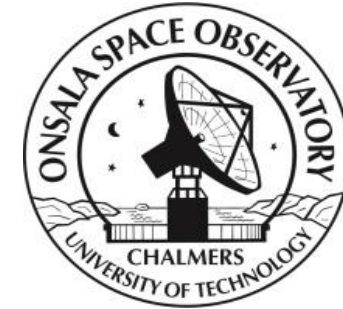


**CHALMERS**

# Recent developments at the Onsala Space Observatory VGOS Twin Telescope project and broadband upgrade

Leif Helldner, Rüdiger Haas, Miroslav Pantaleev  
with colleagues

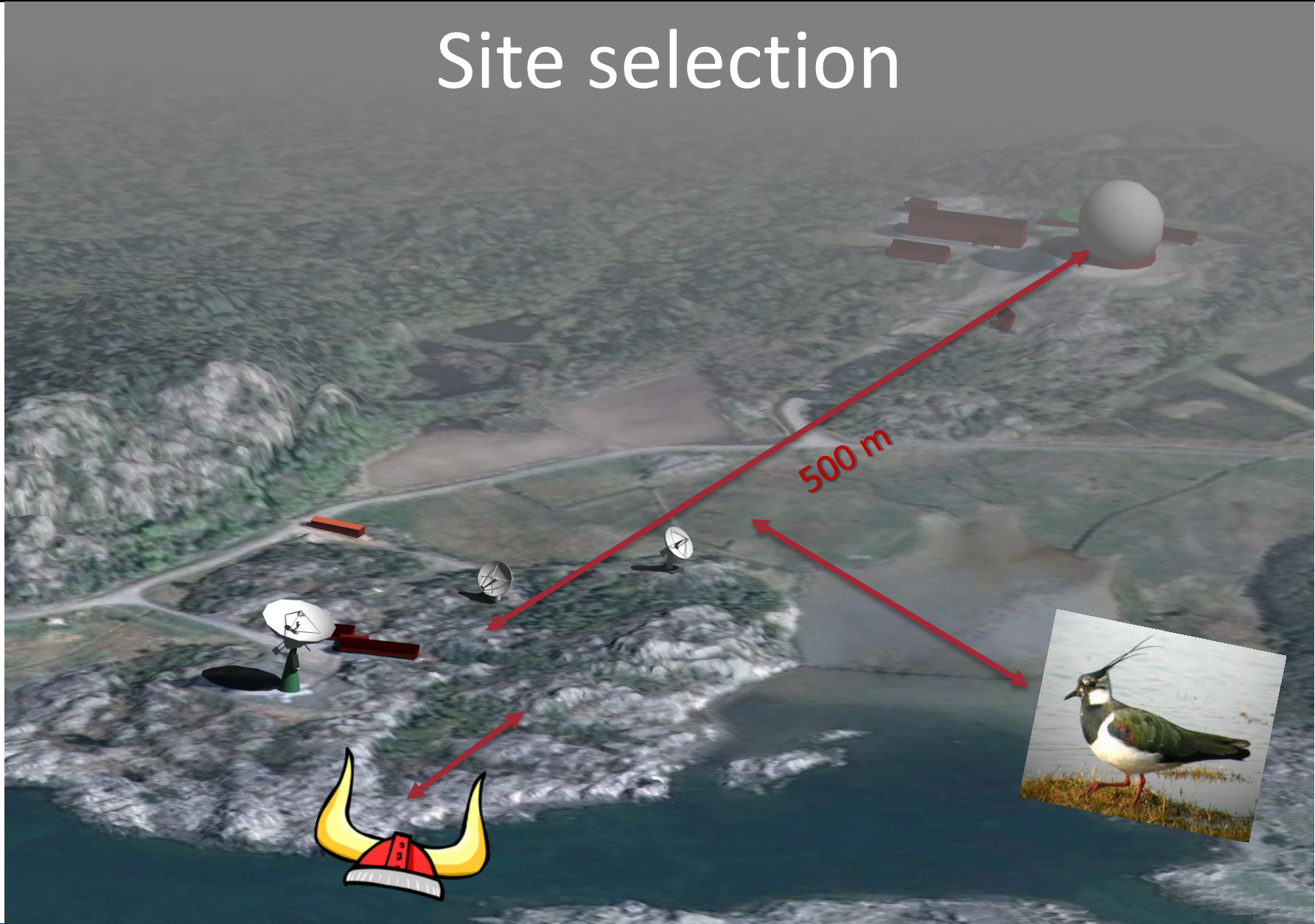
# Outline

- Introduction
- Telescopes
- Infrastructure
- Signal chain
  - VGOS Feed developments
  - VGOS Receiver developments
- Monitoring and survey system
- OSO 20 m broadband developments

# Introduction

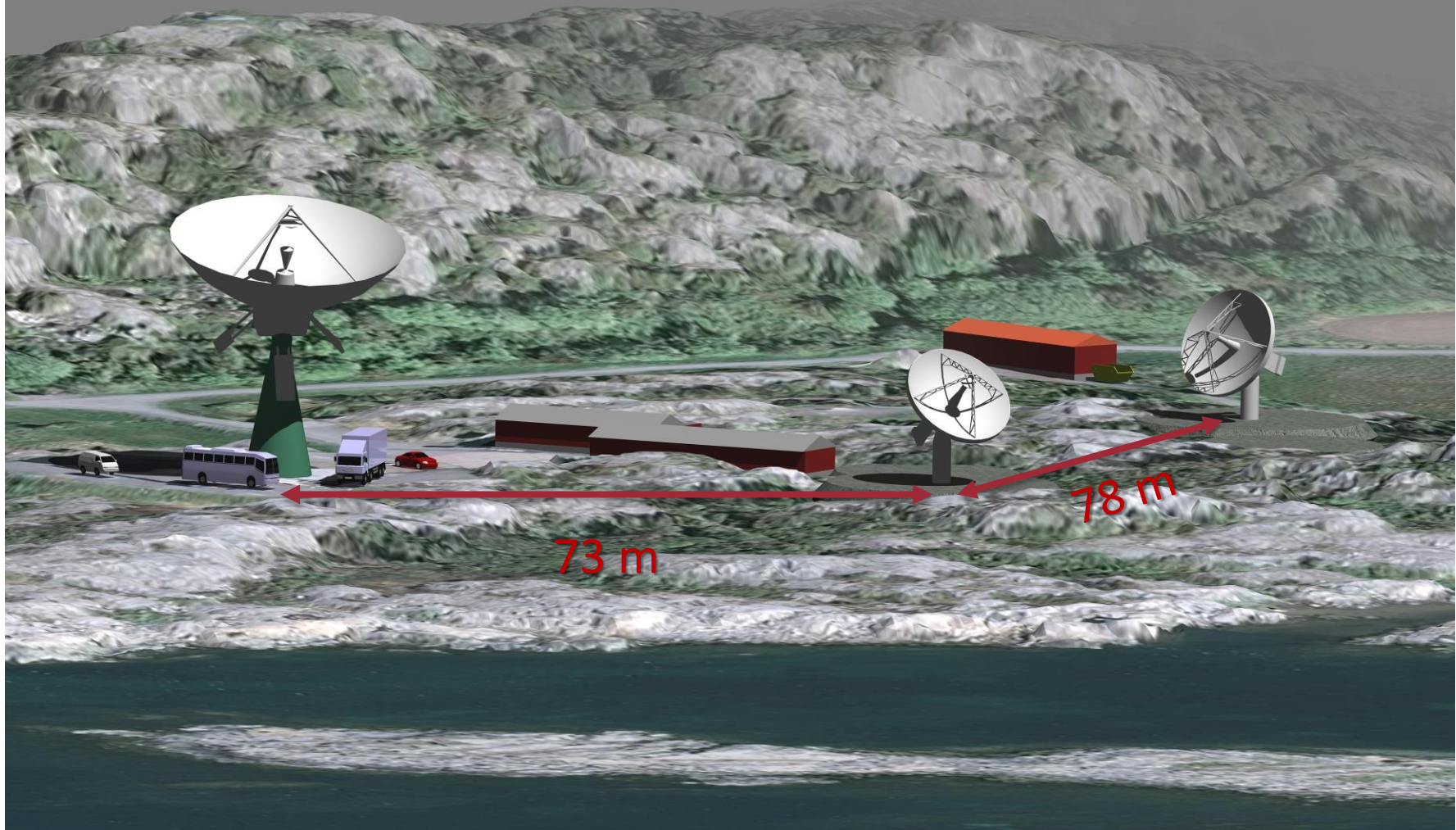
- Installation of two 13.2 m VGOS telescopes – late 2016
- Funding, - Knut and Alice Wallenberg Foundation
- Site selection process, - not an early bird
- Telescope specifications & procurement
- Signal chain specifications, - full VLBI2010
- Feed developments with higher bandwidth, 3 – 15..18 GHz
- New receiver development, matching two types of feeds
- Legacy S/X or semi-broadband on the 20m telescope

# Site selection

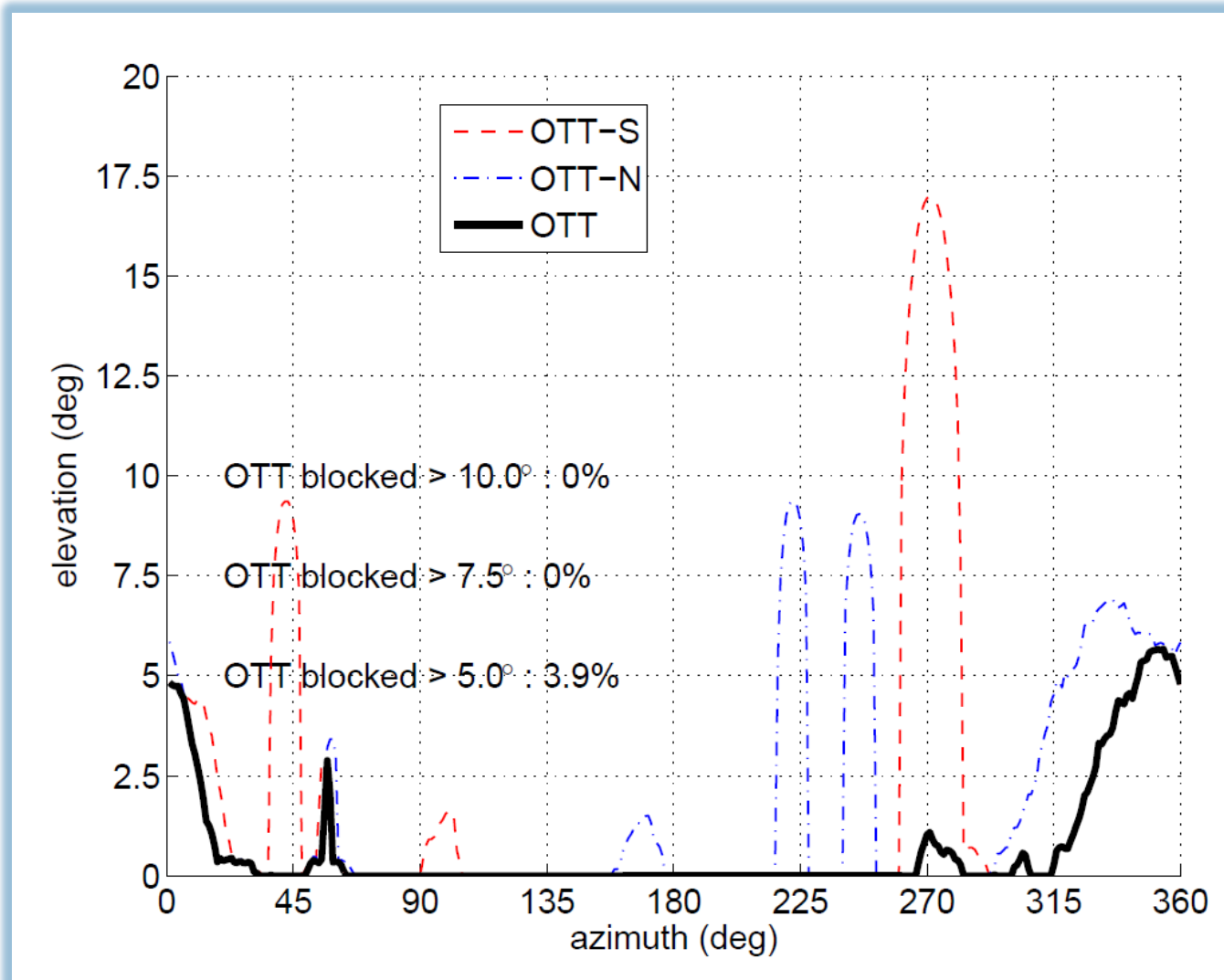




# Final position

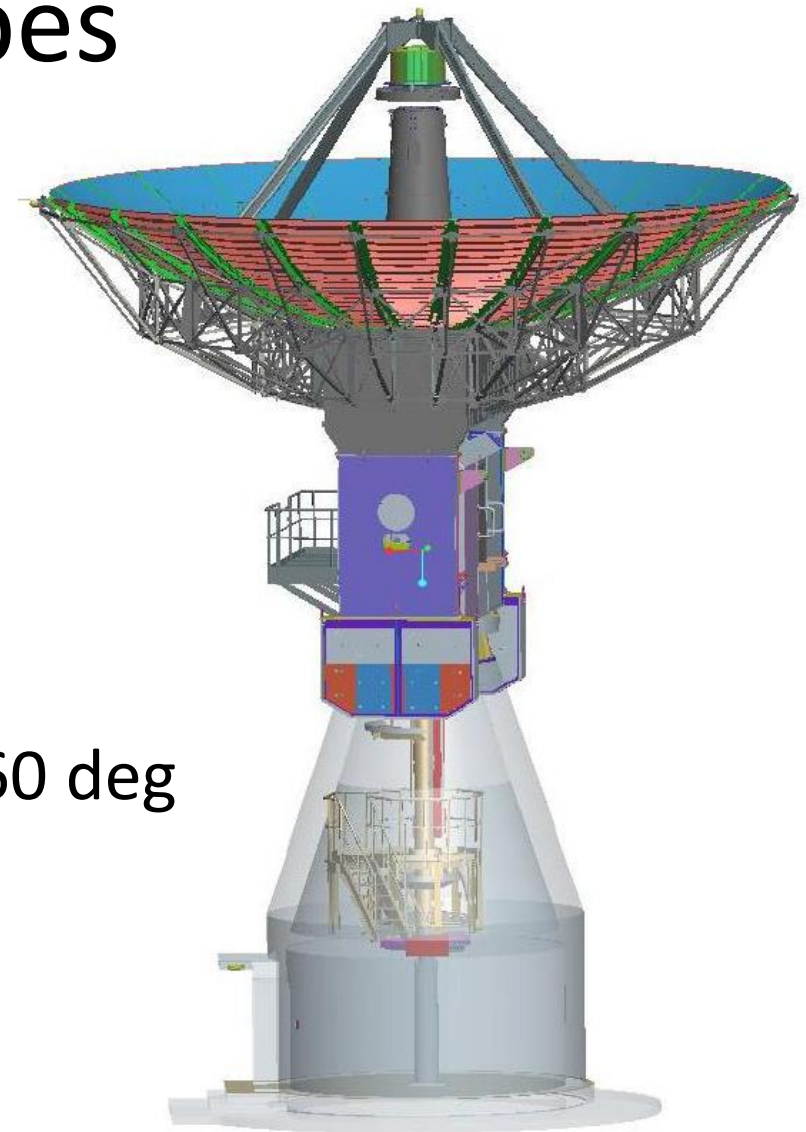


# Skyline



# Telescopes

- MT-Mechatronics 13.2 m
- Fully VGOS specified
- 78 m apart, at the same height
- Fixed ring-focus sub reflector
- Frequency range up to 40 GHz
- Fits both Elevenfeed and QRFH 60 deg
- Expected SEFD below 2000 Jy
- Cabin access through tower
- Fits our harsh marine conditions



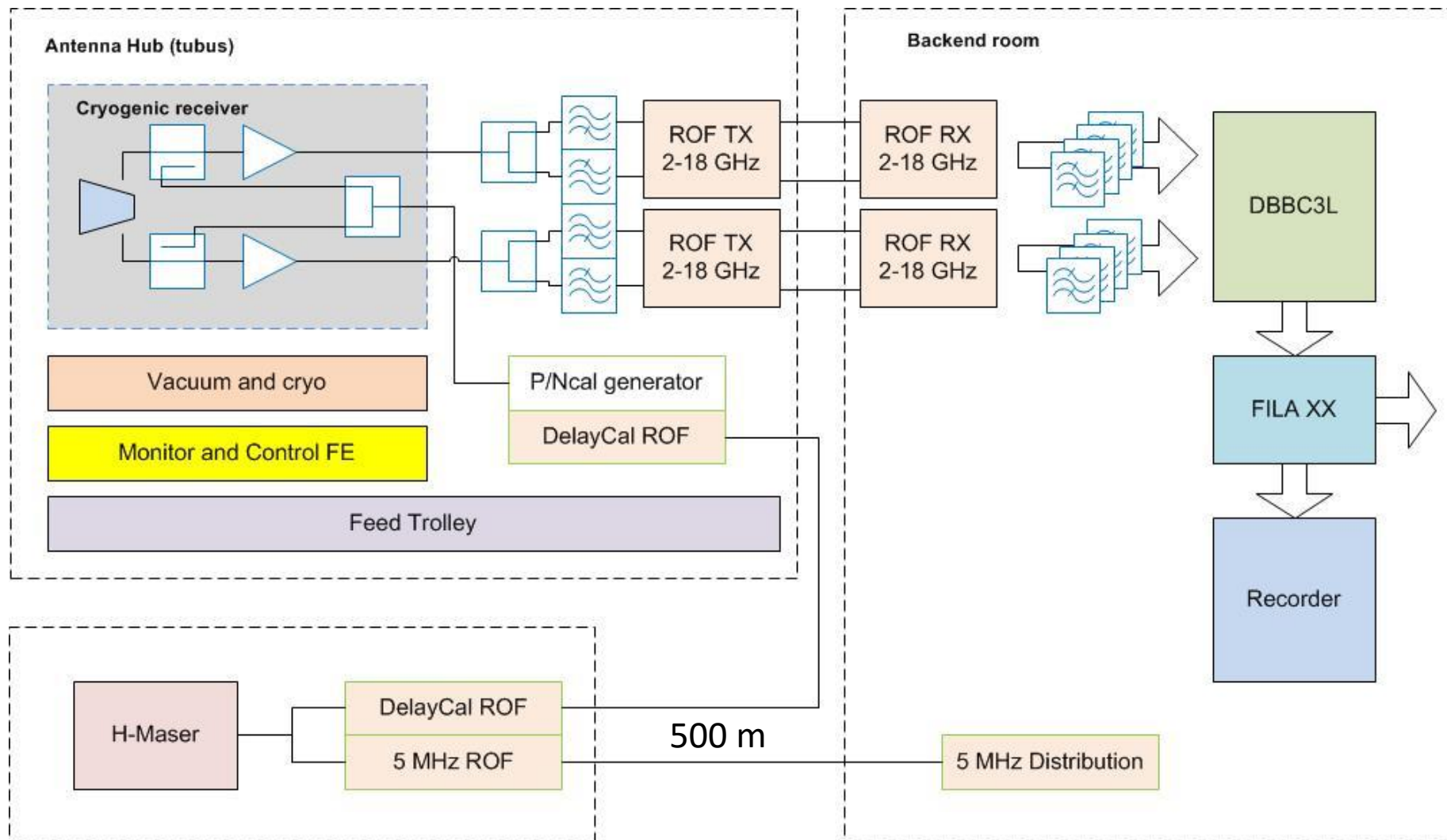


# Infrastructure

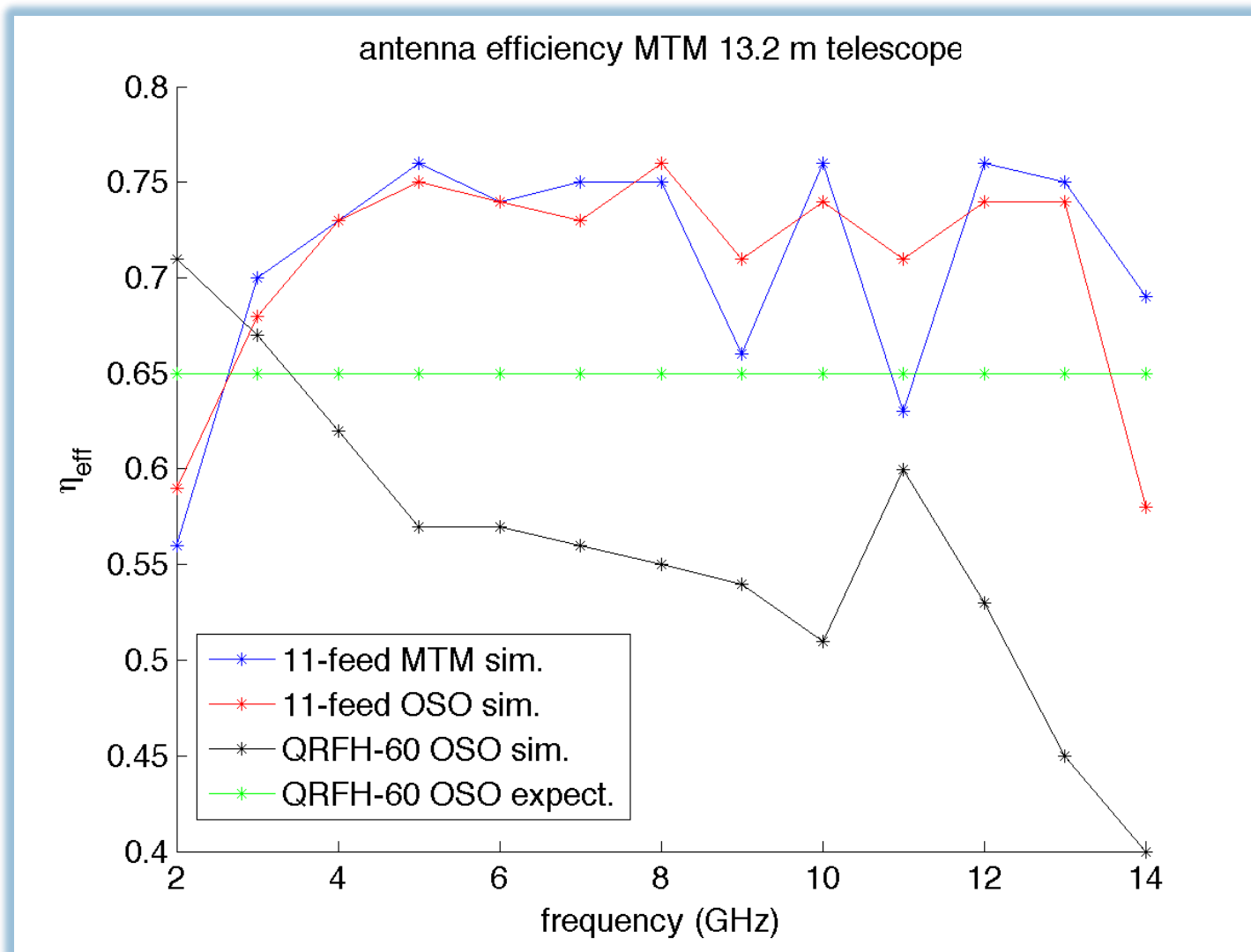
- Landfill and roadwork - done
- Concrete towers – ongoing
- Cable ducts – January
- Power & Diesel - February
- Antenna installation – May to Oct
- Receiver installation – Oct to Dec
- Inauguration – spring 2017



# Signal chain

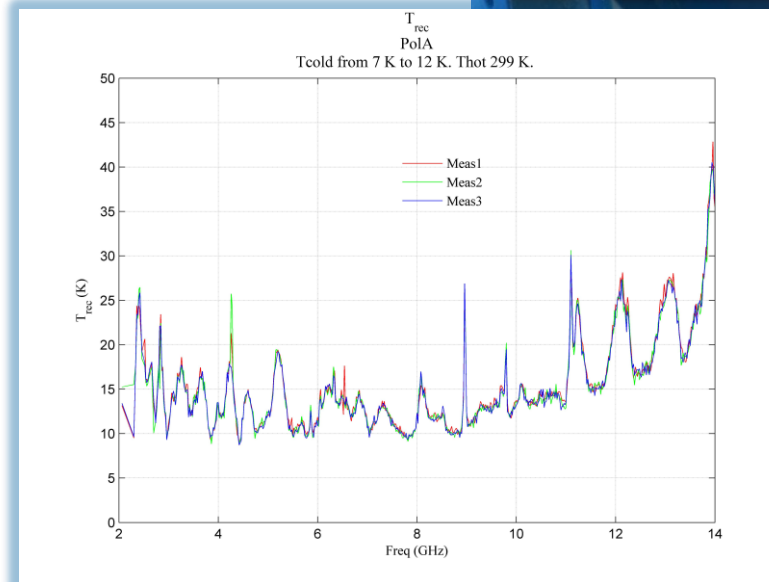
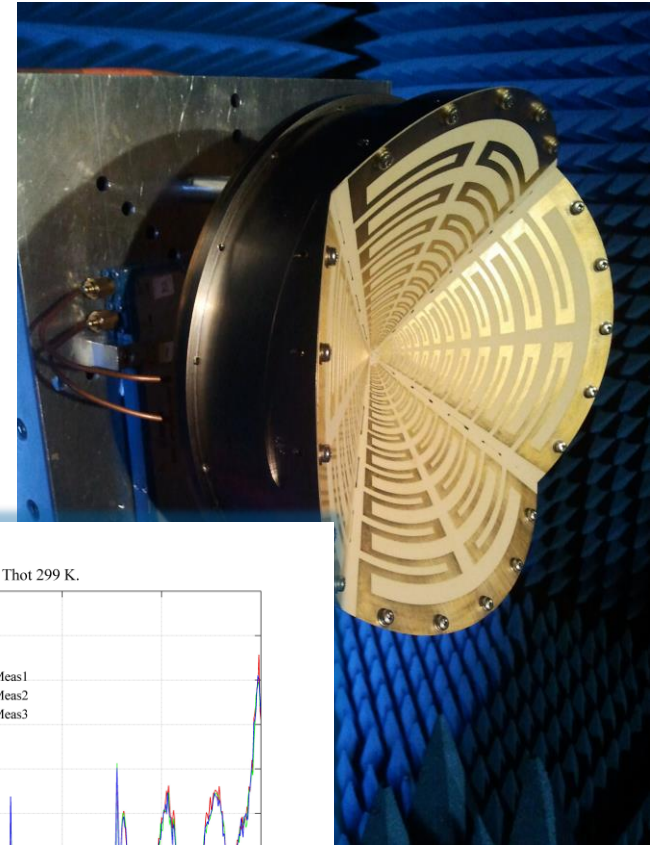


# Feed evaluation, QRFH vs. EF



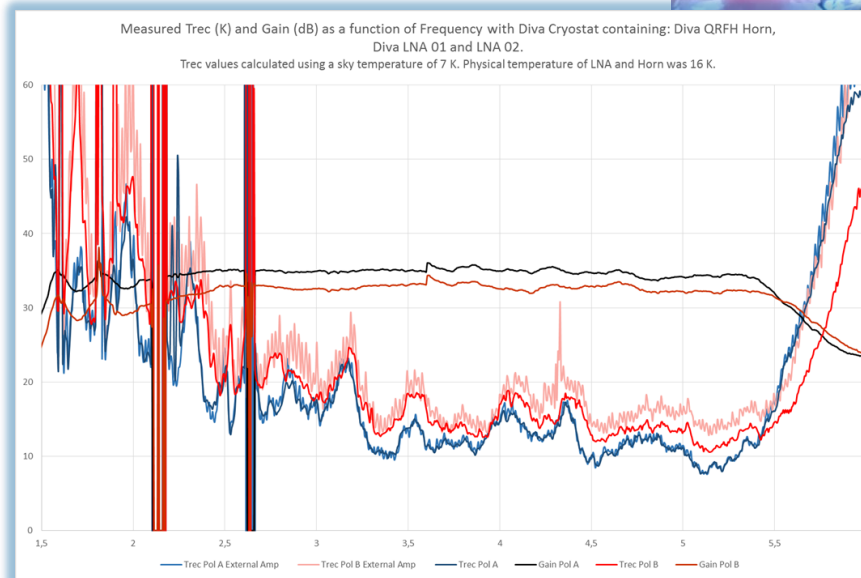
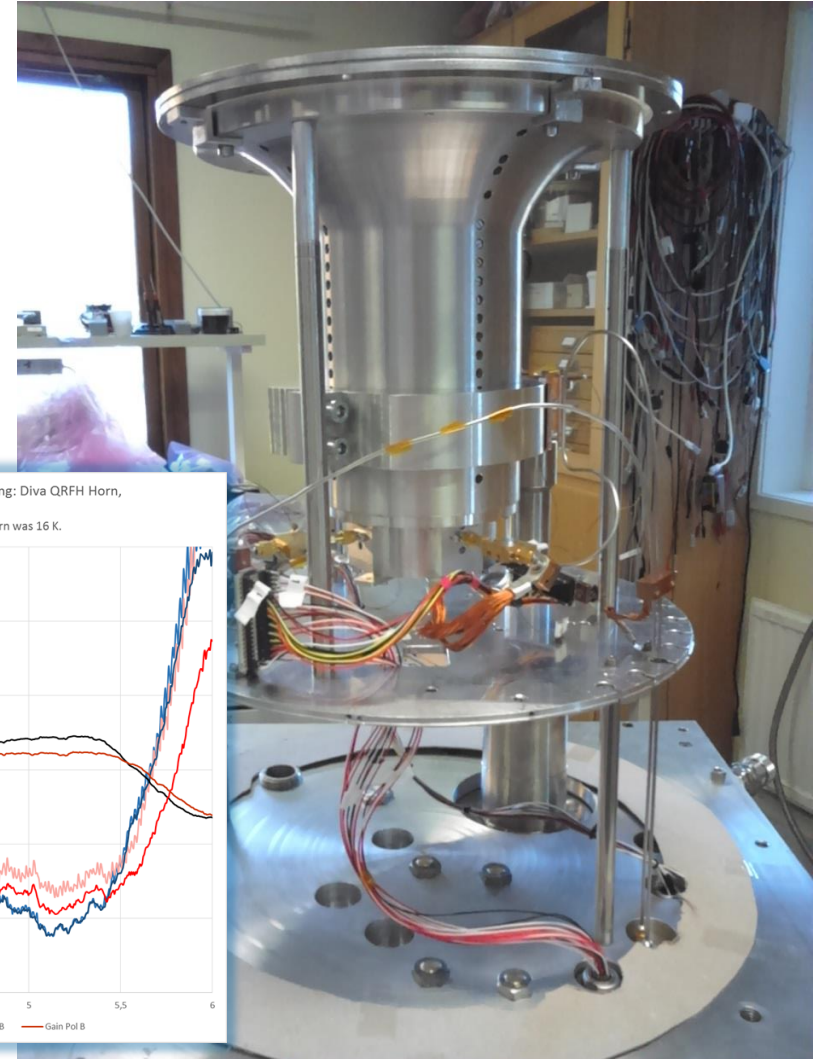
# Elevenfeed – EFiC 2–14 GHz

- Improved cryogenic properties
  - Field replaceable connectors
  - TMM3 8-port circuit board
  - Wider dipoles, - better cooling
  - Improved thermal connection
- 8-port to 2 port testing
  - Cooled hybrids and couplers
  - Phase/Noise injection in hybrid
  - SEFD goal, 2500 Jy on telescope
- Future, 3-18GHz?



# OSO QRFH development

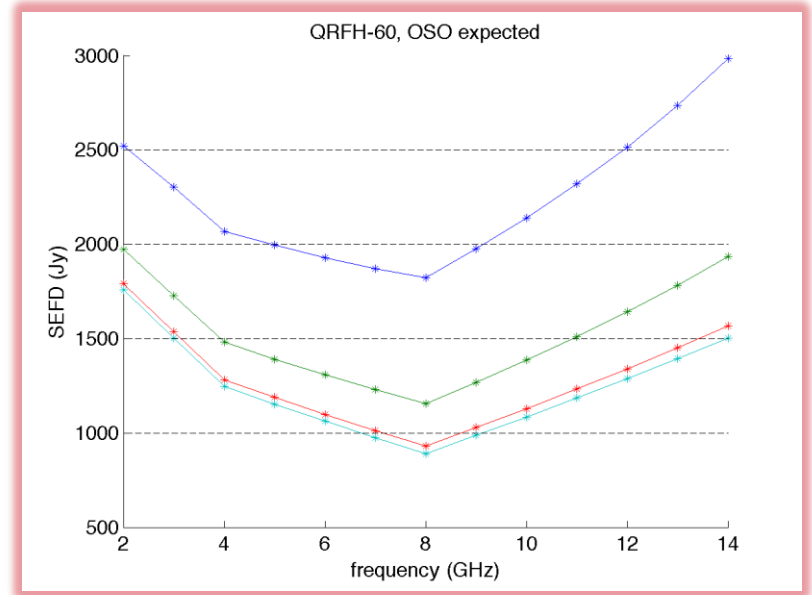
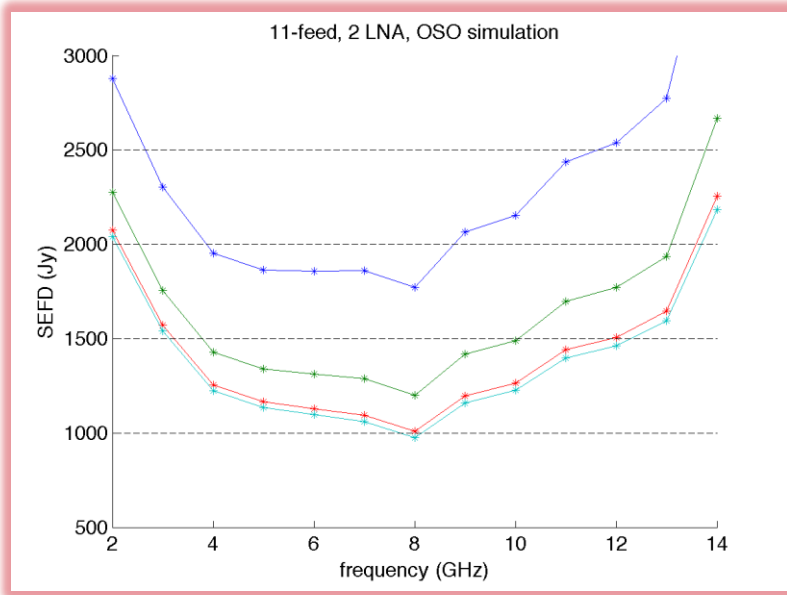
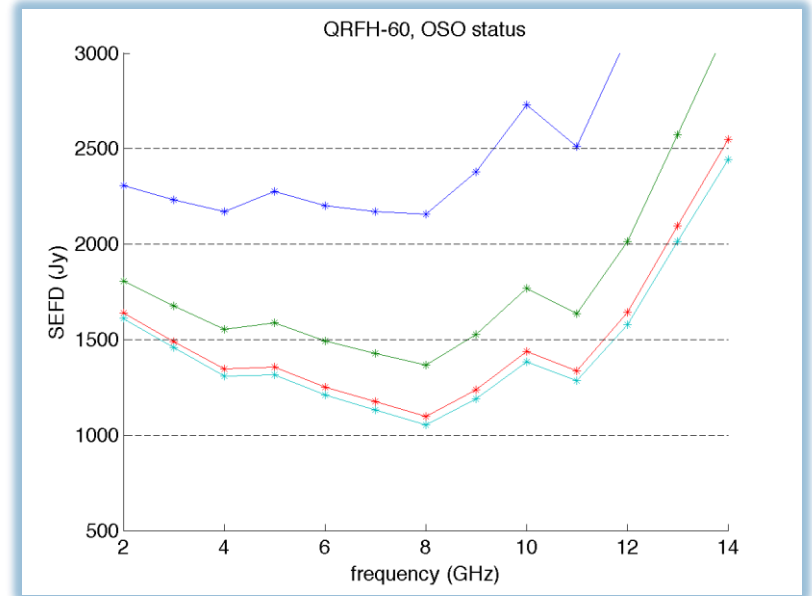
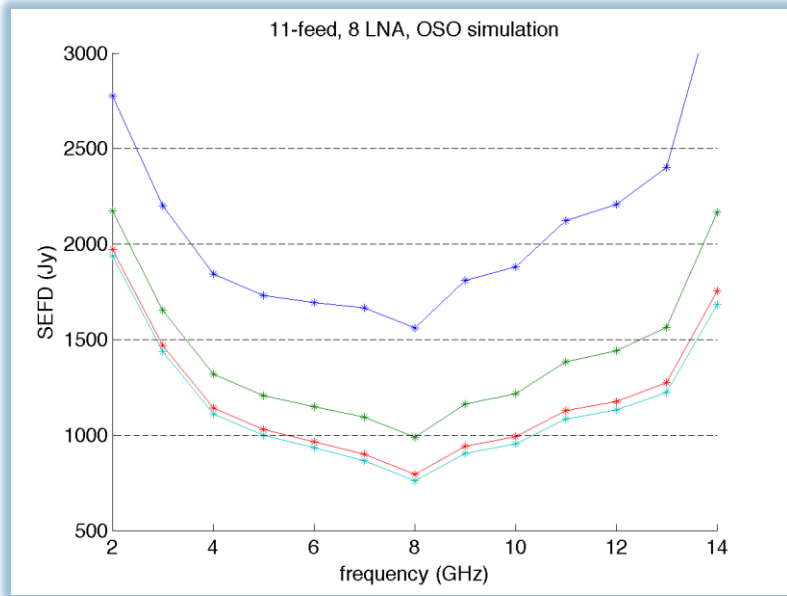
- Optimised for MTM optics
- 60 deg half subtended angle
- Goal, Feed Eap 65 %
- 3-15 GHz
- Low noise





**SEFD**

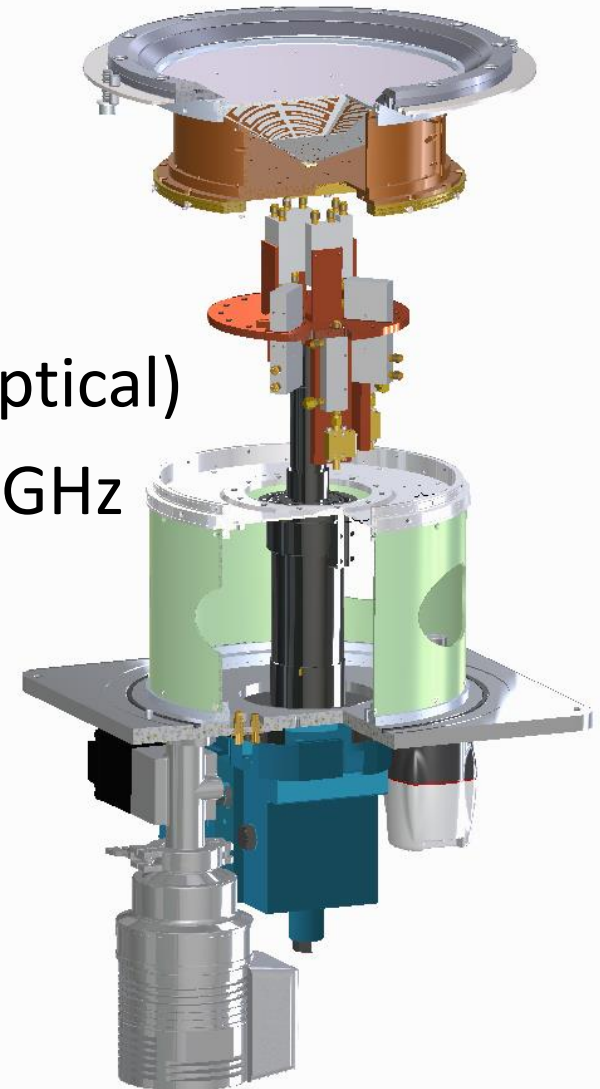
**QRFH  
Vs.  
EFiC**



- EL 5°
- EL 15°
- EL 45°
- EL 90°

# Receiver development

- SKA involvement “spin-off” design
- Improved IR & radiation shielding
- Low RFI, Bias, control & monitoring (optical)
- Uses new ultra low noise LNA's, 3–16 GHz
- Low feed-in-dewar artefacts
- Fits EFiC or QRFH
- Rem. contr. Vac. pump & valve
- Low Power, low cost
- Easy maintenance

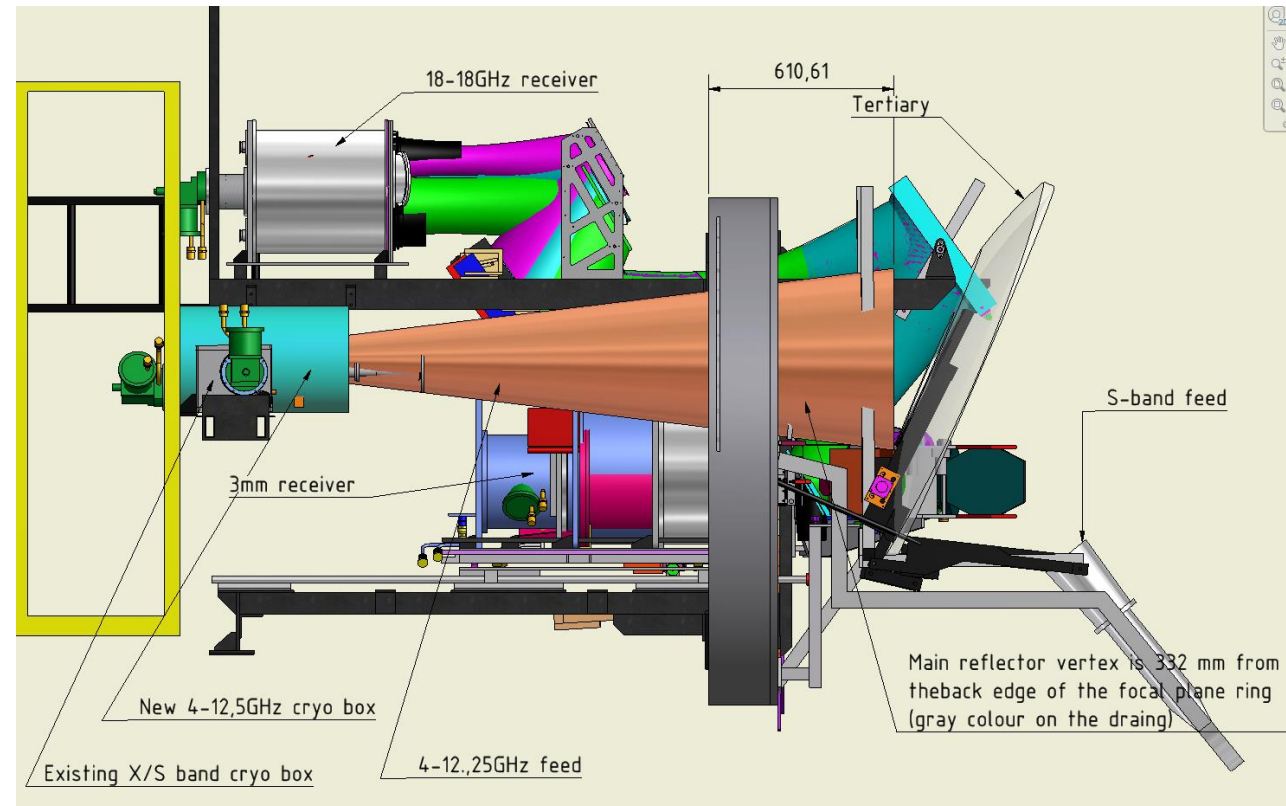


# Monitoring & survey systems

- Telescopes
  - Tower Invar measurements
  - Temperature monitoring and control
  - Inclinometers
  - Laser tracker & targets
- Site
  - GPS station network
  - Weather stations
  - New WVR in 2017

# 20m Legacy S/X and Broadband

- Combines new C-band for 20m & upgrades current legacy S/X receiver
- For GEO & ASTRO VLBI
- Based on bought design
- Manufacture in house
- Cooled OMT
- “VGOS” LNA’s
- Split horn, - low/high
  - 4 – 12.5 GHz
  - 2 + 8 – 12.5 GHz





# Thank you



<http://www.oso.chalmers.se/ottcams/showcams.html>