Measurements of the internal Compton effect in ^{113}In

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The electron-photon double decay of the 99-minute state at 392 keV in ^{113}In was studied by means of a three-dimensional 256 x 256 x 256 channel analyzer and a fast-slow coincidence system. Electrons were detected in a cooled silicon surface-barrier detector placed in a vacuum chamber, and photons in a 25 cm^3 Ge (Li) detector placed outside the chamber at a 0.2 mm aluminium vacuum window. The amplitude of pulses from the two detectors and the time difference were recorded on punched paper tape for each coincidence event. Double-decay events were identified using the conditions of simultaneity and of constant sum energy[1].

Measurements of electron-photon differential coefficients were performed at 8 nominal relative angles of emission of 15^o, 30^o, 35^o, 45^o, 60^o, 90^o, 120^o, and 150^o for Kγ and (L + M + N) γ decay. The results were compared with the theoretical values calculated on the basis of several theories. The theory of the internal Compton effect of Spruch and Goertzel[2] fits the experimental data best.

Total coefficients for double decay were obtained by integration of the differential coefficients over energy and solid angle. A value of $(1.11 \pm 0.04)\ 10^{-3}$ events in the energy range from 35 to 105 keV per K-conversion electron was obtained for Kγ decay, and a value of (1.01 ± 0.08) double decays per (1 + M + N)-conversion electron was obtained for (L + M + N) γ decay. The corresponding values derived from the theory of Spruch and Goertzel are 0.92 10^{-3} and 0.73 10^{-3}.

References

1. M. Jurčević, K. Ilakovac, and Z. Krečak, to be published

2. L. Spruch and G. Goertzel, Phys. Rev 94, 1971 (1954)

3. J. Eichler, Z. Physik 160, 333 (1960)