EGS5 simulation of CZT-GAGG based compton camera

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We simulated a CZT-GAGG based Compton camera by using EGS5 Monte Carlo simulation code. Compton camera is a kind of gamma ray detector which is based on Compton scattering effect. The Compton camera will be applied to scan whether an object contains radioisotopes (e.g. Cs-137, Cs-134), so high sensitivity to high energy gamma rays (e.g. 662keV, 795keV, 1253keV) and relatively good angular resolution are required. The Compton camera consists of a 2×2×1.5cm³ (11×11 array) Cadmium Zinc Telluride (CZT) detector and a 6×6cm² (33×33 array) Cerium-doped Gadolinium Aluminium Gallium Garnet (Ce:GAGG). (Fig. 1) CZT is a semiconductor material which has high energy resolution, but its sensitivity to high energy gamma rays is relatively low. While GAGG, a kind of scintillator, has high sensitivity to high energy gamma rays and high light output. Thus, the combination of CZT and GAGG is expected to achieve high energy resolution and high sensitivity. The CZT detector we simulated can obtain the 3D coordinate of interaction position. Further research will be done to optimize the length of GAGG and evaluate the performance of the whole detector.

Fig. 1 Geometry of the Compton camera