

01_LB_PHASE_CENTER_CV2

May 27, 2024

1 Phase Center Determination for BINGO Horn

1.1 Description:

We work with the data measured in LIT/INPE in an unknown date and provided as is as a excel file with four datasets, with different polarization combinations for AUT and transmitting antenna, with several frequencies, including measurements of Amplitude in dB and Phase in degrees. Only the copolarization datasets were used.

We implement a simple plane wave beam model and we analyze the fit of this model for the data provided, limiting the angle to the first minimum of the phase measured, weighting the data uniformly or with the amplitude in linear scale. We consider the phase data itself or a Savitzky-Golay filtered version.

We provide concluding notes about phase center location for all the coordinates, presenting a statistical analysis of the result and graphs that allow to understand both strengths and weaknesses of the procedure.

We end by considering suggestions to implement in any future measure procedure.

1.2 Dataset Characteristics

- Filename: ../data/raw/beampattern_horn01.xlsx,
- Filesize: 1.2 MB,
- Polarizations: ['Horizontal_Copolar', 'Vertical_Copolar'],
- Frequencies: ['0.900 GHz', '0.925 GHz', '0.950 GHz', '0.975 GHz', '1.000 GHz', '1.025 GHz'],
- Angular Resolutions: 0.25

1.3 Results

- Freq: 900MHz Wavelength: 33.3cm
- Polarization: Horizontal_Copolar Weight: Amplitude
- Theta_max: 13.9° Taper@10dB: 13.9°

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-3.7	-124.4	375.2	376.1	0.96	0.7	0.43	0.00135	0
-3.7	-124.6	375.5	376.8	0.95	0.7	0.43	0.00166	0

- Freq: 900MHz Wavelength: 33.3cm
- Polarization: Horizontal_Copolar Weight: Uniform

- Theta_max: 13.9° Taper@10dB: 13.9°

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-3.4	-112.1	338.1	339	0.99	0.44	0.08	0.00053	0
-3.4	-111.9	337.7	338.6	0.99	0.43	0.08	0.00054	0

- Freq: 900MHz Wavelength: 33.3cm

- Polarizarion: Vertical_Copolar Weight: Amplitude

- Theta_max: 13.4° Taper@10dB: 13.4°

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-3.2	-106.8	321.3	324.5	0.9	0.69	0.41	0.00305	0
-3.3	-108.3	326.1	328.2	0.92	0.7	0.41	0.00262	0

- Freq: 900MHz Wavelength: 33.3cm

- Polarizarion: Vertical_Copolar Weight: Uniform

- Theta_max: 13.4° Taper@10dB: 13.4°

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-3.2	-107.8	325	326.4	0.94	0.7	0.41	0.00203	0
-3.2	-108.1	326.1	327.1	0.94	0.71	0.41	0.00204	0

- Freq: 1050MHz Wavelength: 28.6cm

- Polarizarion: Horizontal_Copolar Weight: Amplitude

- Theta_max: 11.3° Taper@10dB: 11.3°

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-4.2	-120.7	363.9	364.8	0.98	0.92	0.88	0.00054	0
-4.3	-121.5	366.3	367.2	0.98	0.91	0.88	0.0005	0

- Freq: 1050MHz Wavelength: 28.6cm

- Polarizarion: Horizontal_Copolar Weight: Uniform

- Theta_max: 11.3° Taper@10dB: 11.3°

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-3.9	-110.9	334.7	335.4	0.99	0.59	0.31	0.00024	0
-3.9	-111	334.9	335.8	0.99	0.61	0.31	0.00025	0

- Freq: 1050MHz Wavelength: 28.6cm

- Polarizarion: Vertical_Copolar Weight: Amplitude

- Theta_max: 11.2° Taper@10dB: 11.2°

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-4.1	-116.3	350.9	351.6	0.99	0.94	0.63	0.00016	0
-4.1	-116.9	352.7	353.3	0.99	0.93	0.76	0.00013	0

- Freq: 1050MHz Wavelength: 28.6cm
- Polarizarion: Vertical_Copolar Weight: Uniform
- Theta_max: 11.2° Taper@10dB: 11.2°

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-4	-114.6	345.9	346.5	0.99	0.97	0.87	0.00012	0
-4	-114.8	346.5	347	0.99	0.97	0.87	0.00013	0

- Freq: 1200MHz Wavelength: 25.0cm
- Polarizarion: Horizontal_Copolar Weight: Amplitude
- Theta_max: 9.7° Taper@10dB: 9.7°

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-3.9	-96.6	291.8	292.4	0.99	1	0.98	7e-05	0
-3.9	-96.8	292.6	293.1	0.99	1	0.98	8e-05	0

- Freq: 1200MHz Wavelength: 25.0cm
- Polarizarion: Horizontal_Copolar Weight: Uniform
- Theta_max: 9.7° Taper@10dB: 9.7°

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-3.7	-92.9	280.9	281.3	1	0.99	0.91	5e-05	0
-3.7	-93	281	281.5	1	1	0.91	5e-05	0

- Freq: 1200MHz Wavelength: 25.0cm
- Polarizarion: Vertical_Copolar Weight: Amplitude
- Theta_max: 9.8° Taper@10dB: 9.8°

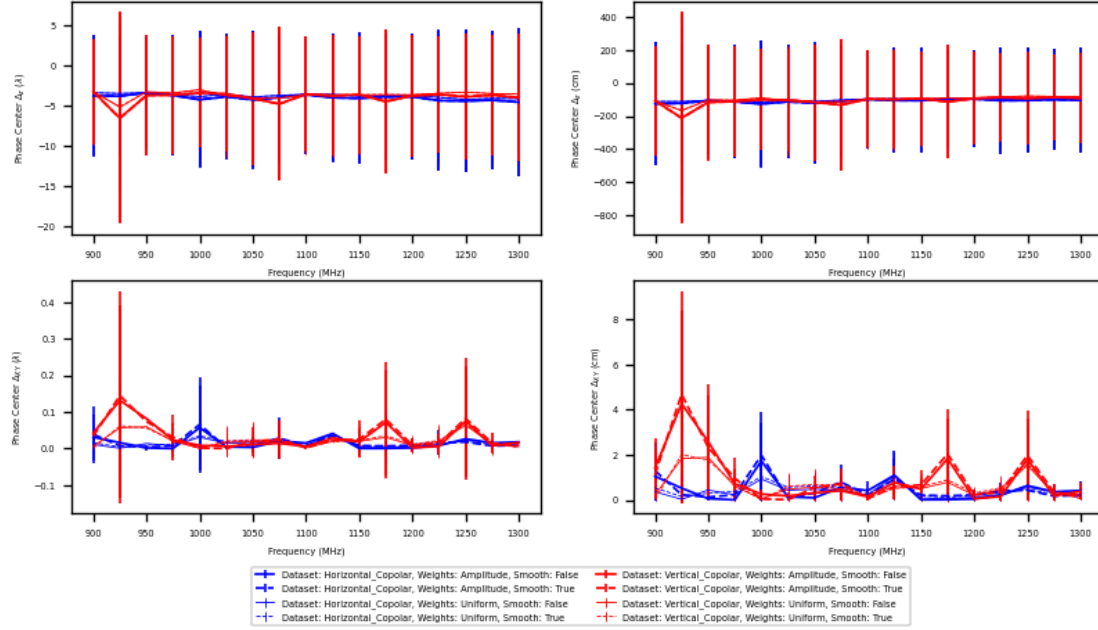
Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-3.7	-93.2	281.7	282	0.99	1	1	8e-05	0
-3.7	-93.1	281.5	281.8	0.99	1	1	6e-05	0

- Freq: 1200MHz Wavelength: 25.0cm
- Polarizarion: Vertical_Copolar Weight: Uniform
- Theta_max: 9.8° Taper@10dB: 9.8°

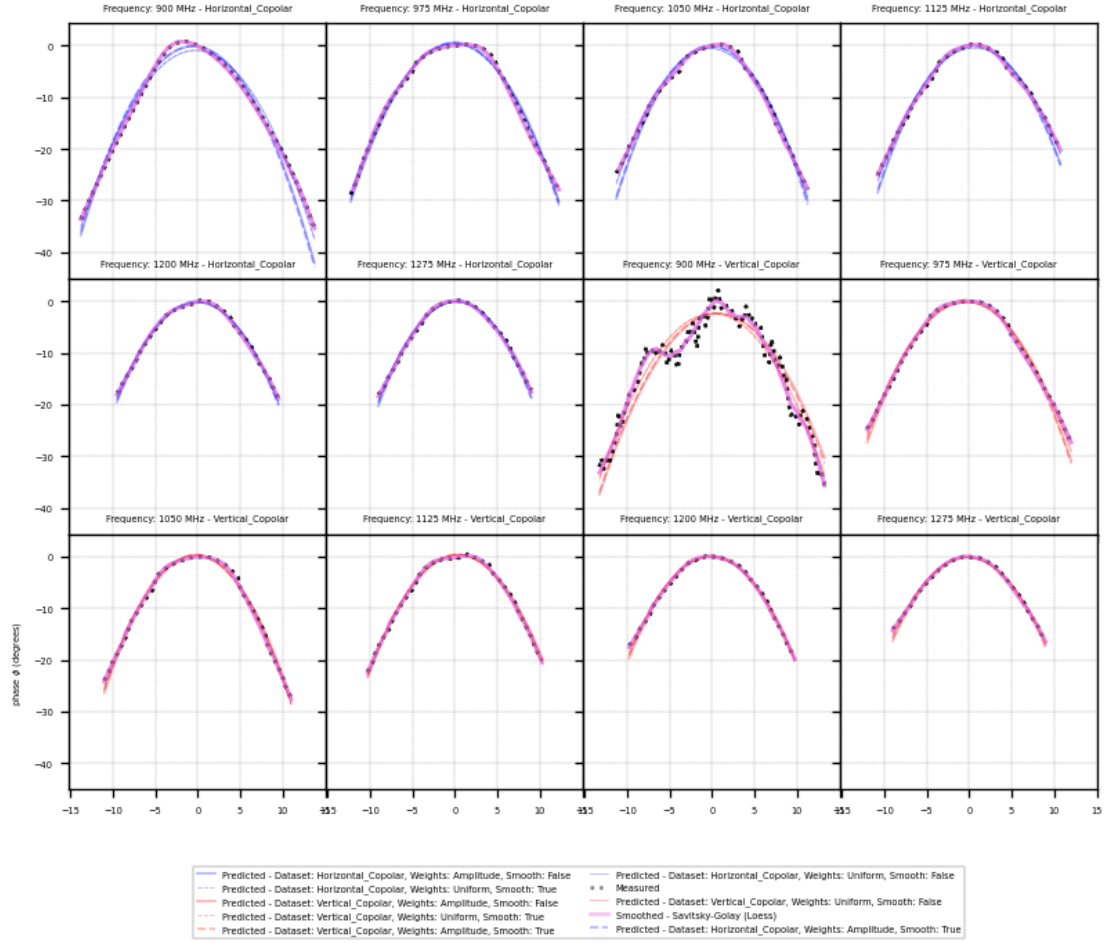
Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-3.6	-90.5	273.7	274.3	1	1	1	5e-05	0

Dz	Dz (cm)	DZ- (cm)	DZ+ (cm)	R2	Cramer	KS	Chi2	KS_res
-3.6	-90.6	274	274.3	1	1	1	6e-05	0

1.4 Phase Center Position as a function of Frequency



1.5 Measures and Predicted Phases for selected frequencies



1.6 Statistical Diagnostics

1.6.1 Scores and Metrics

