

Astrophysics after almost three years of the Imaging X-ray Polarimetry Explorer (IXPE)

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X-ray Astronomy emerged in the early 1960s, and it quickly became evident that X-ray polarimetry would be crucial for interpreting data from celestial sources discovered thereafter. However, the experimental results from those early attempts were limited. On one hand, the sources were less polarized than expected; on the other, the sensitivity of the experimental techniques was still inadequate. Despite these initial challenges, scientists continued to refine their methods, and by 2001, it was demonstrated that the photoelectric effect in gas—a key to unlocking a new window in Astrophysics—could be used efficiently. It wasn't until 2021 that it became possible to launch an observatory with sufficient sensitivity, utilizing the photoelectric effect. The Imaging X-ray Polarimetry Explorer (IXPE), a NASA-ASI mission, is the first Small Explorer to feature three mirror units designed specifically for this purpose.

In this talk, I will present the enabling technology that led to this breakthrough in Astrophysics, the IXPE mission profile, and the main and latest scientific results achieved in its first ~ 2.7 years of operation. These include angularly resolved polarimetry of Supernova Remnants, Pulsar Wind Nebulae, and Molecular Clouds, as well as studies of compact objects like black holes and neutron-star binaries, and Active Galactic Nuclei. Lastly, I will outline potential future directions following IXPE's discoveries.

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