D.10 NuSTAR Guest Observer – Cycle 5

NOTICE: Corrected February 19, 2019. In Section 1.1 the nominal start date and duration of the fifth round of Guest Observations have been updated. New text is in bold and deleted text is struck through.

Amended January 31, 2019. The proposal due dates for this program element were previously temporarily changed to "TBD" as a result of the partial government shutdown. This amendment releases new due dates for the effected program elements in Appendix D. For this program element Phase-1 proposals are now due (via ARK RPS) at 4:30 pm March 29, 2019.

November 20, 2018. Section 1.3.1 has been updated to clarify what can be proposed for joint NICER/NuSTAR Target of Opportunity observations and Section 1.3.3 has also been updated for consistency. New Text is in bold and deleted text is struck through. The due date remains unchanged.

October 11, 2018. This Amendment announces a change in due date for this program element. ~~Phase-1 Proposals are now due January 25, 2019~~ via the ARK/RPS website, see section 2.2.1 for details. Also, the word coordinated has been replaced with the word 'joint' in the bold paragraph below and in the notice on the NSPIRES page for this program element.

This Amendment announces a total text replacement for this program element. Major changes include: New statements that the solicitation of this program element is dependent on the results of the upcoming 2019 Senior Review, a call for 'Large Programs' (> 500 ks) has been added, and ~~coordinated~~ joint observations with NICER are now included. In addition, many small changes have been made throughout. Please read the text carefully. ~~The due date remains unchanged~~.

1. Scope of Program

1.1 Overview

The Nuclear Spectroscopic Telescope Array (NuSTAR) Small Explorer (SMEX) mission is the first orbiting telescope to focus light in the high energy X-ray region of the electromagnetic spectrum (E > 10 keV), with an effective bandpass of 3–79 keV. The observatory provides a combined improvement in sensitivity and spatial/spectral resolution by factors of 10 to 100 over previous missions that have operated at these energies. The NuSTAR Guest Observer (GO) Program solicits proposals for basic research relevant to the NuSTAR mission.

The fifth round of Guest Observations (Cycle 5) will commence on or about ~~June~~ **July** 1, 2019, and last for a nominal period of ~~12~~ **11** months. Based upon the outcome of the 2016 NASA Astrophysics Senior Review process, NuSTAR operations are currently

funded through September 30, 2019. NuSTAR is proposing for continued operations funding in the 2019 NASA Astrophysics Senior Review for operating missions. Further details on the Cycle 5 program may be found on the NuSTAR Guest Observer Program website (http://nustar.gsfc.nasa.gov). Observing time will be made available to scientists at both U.S. and non-U.S. institutions. **[Paragraph above updated February 19, 2019]**

Individuals may submit proposals for three general types of observations: "standard-mode", "Target-of-Opportunity" (ToO) (see Section 1.3.3), and "Large Programs" (LP) (see Section 1.3.4). In addition to proposals for ToO observations submitted in response to this Call for Proposals, unsolicited requests for ToO observations may be made through the NuSTAR Science Operations Center. Note that unsolicited ToO requests are ineligible for funding under the NuSTAR Guest Observer Program. The data from NuSTAR observations selected under the Cycle 5 Call for Proposals will have a limited exclusive-use period dependent upon the observation type. Data from approved standard-mode GO and LP observations will have a nominal one-year exclusive-use period commencing at the time of receipt of the processed data by the observer. Data from approved ToO observations will have a corresponding six-month exclusive-use period. Note that Principal Investigators (PIs) may waive the exclusive-use period and opt for the observation(s) to be placed directly into the NuSTAR public archive. Data resulting from unsolicited ToO requests will have no exclusive-use period.

In addition to investigations utilizing NuSTAR observations only, proposals involving coordinated observations with the European Space Agency (ESA)/NASA X-ray Multi-Mirror Mission (XMM)-Newton X-ray observatory, NASA's Neil Gehrels Swift observatory, and NASA's Neutron star Interior Composition ExploreR (NICER) mission are also solicited under this Call for Proposals. Prospective proposers of joint observations with these facilities should refer to Section 1.3.1 for details concerning the constraints on and implementation of such proposals.

Opportunities for carrying out NuSTAR observations in conjunction with NASA's Chandra X-ray Observatory, Gehrels Swift observatory, and NICER observatory, and with ESA's XMM-Newton and INTEGRAL observatories are also available through the relevant Calls for Proposals for those observatories.

Funding for investigations selected under the NuSTAR GO Program is available only to individuals at U.S. institutions who are identified as Principal Investigators (PIs). U.S.-based Co-Investigators on foreign-led proposals are not eligible for funding.

Proposals directed primarily towards supporting theoretical or laboratory astrophysics research or ground-based observations relevant to the NuSTAR mission are not solicited by this program.

1.2 The NuSTAR Mission

NuSTAR is a PI-led NASA Small Explorer (SMEX) mission. The PI institution is the California Institute of Technology, which is responsible for the overall direction of the program. NASA's Jet Propulsion Laboratory (JPL) is responsible for the project management. The lead domestic partners include Columbia University, the University of California at Berkeley, and NASA's Goddard Space Flight Center. The Danish Technical University Space Centre and the Agenzia Spaziale Italiana (ASI) made significant

contributions to the hardware and data analysis software development, respectively. ASI is an active participant in mission operations, providing access to the Italian ground station at Malindi, Kenya. The NuSTAR Mission Operations Center (MOC) is at the University of California at Berkeley Space Sciences Laboratory, and the Science Operations Center (SOC) is at the California Institute of Technology.

NuSTAR was launched on June 13, 2012, from the Kwajalein Atoll in the Marshall Islands into a low-Earth orbit with an inclination of 6 degrees and an altitude of 630 km × 610 km. After an initial six-week checkout period and subsequent two-year baseline mission, the NuSTAR GO program was initiated. Based upon the results of the NASA 2016 Senior Review, support for mission operations was extended through September 30, 2019 and is proposing for continued operations funding in the 2019 NASA Astrophysics Senior Review for operating missions. The observatory has no expendables, and the orbit lifetime is estimated at ~ 10–15 years from launch. Currently in its seventh year of operations, the observatory continues to function nominally.

The NuSTAR spacecraft carries two sensitive, co-aligned, narrow-field instruments. Table 1 summarizes the primary performance specifications. Details of the observatory and instrument design can be found at http://nustar.caltech.edu/, as well as the NuSTAR mission paper, Harrison et al. (2013; ApJ, 770, 103).

Table 1: Key Observatory Performance Parameters

Parameter	Value
Energy range	3–78.4 keV
Angular resolution (HPD)	58″
Angular resolution (FWHM)	18″
FoV (50% resp.) at 10 keV	10′
FoV (50% resp.) at 68 keV	6′
Sensitivity (6–10 keV) (10^6 s, 3σ, ΔE/E = 0.5)	2 x 10^{-15} erg cm^{-2} s^{-1}
Sensitivity (10–30 keV) (10^6 s, 3σ, ΔE/E = 0.5)	1 x 10^{-14} erg cm^{-2} s^{-1}
Background in HPD (3–10 keV)	9.0 x 10^{-4} counts s^{-1}
Background in HPD (10–30 keV)	1.1 x 10^{-3} counts s^{-1}
Strong source (>10σ) positioning	1.5″ (1σ)
ToO response time	< 48 hr
Slew rate	0.06° s^{-1}
Settling time	200 s (typically)

1.3 NuSTAR Cycle 5 General Information

The total amount of time allocated to Guest Observations during the fifth cycle of the GO phase of NuSTAR is expected to be 11.3 Ms (70% of the total observing time). Of this, it is anticipated that up to 8.5 Ms of observing time will be awarded to selected Cycle 5 investigations. Of the remaining time:

- up to 1.5 Ms is expected to be awarded to NuSTAR/XMM-Newton Joint proposals submitted to the XMM-Newton Cycle 18 Call for Proposals,
- up to 0.5 Ms to NuSTAR/Chandra Joint observing proposals submitted to the Chandra Cycle 21 Call for Proposals,

- up to 400 ks to NuSTAR/NICER Joint observing proposals submitted to the NICER Cycle 1 Call for Proposals,
- up to 300 ks to NuSTAR/Gehrels Swift Joint observing proposals submitted to the Gehrels Swift Cycle 15 Call for Proposals,
- and up to 100 ks to NuSTAR/INTEGRAL Joint observing proposals submitted to the INTEGRAL Cycle 17 Call for Proposals.

It is anticipated that approximately 80 investigations will be selected for implementation under the NuSTAR Cycle 5 GO program.

The remaining 30% of the observing time will be allocated through the NuSTAR Project roughly evenly split between NuSTAR legacy survey observations; NuSTAR PI discretionary time, including unsolicited ToO observations open to the scientific community; and, time reserved for calibration observations, engineering tasks, and resolution of operational issues.

The NuSTAR legacy surveys represent extensions of the Galactic and Extragalactic surveys conducted during the baseline mission. Community input will continue to be solicited to assist in defining the surveys (see http://www.nustar.caltech.edu/page/legacy_surveys for additional information); the NuSTAR science team will perform the detailed planning, execution, and analysis of the surveys. The legacy survey data will be immediately made public, and source catalogs and spectra will be released as soon as they have been processed.

During the baseline mission, the remainders of the fields of view for specific targets were used to create a wide-area serendipitous source survey. This practice is being continued in the GO phase, with the incorporation of non-target background sources in GO fields into the legacy surveys. However, the PI for a particular GO investigation will retain the data rights for the duration of the applicable exclusive-use period to any background source in the field of his/her primary target that is of interest beyond contributing to the wide-area survey statistics.

Proposers to this program must clearly describe how their proposed investigation capitalizes on the unique capabilities of NuSTAR. Proposals for investigations involving targets previously observed or currently planned for observation with NuSTAR must provide a justification of the need for the requested additional data. The "as-flown" observing timeline may be found at http://www.srl.caltech.edu/NuSTAR_Public/NuSTAROperationSite/AFT_Public.php, and lists of the approved NuSTAR Guest Observations from previous cycles are available at https://heasarc.gsfc.nasa.gov/docs/nustar/previous_cycles.html. Observations of targets proposed through this Call for Proposals will take precedence over legacy program observations of those targets that have not been executed as of the submission deadline. The applicable legacy observations will be suspended until the disposition of the proposed GO observations is determined in the Phase 1 review. Proposed GO observations of legacy targets that are not accepted as part of the Cycle 5 program will be restored to the legacy program. A list of legacy observations that are planned to be performed by the end of Cycle 5 will be made available on the NuSTAR website http://www.nustar.caltech.edu/page/legacy_surveys.

For those Phase-1 proposals recommended for implementation, the approved target observations will be assigned a Category (A, B, or C) and a recommended exposure time. Note that for proposals including observations of multiple targets, the priority of each target observation will be separately categorized. Assuming nominal operational efficiency, it is anticipated that observations of all standard-mode Category A and B targets will be carried out during Cycle 5; any standard-mode, non-time-constrained Category A and B observations not observed during Cycle 5 will be carried over to Cycle 6. Time-constrained Category A and B observations not observed during Cycle 5 will be considered for possible scheduling in Cycle 6 (see Section 1.3.2). Observations of Category C targets will be executed on a best-effort basis. Category C targets not scheduled during a particular observing cycle will *not* be carried over to the succeeding cycle; such observations may be reproposed to a future observing cycle. Finally, note that proposals for observations of Cycle 4 Category C targets that have not been scheduled prior to the Cycle 5 proposal due date may be submitted to Cycle 5. Such proposals will be considered for selection in Cycle 5 *only* if the corresponding Cycle 4 observation is not executed in Cycle 4. Multiyear observing proposals will not be accepted in Cycle 5.

Proposers should note that NuSTAR's low-inclination (6°), low-Earth orbit allows, on average, a maximum continuous exposure of ~ 3.2 ksec per 5.7 ksec satellite orbit for targets below a declination of ~ 65°; for targets at high declination, |Dec| > 65°, the unocculted period may be longer. Unless there is a specific reason why the total elapsed time of an observation is important, proposers should specify only the net exposure time required for achievement of the proposed science goals, excluding observational efficiency factors (Earth occultations and South Atlantic Anomaly passages) in the observing time calculation; specification of the total elapsed time requirement will result in the observation being classified as time-constrained (see Section 1.3.2).

1.3.1 *Programmatic constraints*

Proposals are subject to the following limitations:

- The requested time per observation (i.e., a single "visit" to a target) is constrained to a minimum of 20 ks and a maximum of 500 ks;
- Targets for which time-constrained observations are requested will only be guaranteed scheduling if they are designated Category A (see Section 1.3.2);
- Due to the limited number of ground station passes, observations of high count-rate targets place significant demands upon mission resources. Consequently, it is anticipated that the total time available for observation of bright sources (predicted instrument count rate above 100 counts s^{-1} for both modules using 50% PSF extraction with no deadtime) during Cycle 5 will be limited to a maximum of 1 Msec. Note that, for very bright sources, the instrument count rate is significantly lower than the incident event rate due to detector deadtime effects. Proposals requesting observations of bright sources with durations > 30 ks are operationally difficult to carry out. Accordingly, such proposals must provide a sufficiently compelling motivation to be considered for acceptance. In addition, proposals requesting observations of bright sources with exposures longer than 75 ks will be considered for implementation *only* if the total requested

time is distributed in multiple observations, each with exposure < 75 ks and separated by more than 1 week;

- Sources with fluxes > 10^{-11} ergs s^{-1} cm^{-2} within 5° of the target may cause increased nonuniform background gradients due to stray light. Users should check observations for potential stray light contributions using the tools available at http://nustar.caltech.edu/page/researchers. If a field is designated as 'heavily contaminated', proposers should submit a request for a feasibility analysis to nustar-help@srl.caltech.edu at least two business days prior to the proposal submission deadline;
- Proposals for joint NuSTAR/XMM-Newton programs in Cycle 5 will be accepted up to a total of 1.5 Msec of XMM-Newton observing time. Joint proposals must provide a compelling justification of the need for both the NuSTAR and XMM-Newton data for achieving the primary science goals and receive a Category A or B rating to be considered for acceptance. Individuals considering submission of a Cycle 5 proposal for joint NuSTAR/XMM observations should consult the XMM-Newton-18 approved NuSTAR target list prior to submission of their proposal. Duplicate observations of the same targets by NuSTAR will typically not be awarded;
- Proposals for joint NuSTAR/Gehrels Swift programs in Cycle 5 will be accepted up to a total of 300 ksec of Gehrels Swift observing time. Joint proposals must provide a compelling justification of the need for both the NuSTAR and Gehrels Swift data for achieving the primary science goals and receive a Category A or B rating to be considered for acceptance. Proposers are strongly encouraged to carefully read the Gehrels Swift /NuSTAR memorandum of understanding. Gehrels Swift data sets obtained through approved joint NuSTAR/Gehrels Swift proposals will not be proprietary and will be immediately released publicly via the HEASARC data archive. Note that for most NuSTAR pointings, 1–2 ks "snapshot" observations are routinely performed by Gehrels Swift (unless there are multiple observations of the same target, coordinated NuSTAR observations with other X-ray observatories, and during times of Gamma-Ray Bursts and Gehrels Swift ToOs) without the need for a specific joint observing proposal. Individuals considering submission of a Cycle 5 proposal for joint NuSTAR/Gehrels Swift observations should consult the Gehrels Swift Cycle 15 approved NuSTAR target list prior to submission of their proposal. Duplicate observations of the same targets by NuSTAR will typically not be awarded;
- Proposals for joint NuSTAR/NICER projects in Cycle 5 should not exceed a total of 250 ksec of NICER observing time. Joint proposals must provide a compelling justification of the need for both the NuSTAR and NICER data for achieving the primary science goals and receive a Category A or B rating to be considered for acceptance. NICER data sets obtained through approved joint NuSTAR/NICER proposals have the standard NuSTAR exclusive-use period and will be released publicly via the HEASARC data archive. **No ToO proposals of currently unknown targets (e.g. "the next black-hole transient") will be accepted through this solicitation for joint NuSTAR/NICER observations; joint NuSTAR/NICER observations of known targets that may be triggered at an unforeseeable time (e.g., by a state change) may be proposed.** ~~No proposals~~

~~for joint NuSTAR/NICER ToO observations will be considered for Cycle 5.~~ **[Updated November 20, 2018]**

- Proposals requesting coordinated observations with other space- or ground-based observatories will be designated time-constrained and subject to the restrictions described in Section 1.3.2.

1.3.2 *Time-Constrained Observations*

Time-constrained observations are defined as observations that must be performed within a specific time window. This includes phase-constrained observations and coordinated observing campaigns with ground-based or space-based facilities. Time-constrained observations are subject to the following limitations:

- Time-constrained observations designated Category A or B will be given highest priority for scheduling during Cycle 5. Time-constrained observations of Category C targets will be executed on a best-effort basis. Time-constrained Category A and B observations not scheduled during Cycle 5 may be carried over to Cycle 6 where warranted by scientific or operational circumstances (e.g., in the case of coordinated observations with other space- or ground-based observatories). Category C time-constrained observations not scheduled during Cycle 5 will *not* be carried over to Cycle 6.
- Monitoring programs are defined as investigations requiring two or more observations of the same target, each of which is considered a "visit." For such programs, the time interval between successive visits must be ≥ 14 hours. Note that programs in which the time interval between any two successive visits is ≤ 1 week will be designated as time-constrained.
- Note that proposed Gehrels Swift observing time can include monitoring that precedes, follows and/or (for ToOs) triggers NuSTAR observing time.

For coordinated or time-constrained observations, it is the proposer's responsibility to inform the NuSTAR SOC of the observing time windows as soon as possible, but at a minimum of one month before initiation of the observations. In cases where observations involve coordination with other space-based observatories, the NuSTAR SOC will be responsible for communicating detailed schedule constraints with the relevant operations team(s).

1.3.3 *ToO Observations*

A total of up to 500 ks of NuSTAR Cycle 5 observing time will be made available for proposals to observe ToOs, subject to the constraints listed below. Individuals interested in submitting ToO proposals should note the following:

- Proposals must provide exact, detailed trigger criteria and a credible estimate (including justification) of the probability of triggering the ToO during Cycle 5;
- Proposers should indicate on the Astrophysics Research Knowledgebase (ARK)/Remote Proposal System (RPS) proposal submission form (http://heasarc.gsfc.nasa.gov/ark/rps/) the response time required to meet the scientific objectives. Note that the minimum response time that may be specified for NuSTAR observations is 48 hours; proposals will be evaluated based on this criterion. However, a more rapid response time may be requested by the PI; such requests will be accommodated on a best-effort basis;

- The observations must have an astrophysical trigger and be designated as Category A to be eligible for execution;
- Proposals for ToO observations that can be triggered from a class of objects or set of potential targets are permitted;
- Active ToO submissions to the Chandra/NuSTAR, XMM-Newton/NuSTAR, INTEGRAL/NuSTAR, or Gehrels Swift/NuSTAR**, or NICER/NuSTAR** GO Program Calls approved prior to this Cycle 5 call will take precedence over NuSTAR Cycle 5 proposals with the same targets and trigger criteria. **[Updated November 20, 2018]**

It is the responsibility of the PI of an accepted ToO proposal to alert the NuSTAR SOC when the trigger conditions for their accepted ToO have been satisfied. This is done via submission of a NuSTAR ToO Request Form at http://nustar.caltech.edu/page/too_policy. Prior to submission of this form, the PI should verify the visibility of the target at http://www.srl.caltech.edu/NuSTAR_Public/NuSTAROperationSite/CheckConstraint.php Accepted Cycle 5 ToO observations may be triggered until the end of the cycle. ToO observations not triggered during Cycle 5 will not be carried over to Cycle 6; such observations may be reproposed to a subsequent cycle. Data from approved Cycle 5 ToO observations will have a six month exclusive use period after which the data will be placed in the public archive.

ToO proposals to observe either a core collapse supernova in the Local Group or a Type 1a event to the distance of the Virgo Cluster will not be accepted. Such observations constitute part of the NuSTAR core science program and can be most expeditiously and effectively planned and executed by the NuSTAR Project; should either event occur, the discoverer(s) are invited to contact the NuSTAR PI concerning participation in the resultant publications.

Note that requests for observations of unsolicited ToOs may be submitted via the NuSTAR ToO web site (http://www.srl.caltech.edu/NuSTAR_Public/GO/GOsubmit.php). Decisions regarding the disposition of unsolicited ToO requests will be made by the NuSTAR Principal Investigator or official designee. Requests for such unsolicited ToO observations are ineligible for funding under the NuSTAR GO Program.

1.3.4 *Large Programs (LPs)*

A total of up to 2 Ms of NuSTAR Cycle 5 observing time will be made available for a new Large Program (LP) category. The minimum exposure time for LPs is 500 ks, and such proposals will have an additional page of text to describe the proposed program. Data from approved Cycle 5 LPs will have a one year exclusive use period after which the data will be placed in the public archive. A single-trigger ToO may be proposed as part of an LP (e.g., where a long observation is needed after the initial trigger). An approved LP with a ToO would have a six-month exclusive use period.

2. Programmatic Information

2.1 General Information

It is anticipated that at least $3.0M will be available for the support of Guest

Observations during Cycle 5. Proposals ranked as Category A or B by the Phase-1 peer review panel will be given the highest priority for funding. However, limited support will be made available for Category C proposals that are executed during Cycle 5. NuSTAR GO funding is open to individuals who are identified as Principal Investigators and employed at U.S. institutions. The amount of funding awarded to PIs of Category A and B proposals will be based upon NASA's evaluation of the cost realism and reasonableness of the Phase-2 cost proposal. In addition, eligible PIs of proposals with Category C targets that are executed during Cycle 5 can expect awards of $10,000 to support the publication of the results. NuSTAR science team members and scientists participating in the NuSTAR mission are eligible for support under this GO Program. Note that GO proposals from NuSTAR team members who receive funding from the Project must clearly demonstrate that the proposed investigation is not redundant with their science team responsibilities. Following the Phase-1 peer review, Phase-2 (cost) proposals will be solicited from eligible PIs and subsequently evaluated for cost realism and reasonableness via the Phase-2 review process. Joint NuSTAR-XMM and NuSTAR/Gehrels Swift, and NuSTAR/NICER Phase 1 proposals selected through this Call for Proposals are eligible for funding *solely* through the NuSTAR GO program; the corresponding Phase-2 cost proposals may request support for the analysis of *both* the NuSTAR and XMM-Newton, Gehrels Swift, or NICER data. Such proposals should not be submitted to the U.S. XMM-Newton Guest Observer Facility nor to the Gehrels Swift or NICER Projects.

NASA does not anticipate awarding contracts in response to proposals submitted to these program elements, because it would not be appropriate for the nature of the work solicited.

2.2 Proposal Submission and Evaluation

The NuSTAR GO program utilizes a two-phase proposal process. Phase-1 proposals shall provide a detailed description of the proposed investigation, including the requested NuSTAR observation(s) and associated scientific/technical justification. U.S. PI's whose Phase-1 proposals are assigned a Category A/B rating by the peer review panel will be invited to submit a Phase-2 (cost) proposal. Category C programs do not require a Phase-2 proposal. Subject to acceptance of the associated Phase-2 cost submission, proposals for standard-mode observations (excluding proposals involving ToO or time-constrained observations) assigned a Category A or B rating will be eligible for funding immediately. Due to the uncertainty of their execution, the remaining accepted Phase-2 proposals will become eligible for funding only after the proposed observations have been carried out. Phase-2 proposals must include a detailed budget and accompanying narrative, providing a detailed description of how the requested funds will be used to achieve the goals outlined in the proposal. It is nominally expected that the PI of the Phase-1 proposal will serve as the Phase-2 proposal PI; however, for administrative purposes, an alternate individual from the Phase-1 PI's institution may serve as PI on the Phase-2 proposal. All proposal materials shall be submitted electronically, as specified below.

2.2.1 *Submission and Evaluation of Phase-1 NuSTAR GO Proposals*

Individuals submitting Phase-1 proposals to the Cycle 5 NuSTAR GO Program must adhere to the following proposal submission procedures:

- Proposers must submit their Phase-1 proposals (including the accompanying target forms) electronically through the ARK/RPS website at http://heasarc.gsfc.nasa.gov/ark/rps/. Instructions for submitting proposals via ARK/RPS are provided at the HEASARC NuSTAR web site: http://nustar.gsfc.nasa.gov/;
- Due to the nature of prospective investigations within the NuSTAR GO program, the Scientific/Technical/Management section of proposals is limited to four pages (five for LP proposals), in lieu of the default 15 pages specified in the *NASA Guidebook for Proposers*. The requirement for a table of contents in the body of the proposal is waived. No supporting material (e.g., Curriculum Vitae, pending/current support) is required or allowed;
- Optional LaTeX and MS Word templates for the Scientific/Technical/Management section are provided at http://nustar.gsfc.nasa.gov;
- 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 NuSTAR Guest Observer Program, all proposal materials must be submitted electronically by 4:30 p.m. Eastern Time on the Phase-1 due date provided in Tables 2 and 3 of *ROSES*.

Proposals will be evaluated by a science peer panel with respect to the criteria specified in Section VI.(a) of the *ROSES Summary of Solicitation*, where it is understood that the intrinsic merit of a proposal shall include the following factors:

- The suitability of using the NuSTAR observatory and associated data products for the proposed investigation, including the degree to which the investigation exploits the unique capabilities of NuSTAR;
- The feasibility of accomplishing the objectives of the proposed investigation with the requested observations, including the degree to which the proposal satisfies NuSTAR observational constraints and the feasibility of the proposed analysis techniques;
- The extent to which the proposed investigation complements and enhances the anticipated science return from the NuSTAR mission;
- The degree to which the proposed observation(s) places demands upon mission resources.

2.2.2 *Submission and Evaluation of Phase-2 proposals*

Subject to the availability of funding, eligible Phase-1 proposers with Category A/B observations will be contacted by the NuSTAR Program Scientist and invited to submit a Phase-2 (cost) proposal. Upon notification of selection of a Phase-1 proposal, proposers eligible for Phase-2 must follow the instructions for submitting a Phase-2 proposal given in the selection notification letter from the Phase-1 review. Phase-2 proposals must be submitted through the NASA NSPIRES electronic proposal website (http://nspires.nasaprs.com) by an Authorized Organizational Representative (AOR) of

the proposing organization following the instructions in the *Summary of Solicitation* of this NRA. The cost proposal shall consist of a "Budget Details" section (maximum of two pages) and a "Budget Narrative" section (maximum of two pages).

NASA program personnel (as opposed to peer reviewers) will evaluate the Phase-2 cost proposals for cost realism and reasonableness and will also compare the proposed cost to available funds as allowed by Section VI(a) of the *ROSES Summary of Solicitation.* Subject to the conditions stated above, proposers will be notified regarding the award amount for their Cycle 5 investigation(s) by NASA upon completion of the Phase-2 review process.

2.3 Supplemental Information

Further details concerning the proposal submission requirements and process can be found at the NuSTAR Guest Observer website (http://nustar.gsfc.nasa.gov/). This website provides instructions for completing the required proposal forms. A detailed description of the NuSTAR mission, including technical information relevant to the observatory, instruments, and observation feasibility can be found at http://nustar.caltech.edu/page/researchers. Answers to frequently asked questions can be found at http://heasarc.gsfc.nasa.gov/docs/nustar/nustar_faq.html.

3. Summary of Key Information

Expected program budget for Cycle 5 awards	~ $3.0 M
Expected number of new awards pending adequate proposals of merit	30–50
Maximum duration of awards	1 year
Due date for Notice of Intent to propose (NOI)	Option not available.
Due date for Phase-1 proposals	See Tables 2 and 3 of this ROSES NRA
Planning date for start of investigation	Funding will be awarded when the data are made available to the PI. NASA Center proposers should use October 1, 2019 (4 months after start of the Cycle 5 observing program) as a planning date for start of observations.
Page limit for Phase-1 proposals	Standard & ToO proposals: 4 pages. Large Program (LP) Proposals: 5 pages. LaTeX and MS Word templates (available for download at http://nustar.gsfc.nasa.gov/) can be used for the proposals. No supporting material (e.g., CV, pending/current support) will be considered for Phase-1. Page limits include figures and references. This instruction supersedes the limits given in the *NASA Guidebook for Proposers*.

Relevance	This program is relevant to the Astrophysics questions and goals in the NASA Science Plan (https://science.nasa.gov/about-us/science-strategy). Proposals that are relevant to this program are, by definition, relevant to NASA.
General information and overview of this solicitation	See the *ROSES Summary of Solicitation*.
Detailed instructions for the preparation and submission of proposals	See Section I(g) Order of Precedence and Table 1 of the ROSES *Summary of Solicitation* and the *NASA Guidebook for Proposers*.
Submission medium	Electronic proposal submission is required in PDF format; no hard copy is required or permitted.
Web site for submission of Notice of Intent to propose (NOI)	Option not available.
Web site for submission of Phase-1 proposal and required forms	http://heasarc.gsfc.nasa.gov/ark/nustar/ (Help Desk available at http://heasarc.gsfc.nasa.gov/ark/rps/help/)
Web site for submission of Phase-1 proposal via NSPIRES	Option not available.
Web site for submission of Phase-1 proposal via Grants.gov	Option not available.
Web site for submission of Phase-2 proposals	http://nspires.nasaprs.com; See Section 2.2.2
Programmatic information may be obtained from the NuSTAR Program Scientist	William B. Latter Astrophysics Division Science Mission Directorate NASA Headquarters Washington, DC 20546-0001 Telephone: (202) 358-0734 Email: william.b.latter@nasa.gov
Technical questions concerning this program element may be directed to the NuSTAR Guest Observer Program Office	Andrew Ptak NuSTAR Mission Scientist Code 662 Goddard Space Flight Center National Aeronautics and Space Administration Greenbelt, MD 20771-0001 Telephone: (301) 286-1154 Email: andrew.ptak@nasa.gov