REPORT TITLE/ TITTEL

Source Rock Analysis of well 15/9-11

CLIENT/ OPPDRAGSGIVER

Statoil

RESPONSIBLE SCIENTIST/ PROSJEKTANSVARLIG

P.B. Hall

AUTHORS/ FORFATTERE

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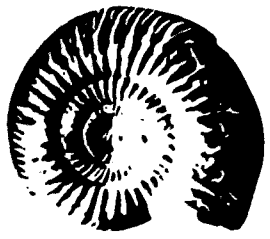

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SUMMARY/ SAMMENDRAG

The analysed section of well 15/9-11 (410-2950m) was divided into ten zones, based on lithology and TOC values.

Zones A and B (410-1100m) consist mainly of greenish claystones and sandstones. They have immature type III or mixed type II/III kerogen with a rich potential for gas and possibly oil.

Zones C, D, E and F (1100-2180m) consist predominantly of claystones, which have mainly immature type III kerogen with a poor to good gas potential.

The claystones of zone G (2100-2360m) have type III or type II/III kerogens. They are immature to moderately mature and have a fair gas potential.

Zone H (2360-2750m) consists mainly of limestone with a poor gas potential.

Zones I and J (2750-2950m) consist of claystones and sandstones. They are moderately mature and have a good to rich potential for gas and/or oil.

KEY WORDS/ STIKKORD

Source Rock Analysis	TOC, Rock-Eval
Sats, Aroms, Py-GC	Microscopic Analysis

063/K/jbl/1

CONTENTS

EXPERIMENTAL AND DESCRIPTION OF INTERPRETATION LEVELS

Total Organic Carbon (TOC)

Picked cuttings of the various lithologies in each sample were crushed in a centrifugal mill. Aliquots of the samples were then weighed into Leco crucibles and treated with hot 2N HCl to remove carbonate and washed twice with distilled water to remove traces of HCl. The crucibles were then placed in a vacuum oven at 50°C and evacuated to 20 mm Hg for 12 hrs. The samples were then analysed on a Leco E C 12 carbon analyser, to determine the total organic carbon (TOC). The results are shown in table 1.

Extractable Organic Matter (EOM)

From the TOC results samples were selected for extraction. Of the selected samples, approximately 100 gm of each was extracted in a flow through system (Radke et al,, 1978, Anal. Chem. 49, 663-665) for 10 min. using dichloromethane (DCM) as solvent. The DCM used as solvent was distilled in an all glass apparatus to remove contaminants.

Activated copper filings were used to remove any free sulphur from the samples.

After extraction, the solvent was removed on a Buchi Rotavapor and transferred to a 50 ml flask. The rest of the solvent was then removed and the amount of extractable organic matter (EOM) determined.

Chromatographic Separation

The extractable organic matter (EOM) was separated into saturated fraction, aromatic fraction and non hydrocarbon fraction using a MPLC system with hexane as eluant (Radke et al., Anal. Chem., 1980). The various fractions were evaporated on a Buchi Rotavapor and transferred to glassvials and dried in a stream of nitrogen. The various results are given in Table 2-6.

Gas Chromatographic Analyses

The saturated and aromatic hydrocarbon fractions were each diluted with n-hexane and analysed on a HP 5730 A gas chromatograph, fitted with a 25 m OV101 glass capillary column and an automatic injection system. Hydrogen (0.7 ml/min.) was used as carrier gas and the injection was performed in the split mode (1:20).

Vitrinite Reflectance

Vitrinite reflectance measurements of the samples, taken at various intervals, were done at IKU. The results are shown in table 8. The samples were mounted in Bakelite resin blocks; care being taken during the setting of the plastic to avoid temperatures in excess of 100°C. The samples were then ground, initially on a diamond lap followed by two grades of corundum paper. All grinding and subsequent polishing stages in the preparation were carried out using isopropyl alcohol as lubricant, since water leads to the swelling and disintegration of the clay fraction of the samples.

Polishing of the samples was performed on Selvyt cloths using three grades of alumina, 5/20, 3/50 and Gamma, followed by careful cleaning of the surface.

Reflectance determinations were carried out on a Leitz M.P.V. microphotometer under oil immersion, R.I. 1.518 at a wavelength of 546 nm.

The surface of the polished block was searched by the operator for suitable areas of vitrinitic material in the sediment. The reflectance of the organic particle was determined relative to optical glass standards of known reflectance. Where possible, a minimum of twenty individual particles of vitrinite was measured, although in many cases this number could not be achieved.

The samples were also analysed in UV light, and the colour of the fluorescing material determined. Below, a scale comparing the vitrinite reflectance measurements and the fluorescence measurements is given.

VITRINITE REFLECTANCE R.AVER. 546 NM	0.20 1516	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10
% CARBON CONTENT DAF.	57	62	70	73	76	79	80.5	82.5	84	85.5
LIPTINITE FLUOR NM	725	750	790	820	840		860	890	940	
EXC. 400 nm BAR. 530 nm colour	G	$G/_Y$	Y	$Y/_O$	L.O	M.O.		D.O.	$O/_R$	R
zone	1	2	3	4	5	6		7	8	9

NOTE: Liptinite NM = Numerical measurements of overall spore colour and not peak fluorescence wavelength.

Relationship between liptinite fluorescence colour, vitrinite reflectance and carbon content is variable with depositional environment and catagenic history. The above is only a guide. Liptinite will often appear to process to deep orange colour and then fade rather than develop or O/R red shade. Termination of fluorescence is also variable.

Processing of Samples and Evaluation of Visual Kerogen

Crushed rock samples were treated with hydrochloric and hydrofluoric acids to remove the minerals. A series of microscopic slides contain strew mounts of the residue:

T-slide represents the total acid insoluble residue.
N-slide represents a screened residue (15 µ mesh).
O-slide contains palynodebris remaining after flotation ($ZnBr_2$) to remove heavy minerals.

X-slides contain oxidized residues, (oxidizing may be required to remove sapropel which embeds palynomorphs, or where high coalification prevents the identification of the various groups).

T and/or O slides are necessary to evaluate kerogen composition/-palynofacies which is closely related to sample lithology.

Screened or oxidized residues are normally required to concentrate the larger fragments, and to study palynomorphs (pollen, spores and dinoflagellates) and cuticles for paleodating and colour evaluation.

So far visual evaluation of kerogen has been undertaken from residues mounted in glycerine jelly, and studied by Leitz Dialux in normal light (halogene) using x10 and x63 objectives. By x63 magnification it is possible to distinguish single particles of diameters about 2 and, if required, to make a more refined classification of the screened residues (particles >15µ).

The colour evaluation is based on colour tones of spores and pollen (preferably) with supporting evidence from colour tones of other types of kerogen (woody material, cuticles and sapropel). These colours are dependant upon the maturity, but are also influenced by the paleoenvironment (lithology of the rock, oxidation and decay processes). The colours and the estimated colour index of an individual sample may therefore differ from those of the neighbouring samples. The techniques in visual kerogen studies are adopted from Staplin (1969) and Burgess (1974).

In interpretation of the maturity from the estimated colour indices we follow a general scheme that is calibrated against vitrinite reflectance values (R_o).

Ro	0.45	0.6	0.9	1.0	1.3
colour index	2-	2	2+	3-	3
Maturity intervals	Moderate mature	Mature (oil window)			Condensate window

The results of the visual kerogen examination are shown in table 7.

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Rock-Eval Pyrolysis

100 mg crushed sample was put into a platinum crucible whose bottom and cover are made of sintered steel and analysed on a Rock-Eval pyrolyser. Results are listed in table 9.

Pyrolysis-Gas Chromatography (Py-GC)

25 mg of extracted kerogen concentrates were programmed pyrolysed (in helium) from 250°C - 500°C at a rate of 25°C/min. A furnace type pyrolyser directly connected to a splitter and fused silica capillary column was used. The pyrolysis product was trapped in a U-shaped part of the column which was cooled in a liquid N_2 nitrogen bath. At the end of the pyrolysis the pyrolysis product was injected by removing the nitrogen bath at a GC-oven temperature of 30°C.

GC chromatographic conditions:-

Column: 25m OV-101 fused silica capillary.
Carrier gas: Helium with inlet pressure 10psi.
Oven program: 30°-260°C at 4°C/min.
Split: 1:20

RESULTS AND DISCUSSION

Lithological description and total organic carbon (TOC)

Generally the claystones or siltstones which constituted more than 10% of a sample were picked and analysed. Occasionally claystones with different colours were picked and analysed separately. Limestones were picked and analysed in a few cases.

Based on variation in the lithology and in TOC values, the analysed section (410-2950m) was divided into 10 zones:

Zone A: 410-560 metres
Zone B: 590-1100 metres
Zone C: 1100-1220 metres
Zone D: 1220-1490 metres
Zone E: 1490-1940 metres
Zone F: 1940-2180 metres
Zone G: 2180-2360 metres
Zone H: 2360-2750 metres
Zone I: 2750-2780 metres
Zone J: 2780-2950 metres

Zone A; 410-560m: Consists predominantly of greenish, sandy clays. The TOC values are high, ranging from 3.1 to 6.2%.

Zone B; 590-1100m: This zone consists mainly of sand/sandstone and shell debris with variable amounts of greenish to olive-grey, sandy claystones. The top of the zone is marked by higher amounts of claystones. The claystones have 0.9-3.1% TOC (i.e. generally good to rich).

Zone C; 1100-1220m: Consists completely of brownish-grey to olive-grey claystone with 1.0-2.1% TOC (generally good TOC abundances).

Zone D; 1220-1490m: The sediments in this zone consist of a mixture of dark-grey, brown claystones with smaller amounts of light olive-grey claystones. The dark-grey claystones have 4.3-6.3% TOC (rich abundances) whereas the light olive-grey claystones have values close to 1.8% TOC (i.e. good abundances).

Zone E; 1490-1940m: This zone consists predominantly of olive-grey claystones. There is generally a good abundance of TOC (1.6-1.9%) except at the bottom of this zone (1910-1940m) where it increases to 2.2%.

Zone F; 1940-2180m: This zone consists mainly of light greenish-grey claystones with only fair TOC values (0.5-0.7%).

Zone G; 2180-2360m: Predominantly grey to dark grey and pale greenish-grey claystones with small amounts of red-brown claystone. Sample M-9696 (2240-2270m) contains 15% limestone. The dark-grey claystones have 0.9-1.5% TOC (generally good abundances) and the pale greenish-grey claystones have 0.1-0.2% TOC (poor abundances).

Zone H; 2360-2750m: The top of the zone consists of sand, limestone and a mixture of claystones. Below a section without samples (2390-2510m) the sediments are mainly composed of limestone with small amounts of claystones. The limestones have 0.0-0.2% TOC. The bottom two samples (2690-2750m) contain 40% marl with 0.4% TOC. Generally poor abundances of organic carbon in this zone.

Zone I; 2750-2780m: This zone consists mainly of silty, dark-grey to greyish-black claystone with 1.8% TOC.

Zone J; 2780-2950m: Consists mostly of sands/sandstones and red-brown to brown sandy claystones and smaller amounts of grey to dark grey, occasionally carbonaceous claystones. One sample from 2840-2850m has 50% limestone. There are small amounts of coal in several samples. The red-brown claystones contain poor to fair abundances of organic carbon (0.4-0.8% TOC). The grey to dark grey claystones contain very variable amounts of organic carbon from fair to rich 0.7-8.0%. Rich values are probably carbonaceous claystones associated with coaly laminae.

Extraction and Chromatographic Separation

Fifteen samples were extracted. The extractable organic matter (EOM) was separated into saturated and aromatic hydrocarbons and NSO fractions. Gas chromatograms of the saturated and aromatic hydrocarbon fractions were obtained.

Extraction Data and Saturated Hydrocarbon Analysis

Zone A; 410-560m: No samples from this zone were extracted.

Zone B; 590-1100m: A sandy, olive grey claystone was extracted (M-9656; 1040-1070m). The n-alkane distribution is unusual. The large nC_{14} peak probably includes a contaminant compound. There is a bimodal n-alkane distribution with maxima at nC_{18} and nC_{31}. There is a slight even n-alkane predominance between nC_{15}-nC_{20} and a very strong odd n-alkane predominance from nC_{24}-nC_{34} (particularly between nC_{29} and nC_{33}). The prominent unresolved hump beneath the n-alkane envelope, and the low pristane/nC_{17} ratio suggests that the hydrocarbons are from a mature source. This distribution is not characteristic for such an immature sediment (indicated by low Rock-Eval T_{max}, high CPI, low vitrinite reflectance). It is probable that there is a contribution from migrated hydrocarbons. In this connection, the percentage of saturated hydrocarbons - 22% - is quite high. A more normal value at this level would be less than 10%.

Zone C; 1100-1220m: Two olive-grey claystone samples were extracted. The saturated hydrocarbon gas chromatograms show some similarities to the sample from zone B except that the n-alkane envelope with a maximum at nC_{18} is much reduced. In M-9659, in particular, the percentage of saturates is also lower and the pristane/nC_{17} ratio is higher. It is probable that there are less migrated hydrocarbons in the two samples from this zone (particularly for M-9659) compared with the sample in zone B.

Zone D; 1220-1490m: Four samples from this zone were analysed. They have a poor to fair amount of extractable hydrocarbons. The saturate/-aromatic hydrocarbon ratio shows an increase with greater depths of the samples. The gas chromatograms of the saturated hydrocarbon fractions are all very similar. The n-alkane distribution indicates that the hydrocarbons are predominantly derived from terrestrial material deposited in mild anoxic conditions i.e. type III kerogens. Steranes and triterpanes are distinctly present, indicating immature samples. The pristane/-nC_{17} ratio varies between 0.7 and 1.0 and the pristane/phytane ratio between 1.4 and 1.8. The CPI lies between 2.1 and 2.8.

Zones E and F; 1490-2180m: Four samples from these zones were analysed. The amount of extractable hydrocarbons is poor to fair. The saturate/-aromatic hydrocarbon ratio shows very large variations. It is very high in sample M-9679 (1730-1760m) and very low in M-9688 (2000-2030m). The gas chromatograms of the saturated hydrocarbon fractions are similar to those of zone D with a strong contribution of C_{25}-C_{33} n-alkanes and the presence of steranes and triterpanes. The amounts of isoprenoid alkanes is much higher than in zone D, especially in the samples from zone E which have pristane/nC_{17} ratios of 3.0-3.6 and pristane/phytane ratios of 2.5-4.4. The increased amount of C_{15}-C_{20} n-alkanes in the sample from zone F (2000-2030m) is probably due to introduced hydrocarbons. This can be either migrated hydrocarbons or mud additive. The latter is probable since the sample extracted - a greenish-grey claystone - has a very low TOC value, and the cuttings in the zone are noticeably stained in some cases.

Zone G; 2180-2360m: The two grey to dark grey claystone samples that were analysed from this zone, have fair amounts of extractable hydrocarbons. The saturate/aromatic hydrocarbon ratio is rather low. The gas chromatogram of the hydrocarbon fraction of sample M-9695 (2210-2240m) is dominated by isoprenoid alkanes and by two peaks in the C_{27}-C_{30} range. These latter two compounds are tentatively identified as a trisnormoretane and a bisnorhopane that have been found in several North Sea crude oils and in samples from the Kimmeridge on the Norwegian continental shelf. The gas chromatogram of sample M-9698 is also dominated by these compounds, but the relative intensity of the n-alkanes is higher in this sample. The presence of C_{25}-C_{32} n-alkanes indicates a contribution from terrestrial material. However, the n-alkane envelope is dominated by lower molecular weight material with a maximum between nC_{15}-nC_{20} probably indicating an input from marine sources.

Zone H; 2360-2750m: From this zone no samples were extracted.

Zone I; 2750-2780m: This sample has a good amount of extractable hydrocarbons. The gas chromatogram of the saturated hydrocarbon fraction shows a terrestrial component. However, as in zone G the C_{15}-C_{20} n-alkanes dominate, indicating a substantial input from organic matter

of algal/bacterial origin. The pristane/nC_{17} ratio is 1.5 and the pristane/phytane ratio is 1.9. The CPI has a value of 1.6.

Zone J; 2780-2950: One sample from this zone was analysed. The amount of extractable hydrocarbons is good. The saturate/aromatic hydrocarbon ratio is low. The gas chromatogram of the saturated hydrocarbon fraction is front end biased, resembling a condensate. The pristane/nC_{17} ratio is 1.4, the pristane/phytane ratio is 2.4 and the CPI is 1.5.

Conclusions The saturated hydrocarbon traces indicate a totally immature section throughout the well, with traces of migrated hydrocarbon in zones B and J (?). Apart from the samples in zones G and I the hydrocarbon pattern of the samples are totally dominated by terrestrial derived material.

Aromatic Hydrocarbon Fractions

Several aromatic fractions contain large amounts of contaminants from an unknown source. Although the chromatograms have been normalized so as to exclude these contaminants, their interpretation is severely hampered.

Zone A; 410-560m: From this zone no samples were extracted.

Zone B; 590-1100m: One sample from this zone was analysed. The intensity of the chromatogram is low. Alkylnaphthalenes are absent. Most prominent peaks are phenanthrene (P) and its C_1(D) and C_2(E) homologues. Several peaks are present in the area of the aromatic steranes and triterpanes (F).

Zones C and D; 1100-1490m: From these zones five samples were analysed. Interpretation of the chromatograms is difficult due to the presence of large amounts of contaminants. The indigenous compounds are dominated by aromatic steranes and triterpanes.

Zones E and F; 1490-2180m: Four samples from these zones were analysed. Although obscured by several contaminants it can be observed that alkylnaphthalenes (A,B,C) phenanthrene (P) and alkylphenanthrenes (D,E) be-

come progressively more important relative to the aromatic steranes and triterpanes with increasing depth of the samples.

Zones G; 2180-2360m: Two samples from this zone were analysed. The trend observed in zones E and F of increasing alkylnaphthalenes and alkylphenanthrenes with increasing depth is continued in this zone. The lower sample (2300-2330m) is dominated by methylnaphthalenes (A).

Zone H; 2360-2750m: From this zone no samples were extracted.

Zones I and J; 2750-2950m: Two samples from these zones were analysed. The chromatograms are dominated by methylnaphthalenes (A). The samples are generally similar. Sample M-9710 (2750-2780m) has higher amounts of naphthalene and of aromatic steranes and triterpanes.

Conclusions The amount of hydrocarbons is very low in these highly immature samples, generally less than 50ppm except for the lowest two samples. The saturated hydrocarbons are dominated by hydrocarbons which are termed geochemical fossils i.e. derived from organisms, no hydrocarbons have been generated from the kerogens. There are some indications that contaminant hydrocarbons are present in zone F, and migrated hydrocarbons particularly in zones B, C and I. The predominant aromatic hydrocarbons in moderate mature to mature samples are generally the C_1-C_3-naphthalenes and C_1-C_2 phenanthrenes plus the non-methylated parent compounds phenanthrene and naphthalene. Except for samples in zone G, H, I and J, the dominant aromatic compounds occur in region F in the chromatograms. These are most probably partly aromatised steranes and triterpanes - i.e. geochemical fossils which have undergone only slight rearrangement during deposition and early diagenesis. Only small amounts of migrated or contaminant hydrocarbon (from mud additives) will swamp the original, representative hydrocarbon pattern. For example the sample from zone F shows a larger contribution from C_1-C_3 naphthalenes - this is probably due to contamination as has been indicated in the discussion on the saturated hydrocarbons.

However, in zones G and I and J the aromatic hydrocarbons are characteristic of type II or type III kerogens which are moderately mature.

Analyses in Transmitted Light

The sedimentary organic matter of well 15/9-11, interval 470m to 2950m, was evaluated on the basis of 36 samples, all of which were picked lithologies from ditch cuttings.

Maturity

The organic remains of samples from 470m to 1900m of this hole reflect mostly material from terrestrial sources and of very low maturity. On the basis of bisaccate pollen we have evaluated a TAI of 1- or 1 (thermal alteration index). The deposits are thus immature.

Slightly darker material, TAI of 1 or 1/1+, was met from 1900m to 2300m, but could be due to an environmental (lithological) control.

For the deposits at 2750/80m and below, we have evaluated TAI as 1+/2 or 2-/2. Probably the material is still not mature but also here TAI is influenced by mildly oxidated material.

The dinoflagellate cysts although they are excellently preserved were outruled as colour indicators. Cysts are, in the interval 470m to 2300m, generally very light coloured, but occasionally have a natural staining.

The sedimentary organic matter

At the low maturity levels encountered in this well we have difficulties in distinguishing the original source of the transformation products met. We have evaluated a main terrestrial input as probably of woody nature. Well preserved woody material is rare.

On the basis of the graphs presented in the Maturation table we tentatively suggest the following zonation. A good zonation on the basis of the organic matter in this well would however demand a more detailed study also of the fossils which in most samples are embedded by the matrix.

- An upper interval down to 1160m, dominated by derivation products of woody material, with stagnant bottom conditions.

- A second, lower interval, 1160m to 1850m, with even stronger stagnant bottom conditions, but closer to vegetation judged by the more abundant cuticles and pollen grains.

- The third interval, 1880m to 2030m and 2150m to 2300m, includes more reworked material and considerable amounts of variable pollen types.

- The fourth interval, 2570m to 2880m, have barren or nearly barren samples on top and at the base. The interval is of higher maturity and reflects more high energy environment, closer (?) to vegetation but with stagnant bottom conditions.

Examination in Reflected Light

Thirty-six samples were chosen for examination in reflected light.

Throughout the section examined (470 - 2950m) the samples are very monotonous (dominantly claystones) and in general have low contents of "solid" organic material. Where this is higher it is generally due to a high bituminite content and the samples are notable for this and associated bitumen staining. The maturity of the section is low throughout with only a few exceptions where higher values are probably attributable to reworked material.

Examination of the samples under ultra-violet light irradiation and analysis of fluorescence colours reveals a rather invariable immature section. One notable aspect is the amount of fluorescing dinoflagellate cysts/acritarchs, often in fair preservation. This is unusual and their presence and low fluorescence colour could be an added indication of low maturity. Their environmental significance (deep water) may account for the paucity of terrestrial material (vitrinite and inertinite).

Sample M-9637, 470 - 500m: Claystone, No Determination Possible
The sample contains only bitumen wisps and blobs with reworked vitrinite (Ro 0.75%). There is an overal bitumen staining. No true primary vitrinite is located. Ultra-violet light shows a trace of indistinct green fragments, possibly spores.

Sample M-9645, 710 - 740m: Claystone and sandstone, No Determination Possible
The sample is almost barren of organic material, containing only a few traces of bitumen wisps and bitumen staining. Ultra-violet light reveals mineral fluorescence only.

Sample M-9649, 830 - 860m: Sandstone, claystone and shells, Ro = 0.32 (3)
The sample has a low organic content confined to the claystone. All of the organic material occurs as small particles difficult to identify. There is a low vitrinite and inertinite content. Ultra-violet light shows only mineral fluorescence.

Sample M-9655, 1010 - 1040m: Sandy claystone, sandstone and shells, Ro = 0.32 (15)
The sandy claystone has a moderate organic content. Bituminite and bitumen staining dominate and all of the organic material is very dark and low reflecting. There is an excellent distribution of values. Ultra-violet light reveals a low content of green (spore?) fragments and dinoflagellate cysts.

Sample M-9656, 1040 - 1070m: Sandstone, claystone and lignite, Ro = 0.32 (3)
Apart from the lignite (which could be additive) the sample has a low organic content. This is dominantly bitumen interstitial in the sandstone. The lignite has an Ro of 0.25%. Ultra-violet light shows green spore fluorescence from the lignite but otherwise only mineral fluorescence.

Sample M-9659, 1130 - 1160m: Claystone, sandstone, shells and lignite, Ro = 0.40 (5)
The claystone which was measured for total organic carbon was analysed here. It has a low organic content which is dominantly bitumen stringers. There is some very dark bitumen staining. The lignite (additive?) has a similar reflectance to the sample above. There is a poor distribution of values. Ultra-violet light reveals a trace of green (spore?) fragments.

sample M-9660, 1160 - 1190m: Claystone, Ro = 0.44 (2)
The sample has a poor organic content which is dominantly bituminite and bitumen staining. There is a trace of inertinite with a low reflectance (0.6%) and only two possible vitrinite fragments. There are some signs of oxidation. Ultra-violet light reveals a trace of green/yellow indistinct fragments.

Sample M-9661, 1190 - 1220m: Claystone, Ro = 0.35 (13)
The sample has a moderate organic content but this is very dominantly bituminite with very heavy bitumen staining in places. There is a low vitrinite content and a poor distribution of values. Ultra-violet light reveals a moderate to high content of green spores and dinoflagellate cysts.

Sample M-9662, 1220 - 1250m: Claystone, Ro = 0.34 (17)
The sample has a high organic content which includes vitrinite, bituminite and bitumen staining but with a low inertinite content. The vitri-

nite occurs mainly as pitted stringers. Ultra-violet light shows a trace of green spores and dinoflagellates.

Sample M-9663, 1250 - 1280m: Sandy claystone, Ro = 0.32 (16)
The sample has a low organic content which is dominantly corroded bituminite with associated bitumen staining. There is a low inertinite content and poor subordinate vitrinite. There are signs of strong localised oxidation. Ultra-violet light shows a moderate content of variably preserved green dinoflagellate cysts.

Sample M-9664, 1280 - 1310m: Varied claystones, Ro = 0.38 (7)
The sample has a low organic content which is dominantly bituminite and subordinate, poorly preserved vitrinite. There is very little inertinite. Oxidation is noted and iron staining makes assessment of bitumen staining difficult. Ultra-violet light shows green fluorescence from a few spores and dinoflagellate cysts.

Sample M-9665, 1310 - 1340m: Claystone, Ro = 0.36 (16)
The sample has a high organic content which is dominantly vitrinite although this is in a poor condition. There is locally heavy bitumen staining. Ultra-violet light shows a trace of green and green/yellow spores and one orange (hydrocarbon?) speck.

Sample M-9666, 1340 - 1370m: Claystones, No Determination Possible
There is a low organic content and this is only bituminite and bitumen staining. There is no obvious primary vitrinite. It is a poor sample. Ultraviolet light shows traces of green fragments of spores and/or cysts.

Sample M-9667, 1370 - 1400m: Claystones, No Determination Possible
There is a low organic content which is dominantly bituminite with a trace of inertinite. There is heavy bitumen staining and the organic material is all corroded. No primary vitrinite is observed. Ultra-violet light shows a low content of green spores and dinoflagellates.

Sample M-9668, 1400 - 1430m: Claystone, Ro = 0.39 (4)
The sample has a low organic content which is dominantly bituminite with a few small, rounded inertinite fragments and only four possible primary vitrinite particles. The sample is poor and is variably masked by bitu-

men and iron staining. Ultra-violet light shows a trace of green/yellow and yellow fragments (spores?).

Sample M-9669, 1430 - 1460m: Claystone, Ro = 0.32 (10)
The sample has a low to moderate organic content but this is dominantly bitumen staining. There is some bituminite and vitrinite but it is in a poor state of preservation. Ultra-violet light shows a trace of green and green/yellow spores.

Sample M-9670, 1460 - 1490m: Claystone and limestone, Ro = 0.33 (4)
The sample has a low organic content. This is dominantly bituminite with a trace of small inertinite fragments. There is very little possible primary vitrinite and this is corroded. It is a poor sample and there is a variable bitumen staining. Ultra-violet light shows a few green dinoflagellate cysts and a trace of green/yellow fragments, possibly spores.

Sample M-9671, 1490 - 1520m: Claystone/marl, No Determination Possible
The sample contain only bitumen wisps and staining which is very heavy locally. No vitrinite or inertinite is located. Ultra-violet light shows a low to moderate content of green/yellow cysts and spores.

Sample M-9672, 1520 - 1550m: Claystone, Ro = 0.33 (2)
The sample has a low to moderate organic content but this is almost totally bitumen blobs and a high concentration of bitumen wisps in some clasts. There is a trace of inertinite and reworked vitrinite and only two particles of possibly primary vitrinite. Ultra-violet light shows a low content of large green wisps (spores?).

Sample M-9674, 1580 - 1610m: Claystone, Ro = 0.42 (1)
The sample has a low organic content. Bitumen wisps dominate and there is heavy bitumen staining in places. There are a few round inertinite particles but only one possible primary vitrinite fragment. The value is therefore to be treated cautiously. Ultra-violet light shows a trace of green/yellow spores and cysts.

Sample M-9676, 1640 - 1670m: Claystones, Ro = 0.36 (7)
The sample has a moderate organic content but this is dominantly bitumen wisps with localised bitumen staining. There are only a few vitrinite particles and a trace of inertinite. No fluorescence is observed.

Sample M-9678, 1700 - 1730m: Claystone, Ro = 0.45 (3)
The sample has a low organic content. This is dominantly bitumen wisps and occasional bitumen staining. There is only a trace of vitrinite and inertinite and this is gnarled and in poor condition. Ultra-violet light shows a trace of green/yellow fragments and mineral fluorescence.

Sample M-9680, 1760 - 1790m: Claystones, Ro = 0.31 (1)
The sample contains a very high content of bitumen wisps and staining in same clasts but almost no other organic material. One possible vitrinite particle is recorded but must be treated cautiously. No definite organic fluorescence is observed.

Sample M-9682, 1820 - 1850m: Claystone, Ro = 0.33 (1)
The sample has a low to moderate organic content and is similar to M-6080 - the organic material is almost exclusively bituminite wisps and staining with perhaps one primary vitrinite particle. Ultra-violet light reveals a low content of very small green fragments (spores?).

Sample M-9684, 1880 - 1910m: Claystone, Ro = 0.40 (6)
The sample has a high concentration of bitumen wisps especially in the fine grained areas and there is some associated bitumen staining. Inertinite is second in abundance and there are only a few poor vitrinite particles. Ultra-violet light shows a trace of green/yellow indistinct fragments.

Sample M-9685, 1910 - 1940m: Claystone, Ro = 0.46 (3)
The sample has a low to moderate organic content. This is dominantly bitumen with heavy bitumen staining and high concentrations of bitumen wisps in places. The sample is poor for vitrinite. No fluorescence is observed.

Sample M-9688, 2000 - 2030m: Claystone and sandstone, No Determination Possible
The claystone contains a variable amount of bitumen wisps which is very high in some clasts. There are a few inertinite and reworked vitrinite

particles but no primary vitrinite is observed. No fluorescence is observed.

Sample M-9692, 2150 - 2180m: Claystone, No Determination Possible
The sample is almost identical to M-9688 and contains almost exclusively bituminite and bitumen staining with just a trace of inertinite. Ultra-violet light shows a trace of green/yellow fragments (spores?).

Sample M-9694, 2180 - 2210m: Claystones and limestone, Ro = 0.61 (1)
The sample is very mixed and appears to consist of three different claystones and a limestone. The limestone is barren as is one of the claystones which is red and oxidised. One of the claystones has a very high bitumen content whilst the third claystone which was analysed for total organic carbon contains dominantly reworked vitrinite and inertinite with one possible primary vitrinite particle. This seems high and is possibly reworked. Ultra-violet light shows a moderate content of green/yellow spores which would imply that the reflectance value is reworked but it is difficult to judge if these are caved or not.

Sample M-9695, 2210 - 2240m: Claystones, Ro = 0.57 (6)
The sample contains dominantly bitumen and inertinite with only a very poor vitrinite component (gnarled and pitted). There is a wide spread of values. There is a trace of mineral fluorescence but no define organic fluorescence.

Sample M-9697, 2270 - 2300m: Claystones, Ro = 0.67 (6)
The sample contains a moderate to high bitumen and inertinite/reworked vitrinite content with the bitumen occurring dominantly as wisps. There is however only a low, poor very variable vitrinite content. The value seems high. A low content of green fluorescing spores is observed.

Sample M-9705, 2600 - 2630m: Limestone, No Determination Possible
The sample is barren. No fluorescence is observed.

Sample M-9710, 2750 - 2780m: Sandy claystone, Ro = 0.44 (9)
The sample has a moderate organic content which includes a moderate to high proportion of bitumen and bitumen staining. There is a low inertinite and vitrinite content. The vitrinite is cleaner than in most of

the samples. Ultra-violet light shows a low to moderate content of green/yellow and yellow spores.

Sample M-9711, 2780 - 2810m: Sandy claystone and sandstone, Ro = 0.57 (9)
The sample has a moderate to high organic content but this is very dominantly inertinite and reworked vitrinite. There is a low vitrinite content but it is clean and occurs as good stringers. Ultra-violet light shows green/yellow indistinct fluorescence (spores?) and green resin in low amounts.

Sample M-9714, 2850 - 2880m: Sandy claystone, Ro = 0.43 (1) and 0.57 (2)
The sample has a moderate organic content but this is very dominantly inertinite with reworked vitrinite and bituminite in approximately equal amounts. There are only three possible primary vitrinite particles and these are very different. Ultra-violet light shows a trace of green/yellow and yellow spores.

Sample M-9719, 2940 - 2950m: Sandstone, claystone, lignite and drilling mud, Ro = 0.43 (1)
This is a bad sample. The claystone and the sandstone are rich in bitumen. Only one possibly primary vitrinite particle is observed and this seems low - it could be caved. Ultra-violet light shows a trace of green fluorescence from possible cuticles and two yellow/orange stringers (spores?).

Rock-Eval Pyrolysis

A total of fifty samples from the analysed section were picked for Rock-Eval Pyrolysis.

Zone A; 410-560m: One sample from this zone was analysed, M-9637 (470-500m) which is a claystone with 6.2% TOC. The hydrogen and oxygen indices indicate a mixed type II/III kerogen. The very low T_{max} suggests there is a contribution of high molecular weight material (possibly soluble asphaltic material) to the S_2 peak. The sample has a very high production index suggesting the presence of migrated hydrocarbons.

Zone B; 635-1100m: From this zone five sandy claystones were analysed. TOC values are generally rich (i.e. >3%). Hydrogen and oxygen indices indicate type II and mixed type II/III kerogens. The top sample M-9641 (590-620m) is a sandy claystone with 0.85% TOC and the kerogen is type III. There appears to be a slight improvement in kerogen type from top to bottom of the zone. T_{max} values indicate immaturity. The samples have a rich potential for oil and gas. Production indices are very high probably as a result of migrated hydrocarbons.

Zone C; 1100-1220m: Three samples from this zone were analysed. They have type III kerogen of a low maturity. The potential as gas source rocks is fair.

Zones D and E 1220-1940m: Twenty-four samples from these two zones were analysed. All samples have immature type III kerogen. Higher oxygen indices are seen in the lower TOC, olive-grey claystones which occur as thin interbeds in zone D and are the major lithology in zone E. The petroleum potential of these claystones is less than that of the associated dark grey, brown claystones in zone D. Zone D has a good potential as a gas source rock and the gas potential of zone E is fair.

Zone F; 1940-2180m: Three samples from this zone were analysed. The kerogen is of type III or mixed type III/IV. T_{max} values indicate immature sediments. The presence of migrated hydrocarbons in two of the samples (1970-2000m, 2120-2150m) is suggested by the high produc-

tion indices. The potential for gas is poor to fair (1940-1970m).

Zone G; 2180-2360: Five samples from this zone were investigated. The samples are immature and have type III kerogens. They have a fair potential as source rocks for gas.

Zone H; 2360-2750m: Consists mostly of TOC-poor limestones, however, two claystone samples from this zone were analysed. The kerogen is type III and immature. The high production index of sample M-9708 (2690-2770m) suggests the presence of migrated hydrocarbons. The limestone or marl samples analysed contain kerogen type IV. The samples generally have a poor potential for gas.

Zone I; 2750-2780m: The sample from this zone has type II kerogen. The maturity is still low. The production index value for this sample (0.1) indicates early maturity at most, assuming that there are no migrated hydrocarbons in the sample affecting the production index value. The sediment has a good potential as source rock for oil.

Zone J; 2780-2950m: Six samples from this zone were investigated. The kerogen in the grey-grey dark grey claystones is mixed type II/III or type III (2850-2880m). T_{max} values are still indicative of immature sediments. The high production index of sample M-9713 (2840-2850m) is probably due to migrated hydrocarbons. The sediments have a fair to good potential as source rocks for gas and some oil, whereas the oil and gas potential of samples M-9713 (2840-2850m) and M-9719 (2940-2950m) is rich.

Pyrolysis-gas Chromatography

Fifteen samples were analysed using thermal evaporation/pyrolysis-gas chromatography.

Zones A and B; 410-1100m: No samples from these zones were investigated.

Zone C; 1100-1220m: Sample M-9659 (1130-1160m) has a low alkene/alkane homology. Alkylbenzenes and phenol are abundant. The chromatogram is

characteristic of vitrinitic/woody material. In sample M-9661 (1190-1220m) alkenes/alkanes are more prominent which probably represent a small higher plant wax component.

Zones D and E; 1220-1940m: Eight samples from these zones were investigated. They are all very similar to sample M-9661 in showing a moderate alkene/alkane homology up to around C_{25} and an abundance of alkylbenzenes and phenol. The chromatograms are indicative of type III kerogens.

Zone F; 1940-2180m: No samples from this zone were investigated.

Zone G; 2180-2360m: The two samples from this zone are richer in alkenes/alkanes relative to zones D and E. The general appearance of the chromatograms suggests a mixed type II/III kerogen.

Zone H; 2360-2750m: No samples from this zone were investigated.

Zones I and J; 2750-2950m: Two samples from these zones were investigated. Both samples have a relatively low abundance of alkylbenzenes. Sample M-9710 (2750-2780m) is dominated by an alkene/alkane homology reaching up to C_{29}. This is indicative of a type II kerogen. The alkene/-alkane homology is less dominant in sample M-9712 (2810-2840m). The kerogen is probably of a mixed type II/III.

CONCLUSIONS

Zones A and B; 410-1100m: Lithology consists mainly of greenish sandy clays. Below 620m important amounts of sand/sandstones and shell debris are present. The claystone samples are rich in TOC. Visual kerogen analysis indicate mainly woody material. Examination in reflected light mainly shows bitumen/bituminite with rare vitrinite particles. Rock-Eval pyrolysis indicates type III or mixed type II/III kerogen with a rich potential for oil and gas. The latter is supported in sample M-9637 (470-500m) by the large amount of algal material seen from visual kerogen analysis. Vitrinite reflectance data, thermal alteration indices, Rock-Eval T_{max} and compositions of saturated hydrocarbon fractions all indicate a low maturity. The saturated hydrocarbon fractions also show the presence of migrated hydrocarbons, which is confirmed by very high Rock-Eval production indices.

Zones C, D and E; 1100-1940m: The lithology of these zones consists of brownish-grey to olive-grey, dark grey to brown, and light olive-grey claystones. TOC values are good in the top and bottom part whereas they are rich in the dark-grey claystones (1220-1550m). Visual kerogen analysis indicates abundant cuticles and pollen grains. Reflected light analysis shows mainly bituminite/bitumen with low vitrinite and trace or absent inertinite. Rock-Eval pyrolysis indicates fair (zones C and E) and good (zone D) type III kerogen. This is confirmed by pyrolysis-gas chromatography and by the composition of the saturated hydrocarbon fractions. Vitrinite reflectances, spore colorations, Rock-Eval T_{max} and distributions of saturated hydrocarbons are indicative for immature samples.

Zone F; 1940-2180m: Lithology consists mainly of light greenish-grey claystones with fair TOC values (0.5-0.7%). Visual kerogen analysis and examination in reflected light yield similar results as in zone E. Rock-Eval pyrolysis indicates poor to fair type III or mixed type III/IV kerogens. Maturation parameters are characteristic for immature samples. The gas chromatogram of the saturated hydrocarbon fraction from sample M-9688 (2000-2030m) suggests the presence of introduced hydrocarbons, probably from mud additives. This is in agreement with the observed high production index in Rock-Eval pyrolysis.

Zone G; 2180-2360m: Consists predominantly of grey to dark-grey and pale, greenish-grey claystones. The former have generally a good abundance of TOC (0.9-1.5%). Visual kerogen analysis shows abundant pollen and dinoflagellates. Examination in reflected light shows bitumen, inertinite and (reworked) vitrinite. Rock-Eval data suggests type III kerogens, whereas pyrolysis-gas chromatograms, being relatively rich in alkenes/alkanes, resemble those of mixed type II/III kerogens. The composition of the EOM also suggests a contribution from marine sources (type II kerogen) as can be deduced from the abundance of C_{15}-C_{20} n-alkanes. Maturation parameters give somewhat different results. Spore coloration and fluorescence, and Rock-Eval T_{max} values suggest immature to slightly mature samples while vitrinite reflectance measurements yield moderate mature to mature values. The latter might be the result of the presence of reworked vitrinite. The sediments have a fair potential as source rocks for gas. The composition of the saturated hydrocarbon fractions (dominant trisnormoretane and bisnorhopane?) is similar to those of samples from the Kimmeridge formation, in particular, at other locations on the Norwegian Continental Shelf.

Zone H; 2360-2750m: This zone consists mainly of limestones with small amounts of claystones. The top of the zone is a mixture of sand, limestone and various claystones. TOC values are generally poor. Visual kerogen analysis shows rare organic particles, mainly cuticles. During examination in reflected light no organic particles were observed. Rock-Eval pyrolysis indicates type III kerogen in claystones and type IV kerogen in limestones. The samples are immature to moderate mature. The gas potential is generally poor.

Zone I; 2750-2780m: This short zone consists mainly of silty, dark-grey to greyish-black claystones with 1.8% TOC (good). Visual kerogen analysis shows mainly terrestrially derived material (pollen, wood, cuticles) and in reflected light a high proportion of bitumen can be recognised. Rock-Eval pyrolysis and pyrolysis-gas chromatography indicate type II kerogen. The sample is moderate mature and has a good oil source potential.

Zone J; 2780-2950m: Lithology consists mainly of sands/sandstones and red-brown to brown sandy claystones with smaller amounts of dark-grey to grey claystones, occasionally carbonaceous and associated with trace

amounts of coal. Visual kerogen examination in reflected light shows mainly inertinite and reworked vitrinite. The kerogen is type III or mixed type II/III as can be deduced from Rock-Eval pyrolysis and pyrolysis-gas chromatography. Maturation parameters indicate moderate mature samples. The potential for gas and possibly some oil is fair to good.

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Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology	
M-9635	410-440	3.84	100%	Clay, greenish, occasionally slightly sandy, calcareous, fossiliferous (shell fragments)
M-9637	470-500	6.23	95%	Clay, as above
			5%	Mud additive, white, soft
			Sm.am.	Sand, quartz, clear, medium - coarse, subrounded - rounded
M-9639	530-560	3.06	100%	sandy Clay, greenish, rich in foraminifera and shell fragments, sand, quartz, fine - medium, coarse, subangular - subrounded, slightly pyritic, slightly glauconitic
M-9641	560-620	0.85	100%	sandy Clay/Claystone, greenish, silty, medium, coarse, very coarse, fine, mostly subrounded - rounded, micromicaceous
M-9643	650-680		65%	Sand, quartz and rock fragments, medium, coarse, very coarse, mostly subrounded
		1.85	35%	sandy Clay/Claystone, as above
				Abundant shell fragments
M-9645	710-740		35%	Sand, as above
		3.10	65%	sandy Clay/Claystone, as above
			Sm.am.	Shell fragments, foraminifera, pyrite
M-9647	770-800	2.75	100%	Clay, sandy as above, less sandy than above

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Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology
M-9649	830-860		30% Sand, quartz, fine - medium, subrounded
			40% Shell fragments
		3.13	30% Clay, sandy, olive grey, some slightly pyritic
			Sm.am. Pyrite
			Trace Glauconite
M-9651	890-920		55% Shell debris and foraminifera
			35% Sand, quartz, clean, fine - medium, subangular, coarse and very coarse, subrounded, some rounded
			10% silty Claystone, olive grey, occasionally, sandy
			Sm.am. Pyrite
			Trace Glauconite, deep green
M-9653	950-980		50% Shell debris
			45% Sand/sandstone, coarse, very coarse, medium, mostly subrounded - rounded, occasionally cemented by calcite and contains shell debris
			5% sandy Claystone, dark olive grey, (greenish) fine, subrounded
			Sm.am. micromicaceous
M-9655	1010-1040		40% Shell debris
			45% Sand, as above, but with a decrease in grain size and
		2.81	15% sandy Claystone/clayey Sandstone, olive grey - brown, rich in small shell fragments, micromicaceous, micaceous, occasionally slightly glauconitic

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Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology	
M-9656	1040-1070		5%	Shell debris
			45%	Sand, as above
		2.64	45%	clayey Sandstone, as above
			5%	Claystone, brown, (?coaly - woody)
			Sm.am.	Glauconite
M-9557	1070-1100		15%	Shell debris
		1.64	20%	Sandy claystone, grey - olive grey, brown (greyish), micromicaceous, pyritic
			65%	Sand, clear, very fine - fine, subangular - subrounded, medium - coarse, mostly subrounded - rounded
			Sm.am.	Pyrite, Glauconite
M-9658	1100-1130		5%	Shell debris
			40%	Sand, quartz, clean, very fine - fine, subangular - subrounded, decrease in content of medium - coarse Sand
		0.98	55%	clayey Sandstone - sandy Claystone, grey, brownish grey, micaceous, glauconitic, calcareous
M-9659	1130-1160	1.07	100%	Claystone, olive grey, occasionally slightly sandy, micromicaceous, occasionally abundant Sponge spicules, slightly pyritic (fine grained framboidal), calcareous
			Sm.am.	Sand, as above; Shell debris, Siderite (succrosic); Glauconite
M-9660	1160-1190	1.84	100%	Claystone, as above, but somewhat darker and with abundant brown stained fragments
			Sm.am.	Cement

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Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology
M-9661	1190-1220	2.12	100% Claystone, olive grey - brown Sm.am. Dolomite; Cement
M-9662	1220-1250	5.36	55% Claystone, brown, micromicaceous, Sponge spicules
		1.80	45% Claystone, olive grey, micromicaceous, some Sponge spicules, slightly pyritic Sm.am. Shell fragments
M-9663	1250-1280	5.96	50% Claystone, brown, as above 45% Claystone, light olive grey 5% Claystone, light olive grey, occasionally stained yellow
M-9664	1280-1310	6.27	40% Claystone, brown, as above 60% Claystone, olive grey - light olive brown
M-9665	1310-1340	4.40	60% Claystone, dark grey, micromicaceous, pyritic (very fine grained framboidal) 30% Claystone, olive grey - light olive brown Abundant Claystone, yellowish brown Sm.am. Glauconite
M-9666	1340-1370	4.91	85% Claystone, dark grey - dark greyish brown, increase in pyrite content, glauconitic
		1.78	15% Claystone, olive grey - light olive grey Sm.am. Glauconite, pale bluish green

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Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology
M-9667	1370-1400	5.22	90% Claystone, dark grey, as above, slightly lustrous 10% Claystone, light olive grey - white
M-9668	1400-1430	5.16	95% Claystone, dark grey (brownish), as above 5% Claystone, light olive grey - white Sm.am. Glauconite; Shell fragments
M-9669	1430-1460	4.28	90% Claystone, dark grey, as above 5% Claystone, light olive grey 5% Glauconite, pale bluish green
M-9670	1460-1490	4.97	89% Claystone, dark grey, as above 5% Dolomite, greyish white 3% Glauconite, as above 3% Claystone, light olive grey - white
M-9671	1490-1520	5.03 1.77	15% Claystone, dark grey, as above 85% Claystone, olive grey, micromicaceous, (slightly), pyritic, occasionally glauconitic, pale bluish green Abundant Dolomite, grey Sm.am. Glauconite; Claystone, greyish white
M-9672	1520-1550	5.11 1.87	15% Claystone, dark grey, as above 85% Claystone, olive grey, as above Sm.am. Dolomite; Claystone, greyish white; Glauconite; Shell fragments
M-9673	1550-1580	1.74	5% Claystone, dark grey, as above 92% Claystone, olive grey, as above 3% Claystone, light brownish white Sm.am. as above

Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology	
M-9674	1580-1610	1.77		As above, the olive grey Claystone is getting more fissile
M-9675	1610-1640		7%	Claystone, dark grey (brownish), as above
		1.58	93%	Claystone, olive grey, as above
			Sm.am.	as above
M-9676	1640-1670		3%	Claystone, dark grey, as above
			2%	Claystone, light brownish white
		1.63	95%	Claystone, olive grey, as above
			Trace	glauconite
M-9677	1670-1700	1.50	98%	Claystone, olive grey, as above
			2%	Claystone, light brownish white
M-9678	1700-1730	1.60	97%	Claystone, olive grey, as above
			3%	Claystone, light brownish white
M-9679	1730-1760	1.53	97%	Claystone, olive grey, as above
			3%	Claystone, light brownish white, ?dolomitic
M-9680	1760-1790	1.72		As above, but main lithology slightly darker
M-9681	1790-1820	1.85	100%	Claystone, olive grey, micromicaceous
			Sm.am.	Claystone, light brownish white; Dolomite; pyritic (fine grained, finely dispersed framboidal)
M-9682	1820-1850	1.80	100%	Claystone, olive grey, as above
			Sm.am.	As above

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Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology	
M-9683	1850-1880	1.75	100%	Claystone, olive grey - grey, as above
			Sm.am.	as above and secondary brown Calcite
M-9684	1880-1910	1.69	100%	Claystone, grey - olive grey, as above
				Abundant claystone, light brownish white, calcareous, hard
M-9685	1910-1940	0.70	35%	Claystone, light green, very slightly micromicaceous, subfissile
		2.20	65%	Claystone, grey, as above, slightly darker
			Sm.am.	Claystone, light brownish white
M-9686	1940-1970	0.61	85%	Claystone, light green, greenish grey, as above
		2.46	15%	Claystone, grey, as above
			Sm.am.	Sideritic claystone, brown, hard
			Trace	Sandstone, very fine, micaceous, ?glauconitic, argillaceous
M-9687	1970-2000	0.57	95%	Claystone, light green, greenish grey - light green, as above
			5%	Claystone, grey, as above
			Sm.am.	as above
M-9688	2000-2030	0.48	100%	Claystone, light green - greenish grey
			Sm.am.	as above, and Claystone, grey
M-9689	2030-2060	0.53	100%	Claystone, light greenish grey, as above
			Sm.am.	As above
				Yellowish brown staining of the cuttings

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Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology	
M-9690	2060-2090	0.46	100%	Claystone, slightly greenish grey - grey and dark grey, subfissile
			Sm.am.	?Siderite/sideritic Claystone
M-9692	2120-2150	0.67	95%	Claystone, as above
			5%	Claystone, brown - purplish brown
			Trace	Pyrite
M-9693	2150-2180	0.01	30%	Claystone, red-brown, subfissile
		0.61	45%	Claystone, pale (bluish) green, subfissile
			25%	Claystone, greenish grey - grey, as above
M-9694	2180-2210		10%	Limestone/marl, white, greyish white, light brownish white
			15%	Claystone, red-brown, as above
			55%	Claystone, pale green, pale bluish green, as above
		1.08	20%	Claystone, grey, as above
			Sm.am.	Siderite, succrosic
M-9695	2210-2240		5%	Claystone, red-brown
			40%	Claystone, pale green, as above
		1.47	55%	Claystone, grey (bluish) often finely laminated
			Trace	tuffaceous Claystone; Coal
M-9696	2240-2270		15%	Limestone and marly Limestone, white, greyish white, light brownish white
			20%	Claystone, pale bluish/greenish grey
		1.36	65%	Claystone, grey, grey - dark grey, pyritic (framboidal), often laminated

Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology	
M-9697	2270-2300		5%	Claystone, pale greenish grey, as above
		1.23	95%	Claystone, grey, grey - dark grey, as above
			Sm.am.	Limestone; Claystone, red-brown
M-9698	2300-2330	0.13	20%	Claystone, pale bluish/greenish grey
		0.87	80%	Claystone, grey, grey - dark grey, laminated
			Sm.am.	Claystone, red-brown; Marl, light brownish white
M-9699	2330-2360	0.16	65%	Claystone, pale greenish grey
		1.16	30%	Claystone, grey, some laminated, as above
			5%	Claystone, greyish white
			Sm.am.	Claystone, red-brown, brown; Sandstone, fine, subangular
			Trace	Coal
				Abundant staining on cuttings by mud contaminant ?(Oil)
M-9700	2360-2390		35%	Sand, Sandstone, clean, milky white, fine - medium, coarse, subangular, argillaceous, very slightly glauconitic, carbonaceous in parts
			5%	Claystone, brown, occasionally with Sponge spicules
			10%	Claystone, grey (slightly bluish)
		0.20	50%	Claystone, pale green - pale greenish grey, partly subfissile
				Some contamination of ? diesel on a few of the sand grains

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Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology
M-9702	2510-2540	0.28	25% Sand, coarse, very coarse, subangular - subrounded, etched surface, good sorting 15% Limestone, white, chalky, partly hard 5% Claystone, red-brown 3% Claystone, brown 2% Claystone, olive 30% Claystone, pale green 20% Claystone, grey (pale bluish)
M-9703	2540-2570	0.02	75% Limestone, white, very pale brownish white in parts 10% Claystone, brown 15% Claystone, grey Sm.am. Claystone, pale green; red-brown; sand, medium coarse, subrounded
M-9704	2570-2600	0.18	90% Limestone, white - very pale red-brown 10% Claystone, grey, brown, red-brown Sm.am. Cement
M-9705	2600-2630	0.19	95% Limestone, pale red-brown - white 3% Claystone, red-brown/purple 2% Cement
M-9706	2630-2660	0.16	50% Limestone, pale red-brown - white 45% Limestone, very slightly greenish white - white 3% Claystone, red-brown, as above 2% Claystone/marl, light greyish white Sm.am. Cement; Claystone, olive

IKU

Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology
M-9707	2660-2690		3% Claystone, red-brown, as above
			50% Limestone, pale red-brown - white, argillaceous, occasionally slightly glauconitic
		0.18	47% Limestone, greyish - very pale greenish white, argillaceous, occasionally glauconitic, micromicaceous
M-9708	2690-2720		10% Claystone, red-brown, calcareous, with thin limestone lamina
			40% Limestone, pale red-brown, as above
			10% Limestone, very pale greenish white, as above
		0.36	40% Marl, greyish white - grey, light grey, micromicaceous
			Abundant Steel fragments
M-9709	2720-2750		10% Claystone, red-brown, as above
			40% Limestone, pale red-brown, as above
			10% Limestone, light grey - very pale greenish white
		0.42	40% Marl, marly claystone, grey - greyish white
			Very abundant Steel fragments

IKU

Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology
M-9710	2750-2780	1.80	60% Claystone, silty, occasionally sandy, dark grey - greyish black, micromicaceous, pyritic (very fine grained framboidal) carbonaceous 15% Claystone, red-brown 15% Limestone, pale red-brown - white 10% Claystone, greenish grey - grey Abundant Sand, medium, coarse, subrounded Sm.am. Pyrite Trace Coal/pyritized wood fragments
M-9711	2780-2810	1.72	70% Sand/sandstone, medium - coarse, fine, subrounded, subangular, good sorting, very slightly calcareous 20% Claystone, sandy, dark grey - grey, micromicaceous, micaceous, slightly glauconitic in parts, carbonaceous 5% Limestone, pale red-brown - white 5% Claystone, red-brown Abundant Claystone, greenish grey Sm.am. Pyrite
M-9712	2810-2840	2.53	60% Sand, as above 30% Claystone, as above, slightly darker 3% Limestone, as above 5% Claystone, red-brown - brown 2% Claystone, greenish grey Sm.am. Pyrite Trace Coal; Claystone, dark brown, waxy, with coal lamina

IKU

Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology
M-9713	2840-2850		Small sample
			20% Cement
			50% Limestone, pale red-brown - white
		6.04	22% Claystone, sandy, occasionally very sandy, dark grey - grey, carbonaceous, micromicaceous, micaceous
			5% Claystone, red-brown - brown
			3% Sand, as above
			Trace-Sm.am. Coal (wood fragments)
M-9714	2850-2880		5% Sand, medium, coarse, fine, very coarse, mostly subrounded, about 60% of the quartz grains have a red-brown coating
			45% Claystone, red-brown - brown, silty, micromicaceous, micaceous
		0.68	45% Claystone, sandy, grey - dark grey, carbonaceous, pyritic, micromicaceous
			5% Claystone, greenish grey
			Sm.am. Limestone
M-9715	2880-2895		25% Sand, as above
		0.35	55% Claystone, sandy, red-brown - brown
		2.63	20% Claystone, sandy, grey - dark grey, as above
			10% Claystone, light greenish/bluish grey, micromicaceous
			Sm.am. Pyrite

IKU

Lithology and Total Organic Carbon measurements

TABLE NO.: 1
WELL NO.: 15/9-11

Sample	Depth (m)	TOC	Lithology	
M-9716	2895-2910		25%	Sand, as above, 80% of grains with a red-brown coating
		0.79	60%	Claystone, sandy, red-brown - brown, micaceous
			10%	Claystone, sandy, greenish grey
			5%	Claystone, grey - dark grey, sandy
			Sm.am.	Pyrite
M-9717	2910-2925		60%	Sand, medium coarse, very coarse, fine, subrounded, subangular, etched surface, less staining than above
			35%	Claystone, brown - red-brown
			5%	Claystone, greenish grey
			Sm.am.	Coal
M-9718	2925-2940		87%	Sand/Sandstone, medium, coarse, subangular - subrounded, carbonaceous, almost no staining
			10%	Claystone, sandy, brown - red-brown
			3%	Claystone, sandy, grey - dark grey, micromicaceous, carbonaceous
			Sm.am.	Claystone, greenish grey
M-9719	2940-2950		80%	Sand, sandstone, coarse - very coarse, granules, medium, subrounded - subangular, argillaceous, pyritic
			5%	Claystone, sandy, brown - red-brown
			5%	Claystone
		8.06	10%	Claystone, dark grey - black, occasionally very carbonaceous, occasionally pyritic
			Sm.am.	Coal; marly Limestone, red-brown

IKU

T A B L E : 2

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKU-No	DEPTH (m)	Rock Extr. (g)	EOM (mg)	Sat. (mg)	Aro. (mg)	HC (mg)	Non HC (mg)	TOC (%)
M 9655	1040.00	10.1	4.0	1.0	0.5	1.5	2.5	2.81
M 9659	1160.00	42.8	11.7	1.1	1.1	2.2	9.5	1.10
M 9661	1220.00	33.9	7.2	1.2	0.7	1.9	5.3	2.21
M 9662	1250.00	14.4	6.2	0.6	0.4	1.0	5.2	6.00
M 9665	1340.00	15.1	6.1	1.3	0.6	1.9	4.2	4.22
M 9667	1400.00	31.8	10.6	3.2	1.2	4.4	6.2	5.29
M 9669	1460.00	20.7	9.0	2.4	0.8	3.2	5.8	4.04
M 9675	1640.00	47.9	14.8	2.2	1.0	3.2	11.6	1.84
M 9679	1760.00	68.4	18.1	1.7	0.3	2.0	16.1	1.67
M 9683	1880.00	38.7	15.2	3.0	2.0	5.0	10.2	1.88
M 9688	2030.00	60.5	5.2	1.1	1.4	2.5	2.7	0.86
M 9695	2240.00	32.7	10.8	2.1	1.9	4.0	6.8	1.60
M 9698	2330.00	50.3	15.8	3.2	3.0	6.2	9.6	1.40
M 9710	2780.00	23.0	22.3	4.1	5.5	9.6	12.7	2.50
M 9712	2840.00	11.7	10.0	1.2	2.1	3.3	6.7	2.40

DATE : 28 - 1 - 83.

IKU

TABLE : 3

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm OF rock)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
M 9655	1040.00	396	99	50	149	248
M 9659	1160.00	273	26	26	51	222
M 9661	1220.00	212	35	21	56	156
M 9662	1250.00	431	42	28	69	361
M 9665	1340.00	404	86	40	126	278
M 9667	1400.00	333	101	38	138	195
M 9669	1460.00	435	116	39	155	280
M 9675	1640.00	309	46	21	67	242
M 9679	1760.00	265	25	4	29	235
M 9683	1880.00	393	78	52	129	264
M 9688	2030.00	86	18	23	41	45
M 9695	2240.00	330	64	58	122	208
M 9698	2330.00	314	64	60	123	191
M 9710	2780.00	970	178	239	417	552
M 9712	2840.00	855	103	179	282	573

DATE : 28 - 1 - 83.

IKU

T A B L E : 4

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
M 9655	1040.00	14.1	3.5	1.8	5.3	8.8
M 9659	1160.00	24.9	2.3	2.3	4.7	20.2
M 9661	1220.00	9.6	1.6	0.9	2.5	7.1
M 9662	1250.00	7.2	0.7	0.5	1.2	6.0
M 9665	1340.00	9.6	2.0	0.9	3.0	6.6
M 9667	1400.00	6.3	1.9	0.7	2.6	3.7
M 9669	1460.00	10.8	2.9	1.0	3.8	6.9
M 9675	1640.00	16.8	2.5	1.1	3.6	13.2
M 9679	1760.00	15.8	1.5	0.3	1.8	14.1
M 9683	1880.00	20.9	4.1	2.7	6.9	14.0
M 9688	2030.00	10.0	2.1	2.7	4.8	5.2
M 9695	2240.00	20.6	4.0	3.6	7.6	13.0
M 9698	2330.00	22.4	4.5	4.3	8.8	13.6
M 9710	2780.00	38.8	7.1	9.6	16.7	22.1
M 9712	2840.00	35.6	4.3	7.5	11.8	23.9

DATE : 28 - 1 - 83.

IKU

T A B L E : 5

COMPOSITION IN % OF MATERIAL EXTRACTED FROM THE ROCK

IKU-No	DEPTH (m)	Sat / EOM	Aro / EOM	HC / EOM	SAT / Aro	Non HC / EOM	HC / Non HC
M 9655	1040.00	25.0	12.5	37.5	200.0	62.5	60.0
M 9659	1160.00	9.4	9.4	18.8	100.0	81.2	23.2
M 9661	1220.00	16.7	9.7	26.4	171.4	73.6	35.8
M 9662	1250.00	9.7	6.5	16.1	150.0	83.9	19.2
M 9665	1340.00	21.3	9.8	31.1	216.7	68.9	45.2
M 9667	1400.00	30.2	11.3	41.5	266.7	58.5	71.0
M 9669	1460.00	26.7	8.9	35.6	300.0	64.4	55.2
M 9675	1640.00	14.9	6.8	21.6	220.0	78.4	27.6
M 9679	1760.00	9.4	1.7	11.0	566.7	89.0	12.4
M 9683	1880.00	19.7	13.2	32.9	150.0	67.1	49.0
M 9688	2030.00	21.2	26.9	48.1	78.6	51.9	92.6
M 9695	2240.00	19.4	17.6	37.0	110.5	63.0	58.8
M 9698	2330.00	20.3	19.0	39.2	106.7	60.8	64.6
M 9710	2780.00	18.4	24.7	43.0	74.5	57.0	75.6
M 9712	2840.00	12.0	21.0	33.0	57.1	67.0	49.3

DATE : 28 - 1 - 83.

IKU

T A B L E 6

TABULATION OF DATAS FROM THE GASCHROMATOGRAMS

IKU No.	DEPTH (m)	PRISTANE / n-C17	PRISTANE / PHYTANE	CPI
M 9655	1040	0.5	1.2	1.5
M 9659	1160	0.8	1.8	1.7
M 9661	1220	0.4	1.2	1.8
M 9662	1250	0.7	1.4	2.8
M 9665	1340	0.7	1.4	2.1
M 9667	1400	1.0	1.4	2.4
M 9669	1460	0.7	1.8	2.2
M 9675	1640	3.0	2.4	2.6
M 9679	1760	3.1	2.9	2.1
M 9683	1880	3.6	4.4	2.8
M 9688	2030	1.1	2.5	2.0
M 9695	2240	4.2	3.3	1.3
M 9698	2330	2.4	1.6	1.0
M 9710	2780	1.5	1.9	1.6
M 9712	2840	1.4	2.4	1.5

DATE : 1 - 2 - 83.

Visual Kerogen Analysis

TABLE NO.: 7
WELL NO.: 15/9-11

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-9637	470- 500	?Algal, Cy, Am/P,S,W,WR!	F-M-L	good	1-	Pyritic aggregates of algal and amorphous nature embedding debris evaluated as of terrestrial (?woody) origin. Resistant minerals.
M-9645	710- 740	He, W, P/Am, Cy	F-M	fair	1-	Small residue dominated by resistant minerals.
M-9649	830- 860	He, W, P/Am,Cy	F-M	fair	1-	Abundant pyrite in a small residue. An amorphous matrix in aggregates embedding mainly terrestrial woody debris and fungal spores. Very thin-walled palynomorphs.
M-9655	1010-1040	He, W, P/Am, Cy	F-M	fair and good	1-	Fresh looking material of spores and well preserved dinoflagellate cysts. Strong fungal activity. Aggregates of amorphous material embedding other strongly degraded particles.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	R!	Reworked	L	Large

IKU

Visual Kerogen Analysis

TABLE NO.: 7
WELL NO.: 15/9-11

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-9656	1040-1070	Am, Cy/He, W, P	F-M	fair and good	1-	Pyritic rounded aggregates, composition as above. Excellent cysts mostly embedded by the amorphous matrix.
M-9659	1130-1160	Am, Cy, He, W	F-M	good and fair	1-	An assemblage of excellently preserved cysts in an amorphous matrix. Terrestrial material light-coloured but appears partly as oxidised. Aggregates rounded as above.
M-9660	1150-1190	He, W/Cy, Am	F-M	good	1-	A strong influx of degraded terrestrial (?woody) material Excellently preserved cysts dominate palynomorphs. Aggregates less firm. Pyrite. Strong sapropelisation.
M-9661	1190-1220	He, W, /Cy, Am	F-M	good	1-	As above.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	R!	Reworked	L	Large

IKU

Visual Kerogen Analysis

TABLE NO.: 7
WELL NO.: 15/9-11

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-9662	1220-1250	(W, P), He/Am, Cy	F-M	good	1-, 2-/2	Mostly strongly sapropelised terrestrially derived material of slightly darker colour than above. Light-coloured cysts embedded in the grannulate,partly amorphous matrix. Strong biodegradation.
M-9663	1250-1280	He, S, P, Am, Cy, Algal	F-M-L	poor - fair	1-	Very strongly biodegraded material. Chemical oxidation has minor effect, supposed algal source. Pyrite.
M-9664	1280-1310	He, W, S, P/Am, Cy, algal	F-M-L	poor - good	1-	Resembles the above: Cysts are embedded by the strongly degraded matrix which, however, is removed by chemical oxidation and suggested to be woody material. Botryococcus is present together with fungal remains.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	R!	Reworked	L	Large

Visual Kerogen Analysis

TABLE NO.: 7
WELL NO.: 15/9-11

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-9665	1310-1340	He, W, Cut, S, P/Am, Cy	F-M-L	poor to fair	1-	As 1280-1310m with Botryococcus
M-9666	1340-1370	He, W, Cut, S, P/Am, Cy	F-M-L	poor to fair	1-	Aggregates as in the above interval, but more flaky structure.
M-9667	1340-1370	He, W, Cut, S, P/Am, Cy	F-M	fair - poor	1-	Dense rounded pyritic aggregates of granulate structure. Composed of degraded terrestrial material as above. Fungal/algal spores.
M-9668	1370-1400	He, W, Cut, S, P/Am, Cy	F-M	fair - poor	1-, 2-	As above.
M-9669	1400-1430	He, W, Cut, P, S/Am, Cy	F-M-(L)	fair - good	1-, 2-	Small globular aggregates and large ones. Matrix of mainly terrestrial degraded material embedding palynomorphs. Pollen dominate. Tasmanitids.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	R!	Reworked	L	Large

IKU

Visual Kerogen Analysis

TABLE NO.: 7
WELL NO.: 15/9-11

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-9670	1460-1490	He, W, P, Cut/Am, Cy	F-M	fair - good	1-	As above but more strongly sapropelised and dissolved structures. Increase in amorphous matter and rel. number of cysts.
M-9671	1490-1520	He, W, P, Cut, S, W/Am, Cy	F-M-L	good	1-	Pyritic aggregates less defined than above. Woody material may be sapropelised and included in the amorphous material. Spores more abundant than in the samples above.
M-9672	1520-1550	He, W, P, Cut, S, W/Am, Cy	F-M-L	good	1-	As 1490-1520m.
M-9674	1580-1610	Am, Cy/He, W, Cut, P, S	F-M	good to fair	1-	Pyritic aggregates, partly globular, denser than in 1520-1550m. Cyst assemblage different. Fungal activity.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	R!	Reworked	L	Large

IKU

Visual Kerogen Analysis

TABLE NO.: 7
WELL NO.: 15/9-11

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-9676	1640-1670	Am, Cy/He, W, P, S	F-M	good	1-	Pyritic residue with weaker tendency to form aggregates (flaky structure) (Botryococcus present). Small aggregates apparently often have an inorganic core.
M-9678	1700-1730	Am, Cy/W, P, S	F-M	good	1	As 1640-1670 but darkly stained cysts (partly) Foram linings.
M-9680	1760-1790	He, W, P, S/Am, Cy	F-M	good	1	More disperse, pyritic residue. The very small aggregates as above seem partly to contain a mineral core. Stained cysts (Tertiary age).
M-9682	1820-1850	He, P/Am, Cy	F-M	good	1	Globular pyritic aggregates, with "mineral cores", as above.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	R!	Reworked	L	Large

IKU

Visual Kerogen Analysis

TABLE NO.: 7
WELL NO.: 15/9-11

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-9684	1880-1910	He, WR!, P, Am, Cy/	F-M	good	1	As in the above interval an amorphous matrix embeds strongly fragmented degraded material evaluated as to be terrestrial.
M-9685	1880-1910	He, WR!, P/Am, Cy	F-M	good	-1, 1/1+	Pyritic residue as above, Deflandrea
M-9688	2000-2030	He, WR!, P, S/Am, Cy	F-M	good	1, 1/1+	Residues with abundant pyrite and other resistant minerals. Reworked material, Tasmanitids. Rich in degraded woody (very small rounded) fragments.
M-9692	2150-2180	He, P, W/Am, Cy	F-M	good	1, 1/1+	Granular, strongly pyritic matrix of mainly woody degraded material. Rich in pollen (spores), dinoflagellates, some semifusinite.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	R!	Reworked	L	Large

IKU

Visual Kerogen Analysis

TABLE NO.: 7
WELL NO.: 15/9-11

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-9694	2180-2210	He, P, WR!,/Am, Cy	F-M	good	1, 1/1+	Organic and inorganic aggregates. Granular to flaky matrix, strongly pyritic . As above rich in pollen and dinoflagellates. Fungi.
M-9695	2210-2240	He, P, WR!/Am, Cy	F-M	good	1, 1/1+	As 2180m above, pollen, dinoflagellates and fungi.
M-9696	2270-2300	He, P, WR!, Cut/Am, Cy	F-M	good	1, 1/1+	As above pollen, dinoflagellates and fungi. Abundance of Early Tertiary pollen.
M-9705	2600-2630m	*Cut, P/Cy	F-M-L	good	1+/2-, 2-	*Small residue, screened. Rare organic particles.
M-9710	2750-2780	P, W, WR!, Cut/Am, Cy	F-M	good to fair	2-, 2-/2	Change in palynomorph flora abundant Callialasporites Spp. Pyrite present.
M-9711	2780-2910	WR!, W, Cut, P/Am, Cy	F-M-L	good	2, 2-/2, 2	Abundant pyrite. Abundant semifusinite/fusinite. Foram linings.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	R!	Reworked	L	Large

IKU

Visual Kerogen Analysis

TABLE NO.: 7
WELL NO.: 15/9-11

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks
M-9714	2850-2880	WR!, W, Cut, P/Am, Cy	F-M	fair - good	2-, 2-/2, 2	Resembles the above but richer in amorphous material.
M-9719	2040-2950	N.D.P.	N.D.P.	N.D.P.	N.D.P.	No residue left.

ABBREVATIONS

Am	Amorphous	Cy	Cysts, algae	W	Woody material	F	Fine
He	Herbaceous	P	Pollen grains	C	Coal	M	Medium
Cut	Cuticles	S	Spores	R!	Reworked	L	Large

IKU

Vitrinite Reflectance measurements

TABLE NO.: 8
WELL NO.: 15/9-11

Sample	Depth	Vitrinite reflectance	Fluorescence in UV light	Exinite content
M-9637	470 - 500	N.D.P.	Trace of indistinct green fragment (spores?)	Trace?
M-9645	710 - 740	N.D.P.	Mineral fluorescence only	Nil
M-9649	830 - 860	0.32 (3)	Mineral fluorescence only	Nil
M-9655	1010 - 1040	0.32 (15)	Green spore fragments and dinoflagellate cysts (?)	Low
M-9656	1040 - 1070	0.32 (3)	Green spores in lignite and mineral fluorescence	Moderate - rich in lignite
M-9659	1130 - 1160	0.40 (5)	Trace green (spore?) fragments	Trace?
M-9660	1160 - 1190	0.44 (2)	Trace green/yellow indistinct fragments (possibly spores?)	Trace?
M-9661	1190 - 1220	0.35 (13)	Green spores and dinoflagellate cysts	Moderate - high
M-9662	1220 - 1250	0.34 (17)	Green spores and dinoflagellate cysts	Trace
M-9663	1250 - 1280	0.32 (16)	Moderate content of green dinoflagellate cysts	Nil?
M-9664	1280 - 1310	0.38 (7)	Green spores and dinoflagellate cysts	Low

IKU

Vitrinite Reflectance measurements

TABLE NO.: 8
WELL NO.: 15/9-11

Sample	Depth	Vitrinite reflectance	Fluorescence in UV light	Exinite content
M-9665	1310 - 1340	0.36 (16)	Green and green/yellow spores and one orange hydrocarbon speck	Trace
M-9666	1340 - 1370	N.D.P.	Fragments of green spores and/or dinoflagellate cysts	Trace
M-9667	1370 - 1400	N.D.P.	Green spores and dino-flagellate cysts	Low
M-9668	1400 - 1430	0.39 (4)	Green/yellow or yellow frag-ments (possibly spores and/or cysts)	Trace
M-9669	1430 - 1460	0.32 (10)	Green or green/yellow spores	Trace
M-9670	1460 - 1490	0.33 (4)	A few green dinoflagellate cysts and a trace of possible green/yellow spores	Trace
M-9671	1490 - 1520	N.D.P.	Green/yellow cysts and spores	Low - Moderate
M-9672	1520 - 1550	0.33 (2)	Large green wisps possibly spores	Low
M-9674	1580 - 1610	0.42 (1)	Green/yellow spores and cysts	Trace
M-9676	1640 - 1670	0.36 (7)	Nil	Nil

IKU

Vitrinite Reflectance measurements

TABLE NO.: 8
WELL NO.: 15/9-11

Sample	Depth	Vitrinite reflectance	Fluorescence in UV light	Exinite content
M-9678	1700 - 1730	0.45 (3)	Trace of green/yellow fragments (spores?) and mineral fluorescence	Trace?
M-9680	1760 - 1790	0.31 (1)	Nil	Nil
M-9682	1820 - 1850	0.33 (1)	Low content of very small green fragments (spores?)	Low?
M-9684	1880 - 1910	0.40 (6)	Trace of green/yellow indistinct fragments	Trace?
M-9685	1910 - 1940	0.46 (3)	Nil	Nil
M-9688	2000 - 2030	N.D.P.	Nil	Nil
M-9692	2150 - 2180	N.D.P.	Trace of green/yellow fragments (spores?)	Trace?
M-9694	2180 - 2210	0.61 (1)	Green/yellow spores	Moderate
M-9695	2210 - 2240	0.57 (6)	Trace of mineral fluorescence only	Nil
M-9697	2270 - 2300	0.67 (6)	Green spores	Low
M-9705	2600 - 2630	N.D.P.	Nil	Nil

IKU

Vitrinite Reflectance measurements

TABLE NO.: 8
WELL NO.: 15/9-11

Sample	Depth	Vitrinite reflectance	Fluorescence in UV light	Exinite content
M-9710	2750 - 2780	0.44 (9)	Green/yellow and yellow spores	Low to Moderate
M-9711	2780 - 2810	0.57 (9)	Green/yellow indistinct spores and green resin	Low
M-9714	2850 - 2880	0.43 (1) and 0.57 (2)	Green/yellow and yellow spores	Trace
M-9719	2940 - 2950	0.43 (1)	Green cuticles and yellow/ orange stringers (spores?)	Trace

IKU

TABLE 9.

R O C K E V A L P Y R O L Y S E S

IKU No.	DEPTH m/ft	S1	S2	S3	TOC (%)	HYDR. INDEX	OXYGEN INDEX	OIL OF GAS CONTENT S1+S2	PROD. INDEX S1/(S1+S2)	TEMP. MAX (C)
M 9637	500	43.58	20.29	3.01	6.23	326	48	63.87	0.68	389
M 9641	620	1.94	1.68	3.45	0.85	198	406	3.62	0.54	425
M 9645	740	17.48	8.13	2.25	3.10	262	73	25.61	0.68	381
M 9649	860	16.24	9.98	1.43	3.13	319	46	26.22	0.62	415
M 9655	1040	11.91	10.71	1.44	2.81	381	51	22.62	0.53	419
M 9656	1070	10.54	10.02	1.40	2.64	380	53	20.56	0.51	420
M 9659	1160	0.63	1.20	0.72	1.07	112	67	1.83	0.34	421
M 9660	1190	0.79	2.93	1.28	1.84	159	70	3.72	0.21	422
M 9661	1220	0.57	3.03	1.18	2.12	143	56	3.60	0.16	418
M 9662	1250	1.11	9.25	3.39	5.36	173	63	10.36	0.11	417
		Clst dk-brn								
M 9662	1250	0.58	2.98	1.47	1.80	166	82	3.56	0.16	422
		Clst olv-gy								
M 9663	1280	1.47	8.62	4.21	5.96	145	71	10.09	0.15	413
M 9664	1310	1.00	8.14	4.59	6.27	130	73	9.14	0.11	417
M 9665	1340	0.91	5.68	3.25	4.40	129	74	6.59	0.14	417
M 9666	1370	1.05	8.55	3.15	4.91	174	64	9.60	0.11	420
		Clst dk-gy-dk								
M 9666	1370	0.40	2.22	2.27	1.78	125	128	2.62	0.15	422
		Clst olv-gy								
M 9668	1430	0.98	8.12	3.30	5.16	157	64	9.10	0.11	419
M 9669	1460	0.71	7.22	3.05	4.28	169	71	7.93	0.09	422
M 9670	1490	1.31	7.03	3.87	4.97	141	78	8.34	0.16	407
M 9671	1520	0.49	1.77	2.55	1.77	100	144	2.26	0.22	407
		Clst olv-gy								
M 9672	1550	0.65	3.00	2.39	1.87	160	128	3.65	0.18	424
		Clst olv-gy								
M 9673	1580	0.25	2.01	2.48	1.74	116	143	2.26	0.11	424
M 9674	1610	0.94	3.33	1.95	1.77	188	110	4.27	0.22	429

DATE : 27 - 1 - 83.

IKU

TABLE 9.

ROCK EVAL PYROLYSES

IKU No.	DEPTH m/ft	S1	S2	S3	TOC (%)	HYDR. INDEX	OXYGEN INDEX	OIL OF GAS CONTENT S1+S2	PROD. INDEX S1/(S1+S2)	TEMP. MAX (C)
M 9675	1640	0.46	2.50	1.72	1.58	158	109	2.96	0.16	423
M 9677	1700	0.41	2.12	1.32	1.50	141	88	2.53	0.16	426
M 9678	1730	0.88	3.33	1.46	1.60	208	91	4.21	0.21	423
M 9679	1760	0.29	1.95	1.32	1.53	127	86	2.24	0.13	425
M 9680	1790	0.56	2.62	1.45	1.72	152	84	3.18	0.18	426
M 9681	1820	0.57	2.94	1.11	1.85	159	60	3.51	0.16	423
M 9682	1850	0.42	2.45	1.41	1.80	136	78	2.87	0.15	427
M 9683	1880	0.34	2.08	1.97	1.75	119	113	2.42	0.14	425
M 9684	1910	0.52	1.83	2.61	1.69	108	154	2.35	0.22	421
M 9685	1940	0.37	2.50	1.94	2.20	114	88	2.87	0.13	427
		Clst	lt - gn - gy							
M 9686	1970	0.40	2.70	1.54	2.46	110	63	3.10	0.13	426
		Clst	lt - gn - gy							
M 9687	2000	0.20	0.31	0.95	0.57	54	167	0.51	0.39	411
M 9692	2150	0.17	0.40	0.83	0.67	60	124	0.57	0.30	421
M 9694	2210	0.41	1.61	0.67	1.08	149	62	2.02	0.20	428
		Clst	gy							
M 9696	2270	0.22	2.89	0.66	1.36	212	49	3.11	0.07	425
		Clst	gy - gy - dk							
M 9697	2300	0.17	2.03	0.58	1.23	165	47	2.20	0.08	426
M 9698	2330	0.13	0.98	0.76	0.87	113	87	1.11	0.12	429
M 9699	2360	0.18	1.96	0.55	1.16	169	47	2.14	0.08	424
		Clst	gy							
M 9702	2540	0.11	0.84	0.75	0.28	300	268	0.95	0.12	427
		Clst	gy							
M 9708	2720	0.66	0.74	0.87	0.36	206	242	1.40	0.47	410
M 9710	2780	0.77	7.18	0.67	1.80	399	37	7.95	0.10	426
M 9711	2810	0.79	4.90	0.76	1.72	285	44	5.69	0.14	431
M 9712	2840	0.82	5.07	0.70	2.53	200	28	5.89	0.14	431

DATE : 27 - 1 - 83.

IKU

TABLE 9.

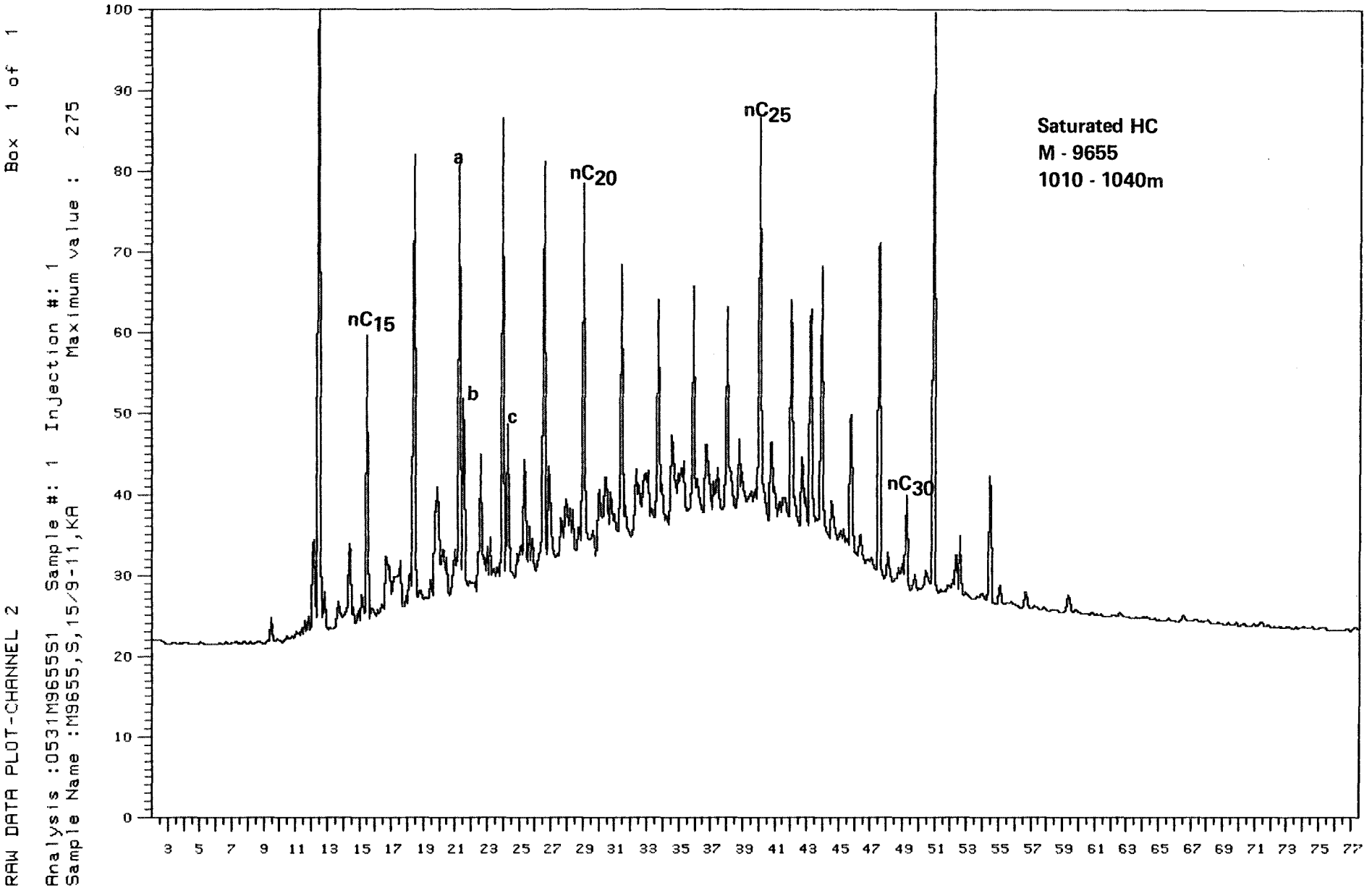
R O C K E V A L P Y R O L Y S E S

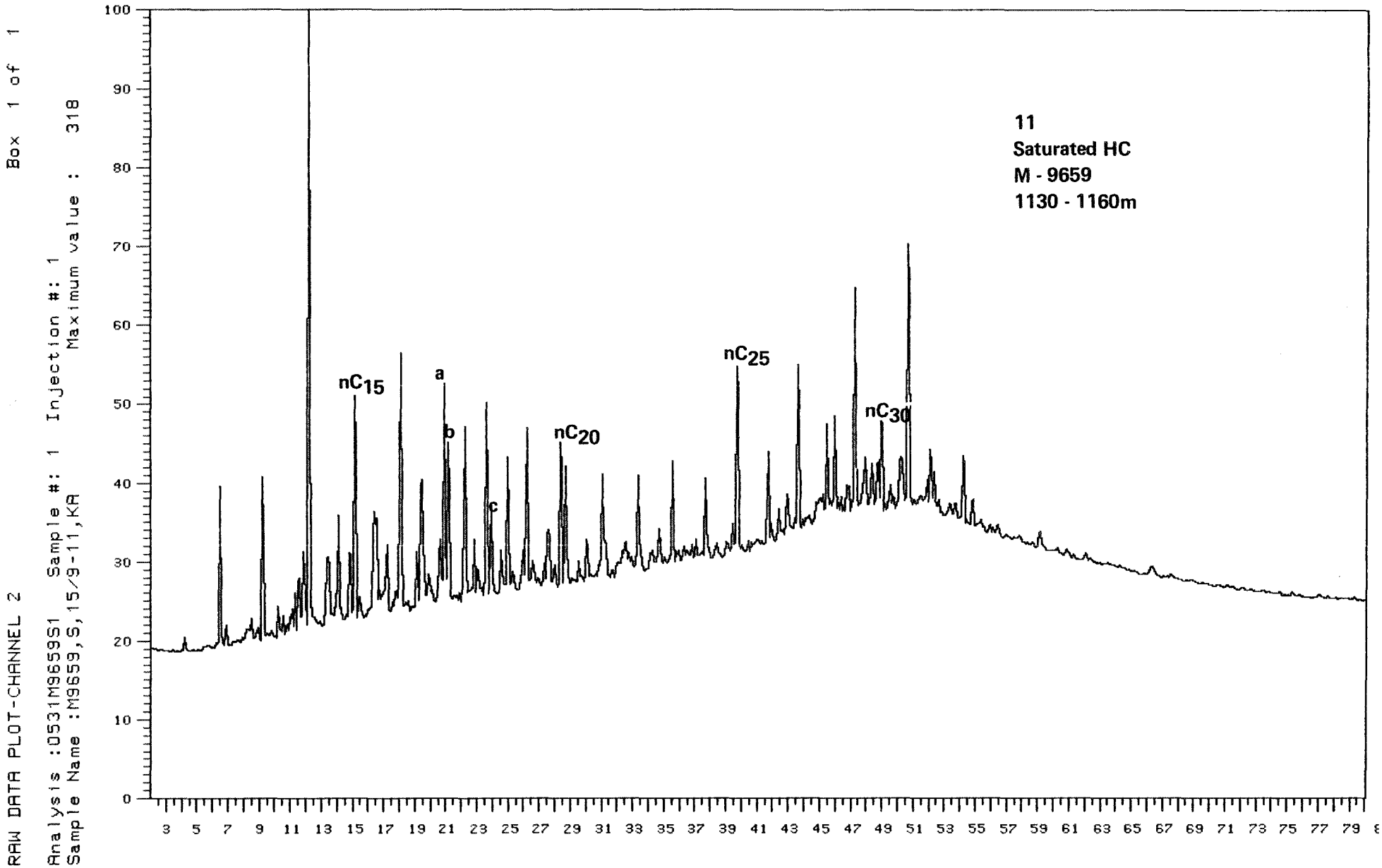
IKU No.	DEPTH m/ft	S1	S2	S3	TOC (%)	HYDR. INDEX	OXYGEN INDEX	OIL OF GAS CONTENT S1+S2	PROD. INDEX S1/(S1+S2)	TEMP. MAX (C)
M 9713	2850	27.41	16.54	1.26	6.04	274	21	43.95	0.62	421
		Clst								
M 9714	2880	0.17	0.93	0.91	0.68	137	134	1.10	0.15	430
M 9715	2895	0.66	5.88	1.16	2.63	224	44	6.54	0.10	430
M 9719	2950	5.42	22.75	1.66	8.06	282	21	28.17	0.19	420
		Clst	dk - gy - bl							

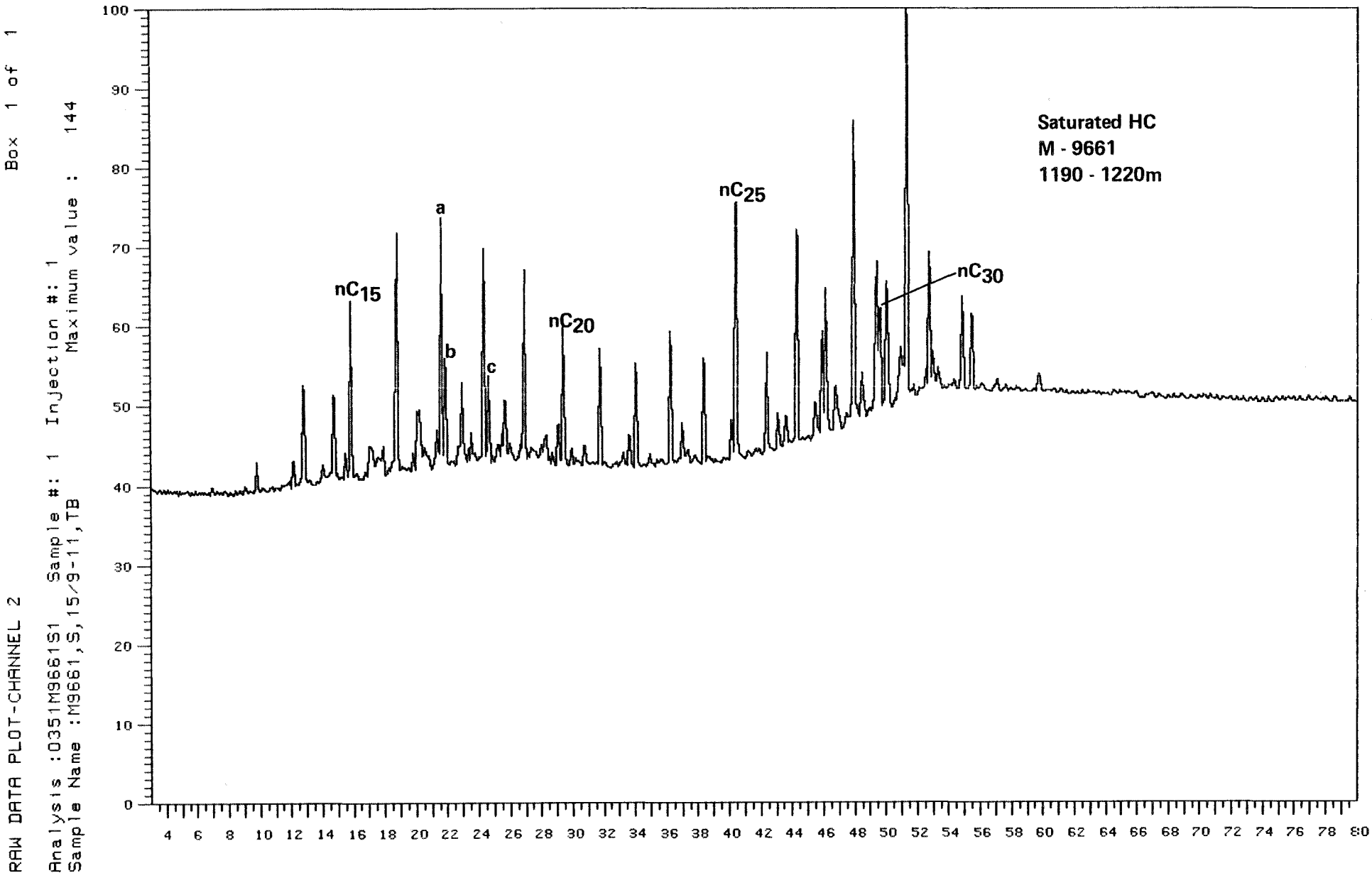
DATE : 27 - 1 - 83.

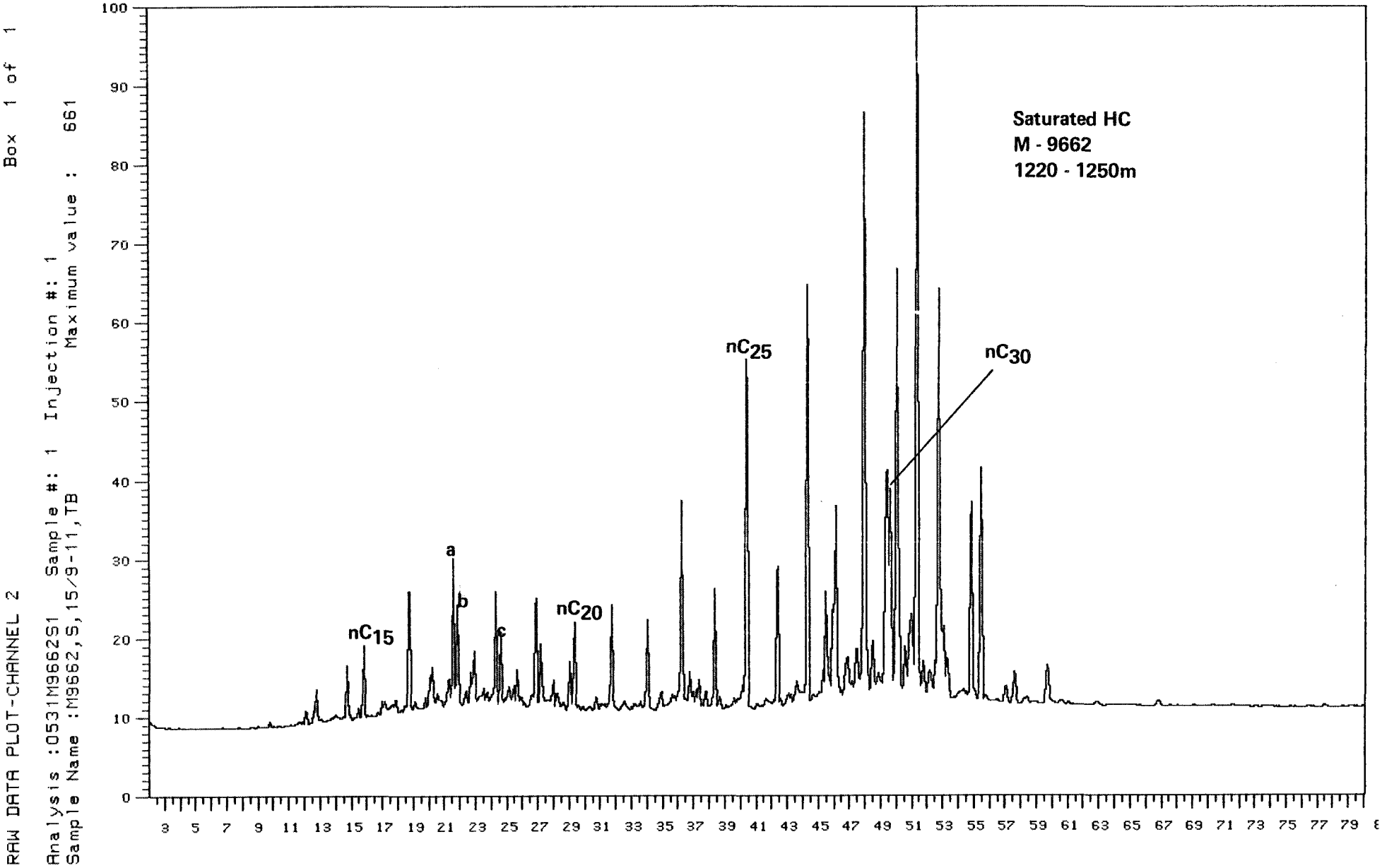
GAS CHROMATOGRAMS OF
SATURATED FRACTION

a = nC_{17} alkane
b = pristane
c = phytane


RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9655S1 Sample #: 1 Injection #: 1
Sample Name :M9655,S,15/9-11,KA Maximum value : 275
nC15
a
b
c
nC20
nC25
nC30
Saturated HC
M - 9655
1010 - 1040m


RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9659S1 Sample #: 1 Injection #: 1
Sample Name :M9659,S,15/9-11,KA Maximum value : 318
11
Saturated HC
M - 9659
1130 - 1160m
nC15
a
b
c
nC20
nC25
nC30


RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0351M9661S1 Sample #: 1 Injection #: 1
Sample Name :M9661,S,15/9-11,TB Maximum value : 144
Saturated HC
M - 9661
1190 - 1220m
nC15
a
b
c
nC20
nC25
nC30
100
90
80
70
60
50
40
30
20
10
0
4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80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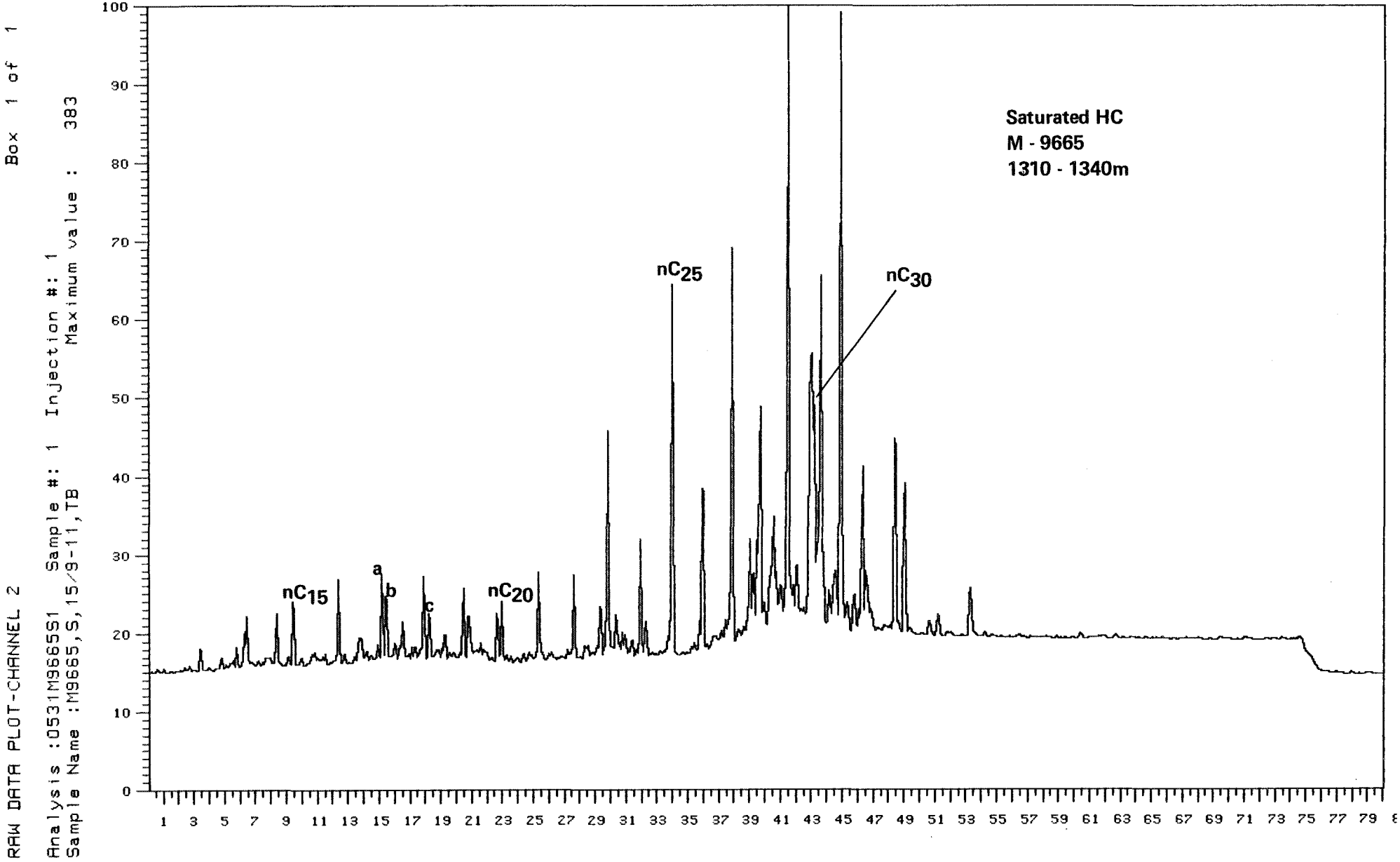
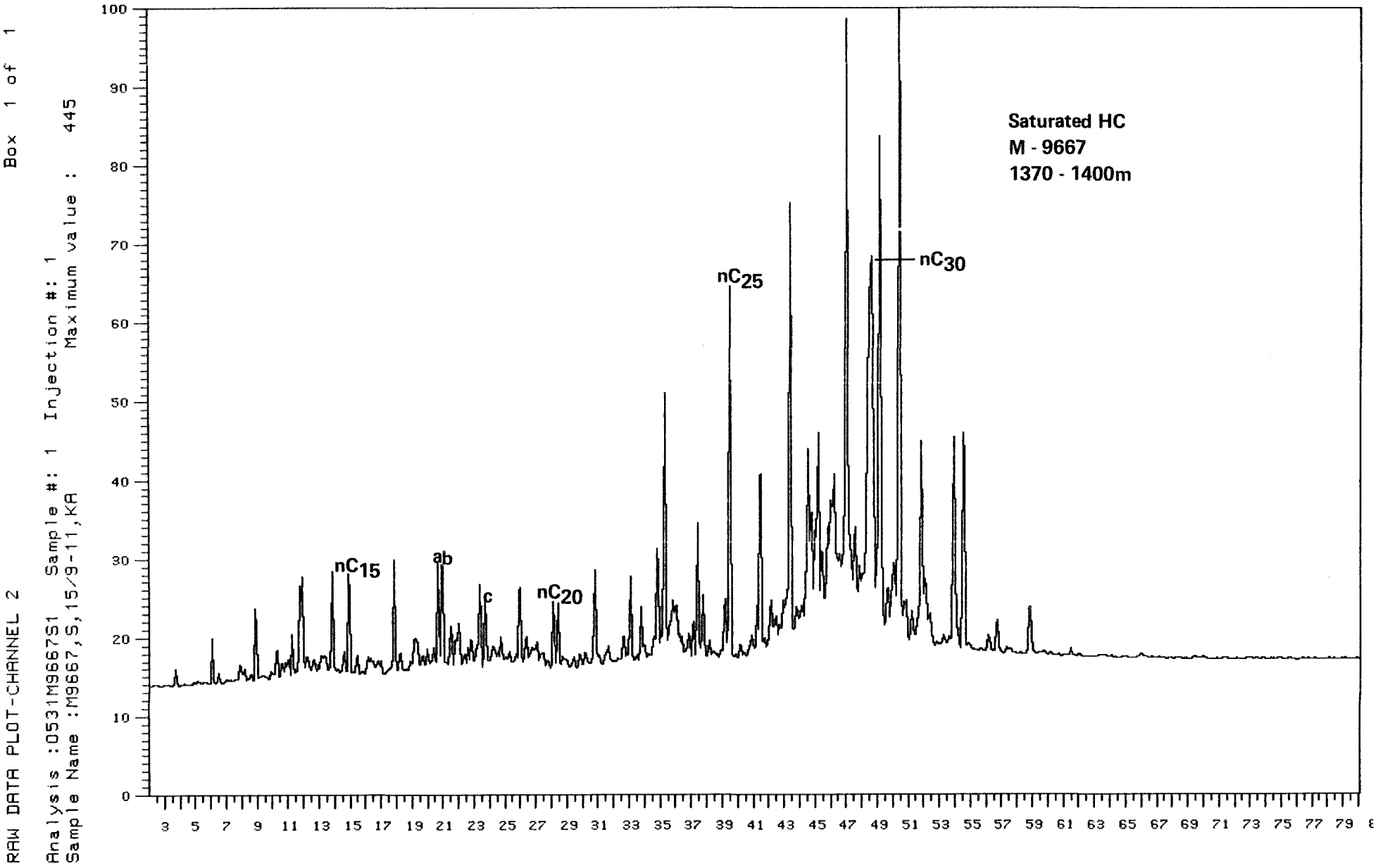
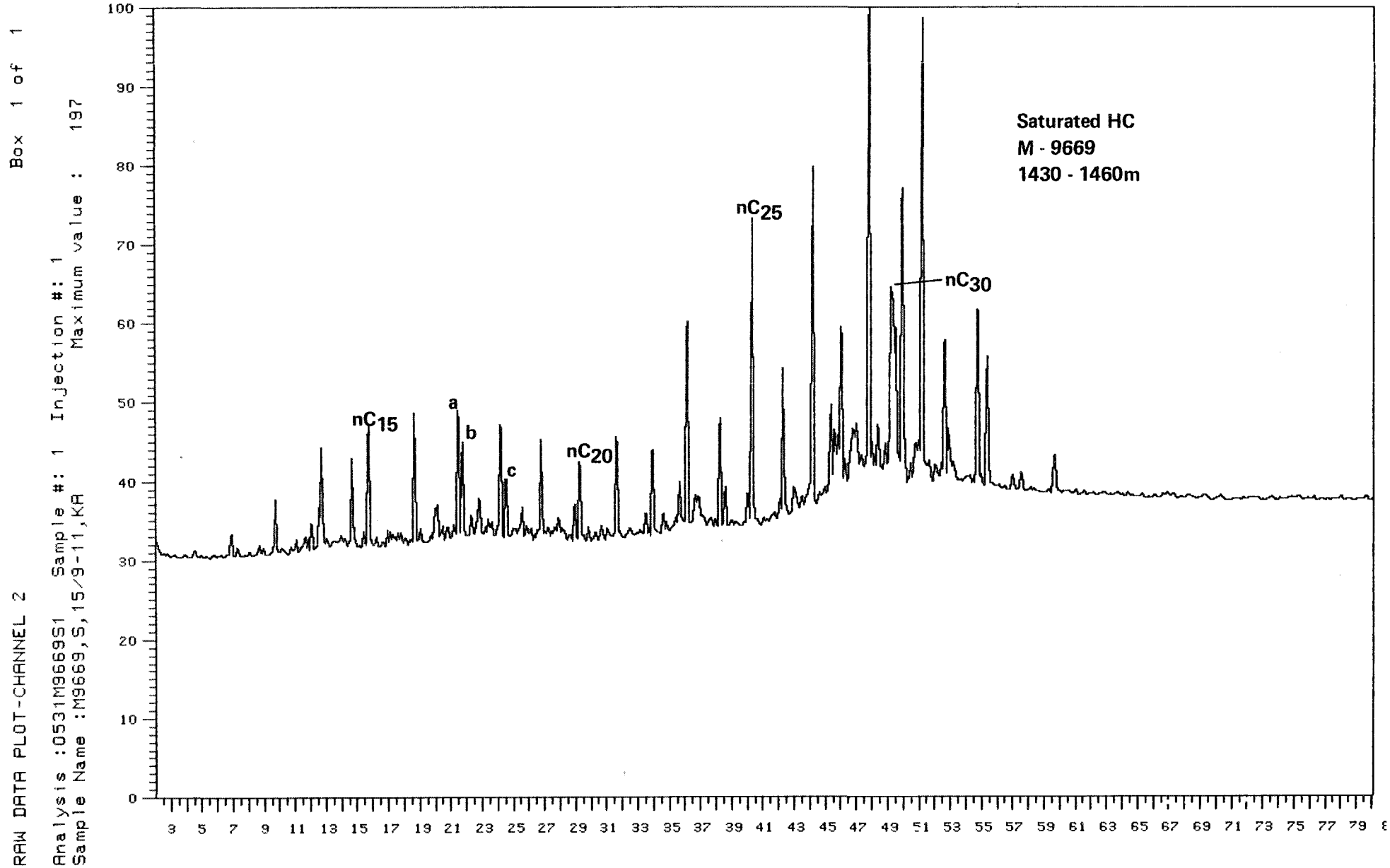
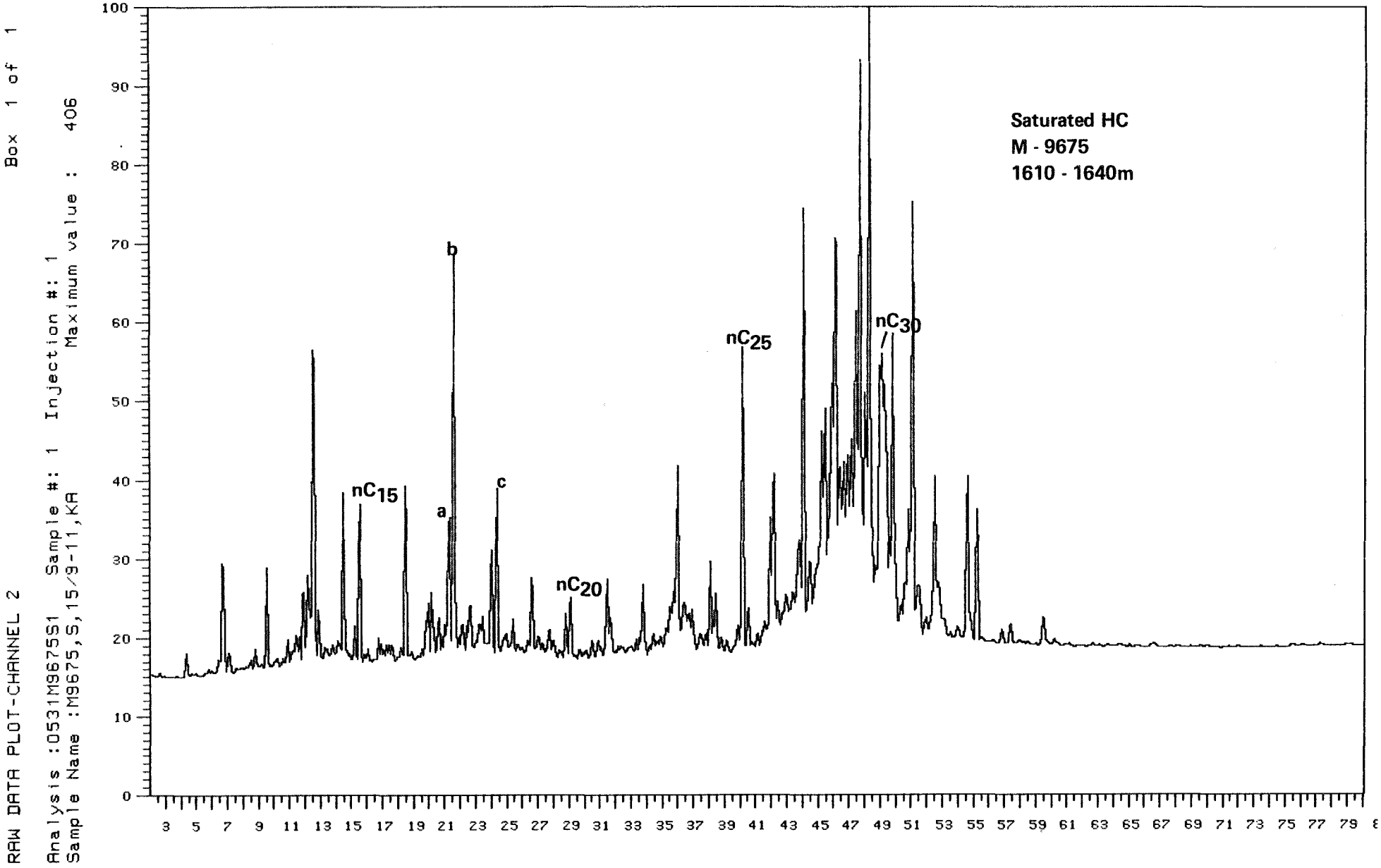
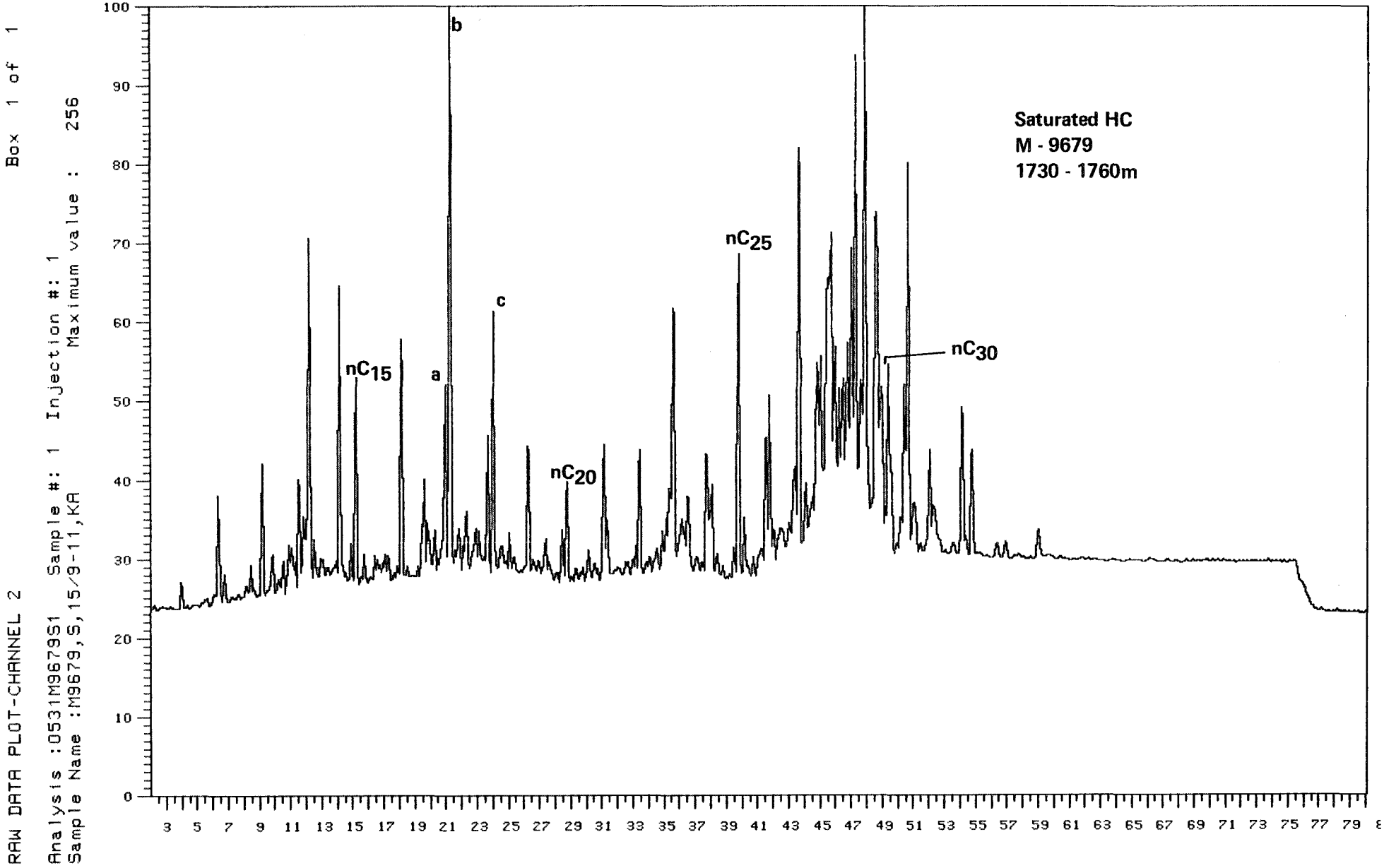
Box 1 of 1
Analysis :0531M9662S1 Sample #: 1 Injection #: 1
Sample Name :M9662,S,15/9-11,TB Maximum value : 661
Saturated HC
M - 9662
1220 - 1250m
nC15
a
b
c
nC20
nC25
nC30

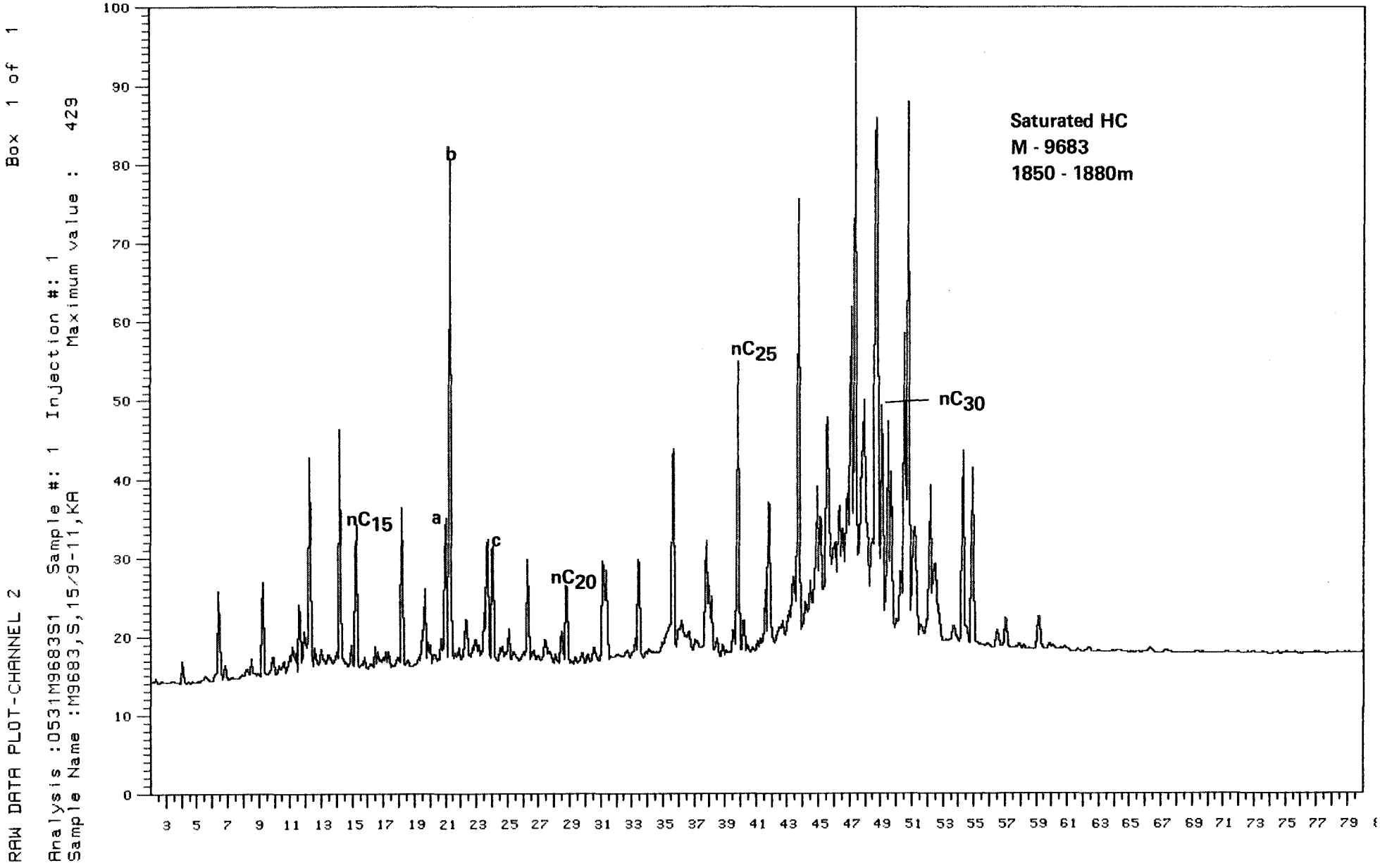

RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9665S1 Sample #: 1 Injection #: 1
Sample Name :M9665,S,15/9-11,TB Maximum value : 383
Saturated HC
M - 9665
1310 - 1340m
nC15
a
b
c
nC20
nC25
nC30

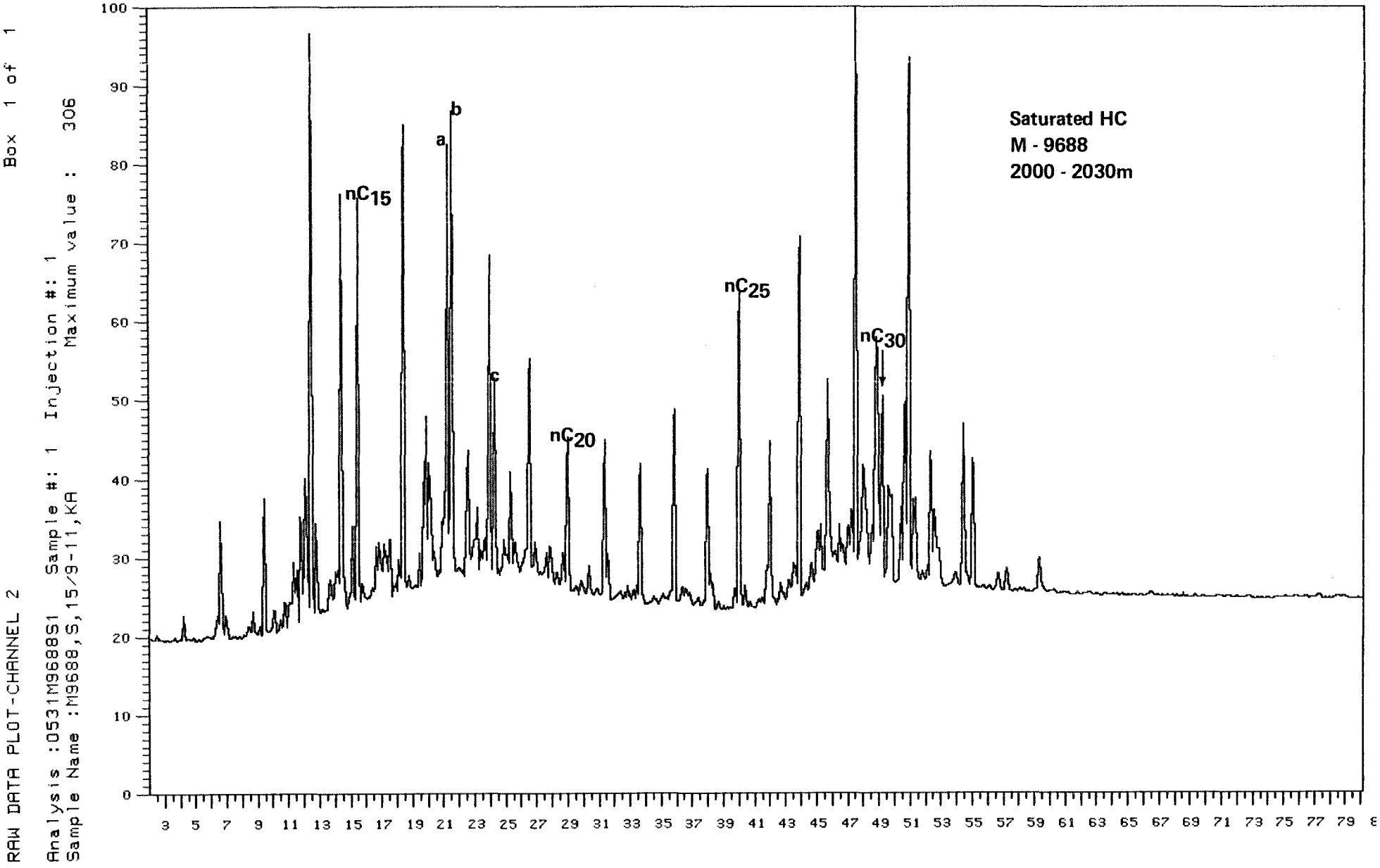

Box 1 of 1
RAW DATA PLOT-CHANNEL 2
Analysis :0531M9667S1 Sample #: 1 Injection #: 1
Sample Name :M9667,S,15/9-11,KA Maximum value : 445
Saturated HC
M - 9667
1370 - 1400m
nC15
ab
c
nC20
nC25
nC30

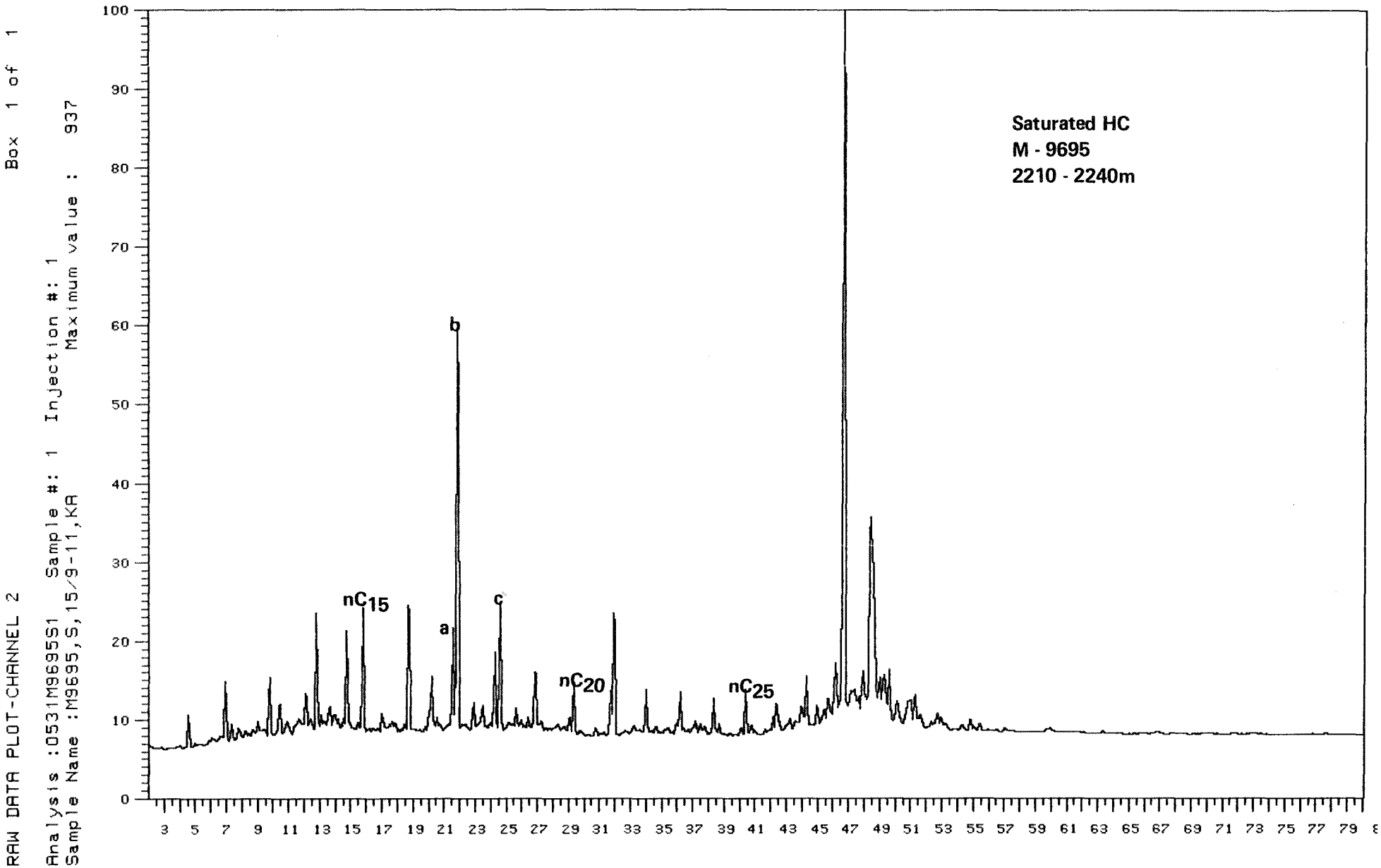

RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9669S1 Sample #: 1 Injection #: 1
Sample Name :M9669,S,15/9-11,KA Maximum value : 197
Saturated HC
M - 9669
1430 - 1460m
nC15
a
b
c
nC20
nC25
nC30

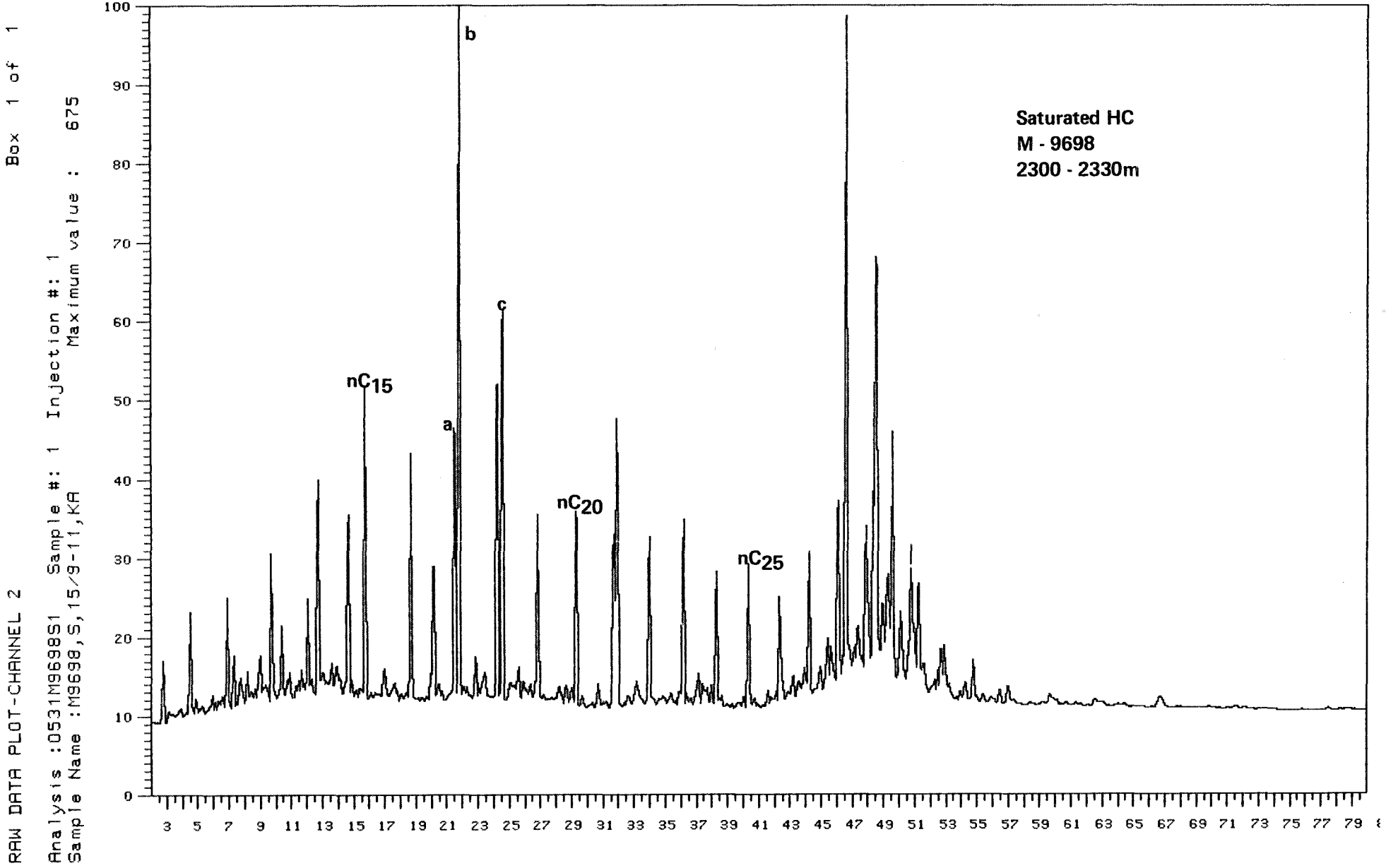

RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9675S1 Sample #: 1 Injection #: 1
Sample Name :M9675,S,15/9-11,KA Maximum value : 406
Saturated HC
M - 9675
1610 - 1640m
nC15
a
b
c
nC20
nC25
nC30

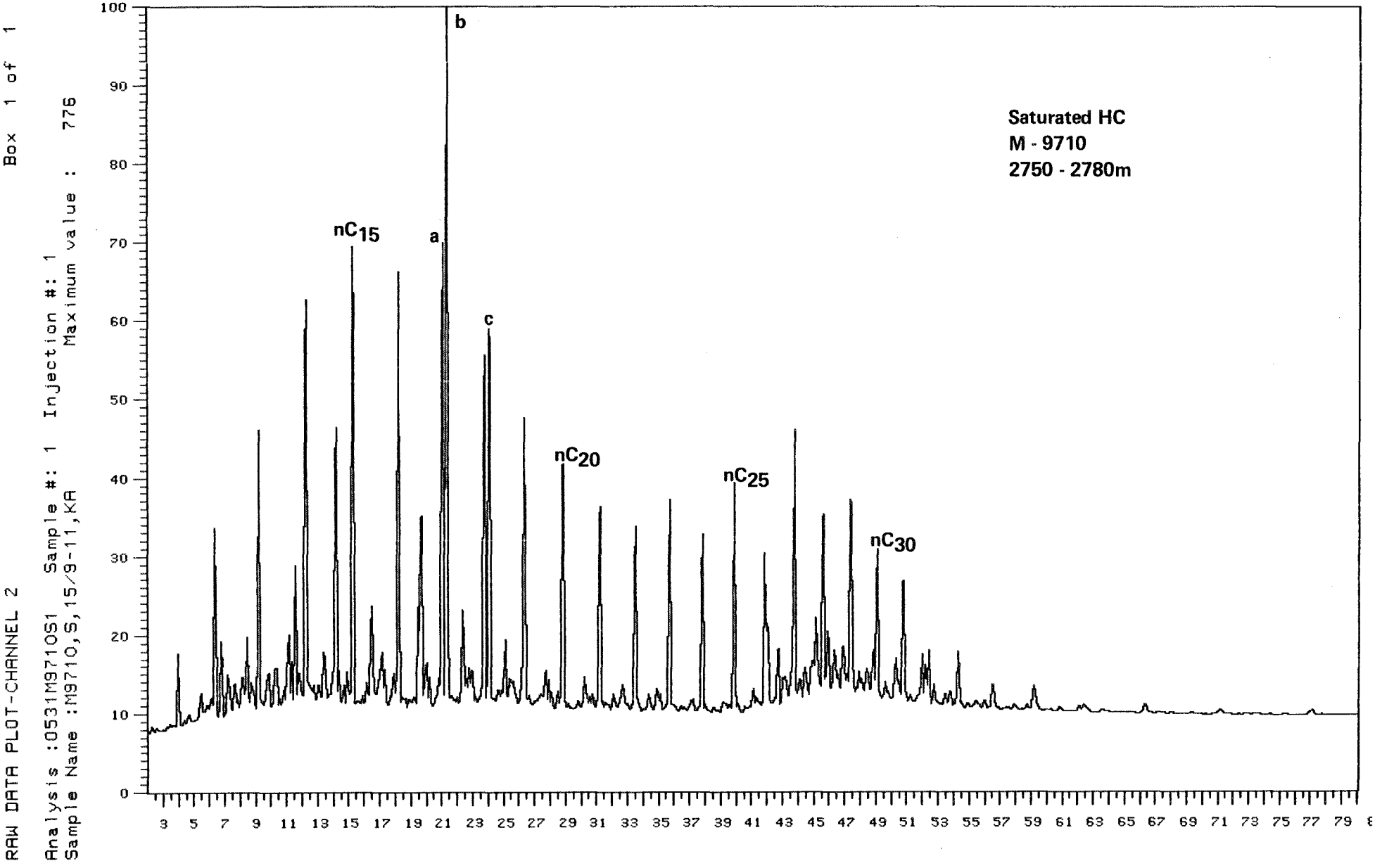

RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9679S1 Sample #: 1 Injection #: 1
Sample Name :M9679,S,15/9-11,KA Maximum value : 256
Saturated HC
M - 9679
1730 - 1760m
nC15
a
b
c
nC20
nC25
nC30

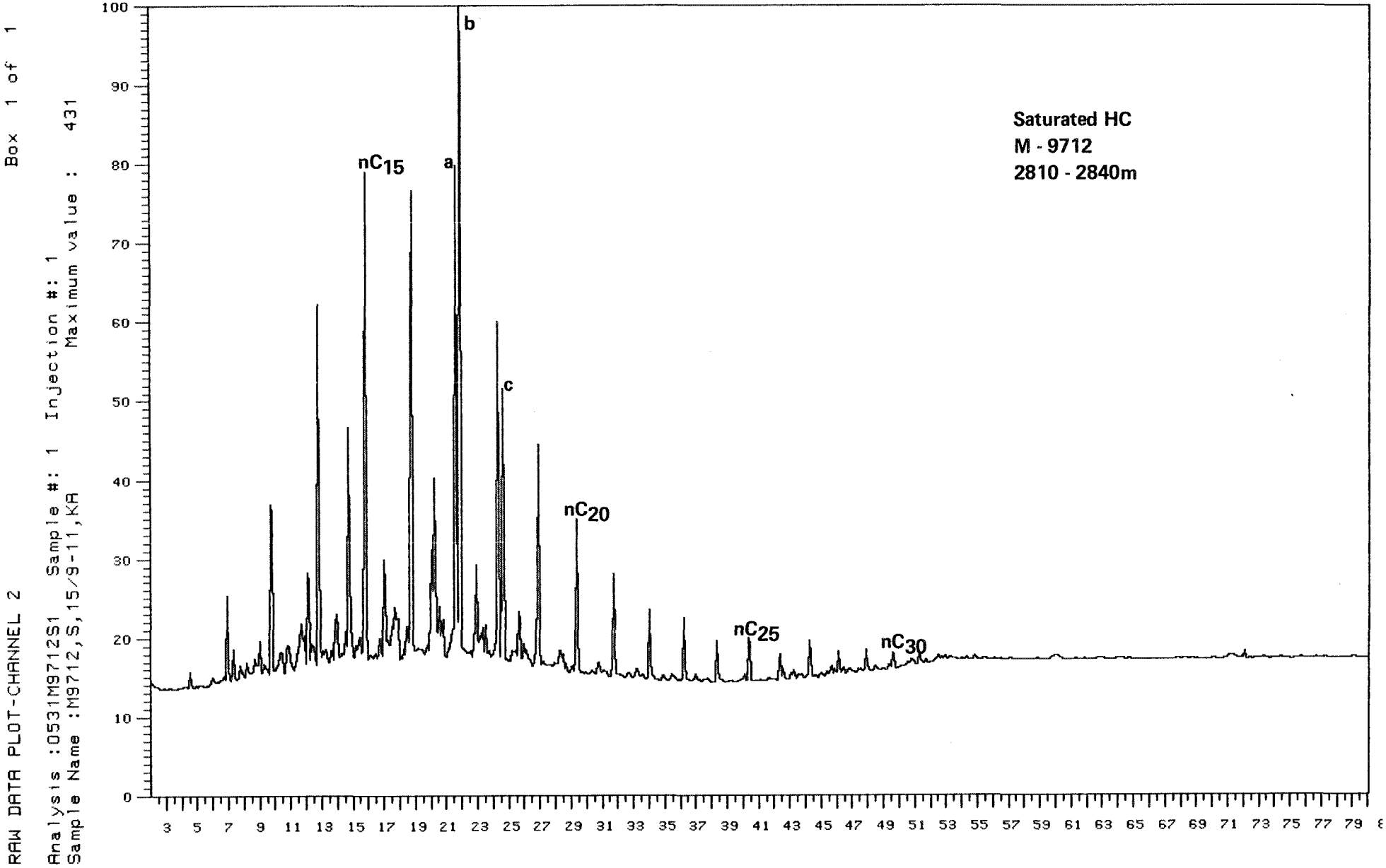

RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9683S1 Sample #: 1 Injection #: 1
Sample Name :M9683,S,15/9-11,KA Maximum value : 429
Saturated HC
M - 9683
1850 - 1880m
nC15
a
b
c
nC20
nC25
nC30


RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9688S1 Sample #: 1 Injection #: 1
Sample Name :M9688,S,15/9-11,KA Maximum value : 306
Saturated HC
M - 9688
2000 - 2030m
nC15
nC20
nC25
nC30
a
b
c


RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9695S1 Sample #: 1 Injection #: 1
Sample Name :M9695,S,15/9-11,KA Maximum value : 937
Saturated HC
M - 9695
2210 - 2240m
nC15
a
b
c
nC20
nC25

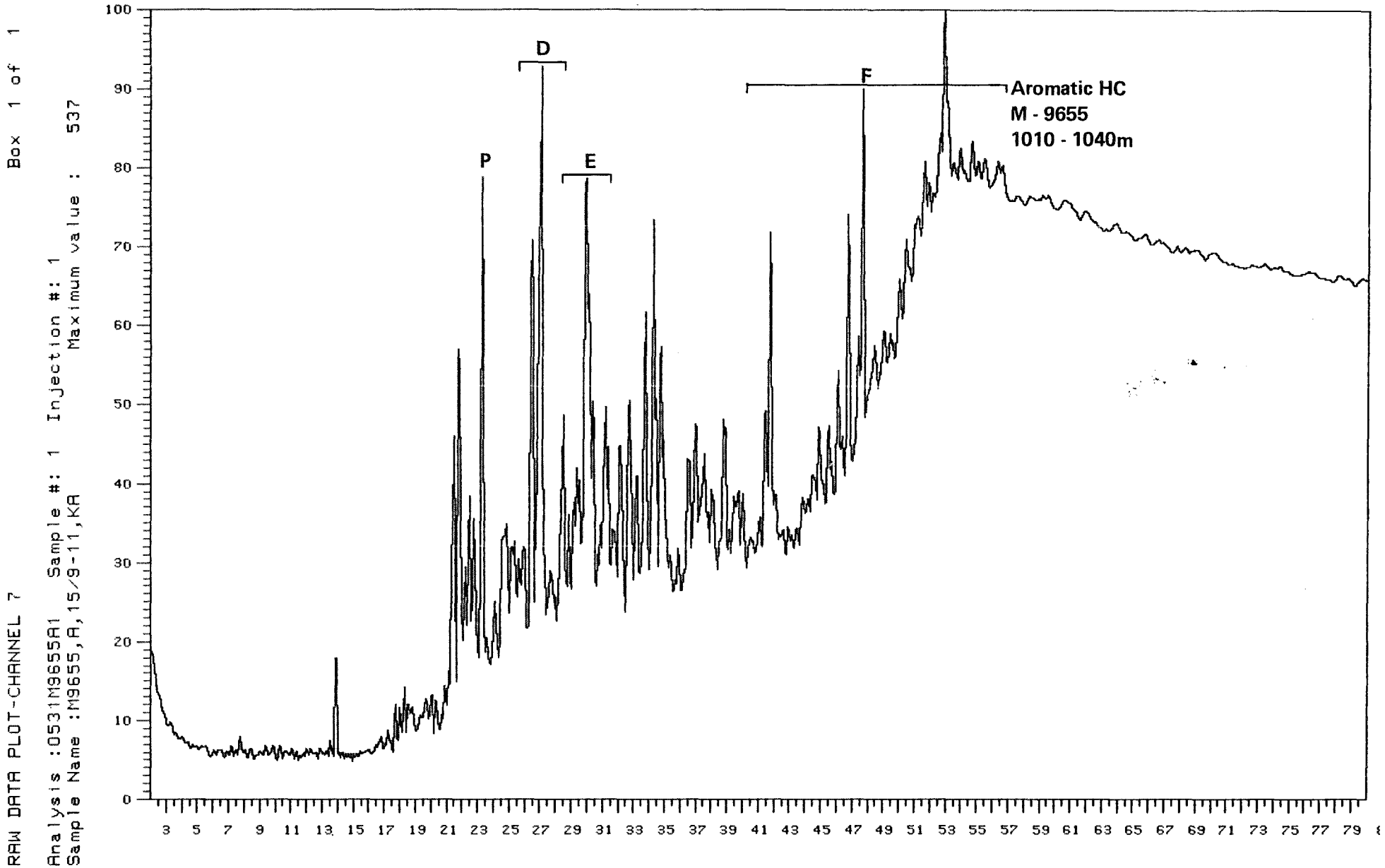

RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9698S1 Sample #: 1 Injection #: 1
Sample Name :M9698,S,15/9-11,KA Maximum value : 675
Saturated HC
M - 9698
2300 - 2330m
nC15
nC20
nC25
a
b
c

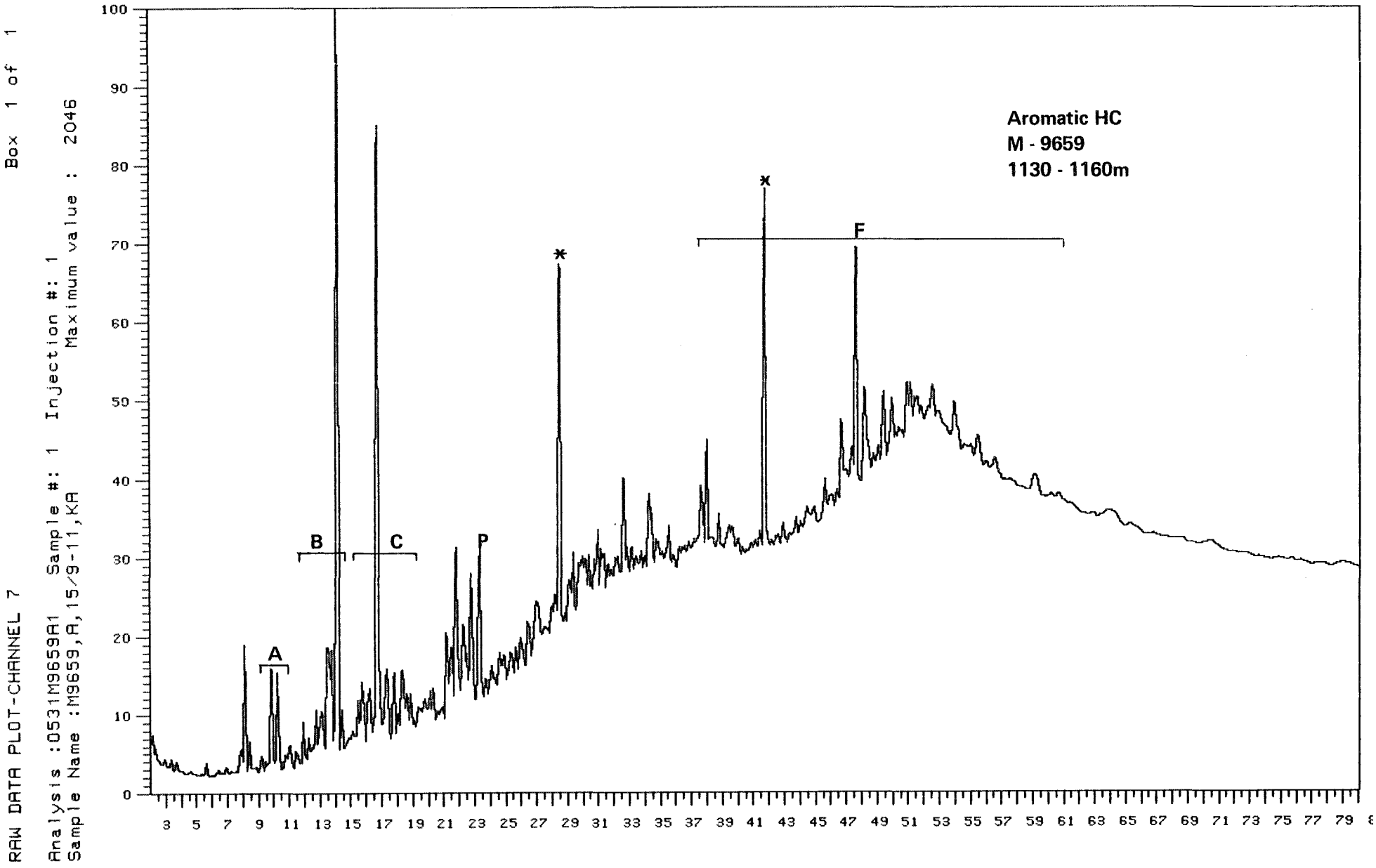

RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9710S1 Sample #: 1 Injection #: 1
Sample Name :M9710,S,15/9-11,KA Maximum value : 776
Saturated HC
M - 9710
2750 - 2780m
nC15
a
b
c
nC20
nC25
nC30


RAW DATA PLOT-CHANNEL 2
Box 1 of 1
Analysis :0531M9712S1 Sample #: 1 Injection #: 1
Sample Name :M9712,S,15/9-11,KA Maximum value : 431
Saturated HC
M - 9712
2810 - 2840m
nC15
a
b
c
nC20
nC25
nC30

GAS CHROMATOGRAMS OF
AROMATIC FRACTION

N = naphthalene
A = methyl-naphthalenes
B = C_2-naphthalenes
C = C_3-napthalenes
P = phenanthrene
D = methyl-phenanthrenes
E = C_2-phenanthrenes
F = aromatised steranes and triterpanes


RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :0531M9655A1 Sample #: 1 Injection #: 1
Sample Name :M9655,A,15/9-11,KA Maximum value : 537
P
D
E
F
Aromatic HC
M - 9655
1010 - 1040m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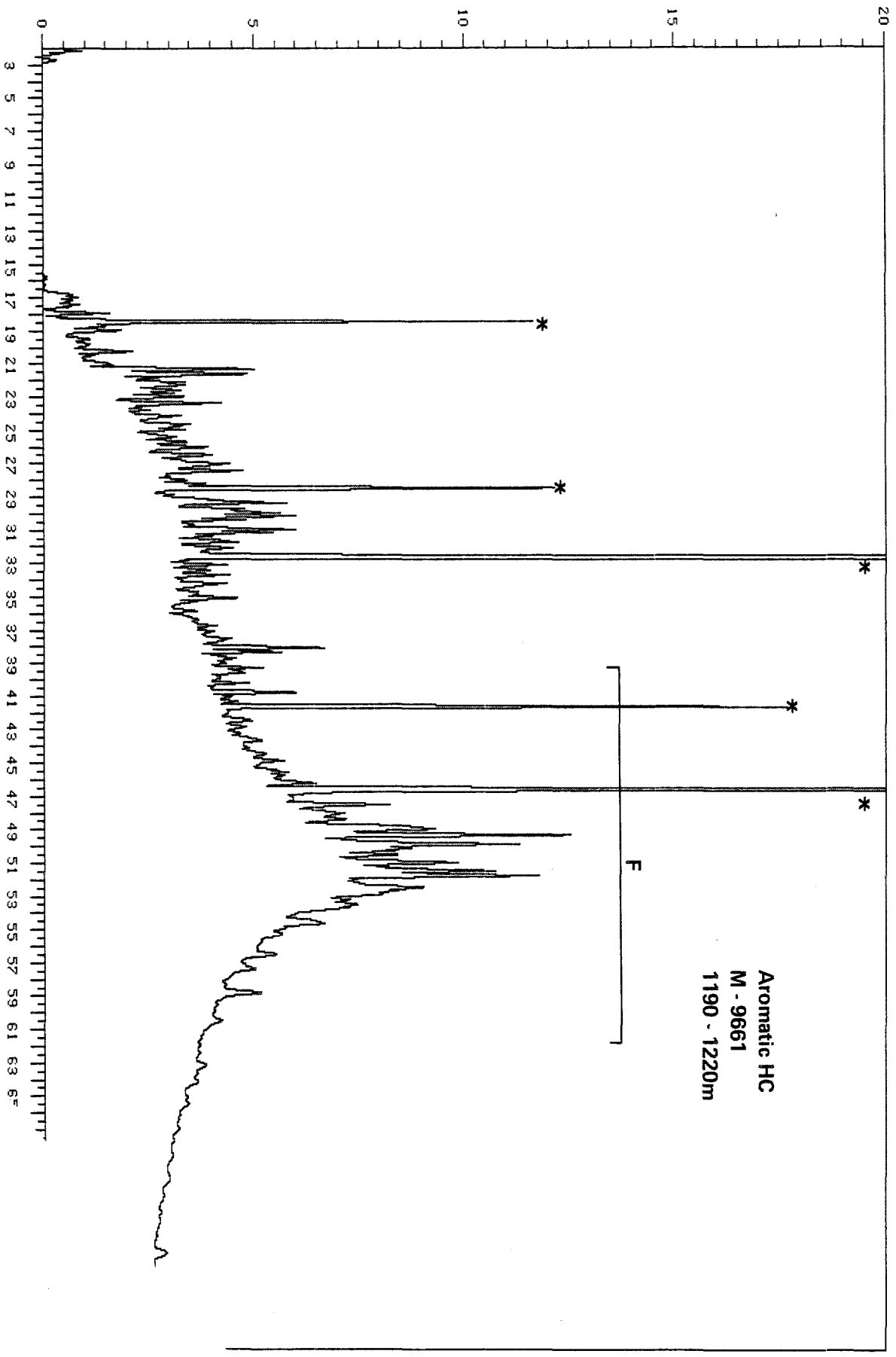
Box 1 of 1
Analysis :0531M9659A1 Sample #: 1 Injection #: 1
Sample Name :M9659,A,15/9-11,KA Maximum value : 2046
Aromatic HC
M - 9659
1130 - 1160m
A
B
C
P
F
*
*
100
90
80
70
60
50
40
30
20
10
0
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79

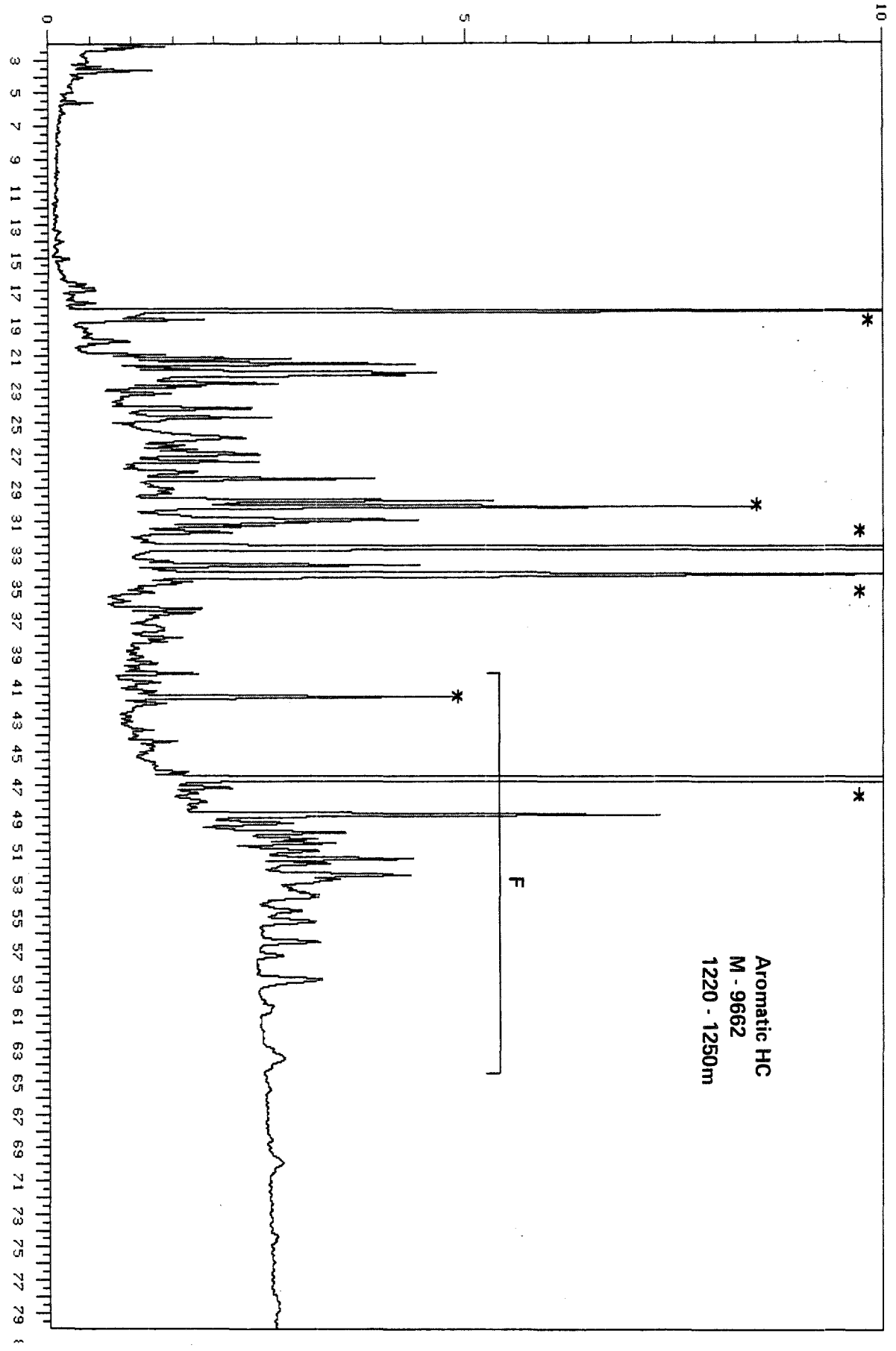
RAW DATA PLOT-CHANNEL 7 Box 1 of 1

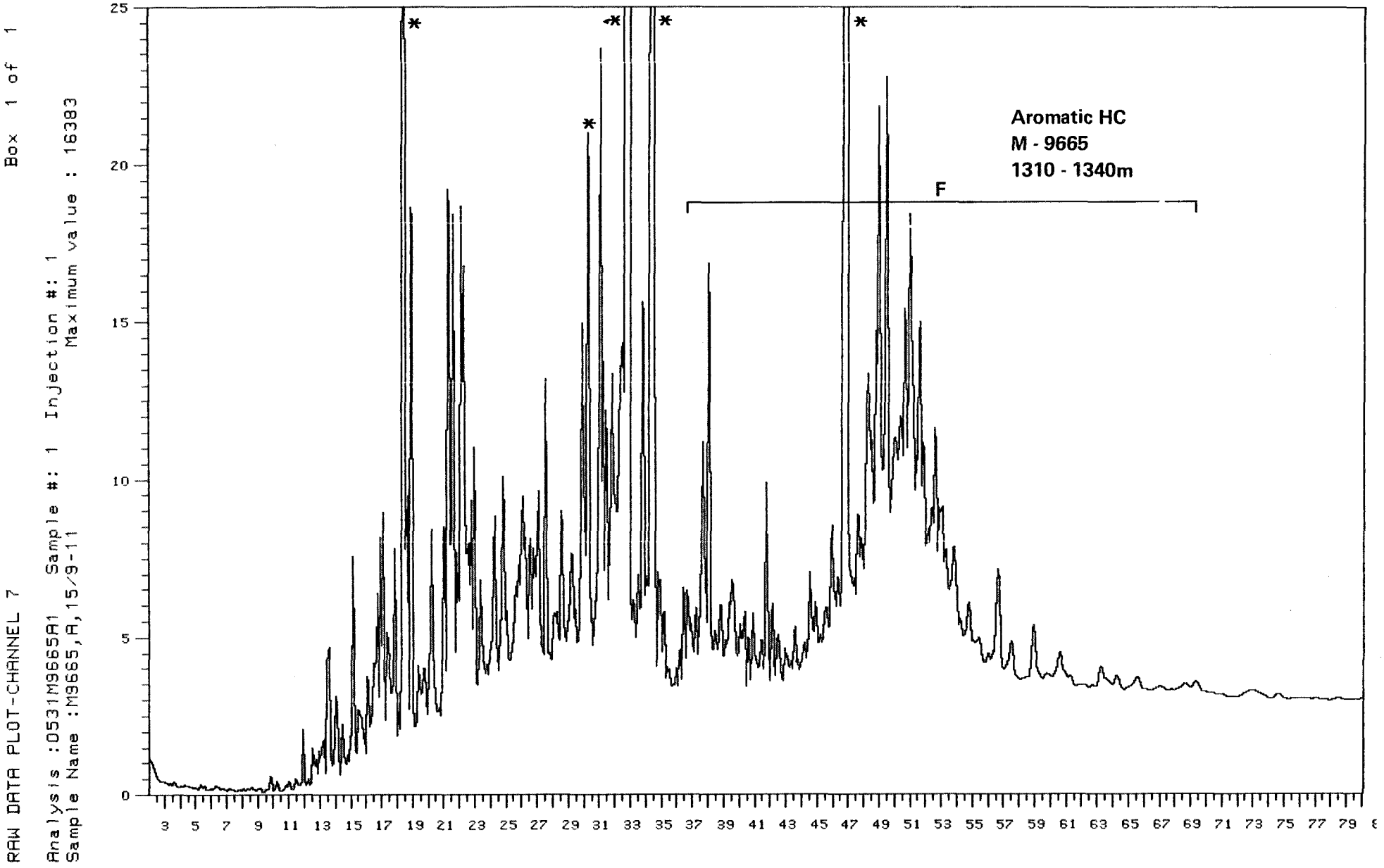
Analysis :0531M9661A1 Sample #: 1 Injection #: 1
Sample Name :M9661,S,15/9-11 Maximum value : 10701



RAW DATA PLOT-CHANNEL 7 Box 1 of 1

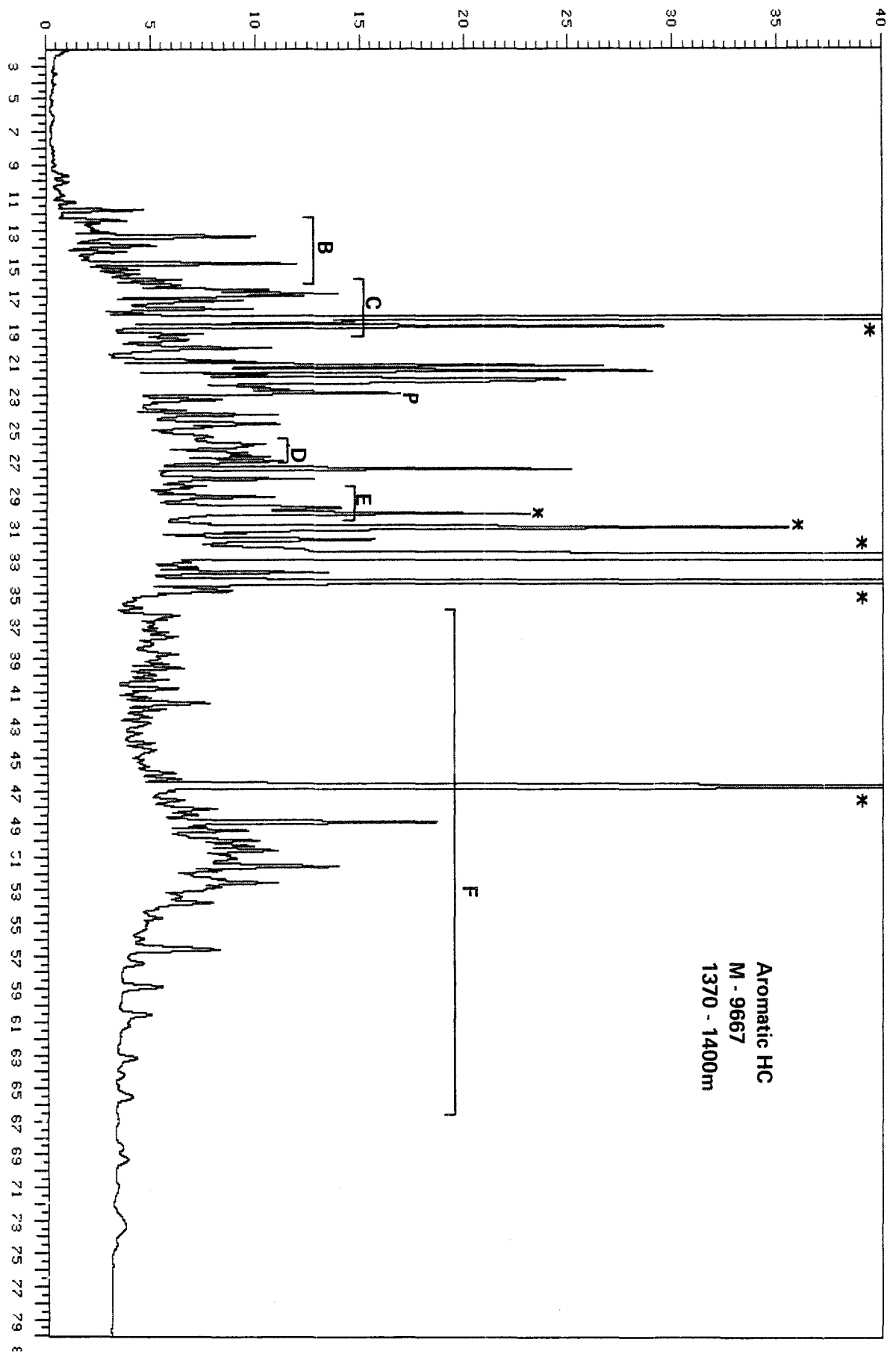
Analysis :0531M9662A2 Sample #: 1 Injection #: 1
Sample Name :M9662,A,15/9-11,TB Maximum value : 16383




RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :0531M9665A1 Sample #: 1 Injection #: 1
Sample Name :M9665,A,15/9-11 Maximum value : 16383
Aromatic HC
M - 9665
1310 - 1340m
F
0
5
10
15
20
25
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79

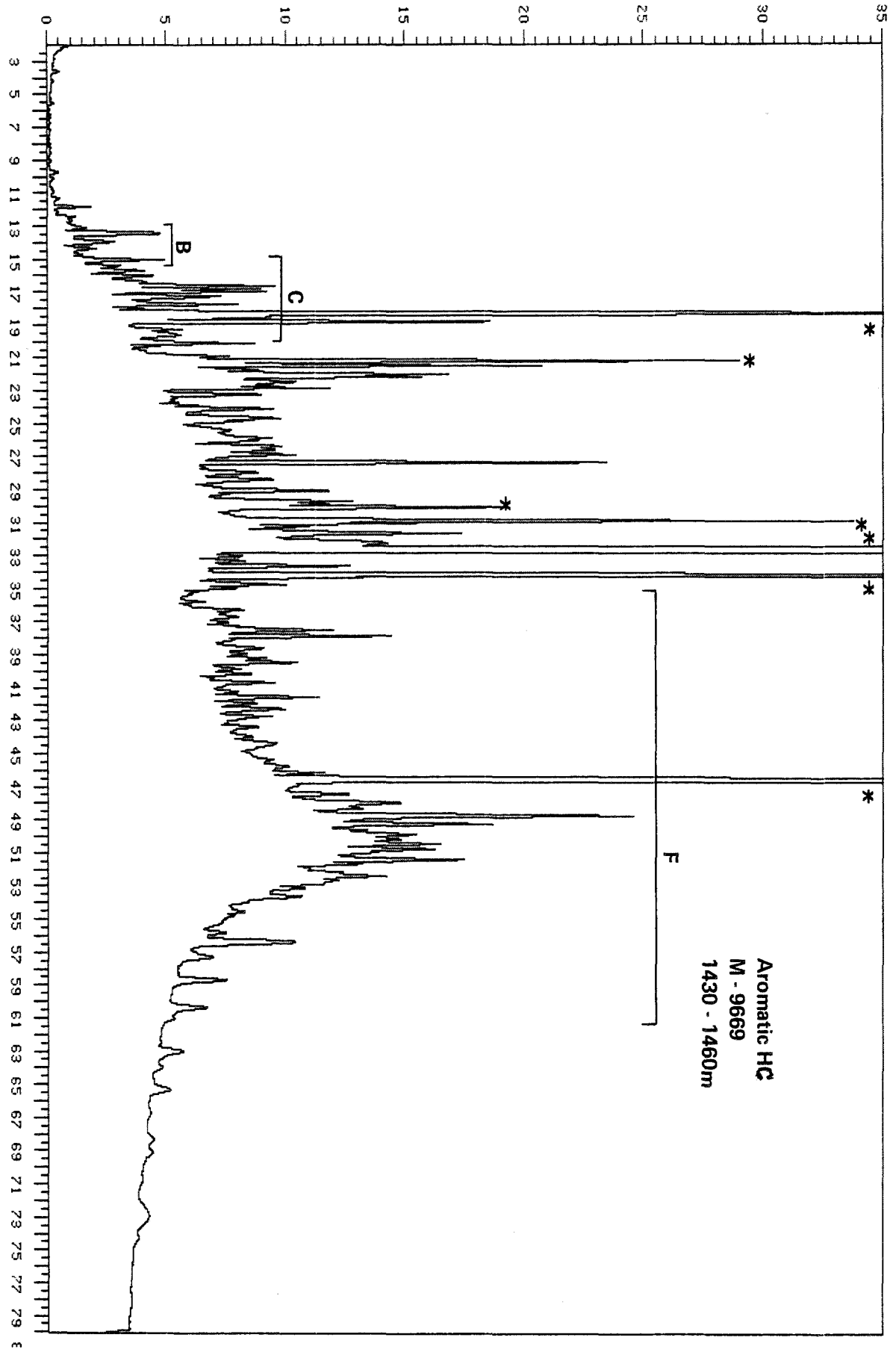
RAW DATA PLOT-CHANNEL 7 Box 1 of 1

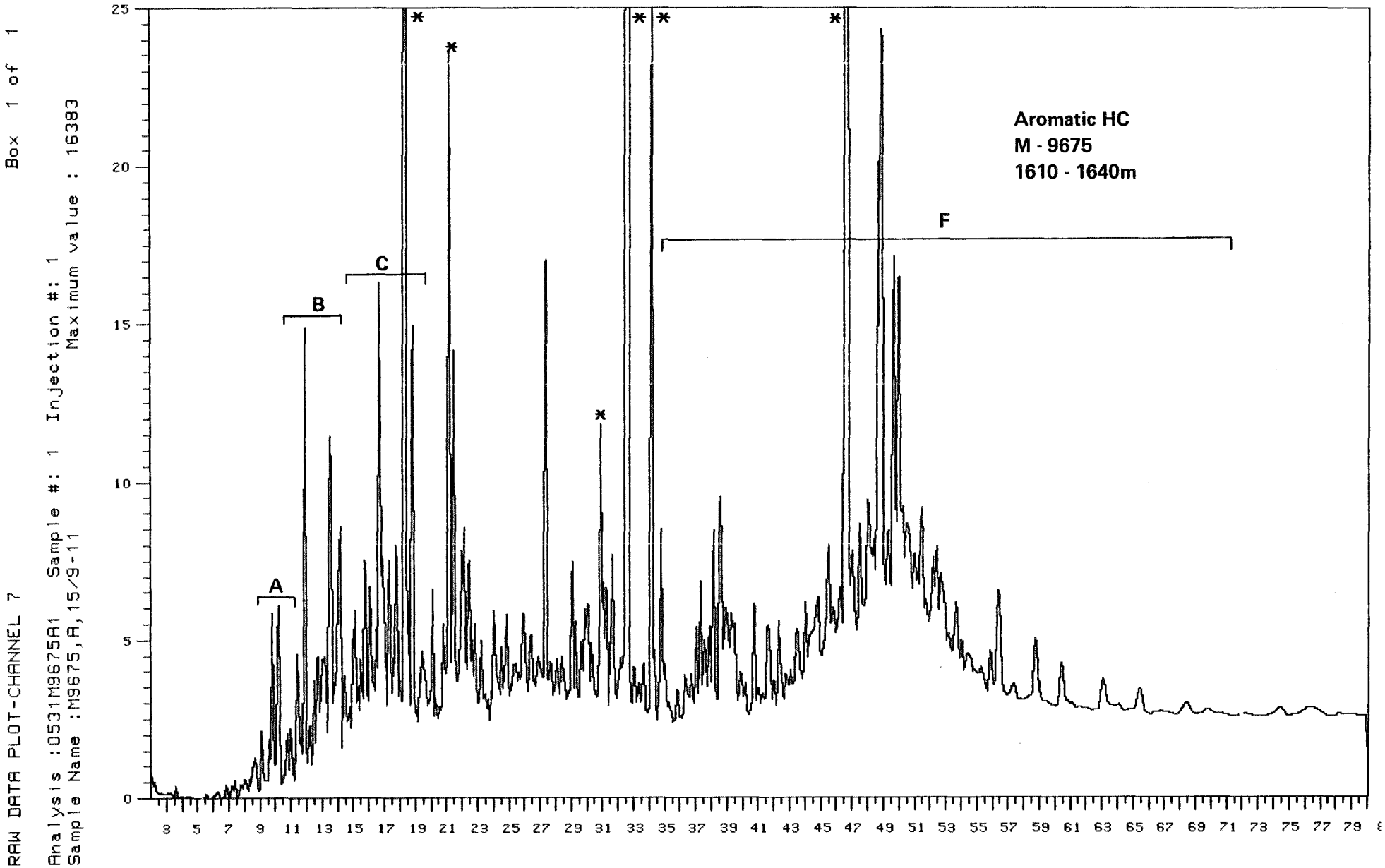
Analysis :0531M9667A1 Sample #: 1 Injection #: 1
Sample Name :M9667,A,15/9-11,TB Maximum value : 16383

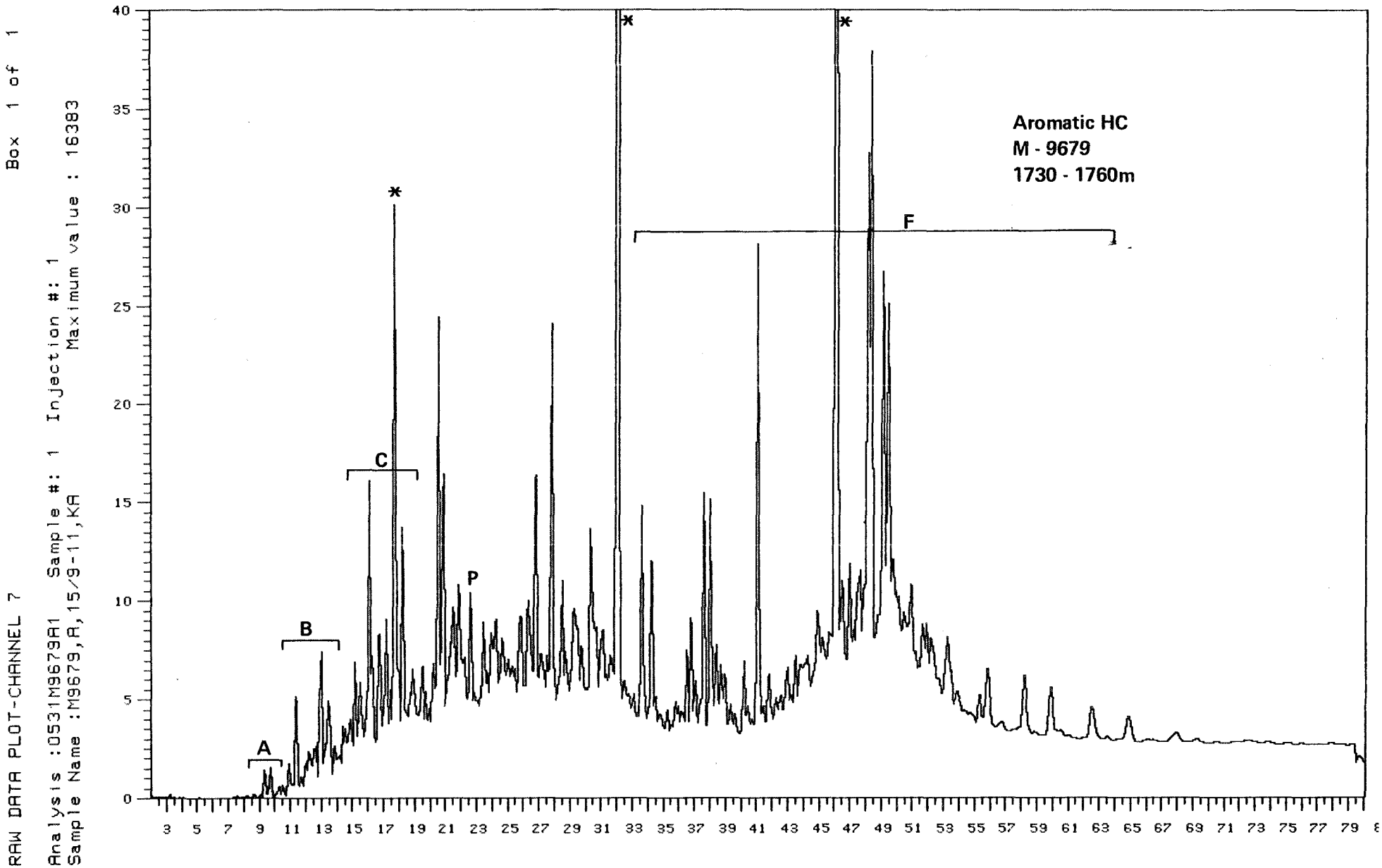


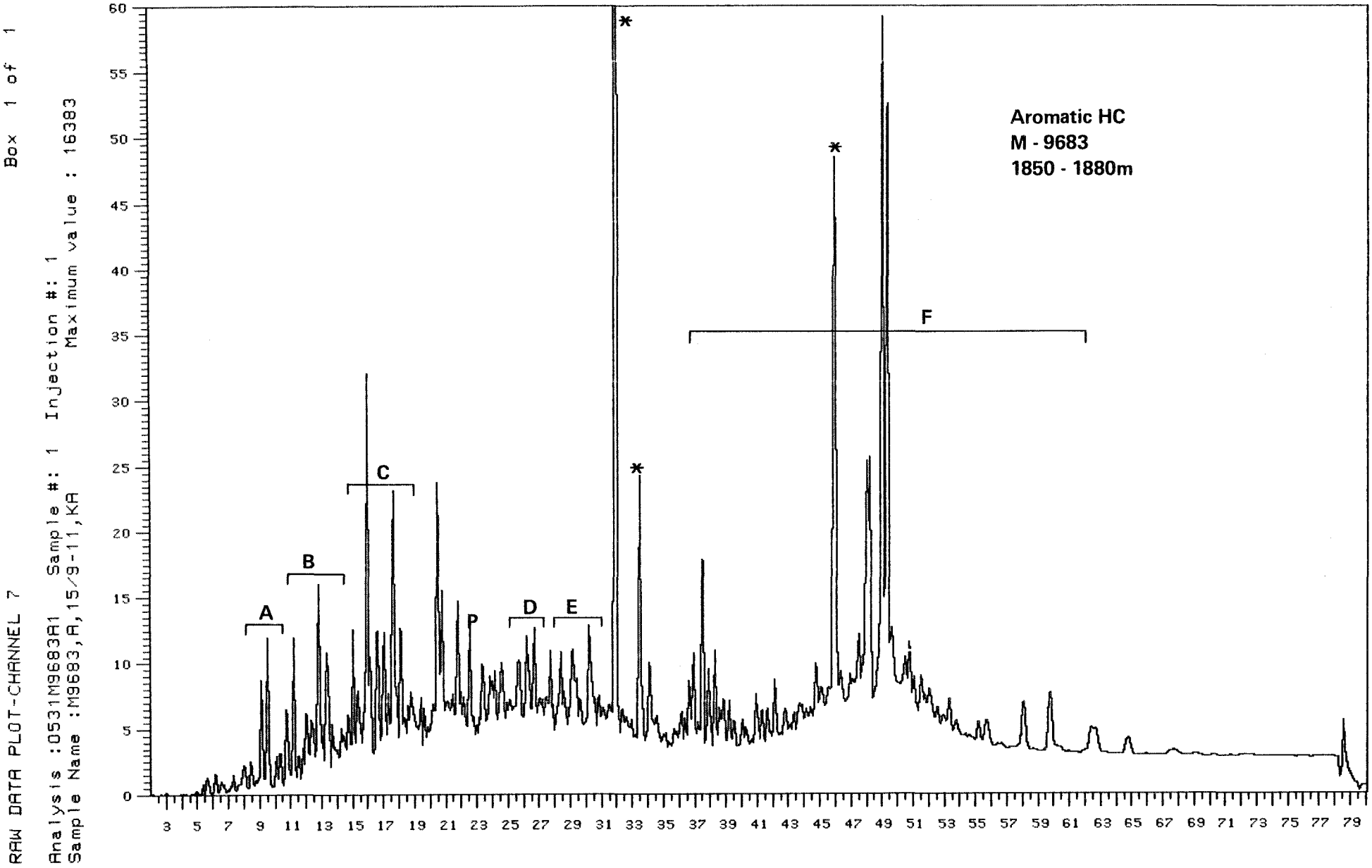
RAW DATA PLOT-CHANNEL 7 Box 1 of 1

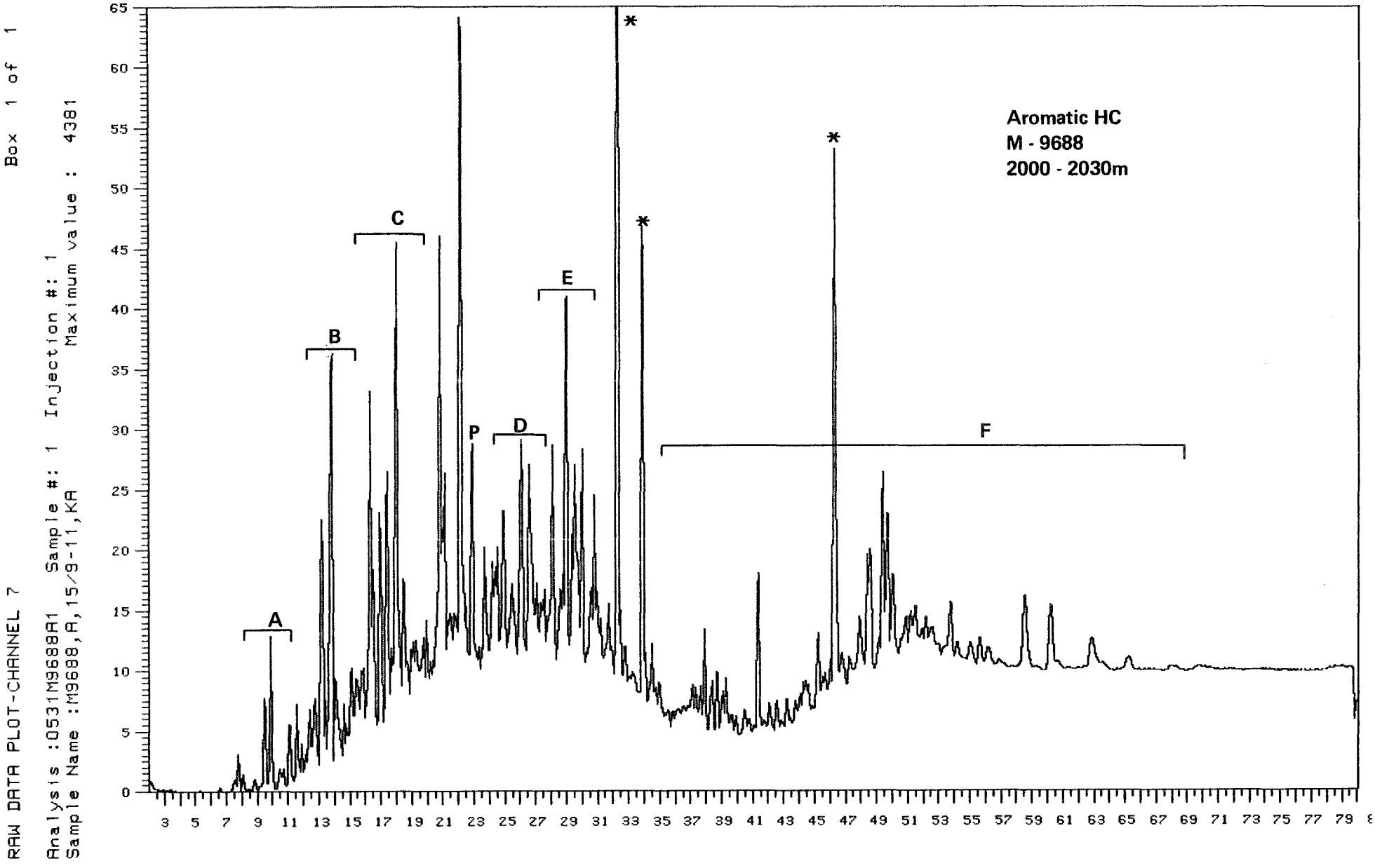
Analysis :0531M9669A1 Sample #: 1 Injection #: 1
Sample Name :M9669,A,15/9-11 Maximum value : 16383




RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :0531M9675A1 Sample #: 1 Injection #: 1
Sample Name :M9675,A,15/9-11 Maximum value : 16383
Aromatic HC
M - 9675
1610 - 1640m
A
B
C
F
0
5
10
15
20
25
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79

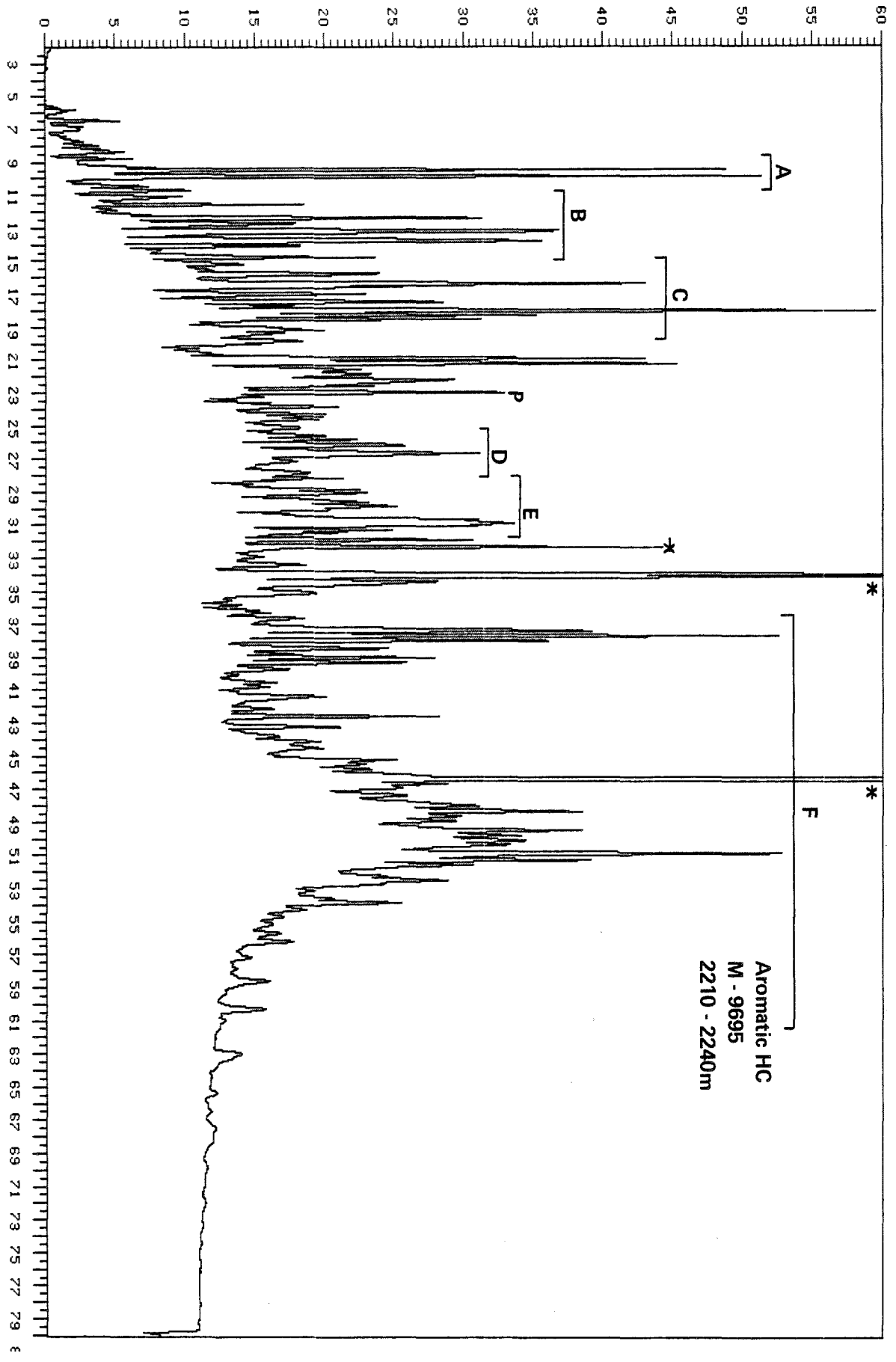

RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :0531M9679A1 Sample #: 1 Injection #: 1
Sample Name :M9679,A,15/9-11,KA Maximum value : 16383
Aromatic HC
M - 9679
1730 - 1760m
A
B
C
P
F
0
5
10
15
20
25
30
35
40
3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79

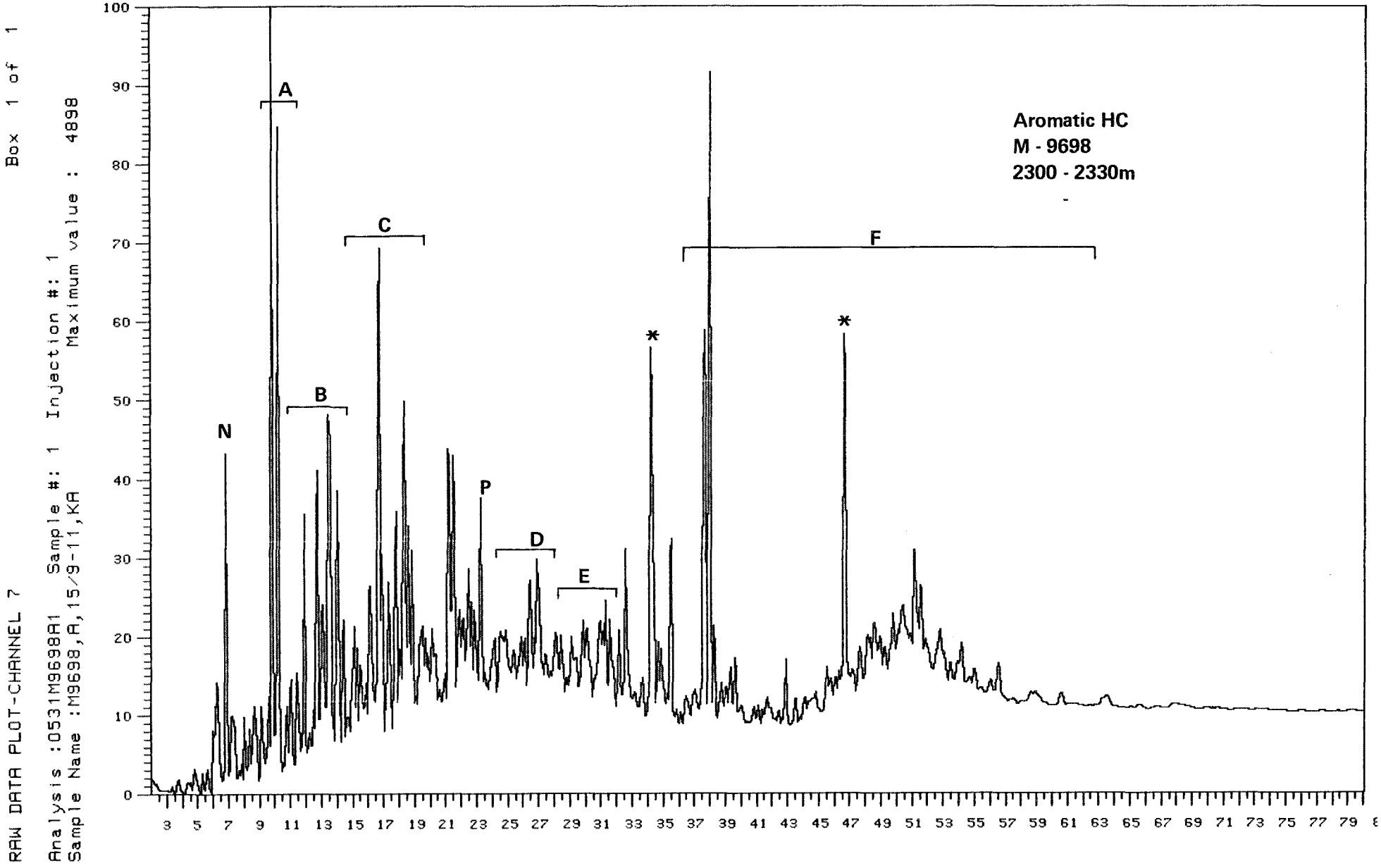

RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :0531M9683A1 Sample #: 1 Injection #: 1
Sample Name :M9683,A,15/9-11,KA
Maximum value : 16383
Aromatic HC
M - 9683
1850 - 1880m
A
B
C
P
D
E
F
*
*
*

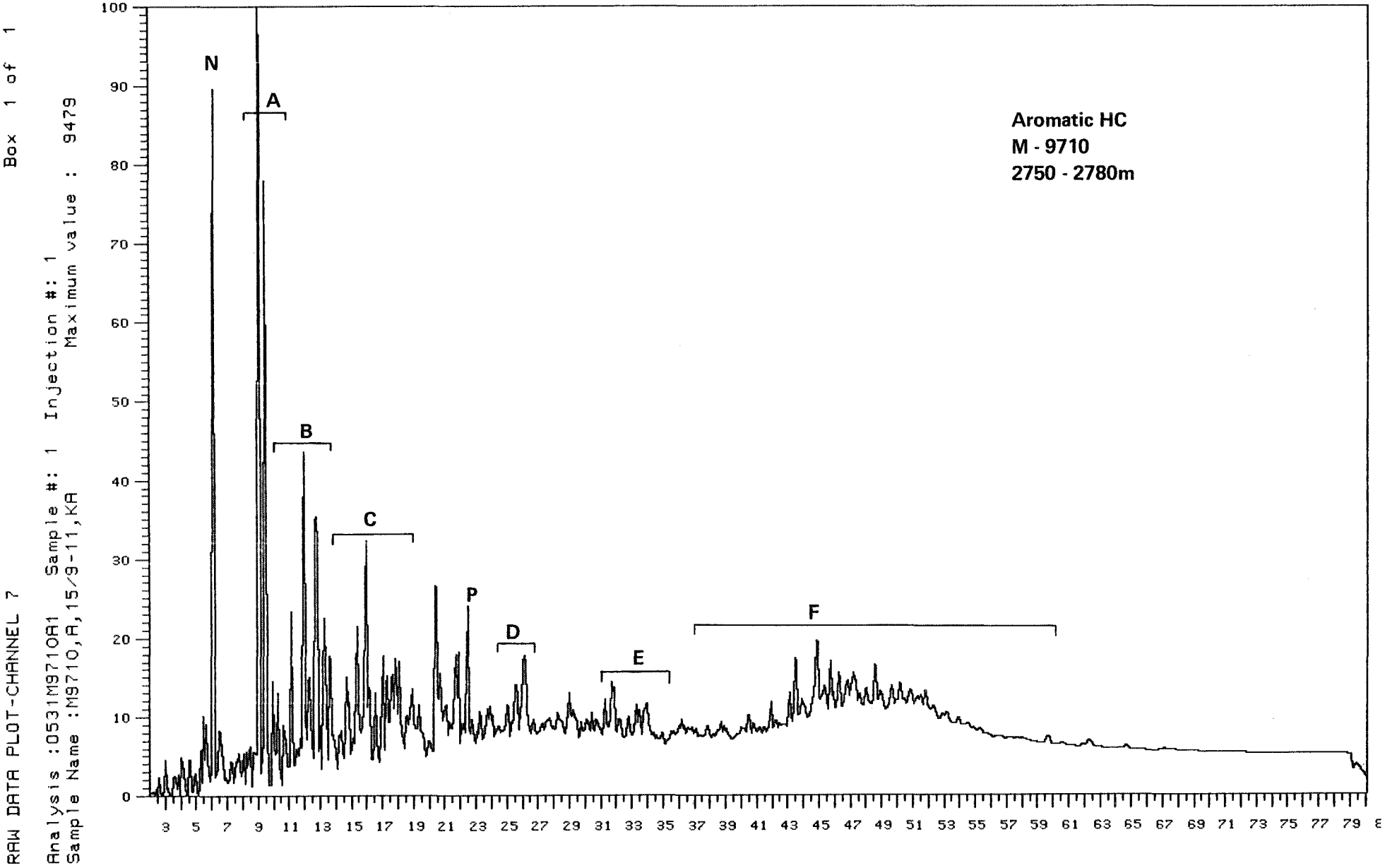

RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :0531M9688A1 Sample #: 1 Injection #: 1
Sample Name :M9688,A,15/9-11,KA Maximum value : 4381
Aromatic HC
M - 9688
2000 - 2030m
A
B
C
P
D
E
F
*
*
*

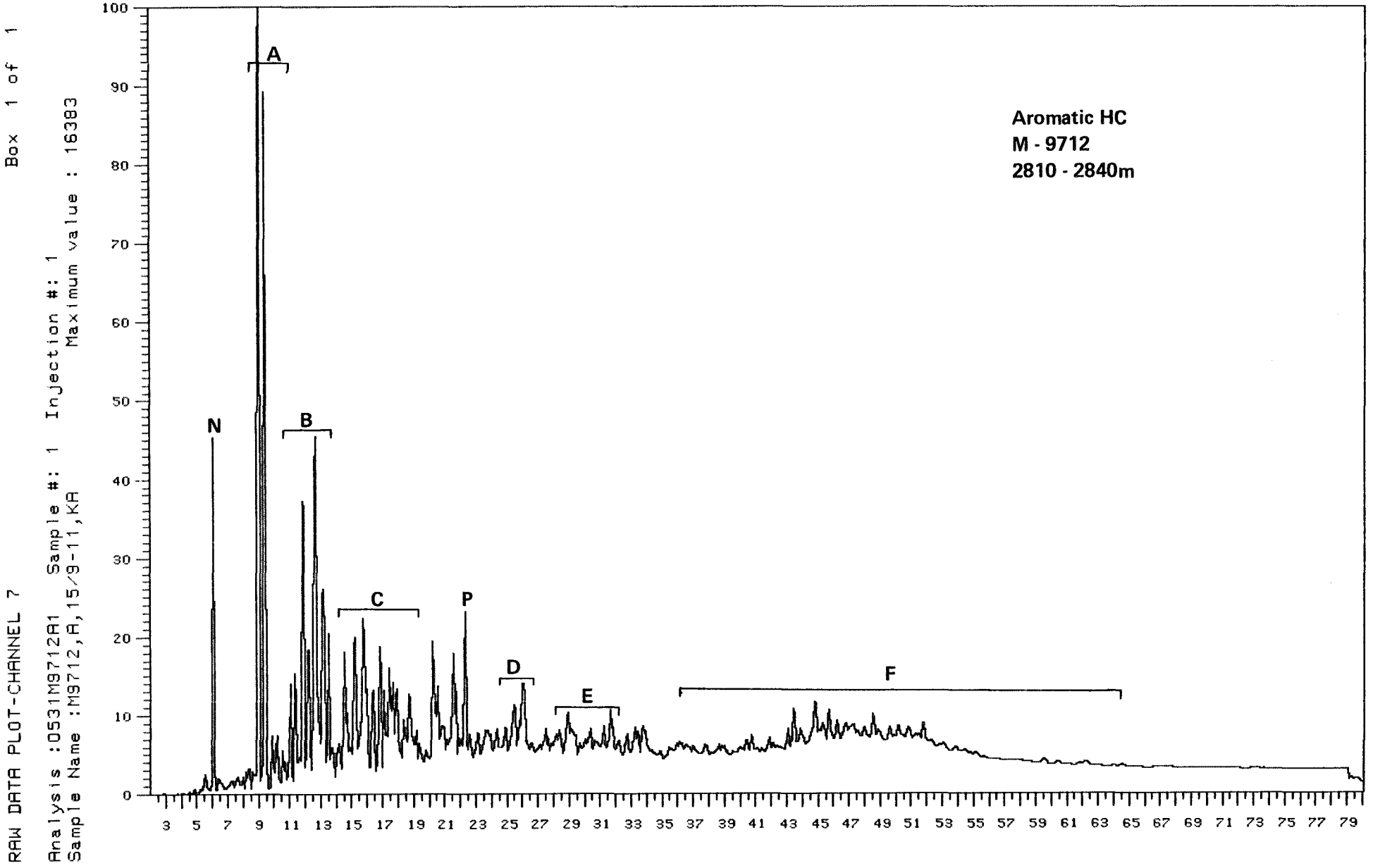
RAW DATA PLOT-CHANNEL 7 Box 1 of 1

Analysis :0531M9695A1 Sample #: 1 Injection #: 1
Sample Name :M9695,A,15/9-11,KA Maximum value : 4473




RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :0531M9698A1 Sample #: 1 Injection #: 1
Sample Name :M9698,A,15/9-11,KA Maximum value : 4898
Aromatic HC
M - 9698
2300 - 2330m
N
A
B
C
P
D
E
F
*
*

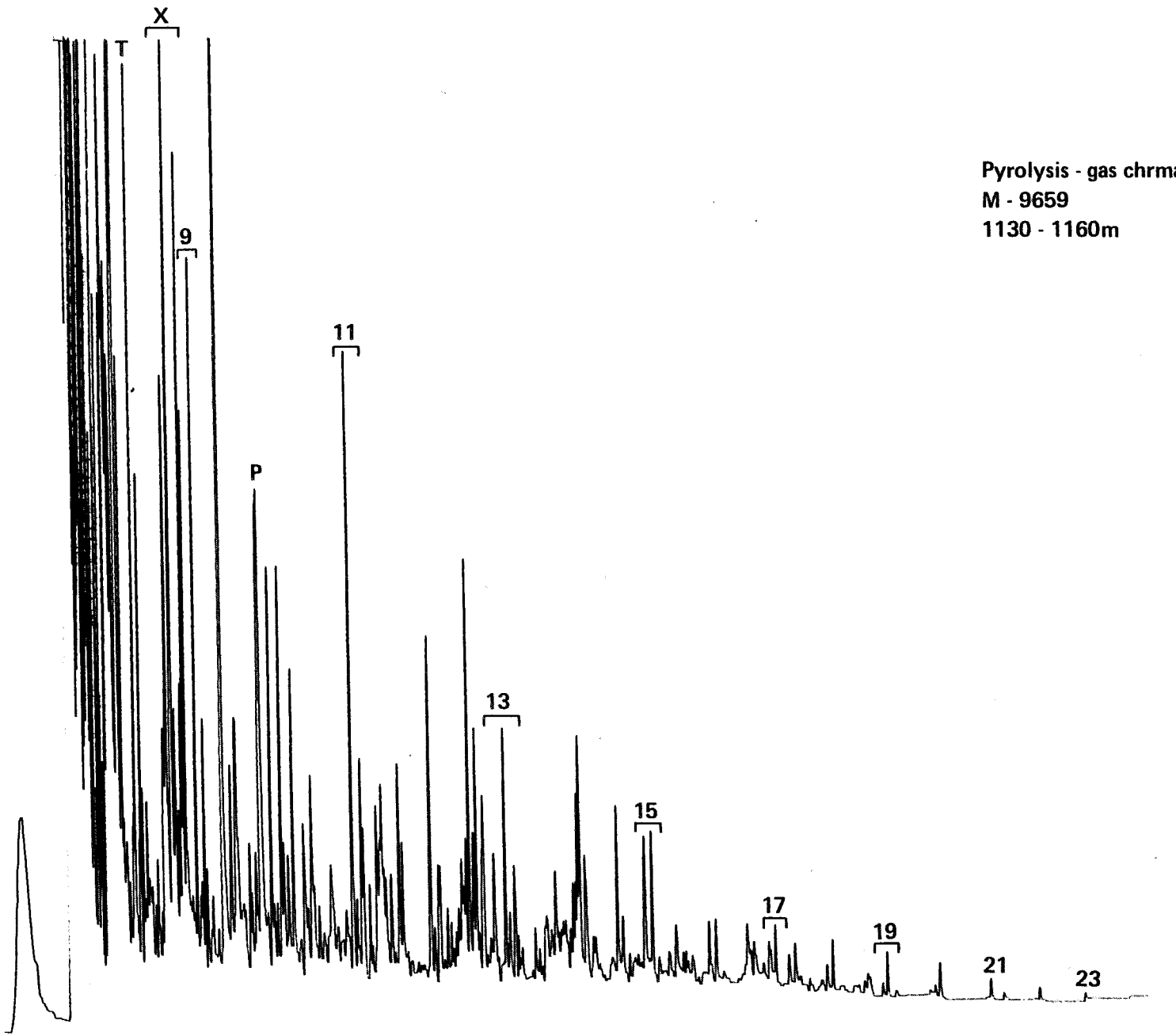

RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :0531M9710A1 Sample #: 1 Injection #: 1
Sample Name :M9710,A,15/9-11,KA Maximum value : 9479
N
A
B
C
P
D
E
F
Aromatic HC
M - 9710
2750 - 2780m


RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :0531M9712A1 Sample #: 1 Injection #: 1
Sample Name :M9712,A,15/9-11,KA Maximum value : 16383
Aromatic HC
M - 9712
2810 - 2840m
N
A
B
C
P
D
E
F

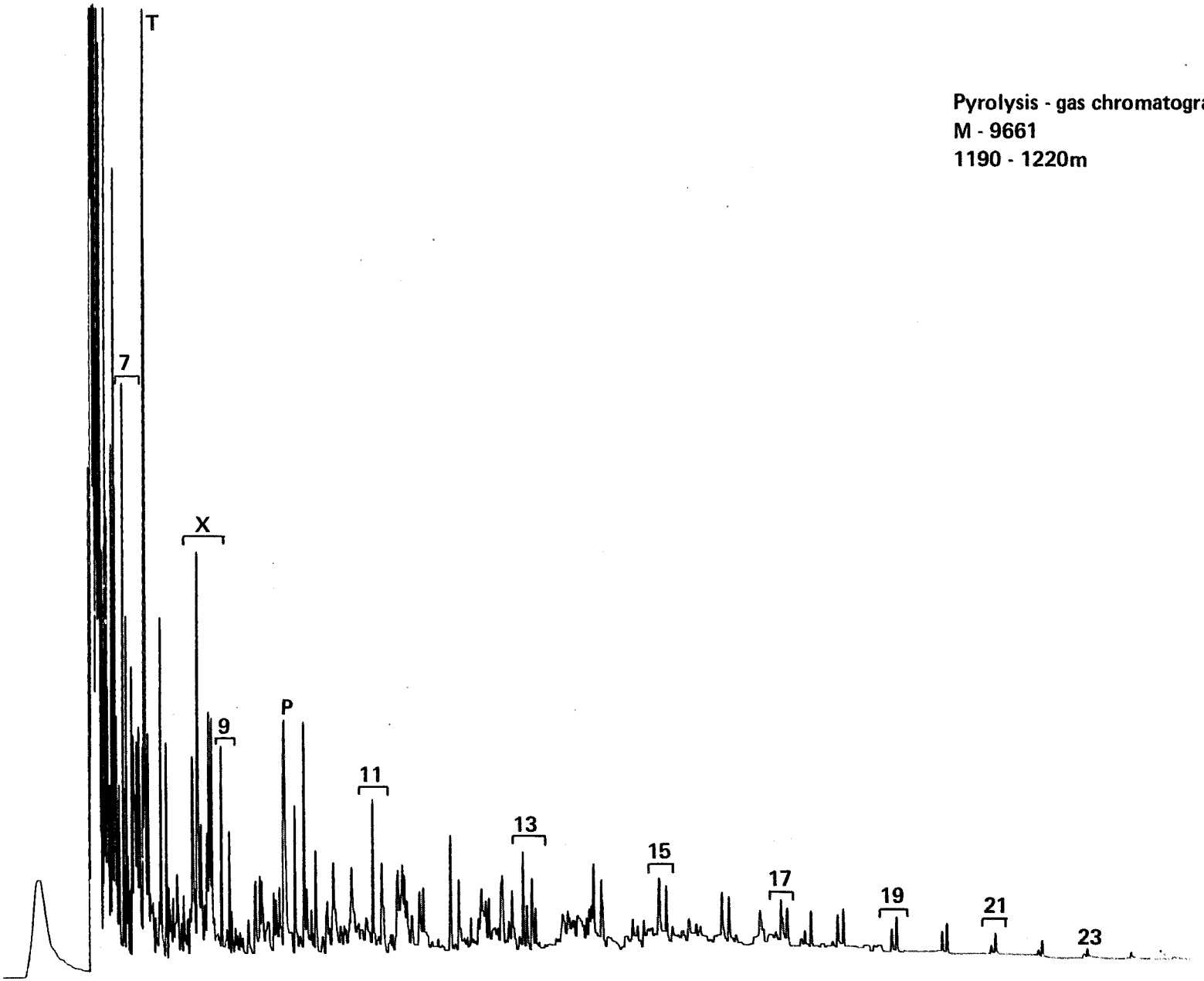
PYROLYSIS-GAS
CHROMATOGRAMS

T = toluene
X = xylenes
P = phenol

numbered peaks are n-alkene/n-alkane doublets
with the n-alkene eluting first.

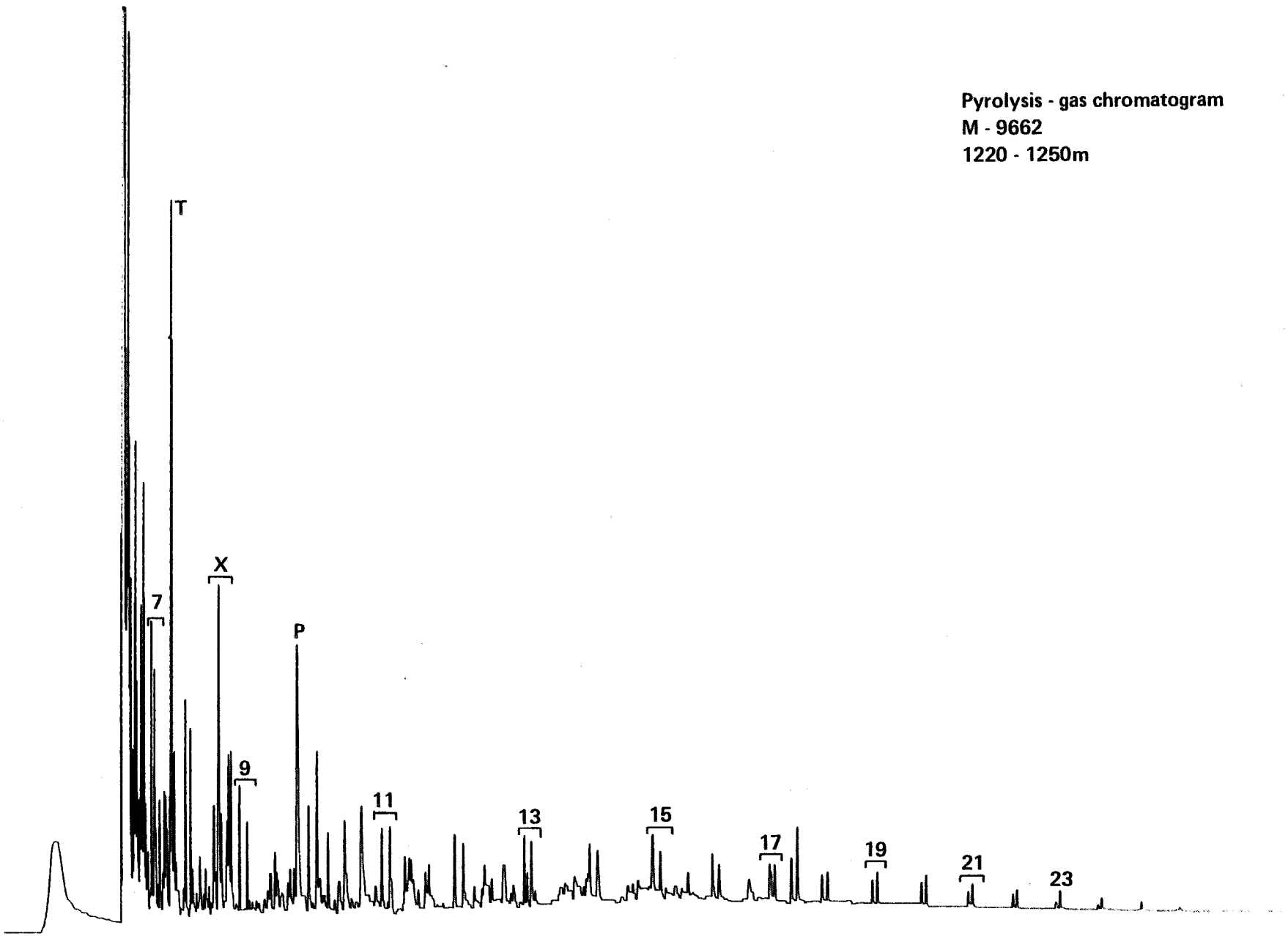


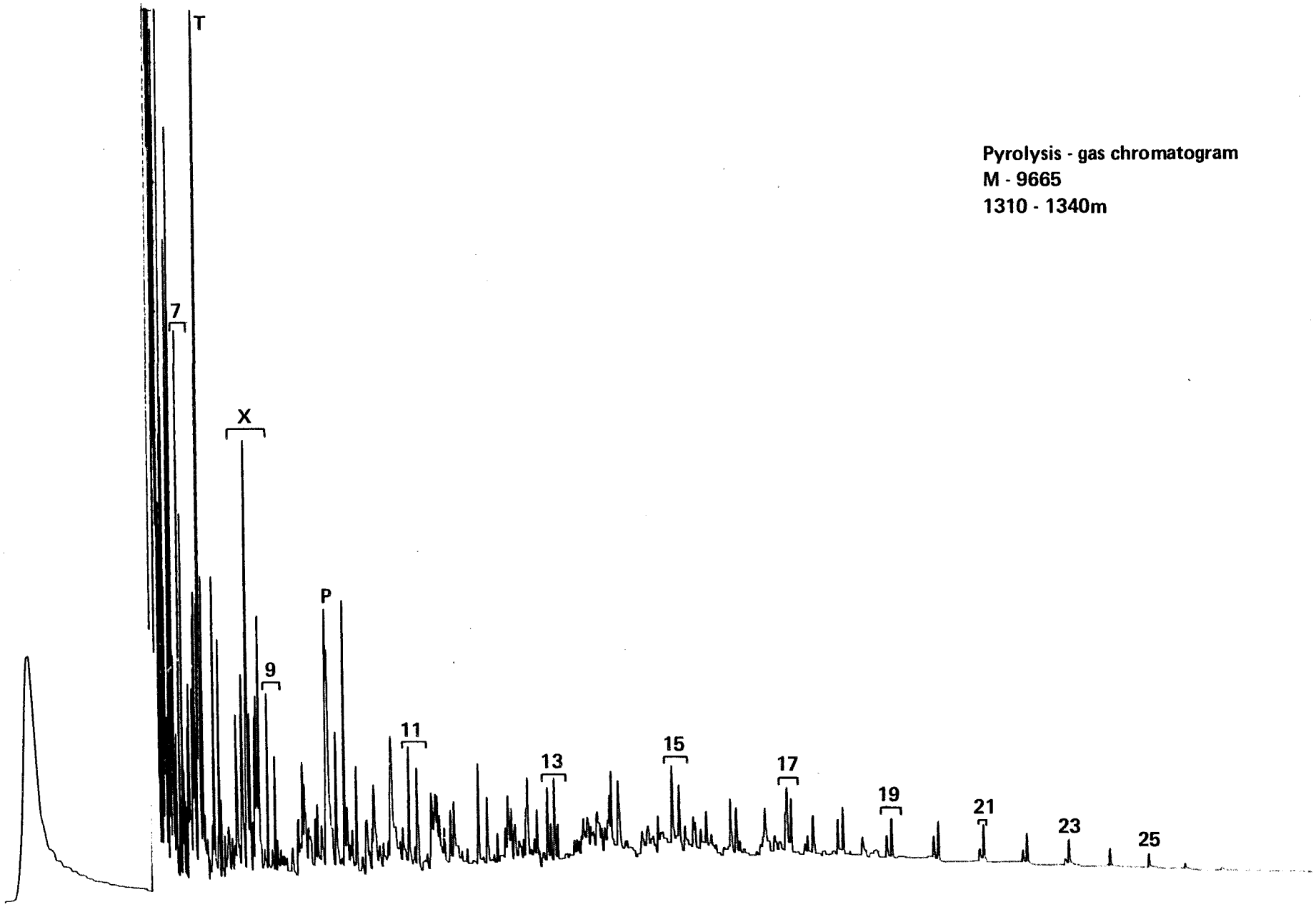
Pyrolysis - gas chrmatogram
M - 9659
1130 - 1160m



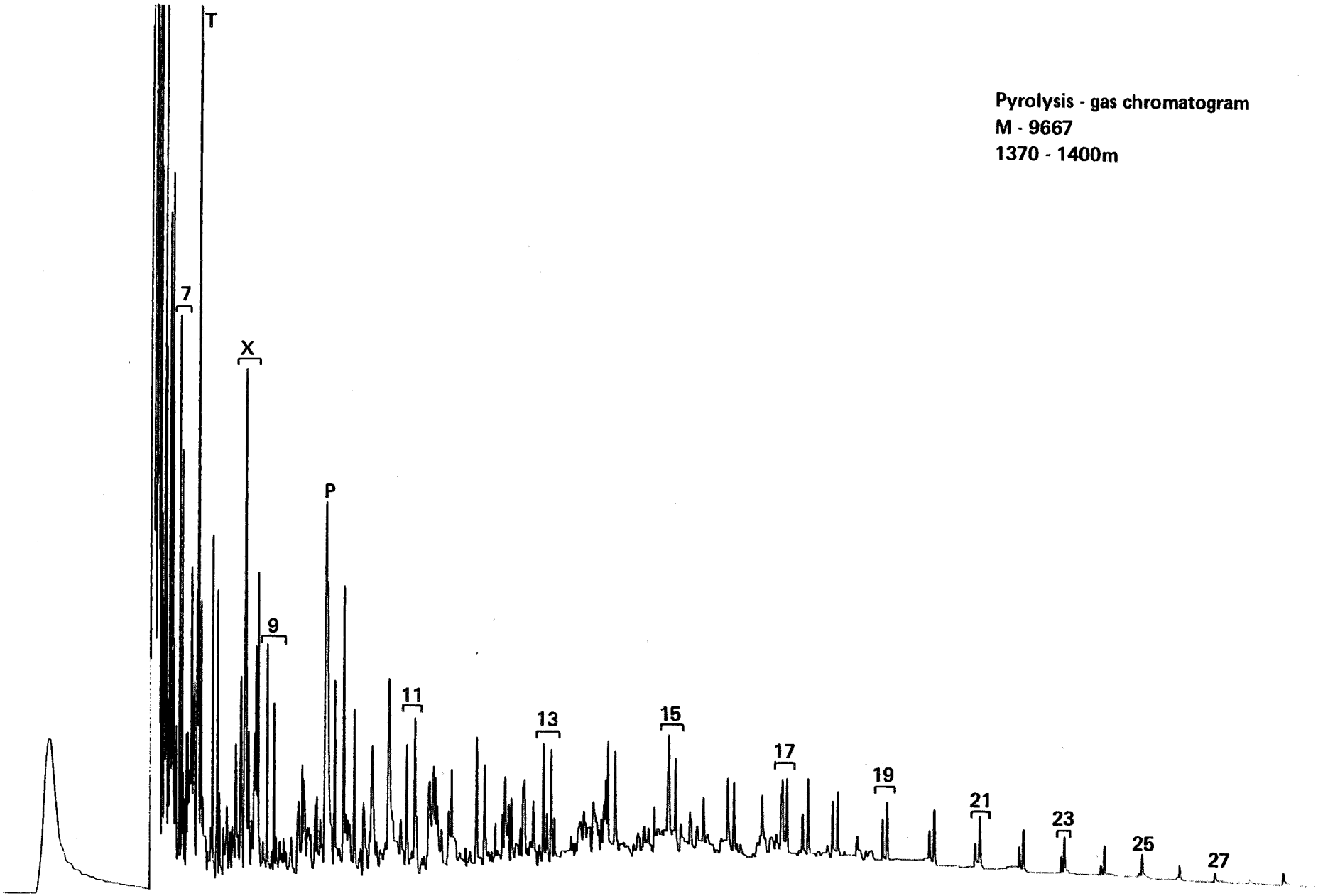
Pyrolysis - gas chromatogram
M - 9661
1190 - 1220m

Pyrolysis - gas chromatogram
M - 9662
1220 - 1250m

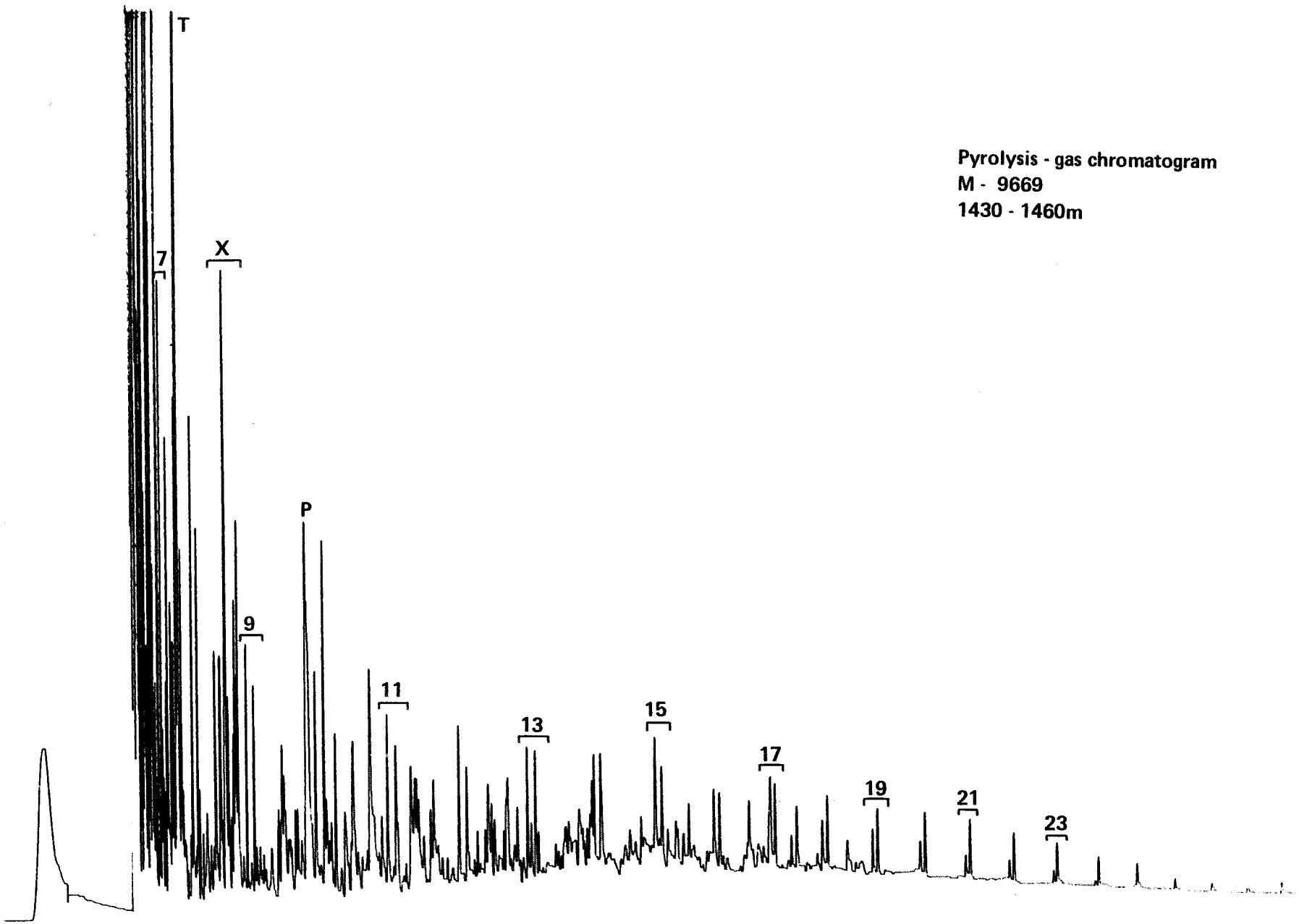




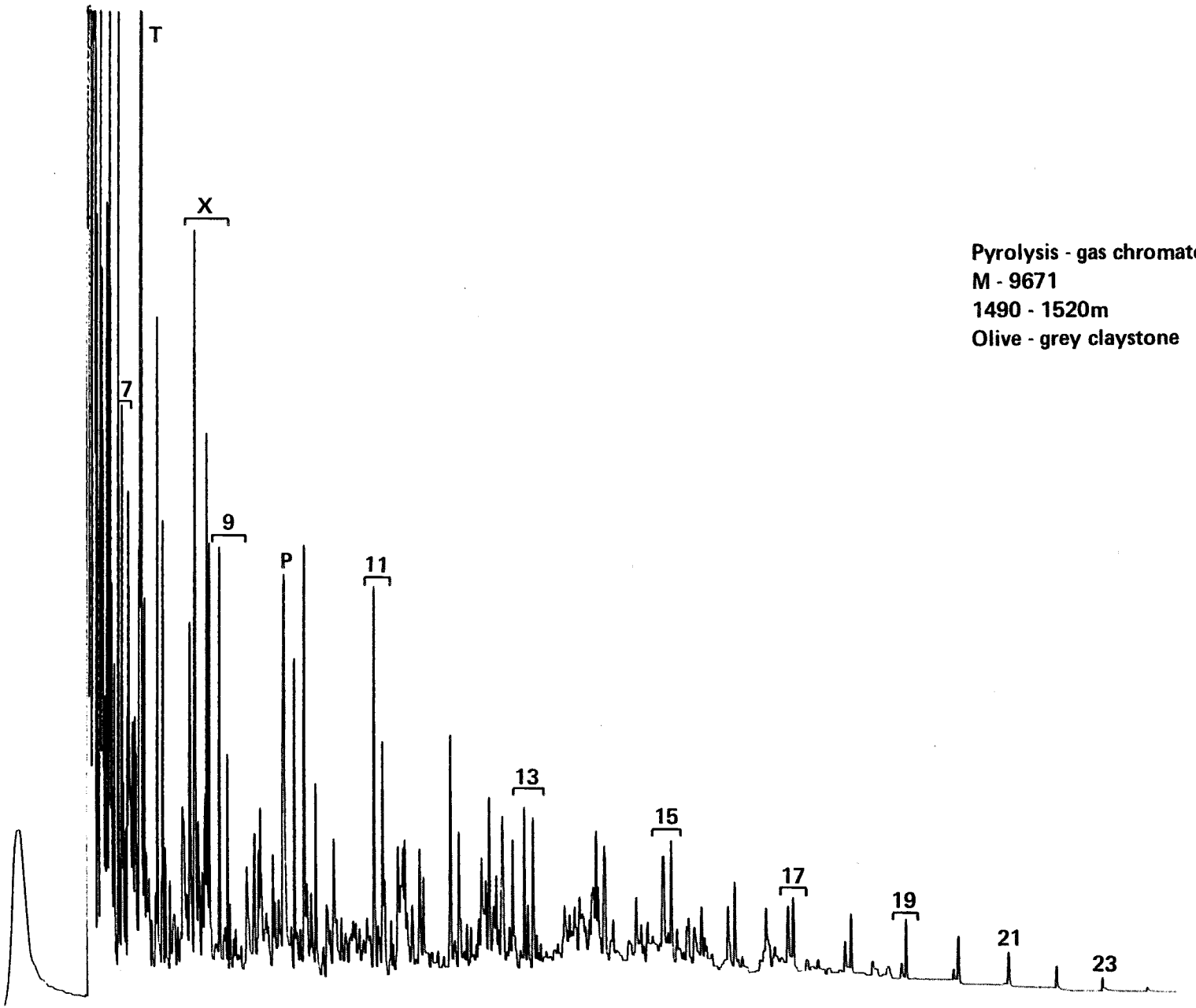
Pyrolysis - gas chromatogram
M - 9665
1310 - 1340m



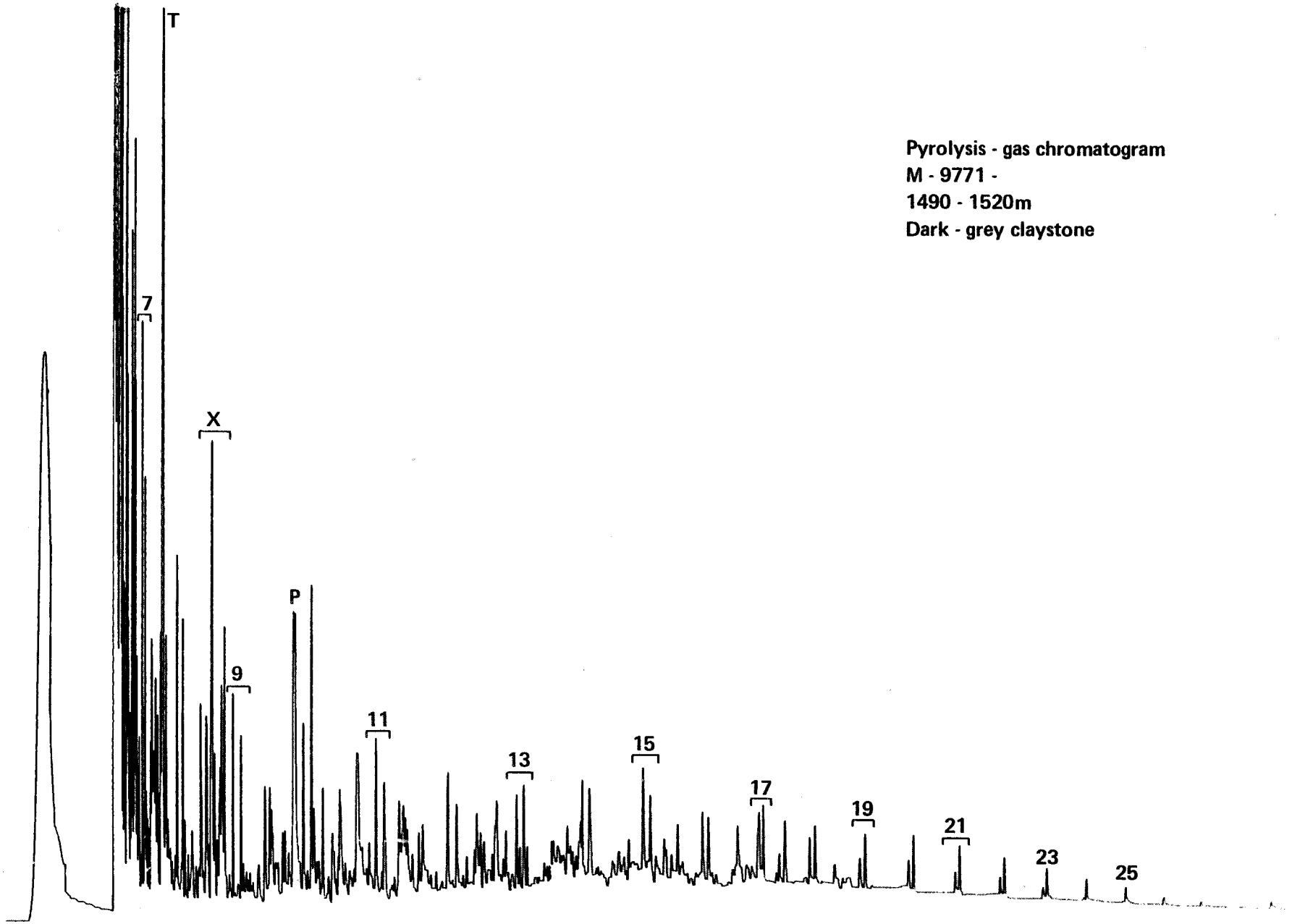
Pyrolysis - gas chromatogram
M - 9667
1370 - 1400m



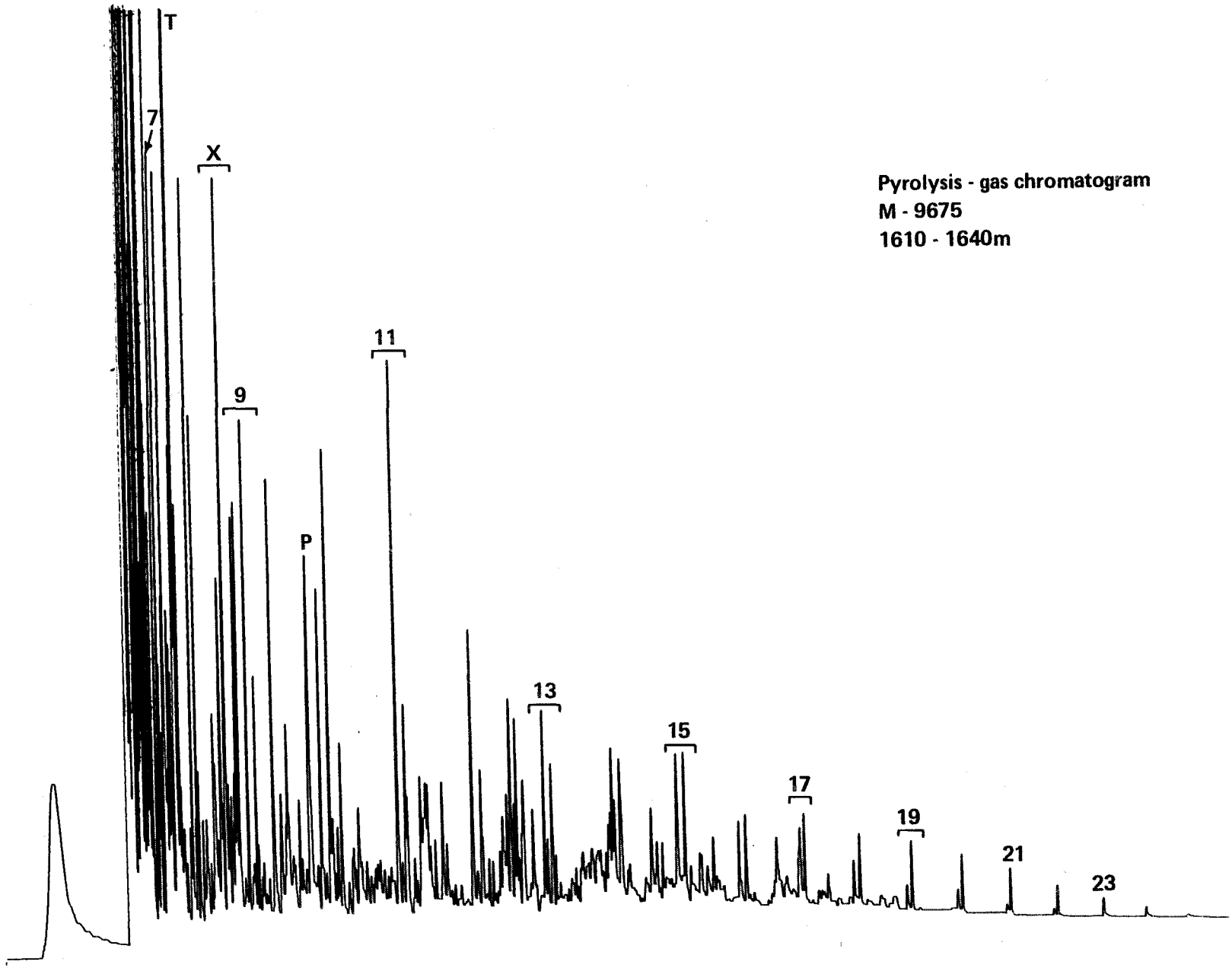
Pyrolysis - gas chromatogram
M - 9669
1430 - 1460m



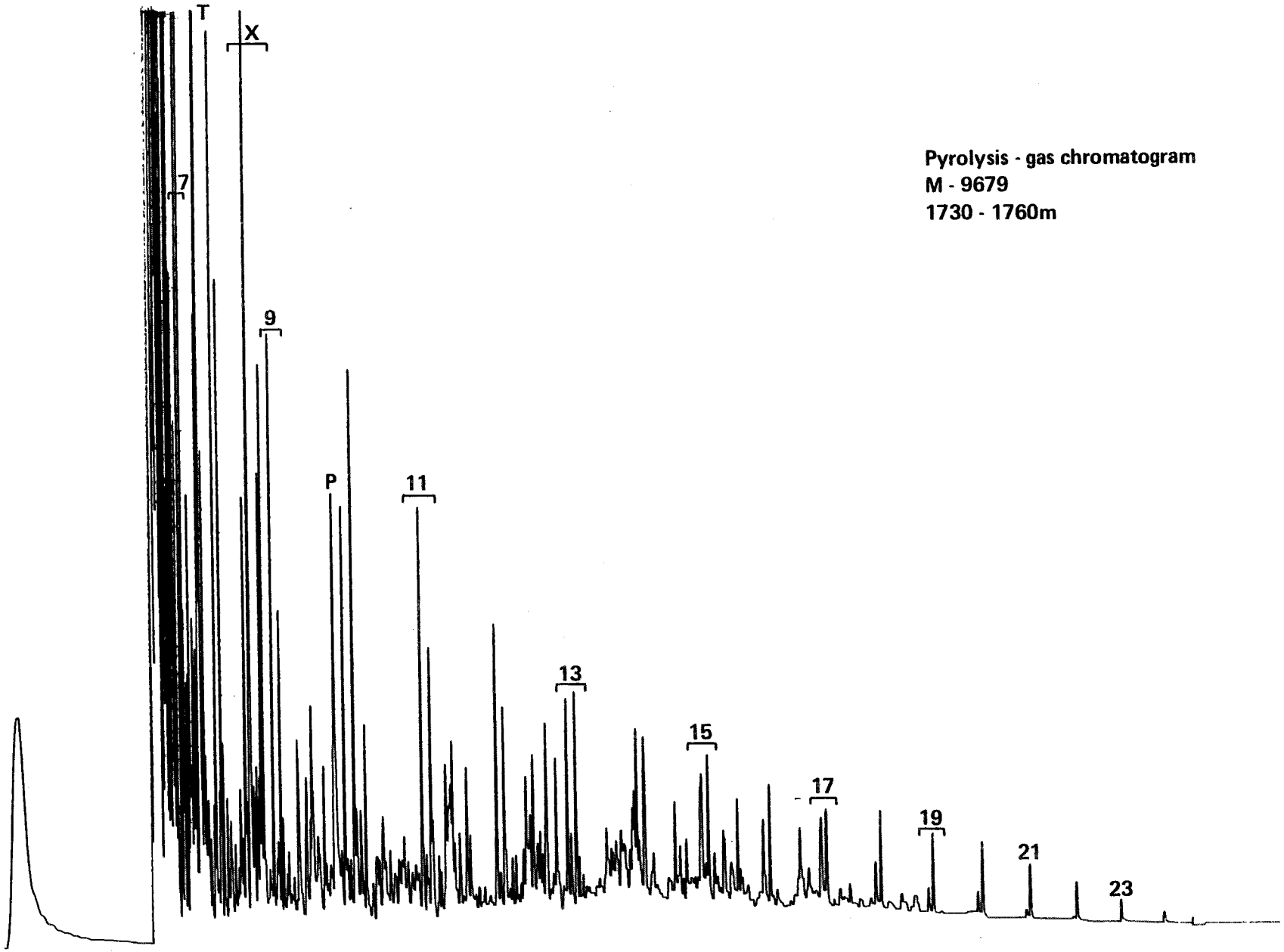
Pyrolysis - gas chromatogram
M - 9671
1490 - 1520m
Olive - grey claystone



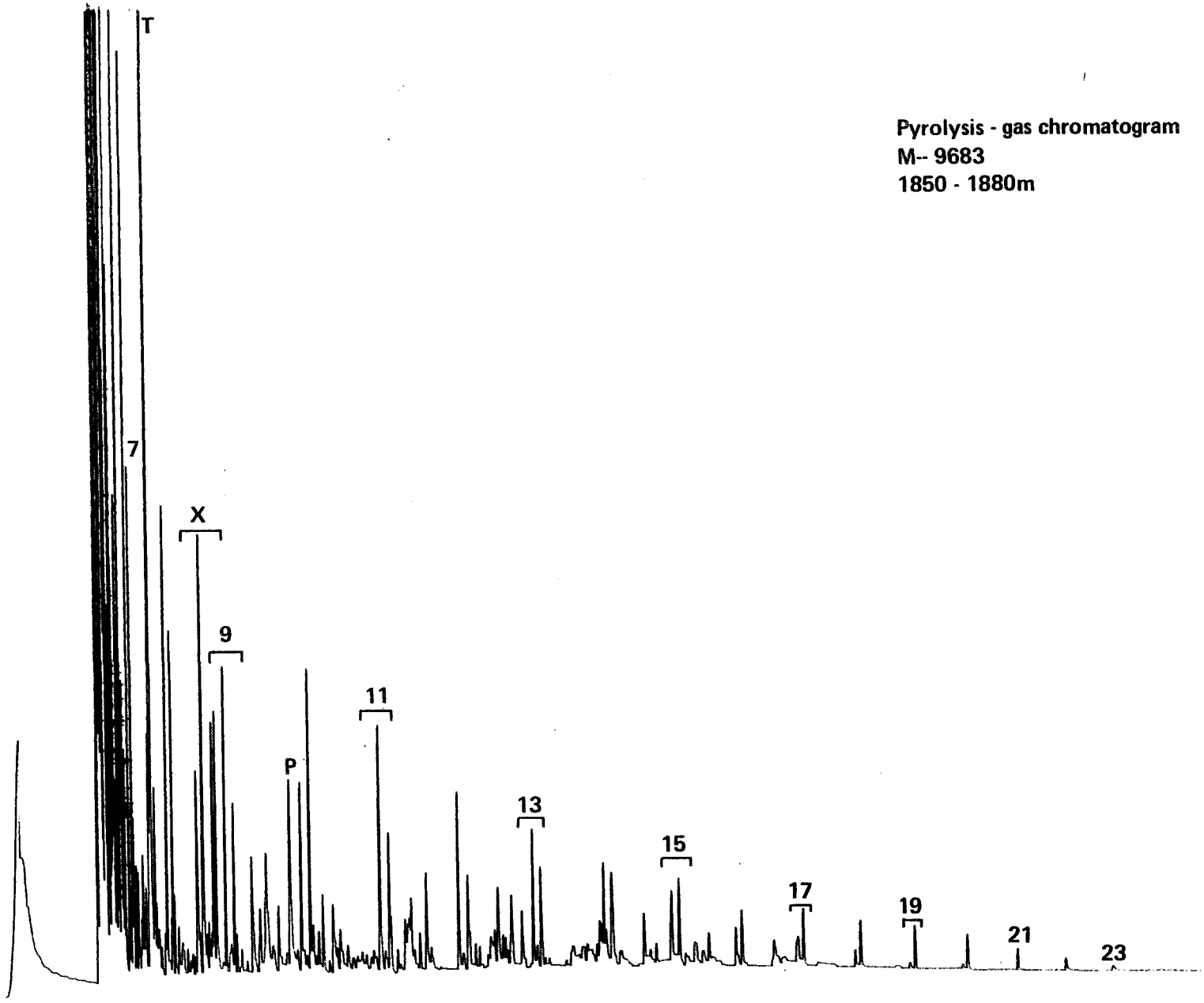
Pyrolysis - gas chromatogram
M - 9771 -
1490 - 1520m
Dark - grey claystone



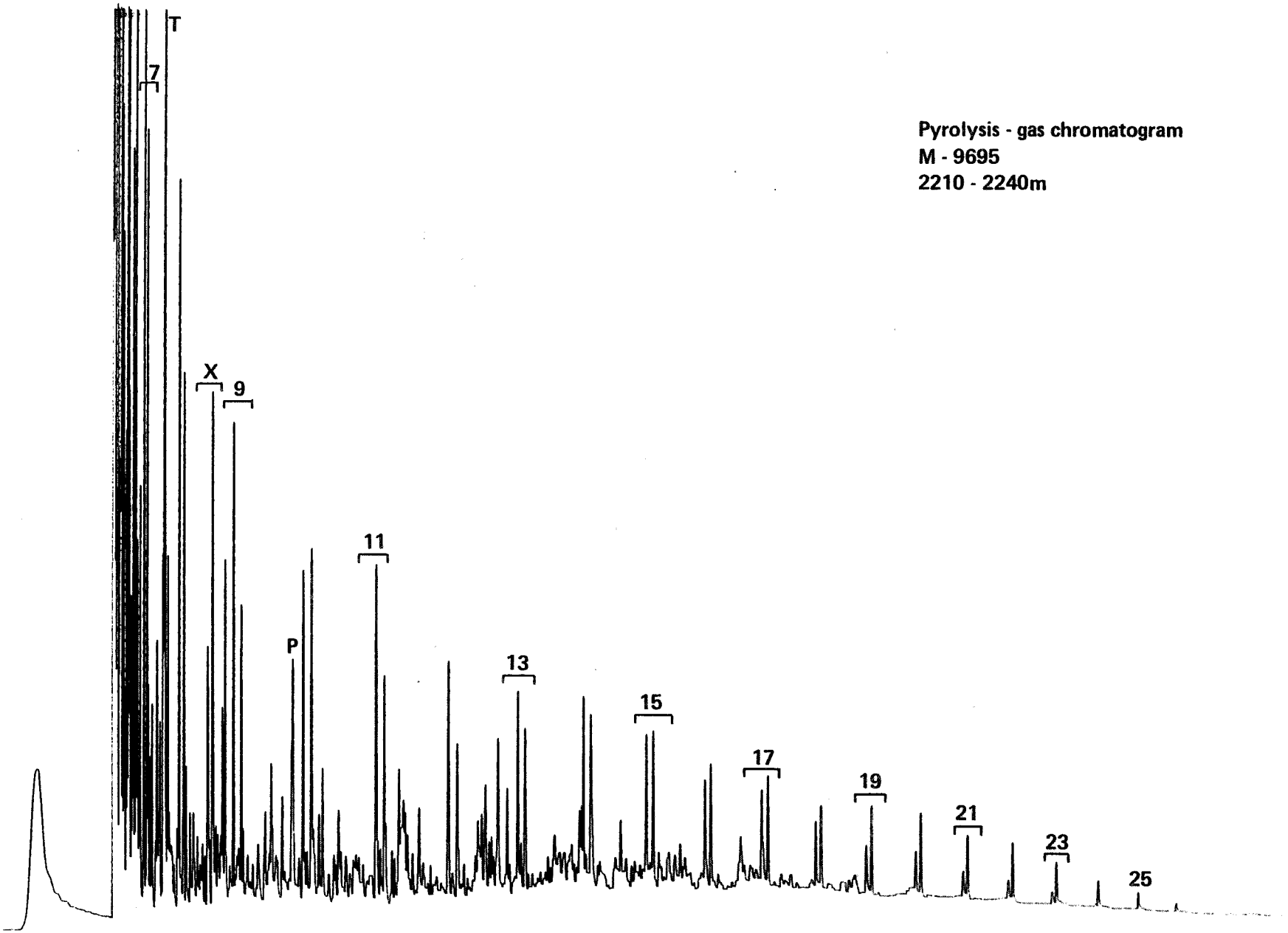
Pyrolysis - gas chromatogram
M - 9675
1610 - 1640m



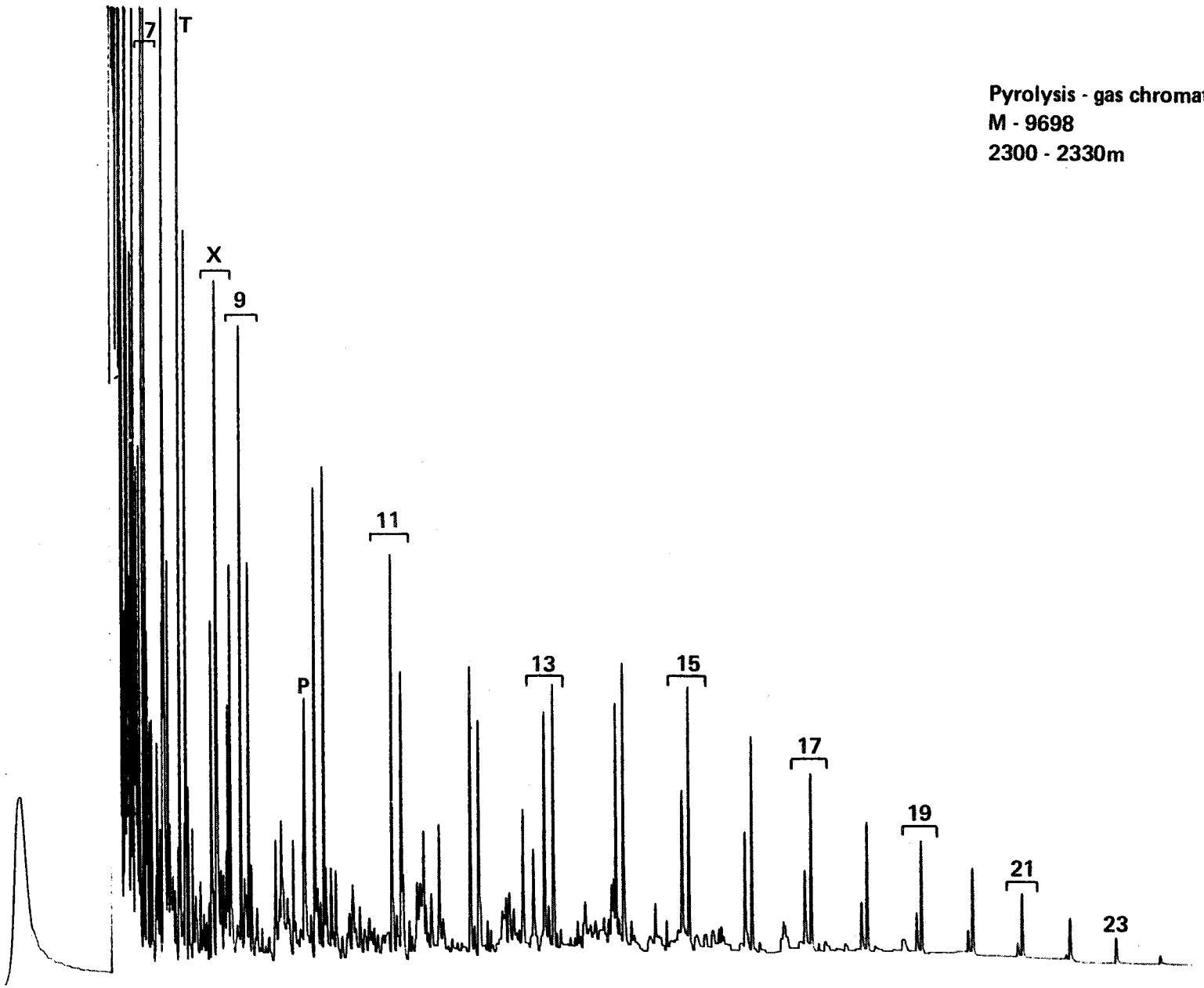
Pyrolysis - gas chromatogram
M - 9679
1730 - 1760m



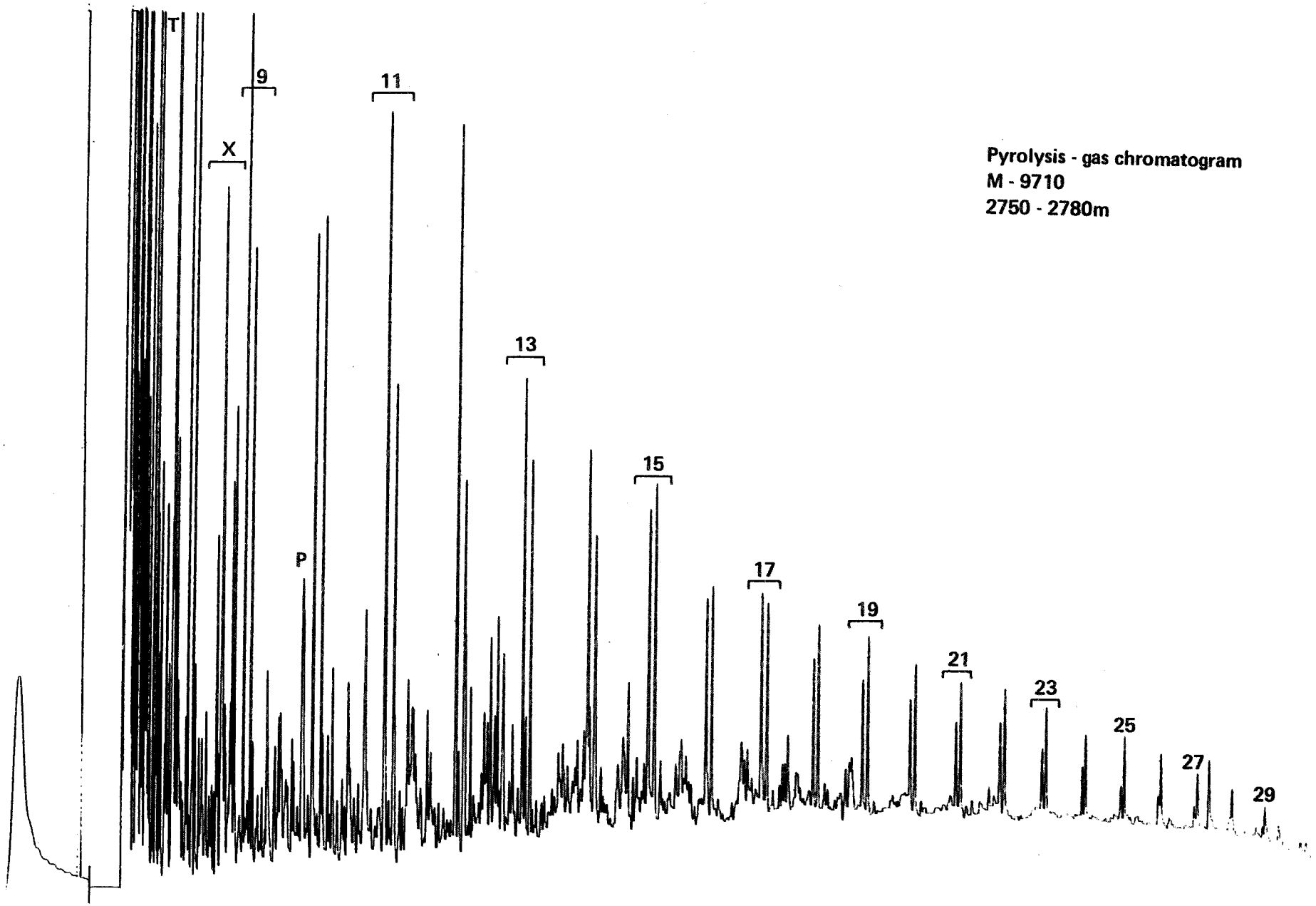
Pyrolysis - gas chromatogram
M-- 9683
1850 - 1880m



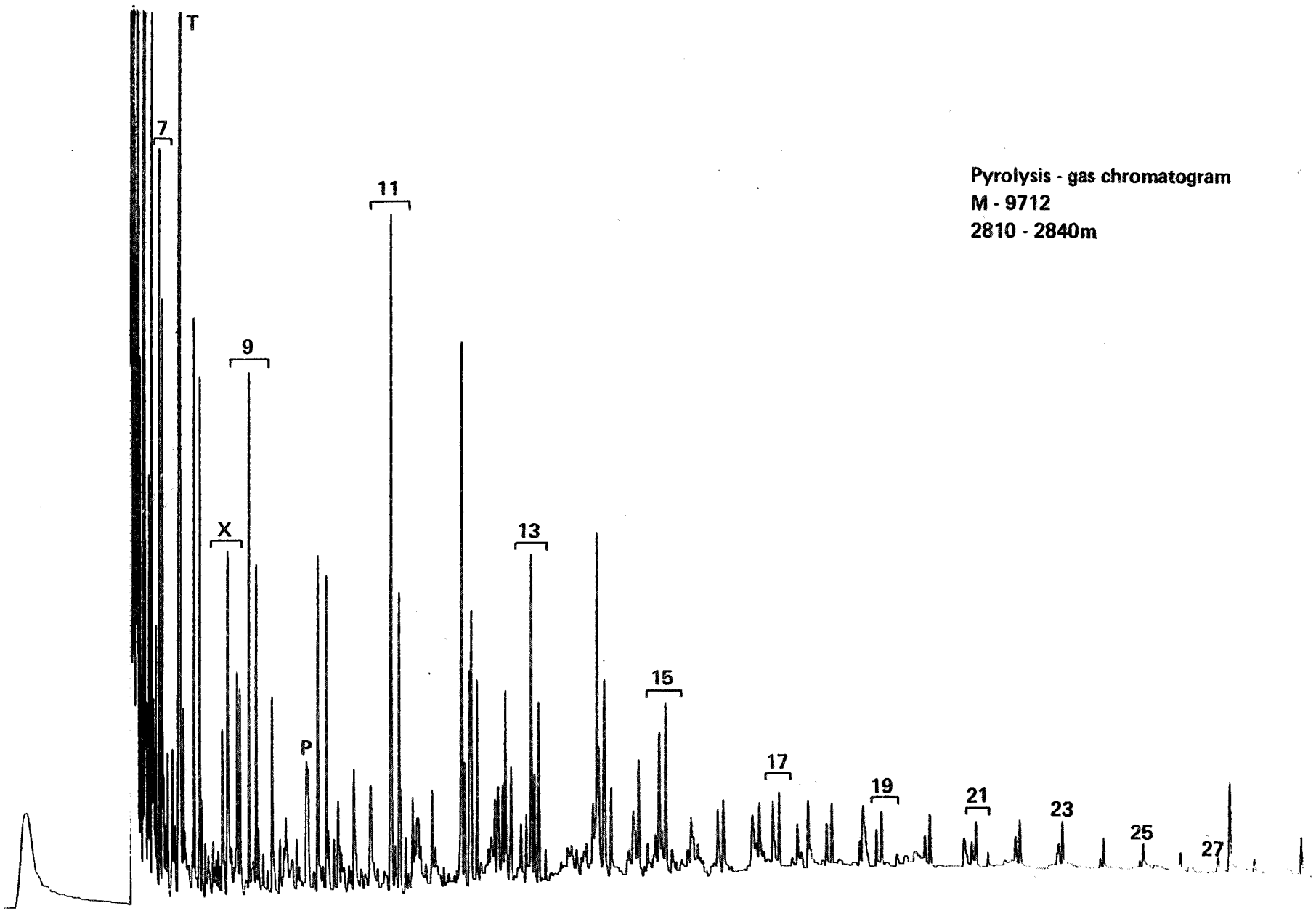
Pyrolysis - gas chromatogram
M - 9695
2210 - 2240m



Pyrolysis - gas chromatogram
M - 9698
2300 - 2330m



Pyrolysis - gas chromatogram
M - 9710
2750 - 2780m



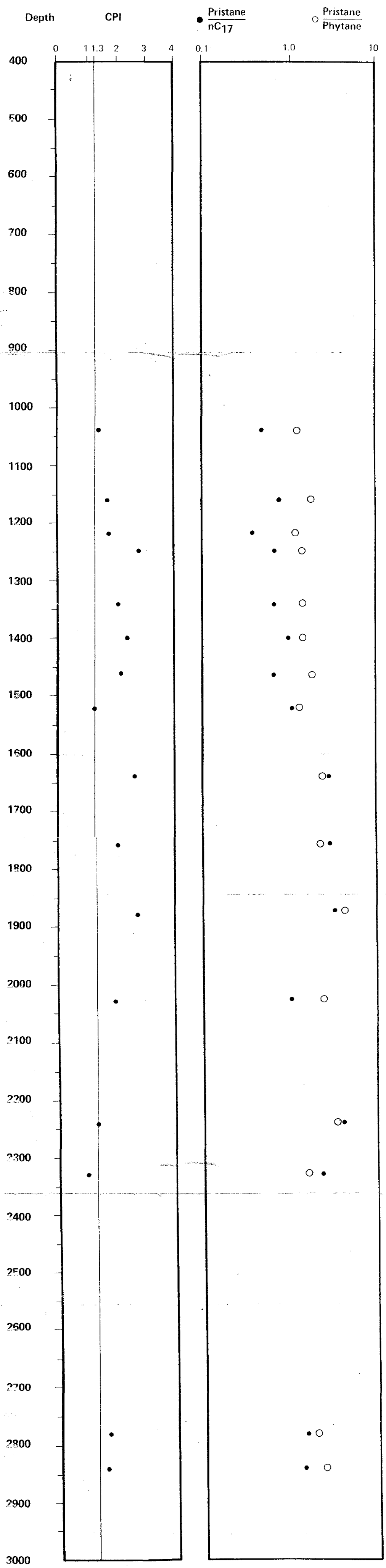
Pyrolysis - gas chromatogram
M - 9712
2810 - 2840m

Organic Geochemistry Department

C_{15}^{+} SATURATED HYDROCARBONS

Presentation of Analytical Data

Well no.: 15/9 - 11
Company: STATOIL

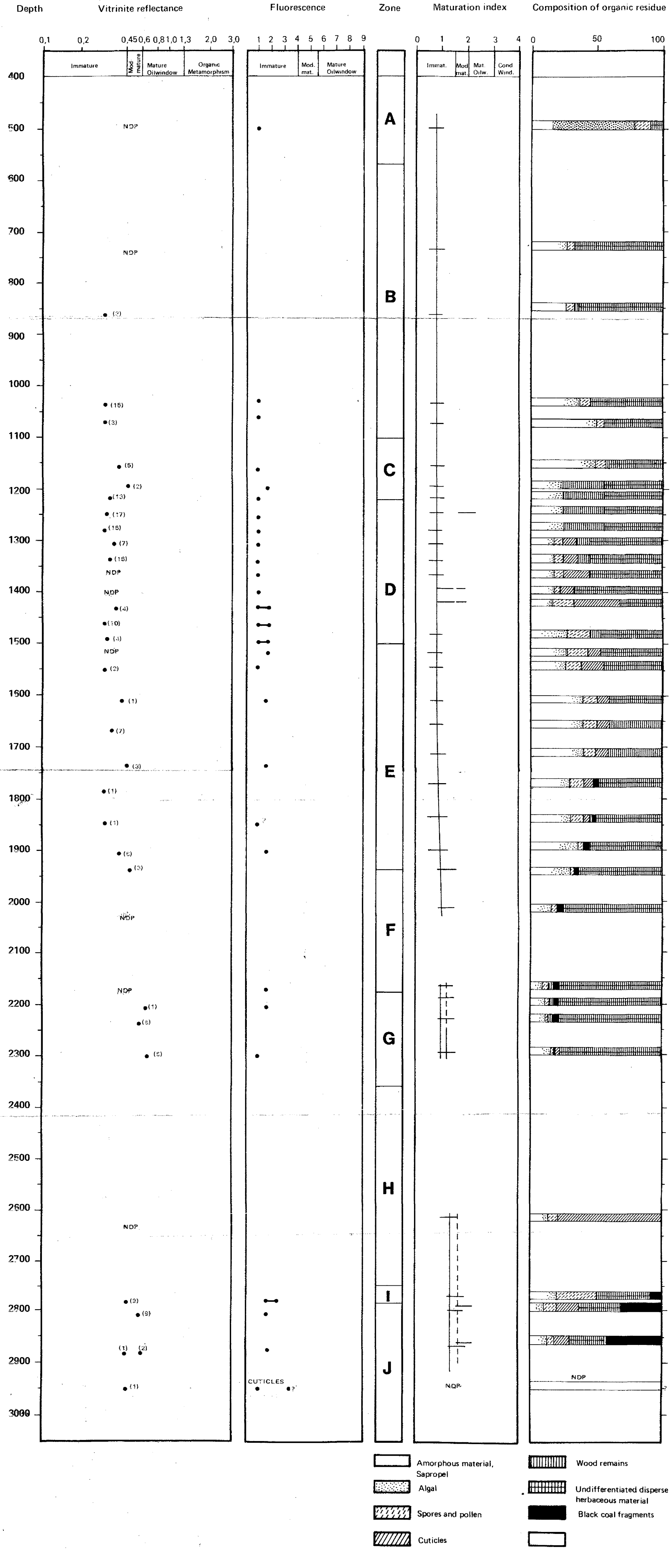


IKU Organic Geochemistry Department

MATURATION

Well no.: 15/9 - 11
Company: STATOIL

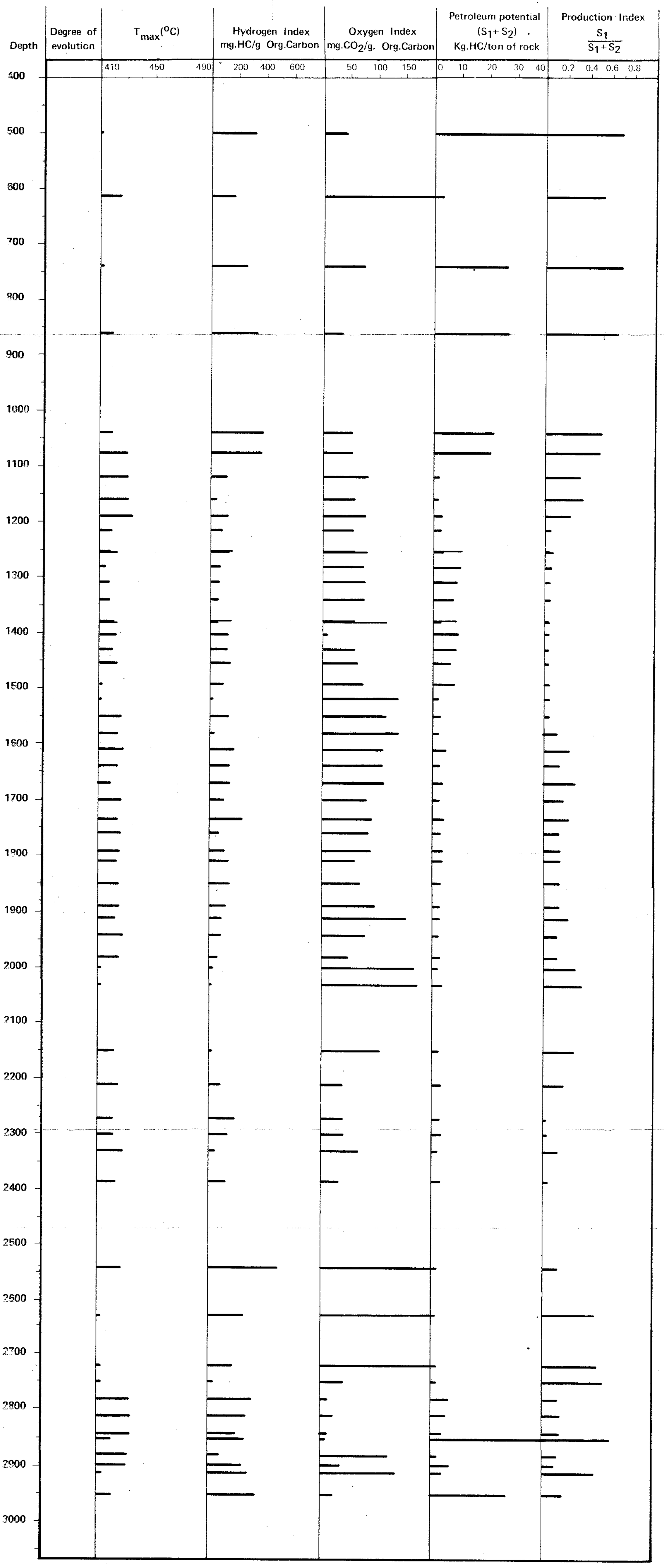
VISUAL KEROGEN
COLORATION AND COMPOSITION OF ORGANIC RESIDUE



Organic Geochemistry Department.

ROCK-EVAL PYROLYSIS

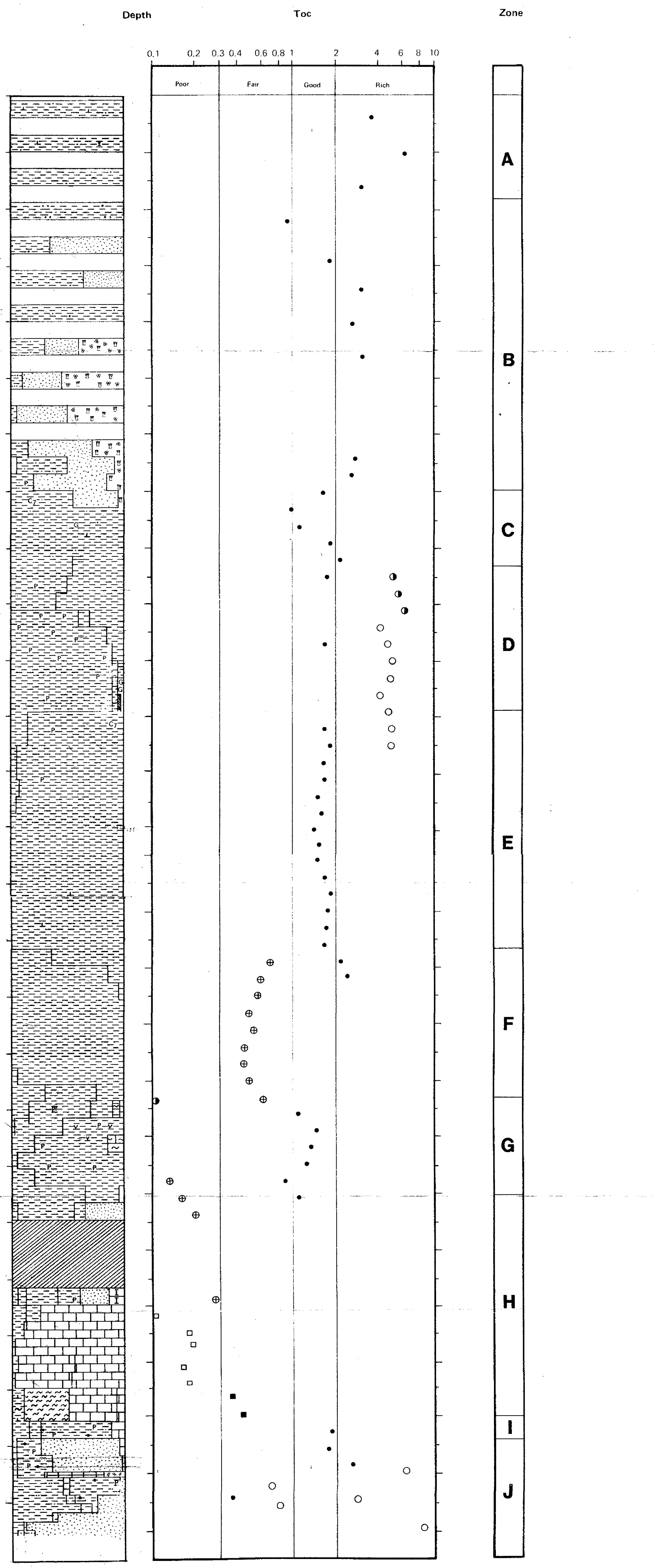
Well no.: 15/9 - 11
Company: STATOIL



Organic Geochemistry Department

TOTAL ORGANIC CARBON (TOC)
Presentation of Analytical Data

Well no.: 15/9 - 11
Company: STATOIL

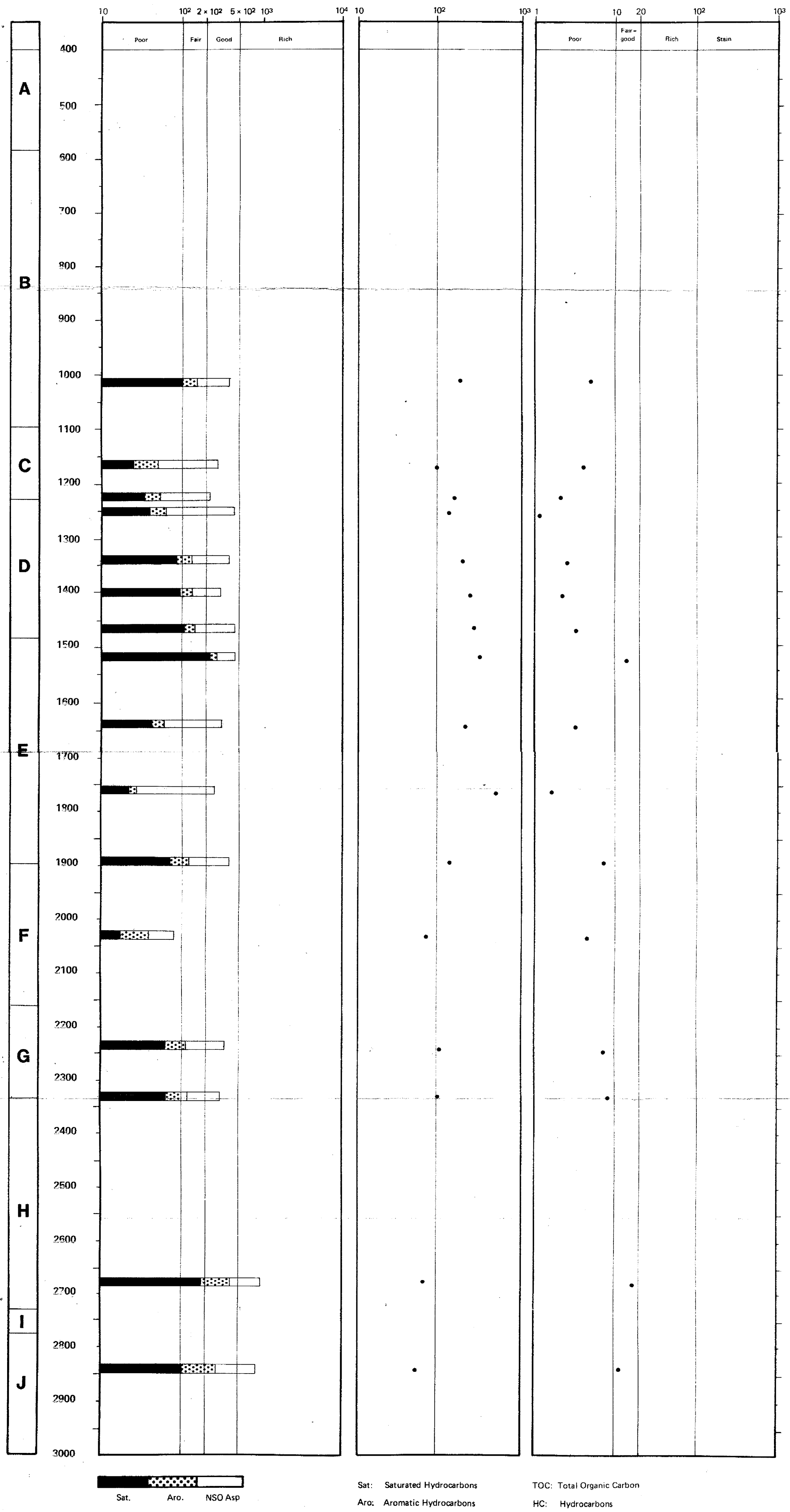


Clay/Claystone
Silt/Siltstone
Limestone
Calcareous
Shell fragments
Carbonaceous-Claystone
Sand/Sandstone
Tuff/Tuffaceous Claystone
Chalk
Foraminifera
Marl
Siderite
Cement
Glauconite
Additive
Pyrite

IKU Organic Geochemistry Department

C_{15}^{+} HYDROCARBONS
Presentation of Analytical Data

Well no.: 15/9 - 11
Company: STATOIL



Sat: Saturated Hydrocarbons
Aro: Aromatic Hydrocarbons
Asp: Asphaltenes

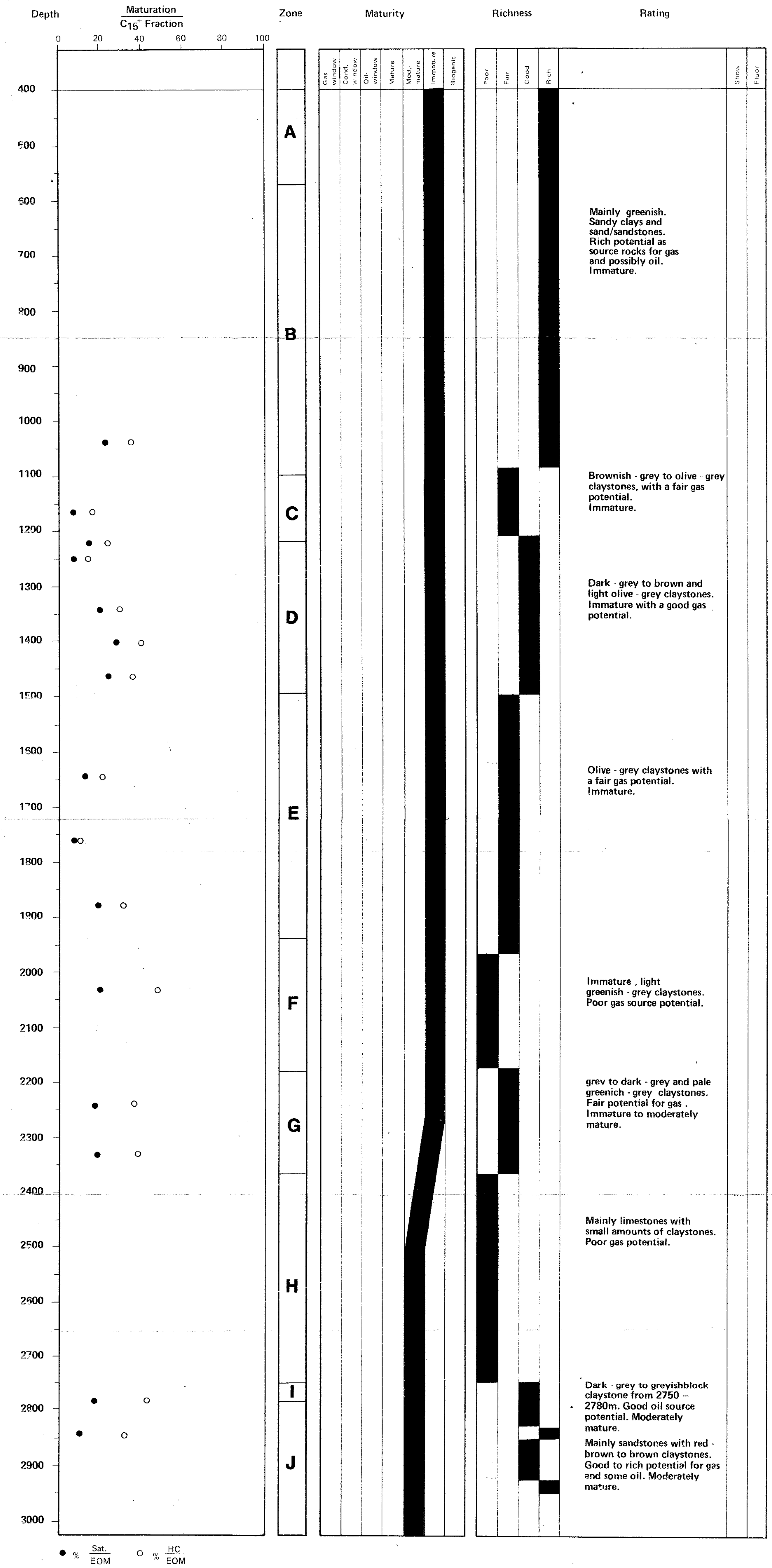
TOC: Total Organic Carbon
HC: Hydrocarbons
NSO: Nitrogen, Sulphur and Oxygen containing compounds

IKU Organic Geochemistry Department

INTERPRETATION DIAGRAM

Well no.: 15/9 - 11
Company: STATOIL

SUMMARY OF SOURCE POTENTIAL



● % Sat./EOM ○ % HC/EOM

Sat: Saturated Hydrocarbons.
HC: Hydrocarbons.
EOM: Extractable Organic Matter.