

Report of the ASAC Operations Study Group
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1. Overall Introduction

There are two topics considered here: the Proposal Review and Time Accounting process; and the functions of the Regional Science Centers. The first topic is covered in Sections 1-6 and the second topic is covered in Section 7. The Appendix collects information on how the proposal review and time allocation process works at other multi-partner facilities and presents the results of discussions about the RSC in the European, Canadian and US communities.

We recommend review of the report on ALMA Operations produced after the Chile meeting because this current document builds on that document and makes considerable reference to it.

2. Proposal Review Committee

In this section, we discuss the ideas regarding Proposal Review Committee(s) (PRC). The first subsection lays out some general principles and the assumptions that we are making. Following are two models: one for a Subject-based PRC; and one for a Partner-based PRC. Each of these attempts to mitigate the negative features of that model. Following the models, there is a section with questions for discussion at the ASAC meeting. Some of these questions apply to specific models, but many are general and we need resolution before we can proceed further.

3. Principles and Assumptions

3.1. Introduction

In this section, we lay out some principles and assumptions that guide our considerations. We will distinguish between time allocation and proposal review. We will adopt the term Proposal Review Committee (PRC) for the group or groups that review proposals. We assume that the ALMA agreement will have some provision for how time must be related to contributions by the partners. After establishing some principles, we list some "Use Cases" that illustrate some of the issues that will come up. Some of the issues we raise have to do with the accounting of that time. Others have to do with the proposal review process itself. Finally, we list some assumptions that we are making in thinking about the time allocation and proposal review process. In particular, we address issues of how the proposal review process interacts with the dynamic scheduler, which is the nexus where the ALMA agreement on time sharing and the proposal review process meet. These are intended to provoke discussion among the ASAC members, leading to a consensus report to the ACC, with a list of unresolved issues for further study.

3.2. Principles

1. Scientific quality should be the prime factor affecting whether a proposal is allocated time or not.
Probably can all agree on this. But, to a certain extent, beauty is in the eye of the beholder.
2. The proposal review process should encourage applicants who are not experts in mm interferometry.
- vital that user community is large - the system should ensure that basically good science even from weak or new proposers is looked on kindly. Principle 1) of course still applies.
3. The quality of an observing team's past productivity with ALMA data will have a bearing on outcomes.
- this implies the need to track previous ALMA proposals and publications in some way as part of the proposal preparation system.

4. The proposal review process should be flexible enough to allow somewhat speculative observations, for short blocks of time, which test the viability of potential future projects.
 - e.g. how bright is this new class of objects at 1mm?
5. The proposal review process should be as transparent as possible.
 - reasonable and informative feedback to applicants is a must. - membership of the PRC should be open and through user consultation - turnover of PRC members should be fairly quick
6. The proposal review process, combined with the dynamic scheduler, should produce on average a return of observing time to the partners commensurate with their contributions.
 - this is assumed to be part of the ALMA agreement. The remaining issues are the exact meanings of “average” and “commensurate”.
7. The proposal review process should make special provision for ‘large’ programs and ‘Legacy’ (no or reduced proprietary period) programs.
 - do we allow for ‘long term status’?
8. There must be a mechanism for dealing with unfinished proposals
 - delete or carry over to future periods?
9. The proposal review process should allow users from non-partner countries to apply for time. Their proposals should be as good as those of partners if they are to win time.

3.3. Use Cases and Questions

These are intended to raise questions for either the ASAC or those negotiating the ALMA Agreement or both.

1. A team with members from each partner sends in a proposal. How is that time accounted?
2. One partner proposes to use all their time for a project that requires the best weather conditions. Is all time counted the same, or does the time when weather is best count for more?
3. Three teams, one from Japan, one from NA and one from Europe, all apply to do a survey during the same proposal period. How do we decide among them? Are collaborations encouraged or enforced?
4. A team applies to observe the 20 brightest sources which will be discovered in the next few weeks by their own balloon mission. How do we handle target of opportunity proposals?
5. A team applies to image Martian atmosphere every three months for the next 5 years. How do we handle long-term monitoring proposals?
6. A team applies to observe the mm light curves of the next three strong Gamma Ray Bursts, at 30 minute intervals for 5 days after the burst. How do we handle proposals that need time critical observations?
7. A team requests flux measurements and lightcurves of 10 asteroids: the observations must be done within the next three months before a satellite starts operating. How do we handle proposals that need time critical observations?
8. A nova occurs mid semester and a team wants to monitor it: the leader rings the ALMA director and asks for time. How do we handle targets of opportunity outside the proposal period?
9. A multi-partner team submits a Legacy proposal that requires a lot of time with the condition that the data are available to the community with no proprietary period.
10. ALMA staff members in Chile submit a proposal

3.4. Assumptions

The outcome of the proposal review process is a ranking of proposals on scientific merit, rather than a guarantee of a given number of hours.

We must consider the interaction of the PRC and the model for observing. We should remember that essentially ALL observing with ALMA will be queue-based scheduling based on the match of current conditions to the requirements of the program. In the model we suggested in our last report, the dynamic scheduler will consider scientific ranking, stringency, and execution status. **The PRC therefore does**

not assign time as usually understood, in the sense of particular dates, or even a number of “guaranteed” hours. Instead it assigns a scientific ranking. While we did not include “partner parity” in the description of the things considered by the dynamic scheduler, that may need to happen. No matter how finely the time allocations are balanced between partners by partner-based or subject-based PRCs, the share may not come out that way in the end because of the statistics of weather. The dynamic scheduler is “where the rubber meets the road.” The degree to which time allocations must balance and the timescale over which they must balance will be decided by negotiations among the partners, as part of their agreement. This appears to be happening in the negotiations on the agreement for the two-way partnership and we expect that it would be so for a three-way partnership as well. This fact removes the issue of partner parity from the considerations on PRCs. We still have to deal with “style of science issues”, but we are not worrying over how much time one partner is likely to get in a particular style of PRC.

We assume that the recommendations of the PRC will be advisory to the Director and that the Director will have some discretionary time to deal with targets of opportunity.

This assumption could be discussed, but it is hard to see how one deals with some of the use cases listed above without it.

We assume that the eventual ALMA is a three-way partnership with equal shares of time to each partner.

This assumption allows us to be specific about structures, but the ideas can be generalized to a two-way partnership or uneven shares.

We assume that 10% of the time goes to Chile and that some fraction goes to Director’s discretionary time, proposals from outside the partners, etc.

For the sake of definiteness in discussion, we assume that 84% of the time is divided among partners equally, leaving 28% for each of three partners or 42% for each of two partners.

We estimate up to about 1000 proposals per year.

We assume that there are 330 days in the year after roughly a month is devoted to maintenance of various sorts. All of these as well as some assumptions that follow are arbitrary and just made in the interest of initiating a discussion. They do not indicate any strong preference. We also require an estimate of the amount of time required for an “average” proposal as well as of the “over-subscription factor”. For the moment, we assume over-subscription by a factor of 4, which is normal for many institutions. ALMA is a single telescope and will probably be mainly used as such even if there is a sub-array capability. On the other hand, due to its excellent UV coverage, many proposals will require merely a single synthesis of a few objects, say 1 day in total. Many proposals will probably be snapshots, with even shorter duration. On the other hand, there will probably be a fraction (say 30 percent at a guess) of the time devoted to long programs (say 10 days or 240 hours). If this were to be the case, we would have 10 long programs and 230 short per year. Taking over-subscription into account, this implies 960 proposals (similar to HST). This may be an overestimate. Long programs are easier to handle and there will be pressure from the institutions in their favor. But we conclude that in a “worst case analysis”, there might be 1000 proposals per year.

We assume that the proposal review process operates twice per year.

Doing the proposal reviews twice per year provides more frequent response to new science opportunities and keeps the number of proposals to be reviewed each time to a more manageable level (up to 500).

For proposals with co-Is from different partners, we assume that the accounting of time will be governed by what partner the PI belongs to.

For example, a proposal by a Japanese PI and 5 European co-Is that received 100 hours would be accounted fully as Japanese time. There are issues with this assumption and one can imagine counting some of the time for the co-I partner share.

The model PRCs that we present are “straw-person” models.

Until ALMA is up and running, we will not really know what is the best solution to the problems of designing an ALMA PRC. Thus, it does not make a lot of sense to define it too precisely at this stage. What we present here are just “straw-person” models. One should remember that all the systems (apart from those which are very new) that we have discussed in our group have evolved in response to the changing scientific climate and the changing capability of the telescopes. Nevertheless, we make the models specific enough that we can see how they might work and how different use cases would be handled.

We define “rank-ordered” and “graded” lists.

Since these terms caused some confusion in our discussion, we define them here. A **rank-ordered** list assigns a unique number to each proposal. If there are n proposals in the list, the top proposal is assigned the number 1 and the lowest proposal has the number n . A **graded** list assigns one of m grades to each proposal. When $m < n$, multiple proposals will have the same grade.

4. Model for Subject-Based PRC

4.1. Introduction

This is a model for a Subject-Based or unified ALMA Proposal Review Committee (PRC). It is based on the systems used at HST and ESO and adapted to the circumstances of ALMA.

4.2. Structure

4.2.1. Overall Structure

We assume that the PRC consists of an Observing Program Committee, the OPC, and Subject-Based Panels. The Panels would provide a ranking of proposals within their subject area and the OPC would merge these into a single set of rankings (with 1 the top ranking) and make recommendations regarding balance between general proposals and special programs (large, legacy, key, treasury, etc...). We propose that the panels and the OPC meet in a location that rotates among the partners. We do not envision mail reviews in addition to the reviews from the panel, but these could be added. The details of the panel operation are not spelled out here.

4.2.2. Composition of the Panels and the OPC.

We assume 4 panels and suggest below the subject areas. We think that roughly half of the panel members should be chosen by the partners as *representatives* of their regions (Europe, Japan, N. America) and the other half by ALMA. The reason for *partner representatives* is to reassure the regional communities that they are fairly treated. The rationale for ALMA or At Large Representatives is to ensure that in the Panels all specialities are covered. Experience at least in ESO suggests that the regional communities by themselves are not capable of ensuring an equitable distribution over the sub-disciplines. We note however that also the At Large Representatives would on average reflect the breakdown 2:2:2:1 between Europe, North America, Japan, and Chile. The Partner & ALMA Representatives should have equal say on the panels. The Panel chairpersons would be members of the OPC and would be distributed among the partners evenly (e.g., 1 Europe, 1 North America, 1 Japan, 1 Chile if there are four panels). We propose 3 year terms for each panelist to balance experience with the need for new ideas and to avoid overstressing individuals. The Panel chairpersons would rotate every year.

The OPC would consist of the chairpersons of each Panel and additional members chosen by the partners (one for each partner) and additional members chosen by the ALMA director. These extra members should have an equal say to the Panel Chairs. The members of the OPC would serve 3 year terms. The final composition of the OPC would then be 3 Europeans, 3 North Americans, 3 Japanese, and 2 Chileans (11 in all).

4.2.3. Rationale for Number of Panels

The assumptions about proposals imply a large amount of work for referees who are neither paid nor have other incentives. Experience suggests that there is a *pain barrier* which is roughly 100 proposals every 6 months. Bearing these considerations in mind, we suggest for ALMA 4 panels of 7 persons each (2 from Japan, 2 from Europe, 2 from North America, 1 from Chile). Based on the assumed proposal pressure, that would imply 120 proposals per panel per 6-month period. At any one time, there would be 28 people (8 Europe, 8 N.America, 8 Japan, 4 Chile) on the ALMA panels. In order to reduce the workload of proposal evaluation, one could have two ‘primary’ assessors, and several ‘secondary’ assessors. However, in order to have an unbiased view, every Panel member should read every proposal. (With the worst case scenario, this means 250 proposals per year! NJE)

4.2.4. Subject Area Distribution

The Panels could be distributed as follows (strawperson plan):

1. Stellar Astronomy including the Sun, circumstellar envelope, planetary nebulae etc.
2. Interstellar Medium, Star and Planet Formation, Solar System including planets and comets.

3. Nearby Galaxies including the Magellanic clouds and AGNs with $z < 0.1$
4. Galaxies and Cosmology including high-redshift objects, S-Z effect etc...

The idea behind this breakdown is to have roughly equal numbers of proposals coming to the different Panels. The subject areas should be redefined periodically based on proposal pressure.

4.3. Charge to the Panels

The Panels are charged with producing a rank-ordered list of all proposals assigned to them along with any time adjustments deemed necessary.

International (no proposer from a partner) and ALMA staff proposals are assigned to the Panels in the same way as any other proposal. The Panels should not explicitly consider partner balance, but they may consider partner priorities for style of science (e.g., continuum versus line, survey versus case study, ...) as expressed by the partner representative. They may also consider balance between sub-areas within their large subject area. While they do not assign time, they may consider time requirements in their ranking. While the ALMA simulator will have determined how long a given proposal requires, the panel may decide to set an upper limit to the time permitted, based on a lower S/N requirement or a judgment that fewer sources would suffice. The Panels may or may not break complex proposals into separate pieces with different rankings (as suggested in our last report). (This last point is controversial.) The Panels may include technical feasibility or stringency in their considerations, as supplied by the ALMA simulator during the proposal process. Comments on each proposal could be sent on request. These comments will reproduce the raw opinions of the primary assessors, including contradictory ones. (There is some difference of opinion on how important the comments are.)

4.4. Charge to the OPC

The OPC is charged with review of special programs and merging the panel rankings into a single number that represents the scientific priority in the dynamic scheduler. Special programs include proposals for large blocks of time with no proprietary period, very large proposals, and anything else that requires an overall view. They may ask the subject-based panels for scientific evaluation of such proposals, but responsibility for their overall ranking rests with the OPC. Finally, they are responsible for advice to the ALMA Director regarding the proposal evaluation process, panel subject areas, etc.

The OPC is responsible for producing a final rank-ordered list of proposals. It must first decide on the fraction of time going to different subject areas (default is an equal amount for each panel, but this could be adjusted based on proposal pressure and priorities for special programs. Just how adjustable this fraction should be is debatable but in any case the OPC should put enough proposals in the queue to cover fluctuations in weather. It is certainly preferable if the proposal pressure is similar in all areas, and the OPC may recommend adjusting the panel subjects for the next cycle to improve the balance. The OPC should also consider special programs as defined above and should decide where to insert these in the rankings (probably based partly on Panel recommendations). They can also consider whether international programs (from outside the partner countries) have had a fair deal. They should rank the proposals following the panel grades and award each proposal a single number that can be fed into the dynamic scheduler. The ranking is a recommendation to the ALMA director, which he (she) would presumably as a rule accept. There is a minor debate here about whether a rank (best proposal 1, 2nd best 2 ...) or a grade (A,B,C,D ...) is the best way of doing things but either way, the number produced by the system should not leave the dynamic scheduler to make choices among science priorities.

This is one way of deriving such a number. We can imagine that the OPC will give all first ranked proposals from a panel rank 1, all second ranked rank 2 and so-on until the time available to a certain panel has been used up. Available in this sense means the maximum time which might be required taking into account the weather. Proposals below the cut-off could then be informed of their misfortune whereas those above the cut-off would merely know their rank and that their proposal was in the queue. This information together with the number of proposals in a given panel above the cut-off can be used to calculate a number (probably > 10 but < 100) which will be transferred to the dynamic scheduler who will use the information to assign a scientific priority to go into the stringency equation. Just how that number will be calculated is open to debate but it should (we think) not be too difficult.

An assumption being made in all of the above is that the dynamic scheduler will deal both with stringency and partner parity but clearly, this is a “cop-out” and the OPC may have to interfere on occasion to make sure that we are not completely ruled by software. In particular, they will continually monitor partner parity and if necessary recommend that the dynamic scheduler software parameters are adjusted to assure that end.

In this matter as in many others, they will have to gain experience as they go and we suspect that it is not useful now to “second guess” too much the problems which may arise when ALMA is in operation.

4.5. Charge to the Director

The OPC reports its rankings to the ALMA director. The duties and powers of the director have yet to be defined. If the director has discretionary time, he or she exercises that by inserting programs into the rank-ordered list. (There is some disagreement on this point.)

4.6. Pros and Cons of a Subject-Based PRC

- **Pros**

1. More expertise on subject-based panels
2. Can favor multi-partner collaborations including large programs or surveys.
3. Competition leads to better proposals.

- **Cons**

1. Issues of partner parity can arise if scientific decisions do not produce an even split.
2. The OPC decides about items such as Large Programs or Key Programs which may be of considerable importance to specific partners.
3. The OPC has to balance priorities among subjects.

The model we propose attempts to mitigate the Cons as follows. To first order, issues of partner parity are removed from the proposal review process. These are handled by the dynamic scheduler in accord with the agreement among the Partners. Second order effects are mostly “Style of Science” issues, meaning that different partner communities may have different priorities regarding large and small programs or subject areas. In the OPC, each partner will have equal representation and thus should in our opinion be able to defend the “style of science” which they find important. In particular the partner representatives on the OPC will be able to defend requests for time for “Large Programs” etc. This in our opinion is in the long run an advantage for those proposing such programs since the effort of preparing a proposal for the ALMA PRC will (we hope and trust) force the proposers to optimise their program to make full use of ALMA. Moreover, we note that in the scheme above, the partner representatives on the panels can also be expected to represent the priorities within their communities.

The trickiest issue in many ways for the subject-based PRC is in fact the repartition between subject areas (solved above by again leaving it to the discretion of the OPC). This also is a problem however for partner-based PRCs though the problem is hidden. Again, we suspect that the solution is to wait and see if it is sufficient to adjust subject areas to ensure a roughly equal distribution of proposals between panels. If one does that, in the above model, people should be happy even if one may debate whether the best science is being done.

4.7. How the Use Cases are Handled

1. Proposal with members from each partner: This is easy in the subject-based PRC. However, the time should be counted in proportion to each partner following a weighting scheme to be defined.
2. Does good weather (high stringency) count for more than bad weather (low stringency)? This is a difficult question. For the sake of simplicity, let us assume that the time is the same for both bad and good weather. This should be further debated.
3. Teams from different partners apply to do a survey: Collaborations between partner teams are encouraged in the subject-based PRC. However should competing proposals appear, the Panel would rank them on the scientific merits of the proposals. Forcing collaborations is never a good thing.
4. Team applies to observe sources that will be discovered soon and targets of opportunity: This should be handled via the Director’s Time.
5. Team applies to monitor Mars over 5 years: if explicitly asked in the proposal and if the science ranking is good, the program should be performed. That is, a project can acquire long-term status.
6. Time critical GRB monitoring, if the proposal is ranked highly enough, time critical observations of foreseen events should be given priority in the scheduling.

7. Time critical asteroid monitoring: Same as last item except that the time constraint on the dynamic scheduler has more flexibility.
8. Targets of opportunity outside the proposal period: Events which are unforeseen (SN explosion) should be handled via the Director's time. This implies that the director can insert projects into the queue during the semester.
9. Legacy projects are in the category of special projects. They are reviewed for science goals by the appropriate panel, but their ranking relative to normal proposals is done by the OPC and/or the Director.
10. Proposals for ALMA staff are handled as any other proposal would be.

5. Partner-Based PRCs: A Model for ALMA

5.1. General Introductory Comments:

It is clear from the discussions so far that there are many important issues to be considered in the design of the PRC(s). It is also clear that some issues in how the PRC(s) run interact with how the dynamic scheduler needs to be designed (for example, is high frequency time worth more than low frequency time).

For Partner PRCs, some critical issues that were articulated in the first round of comments include: whether the PRCs will follow common ground rules in areas such as long term status programs and thesis programs; whether we wish to allow for Key Projects and if so how they should be ranked; do we really need an IPRC (with the resulting increase in committee work and travel for key individuals) or can we design a system that functions well without it?

With these issues in mind, this draft should be considered a "work in progress". Chris Wilson wrote the original draft plan for a Partner-based PRC, with comments from John Richer, Mark Gurwell, and a few key notes from Neal Evans. Seiichi Sakamoto provided a short but eloquent note on the desire for Partner-based TACs by the Japanese community. Mark Gurwell wrote an additional draft plan for a hybrid PRC, which was ultimately deemed to violate "Malcolm's Law" ('Less work, not more!'). What follows is an attempt to merge the Partner-based PRC draft with the Partner-based aspects of the hybrid PRC draft; Mark Gurwell has written with wild abandon in this reworking process (as well as Jane's Addiction on the stereo), and all errors are likely his fault.

5.2. Pros and Cons of Partner PRCs

Pros:

1. Issues of partner parity are minimized.
2. Different partners can define different scientific priorities.

Cons:

1. Can work against collaborations among scientists from different partners.
2. May place "partner share" at a higher priority than "science ranking", depending on how the dynamic scheduler actually works.
3. May produce duplicate science.

5.3. Assumptions Used for Partner PRCs:

1. Each partner has its own proposal review process, likely a Proposal Review Committee (PRC) that weighs the scientific merits of the proposals with PI's from that partner (North America, Europe, Japan, and Chile each have their own PRC).
2. Each partner expects, within reason and over the long run (2+ semesters), certain fractions of the overall science observing time allocated among the Partners (NA=Europe=Japan=28%, Chile=10%, Director Discretionary=6% is the default).

3. Time is time. That is, integration time at 850 GHz counts the same as integration time at 30 GHz. This assumption has significant ramifications, however, and should be discussed thoroughly!
4. ALMA will utilize dynamic scheduling that uses a weighted combination of science ranking, “stringency”, and “execution status” to ascertain which project in the dynamic pool will be observed under current conditions. Aggregate partner share may be a fourth index, or may be used to modify stringency, if there is an imbalance to address. Usually but not always this will be at the highest frequency possible for the given conditions of opacity, seeing, etc, as long as there is a highly ranked project to do at this frequency.

We note here that “science ranking” used by the dynamic scheduler will actually be derived from the Partner PRC science ranking but will also take into account partner parity at the outset (see Suggested Organization, Item 4).

5. We identify three proposal classes: Standard Proposals (to be completed in one semester), Long Term Proposals (those which need to run across more than one semester, for whatever reason) and Key Projects (large amounts of time to do things which are generally useful to the community).

Long Term: something that has a sensible reason for continuing over more than one semester i.e. long-term monitoring of Mars; a very large coherent project needing more time than can be given in one semester.

Key Project: special project of general interest to a large fraction of the community, i.e. Hubble Deep Field; CO survey of LMC; protostars in Taurus etc. Key Projects only to be submitted when called for, perhaps once every 2-3 years, and are considered separately by a special PRC constituted just for that purpose. No proprietary period?

6. The role of the International Proposal Review Committee: In a purely partner-based system, there should be little need for an IPRC, because the partners determine priority. In practice, however, the IPRC will likely be needed as a mechanism for handling conflicts.

The IPRC would also be the logical choice for science review of Key Project proposals received in response to specific calls.

5.4. Suggested Organization

1. Before each semester, an estimate of expected integration time is performed by the International Project Office or SOC. This includes the expected amount of integration time in each of “n” cases where “n” might be four and correspond to opacities good enough for observations at > 450 GHz, $325 - 450$ GHz, $180 - 325$ GHz, and $30-180$ GHz. This should also take into account the expected configuration scales for the semester and the expected post-calibration seeing (e.g., with fast-switching or WVR phase compensation).

In addition, the International Project Office (or SOC) runs an analysis of the partner-share of integration time that has accrued over the past m semesters, to ascertain if partner-share is falling close to the mandated division of time.

2. Each participating partner solicits proposals from their science community. Deadlines should be at roughly the same time for all partners. Solicitation could (should?) include information on the expected amount of time for each band, etc. Standard and Long Term proposals are accepted at this time.
3. The Partner PRCs review and rank the proposals from their community. Criteria should be science first. Each Partner can choose how it wishes to handle such things as Long Term proposals or student theses, but it is handled at this level. The Project itself doesn’t keep track of long term proposals, they are prioritized by the Partners by giving, each applicable semester, high priority to projects they want done.
4. Ranked proposals are forwarded to the Project. An initial pool of projects is created, modeled on the Gemini preliminary scheduler method. A sequential list of the Partners is created, with the number of entries for each Partner approximating the fraction of time each Partner is expected to receive. Each entry corresponds to a set amount of time (say one hour for example). The top proposal from Partner A is given a rank of 1, and the expected amount of time to complete the project is used to determine how many entries for Partner A in the sequential list are “skipped” until another proposal from Partner A is ranked. Priority is then allocated sequentially by running through this list for all partners.

Sophisticated software or some human intervention will be needed to identify conflicts between proposals from different partners. These proposals will be flagged for the IPRC to consider.

5. On a slow cycle (2-3 years?) the Director will solicit Key Project proposals from the entire community. These proposals will be ranked scientifically by the IPRC, and a certain fraction (based upon time?) will be accepted into the project queue following the process in 4.

The remaining unanswered question is how to resolve conflicts? We identify two kinds of overlaps: “identical overlap” and “substantial overlap”:

1. Group A and Group B both want to map M51 in CO J=2-1 with 0.1” resolution (identical overlap) with the same velocity resolution and sensitivity.
2. Group A and Group B both want to do a deep continuum survey of a “blank” field for which they also have deep mid-IR images, but the fields chosen are different (substantial overlap)

One rule is that the first kind of overlap should definitely not be allowed since it is duplicate science without a justification for the duplication (Note that a proposal to observe the same source with higher sensitivity or angular or velocity resolution would not be classified as an identical overlap).

The second kind of overlap may also not be allowed if the proposals are very well matched, but could shade to allowable if, say, one group had mid-IR and VLA data to match while another had optical and X-ray data (although perhaps experts would say one group had a better data set for comparison than the other).

Identical overlap could be dealt with in principle by the dynamic scheduler using the scientific ranking and scheduler priority (see Item 4 in Suggested Organization). Whichever program was ranked higher would be observed first, and then the next would not be allowed because it would be repetitious. Note that even if the two proposals are exactly the same, the “winning” proposal would be the one ranked higher by the PRC that reviewed it. This will be dependent upon the number of good proposals each PRC reviews as well as the “style of science” priorities that each Partner may have. This may work, but could seem quite arbitrary to the “losing” proposers.

Substantial overlap will probably require some human intervention to identify. If we assume that cases where substantial overlap exists will be relatively few in number, then perhaps once they are identified they could again be dealt with on the basis of scientific ranking from the PRCs. The more labor intensive but perhaps more satisfying alternative is to use the IPRC to review and rank such conflicting proposals.

A related case is a proposal to do something that has been done before (e.g. an identical or substantial overlap with an already completed project). My own feeling (M.G.) is that the proposal should be ranked on its scientific merit with the knowledge that the project has been done before; for the project to be ranked highly, it must demonstrate that there is a good reason to do it again (e.g. what is the advantage over archival research?).

5.5. How the Use Cases are Handed

1. Proposal with members from each partner: This will be consistent with how time accounting is implemented.
2. Does good weather count for more than bad weather? In my (M.G.) view, yes it does, but that may make it difficult to achieve partner parity, particularly if a partner chooses to rank highly only proposals with high stringency requirements (a partner priority or style of science issue that runs smack up against reality). It could be weighted so that integration time during more stringent conditions is counted more, but how to do this in a satisfactory way?
3. Teams from different partners apply to do a survey: here the highest ranked team would win if the surveys had substantial overlap; but we don’t have consensus on this yet
4. Team applies to observe sources that will be discovered soon: not addressed explicitly, but could be handled by combination of science ranking and the dynamic scheduler
5. Team applies to monitor Mars over 5 years: if granted Long Term Status when proposal submitted, no problem.
6. Time critical GRB monitoring not addressed; can’t the scheduler handle this by giving the project very high time priority? I thought time of observations was a possible input to the scheduler ...
7. Time critical asteroid monitoring: same as last case.
8. Targets of opportunity outside the proposal period: not addressed; presumably needs something like Director’s Discretionary time. How that time is implemented has not been addressed.
9. Legacy proposals etc. are only accepted in response to special calls. They are considered by PRCs called just for that purpose.
10. ALMA staff proposals Not addressed

5.6. How to Mitigate the Cons of the Partner-based TAC

1. CON: Can work against collaborations among scientists from different partners. This situation may be most easily minimized by the choice of how time is accounted. If a weighted accounting is used (PI gets 50% of the time allocated towards that partner, Co-I's some fraction) this can lessen the barriers to international collaboration.
2. CON: May place “partner share” at a higher priority than “science ranking”, depending on how the dynamic scheduler actually works. This will be minimized by attempting to build optimal time parity among the partners over longer terms, not each semester.
3. CON: May produce duplicate science. This will be minimized or eliminated through the use of either the dynamic scheduler or the IPRC to identify and resolve conflicts.

6. Questions for Discussion re PRCs

1. **Do we agree in general with the Principles and Assumptions?**
2. **What is the output of the proposal review process?** For the most part, we have assumed that the final outcome is a rank-ordered list from top to bottom, in which every proposal gets a different number, from 1 to say, 500. Some prefer a grading system (e.g., 1 to 10.). The question is how the dynamic scheduler deals with a grading system. Consider the situation with 10 levels of grades. At the start of the semester, the weather is good, nothing has been partially executed, and there are 50 (10% of 500) projects that look equal as far as the dynamic scheduler is concerned. How is it supposed to decide which project to do? Should that decision be made by the PRC or by an algorithm?
3. **Do we agree that the dynamic scheduler should keep track of partner parity issues by including that as a fourth criterion?** We do not have unanimity on this proposal. The range within which, and the timescale over which, time must balance should be discussed.
4. **Does time with high stringency count the same as time with low stringency in doing the accounting between partners?** This has a number of consequences for how some PRC models work. We use stringency rather than band or “high frequency” because stringency is designed to be a measure of how rare the conditions are. That is not simply a matter of frequency. Observations of CS 10-9, near the edge of the 490 GHz band are more stringent than CO 6-5 observations, at a higher frequency. The requirement on phase stability may be the most stringent condition for some observations. Opinions on this differ and we should discuss.
5. **How is technical feasibility assessed and is it considered in the scientific ranking?** We assume that the ALMA simulator will produce assessments of technical feasibility and stringency as part of the proposal process. The question is whether the panels consider it in their ranking.
6. **Can the PRCs or their subunits break proposals into pieces with different rankings?** The assumption for simplicity is that they cannot, even though we included this option in the last report. Do we agree?
7. **Does the Partner-based model need an overall (International) PRC?**
8. **Do we agree with the time accounting scheme?** The assumption is that all time is accounted to the partner of the PI. There is a split on this point. Some favor a scheme in which the time on multi-partner proposals is partially counted as time for the partner that the co-Is are affiliated with. In the partner-based PRC model, this allows one partner to assign “time” that is partially credited to another partner. It is an attempt to encourage multi-partner collaborations.
9. **In the partner-based model should the partners have to balance time requests by stringency?** That is, can a partner-based TAC recommend only a certain fraction of the time in various stringency ranges?
10. **Will a model that restricts time within certain stringency classes provide enough flexibility for variations in weather.** Sufficient oversubscription will be needed to account for variations in weather.

7. The Regional Support Centers

In the last report of the ASAC, we discussed the roles of the Science Operations Center (SOC) and the Regional Support Centers (RSCs). We recommended a “single SOC, operated by the ALMA observatory, where the pipeline produces and stores the official archive.” We further recommended that the RSCs “should be responsible for the support of the observer, from proposal preparation through data reduction and analysis.” The natural location for the SOC is in Chile, but the location of the RSCs is less clear. We recommended that all RSCs have the same core functionality, but individual partners could add additional functions as needed by their communities. We have considered the issues of the RSCs further and report on our findings here. Discussions in Europe, the United States, and Canada are described in the Appendix.

7.1. RSC Core Functions

This section summarizes the core functions of the RSC derived from discussions in the various partner communities. The process of collecting input is described in the Appendix.

7.2. Recommendations

The discussions led to strongly convergent views on the core functions of the RSC. These are the core functions that each RSC should have, to be distinguished from additional functions that different partners may add. It is the functions themselves, rather than the particular means to realize them, that we discuss here; the means may differ among the partners. These are the core functions that we have identified, in order of importance:

1. Providing user support for observing proposals, data reduction beyond the pipeline products, and archival research;
2. Providing feedback from the user to the project on performance;
3. Hosting a copy of the ALMA Archive or a link to it.

7.3. Rationale for RSCs

The need for a RSC has been recognized as being a critical aspect in the success of ALMA through the support of the astronomical community at large and in the scientific return of the project. The main problem with interferometry is that it is a ‘cultural change’ for most astronomers, so that assistance is essential for any new user. Astronomers therefore need support in the same time zone, and new users need physical access to a Centre. Even experienced observers need to top-up their knowledge and talk to a team of people who are experts users in the instrument. The interaction of ‘ALMA-qualified’ astronomers with the ALMA users will also be essential to develop tools and strategies for the best use of ALMA. Therefore it is important that such a Centre has close interactions with the instrument and the Operation Centre in Chile but also with the Project. The Centre should also provide easy access to the Data Archive.

7.4. Topics for further consideration

A few of the recommendations listed above are not unanimous. The role in supporting archival research overlaps to some degree with the role of Virtual Observatories and the interaction between the RSC and these VOs needs to be defined. Whether each RSC has a physical copy of the archive or merely provides a link is a matter of implementation, but it has occasioned some discussion. Various communities have considered other functions to be important (e.g., financial support for the US community, software development for the Canadian community), but the core functions listed above are the common denominator of our discussions.

8. Appendices

These appendices are a patching together of various inputs. There are two main sections. The first (I.) collects information on how the proposal review or time allocation process works in various other multi-partner observatories (A-F). The purpose in collecting this information was to get ideas for ALMA, to learn how the interests of different partners are addressed, and to provide for discussion some pros and cons of various solutions (G.). The second issue (II.) is the nature of the Regional Support Centers (RSCs). We will present the results of discussions in the various communities.

I. The Time Allocation Process

We describe below the current structures of, and in some cases, some historical information on, the TACs for IRAM, JCMT, HST, and Gemini. We still hope to get descriptions of the ESO TAC.

A. The IRAM TAC (from Malcolm Walmsley)

IRAM has a single TAC which produces recommendations on the scheduling of the 30-m and Plateau de Bure telescopes. It meets twice a year to schedule the following 6-month period. There are 2 german representatives, 2 french, 2 spanish, and 2 "externs". An attempt is made to have a broad range of competences available with roughly equal representation for "galactic" and "extragalactic" studies. The committee receives proposals typically three weeks prior to the meeting and is expected to send "pre-grades" to Grenoble just prior to the meeting. Members have to read currently all the P.deB proposals (roughly 60 in Sept. 2001) and half of the 30-m (roughly 120 in Sept. 2001). Typically members are rotated off the committee after roughly 3 years. Grades are usually A(accept), B(OK if time), and C(reject) with the B-proposals being used to give the scheduler some flexibility. The TAC itself is supposed to judge proposals purely on the basis of scientific merit. Any other considerations are taken into account by IRAM.

This latter statement means in particular that the IRAM Director (not the TAC) checks whether the recommendations of the TAC are consistent with a proportional distribution of observing time between the partners and, if not, adjusts things. As far as I know, this system has not led to more than the inevitable fraction of unhappy observers or groups of observers but it is difficult to know in any objective fashion. My impression is that in a large fraction of cases, things have been left alone but probably, that has not always been so.

B. The JCMT Time Allocation Process (from John Richer, additional comments from Chris Wilson and Ewine van Dishoeck)

These notes are based on my own experience as a member of the UK and International time allocation committees. But notes on how the process operated in the early years, and on details of Canadian and Dutch issues, may not be so accurate! Comments welcome from Ewine and Chris.

1. The JCMT is funded by the UK (55%), Canada (25%) and the Netherlands (20%), with local support of the University of Hawaii (UH).

2. Time allocation is done twice a year, with proposal deadlines at the end of September and March; the semesters run February-July and August-January. Proposals are submitted as LaTeX templates and Postscript by email, and are processed by scripts at the Joint Astronomy Centre to create a simple database of proposals. Successful proposals are allocated to specific range of submillimetre 'weather' bands based on the atmospheric opacity. Successful proposals are also required to submit a phase-2 style observing template which specifies the observations to be undertaken, to allow for service observing to be undertaken without the PIs being present.

3. Proposals are submitted to JAC, except those from UH which are described later. They are divided into 4 groups - UK, Canada, NL and International - based on the institutional affiliation of the PI, and of the co-Is. The rules for this are quite complex! A proposal is international if none of the investigators qualify as working at UK, Canadian or Dutch institutions. Most JAC staff are on UH contracts and count as international. If a proposal has investigators from two or more partner countries, they can choose which TAC to submit to, but they must not submit the same proposal to both TACs unless they make a special case as to why both TACs should assess the proposal. This is to avoid multi-national teams submitting the same proposal covertly to each national TAC to maximise the chances of getting time. But it does not preclude multinational teams submitting cases for large time allocations to multiple TACs provided they make their strategy clear - this gives the national TACs the opportunity to liaise with each other during the assessment process.

4. Technical refereeing to assess feasibility is performed by the Joint Astronomy Centre (JAC) staff in Hawaii.

5. The JAC is investing in software development to automate the proposal handling, observing queue management and data management: this Observatory Management Project (OMP) will go live gradually over the next two years. It will create a more formal Phase 1/Phase 2 proposal preparation system and

facilitate better automated communications between PI and observatory, and in principle provide higher data quality and better data products.

6. Each of the three partner countries, and I believe the University of Hawaii (UH), has its own separate time allocation committee (TAC). They report to the one International Time Allocation Committee (ITAC). The national TACs meet first and consider their own national proposals. They have been informed by the ITAC roughly how much time they have to allocate. The national TACs make their recommendations to the ITAC regarding which proposals they wish to give time to. There is an expectation that the national recommendations will cover LST ranges and weather bands in a sensible manner.

7. The UK TAC consists of typically 6 people. Each proposal is assigned to a first and second assessor on the TAC. An external, potentially international, referee's opinion is sought on each proposal. Each TAC member scores each proposal based on their own reading of the proposal, the referee's report, and the technical assessment; the expert assessors on the TAC may also write comments for consideration. The scores are combined to create a first-cut ranking of the proposals before the TAC meets face-to-face. At this meeting, each proposal is discussed, with interested parties leaving the room if necessary; scores may be revised as a result of discussions. Each proposal is then either rejected or allocated time to a particular weather range. Proposals needing different frequencies and instruments may get multiple allocations to different weather bands.

8. About a week after the national TACs, the ITAC meets: it is composed of 2 UK members from the UK TAC, one member from NL and one from Canada, and a Secretary from the JAC. Formally, I believe, all time is allocated by the ITAC, and the the national TACs simply report their own recommendations to the ITAC. In practice, changes to the national TAC recommendations are rare, but conflicts do arise - see below.

9. This is how the time is divided up. After allocating engineering and director's time requested by the JAC (based on a written request from the telescope director), 10% of the remaining time is first allocated to the University of Hawaii. UH do their own time allocations internally without reporting to any committee. However, there is an expectation that UH send their allocated proposals to the International Time Allocation Committee (ITAC) for information. The International proposals are then considered by the ITAC, and these are dealt with in a similar way to UK proposals, including external refereeing by one person not on the ITAC. Based on the quantity and quality of the international proposals compared to those winning time at the national TACs, the ITAC decides how much international time to allocate. Historically this has been around the 10% level. Finally, the remaining time is split 55:25:20 between UK, Canada and NL. If all has gone well, these national time allocations will match the allocations by the national TACs, and the job is nearly complete. The ITAC must make sure that the time it allocates is balanced to cover LST and expected weather ranges, and then hands over the agreed allocations to the JAC for scheduling.

10. The ITAC must identify and resolve any conflicts between national time allocations. Although rare, these issues can be sensitive, even with only 2 or 3 countries involved. (parenthetic note: if ALMA were to adopt this TAC model, this would be a serious problem). Conflicts arise from separate teams wanting to observe the same fields or attack identical science goals (eg deep blind surveys, GRBs and other targets of opportunity). There are no hard and fast rules as to how the ITAC deals with this in my experience, and I am afraid I have not seen the official 'rules of engagement' for the ITAC (if they even exist!). In practice, there are several outcomes possible. The ITAC may allow duplicate science or even duplicate observations to be scheduled: the justification for this is to allow competition - but this is probably the final resort in case of stalemate between national TACs. Or it may require/request the teams to form a collaboration and share data and publications. Or it may try to reject a proposal it perceives as palpably weaker (although the national TAC in question would have to agree to this).

The ITAC also deals with cross-TAC proposals if there are any: each national TAC states its own ranking of the proposal and how much time it recommends be allocated. Problems can arise if one national TAC rates a proposal much more highly than another, especially if a large amount of time is required to achieve the science goals.

11. There are no 'Key Projects' in the UK/ITAC system. However, ambitious proposals can request Long Term Status (LTS) and ask for multiple blocks of time to be scheduled over several semesters. These proposals are also allowed to write longer scientific cases, and may be subject to more intensive refereeing: the principle is that large blocks of time need stronger scientific justification and refereeing. Several major JCMT success stories have resulted from the large projects: HDF, 8-mJy survey, Galactic Centre survey, Canadian star-formation surveys, etc.

12. Generally, a proposal is considered terminated at the end of the semester which it was allocated to, regardless of whether the observations have been completed. Investigators must reapply for time if needed. However, the UK TAC and ITAC (also maybe in Canada and NL?) may 'star' a small fraction of highly-rated proposals, and these are then automatically carried over to succeeding semesters to allow them to be completed. This is a vital tool for submm astronomy, because long periods of good weather are rare and unpredictable.

13. The ITAC can allocate override time for targets of opportunity - if the right conditions occur, the

allocated observer loses his time and the target of opportunity program is conducted. Efforts are made to ensure the affected observers programme can be completed later.

14. All UK and International proposals, whether successful or not, are sent a short letter containing feedback on the proposal. (I don't know if this applies in Canada or NL).

15. Interesting historical note: in the early few years of JCMT, there was a single Time Allocation Committee which considered all the proposals for the telescope on a competitive basis. I was not on the TAC at this time. After a few years, the process split into the national TAC system described above. I think this is a significant point, but I can't comment on the reasons as to why this happened. Perhaps Ewine or Chris can comment?

Additional comments from Chris Wilson:

I can add a couple of comments to John's information on how the JCMT TAC operates. In Canada, we ask for TWO letters by experts, generally one from within Canada and one from outside. Other than that the operation of the TAC (ranking, TAC members assessing specific proposals, etc.) is pretty much as John described.

In addition, Canadian Ph.D. students can request "thesis status" for observations that are important for their Ph.D. thesis. If a student is awarded thesis status, their project will remain in the observing queue until it is finished, even if this takes 5 or 6 semesters. We don't have the UK system of "starred" proposals, so only thesis projects and projects awarded long term status can carry over automatically.

Regarding the split from one TAC to 3 TACs, this happened literally within a few months of my arriving back in Canada, so all I know about it is second hand. I served on the Canadian TAC during the early years after that split, and so talked to people who had known the single TAC situation. What I remember hearing is that particularly the Canadians, but perhaps the Dutch as well, were unhappy with the single TAC because even then the scientific interests of the communities were somewhat divergent (the UK did more continuum work at that time and the Canadians more heterodyne, for example). So there seemed to be a feeling that the UK, as the major partner, were driving the scientific direction of the TAC in ways the Canadian community did not like, even though the Canadians were definitely getting their share of the time. I know people seemed much happier with the 3-TAC system soon after it was implemented.

This type of thing may not be such an issue for ALMA, because we will not have a single majority partner. I know Canadian astronomers have thought a bit about whether, if there were two partner TACs, we think we could function well within a single TAC with the U.S., and the general consensus is the scientific interests of the two communities are similar enough that we think this would work. We haven't thought much about how well, say, a single North America-Europe TAC would work yet.

Additional comments from the Dutch Perspective from Ewine

- the Dutch JCMT TAC is joint with our other telescopes, i.e. La Palma optical telescopes and Westerbork. Thus, it is a mixed group of astronomers with few JCMT experts. However, they know the Dutch situation well. We do not ask for outside referee reports. The TAC provides a short feedback. We do not have starred proposals, nor long-term status. However, when PhD students are involved, there is an implicit understanding that the student will get sufficient time to finish his/her thesis. However, the proposal has to be re-submitted each round and the student has to show progress and papers. For the rest, it works the same as for the other JCMT partners.

- I was actually part of the group of "rebels" who argued for the split of the TAC in three separate TACs. I remember very well the talks Frank Israel and I had with the then chair, Mike Edmunds. It worked because the Canadians soon joined forces for this "breakaway". The main frustration was indeed the fact that there was a single dominant partner, UK, whose philosophy for science with the JCMT and allocating time was totally different from those of the other two minor partners. For example, the Dutch prefer long, solid PhD-type projects which were considered "boring" by the UK, who favored at that time very short, mostly continuum projects. So it was virtually impossible for us to get sufficient time for those projects that our community considered important. This was actually even worse for the optical La Palma telescopes, which is a 80%-20% collaboration and where the Dutch proposals always ended up at the bottom! Note that we do not have this problem at ESO where there is not a single dominant partner; there the joint TACs work quite well, and the Dutch get on average more than their share.

C.The HST Proposal Selection Process (from Neal Evans with comments from Peter Shaver)

The Space Telescope Science Institute runs what may be the most extensive proposal evaluation in astronomy, with over 1000 proposals. The oversubscription factor is typically 6 to 8. The proposal reviews are held in the area of Baltimore, either at STScI or in a nearby hotel. The TAC consists of a Chairperson and the Chairpersons of a large number of panels. For the recent Cycle 11 reviews, there were 11 panels. While European astronomers are contractually guaranteed 15% of the time, this has not been rigidly enforced. However, I have been told that European astronomers always have gotten at least 15%.

The TAC responds to overall guidelines from the STScI about the balance of large and small projects. The TAC meets first to review large proposals and special proposal categories (treasury, legacy, ...). Then the panels meet, having received a provisional amount of time from the TAC that they can assign. Since Cycle 9, the panels have been quite broad (e.g., in Cycle 11, there were 11 panels reviewing 5 broad areas). For the rest, I will describe the overall process for Cycle 11, as described in a recent Newsletter, with some notes on experience from Cycle 10 from my service on a panel and from comments by Meg Urry, who ran the reviews for some time. Usually there are two “twinned” panels covering the same area. In Cycle 11, there was only one panel for solar system, but two or three for all other areas. Proposals were then assigned to the panel that did not have a panel member as a PI or co-I. Each panel had 9 reviewers. Efforts were made to have a broad distribution of expertise on each panel, to include a theoretician, and to include a European. Overall, the ratio of US to European members was 6 to 1. At least 1 and usually more of the the panel chairs was European. No STScI staff can be panel members.

Each panel had at least 80-90 proposals to review. The panel members were assigned a subset of these proposals to review before the meeting and were strongly encouraged to arrive with proposal reviews available in electronic form. Two panel members reviewed each proposal. All proposals were ranked by all panel members. The ranking was provided in advance and averaged. Triage was used to eliminate proposals with initial rankings in the bottom third and focus attention on the proposals more likely to succeed. It is possible to revive proposals that have been triaged by panel decision, but these rarely get time. At the end, each panel provided a list of proposals that fit into their time allocation. After the panel meetings were over, the TAC met again to review the panel decisions and make adjustments when necessary for balance.

Is this a good model for ALMA? We can ask if the partners are satisfied. Meg Urry says that in her experience, the fraction of time going to European proposals was always at least the contractual 15%, but this emerged from the proposal process rather than being enforced from above. How is this perceived in Europe? That is a question better addressed by our European colleagues. I have asked Peter Shaver to assess this. Would this work in a 2-way or 3-way partnership of equals? It is one thing for a 15% partner to get 15% or a little more. It may be less comfortable for a 50% partner to get systematically more than 50%. The ALMA equivalent of the TAC might have to force some more balance over some time constant. Is the panel method a good one? My experience was mixed. I think that panels that meet face to face are much better than mail reviewers. However this is expensive. The broad panel areas, with mixed nationalities, foster a science-first attitude, which I prefer to nation or region-based panels. However, I found the breadth and basis set of topics uncomfortable. There were too many that I knew nothing about, while there were proposals in other panels I would have known more about. This might be easier for ALMA, which may have a narrower range of topics to deal with.

Additional comments from Peter Shaver

“In proportion to the amount of time ESA receives by right on HST (15%), the same proportion of panellists are provided by ESA to the annual HST TAC. The contribution includes panellists and chairs. The TAC chair has never yet been an ESA appointee but could be in principle. They are chosen by the ST-ECF representative in discussion with the STScI Science Policies Division. There has always been excellent agreement on the choice of members. The members are chosen mostly for their previous involvement in HST science, although not necessarily as a PI. With the recent introduction of Theory proposals, this becomes less important. The ESA members are fully integrated into the panels and fully share the work load. HST panels are usually 8-10 members and there is 1, or at most 2, ESA members per panel. They also consider Archive proposals which receive US funding, but for which non-US PIs are not eligible to apply. The only difference between ESA and STScI chosen TAC members is that they are separately funded.

The European HST allocation has always been over the 15% mark measured both in terms of PI's and orbits. The ratio submitted/awarded proposals and orbits for Europeans has looked almost identical to US figures. I have never detected any gripes. My impression is that if Europeans submitted more proposals they would get more time!”

D. The Gemini TAC (from Mark Gurwell)

The Gemini Time Allocation Process is described in great detail both on the Gemini website and in several documents available from that site, particularly “Observing with a 21st Century Ground-Based Telescope - or How to do Unique Science with the Gemini Telescopes” by P. Puxley (Gemini preprint #13).

The Gemini project has developed a two-path approach to observing, by operating with a “classical” schedule (e.g. scheduled nights blocked out for specific programs from accepted proposals, with astronomers trekking to the telescope to perform the observations) and “queue-scheduled” programs, where the observatory staff takes on the responsibility for performing observations from previously submitted observing execution files, allowing programs to be better matched to the available conditions. For Gemini it appears that the split is roughly 50-50 between to two “type” of scheduling. For the purposes of ALMA it is expected that essentially all observations will be of the queue type.

1. Proposals are solicited by each National Gemini Office (NGO) or National Time Allocation Committee

(NTAC) from its own user community, twice yearly, and will be coordinated to be simultaneous in all countries.

2. Each NTAC produces two ranked lists of those proposals its received in order of scientific priority (one for classical and one for queued), along with logistical constraints (e.g. preferred dates), and estimates of recommended and minimum time needed for any meaningful scientific result to be obtained. In addition, the NTACs may designate certain programs from the previous semester to be carried over if they were not fully executed. NOTE: this means the default is to not carry over incomplete programs.

3. The various lists are merged into draft classical and queued schedules with a number of constraints involving the fractional allocation to the different partner countries, host institutions (UHawaii or Chile), the International Gemini Office (IGO) science staff, and an allowance for director's discretionary and engineering time. The draft queue contains a reasonable distribution of programs requiring different conditions, e.g. it cannot contain only programs which require excellent seeing, and as such it is oversubscribed. This preliminary merging is the most tricky and interesting step; see below.

4. The International Time Allocation Committee (ITAC) consists of representatives from the NTACs as well as the IGO itself. It meets to consider modifications to the draft schedule and the draft queue required by conflicts (read multiple proposals for same source(s) from different countries). The ITAC is asked to identify highly ranked proposals that can be potentially undertaken as cross-partner collaborations, which I take to mean that they try to push international collaboration rather than choose one country's group over another, particularly for cutting-edge observations. The ITAC recommendations are advisory to the Gemini Director at each site.

5. The final schedule is prepared and approved by each director.

The preliminary merging is an interesting phenomenon. It is driven by the concept of the "merging sequence". The merging sequence is a sequential list of the Gemini partners as well as the host site, and describes the order in which proposals from the partners are selected. The frequency with which each partner occurs in the sequence is roughly proportional to their involvement in the project. Each entry corresponds to a specific amount of time, and thus the ranked lists from each country can quickly be distributed into the queue by running through the list and allocating time to the highest ranked program not already scheduled for that country. The queue preliminary merging also includes a running tally of the "weather" requirements of accepted proposals, and limits overallocation to 30% for each type of requirement based upon site statistics, e.g. if only 20 nights per semester are expected to have the best seeing, 26 nights of queue-scheduled proposals requiring the best seeing can be accepted, and therefore there is a near inevitability that some accepted proposals will not get executed. These proposals will not be carried over to the next semester unless requested by the appropriate NTAC.

E. The ESO TAC (via Peter Shaver)

"At ESO there is no [requirement] to allocate the time to the individual memberstates strictly in proportion to their contributions. Up to now the ESO member states never had strong complaints about the way the available time had been allocated. As for the time available to the National telescopes (1.5mD, SEST), the time allocation was always done for completely separate blocks of time in a totally separate process under the responsibility of the national institutes. That is, ESO never interfered in the scientific evaluation and selection process of these proposals. In case of time co-ordination problems the cooperation between ESO and the National partners always was working fine.

Considering this background, it may be feasible [for ALMA] to have separate TACS for the individual partners, but only under the assumption that each partner is assigned a completely separate block of time that they can use as they want. However, if many partners have one common pool of time of which they can use a certain percentage, this approach of having one TAC per partner certainly will not work.

A big advantage of having one common TAC for the complete amount of time is, that this allows a better inter-comparison of the scientific merit of the proposals and a more uniform evaluation of the proposals (as experience shows, each TAC has a different way of judging proposals even if the grading system to be used is identical). Thus in the end this is to the profit of the quality of the presented science."

F. The CFHT TAC (from Pierre Cox)

The TAC of the CFHT (Canada-France-Hawaii-Telescope) is partner-based. Each country has a TAC with 4 members for Canada, 8 for France, and (TBC) for the University of Hawaii (UH). Each TAC attributes a number of nights which is proportional to their quota. The TACs meet twice a year. The final selection (list of proposals with ranking) from each partner TAC is sent to the CFH in Hawaii, with separate lists for the dark and bright times. Based on the recommendations of each partner, the CFH (in practice one person who is in charge of this) will make an observing schedule which should be acceptable to each partner and which takes into account as well as possible potential conflicts such as right ascensions problems (e.g., cosmological programs all asking for the dark time in march..) or practical constraints (e.g., a new instrument cannot

be mounted every second day) etc.... This preliminary schedule is then discussed, readjusted if needed and finally approved by a committee composed of 6 members (with two representatives for each partner country).

The above description corresponds to the ‘classical’ observations where the observer comes to the telescope. For service mode observations (which represent about 1/3 of the observing time and which is increasing over the years), the national TACs send a list of proposals ranked in order of scientific merit specifying the number of observing hours for each proposal. The scheduling of these service mode observations depends of course on the observing conditions. The time is distributed throughout the semester in such a way that each partner ends up with a number of observing hours in direct proportion to their quota and to the numbers of hours they have allocated for the service pool.

One potential difficulty with the above partner-based TAC is that it has complicated/discouraged scientific collaborations between partners (there seems to be a record of bad experiences over the last decade). The surveys such as the successful CFRS was organized in a rather uncertain fashion by requesting again each semester observing time both on the french and canadian TACs with of course no guarantee of coordinated or coherent responses. The CFRS has been successful largely because one of the members (O. Lefevre) was based in Hawaii and had access to discretionary time. The survey CFH12K has been less successful because it was granted time on the french side but not the canadian side and only half of the originally proposed survey could be performed. One positive aspect of the partner-based TAC is that the load for the TAC members is less than in the case of subject-based TACs.

G. Summary with Pros and Cons

While some descriptions are lacking, we can clearly see two broad categories of TAC structures: Partner-based TACS (JCMT-style); and Subject-based Panels (HST style) that incorporate membership from all the partners. In each case, there probably must be an overall TAC (the International TAC for JCMT, the TAC proper for HST) to sort out conflicts and establish overall priorities.

Here is a brief list of pros and cons for each broad style. These should be added to and discussed at the telecon, with the goal of finding the best way to maximize pros and minimize cons in whatever final structure we recommend.

Partner-based TACS

Pros:

1. Issues of partner parity are minimized (unless the international TAC takes a strong role in deciding between competing proposals). 2. Different partners can have different scientific priorities, choosing to invest large amounts of time in key projects or not, . . .

Cons:

1. Can work against collaborations among scientists from different partners. 2. May produce duplicate science (unless the ITAC takes a strong role . . .). 3. Multi-partner key, legacy, etc. programs are not obviously handled.

Subject-based TACS

Pros:

1. More expertise on subject-based panels. 2. Can favor multi-partner collaborations.

Cons:

1. Issues of partner parity can arise if scientific decisions to do produce an even split. 2. The overall TAC has to decide time allocations among subjects.

II. The Regional Support Centers

We present first a preamble and series of question posed to the North American “community”. These were sent to the NRAO Users Committee and members of the old Millimeter Array Committee (MAC) by Neal Evans. They were sent to the Canadian ALMA Science Steering Committee by Chris Wilson. Chris and Neal tabulated responses, which are summarized in items C. and D., after the summary of European considerations in B.

A. Options for the North American Regional Support Center

This message is an attempt to start some discussion within the North American community about what they would like to see in a Regional Support Center for ALMA. In the current conception, there will be such RSCs in Europe and North America at least. There are likely to be such centers in Chile and Japan as well. The ALMA Scientific Advisory Committee (ASAC) has recommended that each RSC have

the same core functionality, supplemented by other capabilities according to the wishes of the individual regions. Neither the core functionality nor the supplementary functions have been fully defined yet. The overall concept of the RSC and initial ideas about their function are outlined in the ASAC report from the Sept. 2001 meeting, available in PDF from the link under Sept. 2001, Final Report, on the ASAC web page: <http://www.alma.nrao.edu/committees/ASAC/index.html> The report of the operations subgroup is in Appendix C, and the RSC is discussed in Section C.9, pp 33-35.

Because the Canadian and US roles in ALMA are closely linked, we wish to have discussion in both communities. Chris Wilson will solicit responses from Canadian astronomers and Neal Evans will solicit responses from U. S. astronomers. If there is sufficient interest, we may schedule a small town meeting at the Albuquerque AAS meeting, but we need significant input before the next meeting of the ASAC in March, 2002. Therefore, we will proceed primarily by email. We plan to ask the NRAO Users Committee and members of the MMA Advisory Committee (the pre-ALMA version of the ASAC) for input.

In summary, the core functionalities of the RSCs identified by the ASAC are as follows:

1. Support in preparation of proposal
2. Support in analysis of data.

In addition, the ASAC noted the following functions that MAY be part of the RSCs charge.

1. Data portal. The current conception is that each RSC has a mirror of the entire ALMA archive. Whether this is a physical copy, or only a link to the main archive at the Science Operations Center, is unclear. The SOC is likely to be located in Chile, though this is also undetermined.

2. Software Development. People at the RSC might work on improved algorithms for data reduction, analysis, or archive mining.

Other functions, such as providing financial support for travel, students, and publications, have been considered. They may also provide computer resources that would be accessed over the internet. These type of functions will certainly differ among the different RSCs as these matters are handled differently among the different partners. Within the US community, the idea of financial support accompanying grants of time is an idea that has been recommended by various advisory bodies and has been initiated in a minor way with the GBT.

For further information, please see the full ASAC report mentioned above.

What we need to know are your answers to the following questions:

1. How important are the functions we have identified?
2. Which are more important and which less?
3. What other functions can you think of that need to be included?
4. Where should such an RSC in North America be located?
5. Who should operate it?
6. Can we have one for North America or do we need something separate for Canada? (mostly a question for the Canadian community.)
7. How many people are needed? (For comparison, the European community is thinking of at least 10 FTE, though this is very preliminary.)
8. How should the staff astronomers divide their time? (The European community is thinking of 50% support, 50% science)

B. Notes from Pierre Cox

Meeting on the ALMA European Regional Support Centre Paris, 4 February 2002

Participants: R. Bachiller, R. Booth, P. Cox, P. Diamond, F. Genova, F. Gueth, S. Guilloteau, R. Kurz, R. Lucas, P. Quinn, J. Richer, P. Schilke, P. Shaver, E. van Dishoeck, C. Waelkens, M. Walmsley

The main goal of this meeting was to discuss the ALMA European Regional Support Centre (RSC) in order to define the need and the scope and to propose a working model for the European RSC.

As defined in the ASAC report of sep. 2001 (pp. 33-35), the primary responsibility of the RSC is the support of the observer. Such Centres should therefore help the general astronomical community in the

preparation of the proposals and in the analysis of the data. In addition, the RSC may be responsible for Data Portal and Software Development. The ASAC suggested that the RSC should have a core functionality that is common to the different RSCs which should be part of the ALMA project, although this core functionality has still to be defined. Other functionalities might be added by each partner and would then come from resources outside of the ALMA project.

It should be noted that one particularity of Europe is the many countries involved in the ALMA project, each country bringing into the project specific expertise in (sub)millimetre astronomy or past/present experience in large international projects. Some European countries have strong expertise in interferometry at (sub)millimetre, radio and/or optical wavelengths, others have none. Sharing the expertise is thus important in order to build a strong European community around the ALMA project.

1. The need for the ALMA RSC

The need for a RSC has been recognized as being a critical aspect in the success of ALMA through the support of the astronomical community at large and in the scientific return of the project. The main problem with interferometry is that it is a 'cultural change' for most of the people, so that assistance is essential for any new user. Astronomers therefore need support in the same time zone, and new users need physical access to a Centre. Even experienced observers need to top-up their knowledge and talk to a team of people who are experts users in the instrument. The interaction of 'ALMA qualified' astronomers with the ALMA users will also be essential to develop tools and strategies for the best use of ALMA. Therefore it is important that such a Centre has close interactions with the instrument and the Operation Centre in Chile but also with the Project. The Centre should also provide easy access to the Data Archive.

2. The Scope of the European RSC

The primary role of the RSC should be User's Support from proposal preparation to data reduction and use of the Archive.

The core functionalities of the RSC, which should be directly supported by the ALMA project and should be common to all RSCs, include:

- User Support for Observing Proposals, Data Reduction & Archival Research
- Responsibility for the ALMA Performance Feedback from the Users to the Project and vice versa.
- Host of a copy of the ALMA Archive

Other aspects, which could be supported by external/regional funds, are:

- Software development & Maintenance beyond the nominal Operations
- Interferometric Data handling & New Techniques
- Support for special Projects such as Public Surveys with limited time-priority, Legacy Programs or Projects which cannot be handled with the Pipeline
- Organisation of Post-Docs (ALMA Fellowship), Training Program & Interferometry Schools

3. Working Model for the European RSC

For the day-to-day User Support there must be a strong Central Node in Europe, a place where people can meet and discuss, a place where the information is centralized, available and distributed.

To ensure equal access and opportunity for participation by all European ALMA partners, this Central Node must be defined within the context of the ALMA project.

The development activities can be best handled in a Network. This will ensure that the actual expertise on radio astronomy and interferometry is kept in the different european institutes, and multiply the opportunities to develop innovative approaches. The Network should be structured and led by the Centre in order to avoid as much as possible the dispersion of information and efforts, under the guidance of a steering committee representing the ESO and Network communities. Equal access to the whole (European) ALMA community should also be granted for the outcome of the development activities.

C. Summary of Canadian responses on Regional Support Centers

I circulated Neal's email to the members of the Canadian ALMA Science Steering Committee (Lorne Avery, Doug Johnstone, David Naylor, Rene Plume, Chris Pritchett, Jean-Rene Roy, and Ernie Seaquist). The following report is a synthesis of their responses including my own. I apologize in advance if any of this is unclear, and will try to clarify in the telecon next week.

One person made the general comment that he wasn't sure if separate RSC would be affordable or even

desirable. He worried about divergences in direction and quality between the separate RSCs and thought that the time zone issue was easy for individuals to manage, especially doing questions and answers via email. Regarding coordination between the RSCs, he asked whether an astronomer in Japan would get the same answer on policy or technical issues as one from North America, or would there be delays or information gaps as the relevant information is disseminated from the central source to the RSCs. He saw the only advantage to having individual RSCs is that travel to them would be easier, but he wasn't convinced that people WOULD need to travel to them. We have discussed this issue in the operations subcommittee before, but I just wanted to point out that one of the people I contacted raised the issue independently. However, his point also made me wonder where the central coordinating source for information would be, if we have separate RSCs. Would it be the SOC?

Here are my summaries of the individual answers to Neal's specific questions.

1. How important are the functions we have identified? Which are more important and which less?

Everyone agreed that support for proposal preparation and data analysis are both very important functions for the RSC. These are important goals if anyone with a good idea is to be able to use the instrument regardless of their prior observing experience. In addition, even after ALMA has been running for a while, astronomers, even experts, will need to get information on technical changes and/or problems to be able to make the best use of ALMA. Another important function that had wide support was software development. This is based partly on our community's recent experience with learning how to use SCUBA with all the quirks and tricky aspects of data analysis that go along with that instrument (for example, it's not clear that large-area scan maps have a stable best-use reduction package yet). I can see that particularly mosaics with ALMA might be one area where long-term development would be needed. One person also suggests that the ALMA software developers are allowed time to help people elsewhere who are trying to develop their own software, for example, software that explores alternative reduction techniques.

There were fewer opinions about some of the other proposed functions. In particular, there was some confusion over the idea of the data portal. One person thought this wasn't as important, since the data would be stored at the SOC; another thought a data portal at the RSC would be necessary to be able to support data analysis. One person suggested perhaps the Canadian Astronomical Data Centre (CADC) in Victoria could be a data portal. These comments made me realize that I didn't really understand the concept; it sounds like it can be anything from a web link to the archive in Chile to a fully-stored updated mirror of the archive.

The few comments on travel and financial support were not favorable, but this is partly due to the difference between the Canadian and U.S. funding system for individual astronomers. One person said financial support shouldn't be part of the RSC. Two others thought that travel support, which they understood to mean travel to ALMA in Chile to use the telescope, was less important as most observing would be done remotely. They clearly did not understand this part of the text, i.e., that we're considering that ALMA should offer small grants in support of costs associated with using ALMA (students, publications, conference travel, etc.) in a similar way to what is done with, say, HST. A similar confusion will likely exist among our European colleagues and so this exercise mostly tells me we need to be very clear in whatever we finally say in this section. Depending on how the Canadian funding system evolves, Canadian astronomers might eventually be interested in something like the proposed GBT user grants, but at the moment the system does not seem to have a need for them.

Interestingly, no one commented on the need for extra computing resources.

2. What other functions can you think of that need to be included?

One person identified an additional role for the RSC, which would be to encourage use of ALMA through visits to university astronomy departments, web-conferencing, special sessions at the AAS and CASCA meetings, etc. In Canada we currently have a Canadian Gemini Office that fulfills many of these "local" functions. There can be some reluctance to use a new facility because people are unfamiliar with the technology or with what it means, and this may be particularly true for radio interferometry. So another possible role for the RSC could be encouraging people to use ALMA. This could be seen as an expanded version of support for proposal preparation, one that is more proactive than reactive.

3. Where should such an RSC in North America be located?

One person suggested NRAO, while another suggested locating it in Canada, specifically near Victoria where the CADC is. Another suggested locating it near a center of astronomical research (for example, near Caltech or CfA or STScI, to give examples). Two people mentioned the site should be easy to get to, i.e. in a major city with easy access by air, not somewhere with a long drive to the nearest airport. In my own opinion, the location depends on a combination of what we want the RSC to do, what expertise is available already to form a nucleus, and where that expertise is located.

4. Who should operate it?

Three people had opinions here, and two said NRAO while the other said NRC (Canada)! Are there other interesting alternatives, for example, something like the SIRTFF Science Center model, or IPAC, or whatever? There might be ways to access additional funds in Canada if people were located at a Canadian university (as opposed to NRC), but I'd need to look into the programs to see what's eligible and so on. Are there similar programs in the U.S. that universities can access but NRAO cannot?

5. Can we have one for North America or do we need something separate for Canada? (mostly a question for the Canadian community)

Most people didn't see a need for a separate RSC for Canada, although one person would like to see a Canadian center. Interestingly, one person pointed out that the wording of the question implies that, if there is only one RSC for North America, then it would be in the U.S. Would it be possible to think broadly about where the best place in North America would be to have this center, a combination of location, expertise, and funding, or do the political realities dictate that the North American RSC be in the U.S.? If so, it might be good to explore models whereby expertise at other centers (such as the CADAC) could be utilized, for example for archive software development, even if they are in a different geographical location from the RSC itself.

6. How many people are needed? (For comparison, the European community is thinking of at least 10 FTE, though this is very preliminary.)

There weren't strong feelings on this, especially since what exactly will be done at the RSC remains to be defined. We will need enough people to do the jobs! And there is probably some minimum nucleus that is necessary to form an interesting science culture, although this can (and perhaps should) be enhanced by adding postdoc and student positions. One person mentioned that fewer than 10 people might be needed if the RSC blended seamlessly with support for the VLA. My personal feeling on that is that VLA and ALMA support will need to be rather separate, particularly if the group were located in Socorro (with the VLA right there, it would be easy for it to suck up resources). On the other hand, if the two groups were separate but at the same institution, the minimum nucleus needed for either group to form an interesting science culture could be smaller.

Obviously if the project reverted to a single RSC, then more people would be needed at that single site.

7. How should the staff astronomers divide their time? (The European community is thinking of 50% support, 50% science)

The general consensus was that a 50-50 split was what we should aim for, although one person with management experience suggested 60-40 or even 70-30. Several people noted that even if a job is listed as 50% research, 50% support, in practice the support side tends to expand at the expense of the research side. This tendency makes it important to aim for a large fraction of research time, since this may not be achieved in practice. Another point raised was that we won't be able to hire good people unless they have reasonable time for research, and that doing science with ALMA makes you a better support scientist. Probably both partners should have the same fraction of science and support time, otherwise one partner would have an edge in hiring the very best people.

D. Summary of Reactions to RSC questions in US and Mexico

This is an attempt to summarize and even quantify the responses from 6 people. Occasional quotes are included to give some better feeling for the responses or to include ideas that did not fit clearly into the categories.

1. How important are the functions we have identified? Which are more important and which less?

I give the mean and standard deviation of rankings (1 is most important), along with the number of people who ranked that item. These are often abstracted from less clear-cut prioritization...

Proposal Preparation $2.0 \pm 1.4(4)$ Support for Data Analysis $1.2 \pm 0.4(6)$ Data Archive $1.8 \pm 1.0(4)$ Financial Support $1.7 \pm 0.5(3)$ Software Development $2.7 \pm 1.5(3)$

Based on these limited statistics, support for data analysis stands out as most important, while help with proposal preparation, providing a North American data portal, and financial support are effectively equal. (The data portal was described as a separate portal from what might be a separate archive. Obviously, there needs to be access to an archive somewhere.) The need for software development AT THE RSC was the only item that received significantly less support. Here is a representative comment: "Software development may be useful but I suspect that this will happen to a large extent at current NRAO sites and also among the users as specific needs arise and new concepts develop."

Another comment: "I strongly support the idea of financial support accompanying grants of time. Something we have to continue to push NSF on whenever possible."

2. What other functions can you think of that need to be included?

Two things were mentioned here. One was called professional outreach, which included workshops on how to get the most from the data. The other was an attempt to make sure that the technical and scientific staff communicated. "The RSC has to not become isolated from the instrument itself. Somehow a regular exchange of the "techies" at the SOC and the "astros" at the RSC's must be maintained." Of course, this runs somewhat counter to the quote on A.

3. Where should such an RSC in North America be located?

The responses here scattered widely. There were two general categories: at an existing NRAO site and NOT an existing NRAO site, with the latter winning 4 to 2. Among NRAO sites, Tucson and Socorro were favored. Charlottesville got a negative response, "Closer to a big airport than Charlottesville."

Those not favoring a current NRAO site made the following points. It should be convenient for air travel and near major astronomical centers that are NOT just radio astronomy. One favored a central location with a big airport (Chicago, Boulder/Denver, Phoenix/Tucson). Another favored an East coast location to minimize time differences with Europe and Chile. Another suggested soliciting bids.

4. Who should operate it?

NRAO received 3 votes, and AUI one. One person favored competitive bids. One person noted that, if Canada does not have a separate one, Canada and perhaps Mexico, should share operations.

5. Can we have one for North America or do we need something separate for Canada? (mostly a question for the Canadian community)

Most people left this to the Canadian community to decide. The few who commented did not see much need for this.

6. How many people are needed? (For comparison, the European community is thinking of at least 10 FTE, though this is very preliminary.)

Almost everyone thought 10 was insufficient. Estimate ranged from "more than 10" to 40. The mean, crudely estimated, was 17. Several noted that not all staff needed to be astronomers.

7. How should the staff astronomers divide their time? (The European community is thinking of 50% support, 50% science)

Most people thought 50/50 was OK, but some noted that some staff could be mostly support (60/50 or even 80/20). Others noted that the support part always takes more time than it is supposed to, so favored a hard line at no less than 50% for science.

A representative quote: "This is hard to gauge, but if you give the scientists time for their own research then 10-15 FTEs seems adequate, if properly supported by management and support staff."