

Imaging X-ray Polarimetry Explorer: IXPE



- IXPE is a NASA Small Explorer Mission selected in January 2017 and currently scheduled for launch late 2021
- It will open a new window in the sky enabling meaningful polarization measurements of many classes of x-ray sources

- **Launch late 2021 on a Falcon 9 from KSC**
- **~600-km circular orbit at a nominal 0° inclination**
- **2-year baseline mission, optional extension with GO program**
- **Point and stare (with dither) at pre-selected targets**
- **Malindi ground station - primary (Singapore - secondary)**
- **Mission Operations Center (MOC) at the University of Colorado, Laboratory for Atmospheric and Space Physics (LASP)**
- **Sciences Operations Center (SOC) at MSFC**
- **Data archiving at NASA's HEASARC**
 - **During the first 3 months of the mission, including one month of orbital checkout, all IXPE data shall be made publicly available at the HEASARC within 30 days of the end of an observation, which is defined as when data for 90% of the scheduled observation time are received by the MOC**
 - **After the first 3 months of the mission, data shall be made available to the HEASARC within 1 week of the end of an observation, which is defined as when data for 90% of the scheduled observation time are received by the MOC**

 PI team, project management, SE and S&MA oversight, mirror module fabrication, X-ray calibration, science operations, and data analysis and archiving	  ISTITUTO NAZIONALE DI ASTROFISICA NATIONAL INSTITUTE FOR ASTROPHYSICS    Polarization-sensitive imaging detector systems
 Detector system funding, ground station	 Mission operations
 Spacecraft, payload structure, payload, observatory I&T	  Scientific theory
	 Co-Investigator
	 Massachusetts Institute of Technology Co-Investigator









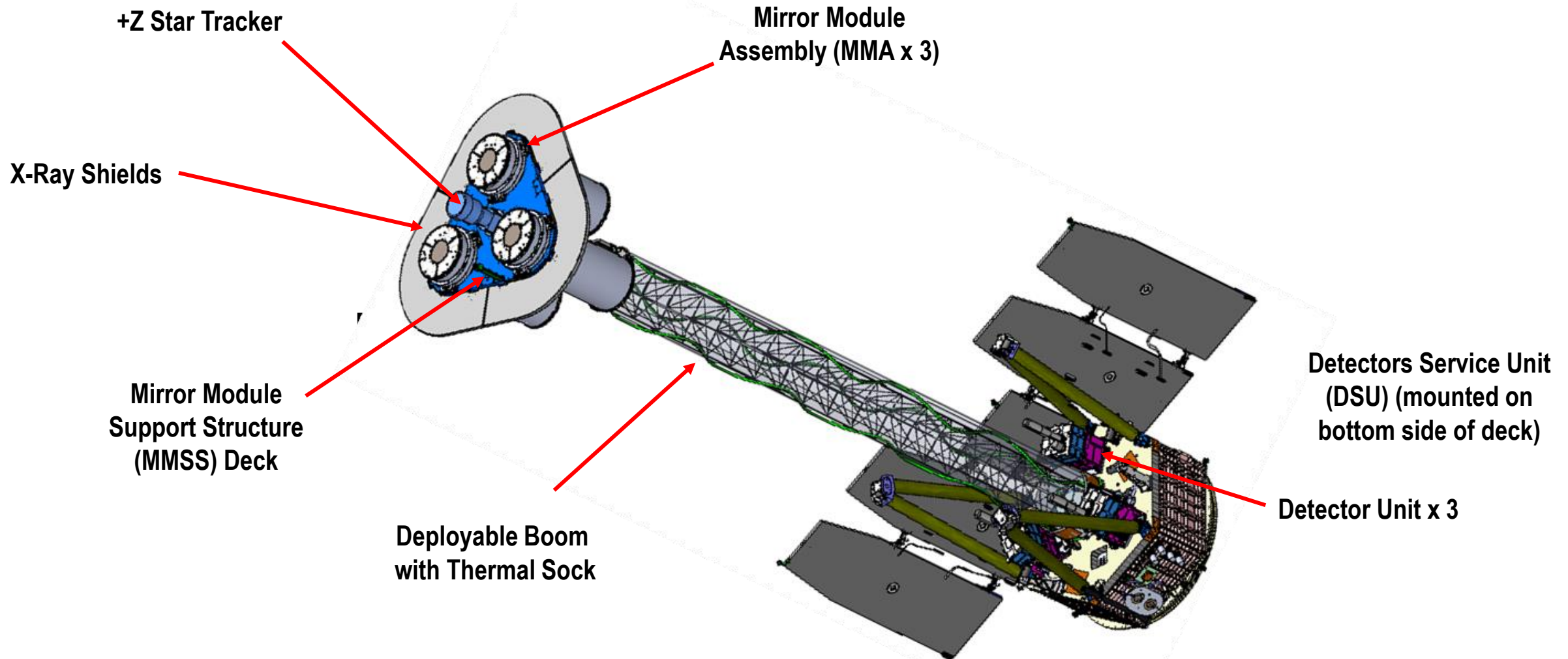


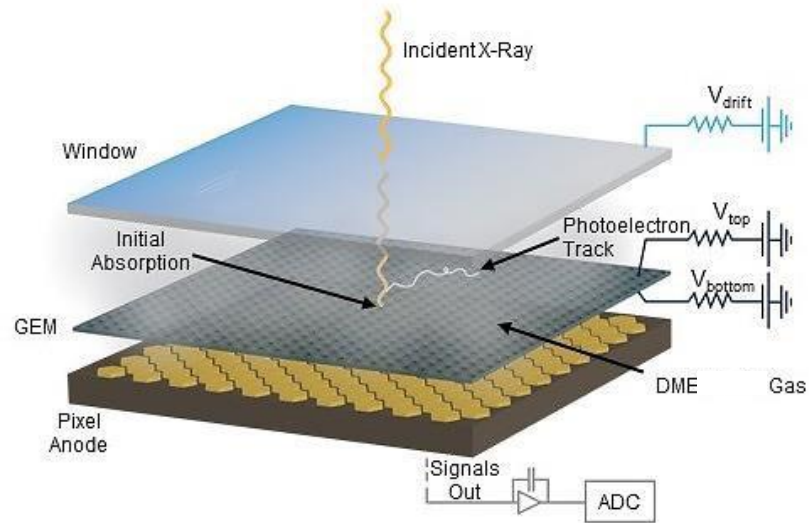


 Science Advisory Team

SAT currently comprises > 90 scientists from 12 countries

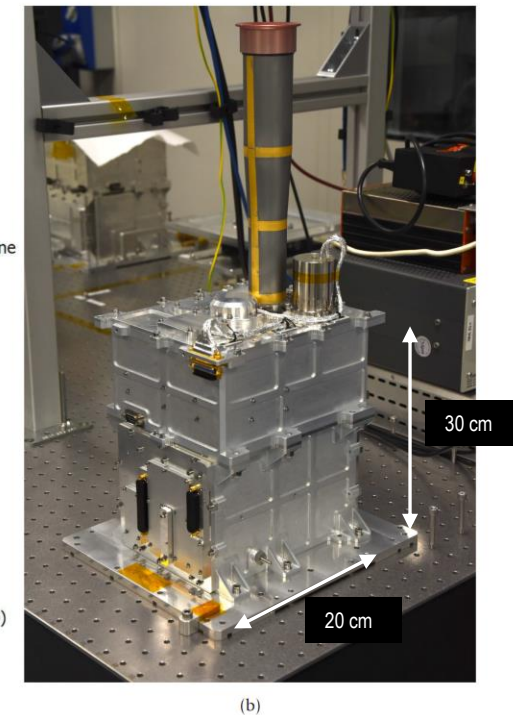
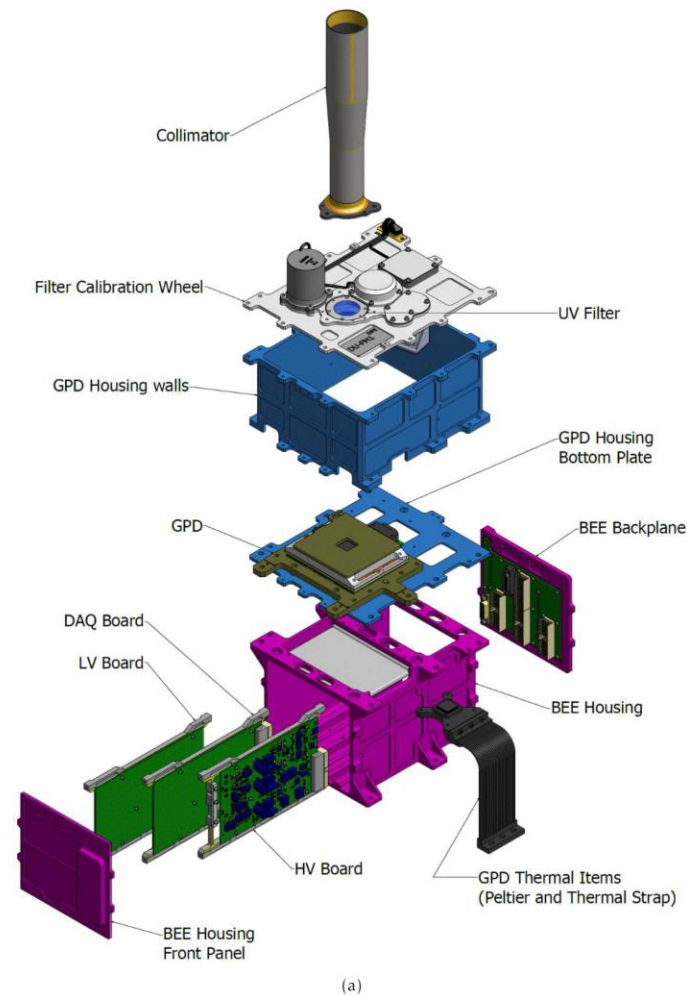
Payload Overview: Deployed Configuration



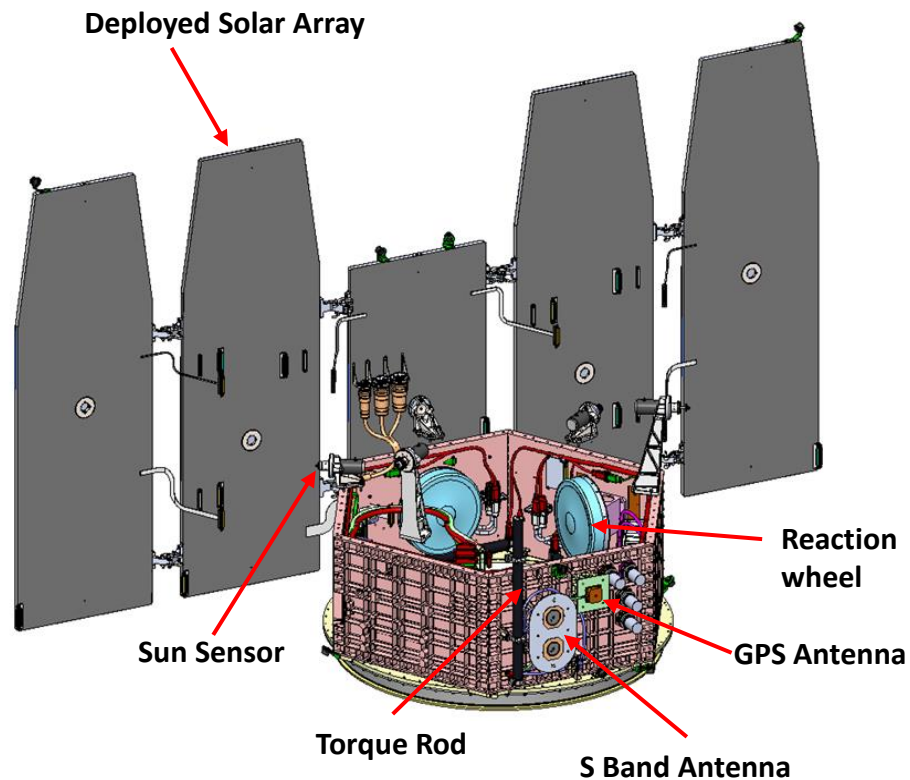


The gas pixel detector, the heart of the detector unit, tracks photoelectrons to measure the polarization angle of absorbed photon

Parameter	Value
Sensitive area	15 mm × 15 mm (13 × 13 arcmin)
Fill gas and asymptotic pressure	DME @ 0.656 atmosphere
Detector window	50-μm thick beryllium
Absorption and drift region depth	10 mm
Spatial resolution (FWHM)	$\leq 123 \mu\text{m}$ (6.4 arcsec) @ 2 keV
Energy resolution (FWHM)	0.57 keV @ 2 keV ($\propto \sqrt{E}$)
Useful energy range	2 - 8 keV

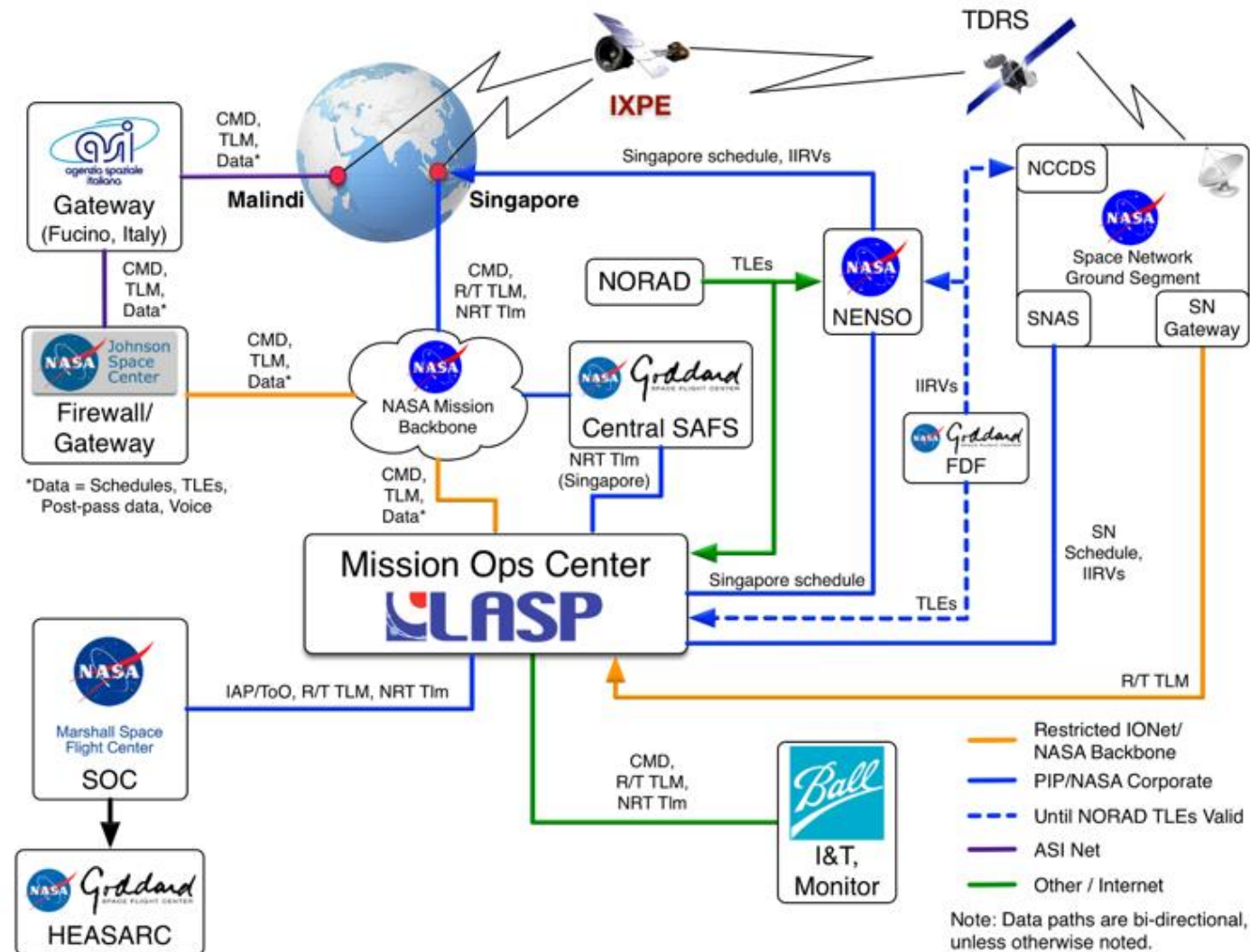


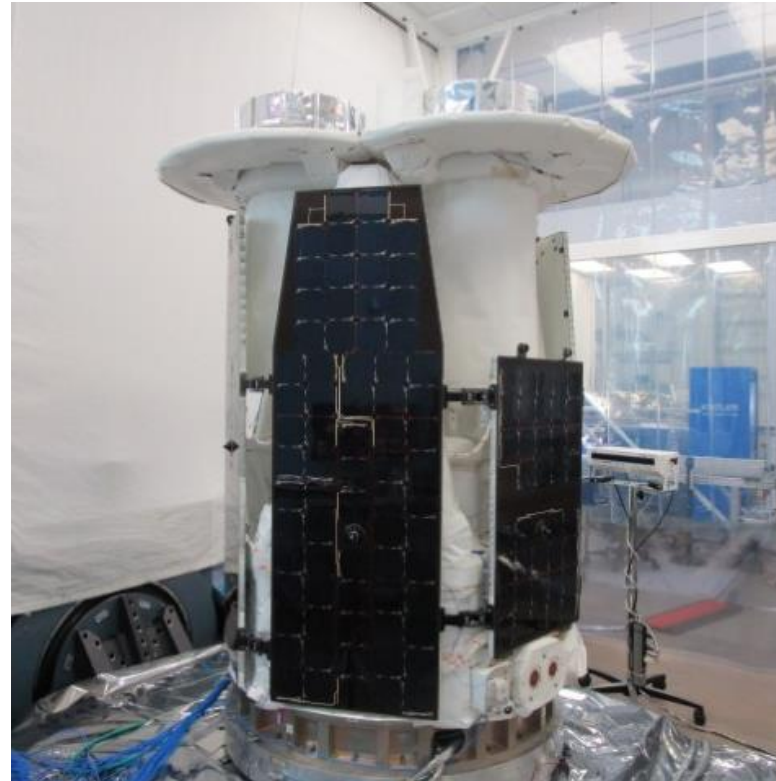
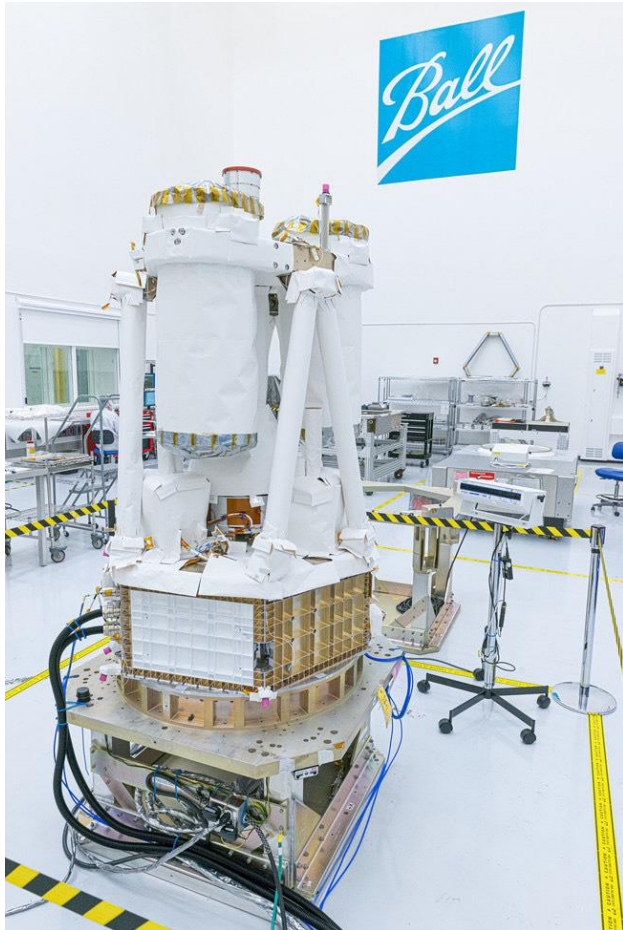
Expanded view of a detector unit (left) and a completed flight detector unit (right)



- Pointing control
 - Via reaction wheels and torque rods
 - Dithering capability
- Attitude Sensing
 - Coarse: 12 sun sensors and 3-axis magnetometer
 - Fine : Star tracker with two optical heads (fore, aft)
- C&DH
 - Integrated Avionics Unit
 - Contains flight software and handles telemetry, data storage and payload control

Parameter	Performance
Orbit Altitude	600 km
Orbit Inclination	~ 0°
Launch Mass	330 kg
Payload Mass	208 kg
Orbit Average Power	306W (EOL)
Launch vehicle	Falcon 9
Lifetime	No limiting consumables
Stabilization	3 axis
Attitude Control	25 arcsec (3 σ)
Bus Voltage	~ 30 V
Communication	S-Band
Command Rate	2 kbps
Telemetry Rate	2 Mbps
On-Board Storage	6 GBytes





IXPE Observatory on Vibration Table



IXPE Observatory Preparation TVAC Testing

Credit: Ball Aerospace