

Polarization of Electrons in Beta Decay of Thallium-204

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(Received September 15, 1959)

The longitudinal polarization of electrons from the beta decay of thallium-204 has been measured by the Møller scattering method, giving a fairly strong indication of negative polarization.

THE longitudinal polarization of electrons arising from the beta decay of thallium-204 (first forbidden, unique),¹ and having an average energy of 0.25 Mev, has been measured by the Møller scattering method.²⁻⁴

The decay electrons were scattered against magnetically-aligned electrons in a "Deltamax" foil, 2.6 mg/cm² thick, in a vacuum. The foil was inclined at 30° to the direction of the incident beam of electrons. The pairs of electrons (knock-on and scattered incident

electrons) arising from electron-electron scattering processes in the foil were detected by scintillation counters in coincidence, the coincidence resolving time being 4×10^{-8} sec. The counting rate was measured for each of the two opposite directions of magnetization of the foil and the asymmetry, $2(\sigma_+ - \sigma_-)/(\sigma_+ + \sigma_-)$, determined. The atomic number of thallium is high and, as the source was also rather thick, considerable back scattering was present. The energy spectrum of the electrons was consequently degraded and low counting rates resulted.

The asymmetry measured was 0.08 ± 0.06 (standard deviation). Under the conditions of the experiment this asymmetry corresponded to a longitudinal polarization of -1.15 ± 0.87 . The measurement thus gives a fairly strong indication of negative polarization.

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