

Report from the ALMA Scientific Advisory Committee
Face-to-Face meeting, Santiago
October 8th and 9th, 2012
Responses from Science Committee Draft Nov. 16, 2012

Membership of the ALMA Scientific Advisory Committee

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Executive summary

Charge 1: (science results and metrics for quantitative analysis)

Outstanding ALMA science results from SV and Cycle 0 are beginning to be published. The ASAC was very impressed with the science highlights presented, and congratulate those involved with these achievements. The ASAC makes the following comments and recommendations:

- The following quantitative metrics are suggested to evaluate the impact of each ALMA science program: number of papers, number of citation, number of download from the archive, number of PhD thesis.
- Track archive science separately, maybe through the use of a different acknowledgement.
- These metrics shall be collected in a coherent format among executives. An excellent example is the ESO telescope bibliography (<http://telbib.eso.org>).
- Non-science metrics should also be considered (e.g., technology spinoffs, EPO).
- **The Board accepts these recommendations and requests a report on the number of papers and early science press releases to be made at the next f2f meeting, while the other metrics should be phased in as they become relevant.**
- The ASAC concerns about the significant time lag between data

acquisition and quality assurance (QA2) process, which could have an impact on the early ALMA science outcome.

- This point will be discussed in response to a later recommendation.

Charge 2: (science demonstration and verification programs)

The ASAC received an excellent presentation from Project Scientist on the issue of Science Demonstration (SD) and Science Verification (SV) as we move forward to Cycle 1 and the opening of the archive. In particular there was universal agreement on the following:

- SD should be a byproduct of SV programs. Given the fact that the ALMA archive is about to open, there is no need for further SD.
- We appreciate the transparency of the SV twiki and its imminent public unveiling.
- SV programs shall be prepared by JAO to verify specific new functions/capabilities to be added to ALMA in the near future. Any significant science conflict between SV programs and peer-reviewed on-going PI programs should be resolved through consultation with the APRC chairs. Transparency to the community is key, and any comments on the proposed SV programs shall be delivered to JAO to improve the SV programs.
- There needs to be a written procedure to address comments from the community

The Board is very pleased that this issue has been resolved and affirms that the need for Science Demonstration has passed.

Charge 3: (encouraging science activities)

- ASAC considered the issues contributing to the low number of staff publications and the low success rate of JAO-led proposals.
- JAO is a potentially excellent research environment: access to library facilities, seminars, a strong visitor programme, funds for conference travel, and dedicated periods (of up to ~3 weeks/year) of research time.
- The scientific staff are obtaining marketable skills through their work on ALMA.
- The ASAC is concerned the followings issues:
 - bar has been placed too high in terms of the QA2 human reduction (best efforts often forgotten).

- the slow progress of the data-analysis pipeline, which causes a high workload to JAO and ARCs and the delay of the data delivery to the PI.
- about management structure, e.g. 21 scientists with 8 different flavors of contract with one manager.
- that CSV scientists will leave unless they are given new contracts.
- The ASAC suggests that one way to reduce the work load on the JAO staff is to scale back on the scope of QA2 data reduction.
- The Board appreciates the attention by the ASAC to this issue. We encourage the JAO to continue to seek ways to facilitate science work by the staff at the JAO, including mentoring, formation of interest groups that bring together scientists from the various institutions in Chile, and other means.
- The DSO leadership maintains that the time lag is due in large part to the unavailability of the data reduction pipeline in Cycle 0. The DSO leadership at the JAO believes that the implementation of this pipeline, which must be in place to handle the increased project load in Cycle 1, will substantially decrease the load on the staff and reduce the time delay between completion between observations and delivery to the PI. If this proves not to be the case, the scope of QA2 must be reconsidered.

Charge 4: ad hoc (cycle 0 progress, cycle 1 readiness, and cycle 2+ issues)

- There has been steady progress toward completion of Cycle 0 programs. We fully endorse the hard end to Cycle 0 on January 2nd, 2013. Clear feedback to the PIs regarding the status of their projects must then be communicated as soon as possible.
- This was noted and we expect that this advice will be followed.
- The Project Tracker will provide better information in future cycles.
- The progress toward release of data, however, remains frustratingly slow. This is one of the biggest community complaints. The ASAC feels that a major part of the problem is the stringent requirements for QA2. We recommend that the data could be released with only rudimentary imaging and delegate more of the final reduction steps to the ARCs and PIs.
- As noted earlier, the DSO leadership asserts that the pipeline will shorten this time and they are aiming at 3 week turnaround to get data to

the PI's.

- The JAO are to be commended on a very successful Cycle 1 APRC process. The ASAC continues to feel that the abstracts of approved proposals should be published as for Cycle 0.
- **The Board agrees and has requested the Directors Council to revisit the issue, and to inform the Board about any institutional impediments to implementing this procedure by the December Board teleconference.**
- The ASAC strongly recommends adhering to the public wording of the Cycle 1 proposal call which specifically states that there would be about 800 hours for “high priority” programs plus about 50% extra time for filler programs. (We understand that some high priority programs may not be completed but we believe that this is better than preemptively cutting the observing time to 500 hours.)
- **The Directors Council and the Board agree and this decision has been taken.**
- We recommend the creation of an “observed target list” with minimal information that can aid future proposers avoid repetitions.
- **This has been taken as a follow-on to the issue with the abstracts.**

I. Introduction

The ASAC met in Santiago at SCO/JAO on October 8th and 9th of 2012, just one week after the ALMA cycle 1 proposal review panel meeting in Santiago. There were 1133 proposals received from ALMA executives and other regions, demonstrating the presence of the increasing demand on the ALMA science. Outstanding ALMA science results from SV and cycle 0 are starting to be routinely published. The ASAC congratulates the Project for these achievements.

The ASAC would like to thank the ALMA staff at SCO/JAO for coordinating this meeting. We also express our gratitude to the number of staff who presented material, provided information, and attended the face-to-face. The tour to OSF and AOS on October 6th to 7th was also very helpful to know the current achievement of ALMA, where more than 40 antennas were already visible at the high site, and the ASAC appreciates all staff that assisted the committee member's visit to OSF and AOS.

The ALMA Board gave the ASAC three formal charges. In addition, the ASAC generated a forth ad hoc charge, which is also discussed in this document.

The ASAC proposes to hold its next face-to-face meeting (Feb. 2013) in Tokyo, based on the policy of holding alternate face-to-face meetings in Chile and at the regional science centers.

II. Response to Charges

Charge 1: Report on science results so far and lay the groundwork for future quantitative analysis. Highlight some outstanding science results from SV or Cycle 0 and put them in context of the fields they apply to. Assess what quantitative metrics will be available for assessing scientific impact by finding out what statistics are collected by the various Executives. Comment on whether the intersection of those sets provides sufficient information for the ASAC to evaluate quantitative measures of scientific outcomes from ALMA.

1.1 Science results thus far

The ASAC was pleased to see the highlights of recent exciting scientific outcomes achieved by ALMA SV and Cycle 0 data. A comprehensive evaluation of ALMA early science results across all areas was impossible as the presentations to the ASAC necessarily covered an incomplete selection of papers in preparation. This issue is thus best evaluated at the First ALMA Science Conference in December. At least three of the ASAC members will attend this conference and this sub-group has been charged with preparing a report for the next ASAC face-to-face meeting in February.

1.2 Quantitative metrics

The ASAC noted that ESO has an existing and excellent telescope bibliography which can be used as a base for an ALMA metric database: [website here](#). The ASAC recommends that metrics used for evaluating the impact of ALMA cover a wider range than only scientific output.

The following quantitative metrics are considered sufficiently important for inclusion. These measure scientific, technical and software products, ease and efficiency of using ALMA data, and impact on education and non-radioastronomy communities:

- A) Scientific Output
 - Number of papers, number of citations, and percentage of all highest cited papers in astronomy which use ALMA data.
 - Archival science (number of datasets downloaded, archival publications)
- B) Technical & Process Output
 - publications based on instrumentation and processes.
 - technology spin-offs to industry.
 - use of ALMA-developed software in other projects (e.g. CASA, TCS).
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- C) Ease of use, inclusion of community, education
 - Median time between data release and submission of publication.
 - number of proprietary datasets which become public before publication, number of datasets not published after N years.
 - number of registered users, number of Ph.D.s, statistics of international collaborations, statistics of “other” scientists.

These metrics should be collected in a coherent format among executives, something

which currently does not appear to be the case. The ASAC felt that a meaningful analysis of the metric database, especially for comparisons with other observatories, will require additional people-power – beyond a quick analysis by the ASAC – which currently do not appear to be in place.

The ASAC concerns about the significant time lag between data acquisition and quality assurance (QA2) process, which could have an impact on the early ALMA science outcome.

Charge 2: Review the goals of Science Demonstration as part of, or as a complement to, Science Verification. Should the current goal of Science Demonstration (Getting cutting-edge ALMA data out to the public) be modified, modulated, or limited now that proposals with proprietary time are being executed and the archive is about to open? How should targets for SV be chosen, announced, and publicized? If the goal is to get some ALMA data out to the public, have SV projects covered the proper spectrum of science areas?

The ASAC wishes to acknowledge the attention paid by the project to the concerns raised in past telecons about the lack of transparency of the science verification process and our suggestions on how to improve it, as well as the collision with peer-reviewed observations. Both have been resolved satisfactorily.

The ASAC received an excellent presentation by the new lead of Commissioning and Science Verification, Dr. Stuartt Corder, on the issues of science verification (SV) and science demonstration (SD). As we move forward to Cycle 1 and the opening of the ALMA science archive, there was universal agreement on the following points:

2.1 Should the current goal of Science Demonstration be modified, modulated, or limited now that proposals with proprietary time are being executed and the archive is about to open?

SV observations will be primarily designed and implemented for testing and debugging ALMA and its new capabilities. SD will be a byproduct of the SV effort: given the

enormous improvement in capabilities over existing facilities, any successful SV observation will have scientific value and should be made public.

The rationale behind this recommendation is the following: 1) With the imminent opening of the science archive and in view of the competing priorities of finishing construction, completing observations of peer-reviewed proposals, and preparing for the next observing cycle, the ASAC sees little need for releasing additional data into the community. In fact, the spectacular results from approved Cycle 0 programs are the best "science demonstration" possible. There is no need of dedicated SD programs to convince the community that ALMA is working and is a great instrument. 2) The ASAC considers that placing effort into an SD program, which by necessity will compete in manpower and observing time with the aforementioned priorities, will send the wrong message to the community. 3) The ASAC considers that there is an unavoidable potential for appearances of "insider advantage" in the implementation and carry forward of an SD program, which will not be in accord with the goal of maximum transparency for the project and thus are best avoided.

2.2 How should targets for SV be chosen, announced, and publicized?

The ASAC recommends that SV observations are designed by the CSV Project Scientist, in consultation with a small committee, to primarily address the engineering needs. The proposed targets and observations will be publicized in the SV twiki page already implemented (which should be soon be made publicly available), and a request for email comments should be announced to the community. The CSV Project Scientist will collect these comments and address them according to a *pre-established written procedure*. The primary goals of this process are to maintain maximum transparency, and to inform the JAO about potential science conflicts. An example of a procedure to address comments concerning a science conflict is to consult the APRC chairs.

This recommendation was worked out with the JAO during the f2f meeting. The rationale is to maintain the goal of maximum transparency, while at the same time allowing the CSV Project Scientist freedom to design the observations that best serve the purpose of verifying ALMA capabilities.

2.3 If the goal is to get some ALMA data out to the public, have SV projects covered the proper spectrum of science areas?

The existing SV projects have already covered a wide spectrum of research fields and have produced noteworthy papers. Nevertheless, there was *universal* agreement that SV should primarily address engineering concerns to verify that new operating modes have been successfully commissioned, and only produce scientifically interesting data as a byproduct. Covering a range of science areas is thus only a secondary consideration, and not a driver in the design of the SV observations.

Charge 3: How can we help those making ALMA work (JAO staff, postdocs, fellows, staff at ARCs, etc.) get some benefit for their own science?

ASAC considered the issues contributing to the low number of staff publications and the low success rate of JAO-led proposals. JAO is a potentially excellent research environment: access to library facilities, seminars, a strong visitor programme, funds for conference travel, and dedicated periods (of up to ~3 weeks/year) of research time. The scientific staff are obtaining marketable skills through their work on ALMA.

ASAC met with a number of local scientists to hear their experiences, their concerns and their ideas. These scientists were proud of their contributions to ALMA, and are committed to their work.

They feel that:

- more science time is their first priority.
- the organization does not see their science as sufficiently important.
- there are simply not enough staff to deal with the workload.
- they do not have enough visibility in the community.
- local scientific mentoring is not available.
- distribution of work is not being handled as well as it could.
- scientists are often confused about their contracts, the structure of their line management and, most importantly, the criteria for promotion and/or renewal of contracts - clear and consistent guidelines are required.
- CSV and maintenance will continue beyond CSV period, but who will do it?

The ASAC is concerned the followings issues:

- bar has been placed too high in terms of the QA2 human reduction (best efforts

often forgotten).

- the slow progress of the data-analysis pipeline, which causes a high workload to JAO and ARCs and the delay of the data delivery to the PI.
- about management structure, e.g. 21 scientists with 8 different flavors of contract with one manager.
- that CSV scientists will leave unless they are given new contracts.

The ASAC suggests that one way to reduce the work load on the JAO staff is to scale back on the scope of QA2 data reduction. We appreciate that basic calibration and flagging probably are best done by staff scientists, since they are aware of common hardware and software problems and can provide rapid feedback to the observatory on new problems. But once the calibrations are complete and a rudimentary image is obtained, the data should be turned over to the PI immediately. (Data requiring new imaging modes, like combining single dish and interferometric data, could be an exception to this rule.) Many highly competent outside observers are waiting impatiently for their data, and will reimage it themselves no matter what the observatory provides. If it is essential that the archive contain images, then a procedure should be developed to enable PIs to submit their images to the archive later.

Charge 4: Ad Hoc; progress of cycle 0, readiness of cycle 1, and issues toward cycle 2 and beyond

4.1 Cycle 0

ASAC fully supports the JAO plan to end Cycle 0 observations with the completion of the 29th block (which ends 2nd January, 2013). It is important to implement this precisely as was advertised. ASAC are pleased to note that progress has been going well, and that the expectation is that only a handful of programs will remain uncompleted.

ASAC recommend that the information about the end of Cycle 0 be communicated very clearly to the community and that the JAO contacts the last few PIs explicitly.

ASAC approves of JAO's intention to provide improved updates on Cycle 0 progress on the Science Portal. It will also be important to put effort into reducing the last data-sets as soon as possible after the end of Cycle 0.

Progress toward release of data, however, remains frustratingly slow, and is one of the biggest community complaints. The ASAC feels that a major part of the problem is the stringent requirements placed on QA2. We recommend that the data could be released with only rudimentary imaging and that more of the final reduction steps could be delegated to the ARCs and PIs.

4.2 Cycle 1

The JAO are to be commended on a very successful Cycle 1 APRC process. It appears that an increased number of members on each panel has helped, and that with continued vigilance regarding conflicts, this should be the basis for the composition of panels for Cycle 2. An increased number of assessors for each proposal meant that it was easier to generate feedback this time. ASAC felt that the 30% triage fraction was reasonable, and could even be higher - provided that the principle is retained of allowing assessors to pull proposals out of triage for further discussion. One possible improvement would be to get input from panel chairs about potential conflicts (across all panels in one subject area) ahead of the meeting. This would also help to group proposals which should be discussed together. Although the plan is for all panelists to continue for Cycle 2, ASAC believes that there should be some turn-over, perhaps through offering some members to skip a cycle. As was the case for Cycle 0, ASAC believes that the process for merging proposals between panels will need to continue to be evaluated, especially regarding the issue of average time requests between subject areas.

ASAC continues to believe that the abstracts of approved proposals should be published together with or soon after the announcement of the high priority proposals, as they were for Cycle 0. We suggest this is done after allowing the successful proposers to remove any sensitive information from the submitted abstracts. Publishing the abstracts of the accepted proposals is an important measure of the transparency of the PRC and the project itself, which should be held to the highest standard. We also believe that publishing the abstracts has the effect of maximizing the range of science targeted by the instrument, as new proposers will tend to avoid direct duplications of approved proposals. If abstracts were not public until the end of the data proprietary period, the information necessary to avoid such duplications would lag behind by about two proposal cycles. Publication will also serve the purpose of publicizing the scientific topics actively pursued with ALMA. All of the members of the ASAC feel that there

will be a net benefit from immediate publication of the abstracts.

The most important recommendation from ASAC is that the wording in the Cycle 1 proposal call be strictly adhered to in what concerns the offered ALMA time. The call specifically states that there would be about 800 hours for “high priority” programs plus about 50% extra time for filler programs, and hence this should be what is communicated publicly as the output of the Cycle 1 proposal process.

Along with the release of the archive, ASAC recommends the creation of an “observed target list” with minimal information that can help future proposers to avoid repetitions.

4.3 Cycle 2

There was little time to discuss plans for Cycle 2. ASAC will solicit views from the community and looks forward to hearing a detailed plan from JAO at the next meeting.

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