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Temporal imaging CeBr3 Compton camera: A new concept for γ ray astronomy?

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Our objective is to promote a Compton camera for the energy range (200 keV- 2 meV) that uses fast scintillating crystals and a new concept for locating scintillation event accurately in thick plates: temporal imaging. We believe this concept could allow cost effective and still efficient imaging systems to be built. Temporal imaging uses monolithic plates of fast scintillators and measures photons time of arrival distribution in order to locate each gamma ray with a high precision in space (X, Y, Z), time (T) and energy (E). This provides a native estimation of the depth of interaction (Z) of every detected gamma ray. This also allows a time correction for the propagation time of scintillation photons inside the crystal, therefore resulting in excellent time resolution. The high temporal resolution of the system makes it possible to veto quite efficiently background by using narrow time coincidence window (<300 ps). It is also possible to reconstruct the direction of propagation of the photons inside the detector using timing constraints. A hand held demonstrator featuring one Compton head with two CeBr3 crystals 32x32x5 mm then 32x32x20 mm both readout by Phillips DPC Si-PM has been built. We present here preliminary images of a 22Na source obtained with the 511 keV line. The sensitivity of our system is better than 1 nSv/h in a 60 seconds acquisition with a ^{22}Na source.

Biography

Alain Iltis has been In-Charge of developing Lanthanum Halides (LaBr3: Ce) scintillators and radiation detectors for St Gobain crystal. He has done the first LaBr3 PET modules for Joel Karp (U Penn). His expertise is in crystal growth and scintillation based radiation detectors. He had proposed the concept of temporal imaging and Founded Damavan imaging to exploit. He is currently Damavan's President. He has filed more than 25 patents.

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