SALT Development Report
To The SALT Board
For The 2015 May Meeting

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1. Scope

This reports on work carried out since the 2014 Nov Board meeting at IUCAA, Pune, India. An attempt has been made to keep the major sections of the report brief. For those interested, more detail is contained in the associated reports in the zip file posted next to this report on the Board papers website.

2. Calibration System Upgrade

At the last Board meeting, the report on the Calsys ended with "Trial assembly should have been completed by the time of the Board meeting and installation and testing on the telescope will take place by the end of November, provided that no major rework is required".

The new system was installed on the telescope in 2014 December and tested. Initial tests showed a factor of ten improvement in delivered light at the instrument focal plane. In addition, far more UV light was available.

However, when the light distribution over the focal plane was examined, it was found to be very highly concentrated towards the centre. Details of the performance are provided in the report to the January BEC meeting.

Plans to correct the situation are also described in the March BEC meeting. As this report is being written, implementation of the "revised" new Calsys is due to take place this very day. A verbal update of how this worked out will be given at the Board meeting.

3. Revised ADC For RSS-NIR

It will be recalled that a long-standing issue has been the need to re-engineer the ADC to accommodate the extended wavelength range of RSS-NIR. In attempting to study the options in detail, the author managed to devise a minimum cost new concept optical design which provides satisfactory performance from 320 to 1700 nm. Details of the new design are provided in a report on the Board papers website. A review of the report was conducted by the BEC and Jack Hughes of Rutgers. The unanimous opinion was that this most recent design is the optimal way forward.

4. RSS-NIR

Following the reorganization of SALT Operations, the author has taken over as SALT's representative in the procurement of RSS-NIR. Paul Kotze, one of the SALT Astronomers, has been appointed as local instrument scientist.

Monthly meetings have been held and the instrument team have provided two quarterly reports. In addition, for this Board meeting, a 2-page summary of the major features of progress has been provided. Significant points include:

- Technically, the instrument is proceeding as planned. The only hitch has been the CO2 cooling system requested by SALT to reduce risk compared to the earlier solution. This has turned out to be prohibitively expensive ($500k). Alternative options are being explored. A promising avenue is a South African vendor who has already visited SALT.
- A recent highlight has been the installation of the science detector in its dewar and demonstration that it is still operational.
- Schedule: the current schedule has the instrument ready to ship to South Africa by 2016 April.
- The instrument team are beginning to provide more details on the commissioning plan, included in the most recent quarterly report.
- Risks: the risk table in the reports seem reasonable. The major items currently comprise the commissioning budget and the cooling system.
- Marsha continues to draw SALT's attention to the de-scoped items and the need to procure them now (if they ever are to be procured) because of the long lead time. In fact, two of the items (slit cooling and cryogenic order-blocking filters), if started now, cannot be implemented before 2016 Apr. After installation on the telescope, the implementation of these items would require removal of RSS. Currently, the instrument will be delivered with just one grating and no cryogenic/order blocking filters, no polarizing beam-splitter and a warm slit. Implications of the descope are discussed in Appendix B of the second Quarterly Report. They are serious and Board members are encouraged to study this.

4.1 The Outlook for RSS-NIR

For some years, RSS-NIR has had a precarious future because of the lack of funding. This is especially problematic in regard to commissioning the instrument on the telescope. There are also technical and operational risks associated with installation and commissioning: there has been growing concern by Chris and his staff, as well as the author, about the technical complexity of mounting the instrument on top of the telescope. These risks, almost entirely faced by SALT, include:

- The cost in local engineering effort to support installation
- The technical complexity to achieve this
- The HUGE loss of efficiency in RSS-VIS at least, and possibly the telescope as a whole, resulting from disturbance to telescope operations

The last point should be taken very seriously by the Board: after recommissioning of the telescope in 2011, it was about 6 months before the telescope settled down into routine operation. After the RSS-VIS optical service in October last year, the disturbance to the system took about 3 months to settle down. Integration of RSS-NIR would take at least six months and maybe as much as a year. During this time, the availability of the telescope for science operations will likely be severely comprised as the amount of engineering time required will shoot up. At present, science data productivity of SALT is very good. This risk will compromise ongoing productivity.

4.2 An Alternative Home For RSS-NIR

Serious investigation has begun to explore seriously the suggestion made by Matt Bershady to mount RSS-NIR in the spectrometer room and feed it with optical fibers. The other end of the optical fibers would be arranged in an integral field unit mounted in either the FIF or Aux ports in the payload. If the Aux port is developed as a "smart focal plane" with movable fibers / IFUs, multi-object spectroscopy (fiber-fed) with RSS-NIR would eventually be possible.

A report studying the pros and cons of this has been assembled by Marsha and the author and is posted on the SALT Board website.

5. Spherical Grating Spectrometers

Progress on this has been slow, due to the large commitment of time required for other activities, and the identification of challenges associated with lenslet-coupling of optical fibers. This was revealed through a collaboration with Matt Bershady and is still under investigation. The issue is complex and too detailed for a report like this but the author is happy to discuss the details either in the Board meeting or during the breaks with interested Board members.

6. SALT Management

The majority of the author's time since the last Board meeting has been spent engaged in SALT management and related activities:

- The re-organization of SALT Operations led the author to extensive engagement in supporting the new structure, through interactions with Chris Coetzee, Petri Vaisanen and the SALT Astronomers on the following topics:
    - Analysis of the end-to-end process for SALT proposal receipt to data distribution (see SALT Operations Report by Chris Coetzee et al.).
    - Engaging in the whole issue of SALT productivity and science (see Astronomy Operations chapter in the SALT Operations Report and SALT Simulations Report).
    - General discussions with Chris and Petri.
    - Participation in the working group on the SALT HRS pipeline (more on this below).

  - At the request of Chris, participation in SAMS Project meetings

- Organization (in collaboration with Petri) of a priority review for fixes and improvements to SALT. The purpose was to discuss the priorities for achieving the biggest improvement to the performance of the telescope, instruments and data, especially for the purpose of achieving 10-m class telescope performance. The result of this review is captured in a short document on the Board papers' website.

- Corporate Governance:
  - Risk management: the author held a meeting of the Risk Committee at which Action Plans from the Risk Register were initiated. See the Risk Report on the Board papers' website.
  - Annual Report: the author collaborated with Srianand, Lizette Labuschagne and David Buckley in producing the Annual Report posted on the Board papers' website.
  - The author attended a meeting of the South African SALT Task Team (report on the Board papers website).

- The author participated in the hosting of the Chinese delegation visiting SALT a few weeks ago, presenting a talk on SALT at the 2.5 day workshop and traveling to SALT to show the delegation the telescope.

- The author joined the South African TAC (SASTAC) for its recent allocation of SALT time. This was a very valuable exercise as it allowed the results from the studies of effective use of the telescope to be communicated to SASTAC, as well as to assess the quality of proposals being submitted by the local community.

- The author participated in the reference team for the compilation of the South African Decadal Plan for Astronomy. This was also a valuable opportunity to influence the future of South African astronomy, interact with high-level officials from the Dept. of Science and Technology, and keep SALT visible in these circles.

7. Other Activities

I simply list some of my other activities and will be happy to take comments or questions during the Board meeting:

- The author has consulted for SAAO on the optical design of the field corrector for the new SAAO 1-m robotic telescope. This led to his re-designing the corrector to improve UV throughput and the re-design has been accepted by the German company supplying the telescope.
- The author provided a design for a 3:1 focal reducer for the Cassegrain focus of the SAAO 1.9-m telescope. The components are a mirror and 3 fused silica components so it has excellent UV performance. SAAO has just started to build this design.