NaI(Tl) detector was 57.5 cm^2.

The gamma intensity flare occurred at an instant of timme when the spectrometer multichannel analyzer operated in a regime in which data were extracted on a previously-measured spectrum. We have at our disposal, however, measurement data obtained during the time of the flare in two wide energy channels of the instrument, 0.05 - 0.3 MeV and in the 4-MeV region, and also data from an intensity meter operating in the 50 - 300 keV range.

The intensity-meter results are shown in the figure. It is seen from the figure that the flare is distinctly visible against the summary background of the diffuse cosmic gamma radiation and of the albedo of the earth's atmosphere, and comprises a sequence of three pulses with total duration 37 sec. The diagram does not show the possible temporal fine structure, since the total time constant of the intensity meter and of the telemetry channel amounted to about 2 seconds.

The starting time of the flare, 63555.5 sec UT, agrees well with the cited time of start of the events 72-1. The total number of detector counts registered in the flash is about 5×10^3. When account is taken of the detector efficiency, this corresponds to an energy flux, in the 50 - 300 keV range, integrated over the time of the flare, amounting to $\sim3\times10^{-5}$ erg/cm^2. The readings of the intensity meter and the data of the wide differential channel 0.05 - 0.3 MeV, in which the measurements are averaged out over an interval of 18 sec, are in full agreement. No statistically significant changes of the counting rate were noted in the 4-MeV region. If it is assumed that the spectrum of the flare is similar to that measured in [2] and follows a power law $\propto E^{-\alpha}$ with α = 1 - 1.5, and then falls off rapidly at photon energies 700 - 800 keV, then the total energy flux in the flare can amount to $(7 - 9)\times10^{-5}$ erg/cm^2.

Simultaneous registration of the flare on the "Vela" satellites and on the "Cosmos-461" satellite obviously precludes the possibility of our having observed an event due to local factors. At the instant of the flare, the "Cosmos-461" was on the part of the orbit illuminated by the sun, at a latitude -5 to -8° and at a longitude 4 - 5°, but the observations of [1] eliminate the sun as the possible source. We note also that according to the data of [4] the activity of the sun was quiet during the day of the observations, nor could we establish any direct temporal connection between the flare and some phenomenon on the sun. We seem thus to be able to state with assurance that the flare comes from a galactic or a metagalactic source.

The fact that the satellite was obscured by the earth during the measurements excludes the possibility that this source is located in a sphere of radius 68° with a center having as coordinates $\alpha \simeq 205°$ and $\delta \simeq +7°$.

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TEST OF THREE SCALING FUNCTIONS FOR $Y_3Fe_5O_{12}$

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By measuring the magnetic properties of $Y_3Fe_5O_{12}$ we calculated the critical exponents for spontaneous magnetization, susceptibility, and the critical isotherm. The calculated critical exponents were used to plot three types of scaling functions, constituting different forms of the magnetic equation of state near the critical point. The scaling functions agree well with the experimental results obtained for $Y_3Fe_5O_{12}$.

The recently obtained extensive experimental data on the physical properties of most substances in the immediate vicinity of the critical points and second-order phase transitions cannot be described within the framework of theories based on representations of an average or molecular (self-consistent) field [1]. Attempts to develop a more satisfactory theory have led to development of the scaling theory [2], which has shown that to describe the singularities of all the thermodynamic quantities it suffices to know two definite critical exponents, in terms of which all the others can be expressed. Scaling theory has demonstrated not only the existence of definite relations between the critical exponents, but also the existence of a single equation of state for magnets in the critical region.

In this communication we verify three M - τ - H scaling functions given in [3] as applied to $Y_3Fe_5O_{12}$. The behavior of the magnetic characteristic of a substance near the critical temperature T_c is described by such critical exponents as β, δ, γ, or γ' and by the coefficients A, B, C, and D, which are determined from the following power-law relations: the magnetic coexistence curve $\sigma_s(T) = A\varepsilon^\beta$ ($\varepsilon < 0$, $H = 0$), the critical isotherm $H = B\sigma^\delta$ ($T = T_c$), and the temperature dependence of the initial susceptibility $1/\chi_0 = c\varepsilon^\gamma$ ($\varepsilon > 0$, $H = 0$) or $1/\chi_0 = D|\varepsilon|^{\gamma'}$ ($\varepsilon < 0$, $H = 0$), where σ_s and σ are the specific spontaneous magnetization and the total magnetization, respectively, H is the internal magnetic field, and ε is the reduced temperature ($\varepsilon = (T - T_c)/T_c$).

These critical exponents are connected by the equation $\gamma = \beta(\delta - 1)$ [4].

In the present investigation, we measured the magnetization of $Y_3Fe_5O_{12}$ by a ballistic method. The absolute temperature measurement accuracy was 0.1°C, and the relative accuracy 0.01 !C. The Curie temperature T_c was determined either by the method of thermodynamic coefficients or from the positions of the extrema on temperature dependences of the velocity and absorption of the ultrasound [5]; its value was 275 ± 0.05°C. The values of T_c obtained by these methods agree within the limits of the absolute accuracy of temperature measurement. In the interval $\varepsilon = 1.8\times10^{-4}$ to 3.5×10^{-2} we obtained for $Y_3Fe_5O_{12}$ the following critical exponents: $\beta = 0.313 \pm 0.02$, $\gamma = 1.17 \pm 0.04$, and $\delta = 4.7 \pm 0.2$, which satisfy the scaling relation $\gamma = \beta(\delta - 1)$. Knowledge of the critical exponents enables us to verify the magnetic equation of state $H(\varepsilon, M) = M^\delta h(\varepsilon/M^{1/\beta})$, where M is the relative magnetization.

In [3], on the basis of an analysis of a generalized homogeneous functions, the following three M - τ - H scaling functions are given:

$$1)\ H_\tau = F^{(1)}_{\mathrm{sign}\,\tau}(M_\tau), \quad \text{where } H_\tau \equiv H/|\tau|^{\beta\delta}, \quad M_\tau \equiv M/|\tau|^{\beta}$$

$$2)\ H_M = F^{(2)}(\tau_M), \quad \text{where } H_M \equiv H/|M|^{\delta}, \quad \tau_M \equiv \tau/|M|^{1/\beta},$$

(the function $F^{(2)}$ is frequently called the Griffiths scaling function), and

$$3)\ M_H = F^{(3)}(\tau_H), \quad \text{where } M_H \equiv M/|H|^{1/\delta}, \tau_H \equiv \tau/|H|^{1/\beta\delta},$$

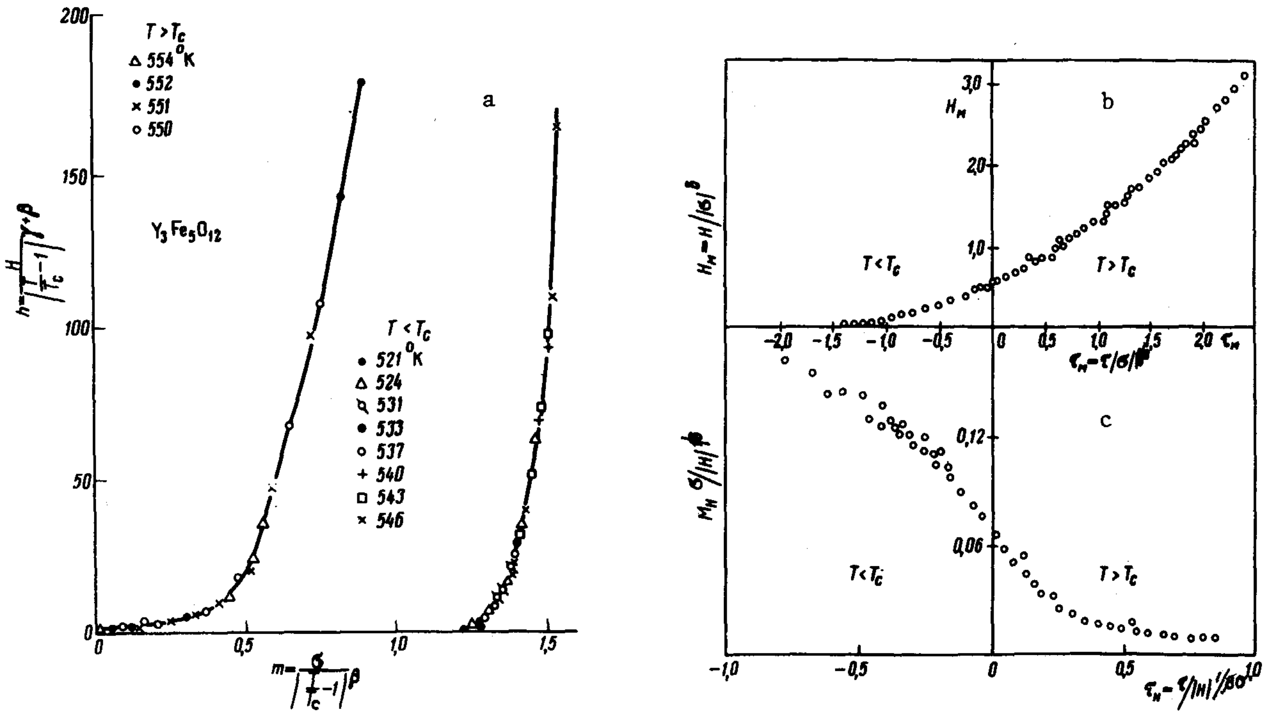
and $\tau = T - T_c$ throughout. We present below the construction of these functions for the yttrium iron garnet. The functions $F^{(1)}$ and $F^{(2)}$ have one disadvantage. Small values of τ in the first of these functions and small values of M in the second lead to a large interval of variation in the values of the scaling variables. To make the graphic representation of the results more convenient, one therefore uses a log-log scale and the isotherms that are closest to the critical.

We shall plot the equation of state (1) in a somewhat modified form [6], namely, h = h(m), where $h = H/|T/T_c - 1|^{\gamma+\delta}$, and $m = \sigma/|T/T_c - 1|^{\beta}$.

The results of the construction of this function in accordance with our critical exponents for yttrium iron garnet are shown in Fig. a. This construction, as can be readily seen, causes the actually infinite number of isotherms in the vicinity of the critical point to degenerate into two curves in such a way that all the isotherms for $T < T_c$ (sign τ = -1) lie on one branch, while all the curves of the magnetization curves for $T > T_c$ (sign τ = +1) lie on the other barnch of the plot. It is just this fact which shows that the data obtained by us for yttrium iron garnet confirm the universal equation of state obtained in scaling theory.

The results of the construction of the function $F^{(2)}$ are shown in Fig. b. A characteristic feature of this function is that, unlike the first function, all the isotherms are close to the critical point and contract into a single smooth curve, the left-hand side of which pertains to $T < T_c$, and the right-hand side to $T > T_c$. In this sense the function $F^{(2)}$ offers certain advantages over the function $F^{(1)}$.

The construction of the third scaling function $F^{(3)}$ for yttrium iron garnet leads to Fig. c, which has the same property as the function $F^{(2)}$, namely that all the isotherms of the right-hand and left-hand vicinities of the critical point degenerate into a single smooth curve, which in fact is the plot of the magnetization against the temperature at a fixed



magnetic field (with the natural exception of the value H = 0). From the point of view of construction, $F^{(3)}$ is much more convenient than $F^{(1)}$ and $F^{(2)}$. We can conclude from the foregoing analysis of the scaling equations that the magnetic data for $Y_3Fe_5O_{12}$ are in agreement with them.

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ASYMMETRY OF MOTION OF DOMAIN WALL IN AN ORTHOFERRITE CRYSTAL

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We investigated the domain structures of single-crystal $YFeO_3$ and $DyFeO_3$ with deformed surface layers. We observed that the character of the domain-wall motion depends essentially on the direction of wall displacement and on the magnetization direction in the surface layer.

Single-crystal plates of rare-earth orthoferrites, the domain structure (DS) of which is presently used for practical purposes, are cut mostly from bulky crystals, after which they are mechanically polished. Such a treatment produces a thin deformed surface layer whose magnetic properties differ significantly from the internal section of the plate. As shown in [1 - 5], the presence of this magnetically-hard layer leads to a number of singularities in the behavior