FURTHER GAMMA-SPECTROSCOPIC INQUIRY INTO THE DECAY SCHEME OF Fe$^{59}$

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The gamma-rays in the decay of Fe$^{59}$ were examined by the sum-coincidence method. The measurements definitely confirm the existence of the 1.432 MeV level and the 143 as well as the 335 keV gamma-lines. It appears on the other hand that the 1.189, 1.458 and 1.479 MeV levels known from the $(p, p')$ scattering are not involved in the decay of Fe$^{59}$. In the case of the 192–1097 keV cascade, the results of the preliminary angular correlation measurements differ from those reported by SCHIFF and METZGER.

Introduction

In the summer of last year, the decay scheme of Fe$^{59}$ was examined at this Institute. The necessity for the investigation was motivated by the fact that the reports in the literature on the beta-spectrum were not in agreement. While M. DEUTSCH et al. [1] and F. METZGER [2] found two beta groups of nearly identical intensity with 257 and 460 keV end-point energy, K. MANN and G. HANSON [3] could not demonstrate one of these groups. In order to clear up the question, the radiations of Fe$^{59}$ were investigated by means of the beta-gamma-coincidence method, which in this case had not yet been applied. The results of measurement clearly showed that there were two beta-groups of 275 ± 5 and 455 ± 5 keV end-point energies in 44.6 and 55.4% ratios, respectively. These are in coincidence with the gamma-rays of 1.283 and 1.097 MeV energies, respectively. The details of these investigations were reported in the "Nuclear Physics" [4].

During last year, J. M. FERGUSON [5] also examined the decay scheme of Fe$^{59}$ by scintillation gamma-coincidence spectroscopic methods. His results give rise to the supposition that the heretofore known decay scheme is supplemented by a new level of 1.439 MeV energy, which decays by emitting 143 or 335 keV gamma-rays through 1.283 or 1.097 MeV levels into the ground state (Fig. 1). FERGUSON's decay scheme represents also the levels obtained by BUECHNER et al. by means of $(p, p')$ scattering.

The investigations reported here on the decay of Fe$^{59}$ had the purpose of deciding through the sum-coincidence method [6] whether there were further transitions or incidental levels involved in the decay. The arrangement of the measuring apparatuses is shown in Fig. 2. (Regarding some experimental experiences on the HOOGENBOOM sum-coincidence method cf. [7].)
Fig. 1. The decay scheme of Fe$^{59}$ [5]

Fig. 2. Experimental arrangement