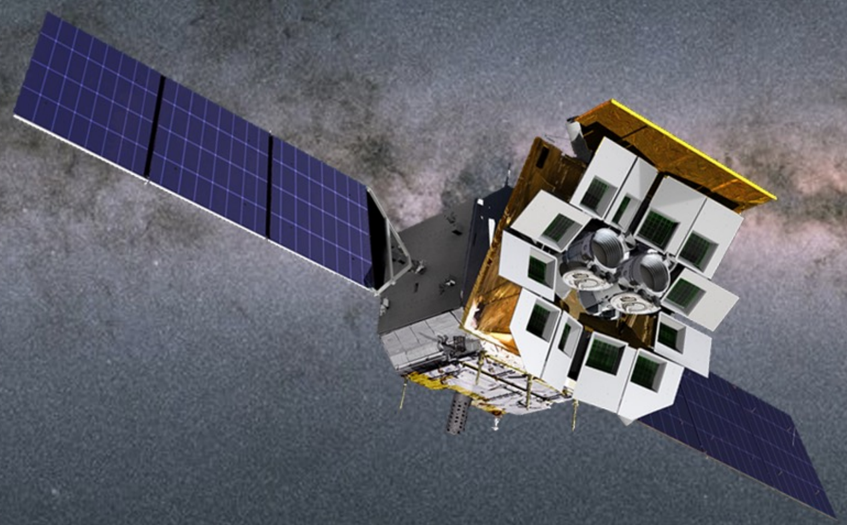


# Einstein Probe

*Exploring the dynamic X-ray Universe*


## *Nanda Rea*

On behalf of the Einstein Probe collaboration (CAS, ESA, MPE and CNES)


Institute of Space Sciences

CSIC Consejo Superior de Investigaciones Científicas

IEEC

Gobierno de España | Ministerio de Ciencia e Innovación

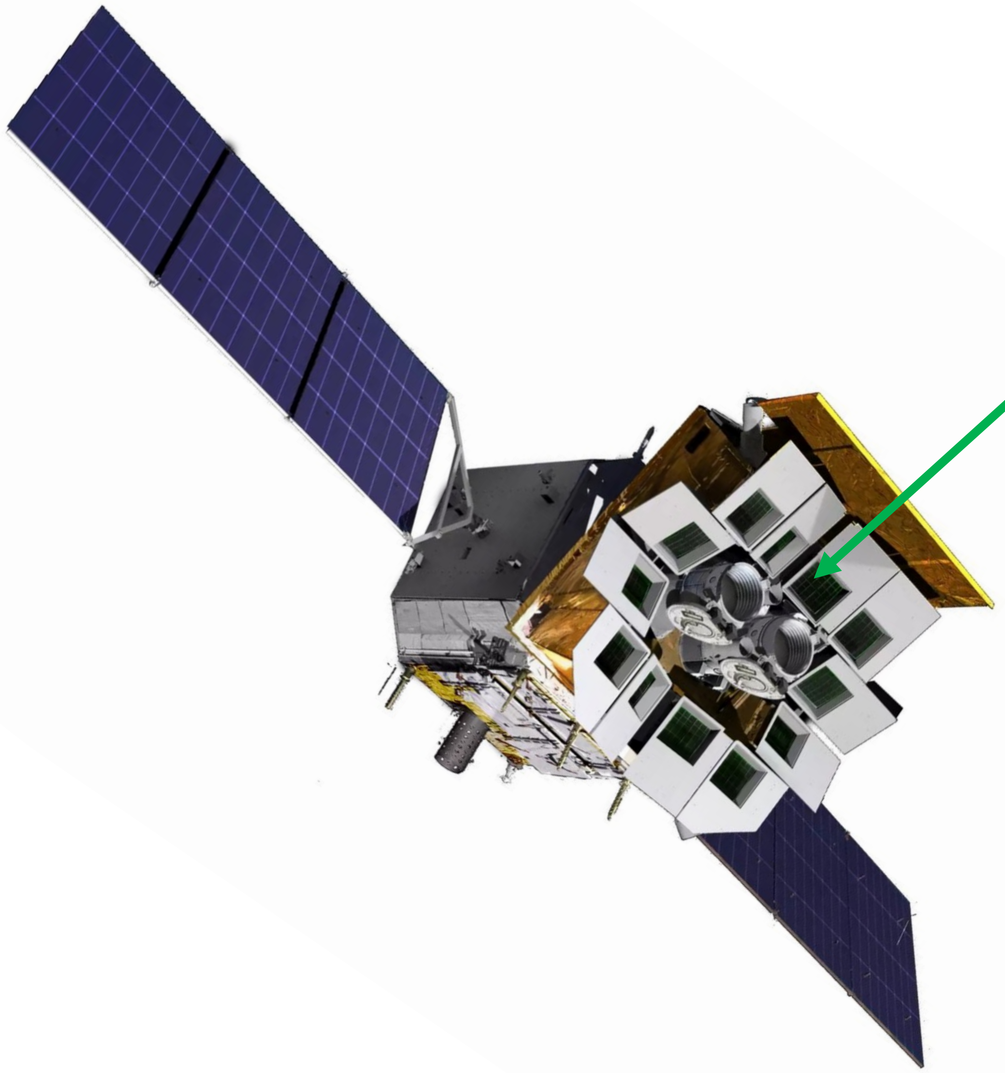
European Research Council

Established by the European Commission

# LAUNCH AND POST LAUNCH ACTIVITIES

- Launched: January 9, 2024
- Commisioning phase ongoing
- All working perfectly thus far
- March 2: FXT first-light obs
- March 7: all WXT modules on
- March 15: PV targets
- ~3 month of calibation
- June 2024: start of AO-1

## INSTRUMENTS



**Wide-field X-ray telescope (WXT - 12 modules)**

Lobster-eye MPO + CMOS

FoV: 3600 sq deg (1.1 sr)

Energy: 0.5-5 keV

Eff. Area: ~3cm$^2$ @1keV

FWHM: 5’

Position accuracy: <1’

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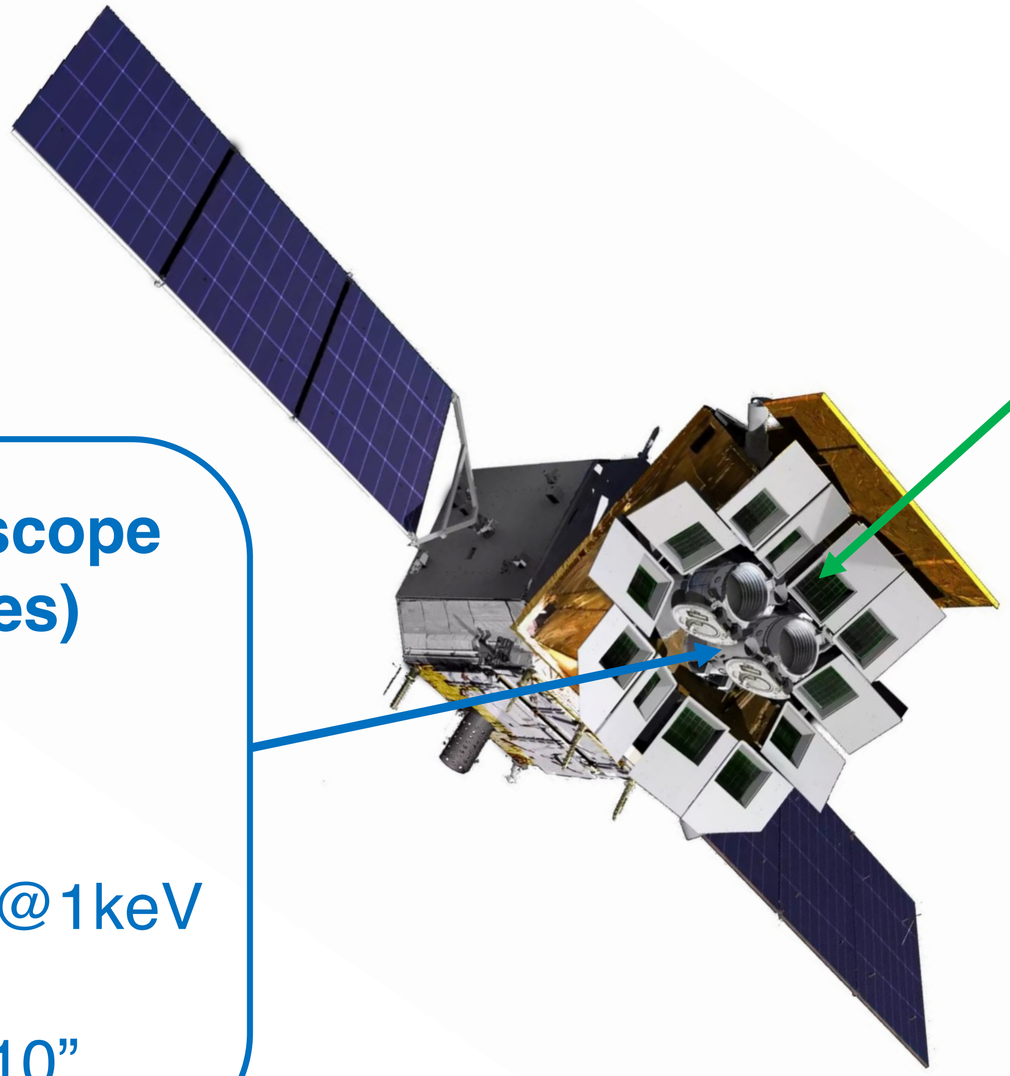


**Focus X-ray Telescope (FXT - 2 modules)**

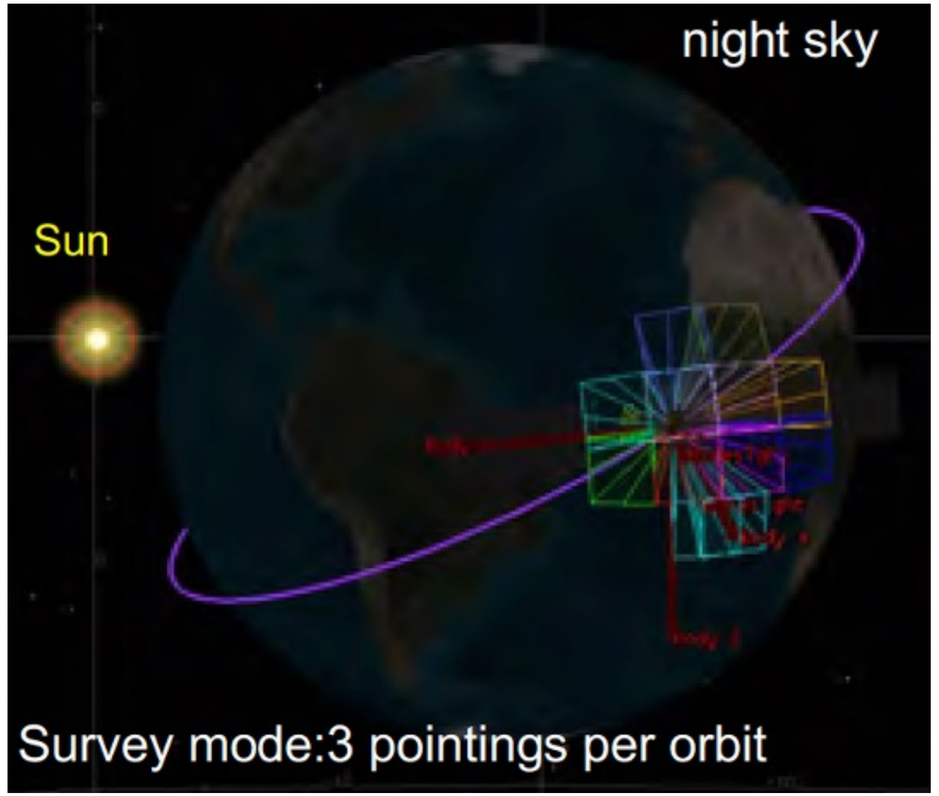
Wolter-1 type CCD
FoV: 38’
Energy: 0.3-10 keV
Eff. Area: 2x300cm$^2$ @1keV
FWHM: 30”
Position accuracy: <10”

**Wide-field X-ray telescope (WXT - 12 modules)**

Lobster-eye MPO + CMOS
FoV: 3600 sq deg (1.1 sr)
Energy: 0.5-5 keV
Eff. Area: ~3cm$^2$ @1keV
FWHM: 5’
Position accuracy: <1’

# OBSERVING MODES AND STRATEGY

- Orbit: 570km (period ~ 97minutes)
- Onboard data processing and transient search
- Autonomous slew with FXT in 3-5 min
- Fast alert data downlink and uplink (VHF, Beidou)



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- Orbit: 570km (period ~ 97minutes)
- Onboard data processing and transient search
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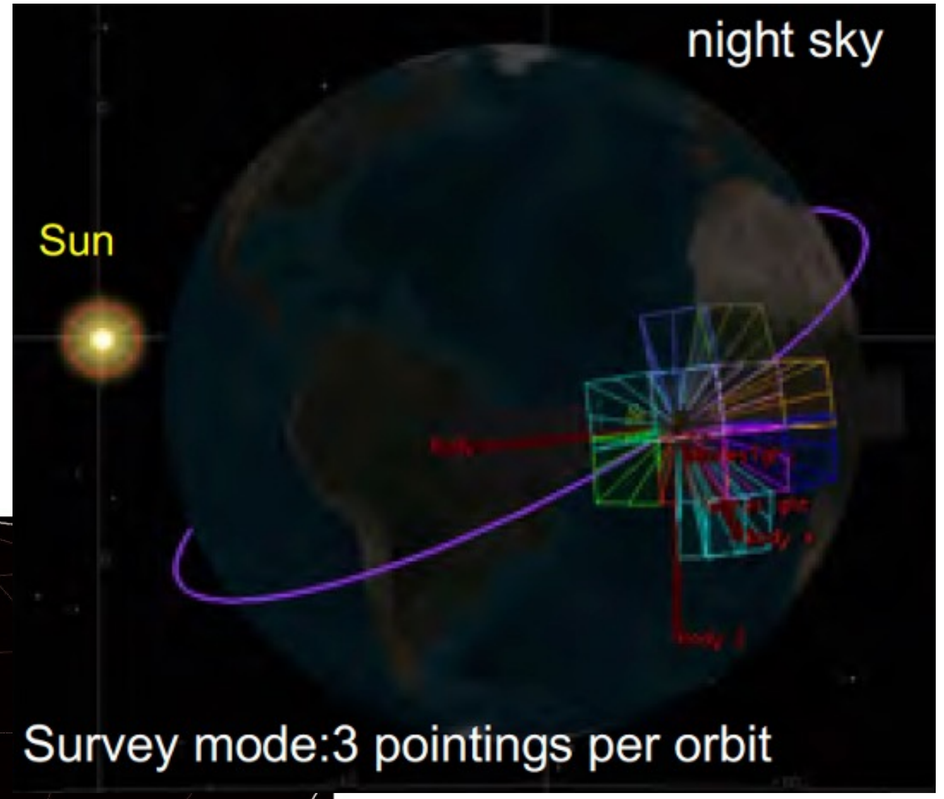
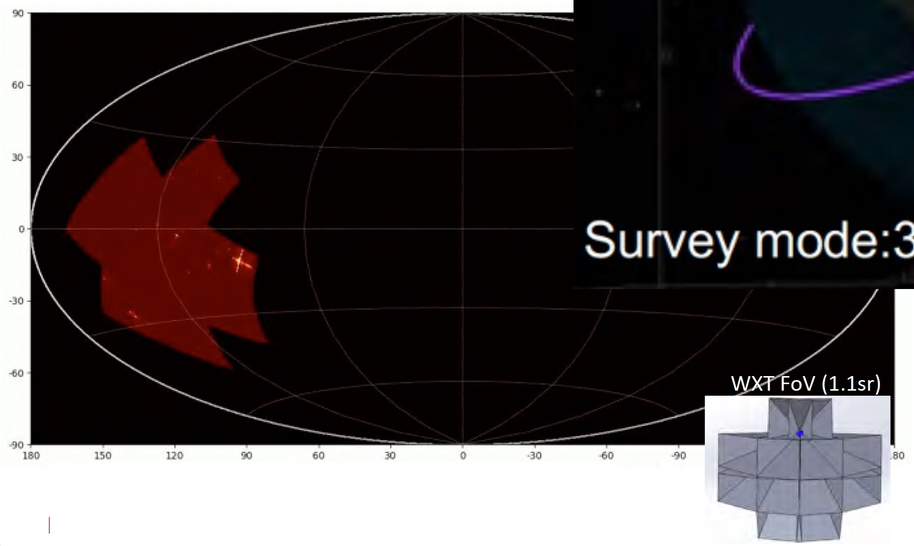
- Fast alert data downlink and uplink (VHF, Beidou)

- WXT Survey mode: 3 snapshots per orbit in the night-sky with 20min exposure
- All night-sky covered in 3 orbits.



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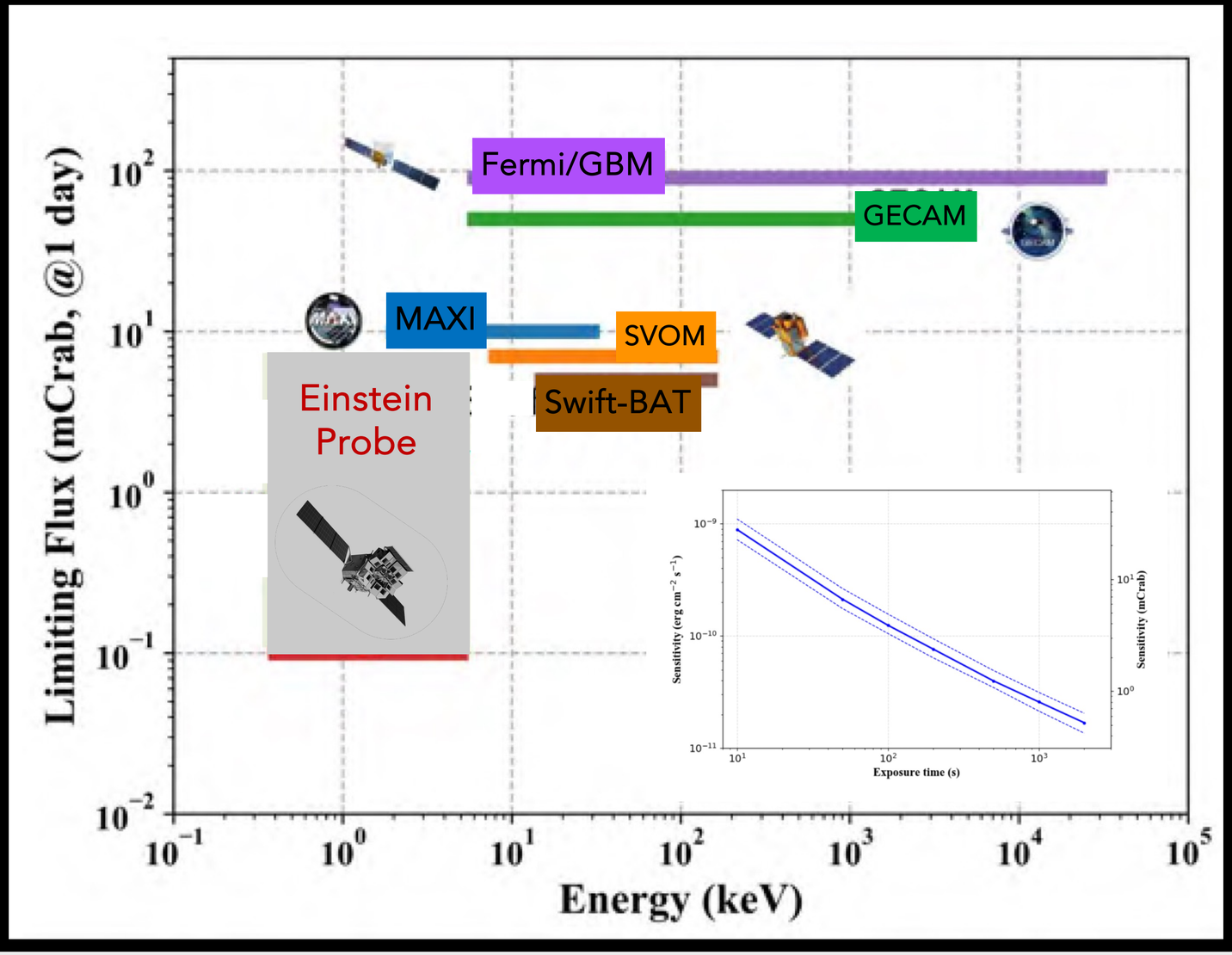
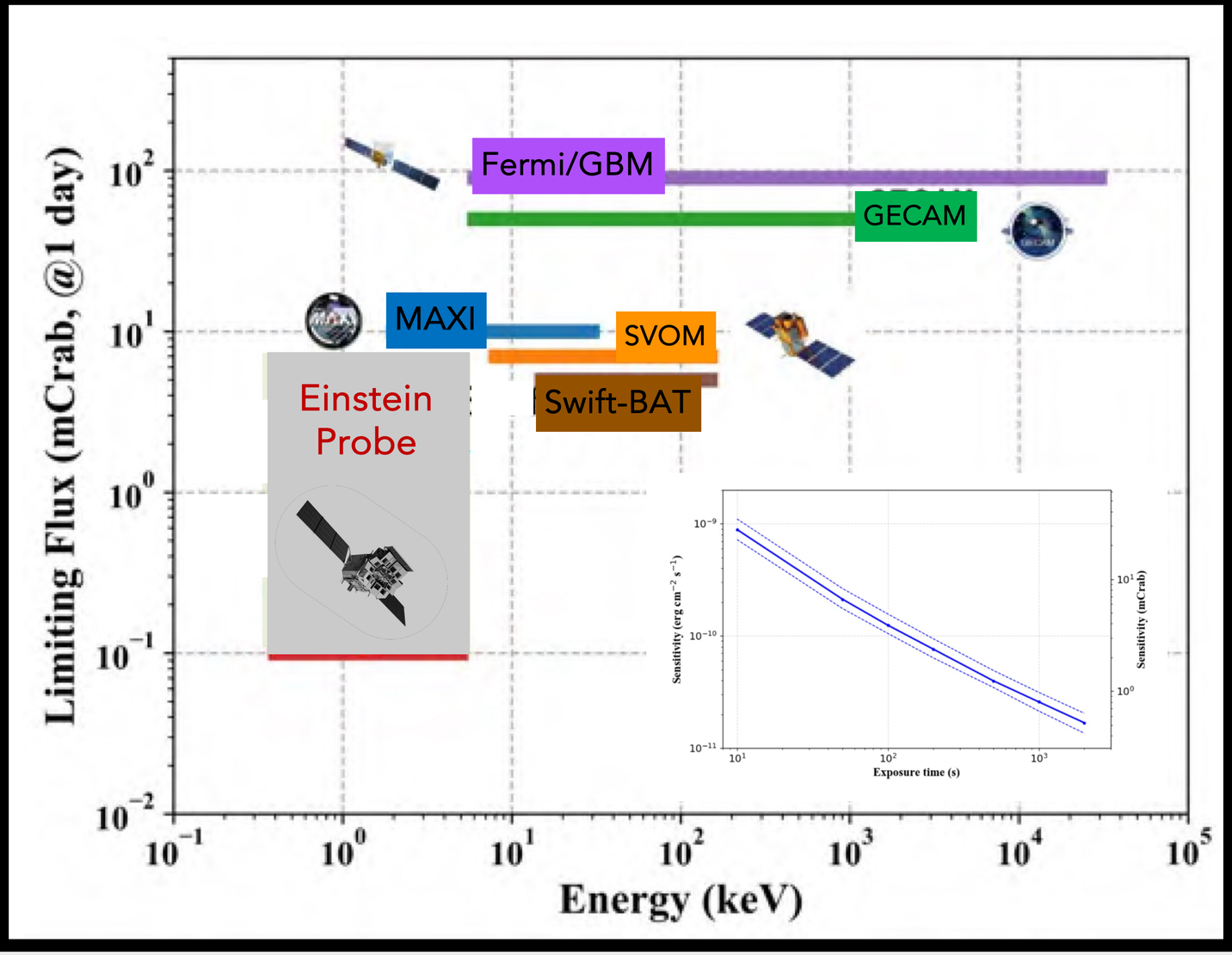
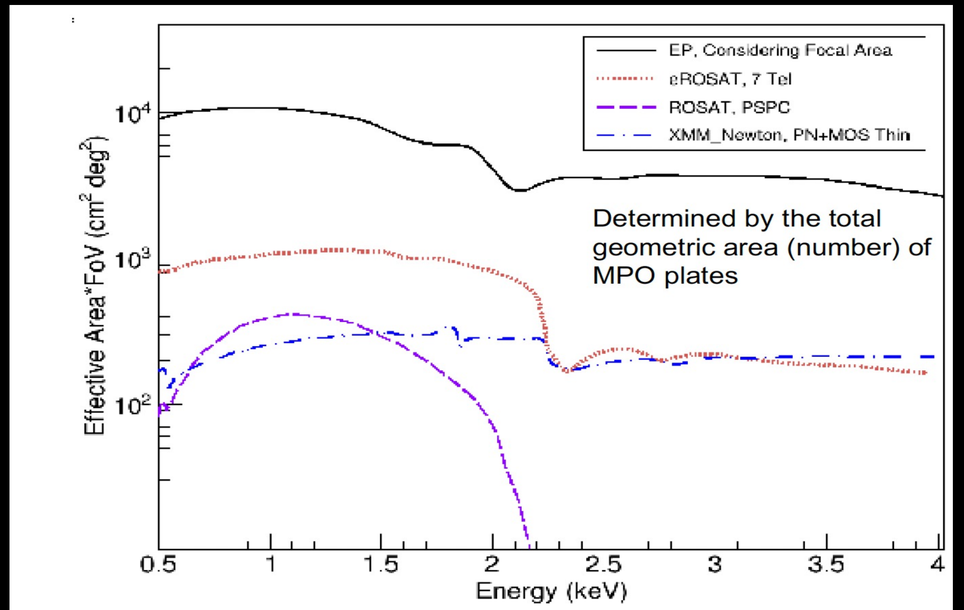
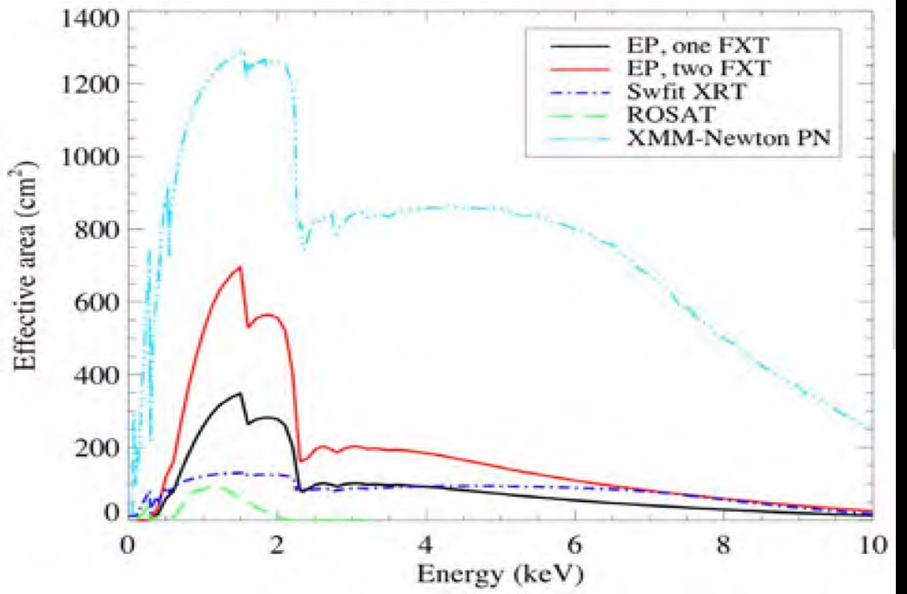


# Einstein Probe

## SENSITIVITY



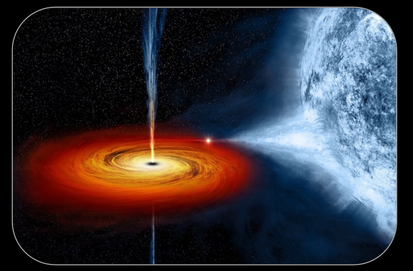



# Einstein Probe

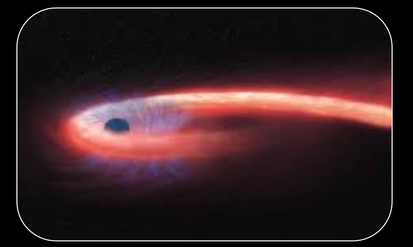
## SCIENCE GOALS

Discover and characterize cosmic X-ray transients, particularly faint, distant and rare X-ray transients, in large numbers.

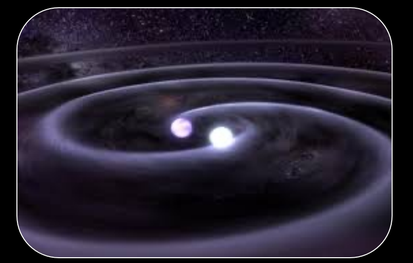
Discovery and monitor new outbursts from the Galactic and extra-Galactic population of neutron stars and black holes.



Discover otherwise quiescent black holes at almost all astrophyscal mass scales during their transient flares.

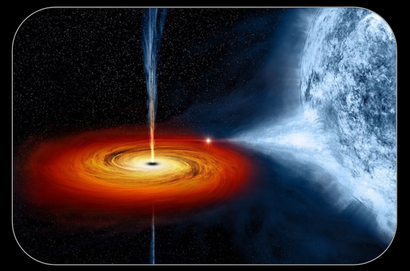


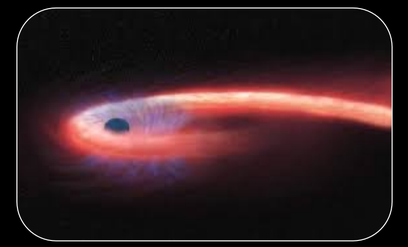
Detect and localize the electromagnetic counterpat to gravitational wave and neutrino events in synergy with multi-messenger facilities.

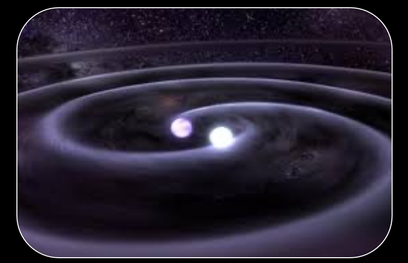


# SCIENCE GOALS

| Type of transients | detections per year |
|---|---|
| Tidal disruption event (TDE) | ~100 |
| TDE with jet | 10 – ? |
| Supernova shock breakout | 50 (?) |
| Long GRB | ~ 80 |
| High-z GRB (z > 6) | a few ? |
| Short GRB | ~ 10 |
| Low-luminosity GRB | ~ 10 |
| Magnetar | ~ a few |
| Stellar flares | several x $10^3$ |
| AGN monitored daily/weekly | several tens/hundreds |







# SCIENCE STRUCTURE

STP1: **Tidal Disruption Events (TDEs) and Active Galactic Nuclei (AGNs)**.
Chair: Chichuan JIN co-Chairs: Lixin DAI, Arne RAU

STP2: **Fast extragalactic transients** (including gamma-ray bursts (GRBs) and non-GRB transients).
Chair: Xuefen WU co-Chairs: Peter JONKER

STP3: **Multi-messenger astronomy** (synergies with gravitational wave events and with neutrino events).
Chair: Bing ZHANG co-Chairs: Luigi PIRO, Yuan LIU

STP4: **Compact stellar objects** (compact objects including stellar mass black holes, neutron stars, and/or white dwarfs in our Galaxy or in nearby galaxies; ultra-luminous X-ray sources).
Chair: Nanda REA co-Chairs: Hua FENG, Lian TAO

STP5: **Observatory Science** (topics not included in the above panels, e.g., stellar flares, supernova remnants, diffuse emission, Solar System objects).
Chair: Jeremy SANDERS co-Chairs: Jungen WANG

# SCIENCE STRUCTURE

**Science Management Committee (SMC)**

Weimin Yuan (PI, Chair)
Erik Kuulkers (ESA, Co-chair)
Kirpal Nandra (MPE, Co-chair)
Bertrand Cordier (CNES)
Zhou Fan (CAS)
Hua Feng (CAS)
Chichuan Jin (CAS)
Yuan Liu (CAS)
Paul O'Brien (ESA)
Arne Rau (MPE)
Nanda Rea (ESA)
Jeremy Sanders (MPE)
Xuefeng Wu (CAS)
Bing Zhang (CAS)
Shuang-Nan Zhang (CAS)

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More soon!