



# ALMA BOARD

ALMA EDM Document	AEDM 2017-079-O
Distribution	<b>Ordinary Session</b>

**Subject:** ASAC October 2017 Report

**AUTHOR(S):** ASAC

**Purpose of Document:** To provide the ALMA Board with the summary report from the October 2017 ASAC Meeting

**Status:** To be noted by the Board at its 15-17 November 2017 Meeting

## **ASAC Report to the ALMA Board**

M. Aravena, H.J. van Langevelde, J. Kim, K. K. Knudsen, K. Kohno, M. Momose (deputy chair), R. Neri, G. Novak, K. Öberg (excused), E. Schinnerer (chair), S. White (nominated deputy chair), & C. Wilson

### **General considerations**

Since the last face-to-face meeting Prof. Kirsten Kraiberg Knudsen and Prof. Christine Wilson have joined ASAC, while Dr. Rachel Osten and Prof. Douglas Scott left ASAC. We would like to thank both for their many contributions to the ASAC. Dr. Stephen White has been nominated by ASAC as the NA deputy ASAC chair (and is awaiting approval by the ALMA Board).

The ASAC face-to-face meeting was held at the Mielparque Center, Kyoto, Japan, on October 1st and 2nd, 2017, with eleven ASAC members present, and one excused (Prof. Karin Öberg). In addition, the acting JAO Director Dr. Stuartt Corder and Observatory Scientist Dr. John Carpenter were present, as well as the three regional Project Scientists (Drs. Daisuke Iono, Leonardo Testi and Al Wootten) and the East Asia ALMA Project Manager Dr. Satoru Iguchi. Additionally, Phil Puxley (NSF) attended the open session on October 2nd.

ASAC briefly discussed its organization and felt no modifications are currently required.

The availability of all documentation well ahead of the meeting helped tremendously in the preparation for the face-to-face meeting. ASAC would like to stress that the availability of documents ahead of the regional SAC (face-to-face) meetings (ANASAC, EASAC, ESAC) is seen as extremely helpful for most effectively gathering regional input, and should be continued to the extent that it is possible. ASAC would like to thank the Observatory Scientist and all others involved for their efforts in providing the necessary information for its face-to-face meeting. ASAC looks forward to hearing about new science highlights from ALMA at its next face-to-face meeting.

ASAC would like to highlight the continuing very high users' interest in ALMA observations (manifested by the further increase in proposal numbers for Cycle 5). ASAC is impressed by the progress made in many areas. ASAC congratulates the full observatory on the substantial reduction of the data backlog that was achieved by a concerted effort by JAO and the ARCs. ASAC is in particular concerned about the following two items and would like to draw ALMA board's attention to them:

- The preliminary results from the demographic analysis of the APR outcome and their implications for a number of current practices in the time allocation and scheduling of observations.
- Sustained timely delivery of QA2 processed data to users is not a solved problem and the observatory's objective to deliver science-ready data to all users is under pressure.

### **Preliminary demographic analysis of APR process**

ASAC would like to thank the acting ALMA Director and Observatory Scientist for presenting the preliminary analysis on the demographic analysis of APR scores which provided very useful input also for the discussions related to charge #4. It is noted that the stage 1 scores can be used to evaluate any trends. ASAC assesses that some preliminary conclusions seem possible, but that more in-depth analysis is required and recommends that JAO considers seeking the help of a social science expert for such an analysis. Among the most clear trends are:

- A. Not unexpectedly, a significant effect in favor of experienced proposers. ASAC suggests analysis to better understand the aspects that are important for this effect.
- B. A very significant advantage for EU and NA users in the APR process. ASAC views this as a serious concern that makes one question a number of current practices. This finding definitely requires follow-up.

We now go through each of the charges in turn, starting with recommendations for each, with the most important recommendations near the top of each list.

**Permanent Charge #1. Assessment of the performance of ALMA scientific capabilities: The ASAC shall indicate what information is required from the Joint ALMA Observatory (JAO) to perform this assessment.**

#### Recommendations/Issues:

- ASAC is very concerned that the QA2 efficiency is not a solved problem. It would like to hear about possible sustainable solutions to be discussed in January 2018 in a meeting held at JAO.
- ASAC notes that a median delivery time of 100 days (as reported) for manually processed data is not ideal. It would like to hear about possible improvements at its next face-to-face meeting.
- ASAC recommends to follow a 2-year cycle for the configuration schedule to minimize the negative impact of unavailable configurations for certain LST ranges. It further recommends investigation of ways to minimize the significant downtimes during the reconfiguration process, to try to optimize the current 2-year plan for certain Galactic observations, and to investigate how A-rated carry-over projects would be affected by this plan.
- ASAC recommends continued effort to increase the completion rate of projects and, in particular, to investigate potential ways to improve dealing with adverse conditions. ASAC would like to better understand where time is lost (besides weather) and asks for a plot that displays time used for scientific observations, technical time, weather/technical downtime etc. as a function of time.
- ASAC recommends that stand-alone high frequency and polarization capabilities for ACA be offered in Cycle 6 (even as non-standard modes).
- ASAC recommends implementation of dynamical execution times and sessions to improve the on-source efficiency for certain types of projects.
- ASAC is looking forward to receive an update on the apparently successful mmVLBI observations in Cycle 4 at its next face-to-face meeting.

*QA2 process/data delivery backlog* -- ASAC is glad to see the improvement in the data backlog, particularly in the last couple of months prior to the ASAC F2F meeting. This improvement was aided by the increase in ARC staff dedicated to data processing, streamlining of the process, as well as weather downtimes. ASAC remains concerned that the data backlog is not a solved problem. Currently, JAO is not in a position to handle most of the data processing by itself. Along these lines, the improvement on the median time of 100 days for delivery of manually processed data is good but not ideal. ASAC looks forward to hearing of possible solutions to be discussed in the meeting to be held in January 2018 at JAO.

*Configuration schedule* -- Proposals for a 2-yr and 3-yr configuration schedule were presented to ASAC. ASAC considered the arguments presented regarding 2-year versus 3-year configuration cycles. The consensus on the committee was that the 3-year cycle, while providing an improvement to observatory operations through the reduced need for engineering resources and reduced downtime, suffered from scientific drawbacks: the complete lack of compact configurations in the 2nd year of the cycle impacts a number of scientific groups, and further limits the possibility of completing A-rated proposals if they cannot be carried over from one cycle to the next. Also the adverse effects of weather downtime would imply that some science could not be done for 3 rather than 2 years. Therefore ASAC suggests following a *2-yr configuration schedule plan*, which could minimize the negative impact of unavailable configurations for certain LST ranges (e.g. compact configurations for solar observing and mmVLBI). However, the currently proposed 2-yr configuration plan needs to be optimized to include moderately extended configurations for Galactic observations. How this 2-yr configuration plan would affect grade-A

carry-over projects should be investigated. ASAC recommends the investigation of ways to minimize the significant downtimes caused by the reconfiguration process, including the effectiveness of acquiring an additional transporter for antenna moves or reducing the number of configurations offered.

*Completion rates* -- Cycle 3 reached a final project completion rate of 76% for grade-A projects, while the completion rate on the MOUS level is higher at 86%. ASAC finds the Cycle 3 completion rates for grade-A projects acceptable given the original long-term observing queue. ASAC acknowledges that the low 12m-array completion rate for grade-A projects in Cycle 4, of 64%, is partly due to exceptional high weather downtime. ASAC recommends investigating potential ways to better deal with adverse conditions. The goals regarding observing and execution efficiency are somewhat unclear. ASAC would like to see some clarification on this at its next face-to-face meeting.

*ACA stand-alone* -- ASAC recognizes the success of the ACA stand-alone delta call in Cycle 4 and congratulates the observatory on the very high completion rate for this call (86% as of beginning of September). The measures taken have helped to increase the awareness of this ACA stand-alone mode in the community. ASAC recommends that the ACA high frequency and polarization capabilities should be made available for ACA stand-alone in Cycle 6 (presumably as non-standard modes) to further increase the attractiveness of ACA stand-alone observations and provide the community with further ways to gain experience in these unique ALMA capabilities.

*On-source observing efficiency* -- The detailed analysis on the on-source efficiency as presented provided useful information to understand the underlying causes (ranging from the non-availability of single calibrators to extra calibrations for polarization, shorter times for phase referencing and additional calibrations and checks necessary at the highest frequencies). ASAC supports the implementation of ways to improve the on-source efficiency (vs. total observing time), including dynamical execution times and the possible addition of sessions in the scheduling scheme.

*mmVLBI* -- ASAC congratulates the observatory for its successful VLBI campaigns with GMVA and EHT. ASAC looks forward to seeing preliminary results and images from these efforts.

**Permanent Charge #2. Assessment of the technical aspects of the ALMA system performance: The ASAC shall indicate what information is required from the JAO to perform this assessment.**

Recommendations/Issues:

- ASAC is concerned that the *faster* spectral scan mode and circular polarization capabilities will not be offered in Cycle 6.

- ASAC requests a quantitative report on the fix of the astigmatism problem of the Vertex antennas at its next face-to-face meeting.
- ASAC urges that the policy be published on how science-ready data products are truncated for cases where full data products are not practical (high resolution cubes, solar data).
- ASAC is looking forward to receive a report on lessons learned from the solar observing campaign (including the QA2 process).
- ASAC looks forward to learn about solutions for CASA compatibility for manually calibrated measurements sets and measurement sets from earlier cycles (if possible) at its next face-to-face meeting).

*Cycle 6 capabilities* -- ASAC was pleased with the progress on the introduction of many new features, notably Band 5. The progress with 90-degree phase switching and total-power fast scanning was noted. The results from band-to-band calibration were promising, as were the results on combined array imaging. ASAC would, however, be disappointed if improved spectral scanning would not be on offer for Cycle 6. We note that implementation of the faster spectral scan mode in Cycle 6 is still TBD and note that it will not be good to delay this any further. ASAC would have liked to see more progress for Cycle 6 on the polarisation capabilities, which it has given high priority before. We note the uncertainty on whether circular polarization will be offered in Cycle 6 as well as wider field of view for linear polarization. Offering polarization with the ACA would help with the second point, and would help make better use of ACA that is often undersubscribed.

*Vertex antenna astigmatism* -- ASAC was impressed by the improvements on the antenna surface accuracies presented and notes the progress with the technical solution for fixing the Vertex antenna astigmatism. ASAC requests a quantitative report on the fix of the astigmatism problem at its next face-to-face meeting.

*Archive* -- ASAC also acknowledges the ongoing improvements with the archive which have improved the usability of the archive tool and looks forward to continuing improvements. ASAC is pleased to learn that CASA will be backwards compatible for (pipeline) calibrated measurement sets starting with Cycle 5. ASAC looks forward to learn about solutions for manually calibrated measurements sets and measurement sets from earlier cycles.

ASAC discussed how the user products are affected by the limited capacity to produce image cubes for many channels and high resolution. ASAC notes that also the release of solar data does formally not meet the 'science-ready' standards that the users may expect (i.e., time-resolved imaging). It is important that the solar campaign be evaluated and the observatory and the science teams agree on what the user can expect to be delivered. Although ASAC sees the need for pragmatic measures, it requests that the observatory formulate a policy that is clear to ALMA users.

**Permanent Charge #3. Assessment of the science outcomes from ALMA: Statistics on publications, citations, press releases, web sites, etc. collected by the Executives shall be collated by the JAO, and analyzed by the ASAC.**

Recommendations/Issues:

- ASAC recommends that JAO improves the way demographic data of ALMA users is collected and would like to receive an update at the next ASAC telecon.
- ASAC would like SV data to be broken out separately when tracking publication data and that the same scientific categories be used for both the publication statistics and the proposal review.

ASAC was happy to see the increased use of archive data. ASAC was also happy to see that the total number of publications resulting from ALMA observations continues to increase at a healthy pace. ALMA seems to be doing reasonably well in comparison with the other major facilities for which data have been collected. Furthermore, ALMA papers seem to be high impact, judging from the high citation rates to these papers.

ASAC asks that one aspect be changed in the record-keeping on publications. Namely, publications from the SV (Science Verification) data should be broken out separately. Specifically, ASAC asks JAO to separately track the publications from SV data in the plots in the presentation file provided on publications. Further, ASAC strongly suggests to use the same categories for the publication statistics as are used for the proposal review (to avoid possible confusion about publications from certain science areas).

The impact of social media and press releases seems good, although no comparison was made to other facilities such as HST. Given the high workload on the ALMA EPO staff, it does not seem reasonable to ask them to carry out such comparisons at this time, but ASAC recommends keeping an eye out for data from comparable facilities as it becomes available, as a way to further gauge effectiveness of ALMA EPO.

Collection of demographic information is deemed important. Locating the “save” button on the same page as where the information is input is essential and should be done as soon as possible. Beyond this, additional measures to encourage users to input this data will be required. However, ASAC does not think that the provision of demographic information should be mandatory for submitting proposals. Instead, gentle reminders sent every so often would seem like a better idea. ASAC asks that JAO report back to us on this issue during the next ASAC telecon.

**Permanent Charge #4. Recommendations of ways to maximize ALMA’s scientific impact: This includes review of the scientific effectiveness of the Proposal Review Process after each Proposal cycle.**

Recommendations/Issues:

- ASAC finds the overall Cycle 5 proposal review process adequate.

- In order to reduce the high workload for individual panel members ASAC recommends restricting the page limit on the scientific justification to a total of 3 pages. ASAC further suggests imposing a lower limit on font size for figure captions (i.e. similar to main body text).
- ASAC continues to be concerned about inherent biases in the review process and recommends that ALMA should maintain awareness of the experience of other large projects, such as HST, and consider implementing further steps in its review process to minimize such biases.
- ASAC received a presentation on the observation queue-building process and finds the overall concept adequate when technical/scientific constraints are concerned. Given the strong trends identified in the review process, ASAC recommends that the observatory addresses the impact of these trends in the current practices in the (long-term and dynamic) scheduling of observations.
- Given the small amount (in time) of duplicate proposals found in previous cycles, ASAC agrees that there is no need for a formal duplication checking tool and recommends adding a checkbox for the PI in the OT to confirm that no duplications exist.
- Regarding duplications between proposals submitted for a given cycle, ASAC recommends that the threshold for descoping be not larger than the median proposal time request.
- ASAC further cautions against reducing the time available for the longest baselines, encourages the observatory to look into changes to the observing algorithm that may favour the completion of more high frequency projects, and suggests the adoption of a separate triage level for ACA stand-alone proposals in the APR panel review process.

*Cycle 5 ALMA Proposal Review (APR) process*-- ASAC is pleased to see that the Cycle 5 proposal review appears to have proceeded smoothly and that an effort was made to use lessons learned in the process to improve the review in the next cycle. The changes proposed to reduce the workload for panel chairs seem to have led to an improved process. ASAC felt that the suggested changes to the review process of large proposals in Cycle 6 seem reasonable. However there is still concern that the workload for individual panelists is too large, and that this impacts the panel outcomes, e.g., high-numbered proposals are known to be disadvantaged relative to low-numbered proposals, presumably because reviewers are under more time pressure when they get to them. Therefore ASAC recommends reducing the page limit on the scientific justification to 3 pages. The proposers can decide on the balance between text and figures within this limit. ASAC also notes reviewer concerns that figure captions are often in small fonts that are difficult to read, and recommends that figure caption fonts be no smaller than the main body text.

There continues to be concern on the committee about possible bias, including gender- and region-based bias, in the review process. Further steps to mitigate this are desirable, and methods such as removing affiliation, removing first names and removing all names were discussed. ASAC recommends that ALMA should maintain awareness of the experience of other large projects, such as HST, who are also trying to address similar concerns.

*Observing queue-building for Cycle 5* -- ASAC received a presentation on the rationale behind the building of the observing queue for Cycle 5. It appreciated the full description of the current scheduling queue process and finds that, while not a perfect solution to a difficult problem, it should help to address issues with the schedule that have occurred in previous cycles (e.g. under-subscribed LST ranges in certain configurations). The overall concept seems appropriate for taking technical/scientific aspects into account (assuming high probability for high frequency observations, requiring 50% of time be available

for project acceptance). However, ASAC is very concerned that the process takes no account of the highly uneven distribution of grades and oversubscription rates across regions. In particular, the committee was distressed by the fact that the stage 1 scores in the review process are dramatically lower for EA and CL proposals than for EU and NA ones. This impacts the ability of these regions to receive an appropriate share of grade-A proposals and therefore very likely impacts their chance to receive time in high-demand LST regions. The committee recommends that ALMA investigates and addresses this issue further.

There are a number of possible causes, one of which is likely to be the relative levels of facility with writing in English and the corresponding clear communication of ideas. An obvious action is to increase awareness of this issue amongst APR panellists. In addition, the project should investigate ways to address this concern outside the review process itself.

There is concern in the affected regions that this factor disadvantages them scientifically. A solution is to award grade-A ratings to proposals in order by region, according to the designated allocations. ASAC recommends that the project considers doing this to ensure balance between regions, and feels that 2 cycles is a suitable period over which regional balance should be achieved.

*Duplication checking* -- The committee appreciates the work done at JAO to analyze the situation with duplications. In view of the small degree of duplications found, the committee agrees with the recommendation that further resources not be spent on developing a formal duplication checking tool. ASAC is in favor of adding a checkbox to the OT asking PIs to confirm that they have checked for duplicates, and the project should take any steps possible to make such a check easy in the archive. For descoping of proposals, ASAC agrees that there should be a minimum threshold of time saved to make descoping worthwhile, and recommends that it should be no larger than the median proposal time request.

*Cycle 5 requests for specific modes (long baselines, high frequency, ACA stand-alone)* -- ASAC notes the lower-than-expected submission rate for the long-baseline configurations in Cycle 5. High spatial resolution is an important feature of ALMA capabilities, and ASAC cautions against reducing the time allocated to the wide configurations in a way that would discourage science on long baselines. ASAC is also concerned with the relatively low number of proposals that request high frequency observations. It encourages JAO to look into changes to the observing algorithm that may favour the completion of more high frequency projects. Finally, ASAC suggests applying a separate APR triage cut, so that ACA stand-alone proposals that are ranked highly relative to other ACA stand-alone proposals are considered for scheduling (esp. if higher-ranked 12m+ACA proposals should not take up all of the available ACA time).

**Permanent Charge #5. Reporting on operational or scientific issues raised by the wider community as communicated by the three regional Science Advisory Committees (ANASAC, ESAC and EASAC).**

Recommendations/Issues:

- ASAC suggests tracking the requests for extensions of the data proprietary period to see what are the effects of the recent improvements and standardization of the approval process. The

committee is interested to understand the reasons for the larger number of requests coming from the EU community and how these requests evolve in future years.

- ASAC would like to continue to receive statistics on the helpdesk, to assess the community satisfaction with the ALMA operation.

*Proprietary period extensions* -- ASAC was presented with statistics by region on the number of requests for extensions of the proprietary period as well as on the number of requests for access to stale data. Since 2014, 75% of the requests for extensions of the proprietary period have come from European PIs with the remaining requests split evenly between North America and East Asia. ASAC is concerned by the large number of requests coming from a single partner and is pleased to see that the process for approving proprietary extensions is being standardized and to hear that requests relating to formal leave (e.g. illness, parental leave) or data requiring reprocessing are likely to be approved. Regarding stale data access, which is a fairly new policy, 65% of the requests originate in North America. ASAC is interested to see how the requests for proprietary extensions and stale data access evolve and the distribution changes among the partners in future years.

Further issues raised by the regional Scientific Advisory Committees have been addressed under the other charges.

**Permanent Charge #6. Assessment of the scientific impacts of the ALMA Development Program, and particularly of new projects that are proposed.**

Recommendations/Issues:

- ASAC looks forward to receiving a document based on the Band 2+ and Band 2+3 PDRs that provides a unified view on the performance of both cartridges before its next face-to-face meeting.
- ASAC endorses the idea of joining up efforts for the construction of a cartridge solution (encompassing advantages from both developments) to ensure the best technology is implemented.
- ASAC looks forward to a report on the correlator and bandwidth up-grade projects that covers a system-wide analysis before its next face-to-face meeting.
- ASAC recommends the implementation of the ALMA Phasing Project phase 2 implementation plan as an ALMA development project.
- ASAC requests JAO to reconsider the possibility of phasing ACA and of sub-arraying of the 12m array for future VLBI operations.

*ALMA Band 2+/2+3 cartridge* -- ASAC is informed that further progress was made in optimizing the noise performance of the NA/EA Band 2+ and EU/EA Band 2+3 cartridges, and that recent performance figures are suggesting promising perspectives for the development of a sensitive wideband-cartridge prototype. However, to better evaluate the operational and scientific benefits of the two developments, the committee would like to receive, before its next face-to-face meeting, a document that provides a unified

view of the performances of both cartridges, based on the respective PDRs. Further, while taking note that activities in the frame of the NA/EA Band 2+ development are currently suspended, the committee continues to endorse the idea of joining up efforts for the construction of a cartridge solution that encompasses the advantages of both developments and ensures the best technology is implemented at ALMA.

*ALMA correlator upgrade* -- ASAC finds the new focus on JAO's "prescriptive" approach for the two-staged upgrade of the ALMA main-correlator to be well motivated. In particular, the committee continues to endorse the EU's and NA's concerted approach to ensure the design of the digital signal processing architecture is optimized for best performance. The committee, however, urges the EU/NA collaboration to consider including the antennas of the compact array (ACA) in the upgrade project. In this regard, the committee invites the EU and NA to collaborate with the EA partner for a review of the requirements. Prior to its next face-to-face meeting, the committee also invites the partners to produce a document on the project that includes a target timeline for the two upgrade phases with a view on the future next generation correlator, and a system analysis by which it will become possible to assess needs and requirements for software developments, data rates, archive storage, VLBI operations and the potential impact on ALMA science operations. Considering that the implementation of the correlator upgrades and the integration of the future Band 2+ or Band 2+3 receiver cartridges are tentatively scheduled for the years 2022-2024, the committee also recommends that efforts are directed to making both deliveries appropriately staged in time to maximize scientific benefits and minimize the downtime of the ALMA observatory.

*ALMA Phasing Project phase 2* -- ASAC endorses the ALMA APP phase 2 implementation plan for Board approval in 2018. The project, which is perceived as a logical continuation of the APP phase 1 and responding to user pressure, should find a quick implementation for enhanced (Cycle 6) and new (Cycle 7) capabilities for the phasing of ALMA. The committee is also pleased to learn that the project is characterized by a highly collaborative spirit and technological prowess among the ALMA regions. However, to maximize the scientific use of the ALMA observatory for future VLBI observations, the committee requests JAO to reconsider the possibility of phasing the ALMA compact array and of sub-arraying the ALMA main array.

*ALMA Band 1 science operation* -- ASAC notes that the Band 1 cartridge manufacturing readiness review is delayed but understands that no delay is expected for the delivery and start of Band 1 science operation in 2022.

**Ad-hoc Charge. ASAC to study and define the relative priority for the Communities to have access to raw data.**

ASAC intensely discussed this charge, its detailed response is provided below:

- (1) The highest priority is the timely completion of the QA2 process for MOUSs that have had all their observations completed. This includes both standard and non-standard mode data.
- (2) Releasing raw data for partially or fully completed MOUSs to PIs who wish to have such access is desirable. Scientific reasons for such a request include, but are not limited to, verification of observing set-ups, optimization of project dedicated data and/or analysis schemes, monitoring of progress, facilitation of fast checks or enabling immediate science results (i.e. before deadlines). The proposal that the proprietary period for the MOUSs of which these data form a part begins as soon as any data are downloaded from the archive would be acceptable. It would also be acceptable to place other constraints on release of raw data, e.g. that it passed QA0.
- (3) Providing user support (when requested) for PIs who have accessed their raw data early is also an important aspect. However, some members of the committee were concerned that providing such support could adversely affect QA2 processing for other projects. In contrast, other members of the committee were concerned about allowing raw data out into the community without the possibility of any user support. The committee consensus is that providing support to PIs who access their data early must not interfere with the timely progress of QA2 processing (see point 1).
- (4) The project must provide detailed warnings to PIs when they attempt to access their raw data concerning the impact on the proprietary period and the possibility that user support may not be available before QA2 should they run into problems processing the data.
- (5) The impact of releasing raw data on the demand for user support should be carefully monitored to see what impacts it has on ALMA resources, such as the ARCs.
- (6) The observatory should strive to have a uniform data release policy.