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TITLE: **COMPARISON BETWEEN TESTS AND SIMULATIONS ON QM 30 GHz AND 44 GHz FEED HORNS**

DOC. TYPE: TECHNICAL NOTE

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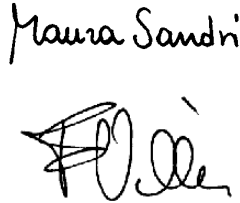


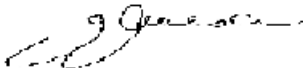
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Agreed by	C. BUTLER LFI Program Manager	Date: December 18 th , 2003 Signature: 
Approved by	N. MANDOLESI LFI Principal Investigator	Date: December 18 th , 2003 Signature: 



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1 INTRODUCTION AND SCOPE

The purpose of this technical note is to show the comparison between the measured and simulated patterns of the feed horns at 30 and 44 GHz.



2 APPLICABLE DOCUMENTS

- [AD 1] *PLANCK-LFI: FEED HORNS REQUIREMENT SPECIFICATION*, PL-LFI-PST-SP-005, Issue 2, 2002
- [AD 2] *PLANCK-LFI: TESTS ON QM 30 GHz FEEDHORN*, Part. No. 700100401, 2003
- [AD 3] *PLANCK-LFI: TESTS ON QM 44 GHz FEEDHORN*, Part. No. 700100405, 2003

3 REFERENCE DOCUMENTS

- [RD 1] *LFI detector data processing*, H-P-3-ASP-TN-0517, D. Dubruel



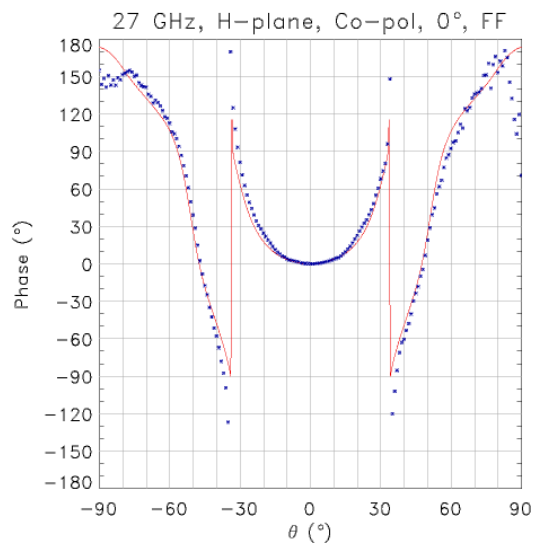
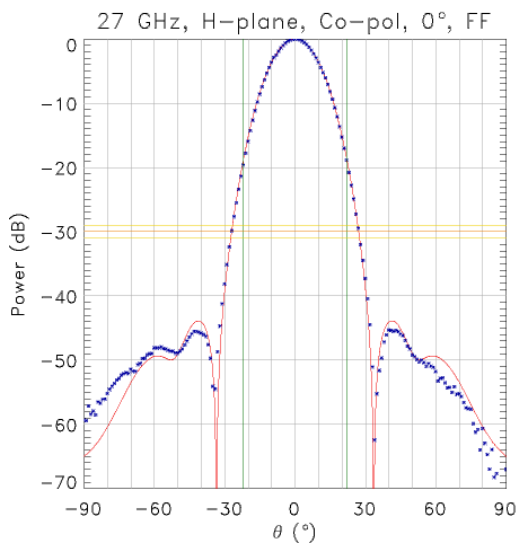
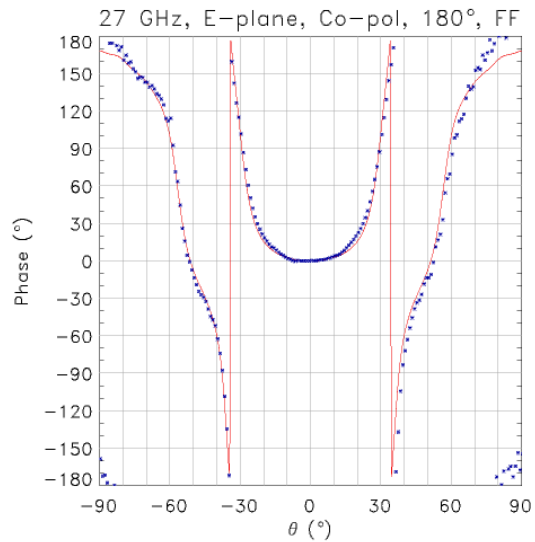
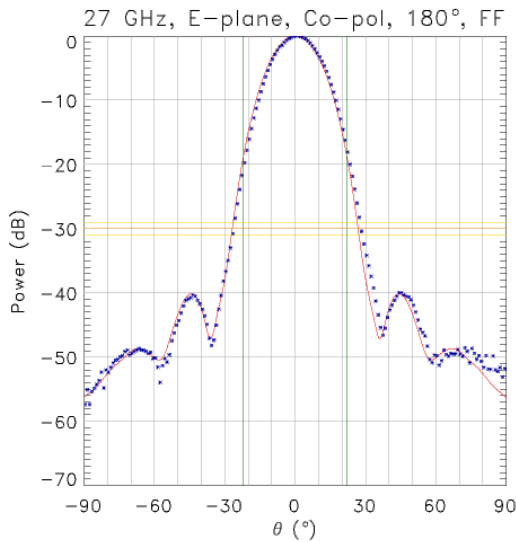
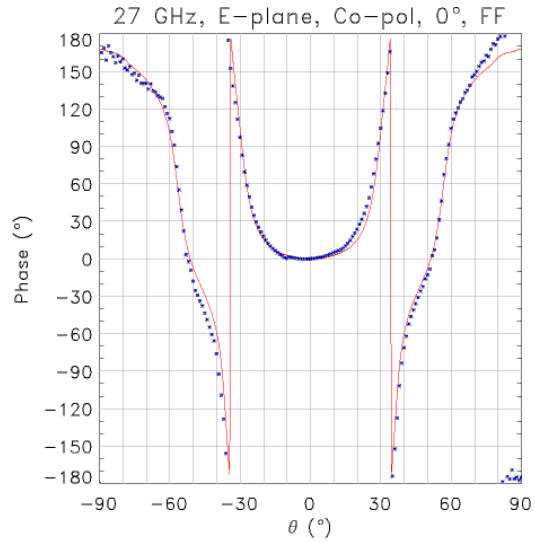
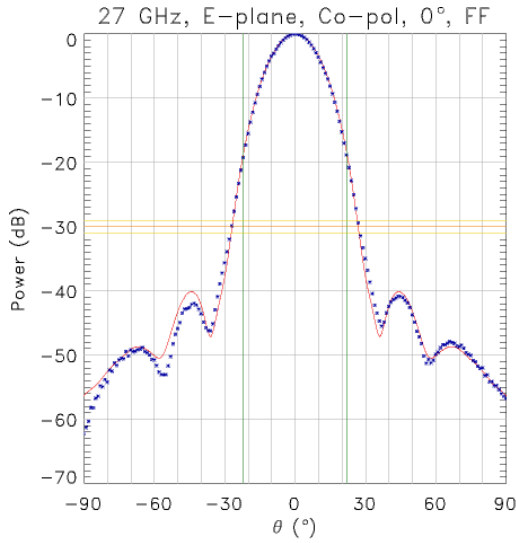
4 30 GHz FEED HORN

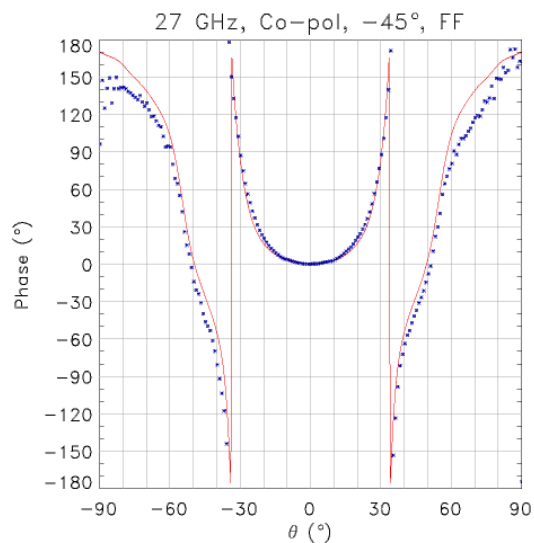
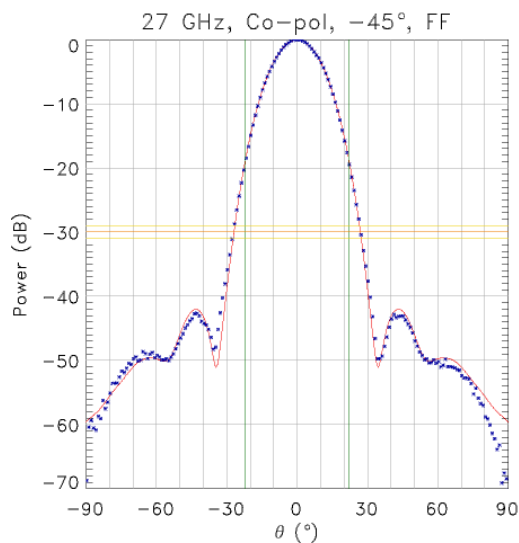
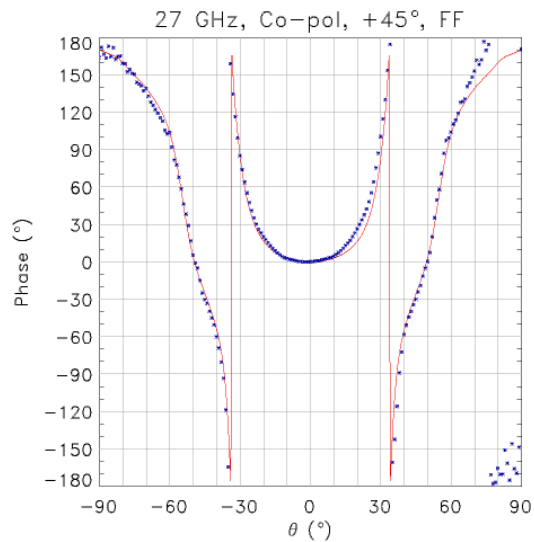
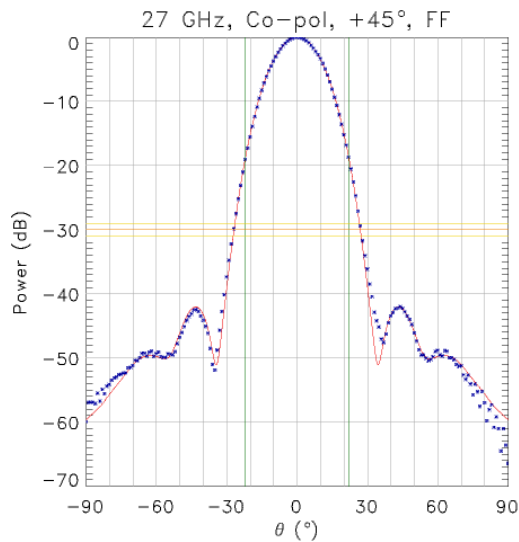
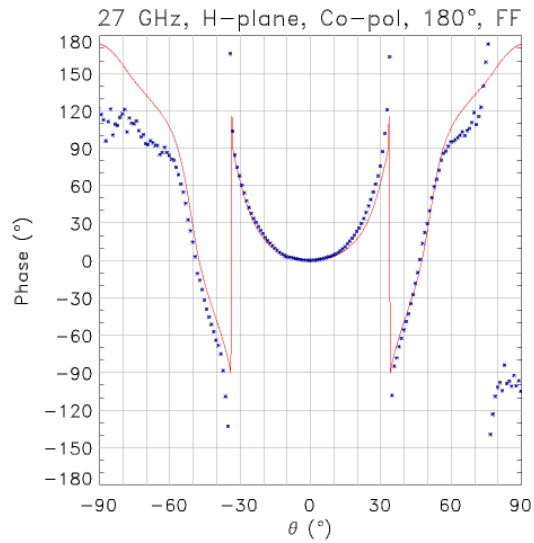
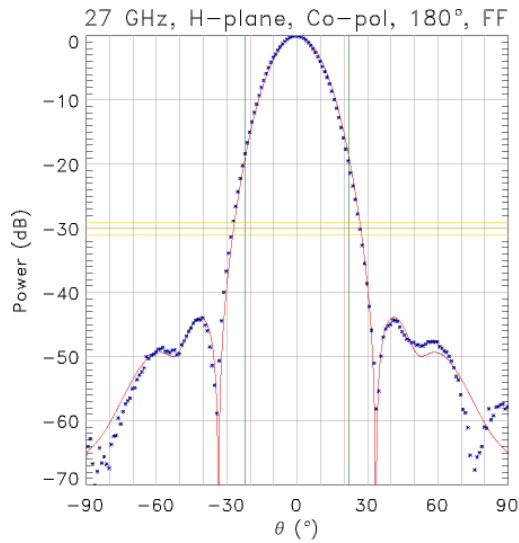
The feed horn pattern was computed using GRASP8 and the source was specified by its spherical wave expansion provided by Alcatel Space Industriesc [RD 1]. The feed horn simulated directivity is 21.68 dBi and the ET is specified to be $30 \text{ dB} \pm 1 \text{ dB}$ at 22° , at the center frequency [AD 1]. Both the near field and the far field were computed. The near field distance set in the simulations is equal to the distance between the source and the target in the measurements, in order to obtain comparable results. The measurements were carried out at the IFP [AD 2].

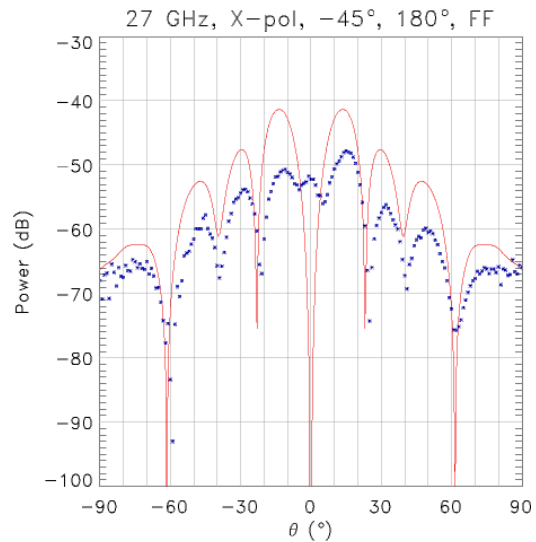
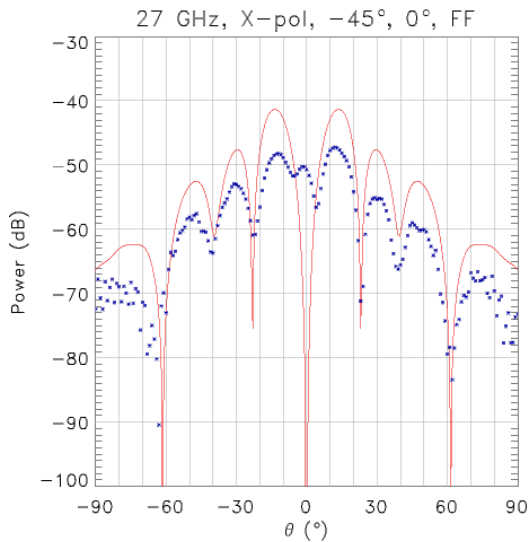
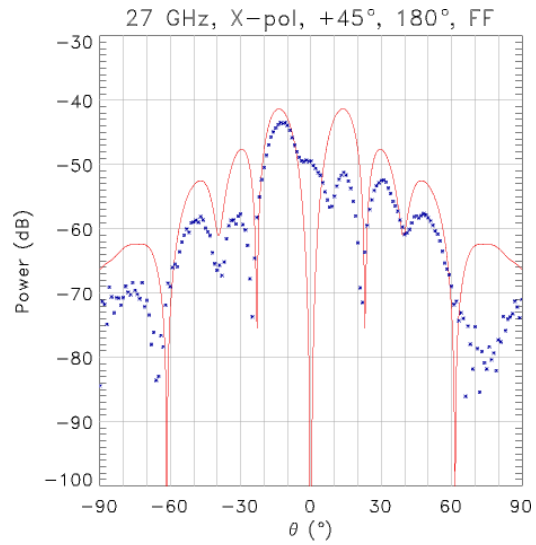
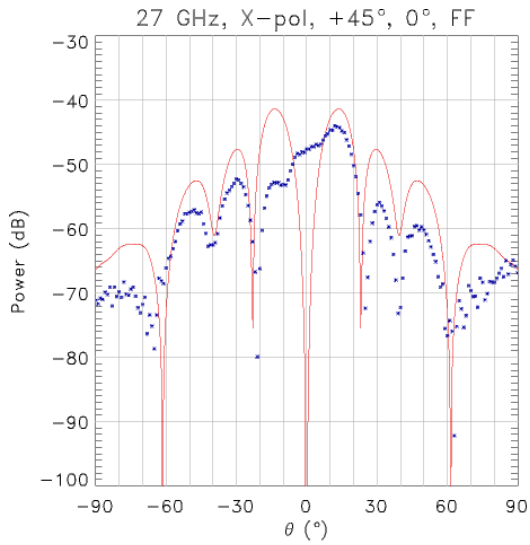
In Tab. 1 a comparison between the measured Edge Taper and the simulated one (in the far and near field, respectively) is reported. In figures from page 3 to page 20, the feed horn patterns are shown, in amplitude and phase. The solid red line represents the simulated data and the blu asterisks are the measured data. In the title of each plot an indication of the measured component and plane is reported, together with a label identifying the field computed (*NF*: near field, *FF*: far field).

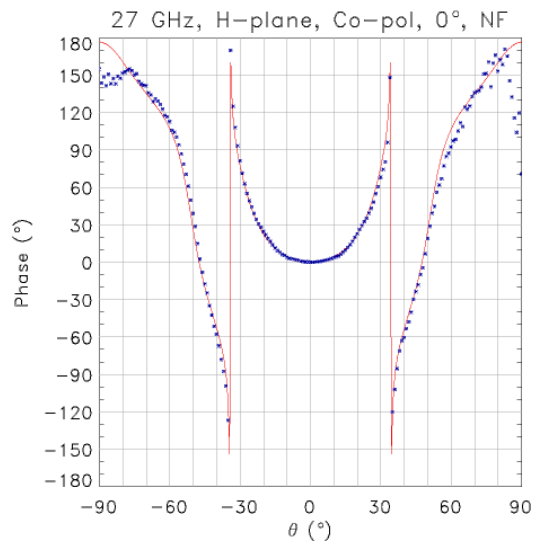
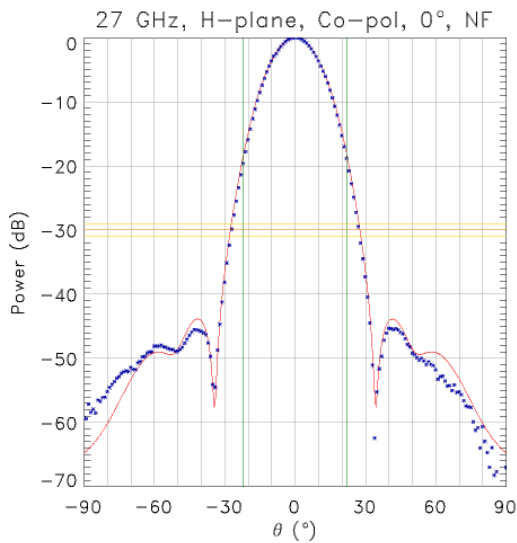
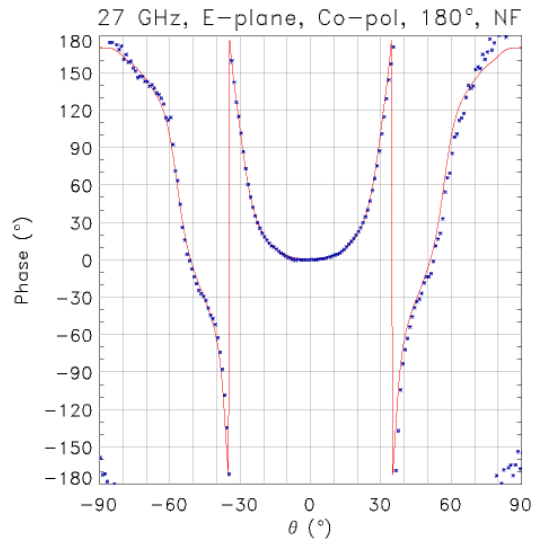
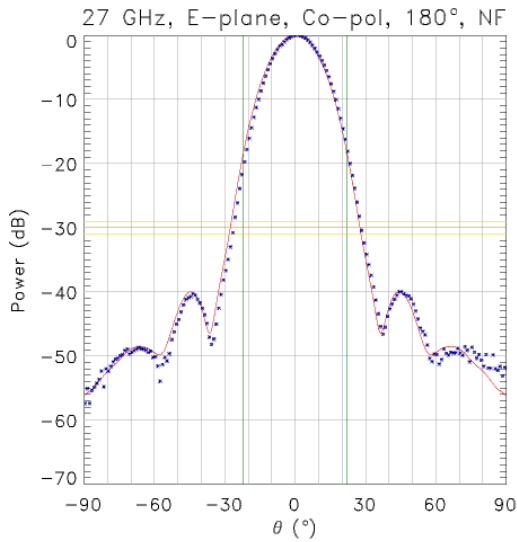
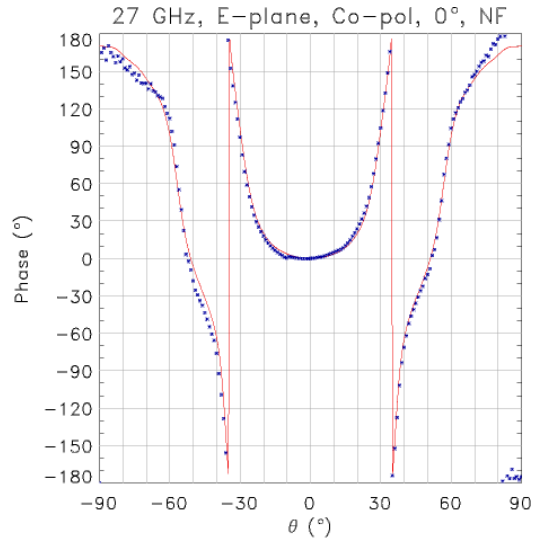
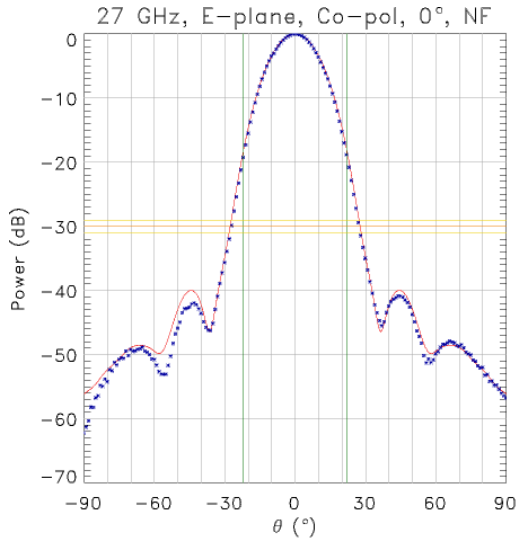
Plane	Freq (GHz)	ET sff (dB@22°)	ET snf (dB@22°)	ET m (dB@22°)
E- plane 0°	27	-18.57	-18.12	-19.06
	30	-30.42	-27.92	-28.81
	33	-41.00	-36.19	-36.37
E- plane 180°	27	-18.57	-18.12	-18.95
	30	-30.42	-27.92	-28.76
	33	-41.00	-36.19	-34.25
H- plane 0°	27	-18.70	-18.23	-19.24
	30	-26.92	-25.92	-26.89
	33	-39.80	-34.15	-35.19
H- plane 180°	27	-18.70	-18.23	-18.96
	30	-26.92	-25.92	-26.89
	33	-39.80	-34.15	-34.57
+45° plane	27	-18.64	-18.17	-18.88
	30	-28.64	-27.01	-27.58
	33	-41.07	-35.22	-35.16
-45° plane 0°	27	-18.64	-18.17	-18.98
	30	-28.64	-27.01	-27.91
	33	-41.07	-35.22	-35.10

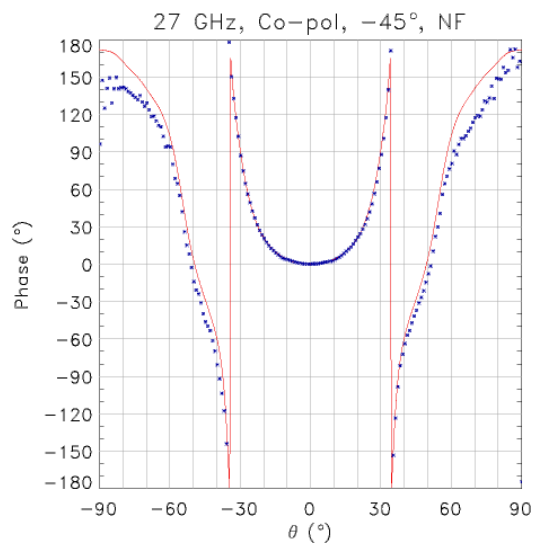
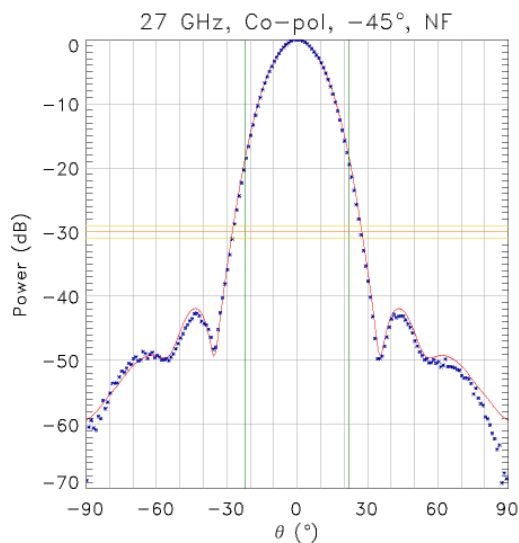
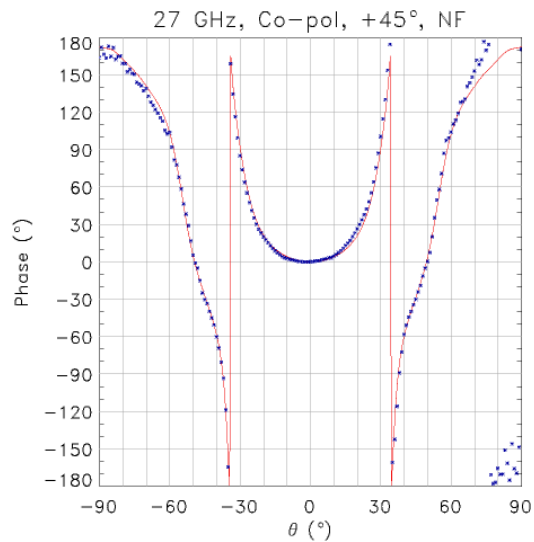
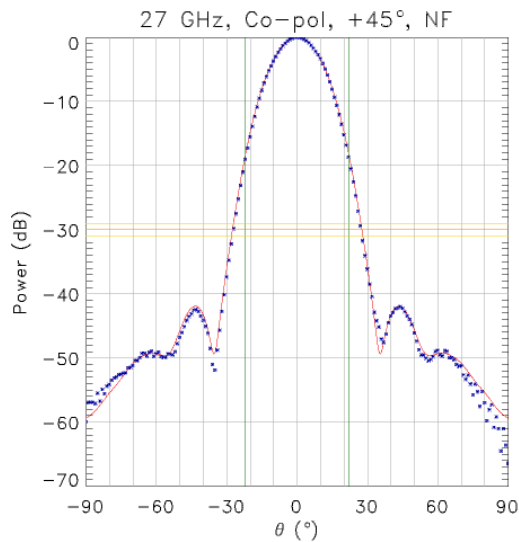
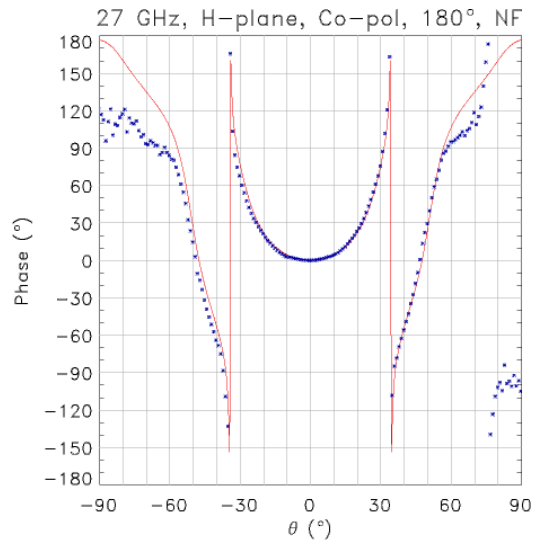
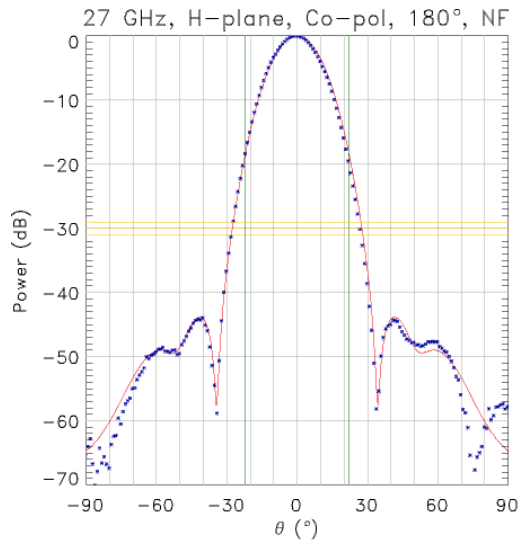
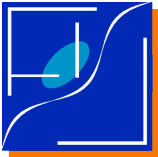
Tab. 1 *ET sff*: Edge Taper of the simulated far field, *ET snf*: Edge Taper of the simulated near field (94 cm), *ET m*: Edge Taper of the measured field, interpolated at 22° .

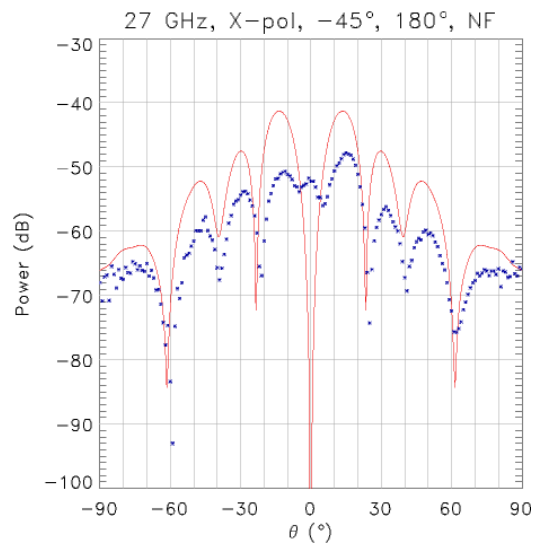
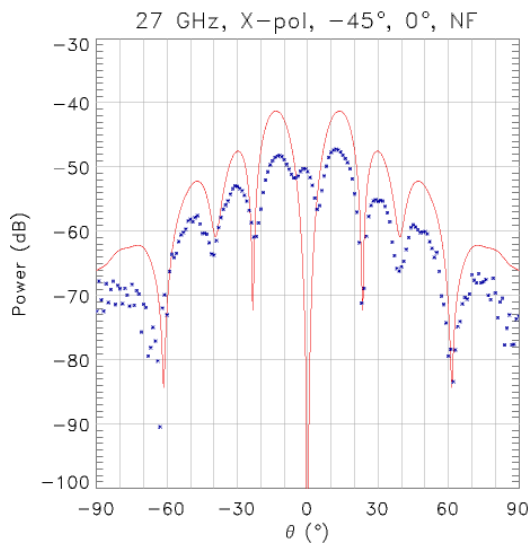
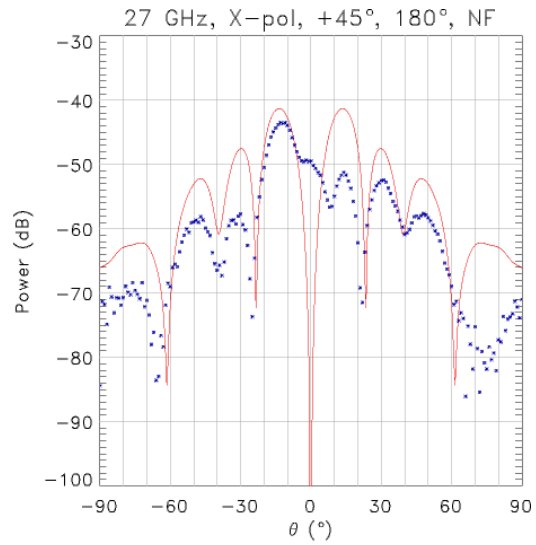
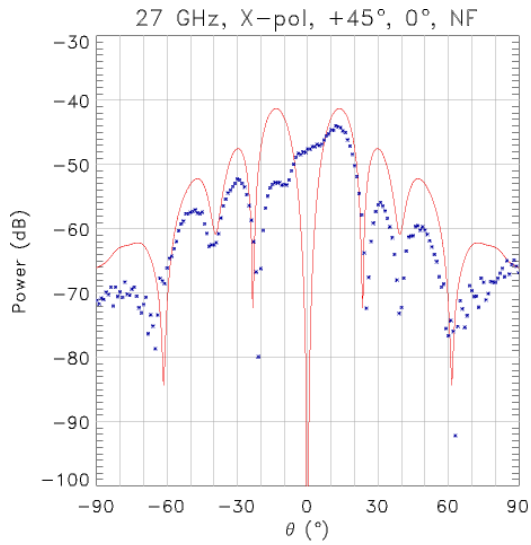


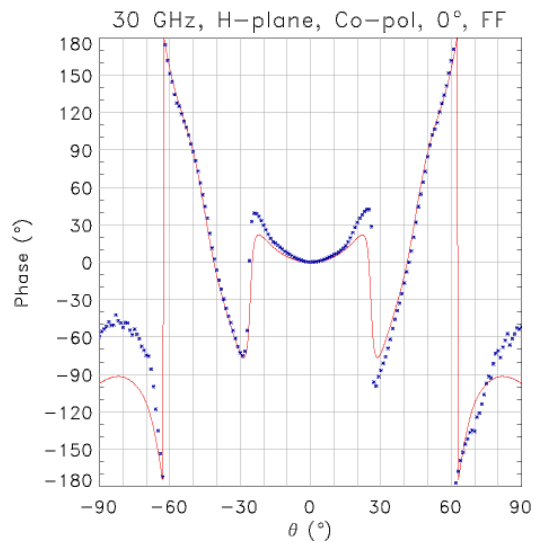
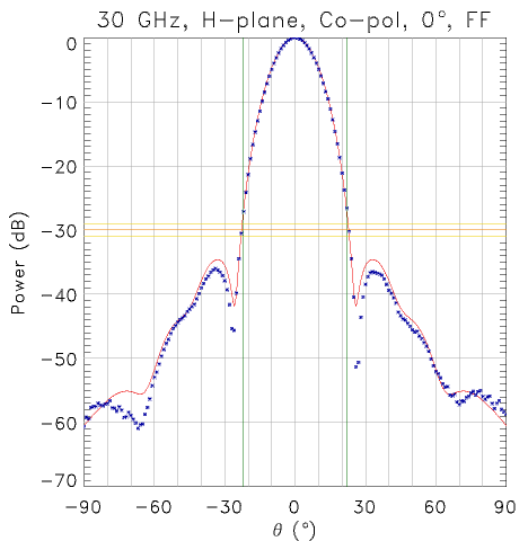
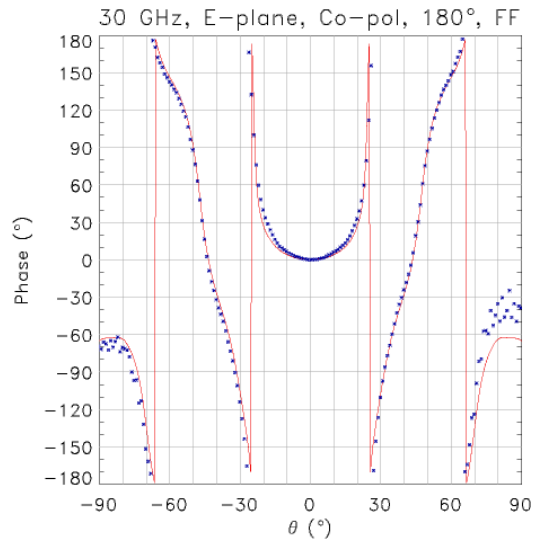
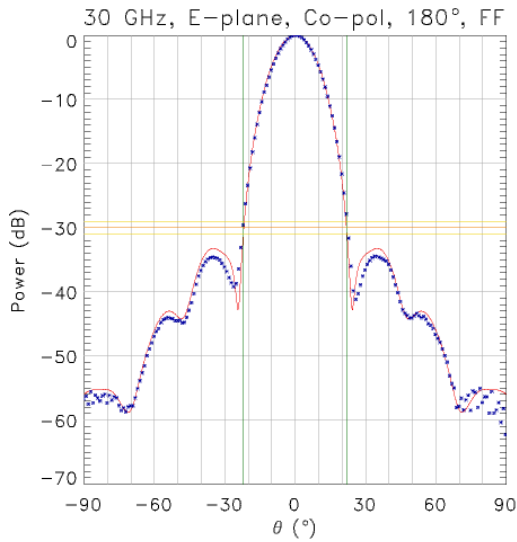
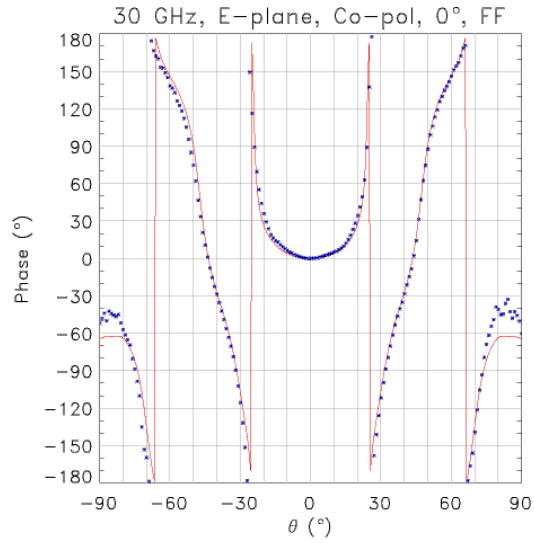
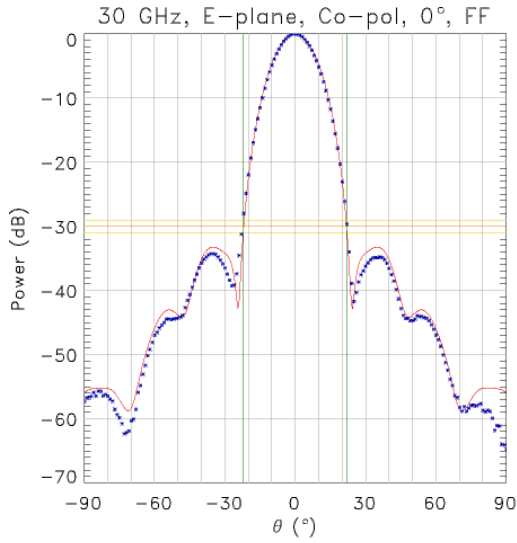


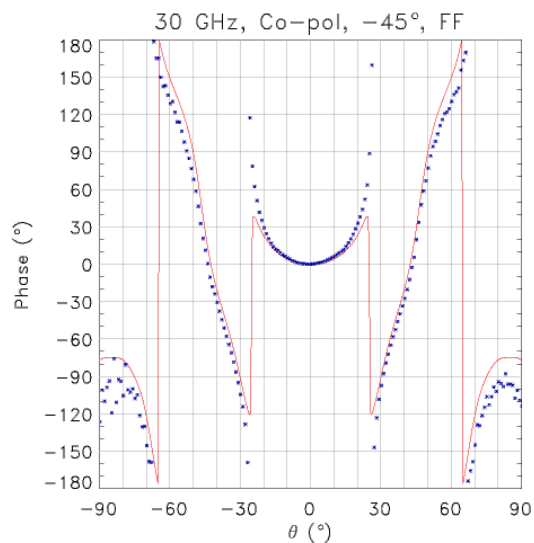
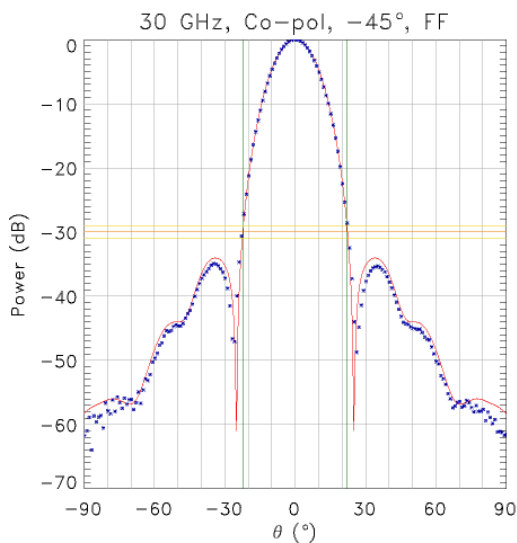
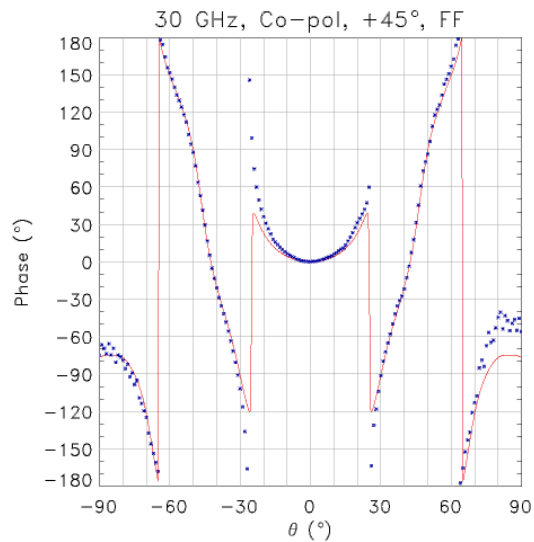
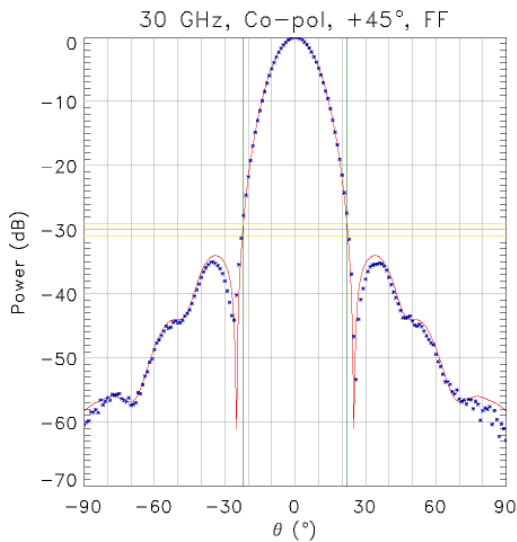
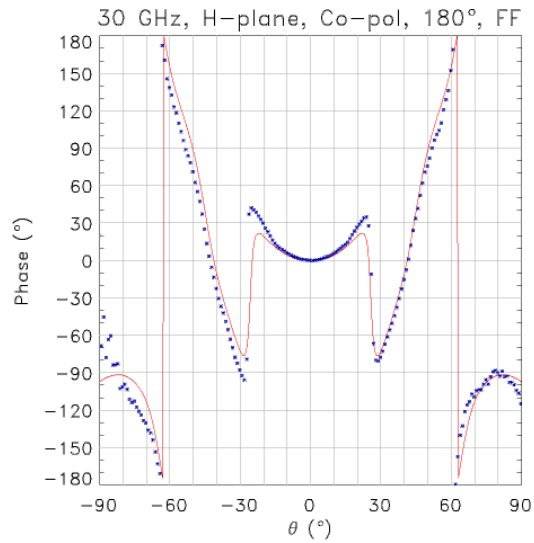
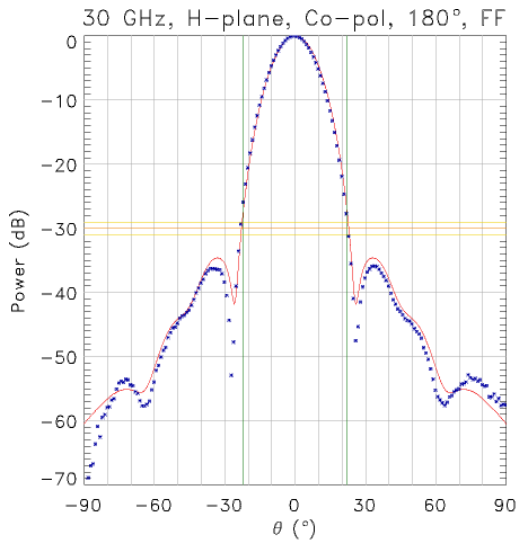


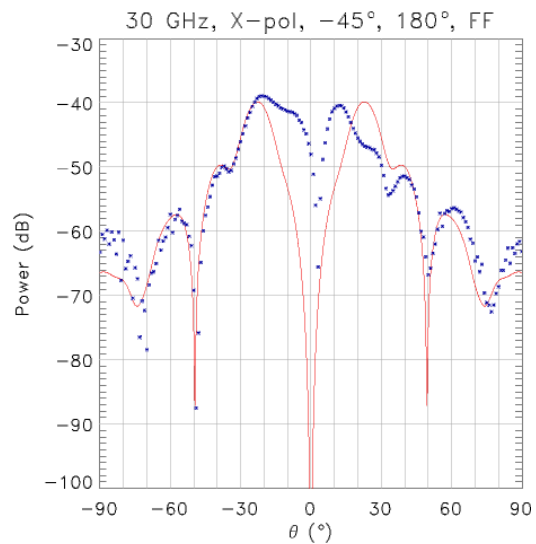
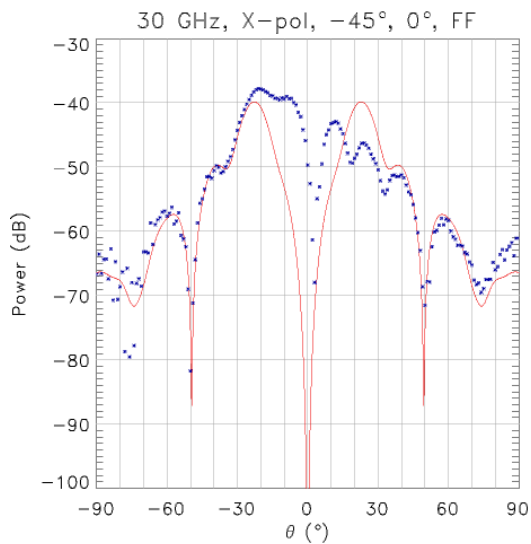
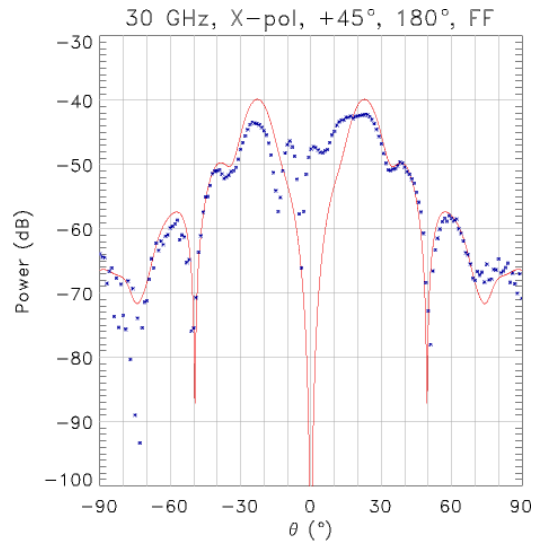
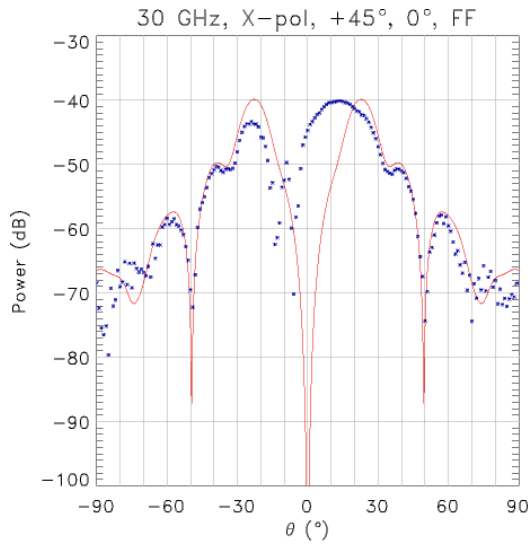


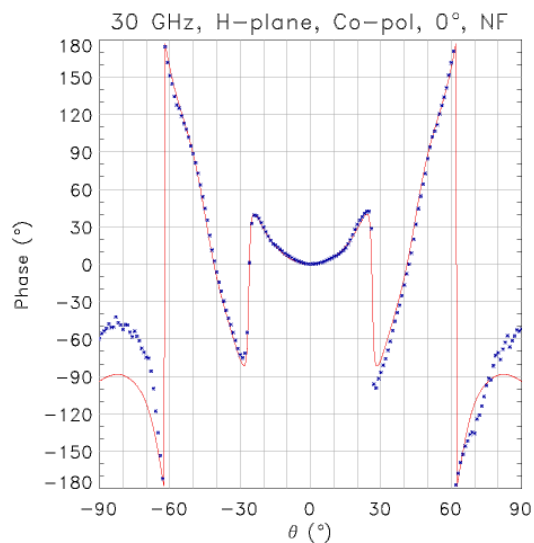
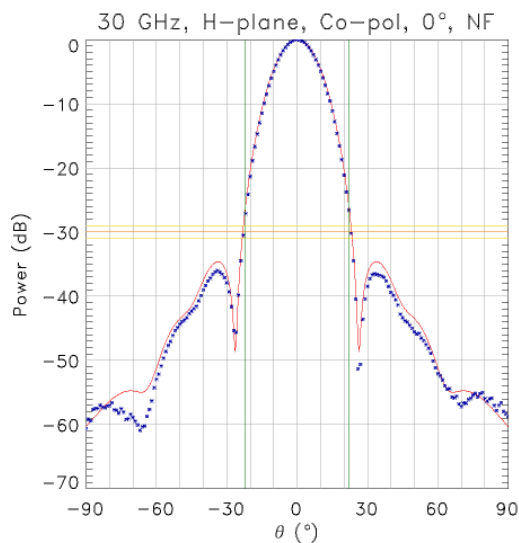
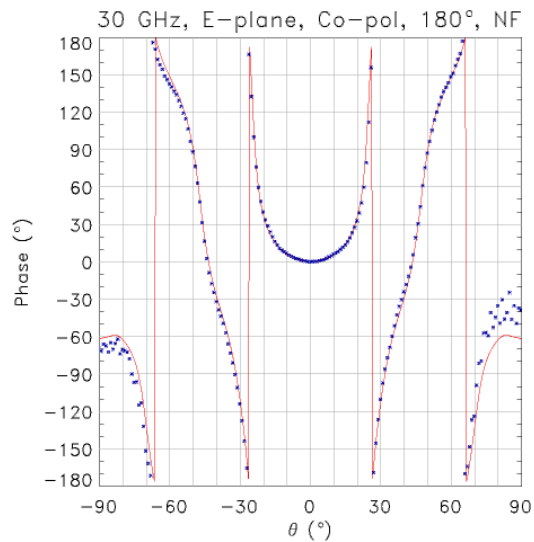
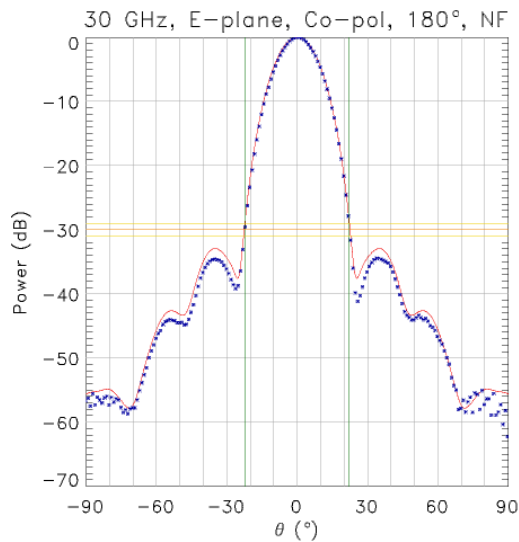
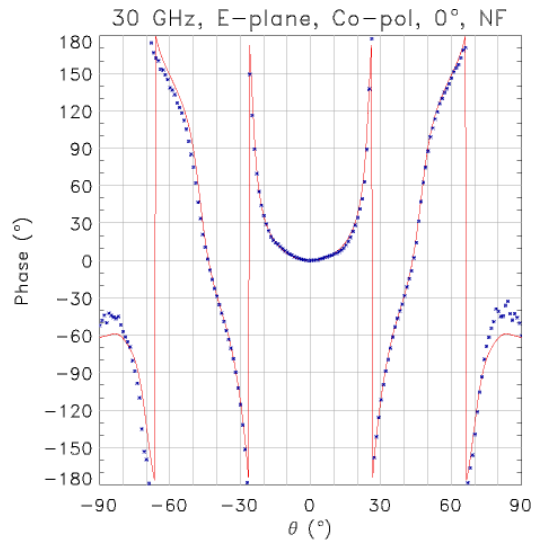
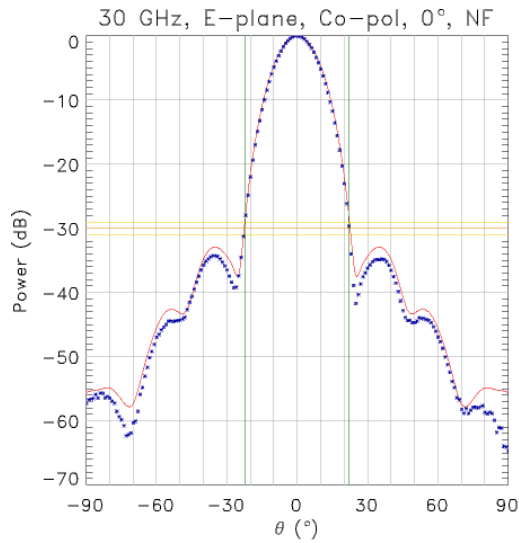


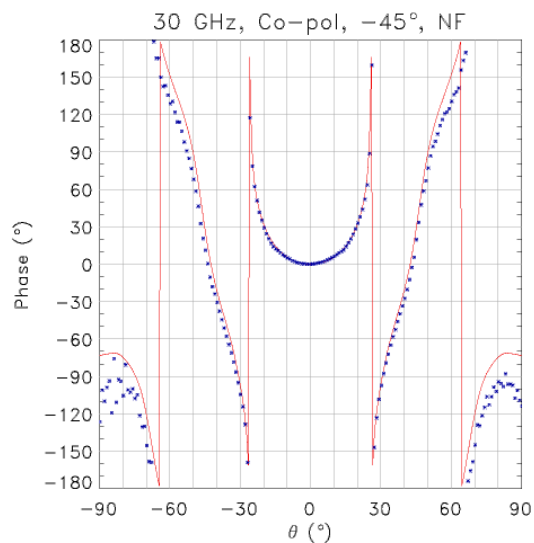
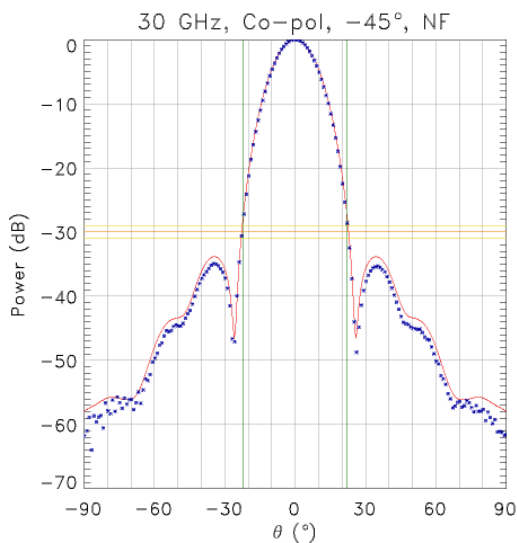
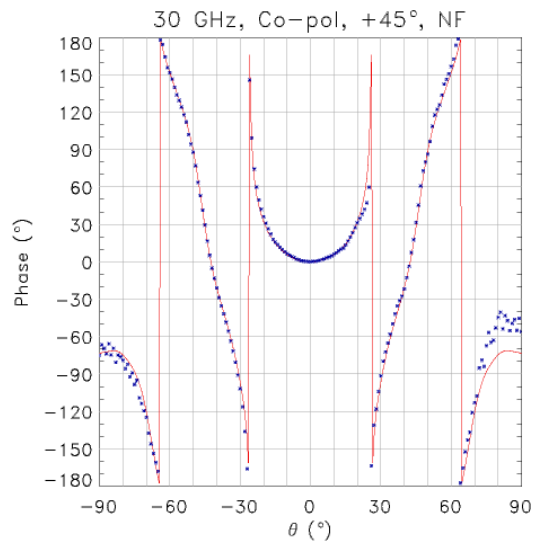
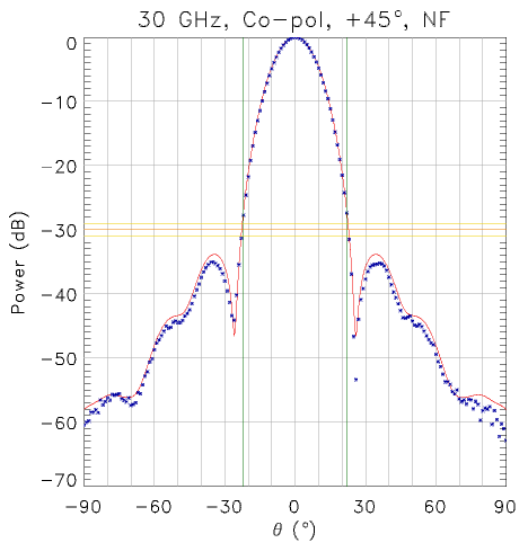
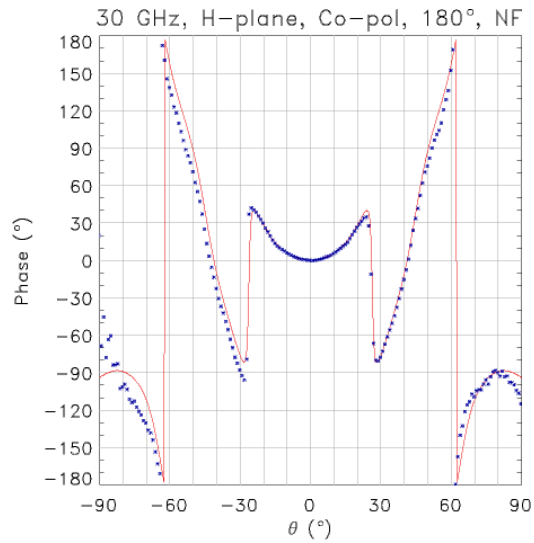
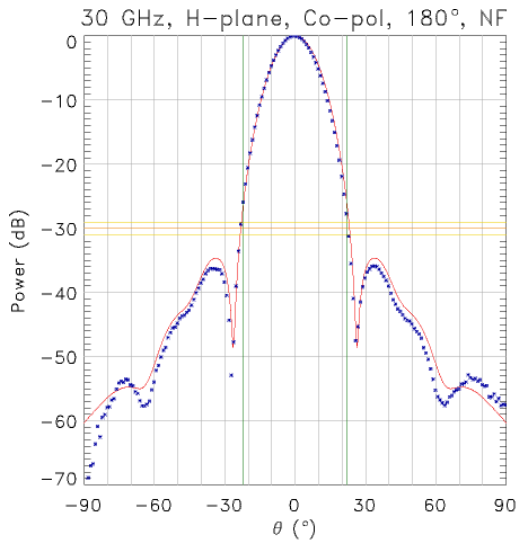


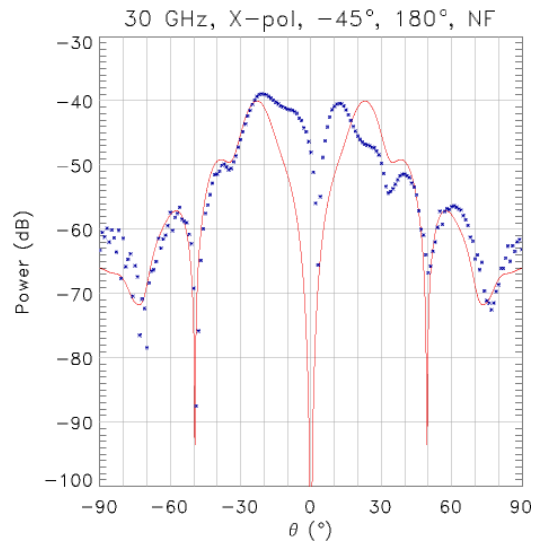
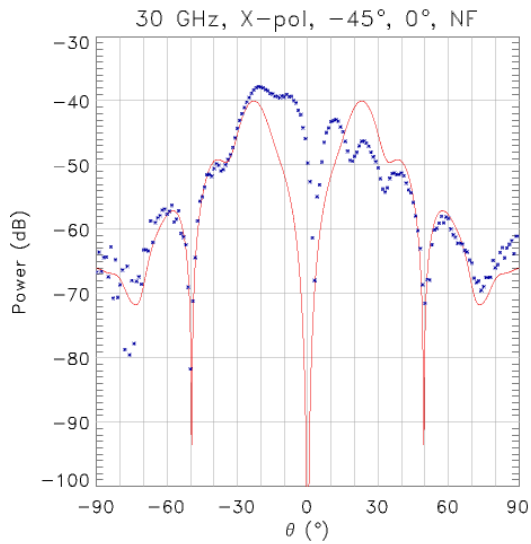
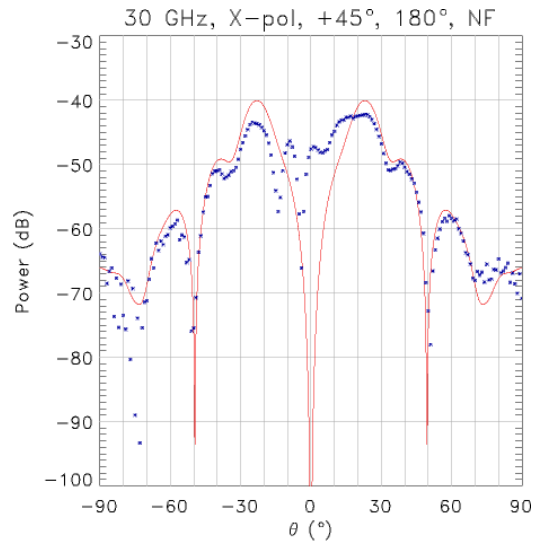
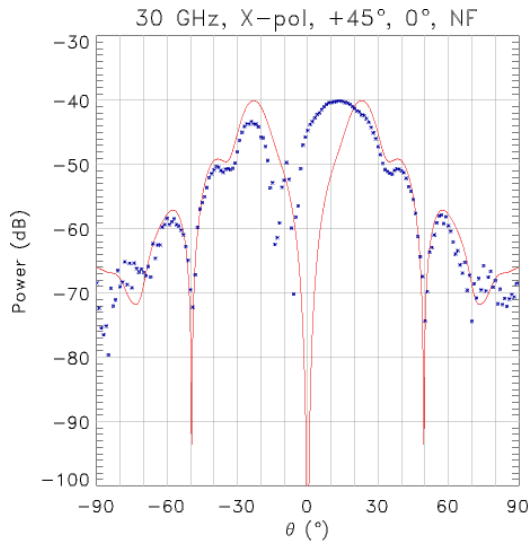


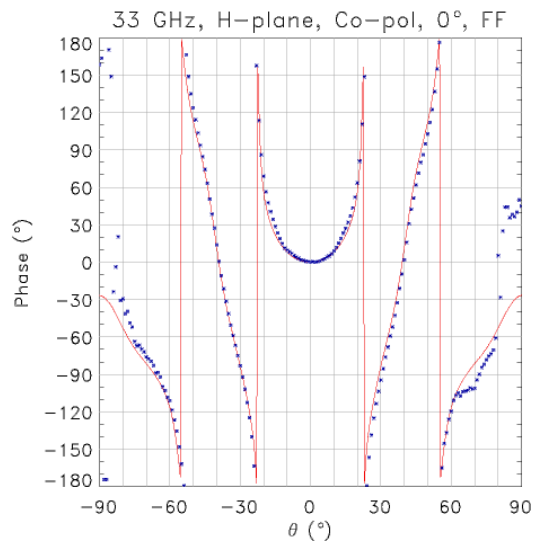
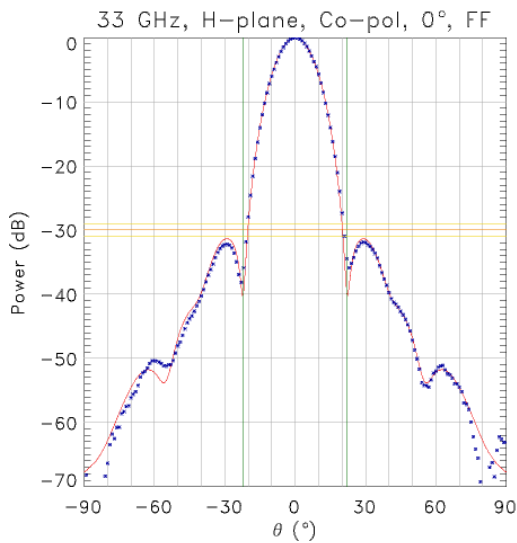
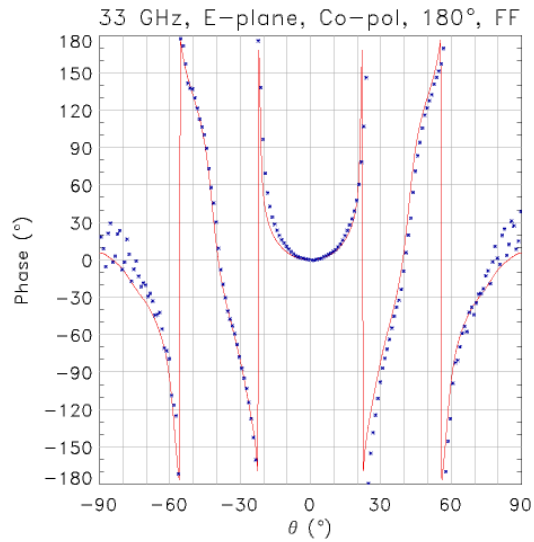
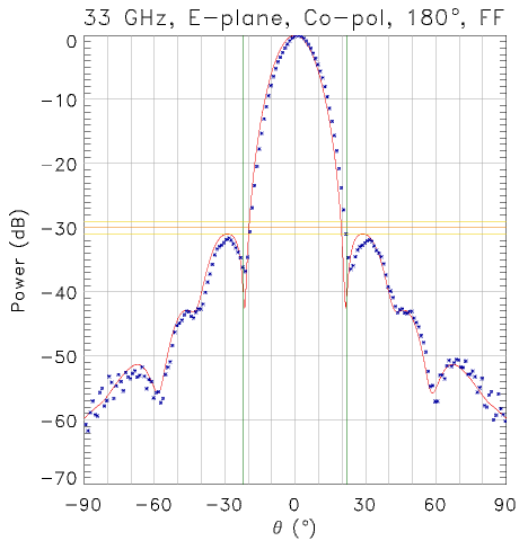
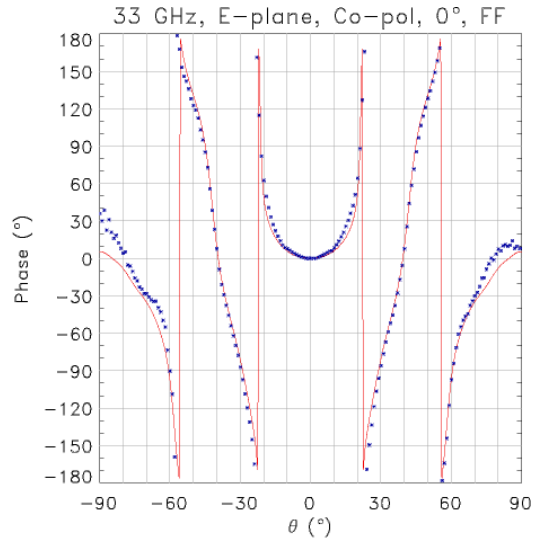
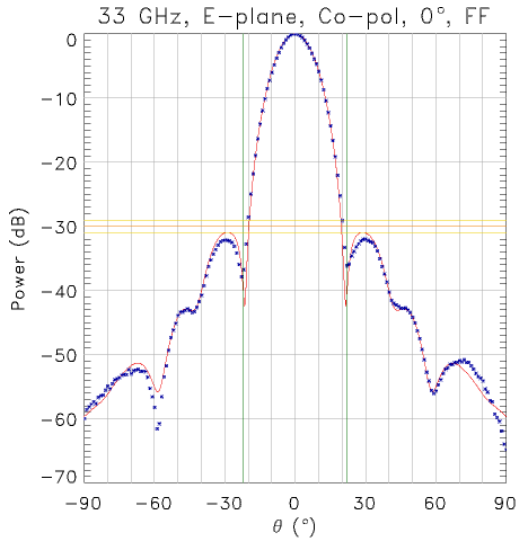


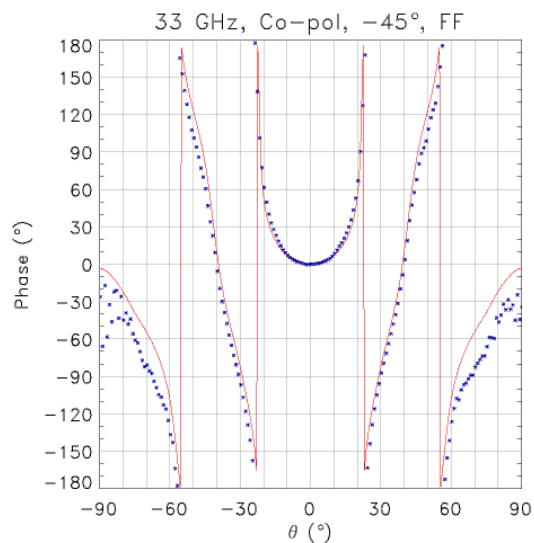
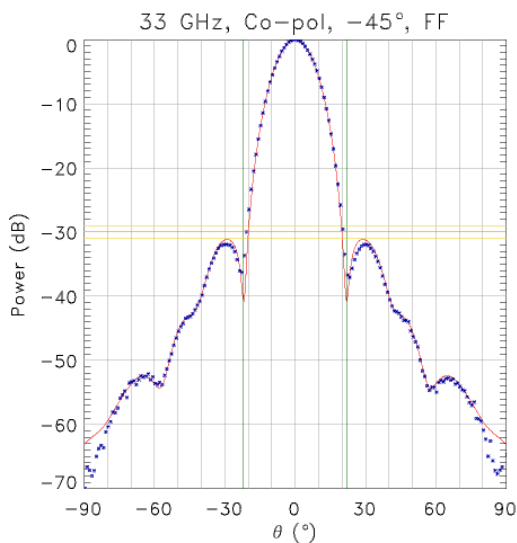
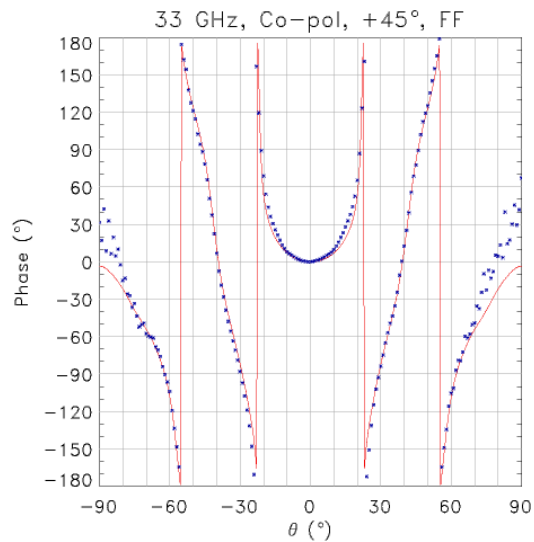
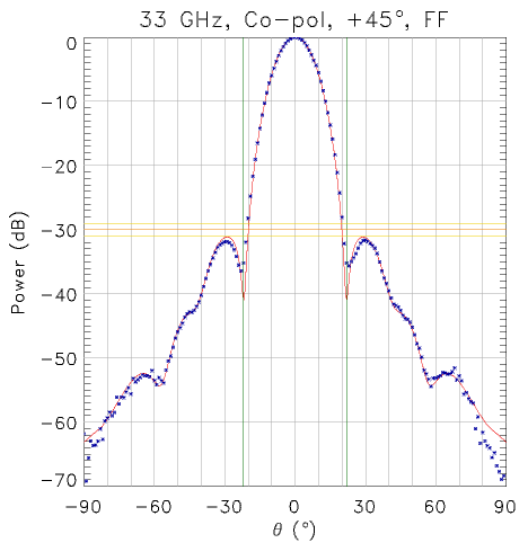
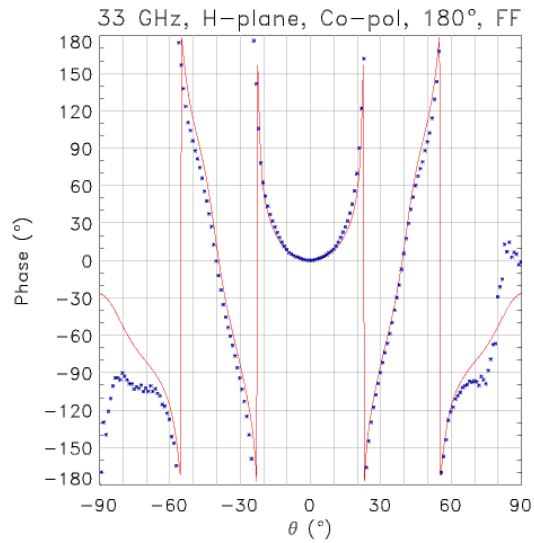
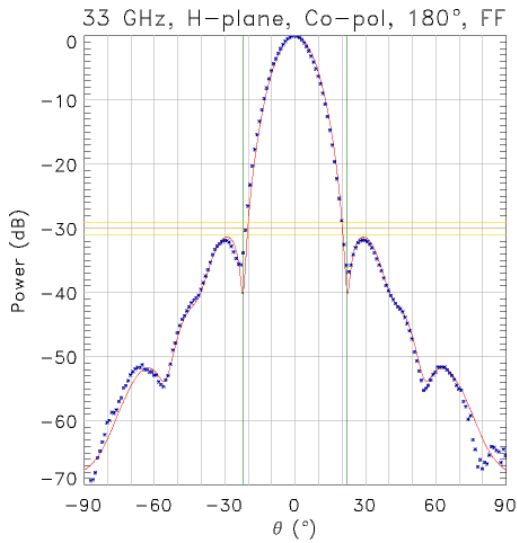


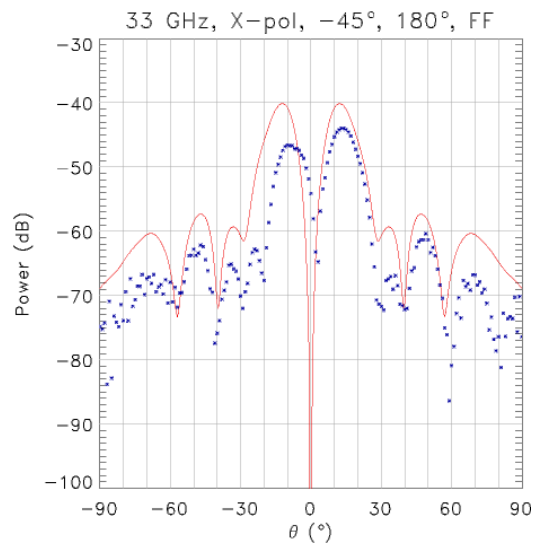
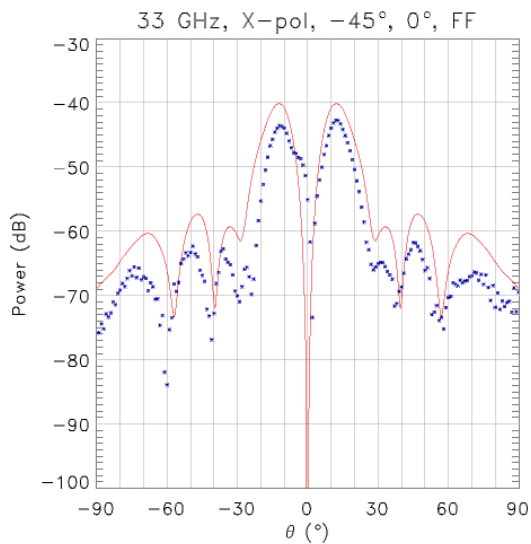
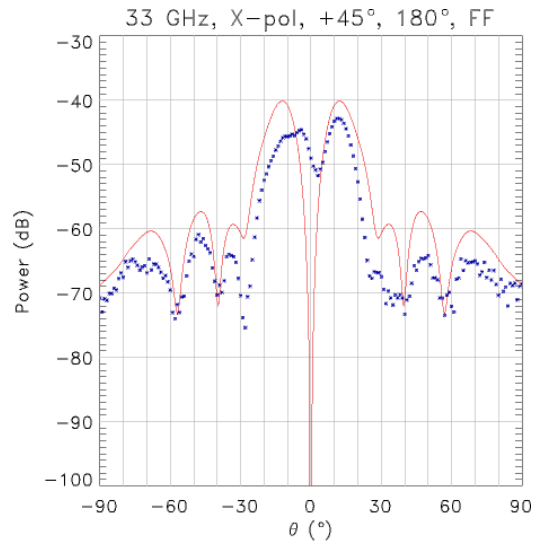
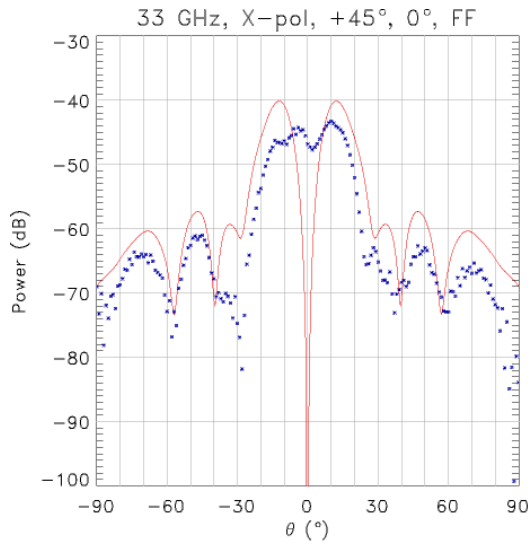


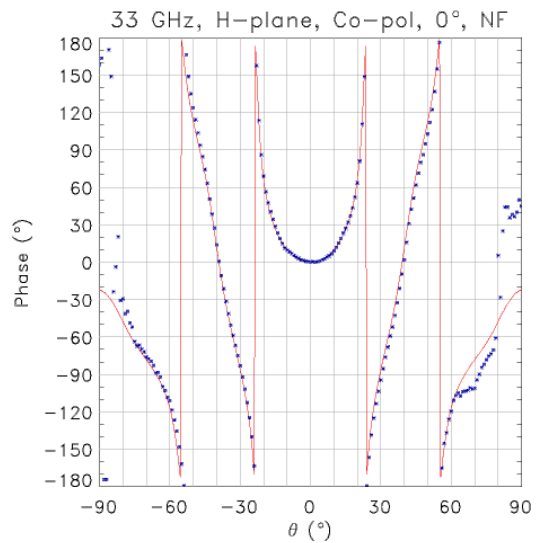
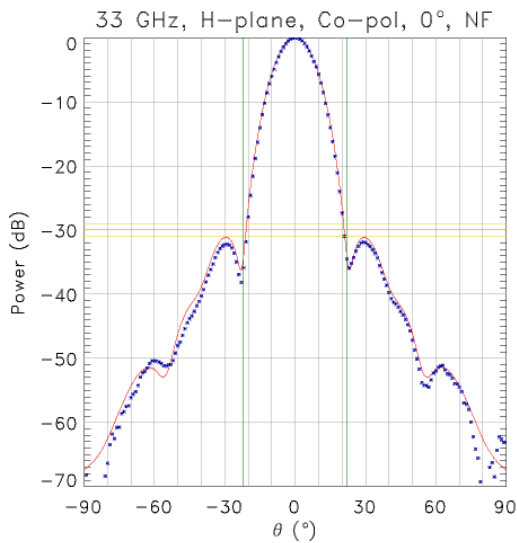
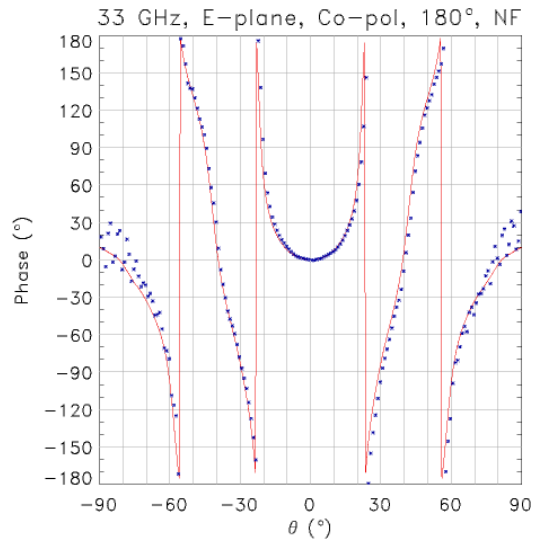
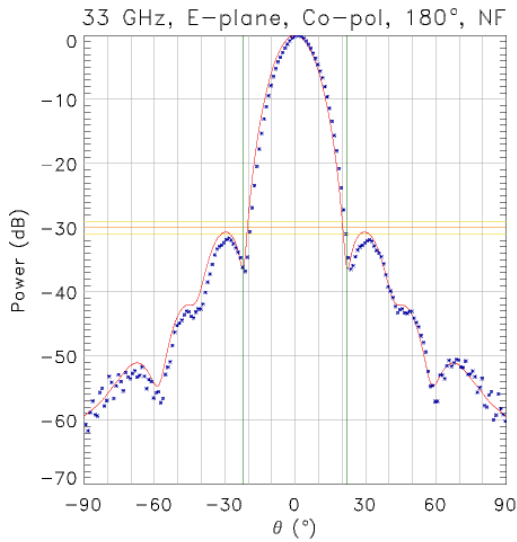
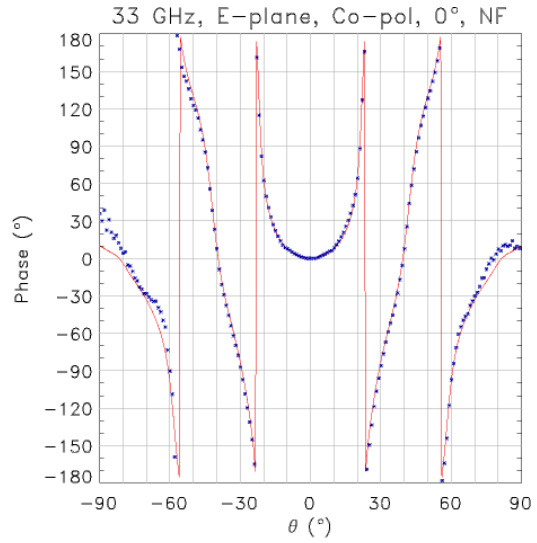
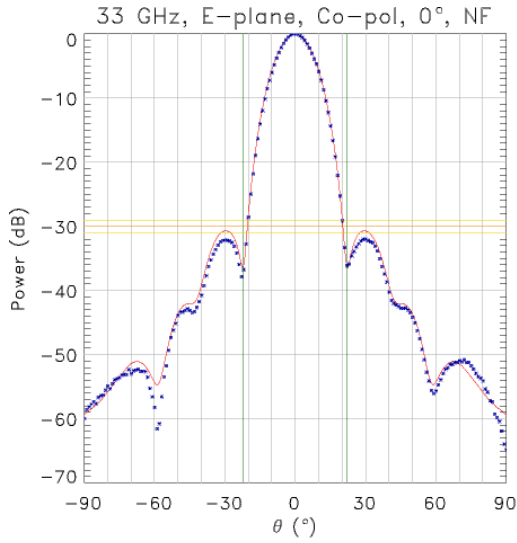


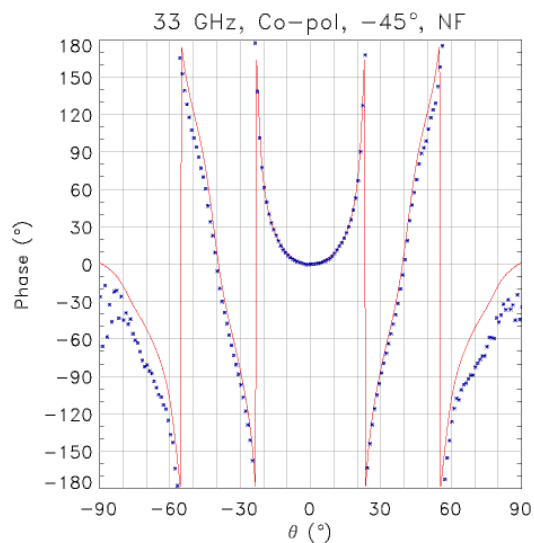
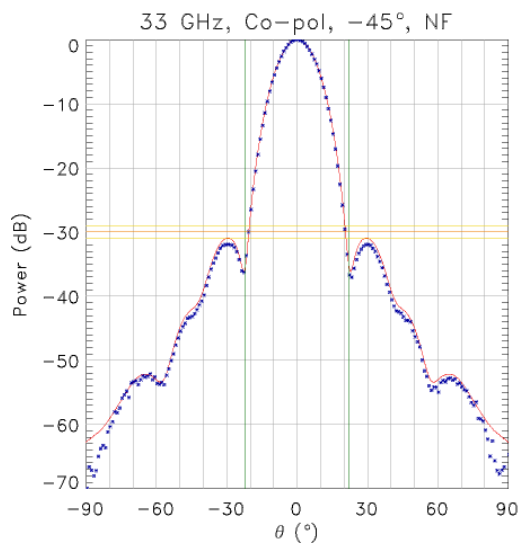
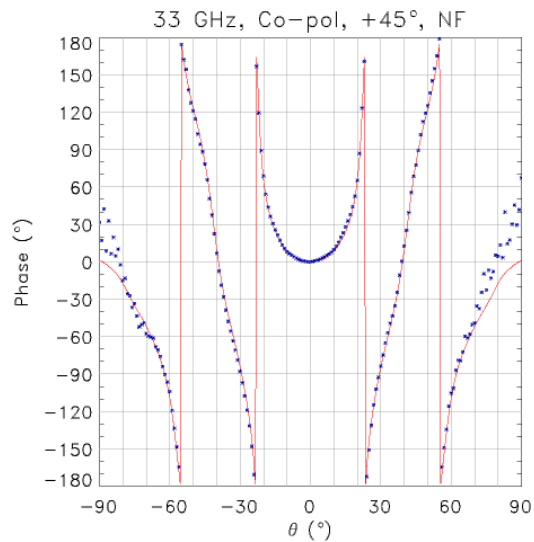
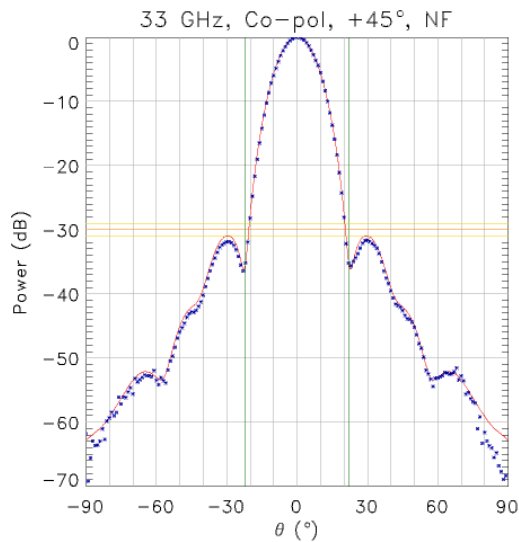
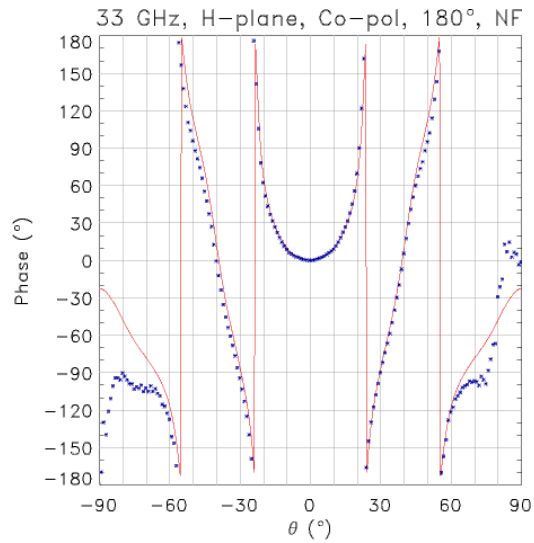
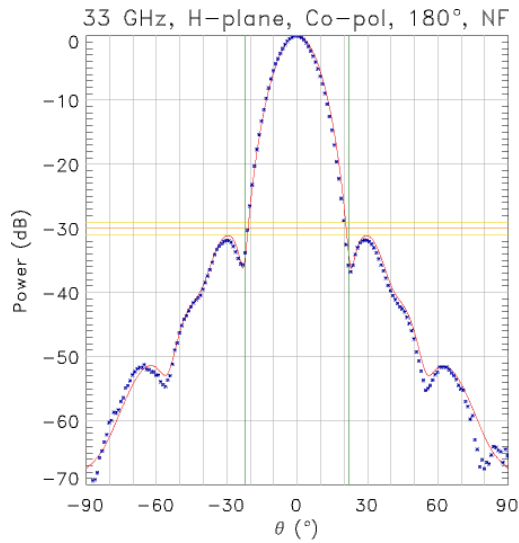


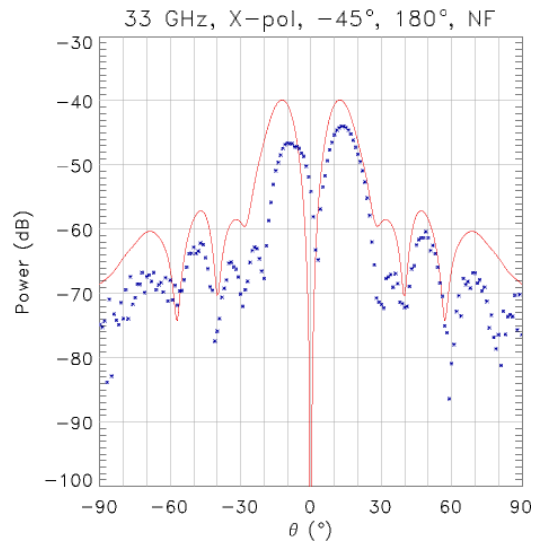
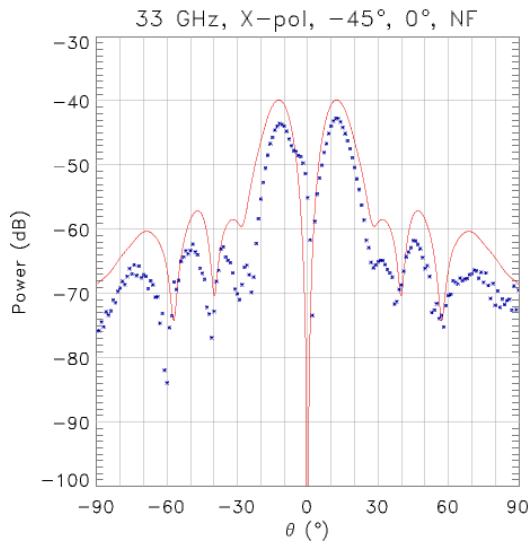
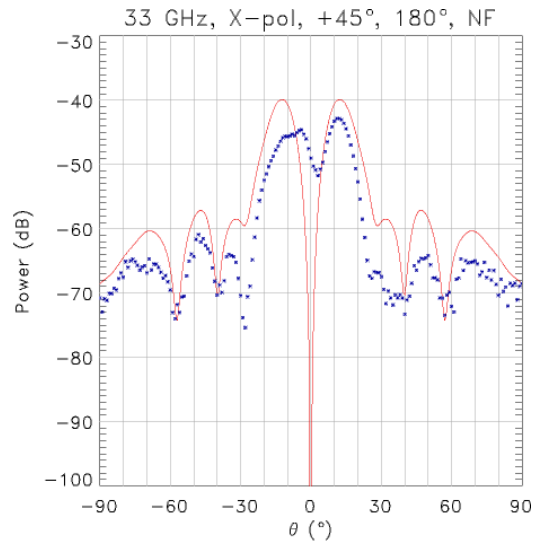
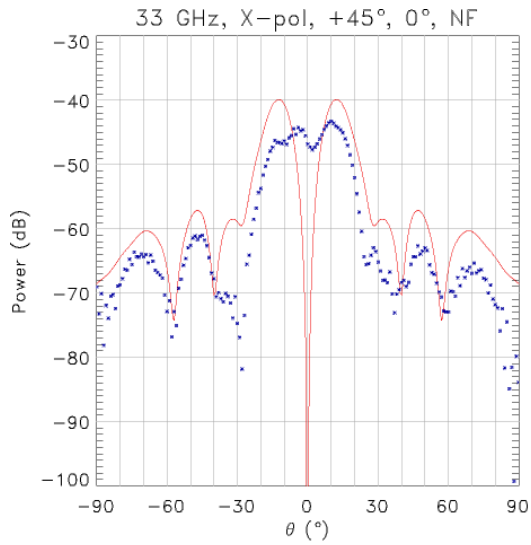














5 44 GHz FEED HORN

The feed horn pattern was computed using GRASP8 and the source was specified by its spherical wave expansion provided by Alcatel Space Industriesc [RD 1]. The feed horn simulated directivity is 21.95 dBi and the ET is specified to be $30 \text{ dB} \pm 1 \text{ dB}$ at 22° , at the center frequency [AD 1]. Both the near field and the far field were computed. The near field distance set in the simulations is equal to the distance between the source and the target in the measurements, in order to obtain comparable results. The measurements were carried out at the IFP [AD 3].

In Tab. 2 a comparison between the measured Edge Taper and the simulated one (in the far and near field, respectively) is reported. In figures from page 22 to page 34, the feed horn patterns are shown, in amplitude and phase. The solid red line represent the simulated data and the blu asterisks are the measured data. In the title of each plot an indication of the measured component and plane is reported, together with a label identifying the field computed (*NF*: near field, *FF*: far field).

Plane	Freq (GHz)	ET sff (dB@22°)	ET snf (dB@22°)	ET m (dB@22°)
E- plane 0°	39.6	-21.27	-20.63	-21.03
	44.0	-32.55	-30.70	-30.65
	48.8	-39.63	-43.73	-48.41
E- plane 180°	39.6	-21.27	-20.63	-21.10
	44.0	-32.55	-30.70	-30.67
	48.8	-39.63	-43.73	-47.42
H- plane 0°	39.6	-21.10	-20.49	-21.50
	44.0	-28.88	-27.68	-28.75
	48.8	-36.47	-33.95	-36.21
+45° plane	39.6	-21.19	-20.56	-21.18
	44.0	-30.52	-29.07	-29.69
	48.8	-52.81	-42.51	-41.36
-45° plane 0°	39.6	-21.19	-20.56	-21.28
	44.0	-30.52	-29.07	-29.66
	48.8	-52.81	-42.51	-43.30

Tab. 2 *ET sff*: Edge Taper of the simulated far field, *ET snf*: Edge Taper of the simulated near field (98 cm), *ET m*: Edge Taper of the measured field, interpolated at 22° .

