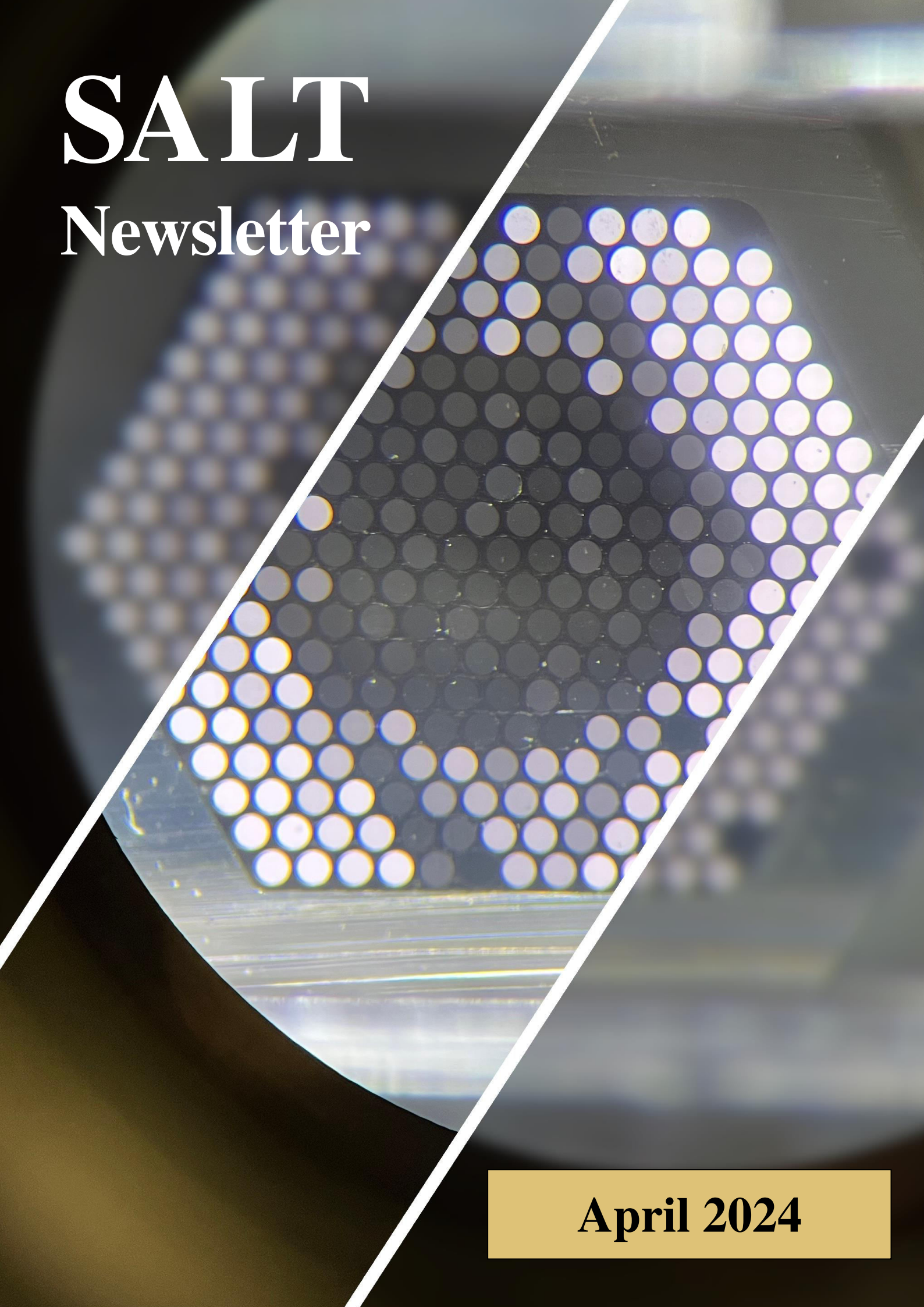
SALT
Newsletter



April 2024

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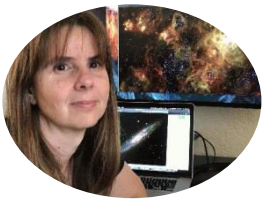
Editor: Anja C. Schröder

Cover image: SALT slitmask IFU. -- *Credit*: Lisa Crause

Letter from the Head of Astro Ops



Dear SALT Community,

Good news — our weather downtime since our last newsletter stayed pretty much as expected for a regular Sutherland summer, at 35.7%! This enabled us to complete the Guaranteed Science Observations for the NIRWALS team and to continue commissioning tests for our upcoming LFC as well as the RSS slitmask IFU, which saw first light on 8 March — please see Sabyasachi's article below for more details. Congrats team! ☺ RSS has also been behaving much better after some hardware repairs earlier this year (details are also below), so, hopefully, we should be good to go until the new detector arrives! And on that subject, the new RSS detector project is still progressing well and we remain on track to begin on-sky commissioning during the first half of 2025.

Our efforts to improve on our acquisition efficiency are also finally paying off — we have reduced our acquisition overheads by about 50s per block for RSS and HRS over the last semester, and we think we can do even better! If you're wondering how we've managed this, please read Malcolm's article about using machine learning to stabilise SALT's focus. This, in combination with the project he is leading to pre-position our guiders in the correct location for each instrument, is what will allow us to achieve even faster acquisition times. We are hoping to incorporate our new overheads in the next call for proposals, which will be announced mid-June, with a deadline end of July — stay tuned!

We are also updating our SALT Status webpage (https://astronomers.salt.ac.za/status) to reflect automatically individual instrument and mode status and, if they're down, when they're expected to return to service — this should be live in the next day or two, so please check it out and let us know what you think: salthelp@salt.ac.za. At the time of writing, the LFC team are currently in Sutherland working hard on the final installation phase, and the RSS and the NIRWALS science pipelines are nearing completion — so we will give you a full update in the next newsletter.

We also share some sad news: Firstly, as most of you know, Petri Väisänen, former SALT Astronomer and now ex-Director of SAAO, resigned at the end of March to take up his dream job in Finland. We've included a brief article below about this. Additionally, SALT Astronomer Solohery Randriamampandry also left the team at the end of March, and SALT Operator Thea Koen, has submitted her resignation with effect end of May — we wish them all the best on their exciting new endeavours. If you or someone you know are interested in joining the SALT team as a SALT Astronomer, the position is now open and accepting applications: please visit https://aas.org/jobregister/ad/666558ec for details. And please share widely!

Clear skies and stay safe!

Encarni

SCIENCE HIGHLIGHT

SALT/RSS probes the history of the galaxy assembly of the counterrotating disc galaxy PGC 66551

by Ivan Katkov (New York University Abu Dhabi, UAE)

Considering the kinematics of disc galaxies, one naively expects that the bulk of the stars rotate in the same direction. However, some galaxies can host a significant fraction of stars (in some drastic cases, almost 50%) rotating in the same plane of the galaxy, but in opposite directions. Such a configuration of a counter-rotating (CR) disc can exist due to the collisionlessness of stellar components since the distance between the stars is much larger than the radius of significant gravitational interaction. After the first discovery in 1992 by Vera Rubin, galaxies hosting CR discs were long assumed to be quite rare. However, thanks to massive spectroscopic surveys, especially SDSS MaNGA, it has been found that stellar CR galaxies constitute around 1% of the galaxy population.

We initiated a multi-semester project with SALT to obtain deep RSS spectroscopy for a sample of CR disc galaxies. We have now published the first results of our observational campaign dedicated to the pivotal observations of CR galaxy PGC 66551 and demonstrate the power of RSS spectroscopy for studying stellar counter-rotation. We found that the CR disc is compact, contains young stars with subsolar metallicity, and has a stellar mass of 5×10^9 M⊙, which amounts to approximately 20% of the galaxy's total. Surprisingly, the main, 8 Gyr old disc of PGC 66551 has a significantly lower metallicity of –0.8 dex than other CR galaxies. By applying a toy model of metal enrichment to reproduce this peculiarity, we constrained the parameters of the galactic outflow wind and estimated the metallicity of the infalling gas that formed the CR disc to be between –0.9 and –0.5 dex. We argued that a merger with a gas-rich satellite, rather than cold accretion from a cosmic filament, was most likely the source of gas that then formed the CR disc in PGC 66551.

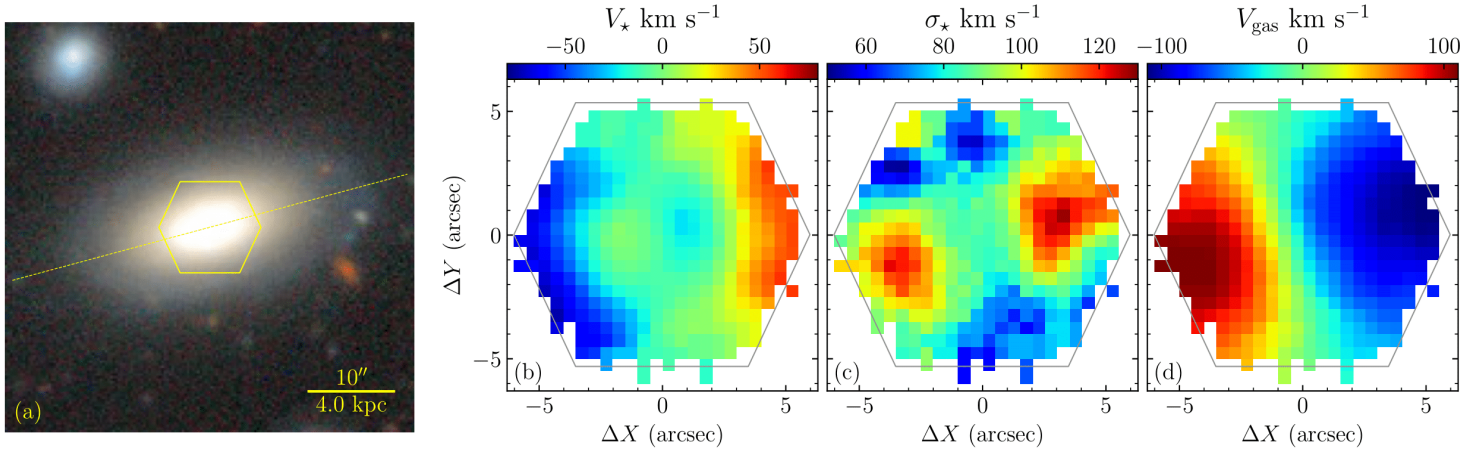


Figure 1: A composite image of the PGC 66551 galaxy taken from the DESI Legacy Imaging Survey (Dey et al. 2019; https://www.legacysurvey.org) is shown in (a). SALT long-slit orientation is shown by a dashed yellow line, while the hexagon presents the MaNGA field of view. The next three panels show the stellar velocity (b), stellar velocity dispersion (c), and ionised gas velocity based on the Hα line (d), all taken from MaNGA DR16 DAP.

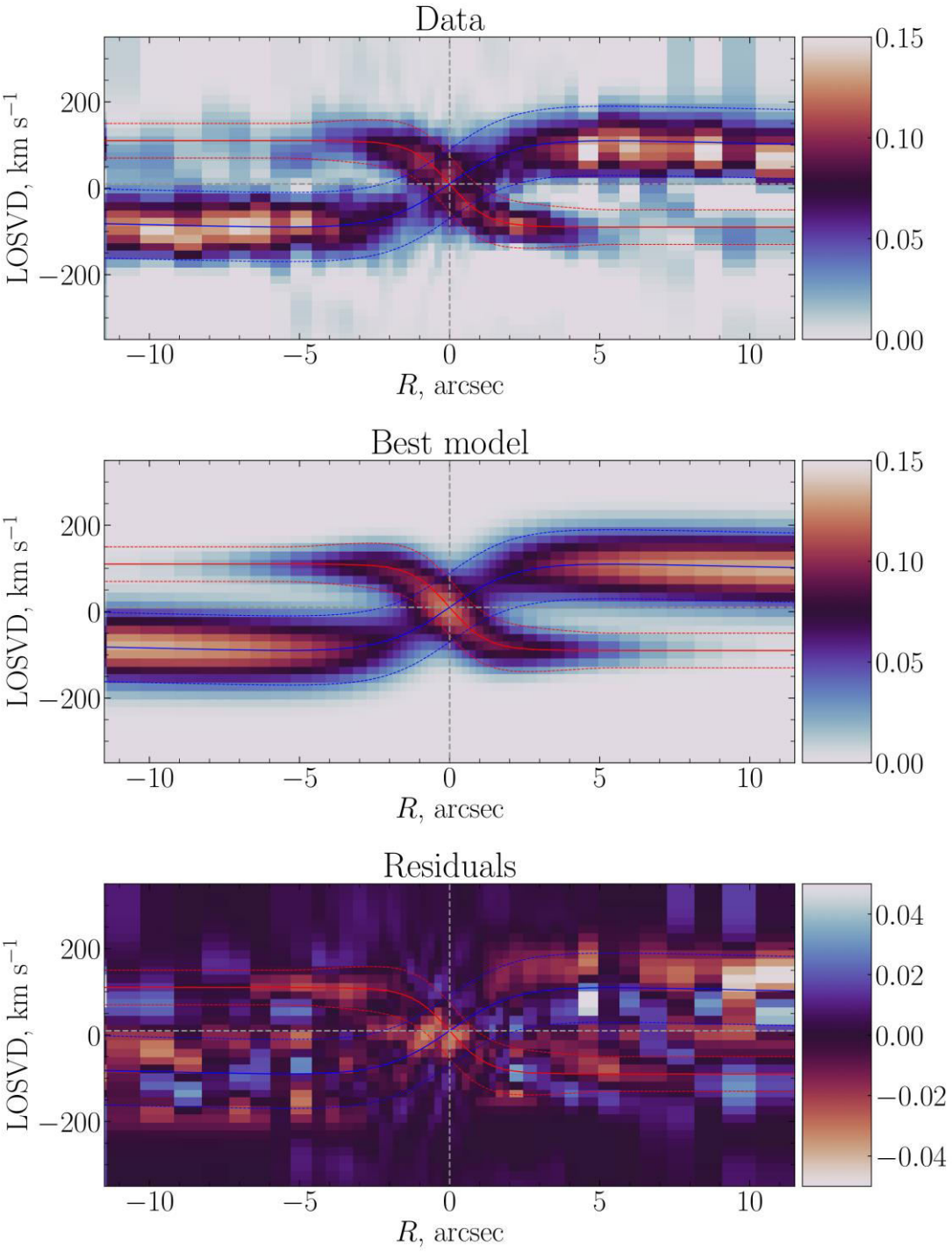


Figure 2: Recovered nonparametric stellar LOSVD (top panel) based on the SALT long-slit spectrum. The recovered LOSVD is normalised to unity in each spatial bin. The model of two CR discs and its residuals are shown in the middle and bottom panels. Two components are clearly detected, and the CR disc is clearly visible within ≈5''.

Published as Katkov et al. (2024), ApJ 962, 15

Good Bye to Petri Väisänen

As most of you know, Petri Väisänen resigned from his position as Director of the SAAO to pursue his dream job in his home country, Finland, at the end of March.

Petri was actually the 2nd SALT Astronomer ever employed, the first being myself (Encarni) who was already in South Africa at the time and therefore I had a head-start. Petri arrived from Chile with his lovely family nearly 20 years ago and swiftly became both a brilliant colleague and friend. He was an excellent SALT Astronomer. He became Head of SALT Astronomy Operations in 2015, and SAAO Director in December 2018.

Just before he left, Petri handed over the symbol of his power to our Acting Director, who you actually already know: (ex-)SALT Astronomer Rosalind Skelton (photo). Ros has big shoes to fill, but she is doing an excellent job already and I'm sure she will be as awesome at being the SAAO Director as she was as a SALT Astronomer. Long live the new "queen"! ☺

Petri made so many contributions to SALT and the SAAO over the years, if I start listing them I'll fill the entire newsletter and I'm still likely to forget some.

So, in the spirit of keeping this short and light, we would just like to thank Petri for all of the contributions big and small he has made to SALT and to SAAO over the years and wish him all the best in his new role "back home". Petri, we'll miss you — you rock!

Encarni Romero Colmenero.—

RSS news

Cryostat and unwanted warming events

In the previous newsletter, we reported on the successful repair of a leak in the RSS cryostat. That repair has held up well in the months since. For most of the semester since then, however, we have been troubled with regular 'warming-up' events, whereby the cold end temperature starts to rise rapidly from its nominal value. The temperature of the CCD quickly follows suit and often requires manual intervention from the Tech Ops team. This quick-fix essentially involves turning the cryo cooler off and on again, which seems to flush the system and allow the temperatures to return to normal within a few hours.

The longer-term fix for this was to order a new compressor (and gas) to replace the struggling parts. This took a lot longer than hoped, but we are happy to say we have now received the new compressor and the gas, which are making their way to Sutherland at the time of writing. This is a major risk mitigation step and will ensure RSS remains operational until the new detector is ready to roll – an event which we optimistically pencil in for early 2025.

Data buffer issues with the PXI rack

A regular problem with RSS this semester has been with the two motion control (PXI-7334) cards that PCON uses to talk to the RSS hardware. These cards are mounted in a chassis, which is set up and maintained by the MAX software. At some point, we think the chassis must have failed in a subtle way, which resulted in an error related to the read data buffer.

This error (usually) manifested itself as configurations being dropped from PCON. The mechanical setup of RSS is actually fine, but the software 'forgets' what the config actually is. This was a problem for blocks with multiple configs, and especially for polarimetry blocks, in which several parts need to move in between exposures. If a data buffer error occurred during such observations, we would have to junk the entire visit.

The SALT software team spent a lot of time and effort trying to solve this unusual problem. A temporary fix was to create a GUI that allows us, the observers, to flush the data buffer when the error occurs. This essentially resets the buffer and removes the error state, allowing us to continue with the observation. However, this was not a long-term solution and it still did not solve the problem for polarimetry blocks because the wave plates could not recover.

Nonetheless, at the time of writing this update, we are pleased to report that this problem seems to have been fixed. After a long and arduous search for a replacement chassis, a spare was eventually found buried in the SALT store room. When this was installed, the read data buffer error went away. We are all crossing our fingers that it doesn't return!

New MOS mask material

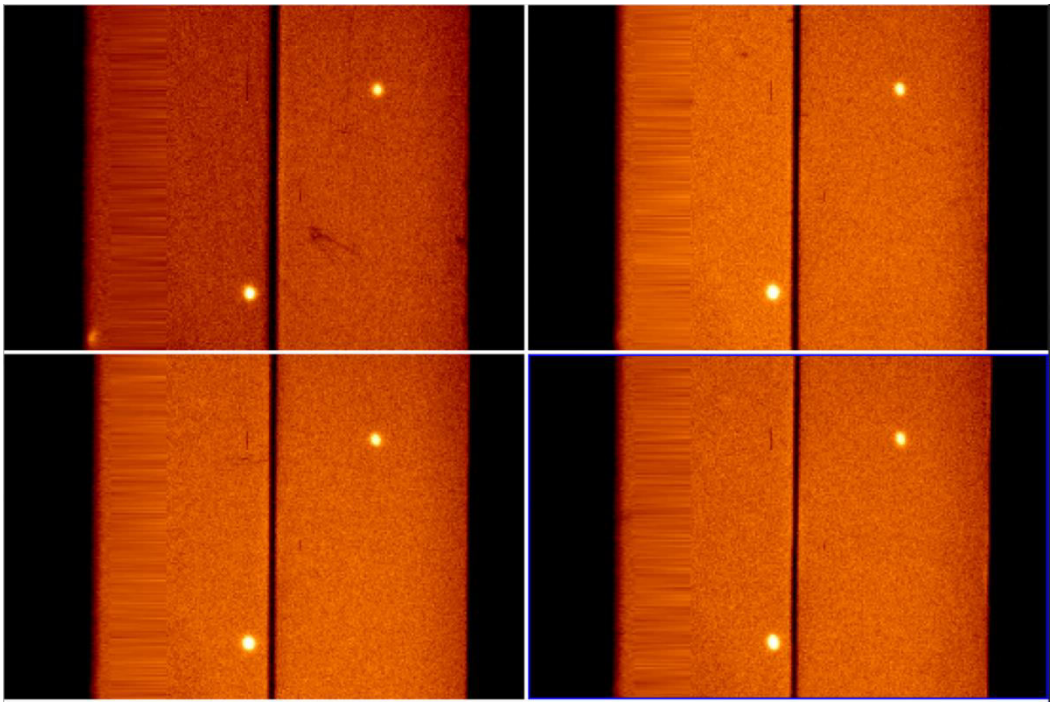
MOS masks used in RSS are cut from 0.2mm thick carbon fibre blank sheets. Enough of these sheets are typically ordered to last a couple of years. When the time came to order a new batch, the USA supplier was unresponsive. With supplies on hand running low and the original supplier unresponsive it was clear that replacement material was needed and soon.

The requirements for the new material were simple. It should block out light, have descent stiffness, and our laser cutter should be able to make clean cuts. Several carbon sheets were tested but none ticked all of the requirement boxes. During a late morning coffee discussion, Jonathan told Nico about a composite company based in Strand that he used in a Calsys project. *Advanced Fibre Form* was very interested in helping to develop the carbon fibre blanks we required. After some collaboration, a new carbon blank sheet was tested and accepted. The new sheet is manufactured from a single layer of prepreg twill weave carbon fibre and epoxy. It is autoclave cured using a peel ply process. Around 70 MOS masks (and several engineering masks) have been cut from the new material with a second batch already ordered.

New longslits

In the last annual review, we discussed the efforts of the SAAO mechanical workshop to produce a full set of new slit-masks for RSS. Some of that information is repeated here, with an update on the status.

The first set of SAAO-cut longslits (1.5” and 2” x 8’) were tested on-sky in August 2023 and showed remarkable promise. It was immediately obvious from inspection of flat field frames that the new samples were a significant improvement over the existing slit-masks. This was also evident from the slit-view frames, with no visible defects along the slit edge and increased reflectivity of around 20%.

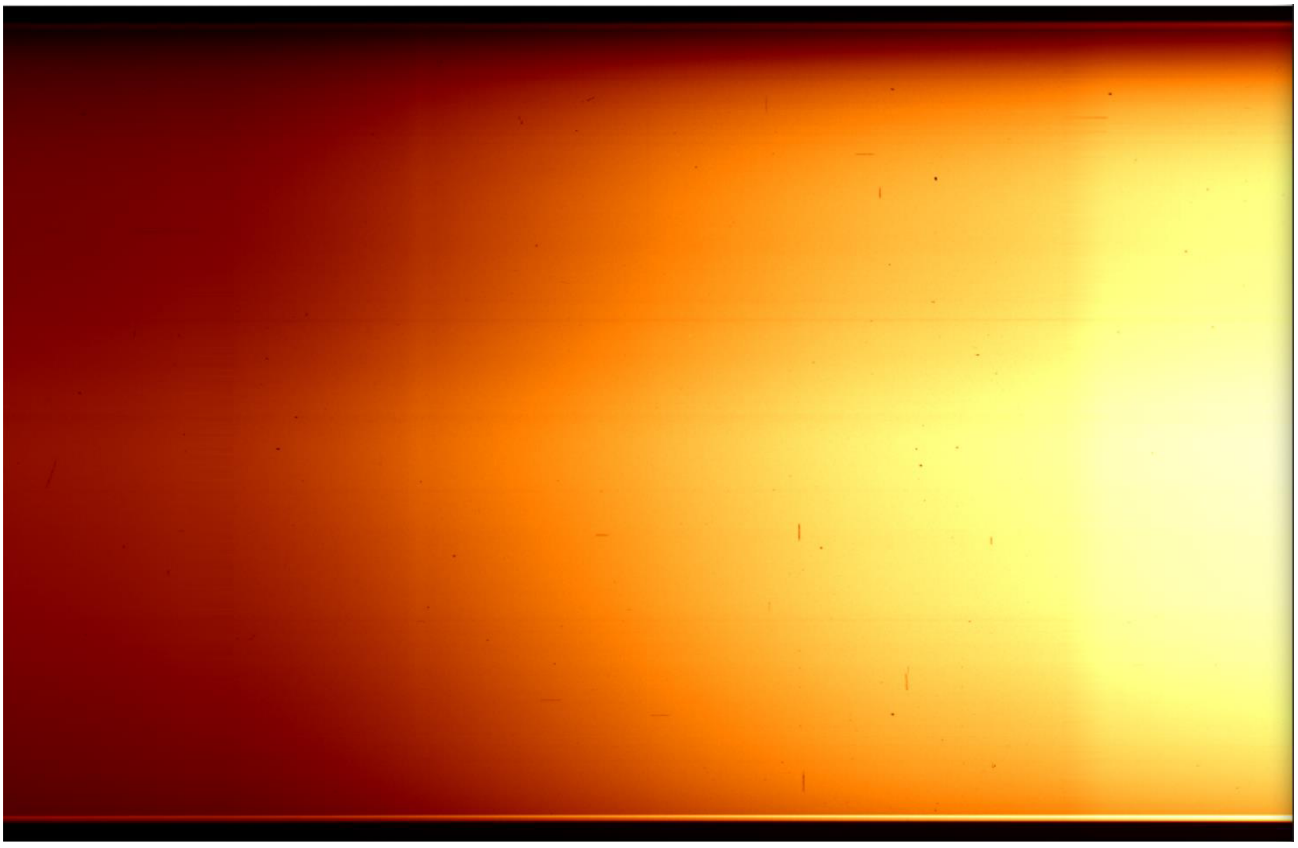


Slit-view of the 3 sample longslits, compared to the existing 2” longslit (top left).

However, as one can also see from the figure, our existing 2” slit (top left) is wider than the newly cut 2” slit (top right). This was also evident from the resolution of arc lines. After a bit of head scratching, we discovered that the settings used to cut the new slit masks were not quite right, and they had in fact cut the slits slightly narrower than desired.

This was quickly corrected and a second set of samples were cut and sent to the telescope for inspection in October 2023. At that time, we had BCAM installed because of emergency repair work to SALTICAM, so it was very difficult to assess the quality of the new samples on slit-view. The arcs and flats, however, showed excellent results and also told us that the longslit production process was repeatable at a very high standard.

Engineering tests by the Tech Ops team also showed the samples exceeded our initial requirements for straightness, flatness and reflectivity. Everyone was happy! With one final adjustment to the manufacturing process just before the Christmas break (to make sure that all longslits are cut to exactly 8’ in length, and all polarimetry masks to 4’ in length), we were ready to start cutting our production set of new masks. The first mask (3” x 8’) has very recently been verified at the telescope and looks good, as can be seen from the uniform flat field frame below.



Flat field frame using our first production longslit (3” x 8’).

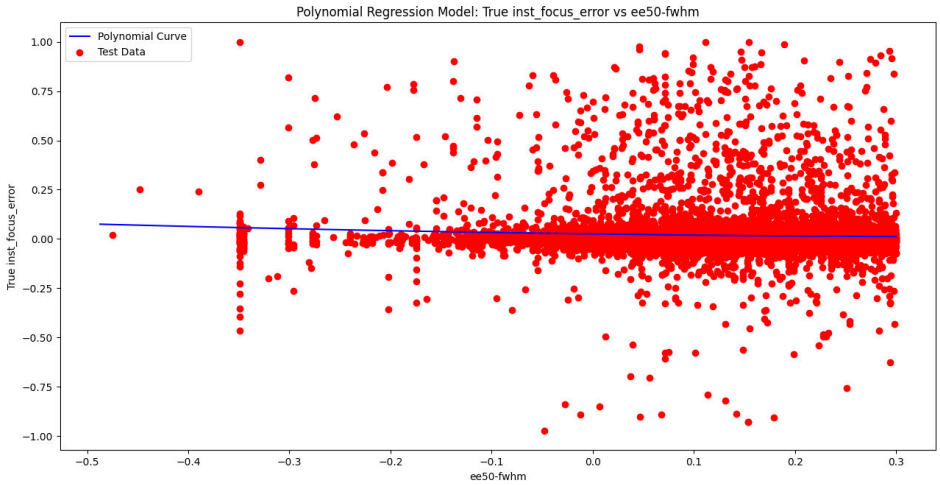
As I write this article, under a cloudy night sky from the SALT control room, we have now installed the final versions of our 2” and 3” x 8’ longslits for regular science. Unfortunately, a small defect was found in the 1.5” x 8’ slit mask, which meant it had to be recut. This is hopefully just a small delay, as the SAAO workshop can now manufacture this with good repeatability. In fact, we have the new 0.6” x 4’ polarimetry mask set here ready to be tested on sky after Easter.

Lee Townsend, Nico van der Merwe, Anthony Koeslag.--

Machine learning focus model

The primary aim of the focus project was to develop a model, specifically to provide focus control for the FIF (fibre instrument feed) guider. The FIF guider probe does not have a PWFS (pyramid wave front sensor) that splits the incoming light into two ‘spots’ to provide focus control. This is currently done for the RSS guiders and works well to maintain focus during observations.

Extensive efforts were made to model the focus for the FIF based on data recorded by the RSS guiders. However, it was realised that due to the RSS guiders having a PWFS that allows analysis of the two spots (instead of relying on environmental data to maintain focus), this posed a significant challenge in modelling the focus for the FIF guider. The available data would only produce a very noisy assumption, instead of the fine focal adjustments needed. Various attempts at producing an accurate model were made using environmental data such as the ee50 (50% encircled energy radius of the guidance object) and FWHM values, but none were able to accurately describe the way the RSS guiders maintain focus. The data (see below) was far too noisy to properly build a reliable model for what was required.



Initial model of how the separation in the ee50 and FWHM values are affected by the changes applied by the RSS guiders.

It should be noted that the RSS data that this model was being built from was obtained while the guiders were active. As a result, the focus would always be ‘good’ and hence any drift in the separation of the ee50 and FWHM values could not be attributed to how the guiders were choosing to correct the focus. With no specific instances where the guiders were not working, it is difficult to draw conclusions about how the focus changes the difference between the ee50 and FWHM values.

This led to an investigation into adding auto focus capabilities (that is, a PWFS) to the FIF guider (including the relevant software changes), so that the SALT Operator does not need to constantly adjust for the focus drift.

Instead of trying to model the separation in the ee50 and FWHM values with respect to the correction made by the RSS guiders, efforts were directed at building a focus model that would better control the overall focus of the telescope, where environmental data is a factor in determining how the focus varies throughout a track. It was decided that machine learning (ML) would generate a more dynamic model and thus give us the best chance of capturing the complexities of the focus of the telescope.

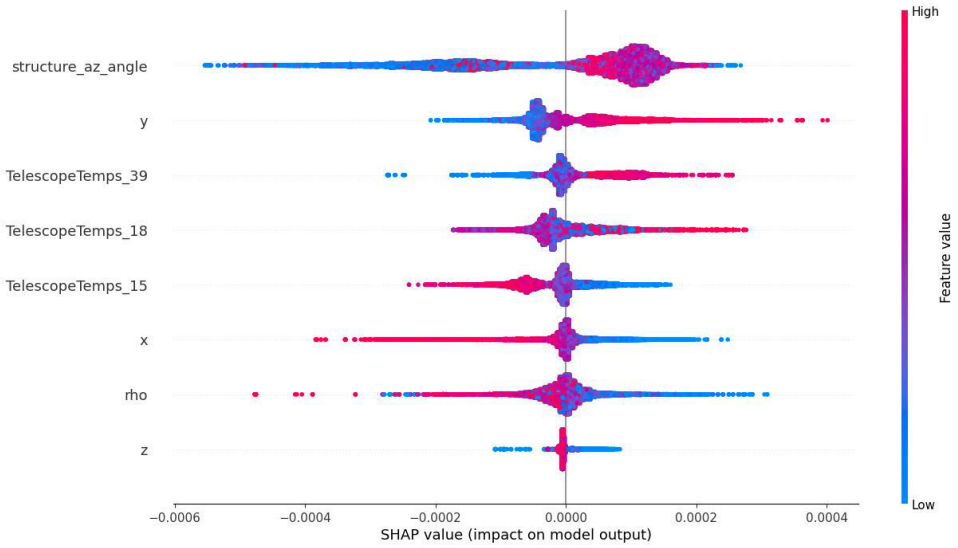
A python library called Autogluon was found to be best at capturing the complex nature of how the focus shifts throughout a track. Autogluon allows for a wide range of ML models to be rigorously tested against each other, allowing us to choose the best performing ML model based on a number of statistical metrics.

This model was trained on a year's worth of data from 2022 and included the tracker locations, the structure azimuth, and temperatures. The model specifically trained on in-focus data to ensure that we got a good quality set of data for the model to work with.

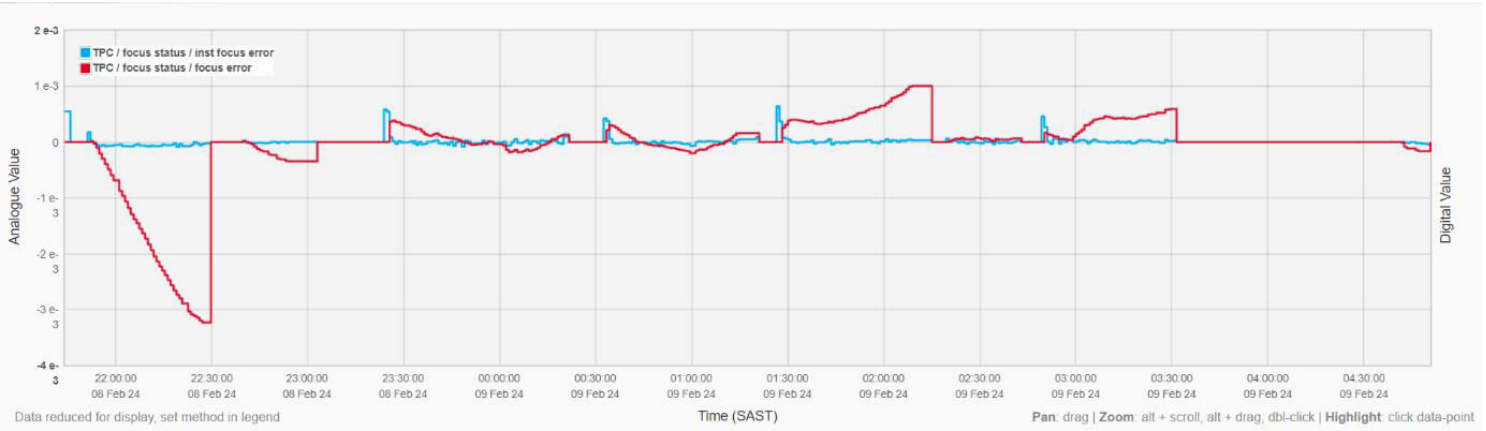
	model
0	WeightedEnsemble_L3
1	ExtraTreesMSE_BAG_L2
2	RandomForestMSE_BAG_L2
3	NeuralNetFastAI_BAG_L2
4	CatBoost_BAG_L2
5	LightGBMLarge_BAG_L2
6	LightGBM_BAG_L2
7	LightGBMXT_BAG_L2
8	WeightedEnsemble_L2
9	KNeighborsDist_BAG_L1
10	NeuralNetTorch_BAG_L2
11	XGBoost_BAG_L2
12	KNeighborsUnif_BAG_L1
13	LightGBMLarge_BAG_L1
14	ExtraTreesMSE_BAG_L1
15	LightGBM_BAG_L1
16	RandomForestMSE_BAG_L1
17	CatBoost_BAG_L1
18	LightGBMXT_BAG_L1
19	NeuralNetTorch_BAG_L1
20	NeuralNetFastAI_BAG_L1
21	XGBoost_BAG_L1

A leaderboard of all the different ML models that were used.

Accuracies for this model were better than expected and a Flask web application was created to allow for the Telescope Control System (TCS) to interface with the model, since the version of LabView that is used does not natively allow for python to be integrated into it. Initial daytime tests showed that TCS can send and receive data from the Flask application, and so on-sky tests were done on the same day. They showed that the model did not immediately pull the focus far out, which could have easily been the case! The model needed to be added to the existing polynomial focus model, but once that change had occurred, it could be seen that the guiders were not having to make many large corrections, showing that the ML model was successfully keeping the focus stable. After the first night of initial tests we saw a 30% increase in the stability of the focus over that evening.



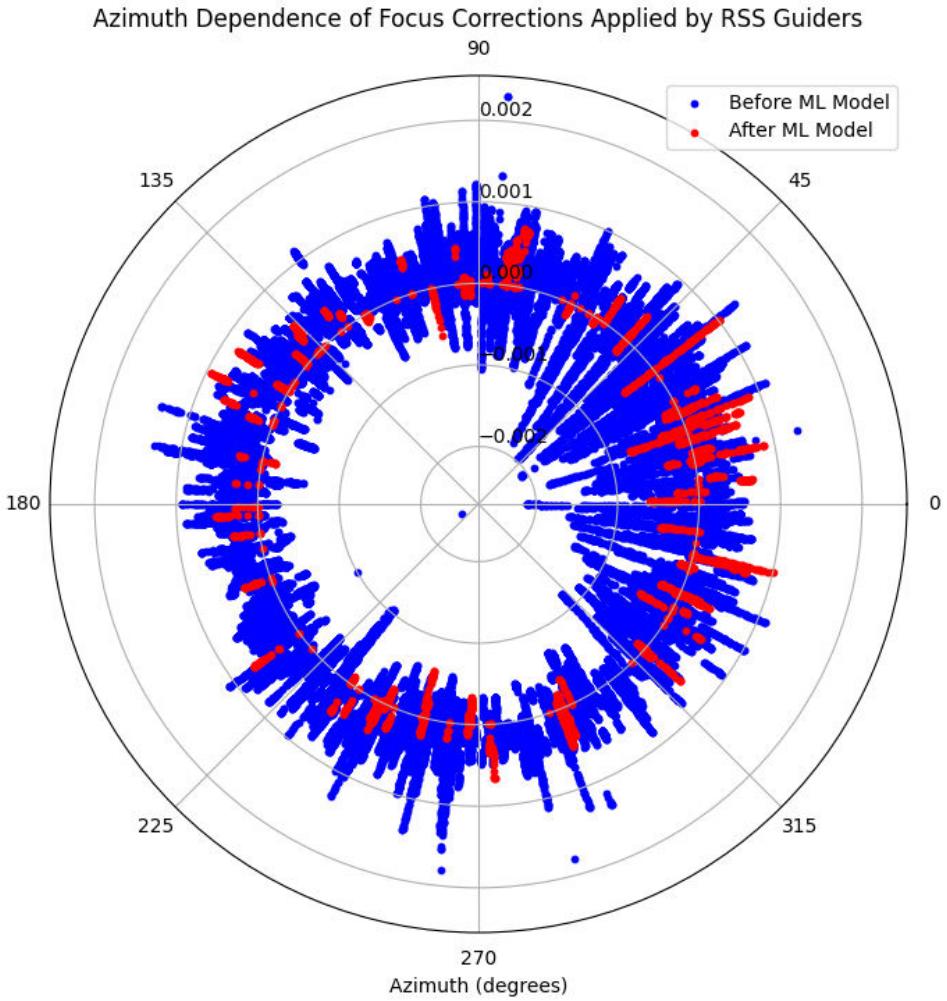
A SHAP diagram describes how each feature value contributes to the movement of the Delta Z of the tracker. It can be seen that the structure azimuth contributes the most to the ML model.



The red plot shows the corrections that the RSS guiders had to apply. The first major dip is when the polynomial model was not being added to the ML model. The focus for the rest of the blocks can be seen to perform significantly better.

The model was monitored closely for the following weeks and the figure on the next page shows the difference that the model has made so far.

The model is not without its own faults of course. There have been a few instances where the model has pushed the telescope out of focus for specific tracks. These are very isolated incidents, and efforts are being made to rectify them. The consistency of these drifts is low and so the focus model has not been adjusted just yet, as we are uncertain whether this will cause other issues.



A polar plot of the focus drift before and after the ML focus model was implemented. Previously, the drift ranged from –2mm to +1mm, whereas after the ML model implementation, the focus only drifted between –0.75mm and +1mm.

As the model has only been dealing with keeping the telescope focus stable, and not pulling it in from being out of focus, future plans include incorporating the current polynomial model into the ML model. This way the ML model would control the majority of the focus corrections, allowing for a more dynamic system to handle complex scenarios. This means that the ML model will need to be moved onto a more secure server inside of the SALT network, so that it does not fail if there are any network issues or load shedding problems.

Malcolm Scarrott.--

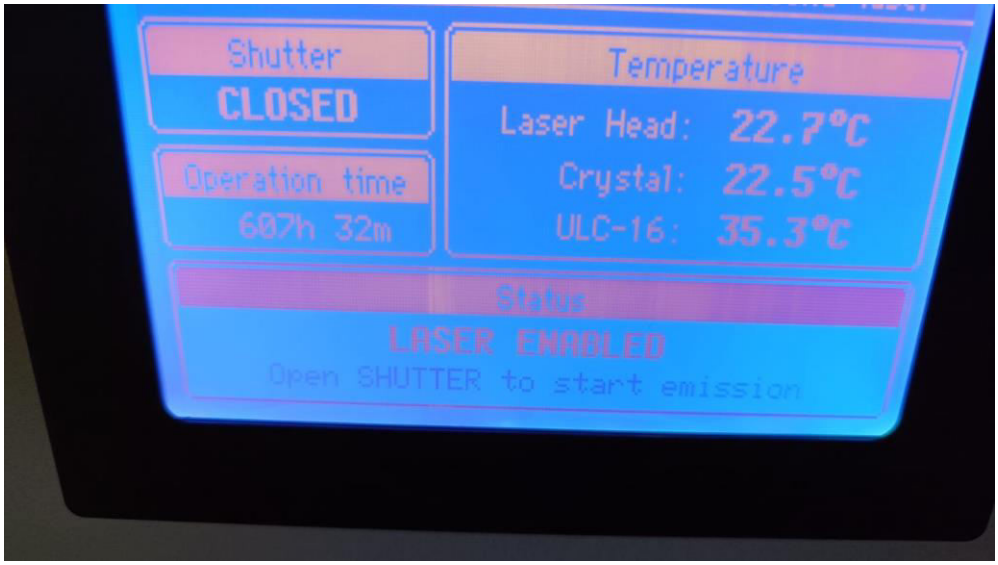
LFC update

The next stage of the LFC integration is due to start at the end of April — when Richard and Shan will return to SA for 10 days. We will pick them up at the airport and drive straight to the telescope to continue where we left off in early December. That last campaign was somewhat derailed when a firmware update (that the vendor told us to do) for the main laser went awry and the system got locked — to the extent that even the Laser Quantum (LQ) support team in the UK could not communicate with the laser at all. Richard, Shan and Derryck still made a great deal of progress during that visit, but having the heart of the system unavailable for the final three days did limit what they were able to complete. LQ subsequently sent us a dongle that allowed us to re-establish comms with the laser and its controller to reset everything. The support team then did a remote service to tweak the internal alignment of the laser to get the power output back to nominal and it has been behaving well ever since. This next visit will be from 29 April to 9 May — later than we had hoped, but this is the earliest that our respective schedules permitted.

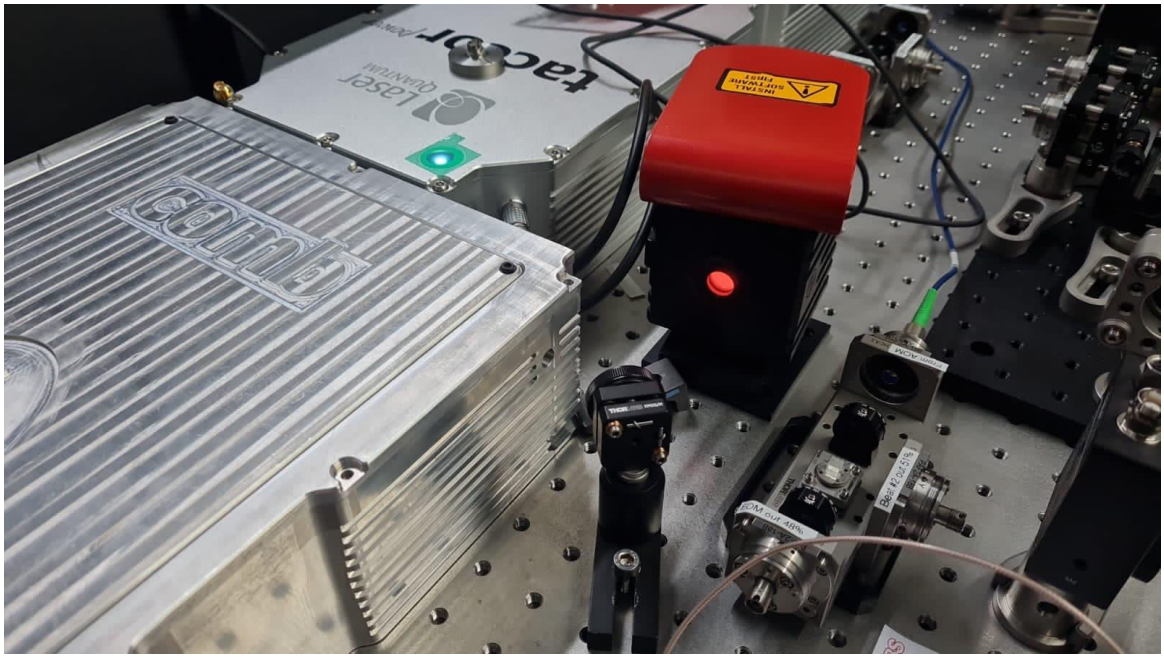
In terms of the HS pipeline development — Daniel Holdsworth has the reductions for the Blue channel of HRS working well, but the Red channel is much more challenging (due to the severe shortage of arc lines in the red half of the chip, as a result of the filter that is needed to keep the worst of the bright argon line saturation from bleeding across the whole chip). It is exactly because of how problematic the Red channel's ThAr spectrum is that we are building an LFC for the Red channel first, so it is less important to get this part of the pipeline ironed out at this stage. The LFC will simplify wavelength calibration for the Red side once it is operational. As a result, Daniel has now moved over to reducing a variety of data to evaluate the performance and stability of the instrument on different timescales. This includes the daily ThAr reference arc calibration frames (obtained over the past three years) to check the long-term behaviour, as well as the various stability test runs (ThAr reference arc frames for monitoring stability over the course of hours, and repeated months apart). We have also been taking on-sky data, using simultaneous ThAr observations of stars with known planets to test both the instrument and the pipeline, so those data will be reduced and analysed after the calibration frames have been dealt with.

Given the delay in completing the LFC, the pipeline development will also be held back. It is not yet clear exactly what the schedule impact will be, but we will know much more by the end of the upcoming LFC integration campaign...

The display for the laser power.



The laser is ready to be used.



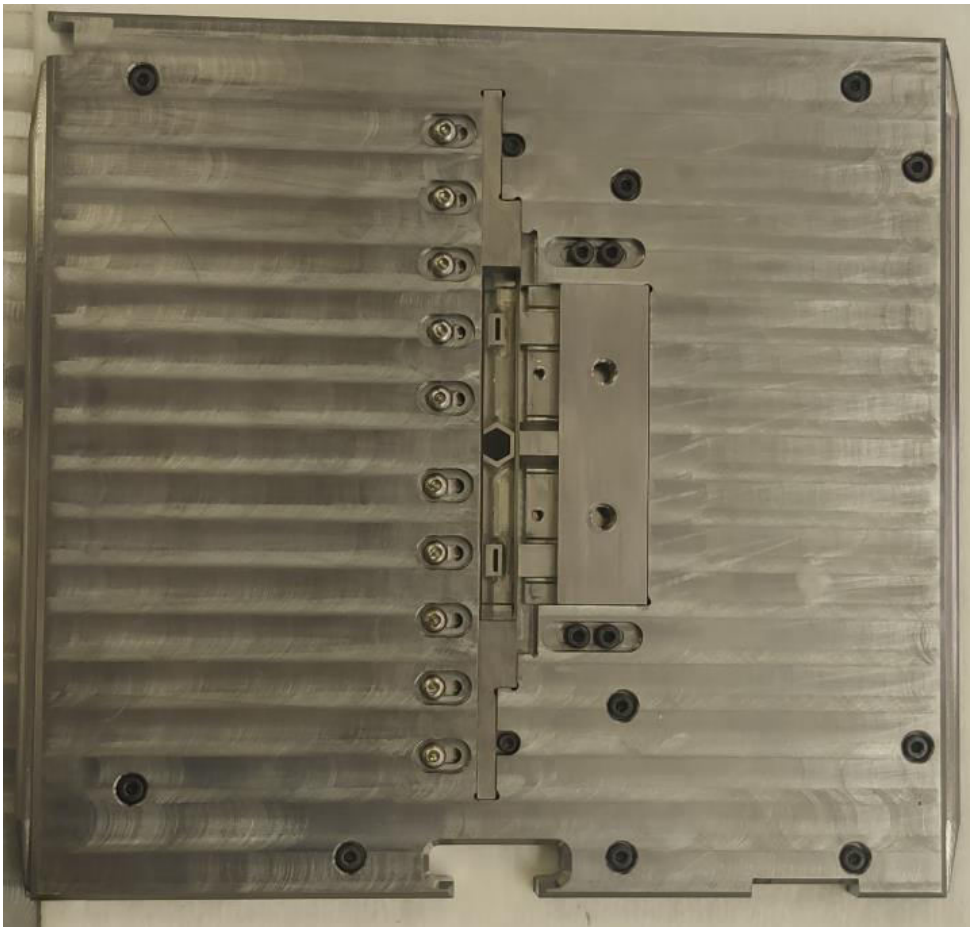
Testing the laser.

Lisa Crause.--

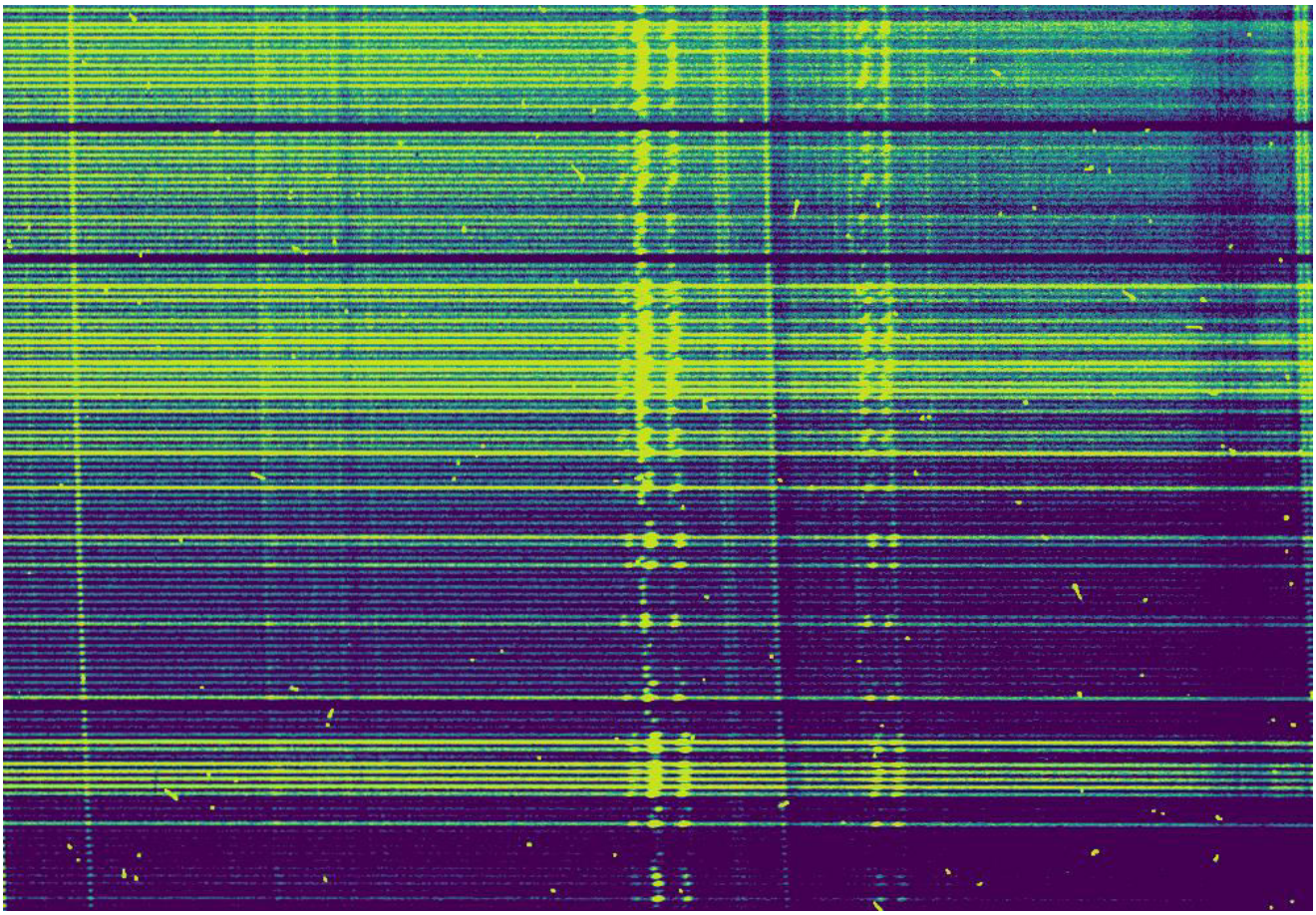
Slitmask IFU update

The Astro-photonics Lab at SAAO has been initiated and matured by Matt Bershady (UW) during his tenure at SAAO. On behalf of the Astro-photonics Lab, I feel excited to inform you that the first version of the Slit Mask Integral Field Unit (SMI) has recently gone through engineering commissioning. The SMI uses 200µm/0.9”-diameter core optical fibres (hence the name SMI-200) with an on-sky footprint of 18" x 23" through 309 fibres and two additional sets of 17 fibres each to sample the sky. The preliminary tests show that SMI-200 is achieving on-telescope median throughput similar to the in-lab characterisation. The next step is the science commissioning to demonstrate its scientific capabilities. We aim to make the instrument available to the user community for the second semester in 2024.

SMI-200 and the other upcoming SMIs are retro-fitted front end systems for the RSS. These systems may be used interchangeably with any slit mask unit and available RSS configuration. The SMI-200 is an incredibly compact system (almost to the scale of a DVD cassette – see image below) and is a state-of-the-art novel instrument delivering throughput similar to other fibre-fed systems at similarly sized telescopes. SMI-200 is the first optical integral field spectroscopic capability on the African continent. The system has been designed and developed through scientific and technical in-house expertise of the SAAO Workshop and Astro-photonics Lab, demonstrating the remarkable capability that exists within SAAO. In addition to expertise, the unwavering support of SAAO, family and leadership has played a crucial role in this development.



The SMI cassette with thehexagonal IFU visible in the middle.



Some of the SMI-200 spectra of a bright, star forming galaxy. Individual horizontal lines represent fibre-generated spectra, while the vertically zi- zag blobs represent the Hydrogen-α emissions along with doubly ionized Nitrogen and Sulphur emissions.

The aim now is to make at least one more SMI (SMI-300) over the next two years. We hope that this development effort would be scientifically successful and would lead to several significant scientific results in the future.

Sabyasachi Chattopadhy.--

Training students

Towards the end of last year we offered training on observing with SALT to interested staff and students. It was geared towards night operations and was focused on the SALT operator role at the telescope. Students at SAAO are required to fulfill 40 hours of service to the Observatory, which the observing run counts towards. In addition, it offers the opportunity to gain practical experience using a telescope (and a pretty cool one at that!). Since we are only 2.5 operators (two full-time operators and one that stands in every couple of weeks), it also has the benefit of training people who can be on standby should an emergency arise. We had five candidates in all and expect to see one or two faces back at SALT as their astronomical careers develop ;)

Right: Science engagement intern Shamin Doman.

Below: Thea (second from the right) explaining the display monitors in the control room.

Thea Koen.—

MEET THE TEAM: Anita Jonker

Junior Software Developer

Hello everyone,

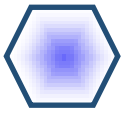
Good day,
My name is Anita Jonker. I was born in 1995 and I went to High School Durbanville. I went to CPUT and studied software development. I have a BTECH in software development. I studied part-time for two years whilst working full-time. It meant driving at 17:00 to Cape Town and sometimes only arriving home at 21:00 it was a tough time but I persevered thanks to friends and family.

I am known by my friends as The Support if you are searching for something or you are looking for a life hack then I'm usually the person who will pull a saved video or bookmark from the archives. I'm always thrilled with requests that allow me to explore corners of the internet or corners of knowledge not yet trod before. So I not only encourage my friends to ask me I celebrate when the questions come through. It energizes me to learn about new topics and find out how it works.

I am thrilled when I am able to learn something and implement it into a working solution. I have been a developer since 2016. I started coding in Grade 10. My strength is making learning an adventure and building with tech stacks never used before while making quick MVPs and prototypes from scratch.

I used to be a tutor back when I was studying at CPUT. I was supposed to teach and explain the concepts of while and for-loops. I realized the starting point was too far and for that specific class, variables were still new. I broke the class up into sections and in 60 minutes I explained every core concept up until where they needed to be able to go. I can explain difficult concepts in simple ways but also in consistently detailed ways depending on what is required for the scenario.

I have a bit of a bookmark emporium. From movies to games to shopping to courses. I have a massive encyclopaedia of information in my bookmarks that I hope to migrate to a website one day.



I am known for having many hobbies.

- I have reviewed books for authors in exchange for free-digital copies and physical copies.
- I regularly play demos of new games. I will email the developers potential improvements and potential challenges that could arise and what should be kept or amplified — I do this because I want the best version of that game.
- I have used Keymailer where I request keys in exchange for game reviews and have streamed on Twitch
- I am currently quite enthusiastic about Figma
- I am a professional list maker. Every hobby I am passionate about is categorized and sorted in collections either on the platform or in detailed folder paths on my desktop and the latest list software tracker is of course, Notion.
- I'm currently brushing up on my foundation of programming reading through O'Reily Books.
- I love Taylor Swift.

You can usually find me discussing ideas or challenges with people somewhere in a discord server or a forum online exploring the latest trends in the interest of the day.

Cheers, Anita

SALT SCIENCE PAPERS

December 2023 – March 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.

- Katkov, I. Y., Gasymov, D., Kniazev, A. Y., et al. 02/2024: Probing the History of the Galaxy Assembly of the Counterrotating Disk Galaxy PGC 66551, ApJ 962, 27 -- https://ui.adsabs.harvard.edu/abs/2024ApJ...962...27K
- Shrestha, M., Pearson, J., Wyatt, S., et al. 02/2024: Evidence of Weak Circumstellar Medium Interaction in the Type II SN 2023axu, ApJ 961, 247 -- https://ui.adsabs.harvard.edu/abs/2024ApJ...961..247S
- Sacchi, A., Esposito, P., de Martino, D., et al. 02/2024: A soft and transient ultraluminous X-ray source with six-hour modulation in the NGC 300 galaxy, A&A 682, A151 -- https://ui.adsabs.harvard.edu/abs/2024A&A...682A.151S
- Kamiński, T., Schmidt, M. R., Djupvik, A. A., et al. 02/2024: A radical transition in the post-main-sequence system U Equulei, A&A 682, A133 -- https://ui.adsabs.harvard.edu/abs/2024A&A...682A.133K
- Aydi, E., Chomiuk, L., Strader, J., et al. 01/2024: Revisiting the classics: on the evolutionary origin of the 'Fe II' and 'He/N' spectral classes of novae, MNRAS 527, 9303 -- https://ui.adsabs.harvard.edu/abs/2024MNRAS.527.9303A
- Driessen, L. N., Barr, E. D., Buckley, D. A. H., et al. 01/2024: FRB 20210405I: a nearby Fast Radio Burst localized to sub-arcsecond precision with MeerKAT, MNRAS 527, 3659 -- https://ui.adsabs.harvard.edu/abs/2024MNRAS.527.3659D
- Castro Segura, N., Knigge, C., Matthews, J. H., et al. 01/2024: Shedding far-ultraviolet light on the donor star and evolutionary state of the neutron-star LMXB Swift J1858.6-0814, MNRAS 527, 2508 -- https://ui.adsabs.harvard.edu/abs/2024MNRAS.527.2508C
- Pradeep, K. G., Singh, K. P., Dewangan, G. C., et al. 01/2024: A multiwavelength study of Swift J0503.7-2819: a chimeric magnetic CV, MNRAS 527, 774 -- https://ui.adsabs.harvard.edu/abs/2024MNRAS.527..774P
- Siebert, M. R., Kwok, L. A., Johansson, J., et al. 01/2024: Ground-based and JWST Observations of SN 2022pul. I. Unusual Signatures of Carbon, Oxygen, and Circumstellar Interaction in a Peculiar Type Ia Supernova, ApJ 960, 88 -- https://ui.adsabs.harvard.edu/abs/2024ApJ...960...88S
- Pearson, J., Sand, D. J., Lundqvist, P., et al. 01/2024: Strong Carbon Features and a Red Early Color in the Underluminous Type Ia SN 2022xkq, ApJ 960, 29 -- https://ui.adsabs.harvard.edu/abs/2024ApJ...960...29P
- Stoop, M., Derkink, A., Kaper, L., et al. 01/2024: The early evolution of young massive clusters. II. The kinematic history of NGC 6618/M 17, A&A 681, A21 -- https://ui.adsabs.harvard.edu/abs/2024A&A...681A..21S