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## Laboratory Tests of the Hard X-ray Polarimeter X-Calibur

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X-ray polarimetry promises to give qualitatively new information about high-energy sources, such as binary black hole systems, rotation and accretion powered neutron stars, Microquasars, Active Galactic Nuclei and Gamma-Ray Bursts. Furthermore, hard X-ray polarimetric observations of galactic sources can place uniquely sensitive constraints on Lorentz Invariance violations. We designed, built and tested a hard X-ray polarimeter X-Calibur to be used in the focal plane of the InFOCuS grazing incidence hard X-ray telescope. The polarimeter combines a low-Z Compton scatterer with a high-Z Cadmium Zinc Telluride (CZT) detector assembly to measure the polarization of 10-80 keV X-rays. X-Calibur makes use of the fact that polarized photons Compton scatter preferentially perpendicular to the electric field orientation. In contrast to competing designs, which use only a small fraction of the incoming X-rays, X-Calibur achieves a high detection efficiency of order unity. We report on the technical design of X-Calibur, the X-Calibur and InFOCuS sensitivity on short and long duration balloon flights, and present detailed laboratory calibration measurements.

### Summary

X-ray polarimetry promises to give qualitatively new information about high-energy sources, such as binary black-hole-systems, Microquasars, AGN, GRBs, etc. We designed, built and tested a hard X-ray polarimeter X-Calibur to be used in the focal plane of the InFOCuS grazing incidence hard X-ray telescope. The polarimeter combines a low-Z Compton scatterer with a high-Z CZT detector assembly to measure the polarization of 10-80 keV X-rays, making use of the fact that polarized photons Compton scatter preferentially perpendicular to the electric field orientation. X-Calibur achieves a high detection efficiency of order unity. We report on the technical design, sensitivity, and laboratory calibration measurements.

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