ADVANCED γ-RAY TRACKING: NEW SENSITIVITY FOR NUCLEAR STRUCTURE AND ASTROPHYSICS STUDIES

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The expected experimental conditions at the future facilities for radioactive ion beams and for high–intensity stable beams are extremely challenging. Unprecedented levels of efficiency and sensitivity are required for the detection of γ rays, which cannot be obtained with conventional arrays of Compton–suppressed high–purity germanium detectors. The approach pursued in the past few years implies covering the full 4π solid angle with germanium detectors only, and maximizing the photopeak efficiency and the peak–to–total ratio through the identification of the interaction points of the photons within the germanium crystals and a software reconstruction of their individual trajectories (*Pulse Shape Analysis* and *γ–ray tracking* techniques). The AGATA and GRETA projects, in Europe and USA respectively, aim to the realization of this technology.

This contribution will focus on the Advanced-GAmma-Tracking-Array AGATA, operational since 2009. After a demostration phase and physics campaign with stable beams at LNL, Italy, it has moved to GSI, Germany, for an experimental campaign at the FRS separator and it is installed nowadays in GANIL, France, for the first experimental campaign coupled to the VAMOS magnetic spectrometer.

The performance of the array will be reported through selected examples, in particular concerning the study of the structure of neutron-rich nuclei produced in deep-inelastic and fission reactions and the extraction of nuclear observables of interest in Nuclear Astrophysics. The main advantages of the use of the germanium detectors in position–sensitive mode will be highlighted, in particular the new sensitivity achievable for lifetime and gamma linear polarization measurements will be shown.