

Spring School of Spectroscopic Data Analyses



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SALT



Southern African Large Telescope

SALT – Basic Characteristics

- Spherical primary mirror
- Hexagonal array: 11.1 m * 9.8 m
- Entrance pupil diameter: 11m
- Tilt angle 37°
- Telescope azimuth range: 0° to 360°



SALT

- Karoo plateau
- El: 1759 m above Sea Level
- Coordinates:
Lat: -32 22 46
Long: 20 48 38.5 E
- 370 km from Cape Town
- Near a small town Sutherland.
- African cold pole
- Between two climate zones
 - ◆ Summer : warm and dry in Cape Town + rainy in the North
 - ◆ Winter: cool and rainy in Cape Town + dry in the North



Virtual Tour







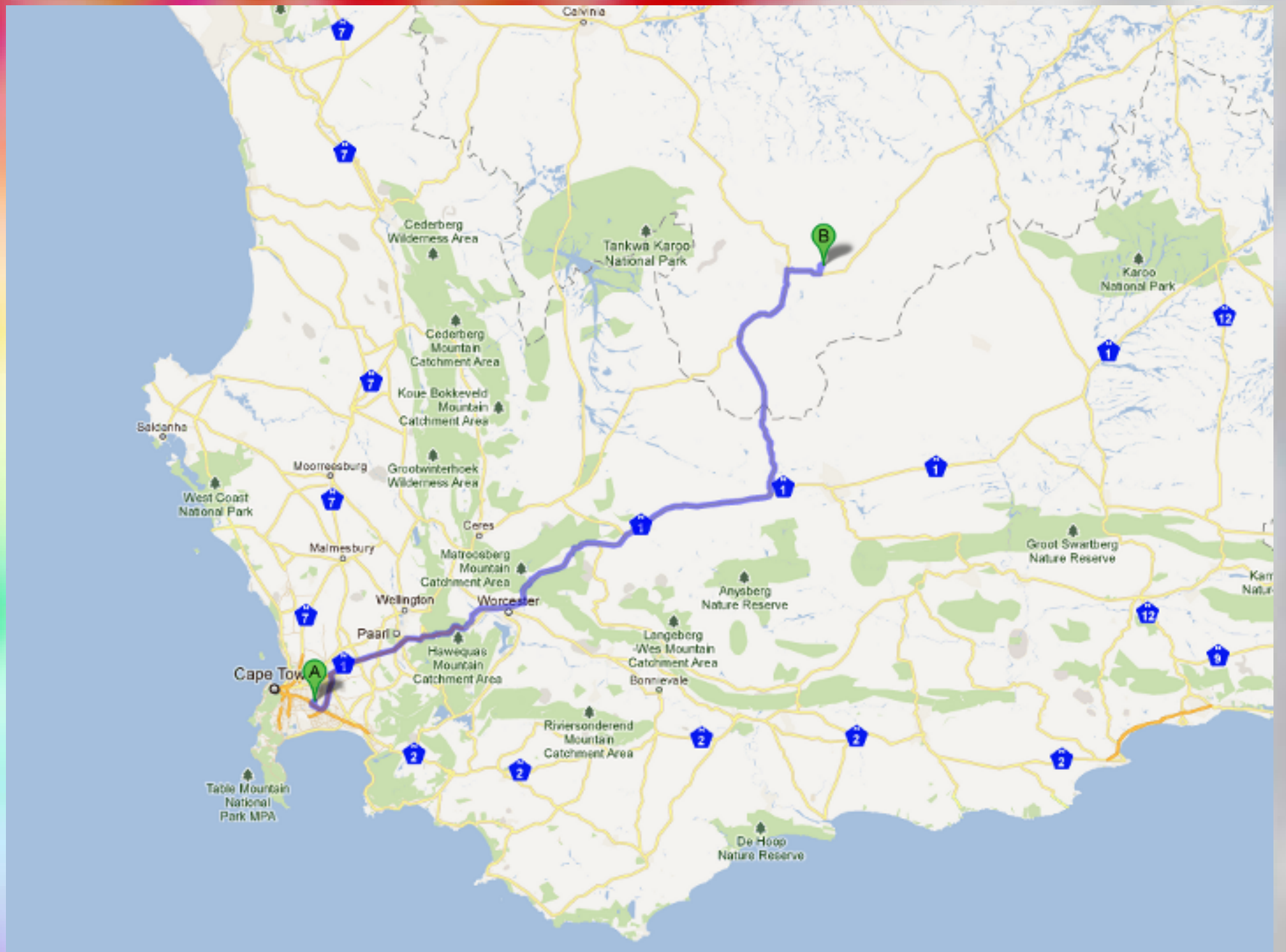
























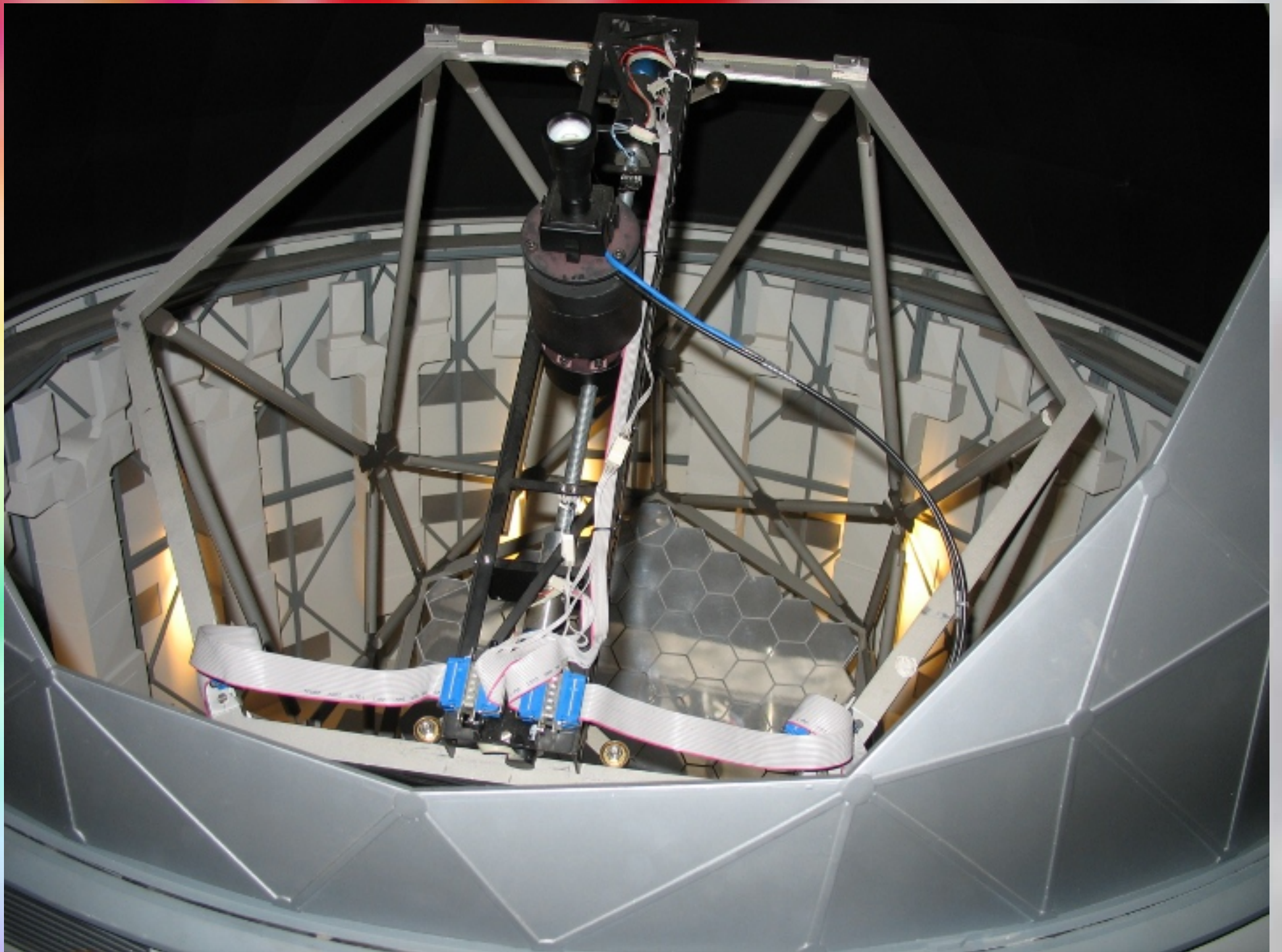














SALT

The dome

- diameter 25 m
- mass 30 tons



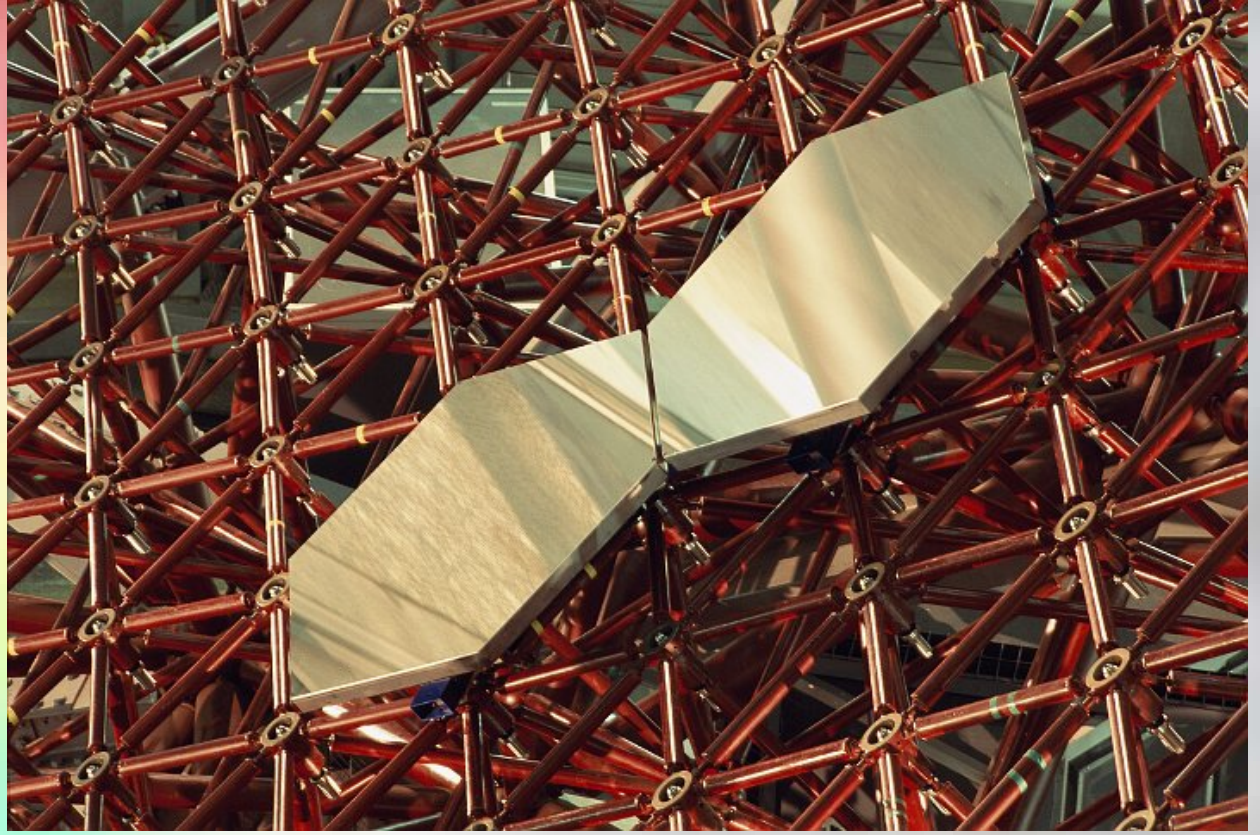






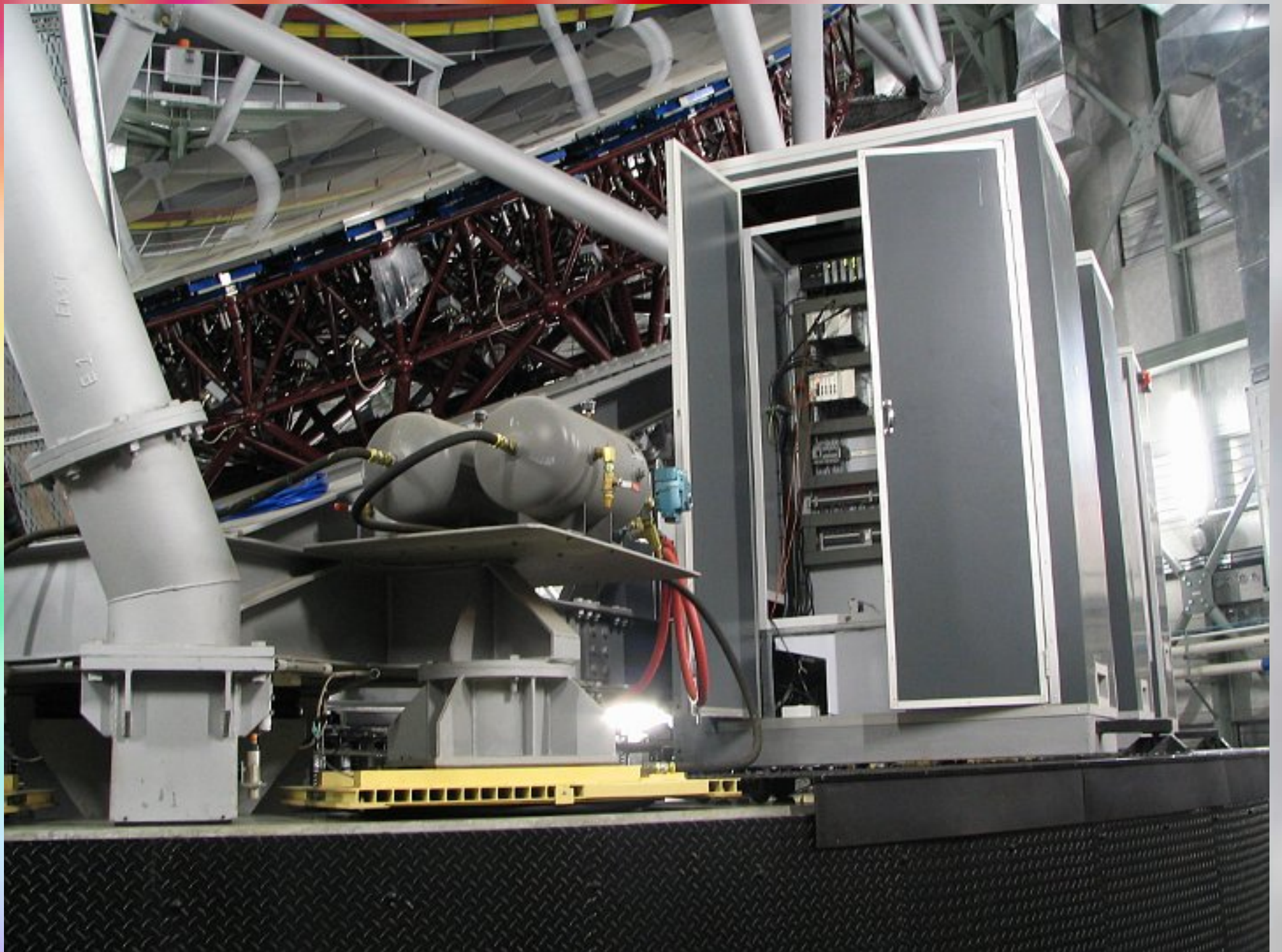


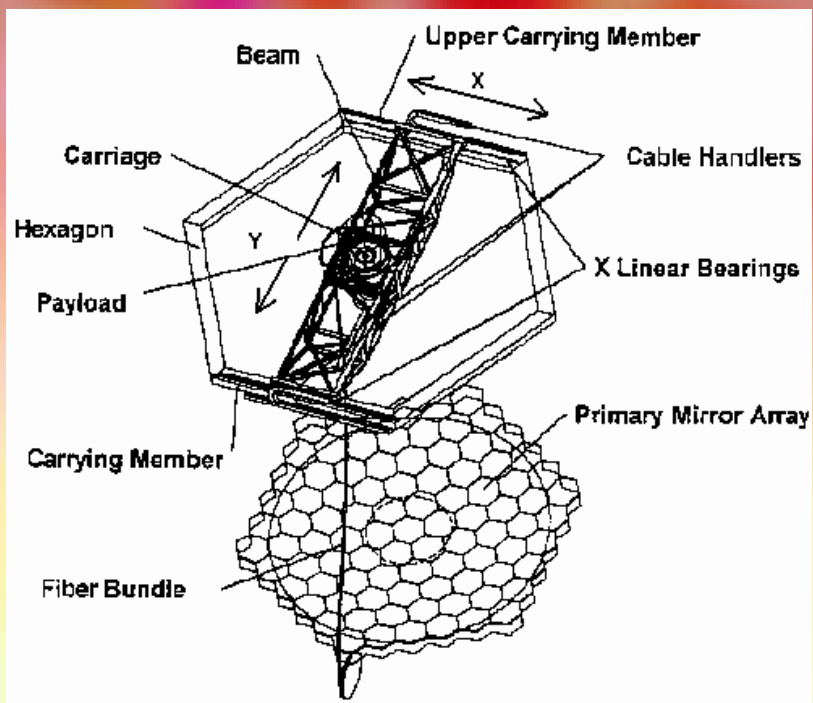




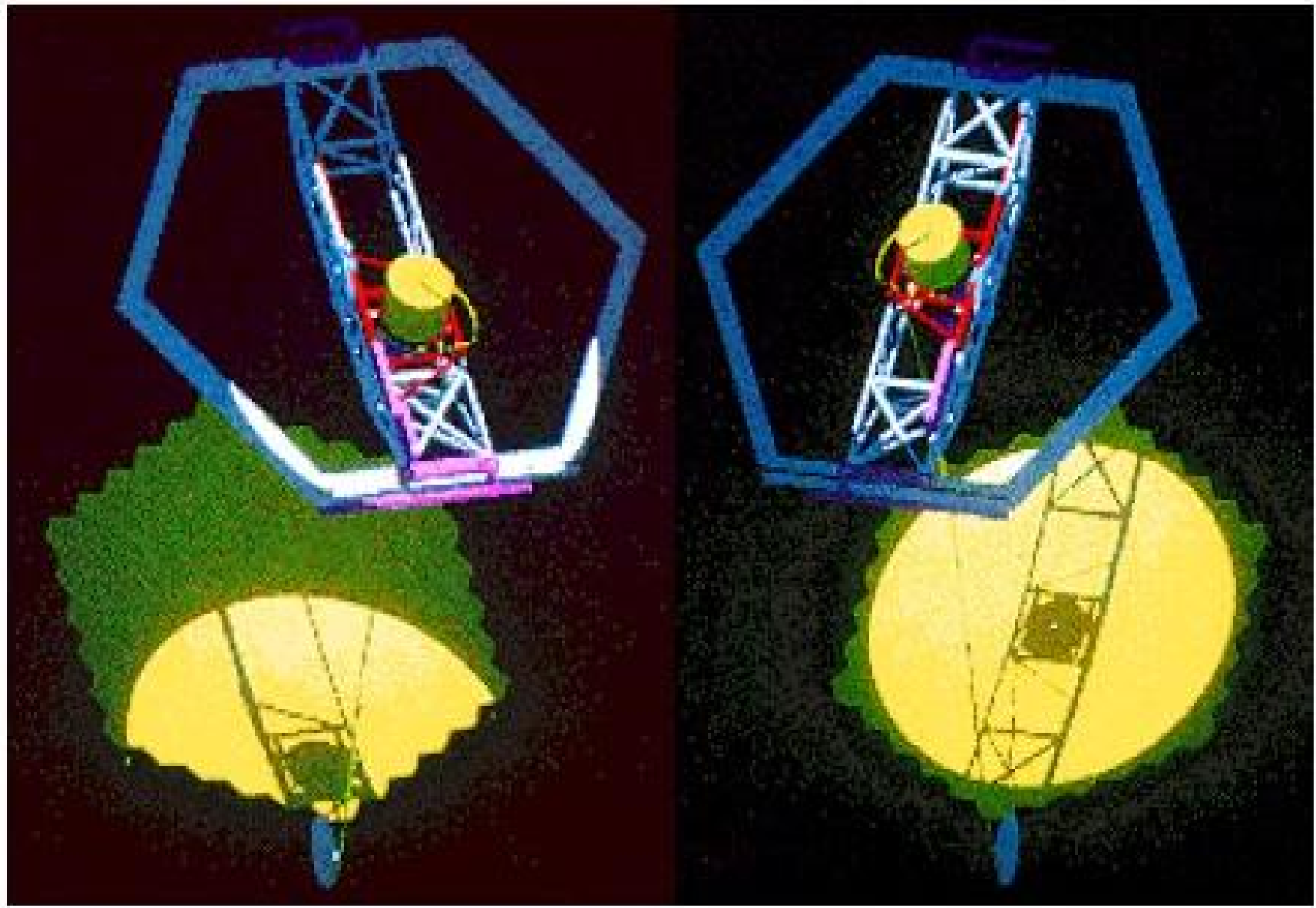
- 91 identical segments
- Weight of one segment ~100 kg
- Systematic replacement of the segments – one per week







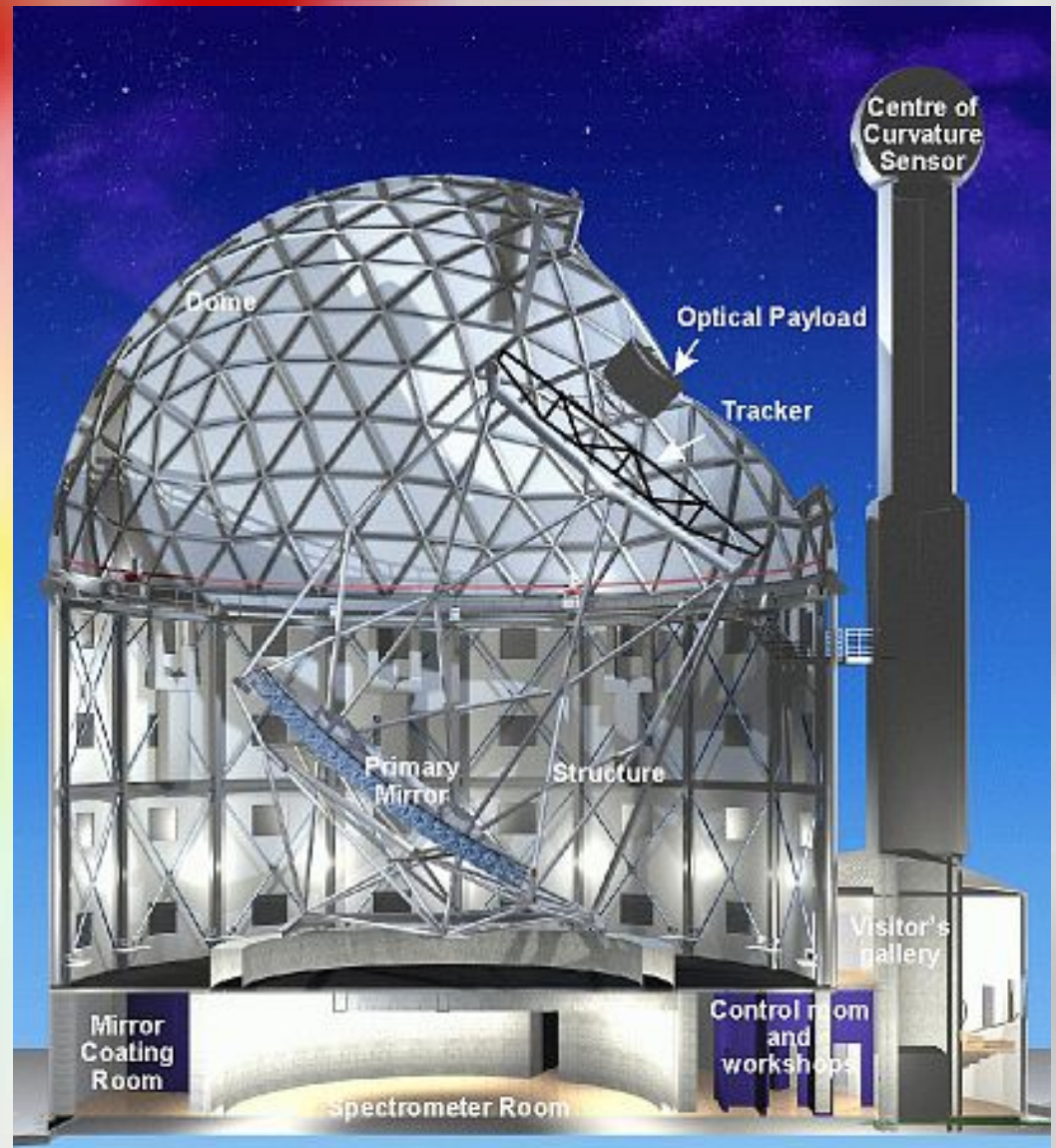
- The telescope does not move during the observation. The tracker moves across the mirror on a virtual spherical focus surface.
- Declination angles between approximately -75 degrees and +10 degrees.



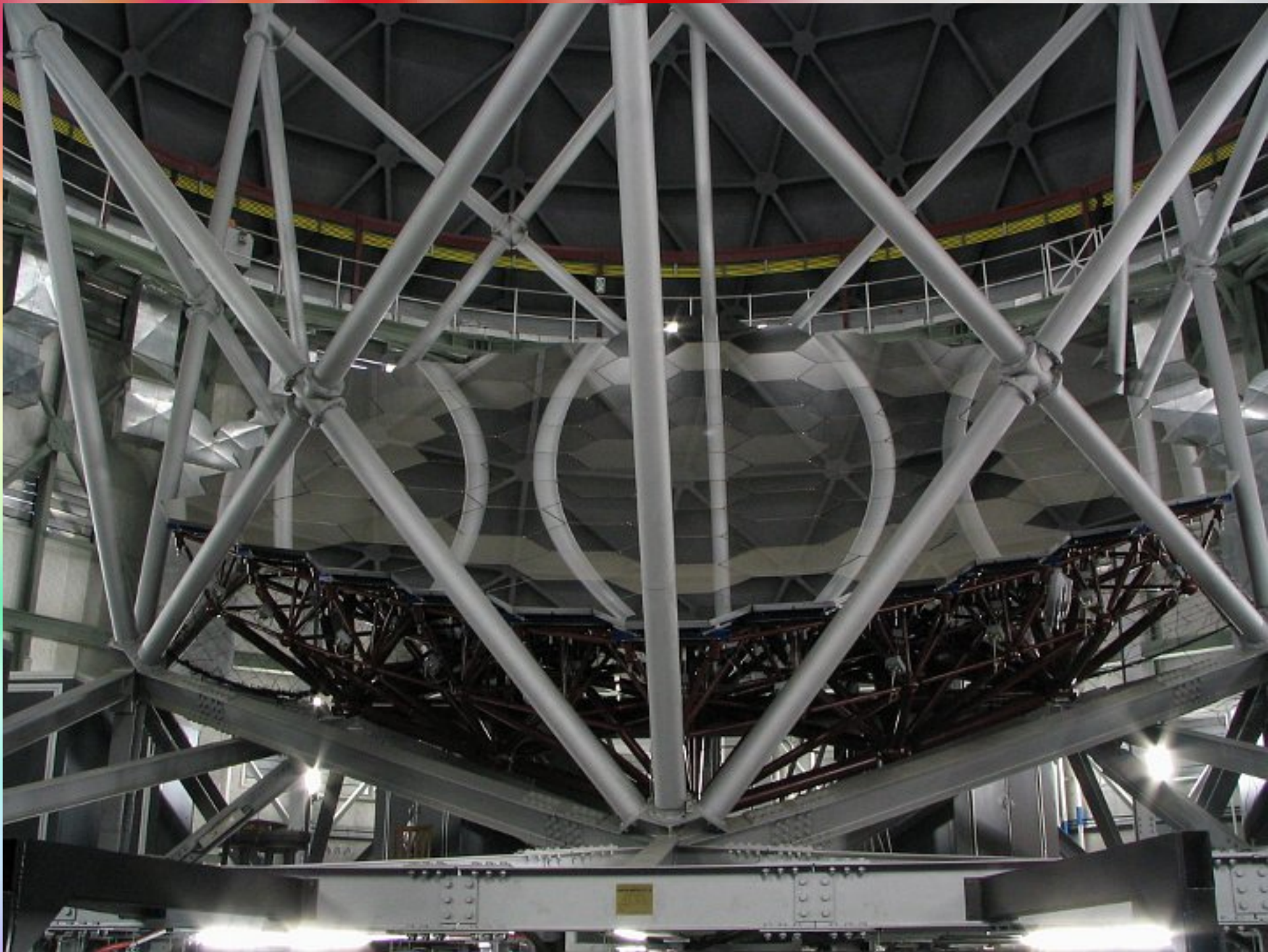




SALT



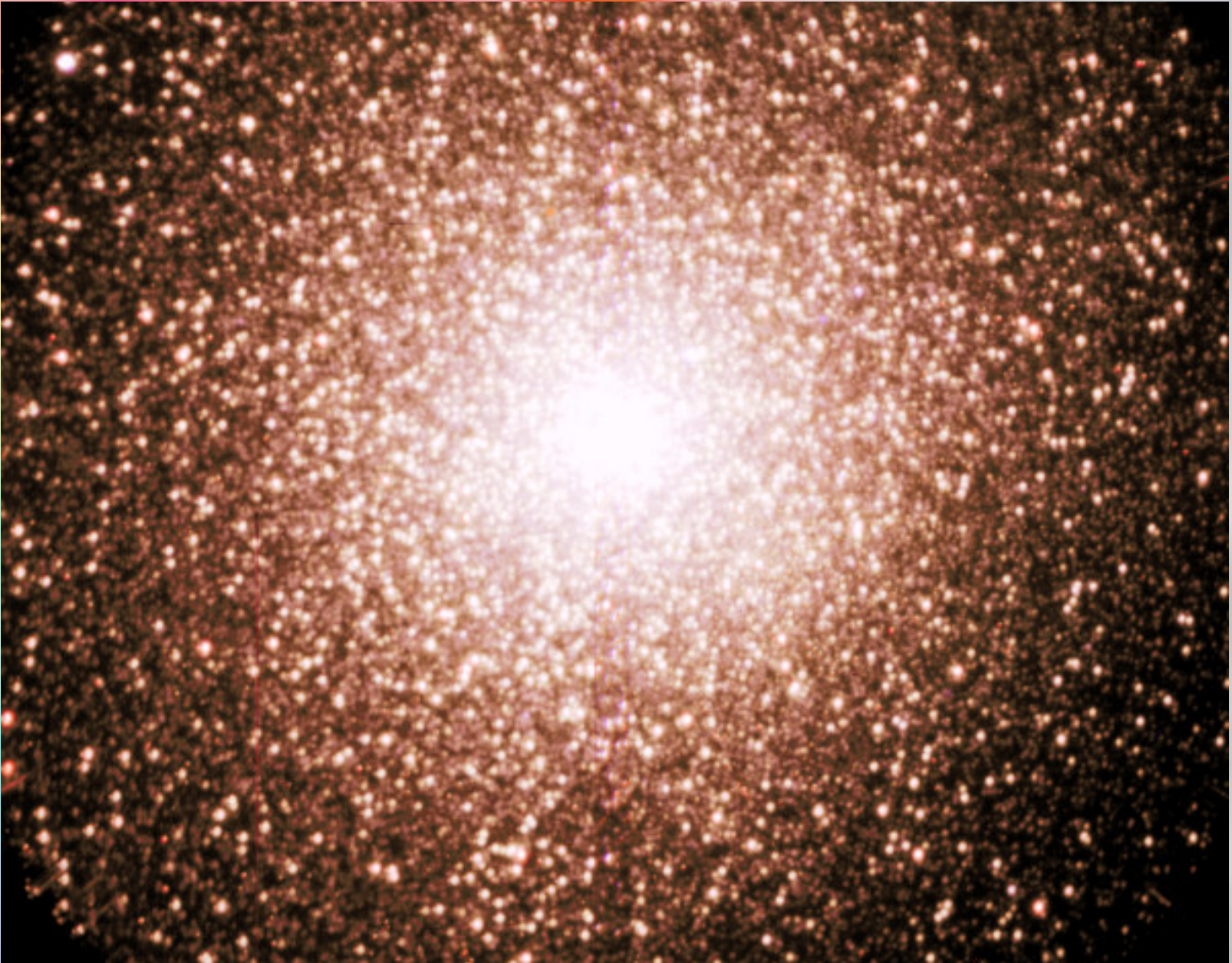
Primary mirror alignment using a laser beam.



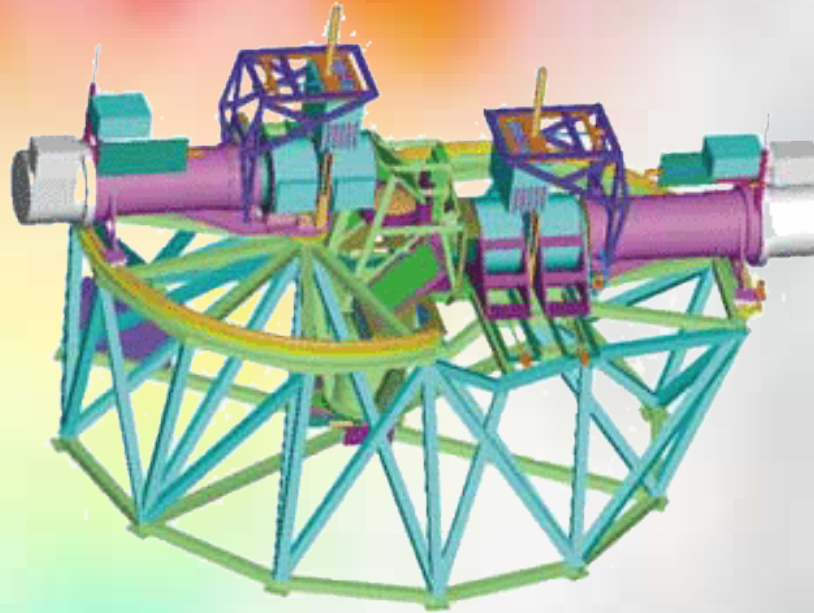
SALT - Instruments

- SALTICAM: imaging and acquisition camera - a CCD mosaic situated at the prime focus
- RSS: the Prime Focus Imaging Spectrograph
- Fibre-fed High Resolution Spectrograph

47 Tucanae



Robert Stobie Spectrograph



Wavelength range: from 320 nm to 1.7 μm
(from ultraviolet to infrared)

RSS



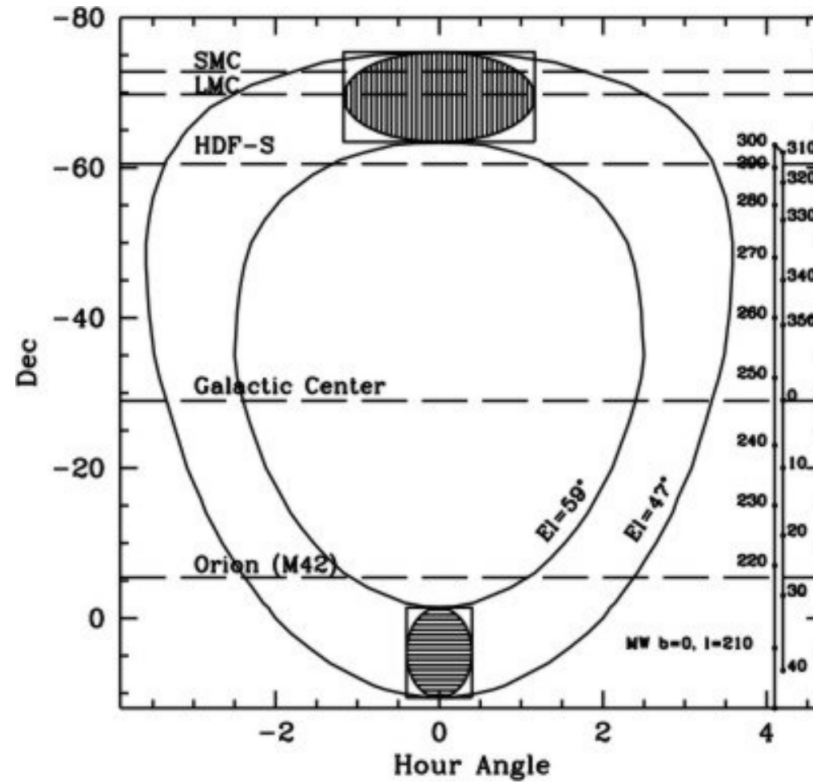
RSS

- The Robert Stobie Spectrograph (RSS) is a dual-beam Visible/Near-IR spectrograph that uses Volume Phase Holographic (VPH) gratings to achieve high throughput from 320 nm to about 1.7 microns.
- The visible beam covers 320 nm to 900 nm with spectroscopic resolution $R = 500$ to 10000.
- The near infra-red beam covers 800 nm to 1.7 microns at $R = 1200$ to 7000.
- Each beam supports long-slit and multi-object spectroscopy, Fabry-Perot imaging spectroscopy, and spectropolarimetry.
- The visible beam supports high-speed spectroscopic modes as well.

RSS

- spherical aberration corrector (SAC) provides an F/4.2 beam with an 8 arcminute field of view at prime focus
- Window of opportunity: annulus on the sky with elevations of 53 ± 6 degrees.
- The airmass over this elevation range varies from 1.17 to 1.37 with a mean of 1.25.

RSS



SALT observing annulus as a function of declination and hour angle. The hashed regions show the range of motion for the tracker at two different declinations.

RSS Gratings

- The VPH gratings provide high diffractive efficiency and significantly reduced scattered light
- VPH gratings can be tuned to shift the diffraction efficiency peak to a desired wavelength
- The grating resides on a rotatable stage, and the entire camera articulates about the same axis as the grating rotation so that the grating is always used in a Littrow configuration

RSS Fabry-Perot Etalons

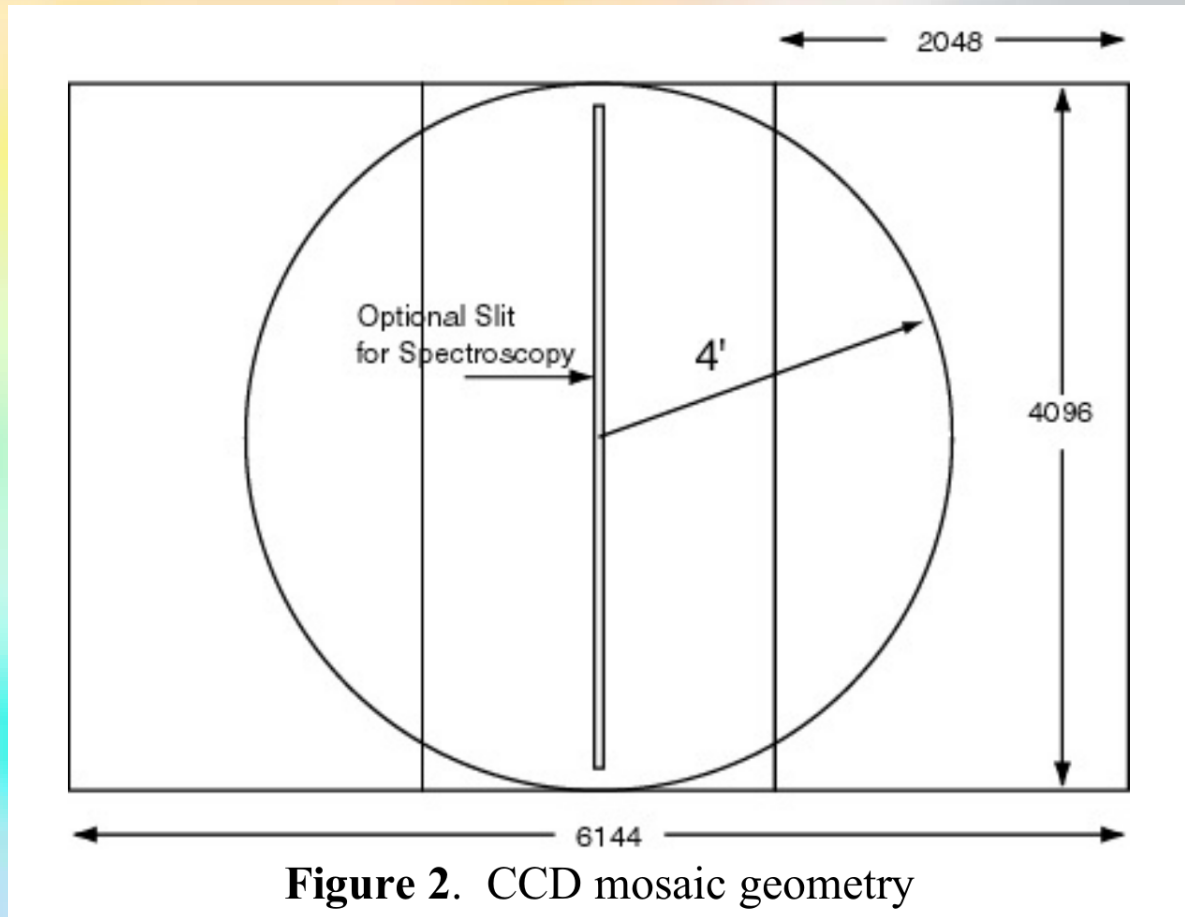
- double etalon system
- Resolution modes:
 - Low: from $R=500$ to $R=1000$ (tunable)
 - Medium: $R=2500$
 - High: $R=12500$
- a full octave in wavelength (430 - 860 nm)
- Low-resolution mode uses a single etalon, with an interference filter to select the desired interference order

RSS Polarimetric Optics

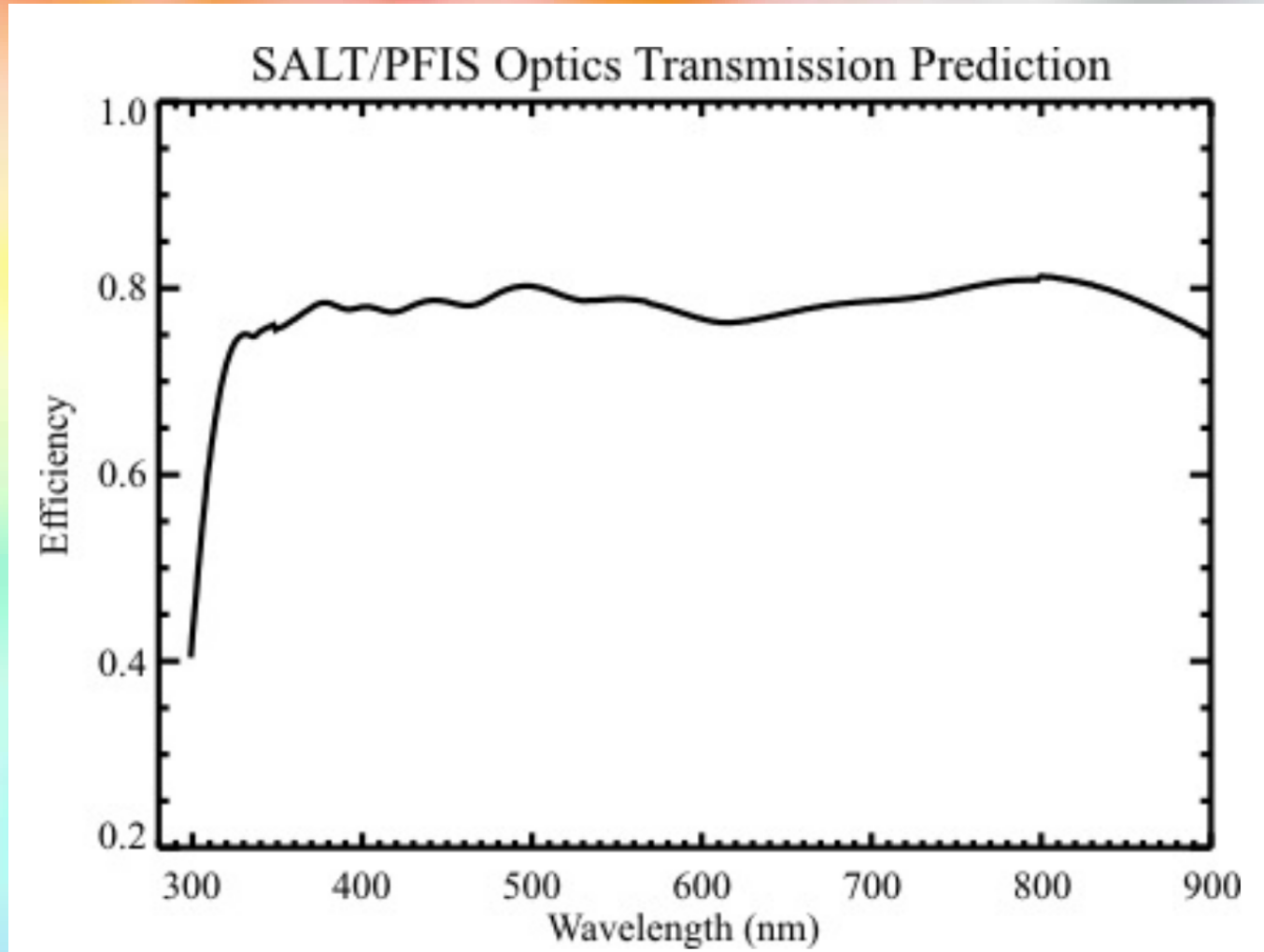
- polarizing beamsplitter in the collimated beam splits it into two orthogonally polarized fields, the “ordinary” (O) and “extraordinary” (E) beams.
- A polarization modulator preceding the beamsplitter modulates the polarization state with time, and the difference between the intensities of the O and E images as a function of time yields the polarization.

RSS CCD Array

3x1 mini-mosaic of CCD chips with $2k \times 4k \times 15$ micron pixels.



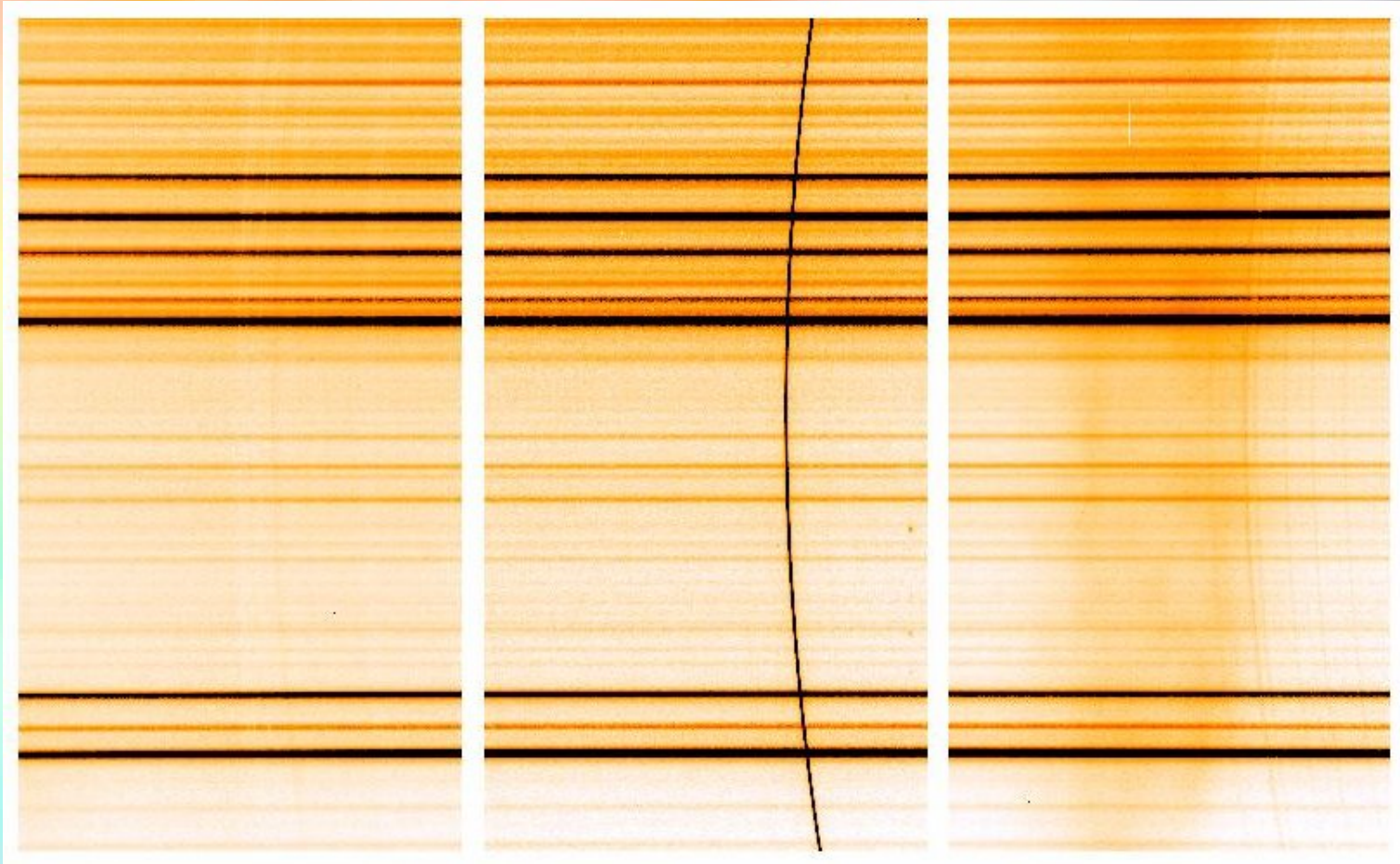
RSS Efficiency



RSS Observing Modes

- Imaging
- Grating Spectroscopy
- Spectropolarimetry
- Fabry-Perot Imaging Spectroscopy
- Polarimetry

RSS example spectrum









The Largest Telescopes

Gran Telescopio Canarias	10,4 m	Canary Islands (Spain)
Keck 1, 2	10,0 m	Hawaii
SALT	9,2 m	South Africa
HET	9,2 m	Texas
Large Binocular Telescope	2 * 8,4 m	Arizona
Subaru	8,2 m	Hawaii
VLT 1, 2, 3, 4	8,2 m	Chile
Gemini N, E	8,1 m	Hawaii, Chile
MMT	6,5 m	Arizona
Magellan 1, 2	6,5 m	Chile

