

XRISM General Observer – Cycle 2

Scope of Program

1.1. Overview

This program element solicits proposals for participation in the Institute of Space and Astronautical Science of the Japanese Aerospace Exploration Agency (ISAS/JAXA) program for the conduct of space science observations using X-Ray Imaging and Spectroscopy Mission (XRISM). The XRISM mission is led by ISAS/JAXA, with significant contributions from NASA and ESA. The primary goal of the XRISM mission is to investigate the nature and physics of astrophysical objects as revealed through detailed observations of their high-energy emission. A broad range of astrophysical sources will be studied, including stars, X-ray binaries, diffuse galactic emission, active galactic nuclei, and clusters of galaxies.

JAXA is responsible for allocating the Japanese share of XRISM observing time during the mission via this and subsequent solicitations. Following the completion of the Performance Verification (“PV”) phase, all JAXA-allocated observing time, including that fraction allocated to the other nations, will be awarded competitively. Allocation of the U.S. observing time will be the responsibility of NASA. Allocation of time awarded to proposers from European Space Agency (ESA) member state countries will be the responsibility of ESA. This Call solicits proposals for observations using one or both instruments comprising the XRISM scientific payload.

1.2 The XRISM Mission

1.2.1 Overview

XRISM, seventh Japanese X-ray Astronomy satellite, is a collaborative mission between ISAS/JAXA and GSFC/NASA, with contributions from over 70 institutions in Japan, the U.S., Canada, and Europe. XRISM, with the unprecedented combination of spectral resolution of the Resolve instrument and the wide field of view of the Xtend instrument, will execute a diverse and exciting program of astrophysical research.

Cycle 2 of XRISM General Observer (GO) observations will commence on November 1, 2025, and last for a period of 6 months. The duration of Cycle 2 has been reduced to six months to accommodate a potential gate valve opening attempt. Shortly after cycle 2 observations commence, the cycle 3 solicitation will be released, allowing for the inclusion of new observations if the gate valve opening is successful. This approach ensures that we can quickly leverage any new capabilities resulting from a successful gate valve operation. Following the completion of Cycle 2, subsequent 12-month observing cycles will be carried out through the end of the mission.

1.2.2 The XRISM Observatory

The XRISM scientific payload is composed of a suite of two co-aligned instruments covering the energy band between ~ 0.3 – 12 keV: the Resolve Soft X-ray Spectrometer and the Xtend Soft X-

ray Imager. These instruments placed on the focal plane of the X-ray Mirror Assemblies (XMAs), lightweight foil telescopes similar in design to those flown on ASCA and Suzaku, but with an improved half-power diameter (HPD) of ~ 1.3 arcmin. The cryogenically cooled 6×6 microcalorimeter array of Resolve covers a field of view (FOV) of 3×3 arcmin² with a spectral resolution of approximately 5 eV over its 0.3 -12 keV bandpass. This spectral capability is the best yet achieved at energies above 3 keV for observations of celestial sources outside the Solar System; in addition, unlike grating instruments, Resolve can observe spatially extended X-ray sources with the same spectral resolution across the FOV. The CCD-based Xtend at the focus of the second XMA has a wide (38.5×38.5 arcmin²) FOV over the 0.3 -13 keV energy range with a spectral resolution of 180 eV at 6 keV.

The XRISM Resolve instrument's Gate Valve (X-ray aperture door) has not opened, thereby shifting Resolve's energy band from 0.3 - 12 keV to 1.7 - 12 keV and lowering the effective area. The Cycle-2 program will be carried out under the assumption that the Gate Valve will remain in the closed configuration. The relevant response files and technical information are provided via the XRISM website at <https://xrism.isas.jaxa.jp/research/proposer/index.html>

For detailed description of the XRISM mission, including technical information about the instruments and the currently available data relevant to their in-orbit performance, and observation feasibility, proposers should consult the XRISM Proposer's Observatory Guide, which will be accessed at the JAXA XRISM website for proposers (<https://xrism.isas.jaxa.jp/research/proposer/POG/index.html>).

1.2.3 Science Operations

The XRISM spacecraft has a mass of 2,300 kg and was launched on September 7, 2023, from Tanegashima Space Center (TNSC) in Japan. A JAXA H-IIA rocket placed the observatory into an approximately circular orbit with an inclination of ~ 31 degrees and an altitude of ~ 575 km. XRISM operations are managed by scientists and engineers at ISAS/JAXA. The operations team is responsible for scheduling of the observations, command/control of the satellite, collection of the data, and monitoring of the health of the spacecraft and scientific payload. Spacecraft operations are carried out from the Uchinoura Space Center (USC) in Japan, where direct contact with the satellite is possible for five orbits per day. The onboard data recorder has a capacity of 12 Gbits, and telemetry can be downlinked to USC at a rate of 8 Mbps for approximately 500 s per contact. The data are routed to ISAS/JAXA, where pre-processing tasks are performed, including FITS conversion and generation of orbit and attitude files. The resultant data are transmitted to the processing pipeline at GSFC/NASA, where calibration data will be applied to the pre-processed science data. Subsequently, the processed data will be copied to identical mission archives at ISAS/JAXA and GSFC/NASA in an encrypted form, at which time their address and the decryption key will be made available to the PI of the observation. At the end of the 1-year proprietary period, the associated data files in the archive will be decrypted and made publicly accessible. It is anticipated that XRISM will generate ~ 1 Tbyte of data per year, although the total daily data volume rate may approach 8 Gbytes.

1.3 XRISM Cycle 2 GO Program

- (1) Individuals affiliated with Japanese institutions at the time of the proposal deadline are invited to submit, as Principal Investigators (PIs), proposals for science observations using the XRISM instruments by responding to this solicitation. If a proposer is affiliated with multiple institutes, the eligibility for being a PI of Japanese investigation is determined based on her/his *primary affiliation*. For professors, postdocs, or any other research staff, an institute which pays at least 50% of their salary is defined (within this solicitation) as their primary affiliation. Any temporary or remote status, such as visiting professor or visiting research fellow, is not considered as a primary affiliation status.
- (2) Individuals affiliated with institutions outside Japan, US/Canada, or ESA member states in Europe at the time of the proposal deadline are also eligible to submit proposals as PIs. In such case, however, the proposers *must* designate a co-PI who is affiliated with Japanese institutes. Note also that the relative time allocation for PIs affiliated with institutions outside Japan is limited to no more than 4% of the total GO time, and these proposals are not subject to international merging.

The relative time allocations for the various categories of Cycle 2 observing time (after accounting for the carryover of remaining Cycle 1 observations) are as follows:

- Observatory time (Calibration, Director's Reserve, Director's Discretionary Time for unpredictable events)- 10%;
- GO time - 90%.

The Cycle 2 allocation of GO time among the mission partners is as follows:

- Japanese investigations (including other partners) - 48%.
- U.S. investigations (including Canadian partners) - 44%;
- ESA investigations – 8%;

Each recommended GO target will be assigned a priority grade of A, B, or C by the International Panel based on the recommendation by the Science peer review panel. Note that multiple targets (or multiple pointings/phases) accepted through a single proposal may be assigned different priority grades. Priority A and B targets are guaranteed to be observed; best efforts will be made to schedule such targets within the Cycle 2 period. Those Priority A/B targets that cannot be scheduled during Cycle 2 will automatically be carried over to the subsequent cycle. Note, however, that this carry over does not apply to TOO targets: observations of such targets that are unable to be scheduled during Cycle 2 must be re-proposed to a future observing cycle. Priority C targets will have lowest priority for scheduling; observations of such targets that are not scheduled during Cycle 2 must be resubmitted to a future observing cycle. The available Cycle 2 GO time will be allocated as follows: Priority A = 50%, Priority B = 40%, and priority C = 50%, resulting in an oversubscription of 40% of the nominal total GO time, to allow for a pool of targets to be used if needed. Accordingly, C targets will nominally have a 20% probability of being observed during a given cycle, although the actual fraction may be greater if the observing efficiency is higher than predicted.

Note that, as a general policy, proposals for observations of targets that have been previously

observed in any phase of the mission are permitted. Such proposals must provide a convincing justification of the need for additional observations of the target, e.g., observations during a different binary phase or source state, or of different locations within extended sources. Similarly, proposers may request multiple observations of the same target for a specific investigation. However, such requests will be approved only if a clear scientific and logistical justification of the need for separate observations is provided in the proposal. Targets that have been observed and are planned to be observed during Cycle 1, calibration target candidates for a year including AO-2 phases as well as the required tools for searching the observation database, are available from the XRISM homepage (<https://xrism.isas.jaxa.jp/research/proposer/approved/index.html>). Prospective proposers should consult this database to ascertain if their targets of interest have previously been (or are scheduled to be) observed.

In cases where the same target is selected in more than one national program (JAXA, NASA, ESA), the feasibility of merging the investigations will be explored. The decision will be made by the International Merging Panel. In all instances where feasible, a single observation of the target will be awarded to both proposing teams, a single, Prime PI (PPI) will be designated, and the time will be accounted for based on the Agency to which the PPI proposed the observation. The PPI will assume the responsibility for planning of the observation and both teams will have access to the processed data. Alternatively, PIs have the option of indicating on their proposal that they do not wish their proposed observation merged. In such cases, if one or both of the accepted proposals are so marked, only one will be selected for observation. The priority given by the national reviews, as well as the lengths of the accepted observations, will be considered. Proposals with PIs affiliated with institutions outside Japan or those with scientific justifications written in Japanese are not subject to joint observations.

Investigators whose observing proposals are selected for implementation will receive the resultant data in a form suitable for analysis. As agreed to in the NASA/JAXA Memorandum of Understanding PIs will be granted exclusive access to the data resulting from their approved observations for a period of one year. Subsequently, the data will be placed in a public archive and made available publicly.

All proposals submitted to JAXA will be evaluated in a single peer review. Note that a target form providing details of the requested observation, including the source coordinates, required exposure time, instrument mode, any observing constraints, etc., must be completed for each target to be observed as part of the proposed investigation. Positional accuracy of targets (for the aimpoint of Resolve) must be specified to an accuracy of better than 1'.

1.3.1. Observing Constraints

Proposals may be submitted for investigations requesting observations that can be executed within the 6 month period of Cycle 2 (November 1, 2025-May 1, 2026); proposals for investigations requiring observations beyond the period of Cycle 2 will not be accepted under this solicitation.

It is anticipated that XRISM will typically perform one pointing every a few days (typical exposures of ~50 - 200 ks). This constraint is primarily driven by the need to collect a sufficient number of photons to take advantage of Resolve's high spectral resolution. In order to maintain a

satellite observing efficiency of ~50%, the minimum allowable observing time on a particular target is 10 ks (~4 orbits). To maximize the breadth of scientific investigations undertaken with XRISM during Cycle 2, observations will be limited to 300 ks per pointing with the total not to exceed 600 ks per proposal; it is anticipated that these restrictions will be relaxed over succeeding cycles. Subject to the above constraints, individual proposals may be submitted for observations of a single pointing with a requested observing time of 10 - 300 ks, or for a larger program including multiple targets or pointings with an observing time request not to exceed 600 ks. These rough guidelines are unchanged despite the closed gate valve configuration.

Note that as the XRISM Project gains experience in operating the observatory and its instruments, additional operational constraints/clarifications regarding the scheduling of Cycle 2 observations may be issued. In such cases, the change(s) will be posted on the XRISM website.

1.3.2 Time-constrained observations

Time-constrained observations, that is, observations with scheduling constraints imposed either by the nature of the target or the requirement for coordination with other ground- or space-based observatories, place a special burden on XRISM mission planning. (For further discussion of such observations, see the XRISM Proposer's Observatory Guide, available from the JAXA XRISM page for proposers (<https://xrism.isas.jaxa.jp/research/proposer/POG/index.html>)). The additional constraints associated with the scheduling of an excessive number of time-critical observations would compromise the capability of the mission planning and operations team to effectively execute the complete set of approved programs. To maintain the number of such observations at a manageable level, targets requiring time-constrained observations must receive the highest scheduling and scientific priority. Consequently, time-constrained observations must be designated Priority A.

1.3.3 Target-of-Opportunity (TOO) observations

Observations of classes of targets involving outbursts from previously identified transient sources or changes in the intensity or spectral state of previously identified persistent sources (designated "pre-approved" Target-of-Opportunity observations) constitute another special category of XRISM observations. Proposals for observations of such targets will be permitted in Cycle 2. The turnaround time for such observations is 48 hours during weekdays, and 72 hours during weekends. Details regarding the criteria for "triggering" a requested TOO observation, as well as an estimate of the trigger probability during Cycle 2, must be provided in the scientific justification and summarized on the target form. To assist the XRISM team in estimating the total exposure time of approved TOO observations during Cycle 2, the product of the requested exposure time and the trigger probability will be used. Proposers may request observations for up to 10 candidate targets, where the proposed and/or accepted number of triggers need not be identical to the total number of candidate objects (e.g., proposers may request "up to three of the following 10 X-ray transients in outburst"). In such cases, the 600 ks limit on the total requested observing time per proposal refers to the total actual observing time that might be incurred, and for which the trigger probability of interest is not that for individual targets, but rather the aggregate probability of all candidate targets in a proposal.

Note that, as with time-critical observations, TOO targets must be assigned a rating of Priority A to be eligible for scheduling. Approved TOO targets that are not triggered or otherwise unable to be scheduled due to observatory constraints during Cycle 2 will *not* be carried over to Cycle 3.

Due to the additional complexity associated with the scheduling of observations of time-constrained and TOO targets, a limit will be imposed on the total time awarded to such observations (currently expected to be ~10% of the total GO time). It is anticipated that this limit will be adjusted during future observing cycles as experience in the scheduling of observations is gained over the course of the mission.

In case of truly unpredictable events, e.g., outburst of a hitherto unknown X-ray transient, a real-time request for a TOO observation may be submitted. If accepted, the resulting observing time will be charged to the Director's Discretionary Time and the obtained data will go to public immediately. The procedure for requesting such observations and the relevant data rights policy can be found at <https://xrism.isas.jaxa.jp/research/proposer/too/index.html>

2. Programmatic Information

2.1 Submission and Evaluation of XRISM GO Proposals

Proposals shall provide a detailed description of the proposed investigation, including the requested XRISM observation(s) and associated scientific/technical justification. All proposal materials shall be submitted electronically, as specified below.

Individuals submitting proposals to the Cycle 2 XRISM GO Program must adhere to the following proposal submission procedures:

- Proposers must submit their proposals (including the accompanying target forms) electronically through the ARK/RPS website at <https://xrsv1.isas.jaxa.jp/ark/>. Instructions for submitting proposals via ARK/RPS are provided at the same website.
- Due to the nature of prospective GO investigations within the XRISM GO program, the Scientific/Technical/Management section of proposals, including figures and references, is limited to **4 pages, with a font size of 11pt or larger**.
- The Scientific/Technical/Management section should be written in English, if PI has a master's or higher-level degree or if the PI accepts international merging. Otherwise, proposals written in Japanese is accepted.
- The Scientific/Technical/Management section must be uploaded to the RPS website as a PDF file.

In order to be included in the review of proposals for this cycle of the XRISM Guest Investigator Program, all proposal materials must be submitted electronically by 4:30 p.m., Japan Standard Time on the due date provided in Section 3 of this program element appendix.

GO Proposals will be evaluated by a science peer panel based on criteria that include the following factors:

- The scientific significance of the proposed observations (background and objectives)
- The suitability of using the XRISM observatory
- The feasibility of observations and rationale for required exposure times

2.2 Supplemental Information

Further details concerning the proposal submission requirements and process can be found at the JAXA XRISM website for proposers (<https://xrism.isas.jaxa.jp/research/proposer/index.html>) This website provides instructions for completing the required proposal forms. A detailed description of the XRISM mission, including technical information relevant to the observatory, instruments, and observation feasibility can be found at the same website. Answers to frequently asked questions can be found at (<https://xrism.isas.jaxa.jp/research/helpdesk/index.html>).

3. Summary of Key Information

Due date for proposals	4:30 p.m. JST, 15, May, 2025 Proposals will not be replaced after the due date
Page limits for Scientific/ Technical/Management section	4 pages, pdf file, including figures and references.
Submission medium	Electronic proposal submission is required in PDF format; no hard copy is required.
Website for submission of proposal and required forms	https://xrsrv1.isas.jaxa.jp/ark/ (Assistance for technical questions is available at the Help Desk https://xrism.isas.jaxa.jp/research/helpdesk/index.html)
Eligibility	At the time of the proposal deadline, PI primary affiliated with Japanese institutions. If PIs affiliated with institutions outside Japan, NASA, and ESA, a Co-PI affiliated with institutes in Japan must be designated, and the proposal will not subject to the international merging.
Language used in proposals	English for PI with a master's degree or at higher level or for PI accepts international merging. Otherwise, Japanese is accepted.