

REQUEST FOR INFORMATION (RFI)

Concepts for the Next NASA X-ray Astronomy Mission

General Information

Solicitation Number: NNH11ZDA018L
Release Date: September 13, 2011
Response Date: October 28, 2011
Recovery and Reinvestment Act Action: No
Classification Code: A -- Research and Development
Issued by: Science Mission Directorate

Description

The National Aeronautics and Space Administration (NASA) and its Physics of the Cosmos (PCOS) Program is soliciting information through this Request for Information (RFI) pertaining to potential X-Ray astronomy missions. Specifically, NASA is seeking information that can be used to develop concepts that meet some or all of the scientific objectives of the International X-ray Observatory (IXO) (Table 1). Information being sought includes relevant mission concepts, instrument concepts, enabling technologies, or any aspect of flight, ground or launch systems architecture.

In accordance with FAR 15.201(e), the information requested is for planning purposes only and is NOT intended to bind the Government. This RFI is not expected to lead to a future procurement.

Background

The future mission portfolio of NASA's Astrophysics Division is constrained by budgetary resources. The Division is making a concerted effort to control cost growth of future strategic missions through a combination of improved early cost estimation, a more conservative posture of cost reserves, and a reinvigorated technology development program.

Since termination of the NASA/ESA partnership X-ray mission, IXO, NASA's PCOS Program is developing alternative plans to address high priority IXO scientific objectives described in the 2010 Astrophysics Decadal Survey, "New Worlds, New Horizons" (NWNH) (NRC 2010, <http://www.nap.edu/catalog/12951.html>).

The PCOS Program Office will work with the science community to develop new X-ray astronomy mission concepts satisfying some or all of the scientific objectives listed in Table 1.

Such scenarios might include one or more observatories. These scenarios will be presented to the National Academy of Sciences Committee on Astronomy and Astrophysics (CAA) for consideration. Recommendations from the CAA will subsequently be used to guide detailed development of scientific, technical, and cost information for some or all of these X-Ray mission concepts. Data from these concept studies will also be used to assess future technology needs for the Astrophysics Division. Information from the technology assessment will also be provided to the CAA.

This Request for Information (RFI) is the first step in this process. Through this RFI, NASA is seeking information relevant to an X-ray astronomy mission concept or mission concepts that will satisfy some or all the scientific objectives listed in Table 1. The RFI also requests standalone instrument concepts as well as relevant key enabling technologies for such missions or instruments. Mission concepts should range in cost from ~ \$300M to \$2,000M in FY12 dollars.

Science Objectives

NWNH identified a number of high priority science objectives that IXO could fulfill. These objectives are listed in Table 1. Also listed in Table 1, for reference, are the performance requirements of IXO driven by these objectives. More detailed information about IXO, its science objectives and its proposed instrumentation and configuration can be found at <http://ixo.gsfc.nasa.gov/>.

Table 1: Primary IXO Science Objectives		
Science Question	Measurement	Key IXO performance requirements
What happens close to a black hole?	Time resolved high resolution spectroscopy of the relativistically-broadened features in the X-ray spectra of stellar mass and supermassive black holes	Spectral resolution of 2.5 eV at 6 keV; effective area > 0.65 m ² at 6 keV and 150 cm ² at 30 keV.
When and how did super-massive black holes grow?	Measure the spin in supermassive black holes; distribution of spins determines whether black holes grow primarily via accretion or mergers.	Spectral resolution of 150 eV at 6 keV and 1 keV at 30 keV; effective area of 3m ² at 1.25 keV, 0.65 m ² at 6 keV, and 150 cm ² at 30 keV; 5 arcsec angular resolution and 18 arcmin field of view at 2 keV.

How does large scale structure evolve?	(i.) Find and characterize the missing baryons by performing high resolution absorption line spectroscopy of the WHIM over many lines of sight using AGN as illumination sources. (ii.) Measure the growth of cosmic structure and the evolution of the elements by measuring the mass and composition of clusters of galaxies at redshift < 2	(i.) Spectral resolving power of >3000 ; effective area $> 1000 \text{ cm}^2$ in 0.3-1.0 keV band. (ii.) Imaging spectroscopy with spectral resolution of 10 eV at 6 keV; 10 arcsec angular resolution and 5 arcmin field of view across 0.3-7.0 keV band; effective area of 1 m^2 at 1.25 keV and 0.1 m^2 at 6 keV.
What is the connection between supermassive black hole formation and evolution of large scale structure (i.e., cosmic feedback)?	Measure the metallicity and velocity structure of hot gas in galaxies and clusters.	Imaging spectroscopy with spectral resolution of 2.5 eV at 6 keV; 5 arcsec angular resolution and 2 arcmin field of view across 0.3-7.0 keV band; effective area of 3 m^2 at 1.25 keV and 0.65 m^2 at 6 keV; total bandpass of 0.3-10 keV.
How does matter behave at very high density?	Measure the equation of state of neutron stars through (i.) spectroscopy and (ii.) timing	(i.) Spectral resolving power >3000 ; effective area $>1000 \text{ cm}^2$ in 0.3-1.0 keV band. (ii.) Maximum count rate of 10^6 s^{-1} with relative timing accuracy of 10 μs and <10 percent deadtime over 0.3-10 keV band; spectral resolution of 150 eV and effective area of 0.6 m^2 at 6 keV.

Requested Information:

The response to this RFI will be in the form of a PDF document that is uploaded through NASA’s NSPIRES system (see instructions below). The response should not exceed ten (10) pages in length.

The response should contain the following information:

- Name of submitter and contact information including all team members, institutional affiliations, and email addresses. Note that a lead submitter or point-of-contact must be identified (name and position, organization, email, phone number);

- Category of response: List all applicable and provide brief description of each in less than 20 words.
 - Mission concept,
 - Instrument concept,
 - Enabling technologies,
 - Other;
- Answer to these questions:
 - Will you be willing to participate and present your concept at the workshop if invited?
 - Does your organization have any sensitive or controlled information (e.g., export controlled, proprietary, competition sensitive) that might be useful for this exercise? If so, are you willing to discuss this information with NASA if proper arrangements can be made to protect the information?
- The information should be submitted in a format most effective for conveying the information (e.g., white paper, presentation charts, technical paper, other). The response should include, at a minimum, the following information:
 - A description of the concept or technology including a list of key performance and technical parameters. Performance parameters include sensitivity, bandpass, angular resolution, spectral resolution, and field of view. Technical parameters include mass, power, and dimensions. The technical readiness level (TRL) of key components should be listed. Sufficient technical detail should be provided so that the level of complexity and technical readiness can be assessed.
 - A description of how the concept or technology fulfills some or all of the IXO science objectives (Table 1).
 - A rough-order-of-magnitude (ROM) total cost, plus a brief explanation of how this cost was estimated. The ROM cost will be used to bin concepts into the following cost categories: small (\$300-\$600M), medium (\$600M-\$1B) and large (\$1B-\$2B).

Future Plans

Within two weeks of release of this RFI, NASA will release an open solicitation inviting members of the astronomy community to participate in an X-ray astronomy mission Community Science Team (CST). The CST will work with the astronomy community and the PCOS Program Office in reviewing all RFI responses and defining mission concepts at various cost points between \$300M to \$2,000M.

As part of the definition process, NASA will sponsor a workshop this Fall (2011) to present:

- a) The latest information regarding the landscape and circumstances that surround formulation and implementation of the next X-ray astronomy mission (or missions)
- b) A summary of the information received in response to this RFI
- c) Potential mission scenarios for further study

All responders to this RFI, as well as the broader community, are invited to attend the workshop and participate in this process. The workshop will serve as a forum for receiving community input for mission concept(s) definition. The CST and the PCOS Program Office will use the RFI

responses and the workshop input to define mission concepts at various price points. These concepts will undergo more detailed definition and cost estimation using NASA's mission design laboratories in collaboration with the study team consisting of CST members plus PCOS Program Office staff.

The final product of this effort will be a report describing scientific capabilities that can be achieved at various cost points as compared to IXO, the science achieved by Athena (if selected), and other science missions in the time frame of the proposed mission. The report will also describe each mission concept, its scientific capability, technical readiness and overall cost. In the Spring of 2012 the PCOS Program will release this study report to the community and present it to the CAA of the National Research Council's Space Studies Board.

Disclaimer

It is NASA's intent to publicly disclose information obtained through this RFI and to incorporate relevant portions into the workshop proceedings and the final study report. Responders shall not submit proprietary information, export controlled information (including ITAR restricted information) or confidential information in response to this RFI. It is emphasized that this RFI is NOT a Request for Proposal, Quotation, or Invitation for Bid. This RFI is for information and planning purposes only, subject to FAR Clause 52.215-3 titled "Solicitation for Information or Planning Purposes", and is NOT to be construed as a commitment by the Government to enter into a contractual agreement, nor will the Government pay for any information submitted in response to this RFI.

No solicitation exists; therefore, do not request a copy of the solicitation. If a solicitation is released it will be synopsisized in FedBizOpps and on the NASA Acquisition Internet Service (NAIS). It is the potential Offeror's responsibility to monitor these sites for the release of any solicitation or synopsis. The Government reserves the right to consider a small business or 8(a) set-aside based on responses hereto. As part of its assessment of industry capabilities, NASA-GSFC may contact respondents to this Request for Information (RFI), if clarifications or further information is needed. Respondents will not be notified of the results of the evaluation.

Instructions

All responses submitted in response to this RFI must be submitted in electronic form via NSPIRES, the NASA online announcement data management system, located at <http://nspires.nasaprs.com/>. For this RFI, a response submission will take the form of a Notice of Intent (NOI) within the NSPIRES online announcement data management system. The RFI response itself will be a PDF-formatted document that is attached (uploaded) to the NSPIRES system.

You must be registered with NSPIRES to submit a RFI response. See registration instructions at <http://nspires.nasaprs.com> (select "Getting an account"). Neither institution registration nor an institution affiliation is required to respond to this RFI.

1. Log in to your account at <http://nspires.nasaprs.com/>.
2. Select "Proposals" from your account page.
3. Select "Create NOI" from your proposals page.
4. Click "Continue" on the next page.
5. Select "Request for Information: NNH11ZDA018L (Concepts for the Next NASA X-ray Astronomy Mission)" from the bullet list of announcements. Click "Continue".
6. Enter RFI response title ("NOI title" field will be shown).
7. Select "do not link at this time" for submitting organization page.
8. Click "Save" on next page.
9. It is not necessary to complete any of the "NOI Details"; all requested information must be included in the attached PDF document. Information which is entered into "NOI Details" but not included in the attached PDF document will not be considered.
10. Prepare your RFI response offline and save as a PDF document (note NSPIRES instructions on .pdf formats). The response document must include the respondent's Name, institution, phone number, and E-mail address so the file is self-contained. File names format should be "Respondent Last Name - First Name - RFI". The response should not exceed ten pages in length.
11. To attach (upload) your PDF document:
 - a. Click "add" under NOI attachments section;
 - b. Select "Proposal Document" from the drop down list;
 - c. Browse to attach your PDF file;
 - d. Select "Upload";
 - e. Click "OK";
 - f. Your RFI document has been uploaded to NSPIRES.
12. Click "Submit NOI" button. NOTE that this does not complete the submission process.
13. Ignore any warnings about incomplete NOI elements. Ensure that your NOI document is attached and click "Continue".
14. Click "Submit". This will take you to the NOI submission confirmation page, which provides you with the NOI/RFI number for your records.

Please note: You may delete and replace form fields and uploaded documents anytime before the submission deadline. Submitted NOIs cannot be deleted.

For Additional Information

For further information on this RFI, please contact Jean Cottam, PCOS Chief Scientist, at jean.cottam@nasa.gov. You may also contact the NASA HQ PCOS program officers, Jaya Bajpayee, PCOS Program Executive, at jaya.bajpayee-1@nasa.gov, and Rita Sambruna, PCOS Program Scientist, at rita.m.sambruna@nasa.gov. Please check <http://pcos.gsfc.nasa.gov/> for the most up to date information on the PCOS Program.