In view of the fact that the thickness of the neutron-configuration shell is one order of magnitude smaller than the dimensions of the nucleus, we introduce for an estimate of the shell deformation the quantity

$$\frac{\Delta}{R} = \frac{\tilde{r} - R}{R} \qquad (5)$$

where $\tilde{r}$ is the coordinate of the surface, and the quantity $(\Delta/R)^2$ can be neglected.

In determining Δ/R from (4) we choose the value of $\ln[\mu(\tilde{r})/\mu(R)]$ such that in the absence of rotation the thickness of the shell coincides with the published calculations for statistical configurations [1].

In a superdense configuration with central density $\rho(0) \to \infty$, mass $M = 1.1M_\odot$, and angular momentum of the order of that of the sun, $\mathcal{M} \sim \mathcal{M}_\odot$, we obtain for Δ/R the values 0.127 and 0.176 on the pole and on the equator, respectively. If the configuration core were not rotating, then Δ/R on the equator would be 0.254.

In conclusion I am grateful to A. G. Doroshkevich, Ya. B. Zel'dovich, and I. D. Novikov for a discussion of the results.

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SEARCH FOR COSMIC-RAY CHARGED PARTICLES HAVING MASS $\geq 50m_e$ AND DECAYING IN MILLISECOND TIME INTERVALS

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Kenffel et al [1] investigated the existence of charged particles with lifetime 10^{-7} - 10^{-1} sec. In particular, Fazio and Ritson searched in cosmic rays for long-lived charged particles with mass > $60m_e$ and with lifetimes in millisecond time intervals (10^{-4} - 10^{-1} sec). According to them, if such particles do exist their intensity should not be more than 0.05% that of muons.

Their result, however, is not quite unambiguous, since their apparatus did not make it possible to eliminate from the observed cases the decay-stimulating random coincidences, the calculated number of which was equal to the observed effect.

To check on the existence of unstable cosmic-ray charged particles with lifetimes in the millisecond interval, we have constructed the experimental set-up two projections of which are shown in Fig. 1. Figure 2 shows a block diagram of the electronic control system.

Our set-up permitted highly reliable visual identification of decay events in space, and by the same token eliminated false events due to random coincidences.

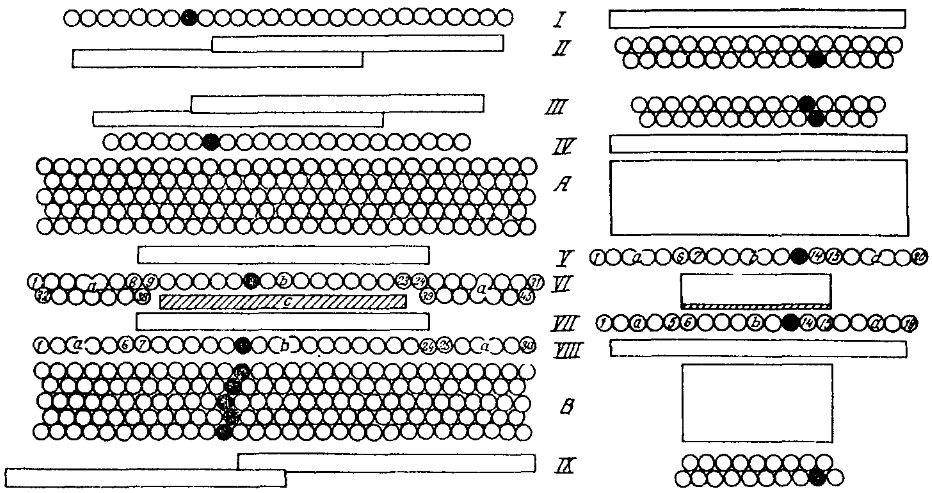

Fig. 1

I - IV, A, V, VII, VIII, and IX are trays of self-quenching type SI-6G Geiger-Mueller (GM) counters (diameter d = = 3 cm, length l = 56 cm), while VI and B are trays of self-quenching type MS-9 GM counters (d = 3 cm, l = 28 cm). Each counter was connected with a hodoscopic cell built with an MTK-90 cold-cathode thyratron. The counters of trays I - IX were fed with dc while those of the 5-layer trays A and B operated under pulsed conditions. The pulse I + VI^b - VII - VIII[1)] (control pulse "1") selected charged particles stopped in the 2-cm copper absorber C. The selecting pulse "1" triggered the hodoscopic cells in trays I + IX, corresponding to the passage of the charged particle. The hodoscopic cells of trays I + VI made it possible to reconstruct in space the trajectory of the stopped particles by means of not less than 3 operating counters in each projection.

After separation of the control pulse "1," part "A" of the control circuit was blocked, and an unblocking pulse of 100 msec duration was shaped 10^{-4} sec later. The latter unblocked during that time part "b" of the control circuit, intended for the registration of the charged-particle decay product in the interval 10^{-4} - 10^{-1} sec following the particle stopping. The decay product was separated by the pulse VII^b-IX-V-VI-VII^a-$VIII^a$ (control pulse "2"). The control pulse "2" triggered the thyratron generators which shaped the high-voltage pulses to trays A and B (amplitudes V_A = 2.5 kV and V_B = 1.8 kV, duration RC = 1 μsec). At the same time, the selecting pulse "2" caused operation of the hodoscopic cells of trays I + IX, after which the shutter of the camera opened. After the photo-

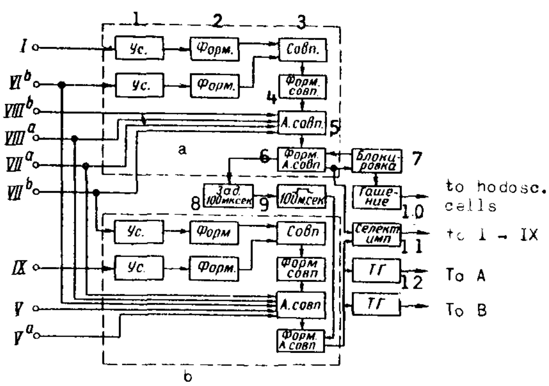

Fig. 2

1) Amplifier, 2) shaper, 3) coincidence, 4) coincidence shaper, 5) anticoincidence, 6) anticoincidence shaper, 7) blocking, 8) 100 μsec delay, 9) 100 msec square pulse, 10) quenching, 11) selector pulse, 12) thyratron generator.

graphs were taken, all the operated hodoscopic cells were quenched, the film advanced, and circuit "a" was unblocked.

The mechanical registrator made it possible to count coincidences and anticoincidences. Figure 1 shows a clear picture of the proposed decay of a long-lived particle $X_1^{\pm}$ decaying in accordance with the scheme $X_1^{\pm} \rightarrow X_2^{\pm} + X_3^{0} + \ldots + Q$. The minimum kinetic energy of the particle X_2 for our set-up was 12 MeV. Accordingly, the mass of the decaying particle should be 48 m_e if particle X_2 is an electron.

The measurements were made at 960 meters above sea level under a layer of ground corresponding to a muon energy of 2 BeV. In practice all the stopped particles can be identified as muons.

The obtained pictures were scanned and processed with the aid of special templets which made it possible to reconstruct the observed event in space (Fig. 1). The number of stoppings in the copper absorber was approximately 5 per minute. During the entire measurement time we registered 2.2 x 10^5 stoppings. Processing of the entire material demonstrated the absence of "joining" tracks at the particle-stopping site, as should have been observed in the case of decay of the X_1 particle. All the pictures obtained had the character of random coincidences.

Thus, the present experiment, with account taken of the solid angle of emission of the X_2^{+} particle and the capture by the nucleus of the X_2^{-} particle, both particles resulting from the decay of an $X_1^{\pm}$ particle stopping in a copper absorber, shows that the intensity of the charged X_1^{+} particles with lifetimes 10^{-4} - 10^{-1} sec is less than 4.5 x 10^{-3}% of the muon intensity. The foregoing result holds true if the X_1 particles, like the muons, are nuclear-active.

The authors thank A. T. Dadayan for suggesting the idea of this work.

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1) V^a -- counters 1 - 6, 15 - 20; V^b -- counters 7 - 14; VI^a -- counters 1 - 8, 24 - 45; VI^b -- counters 9 - 23; VII^a -- counters 1 - 5, 15 - 19; VII^b -- counters 5 - 14; $VIII^a$ -- counters 1 - 6, 25 - 30; $VIII^b$ -- counters 7 - 24.

ANGULAR DISTRIBUTIONS OF α PARTICLES FROM THE REACTIONS $C^{12}(d, \alpha)B^{10}$ AND $O^{16}(d, \alpha)N^{14}$

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The experimental results reported in this note are part of a study of nucleon clusters in light nuclei.

The deuterons were accelerated with the Moscow State University cyclotron to 12.4 MeV. The deuteron energy was changed by means of aluminum foils placed in the path of the beam. The reactions $C^{12}(d, \alpha)B^{10}$ and $O^{16}(d, \alpha)N^{14}$ were investigated at two values of the deuteron