The AGATA demonstrator at LNL

E.Farnea
INFN Sezione di Padova, Italy
On behalf of the AGATA and PRISMA Collaborations

Valuable information on exotic nuclei far from stability has been obtained in the recent past using powerful 4π arrays of Compton-suppressed high-purity germanium arrays such as GASP, EUROBALL and GAMMASPHERE. The expected experimental conditions at the planned future facilities for radioactive ion beams and for high-intensity stable beams are extremely challenging, requiring unprecedented levels of efficiency, which cannot be reached with the conventional techniques.
The approach pursued in the past few years implies covering the full 4π solid angle with germanium detectors only, thus removing the Compton-suppression shields. The photopeak efficiency and the peak-to-total ratio of such arrays are maximized through the identification of the interaction points of the photons within the germanium crystals (pulse shape analysis) and a software reconstruction of the trajectories of the individual photons (γ-ray tracking). The results of extensive Monte Carlo simulations suggest that a γ-ray tracking array will have quite a high photopeak efficiency over a broad energy range (larger than 35% for single 1 MeV photons and larger than 20% for a cascade of 30 photons of 1 MeV energy), combined with an excellent peak-to-total ratio (of the order of 55%). The major advantage with respect to the present generation arrays is arguably the excellent spectra quality provided up to relativistic beam velocities, where the Doppler broadening correction is dominated by the position resolution within the individual crystals rather than by the finite opening angle of the detectors.
Presently, two projects aim to build an array based on the concepts of pulse shape analysis and γ-ray tracking: AGATA in Europe and GRETA in the United States. Both instruments are expected to play a major role in the future nuclear structure studies at the very limits of nuclear stability.
This contribution will focus on the status of the AGATA project. Presently, a subset of the whole array, known as the AGATA Demonstrator Array, is under installation at the Laboratori Nazionali di Legnaro, replacing the CLARA array at the target position of the magnetic spectrometer PRISMA. The AGATA Demonstrator is foreseen to start operation late in 2009. Following the commissioning and the initial “demonstration” phase, in which the Collaboration aims to prove that the operation of a γ-ray tracking array is indeed feasible, a one-year campaign of measurements is planned. Several letters of interest have been already submitted to the LNL PAC, aiming at studies of both neutron-rich and proton-rich nuclei.
Following a brief introduction to the concepts of pulse shape analysis and γ-ray tracking, the status of the installation of the AGATA Demonstrator Array will be reviewed and the perspectives offered by the AGATA+PRISMA combination will be discussed.