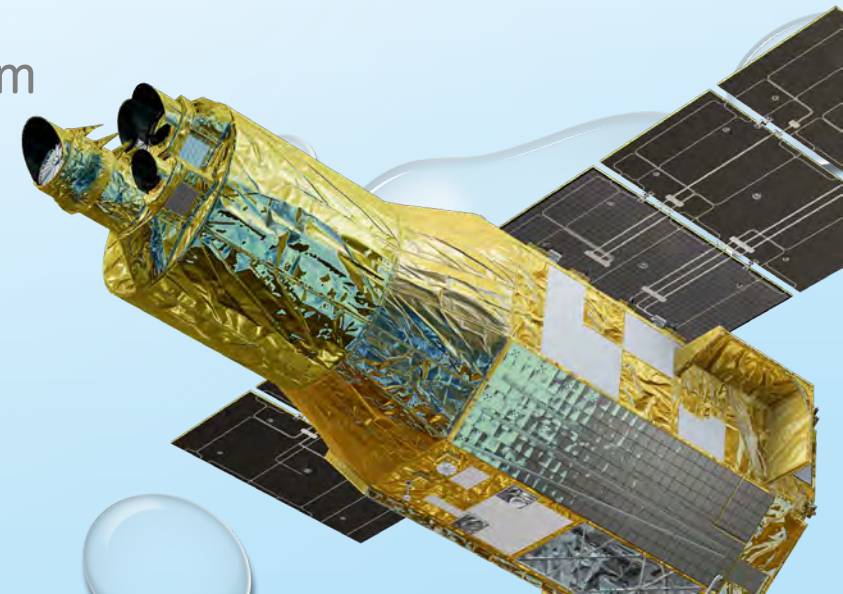


# Status of XRISM (Apr.2023)

Yukikatsu Terada (Saitama U., JAXA)

On behalf of XRISM project team





# XRISM team

## XRISM Science Team Meeting (Dec 2022 @ Tukuba, Japan)

Russel 😊



### Planning participating organization



We are in the same room for the 15<sup>th</sup> IACHEC.  
If you have questions, please contact us!

# Talk plan

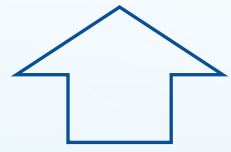
1. Overview of XRISM
2. Current status
3. Presentations in IACHEC
4. In-orbit Plan



# I. Overview of XRISM (1/2)

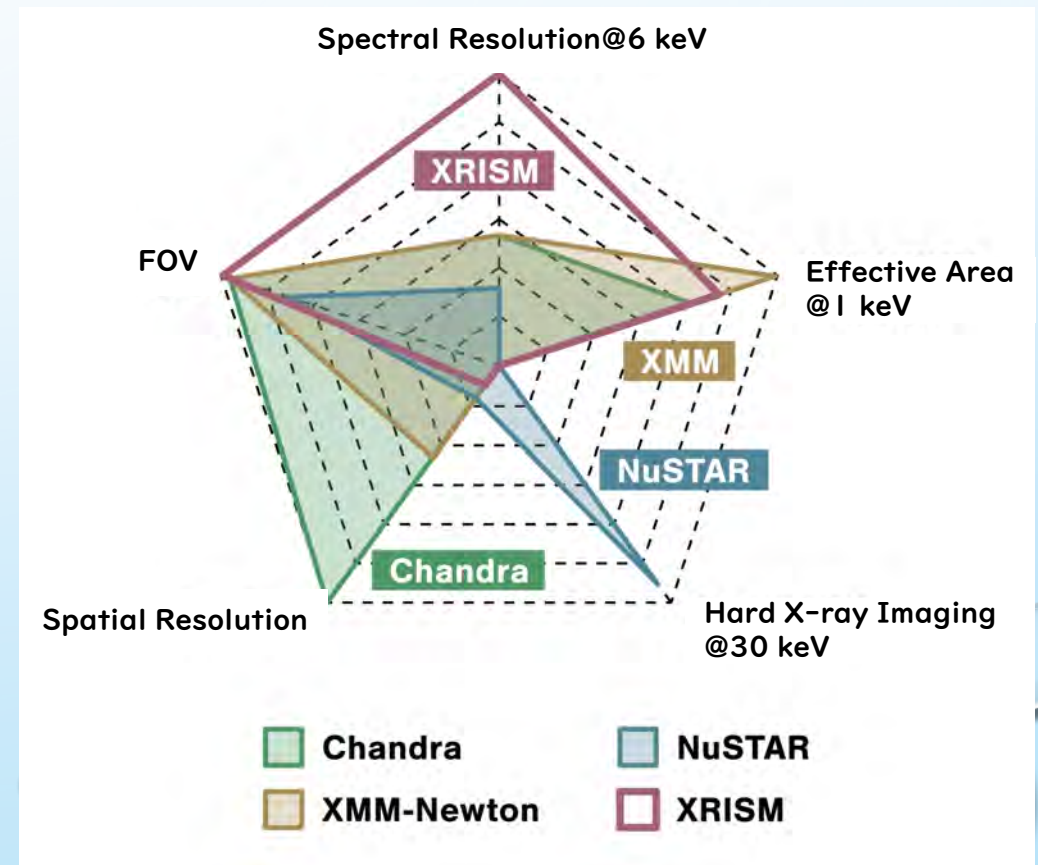
## Scientific objectives

1. Revealing the structure formation of the Universe and evolution of clusters of galaxies
2. Understanding the circulation history of baryonic matters in the Universe
3. Investigating the transport and circulation of energy in the Universe
4. Realizing the new science with high-resolution X-ray spectroscopy



## Key technologies

- An X-ray micro-calorimeter detector which enables high resolution ( $\leq 7$  eV) spectroscopic observations between 0.3 and 12 keV
- An X-ray imager detector which enables a wide-field imaging spectroscopy between 0.4 and 12 keV



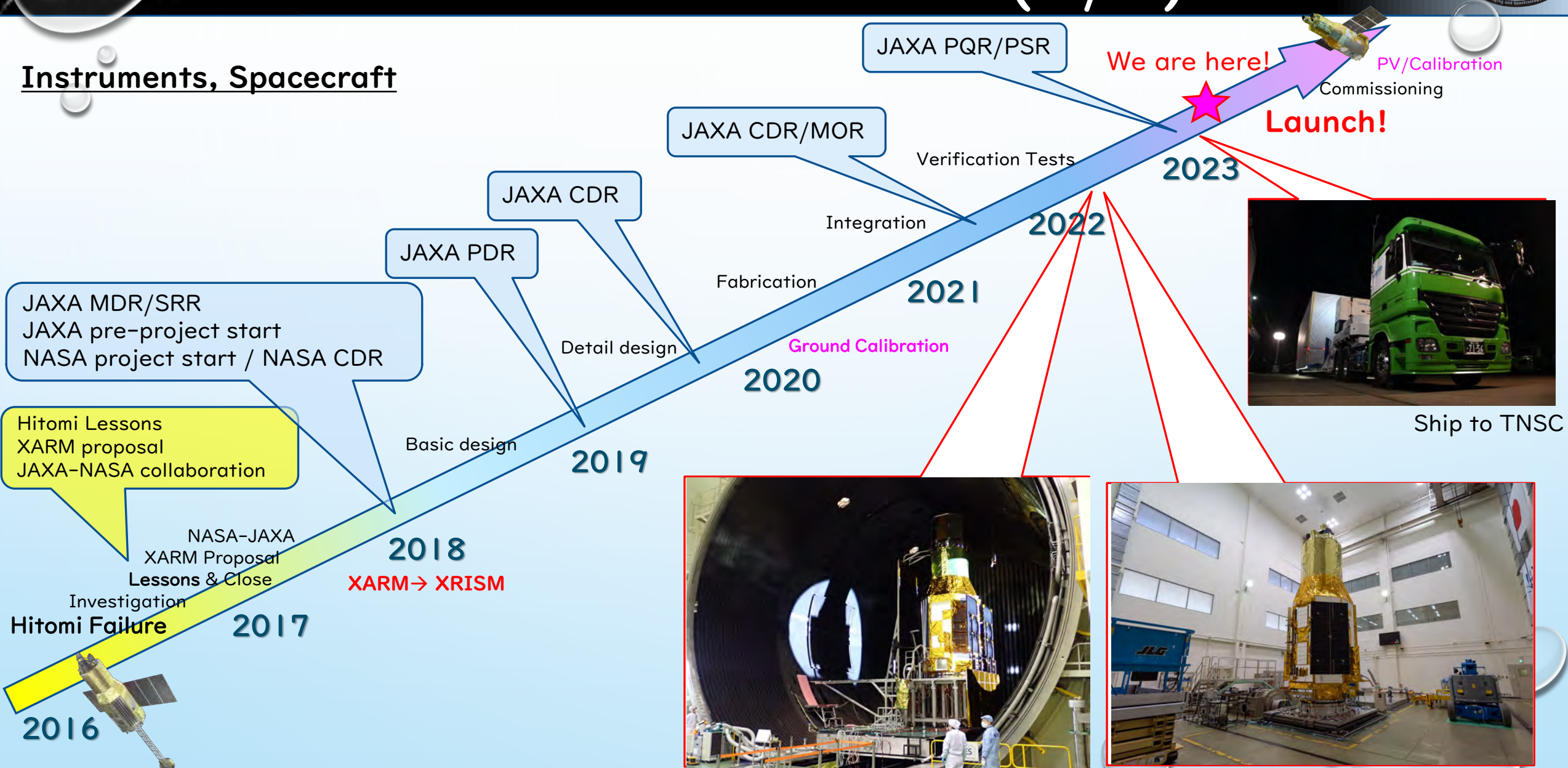
# I. Overview of XRISM (2/2)

## Design goals of Payload instruments

	X-ray Mirror	
Type	Conically approximated Wolter I optics (203 nested)	
Focal length	5.6 m	
Angular resolution	$\leq 1.7$ arcmin (HPD)	
	Resolve	Xtend
Detector technology	X-ray micro-calorimeter	X-ray CCD
Effective Area	$\geq 210 \text{ cm}^2 @6\text{keV}$ $\geq 160 \text{ cm}^2 @1\text{keV}$	$\geq 300 \text{ cm}^2 @6\text{keV}$
Field of View	$\geq 2.9 \times 2.9 \text{ arcmin}^2$	$\geq 30 \times 30 \text{ arcmin}^2$
Energy range	0.3 - 12 keV	0.4 - 12 keV
Absolute energy scale	$\leq 2 \text{ eV}$	-
Energy resolution	$\leq 7 \text{ eV FWHM}@6 \text{ keV}$	$\leq 250 \text{ eV @6 keV (EOL)}$
Non X-ray Background	$\leq 2 \times 10^{-3} \text{ c/s/keV/array}$	$\leq 1 \times 10^{-6} \text{ c/s/keV/arcmin}^2$ in 5-10 keV
Absolute Timing accuracy	$\leq 1 \text{ ms}$	-

# 2. Current Status (1/2)

## Instruments, Spacecraft



# 2. Current Status (2/2)

## Mission Operations / Science Operations

- Preparation of operations well before launch (**Lessons learned from Hitomi**)
  - Review Lessons learned from X-ray missions, ASCA, Suzaku, Hitomi
  - XRISM Operations Concept
  - XRISM Operations Plan
  - XRISM Operations Manual, Science Operations Document
  - Terada et al., JATIS 2021
- Preparation for Science Operations
  - Data/software/caldb distributions, GO program&ToO, helpdesk
  - Development of tools, manual writing, training are completed.
  - Loewenstein et al., Proc. of SPIE 2020
- In-flight calibration plan
  - Miller et al., Proc. of SPIE 2020
- Now: Training for critical/commissioning operations!

Development of pre-pipeline @ISAS



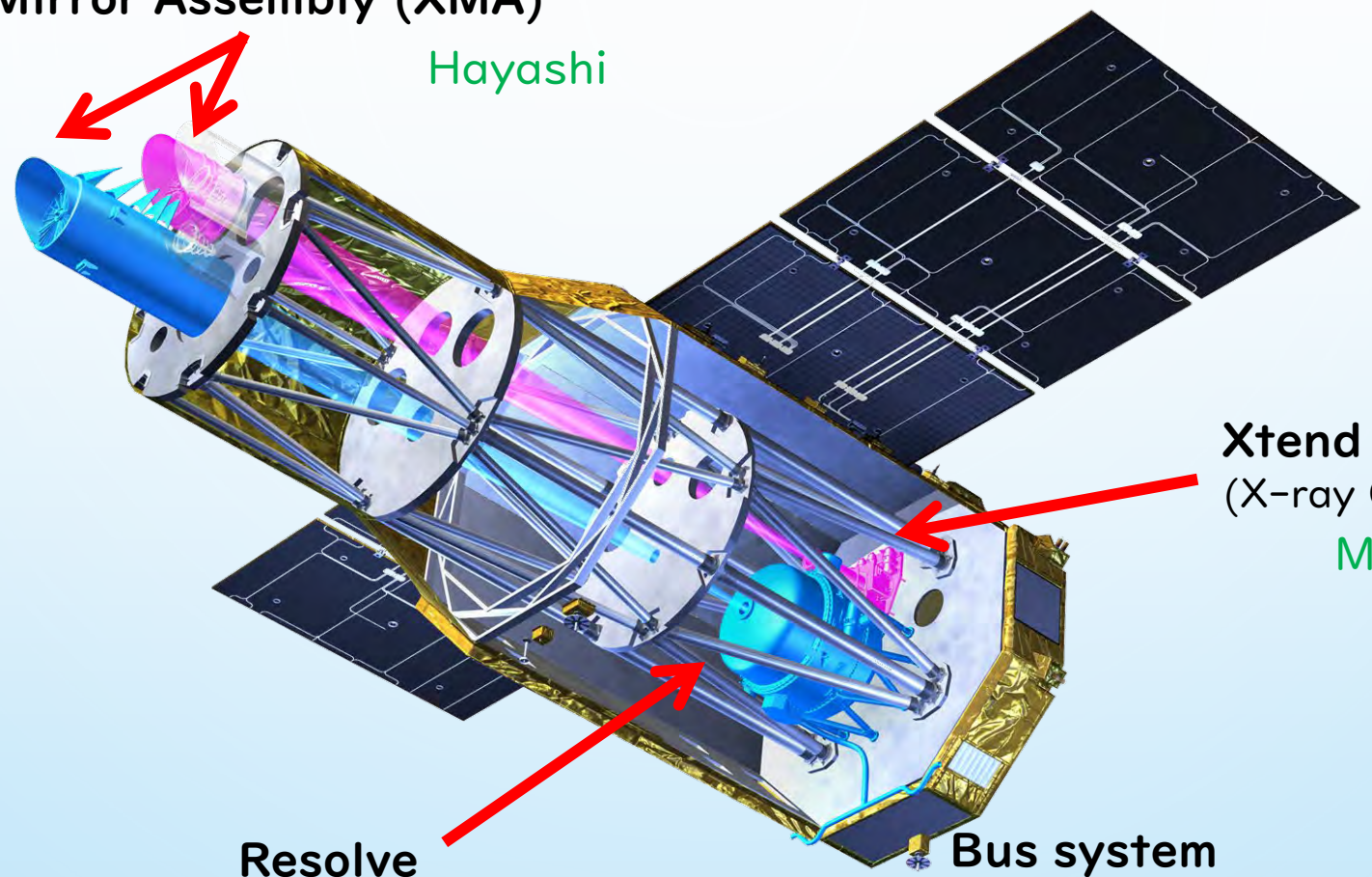
Critical Operation rehearsal @ISAS





# 3. Presentations in IACHEC

## X-ray Mirror Assembly (XMA)



Hayashi

**Xtend**  
(X-ray CCD)  
Mori, Suzuki

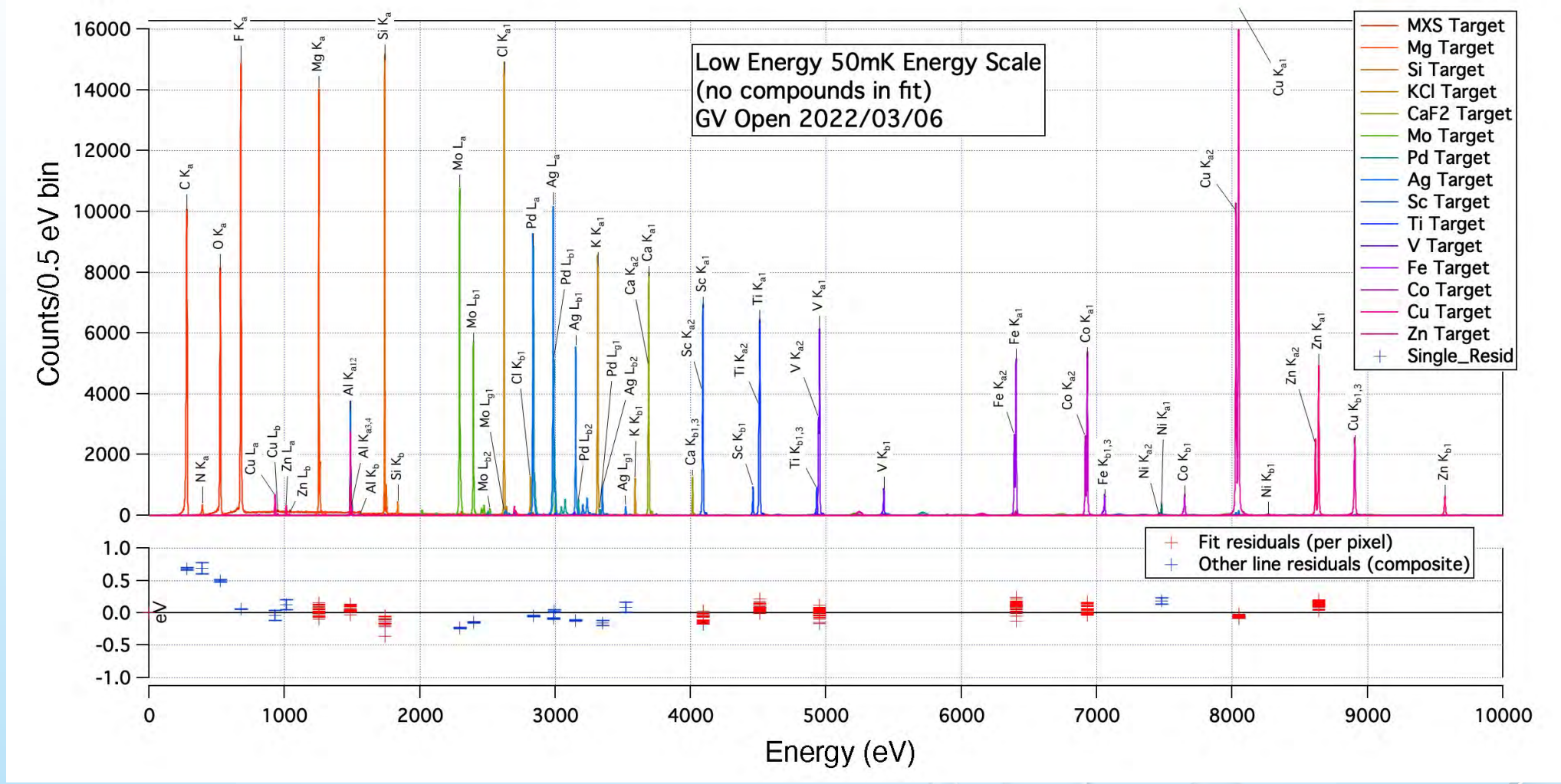
**Resolve**  
(micro-calorimeter array)  
N/A (2 plots from Resolve team)

**Bus system**  
Terada, Shidatsu (Timing WG)

# Resolve Status (1/2)

Ishisaki et al., Proc. of SPIE 2022

\* Label of Figure 10 in the paper was wrong



Absolute energy scale accuracy < 2 eV in 0.3 - 9 keV band

# Resolve Status (2/2)

Ishisaki et al., Proc. of SPIE 2022

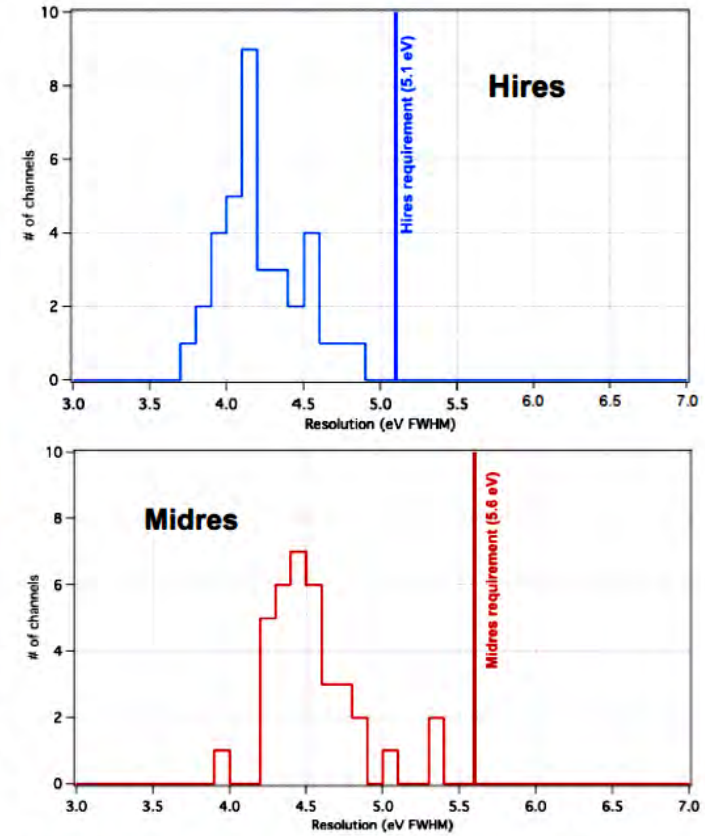
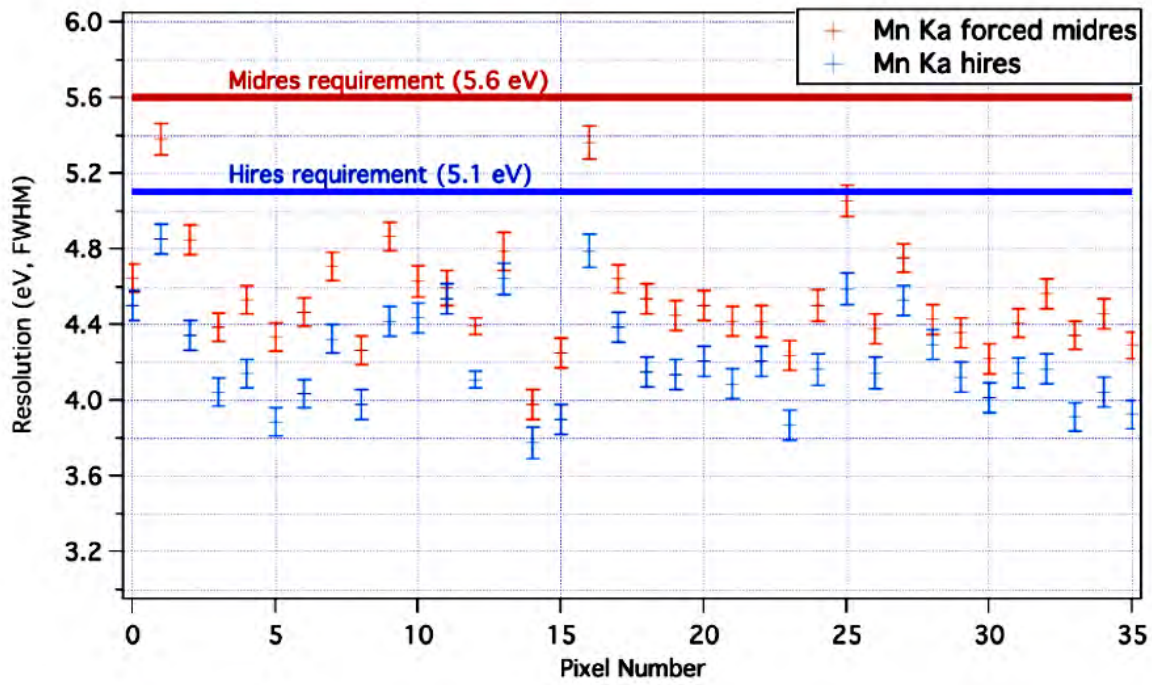


Figure 9. (left) Energy resolution (FWHM) of each pixel at 5.9 keV. (right) Histograms of hires events and midres events. The data were obtained using a Mn target (5.9 keV) at a good cryocooler frequency pair after the Dewar vibration test.

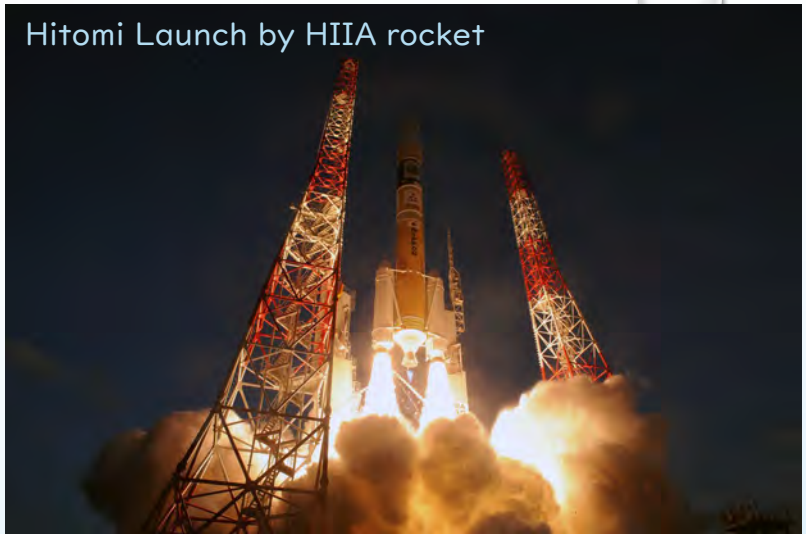
Energy resolution of Hi-res < 4.9 eV, those of Mid-res primary < 5.4 eV; within margin

See also, Hitomi/XRISM micro-calorimeter review; [arXiv:2303.01642](https://arxiv.org/abs/2303.01642)

# 4. In orbit Plan (1/2)

## Launch Day

NET(no earlier than) August 2023  
*spacecraft is waiting for launch at the launch site.*



© JAXA

## Schedule in orbit

Date	Event
Aug 2023 (Assumption)	Launch
Aug to Nov 2023	Critical & Commissioning operation
Nov 2023	First Light
Dec 2023	Early release target, Calibration target
Dec 2023 to June 2024	Performance Verification (PV) and Calibration
June 2024	Guest Observers Program (GO-1)



**Under the assumption of Launch in Aug 2023, the calibration campaign will be in Dec 2023.**

# 4. In-orbit Plan (2/2)

## PV & Calibration targets

- PV target: 33 pri-A targets + 3 reserved ToO and 28 pri-C observations
- Calibration target: 13+ candidates are listed (most of them are IACHEC targets)

<https://xrism.isas.jaxa.jp/research/proposer/approved/pv/index.html>

Miller et al, Proceedings of the SPIE 2020

Home \*under construction

About XRISM  
Proposer  
Useful links

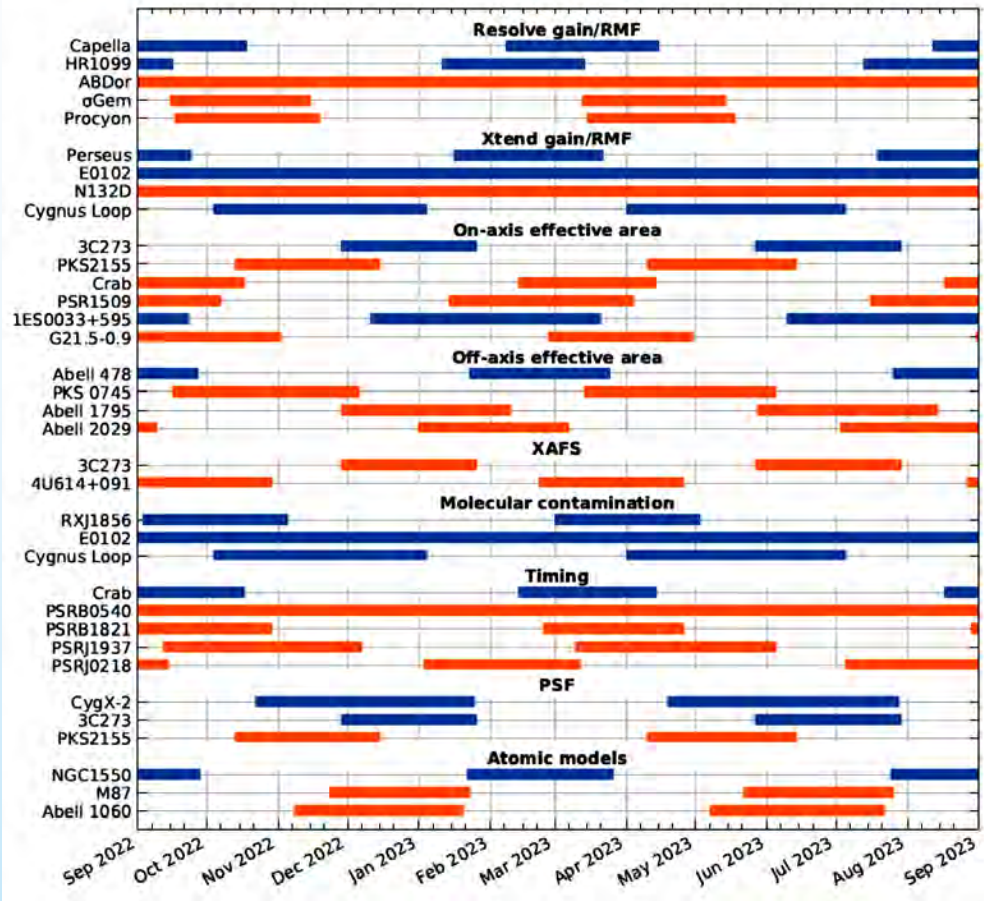
### PV Targets

Following the successful commissioning of spacecraft and payload, XRISM will undergo a 6-months Performance Verification (PV) Phase. The goal of this phase is to showcase the XRISM transformational science, while providing the scientific community worldwide with a comprehensive set of experiments thoroughly verifying the capability of the mission to fulfil all its scientific goals.

Data of the PV phase observations are reserved to the members of the XRISM Science Team, as well as to a small number of "XRISM Guest Scientists" to be appointed by the XRISM Participating Agencies by the end of 2021. Data will be made public following the rules holding for all XRISM proprietary data.

Category	Target	Exposure (ks)	Priority	Remarks
GC	4U 1916-053	50	A	
GC	4U 1624-490	50	A	
GC	GX 13+1	30	A	
GC	Cyg X-1	100	A	
GC	SS 433	80	A	
GC	Cyg X-3	40	A	
GC	Cen X-3	90	A	
GC	Eta Carinae	100	A	
GC	V834 Cen	100	A	
GC	GT Mus	90	A	ToO
GC	SS Cygni (flare)	100	A	ToO
GC	T Cor-Bor	150	A	ToO
GC	2S 0921-630	80	C	
GC	Cir X-1	40	C	
GC	Vela X-1	70	C	
GC	SS Cygni (quiescence)	100	C	
GD	SN1006 pointing 1	20	A	
GD	SN1006 pointing 2	60	A	
GD	SN1987A	100	A	
GD	Cygnus Loop pointing 1	50	A	
GD	Cygnus Loop pointing 2	30	A	
GD	Cygnus Loop pointing 3	20	A	
GD	Tycho SNR pointing 1	75	A	
GD	Tycho SNR pointing 2	75	A	
GD	W49B pointing 1	100	A	

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Please collaborate (enjoy) on in-orbit calibration of XRISM !!

# XRISM information

## XRISM mission

- <https://xrism.isas.jaxa.jp/>

## XRISM web for researchers

- JAXA <https://xrism.isas.jaxa.jp/research/>
- NASA GOF <https://heasarc.gsfc.nasa.gov/docs/xrism/>
- ESA <https://www.cosmos.esa.int/web/xrism>

## XRISM twitter

- [https://twitter.com/XRISM\\_jp](https://twitter.com/XRISM_jp)