

Material Acknowledgement

Suppliers: Shenzhen Maya Communication Equipment Co., Ltd

Model: A89

Product Name: On the antenna assembly

Specifications / Models: _____

Antenna trademark:  _____

Color: black

Address: _____

Contact / Phone: _____

Supplier (with official seal)

Structural Department	R&D Department	Quality Department	Project Department	

Customer review

ID Department	Structural Department /	Hardware Department	Packaging engineering	Quality Department
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Confidential Information

	Special Project			

Citations

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Specifications

The report mainly provides A89 GSM +LTE,performance parameter test, antenna for built-in antenna:

2、Electrical performance

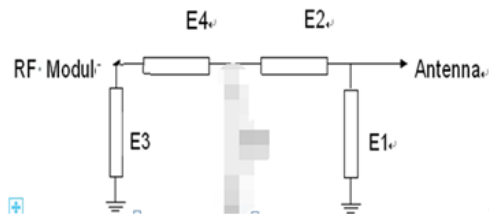
2-1Specification Standard

The A89 antenna operates in the LTE700/850/900 1800/1900/2100/2300/2700Mhz/3500Mhz/5000Mhz band, which generates resonances in this ;The following table shows the mass production performance test indicators for the A89 design antenna:

EGSM+WCDMA+TDSCDMA+LTEAntenna Indicator				
	Frequency (MHz)	VSWR	Frequency (MHz)	VSWR
Band	Transmitter		Receiver side	
GSM850	824-849	≤ 2.86	869-894	≤ 2.02
GSM900	880-915	≤ 2.1	925-960	≤ 3.1
DCS1800	1710-1785	≤ 3.3	1805-1880	≤ 3.7
PCS1900	1850-1910	≤ 2.01	1930-1990	≤ 2.12
TDSCDMF1900	1880-1980	≤ 2.0	2110-2170	≤ 2.74
TDSCDMA2100	1920-1980	≤ 2.10	2110-2025	≤ 2.74
WCDMA2100	1920-1980	≤ 2.10	2110-2090	≤ 2.97
LTE TDD, B38	2570-2620	≤ 1.07	2570-2620	≤ 2.07
LTE TDD, B39	1880-1920	≤ 3.2	1880-1920	≤ 3.7
LTE TDD, B40	2300-2400	≤ 2.17	2300-2400	≤ 1.43
LTE TDD, B41	2496-2690	≤ 2.36	2496-2690	≤ 2.67
LTE FDD, B1	1920-1980	≤ 2.10	2110-2170	≤ 2.74
LTE FDD, B3	1710-1785	≤ 2.01	1805-1880	≤ 2.12

2-2antenna matching circuit

Antenna Matching circuit is designed to match the motherboard and antenna, so that the mobile phone in the operating frequency band to achieve the best RF performance.
EGSM+WCDMA+TDSCDMA+LTE, antenna structure mode:



Element	Value
E1(0402)	0.5pf
E2(0402)	3nh
E3(0402)	8.2nh
E4(0402)	0

Main antenna

3.Standing Wave Ratio(VSWR)test

3-1 Test settings

The VSWR test units are connected in turn: E5071B Network Analyzer → 50 ohm coaxial

Cable → 156mm long copper tube /b110> → Test fixtures.

Processing of the test fixture: A hard cable is used from the antenna 50 ohm test point on the pcb of the mobile phone to lead out the SMA-J connector, connect it to the copper tube with a choke, and then connect the other devices in turn.

3-2 VWR test

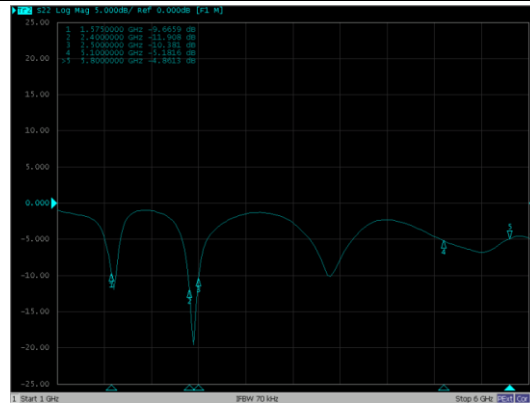
The following table shows the value of the standing wave ratio of the edge frequency point of the GSM+LTE antenna operating band, , the return loss, VSWR, and the relevant waveform plot is shown in the annex:

Main antenna VSWR								
Freq(MHz)	824	894	880	960	1710	1880	1850	1990
Free Space	5.48	3.9	2.1	3.1	3.3	2.7	2.01	2.02

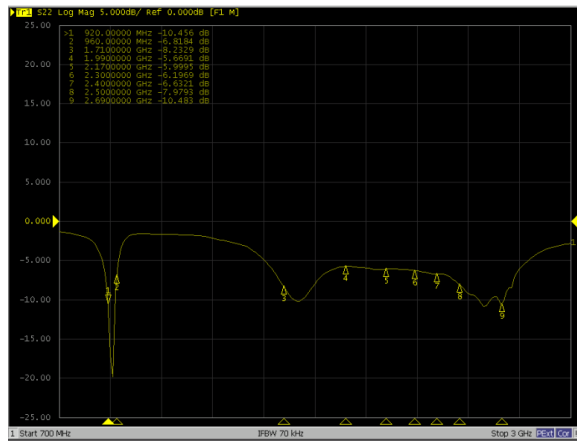
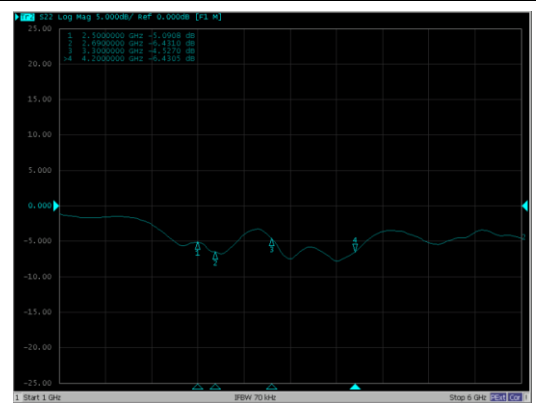
Main antenna VSWR					
Freq(MHz)	2170	2300	2400	2500	2700
Free Space	2.74	2.17	1.43	1.07	2.67

3-3 test results

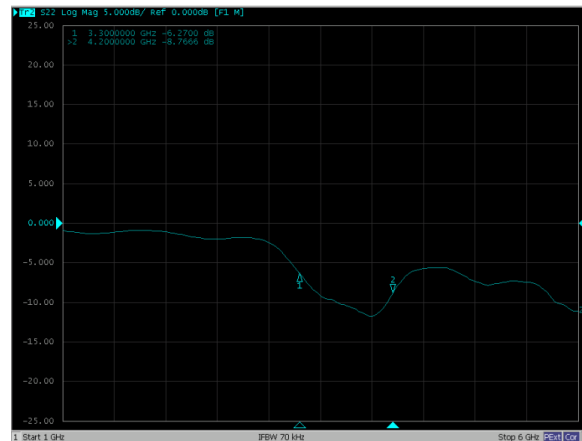
A89 ANT4 VSWR/Return Loss



A89 ANT5 VSWR/Return Loss



A89 ANT6 VSWR/Return Loss



A89 ANT7 VSWR/Return Loss

3-4 gain test

ANT4 Gain

Freq	Gain	Freq	Gain
1560	-1.3	2400	-1.4
1570	-1.2	2420	-1.3
1580	-1.2	2440	-1.2
1590	-1.3	2460	-1.2
		2480	-1.2
		2500	-1.3

ANT5 Gain

Freq	Gain	Freq	Gain	Freq	Gain
2500	-2.3	3300	-1.7	3760	-1.9
2520	-2.2	3320	-1.9	3780	-1.9
2540	-2.6	3340	-2.5	3800	-2.2
2560	-2.3	3360	-2.3	3820	-2.1

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2580	-2.3	3380	-2.2	3840	-1.9
2600	-2.2	3400	-2.3	3860	-1.8
2620	-2.4	3420	-2.4	3880	-1.9
2640	-2.3	3440	-2.5	3900	-1.8
2660	-2.4	3460	-2.6	3920	-1.8
2680	-2.5	3480	-2.6	3940	-1.8
2700	-2.5	3500	-2.7	3960	-1.9
		3520	-2.6	3980	-1.9
		3540	-2.6	4000	-1.8
		3560	-2.5	4020	-1.8
		3580	-2.5	4040	-1.7
		3600	-2.4	4060	-1.7
		3620	-2.4	4080	-1.6
		3640	-2.3	4100	-1.6
		3660	-2.3	4120	-1.5
		3680	-2.5	4140	-1.5
		3700	-2.5	4160	-1.5
		3720	-2.6	4180	-1.9
		3740	-2.6	4200	-1.9

ANT6 Gain

Freq	Gain	Freq	Gain	Freq	Gain
700	-3.8	950	-4.2	2160	-1.7
710	-3.7	960	-4.2	2180	-1.9
720	-3.6	1700	-2.1	2300	-2.5
730	-3.6	1720	-2.1	2320	-2.3
740	-3.7	1740	-1.9	2340	-2.2
750	-3.8	1760	-1.9	2360	-2.3
760	-3.9	1780	-2.2	2380	-2.4
770	-3.9	1800	-2.1	2400	-2.5
780	-4.1	1820	-1.9	2420	-2.6
790	-4.1	1840	-1.8	2440	-2.6
800	-4.2	1860	-1.9	2460	-2.7
810	-4.2	1880	-1.8	2480	-2.6
820	-4.1	1900	-1.8	2500	-2.6
830	-3.9	1920	-1.8	2520	-2.5
840	-3.9	1940	-1.9	2540	-2.5
850	-4.1	1960	-1.9	2560	-2.4

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860	-4.1	1980	-1.8	2580	-2.4
870	-4.2	2000	-1.8	2600	-2.3
880	-4.1	2020	-1.7	2620	-2.3
890	-3.9	2040	-1.7	2640	-2.5
900	-3.9	2060	-1.6	2660	-2.5
910	-3.8	2080	-1.6	2680	-2.6
920	-3.8	2100	-1.5	2700	-2.6
930	-3.9	2120	-1.5		
940	-4.1	2140	-1.5		

ANT7 Gain

Freq	Gain	Freq	Gain
3300	-1.7	3760	-1.9
3320	-1.9	3780	-1.9
3340	-2.5	3800	-2.2
3360	-2.3	3820	-2.1
3380	-2.2	3840	-1.9
3400	-2.3	3860	-1.8
3420	-2.4	3880	-1.9
3440	-2.5	3900	-1.8
3460	-2.6	3920	-1.8
3480	-2.6	3940	-1.8
3500	-2.7	3960	-1.9
3520	-2.6	3980	-1.9
3540	-2.6	4000	-1.8
3560	-2.5	4020	-1.8
3580	-2.5	4040	-1.7
3600	-2.4	4060	-1.7
3620	-2.4	4080	-1.6
3640	-2.3	4100	-1.6
3660	-2.3	4120	-1.5
3680	-2.5	4140	-1.5
3700	-2.5	4160	-1.5
3720	-2.6	4180	-1.9
3740	-2.6	4200	-1.9

The active test units are connected in turn as follows: Agilent8960/8820C → 50 ohm

coaxial Cable → GTS Test System → sted.

4-1 Test site

GTS microwave anechoic chamber: the test frequency range is 400MHz-6GHz, the quiet zone range is 40cm circumference, and the reflectivity is less than -90 dB.

4-2 Test results

Maximum radiated power and maximum receive sensitivity reflect the antenna's maximum power radiated value and optimal reception performance over the entire radiation space. /b10> TRP and TIS reflect the average radiated power and average reception sensitivity of the antenna, that is, the overall reception performance of the antenna.

5. Environmental treatment

Original environment treatment.

6. Recommendations and Conclusions

This report is based on the antenna electrical performance measured by the customer's final version of the A89. As can be seen from the above test data, this antenna provides better electrical performance.

Fubang R&D looks forward to your confirmation, thank you for your cooperation!

Electrical performance

The A89 antenna operates in the LTE700/850/900 1800/1900/2100/2300/2700Mhz/3500Mhz/5000Mhz band, which generates resonances in this ;The following table shows the mass production performance test indicators for the A89 design antenna:

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GSM900	880-915	≤2.1	925-960	≤3.1
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PCS1900	1850-1910	≤2.01	1930-1990	≤2.12

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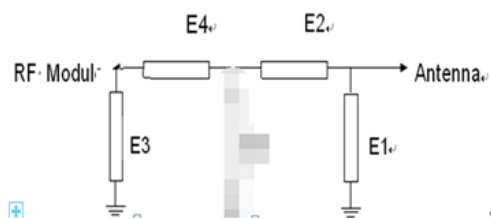
WCDMA2100	1920-1980	≤ 2.10	2110-2090	≤ 2.97
LTE TDD, B38	2570-2620	≤ 1.07	2570-2620	≤ 2.07
LTE TDD, B39	1880-1920	≤ 3.2	1880-1920	≤ 3.7
LTE TDD, B40	2300-2400	≤ 2.17	2300-2400	≤ 1.43
LTE TDD, B41	2496-2690	≤ 2.36	2496-2690	≤ 2.67
LTE FDD, B1	1920-1980	≤ 2.10	2110-2170	≤ 2.74
LTE FDD, B3	1710-1785	≤ 2.01	1805-1880	≤ 2.12
N77	3300-4200	≤ 2.01	3300-4200	≤ 2.83
N78	3300-3800	≤ 2.01	3300-3800	≤ 2.83
N78	4400-5000	≤ 2.18	4400-5000	≤ 2.59

2-2 antenna matching circuit

Antenna Matching circuit is designed to match the motherboard and antenna, so that the mobile phone in the operating frequency band to achieve the best RF performance.

EGSM+WCDMA+LTE+NR, antenna structure

mode:



Element	Value
E1(0402)	N/A
E2(0402)	0
E3(0402)	N/A
E4(0402)	0

Main antenna

3、Standing Wave Ratio(VSWR)test

The VSWR test units are connected in turn: E5071B Network Analyzer → 50 ohm coaxial

Cable → 156mm long copper tube /b110> → Test fixtures. Processing of the test fixture:

A hard cable is used from the antenna 50 ohm test point on the pcb of the mobile phone to lead out the SMA-J connector, connect it to the copper tube with a choke, and then connect the other devices in turn.

3-2 VWR test

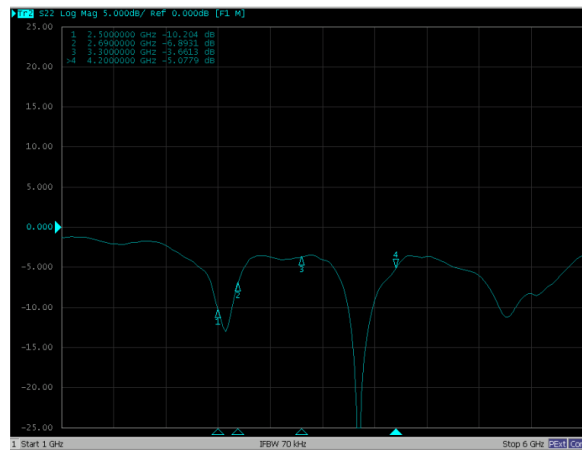
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Free Space	5.48	3.9	2.1	3.1	3.3	2.7	2.01	2.02

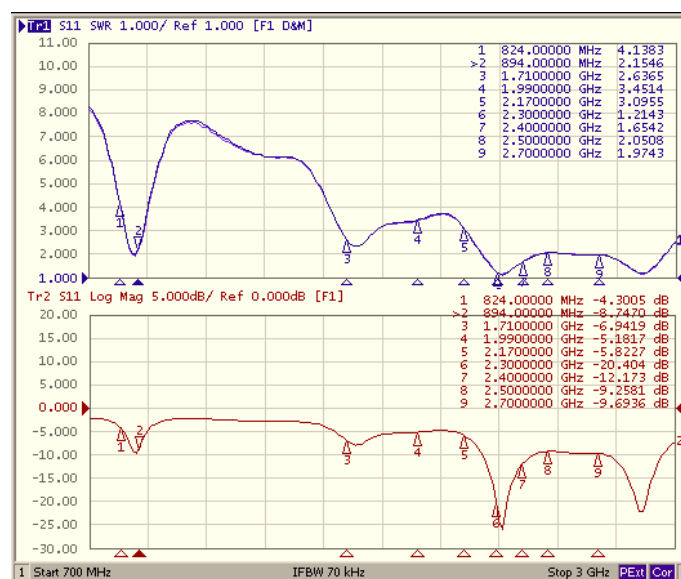
Main antenna VSWR					
Freq(MHz)	2170	2300	2400	2500	2700
Free Space	2.74	2.17	1.43	1.07	2.67

Main antenna VSWR					
Freq(MHz)	3300	3800	4200	4400	5000
Free Space	2.05	2.17	2.29	2.23	2.19

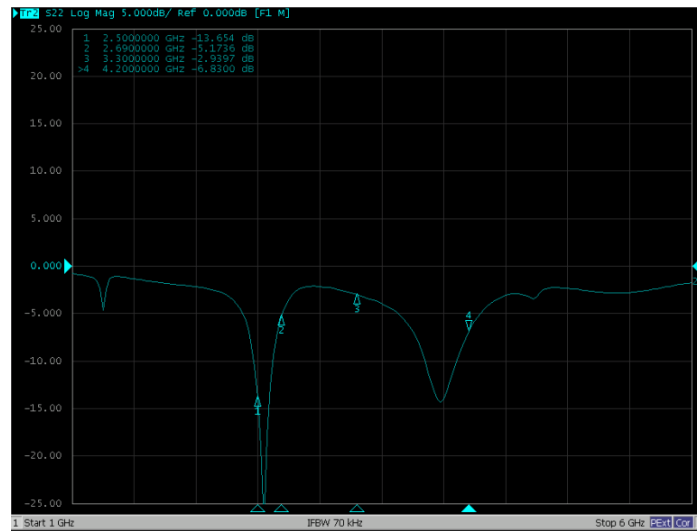
3-3 test results



A89 ANT1 VSWR/Return Loss



A89 ANT2 VSWR/Return Loss



A89 ANT3 VSWR/Return Loss

3-4 gain test

ANT1 Gain

700	-2.8	1400	-4.2	2120	-2.8
710	-2.7	1420	-4.1	2140	-2.7
720	-2.5	1440	-3.9	2160	-2.8
730	-2.5	1460	-3.7	2180	-2.9
740	-2.6	1480	-3.8	2300	-3.6
750	-2.7	1500	-3.9	2320	-3.5
760	-2.8	1700	-3.5	2340	-3.4
770	-2.8	1720	-3.4	2360	-3.3
780	-2.9	1740	-3.4	2380	-3.5
790	-3.1	1760	-3.3	2400	-3.5
800	-2.8	1780	-3.3	2420	-3.6
810	-2.6	1800	-3.2	2440	-3.7
820	-2.4	1820	-3.2	2460	-3.8
830	-2.3	1840	-3.1	2480	-3.9
840	-2.2	1860	-2.9	2500	-4.1
850	-2.1	1880	-2.9	2520	-4.2
860	-2.2	1900	-2.8	2540	-4.1
870	-2.3	1920	-2.8	2560	-3.9
880	-2.5	1940	-2.7	2580	-3.8
890	-2.5	1960	-2.7	2600	-3.6
900	-2.4	1980	-2.9	2620	-3.7
910	-2.4	2000	-2.8	2640	-3.8
920	-2.3	2020	-2.9	2660	-3.9
930	-2.3	2040	-3.1	2680	-3.9
940	-2.4	2060	-3.1	2700	-4.1
950	-2.4	2080	-2.9		

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960	-2.5	2100	-2.9		

ANT2 Gain

700	-2.8	1400	-4.2	2120	-2.8
710	-2.7	1420	-4.1	2140	-2.7
720	-2.5	1440	-3.9	2160	-2.8
730	-2.5	1460	-3.7	2180	-2.9
740	-2.6	1480	-3.8	2300	-3.6
750	-2.7	1500	-3.9	2320	-3.5
760	-2.8	1700	-3.5	2340	-3.4
770	-2.8	1720	-3.4	2360	-3.3
780	-2.9	1740	-3.4	2380	-3.5
790	-3.1	1760	-3.3	2400	-3.5
800	-2.8	1780	-3.3	2420	-3.6
810	-2.6	1800	-3.2	2440	-3.7
820	-2.4	1820	-3.2	2460	-3.8
830	-2.3	1840	-3.1	2480	-3.9
840	-2.2	1860	-2.9		
850	-2.1	1880	-2.9		
860	-2.2	1900	-2.8		
870	-2.3	1920	-2.8		
880	-2.5	1940	-2.7		
890	-2.5	1960	-2.7		
900	-2.4	1980	-2.9		
910	-2.4	2000	-2.8		
920	-2.3	2020	-2.9		
930	-2.3	2040	-3.1		
940	-2.4	2060	-3.1		
950	-2.4	2080	-2.9		
960	-2.5	2100	-2.9		
Freq	Gain	Freq	Gain	Freq	Gain
2500	-2.3	3300	-1.7	3760	-1.9
2520	-2.2	3320	-1.9	3780	-1.9
2540	-2.6	3340	-2.5	3800	-2.2
2560	-2.3	3360	-2.3	3820	-2.1
2580	-2.3	3380	-2.2	3840	-1.9
2600	-2.2	3400	-2.3	3860	-1.8
2620	-2.4	3420	-2.4	3880	-1.9
2640	-2.3	3440	-2.5	3900	-1.8

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2660	-2.4	3460	-2.6	3920	-1.8
2680	-2.5	3480	-2.6	3940	-1.8
2700	-2.5	3500	-2.7	3960	-1.9
		3520	-2.6	3980	-1.9
		3540	-2.6	4000	-1.8
		3560	-2.5	4020	-1.8
		3580	-2.5	4040	-1.7
		3600	-2.4	4060	-1.7
		3620	-2.4	4080	-1.6
		3640	-2.3	4100	-1.6
		3660	-2.3	4120	-1.5
		3680	-2.5	4140	-1.5
		3700	-2.5	4160	-1.5
		3720	-2.6	4180	-1.9
		3740	-2.6	4200	-1.9

ANT3 Gain

Freq	Gain	Freq	Gain	Freq	Gain
2500	-2.3	3300	-1.7	3760	-1.9
2520	-2.2	3320	-1.9	3780	-1.9
2540	-2.6	3340	-2.5	3800	-2.2
2560	-2.3	3360	-2.3	3820	-2.1
2580	-2.3	3380	-2.2	3840	-1.9
2600	-2.2	3400	-2.3	3860	-1.8
2620	-2.4	3420	-2.4	3880	-1.9
2640	-2.3	3440	-2.5	3900	-1.8
2660	-2.4	3460	-2.6	3920	-1.8
2680	-2.5	3480	-2.6	3940	-1.8
2700	-2.5	3500	-2.7	3960	-1.9
		3520	-2.6	3980	-1.9
		3540	-2.6	4000	-1.8
		3560	-2.5	4020	-1.8
		3580	-2.5	4040	-1.7
		3600	-2.4	4060	-1.7
		3620	-2.4	4080	-1.6
		3640	-2.3	4100	-1.6
		3660	-2.3	4120	-1.5
		3680	-2.5	4140	-1.5
		3700	-2.5	4160	-1.5
		3720	-2.6	4180	-1.9
		3740	-2.6	4200	-1.9

GPS/WIFI/BT

Freq	Gain	Freq	Gain	Freq	Gain
1560	0.4	2400	0.6	5100	1.1
1570	0.5	2420	0.7	5200	1.2
1580	0.4	2440	0.7	5300	1.0
		2460	0.6	5400	1.2
		2480	0.7	5500	1.2
		2500	0.8	5600	1.1
				5700	1.0
				5800	1.1

The active test units are connected in turn as follows: Agilent8960/8820C → 50 ohm

coaxial Cable → GTS Test System → sted.

4-1 Test site

GTS microwave anechoic chamber: the test frequency range is 400MHz-6GHz, the quiet zone range is 40cm circumference, and the reflectivity is less than -90 dB.

4-2 Test results

Maximum radiated power and maximum receive sensitivity reflect the antenna's maximum power radiated value and optimal reception performance over the entire radiation space. /b10> TRP and TIS reflect the average radiated power and average reception sensitivity of the antenna, that is, the overall reception performance of the antenna.

5. Environmental treatment

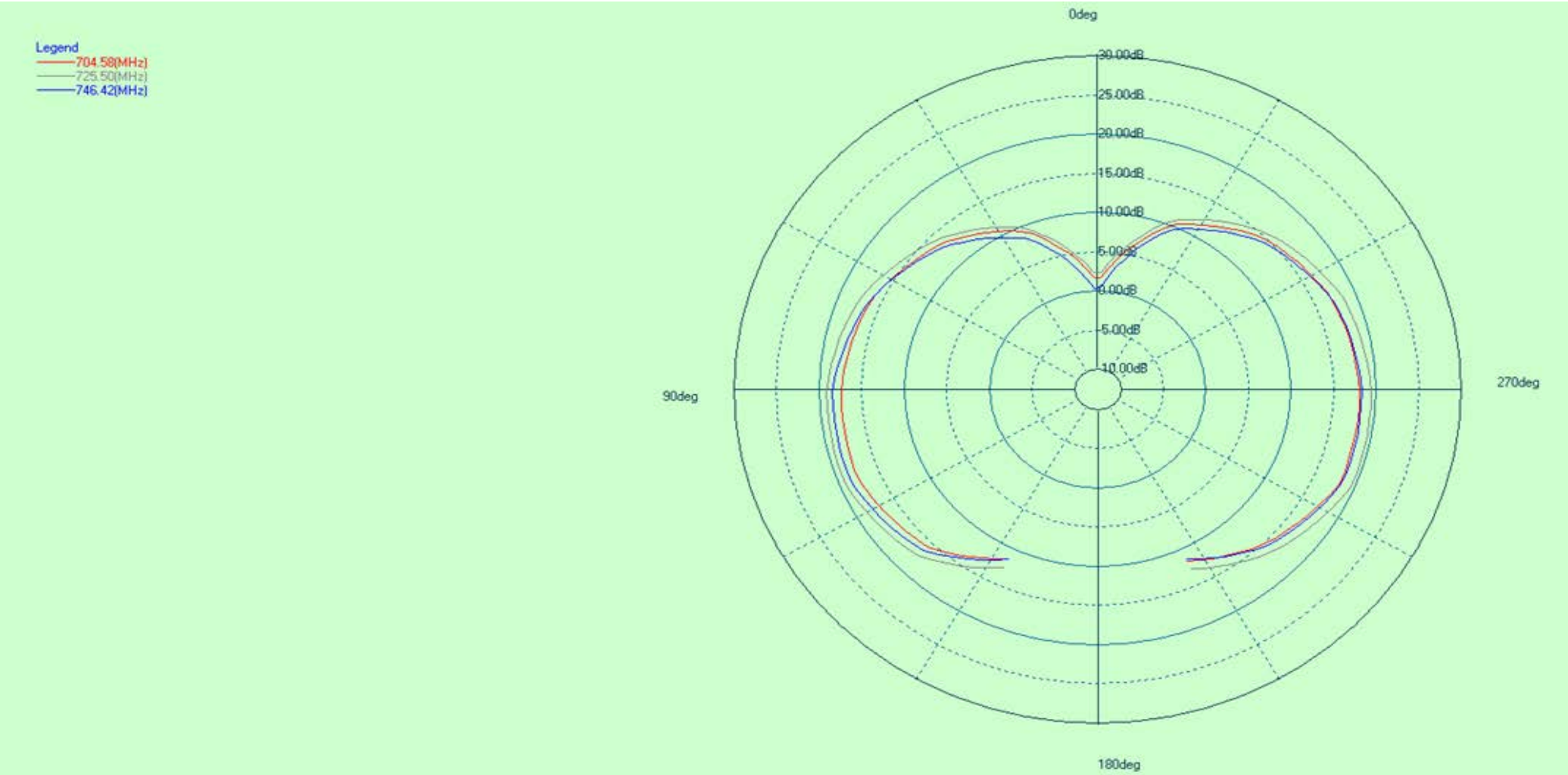
Original environment treatment.

6. Recommendations and Conclusions

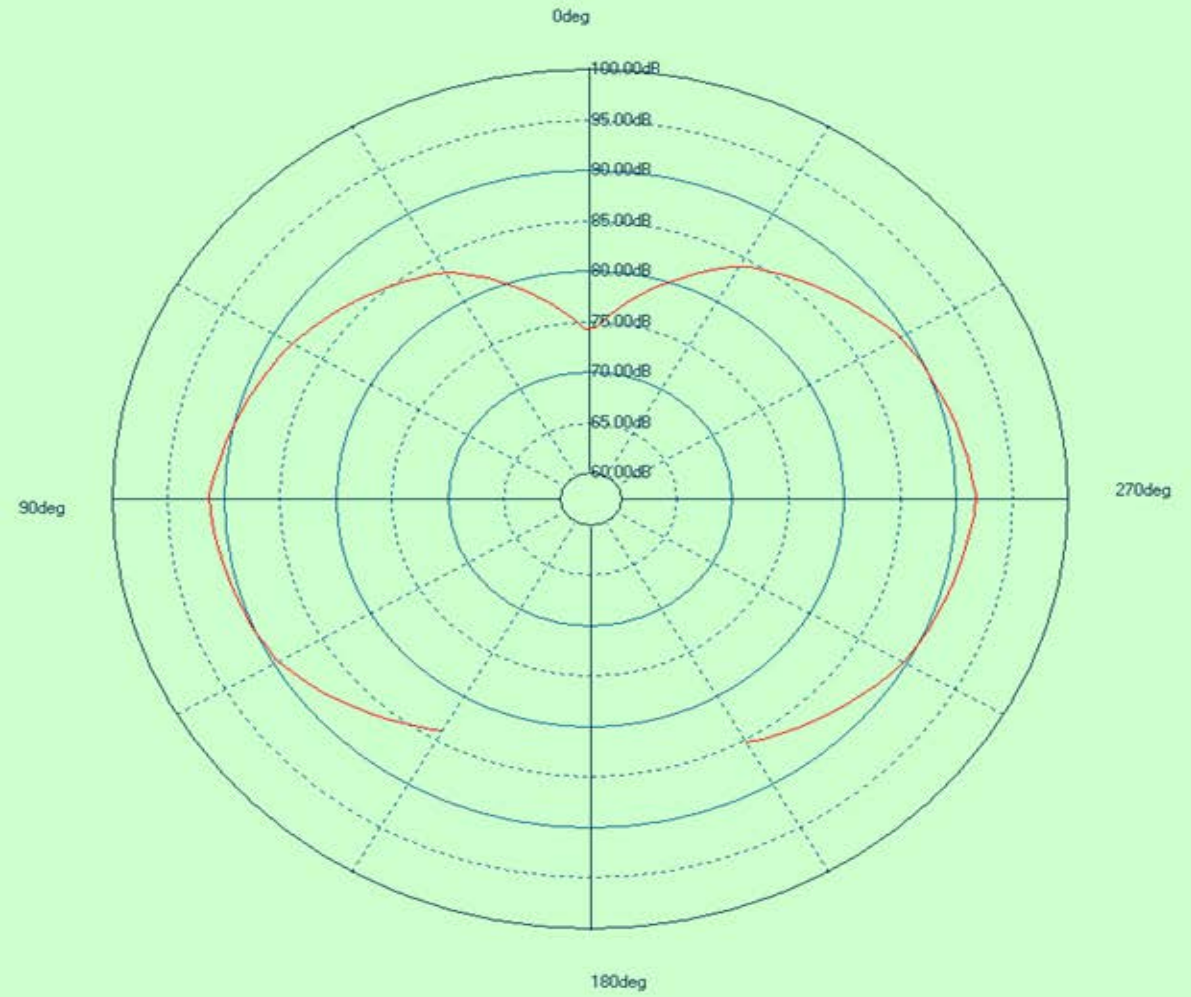
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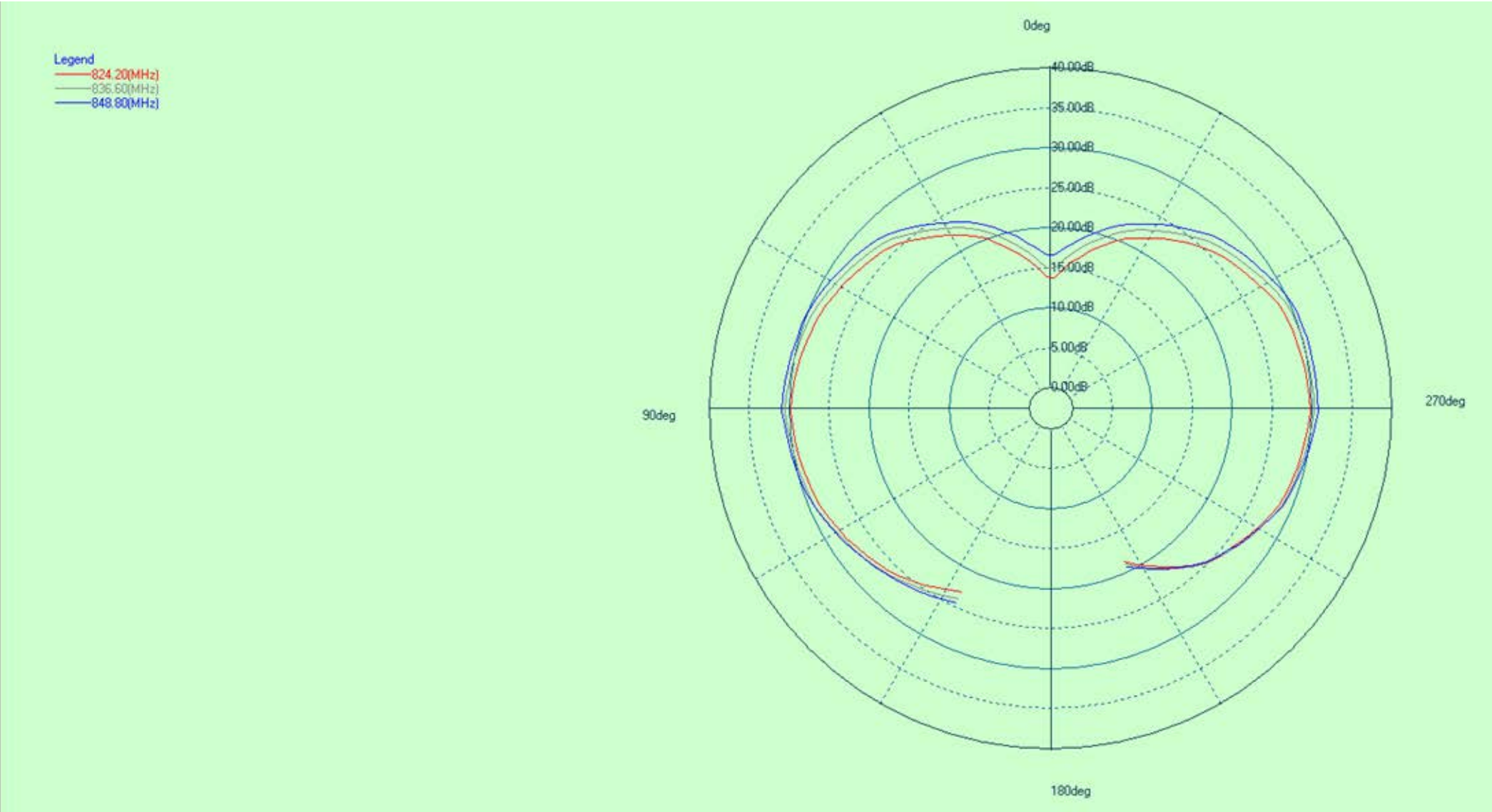
FS pattern 700M-800M



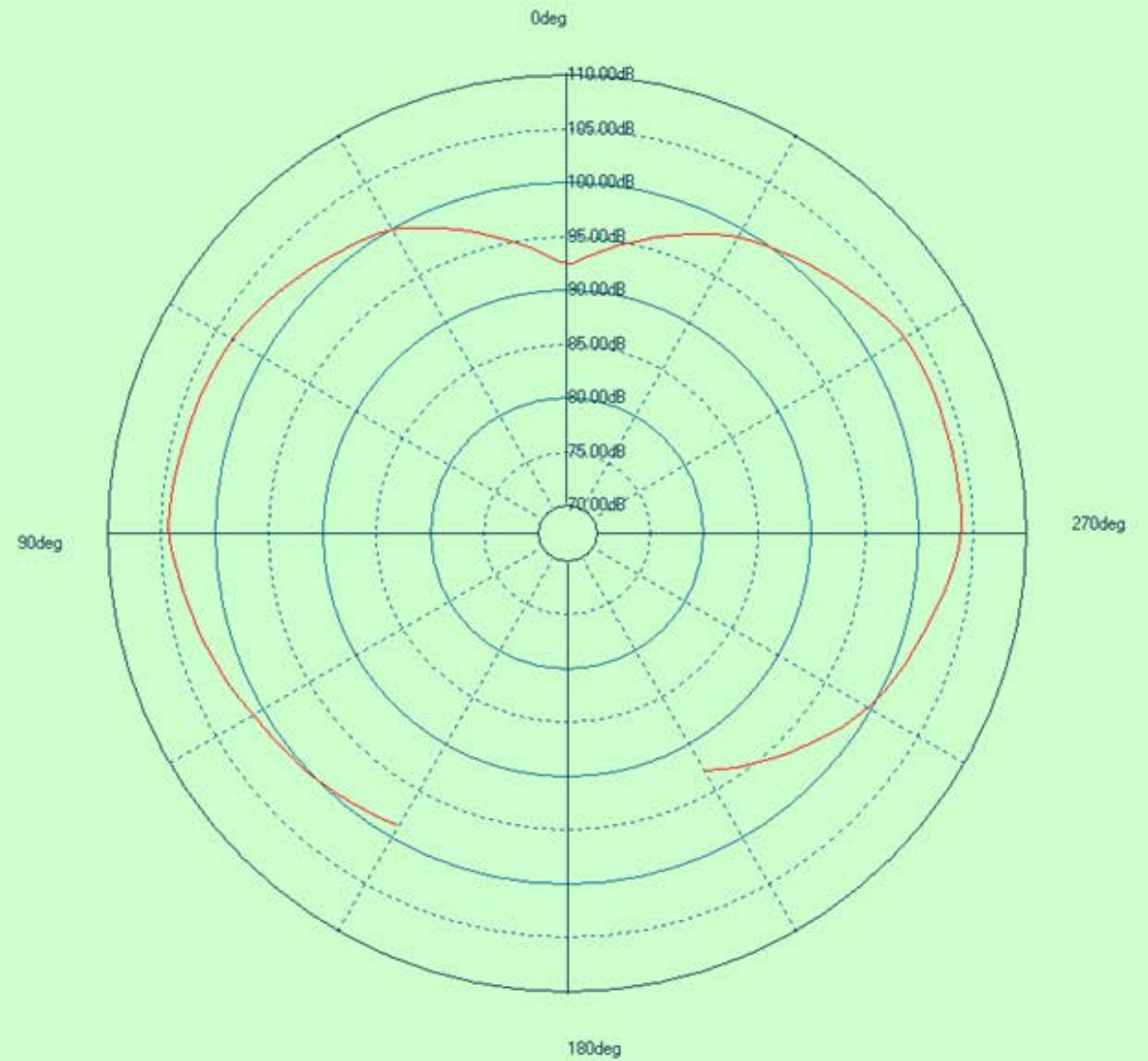
Legend
798.00(MHz)



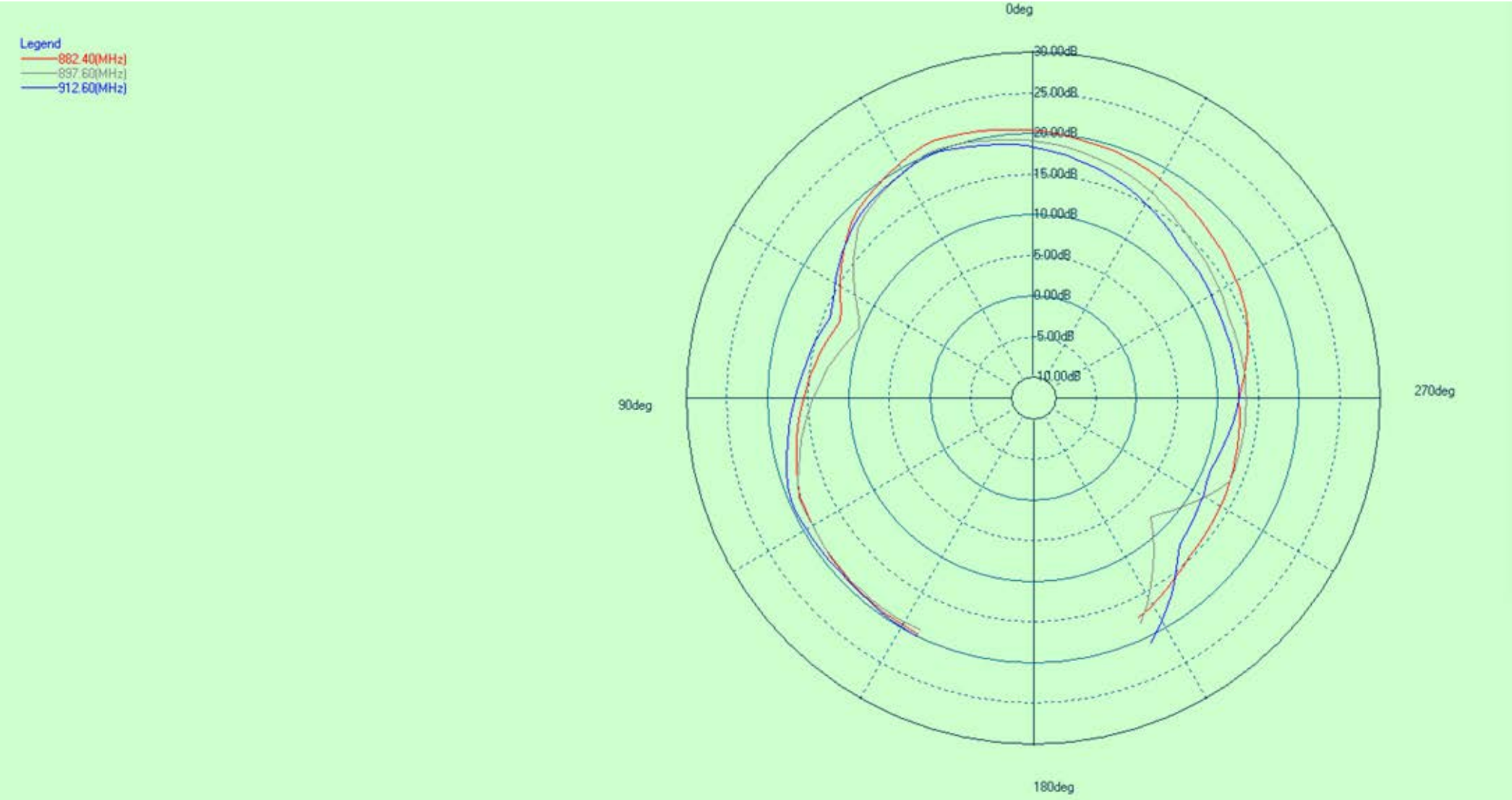
800M-900M



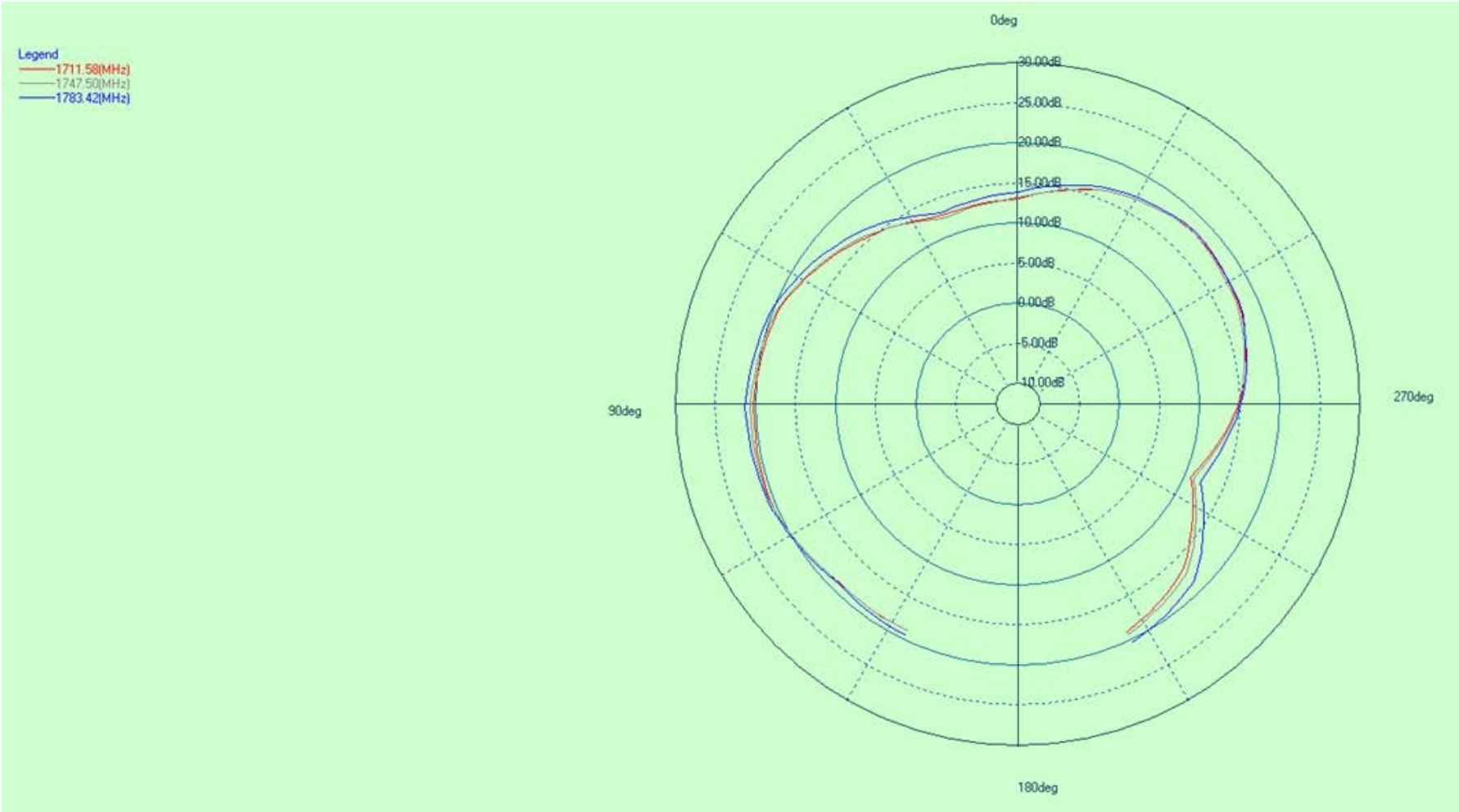
Legend
— 893.80(MHz)

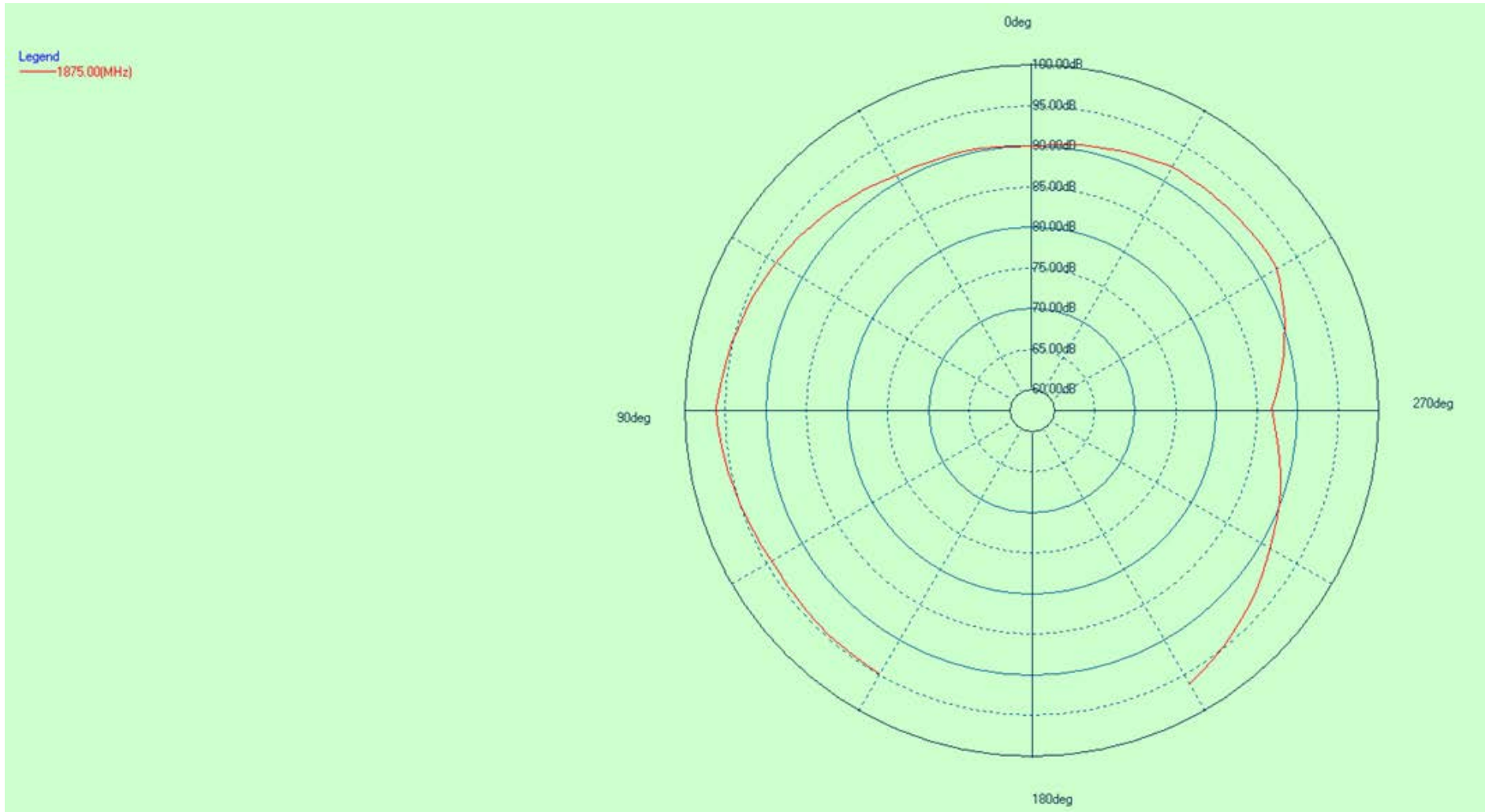


900M

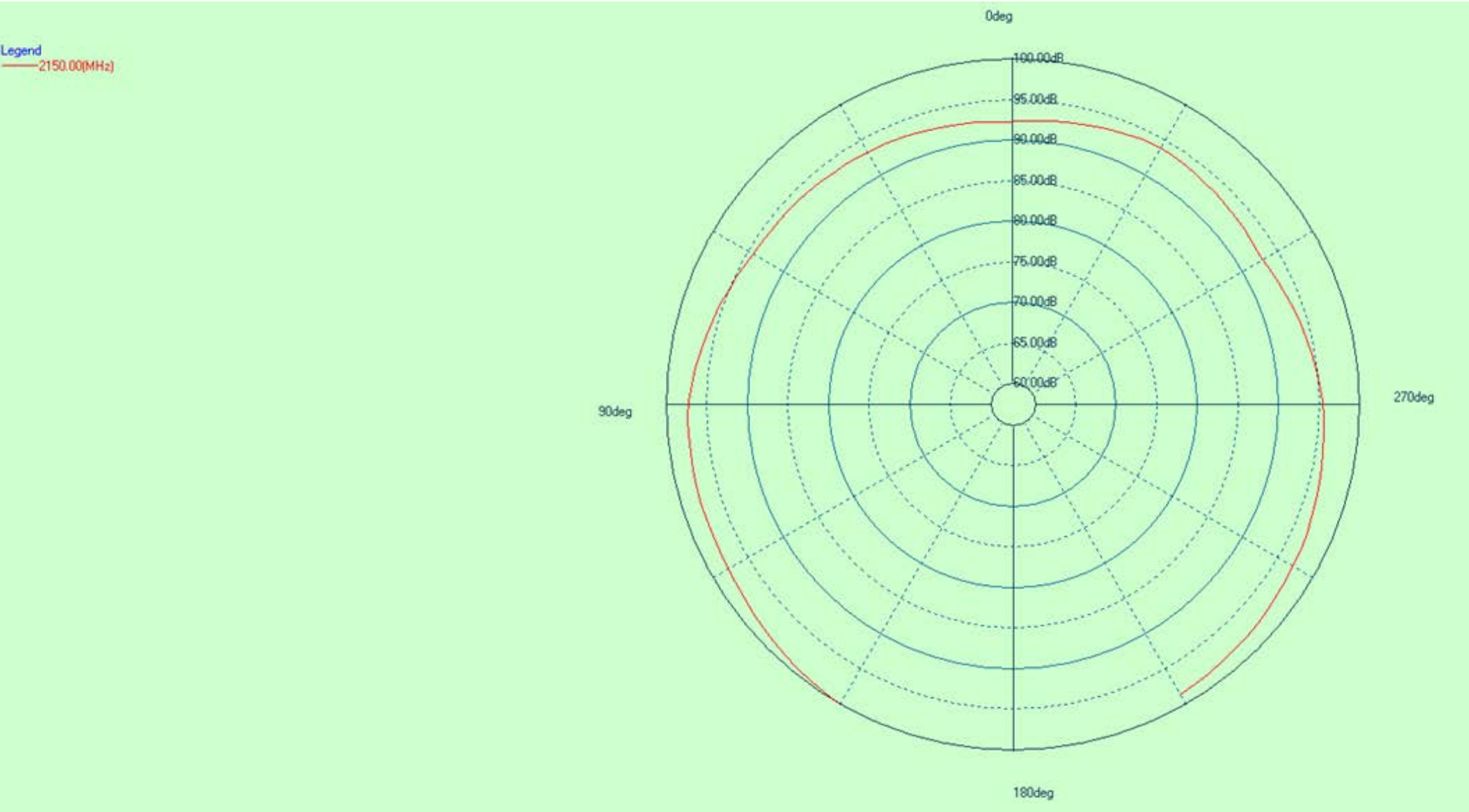


1710M-2100M

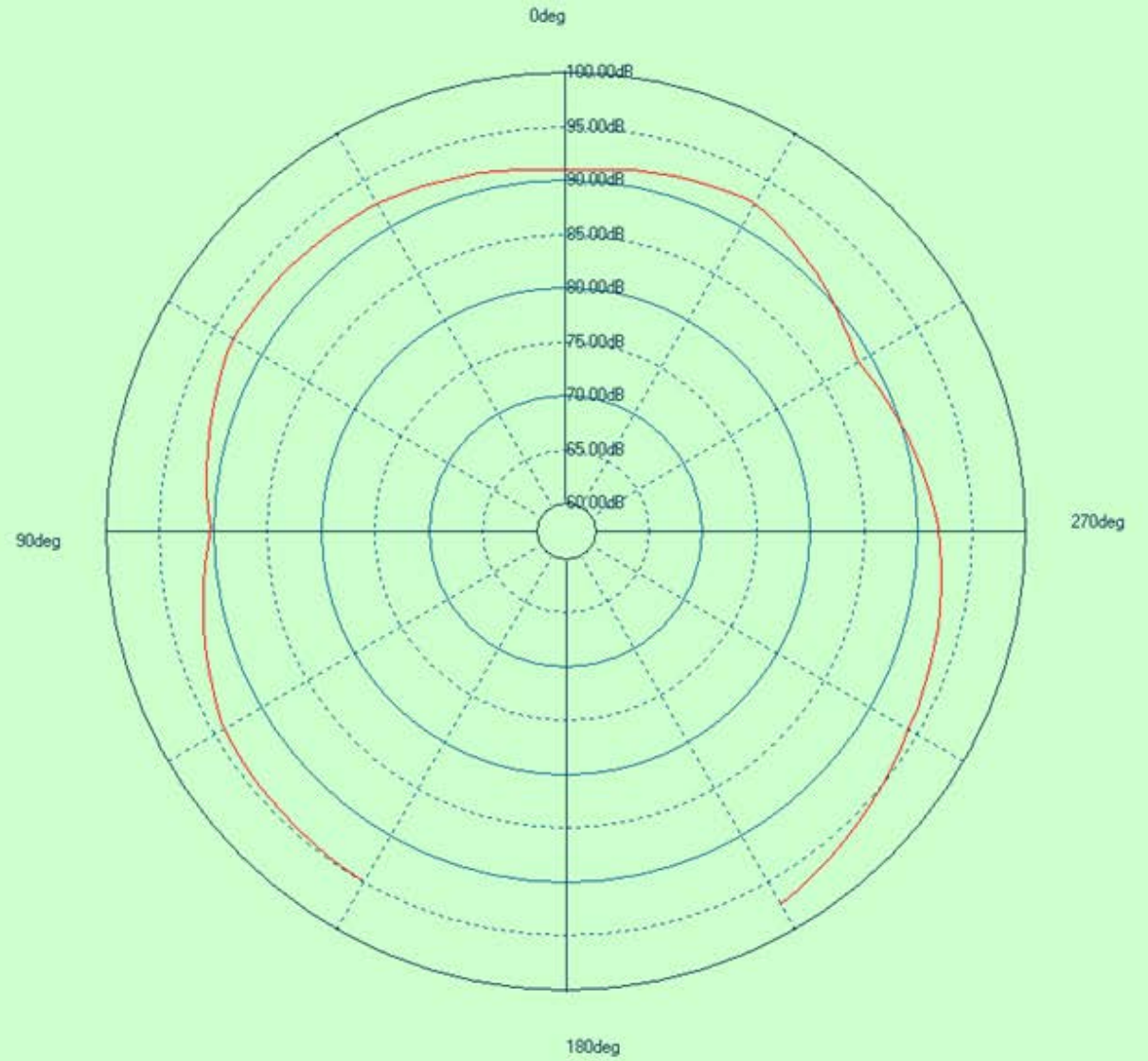




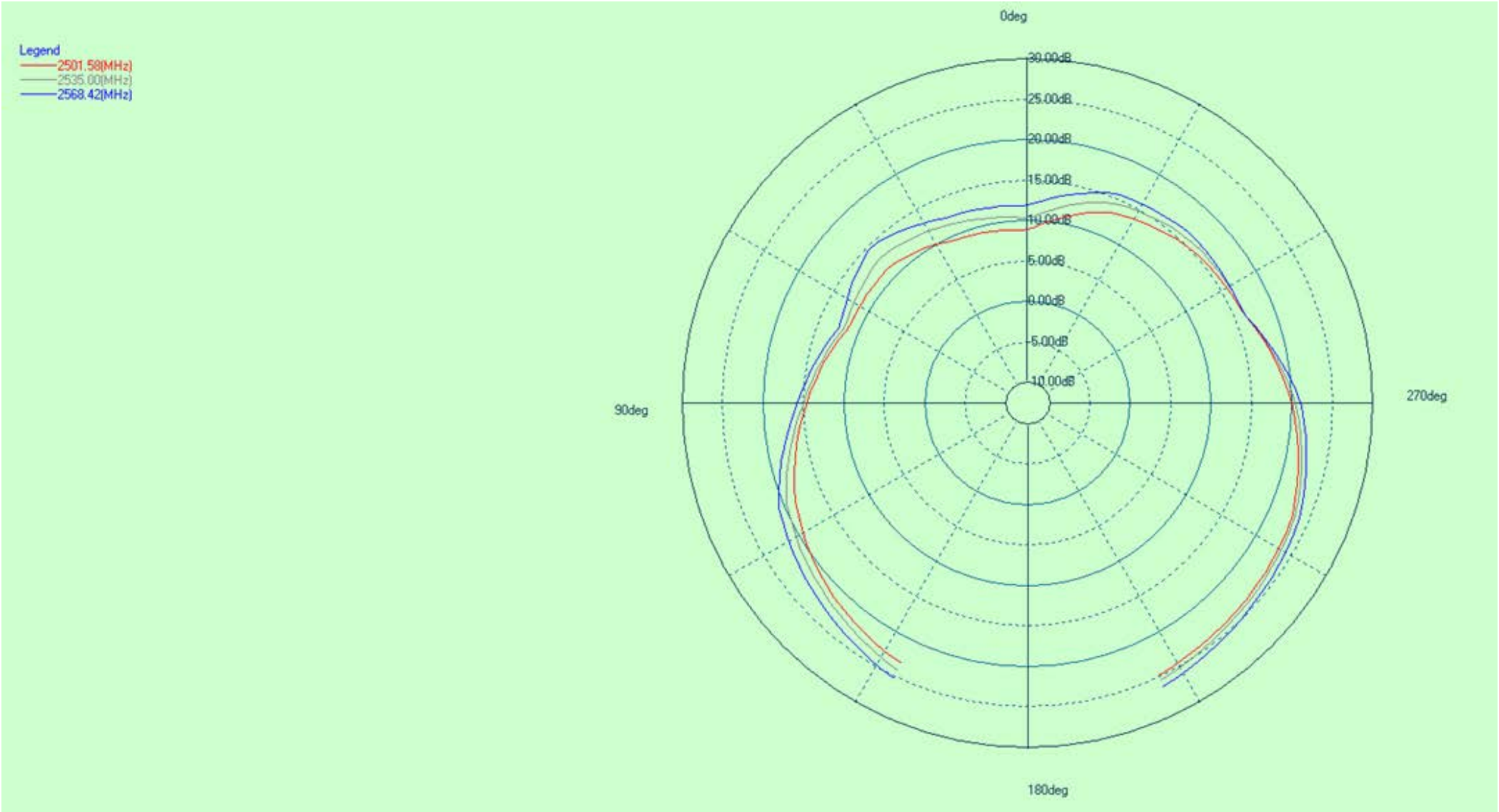
2100M-2400M



Legend
— 2150.00(MHz)



2400M-2700M



Legend
— 2685.00(MHz)

