



WIFI PCB Antenna Design Guidelines Modle ANT4411D

Renee 2016-03-02

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1. General Info

Using RK universal type antenna technology, the Model ANT4411D antenna provides a high gain, on-board antenna solution for Wi-Fi and ISM band applications. As universal antenna solutions, the ANT4411D provides the flexibility of an antenna on different PCB without sacrificing performance. The ANT4411D dual band antenna was designed to accommodate most WLAN access point applications, such as routers and gateways and so on, with a low-cost, low profile, and enhanced performance PCB on-board design.



Figure 1: Model ANT4411D Antenna

2. Features

The Model ANT4411D is defined by the following features:

- IEEE 802.11 a/b/g/n compatible
- Dual Band (D)
- Antenna on board, low profile design
- Peak Gain 5-6dB
- Low Cost, High performance

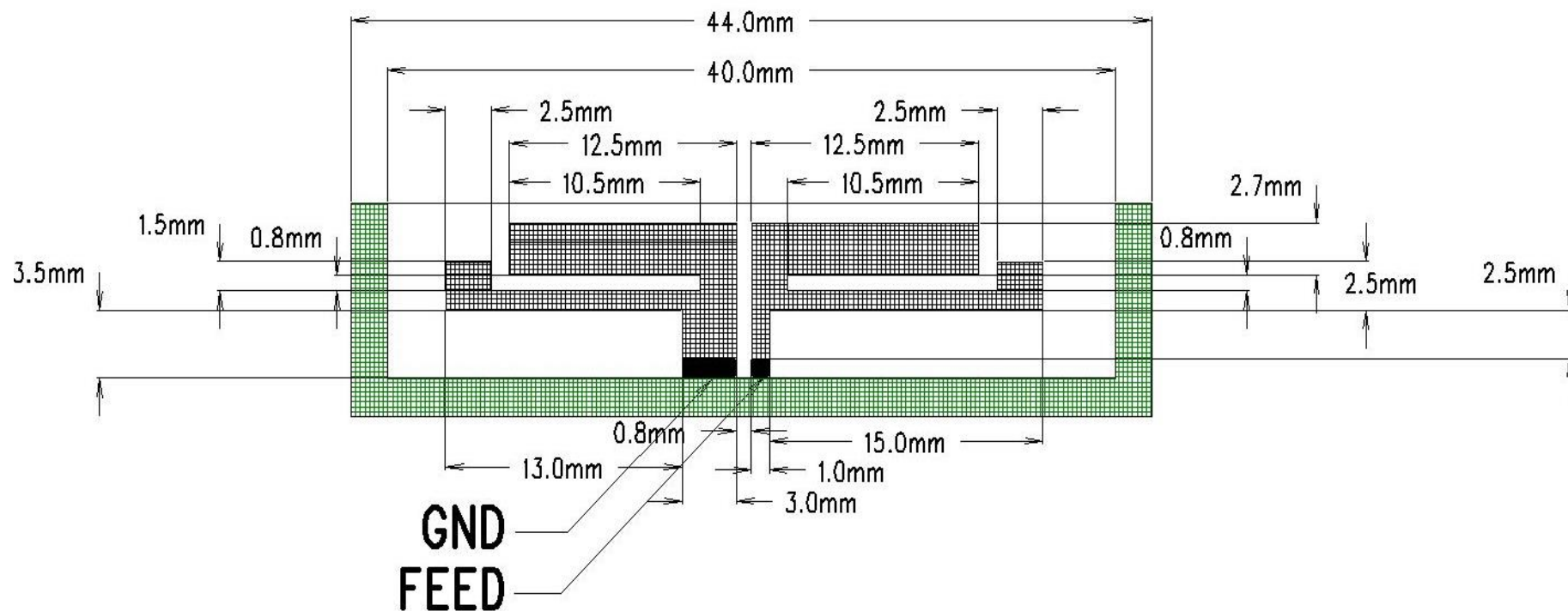


3. Specification

Standard	IEEE 802.11n and 802.11 a/b/g
Frequency Range	2.4 to 2.49 GHz, 5.15 to 5.85 GHz
Peak Gain	5-6dB
VSWR	2:1
Feed Impedance	50 Ohms
Antenna Dimensions	40*9*1.0-1.6 (mm)
Package Dimensions	44*11(mm)
Temperature	Operating: -40 °to +75 °C
	Storage:: -40 °to +85 °C
Humidity	0 to 95%, non-condensing

4. Antenna Package View

TOP VIEW



BOTTOM VIEW

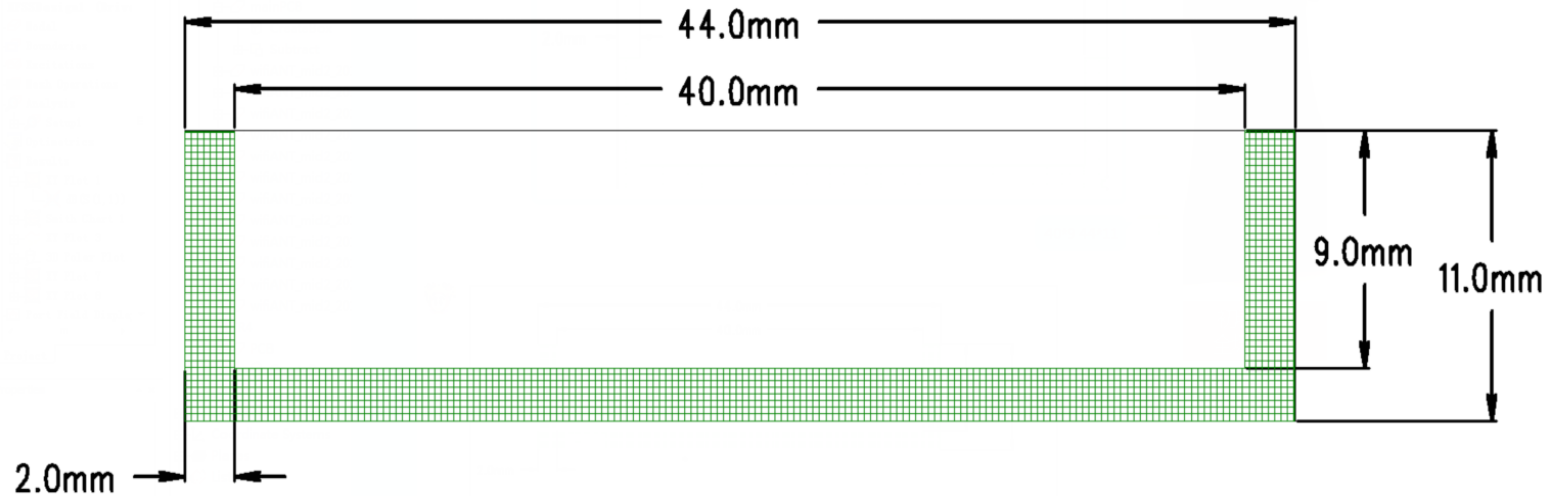


Figure 2 Model ANT4411D Antenna Package

NOTES:

1. The black grid part is antenna pattern with feed point and ground point.
2. The green grid part must be poured GND copper, and need to play more vias.
In addition to the antenna matching circuit, the other components are not in here.
3. The white space is air area.

5. Application Guidelines and Reference Board

Application Guidelines:

1. The antenna package can be located on the random edge of the various PCB.
2. The antenna package has been set in an area, whose size can't be changed, otherwise the frequency will be shifted.

Reference Board: 120mmx160mmx1.2mm

Reference antenna location: ANT1(11mm)、ANT2(16mm)、ANT3(In the corner)

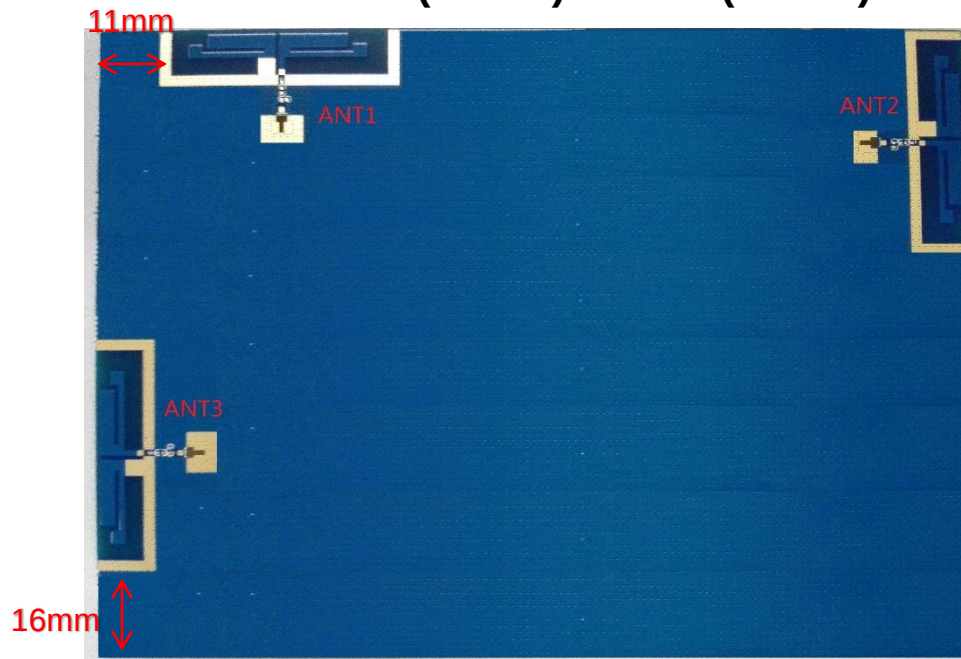


Figure 3 Model ANT4411D Reference Board

6. PCB Guidelines

Environmental effect:

1. It is best to keep as far as possible with speaker、camera、 receiver、 battery、 vibrator and LCD's FPC etc to avoid the noise inference.
2. It is best to keep as far as possible away from Bluetooth antenna and LTE antenna to avoid the mutual interference.
3. It is best to keep as far as possible away from metal components and metal decoration in the cover which should be grounded well to avoid the Second Harmonic Generation.
4. It is best to make the non-metallic materials in the area of antenna. It is hard to make good permanence when the antenna is under the metallic cover. And also it can adopt the NCVM processing on the cover of antenna part .

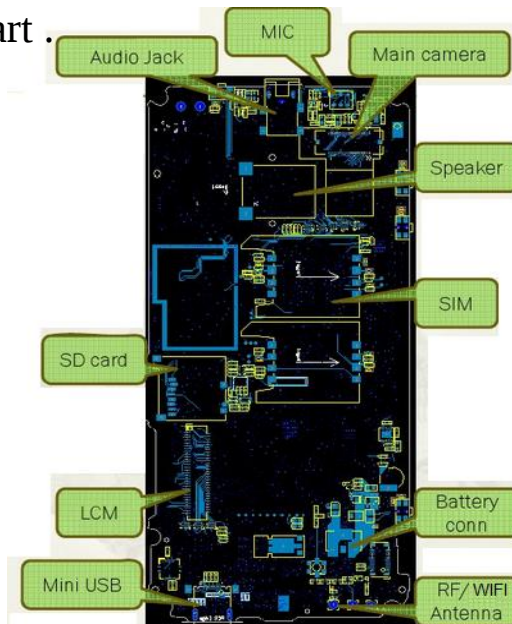


Figure 4 Renefernce placement

7. Simulate Result and PCB Test Result

ANT1、ANT2 and ANT3 in the Reference Board (**Figure 3**) are tested by simulation software (HFSS) and Vector Network Analyzer (E5071C), the test results are as follow:

2.4G (H=1.2mm)		Simulate		PCB Test		Delta	
ANT1	Center Freq (MHz)/S11(dB)	2530	-25.7	2445	-30	85	4.3
	BW(MHz) (-10dB)	230		600		370	
ANT2	Center Freq (MHz)/S11(dB)	2640	-20.2	2600	-18	40	-2.2
	BW(MHz) (-10dB)	180		300		120	
ANT3	Center Freq (MHz)/S11(dB)	2560	-20.2	2500	-26	60	5.8
	BW(MHz) (-10dB)	150		450		300	

5.8G (H=1.2mm)		Simulate		PCB Test		Delta	
ANT1	Freq (MHz)	5150	5850	5150	5850	5150	5850
	S11(dB)	-10.9	-14.2	-19.6	-14.8	8.7	0.6
ANT2	Freq (MHz)	5150	5850	5150	5850	5150	5850
	S11(dB)	-10.24	-15.8	-11.2	-17.4	0.96	1.6
ANT3	Freq (MHz)	5150	5850	5150	5850	5150	5850
	S11(dB)	-11.65	-15.1	-7.6	-12.2	-4.05	-2.9

NOTE:

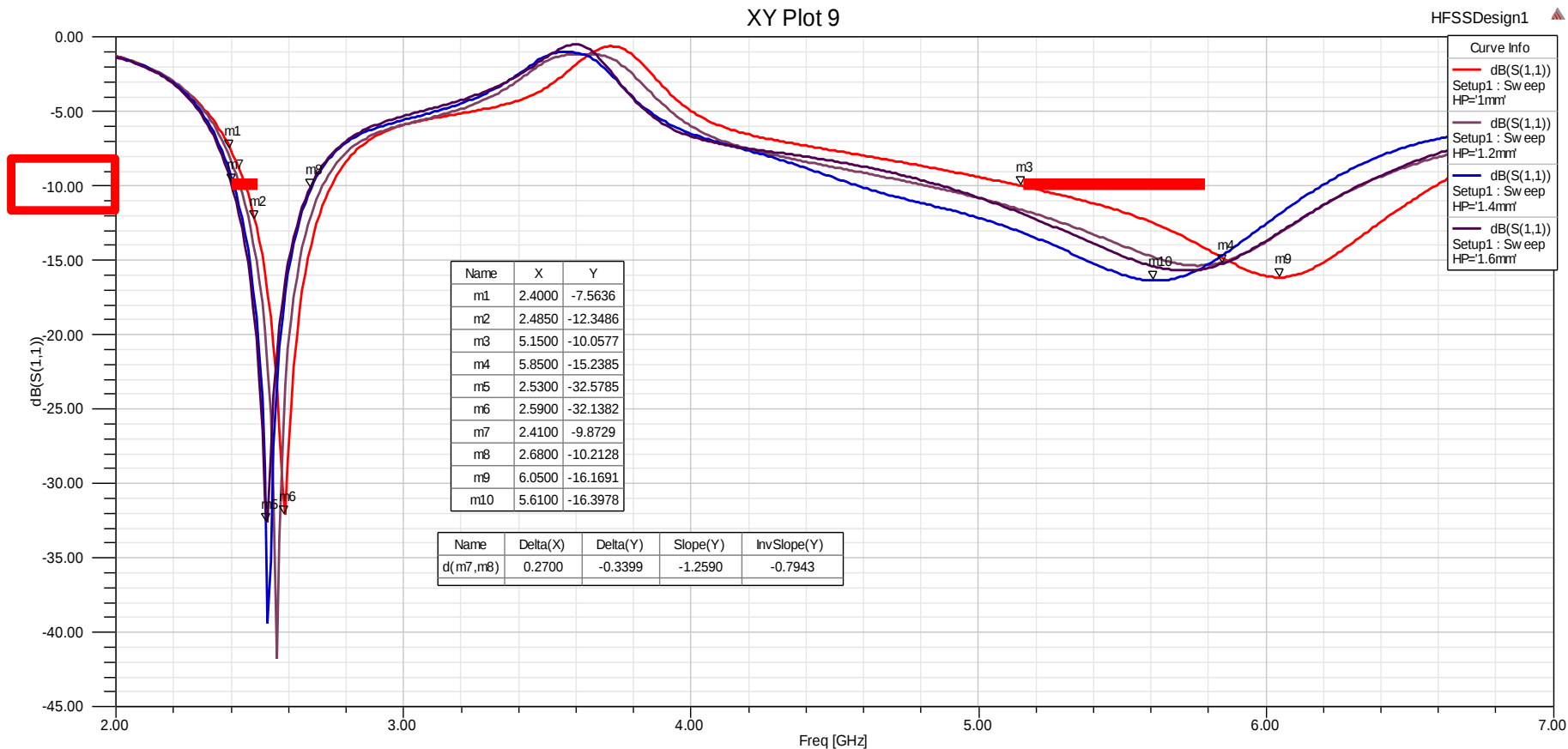
Considering some boards need to add casing, so the antenna frequency can be simulated slightly on the high side.

PASS

Acceptable

Fail

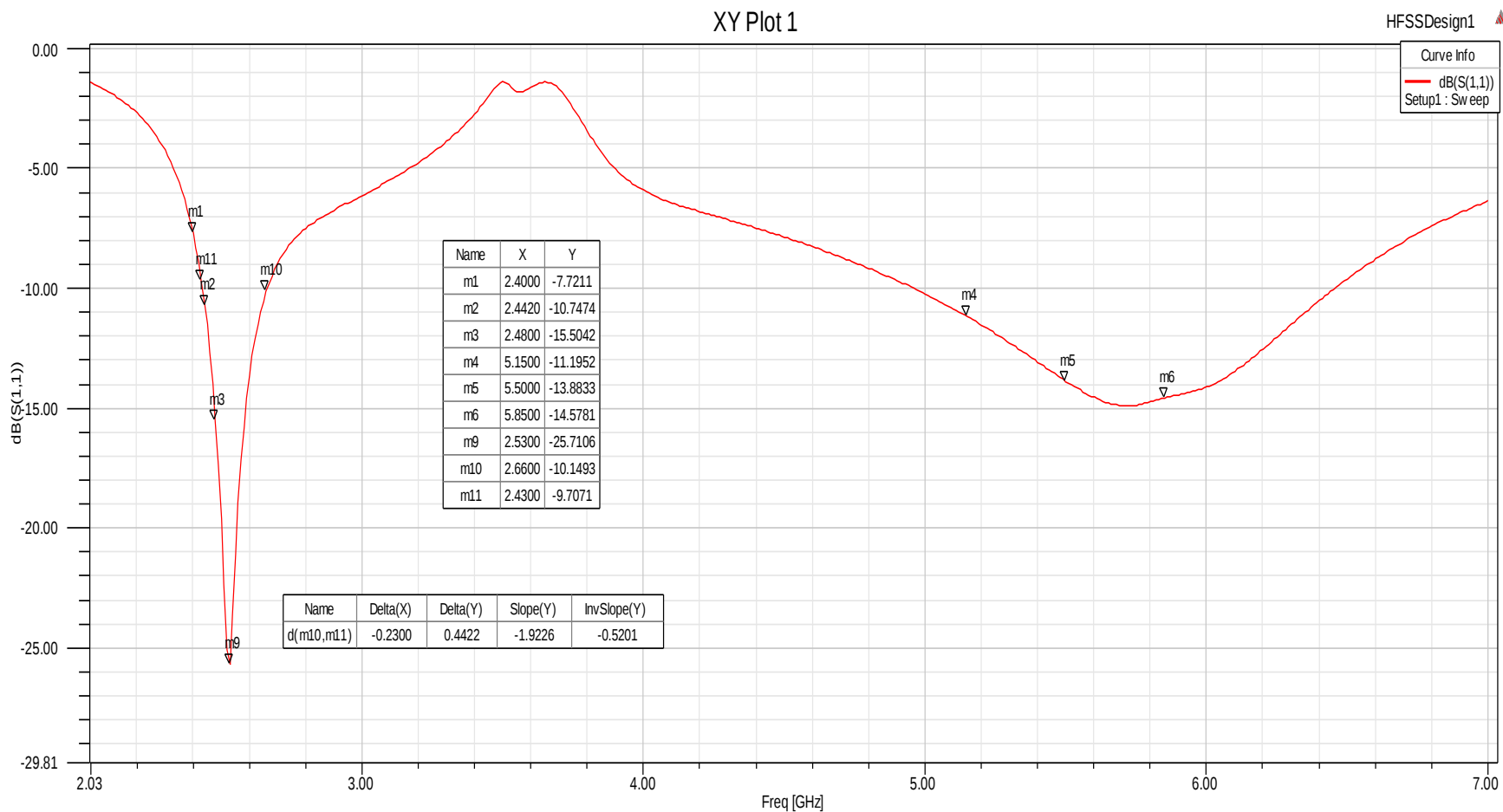
7. Simulate Result -With Different Hieght



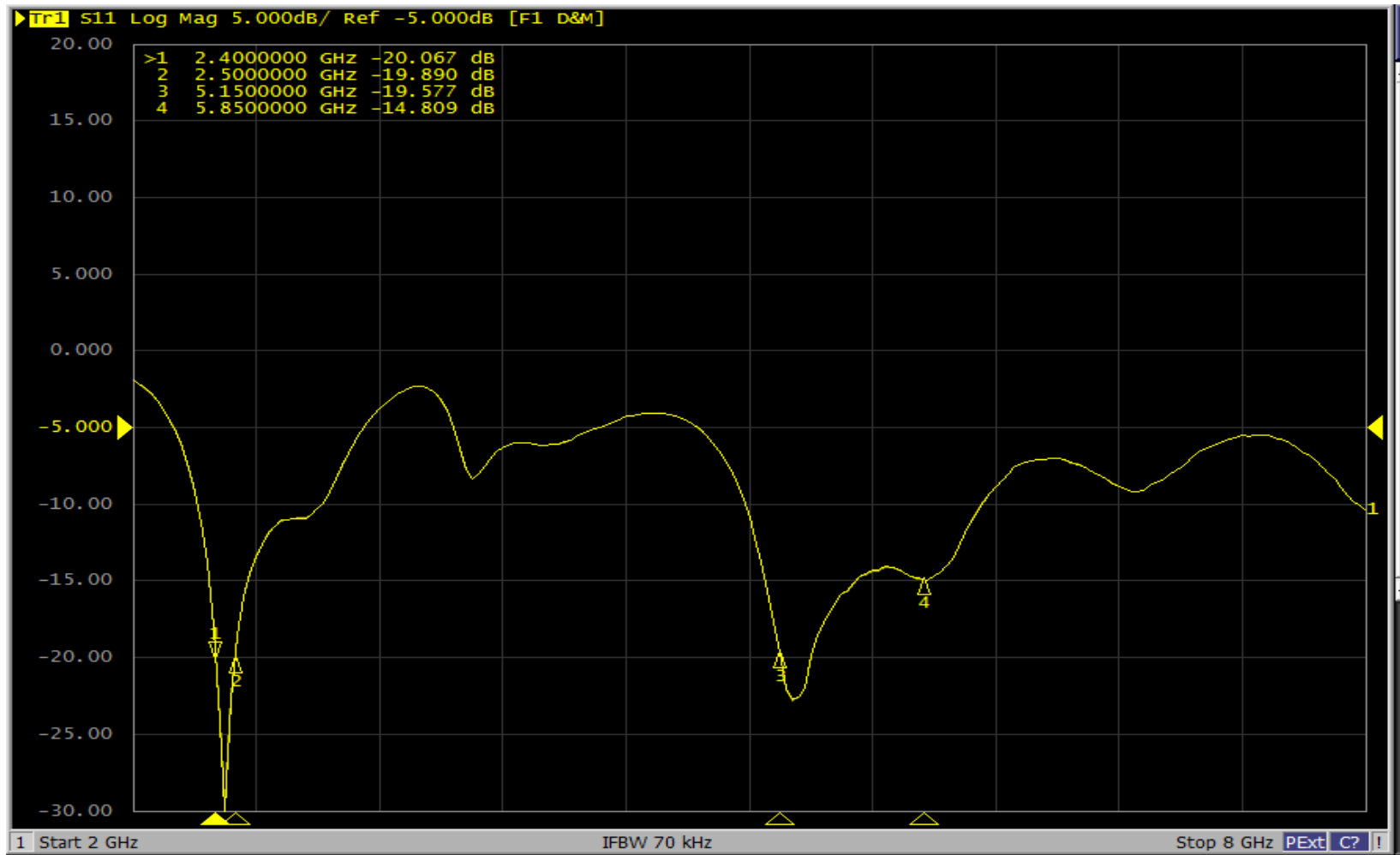
NOTES:

When the PCB height step from 1mm to 1.6mm (step=0.2mm), the low band and the high band still can reach the SPEC ($S_{11} < -10\text{dB}$).

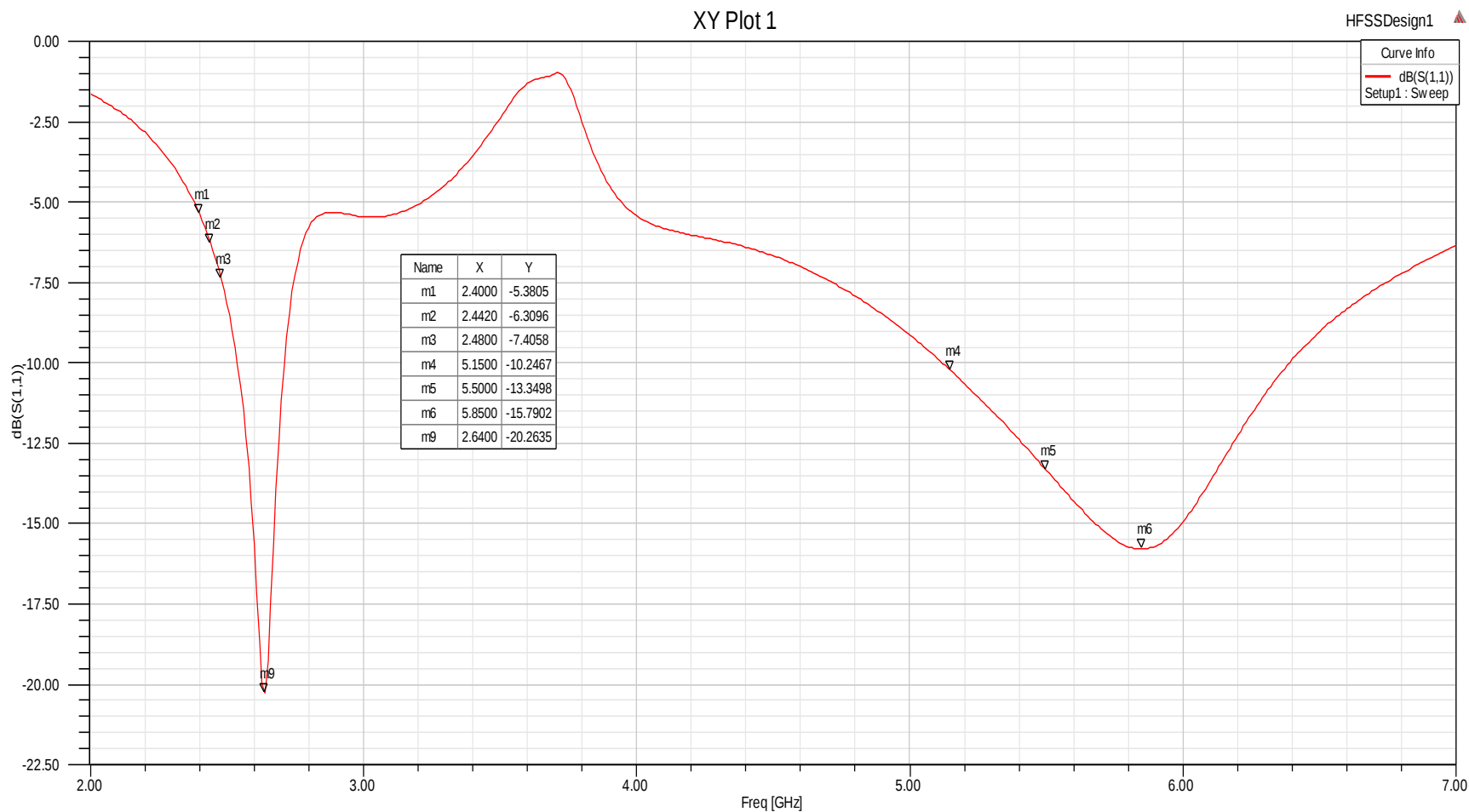
7.1 Simulate Result -ANT1



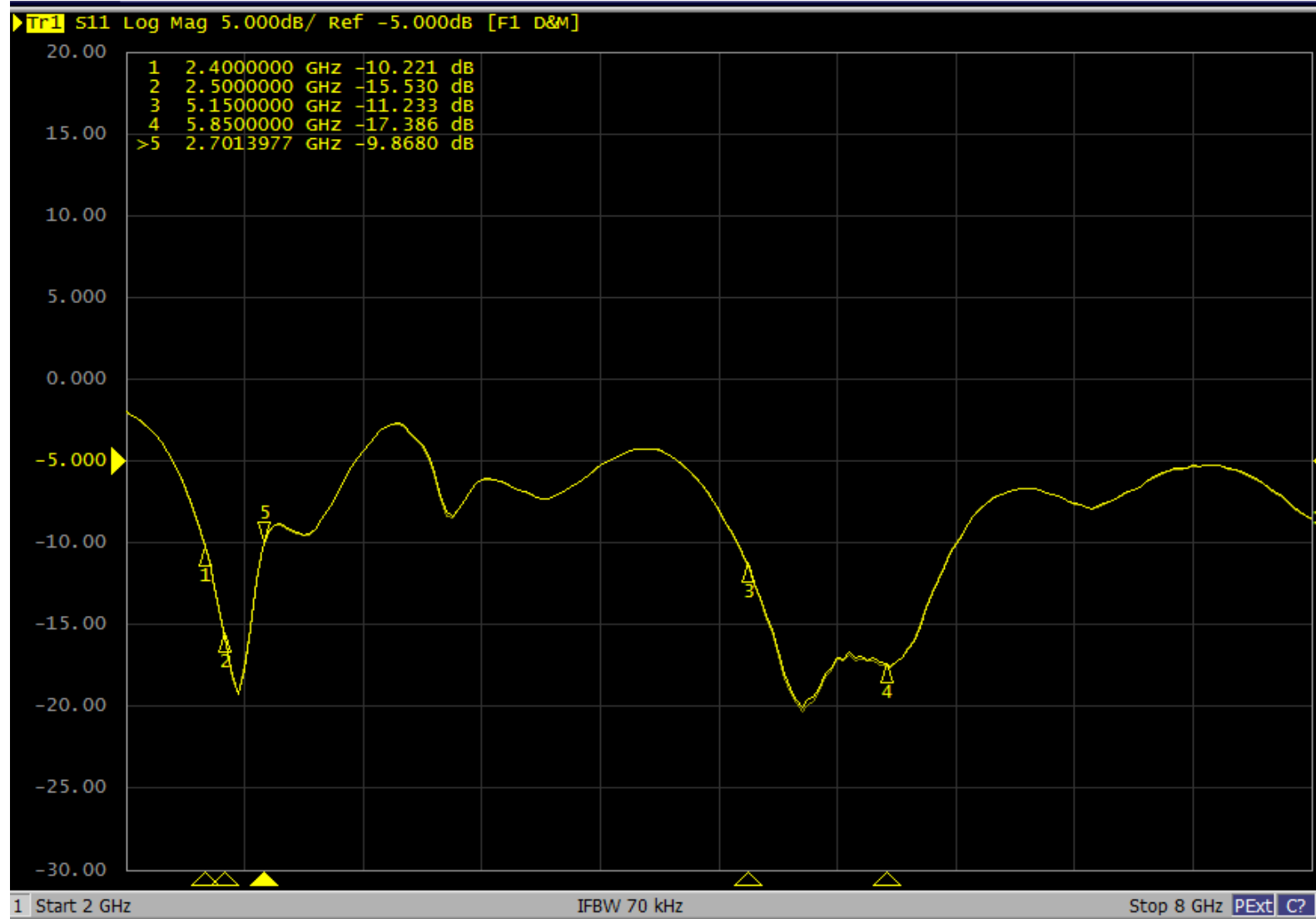
PCB Test Result -ANT1



7.2 Simulate Result -ANT2



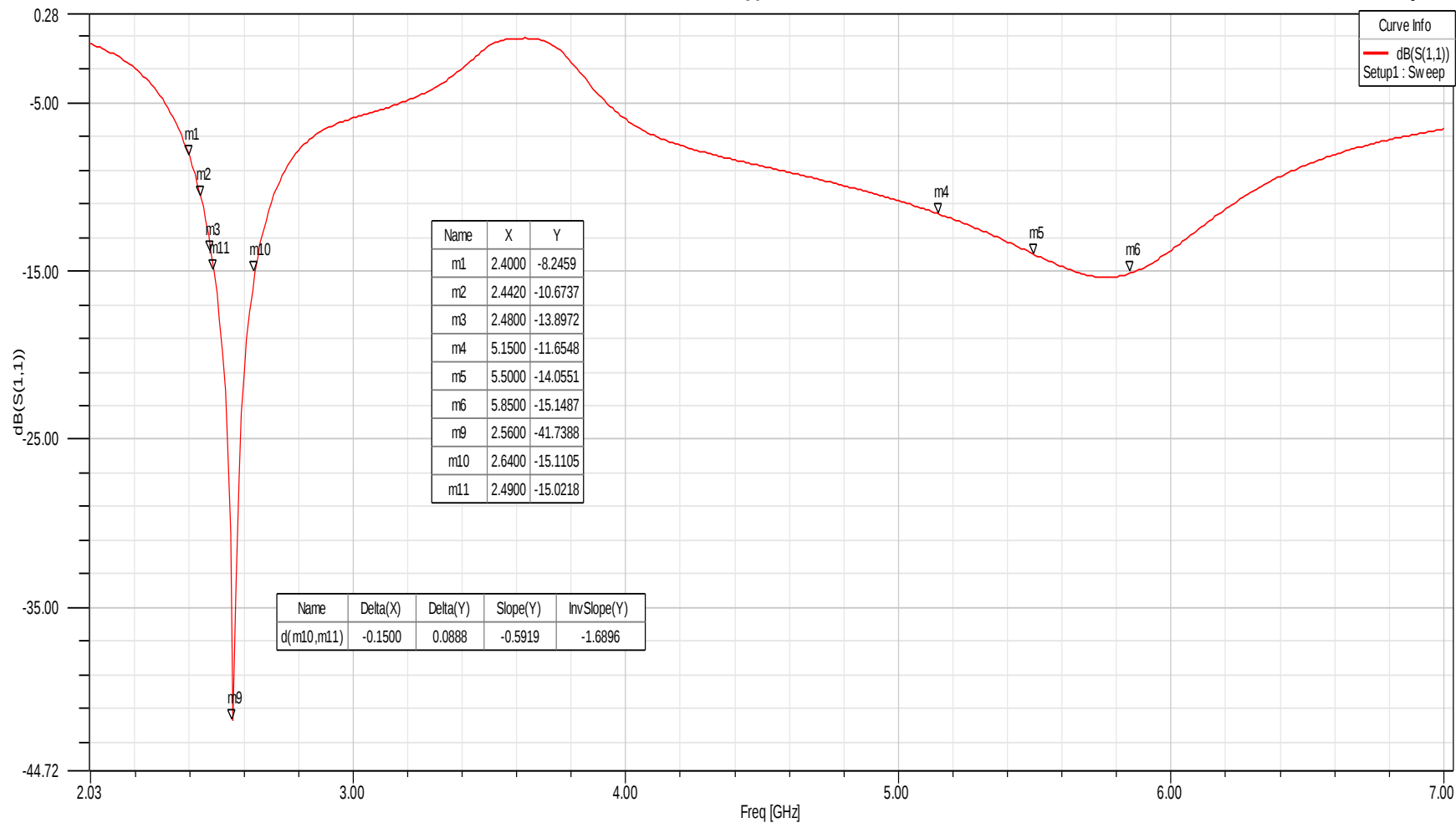
PCB Test Result -ANT2



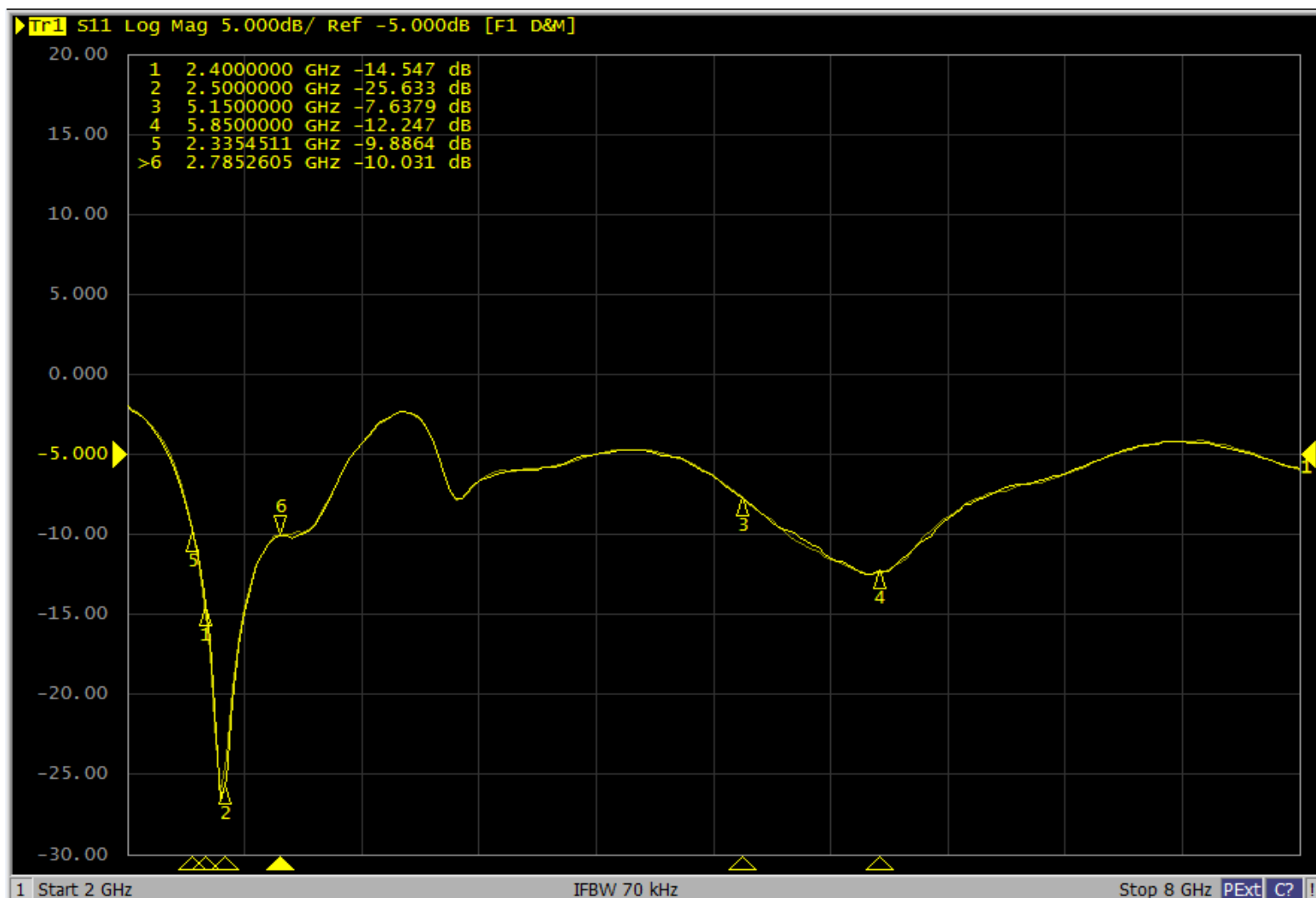
7.3 Simulate Result -ANT3

XY Plot 1

HFSSDesign1



PCB Test Result -ANT3



Data Set

Polarization : Power-Sum ▾

Cut : 90 [deg]

Freq. : [MHz]

2412,000
2417,000
2422,000
2427,000
2432,000
2437,000
2442,000
2447,000
2452,000
2457,000
2462,000
2467,000
2472,000
2484,000
5180,000
5200,000

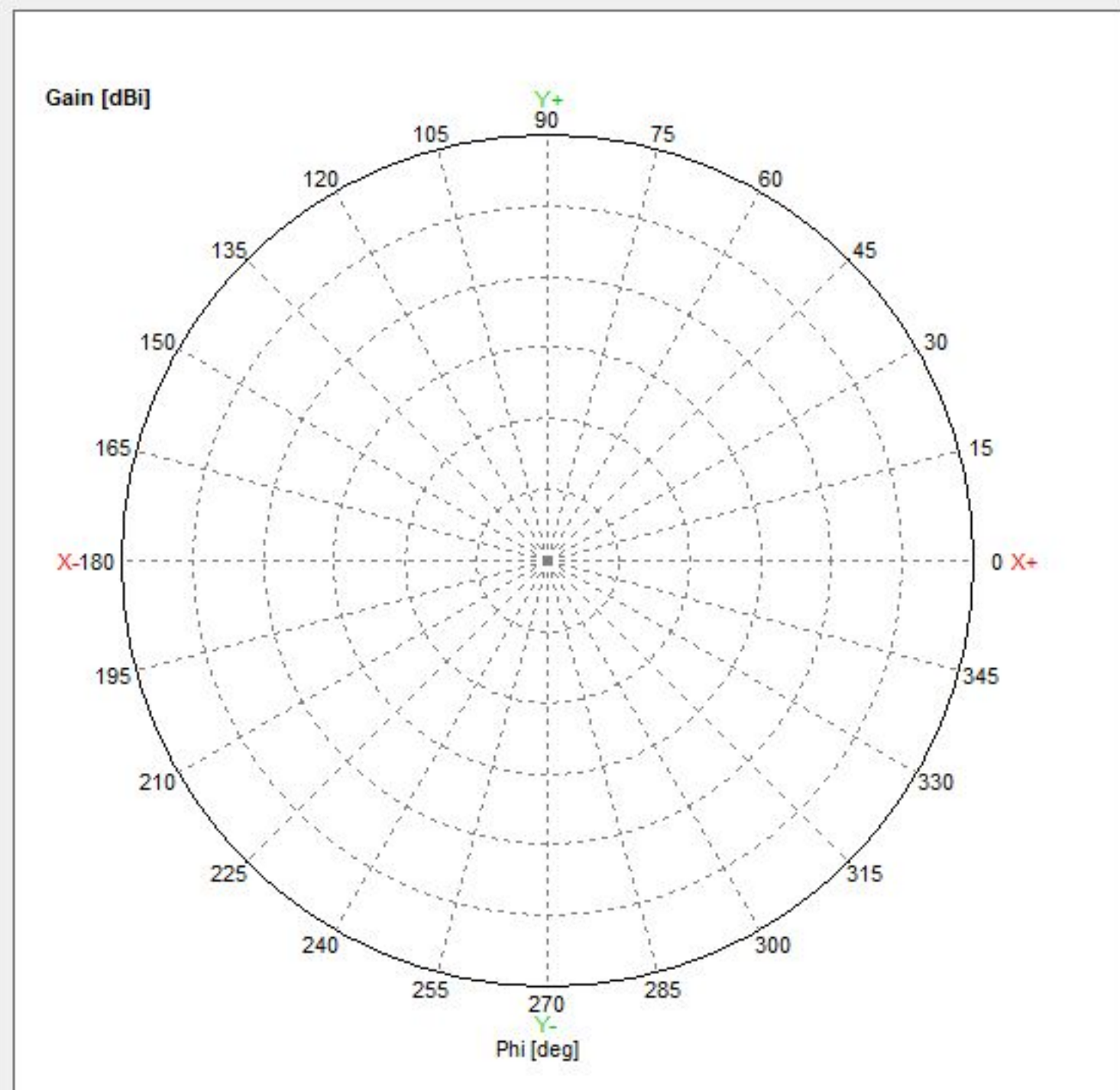
Param.

BW[dB] : - 3

F/B[deg] : ± 30

Lobe Filter [dB] : 1

Apply



Data Set

Polarization : Powr-Sum ▾

Cut : 90 [deg]

Freq. : [MHz]

2412,000
2417,000
2422,000
2427,000
2432,000
2437,000
2442,000
2447,000
2452,000
2457,000
2462,000
2467,000
2472,000
2484,000
5180,000
5200,000

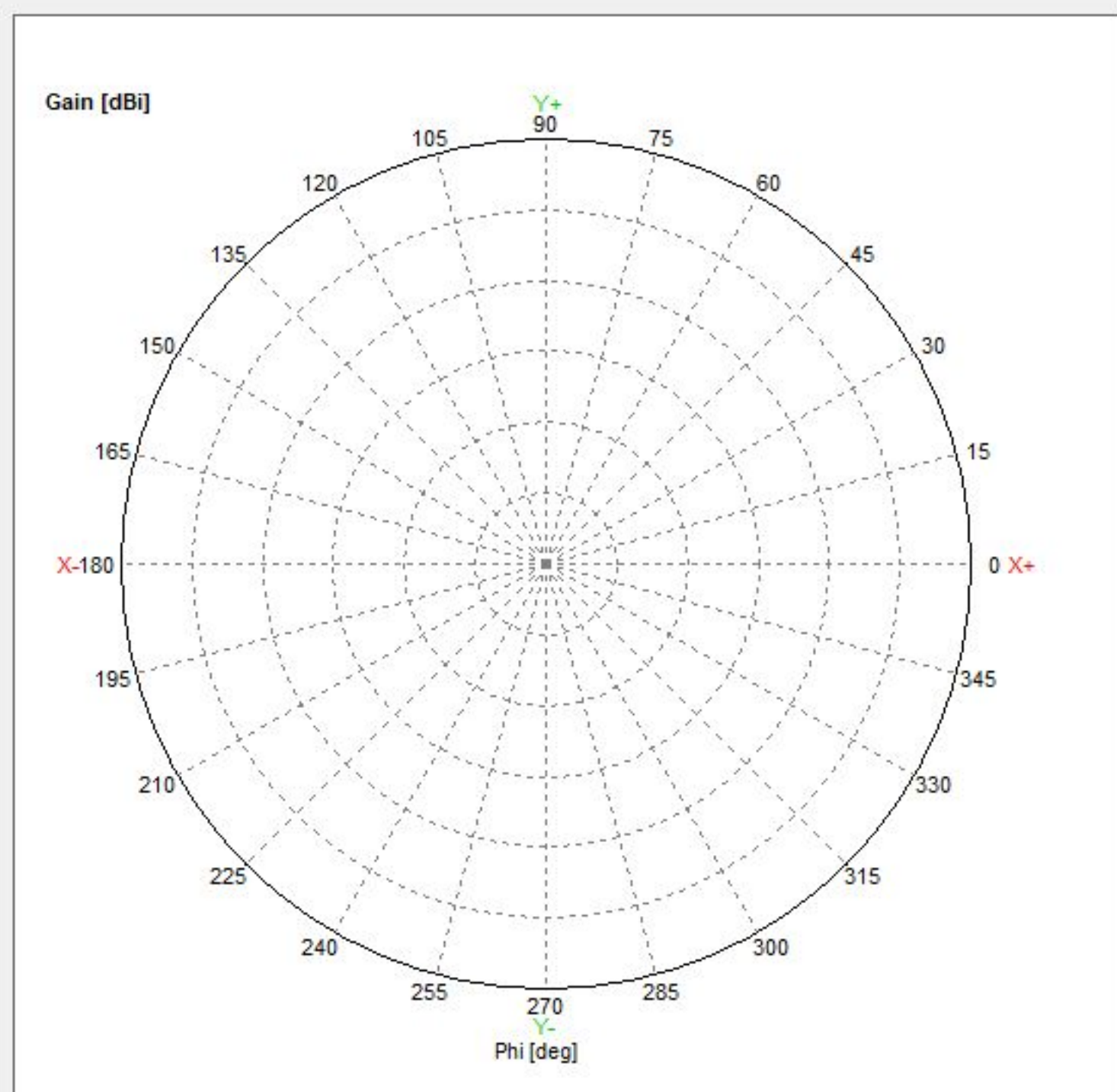
Param.

BW[dB] : -3

F/B[deg] : ± 30

Lobe Filter [dB] : 1

Apply



Data Set

Polarization : Power-Sum

Cut : 90 [deg]

Freq. : [MHz]

2412,000
2417,000
2422,000
2427,000
2432,000
2437,000
2442,000
2447,000
2452,000
2457,000
2462,000
2467,000
2472,000
2484,000
5180,000
5200,000

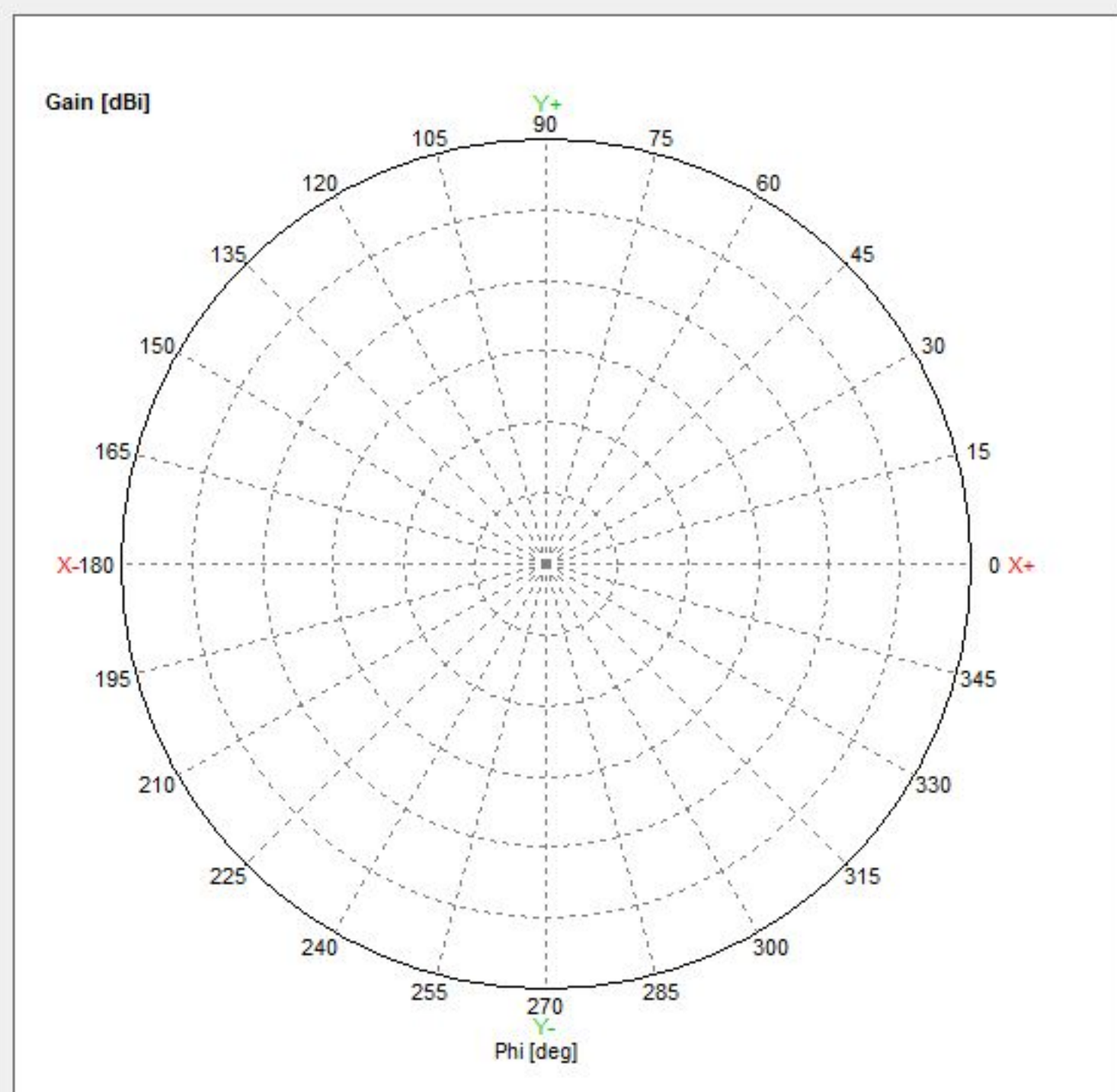
Param.

BW[dB] : 3

F/B[deg] : ± 30

Lobe Filter [dB] : 1

Apply



Data Set

Polarization : Powr-Sum ▾

Cut : 90 [deg]

Freq. : [MHz]

2412,000
2417,000
2422,000
2427,000
2432,000
2437,000
2442,000
2447,000
2452,000
2457,000
2462,000
2467,000
2472,000
2484,000
5180,000
5200,000

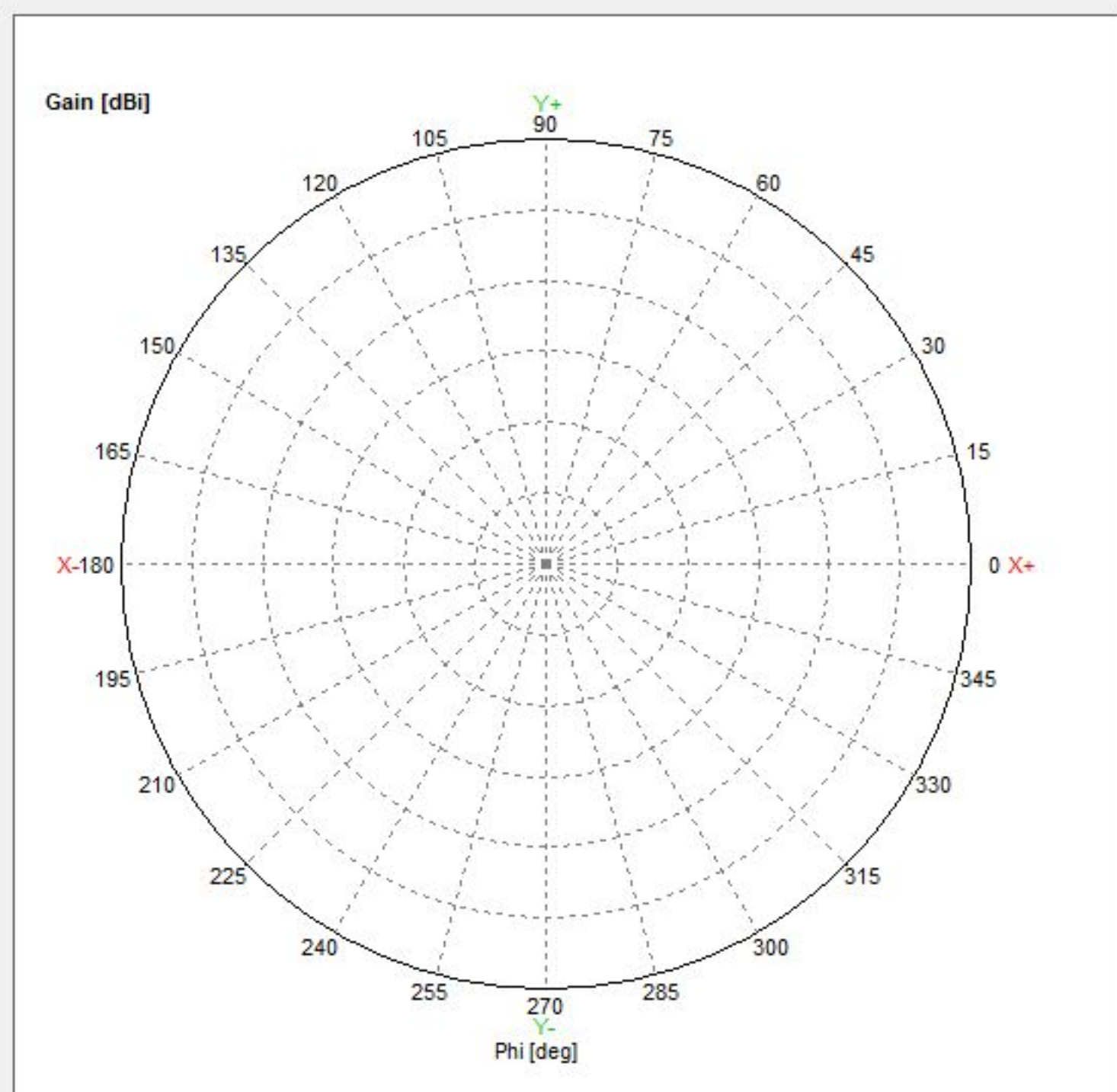
Param.

BW[dB] : 3

F/B[deg] : ± 30

Lobe Filter [dB] : 1

Apply



Data Set

Polarization : Power-Sum

Cut : 90 [deg]

Freq. : [MHz]

2462,000
2467,000
2472,000
2484,000
5180,000
5200,000
5220,000
5240,000
5260,000
5280,000
5300,000
5320,000
5500,000
5520,000
5540,000
5560,000

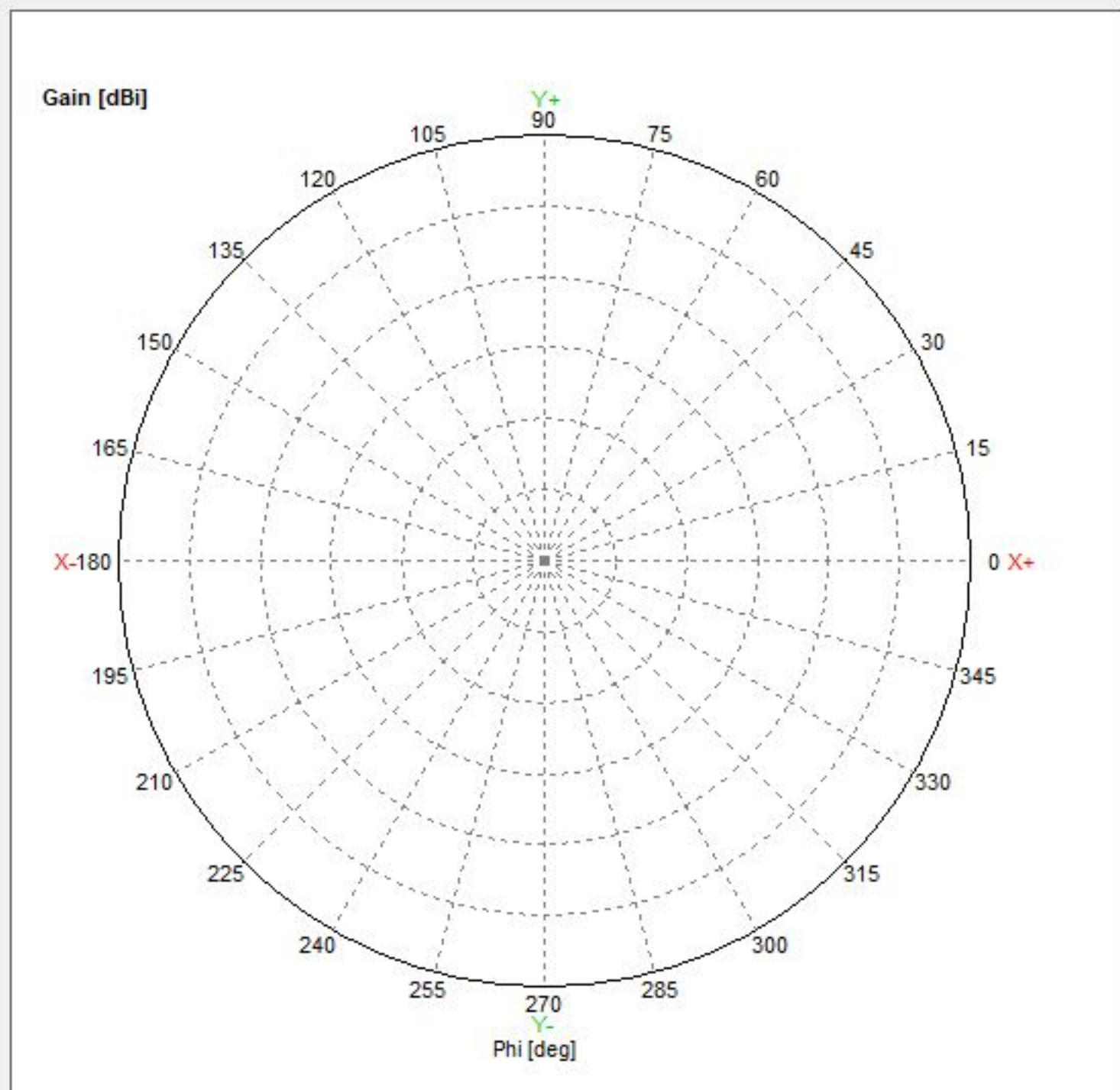
Param.

BW[dB] : 3

F/B[deg] : ± 30

Lobe Filter [dB] : 1

Apply



Data Set

Polarization : Powr-Sum

Cut : 90 [deg]

Freq. : [MHz]

2437,000
2442,000
2447,000
2452,000
2457,000
2462,000
2467,000
2472,000
2484,000
5180,000
5200,000
5220,000
5240,000
5260,000
5280,000
5300,000

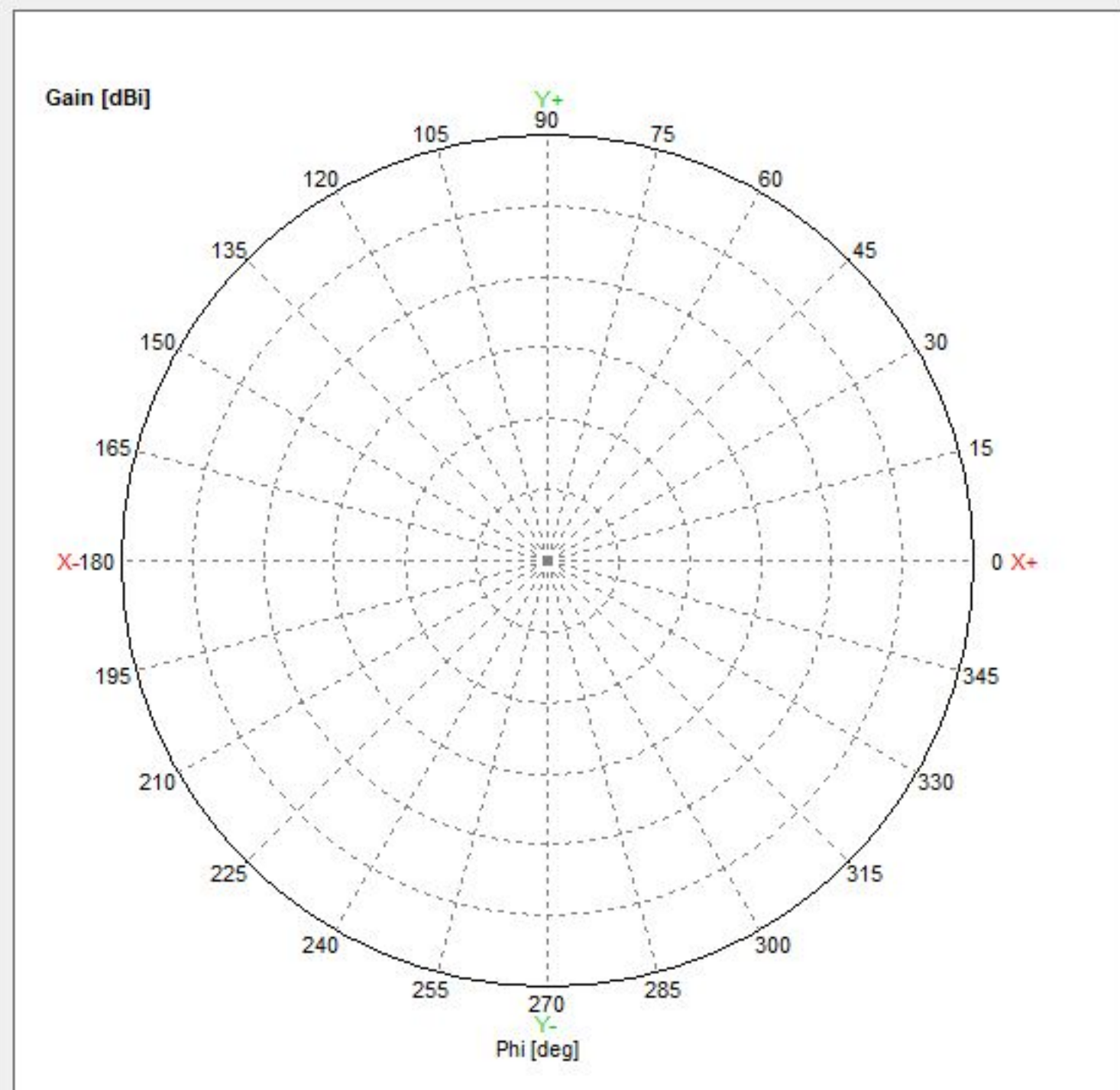
Param.

BW[dB] : -3

F/B[deg] : +30

Lobe Filter [dB] : 1

Apply



Data Set

Polarization : Power-Sum

Cut : 90 [deg]

Freq. : [MHz]

5220,000
5240,000
5260,000
5280,000
5300,000
5320,000
5340,000
5360,000
5380,000
5400,000
5420,000
5440,000
5460,000
5480,000
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5580,000
5600,000
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5640,000
5660,000
5680,000

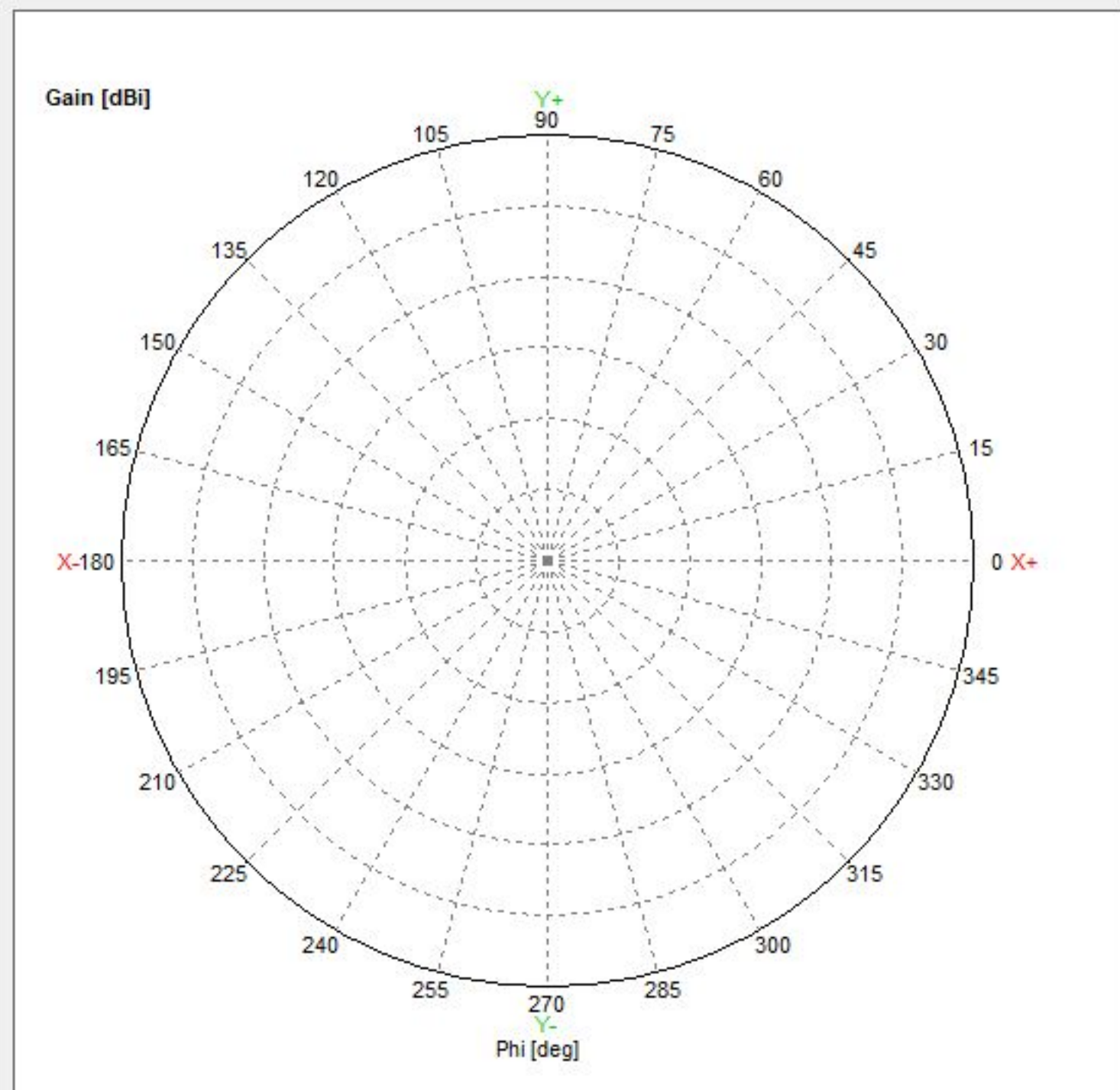
Param.

BW[dB] : 3

F/B[deg] : ± 30

Lobe Filter [dB] : 1

Apply



Data Set

Polarization : Power-Sum

Cut : 90 [deg]

Freq. : [MHz]

5580,000
5600,000
5620,000
5640,000
5660,000
5680,000
5700,000
5720,000
5745,000
5765,000
5785,000
5805,000
5825,000
5845,000
5865,000
5885,000

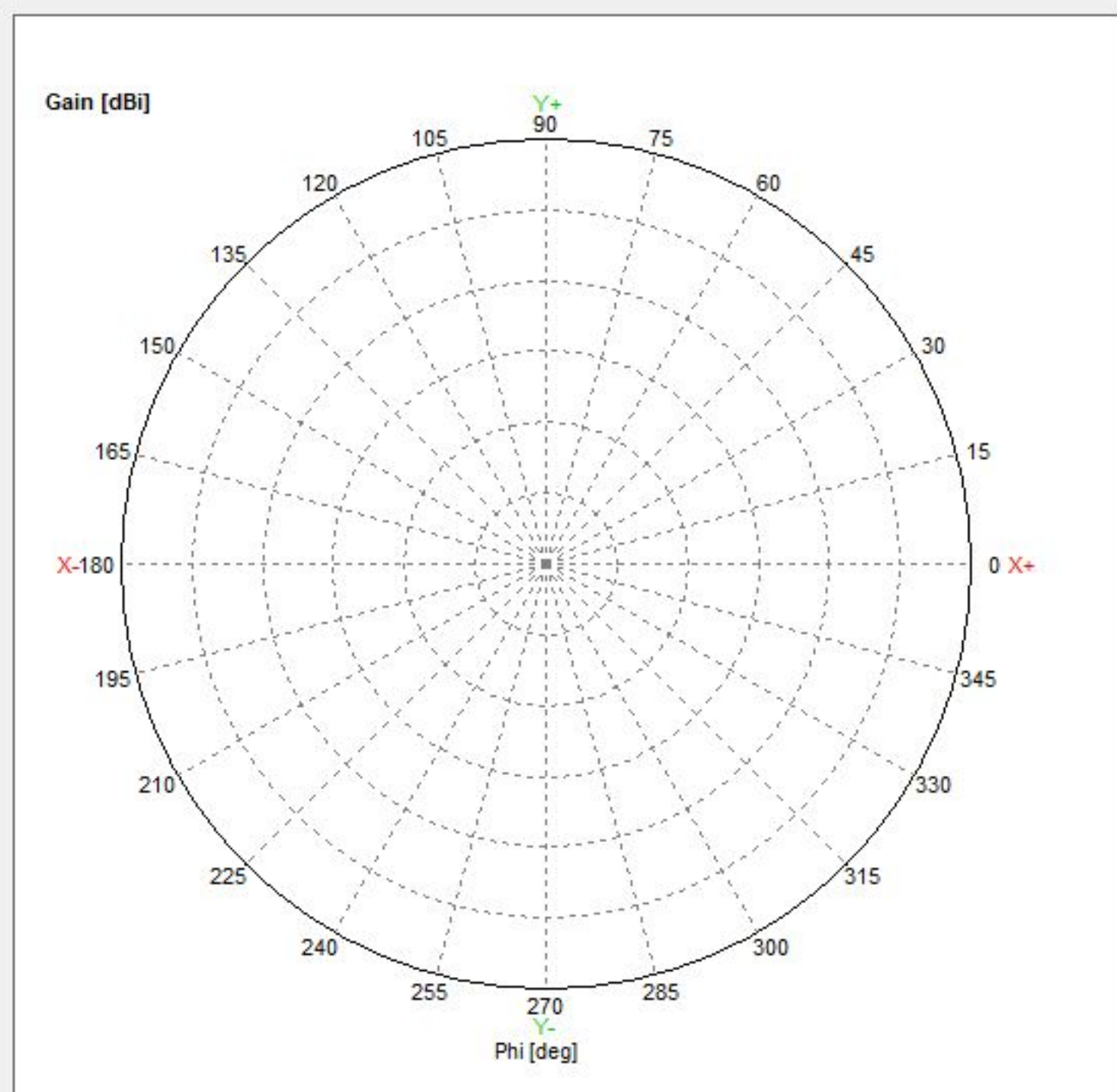
Param.

BW[dB] : -3

F/B[deg] : ±30

Lobe Filter [dB] : 1

Apply



Data Set

Polarization : Power-Sum

Cut : 90 [deg]

Freq. : [MHz]

5500,000
5520,000
5540,000
5560,000
5580,000
5600,000
5620,000
5640,000
5660,000
5680,000
5700,000
5720,000
5745,000
5765,000
5785,000
5805,000

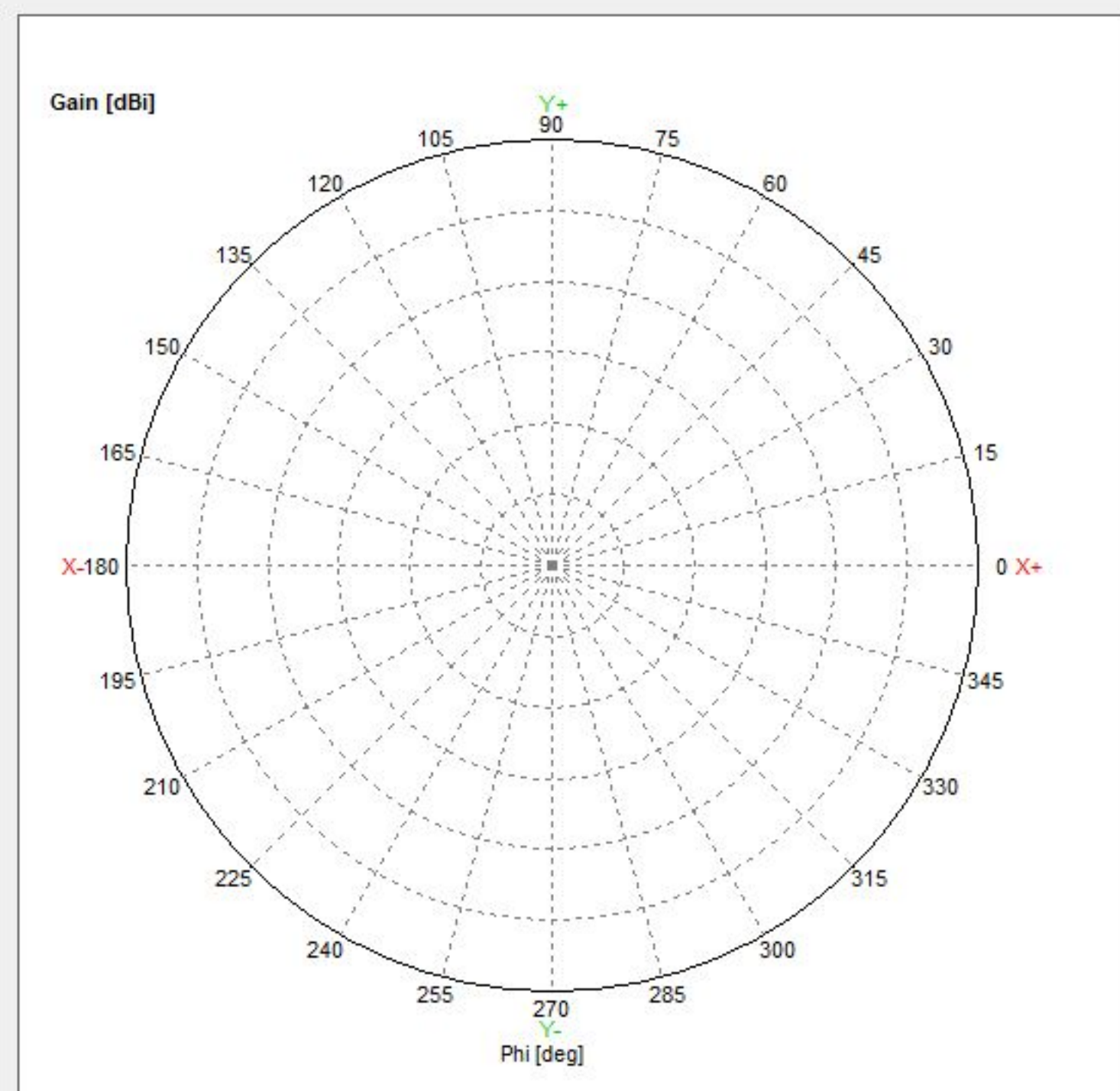
Param.

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F/B[deg] : ±30

Lobe Filter [dB] : 1

Apply



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Freq. : [MHz]

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5680,000
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5745,000
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5825,000
5845,000
5865,000
5885,000

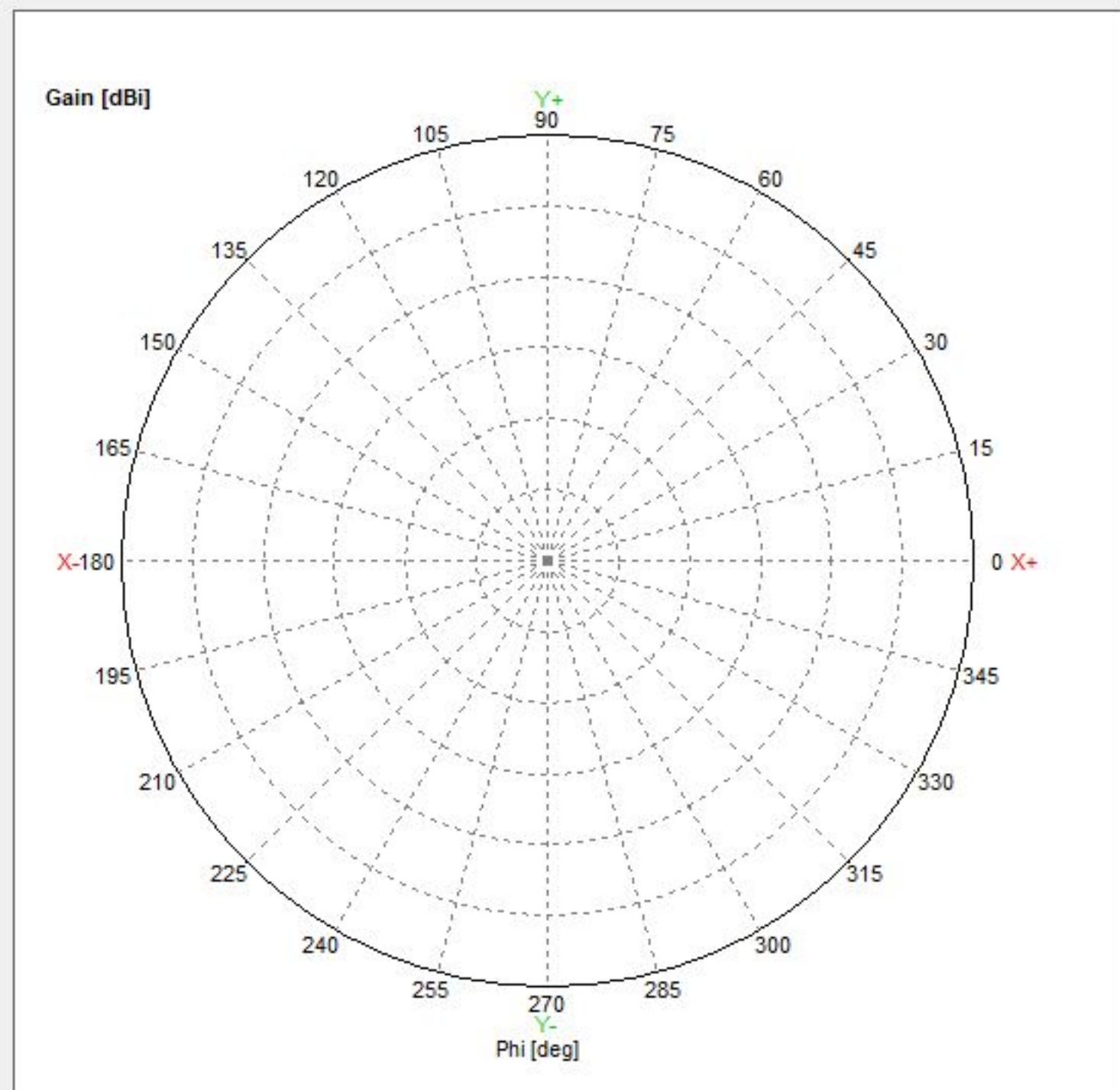
Param.

BW[dB] : 3

F/B[deg] : ± 30

Lobe Filter [dB] : 1

Apply



Data Set

Polarization : Power-Sum

Cut : 90 [deg]

Freq. : [MHz]

5580,000
5600,000
5620,000
5640,000
5660,000
5680,000
5700,000
5720,000
5745,000
5785,000
5785,000
5805,000
5825,000
5845,000
5865,000
5885,000

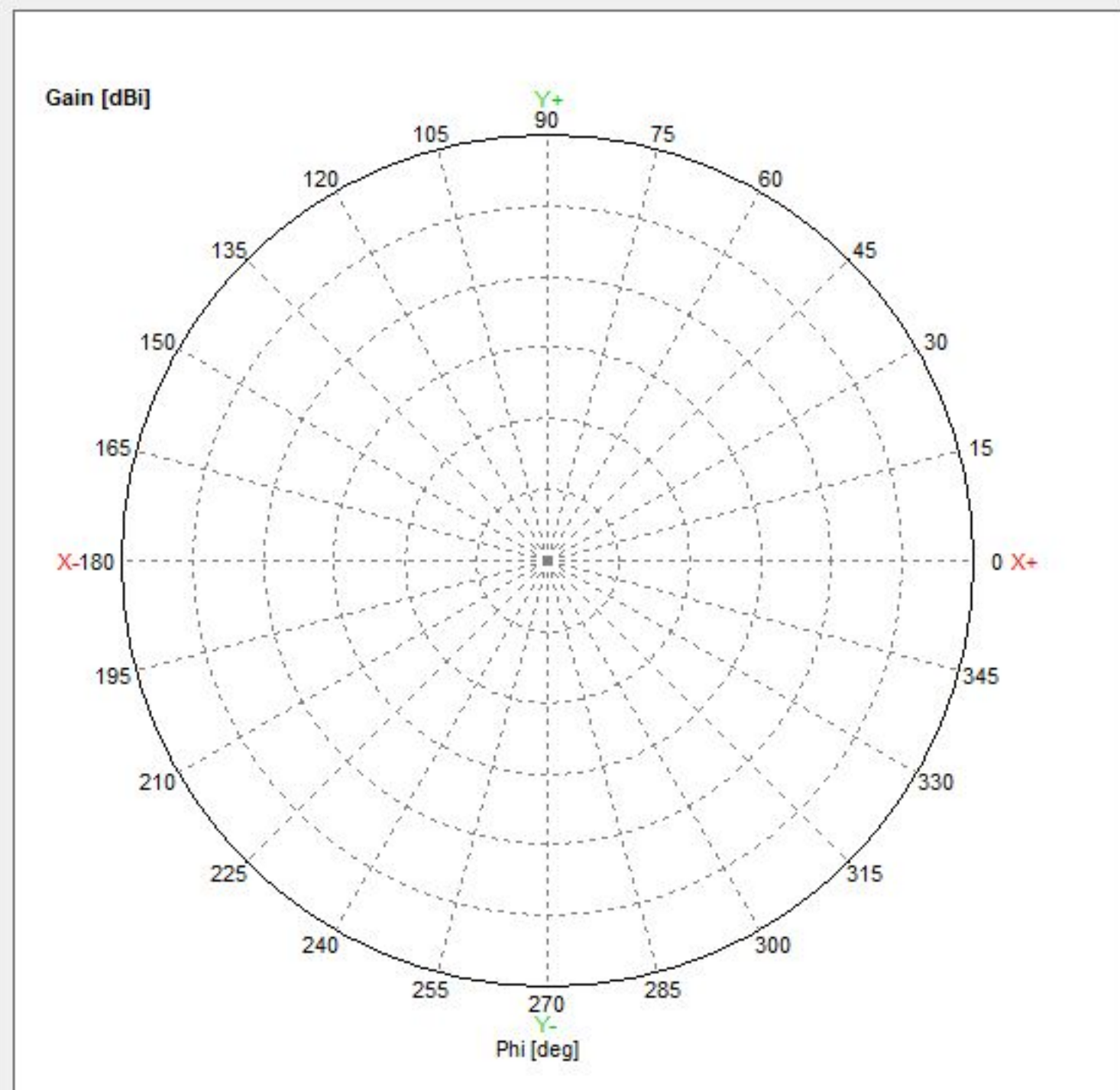
Param.

BW[dB] : 3

F/B[deg] : ± 30

Lobe Filter [dB] : 1

Apply



Data Set

Polarization : Powr-Sum

Cut : 90 [deg]

Freq. : [MHz]

5580,000
5600,000
5620,000
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5680,000
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5745,000
5785,000
5785,000
5805,000
5825,000
5845,000
5865,000
5885,000

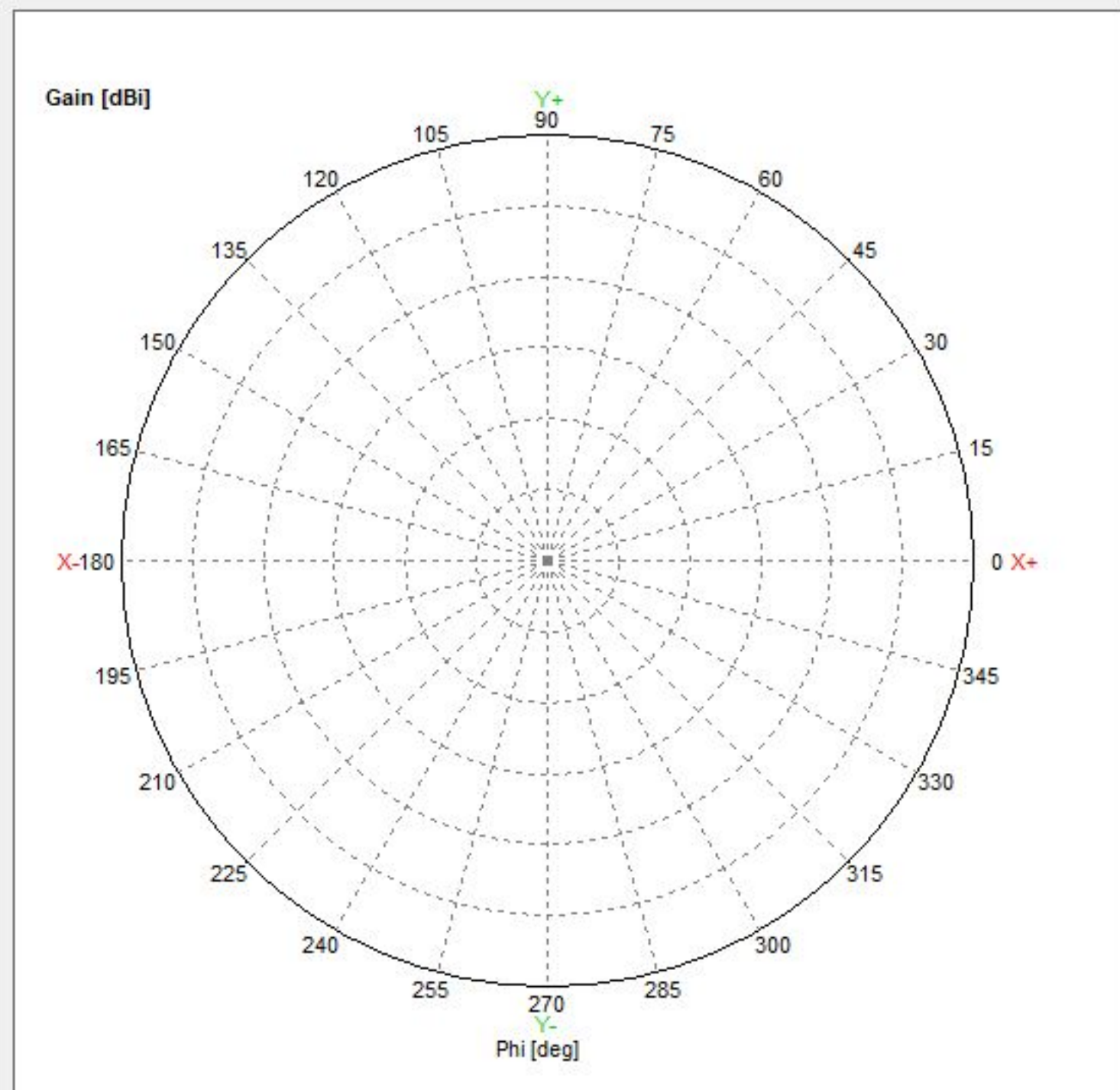
Param.

BW[dB] : -3

F/B[deg] : ± 30

Lobe Filter [dB] : 1

Apply





Thank You!



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