

Evaluation of Timepix3 for applications as Compton scatter polarimeter in the hard X-ray and soft gamma-ray band

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Timepix3 hybrid semiconductor detector offers a fine grid of 256×256 pixels with 55 μm pitch. Thanks to 1.56 ns timing precision, it is possible to use Timepix3 as a time projection chamber and reconstruct events in 3D. This makes Timepix3 suitable for simultaneous usage as a single-layer Compton camera and a scattering polarimeter. The need for at least two coincident interactions greatly reduces background in itself and the capability of Timepix3 for track classification can further help in background suppression. In laboratory experiments with X-ray photons scattering on a plastic target, we found up to 80 % modulation with a 1-mm thick silicon Timepix3 sensor. By using simple back-projection of cones in Compton camera, we were able to locate direction to the scattering target. We will present results from laboratory measurements with silicon and CdTe Timepix3 and their comparison to simulations. We will outline the possible usage of Timepix3 or the newer Timepix4 detectors in X-ray and gamma-ray astronomy. A polarimeter based on Timepix3 detectors could perform measurements in not yet well understood energy range from 100 keV to units of MeV.

Collaboration

Role of Submitter

I am the presenter

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