



# ALMA BOARD

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**Subject:** Science Committee Response to the October 2022 ASAC Report

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**Purpose of Document:** To provide the ALMA Board with the Science Committee's proposed response to the ASAC's October 2022 Report

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## ALMA Board Science Committee Response to the October 2022 ASAC Report January 2023

The ALMA Board thanks the ASAC for its latest guidance on issues related to science. The format change at the most recent ASAC meeting indeed appears to have led to more discussion among ASAC members, resulting in many detailed recommendations. The Board received the latest ASAC Report document prior to its November 2022 meeting. The ASAC Chair, M. Tafalla, summarized the Report first to the Board's Science Committee and again a couple of days later to the entire Board during the Ordinary Session of the Board meeting in Santiago. J. Di Francesco, the Chair of the Science Committee, then presented a preliminary response to the Board immediately after M. Tafalla's second presentation. In this document, prepared with input from the entire Board, we provide a formal response to the ASAC's most recent Report.

### **Permanent Charge #1: Assessment of the performance of ALMA scientific capabilities**

*ASAC recommends as a priority multi-cycle proposals to promote monitoring and related observations as well as high dynamic range observations with different configurations. Also, ASAC supports the modification of the scheduler algorithm to boost lower-ranked high-frequency programs upward to improve the completion rate of the high-frequency programs.*

Multi-cycle proposals are intended for programs that require monitoring targets beyond the duration of a single Cycle. Such proposals are indeed formally included as a proposal type in the Principles of the ALMA Proposal Review Process document, with the amount of time set aside for such projects each Cycle being limited by the ALMA Director. Despite this previous definition, multi-cycle proposals have not yet been implemented at ALMA due to other Extension and Optimization of Capabilities (EOC) priorities. Indeed, ALMA's Department of Science Operations recommended to the Board in a separate presentation this past meeting *not* prioritizing multi-cycle programs and other new capabilities in favor of priorities expected with the upcoming Wideband Sensitivity Upgrade (WSU). That said, it may be actually beneficial to have multi-cycle proposals in place soon, given the limits on the availability of ALMA for science that WSU commissioning activities will impose. With this latter point in mind, the Board will action the Director to consider carefully the operational impact of implementing multi-cycle proposals as early as Cycle 11 amid other pressing priorities.

Modifying the scheduler algorithm to boost high-frequency (HF) projects further in the ALMA observing queue may indeed help with their overall execution and completion. It is not *a priori* obvious, however, how much queue boosting is necessary, given the limited time available for HF projects and the complexities of queue building. To evaluate whether the weather conditions are being used optimally, the Board will action the Director to develop an appropriate metric that can be tracked over future Cycles and permit tweaks to queue boosting of HF projects, as needed. We note that HF projects should not be strictly defined as those needing data from Bands 8-10, and should include projects needing data at lower frequency ranges that are highly impacted by

water vapor, such as the middle of Band 5 or the high end of Band 7. Further discussion of HF projects is found in our response to Ad hoc Charge #2 below.

### **Permanent Charge #2: Assessment of the technical aspects of ALMA system performance**

*ASAC congratulates JAO for their efficient run of Cycle 8 and prompt deliveries of ALMA data, warmly acknowledges their investigation of array downtimes, and thanks the JAO for their study of completion rates.*

The Board agrees with ASAC that the JAO did an excellent job with Cycle 8, in terms of hours observed and data delivery timescales. It is especially pleased with the JAO's commitment to improving ALMA's science observing efficiencies through detailed analyses.

The Board acknowledges ASAC's concerns about ALMA's project completion rates, which show that roughly 50% of Grade A+B projects are completed, 25% of such "high-priority" projects are begun and only partially completed, and 25% are not observed at all. Observing efficiencies do play a role in maximizing the amount of time available for science, and indeed achieving the ambitious target of 4,300 hours of observing time per Cycle. That said, the Board is not certain if ALMA's project completion rates are unusual. Indeed, these completion rates may reflect the challenge of queue building under optimistic weather assumptions. To clarify this concern, however, we invite the JAO to describe the queue building procedure to the ASAC. In addition, the Board will action the Director to explore how ALMA's high-priority project completion rates compare to those of other observatories and report these comparisons to the Board. Nevertheless, educating the community to manage expectations should be explored, but with some sensitivity so the community is not discouraged in submitting proposals. For example, rather than reporting a probability for project completion in the OT, statistics on project completion averaged over several Cycles can be reported in the "Proposal selection" section of the Proposer's Guide that is delivered with each Call for Proposals. The Board will action the ALMA Director to continue monitoring overall project completion rates and consider the most effective way to manage the expectations of the community by education. Finally, we note from a JAO presentation made to the Board at its most recent meeting that scheduling block completion rates for high-priority projects in Cycle 8 across all arrays appear to have been quite good, with 83% and 75% of Grade A and Grade B SBs completed.

### **Permanent Charge #3: Assessment of the science outcomes from ALMA**

*ASAC strongly supports the organization of the "ALMA at 10 years: Past, Present, and Future" conference to be held in Chile in December 2023, and is glad to accept the invitation to be part of its Scientific Organizing Committee.*

The Board also supports the "ALMA at 10" meeting going forward, including its planned hybrid format. It will be a key point for the astronomical community to celebrate ALMA's past successes and also plan for the future ones that will be made possible with the ALMA2030 upgrades. In particular, the Board is grateful to the ASAC for agreeing to serve as members of the meeting's

Science Organizing Committee (SOC; see the Board response to Permanent Charge #5 below for further suggestions to the ASAC regarding its SOC duties.)

#### **Permanent Charge #4: Recommendations for ways to maximize ALMA's scientific impact**

*ASAC would like to understand what science priorities are driving the observatory and suggest that JAO clearly communicate these priorities to the community. ASAC also suggests that increasing the number of science categories and revising the science keywords might also contribute to better matches. ASAC suggests adding additional external reviewers to DPR in cases where reviewer expertise in certain areas is missing. ASAC also asks JAO to explore ways to test if top proposals from DPR relative ranking are the same if proposals are given an absolute score.*

The Board thanks the ASAC for continuing to consider ways to improve DPR. Indeed, the JAO should be vigilant of any biases emerging in DPR, such as one against so-called “minority fields.” The ALMA Observatory Scientist has indicated to us, however, that such biases have not been observed. Indeed, concerns raised by members of such communities that the DPR process is biased against their proposals may instead simply reflect how few ALMA proposals are successful relative to the large numbers submitted. To offset perceptions of bias, however, we invite the JAO to brief the ASAC about the lack of observed biases against minority fields at the next ASAC meeting. In addition, the Board believes at this time that ASAC’s suggestion to compare DPR’s relative rankings with absolute rankings is not warranted at present, as the current process, which forces reviewers to make full use of a 1-10 scale, outweighs the negatives. Finally, the Board wishes the JAO to preserve anonymity throughout the entire proposal process.

Regarding the ASAC’s suggestion about defining the scientific priorities of ALMA, it is not clear if their comment applies to science topics or proposal lengths. If the former, the Board believes ALMA is taking the right approach, namely that its science topic priorities are communicated every Cycle by the proposal peer-review proposal process. Indeed, this process allows such priorities to be driven and updated every year by the very community ALMA serves. Defining a set of preferred science topics for ALMA could send an unfortunate message to the community about what science is “better.” (Taking this idea to an extreme, the Board believes that ALMA time should not be divided *a priori* to certain subfields.) If the latter, the balance between small, medium, and large projects is indeed a topic for which ASAC guidance would be welcome. At present, Large Programs are allowed to fill up to 50% of a given LST range for all configurations except (the most extended) C-9 and C-10 which are limited to be filled up to 33% of a given LST range. Successful Large Programs get priority in these LST ranges because they require Grade A for success in the first place. No fixed percentage of ALMA time is presently set aside for Large Programs. The International Visiting Committee, however, did recommend the observatory encourage more ambitious proposals from the community. Judging by how the average time requested per proposal has increased and the numbers of Large Proposals submitted remains large in recent Cycles, the JAO has been successful in growing the appetite for larger projects overall. Though the Board is pleased to that the see the ASAC is willing to consider the issue via a charge, it invites the ASAC to clarify what is meant by science priorities first.

## **Permanent Charge #5: Reporting on operational and scientific issues raised by the community**

*The ASAC requests that the JAO approach the communities of “minority fields” and address their concerns to increase their confidence in a fair review process. The ASAC also requests that the JAO study possible solutions to address the issue of partly completed projects. The ASAC is also concerned about the bias against proposals led by EA females that appeared in Cycle 9.*

As described above, the Board is convinced the JAO has been monitoring well the results of the proposal review process in recent Cycles, and their analyses indicate that no significant biases against “minority fields” are apparent. That said, the Board encourages the ASAC, as SOC members of the “ALMA 10 Years” conference, include such fields fully within the overall design of the meeting, e.g., via keynote speaker invitations or designated sessions. Indeed, that meeting will be also an excellent opportunity for the JAO to present data, perhaps as part of an overall ALMA community update, that reinforce that no biases against “minority field” proposals are apparent. Otherwise, JAO or ARC staff could conduct community outreach by, e.g., targeting field-specific meetings to attend as “ALMA ambassadors,” reassuring attendees about biases and encouraging new proposals. That approach, however, may be difficult for the resource-constrained JAO or ARCs to implement. Indeed, the Board invites ASAC members to provide such reassurances in their professional circles at their future conferences and meetings.

The ASAC provides some interesting ideas about reducing the number of partially completed projects at ALMA, including the implementation of multi-cycle proposals and perhaps having a new category for unfinished programs. As stated earlier, we agree that including options for multi-cycle proposals should be examined seriously for upcoming Cycles, among other EOC needs. The Board, however, is reluctant to introduce the concept as a general means for uncompleted projects to be carried over to future Cycles. Such carryovers already exist for Grade A projects and are now under consideration for high-frequency projects as well. Moreover, the Board does not support the idea of a separate category for the proposals of unfinished programs. The reasons for the Board’s stance are twofold. First, ALMA needs to maintain its flexibility to address the most current, pressing science issues of the day and sometimes that means making room for new projects of high priority. Second, ALMA already allows proposers to indicate that a given proposal is a resubmission of one for which a project was not completed (or begun) in a previous Cycle. With that information, reviewers can fairly judge if the project warrants completion.

The Board is also concerned to learn that EA female PIs have a lower ALMA proposal success rate than other regional groups. This dip appears to be at a 2-3 sigma level, however, and it did not appear during Cycle 8. Hence, it may be a statistical fluke. Nevertheless, the Board invites the JAO to continue monitoring the proposal review process statistics for further evidence of this, or indeed any, concerning trend.

## **Permanent Charge #6: Assessment of the scientific impacts of the ALMA Development Program**

*ASAC strongly endorses the project proposal of the Data Transmission System (DTS), congratulates the team for the progress in Band 1 receiver development, confirms that the updated ALMA Science Requirements properly reflect the ALMA2030 specifications, and are concerned about the delays in the development of the next generation Observing Tool (OT).*

The Board thanks the ASAC for its endorsement of the DTS and its support of the updated ALMA Science Requirements. It is pleased to relay to the ASAC that the proposals for ALMA Development funds to begin construction of the ALMA Talon Central Signal Processor and Phase 1 of the Data Transmission System, both key elements of the ALMA2030 WSU initiative, were approved at our November 2022 meeting. The Board is also pleased to see continued progress in the development and deployment of the Band 1 receivers on ALMA with availability for science use by the community as early as Cycle 10. The Board indeed shares the ASAC's concerns about delays in the development of the next generation Observing Tool.

**Ad hoc Charge #1: ALMA Large Project Data Delivery issues**

*ASAC is charged to identify for the April 2022 Board meeting what level of observatory and ARC support is needed to ensure the success of Large Programs, including timely delivery of higher-level data products to the ALMA community. Polling the PIs of more recent LPs is recommended to determine what roadblocks they have faced in completing their projects*

*To improve Large Program data deliveries, the ASAC recommends: i) increasing the time expected for delivery higher level data products after project completion; ii) requiring successful PIs to submit semi-annual reports on survey progress; iii) including the feasibility and utility of the public data products as criteria for Large Program proposal review; iv) requiring all PIs of Large Programs include more fleshed-out management plans that are considered by reviewers in addition to science merit, as planned in part for Cycle 10; and v) disallowing Large Program PIs and co-PIs to lead new proposals until their Large Program data are delivered.*

The Board thanks the ASAC for continued consideration of this ad hoc charge and its subsequent recommendations to improve the timely delivery of Large Program data products to the ALMA Archive. Of these recommendations, the Board endorses requiring successful PIs to submit semi-annual reports on the progress of their surveys to the ASAC.

On the other hand, the Board recommends the time between project completion and data product delivery remain at 12 months, to enable the community to benefit from them in a timely manner. (Note that the concept of "completion" may mean a significant fraction of data (e.g., 90%) is delivered to achieve the science goals rather than all data requested by the Large Program team.) Next, the feasibility and utility of the public data products are already considered as criteria to evaluate within the present Large Program review process.

Furthermore, the Board remains convinced that the current requirement to produce a management plan with the proposal is sufficient for compelling PIs to consider an organizational structure suitable for the success of their program. Finally, the Board considers ASAC's

suggestion to restrict PIs and co-PIs from leading further proposals until high-level data products are delivered to be too difficult to oversee; for example, the craftiest of PIs could easily find colleagues to lead their proposals as proxies in the face of this restriction, a loophole that is too complicated to close.

### ***Ad hoc Charge #2: Consideration of High-Frequency Director's Discretionary Time Projects***

*The ASAC is charged to advise the Board on ways to implement a scientifically beneficial, equitable, and fair use of Director's Discretionary Time on a dedicated campaign (project or projects) that will demonstrate the uniqueness and power of ALMA's high-frequency capabilities by providing high quality data products to the community. Namely, the ASAC should consider where this approach is warranted and, if so, how such projects should be conceived, competed, and selected to maximize both partner participation and overall impact in a reasonably short execution timeframe.*

*The ASAC agrees on the importance of increasing the number of high-frequency projects, praises the JAO for their preliminary analysis of the causes of a low completion rate of [such] projects, and supports taking additional measures to increase [their] completion rate...prior to considering other proposal methods to promote these projects.*

The Board also thanks the ASAC for its thorough consideration of this ad hoc charge. Though the ASAC does not recommend at this time proceeding with a community-driven, dedicated high-frequency (HF) project using Director's Discretionary Time (DDT), its consideration of this issue has led the Board to action the ALMA Director to develop a robust policy to enable future strategic use of DDT. The Board reminds the ASAC that the need to consider a dedicated HF project with DDT was predicated on a concern that boosting the priorities of projects in the queue was not tenable as they would fundamentally alter the project rankings agreed upon by the Executives prior to the start of a Cycle. On its own initiative, the JAO began adjusting the priorities of HF projects in the Observing Queue after the Board issued this ad hoc charge to the ASAC, and these small changes to project rankings have not been viewed as unfavorable by the Executives after all. With these adjustments in play, and other data from the JAO demonstrating that HF projects are being proposed in good numbers and many of which are obtaining good grades, the Board concurs that there is no need to consider a dedicated HF project using DDT at this time.

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### **Specific Actions to the ALMA Director**

1. The ALMA Director should consider the operational impact of implementing multi-cycle proposals in the face of expected demands on JAO staff related to the Wideband Sensitivity Upgrade. If the impact is deemed minimal, the ALMA Director should include multi-cycle proposals in the Calls for Proposals of future Cycles.
2. The ALMA Director should develop a metric that will track whether or not weather conditions are being used optimally, especially for high-frequency projects. With this metric, the ALMA Director should then be able to determine if further tweaks to the queue boosting of high-frequency projects are needed.
3. The ALMA Director should continue to monitor the completion rates of high-priority (Grade A and B) projects. The ALMA Director should also determine how ALMA's project completion rates compare to those of other observatories, to provide the Board with sufficient context.
4. The ALMA Director should also consider and implement the most effective ways to manage the expectations of the community about the completion of "high priority" projects.
5. The ALMA Director should develop a robust policy for general strategic use of Director's Discretionary Time, so one will be in place when needed in future.

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