The polarization sensitivity of GRETINA

ANDREAS WIENS, Nuclear Science Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA, FOR THE GRETINA COLLABORATION — The new tracking array GRETINA provides position information of the individual interactions of $\gamma$ rays within the active Ge detector material. The position knowledge of the first two interaction points enables the calculation of the Compton scattering angle, which is sensitive to the linear polarization. Measuring the angular distribution and the linear polarization can help determine the electromagnetic character of a transition and its parity. Inelastic proton scattering on Mg ($^{24}Mg(p,p'\gamma)$) provides highly polarized $\gamma$ rays which we used to characterize the polarization sensitivity of GRETINA. We have studied the angular distribution and the azimuthal Compton scattering angle of the 1368 keV gamma transition after signal-decomposition and tracking, which were normalized with the unpolarized results derived from $^{60}Co$. The $a_2$ and $a_4$ coefficients from the Legendre Polynomial fit of the angular distribution confirmed the high degree of polarization. We will report on the asymmetry in the azimuthal Compton scattering angle distribution which is in good agreement with a $\cos(2\varphi)$ fit. We will discuss the energy dependence of the polarization sensitivity and compare the results with a GEANT4 simulation.

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