ANGULAR DISTRIBUTIONS OF Cu^{64} RECOIL NUCLEI IN THE REACTION $Cu^{65}(\gamma, n)Cu^{64}$

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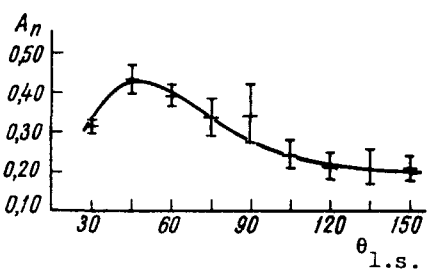
Submitted 21 January 1967
ZhETF Pisma 5, No. 8, 249-250 (15 April 1967)

We investigated the angular distributions of radioactive Cu^{64} recoil nuclei produced on targets of copper enriched with Cu^{65} (96.5%), 29.3 mg/cm^2 thick, exposed to bremsstrahlung with maximum end-point energy 260 MeV. The investigations were made with the FIAN 280-MeV synchrotron with the aid of a setup desribed in [1].

The collecting and control films were made of polystyrene 5.3 mg/cm^2 thick. The frame with the targets was irradiated for approximately 15 hrs. The $Cu^{65}(\gamma, n)Cu^{64}$ reaction was identified by means of the half-life of the Cu^{64} nuclei. An analysis of the decay curves has shown that 13 - 14 hrs after the end of the irradiation the entire radioactivity of the collecting films was due to the Cu^{64} recoil nuclei (half-life 12.8 hrs).

The angular distributions of the Cu^{64} recoil nuclei were plotted for l.s. angles from 30 to 150° in steps of 15° at an air pressure 10^{-2} Torr in the chamber, corresponding to an air layer of approximately 0.03 μg/cm^2 between the targets and the collecting films.

The measurement results are shown in the figure, where $\bar{A}_n$ is the average relative yield of the Cu^{64} recoil nuclei, obtained by averaging the results of several series of measurements at the specified angle, and θ is the angle of emission of the Cu^{64} recoil nuclei relative to the incident-photon beam.



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As seen from the plot, the Cu^{64} recoil nuclei are emitted predominantly forward in the direction of the γ-radiation beam. The maximum of the angular distribution is at 45°. The yield of Cu^{64} nuclei at 45° is approximately double the yield at 135°.

Inasmuch as the Cu^{65} target used in our experiments was not "thin," the true angular distribution should differ from the distribution in the figure. In our experiments, however, the recoil nuclei were collected for each of the angles in a direction normal to the target surface, and consequently this difference cannot influence greatly the general character of the curve and affect the conclusions.

The anisotropy in the angular distribution of the Cu^{64} recoil nuclei offers evidence that the direct-interaction mechanism plays an appreciable role in the absorption of the photons by the Cu^{65} nucleus.

[1] F. P. Denisov, A. Dyisebaev, and V. P. Milovanov, PTE No. 1, 183 (1966).