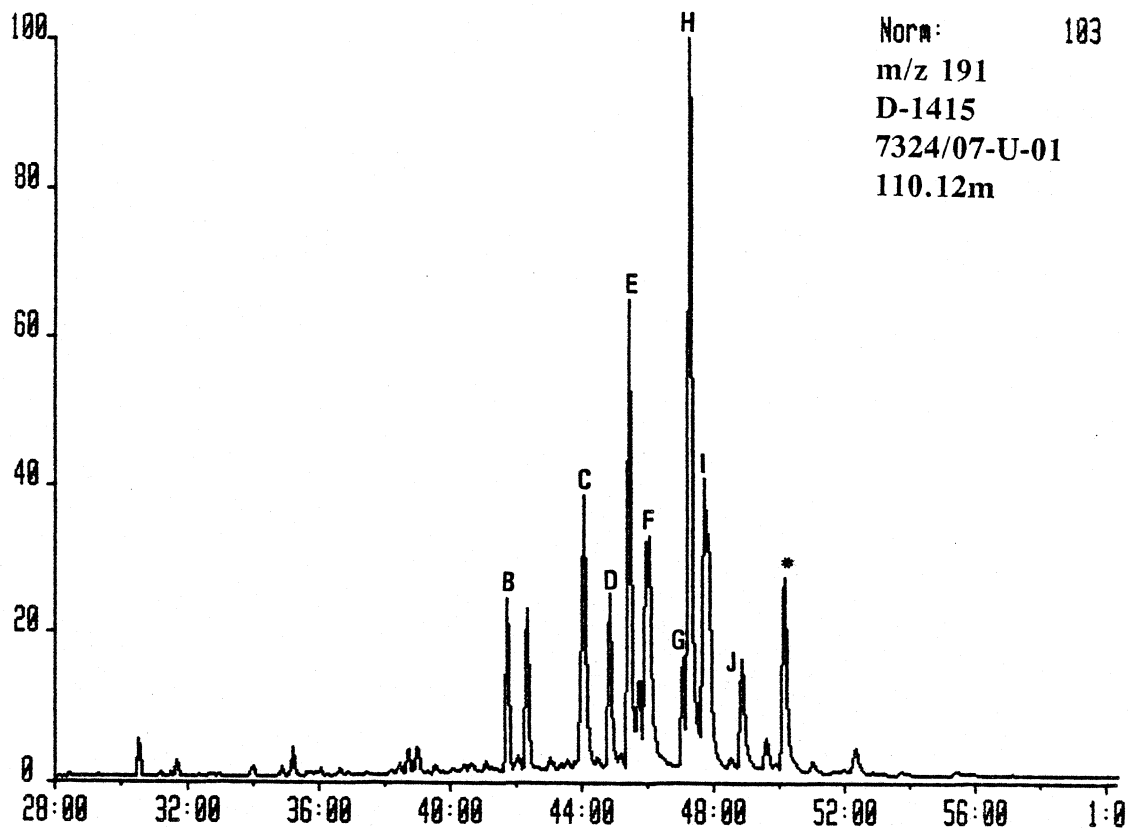
Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 191.1000

Text:



D1415SAT 8-DEC-87

Sir: Voltage 12-250

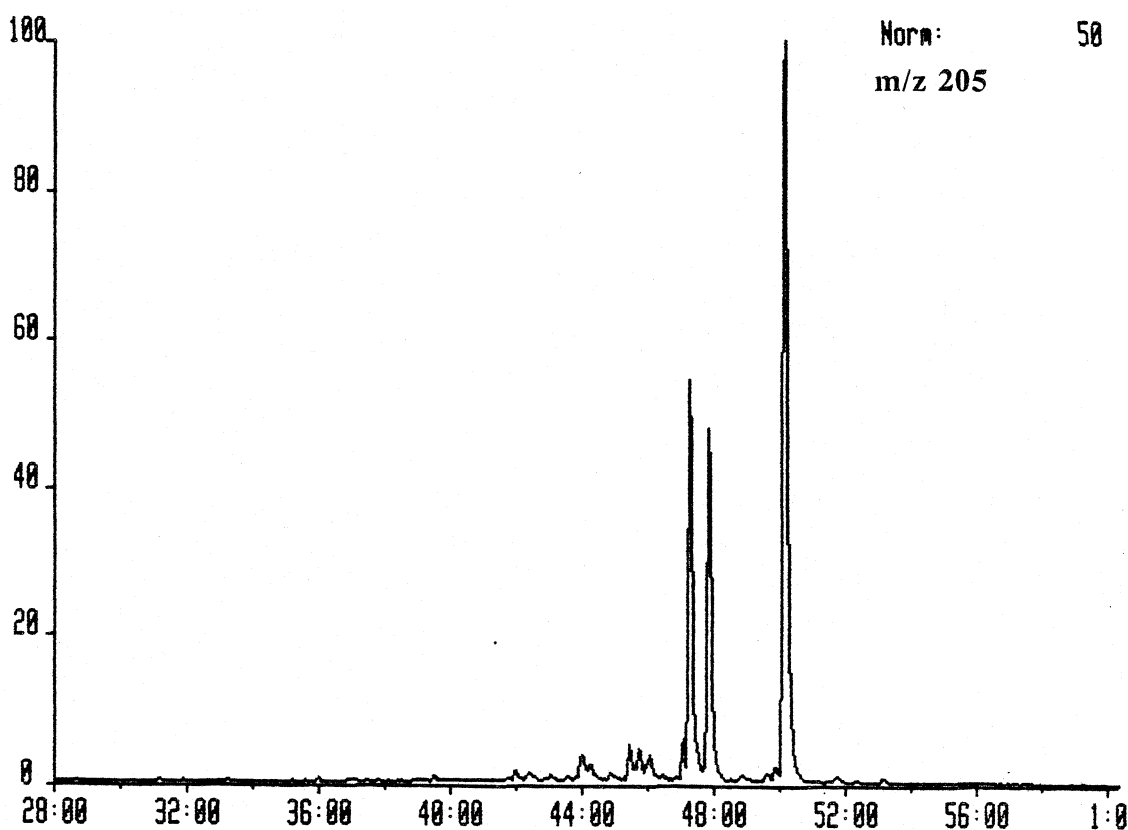
Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 205.1000

Text:



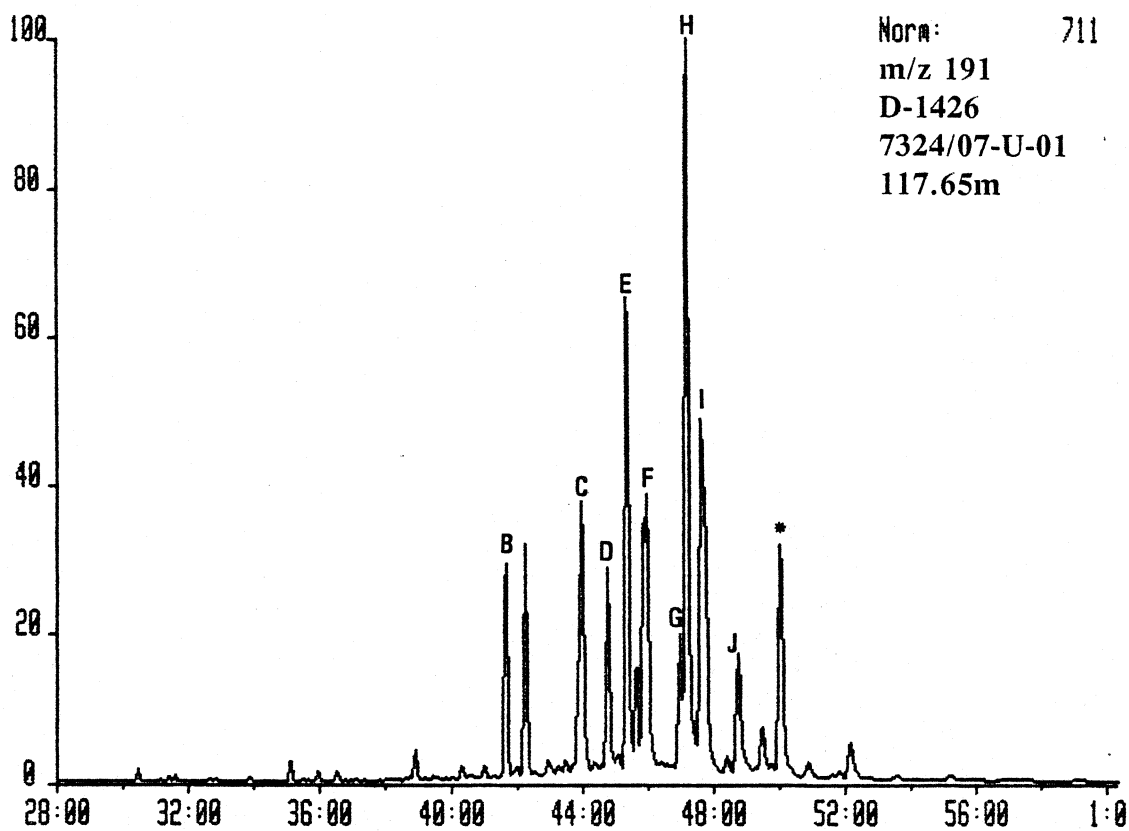


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D1426SAT 3-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 191.1000

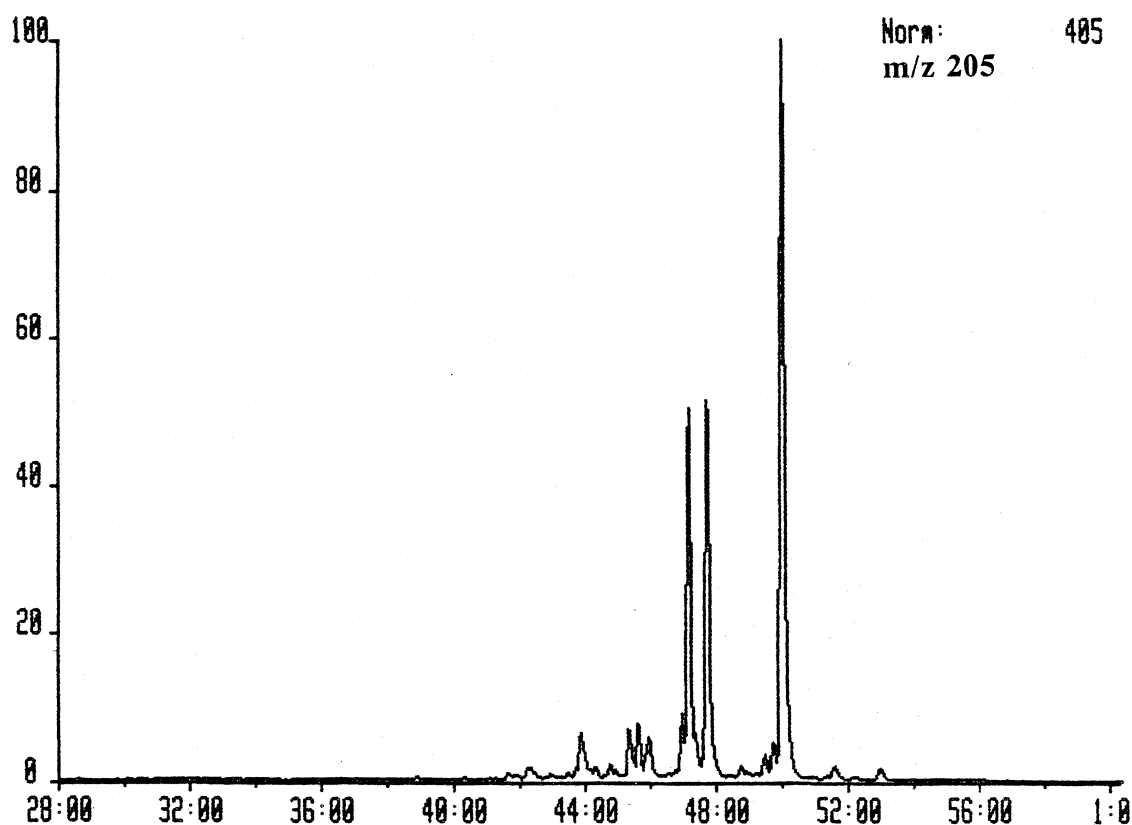
System: QUADSAT



D1426SAT 3-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 205.1000

System: QUADSAT





IKU

SINTEF GRUPPEN

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D1426SAT 3-DEC-87

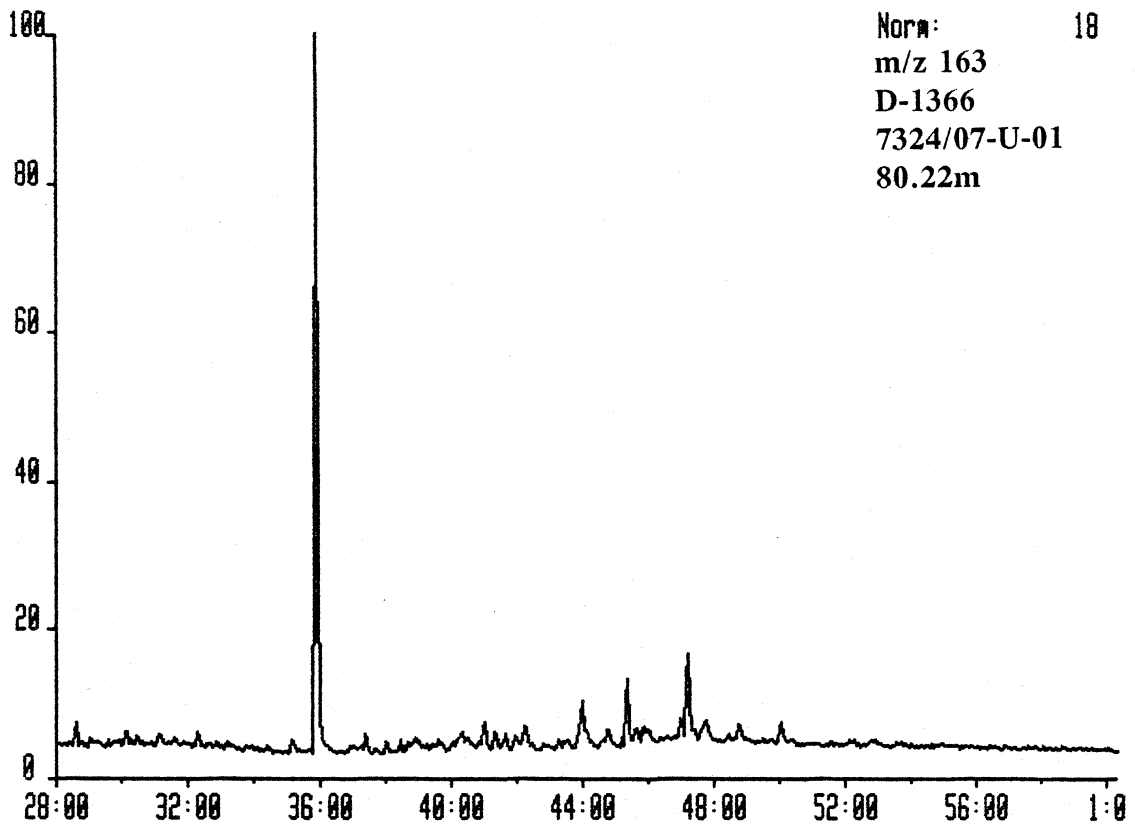
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 163.1000

Text:



Norm: 18
m/z 163
D-1366
7324/07-U-01
80.22m

D1426SAT 3-DEC-87

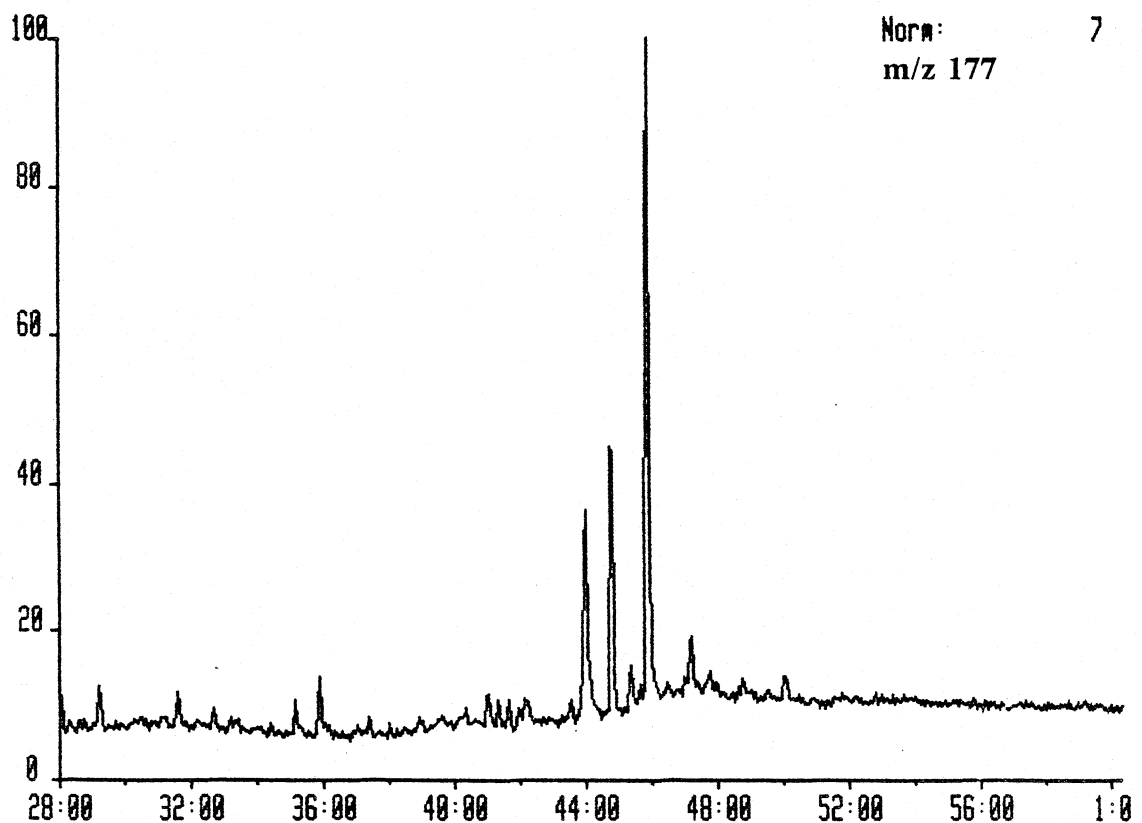
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 177.1000

Text:



Norm: 7
m/z 177



IKU

SINTEF-GRUPPEN

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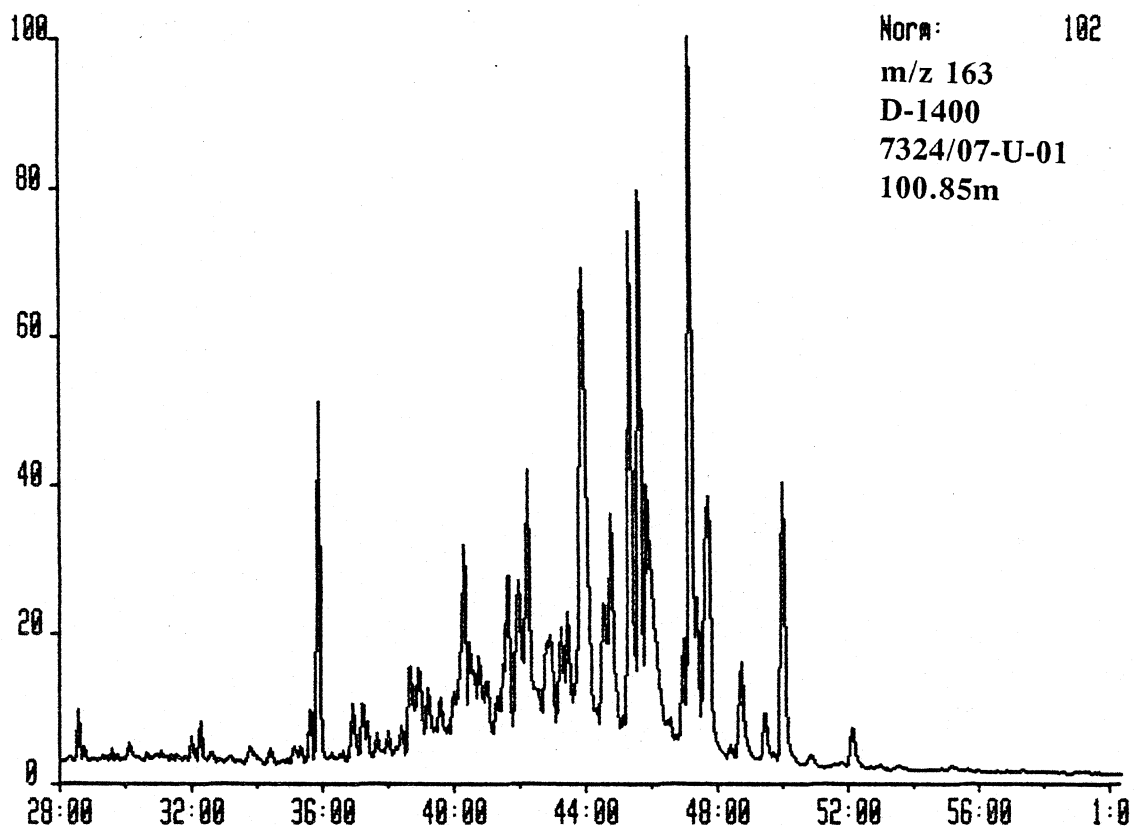
D1400SAT 3-DEC-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1 Group 1 Mass 163.1000

Text:



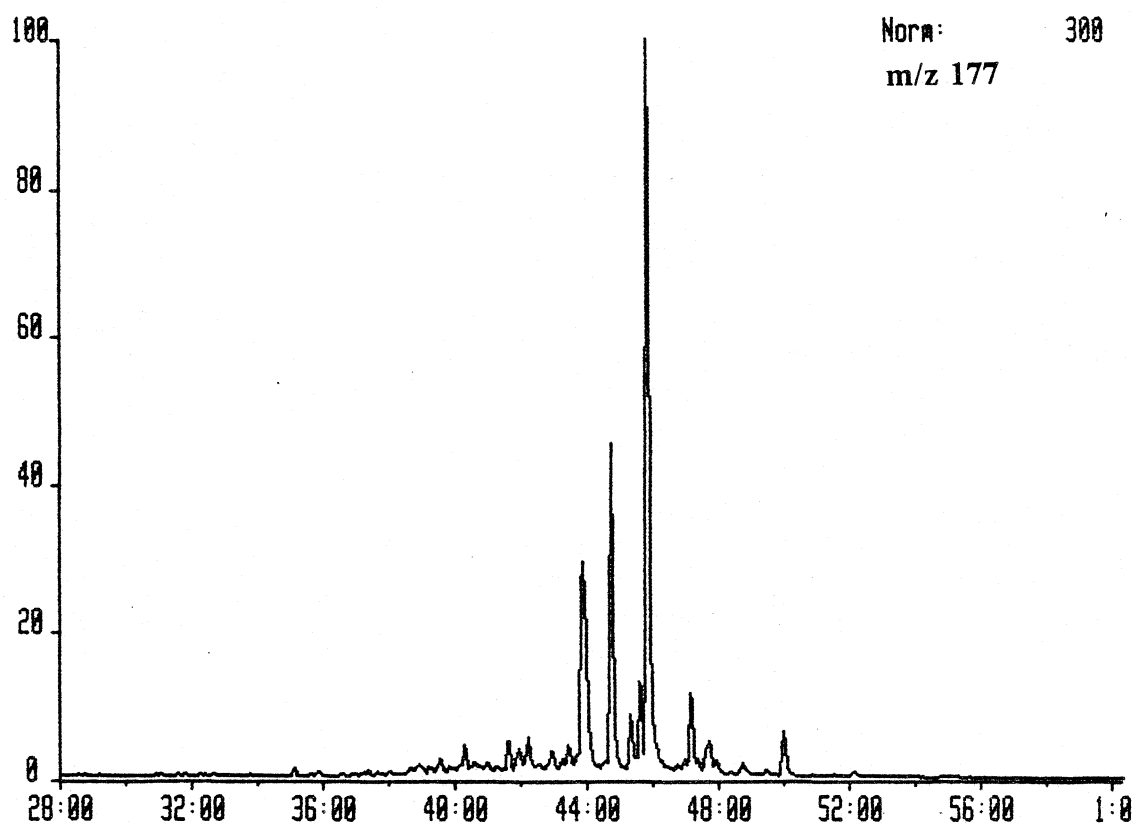
D1400SAT 3-DEC-87

Sir:Voltage 12-250 Acnt:IKU

System:QUADSAT

Sample 1 Injection 1 Group 1 Mass 177.1000

Text:





IKU

SINTEF-GRUPPEN

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D1415SAT 8-DEC-87

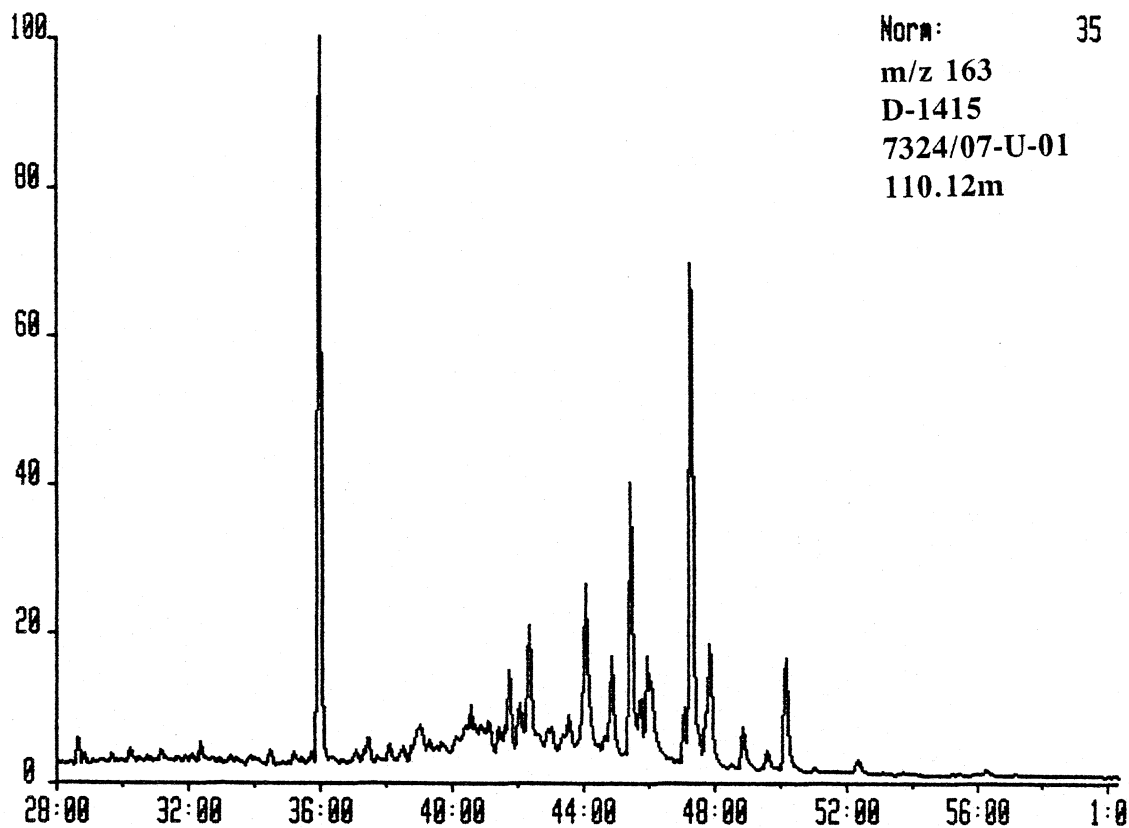
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 163.1000

Text:



D1415SAT 8-DEC-87

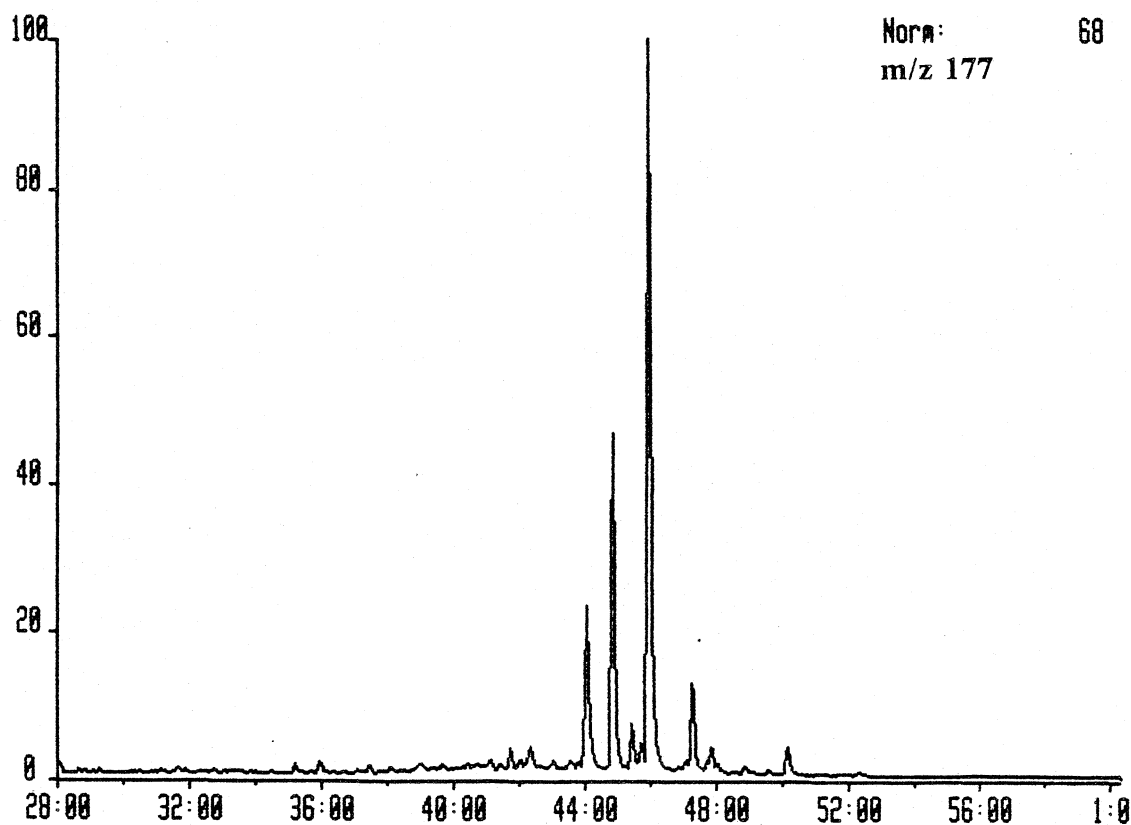
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 177.1000

Text:





IKU
SINTEF-GRUPPEN

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D1426SAT 3-DEC-87

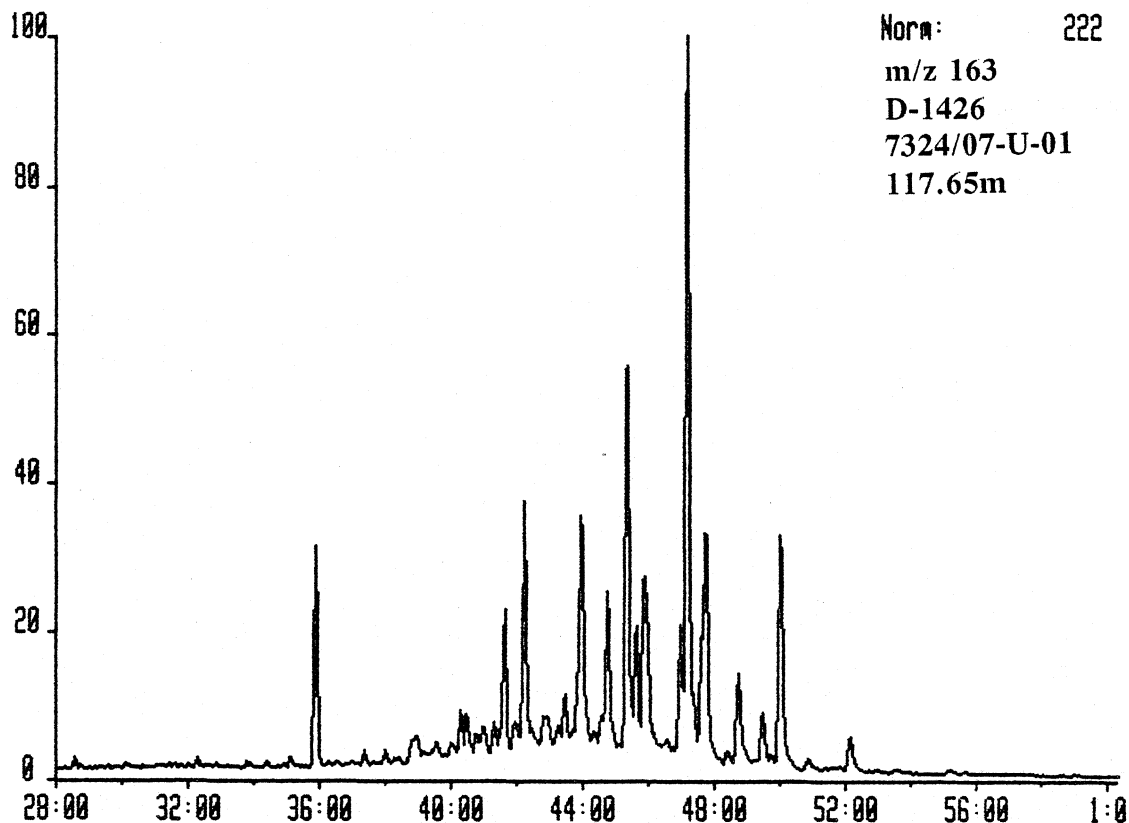
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 163.1000

Text:



D1426SAT 3-DEC-87

Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 177.1000

Text:

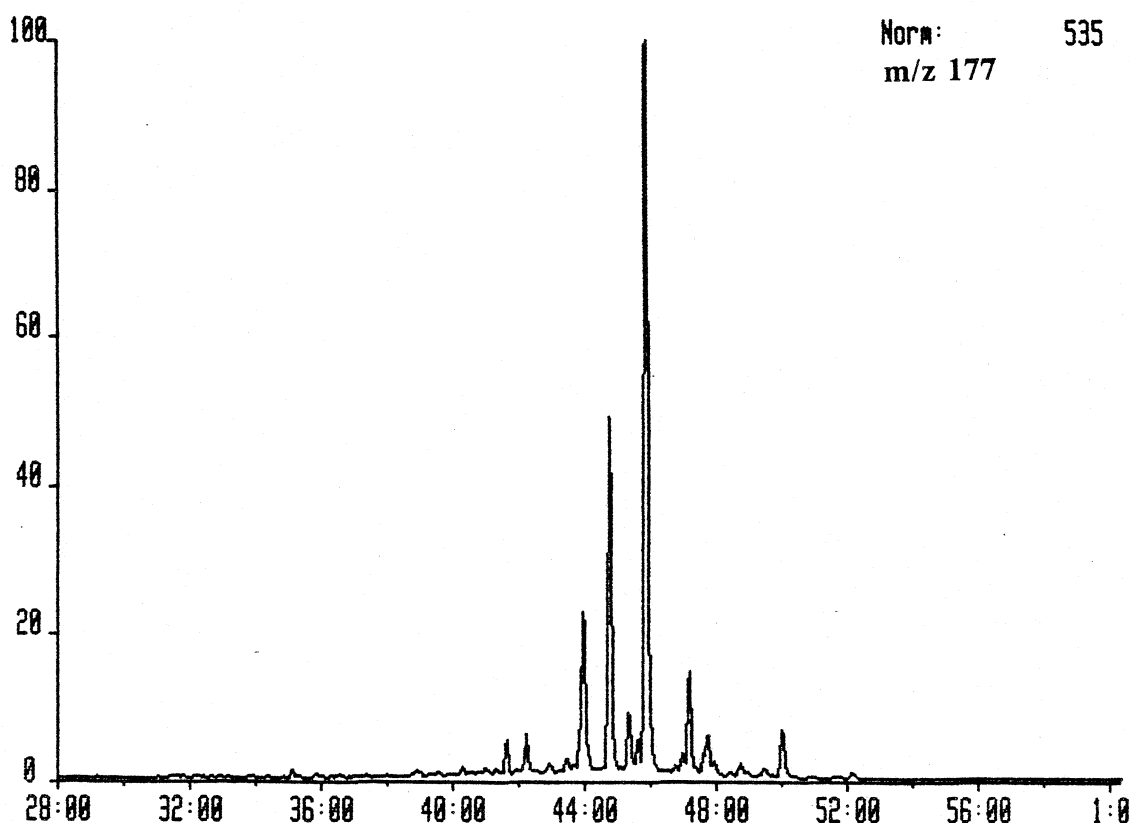
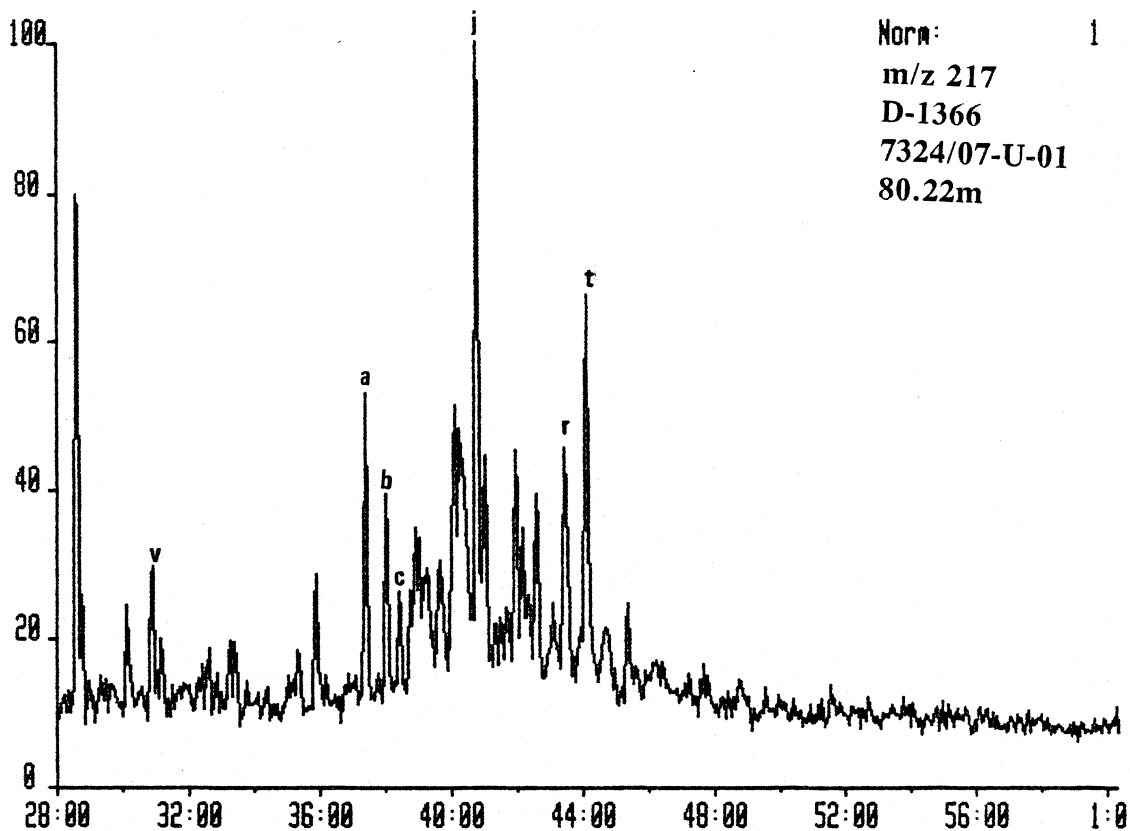


Figure A.II.4.3:

Mass fragmentograms of m/z 217, 218, 231, 259 (steranes)

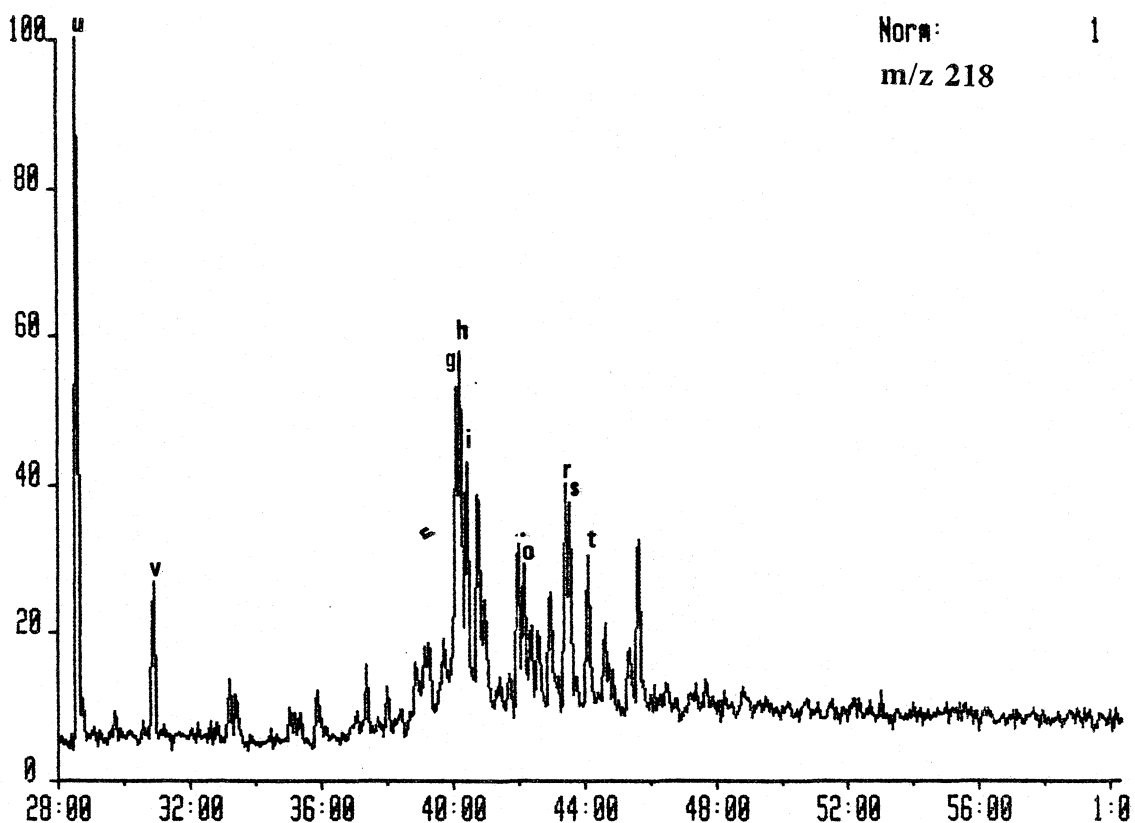
D1426SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



D1426SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT



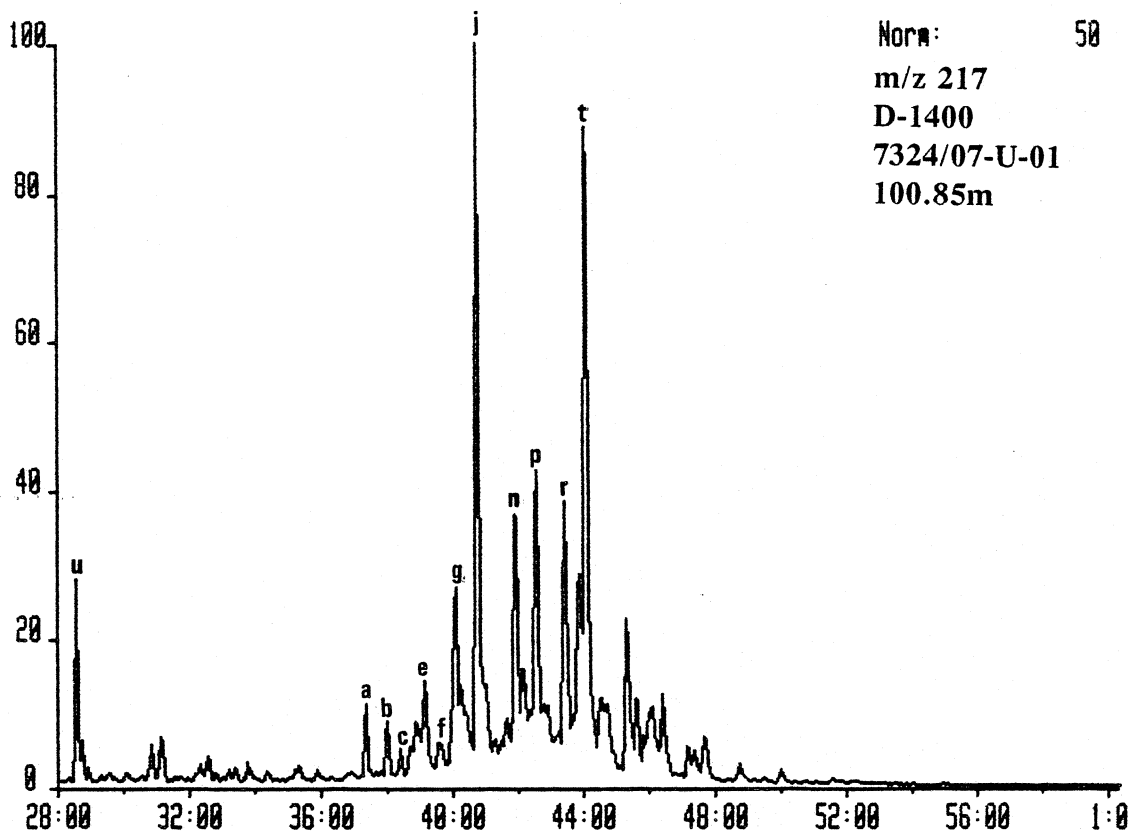


IKU
SINTEF-GRUPPEN

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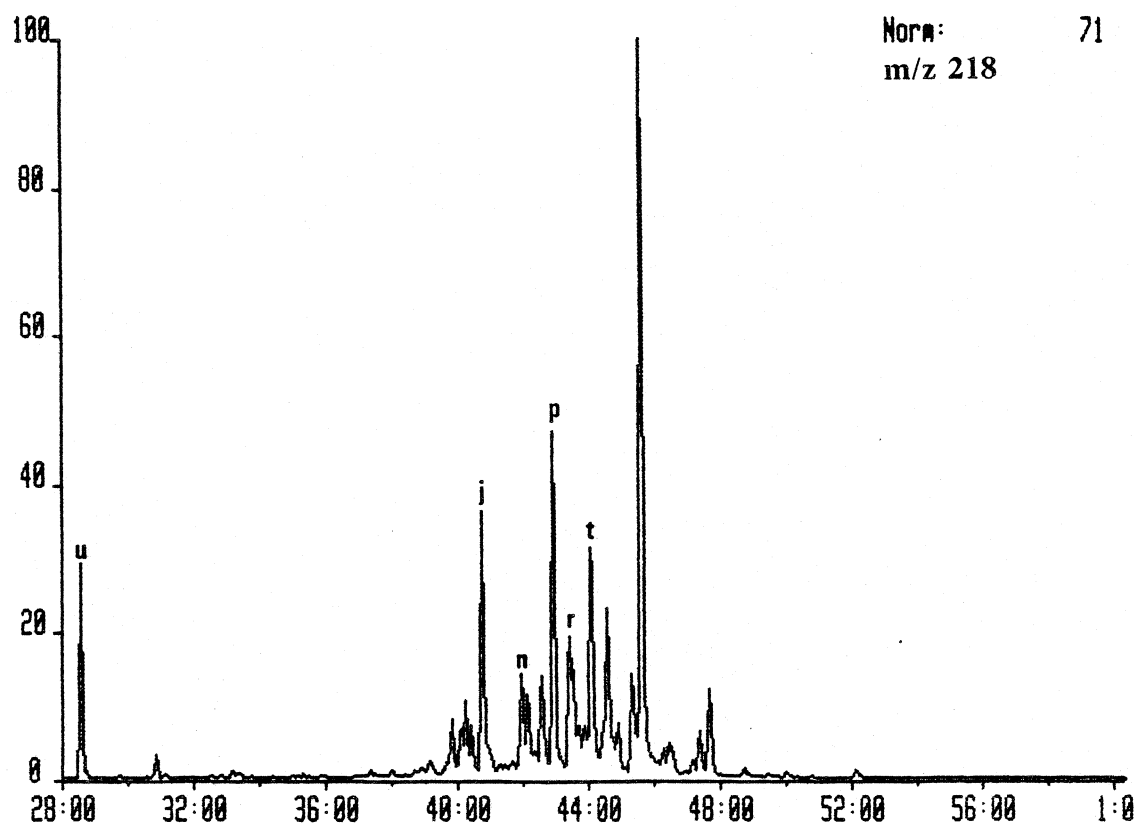
D1400SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



D1400SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT





IKU

SINTEF-GRUPPEN

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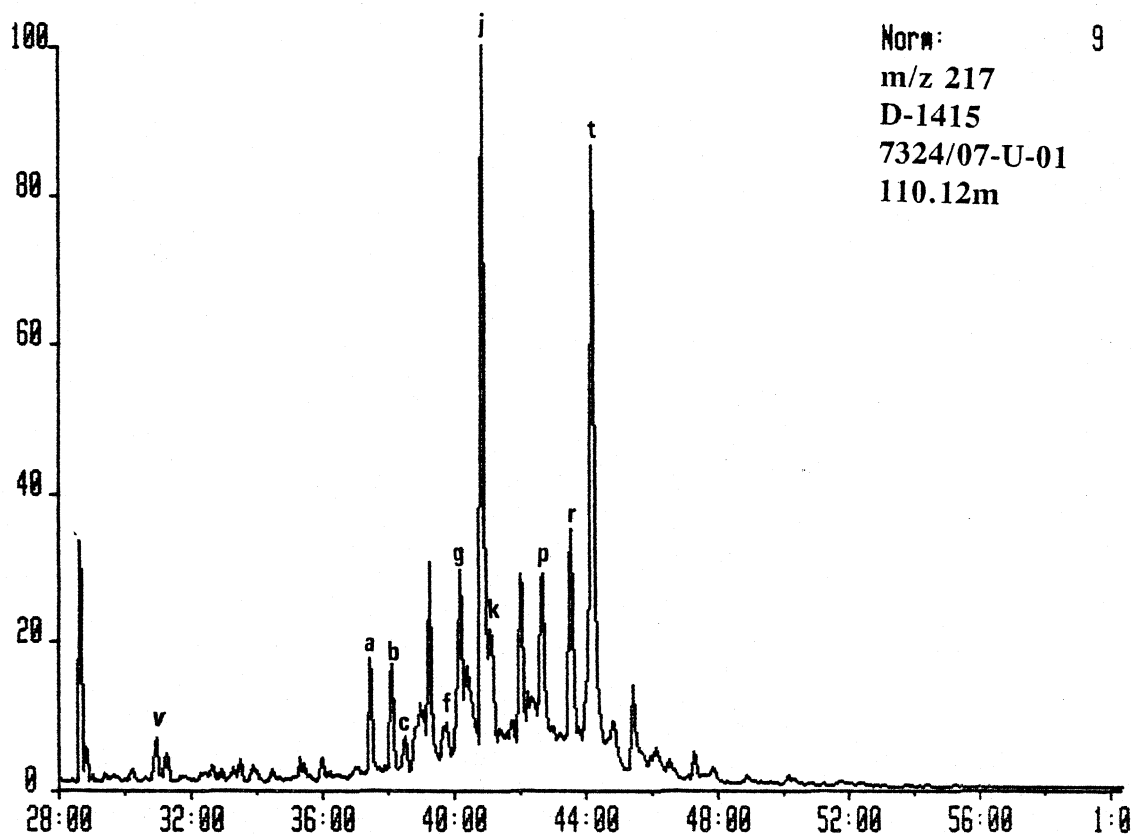
01415SAT 8-DEC-87

Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1 Group 1 Mass 217.1000

Text:



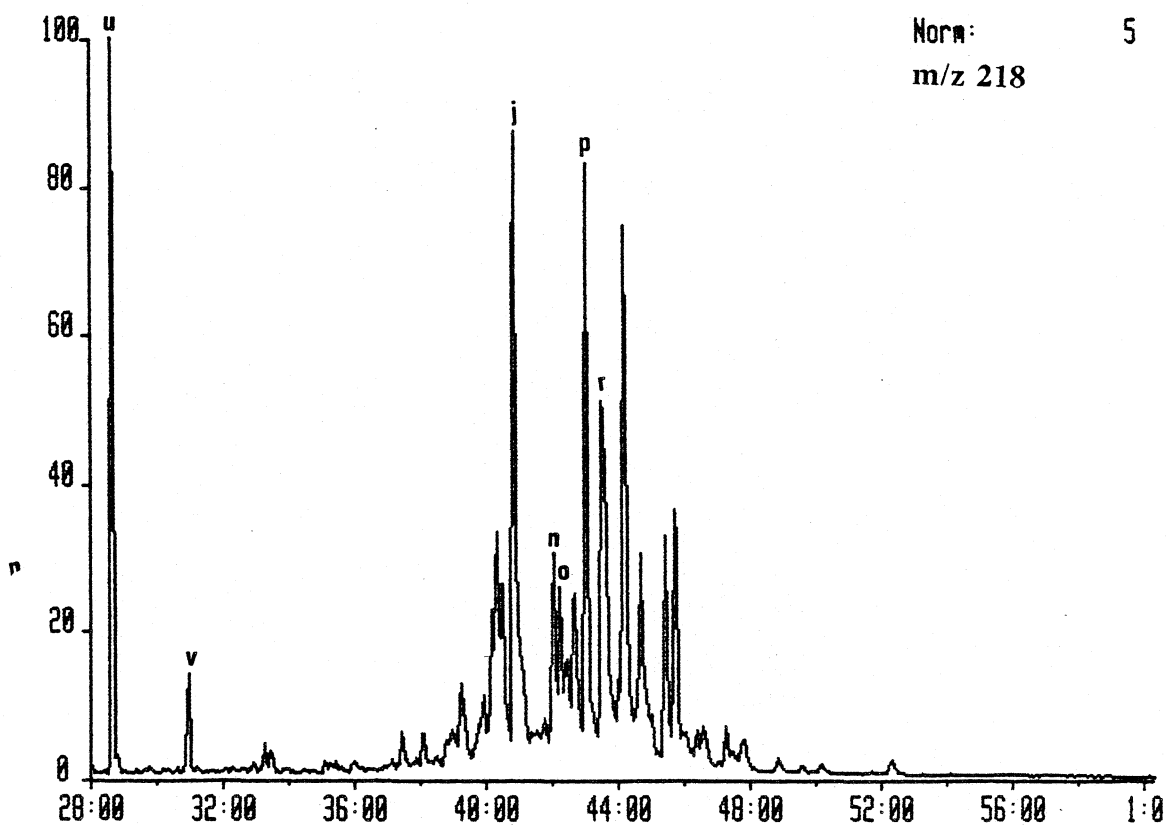
01415SAT 8-DEC-87

Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1 Group 1 Mass 218.1000

Text:



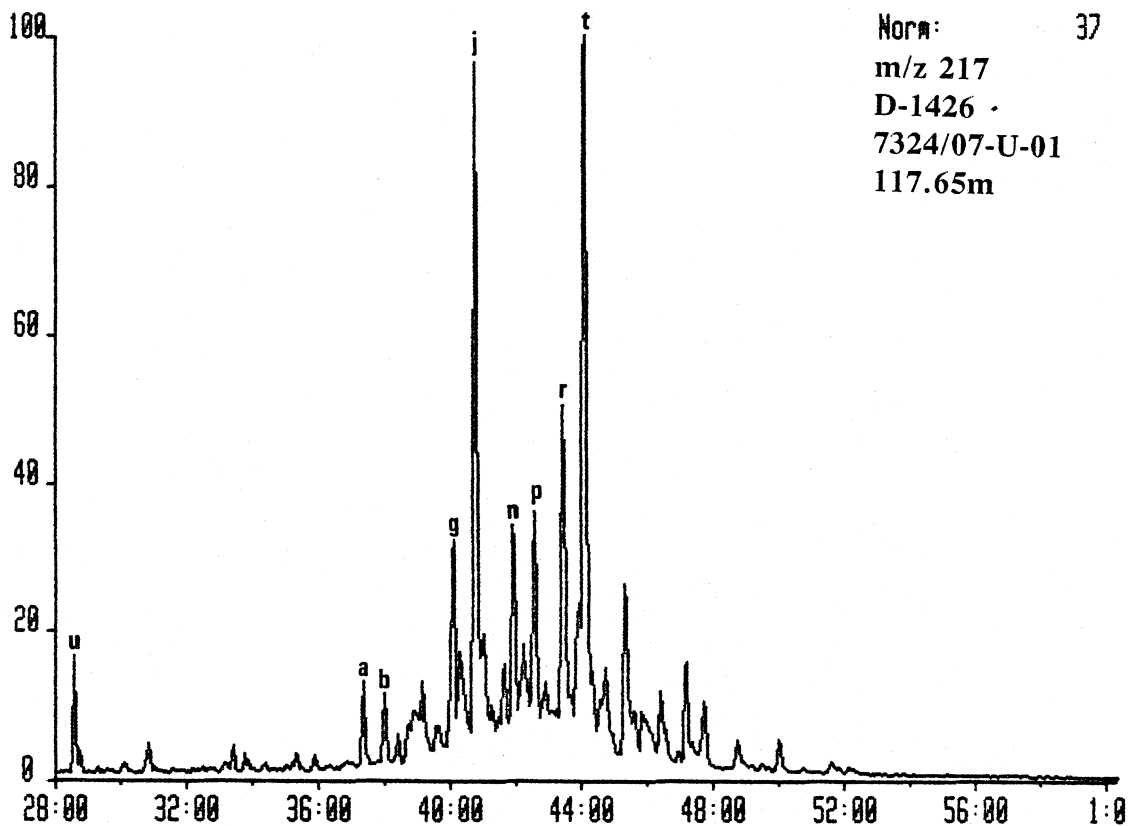


IKU
SINTEF-GRUPPEN

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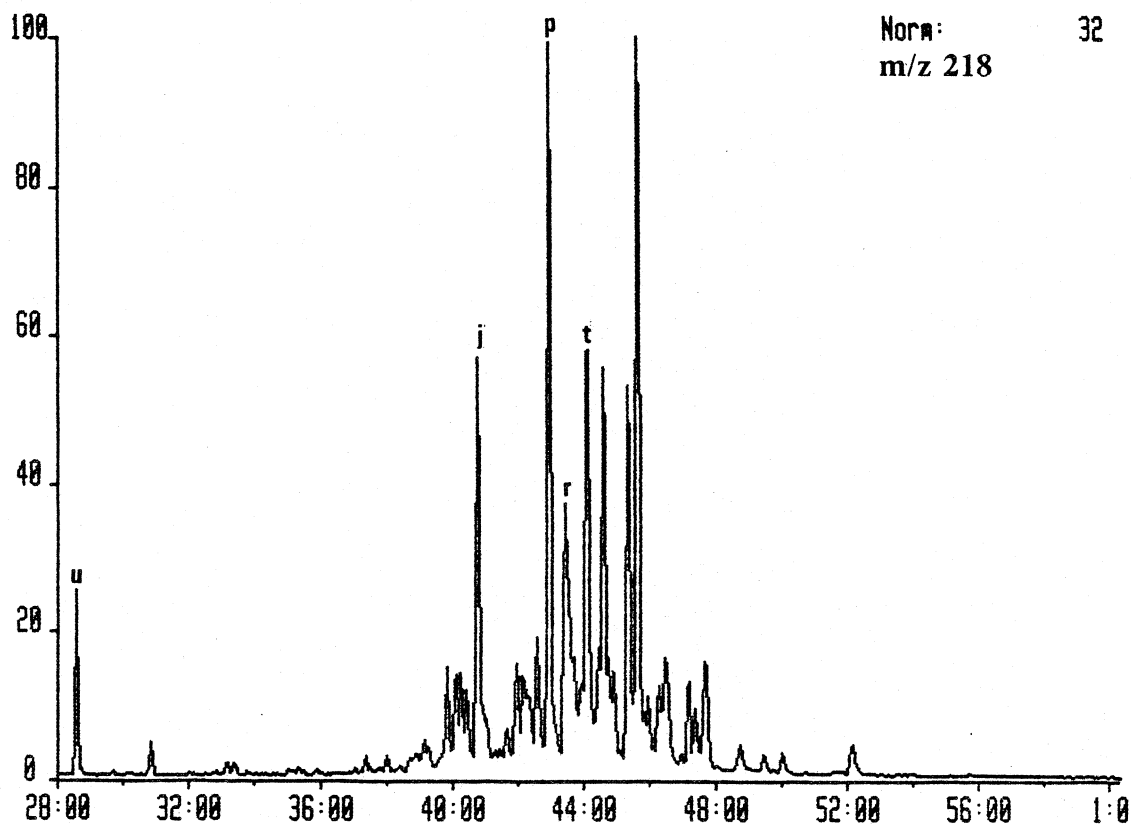
D1426SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 217.1000
Text:

System:QUADSAT



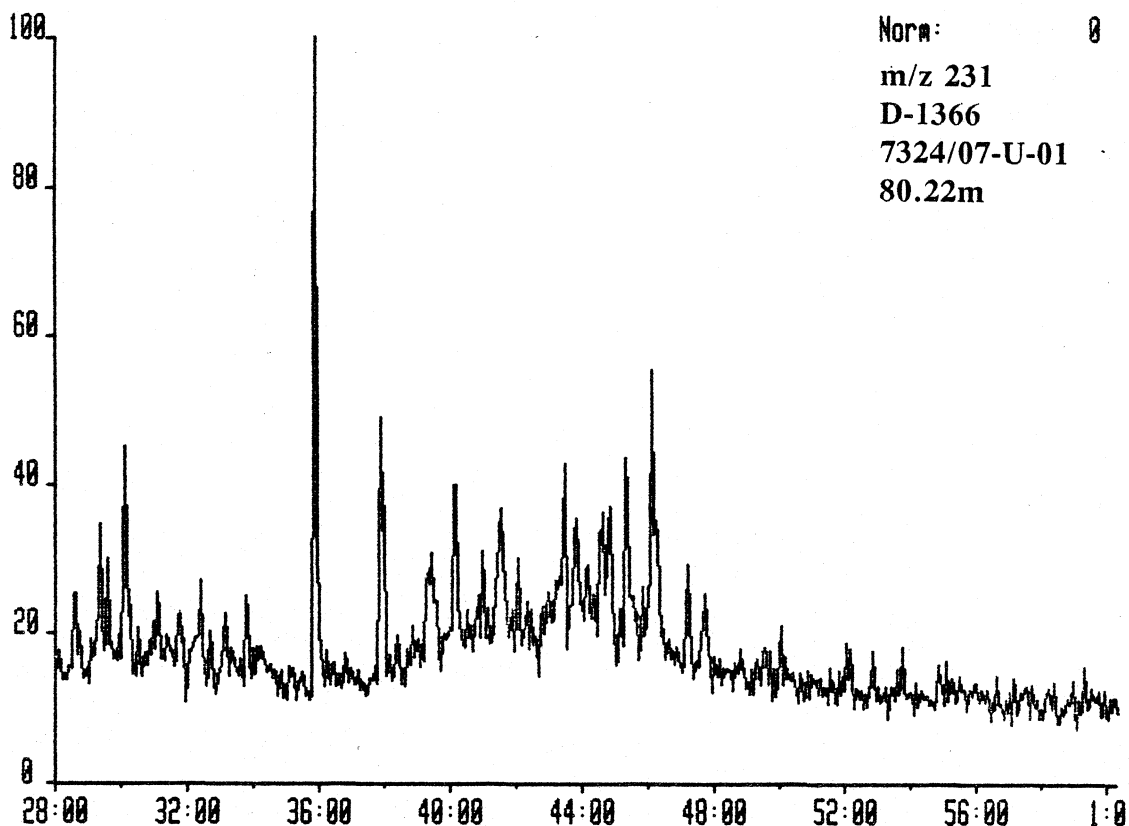
D1426SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 218.1000
Text:

System:QUADSAT



D1426SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 231.1000
Text:

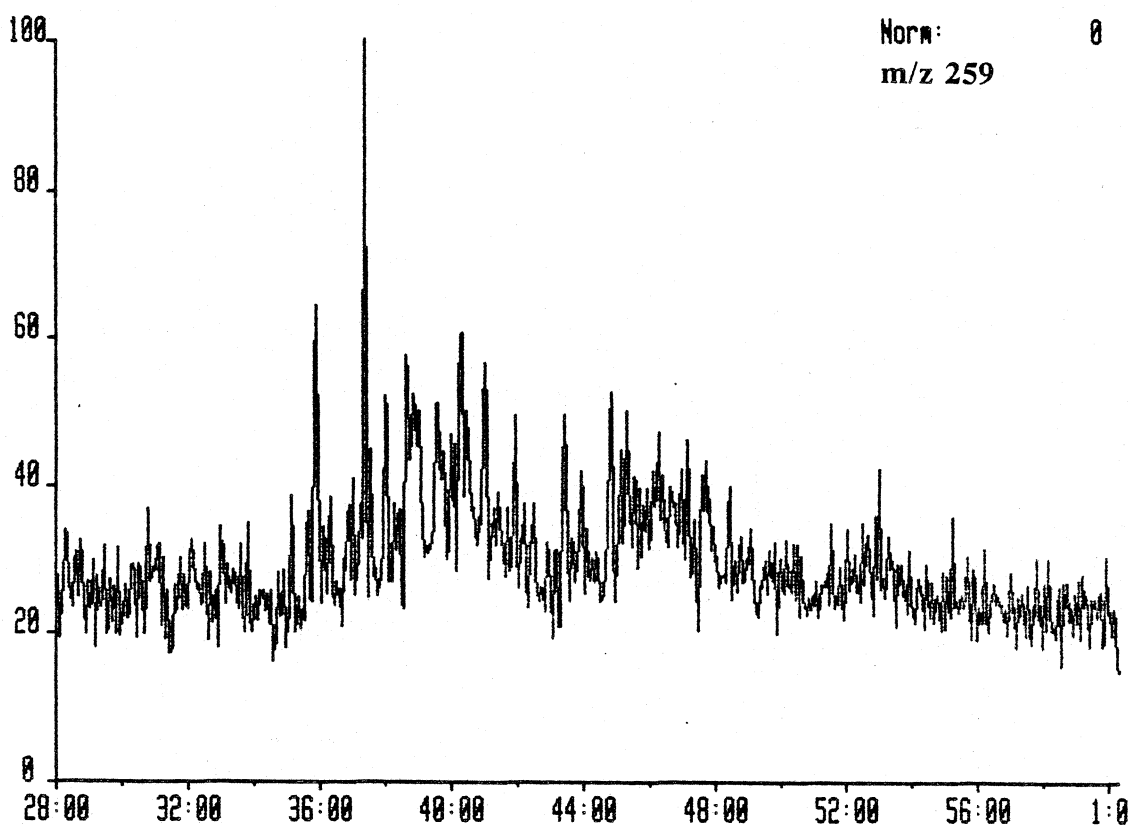
System:QUADSAT



Norm: 0
m/z 231
D-1366
7324/07-U-01
80.22m

D1426SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 2 Injection 1 Group 1 Mass 259.1000
Text:

System:QUADSAT



Norm: 0
m/z 259

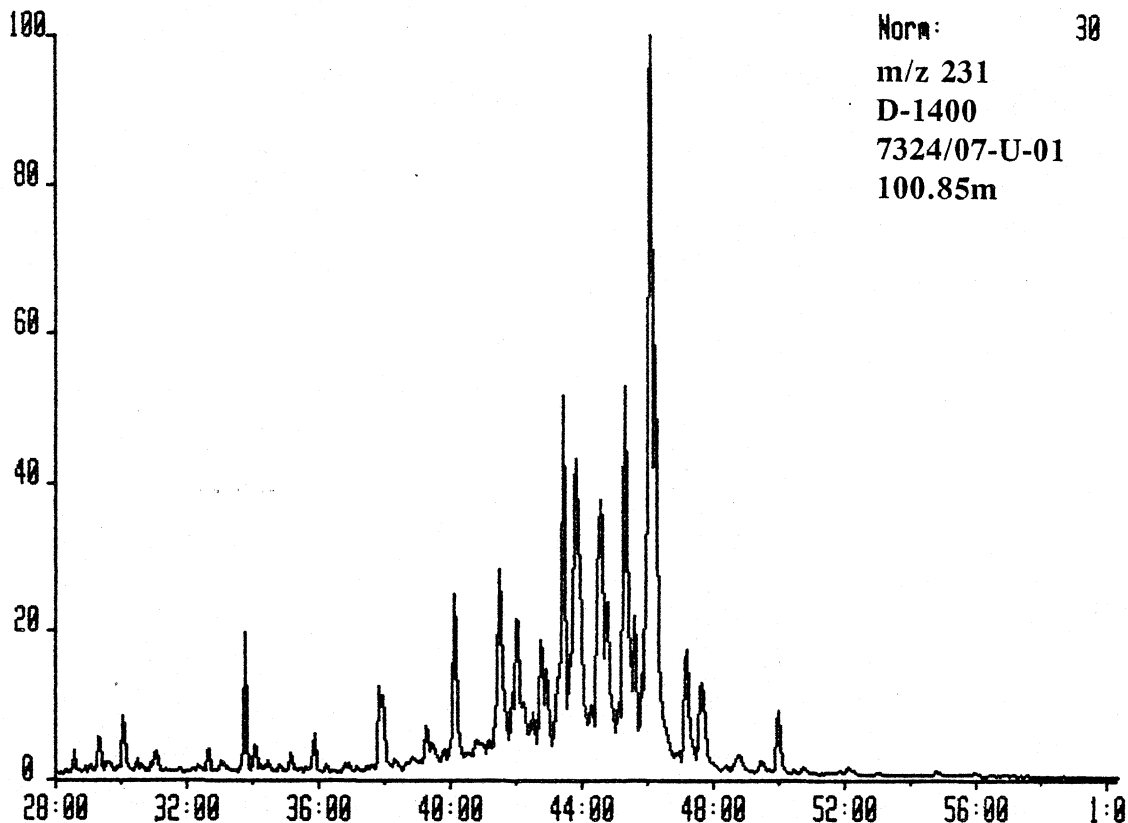


IKU
SINTEF-GRUPPEN

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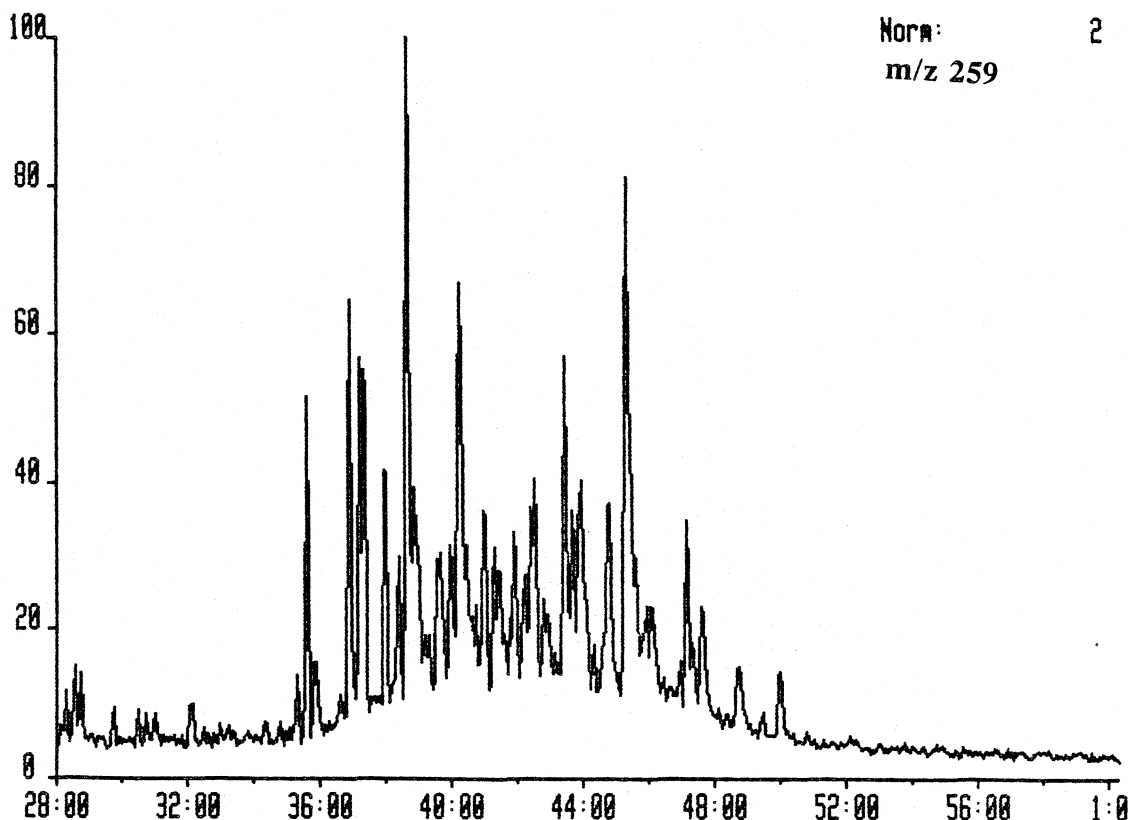
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Sample 1 Injection 1 Group 1 Mass 231.1000
Text:

System:QUADSAT



D1400SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 259.1000
Text:

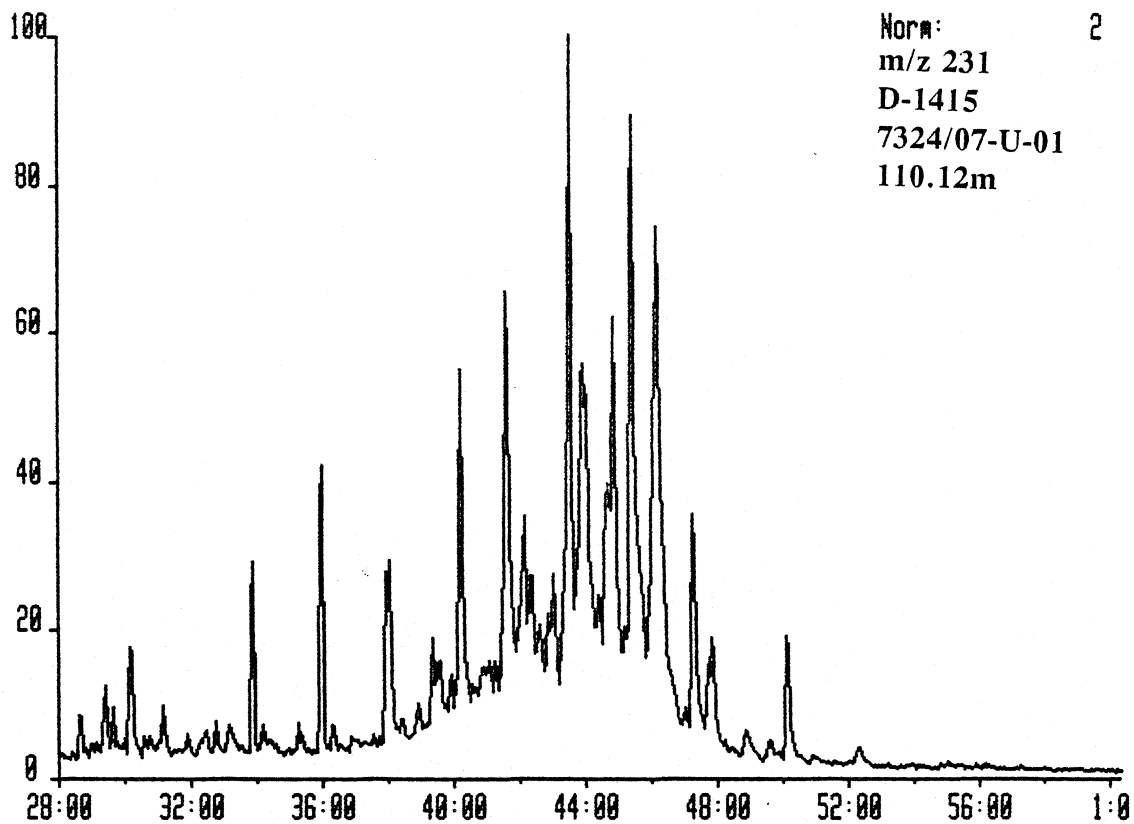
System:QUADSAT



D1415SAT 8-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 231.1000

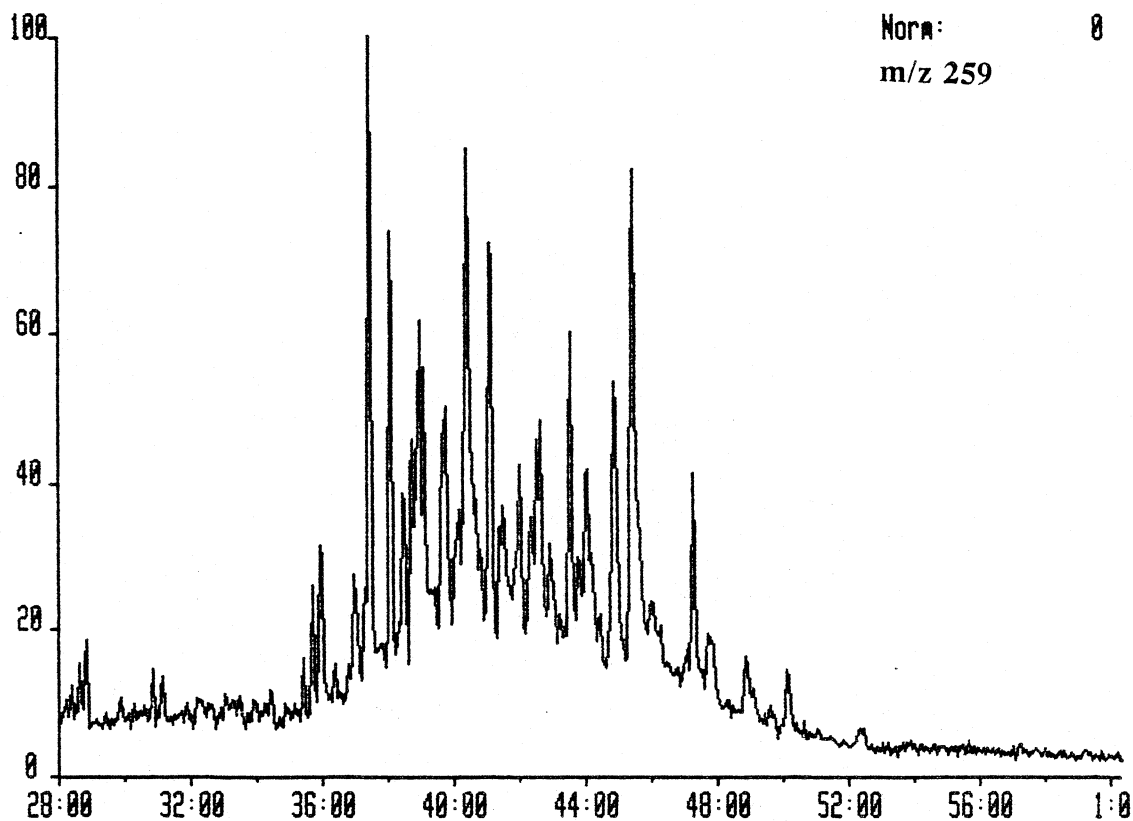
System: QUADSAT



D1415SAT 8-DEC-87
Sample 1 Injection 1
Text:

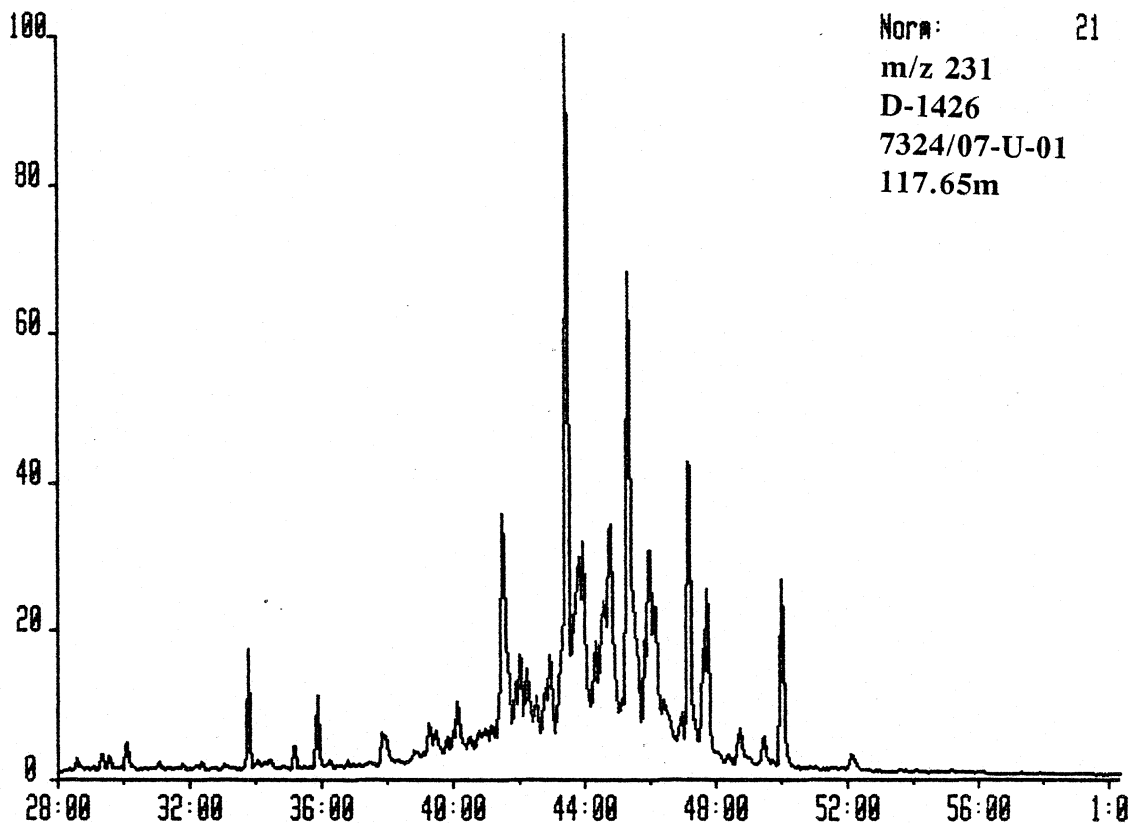
Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 259.1000

System: QUADSAT



D1426SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:

System:QUADSAT



D1426SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 259.1000
Text:

System:QUADSAT

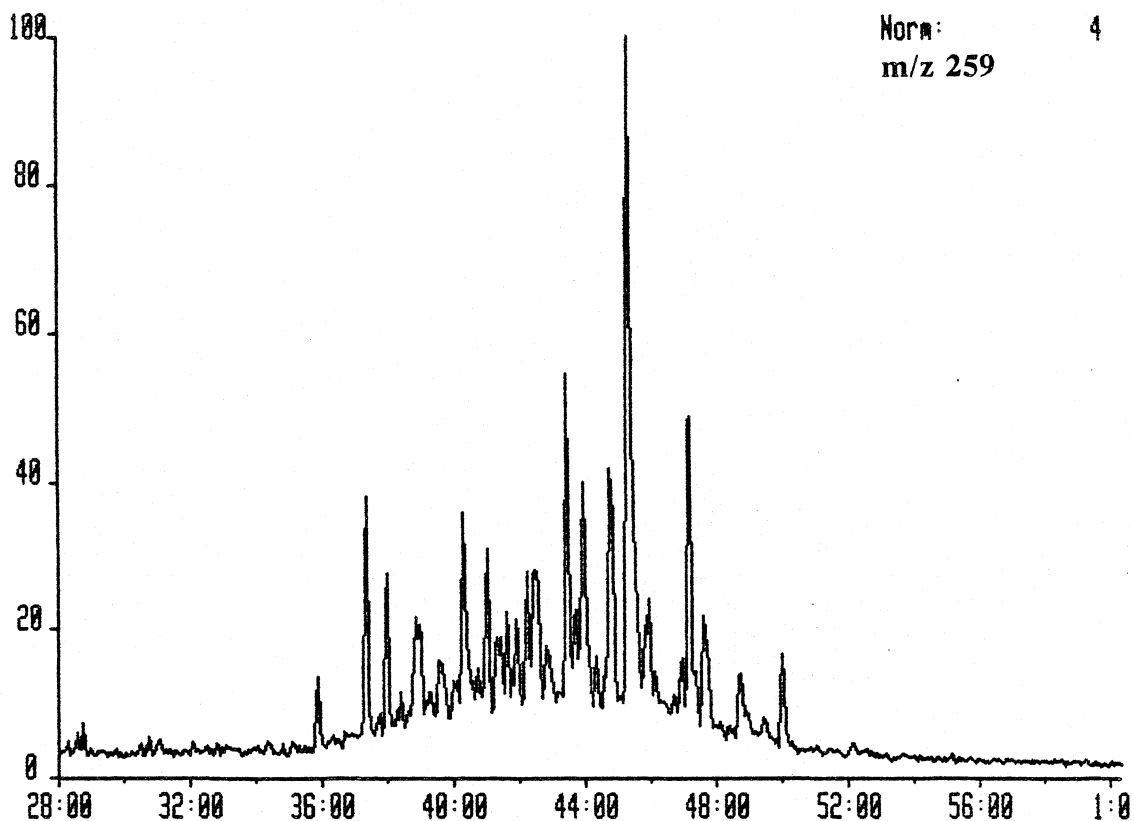


Figure A.II.4.4: Vitrinite reflectance histograms.

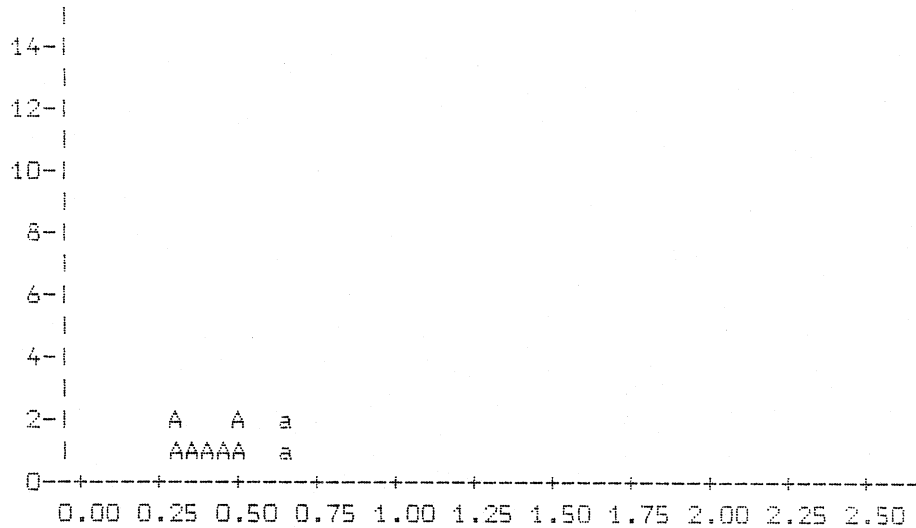
Key:

A	= Grey-black-brown claystone.
	Upper case letters indicate values included in the main population. Lower case letters represent values in other population.
pp	= Statistical data population
	Y = Main population, not necessarily representative of sample maturity.
	N = Other populations.
LOW+HIGH	= Population limits.
VAL.	= Number of measurements in that population.

Lithology cross-reference table

A = Clst. gy
 B = Clst. dk gy
 C = Clst. dk gy
 D = Clst. gn
 E = Clst. bn
 F = Clst. rd
 G = Clst. carb.
 H = Shale
 I = Sandstone
 J = Limestone
 K = Coal
 L = Lignite
 M = Carbargillite
 N = Siltstone
 O = Bit
 P = X

IKU# D-1400 100.8M 7234/7-U-1

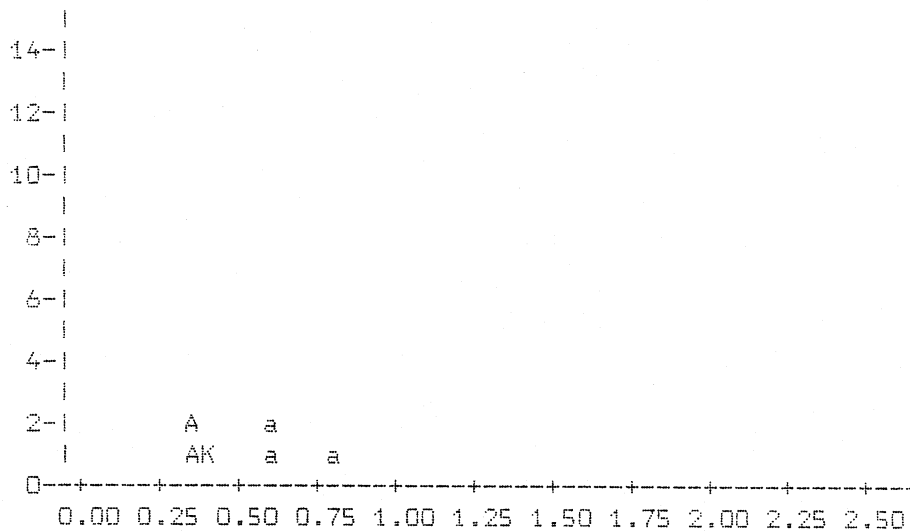


PP	LOW	HIGH	LIT	#VAL	MEAN	STDV
Y	0.30	0.54	ALL	7	0.41	0.09
N	0.67	0.69	ALL	2	0.68	0.01
OVERALL				9	0.47	0.14

ORDERED VALUES FOLLOW:

0.30A 0.33A 0.35A 0.42A 0.46A 0.51A 0.53A 0.67a 0.68a

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PP	LOW	HIGH	LIT	#VAL	MEAN	STDV
Y	0.35	0.43	ALL	3	0.38	0.04
N	0.60	0.63	ALL	2	0.61	0.01
N	0.81	0.82	ALL	1	0.81	0.00
OVERALL				6	0.53	0.18

ORDERED VALUES FOLLOW:

0.35A 0.36A 0.42K 0.60a 0.62a 0.81a

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Core 7323/12-U-01

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Table A.II.5.1a

CORE 7323/12-U-01

CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS IN HEADSPACE GAS

[illegible]

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Table A.II.5.1b

CORE 7323/12-U-01

CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS IN OCCLUDED GAS

I	I	I	I	I	I	I	I	I	I	I	I	I	I
		IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	SUM	SUM	WET-	iC4
		no.	m							C1-C4	C2-C4	NESS	-----
												(%)	nC4
I	D	1440	71.01	17951	164	40	33	20	69	18208	256	1.41	1.63
I	D	1446	75.35	1824	10	1				1835	11	0.60	*****
I	D	1452	78.26	8413	154	40	29	20	62	8657	243	2.81	1.47
I	D	1458	81.37	5047	192	56	40	28	115	5362	316	5.89	1.44
I	D	1463	84.16	5832	130	35	35	18	87	6050	218	3.61	1.95
I	D	1469	86.57	4207	92	34	45	19	93	4396	189	4.31	2.38
I	D	1481	96.42	5274	21	9				5304	30	0.57	*****
I	D	1486	99.35	17600	120	34	28	17	68	17799	199	1.12	1.66
I	D	1492	102.44	3686	24	11	4	2		3727	41	1.11	1.81
I	D	1497	105.49	1215	15	17	6			1254	39	3.08	*****
I	D	1502	108.54	5879	76	26	26	18	109	6025	146	2.42	1.39
I	D	1507	111.54	5968	59	26	18	14	84	6085	117	1.92	1.27
I	D	1515	117.50	3698	59	20	20	14	81	3811	114	2.98	1.46
I	D	1519	120.27	2014	17	18				2049	35	1.70	*****
I	D	1523	123.48	2360	17	12				2390	30	1.23	*****
I	D	1530	126.60	1743	12	13				1768	25	1.41	*****
I	D	1535	127.27	51756	67					51823	67	0.13	*****

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Table A.II.5.1c

CORE 7323/12-U-01

CONCENTRATION (ul Gas / kg dry Rock) OF C1 - C5+ HYDROCARBONS SUMMATION

I		SUM	SUM	WET-	iC4									
I	IKU	DEPTH	C1	C2	C3	iC4	nC4	C5+	C1-C4	C2-C4	NESS	----	iC4	
I	no.	m									(%)	nC4		
I	D 1440	71.01	27789	165	40	33	20	69	28047	258	0.92	1.63		
I	D 1446	75.35	25294	11	1				25306	12	0.05	*****		
I	D 1452	78.26	39368	156	40	29	20	62	39613	245	0.62	1.47		
I	D 1458	81.37	34519	194	56	40	28	115	34837	318	0.91	1.44		
I	D 1463	84.16	35731	138	36	37	18	87	35960	229	0.64	2.04		
I	D 1469	86.57	51507	97	36	47	19	93	51705	198	0.38	2.52		
I	D 1481	96.42	62405	25	9				62439	34	0.05	*****		
I	D 1486	99.35	48544	122	34	28	17	68	48745	201	0.41	1.66		
I	D 1492	102.44	43516	28	11	4	2		43561	45	0.10	1.81		
I	D 1497	105.49	6021	16	17	6			6060	39	0.65	*****		
I	D 1502	108.54	24728	78	26	26	18	109	24876	148	0.59	1.39		
I	D 1507	111.54	32573	61	26	18	14	84	32692	119	0.36	1.27		
I	D 1515	117.50	26783	60	20	20	14	81	26898	115	0.43	1.46		
I	D 1519	120.27	35702	19	18				35739	37	0.10	*****		
I	D 1523	123.48	35793	22	12				35827	34	0.09	*****		
I	D 1530	126.60	31939	14	13				31966	27	0.09	*****		
I	D 1535	127.27	75237	69					75307	69	0.09	*****		

Table A.II.5.2:

CORE 7323/12-U-01

DATA FROM ROCK EVAL PYROLYSIS

I	I	I	I	I	I	I	I	I	I	I	I	I
I	IKU	DEPTH	:	S1	S2	S3	TOC	HYDR. INDEX	OXYGEN INDEX	PETROLEUM POTENTIAL	PROD. INDEX S1	TEMP. MAX
I	No.		:									
I		m	:	(mg/g ROCK)		(%)	(mg/g TOC)			S1+S2	S1+S2	(C)
I			:									
I	D 1440	71.01	:	****	****	****	0.25	*****	****	*****	*****	***
I	D 1441	71.66	:	0.10	0.03	0.55	0.64	5	86	0.13	0.77	449
I	D 1447	74.91	:	0.07	0.05	0.52	0.64	8	81	0.12	0.58	370
I	D 1446	75.35	:	****	****	****	0.55	*****	****	*****	*****	***
I	D 1453	76.91	:	0.12	0.04	0.44	0.67	6	66	0.16	0.75	273
I	D 1452	78.26	:	****	****	****	0.39	*****	****	*****	*****	***
I	D 1460	79.96	:	0.85	0.10	0.79	0.65	15	122	0.95	0.89	324
I	D 1458	81.37	:	****	****	****	0.32	*****	****	*****	*****	***
I	D 1463	84.16	:	****	****	****	0.39	*****	****	*****	*****	***
I	D 1464	84.50	:	0.07	0.02	0.77	0.61	3	126	0.09	0.78	242
I	D 1469	86.57	:	****	****	****	0.43	*****	****	*****	*****	***
I	D 1474	87.70	:	0.06	0.06	1.27	0.60	10	212	0.12	0.50	320
I	D 1475	89.35	:	0.09	0.03	1.03	0.71	4	145	0.12	0.75	281
I	D 1478	91.40	:	0.25	0.02	1.61	0.47	4	343	0.27	0.93	257
I	D 1480	92.95	:	****	****	****	0.43	*****	****	*****	*****	***
I	D 1482	94.40	:	0.12	0.10	0.93	0.63	16	148	0.22	0.55	371
I	D 1484	95.15	:	0.10	0.06	1.87	0.56	11	334	0.16	0.63	320
I	D 1481	96.42	:	****	****	****	0.42	*****	****	*****	*****	***
I	D 1490	97.89	:	0.12	0.08	1.40	0.73	11	192	0.20	0.60	327
I	D 1488	98.40	:	0.06	0.09	1.59	0.60	15	265	0.15	0.40	391
I	D 1486	99.35	:	****	****	****	0.44	*****	****	*****	*****	***
I	D 1496	100.03	:	****	****	****	0.38	*****	****	*****	*****	***

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Table A.II.5.2 (cont'd):

CORE 7323/12-U-01

DATA FROM ROCK EVAL PYROLYSIS

I	I	I	I	I	I	I	I	I	I	I	I	I
I	IKU	DEPTH	S1	S2	S3	TOC	HYDR. INDEX	OXYGEN INDEX	PETROLEUM POTENTIAL	PROD. INDEX	TEMP. MAX	I
I	No.									S1		I
I		m	(mg/g ROCK)		(%)	(mg/g TOC)			S1+S2	S1+S2	(C)	I
I	D 1494	101.70	0.12	0.08	1.73	0.49	16	353	0.20	0.60	321	I
I	D 1492	102.44	****	****	****	0.40	*****	****	*****	*****	***	I
I	D 1498	103.74	0.07	0.06	2.65	0.39	15	679	0.13	0.54	279	I
I	D 1497	105.49	****	****	****	0.45	*****	****	*****	*****	***	I
I	D 1505	107.12	0.07	0.04	1.42	0.41	10	346	0.11	0.64	278	I
I	D 1506	108.15	****	****	****	0.37	*****	****	*****	*****	***	I
I	D 1502	108.54	****	****	****	0.28	*****	****	*****	*****	***	I
I	D 1509	110.73	0.34	0.07	1.75	0.53	13	330	0.41	0.83	278	I
I	D 1507	111.54	****	****	****	0.43	*****	****	*****	*****	***	I
I	D 1514	112.86	0.09	0.04	1.74	0.48	8	363	0.13	0.69	278	I
I	D 1518	115.34	0.12	0.08	1.25	0.44	18	284	0.20	0.60	338	I
I	D 1515	117.50	****	****	****	0.47	*****	****	*****	*****	***	I
I	D 1519	120.27	****	****	****	0.43	*****	****	*****	*****	***	I
I	D 1524	120.62	0.05	0.05	0.73	0.46	11	159	0.10	0.50	278	I
I	D 1525	121.48	0.10	0.04	0.89	0.50	8	178	0.14	0.71	278	I
I	D 1523	123.48	****	****	****	0.32	*****	****	*****	*****	***	I
I	D 1530	126.60	****	****	****	0.33	*****	****	*****	*****	***	I

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Reference number: 21.3435.23
(1/1)

Table A.II.5.3:

VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
D-1460	-----	79.96	N.D.P.	-	----	1-2
D-1482	-----	94.40	N.D.P.	-	----	1-2?

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor
S = Stained; R = Reworked.

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Table A.II.5.4:

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKU-No	DEPTH (m)	: Rock : Extr. : (g)	EOM (mg)	Sat. (mg)	Aro. (mg)	HC (mg)	Non HC (mg)	TOC (%)
D 1460	79.96	: 10.3	6.2	0.3	1.0	1.3	4.9	0.65
D 1478	91.40	: 11.5	3.2	0.2	1.0	1.2	2.0	0.47
D 1490	97.89	: 6.8	7.6	0.1	0.2	0.3	7.3	0.73
D 1509	110.73	: 10.1	6.4	0.6	1.7	2.3	4.1	0.53
D 1525	121.48	: 10.3	3.6	0.6	0.6	1.2	2.4	0.50

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Table A.II.5.5:

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKU-No	DEPTH (m)	:	EOM	Sat.	Aro.	HC	Non HC
D 1460	79.96	:	600	29	97	126	474
D 1478	91.40	:	278	17	87	104	174
D 1490	97.89	:	1111	15	29	44	1067
D 1509	110.73	:	631	59	167	227	404
D 1525	121.48	:	350	58	58	117	233

(mg/g TOC)

I		:						
I	IKU-No	DEPTH	:	EOM	Sat.	Aro.	HC	Non HC
I		(m)	:					
I			:					
I	D 1460	79.96	:	92.3	4.5	14.9	19.4	73.0
I			:					
I	D 1478	91.40	:	59.1	3.7	18.5	22.2	36.9
I			:					
I	D 1490	97.89	:	152.2	2.0	4.0	6.0	146.2
I			:					
I	D 1509	110.73	:	119.0	11.2	31.6	42.8	76.2
I			:					
I	D 1525	121.48	:	69.9	11.7	11.7	23.3	46.6
I			:					

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Table A.II.5.7:

COMPOSITION OF MATERIAL EXTRACTED FROM THE ROCK

IKU-No	DEPTH (m)	Sat EOM %	Aro EOM %	HC EOM %	SAT Aro x 100	Non HC EOM %	HC Non HC x 100
D 1460	79.96	4.8	16.1	21.0	30.0	79.0	26.5
D 1478	91.40	6.3	31.3	37.5	20.0	62.5	60.0
D 1490	97.89	1.3	2.6	3.9	50.0	96.1	4.1
D 1509	110.73	9.4	26.6	35.9	35.3	64.1	56.1
D 1525	121.48	16.7	16.7	33.3	100.0	66.7	50.0

Table A.II.5.8:

Core 7323/12-U-01

TABULATION OF DATA FROM THE GASCHROMATOGRAMS

I	DEPTH	:	PRISTANE	PRISTANE	PHYTANE	A	n-C17			I
I	IKU No.	:	-----	A = -----	B = -----	-----	-----	CPI	CPI	I
I	(m)	:	PHYTANE	n-C17	n-C18	B	n-C27	1	2	I
I		:								I
I	D 1460	79.96	1.0	0.7	0.5	1.5	0.5	2.1	1.5	I
I	D 1478	91.40	0.9	0.8	0.5	1.6	0.9	1.4	1.1	I
I	D 1490	97.89	1.0	0.9	0.6	1.5	0.4	1.5	1.3	I
I	D 1509	110.73	2.3	0.5	0.6	0.9	0.6	1.5	1.2	I
I	D 1525	121.48	0.9	0.6	0.5	1.1	1.1	1.6	1.2	I

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Table A.II.5.9a:

Molecular ratios from sterane and terpane mass chromatograms.
Maturity-characteristic ratios.

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IKU no.	Depth (m)	$\alpha\beta/(\alpha\beta+\beta\alpha)^{1)}$ hopanes	%22S ²⁾ ext.hop.	% $\beta\beta^{3)}$ ster.	%20S ⁴⁾ ster.
D 1509	110.73	0.78	37.38	41.44	-
D 1525	121.48	0.81	44.80	72.81	16.13

1) E/(E+F) in m/z 191

2) Average % distribution between first and second eluting isomers of extended hopanes (G...M in m/z 191, e.g. $100 \cdot G/(G+H)$).

3) $100 \cdot q/(q+t)$ in m/z 217

4) $100 \cdot 2(r+s)/[q+t+2(r+s)]$ in m/z 217

Table A.II.5.9b:

Molecular ratios from sterane and terpane mass chromatograms.
Maturity- and source-characteristic ratios.

Core 7323/12-U-01

IKU no.	Depth (m)	Q/E ¹⁾	T _m /T _s ²⁾	X/E ³⁾	Z/E ⁴⁾	C ₂₇ rearr. steranes ⁵⁾
D 1509	110.73	0.18	1.89	-	-	-
D 1525	121.48	0.32	1.73	-	-	0.47

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191)

2) B/A in m/z 191

3) Relative abundance of unknown (X/E in m/z 191)

4) Relative abundance of bisnorhopane (Z/E in m/z 191)

5) $100 \cdot a/(a+j)$ in m/z 217

Figure A.II.5.1:

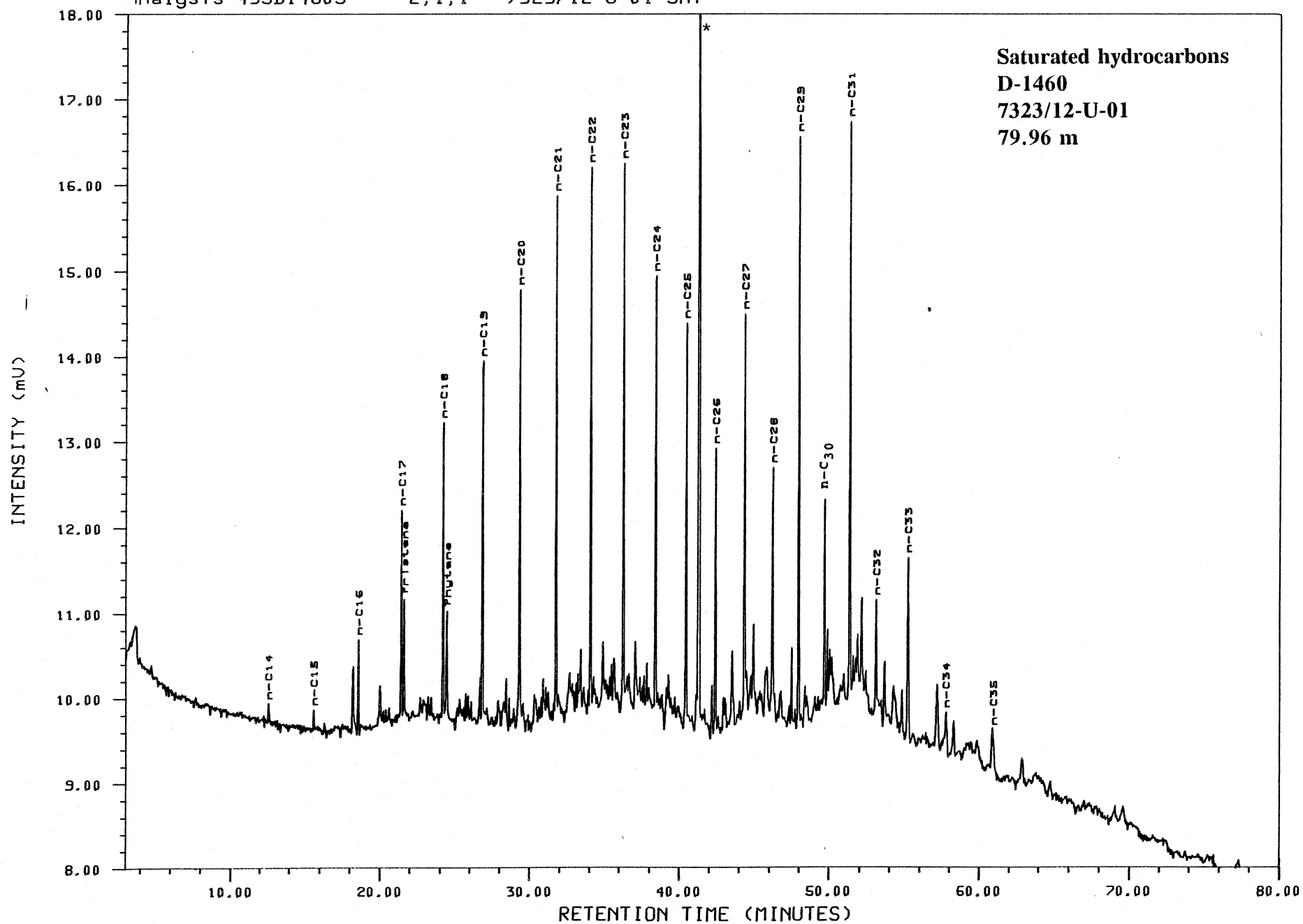
Saturated hydrocarbon gas chromatograms

n-C ₁₅ etc.	- n-alkanes
Pr	- pristane
Ph	- phytane
*	- contamination (dioctylphthalate)

analysis 435D1460S

2,1,1

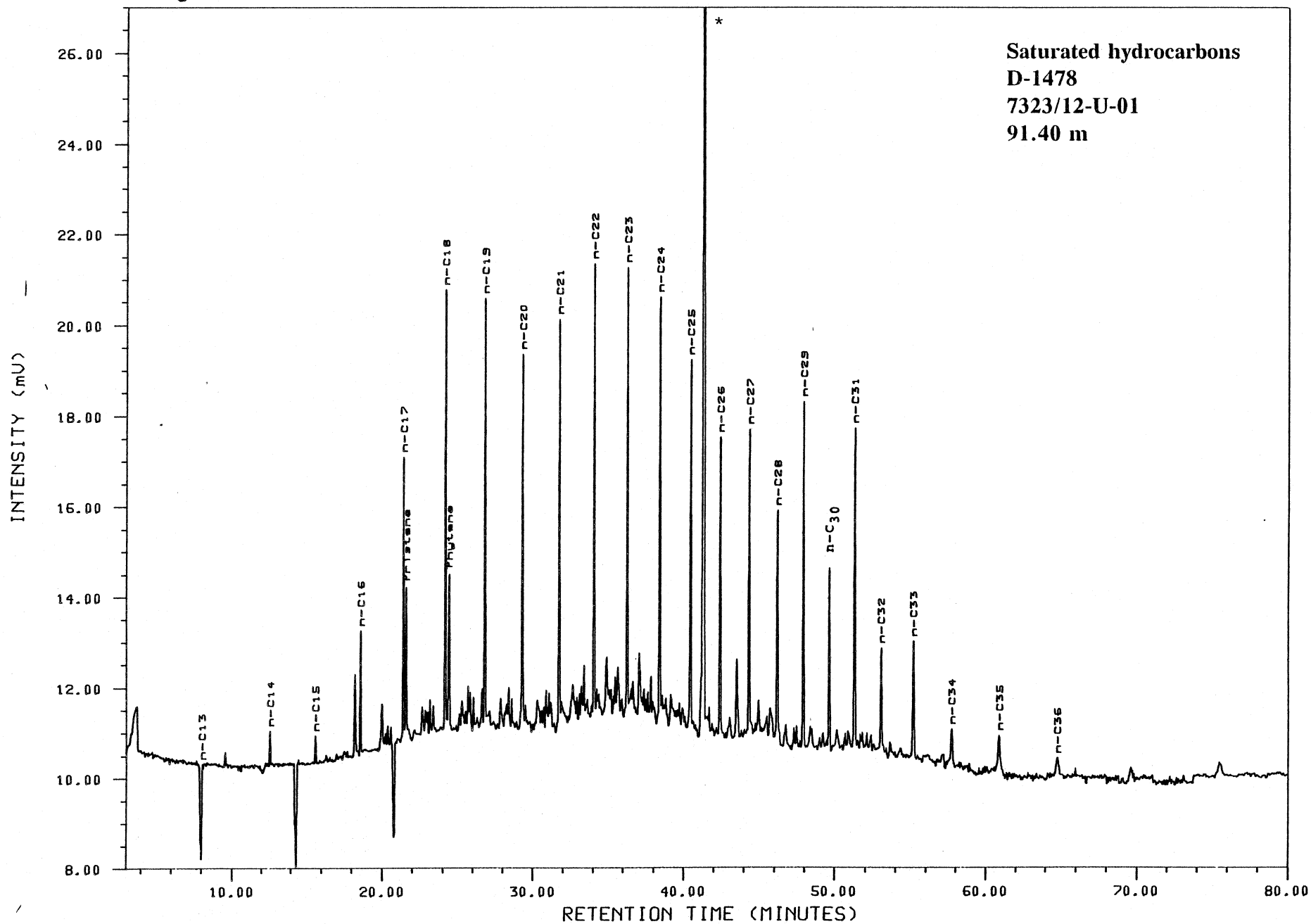
7323/12-U-01 SAT



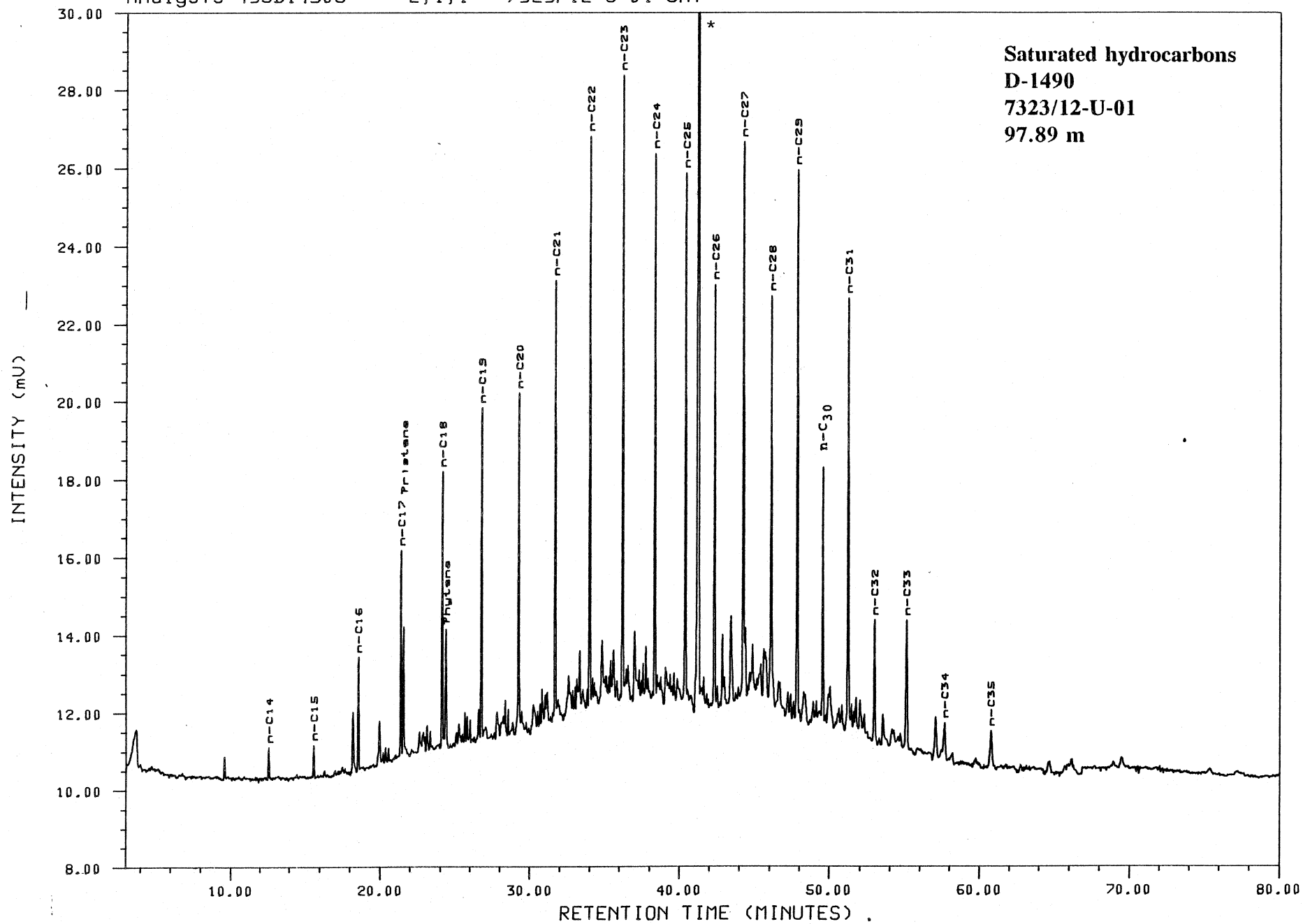
Analysis 435D1478S

2,1,1

7323/12-U-01 SAT



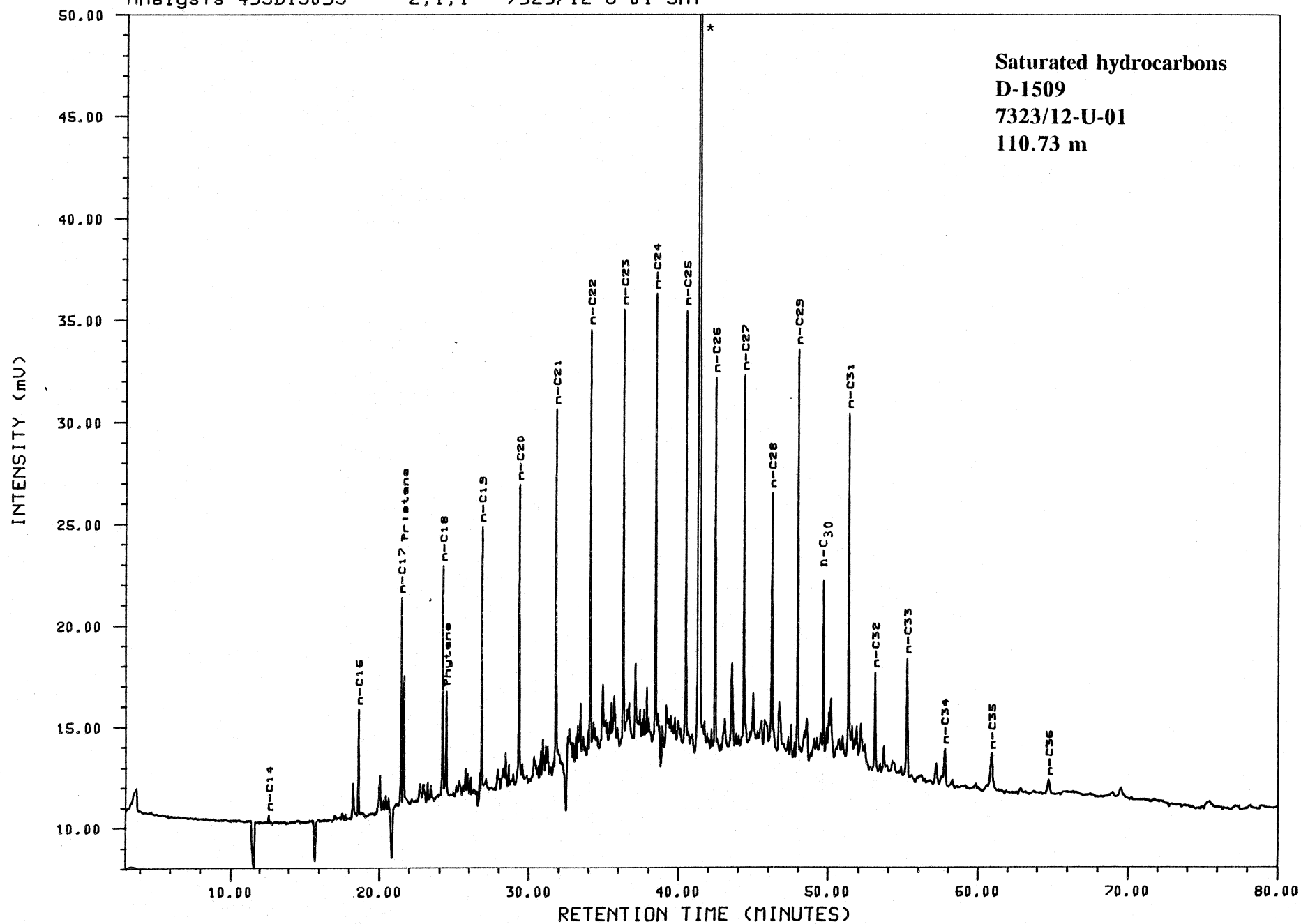
Analysis 435D1490S 2,1,1 7323/12-U-01 SAT



Analysis 435D1509S

2,1,1

7323/12-U-01 SAT



Analysis 435D1525S 2,1,1 7323/12-U-01 SAT

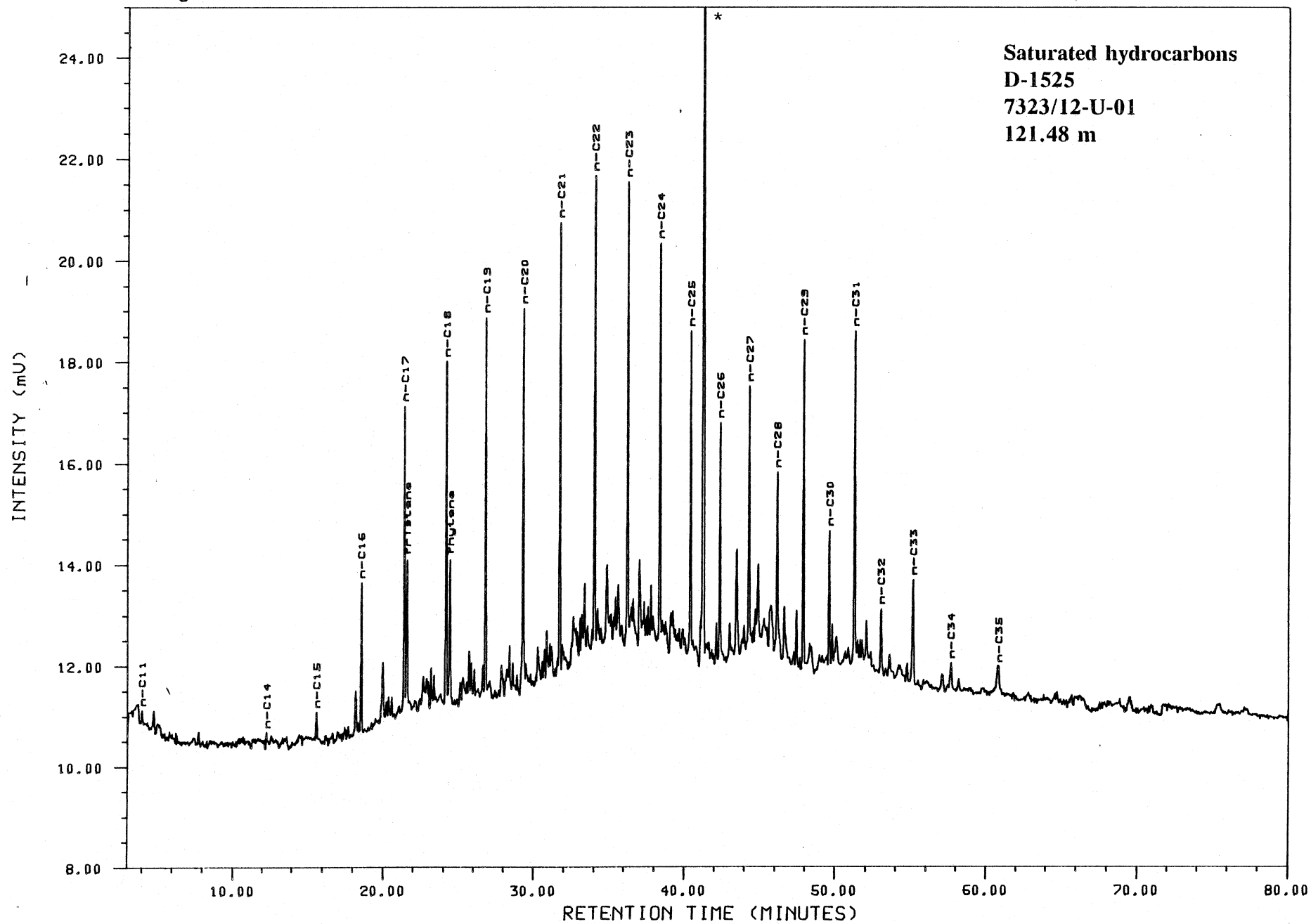
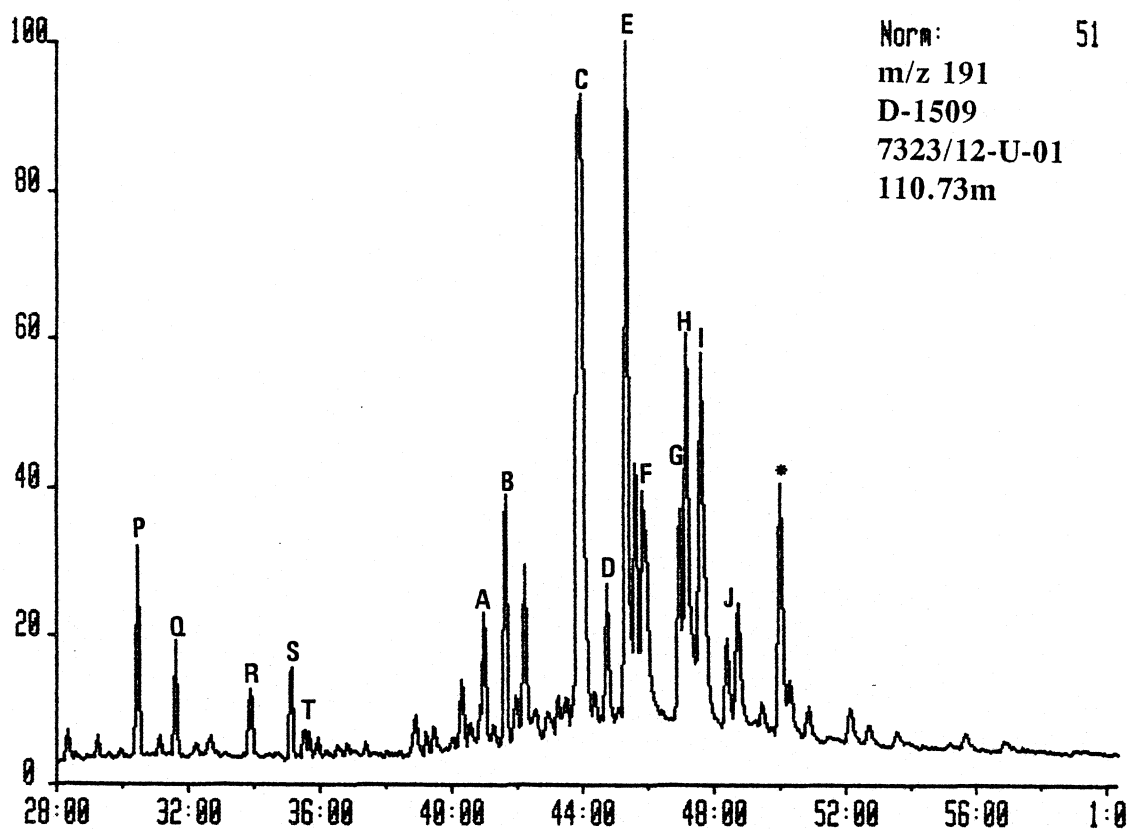


Figure A.II.5.2:

Mass fragmentograms of m/z 191, 205, 163, 177 (terpanes).

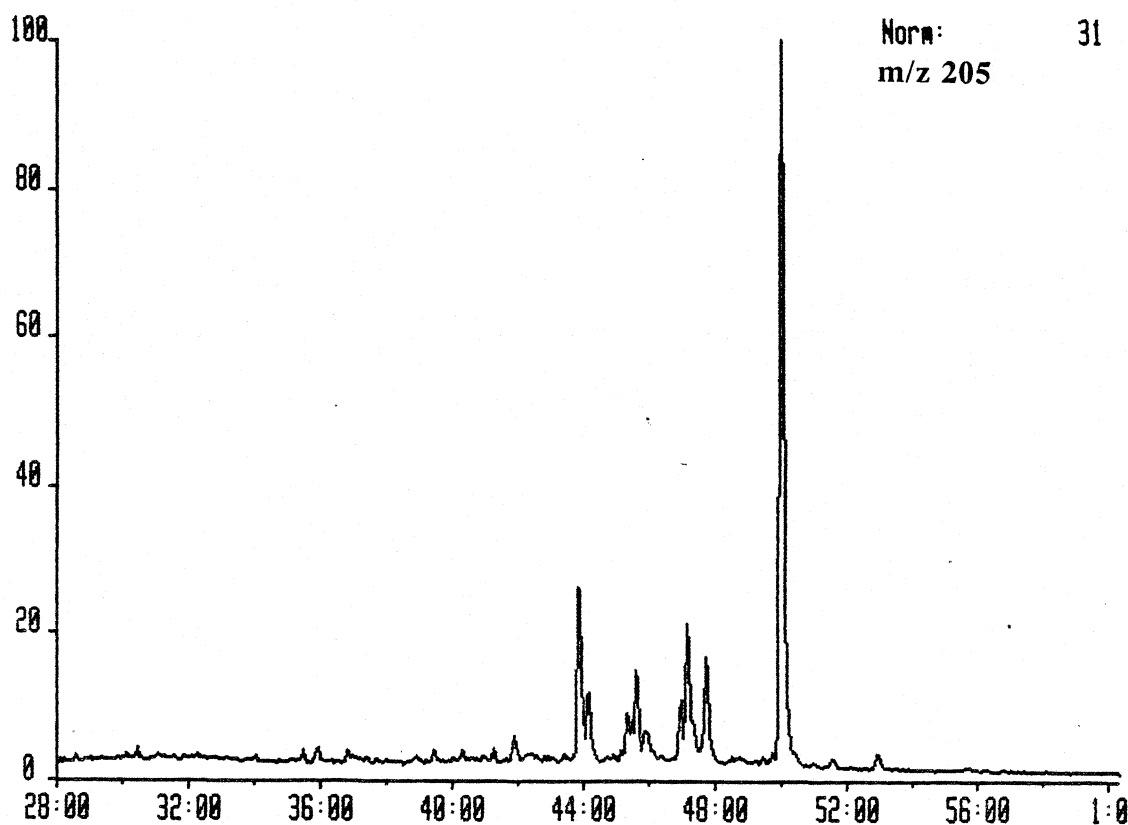
D1509SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 191.1000
Text:

System:QUADSAT



D1509SAT 3-DEC-87 Sir:Voltage 12-250 Acnt:IKU
Sample 1 Injection 1 Group 1 Mass 205.1000
Text:

System:QUADSAT



D1509SAT 3-DEC-87

Sir:Voltage 12-250

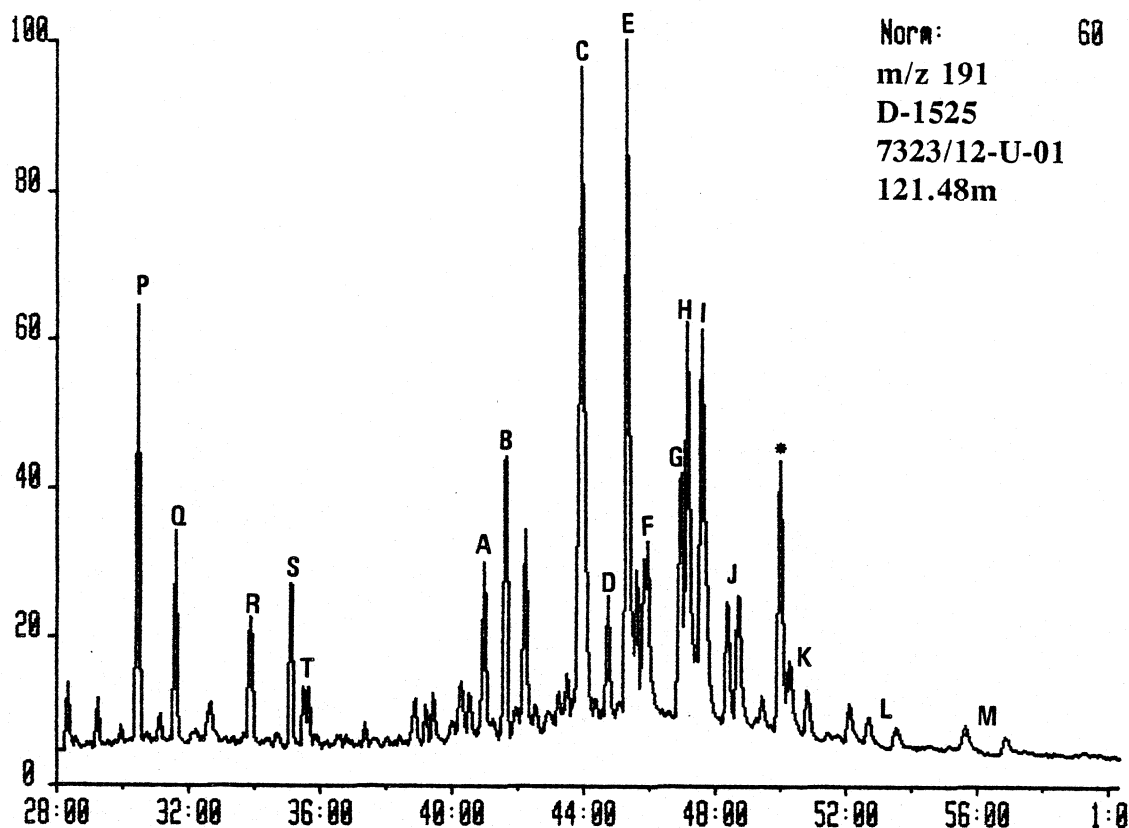
Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 191.1000

Text:



Norm: 60
m/z 191
D-1525
7323/12-U-01
121.48m

D1509SAT 3-DEC-87

Sir:Voltage 12-250

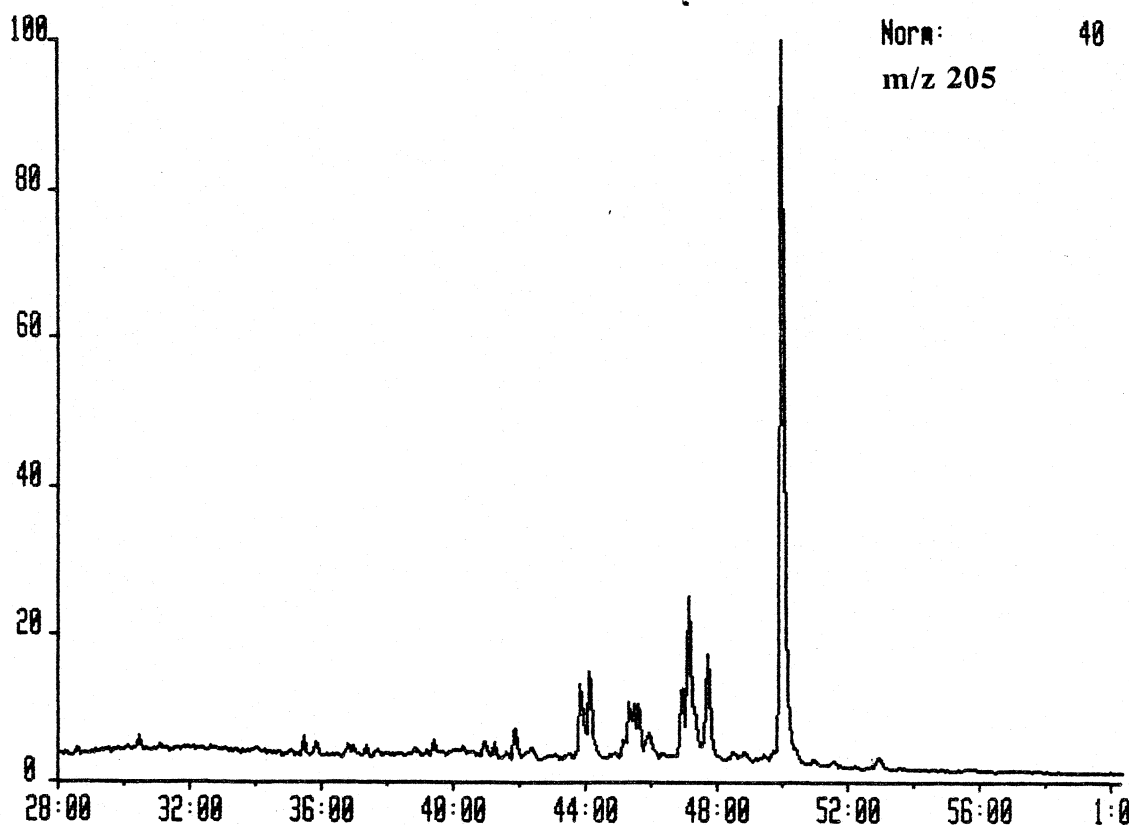
Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 205.1000

Text:

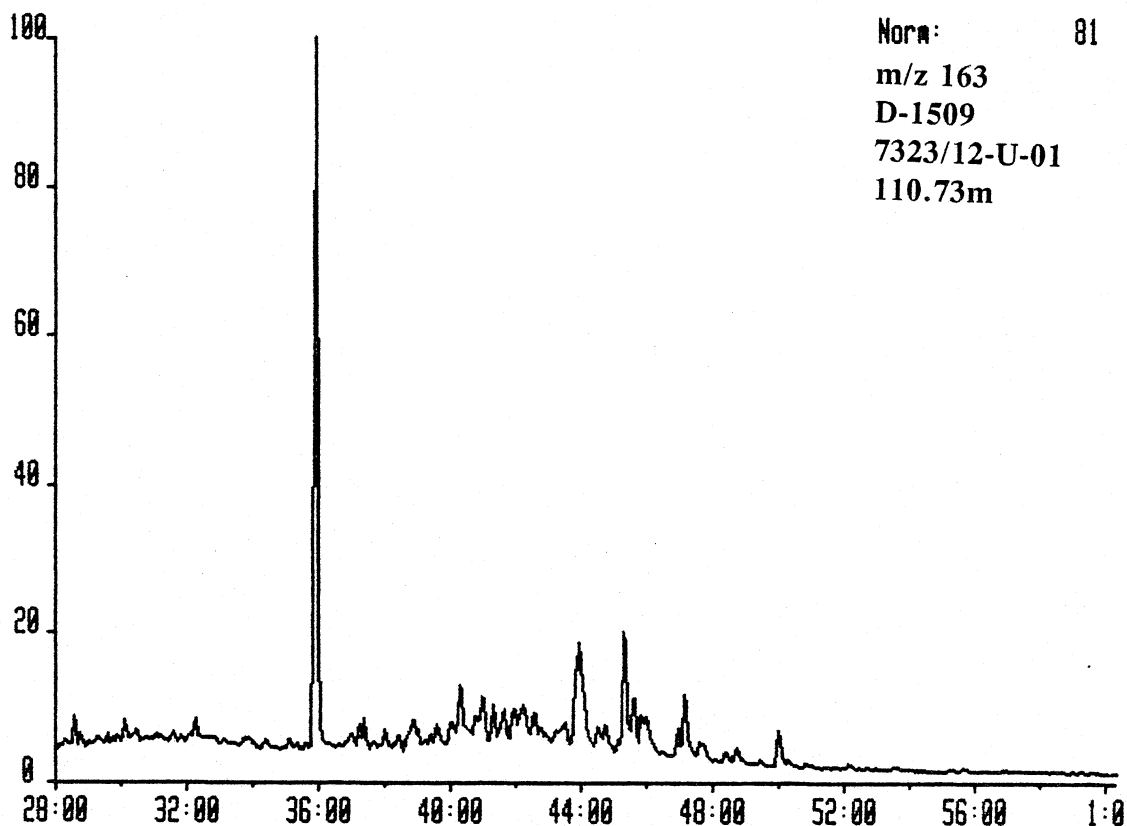


Norm: 40
m/z 205

D1509SAT 3-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 163.1000

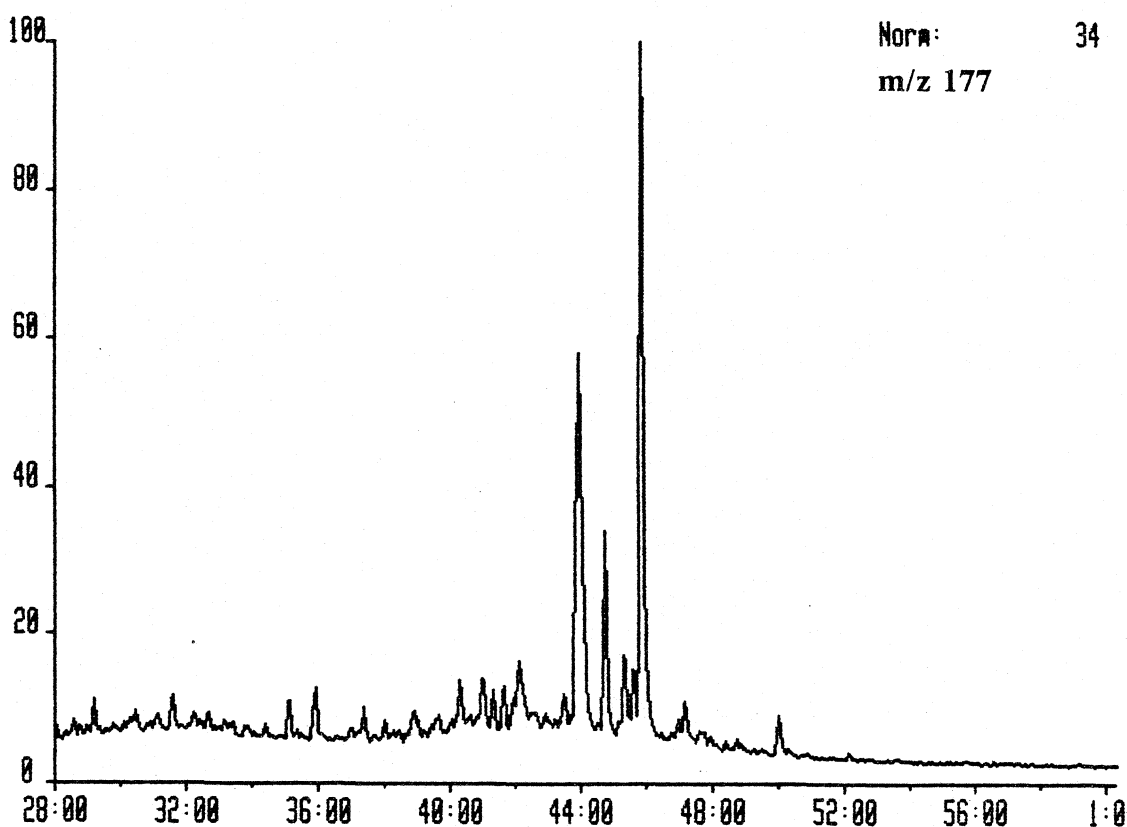
System: QUADSAT



D1509SAT 3-DEC-87
Sample 1 Injection 1
Text:

Sir: Voltage 12-250 Acnt: IKU
Group 1 Mass 177.1000

System: QUADSAT





IKU

SINTEF-GRUPPEN

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D1509SAT 3-DEC-87

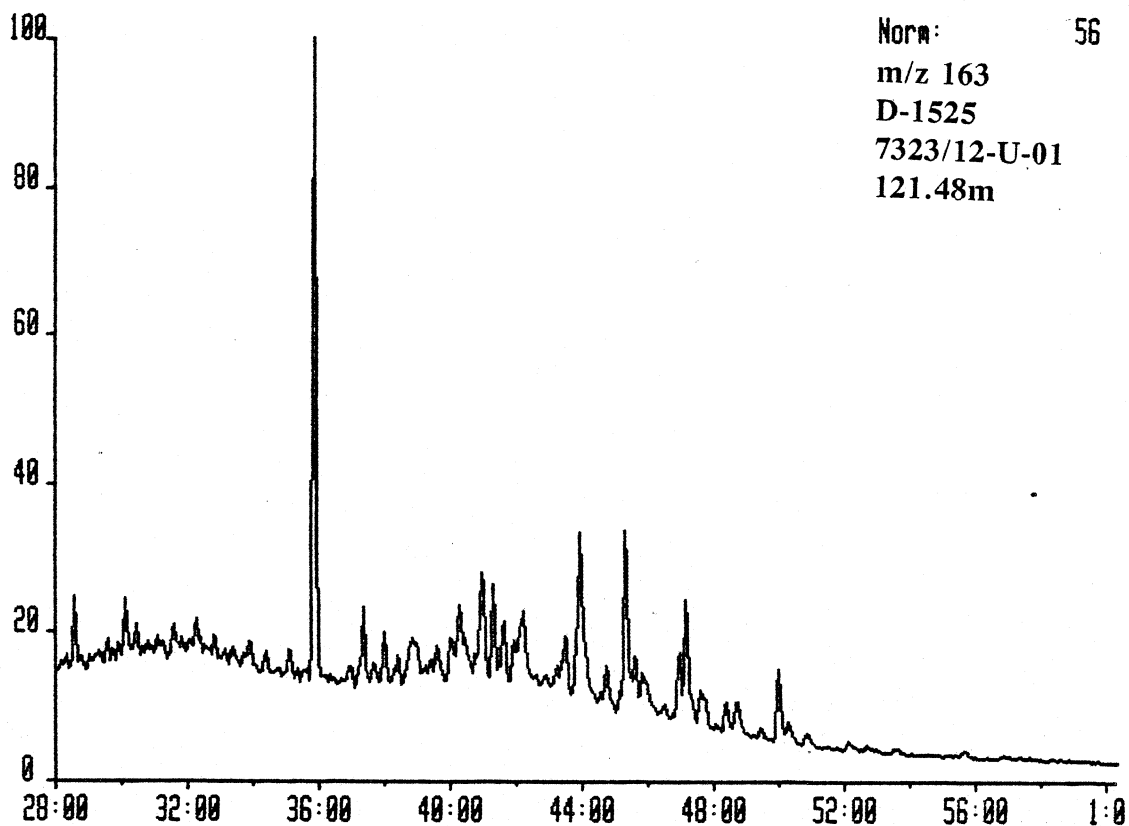
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 163.1000

Text:



D1509SAT 3-DEC-87

Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 177.1000

Text:

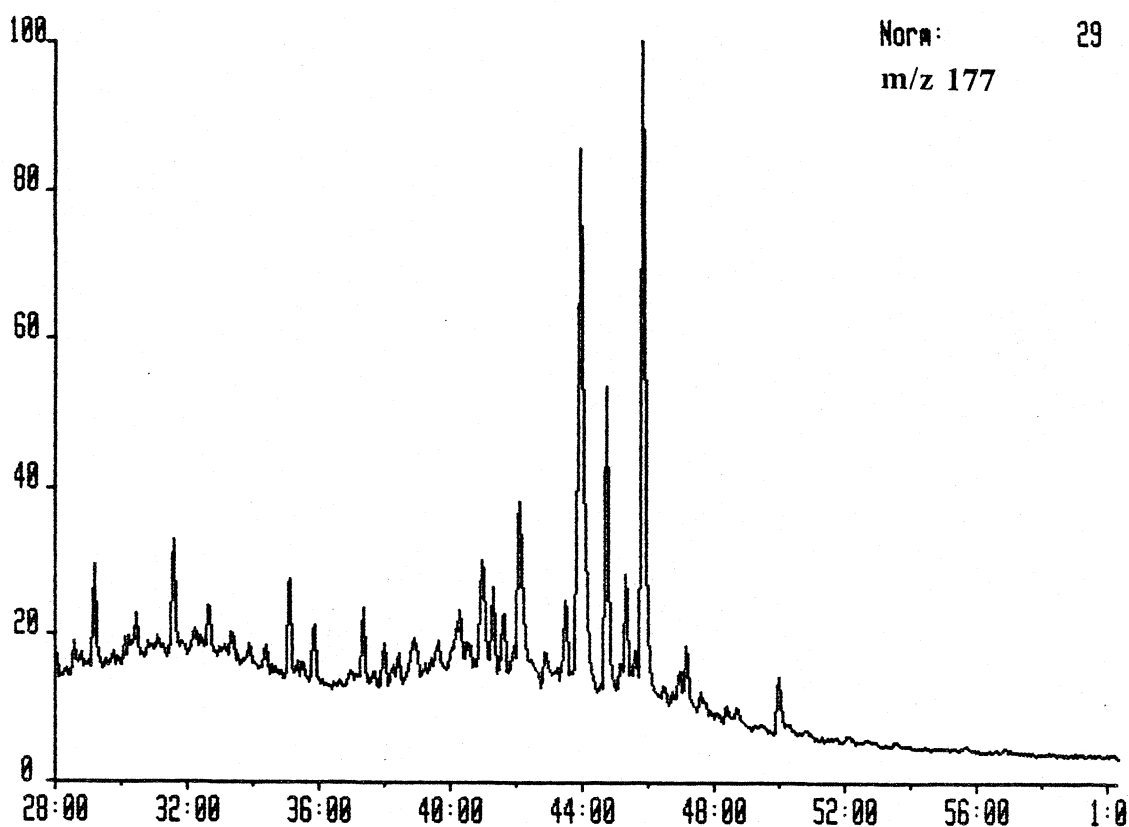


Figure A.II.5.3:

Mass fragmentograms of m/z 217, 218, 231, 259 (steranes)



IKU

SINTEF-GRUPPEN

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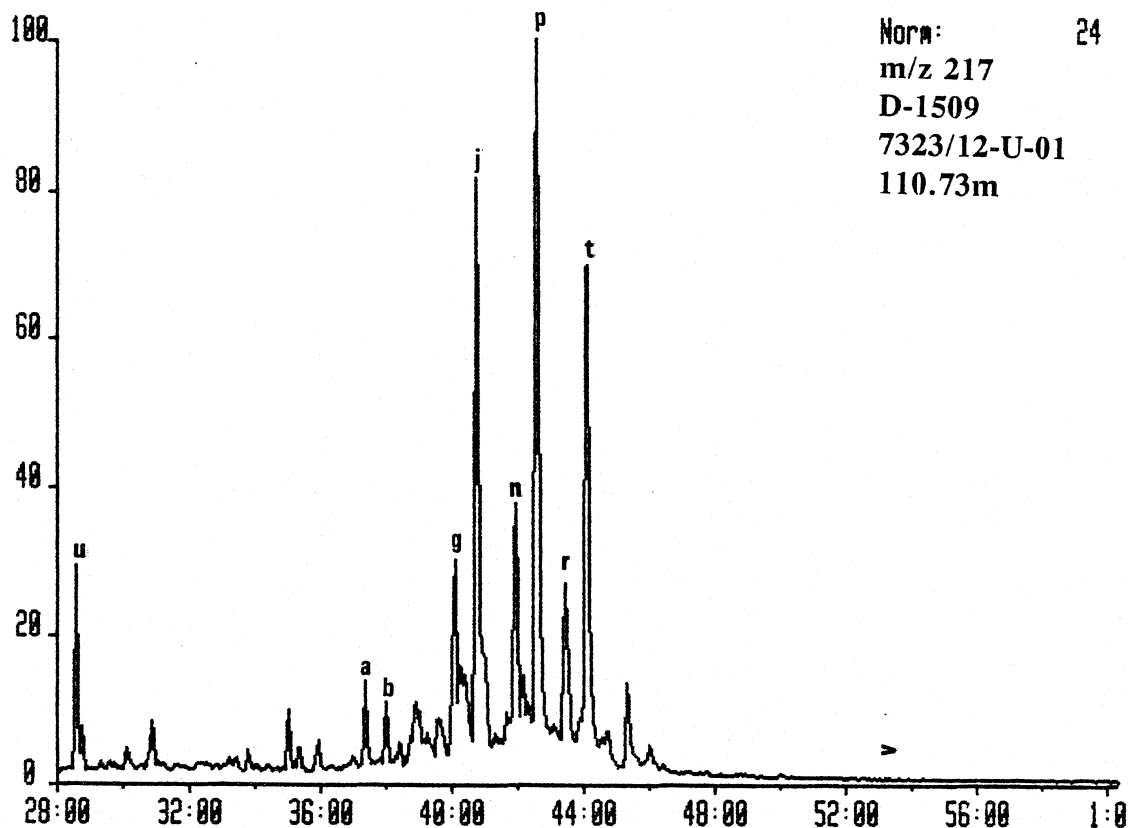
D1509SAT 3-DEC-87

Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1 Group 1 Mass 217.1000

Text:



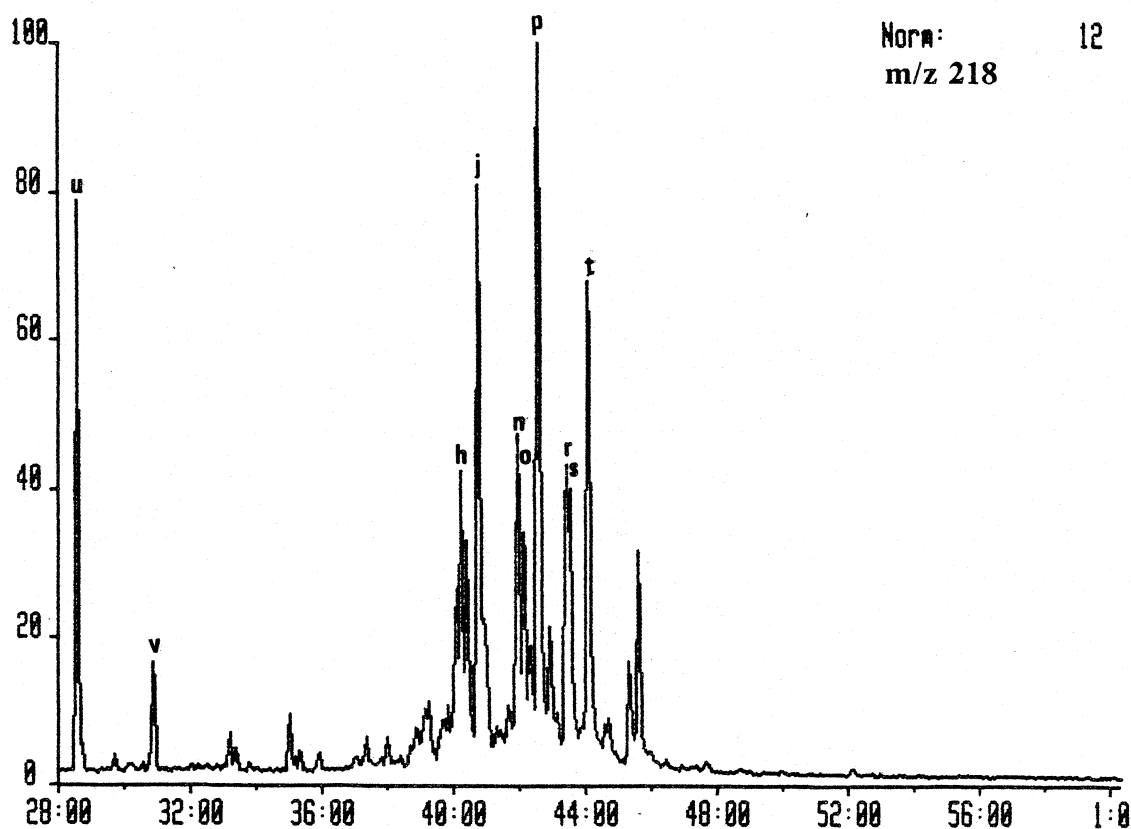
D1509SAT 3-DEC-87

Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1 Group 1 Mass 218.1000

Text:



**IKU**

SINTEF-GRUPPEN

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01509SAT 3-DEC-87

Sir:Voltage 12-250

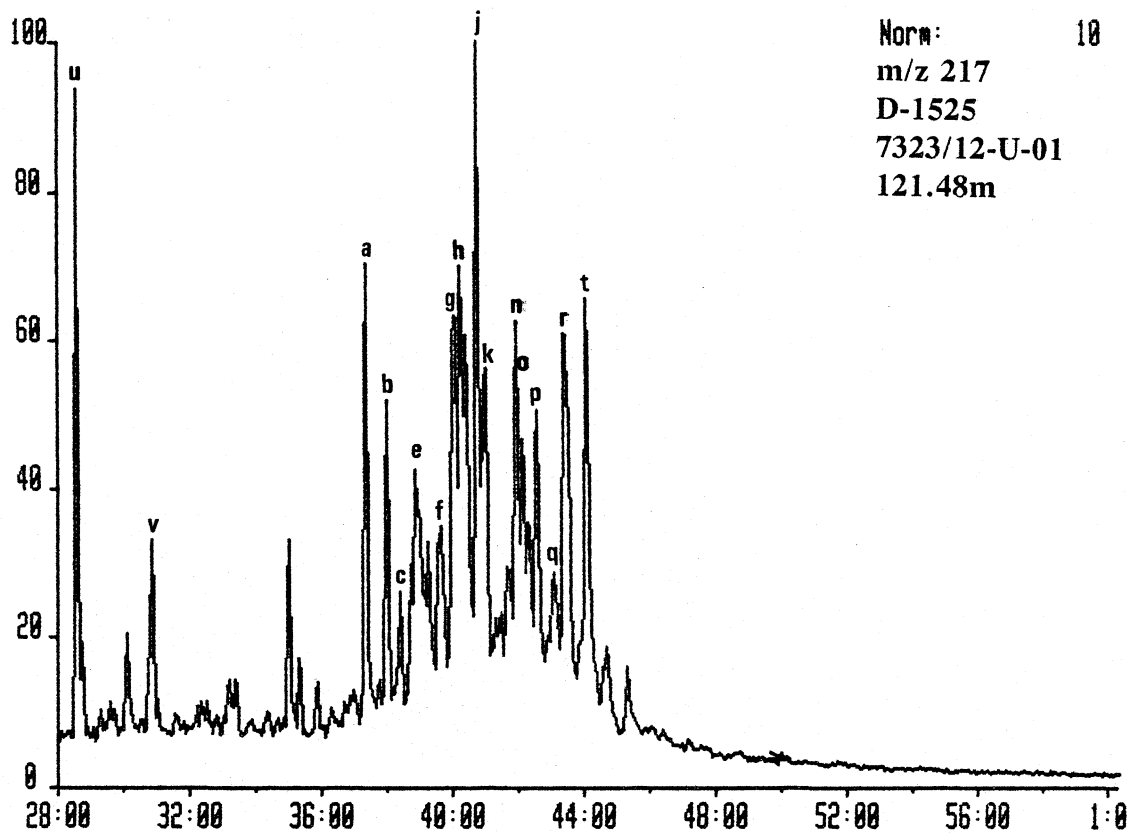
Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 217.1000

Text:



Norm: 10

m/z 217

D-1525

7323/12-U-01

121.48m

01509SAT 3-DEC-87

Sir:Voltage 12-250

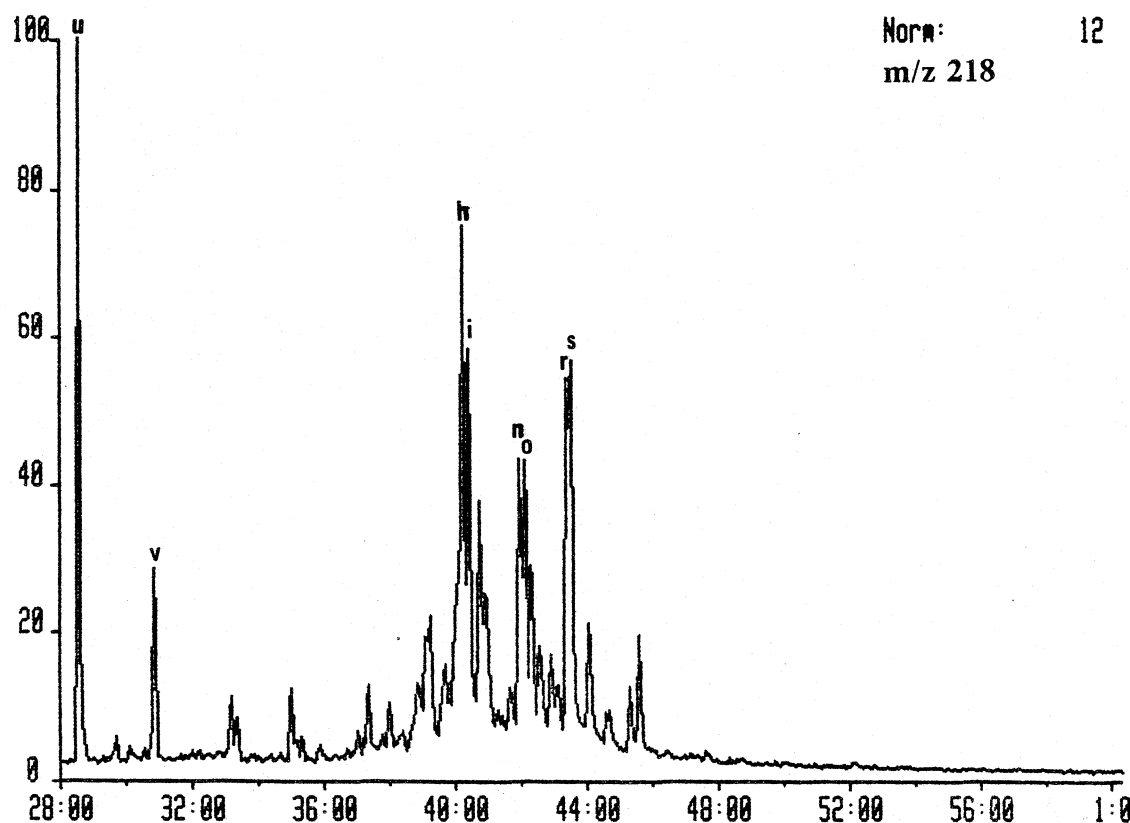
Acnt:IKU

System:QUADSAT

Sample 2 Injection 1

Group 1 Mass 218.1000

Text:



Norm: 12

m/z 218



IKU
SINTEF-GRUPPEN

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D1509SAT 3-DEC-87

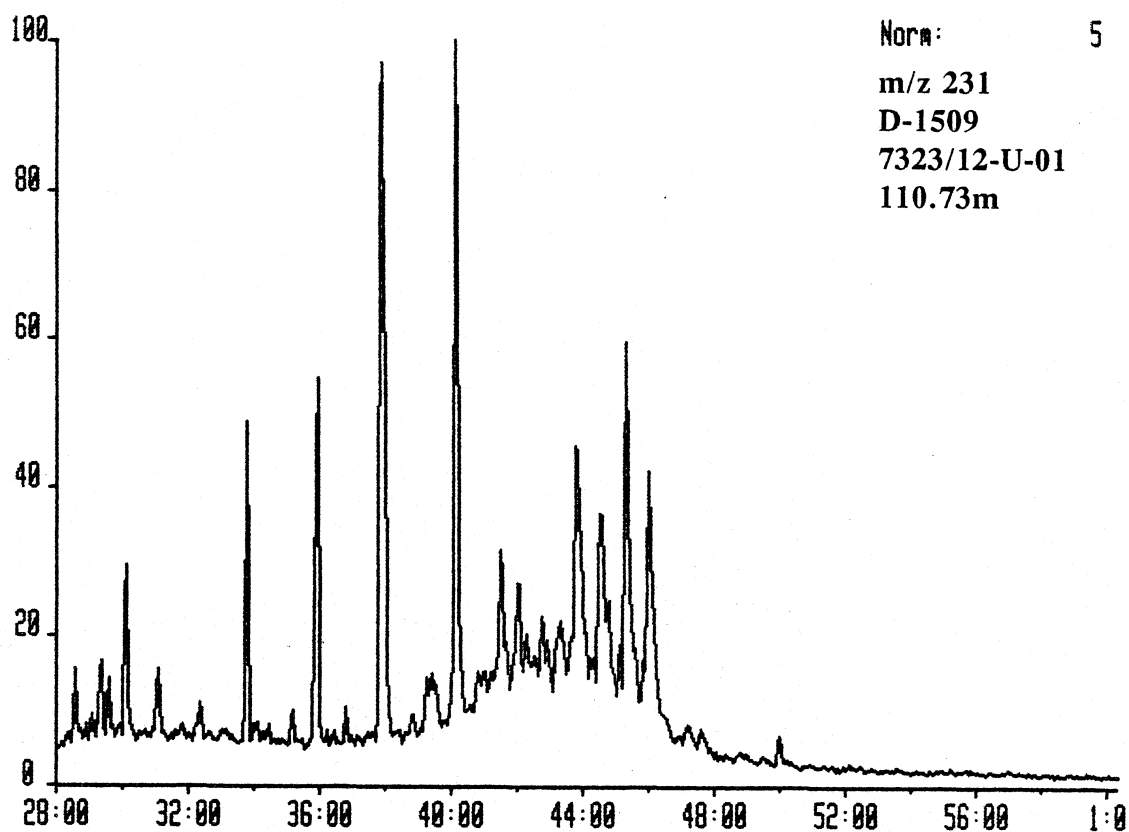
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 231.1000

Text:



D1509SAT 3-DEC-87

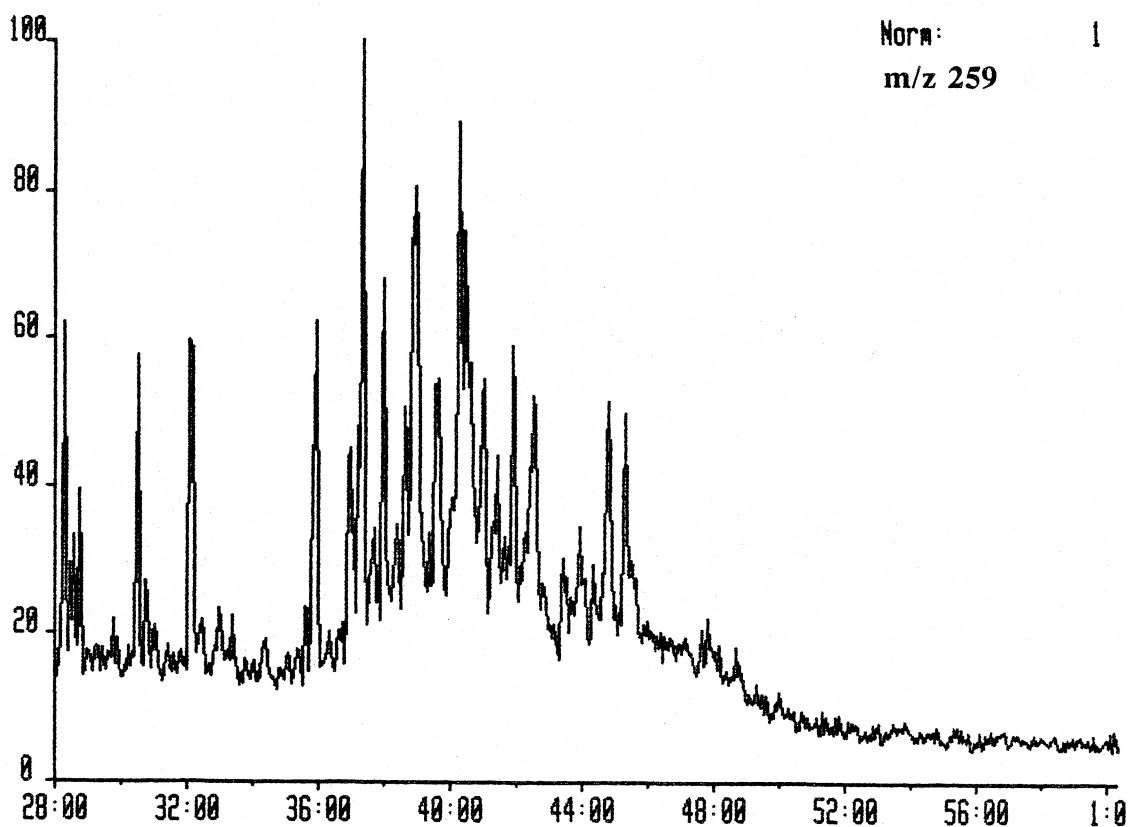
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 1 Injection 1

Group 1 Mass 259.1000

Text:





IKU
SINTEF-GRUPPEN

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D1509SAT 3-DEC-87

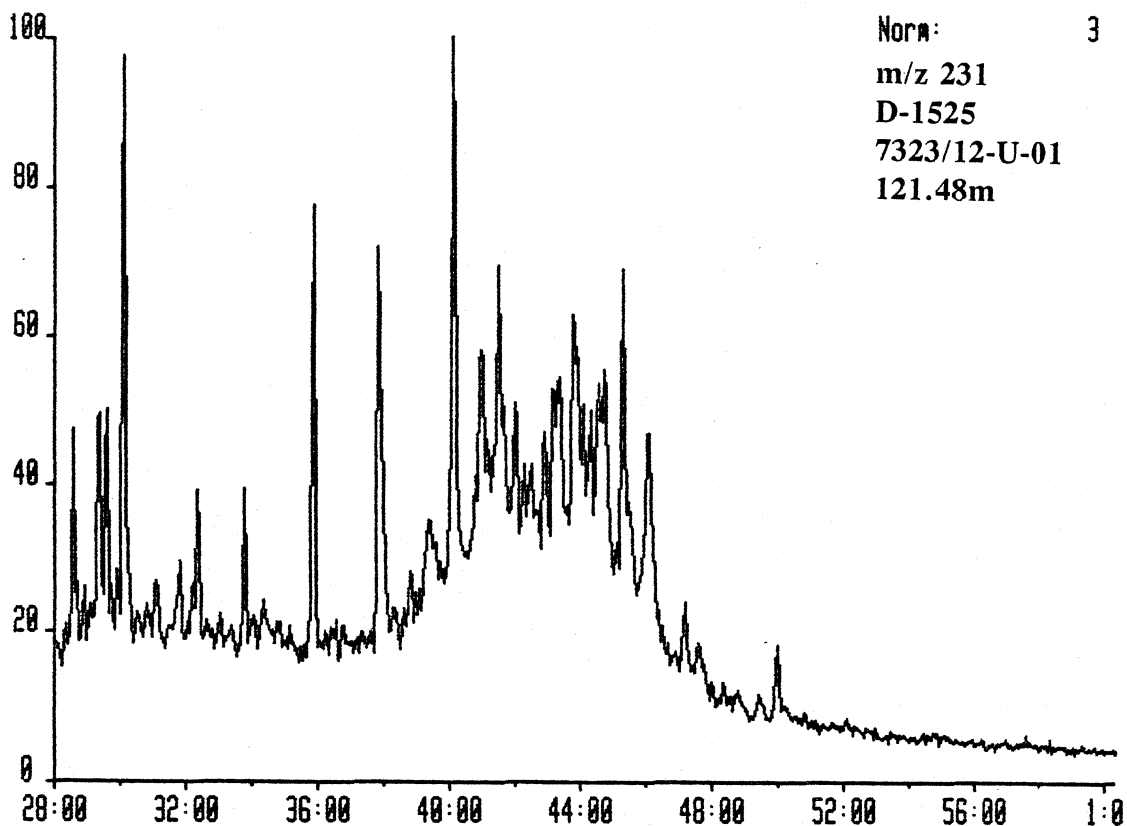
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 231.1000

Text:



D1509SAT 3-DEC-87

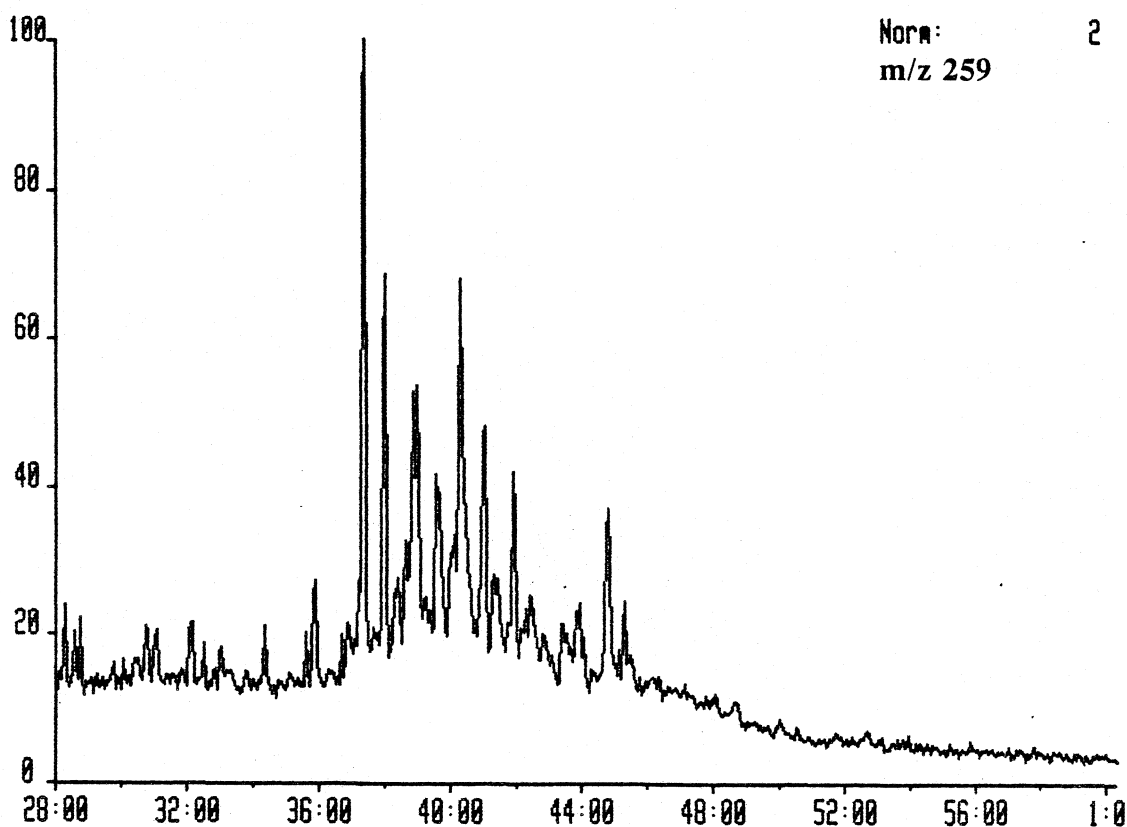
Sir: Voltage 12-250 Acnt: IKU

System: QUADSAT

Sample 2 Injection 1

Group 1 Mass 259.1000

Text:



A.III EXPERIMENTAL METHODS AND INTERPRETATION LEVELS

Gas analyses

Hydrous pyrolysis gas (full analysis of hydrocarbons and inert gases):

Natural gas samples were analysed on an HP 5880 gas chromatograph equipped with a capillary column and an FID for hydrocarbon analysis and two packed columns and a TCD for analysis of the inert gases (N_2 , O_2 , CO_2):

- 50 m x 0.2 mm i.d. fused silica column, coated with 0.5 μ m OV-101.
- 3 ft steel column packed with molecular sieve 13x, 80/100 mesh.
- 6 ft steel column packed with Porapak T x 4 ft steel column packed with Porapak Q, 80/100 mesh.

Temperature program: 30°C (12 min.) - 8°C/min. - 150°C (5 min.).

Standard gas samples containing methane, ethane, propane, n-butane, n-pentane, n-hexane and hydrogen, oxygen, nitrogen, carbon monoxide, carbon dioxide and methane, respectively, were used for quantification.

Headspace gas:

A septum was attached to the can and a sample of the headspace gas was taken for analysis of C_1 , C_2 , C_3 , i- C_4 , n- C_4 and C_{5+} hydrocarbons.

This analysis was performed on Carlo Erba Fractovap 2150 and 2350 gas chromatographs equipped with 2 m x 1/8" stainless steel columns filled with Porapak Q on Chromosorb using nitrogen as carrier gas. An oven temperature of 150°C was used. After elution of n-butane, the column was back-flushed and C_{5+} compounds were recorded as one peak. A standard gas sample containing methane, ethane, propane, n-butane, n-pentane and n-hexane (100 ppm each) was used for quantification.

The can was then opened and headspace volume, water volume, and sample weight were measured. The canned samples were washed with warm water (30-40°C) on 4.0, 2.0 and 0.125 mm sieves to remove drilling mud and were then dried at 35°C.

Occluded gas:

Prior to drying, an aliquot of the 1-4 mm fraction of each sample was crushed in water for 10 minutes using a gas-tight ball mill. The evolved gas was analysed as described for headspace gas.

Total Organic Carbon

Bulk samples were crushed in a disk mill or mortar. Aliquots of the samples were then weighed into Leco crucibles, then treated three times with hot 10% HCl in order to remove carbonate, and finally washed four times with distilled water in order to remove any traces of HCl. The crucibles were then placed on a hot plate (60°C) and dried for 24 hours. The total organic carbon (TOC) content of the dried samples was determined using a Leco CS 244 carbon/sulphur analyser.

The instrument was calibrated using a sediment standard with 2.72 % carbon. Calibration and blank runs were carried out every 15th measurement.

Rock-Eval pyrolysis

Powdered sample (100 mg shale, 5-10 mg coal) was weighed into a platinum crucible (the base and cover of which are made of sintered steel), and analysed on a Rock-Eval II pyrolyser (Girdel/IFP) under standard conditions (Carrier gas: helium; flow rate: 100 ml/min.; temperature programme: 300°C (3 min.) - 25°C/min. - 550°C).

Extractable Organic Matter

Powdered rock was extracted by Soxhlet technique with boiling dichloromethane (DCM) containing 7%(v/v) methanol as solvent in a Soxtec apparatus for 3 hours (1 h boiling, 2 h rinsing).

DCM of organic geochemical grade was used and blank analyses indicated that the occurrence of contaminating hydrocarbons was negligible. Activated copper fillings were used in order to remove any free sulfur from the samples.

After extraction, the solvent was evaporated off using a Büchi Rotavapor and the amount of extracted organic matter (EOM) was determined.

Medium-pressure liquid chromatography (MPLC)

The EOM or oil (>210°C) sample was diluted in DCM (1:3 mg/μl) and the asphaltenes were precipitated using excess n-pentane (40:1 pentane:(DCM+EOM)). The asphaltene fraction was weighed after drying at 50°C for 12 hours.

The remaining maltenes were separated into saturated, aromatic and non-hydrocarbon fractions using an MPLC system with n-hexane as eluant (Radke et al. 1980). The various fractions were concentrated using a Büchi Rotavapor, then transferred to glass vials and the remaining solvent removed.

Gas chromatographic analysis

The saturated hydrocarbon fractions were diluted with n-hexane and analysed on Carlo Erba Fractovap gas chromatographs equipped with a 15 m DB-1 or DB-5 fused silica column. Hydrogen was used as a carrier gas with a flow rate of about 1.5 ml/min. Injections were performed in splitless mode. The temperature program used was 80°C (2 min.) - 4°C/min. - 280°C.

Pyrolysis Gas Chromatography (Py-GC Programmed)

Thermal extraction (S1)

The whole rock sample (20-30 mg) was placed in a boat-shaped sample probe and thermo-extracted in a stream of helium at 340°C for 4 minutes.

Pyrolysis-Gas Chromatography (S2)

The thermo-extracted sample was pyrolysed in a helium atmosphere using a furnace type pyrolyzer as described by Solli et al. (1984). The pyrolysis temperature program was 340°C - 50°C/min. - 550°C. The outlet of the

furnace was directly connected to a splitter (30:1) which enabled the pyrolysis products to be simultaneously recorded as a bulk "S2" peak by an FID and passed into a gas chromatograph. The pyrolysis products were trapped on the chromatographic column by cooling the front part of the column with liquid nitrogen. On completion of the pyrolysis programme, the collected pyrolysis products were injected on to the column by removing the nitrogen bath. The GC conditions are outlined below.

GC conditions

Column: 30 m DB-1, i.d. 0.32 mm, fused silica capillary column.

Carrier gas: Helium, inlet pressure 7.5. psi; flow rate 1.5 ml/min.

Temp. programme: -10°C (1 min.) - 5°C/min. - 310°C (10 min.)

Gas chromatography - mass spectrometry (GC-MS)

GC-MS analyses were performed on a VG Quadrupole 12-250 GC-MS system. The HP 5790A Series GC was fitted with a fused silica DB-5 capillary column (30 m x 0.32 mm i.d.). Helium (1.5 ml/min.) was used as carrier gas and the injections were performed in splitless mode.

GC-program: 60°C (2 min.) - 8°C/min. - 120°C (0 min.) - 4°/min. - 280°C.

The saturated hydrocarbons were analysed in multiple ion mode (MID) at a scan cycle time of approximately 2 secs. The mass spectrometers operated at 70eV electron energy with an ion source temperature of 200°C. Data acquisition was performed using VG data systems.

Peaks were identified by comparison with elution patterns in certain mass chromatograms. Peak ratios were calculated from peak heights in the appropriate mass chromatograms.

Vitrinite Reflectance

Vitrinite reflectance measurements were carried out on whole-rock samples as follows: the rock samples were broken up if necessary, and mounted in a fast-setting synthetic resin. Temperatures in excess of 50°C were avoided

as these can result in alteration of the organic material. Once the resin was set, the sample plugs were ground on coarse silicon carbide paper in order to expose an area of sample for polishing. The samples were then ground on 600 and 280 grade silicon carbide paper to remove any coarse scratches.

Where clastic sediments were involved, grinding and polishing was carried out using propan-2-ol to avoid swelling of any clay minerals in the sample. If coals were to be measured, then water was used.

After coarse grinding, the samples are polished on Selvyt-covered laps using 5/20 and gamma grade alumina powder. Following polishing, the surface of the sample plugs was carefully cleaned to remove any traces of the polishing powders.

Reflectance measurements were carried out using a Leitz MPV-Compact microscope and photo-multiplier combination. The measurements were made under oil immersion, using an oil with a refractive index of 1.518 at a wavelength of 546 nm. The surface of the sample was examined for suitable vitrinite particles, and measurements were taken on these. The reflectance of a vitrinite particle was determined relative to an optical glass standard with a known reflectance of a similar order to that of the sample.

If possible, a minimum of twenty reflectance measurements was taken on each sample. Coals and carbonaceous claystone samples provide the most reliable data, while sandstones and carbonates provide the least reliable data.

The samples were also examined in ultra-violet light in order to better determine the composition and colour of the fluorescent material present in the sample. The colour of certain liptinite macerals in ultra-violet light can be related to the thermal maturity of the sample kerogen. A scale comparing vitrinite reflectance measurements and sporinite fluorescence to thermal maturity is shown in Table 3 of the interpretation levels.

Evaluation of kerogen type and thermal maturity in transmitted light

The rock samples were crushed and treated with hydrochloric acid and hydrofluoric acid in order to remove the mineral matter and isolate the kerogen. The isolated kerogen was mounted in glycerine jelly on microscope slides as a strew-mount.

The treatment of the isolated kerogen varied according to the requirements and preservation of the samples. This included:

<u>T-slide:</u>	total acid residue.
<u>O-slide:</u>	kerogen debris remaining after flotation in ZnBr_2 to remove heavy minerals.
<u>Si-slide:</u>	sieved residue.
<u>X-slide:</u>	oxidised residue.

T- and/or O-slides were necessary in order to evaluate the kerogen composition/palynofacies of the samples.

Si- and/or X-slides were required if it was necessary to concentrate larger kerogen fragments or spores/pollen for spore colouration and/or age determination, respectively, (N.B.: oxidised residue is not used for spore colour determination as oxidation will alter the colour).

The samples were examined using a Leitz Dialux microscope with a white halogen light source. Objective lenses of 10x and 63x magnification were used. The higher magnification allowed a more detailed description of the kerogen, with resolution down to 2 μm diameter.

Thermal alteration indices (TAI) were measured from the colour of spores and pollen. The techniques used for this are adapted from Staplin (1969) and Burgess (1974). IKU has used a 1-10 scale for thermal alteration index (TAI)/Spore colouration index (SCI) since December, 1986.

Kerogen terminology

The following kerogen terminology is used:

1. Amorphous material - degraded, unstructured material of unidentified origin.
2. Algal material - particles of recognisably algal origin.
3. Liptinitic material - recognisable spores, pollen, cuticle and cysts.
4. Woody material - structured and unstructured woody tissue.
5. Coaly material - black, reworked or oxidised material.

INTERPRETATION LEVELS

1. TOTAL ORGANIC CARBON (TOC)

TOC (wt%)	Richness of source rock
<0.5	Poor Source Rock
0.5-1	Fair Source Rock
1-2	Good Source Rock
>2	Rich Source Rock

2. ROCK-EVAL PYROLYSIS

a) Data Supplied

S1	Free hydrocarbons (mg/g rock).
S2	Potential or pyrolysable hydrocarbons of kerogen (mg/g rock).
S3	Oxygen content of kerogen (mg CO ₂ /g rock).
Hydrogen Index	S2/TOC x 100 (mg hydrocarbons/g TOC).
Oxygen Index	S3/TOC x 100 (mg CO ₂ /g TOC).
Petroleum Potential	S1+S2 (mg HC/g rock).
Production Index	S1/(S1+S2).
Tmax	Temperature at which the S2 peak is at maximum (°C).

b) Interpretation

Kerogen type	Hydrogen Index (mg HC/g TOC)
Type I	>650
Type II	400-650
Type II/III	200-400
Type III	50-200
Type IV	<50 and up to 100 where oxygen index is very high.

N.B. Hydrogen and particularly oxygen indices are affected by organic carbon and carbonate mineral contents. Thus decreasing TOC contents, where the same organic matter type is present, can result in reduced hydrogen and increased oxygen indices (Katz 1983 and Espitalié et al. 1984). Hence oxygen indices are not used.

Petroleum Potential	S1+S2 (mg HC/g rock) *)
Poor	<1
Fair	1-5
Good	5-10
Rich	>10

S1 and S2 values can be raised by the presence of migrated bitumens.

Production Index	S1/(S1+S2) *)
Primary bitumen	<0.1
Generated or migrated hydrocarbons	0.1-0.5
Predominantly migrated Hydrocarbons or stain	>0.5

Tmax

Variations in values can occur due to maturity, kerogen type, migrated bitumens or low S2 peaks. The following maturity boundaries are therefore only approximate.

Tmax (°C)	Maturity stages of type II kerogens	Equivalent vitrinite reflectance in coals (% Ro)
425	Immature	0.5
435		0.7
450	Oil generation zone	1.0
>450	Gas generation zone	

3. COMPARISON OF MICROSCOPIC THERMAL MATURATION SYSTEMS AT IKU

MATURATION LEVEL	SPORE COLOUR TAI	VITRINITE REFLECTANCE %Ro	SPORINITE FLUORESCENCE
IMMATURE	1.0 - 3.5	0.25 - 0.40	1 - 4
EARLY MATURITY	3.5 - 4.0	0.40 - 0.60	4 - 6
MODERATE MATURITY	4.0 - 4.5	0.60 - 0.80	6 - 7
MATURITY	4.5 - 5.5	0.80 - 1.00	7 - 8
LATE MATURITY	5.5 - 6.0	1.00 - 1.20	8 - 9
POST-MATURE	6.0 - 10.0	>1.20	Absent

*) Only approximate guide and not intended to indicate absolute limits.

4. EXTRACTABLE ORGANIC MATTER (OR SOLUBLE BITUMEN)

a) Data Supplied

Weight of extracted rock	(g)
EOM extractable organic matter	(mg, mg/g of rock, mg/g TOC)
Sat saturated hydrocarbons	(mg, mg/g of rock, mg/g TOC, wt% of EOM)
Aro aromatic hydrocarbons	(mg, mg/g of rock, mg/g TOC, wt% of EOM)
HC/EOM = (Sat+Aro)/EOM	(wt%)
Non-HC/EOM	(wt%)
HC/non-HC x 100	
Sat/Aro x 100	

b) Interpretation of source-rock richness based on hydrocarbon content.

Hydrocarbon content is dependent on maturity, total organic carbon content and kerogen type as well as being influenced by migrated hydrocarbons. The values should therefore be treated as a rough guide only.

Source rock richness	HC (ppm of rock)
Poor	<100
Fair	100-250
Good	250-500
Rich	>500

INTERPRETATION LEVELS

1. TOTAL ORGANIC CARBON (TOC)

TOC (wt%)	Richness of source rock
<0.5	Poor Source Rock
0.5-1	Fair Source Rock
1-2	Good Source Rock
>2	Rich Source Rock

2. ROCK-EVAL PYROLYSIS

a) Data Supplied

S1	Free hydrocarbons (mg/g rock).
S2	Potential or pyrolysable hydrocarbons of kerogen (mg/g rock).
S3	Oxygen content of kerogen (mg CO ₂ /g rock).
Hydrogen Index	S2/TOC x 100 (mg hydrocarbons/g TOC).
Oxygen Index	S3/TOC x 100 (mg CO ₂ /g TOC).
Petroleum Potential	S1+S2 (mg HC/g rock).
Production Index	S1/(S1+S2).
Tmax	Temperature at which the S2 peak is at maximum (°C).

b) Interpretation

Kerogen type	Hydrogen Index (mg HC/g TOC)
Type I	>650
Type II	400-650
Type II/III	200-400
Type III	50-200
Type IV	<50 and up to 100 where oxygen index is very high.

N.B. Hydrogen and particularly oxygen indices are affected by organic carbon and carbonate mineral contents. Thus decreasing TOC contents, where the same organic matter type is present, can result in reduced hydrogen and increased oxygen indices (Katz 1983 and Espitalié et al. 1984). Hence oxygen indices are not used.

Petroleum Potential	S1+S2 (mg HC/g rock) *)
Poor	<1
Fair	1-5
Good	5-10
Rich	>10

S1 and S2 values can be raised by the presence of migrated bitumens.

Production Index	S1/(S1+S2) *)
Primary bitumen	<0.1
Generated or migrated hydrocarbons	0.1-0.5
Predominantly migrated Hydrocarbons or stain	>0.5

Tmax

Variations in values can occur due to maturity, kerogen type, migrated bitumens or low S2 peaks. The following maturity boundaries are therefore only approximate.

Tmax (°C)	Maturity stages of type II kerogens	Equivalent vitrinite reflectance in coals (% Ro)
425	Immature	0.5
435		0.7
450	Oil generation zone	1.0
>450	Gas generation zone	

3. COMPARISON OF MICROSCOPIC THERMAL MATURATION SYSTEMS AT IKU

MATURATION LEVEL	SPORE COLOUR TAI	VITRINITE REFLECTANCE %Ro	SPORINITE FLUORESCENCE
IMMATURE	1.0 - 3.5	0.25 - 0.40	1 - 4
EARLY MATURITY	3.5 - 4.0	0.40 - 0.60	4 - 6
MODERATE MATURITY	4.0 - 4.5	0.60 - 0.80	6 - 7
MATURITY	4.5 - 5.5	0.80 - 1.00	7 - 8
LATE MATURITY	5.5 - 6.0	1.00 - 1.20	8 - 9
POST-MATURE	6.0 - 10.0	>1.20	Absent

*) Only approximate guide and not intended to indicate absolute limits.

4. EXTRACTABLE ORGANIC MATTER (OR SOLUBLE BITUMEN)

a) Data Supplied

Weight of extracted rock	(g)
EOM extractable organic matter	(mg, mg/g of rock, mg/g TOC)
Sat saturated hydrocarbons	(mg, mg/g of rock, mg/g TOC, wt% of EOM)
Aro aromatic hydrocarbons	(mg, mg/g of rock, mg/g TOC, wt% of EOM)
HC/EOM = (Sat+Aro)/EOM	(wt%)
Non-HC/EOM	(wt%)
HC/non-HC x 100	
Sat/Aro x 100	

b) Interpretation of source-rock richness based on hydrocarbon content.

Hydrocarbon content is dependent on maturity, total organic carbon content and kerogen type as well as being influenced by migrated hydrocarbons. The values should therefore be treated as a rough guide only.

Source rock richness	HC (ppm of rock)
Poor	<100
Fair	100-250
Good	250-500
Rich	>500

MOLECULAR RATIOS FROM TERPANE AND STERANE MASS CHROMATOGRAMS APPLIED AS MATURITY AND SOURCE CHARACTERISTIC PARAMETERS

Geochemical fossils or biological marker components are characteristic of the type of organic matter present at the time the sediments were deposited. The biological isomers of these components undergo changes due to increased maturity in particular, but also to a certain degree caused by migration and weathering processes.

Source characteristic parameters

In the m/z 191 mass chromatograms which represent the terpanes, the hopanes and moretanes are the major components in most extracts and oils. Of the hopanes the C_{27} and C_{29} - C_{35} homologs are ubiquitous, while the C_{28} bisnorhopane is believed to be typical of certain types of source rocks. This is also the case for the component, probably gammacerane, sometimes seen to coelute with the 22S isomer of the C_{31} $17\alpha(H)$ -hopanes (H). In the sterane mass chromatograms, m/z 217 and m/z 218, the molecular weight distribution of the C_{27} - C_{29} regular steranes is believed to be representative of the original input of organic matter. The highest molecular weight compounds, the C_{29} steranes, represent organic matter of terrestrial origin, while the lower molecular weight analogs originate from more marine type environments.

Maturity dependent parameters

The biological isomers of the hopanes, the $17\beta(H)$, $21\beta(H)$ -hopanes, undergo structural changes during the maturation process. The isomerisation reactions are thought to be produced via the $17\beta(H)$, $21\alpha(H)$ -hopanes (moretanes) to the most stable $17\alpha(H)$, $21\beta(H)$ -hopanes. At equilibrium 100% of the $17\alpha(H)$ -hopanes are seen. The ratio $\alpha\beta/\alpha\beta+\beta\alpha$ is used to describe this reaction. In the extended hopanes ($>C_{31}$), the thermally stable S configurations at C-22 become increasingly more abundant as compared to the biologically preferred R configurations at increased maturity level. The equilibrium ratio is approximately 60% of the 22S configuration. Another ratio that is known to change with maturity is the T_m/T_s (Seifert et al., 1978) of the C_{27} hopanes. The maturable $18\alpha(H)$ -trishnorhopane (T_m) is reduced in intensity relative to the more stable $17\alpha(H)$ -trishnorhopane (T_s), causing the T_m/T_s to decrease at increased maturity. This ratio is

also believed to be source dependant, and this should be born in mind when applying the ratio for maturity comparison. The amount of tricyclic terpanes is also to a certain extent seen to be maturity dependant.

Two isomerisation reactions taking place in the steranes are most commonly applied for maturity assignments from the m/z 217 mass chromatograms. The biologically preferred 14 α (H),17 α (H)-isomers of the regular steranes is transformed to the thermally stable 14 β (H),17 β (H)-steranes, the % $\beta\beta$ approaching 75% at equilibrium. An equilibrium concentration of 50% is seen of the stable S configuration at C-20 as opposed to the 100% of the biological 20R epimer (Mackenzie et al., 1980). The abundance of rearranged steranes increased with increasing maturity.

One of the reactions taking place at an early stage of diagenesis is the aromatisation of steranes, leading to the formation of mono- and triaromatic analogs. This process is measured as the abundance of triaromatic relative to mono-aromatic compounds (% tri/tri + mono) in the m/z 231 and 253 mass chromatograms, respectively. In addition the degree of side chain cracking, as %C₂₀/C_{26,27} and %C₂₁/C_{28,29} respectively, is applied. These cracking processes are also taking place during early diagenesis, and are used for maturity assignment together with the previously mentioned ratios.

Migration and weathering

The effect on the geochemical fossils of migration and weathering, is less apparent than the maturity induced changes. Migration is believed to cause an increase in the relative amounts of rearranged and 14 β (H),17 β (H) regular steranes (Seifert and Moldowan, 1978, 1981). Severe biological alteration leads to the formation of desmethyl-hopanes (Seifert and Moldowan, 1979).

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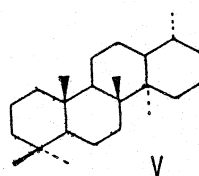
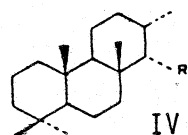
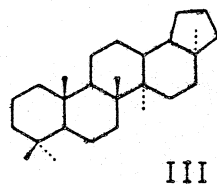
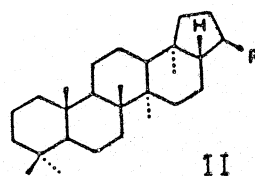
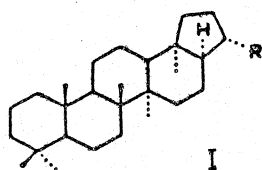
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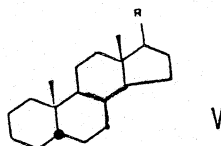
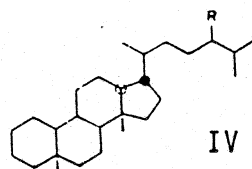
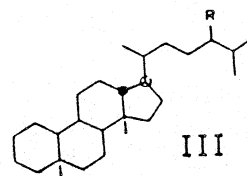
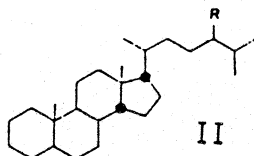
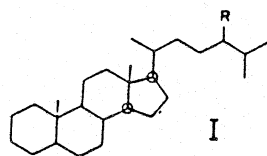
Key to mass fragmentograms representing terpanes (m/z 191)

P	tricyclic terpene	$C_{23}H_{42}$	(IV, R= C_4H_9)
Q	tricyclic terpene	$C_{24}H_{44}$	(IV, R= C_5H_{11})
R	tricyclic terpene (17R,17S)	$C_{25}H_{46}$	(IV, R= C_6H_{13})
S	tetracyclic terpene	$C_{24}H_{42}$	(V)
T	tricyclic terpene (17R,17S)	$C_{26}H_{48}$	(IV, R= C_7H_{15})
A	T_s , 18 α (H)-trisorneohopane	$C_{27}H_{46}$	(III)
B	T_m , 17 α (H)-trisnorhopane	$C_{27}H_{46}$	(I, R=H)
Z	bisnorhopane	$C_{28}H_{48}$	
C	17 α (H)-norhopane	$C_{29}H_{50}$	(I, R= C_2H_5)
X	unknown triterpene	$C_{30}H_{52}$	
D	17 β (H)-normoretane	$C_{29}H_{50}$	(II, R= C_2H_5)
E	17 α (H)-hopane	$C_{30}H_{52}$	(I, R= C_3H_7)
F	17 β (H)-moretane	$C_{30}H_{52}$	(II, R= C_3H_7)
G	17 α (H)-homohopane (22S)	$C_{31}H_{54}$	(I, R= C_4H_9)
H	17 α (H)-homohopane (22R)	$C_{31}H_{54}$	(I, R= C_4H_9)
	+ unknown triterpene (gammacerane?)		
I	17 β (H)-homomoretane	$C_{31}H_{54}$	(II, R= C_4H_9)
J	17 α (H)-bishomohopane (22S,22R)	$C_{32}H_{56}$	(I, R= C_5H_{11})
K	17 α (H)-trishomohopane (22S,22R)	$C_{33}H_{58}$	(I, R= C_6H_{13})
L	17 α (H)-tetrakishomohopane (22S,22R)	$C_{34}H_{60}$	(I, R= C_7H_{15})
M	17 α (H)-pentakishomohopane (22S,22R)	$C_{35}H_{62}$	(I, R= C_8H_{17})



Key to mass fragmentograms representing steranes (m/z 217 and 218)

u	5 α (H)-sterane	C ₂₁ H ₃₆	(V, R=C ₂ H ₅)
v	5 α (H)-sterane	C ₂₂ H ₃₈	(V, R=C ₃ H ₇)
a	13 β (H), 17 α (H)-diasterane (20S)	C ₂₇ H ₄₈	(III, R=H)
b	13 β (H), 17 α (H)-diasterane (20R)	C ₂₇ H ₄₈	(III, R=H)
c	13 α (H), 17 β (H)-diasterane (20S)	C ₂₇ H ₄₈	(IV, R=H)
d	13 α (H), 17 β (H)-diasterane (20R)	C ₂₇ H ₄₈	(IV, R=H)
e	13 β (H), 17 α (H)-diasterane (20S)	C ₂₈ H ₅₀	(III, R=CH ₃)
f	13 β (H), 17 α (H)-diasterane (20R)	C ₂₈ H ₅₀	(III, R=CH ₃)
g	13 α (H), 17 β (H)-diasterane (20S)	C ₂₈ H ₅₀	(IV, R=CH ₃)
	+ 14 α (H), 17 α (H)-sterane (20S)	C ₂₇ H ₄₈	(I, R=H)
h	13 β (H), 17 α (H)-diasterane (20S)	C ₂₉ H ₅₂	(III, R=C ₂ H ₅)
	+ 14 β (H), 17 β (H)-sterane (20R)	C ₂₇ H ₄₈	(II, R=H)
i	14 β (H), 17 β (H)-sterane (20S)	C ₂₇ H ₄₈	(II, R=H)
	+ 13 α (H), 17 β (H)-diasterane (20R)	C ₂₈ H ₅₀	(IV, R=CH ₃)
j	14 α (H), 17 α (H)-sterane (20R)	C ₂₇ H ₄₈	(I, R=H)
k	13 β (H), 17 α (H)-diasterane (20R)	C ₂₉ H ₅₂	(III, R=C ₂ H ₅)
l	13 α (H), 17 β (H)-diasterane (20S)	C ₂₉ H ₅₂	(IV, R=C ₂ H ₅)
m	14 α (H), 17 α (H)-sterane (20S)	C ₂₈ H ₅₀	(I, R=CH ₃)
n	13 α (H), 17 β (H)-diasterane (20R)	C ₂₉ H ₅₂	(IV, R=C ₂ H ₅)
	+ 14 β (H), 17 β (H)-sterane (20R)	C ₂₈ H ₅₀	(II, R=CH ₃)
o	14 β (H), 17 β (H)-sterane (20S)	C ₂₈ H ₅₀	(II, R=CH ₃)
p	14 α (H), 17 α (H)-sterane (20R)	C ₂₈ H ₅₀	(I, R=CH ₃)
q	14 α (H), 17 α (H)-sterane (20S)	C ₂₉ H ₅₂	(I, R=C ₂ H ₅)
r	14 β (H), 17 β (H)-sterane (20R)	C ₂₉ H ₅₂	(II, R=C ₂ H ₅)
	+ unknown sterane		
s	14 β (H), 17 β (H)-sterane (20S)	C ₂₉ H ₅₂	(II, R=C ₂ H ₅)
t	14 α (H), 17 α (H)-sterane (20R)	C ₂₉ H ₅₂	(I, R=C ₂ H ₅)



Shallow Drilling
Elf Aquitaine/Norsk Hydro/Statoil
Barents Sea 1987

Appendix
to

Main
data
report:

Organic
geochemical
data



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