INVESTIGATION OF THE RADIATIONS FROM Zn^{63}

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The β^+ and γ spectra of Zn^{63}, which possesses a half-life of 37.6 ± 0.3 min, were investigated. The β^+ spectrum consists of five components with end-point energies of 500, 1020, 1400, 1710 and 2360 kev. The observed 680-, 970-, 1350-, 1430- and 2300-kev γ transitions agree on the whole with the β^+ spectra.

THERE have been relatively few investigations of Zn^{63} to date.[1-4] These investigations have established the presence of three partial β^+ spectra. The Zn^{63} was investigated by using copper targets of natural isotopic composition.

We used enriched targets containing up to 98.1 percent Cu^{63} to investigate the β^+ and γ spectra of the Zn^{63} obtained from the reaction Cu^{63}(p, n) Zn^{63}. The irradiation was in the 120-cm cyclotron of the Nuclear Physics Institute of the Moscow State University with 6.7 Mev protons for several minutes. The investigation of the Zn^{63} spectra began 3 — 5 minutes after the irradiation.

The β^+ spectra of Zn^{63} were investigated with a β spectrometer with a thin magnetic lens with an end-window β counter. The Fermi plot of the obtained β^+ spectrum (Fig. 1) can be resolved into five linear sections, corresponding to the individual β^+ spectra with end-point energies 500 ± 30, 1020 ± 30, 1400 ± 30, 1710 ± 30, and 2360 ± 30 kev. The relative intensities of these partial β^+ spectra are respectively 2, 10, 10, 10, and 68.

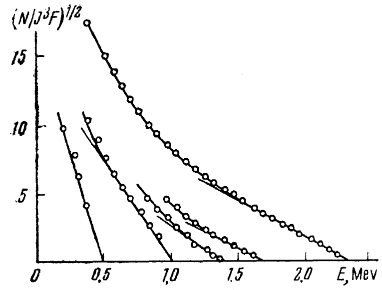

FIG. 1. Fermi plot for the positron spectrum of Zn^{63}. N – number of positrons registered by the spectrometer, F – Coulomb factor, J – current in the spectrometer lenses.

The γ spectrum of the Zn^{63} was investigated with a luminescence spectrometer. The pulses from the FÉU-1S photomultiplier with NaI(Tl) crystal were fed to the input of a 100-channel pulse-height analyzer type AI-100 ("Raduga"). Figure 2 shows the γ spectrum of Zn^{63} we obtained. In addition to the intense annihilation peak, γ lines with energies 680 ± 10, 970 ± 10, 1350 ± 20, 1430 ± 20, and 2300 ± 30 kev were observed. In all probability, a γ line with energy 1540 ± 20 kev is also present. The half-life measured by the annihilation peak was found to be 37.6 ± 0.3 minutes, the same value as obtained for the remaining γ lines, within the limits of experimental error.

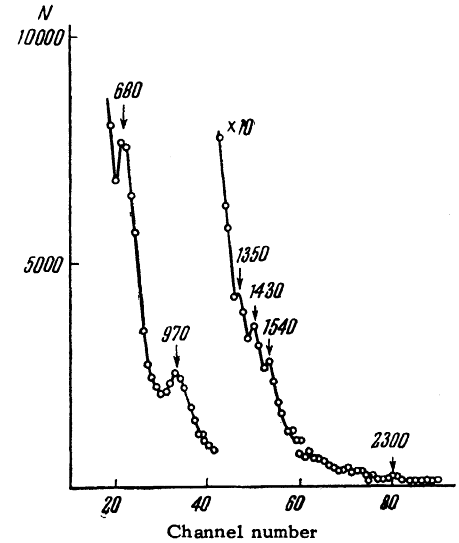

FIG. 2. γ spectrum of Zn^{63}.

Our experimental data on the β^+ transitions differ from those of Huber et al.,[1] who indicated only β^+ transitions with end-point energies 470, 1400, and 2360 kev. Recently Ricci et al.[4] proposed a probable decay scheme for Zn^{63}, starting out with the energy and relative intensity of the γ rays. In the opinion of these authors, β^+ transitions with end-point energies 950 and 1700 kev, close to those obtained by us, should exist in addition to those indicated by Huber et al. Thus, the β^+ transitions which we observed apparently confirm the decay scheme given in reference 4.

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[3] Hayward, Farrelly, Hoppes, and van Lieshout, Nuovo cimento **11**, 153 (1959).

[4] Ricci, Girgis, and van Lieshout, Nuovo cimento **11**, 156 (1959).

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