

**Announcement of Opportunity
ASTRO-F**

CALL FOR OBSERVING PROPOSALS

Policies and procedures

**20 September 2005
(updated 21 September 2005)**

ASTRO-F Programming Committee

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1. Overview

This “Call for Observing Proposals” offers the Japanese and Korean astronomical community observing opportunities with ASTRO-F, an infrared space mission of the Institute of Astronautical Science (ISAS), Japan Aerospace Exploration Agency (JAXA).

This document presents an overview of the ASTRO-F mission, an introduction of the observing opportunities with ASTRO-F, the policies adopted and the procedures to be followed for proposal submission.

Detailed documentation about the mission and tools for proposal submissions are available at:

<http://www.ir.isas.jaxa.jp/ASTRO-F/Observation/>

Scientists in ESA member states should consult the parallel announcement at:

<http://www.astro-f.esac.esa.int/>

2. The ASTRO-F Mission

ASTRO-F is the second Japanese space mission for infrared astronomy. A major goal of the mission is to perform an all-sky survey in six infrared bands between 6 and 180 micron. ASTRO-F will also perform pointed observations over the wavelength range 2-180 microns in 13 bands, providing comprehensive multi-wavelength photometric and spectroscopic coverage of a wide variety of astronomical sources.

ASTRO-F is scheduled to be launched in early 2006 and brought into a sun-synchronous orbit at an altitude of 750 km with a period of approximately 100 min by a JAXA M-V rocket. The telescope system and the scientific instruments on board will be cooled down by super-fluid liquid helium with mechanical coolers. The expected lifetime of the cryogen is about 550 days. ASTRO-F is equipped with a 68.5 cm cooled telescope and two scientific instruments, the Far-Infrared Surveyor (FIS) and the Infrared Camera (IRC). The FIS has two 2-dimensional detector arrays and observes in four far-infrared bands between 50 and 180 μm . The IRC consists of three cameras covering 1.7 - 26 μm with a field-of-view of approximately 10×10 arcminutes². Both instruments have low to moderate resolution spectroscopic capabilities. The spacecraft will spin about the

sun-pointed axis once per orbit, pointing the telescope at the zenith. In this scanning mode, an all-sky survey will be executed simultaneously both with FIS and IRC. Up to three times per orbit, the attitude of the spacecraft may be fixed in the inertial space for up to approximately 600s to make a pointed observation with FIS or IRC. The absolute pointing accuracy is expected to be 30 arcsec and the attitude stability is 1 arcsec per minute in the pointed observation mode.

The ASTRO-F project is run by JAXA's Institute of Space and Astronautical Science (ISAS) in Japan in collaboration with other Japanese institutions, Seoul National University in Korea, Imperial College London, University of Kent, Sussex University in the United Kingdom, the Space Research Organization of the Netherlands (SRON) and the Kapteyn Astronomical Institute in the Netherlands, and the European Space Agency (ESA).

3. Mission phases and time allocation

Three phases of the observing program are foreseen.

- Phase 1 comprises the first 6 months after the Performance Verification phase, in which the all-sky survey is the primary program. Some pointed observations (~1500 observations) are also planned in this phase for the ASTRO-F project team.
- Phase 2 encompasses the period after Phase 1 until liquid helium exhaustion. It will last approximately 300 days. During Phase 2, the area that could not be observed for the survey in Phase 1 will be observed in the scanning mode to complete the all-sky survey. In the rest of observing time, about 5000 to 6000 pointed observations are expected to be executed.
- In Phase 3 the telescope and scientific instruments will still be kept below 40K by the mechanical coolers and only near-infrared observations will be carried out.

This Call offers observing opportunities in Phase 2. A Call for observations in Phase 3 will be made separately.

Of the total observing time, including the scan and pointed observations, 10% is reserved for calibration and director's time. ASTRO-F will carry out scientific

observations in the remaining 90%. The ASTRO-F team has its own observing programs, in two categories: “Large Area Survey (LS)” and “Mission Program (MP)”. The LS uses a large fraction of the observing time to make surveys in wide areas. It consists of three programs: All-Sky Survey (LSASS), North Ecliptic Pole Survey (LSNEP), and Large Magellanic Cloud Survey (LSLMC). MP is a coherent set of guaranteed time programs dedicated to specific scientific goals. It comprises 15 programs. As described above, the pointed observations in Phase 1 will be used exclusively for LSs and MPs. In phase 2, 70% of pointed observations will be allocated to LSs and MPs and the remaining 30% will be open to general observers (hereafter Open Time observations; OT). One third of the OT will be allocated to the European astronomers through ESA as part of an internal collaboration (hereafter ESA OT). The remaining two thirds will be assigned to observation opportunities for the Japanese and Korean communities (hereafter ISAS OT). Over 1000 observation opportunities are anticipated to be available for the ISAS OT observations and 500 for the ESA OT.

4. Observing constraints

Because the ASTRO-F telescope has to avoid the Sun- and Earthshine in its low Earth orbit, the sky visibility is highly restricted. Particularly, objects near the ecliptic plane have a small chance of being observed. Except for the ecliptic polar regions, several pointed observations of a given target are thus quite difficult. The attitude control system has a capability to locate the telescope axis ± 1 degree off the canonical position of the solar elongation of 90 degree, which increases the observable area on a given orbit.

Because of the stringent visibility constraints, it is anticipated that observations of some targets in LSs and MPs may not be executed. The targets of the LSs and MPs are given a priority A, B, and C. Those graded with A and B priorities are the targets to be scheduled for observations and those graded with C are backup targets, which come into the schedule only when A or B targets cannot be allocated observing time.

In general, OT investigators should not propose observations that are deemed to duplicate those of priority A and B of LSs and MPs. Observations with priority C in MPs can be proposed in OT observations. Since both instruments have array detectors, a guideline of the definition of a duplication observation is to overlap with half of the field-of-view of existing LS or MP targets with the same observing mode (AOT, see

below). Those with a requested number of pointings a factor of 4 higher are not regarded as duplications. However as described above, such observations may only be possible in very small regions of the entire sky.

ASTRO-F will be operated in a pre-planned manner without any significant routine real-time interaction. Thus, all observations must be specified in full detail by the observers with pre-packaged templates or AOTs (Astronomical Observations Templates). Open time proposers may apply to use any of the instrument modes or AOTs described in the Observer's manual. A specific point for observations with the FIS spectroscopic mode (AOT FIS03) to note is that;

because of the complexity of the instrument, dedicated iterative data reduction procedures are required to reduce the FTS data in addition to the standard processing. Thus the following restrictions apply for the open time FTS observations. There will be no difference from other AOTs in the reviewing procedure.

1. The number of FTS observations in the open time will be limited to no more than 5% of the total open time pointing observations.
2. Proposers are strongly recommended to confirm the feasibility of proposed observations with the condition that the signal-to-noise ratio be larger than 10 in one pointing observation.
3. Successful proposers are required to work closely with the FIS/FTS team for the data reduction. A dedicated contact point will be given.

In making LS and MP observing programs, 6 orbits in two days are reserved for OT observation opportunities. Taking account of the ± 1 degree pointing capability off the canonical attitude, any part of the sky should be observable in OT observations in the reserved orbits, except for the areas disturbed by the presence of the Moon and the South Atlantic Anomaly (SAA) where a high hit rate of ionizing particles are anticipated. Note, however, that targets near the ecliptic plane generally have a small number of observation opportunities. **Observers should understand that opportunities to observe particular objects or fields with ASTRO-F are severely limited. Observations of generic targets distributed over the entire sky are preferred to those of specific targets.** Time critical observations are not recommended for the same reasons. Target-of-opportunity (TOO) proposals will not be accepted as OT proposals. They can instead be requested as director's time.

An Open Time proposal should have a sufficient number of backup targets (priority C) in addition to those with A and B priorities. Backup targets should not duplicate backup (priority C) observations in MPs. The targets should be distributed across priorities A:B:C in the ratio of 1:1:1. As a summary, the priority of the targets for duplication is given as LS/MP A, B > OP A, B > MP C > OP C (no C targets in LSs).

5. Review process and schedule

Proposals may be submitted from 20 September to 18 November 2005. All proposals will be evaluated by peer review. ESA and ISAS will make the review independently. The following items will be taken into account during the review process:

- Scientific case and justification
- Scientific merit and relevance of the proposed observation(s)
- Exploitation of the ASTRO-F instruments
- Duplication with MP and LS observations
- Technical feasibility and adequate performance estimation
- Visibility and requested number of pointings

The final selection of the proposals will be made based on the results of both reviews. In case of conflict, the proposal with the higher ranking in the individual lists will be selected. If there are similar proposals with similar evaluation in both sides, corresponding investigators may be asked to make collaborative observations. The visibility of the proposed observations will be examined before the selection to ensure that they can be allocated the requested observing time. Results will be made available to the observers after the launch. Successful proposers will be given the number of pointed observations of each priority and asked to revise the target list, if necessary, to meet the given observation opportunities.

After the performance verification phase, the observation scheduling will be carried out. In this process, priority A observations will be scheduled first, followed by B and C observations. In general, observations with priority C will not be executed even if observing time is allocated. Investigators of successful proposals will be informed which A and B observations are allocated the observing time and asked to report which

C observations should replace unallocated A and B observations. Investigators should understand that the execution of the allocated observations cannot be guaranteed.

6. Data products and data rights

The data will be delivered to the successful proposer after standard processing has been performed. The data package will comprise both raw and pipeline-processed data together with the associated calibration files. All Open Time data will go into public domain one year after completion of Phase 2.

7. Proposal submission

- a) **Who may propose.** Only PIs affiliated with institutions located in Japan or Korea or who are Japanese or Korean are eligible to propose for ASTRO-F Open Time programme through ISAS. This requirement does not extend to Co-Investigators.
- b) **Due date of proposals.** Proposals are due on **18 November, 2005, 18:00 hrs JST (09:00 UT)**.

In view of possible network congestion close to the deadline, proposers are urged to submit their proposals well in advance of the due date.

- c) **Proposal format.** Proposals must be submitted electronically using the Proposal Submission Tool available at the ASTRO-F website <http://www.ir.isas.jaxa.jp/ASTRO-F/Observation/>. Details of the mission, instruments and observing modes (AOTs) are provided in the Observers Manual documentation. Observers are required to check the visibility and the technical feasibility of the observations, and the duplication with blocked observations, via usage of the specific tools provided. Proposals should include a scientific justification for the program and a demonstration of the feasibility of the proposed observations and the need of the unique capabilities of ASTRO-F for carrying out the investigation. The scientific justification is limited to 5 pages at most (3 for text and 2 for figures and tables). Japanese observers are encouraged to add Japanese direct translation of the Scientific Justification (text part, up to 3 pages).

8. Documentation and Tools

The following documentation and tools are available at:

<http://www.ir.isas.jaxa.jp/ASTRO-F/Observation/>

- **The ASTRO-F Announcement of Opportunity**
This document, providing the necessary information about the policies adopted and the procedures to be followed.
- **ASTRO-F Observer's manual.**
A document which describes the mission scientific instruments and AOTs, including the pre-flight performance of the instrument and the guidelines for the observation planning.
- **Large Area Surveys (LS) and Mission Program (MP) abstracts**

- **Blocked target list and MP backup target list**
- **Duplication check tool**
A web tool to search for nearby targets in the blocked target list
- **Proposal Submission Tool**
A web tool for the submission of the proposal and the target list.
- **Visibility tool**
A web tool to provide the target visibility.
- **Instrument Performance tool**
A web tool to estimate the number of pointing observations needed for a given flux and signal-to-noise ratio, or the signal-to-noise ratio for a given flux in one pointing observation with a given AOT.
- **iris_sky**
An IDL tool to browse IRAS and 2MASS image and overlay the ASTRO-F Field-of-Views.

For any question regarding Open Time observations, please consult with the ISAS ASTRO-F helpdesk at iris_help@ir.isas.jaxa.jp.