

POLAR: a new polarimeter for X and gamma rays

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We present a novel compact polarimeter instrument (POLAR) for polarization measurements in the energy range from hard X-rays to soft gamma rays. It uses an array of fast, low density scintillators and properties of the gamma-electron Compton scattering to determine polarization of the incoming photons. The design consists of 2304 plastic scintillator bars with dimension of $6x6x200mm^3$. The instrument has a wide viewing angle (third of the sky cover) and is sensitive in the range from about ten to few hundred keV. Its analyzing power and efficiency were optimized and modeled with Monte Carlo simulations. Large active area and high efficiency for Compton scattering detection result in a particularly big figure of merit that combines analyzing power and the effective area of the detector. Moreover, such high values are kept also for gammas coming off the detector axis what makes POLAR especially attractive as a large field of view device that can be easily used for measurements from random sources like Gamma Ray Bursts. Currently the laboratory tests are performed using smaller version of the instrument and polarized photon sources at different energies. In the next step the detector prototype will be intensively calibrated with the polarized light from the PSI synchrotron source. First verification in space will be performed using a balloon flight for background studies and observations of bright X-ray sources like CRAB.