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Some Recent Experiments on the Overhauser-Abragam-Effect in Liquids

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(presented by P. Parikh).

The application of the Overhauser-Effect to liquids with paramagnetic ions, as first proposed by Abragam [1], enables us to make interesting NMR-studies in weak magnetic fields. In this paper some recent experiments with a sensitive spectrometer working in the range of about 0,4 to 21 Oersteds, are described. The apparatus is capable of registering the nuclear magnetic resonance signals with and without enhancement by the effect of dynamic polarisation. In particular, the following experiments have been performed, the details of which have been presented at the conference:

a) Measurements of weak magnetic fields even under unfavourable conditions in the laboratory and improvement of their homogeneity, with the aim of constructing a high resolution weak field NMR spectrometer,

b) Realisation of a proton magnetic resonance MASER oscillator in the whole range,

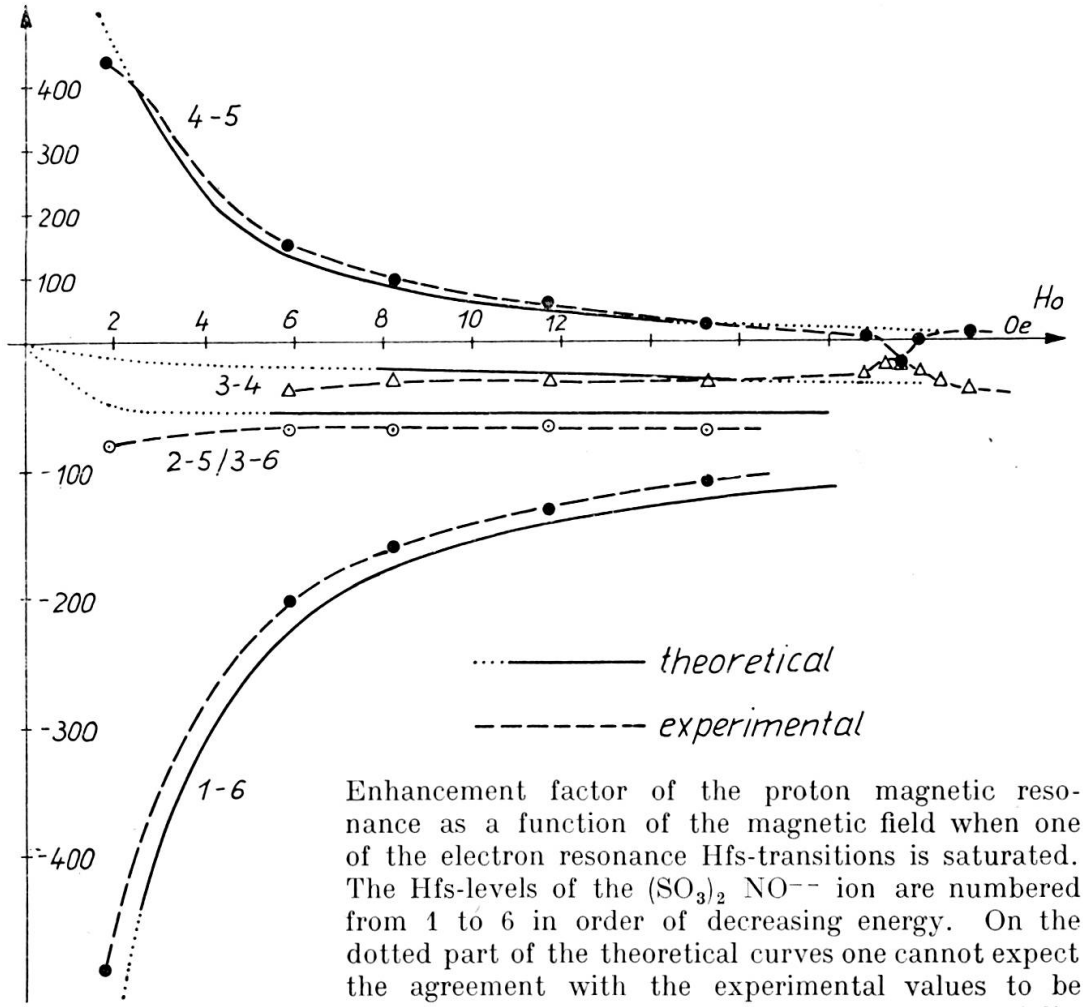
c) Application of this double-resonance apparatus to measure signals either from nuclei giving resonances normally too weak to be observed in this range, or in solutions with very low ion concentrations,

d) Studies of proton resonance enhancements in a solution of the free radical $(SO_3)_2NO^{--}$ by simultaneous excitation of each of the eight magnetic dipole Hfs-transitions in turn.

The sensitivity of the arrangement is achieved by employing a modified Q-Meter [2] along with a phase sensitive method, using a modulation frequency between 2 cps and 120 cps. For the comparison of intensities of weak and even narrow signals in spite of their complicated shape [3], this has proved quite convenient. The necessary electron resonance

frequencies are excited by two strong generators covering a range of 5 - 100 Mcs.

Some of the results of *d)* are shown in the figure and are compared with the values one of us has calculated. More particulars will be given elsewhere [4].



Enhancement factor of the proton magnetic resonance as a function of the magnetic field when one of the electron resonance Hfs-transitions is saturated. The Hfs-levels of the $(SO_3)_2$ NO^{--} ion are numbered from 1 to 6 in order of decreasing energy. On the dotted part of the theoretical curves one cannot expect the agreement with the experimental values to be good, because the excitation frequency also partially saturates one or more closely adjacent lines. (Radical concentration 0,0037 -m).

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