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ANNOUNCEMENT OF OPPORTUNITY

XMM-Newton, ANNOUNCEMENT OF OPPORTUNITY: POLICIES AND PROCEDURES

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1 PURPOSE AND SCHEDULE

The X-ray Multi-mirror Mission (XMM-Newton) is the second cornerstone of ESA's Horizon 2000 Science Programme, providing an observatory-class X-ray facility. XMM-Newton was launched by an Ariane 5 on 10 December 1999 and has an expected lifetime of about 28 years. The observatory provides simultaneous nondispersive spectroscopic imaging and timing (European Photon Imaging Camera; EPIC), medium resolution dispersive spectroscopy (Reflection Grating Spectrometer; RGS) and optical/UV imaging, spectroscopy and timing from a co-aligned telescope (Optical Monitor; OM).

In combination the three cameras of EPIC offer a large effective area over the energy range from 300 eV to 12 keV, up to 2500 cm^2 at 1.5 keV and ~1800 cm^2 at 5 keV. Each of the two modules of the RGS cover an energy range from ~0.4 keV to 2.2 keV with an effective area of up to 60 cm^2 at 15 Å. Thus, XMM-Newton offers a unique opportunity for a wide variety of sensitive X-ray observations accompanied by simultaneous optical/UV measurements.

The majority of XMM-Newton's observing time is made available to the astronomical community by the traditional route of Announcements of Opportunity (AO), followed by peer review. These Announcements are open to the worldwide scientific community and the observing time they offer is referred to as "Open Time". This Announcement solicits proposals for observations to be carried out in the period between (approximately) May 2020 and April 2021. Electronic submission of proposals will be required in response to this Announcement. For all matters related to a proposal, the Principal Investigator (PI) is the single point of contact for ESA. After peer review by the XMM-Newton Observing Time Allocation Committee (OTAC), every PI will be informed about OTAC's decision.

The following schedule has been established:

Announcement of Opportunity	20 August 2019
Due date for proposals	11 October 2019 (12:00 UT)
Final OTAC approved programme	late December 2019
Definition of observation details	8 January to 31 January 2020

As soon as the technical details of successful proposals are confirmed, the observations will be made available for scheduling. Thus, execution of observations resulting from the Announcement of Opportunity could start four to five months after OTAC's decision, or in individual cases a few weeks to months earlier, depending1on the visibility of a target and on the science aimed.

2 INTRODUCTION

This document informs potential proposers about the policies adopted, the procedures to be followed for the AO and the interactions foreseen between proposers and the Science Operations Centre (SOC).

The organization of this document is as follows:

An overview of the different categories of observing time is presented in section 3.

The entire proposal process is summarized in section 4.

Details of the proposal submission procedure, evaluation and selection processes are described in sections 5, 6 and 7, respectively.

Some information on proposal enhancement and scheduling of accepted targets is summarized in section 8.

Sections 8.5 and 9 contain information on data products, proprietary data rights and publication acknowledgement.

Proposers are advised to read all sections of this document carefully; special attention should be paid to sections 5, and 6 and section 7.1

3 OBSERVING TIME

About 90% of XMM-Newton's observing time is made available via Announcements of Opportunity, which are open worldwide. In addition to this "Open Time", there is "Calibration Time", and Project Scientist's "Discretionary Time".

This Announcement solicits proposals to be carried out in the period defined in Section 1. About 80% of the available "Open Time" of this period is distributed via this call, which results in 12.0 Ms total observing time per year. The remaining 20% of the available "Open Time" will be distributed within the framework of joint programs, see section 5.6.

"Open Time" observations resulting from this Call for Proposals will be interleaved into the observing schedule, together with a few observations which failed or were not performed during the time period allocated to previous Announcements of Opportunity. A few observations approved in this call may be scheduled outside of the above period, depending on the visibility and science aimed.

3.1 Open Time

XMM-Newton is operated in a pre-planned manner, i.e. observers are not present at the SOC during the execution of their observations. Thus, all observations must be specified in full detail in advance by the proposers.

Proposers for "Open Time" are not allowed to duplicate any of the planned observations and should carefully justify duplications with performed observations (see section 5.9.1for the exact definition and further discussion of duplication issues). Proposers for "Open Time" observations should avoid the violation of data rights of planned or performed observations (see section 5.9.2 for the exact definition and further discussion of this issue). Checks for duplications and violation of data rights will be performed by the SOC during the processing of the proposals prior to the Scientific Review.

3.2 Discretionary Time

The XMM-Newton Project Scientist can grant "Discretionary Time", which is ~5% of the XMM-Newton observing time.

Unanticipated Target of Opportunity observations can be executed in the "Discretionary Time" of the Project Scientist. "Discretionary Time" may be granted for programs where a timely observation (outside of the normal announcement of opportunity cycle) is likely to result in a significant scientific impact. The Project Scientist can also use "Discretionary Time" to increase observing time of accepted targets. This does not impact on the data rights nor the proprietary period of the observation.

3.3 Calibration Time

About 5% of XMM-Newton's observing time is required to maintain the calibration, to monitor the health of the instruments and to perform engineering observations. Calibration observations already foreseen at the time of the Announcement of Opportunity are called routine calibration observations and are published.

Calibration observations which could not have been foreseen at the time of the Announcement of Opportunity are called non-routine calibration observations. Whenever possible, targets required for non-routine calibration observations are selected without generating additional duplications or violations of data rights of accepted observations.

3.4 Guaranteed Time

No "Guaranteed Time" has been made available beyond AO-1.

4 OVERVIEW OF PROPOSAL PREPARATION, SUBMISSION AND SELECTION

The proposal process in response to this Announcement of Opportunity is similar to that of the previous calls and, in summary, is as follows. Proposers will have to submit proposals to ESA by the deadline given in section 1 using the Remote Proposal System (RPS). This system is a version of the widely known HEASARC remote proposal submission system adapted for the specific needs of XMM-Newton. These proposals must contain the scientific justification and some observing details such as target coordinates, scientific prime instrument, and total required observing time. The OTAC reviews these proposals and recommends priorities. Only proposers of successful proposals will be asked to specify full observing details.

Users must perform the following tasks:

- Study the documentation for the Call
- Prepare a concise scientific justification for the proposal (PDF file) and a feasibility study of the observations (see also section 5.8.1, 5.8.2and 6.2). Note that figures can be included in the pdf file.
- Fill in the RPS forms, according to the instructions provided online and use exposure times calculated with the methods described in the XMM-Newton Users' Handbook.
- Verify the proposal through the RPS. This allows
    a) validation of the format of the proposal (completeness, syntax, parameter limits checking), and
    b) if validation succeeds, production of a file suitable for printing.
- Submit the proposal through the RPS to ESA. Both, proposal submission and justification upload must be performed before the deadline.

On receipt of the proposals, the SOC will forward them to the OTAC for scientific review, while performing some technical assessments and preparing overall statistics on the response. The OTAC will assign priorities to each proposal (and, as needed, grade individual observations within a proposal). For details see section 7.3.2.

Only proposers of OTAC approved observations will have to specify all observing details via the 2nd Phase XMM-Newton Remote Proposal Subsystem (XRPS). Detailed instructions will be provided within the e-mail which informs the PI about the OTAC decision.

One of the parameters used to plan which observations will be carried out during a particular orbit, is the priority of the observations as allocated by the OTAC. However, for operational reasons, no guarantees can be given that a particular observation will in fact be executed, regardless of its grade.

5 SPECIFIC CALL ISSUES

5.1 Remote Proposal System of XMM-Newton

Proposals in response to this Announcement of Opportunity have to be submitted electronically. A two phase submission process will be applied:

Phase 1: In response to the call all proposals have to be sent using the Remote Proposal System (RPS). These proposals must contain the scientific justification and some observing details such as target coordinates, scientific prime instrument, and total required observation duration (including the overhead time of the prime instrument). The instructions for using RPS are available online.

Phase 2: PIs of observation(s) accepted by OTAC, will have to provide full observation details. This has to be done using the XMM-Newton Proposal Submission Subsystem (XRPS). Instructions and details will be provided via e-mail together with the information about the OTAC decision. Observations for which a PI fails to provide the required observation details in due time will not be performed.

5.2 Proposal Types

There are two types of proposals: “Guest Observer” and “Anticipated Target of Opportunity”. The two types of proposals are explained in detail below.

5.2.1 Guest Observer

The large majority of proposals will fall under the type “Guest Observer”. The exceptions are proposals requesting XMM-Newton observations, where the scheduling time cannot be planned in advance as described in section 5.2.2.

5.2.2 Targets of Opportunity

Targets of Opportunity (TOOs) are astronomical events observable by XMM-Newton, which cannot be predicted and scheduled on the time scale of a year, yet are scientifically sufficiently important to justify interrupting the overall XMM-Newton programme. TOOs can only be observed on a best effort basis. The overall responsibility lies with the Project Scientist, who may coordinate his decision with a chairperson of the OTAC. The Project Scientist makes the decision for an interruption of the programme.

The XMM-Newton project recognizes two kinds of TOOs: anticipated and unanticipated TOOs. They are described in the following sections:

5.2.2.1 Anticipated Target of Opportunity

The proposer has to select the proposal type “Anticipated Target of Opportunity” and to specify the coordinates whenever they are known in advance. For event types where the coordinates are not known in advance the PI has to use the place holder coordinates RA=0 and Dec=0 for each observation. TOO observations must be submitted as “Fixed-Time” observations, see section 5.7.1, and require observing priority A or B, see section 7.3.2. In the “Trigger criteria, reaction time and observing strategy” box of the proposal form the proposer must provide a short and clear description of what triggers the actual observation to be performed, the necessary reaction time for scheduling the observation after it is triggered and the observing strategy in particular the principal instrument and mode. For accepted proposals, this description will be made public as entered in the proposal form.

Given the nature of such events, re-scheduling of the XMM-Newton observing sequence and update of instrument modes is likely to be necessary. Consequently, the observing parameters should be provided on a best guess basis. It is the responsibility of the PI of the TOO proposal to alert the SOC when the triggering condition is met. To avoid any conflict with an unanticipated Target of Opportunity (section 5.2.2.2), the PI is asked to provide all necessary information and to update the observing parameters immediately after an event has occurred. In case of a conflict with other approved observations, including unanticipated TOOs (section 5.2.2.2), the Project Scientist will decide. The basis of the decision will be the information provided, as well as the time when the information arrived at the SOC.

In contrast to all “Guest Observer” proposals, the OTAC can allocate observing time to the entire “Anticipated Target of Opportunity” proposal and not to individual observations. This offers the possibility to provide a list of candidates, without specifying which of the sources will finally be observed. For every source in a candidate list a separate observation form has to be filled-in within the RPS. For some of the candidates one may ask for zero observing time such that the total requested time in the proposal reflects the proposed observing strategy. OTAC may accept only a subset of the candidates.

XMM-Newton aims to perform rapidest follow-up observations of bright γ-ray bursts and gravitational wave events in Discretionary Time (section 3.2).

5.2.2.2 Unanticipated Target of Opportunity

The possibility to recommend unanticipated TOO observations is open to all astronomers worldwide. Astronomers who detect a suitable event are strongly encouraged to send a recommendation via the TOO alert page at:

http://www.cosmos.esa.int/web/xmm-newton/too-alert

It is expected that an event proposed as unanticipated TOO is a very rare event, specifically, that it is too rare to be reasonably proposed as anticipated TOO, see section 5.2.2.1.

Receipt of an urgent TOO recommendation immediately initiates the process of a technical review, a decision on whether or not to interrupt the XMM-Newton programme and, if accepted, the observation of the proposed target. For non urgent requests, this process is initiated only at the first next working day after the receipt of the alert at the SOC.

Unanticipated TOO observations are performed under the “Discretionary Time” category (section 3.2) or, if approved by an OTAC chairperson, as “Open Time” (section 3.1). Unanticipated TOO observations which do not violate data rights of accepted proposals may either get half a year proprietary rights or be made public after successful Observation Data File (ODF) generation. The Project Scientist decides about data rights and the proprietary period of data resulting from unanticipated TOO observations. The basis of the decision is the information provided in the alert, as well as the time when it arrived at the SOC.

5.3 Large Programmes

Scientific programmes which require a significant amount of observing time (>300 ks) may be submitted as “Large Programmes”.

“Large Programmes” may be submitted by up to four Prime Investigators. The concept of Prime Investigator team or, in short, Prime Investigators is established to facilitate international collaboration. Therefore, Prime Investigators are expected to come from institutes of two or more countries. Inline with ESA policy, the Prime Investigators are expected to be (gender-)diverse and inclusive. The Prime Investigator who is first listed in the proposal is the single point of contact for the Science Operations Centre. It is the responsibility of the Prime Investigators to flag a proposal as “Large Programme” within the electronic submission of the proposal with the RPS. In the case that the Prime Investigator team splits, the PS decides about the continuation of the observing programme and data distribution (e.g. to make the data public).

Two OTAC panels will review each “Large Programme” with respect to the expected return for the scientific category. Each of the two panels, independently, recommends “Large Programmes” to the chairpersons meeting. Within the chairpersons meeting a session will be devoted to discuss and compare the recommended “Large Programmes”.

Some Large Programmes approved in previous AOs may have failed to achieve the original scientific goal due to enhanced background radiation and the Prime Investigators may want to request additional observing time. In this case the proposal shall be flagged as “resubmitted” and identified as “Large Programme” type, regardless of the total time requested in the current AO.

OTAC can apply the “Large Programmes” procedure to every programme that asks for a significant amount of total observing time (300ks) if the scientific case is judged to be of scientific importance.

5.4 Multi-Year Heritage Programmes

In AO 19 “Multi-Year Heritage Programmes” can not be proposed.

Scientifically visionary programmes which require more than 2 Ms of observing time may be proposed as “Multi-Year Heritage Programmes”. A very strong scientific case and a clearly defined observing strategy are obviously essential requirements. “Multi-Year Heritage Programmes” may be submitted by up to four Prime Investigators. The Prime Investigator who is first listed in the proposal is the single point of contact for the Science Operations Centre. The Prime Investigators are asked to flag proposals as “Multi-Year Heritage Programme” within the electronic submission of the proposal with the RPS.

“Multi-Year Heritage Programmes” may be accepted for observation over three consecutive AOs. In total, up to 6.0 Ms of observing time may be allocated for such ”Multi-Year Heritage Programmes” to be performed over at most three consecutive AOs. The total observing time requested for a specific position on the sky may be up to the length of the total visibility period during one and half a years. Up to 200 ks of the requested observing time may be observed as TOO (section 5.2.2) requiring a short reaction time.

“Multi-Year Heritage Programmes” will be reviewed by the Senior Review Panel, which will be a special and separate panel within the time allocation committee. Senior scientists with past experience of assessing large programmes will be selected to participate in the evaluation of “Multi-Year Heritage Programmes”.

5.5 Fulfil Programmes

Targets that are important within an archival context and so will strengthen the legacy of the mission may be proposed as "Fulfil Programmes”. Such programmes may assist in the completion of samples e.g. in terms of the key parameter space covered, or propose to observe targets already well observed at other wavelengths, or help homogenize the exposure and fill in coverage gaps of extended sources or fields, or provide observations which are cases of high risk and high gain. "Fulfil Programmes" are suggested to be observed with observing priority “C”.

Given the scientific nature of the “Fulfil Programmes” it is expected that the observations are not in any way time constrained (section 5.7.1), coordinated (section 5.6and section 5.7.2) or TOO (section 5.2.2).

5.6 Joint Programmes

With the aim of taking full advantage of the scientific opportunities offered by coordinated observations with complementary missions and facilities, the XMM-Newton project offers different joint programmes. Time within the joint programmes will only be granted to

highest rated observations with observing priority A or B, see section 7.3.2. The offered joint programmes are described below.

5.6.1 Joint XMM-Newton / INTEGRAL Programme

With the aim of taking full advantage of the complementarity of ESA's high-energy observing facilities, both project teams have agreed to establish an environment for those scientific programmes that require observations with both the XMM-Newton and the INTEGRAL observatory to achieve outstanding and competitive results.

By agreement with the INTEGRAL Project, the XMM-Newton Project may award up to 300 ks of INTEGRAL observing time. Similarly, the INTEGRAL Project may award up to 300 ks of XMM-Newton time. The time will be awarded only for highly ranked proposals. The only criterion above and beyond the usual review criteria is that both sets of data are required to meet the scientific objectives of the proposal.

The allocated INTEGRAL time should not exceed the allocated XMM-Newton INTEGRAL time. The minimum time per Integral pointing is 1.8 ks, i.e. a minimum of 13 ks for a Hexagonal (7 pointings) and 45 ks for a 5x5 (25 pointings). Other Integral observing modes can not be proposed through this joint program. No observations with a reaction time of less than 2 working days from an unknown triggering date will be considered for this cooperative programme. It is the responsibility of the PI to inform both observatories immediately if the trigger criterion is fulfilled.

It is the proposers' responsibility to provide a full and comprehensive scientific and technical justification for the requested observing time on both facilities. The ESA science operations teams for XMM-Newton and INTEGRAL will perform feasibility checks of the proposals. They each reserve the right to reject any observation determined to be unfeasible for any reason.

Apart from the above, both missions' general policies and procedures currently in force for the final selection of the proposals, the allocation of observing time, the execution of the observations and the data rights remain unchanged.

Scientists can apply for the joint programme in the "Observation Form" of the XMM-Newton RPS. For each observation the PI has to specify the required observing time for both observatories. The "Comment" field should be used to define the Integral instrument modes (Hexagonal or 5x5) and scheduling constraints.

5.6.2 Joint XMM-Newton / Chandra Programme

If a science project requires observations with both Chandra, sponsored by the U.S. National Aeronautics and Space Administration, and the XMM-Newton Observatory, then a single proposal may be submitted to request time on both observatories to the XMM-Newton Announcement of Opportunity, so that it is unnecessary to submit proposals to two separate reviews.

The XMM-Newton Project may award up to 1 Msec of Chandra time. Of that time, 600 ksec is reserved exclusively for XMM-Newton Large (or when offered, Multi-Year Heritage) programs. Up to 400 ksec is allocated to regular XMM-Newton GO programs, and any such unused time may be allocated to LP/MYHP as needed. By agreement with the XMM-Newton Project, the Chandra Project may award up to 1 Msec of XMM-Newton observing time, of which 600 ksec is reserved for Chandra Large and Very Large programs, through an exactly reciprocal policy. The time will be awarded only for highly ranked proposals that require use of both observatories and shall not apply to usage of archival data. The only criterion above and beyond the usual review criteria is that both sets of data are required to meet the primary science goals. Proposers should take special care in justifying both the scientific and technical reasons for requesting observing time on both missions. It is not essential that the project require simultaneous XMM-Newton and Chandra observations. For this solicitation, no Chandra time will be allocated without the need for XMM-Newton time on the same target to complete the proposed investigation.

No Target of Opportunity observations with a turn-around time of less than 5 working days from an unknown triggering date will be considered for this cooperative program.

Establishing technical feasibility is the responsibility of the PI, who should review the XMM-Newton and Chandra documentation (http://cxc.harvard.edu/proposer/POG) or consult with the Chandra Guest Observer Facility (http://cxc.harvard.edu/helpdesk). For proposals that are approved, both projects will perform detailed feasibility checks. Both projects reserve the right to reject any approved observation that is in conflict with safety or mission assurance priorities or schedule constraints, or is otherwise deemed to be non-feasible. Simultaneous long duration observations with XMM-Newton may violate restrictions at some Chandra satellite pitch angles, which can be evaluated using Chandra PRoVis http://cxc.harvard.edu/cgibin/provis/provis load.cgi. Any observation(s) deemed to be not performable as indicated above would cause revocation of observations on both facilities.

Scientists can apply for the joint programme in the “Observation Form” of the XMM-Newton RPS. For each observation the PI has to specify the required observing time for both observatories. The “Comment” field should be used to briefly describe the Chandra instrument modes and scheduling constraints.

5.6.3 Joint XMM-Newton / VLT(I) Programme

With the aim of taking full advantage of the complementarity of ground-based and space-borne observing facilities, ESO and ESA have agreed to establish an environment for those scientific programmes that require observations with both the ESO VLT(I) telescopes and the XMM-Newton X-ray observatory to achieve outstanding and competitive results.

By agreement with the XMM-Newton observatory, ESO may award up to 290 ks (80h) of XMM-Newton observing time. Similarly, the XMM-Newton project may award up to 80 hours of ESO VLT(I) observing time. This applies to the duration of an XMM-Newton cycle, which normally extends over two ESO observing periods.

Proposers wishing to make use of this opportunity will have to submit a single proposal in response to either the XMM-Newton or the ESO call for proposals: proposals for the same programme submitted to both observatories will be rejected. Although time is requested on both observatories, it will be unnecessary to submit proposals to two separate reviews. A proposal submitted to ESO will be reviewed exclusively by the ESO's OPC; a proposal submitted to the XMM-Newton observatory will be reviewed exclusively by the XMM-Newton OTAC. Proposals that request different amounts of observing time on each facility should be submitted to the observatory for which the greatest amount of time is required.

The primary criterion for the award of observing time is that both ESO VLT(I) and XMM-Newton data are required to meet the scientific objectives of the proposal. It is not essential that the project requires simultaneous XMM-Newton and ESO telescope observations. No observations, requiring simultaneous observation with both facilities, with a reaction time of less than 2 working days from an unknown triggering date will be considered for this cooperative program. It is the responsibility of the PI to inform both observatories immediately if the trigger criterion is fulfilled.

It is the proposers' responsibility to provide a full and comprehensive scientific and technical justification for the requested observing time on both facilities. In the comment field for VLT observations, proposers should specify for each target: 1) instrument and set-up, 2) target brightness (w/ associated wave-band), 3) special scheduling requirements (time criticality, split of various runs and their corresponding telescope-time, etc.), 4) special calibrations, if needed and 5) observing constraints (at least seeing/transparency). Both the ESO and XMM-Newton observatories will perform feasibility checks of the approved proposals. They each reserve the right to reject any observation determined to be unfeasible for any reason. The rejection by one observatory could jeopardize the entire proposed science programme.

Apart from the above, for both the ESO VLT(I) and the XMM-Newton observatory, the general policies and procedures currently in force for the final selection of the proposals, the allocation of observing time, the execution of the observations, and the data rights remain unchanged.

Scientists can apply for the joint programme in the “Observation Form” of the XMM-Newton RPS. For each observation the PI has to specify the required observing time for both observatories. The “Comment” field should be used to briefly describe the VLT(I) instrument modes and scheduling constraints.

5.6.4 Joint XMM-Newton / Hubble Space Telescope Programme

If a science project requires observations with both the Hubble Space Telescope (HST) and XMM-Newton, then a single proposal may be submitted to request time on both observatories to the XMM-Newton Announcement of Opportunity, so that it is unnecessary to submit proposals to two separate reviews. The proposal should be submitted to the observatory that represents the primary science.

By agreement with the HST Project, the XMM-Newton Project may award up to 30 orbits of HST observing time. Similarly, the HST Project may award up to 150 ks of XMM-Newton time. The time will be awarded only for highly ranked proposals that require use of both observatories and shall not apply to usage of archival data. The only criterion above and beyond the usual review criteria is that both sets of data are required to meet the primary science goals. Proposers should take special care in justifying both the scientific and technical reasons for requesting observing time on both missions. It is not essential that the project requires simultaneous XMM-Newton and HST observations. No observations with a reaction time of less than 5 working days from an unknown triggering date will be considered for this cooperative programme. Target of Opportunity (ToO) proposals must state explicitly whether the HST observations require a disruptive ToO (observations within 21 days of notification). No more than one (1) disruptive ToO will be allocated to the HST Cycle 26 time awarded jointly with XMM-Newton observations. It is the responsibility of the PI to inform both observatories immediately if the trigger criterion is fulfilled. For this solicitation, no HST time will be allocated without the need for XMM-Newton time on the same target to complete the proposed investigation.

Establishing technical feasibility is the responsibility of the PI, who should review the XMM-Newton and HST Calls for Proposals and Instrument Handbooks and/or contact the HST Helpdesk at STScI (help@stsci.edu). All standard observing restrictions for both observatories apply to joint proposals. For proposals that are approved, both projects will perform detailed feasibility checks. Both projects reserve the right to reject any approved observation that is in conflict with safety or mission assurance priorities or schedule constraints, or is otherwise deemed to be non-feasible.

Scientists can apply for the joint programme in the “Observation Form” of the XMM-Newton RPS. For each observation the PI has to specify the required observing time for both observatories. The “Comment” field should be used to briefly describe the HST instrument modes and scheduling constraints.

5.6.5 Joint XMM-Newton / Swift Programme

By agreement with the Swift Mission Project, proposers interested in making use of Swift time as part of their XMM-Newton science investigation may submit a single proposal in response to this XMM-Newton AO. The award of Swift time will be made to highly ranked XMM-Newton proposals and will be subject to approval by the Swift Project.

The primary criterion for the award of Swift time is that both XMM-Newton and Swift data are required to meet the scientific objectives of the proposal. Swift time will not be awarded without accompanying XMM-Newton observing time. The Swift Project is making up to 300 ks of Swift observing time available to such joint science proposals.

The awarded Swift time will be valid for a 12 months period since the start of the XMM-Newton AO. There will be no Swift time carried over to next the observing cycle, except when observing for an awarded program has commenced during the current cycle. PIs whose observing programs have not begun in the current cycle will be required to repropose if they wish to acquire Swift observing time.

Swift observing time can be time-constrained, including coordinated observations and Targets of Opportunity. For coordinated and constrained observations, it is the proposer's responsibility to inform the Swift Science Operations Team of the observing time windows at least one week before observations start. Proposers must clearly describe how their proposal capitalizes on the unique capabilities of Swift. It is the responsibility of the proposer to demonstrate the feasibility of the proposed Swift observation (instrument modes, observing time and expected count rates from simulations or previous Swift observations). The requested time per Swift observation must be between a minimum of 1 ks and a maximum of 40 ks. Detailed technical information concerning Swift may be found at http://swift.gsfc.nasa.gov/proposals/appendix f.html. PIs are expected to determine if a target can be viewed by Swift (http://heasarc.gsfc.nasa.gov/Tools/Viewing.html) and whether bright stars prohibit the use of Swift UVOT. PIs need to provide a strong justification for the choice of the filters if UVOT filters other than ”filter of the day” are requested. If no strong justification is provided, all observations will be performed in ”filter of the day” mode.

The Swift Guest Observer Facility will make feasibility assessments of the proposed observations independently of the XMM-Newton review. Proposed Swift observations determined to be infeasible will be rejected. Such a rejection could jeopardize the entire proposed science programme and impact the award of the XMM-Newton observing time as well.

If Swift time is approved, successful PIs will have to submit the standard Swift cover and target forms to the Swift Guest Observer Facility via ARK/RPS

(https://heasarc.gsfc.nasa.gov/ark/swiftrps/joint/joint.html) to provide the required information about observing strategy and instrument configurations.

Swift data sets obtained under this agreement will not be proprietary to the PI and immediately released publicly via the HEASARC data archive. No funds will be provided from the Swift Project for such joint XMM-Newton/Swift investigations.

However, successful U.S.-based investigators are eligible for funding via the "Correlative Observations" category of the Swift Guest Investigator Program. Further information on the Swift Guest Investigator Program, and how to apply for funding can be found at: http://swift.gsfc.nasa.gov/proposals/swiftgi.html

Scientists can apply for the joint programme in the "Observation Form" of the XMM-Newton RPS. For each observation the PI has to specify the required observing time for both observatories. The "Comment" field should be used to briefly describe the Swift instrument modes and scheduling constraints.

5.6.6 Joint XMM-Newton / NuSTAR Programme

If a science project requires observations with both NuSTAR and XMM-Newton, then a proposal may be submitted to request time on both observatories.

By agreement with the NuSTAR Project, the XMM-Newton Project may award up to 1.5 Ms of NuSTAR observing time. Similarly, the NuSTAR Project may award up to 1.5 Ms of XMM-Newton time. The time will be awarded only for highly ranked proposals that require use of both observatories and shall not apply to usage of archival data. The only criterion above and beyond the usual review criteria is that both sets of data are required to meet the primary science goals. Proposers should take special care to justify both the scientific and technical reasons for requesting observing time on both missions. It is not essential that the requested NuSTAR and XMM-Newton observations be simultaneous, however clear discussion of the required level of coordination is essential for evaluating feasibility. No NuSTAR time will be allocated without the need for XMM-Newton time on the same target to be obtained within this AO cycle.

Establishing technical feasibility is the responsibility of the PI, who should review the XMM-Newton Calls for Proposals and the NuSTAR web-page. For efficiency reasons NuSTAR observations should not be shorter than 20 ks. For each target the total requested XMM-Newton observing time should be comparable (within approximately a factor two of) to the total requested NuSTAR observing time. Observations of high count rate targets with NuSTAR (>50 cps/NuSTAR module) require special planning and increased downlink capacity. Such observations should be carefully justified, and should not be feasible with other less-sensitive hard X-ray observatories. High count rate (>50 cps/module) observations of duration >30 ksec are difficult and can be accepted only if well-motivated. High count rate observations longer than 75 ksec cannot be accepted.

No observations with a reaction time of less than 2 working days from an unknown triggering date will be considered for this cooperative programme. It is the responsibility of the PI to inform both observatories immediately if the trigger criterion is fulfilled. For proposals that are approved, both projects will perform detailed feasibility checks. Both projects reserve the right to reject any approved observation that is in conflict with safety or mission assurance priorities or schedule constraints, or is otherwise deemed to be non-feasible.

Apart from the above, both missions' general policies and procedures currently in force for the final selection of the proposals, the allocation of observing time, the execution of the observations and the data rights remain unchanged. Scientists can apply for the joint programme in the "Observation Form" of the XMM-Newton RPS. For each observation the PI has to specify the required observing time for both observatories. The "Comment" field should be used to briefly describe the NuSTAR instrument modes and scheduling constraints.

5.6.7 Joint XMM-Newton / H.E.S.S. Programme

If a science project requires observations with both H.E.S.S. and XMM-Newton, then a proposal may be submitted to request time on both observatories.

By agreement with the H.E.S.S. Project, the XMM-Newton Project may award up to 42 h of H.E.S.S. observing time. Similarly, the H.E.S.S. Project may award up to 150 ks of XMM-Newton time. The time will be awarded only for highly ranked proposals that require use of both observatories and shall not apply to usage of archival data. Proposers should take special care to justify both the scientific and technical reasons for requesting observing time on both facilities. It is not essential that the requested H.E.S.S. and XMM-Newton observations be simultaneous, however clear discussion of the required level of coordination is essential for evaluating feasibility. No H.E.S.S. time will be allocated without the need for XMM-Newton time on the same target to be obtained within this AO cycle. The program may be used to follow-up expected new detected sources.

Establishing technical feasibility is the responsibility of the PI, who should review the XMM-Newton Calls for Proposals and the H.E.S.S. web-page (https://www.mpi-hd.mpg.de/hfm/HESS/pages/home/proposals/).

No observations, requiring strict simultaneousness, with a reaction time of less than 2 working days from an unknown triggering date will be considered for this cooperative programme. It is the responsibility of the PI to inform both observatories immediately if the trigger criterion is fulfilled. For proposals that are approved, both projects will perform detailed feasibility checks. Both projects reserve the right to reject any approved observation that is in conflict with safety or mission assurance priorities or schedule constraints, or is otherwise deemed to be non-feasible.

Apart from the above, both missions' general policies and procedures currently in force for the final selection of the proposals, the allocation of observing time, the execution of the observations, data rights and publication agreements remain unchanged.

Scientists can apply for the joint programme in the ``Observation Form'' of the XMM-Newton RPS. For each observation the PI has to specify the required observing time for both observatories. The ``Comment'' field should be used to briefly describe the H.E.S.S. instrument modes and scheduling constraints.

5.6.8 Joint XMM-Newton / MAGIC Programme

If a science project requires observations with both MAGIC and XMM-Newton, then a proposal may be submitted to request time on both observatories.

By agreement with the MAGIC Project, the XMM-Newton Project may award up to 42 h of MAGIC observing time. Similarly, the MAGIC Project may award up to 150 ks of XMM-Newton time. The time will be awarded only for highly ranked proposals that require use of both observatories and shall not apply to usage of archival data. Proposers should take special care to justify both the scientific and technical reasons for requesting observing time on both facilities. It is not essential that the requested MAGIC and XMM-Newton observations be simultaneous, however clear discussion of the required level of coordination is essential for evaluating feasibility. No MAGIC time will be allocated without the need for XMM-Newton time on the same target to be obtained within this AO cycle. The program may be used to follow-up expected new detected sources.

Establishing technical feasibility is the responsibility of the PI, who should review the XMM-Newton Calls for Proposals and the MAGIC web-page.

No observations with a reaction time of less than 2 working days from an unknown triggering date will be considered for this cooperative programme. It is the responsibility of the PI to inform both observatories immediately if the trigger criterion is fulfilled. For proposals that are approved, both projects will perform detailed feasibility checks. Both projects reserve the right to reject any approved observation that is in conflict with safety or mission assurance priorities or schedule constraints, or is otherwise deemed to be non-feasible.

Apart from the above, both missions' general policies and procedures currently in force for the final selection of the proposals, the allocation of observing time, the execution of the observations and the data rights remain unchanged.

Scientists can apply for the joint programme in the ``Observation Form'' of the XMM-Newton RPS. For each observation the PI has to specify the required observing time for both observatories. The ``Comment'' field should be used to briefly describe the MAGIC instrument modes and scheduling constraints.

5.6.9 Joint XMM-Newton / NRAO/GBO Programme

If a science project requires observations with both NRAO/GBO and XMM-Newton, then a proposal may be submitted to request time on both the radio and X-ray observatories.

By agreement with the NRAO/GBO Observatories, the XMM-Newton Project may award up to 3% of NRAO/GBO open skies observing time (as an indication, this corresponded to approx. 105/82/34 hours respectively in Semester 18A). Similarly, the NRAO/GBO Time Allocation Committee may award up to 150 ks of XMM-Newton time per year. The time will be awarded only for highly ranked proposals that require use of both observatories and shall not apply to usage of archival data. Proposers should take special care to justify both the scientific and technical reasons for requesting observing time on both facilities. It is not essential that the requested NRAO/GBO and XMM-Newton observations be simultaneous, however clear discussion of the required level of coordination is essential for evaluating feasibility. No NRAO/GBO time will be allocated without the need for XMM-Newton time on the same target to be obtained within this AO cycle.

Establishing technical feasibility is the responsibility of the PI, who should review the XMM-Newton Calls for Proposals and the NRAO (https://science.nrao.edu/observing/call-for-proposals), GBO (http://greenbankobservatory.org/gbt-observers/proposals) web pages and the NRAO Helpdesk (https://science.nrao.edu/observing/helpdesk).

No observations requiring simultaneous observation with both facilities, with a reaction time of less than 2 working days from an unknown triggering date will be considered for this cooperative program. It is the responsibility of the PI to inform both observatories immediately if the trigger criterion is fulfilled. For proposals that are approved, both observatories will perform detailed feasibility checks. Both observatories reserve the right to reject any approved observation that is in conflict with safety or mission assurance priorities or schedule constraints, or is otherwise deemed to be non-feasible.

Apart from the above, both missions' general policies and procedures currently in force for the final selection of the proposals, the allocation of observing time, the execution of the observations, data rights and publication agreements remain unchanged.

Scientists can apply for the joint programme in the ``Observation Form'' of the XMM-Newton RPS. For each observation the PI has to specify the required observing time for both observatories. The “Comment'' field should be used to briefly describe the NRAO/GBO instrument modes and scheduling constraints.

5.7 Specific Observations

5.7.1 Fixed-Time Observations

A “Fixed-Time” observation (“Time Critical” in RPS) is defined as an observation whose scheduling is not solely determined by its visibility. Examples of “Fixed-Time” observations are:

- “Anticipated Target of Opportunity”, see section 5.2.2.1,
- Observations for which the observer can specify the calendar date, or relative date through, e.g., an orbital ephemeris,
- Observations which must be conducted more than once with a pre-determined time lag in between,
- “Coordinated Observations”, see section 5.7.2.
- Observations for which non-standard instrument modes are used, see section 5.8.5

“Fixed-Time” observations reduce the flexibility available to the mission planning system for scheduling of observations and can lead to larger than nominal slew overheads. Thus, all proposers are reminded that “Fixed-Time” observations should only be asked when there is a strong scientific requirement. This justification must be provided explicitly in the proposal justification. For operational reasons, the start time of “Fixed Time” observations should not be constrained below a margin of ±15 ks. In addition, the scheduling constraints should be described in detail in the “constraints” sub-menu after entering an observation as “Time critical”. “Fixed-Time” observations are approved by OTAC by allocating A or B observing priority. C priority observations cannot be “Time-critical” or “Fixed-time”.

It is the responsibility of the PI to demonstrate that proposed “Fixed-Time” observations are visible, see section 5.8.1.

5.7.2 Coordinated Observations

Observations of XMM-Newton which should be performed simultaneously with approved observations at other telescopes require a careful coordination of the planning between two or more science operations centres or observatories. Similarly to “Fixed-Time” observations, they reduce the flexibility available to the mission planning for scheduling of observations and often lead to larger than nominal slew overheads.

Observations will be performed simultaneously with other telescopes on a best effort basis. The mission planning will consider requests for simultaneous observations only if the observation was flagged as “Coordinated” at the time of proposal submission and approved as such by OTAC.

It is the responsibility of the observer to demonstrate that a target proposed for “Coordinated Observation” is visible, i.e. that a common visibility window exists (see section 5.8.1). It is strongly recommended that targets proposed for coordinated observations have a sufficiently long common visibility window per revolution (i.e. common visibility window > observation duration + six hours). “Coordinated” observations are approved by OTAC by allocating A or B observing priority.

5.7.3 Observation of Large Areas

Large areas of the sky may be observed by XMM-Newton through observations next to each other such that the fields of view of the individual observations touch each other or even overlap. Proposals asking for more than ten of such observations have to be submitted by requesting “Large Area” in RPS. Depending on the amount of total observing time the PI may consider to send the proposal as “Large Programme”, see section 5.3. The PIs are asked to describe the proposed area of the sky in detail within the scientific justification. In the RPS only one observation, that is located at the centre of the proposed area, should be entered. The observations will be defined as “Time Constrained”, fixed as “Large Area”. In addition, the exposure time of the requested observation and the number of repetitions have to be selected such that the total number of observations and the total amount of observing time are correct. The details of each observation will have to be defined in XRPS within the phase 2 submission.

5.8 Aspects of Visibility, Feasibility, Background and Instrument Modes

5.8.1 Source Visibility

Observations with XMM-Newton are only possible under a number of celestial constraints, for example Sun, Earth limb, and Moon avoidance angles. As a consequence, not every source is visible at all times. Therefore, it is mandatory that observers study the visibility of a target, in particular if the target should be observed under a specific position angle, on a certain date (see section 5.7.1) or simultaneously with other telescopes (see section 5.7.2). The XMM-Newton SOC provides a web-based tool which allows an online target visibility check for given coordinates and observation times, the “XMM-Newton Target Visibility Checker”. For details see:

http://www.cosmos.esa.int/web/xmm-newton/target-visibility-tool

For programs aiming large amounts of observing time of a particular area on the sky observers should ensure that the total requested exposure time does not exceed approximately 40% of the cumulative visibility of the area during the AO. This 40% is typically 15 XMM-Newton revolutions for most parts of the sky, but observers are encouraged to check the visibility. An exception to this rule may apply for “Multi-Year Heritage Programmes”, see section 5.4 for details.

Several scientific questions might be addressed equally well with several different targets or areas on the sky. In this case it is strongly recommended that the proposer selects the target or area with the longest cumulative visibility.

5.8.2 Feasibility of Observations

The duration of each requested observation has to be estimated and entered into RPS by the proposer. Instructions for calculating exposure times are contained in the XMM-Newton Users' Handbook. The XMM-Newton SOC recommends that proposers base their estimation of exposure times on previous X-ray measurements whenever possible, especially on previous XMM-Newton observations. After correction for the different energy bands and effective areas (for example with PIMMS, see below), these give reasonable estimates of the needed exposure times. It is mandatory that observers describe in their proposals how they calculated the exposure times. A realistic estimate of the observing time is a major selection criterion for the OTAC.

PIMMS (Portable, Interactive, Multi-Mission Simulator) allows users to estimate the count rate, hence the exposure time necessary to achieve the scientific objectives of an observation, based on the count rate measured with another instrument, or a theoretically calculated flux, and an approximate spectral shape. Although it cannot substitute a full spectral or timing simulation, PIMMS nevertheless provides a useful first-order estimate of the count rate when a proposal is being considered. "First-order estimate" in this context means that the uncertainties of the PIMMS estimates are often (though not always) dominated by the scientific uncertainties regarding the source.

PIMMS for XMM-Newton is officially supported by NASA and is available from HEASARC via the WWW:

http://heasarc.gsfc.nasa.gov/Tools/w3pimms.html

Experience from previous AOs has demonstrated that the requested exposure time is often significantly underestimated. An estimate of the exposure time based on a "3" signal to noise ratio implies a significant (3) detection only in 50% of the cases. Many estimates of exposure times are based on a comparison with physically similar targets already observed in the X-ray band. Proposers should be aware that the literature is biased against detections and therefore many reported fluxes are not good representatives for a particular object class, as a whole.

5.8.3 Background Radiation

Background radiation affects XMM-Newton observations. Experience shows that observations aiming to detect faintest point-like sources or extended structure, like clusters of galaxies, require a "low" background radiation level and that only about 60% of the observing time can be considered as low background radiation level. There are different observing strategies to handle the high background radiation level. Most common are:

- To increase the observing time by 40%. This strategy is often used for targets with a long observing time.

- To observe the targets with the minimum time and to ask in the next AO for a repetition of the observations suffering under high background time. This strategy is often preferred if the proposal contains many observations with a short observing time.

OTAC is asked to carefully consider the discussion of the background handling and exposure time calculation in its decision.

The feasibility study of extended sources requires special attention. Proposers should consider that besides the X-ray background also the instrumental background has to be taken into account. Experience shows that in the absolute minimum proposers should provide the background count rate per unit area (count/s/cm2) and the signal to background ratio required for the most critical region, i.e. the region for which the spectral analysis or deeper source detection is proposed. Proposers should also specify the energy bands to which these numbers are referring.

5.8.4 Inappropriate Instrument Modes and Filters

Inappropriate instrument modes and/or optical-blocking filter may lead to pile-up and/or optical loading of the obtained data and as such diminish the scientific return of the mission. In exceptional cases the Project Scientist can approve the usage of improper instrument modes or optical-blocking filters. Proposers are requested to demonstrate the need and, if required, availability of proper calibration and data analysis techniques or tools in the scientific justification of the proposal.

5.8.5 Non-Standard Instrument Modes

Four modes, the “mosaic mode”, the “pn modified timing” (compare section 5.8.6), the “RGS multi-pointing” and the “RGS small window” mode, may be considered for individual observations on a best effort basis. The Project Scientist can approve observations using these modes if the proposer can demonstrate the need and, if required, can ensure proper calibration and data analysis. None of the modes is recommended in general nor can be fully supported by the SOC. Furthermore, “mosaic mode” can not be requested for anticipated ToO’s.

Scientists can apply for these modes by selecting the corresponding “Prime Instrument” and “Observing Mode” in RPS. As such observations require careful manual planning, commanding and coordination, it is mandatory that the proposer asks for “Fixed-Time” observations in RPS, see section 5.7.1. The evaluation of the success of these observations (section 8.4) may differ from the evaluation of observations performed with standard instrument modes.

5.8.6 Observation of Brightest Sources in pn Timing Mode

There are scientific questions, which cannot be answered with the time sampling provided by the pn burst mode. In such cases pn timing mode is often requested. Observing the brightest sources with the timing mode may cause pile-up which leads to distorted spectra as well as distorted light curves. Experience shows that such data are often degenerated and their scientific interpretation is seriously hampered.

Brightest sources (with an expected count rate >400 c/s) may be observed in pn timing mode (or modified timing mode), if the case is clearly explained in the proposal scientific justification and if one additional 10 ks exposure in pn burst mode is requested.

5.8.7 Additional OM Filter Wheel Rotations

There are scientific questions, which cannot be answered with the standard sequence of OM filter wheel positions. In such cases, the PI has to request multiple filter wheel rotations in the proposal form and to justify them in the scientific justification. Only if explicitly approved by the OTAC, the additional filter wheel rotations will be performed.

5.9 Aspects of Duplication and Data Rights

5.9.1 Duplication and Reserved Observations

The general policy of the XMM-Newton Observatory is to avoid repeating the same observation, i.e. to avoid duplications.

In general, duplication is determined by consideration of the target coordinates and of the main observing parameters (especially the instrument(s) and the observing modes). A proposed observation duplicates another one if the expected science data are essentially the same or of lower quality (e.g. lower exposure time). It is, however, allowed to observe the same target with the same instrument configuration several times for variability studies. On the other hand, observations of hard X-ray sources with EPIC using different filters only (which mainly affect the soft energy response) may be classified as a duplication.

The responsibility for defining and resolving cases of duplication rests with the OTAC in consultation with the Project Scientist as needed. The OTAC can allow duplications between a proposed observation and an observation of a previous cycle. These should be restricted to proposals which provide convincing evidence that additional data are of scientific relevance and that the scientific case cannot be fulfilled with the existing data.

All observations which are not considered as being successfully observed, as well as the calibration observations already foreseen at the time of the announcement are made public

for each Announcement of Opportunity. Proposals in response to this call are not permitted to duplicate these observations. Proposers are requested to check for duplications of their preferred targets against already performed or planned observations, using the XMM-Newton "Target Search Tool" or "Observation Lokator" web tool (http://www.cosmos.esa.int/web/xmm-newton/target-search-tool). This tool includes all types of XMM-Newton observations like open, TOO and routine calibration.

5.9.2 Violation of Data Rights

In general, a violation of data rights is determined by considering the coordinates, the target, the proprietary period and the scientific questions raised. A proposed observation will violate the data rights of a performed or planned observation if it has the potential to address scientific questions of the performed or planned observation on the same sky field within its proprietary period. It is the general policy of the SOC to solve violation of data rights by delaying observations or by holding back the delivery of datasets. Potential proposers should carefully check the planned and performed observations.

6 PROPOSAL SUBMISSION PROCEDURE

6.1 Proposers

Proposers from all over the world are welcome to participate.

6.1.1 US Proposers

Proposers at institutions in the United States may respond to this AO either as PIs or as Co-Investigators on foreign-PI proposals. Limited funding may be made available by NASA to accepted US investigators, most likely only those with the highest ranked proposals, through a separate solicitation. Details regarding the deadline, content, and target funding level for cost proposals will be decided at a later time.

6.2 Proposal Length and Figures

The OTAC encourages all proposers to be as concise as possible in their proposals. Use of graphical material (figures, diagrams, examples of data, etc.) is encouraged whenever it helps the OTAC to draw conclusions on the scientific merit of the proposal. The scientific justification must be prepared as a single PDF file. The size of the (uncompressed) PDF file should not exceed 10 M byte. The maximum total number of pages of the scientific justification differs for the different proposal categories. In all cases this maximum number of pages includes all accompanying material, like the graphical material, the section on the feasibility of the proposed observations (section 5.8.2), tables, references, previous work and publications. The following total number of pages is allowed for the scientific justification of the different categories:

- Guest Observer (section 5.2.1) which are not flagged as any of the categories listed below: 4 pages
- TOOs (section 5.2.2.1) Programmes: 4 pages
- Large Programmes (section 5.3): 5 pages
- Multi-Year Heritage Programmes (section 5.4): 8 pages
- Fulfil Programmes (section 5.5): 2 pages

Proposals send to the wrong category will be moved to the correct schemata by the SOC on a best effort basis. Scientific justification files whose length exceeds the allowed limit will be cut by the SOC such that only the specified maximum number of pages will be made available to the OTAC. The minimum allowed font size is 11 pt. Non-compliance with these instructions may lead to the rejection of the proposal. The usage of the SOC provided LaTex template to write the scientific justification is strongly recommended. The RPS on-line help gives further details on how to send the scientific justification (PDF file) during proposal submission.

6.3 Submission of Open Time Proposals

XMM-Newton proposals must be prepared using RPS provided by ESA. This tool checks for the formal correctness of the proposal's entries. It produces formatted text output in electronic form. Proposals in any other format will not be accepted.

For each observation contained in the proposal, the total observation duration which includes the overheads of the instruments is considered by OTAC. In order to calculate this time, proposers have to enter the requested science exposure time of the scientific prime instrument and the prime instrument mode in the RPS.

Submission of a proposal is only complete if:

1. the validated RPS file of the proposal (i.e. the file produced by RPS when no formal errors are reported) is received before the deadline of the call and

2. the scientific justification is received before the deadline of the call.

In view of possible network congestion close to the deadline, proposers are urged to submit their proposals well in advance of the due date. Proposers will receive an e-mail acknowledgement confirming the receipt of their proposal(s) and providing the proposal number assigned after successful submission.

7 PROPOSAL EVALUATION AND SELECTION

7.1 Valid Proposals

Proposals submitted in response to a call are considered valid if

- the submission was completed as defined in section 6.3,
- the proposal is in agreement with the policies and procedures described in this document.

Within a proposal, individual observations are considered valid if

- the observation was entered in the RPS,
- the observation is in agreement with the policies and procedures described in this document,
- the target is visible during the period covered by the call.

Any information becoming available after the due date for proposals can not be considered for the proposal evaluation.

By the submission of a proposal, the PI as well as all Co-Investigators are accepting the policies and procedures described in this document. In case of doubts about the interpretation or in case of unforeseen conflicts, the final decision stays with the XMM-Newton Project Scientist.

It is the obligation of the PI to inform the SOC about every change which potentially impacts on the enhancement, the scheduling, the observation or the data distribution. Especially, the SOC should be informed about any change of the electronic address of the PI via e-mail to xmmpi@sciops.esa.int and writing the proposal number in the subject of the e-mail.

7.2 Proposal Handling at the Science Operations Centre

The receipt of each incoming proposal will be automatically acknowledged. A check will be made to verify that it is a valid RPS input file.

The valid proposal will then be forwarded to the appropriate panel members of the XMM-Newton OTAC for scientific assessment and review.

The electronic versions will be ingested into a proposal data base for statistical analysis. Also, some investigations will be performed to search for, amongst others, duplications, violations of data rights, instrument safety, oversubscription in particular areas of the sky, technical feasibility.

Every proposed target will be checked with respect to performed and planned observations of XMM-Newton and Chandra. Targets which duplicate previous observations or planned observations of one or of both missions will be flagged for the OTAC evaluation. Therefore, a detailed analysis of the scientific content of existing X-ray data with respect for the scientific goal of a submitted proposal is highly recommended.

7.3 Scientific Review

7.3.1 Observing Time Allocation Committee

All proposals will be reviewed by the OTAC. It is headed by a chairperson and it consists of panels for each of the following scientific categories:

1. Stars, White Dwarfs, Solar System, and Exoplanets
2. White Dwarf Binaries, Neutron Star Binaries, Cataclysmic Variables, ULXs and Black Holes
3. Supernovae, Gamma-Ray-Bursts, Gravitational Wave Events, Supernova Remnants, Diffuse (Galactic) Emission and Isolated Neutron Stars
4. Active Galactic Nuclei, Quasars, BL-Lac Objects and Tidal Disruption Events
5. Galaxies, Groups of Galaxies, Clusters of Galaxies and Superclusters
6. Cosmology, Extragalactic Deep Fields and Large Extragalactic Areas

Proposals, which were submitted to a wrong scientific category, will be moved to the correct scientific category by the SOC on a best effort basis.

7.3.2 Review Process and Selection Criteria

The OTAC will review all proposals and will make recommendations on the observing programme to be carried out by XMM-Newton. 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),
- contribution to the overall scientific return of XMM-Newton,
- duplication with performed and planned XMM-Newton and Chandra observations
- technical feasibility and exposure time estimation,
- visibility and requested observing time.

The recommendations on XMM-Newton's observing programme are made via assignation of one of three scientific priorities to every individual observation: A, B and C (A being the highest ranking). In addition, the OTAC

- is responsible for defining and resolving cases of duplication,
- has the right to recommend exposure times either for entire proposals or for individual observations,
- decides about the acceptance of observing constraints.

For efficient timelining of observations, the scientific scheduling software needs to work from a pool of observations which significantly overfills the time available. Thus, the recommendations mentioned above will take into account the provision of the necessary oversubscription in the data base of planned observations. Priority A and B targets are of major scientific importance and will be scheduled with highest priority. Priority C targets are used as “fillers” and have a significant lower likelihood to be finally scheduled. The fraction of priority C targets which are expected to be observed can be estimated from the statistics in previous AOs. The interested scientist may consult the “XMM-Newton Quarterly Status Report” in the XMM-Newton web site.

Without further review by the OTAC, A and B targets will be transferred to the next observation period, if their successful observation should not be possible during the current one. “Fixed-Time” proposals from this AO which are no longer technically feasible in the following observing period will not be carried forward. “Anticipated Target of Opportunity” with priority A or B are only transferred twice to the following AO. C priority targets that have not been observed by the end of the AO will not be transferred into the following AOs and therefore will be freely available for new proposals. However, it is emphasized that, for operational and technical reasons, no guarantee can be given that any particular observation will, in fact, be executed.

Titles and abstracts of accepted proposals will be made publicly available.

8 ENHANCEMENT, SCHEDULING, OBSERVATION AND DATA PRODUCTS

8.1 Enhancement of Accepted Observations

Before an XMM-Newton observation can be released for scheduling, several checks must be completed to ensure that the proposed instrumental configuration is safe and adequate for the scientific proposal goals. This process is called proposal enhancement. Only after the proposal enhancement process is successfully completed, an XMM-Newton observation can be released for scheduling. The PIs of accepted observations which cannot be performed as requested through the XRPS will be contacted by the XMM-Newton SOC at the most appropriate time, to start the enhancement process.

During the proposal enhancement, changes of observations are allowed as long as they are in agreement with the scientific justification of the proposal and approved by SOC and the Project Scientist. The proposed prime instrument is considered to be a substantial component of the scientific claim. Changes leading to unforeseen duplications or violations of data rights are not allowed.

8.2 Planning and Scheduling of Accepted Observations

The planning and scheduling of XMM-Newton observations is a work-intensive and complex process. The goal of this process is to maximize simultaneously the scientific return and the observation efficiency.

The planning and scheduling has to take into account the visibility of the targets, scientific constraints, times with expected high radiation background, handover between ground-stations and on-board antennas, and feasibility of slews. Observations with XMM-Newton must comply with a number of celestial constraints, such as solar, Earth limb, Moon or Jupiter avoidance angles. Examples of additional scientific constraints are specific spacecraft position angles, “Fixed-Time” observations, “Anticipated Target of Opportunity”, or requests for simultaneous observations. Depending on the solar activity, a part of the science window at the start and at the end of an XMM-Newton orbit can be affected by a high radiation background, which forbids opening of the filters of the EPIC camera. During the handovers between the different ground-stations used in each XMM-Newton revolution, observations can be continued but commanding is not possible and slewing has some restrictions. Even if a target is well visible according to the visibility constraints, it may not be reachable from the perigee position at the start of a revolution, because the slew would violate some of the constraints mentioned above. Other targets may not be scheduled because the slew back to the perigee position is forbidden.

Whenever possible, the priority of an observation as allocated by the OTAC is considered for the mission planning and scheduling. However, for operational reasons, no guarantees

can be given that any particular observation will, in fact, be executed, regardless of its grade. XMM-Newton reserves the right to reject any approved observation that is in conflict with safety or mission assurance priorities or schedule constraints, or is otherwise deemed to be non-feasible.

The SOC prepares the final detailed timeline about 3-4 weeks in advance. Given the various constraints, listed above, the mission planning and scheduling team can not avoid that some observations are split in multiple parts. Additionally, the actual performance of the instruments and the corresponding observing modes are taken into account, i.e. requested observing modes may be replaced by a similar but better one based on the performance reports from the instrument teams.

The PIs are automatically informed via e-mail when their observation is scheduled. It is the responsibility of the PI to check carefully the scheduling details within three days and report about any observation which is not in agreement with the enhancement or the rules and procedures in force. After three working days, the SOC assumes that the PI agrees with the implementation of the observation. It is the PI's responsibility to communicate the SOC any change of her/his e-mail address, by e-mail to xmmpi@sciops.esa.int with the proposal number in the subject line.

8.3 Observation

XMM-Newton is operated in a pre-planned manner. Observers are not present at the SOC for the execution of their observations.

Depending on the unpredictable activity of the Sun, e.g. solar "flares", the start of the execution of scheduled observations may have to be delayed or the execution has to stopped earlier than originally planned in the timeline. Observations may even need to be completely cancelled for this specific scheduled time.

8.4 Success of Observations

The Project Scientist is responsible for declaring a particular observation successful. Observations are declared successful based on the accumulated observation time according to the following rules:

1. The accumulated exposure time of the prime instrument is greater () than 80% of the requested observing time.
2. The accumulated exposure time of non-prime X-ray instruments is greater () than 60% of the requested exposure time.
3. For structural identically instruments all calculations are performed for all instruments together.
   RGS-1 and RGS-2 are evaluated together and have the same weight. MOS-1, MOS-2 and pn are evaluated together for EPIC and the two MOSs have the same weight.

The higher effective area of pn relative to MOS-1 and MOS-2 is reflected through a weighting factor of two for pn exposure times.

4. Exposure time of non-prime X-ray instruments lost for operational or safety reasons (e.g. radiation alert) is only counted if the exposure is crucial for the science originally addressed in the proposal.
5. Radiation induced background is not taken into account.

All observations for which no compensation time is allocated are considered as successfully observed.

The SOC automatically allocates compensation time for observations which have not been successfully performed or which have not been completed fulfilling the above rules. The compensation time is calculated through comparison between the accumulated and allocated observing time. The requested observing time is given by the exposure time requested by the PI in the original proposal, but not exceeding the total time allocated by OTAC, for those observing modes which are not violating security or technical constraints of the instruments or the spacecraft.

The compensation time should significantly increase the signal-to-noise ratio of the data already obtained and is crucial for the science originally addressed in the proposal, e.g. the compensation time should exceed 5 ks.

These rules may be illustrated with the following examples:

- Taking rule 3 into account, 60% of the requested observing time accumulated for RGS-1 and 105% obtained for RGS-2 fulfills rule 1 for RGS prime (60% + 105% = 165% > 160% = 80% + 80%)
- Taking rule 3 into account, 50% of the requested observing time accumulated for pn, 80% obtained for MOS-1 and MOS-2 fulfills rule 2 for EPIC secondary. (2.0 × 50% + 80% + 80% = 260.0% > 240% = 2.0 ×60% + 60% + 60%)
- Taking rule 4 into account, 0% of the requested observing time accumulated for RGS fulfils a proposal which aims at the detection of a weak source with EPIC (RGS not prime).
- Taking the rule of compensation time into account, 3 ks missing observing time fulfils an observation aiming at a long (140 ks) variability study.

The Project Scientist can grant a complete repetition of a partly performed observation if the collected data are insufficient. In this case the Project Scientist decides about the data rights of the data taken during the partly performed observation. Observations that are performed in instrument modes, which are supported by the SOC on a best effort basis, compare section 5.8.5, are declared successful by the Project Scientist independently of the rules established above.

8.5 Data Products

The data from each observation undergoes pipeline processing at the XMM-Newton Science Operations Centre (SOC), which produces a set of standard products for each observation. These products are available in the XMM-Newton Science Archive. The PI of each observation is informed immediately after successful pipeline processing via e-mail using the address provided via the XRPS. The associated appropriate calibration and auxiliary files can be obtained from the SOC web site. All products are kept in the XMM-Newton Science Archive and are made publicly available after expiration of the proprietary period (see section 9.1).

The data products reflect the state-of-the-art of XMM-Newton data analysis at the date of their production. However, subsequent improvements of the pipeline products and the corresponding calibration and auxiliary files are to be expected. In order to allow observers to benefit immediately from the improved understanding of the instruments, calibration files (as well as updated versions of the Scientific Analysis Software (SAS)) are made public on the SOC web-pages. This allows observers to reprocess their data.

Following the generation of data products, observers are responsible for further data processing as well as for the scientific analysis, interpretation and publication of their observations.

9 DATA RIGHTS AND PUBLICATION

9.1 Data Rights

For individual observations, there is a proprietary period of 1 year during which, subject to the caveat below, the data from an observation will only be made available to the PI of that proposal. After this period, the data are available to the community. The proprietary period starts at the time when the data are made available to the PI of the proposal in a usable form, i.e. suitable calibration and appropriate data processing being available.

The Project Scientist decides about data rights of partly performed observations for which he has requested complete repetitions.

This is modified for proposals, which consist of more than one observation of a single target, e.g. repeated observations for variability studies. For all data, which are delivered within the observing cycle for which OTAC has accepted the proposal, the proprietary period of 1 year starts when the last (part of the) data has been made available to the PI. Data, which are delivered after the end of the observing cycle, for which OTAC has accepted the proposal, are treated like individual observations, i.e. each data set gets (individually) a proprietary period of one year.

The end times of the previous observing cycles are:

- AO-16: 1st of May 2018
- AO-17: 1st of May 2019
- AO-18: 1st of May 2020 (TBC)

No proprietary rights will be allocated by default for data resulting from “Multi-Year Heritage Programmes”, (Section 5.4) but the Project Scientist can assign data rights to those programmes. Principal Investigators who wish to obtain data rights for “Multi-Year Heritage Programmes” have to state the request explicitly in the scientific justification of the proposal.

The PI retains the proprietary rights for the whole dataset in a proposal if no other recommendation was given by the OTAC.

Data taken during a slew of the spacecraft become directly available to the community.

In accordance with ESA’s rules concerning information and data, ESA retains the right to use any data obtained by XMM-Newton for instrument evaluation, diagnostic and calibration purposes, while maintaining scientific confidentiality during the proprietary period. ESA also reserves the right to use any data for public relations purposes; in this

case if the data are still proprietary, due acknowledgement shall be given to the PI of the proposal.

9.2 Publication

Each publication using XMM-Newton data should mention “XMM-Newton” in the abstract. In addition the publication should specify the observation-ID to ensure that the data can be uniquely identified.

Any publication based on data from XMM-Newton observations shall acknowledge that fact by a footnote, preferably on the initial page in the paper:

“Based on observations obtained with XMM-Newton, an ESA science mission
with instruments and contributions directly funded by
ESA Member States and NASA”.

Any publication based on data sets from a joint program shall acknowledge both facilities by a footnote, preferably on the initial page in the paper.