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NMR IN A NEW PERSPECTIVE

(Nuclear Magnetic Resonance)

57
N - M - R
AT WORK

TO
ZERO MAGNETIC FIELD
223 MILES - 695 DAYS

The picture above places 60 megacycle High Resolution NMR in a frame of reference that reveals the extraordinary precision that Varian equipment is achieving. The extreme degree of time stability and resolution necessary to attain such performance speaks for itself. Furthermore the spectrometer is capable of being focused quickly on this narrow but meaningful segment of interest.

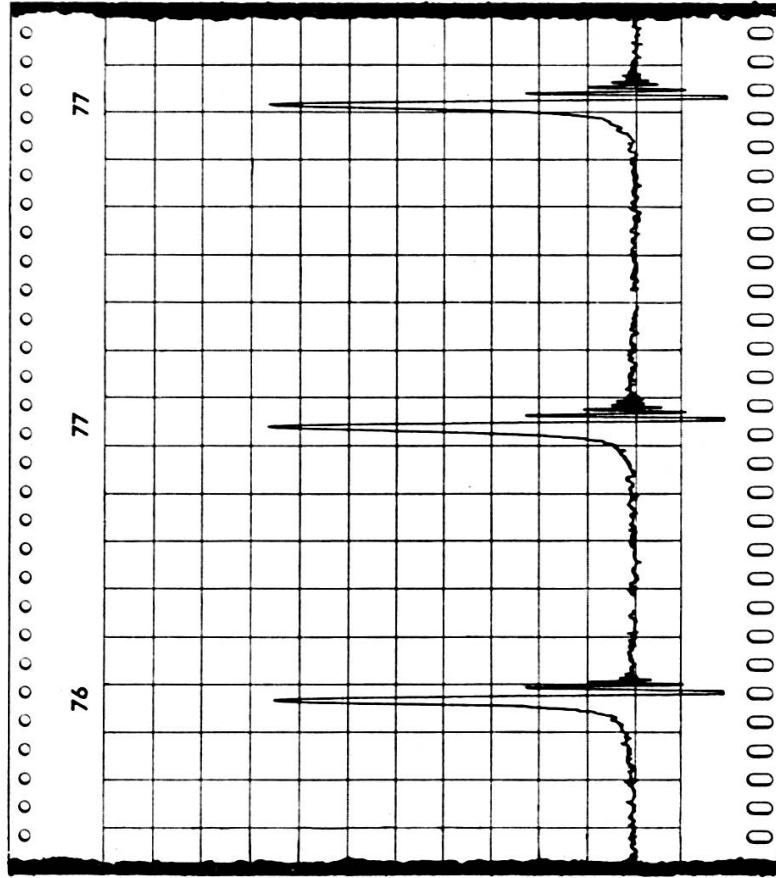
Theoretically 60,000 megacycle r-f energy would be absorbed by isolated hydrogen nuclei in a magnetic field near 14,092 gauss. Such an NMR spectrum would consist of a single narrow line. Actually, external fields infinitesimally larger than this must be applied to achieve this exact field strength at each particular chemical environment within the molecule.

Proton region
approximately
140 inches,
traversed in 10 minutes

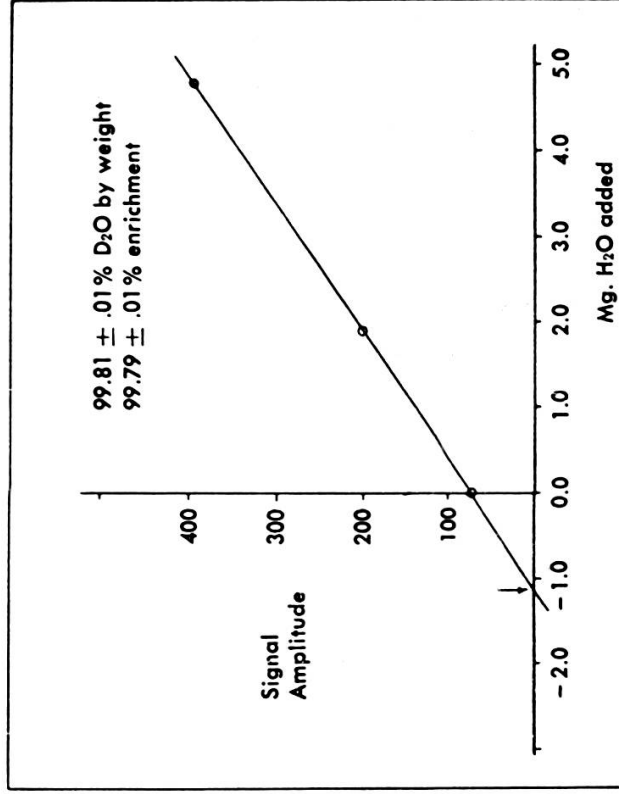
This is because surrounding electrons in the molecule alter the field locally by minute, but detectable, amounts. The spectrum of resonant peaks resulting from these shieldings are a description of the chemical environment. The Varian 60 mc NMR Spectrometer solves chemical problems because it can detect significant shifts and splittings of as little as 1/10th milligauss out of an applied 14 kilogauss!

QUANTITATIVE ANALYSIS OF RESIDUAL H₂O IN HIGH PURITY D₂O

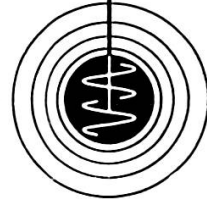
INTERPRETATION: In No. 4 of this series a sample containing 3.4 percent H₂O was analyzed by comparison with standards of known concentration. The analysis has now been extended to the residual H₂O in high purity D₂O, utilizing the great sensitivity of the 60 mc Spectrometer. The traces at left below demonstrate the reproducibility of the signal amplitude at the residual proton level encountered with such samples. The analysis is performed by adding precisely known



amounts (by weight) of H₂O to the sample and plotting the total signal amplitude against the added H₂O, as shown in the graph at the lower right. Extrapolation to zero signal gives the amount of H₂O initially present. The sample studied contained 1.15 mg. of residual H₂O in 593.7 mg. of D₂O. This gives the result of 99.81% D₂O by weight, or 99.79 atom-percent deuterium.



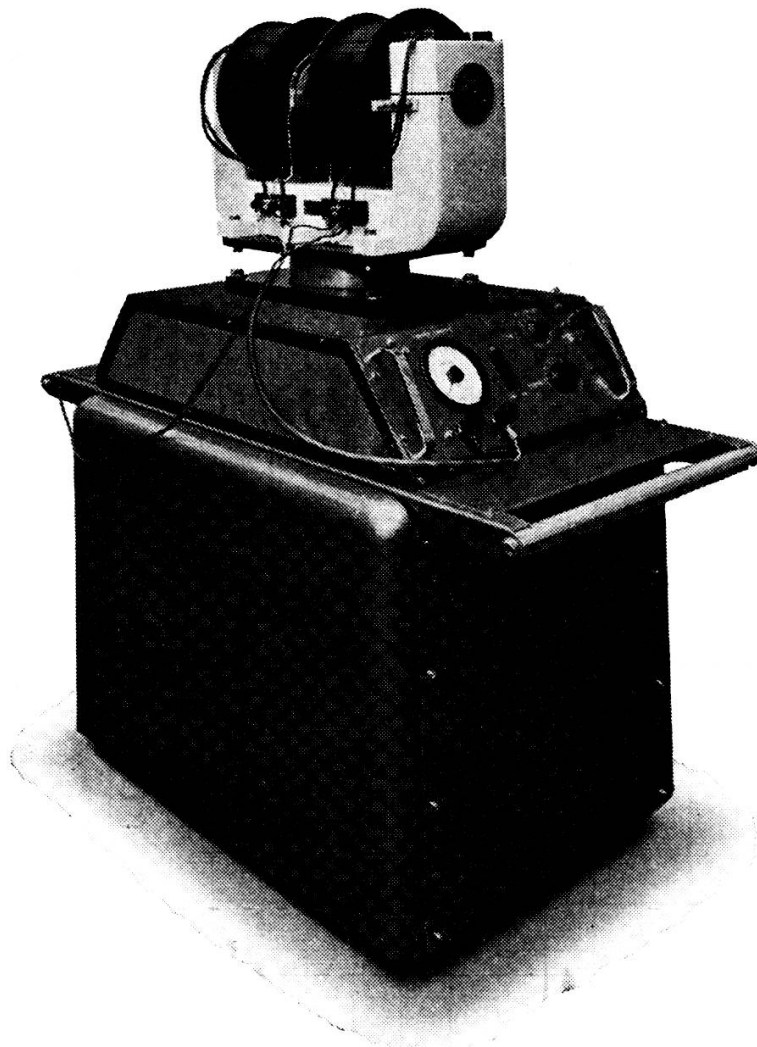
H₂O Remaining in High Purity D₂O by the Method of Adding Known Amounts of H₂O and extrapolating to Zero Signal Amplitude.



VARIAN associates
PALO ALTO 38, CALIFORNIA

For other examples in this series and for current technical information on Varian NMR and EPR Spectrometers, write the Varian Associates Instrument Division.

STABILITY



Newport Instruments give real meaning to the word with this new current-stabilised power unit.

The illustration shows a 4 inch, high homogeneity Newport electromagnet Type A with a Type AE rotating base, mounted on the power-supply unit.

The Newport Type B unit provides a rectified, stabilised and smoothed D.C. output, steady to within 0.15 mA, regardless of mains fluctuations within $\pm 4\%$. Output current can be adjusted from 0.9 to 12 amps at 120 volts maximum. This unit has a flat top designed for mounting magnets, instrument racks etc., up to a maximum weight of 12 cwt. (6.1 kg). 3.8 cm Type C, 17.75 cm Type E and 20.3 cm Type D magnets are also available.

For full particulars of the Type B power-supply unit and Newport electromagnets and instruments write to

NEWPORT INSTRUMENTS (Scientifique & mobile) **LTD**

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