The bending of the surface forms a focusing lens, so that in principle the beam can be self-focused in a linear medium (Fig. 2). The central part of the refracted beam is focused within a distance $Z_f(T)$:

$$Z_f^{-1}(t) = \frac{(n-1)^2}{n(n+1)} \frac{|E_o|^2}{8\pi} \frac{t^2}{\rho a^3} \phi''(0), \quad \phi''(s) = \frac{d^2\phi}{ds^2}. \tag{8}$$

The phenomenon is nonstationary, since the bending, and with it the curvature of the wave front, depend on the time. In a self-focusing nonlinear medium, the curvature of the beam wave front on the boundary, brought about by the bending (curvature $Z_f^{-1}(t)$) leads to motion of the focal spot. The self-focusing distance Z(t) (cf. [6]) equals

$$Z^{-1}(t) = R_{nl}^{-1} + Z_f^{-1}(t), \quad R_{nl} = \frac{a}{2}\sqrt{\frac{\epsilon_o}{\epsilon_2 |E_o|^2}}, \quad \epsilon = \epsilon_o + \epsilon_2 |E_o|^2. \tag{9}$$

Numerical estimates show that the described effects can apparently be observed in fields of modern powerful lasers. Let, for example, a = 0.2 cm, I = 10 MW/cm^2, and $\Delta = 10^{-3}$ sec [6]. Then $Z_f(\Delta) \approx 6$ cm at $\rho \sim 1$ g/cm^2, $n \approx 1.3$ and $\zeta(\Delta) \approx 4 \times 10^{-3}$ cm. At an absorption coefficient $\sim 10^{-3} - 10^{-4}$ cm^{-1}, the thermal defocusing leads, according to [7], to effects of the same order of magnitude.

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ANGULAR ANISOTROPY OF Am^{241} NEUTRON-FISSION FRAGMENTS

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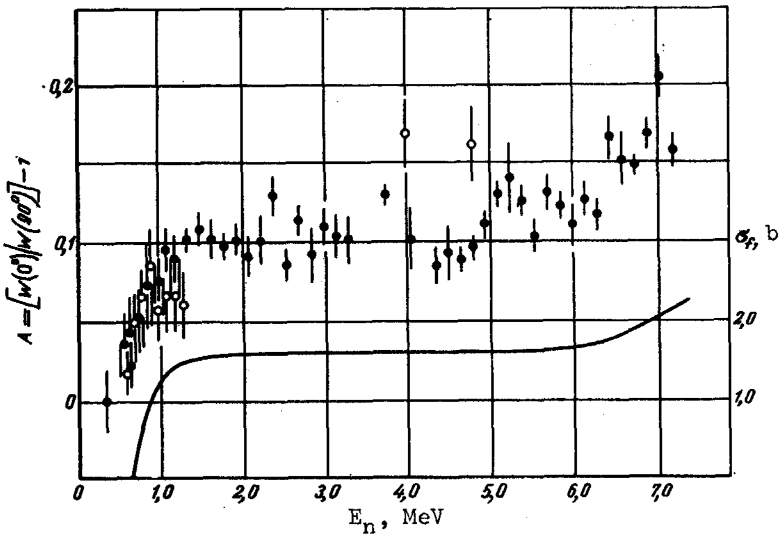
Submitted 23 December 1968
ZhETF Pis. Red. 9, No. 3, 196 - 198 (5 February 1969)

Only fragmentary information is presently available concerning the angular anisotropy of the fission fragments of odd-odd compound nuclei. We report here the results of detailed measurements of the fragment angular distributions $W(\theta)$ for the reaction $Am^{241}(n, f)$ in a wide range of neutron energies E_n, from 0.3 to 7.2 MeV. The experiment was performed with an electrostatic generator. Glass detectors were used to register the fragments. The measurement procedure was described in detail in [1].

Interest in the study of the angular anisotropy of the $Am^{241}(n, f)$ fission fragments is connected to a considerable degree with the fact that the compound nucleus produced in this reaction is a classical representative of spontaneously-fissioning isomers, or "form isomers."

Before this work was started, the theoretical considerations [2], which are based on the model of the double-hump fission barrier, had already been formulated. According to them,

Fig. 1. Angular anisotropy of $Am^{241}(n, f)$ fission fragments, as a function of the neutron ene energy. o - data of [3], • - data of present paper. The lower curve shows schematically the variation of the fission cross section σ_f.



the fissioning isomer states are quasi-equilibrium states of the nucleus in the well between the maxima of the potential energy of the deformation. Inasmuch as the angular anisotropy of the fission fragments is determined by the spectrum of the angular momenta of the transition states at the barrier, it would be natural to expect that effects having the same nature as the isomer form would appear in the angular distributions of the fragments.

The results of the performed measurements, in the form of the angular anisotropy, $A = (W(0)/W(90°)) - 1$, together with the only similar published data [3], are shown in Fig. 1. The lower part of the figure shows, for comparison, the variation of the fission cross section σ_f. The total angular distributions of the fission fragments, $W(\theta)$, just as in [3], agree within the limits of the statistical errors (1 - 2%) with the relation $W(\theta)/W(90°) = 1 + A\cos^2\theta$ in the entire investigated region of energies E_n.

Thus fission of Am^{241} by neutrons is characterized by a very small angular anisotropy of the fragments ($A \leq 0.1$), and a constant form of the fragment angular distribution. These properties appreciably distinguish the fission of Am^{241} from that of other lighter nuclei, such as, for example, Th^{230} and U^{234}. These target-nuclei have approximately the same fission threshold, but an entirely different scale of angular anisotropy and a different character of the energy dependence of $A(E_n)$ and of $W(\theta, E_n)$ (see Fig. 2). The channel effects, which are strongly pronounced in Th^{230} and U^{234}, are missing in the case of Am^{241}.

We can attempt to relate the differences in the fission pictures in these cases with the different densities of the fission channels of the odd and odd-odd compound nuclei, and expect the density to be much higher in the latter. However, this is hardly the only cause of the observed differences. Figure 2 shows also data on $A(E_n)$ for the heavier odd fissioning nuclei Pu^{239}, Pu^{241}, and Pu^{243}, which reveal a much greater similarity with the odd-odd Am^{242} than with the representatives of the same class of odd nuclei, namely Th^{231} and U^{235}.

The vanishing of channel effects near the threshold with increasing number of nucleons in the fissioning nucleus has been interpreted within the framework of the model of the two-

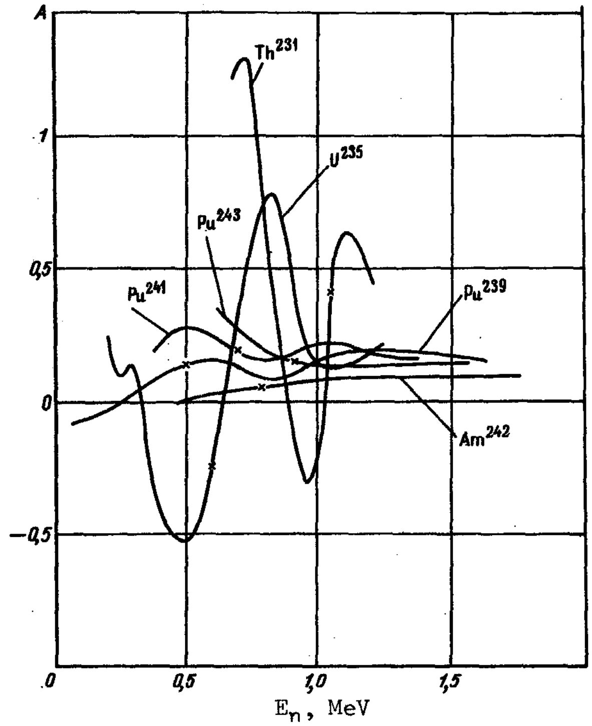


Fig. 2. Energy dependence of the angular anisotropy of the fission products of the compound nuclei Th^{231}, U^{235}, Pu^{239}, Pu^{241}, Pu^{243}, and Am^{242} in the (n, f) reaction near threshold. The symbol × denotes the approximate values of the neutron threshold energy.

hump barrier [4].

The authors thank V. M. Strutinskii, at whose initiative the present work was undertaken. The authors are grateful to M. G. Golubeva, N. E. Fedorova, and B. I. Fursov for taking part in the work, and also to A. G. Kozlov and V. B. Pavlovich for supplying the isotopically pure Am^{241}.

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A PULSAR MODEL

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Submitted 12 December 1968
ZhETF Pis. Red. 9, No. 3, 199 - 200 (5 February 1969)

A pulsar model was recently proposed [1], explaining the periodic variations of the intensity of the radio emission as being due to oscillations of the shape of the star [2]. The frequency of the quadrupole oscillations of an incompressible liquid sphere is given by

$$\nu^2 = (16\pi/15)G\rho, \qquad (1)$$

where G is the gravitational constant and ρ is the density. At densities close to those of white dwarfs, oscillation periods on the order of 1 sec are obtained, which are characteristic of pulsating radio-emission sources. Allowance for compressibility does not change the order of magnitude of the frequencies.