

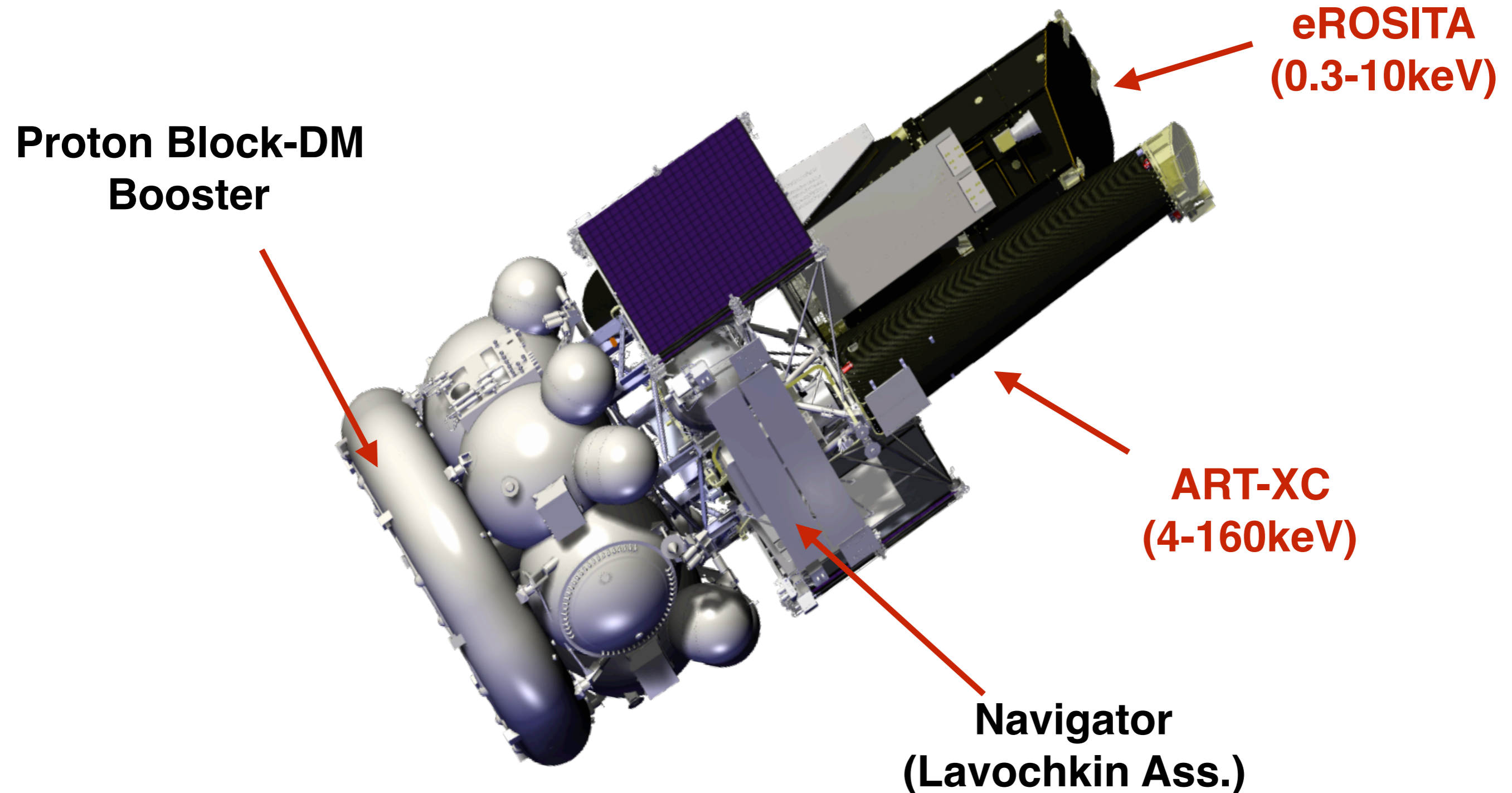
Spectrum-Röntgen- Gamma (SRG)

Overview for TDA-MMS Meeting (2018 Feb 8-10,
Tokyo/Nikko)

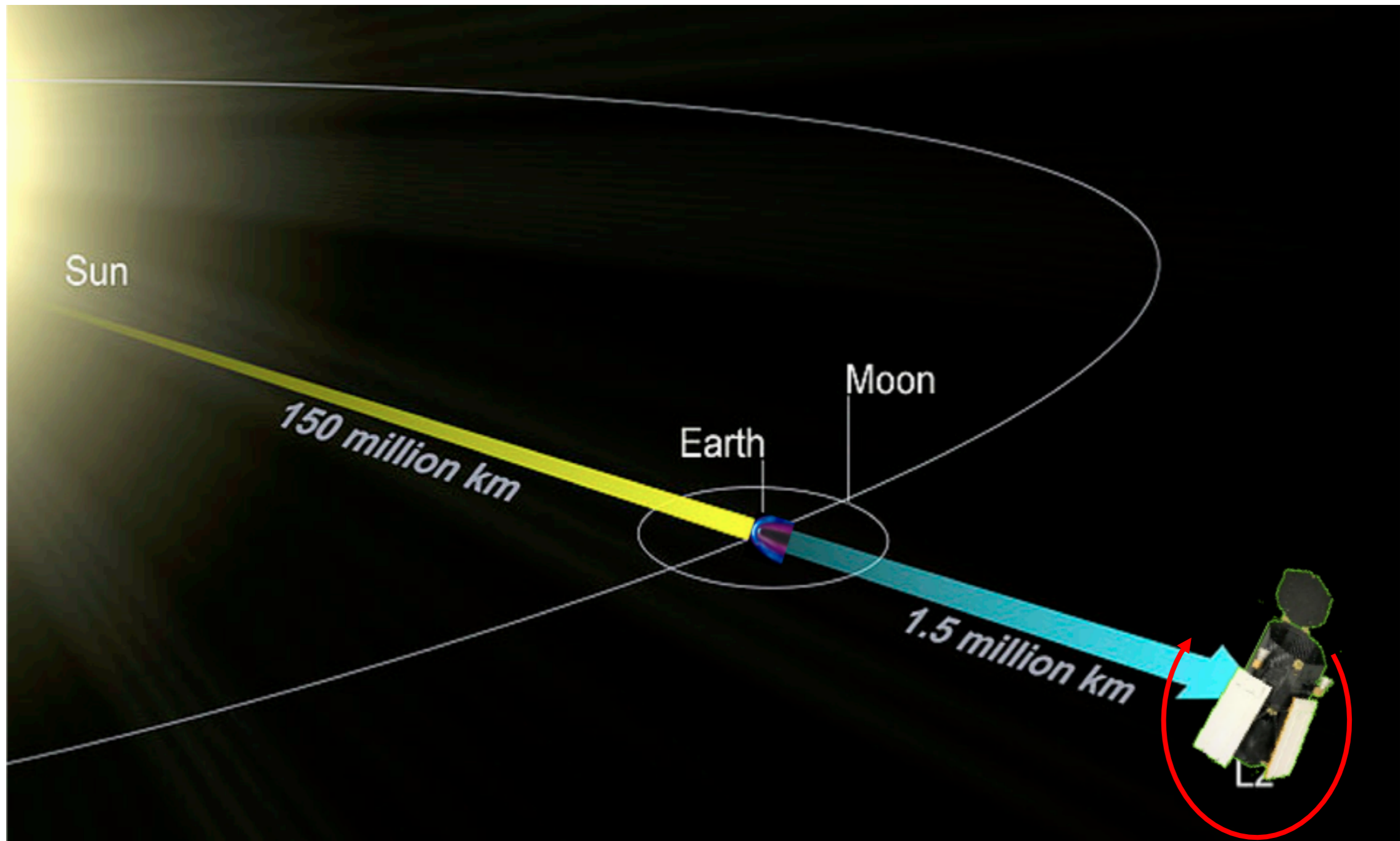
Prepared by Arne Rau (MPE)

SRG: overview

SRG - Russian satellite with two scientific instruments: eROSITA lead by MPE (Germany), and ART-XC lead by IKI (Russia). To be launched from Baykonour in 2019.

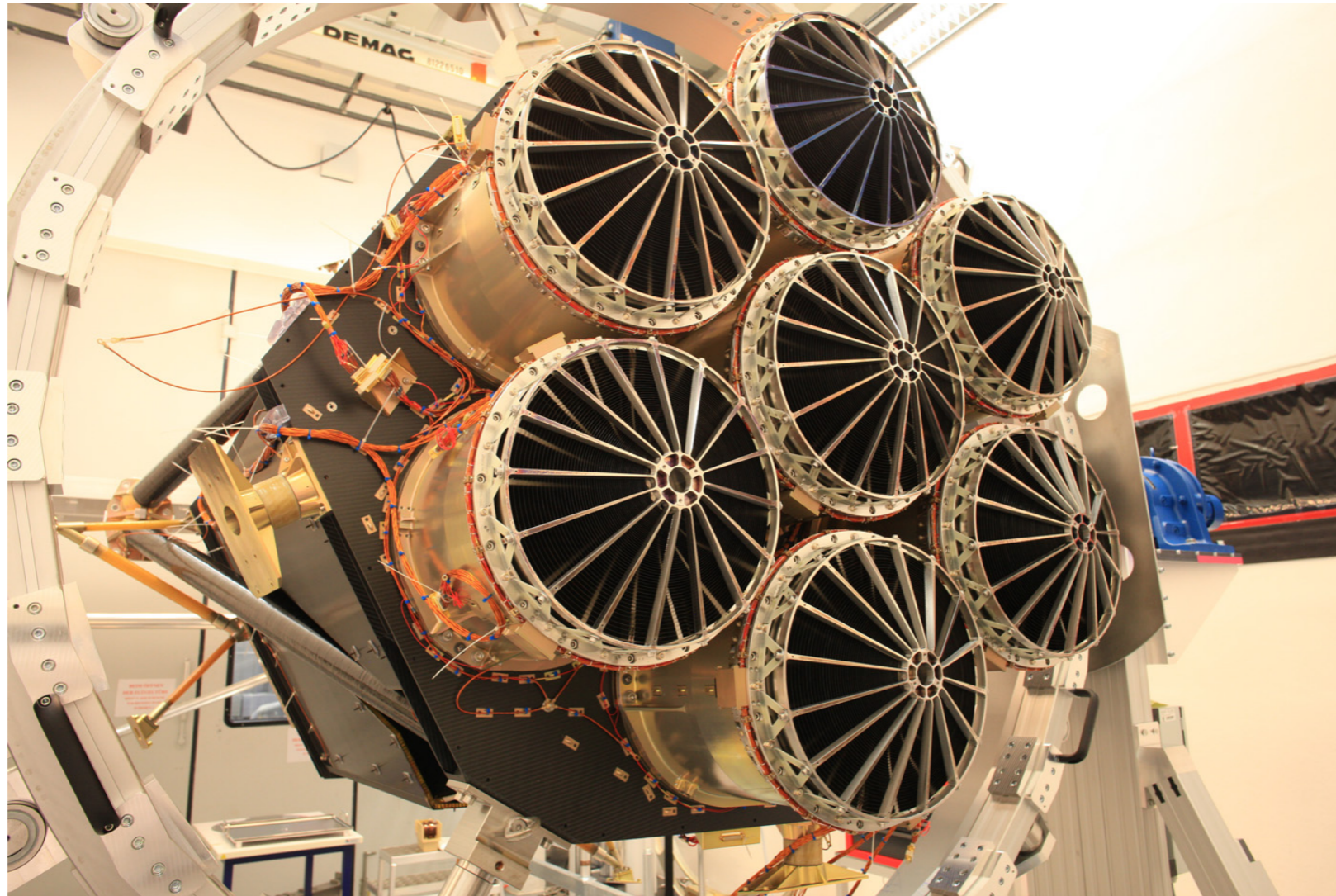


SRG: orbit (L2)



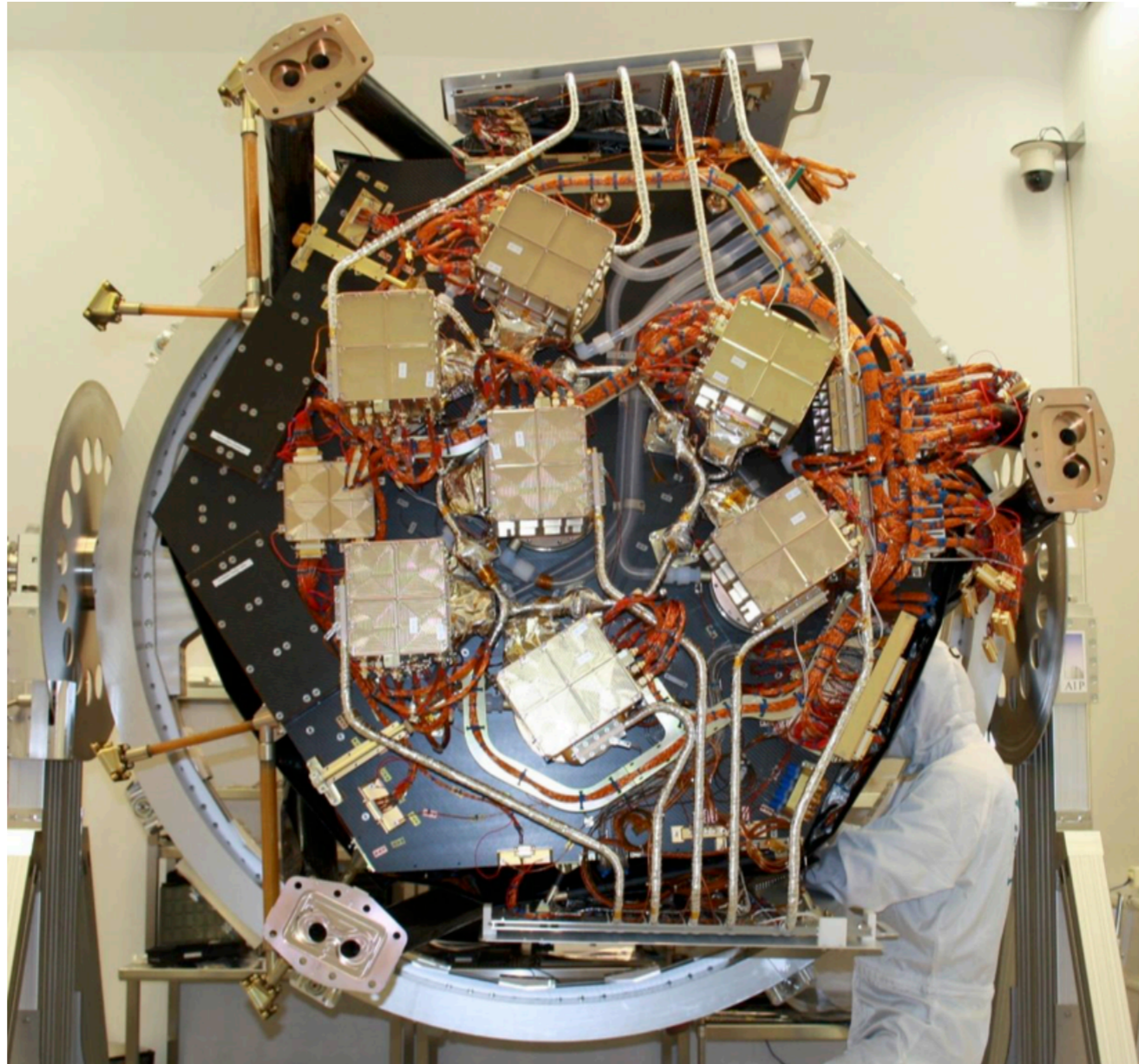
- continuous rotation (4hr) of the satellite
- 4yr survey operation
- 3yr pointed observations

eROSITA: optics



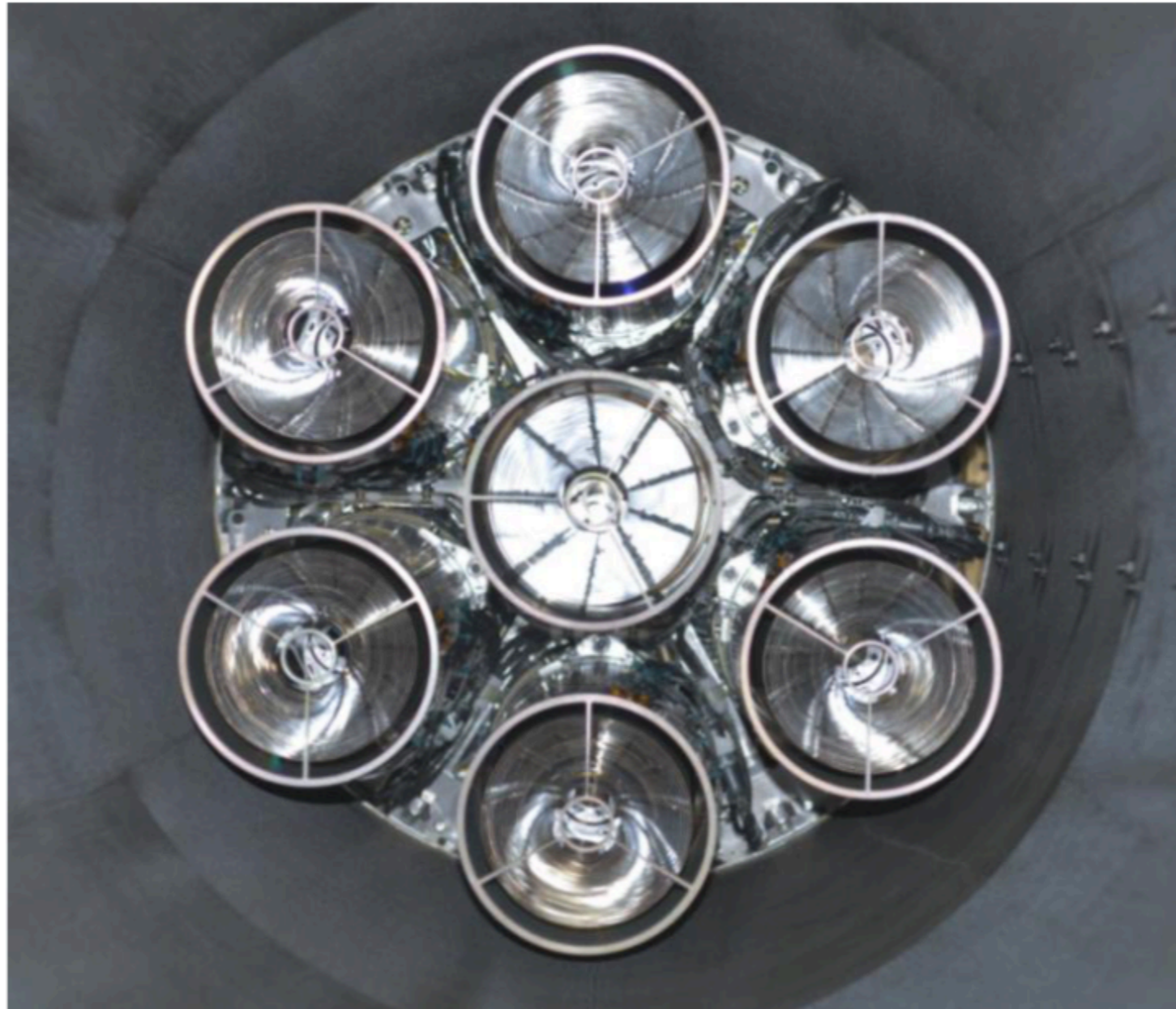
- 7x 54 nested gold-coated nickel mirror shells
- 1.6m focal length
- on-axis HEW $\sim 18''$, $\sim 25''$ survey averaged
- FoV-averaged effective area comparable to XMM on-axis ($\sim 1700\text{cm}^2$ @1keV)
- survey speed 7-8x larger than XMM

eROSITA: camera



- 7 identical framestore pnCCDs
- energy resolution of 77eV at 1.5keV, 136eV at 6.4keV
- time resolution 50ms
- FoV $\sim 1\text{deg}^2$

ART-XC: optics & camera



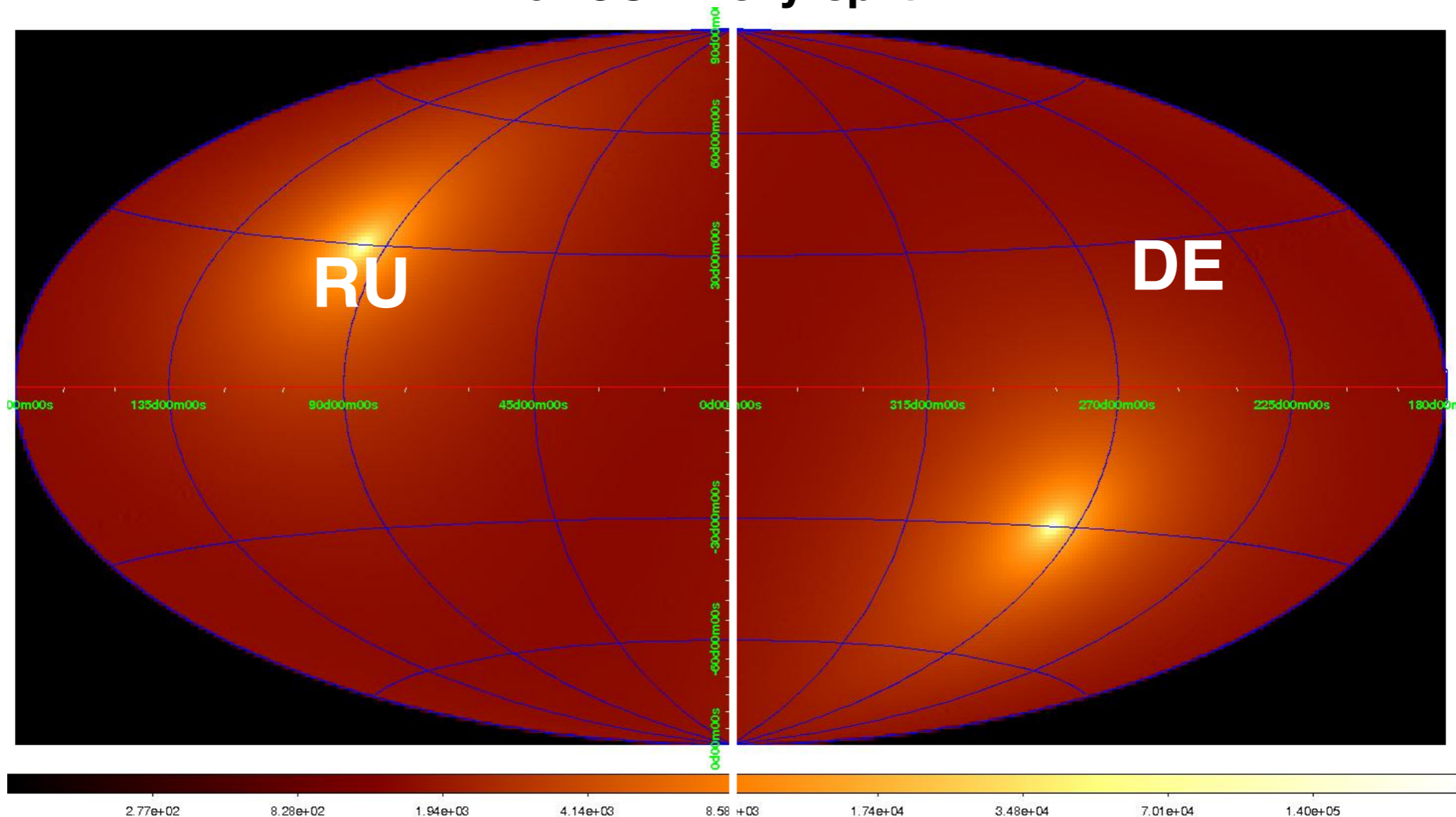
- 7x 28 nested iridium-coated Ni/Co mirror shells
- 2.7m focal length
- on-axis HEW <35"
- 7 identical DSDD CdTe detectors
- FoV $\sim 0.3\text{deg}^2$

SRG: politics

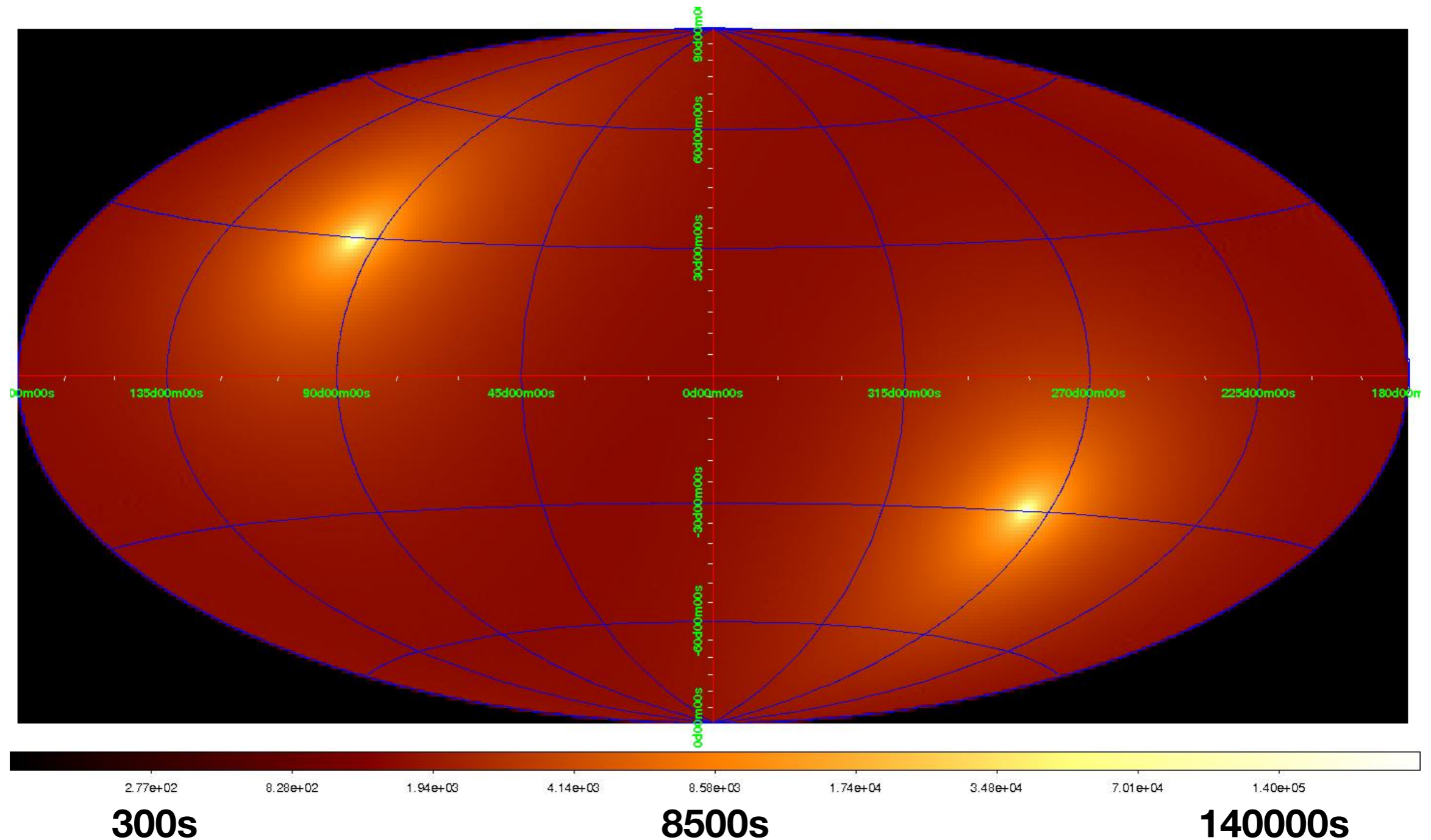
ART-XC: Russia owns data rights over entire sky

eROSITA: data rights split evenly between Germany (West in Gal. Coord.) and Russia (East). —> 2 separate consortia, little collaboration foreseen at the moment.

eROSITA sky-split

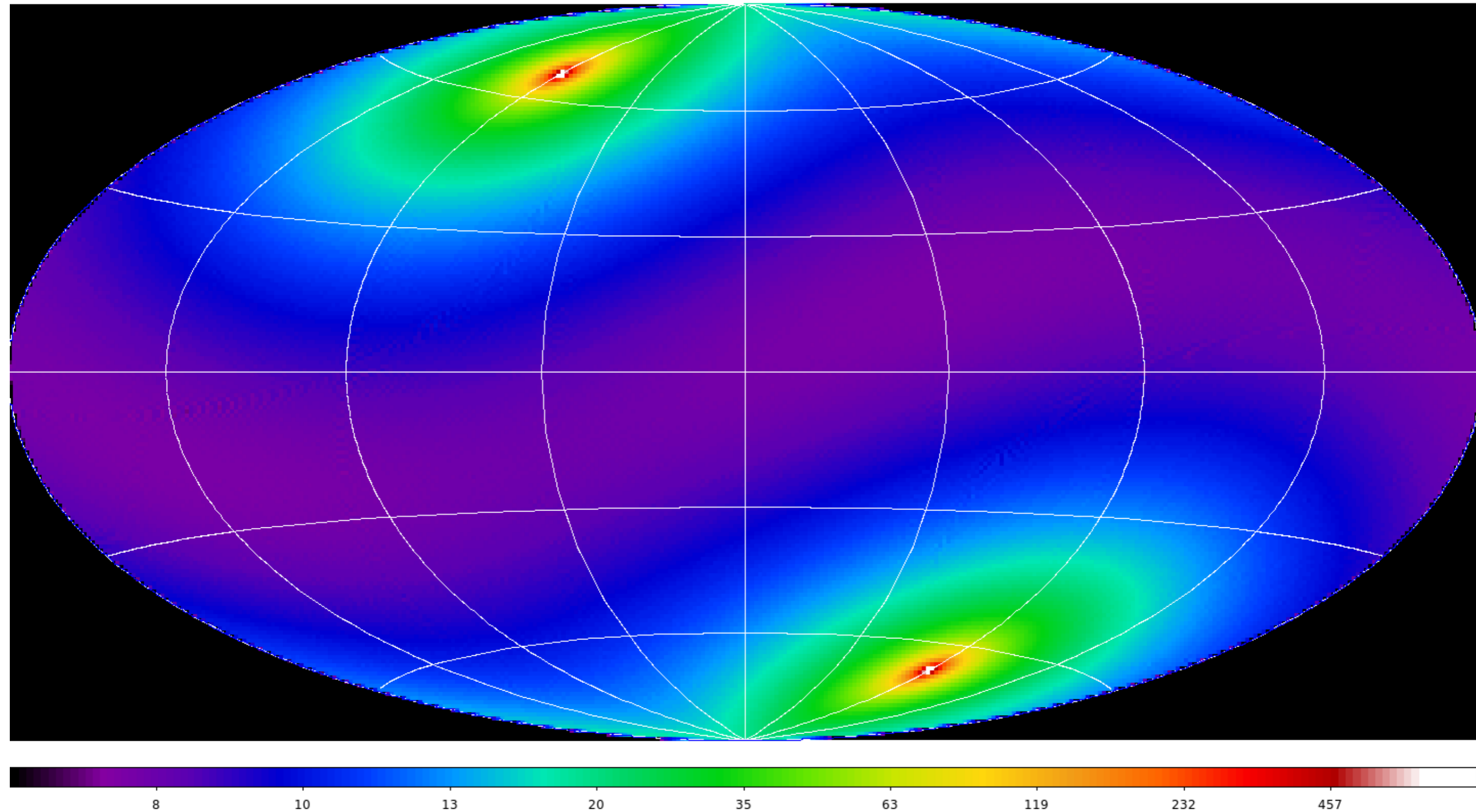


eROSITA: survey strategy



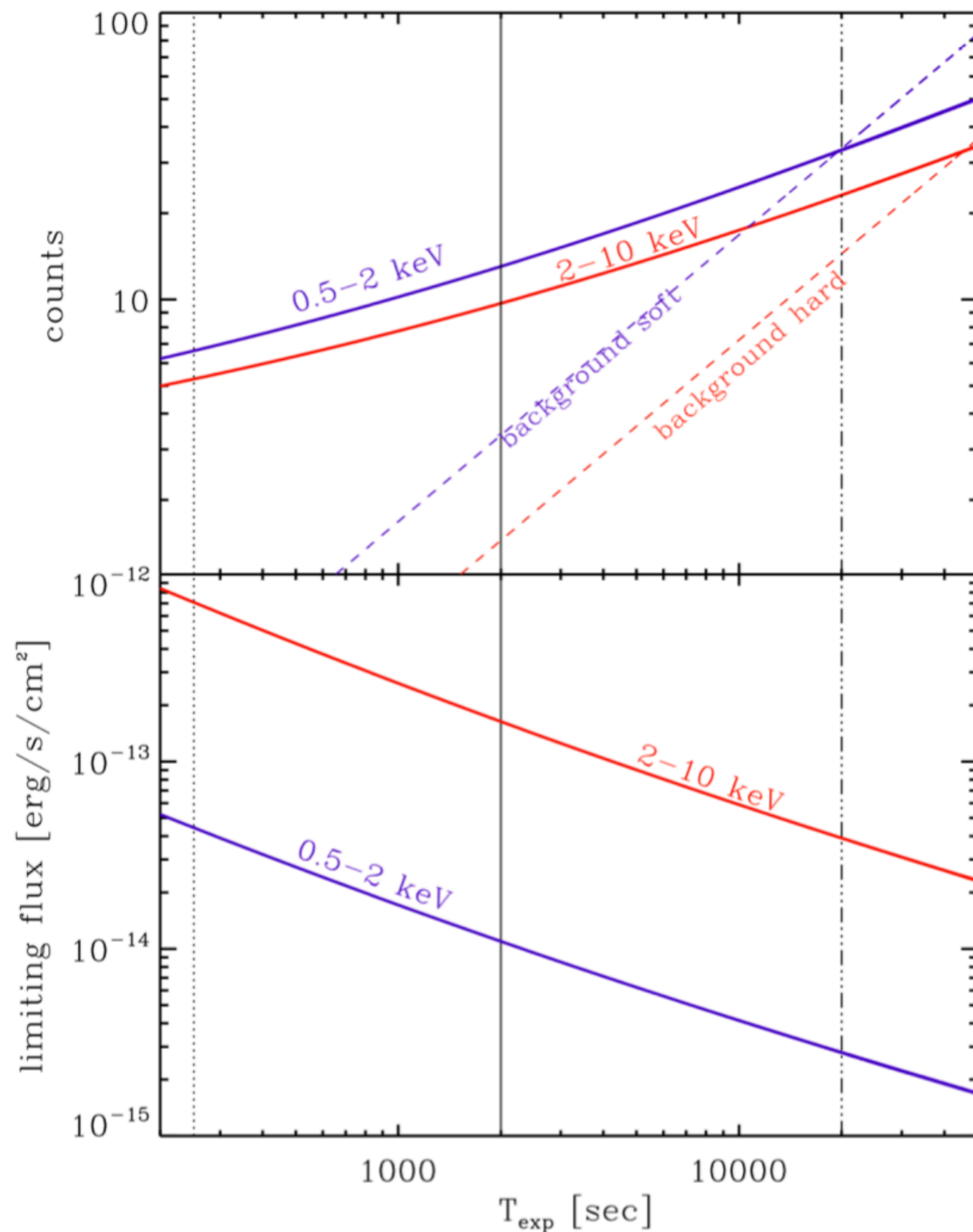
- eRASS: full sky coverage in 1/2yr
- eRASS1,2,..8: together form the 4-yr all-sky survey
- each skyposition covered >6x with 4hr cadence per eRASS

eROSITA: visits at sky position



- 8-500 visits within 4yr
- each visit consists of ~ 6 subsequent passes with ~ 40 s exposure every 4hrs

eROSITA: sensitivity vs exposure

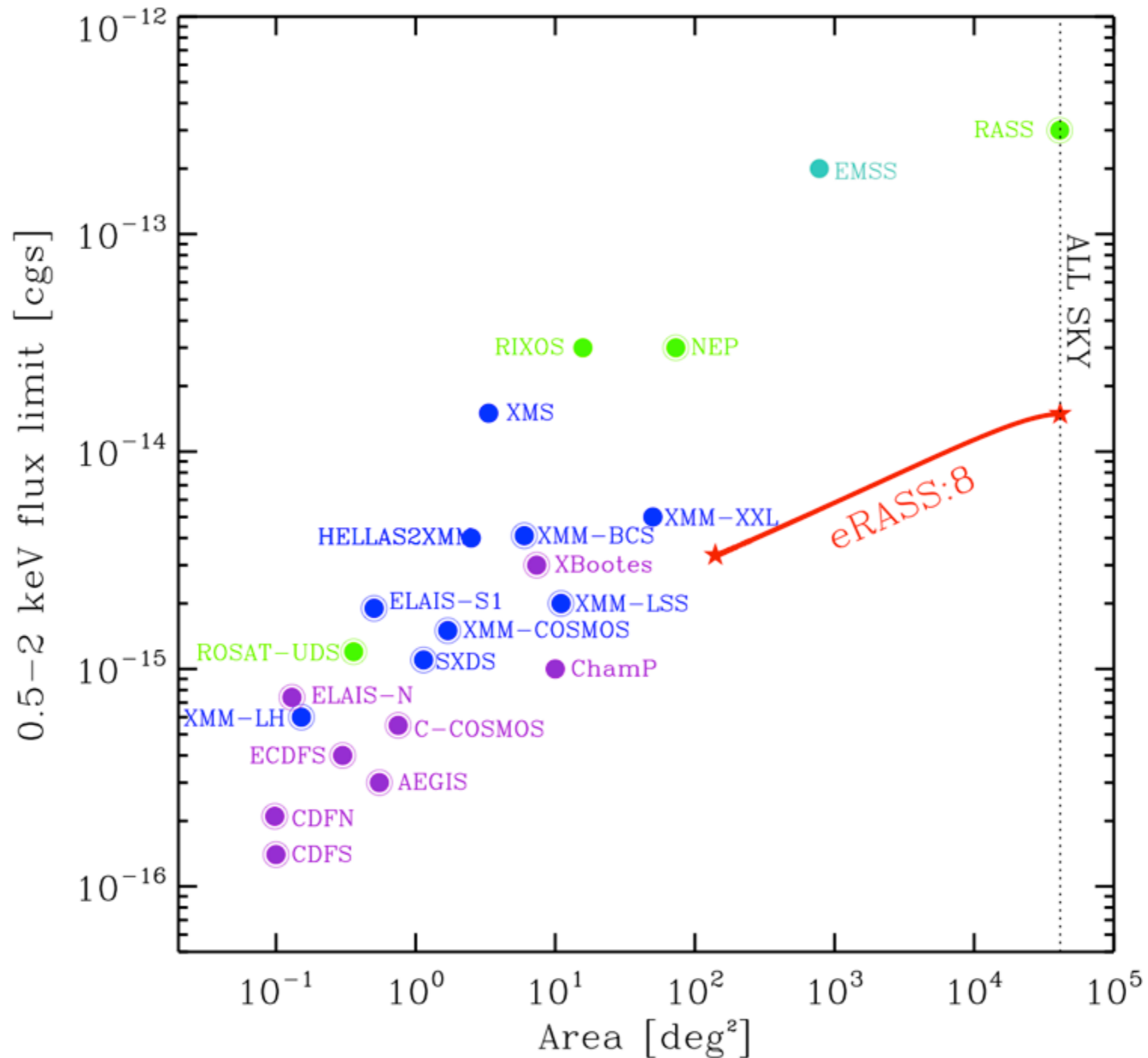


Top panel: Minimum number of net counts needed to securely identify a point source in survey mode as a function of exposure time

Bottom: Sensitivity plot for AGN (power-law with $\Gamma = 1.8$, $N_{\text{H}} = 3 \times 10^{20}$) limiting flux versus exposure time.

Three vertical lines are shown, marking the average exposure times for one all-sky survey (eRASS:1, 6 months; 250 s, dotted) the final 4-years all-sky survey (eRASS:8, ~2 ks, solid) and the 4-years deep exposure at the ecliptic poles (~20 ks, dot-dashed).

eROSITA: sensitivity comparison (4yr)

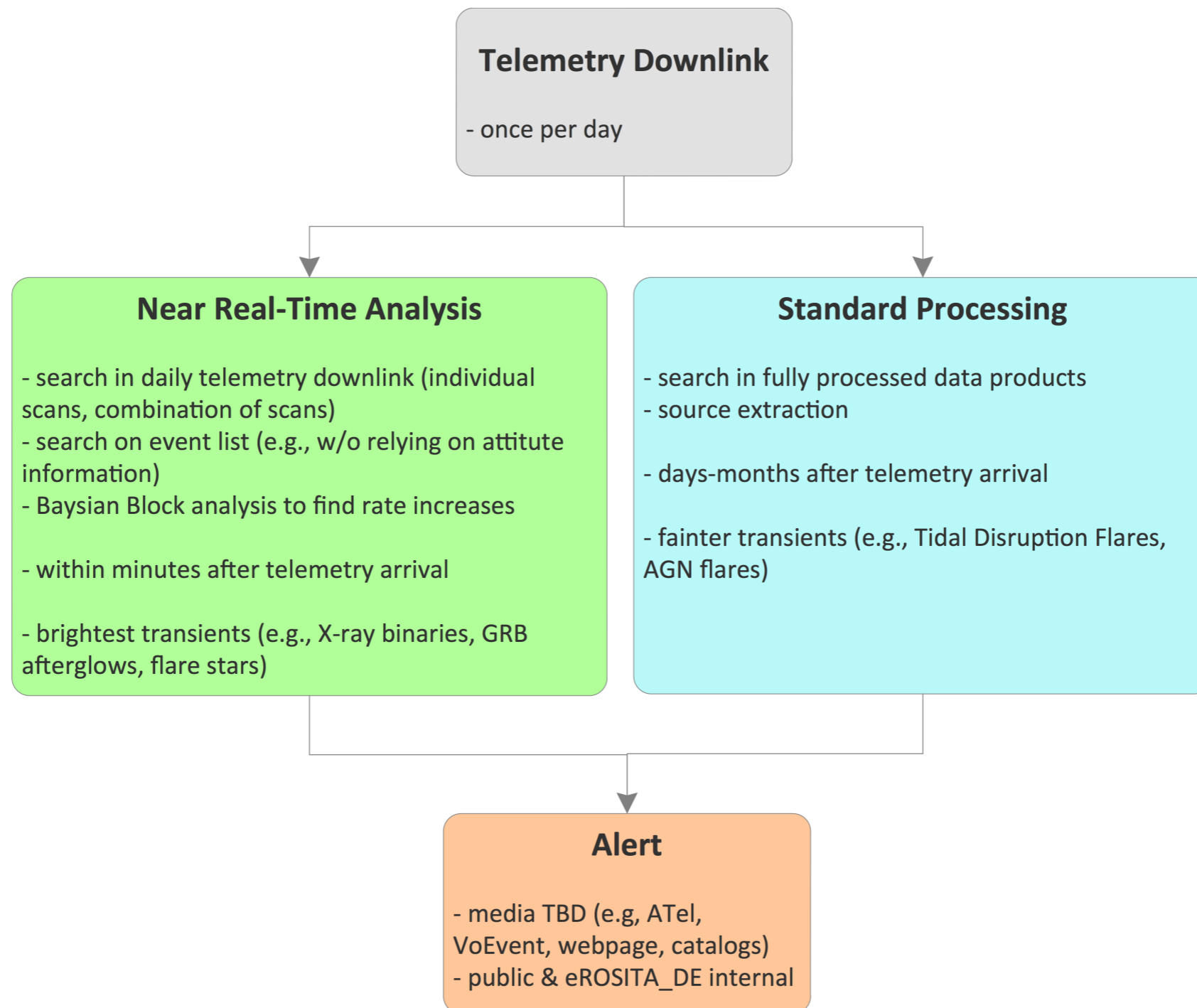


All sky: 10^{-14} [erg/cm²/s] (0.5-2 keV) (25x ROSAT)

2×10^{-13} [erg/cm²/s] (2-10 keV) (100x HEAO/RXTE)

eROSITA_DE: transient search plans

Transients and variables will be searched for in all time scales, from <40s to years. (Only in the German part of the sky for the moment. Discussion with Russia ongoing!)



eROSITA_DE: transient alert timeline

Calibration / PV Phase	eRASS1	eRASS2	eRASS3
Manual source vetting.			
Distribution of man. vetted alerts to interested eROSITA_DE members (e.g., TDA working group, external collaborators) via mailing list and/or internal web page.			
Public announcement of exceptional transients via Astronomer's Telegrams, GCNs.			
		Distribution of semi-automatically generated alerts to interested eROSITA_DE members (e.g., TDA working group, external collaborators) via VOEvent or similar.	
		Public web page for high significance alerts. Public block-announcement of new events via Astronomer's Telegram.	
		Distribution of semi-automatically generated alerts to the public via VOEvent or similar.	
		Public web page for semi-automatically generated alerts.	

NRTA system developed at ECAP (J. Wilm's group). NRTA team will involve broader eROSITA_DE community. Efforts will be man power limited, though.

eROSITA_DE: collaboration opportunities

- **Individual External Collaborations** to make proposal for well-define project to Science Working Group Chairs (TDA: A.Rau, J.Wilms)
- **Group External Collaborations** for larger facilities through team-to-team MoUs (e.g., Hyper Supreme Cam, SDSS IV)

More Details can be found in the

**eROSITA Science Book: Mapping the Structure of the Energetic Universe
(Merloni et al. 2012)**

<https://arxiv.org/abs/1209.3114>