eROSITA/*SRG*

Instrument ▪ Obs Strategy ▪ Science

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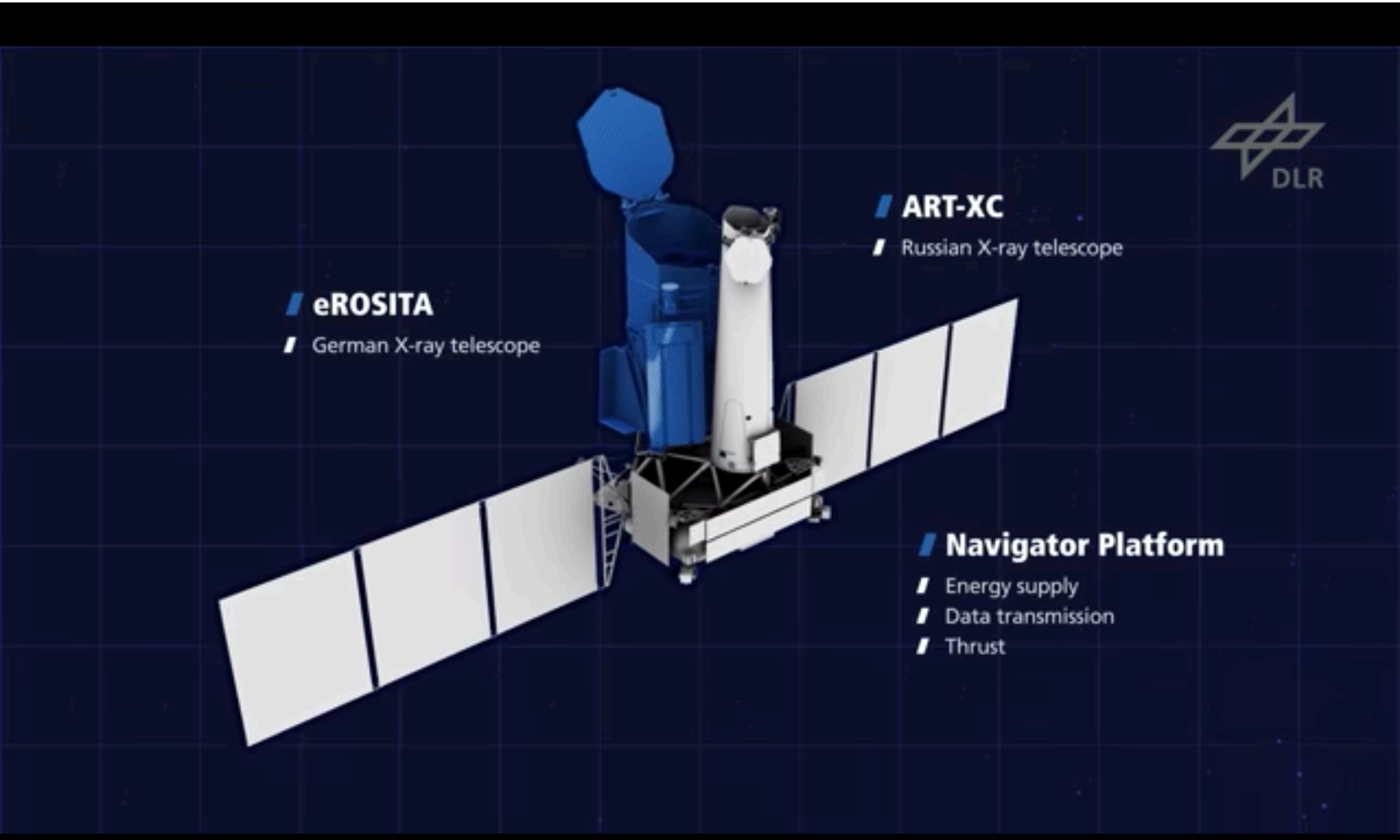
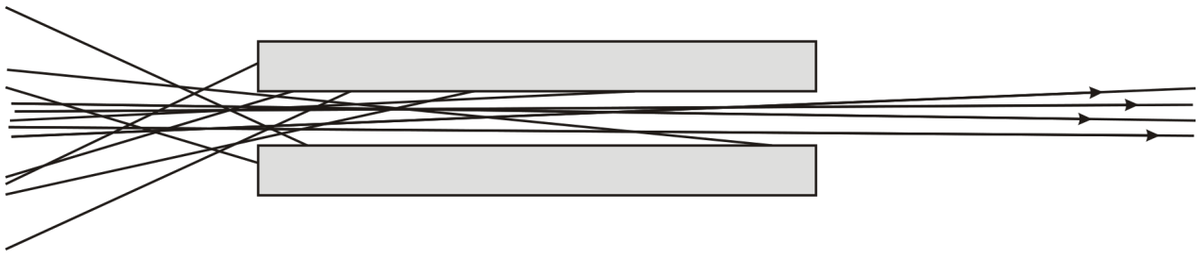
Instrument

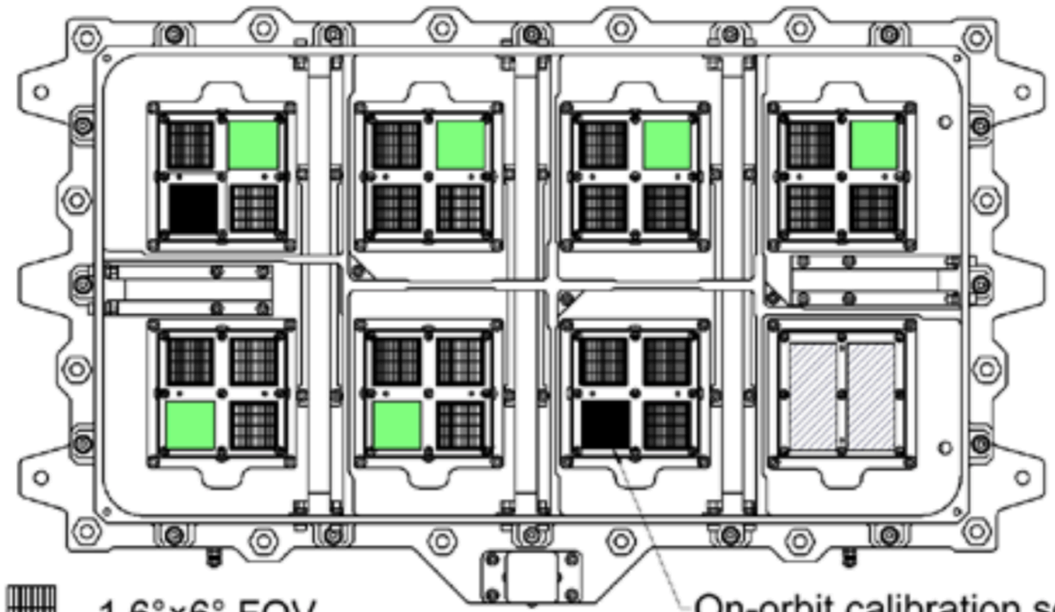

DLR
ART-XC
Russian X-ray telescope
eROSITA
German X-ray telescope
Navigator Platform
Energy supply
Data transmission
Thrust

Collimator vs. Focusing X-ray optics

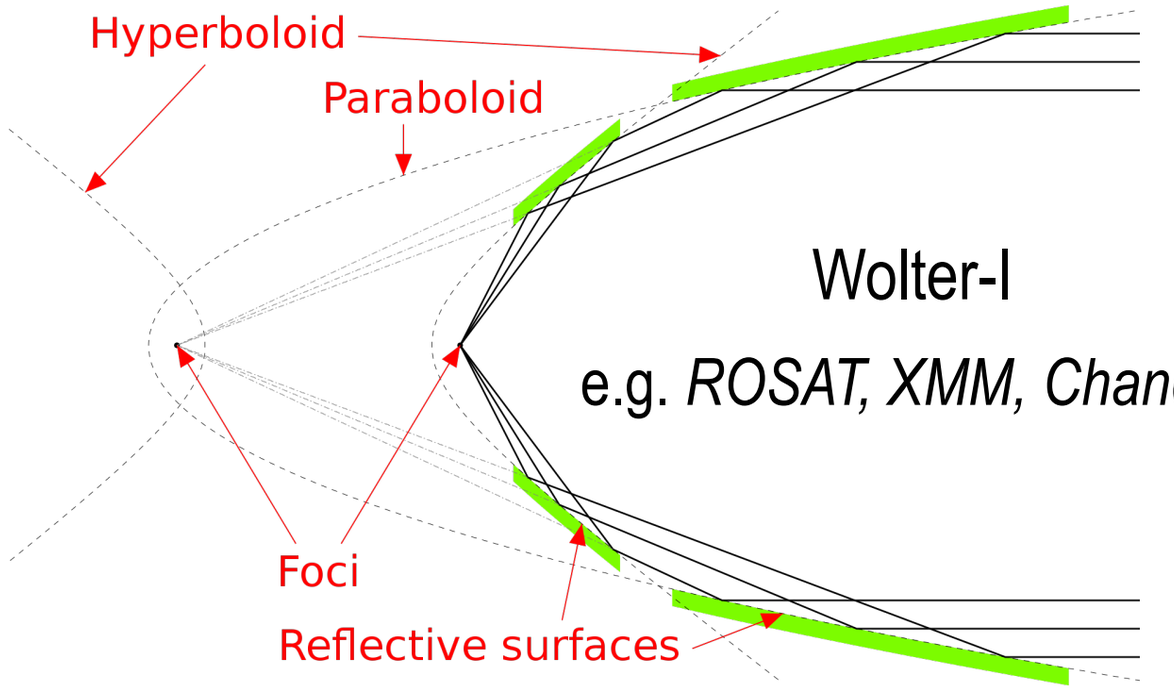


Scan to determine source location

e.g. PCA/*RXTE*



Layout of HXMT Collimator
FoV in the Low-Energy Detector Boxes



Wolter-I

e.g. *ROSAT, XMM, Chandra*

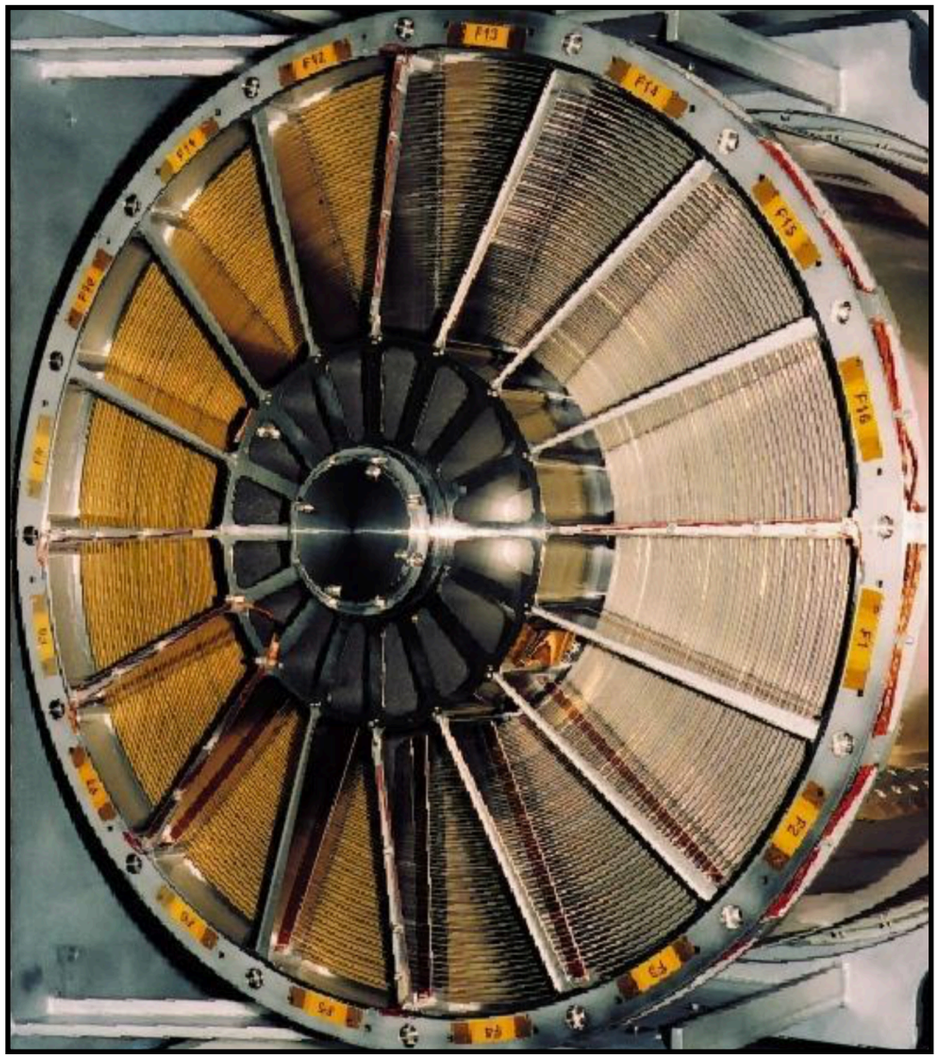
eROSITA Mirror Modules Configuration

DLR

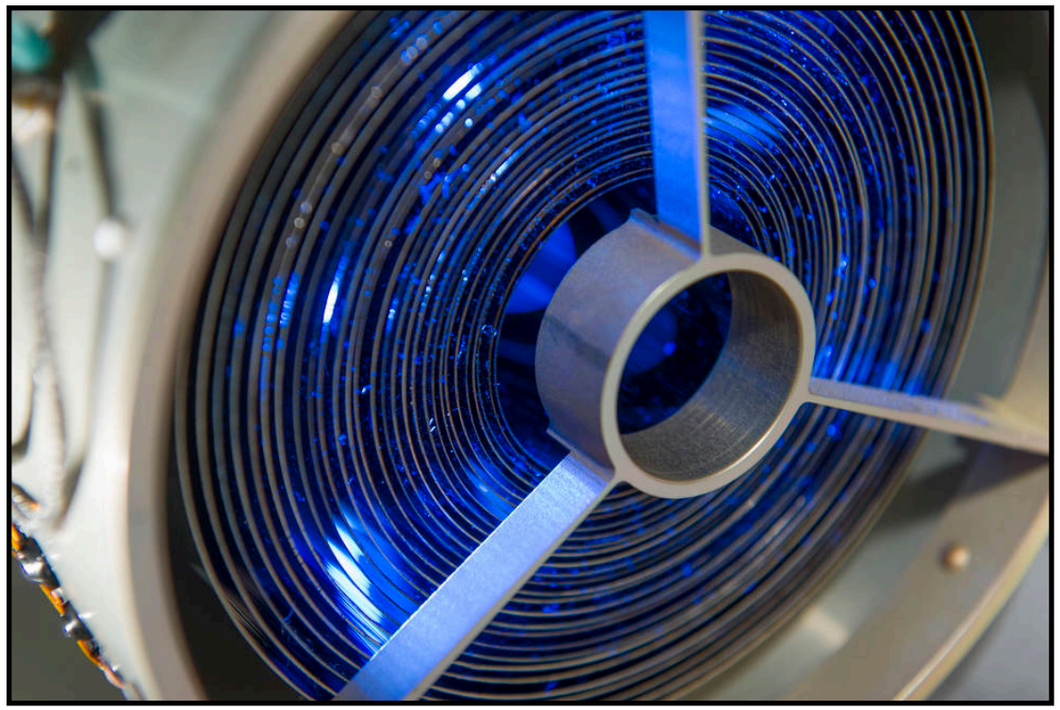
eROSITA

- Consists of seven parallel telescope modules
- Each module has an X-ray mirror system and a highly-sensitive CCD camera
- Features a unique combination of light-collecting area, field-of-view and resolution
- Is approximately 20 times more sensitive than the German ROSAT X-ray telescope in the 1990s

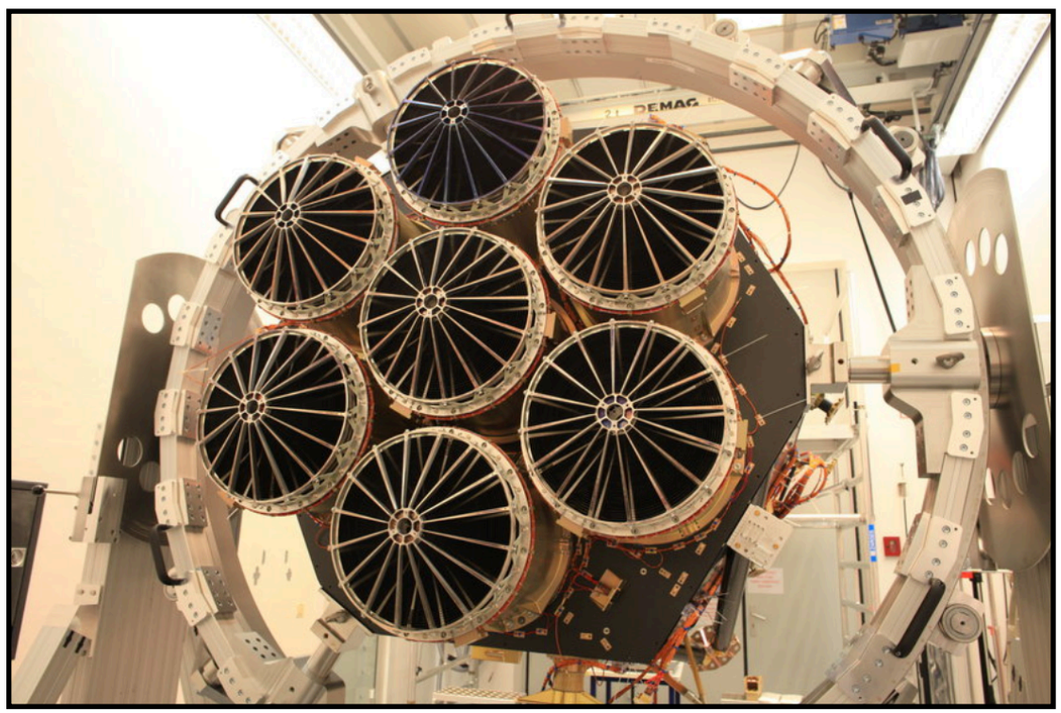
$$\theta_c \propto \frac{1}{E}$$



XMM-Newton (0.1–12 keV):
3x58 mirror shells

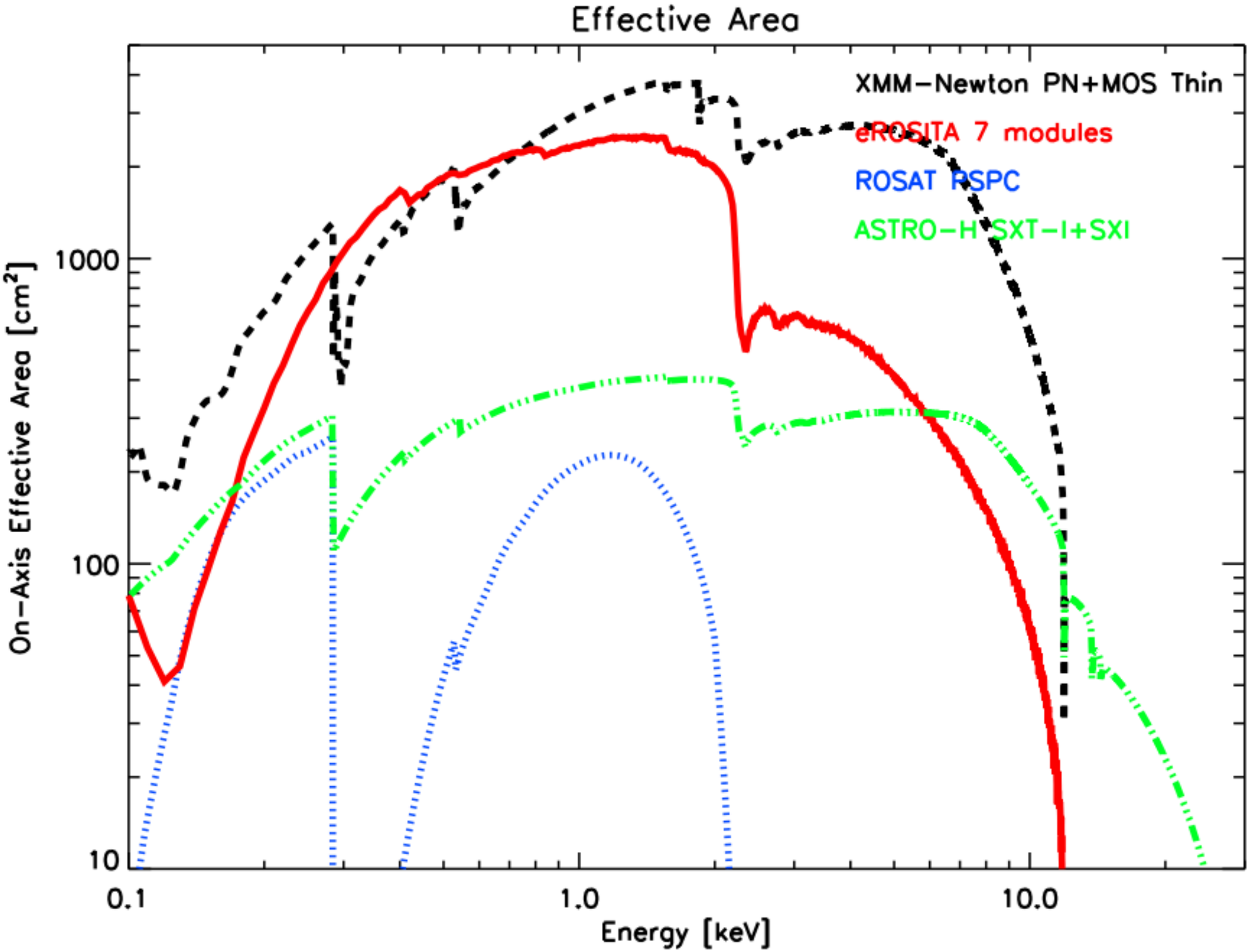


ART-XC (4–30 keV): 7x28 mirror shells

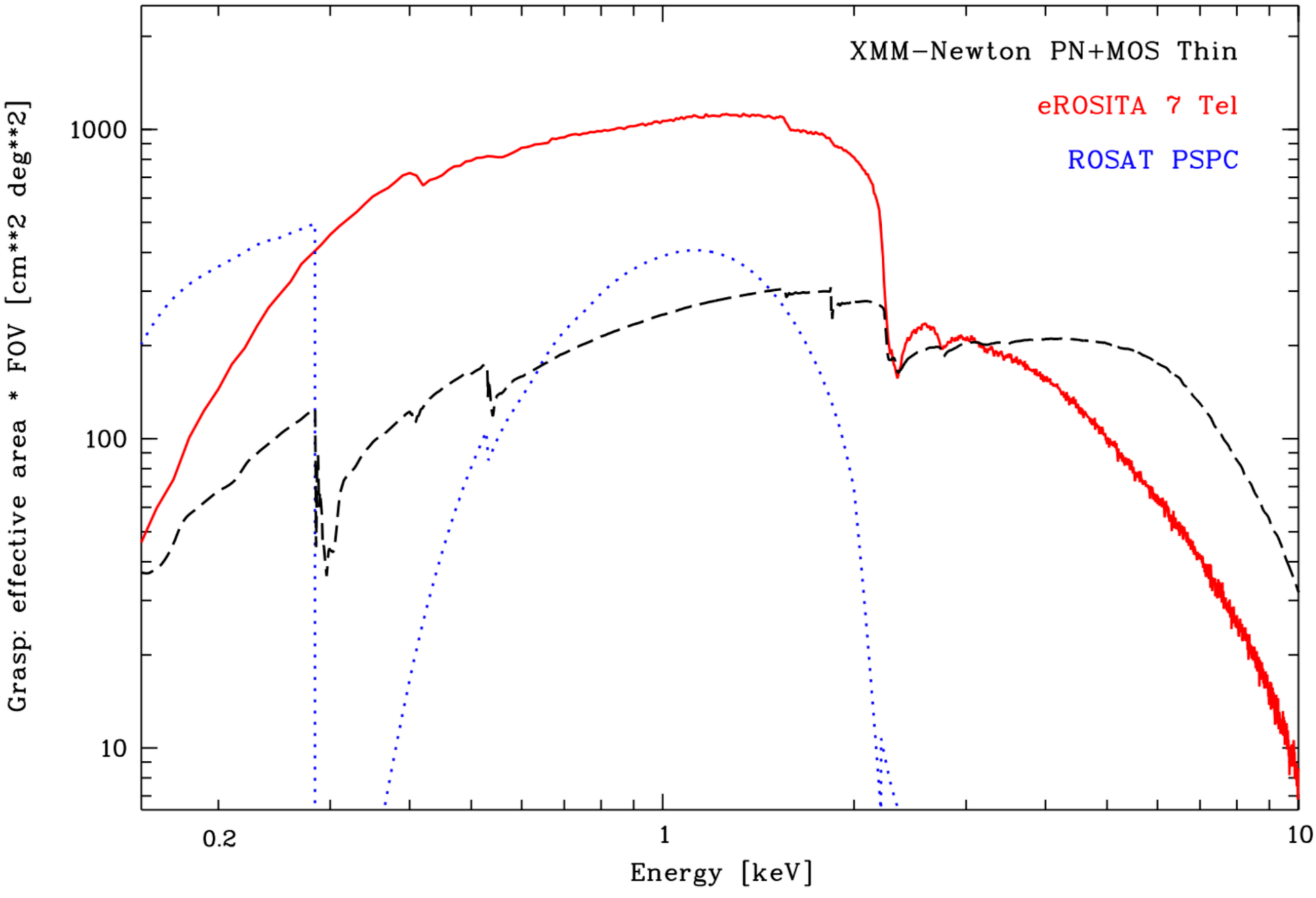


eROSITA (0.2–10 keV): 7x54 mirror shells

Effective Area ~ 1700 cm^2 (FoV avg. @ 1 keV), comparable with *XMM-Newton*



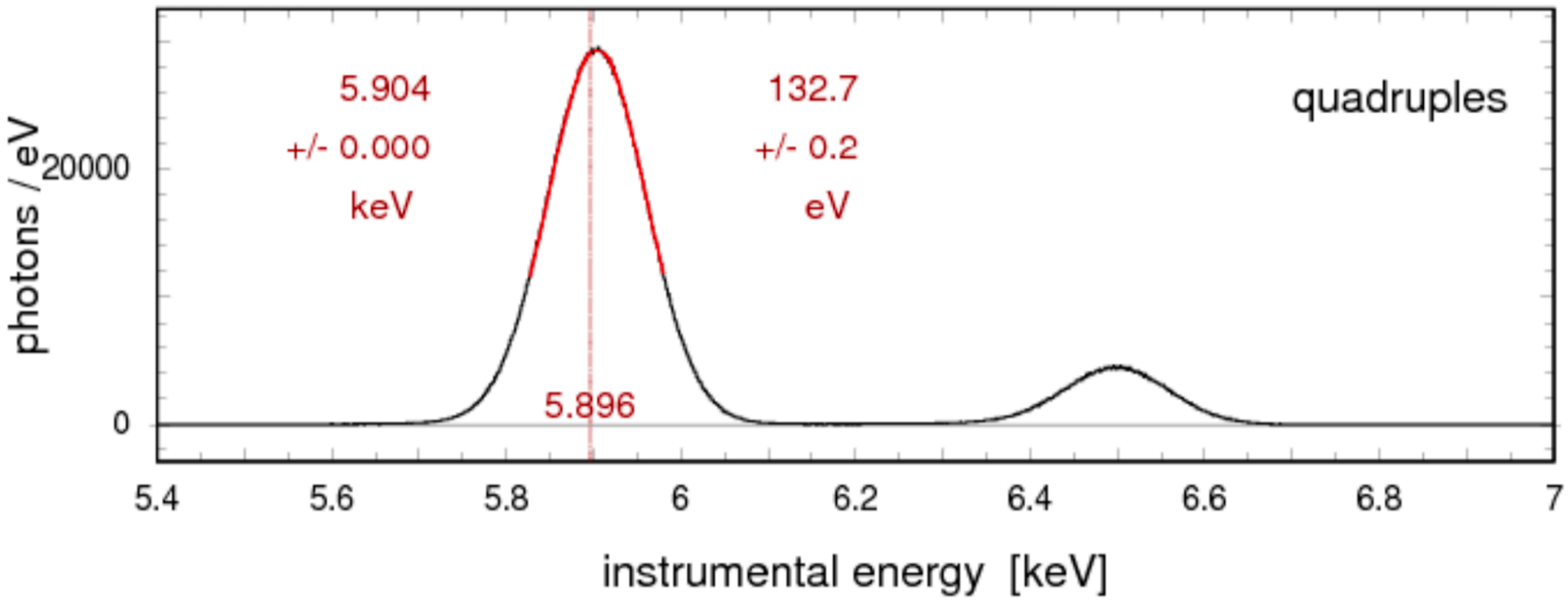
7—8 larger survey speed compared with *XMM-Newton*



Yuhan's question: But *XMM-Newton* has FoV of 30'x30'.
Why don't we do sky survey with *XMM-newton*?

Spectral Resolution

https://www.cosmos.esa.int/documents/332006/1402684/AMerloni_t.pdf



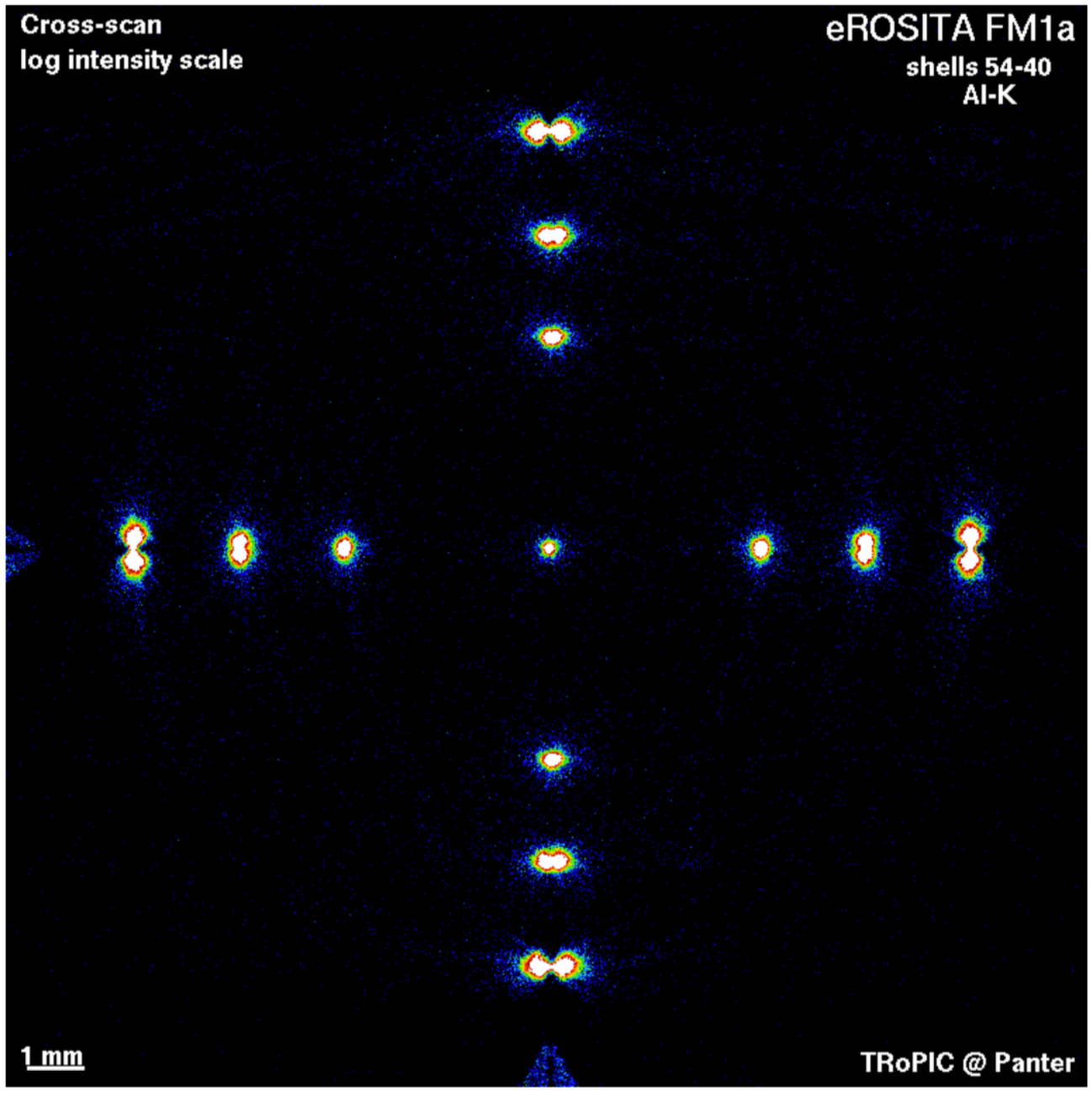
132 eV @ 5.9 keV

R = 6 @ 0.28 keV
R = 20 @ 1.5 keV
R = 47 @ 6.4 keV

Similar to *XMM-Newton*

Angular Resolution

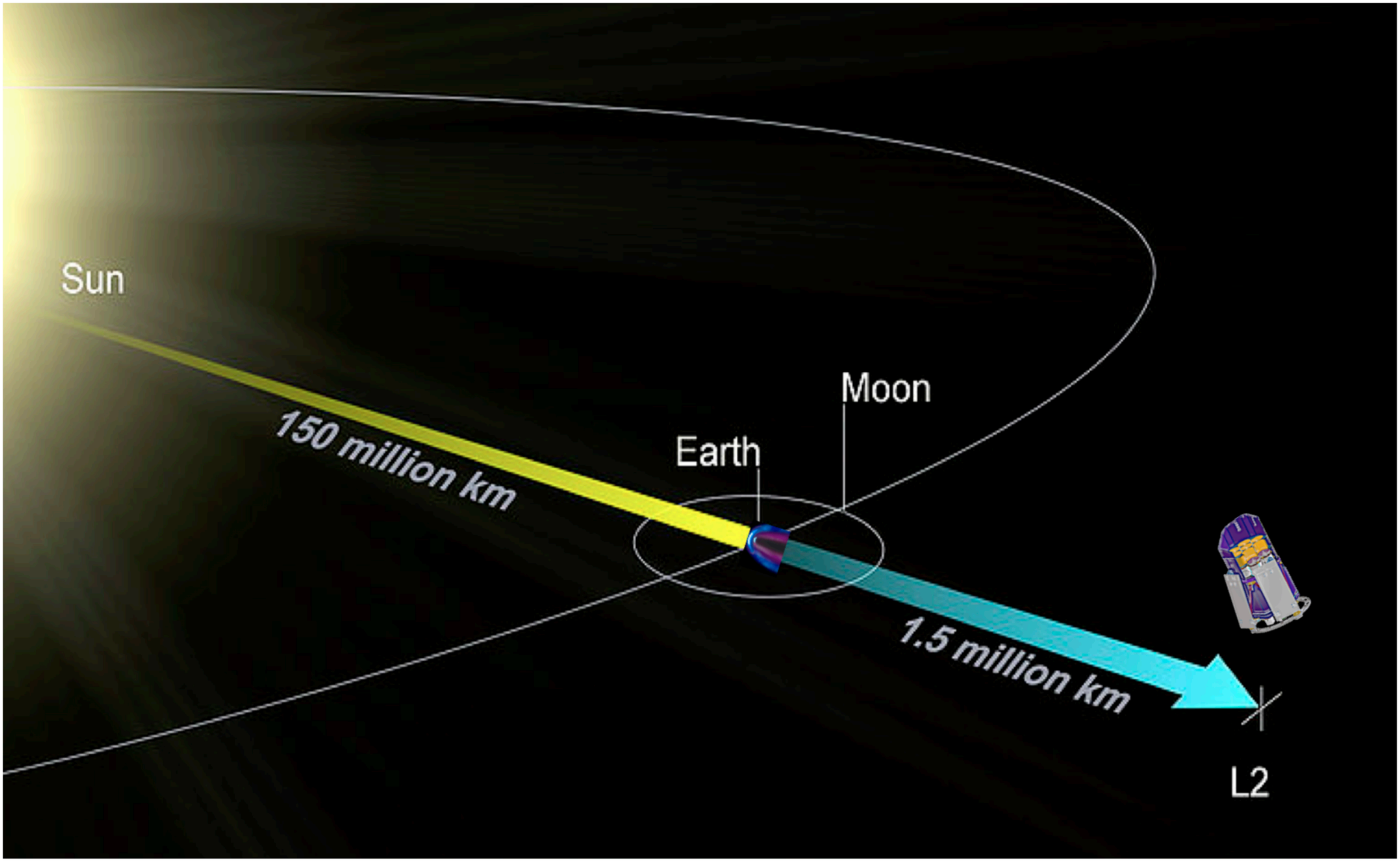
HEW @ 1.5 keV ~ 10” on axis (half of ROSAT)

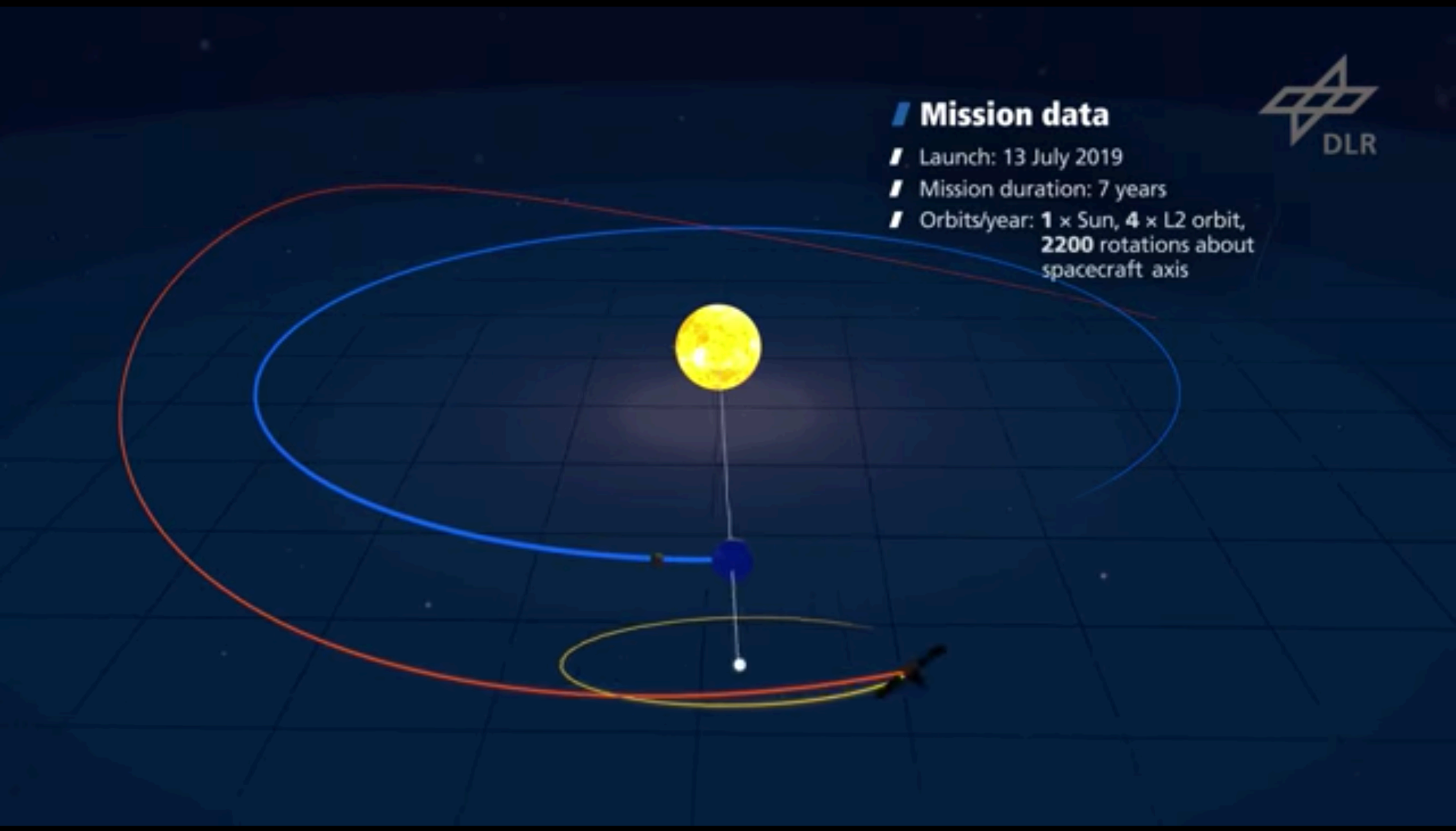


Similar to *XMM-Newton*

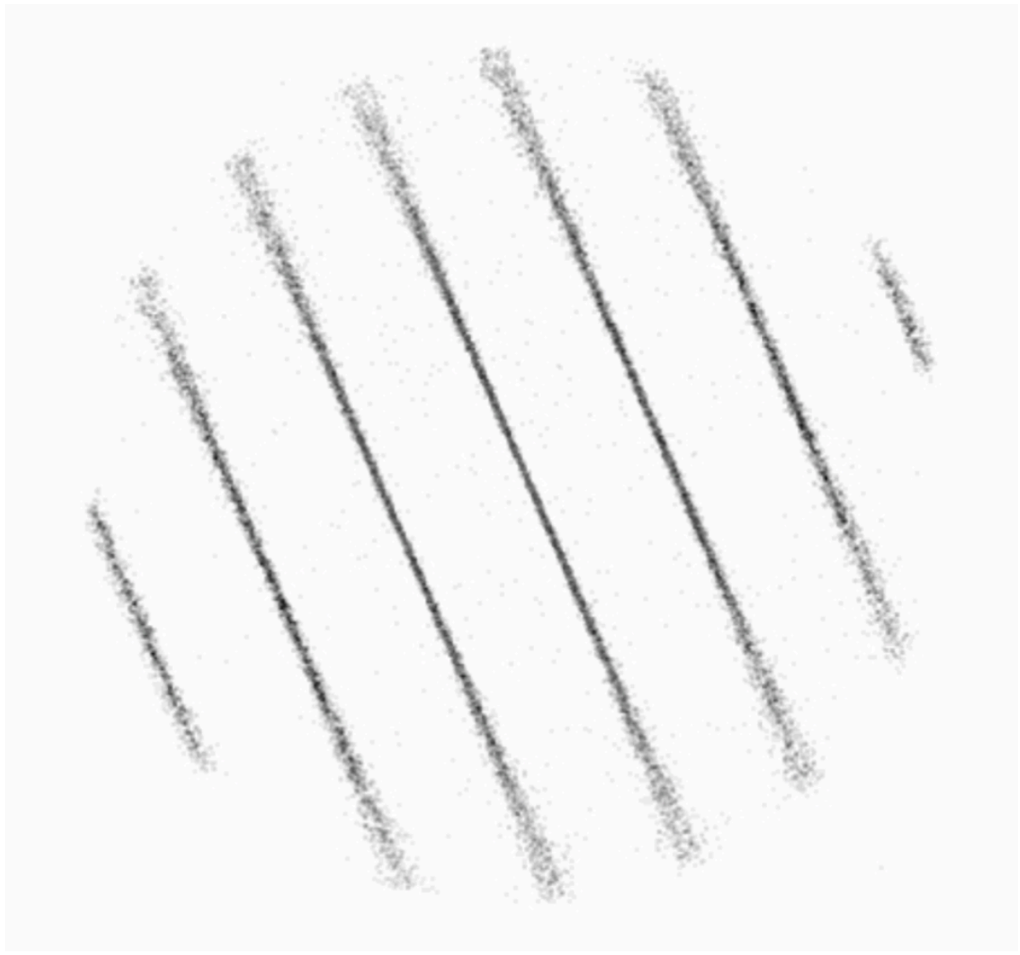
Obs Strategy

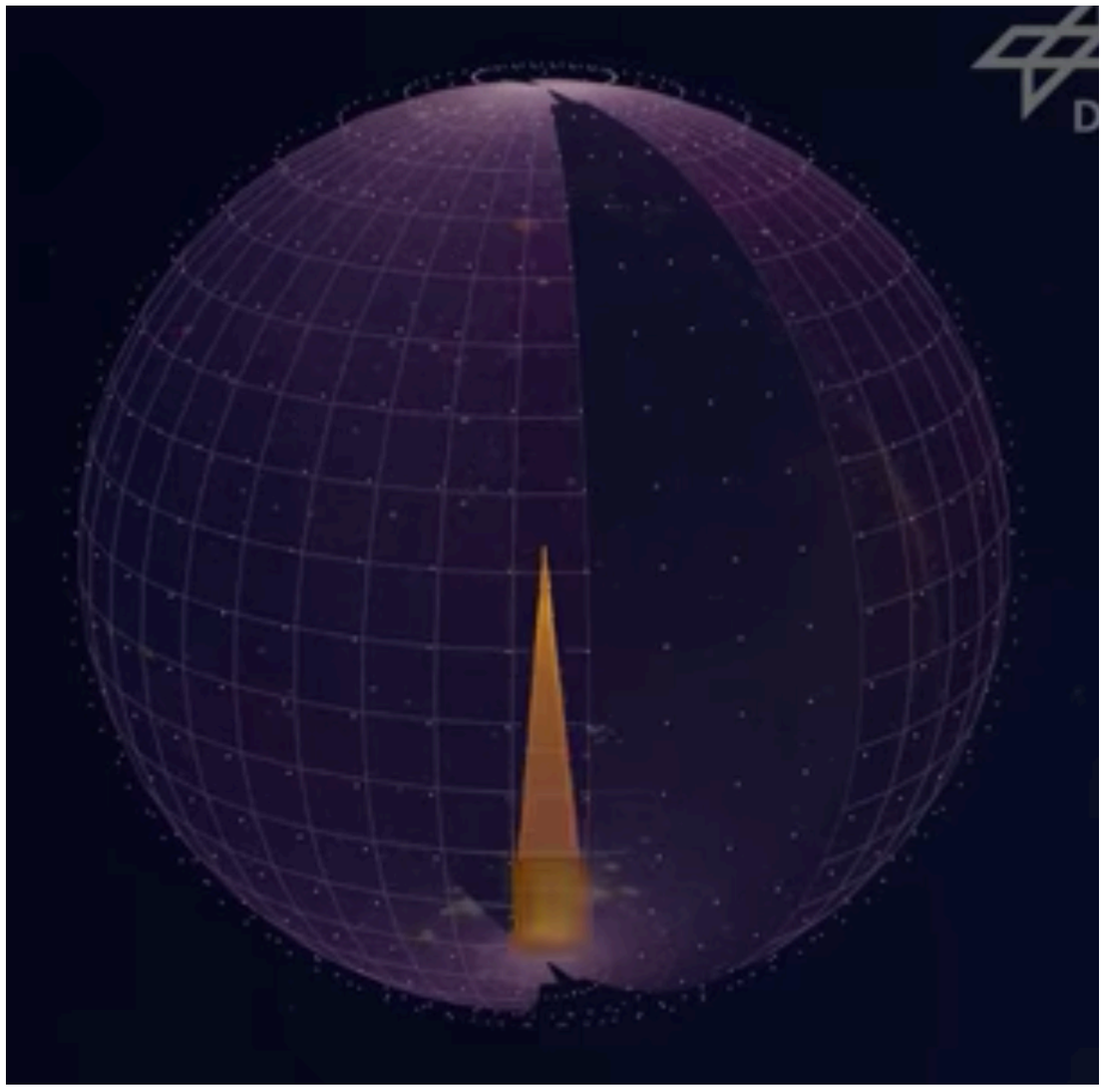
The first X-ray mission at L2



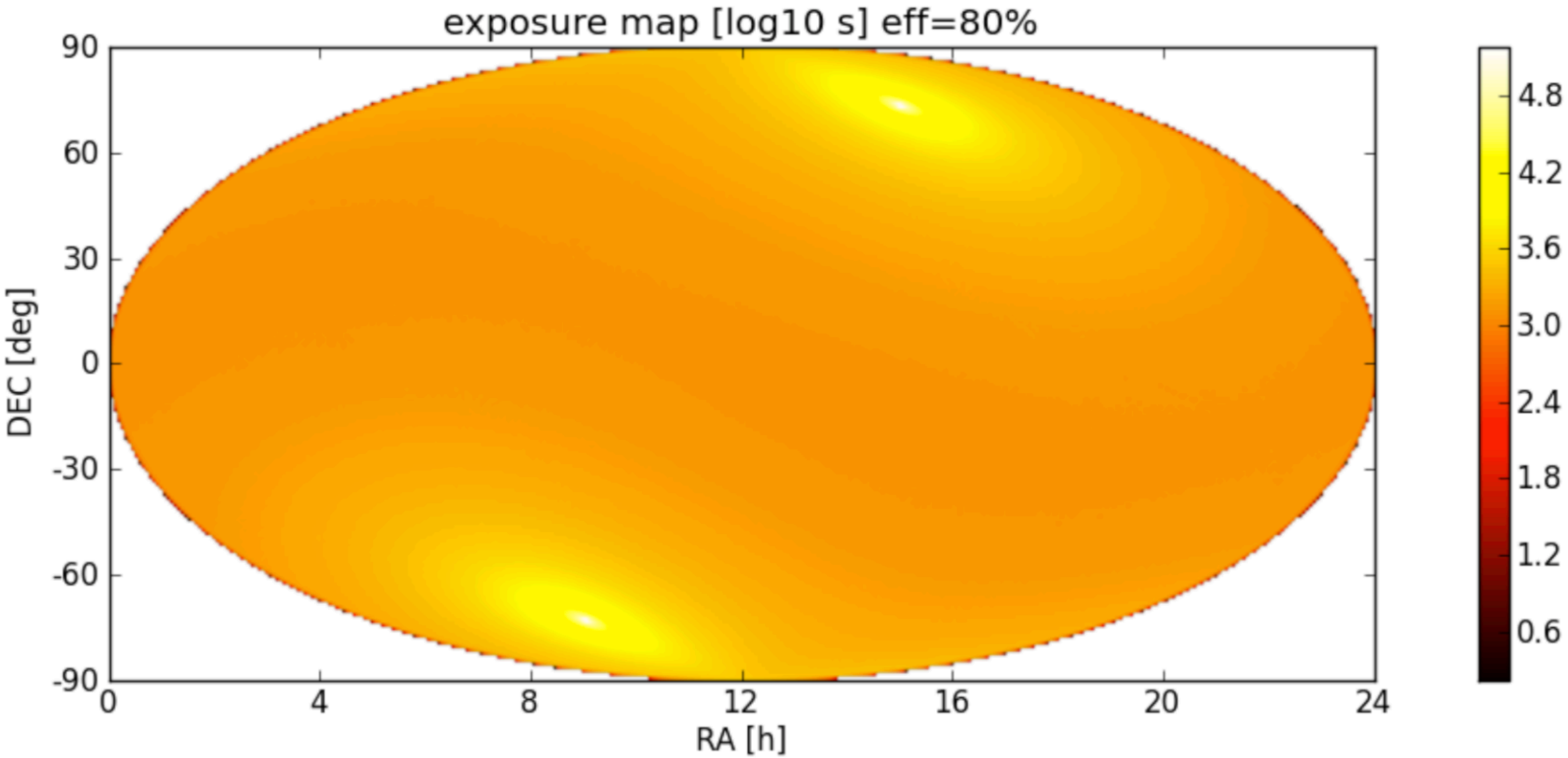

Mission data
Launch: 13 July 2019
Mission duration: 7 years
Orbits/year: 1 × Sun, 4 × L2 orbit, 2200 rotations about spacecraft axis
DLR

Field of View: ~ 1deg x 1 deg





One full circle: 4 hours
Drift: ~ 1 degree per day
Each source will be scanned at least 6 times (in 1 eRASS)
Each scan will be 40 s on axis (40 s = 4 h / 360 deg x 1 deg)
On average, 30 s per scan. Exposure time is 30s x 6 = 180 s per eRASS

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In [6]: np.log10(6*8*0.8*30)
Out[6]: 3.0614524790871935
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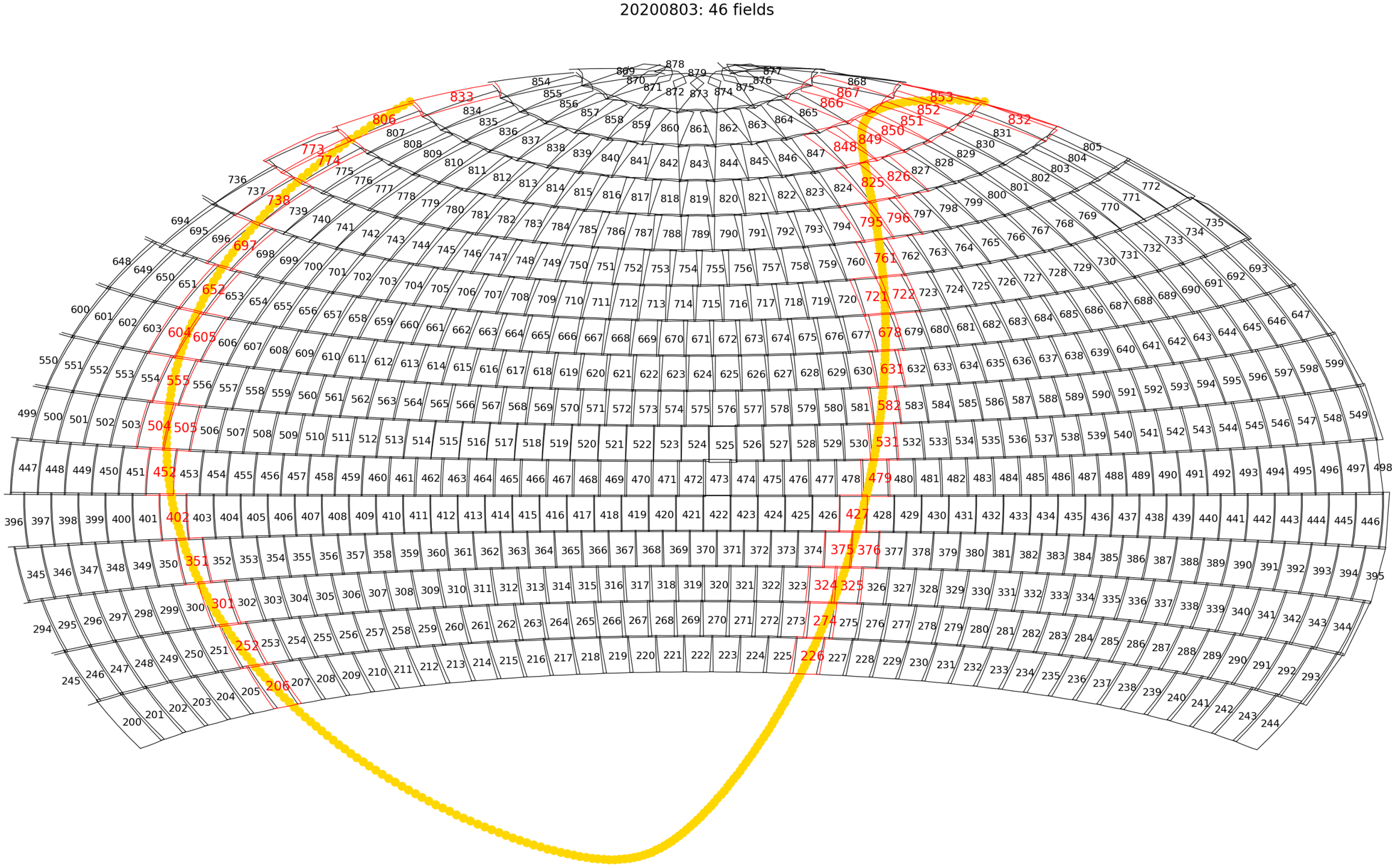
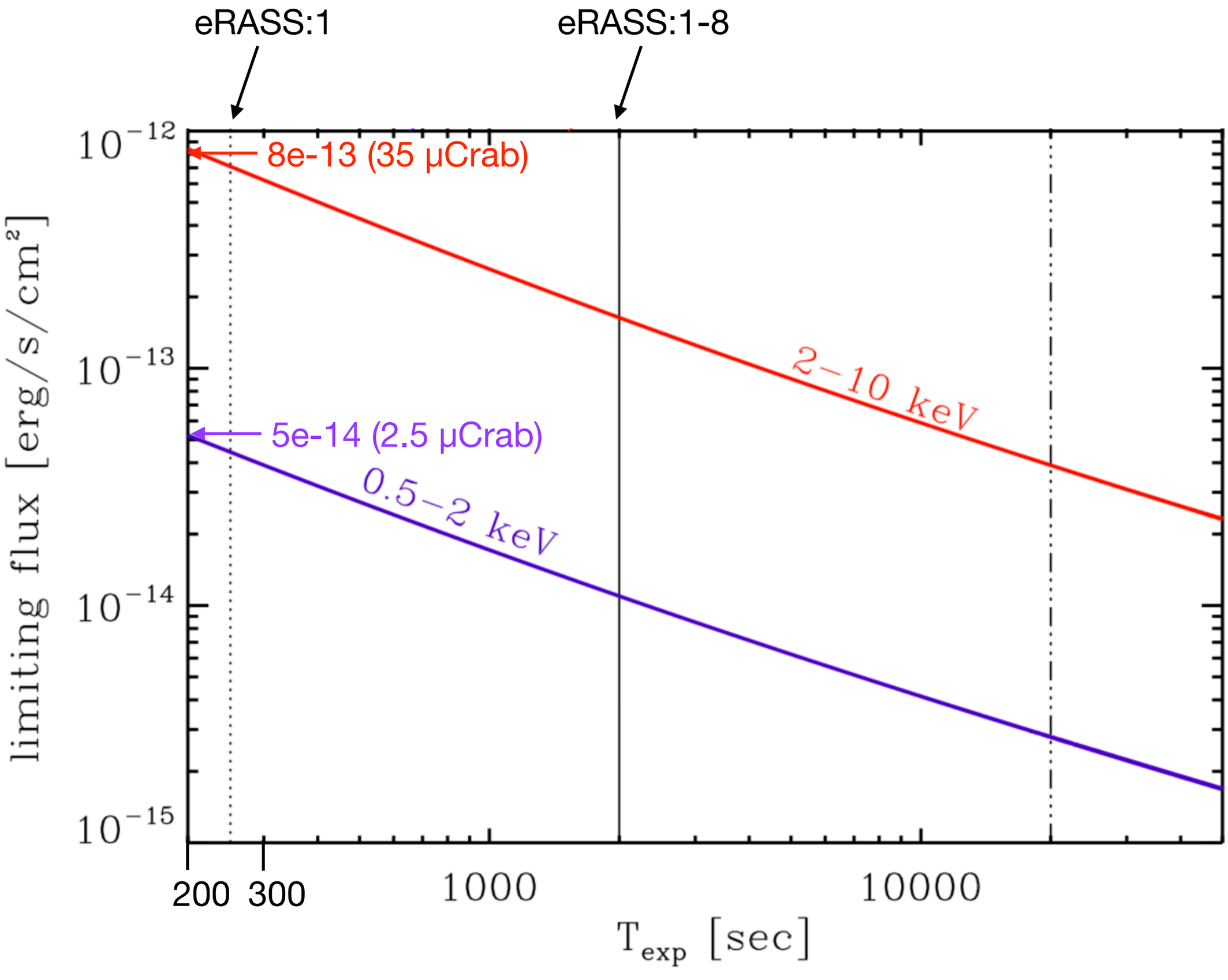
ZTF Observing Strategy (synergy with SRG)

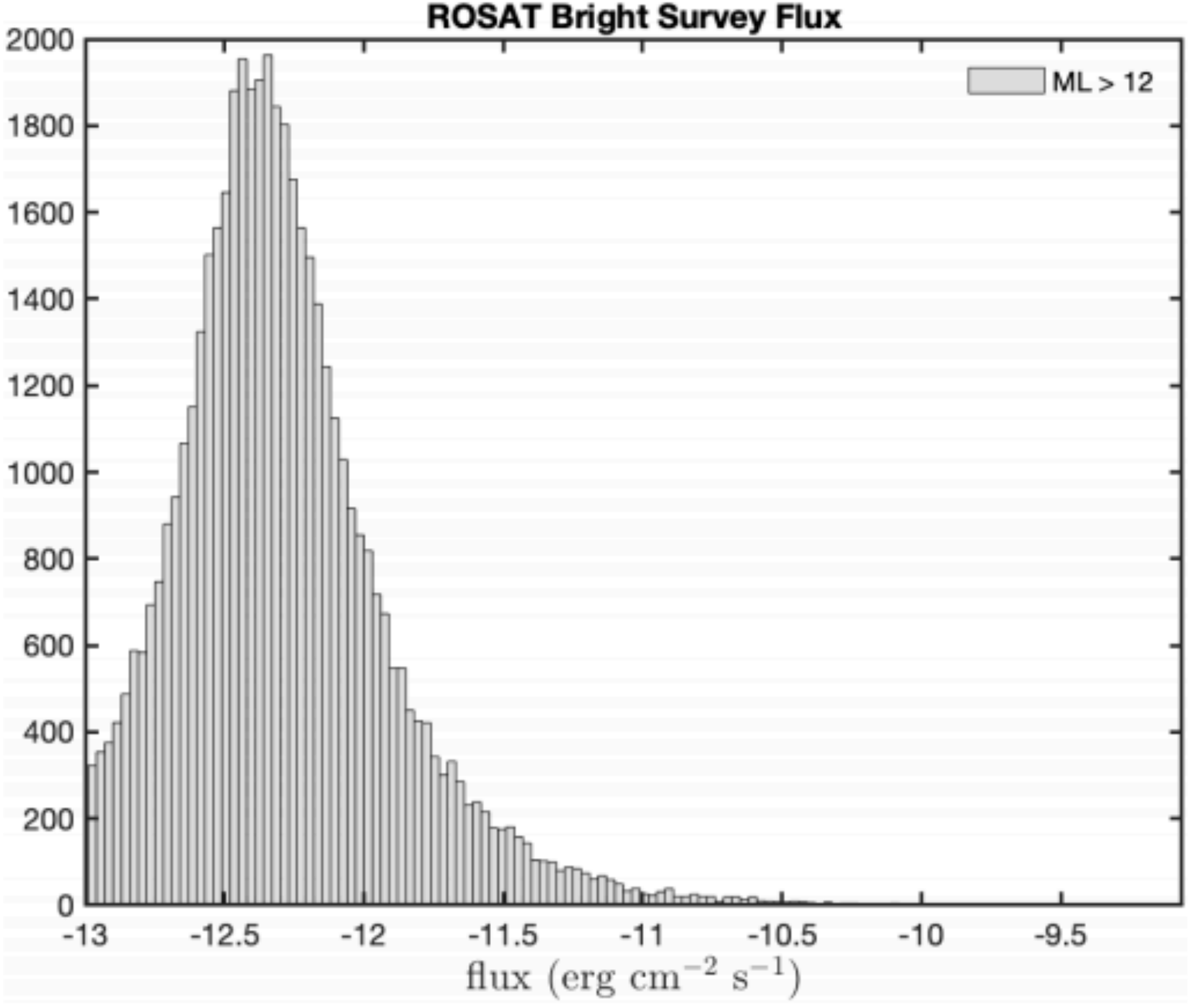


Yuhan’s question: how to know about this more accurately?
Need internal info of satellite pointing.

1mCrab (0.5-2keV) = 2.0e-11 erg cm^-2 s^-1

1mCrab (2-10keV) = 2.3e-11 erg cm^-2 s^-1




ROSAT Bright Survey Flux
ML > 12
2000
1800
1600
1400
1200
1000
800
600
400
200
0
-13
-12.5
-12
-11.5
-11
-10.5
-10
-9.5
flux (erg cm^{-2} s^{-1})

Science

5.1 Clusters of galaxies and cosmology

5.2 Active Galactic Nuclei and normal galaxies

5.3 Stellar mass compact objects

5.4 Stars and stellar systems

5.5 Studies of diffuse X-ray emission: SNRs, superbubbles and the hot ISM

5.6 Solar system studies

5.7 Studying the variable sky with eROSITA

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In [20]: 1e+30 / (4*np.pi*3e+21**2)
Out[20]: 8.841941282883074e-15
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