

THE ALMA PROPOSAL REVIEW PROCESS

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1 Introduction

This report was requested by Fred Lo on behalf of the ALMA Board Working Group on time allocation. We were asked to base our recommendations on the outline proposal encapsulated in the Operations Plan, and on a presentation given by the Working Group to the ALMA Board in November 2006. Specifically we have based this document on the ALMA Operations Plan Version C dated 13 February 2007, in particular sections 4.3, 4.8 and 4.9, and on the Working Group's slide presentation from November 2006. We try to stick to the recommendations in those two documents, but in some cases our scientific judgement suggest some of the assumptions in those documents may need further consideration by the Board.

We assume in this document that there will be a common proposal review process for the NA, EA and EU members and a separate proposal review process for Chilean proposals. We propose a system that smoothly joins Chilean proposals with the others, and which can accomodate Chilean participation in the future, even though the detailed Chilean proposal review process is not defined yet.

In this document we first summarise the current process in the Operations Plan (x2), and discuss various policy questions (x3). In section 4, we then propose a more detailed and slightly modified review system for ALMA, and finally (x5) reply to some specific questions from the Board Working Group.

2 The Proposal Review Process from the Operations Plan

For definiteness, we outline the process as defined in the Operations Plan, version C (hereinafter, the Plan), and the Working Group's presentation. Quote marks are used to identify verbatim sections from the Plan.

- The Director of the Joint ALMA Observatory (JAO) will issues Calls for Proposal (CfP) via the ARCs, "once per year initially; goal of twice per year"
- Astronomers submit proposals to an ARC using the JAO-supplied ALMA Observing Preparation software tool. The ARCs support users to achieve this.
- The first and principal round of scientific peer review is done by a group of Panels, made up of Referees, which deal with various scientific categories. Proposers will be expected to choose the most relevant Panel for their application. Each Panel has a Chair and several members, all appointed by the JAO in consultation with the executives. Each Panel ranks the proposals "via email, phone or video conference". Its output is a ranked list, presumably with accompanying notes on each proposal i.e. the Referees' reports.
- In parallel with the scientific assessment, proposals are technically assessed for feasibility by JAO staff.
- The next phase is a face-to-face meeting of the Program Review Committee (PRC). It is composed of "all panel chairs and representatives from each Region's Science Advisory Committees". It takes as input the technical assessments plus the ranked lists and reports

from the Panels. The PRC produces as output “a list of scientific ranked proposals, any comments, and a recommended time allocation for each to the ALMA Scheduling Committee (ASC)”.

- The ALMA Scheduling Committee (ASC) is composed of “the ALMA Director and Executive designates, plus a Chilean representative”. It takes the outputs from the PRC and “recommends ALMA time assignment, and assures appropriate distribution of time per region”. It is expected that the ASC carries forward an excess of proposals (to fill more than twice the available time) to ensure there are always programmes to execute on the telescope.
- “Each Executive may then choose to review and/or modify the ASC recommendations”. This is called the Directors’ Council in the Board Working Group presentation, but a new name may be needed to avoid conflict with an existing body of that name. Executives can at this stage designate some proposals as high priority (“starring” them in some terminology), such that these proposals stay in the queue for more than one period (By default, programs survive in the queue for only one period).
- Finally “the ALMA Director assigns observing time on ALMA”.

So in summary one can identify six review points in this process and six distinct groups of reviewers:

1. The subject-based Panels made up of Referees rank the proposals.
2. Technical Assessment (TA) — in parallel with ATAC.
3. The Program Review Committee (PRC)—gets input from Panels and TA.
4. The ALMA Scheduling Committee (ASC)
5. The Directors’ Council
6. The Director

However, we expect that for most proposals the last three stages are light touch.

3 Discussion Points

1. We take the view that ALMA does not have to reinvent the wheel here. Many other international observatories run effective single time allocation systems. No system is perfect, but we can and should adopt best practise from other observatories where we can. We should avoid having to break new ground unless it is required. Nonetheless, ALMA is unique in its global reach and mode of operation, so some special considerations are required.

2. We believe the use of the phrase Time Allocation is not best suited to ALMA’s mode of operation and we suggest that this phrase be deprecated in our planning. Whilst for telescopes such as HST, time can be allocated to each project because scheduling constraints are well known a priori, the changeable weather in the submm suggests the best we can do is make scientifically (or otherwise) ranked list of proposals, and give each of these a maximum amount of time on the array. The job of the Scheduler (either human or computerised) then becomes paramount for ALMA. At any moment, it must select the highest ranked proposal that can be observed based on the weather and instrumentation available. But over some longer averaging period it must achieve a spread of observations that are consistent with high-level policy set by the Board, including the fair return of observing time to the partners.

This is common practice at other (sub)millimetre telescopes such as the JCMT and IRAM, and the community is used to this mode of operation: they accept that highly ranked proposals are very likely to get time, as long as weather and instrumentation behave, and that middle-ranked proposals (‘B’ in IRAM terminology) are less likely to get scheduled. Guaranteeing fair return on time can be done in different ways: at the JCMT, separate national queues are implemented for

the 3 partners plus Hawaii. For ALMA, we think a single queue system is more likely to be optimal and easier to operate, because we expect and encourage many collaborations between scientists from separate partners. But it is possible (if necessary) to envisage the single queue as a virtual entity, derived by a mapping from 5 separate queues (EU, NA, EA, Chile, International) into one derived queue.

The need to ensure that the return of observing time to the Executives and to Chile matches the agreements between the parties implies it must be possible to 'steer' the Scheduler to ensure parity in the medium to long term. This implies there must be 5 parameters in the scheduling system, one per partner plus one for International proposals, that can be modified which lead to a change in the probability of certain partner's time share being used up.

3. The distinction in the Operations Plan between the roles of the Panels and the ASC is somewhat unclear. We outline a slightly different approach in the x4.

4. We also believe the name of the 4th review stage, the ALMA Scheduling Committee, could be improved. It suggests that ALMA is scheduled in advance, as at the HST or VLA. This is not the case, as we discuss above, and it would be useful to find a better name for this committee. However, it is clear that the distribution of projects amongst weather bands and Right Ascension must be checked early on to ensure that it is at least possible in principle to schedule the proposals given nominal assumptions about the weather: we suggest this is done by the JAO as part of the technical refereeing stage, and by the PRC when it does its ranking.

5. Technical Assessment: in the proposed model, this is done by the JAO and input is not provided to the PRC. We feel that the PRC should receive the technical assessment before it begins its deliberations. The PRC can then pass over proposals which are technically infeasible. In addition, the PRC can then, at the end of its assessment, see if its ranking will lead to a well balanced set of proposals which will cover the available weather bands and right ascension ranges. We believe this is best done early in the process because certain RA ranges e.g. prime locations in the galaxy/galactic centre/LMC will be heavily targeted, and there is little point in the PRC giving its highest ranking to proposals which request the same patch of sky. Hopefully much of the Technical Assessment will be automatic — the proposal preparation tool should ensure that sources are observable, the observing modes required are supported, and that expected integration times are correct.

6. Frequency of Calls for Proposals: there is strong support in our group for two proposal calls per year, as defined in the Operations Plan, at least once ALMA construction is complete and we have routine operation with all 66 antennas. The strong drivers for this are timeliness and managing PhD student projects. While yearly calls may work well for eg. the HST, we believe the situation is different for telescopes at the mercy of the weather. Programmes scheduled on HST are highly likely to produce data of known quality at a well-defined time. ALMA projects will be scheduled as and when the weather allows. A bad year of weather for example could for example leave many highly-ranked projects without data, and forced to reapply for time. If the CfP is annual, delays in trying to get a project completed could be very significant. This impedes the rapid delivery and follow up of high profile science results — which is important to ALMA's international profile and perceived value for money. In addition, it makes it much harder for PhD students to be involved in ALMA projects. Although the 'starring' process by which very highly ranked proposals are left in the queue until complete will help for the very best proposals, it is envisaged that this will only apply for the very best 10-20% of projects.

7. Division of Time between partners. Joint proposals — that is, proposals from investigators from countries including more than one Executive — are expected to be common for ALMA. Indeed they should be encouraged to ensure scientific excellence and the spread of ideas worldwide. In the medium to long term, say 2-4 periods, it is important that there is a fair return of time to the 3 Executives and Chile in the proportions agreed by the parties. Hence an accounting procedure is needed so that the time used on the array by a project can be allocated in fractions to the 3 Executives and Chile.

There are two philosophies possible. With an automatic allocation according to a formula, the Principal Investigator (PI) and co-Investigators (co-I) are each given a numerical weighting, and the time used by the project is divided according to this. The simplest would be for an equal weighting to be applied, but we believe the PI should in general have a greater weight. This formula could depend on the number of proposers — there is probably some merit to this because a 50-author proposal might be handled differently to a 3-author proposal. The alternative philosophy is investigator chosen allocations: in this scheme, the proposal team indicate on their proposal what fractions of time they wish to be allocated to the four partners involved (3 Executives plus Chile).

Both have their benefits. We believe that an automatic procedure, albeit somewhat arbitrary, is to be preferred. The main reason for this is if a joint proposal is very strong, but submitted with a skewed request for how the time should be split, the review committee is presented with a dilemma. In addition, with a formula-based approach, there can be a small ‘cost’ associated with putting co-I’s on a proposal, so to some extent this may discourage the inclusion of ‘sleeping’ co-I’s who are unlikely to contribute much to the data analysis and publication.

After a lot of discussion, our consensus view is that time should by default be counted 100% against the PI’s Executive affiliation, except if the proposers wish in their proposal to request time from more than one Executive, as may be the case for a joint proposal requiring a large amount of time. Although not perfect, we think this simplifies many issues, in particular the important aim of incorporating Chile smoothly into the process.

8. It is widely held in the scientific community that primary scientific review of the proposals is most effective in a face-to-face environment. We support this view. Although we understand that this implies an extra cost and complexity to the process, our experience as scientists with experience of the peer review process tells us that ALMA should aim for this goal if possible.

Such meetings tend to be long and involved unless one adopts a purely score-based system with no discussion of individual proposals. Meeting by audio or video conference is difficult for such meetings, in part because the technology for video conferencing is still at an early stage, but also because of the time differences between the countries involved. For a meeting involving the US, Europe and Japan, at least one of the partners will be meeting in the middle of their night. Nonetheless, video conferencing is improving rapidly, and the human and financial cost of travel is high and likely to increase, so that by 2013 when ALMA is operating routinely the landscape may well have changed. We need to keep an open mind here.

But for the moment, given current technology, we favour a system where detailed scientific evaluation of proposals can be done face to face. We think this leads to the best use of the telescope. It is also normal practice at most other international observatories.

9. Duplications. These come in three types (a) when more than one team applies to observe the same objects in the same observing mode (frequency, configuration, area, depth, etc); (b) when teams propose to try to answer similar science questions with different observations; and (c) where observations of objects already in the archive are requested.

The first case again has to be dealt with by the scientific judgement of the committees. We take the view that identical data should not be taken twice unless absolutely necessary, so in this case if the proposals overlap to a very high degree, one team has to be given a ranking and the others rejected. This is straightforward if one proposal is obviously more highly ranked, but if this is not the case, a forced collaboration may be worth considering if this is acceptable to the proposers. A second attractive option is to deliver the data to both teams simultaneously.

The second case is also dealt with easily by the programme review committee. If a science question is of very high importance, multiple independent approaches will be likely to be encouraged. We cannot and should not try to legislate for this; it comes down to the scientific judgment of the committee, which should be allowed to operate with some degree of common sense and freedom, and which should be sensitive to regional scientific priorities. Since the committee is only advisory to the Board, this is surely acceptable.

Our experience suggest that this will be commonplace in ALMA and that every case is different. A face to face discussion among scientific experts, who have the best interests of ALMA at heart and who are representative of the regional scientific priorities, is in our view the best way to resolve these issues. It is not possible in our view to write a protocol which covers all the eventualities. Ultimately, time on ALMA belongs to the Executives, so that the top level Directors' Council to which the APRC report (see x4) can amend the final recommendations if necessary to ensure each partner (including Chile) has a final say on how its time is used. We simply have to accept the possibility therefore that duplicate observations are made by ALMA for different science teams in exceptional circumstances. There is precedent for this at other international observatories.

4 Detailed Proposal for ALMA Program Review

We here propose a slightly revised process for programme review for ALMA, which we believe provides a useful basis for further consultation with the Board and ASAC. We are addressing here steady state operations with a completed ALMA, from late 2012 on, A similar system could be used and exercised during Early Science, perhaps with a reduced number of panels and with no more than one Call for Proposals per year. We recommend that from the start of full science operations, proposal calls should be issued twice per year.

Succinctly, we propose a three stage process:

- Several ALMA Review Panels (ARPs) — we assume 8 subject-based panels covering 4 scientific areas — review the proposals scientifically, and make recommendations to the ALMA Programme Review Committee (APRC)
- The APRC receives inputs from the 8 ARPs and also from the Chilean review process. It produces a single ranked list of proposals, incorporating regional scientific priorities. It may also indicate which proposals should receive special 'starred' status — these are proposals which can be carried over from semester to semester if observations are not completed.
- These recommendations are passed to a Directors' Council (DC) comprising the Chair of the APRC, the ALMA Director, and representatives of each of the 3 Executives, and Chile (6 people in total). This body makes the final decision on proposal ranking, taking into account any further regional considerations and other general balancing issues. (As mentioned earlier, a new name for this body may be needed).

This final ranked list of proposals is then used to solicit Phase 2 information from proposers, which then results in a queue of Scheduling Blocks being created, and finally observed. In more detail, the process should proceed as follows:

1. An overall Chair of the ALMA proposal review process must be appointed by the ALMA Board, with nominations from the Executives. The 'super' Chair is not a member of any ALMA Review Panel. This position should rotate appropriately between the partners.
2. On the Director's instruction, the JAO issues two calls per year for proposals, with details of the instrumentation, configurations and time expected to be available. These instructions are communicated to the ARCs who then inform their user communities.
Perhaps yearly calls for proposals in early days of ALMA will be sufficient. The possibility of 9-monthly calls for proposals could be considered. It may be a good compromise between yearly (too infrequent) and 6-monthly (perhaps too frequent) calls.
3. Proposers must submit their proposals in English using the JAO-provided Observing Preparation software tools. They choose one of 4 defined science areas in the proposal. For each

of these 4 areas, there are two equal ALMA Review Panels (ARPs), making 8 panels in total. The separate panels for each area are to help spread the reviewing burden, and to minimize conflict of interest issues. The proposal deadline should be at least 6 weeks after the Call for Proposals (CfP) is issued.

We assume here that there are 4 scientific areas, as defined by the ESO OPC; but there is clearly scope to increase this number or change titles if appropriate. Specifically, the subjects could be Cosmology; Galaxies and Galactic Nuclei; Interstellar Medium, Star Formation and Stellar Evolution; Planetary Systems including Solar System. A detailed specification of the subjects encompassed by each Panel will need to be written down. We should seek more detailed input from existing telescopes running Panel-based systems. The ALMA areas need to be defined to balance the workload of each panel.

4. The proposals should contain a declaration by the proposal team as to what fraction of time being sought should be charged against EU, NA, EA, Chilean and International time. If this section is not completed, all time used will be counted against the P.I.'s Executive affiliation.

We did consider more sophisticated allocation of time to partners, including a formulabased system with different weights for PIs and co-Is which has some benefits, but in the end we recommend this simpler solution. We expect typical single partner proposals to be charged 100% to the PI, whereas joint proposals requesting significant amount of time will likely request to split the time allocated between partners. The Board may wish however to run in parallel a formula-based system purely for monitoring purposes, to give a better idea of how ALMA time is being used and how effective is its open skies policy.

5. Proposals where the PI's affiliation is not an ALMA-partner country will be submitted in the normal way to the Panels, but they will be flagged with International status. They are to be reviewed and processed in exactly the same way as a normal proposal. The total amount of time that can be used by International proposals should be limited by the Board to a fixed level, which could be varied depending on the quality and quantity of International proposals received. The Board will need to decide how open the ALMA skies can be given the significant investment of the partners. We suggest something of order of 5% of the total time available on ALMA. We also suggest this time be counted against the ALMA partners, in proportion to their share of observing time.

6. Chile do not currently anticipate taking part fully in the ALMA review process outlined in this document, but hope that a closer involvement may be possible in the future. We encourage the Board and the Chilean community representatives to work towards this goal as we feel it is in the best long-term interests of ALMA, of science, and of development of the Chilean community. Because a return of 10% of the total to observing to Chile is guaranteed by the process defined in this document, we feel this is an achievable goal within the current framework. Nonetheless, there are special considerations within the Chilean community that require, at least initially, that Chilean proposals are assessed by a separate Chilean TAC.

Proposals requesting time both from Chile and another partner(s) would have to be submitted separately to the Chilean and the ARPs, likely with different PIs.

7. Proposals are technically assessed by the JAO for feasibility, as rapidly as possible after the submission deadline, and these are provided to the Panels in a timely fashion.

It seems to us that the Technical Assessments should be seen early on by the Panels, as there is no point working hard on proposals which are not feasible. Hopefully the Phase 1 process will catch the majority of infeasible projects, but this system cannot account for example with sudden failure of a whole observing mode.

8. Each of the 8 ALMA Review Panels (ARPs) is made up of a Panel Chair and Members, who are nominated by the JAO in consultation with the overall APRC 'super' Chair and the Executives. Each ARP will also need a Secretary with astronomical knowledge to assist their work. All are scientists and appointed by the ALMA Board from Executive nominations. We suggest that each Panel comprises 8 people including its Chair, with the total number of

representatives from each partner being proportional to their contribution to ALMA. A possible make up of a typical panel might then be 3 NA, 3 EU, and 2 EA members. If Chile were to join the main review process, one would add a Chilean representative also, to make a membership of 9. The ARP will receive the proposals promptly after the submission deadline, within a week or so. In addition, they will receive the Technical Assessments for each proposal from the JAO.

It is assumed that proposal distribution and assessment will be handled by an online system, so that for example the technical assessments are written in Chile but available via a web system anywhere in the world. In addition, the ARP members should be able to add confidential notes to the proposal system.

9. The Chair of each ARP, with the assistance of the Secretary, allocates a principal assessor (PA) and a secondary assessor (SA) for each proposal from amongst the ARP members. At their own institutions, and over a period of about 1 month from the submission deadline, the ARP members read and grade all the proposals, taking account of both the proposal itself and the technical information when available from the JAO. The PA and SA should write a short critique of each proposal, and grade it; other panel members will simply grade the proposal on a numerical scale. Note that in this proposal, external referee reports on the proposals are not envisaged: peer review is done entirely by the ARP.

Assuming 1000 proposals per call, we expect of the order of 250 per subject area, so that of the 8 ARPs will receive 125 proposals. A typical panel member will then be expected to be principal assessor for about 15 proposals, and secondary assessor the same number. But each ARP member will be expected to read and grade all 125 proposals; depending on the number of proposals that will actually be submitted to each of the scientific areas, if the workload for each individual panel member becomes too great, additional panels for that area will have to be set up, so that each panel member will be able to grade all proposals assigned to his/her panel (this is common practice within the ESO OPC for example.)

10. Each ARP then 'meets' to discuss the proposals and initial ranking. The PA and SA on each proposal have an opportunity to present their critique, and all members have an opportunity to comment on the critique.

It is at this meeting that the ARP considers the relative scientific merit of each proposal, and determines how to handle clashes between proposals requiring similar observations or pursuing closely related scientific goals.

What form of meeting should this be? In common practice, this is a lengthy face-to-face meeting of all the Panels, often coinciding in time and space. The Operations Plan suggests a telephone or videoconference will suffice. The majority view of professional astronomers we have talked to strongly favour a face-to-face meeting. However, there is no scientific evidence to suggest that face-to-face meetings will have a better outcome than a virtual meeting. It is based entirely on anecdote, and given the high cost of travel in terms of travel costs, carbon costs and lost time on other duties, it is clear that this decision needs careful consideration, and constant review, by the Board.

11. Regardless of how the ARPs meet and do their work — remotely or face-to-face — the output from each ARP is the same: a ranked list of proposals with recommendations on how to handle duplicate proposals. It may also include a list of 'starred' proposals which are the highest priority ones that should be left in the queues for more than one semester.

12. The next phase is for a meeting of representatives of all the ARPs to do the final merging of lists. We suggest that this body be called the ALMA Programme Review Committee (APRC). Its membership should consist of the overall APRC 'super' Chair (who is not a Panel member), 8 ARP chairs, and representation from the Chilean TAC if appropriate. This leads to an APRC of some 9-10 people in size. We expect this Panel to meet face to face, probably in Santiago, but perhaps by rotation in other partner countries.

The APRC should also be involved at the start of the proposal review process. It is the APRC which convenes the panels (ARPs) and recommends the amount of time notionally available to

each Panel to assign. In practise, this time estimate is simply a guide to how much observing might be typically available to proposals to each panel assuming normal weather conditions.

The APRC's main role is to generate a single ranked list of observing projects which can be executed by the ALMA scheduling system. To do this, the APRC has to take account of the ARP and Chilean recommendations.

13. It is necessary that the final observing queue contains sufficient projects to cover the available range of observing parameters: RA ranges, weather bands, and array configurations. The total time required by the proposals in the queue is therefore likely to be 2 or more times greater than the total time available. Fluctuations in weather statistics mean this is a difficult problem to quantify. In the first instance, each ARP should strive to ensure that a reasonably well-balanced set of proposals is recommended, i.e. it should ensure that the final proposal list does not concentrate solely on small areas of the sky or at particular frequency bands. However, because different panels will have different requirements for RA ranges, weather bands and configurations, it is the APRC's job to ensure the final queue is relatively balanced, but is also capable of providing good scientific programmes to cover all weather eventualities.

It may be a good idea to develop a software tools that uses the ALMA Scheduling software to examine the APRC recommendations, using Monte-Carlo simulations to assess likely outcomes depending on different weather scenarios.

14. The APRC must also review the use of time over previous observing periods to ensure that it is achieving high-quality science with its allocations of time, that partner strategic priorities are being met, and that fair return of observing time to the partners is being achieved on average.

15. The final step in the process is for the APRC recommendations to be examined by the Directors' Council consisting of the JAO Director, a representative from each Executive, one from Chile, and the APRC 'super' Chair — a total of 6 people. This body has final executive authority over the time. It should meet immediately after the APRC. It makes the final recommendations and adjustments to the APRC's ranked list of proposals. This top-level body is the final place for dispute resolution and where in particular issues of *juste retour* and partner strategic priorities can be addressed directly at an executive level. The role of the APRC Chair in this meeting is to present the APRC recommendations and to answer questions as necessary from the members of the Council.

5 Response to Specific Questions

The Board's Working Group presentation raised 8 explicit questions which need to be discussed and answered. We include these for reference here, plus our responses in italics. Several of these have already been touched on above.

1. How many calls for proposal per year?

Two per year in steady state is strongly preferred by most scientists we have consulted. The strong drivers for this are the vagaries of the weather, the different ALMA configurations, and the need to get students involved in ALMA science which is much easier with frequent calls for proposals.

2. Proposals refereed and ranked by one Time Assignment Committee and observing time assigned by Scheduling Committee?

We believe Time Allocation and Scheduling are best avoided as phrases in the peer-review process, because ALMA will schedule observations dynamically (see x3) and the outcome of peer review is a ranking rather than a firm schedule.

3. How are regional differences in science emphasis incorporated?

If required after scientific assessment and ranking by the APRC, then this must be handled by the Directors' Council, as detailed in x4.

4. How should duplications be treated?

This must be handled by the Panels and APRC (x4).

5. Distribution of observing time strictly tied to Value of each region and 10% for Chile for each round of proposals? Strict balance achieved over 2 years? (Essentially, four parallel ranked lists of proposals).

In the early phases, it is important that strict balance is achieved on a yearly basis to ensure partners have a reasonable involvement in early results from ALMA; in steady state, a 2- year balancing should suffice.

6. How is the share of observing time of joint proposals attributable to each region and Chile?

We propose that the default algorithm is for time to be counted entirely against the PI affiliation, but that the proposal form should allow proposers override this and request specific fractions of time from the partners.

7. What fraction of the total observing time should large projects take up? What defines a large project?

We do not feel it is the right time to make any policy on this. ALMA is a new instrument, pushing the boundaries of submillimetre astronomy in sensitivity and resolution. The discovery space is unexplored and scientific results will be uncertain and exciting. ALMA is not like, for example, a 4-m dedicated IR survey telescope where it is possible to plan large legacy surveys with some degree of confidence before first light. ALMA surveys will, we believe, be organised via a bottom-up process in the community once ALMA is fully operational, and the community has seen early science results. The proposal system as described can handle large proposals naturally without any need for top-level intervention. In particular, the single review process (with the possible exception of Chile) makes joint proposals easy to put together, and the possibility of teams declaring what fraction of time a proposal should be assigned to the different partners allows large proposals to be submitted via the normal channels. The review panels can rank the large proposals meritocratically against the smaller ones, and take a strategic view as to which are most scientifically valuable. In addition, if the programme review panels and committees are not giving time to large proposals in line with strategic recommendations of the ALMA Board, the final stage of proposal review can be used to align allocations with these priorities. If the Director and the Board wish at a later time to call specifically for large proposals for ALMA, perhaps with a different time allocation system, then it will be straightforward to do this at a later date, but we do not feel it is imperative to define this process now.

8. How to incorporate Open Sky Policy?

This depends of course on exactly what is meant by 'Open Sky'. ALMA is by now a 17- country collaboration. Only a small fraction of astronomers worldwide do not have access through their national status. For the majority of these, we feel that natural collaborations with astronomers from member countries will occur. But to ensure that the best ideas from non-member countries can be observed by ALMA, we have suggested that an 'International' category of proposals be created, as described in 4. Up to 5% of the ALMA time could be allocated to this type of proposals.

6 Summary of Key Issues to be Resolved

1. The role of Chile needs further discussion with their community representatives.
2. One queue, or multiple queues? Because we have argued that proposals with co-I's from different partners should be encouraged, we favour a single queue system, including Chile even if they are outside the ALMA Panel review structure.
3. If a single ALMA queue is to be operated, then the detailed of the merging process need to be addressed. A simple renormalisation of each panel's (plus Chile's) ranked lists before merging will probably not suffice, because each list will contain more observing projects than there is time available to cater for weather fluctuations. One simple approach might be to cut each input list at the point that the total schedulable time is equal to the time available to that Panel (or to Chile), then renormalise, and merge. This produces a highquality queue which will only just provide enough observing projects to fill the available time. The remaining

projects then need to be merged below this by some other means. There is a lot of scope for creativity here. We need to talk to other observatories and investigate options if a single queue system is adopted.

4. The formula for accounting for time according to the list of investigators needs to be sanity checked.
5. How, and if, the time allocated to the various partners should be balanced across array configurations, frequency bands, and right ascension. If the time is balanced across these parameters, then my concern raised above is no longer valid. We may need to provide guidance here.
6. How should projects across different frequencies bands be scheduled. For example, if the weather is good, should a low ranked project requiring "great" weather be observed before a high-ranked project that only needs "average" conditions? This is a scheduling matter that some other committee will need to address, but we may want to point out that it has implications for which projects get observed.