



EAO-5

ESA Announcement of Opportunity (EAO-5)

Suzaku
Guest Investigator Programme
28 August 2009

1. Overview

This announcement solicits proposal for observations using the Japanese-US X-ray astronomy satellite "*Suzaku*".

The X-ray Astronomy satellite *Suzaku* was developed under the collaboration of Japan and the United States, and was launched by ISAS/JAXA on 2005 July 10. *Suzaku* has successfully carried out astronomical observations using the X-ray Imaging Spectrometer (XIS) and the Hard X-ray Detector (HXD). After the initial operation for instrument calibration and performance verification, which confirmed the wide-bandpass, high-sensitivity, moderate spectral resolution capabilities of *Suzaku*, the international AO phase of the mission was entered in 2006 April, performing observations based on proposals received from the astronomical community world-wide. ISAS/JAXA plans to start AO-5 observations in April 2010, and hereby solicits submission of observing proposals.

In EAO-5, ISAS/JAXA will accept observations using P-sum/timing mode for the XIS for up to 5% of the total ordinary observing time.

ISAS/JAXA will continue to solicit Key Project proposals, which were initiated in AO-4, in order to fully utilize unique capabilities of *Suzaku* and have allocated 2000 ksec for them. In the Key Project programme, the *Suzaku* project team expects to carry out observations that challenge important astrophysical issues and will be utilized for a long time after the observations as a legacy of *Suzaku*. The data taken in the Key Project program and those of ordinary proposals with an exposure time ≥ 300 ksec are to be opened immediately after the initial data processing is completed and no proprietary period is rewarded to the proposer.

This is one of three parallel announcements, and solicits proposals from researchers affiliated with institutes or universities located in the ESA Member States (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom). Details of the Announcement and links to mission descriptions etc can be found at:

<http://www.rssd.esa.int/Suzaku/>

Researchers in the US should consult the version at:

<http://astroe.gsfc.nasa.gov/>

Researchers based in Japan, and all other countries, should consult the version at:

<http://www.astro.isas.jaxa.jp/suzaku/>

2. The Suzaku X-ray observatory

The *Suzaku* satellite carries four modules of the X-Ray Telescope (XRTs) that focus X-rays up to ~ 10 keV with a high efficiency. In the focal plane of each XRT there is an X-ray CCD camera (XIS) module. The XIS has a high sensitivity and a moderate spatial resolution, and is particularly suitable for the studies of extended sources. The XIS also has a good spectral resolution for soft X-rays below 0.8 keV, which is superior to those of *Chandra* and

XMM-Newton. Moreover, ISAS/JAXA have applied the so-called Spaced-row Charge Injection technique for the XIS since AO-2 to suppress the degradation of energy resolution. The HXD has unprecedented sensitivity in the wide energy range up to 600 keV, although it has no imaging capability. The wide bandpass coverage of 0.2 keV through 600 keV with the XIS and the HXD is an important characteristic of the *Suzaku* mission.

The details of the instruments (Technical Description document), and a list of targets that have been observed, or accepted, can be found at the following *Suzaku* homepage:

<http://www.astro.isas.jaxa.jp/suzaku>

3. Mission phases and time allocation

The *Suzaku* mission has been developed and maintained under a collaboration of Japan and the US, and the Science Working Group (SWG) that consists of researchers involved in the development and operation oversees the project overall. Since the end of the SWG phase of the mission (2006 March), all observation time except:

- (1) Observatory Time (3%) for satellite maintenance and related purposes
- (2) Calibration time (5%) for calibration of instruments
- (3) Director's Discretionary Time (DDT; 5%) for gamma-ray bursts or any genuinely unpredictable events and other important observations granted at the discretion of the mission director,

has exclusively been allocated through an open AO process. The AO-5 program (1 year period starting on 2010 April) will be run under the same policy. The remaining 87% of the total time, which amounts to $360 \text{ d} \times 38 \text{ ksec/day} \times 0.87 = 11,902 \text{ ksec}$, is open to the AO-5 program, and is distributed among Japan, US, ESA and other countries as follows:

| Category | Observing Time (ksec) |
|---------------------|--|
| Japanese time | 5451 of which 909 is for ESA and 4542 is for Japan and other countries |
| US time | 3963 |
| Joint Japan-US time | 488 |
| Key project time | 2000 |

Here the Japan time includes joint Japan-ESA time, which amounts to 909 ksec. Accordingly, the remaining 4541 ksec is the time for Japanese scientists in AO-5. All proposals from scientists located in institutes that are **not** in Japan, US and the ESA Member States should be submitted to the Japanese time. Note, however, that the total approved exposure time of proposals whose Principal Investigators (PIs) are not Japanese, nor researchers from ESA Member States, is restricted not to exceed the joint Japan-ESA time. The joint Japan-US time will be used if proposals for the same targets are accepted both in Japan and US, and if both PIs accept such merging (the proposal form has a check box for the PI to indicate whether he/she accepts the merging).

4. Proposal policies

(1) The complete list of the targets accepted by AO-4 can be found at the following URL:

<http://www.astro.isas.jaxa.jp/suzaku/accept/>

Observations of priority A and B targets are guaranteed. New proposals for these targets will not be approved without a strong justification for an additional observation, such as a much longer exposure, different pointing position on the same extended object, or a different phase of a variable object. On the other hand, some of the priority C targets and ToO targets will not be observed. This can be checked at the following URL:

<http://www.astro.isas.jaxa.jp/suzaku/log/>

Anyone can submit proposals for the C or ToO targets that are unobserved. It must be noted, however, that these unobserved C targets and ToO targets can be observed by the end of the AO-4 period (March 2010). In this case, the observations of the C targets are regarded as being completed if the exposure time exceeds 70% of the proposed time. If the exposure time is less than 70 %, on the other hand, an additional observation will be carried out to fill the remaining time only if a proposal for the same target and the same PI is accepted at a higher priority (A or B) in AO-5. Otherwise the observation carried out in AO-4 is ignored, and the target is open for competition in AO-5.

(2) The exposure time of the observation should be justified based on the specific scientific objectives, preferably using simulations. However, there is a minimum exposure time of a single pointing observation of 10 ksec, considering the efficiency of satellite operation. On the other hand, there is no upper limit on the exposure time for a long observation. A longer observation, however, requires a stronger scientific justification. Note also that any observation based on a proposal whose approved total observation time is equal to or exceeds 300 ksec is open to the public as soon as the data are available for analysis (no proprietary period is awarded to the proposer).

(3) As in AO-4, ISAS/JAXA are soliciting Key Project proposals in AO-5, which will be refereed separately from the ordinary proposals. The announcement of opportunity of the Key project will be issued separately and scientists located in institutes within the ESA Member States should submit proposals directly to ISAS/JAXA. There is no observing time limit on Key Projects. This will provide a unique opportunity to carry out various projects, such as an extremely long observation of a single object, mapping observation of a certain area of the sky, a long term monitoring observation of an object over several years, and so on, by fully utilizing the unique capabilities of *Suzaku*. The dead line for Key Project proposals is the same as that of the ordinary proposals (solicited by this announcement), 2009 November 20. Key Project proposals are sent to the initial refereeing process in Japan and the United States separately. The principal investigators of the proposals survived the initial refereeing process are requested to make a presentation in a workshop, which is open to all investigators. Please note that ESA is unable to support this travel. Immediately after this workshop, the Japan-US merging committee will finally selects the Key Project proposals for AO-5. The data taken in the Key Project program are opened to the public immediately after the data are ready for analysis.

(4) Submission of the same proposals both to the Key Project and the ordinary observation is

strictly prohibited. If the same researchers are found in the Co-I lists of both proposals, they will be rejected without being sent to the refereeing process.

(5) Target of opportunity (ToO) proposals are allowed for short-lived events on known objects whose timing is uncertain. This category is referred to as “Reserved ToO observation”. In this case, condition to trigger the observation, estimated probability of the event to take place during the AO-5 period, and the expected duration of the event should be specified in the proposal as well as other information required for the ordinary observation proposals. Any proposal without specifying a target name, such as “Observation of a forthcoming nearby supernova”, or “Next nova explosion in M31”, is not to be accepted. The number of targets that is allowed in the target list is limited at most 5 per proposal. It is requested to specify in the scientific justification how many targets should be observed to fulfil the scientific goals of the proposal. If the total exposure time to complete the requested number of targets is equal to or larger than 300 ksec, the data will be opened to public as soon as the first observation is finished. See (2) above.

(6) It is possible to submit proposals specifying the time of observations as TC (Time Critical) Observations. These include observations of a specific binary phase, coordinated observations with other wavebands, monitoring a target several times with certain time intervals, roll-angle-constraint observations of diffuse sources, and so on. The *Suzaku* operation team will do their best to perform the observations as requested. In all these cases, the PI must activate the TC flag in the target form. Even if the coordination with other instruments is not planned in detail at the time of the proposal submission, the PI is requested to check the TC box if he/she would like to do so after the approval of the proposal. The observation without a TC flag is treated as non-TC observation, and the coordinated observation can only be carried out if the other telescopes follow the *Suzaku* schedule.

(7) Any genuinely unpredictable events such as, gamma-ray bursts and supernovae and so on, can be observed as part of the DDT. This category is referred to as a “realtime ToO observation”. The observation proposals of this category are received at any time and are refereed out of the ordinary proposal selection process. Any proposer who would like to propose a realtime ToO observation is requested to fill the form:

<http://www.astro.isas.jaxa.jp/suzaku/planning/gtoo/>

and send it to the *Suzaku* manager by e-mail

suzaku_managers@astro.isas.jaxa.jp

The proposer has no proprietary rights to the realtime ToO observation data. Realtime ToO observations on gamma-ray bursts will be planned by the *Suzaku* Science Working Group, referring to information from various other observation networks.

(8) In AO-5, the *Suzaku* project team will accept proposals using P-sum/timing mode for the XIS, as well as the normal imaging mode. In the P-sum/timing mode, photon pile-up scarcely occurs, and a time resolution as fast as 7.8 msec can be achieved, although only 1-dimensional image can be obtained. Note, however, that the P-sum/timing mode can be used only for XIS0 and XIS3, and neither Spaced-row Charge Injection nor CTI correction can be applied, and hence the energy resolution is significantly worse than in the normal imaging mode. Calibration accuracy is not as good as that in the normal imaging mode,

either. Refer to the technical description document for the P-sum/timing mode in detail. Switching the XIS to the P-sum/timing mode poses relatively high load to the operation team. Hence, total time of the P-sum timing mode observations will be limited up to 5% of the ordinary observation time (11902 ksec, see section 3).

5. Review process and schedule

(1) Researchers affiliated with institutes located in the ESA Members States should submit their proposals to ESA according to this AO document. The deadline is 2009 November 20 at 16:30 CET. After the ESA review, a Japan-US merging committee will be convened in late February – early March 2010, and the final observing program will be released soon thereafter.

(2) Accepted targets will be classified into three categories (A, B, and C) based on proposal ranking. Priority A targets will be preferentially observed during the AO-5 period (2010 April to 2011 March) and the observations are regarded as completed if the exposure time is more than 90% of the requested time. Priority B targets will be scheduled in this period as much as possible, but may be carried over to the next cycle. Observations of priority B targets are regarded as completed if the observation covers more than 70% of the requested time. Priority C targets will be used as fillers when there are gaps in the schedule. Of the total available time, T , (=11902 ksec, $360 \text{ d} \times 38 \text{ ksec/day} \times 0.87$) JAXA will accept $0.6T$ (=7141 ksec) for Key+A, (Key Project time is at most 2000 ksec), $0.3T$ (=3571 ksec) for B, and $0.5T$ (=5951 ksec) for C priority proposals. This implies an over-subscription of 40%. The oversubscribed targets will be scheduled if observing time remains after the observatory time, the calibration time and DDT are assigned.

(3) Reserved TOOs and Time Critical observations pose constraints on scheduling observations. Hence their total fraction is limited to be some 15% of the total available time.

6. Data rights

The data taken in the ordinary observation program are immediately delivered to the proposer. The proposer has proprietary to the data for 1 year after the data are ready for scientific analysis. This does not apply to the data based on the ordinary observation proposals whose total exposure time is equal to, or more than, 300 ksec, those based on Key Project proposals and realtime ToO proposals.

1. Observations solicited in AO-5

ESA is calling for X-ray observations with the *Suzaku* observatory from April 2010 through March 2011.

2. Applicant eligibility for submitting proposals to the ESA time

Principal investigators who submit their proposals to ESA have to be affiliated with institutions or universities located in one of the ESA Member States.

U.S. based proposers should submit their proposals through NASA. European researchers who spend most of their time during AO-5 period in Japan can submit their proposals to ISAS/JAXA. PIs in the other countries should submit their proposals to ISAS/JAXA Japan. Proposals submitted to ISAS/JAXA can include US/ESA researchers as Co-Is.

It is not permitted to submit identical proposals to ESA, ISAS/JAXA and NASA. They will be ignored on all sides.

In rare cases, a single PI may be considered eligible to submit *Suzaku* proposals through multiple agencies. Such a PI must, however, choose a single agency for all his/her AO-5 proposals; it is forbidden for a single PI to submit proposals to multiple agencies during a single cycle, even if they are independent projects.

There are no restrictions on the countries of co-investigators on proposals submitted to ESA.

3. Due date of proposals

The observation proposals should be submitted to ESA by 16:30 CET on 20 November 2009. Only electronic submission through the Remote Proposal-submission System (RPS) is allowed (see below for details).

4. Proposal submission

The forms summarized in the next section should be submitted electronically with the Remote Proposal-submission System (RPS). The RPS will be ready for use in late September.

5. Proposal form

The proposal form consists of:

- (1) **Cover Page:** general information including investigators' names, title and abstract of the proposal.
- (2) **Target Form:** information on the proposed targets including target name, celestial coordinates, expected counting rate, and preferred observation mode. The target information in this form is automatically registered in the observation database and utilized for making the long-term observation time line of AO-5. The proposers are therefore strongly required to provide accurate information. From AO-5, at most 2 XIS modules (XIS0 and XIS3) out of 3 can be used in the P-sum/timing mode. In this case, the PI is required to select "PSUM" in the XIS mode pull-down menu, and specify which XIS

module should be set to the P-sum/timing mode in the remark column. The mode setting of the other XIS modules, such as window or burst options, should also be written in the remarks column. It is possible to apply the P-sum/timing mode for either one of XIS0 and XIS3 or both. It will take ~3 days to start a reserved ToO observation in the P-sum/timing mode following the trigger from the PI, during which the operation team prepares the mode setting commands.

- (3) **Target Constraints:** constraints for planning the observation should be specified in this form, which include any phase constraints, roll-angle constraints, condition for monitoring observations etc. This form is required only for reserved ToO and TC observations.
- (4) **Target Remarks:** Any additional constraints for performing observations can be written in this form. This form is required only for reserved ToO and TC observations.
- (5) **Scientific Justification:** Background of the proposal, scientific issues to be resolved, and technical feasibility of the proposed observation should be summarized within 4 pages including text, figures, charts, tables, and references.

Of these, the forms (1) and (2) ((1) through (4) in the case of reserved ToO and TC observations) should be created electronically by accessing:

<http://www.rssd.esa.int/RPS/SUZAKU/RPS.pl>

The form (5) can be made off-line. The proposers can use any editors/word processors they like. It should be in the format either of pdf or ps at the time of submission. The allowed language for (5) is English. In submitting a proposal, the proposer should submit the forms (1) and (2) ((1) through (4) in the case of reserved ToO and TC observations) through the RPS, and after acceptance of them, the form (5) is allowed to be uploaded.

6. Supplemental Information

Detailed information on the *Suzaku* instrumentation, such as capabilities of scientific instruments, is summarized in the Technical Description (TD) document, which can be found at

http://www.astro.isas.jaxa.jp/suzaku/doc/suzaku_td

ISAS/JAXA plan to update the TD document, as well as the proposal planning ToOs, in the middle of September 2009. Until then, the proposers are advised to use existing versions of them. For those who are not familiar with *Suzaku* data, we summarize how to “walk through *Suzaku* analysis” and a few set of test data (of Crab and other typical X-ray objects) at

<http://www.astro.isas.jaxa.jp/suzaku/pub/20051201.html>

If you have questions, please contact

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