resolution of the apparatus (4.5 nsec), the plasma ion temperature does not exceed 5 keV, which points with a large probability to a thermal character of neutron generation in a spherically heated plasma. If this conclusion is accepted, then the relatively large neutron yield at a relatively low ion temperature and a small number of particles in the plasma can be attributed to the fact that the reaction proceeds mainly in a plasma shell with transcritical density.


[1] K. Bűchl, K. Eidmann, P. Mulser, H. Salzmann, and R. Sigel, in: Laser Interaction and Related Plasma Phenomena, vol. 2, Proceedings of the 2d Workshop, Plenum Press, N.Y.-London, p. 409, 1972.
[2] C. Yamanaka, T. Yamanaka, et al., Phys. Rev. A6, 2335 (1972).
[3] G. H. McCall, Fr. Young, A. W. Ehler, J. F. Kephart, and R. P. Godwin, Phys. Rev. Lett. 30, 1116 (1973).
[4] N. G. Basov, V. A. Boiko, S. M. Zakharov, O. N. Krokhin, and G. V. Sklizkov, ZhETF Pis. Red. 13, 691 (1971) [JETP Lett. 13, 489 (1971)].
[5] N. G. Basov, Yu. S. Ivanov, O. N. Krokhin, Yu. A. Mikhailov, G. V. Sklizkov, and S. I. Fedotov, ibid. 15, 589 (1972) [15, 417 (1972)]; N. G. Basov, O. N. Krokhin, G. V. Sklizkov, S. I. Fedotov, and A. S. Shikanov, Zh. Eksp. Teor. Fiz. 62, 203 (1972) [Sov. Phys.-JETP 35, 109 (1972)].
[6] V. A. Boiko, Yu. A. Drozhnin, S. M. Zakharov, et al., FIAN Preprint No. 77, Moscow, 1973.
[7] F. Floux et al., Phys. Rev. A1, 821 (1970).
[8] J. M. Shearer et al., Phys. Rev. A6, 764 (1972).
[9] L. A. Artsimovich, Upravlyaemye termoyadernye reaktsii (Controlled Thermonuclear Reactions), Fizmatgiz, 1963.


## DOMAIN WALL CONFIGURATION IN CYLINDRICAL SILICON IRON CRYSTALS


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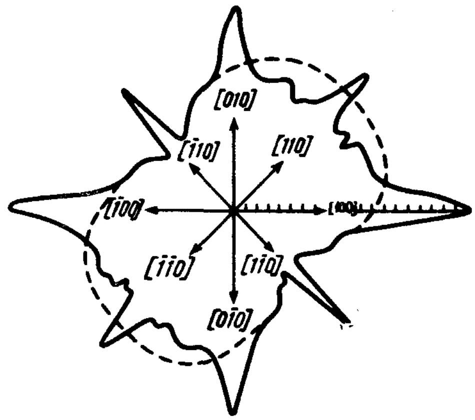
Information on the arrangement of the domain walls inside a ferromagnet is limited, since the picture of the interior is usually assessed from the emergence of the wall to the surface. Direct information on the internal domain structure is obtained with a neutron-optics method based on the study of neutron refraction by the domain walls under conditions of rather high angular resolution [1]. If the neutron beam is parallel to a certain wall system, there is no refraction by the system. This is manifest by a transmission maximum, so that the directions of the domain walls can be established thereby. Each pair of these directions defines one system of parallel walls. To find the indices (hkℓ) of the plane to which they are parallel, it is necessary to solve a system of two equations of the type $hu + kv + \ell w = 0$, where u, v, and w are the indices of two directions corresponding to transmission maxima.

We investigated the domain-wall configuration in cylindrical (13 mm diam) Fe + 3.5% Si crystal of different height and different degree oq perfection. The neutron transmission measurements ($\lambda = 2.46$ Å) were made with a two-crystal spectrometer [1, 2]. The sample was placed between two germanium crystals in a parallel mount and rotated about the cylinder axis [001], which was perpendicular to the [100] axis, and also about the [110] axis. In all cases, the neutron beam was perpendicular to the rotation axis. A single-crystal quartz filter was used to suppress the neutrons of wavelength $\lambda/n$, which were present in the monochromatic beam.

The transmission curves (Figs. a and b) show distinct maxima corresponding to passage of neutrons along the domain-wall systems. The widths of the maxima are determined by the geometrical parameters of the wall systems, and the oscillations near them are due to the mutual influence of refraction by the neighboring parallel walls [1]. The smooth increase of the intensity with increasing distance from the maxima is connected with the weakening of the refraction effects with increasing an angle of incidence on the wall. The angular dependence of the transmission did not change qualitatively when the height of the sample was increased from 1.5 to 35 mm, or when the mosaic structure increased from the equivalent of several minutes to ∿ 1°.

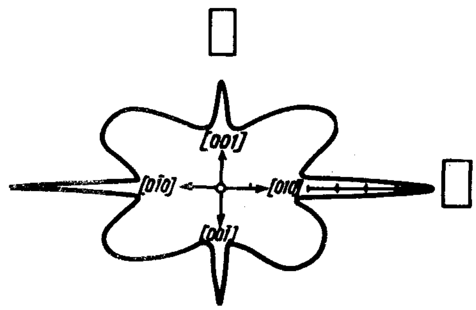
It was established from the indices of the directions corresponding to the maximum transmission (Figs. a and b) that the domain walls in the investigated crylindrical samples lie in four planes, (100), (010), (110), and $(1\bar{1}0)$, passing through the cylinder axis and in the plane

Angular dependence of neutron transmission (in polar coordinates) for a cylindrical Fe + 3.5% Si crystal of 13 mm diameter and 22 mm height. One scale division on the polar axis corresponds to 200 counts/min (beam cross sections 5 x 15 and 5 x 11 mm for Figs. a and b, respectively. a) Rotation axis [001], b) rotation axis [100]. The dashed line in Fig. a corresponds to the theoretical change of intensity for one wall system. Figure b shows schematically the position of the sample relative to the neutron beam.



a

(001) perpendicular to it, and there are no walls of type {101} inclined 45° to the cylinder axis. This conclusion is further corroborated by the absence of any transmission maxima (other than those listed) on the picture obtained by rotation about [110].



b

As is well known, {100} and {110} in iron are 180° and 90° walls, respectively. We have thus observed all the possible 180° walls and some of the possible 90° walls. The absence of {101} walls separating domains magnetized along the cylinder axis and those perpendicular to it indicates that all the domains are magnetized perpendicular to this axis. The domain structure has a quasi-two-dimensional layered character, the layers being separated by (001) walls, but it does not follow from experiment that they pass through the entire crystal. A picture similar to the parallelogram grid observed by Shur and co-workers in disk-shaped Fe-Si crystals [3] is apparently realized in the (001) section. It can be assumed that the quasi-two-dimensional character of the domain structure is connected with singularities of the shape of the crystals investigated by us (with the presence of a preferred direction).

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[1] S. Sh. Shil'shtein, V. A. Somenkov, and M. Kalanov, Zh. Eksp. Teor. Fiz. 63, 2214 (1972) [Sov. Phys.-JETP 36, No. 6 (1973)].
[2] S. Sh. Shil'shtein, V. I. Marukhin, M. Kalanov, and V. A. Somenkov, Prib. Tekh. Eksp. No. 3 No. 3, 70 (1971).
[3] I. E. Startseva, V. V. Shulika, and Ya. S. Shur, Izv. AN SSSR ser. fiz. 36, 1597 (1972).

## THERMODYNAMICS OF THE MELTING OF CESIUM AT HIGH PRESSURES

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We obtain, for the first time, data characterizing the thermodynamics of melting cesium at pressures up to $22\times10^3$ kgf/cm$^2$. The nature of the maximum on the melting curve of cesium is discussed briefly.

Since the discovery of temperature maxima on the melting curves of various substances (see [1]), the question of the nature of this phenomenon was discussed in the literature many times [1 - 4]. There are, however, still no reliable experimental data describing the melting