source it is possible to determine the orientation of the individual blocks in the plate (and in general to investigate very small sections of the crystal).

Figure 2b shows the results of photometry of the canalogram in different directions. They reduce to the following: 1. The intensities of the lines corresponding with different packing densities are different. The most intense lines are produced by the (110) planes, and the least distinct (from among those seen on the photograph), by the (111) planes. 2. The angular line width, on the one hand, characterizes the angle of emission of the channelled particles from the crystal, and consequently depends on the channel parameters and on the energies of the emitted particles, and on the other hand it depends on the dimensions of the source and on the distance to the photographic plate. Since this distance cannot be made sufficiently large (owing to the increased exposure), it follows that when a source of 0.5 mm diameter source is used the line width is determined mainly by this last factor. 3. The line profile has a complicated form that is far from Gaussian and is determined also by two factors, the angular distribution of the particles in the channels and the inhomogeneity of the active layer of the source.

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INFLUENCE OF MAGNETIC FIELD ON THE BEHAVIOR OF THE SUSCEPTIBILITY IN THE REGION OF A FERROMAGNETIC PHASE TRANSITION

G. M. Drabkin, E. I. Zabidarov, Ya. A. Kasman, and A. I. Okorokov
A. F. Ioffe Physico-technical Institute, USSR Academy of Sciences
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The magnetic susceptibility is one of the main characteristics of the dynamic state of a spin system. Phase transitions are usually characterized by the appearance of singularities in the temperature dependence of the susceptibility. The most interesting is the temperature region immediately adjacent to the Curie point, for this is precisely where the greatest development of fluctuations is observed and where long-range order appears.

The experimentally determined character of the dependence of the susceptibility χ on the distance to the the Curie point depends strongly on the choice of the Curie temperature T_C itself. Most existing well-developed methods of determining T_C are extrapolation methods [1]. They are based on various assumptions concerning the equation of state of the ferromagnet near T_C. The determination of T_C from direct measurements of the singularities of the behavior of the macroscopic parameters is likewise insufficiently accurate and unambiguous. As shown in our earlier paper [2], a very accurate method of determining T_C can be the measurement of the depolarization of the neutrons passing through the investigated sample. In this case T_C is determined from the position of the maximum of the derivative of the polarization of the passing neutrons with respect to the temperature. To determine the functional dependence of the susceptibility on the temperature, it is important to determine independently and experimentally, for the same sample, both the magnetic susceptibility and the position of T_C by the polarized-neutron method. We present here the results of such measurements.

A nickel sample of high purity was prepared in the form of a sphere of 7.8 mm diameter. The susceptibility variation was determined from the temperature dependence of the magnetization of this sphere in an external magnetic field. The magnetization was determined from the induced emf produced when the magnetic field was removed. The pickup was a coil of 800 turns of glass-insulated wire of 0.07 mm diameter. The coil diameter was 10 mm. The sample was located inside the coil, which was placed in turn in a thermostat whose temperature was maintained accurate to ±0.003°C. The induced emf was measured with an F-18 microweber meter. The susceptibility was determined by Arrot's method [3]. The polarization of the transmitted neutrons was measured for the same sample simultaneously with the magnetization measurement. The measurement apparatus was described by us earlier [4]. We used neutrons of 4 Å wavelength. The beam diameter at the location of the sample was 3 mm. Figure 1 shows the results of the magnetization measurements in fields H from 15 to 150 Oe as a function of the temperature. The triangles indicate the positions of the maxima of the derivative dP/dT obtained by simultaneously measuring the polarization of the transmitted neutron beam (P - polarization of the transmitted neutrons, T - temperature). The susceptibility calculated from these data is shown in Fig. 2. The Curie point was determined from the position of the maximum of dP/dT at $H \approx 0$ [2], making the determination of T_C independent of the magnetic measurements [5, 6]. It is seen from Fig. 1 that the maximum of dP/dT coincides with the break of the magnetization curve at all values of the field. In fields from 15 to 60 Oe, these singularities are observed at practically the same temperature, which coincides with T_C at $H = 0$. In this range of fields, the susceptibility χ is described by a power-law dependence $\chi \sim (T - T_C)^{-\gamma}$ with an exponent $\gamma = 1.33 \pm 0.03$ (Fig. 2). In fields of 100 and 150 Oe, χ begins to deviate from this power-law dependence when T_C is approached. However, if γ is plotted not against T -

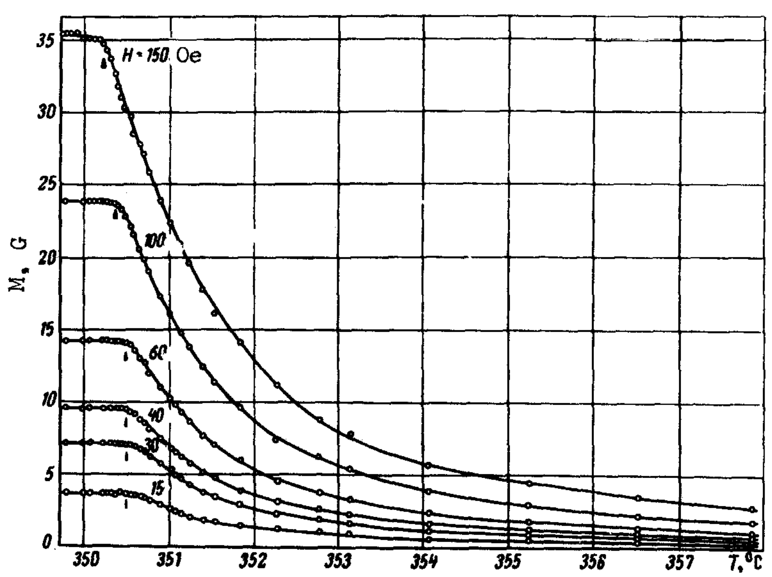

Fig. 1. Magnetization M of a spherical nickel sample vs. temperature at different values of the external magnetic field H. Δ - position of the maximum derivative dP/dT.

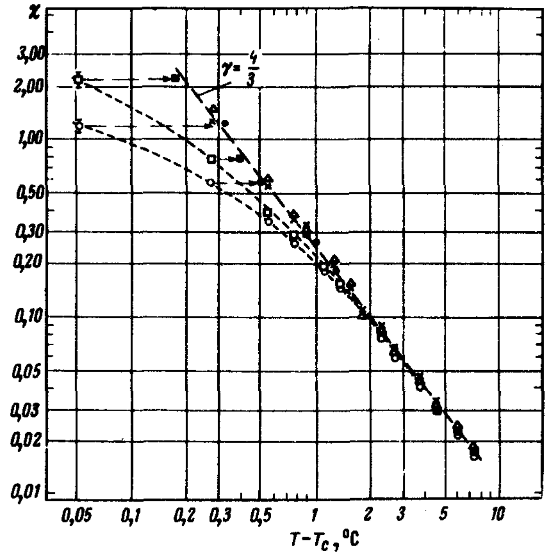

Fig. 2. Temperature dependence of the susceptibility χ of nickel. $T_C = T_C(0)$: Δ - H = 15 Oe, × - 60 Oe, □ - 100 Oe, o - 150 Oe; $T_C = T_C(H)$: ■ - H = 100 Oe, o - 150 Oe.

$T_C(0)$, but against $T - T_C(H)$, which is determined by the shifted position of the maximum of dP/dT in the field H (Fig. 1), then the power-law dependence with exponent $\gamma = 4/3$ is restored. The absence of a shift of the maximum in fields 15 - 60 Oe is apparently due to the fact that in this case the effective internal magnetic field, which is equal to the external field minus the demagnetization field, is close to zero, and the external field becomes more noticeable only in fields exceeding 60 Oe. The foregoing data on the temperature dependence of the susceptibility confirm our previous conclusions concerning the influence of the magnetic field on the positions of the singularities in phase transitions [7], and also explain the susceptibility variation previously observed by the method of rotating the polarization vector.

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PARAMETRIC LUMINESCENCE AND LIGHT SCATTERING BY POLARITONS

D. N. Klyshko, A. N. Penin, and B. F. Polkovnikov
Moscow State University
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Parametric and polariton scattering of light have been heretefore studied separately, both in theoretical and experimental investigations (cf., e.g., [1 - 6]), although it was clear [2, 3] that these are limiting cases of a single phenomenon. Parametric luminescence is a scat-