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Scintillation materials for PET/MRI coupled to digital SiPM

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Efficient PET scanners rely on inorganic scintillation crystals paired with efficient photon detectors. New PET machines are increasingly designed to co-register PET with MRI signals, which calls for a compact detector design insensitive to magnetic fields. The advent of SiPM, and digital SiPM (dSiPM) in particular promises a natural design route for an MRI compatible PET scanner.

The main detector requirements influencing the image reconstruction are the position resolution, energy resolution and coincidence time resolution. The use of SiPM technology mandates the study of the temperature dependence of the system.

We study the response of BGO, LYSO:Ce, GAGG:Ce and LuAG:Pr coupled to two modules of Philips DPC 3200 as a function of gamma energy between 100 keV and 1 MeV as well as in the ambient temperature range from 273K to 303K. The results are compared to the SensL J-series analog SiPMWe will present the characterisation of the dSiPM response in terms of breakdown voltage, dark count rate and duty factor. The energy resolution and coincidence time resolution for these four materials as a function of temperature will be shown. Last not least the influence of intrinsic background either from the photon sensor or the crystal will be discussed.

Has accepted

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