

# Characterization of IXPE Gas Pixel Detectors with the X-ray Calibration Facility

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The Imaging X-ray Polarimetry Explorer (IXPE) represents the current state-of-the-art of astrophysical X-ray polarimetry. This mission (collaboration NASA and ASI) has been launched on December 9th 2021 and it can measure the linear polarization of different astrophysical sources over the photon energy range 2-8 keV. The core of IXPE Detector Unit and future X-ray polarimetry missions is the Gas Pixel Detector (GPD). The X-ray photons enter the detector volume through a Beryllium window and are absorbed into the dimethyl-ether gas, interacting via photoelectric effect. In the gas gap, an electric field drifts the primary ionization electrons towards the Gas Electron Multiplier and the produced charge is collected on the readout ASIC.

GPDs can be calibrated and characterized using the X-ray Calibration Facility (XCF), available at the Physics Department at the University of Turin. The XCF is a table-top, open-design irradiation setup for research: it offers beams of photons at different energies and with different spatial and polarization configurations. The radiation source can be chosen between a single-anode and a multi-anode X-ray tube. In addition, the XCF can provide two beam-lines: one of them is linearly polarized through Bragg diffraction on a number of crystals that are selected to fulfill the Bragg condition at the primary beam energy.

Thanks to a handling system, the GPD can measure both the unpolarized and polarized beam: for example, in the first case, spurious effects that take place in the detector and the intrinsic polarization of the source can be studied, while, in the second, the GPD response to the polarized radiation can be characterized. In addition, to study long-term variations of the GPD response, it is possible to use a 55 Fe radiative source.

Initially conceived as a calibration source to qualify GPDs, the XCF can satisfy evolving requirements to support R&D programs of innovative position-energy and polarization-sensitive X-ray detectors.

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