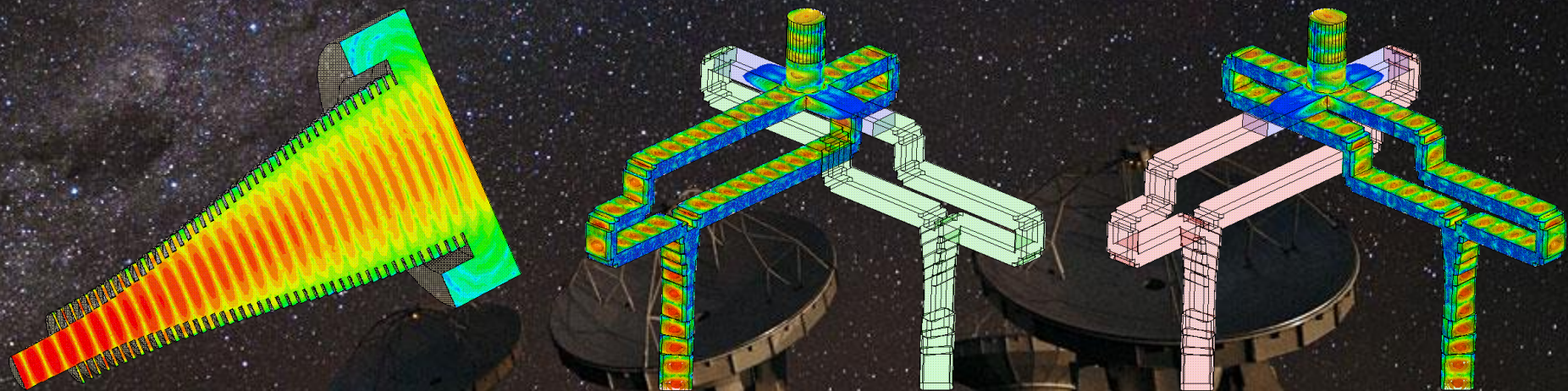


# ALMA Band 2-3 Feedhorn and OMT developments @ INAF

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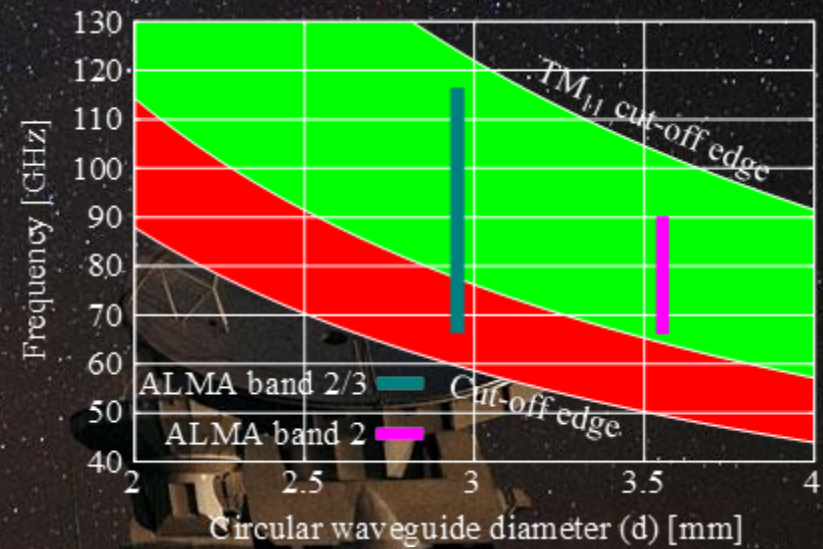
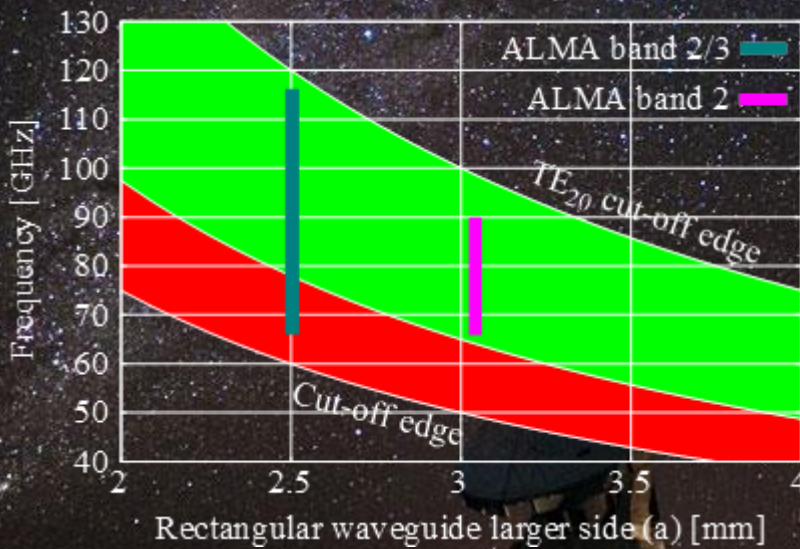


# Band 2-3 waveguide component design

Challenging but not impossible



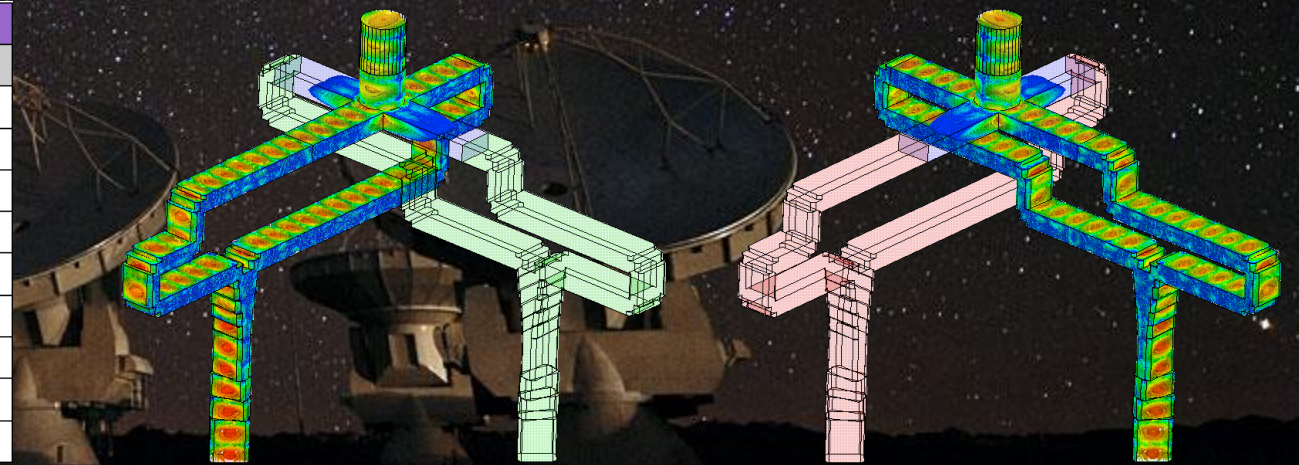
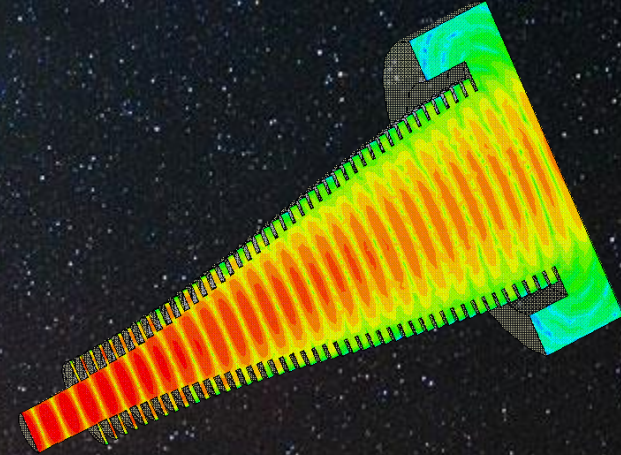
Recommended: Yes █ No █



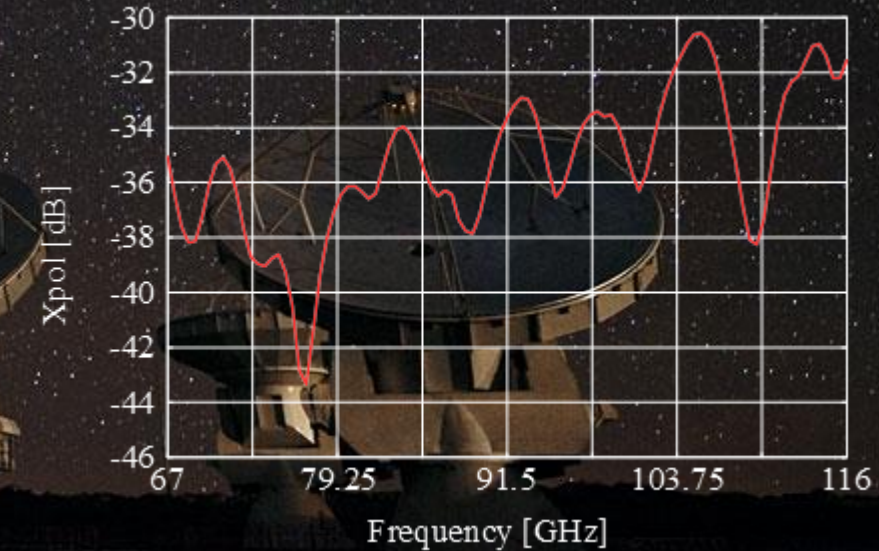
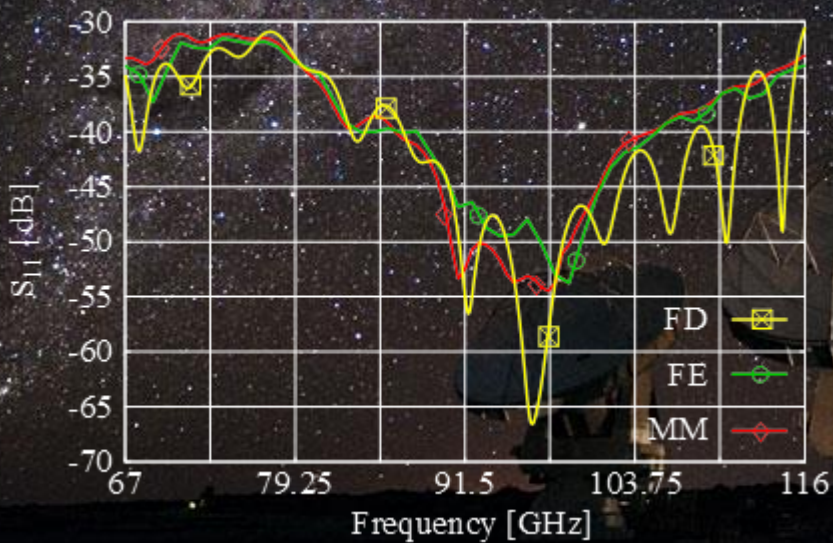
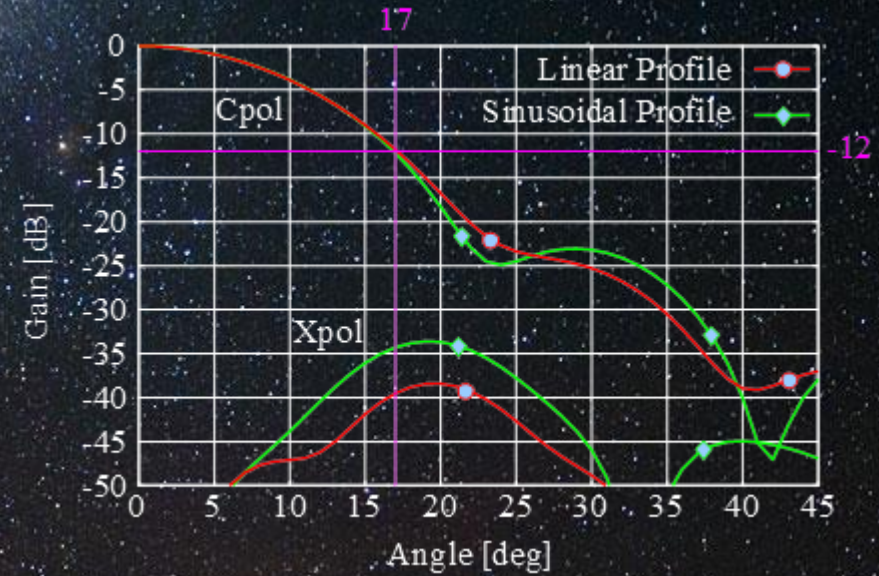
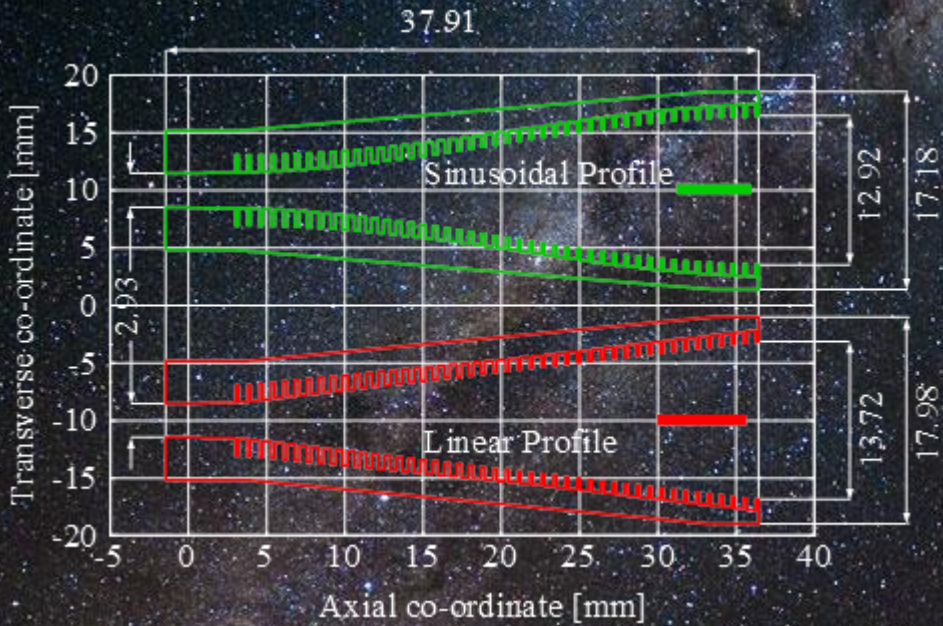
# Band 2-3 Feed and OMT Specifications

Feed Horn Specifications		
	Band 2	Band 2/3
Bandwidth [GHz]	67-90	67-116
Return loss [dB]	>30	>30
Insertion loss [dB]	TBD	TBD
Cross-Polar Maximum [dB]	<-30	<-30
ET [dB@deg]*; W0[mm]*	12@17; 4.73	12@17; 4
Technology	Circular Corrugated Horn	Circular Corrugated Horn
Throat Flange	UG387/U	UG387/U
Throat input diameter	TBD	TBD
Max envelope	TBD	TBD

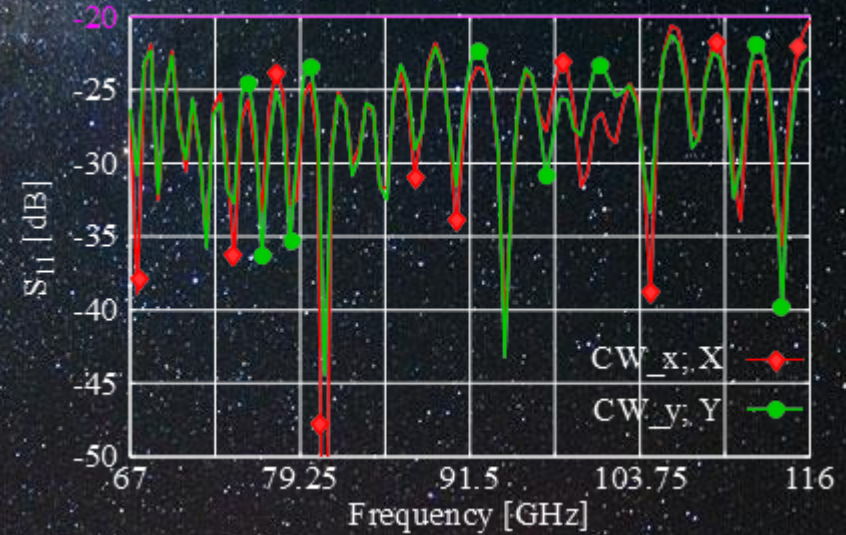
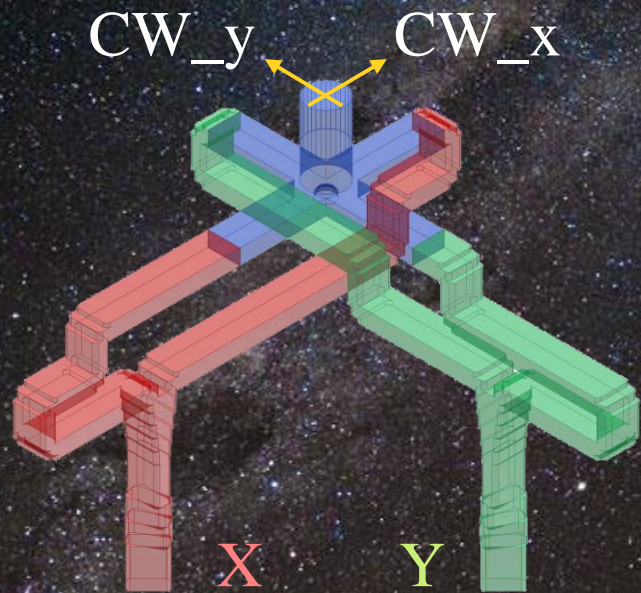
Orthomode Transducer Specifications		
	EM Simulation	Measurements
Bandwidth [GHz]	67-116	
Return loss (Input and Output ports) [dB]	>20	>15
Insertion loss [dB]	<0.5	<0.5
Cross-Polar Maximum [dB]	<-30	<-20
Output ports Isolation [dB]	<-30	<-25
Throat Flange	UG387/U	
Input diameter (Band 2; Band 2/3) [mm]	(TBD; 2.93)	
Output dimensions (Band 2; Band 2/3) [a x b, mm]	(TBD; 2.5 x 1.2)	
Max envelope	TBD	



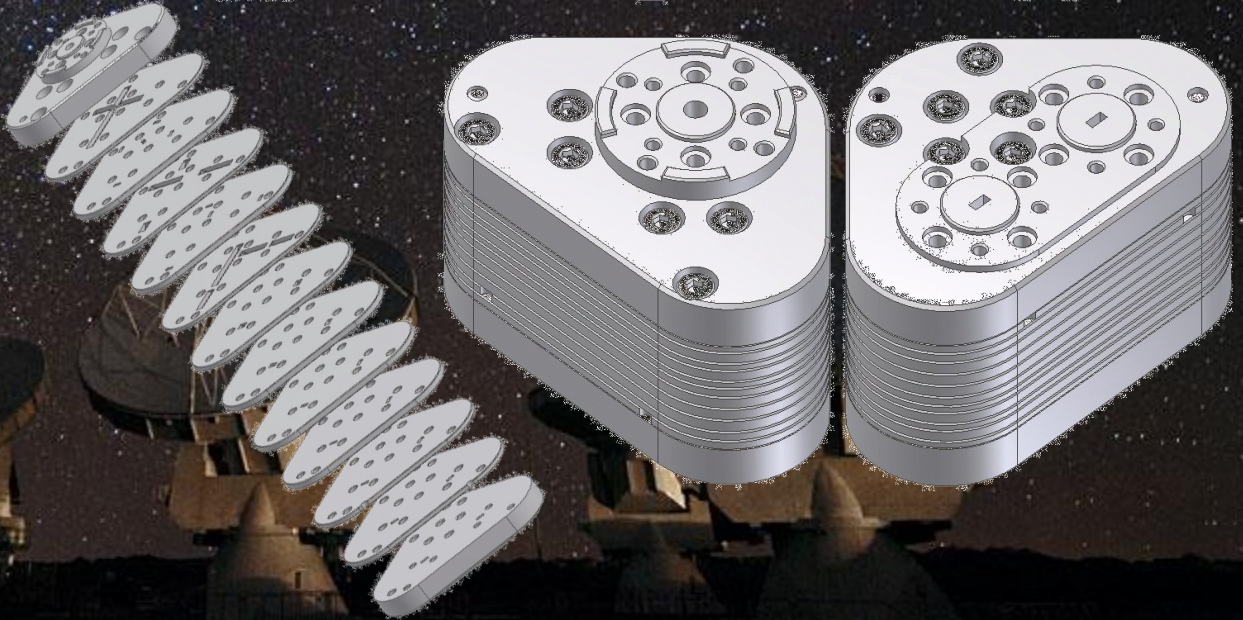
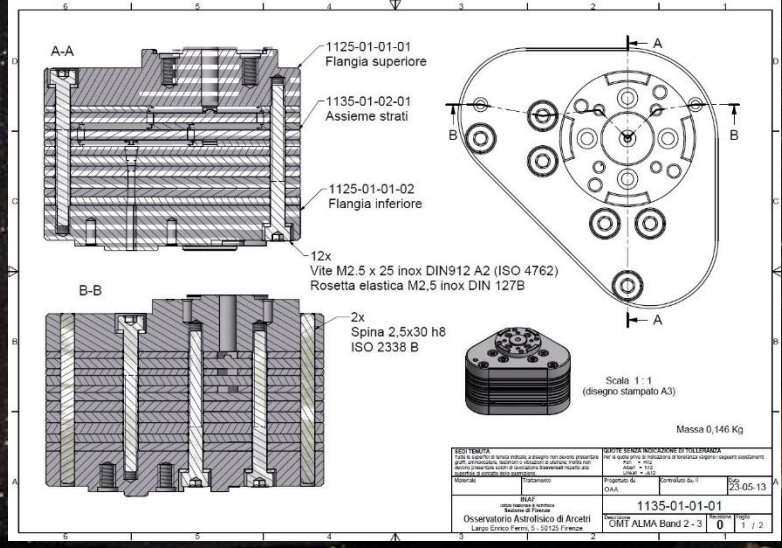
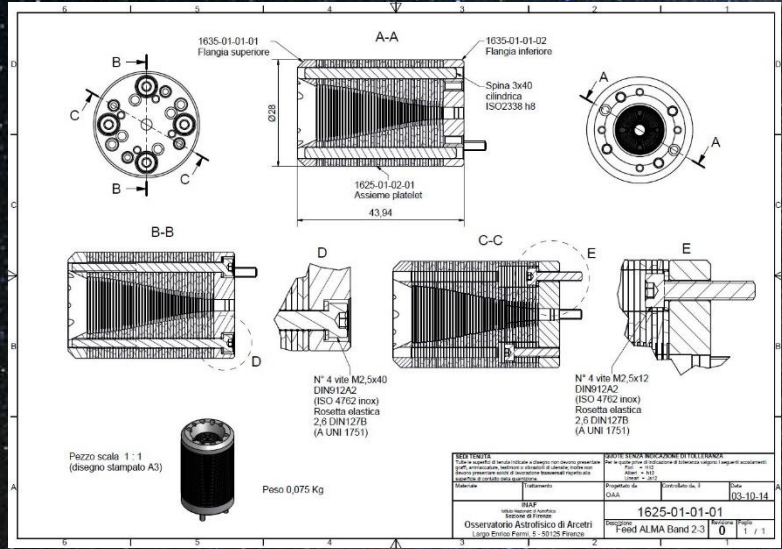
# Band 2-3 Feed Design



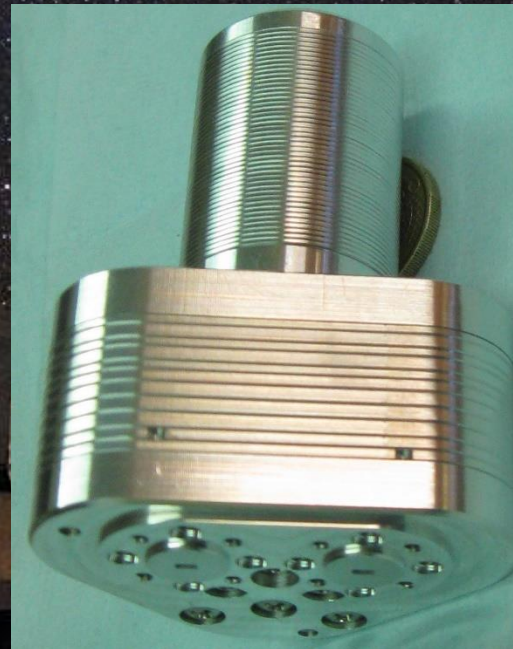
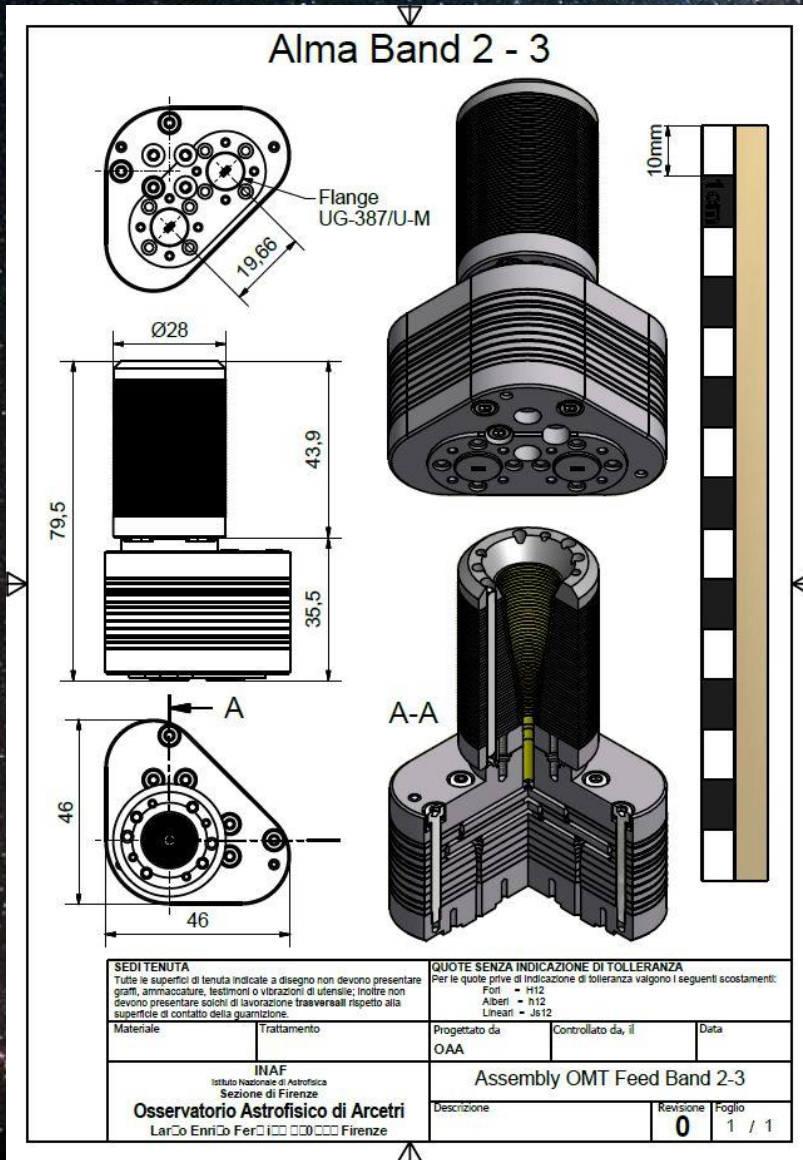
# Band 2-3 OMT Design



# Band 2-3 Feed-OMT Engineering

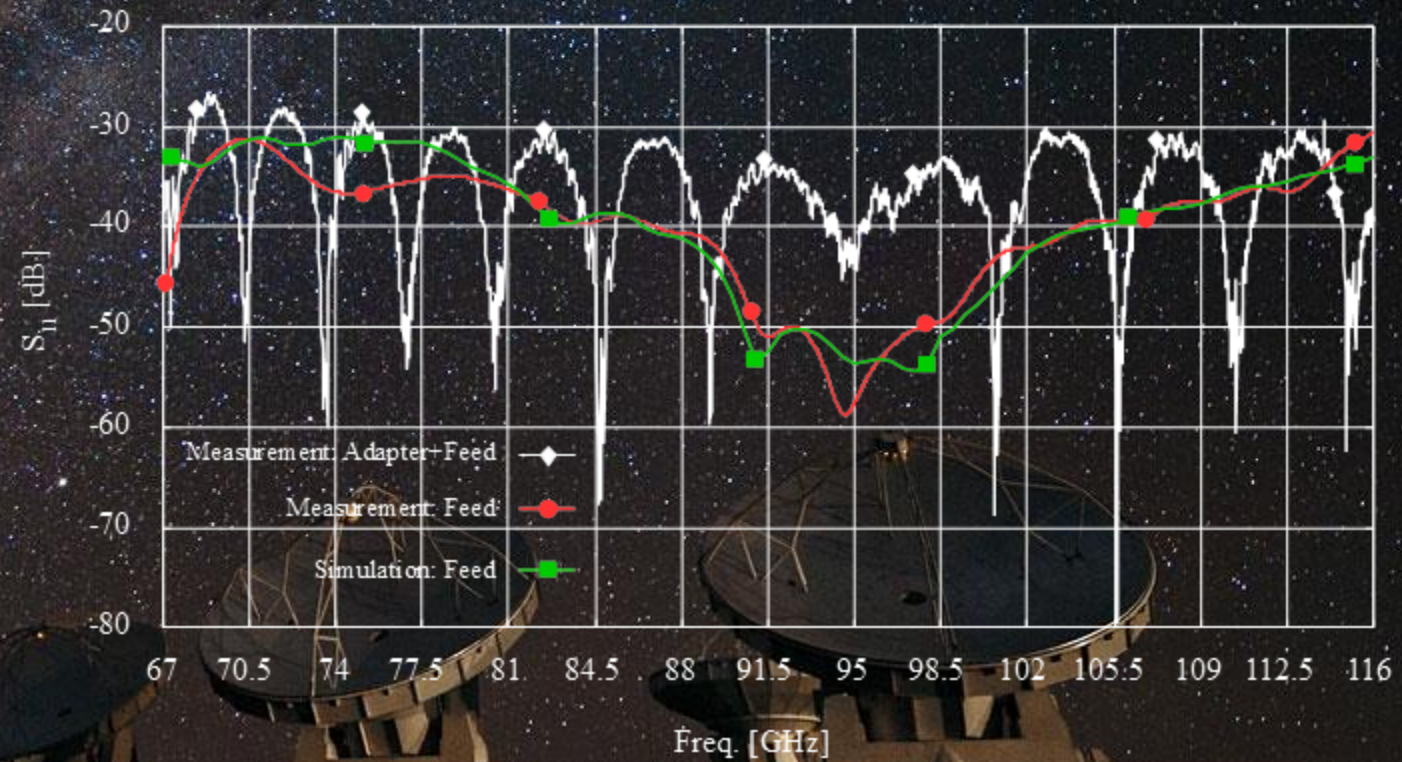
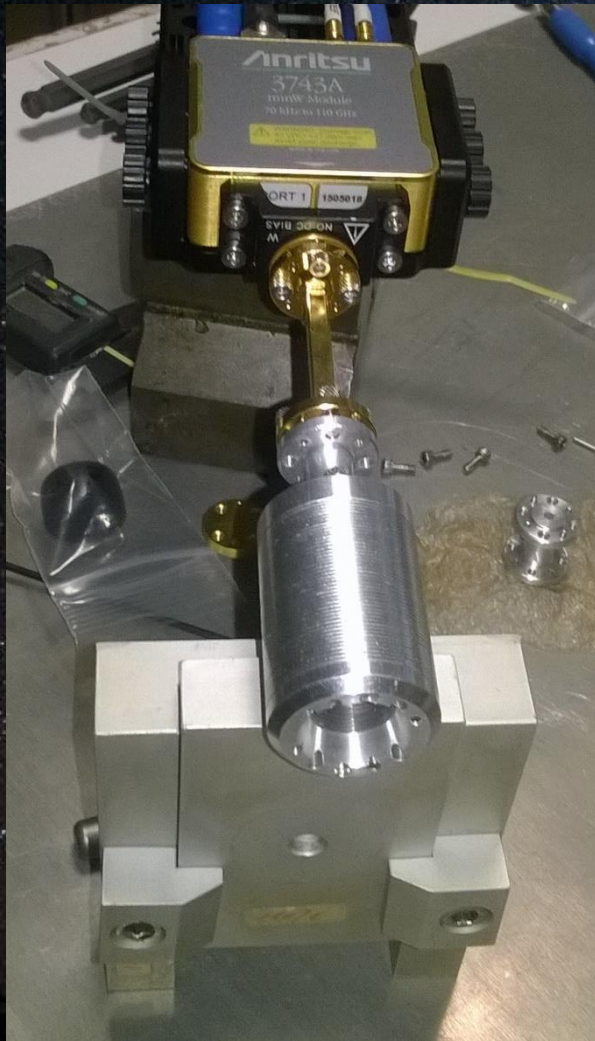


# Band 2-3 Feed-OMT Prototyping



# Band 2-3 Feed Testing

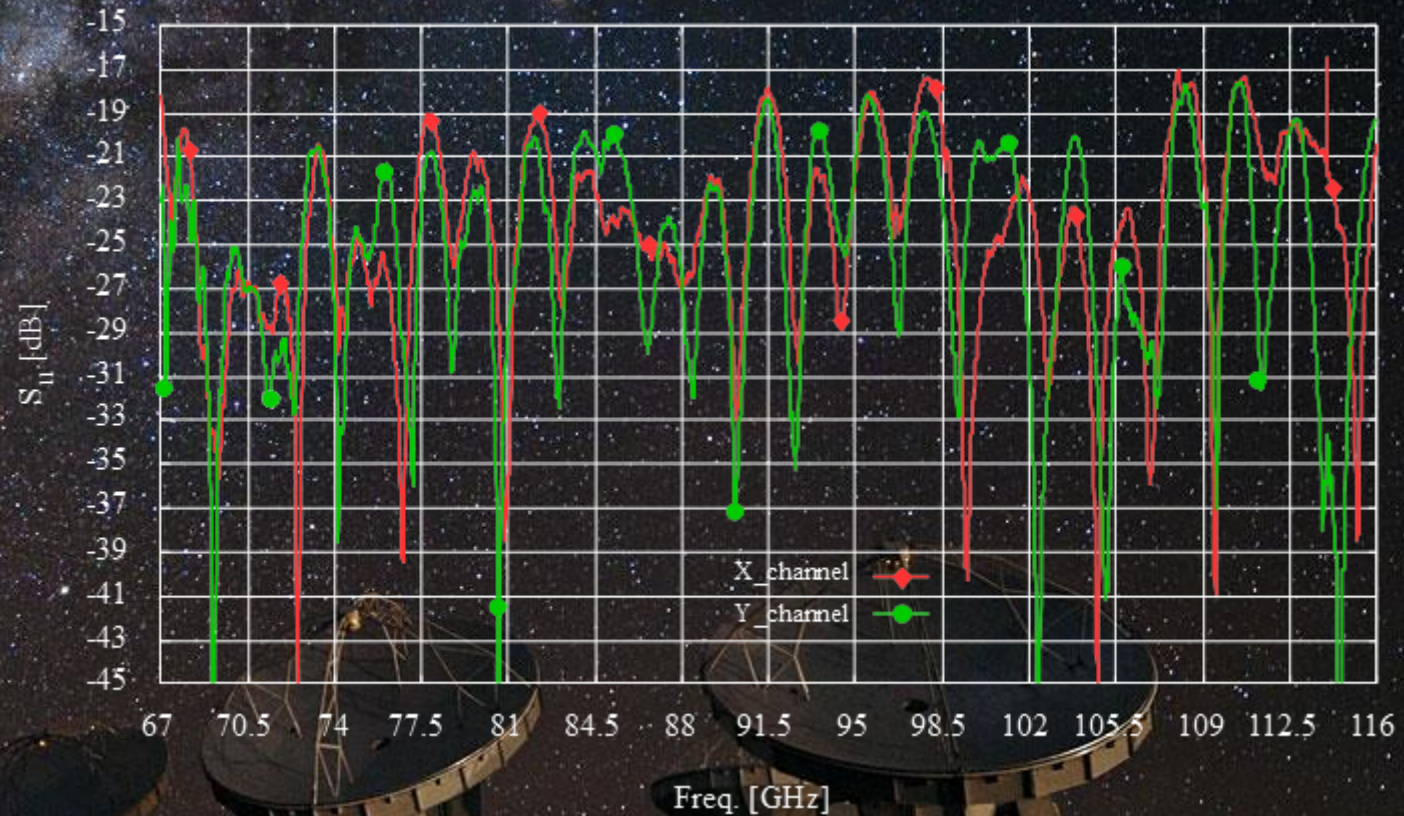
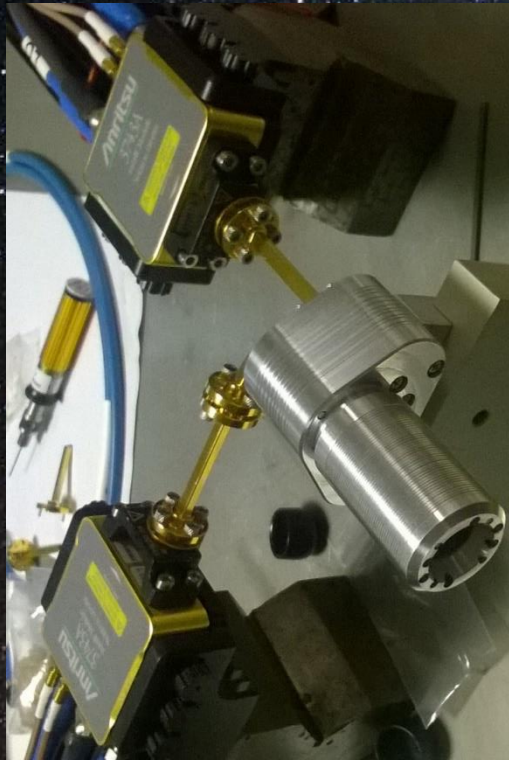
Reflection coefficient: measurement and TD filtering





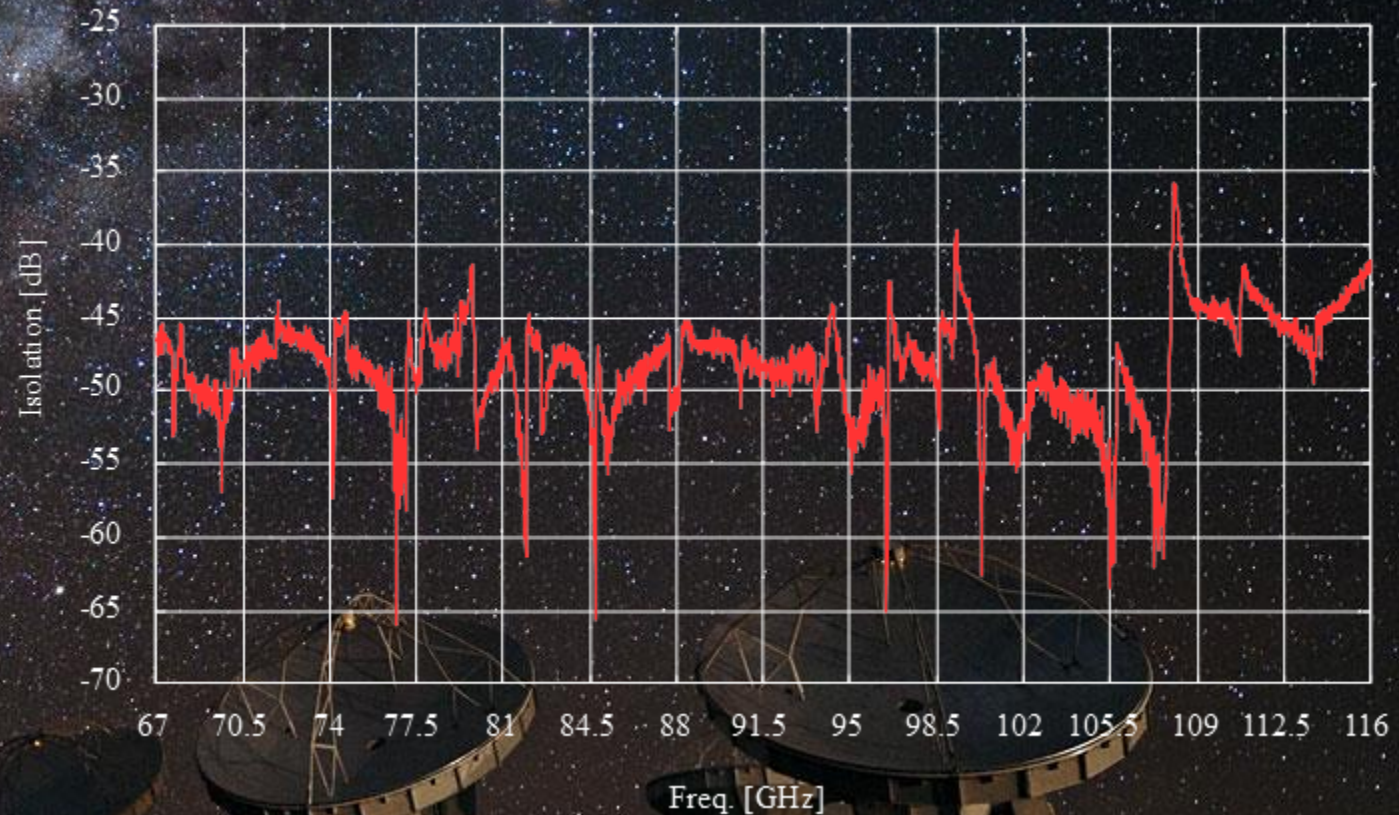
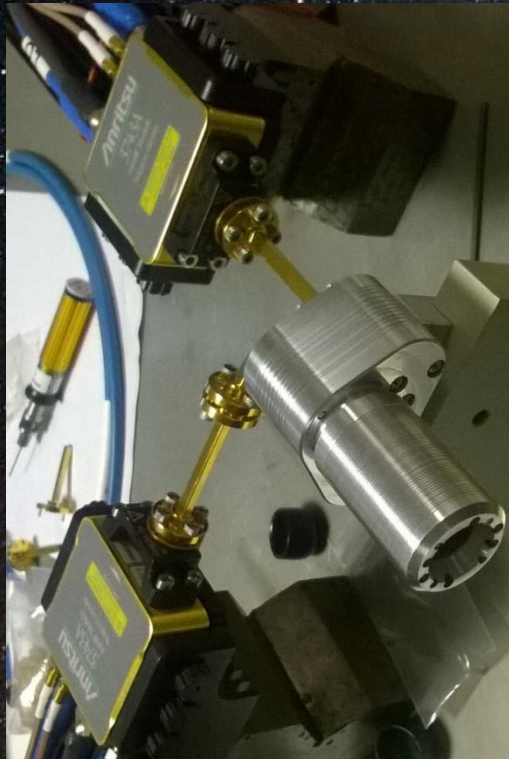
# Band 2-3 Feed-OMT assembly Testing

Reflection coefficient: measurement



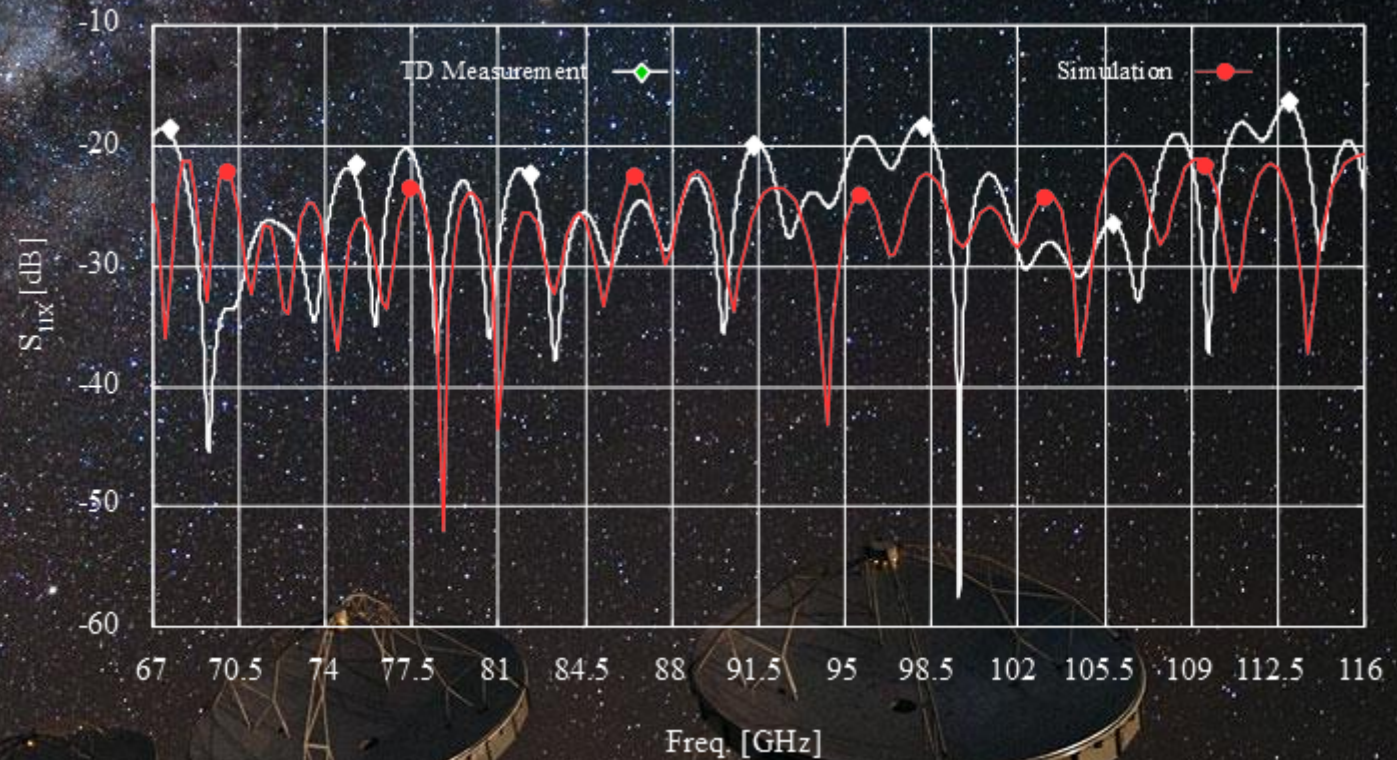
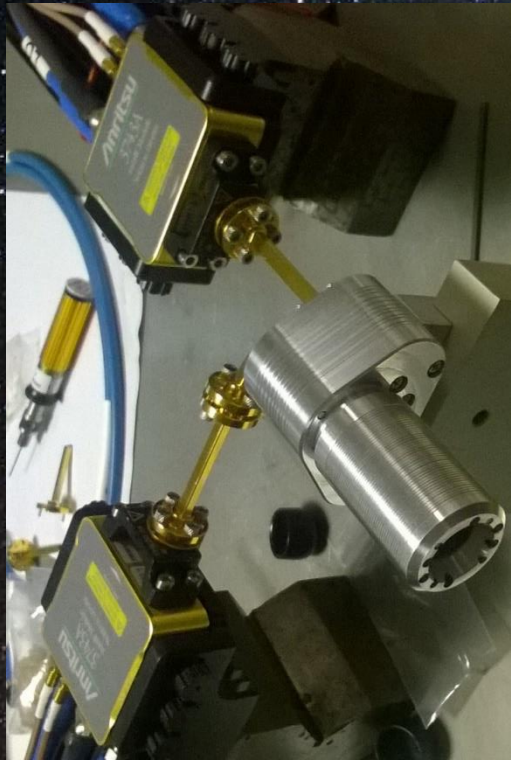
# Band 2-3 Feed-OMT assembly Testing

## Isolation between output ports (X, Y): measurement



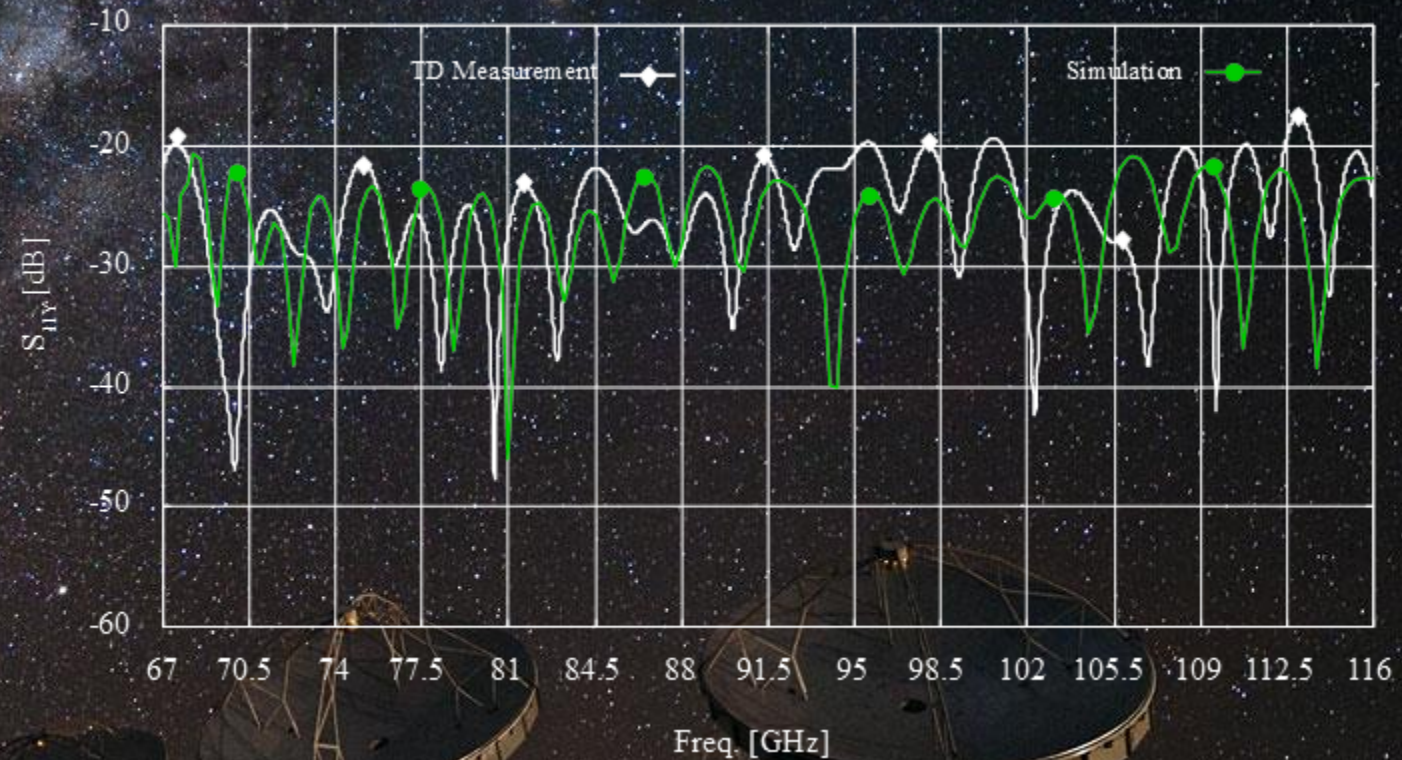
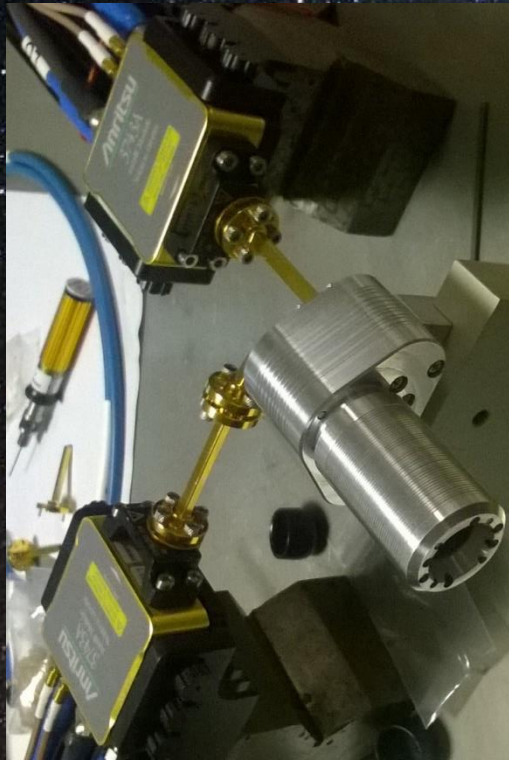
# Band 2-3 Feed-OMT assembly Testing

## OMT X-channel reflection coefficient: measurement (TD)



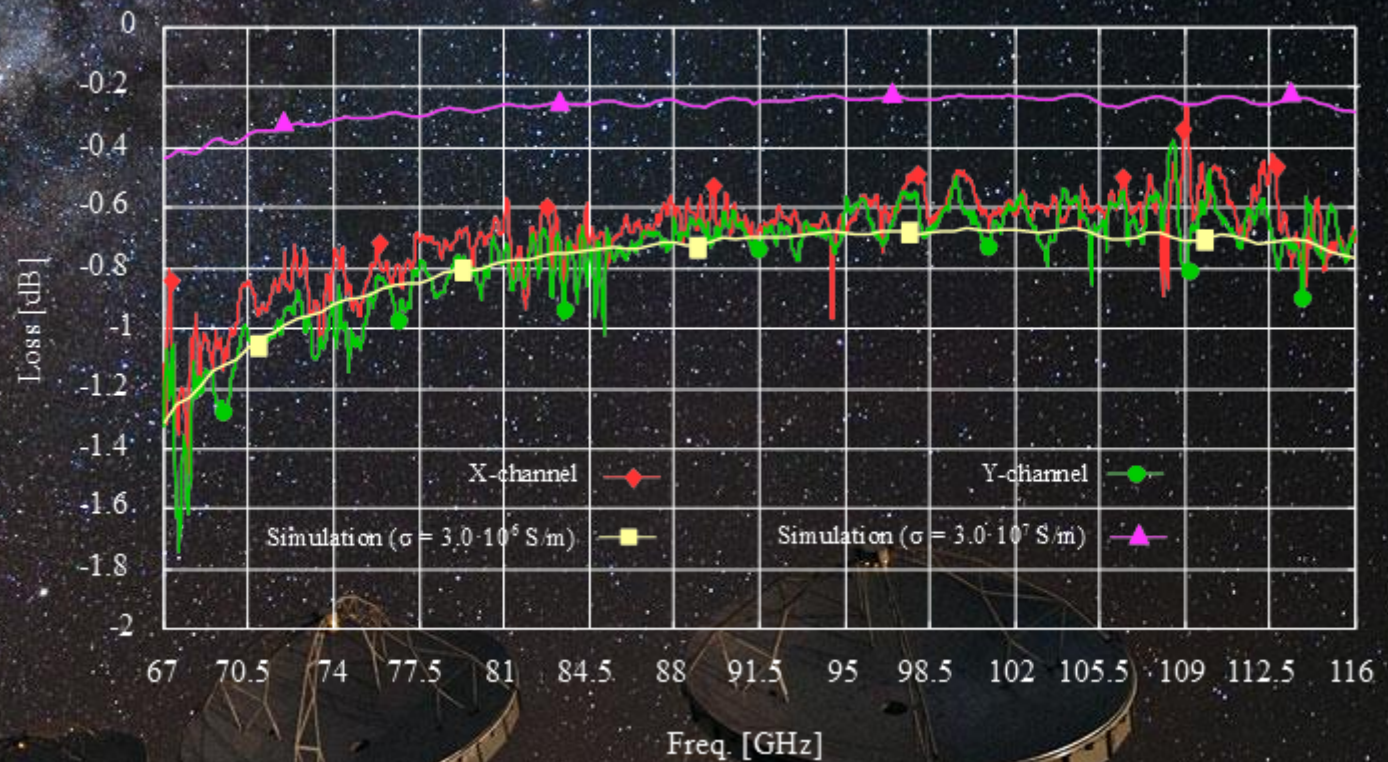
# Band 2-3 Feed-OMT assembly Testing

## OMT Y-channel reflection coefficient: measurement (TD)



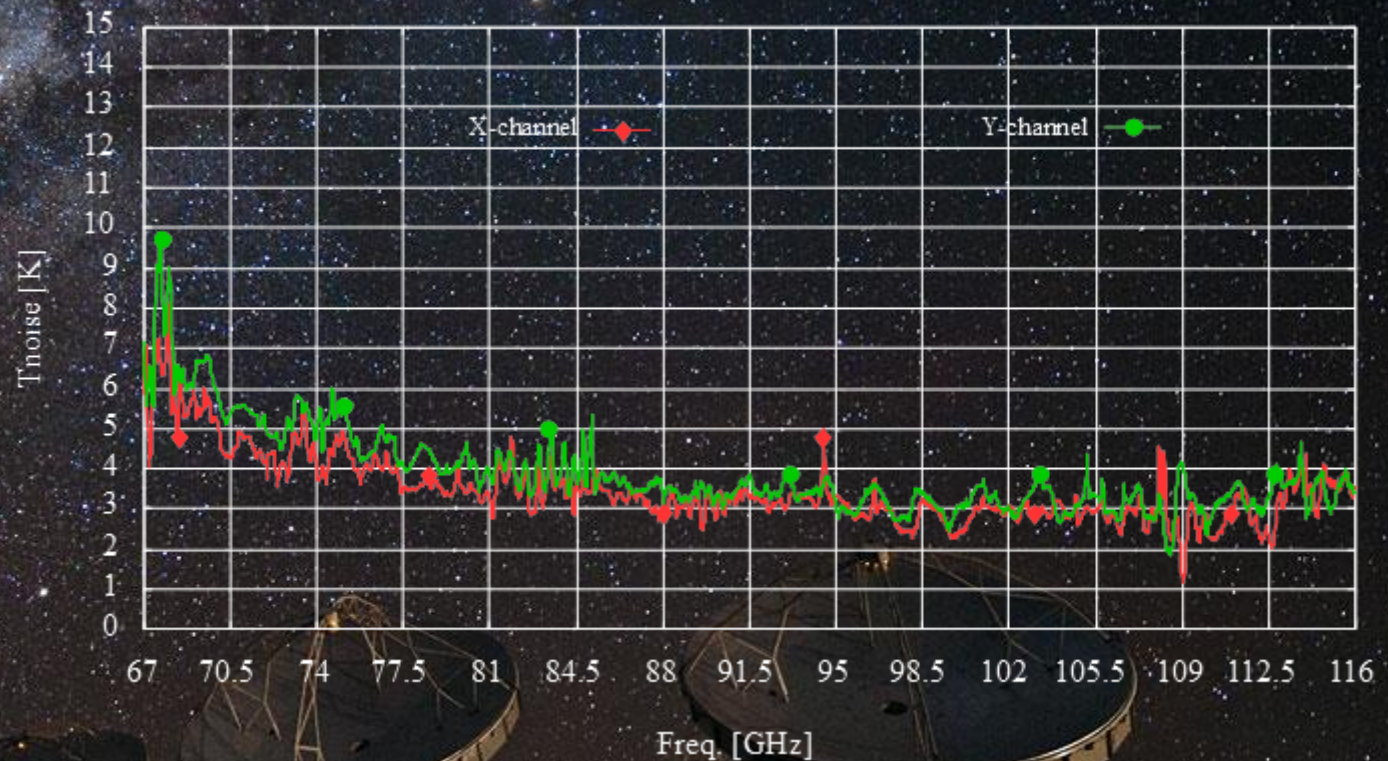
# Band 2-3 OMT Testing

## OMT loss: measurement



# Band 2-3 OMT Testing

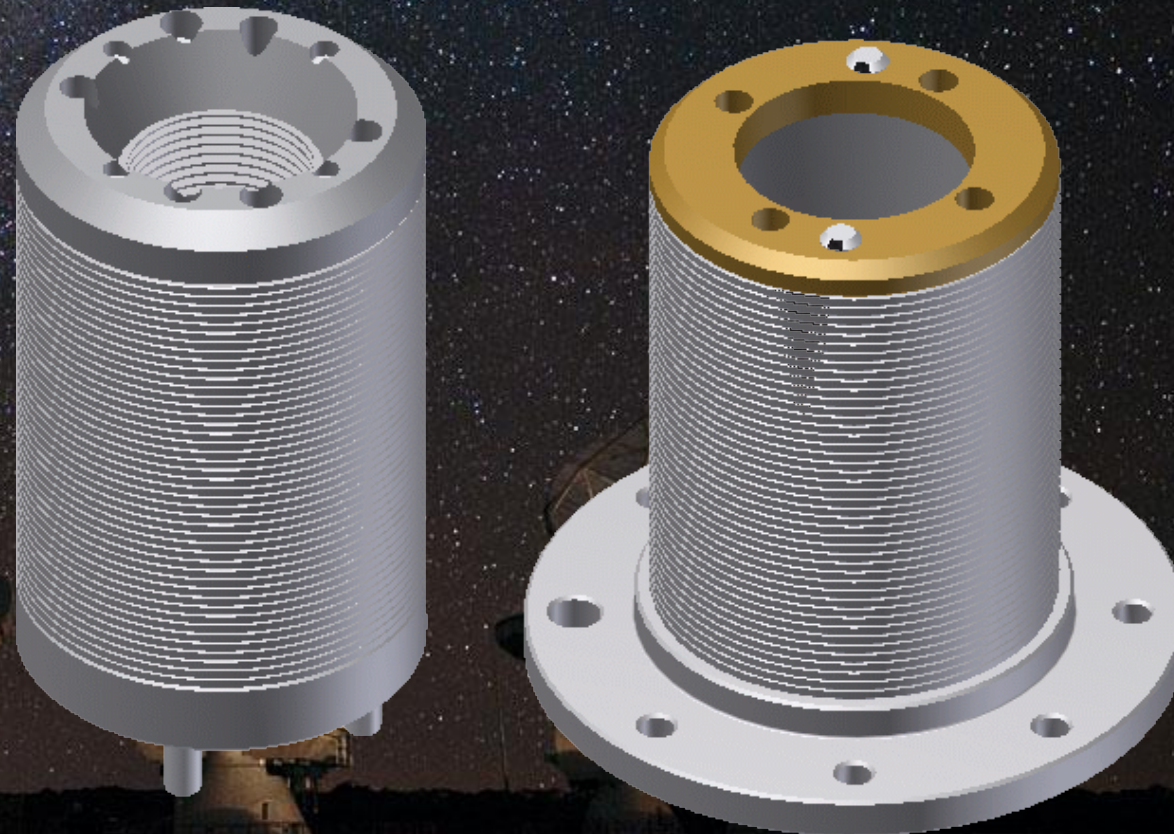
OMT added noise @20K: from loss measurement



# Band 2-3 Feedhorn and OMT

## Further investigations

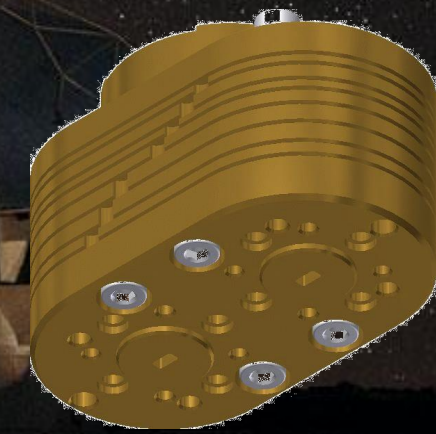
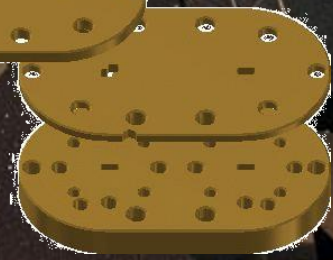
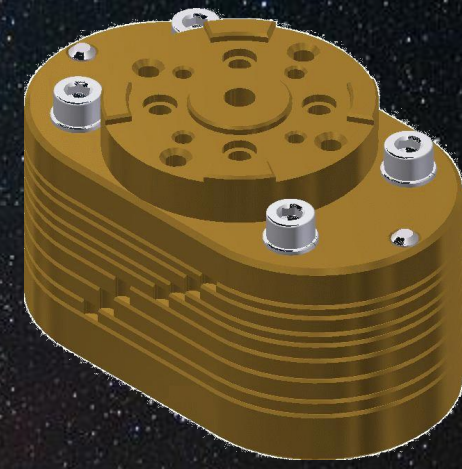
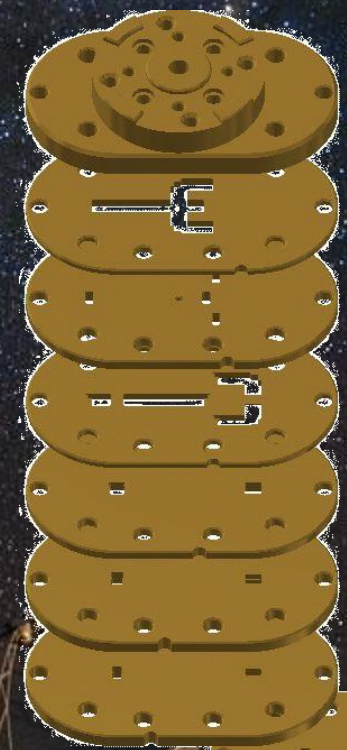
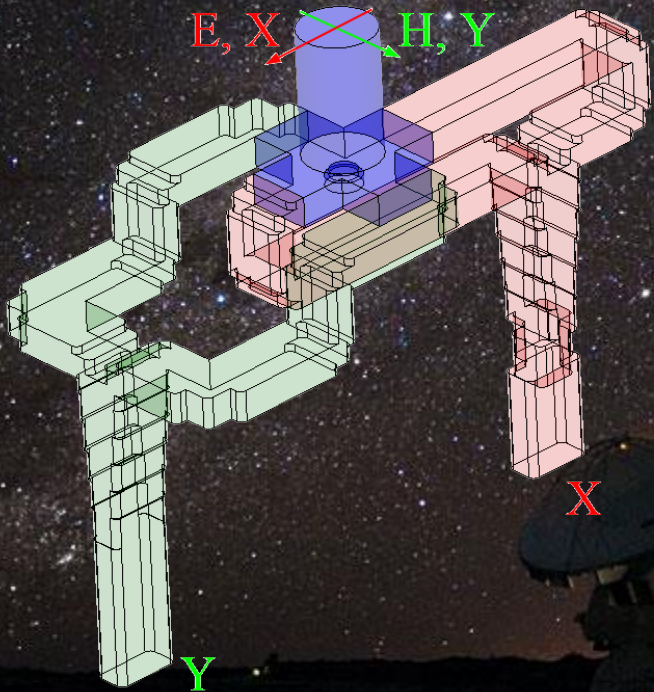
- Feed cross-polarization need to be improved
  - New design for the feed top flange



# Band 2-3 Feedhorn and OMT

## Further investigations

- OMT loss need to be improved
  - New OMT design
  - Shorter waveguide paths
  - New material (brass)

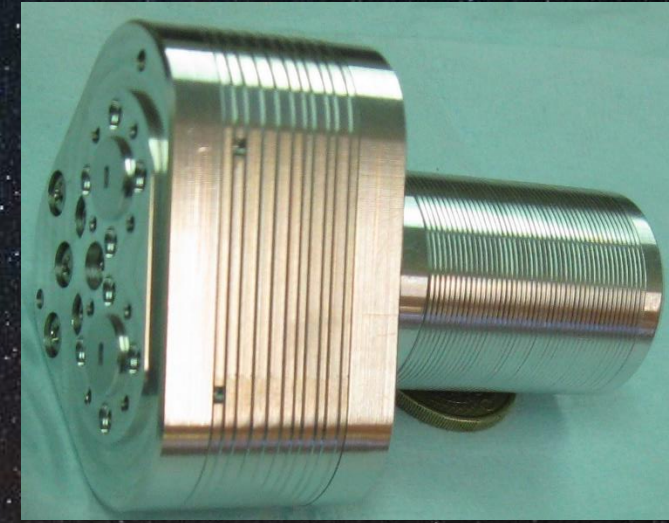
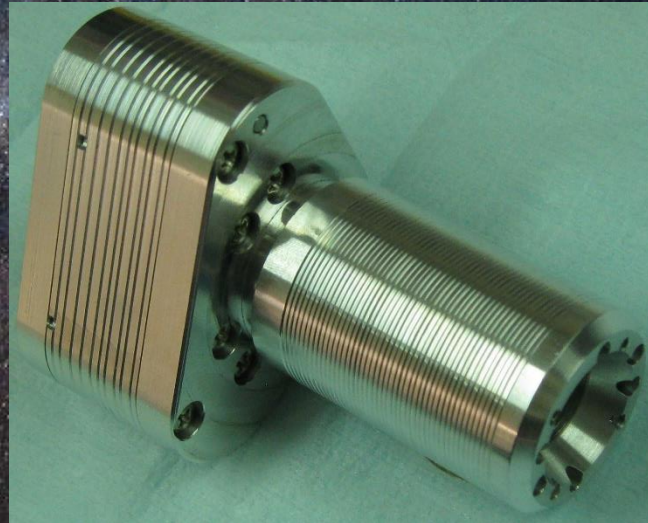




# Band 2-3 Feedhorn and OMT

## Further investigations

- Old Assembly

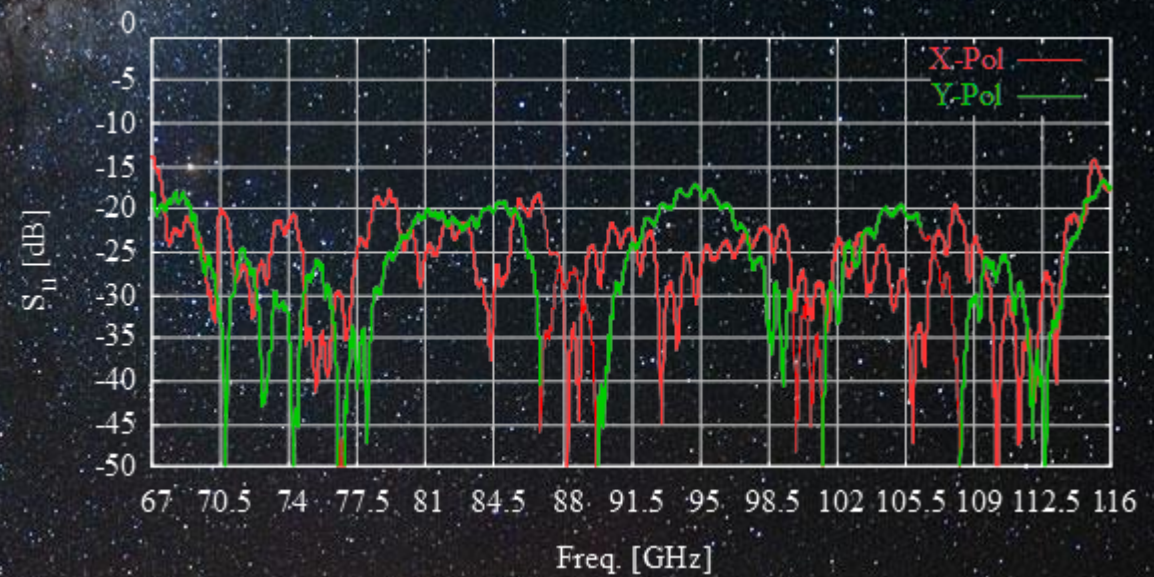
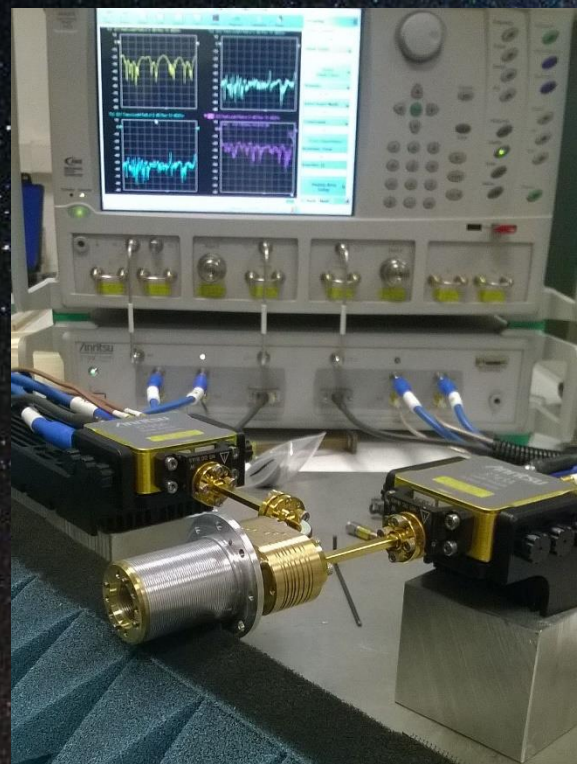


- New Assembly
  - With option

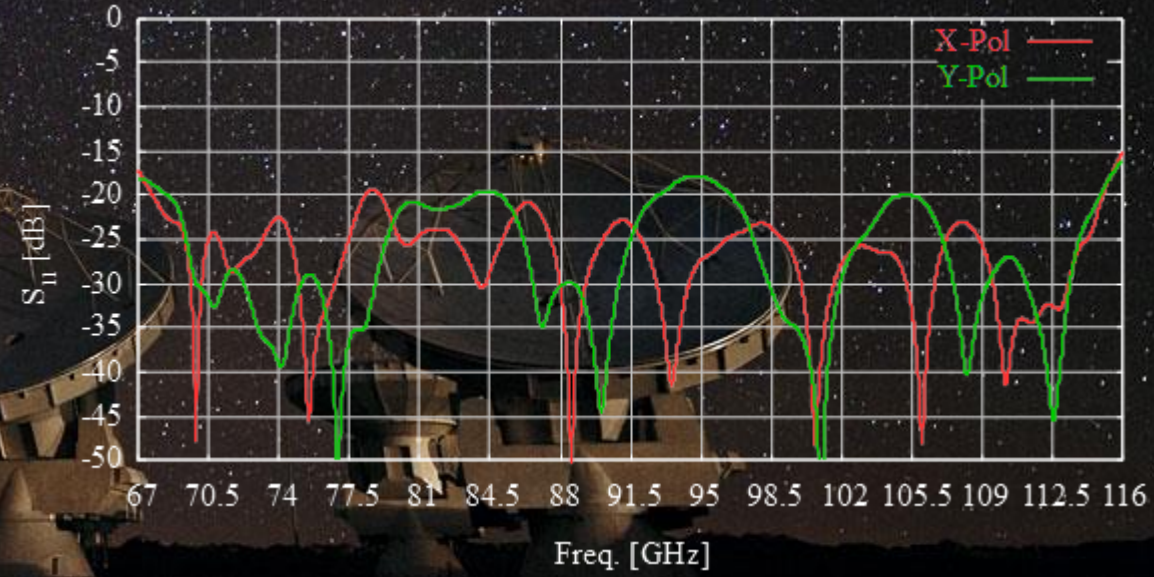


# Band 2-3 Feedhorn and OMT

Measurement:  
Rough data



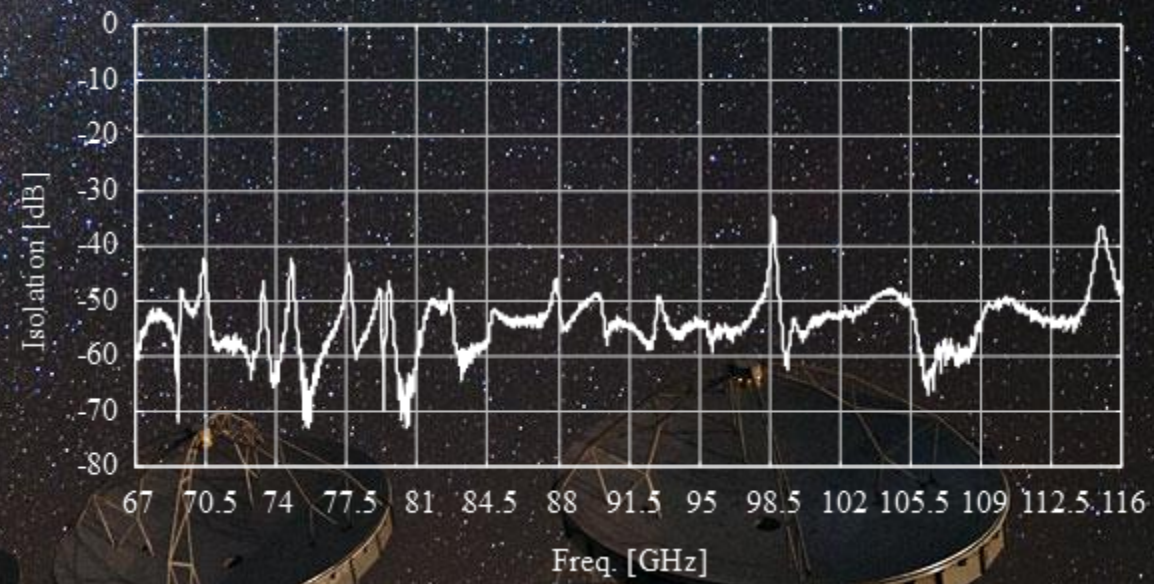
Measurement:  
TD gating



# Band 2-3 Feedhorn and OMT

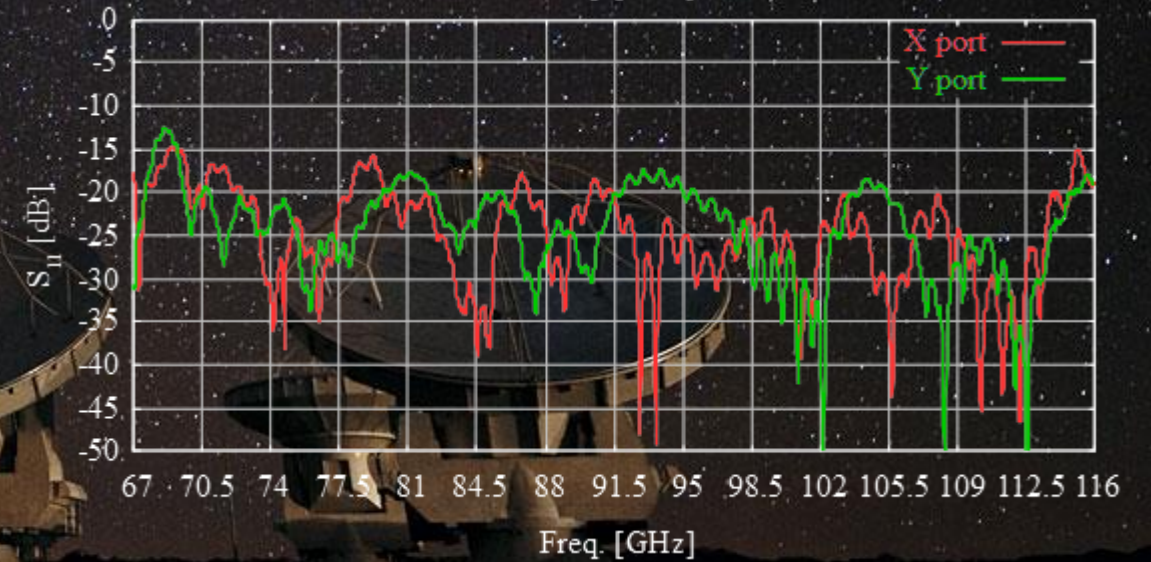
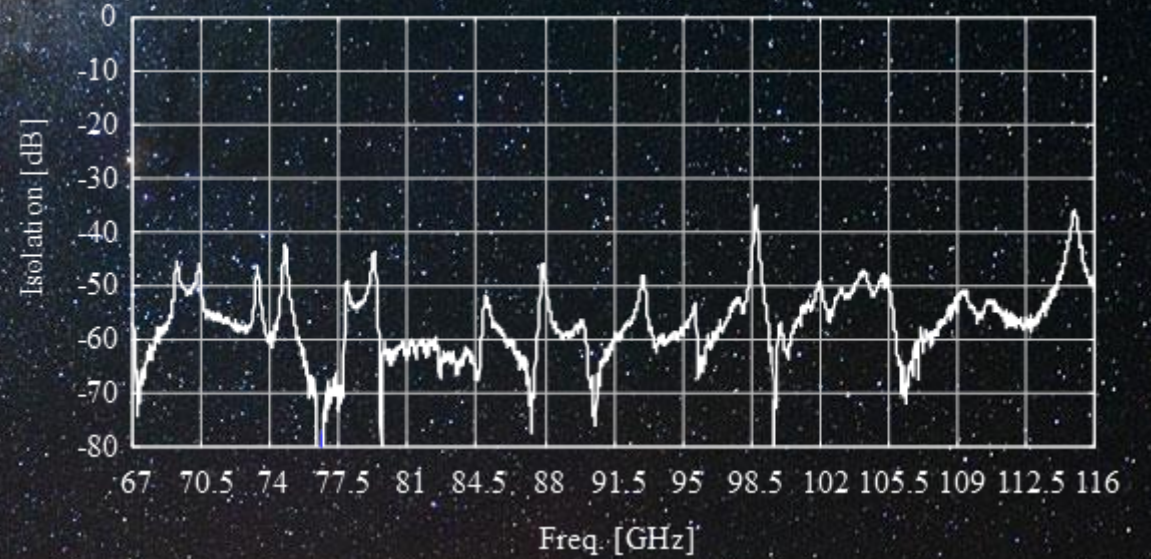
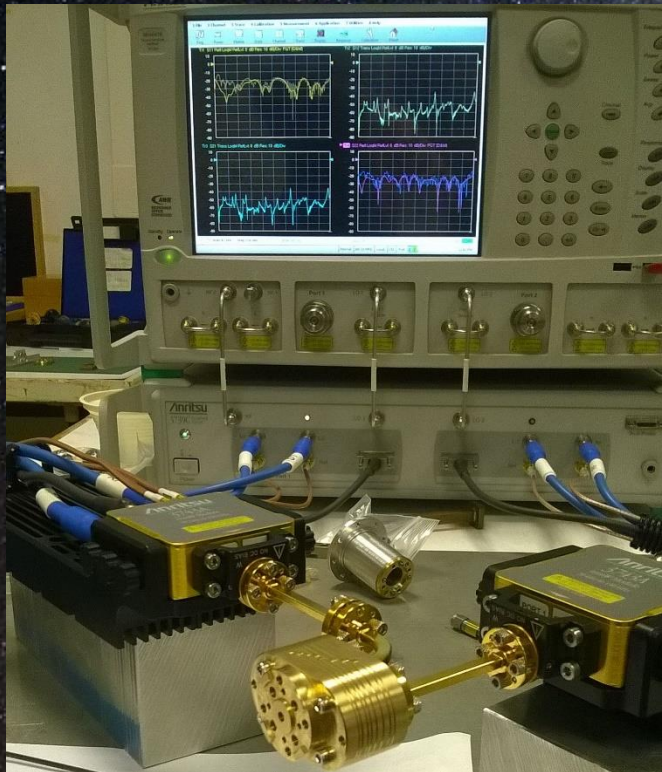


Isolation:  
Measurement



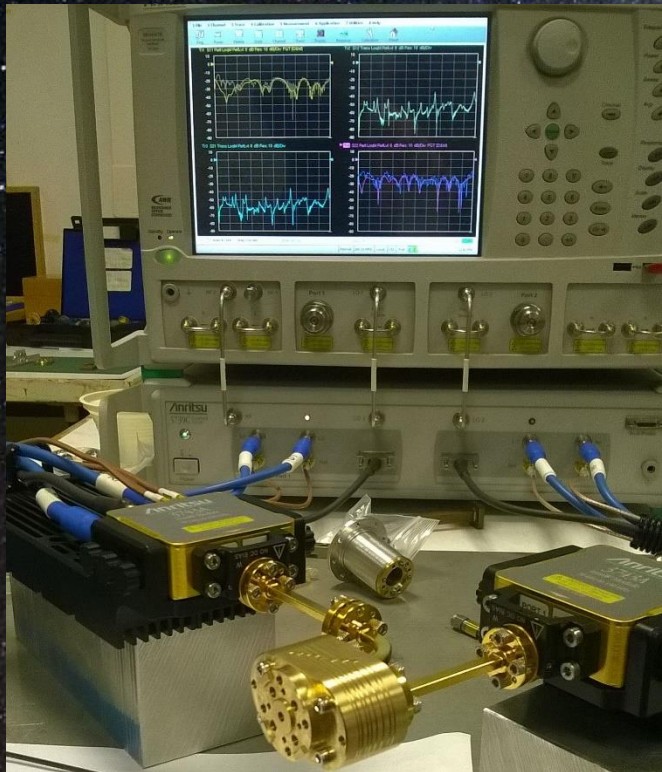
# Band 2-3 Brass OMT

## Measurement

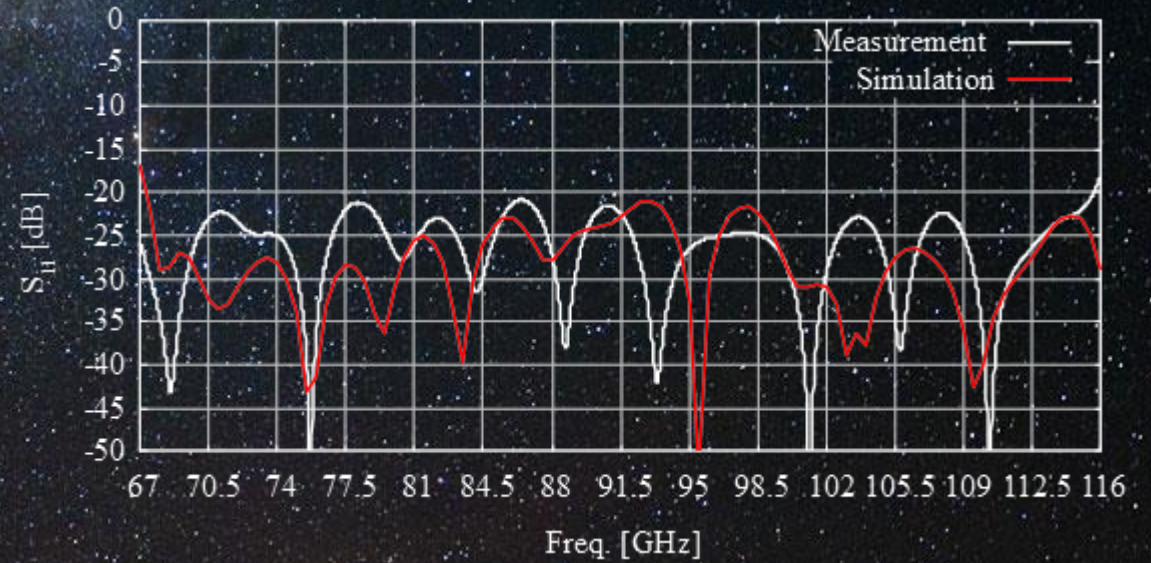


# Band 2-3 Brass OMT

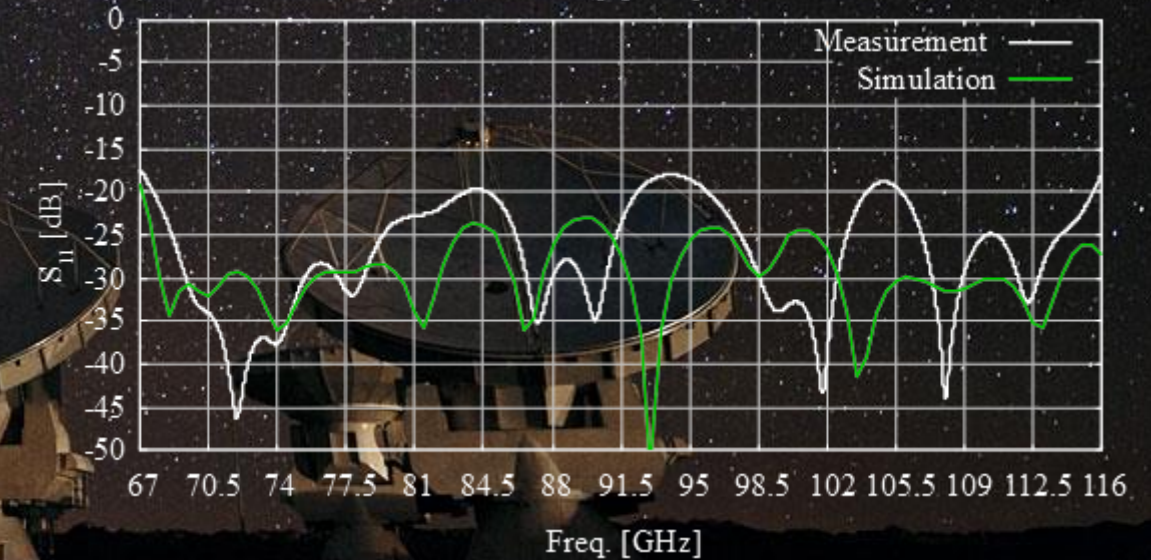
TD gating measurement data



Sim Vs Meas:  
X-Pol

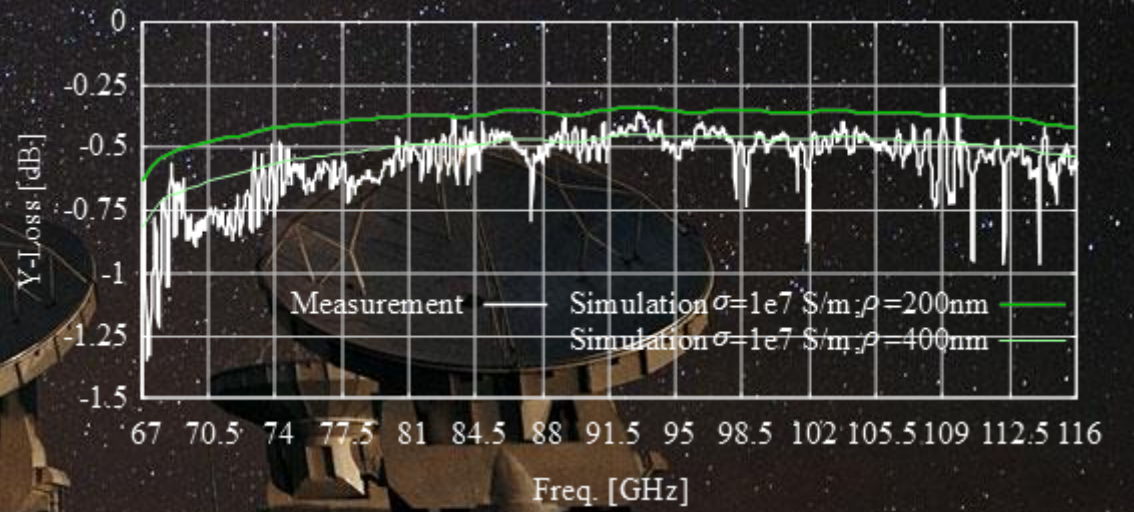
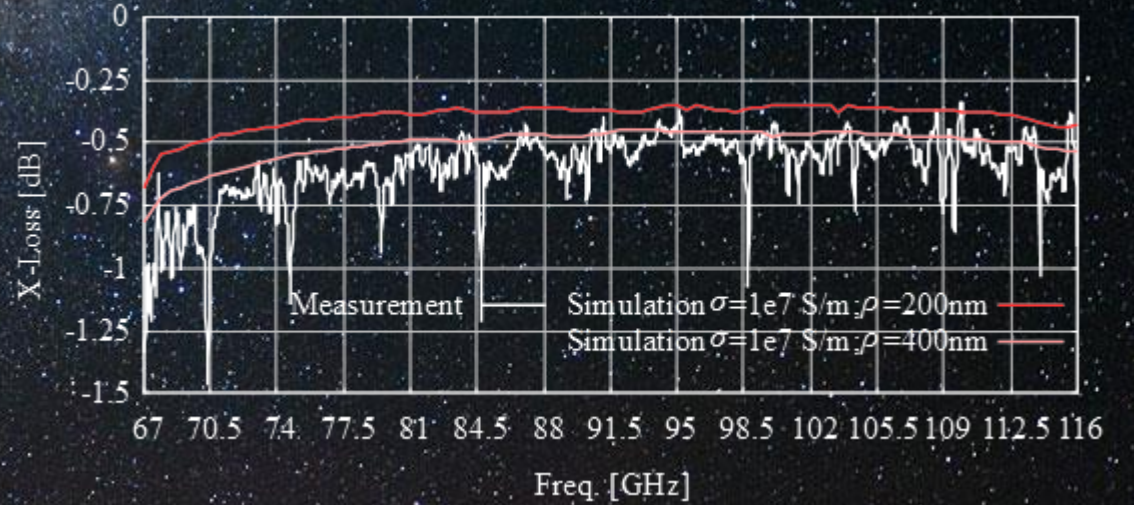
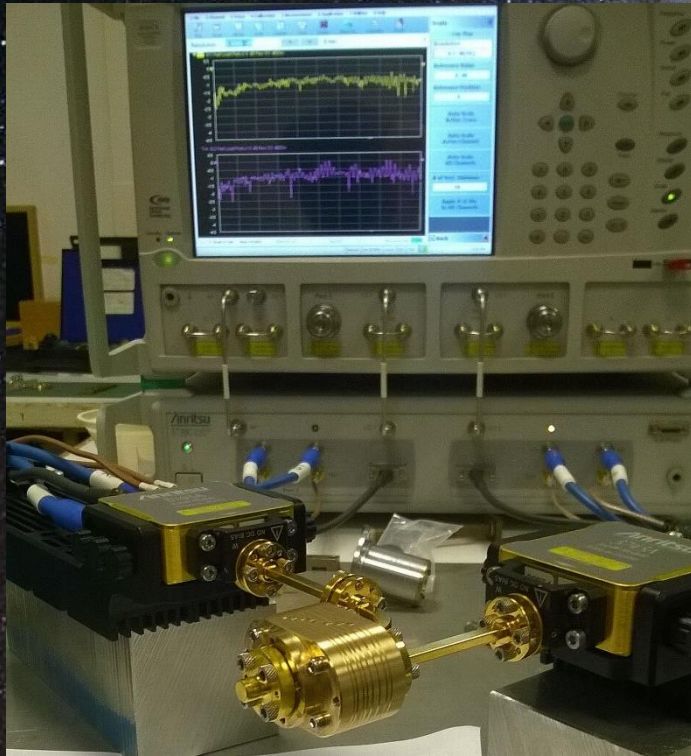


Sim Vs Meas:  
Y-Pol



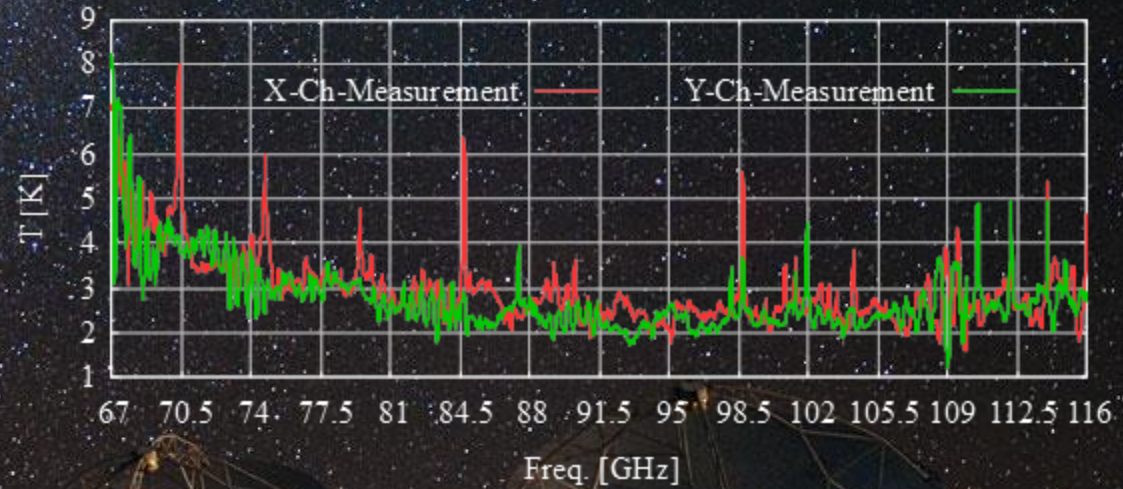
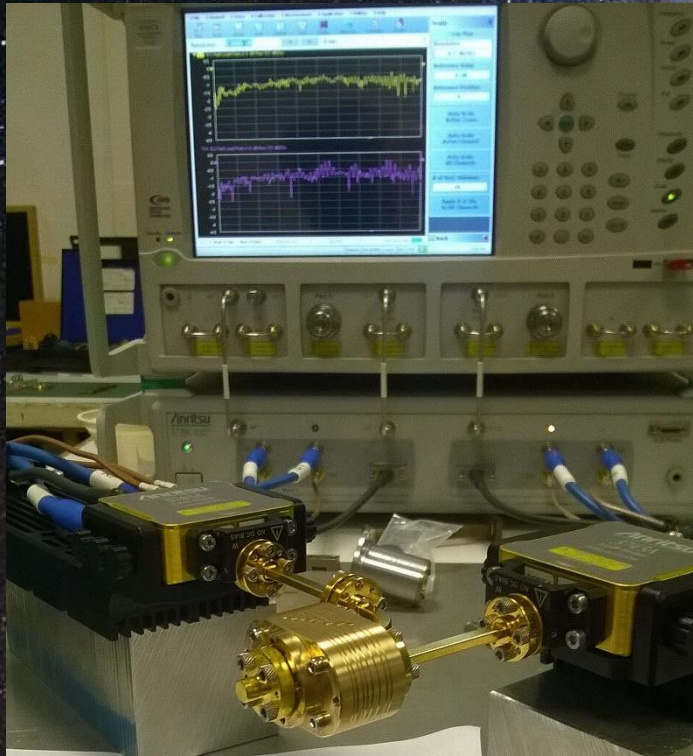
# Band 2-3 Brass OMT

Loss:  
Measurement vs Simulations



# Band 2-3 BrassOMT

Added noise temperature @ 20K:  
From loss measurement



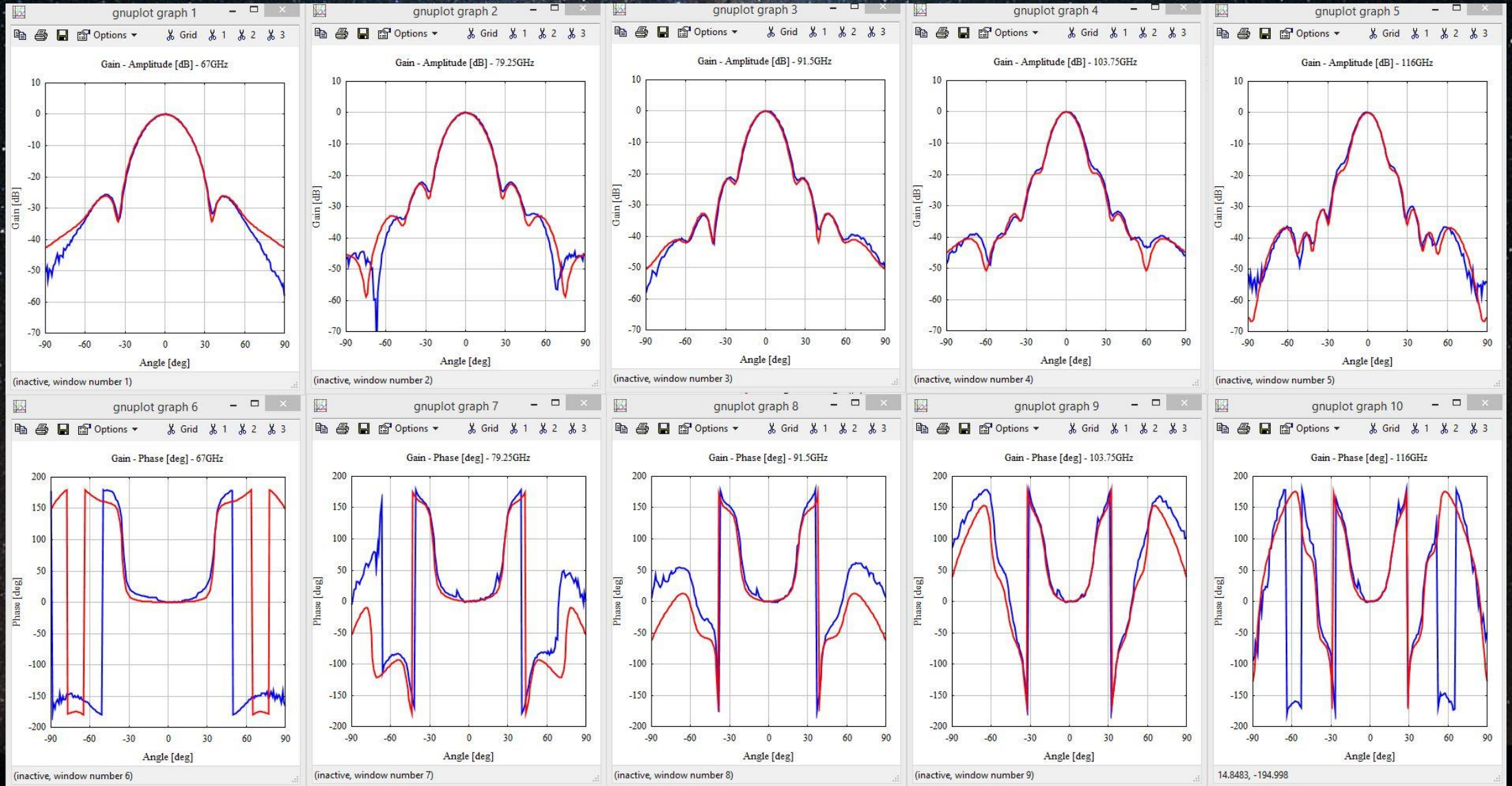
# Band 2-3 Feedhorn Beam Measurement

Co-polar component measurement: E and H planes

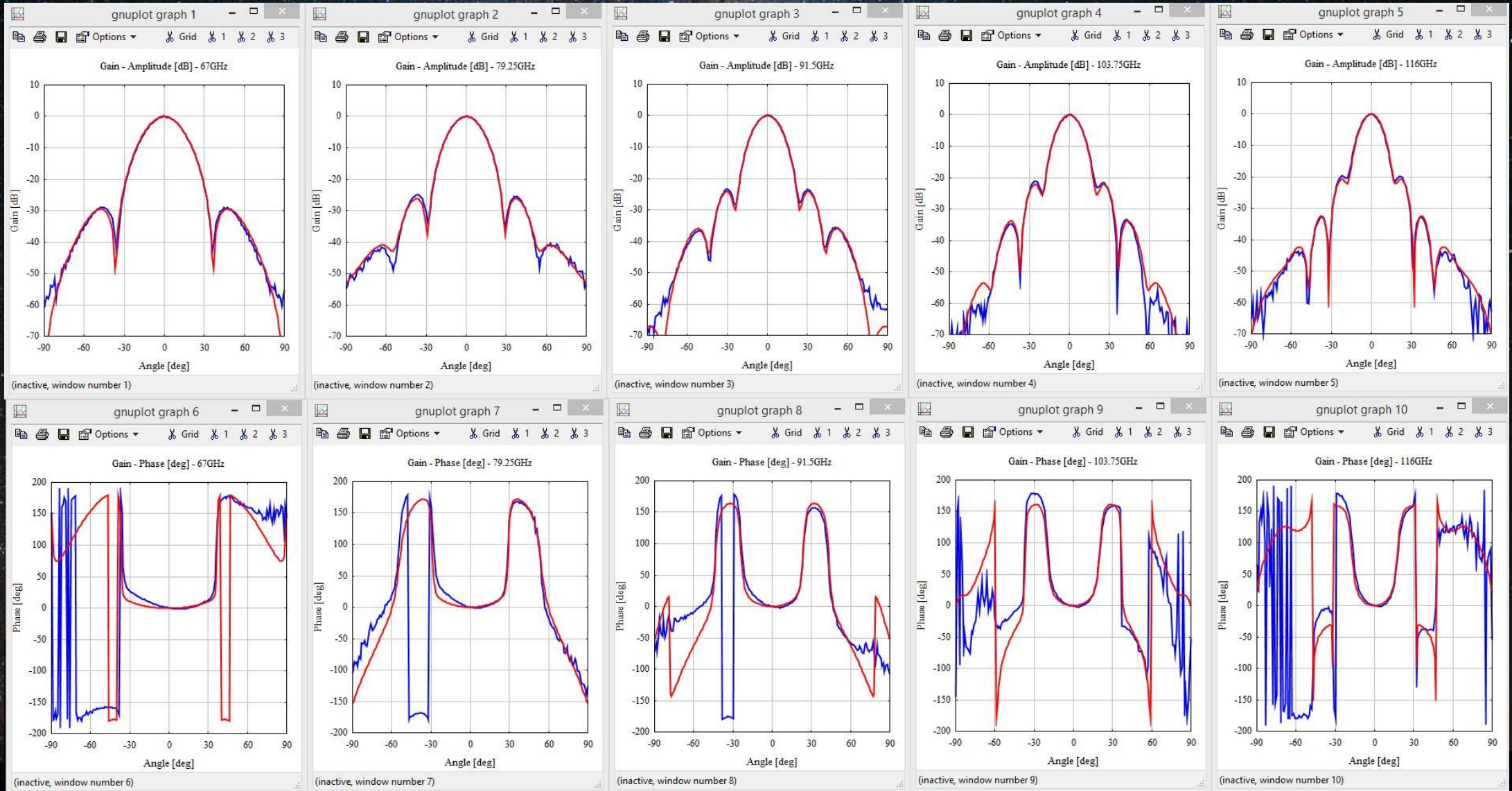




# Band 2-3 Feed: E-plane Meas Vs Sim

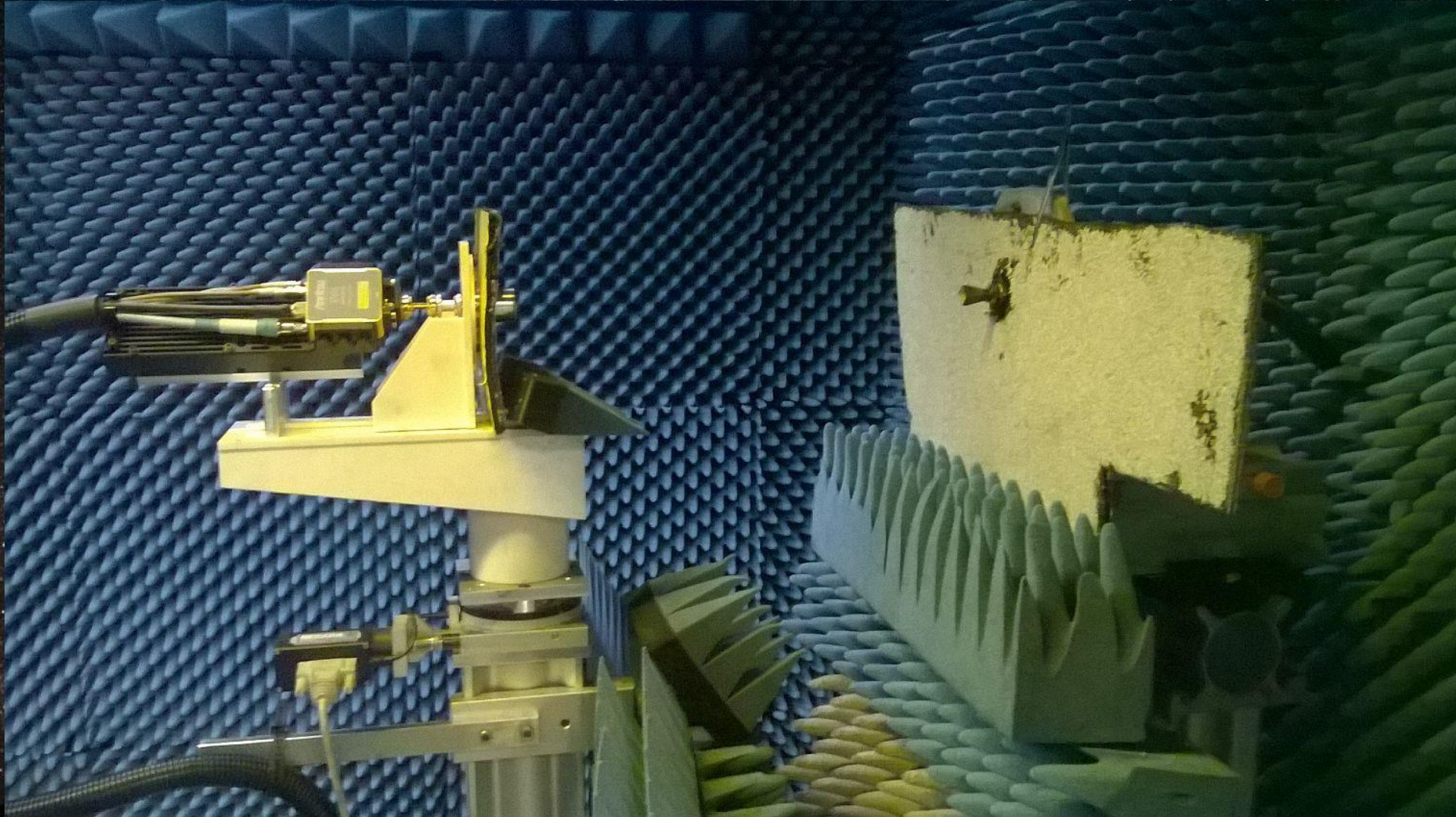


# Band 2-3 Feed: H-plane Meas Vs Sim



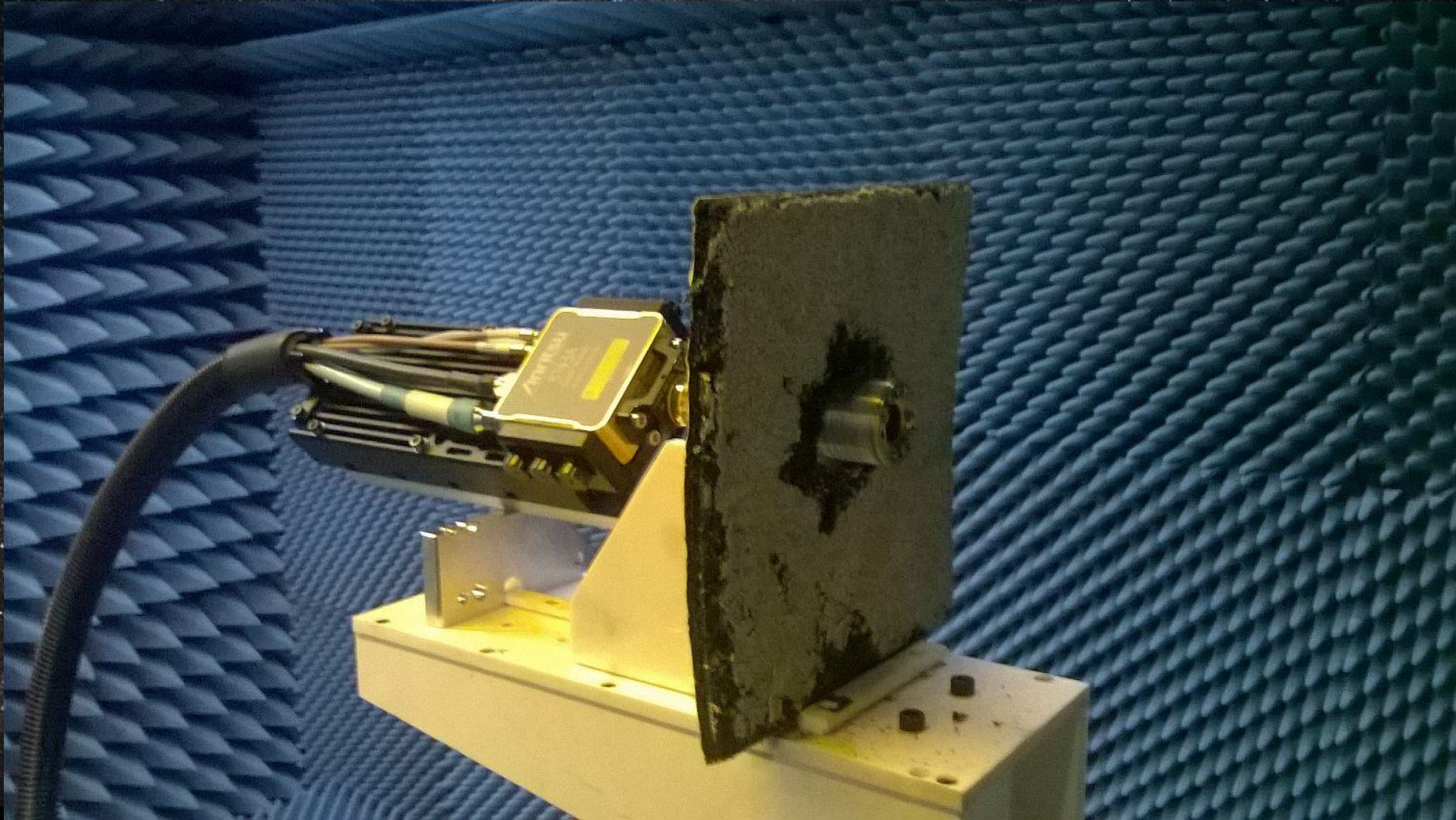
# Band 2-3 Feedhorn Beam Measurement

Cross-polar component measurement: E and H planes

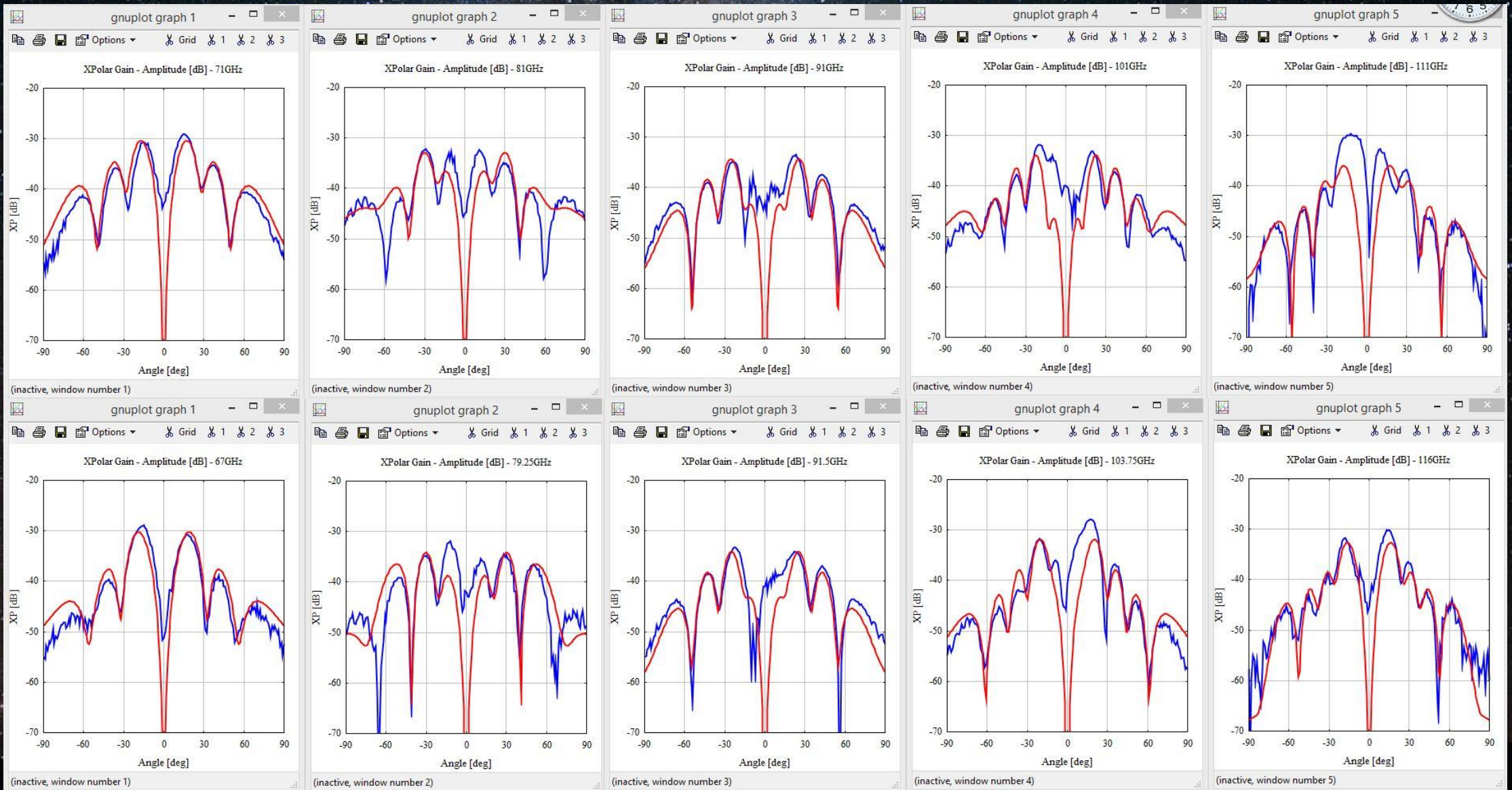


# Band 2-3 Feedhorn Beam Measurement

Cross-polar component measurement: 45 deg plane



# Band 2-3 Feed: 45° Cross-polar Beam Measurement



# Band 2-3 Feedhorn and OMT

## Conclusion

ALMA Band 2-3 Feedhorn and OMT recent developments demonstrate that Band 2-3 feedhorn and OMT are feasible even if challenging.....

..... Thank you for your attention

