



The Imaging X-Ray Polarimetry Explorer (IXPE)

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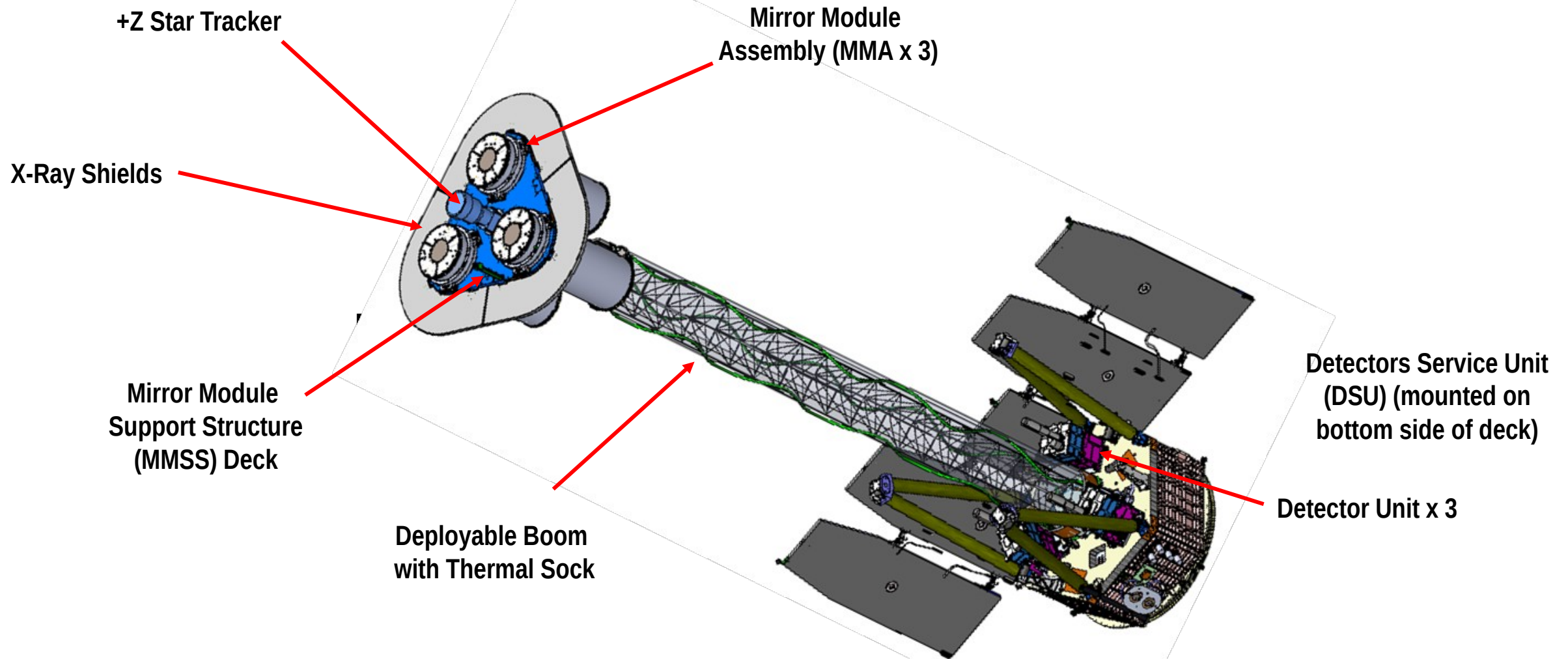
- **Launch Dec 9, 2021 on a Falcon 9 from KSC**
- **~600-km circular orbit at a nominal 0° inclination**
- **2-year baseline mission, optional extension with GO program**
- **Point and stare (with dither) at pre-selected targets**
- **Malindi ground station - primary (Singapore - secondary)**
- **Mission 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**

<p>PI team, project management, SE and S&MA oversight, mirror module fabrication, X-ray calibration, science operations, and data analysis and archiving</p>	<p>Polarization-sensitive imaging detector systems</p>
<p>Detector system funding, ground station</p>	<p>Mission operations</p>
<p>Spacecraft, payload structure, payload, observatory I&T</p>	<p>Scientific theory Thermal Shields Co-Investigator</p>



SAT currently comprises > 90 scientists from 12 countries

Payload Overview: Deployed Configuration

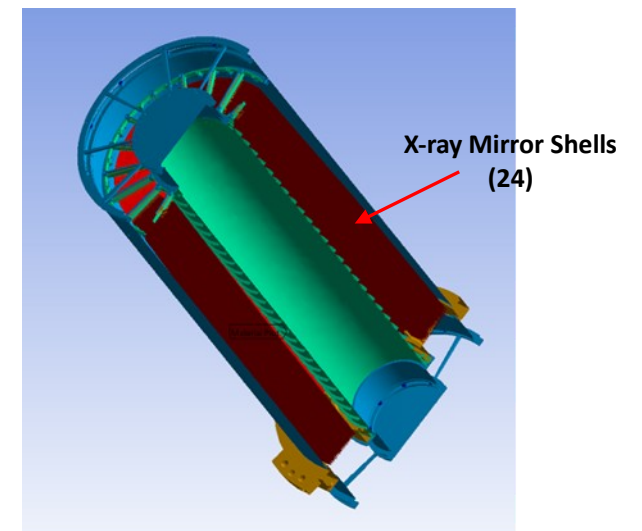
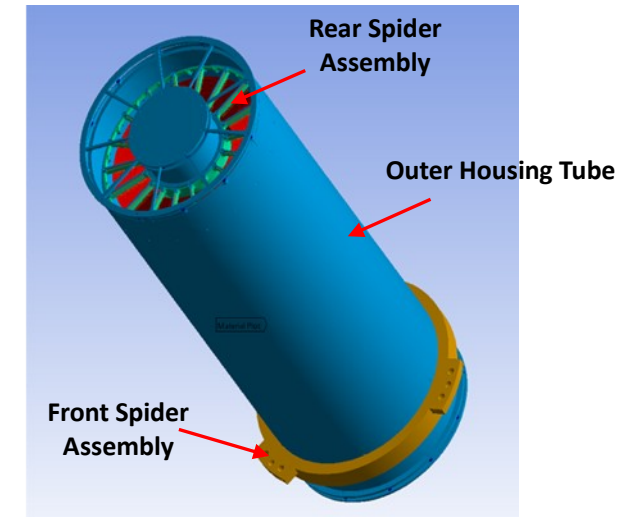


Mirror Module Assemblies (MMA)

Parameter	Value
Number of mirror modules	3
Number of shells per mirror module	24
Focal length	4 m
Total shell length	600 mm
Range of shell diameters	162–272 mm
Range of shell thicknesses	0.18–0.25 mm
Shell material	Electroformed nickel–cobalt alloy
Effective area per mirror module	166 cm ² (@ 2.3 keV); > 175 cm ² (3–6 keV)
Angular resolution (HPD)	≤ 28 arcsec
Field of view (detector limited)	12.9 arcmin square



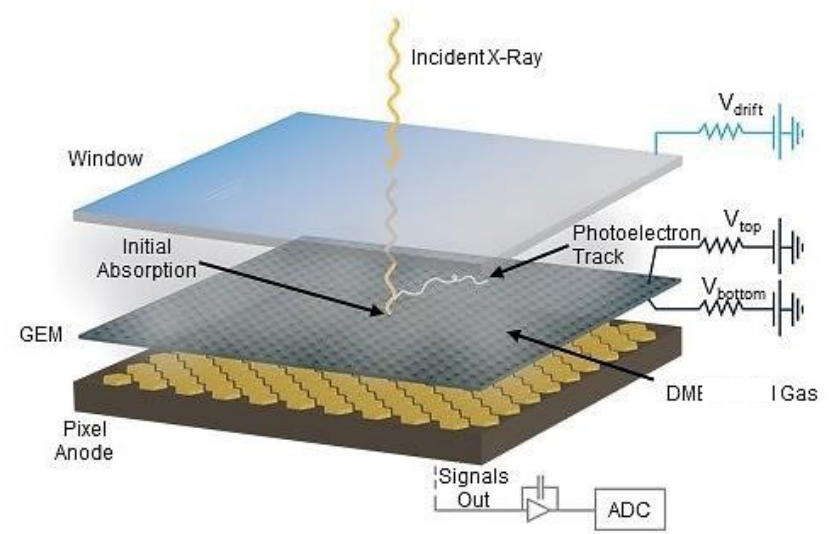
Rear of MMA Showing 24 Nested Mirror Shells



Three IXPE Mirror Module Assemblies

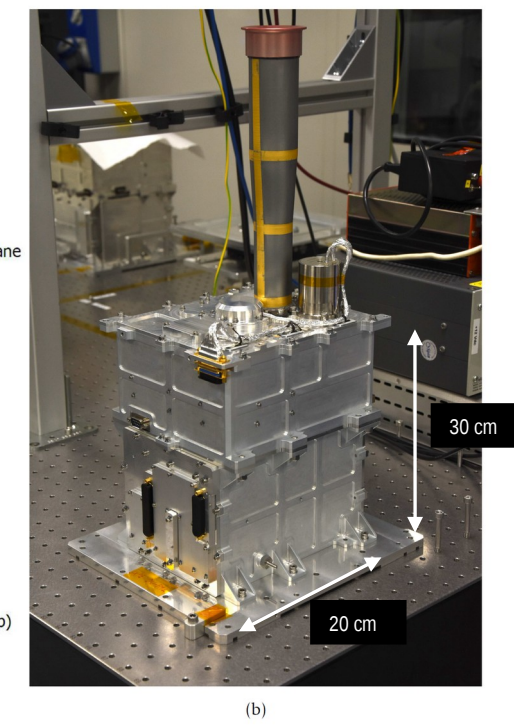
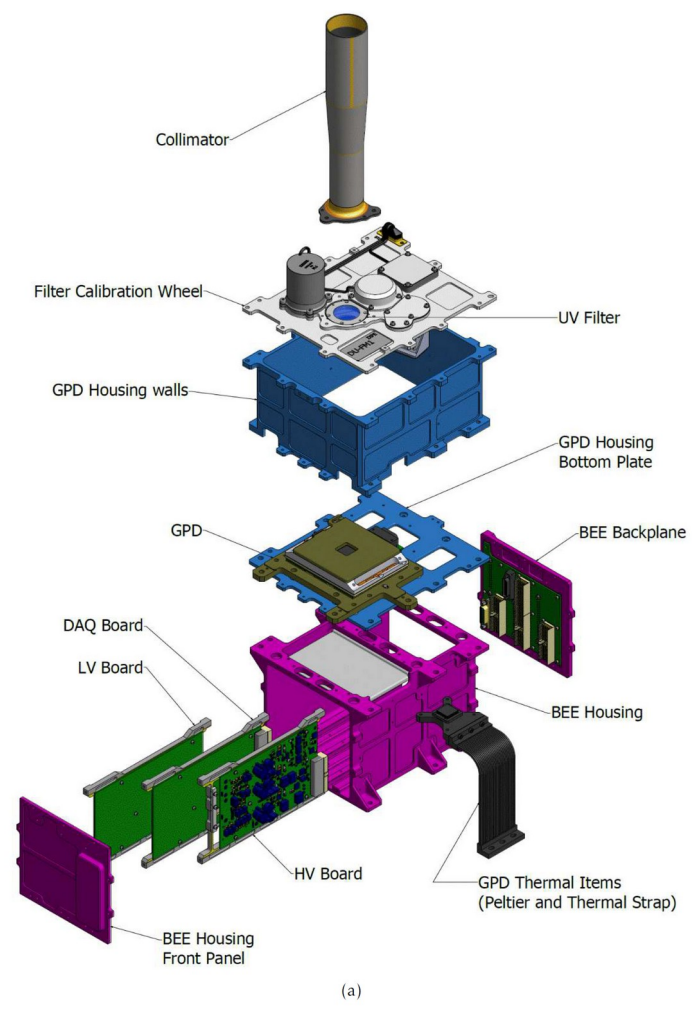


MMA with Thermal Shield



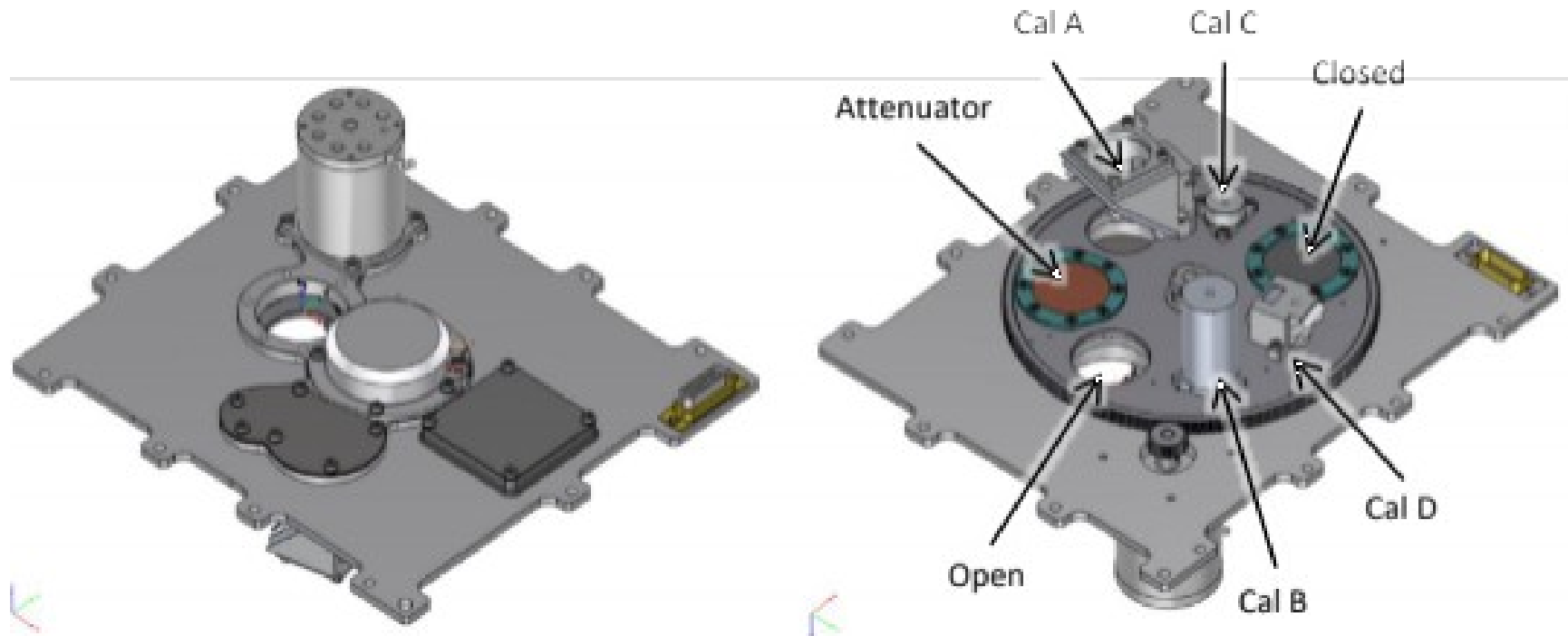
The gas pixel detector, the heart of the detector unit, tracks photoelectrons to measure the polarization angle of absorbed photon

Parameter	Value
Sensitive area	15 mm × 15 mm (13 x 13 arcmin)
Fill gas and asymptotic pressure	DME @ 0.656 atmosphere
Detector window	50- μ m 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



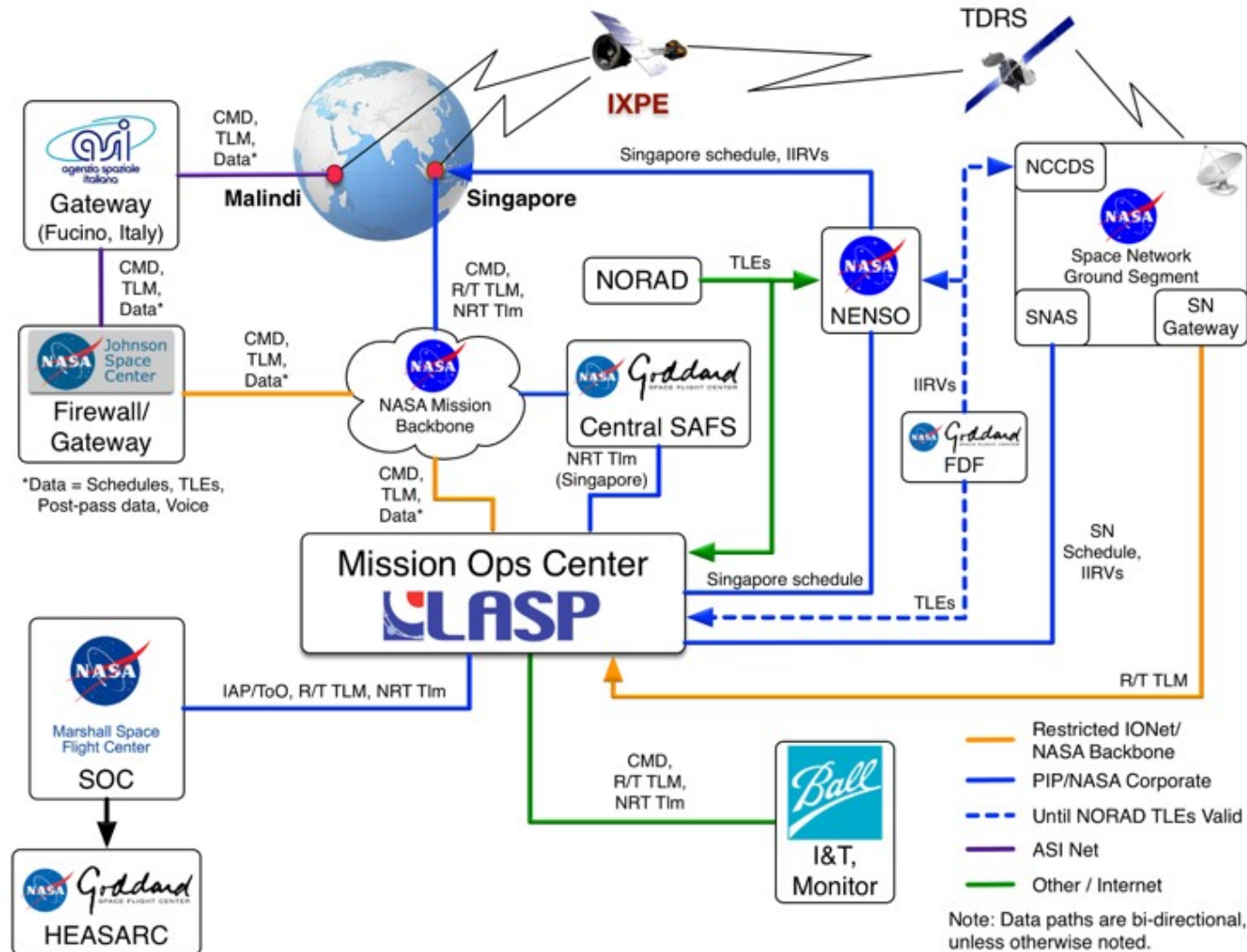
Expanded view of a detector unit (left) and a completed flight detector unit (right)

On-Board Calibration Sources: Filter Calibration wheel Assembly



Filter and Calibration Wheel (FCW), providing open, attenuated, and closed positions, plus four ^{55}Fe -powered calibration sources:

- Cal A – Bragg-reflected polarized 2.98-keV (Ag-L α fluorescence) and 5.89-keV (Mn-K α)**
- Cal B – unpolarized 5.89-keV spot**
- Cal C – unpolarized 5.89-keV flood**
- Cal D – unpolarized 1.74-keV (Si-K α fluorescence) flood**



- **MOC – SOC**

- Schedule observations with MOC, at U Colorado’s Laboratory for Atmospheric and Space Physics (LASP)
- Ingest and aggregate science and engineering telemetry from the MOC

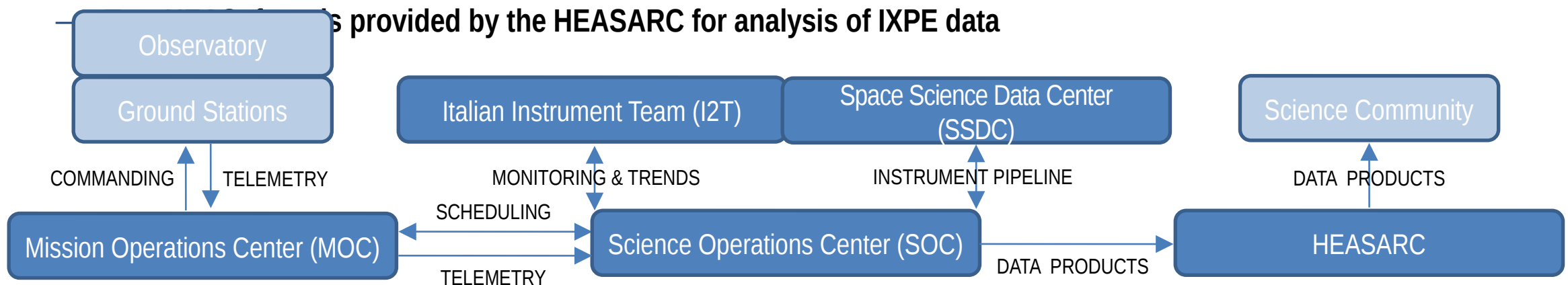
- **SOC – ASI Organizations**

- Transmit low-level data products to Instrument Team; receive recommendations for adjustments
- Collaborate with ASI’s Space Science Data Center (SSDC) to develop and maintain the Instrument Pipeline and CalDB at the SOC

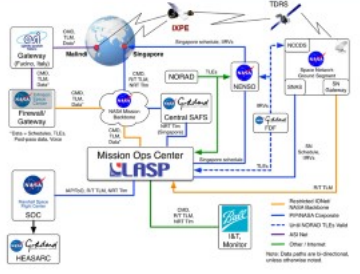
- **SOC – HEASARC**

- Archive science data products at NASA’s HEASARC for public access to IXPE data and tools

- Tools provided by the HEASARC for analysis of IXPE data

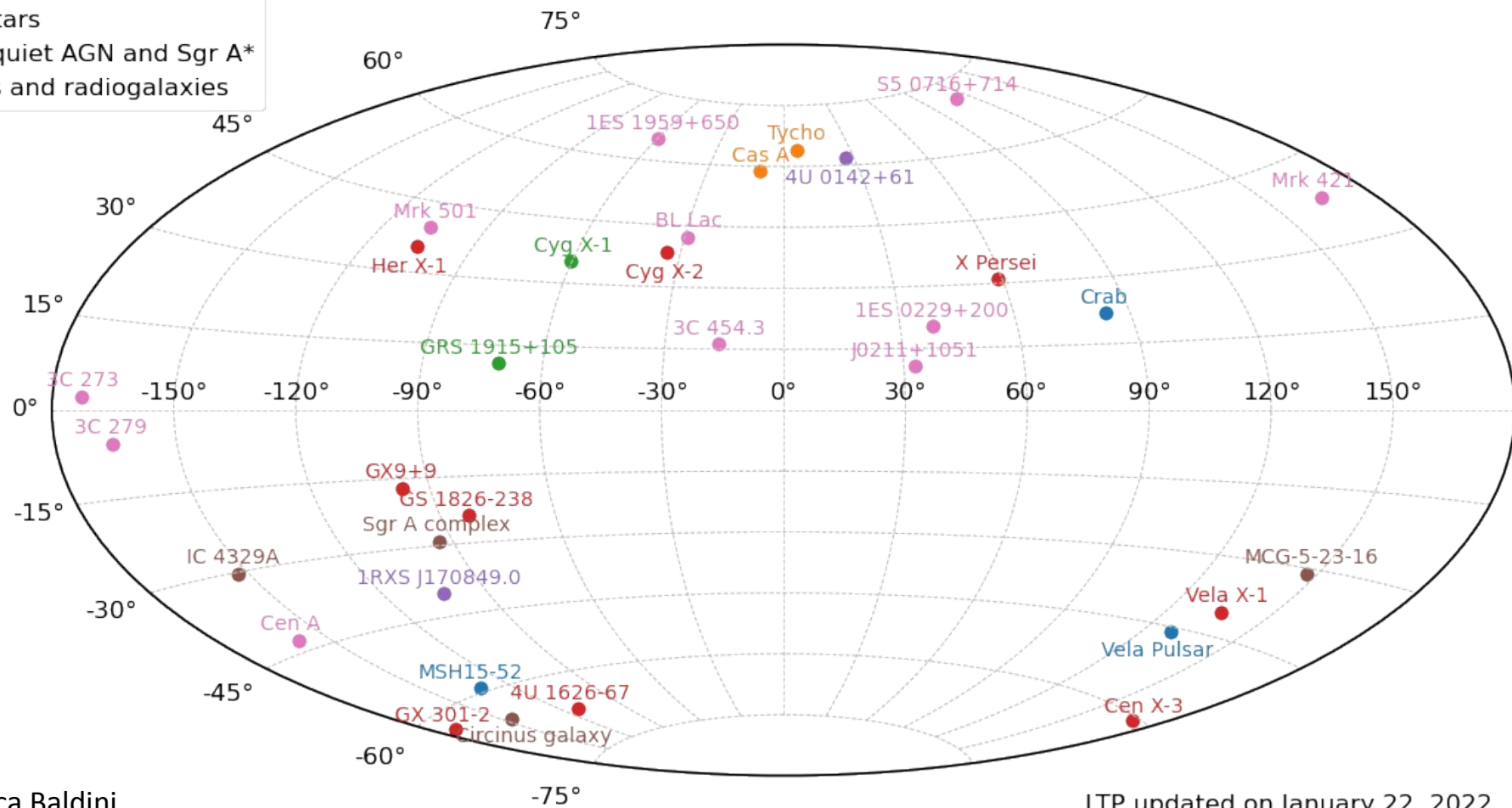


- **Science Working Group**
 - Serves as steering group comprised of official mission investigators (Principal and Co- Investigators)
- **Science Analysis and Simulation Working Group**
 - Coordinates development of software for advanced analysis and simulation of IXPE observations
 - Including `ixpeobssim`
 - Chaired by Luca Baldini (INFN-Pisa) and Herman Marshall (MIT)
- **Science Advisory Team**
 - Coordinates science activities required for planning, analyzing, interpreting, and reporting IXPE observations
 - Chaired by Giorgio Matt (Uni Roma Tre) and Roger Romani (Stanford)
 - Organized into seven Topical Working Groups
 - TWG1 Pulsar Wind Nebulae, led by Niccolò Bucciantini (INAF-Arcetri)
 - TWG2 Supernova Remnants, led by Pat Slane (CfA)
 - TWG3 Accreting Black Holes, led by Michal Dovčiak (CAS-ASU)
 - TWG4 Accreting Neutron Stars, led by Juri Poutanen (Turku)
 - TWG5 Magnetars, led by Roberto Turolla (Uni Padua)
 - TWG6 Radio-Quiet AGN & Sgr A, led by Frédéric Marin (Strasbourg)
 - TWG7 Blazars & Radio Galaxies, lead by Alan Marscher (Boston U)
 - Recommends list of targets for observation during the baseline (2-year) mission
 - For an extended mission, HEASARC will administer an IXPE General Observer (GO) program



Equatorial Coordinates

- Accreting stellar-mass BH
- Accreting WD and NS
- Magnetars
- Radio-quiet AGN and Sgr A*
- Blazars and radiogalaxies



INFN-PI/ Luca Baldini

LTP updated on January 22, 2022

Name	TWG	Exposure [d]	Start	Stop
Vela X-1	Acc NS	3.47	2022-04-15T18:11	2022-04-21T12:17
Vela Pulsar (2 of 2)	PWN	5.24	2022-04-21T12:24	2022-04-30T10:02
Cyg X-2	Acc NS	1.16	2022-04-30T11:04	2022-05-02T11:07
Cyg X-2 (off-set)	Acc NS	0.57	2022-05-02T11:11	2022-05-03T11:13
1ES 1959+650	Blazar RG	0.58	2022-05-03T11:29	2022-05-04T09:49
Mrk 421	Blazar RG	1.16	2022-05-04T10:11	2022-05-06T10:50
BL Lac	Blazar RG	4.63	2022-05-06T11:30	2022-05-14T12:27
MCG-5-23-16 (1 of 2)	RQ AGN Sgr A	0.58	2022-05-14T13:17	2022-05-15T14:55
Cyg X-1	Acc BH	3.47	2022-05-15T15:45	2022-05-21T17:52
MCG-5-23-16 (2 of 2)	RQ AGN Sgr A	5.21	2022-05-21T18:42	2022-05-31T03:47
3C 454.3	Blazar RG	1.16	2022-05-31T04:36	2022-06-02T08:40
3C 273	Blazar RG	1.16	2022-06-02T08:53	2022-06-04T10:48
Mrk 421	Blazar RG	1.16	2022-06-04T11:05	2022-06-06T10:57
1ES 1959+650 (adjust)	Blazar RG	0.58	2022-06-06T11:20	2022-06-07T08:38
Mrk 421	Blazar RG	1.16	2022-06-07T09:01	2022-06-09T09:39
3C 273	Blazar RG	1.16	2022-06-09T09:57	2022-06-11
3C 279	Blazar RG	1.16	2022-06-11	2022-06-13

Observed and delivered to HEASARC

Observed before this week

To be observed during this week

To be observed later