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Basic Performance of a New Positron Emission Mammography (PEM) using Pr:LuAG Scintillator Crystals

In this report, a positron emission mammography (PEM) using a Pr:Lu₃Al₅O₁₂ (LuAG) scintillator will be discussed. PET is modality of annihilation gamma-rays scanner and the PEM is a PET dedicated for breast cancer. We have developed a new PEM scanner with planer detectors. As the scanner angle and the distance between the pair of opposite detectors can be controlled depending on the scanning conditions, it was realized to scan breast images in different positions. One-side of the scanner was composed of four detector units and one detector unit consisted of a 20×64 pixels scintillator array optically coupled with three H8500 PMTs. As a scintillator, Pr:LuAG was installed which possesses interesting properties such as a very fast decay time of 20.1 ns, a good energy resolution of 4.2% and a high light yield of 22,000 photon/MeV. The pixel size of the Pr:LuAG was 2.1×2.1×15 mm³ and a BaSO₄-type reflector was used for the array assembly. By the fundamental investigation of the PEM, the spatial resolution measured using a ²²Na point source was found to be 1.1 mm for image planes parallel to the detector faces. The time resolution was 3.1 ns and the energy resolution was 11.6% (@511 keV) at the center of the detector. In addition, we have performed the clinical trials and compared with the images detected by the PET. As the spatial resolution of PEM was better than PET, advantages of PEM were clearly shown.

quote your primary experiment

PET breast cancer

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