SALT
Newsletter

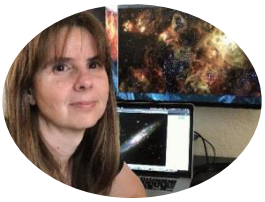
August 2024

Table of Contents

Editor: Anja C. Schröder

Cover image: Sutherland drowns in snow. -- *Credit*: David Buckley

Letter from the new SALT Director



Dear SALT Community,

I am excited to share that I have recently taken on a new role as the Director of SALT. For those who may not be familiar with me or new to SALT, I'm Encarni Romero Colmenero, formerly the Head of SALT Astronomy Operations. My new official title is "SAAO Deputy Director: SALT Director," which means I now report to two key figures: the SAAO Director, currently Ros Skelton in her Acting capacity, and the SALT Board through its Chair, Brian Chaboyer from Dartmouth College.

In this new role, which I assumed on 1 July, I am responsible for overseeing all aspects of SALT operations and ensuring SALT reaches its full potential through strategic development of new instrumentation, optimising operations, and maintaining and improving it technical performance and it scientific edge. I will be working closely with all stakeholders, from the SALT Board to our users and supporting bodies, gathering insights and develop a cohesive strategy. Additionally, I will be focused on promoting SALT strategically.

Another important aspect of my role is driving human capacity development and transformation at SALT to maximise our contributions to South Africa's national priorities.

After six rewarding years as Head of Astronomy Operations, I am eager to embrace new challenges and contribute to SALT in this new capacity.

I would also like to extend my gratitude to Dr Danièl Groenewald, who has stepped up as Acting Head of SALT Astronomy Operations. Her leadership will ensure a smooth transition while keeping Astro-Ops running seamlessly — Astro-Ops is definitely in excellent hands! ☺

Please keep an eye out for the upcoming advert for this position!

Clear skies,

Encarni

Letter from the Acting Head of Astro-Ops

Dear SALT Community,

As many of you know, Encarni assumed her new role as SALT Director at the beginning of July. In the meantime, I have stepped into the role of Acting Head of SALT Astronomical Operations until the position is officially filled.

Winter has arrived in South Africa with a snowy flourish, transforming Sutherland into a winter wonderland earlier this month. Unfortunately for me, most of the snow had melted by the time my observing run started, but the cold and cloudy weather persisted. We were only able to obtain two hours of science observations that week — the worst record I've had since becoming a SALT Astronomer in 2019.

Despite the weather, there have been several exciting developments over the past few months. These include the successful integration of the laser frequency comb and its First Light on-sky. An eagerly awaited update on the polarimetry calibrations is now available, and polarimetry users can expect a calibration release within the next few months. Additionally, we are pleased to announce that the slitmask integral field unit has passed the engineering commissioning phase and will be available for science observations in the 2024-2 semester on a shared-risk basis.

Three of our team members had the opportunity to visit the Hobby-Eberly Telescope, SALT's twin, in May. You can read all about it in Lisa's article below. In June, a few members of the SALT team attended the SPIE conference in Japan, where we presented updates on various SALT projects and enjoyed some Japanese culture before returning home.

We'd like to remind SALT users about SUGAR, the SALT Users Group for Astronomical Resources, which serves as an independent point of contact for feedback, suggestions, and concerns. We welcome any feedback from the community, and contact details can be found within the newsletter.

Lastly, we welcomed two new engineers to the SALT team, Michael Sam and Sam Ndumo, in Sutherland. Two new SALT Operators will also join the team in the next two months. Look out for their introductions in the near future.

Until next time,
Danièl

SCIENCE HIGHLIGHT

HRS-HS observations recover exoplanet signature

by Daniel Holdsworth (University of Central Lancashire, UK)

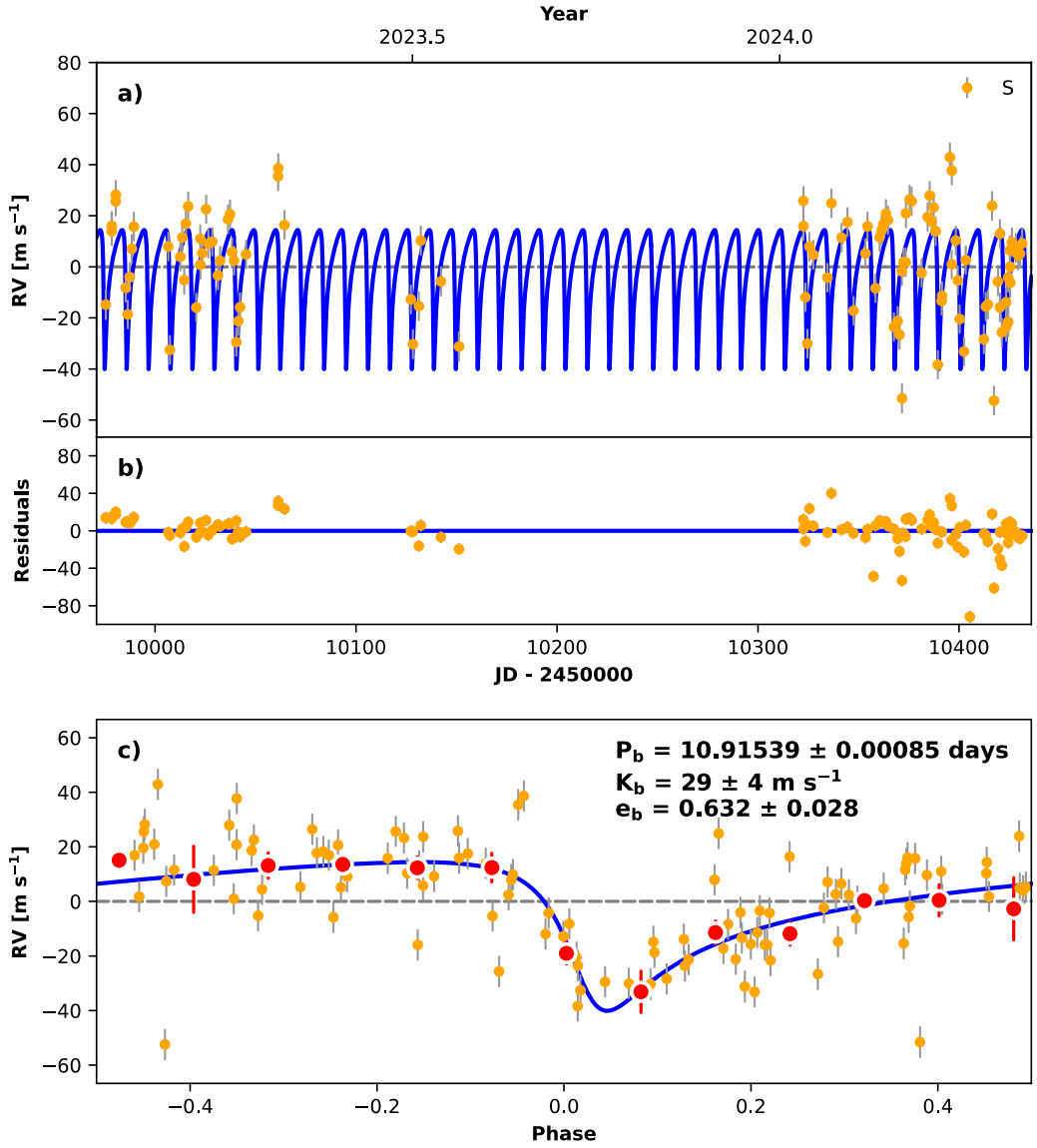
In preparation for the Precision Radial Velocity (PRV) capabilities that the new Laser Frequency Comb (LFC) will bring to HRS, we have been monitoring a known exoplanet host star with the High-Stability (HS) mode with simultaneous Thorium Argon (ThAr) light fed into the calibration fibre. As part of the development of the HRS-HS pipeline we can now report the success of the observations, the instrument stability and the pipeline with the recovery of an exoplanet signal with an amplitude of 29 m/s.

HD 108147 was discovered to host a planet by Pepe et al (2002)[1], with parameters later refined by Butler et al (2006)[2], as shown in the table. The host is a bright, V=7.0 mag, F8/G0 main sequence star with an effective temperature of 6200 K, a low projected rotational velocity (v sin i) of 6 km/s and a mass of 1.2 $M_{\odot}$.

Parameter	Butler et al (2006)	SALT Results
P_{orb} (d)	10.899±0.005	10.915±0.001
RV Amplitude (m/s)	25.1±6.1	29±4
Eccentricity	0.53±0.12	0.63±0.03

With our SALT HRS data spanning about one year (113 observations), we are able to recover the planet signal as shown in Column 3 of the table. These early results show that the instrumentation is more than capable of expanding SALT's science capabilities, and delve into the regime of exoplanet science. Furthermore, given these are both early results for the current hardware capabilities (i.e., before the LFC is fully commissioned) and the first results of the HS pipeline, it is expected these results will be improved upon in the reduction realm, and further improved when the hardware upgrade is complete.

[1] A&A 388, 632
[2] ApJ 646, 505



The figure shows the RV time series (panel a)), and the residuals (panel b)) after the fit (blue line) is subtracted from the observations. Panel c) shows the phase folded RV curve (orange points), binned data (in red) and the best model fit to the data, as derived with the RADVEL code of Fulton et al. (2018)[3].

It is clear, with these preliminary results, the investment in both hardware and software for the HRS HS mode will broaden the science return of SALT, and open new avenues of research capabilities.

[3] A&A., 388, 632

Slitmask IFU available

The engineering commissioning of the first generation Slit Mask Integral Field Unit for the RSS, SMI-200, has been successful, and SMI-200 is now available to the SALT user community on a shared-risk basis.

During engineering commissioning, we have tested several aspects of the SMI-200 integration within the SALT longslit mechanism. These tests revealed that SMI-200 can be seamlessly integrated within the SALT elevator mechanism, and operation can be performed interchangeably with other slit masks, which was the main operating requirement for the instrument. When inserted, SMI-200 requires no change in the telescope focal plane, while the RSS detector requires a constant offset of 450 micron irrespective of the tracker settings and other environmental conditions. On-sky observation of a standard star indicates that there is a known 2.5±1 arcsecond offset between longslit centre and SMI-200 centre, again irrespective of tracker orientation. This enables smoother target acquisition on SMI-200, which would require a longslit to reference the target with the existing back reflection imaging system. Observations of flat field spectra revealed that SMI-200 has a median throughput of 19% on all fibres compared to the 1-arcsec longslit, whereas the expected throughput is 31%. This lower than expected median throughput is attributed to fibres with non-matching telecentricity, a design issue that has been corrected in the upcoming SMI-300 and second version SMI-200, both currently under development. We hope to deliver the former by late 2025.

The engineering commissioning involved obtaining several calibration exposures such as flat and arc spectra. The data reduction pipeline is initially built with IRAF due to the proficiency of instrument developers in it. We now have the right set of parameters for each IRAF package to deliver wavelength calibrated spectra of each fibre trace to a multi-spectral image file. In addition, we are working on Pythonising the reduction process. At this point, except for the wavelength calibration the rest of the reduction process can be performed with Python scripts.

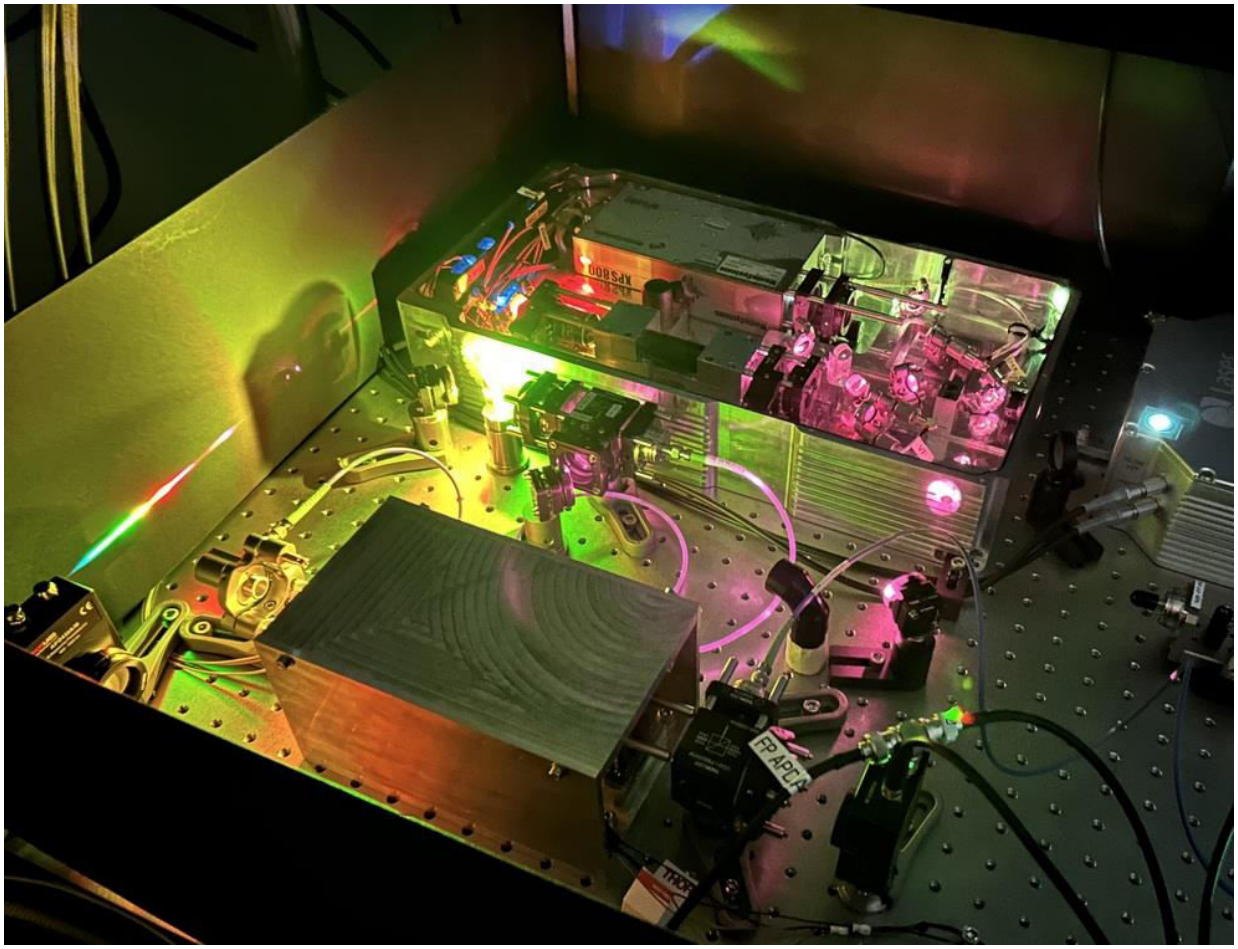
Although fibres are tightly packed on the focal plane, due to cladding, buffer and circular geometry, the packing fraction is only 60%. Filling the interstitial gaps requires a procedure called dithering: This procedure moves the entire SMI-200 by small movements to three pointings, separated by the diameter of a single fibre. The three exposures can be combined using a Python script that has been developed to obtain spectral cube or map data as needed. Dithering enables truly integral field data.

Over the future months, we will perform detailed science commissioning. This involves observing a standard star at multiple fibre locations to verify relative throughput of the fibres, enabling relative calibration beyond flat calibration. We want to further demonstrate the capability with emission line star-forming galaxies as well as fainter dwarf galaxies to probe the limiting surface brightness. In addition, the goal is to deliver a science-ready Python version of the data reduction and data analysis pipelines.

Sabyasachi Chattopadhy.--

First Light for the LFC

We've had a successful LFC integration run and a set of press releases[4] about it since the last newsletter. Richard McCracken and Shan Cheng from Heriot-Watt University (HWU) came back out to SALT at the end of April and by the time they left ten days later, we'd achieved both engineering and on-sky First Light with the comb! As always, there's more to be done — but this campaign was particularly exciting. Without wanting to jinx things by saying this too loudly: we really can see things coming together now and looking like what we're aiming for!

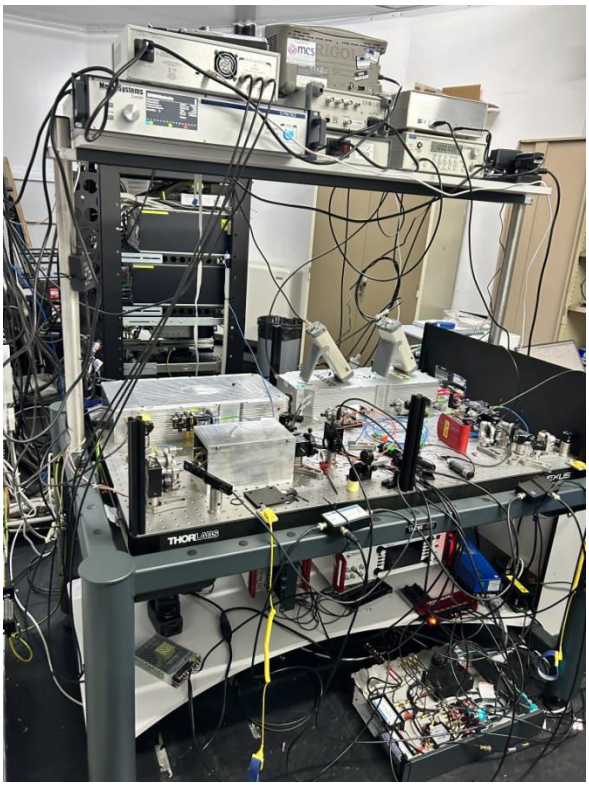


LFC all aglow. At the left wall, the supercontinuum spectrum can be seen, and at the top is the comb module.

They managed to get more of the system's electronic locking loops (notably the one for the Fabry-Pérot cavity, that thins out the supercontinuum to yield the right number of comb teeth to suit the resolution of the spectrograph's high stability mode) working reliably. We could then couple the comb light into the single mode launch fibre that sends this beautiful calibration spectrum into the HRS, and take some frames!

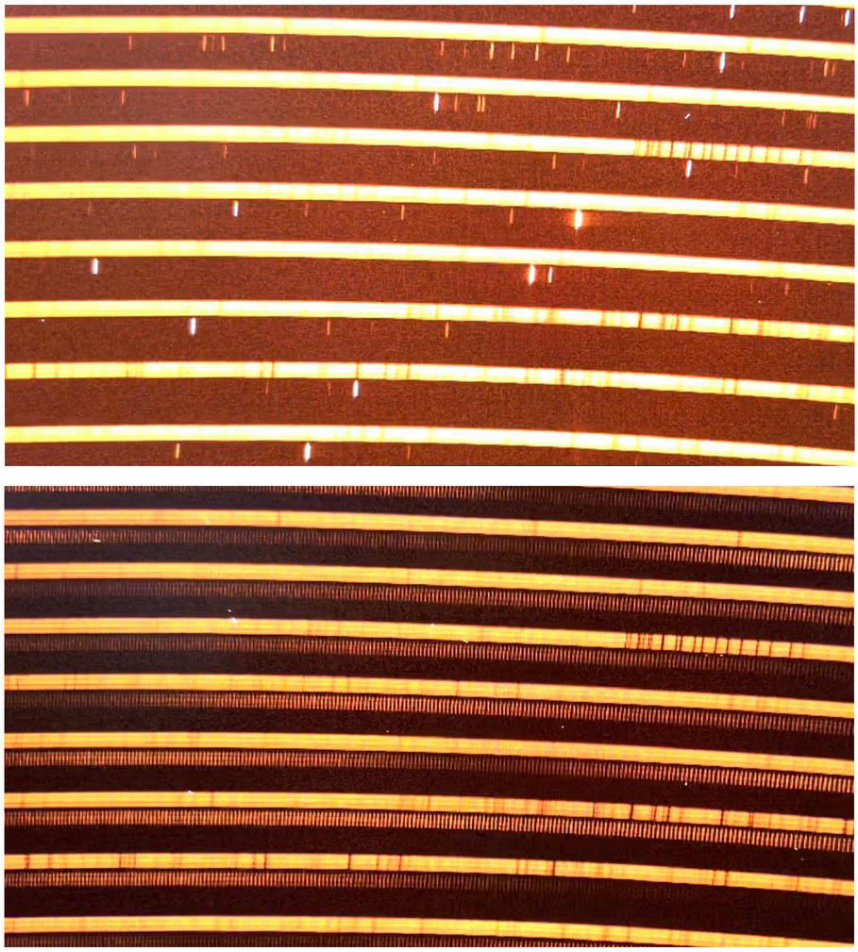
[4] HWU press release: https://www.hw.ac.uk/news/2024/southern-african-large-telescope-gears-up-for-exoplanet-hunting-with-heriot-watt-astrocomb;
SAAO press release: https://www.saao.ac.za/2024/07/05/saltlfc

The comb bench and associated electronics grew cartoonishly chaotic in getting to that point (see photo right), but we can happily report that things did settle back down again after all that. A couple of days later we were in a position to snap a few spectra with a radial velocity standard star down the object fibre + thorium-argon arc light, and then LFC light, down the calibration fibre. The comparison between those two simultaneous calibration options is spectacular! That was a thrilling way to end the run, along with stopping for the now-obligatory buttermilk flapjacks at the Veldskoen farmstall on the way back to Cape Town the next day (photo below).



First Light on-sky excitement on 8 May.

We still need to incorporate the spatial light modulator to do the spectral flattening of the comb spectrum, to ensure that we end up with relatively even illumination across the entire Red channel. Work is underway too to refine a few other modules within the comb, and to develop at least a basic user interface with which to control the various elements in the system. The current plan is for Richard and Shan to return again in November/December to apply the final touches. In the meantime though, we have some extremely zippy kit up at the telescope that we can tinker with!



RV standard with simultaneous ThAr (top panel) and LFC (bottom panel) showing how many more useful calibration lines the comb provides. The LFC still needs spectral flattening to even out the comb features across the whole wavelength range.

Lisa Crause.--

Pupil dependence of polarimetric sensitivity on SALT

Over the past few years, our efforts have been focused on achieving reliable polarimetry calibrations. We aim to release an update to the polSALT GitHub repository (https://github.com/saltastro/polsalt) within the next 2 – 3 months, including the new calibrations and updates to the reduction software. We summarise the new calibration technique and findings below. More details can be found in a paper presented at this year's SPIE conference (the paper is available at https://doi.org/10.1117/12.3017792).

Overview

The RSS is capable of high-throughput, medium-resolution spectropolarimetry over a wavelength range of 350 – 900 nm, using VPH gratings, and with a field of view (FOV) of 4 x 8 arcminutes. RSS uses a mosaic calcite beamsplitter in the collimated beam and Pancharatnam waveplates after the focal plane. It has been operational since 2016, using an on-axis calibration based on calibration system lamps viewed through a polaroid.

Our initial goal was to achieve high-precision spectropolarimetry, given the 10 m primary mirror. Extensive observations of this nature have revealed a variable pseudo-sinusoidal wavelength position angle calibration error, with an amplitude of up to 0.5 degrees. This error varies predictably with the position in the SALT "track". During an observation, SALT fixes the primary mirror and tracks the primary focus instrument, causing variation in the pupil illumination. This effect likely arises from varying illumination of the pupil on the waveplate, which is not in the collimated beam.

We developed a new calibration technique that explicitly models the pupil dependence of the polarimetric sensitivity. This involves:

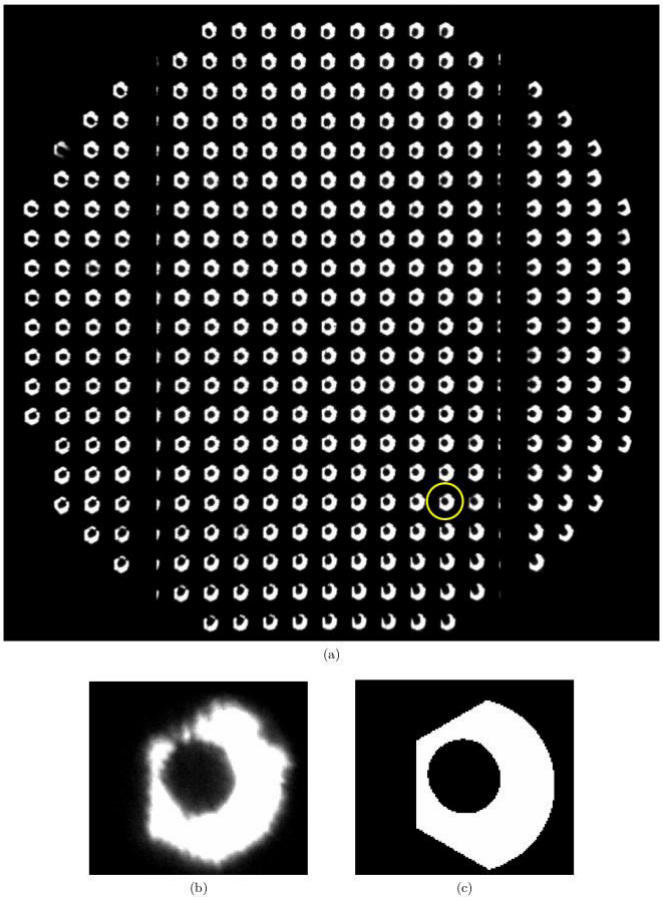
- Calibrating a model of the pupil illumination *vs* track position and FOV.
- Calibrating a model of the polarimetric response over the pupil as a function of the FOV position.

Calibrating the polarimetric response

We imaged the twilight sky through a slit mask of small holes, significantly out-of-focus by removing the filter, and created a model of these pupil images. An example of a pupil image is shown in Figure 1.

Using a ZEMAX model, we fit the %P and PA dependence over the pupil x, y at each wavelength. The model reveals that even power laws suffice. The fitting process (examples shown in Figure 2) indicates that adding a linear power law in x and y is needed to compensate for waveplate nonuniformity.

Figure 1: (a) Example of the pupil image. The magnified figures shown in (b) and (c) correspond to the FOV position highlighted by the yellow circle. In (b) one can see the central obstruction, the primary and the truss shadow, while (c) show the modeled view of the FOV position.



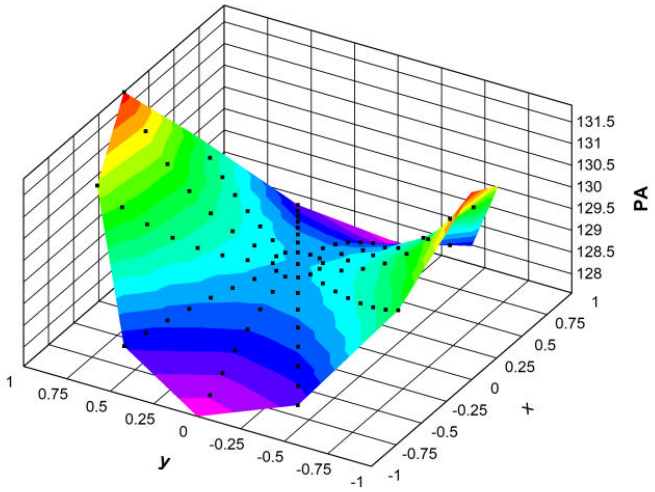
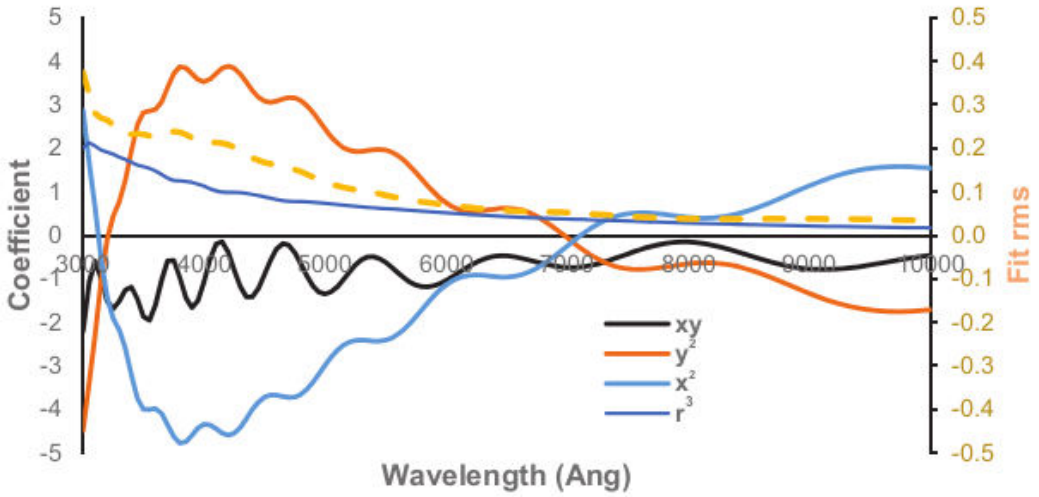


Figure 2: Left: The wavelength dependence of the four power law coefficients for FOV positions X = Y = 0. Bottom: The power law fit from the ZEMAX model at 5500 Å.



Spectropolarimetric observations of the full Moon (four images at waveplate angles) were obtained through a polaroid combined with a 25-position mask over various full SALT tracks (40 observations), covering the full wavelength range using two grating settings for tracks in the x and y directions in the RSS frame. This resulted in a total of 640 images. At each track point and wavelength, we computed the expected mean %P and PA, weighted by the pupil illumination. At each wavelength, we varied the chosen power law coefficients to minimise errors.

Science Verification

For the Moon observations, we compare the old with the new calibration ripple variation ("precision") and accuracy (compared to known polarisation, PA) in Figures 3 and 4. We find that:

- Systematic precision and accuracy improvements meet or come close to goals;
- Precision estimates for standard star HD298383 show that while systematic effects are removed, ultimate precision is affected by environmental variations (e.g., focus and guiding, see Figure 5);
- Accuracy estimates for the standard star indicate that knowledge of correct results (e.g., Serkowski parameters) is more uncertain than remaining calibration effects (see Figure 5).

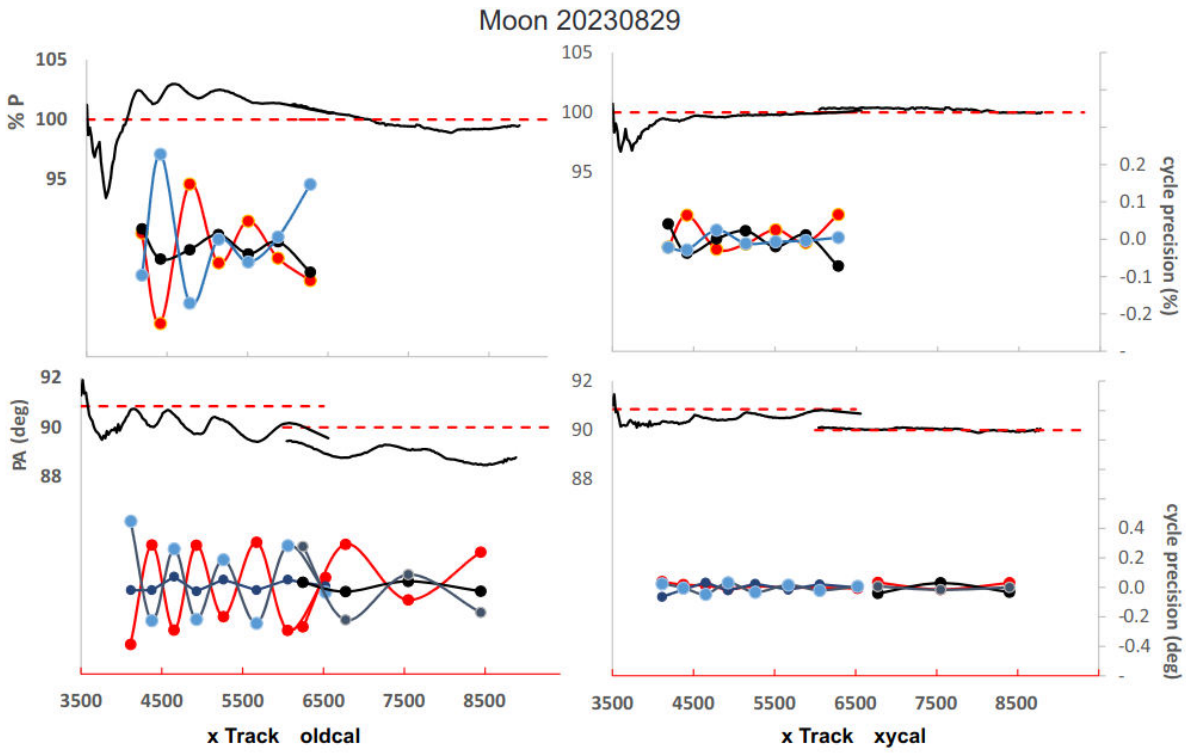


Figure 3: Calibrated degree of polarisation (upper panels) and PA (lower panels) derived from the 2023/08/29 Moon observation (using the x track). Results with the old and new calibrations are shown on the left and right, respectively. Black lines (top, left hand scale) show the mean over all 40 cycles, compared for accuracy with the known polarisation (100%) and PA of the polaroids (red dashed line). Lines with dots show deviation of the first, middle, and end cycles from the mean, indicating precision for the blue and red observations.

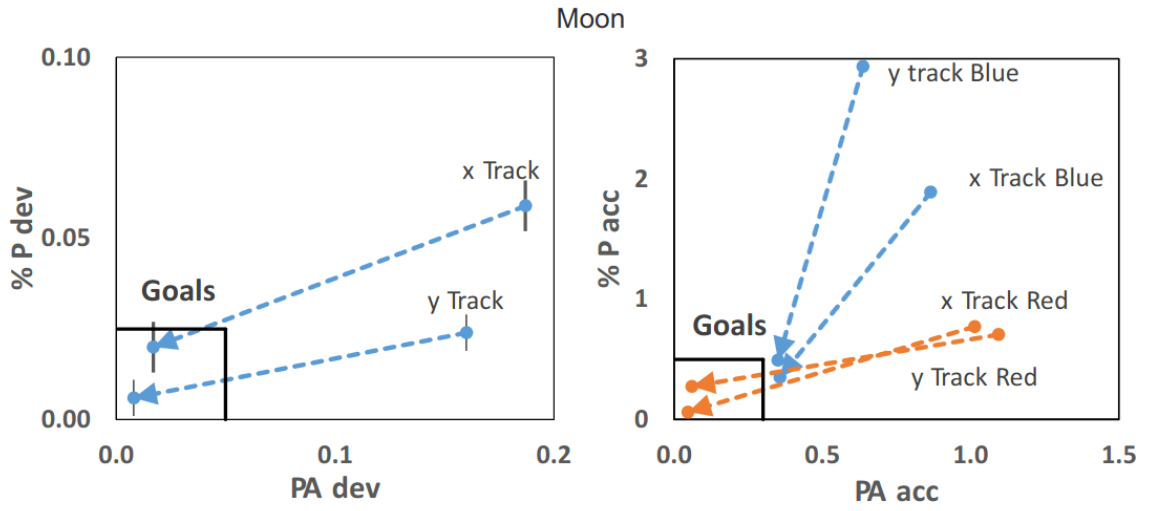


Figure 4: Precision estimates (left panel) and RMS accuracy (right panel) for both x and y tracks of the Moon, obtained using the old and new calibrations (arrow points from old to new). Boxes represent initial goal values, important for high-precision spectropolarimetry.

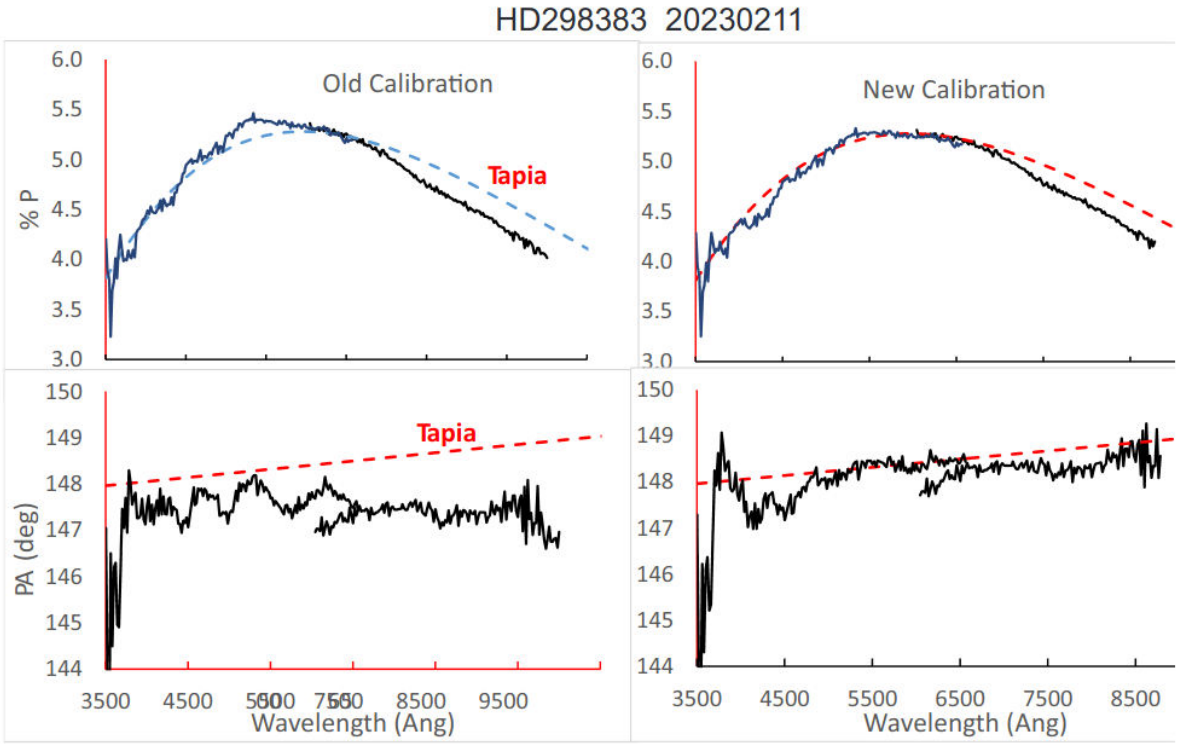


Figure 5: Comparison of %P (upper panel) and PA (lower panel) of the polarised standard star HD298383, derived using both the old and new calibrations. Dashed lines in the top panels represent Tapia's Serkowski law, while dashed lines in the bottom panels represent a linear wavelength fit to Tapia's filter polarimetry data.

Conclusions

We conclude, that precision and accuracy are now approaching what can be achieved given the environment and available photons. We still need to complete the calibration and verification for the full FOV to allow multiobject spectropolarimetry.

Danièl Groenewald & Kenneth Nordsieck.--

NIRWALS and RSS science product pipeline

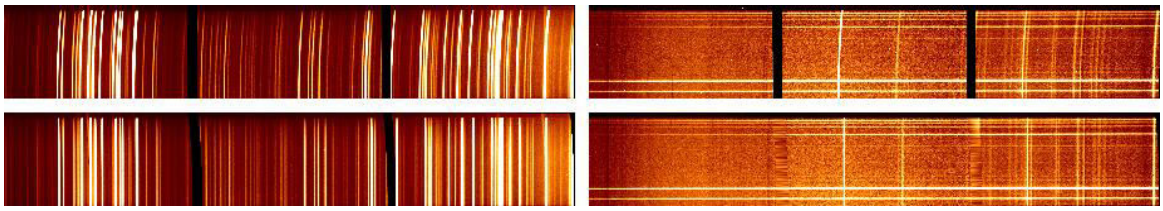
NIRWALS: Beware of workers overhead!

The NIRWALS science pipeline is a Pythonised attempt to automate Matt Bershady's IRAF reduction package `nirspecpkg`. Fibre extraction and wavelength calibration for standard configurations are in a stable state, but good sky subtraction is still a bit of a challenge. From a practical point of view, the pipeline is still under construction until finalisation of i) the sky subtraction procedure, and ii) the near-infrared-specific pre-processing software, supplied by the University of Wisconsin-Madison, which is attempting to ameliorate the deteriorated state of the detector. Once the pipeline is finalised it will be integrated in SALT's primary data pipeline that runs daily at 10:30 SAST.

RSS: Get you calibrated normal and frame transfer long-slit spectra here… soon!

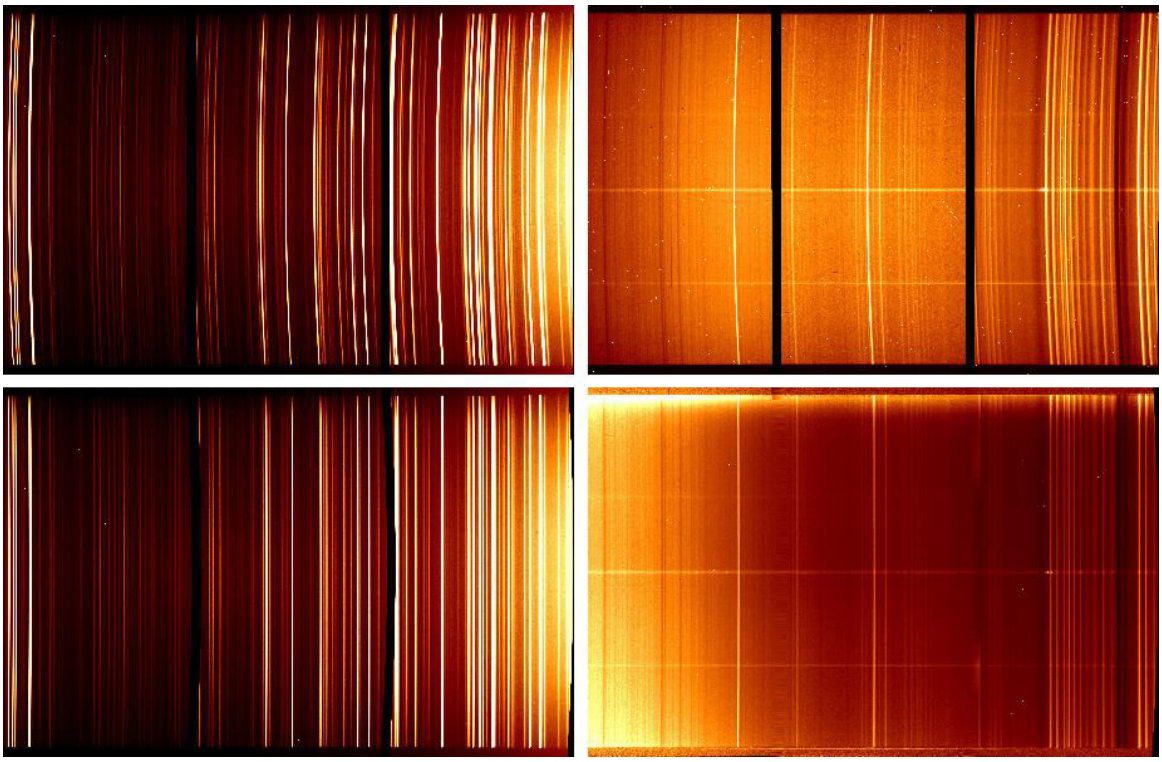
The RSS science product pipeline is undergoing a final monitoring phase before calibrated normal and frame transfer long-slit spectra will be made available to users. The pipeline is integrated in SALT's primary data pipeline that runs daily at 10:30 SAST. The additional products produced, which will be included in the data distribution to the user ftp locations, are: i) 2D wavelength calibrated and rectified reference (arc) exposures; and at minimum ii) 2D bad pixel replaced, cosmic ray cleaned, CCD gaps filled, wavelength calibrated and rectified object exposures. If object exposures have an accompanying set of flat field exposures (or there is an archival set with the same instrument configuration) then the object exposures will also be auto gain corrected[5] and flat fielded. In simple terms the pipeline is basically a Pythonised version of Alexei Kniazev's IRAF/MIDAS RSS long-slit pipeline reduction package [1].

To whet user appetites we include examples of some of the products produced by the pipeline:



- FITS 2D images from a typical 2x4 frame transfer long-slit observation. The top row shows the reference (left panel) and object (right panel) products currently distributed. The bottom row shows the wavelength calibrated and rectified reference exposure (left panel) and the bad pixel replaced, cosmic ray cleaned, CCD gaps filled, wavelength calibrated and rectified object exposure (right panel).

[5] The RSS CCDs have some electronics problems which can result in slight changes to the routinely obtained gain levels used for gain correction in the primary data reduction. An auto gain correction is applied to ameliorate any significant change in the gain levels.



- FITS 2D images from a typical 2x2 normal long-slit observation. The top row shows the reference (left panel) and object (right panel) products currently distributed. The bottom row shows the wavelength calibrated and rectified reference exposure (left panel) and the bad pixel replaced, auto gain corrected, flat fielded, cosmic ray cleaned, CCD gaps filled, wavelength calibrated and rectified object exposure (right panel).

It is important to note that the pipeline products do not include the extracted 1D spectra of any or all of the objects on the slit. The extraction of the relevant target spectrum must be done by the user. A user application (in a Docker container) will be made available to aid users with the extraction if they do not want to use another existing tool for the extraction of the relevant target spectrum (or spectra). The user application will also enable users to redo a different combination of the default applied reductions mentioned above.

References

1 A. V. Kniazev, “Pipeline Reduction of Long-Slit Spectra Obtained with the SALT Telescope,” Astrophysical Bulletin 77, 334–346 (2022). [doi:10.1134/S1990341322030075].

Enrico Kotze.—

Updates from the Astro-Ops software team

In mid-July, a new version of the Principal Investigator Proposal Tool (PIPT) was released. This version is of particular interest to Principal Investigators from African institutions outside South Africa. Even if they do not have a co-investigator from within the SALT partnership they may use the new version to apply for observing time. The request will be decided on by the South African Time Allocation Committee. Have a look at the Tips & Tricks page on the SALT for Astronomers site (https://astronomers.salt.ac.za/proposals/tips-and-tricks/#african-pi) for more details.

Speaking of that website, you might be aware that SALT's current operational status is displayed on its status page (https://astronomers.salt.ac.za/status/). However, if you want to keep up to date without having to regularly check that page, you can now ask for an automated email to be sent to you whenever the status is updated. Send an email to salthelp@salt.ac.za if you are interested.

Over the next two or three months, the software team is planning to officially launch a new version of `PyAstroSALT`, a Python library for user-friendly access to some of the functionality of the API which is used for the Web Manager. Its main focus will be on proposal submissions and block status updates. However, if there is anything else related to SALT proposals which you'd like to achieve with a Python script, let us know. We appreciate any suggestions sent to salthelp@salt.ac.za.

Also planned for the next months is a major new version of the PIPT. This version will be more robust and significantly improve the performance for large proposals. And when it comes to large proposals, you are reminded that there is no need to create dozens of blocks by clicking around in the PIPT — instead you can let a Python script generate the blocks and then import them into the PIPT. You can find out more on https://astronomers.salt.ac.za/software/pipt/#defining-lots-of-blocks.

Another change is more imminent, or may have happened already by the time you are reading this: Emails about your observations will no longer contain the full night log, but just the information which is relevant for your proposal, making it easier to find what you are interested in.

Christian Hettlage.—

SALT Users Group

Dear SALT Users,

As you may be aware, the SALT Users Group for Astronomical Resources (SUGAR) was established recently to provide an independent point of contact for users to raise requests, concerns, suggestions, or to provide feedback to the SALT Team. Areas that fall within our remit include: data quality, scientific performance, software bugs, SALT provided documentation or support issues. Requests for new software, or new features of existing software, can also be sent to SUGAR.

SUGAR is also responsible for soliciting input from users on scientific directions of upcoming instrumentation and telescope capabilities, when the time comes.

Users can contact SUGAR via the dedicated email address sugar@salt.ac.za or via the permanent Google form https://forms.gle/79WbduuHzWhmr5pbA The Google form is anonymous unless you provide your details.

We look forward to working with the SALT User community to help to improve the end user experience of SALT.

Kind Regards,
Daniel Holdsworth
Chairperson SUGAR

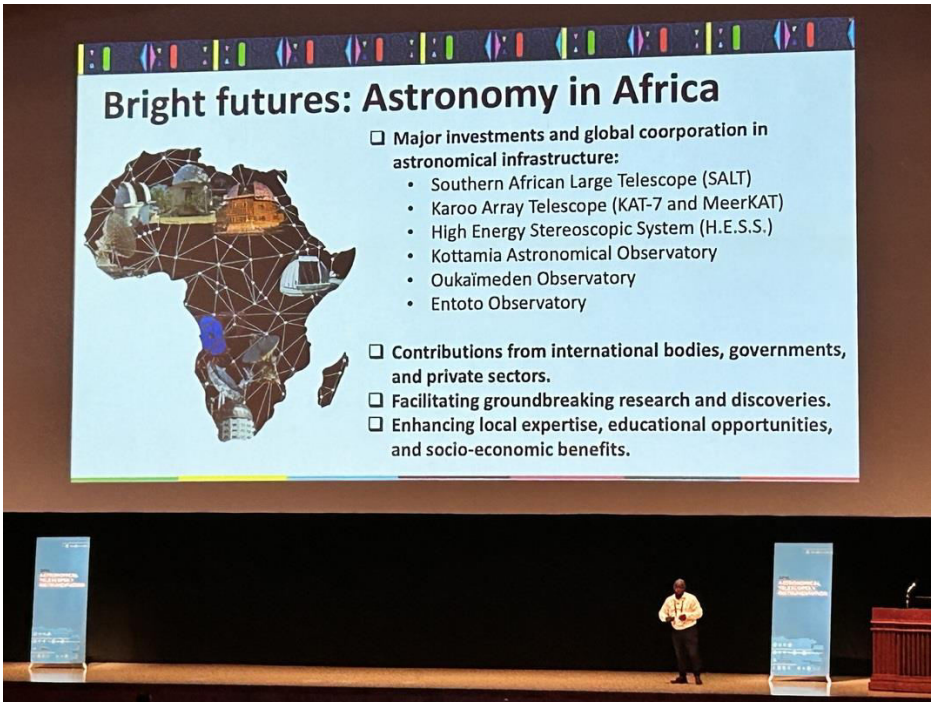
SPIE Astronomical Telescopes and Instrumentation 2024

SPIE (the Society of Photo-Optical Instrumentation Engineers) is an international not-for-profit professional society for optics and photonics technology. Their Astronomical Telescopes and Instrumentation conference takes place every two years and is usually held somewhere in North America or Europe. The 2024 meeting was in Japan (in Yokohama, not far from Tokyo) from 16 – 21 June.

These fascinating events are attended by over two thousand people from the worldwide astronomical instrumentation community. Thus it's the best way to get updates on all the major telescope and instrumentation developments underway around the world, as well as operational news from the various observatories. It's also the place where bad news/scary moments/growth experiences are shared to help the whole community benefit from lessons learned (e.g., the Gemini North primary mirror accident and the subsequent repair and recovery process).

As always, it was a jam-packed week of meetings, starting at 08:30 on the Sunday morning! With nine different conference streams, each with their own sets of talks and poster sessions, it's pretty chaotic to try to catch everything you're interested in. There's even an SPIE app to help delegates plan and manage their week! It's not a very Good app, but we'd be lost without it...

The middle four days kicked off with wonderful plenary sessions in the huge auditorium, spanning a range of major topics; from future space missions, to transformative approaches to community engagement. Our own Charles Takalana gave an energetic, inspiring talk that walked the large audience through the evolution of astronomy in Africa, including the establishment of the African Astronomical Society, the work done by the International Astronomical Union's (IAU) Office of Astronomy for Development, as well as the exciting lead-up to South Africa hosting the IAU General Assembly in Cape Town in August this year.



Charles Takalana giving his pleanry talk on Astronomy in Africa.

The other big highlight of the conference is the exhibition hall that's open for three of the days. Here you have dozens of vendors displaying their most interesting gadgets and wares, eagerly waiting to chat to everyone. Not only do you get to gawk at, and even play with, beautiful hardware and optics, it's also the best place to make new contacts and physically meet people you may have been corresponding with by email for years.

The poster sessions in the evenings (Monday through Thursday) are an insane crush of people all trying to skim through the hundreds of posters and get to talk to those presenting (ideally without spilling the free drinks on each other, but often not!)... It's a great opportunity to mingle around chatting to as many people as you can and to spot interesting presentations to hunt down later in the SPIE Digital Library.

There's also an assortment of social gatherings: a welcome reception on the Sunday night, networking lunches for specific groups to get together and chat; along with a number of (eye-wateringly expensive) half-day and full-day courses presented by specialists in the various fields that you can sign up for. Lastly, it was a brilliant opportunity to get to experience Japan, which truly is an amazing place! Now to catch the next instalment, in Copenhagen in 2026!

Familiar face: Brent Miszalski, ex-SALT Astronomer, now at the Macquarie University in Sydney. .

Lisa giving her invited talk on SALT instrumentation.

Lisa Crause.—

Visiting HET

Deon Lategan, Wimpie van der Westhuizen and Lisa Crause were fortunate to get to visit SALT's older twin, the Hobby-Eberly Telescope (HET) from 25 – 29 May. It's about a 7-hour drive from Austin to McDonald Observatory, which is near the quaint town of Fort Davis in West Texas. We travelled with John Booth, former chief engineer for McDonald Observatory and member of the small project team that built the HET in the early 1990s. John worked for the University of Texas until his retirement in 2012, and was deeply involved with SALT during the design and construction phases. He also contributed significantly to the investigation into, and the eventual resolution of, SALT's debilitating image quality problems from 2007 – 2010.

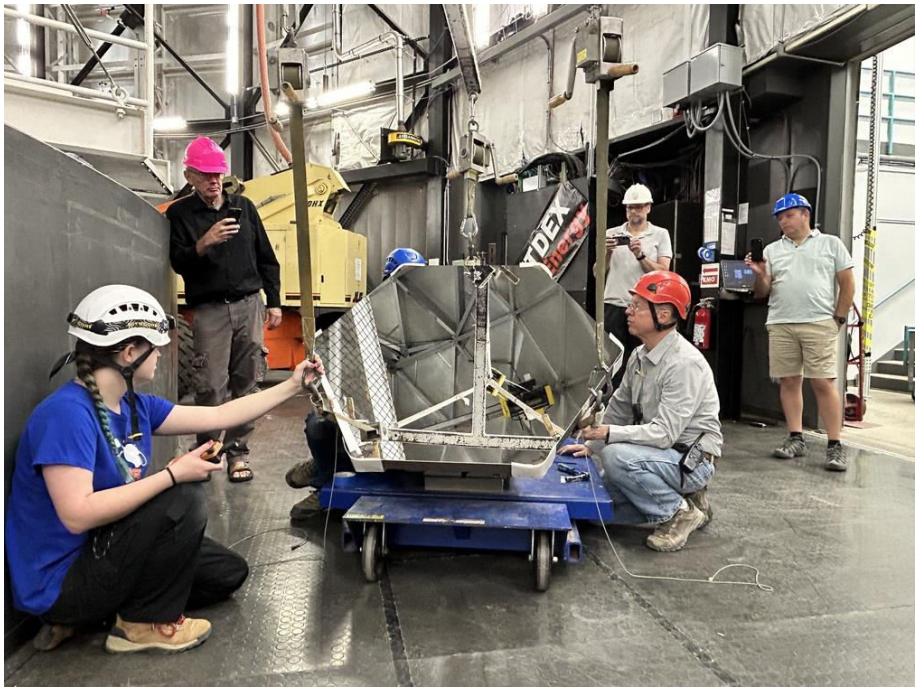
Deon Lategan, Wimpie Van Der Westhuizen and Herman Kriel (from left to right).

At the observatory we were warmly hosted by Herman Kriel, HET Facility Manager and former Ops Manager at SALT, from 2005 until his move to the HET in 2009. Herman spent his entire Sunday, and the public holiday on the Monday, sharing absolutely every detail about the telescope and instruments with us, showing us every room and system throughout the facility and outlining their many projects and challenges. The combination of Herman and John made for a fascinating backstage tour, filled with countless valuable insights and entertaining anecdotes.

We also visited the HET observers on the Sunday evening to experience their incredibly smooth night-time operations, which included getting to see observations made with VIRUS (the 156 low-resolution, integral field unit spectrographs built for HETDEX — the HET Dark Energy Experiment), as well as their infrared precision radial velocity spectrograph, the Habitable Zone Planet Finder with its laser frequency comb.

At lunchtime on Monday we joined the Memorial Day BBQ held on site for staff and families. As good as the weather, food and company was, the Observatory's exceedingly cool fire truck proved particularly captivating for the SALT engineers!

First-thing on Tuesday we were treated to the HET's amazing primary mirror CO_2 cleaning extravaganza. This is an extraordinary high-speed dance between the telescope structure, their JLG person-lift with two people onboard, a large insulated wand and an epic amount of CO_2 snow — all expertly choreographed by four members of staff who (almost) make it look easy. The whole process takes less than 15 minutes and the entire HET team takes turns doing this at least three times a week. As a result, their primary mirror looks *Gorgeous*!



The HET team is getting ready to install a fresh mirror segment, with the visitors John Booth, Wimpie and Deon in the background, watching and taking pictures.

After the mirror cleaning excitement, Deon and Wimpie donned safety harnesses and senior electronics engineer George Damm took them up in the JLG to get a close look at the tracker and payload. The latter includes their prime focus instrument platform and the impressive wide-field corrector that delivers a 22-arcmin field of view (SALT's is only 10 arcmin). We had a number of interesting conversations with various HET staff members through the day, particularly those in the software team. Next up, John took us on a tour of the McDonald telescopes over on Mount Locke, specifically the 107-inch (the primary mirror of which still bears minor scars from being shot multiple times by a mentally unstable observatory employee in 1970) and then the older, more elegant 82-inch. We also got to visit the impressive new McDonald Geodetic Observatory, an extremely fast, fully-steerable 12-m radio antenna located near the visitor centre (VC). This zippy dish contributes to very long baseline interferometry projects and efforts to define the celestial and terrestrial reference frames that global navigation systems depend on.

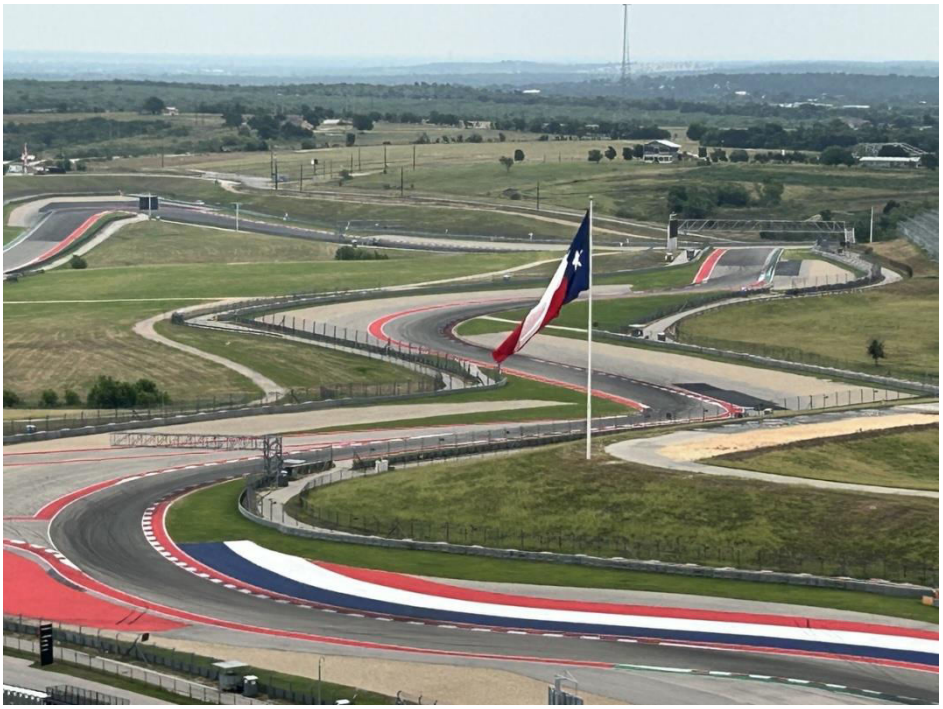
Herman had kindly arranged for us to attend a star party (public open night) on the Tuesday evening and fortunately the weather played along. After the constellation tour (tricky with everything being upside-down for us!), we got to look at a few spectacular deep-sky objects (the Whirlpool Galaxy, a beautiful planetary nebula and a globular cluster) through various telescopes that had been set up near the VC.

Before setting off back to Austin on the Wednesday morning, we got to watch the HET mirror team remove their dirtiest segment and replace it with a freshly coated one. Yet another slick operation! We couldn't resist popping back in at the wonderful shop in the VC on our way

down the hill, and that provided a chance to check out the cool solar spectrum display down there, which was pretty impressive with the sun actually shining this time!

On the Thursday we visited the Astronomy Department at the University of Texas at Austin and spent hours talking to and getting lab tours from optical guru Hanshin Lee and instrumentation specialist Phillip MacQueen. Hanshin is involved in numerous big projects, from designing a new CCAS instrument for the HET, to building half a dozen 4-channel spectrographs called VIRUS-2 for the 107-inch, as well as developing a new grating manufacturing process, among several other interesting things! Meanwhile Phillip was the person responsible for getting all of the VIRUS spectrograph units fixed up and working optimally — a massive multi-year undertaking — and now he's back to working on a major upgrade to the HET's HRS.

We spent the Friday catching our breath for the first time, eating yet more fantastic Mexican food and introducing Deon and Wimpie to the cultural experience that is shopping at Costco, a huge wholesale store that sells absolutely everything, typically in *Large* quantities! Saturday included several happy hours exploring the Formula 1 race track in Austin (known as The Circuit of the Americas) and then John put on a huge grill-fest with his partner in many a HET/McDonald Observatory crime, fellow mechanical engineer, John Good.



Sunday was another quiet day digesting all we'd experienced and on Monday it was off to the airport to begin the ~24 hour trek home. Copious notes, photos and videos were taken throughout the visit and so we have much to share with the whole SALT Ops team now that the dust from that trip, as well as the SPIE conference in Japan soon afterwards, is settling at last! It's both exciting and inspiring to see what these unusual telescope are capable of, we have lots of good work to do :)

Lisa Crause.—

SALT SCIENCE PAPERS

April 2024 – July 2024

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.

- Potter, S. B., Buckley, D. A. H., Scaringi, S., et al. 07/2024: Optical spectroscopic and photometric classification of the X-ray transient EP240309a (EP J115415.8-501810) as an intermediate polar, MNRAS 532, L21 -- https://ui.adsabs.harvard.edu/abs/2024MNRAS.532L..21P
- Bachelet, E., Rota, P., Bozza, V., et al. 07/2024: A Close Binary Lens Revealed by the Microlensing Event Gaia20bof, AJ 168, 9 -- https://ui.adsabs.harvard.edu/abs/2024AJ....168....9B
- Proshina, I. S., Sil'chenko, O. K., & Kniazev, A. Y. 06/2024: Spectral study of star-forming rings in S0 galaxies of Dorado group - NGC 1533 and NGC 1543, MNRAS 531, 2448 -- https://ui.adsabs.harvard.edu/abs/2024MNRAS.531.2448P
- Malyali, A., Rau, A., Bonnerot, C., et al. 06/2024: Transient fading X-ray emission detected during the optical rise of a tidal disruption event, MNRAS 531, 1256 -- https://ui.adsabs.harvard.edu/abs/2024MNRAS.531.1256M
- Podjed, S. A., Hickox, R. C., Isler, J. C., Böttcher, M., & Schutte, H. M. 06/2024: Optical Spectropolarimetric Variability Properties in Blazars PKS 0637–75 and PKS 1510–089, ApJ 968, 130 -- https://ui.adsabs.harvard.edu/abs/2024ApJ...968..130P
- Singh, K., Ninan, J. P., Romanova, M. M., et al. 06/2024: Accretion Funnel Reconfiguration during an Outburst in a Young Stellar Object: EX Lupi, ApJ 968, 88 -- https://ui.adsabs.harvard.edu/abs/2024ApJ...968...88S
- Marocco, F., Kirkpatrick, J. D., Schneider, A. C., et al. 06/2024: Thirteen New M Dwarf + T Dwarf Pairs Identified with WISE/NEOWISE, ApJ 967, 147 -- https://ui.adsabs.harvard.edu/abs/2024ApJ...967..147M
- Kołaczek-Szymański, P. A., Łojko, P., Pigulski, A., Różański, T., & Moździerski, D. 06/2024: Exploring extreme brightness variations in blue supergiant MACHO 80.7443.1718: Evidence for companion-driven enhanced mass loss, A&A 686, A199 -- https://ui.adsabs.harvard.edu/abs/2024A&A...686A.199K
- Ok, S., Schwope, A., Buckley, D. A. H., & Brink, J. 06/2024: Discovery of the magnetic cataclysmic variable XMM J152737.4-205305.9 with a deep eclipse-like feature, A&A 686, A175 -- https://ui.adsabs.harvard.edu/abs/2024A&A...686A.175O
- Ochmann, M. W., Kollatschny, W., Probst, M. A., et al. 06/2024: The transient event in NGC 1566 from 2017 to 2019. I. An eccentric accretion disk and a turbulent, disk-dominated broad-line region unveiled by double-peaked Ca II and O I lines, A&A 686, A17 -- https://ui.adsabs.harvard.edu/abs/2024A&A...686A..17O
- Oates, S. R., Kuin, N. P. M., Nicholl, M., et al. 05/2024: Swift/UVOT discovery of Swift J221951-484240: a UV luminous ambiguous nuclear transient, MNRAS 530, 1688 -- https://ui.adsabs.harvard.edu/abs/2024MNRAS.530.1688O
- Gerasimov, I. S., Egorov, O. V., Moiseev, A. V., et al. 04/2024: Stellar feedback impact on the ionized gas kinematics in the dwarf galaxy Sextans B, MNRAS 529, 1138 -- https://ui.adsabs.harvard.edu/abs/2024MNRAS.529.1138G
- Kirkpatrick, J. D., Marocco, F., Gelino, C. R., et al. 04/2024: The Initial Mass Function Based on the Full-sky 20 pc Census of ~3600 Stars and Brown Dwarfs, ApJS 271, 55 -- https://ui.adsabs.harvard.edu/abs/2024ApJS..271...55K

- Gaudin, T. M., Kennea, J. A., Coe, M. J., et al. 04/2024: Discovery of a Rare Eclipsing Be/X-Ray Binary System, Swift J010902.6-723710 = SXP 182, ApJL 965, L10 -- https://ui.adsabs.harvard.edu/abs/2024ApJ...965L..10G
- Andrews, J. E., Pearson, J., Hosseinzadeh, G., et al. 04/2024: SN 2022jox: An Extraordinarily Ordinary Type II SN with Flash Spectroscopy, ApJ 965, 85 -- https://ui.adsabs.harvard.edu/abs/2024ApJ...965...85A
- Kovtyukh, V. V., Andrievsky, S. M., Werner, K., Korotin, S. A., & Kniazev, A. Y. 04/2024: Lithium Cepheid V708 Car with an unusual chemical composition, A&A 684, A145 -- https://ui.adsabs.harvard.edu/abs/2024A&A...684A.145K
- Arcodia, R., Liu, Z., Merloni, A., et al. 04/2024: The more the merrier: SRG/eROSITA discovers two further galaxies showing X-ray quasi-periodic eruptions, A&A 684, A64 -- https://ui.adsabs.harvard.edu/abs/2024A&A...684A..64A