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ORIGINAL ARTICLE

Compton polarimeter as a focal plane detector for hard X-ray telescope: sensitivity estimation with Geant4 simulations

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Abstract X-ray polarimetry can be an important tool for investigating various physical processes as well as their geometries at the celestial X-ray sources. However, X-ray polarimetry has not progressed much compared to the spectroscopy, timing and imaging mainly due to the extremely photon-hungry nature of X-ray polarimetry leading to severely limited sensitivity of X-ray polarimeters. The great improvement in sensitivity in spectroscopy and imaging was possible due to focusing X-ray optics which is effective only at the soft X-ray energy range. Similar improvement in sensitivity of polarisation measurement at soft X-ray range is expected in near future with the advent of GEM based photoelectric polarimeters. However, at energies >10 keV, even spectroscopic and imaging sensitivities of X-ray detector are limited due to lack of focusing optics. Thus hard X-ray polarimetry so far has been largely unexplored area. On the other hand, typically the polarisation degree is expected to increase at higher energies as the radiation from non-thermal processes is dominant fraction. So polarisation measurement in hard X-ray can yield significant insights into such processes. With the recent availability of hard X-ray optics (e.g. with upcoming NuSTAR, Astro-H missions) which can focus X-rays from 5 KeV to 80 KeV, sensitivity of X-ray detectors in hard X-ray range is expected to improve significantly. In this context we explore feasibility

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