tensity of the singly-passing beam, i.e., the former can be neglected.

The curve shown in the figure is similar in character to the theoretical curve, corresponding to the interference of two parallel polarized anomalous waves (see reference 4). Thus, our earlier qualitative conclusions are confirmed by the present more accurate results. The latter, it appears to us, represent a weighty experimental proof of the existence of additional anomalous waves in the anthracene crystal, as predicted by the theory.

It is quite desirable that similar investigations be carried out by others, both in anthracene and in other crystals. It is necessary to bear in mind here that, depending on the frequency, the difference in the indices of refraction of the two waves may prove to be considerably greater than in the case described above (see Figs. 1 and 2 of reference 2). Accordingly, the frequency of oscillation of the curve such as shown in the figure, will be much greater, and this will require a greater accuracy in the measurement of l. Otherwise the experimental points will be merely disordered.

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367

INFLUENCE OF MAGNETIC FIELDS ON RESONANT ABSORPTION OF GAMMA RAYS

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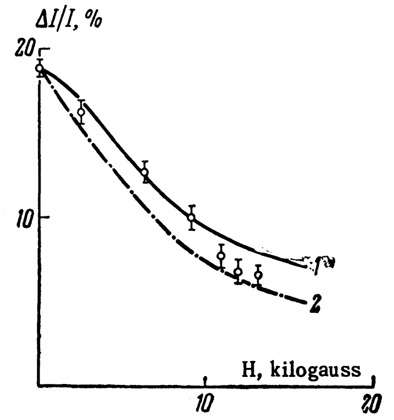
THE discovery by Mössbauer[1] of the emission and resonance absorption of γ rays without loss of energy due to nuclear recoil opened the possibility of directly detecting the Zeeman splitting of excited nuclear states and of measuring their magnetic moments. This possibility was pointed out independently by several people,[2] in particular by one of the authors (A.I.A.).

To observe the Zeeman effect, we chose the γ transition in Sn^{119m} with an energy of 23.8 kev and a lifetime of 2.67×10^{-8} sec, i.e., with a level width of 2.5×10^{-8} ev.

However, in the mixture of isotopes of Sn there is a very strong source of x rays with an energy near to this (around 24 kev) in the form of In^{113} formed from Sn^{112} with a high cross section after neutron capture. For this reason we used a sample of tin enriched in the Sn^{118} isotope (96%) in which the impurity of Sn^{112} was less than 0.05%.

The apparatus for the measurements with a magnetic field consisted of an electromagnet with poles of pyramidal shape. The separation of the poles was 6 mm and the field could reach 20,000 gauss. The γ-ray source was 20×4 mm and 5 mg/cm^2 in thickness, and was fixed tight to one side of a Plexiglas plate 2 cm thick, while absorbers of natural tin of various thicknesses were attached to the other side of the plate. The absorption length of 23.8 kev γ rays due to the photoeffect in tin is 70 mg/cm^2, i.e., exceeds by far the resonance absorption lengths both in the source and in the absorber. The end of the plate holding the source was placed between the poles of the magnet. The source and absorber were immersed in liquid nitrogen. At the position of the absorber, there was a fringing magnetic field whose magnitude at high fields reached around 24% of the value of the magnetic field at the position of the source.

The experiment consisted in the following: Using a proportional counter filled with a mixture of krypton, argon and propane, we measured the intensity of the soft radiation from the source passing through the absorber after filtering by a plate of Plexiglas 2 cm thick and a palladium plate 60 mg/cm^2 thick for absorption of the x-ray



Dependence of intensity difference on magnetic field, for temperatures of source and absorber equal to 90 and 293°K. 1 - theoretical curve for a Debye temperature Θ = 170°K and a magnetic moment of the excited state of Sn^{119m} equal to $\mu = 1.5\ \mu_0$, where μ_0 is the magnetic moment of the ground state of Sn^{119}; 2 – similar curve for $\mu = 2.0\ \mu_0$.

radiation of tin with energy ~ 25 kev. When the source was cooled to 90° K, the intensity of the soft radiation recorded by the counter dropped by 12%. When the magnetic field was turned on with source and absorber cooled, the intensity of the soft radiation began to increase with increasing magnetic field. The magnetic field splits the 23.8-kev level and shifts the energy of the recoilless radiation from its resonant energy by an amount of the order of 10^{-7} ev, while the 23.8-kev level in the absorber, which is in a much weaker field, is shifted much less. As a result of this detuning of the energy, the absorption in the absorber decreases and the intensity increases.

The measurements were carried out for three thicknesses of the absorber of natural white tin: 36, 11, and 5 mg/cm^2. In the figure we show the data of the experiment for the thinnest absorber. From all the data we determine with good internal consistency a value for the magnetic moment of the excited state of Sn^{119m} equal to $\mu = -(1.1 \pm 0.1)\mu_0$ or $\mu = (1.72 \pm 0.06)\mu_0$ with a value of the Debye temperature Θ equal to 170° K, which follows from our experiments. The value $\mu = -(1.1 \pm 0.1)\mu_0$ is to be preferred since it is in good agreement with the established level scheme for Sn^{119m}. The value of the magnetic moment calculated from our experiments was only slightly dependent on the value chosen for the Debye temperature of white tin: for Θ = 200° K we have $\mu = -1.15\mu_0$, while for Θ = 140° K, we get $\mu = -1.05\mu_0$, where μ_0 is the value of the magnetic moment of the ground state of Sn^{119} which is equal to − 1.046 nuclear magnetons.

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368

ELECTRICAL AND GALVANOMAGNETIC PROPERTIES OF LITHIUM FERRITE-CHROMITE NEAR THE COMPENSATION POINT

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In certain ferrites one observes a highly anomalous temperature dependence of the spontaneous magnetization, with a so-called compensation point Θ_c at which a "balancing" of the magnetic moments of the sublattices occurs.[1-3] The study of such ferrites is of interest from the point of view of explaining the extent to which one or another sublattice "shares" in the ferrimagnetism, and could contribute to a deeper understanding of the nature of the physical properties of crystalline materials of the ferrite type.

In reference 4 it was established that in gadolinium ferrite-garnet the magnetostriction properties are markedly different in character above and below Θ_c. Below Θ_c they are chiefly due to the "gadolinium" sublattice, and above Θ_c to the "iron" sublattices. With the aim of further studying the role of the sublattices in ferrimagnetism and the physical phenomena which accompany it in ferrites, we undertook the measurement of the electrical and galvanomagnetic properties of