



Antenna Evaluation Report For NCM2000B2-D299 Project

- Passive measurement report -

Prepared/tested by: White

Test Date: 8rd of Aug, 2023

Report release Date: 3rd of Oct, 2023

Version: V9.4



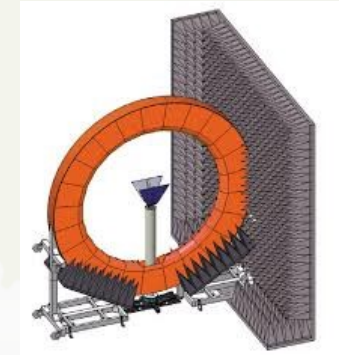
Summary

- **Test Environment and Equipment**
- **DUT Orientation Setting**
- **Testing Contents – Default Configuration Of HW**
 - Antenna Information
 - Measurement Results:
 - Return Loss
 - Antenna Efficiency and Peak Realized gain
 - 2D Realized Gain Radiation Patterns @Total Polarization



Test Environment & Equipment

- SATIMO SG 24 Multi-Probe Antenna Measurement System
- Angle between probes: 15°
- Frequency range: 400 MHz – 8.5 GHz
- Chamber Room Size: 4.0 m L x 4.0 m W x 4.0 m H



- Agilent and Keysight Vector Network Analyzer
- Frequency range: 100KHz – 8.5GHz
- Ports numbers: 2 ports



- ETS-Lindgren AMS-8500 Antenna Measurement System
- EM Quest EMQ-100 Software
- Model 3164-04 Diagonal Dual Polarized Horn antenna
- Frequency range: 700 MHz - 6 GHz
- Positioning Systems
- Chamber Room Size: 7.32 m L x 3.66 m W x 3.66 m H



Test procedure

- The return loss of the antennas was measured by the Network Analyzer. All of the antennas were mounted in the NCM2000B2-D299 device. The span of the test frequency was from 500MHz to 6GHz.
- The efficiency of the antennas and the gain of the antennas were measured in the ETS chamber. All of the antennas were mounted in the NCM2000B2-D299 device. Test data was calculated automatically by EMQuest Data Acquisition and Analysis Software.

Calibration information	Calibrate Date	Calibrated Until
SATIMO SG 24 Multi-Probe Antenna Measurement System	2023/7/7	2024/7/7
Agilent and Keysight Vector Network Analyzer	2023/7/21	2024/7/21
ETS-Lindgren AMS-8500 Antenna Measurement System	2023/7/14	2024/7/14



DUT Orientation Setting

Please refer to the file name NCM2000B2-D299 product photo.



Default Configuration Of HW

- Antenna location
- Antenna Information



Antenna Location

Please refer to the file name NCM2000B2-D299 product photo.



Antenna Information

Designator	Frequency Range	Antenna Type	Dimension	Test Cable Length	Real Cable Length	Cable Type
Ant11	2400 – 2500MHz 5150 – 5850MHz	PCB Antenna	32 x 13 x 1.2 mm	45mm	45mm	Ø1.37 Low Loss
Ant12	2400 – 2500MHz 5150 – 5850MHz	PCB Antenna	35 x 10 x 1.2 mm	70mm	70mm	Ø1.37 Low Loss
Ant1	703 - 960MHz 1710 – 2690MHz	FPC Antenna		120mm		Ø1.37 Low Loss
Ant4	703 - 960MHz 1710 – 2690MHz	PCB Antenna	60 x 37 x 1.2 mm	130mm	130mm	Ø1.37 Normal
Ant5	814 - 894MHz 1710 – 2690MHz	FPC Antenna		85mm	85mm	Ø1.37 Normal
Ant7	703 – 960MHz 1710 – 2690MHz	FPC Antenna		120mm		Ø1.37 Low Loss
Ant0	3300 - 4200MHz	PCB Antenna	35 x 10 x 1.2 mm	80mm	80mm	Ø1.37 Low Loss
Ant2	3300 - 4200MHz	PCB Antenna	35 x 10 x 1.2 mm	150mm	150mm	Ø1.37 Low Loss
Ant3	3300 - 4200MHz	PCB Antenna	35 x 10 x 1.2 mm	90mm	90mm	Ø1.37 Low Loss
Ant6	3300 - 4200MHz	PCB Antenna	35 x 10 x 1.2 mm	85mm	85mm	Ø1.37 Low Loss



Measurement Results

- Return Loss
- Antenna Efficiency and Peak Realized Gain
- 2D Realized Gain Radiation Patterns @Total Polarization



Return Loss Of ANT11 Antenna



Return Loss Of ANT12 Antenna



Return Loss Of ANT0 Antenna



Return Loss Of ANT1 Antenna



Return Loss Of ANT2 Antenna



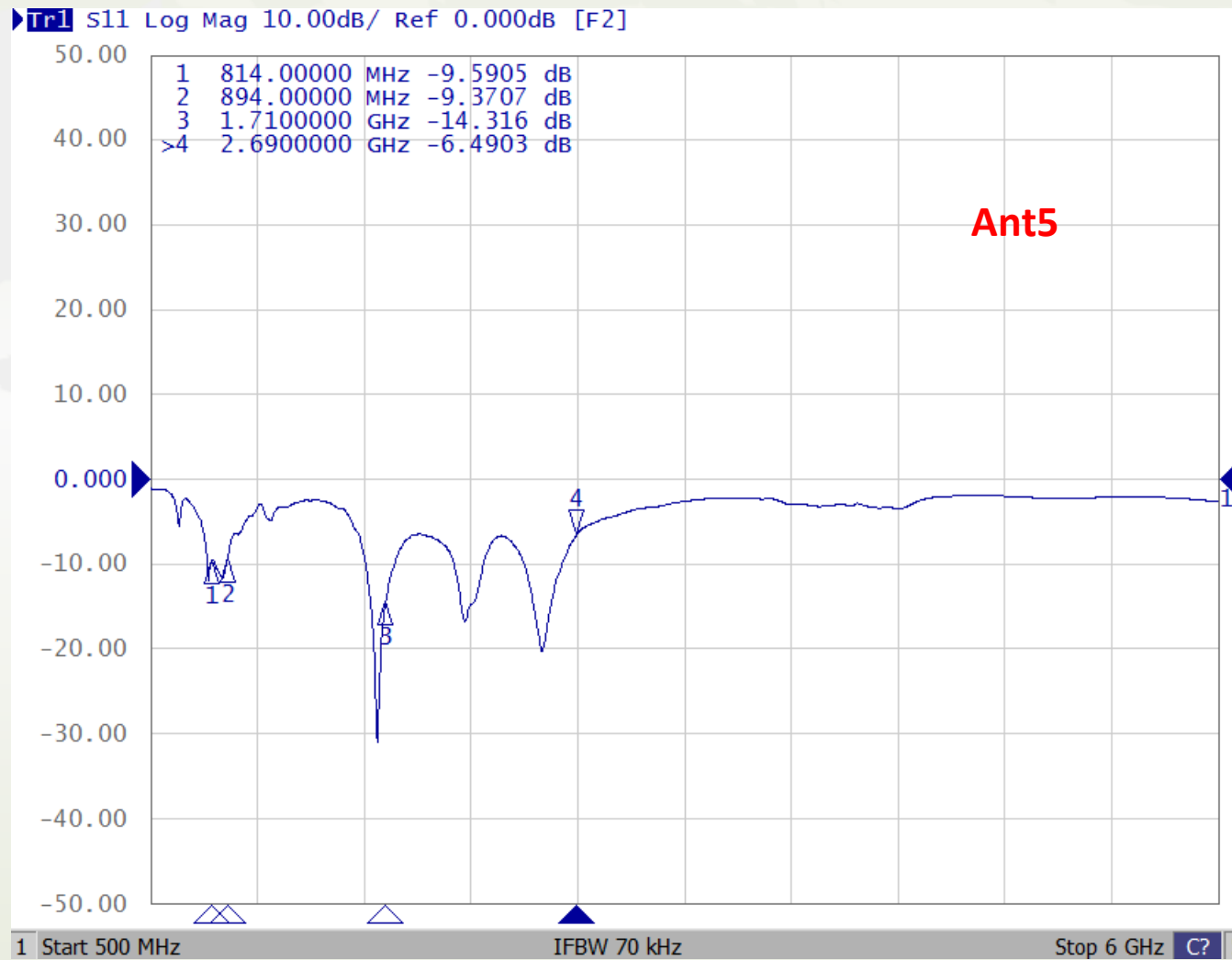
Return Loss Of ANT3 Antenna



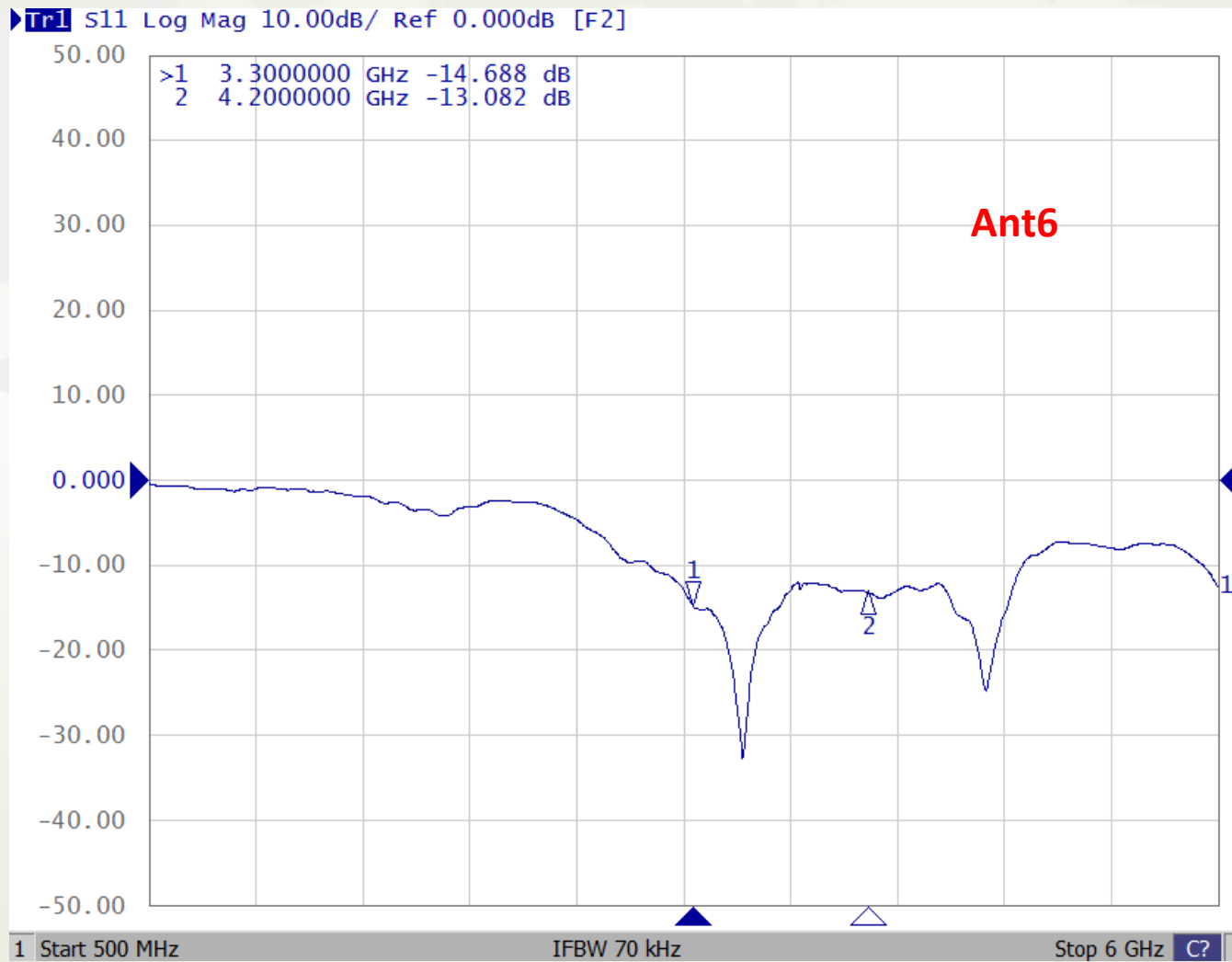
Return Loss Of ANT4 Antenna



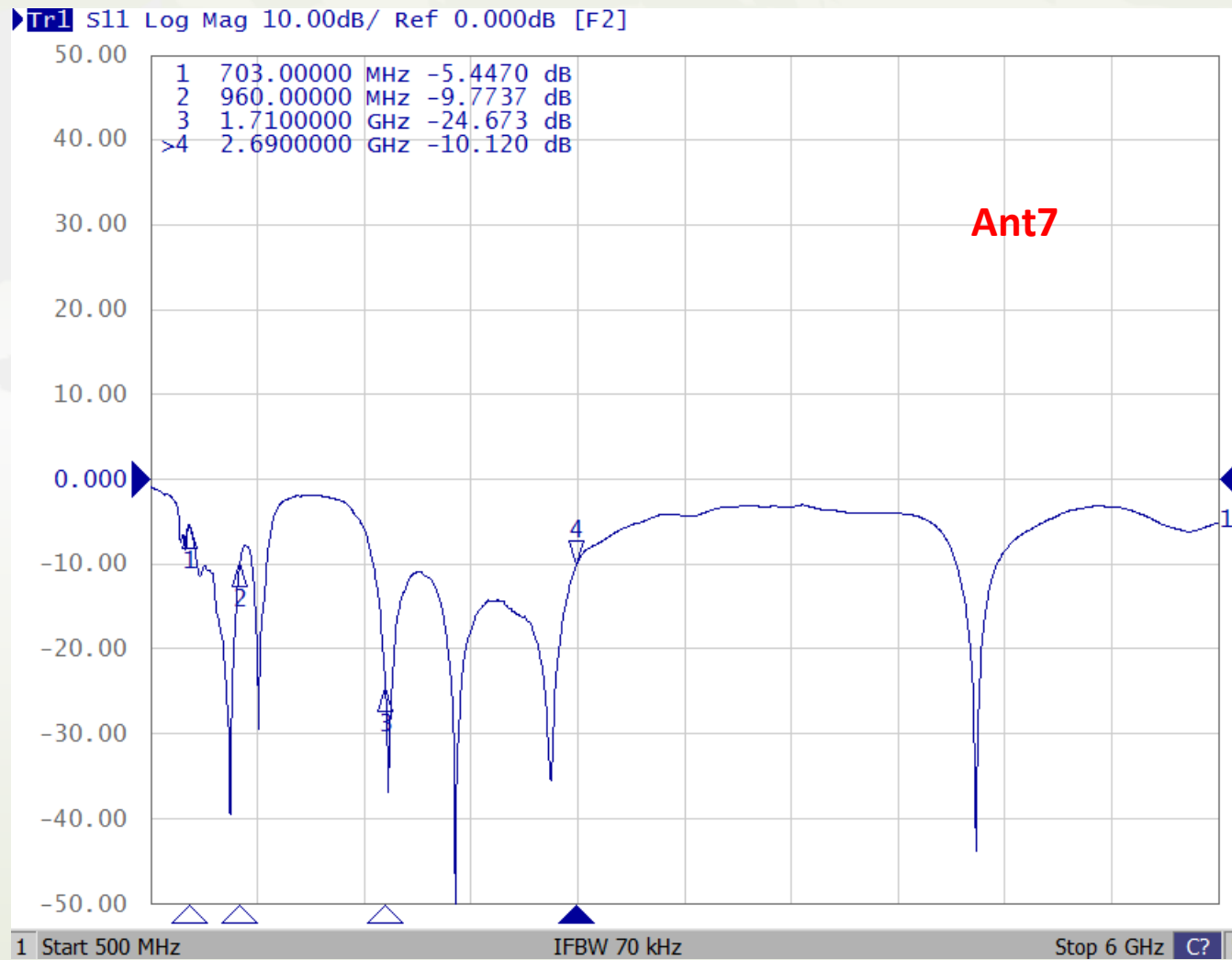
Return Loss Of ANT5 Antenna



Return Loss Of ANT6 Antenna



Return Loss Of ANT7 Antenna



Antenna Efficiency & Peak Gain

Ant11			Ant12		
Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)
2400	62	5.5	2400	62	3.9
2410	65	5.6	2410	64	4.0
2420	65	5.5	2420	63	4.0
2430	65	5.5	2430	64	4.1
2440	66	5.5	2440	64	4.0
2450	63	5.2	2450	63	3.9
2460	62	5.1	2460	63	3.9
2470	64	5.0	2470	64	3.9
2480	64	4.9	2480	64	4.0
2490	64	4.7	2490	62	3.9
2500	63	4.5	2500	62	3.8



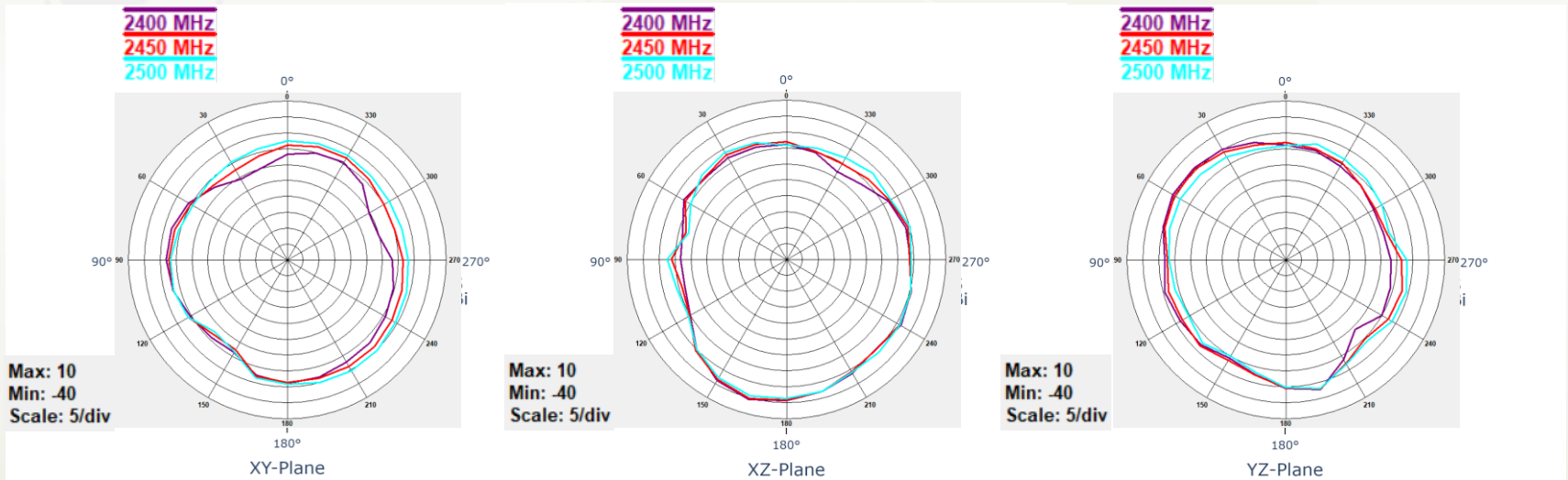
Antenna Efficiency & Peak Gain

Ant11			Ant12		
Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)
5150	61	4.7	5150	61	4.7
5200	61	5.0	5200	61	4.8
5250	62	5.1	5250	65	5.3
5300	63	5.4	5300	65	5.6
5350	63	5.6	5350	66	6.0
5400	64	5.6	5400	65	6.2
5450	64	5.2	5450	64	6.2
5500	65	4.3	5500	64	6.1
5550	65	3.5	5550	63	6.0
5600	63	3.8	5600	65	6.1
5650	64	3.7	5650	63	6.1
5700	64	3.8	5700	63	6.1
5750	61	3.8	5750	64	6.1
5800	61	4.1	5800	63	5.8
5850	62	4.3	5850	63	6.1



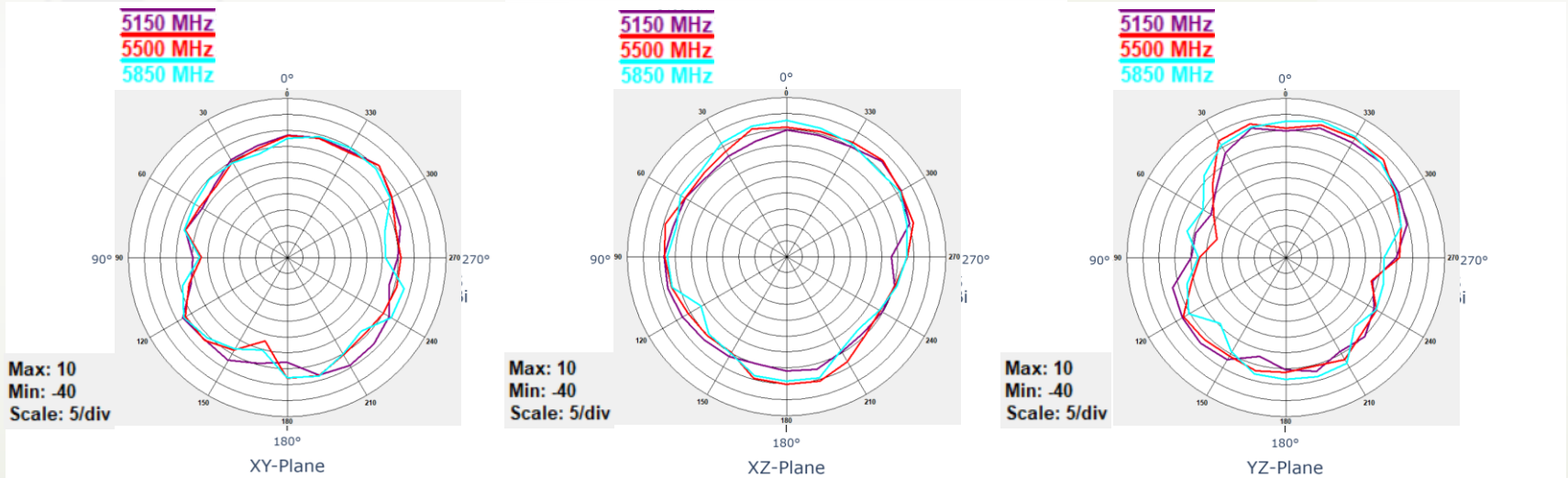
2D Realized Gain Radiation Patterns Of Ant11 at 2400-2500MHz

Please refer to the file name NCM2000B2-D299 product photo.



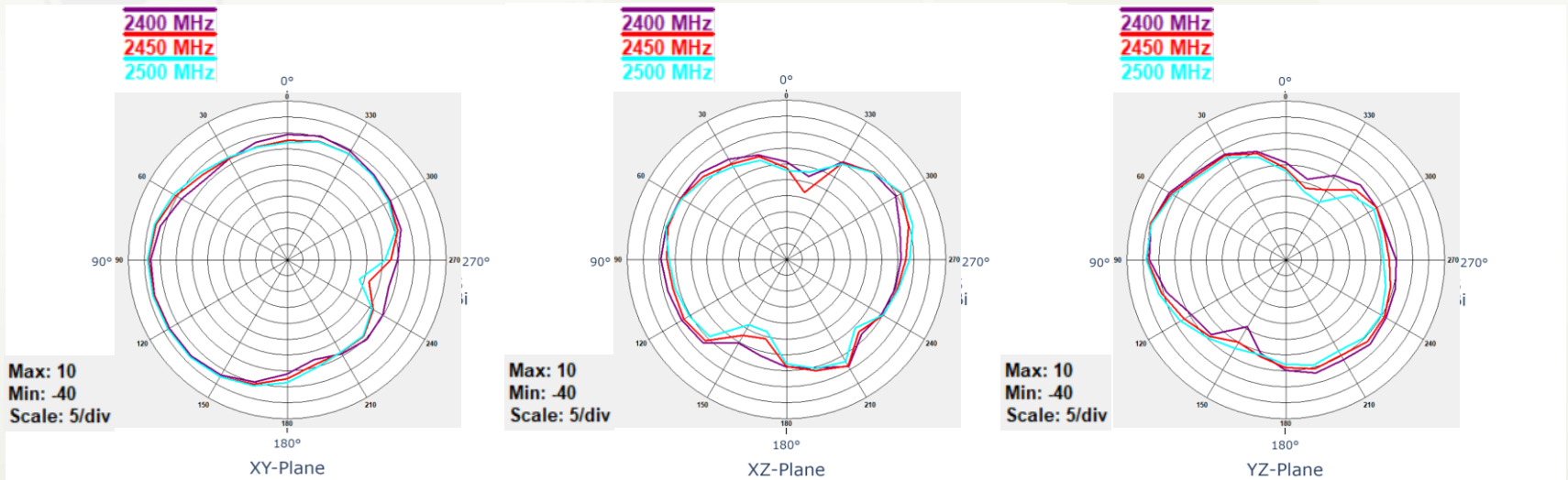
2D Realized Gain Radiation Patterns Of Ant11 at 5150-5850MHz

Please refer to the file name NCM2000B2-D299 product photo.



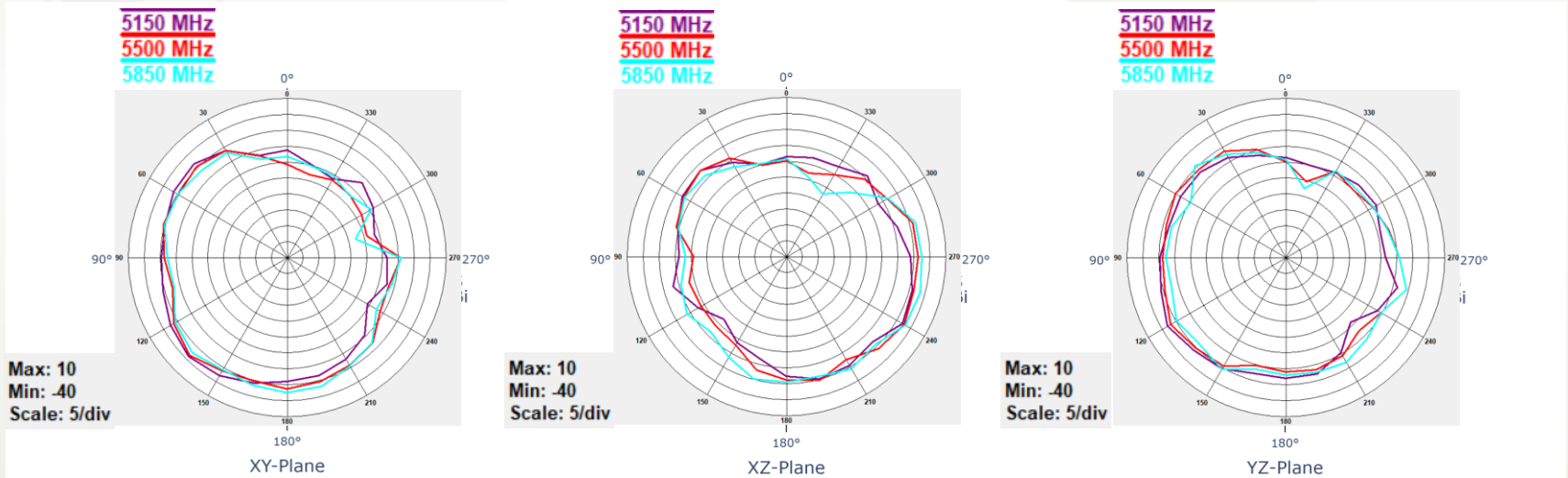
2D Realized Gain Radiation Patterns Of Ant12 at 2400-2500MHz

Please refer to the file name NCM2000B2-D299 product photo.



2D Realized Gain Radiation Patterns Of Ant12 at 5150-5850MHz

Please refer to the file name NCM2000B2-D299 product photo.



Antenna Efficiency & Peak Gain

Ant1			Ant4			Ant5			Ant7		
Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)
703	53	1.9	703	14	-4.2	814	38	0.0	703	35	1.4
720	58	3.2	720	11	-5.3	820	42	0.5	720	43	2.0
740	60	2.4	740	11	-5.1	830	47	1.3	740	51	0.7
760	57	2.5	760	17	-3.4	840	50	1.6	760	57	1.2
780	49	2.3	780	19	-2.2	850	54	1.4	780	55	1.1
800	47	1.8	800	24	-1.3	860	57	1.8	800	49	0.9
820	57	2.5	820	31	-0.3	870	55	2.0	820	45	0.8
840	58	2.8	840	36	0.7	880	53	2.0	840	52	1.6
860	57	2.7	860	38	0.9	890	51	1.9	860	57	1.5
880	55	2.7	880	28	-1.1	894	50	1.9	880	60	2.1
900	48	2.1	900	27	-1.8				900	59	2.2
920	44	1.3	920	37	-0.1				920	57	2.0
940	36	0.3	940	39	-0.4				940	55	1.0
960	31	-0.1	960	35	0.1				960	50	0.3



Antenna Efficiency & Peak Gain

Ant1			Ant4			Ant5			Ant7		
Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)
1710	54	2.7	1710	57	2.1	1710	54	2.6	1710	63	3.1
1810	56	2.5	1810	64	2.9	1810	47	1.1	1810	60	2.4
1920	43	2.4	1920	54	2.0	1920	41	1.0	1920	58	2.9
2010	46	2.9	2010	60	3.2	2010	40	0.9	2010	62	2.3
2110	48	2.7	2110	60	2.5	2110	56	3.2	2110	61	1.5
2170	54	4.0	2170	54	2.1	2170	57	3.0	2170	61	1.5
2210	54	3.6	2210	52	2.6	2210	57	3.5	2210	59	1.5
2310	62	3.6	2310	49	3.7	2310	50	2.3	2310	62	1.7
2410	61	3.3	2410	49	3.1	2410	57	2.7	2410	62	1.7
2500	61	4.0	2500	46	2.6	2500	64	3.3	2500	63	2.0
2610	57	3.5	2610	47	3.3	2610	51	3.4	2610	58	3.3
2690	57	3.5	2690	49	3.8	2690	42	3.4	2690	42	1.8



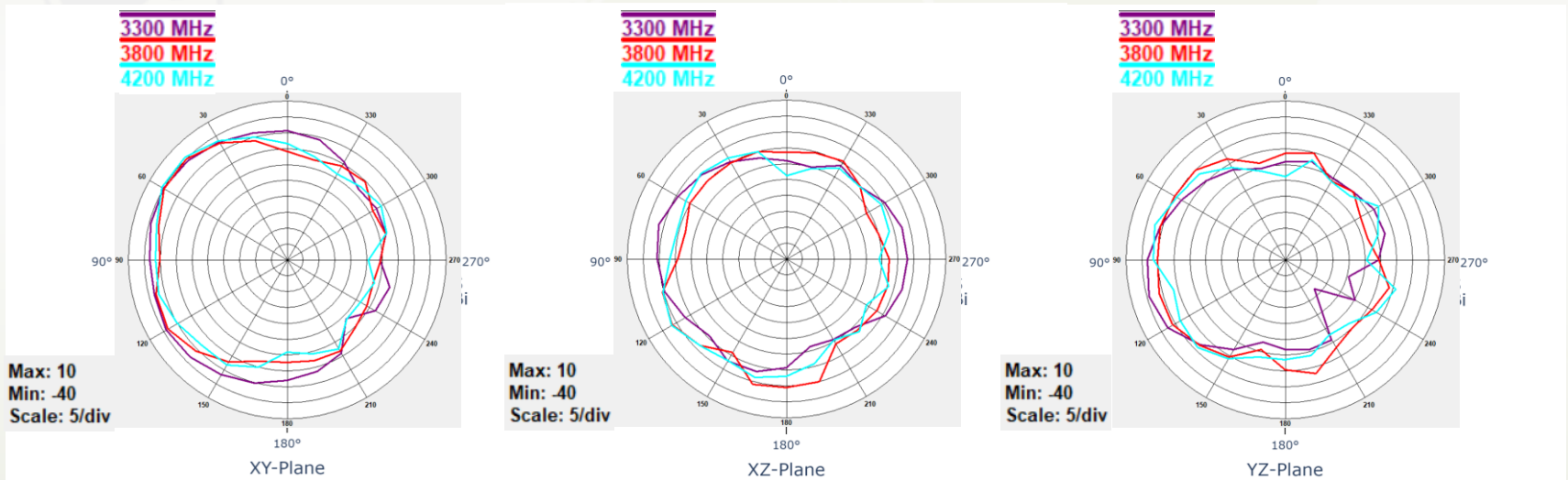
Antenna Efficiency & Peak Gain

Ant0			Ant2			Ant3			Ant6		
Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)	Frequency (MHZ)	Efficiency (%)	Peak Gain (dBi)
3300	66	5.8	3300	62	4.2	3300	62	4.9	3300	63	3.4
3350	65	6.4	3350	66	4.2	3350	64	5.0	3350	64	3.8
3400	64	6.5	3400	64	3.7	3400	62	5.0	3400	67	3.5
3450	63	6.2	3450	65	3.9	3450	62	4.9	3450	66	2.8
3500	63	6.0	3500	63	3.4	3500	62	4.9	3500	61	3.0
3550	62	5.3	3550	63	3.8	3550	58	4.5	3550	61	3.0
3600	62	5.1	3600	66	4.3	3600	62	5.0	3600	65	4.1
3650	62	4.7	3650	65	4.6	3650	62	5.1	3650	65	4.4
3700	58	4.7	3700	62	4.3	3700	59	5.1	3700	59	4.0
3750	61	5.2	3750	65	4.5	3750	61	5.7	3750	63	3.5
3800	62	5.1	3800	63	4.4	3800	62	5.4	3800	62	3.8
3850	65	5.6	3850	64	3.8	3850	63	4.9	3850	65	4.4
3900	63	5.7	3900	63	2.9	3900	64	5.1	3900	60	4.1
3950	65	5.8	3950	66	3.3	3950	65	5.3	3950	63	4.0
4000	62	5.4	4000	62	3.3	4000	63	5.0	4000	60	3.1
4050	64	5.7	4050	66	3.6	4050	63	4.8	4050	62	2.6
4100	63	5.7	4100	63	3.2	4100	60	4.7	4100	59	2.8
4150	64	5.7	4150	65	3.5	4150	58	4.2	4150	59	2.9
4200	62	5.5	4200	62	3.0	4200	56	4.0	4200	59	3.0



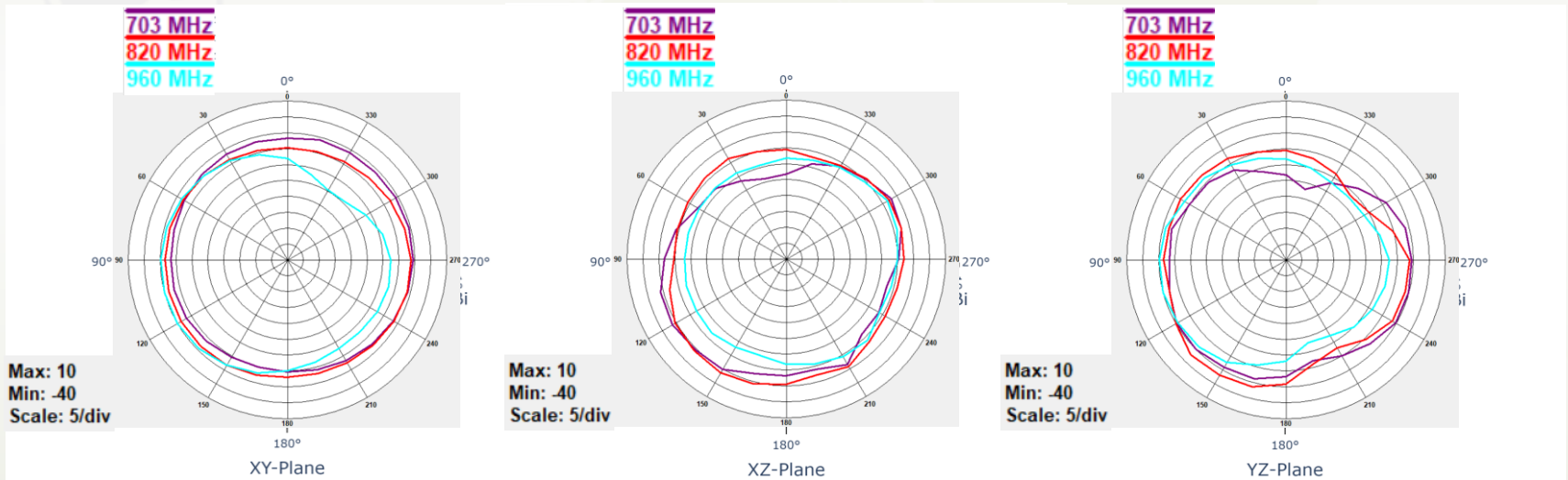
2D Realized Gain Radiation Patterns Of Ant0 at 3300-4200MHz

Please refer to the file name NCM2000B2-D299 product photo.



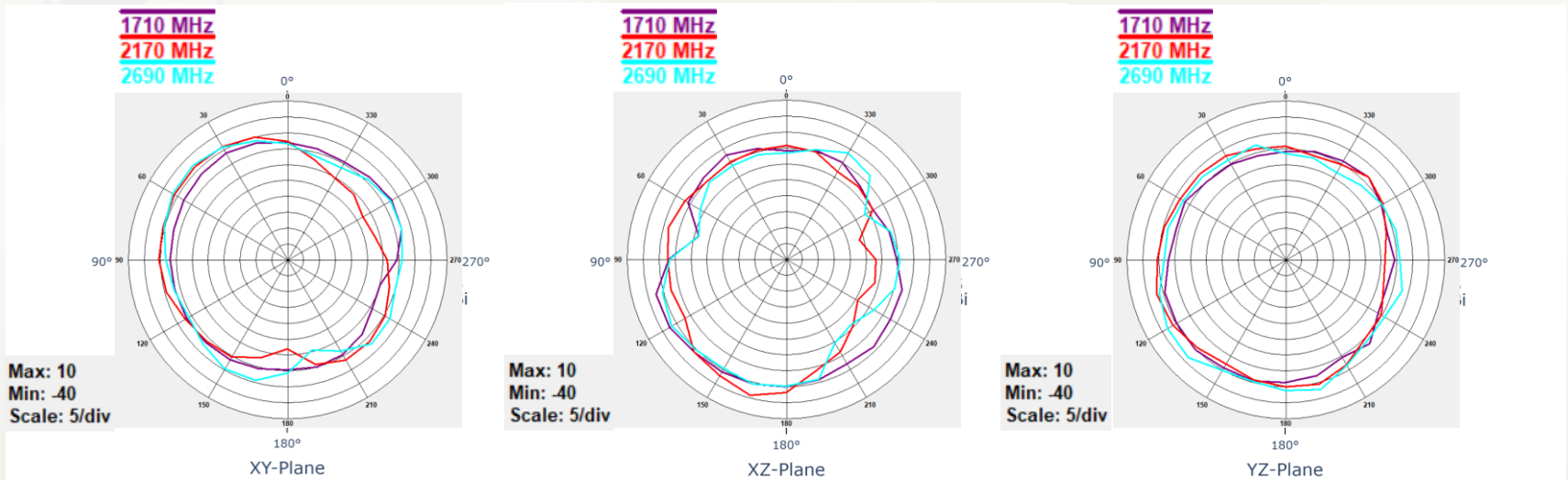
2D Realized Gain Radiation Patterns Of Ant1 at 703-960MHz

Please refer to the file name NCM2000B2-D299 product photo.



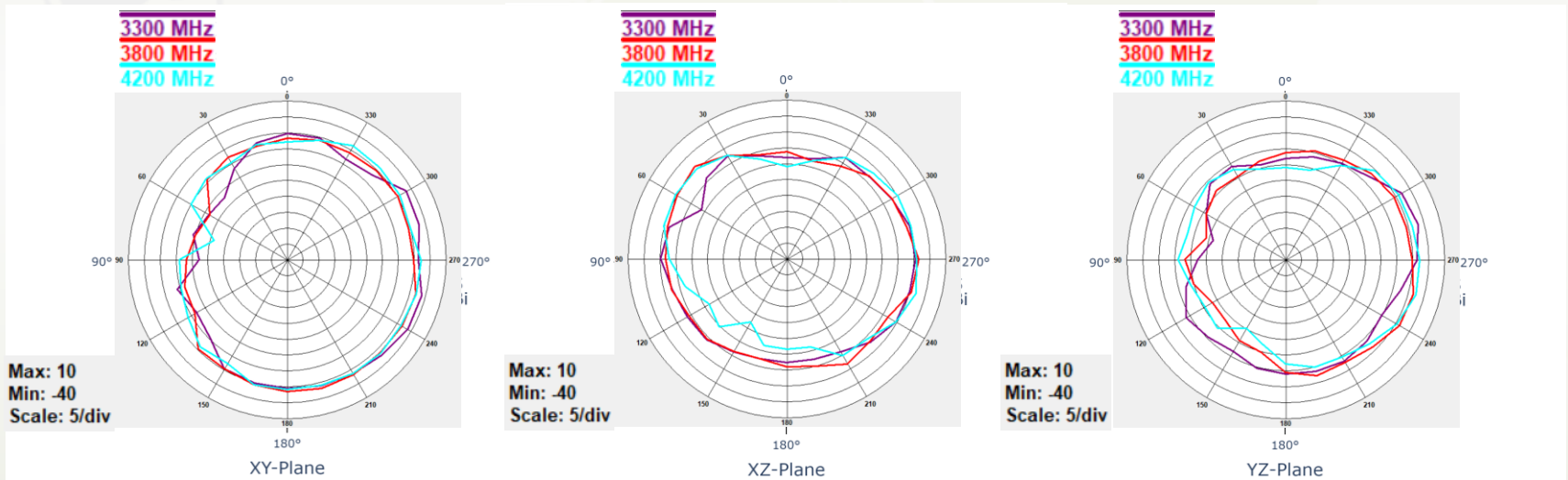
2D Realized Gain Radiation Patterns Of Ant1 at 1710-2690MHz

Please refer to the file name NCM2000B2-D299 product photo.



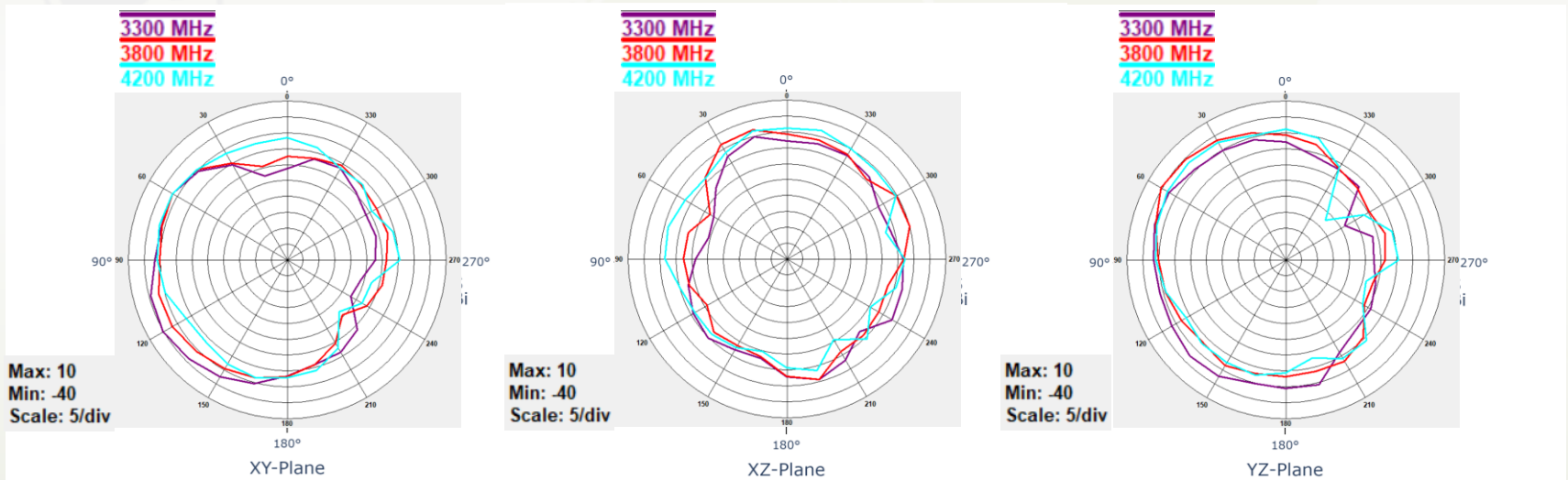
2D Realized Gain Radiation Patterns Of Ant2 at 3300-4200MHz

Please refer to the file name NCM2000B2-D299 product photo.



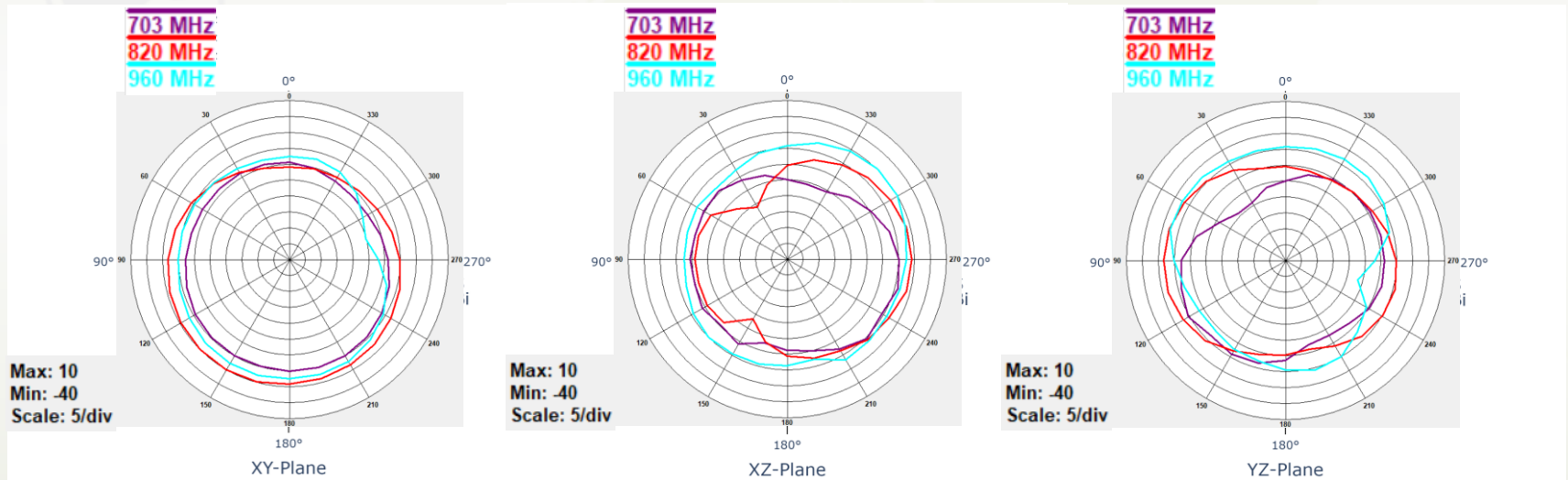
2D Realized Gain Radiation Patterns Of Ant3 at 3300-4200MHz

Please refer to the file name NCM2000B2-D299 product photo.



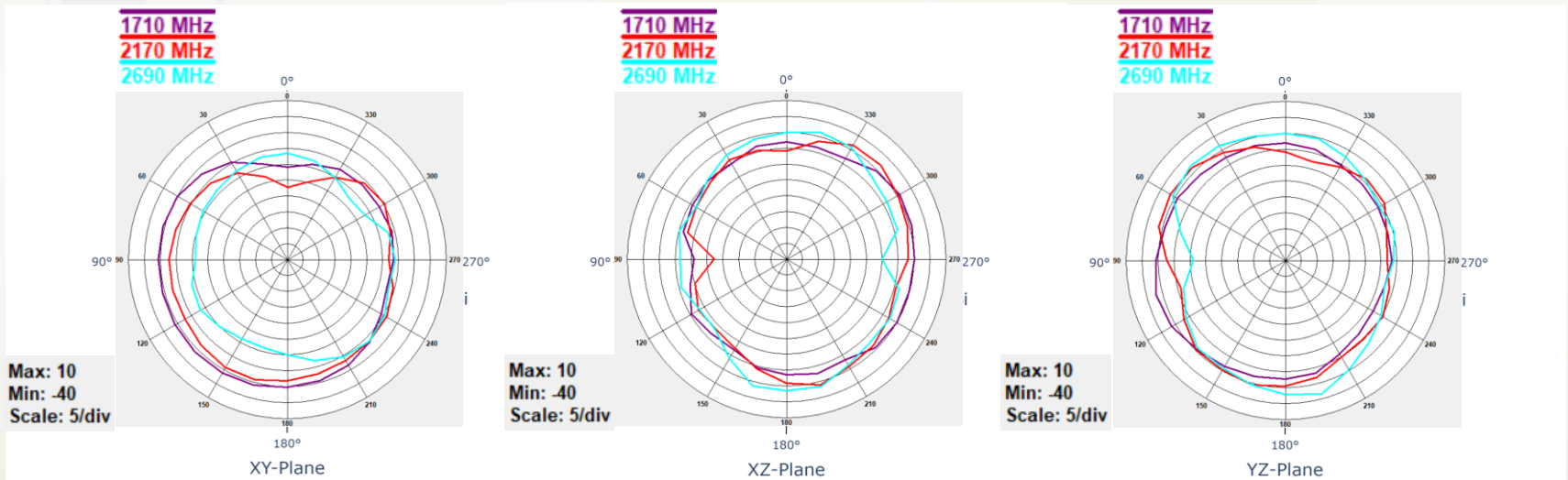
2D Realized Gain Radiation Patterns Of Ant4 at 703-960MHz

Please refer to the file name NCM2000B2-D299 product photo.



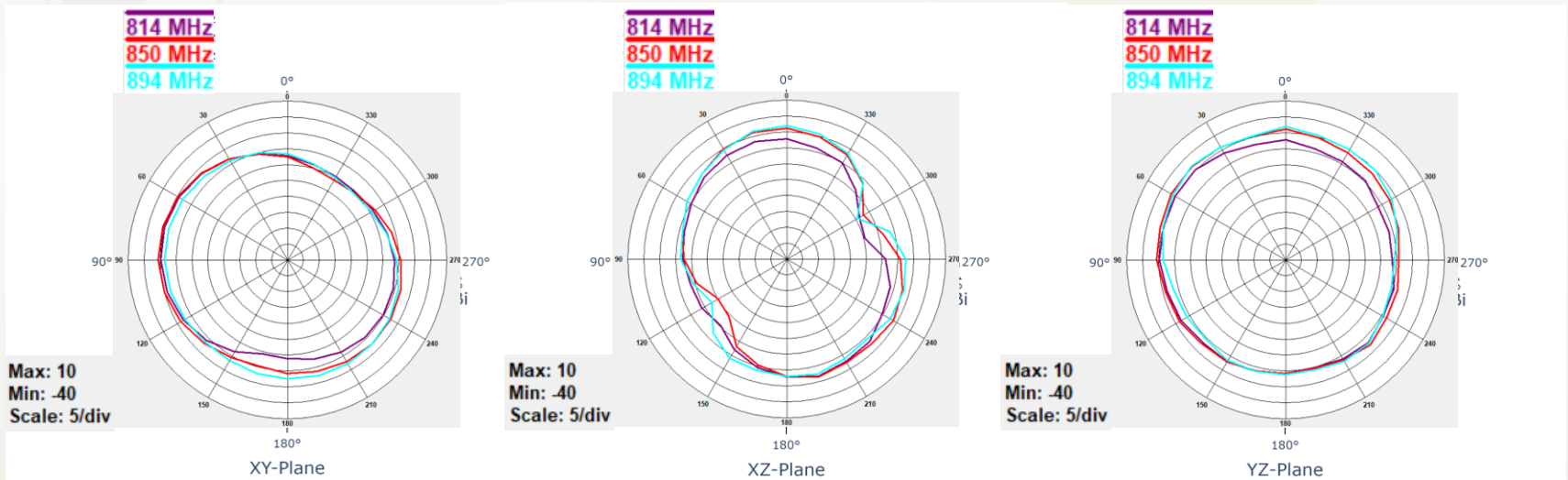
2D Realized Gain Radiation Patterns Of Ant4 at 1710-2690MHz

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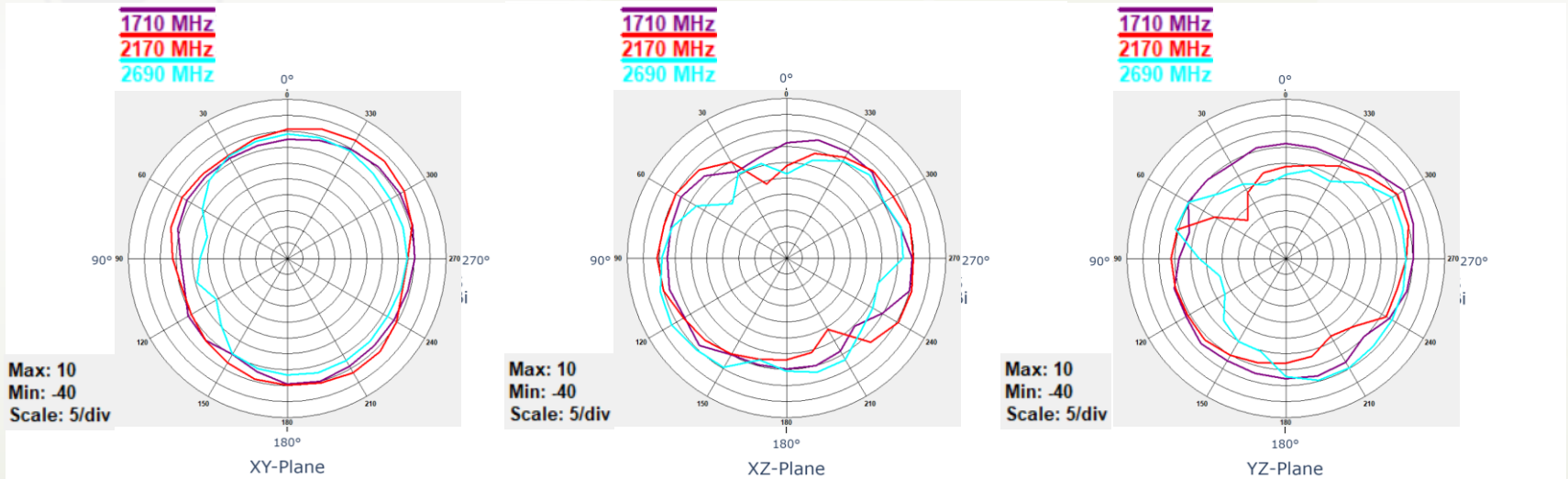
2D Realized Gain Radiation Patterns Of Ant5 at 814-894MHz

Please refer to the file name NCM2000B2-D299 product photo.



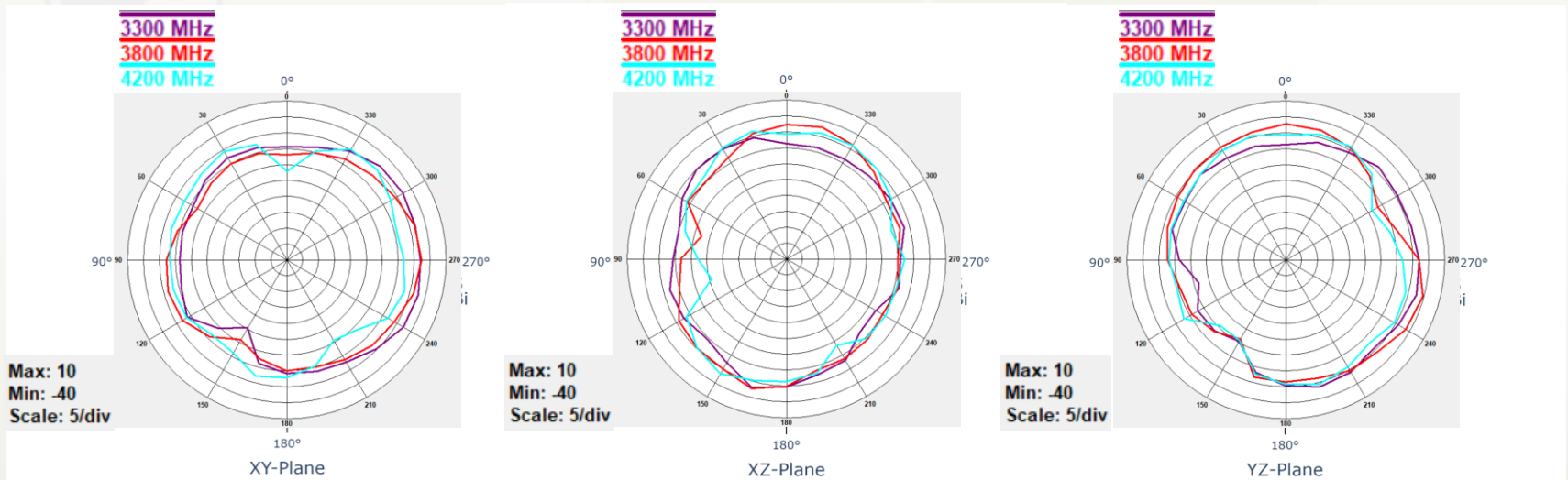
2D Realized Gain Radiation Patterns Of Ant5 at 1710-2690MHz

Please refer to the file name NCM2000B2-D299 product photo.



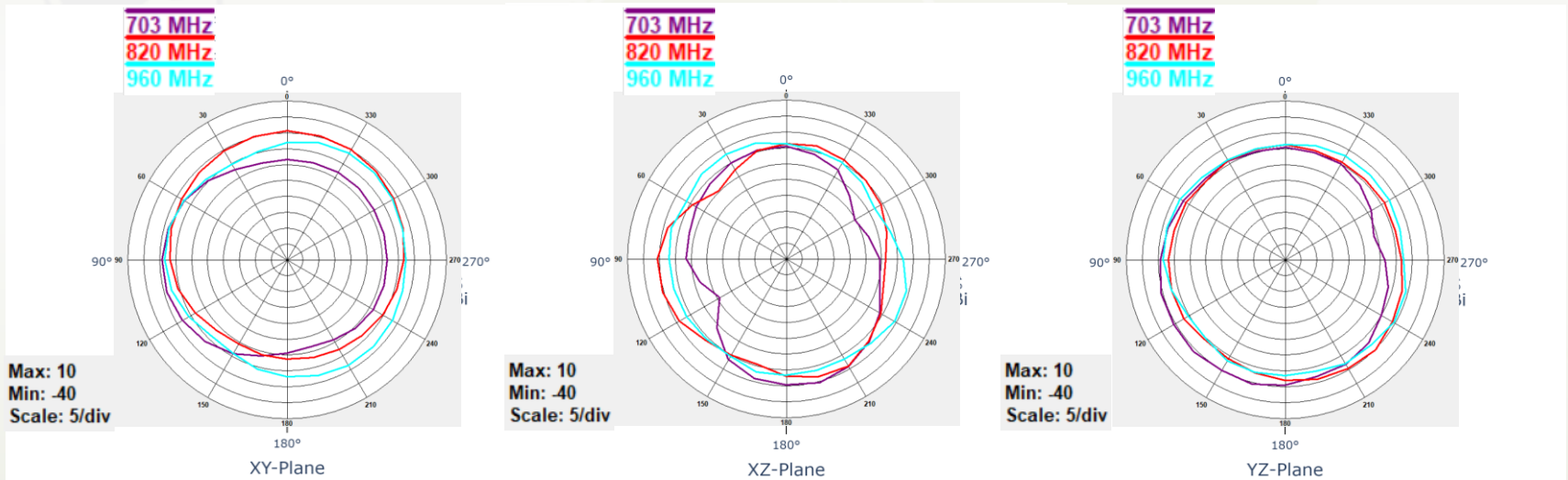
2D Realized Gain Radiation Patterns Of Ant6 at 3300-4200MHz

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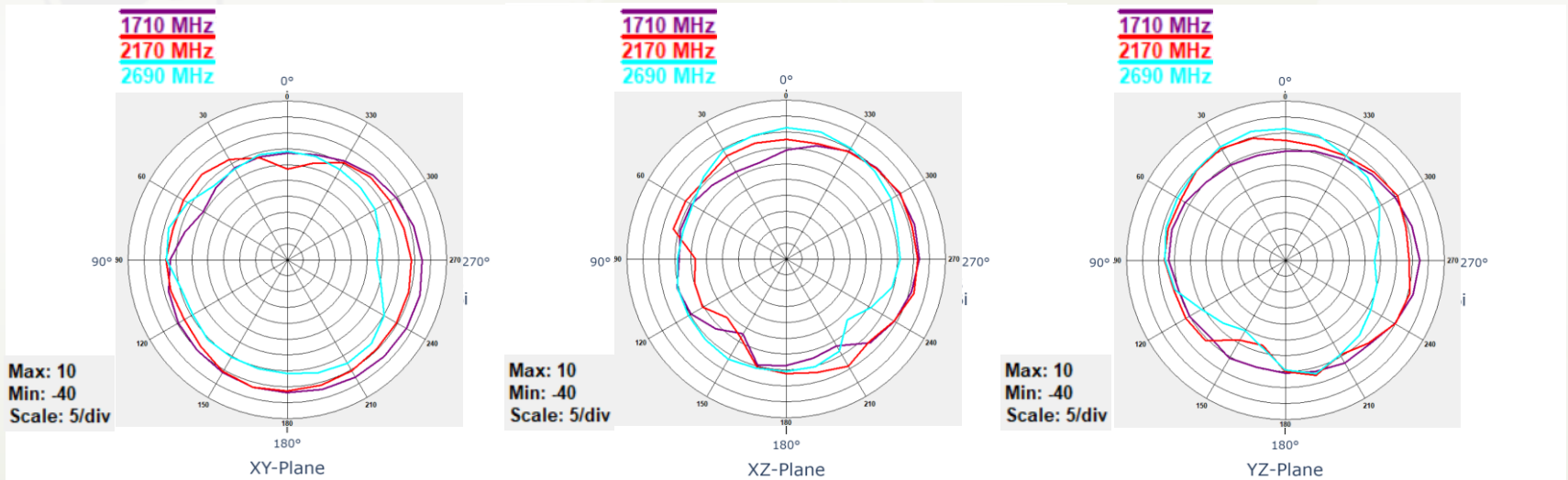
2D Realized Gain Radiation Patterns Of Ant7 at 703-960MHz

Please refer to the file name NCM2000B2-D299 product photo.



2D Realized Gain Radiation Patterns Of Ant7 at 1710-2690MHz

Please refer to the file name NCM2000B2-D299 product photo.



A light green world map is centered in the background of the slide.

Thanks !



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