The remaining oxides in the ferrites had a purity not lower than ch.d.a. (pure for analysis) grade. An x-ray phase analysis (URF-50 IM diffractometer, filtered CoK_α radiation) has shown that all the samples are single-phase within ~3%.

The magnetostriction was measured with wire-wound pickups in the temperature interval from liquid nitrogen to 300°K in fields up to 14.5 kOe. The magnetostriction measurement accuracy was $\pm 0.4 \times 10^{-6}$.

Figure 1 shows the temperature dependences of the longitudinal magnetostriction in a 14.5 kOe field for all the prepared compositions of the substituted terbium iron garnets.

It is seen that the magnetostriction decreases with increasing number of terbium ions (with increasing x).

In the study of the dependence of the longitudinal and transverse magnetostriction on the field, at all the investigated compositions of the substituted terbium iron garnets, we noticed the presence of a positive volume component of the magnetostriction, which we assumed to accompany the para process in the terbium sublattice and to have an exchange nature. It is due to the exchange interaction between the terbium and iron sulattices.

The susceptibility of the magnetostriction para process for this composition decreases with increasing temperature.

Figure 2 shows the dependence of the susceptibility of the magnetostriction para process (in a field ~14 kOe) on the composition, calculated per terbium ion, at a temperature $T = \theta/4$, where θ is the Curie temperature of the given composition. We see that with increasing substitution, the exchange magnetostriction increases, this being due to the decrease of the effective field of the iron sublattices acting on the rare-earth sublattice.

We are grateful to B. V. Mill' for carrying out the x-ray phase analysis of the samples.

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CONCERNING THE CORRELATION OF γ QUANTA IN THE X-RAY BAND

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Submitted 6 September 1968
ZhETF Pis. Red. 8, No. 10, 560-562 (20 November 1968)

Questions of coherence and correlation properties of photons of the optical band are considered in detail in a number of papers [1-5]. Interest attaches to the possibility of extending the idea of optics to the x-ray region, where several problems of independent interest also arise, such as a study of interference effects in nuclear physics [6,7], the problem of developing an x-ray laser [8,9], study of interference properties of individual photons [5,10,11], etc. Therefore, interest attaches to the experimentally observed [12] appreciable effect of γ-quantum correlation, wherein photons emitted by the Mossbauer isotope Sn^{119} strike the counter simultaneously. This effect can be due either to induced radiation, or to correlations of the Brown-Twiss type, or to some new uninvestigated phenomenon.

A thorough examination of the possibility of observing induced γ radiation [13] shows that when the isotope Rh^{103}, which has a very narrow line ($\Delta E = \hbar/\tau = 2 \times 10^{-19}$ eV), is used, not more than one stimulated γ quantum is produced in 10^6 spontaneous γ quanta, provided a number of difficultly-realizable experimental conditions are satisfied. Inasmuch as the lifetime of the excited state of the Sn^{119} isotopes is much smaller (and consequently the Mossbauer-line width is larger) than in the case of Rh^{103}, the effect of stimulated emission of Sn^{119} can not be observed in practice.

The experimental setup of Kolpakov and Kuz'min [12] is analogous to a great degree to the schemes of Brown and Twiss [3,14]. However, calculation with the aid of the apparatus developed by Purcell [15], and also estimates made in one of the later papers [16], show that it is practically impossible to observe the Brown-Twiss effect in beams of γ quanta from Mossbauer sources (the γ-quantum registration time should be larger by 10^{12} times than the registration time of the optical photons).

Inasmuch as the effect observed in [12] cannot be explained by means of the considerations advanced above, we have undertaken to repeat the experiment of [12]. Satisfying the conditions of the collimation and geometry of the experiment prevailing in [12] (collimator diameter 0.2 mm) [1)], the γ-quantum counting rate was much larger than the value given in [12]. This gave rise to the idea that the effect observed by the authors of [12] has no bearing on the correlation of the γ quanta, and is the consequence of experimental errors. As shown by a calculation of the attenuation of the γ-quantum beam under the conditions of [12], which we do not present here in view of its elementary character, the counting rate of the γ-quantum of the Sn^{119} source could not amount to 30 counts/sec.

A possible cause of the registration of such a counting rate may be the high-energy γ radiation from the Sn^{119} source [2)], which penetrated sufficiently freely through the walls of the collimator and through the shielding screen of the counter. Our experiments, in which 23.8-keV γ radiation was completely absorbed by a layer of lead, made it possible, nonetheless, to observe an effect similar to that described in [12]. The magnitude of this effect, which has no bearing whatever on the γ-quantum correlation, changed with changing experimental geometry and assumed all possible values (up to 50%, which is twice as large as the effect described in [12]).

Finally, we set up an experiment which should have led to observation of the correlation of γ quanta of the Sn^{119} source if such a correlation were to exist. Inasmuch as the effect observed by the authors of [12] consisted of simultaneous (within the limits of the resolving time of the counter) entry of the γ quanta into the counter, this circumstance should lead to the formation of an additional peak, with energy larger than the energy of the γ quanta entering singly into the crystal, in the spectrum of the γ quanta incident on the

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1) Detailed data on the performance of the experiment were kindly supplied by the authors of [12].

2) The presence of lines with energy up to 600 keV in the spectrum of the γ radiation from the Sn^{119} source was established experimentally.

scintillation crystal. This phenomenon is due to the mechanism of occurrence of scintillations [17] and was verified by us experimentally.

An intense beam of 23.8-keV γ quanta from a Sn^{119} source entered a scintillation counter consisting of a NaI(Tl) crystal and an FEU-35A photomultiplier. The signals from the photomultiplier output were analyzed with the aid of a 256-channel pulse-height analyzer of the AI-256 type. An additional peak, due to random coincidences of the γ quanta within the limits of the resolving time of the scintillation counter, appeared in the spectrum of the γ radiation from the source.

The intensity of the γ-quantum beam decreased to a value at which the number of random coincidences in the counter becomes negligibly small. With this, an additional peak in the spectrum of the γ radiation of the counter was not registered, thus indicating the absence from the beam of γ quanta entering the counter simultaneously.

Thus, the effect of correlation in the beam of γ quanta from the Sn^{119} source, observed in [12], should be regarded as in error.

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DIFFRACTION OF RESONANT γ RADIATION IN BRAGG SCATTERING BY NUCLEI AND ELECTRONS IN PERFECT SINGLE CRYSTALS OF TIN

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Submitted 9 September 1968

ZhETF Pis. Red. 8, No. 10, 563-565 (20 November 1968)

In [1] we investigated experimentally the diffraction of resonant γ radiation by nuclei and electrons in the case of Bragg reflection from mosaic crystals of tin containing 80% of the isotope Sn^{119}. For crystals with thicknesses 2 - 16 μ, we obtained the dependence of the intensity of the scattered radiation on the relative velocity of the source and scatterer (scattering spectra) in three orders of reflection at temperatures 293°K and 110 - 120°K.