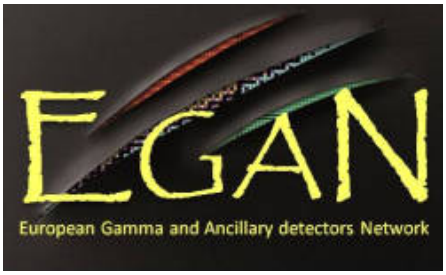

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Test of AGATA modules as polarization analyzers

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We have investigated the ability of AGATA modules to measure the linear polarization of gamma rays, exploiting the dependence of the Compton scattering differential cross section on the azimuthal angle. To this purpose, enriched targets of 104 Pd, 108 Pd were bombarded by a 32MeV 12 C beam. Partially polarized gamma rays have been produced by Coulomb excitation of the first excited states of 104Pd and 108Pd, which deexcite by emission of gamma rays of 555.8 keV and 433.9 keV, respectively. Two of the AGATA demonstrator modules were positioned in such a way as to select gamma rays at angles not far from 90 degrees to the beam direction. The azimuthal distributions, with respect to the plane defined by the beam and the gamma directions, of the first Compton scattering of these gamma rays have been evaluated and compared to the corresponding distribution for the unpolarized 661 keV gammas from a 137Cs source. The instrumental distortions in the measured distributions appear to partially compensate in the ratio of the COULEX data to those of the 661 keV gammas, and a clear signal of linear polarization becomes apparent. This result opens the way to a possible measurement of the relative polarization of entangled gamma rays from singlet positronium decay and also to the measurement of the linear polarization of gammas from nuclear reactions. In the latter case, a careful calibration with radioactive sources would be necessary for each AGATA module.

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