IXPE *IMAGING X-RAY POLARIMETRY EXPLORER*

EXPANDING THE X-RAY VIEW OF THE UNIVERSE

Opens new dimensions for exploring how X-ray emission is produced under extreme physical conditions near objects such as neutron stars and black holes

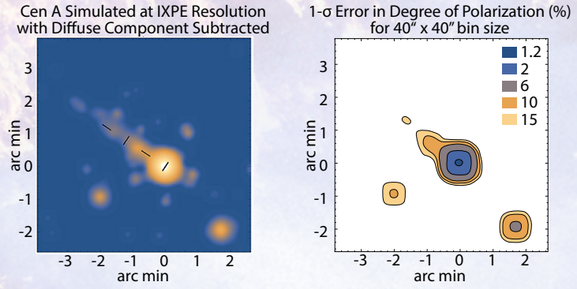
Fundamental New Measurements Address Key Science Questions

IXPE will improve sensitivity over OSO-8, the only previous X-ray polarimeter, by two orders of magnitude in required exposure time. *IXPE* also will introduce the capability for X-ray polarimetric imaging, uniquely enabling the measurement of X-ray polarization with scientifically meaningful spatial, spectral, and temporal resolution, to address NASA's Science Mission Directorate's science goal "to probe the origin and destiny of our universe, including the nature of black holes, dark energy, dark matter, and gravity."

IXPE measurements will provide new dimensions for probing a wide range of cosmic X-ray sources—including active galactic nuclei (AGN) and microquasars, pulsars and pulsar wind nebulae, magnetars, accreting X-ray binaries, supernova remnants, and the Galactic center. These polarization measurements will help answer fundamental questions:

- ***What are the geometries of the flows, emission regions, and magnetic fields?***
- ***What physical processes lead to particle acceleration and X-ray emission?***
- ***What are the physical effects of gravitational, electric, and magnetic fields at their extreme limits?***

IXPE Maps the Magnetic Field of Bright Extended X-ray Sources and Reduces Source Confusion

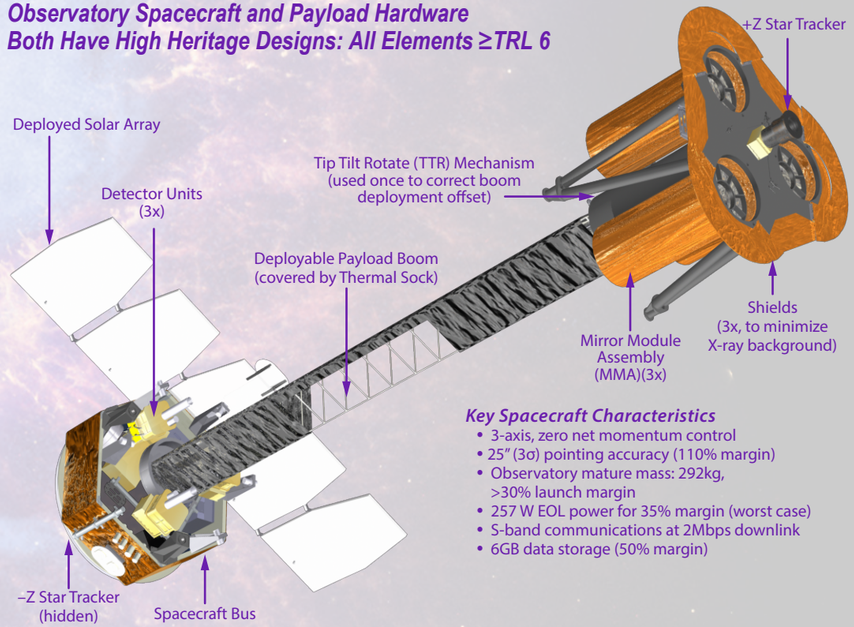


Simulated IXPE image (left) near the center of the bright AGN Centaurus A with superposed polarization model and a contour map (right) of the expected RMS noise in measuring the degree of polarization. IXPE imaging will resolve the AGN's jet and core and two adjacent sources, enabling unambiguous polarization measurements of each component.

Clear Science Requirements Drive the Payload Definition

- Measurement objectives are met with three identical telescopes, each with a Mirror Module Assembly and a polarization-sensitive imaging Detector Unit
- *IXPE* payload features a 2-8 keV range, proportional counter energy resolution, 11′ field-of-view, and ≤30" angular resolution
- Mature mirror and detector technologies were pioneered and developed by the *IXPE* team

Observatory Spacecraft and Payload Hardware Both Have High Heritage Designs: All Elements ≥TRL 6

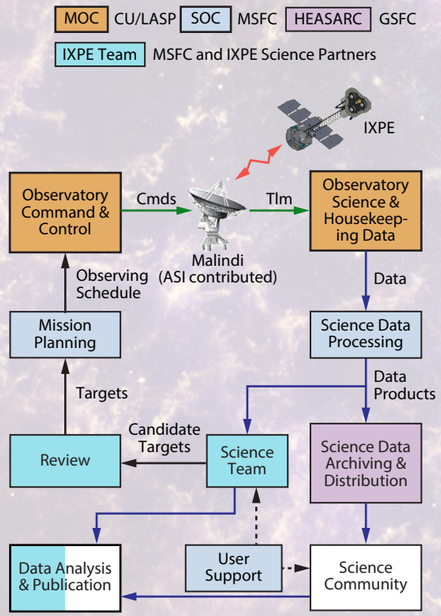


Key Spacecraft Characteristics

- 3-axis, zero net momentum control
- 25″ (3σ) pointing accuracy (110% margin)
- Observatory mature mass: 292kg, >30% launch margin
- 257 W EOL power for 35% margin (worst case)
- S-band communications at 2Mbps downlink
- 6GB data storage (50% margin)

Mission Design and Operations Concept

- Pegasus launch from Kwajalein (RTS) on or after 11/20/2020
- 540-km circular orbit at nominal 0° inclination
- Two-year mission
- Point-and-stare observations of known targets
- Science Operations Center (SOC) at MSFC
- Mission Operations Center (MOC) at CU/LASP
- Ground Station at Malindi (backup: Singapore)



Institutional Roles & Responsibilities

- **MSFC** – PI team, project management, SE and S&MA oversight, mirror module fabrication, X-ray calibration, science operations, and science data processing and archiving
- **Ball Aerospace** – Spacecraft, payload structure, payload and observatory I&T
- **ASI** – Detector system funding, ground station
- **IAPS/INAF and INFN** – Polarization-sensitive imaging detector systems
- **CU/LASP** – Mission operations
- **Stanford and Univ Roma Tre** – Scientific theory
- **McGill University** – Science Working Group Co-Chair
- **MIT – Co-Investigator**

Green = contributed funding

Schedule Summary