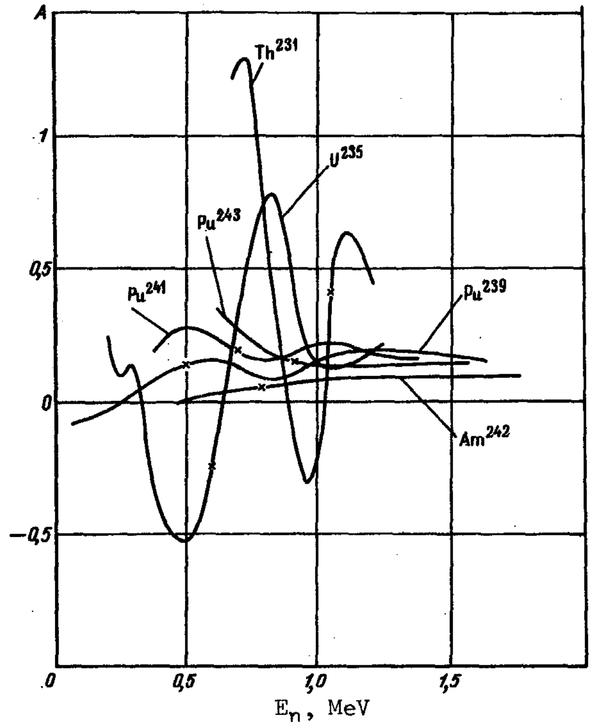

Fig. 2. Energy dependence of the angular anisotropy of the fission products of the compound nuclei Th^{231}, U^{235}, Pu^{239}, Pu^{241}, Pu^{243}, and Am^{242} in the (n, f) reaction near threshold. The symbol × denotes the approximate values of the neutron threshold energy.

hump barrier [4].

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A PULSAR MODEL

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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.

The main difficulty of such a model is the attenuation of the quadrupole oscillations, which is connected with the emission of gravitational waves. The lifetime of the free shape oscillations is less than a day. We consider here a rotational-vibrational model which, apparently, can explain the longer lifetime of small deviation of the shape of the star from axial symmetry.

The connection between the shape oscillations of a heavy liquid and the rotation of the liquid arises at sufficiently rapid rotations, when the dimensionless rotational moment

$$j = J(GM^3R)^{-1/2} \tag{2}$$

exceeds the value $j_{cr} = 0.304$. Here J - rotational moment, M - mass of star, and R - average radius. In the interval $0 < j < 0.304$ the stable shape of a heavy rotating incompressible liquid is an oblate ellipsoid of revolution. In the interval $0.304 < j < 0.39$ the stable shape is that of a tri-axial Jacobi ellipsoid, whose smallest axis is directed along the axis of revolution [3]. In the stability region of the Jacobi ellipsoids, the equatorial cross section becomes elliptical, and the ratio of the semi-axes changes from $a/b = 1$ at $j = 0.304$ to $a/b = 2.32$ at the upper limit of the admissible moments. The revolution frequency changes little in this interval:

$$\omega^2 = \kappa 2\pi G\rho, \tag{3}$$

where $\kappa = 0.187$ at $j = 0.304$ and $\kappa = 0.14$ at $j = 0.39$. From the point of view of an observer at rest, the star executes in this case rotational shape oscillations with frequency $\nu = 2\omega$. Comparing (1) with (3), we readily see that this frequency is very close to the frequency of small oscillations of a spherical drop.

At appreciable deformations of the star's equator, the gravitational radiation will suppress the deformation just as rapidly as in the case of quadrupole oscillations that are not connected with the rotation. The energy lost to gravitational radiation equals

$$-\frac{d\epsilon}{dt} = \frac{9GM^2(a^2-b^2)^2(2\omega)^6}{125c^5}. \tag{4}$$

In the case of a relatively rapid compression of the star, the energy will be replenished by the kinetic energy ϵ_k of the star's rotation, and the star will be in a supercritical state $0 < j - j_k \leq 1$ with small deformation of the equator

$$\left(\frac{a-b}{a}\right)^2 \sim 0{,}14\,\frac{c^5(-\dot{\epsilon})}{R^5(2\omega)^6\epsilon_K}. \tag{5}$$

At the characteristic times $\epsilon_k/(-\dot{\epsilon}) \approx 10^6$ years and $R \approx 10^8$ cm, the obtained deformation $(a - b)/a$ is of the order of 10^{-3} or 10^{-4}. The extent to which this model can explain the pulsations of the radio emission depends on whether the deep modulation of the emission can be attributed to relatively small deformations of the star.

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POSSIBLE TYPE OF INSTABILITY IN MONOPOLAR INJECTION

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We shall show that the effect of vanishing of local levels upon screening by free carriers, predicted theoretically in [1] and observed experimentally in [2], can lead, in the case of monopolar injection from the contact (i.e., in the space-charge-limited current mode - SCLC), to an S-shaped current-voltage characteristic.

We consider a thin dielectric layer of thickness L, in which there is a high concentration N_t of monoenergetic electron traps of depth E_t. The electrons injected from the contact are distributed among the traps and the conduction band. The free electrons screen the traps and E_t decreases. At a critical voltage $V = V_1$ at which the concentration of the free electrons becomes sufficiently large, $n = n_1$, a cascade-like decrease of E_t and an increase of n set in as a result of the release of the electrons from the trap, and a region of negative conductivity appears on the current-voltage characteristic. This process is in essence a Mott transition due to the injection [3].

Let us obtain the current-voltage characteristic of the dielectric diode under consideration within the framework of the simplest SCLC model [4]. The initial system of equations is:

$$j = q\mu n(V/L), \tag{1}$$

$$CV/qL = n + n_t, \tag{2}$$

$$n_t = \frac{nN_t\,\theta(E_t)}{n + N_{ct}};\quad N_{ct} = N_c e^{-E_t/kT} = N_{ct}^{o} e^{n/\bar{n}};\quad \theta(z) = \begin{cases} 1, & z > 0 \\ 0, & z < 0 \end{cases}, \tag{3}$$

$$E_t = E_{to} - kT\frac{n}{\bar{n}};\quad \bar{n} \approx \frac{m\epsilon(kT)^2}{2\pi^3\hbar^2 q^2}, \tag{4}$$

where j is the current density, μ the electron mobility, $C = \epsilon/4\pi L$ the interelectrode geometric capacitance, ε the dielectric constant, q and m the charge and mass of the electron, N_c the effective density of states in the conduction band. The phenomenological expression (4) for the level shift can be obtained by analytically approximating the the numerical curve obtained in [5]. Substituting (3) in (2) and differentiating the expression term by term with respect to n, we have respectively

$$CV/qL = n + [nN_t\,\theta(E_t)/(n + N_{ct}^{o} e^{n/\bar{n}}, \tag{5}$$

$$\frac{C}{qL}\frac{dV}{dn} = 1 + N_t\left\{\frac{N_{ct}^{o} e^{n/\bar{n}}(\bar{n} - n)}{(n + N_{ct}^{o} e^{n/\bar{n}})^2}\,\theta(E_t) - \frac{n}{n + N_{ct}^{o} e^{n/\bar{n}}}\delta(E_t)\right. . \tag{6}$$