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Characterization of n ew crystals for X rays detection

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Development of fast scintillators, such as Pr:LuAg or Ce:GAAG crystals, has been put forward in the framework of Time-of-Flight (TOF) Positron Emission Tomography (PET). These crystals have fast primary decay time (20-90 ns), high density and a fairly high light output (up to 57000 photons/MeV). The fact that they have higher densities and are not hygroscopic, as compared to Ce:LaBr3, points to their use as X-rays detectors (around 100 KeV) for nuclear physics experiments. These new scintillating crystals for X-ray spectroscopy applications have been studied using different radioactive sources,wrapping diffusers and photodetectors, including UV sensitive SiPM arrays. A sample of Pr:LuAG and Ce:GAAG crystals with 0.5" x 0.5" surface area and 13 mm thickness and a NaI crystal of the same surface and 26 mm thickness used as a reference have been characterized in the X-rays energy range 100 - 1000 keV. Different light detectors were adopted for the Pr:LuAG studies,sensitive to its ultraviolet emission (peak at 310 nm): a 3" PMT (Hamamatsu R11065) and the new S13361 Hamamatsu MPPC arrays of, with silicon resin as a window. Results are presented on the performance of the Pr:LuAG (Ce:GAAG) crystals, to be mounted in a 2 x 2 array to be tested in the 2015 run of the FAMU experiment at RIKEN-RAL muon facility, for the precise measurement of the proton radius where the detection of X rays around 100 KeV is crucial.

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