



Minutes of the 12th SALT Science Working Group meeting

14 & 15 November 2004

SALT Boardroom, SAAO, Cape Town

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R. E. Griffiths

5 May 2005

1. Participants

Members:

Gordon Bromage (Proxy: UK Consortium)
David Buckley (Project Scientist, Chair)
Brian Chaboyer (Dartmouth College)
Chris Clemens (UNC; Mon p.m. only)
Peter Cottrell (Prox: U. Canterbury)
Richard Griffiths (CMU)
Janusz Kaluzny (Poland)
Wolfram Kollatschny (Göttingen)
Ken Nordsieck (Wisconsin-Madison)
Darragh O'Donoghue (South Africa)
Ted Williams (Rutgers)

Luis Balona (SAAO)
Phil Charles (SAAO Director)
Roy Emmerich (SALT)
Robert Fesen (Dartmouth College)
Chris Koen (SAAO)
John Menzies (SAAO)
Kobus Meiring (SALT)
James O'Connor (SAAO)
Steve Potter (SAAO)
Encarni Romero Colmenero (SAAO)
Marek Sarna (Poland)
Gerhard Swart (SALT)
Petri Vaisanen (SAAO)
Patricia Whitelock (SAAO)

Ex-officio attendees:

Arek Swat (SALT)

2. Welcome and Minutes of the previous SSWG meeting

The participants were welcomed by the Project Scientist, who briefly informed everyone of the recent successes in obtaining reasonable image quality during the second phase of on-sky testing.

The minutes of the 11th SSWG meeting (May 2004) were accepted. The only matter arising was a provision for SALT science discussions on Monday afternoon, time permitting.

3. **Agenda**

Sunday 14th November

1. SALT Update and Schedule (Gerhard/Kobus) (09:00 – 09:40)
2. SAMS System Update (Jian) (09:40 – 10:20)
3. Calibration System Design (David/Arek) (10:20 – 10:40)
4. Coffee/Tea (10:40 – 11:00)
5. Update on Planning Tools, etc. (Roy/Encarni) (11:00 – 11:20)
6. PFIS Proposal Tool Update (Ken/Eric) (11:20 – 11:40)
7. Observation Scheduling Update (Encarni/David) (11:40 – 12:00)
8. Discussions of Scheduling Algorithms (Chris Koen/Luis Balona) (12:00 – 13:00)
9. Lunch (13:00 – 14:00)
10. SALT Data Operations Support (Phil) (14:00 – 14:30)
11. SALTICAM & CCD Detector Status (Darragh) (14:30 – 15:30)
12. Coffee (15:30 – 16:00)
13. PFIS Status Report (Ken) (16:00 – 17:00)
14. PFIS Shared Risk/Verification Science Phase (Ken & David) (17:00 – 17:30)

Monday 15th November

15. PFIS Near IR Beam (Ken/Andy Sheinis) (09:00 – 09:40)
16. Report on FIF CDR and Status (David) (09:40 – 10:00)
17. Report on HRS R4 PDR (David/Peter) (10:00 – 10:30)
18. Coffee/Tea (10:30 – 11:00)
19. HRS Status Report (Peter/Michael) (11:00 – 12:00)
20. HRS Detector Issues (Peter/Michael) (12:00 – 12:30)
21. Lunch (12:30 – 13:30)
22. SALT Future Development & 2nd Gen. Instruments (13:30 – 14:30)
23. P-V Phase Science (14:30 – 15:30)
24. Coffee (15:30 – 16:00)
26. HET status report (Larry) (16:00 – 16:15)
27. SALT Partner reports (16:15 – 16:30)
28. Telecon with Robert Current (*Spectral Instruments*) (16:30 – 17:00)

4. **Technical Progress Status (Gerhard Swart)**

Gerhard gave a presentation on the telescope subsystems, including the remaining work to be done.

Next phase of tracker work, including the ATP, will be completed in 2-3 weeks.

There was still a lot of work remaining on the TCS.

A total of 62 mirrors were now installed in the truss.

Current capability for recoating mirrors is 4 per day.

Interruptions per track have been reduced.

Current pointing accuracy is ~40 arcsec and an image quality of EE50 = 1.5 arcsec has been achieved (without edge sensor control).

The edge sensor performance, *in situ*, is currently unknown.

Major milestones were summarized.

Full functionality is expected by end of Feb 05, excluding the SALTICAM guider probe.

PFIS installation is currently anticipated in Mar 05.

5. SAMS (Edge Sensor) System Progress Status (Jian Swiegers)

Jian presented the history of the development of the SAMS and summarized the various problems that have occurred in their development. The latest being the coatings of the sensors, which has suffered from pin-holes and subsequent degrading of the sensor. The Au-Ni plates have now been replaced by Cu plates, to which the thin parylene dielectric coating adheres much better. However, it has been difficult getting coatings of sufficient quality from the original Swiss supplier, which has meant FOGALE have had to find a new (UK) supplier. Testing of the sensors is now more involved, and will include dunking the plates into water to check for electrical short circuits.

Darragh raised concerns about the sensor longevity and proposed that there be some accelerated lifetime testing. He presented information from Geoff Evans (SAAO Electronics Workshop) on a climatic test chamber, which he advocated should be purchased to undertake such tests. There followed some debate on this point, with the SALT engineers arguing that such tests would not assist in solving the current problem.

Following discussion, David proposed the following amended motion from Darragh:

“The SSWG, being concerned about the longevity of the SAMS system, recommends that the SALT Project conduct accelerated testing of a sample of sensors in realistic conditions appropriate for Sutherland, and with operational voltages applied, to establish the risk of their failure.”

The motion was passed, with 7 in favour, 1 against and 2 abstentions.

David would advise the Board of this motion.

6. Calibration System (Arek Swat)

David briefly reminded everyone about the basic proposed design of the calibration system and the optical analysis work that was carried out by Arek. Arek discussed this in some detail, and circulated the design tradeoff study that he had recently completed. The conclusion is that the proposed system involving using a Fresnel lens with axicon, plus diffusing screens, would allow for the incidence angles of the rays to closely mimic those from a uniformly illuminated sky. The efficiency of the system was deemed sufficient.

7. PI Planning and Proposal Tools (Roy Emmerich)

Roy gave a status report on the PIPT development, including a demonstration of the current prototype.

Darragh asked that Roy summarise the assumptions made in the development of the PIPT and use dummy proposals to test the concept. This would be done by Roy before the next meeting.

It was mentioned that there should be some high-level rules that governed, for example, whether or not targets could be changed after Phase I approval.

Ken summarized the status of the PFIS proposal tools, including demonstration of the latest web tools.

8. Telescope Scheduling

Both Luis Balona and Chris Koen presented the work they had done on scheduling algorithms. Luis' approach was to use a simulation using a rule-based system, where the rules were carefully quantified and fixed. This would produce a schedule fixed for the night. Chris used an algorithm that calculates a score based on summing weighted rankings based on various adopted criteria (e.g. science priority, time left to finish, partner allocation, efficiency). This algorithm could be run several times during a night to update the schedule depending on circumstances (e.g. weather changes).

Chris' graduate student, Keobakile, summarized the scheduling work he was doing for his Master thesis, which involves the use of Multiple Criteria Decision Making. In the end a schedule can be derived using various search algorithms (e.g. greedy search, genetic algorithm). The choice of these might vary depending on the time of night. A heuristic scheduling scheme might even be a possibility in the future.

The SSWG felt that there were merits in both approaches, and it was resolved that the methods of Luis' and Chris' should be combined and simulations used to refine the rules and weighting/ranking scheme. Encarni was charged to take overall responsibility for the further development of the scheduling algorithms, taking into account the results of the simulations.

The following was actioned:

The dynamical ranking scheme, proposed by Chris Koen, was endorsed by the SSWG. It was further agreed that scheduling algorithm to be used in the Observation Planning Tool (OPT) should utilize the scheme suggested by Chris and that simulations, as initially undertaken and presented by Luis Balona, be conducted using the OPT by Encarni Romero (SA).

Encarni gave an update of the current status of the Observation Planning Tool, which is currently used to schedule SALT. The "Toddler OPT" allows catalogues and the Science Database to be used in selecting objects currently (or soon) visible by SALT. Filtering (e.g. on brightness, position) is also possible.

9. SALT Proposal Protocols

David summarized the latest update to the observing protocols, and this included a semester based system as follows:

<u>Semester</u>	<u>Period</u>	<u>Phase I due</u>	<u>Phase II due</u>
Semester I:	1 Mar – 31 Aug	15 Nov	15 Jan
Semester II:	1 Sep – 28 Feb	15 May	15 July

There was some discussion concerning the initial Performance Verification / Shared Risk Science phase. Phil strongly encouraged collaboration between groups with same science goals and targets.

It was decided that the first period of general science operations with SALT should commence on 11 Nov 2005. The deadline for submission of Phase I proposals for this period would be 1 Aug 2005, and TACs will meet by 15 Aug and the TAC Chairs Committee by 22 Aug. The deadline for Phase II proposals to be submitted will be 1 Oct.

10. Data Operation Support

The planned data operations support was described by Phil. The aim is to have pipeline processing of all CCD data, as in space missions. This will need to include proper quality control diagnostics (e.g. error mask for CCD data).

Ken suggested that immediate collaboration is needed (e.g. between those involved in pipeline development and the University of Wisconsin, who are writing the initial "quick look" reduction software. It was felt that the latter should evolve into the pipeline reduction software and there needed to be a close collaboration, including instrument teams and the SSWG.

It was asked that Luis (being responsible for pipeline development) and the instrument teams circulate a document discussing quality control.

11. Detector Status (Darragh)

Darragh presented a status report on the detector development for both SALTICAM and PFIS. Following his presentation, he received a round of applause for his efforts.

[A tour of the workshop followed later, where people had an opportunity to see SALTICAM ACSI work]

12. PFIS Status (Ken)

Ken presented a status update on PFIS.

Hew noted that, happily, the etalons were ~6 kg lighter than spec.

The revised Cost to completion is ~1.8% higher than the Baseline + Contingency cap.

Ken summarized the shared-risk/verification phase and normal operations. Commissioning time requirements are based on ~50% access to the telescope.

There was lengthy discussion of the proposed schedule, and the deadlines for shared risk science proposals. It was agreed that a deadline of 1 April 2005 should be adopted. The call for proposals would be issued in Feb 2005 which would be assessed by the P-V phase TAC consisting of Phil (SAAO Director), David (Project Scientist), Ken (PFIS PI) and Darragh (SALTICAM PI). The selected proposals would be discussed at the next SSWG meeting (May 2005).

13. Near IR upgrade of PFIS (Andy Sheinis)

A telephone/PowerPoint presentation was presented by Andy Sheinis (new UW faculty hire) on the PFIS/NIR upgrade. There was some discussion on appropriate slit size, i.e. median of 1.25 arcsec (as in visible), or smaller (due to IR). Rob argued that the short wavelength cutoff of 900 nm was too long, and suggested 800nm as more appropriate. Darragh noted that the ADC was designed to operate at near IR wavelengths. The SSWG endorsed the continuing development of a near IR arm of PFIS to a Concept Design, although this did in no way commit the SSWG to its eventual construction. The following motion was passed:

The SSWG recommends to the Board that it endorses the development of the PFIS near-IR concept by the University of Wisconsin and supports the continuation of the design studies to a full Concept Proposal.

14. FIF status (David)

David reported on the successful CDR held on 18 Oct. Some minor design work was still required in light of some review suggestions. Nicholas Sessions was now finishing his design contract and the SSWG thanked him for his work on FIF, and other SALT work. Responsibility for the remaining FIF mechanical work would be taken over by Willem. FIF software would be taken over by Janus, who has had software responsibility for the Payload subsystems and will become one of the SALT Operations Team Software Engineers in 2005.

15. HRS Status (David and Peter)

David reported on the successful PDR for the HRS R4 design held in Goettingen in July. The four external reviewers were Hans Dekker (ESO), Bernard Delabre (ESO), Steve Shectman (Carnegie Obs) and David Walker (UCL). The reviewers were unanimous that, notwithstanding some suggested refinements to the design, the HRS now proceed to a Critical Design Review.

Peter presented the HRS team's response to the Project Scientists report on the HRS PDR, and comments from the reviewers. There was discussion of the nod & shuffle option, which was recommended for deletion by the review panel. Following discussion, it was agreed to have nod & shuffle only as an option for the lowest resolution mode (no fibre slicing), since this would be typically used on fainter objects where the advantages of nod & shuffle in improving background subtraction will be most useful.

In discussing budget matters, David suggested that from now on instruments, like HRS, should have "risk accounts" separate from contingency amounts already planned. These accounts would be handled like the risk account on the telescope, where the Board controls its usage after proposals put to it by the Project Scientist and PI. The latter would still have access to an internal contingency account, that he/she would have control.

Peter presented the detector options for HRS. Darragh gave advice based on his experience from SALTICAM and PFIS detector development. The possible fringing effects in Fairchild CCDs is unknown, and there was considerable discussion on the possible merits of Fairchild devices and a general concern that the devices are relatively

new and their performance in astronomy is relatively unknown. Darragh commented that the criteria for CCD selection should be clarified and that the choice should be made taking into account the operational experience of their users.

David has listed some questions to the PI and detector supplier relevant to the choice of detector and performance of the entire detector system. In light of SAAO's reluctance to be in the business of building CCD cameras, when there are potentially more interesting instrument projects, the route of procuring a camera from a commercial vendor, like Spectral Instruments, had to be considered seriously. Several issues were raised with regard to the Spectral Instruments camera and controller and Peter noted these for discussion with Spectral Instruments.

The following motion regarding the HRS budget and cost was carried:

[insert motion]

16. Future Development

David led a discussion of the document dealing with SALT's development and second generation instruments, written by Darragh, David and Matt. It was noted the Goettingen and ASTRON (Netherlands) had expressed interest in collaborating in some manner for the development of some aspect of the PFIS near IR arm.

There was discussion of A-O and its potential applicability to SALT and future SALT-class telescopes. Phil discussed the possible science niches of SALT in performing suites of observations that are difficult to achieve on other 10-m telescopes. Darragh agreed to help in coordinating future development plans for SALT, i.e. to expand on the current ideas summarized by David. David would solicit expressions of interest in proposals for future developments for SALT.

17. Performance Verification Phase

There was discussion of the initial P-V science programme. David was actioned to issue a call for proposals for the PV phase and set up the SALT website as a forum for the exchange and development of proposals. The PV phase period will run from 1 June to 10 Nov, with proposals due on 15 April.

A timetable of significant dates of proposal deadlines, TAC meetings, semester was discussed. This should be refined by David and Phil.

18. SALT Partner Reports

HET

Larry reported on HET developments. A new site manager has been appointed. HET now has four Resident Astronomers and a new Project Scientist, Don Schneider (Penn State). Telescope performance slowly continues to improve. A total of 60 papers have been published so far garnering a total of 800 citations. About 8% of HET papers are high impact. Most of the current papers are based largely on HET data.

CMU

Richard reported that Tiziani Di Matteo will join the astrophysics faculty in Jan 05. Matteo and Rupert Croft have replaced Nichol and Romer, who have returned to the UK.

Canterbury

Funding has been obtained for a new detector for HERCULES, which will be a Spectral Instruments camera. Chris Sneden (Texas) has been visiting Canterbury for the past few months.

Rutgers

Ted reported they were searching for a replacement for David Merritt. Rutgers is involved in ACT (Atacama Cosmology Telescope), a sub-mm telescope which will survey a 2 degree strip of the sky a should detect ~100 clusters via the S-Z effect. A drift scan survey will be persued.

South Africa

Darragh commented on drift scan survey plans for SALT. These could reach ~26th magnitude.

Goettingen

Wolfram reported that Klaus Fricke has retired and a search is currently happening for a new position in mid 2006-2007 in extragalactic astronomy. Stefan Dreizler needs a letter from the SALT Board approving the "sale" of SALTICAM in exchange for additional cash which would earn Goettingen further observing shares.

19. Teleconference with Spectral Instruments

A telephone conference call was made with Spectral Instruments (SI) in Tucson regarding the HRS camera. David asked about past performance of cameras delivered for astronomy. SI responded that ~100 camera were built last year. They had RON of 2.6 to 3 electrons at 100 kHz for low light level applications. Three camera have been delivered with large formal back-illuminated CCDs. SI controllers are very different from the SDSU (Leach) CCD controllers. The SI camera is a turn-key system, without the need for adjustments. Most problems could be handled by having spare cards, etc., and could be addressed fairly easily. Anything involving the internal working in the cryostat would require returning to SI for repair. The current staff complement on CCD camera is 3 engineers and 1 technician, who can program in DSP. Fringeing effects are unknown at SI, but they will investigate with Mike Lesser. Failures with camera systems are very rare on cameras which have not been disassembled.