for the resonance energies $E_1 = 16.8$ Mev, $E_2 = 15.0$ Mev, $E_3 = 12.5$ Mev, and for the widths $\Gamma_1 = \Gamma_2 = \Gamma_3 = 1.9$ Mev (it is clear that even better agreement would be obtained if the widths were chosen to be somewhat different). Using these E_i ($E_i = \text{const}\cdot k_i$) in Eq. (4), calculation of the deformation gives $\beta = 0.30$ and $\gamma = 19°$. Calculation of β from $Q_0 = 6.9$ b (Coulomb excitation[6]) gives $\beta = 0.35$ (for $R_0 = r_0A^{1/3}$ and $r_0 = 1.2 \times 10^{-13}$ cm).[7] The value of γ for Tb^{159} is not given from other sources; however, from the nearby nuclei[8] Gd^{154} and Dy^{160}, $\gamma = 14°$ and 12°, respectively.[8] Thus, the proposed interpretation of the (γ, n) data for Tb^{159} agrees satisfactorily with data obtained from other sources.

In conclusion, I would like to express my deep gratitude to A. K. Val'ter, who brought this problem to my notice, and also to S. P. Kamerdzhiev for help in carrying out the calculations.

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ANGULAR DISTRIBUTION OF Na^{24} NUCLEI AND FISSION FRAGMENTS PRODUCED BY INTERACTIONS BETWEEN HIGH-ENERGY PROTONS AND Au AND U NUCLEI

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IN this communication we present the preliminary results on the angular distribution of Na^{24} nuclei and the fission fragments Sr^{91}, Br^{76}, I^{131}, $I^{130+133}$ from gold and uranium irradiated by 660-Mev protons. The experiment was carried out with the synchrocyclotron of the Joint Institute of Nuclear Studies. Sheets of metallic beryllium 50 μ thick were used as absorbing foils. The proton beam was monitored by the reaction $Al^{27}(p, 3pn)Na^{24}$. After irradiation, the beryllium sheets were dissolved in acid containing isotopic carriers of the produced elements, after which the elements were separated chemically and purified. The apparatus for measuring the activity and identifying the isotopes consisted of twin end-window counters of type T-25-BFL working in anti-coincidence with a ring of MS-9 counters to reduce the background. The geometric efficiency was about 70%.

Two series of experiments were made to determine the "forward-backward" ratio and to study the angular distribution from 0 to 180° in angular intervals of 30°.

1. An investigation of the "forward-backward" ratio was carried out for the isotopes Na, Sr, Br, and I emitted from plates of metallic uranium of size 20 × 15 × 1 mm. A second beryllium foil was placed as a shield between the aluminum foil-monitor and the absorbing sheet of beryllium. It was found that, in the laboratory system, the "forward-backward" ratio for the fission fragments Sr^{91} was 1.1; for Br^{76}, 1.0; for I^{131}, 0.6; for $I^{130+133}$, 1.0. The error in determining the ratio did not exceed 20%.

The calculation of the "forward-backward" ratio for Na^{24} was made more complicated by the presence of an impurity due to silicon in the beryllium sheets (1%). In order to introduce a correction for the production of Na^{24} from the silicon, a control experiment was made, in which the beryllium sheets were irradiated with 660-Mev protons, and the sodium was subsequently separated. Such an experiment made it possible to introduce a correction for Na^{24} produced from silicon in the "forward-backward" experiments. In making the comparison with the control experiments, all the variable factors were taken into account: a) proton stream, b) chemical yields, c) weight of the beryllium sheets, d) time of irradiation and time between the end of the irradiation and the beginning of the counting, e) isotopic composition. After the introducing of these corrections, it was found that in the rear beryllium sheet (with respect to the direction of the proton beam) the entire activity was due to the admixture of silicon, and in the front sheet the activity produced by the reaction on silicon Si^{28}(p, 4pn) N^{24} constituted only 20% of the total Na^{24} activity. Hence the major part of all Na^{24} nuclei produced from uranium is emitted in the forward direction.

2. An investigation of the angular distribution from 0 to 180° in angular intervals of 30° was carried out for Na^{24} and Sr^{91} nuclei emitted from a gold thread 300 μ in diameter (see reference 1 for the experimental arrangement). The angular distribution obtained for S^{91} was isotropic within the limits of error. The small anisotropy in the angular distribution of fission fragments observed by other authors[2,3] was not observed in the present work.

In view of the difficulty in making a correction for the admixture of silicon in the experiments on the angular distribution, the results for Na^{24} cannot be considered conclusive; nevertheless, there was an appreciable sharp asymmetry in the forward direction. After introducing the correction for the admixture of silicon, we observed that the activity of Na^{24} due to nuclei emitted from the gold thread are distributed in the angular intervals 0 — 30°, 30 — 60° as follows: If the activity of Na^{24} in the interval 0 — 30° is taken as unity, then the Na^{24} activity in the interval 30 — 60° is 0.4. The major part of the Na^{24} activity in the angular intervals 60 — 90°, 90 — 120°, 120 — 150°, 150 — 180° is apparently due only to the admixture of silicon.

Comparison of the data obtained for the angular distribution of Na^{24} nuclei and the fission fragments Sr^{91}, Br^{76}, I^{131}, and $I^{130+133}$ indicates that the greater part of the Na^{24} nuclei are apparently not produced in the fission process, which is contrary to the previous assumptions.[4] The Na^{24} nuclei apparently cannot be produced in an evaporation process, since in this case their angular distribution should be close to isotropic.

At present, the investigation of the angular distribution is being continued. Materials not containing admixtures of heavy elements are being used as absorbing foils, which will make it possible to obtain more accurate data.

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SCATTERING AND RADIATIVE CAPTURE OF Λ PARTICLES

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IN the interaction of low energy Λ particles with even-even nuclei, the spin, noncentral, and spin-orbit forces do not come into play. This permits us to estimate the magnitude of the scattering cross section for slow Λ particles in a simple fashion, provided that we know the parameters of the central spin-independent part of the Λ-N interaction, which is weaker and has smaller range than the N-N forces.[1,2] Regarding the range of the Λ-N forces as small in comparison with the radius of the nucleus and neglecting the deformation of the core,[2] we can write the potential of the interaction of the Λ particle with the nucleus in the form

$$V(r) = \int \rho(r_1) V_{\Lambda N}(r_{12})\, dv_1 \approx \rho(r) C_{\Lambda N}(1 + R_2^2/R^2(r)),$$

$$R_2^2 = C_{\Lambda N}^{-1} \int V_{\Lambda N}(r_{12})\, r_{12}^2 dv_{12},$$

$$R^2 = \rho^{-1}(r) \left\{ \frac{1}{2} \frac{d^2\rho(r)}{dr^2} + \frac{2}{3r^2} \frac{d\rho(r)}{dr} \right\},$$

$$\mathbf{r}_1 = \mathbf{r} + \mathbf{r}_{12}, \qquad C_{\Lambda N} = \int V_{\Lambda N}(r_{12})\, dv_{12}, \tag{1}$$

where $\rho(r)$ is the nucleon density in the nucleus, $V_{\Lambda N}$ is the potential of the Λ-N interaction, r is the distance of the Λ particle from the center of