SCIENTIFIC TECHNICAL COMMITTEE

68th Meeting
ESO, Garching, April 16 & 17, 2008

STC recommendations
Recommendations and Report from the 68th STC Meeting on April 16th and 17th, 2008


Present Wednesday only: H. van Langevelde

Participating via Videolink: D. Minniti from Chile

Absent: Y. Mellier

1) Recommendation on the LGSF and AO Programmes at ESO

The LGS operation at Paranal remains a challenge. This is significantly impacting the science produced by the VLT, as many observations cannot be completed. The STC appreciates that part of the problem lies with commercial products for which finding solutions may be difficult. The STC appreciates the heroic efforts from the operation staff to maintain the system operating. We however urge ESO to devise a recovery plan and to give it highest priority so as to recover nominal AO/LGS operations at the VLT and bring the system to the same level of quality prevailing at Paranal and which has made it its success.

The STC feels that the success of the current generation LGSF is critical to the success of the many other LGS systems planned in the ESO Programme, firstly the AOF and the projects GRAAL and GALACSI, and later the E-ELT for which LGS operation is critical.

While the recovery programme is in progress, ESO should inform the astronomical community in the calls for proposals that only a limited number of observations will be possible to execute with LGSF in the foreseeable future.

2) Maintaining the Worldwide Leadership of the VLT and Novel Upgrades for LaSilla

Based on new information presented by ESO, the STC continued discussing strategies for securing and maintaining the scientific eminence of the VLT well into the ELT era. This time the discussions focussed more on short-mid term upgrades of current VLT and LaSilla facilities, but the STC also acknowledges the work being done on securing future instrumentation. The STC was pleased with the detailed and clear near-term upgrade plan for LaSilla and Paranal instrumentation presented by ESO. The recommendations from the STC discussions following the ESO presentations were as follows:

A) As stated in previous STC recommendations, it continues to be important for ESO to look for cost effective ways to enable and maintain wide-field imaging and spectroscopic facilities for the ESO community without jeopardizing the other major approved ESO projects. VISTA and VST progress is extremely encouraging, and the STC was very pleased that the imaging surveys would be starting in the near future. Complementing spectroscopic surveys will significantly increase the scientific impact of VISTA and VST.
Pending results from an upgrade to improve the red sensitivity of GIRAFFE, replacement of the 4 VIMOS red detectors with CCDs that have higher quantum efficiency in the red was presented as part of the possible VLT short-term upgrade plan. The STC realizes that this upgrade would require a fair investment of personnel and monetary resources. However, such an upgrade would enable starting the spectroscopic surveys in an efficient manner, enabling new science opportunities for the ESO community. Because of this, if the GIRAFFE results show a significant improvement in the red sensitivity with the new detectors, the STC ranks the VIMOS upgrade at highest priority of the short-term upgrade plan.

B) Potential upgrades of HARPS were presented, including a proposal for a polarimetric unit, proposed by a Swedish/Dutch (and others) consortium. Other potential upgrades for HARPS include a laser comb, a new FP calibration unit, new fibres and scrambler, improved guiding, new ultra-stable cryostat, and an improved detector with highest red sensitivity. A clear and interesting scientific case was made for the polarimetric unit, but the written proposal does not address the possible impact that the installation of this unit could have on future possible improvements on high precision radial velocity determinations, which remains the highest scientific priority of HARPS.

We recommend that ESO, with the help of the HARPS Consortium and of the group proposing the polarimetric unit and perhaps other interested groups, prepare a single upgrade plan, which would outline the scientific priorities of each proposed upgrade, whether they would be compatible with each other, the resources needed, and the timescale for these upgrades. If the study shows that the polarimetric unit does not compromise the remaining upgrades, we recommend that its implementation go forward.

In addition to the HARPS upgrades, the STC heard of options to maintain the capabilities on the NTT and the 2.2m. In particular, there is an option to have continued operations of the 2.2m telescope (with FEROS, WFI and GROND) and SOFI at the NTT as part of the LaSilla Operations 2010+ operations plan. The STC supports a plan where ESO could continue to offer these scientifically excellent facilities to the community if compatible with the Council resolution on the LaSilla 2010+ operations plan.

C) The STC was pleased with progress being made on VLTI with PRIMA and with the contracts for the second generation VLTI instruments, MATISSE and GRAVITY. The STC also welcomed the news that ESO has issued a call for proposals for the ultra-stable spectrograph as the first element in the overall instrumentation plan for the VLT in the ELT era. We hope to see the additional calls come out in a well-defined sequence for – a wide-field, very high-multiplex spectrograph facility for one or more Nasmyth foci and an additional open concept for future instruments, as well as actions aiming to upgrade or replace the work-horse instruments. The STC emphasizes that these new instrument concepts are meant as long term enhancements and upgrades to the VLT in the era of the ELT, and should not compromise the suite of approved second generation instrumentation in the short- and mid-term.

3) Comments on the New STC and Sub-Committee Structure

The STC welcomed the proposal of the SSWG to Council on the new Terms of Reference for the STC and the new Sub-committee structure. The STC notes that all but one of the current STC
members have terms that expire at the end of 2008. The STC suggests that Council and ESO try to maintain some memory of the current STC by staggering the replacements of some of the current members. The STC very much appreciates the general policy of strengthening the STC links to its sub-committees (ESAC, ESE and the new LSP) by making sure that there are at least two STC members on each sub-committee. The relative complexity of this structure requires that the mechanisms for appointing/replacing members (and chairs) at the STC and its sub-committees are defined in detail, and as clearly as possible.

Pending the Council decision on the STC membership for 2009, the STC recommends to ESO the following changes to the STC membership of the Sub-committees for the remainder of 2008:

- **ESAC**: R. Bachiller should join J. Afonso, who would continue as Chair, on the ESAC for the fall 2008 ESAC meeting.

- **LaSilla/Paranal Sub-Committee**: This sub-committee is the replacement for the current VLTI sub-committee. J. Blommaert should join H. Kjeldsen, who would act as Chair, for the fall 2008 LSP Sub-committee meeting. This sub-committee should also include, as much as possible, the current members of the VLTI Sub-committee in order to keep the urgently needed expertise on the complex issues related to VLTI.

- **ESE**: The current membership of T. Herbst (Chair), J.-G. Cuby, R. Gratton and G. Olofsson should continue in 2008.

4) **The STC Sub-committee Reports**

The STC received both written and oral reports from the Chairs and/or co-chairs of all three of its subpanels: the ESAC, the ESE, and the VLTI sub-committee. The ESAC met twice since the last STC meeting, and have submitted two written reports. We welcome the detail of the reports from the sub-committees in helping us to make overall recommendations to Council and ESO. The full, unedited written reports of the three subpanels are attached as an appendix to the main STC report for information. The STC takes note of and endorses the recommendations from the ESAC, the VLTI sub-committee and the ESE.

A) **The highlights from the ESAC reports and recommendations were:**

1. ESAC Functioning and Terms of Reference:
   - The ESAC considers the speedy conclusion of this process to be of the utmost importance, and was pleased to know details of a concrete proposal under consideration. The ESAC recommends a phased replacement of current members, to guarantee a smooth transition phase. Current ASAC membership should be considered.

2. ALMA Project Status:
   - The ESAC appreciates the project's efforts to minimize delays (e.g., speeding up production of Front- and Back-ends, ramping up hiring) in anticipation of the very demanding Commissioning phase.
- The committee is very concerned with the recent key personnel movements within the project, namely the ALMA director and the European ALMA Project Manager and Head of the ESO ALMA Division, and urges the project to quickly find the best candidates for these positions.
- The ESAC is concerned about an approved change request to relax the cross-polarization accuracy specifications for Band 7, specifically designed to be the most accurate for polarization measurements, apparently prior to sufficient investigation of the problem. At the last ESAC meeting the problem had been further characterized and a solution seems to be possible, but the impact on the budget and schedule is still unclear.
- The ESAC recognizes the vital role of the ALMA Test Facility (ATF) in testing both the ALMA software and hardware. The facility is currently being run, and until June, as an observatory by the CIPT, SciIPT and ALMA operators. Given the clear benefits to the project, and the gap until a two-element interferometer is available for software testing at the Operations Support Facility, the ESAC recommends the consideration of an extension of the ATF operations.

3. APEX Project Status and Plans:
- The ESAC congratulates the Swedish Heterodyne Facility Instrument (SHFI) team on solving all major problems with the instrument suite, and applauds its successful commissioning and Science Verification at APEX.
- The ESAC considered the scientific case for Artemis, a large-format, filled bolometer array being proposed as a Visitor Instrument to ESO. The ESAC compared the expected performance with current and planned sub-millimetre facilities, taking into account the results from the 2007 test runs of a prototype of the instrument, p-Artemis. The ESAC is favourably impressed with the anticipated capabilities of Artemis, and finds its scientific case one of very high interest. The technology, developed for Herschel's PACS, has proven to be successfully adaptable to ground-based observations and Artemis appears to be technically feasible. Together with the unique conditions of the Chajnantor site for sub-mm astronomy, Artemis is expected to be a competitive instrument with, for example, the upcoming SHARC-2 and SCUBA-2 facilities at 350/450 micron. The capability of observations at 200 micron is an extra point of interest, as it will allow using the very best observing conditions at Chajnantor.

B) The highlights from the ESE report and recommendations were:

- Examine ways to increase ESE-ESRC communication
- Add a telescope engineer to ESE until Daniel Enard’s return
- Request an overview meshing focal stations with AO and instruments
- Recommend increased communication between Project Office, AO group, and instrument study teams
- Recommend focusing all necessary resources on site characterization
- Miscellaneous items need attention - see last section of ESE report
C) The highlights from the VLTI sub-committee report and recommendations were:

- The sub-committee congratulates the PRIMA and VLTI teams on the solid progress made in the last six months towards PRIMA commissioning and towards the ongoing strengthening of the VLTI systems group, which has already led to much improved characterization of VLTI infrastructure performance.
- Given the first successes in limiting vibrations, the goal to further reduce them into the originally specified range of 100-150 nm rms should be maintained.
- Seeing results convincingly show the presence of strong turbulence in a relatively thin ground layer, which normally does not affect UTs but does so in an important way for the DIMM seeing monitor and the ATs. Introduction of AO correction beyond tip/tilt should be seriously considered as a future step to upgrade AT performance.
- For proper consideration of VLTI within the overall LaSilla/Paranal instrumentation suite it is important that the new LSP STC-subcommittee comprises among its members an adequate number of persons with interferometric experience.
Appendix 1: Reports from the 3 STC Sub-committees

A) Report from the January 2008 ESAC Meeting

ESO, Garching, January 15, 2008

ESAC members: S. Aalto, J. Afonso (chair), D. Field, F. Gueth, J. Harju, J. Richer, P. Schilke, L. Testi (European ALMA Project Scientist)

Other participants (part-time): P. Andreani, E. van Dishoeck, R. Laing, D. Rabanus (via videocon), G. Raffi, T. De Zeeuw, M. Zwaan

Apologies: A. Benz, J. Cernicharo, M. Hogerheijde, R. Maiolino, C. Waelkens

The ESAC met in Garching on January 15th, 2008. The agenda of the meeting is attached as an appendix to this report.

ESAC Functioning and Terms of Reference

The committee was informed that a new version of the ESAC Terms of Reference is currently being considered by the ESO Council. The ESAC considers this process to be of the utmost importance, and urges its completion in the shortest possible time.

ALMA project status

The ESAC was informed of the general status and progress of the ALMA project by L. Testi.

The ESAC welcomes Richard Hills as ALMA Project Scientist as of November 2007. His contributions to the project will certainly help to the successful completion and commissioning of ALMA.

The ESAC is pleased by the project’s efforts to speed up the production of Front- and Back-ends, as the late arrival of these elements to the OSF could create a bottleneck situation for Commissioning in early 2009. The committee hopes that these efforts may minimize any delay to the project.

The ESAC notes with some worry the recent personnel movements, namely the pending replacement of the ALMA Director and the European ALMA Project Manager and Head of the ESO ALMA Division. While it is understandable that a huge project as ALMA may display an intense personnel movement, with many departures and arrivals, the current time is a critical one, with the first antennas arriving on site and the commissioning quickly approaching. The committee urges the project to quickly find the best candidates for these key positions. The ESAC would also like to express its appreciation for the energy and enthusiasm that both Massimo Tarenghi and Hans Rykaczewski have brought to ALMA. The project has successfully overcome many difficulties under their leadership and guidance.

The committee was informed about some of the Change Requests recently submitted to the project. In particular, the ESAC notes with worry the approved request to relax the cross-polarization accuracy specifications for Band 7, designed to be the most accurate for polarization measurements, prompted by measurements that failed to meet the original specifications. The origin of the problem is still unclear, and it appears to the committee that more investigation must be performed in order to explore all possibilities for not loosing important ALMA capabilities. The ESAC recommends that the project dedicate appropriate resources to characterize the
problem quickly, so that a solution may be devised. Only at that stage one can estimate the impact of the proposed solutions on the project’s budget and schedule and balance it with the important scientific implications such modification may represent.

The ESAC recognizes the vital role the ATF is currently having in testing the ALMA software (but also the hardware). From September 2007, the ATF has been run as an observatory by the CIPT, SciIPT and ALMA operators, with the aim of testing and debugging the ALMA software, and developing end-to-end processes. The careful planning has already led to important improvements, namely in terms of stability, and that is seen as a great contribution to a smoother commissioning phase. Also the training of staff, which is currently happening, is a highly beneficial situation to the project.

ASAC Charges
The ESAC discussed the current ASAC charges.

Charge A. Review the calibration plan and scientific aspects of Assembly, Integration, Verification testing and for Commissioning. Being mindful of the finite resources (human, financial) available, are changes necessary or desirable for scientific reasons to the plans being implemented?

The ESAC revisited this charge, as it had been already discussed in its previous meeting (September 2007). The committee was informed by Robert Laing about the latest revisions to the Commissioning and Science Verification Plan, and by Leonardo Testi and Paola Andreani on the efforts to secure appropriate manpower for the Commissioning phase both in the Science IPT and in the ARC. It is reassuring to see that the new estimates for required manpower for Commissioning are well in-line with the previous numbers. The ESAC was informed that, however, it appears the previous estimates of the available manpower in the project were perhaps somewhat optimistic. The ESAC notes that appropriate steps are being taken to increase the staffing for the CSV phase to the estimated requirements, and that more positions will be advertised during the current year. In face of complexity and importance of the CSV phase for the project, the ESAC recommends that a review of the CSV procedures and processes to be realized after the first few months of this phase.

Charge B. Assess the preparation of the ALMA real time, observing, and off-line software for early science. In particular, review the impact of the recommendations of the May 2007 software review and the schedule for the next two years.

For this charge, the ESAC was presented an update on the Computing IPT by G. Raffi. The ESAC was pleased to see that there has been a prompt and efficient response to the recommendations of the May 2007 SW review, and most (if not all) have been, or are been, addressed. It is clear that, although the ALMA online and offline software are not yet ready for Early Science, major progress is being made. The access to the ATF, which will happen until June 2008 barring some major hardware faults, has been very successful to develop and test the online software. It is with some concern that the ESAC considers the period following the ATF shutdown. The ATF operations will then be shifted to the OSF, but there will likely be at least a 6 month gap before a 2-element array can be used for software testing at the OSF. This period will not exclude all software testing, but it will obviously hinder the fundamental developments that will still be necessary. Extending the ATF operations until the achievement of interferometry at the OSF is a possibility that should be re-evaluated closer to June, considering all other priorities to the project, as it may result in lower long-term costs as well as potentially minimizing delays.
As for the off-line software, CASA (Common Astronomy Software Applications) has had a beta release last October, a release restricted to ALMA and EVLA project personnel and a limited number of users drawn from the scientific advisory committees. CASA is still far from completion, still lacking essential functionality. Although already able to reduce datasets from several radio-interferometers, CASA is still lacking many millimetre specific tools that will be fundamental for ALMA, as well as the capability to reduce single-dish data. Feedback from the community has been limited, which is in part due to the installation of CASA being supported only for a limited number of operating systems. This is currently being addressed by the CASA team, and is expected that during 2008 more widespread support exists. In order to steer the CASA development towards dedicated ALMA issues, the ESAC recommends that particular attention is giving to handle data from (sub-)millimetre observatories like CARMA, SMA or Plateau de Bure (a suitable converter between formats is currently non-existent). Also, the ESAC recommends that a number of CASA tests particularly relevant for ALMA data to be developed and performed by dedicated individuals or teams, preferentially within the project itself. It will be difficult to replace the results from this kind of focused testing by the eventual feedback from CASA testers at this point.

Charge C. The ALMA Board has charged the project to develop a long term ALMA Development Plan in consultation with the international astronomy community. The plan should set out the scientific context for transformational science with ALMA in 2020, in the era of for example JWST, ELTs and SKA, and the developments necessary to achieve this vision. The ALMA Board views this plan as having the utmost strategic priority, and is coordinating its development across the entire ALMA partnership. The process of generating the ALMA Development Plan should be led by the JAO Project Scientist and the ASAC (with support from the Executives). The first stage (to be completed by the end of 2008) will involve an examination of the scientific drivers by a number of specialist sub-groups, representative of the wider astronomical community, covering the whole field. In time for the Board's April 2008 meeting, the ASAC should identify the scientific themes on which sub-groups will work (for example: star formation, galaxy formation etc) and appoint appropriate Chairs for each subgroup.

The ESAC recognizes the importance of this exercise, and notes the recent considerations about the future of Astronomy present in Astronet’s “A Science Vision for European Astronomy” report. All scientific themes present in that report are directly pertinent to ALMA in an epoch where JWST, ELTs and SKA will likely be operating, and these will be the scientific drivers not only for ALMA but for all these other concurrent facilities. Development of ALMA will necessarily be focused on these topics, where ALMA will have a major role. Possible names to be include in the specialist sub-groups were discussed and will be suggested to the ASAC.

ALMA related Outreach and Meetings
The ESAC was informed of the possible ALMA related funding schemes. At this point several possibilities within the FP7 framework are being considered, both for the development of ALMA Hardware or Software and for contributing to the ALMA Regional Centre Nodes effort. For the latter, a COFUND initiative is being prepared under the ARC initiative. Also, the possibility of submitting a proposal under the Initial Training Network programme is also under consideration. The ESAC would be willing to be involved in such proposal. L. Testi will be obtaining more information on this and report in forthcoming ESAC telecons. The ESAC also discussed the organization of future European ALMA related meetings. In particular, a meeting on “Simulations for ALMA”, to take place towards the end of the year, is being considered and will be decided upon in the next few weeks.
APEX project status and plans
The ESAC was informed by David Rabanus of the APEX status and recent developments. Of particular interest at this time was the status of the Swedish Heterodyne Facility Instrument (SHFI), and the decision about shipping it to Chile. The ESAC was informed that essentially all previous problems with the SHFI had been solved, with all receivers essentially within specifications but for some residual fine tuning issues. The only unclear situation concerns the control software, which was still to be finalized. As such, the decision on the shipping had been postponed for a further 10 days‡. The ESAC congratulates the SHFI on the resolution of the standing issues and waits with anticipation the installation of the instrument on APEX, increasing its already considerable capabilities.

The ESAC also discussed the tests being done with the prototype ARTEMIS instrument on APEX. This instrument has the potential of being of huge interest to the European astronomical (sub-) millimetre community, and the ESAC would like to consider this instrument and its possible standing with the APEX partners in depth in the near future, to better understand its envisaged capabilities and how they will match the scientific requirements of the European astronomical community.

‡ In the meantime, the SHFI was indeed accepted for shipping to Chile, and a Call for Proposals for Science Verification has been issued on the 7th of February.

Agenda of the January 2008 ESAC meeting, ESO ALMA building, Room 054

09:30-09:35 Welcome
09:35-09:45 ESAC functioning and Terms of Reference
09:45-10:30 ALMA Project Update
  - Overview (all IPTs) (Leonardo)
  - ALMA Change Requests: Cross-polarization specifications
10:30-11:00 ASAC Charge: Calibration
  - Response to ASAC comments and discussion (Leonardo/Robert)
11:00-11:15 Coffee break
11:15-12:30 ASAC Charge: AIV, Commissioning
  - Response to ASAC comments: revisions to the plan (Robert)
  - Response to ASAC comments: staffing for commissioning (Leonardo/Paola)
12:30-13:30 Lunch break
13:30-14:30 ASAC Charge: ALMA software
  - Software system development, status, review and actions (Gianni)
  - ESAC CASA tester’s reports and discussion (ESAC members)
  - ESAC discussion - coordinate input for ASAC
14:30-15:30 ASAC Charge: ALMA development plan
  - Introduction (Leonardo)
  - ESAC discussion - coordinate input for ASAC
15:30-15:45 Coffee break
15:45-16:15 Outreach, ALMA Forum, Community Development, Meetings
  - ALMA meetings for 2008/9
  - FP7 planning and opportunities
  - The Messenger (articles on Antennas, Community Days and Survey ws)
  - The European ALMA Newsletter latest edition
  - DRSP 2.0 vs. ESO Garching Science day
16:15-17:00 APEX status and plans (David)
  - Heterodyne Facility
  - Artemis Developments
17:00-17:15 A.O.B.
B) Report from the ESAC Meeting of April 15, 2008

ESAC members: J. Afonso (chair), J. Harju, P. Schilke, L. Testi (European ALMA Project Scientist)

Other participants (part-time): P. André (Artemis scientific team), P. Andreani, C. De Breuck (ESO APEX Project Scientist), J. Cernicharo (via telecon), B. Leibundgut, Y. Le-Pennec (Artemis technical team), R. Maiolino (via telecon), H. Rykaczewski (European ALMA Project Manager and Head of the ESO ALMA Division), J. Richer (via telecon), L. Rodriguez (Artemis technical team), T. De Zeeuw

Apologies: S. Aalto, A. Benz, D. Field, F. Gueth, M. Hogerheijde, C. Waelkens

The ESAC met in Garching on April 15th, 2008. The agenda of the meeting is attached as an appendix to this report.

ESAC Functioning and Terms of Reference

The committee was informed by Bruno Leibundgut of the new ESO management structure being considered by the ESO Council, which includes a revised model for the functioning of ESAC as an ESO Scientific Technical Committee (STC) sub-panel. The ESAC recognizes the importance of working within the STC structure and looks forward to the implementation of the new structure. The ESAC notes that essentially all its members are currently past their nominal appointment period, but recommends a phased replacement of current ESAC members, to guarantee a smooth transition phase. Special consideration should be taken of the currently appointed European ASAC members, whose terms expire between 2008 and 2010.

ALMA project status

The ESAC was informed of the general status and progress of the ALMA project by H. Rykaczewski and L. Testi. The ESAC appreciates the Project’s efforts in the ramping up of hiring, in preparation for the demanding Commissioning period. The arrivals of Dr. Robert Lucas and Dr. Reiner Mauersberger as ESO ALMA Commissioning Scientists are a good sign for the Project. The ALMA Test Facility (ATF) is currently being run as an observatory by the CIPT, SciIPT and ALMA operators. Its operations remain highly productive in testing and debugging the ALMA software, and preparing the end-to-end processes for Commissioning. The ESAC reaffirms its importance for the project, and recommends the re-evaluation of extension of its operations closer to June.

ALMA related Outreach and Meetings

The ESAC was informed of the submission of a COFUND proposal by ESO for the funding of 9 fellows that will work within the ESO ALMA effort. These fellows will be placed both at ESO and at the European ALMA Regional Centre nodes. The ESAC considers that this is very positive, and will contribute to the strengthening of ties in the European ARC. A future proposal for an Initial Training Network is still under consideration.

APEX project status and plans

The ESAC was informed by Carlos De Breuck of the APEX status and recent developments. The Swedish Heterodyne Facility Instrument (SHFI) has now been commissioned in Chile and is performing Science Verification (SV) observations. The ESO SV call for proposals has returned a good reply from the community, resulting in a total of 39 submitted proposals. The SABOCA bolometer array, for observations at 350 micron, has been shipped to Chile and test observations
are planned for the end of April. A decision on commissioning and Science Verification will be subsequently taken.

In response to a previous request from ESAC (cf. report from the January 08 ESAC meeting) the committee was informed on the status and future plans for the instrument Artemis. This is a large-format, filled bolometer array being built by CEA Saclay (France), to be ready by early 2010, based on technology developed for the PACS photometer aboard the Herschel Space Observatory. It will be able to perform sub-millimetre observations at 200, 350 and 450 microns and is currently being proposed as a Visitor Instrument to ESO, with the PI institution available for collaborations with the ESO community for observations with this instrument. For the Artemis team, the committee heard presentations from Philippe André, for the science case, and Luiz Rodriguez and Yannick Le Pennec, for the technical case.

The ESAC considered the scientific case for Artemis, in comparison with current and planned sub-mm arrays available to the astronomical community, and taking into account the results from the 2007 test runs of p-Artemis, a prototype of the instrument.

The ESAC is favourably impressed with the anticipated capabilities of Artemis, and finds its scientific case one of very high interest. The technology, developed for PACS, has proven to be successfully adaptable to ground-based observations and, as such, Artemis appears to be technically feasible. Together with the unique conditions of the Chajnantor site for sub-mm astronomy, Artemis is expected to be a competitive instrument with, for example, the upcoming SHARC-2 and SCUBA-2 facilities at 350/450 micron.

The capability of observations at 200 micron is an extra point of interest, as it will allow using the very best observing conditions at Chajnantor.

**Agenda of the April 2008 ESAC meeting**

09:30-09:35 Welcome
09:35-10:30 ALMA Project Update
- Overview (all IPTs, Hans)
- Science (LT)
- Feedback from Board Meeting (Pepe)
10:30-11:15 ALMA Discussion Items
- ALMA Development Programme Plan organization of the groups
- Outreach, Community Development, Meetings (LT)
- Report on FP7 proposals
11:15-11:30 Coffee break
11:30-12:30 APEX Project Update
12:30-13:30 Lunch break
13:30-14:15 Brief overview of current and planned sub(mm) facilities
14:15-15:30 The ARTEMIS project: scientific and technical aspects (I)
15:30-15:45 Coffee break
15:45-16:30 The ARTEMIS project: scientific and technical aspects (II)
16:30-17:00 Discussion
17:00-17:15 A.O.B.
C) Report from the ESE Meeting of April 3, 2008

ESE Participants:
Jean-Gabriel Cuby, Colin Cunningham (via video link), Marijn Franx, Raffaele Gratton, Roland Gredel, Tom Herbst (acting chair), Isobel Hook, Florian Kerber (secretary), José Miguel Rodríguez Espinosa, Gerard Rousset (Absent: Daniel Enard, Göran Olofsson, Didier Queloz)

ESO Participants:
Fernando Comeron, Bernard Delabre, Sandro D’Odorico, Roberto Gilmozzi, Norbert Hubin, Markus Kissler-Patig, Guy Monnet, Alan Moorwood, Lothar Noethe, Jason Spyromilio, Roberto Tamai

ESE Comments and Recommendations
The meeting took place in the ESO Council Room on 3 April 2008 and followed the attached agenda. The following Comments and Recommendations arose from the ESE meeting. They appear in the approximate chronological order of the presentations and discussion.

The ESE regretted the absence of Daniel Enard and conveyed their best wishes for a speedy recovery.

Overall, the panel was very positively impressed with progress on the telescope and congratulates the E-ELT team for their efforts. The general concern of the ESE was the expenditure of contingency, both financial and schedule, during Phase B of the project. Meeting the budget and first-light targets will require continued focused effort and some creative solutions.

Structure of ESO Committees

The ESE acknowledged the new ESO committee structure as proposed by the SSWG. The ESE is a subcommittee of the STC, and advises that body on the more technical and scientific aspects of E-ELT. The ESRC is a subcommittee of Council which uses ESE technical input in its deliberations and recommendations.

The ESE noted the parallel construction of ESE-STC and ESRC-Council and expressed some concern about duplication of effort, working at cross-purposes, etc. Apparently, information flows from ESE to ESRC but not vice-versa. While the ESRC, as a subcommittee of Council, should be able to conduct its business with some confidentiality, the overall transparency and efficiency of these advisory bodies may benefit from greater cross-pollination. One possibility is to make ESRC reports available to ESE at some point after the relevant Council meeting.

ESE also remarked that with the lengthy absence of Daniel Enard, the committee is somewhat light on telescope engineering expertise. The addition of an appropriate specialist, at least on an interim basis, would strengthen the panel.

The committee discussed the mechanics of how ESE operates, with a focus on how specific requests for recommendation from the Observatory could be addressed to the panel. The consensus was that specific items for recommendation should be transmitted to the ESE chair for incorporation in the draft agendas for upcoming meetings.
Telescope Opto-Mechanical Design and Instrument Interfaces

The ESE welcomed news of the lighter, stiffer, and less costly telescope structure. This, coupled with the higher M3 location and the natural balance of the telescope, should lead to substantially improved performance.

The panel discussed the symmetrization of the telescope foci and the modified Nasmyth stations in some detail, but there was no clear consensus that the new design was superior:

Pro:  
- Operationally simpler – fewer types of focus  
- Instrument switch logistically easier – can go on either side  
- Two gravity-invariant foci available

Con:  
- Possible loss of flexibility  
- Constraints on instruments and provision of wavefront sensing (WFS)  
- Reduced unobscured field of view for the gravity invariant focus (TBC)

To help resolve these issues, the ESE would like to see an overview which harmonizes and meshes the available focal stations with the adaptive optics and instrumentation. This could be in the form of a table giving the requirements and capabilities of each item. Specific questions to be addressed include:

- Is Ground-Layer Adaptive Optics (GLAO) needed on both sides?  
- Which instruments need to supply their own WFS (on / off axis)?  
- What are the actual (footprint free) delivered Fields of View?  
- Which WFS / laser beacons need to follow the sky and which don’t?  
- How will M6 work with each focal station?

The ESE recommends immediate transmission of the redesigned derotator/ wavefront sensing units to the instrument teams to check for possible incompatibilities. These include partial vignetting, responsibility for sensing, etc.

The ESE concluded by noting that the scientific success of the E-ELT depends on the telescope, adaptive optics, and instruments working well together. This, in turn, requires continuous communication between the Project Office, the AO effort, and the instrument teams. ESO should take pro-active measures to ensure effective communication. This could be in the form of regular gatherings of the various parties, although this may introduce difficulties related to competition between instruments. A better option would be a “travelling road show,” made up of 2-3 key E-ELT personnel who make regular (semi-annual) visits to the instrument study teams for two-way discussions and exchange of information.

Site Selection

The ESE welcomes the news that all five sites will be under characterization within a month. This process has been long and difficult, with many problems along the way. It now seems that there is zero contingency to allow proper characterization. Everything must go right from now on, and the Project Office needs to devote sufficient priority, resources, and attention to this effort.
This and other factors have led to a very aggressive schedule. According to the Project Office, ground-breaking must take place within one month of Council approval of the construction proposal in order to meet the target first light date.

The ESE recognizes the potential importance of understanding the surface layer turbulence. An experiment at Paranal, for example with a DIMM at the height of the VLT primaries, would provide essential confirmation.

The ESE and SWG would like to receive a list of the site characterization criteria in the coming weeks, and the interim reports on site characterization as soon as they are available.

**Staffing**

The ESE noted with approval the new management structure and welcomed the appointment of the new Systems Engineer and Project Scientist.

Nevertheless, the Project Office has taken on a very ambitious project, including internal and external studies of complex telescope systems and a large suite of instruments. The ESE expressed some concern that managing these efforts effectively may require a larger team.

**Miscellaneous**

*Telescope Design:* An analysis of the thermal and diffraction footprints of the M2 assembly is still outstanding.

*Telescope Design:* The issue of whether and where to install a facility atmospheric dispersion compensator (ADC) remains unresolved.

*Wavefront Control:* ESE notes the importance of wavefront control and the systems engineering associated with managing many interacting control loops. Ongoing refinement of these algorithms should be a top priority.

*Adaptive Optics / Lasers:* The ESE believes that the AO team has correctly identified the importance of large, noise-free detectors and high power lasers to success of the project. We encourage exploration of alternative schemes that will reduce this dependence.

*Adaptive Optics / Lasers:* The panel noted the importance of analyzing GLAO uncertainties. Specifically, the AO team should devote resources to understanding the extrapolation of the MAD results to a 6 arcminute field of view.

*Adaptive Optics / Lasers:* The performance consequences of shifting the M4 ground-layer conjugation altitude from 180 m to 370 m needs to be studied.

*Adaptive Optics / Lasers:* Given the difficulties with detector procurement, the Project Office should explore alternate WFS schemes.

The ESE will hold its next meeting on 8 October 2008, one day after the Science Working Group.
Agenda of the ESE Meeting, April 3rd, 2008, ESO Council Room

09:00     Introduction, agenda (Tom)
09:10     Role of ESE and other oversight committees in phase B (Roberto G.)
09:20     Status of E-ELT project (Roberto G.)
09:45     Report from the Science Working Group and DRM (Marijn, Markus and Isobel)
10:15     Project management and schedule (Jason)
11:00     Coffee break
11:15     Site selection: status and procedure (Roberto G.)
11:45     1st executive session
12:30     Lunch
13:30     Optical Design (Bernard)
14:00     Instrument Studies and focal stations (Sandro)
14:30     Wave front control and one observation with the E-ELT (Lothar)
14:50     AO and lasers (Norbert)
15:10     A day at the E-ELT (Roberto T.)
15:30     Science Operations and archive (Fernando)
15:45     Coffee break
16:00     Project Cost estimate (Jason)
16:15     2nd executive session
17:00     End of meeting

D) Report from the VLTI Sub-committee on April 15, 2008

The content of the following report was prepared by Hans Kjeldsen (hans@phys.au.dk), Christoph Leinert (leinert@mpia-hd.mpg.de), R.S. Le Poole (lepoole@strw.leidenuniv.nl), and Alessandro Marconi (marconi@arcetri.astro.it)

Following presentations on the imminent changes in ESO’s managerial structure, seeing conditions on Paranal, PRIMA and IIIIP activities the committee met in closed session. Based on the discussions in the closed session the sub-committee state:

1. We are pleased to hear about the solid progress towards PRIMA commissioning and about the still ongoing strengthening of the VLTI systems group, which already led to much improved characterization of VLTI infrastructure performance, a necessary prerequisite for further improvement. The fact that these results will make their way into the Interface Control Documents will be quite helpful in the collaborations for the new generation instruments. It is also good to notice the intentions for further completion of the infrastructure, seeking to provide Star Separators on all AT’s. The PRIMA and VLTI teams have to be congratulated for such progress.

2. The emphasis of activities on PRIMA commissioning and VLTI systems work, which was apparent from the presentations, appears a very reasonable and constructive approach which we support. This does not mean that other lines of improvement (e.g. replacement of STRAP on ATs or the gains in sensitivity and AT baselines mentioned below) should lose their priority.
3. Notwithstanding the first successes in limiting vibrations, the goal to further reduce them into the originally specified range of 100-150 nm rms should be maintained. This would boost the performance of FINITO close to its original specification, allow precise AMBER observations down to J and generally would increase the accuracy and reliability of the fringe tracking/astrometry system. Continuing the work to improve thermal stability in the VLTI area also remains important. The resulting improved stability of the system will have the benefit that fewer corrective interventions (e.g. on delay line rails) will be necessary. Such a reduction of activities in the tunnel and the interferometric laboratory not only is required for the delicate astrometric work to come as well as imaging, but also is a step in the direction to keep the maintenance effort manageable.

4. The seeing results presented convincingly showed the presence of strong turbulence in a relatively thin ground layer, which therefore normally does not affect UTs but does so in an important way for the DIMM seeing monitor and the ATs. Therefore introduction of adaptive optics correction beyond tip/tilt should be seriously considered as a future step to upgrade AT performance.

5. Given the vibrations in the VLTI, PRIMA fringe tracking should be by design more sensitive than FINITO, and in particular so for red sources - as they are typically found among AGN and young stars. Because of this expected gain in sensitivity, the operational mode of on-axis fringe tracking by PRIMA should be kept an option with the aim to implement it at the suitable time. PRIMA commissioning will give, among others, an estimate of the actual gain. The promise - to be confirmed - is that observations now only possible with UTs can be transferred to ATs and that UTs in one-baseline operation will open to fainter objects, of high interest not only but in particular to AGN work.

6. Work on the VLTI has shown that for determining the geometry of certain object classes like thick tori in AGN or thick envelopes of hot stars or AGB stars, some more baselines are needed in addition to those offered for periods P81 and P82. These are short baselines (32 m down to at least 11 m) and also offering position angles more or less perpendicular to the presently dominating E-W orientation. We know about the pressure on the VLTI group on Paranal and the work involved in adding new AT stations to the set with an operational status but ask also to weight the scientific interest in these additions. Support could be given to ESO in the selection of the appropriate new AT positions and by a visiting astronomer in the characterization of the new stations.

7. Compared to other instruments on Paranal or La Silla, VLTI instruments have a particularly strong dependence on and interaction with a complex infrastructure, with the resulting particular complexity for operation at their full scientific potential. For proper consideration of VLTI within ESO instrumentation it therefore appears important that the new STC-subcommittee on optical/infrared instrumentation comprises among its members an adequate number of persons with interferometric experience.
Appendix 2: STC 68th Meeting Agenda

Wednesday, April 16th

09:00  Closed session with DG
09:30  Welcome
09:35  1. Adoption of the Agenda
       2. Approval of the Minutes of the 67th STC Meeting

09:45  3. Discussion of the Fact Sheets

10:30  4. Report of the Director General (incl. VST, VISTA)

10:45  Coffee Break

5. STC and subcommittee structure
11:00  5a. SSWG recommendations (T. de Zeeuw)
11:15  5b. Discussion of subcommittee membership

6. La Silla / Paranal
12:00  6a. Report from La Silla/ Paranal (A. Kaufer)

12:30  Lunch

6. La Silla / Paranal (continued)
13:30  6b. Status of instrument upgrades (A. Moorwood)
13:50  6c. HARPS polarimeter proposal [*] (A. Kaufer)
14:05  Discussion

7. VLT/I
14:30  7a. Status of PRIMA (F. Delplancke)
15:00  7b. Second Generation VLT/I instrumentation (A. Moorwood/ A. Richichi)
15:15  7c. VLTI subpanel report (H. Kjeldsen)
15:30  Discussion

15:45  Coffee Break

16:00  Closed session
Thursday, April 17th

8. E-ELT
09:00  8a. Report from the Programme Office (R. Gilmozzi)
09:50  8b. Report from the Instrumentation Office (S. D'Odorico)
10:10  8c. Report from the ESE Subpanel (T. Herbst)
10:25  Discussion

10:45  Coffee Break

9. ALMA
11:00  9a. Project Status Report (H. Rykaczewski)
11:15  9b. ALMA Operations (P. Andreani)
11:30  9c. Report from ESAC (J. Afonso)
11:45  Discussion

12:15  10. ESO Fellowship Programme (B. Leibundgut)
12:45  11. Other topics

13:00  Lunch

14:00  Closed Session

16:30  Meeting with DG et al.

17:00  End of Meeting