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#11-104 Development of a position-sensitive fast scintillator for gamma-ray imaging application

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We have characterized a Cerium doped Lanthanum Bromide (LaBr3(Ce)) crystal coupled with the position-sensitive photo-multiplier system for the γ-ray imaging application. One can use this detector set-up for the scanning of high purity germanium detectors for pulse shape analysis in γ-ray spectroscopy experiments and the image formation of an object by Compton back-scattering [1, 2]. The sensor has been tested for energy, timing and position information of the gamma-rays interacting within the detector crystal. The GEANT4 simulation results are consistent with the experimental results. We have reconstructed the image of irradiation spots in different positions throughout the detector crystal. Position resolution is found to be around 3.5 mm with the 1.5 mm collimated gamma-rays. The 2-d image of hexagonal Bismuth Germanate (BGO) crystal and a cylindrical LaBr3(Ce) crystal have been reconstructed in coincidence technique. The performance of the detector for imaging application has been investigated by coincidence technique in GEANT4 simulation and compared with the experimental data. We have reconstructed the 2-d images of objects with various geometrical shapes by Compton back-scattering of the gamma-rays. We have simulated a Compton camera for the image reconstruction of an extended radioactive source where we have used the LaBr3(Ce)-PSPMT detector as an absorber of the camera. One can also use this kind of set-up in radiation imaging and many other applications where the energy and source position of the γ-ray is the main interest.

References:
1. Ivan Kojouharov et. al, 2007 IEEE Nuclear Science Symposium Conference Record.
2. J. Gerl. Nuclear Physics A 752 (2005) 688c–695c.

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