COUNCIL

115th Meeting
Garching, 9 and 10 December, 2009

SCIENTIFIC TECHNICAL COMMITTEE

71st Meeting
ESO, Garching, October 21-22, 2009
Recommendations and Report from the 71st STC Meeting

Participated via VC: J. Afonso, T. Herbst.
Excused: J. Fynbo, G. Olofsson.

The STC would like to begin by complimenting the ESO staff on the outstanding progress that was reported in virtually all areas of operation and development, especially during this intense period of activity (scientific, next generation VLT instrument development, VISTA commissioning, ALMA integration and test, and E-ELT design and development).

1) La Silla-Paranal Observatory

- **Recommendation on “workhorse” or general purpose instruments**
  STC appreciated very much receiving the long awaited overview of the plan for the general-purpose instruments for the future of VLT. It confirmed the fact that VLT with its impressive suite of instruments will remain for years to come the premier ground-based observatory in the world.
  This exercise showed that with the de-commissioning of NACO foreseen for 2012, ESO would lose significant capacities in diffraction limited near-infrared imaging. SPHERE and HAWK-I GLAO will be able to provide only partial relief. Hence, the decommissioning will have a severe impact on a number of science areas including some high profile ones (e.g. galactic center astrometry). Further impact on the science output of GRAVITY is also to be expected. STC strongly endorses ESO’s plans to complete the studies of the options presented to ensure the availability of NIR diffraction limited imaging and report at the next STC meeting. In addition, STC also recommends investigating whether moving NACO on/off one of the UTs would be a viable alternative to decommissioning, especially since all science cases may not require the instrument to be located at UT4.

- **Recommendation on VLTI**
  STC appreciates the significant and steady progress made at VLTI and congratulates everyone involved. It also recalls that PRIMA is central not only for the astrometric capabilities of VLTI but also for extending the science capabilities of AMBER & MIDI. Therefore a complete and timely commissioning of PRIMA is important. Equally important is to continue the excellent work being done on improving the ATs performances and on reducing the vibration problems.

- **Recommendation on SURVEYS**
  STC can only take note of the unfortunate additional delays in the start of the VST operations implied by the latest problems. In the light of these developments, the STC strongly supports ESO’s initiative to carry out a re-assessment of the science goals of the VST public surveys to ensure that they still remain competitive on the new timescale.
2) ALMA

- **Recommendation on impact of potential delays**
  STC was very impressed by all the hard work being done and the steady progress being achieved in the ALMA project. The lack of significant time contingencies in the deliveries of many major components of the project, with the obvious consequences on the ALMA construction is, however, becoming a major concern to STC. Recognizing the need to remain within the established cost to completion, the STC urges that if measures have to be taken to mitigate budgetary problems, solutions be found that preserve ALMA’s original scientific capabilities.

- **Recommendation on time allocation**
  With early science being only a year away, a proper time allocation process needs to be completed and settled on now. STC was very disappointed that this was not yet the case and urges that this matter be addressed without further delays. Having a proper procedure in place is an essential first step towards meeting the scientific goals and community expectations for ALMA first science.

- **Advice on APEX**
  APEX is, and is likely to remain even after ALMA inauguration, an instrument in high demand by the community. A continuation of APEX beyond 2012 is, in STC’s opinion, highly desirable.

- **Comment on development**
  We draw attention to the availability during the next few years of funding for future ALMA developments, which will require careful and timely planning. The existence of this possibility should be advertised widely throughout the ESO community.

3) E-ELT

- **Recommendation on the selection of the first instruments**
  STC believes that the proposed selection criteria for the capabilities of the first instruments (3 science requirements and 3 technical & managerial requirements) are appropriate and sufficient. STC strongly believes that the selection process should proceed by identifying the full set of first generation instrument capabilities and not just the ones for the first light instruments. This way of proceeding will ensure not only a coherent set of instrument capabilities but also a maximum involvement of the community, which is essential for the success of the project. First light instruments should then be identified from this selection.

- **Request on instrument selection**
  Given the high expectation raised by E-ELT in the community, it is essential that the instrument selection process be transparent and carried out in a way that satisfies the community. To insure this, and to have the possibility for appropriate input on the set of first generation instruments, STC would like to be able to discuss the selection of instrument capabilities as a whole as early as possible. To allow for this, STC would like to receive very brief summaries of the instrument concept, the capabilities, options, costs and relevant comments from the review process.

**Appendices**

1. **STC 71st Meeting Agenda**
2. **Report from the 3 STC sub-committees**
   a. LSP sub-committee meeting, October 20, 2009
   b. ESAC sub-committee meetings, June 15 & October 12, 2009
   c. ESE sub-committee meeting, October 6-7, 2009
<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>09:00</td>
<td>Closed session</td>
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<tr>
<td>09:30</td>
<td>Closed session with DG</td>
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<tr>
<td>10:00</td>
<td>Welcome</td>
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<tr>
<td>10:05</td>
<td>1. Adoption of the Agenda</td>
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<td>2. Approval of the Minutes of the 70th STC Meeting</td>
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<td>10:15</td>
<td>3. Report of the Director General incl. VST, VISTA, discussions of previous recommendations</td>
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<td>11:00</td>
<td>Coffee Break</td>
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<td>4. Directorate of Operations</td>
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<td>11:45</td>
<td>4b. Discussion of Directorate of Operations Fact Sheets</td>
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<td>12:00</td>
<td>Lunch</td>
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<td>5. Directorate of Programmes</td>
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<td>13:00</td>
<td>5a. Directorate of Programmes Overview (A. Moorwood)</td>
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<tr>
<td>13:15</td>
<td>5b. Discussion of Directorate of Programmes Fact Sheets</td>
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<td>6. Second generation VLT/I instrumentation</td>
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<td>13:30</td>
<td>6a. The future of general-purpose observing modes on the VLT (M. Casali)</td>
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<td>14:15</td>
<td>6b. Discussion</td>
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<td>14:30</td>
<td>Coffee Break</td>
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<td>14:45</td>
<td>6c. Report from the La Silla Paranal Subpanel (Y. Mellier)</td>
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<td>15:05</td>
<td>6d. Discussion</td>
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<td>7. Directorate for Science</td>
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15:20  7a. Overview of Directorate for Science (B. Leibundgut)
15:35  7b. Discussion of Directorate for Science Fact Sheets

16:00  Closed session

### October 22

#### 8. ALMA and APEX

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<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Document</th>
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<tbody>
<tr>
<td>09:00</td>
<td>8a. Project Status Report (W. Wild)</td>
<td>STC-458</td>
</tr>
<tr>
<td>09:30</td>
<td>8b. Discussion of ALMA Fact Sheets</td>
<td>STC-457D-ALMA</td>
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<tr>
<td>09:45</td>
<td>8c. Report from ESAC (L. Tacconi)</td>
<td>ALMA</td>
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<tr>
<td>10:05</td>
<td>8d. Discussion</td>
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Also available: June 2009 ESAC report and October 2009 ESAC report

10:15  *Coffee Break*

#### 9. E-ELT

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
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<tbody>
<tr>
<td>10:30</td>
<td>9a. Report from the Programme Office (R. Gilmozzi)</td>
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<td>10:45</td>
<td>9b. Report from the Telescope Project Office (J. Spyromilio)</td>
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<td>11:05</td>
<td>9c. Report from the Instrumentation Office (S. D’Odorico)</td>
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<td>11:25</td>
<td>9d. Report from the ESE Subpanel (T. Herbst)</td>
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Also available: ESE Presentation

11:45  9e. Discussion (including process of instrument selection)

#### 10. Budget 2010

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<th>Topic</th>
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<tr>
<td>12:00</td>
<td>10a. Budget proposal 2010 (T. de Zeeuw)</td>
<td>FC-1768</td>
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<tr>
<td>12:20</td>
<td>10b. Budget Discussion</td>
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12:45  *Lunch*

13:45  Closed Session

16:15  Meeting with DG and Directors

16:45  *End of Meeting*
Report of the LSP Subpanel

October 20, 2009
LSP Subpanel members

- Yannick Mellier
- Bill Cotton
- Johan Fynbo
- Allessandro Marconi
- Bob Nichols
- Guy Perrin
- Michael Prouza
- Roberto Raggazzoni
- Marco de Vos
La Silla – Paranal STC Subpanel

Draft Agenda

Tuesday, October 20th, 2009

Council Room

Agenda

09:30 Welcome: (Y. Mellier)
09:35 Review of actions and recommendations from last meeting (Y. Mellier)
09:50 ESO strategy for AO instruments on the VLT (M. Casali)
10:20 Status report on the AOF (N. Hubin)
10:40 Coffee Break
11:00 Status report on VLTI infrastructure & PIONIER: (P. Hagnénauer & S. Brillant)
11:30 PRIMA Commissioning (G. van Belle)
12:00 Status of VISTA (A. Kaufer)
12:20 VST (A. Kaufer)
12:40 VIMOS (H. Dekker)
13:00 Lunch
14:00 Closed Session
16:30 Meeting with ESO staff
17:30 End of Meeting
La Silla – Paranal STC Subpanel

Draft Agenda

Tuesday, October 20th, 2009

Council Room

October 19: meeting sub-committee/ESO on VLTI « baseline meeting »

Agenda

09:30 Welcome: (Y. Mellier)
09:35 Review of actions and recommendations from last meeting (Y. Mellier)
09:50 ESO strategy for AO instruments on the VLT (M. Casali)
10:20 Status report on the AOF (N. Hubin)
10:40 Coffee Break
11:00 Status report on VLTI infrastructure & PIONIER: (P. Haguenauer & S. Brillant)
11:30 PRIMA Commissioning (G. van Belle)
12:00 Status of VISTA (A. Kaufer)
12:20 VST (A. Kaufer)
12:40 VIMOS (H. Dekker)
13:00 Lunch
14:00 Closed Session
16:30 Meeting with ESO staff
17:30 End of Meeting
Summary

- AO
  - Strategy for AO instrument
  - Report on the AOF
- VLTI
  - Status report on VLTI infrastructure
  - PRIMA commissioning
- Imaging and spectro surveys
  - VISTA
  - VST
  - VIMOS upgrade
  - Call for Public Surveys
AO

ESO strategy for AO instrument

– Clear short+mid term plan (2010-2016), with several options
– An ambitious project « beyond Gemini » is proposed in the plan (New MCAO instrument)
– Motivated by:
  • Competition : Keck (major plan), Gemini, LBT
  • Decommissioning of NACO:
    60% of NACO science lost: black hole, sub-stellar companion, IR imaging of massive stars, sequential star formation, star cluster, galactic center (GRAVITY needs good image quality of the galactic center)
ESO strategy for AO instrument

- The LSP SubPanel is happy and supportive but some points need clarifications and interactions with scientists prior to decide the best options among those proposed.
  - Need science drivers for each option and a table that show
    - what is really lost after NACO decommissioning,
    - what each new instruments proposed may win,
    - Where are the next Gen. Keck and GEMINI, LBT AO projects
  - Need to clarify if some science done by NACO may be done with 2sd Gen. VLT instruments
    - These point should be adressed in the next report expected by April 2010.
AO

Status report on the AOF

– Excellent and very clear presentation of the present status of AOF and on the implementation plans
– The report perfectly meets the request of the SubPanel and the STC recommendation
– Very good progress
  • DSM Assembly Readyness Review
  • GALACSI : FDR
  • GRAAL-GALACSI-ASSIST: optics procurement
  • Laser study: nearly complete
  • 4 LGSF PDR
  • Cirrus problem: study on going
AO

Status report on the AOF

- The Subpanel congratulates the team members for the work done and the report, and encourage them to go ahead in the same direction.

- Natural Guide Star: option with GRAAL is no longer feasible: need a new design and GRAAL in no ready for construction.

- The SubPanel recommends that ESO to consider an option in the AO instruments proposed in the AO plans.
VLTI

The Subpanel has the feeling that a new good spirits of discussion/collaboration is now in place

• Report on VLTI infrastructures
  – Very good progress on vibrations: understanding, improving
  – There is still a demand from the Subpanel and the VLTI community to have clarification on the limiting magnitude. The VLTI team is reluctant to provide this, but the Subpanel insists to have limiting magnitude for typical configurations and observing conditions. These are numbers astronomers understand and need to start a project with VLTI instrument.
VLTI

- PIONIER
  - Reports from the PIONIER team and ESO,
  - Good progress, no delay so far
  - Seems that PIONIER is indeed a motivation to improve ATs, as expected by STC and ESO
  - No conflict with GRAVITY or MATISSE reported
VLTI

• AMBER
  – Problems are being solved
  – Improve sensitivity, Improve data quality
  – AMBER turns out to be stable, but the alignment are not stable
  – New efficient mid-res polariser
  – In addition to ongoing progress, future plans have been shown (improve operation, imaging more stable and reliable, replace the high dispersion mode, go fainter)
  – AMBER: produce reconstructed images, got fringes on AGN at K~11
  – The Subpanel was very impressed and congratulate the team
VLTI

• Current and future implementation
  – Missing :
    • More short baselines
    • Compact configurations
    • Increase the sky coverage
    • Improve operation to change configuration
  – The Subpanel is impressed by the amount of work done. He just ask the team to keep going.
  – Regarding an implementation plan for the missing modes, the Subpanel thinks it is too early. The best is to keep the strong interactions between scientists and engineers and between ESO and non-ESO teams in order to define the best options. Then an implementation plan should drawn and submitted to STC.
VLTI

• PRIMA
  – Very detailed and clear presentation of PRIMA « commissioning »
    • PRIMA is a very complex instrument
    • Detailed review of sub-system and systems
    • Very well organised project
    • Still some issues (STS, STRAPPS, VCM availability)
    • The Subpanel share the concerns about STS and encourage the team to ahead
  – The Subpanel is impressed by the amount of work done. He just ask the team to keep going.
Surveys

• VISTA
  – Excellent progress
  – Science verification time: now.
  – Ready for public surveys in 4-6 month

  – Concerns about the joint VST-VISTA public surveys: the Subpanel suggests a prioritisation of public surveys. Joint VST-VISTA surveys should have lower priority until VST problems are fixed. VISTA are not starting immediately: there is time to anticipate and draw a VISTA operation plan with priorities.
Surveys

• VST
  – The last problems of the VST means beginning of surveys by mid-2011?
  
  – But DES first light is September 2011.

  – Serious issues about competitiveness of some VST Public Surveys.
Surveys

• VST

  – Question about the competitiveness of the VST and some of the Public Surveys that have been accepted. The science goals must be redefined and the survey must be redesigned in order to take into account the new surveys planned in the world. But prior to decide the best scientific projects, the Subpanel ask ESO a clear recovery plan and a realistic date for the beginning of VST surveys.

  – The redefinition of the Public Survey could be done into more global projects (like a joint DES-VST survey or a KIDS:VIKING+wide field spectro survey).

  – The redefinition of the surveys must be done with the PIs of accepted surveys and a panel that includes OPC, STC and PSP members.
Surveys

• VIMOS

  – The Subpanel supports the upgrade plan proposed by ESO, with 2 phases. Phase I would already permit to start public surveys by the end of 2010.

  – There are however ways to optimise the upgrade, so that the specifications meet the most important needs of the accepted survey. The Subpanel then urge ESO to send the call and start the selection process as soon as possible.
Appendix 2b: ESAC sub-committee meetings, June 15 & October 12, 2009

Report of the June 2009 ESAC Meeting

ESO – ALMA Building, Garching, June 15, 2009

ESAC members: Linda Tacconi (chair), Jose Afonso, Frederic Gueth, Lauri Haikala, Michiel Hogerheijde (video link), Rob Ivison, Roberto Maiolino, Jesus Martin-Pintado, Raphael Moreno

Apologies: Elaine Sadler

ESO participants: Paola Andreani, Fernando Comeron, Robert Laing, Leonardo Testi, Eelco van Kampen, Martin Zwaan

Part-time: Carlos DeBreuck, Jonas Larsen, Bruno Leibundgut, Gianni Raffi, Hans Ryckaczewski, Wolfgang Wild (via telecon)

Other participants (Part-time): Brian Glendenning (NRAO, CASA interim manager)

General Remarks

The ESAC met for a special meeting in Garching on 15 June, 2009, with the main purpose of bringing the many new ESAC members up to speed on the ALMA project. New to the ESAC after the committee restructuring are: Linda Tacconi, Lauri Haikala, Rob Ivison, and Elaine Sadler (all of the STC), and Jesus Martin-Pintado and Raphael Moreno. The agenda for the meeting is attached as an appendix to this report.

Our main recommendation from the meeting was to warmly recommend that the Czech node be accepted into the European arc, assuming that they bring their interferometry capabilities to the level of the other European ARC nodes.

ALMA Project and Science IPT Update

The ESAC welcomed the news of the many project milestones that have been reached in 2009, such as: the conditional acceptance of the first 3 antennas, the arrival of the first EU Front End at the OSF, the arrival of the first EU antenna at the OSF; the first WV radiometers on site; the first science fringes at OSF, and the start of the Santiago central office construction.

The ESAC was especially pleased with the news of improvement in the European antenna production, which is once again stable and on schedule. High pressure from ESO and Council, and continuous action on the parts of the European Antenna Manager and the European Project manager resulted in AEM devising a recovery plan with much more attention to technical and management problems. There is now a detailed schedule for the assembly and delivery of the first 12 antennas, although there is concern that there is very little margin for slippage in the ambitious schedule.

The ESAC shares the concerns of the project that the Front End integration and production are now the main items on the critical path for the current ALMA schedule. On the short term, this is driven by the readiness of the FE Integration Centers; on the longer term, the issue could be the delivery of components to the Centers. The ESAC is concerned by the schedule of the EU FEIC, which will need to achieve a production rate of 1 FE every 5 weeks.
A final piece of important news from the ALMA project, applauded by ESAC, was the decision taken to generate power on site by adopting an island mode solution, similar to how ESO generates power on Paranal.

For the science IPT, the ESAC heard about the plans to build the Commissioning Science Verification team, and responded to the project’s request to have ESAC participation in the CSV review in September with the following recommendation:

**Recommendation:** The ESAC recommended that R. Moreno or J. Martin-Pintado participate in the CSV in Chile in September. However, unfortunately neither could attend in the end. The ESAC, feeling that it was important to have someone with telescope/instrument commissioning experience participate in this important review, invited P. Schilke to represent the ESAC in PSV. He has accepted this task and will report back to ESAC after the review.

**ARC and the New ARC Node in the Czech Republic**

The status of the European ARC and its nodes was a lively topic. A proposal for a new ARC node at Ondrejov in the Czech Republic was presented for recommendation. The ARC also requested ESAC comment on the idea of a global vs regional helpdesk for User questions and problems.

**Recommendation on new ARC node in the Czech Republic:** The ESAC recognizes the importance of the two areas of expertise that the new Czech node would bring to the European ALMA portfolio: it would be another European center for laboratory spectroscopy and is a leading center in solar astrophysics. The ESAC recognizes that the center is building the necessary expertise to run properly an ALMA ARC node, and encourages the scientists involved to continue to develop the node through continued exchange with the more established European centers. In that light, the ESAC welcomed the news that the Ondrejov center has seconded a postdoc to IRAM for 1 year. The ESAC warmly recommends the acceptance of the new Czech node, assuming that they will bring their interferometry capabilities to the level of the other ARC nodes.

The ESAC also discussed the pros and cons of having a global ALMA Helpdesk vs each of the three Regional ARCs sponsoring their own Helpdesk.

**ESAC Comment:** The ESAC is convinced that high priority should be given to assure that solutions to problems ticketed in one region be made available to all ALMA users. Such a global information exchange, especially in the early days of ALMA, will avoid possible duplication of effort, saving value personnel resources for the many other tasks that will be required. The ESAC can envisage a compromise scheme where there could be different Helpdesk logins from each ARC site and then each Executive could decide what to do with their own helpdesk tickets.

**ALMA Computing**

Gianni Raffi gave a comprehensive overview of the ALMA Computing IPT for the sake of the new ESAC members.

**APEX Status**

Carlos DeBreuck gave an interim update on APEX, including numerous exciting science results for this meeting. The ESAC is extremely impressed with the overall performance of the telescope and its
instruments and of the ever-increasing science output. The biggest concern seems to be the delay of the SHFI/APEX-3 band. Onsala may buy an ALMA Band-8 cartridge from NAOJ at this stage. The ESAC encourages this move, and requests continued updates on progress.

AOB

The date for the next ESAC meeting was set for October 12 in Garching. This is the day immediately before the fall ASAC meeting, which will also be held in Garching.
Appendix 2b to ESO/STC-459

Location

ALMA Building ESO-Garching. Meeting room 054. Starting at 9:30 am, lunch provided

Agenda

(A PDF version of the agenda is also available)

9:30-9:45: Welcome, introduction

9:45-11:00: ALMA Project Update
  - overview (all IFTs) (Wolfgang Wild - telecon, presentation LT)
  - Sci IPT update (Leonardo Testi)

11:00-11:15: coffee break

11:15-12:30: ARC and new ARC node in CZ
  - ARC status and plans - (Paola Andreani)
  - Discussion on new ARC node in CZ - (all)

    Procedure for accepting new ARC nodes

    Proposal for a new ARC node in Ondrejov (CZ)

12:30-13:30: lunch break

13:15-14:15: ALMA Computing
  - Status and progress - (Gianni Raffi)

    Report of the CIPT Review Panel

    CASA Tutorial webpages

    OT UserTest 6.0 webpages

14:15-15:00: FP6 ALMA Enhancement program
  - Status and Programme (Robert Laing/Hans Ryczewski)

15:00-15:15: coffee break
15:15-16:15: APEX status and update
   - APEX update and current issues (Carlos de Breuck/David Rabanus - videocon)

16:15-16:30: AOB
Report of the October 2009 ESAC Meeting

ESO – ALMA Building, Garching, October 12, 2009

ESAC members: Linda Tacconi, (chair), Jose Afonso, Jesus Martin-Pintado, Rob Ivison, Lauri Haikala, Michiel Hogerheijde, Roberto Maiolino, Elaine Sadler (telephone link until 11:30), Frederic Gueth (Videolink)

Apologies: Rafael Moreno

ESO participants: Leonardo Testi, Robert Laing, Martin Zwaan, Dirk Petry, Liz Humphreys, Carlos DeBreuck

Part-time: Paola Andreani, Bruno Leibundgut, David Rabanus (remotely from Apex), Andy Biggs

Other participants: Alan Bridger

General Remarks and Summary of Recommendations

The ESAC met for the regular fall meeting in Garching on 12 October, 2009, one day before the ALMA Science Advisory Committee Meeting (ASAC). The agenda for the meeting is attached as an appendix to this report. As part of the agenda, the ESAC discussed and gave input on the current charges of the ASAC. There are currently six formal charges given to the ASAC by the ALMA Board spanning a range of issues from commissioning and science verification, time allocation, ARC readiness, to future development. These were discussed individually within the relevant agenda item, rather than all at once.

The main recommendations and endorsements from the ESAC are as follows:

1) Recommendation: The ESAC recommends that the timing of the Call for Proposals for early science be based on readiness and reliability of all sub-components of the project rather than a target date alone. Even assuming that Early Science users will still likely be largely “black belt” radio astronomers, the system can not be plagued by a high failure rate, which would be detrimental to the image of the project as a whole.

2) Software Latency: The ESAC fully endorses the very well written and analyzed Software Latency Document, which will only serve to increase the observing efficiency of ALMA, already in the Early Science phase.

3) ALMA Development: The ESAC recommends that any development Call at this point be kept as open as possible, and to include the possibility for smaller, short term developments in addition to enabling new capabilities for ALMA. We also support keeping some “seed” money to support future, large developments that are not yet technologically mature.

4) OT Software Tool: The ESAC commends the software team on the progress made on the OT and strongly urges the release of the Beta version to the ARCs as soon as possible to allow them sufficient time to prepare adequate documentation and tutorials for user support. The ESAC recommends the release of the OT to the user community well in advance of the Call of Proposals for Early Science – the OT release date could well impact when that Call is ultimately made.
5) **Readiness of European astronomers for ALMA:** ESAC feels that the European astronomical community is not developing proficiency in the necessary ALMA software tools, CASA and the OT, at a fast enough rate to be ready and competitive to use ALMA early on. ESAC recommends that CASA tutorials, including the OT once it is openly available, take place more frequently than presently.

6) **Time Allocation:** The allocation process needs to be completed and settled now. ESAC is in favour of a small amount of telescope time being reserved for Director’s Discretionary Time (DDT) for science reasons of rapid response, quick measurements with specific frequencies, etc. The ESAC recommends that this DDT be distributed by the ALMA Director in consultation with the three ALMA Executives where necessary.

7) **APEX:** Given its current and planned suite of instrumentation, the ESAC believes that APEX will continue to be in high demand even after ALMA inauguration. The ESAC would strongly support a continuation of the APEX project by the consortium beyond the term of the current contract, if this should be a possibility.

**ALMA Project and Science IPT Update**

The ALMA project continues to progress at a rapid pace, and it is has achieved several important milestones. In particular, the ESAC was delighted to hear the news that the first ALMA antenna (MELCO antenna) had been successfully brought up to the high site, and that the next one would be brought up within days of our meeting. Assuming that this takes place as planned, the ESAC looks forward to hearing news about interferometry at the high site, which is still planned before the end of the year. The construction of the office facility in Santiago is also proceeding, with a completion date in mid-2010. The Call for Proposals for Early Science is still planned for late 2010, with the first observations slated for mid-2011.

There are still delays and areas of concern that could impact the current aggressive schedule. The ESAC shares the concerns of the project that Front End integration and production continue to be the main items on the critical path for the current ALMA schedule. The ESAC was shown a number of production rate plots, which all seemed to show currently flat slopes in production rate, but with an imminent rapid turn-over that needed to occur to maintain the start of Early Science in mid-2011.

The following ASAC charges were discussed as part of the project update:

**ASAC Charge 2:** Continue to review the progress and schedule of the AIV/CSV process, especially with respect to readiness for Early Science. The Board would appreciate a report on the status of plans for Commissioning and Science Verification and for obtaining “ALMA Public Images”, and commentary on the outcome of the Review of CSV plans which will take place in September.

The ESAC was presented a report on the AIV/CSV (Assembly, Integration and Verification/Commissioning and Science Verification) review, which took place in Chile on September 2-3. The ESAC was represented at that review by Peter Schilke, since no ESAC member with the relevant expertise was available to travel to Chile at the meeting dates. The preliminary report of the committee was generally positive, with lots of detailed suggestions, but with some concern that there was no contingency in the current “success oriented” commissioning schedule.
The ESAC was impressed by the dedication and hard work of the Project Scientists and the AIV/CSV staff in carrying out very successfully this phase of the project and commends them on their efforts. We were pleased to see the increase in staffing levels in Chile reaching to near their final complement.

The ESAC reflects the overall schedule concerns of the project and the AIV/CSV review panel. It is worrisome that there is no contingency in the delivery times for Front Ends, software, or the Observing Tool (OT) for proposal and observation preparation that all need to be in place well in advance of the Call for Proposals for Early Science, which is slated for a little over a year from now. The ESAC opinion was split on what should be available at Early Science. One opinion was that it was more important to stay close to the set schedule and offer something to the community on-time, since the initial expert users will not be disappointed by an initially decreased capability, and it is important that the project is not perceived as being too delayed. The second opinion was that in its Early Phase, ALMA should already offer science to the community that significantly surpasses what can be achieved on other telescopes, even at the cost of a slippage in the date of the Call. Despite the differing opinions, ESAC emphasizes the following:

**Recommendation:** The ESAC recommends that the timing of the Call for Proposals for early science be based on readiness and reliability of all sub-components of the project rather than a target date alone. Even assuming that Early Science users will still likely be largely “black belt” radio astronomers, the system can not be plagued by a high failure rate, which would be detrimental to the image of the project as a whole.

**ASAC Charge 3:** Discuss the revisions to Scientific Requirements and Specifications, which are in preparation, and make a recommendation to the Board on approval.

A detailed set of revisions to the current Scientific Requirements and Specifications was not available for the meeting. The ESAC discussed this charge mainly in the context of a “Software Latency Requirements” document that was written by the ALMA Project Scientist. The goal of this document was to initiate discussion on specs for acceptable software overheads during setup and observations.

**Endorsement:** The ESAC fully endorses the very well written and analyzed Software Latency Document, which will only serve to increase the observing efficiency of ALMA, already in the Early Science phase.

**Request:** A report of the revisions to the science requirements and specs for discussion at the next ESAC meeting in spring 2010.

**ALMA Development Plan**

ESAC discussed the possibilities of future development avenues for ALMA together with ASAC Charge 6 (below), based on the list of potential items being considered for funding from the Development Budget. There is likely to be a Call for Proposals already in early 2010. The ESAC felt the best area for development for Europe would be in the general area of Front End technology and enabling VLBI with an ALMA phased array. The potential items that ESAC felt would be of high interest for European groups would be VLBI, Bands 1 and 5, wide-band development for Band 3 to include part of Band 2, an upgrade of Band 9 to side-band separating mixer technology, among other things. The ESAC felt that using development money to purchase additional
antennas was not as high a priority as opening up new areas of science through receiver development.

Charge 6: Provide further commentary on the prioritization of the items that are being considered for funding from the Development Budget, in particular those that might be considered for the first call for proposals.

Recommendation: The ESAC recommends that any development Call at this point be kept as open as possible, and to include the possibility for smaller, short term developments in addition to enabling new capabilities for ALMA. We also support keeping some “seed” money to support future, large developments that are not yet technologically mature.

ALMA Software

The ESAC was given a detailed presentation of the Observing Tool software (OT), and discussed this in relation to ASAC Charge 1. The OT will be the main user interface with ALMA during Phases 1 and 2 of the proposal/observation preparation process. The tool is well-developed and the ESAC commends the software team on the huge achievement thus far, and thanks Andy Biggs and Alan Bridger for the very clear presentation. The main ESAC concern is that the current schedule does not allow for much time for the ARC personnel and for the users to become familiar with this tool before they will need to use it for Early Science.

Charge 1: Continue to monitor the readiness of the ALMA software system. Of special interest at present are: the archive, the interface between the observing tool and the archive, and the capture of necessary proposal information by the observing tool, in the context of ALMA operations planning.

Recommendation: The ESAC strongly urges the release a of Beta version of the OT to the ARCs as soon as possible to allow them sufficient time to prepare adequate documentation and tutorials for user support. The ESAC recommends the release of the OT to the user community well in advance of the Call of Proposals for Early Science – the OT release date could well impact when that Call is ultimately made.

ARC Update

The ESAC was impressed by the flurry of activity currently ongoing within the European ARC. We were pleased to hear that ARC astronomers are actively participating in the CSV process by being seconded to Chile for several month periods. Not only does this ease the burden on the AIV/CSV staff in Chile, but greatly helps the ARC to gain the experience that they will need to support ALMA users in the future. Paola Andreani also reported to ESAC on the steps that are necessary for ARC readiness for early science proposals.

Charge 5: Report on the readiness of the ARC’s to support early science proposals and the of the ALMA helpdesk, and on the plans to reach out to the communities to encourage early science proposals, and to inform the communities about realistic capabilities and performance.

Recommendation: ESAC feels that the European astronomical community is not developing proficiency in the necessary ALMA software tools, CASA and the OT, at a fast enough rate to be ready and competitive to use ALMA early on. ESAC recommends that CASA tutorials, including
the OT once it is openly available, take place more frequently than presently.

**ALMA Time Allocation**

The ESAC was disappointed that there was no draft of the report on the Proposal Evaluation Process available to us in time for the meeting. Given that the call for proposals will likely take place roughly one year from now, at the end of 2010, the procedures, software, etc. all need to be in place very soon. The ESAC looks forward to viewing the report when it is made available.

**Charge 4: Report on the status of the plans for the proposal review process, and on what is being done to ensure that all the necessary software and procedures will be established and tested in readiness for the Call for Proposals for Early Science.**

**Recommendation:** The allocation process needs to be completed and settled now. ESAC is in favour of a small amount of telescope time being reserved for Director’s Discretionary Time (DDT) for science reasons of rapid response, quick measurements with specific frequencies, etc. The ESAC would favour that this DDT be distributed by the ALMA Director, if necessary in consultation with the three ALMA Executives.

**APEX Status**

Carlos De Breuck gave an update on APEX, including numerous exciting science results. The ESAC is extremely impressed with the overall performance of the telescope and its instruments and of the ever-increasing science output. The ESAC was also pleased to hear that the full 5 astronomer complement at APEX is again reached, and of the new APEX support astronomer hired within USD, which now enables 24-hour operation of the telescope. For ESO astronomers this capability increases the available observing time from 550 to 750 hours per semester, which alleviates some of the high-pressure on ESO time.

There was some concern in the ESAC that some of the instruments, especially the multi-beam instruments, are PI projects and as such are not immediately available to the ESO user community.

**ESAC Comment:** Given its current and planned suite of instrumentation, the ESAC believes that APEX will continue to be in high demand even after ALMA inauguration. The ESAC would strongly support a continuation of the APEX project by the consortium beyond the term of the current contract, if this would be a possibility.

**AOB**

The ESAC was reminded that several members’ terms will expire at the beginning of 2010, including ASAC members Michiel Hogerheijde, Jose Afonso and Frederic Gueth. The next face-to-face meeting of the ESAC will likely take place in late February or early March, prior to the next ASAC meeting.
ESAC FACE TO FACE MEETING
2009-10-12

M2009-10-12   T2008-02-18   ALMA PICTURES

ALMA Building ESO-Garching, Meeting room 054.
Starting at 9:30 am, lunch provided

(A PDF version of the agenda is also available)

9:30-9:35: Welcome, introduction

9:35-11:00: ALMA Project Update
   - ALMA project status update, CSV review report (Leonardo Testi)
   - Information/Discussion miscellaneous (Leonardo Testi)
   - discussion on ASAC Charge 2
   2. Continue to review the progress and schedule of the AIV/CSV process,
especially with respect to readiness for Early Science. The Board would
   appreciate a report on the status of plans for Commissioning and Science
   Verification and for obtaining “ALMA Public Images”, and commentary on
   the outcome of the Review of CSV plans which will take place in September.
   3. Discuss the revisions to Scientific Requirements and Specifications,
   which are in preparation, and make a recommendation to the Board on
   approval.

   ALMA Picture Gallery
   Software Latency Requirements.pdf

11:00-11:15: coffee break

11:15-12:15: ALMA Development Plan
   - Introduction (LT), Discussion on ASAC Charge 6
   6. Provide further commentary on the prioritization of the items that are
   being considered for funding from the Development Budget, in particular
   those that might be considered for the first call for proposals.

12:15-13:15: lunch break

13:15-14:15: APEX
   - Status report - (Carlos de Brueck)
- Discussion


14:15-15:15: ALMA software
- Status of the ALMA OT (Andy Biggs/Alan Bridger)
- Discussion on ASAC Charge 1
  1. Continue to monitor the readiness of the ALMA software system. Of special interest at present are: the archive, the interface between the observing tool and the archive, and the capture of necessary proposal information by the observing tool, in the context of ALMA operations planning.

15:15-15:30: coffee break

15:30-16:15: ARC
- Brief ARC status and plans update - (Paola Andreani)
- Operation Implementation Review report (Paola Andreani)
- Discussion on ASAC Charge 5
  5. Report on the readiness of the ARC’s to support early science proposals and the of the ALMA helpdesk, and on the plans to reach out to the communities to encourage early science proposals, and to inform the communities about realistic capabilities and performance.

16:15-16:30: ALMA Time Allocation
- Brief update and Introduction (LT); Brief discussion on ASAC Charge 6
  4. Report on the status of the plans for the proposal review process and on what is being done to ensure that all the necessary software and procedures will be established and tested in readiness for the Call for Proposals for Early Science.

16:30-16:45 ASAC membership, procedures for forthcoming nominations (2010)

16:45-17:30: Summary for ASAC/STC (closed)

17:30-17:45 AOB
Appendix 2c: ESE sub-committee Meeting, October 6-7, 2009

European ELT Science and Engineering (ESE) Committee Report
October 2009

ESE Participants
Joris Blommaert, David Crampton (via videolink), Colin Cunningham, Raffaele Gratton, Roland Gredel, Tom Herbst (chair), Isobel Hook, Josef Hron, Gerard Lemaitre, José Miguel Rodriguez-Espinosa, Gerard Rousset, Florian Kerber (secretary)

ESO Participants
Fernando Comeron, Sandro D’Odorico, Roberto Gilmozzi, Markus Kissler-Patig, Bruno Leibundgut, Suzanne Ramsay, Jason Spyromilio, Roberto Tamai

The meeting took place at ESO on 6-7 October 2009 and followed the attached agenda. The ESE report follows, beginning with some general remarks, followed by more specific comments, actions, and recommendations, which appear in the approximate chronological order of the presentations and discussion.

General Remarks

The ESE continues to be impressed with progress on the E-ELT, and the Project Office and associated staff deserve congratulations for their efforts.

The ESE and Science Working Group (SWG) coordinated their respective meetings during this cycle, allowing for overlap during lunch on 6 October (the SWG took place from midday on 5 October through midday on 6 October). In addition to simplifying travel logistics for the several participants in both panels, this overlapping scheme allowed for fruitful exchange between the two groups. In addition, the ESE recognizes the benefit of spreading the meeting over two half days – an informal dinner with E-ELT staff and subsequent evening and breakfast discussions led to improved perspective on several issues.

As in the past, documentation was either limited in scope or delivered very late to the panel. We discussed a number of approaches to improve this situation for upcoming meetings – see “Future Meeting Structure” below.

Future Meeting Structure

The Phase B process of the European E-ELT is approaching completion, with the construction proposal anticipated for late 2010. The next 12-16 months are critical to the success of this effort, and the ESE feels that semi-annual meetings are insufficient at this stage.

At the same time, the ESE expressed its desire for more complete documentary materials in advance of its regular meetings. Of course, the E-ELT Project Office already prepares significant documentation for other oversight bodies, and neither the ESE nor the PO see value in repeated effort. As a result, the ESE formulates the following Recommendations:

Recommendation 1: The ESE should continue to meet face-to-face on a semi-annual basis at a time appropriate to benefit from the activities of the Science Working Group (SWG) and to provide timely advice to the Science and Technical Committee (STC). Practically, this means a shared meeting with the SWG in spring and autumn, approximately two weeks prior to the STC. ESO should prepare the E-ELT Fact Sheets for the STC on a timescale that they can be supplied to ESE a few days in advance of their meeting. The ESE should hold a telecon in January and July. Approximately a week in advance, ESO should make the semi-annual E-ELT report available to the panel for discussion and questions during the telecon.
This scheme should address the difficulties associated with distributing documentation and more importantly, improve the information flow during the final critical months of Phase B.

14:00 Review of action items and previous ESE recommendations (T. Herbst, R. Gilmozzi)

The ESE appreciated the clear presentation of action items and the review of ESO action on previous recommendations. The ESE was particularly pleased to see that most of these items were closed, and that important issues had their own, separate presentations.

The following individual issues arose during the subsequent discussion:

1. The Science Office distributed formal terms of reference for STC subcommittees, as well as the document on conflicts of interest. This is not what the ESE was requesting. Rather, the panel would like to receive a short (1 page) document clearly describing our role and relationship to the STC, SWG, and SSAC.

2. The ESE welcomes the evaluation of a high site (Tolonchar) via TMT data. The panel was also happy to hear that Lunar Scintillometers are evaluating surface and low altitude turbulence at the 4 primary sites.

3. The adoption of Mauna Kea by TMT, coupled with more complete information on other locations, means that the selection of an E-ELT site should occur by the end of 2009. Since site characteristics have a direct impact on both science and engineering, the ESE would like to receive an update on site selection during its January telecon (see Recommendation 2 above).

Request 1: The ESE would like to receive a short (1 page) document clearly describing its role and relationship to other E-ELT panels, including STC, SWG, and SSAC.

Request 2: The ESE would like to receive an update on site selection during its January telecon.

14:45 Updated Status of Programme, including Top 10 Risk Register (R. Gilmozzi)

The ESE found the candid discussion of risk items very useful and appreciated that the Principal Investigator included non-technical programmatic issues, such as science and finance. The panel would welcome such presentations at all future meetings. The Risk Register contains evaluations of likelihood (remote…likely) and impact (mild…catastrophic). The ESE would like to see these assessments in future.

The ESE noted that industrialization of stress figuring of mirror segments did not appear explicitly on the Top Ten risk register. Given the importance of this subsystem, the ESE requests that M1 risk, including schedule and contingency issues, be presented in the future, independent of whether it is “Top Ten” or not.

The ESE welcomed the SAGEM study of alternative figuring strategies, but was somewhat surprised that stressed-lap polishing was such an alternative and not a primary choice. The panel would appreciate any information on competing figuring strategies but recognizes that such information may be covered by intellectual property considerations.

The panel was also somewhat surprised that system control strategy – that is, the methods for making M1-M5 operate as a single telescope – did not appear in the top 10. Interface and coordination with post-focal adaptive optics systems provided by external instrument teams will only complicate the situation. The ESE would like to see system control in the context of science top level requirements appear in future risk presentations, again independent of its location in the risk assessment.

Request 3: Future presentations on the risk register should include numbers for both likelihood and impact. The ESE also requests information on M1 risk and fabrication methods, as well as system control risk at future meetings.
Telescope thermal analysis (M. Kissler-Patig)

The ESE was happy to see an initial thermal analysis of the E-ELT design and welcomed the news that both the software and expertise now exist in-house to refine the calculations. The panel had a number of specific concerns about the current study:

1. The emissivity figure of 2% for aluminum seems optimistic. Freshly deposited aluminum has a typical emissivity in the K band of 2.5%. Although the difference is small, there are five or six reflections to consider, and very few real-world coatings achieve this value. Up-facing mirrors, such as M1 and M3, will collect dust and, on average, all surfaces will be six months old, given the current coating strategy.

2. It was not clear to the ESE that dust was included in both scattering and emissivity. For thermal wavelength observations, a dust grain will emit at 290K, overwhelming its potential scattering of much colder sky radiation.

3. The thermal analysis may be very important for the science case, the design of instruments, and the selection of a suitable site. ESO should ensure that the updated figures are made available to the relevant working groups and teams.

Recommendation 2: ESO should verify the assumptions about coating properties, mirror aging, and dust effects in the thermal analysis of the telescope. Updated emissivity values should be distributed to the relevant science, instrument, and site selection teams.

Status of Programme, including Construction Phase Time Line (R. Gilmozzi)

The ESE was very pleased to hear that the Phase B programme was on track to meet the Construction Review milestone in September 2010. However, a number of concerns arose during the presentation and subsequent discussion:

1. There was a general concern about the compressed time line, including potential large schedule risks, the expiry of fixed-price offers associated with engineering studies, etc. Risk analysis and contingencies will clearly help in these areas.

2. Whether or not overlap with JWST will occur is essential to science planning. The E-ELT Project Office should work with the SWG and the wider community in evaluating alternate scenarios (e.g. several years overlap vs no overlap) and their impact on science.

Recommendation 3: The E-ELT Project Office should work with the SWG and wider community to evaluate the science impact of various amounts of operational overlap with JWST.

Site Testing Update - Roberto Gilmozzi

The ESE acknowledges the addition of Armazones to the list of actively considered sites and concurs with the decision to drop both the Morocco and Argentina sites. Subsequent discussion led to the following recommendations and request.

Recommendation 4: ESO should verify that wind impact on optical surfaces is included in the performance analysis of the telescope (i.e. not just mechanical wind shake).

Request 4: During its January telecon, the ESE would like to hear Guy Monnet’s analysis of six months of telescope operation.

Recommendation 5: Despite manpower requirements, the ESE encourages ESO to have continuous sodium monitoring during Paranal laser guide star (PARSEC) operations.
**Update Instrumentation (S. Ramsay, S. D’Odorico)**

The ESE appreciated the update on design studies and the plans for proposing both first light and subsequent instruments. There was substantial discussion on the latter topic. Specifically, it was not clear how best to provide ESE and STC input to the instrument selection included in the E-ELT construction proposal. Compressed timescales will limit our ability to provide feedback between the spring 2010 SWG meeting and the completion of the proposal draft. This led to the following recommendation:

**Recommendation 6:** In order to allow sufficient time for ESE and STC feedback on initial instrument capability for the construction proposal, the ESE recommends a slightly altered meeting schedule in spring 2010. Ideally, the STC could be postponed by approximately 4 weeks to allow the usual SWG-ESE-STC sequence. Alternatively, extraordinary ESE and STC meetings may have to take place.

**Telescope Update, including Mid-Term Review – Jason Spyromilio**

The ESE acknowledges the report on telescope status and congratulates the Project Office on its progress. The panel was particularly appreciative of the inclusion of comments from the mid-term review panel on specific telescope design issues. The responses from the Project Office seemed complete, but it would be interesting to hear the Review panel’s “response to the response.” There was discussion of a number of issues included in prior recommendations and requests, specifically stressed blank polishing and system control.

The ESE had one remark on “ownership” of the error budget. While it is acceptable that this ownership does not lie with the Project Scientist as the Mid-Term Review panel suggested, ESO should ensure that sufficient science-based input and feedback to the error budget take place.

**Summary of Requests and Recommendations**

**Request 1:** The ESE would like to receive a short (1 page) document clearly describing its role and relationship to other E-ELT panels, including STC, SWG, and SSAC.

**Request 2:** The ESE would like to receive an update on site selection during its January telecon.

**Request 3:** Future presentations on the risk register should include numbers for both likelihood and impact. The ESE also requests information on M1 risk and fabrication methods, as well as system control risk at future meetings.

**Request 4:** During its January telecon, the ESE would like to hear Guy Monnet’s analysis of six months of telescope operation.

**Recommendation 1:** The ESE should continue to meet face-to-face on a semi-annual basis at a time appropriate to benefit from the activities of the Science Working Group (SWG) and to provide timely advice to the Science and Technical Committee (STC). Practically, this means a shared meeting with the SWG in spring and autumn, approximately two weeks prior to the STC. ESO should prepare the E-ELT Fact Sheets for the STC on a timescale that they can be supplied to ESE a few days in advance of their meeting. The ESE should hold a telecon in January and July. Approximately a week in advance, ESO should make the semi-annual E-ELT report available to the panel for discussion and questions during the telecon.

**Recommendation 2:** ESO should verify the assumptions about coating properties, mirror aging, and dust effects in the thermal analysis of the telescope. Updated emissivity values should be distributed to the relevant science, instrument, and site selection teams.
**Recommendation 3:** The E-ELT Project Office should work with the SWG and wider community to evaluate the science impact of various amounts of operational overlap with JWST.

**Recommendation 4:** ESO should verify that wind impact on optical surfaces is included in the performance analysis of the telescope (i.e. not just mechanical wind shake).

**Recommendation 5:** Despite manpower requirements, the ESE encourages ESO to have continuous sodium monitoring during Paranal laser guide star (PARSEC) operations.

**Recommendation 6:** In order to allow sufficient time for ESE and STC feedback on initial instrument capability for the construction proposal, the ESE recommends a slightly altered meeting schedule in spring 2010. Ideally, the STC could be postponed by approximately 4 weeks to allow the usual SWG-ESE-STC sequence. Alternatively, extraordinary ESE and STC meetings may have to take place.

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**Agenda – ESE Meeting October 6-7, 2009**

**Tuesday, October 6th**

12:00 *Joint lunch with SWG*
13:30 Introduction (T. Herbst, B. Leibundgut), ESE terms of Reference
13:45 Adoption of minutes (T. Herbst)
14:00 Review of action items and previous ESE recommendations (T. Herbst, R. Gilmozzi)
   • Seeing distribution impact on instruments (R. Gilmozzi)
   • Draft of the construction phase time line (R. Gilmozzi)
   • Telescope thermal analysis (M. Kissler-Patig)
14:45 Updated Status of Programme (R. Gilmozzi)
   • Top 10 risk register
15:30 *Coffee break*
16:00 Site testing update (R. Gilmozzi)
16:15 Update Operations PO (F. Comeron)
16:30 Update Instrumentation PO (S. D’Odorico)
17:00 Discussion
17:30 Closed session

**Wednesday, October 7th**

09:00 Update Telescope PO (J. Spyromilio)
   • Incl. Mid-term review: outcome and E-ELT response (R. Gilmozzi, J. Spyromilio)
10:00 SWG report (I. Hook)
10:30 Science Office update (M. Kissler-Patig)
   • Design Reference Science Plan: first results
11:00 *Coffee Break*
11:30 Closed session
13:00 Feedback to ESO