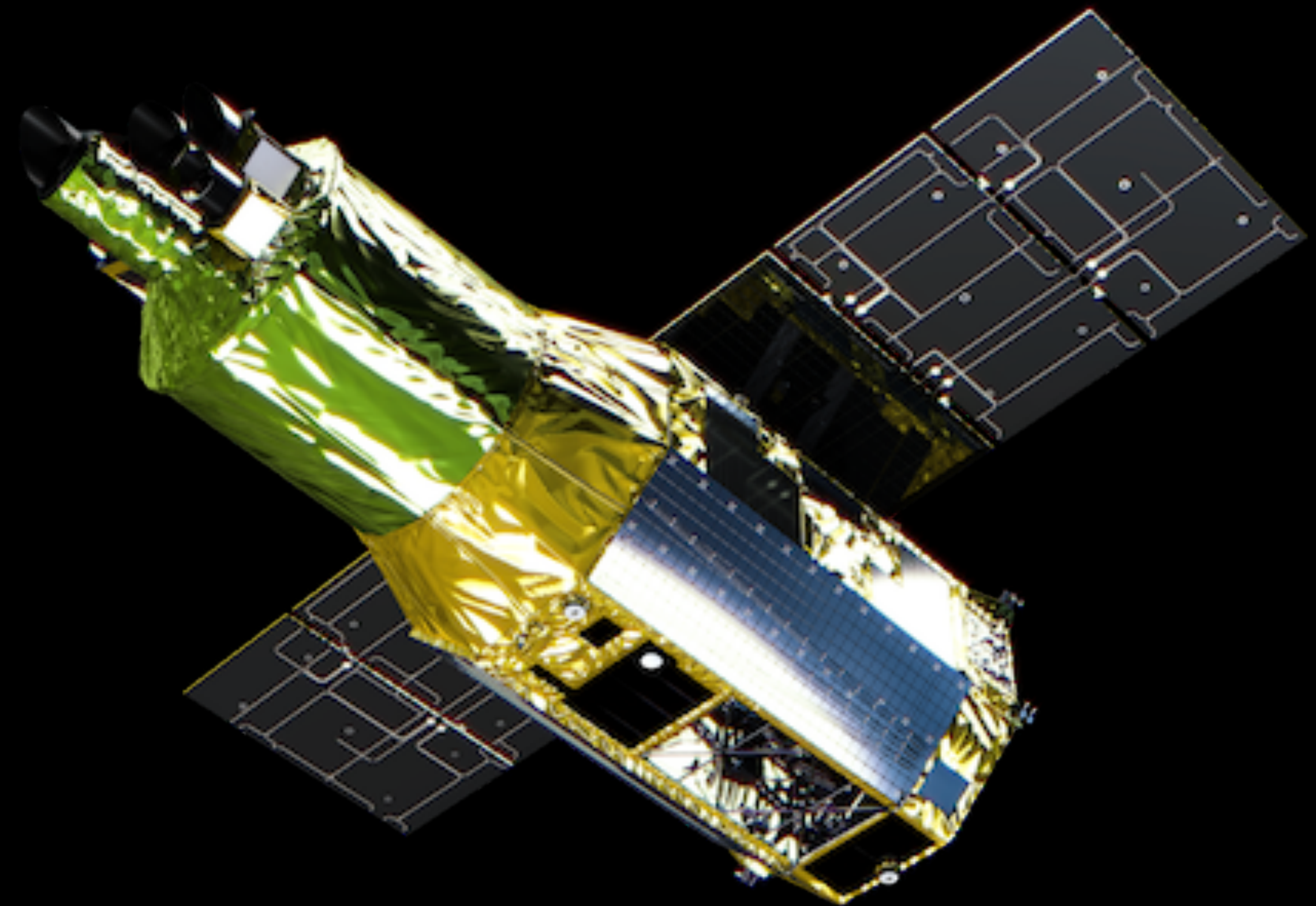


Mission Status Update for

XRISM X-Ray Imaging and Spectroscopy Mission

Resolving the Nature of the Energetic Cosmos

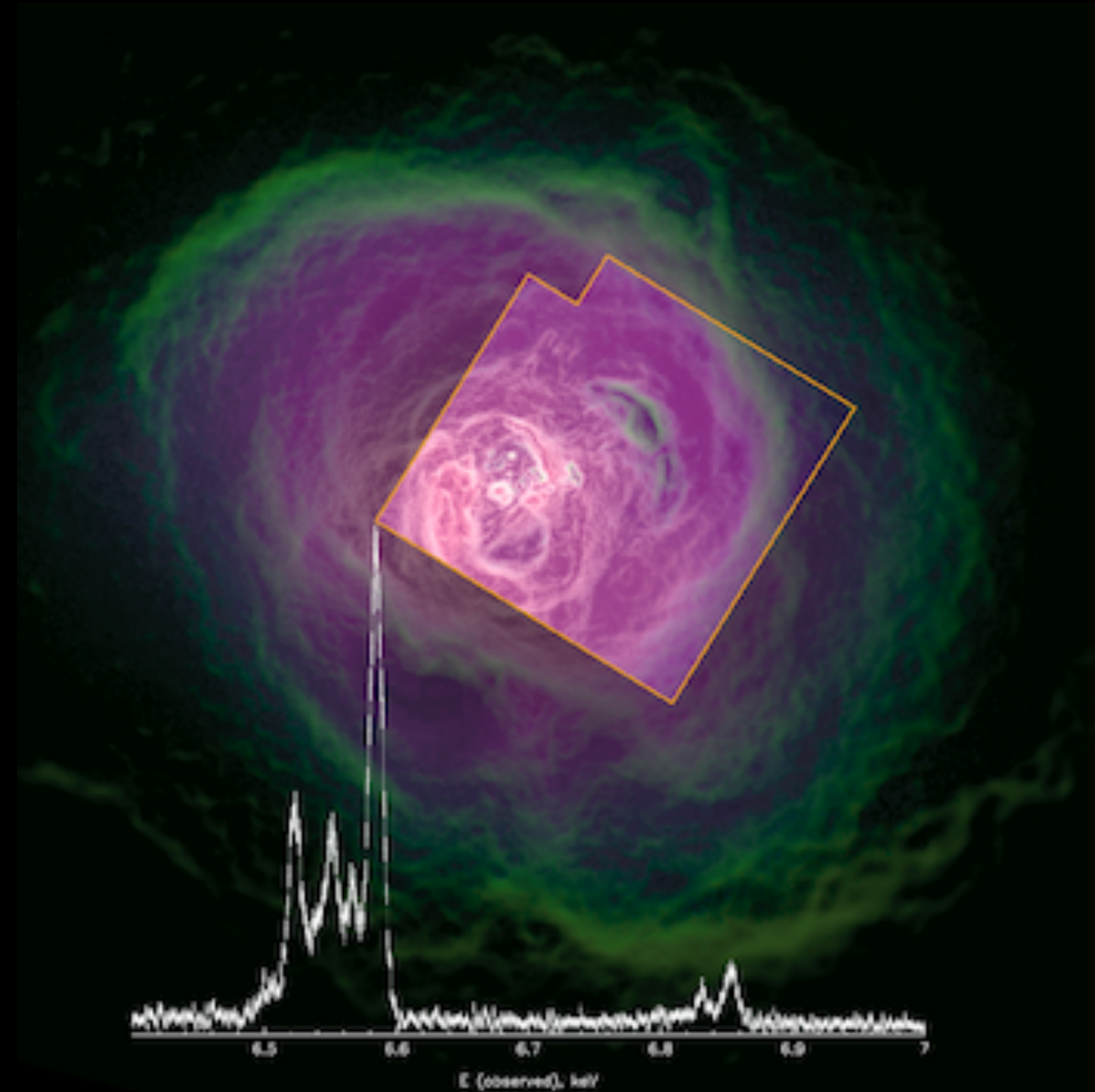
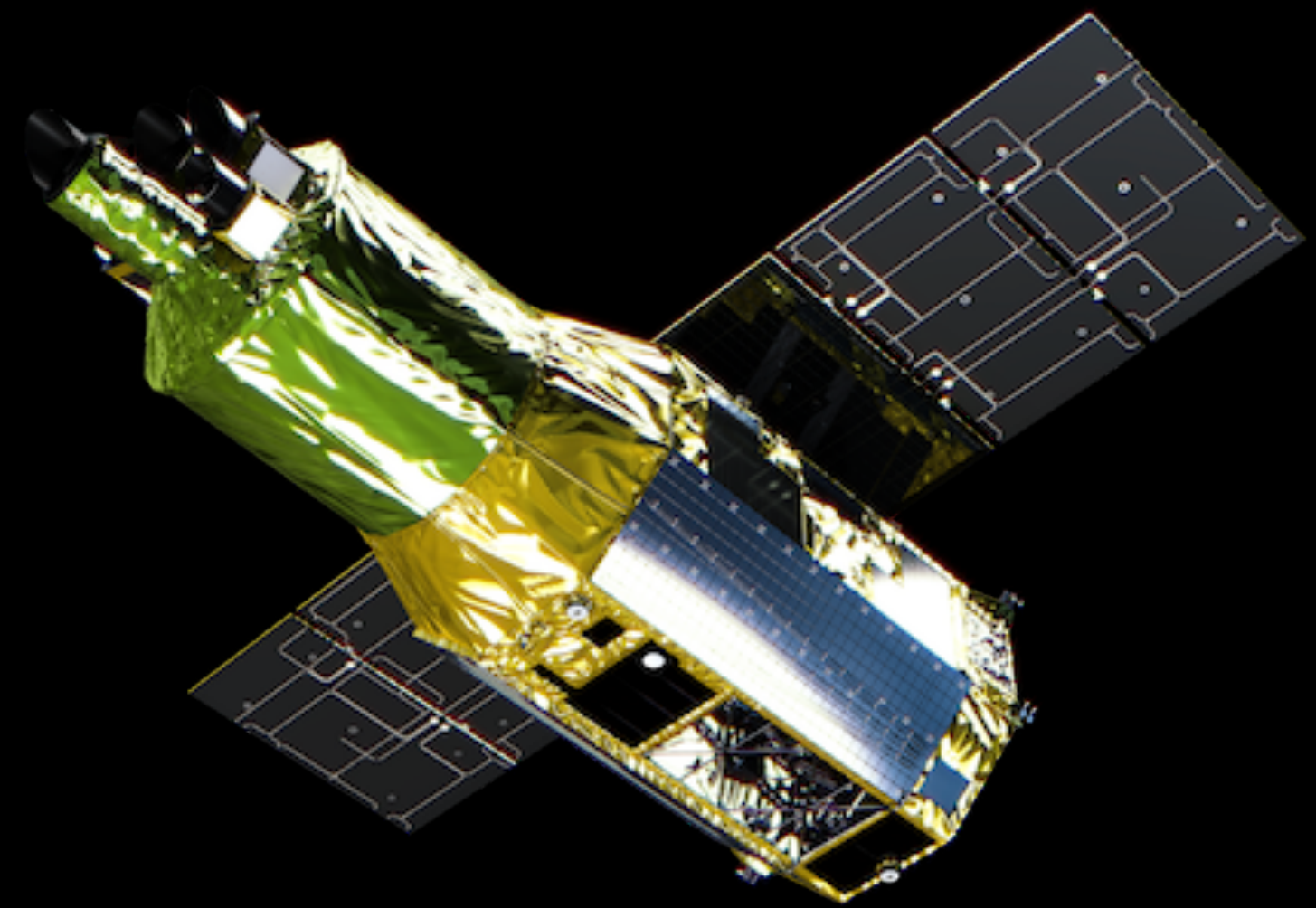


Brian Williams

**NASA Goddard Space Flight Center
NASA XRISM Project Scientist**

XRISM

X-Ray Imaging and Spectroscopy Mission



XRISM Quick Summary

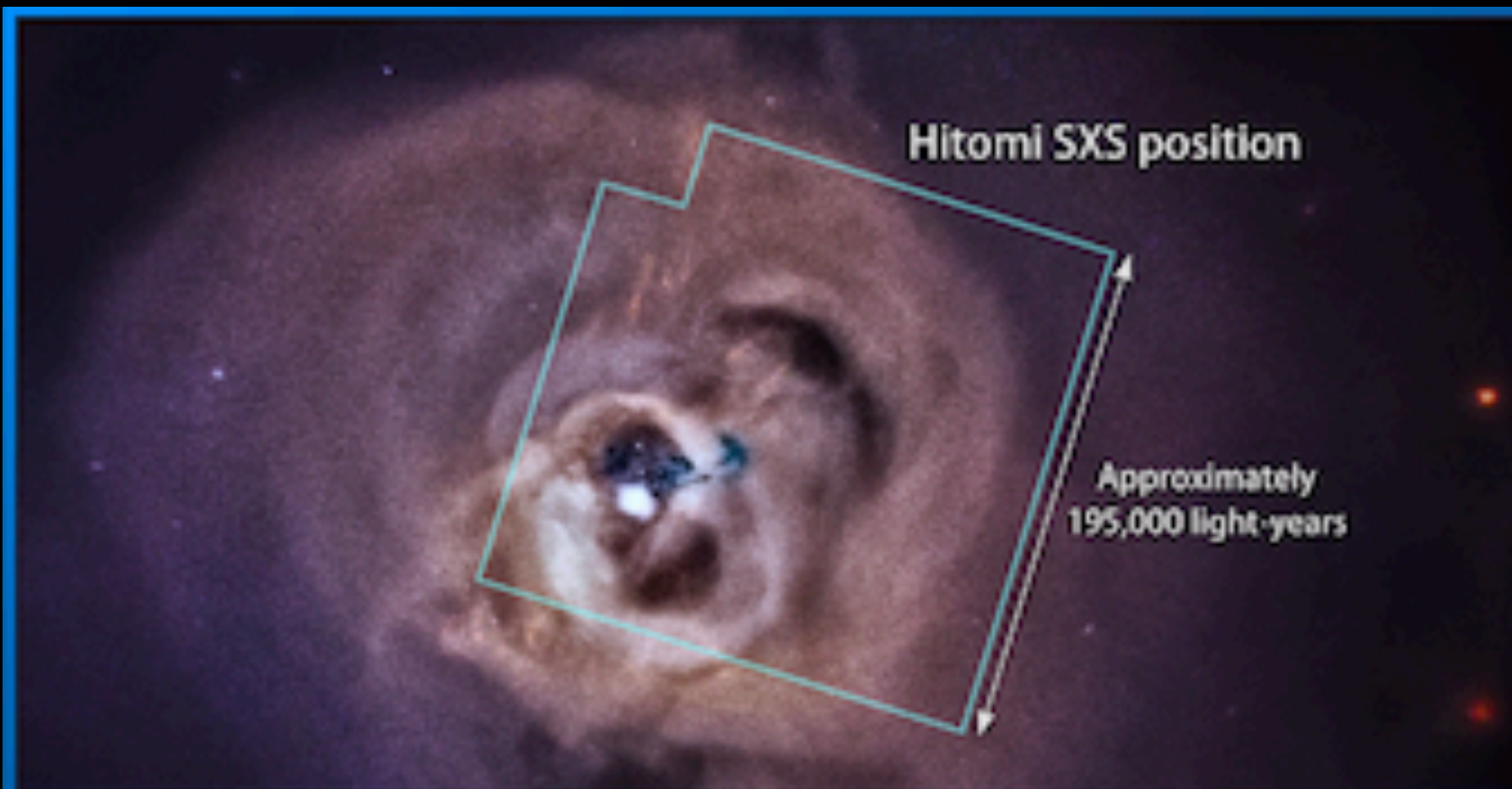
- **JAXA/NASA Collaborative Mission with ESA participation**
- **Two instruments**
 - *Resolve* - a soft X-ray (0.3-12 keV) spectrometer providing non-dispersive high-resolution X-ray spectroscopy
 - *Xtend* - a 40' field of view soft X-ray imager
- **Scheduled to launch from Japan in JFY 2023**
- **Mission is to recover science lost with demise of *Hitomi* in 2016**
- **After a 9-month calibration and performance verification phase, rest of mission lifetime will be for General Observers worldwide**

Hitomi Legacy

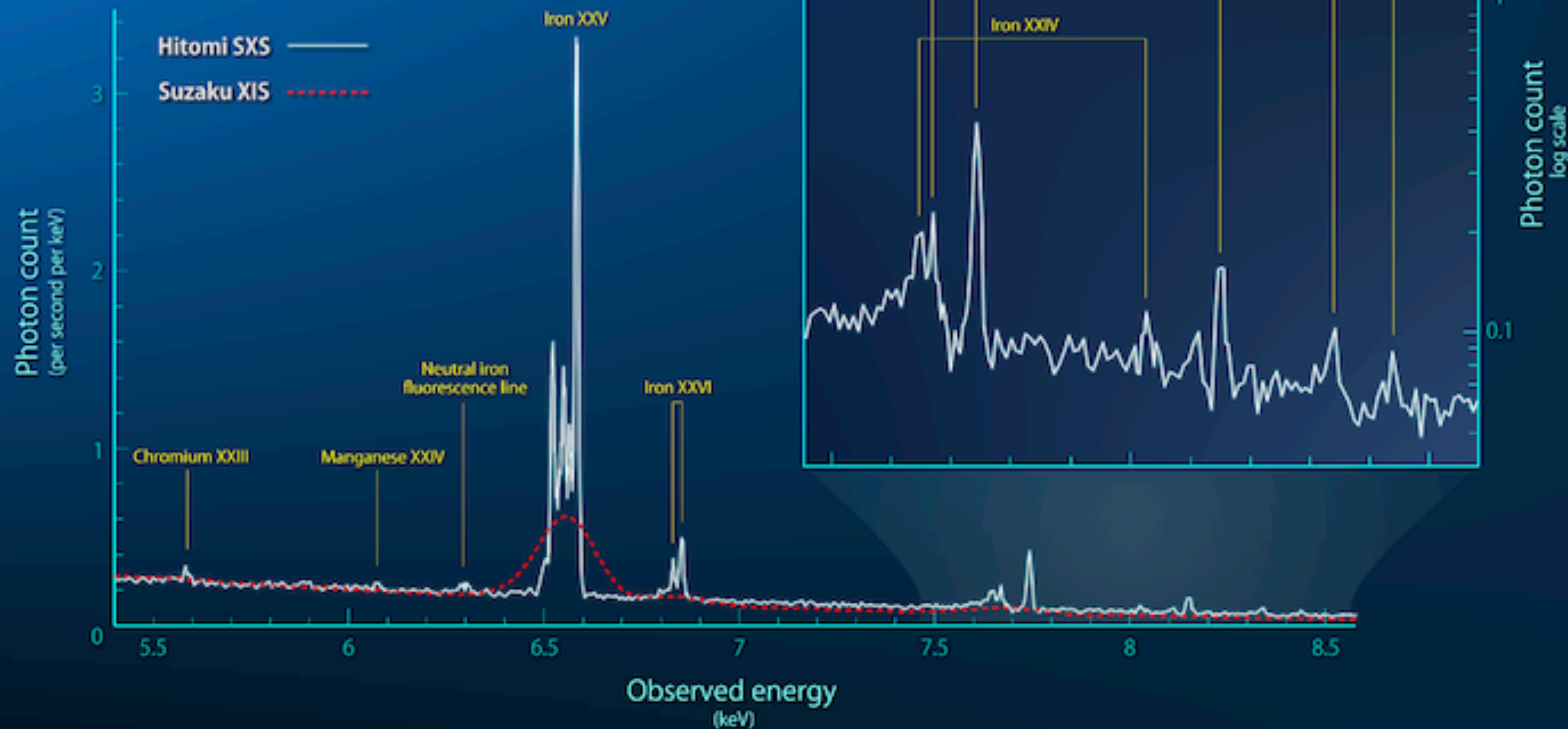
- Hitomi lost to an operations mishap on Day 38, but prior to that, had been working perfectly (even exceeding requirements)
- Even with only a few weeks of operations, we observed ~half-dozen targets, and have 13 scientific papers and counting, plus a few dozen instrumental papers
- We got a brief glimpse into the power of high-resolution X-ray spectroscopy.
- This is a *transformational* leap forward, and is the future of X-ray astronomy



Hitomi launch
credit: Scott Porter

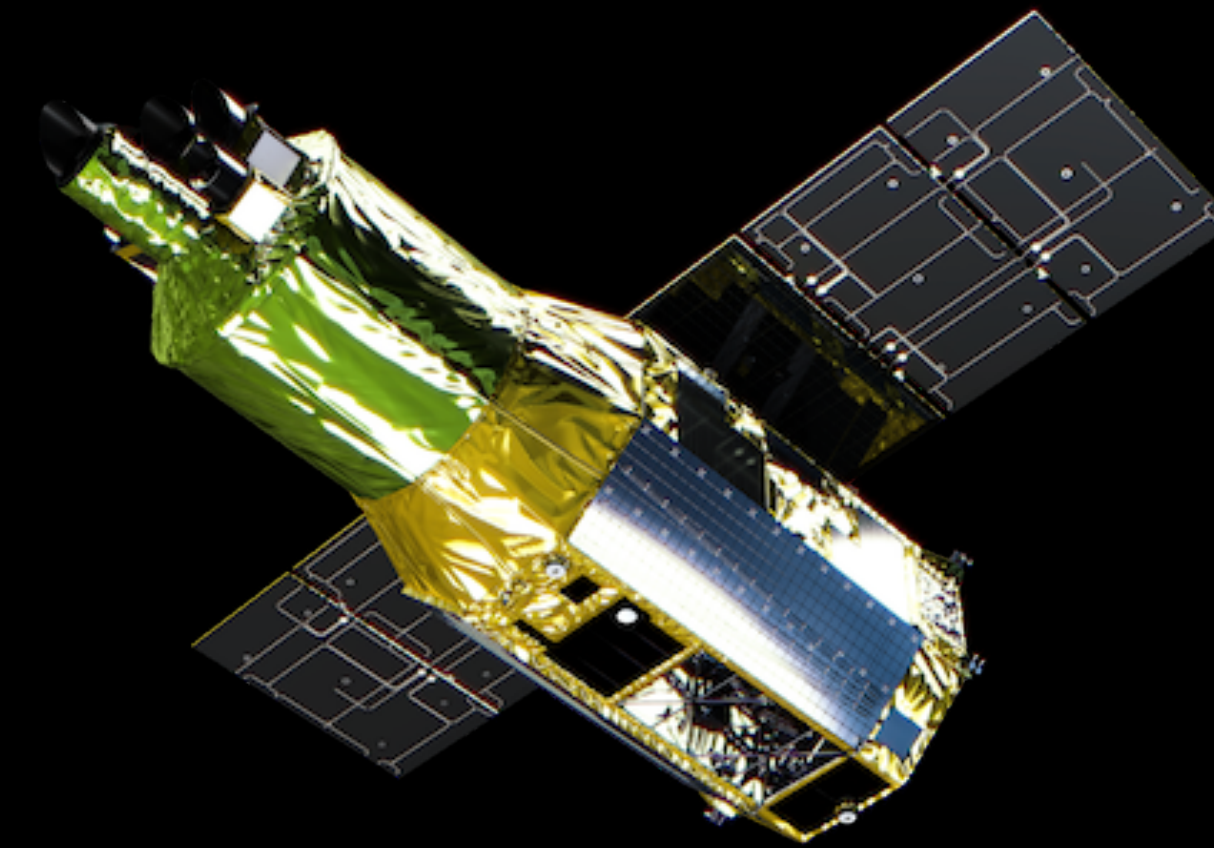


Perseus Galaxy Cluster X-ray Spectra



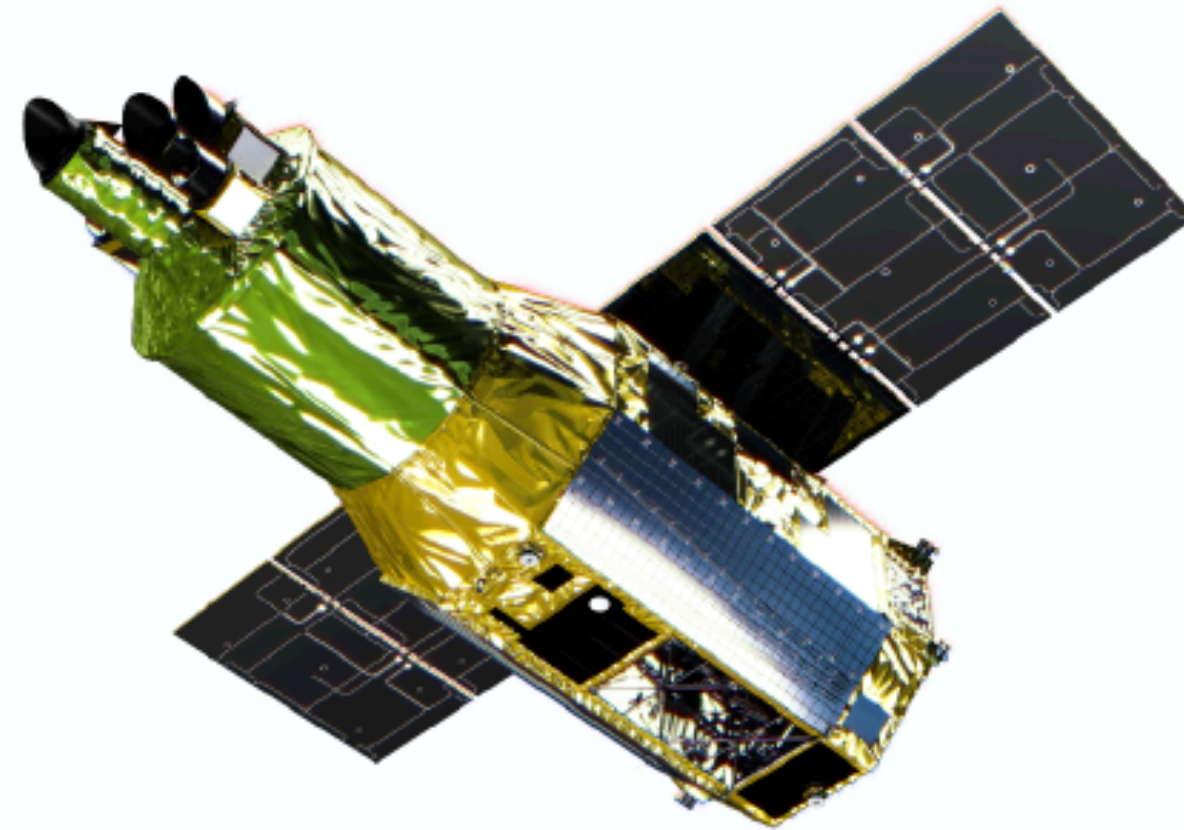
XRISM Mission Timeline

- NASA delivery of calorimeter spectrometer insert (CSI) to Japan - **November 2019**
- XRISM Science White Paper released - **March 2020**
- Final selection of PV targets - **February 2021**
- NASA delivery of X-ray Mirror Assembly - **fall 2022**
- Launch - **9:34:57 AM JST, August 26th 2023 (8/25 in US)**
- Start of AO1 observations - **mid 2024**



White paper on science with XRISM

Science with the X-ray Imaging and Spectroscopy Mission



This white paper was prepared by members of the XRISM Science Team for the benefit of the general astronomical community. This paper describes the capabilities of XRISM, offers a sampling of the many science topics that the mission will address, and discusses the synergies of XRISM with the plethora of planned and existing facilities in the 2020s and beyond.

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We cover just about every area of astronomy in this... even exoplanets!



Feb 7th, 2023



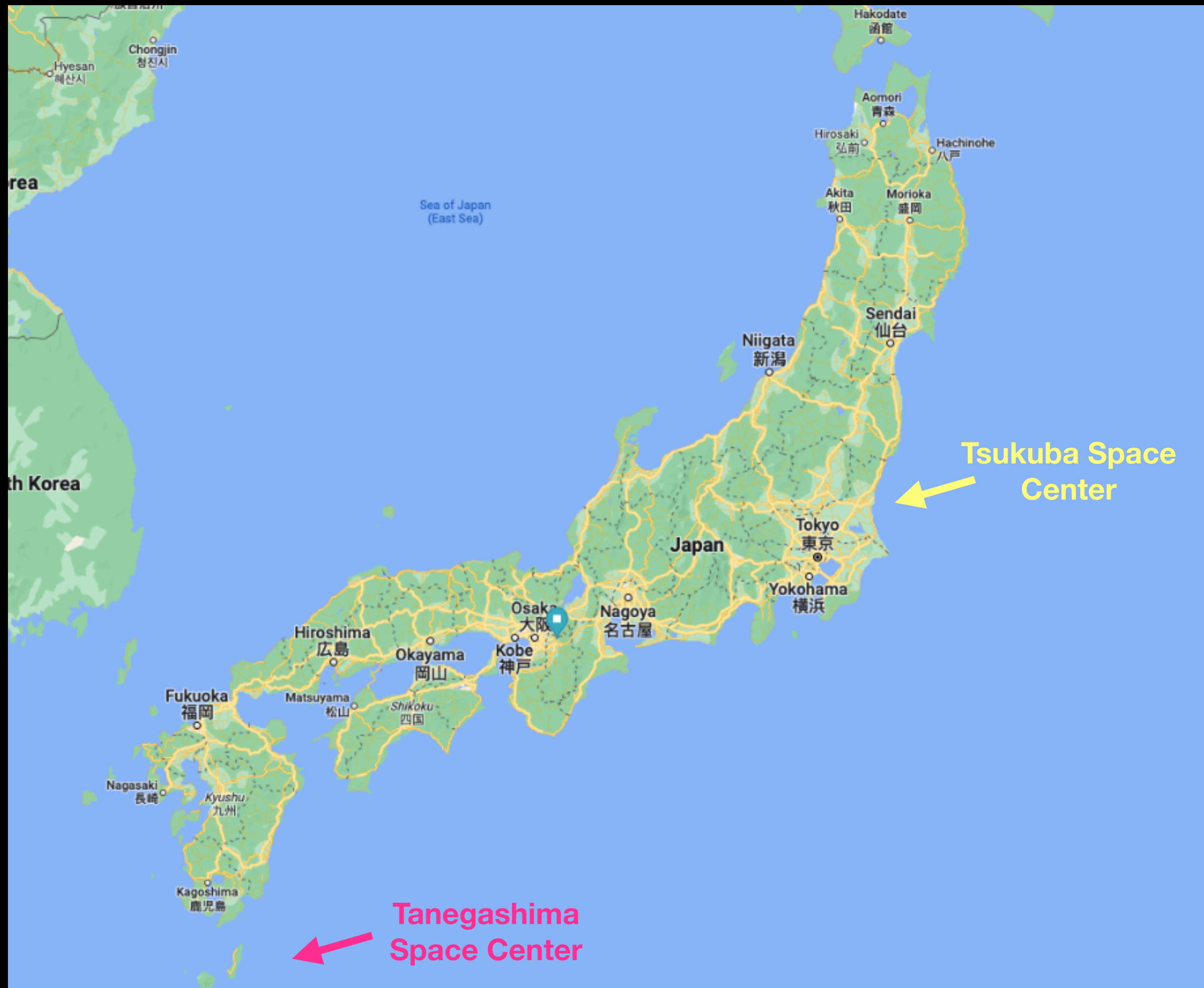
**ISAS Director General
Hitoshi Kuninaka**

**NASA Administrator
Sen. Bill Nelson**

**JAXA President
Hiroshi Yamakawa**

**NASA Deputy
Administrator
Pam Melroy**

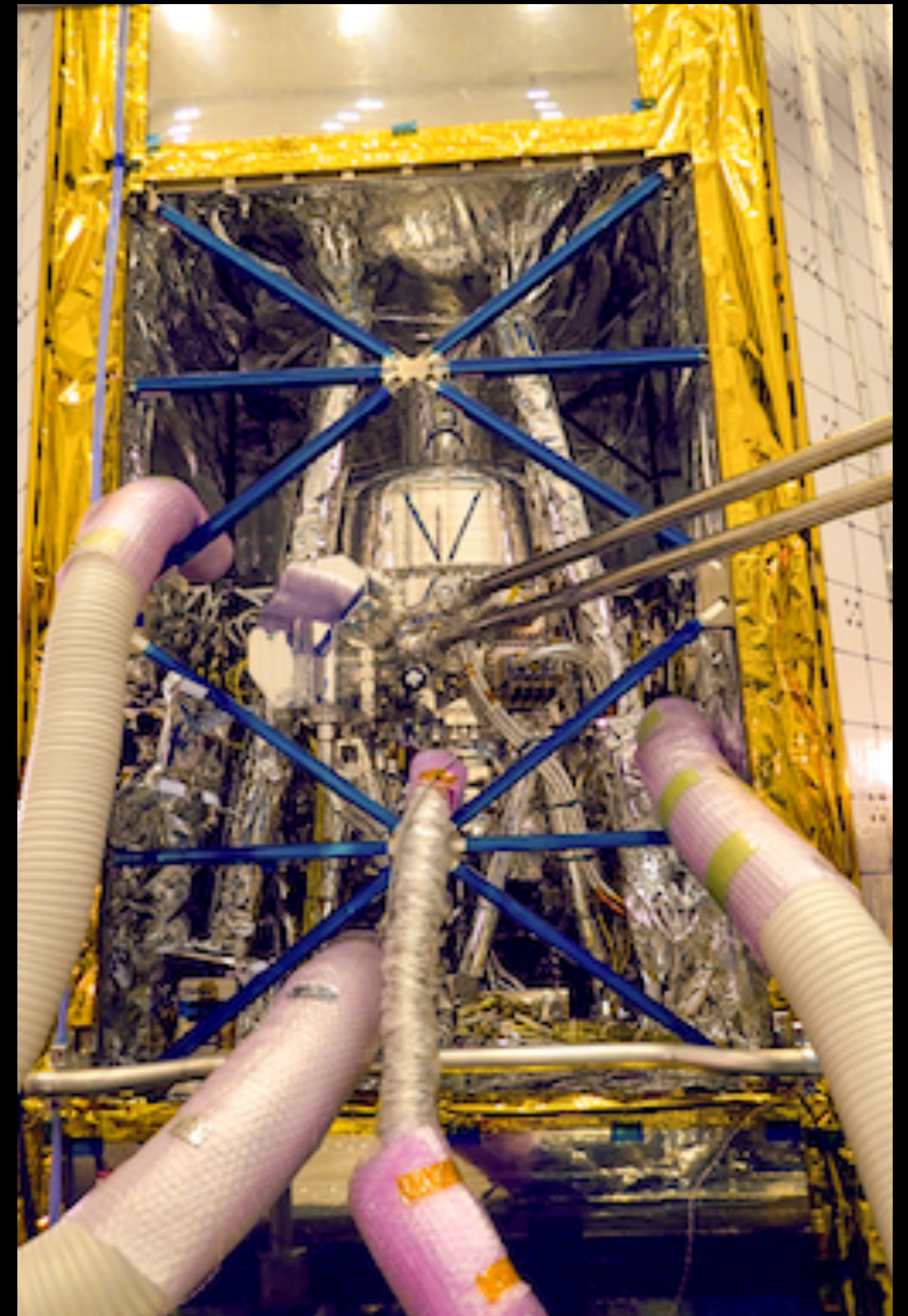
**XRISM Project Manager
Hironori Maejima**



XRISM was successfully shipped from Tsukuba Space Center to Tanegashima Space Center (launch site) arriving ~March 15th



XRISM at Tanegashima Space Center



Launch: August 26th, 2023

- Launch is on H-IIA rocket. H-IIA has been re-certified for launch following H3 launch failure in March 2023
- XRISM is co-manifest with SLIM (Smart Lander for Investigating the Moon). SLIM *“will make a qualitative shift towards being able to land where we want and not just where it is easy to land... [making it] possible to land on planets even more resource scarce than the Moon.”*
- SLIM launch requires pinpoint timing → ONE launch opportunity per day
- If daily launch opportunity missed, delay could be 1-3 days, depending on status of XRISM cryogen recycling

9:34:57 AM, JST (8:34:57 EDT, 8/25)



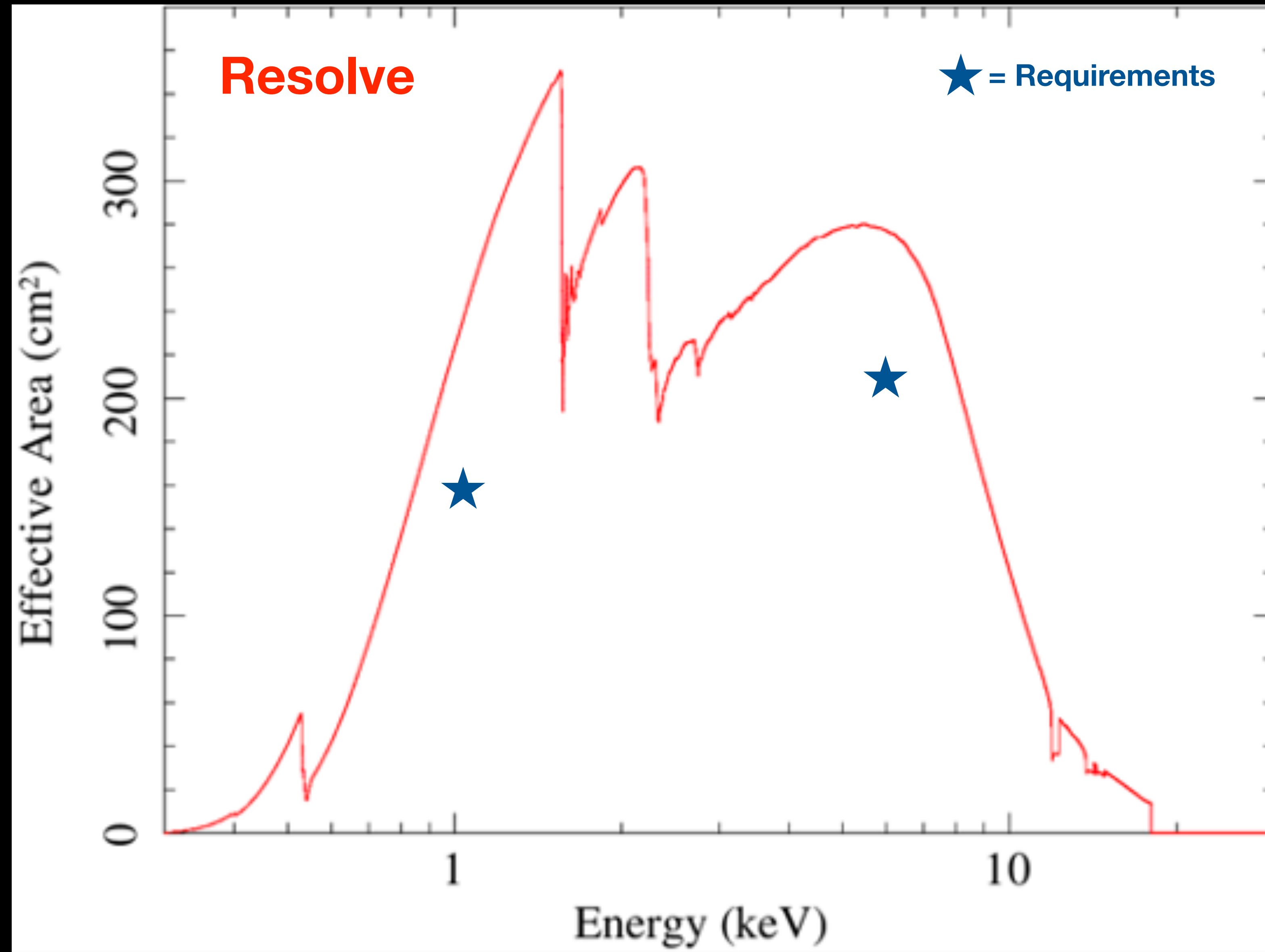
SLIM



Resolve Top-level Performance Requirements

Parameter	Requirement	Current actual
Energy resolution	7 eV (FWHM)	5.0 eV
Energy scale accuracy	± 2 eV	± 0.5 eV
Residual Background*	2×10^{-3} counts/s/keV	0.8×10^{-3} counts/s/keV
Field of view	2.9 x 2.9 arcmin	by design
Angular resolution	1.7 arcmin (HPD)	1.3 arcmin
Effective area (1 keV)	> 160 cm ²	220 cm ²
Effective area (6 keV)	> 210 cm ²	275 cm ²
Lifetime	3 years	> 3.5 years
Operational Efficiency	> 90%	97% (cryogen), 93% CF

Current Best Estimate for Effective Area



COVID-19 and XRISM

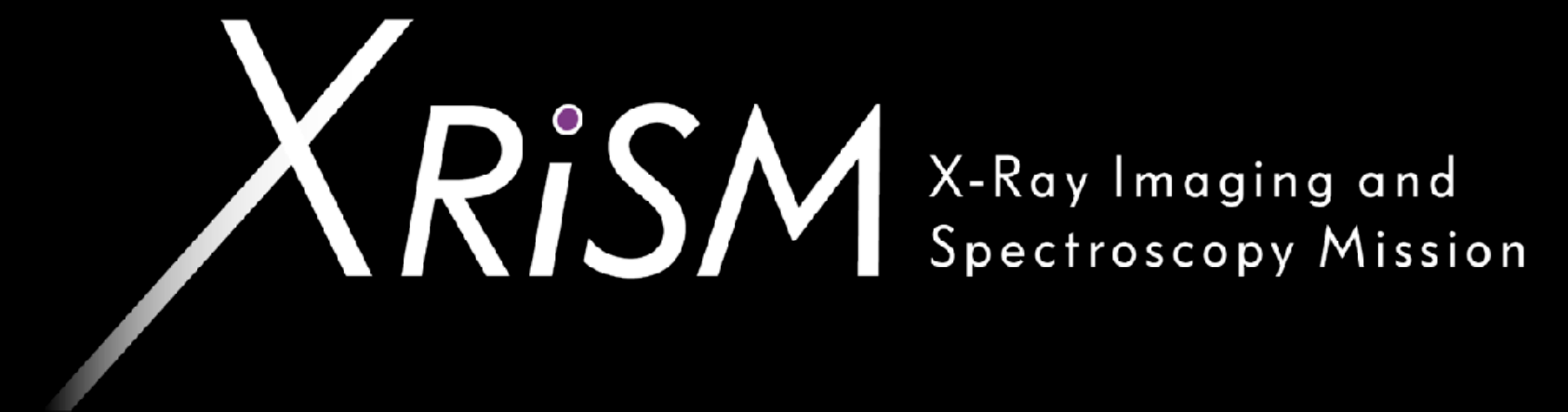
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XRISM General Observer Program

- After commissioning (~4 months) and PV phase (~6 months), the entire remainder of the mission is the GO phase
- *Aside from regular calibration time, we are not reserving any more time for proprietary Science Team observations*
- AO to be released simultaneously by JAXA, NASA, ESA. AO-1 expected to be released **~2 months after launch, due 3 months later**
- A small number of objects will be observed immediately after commissioning (and before calibration) for immediate public data release to allow astro community a glimpse of instrument performance before AO-1 proposals are due
- We will have ToO capabilities, with turnaround of 48 hours (or perhaps less)
- Will include opportunity for XRISM-related laboratory astrophysics work
- Includes NASA funding for US-based scientists



Proposal Logistics

XRISM observing time is open to the world-wide astronomy community via 3 parallel solicitations. The institutional affiliation of the PI determines the agency to which proposals should be submitted. There are no restrictions on the affiliations of the co-Is.

NASA solicitation for researchers based in the US and Canada - 44% of total GO time.

ESA solicitation for researchers based in ESA member countries – 8% of total GO time.

JAXA solicitation for researchers in Japan and the rest of the world – 48% of total GO time, of which up to 4% will be made available to PIs outside Japan.

International teams should *not* submit identical/strongly overlapping proposals on the same targets with the same scientific objective to multiple agencies. Independently proposed observations of the same target may be merged.

TOO proposals for a specific target, or a list (up to 10) specific targets are allowed. TOO proposals for generic targets (e.g., “nearby supernova”) are *not* allowed in AO-1

Joint observations with other observatories will not be formally solicited in AO-1. Proposers are free to arrange joint observations independently by submitting proposals to XRISM and other missions.

NASA XRISM General Observer Program

- Total budget for observations in Cycle 1 is \$6.5M (to cover 50-80 proposals), including \$500k for lab astro investigations
- Resources for proposers
 - Help desk
 - Proposal tools and response matrices
 - ER Observations
- In recognition of the potential need for improvements in the accuracy of the existing knowledge of atomic features to fully exploit the richness of the Resolve data, proposals for atomic physics investigations that directly support the interpretation of one or more classes of Resolve-measured spectra will solicited
- Proposals must address an atomic physics issue expected to be encountered in Resolve observations. Proposed investigation can be theoretical (e.g., calculation of atomic cross sections or collision strengths) and/or an experimental (e.g., EBIT measurements of particular ionization states) investigation
- Investigations may request support for a period of up to three years

Future AOs

- **Future AOs are anticipated annually.**
- **We will consider introducing Key Projects category or similar to allow large projects.**
- **Joint proposals with several missions (e.g., NuSTAR, NICER, XMM-Newton, Swift) will likely be allowed, subject to successful negotiations. This was considered too complicated for implementation during AO-1, given the various uncertainties of a mission yet-to-launch.**

Reminder: Resolve and Xtend are co-aligned and always operate simultaneously.

XRISM Early Release Program

- **The purpose of the ER program is to ensure that the global astronomical community has the ability to write the best possible science proposals for AO-1 by seeing real data from the Resolve and Xtend instruments prior to writing their proposals.**
- **ER targets will represent typical examples of a few of the types of objects that XRISM will observe**
- **The ER targets will be observed as early as possible to allow for quick dissemination to the public archive**

X-ray Astrophysics with XRISM



Organization National Aeronautics and Space Administration (NASA)

Reference Code 0225-NPP-JUL23-GSFC-Astrophys

Application Deadline 7/1/2023 6:00:00 PM Eastern Time Zone

Description The X-ray Imaging and Spectroscopy Mission (XRISM) is a JAXA/NASA collaborative mission with ESA participation, expected to launch in the fall of 2022. XRISM is capable of high-resolution, non-dispersive X-ray spectroscopy over a 3' square field of view, as well as imaging over a much larger 40' square field of view. Four categories of science objectives have been defined for the mission: (1) Structure formation of the Universe and evolution of clusters of galaxies; (2) Circulation history of baryonic matter in the Universe; (3) Transport and circulation of energy in the Universe; (4) New science with unprecedented high resolution X-ray spectroscopy. XRISM will observe virtually all classes of celestial objects, including clusters of galaxies, active galactic nuclei, X-ray binaries, supernova remnants, hot stars, and many others. The successful applicant will carry out a research program in any area related to the science of XRISM. This can include, but is not limited to: theoretical studies of celestial sources observable with XRISM, simulations of potential XRISM observations, relevant laboratory astrophysics, development of spectral models or atomic codes, or exploring synergies between XRISM and other contemporaneous observatories.

NPP is a standing opportunity with deadlines every 4 months; open to most foreign nationals

xrism.isas.jaxa.jp



Researcher's site can be found at:

go.nasa.gov/xrism



nasa.gov/xrism

