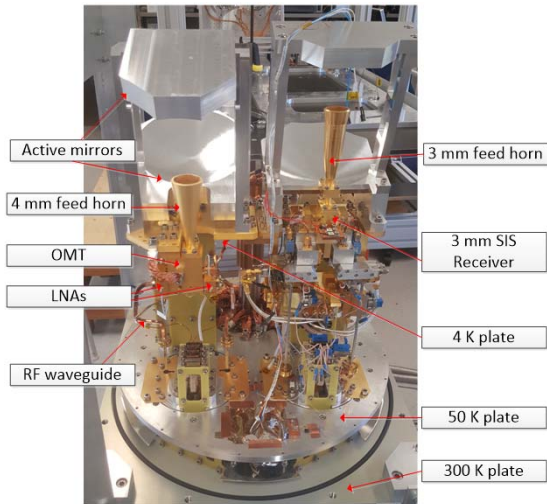


3mm/4mm Receivers for the OSO 20-m

Abstract

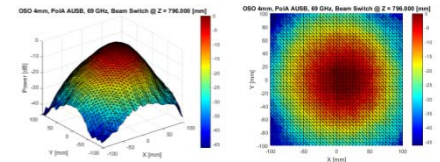
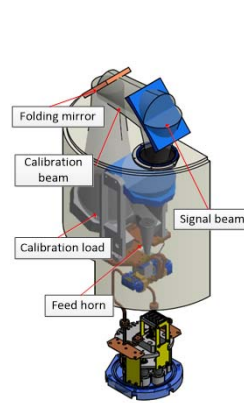
We present the design and performance of the receiver for the 3mm and 4 mm bands recently installed and commissioned on the 20 m telescope at Onsala Space Observatory. The 3mm channel is dual polarisation 2SB SIS receiver. The 4mm channel uses cryogenic LNAs and commercial IQ mixer to provide dual polarisation 2SB operation. The 3mm and 4mm receiver channels are integrated in common dewar with cold optics and calibration loads. The receiver utilizes novel beam switch.

Cryogenic assembly



> 4mm cryogenic assembly (left half of the picture) and the 3 mm channel (right half of the picture).

Beam characterisation

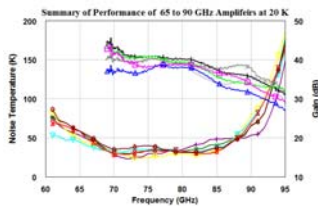


> Beam trace for the 4 mm receiver showing signal and calibration path (left)
 > Beam measurement set-up (right up) and results (right down) showing the beam profile.

Receiver key components

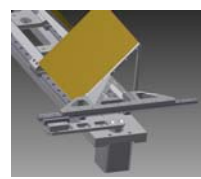
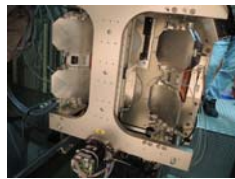
Mirrors, feed, OMT and LNA assembly

- > Close view of the cryogenic mirrors, feed horn, OMT and cryogenic RF LNAs.
- > Performance of the LNAs from National Radio Astronomy Observatory in US.



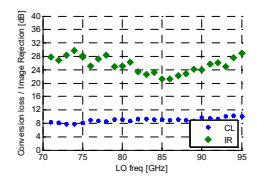
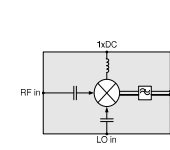
Beam Switch

- > Innovative on- source/off-source optical switch design
- > Cryogenic calibration loads for 3 mm and 4 mm channels
- > Sideband rejection measurement
- > Test signal for tuning
- > VLBI polarisation filter

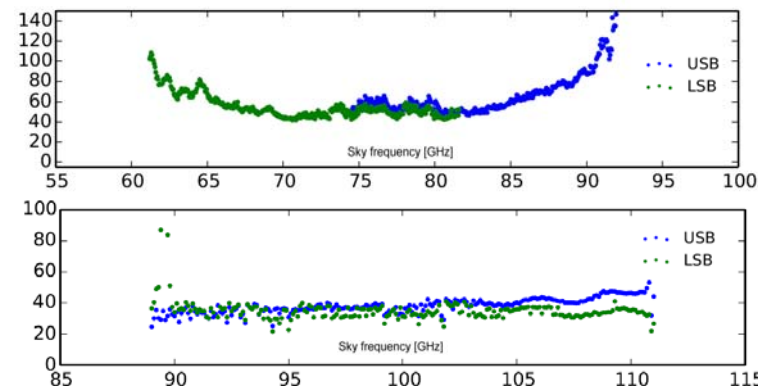


IF Downconverter for the 4mm channel

- > Uses commercial MQR0011 chip from Gotmic.
- > Image rejection mixer covering the full E-band.
- > IF port has an IQ in/output ranging from DC up to 12 GHz.
- > Image rejection level is 20 dB throughout the E-band.
- > LO input power level of 5 dBm is required.



Performance



Summary

- > Receiver for 3mm and 4 mm bands was designed and commissioned.
- > The IF system for the 4mm channel is based on commercial IQ mixer chip providing very wide IF bandwidth.
- > The receiver uses novel chopper mirror that minimises the blanking time.
- > Local oscillator (LO) system for both channels is based on a Gunn oscillator with a phase lock loop (PLL) and mechanical tuners for broadband operation, providing independently tunable LO power for each polarization.