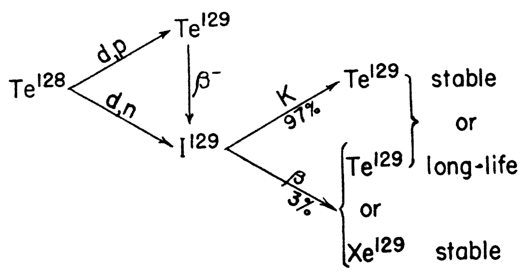
whether growth was occurring could be made in the time of observation.

A possible transformation scheme would be



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Resonance Absorption by Nuclear Magnetic Moments in a Single Crystal of CaF_2

E. M. Purcell, N. Bloembergen, and R. V. Pound*
Harvard University, Cambridge, Massachusetts
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THE magnetic dipole-dipole interaction between nuclei arranged on a cubic lattice in the presence of a strong external field H_0 depends markedly on the direction of H_0 with respect to the lattice axes. If the width of the radiofrequency absorption[1] line at $\nu=\mu H_0/Ih$ arises mainly from this interaction, the width and also the peak intensity of the resonance absorption observed in a suitable single crystal should vary as the crystal is rotated in the field H_0. We have observed such an effect in a single crystal of fluorite, CaF_2, in which the magnetic nuclei (F^{19}) occupy a simple cubic lattice.

A cylindrical specimen, 6-mm diam. by 15 mm long, was cut from a fluorite crystal, the axis of the cylinder lying in the *110*-direction. The axis of the r-f coil into which the specimen was inserted was perpendicular to the strong field H_0, and the specimen could be rotated within the coil to align any vector in the *110*-plane with H_0. The fluorine resonance was observed at 29.1 mc/sec. by our modulation method.[2] Quantities related to line width and peak intensity were measured as functions of crystal orientation. The "line width" measured (expressed in gauss) is the width between points of maximum slope of the curve of absorption *vs.* H_0 at constant frequency. The maximum slope multiplied by this line width is taken as a measure of the peak intensity; it would be strictly that for lines of similar shape, for which in addition, the product of line width and peak intensity should be constant in our experiment.

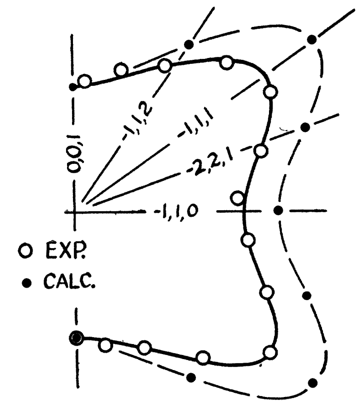

Fig. 1. Polar plot of the dependence of the intensity of magnetic resonance absorption in CaF_2 with the direction of H_0 with respect to the crystal. Absorption is maximum, for example, when H_0 lies along the (*−1, 1, 1*) direction.

The variation of the product of measured width and measured intensity was in fact no more than ±5 percent, while each of these quantities individually displayed a pronounced anisotropy of the expected type. Figure 1 is a polar plot of the relative intensity observed with H_0 in various directions. The solid points are located on radii inversely proportional to the r.m.s. line width from dipole-dipole interaction, calculated for certain crystal directions. That the observed anisotropy is somewhat less pronounced that that calculated may be ascribable to variation of line shape with orientation or to broadening influences other than the dipole-dipole interaction.

In absolute magnitude, the measured line width for the *001*-direction was 8.5 gauss. The theoretical r.m.s. width, computed from a rigorous formula kindly provided by Professor Van Vleck, is 5.4 gauss in this case. The quantities are not strictly comparable, but one would expect rough agreement.

The spin-lattice relaxation time was of the order of 5 sec., and no variation with crystal orientation was found. All line width measurements were made at low signal power to avoid saturation. In all these experiments, moreover, the r-f field is so weak ($<10^{-2}$ gauss) as to have no direct influence on the line width.

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* Society of Fellows.
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