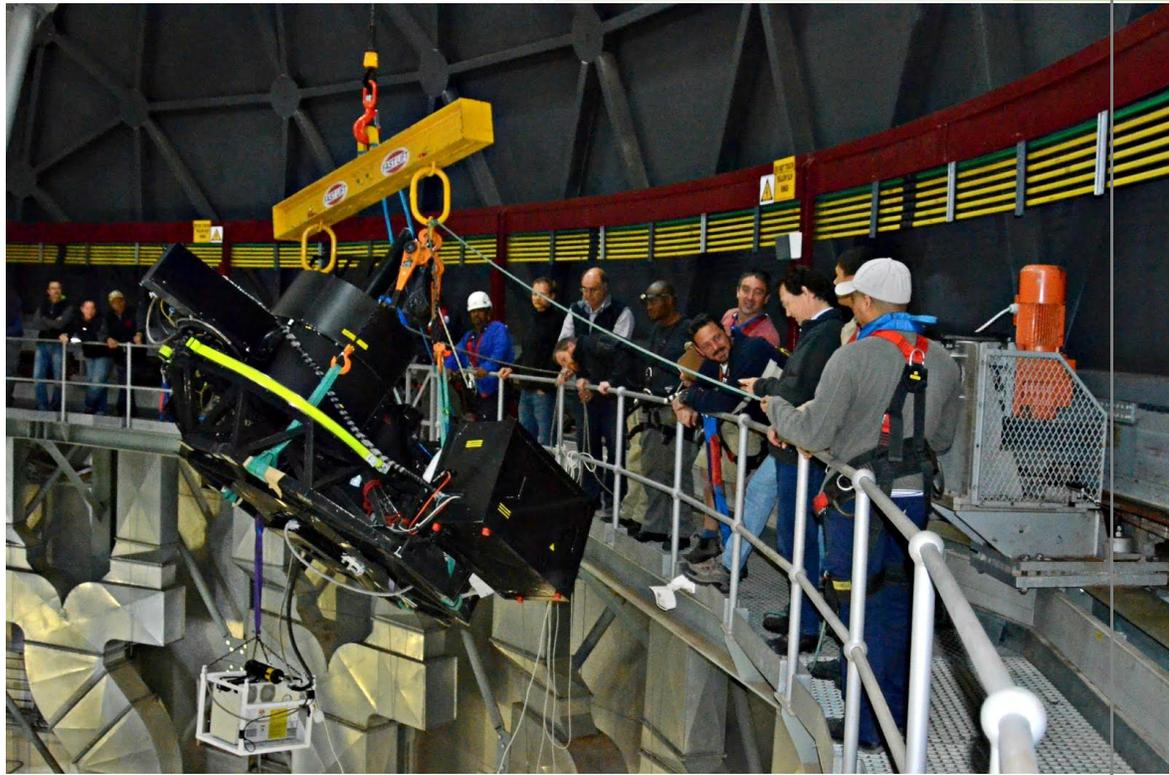




# SALT NEWSLETTER

## ISSUE OCTOBER 2016



Southern African Large Telescope,  
Sutherland, South Africa

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Contributors to this issue: Encarni Romero Colmenero, Hitesh Gajjar, Rudi Kuhn, Ockert Strydom, Petri Vaisanen, Ted Williams, Thea Koen (editor).



## LETTER FROM HEAD OF ASTRO OPS



Dear SALT community –

In our last SALT Newsletter in May we reported on the active mirror alignment system SAMS just having been turned on. It really has revolutionized the nightly observations at SALT, with fully stable seeing limited image quality. We save time by not having to align the mirror at all during the night hours – but this is not biggest impact. Now, every PI gets their observations with the intrinsic seeing, not only the lucky ones just after an alignment. Read more details about the success of SAMS further down in this issue. Also note hot-off-the press quantitative results on the *darkness* of the Sutherland sky, also affecting science data quality.

SALT had a planned one month shutdown service period in August. This went well, and exactly in the scheduled time, with another week spent on on-sky re-commissioning of all the science modes. More details are reported in this newsletter. In addition to a more reliable system, the news making the biggest impact on users is that the telescope optics throughput improved by around 10%, and the RSS optics efficiency by about another 10%, giving a significant boost especially to the RSS programs. A news item on the negative side, however, is that the high-resolution mode of Fabry-Perot is still not working as it should.

We are now only 2 weeks away from a new SALT semester, 2016-2, and have already started observing 2016-2 programs in gaps in the queue. Phase-2 deadline of 2016-2 is looming. For 2016-1, we stand now at more than 1100 completed observing Blocks, and about 70% of allocated P1 time completed. That fraction is lower than the record breaking last period mainly due to the longer shutdown period than *originally* budgeted last year when the time allocations had to be made, but still a good number if we go over 75% in the last weeks.

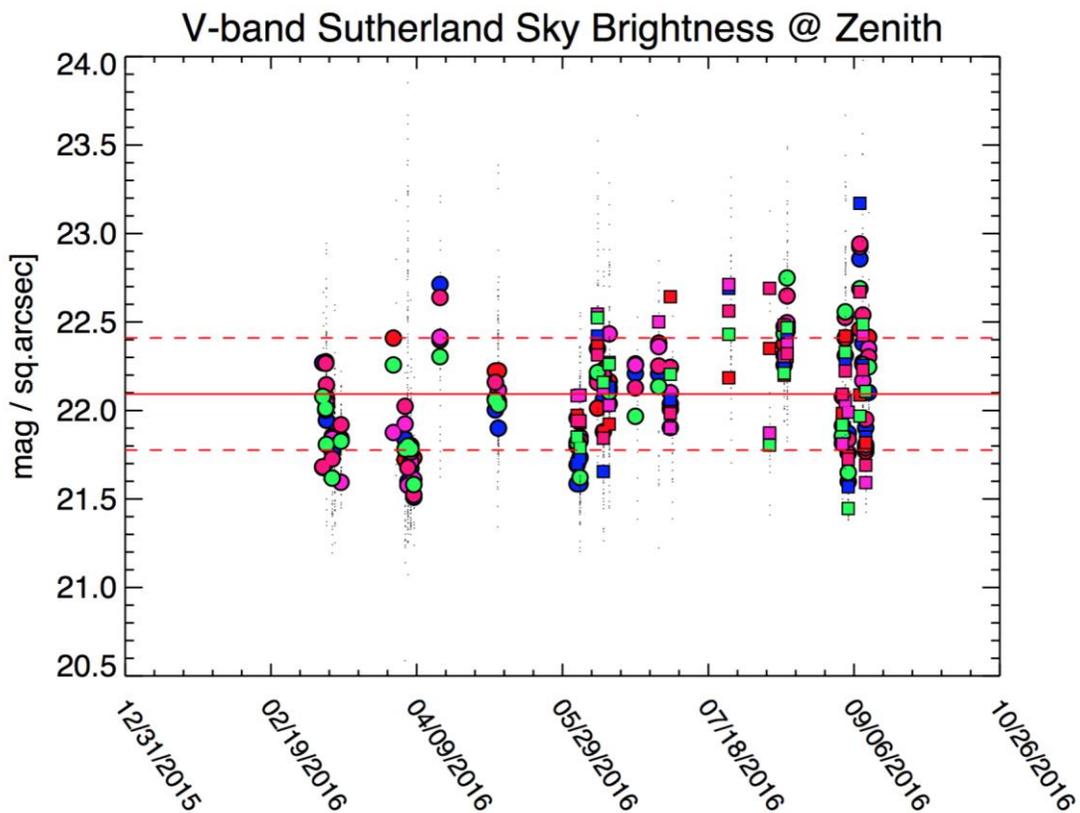
Please enjoy our Newsletter, which also includes updates on SALT science papers. Let us know of papers you publish. It would be great to include more popular level stories of science results in our News pages <http://www.salt.ac.za/news/> Please contact Thea Koen ([thea@salt.ac.za](mailto:thea@salt.ac.za)) with those. And as always, never hesitate to contact [salthelp@salt.ac.za](mailto:salthelp@salt.ac.za) with any questions you have.

*Petri Vaisanen*

*SALT Astronomy Operations*

## SUTHERLAND NIGHT SKY IS DARK!

SAAO has been operating two all-sky monitors capable of absolute sky brightness measurement under a NRF/DST funded project (PI: Ramotholo Sefako, SAAO). The ASTMON units have been running from earlier this year. We now have enough time baseline to present meaningful, albeit preliminary, results. The data show 22.7, 22.0, 21.0, and 20.0 mag/arcsec<sup>2</sup>, respectively, for B, V, R, I sky brightness at Zenith. See the Figure below for the V-band measurements. These values are very close to darkest Mauna Kea, Cerro Paranal, and La Palma values. Sky brightness depends on the Solar Cycle, and since 2016 is not yet in minimum, these could even get better.



*Figure:* An example of the night sky brightness in the V-band. Individual nights are plotted with one symbol, all measurements on cloudless and moonless nights are plotted as black dots, while the coloured symbols show the nightly median value. The different colours are the 5 different sky regions that the ASTMON deliver, and the squares and circles are from two independent monitors. the average over the whole period is overplotted as the red line with the dashed lines showing the  $1\sigma$  limits.

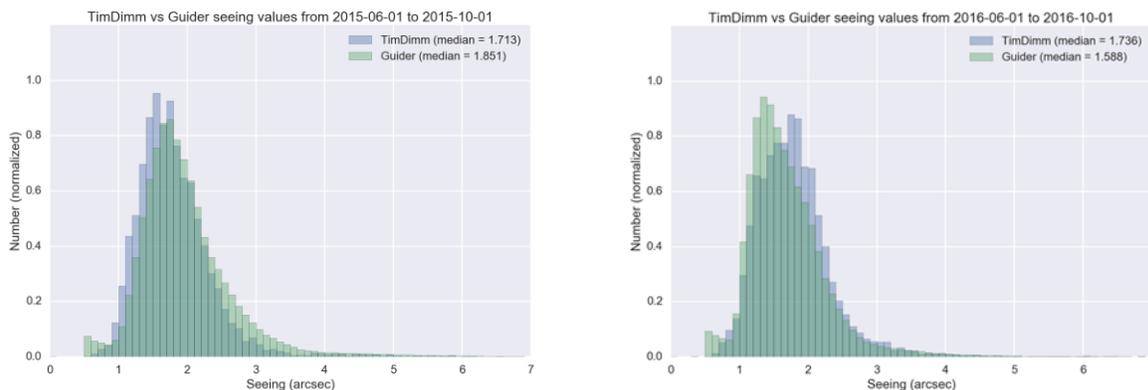
## SAMS ON SKY

The SAMS edge sensor system is now in regular and continuous 24hr operation and has been operating in this mode since June 2016. The SAMS system has demonstrated the ability to keep the primary aligned over a temperature span of 14°C and for a period of up to 7 days/nights.

The continuous maintenance of the primary mirror figure has significantly improved the image quality observed at SALT.

Histograms comparing the external seeing (made with TimDIMM in the ox-wagon, corrected to Airmass = 1.3 where SALT observes) with the internal seeing (obtained from the FWHM value of the guider image) are presented below. The graph on the left illustrates measurements over the period June to October 2015 before SAMS went into operation. The graph on the right shows the significantly improved image quality obtained with SAMS in operation. The median guider value improved from 1.85" to 1.59" after SAMS. It is, in fact, better now than the DIMM seeing value, which is likely due to the SALT instruments being much higher up than the ox-wagon.

We are extremely pleased with the performance of the SAMS system after a lengthy development period and are confident that the improved image quality will have a major impact on the quality of science produced by SALT.



Figures: DIMM vs Guider seeing measurement pre-SAMS (left) and with SAMS in regular operation (right). Note that the values are for Airmass ~ 1.3. The median intrinsic DIMM seeing at *Zenith* is 1.50.



## SALT SHUTDOWN

SALT was shut down during the month of August for maintenance of SALT. Most of the subsystems buried deep inside the telescope were given some TLC. The highlights included:

- Cleaning of the RSS collimator optics and changing the lens coupling fluid,
- Fitting of the new Tracker Hexapod ball-joints. (The entire Payload is supported these three pins about the thickness of your thumb.)
- The SAC was given a good bath too. Specifically M4 and M5. We hope that this will make a significant improvement in throughput.
- PCON was ported to a new version of Labview and new motion control software. Previously it ran on Win2000 and this big risk item is now retired.
- The complete Payload was serviced. A virtual zoo of acronyms, ADC,MB, SFM, AFM, FIF.

RSS got several other improvements too. The Filter Magazine was repackaged to be dust proof. The Etalon base plate was changed to an Invar version, this should help make dual mode FP observations possible. We also fitted new covers to the fold mirror and shutter area. This will keep the optics cleaner for longer. The Slitmask mechanism got a new stage.

Finally the spectrograph was put through a battery of optical tests to ensure the IQ was within specification. This was a huge team effort by both Tech Ops and Astro Ops and these test will be used to monitor the performance of the instrument going forward.

We are happy to report that SALT was back in operations and Science Ready by the 7<sup>th</sup> of September, four days ahead of our deadline.





## FABRY-PEROT

Despite the heroic efforts of the SALT team, the dual-etalon HR mode of the RSS Fabry-Perot system is still suffering from temperature related instabilities. A plan is being developed to insert a circular polarizer in front of the HR etalon, which will remove these instability effects but at the cost of a 50% throughput loss for this mode. Therefore, PIs with existing dual-etalon HR proposals will have to adjust their blocks to account for the lower throughput and/or to contact salthelp to discuss alternative options. Please note that FP is working normally in its LR mode.

## PHASE-2 DEADLINE AND REMINDERS

The **deadline** for Phase 2 proposals for the 2016-2 semester is **19 October 2016, 23:59 UT**. Please note that this is a firm deadline: **no late proposals will be accepted** without prior arrangement with salthelp.

PIs will need the latest version of the PIPT (version 4.15) for accessing and submitting Phase 2 of your 2016-2 proposals.

This may be downloaded from: <http://astronomers.salt.ac.za/software/#PIPT>

This latest version includes some important changes:

- The PIPT now automatically adds an arc for all spectroscopic RSS setups. PIs not requiring an arc will now have to tick the respective checkbox on the RSS form. This also applies to 2016-1 proposals.
- Blocks can now have an expiry date (after which the block will no longer be observed). This is mostly intended for ToO proposals and does not affect the usual observation windows and/or phase constraints on the observation form – blocks may even have both, if required.
- Users of FP will also notice that the FP setup page also been improved with a new easier way to setup the wavelength scan, filters set by the PIPT according to the scan and added warnings when requested scans fall outside the default filter. Feedback welcome.

## SALT EXTERNAL REVIEW

The SALT Shareholders Agreement mandates a review of the telescope, its operations, and its science output every five years, by an independent panel of international experts. The first such review was held 10-14 October 2016. The members of the review panel were (from left to right) Megan Donahue (Michigan State University, USA), Laura Ferrarese (NRC Herzberg Astrophysics, Canada), Patrick Woudt (University of Cape Town, South Africa), Catherine Cesarsky (CEA Saclay, France), Ted Williams (SALT host, non-member), Chris Smith (Cerro Tololo Inter-American Observatory, Chile), Azwinndini Muronga (Nelson Mandela Metropolitan University, South Africa), and Petri Vaisanen (SALT host, non-member).





Before their visit they received documents describing the telescope, its history, current operations and outputs, and plans for the future. They were also provided with information on the financial aspects of the telescope. The panel visited both the Cape Town and Sutherland sites and interviewed members of the SALT team, SALT users including students and postdocs, SALT Board Directors, and representatives of the SALT partner institutions. They reviewed all aspects of the telescope, its past and current scientific productivity, its financial situation, its impact on human capital development, its public outreach and science engagement contributions, its effect on the local, regional, and national economy and the development of science and technology, and its strategic plans for the future.

The committee completed a draft report at the end of their visit, which will be finalized in the coming weeks and submitted to the SALT Board of Directors for consideration at their upcoming meeting in November.

## SALT SOCIAL MEDIA

SALT is active on facebook and twitter. So be sure to “like” and “follow” us to keep your finger on the pulse of what we’re getting up to 😊

The official facebook account is [www.facebook.com/SATelescope](http://www.facebook.com/SATelescope)

The official account for twitter is @SALT\_Astro

As mentioned earlier in the Newsletter, we’re always looking for additional contributions for the News page on the SALT website. Whether it’s a press release, quick article on astronomy & SALT or even a fun fact you’d like to share, please contact Thea Koen at [thea@salt.ac.za](mailto:thea@salt.ac.za).



## MEET THE TEAM: MARISSA KOTZE



Written by one of our SALT journalism interns, Karabo Baloyi.

Making the drastic shift from working in the insurance industry to studying astronomy and becoming an astronomer at the Southern African Large Telescope (SALT), Marissa Kotze is a charismatic, humorous and very intelligent person. She grew up in the 1980s when space travel and the first moon landing were still new and exciting topics. “Mainstream media focused a lot on space travel and that also influenced my passion for astronomy”, she explains.

During the 1980s, there were fewer career options in South Africa, especially for women. “We don’t have that in South Africa, was the response I received when I said I wanted to do astronomy”, Kotze explained further.



With that disheartening answer, she began her career elsewhere. This did not, however, deter her from her dream completely, because she began studying for a BSc, with majors in Mathematics and Astronomy, part time through UNISA. When she was ready to resign from the insurance industry, she decided to apply at the University of Cape Town and the National Astrophysics and Space Science Programme (NASSP) in 2007.

“The whole process of study takes about seven to 10 years and today I am an astronomer. It is an uncomfortable job, it takes you away from your family and it has strange working hours because we work at night when we do observations” Kotze said. “But having said that, it’s amazing when you’re looking at a galaxy or a star, and chances are you are the only person on the planet looking at it, and that it so cool.”

Kotze specializes in studying x-ray transients and multi-wavelength observations on binary star systems emitting energy as material is transferred from a donor star to a compact object (white dwarf, neutron star or black hole).

Despite the shortage of women in the field of science and astronomy in South Africa, there are many opportunities for all women who have the skills and the passion for astronomy: “There is no bias towards men any more and it is no longer a question about whether or not women can do it, but about whether or not they want to become astronomers and scientists.”

## SCIENCE PAPERS

Published SALT papers after the previous SALT update sent in May are listed below. We encourage SALT users to inform us of any papers making use of SALT data, and to double check the list here after publication: <http://astronomers.salt.ac.za/data/publications/>

Also, please adhere to the Acknowledgements policy found under the link.

- ❖ *Aydi et al.* present a study of V5852 Sgr using RSS spectroscopy combined with infrared photometry. It turns out to be an unusual nova exhibiting a combination of features from different nova classes, and location-wise could possibly be associated with the Sagittarius stream. More details are on the SALT News site at:



<http://www.salt.ac.za/news/an-unusual-nova/>

<http://adsabs.harvard.edu/abs/2016MNRAS.461.1529A>

- ❖ *Black, Fesen & Parrent* examine the evolution of late time optical nebular features in a large sample of literature Type 1a Supernovae, including a new spectrum observed with SALT/RSS. <http://adsabs.harvard.edu/abs/2016MNRAS.462..649B>
  
- ❖ *Han, Curtis & Wright* study the old nearby stellar cluster Lodén 1 using SALT/RSS spectroscopy, and conclude that is neither old, nor nearby, nor a cluster. More details of the intriguing study can be found at the SALT Press Releases page at:  
<http://www.salt.ac.za/news/loden-1-debunked/>  
<http://adsabs.harvard.edu/abs/2016AJ....152....7H>
  
- ❖ *Foley et al.* examine the late-time spectra of Type Iax supernovae, a low-luminosity, low-energy class of thermonuclear stellar explosions distinct from Type Ia supernovae. Data presented include the most complete late-time spectral sequence of an SN Iax, SN 2014dt, to which SALT/RSS contributed. <http://adsabs.harvard.edu/abs/2016MNRAS.461..433F>
  
- ❖ *Lutovinov et al.* report on 2S 1553-542, a Be/X-ray binary pulsar. Using SALTICAM photometry combined with X-ray and NIR data, they show that the source is one of the furthest known X-ray binaries in the Milky Way, located at >15 kpc on the far side of the Galaxy. <http://adsabs.harvard.edu/abs/2016MNRAS.462.3823L>
  
- ❖ *Mazzalay et al.* combine HST, VLT, and SALT RSS data to study the core of the giant elliptical galaxy NGC 5419. The galaxy is found to host a double nucleus, with potentially also a double supermassive black hole, with the inner parts rotation in the opposite sense to the outer regions. <http://adsabs.harvard.edu/abs/2016MNRAS.462.2847M>
  
- ❖ *Ninan, Ojha & Phillip* find large variations in the outflow wind velocity from a young eruptive star, V899 Mon, during its ongoing high accretion outburst phase, and conclude that magnetically driven polar winds are the likely contributing mechanism. The results are based on high-resolution spectroscopic monitoring with the SALT/HRS.  
<http://adsabs.harvard.edu/abs/2016ApJ...825...65N>

- ❖ *Parker et al.* report the detection of high-amplitude X-ray flaring of the AGN HE 1136-2304. Optical spectroscopy with SALT/RSS shows that the AGN has changed from a Seyfert 1.95 to a Seyfert 1.5 galaxy, with greatly increased broad line emission and an increase in blue continuum AGN flux by a factor of  $>4$ .

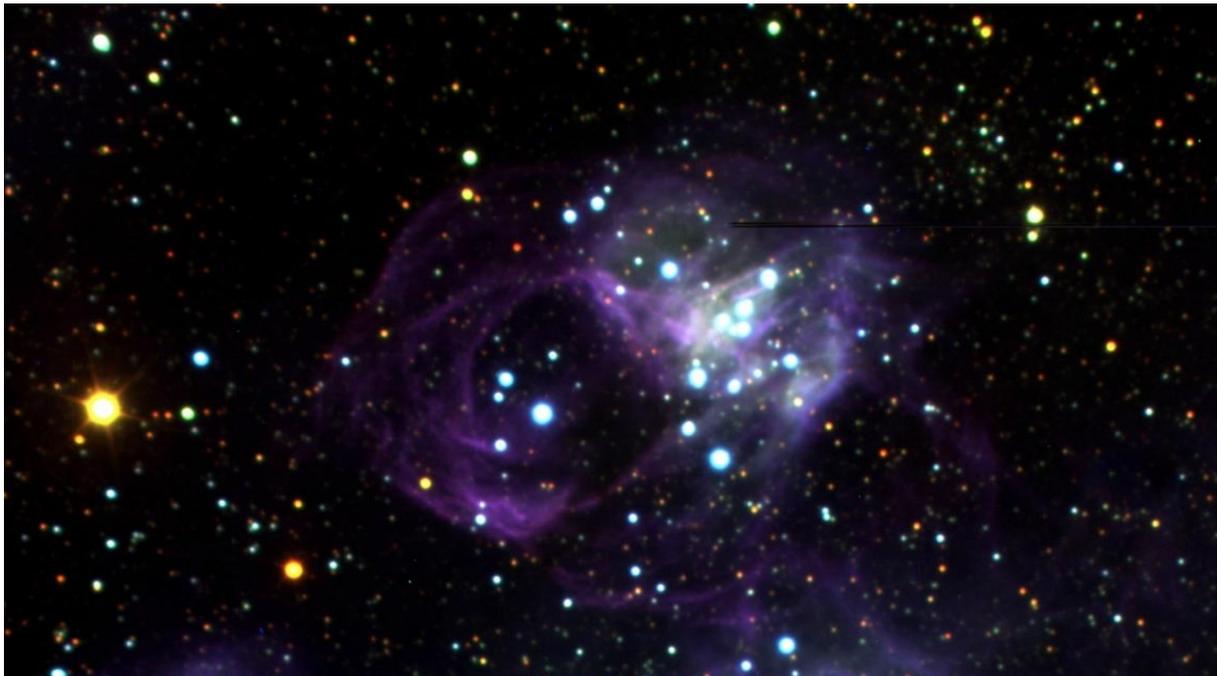
<http://adsabs.harvard.edu/abs/2016MNRAS.461.1927P>

- ❖ *Sifon et al.* present galaxy velocity dispersions and dynamical mass estimates for 44 galaxy clusters selected via the Sunyaev-Zel'dovich effect by the Atacama Cosmology Telescope, nearly half of them for the first time. Many of the new ones were observed using the Multi-object (MOS) spectroscopy mode of SALT/RSS.

<http://adsabs.harvard.edu/abs/2016MNRAS.461..248S>

- ❖ *Zemco et al.* study V4743 Sgr, an intermediate polar candidate. RSS spectra reveal a very hot region, with the peak temperature shifted to the ultraviolet range.

<http://adsabs.harvard.edu/abs/2016MNRAS.460.2744Z>



Supernova remnant, DEM L241 in the LMC.