

The image features a detailed rendering of the IXPE (Imaging X-ray Polarization Explorer) satellite in space. The satellite is shown from a perspective that highlights its long boom with five solar panel arrays and its main body. The background is a vibrant, colorful nebula with shades of purple, red, and blue, interspersed with numerous stars. In the bottom left corner, the curved horizon of the Earth is visible, showing blue oceans and green landmasses. The overall scene is set against the blackness of space.

IXPE

Overview and activities

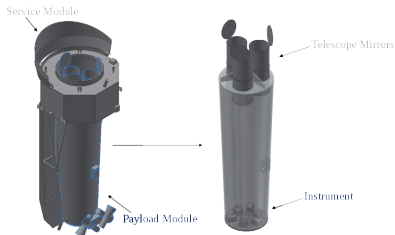
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NEWS KO meeting

—XIPE (ESA M4)



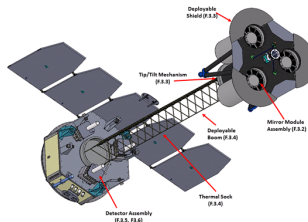
P. Soffitta (INAF/IAPS)
R. Bellazzini (INFN)

400 Meuro
2000 kg (Vega)
450 cm²
April 2017
2025–2026
> 3 years

Principal Investigator
Co-Investigators

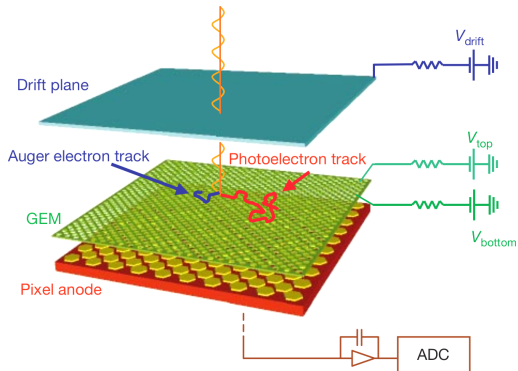
Cost envelope
Mass envelope
Eff. area @2 keV
Down-selection date
Launch date
Duration

—IXPE (NASA SMEX)

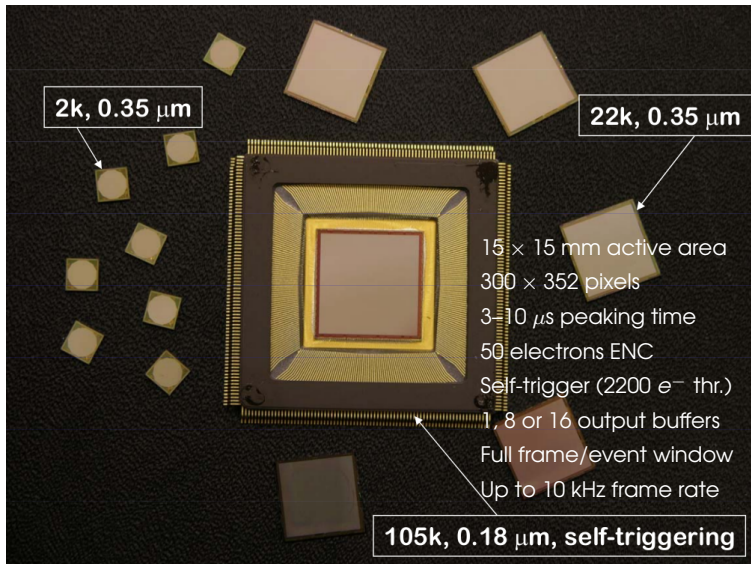


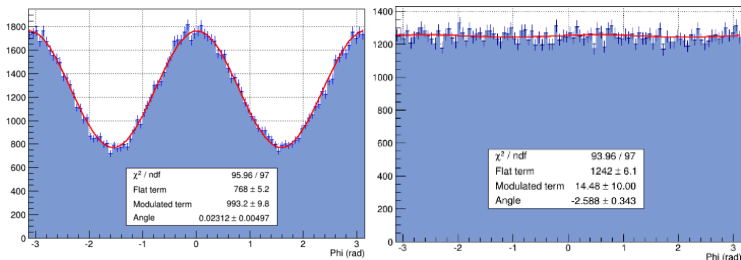
M. Weisskopf (MSFC)
P. Soffitta (INAF/IAPS)
R. Bellazzini (INFN)
125 M\$
400 kg (Pegasus)
200 cm²
February 2017
2020–2021
> 2 years

- ▷ Three (out of 6) missions in phase study for the last ESA and NASA calls are specifically devoted to X-ray polarimetry.



- ▷ Basic components:
 - ▷ gas-filled absorption gap acting as detection medium;
 - ▷ Gas Electron Multiplier (GEM) providing gas amplification;
 - ▷ finely pixelized readout anode for signal collection.
- ▷ Sensitive down to very low energy (~ 1 keV).
- ▷ Fully two-dimensional (imaging).
- ▷ Highly azimuthally symmetric (no need of rotation).

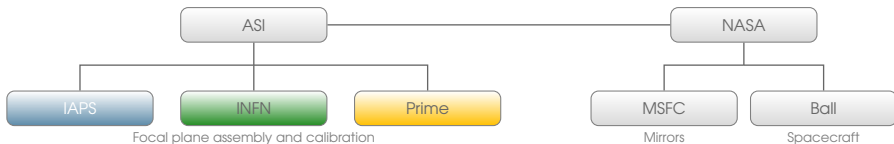
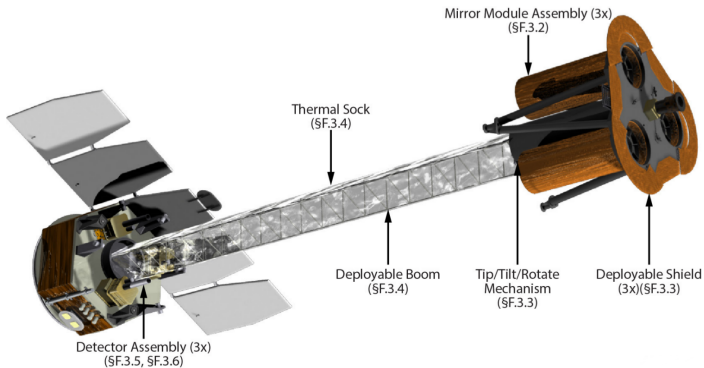




- ▷ **Modulation** factor: 0.2 (0.7) at 2 (8) keV.
 - ▷ Stability over ~ 3 years demonstrated with a sealed detector.
- ▷ Residual modulation for unpolarized radiation $\sim 0.1\%$.
- ▷ $\sim 90 \mu\text{m}$ **spatial resolution** at 5.9 keV, measured (\ll track length).
 - ▷ Good match for a 20 arcsec-type X-ray optics with ~ 4 m focal length.
- ▷ $\sim 15\%$ **energy resolution** (FWHM) at 5.9 keV.
 - ▷ Enough for spectrally-resolved polarimetry (in a few energy bins) when statistics allow it.
- ▷ μs -type **time resolution**.
 - ▷ More than adequate for the shortest time scales of interest.

The situation now

IXPE has been selected by NASA as the next SMEX

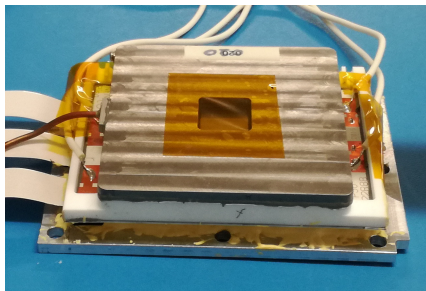
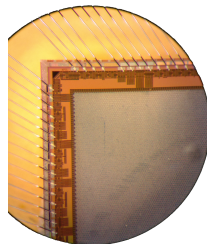
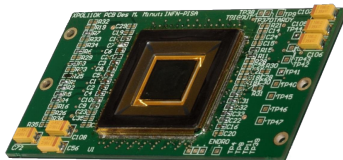
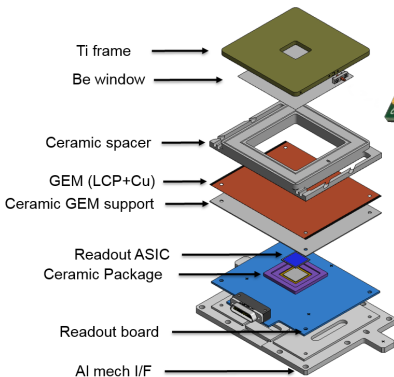


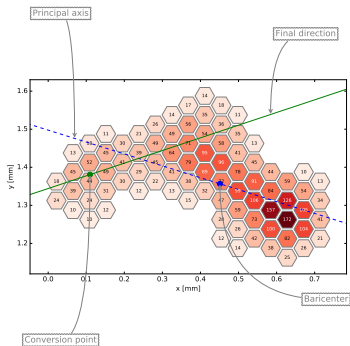
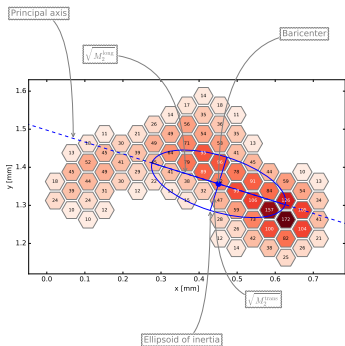
After more than 4 decades, the recent development of the photoelectron tracking gas counter has now enabled a meaningful exploration of X-ray polarimetry within a SMEX envelope.

The physical scales and conditions probed by IXPE require a high-energy polarimetry capability and are not achievable by other current or planned missions.

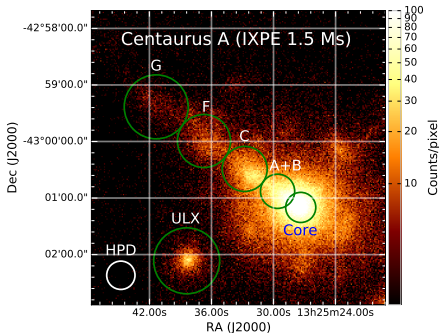
—Verbatim from the NASA selection debrief package.

- ▷ Three identical telescopes, each including GPD and optics:
 - ▷ Provide full redundancy, mitigate possible residual systematic effects.
- ▷ Mass and power budget (total): ~ 300 kg, ~ 200 W:
 - ▷ ~ 15 kg, ~ 20 W for the three detector units;
 - ▷ ~ 85 kg for the mirror module assembly.
- ▷ Focal length: 4 m (deployable boom, launched in stowed configuration).
- ▷ Pegasus launch from Kwajalein on or after November 20, 2020.
 - ▷ 2-year mission on a 540 km circular orbit at nominal 0° inclination.
 - ▷ One (simple) operation mode: point-and-stare at known targets.





- ▷ Analysis is done event-by-event.
- ▷ Track reconstruction: energy, time, absorption point, direction of emission of the photoelectron (providing polarization information).
- ▷ Event selection: performance optimization and background rejection.
 - ▷ Ongoing collaboration with our Swedish colleagues on IXPE.



- ▷ Develop an observation-simulation framework to inform the compilation of the observation plan.
 - ▷ Germane to the framework developed by SLAC for Fermi-LAT.
- ▷ Develop the tools to extract and interpret the polarization information from the photon list.
 - ▷ Again: vast experience at SLAC for Fermi-LAT.