the problem can be treated by perturbation methods. The degeneracy in the quantum number m is already fully lifted in the first order (see reference 1). The nucleon states now can be classified by the quantum numbers n, l, $|m|$, and w, where w is the parity with respect to reflections in the (x, z) plane. The meaning of the other quantum numbers can be easily explained by going to the limits of axial symmetry and spherical symmetry.

The energies of the levels as a function of ρ and γ was calculated up to and including quadratic terms for s, p, d, and f states. Thus, for states with $l = 3$ and $m = 1$ the energy is given by

$$\begin{aligned} E_{n31\pm} = E_{n3}^0 \Big\{ 1 &+ \frac{4}{15}\rho\left[\sin\left(\frac{\pi}{6}\pm\gamma\right) - \sqrt{1+4\cos^2\left(\frac{\pi}{6}\pm\gamma\right)}\right] + \rho^2\Bigg[1 - \frac{2}{15}\cos^2\left(\frac{\pi}{6}\pm\gamma\right) \\ &+ \frac{12\cos^3\gamma \mp \sqrt{3}\sin\gamma}{15\sqrt{1+4\cos^2(\pi/6\pm\gamma)}} + \frac{24}{7}\Bigg(5 + 4\sin^2\left(\frac{\pi}{6}\pm\gamma\right) \\ &- \frac{44\sin^3(\pi/6\pm\gamma) - 35\sin(\pi/6\pm\gamma)}{\sqrt{1+4\cos^2(\pi/6\pm\gamma)}}\Bigg) D_{n3}^- \\ &+ \frac{72}{77}\Bigg(103 + 60\sin^2\left(\frac{\pi}{6}\pm\gamma\right) \\ &- \frac{380\sin^3(\pi/6\pm\gamma) - 343\sin(\pi/6\pm\gamma)}{\sqrt{1+4\cos^2(\pi/6\pm\gamma)}}\Bigg) D_{n3}^+\Bigg]\Big\}, \end{aligned} \quad (3)$$

where

$$E_{nl}^0 = \frac{\hbar^2\mu_{nl}^2}{2Mr_0^2},$$

$$D_{nl}^{\pm} = \mp\left\{\frac{2(l\pm3)+1}{16[2(l\pm1)+1]^2} - \frac{\mu_{nl}^2}{8[2(l\pm1)+1]^3}\right\},$$

μ_{nl} is the n-th root of the spherical Bessel function $j_l(x)$. For the axially symmetric ($\gamma = 0$) case these expressions go over into Moszkowski's expressions.[3]

Numerical evaluations of the energy were performed for different configurations. They show that for the case of a few particles above the closed shell, beginning with three, the minimum of the energy can correspond to an axially nonsymmetric shape of the nucleus. So, for example, the configuration $(1s)^6$ $(1p)^6$ $(1d)^4$ of one nucleon kind, corresponding to the nucleus Mg^{24} the minimum of the energy occurs at $\beta \approx 0.3$, $\gamma \approx 7°$; for the configuration $(1s)^2$ $(1p)^6$ $(1d)^{10}$ $(2s)^2$ $(1f)^2$ corresponding to Ti^{44}, it occurs at $\beta \approx 0.2$, $\gamma \approx 5°$.

In this one has to keep in mind the rough character of the utilized model and the slow convergence of the perturbation series (this is particularly so for values of γ close to zero and for small m). Therefore the obtained results can by no means aspire to be in agreement with experiment. However, it follows from the above that the independent particle model in its simplest form contains the possibility of deviations of the nuclear equilibrium shape from axial symmetry. This result is in agreement with the results of similar calculations of Gursky[4] and Geĭlikman[5] for the oscillator potential. Analogous results have been obtained for the unified model by Davydov and Filippov.[6]

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A POSSIBLE METHOD FOR THE DETERMINATION OF THE DIRECTION OF POLARIZATION OF μ- MESONS

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It is well known[1,2] that the law of lepton conservation will be completely verified only when it is shown experimentally that μ^- mesons produced in the decay of π^- mesons are longitudinally polarized in the direction of their motion. Dolginov[3] suggested the use, for this purpose, of the angular distribution of circularly polarized γ rays emitted in the $2p \rightarrow 1s$ transition in mesic atoms.

In the first order effect ($2p \rightarrow 1s$ transition) the expression for the angular distribution (see, e.g., reference 4) naturally depends on the degree of polarization P of the μ^- meson prior to the transition under study. However in reality, no such isolated transitions take place in the μ-mesic atom. Previous transitions[5] lead to a depolarization of the μ^- mesons and therefore the formula given in reference 4 cannot be used for comparison with experiment. A calculation will show that it is also incorrect to take for P the residual degree of polarization in the 2p or 3d levels. Consequently it is necessary to consider the whole effect at once, as was done for example in the depolarization calculation.[5]

The mesic atom is formed by capture, from the continuum, of a μ^- meson with orbital angular momentum l_N. Thereafter, by successive emissions of Auger electrons and γ rays (the latter transitions are important since they proceed for low l), the μ^- meson cascades down to a level l_1 from which it proceeds to the level l_0 by emission of a circularly polarized γ ray. In such a process the angular distribution of the circularly polarized γ rays is given by

$$W = 1 + [3l_1(l_1+1)]^{-1/2} \times \left\{ l_1 \left[\frac{(2l_N+3)(l_N+1)}{(2l_N+1)^2} - \sum_{l=l_1+1}^{l_N} \frac{4l^2-5}{(4l^2-1)^2} \right] - \frac{(l_1+1)(2l_1-1)l_1}{(2l_1+1)^2} \right\} \tau F_1(1l_0l_1) P_0 \cos\theta, \qquad (1)$$

where θ is the angle between the direction of emission of the circularly polarized γ ray and the direction of motion of the μ^- meson prior to capture into the orbit l_N (i.e., the direction of the beam); P_0 is the degree of the polarization of the μ mesons in the beam; and τ and F_1 are given in references 4 and 6.* The expression (1) was derived assuming a descending cascade $l_i = l_1 + i - 1$ $(i = 1, \ldots N)$. Corrections due to other channels are negligible.[5]

Setting $l_N = 14$, $l_1 = 1$, $l_0 = 0$ in expression (1) we obtain

$$W = 1 - 0.102\tau P_0 \cos\theta. \qquad (2)$$

Equation (2) gives the required angular distribution of circularly polarized γ rays in a 2p → 1s transition in a μ-mesic atom.

*In reference 4 τ_1, τ_2 should be replaced everywhere by $-\tau_1$, $-\tau_2$.

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DEPENDENCE OF THE ANGULAR ANISOTROPY OF FISSION ON THE NUCLEAR STRUCTURE

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THE recently-obtained experimental data on the angular distribution of the fragments in the fission of various heavy nuclei induced by particles of 10 — 40 Mev made it possible to conclude[1-4] that a connection exists between the degree of anisotropy of the angular distribution $\sigma(0°)/\sigma(90°)$ and the parameter Z^2/A of the nucleus undergoing fission. This connection is characterized by a decrease of the degree of anisotropy with increasing value of the parameter Z^2/A.

A thermodynamical interpretation of this relation is attempted in the present work.* It is assumed that, for a sufficiently large excitation of the compound nucleus, the ratio of the cross section for fission at the angles of 0° and 90° to the direction of the incident particle varies qualitatively from nucleus to nucleus according to the known expression of statistical mechanics for the ratio of velocities of two competing processes:

$$\sigma(0°)/\sigma(90°) \sim \exp(\Delta E/T),$$

where ΔE is the difference of the activation energy of fission parallel and perpendicular to the beam, arising as a result of an interaction of incident particles with the target nucleus, and T is the temperature of the nucleus in the state of critical deformation. There are reasons for assuming that, for the nuclei considered below (far away from the nearest magic nucleus Pb^{208}), ΔE is independent of the structure of the target nucleus, but probably depends on the properties of the nucleus and particularly on its parameter Z^2/A, de-