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CsI-bowl: an ancillary detector for exit channel selection in gamma-ray spectroscopy experiments

A particle detector array designed for light-charged particles, known as the CsI-bowl, was built for exit channel selection for in-beam gamma-ray spectroscopy experiments. This device is composed of 64 CsI(Tl) detectors, organized in a structure reminiscent of a tea-bowl. High quantum efficiency photodiodes, characterized by their minimal mass, were employed to collect scintillation light. Its design, construction, particle identification resolution, and its effectiveness in relation to exit channel selection are described in this paper. In source tests, the optimal figure of merit for the identification of gamma-particles and gamma-rays using the charge comparison method was found to be 3.3 and 12.1 for CsI detectors coupled to photodiodes and avalanche photodiodes, respectively. The CsI-bowl demonstrated effectiveness in identifying particles, specifically the emission of protons and α -particles in the $^{58}\text{Ni}(^{19}\text{F}, \text{xpyn})$ fusion–evaporation reaction, thereby enabling the selection of the desired exit channels.

Notes

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