section is determined by the higher of the barriers, A. The mechanism of occurrence of anisotropy in this case, according to Strutinskii and Bjornholm [3], consists in the following: after overcoming the first barrier, the nucleus stays in the second well long enough to "forget" that value of K with which it passed through the first barrier. Therefore, when $E_{fB}^{1^-,0} < E < E_{fA}^{1^-,0} < E_{fA}^{1^-,1}$, the nuclei fall into the second well via the channel 1^-, 0 on the barrier A, since this is energetically inconvenient, after which they fission, and the angular distribution is determined by the position of the excitation energy relative to the channels of the barrier B. In this case F_f (i.e., the observed fission threshold) approximately coincides with $E_{fA}^{1^-,0}$ for barrier A (or is somewhat lower than this threshold), and the maxima of the ratios b/a and c/b are approximately at energies $E_{fB}^{1^-,0}$ and $E_{fB}^{2^+,0}$ for the barrier B (see lower Fig. 2). The experimental picture agrees quite satisfactorily with such a description, and the following thresholds are obtained from its analysis:

	$E_{fB}^{2+,0}$	$E_{fB}^{1-,0}$	$T_f (\leq E_{fA}^{1-,0})$	Δ_{AB}
Th^{232}	5.7	5.9	5.9	0
U^{238}	<5.0	5.4	5.6	0.2
Pu^{238}	<5.2	5.4	6.1	0.7
Pu^{240}	<5.0	5.1	6.0	0.9
Pu^{242}	<5.0	5.2	6.1	0.9

$\Delta_{AB} = T_f - E_{fB}^{1^-,0}$ increases from thorium to plutonium in accordance with the predictions of [3]. Since in most cases c/b increases monotonically with decreasing energy, the upper limiting values are listed in the table for $E_{fB}^{2^+,0}$, which is determined from the position of the maximum of this ratio.

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POSSIBLE UNSTABLE OSCILLATIONS OF A NEUTRON STAR

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It is known that the criterion of conductive instability is written in the form

$$\rho'/\rho - p'/\gamma p \leq 0, \tag{1}$$

where $\gamma(p, \rho)$ determines the relation between the Lagrangian components of the pressure and density perturbations: $\delta p/p = \gamma \delta\rho/\rho$, and the prime denotes the derivative with respect to the radius r. In the case of small radiation pressure and total ionization, $\gamma = 5/3$.

Let us consider now a superdense body, for which the pressure is a function of the density only, and the time of establishement of chemical-composition equilibrium is much shorter than the period of the oscillations. These conditions are satisfied in the case of a neutron star.

The value of γ is precisely such that the left side of (1) vanishes, and consequently, the neutron star is neutral with respect to excitation of convection. Since the perincipal terms in (1) cancel out, the correction terms become significant, as well as the terms that appear in the left side of the same equation (1) in the presence of additional perturbing forces. Particular interest attaches to the possible instability.

It is known that the criterion (1) remains valid when account is taken of corrections of the order of MG/c^2R, due to the effects of general relativity theory (GRT) [1]. Here M and R - mass and radius of star, and G - gravitational constant. Calculations with allowance for subsequent corrections (containing c^{-4}, etc.) have not yet been performed. In the present paper we investigate the possibility of instability in the presence of small perturbing forces due to a magnetic field and to the rotation of the star. For simplicity, we disregard the GRT corrections.

In the derivation of the criterion of convective instability it is customary to consider perturbations of a local character, which have small increments and a large number of nodes along the radius. The oscillations perturb the gravitational potential weakly. In connection with the locality condition, it is possible to consider perturbations that have a large amplitude only near the surface of the star, and then the separation boundary can be approximately regarded as plane. We shall perform the analysis for a more general cylindrical configuration in the presence of a longitudinal magnetic field and rotation with angular velocity Ω = const. We shall assume the medium to be ideally conducting, in the equilibrium state

$$p' + \frac{1}{4\pi} HH' - \rho r \Omega^2 + \frac{4\pi G\rho}{r} \int_0^r r\rho\, dr = 0. \tag{2}$$

The equations of the oscillations for perturbations of the form $f(r) \exp i(m\varphi + \omega t)$ are written out in [2]. For the considered case of a pressure that depends on the density only, the equations will contain $\rho p'/p\rho'$ in lieu of γ. In the same paper, a criterion for convective instability was derived (at $\Omega = 0$), from which it follows that the instability will occur if at least in a small region we get

$$(H/\rho)' < 0. \tag{3}$$

We can obtain the following asymptotic formula for the frequency of the oscillations of a rotating cylinder

$$\omega + m\Omega = \pm \frac{2i}{\pi(2j + d)} \int \left\{ \frac{m^2 H (H/\rho)' (4\pi p' + HH')}{4\pi r^2 [4\pi p' (\rho/\rho') + H^2]} \right\}^{1/2} dr, \tag{4}$$

where $j \gg d$, $j \gg |m|$, j - integer, d - a certain constant, and the integration is carried out over those regions where the radicand is positive. In the derivation of (4) it was assumed that $p' < 0$, $\rho' < 0$, $4\pi p' + HH' < 0$, and H^2/p is finite.

Thus, when the criterion (3) is satisfied, the neutron star with a magnetic field will be conductively unstable. According to (4), in a coordinate system connected with the star, the perturbations grow exponentially with an increment that is smaller by a factor j than the ratio of the Alfven velocity to the radius. For more dangerous perturbations corresponding to small j, a vibrational instability is expected with a real frequency $\mathrm{re}(\omega + m\Omega)$ of the order of the angular velocity of rotation.

The cause of the instability can be readily understood on the basis of simple qualitative considerations. In connection with the neutrality with respect to convection in the absence of a magnetic field, it is sufficient to check on the stability by considering the mutual substitution of individual magnetic force tubes together with the particles contained in them. If the motion is planar, and the magnetic field is perpendicular to the velocity, then the ratio H/ρ is conserved, so that when (3) is satisfied the displacement of a certain tube to the outside contributes to the displacement of the internal field by particles. This process leads to an instability (just as in a heavy liquid that is supported from below by a light liquid).

In the case of an arbitrary field, the ratio H/ρ changes in proportion to the length dl of the element of the magnetic force line, and therefore $h/vl = \mathrm{const}$ for a distribution corresponding to the stability limit.

A difficult theoretical question is whether the instability in question can lead to oscillation of finite amplitude at one frequency. If the field at the instant of production of the magnetic rotating neutron star differs strongly from that which determines the stability limit, then many modes will be initially excited in the system. In the presence of oscillations, the instability criterion changes, and it is therefore possible that only one mode remains in the steady state (for the case of radial pulsations, qualitative reasoning confirming this conclusion is presented in [3]). An estimate of the convection rate v is obtained by equating the kinetic and magnetic energies. At $H \sim 10^{13}$ Oe, $R \sim 10^6$ cm, and $M \sim 10^{33}$ g we get $v \sim 10^5$ cm/sec.

It can be assumed that the recently observed pulsating radio sources (pulsars) [4] are magnetic rotating neutron stars, in which one mode of nonradial oscillations that are unstable by virtue of the foregoing mechanism is excited. This hypothesis explains the main properties of pulsars: high accuracy of the signal repetition period, the magnitude of this period, which is of the order of one second, the polarization of the radiation [5], and the variability of the pulse amplitude. The high accuracy of the period is a result of the fact that natural oscillations of the star are observed. The amplitude and the form of the pulse will then depend also on the emission properties of the atmosphere. Angular velocities on the order of 1/sec are perfectly feasible in neutron stars 1).

1) We note that the hypothesis that the signal repetition period is dictated by the rotation of the star (in the presence of some unknown source of activity) has already been advanced in the literature [6].

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RADIOPHYSICAL METHODS OF MEASURING THE REST MASS OF THE PHOTON [1)]

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Recently I. Yu. Kobzarev and L. B. Okun' [1] and also L. S. Marochnik [2] considered the question of an experimental upper limit of the photon rest mass m_γ. Rocket measurements of the earth's static magnetic field yield a better experimental estimate $\lambda\!\!\!^{-} = \hbar/m_\gamma c > 0.89 \times 10^5$ km, corresponding to a frequency $\Omega = c/\lambda\!\!\!^{-} < 3.4\ \mathrm{sec}^{-1} < 4 \times 10^{-48}$ g.

It will be shown in the present paper that radiophysical methods can give a much better estimate of λ. The equations of electrodynamics in the presence of a rest mass are

$$F^{ik}_{\ ,k} - \Lambda^2 A^i = -\frac{4\pi}{c} j^i, \quad F_{ik} = A_{k,i} - A_{i,k}; \qquad A^i = (\phi, \mathbf{A})$$
$$F^{ik} = (-\mathbf{E}, \mathbf{H}); \qquad \Lambda = 1/\lambda\!\!\!^{-} = m_\gamma c/\hbar. \tag{1}$$

The notation is in accordance with [4], and "juggling" of the space indices is connected with a reversal of the sign. When $\Lambda \neq 0$ an additional condition on the potentials $A^i_{\ ,i} = 0$ follows from the continuity equation $j^i_{\ ,i} = 0$ [5] and leads to a wave equation for the vector A^i:

$$A^i_{\ ,i} = 0, \quad F^{ik}_{\ ,k} = -A^{i;k}_{\ \ ;k} = \Box A^i; \qquad \Box = \Delta - \frac{1}{c^2}\frac{\partial^2}{\partial t^2}. \tag{2}$$

We seek a solution of (2) in the form of plane waves $\exp(-ik_i x^i)$, and consider only the longitudinal branch, defined by the condition:

$$k^a \parallel A^{(a)}(\mathbf{k}); \qquad (\Box - \Lambda^2)A^i = 0. \tag{3}$$

Let us consider the nonsingular solution

$$k^a \neq 0, \qquad A^a(\mathbf{k}) \neq 0. \tag{4}$$

Using the relation $A^i_i = 0$, we get

$$A^a_{(\mathbf{k})} = (k^0 k^a/k^2) A^0(\mathbf{k}), \quad \mathbf{E} = i\Lambda^2 A^0(\mathbf{k})(\mathbf{k}/k^2) = i\mathbf{A}(\Lambda^2/k^0), \quad \mathbf{H} = 0. \tag{5}$$

1) Unscheduled report at GR-5.