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

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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

73 m
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

Antenna Hub (tubus)
- Cryogenic receiver
- Vacuum and cryo
- Monitor and Control FE
- Feed Trolley

500 m

Backend room
- ROF TX 2-18 GHz
- ROF RX 2-18 GHz
- DBBC3L
- FILA XX
- Recorder

H-Maser
- DelayCal ROF
- 5 MHz ROF

5 MHz Distribution
Feed evaluation, QRFH vs. EF

antenna efficiency MTM 13.2 m telescope

- 11-feed MTM sim.
- 11-feed OSO sim.
- QRFH-60 OSO sim.
- QRFH-60 OSO expect.

frequency (GHz)

Department of Earth and Space Sciences
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