SALT NEWSLETTER

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Southern African Large Telescope, Sutherland, South Africa

Cover & topics images: Lafras Smit

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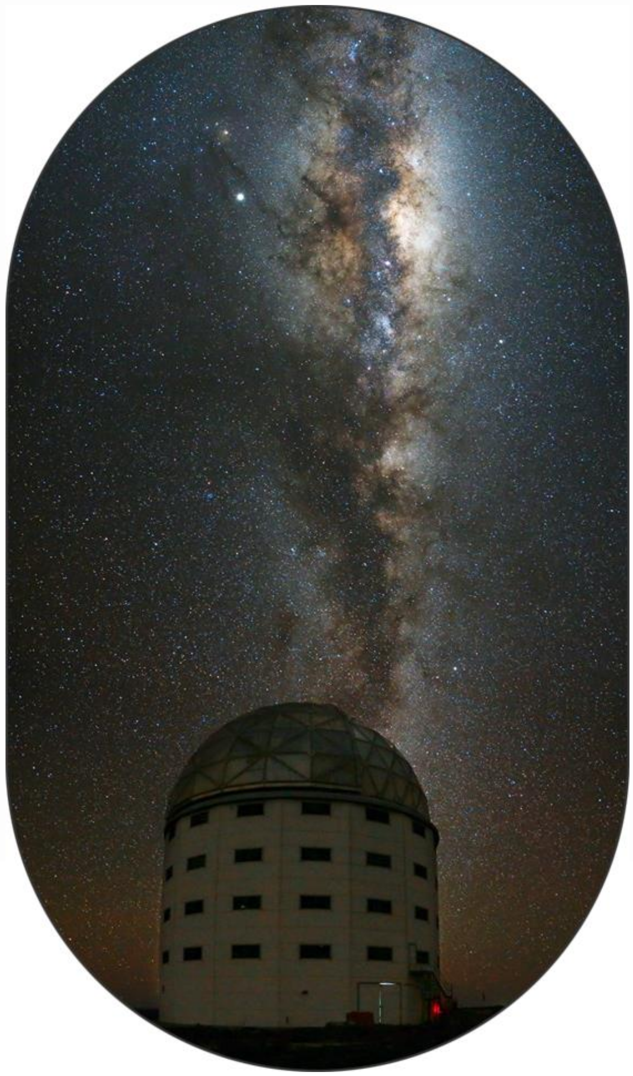


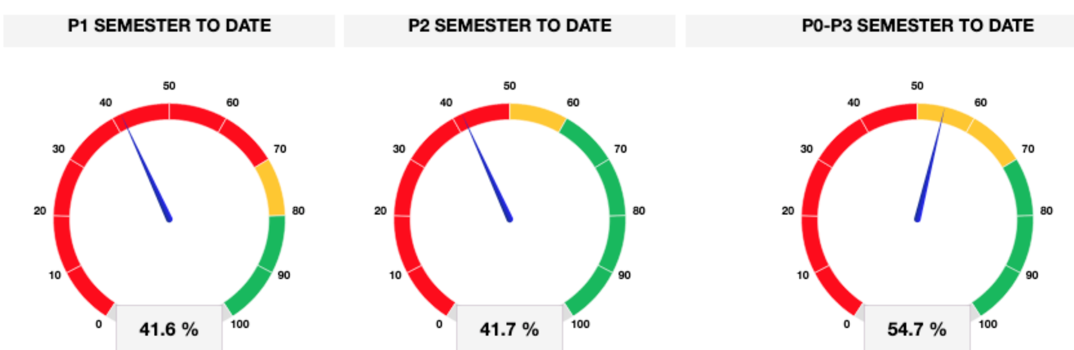
Contributors to this issue: Encarni Romero Colmenero, Christian Hettlage, Lisa Crause, Retha Pretorius, Enrico Kotze, Keith Browne, Richard Banda
Thea Koen (editor).

LETTER FROM THE HEAD OF ASTRO OPS

Dear SALT community,

It has been a busy few months since our last newsletter. In this issue, we have some great news about the RSS Fabry-Pérot system, some very interesting updates on the HRS High Stability mode and on MaxE, our upcoming spectrograph, and even an extreme UPS meltdown causing telescope havoc to contend with - so please read on!

This semester, our dark, clear, good seeing conditions queue is severely over-subscribed at all priorities - including P3! There is also currently a big cluster of high-priority targets between 0h and 3h in RA competing with each other. On the other side of the coin, there are some glaring gaps in the bright-time and/or poor conditions queue, where we often don't even have P4 blocks to observe. While we're using the gaps to carry out engineering observations, we expect our science completion this semester will be lower than expected and at similar levels for all priority classes - we are currently at ~41.6% for both P1 and P2, and ~55% completion for all priorities combined. We are in the process of analysing this semester in more detail and establishing trends from previous semesters, so we can propose some strategic solutions. Meanwhile, we'd like to suggest to all PIs to please review your block requirements, especially for those lower priority classes and/or targets between 0h and 3h in RA. Do you *really* need no Moon, clear skies and 1.5" seeing? If you can relax your blocks to take advantage of brighter Moon and/or worse seeing, even at the price of increasing your exposure times, your chances of getting your data this semester will increase significantly.



We'd also like to let you know about our upcoming shutdown, planned for February 2020. The main thrust will be to replace our ageing primary mirror segment controllers (3 per mirror), as there are no longer spare parts available (gulp!). For those of you who'd like to know more, Richard Banda, our new mechatronics engineer, has written a short piece about the trip to Germany to verify the performance of our new, improved controllers. There are several other improvements and fixes planned during this shutdown, including the replacement of the RSS doublet (which should hopefully result in improved RSS throughput) - more details on this below.

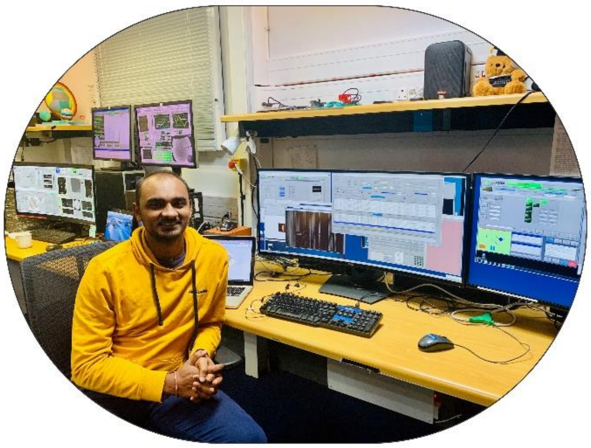
From the Astro-Ops side, we have been working hard on the new SALT & SAAO Data Archive. The SALT part of the archive is expected to go online in the next couple of months and we will be contacting PIs directly regarding access to their older datasets. More details on the project from Christian below.

We've also initiated a program to upskill our postdocs by teaching them to observe with SALT - so expect to see their names popping up as observers and possibly answering questions via salthelp@salt.ac.za over the next few months. This is also very exciting for us at SALT - more experienced observers mean more experienced users who understand SALT data and who are able to spread the word about our awesome telescope!

And to end off - this year, we've counted 33 SALT papers to date. It is not looking likely that we'll beat our previous record of 49 papers in 2017, but hopefully we won't fall too short. As always, please let us know how we can help you to keep those papers coming - we're all ears (or eyes!)

Clear skies!
Encarni

Right: One of our postdocs, Rajeev Manick, observing with SALT.



REPEATING OUTFLOWS OF HOT WIND FOUND CLOSE TO A GALACTIC BLACK HOLE

An international team of astrophysicists from Southampton, Oxford and South Africa have detected a very hot, dense outflowing wind close to a black hole at least 25,000 light-years from Earth.

Lead researcher Professor Phil Charles from the University of Southampton explained that the gas (ionised helium and hydrogen) was emitted in bursts which repeated every 8 mins, the first time this behaviour has been seen around a black hole. The findings have been published in the journal Monthly Notices of the Royal Astronomical Society.

The object Professor Charles' team studied was Swift J1357.2-0933 which was first discovered as an X-ray transient – a system that exhibits violent outbursts – in 2011. These transients all consist of a low-mass star, similar to our Sun and a compact object, which can be a white dwarf, neutron star or black hole. In this case, Swift J1357.2-0933 has a black hole compact object which is at least 6 times the mass of our Sun.

Material from the normal star is pulled by the compact object into a disc in between the two. Massive outbursts occur when the material in the disc becomes hot and unstable and it releases copious amounts of energy.

Professor Charles said: "What was particularly unusual about this system was that ground-based telescopes had revealed that its optical brightness displayed periodic dips in its output and that the period of these dips slowly changed from around 2 mins to about 10 mins as the outburst evolved. Such strange behaviour has never been seen in any other object.

"The cause of these remarkable, fast dips has been a hot topic of scientific debate ever since their discovery. So it was with great excitement that astronomers greeted the second outburst of this object in mid-2017, presenting an opportunity to study this strange behaviour in greater detail."

Professor Charles and his team recognised that key to getting the answer was to obtain optical spectra a number of times during each dip cycle, essentially studying how their colour changed with time. But with the object about 10,000 times fainter than the faintest star visible to the naked eye and the dip period of only around 8 minutes, a very big telescope had to be used.

Not only does SALT have the necessary huge collecting area, but being 100% queue-scheduled and operated by resident staff astronomers means that it can readily respond to unpredictable transient events. This was perfect for Swift J1357.2-0933, and SALT obtained more than an hour of spectra, with one taken every 100 secs.

“Our timely observations of this fascinating system demonstrates how the quick response of SALT, through its flexible queue-scheduled operation, makes it an ideal facility for follow-up studies of transient objects”, said Dr David Buckley, the Principal Investigator of the SALT transient programme, based at the South African Astronomical Observatory, who also added, “With the instantaneous availability of a number of different instruments on SALT, we can also dynamically modify our observing plans to suit the science goals and react to results, almost in real-time”.

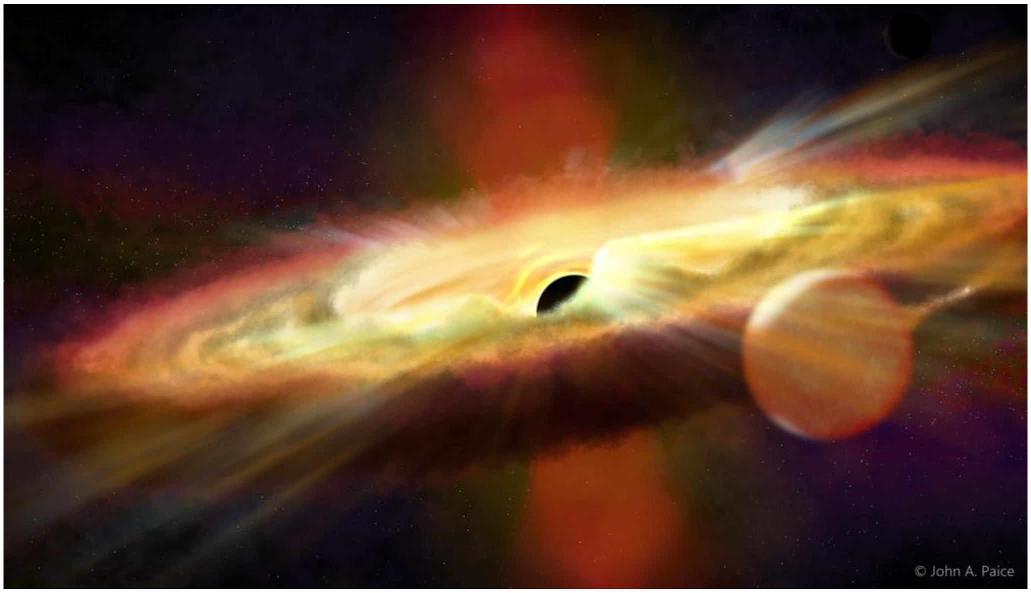


Image produced by John Paice,

Professor Charles added: “The results from these spectra were stunning. They showed ionised helium in absorption, which had never been seen in such systems before. This indicated that it must be both dense and hot – around 40,000 degrees. More remarkably, the spectral features were blue-shifted (due to the Doppler effect), indicating that they were blowing towards us at about 600km/s. But what really astonished us was the discovery that these spectral features were visible only during the optical dips in the light-curve. We have interpreted this quite unique property as due to a warp or ripple in the inner accretion disc that orbits the black hole on the dipping timescale. This warp is very close to the black hole at just 1/10 the radius of the disc.”

What is driving this matter away from the black hole? It is almost certainly the radiation pressure of the intense X-rays generated close to the black hole. But it has to be much brighter than we see directly, suggesting that the material falling on to the black hole obscures it from direct view, like clouds obscuring the Sun. This occurs because we happen to be viewing the binary system from a vantage point where the disc appears edge-on, as depicted in the schematic illustration, and rotating blobs in this disc obscure our view of the central black hole.

Interestingly there are no eclipses by the companion star seen in either the optical or X-ray as might be expected. This is explained by it being very small, and constantly in the shadow of the disc. This inference comes from detailed theoretical modelling of winds being blown off accretion discs that was undertaken by one of the team, James Matthews at the University of Oxford, using supercomputer calculations.

This object has remarkable properties amongst an already interesting group of objects that have much to teach us about the end-points of stellar evolution and the formation of compact objects. We already know of a couple of dozen black hole binary systems in our Galaxy, which all have masses in the 5-15 solar mass range, and the single black hole at our Galactic Centre is around 4 million solar masses. They all grow by the accretion of matter that we have witnessed so spectacularly in this object. We also know that a substantial fraction of the accreting material is being blown away. When that happens from the supermassive black holes at the centres of galaxies, those powerful winds and jets can have a huge impact on the rest of the galaxy.

These short-period binary versions are a perfect way to study this physics in action.

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LR AND MR ETALON REFURBISHMENTS GET THE GREEN LIGHT

As you know, the RSS Fabry-Pérot (FP) system is currently offline. It has been suffering from several problems, including the degradation of the coatings and other operational issues. Their FWHM was nearly double the original values, which were already broader than their designed specifications.

We have good news for the FP fans out there: the SALT Board have approved the refurbishment of both the MR and the LR etalons.

The refurbishment plan includes:

- New coatings. These have been designed to increase the spectral resolution of the etalons to their original specs and to reduce significantly the number of regions required to calibrate them, simplifying the calibration process and the number of scans required to cover a given wavelength range.
- New sealed cells to hold the etalons, expected to prevent the zero-points wandering and tripping and to prevent future environmental degradation.
- Ability to operate the controllers remotely from the control room, thus the ability to adjust their balance automatically and prevent tripping.
- A new, sturdier mount with tip/tilt adjustments operable from the control room, to allow the adjustment of the dual etalon mode. It is hoped that the new housing will remove the need to operate the etalons at rho=0, thus allowing PIs the flexibility to choose a suitable position angle.

The refurbishment plan also includes funding for a dedicated 2-3 year Fabry-Pérot postdoc - please keep an eye out for the advert coming out in September/October.
Both etalons are currently in the UK waiting to receive their new coatings and are expected to arrive back in South Africa around the middle of next year.

Once they arrive, they will undergo calibration and re-commissioning work in the lab in Cape Town before being taken to the telescope, where on-sky re-commissioning will take place. If all goes well, we're hoping they will be available to the SALT astronomical community for semester 2020-2!

GLYCOL-INDUCED UPS MELTDOWN AT SALT

On 31 July, what seemed like an ordinary Wednesday lunchtime went completely haywire when a large pipe entering an air-handling unit in one of the electrical utility rooms at SALT suddenly sprang a massive leak and showered Everything in the room with glycol (cooling fluid). To maximise the drama, right in the line of fire was SALT's *main* UPS - that keeps all of the telescope's most critical sub-systems (apart from the coffee machine) on life-support in the event of any electrical power issues. Cue the howling glycol-leak and fire alarms, followed by all the pumps shutting off and various things tripping and squealing in protest...

Eben Wiid – who had drawn the short straw as the acting Tech Ops manager while others were in Germany to meet with the suppliers for the mirror control system upgrade - vividly described the huge sparks and associated gunshot-like bangs that the dying UPS issued en route to oblivion. Upon entering that room to check what was going on, he recalls instinctively bolting back out of there at top speed. Meanwhile, the unflappable safety officer Etienne Simon (a seasoned electronicker and hence more comfortable with leaping sparks than most mechanicals), stuck around to see what he could do to keep the precious smoke (that makes electronic devices work) from escaping. As it turned out - there was nothing that he, or anyone else, could possibly do for this poor device by that point!

Left: the offending black pipe is visible at the top, while the unfortunate UPS is visible in the lower left corner. **Centre**: close-ups of Ground Zero. **Right**: Etienne Simon and Thabelo Makananise wiring in the new UPS.

Pretty soon it was all-hands-on-deck. The intrepid IT Crowd of Jean Bernado, Chantal Fourie and Paul Booysen came running, and even Mark Wichman - who was happily enjoying his July shopping day down in town - dashed up the hill (still with groceries in the car) after receiving a telephonic "invitation" to join the frenetic action. Triage - the art of solving problems in the right order - was the name of the game. Top priority was given to preventing the instruments' detectors from warming up. Then each of the different systems that had been wiped out needed to be resurrected as best possible.

Tech Ops boss Paul Rabe even joined in on WhatsApp calls from Germany while VNC'ing in to work on the mightily unhappy building management system (BMS) software. It turned out that the programmable logic controller (PLC) which runs the low-level BMS software lost its program due to the loss of power. The PLC battery, which is meant to prevent this from happening, had also failed. The high-level BMS software runs on a virtual machine and has been working very well for quite some time. Unfortunately, it was discovered that the license for the PLC programming software does not work in a virtual environment. The IT Crowd put their heads together to come up with a solution for this dilemma.

Left: The scene about 9 hours into the battle, still trying to talk to the BMS.
Right: Paul Rabe vncing in to help out from Germany.

Mercifully, the humidity limit was reached by 21:30 that night so most of the observing time that was lost qualified as "weather", rather than "technical", downtime. But even so, SALT was abuzz for much of the night with numerous busy people that had not eaten since lunch. The last of the Tech Ops team left after 3am and were back by 8am on Thursday to continue the fight!

Fortuitously, the original BMS machine had long ago been repurposed as the SOMMI (SALT Operator Man Machine Interface) PC and so the original computer hardware and the PLC programming software license were still *theoretically* available. IT then worked their magic to recreate the old BMS computer, effectively removing the SOMMI consciousness for safekeeping and restoring the BMS consciousness from the backup universe to its original physical body. This gave Mark (who despite being thoroughly sleep deprived managed to keep his cool under extreme pressure) the ability to upload the low-level software to the BMS PLC. Once the BMS PLC was operational again, the SOMMI PC was restored.

Meanwhile, Adelaide Malan on the procurement side managed to pull off a miracle as well by tracking down an identical replacement 40kVA UPS. The last one in stock, which had already been sold! She managed to persuade Pyrotec, original buyer, that SALT needed this UPS more urgently than they did, so they graciously gave up the UPS, which was then delivered and installed by the Friday afternoon. That warded off the need for temporarily transferring the various systems to numerous individual UPSs that would have to have been scrounged from all around the site. Although that left the telescope vulnerable to power glitches, observers Rudi Kuhn and Fred Marang were at least able to limp along on the Thursday night and even managed to complete a DDT (highest possible priority) observation midst the assorted problems. Then by Friday evening, with the new UPS installed and tested, and the BMS running happily again, the whole telescope and all instruments were fully back online, allowing the observers to continue collecting highly-prized dark-time targets.

Poor Alrin Christians, still somewhat traumatised as the first one on the scene, later mused that he had learned more about SALT in that one day than in all of his time here to date, since every system was critically impacted by this freakish incident. The situation highlighted some serious vulnerabilities that we were not aware of, and we are extremely grateful for the relatively limited consequences - this was an invaluable warning shot! It was also a brilliant team-building exercise that drew on everybody's expertise and commitment to get the telescope back online incredibly quickly, considering the magnitude of the problem. Really fantastic work by all concerned - Hugely well done!!

A HUGE *THANK YOU* TO PYROTEC FOR GENEROUSLY ALLOWING SALT TO USE THEIR UPS!

UPDATE ON THE MAXE (MAXIMUM EFFICIENCY) SPECTROGRAPH PROJECT

The project to build a simple, efficient, broad-band, low-resolution spectrograph, mainly for transient identification spectroscopy, has taken a new direction.

The original concept for the design of MaxE was based on the spherical transmission grating spectrometer (STGS) proposed by Darragh O'Donoghue and Chris Clemens. This novel design can deliver high throughput, since the spectrograph itself in principle requires only two optics (a spherical VPH grating and a spherical relay mirror, although in this application there are also fore-optics and fibres). However, there are other limitations. The design required a very narrow entrance aperture, leading to extreme fibre image slicing. The large number of fibres needed to sample even a point source, together with the simple optics that do not allow demagnification, would imply unacceptable oversampling on the detector. Furthermore, a wide wave-band is a key requirement for ID spectroscopy, which the single-band STGS design cannot deliver.

The astronomers therefore considered several other concepts for MaxE. A dual-band STGS design cannot achieve the resolving power (at least R=2000) needed in the red to reject OH night sky lines, and would suffer from the same inefficiency caused by extensive image slicing and over-sampling as the single-beam STGS design. A conventional dual-beam spectrograph can in principle meet all our requirements, but in practice would be too expensive for this project, if it were to have a real advantage over the option we have settled on. This third option is to turn RSS into a dual-beam spectrograph by building an additional optical arm.

In this concept, the existing RSS optical beam would be our blue arm. The fold mirror will turn into an interchangeable dichroic/fold mirror (so that with the fold mirror in place, all the existing capabilities of RSS will still be available). The new red arm will then be built where the NIR arm was originally intended to be, sharing the existing RSS field lens and collimator main group. The dual-beam RSS will then cover the bandpass 360 to 900 nm simultaneously, at R of roughly 900 in the blue, and roughly 2000 in the red. For science cases other than ID spectroscopy, this also opens up many interesting options involving any existing grating in the blue arm, and different exposure times in the two arms.

There are other projects planed to improve RSS. The collimator will be upgraded to improve its throughput, and the 3 chip mosaic will be replaced by a single detector. We believe that in the end, the dual-beam spectrograph will have similar or better performance than any new spectrograph we could reasonably build, since any option other than RSS would have to be fibre-fed. In the future we also hope to be able to use an optical/near-IR dichroic, instead of a fold mirror, to feed the coming NIR spectrograph and RSS blue+red simultaneously to extend the bandpass into the near-IR.

PRELIMINARY SHUTDOWN PLANS

A full telescope shutdown is being planned for 3 February to 2 March 2020. We are currently in the early planning stages, so things can still change, but we will be striving to minimise the downtime required for completion of the various shutdown tasks.

During that time we will be commissioning the new SPS (segment positioning system) actuator controllers and software. On RSS we will be checking the focal point of the collimator, cleaning the optics and installing the new doublet in the collimator. The new doublet will take care of a potential coupling fluid leak risk and it will also have new coatings and improved baffling. The waveplate mechanism will get a once-over with realigned detente sensors, and the force required to move the waveplates in and out of beam will be reduced so that they can be manipulated at any angle. This will mean shorter acquisition times for polarimetery. We will take advantage of RSS being off the telescope and take the payload down in order to measure the condition of the coatings of the spherical aberration corrector mirrors using the newly purchased reflectometer. A multitude of small housekeeping tasks will also need to be carried out during the shutdown.

WANTED: SUGGESTIONS FOR THE PIPT

We are aiming to have a coding sprint to improve the PIPT in the next two months. The main focus will be to turn the PIPT into more of an online tool, so that server-side information can be used for validation, updating available times and the like.

This will also be a great opportunity to get rid of some of the irritating "features" or add some new helpful functionality. So if you can complete the sentence "Oh, if only the PIPT would or could (not) ...", we'd love to hear from you. Please send your suggestions to Christian (hettlage@saao.ac.za).

WHERE IS THE DATA ARCHIVE?

Work on the data archive mentioned in the previous newsletter is continuing. The administrative and query backend, the frontend and the script for populating the database are all in place. However, a recent review resulted in suggestions for an improved search form, which affects the other parts of the archive as well.

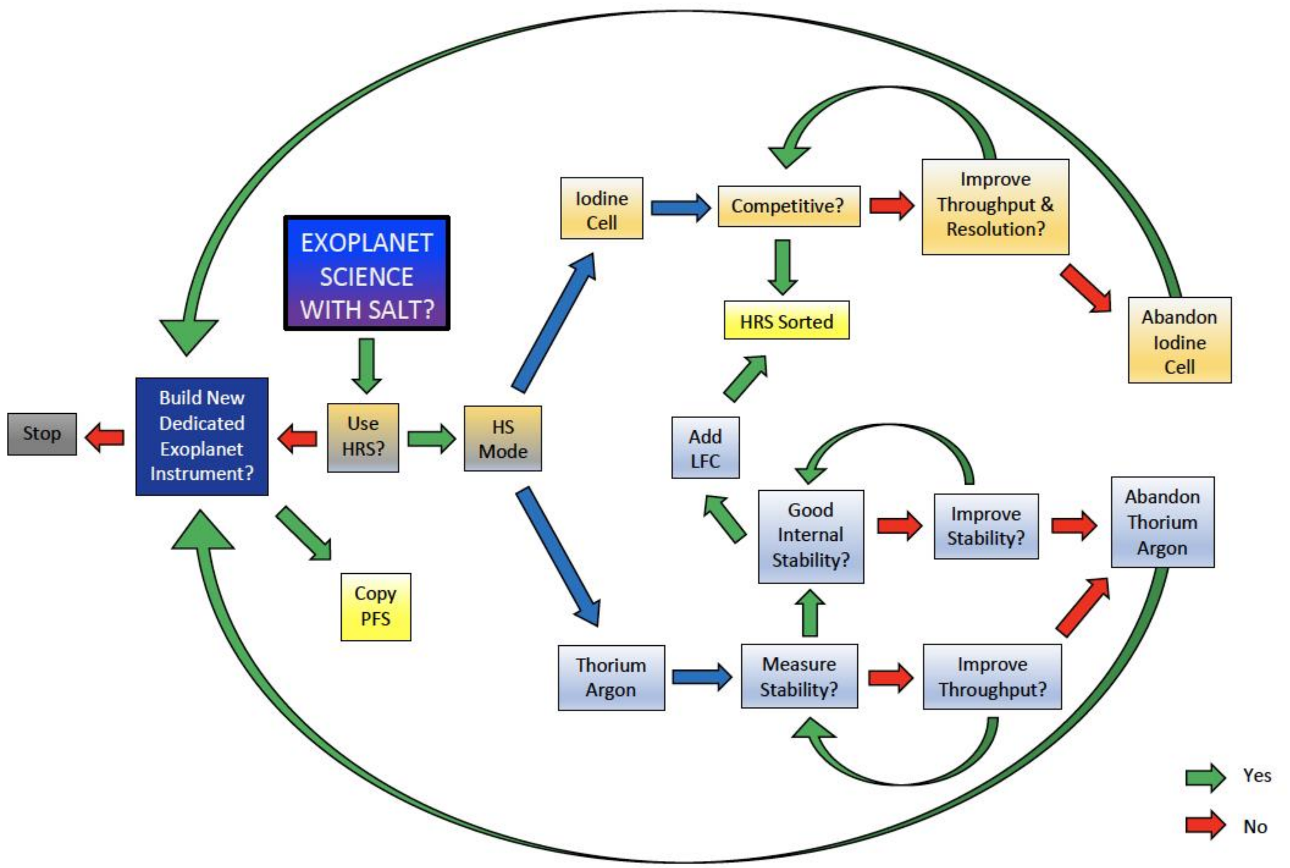
While this unfortunately delays the release of the archive, the changes come with great benefits. The resulting search form will be more user friendly and will allow broader queries. The revised database will be more in line with the Common Archive Observation Model, thus paving the way to potential future integration with other archives.

Implementing the changes will take a few weeks. However, we are hoping to get beta testers involved as soon as possible. Please drop a line to Christian (hettlage@saao.ac.za) if you are interested.

UPDATE ON THE HRS HIGH STABILITY MODE

Work is ongoing to investigate the suitability of the HRS for pursuing exoplanet science – see the flow chart below. The spectrograph's high-stability (HS) mode has two specialised wavelength calibration options for precision radial velocity (PRV) measurements. These are known as the Iodine Cell (a gas absorption cell that superimposes a well-defined series of absorption lines onto the stellar spectrum) and the "simultaneous Thorium Argon" (ThAr) channel, whereby arc light is injected into the calibration fibre at the same time that starlight travels down the target fibre.

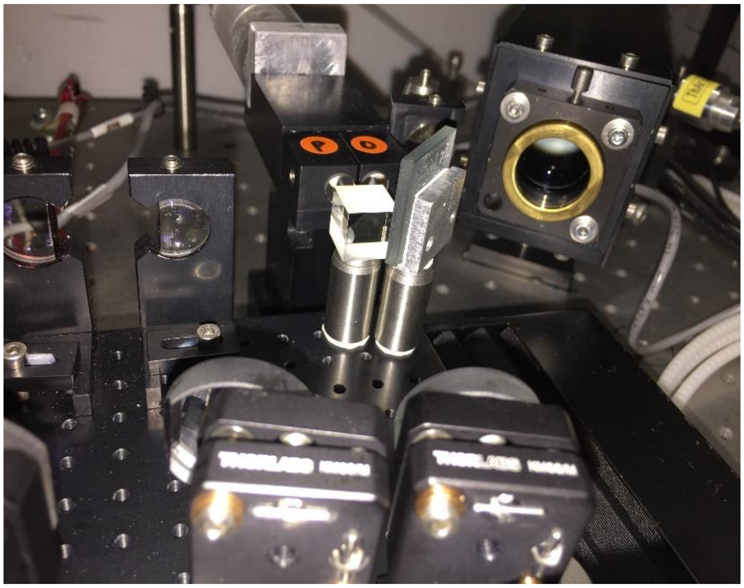
Previously we reported on the new Iodine Cell, that was installed and commissioned earlier in the year. We have since established that the cell can deliver radial velocity precision at the 3 m/s level for very bright stars (5th and 6th magnitude), or at the 5-10 m/s level for 7th and 8th magnitude targets. The limitation is due to the overall throughput of the system. The Iodine Cell is the worst affected due to the combination of the 50 m fibre cable, the fibre double-scrambler unit, losses arising from the cell itself and, finally, the slicer optics that convert the relatively large (1.6" on the sky) HS-fibre into a narrow enough "slit" to deliver R~65k. We still have some options to explore in order to improve the throughput, but at least the Iodine Cell setup is operational and available to users. That said, we urge PI's to contact us to discuss the viability of projects before submitting proposals involving the Iodine Cell.



Above: Flow chart describing the process of investigating the suitability of the HRS for exoplanet science. Note that LFC = laser frequency comb and PFS = Planet Finder Spectrograph (on the 6.5 m Magellan II Telescope).

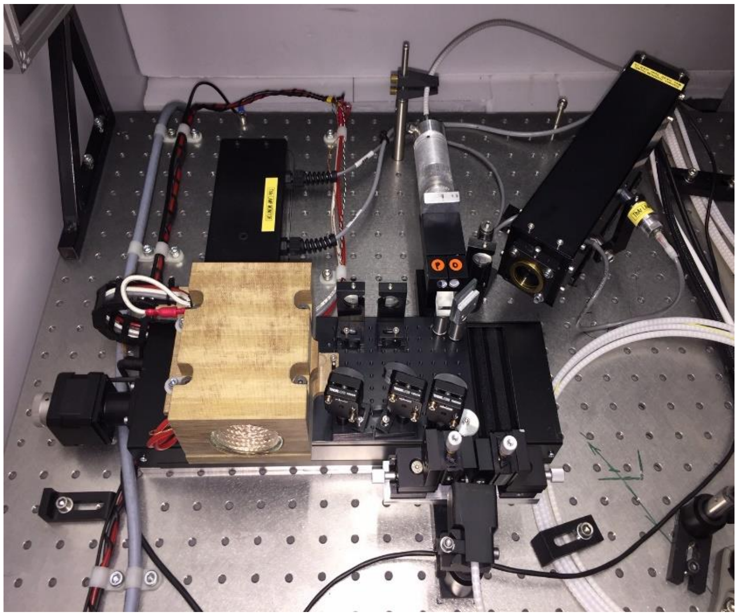
The HRS's other PRV channel (using "simultaneous ThAr" arcs) is also being investigated to gauge its potential, particularly as it does not suffer all of the same losses as the Iodine Cell. The first step is to test the intrinsic stability of the instrument, and for that we need to inject arc light down both the HS-mode fibres at once, to compare shifts measured in each. If the two fibres experience significant differential drifts (i.e. if they do not "fly in formation"), it would not be worth investing in this approach. If the stability is good (within a couple of m/s), it would serve us well to acquire a laser frequency comb to dramatically improve the HS mode's wavelength calibration system.

Right: The new ThAr feed required to direct arc light into both the HS-mode fibres at the same time.



Since the ThAr lamp on the HS bench could only be fed into one or the other HS fibre at a time, we employed the ThAr lamp inside the payload (part of the telescope's calibration system) for our initial round of tests. Unfortunately, this setup could not deliver enough light to yield the required signal-to-noise, so a new optical feed was required on the HS bench. These new optics, consisting of a cube beamsplitter and a couple of fold mirrors, are shown above.

Below: The HRS high-stability bench showing the beige Iodine Cell housing on the left, and the black translation stage (that moves horizontally) configured to direct arc light from the ThAr lamp (top right) into both HS-mode fibres (labelled P and O) for the ThAr stability tests.



The ThAr lamp on the HS bench is visible in the upper right of the figure above. The arc light emerges from the brass-rimmed window and reflects off the righthand fold mirror in the foreground, which directs it into the cube beamsplitter near the centre of the image. Half of the beam proceeds straight through the cube into the lens on the front of the P-fibre. The other half travels to the right, where it reflects off another fold mirror, sending that light into the lens on the front of the O-fibre. The single beam of ThAr light is thus split into two beams and directed into both HS fibres at once. There is plenty of light available with this new configuration and so we are now waiting on a spell of bad weather in order to run a long sequence of arcs every few minutes (over at least a 24-hour period) to evaluate the overall stability of the spectrograph.

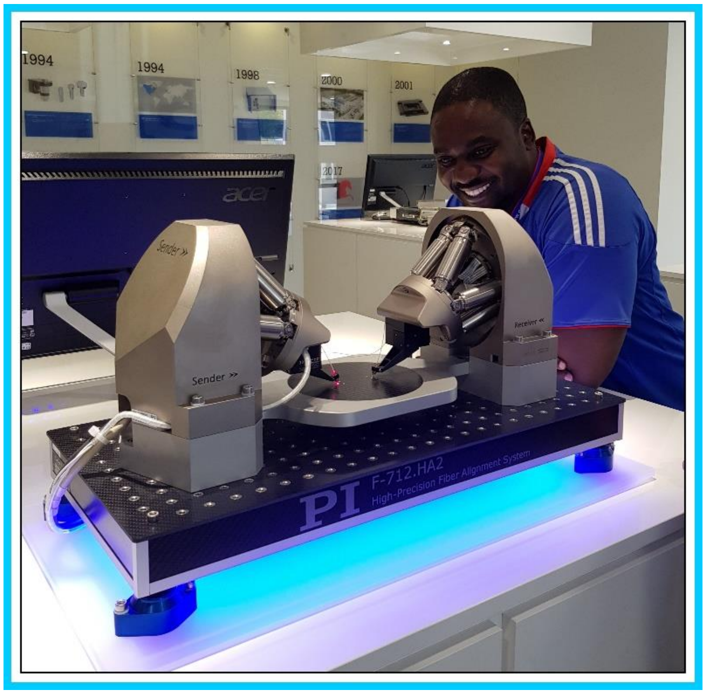
The 3 m/s "stability" measured with the Iodine Cell is different to what we are seeking with the ThAr tests. The Iodine Cell results are derived from forward-modelling each individual exposure, in which the calibration light is directly superimposed on the starlight. For the simultaneous ThAr approach, the results are dependent on the physical stability of the instrument itself, since the calibration light runs alongside the starlight, in a different fibre.

The main advantages of the ThAr system are that the calibration light spans the full wavelength range of the spectrograph (370-890 nm) – versus the Iodine Cell that only produces lines in the 500-600 nm range – and the fact that absorption within the gas cell eats some of the starlight. If we eventually find that neither of the HRS HS options can deliver competitive exoplanet science capability, SALT would need to consider whether to pursue this field by investing in a new, dedicated instrument optimised for exoplanet work.

SPS GERMANY

By Richard Banda

In early August a team from Sutherland travelled to Karlsruhe Germany to visit the suppliers of the new SPS (Segment Positioning System) actuator controllers. The purpose of the visit was to do a Factory Acceptance Test to make sure that the controllers are fit for purpose before they leave the factory. SALT has a history with the company, *Physik Instrumente,* who supplied the actuators and controllers for the original SPS. While the actuators are still going strong, the controllers have become long in the tooth. The original designer of the system used at SALT also designed the new controllers.



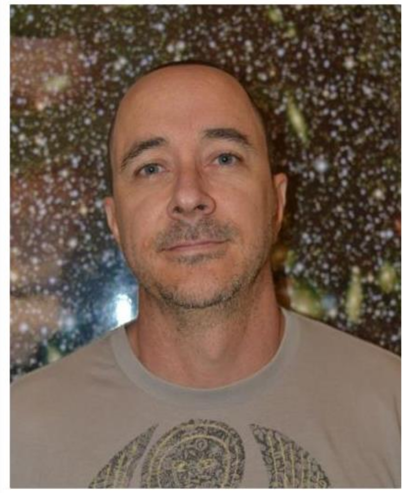
The company has grown a lot since the original SPS system and one of its specialties is the hexapod. In the field of mechatronics, a hexapod is one of the most complicated systems to develop, requiring a robust control system that includes an algorithm that takes into account all of the relevant dynamics. *Physik Instrumente* demonstrated their hexapod systems and other excellent machines, giving us new insights into our own engineering systems.

I had prepared for months only to get to the facility in Germany and be told that I wouldn't be able to test the controllers in the manner I had expected to. I therefore started to develop new test software right then and there. The PI guys helped me when I was stuck, and after 2 days I was able to put together a full test that would satisfy our needs. We were able to keep to our timeframe and sign off for the controllers as planned.

My passion is working with sensors and actuators in control systems and since my visit to Germany, I have been focusing heavily on the SPS control – even working on Sundays! With Keith and Paul's help, it has been great so far ☺

From left to right: Carsten Brandes, Paul Rabe, Keith Browne, Richard Banda

MEET THE TEAM: ENRICO KOTZE



How did you become an astronomer?

As far back as I can remember I've always been interested in all the natural sciences. However, somehow I ended up in a corporate career in the financial sector for almost 20 years. Luckily, along the way, I was inspired by my wife to get back to my original interests and, voilà, my indulgence in astronomy got underway. Even though I never thought that I would actually be able to pursue a career as an astronomer, I eventually resigned from my corporate job and applied to the National Astrophysics and Space Science Programme hosted at the University of Cape Town, and the rest, as they say, is history.

What is your role on the SALT team?

My main responsibility is the maintenance and further development of the primary data pipeline and, eventually, the science reduction pipeline.

What is your research on?

I'm fascinated by the morphology and transient nature of especially cataclysmic variables and low-mass X-ray binaries - quintessential stellar objects for the study of mass transfer, accretion flows and accretion discs. I'm extremely privileged to be part of collaborations that make use of high quality SALT data to expand our understanding of these systems (for example, see the Science Highlight in this issue).

SALT SCIENCE PAPERS

Below is the list of SALT publications since our last newsletter (for our full list of publications, please visit http://astronomers.salt.ac.za/data/publications/). We encourage SALT users to inform us of any papers making use of SALT data, and to double check the link above after publication.

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