SALT

Newsletter

August 2026

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Editor: Anja C. Schröder

Cover image: SALT primary mirror array. -- *Credit*: Lisa Crause

Letter from the Head of Astro-Ops

Dear SALT Community,

As we move through the heart of the Southern Hemisphere winter, many of us have experienced first-hand just how unpredictable this season has been. With the unusual weather patterns, the telescope has endured one of the more weather-challenged winter observing periods in recent memory. While frustrating for observers eager to collect data, these conditions are also a reminder that astronomy is ultimately at the mercy of the skies.

Despite the weather, there has been no shortage of exhilerating progress at SALT. One of the highlights is the successful commissioning of the SMI-300 integral field unit. The commissioning results have been extremely exciting, and we are delighted that the instrument is now being offered in shared-risk mode for Semester 2026-2. We hope you enjoy reading about the journey to this milestone and the exciting science opportunities it will enable. Congratulations to the entire SMI team on bringing this project to fruition. The dedication, perseverance, and countless hours invested over the past several months have culminated in an instrument that will significantly enhance SALT's scientific capabilities.

This issue also includes an update on the Laser Frequency Comb project. I encourage you to take a look at the article to see how this project is progressing.

I would also like to take this opportunity to acknowledge our Technical Operations team. Their work often happens behind the scenes, but it is fundamental to keeping SALT operating safely and efficiently. From routine maintenance to complex engineering interventions, their expertise underpins everything we do. In this issue, we highlight two examples of this work—the recent hexapod adjustments and the lower tracker bearing replacement — to give our community a glimpse into the engineering effort required to keep a world-class telescope performing at its best.

Finally, it is my pleasure to welcome two new members to the SALT team. Nikki Zabel joined us on 1 June as our new Pipeline SALT Astronomer, and James Lamola started as the new Head of SALT Technical Operations. We are delighted to have them on board and look forward to the experience and expertise they bring to the team. Be sure to read James's introduction in this issue and look out for Nikki's profile in an upcoming newsletter.

Finally, we bid farewell to Tasheen Naicker, who has been a valued member of the SALT Technical Operations team for the past few years. We thank Tasheen for everything he has done for the telescope and our community, and we wish him every success and fulfilment in his future endeavours.

As always, thank you to everyone who contributes to the continued success of SALT. Whether you are observing, developing software, maintaining the telescope, supporting operations, or advancing the science, your efforts are what make SALT possible.

Until next time, Danièl

SCIENCE HIGHLIGHT

From X-ray flash to supernova: SALT follows the remarkable death of a massive star

by Brendan O'Connor and Xander Hall (Carnegie Mellon University, USA)

Most people picture a supernova beginning when a new point of light suddenly appears in the night sky. In reality, the explosion starts earlier. As the shock wave generated deep inside a dying star reaches its surface, it produces a brief flash of ultraviolet and X-ray radiation known as shock breakout. This brief flash is theoretically expected to accompany every core-collapse supernova. It is extremely difficult to observe, though, because it is short-lived and radiates mainly at wavelengths that are not continuously monitored and are also absorbed by Earth's atmosphere, requiring serendipitous space-based observations, such as those that captured the X-ray flash associated with SN 2008D.

On 21 March 2026, the *Einstein Probe* satellite detected a brief (~1000 s) X-ray flash from a source named EP260321a. The transient was localised to a nearby galaxy around 515 million light-years from Earth (or at a redshift of 0.0344). Its unusually soft, thermal X-ray spectrum immediately suggested that the *Einstein Probe* might have witnessed the first moments of a stellar explosion. At the time, however, the nature of the explosion and its relationship to more powerful and much more common phenomena such as gamma-ray bursts (GRBs) remained unclear.

Answering that question required spectroscopy to classify the rising optical counterpart. Our first observation with SALT was obtained on 24 March, only 3.3 days after the X-ray detection. The observation used the RSS and provided one of the earliest views of the emerging explosion. We extended the campaign through a Director's Discretionary Time programme that allowed us to fully trace the evolution of the supernova out to two months post-explosion (Figure 1).

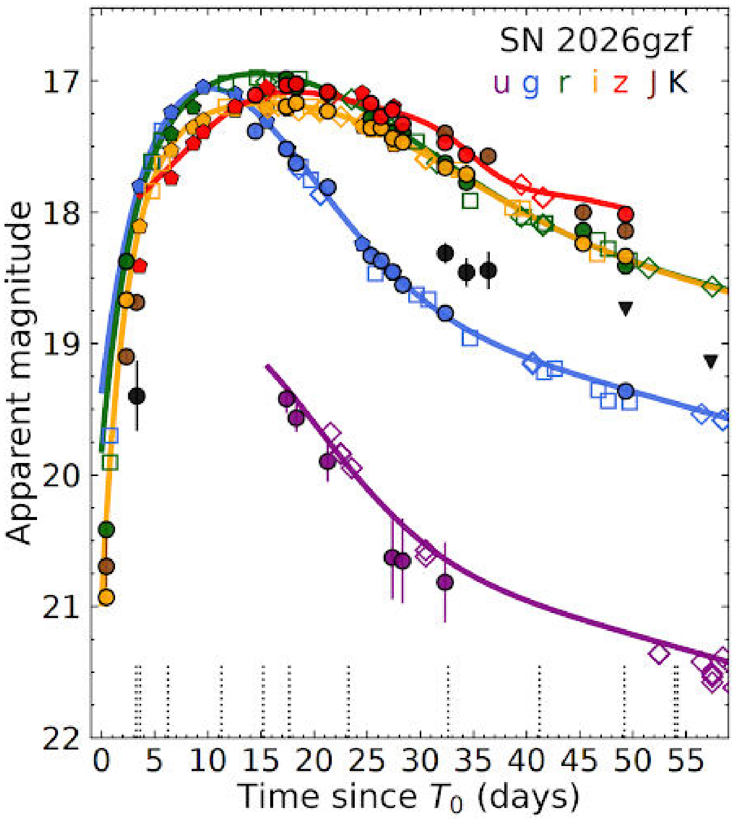


Fig 1: Multiband lightcurve (ugrizJK) of SN 2026gzf from the Fraunhofer Telescope at Wendelstein Observatory (filled circles), Dark Energy Camera (filled pentagons), Zwicky Transient Facility (empty squares), and the Vera C. Rubin Observatory (empty diamonds). Solid lines are empirical fits to the lightcurve. The vertical dashed lines at the bottom mark the timing of our spectroscopic observations.

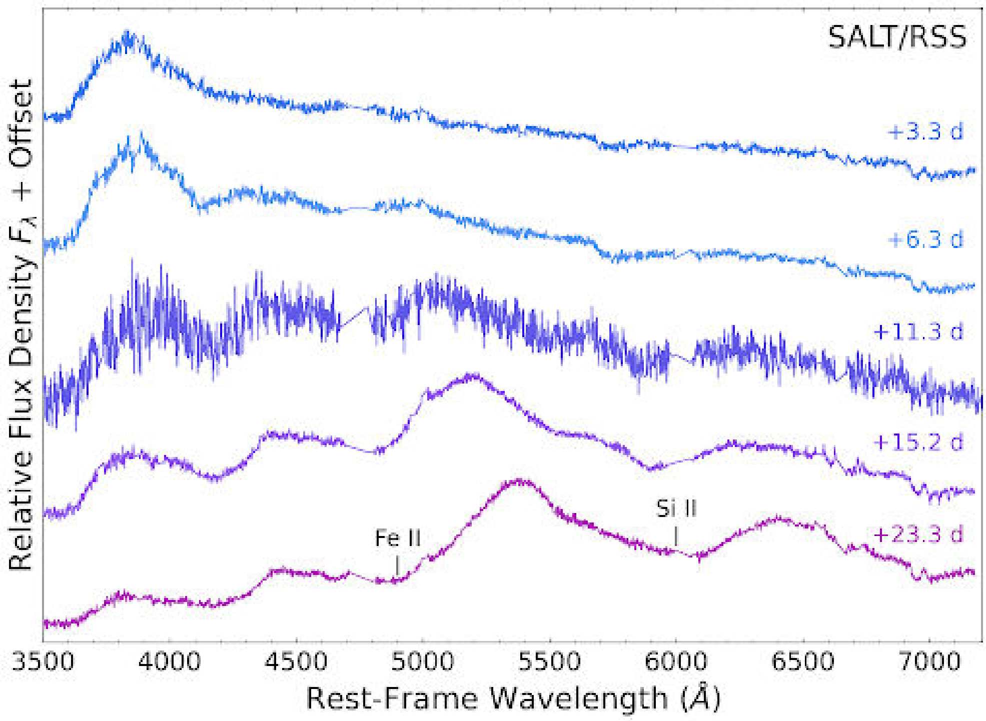


Fig 2: Spectral sequence of EP260321a/SN 2026gzf obtained with SALT/RSS out to the peak of the supernova's optical light (see Figure 1). Blueshifted absorption features are clearly visible and correspond to Fe II and Si II. These features are used to constrain the expansion velocity of the ejecta (see Figure 3). Emission lines have been clipped from the spectra for clarity.

This rapid access and repeated follow-up was essential. A single spectrum can classify a supernova, but a sequence of spectra reveals how the explosion develops and decelerates as it expands. The spectral sequence reveals the specific elements in the ejecta and their velocity and composition (Figure 2). The SALT spectra allowed us to follow the source from its hot, blue early phase, through maximum light, and into the weeks when the expanding debris began to cool.

The spectra display broad absorption features produced by iron and silicon. Their large widths and significant blueshift showed that material had been launched at more than 30,000 km/s (Figure 3), corresponding to approximately a tenth the speed of light. As SALT continued to return to the source, these features became stronger and evolved. By tracking those changes, we could watch the visible layers of the explosion slow from roughly 30,000–35,000 km/s during the first few days to around 10,000–20,000 km/s several weeks later.

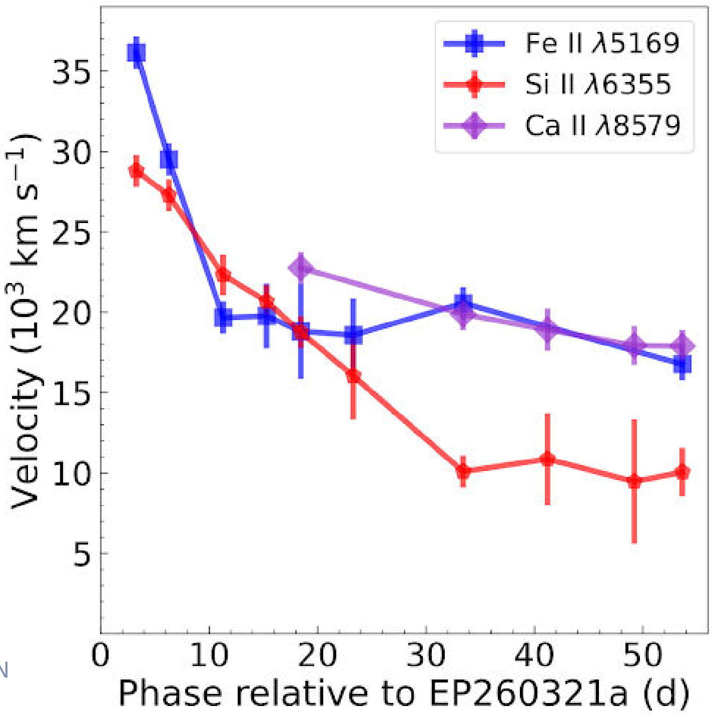


Fig 3: Evolution of the expansion velocity of different absorption features identified in the spectral sequence of SN 2026gzf (see Figure 2 for reference).

These observations established SN 2026gzf as a broad-lined Type Ic supernova. Type Ic supernovae are produced by massive stars that lost their outer hydrogen and helium layers before exploding. The term “broad-lined” refers to the unusually high expansion speeds that blend individual spectral lines into wide troughs. This is an especially energetic class of supernova and is frequently associated with long duration gamma-ray bursts (GRBs).

This connection immediately made SN 2026gzf extremely interesting. Though the SALT spectra resembled those of the supernovae accompanying GRBs, no GRB was detected. The optical supernova itself was not unusually faint or weak. Its brightness, spectral evolution and expansion velocities were broadly typical of energetic broad-lined Type Ic explosions. The associated X-ray flash, however, was much fainter than those of the nearby low-luminosity GRBs with which such supernovae have been associated.

The SALT sequence formed the backbone of our spectroscopic monitoring, complemented by observations from the Hobby–Eberly Telescope (HET) and the Dark Energy Spectroscopic Instrument (DESI). Together, the spectra provide a record of the explosion over the first two months of its evolution, covering the photospheric phase. Follow-up observations with the Chandra X-ray Observatory and the Very Large Array (VLA) found no X-ray or radio afterglow like those normally created when a successful relativistic jet escapes from a star. In fact, the X-ray and radio observations can exclude all known GRB afterglows and provide strong constraints on the properties of the most relativistic ejecta.

Our interpretation is that the star may still have attempted to launch a jet, but that the outflow was relatively weak and only mildly relativistic. It may have become choked inside the star or its immediate surroundings rather than escaping and producing a bright GRB. A small amount of the fastest material could nevertheless have driven the shock that created the soft X-ray flash seen by *Einstein Probe*. In this picture, EP260321a occupies a sparsely populated region between the X-ray only shock breakout associated with the Type Ib SN 2008D and the substantially brighter X-ray emission of low-luminosity GRBs. Low-luminosity GRBs such as GRBs 060218 and 100316D are generally thought to represent relativistic shock breakout and EP260321a provided a missing link.

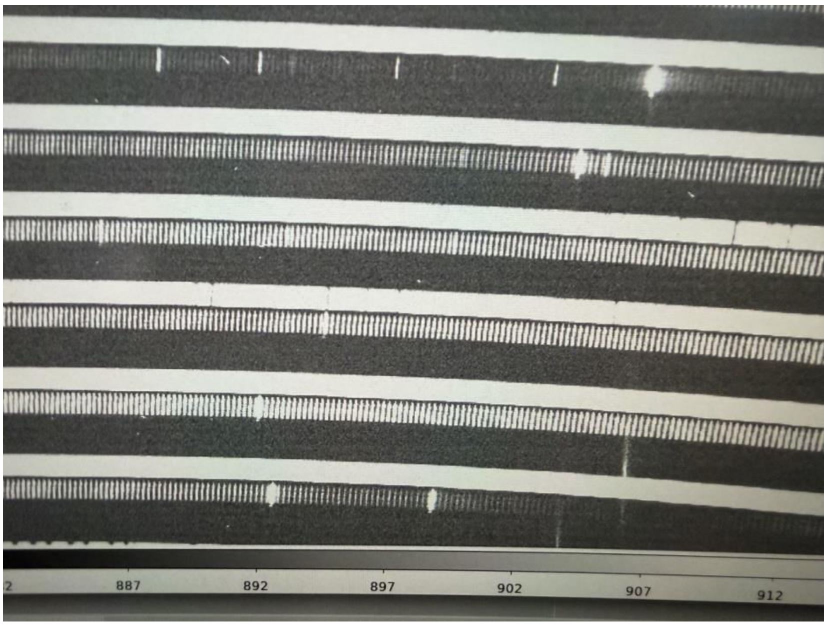
As wide-field X-ray satellites discover more of these fleeting flashes, facilities such as SALT will be crucial for determining what produced them. Some will accompany GRBs, while others may reveal failed jets, unusual stellar winds or more ordinary supernovae caught at extraordinary times. EP260321a/SN 2026gzf shows that even an apparently faint X-ray flash can mark a remarkably energetic explosion, demonstrating a broad luminosity function of shock breakout from broad-lined supernovae. Further observations deep into the nebular phase have been approved with the James Webb Space Telescope (JWST) and will reveal the inner workings of the explosion, its geometry, and ejecta composition.

We are especially grateful to SALT for approving our SALT Director’s Discretionary Time request.

Published as O’Connor et al. (2026), ApJL 1006, L13

LFC update

The second of the four scheduled two-week laser frequency comb (LFC) runs in 2026 (from 10 – 23 June) proceeded smoothly. We encountered no major technical difficulties, and as a result we were able to complete the essential hardware installation and acquire various frames that will be used to evaluate the performance of the newly installed modules (a more compact Fabry-Pérot cavity and a revised spectral flattener), as well as the full system. The high-stability (HS) bench was adapted to provide the necessary LFC feeds (to efficiently direct comb light down one or both HS mode fibres) and when weather permitted, we were delighted to achieve first-light on-sky with this significantly upgraded version of the LFC (a fully-locked, absolute-wavelength-referenced, spectrally-filtered and flattened comb) on Saturday 20 June. We were also relieved to obtain frames that will allow Daniel Holdsworth to get back to working on the HRS high-stability mode pipeline once he becomes available again. Local members of the team (MSc student Malcolm Scarrott and LFC PI Lisa Crause) were trained to operate the system, with the understanding that remote support will be needed from Shan Cheng and/or Jake Charsley at Heriot-Watt University when next we get to fire up the comb. The full team is now scheduled to return for another two weeks at the telescope in mid-September, during which time a few more hardware tweaks will be made, the level of automation of the system will be improved and additional staff will be trained to operate the comb. Most members of the team recently attended the SPIE Astronomical Telescopes and Instrumentation conference in Copenhagen in early July and Malcolm's poster, describing the as-built LFC, attracted enthusiastic interest from the precision radial velocity community.



Top: From left to right: Lisa, Malcolm, Jake, Chan.

Right: Comparison between the normal ThAr arc lines and the multitude of comb lines that are now available for simultaneous calibration when observing HS mode targets.

Lisa Crause.--

The SMI-300 Integral Field Unit

is on sky and performing to expectations

SALT's newest integral field unit, the Slit Mask Integral Field Unit 300 µm (SMI-300), has completed both engineering and on-sky commissioning — and we are delighted to report that the instrument was delivered performing to its design expectations. This second unit in the SMI family reflects the continued commitment of the SAAO Instrumentation Department and the SALT Technical and Astronomical Operations teams to advance SALT's scientific capabilities.

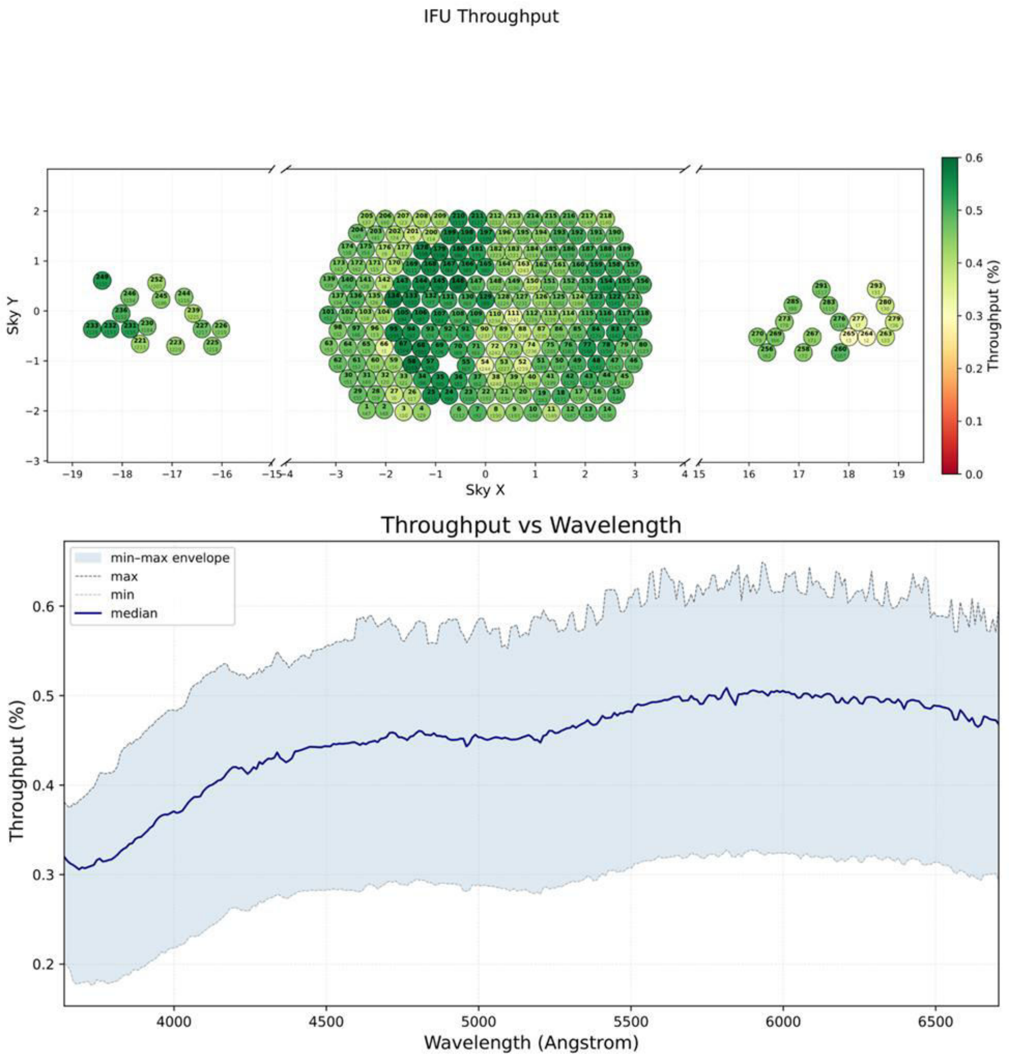
The SMI concept is elegantly simple: a fibre integral field unit packaged as a standard slit mask. Deployed through the RSS slit-mask mechanism like any other mask, the unit reformats a two-dimensional patch of sky into a linear pseudo-slit at the spectrograph focal plane — bringing spatially resolved spectroscopy to RSS without any modification to the spectrograph itself.

The SMI-300 employs 211 optical fibres with 300 µm cores — each subtending 1.33 arcsec on the sky — to deliver a field of view of 18.6 × 33 arcsec. In addition, two dedicated sky-sampling fibre bundles of 33 fibres each provide simultaneous, accurate sky-background measurements: a decisive advantage for faint and low-surface-brightness targets, where the accuracy of sky subtraction often sets the science floor.

Commissioning confirmed that the as-built instrument meets its performance goals. Instrument throughput was measured on the telescope using lamp-flat spectra, comparing the SMI-300 trace flux with the equivalent long-slit flat-field flux; the measured median throughput was 48%. Spectral performance was characterised with Xe arc-lamp exposures using the PG900 grating (grating angle 13.625°): arc lines were extracted from 244 slit positions, wavelength-calibrated against the SALT lamp atlases, and bright, unblended emission lines were fitted with Gaussian profiles to map the spectral resolution across the detector. The resulting full-width at half-maximum measurements yield a median resolving power of $R = \lambda/\Delta\lambda \sim 818$ for the PG900 setup.

For observers, the SMI-300 opens a rich discovery space. A contiguous 18.6 × 33 arcsec field sampled at 1.33 arcsec means every exposure returns a spectrum at every spatial position: resolved gas and stellar kinematics in nearby galaxies, ionisation and abundance mapping of H II regions and planetary nebulae, spectroscopy of supernova and transient host environments, and programmes on crowded fields and extended sources where slit placement and slit losses have traditionally constrained what could be done. Targets once demanding multiple carefully positioned long-slit visits can now be captured in a single pointing.

Building on the success of the SMI-300, the next phase of development aims to produce at least one SMI-400 and an improved SMI-200. We anticipate that these developments will further enhance SALT's integral-field spectroscopy capabilities and enable a wide range of impactful scientific investigations in the coming years.



Top: Mean throughput map of SMI-300 fibers on sky. *Bottom*: Throughput variation of SMI-300 fibers vs wavelength in PG900 grating at 13.625° grating angle.

Subject to final validation and operational readiness, we plan to make the SMI-300 available to the SALT user community during the second semester of 2026 on a shared risk basis. We encourage prospective users to begin thinking now about the integral-field science they would like to pursue — we look forward to seeing the first community programmes on sky.

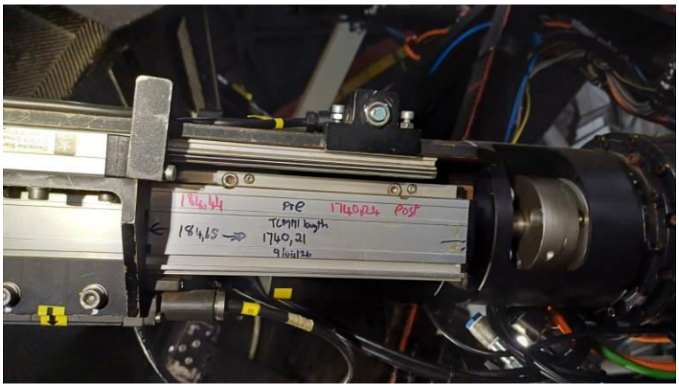
Antoine Mahoro and Sabyasachi Chattopadhy .—

SALT hexapod encoder fix and bearing replacement

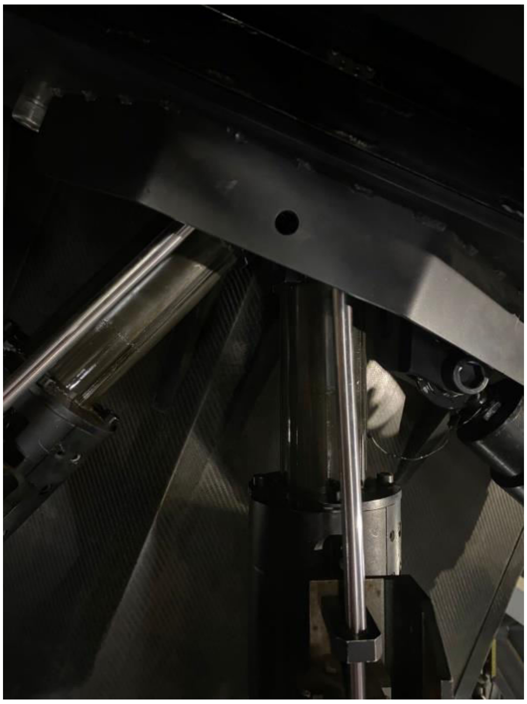
The tracker at SALT is the main part of the telescope following the stars during observations to compensate for the earth's rotation. The tracker can move in 6 degrees of freedom — X (left to right), Y (bottom to top), Z (closer and further from the primary in focus) and the tracker can move with a rotational movement around each of these axes. Phi is the movement around X, Theta is the movement around Y and Rho is the movement around Z. The X and Y movement of the tracker is constrained by linear bearings allowing a very repeatable movement, and these movements are controlled with the assistance of encoders with 5000 counts per mm for accurate positioning. The hexapod encoders are accurate to 10,000 counts per mm.

The hexapods are used to move the tracker in Z, Phi and Theta, controlling these axes during tracks. When we started seeing some signs of telescope pointing issues, we inspected these hexapod encoders and found a possible move on the H1 encoder. When any encoder on this system is bumped, the tracker would still happily be controlled to the suggested encoder values of the theoretical track, but the actual tracker position will be off. We had many discussions with the original design engineers from Reutech Radar over the years. We were always made aware of the very intricate alignment that had to be done on the tracker in the original design and manufacturing setup and of the enormous amounts of time spent on this alignment.

The team put together a proposal to correct for this apparent bump on the H1 encoder and managed to use the low-level tracker jog axis software to prove our point. When taking the tracker to the flat field, called Spherical Aberration Corrector (SAC) static offset position, the auto collimator (AC) on the tracker can give feedback of the exact angle that the SAC makes with the primary mirror, in arc second increments. By moving the tracker to these SAC static offsets, noting the Phi and Theta feedback from the tracker, we can then use the low-level software to manipulate the length of one specific hexapod (in this case H1) and get the effect on the Phi and Theta feedback from the AC. The movement direction of the encoder, though, can play games with your mind! When the encoder is bumped downwards, the hexapod will extend to compensate for the encoder feedback that is reading "too short". This means that if the hexapod is too long (just to confuse the techies further, this is a negative encoder direction!), the encoder mount should be moved upwards to bring the system back to the original mount position.



Some technician notes during the encoder move process.



The stainless 12mm guide rod on the right hand side showing a clear bend to the left on the top mount.

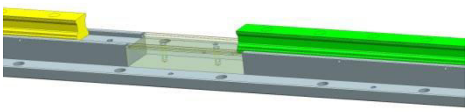
With the results of this test, we planned to move the H1 encoder upwards by 2.5mm and that should have given us a Phi reading of –104" and a theta reading of 50" on the AC at the SAC static offset position. After the move of the encoder, the tracker was taken to the SAC static offset position and actual AC readings were –111" in Phi and 47" in Theta. These readings proved our method to not only be very efficient but also very accurate. The encoder fix made a huge improvement to the telescope pointing.

One day, during a routine inspection inside the telescope, a clicking sound was heard with the tracker moving in the X direction at certain positions and in a certain direction. For any mechanical engineer or technician, these are usually not good sounds to hear!

Rail section removed to enable bearing replacement.

The tracker has an upper X and a lower X drive, but the bearing configuration differs between upper and lower X. The lower X linear bearing system carries most of the tracker weight, while the upper X system is mounted with an extra set of linear bearings in a 90-degree orientation to prevent the system from being over constrained. This configuration leads to the lower X bearings carrying a much heavier load than all the other bearing systems on the tracker. The fact that these lower X bearings are mounted on the same slant angle as the primary mirror and that the tracker force is applied a good distance above the side loaded rails, makes the moment on these bearings a real killer.

Like most parts in any telescope, these bearings are a real bugger to reach. From the catwalk, they are completely inaccessible. The only way to get near to them is by riding our cherry picker from the upper X side to the back of what we call the Elvis boxes.



Top: New positive side rail fitted.

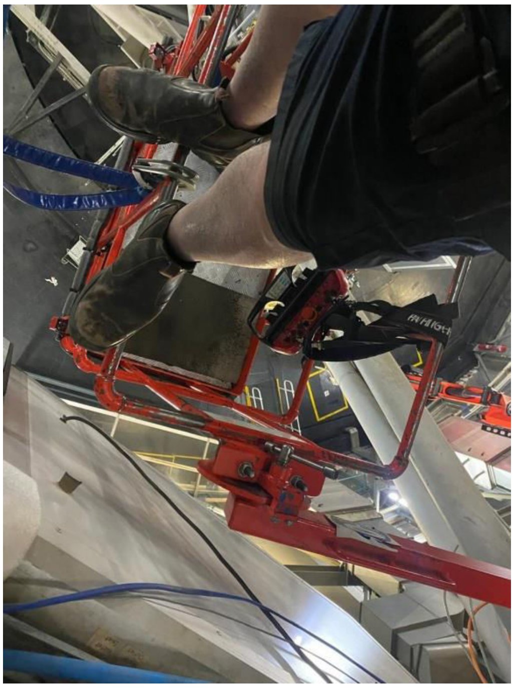
Right: Rail support section removed as viewed from catwalk.

The bearings and the rail were not designed to be replaced in situ, so we had to improvise and become creative to solve this problem. This same bearing replacement procedure had been performed in 2013. We had to create a procedure in 2013 and modified the bearing guide rail mounting to allow the removal and replacement of these bearings in situ. The rail lengths differed and that was one way of being able to get an acceptable window to change these bearings. Since the tracker structure supported by the lower X bearings is of the order of 4500kg, we had to use hydraulic cylinders to manipulate the tracker positions during the replacement procedure.


Bearing 1 halfway entered.


Z and Y direction press plates in place with the second bearing replacement.

After the "gap" was created in the guide rail and a new rail was mounted on the one side, the tracker was moved onto the new rail by replacing the bearings one by one. As soon as the tracker was moved to a position where the first bearing cleared the old rail, the bearing was removed and a new bearing was fitted onto the new rail. The fun and games begin when you need to manipulate the constrained tracker bridge to a position where this new bearing can be bolted into position. The process will then start again with the second bearing and the constraints and available working space around the bearings also changes with each unit. Some of the bolts that held these bearings, took at times a couple of hours to enter and tighten!



By the end of the day on Thursday 28 May, we had the whole tracker assembled again, everything closed up and covered, and we had a successful initialisation on the first attempt which was quite a relief. This was again a huge team effort from the SALT Tech Ops team, showing what this crew is capable off. Congratulations on this successful repair!

Eben Wiid.--

Office space and view during the week of the repair (more specifically: Eben stands on the top rail of the cherry-picker crane, which is already extended as far as it can go below the tracker bridge).

MEET THE TEAM: Lesibana James Lamola

Head of Technical Operations

Hello everyone,

I am the newly appointed Head of Technical Operations at SALT. I lead the technical operations responsible for ensuring the reliability, availability, and continuous performance of one of the world's premier optical astronomical research facilities.

I bring with me over 25 years of professional experience, spanning engineering, project management, operations and maintenance, project controls, asset management, and technical leadership. Throughout my career, I have successfully led multidisciplinary teams, delivered complex infrastructure and engineering projects, improved operational performance, and implemented strategies that enhance reliability, safety, and long-term sustainability. My experience covers the full asset lifecycle — from project conception and execution to commissioning, operations, maintenance, and continuous improvement.

I am passionate about building high-performing teams, developing engineering talent, and fostering a culture of innovation, accountability, and operational excellence. I believe that strong leadership is built on collaboration, integrity, and empowering people to achieve shared goals while delivering measurable business value.

Outside of my professional career, I have developed a keen interest in agriculture, particularly sustainable farming and fresh produce cultivation. I enjoy learning modern farming techniques, improving agricultural productivity, and exploring opportunities to combine technology, engineering, and agriculture to promote sustainable food production. This passion provides a rewarding balance to my engineering career and reflects my commitment to continuous learning and creating value beyond the workplace.

Whether leading world-class technical operations or cultivating the land, I am driven by a commitment to excellence, continuous improvement, and leaving every system better than I found it.

Regards, James

SALT SCIENCE PAPERS

April 2026 – July 2026

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.

- Rawat, N., Buckley, D. A. H., Thorstensen, J. R., et al. 06/2026: SRGA J115215.0–510656: an unusual long-period eclipsing dwarf nova with disc wind signatures, MNRAS 549, stag813 -- https://ui.adsabs.harvard.edu/abs/2026MNRAS.549ag813R
- Coti Zelati, F., Marino, A., Wang, Y. L., et al. 06/2026: Multiwavelength Outburst Activity from EP J174942.2-384834: A Very Faint X-Ray Transient Discovered by Einstein Probe, ApJ 1003, 224 -- https://ui.adsabs.harvard.edu/abs/2026ApJ..1003..224C
- Wicker, M., Wyrzykowski, Ł., Hundertmark, M., et al. 06/2026: Gaia20fnr: A binary-lens microlensing event with full orbital motion revealed by four space telescopes, A&A 710, A294 -- https://ui.adsabs.harvard.edu/abs/2026A&A...710A.294W
- Markowitz, A., Krumpe, M., Homan, D., et al. 06/2026: A changing-look Seyfert discovered by eROSITA reveals a two-component broad-line region, A&A 710, A222 -- https://ui.adsabs.harvard.edu/abs/2026A&A...710A.222M
- Savage, R. W., Sansom, A. E., & Glass, D. H. W. 05/2026: Stellar population characterizations in nearby, dusty early-type galaxies, MNRAS 548, stag630 -- https://ui.adsabs.harvard.edu/abs/2026MNRAS.548ag630S
- Pustilnik, S. A., Kniazev, A. Y., Tepliakova, A. L., & Perepelitsyna, Y. A. 05/2026: Dwarfs in nearby voids: results of SALT spectroscopy – II, MNRAS 548, stag559 -- https://ui.adsabs.harvard.edu/abs/2026MNRAS.548ag559P
- Chattopadhyay, S., Bershady, M. A., Smith, M. P., Mahoro, A., & Wolf, M. J. 04/2026: A Slit Mask Integral Field Unit for the Robert Stobie Spectrograph on the Southern African Large Telescope. I. Instrument Development, PASP 138, 045001 -- https://ui.adsabs.harvard.edu/abs/2026PASP..138d5001C