EUROPEAN ORGANISATION FOR ASTRONOMICAL RESEARCH IN THE SOUTHERN HEMISPHERE

For Information

COUNCIL

137th Meeting
Lisbon, 8 and 9 December 2015

SCIENTIFIC TECHNICAL COMMITTEE

86th Meeting
Garching, 20 and 21 October 2015
STC Recommendations from the 86th STC meeting (20-21/10/15) v.1.1


Excused: Rachel Akeson, Stephane Vennes, Marcos Diaz.

The STC held its 86th meeting on the 20 and 21 October 2015 at ESO Headquarters. The two days contained presentations from the ESO staff, as well as reports from the STC sub-committees.

The STC wishes to thank all ESO staff for their clear and informative presentations and open discussions. This is much appreciated and helped us considerably in our work.

We list in points 1.1 – 1.10 the main recommendations that STC wishes to make based on the presentations and documentation received, and the reports from our sub-committees. We also include in our report a few additional comments and minor recommendations (in sections 2.1–2.3). This document also includes four appendices: the reports from the three sub-committees and a list of the conflict of interest of those STC members who participated in the meeting.

Potential conflicts of interest were noted during discussions of STC. As a rule committee members with institutional or scientific conflicts did not take part in discussions, while those with significant direct conflicts (PI/co-PI of an instrument) were required to leave the room.

1. The following are the main recommendations of STC:

1.1 VLT GTO policy (document Cou-1628)

The STC was presented with a new VLT GTO Policy. The new policy seeks to fix GTO time per project based on instrument complexity (e.g., 150 nights for a typical 2nd generation VLT instrument). In addition, the new policy increases the upper limit of 15% to the total GTO within a given year. The policy also allows instrument teams to be reimbursed for cash contributions through additional GTO time, a practical mechanism to ameliorate the expected strong budget reductions in the Paranal instrumentation programme.

The STC wishes to emphasize the enormous success of the current GTO model in engaging much of the ESO community in instrumentation plans and development for the VLT. The STC would like to stress that it is important to ensure that this continues to be the case for any new scheme.
The STC considers that the general approach of announcing a fixed number of GTO nights for the FTEs with the call for instrument proposals is fair and open, and STC recognizes that cash contributions can also bring scientific benefit to the programme.

However, the STC has serious concerns about the unintended consequences of a potential expanded role for cash contributions in projects. We therefore recommend that consideration be given to placing limits on the GTO reward for cash contributions in order to ensure an appropriate balance of FTE and cash within projects.

On this basis STC endorses the new VLT GTO policy. If Council adopts this policy, the STC urges active monitoring of the effect of the new policy on the instrumentation ecosystem throughout all ESO member states in order to counteract any negative consequences.

1.2. Hosted telescope proposals – MASCARA and BlackGEM (document STC-561) STC endorses the panel’s recommendation that both proposals go forward for further detailed negotiation to allow hosting of the two telescopes at La Silla on the understanding that there are identifiable benefits to the wider ESO community.

Other important recommendations and comments by STC:

1.3 Cost to Completion
The STC wishes to voice its appreciation of the adoption of the cost to completion as a metric to assess all projects. This makes for a clear understanding of the actual effort needed for each project within the programme and will enable the STC to gain a better overview which will help us make more robust recommendations for projects.

1.4 Instrument decommissioning plan
As part of the Scientific Prioritization process for Paranal, the STC recommends that ESO develops a long-term decommissioning plan for VLT and VLTI instruments. STC recognises that with constrained operations budgets and aging hardware there is a need to decommission instruments and STC supports the proposed philosophy that new instruments generally replace existing instruments that cover the same general observing parameter space. The question of future decommissioning/removal of instruments with no ready replacement (e.g., VISIR in the era of JWST) requires careful thought and must be traded against strategic opportunities, such as those which may be provided by the creation of a visitor port.

1.5 Instrument removal upon return of CRIRES+
The STC recognizes that a final decision needs to be made soon about which instrument is removed when CRIRES+ comes back to the telescope (expected early 2018). At the next STC meeting, we would like to see a clear comparison between the practical options (e.g. FLAMES, UVES, VIMOS, others) that will include both the expected impact on the community as judged by usage and citation statistics, as well as strategic issues (e.g. the upcoming release of Gaia data). STC would like to be asked to formally endorse the ultimate decision about which instrument is removed. Once this decision is made, it should be communicated to the wider ESO community as soon as possible.
1.6 ERIS
The PI of the ERIS instrument presented the current science and instrument plan. The STC was impressed by the range of science capabilities offered by ERIS and look forward to seeing this instrument on the VLT in 2020. STC noted that it replaces and expands in significant ways on the capabilities of NACO and SINFONI and will enable new science in the period beyond 2020.

1.7 VLT AO meeting
We also look forward to seeing a report from the VLT AO meeting which discussed new opportunities for exploiting the powerful capabilities of the AOF, as well as a wider community discussion of possible developments.

1.8 Science Verification Data from ALMA Band 5 Receivers
The STC strongly endorses ESO’s plans for producing public datasets using the ALMA Band 5 receivers (delivered by the EU development project) ahead of the Cycle 5 call for proposals.

1.9 mmVLBI Operations Plan
The STC reiterates the urgent need for JAO to provide a publically available mmVLBI Operations Plan document well ahead of the call for proposals for Cycle 4.

1.10 Documentation for STC meetings
The STC was very happy to receive essentially all documentation for the 86th meeting well ahead of the meeting. This is much appreciated and we look forward to the same procedure for the 87th meeting. The STC also appreciated the new format of the fact sheets.

2. In addition the STC note the following specific items in each of the sub-committee areas

2.1 E-ELT:

The STC congratulates ESO for the recent positive developments on the E-ELT. The ELT has started a very active phase that will naturally require new resources in the next years.

Three contracts for first instruments have been signed; another one, MAORY will shortly follow. We highlight the organization put in place by ESO to ensure good communications with the consortia.

2.1.1. A presentation by the PIs of the approved E-ELT instruments at future ESC meetings would be welcome.
2.1.2. The STC noted the status of activities concerning HIRES and MOS, and important forthcoming milestones. ESC/STC would expect to be represented in any discussions whenever decisions on trade-offs with potential impact on science capabilities are made.

2.1.3. The STC encourages ESO to provide the consortia with clear criteria early in phase A that will be used for the final decision on the instruments final TLRs and science objectives.

2.2 ALMA and sub-mm single dish items:

2.2.1. The STC supports ESO’s plan to propose to JAO that they undertake a public Band 5 Science Verification programme and also supports ESO’s willingness to aid in the delivery of this dataset to the community.

2.2.2. The STC remains extremely concerned about the continued delay in the imaging pipeline (expected in December 2015) for Cycle 3 and the impact this has on the ARC network.

2.2.3. The STC appreciates the inclusion of more quantitative estimates of available resources and expected needs in the EU ARC network documents, as well as efforts to provide a more formal framework for the coordination of the network nodes through an MOU. The STC believes that the document would be further strengthened by including higher level visions on the future directions of the user support needs in Europe and that specialization of the individual nodes should be strongly encouraged and stated in the documents.

2.2.4. The STC supports ASAC’s recommendation that a “global” view is taken of development projects among the ALMA executives within the ALMA2030 framework. ESAC welcomes the leadership role being taken by the Observatory Scientist in this task.

2.2.5. The STC welcomes the appointment of the Observatory Scientist. It notes that ALMA Operations Review “...expected that the Observatory Scientist will be a member of ALMA Management Team”. ESAC believes that it is important that the voice of the Observatory Scientist is heard at the highest level within the organization in terms of both the current and future programme.

2.2.6. The STC is prepared to comment on the MoU/written procedure for bringing a Band 9 receiver to APEX in return for GTO time and make a recommendation on this at short notice if asked.

2.3 La Silla and Paranal Observatories

2.3.1. The STC notes the impressive progress on a number of ambitious instrumentation projects on Paranal. Since the last STC meeting, the AOF Laser #1 was tested on-sky with performance that exceeded expectations, the operationally-challenging VLTI lab reconfiguration has been nearly completed, and the GRAVITY
instrument was shipped, integrated on site, and commissioning has started on-sky with first engineering fringes. We congratulate the AOF, ESO VLTI, and GRAVITY consortia members for reaching these important milestones.

2.3.2. STC was pleased to see progress towards developing a VLT Scientific Priorities Document (STC-560) and we appreciate the large amount of work required to tackle the complexities of the relevant issues. As the document matures, we recommend that stronger links are made with the earlier Scientific Priorities document (STC-551) and that controversial choices are clearly supported with evidence, possibly including citation and usage statistics, user survey data, and specific comparisons with capabilities from future space- or other ground-based observatories. The STC would like an opportunity to comment on the draft and to continue the two-way conversation as priorities for VLT in the 2020+ era are developed. The STC recognizes that the VLTI Programme Scientist is pursuing a separate process for establishing priorities and hope to see a draft of these recommendations at our next meeting.

2.3.3. The STC was pleased to see that the response to the new call for public VISTA surveys has been strong. With 13 LoIs submitted, there were as many responses to the call as there are total public surveys in progress at ESO. The STC raised the concern that the timing of the call is before the 4MOST survey plans are completed and therefore suggest that some consideration might be given as to how to consider any precursors specifically in support of 4MOST.

2.3.4. STC recognizes the risk to the continuity of the VLTI program when Jean-Philippe Berger leaves his post as VLTI Programme Scientist next year. Given the extensive interferometer activities planned for the next three years as GRAVITY and MATISSE are fully commissioned and VLTI Infrastructure activities are completed, the STC believes that the VLTI Programme Scientist post should be re-filled as soon as possible with an experienced interferometrist.

2.3.5. The STC encourages completion of the negotiations for the new instruments for NTT and the 3.6m quickly and recalls our previous recommendation that, in total, no more than 50% of the time be used as GTO to secure new instruments. We note that in practice none of the proposed instruments have yet identified contributions to the operational costs and so there remains a concern about funding for La Silla operations.

2.3.6. STC notes the good use of consortia to deal with overheating instrumentation program.

Attachments: LSP sub-panel report
             ESAC sub-panel report
             ESC sub-panel report
             List of conflicts of interest
Report of the STC sub-committee LSP

The La Silla Paranal (LSP) Panel met on 2015 Oct 19 at ESO Headquarters in Garching. In attendance were STC members Alexis Finoguenov, Gillian Wright, Andre Moitinho, Hans Van Winckel, Eline Tolstoy, and John Monnier (LSP Chair) -- STC member Stephane Vennes was absent. LSP was also attended by Alberto Franceshini (Padova) and Michael Ireland (Australia National University).

The whole panel very much appreciated ESO’s responses to our request from last meeting, including a much-improved treatment of project schedules, ERIS top-level science requirements, and a strong beginning to the VLT AO master plan and an analysis of MATISSE sensitivity in the context of fringe tracking.

Top-level Action Items requested by LSP for next meeting:
1) Written report on MATISSE sensitivity w/ gravity fringetracker (and w/ NAOMI which strongly affects fringe tracking sensitivity)
2) Continued detailed updates on AOF, VLTI infrastructure, GRAVITY (including CIAO), MATISSE progress towards PAE
3) Master AO Plan document, as informed by recent invite-only workshop
4) More mature VLT Scientific Priorities Document
5) Decommissioning plan for VLT instruments, with justification
6) VLTI Scientific Priorities document
7) Update on NIRPS at La Silla, including impact of GTO on 3.6m open time.

This report is meant to be read after the main STC report, and we do not repeat the main LSP-related conclusions that already were included in the main report.

We organize our report based on the following topics:

Adaptive Optics

The LSP was very pleased to see the on-sky results of the AOF Laser since last meeting. The team reported performance much better than expectations, in the key specification of the return power and the spot size. Congratulations to the whole team and we look forward to hearing many more on-sky commissioning results over the coming years.

As the 2017 Galactic Centre event approaches and GRAVITY is commissioned on sky, some activities of AOF are being re-staged. The 6-month shift in project schedule was due to accommodating VLTI infrastructure and not due to AOF schedule overruns. The LSP appreciated the thoughtful restaging to get MUSE on sky earlier in the new context.

An invite-only workshop was held to discuss a possible next-generation instrument for UT4 that can take full advantage of the AOF capabilities. We heard a verbal report of the meeting and heard about new enthusiasm for a multi-conjugate visible AO System, exploiting the 4 LGS of AOF. We request to see a written report summarizing the conclusions of this meeting, including a plan for how to move forward towards adding such an instrument to the VLT instrument programme. There was some concern that the results of this one meeting should not be over-interpreted and that any future call for AOF instruments not be too prescriptive.
The LSP heard more details about the capabilities of ERIS and felt the new consortium presented a compelling science case that flowed down to largely credible technical requirements. Although the time schedule is not as rapid as originally hoped, ERIS should be a powerful instrument for VLT starting ~2020.

**VLTI**

The LSP members were extremely impressed with successful VLTI lab upgrade after the shutdown period. While we realize that not everything is completely back up to acceptable levels, the main systems have already been back on sky and obtained sky fringes. We appreciated hearing about the detailed planning behind this success.

Since the last meeting, GRAVITY was shipped to Paranal and integrated with the VLTI. We saw some engineering fringes from sky tests and the LSP would like to congratulate the entire GRAVITY teams, both ESO staff and the consortia, for achieving this spectacular milestone so soon. The report of good fringe tracking performance on-sky was welcome news. We look forward to hearing continued detailed reports on GRAVITY and the uncommissioned subsystems (e.g. CIAO) over the next year.

We heard about the plan to have the bulk of the new AO systems for the ATs (NAOMI) to be built by Grenoble. This is good way to spread the work as the critical FTEs at ESO are busy with other high priority projects. We re-iterate that NAOMI is crucial for obtaining good NIR sensitivity with GRAVITY and for fringetracking with MATISSE.

The LSP heard more information about the plan to integrate MATISSE with GRAVITY to allow for both fringetracking and simultaneous science observing from 2 -> 12 microns. This is a crucial capability for MATISSE in order to increase the sensitivity by orders of magnitude. We had requested a report on the sensitivity of MATISSE w/ and w/o fringetracking and we were presented some initial results of the study but look forward to seeing a more complete written report. There appears to be good progress on feasibility and work plan but the LSP still have some concerns about the how the FTE effort will be maintained over many years w/o more direct involvement by key members of the MATISSE consortia.

We heard about two major failures in the Nice lab where MATISSE is being integrated and tested. The resulting damage now requires major rebuilding of key electronic and dewar components. This caused a 9 month delay in PAE from 2016Q2 to end of 2016Q4. We note that any further slips may cause a collision with the GRAVITY campaign of the 2017 Galactic Center event that requires high stability in the lab. This means a small delay now could lead to a large (>6 months) delay due to high priority GRAVITY observations.

LSP is concerned about finding a suitable replacement for Jean-Philippe Berger as VLTI Programme Scientist. See main STC comments on the importance of replacing this position in a timely fashion with an experienced interferometrist.

**Future Planning**

FLAMES was originally identified by ESO as the most logical instrument to be decommissioned when CRIRES+ arrives (and this was announced to the community in a past CfP), but scientific and strategic arguments have emerged to revisit this decision. While FLAMES is not a very competitive instrument (for instance, in throughput) in the world-wide context, it is the only
wide-field multi-object high-resolution spectrograph available to ESO users, and it will remain so until MOONS arrives. There is concern about losing this capability, especially when GAIA results are released. The alternative of removing UVES when ESPRESSO is commissioned, as it will retain some similar capabilities, was discussed but may have too large impact on the wide community of UVES users, specifically high-resolution UV spectroscopy will no longer be available. This is also a unique capability and critical for various scientific areas, such as specific abundance determinations in stellar spectra. UVES is also one of the most over-subscribed instruments and also tops the publications per year. The only other instrument that can be considered is VIMOS. It was not clear why the scientific competitiveness of the on-going VIMOS surveys should not also be considered in comparison to FLAMES and UVES programmes. We request ESO present a final decision as to which instrument will be decommissioned when CRIRES+ returns and this should be determined by the CRIRES+ FDR (planned for April 2016). The ESO community deserves a clear statement of why a given instrument was chosen. It should be clear what the choices were, and why one instrument was selected. There should be a document that includes a direct comparison of options. We expect the STC to be asked to comment and ultimately endorse the final plan during the next meeting.

The LSP was intrigued by many of the ideas in the VLT science priorities document STC-560 by Bruno Leibundgut. That said, many key issues were not included yet and we look forward to the next version, which will have clearer ties to STC-551 and some VLTI context. The future of VLTI instrumentation and infrastructure beyond the 2nd generation instruments needs to be further developed. Currently, the instrumentation programme and the VLT Scientific Priorities documents are both waiting for guidance from a separate VLTI long range plan to be finalized by the VLTI Programme Scientist Jean-Philippe Berger. We hope to hear more details about the VLTI planning at the next LSP and STC.

La Silla

We heard some updates about new instrumentation plans for La Silla. We re-iterate concerns about giving away too much GTO time and we recommend always maintaining 50% open time on the telescopes. The GTO impact on 3.6m open time with the selection of the instrument NIRPS were not clear and we would like to hear an update at the next LSP meeting.

Other issues

We note with concern the large increase in cost for the original detectors planned for MOONS. We wish to stay informed as to how this would affect the scientific capabilities of MOONS if alternate detectors need to be obtained.
Report of the September 2015 ESAC Meeting

ESO Garching, 22 September 2015

(including follow-up Telecon on 19 October 2015)

ESAC members: Rachel Akeson (via phone, 2nd half), Jes Jørgensen, Huib van Langevelde, Jesus Martin-Pintado, Michael Meyer (via videocon), Raphael Moreno, Roberto Neri, Isabella Prandoni, Eva Schinnerer (chair), Ian Smail (via videocon)

ESO participants: Paola Andreani, Carlos de Breuck, Maria Diaz Trigo, Andreas Kaufer (via videocon), Robert Laing, Erich Schmid, Leonardo Testi, Wolfgang Wild, Pavel Yagoubov, Martin Zwaan

1) General Remarks

ESAC met at ESO Headquarters in Garching on Tuesday 22 September 2015, three weeks before the ASAC face-to-face meeting in Tokyo on 14-15 October 2015. The European ASAC members are Huib van Langevelde, Jesus Martin-Pintado, Raphael Moreno, Roberto Neri and Eva Schinnerer. Rachel Akeson, Jes Jørgensen, Michael Meyer, Eva Schinnerer and Ian Smail are also STC members.

A number of members will leave ESAC (and ASAC) by next summer: The terms of Raphael Moreno at ESAC (2nd) and ASAC (1st) end this year, similarly Jesus Martin-Pintado’s terms (both 2nd) end by summer next year. Both plan to leave ESAC and ASAC. ESAC would like to see these positions (in particularly the European ASAC positions) filled without delay. We would like to thank Raphael for all his work and contributions to ESAC. For a number of other ESAC members whose 1st terms end we hope that they will be renewed for a 2nd term. Finally, Michael Meyer is leaving ESAC as he wishes to join an ESO sub-panel closer to his expertise and scientific interests. We thank all of them for their insightful contributions and work on the ESAC (and ASAC).

The ESAC meeting has been decoupled from the STC schedule to ensure informed and timely input to the ASAC face-to-face meeting. This ESAC meeting fulfilled this goal only partially due to the lack of important documentation from the Joint ALMA Office and incomplete information to address all points raised in the ALMA Board charges. The access to relevant documents and information is critical for providing helpful and insightful input to ASAC charges in preparation for the ASAC face-to-face meeting. ESAC would like to reiterate that timely distribution of relevant documentation, as well as presentations, well ahead of the face-to-face meeting is essential to allow the efficient use of the face-to-face meeting and to guarantee it delivers useful and considered recommendations.

The agenda for the 22 September 2015 meeting is attached at the end of this report as Appendix 1. In addition, the ASAC charges for the 14-15 October 2015 meeting are attached at the end of this report as Appendix 2.

ESAC was pleased to hear during the meeting about the many positive developments from ALMA and APEX, in particular we note:

- The impressive science output of ALMA to date;
- The improved efficiency of observing (as judged at QA0);
• The successful start of Band 5 integration (an EU development project);
• The successful detection of first inter-continental fringes with the ALMA Phasing Project (APP);
• Good progress on the Residencia construction (an EU deliverable);
• The successful review of the EU ARC network;
• The very clear and constructive ALMA Operations Review report;
• The hiring of the ALMA Observatory Scientist;
• The briefing on the compelling APEX facility instrumentation plan as part of negotiations for APEX operations till 2022;
• We welcome the opportunity to comment on a draft of the Single Dish Working Group report.

2) ESAC recommendations and concerns for STC regarding ALMA

ESAC was informed about the successful review of ALMA operations including the implementation of the ALMA Operations Plan that took place in April 2015, as well as the panel’s recommendations. ESAC notes that it was felt that the lack of consultation with ASAC in the review process was a missed opportunity. Nevertheless, ESAC endorses the recommendations for ALMA operations and would like to particularly emphasize the following recommendations:

a) ‘R5 - JAO to define annual goals and performance metrics to measure progress in meeting the goals’;
b) ‘the Review Panel expects the Observatory Scientist will become a member of the AMT (ALMA Management Team)’.

ESAC strongly agrees with the panel’s assessment that “The status of the Observatory Scientist should be effectively equal to the Deputy Director”.

Regarding the current ALMA operations, ESAC notes the following issues that need to be addressed in the near future to ensure efficient observing:

i) The astigmatism problem of the NA Vertex antennas that is still unsolved has the potential to become a significant issue, particularly for high frequency observations;
ii) The delay in the delivery of the imaging pipeline (expected to arrive in December 2015) is a significant issue as it will result in a substantial extra work load in the QA process for both the ESO ARC and its ARC nodes;
iii) The lack of a dynamic scheduling tool of ALMA observation blocks is a serious issue as such a tool should ensure more efficient observing optimized for weather conditions;
iv) The lack of full sub-array capabilities is an issue which reduces Observatory efficiency;
v) In general, ESAC is concerned that the Observatory is overpromising in the delivery of new capabilities while attempting to maintain a high observing efficiency and that this risks staff members in Operations becoming overloaded.

In addition, ESAC remains concerned about the implementation of mmVLBI observations with ALMA and would like to re-iterate the need for a document that clearly describes the operational implementation (including realistic overheads and operational costs in terms of disruption), including proposal handling, scheduling of observations and data access principles.

Regarding EU activities the idea of initiating (small) internal development studies within ESO was presented to ESAC. ESAC welcomes this initiative and will consider endorsing such an implementation if presented a full scheme.
The delivery and installment of Band 5 receivers, an EU development project, has started with first fringes achieved and system performance better than the specified requirements. ESAC was pleased to hear about the good cooperation between the Executives for this development project, with NRAO contributing 30% to this project and NOAJ providing in-kind contributions during the installment phase. ESAC supports ESO’s plan for providing public Science Verification datasets preferably ahead of the ALMA deadline where Band 5 will become available.

Finally, ESAC congratulates ESO on a successful review of the EU ARC network. ESAC agrees with the panel findings and endorses the panel recommendations. ESAC was pleased to see that ESO has already started addressing the recommendations and welcomed the opportunity to comment on draft versions of the ‘Strategy Plan’ and ‘Workforce Management Plan’ documents. ESAC believes that these documents should include higher level visions on the future directions of the needs and expectations of the EU ALMA user community. Connected to this, ESAC endorses the recommendation of a higher diversification, i.e. clearly defined and distinct expertise areas, of the nodes in the EU ARC network. ESAC would also like to point out the generally high users satisfaction with the support in proposal preparation for Cycle 3 and in particular the very high satisfaction with face-to-face support.

3) ESAC recommendations and concerns for STC on other items

ARO Public Surveys - Call 2015-2018:

The panel was very pleased to see that the call had been successful, and that the first 2,000 hours of the ESO ARO time have been allocated to competitive projects. ESAC endorses the proposal to critically assess progress on the projects each semester, and it expects to see the first progress reports at the next f2f meeting. Some concern was expressed about the lack of detail in the management plan provided by the two high-priority projects and it was hoped this could be addressed in their progress reports.

APEX Instrumentation Plan:

ESAC was informed about the instrumentation development plan that is being discussed for APEX, and in particular about the single pixel/dual band opportunity. The instrumentation proposed appeared potentially interesting and the panel felt that a document presenting the scientific justifications was now needed to help evaluate the various options. ESAC understands that this documentation is in progress, and looks forward to receiving it for consideration and endorsement. ESAC is prepared to comment on the MoU/written procedure for bringing a Band 9 receiver in return for GTO time to NOVA and make a recommendation on short notice.

Single Dish Working Group:

ESAC welcomed the opportunity to comment on a draft of the Single Dish Working Group report. The document presents a very interesting and diverse science case. The scientific vision is compelling, and various implementation options are extensively discussed. ESAC understands that a wider comparison to other existing facilities (e.g. LMT, IRAM, etc.) was not yet included in the document and encouraged the WG to extend this comparison as far as feasible. In addition the panel felt that the report would be strengthened by including a more quantitative analysis of the science requirements.

The draft document’s recommendation for a 40m sub-mm dish at the Chajnantor plateau (or
alternatively a 25m telescope on Cerro Chajnantor) appears well justified. ESAC agrees in particular with the conclusion that neither an upgraded APEX nor an appropriate modification of ALMA TP antennas appear to be viable options to deliver cutting edge science in 2025+.

Some concern has been expressed by some ESAC members about the cost/benefit of a large aperture sub-mm survey telescope within the envelope of the full ESO development program. A possible framework to discuss this issue is the ALMA2030 report, but ESO should explore other routes as well (e.g. partnerships). ESAC looks forward to the opportunity to consider and endorse the final report when it is received from the Director of Science by STC.
4) ESAC recommendations and concerns on ALMA (response to ASAC charges for ASAC October 2015 meeting)

In the following ESAC’s response and concerns regarding the ASAC charges (see Appendix 2) are summarized and its recommendations for the ALMA observatory and/or ESO are provided.

**Charge #1 Principles of Proposal Review document**

ESAC received the previous and the updated draft version of the *Principles of ALMA Proposal Review Process (PPR)* documents prior to the meeting. For the discussion, inputs from the ESAC members were collected before the meeting. ESAC considers that the PPR documents basically covers all the relevant aspects involved in the proposal evaluation, but in its present version still reflects the “share risk” phase of operations, rather than normal operations. ESAC realised that the Implementation Plan of the review process, which will be updated for each observing cycle, is key to optimise the evaluation process as ALMA evolves. ESAC discussed a number of issues to be considered in both the PPR document and the Implementation Plan. A complete list of all the issues and concerns raised during the discussion is given in Appendix 3.

The main comments and suggestions from ESAC on the PPR document are:

- The evaluation of special programs is only described for Large Programs. The evaluation and the observation policy for mm-VBLI should be also addressed in the PPR.
- The evaluation process of Large Programs needs to be clarified. It is unclear if there will be inter-panel evaluation, i.e. all panels of the same category discuss all large programs in their category prior to the ARPC discussion.
- For multi-cycle programs it was felt that progress reviews and the handling of possible duplications with normal programs needed to be considered.
- Given that review panels comprise mm/sub-mm experts and non-experts, a technical assessment by JAO of all proposals ensures the same treatment for all proposals. The criteria used for the technical assessment should be clearly stated and uniformly applied in the evaluation process. ESAC notes that ASAC recommends to restrict technical assessment in Cycle 4 to proposals requesting non-standard mode, special proposals and ToO proposals before the face-to-face meeting of the panels.
- The rules on conflict of interest for members of the same department should be clarified.
- The mechanism for merging of the recommendations from the individual ARPs into a single ranked list by APRC should be clarified. Is it done in terms of just scientific excellence and how is a uniform assessment of this achieved between ARPs?

Concerning the Implementation Plan of the Review Process, ESAC unanimously recommends that the proportion of proposals given an A-ranking (to ensure that they roll-forward if incomplete at the end of the cycle) should be as high as feasible in each cycle to guarantee the highest scientific output of ALMA. A side benefit of a higher fraction of A-ranked proposals would be a lower number of resubmission of rank B projects, in particular of those that are scheduled but not executed due to the 0.5 year lag inherent to ALMA’s schedule. ESAC supports the ASAC recommendation that delivery of public value-added data products should be an explicit part of the evaluation criteria for large proposals.
Charge #2 Cycle 3 proposal review process, Cycle 4 plans, special proposal category, duplication checking procedure

**Cycle 3 Proposal Review:** The impression of ARP members was that the workload on several panels appeared too high and risked unequal outcomes for projects in some areas. Several panels had to discuss more than 100 proposals at the face-to-face meeting with one panel discussing ~130-140 proposals and requiring some panel members to read over 100 proposals. In addition based on personal experience of two ESAC members the identification and handling of duplications required a large amount of time. Also it was not clear whether duplications were being treated consistently between panels. Finally there seemed to be some confusion about certain procedures which risked them being applied inconsistently between ARPs (e.g. selection of proposals for rank A, final ranking). ESAC recommends that the information/training of the chairs is strengthened to ensure that all panels follow the same guidelines.

The User Survey showed that ALMA continues to attract a significant number of non-expert users (~1/3 of the people who responded). The users’ satisfaction with information and services offered for the proposal preparation is typically above average to high. This was in particular true for EU users who were the most satisfied and the EU ARC nodes had the highest fraction of people utilizing the offer for face-to-face support. It is interesting to note that the number of helpdesk tickets has been the lowest among the cycles.

Overall the users rated the proposal submission process as smooth, although the feedback suggests that users still encounter problems related to the OT.

ESAC notes that only a modest amount of ACA time is associated with high-priority programs (A+B), while a similar amount is requested for filler projects (rank C).

Some frustration has been heard from users about the feedback provided by the panels. The idea of providing more homogeneous feedback through the itemized list on each proposal was good – but the exact categories should be refined. In particular, the duplication of some of these items did make the reports look less thought-through than they actually were.

**Cycle 4 plans:** ESAC felt that more information is required from JAO to address this topic including a matrix that makes it possible to measure progress and evaluate if Cycle 4 plans are realistic. ESAC would like to reiterate its recommendation to prioritize measures that improve the stability and efficiency of the current system – including the use of the long baselines – over new modes such as mmVLBI, polarization and solar observing. ESAC supports the ASAC recommendation to increase the fraction of rank A proposals to about 50% for Cycle 4 to minimize the large fraction of resubmitted projects among scheduled rank A/B projects.

**Special Proposal Category:** Both large and multi-cycle programs are desired by the community – with some groups already starting to put in smaller but coordinated projects in the current cycles. In general ALMA now seems stable and efficient enough to allow for the execution of some large and multi-cycle programs. Although a restriction that these use on standard modes seems sensible at this stage. Further restrictions to a certain set of array configurations and bands may also be desirable. It is unclear if there will be a restriction on the amount of time available per LST per configuration per band for a given large program. ESAC requests a dedicated document from JAO for the plans for mmVLBI proposals that will describe the procedure for mmVLBI observations, the time evaluation and allocation process. Such a document is urgently needed for full evaluation. From the information currently available it seems that 3mm VLBI observations are ready to go ahead, while concerns remain regarding observations at 1mm – in particular, the delays in an agreement between the different stations.
**Duplication checking procedure:** ESAC strongly believes that the task of duplication identification and treatment should be done by JAO to as large a degree as possible – as the panels often lack information and overview to deal with duplications. The duplication checking of proposals in the panel discussion should be restricted to duplication of archival observations (with information in the proposal for why a duplication is requested) and duplications within the respective Cycle itself. It might be worthwhile to introduce a category for “Resubmission” where a PI can inform the panel how s/he would like to see pending observations (that are not carried-over) to be treated. This would help to reduce the load on the panels. In any case there should be a mechanism in place that ensures that duplications are treated consistently across panels. ESAC supports the ASAC recommendation to activate the resubmission button in the OT and add a text box to the technical justification section of the OT to allow PIs to scientifically justify duplications for Cycle 4.

**Charge #3 Balance of observing time vs. EOC activity vs. maintenance**

On the whole ESAC is under the impression that the observatory is continuing to improve the observing efficiency and that sensible choices are being made to balance EOC and maintenance activities against science observing. However, ESAC was not presented with any quantitative information that either conclusively demonstrated the reliability of the current efficiency estimates or allowed these to be compared with the original goals. In particular it seems that there is still confusion on how observing efficiency should be calculated and how it is evolving. ESAC did note that the sub-array correlator option, which is expected to improve the efficiency of the observatory, is almost, but not quite, completed. Hopefully this can be used effectively in the upcoming cycle.

Considering the configuration schedule, ESAC understands that there are concerns whether the Cycle 4 schedule will be optimal given the pressure on long baselines configurations and hour angle coverage, but clearly it is yet too early to make a final assessment on this. The observatory is encouraged in Cycle 3 to track how the observing of highly ranked proposals is progressing as a function of hour angle, configuration and observing band. The distribution of allocated projects against project time for the expected configurations in Cycle 3 that has been presented suggests that the overall distribution might not be optimal. However, it was not clear how EOC activities could affect the distributions.

Also on the question of the number of antennas available for science programmes, the ESAC is under the impression that reasonable statistics underlie the current practice, but were not presented with detailed information that the observatory is undertaking a cost-benefit analysis of the optimal number of antennas that should be available for observations. It is noted that such an analysis should also include the impact on the ACA and TP facilities.

Hopefully ASAC will have timely access to the completed ORR documents that are mentioned in this charge.

**Charge #4 ALMA Development Plan**

ESAC is pleased to see that excellent progress is being made on the priority programs of the European ALMA Development Plan 2010 and 2013. The committee notes that significant progress has been reported in the ALMA Band 5 receiver project and in the ALMA Phasing Project (APP). ESAC was also informed of the successful deployment of an optical fiber network for high-speed communication.
The committee is pleased to see that the delivery of the ALMA Band 5 receivers and the implementation of the ALMA mm-wave VLBI capabilities are proceeding smoothly and according to plan.

ESAC is very impressed by the performance of the Band 5 receivers, the detection of fringes and phase closure with ALMA Band 5 receivers, and the detection of first intercontinental fringes at 1.3mm between phased ALMA and the IRAM 30m telescope. ESAC congratulates ESO, JAO and all staff involved for these great achievements.

While ESAC fully acknowledges progress made for the APP, it remains concerned about the plans for ALMA mm-wave VLBI implementation in future cycles and requests the opportunity to comment on a document that establishes the guiding principles for VLBI operation with ALMA.

ESAC was also informed about progress made on the high-speed digitizer development, the optimization of the ALMA cryo-cooler system, the ALMA Band 2+3 receiver design, and on advances made in the frame of the solar observing study. ESAC continues to endorse strongly these development programs, and research and development work being conducted on the follow-up studies. The committee is also appreciative and supportive of European efforts and contributions that aim at securing the long-term operation of ALMA.

ESAC endorses work to improve the surface quality of the ALMA antennas, the design and implementation of an integrated alarm system for the safety of the ALMA observatory, and all measures directed to improving the operational efficiency of ALMA. ESAC noted with satisfaction not only the progress made in the high-speed digitizer and the Band 2+3 receiver, but also the side band separation for band 9 receivers. All of these items are well aligned with the implementation of larger bandwidths recommended as one of the main goals of the development path in ALMA2030. ESAC fully supports the idea to have the 2016 edition of the Call for Development Studies focused on the vision outlined in the ALMA2030 roadmap. Due to the lack of documents from AMT and IST ESAC could not comment on the prioritization of future development projects.

**Charge #5 ALMA science and performance**

ESAC agrees with the conclusions in the presentation of ESO’s ALMA project scientist L. Testi: high user satisfaction (once they have the data), most projects have quick publication(s) with high impact, several key goals/requirement are already met or will likely be met in the near future.

Based on the information received about performance goals and metrics, ESAC acknowledges the progress in system stability, as measured by the QA0 execution efficiency between Cycle 1 and 2, which increased from 54% to 69% (i.e. execution efficiency in time from 74% to 84%), as well as a QA2 efficiency that rose from 85% to 92%. Further efficiency improvement could be obtained with a better understanding of the telescope idle time, as well as a fully operational sub-array and a dynamic scheduler. ESAC did not discuss the "over-calibration" issue, but a conservative view is to keep the current calibration scheme based on JAO experience, in order to maintain high efficiency of QA0/2. We also note that the image fidelity is in practice “very good”, but in some cases the performance cannot really be tested – as the true image being not known. Moreover, we have estimated for Cycle 3 that the sensitivity and spatial resolution of ALMA will be of 72% and 62% of their maximum goal, respectively (see table below of the metrics measuring the ALMA progress). The sensitivity and spatial resolution expectations for Cycle 5/6 is to reach 90% of the ALMA goal.
ESAC shares the ASAC concern that the need to calibrate archival data with a specific CASA version bares the risk of losing access to these data in the distant future.

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<th>Spatial res. (% vs Bmax =16km)</th>
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Appendix 1: ESAC meeting agenda

Tuesday 22 September 2015

08:30 Welcome, Intro and Plan of the Day (L. Testi)
08:45 ALMA/EASC up-date (W. Wild)
09:00 Science Operation overview (P. Andreani) – focus on C2 completion, C3 proposal review
09:20 User Survey (M. Diaz Trigo)
09:30 Operations Readiness Review outcome and feed-back (W. Wild)
09:50 Discussion and input for ASAC Charge 3
10:20 Coffee Break
10:30 EU ARC Review (M. Zwaan)
10:45 Discussion on Charge 2 and Eu ARC Review
11:15 Development plan status overview and studies at ESO (L. Testi)
11:25 Report on the status of: Solar, mmVLBI and Band 2+3 (R. Laing)
11:40 Report on status of Band 5 (P. Yagoubov)
11:50 Discussion, input to ASAC on Charge 4
12:20 Closed session
12:40 Lunch
13:40 Discussion on Charge 1 (no specific presentation planned)
14:10 Status of available modes, standard/non-standard, efficiency at the end of Cycle 2
   (P. Andreani)
14:25 Comparison with science requirements and science output (L. Testi)
14:40 Discussion and input to ASAC on Charge 5
15:10 Coffee Break
15:25 Update on ESO-SD WG and ARO Surveys (L. Testi)
15:40 APEX (C. de Breuck)
16:10 Discussion
16:40 Closed session
17:10 AOB
17:30 End of day
Appendix 2: Charges for ASAC meeting October 2015

**Charge 1:** ASAC will be presented with an updated version of the Principles of Proposal Review (PPR) document. This new document includes changes in line with the ALMA Trilateral Agreement of the Partners, and changes that reflect the more evolved operations state of ALMA since the version of the document from Cycle 0. The Board and ALMA Project welcome comments from ASAC on issues discussed in the document that would have an impact on the scientific output of ALMA. The PPR is meant to be a high-level, stable document, while the Proposal Review implementation plan will contain details that might vary from call to call.

**Charge 2:** With the Cycle 3 Proposal Review Process (PRP) recently completed, the JAO should present the ASAC with an analysis of the success and shortcomings of Cycle 3 proposal process, starting from the Call for Proposals through the PI notification stage. The ASAC should comment on the Cycle 3 proposal process and any planned or proposed changes to future cycles. Looking forward to Cycle 4, the ASAC will receive updated information on the Cycle 4 plans. Are there any issues in these updates that need further attention? Does the special proposal category (new to Cycle 4), including Large Programs and VLBI proposals, meet the expectations and needs of the user community? Are the changes to the duplication checking procedure sufficient for a smooth proposal submission and evaluation process? If not, ASAC should indicate any further updates to duplication checking that are indispensable for the Cycle 4 evaluation process.

**Charge 3:** As ALMA transitions from its Early Science phase to full operations, ASAC is asked to investigate and comment on the balance between science operations, enabling new EOC capabilities, and regular maintenance of the array:

- a) Is the current balance of the fraction of array time dedicated to carrying out approved science programs vs implementing new EOC capabilities correct?
- b) Are configuration schedules optimized for the greatest scientific return?
- c) The documentation describing ALMA Steady State and Full Operations for the Operations Review Committee indicated a nominal schedule of 85% of the array elements (i.e. at least 56) at a given time in use for science observations. ASAC should comment on the impact that this expected number of available array elements will have on the science output and efficiency of ALMA. The JAO will give ASAC access to ORR documents that are relevant to this charge.

**Charge 4:** Pursuant to standing charge 4, now that the first generation of Development programs are well under way, ASAC should give a preliminary assessment of their impact on the JAO. They should also comment on whether the projects have met or are expected to meet their initial specifications. As a follow-on to this charge, ASAC should also make a scientific prioritization of the new planned Development projects and remaining, unimplemented baseline capabilities. To help with this discussion the ALMA project (the AMT and the IST) will provide ASAC with lists, timelines and a cost assessment of these projects and capabilities.

**Charge 5:** Looking back at the key science goals of ALMA, ASAC should discuss and comment on the basic performance and function of ALMA at the end of Cycle 2. Is the array performance living up to user expectation at this stage of the project? Is it already able to fulfill some of the key science goals and specifications for ALMA? Are there areas for improvement? The ASAC should comment on the ALMA project list of annual performance goals and metrics that will become the basis for measuring progress as ALMA transitions to steady-state operations.

**Finally,** the ASAC is encouraged to bring to the attention of the Board any additional issues or concerns resulting from discussions at the ASAC meeting and telecons.
Appendix 3: ESAC’s detailed comments and suggestions on the PRP document

Section 3.4 Special Proposals

Clarify if there will there be an upper limit as to how much time per cycle (LST, frequency, configurations, ..) will be available to different special programs? In the case of large programs the PRP indicates that this will be announced in the call for proposals.

Clarify if multi-cycle programs, like large programs, are restricted to standard modes and the amount (maximum number) of cycles such projects will be executed.

Clarify if the minimum of 50 hours specified for a large program refers to only 12m-array time or the aggregate of 12m+ACA+TP time.

Section 4: Proposal Submission

Point (f) status of previous ALMA observations: Does it mean led by the PIs and co-PIs or those were the PIs and co-PI are involved in?

Section 4.1: Duplications

The handling of proposals that duplicate observed B projects from the previous cycle should be clarified.

Section 5.2: Science categories

For completion, one should consider adding Fundamental Physics in Category 1

It might be useful to include, in the call for proposals, more detailed keywords for what goes into what category.

Section 6: The Proposal Ranking

Clarify the carry over of A-ranked proposals. It is unclear if the roll-over only apply to the next subsequent cycle or is there a continuous roll-over for several cycles until the project is finished.

Section 7.3: The Scientific Review Process

Clarify how to handle the discussion of duplications at the (inter-)panel level. A more defined process would ensure more consistency between years and likely categories.

Clarify if the ranking for large programs will consider extra properties in addition to its 'scientific merit' or as part of its 'scientific merit'. Most of the observatories require, for instance, the delivery of public high level data product.
Section 9: Accounting of Time to the Executives and Chile

Clarify if there will be a limit on the number of co-PIs considered for the assignment of time to different partners.
Report from the E-ELT Sub Committee meeting
October, 19th, 2015

ESC: Almudena Alonso-Herrero, Benoit Carry, Simone Esposito, Sofia Feltzing, Stefan Gillessen (visioconf), Anne-Marie Lagrange (Chair), Steve Longmore, Jose Miguel Rodriguez Espinosa, Matthias Steinmetz.

ESO: Mark Casali, Michele Cirasuolo, Roberto Gilmozzi, JC Gonzalez, Rob Ivison, Roberto Tamai.

Conflicts of interest update: B. Carry: HIRES (inst), MICADO (pers); S. Esposito: MAORY (inst); S. Gillessen: MICADO (inst, perso); A.-M. Lagrange: MICADO (inst), MAORY (inst); S. Longmore: none; J.M. Rodriguez: none; M. Steinmetz: MOS, HRES (inst).

Report on the ELT status (R Tamai)

The committee was pleased to hear about the progress made during the last six months. The management team is now complete, and a new program scientist has been hired. A lot of developments have happened in the past months (telescope, instruments, organization). The ESC was pleased to see a very good momentum, at all levels of the project, and congratulates the ELT team.

At the same time, the team faces a lot of pressure. Considering the current and forthcoming phases that include big contracts and related review activities, the ESC notes that it would make sense to increase the resources devoted to the project temporarily. The STC was informed on the next day of a temporary increase of the manpower in the coming months.

Concerning the fundings of the project, the ESC notes that the signature of Brazil is still pending, and 2017 is approaching. The ESC asked about the impact of a phase 1 only on the instruments Phase A studies. The ESC was told that 90-95% of the requirements are insensitive to phase 1/2 and that, from a calendar point of view, MICADO, HARMONI, METIS and MAORY would have time to adjust before the end of PDR (scheduled end of 2017). The ESC advises to discuss in advance with the consortia whether a one year period is a consistent time frame to readjust the design work, or if the bifurcation should be anticipated before the end of 2016.

First light instruments (M. Curasuolo):

The ESC was informed that the contracts have been signed with the consortia with MICADO, HARMONI and METIS, and that the MAORY contract will follow soon.

There is a concern about the increase of IR detector costs.

The ESC was pleased to hear that clear procedures have been put in place to share both frozen & evolving ICDs with the consortia.

The ESC inquired about the impact of possible changes in the METIS organization (ETH); ESC was told that the situation is under control.

The technical specifications of the instruments were discussed. While most are clear, and while they fully understand that all specifications cannot be frozen now, the ESC noticed that some technical specifications are not sufficiently developed. Questions were asked for example about e.g. specifications on the PSF temporal stability, the HARMONI background and AO performances, the MICADO differential tracking (SS targets), the MAORY WFS
In case of trade off impacting on science, the ESC asks to be involved early enough so as to have a way to give useful inputs.

Finally, now that the contracts have been signed, the ESC feels it would be timely to have a presentation of the instrument by the PIs.

MOS and HRES (M. Casali):

A call for proposals (CFP) was issued by ESO in summer 2015, with a deadline in Dec. 2015. It is anticipated that only one proposal will be presented for each instrument. The next steps include i/ a PST meeting to discuss the TLRs together with the white papers and answers to CFP, ii/ a start of Phase A in Feb 2016, and iii/ a mini review in spring 2016. These next steps will be crucial for the projects. The ESC is willing to help in this process, and the ESC and STC should be involved whenever trade-offs (e.g. on requirements) impacting on science have to be made (before the start of Phase A, and at next ESC/STC).

Finally, the ESC encourages ESO to provide the consortia, at the beginning of phase A, clear criteria that will be used for the final decision on the instruments final TLRs and science objectives.

AIV and instrument interfaces (JC Gonzalez):

The ESC was informed that a first draft of ICDs has been issued and shared with the consortia. The ESC asked about the test camera. The objectives are well understood. The ESC notes that even though the test camera will be designed and optimised for the test of the telescope, it could offer an opportunity of demonstration of the E-ELT science capabilities. The ESC suggests to anticipate which high impact science demonstration could be done with the test camera, and to discuss possible overlap with GTO of 1st light instruments.

Miscellaneous:

The ESC had a very interesting visit of on-going tests, and appreciated the information that were given.

The ESC expresses a need for an expert on stellar populations in the committee.
## Conflicts of Interest STC 2015

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