REQUIREMENTS FOR THE ANCILLARY DEVICES FOR THE AGATA DEMONSTRATOR

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In the past few years, two projects have been started with the goal of building an array of germanium detectors based on the concepts of pulse shape analysis and γ-ray tracking: AGATA in Europe [1] and GRETA in the USA [2]. In the first phase of the AGATA project, a "demonstrator" array composed of five triple germanium clusters will be built to prove the feasibility of a device based on such new technologies. The demonstrator and especially the full AGATA array will be mainly used at the planned radioactive beam facilities, where in most cases the beam momentum will not be well defined, nor the beam spot size will be negligible. Since the γ-ray tracking algorithms rely on the knowledge of the source position and direction, the demonstrator and the full array will be most likely used in conjunction with ancillary devices tracking the beam particles or the recoiling nuclei. Therefore, extensive Monte Carlo simulations were carried out in order to determine to what extent the finite resolution of such devices influence the overall performance of AGATA.

A Monte Carlo code has been developed, which is based on the C++ classes of the Geant4 package for the description of the physical processes, of the geometry and the internal handling of the information [3]. With the present version of the code, it is possible to evaluate the performance of arrays of germanium detectors based on irregularly shaped encapsulated crystals, forming three- or four-fold clusters within a single cryostat, such as the proposed configurations for AGATA and GRETA. The code produces list-mode output files containing the sequence of interactions within the crystals; spectra are then produced by processing these files with a forward tracking algorithm.

The requirements for the beam tracking devices were estimated by simulating the case of photon emission from a diffused source, assuming an event-by-event measurement of the source position with a fixed precision. Analogously, the requirements for the recoil detectors were evaluated by simulating the case of γ-ray emission from a point source with a dispersion in its vector velocity and assuming an event-by-event measurement of the source velocity with a fixed precision. The results show that an array like AGATA or GRETA will mantain its superior performance under quite extreme conditions, such as those expected at the radioactive beam facilities, if coupled to devices tracking the beam particles or the recoiling nuclei with a precision compatible with that of already existing devices.

[1] J. Gerl and W. Korten (editors), *AGATA Technical Proposal*, GSI Darmstadt (2001).
[2] M.A. Delaplanque et al., N. Inst. and Meth. A430, 292 (1999).
[3] S. Agostinelli et al., N. Inst. and Meth. A506, 250 (2003).