Pointing Things at the Sky

and some other things

09 March 2016

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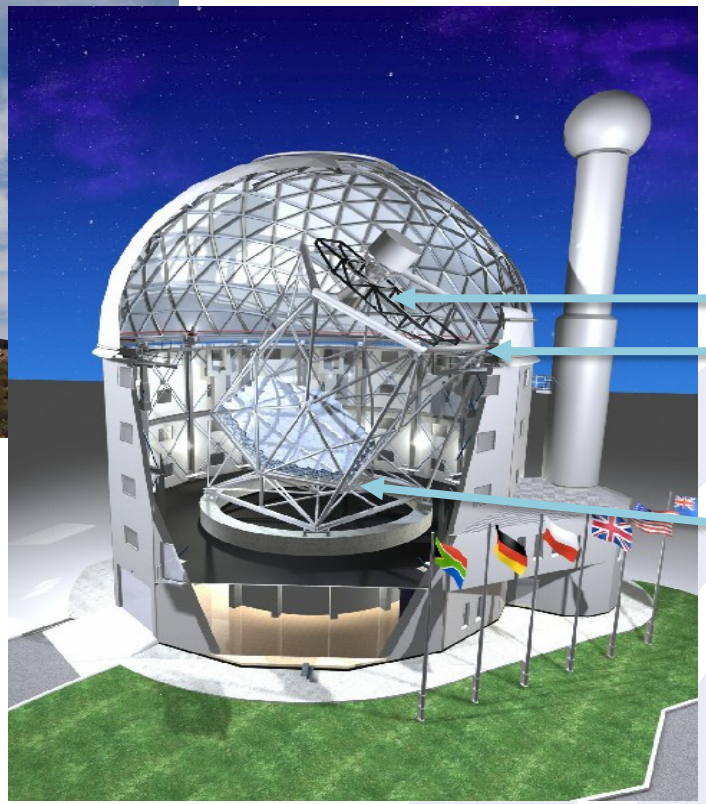
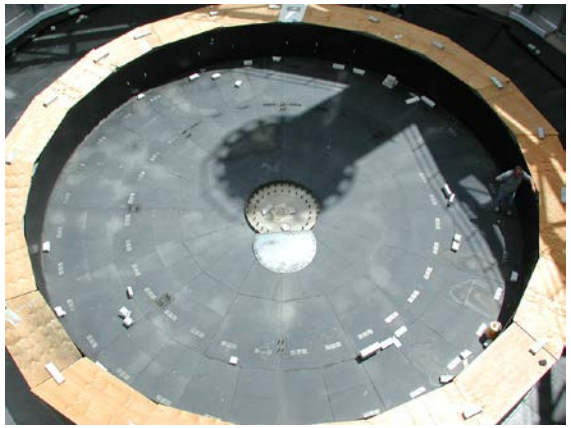
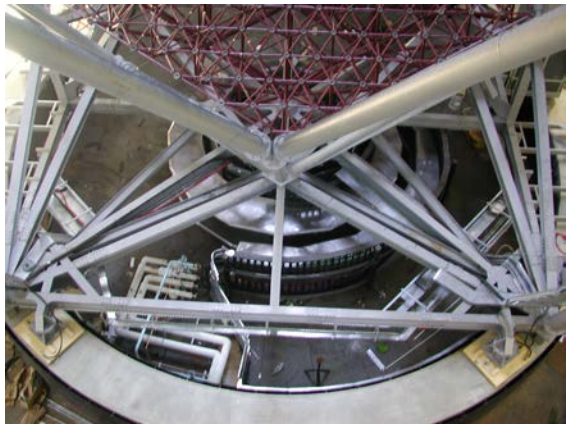
RRS and SALT


Tracker
Dome Drives & Bogie Assemblies
Structure Drive & Control

SALT: Structure Drive and Pintle Bearing





- Air bearings for shock-free rotation
- Structure drives for azimuth rotation
- Pintle bearing assembly in the centre

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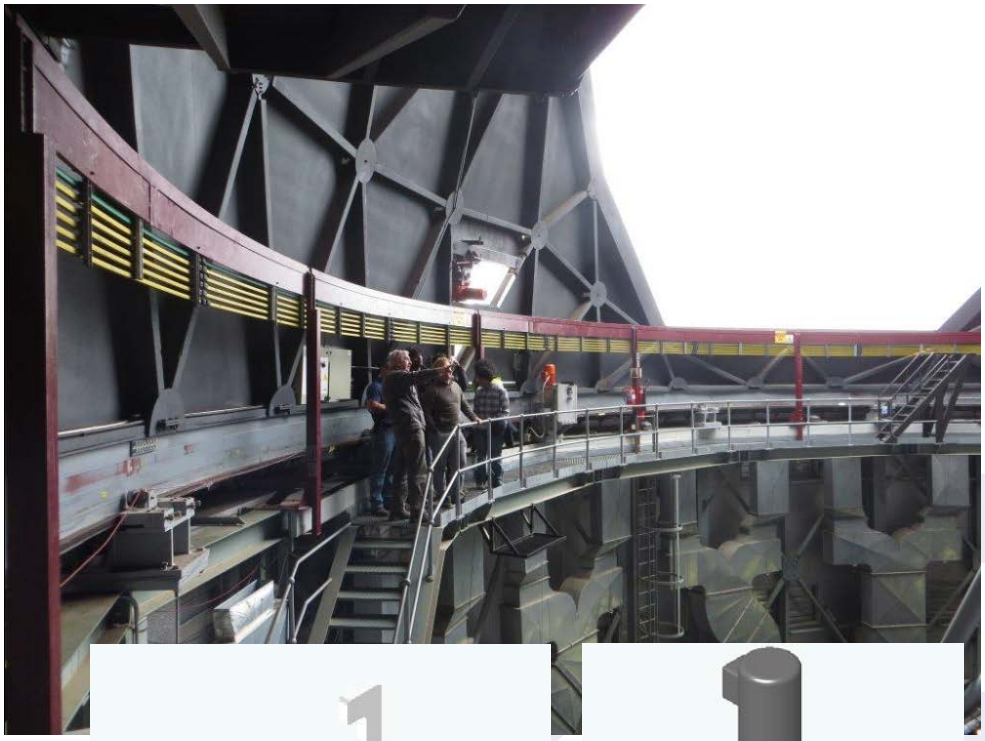
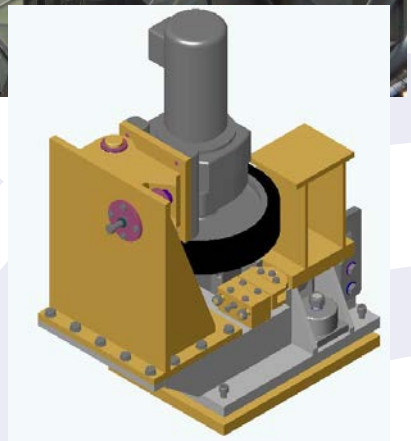
SALT: Dome Rotation

- 12 Bogie Assemblies on top of ring wall I-beams
- 4 Dome drives rotate and control the dome to position the shutter





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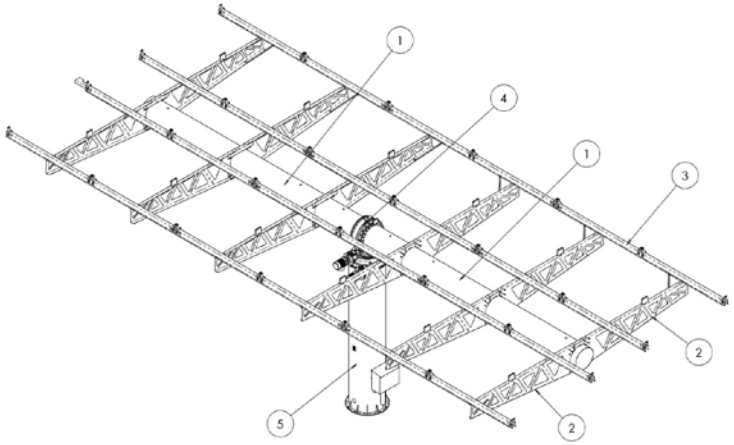
SALT: Tracker

- Total mass 4500 kg
- 13 m above mirror
- Positions payload in 2-D in a range of 3.25 m in each dimension
- Pointing accuracy of 6 microns in 10 axes of motion

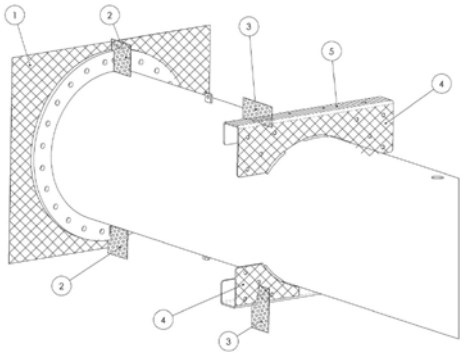
CPV Plant at Touws River: 44 MW

CPV Plant at Touws River: Design

- Dual-axis tracker
- 105m² with 12 CPV panels
- Had to be designed, proto type erected and tested within 3 months



- Acceptance angle 0.1º up to 8m/s wind
- Drive working in elevation up to 22m/s
- Survive wind in stow up to 40m/s
- Wind force analysis
- FEA for structural deformation



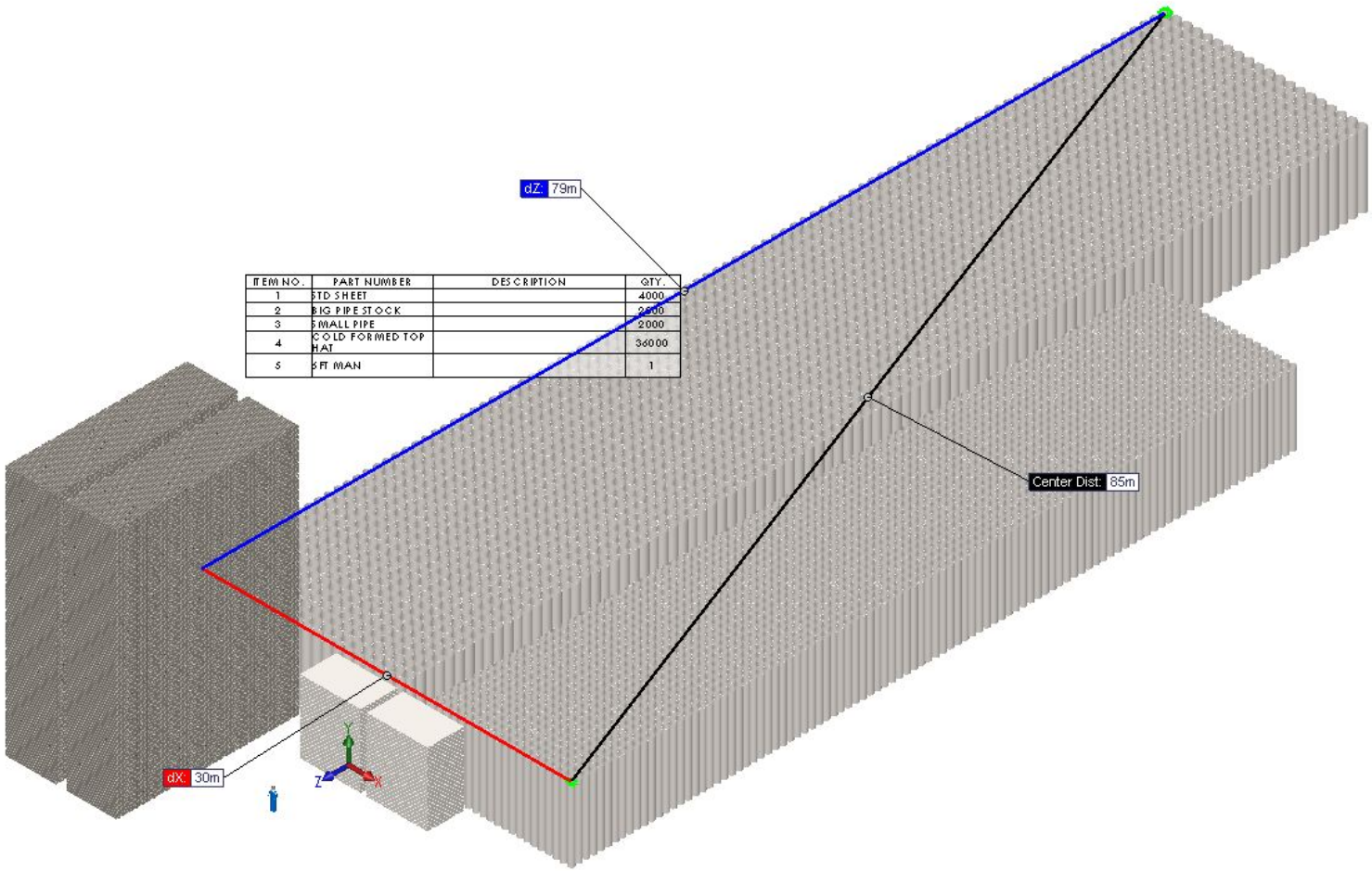
CPV Plant at Touws River: Production

- Total mass of 1 tracker parts 2200kg
- Dual Axis Drive 600kg
- CPV Modules 12 x 240kg 2880kg
- Total 5680kg
- Total number of trackers 1540

- Do the math 3400 tons of steel

- All steel manufacturing done in Gauteng. Not enough capacity in Cape Town

CPV Plant at Touws River: Production



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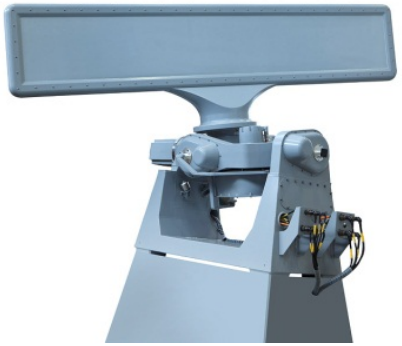
CPV Plant at Touws River: Lessons Learnt

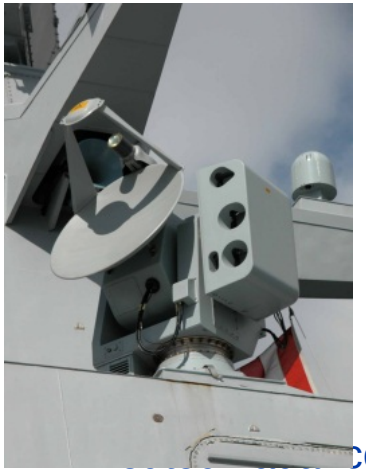
- Murphy is alive!
- Contract negotiations are extremely tiring and frustrating for technical people
- Packaging for long distance transport is very important
- Make provision for 3 times your original QA budget
- This cannot be done without serious project management, config management and system engineering

RRS Systems Engineering and SKA1

- RRS has been involved with System Engineering on the SKA1 Project as a Member of the SKA1 CSP Consortium from the commencement of the Pre-Construction Phase in Nov 2013.
- RRS was responsible for the Integration and Verification Planning and assisted on Requirements Management for CSP.
- In June 2015 RRS, together with SKA SA, withdrew from the CSP Consortium and RRS started working with the SKA1 Dish Consortium.
- For Dish we are again involved in Integration and Verification Planning and Requirements Management

RRS Products





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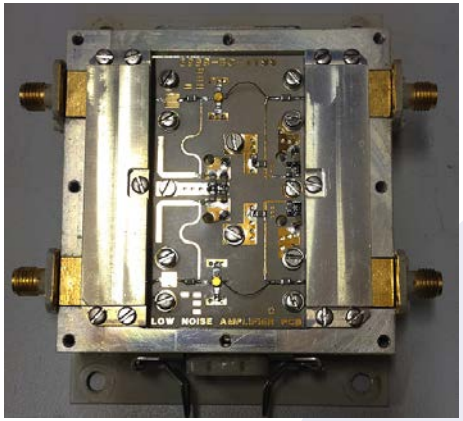
Receiver Characteristics

- Pulse-Doppler
  - Multiple down-conversion stages
  - Sample at IF
  - Typical bandwidth 5MHz to 40MHz
- FMCW
  - Single down-conversion
  - Sample at base band
  - Bandwidth ranges from 100kHz to 10MHz

“Low” Noise Receivers

- System Noise Figures vary from 2dB to 5dB
- Radars cannot be too sensitive because they observe the ground and sun, and they become more sensitive to Noise Jammers
- Receiver sub-systems contain Low Noise Components
  - L-Band LNA: 1dB NF
    Developed at RRS



  - X-Band LNA: Miteq 0.75dB NF

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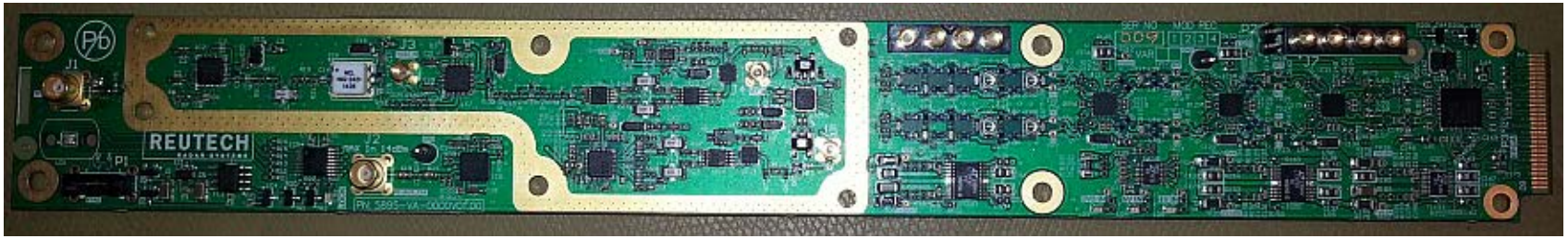
Receivers



- 950 MHz to 2150 MHz Direct down-conversion receiver
- 140 MHz instantaneous bandwidth
- Very high dynamic range
- Must be able to handle large CW input signals
- IQ unbalance (over frequency and temperature):
  - Magnitude: <= 0.3 dB peak, <= 0.1 dB Pk-Pk variation
  - Phase: <= 3 degrees peak, <= 0.5 degrees Pk-Pk variation

Summary

- We can do certain things
- We could do some of these things for AAMID

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