FOR APPROVAL

SCIENTIFIC TECHNICAL COMMITTEE

71st Meeting

ESO, Garching, October 21 & 22, 2009

DRAFT MINUTES
Draft Minutes of the 71st meeting of the Scientific Technical Committee held at ESO, Garching, on October 21 & 22, 2009.

The STC convened in the following composition:

**Chair:** W. Benz (Switzerland)

**Members:**
- J. Hron (Austria)
- J. Blommaert (Belgium)
- L. Bronfman (Chile)
- M. Prouza (Czech Republic)
- L. Haikala (Finland)
- Y. Mellier (France)
- T. Herbst (Germany) Via Video
- A. Marconi (Italy)
- M. de Vos (Netherlands)
- J. Afonso (Portugal) Via Video
- R. Bachiller (Spain)
- D. Queloz (Switzerland)
- R. Ivison (United Kingdom)

**Members at Large:**
- E. Sadler (Australia)
- D. Crampton (Canada)
- L. Tacconi (Germany)

**Excused:**
- J. Fynbo (Denmark)
- G. Olofsson (Sweden)

**On behalf of the ESO Executive:**
- T. de Zeeuw (Director General)
- P. Ballester
- T. Bierwirth (Day 1)
- M. Casali
- G. Chiozzi
- F. Comerón
- C. de Breuck (Day 2)
- S. D’Odorico
- R. Fosbury
- R. Gilmozzi
- N. Hubin
- A. Kaufer
- B. Leibundgut
- A. Longinotti
- J. Melnick
- A. Moorwood
- M. Peron
- L. Testi
- W. Wild

**Minutes:** C. Goddi
21 OCTOBER 2009

1. **Opening of the meeting and adoption of the agenda (STC-456)**

The chair W. Benz expressed the wish to add a point in the agenda, following B. Leibundgut’s request to communicate the dates for next year’s meetings. There were no other changes and the agenda was adopted without any further changes.

1a. **Dates for the STC meetings in 2010**

B. Leibundgut proposed dates as close as possible to the current year. STC: first meeting April 20-21, 2010; second meeting October 19-20, 2010. The STC agreed to these dates. Sub-committees: no dates were proposed.

2. **Approval of the minutes of the 70th STC Meeting (STC-455)**

The minutes were approved without any changes. W. Benz thanked ESO for providing the minutes.

3. **Report of the Director General**

ALMA:
E. Sadler had a question about science related to ALMA in an optical observatory and how to integrate it in practice with scientific topics like star formation, galaxy evolution, etc. The Director General replied that ALMA would address every single topic in astronomy including star formation and galaxy evolution, and there would be large amount of synergy between ALMA and optical/ infrared astronomy. He also added that L. Testi (the European project scientist for ALMA) and the VLT programme scientist are in the Directorate for Science. He concluded that the presentation from W. Wild would address this aspect.

E-ELT:
M. de Vos inquired about the funding scheme for E-ELT and whether the Council position was for a structural increase in the ESO budget. The Director General replied that one option was to somehow find the money to construct E-ELT and use the remaining (current) ESO income, to operate Paranal, contribute to ALMA and operate the E-ELT but then there would be no money for any future development. ESO would be able only to operate facilities. He pointed out that ESO’s mission was to build and operate telescopes, not just to operate them. Council in principle agreed but an increased structural income of 25% by 2018 was required. Solutions to this issue were under discussion.

4. **Directorate of Operations**

4a. **Directorate of Operations Overview (A. Kaufer)**

L. Tacconi inquired about the backlog of observations for the LGS, specifically about a significant time loss in August. A. Kaufer answered that there was a mistake in the instructions to the operator
that resulted in a higher priority for the non-LGS with respect to the LGS observations. He stated that the issue had been sorted out.

D. Queloz asked why there was 50% weather downtime in the telescope statistics of the VLTI in the month of July which was twice the downtime on other telescopes and wondered if the number was computed differently. A. Kaufer replied that the weather downtime was specific to the facility, in the sense that different weather conditions were required for different facilities to work. Since VLTI was based a lot on adaptive optic systems, one needed to have the right seeing, coherence time, etc. to make the facility available. In the specific case, July had particularly critical weather conditions.

D. Queloz asked about the status of the ATs, since an upgrade plan was mentioned in the fact sheets and asked if the committee was going to get a report on the scheduled actions. A. Kaufer replied that the statement in the fact sheets was correct and was complemented by presentations in the sub-committee by the VLTI engineering group who developed the plan. He added that no report on the upgrade was planned at that moment.

D. Crampton pointed out that there were 4 nights of successful LGSF science time and asked if it was possible to support a higher demand. A. Kaufer replied that the demand for LGSF was indeed very high. 7 nights per months were generally provided but they were able to extend from 7-9 nights per month up to 12-14 nights per month by shortening the time needed for maintenance. In particular, a new maintenance scheme with daily replacement of a fraction of the dye solution had been successfully adopted which could extend in principle the lifetime of one dye solution up to two weeks. In the old scheme the dye solution had been changed once per week which required the time-consuming operation of re-alignment of the whole system. More than two weeks would be impossible owing to the interferometer blocks and visitor modes. A. Kaufer concluded that given the huge demand for LGSF and the number of observations not executed in the past because of technical failures, it was very challenging to run all blocks and to keep up with user expectations.

J. Afonso was concerned about the list of problems reported in the fact sheets for X-SHOOTER (e.g. cryostat vacuum, slit wheel breaking, etc.) and asked if everything was sorted out or further downtime was expected. M. Casali replied that all instruments presented some technical problems and X-SHOOTER was not particularly affected in this context, especially given the complexity of the instrument (three instruments in one). He added that most of the problems were with the infrared part of the spectrograph. He reassured that the vacuum problem was identified, the vacuum leak was found and they were just waiting for the final part to fix it permanently. Similarly, the slit wheel coupling had been replaced. He concluded that good science was expected in the near future.

J. Afonso inquired about the ESO archive capability (420 Tb) and asked whether there were plans to increase it. F. Comerón replied that ESO had expansion plans for the storage volume of the archive capability which was coupled with the periodic renewal of the hardware. The solution was the passage to higher density media: e.g. replacement of 400 Gb disks with 2 Tb disks. F. Comerón concluded that no problem was foreseen in the next few years in copying the data from the servers, including the integration of the ALMA archive that would be hosted in Garching. In this respect, Y. Mellier pointed out that, in addition to the archiving, there might be the problem of data distribution, for example in case of a huge request from users of VISTA data. F. Comerón explained that, in the past, data had been distributed in CD-ROMs, in the last few years data were distributed in DVDs; for the wide-field imager data were provided temporarily in USB disks to users which had to return them after data
processing; since early 2009 data were distributed in Blu-ray disks. Following a further inquiry from Y. Mellier, F. Comerón clarified that the possibility of data download through the Internet was limited to regular requests; for surveys the possibility would depend on the data volume requested.

T. Herbst asked for a brief overview of the VLTI vibration problems. A. Kaufer answered that the topic would be described in the subpanel report. In summary, there had been a continuous effort which resulted in continuous improvements (190 nm rms for the OPD variations due to vibrations where the number could change depending on baseline combinations). Moving one instrument like ISAAC from one UT to the other had further changed the picture because some of the instruments still contributed to the vibrations seen by the VLTI. Nevertheless, the situation had slowly improved in the past year, although the effect had not been completely corrected. A. Moorwood pointed out that there were systems under development like active control and improved metrology. The new instruments had been equipped with new cryostat coolers, so the instrument vibrations for those were certainly reduced, and the situation was definitely improved with respect to one year before.

D. Crampton returned to the question of data distribution and pointed out that there was high scientific interest in having the data available immediately as it was the case for CFHT (10 minutes per image of download time). D. Crampton asked if there were plans to improve that. A. Kaufer replied that there was an ongoing project supported by the European Union for high-speed data transfer. The main limitation was that the Paranal Observatory was linked to the outside world by microwave connections. ESO was presenting a proposal to Finance Committee to connect the fibers from the Observatory to the Chilean Internet backbone which would set up an initial step to Gb link to Europe. The transfer at the moment was based on solid-state media. On the other hand, all data from VLT and VLTI are already transferred via the regular internet connection to Garching. VISTA and VST data were a new dimension in this respect but changes were on the way.

Following an inquiry by D. Crampton, A. Moorwood stated that he would talk in his presentation about the possible replacement of the Fabry-Perot calibration unit by a laser comb.

M. Prouza inquired about the small telescopes installed on La Silla and the usual conditions required at the ESO sites. A. Kaufer replied that La Silla provides an infrastructure to put user experiments compatible with the site. ESO took into consideration the proposed projects case by case and, based on scientific validity, looked for the best setup to host the project. In addition, some new projects were hosted like the QUEST Survey at the SCHMIDT telescope which required to install a CCD camera in the telescope’s focal plane (first light in May 2009). Moreover, an agreement had been signed for a project to study transits of exoplanets (TRAPPIST) re-using the old 70-cm Swiss telescope dome. The financial conditions were discussed case by case following some general rules mainly dependent on the size of the facility and the infrastructure support required by the users. Possible cases could range from a fully robotic telescope working remotely to facilities requiring visiting astronomers, control rooms, etc. In this context, the Director General reminded that 10% of the time went to Chile based on the agreement with Chile for La Silla. M. Prouza asked if there were unused telescopes in the site or if all of them were operational. A. Kaufer replied that there were several unused telescopes and that a careful study was required to establish if old telescopes were still operational or not. As an example the SCHMIDT telescope was evaluated still operational after 20 years.
4b. **Discussion of Directorate of Operations Fact Sheets (STC-457A-OPS)**

**VISIR:**
J. Bloemmaert asked if after the taking off and reinstallation of VISIR, there was a plan for an upgrade of the instrument and which were the timelines for that. A. Moorwood replied that he would discuss this in his presentation.

**VLTI PRIMA:**
Following an inquiry from D. Queloz, A. Kaufer explained that PRIMA was an instrument in installation and commissioning and hence not part of operations (which was the reason why it was not included in his presentation) and said that it had been discussed in the sub-committee. A. Moorwood confirmed that there had been a detailed discussion on VLTI PRIMA in the LSP panel that had met the day before and hence information on the specific topic would be provided to the STC by the panel itself. Following an inquiry from A. Moorwood, D. Queloz explained that it was not clear from the report what the impact of the ongoing operations at the VLTI in the short- and mid-term would be. A. Kaufer reassured that, following the first integration of PRIMA into the VLTI last year, there was no interference with the ongoing operations and that the installation of PRIMA did not have any significant impact on the ongoing operations at the existing VLTI facility.

5. **Directorate of Programmes**

5a. **Directorate of Programmes Overview (A. Moorwood)**

D. Crampton raised his concerns about the lack of description of problems in the projects as reported in the presentation. A. Moorwood said that, as an example of a real problem mentioned, a 1.1m Zerodur thin Shell mirror had broken during manufacture. Following a further inquiry from D. Crampton, A. Moorwood explained that the time for real problems that would affect significantly the second-generation instruments and the AO was just ahead, especially in the manufacturing and integration phase. M. Casali added that the introduction of prototyping of risky components and subsystems should start at an early stage to mitigate risk. In the case of KMOS, for example, prototyping of the pickoff arm was much more difficult and took much longer than expected.

E. Sadler commented about the complexity of the new instruments being brought into operation and asked if it was as complex as bringing the E-ELT into operations. A. Moorwood replied that for E-ELT there would be fewer instruments in total. At the moment, there were ten studies for E-ELT instruments and AO systems, which were certainly more complicated than the present instruments, but did not necessarily involve new technology. For VLTI there were already 13 instruments running and there were new ones coming which were generally more sophisticated than past generation instruments but not necessarily much bigger. A. Moorwood stressed that E-ELT would be based on this new expertise gained through VLT in the ESO community. Following the inquiry from D. Crampton and the mention of the breakage of the 1.1m thin shell mirror, E. Sadler wondered if that was a common problem, since it happened at other observatories. A. Moorwood replied that some such shells had been successfully produced and that one of the aims of the AOF programme mentioned was to master this new technology at ESO.

T. Herbst inquired about ESPRESSO operation modes which at the moment consisted in either using one of the UTs or collecting light from the 4 UTs simultaneously but there were no intermediate capabilities (2-3 UTs together). T. Herbst commented that in his view it was worth to inquiere time
required to offer other options as well. A. Moorwood agreed that they should pursue all the options. M. Casali added that ESPRESSO was under study and, after getting the phase A study report, they should look at how much implementing new operation modes would cost, especially because having 4 UTs simultaneously could be expensive. The consortium was preparing the phase A study document in which it would be explained how to switch between one telescope and multiple telescopes and how much the extra capability would cost.

D. Crampton asked if ESPRESSO for 4-UTs really had a strong science case. M. Casali replied that the science case had been studied in detail and would be a result of the ongoing study. T. Herbst clarified that his question arose from a statement made in the previous STC meeting, that ESPRESSO could work when other instruments could not. A. Moorwood acknowledged this and explained that, since the next generation of VLTI planned to use the 4 UTs, the idea was to be able to switch from 4-UTs VLTI to ESPRESSO (which would be able to work with 4 UTs) in those cases where for example the seeing was not good enough for VLTI. As the resolving power would depend on the number of telescopes combined, the science cases would also depend on this. Details would be elaborated in the study. Apart from that the study would also estimate the increased photon collecting efficiency of the combined 4 UTs relative to a single UT and other related issues. A. Moorwood concluded that the case appeared to be strong, but that the study remained to be finished. He added that cost could also be an important factor in the achievable goals.

5b. Discussion of Directorate of Programmes Fact Sheets (STC-457B-DOP)

L. Tacconi inquired about the reliability of the schedule for arrival and commissioning of both SPHERE and KMOS in the first three quarters of 2011 as reported in the fact sheets. A. Moorwood replied that the dates given come from the schedules provided by the consortia and should be reasonably accurate barring unexpected problems which might arise during integration and testing.

D. Queloz had two questions about VLTI PRIMA infrastructure. First, he asked if the (VLTI) STar Separator recovery process was over (scheduled in October as from the fact sheets) and if the instrument was working again. Y. Mellier replied that there was no positive report on the (VLTI) STar Separator recovery and that the instrument was not working yet.

Secondly, D. Queloz asked for a more precise timescale for the planned intervention to repair the FSU cold camera which was reported to be “major in time and scope” (as in page 36 of the fact sheets). He also commented that with such a failure of PRIMA he doubted the ongoing/forthcoming commissioning could proceed. A. Kaufer explained that all the STRAP heads (but one) for the ATs had been delivered before the last PRIMA commissioning run. The adopted strategy was to use the replaced STRAP head for the (VLTI) STar Separator and integrate it there. Unfortunately, the last STRAP head had been destroyed during the installation in the (VLTI) STar Separator because of wrong polarity of some cables.

A. Marconi asked about the priority to attribute the manpower to implement the templates for the off-axis fringe tracking and imaging with AMBER and MIDI, in particular if it had to wait till the end of PRIMA commissioning.

A. Kaufer replied that the real question was who was implementing the templates: Paranal operation people who knew the templates better and could integrate them more efficiently in PRIMA or whether
they should be delivered by PRIMA to operations. The latter could not deliver them because they were occupied with more important activities. He concluded that in principle there was manpower to implement the templates but there was still no agreement on who should do it.

6. **Second generation VLT/I instrumentation**

6a. **The future of general-purpose observing modes on VLT (M. Casali)**

W. Benz opened the floor for questions specific to the presentation by M. Casali.

L. Tacconi asked a general question about the fate of old instruments, in particular if ESO excluded the possibility of moving instruments making them available not all the time (as other observatories do) as opposed to decommissioning and losing capabilities/facilities. M. Casali answered that the experience of ESO and other observatories was that putting an instrument on and leaving it at work for a long run was a good way to assure a long science production. Returning an instrument into operations created problems of various kinds. For that reason, the adopted approach was to leave instruments on as opposed to moving them around. However, soon there would be no room left for any more instruments implying that any new forthcoming instrument would result in the decommissioning of an old instrument.

In this regard, A. Kaufer reminded that it took three weeks to move ISAAC to another focus station. In general instruments could be moved but timescales of weeks should be taken into account. A. Kaufer strongly advised against the possibility of making instrument changes part of regular operations.

A. Moorwood commented that the nominal lifetime of instruments was normally specified to be ten years. In practice some of them continued to operate and remain in demand by the scientific community for longer (like ISAAC) despite the introduction of more powerful instruments offering the same or similar modes. NACO would also have been operating for more than 10 years when replaced by MUSE in 2012.

D. Crampton commented generally on the strategy adopted of providing something for everybody rather than focusing on things that ESO can do better than anybody else in the world. M. Casali answered with a recent statement from L. Pasquini: “ESO is such an important and big observatory that it should be at the forefront in all common observing modes”. He thought that to surrender major areas of research (as opposed to specialties) was not something ESO should do. The Director General added that the ESO User Portal had 5700 registered users, indicating that a significantly sizeable community was gathered by ESO. M. Casali also noted that there were some specialist areas where ESO was not trying to compete, e.g. very large multiplex, multi-object spectroscopy and large telescope optical imaging for dark energy surveys. D. Crampton commented that when they would get a MCAO system commissioned, there would be the serious competition of JWST. M. Casali used the argument that, similarly, HST was thought to kill ground-based optical imaging and yet that was the most requested mode on the VLT. He added that JWST would be a telescope for the whole planet and the competition for time would be so high that some observing modes in ground-based facilities would be most likely still highly requested.

M. de Vos inquired if choices made some years ago had any negative consequences on the capabilities of the VLT that people realized only nowadays. M. Casali replied that there were some areas where decisions could have been slightly different. A. Moorwood noted that there had been suggestions to
extend HAWK-I to 5µm as in the ISAAC long wave arm but this would have complicated the instrument and precluded use of the detectors already purchased for the cancelled NIRMOS instrument. The actual demand at the longer wavelengths was/is also much lower than in the near infrared.

D. Crampton stressed that, although he agreed on the argument on the 3-5µm imaging, 3-5µm spectroscopy was a growing research field (e.g. solar system and planets) owing to important molecular emission in that wavelength range. A. Moorwood agreed and pointed out that CRIRES on the VLT provides coverage of the complete 1-5µm range at a spectral resolving power of 100,000.

6c. Report from the La Silla Paranal Subpanel (Y. Mellier)

B. Leibundgut commented that there was an extra complication in the VST surveys due to the fact that ESO never received the GTO programme from INAF. J. Blommaert inquired about the actual situation regarding the problem raised at the previous STC meeting about AT availability and technical downtime. A. Kaufer replied that they had discussed the numbers in a pre-meeting to the subpanel meeting (the so-called baseline meeting), where it had been stated that there was a 75% availability of ATs (three of four), the goal was to have four of four ATs available in the four telescope operation mode. The telescopes were working and a refurbishment plan was on the way to address reliability and maintainability issues. There had only been one case in visitor mode when half a night was lost because one AT had to be swapped with another one, the second half of the night was OK.

The Director General thanked Y. Mellier for the positive words and hoped that the committee would convey much of this information to the Council. Regarding the VST, he explained that the actual recovery was not completely under ESO control; it was a deliverable from INAF and a prediction for a date was hard to make. Regarding the issue of the surveys, the originally planned meeting (previous month) would have included the PIs of the approved public surveys and the PIs of the GTO programmes. The Italian team had already received the invitation to explain the plans about the programmes.

W. Benz asked about plans for the spectroscopic surveys given the subcommittees’ recommendation to move ahead in this respect. B. Leibundgut responded that the plan was to write a call as soon as ESO could. W. Benz was concerned that the spectroscopic surveys were slightly more complicated to plan than imaging surveys because of possibly conflicting science requirements with conflicting instruments and asked if the plan was to make an open call or define some science. B. Leibundgut replied that in its 70th meeting the STC had suggested an open call for spectroscopic public surveys (i.e. no instruments or science areas singled out). He agreed with W. Benz that it was not possible to take the same plan as for the public imaging surveys and use it for the spectroscopy surveys. ESO would start with a call of letters of intent and then based on that it would proceed with the call. He admitted that they lost the time frame to have the call ready for the May 2009 OPC but it would still be possible to start during period P86.

E. Sadler suggested that one could put out a call or alternatively have workshops to get people together. B. Leibundgut replied that there had already been a workshop in March. E. Sadler added that a following workshop could be just to inform about the proposals.
D. Crampton wanted to have more information on the Dark Energy Survey and if it was real competition for VST. Y. Mellier replied that the DES project aimed to build a camera to reach 0.8 arc-seconds angular resolution in imaging. He pointed out that the team was very strong and there were huge resources. He concluded saying that the original goal of September 2010 for the first light was reliable, as he did not foresee any significant delays in the operations, in both data processing and instrumentation.

7. Directorate for Science
7a. Overview of Directorate for Science (B. Leibundgut)

Following the comment from B. Leibundgut about the lack of enthusiasm from ESO Fellows to attend the ESO Fellowship meeting, L. Tacconi asked if senior scientists were involved. B. Leibundgut replied that the meeting was open to everybody and announced to the staff. His main surprise was that he felt some of the Fellows were reluctant about presenting their research. He also stressed that the environment in Chile was more difficult than in Garching for Fellows as there were no other big institutions around like the MPE or MPA and additionally part of the staff was often away at the observatories. L. Tacconi made the suggestion to allow ESO Fellows in Chile coming to Europe to have extra time to give lunch talks and colloquia (in Europe as well as in their home countries). B. Leibundgut added that the Fellowship meetings were scheduled every two years, so every Fellow had a chance to attend this event at least once (November in Chile and May in Garching). Fellows in Garching were generally willing to go to Chile at least once and visit the observatories, a kind of attraction that Garching did not have for Fellows in Chile. Following an inquiry about Fellowship applications B. Leibundgut said that the number of applications for ESO Fellowships was still growing.

W. Benz commented that the large number of proposals was becoming a real problem for the OPC to handle. He added that the level of satisfaction in the community was directly related to how well the proposals had been evaluated. In this respect, he asked if there would be an OPC for ALMA. The Director General responded that there would be a single proposal process for ALMA for the three partners (Europe, North America, East Asia), Chile (10% of the time) was in the process of deciding what to do. A subcommittee of the ALMA Board was setting main guidelines for the overall process, there were still some diverging opinions under discussion, e.g. about who should hold the Director’s Discretionary Time. In the hypothesis of a single evaluation process, ESO would be the portal for the European region and then the proposals would go in to the global process.

J. Blommaert inquired about the calibration proposals as there were very few of them and only one accepted. In particular, he was concerned that, by following the same procedure, there was not a fair competition between science and calibration proposals when they went to the scientific committee. B. Leibundgut explained that the actual process was that the calibration proposals went to the OPC and the OPC discussed them (not the panels). The calibration programmes were discussed at the very beginning of the OPC, the large programmes were discussed at the end. B. Leibundgut agreed with the point raised by J. Blommaert and that ESO should look into other procedures for the calibration proposals. A. Kaufer commented that it turned out that most of the proposals failed the technical evaluation by the observatory because they, for example, requested to commission new modes or there were proposals aiming to do some science under the cover of the calibration proposals. A good example of a calibration programme was the astrometric solution for NACO, several proposals had been received and some progress had been made for the good of the community, since it was well
beyond what the observatory could have provided. J. Blommaert added that there was a large interest in calibration programmes from the community, since they were necessary for other instruments, operations, missions, etc., although not generally exciting for science. E. Sadler asked if all these proposals went to the OPC or some of them to the DDT. A. Kaufer replied that all calibration proposals were reviewed and recommended by the OPC. The time for execution of calibration proposals is shared between the observatory’s technical time allocation and the DDT time allocation.

J. Hron noticed that the pressure factors for the VLTI changed by a factor of two for normal programmes and asked if it was due to guaranteed time and how long it would last. B. Leibundgut replied that there was still guaranteed time on the VISA (the array with the ATs), the pressure factor on the VLTI was set approximately as for individual telescopes. He agreed that it was difficult for normal programmes to obtain VLTI time.

ESO RESPONSE TO D. QUELOZ’S PREVIOUS QUESTIONS ABOUT PRIMA:

A. Moorwood clarified that the STS alignment problem was understood. One STRAP unit (in AT3) had broken but there were three new STRAP units (one going out to Paranal the following month). The FSUA camera had one fiber out of four damaged in a previous intervention but the plan at the moment was not to repair it (considerable effort, cost and risk involved), but to carry on accepting a small reduction in performance for the time being.

With regard to the AMBER/ MIDI off-axis fringe-tracking A. Moorwood stated that it was an ESO responsibility, but had a low priority at the moment relative to the astrometry. It would be taken into account in the following weeks/ months. The on-axis fringe tracking for MIDI had been tested but it was a separate issue since it was not an ESO deliverable.

It is expected that the problems encountered during the October commissioning will be resolved during the next commissioning in early December 2009.

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8. ALMA and APEX
8a. Project Status Report (W. Wild) (STC-458)

W. Benz opened the floor for questions directly related to the report from W. Wild.

E. Sadler wanted an update on the correlator. W. Wild replied that at least one quarter of the correlator had been installed and it was not on the critical path. Following a further inquiry from E. Sadler, W. Wild said that the correlator on the three-element interferometer at the AOS would be tested at the end of 2009. The Director General clarified that half of the correlator had already been installed for the main array and that the Japanese partner was in an even more advanced stage with the correlator for the compact array.

R. Bachiller asked for the reason why on the site there were only three conditionally accepted antennas as it had been the case six months before despite 20 antennas being assembled at that moment at the
OSF. W. Wild replied that there were two main reasons. First, the relatively small number of antennas accepted reflected difficulties in doing measurements of key specifications at the OSF, since the antennas were designed to maintain the nominal surface accuracy from -20°C to +20°C, so they could not be fully tested at the OSF where it did not get cold enough. He added that the tests were run as simulations and depending on the specific model used (e.g. JAO or Vertex), the results were different. Hence, the plan was to do measurements at the high site and settle the issue. A second reason was that the execution of the “punch list” (i.e. part of the conditions to accept the antennas) was proceeding more slowly than planned and the project was pressing very much on Japan and North America to fix that.

D. Crampton inquired generally about the schedule contingencies. W. Wild replied that the schedule contingency depended on which part of the ALMA interferometer was considered. There was no contingency for the CSV; European antennas had built in three months of contingency, cryostats in two months, etc. In this respect, there was not a uniform picture across the project.

Following a further inquiry from D. Crampton, W. Wild clarified that the overall goal was to have 66 antennas in service by the end of 2012/ beginning 2013, although there were accumulating delays (e.g. the European antennas). Hence, in order to respect the schedule, it was necessary to speed up the production rate for all the deliverables (CSV activity, hardware and software delivery). In this respect 2010 was a critical year. Following a new inquiry from D. Crampton, W. Wild also explained that ALMA had a very strict distinction between construction budget and operation budget (owing mainly to the partnership with North America) and that the development fund was in the operations budget.

W. Benz asked if there was a plan B in the event that the schedule could not be respected. W. Wild responded that ALMA had been doing a cost to completion exercise since July 2009 based on the experience learned since the 2006 re-baselining. This exercise allowed identifying increased costs and a number of omissions that should have been included in the plan. The first results would be presented to the ALMA Board in November. One possible plan B was to include in the risk register cost of an extra year of ALMA construction. A “negative” plan B would imply a re-scope of options but this possibility was currently not pursued. The project was still in the phase of collecting cost-to-completion data.

R. Bachiller commented that, looking at the list of concerns, the European antennas were at the very top but actually with 20 antennas on the site and only 3 front ends, the latter became an even more critical item. W. Wild clarified that the number of twenty included antennas in different assembling stages and not antennas completely built and ready for testing which were a much lower number. Nevertheless, he acknowledged that if Europe were able to provide in a very short time, say, five antennas, indeed there would not be front ends to equip them. For that reason, the front ends were on the critical path and a lot of effort was devoted to solving that problem.

M. de Vos inquired if, based on the fact that the main contracts had been placed, the re-scope was a realistic option (negative plan B). W. Wild replied that it would have to be but they were still in the stage of looking at the costs of the various items and considering various options. As an example he mentioned that ESO was building 192 antenna foundations which were rather costly to equip with high-precision ridges (ESO deliverables), fibers, power connectors, etc. Hence, one possibility that might have to be considered was to delay the outfitting and completion of the most remote locations. That would preclude the capability of good interferometry over baselines of 16 km (which is only
planned some time after beginning ALMA operation) but would help to save some money. Another option was to reduce on the staff cost which would have a direct impact on the number of antennas equipped and tested to some level. W. Wild clarified that none of these possibilities was actively pursued and that they were only mentioned as an illustration.

8b. **Discussion of ALMA Fact Sheets (STC-457D-ALMA)**

The chair W. Benz was surprised that the call for tenders for the ALMA power generation represented a significant call on ALMA contingency funds. W. Wild explained that the reason dated back to 2006, when the project had been re-costed. At that time the required power need for ALMA was not known well enough. He added that there was still some discussion among experts about the total power needed to operate the array and the options were either to choose the safe side or assume different load factors. Another reason was that the power supply was a costly procurement and the cost included in the 2006 budget turned out not to be enough. Part of the reason was a cost increase for civil works mainly owing to the trend of Chilean economy and market.

The Director General added that the original plan had been to install a power line to Calama which had been approved by Finance Committee, including a giant call in contingency. That approach had been subsequently abandoned in favour of a generator but the second option turned out to be not as cheap as thought during the (optimistic) re-baseline of ALMA 3-4 years before. This was on the agenda of the Directors Council in the ALMA Board in the following month.

M. de Vos stated that only the online and operation support software was considered in the computing and not the post-processing software (e.g. CASA) which was mentioned in science but only in testing and asked if there were no concerns about the development of the CASA software. W. Wild replied that it was a challenging job but it was not on top of the list of concerns.

8c. **Report from ESAC (L. Tacconi)**

R. Bachiller asked about the minimum requirements for early science and asked if ESAC was considering to respect the original minimum or instead to adopt a “minimum of the minimum”. L. Tacconi clarified that there were concerns that the minimum fixed originally might not be reachable with the present schedule, so the choices were either to change the date or to change the final goals. R. Bachiller noted that in his view it was preferable to have a system as complete and reliable as possible as opposed to lowering the minimum which was consistent with the plan to keep the minimum for science requirements as it had been established at the beginning. L. Tacconi responded that there were different ways to implement early science with less than the originally planned capability. One possibility was to start early science without guaranteeing to provide to the users publishable quality maps at the end (data reduction tools might not be ready).

J. Afonso added that having the system ready for early science did not simply mean that the antennas were ready with the receivers installed but that users would need support from the ARCs for proposals and related software, data reduction tools, etc. If these tools were not ready, he did not think proposals should have to be submitted by hand (e.g. latex email). He concluded that, since ALMA was a new, revolutionary observatory, ESO and partners should not open to early science without all the tools being ready. The minimum of the minimum should include, apart from 16 antennas working, all the
tools for proposal submission and data reduction. E. Sadler agreed with the comment from J. Afonso and added that having a specific number of antennas working as well as all the tools for proposal submission and data reduction was different from asking for 16 antennas to work. She made the point that early science could be done for example with 12 antennas and 250m baselines, many science goals could be reached with much less than the originally planned capability.

**Discussion on APEX (based on the STC-458 document):**

Before proceeding to the following presentation on E-ELT, the chair W. Benz opened the floor to questions about the plans for APEX based on the STC-458 document which had been presented and discussed previously in detail at the ESAC meeting. The Director General clarified that there was no request to extend the APEX project from the ESO side. He reminded that the project was a partnership and ESO represented only a minority share, and despite significant urging from ESO, the main partner had not come with a proposal at that point. He concluded that it did not imply that the project was not going to be extended, as recommended by ESAC.

9. **E-ELT**

9a. **Report from the Programme Office (R. Gilmozzi)**

W. Benz asked if Cerro Armazones in Chile was completely released by TMT as a candidate site. The Director General replied that TMT had completely evacuated the site and would be glad if ESO could take over some of their equipment. He added that the site was under concession for another two years to Universidad Catolica del Norte but he did not foresee any obstacle to continuing the technical measurements.

Y. Mellier asked, based on the Design Reference Science Plan proposal statistics, which fraction of the spectroscopy was in integral field units. R. Gilmozzi replied that it was a substantial fraction. W. Benz commented that an alternative way to foresee proposal statistics with future instruments was to consider the use and request of present instruments (e.g. VLT).

J. Afonso asked if there were particular reasons to drop the Argentinean and Moroccan sites. R. Gilmozzi replied that the Argentinean site was very windy and the seeing distribution was not as good as the other sites. The site in Morocco appeared to be good but the amount of data collected till that moment was not enough to establish that it was better than the sites in Chile or La Palma.


W. Benz commented that little was known about the results from the mid-term review and asked for comments about the concerns reported there (e.g. M4 issue, breaks of deformable mirrors). R. Gilmozzi answered that the mid-term review pointed out several concerns and provided advice on how to mitigate possible risks. He added that some of them were known but others were not. Hence, the panel was very useful and helped to improve several aspects of the project. Specifically with regard to M4 discussion focused on risk mitigation, and the suggestion was to procure two mirrors. An intermediate solution might be to procure a second back-plate and more than one thin shell. He concluded that the project was taking actions to address every single issue pointed out by the mid-term review panel and that a presentation had been given to the ESE where these issues were discussed.
Following a comment from W. Benz, he proposed to make the presentation to ESE available online on the STC meeting website. In this regard, the Director General commented generally that the ESO executive, the STC and the subcommittees were working hard on how to optimize the procedures between the subcommittees and the STC and that it would have been bad if all the presentations made to the subcommittees had to be repeated to the STC.

9c. **Report from the Instrumentation Office (S. D’Odorico)**

There was no discussion on this presentation.

9d. **Report from the ESE Subpanel (T. Herbst)**

L. Tacconi commented that at the end of 2006, during a tough phase for E-ELT, the STC had planned to have extraordinary meetings during critical times for specific projects. M. de Vos commented that it was important to clarify in advance responsibilities and roles of various committees (e.g. relation between ESE and STC) before planning new meetings. W. Benz stressed the important role of the STC saying that never had an instrument been built without the recommendation of the STC. T. Herbst specified that the main role regarded the analysis of the instrument proposals and was not directly related to building instrumentation.

In this respect, A. Moorwood explained that for the VLT for which there was an instrumentation plan, in order to have a framework and guidelines, it was stated that the plan could be modified at any time, with the caveat that each instrument in that plan had to go through a selection/approval procedure. The technical, managerial and cost aspects of proposals were normally reviewed by ESO and the results (and sometimes the complete proposals) presented to the STC.

D. Queloz added that there would be a technical evaluation on top of the science but also the funding of the instruments should have been a concern and taken into account before the first selection. There would be a huge load and request for funding from the member states and there would be additional funding for the instruments. He made the point that the timing for evaluation was key in order to avoid selecting something that could not be funded and built.

W. Benz stressed the importance for the STC to give timely comments on science evaluation and selection criteria.

D. Crampton added that the selection of instruments should be based on a synthesis of three elements: pragmatism, funding and science. W. Benz acknowledged that all aspects were mentioned regarding selection, science and technical evaluation criteria but also affordability and manageability. A. Moorwood commented that ESO responsibilities should be to put all these aspects together and then present the proposals to the committees for recommendations. D. Crampton agreed but said he would have expected ESO to bring all these things to all significant parties at the same time rather than individually or sequentially. A. Moorwood stated that it was actually what ESO did and planned to do, essentially to bring the information to everybody involved. W. Benz insisted that the only thing STC could do was to make comments on the evaluation criteria ESO had been using to glue everything together. M. de Vos commented that the selection criteria were presented only the day of the meeting, so it was difficult for the members of the committee to give well-funded comments if they did not have
the chance to read them well before the meeting. S. D’Odorico stated that the selection criteria had been mentioned at the previous STC meeting and had been given in the ESE meeting three weeks before. W. Benz closed the discussion saying that the topic would be discussed further in the afternoon session.

10. **Budget 2010**

10a. **Budget proposal 2010 (T. de Zeeuw) (FC-1768)**

The Director General noted that the STC should have the complete description of the programmes but also some of the financial information in order to make recommendations based also on the cost impact. This was the reason why this year the financial document had been provided five days before the STC meeting. He also noted that ESO went through a financial analysis to protect the potential contribution ESO was going to make towards the E-ELT construction over the next decade. This financial process was presently ongoing. He added that the document presented to the committee contained a balanced description of what ESO had done last year, the plans for the following year (2010) and the forward outlook for the following three years (2011-2013). It would be presented to the Finance Committee in two weeks time.

10b. **Budget Discussion**

E. Sadler asked as a clarification if they had only received one part of the document (the budget forward look). The Director General responded that the part of the document the committee had received was the request for the budget for 2010 and the forward look for the following three years (2011-2013). The only thing that was missing (from the original whole document) was part 2 which described the income from the member states (i.e. financial analysis).

The chair W. Benz asked how realistic the statement was reported on page 13 of the Budget document FC-1768: “As the E-ELT moves into the construction phase, it is expected that some of the consequent increase in work will be compensated by a reduction in the new instrumentation required by LPO, so that only a modest increase in staff will be required.” His concerns were mainly due to the large number of instruments in the pipeline to be done at LPO.

The Director General replied that the specific point connected back to the presentation from M. Casali. ESO should look very carefully at the needs in the future, get the feedback from the STC and come back with a number of ideas and/or possibilities. The procedure was similar to the one adopted for the VLT (as described by A. Moorwood) which would be followed for the E-ELT as well.

A. Moorwood commented that there had been budget planning for the instruments for many years. Increases for the E-ELT were included in the planning and matched the budget. The budget was presently lower due to the need to save and ESO would not go for dramatic increases in staff. He concluded that there was a plan for balance reducing somewhat LPO while building up the E-ELT.

W. Benz clarified that he trusted the document but he was just surprised that the reduced or over-optimistic scenario for LPO was actually realistic given the number of impressive things that were planned.
M. Casali remarked that looking at the numbers, they worked out pretty well in the near-term. The long-term would depend on the new instruments that would be approved for the VLT. He added that VLT was undergoing a phase peak of instrument production which would probably not be repeated in the future. By maintaining constant the rate of production of a new instrument per year (as done in the last ten years), then it would imply the decommissioning of one instrument per year. La Silla and Paranal programmes would drop off as compared to the rate of the previous few years.

The Director General reassured that the main goal of ESO was to maintain Paranal and La Silla. W. Benz concluded saying that the STC would give the recommendation of keeping VLT performances as high as possible to ESO.