

DEVELOPMENT OF WHOLE-BODY PET SYSTEM WITH 3mm RESOLUTION AND 1M\$

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Introduction Existing PET systems have a problem caused by Compton scattering. If they have high resolution about photoelectric absorption (e.g. 1mm), it about Compton scattering is low (e.g. 10mm). As a result, total resolution become low. We expect that rejecting Compton scattering events by GAGG scintered-scintillator improve resolution.

Methods we approached this matter with numerical simulation in geant4 (Fig.1 and Fig2) and experimentation. In simulation, six detectors surround human (30cm in diameter and filled with water) like a hexagon, One detector is constructed 24 layers, and one layer has 300mm width and 1mm thickness. Divided layer into some segments (the smaller segment size is, the better resolution is). In parallel, we measured resolution of GAGG scintered-scintillator (1mm thickness, top and bottom surface of scintillator are covered by dual sheets of WLSF with a diameter of 0.2 mm) in Compton scattering with Sodium-22 gamma-ray source. We compared resolution in simulation and in real scintillator.

Results: In simulation, we confirmed that 2mm sufficient resolution in Compton scattering is necessary for 3mm resolution for radiation source. On the other hand, resolution of GAGG scintered-scintillator in plural emission was measured 1mm, and in photoelectric absorption was measured 0.2mm.

Discussion: Resolution of real scintillator is better than simulation. This result means that scintered-scintillator must be able to reject Compton scattering events and improve PET's resolution.

Conclusion: PET's problem about resolution arise from Compton scattering events, so that rejecting them makes PET systems much better. According to simulation and experimentation, our scintillator is sufficient for our plan, therefore we will improve PET sysetem.

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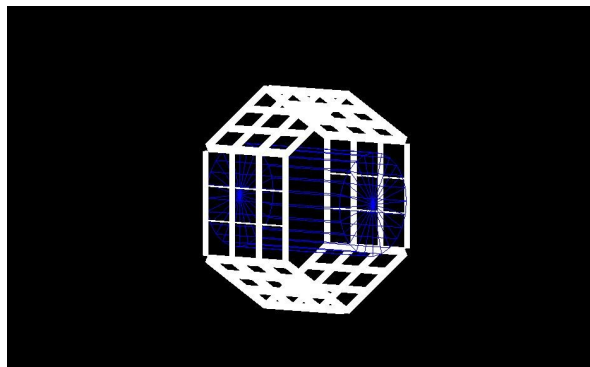


Fig.1 Overall view of PET simulation in geant4

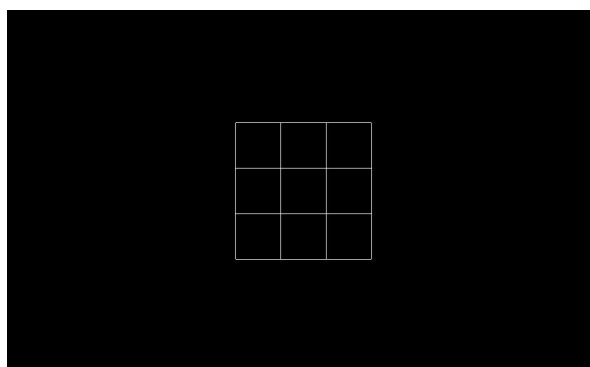


Fig.2 One board in detector