



## SOUTHERN AFRICAN LARGE TELESCOPE

### AFRICA'S GIANT EYE ON THE SKY

## SALT TELESCOPE

The Southern African Large Telescope, SALT, is the largest single optical telescope in the southern hemisphere and amongst the largest in the world. It has a hexagonal primary mirror array measuring 11 x 9 metres, consisting of 91 individual 1-metre hexagonal mirrors. SALT has an "alt-az" mount with a fixed elevation angle (37 degrees from the vertical). As an additional simplification it only rotates in azimuth when acquiring a target; the telescope structure remains stationary during the course of an observation and a tracker assembly at the top of the telescope follows the image of the target as it moves along the focal surface of the spherical primary mirror. This greatly simplifies the mechanical design of the telescope structure and therefore significantly reduces the cost. The complexity resides in the prime-focus tracker assembly that carries the secondary optics and instruments, tracking the target's movements during the course of an observation.

## SALT'S FORTÉ

### HOW DO I GET THE BEST SCIENCE OUT OF SALT

SALT is, first and foremost, a spectrographic telescope. Due to its operating mode and design, it is most efficient when employed as a survey telescope, with a wide range of targets available in the observing queue.

The telescope's large collecting area and Sutherland's dark skies mean that highly competitive results can be obtained for diffuse, low-surface-brightness objects.

Brighter targets – where most of the light is above the sky background, regardless of the seeing – can be observed very efficiently.

There are several spectroscopic options available, including multi-object and high-resolution capabilities, as well as polarimetric modes, some of which are rare on large telescopes.

Operationally, SALT is capable of rapidly changing modes and instruments on-the-fly, and can respond to sudden events and requests (e.g., targets of opportunity) during the course of a night.

SALT is located in the Karoo semi-desert; far from city lights and pollution it is one of the darkest observatory locations in the world. It is ideally placed in longitude between the other large optical observatories of the southern hemisphere (in Chile and Australia) to allow continuous coverage for time-critical observations.

## SALT INSTRUMENTATION

### WHAT KIND OF DATA CAN I GET OUT OF SALT

**SALTICAM** serves as the acquisition and imaging camera for the telescope with a science field-of-view of 8 arcminutes. It operates from 320 to 950 nm and also offers high-speed observing modes. Using co-added exposures, magnitudes as faint as 24.7mag in the g-band can be reached.

The low-to-medium-resolution **Robert Stobie Spectrograph** (RSS) offers long-slit and multi-object capabilities, along with various (linear and circular) polarimetric imaging and spectroscopic modes and narrow-band imaging options. The spectrograph operates from 320 to 900 nm and also includes high-speed options for the different modes. A 30-minute observation at the lowest resolution can achieve ~21.4mag in the V-band.

The fibre-fed **High-Resolution Spectrograph** (HRS) permits high-resolution single-object spectroscopy from 370 to 890 nm, divided into blue and red channels with a cross-over wavelength of 555 nm. The Low-, Medium- and High-Resolution modes yield resolving powers of 15, 40 and 65 thousand, respectively. The High-Stability mode (also with  $R = 65,000$ ) for precision radial velocity calibration offers the choice of an Iodine Cell or simultaneous Thorium-Argon injection for exoplanet science. A 45-minute observation at the lowest resolution can achieve ~16mag in the R-band.

## COMING SOON

SALT's science focus areas call for complementary new SALT instruments and software development in the short- and medium-term:

- The **Near Infrared Washburn Astronomical Laboratories Spectrograph** (NIRWALS) is a medium resolution spectrograph ( $R = 2000 - 5000$ ) over the wavelength range of 800 – 1700 nm. Its integral field unit has 212 fibres and on-sky dimensions of 29 x 18 arcseconds.
- The **HRS High-Stability mode** is currently being optimised for exoplanet science, with a laser frequency comb (to provide precision wavelength calibration) and a specialist data pipeline.
- **MaxE (Maximum Efficiency Spectrograph)** will be an extremely efficient single-object spectrograph intended for transient identification spectroscopy. It will be a dual-beam mode of RSS, covering 360 to 900nm. It will add a red arm to the RSS, using the existing instrument as the blue arm while keeping all the current functionality of RSS.



## SALT OBSERVING

### HOW DO I GET SALT OBSERVING TIME

SALT is an international consortium consisting of a small number of partners that share the costs of the telescope, in return for corresponding fractions of the available observing time. Some of the partners have also made in-kind contributions, in the form of instruments and/or other intellectual property, to secure their membership. Each partner country or institution has their own time allocation committee, and scientists outside the consortium that wish to use SALT are welcome to collaborate with those affiliated with partner institutions. SALT also offers a limited amount of *free* Director's Discretionary Time\* (DDT) for the opportunistic pursuit of high-impact science, as the flexibility of SALT's queue-scheduled operation supports rapid response to new top-priority targets.

Alternatively, the SALT Foundation invites researchers from around the world to purchase their own guaranteed SALT time (see table below). This can be in the form of normal time (divided into the default priority categories as used in the service observing queue) or in the form of the highest priority time only, which is guaranteed to be observed fully. Any partner institution may also purchase time beyond their normal share, and reduced rates apply in that case.

\*<https://astronomers.salt.ac.za/proposals/directors-discretionary-time/>

#### COST<sup>†</sup> OF TELESCOPE TIME PER HOUR

Time purchase by existing shareholders	no minimum purchase	\$1,700
Time purchase by non-shareholders	50 hours minimum <sup>‡</sup> purchase	\$2,600
Premium time (guaranteed time) purchase by non-shareholders	50 hours minimum <sup>‡</sup> purchase	\$3,450

#### COST<sup>†</sup> OF INVESTMENT IN SALT

	Price per share Base <sup>§</sup>	Price per share Nominal <sup>  </sup>	Cost of 10% share
Existing shareholder	\$1.00	\$1.77	\$4,84 m
New shareholder	\$2.00	\$3.55	\$10,02 m

<sup>†</sup> Based on March 2023

<sup>‡</sup> Negotiable

<sup>§</sup> Base Date is 31 March 1999

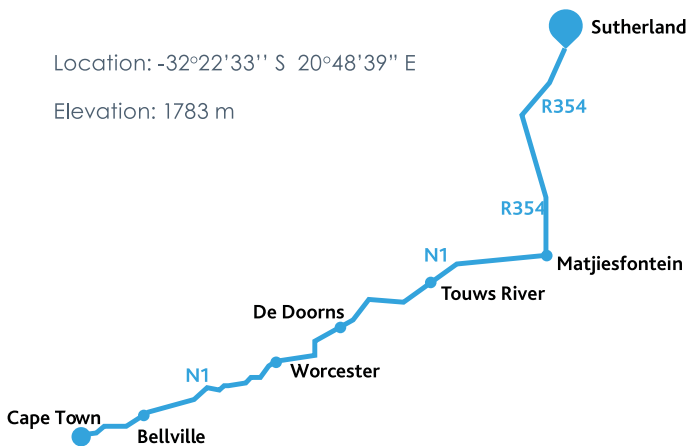
<sup>||</sup> Nominal values are adjusted forward or backward to the Base Date<sup>†</sup>, based on the percentage changes in the Consumer Price Index.

## SALT LOCATION

SALT is located in the Karoo desert near Sutherland, about 370 km north-east of Cape Town. Far from city lights and pollution, it is one of the darkest observatory locations in the world.

Location: -32°22'33" S 20°48'39" E

Elevation: 1783 m



## SALT PARTNERS



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