



**esac**

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# MEETING

**Meeting Date** 7-8 May 2019

**Ref** MoMUG#20

**Meeting Place** ESAC/XMM-Newton SOC B5/B65

**Chairperson** Rudy Wijnands

**Minute's Date** 10 June 2019

**Participants**

**UG members:** Rudy Wijnands (Chair), Stefano Bianchi, María Diaz Trigo, Ioannis Georgantopoulos, Jimmy Irwin, Christine Jones, Lida Oskinova, Gabriel Pratt, Nanda Rea.  
**In attendance:** Norbert Schartel (Project Scientist), Peter Kretschmar (Mission Manager), María Santos-Lleó (Science Operations Manager)  
**Invitees:** Jelle Kaastra (RGS PI), Natalie Webb (SSC Project Director); Presenters and interested staff from the XMM-Newton Science Operations Centre.  
**Absent:** UG members Peter Schneider (OTAC Chair), and the invited external experts Frank Haberl (EPIC pn), Mike Watson (SSC), Mat Page (OM acting PI), Steve Sembay (EPIC MOS acting PI) have sent their apologies.

**Subject**  
 Minutes of XMM-Newton Users' Group Meeting 20

**Copy**

Description	Action	Due Date
Edited by Jan-Uwe Ness. Approved by UG members on 8 July 2019		



## WELCOME:

Rudy Wijnands (Chair) and Norbert Schartel (Project Scientist, PS) opened the meeting on May 7<sup>th</sup> at 10:00.

The meeting consists of an open meeting on the 1<sup>st</sup> day, and an open discussion session in the morning of the 2<sup>nd</sup> day, followed by a UG member-only executive session in the afternoon.

For the 20<sup>th</sup> anniversary, short videos are being produced to motivate young people to take active part in XMM-Newton science. During the breaks, UG members were invited to give short interviews.

## ADOPTION OF THE AGENDA:

The agenda of the meeting was presented and adopted with the modifications:

- The planned presentation “SPACON merger” by M. Kirsch was not given, and the contents were part of the presentation on the overall Mission Status (P. Kretschmar) and the Instrument automation (E. Verdugo).
- The presentation “Calibration EPIC” was split in three parts by M. Smith with general introduction and specific presentations on pn (I. Valtchanov) and MOS (M. Stuhlinger), respectively.

The adopted agenda thus contained the following on May 7<sup>th</sup>:

## PRESENTATIONS:

Overall Mission Status	(P. Kretschmar)
Report of the Project Scientist	(N. Schartel)
Instrument automation and transfer to MOC	(E. Verdugo)
Scientific Impact of Merger	(J. Ebrero)
User Support and Mission Planning	(R. Gonzalez)
Calibration EPIC	(M. Smith)
- XMM-Newton EPIC-pn Energy Scale for Window Modes	(I. Valtchanov)
- EPIC Calibration monitoring	(M. Stuhlinger)
Calibration RGS	(R. Gonzalez)
Calibration OM	(S. Rosen)
Pipeline development	(P. Rodriguez)
Status of SAS medium-long term plan	(R. Saxton)
XMM-Newton anniversary	(S. Migligari)
SSC Status	(N. Webb)

The slides of all the presentations are available on the XMM-Newton public web site, under the headings “General User Support” → “Users’ Group”.

## DISCUSSIONS:

During the course of these presentations, several questions were raised and discussions took place at that time, and also on completion of each presentation:

After the presentation on the Overall Mission Status, UG members asked about the fuel migration activities. The dates are rather flexible and can be optimized to need. There is good reason to assume that fuel can last until the end of the next decade, although it is not entirely certain how much fuel can really be migrated, thus how much fuel will remain unused in the tanks. There may be other life limiting factors beyond fuel.



Rudy Wijnands asked whether there are any risks. The fuel migration was prepared with high effort to minimize any risks, and there are actually more risks in not doing anything than performing the planned fuel migration.

The Report of the Project Scientist led to discussion about the joint programmes with H.E.S.S., MAGIC, and NRAO. The XMM-Newton call for proposals has not received any time requests for INTEGRAL, MAGIC, and H.E.S.S. time while their respective calls have requested XMM-Newton time. Meanwhile, for NRAO this is the other way around. UG wondered about consequences and the Project Scientist emphasised the benefits of the high-energy community to work with XMM-Newton data and thus increase the XMM-Newton scientific output. It will also be easier to exploit synergies with CTA when CTA is operational. Maria Diaz Trigo commented that XMM-Newton users may find access to MAGIC or H.E.S.S. more difficult. For example, it is not clear how much support can be expected when analysing H.E.S.S. data. It was commented that the high energy astrophysics community is moving towards a more open and supportive approach aiming at CTA being an observatory.

The presentations about instrument automation (E. Verdugo) and scientific impact (J. Ebrero) of the SPACON merger triggered curiosity about the achieved improvement of the new automation measures in place since March 2019 to minimize the loss of science time. The baseline of only two months is too short to judge as over the year, as conditions vary substantially. Really robust statistics requires collecting experience over a full year. The UG congratulates on the efforts made to minimize the scientific impact and is eager to see the results next year.

The presentation on User Support and Mission Planning was followed by questions from the UG members about the availability of more Pipeline Processing System (PPS) products such as radiation background flaring curve which was appreciated as a good addition. The Archive Scientist explained that it is already planned to make this plot available when the bulk reprocessed products, currently generated and waiting for the catalogue production, are ingested. This news was received with approval. Strong interest was raised by the UG to stack data from multiple observations (see SSC presentation).

Since Ligo/Virgo are operating again, six alerts have been received, but none have so far met our conditions. The UG wondered why, and what they are. Main criteria are that either the likelihood of having the counter part in the XMM field of view is >50% or that a counterpart candidate has already been identified and can directly be observed, i.e. it is unconstrained for XMM-Newton observation.

After the presentation on EPIC calibration, it was emphasised that for the Crab calibration observations, extrapolation from burst mode to other modes is difficult because of their individual peculiarities. Regarding the rate-dependent corrections in Timing modes, the plots showed large scatter around the trends, and the question was raised about the reasons for the outliers, whether it may be spectral shape or variability. The number of outliers was already reduced by excluding highly variable sources, but the reason for what remains is not fully understood. To reduce problems at very low energies, when using pn timing modes, only thick filter observations should be used.

Related to effective area calibration, the strategy now is to apply first an energy-dependent correction to make MOS and pn agree and then to align the pn calibration to NuSTAR. Jelle Kaastra asked how to do the alignment at low energies which was responded could be done either with BL Lacs or white dwarfs.

About the MOS calibration, Jelle Kaastra commented that the calibration source N132D, that has been used for long-term monitoring over the baseline of 20 years, is actually a rather young (3000 year) supernova remnant. The 20-year baseline is thus 1% of the baseline, and some intrinsic evolution may be expected.

The presentation about RGS calibration was followed by the question why the effective area is decreasing. This is not well understood, contamination appears the most likely cause, and the spectral evolution suggests,



nitrogen may be involved. The cross-calibration with pn is tricky because at the soft energies (where RGS operates) the energy resolution of the pn is too low for sensible comparisons.

The OM calibration talk was for the first time given by Simon Rosen who thanked Antonio Talavera, former OM Calibration Scientist who recently retired, for his contribution to the OM, and conveyed also the appreciation of Antonio's work from the OM Principal Investigator. The question was asked by the UG how many X-ray sources are also detected in simultaneous UV observations, and the surprisingly small number of 3600 (out of 72000) sources was reported by SSC based on a cross correlation of OM and XMM3-DR7 catalogues. Reason is likely the smaller field of view of the OM compared to EPIC.

Based on the presentation on SAS medium- and long-term strategy, UG members asked about stacking observations. While stacking images is already done, stacking spectra would be of high interest. This is planned for the near future. Regarding the conversion from Perl to Python, Peter Kretschmar commented that a feasibility study is underway. Maria Diaz-Trigo asked which Python version will be used (Python 3).

A document with the medium to long term SAS survival plan had been presented to and endorsed by the UG in 2017 (Endorsement 2017-05-11/02). This document is now under revision because the Perl to Python was then proposed to be done after 2020, pending on the analysis of the previous steps.

N. Webb presented the status of the Survey Science Centre (SSC). She mentioned new variability search techniques with which more than 2800 variable sources have been discovered of which about 2000 were unknown. The UG asked about these unknown sources. A few have been identified, this is work in progress. There was a further question about how to categorize sources in the catalogue. Some characterizations are done, like, e.g., point source vs extended or based on spectral shape, hardness ratios. Machine learning algorithms could be used or citizen science projects.

Ioannis Georgantopoulos asked about stacking spectra, already raised earlier. Reducing the count threshold within acceptable limits to not overload the computers would have the benefit to get spectra of fainter sources which can be studied with Cash statistics. Spectra, even if faint, are argued to be superior over hardness ratios.

With a 3-sigma detection threshold, a catalogue size of 72,000 detections will contain ~200 false detections. It has been attempted to reduce the number of false detections by comparing multiple observations. However, the question was raised how they can be distinguished from variable sources which is indeed an ambiguous situation.

## **INPUT FROM THE COMMUNITY**

As inputs from the community and for further discussion, the UG discussed inputs they have collected from outside the UG.

Maria Diaz-Trigo reports on input received in which it was asked whether it would be a useful service to produce alerts for tidal disruption events during the generation of PPS products. Since this will be for mostly proprietary data, this would need to be coordinated with the respective PIs in some way.

The UG discussed that such an alert system would be of interest for any type of transient, although the time scale between observation and release of an alert would be of order 8 days which is only of interest to slow transients. A large fraction of such alerts may be flare stars which are only of interest to a small fraction of the scientific community, and perhaps the presence of a nearby known flare star could be flagged.

The algorithms have already been developed by SSC and are currently under testing by SCC, e.g., with the 4XMM catalogue generation. If the tests are successful, the SSC could deliver the algorithms and scripts to the SOC for evaluation and implementation in the pipeline. Since proprietary data are involved, the process needs to be accompanied by appropriate policies, e.g., how to establish proprietary rights, how to respect PI



rights, which information to be released (flux, hardness ratios...). Before working out policies, some experience needs to be gathered.

Ioannis Georgantopoulos proposes: Although the XMM-Newton spectra have very good photon statistics, they can be improved even further by developing a method to stack spectra from different pointings at different chip positions with tasks such as edetect stack and include the output in the pipeline products. The pipeline works only on observation by observation basis. However, the catalogue generation process can combine PPS from different observations and this is precisely what is done for source detection in the stacked catalogue. SSC confirms to already have plans in this direction, i.e., combining spectra and providing area curves.

Lida Oskinova pointed out that the XMM-Newton grasp (=effective area \* field of view) is inferior to eROSITA at soft energies but still superior at energies above 2.5 keV. It was noted that XMM-Newton deep observations will be needed/important/essential to follow-up some eROSITA sources.

The Project Scientist looks for a new OTAC chair person with maximum expertise and a minimum of conflicts and asks for suggestions to be sent by email to him.

The UG is asked how the concept of self-nominations for UG members is perceived. The return was adequate. It was commented that it was not well communicated. In addition to an item in the XMM-Newton newsletter, perhaps it could be circulated as a dedicated note.

The visibility of XMM-Newton in the social media was discussed. The SOC has started to increase the activities on Twitter, now having 1600 followers. A Facebook presence would be desirable but it is cautioned that it costs manpower to do it properly. A Facebook account "XMM-Newton Satellite" was found with 16,000 followers but last entry in 2015. It was created and operated from NASA. Felix Fuerst comments that it would not be a lot of work to do on Facebook what is done on Twitter.

The question is raised how ToO proposals in the joint programme are handled when different missions have different policies with regards to validity ranges. XMM-Newton has a 3-year validity period for ToO. If an observation is triggered within this period without the other mission also observing, then the XMM-Newton observation may still be performed if scientifically valuable. If, however, a joint mission cancels an open trigger where the XMM-Newton time was approved by their OTAC, then XMM-Newton also cancels it.

Jimmy Irwin comments NASA Senior Review took place previous week and XMM-Newton was in the review. Asked about the impact of the review results, he comments that the NASA support for US PIs having being awarded XMM-Newton time may change as it indeed has varied over the mission life time, in fact had been set to zero in 2011 but slowly increased again. It was observed that the number of proposals from the US goes down if funding is reduced. C proposals are no longer funded while A and B proposals are only funded when scheduled.

A proposal by Christine Jones to organise two sessions in the winter AAS meeting related to XMM-Newton is postponed to the dedicated discussion.

The meeting concluded on the 1<sup>st</sup> day at 17:00.

## **DEDICATED DISCUSSION:**

Discussions continued on May 8<sup>th</sup> starting at 10:00. UG discussed items presented or arising from discussions on the 1<sup>st</sup> day of the meeting.



Christine Jones proposes to organise two sessions related XMM-Newton in the Winter 2020 AAS meeting. The winter meetings are generally best attended. A large number of parallel sessions are arranged, and participants gravitate to the special sessions.

It is proposed to organise a Galactic and an Extragalactic session with 4 invited speakers in each session. Names of potential speakers are discussed in detail. Further input was welcomed from anyone in the room. Christine Jones will combine the input received to get a final list of invited speakers.

For the GO proposals, the situation is discussed that preference is often times given to shorter observations. Scientifically valuable proposals needing longer observations are perceived to have a lower chance of ever being selected. It is perceived that proposals might get better chances if boosting up the requested observing time to a 300ks observation to be evaluated as a Large Programme, however, this is not seen as ideal option in many cases.

The Project Scientist emphasises that more than half of the available observing time is given to large or very large programmes. The scientific merit is always highest priority, but if two proposals with the same scientific value but different cost are to be compared, the one with the lower cost in terms of observing time is often chosen by OTAC.

300ks is nowadays considered a medium size proposal, 130ks observations are generally well regarded because they fill one revolution and can be scheduled quite easily.

It was observed that the large programmes are not so much used to observe fainter sources but rather to learn more about the brighter ones, e.g., deeper observations to see more details, monitoring, or samples.

It is acknowledged, that a fixed limit of exposure time naturally leads to complications with those proposals near this border, but no benefit could be seen to redefine these borders.

Date and time of next meeting are discussed. The meeting should be some time after the X-ray Universe conference (May 25-29 2020), thus mid June. A doodle will be sent late summer to identify a final date.

The open session ended on May 8<sup>th</sup> at 11:00 am

## **RECOMMENDATIONS FROM PREVIOUS MEETINGS**

The UG's executive session started on May 8<sup>th</sup> at 13:30. Participating: All voting UG members, Mission Manager (Peter Kretschmar), Science Operations Manager (María Santos-Lleó), and Project Scientist (Norbert Schartel).

In the UG's executive session, the UG reviewed the status of resolutions, recommendations, and action items formulated at previous meetings and formulated new ones. For clarification purposes, the UG uses the following definitions: a recommendation is a suggestion or proposal as to the best course of action; a resolution is a decision to do or not to do something.

### ***1: On the SPACON arrangement involving XMM-Newton, Gaia and INTEGRAL:***

**Resolution 2016-06-08/01:** The UG recognizes the reasons for this proposed arrangement, which is still under study at this time. However, in order to protect the scientific return from XMM-Newton it strongly recommends that every effort be made to limit the impact of this new arrangement to be below 2%, after one year.

**Status: Open**



**Resolution 2018-56-18/01:** The UG noted with great concern the negative impact (based on analysis over a limited time), of the new mode of combined operations. This was especially serious in the case of several joint programmes offered by XMM-Newton together with other major facilities. The UG urges that all possible measures be taken to mitigate the negative impact of combined operations as soon as possible.

In this regard, the UG recalls **Resolution 2016-06-08/01** in which the impact of this new arrangement is aimed to be below 2% after one year.

**Status: Open**

**Action 2018-05-18/01:** Mission manager to investigate all possible means to mitigate negative impact on XMM-Newton, of implementing the combined mission operations.

**Status: Closed**

## ***2: On the Erosion of Expertise and Cross-mission Synergies***

**Recommendation 2017-05-11/03:** A significant continuing challenge is the erosion of expertise via staff retirements and the potential movement of staff into other projects. Whilst this process is inevitable, the UG recommends that consideration be given to cross-mission synergies with future missions, Athena in particular, in the areas of pipeline products and the associated software.

**Status: Closed**

## ***3: On Calibration Priorities:***

**Recommendation 2015-05-22/02:** The UG identifies the following tasks in order of priority:

1. Cross-calibration of the responses of the XMM-Newton X-ray cameras and spectrometers. This is a longstanding issue, and it should be resolved as far as is possible in the near future.
2. Evidence for a shift in gain of the PN detectors, which is dependent on the quiescent background. This should be investigated and quantified, and a correction implemented.
3. Calibrated spectra from NuSTAR and XMM-Newton sometimes show a significant mismatch in spectral slope and offset above 3keV. This is a matter, which the IACHEC should be encouraged to investigate.
4. Complete the calibration of the PN Burst Mode, RDPHA correction.

**Status: Item 2 is closed; the other three items are still ongoing but this recommendation, together with 2017-05-11/05, have been reformulated in the new recommendations 2019-05-08/02 and 2019-05-08/03. Therefore, recommendation 2015-05-22/02 is now closed.**

**Recommendation 2016-06-08/02:** The time and energy reconstruction of the pn Timing mode should be studied with respect to recently observed discrepancies.

**Status: Closed**

### ***On Calibration matters of high priority:***

**Recommendation 2017-05-11/05:** The NuSTAR off-axis observation of the Crab has the potential to serve as a “standard candle” in the hard X-ray domain by virtue of the significant overlap with the bandwidth



of the EPIC detectors. Therefore, the UG recommends that the SOC study the implications of this observation in the context of the still open UG recommendations on calibration issues: Recommendations 2015-05-22/02-1, 2015-05-22/02-3, 2015-05-22/02-4, and 2016-06-08/02.

**Status: Reformulated together with 2015-05-22/02 number 3 (see above). Therefore recommendation 2017-05-11/05 is now closed.**

#### ***4: On the XMM-Newton Survey Science Centre (SSC)***

**Recommendation 2017-05-11/01:** The UG noted the SSC's continued valued contribution to the high scientific impact of XMM-Newton, via the production of catalogues and input into other areas such as the SAS development. The SSC is working on provision of a "stacked source" catalogue containing new fainter source detections. This will be a valuable addition to the archive, when it becomes available later this year. Of the various tasks identified by the SSC for the coming years, it is considered highly desirable to give a high priority to new data products that could be used to search for source variability, between separate XMM-Newton observations. Also, it is recommended that effort should be directed towards the provision of one version of the 4XMM catalogue, for the whole scientific community.

**Status: Closed**

#### ***5: On the Pipeline Processing System***

**Recommendation 2017-05-11/02:** The UG noted the ambitious list of current development activities in the pipeline, incorporating EPIC and OM light curves for a single source into a single file, and including pile-up level estimates in the source products. The UG endorses the current planned developments and recommends continuing the optimization of pipeline products as a high priority.

**Status: Closed**

#### ***6: On the Remote Interface for Scientific Analysis (RISA)***

**Recommendation 2017-05-11/04:** The UG noted that RISA is both a current resource, as well as providing the basis for the long-term preservation of the Scientific Analysis System (SAS). The UG endorses RISA and recommends its further development. Since RISA is still in its early phase, the UG strongly encourages XMM-Newton users, particularly those already familiar with the SAS, to test the RISA in terms of its functionality, and with attention to its key role in maintaining the legacy of XMM-Newton observations. The UG recommends using the feedback from these users and from the UG, to ensure the best possible provision for the post-mission phase.

**Status: Closed**

#### ***7: On Observational Programme Changes***

**Recommendation 2018-05-18/01:** During "XMM-Newton: The next Decade" workshop held in June 2016, community discussions led to several outcomes. The introduction of a new, very large project category (Multi-Year-Heritage proposals), stressing the importance of new (future) joint programmes (e.g. CTA, ELT, SKA), and an increased frequency of TOOs to ensure XMM-Newton's position as a primary astrophysical research facility into the next decade.





Based on the community's response to the previous proposal call (AO-17), the UG considers that this new "Heritage" category was well received and recommends that it should be offered again in the future.

**Status: Closed**

### ***8: Concerning the SSC processing and data archives***

**Action 2018-05-18/02:** The Project Scientist should clarify with the SSC the most appropriate means of handling detections of rare, unexpected transients during the pipeline product screening process, where fast follow-up observations may result in major added scientific value.

**Status: Closed**

### ***9: On Mission Extension***

**Resolution 2018-05-18/02:** With respect to the up-coming request for mission confirmation and extension, the UG very strongly endorses its continued operation, as a crucial element in providing unique stand-alone X-ray data, and synergetic observations with the new space and ground-based facilities e.g. JWST, eROSITA, Euclid, Einstein Probe, XRISM, ELT, LSST, CTA, SKA... and gravitational wave observations, in addition to bridging the time gap to Athena.

**Status: Closed**

### ***10: On the 20th Anniversary***

**Recommendation 2018-06-08/03:** The UG notes this approaching important milestone in 2019. The 20th anniversary of XMM-Newton presents an ideal opportunity for "public outreach" to publicize and celebrate a major ESA success story, as well as a time to look forward to new scientific directions and opportunities.

The UG recommends that all members of the X-ray community, especially members based in ESA member states, consider ways to mark this anniversary, in a coordinated fashion and in collaboration with ESA.

**Action 2018-05-18/03:** All UG members to consider ways to mark the 20th anniversary of XMM-Newton, with emphasis on the future of the mission, and to coordinate events.

**Status: Ongoing**

### ***11: On Users' Group***

**Endorsement 2018-05-18/01:** The Users' Group encourages a trial period for "self-nomination", in order to provide a wider list of possible candidates for future UG member replacements.

**Status: Closed**



## **NEW RESOLUTIONS, RECOMMENDATIONS, AND ACTION ITEMS**

The UG formulated the following new recommendations, endorsements, and action items:

### ***On the SPACON arrangement involving XMM-Newton, Gaia and INTEGRAL:***

**Endorsement 2019-05-08/01:** The UG strongly appreciates the efforts done by the mission management to limit the impact on XMM-Newton of the new SPACON arrangement.

### ***On Calibration Priorities:***

**Recommendation 2019-05-08/02:** The UG strongly recommends to continue the ongoing efforts to cross-calibrate the responses between the XMM-Newton X-ray cameras and spectrometers. In addition, the UG also strongly recommends to continue the ongoing efforts to cross-calibrate the XMM-Newton EPIC detectors with the NuSTAR detectors to resolve the current discrepancies between the two different observatories in inferred spectral shape and normalizations.

**Recommendation 2019-05-08/03:** The calibration of the energy reconstruction of the pn Timing and Burst modes has significantly improved and a new CCF has already been released for the Timing mode. The UG recommends to continue the work on the calibration of these modes including, e.g., the investigation of a column-dependent correction.

**Recommendation 2019-05-08/04:** The long time CTI correction calibration was completed for the pn small window mode but still is ongoing for the large window mode. However, lack of observations in this mode makes calibration difficult. The UG recommends continuing the work on the calibration of this mode but also recommends that the SOC investigates the usage and the usefulness of this mode so it can be assessed if this mode should keep being supported.

**Endorsement 2019-05-08/05:** The UG strongly appreciates the work done by the previous OM calibration scientist, Antonio Talavera.

### ***On the XMM-Newton Survey Science Centre (SSC):***

**Endorsement 2019-05-08/06:** The UG noted the SSC's continued valued contribution to the high scientific impact of XMM-Newton, via the production of catalogues and input into other areas such as the SAS development. The UG congratulates the SSC on the stacked catalogue work and endorses their ongoing work towards the release of the 4XMM catalogue.

**Recommendation 2019-05-08/07:** The UG recommends to investigate the viability to implement an automatic source variability search (as developed by the SSC and to be delivered by SSC to SOC in case current testing proves successful) on serendipitous sources found in proprietary data.



***On Mission Extension:***

**Recommendation 2019-05-08/08:** Review of mission extensions at NASA are done every 3 years. The UG recommends that ESA also performs the review of the mission extension of XMM-Newton once every 3 years instead of once every 2 years.

***On OTAC:***

**Action 2019-05-08/09:** The UG members are urged to send (as soon as possible) suggestions for a new OTAC chairperson to Norbert Schartel.

The executive session ended on May 8<sup>th</sup> at 15:30.

**Date of next meeting:** TBD mid June 2020, starting at 10:00 at ESAC.