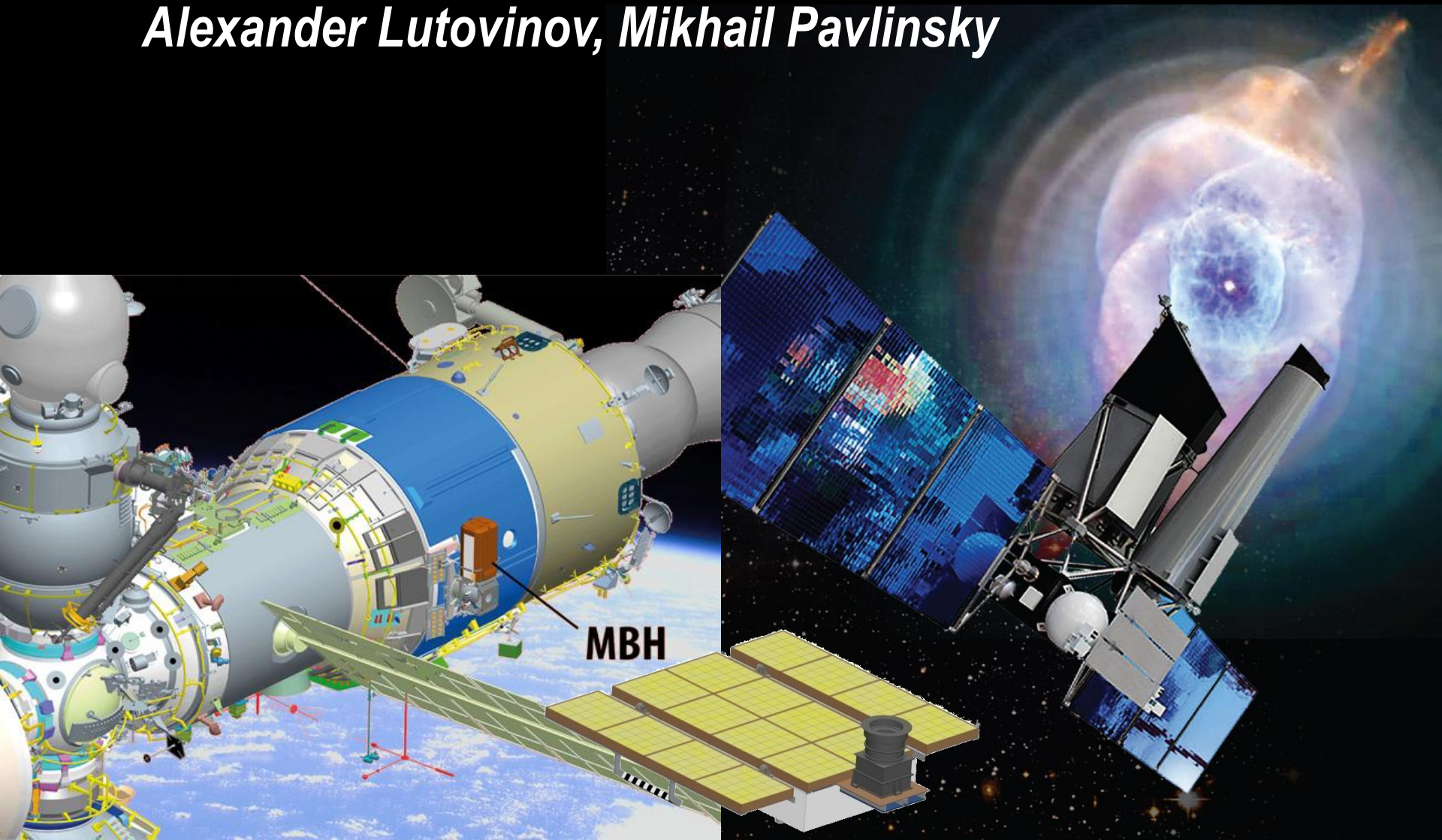
Spectrum–X–Gamma, MVN, G400, etc.

Alexander Lutovinov, Mikhail Pavlinsky



Russian X-/γ-ray space projects

- Spectrum-X(Roentgen)-Gamma
  FMs of telescopes were delivered, expected launch **Mar 2018**

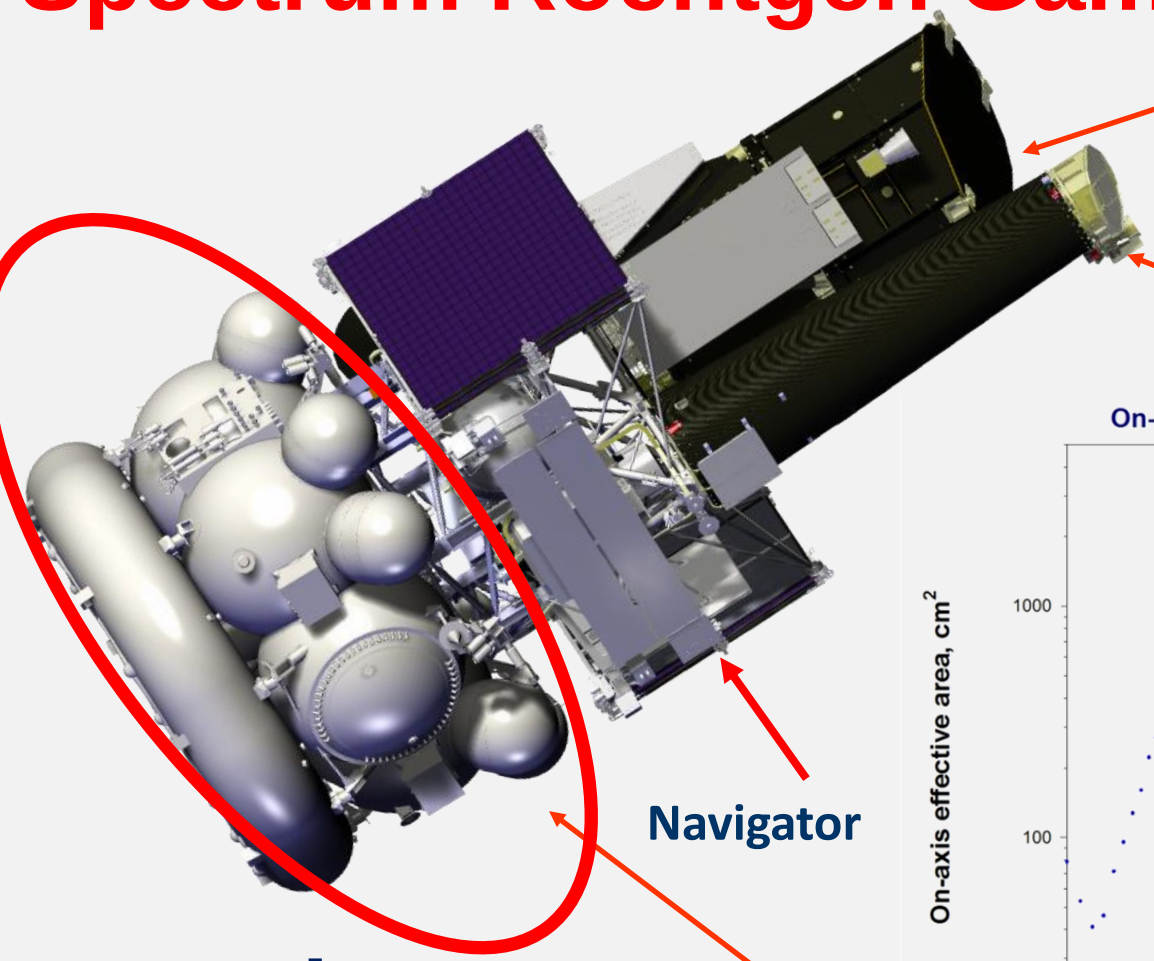
- All-Sky-Monitor (MVN) onboard ISS
  FM assembling, expected delivery middle of **2018**

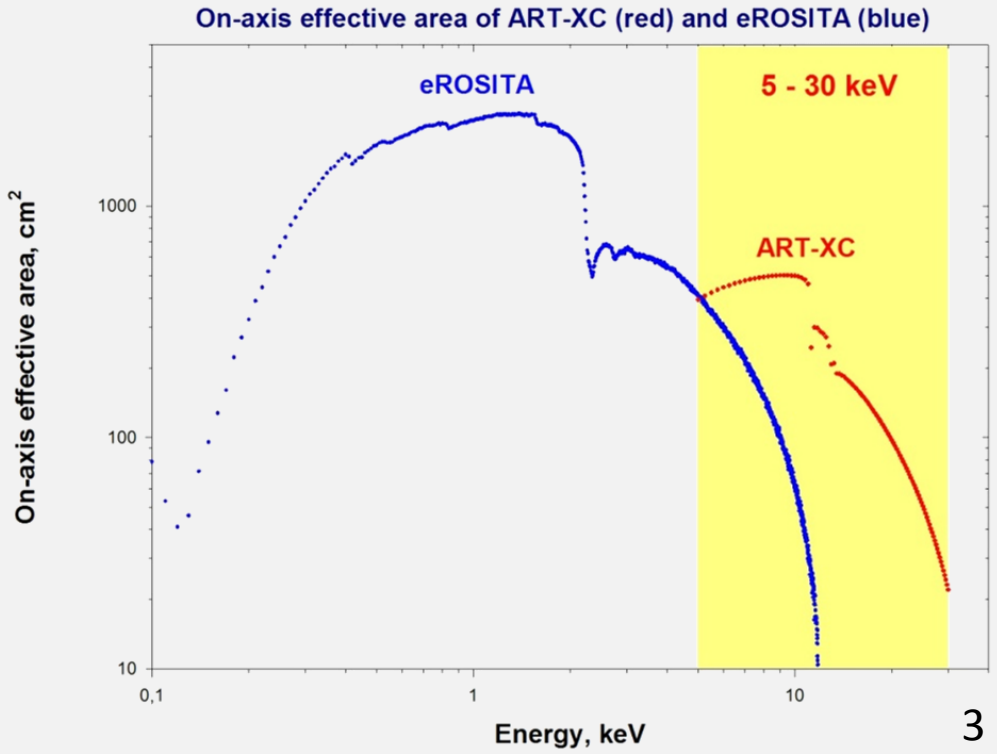
- MVN M2 onboard ISS
  Phase A2 started in 2017

- Gamma-400
  Phase A2 (redesign), expected launch – **after 2025**

SRG

Spectrum Roentgen Gamma



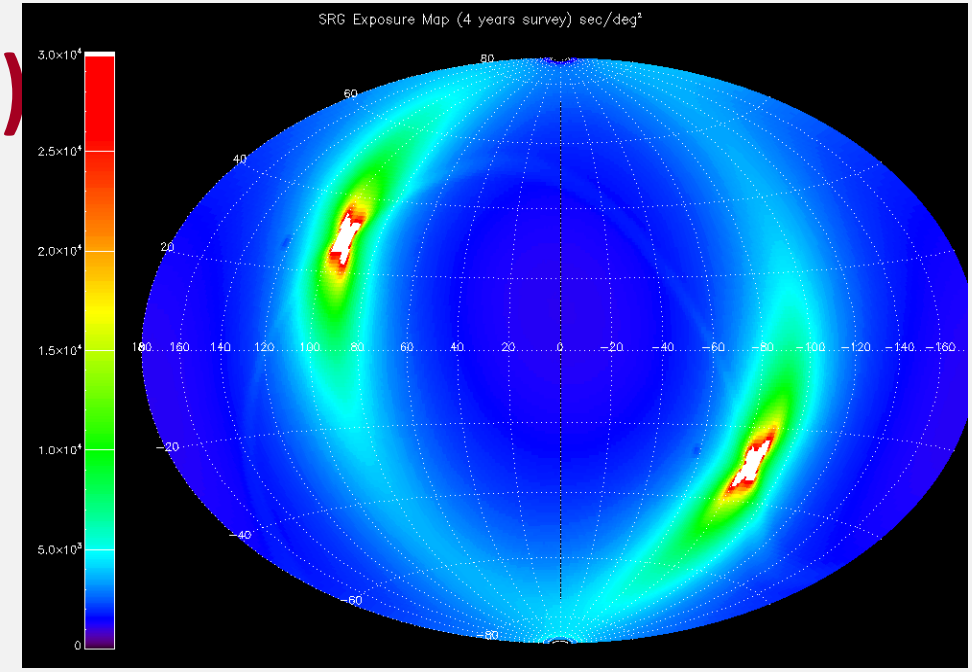


Launch 2018

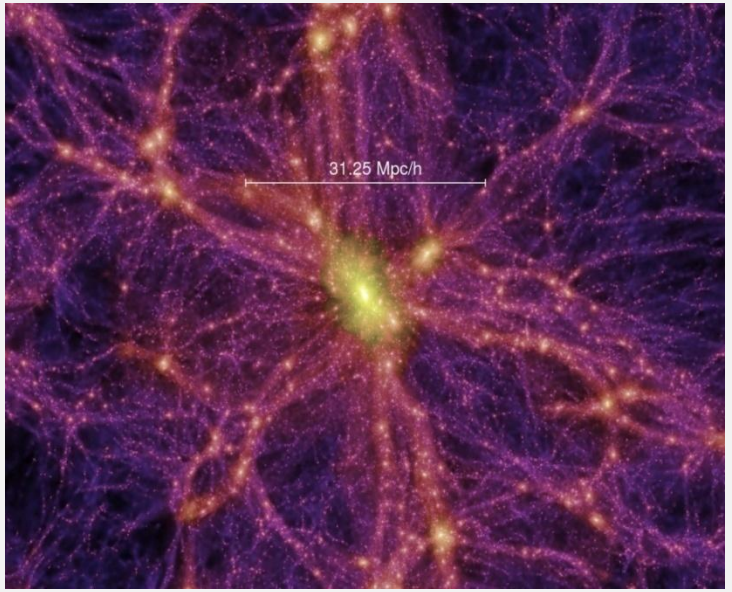
L2 point

Scientific goal: new sensitive all sky survey

(~10^{-14} erg/sec/sq.sm)

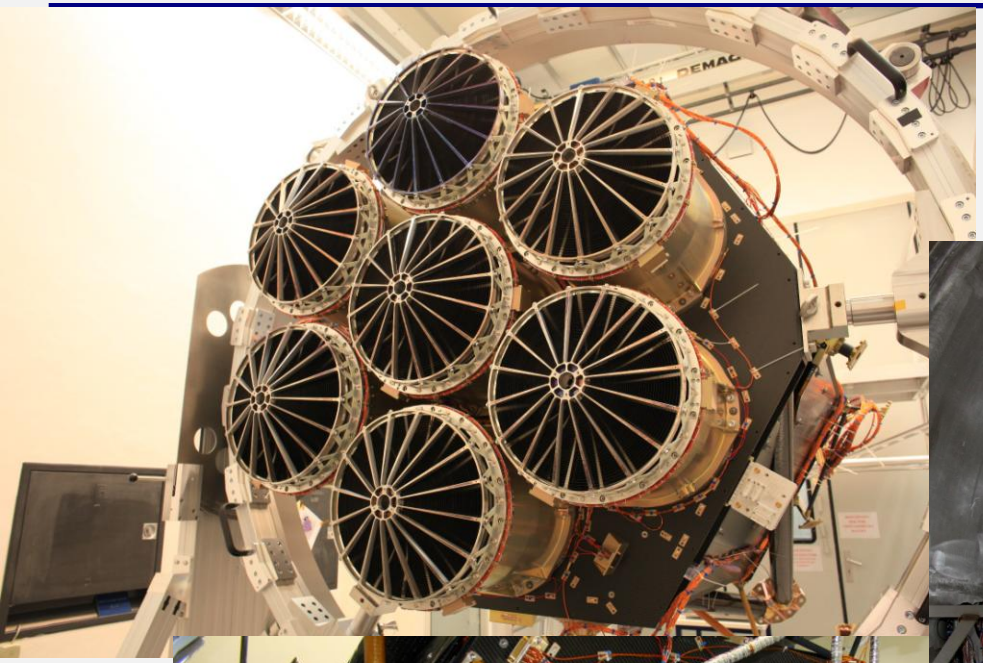


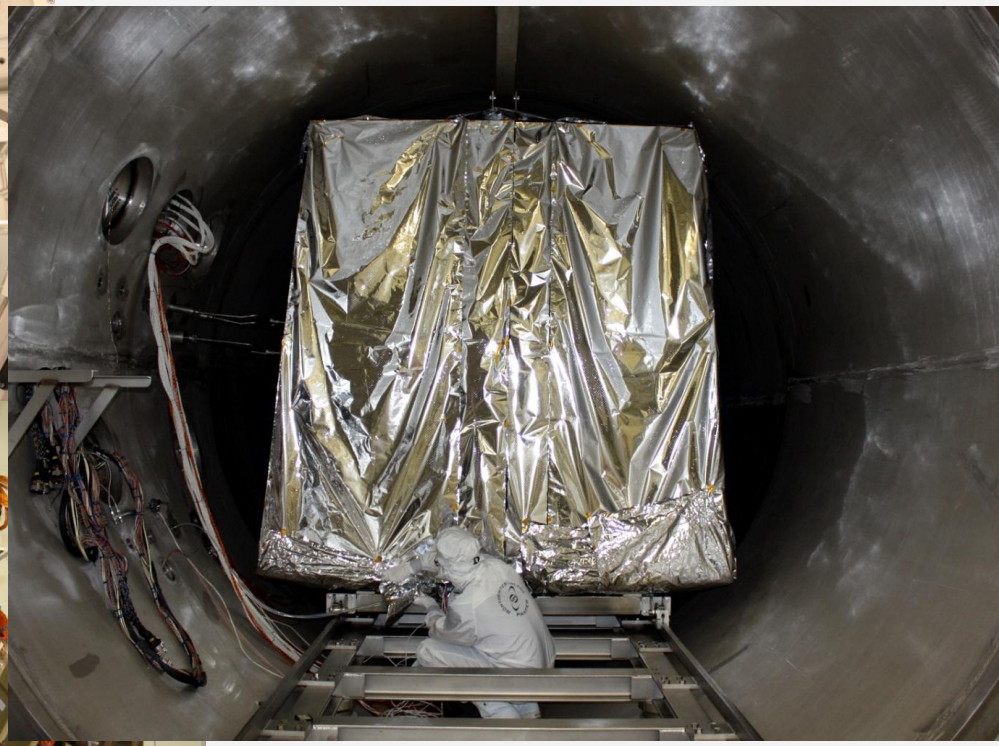
- More than 100 000 clusters of galaxies ⇒ Study of large scale structure
- More than 3 million AGNs ⇒ studies of joint evolution of black holes and galaxies over cosmic time
- Few millions of X-ray active stars ⇒ studies of effects of stellar dynamo and formation of coronae
- More than 100 000 cataclysmic variables

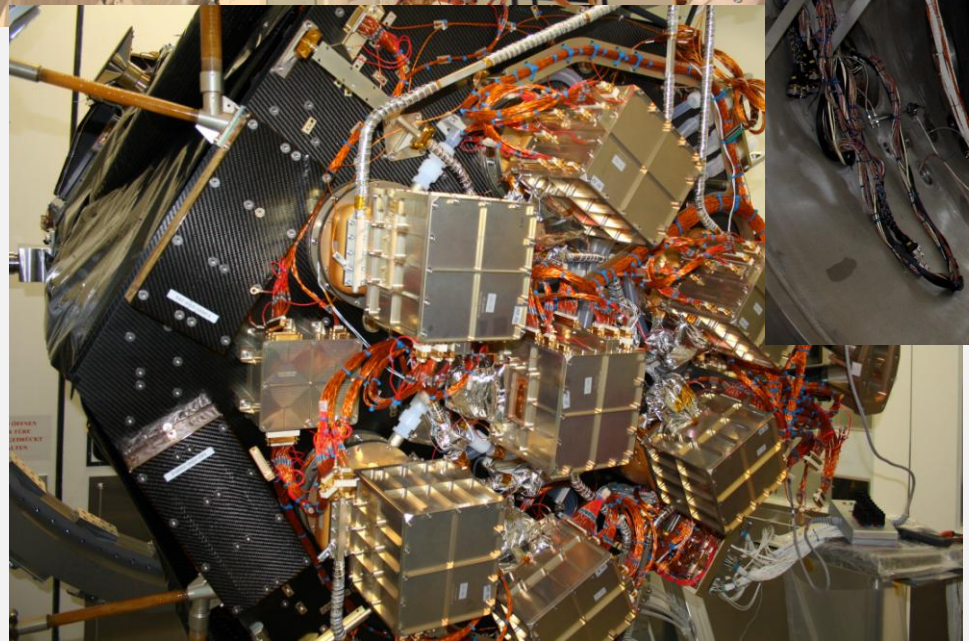


SRG

e-Rosita



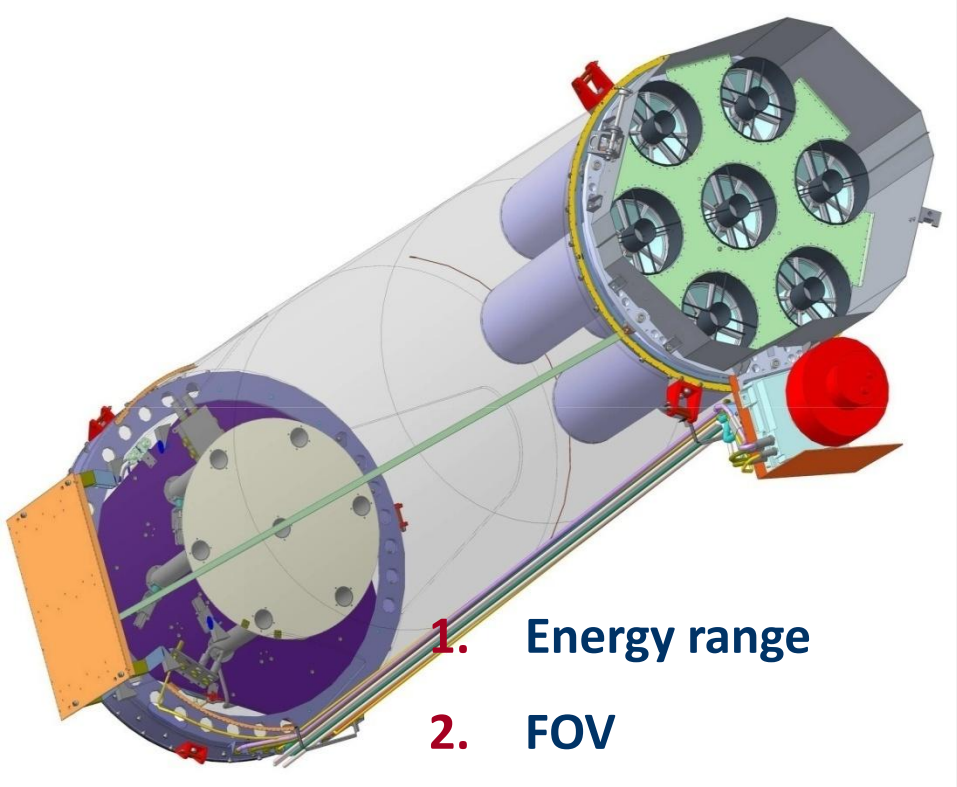




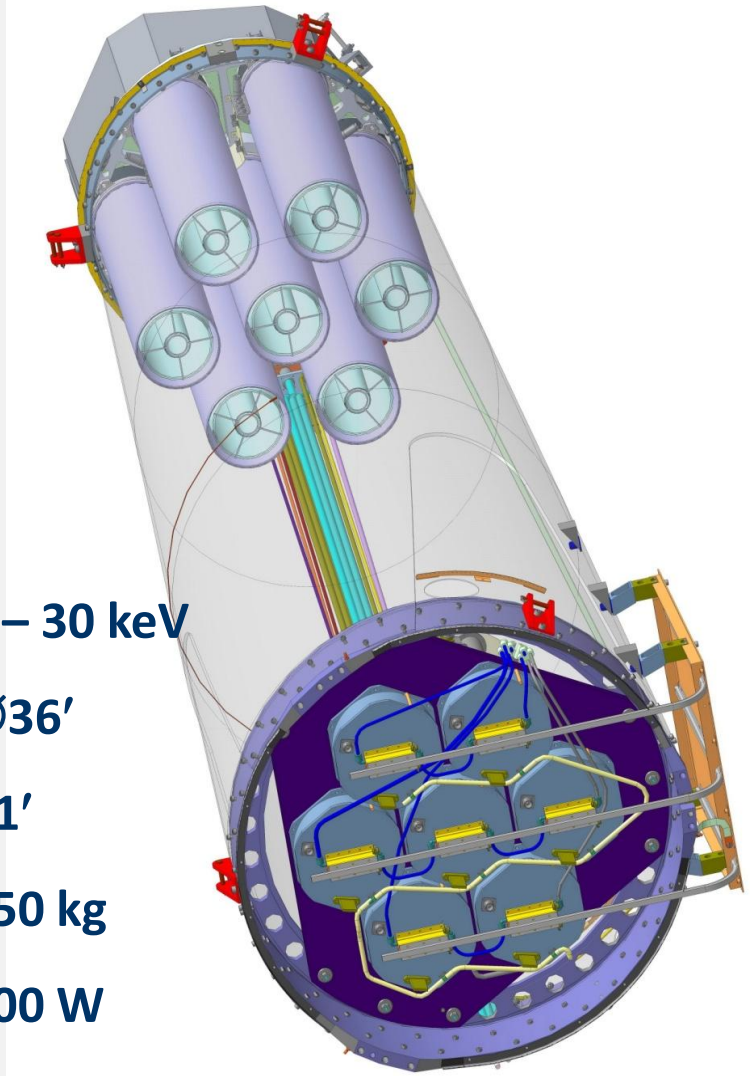
SRG

e-Rosita was delivered to the LA on 25/01/2017

ART-XC

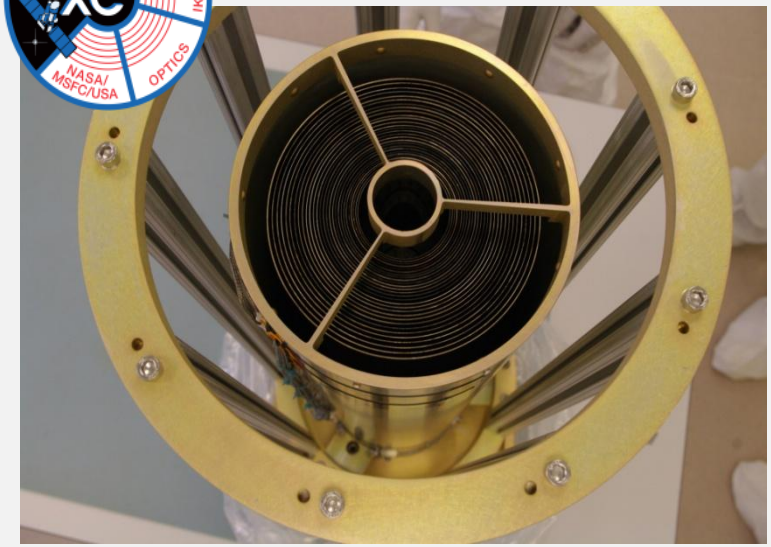


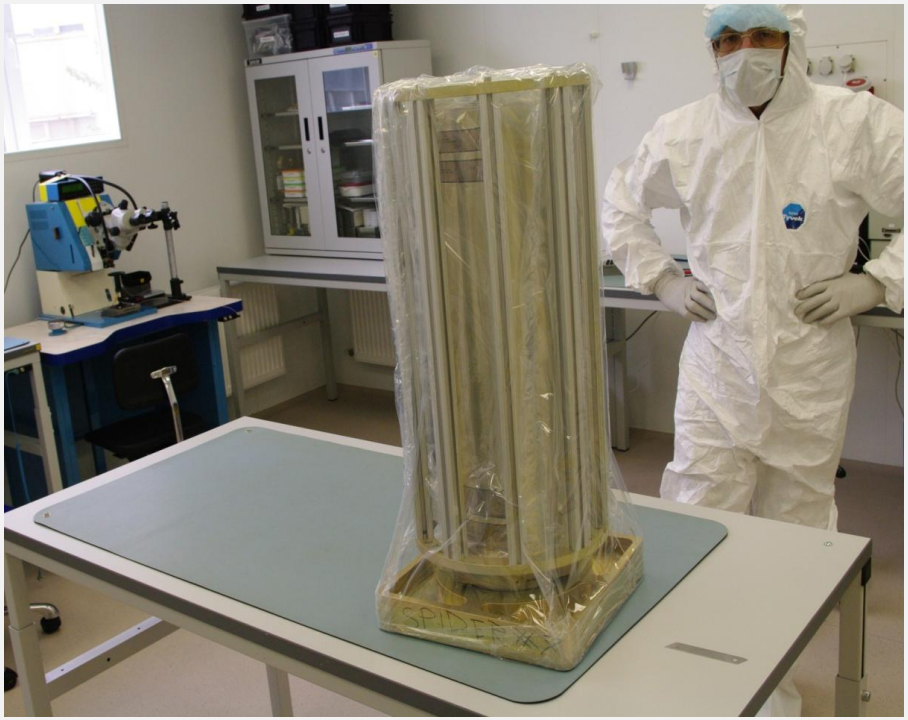
1.	Energy range	5 – 30 keV
2.	FOV	∅36′
3.	On-axis resolution	≤1′
4.	Total weight	350 kg
5.	Power consumption	300 W



SRG

FM MSFC/NASA mirror systems



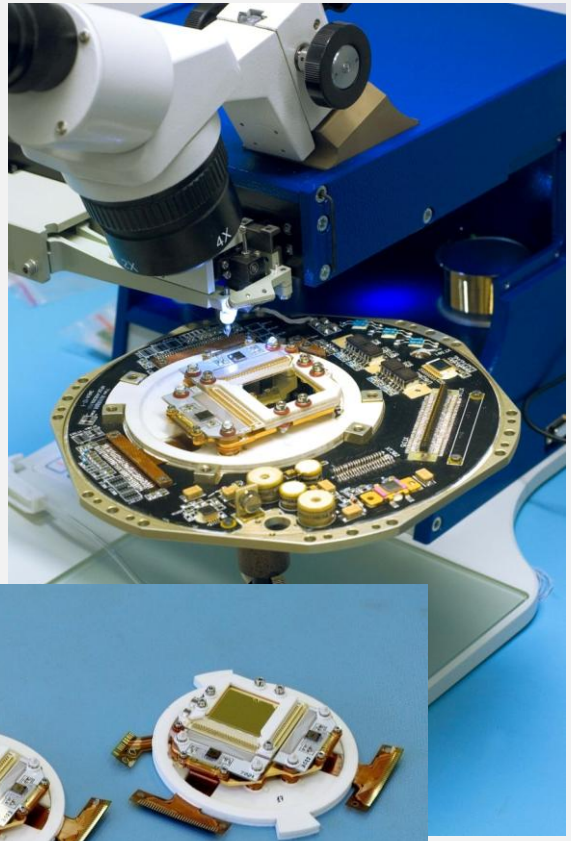


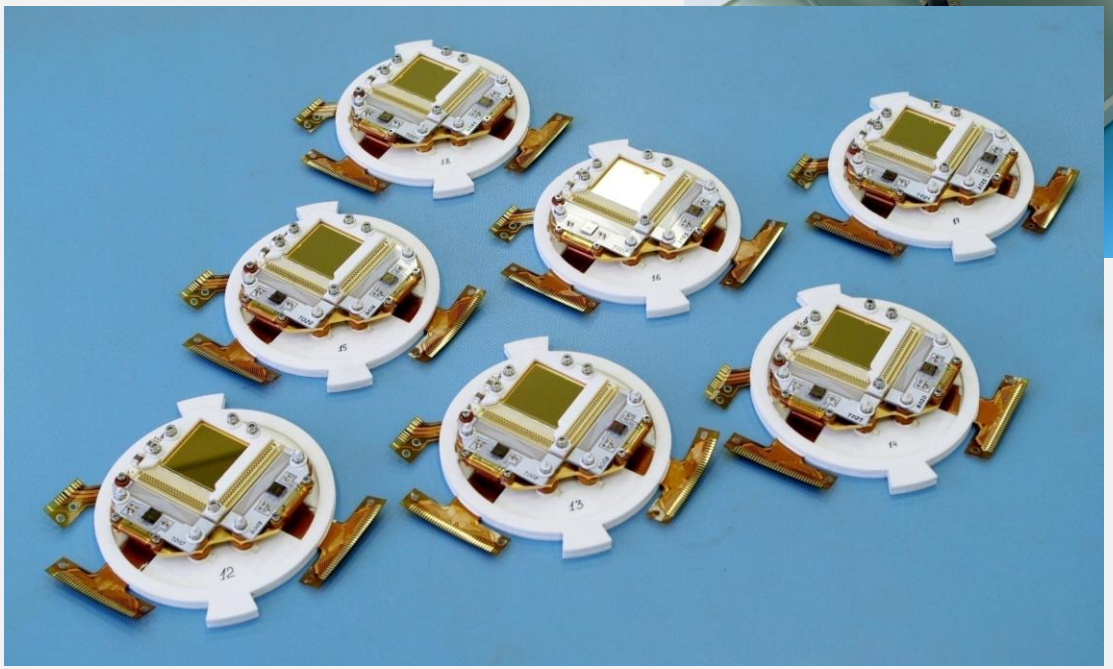
Module #	1	2	3	4
HPD, arcsec	29,7	31,8	32,3	33,7
W90, arcsec	94,1	108,6	101,1	121,9
on axis Eff. Area, cm^2 at 8 keV	71,0	69,0	67,0	65,2

ART-XC: FM DSSD

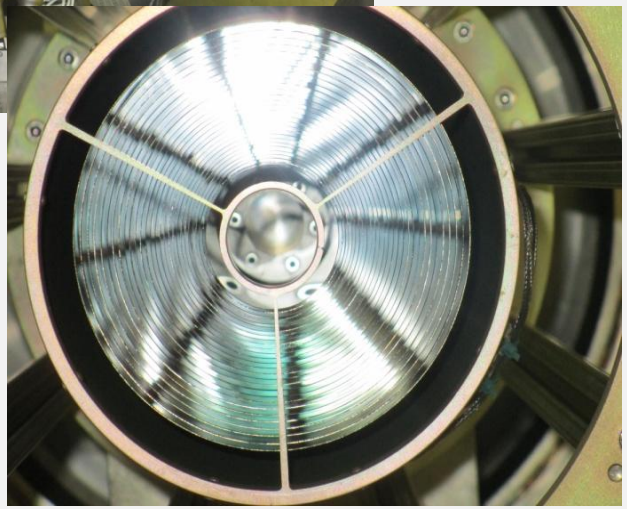
CdTe crystals

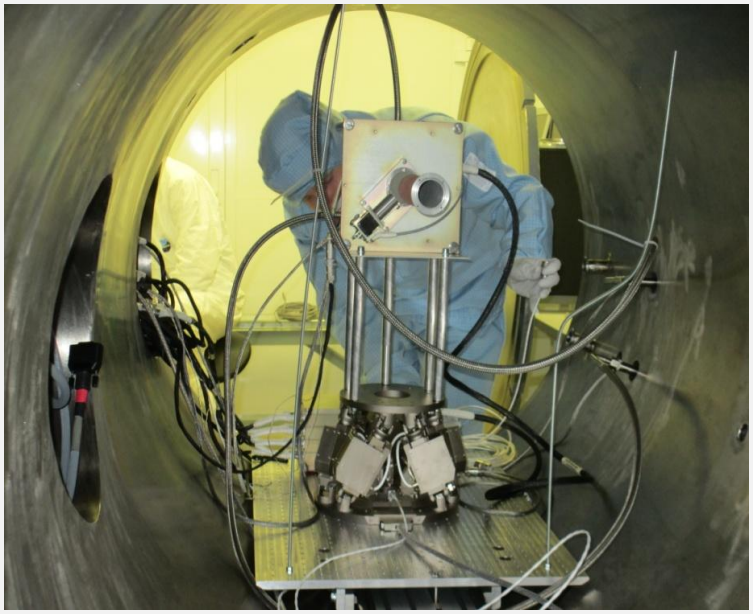
Developed and produced at IKI

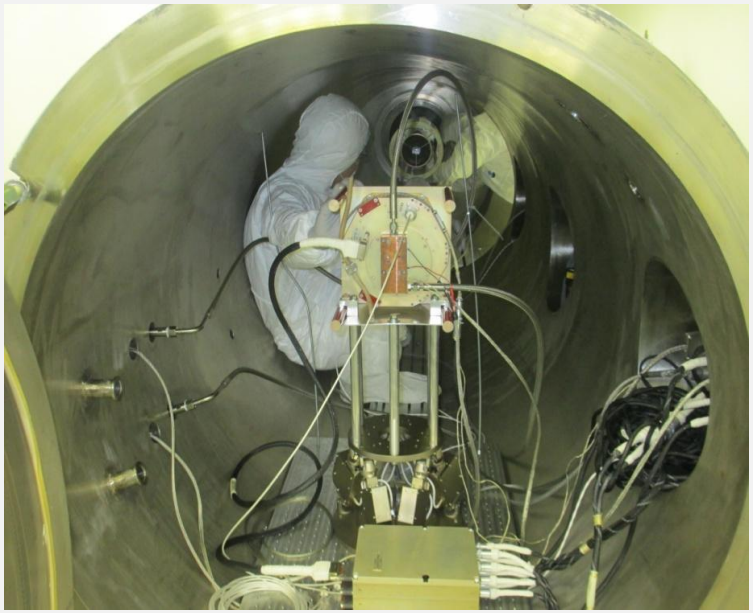




ART-XC: FM MS+CdTe tests at IKI facilities



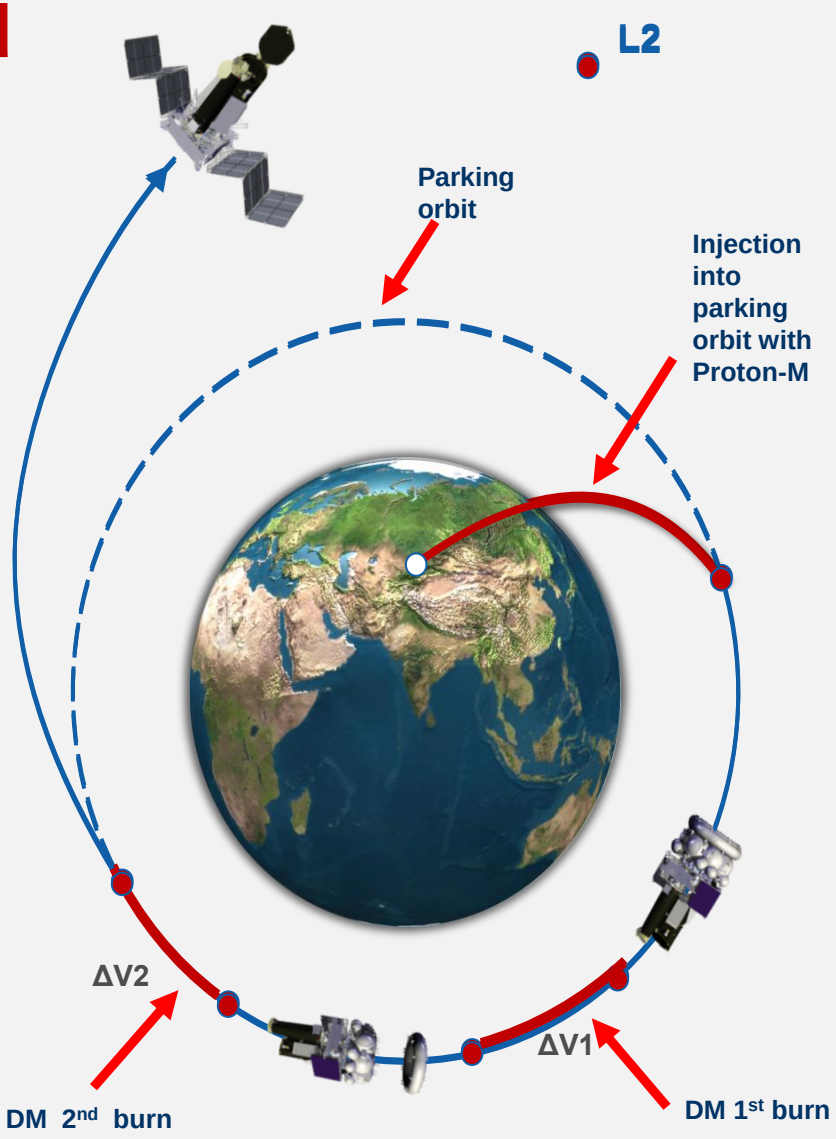




FM of ART-XC was delivered to the LA on 16/12/2016

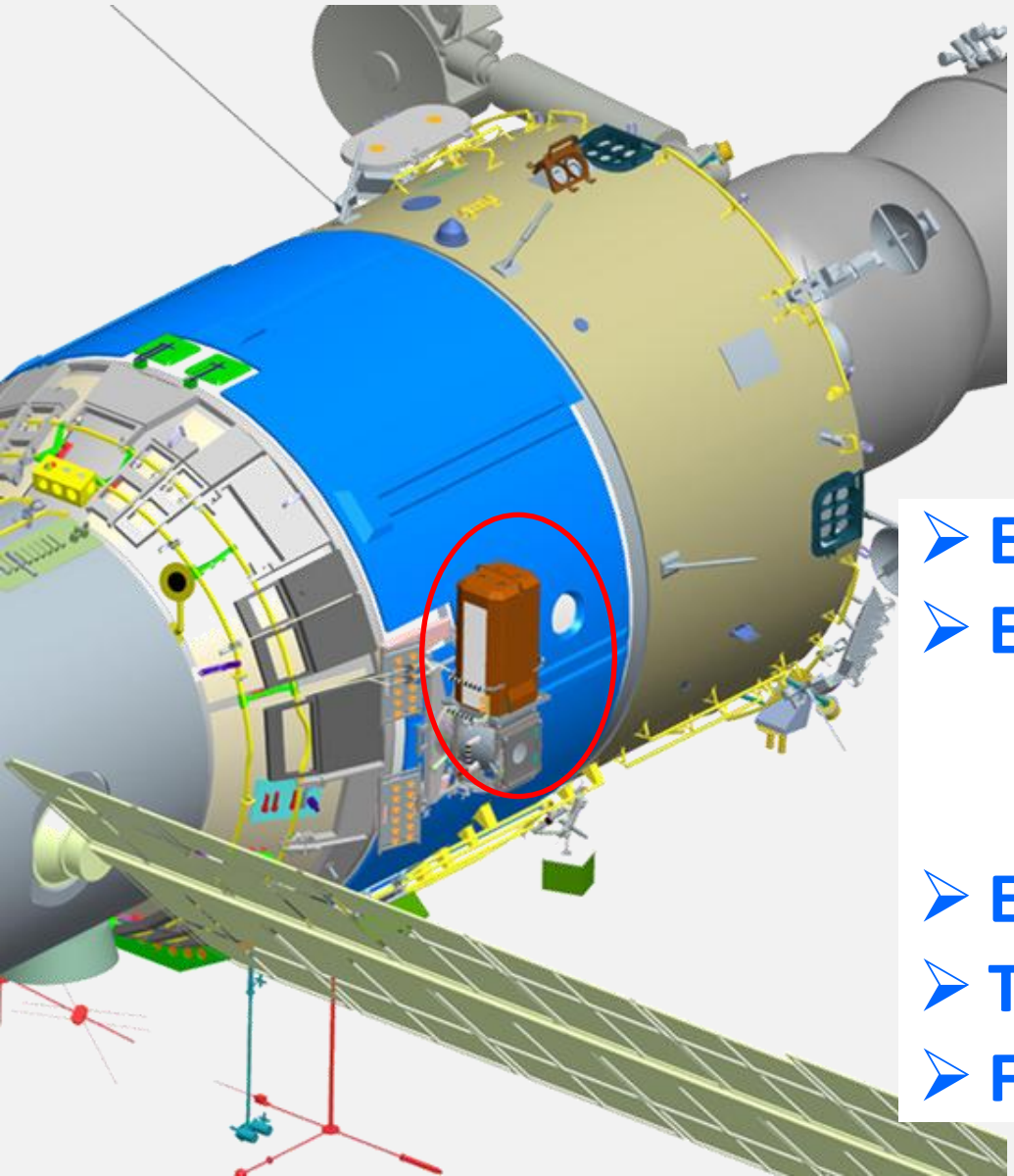
We are ready to flight!

March 2018 PROTON



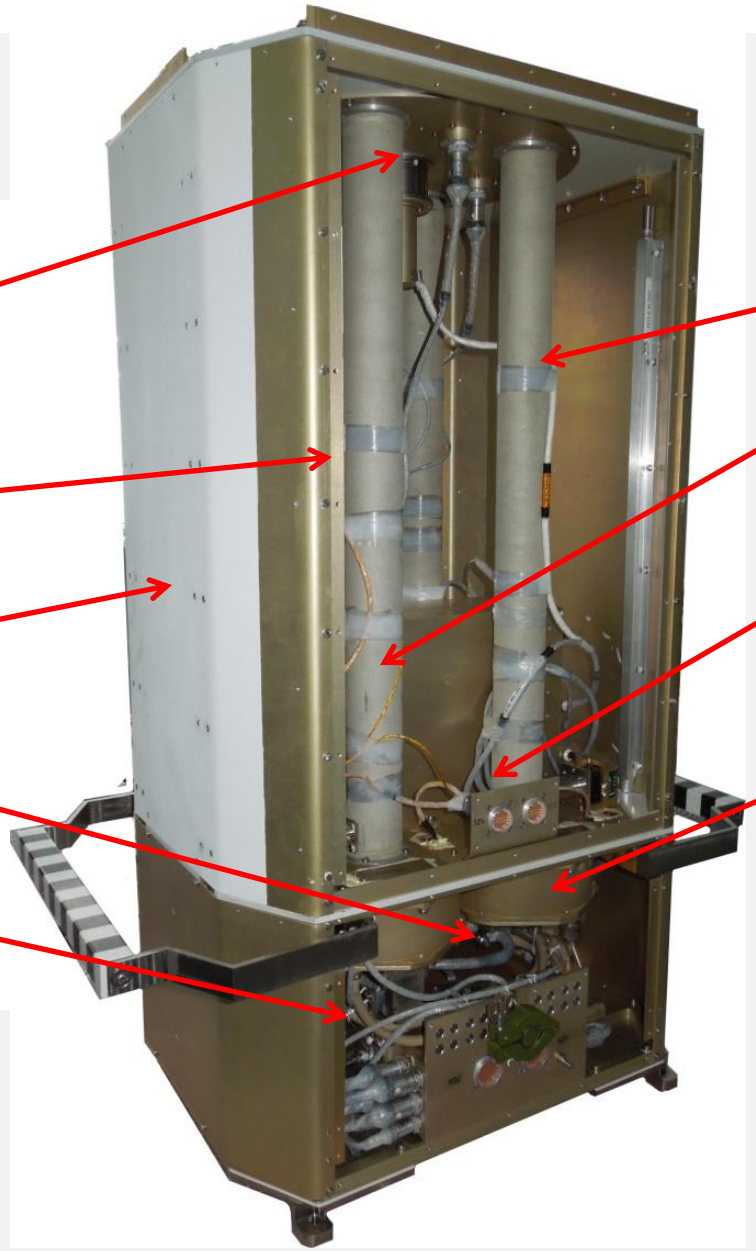
All sky monitor "Monitor Vsego Neba" (MVN) onboard ISS

Delivery to ISS 2018

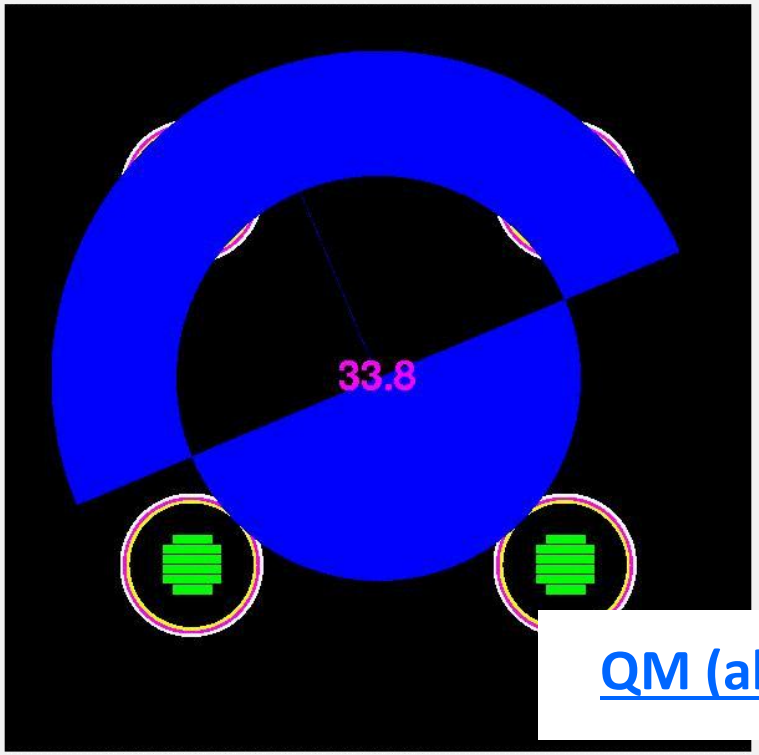


- Energy range 6 – 100 keV
- Energy resolution
  - at 13,9 keV < 1,6 keV
  - at 59,9 keV < 1,8 keV
- Effective area 4x3,88 cm^2
- Time resolution 1 ms
- Field of view $3,2^o$

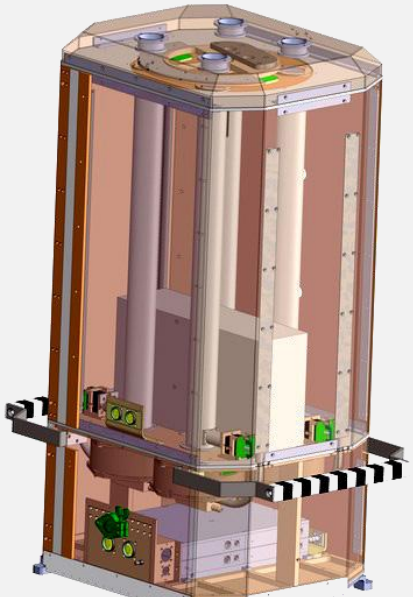
MVN X-ray monitor



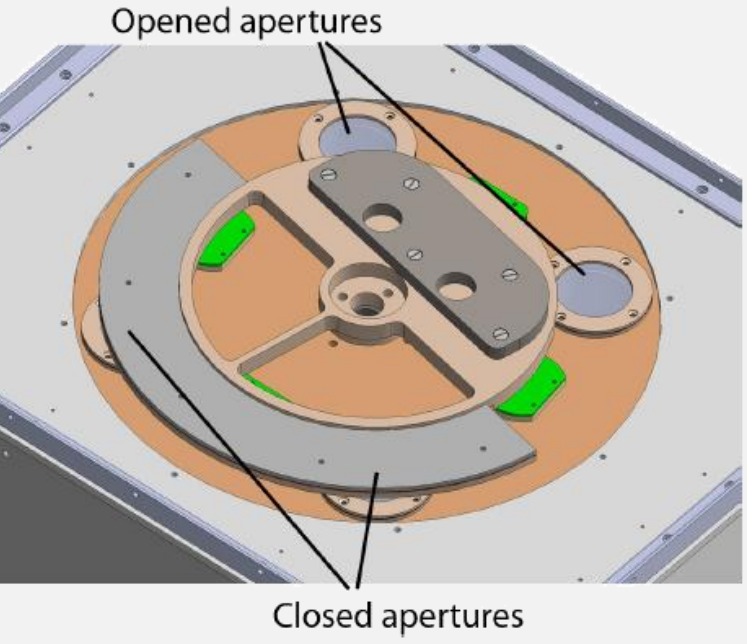
- Aperture Overlapping system
- Collimators
- Radiators
- Switching unit
- Electronic unit
- Heat pipes
- Actuators controller
- Calibration sources module
- X-ray detector assemblages (CdTe)

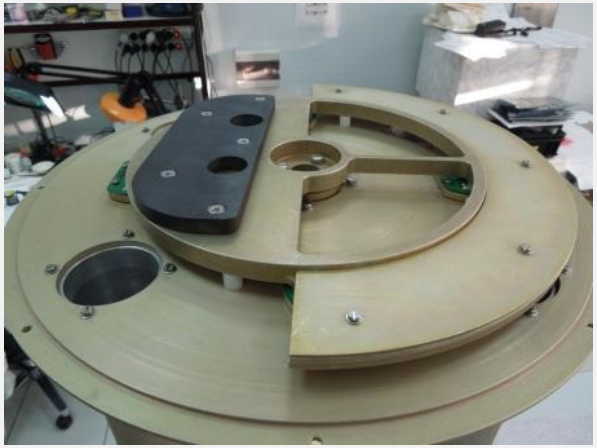


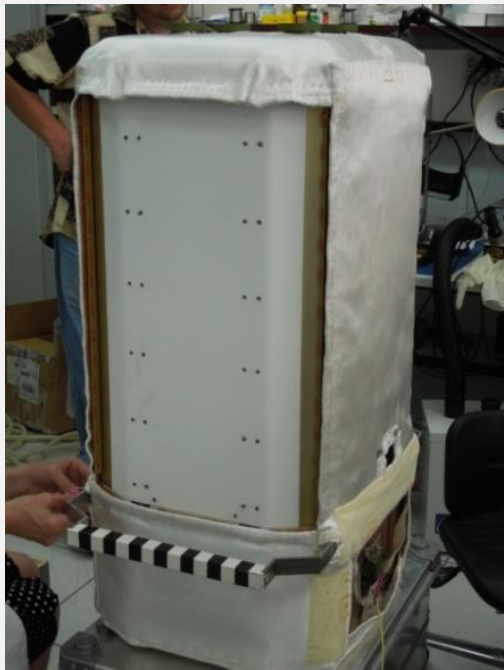
Account instrumental background



[QM (all tests were finished), FM is in the progress]

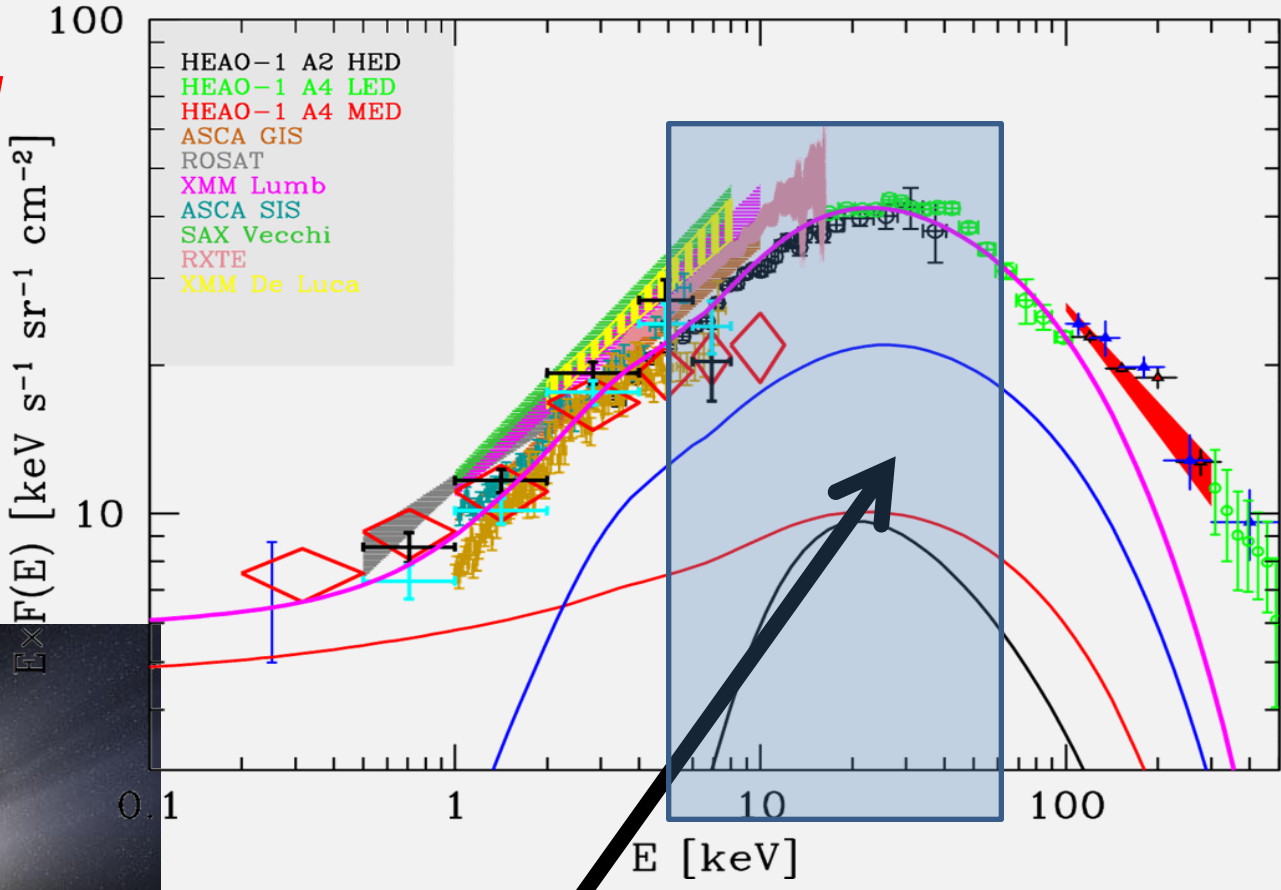


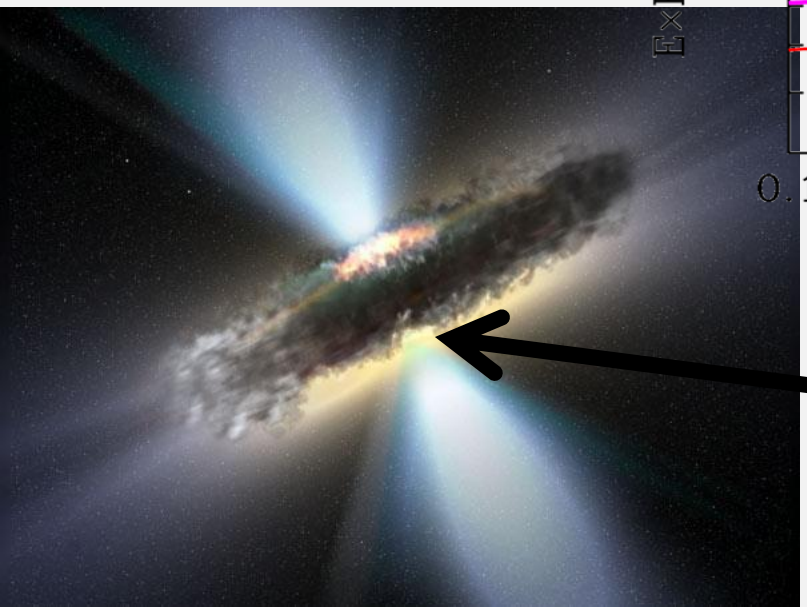




Cosmic X-ray Background

Expected accuracy of measurements ~ 5%

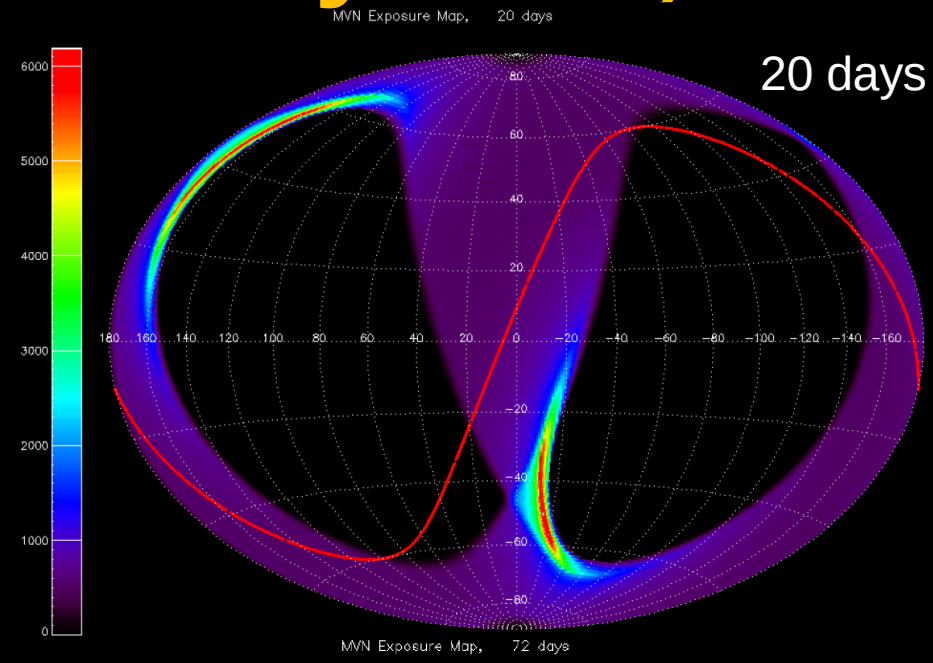


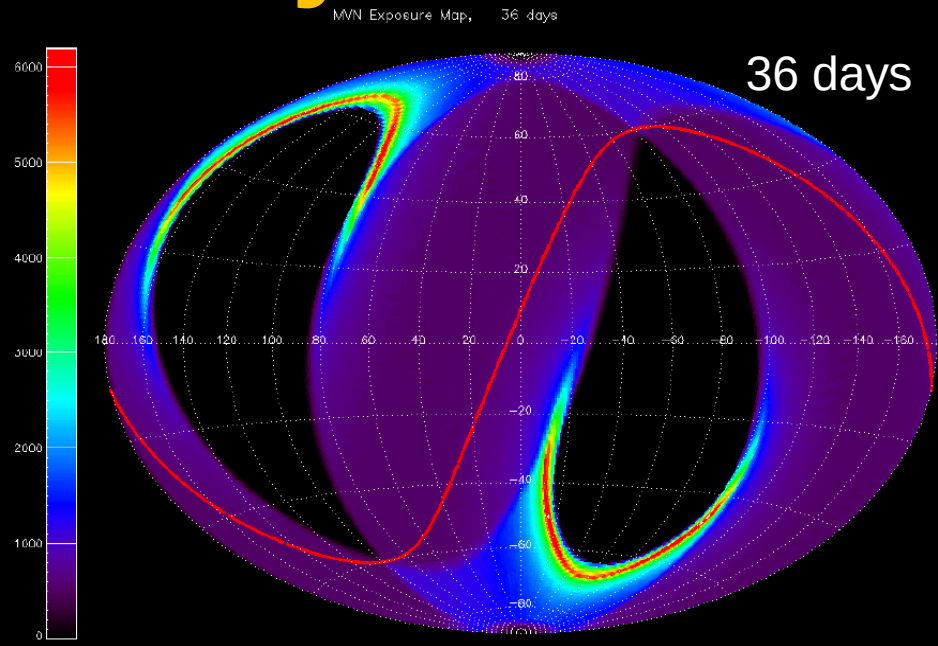


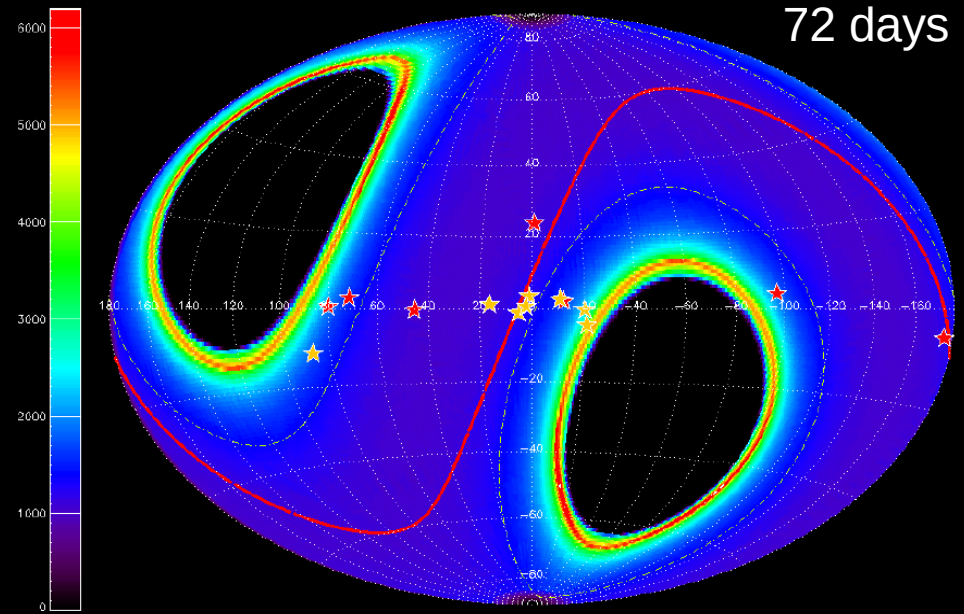
Compt. Thick AGNs

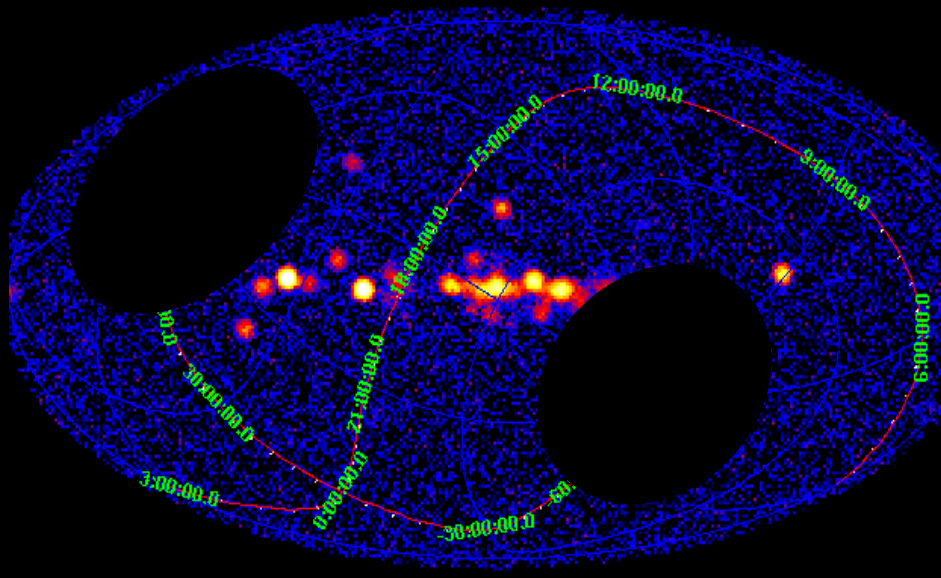
Contribution of "hidden" AGNs

Sky area, covered by MVN-1









ART-XC/G400

Gamma-400 (Phase A2)

2015-2016 – significant redesign of the project

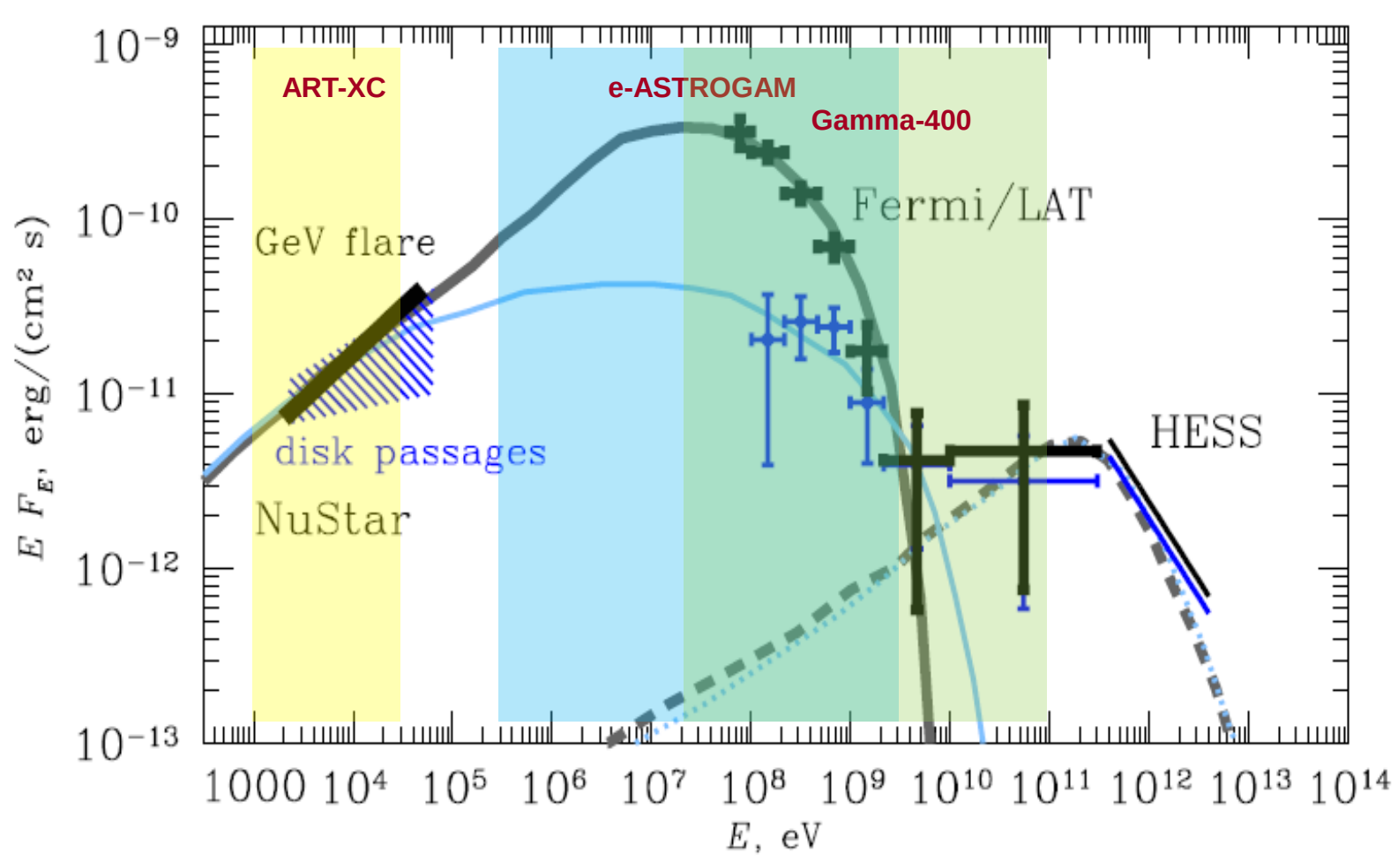
Decrease of the mass down to 2.5 t (standard Navigator)
Shift of the working range to the soft energies (<1GeV)
Inclusion of the X-ray telescope to the payload

Goals of X-ray telescope new ART-XC/G400:

1) Support of gamma ray telescope observation in X-ray energy band
2) Deep survey of the Center of Galaxy, Galactic ridge and arms
3) X-ray pulsars, bright transients

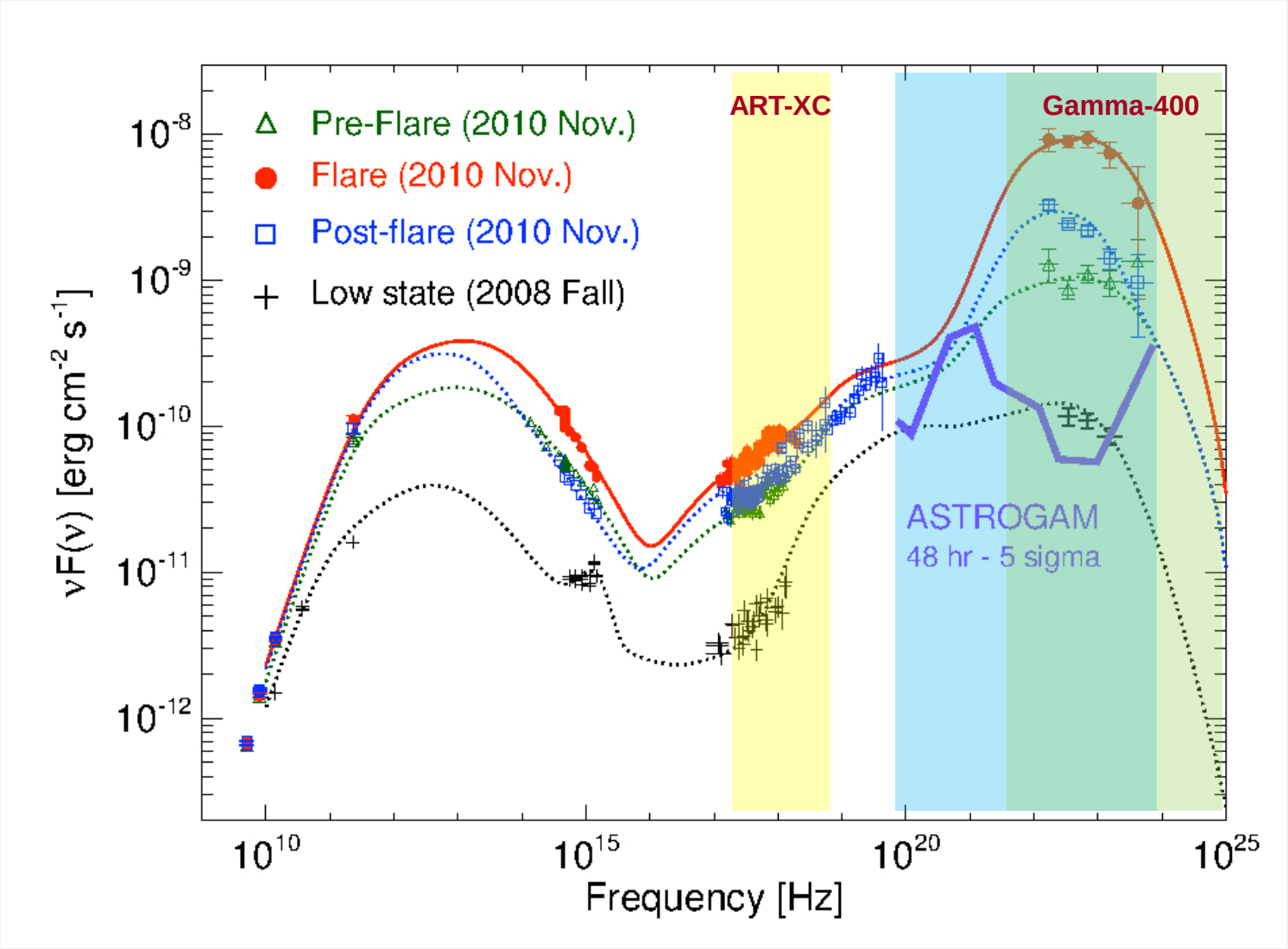
ART-XC/G400

PSR B1259-63 – high-mass γ-ray emitting binary system with a young pulsar companion

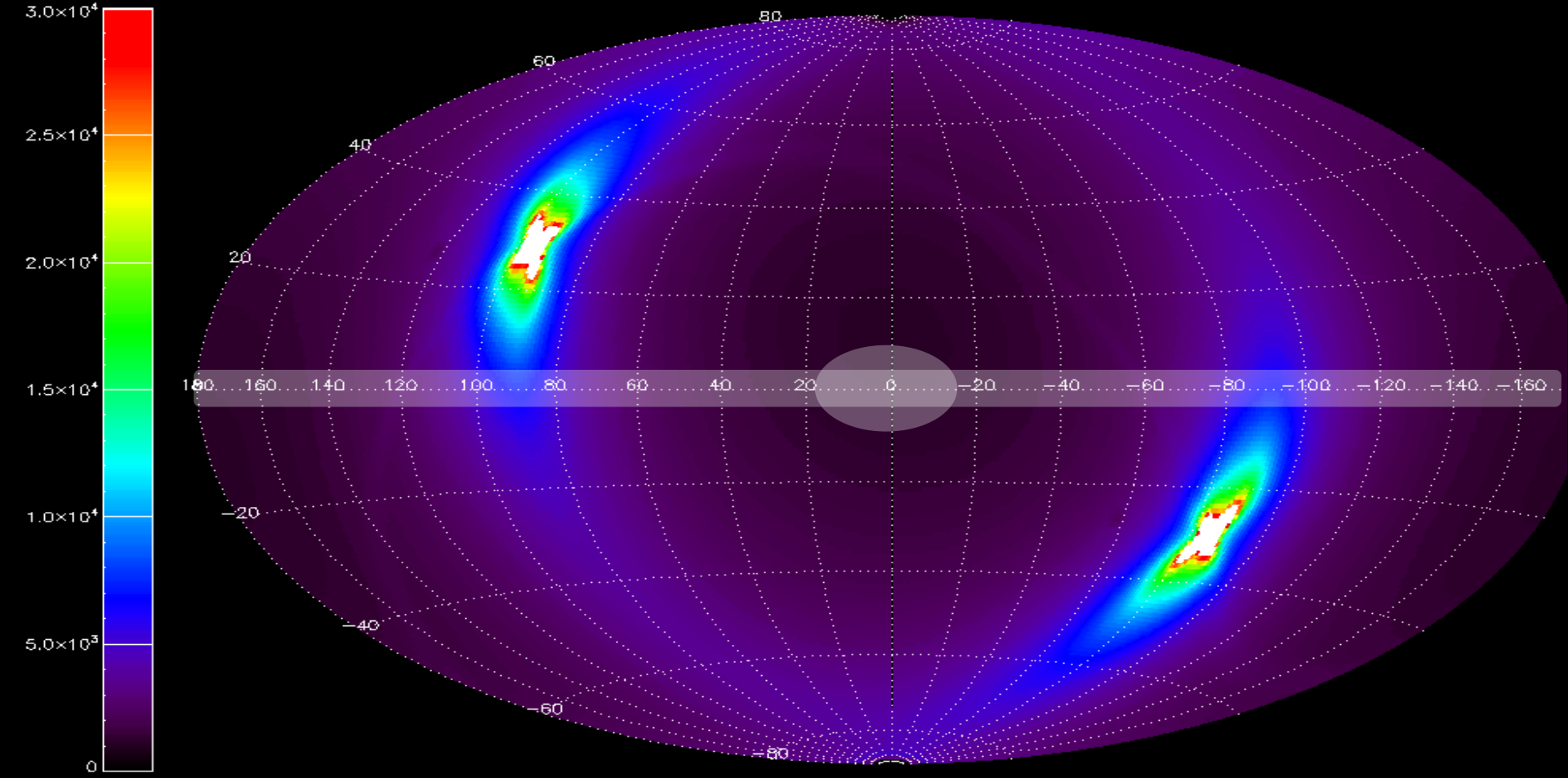


ART-XC/G400

Blazar 3C 454.3



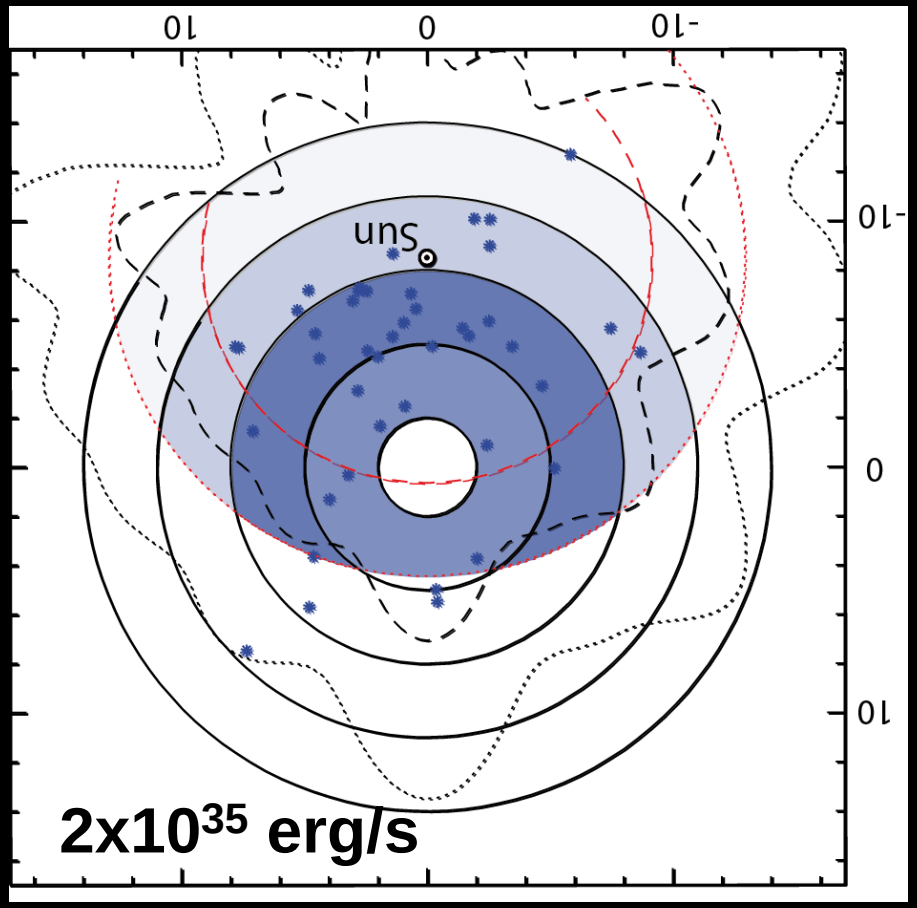
Map exposure of SRG survey after 4 years (sec/deg^2)
~1.2×10^8 sec for survey of the sky 41253 deg^2



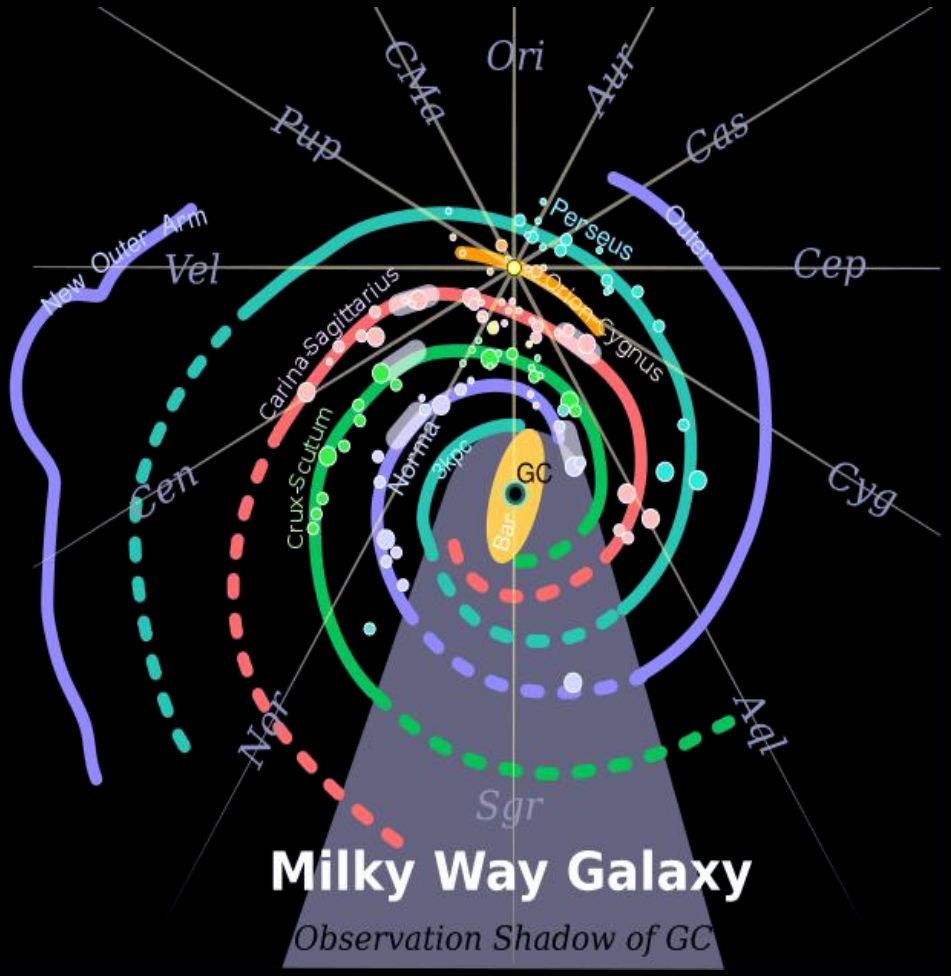
G400 ⇒ ~1.3×10^8 sec, survey 360×4 + 160 = 1600 deg^2

ART-XC/G400, 8 – 24 keV
exposure time ~8×10^4 sec/deg^2 ⇒ 10^{-13} erg s^{-1} cm^{-2}

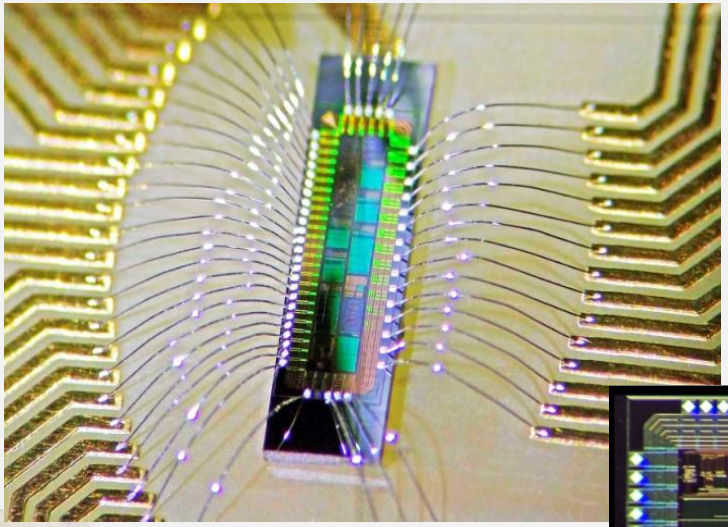
INTEGRAL, 17-60 keV

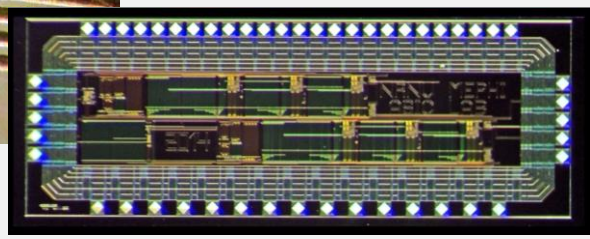


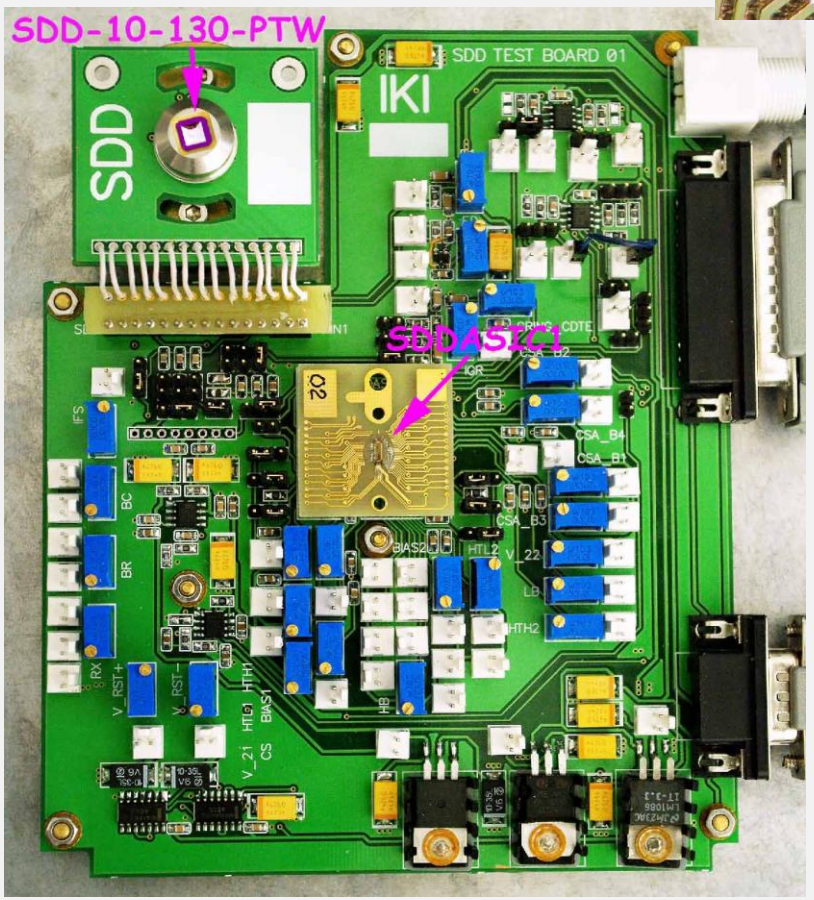
5x10^{33} erg/s at 20 kpc

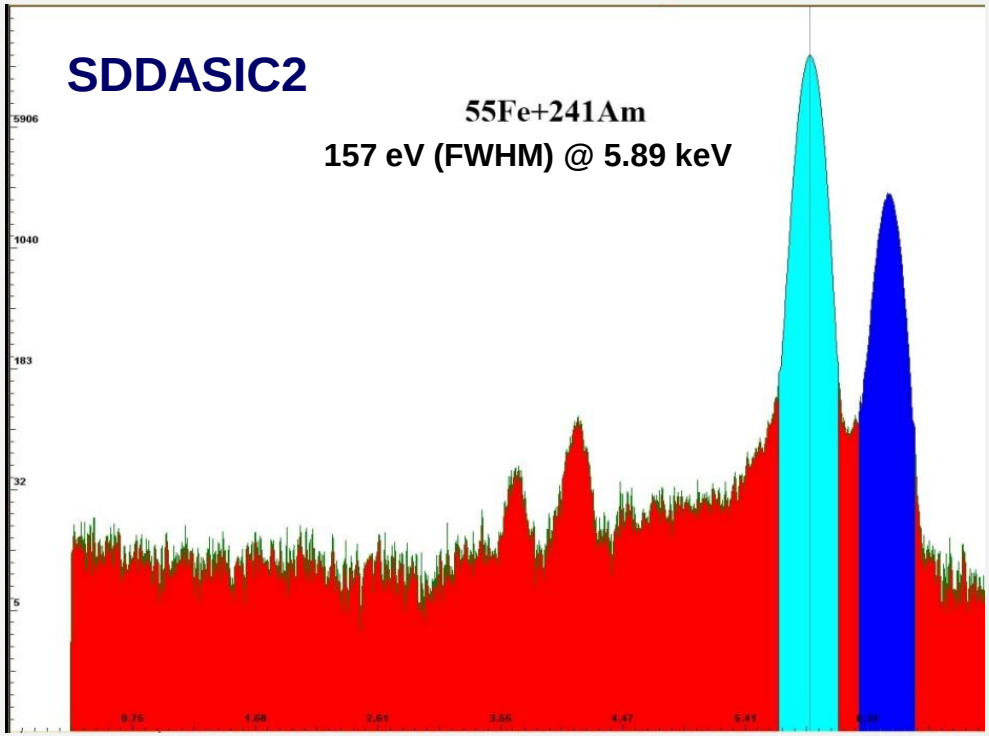


SDD + ASIC



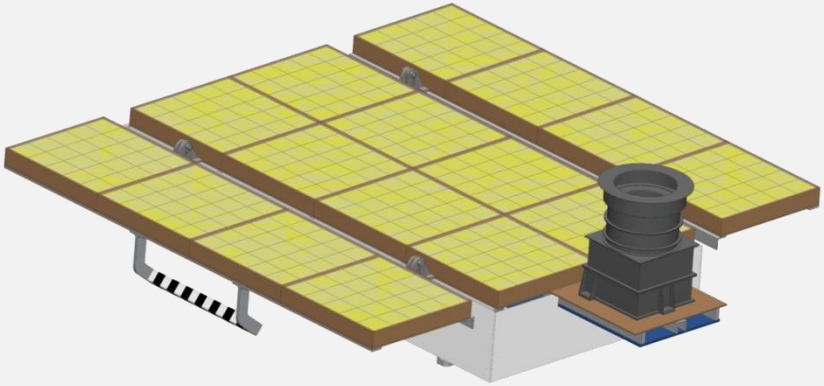


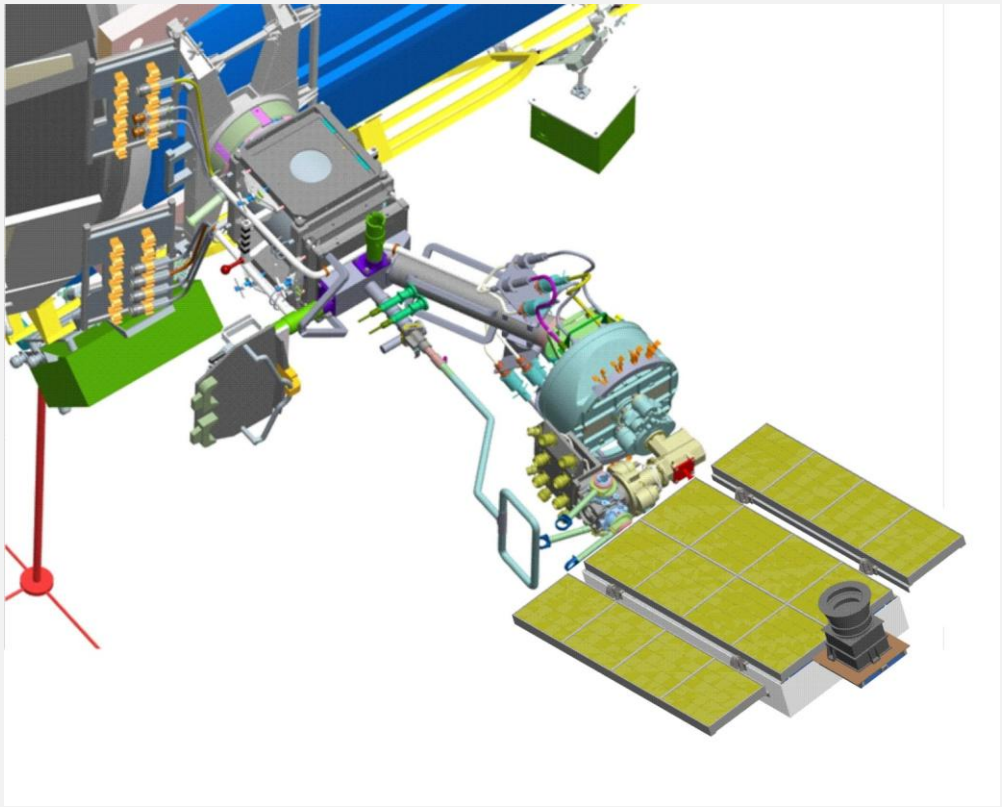

SDD-10-130-PTW
SDD TEST BOARD 01
IKI
SDD
SDDASIC1


SDDASIC2
55Fe+241Am
157 eV (FWHM) @ 5.89 keV
5906
1040
183
32
5

MVN M2 (spectrometer ~1 m²) – pathfinder to any mission with LAD

Available rotating platform on Russian segment of ISS





Phase A2 started in **2017**

Final design of the project **Sep 2018**

Pathfinder for eXTP/LAD?

Thank you for your attention!