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Ancillary Detector for INGA and the Associated Readout System

Content :

The high spin states of neutron deficient and stable isotopes remain a topic of significant interest in nuclear structure research. Heavy-ion fusion evaporation reactions are used to populate the high-spin states of these nuclei. Different exotic nuclei with quite low cross-sections can be populated in the charged particle emission channel. Large array of Compton suppressed High-Purity Germanium (HPGe) clover detectors coupled to a 4π-charged particle detector array will be an efficient tool to study isotopes produced with low cross-sections through charged particle emission channels [1]. In addition, large segmentation of the 4π-charged particle detector array will improve the resolution of the gamma rays from the thin target experiments
through better estimate of the momentum of the recoils [2]. The thallium-activated cesium iodide (CsI(Tl)) crystal coupled with a light guide and photo diode is one of the compact size detector system being used in various 4π charged particle detector arrays (CPDA) [2, 3]. This detector is capable of discriminating various particles based on the rise-time of pre-amplifier pulse shapes. A 4π charged particle array containing around eighty CsI(Tl) detectors is being planned to be coupled with the Indian National Gamma Array (INGA). The particle identification (PID) is one of the most important parameters in these kind of experiments. The rise time of this processed signal will be different for different particles and
hence can be used for particle identification. Digital pulse shape analysis of CsI(Tl) detectors has been used to discriminate between the signals obtained from γ, α, p and other charged particle channels. This will help in the optimization of the DSP algorithm for the CPDA. We will describe the performance of a CsI(Tl) array as an ancillary detector for gamma spectroscopic study.

Primary authors : Mr. LASKAR, Md. S. R. (TIFR)

Co-authors : Prof. PALIT, Rudrajyoti (TIFR)

Presenter : Mr. LASKAR, Md. S. R. (TIFR) ; Prof. PALIT, Rudrajyoti (TIFR)

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