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Antenna Matching Circuit Debugging Service

ReviewGPS – EV12 Charger

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Overview

1. Objective

2. Antennas used

3. DUT Assembly Setup

4. Recommended antenna matching network circuit

5. Performance Analysis Reflection Coefficient (dB)

5.1 Antenna Reflection Coefficient (dB)

5.2 Antenna Radiation Efficiency (%)

5.3 Antenna Radiation Pattern

6. Summary

1. Objective

Customer's design requirements:

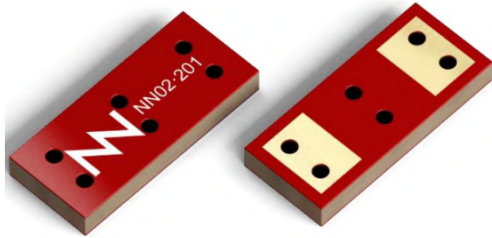
§ Frequency band coverage: Lora: 863-870MHz or 900-912MHz or 902-928MHz

§ Number of antennas: 1

§ PCB size: 58X51mm

§ Selected antenna: NN02-201

2. Planned antenna to be used



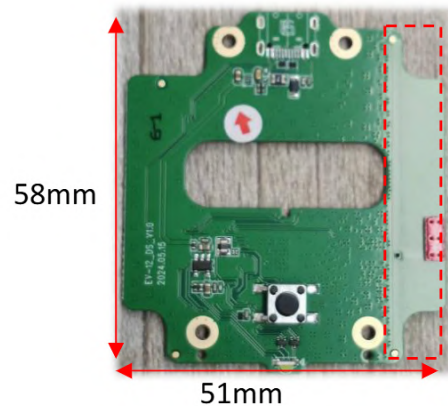
PN: NN02_201

ONE mXTEND™ ANTENNA BOOSTER (NN02-201)

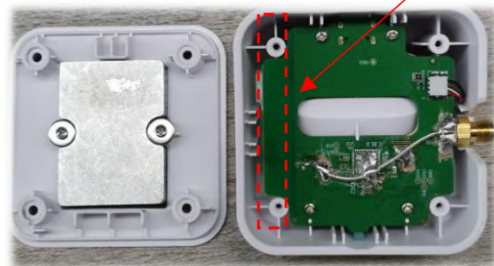
This product and/or its use is protected by at least the following patents and other domestic and international patents pending. Any update on new patents linked to this product will appear in <https://ignion.io/files/Patent-list-NN.pdf>



3. Assembly



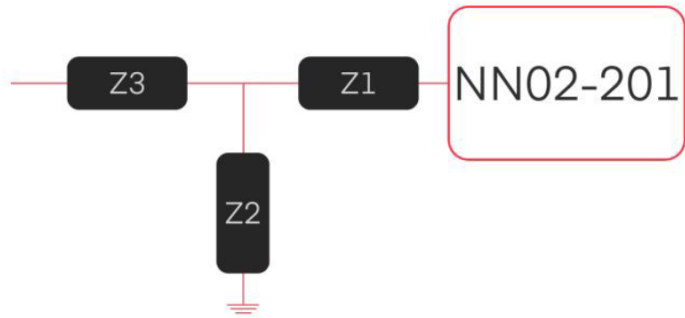
天线位置
NN02-201天线净空区:
8X58mm



SMA连接器



4. Recommended Antenna Matching Network Circuit



EV12 Charger 906MHz Ver Proposed Matching Network 1

Z	Value	Part Number
Z_1	33nH	LQW15AN33NG00
Z_2	5.8nH	LQW15AN5N8B00
Z_3	1.8pF	GJM1555C1H1R8WB01

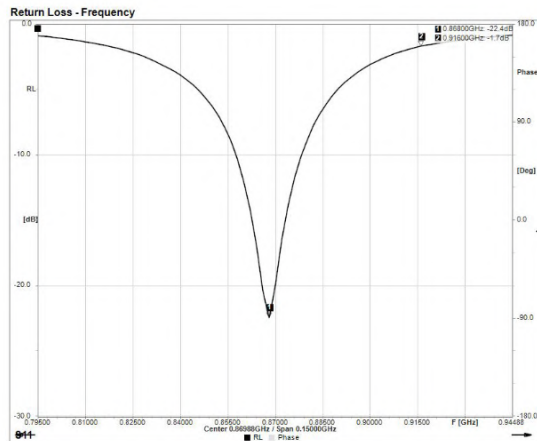
EV2 Charger 868MHz Ver Proposed Matching Network 1

Z	Value	Part Number
Z_1	39nH	LQW15AN39NG00
Z_2	6.5nH	LQW15AN6N5G80
Z_3	4.7nH	LQW15AN4N7B80

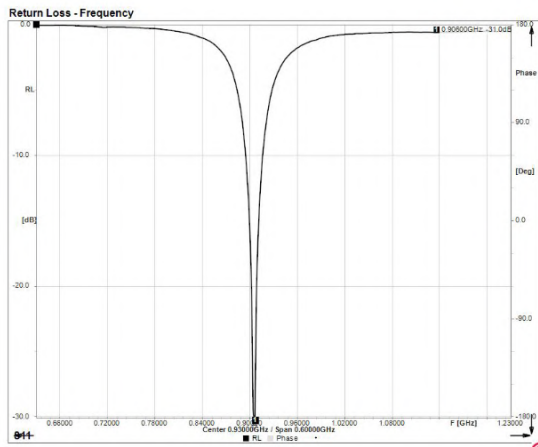
EV12 Charger 916MHz Ver Proposed Matching Network 1

Z	Value	Part Number
Z_1	33nH	LQW15AN33NG00
Z_2	5.2nH	LQW15AN5N2B80
Z_3	2.2pF	GJM1555C1H2R2WB01

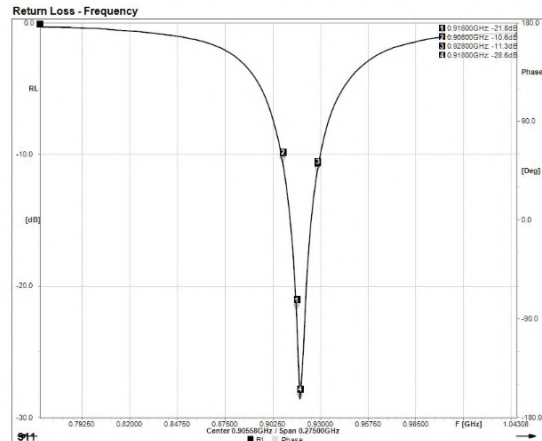
5.1 Performance Analysis: Antenna reflection coefficient after debugging (dB)



868MHz version

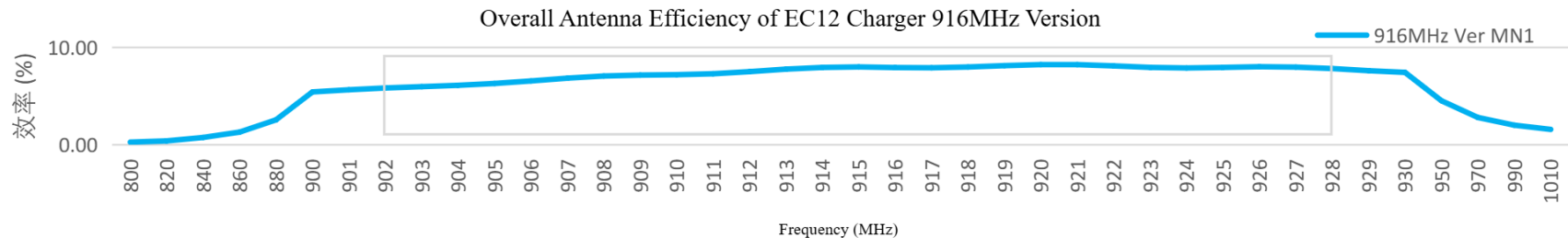


906MHz version



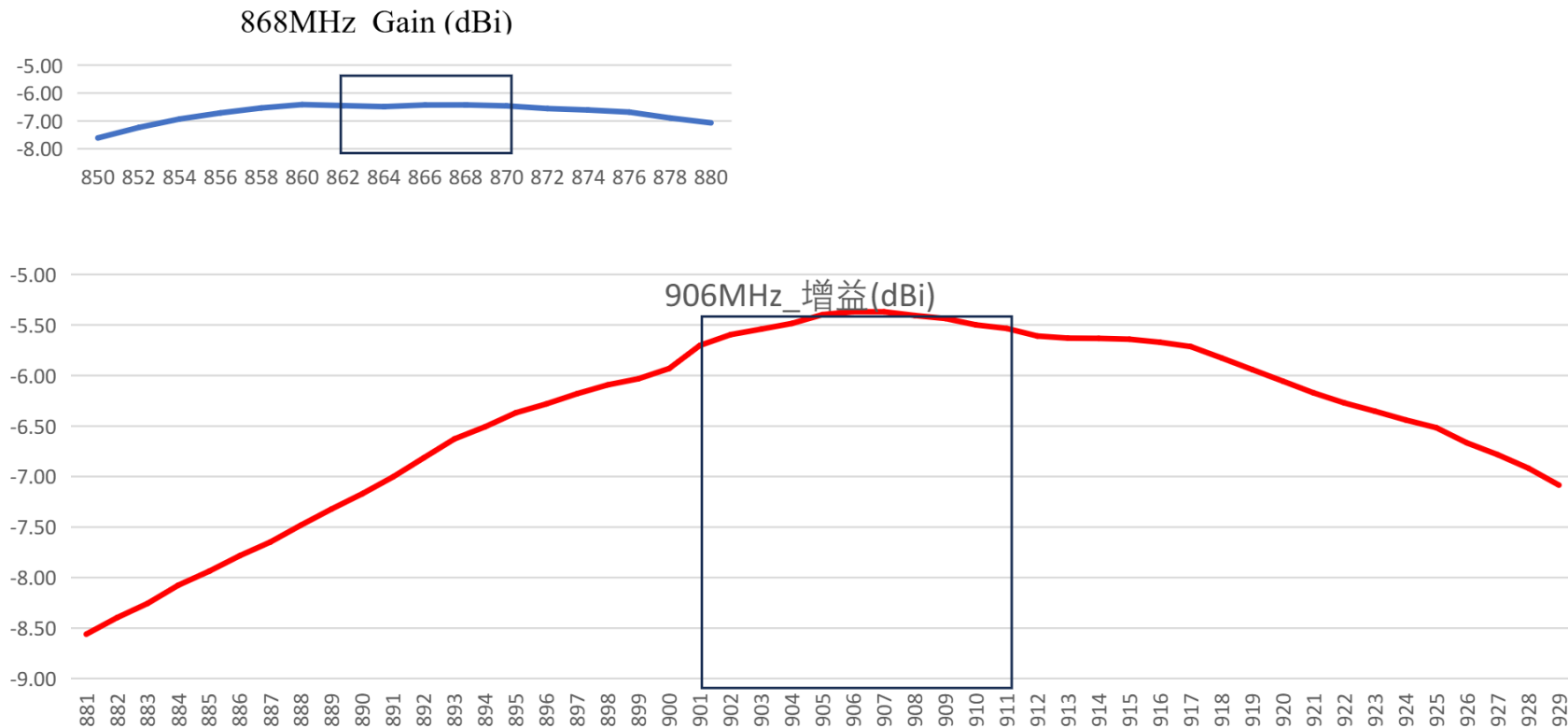
916MHz version

5.2.1 Performance Analysis: Antenna Radiation Efficiency (%)



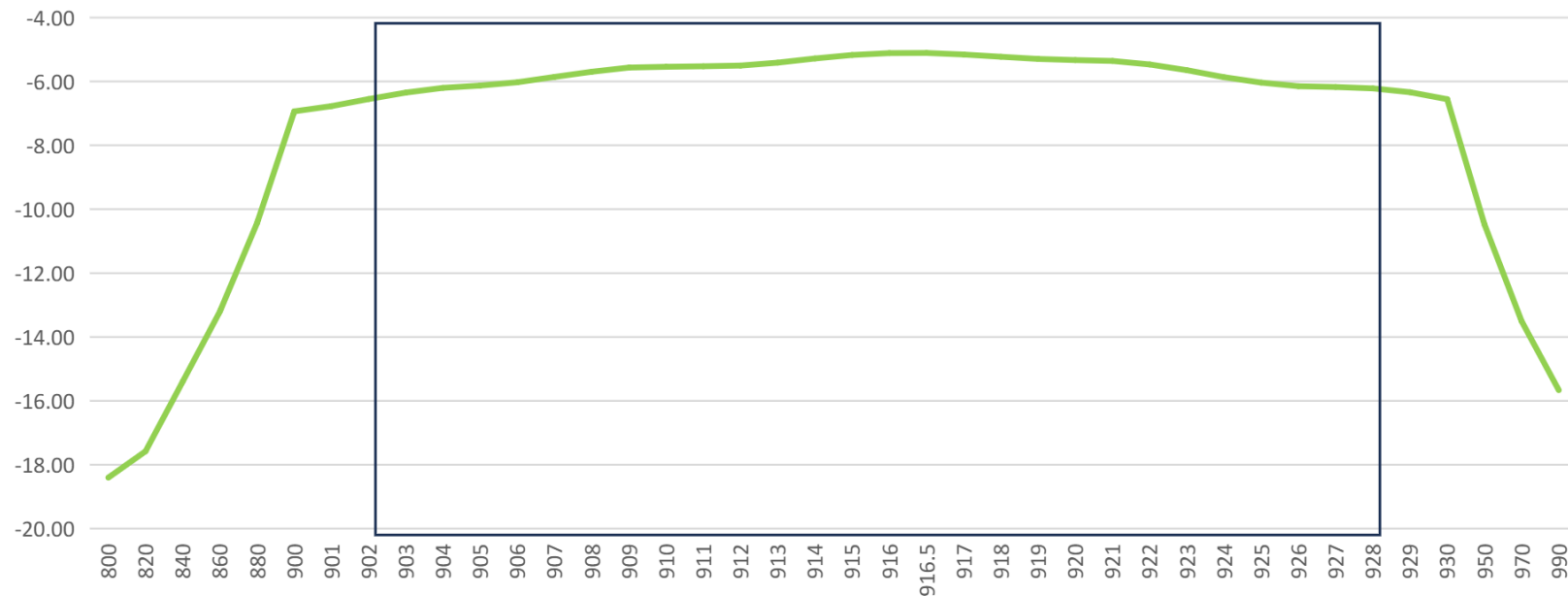
Frequency (MHz)	864	868	872	Average
868MHz Version Full Device Efficiency (%)	9.03	9.06	8.71	8.96
Frequency (MHz)	900	906	912	Average
906MHz Version Full Device Efficiency (%)	8.46	9.51	9.2	9.26
Frequency (MHz)	902	916	928	Average
916MHz Version Full Device Efficiency (%)	5.84	7.93	7.83	7.47

5.2.2 Performance Analysis: Antenna Gain (dBi)



5.2.2 Performance Analysis: Antenna Gain (dBi)

916MHz Gain (dBi)



5.2.2 Performance Analysis: Antenna Gain (dBi)

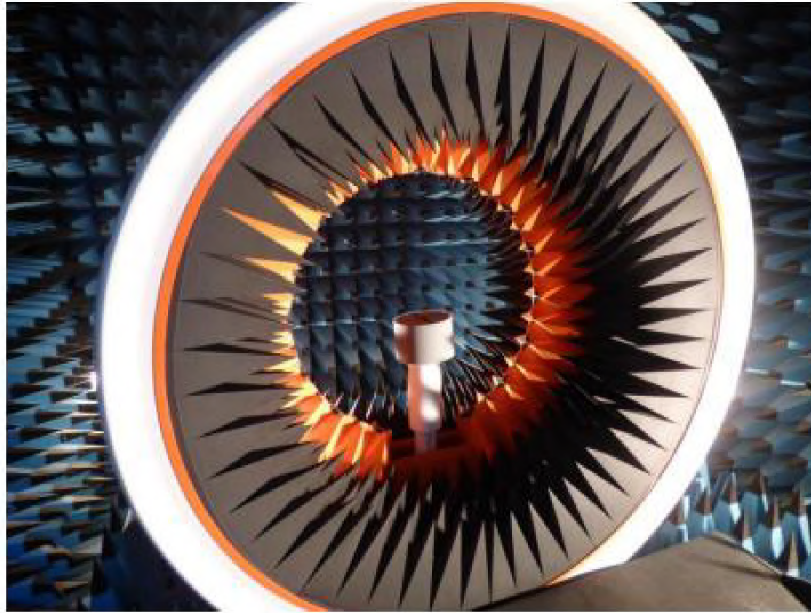
868MHz		
频率 (MHz)	效率 (%)	增益 (dBi)
850MHz	7.08	-7.61
852MHz	7.58	-7.23
854MHz	8.04	-6.93
856MHz	8.43	-6.71
858MHz	8.75	-6.53
860MHz	8.95	-6.41
862MHz	9.02	-6.45
864MHz	9.03	-6.49
866MHz	9.07	-6.43
868MHz	9.06	-6.42
870MHz	8.94	-6.40
872MHz	8.71	-6.56
874MHz	8.49	-6.61
876MHz	8.25	-6.68
878MHz	7.94	-6.89
880MHz	7.61	-7.07

906MHz		
频率	效率 (%)	增益 (dBi)
880MHz	4.77	-8.71
881MHz	4.94	-8.56
882MHz	5.11	-8.40
883MHz	5.28	-8.26
884MHz	5.45	-8.08
885MHz	5.62	-7.94
886MHz	5.79	-7.78
887MHz	5.98	-7.65
888MHz	6.18	-7.48
889MHz	6.38	-7.32
890MHz	6.59	-7.17
891MHz	6.80	-7.00
892MHz	7.01	-6.81
893MHz	7.21	-6.63
894MHz	7.40	-6.51
895MHz	7.60	-6.37
896MHz	7.80	-6.28
897MHz	7.99	-6.18
898MHz	8.16	-6.09
899MHz	8.30	-6.03
900MHz	8.46	-5.93
901MHz	8.94	-5.70
902MHz	9.05	-5.60
903MHz	9.17	-5.54
904MHz	9.30	-5.48
905MHz	9.44	-5.40
906MHz	9.51	-5.37
907MHz	9.56	-5.37
908MHz	9.55	-5.41
909MHz	9.51	-5.44
910MHz	9.42	-5.50
911MHz	9.30	-5.53
912MHz	9.20	-5.61
913MHz	9.14	-5.63
914MHz	9.07	-5.63
915MHz	9.02	-5.64
916MHz	8.98	-5.67
917MHz	8.88	-5.71
918MHz	8.73	-5.83
919MHz	8.53	-5.94
920MHz	8.28	-6.06
921MHz	8.09	-6.17
922MHz	7.89	-6.27
923MHz	7.73	-6.35
924MHz	7.57	-6.44
925MHz	7.41	-6.52
926MHz	7.24	-6.67
927MHz	7.06	-6.78
928MHz	6.85	-6.92
929MHz	6.59	-7.08
930MHz	6.35	-7.23

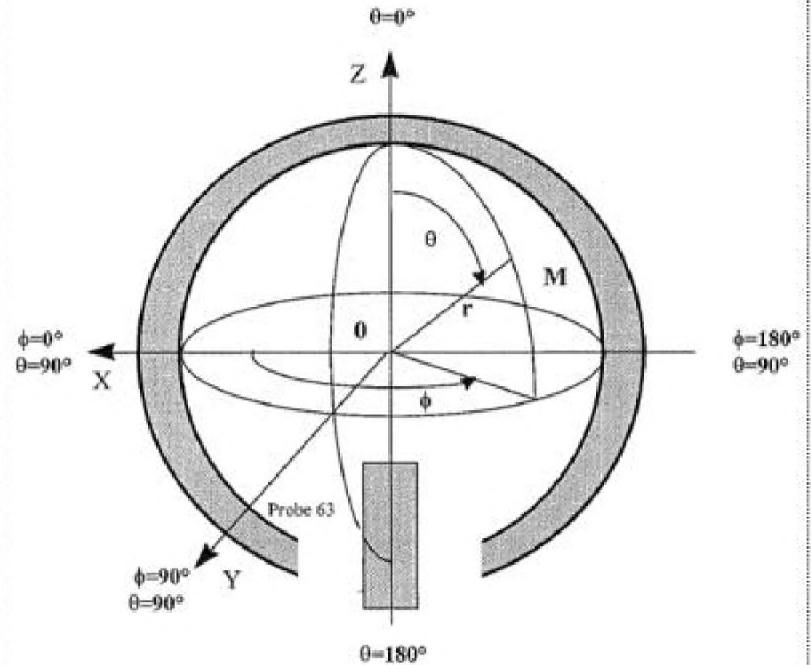
916MHz		
频率	效率 (%)	增益 (dBi)
800MHz	0.36	-18.40
820MHz	0.41	-17.58
840MHz	0.67	-15.40
860MHz	1.05	-13.20
880MHz	1.96	-10.43
900MHz	4.39	-6.94
901MHz	4.59	-6.77
902MHz	4.75	-6.55
903MHz	4.87	-6.35
904MHz	5.01	-6.20
905MHz	5.19	-6.13
906MHz	5.42	-6.02
907MHz	5.67	-5.86
908MHz	5.84	-5.69
909MHz	5.92	-5.56
910MHz	5.95	-5.54
911MHz	6.03	-5.52
912MHz	6.20	-5.50
913MHz	6.38	-5.41
914MHz	6.47	-5.28
915MHz	6.47	-5.17
916MHz	6.36	-5.11
916.5MHz	6.33	-5.11
917MHz	6.29	-5.16
918MHz	6.28	-5.23
919MHz	6.30	-5.29
920MHz	6.27	-5.33
921MHz	6.16	-5.36
922MHz	5.94	-5.47
923MHz	5.71	-5.65
924MHz	5.55	-5.87
925MHz	5.45	-6.04
926MHz	5.37	-6.15
927MHz	5.20	-6.17
928MHz	4.98	-6.22
929MHz	4.73	-6.34
930MHz	4.53	-6.56
950MHz	1.89	-10.47
970MHz	0.94	-13.50
990MHz	0.56	-15.66
1010MHz	0.39	-17.20

5.3 Antenna Pattern Testing System

MVG StarLab18



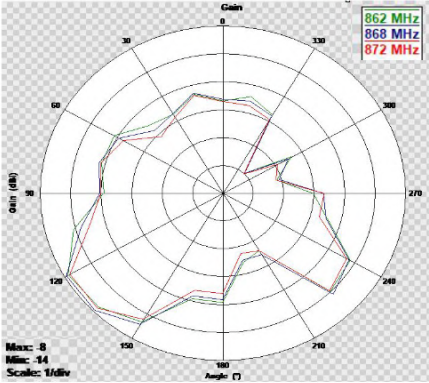
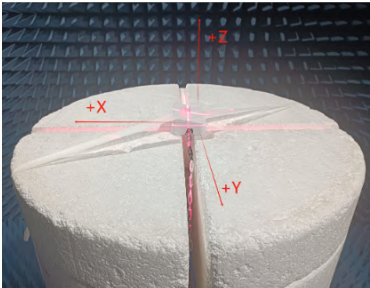
Measurement coordinate system



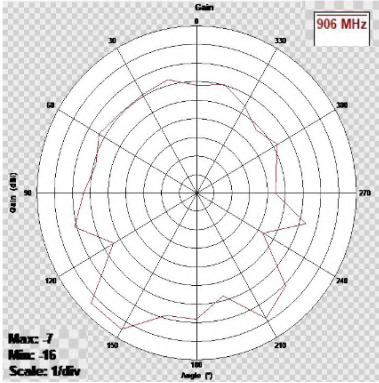
5.3 Antenna Radiation Pattern (1/3)

Plane XZ

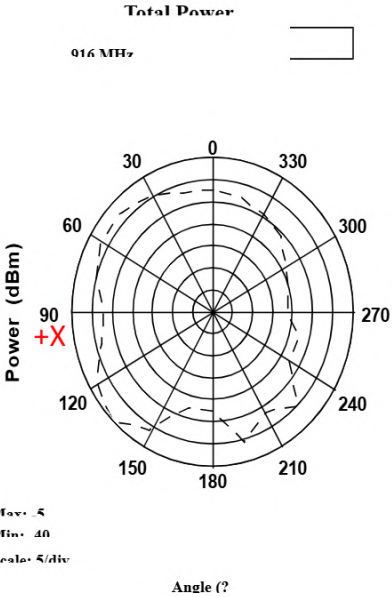
Y=0



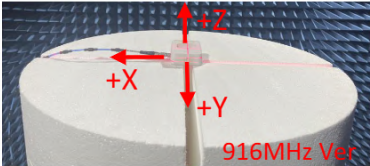
868MHz version



906MHz version



916MHz version

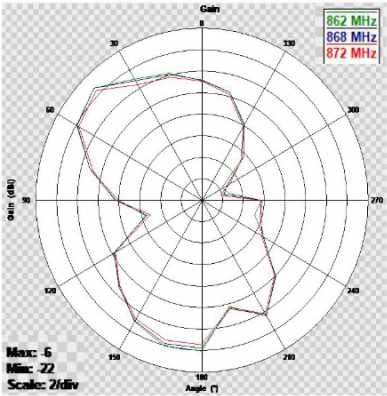
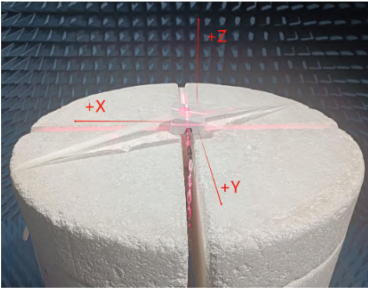


5.3 Antenna Radiation Pattern (2/3)

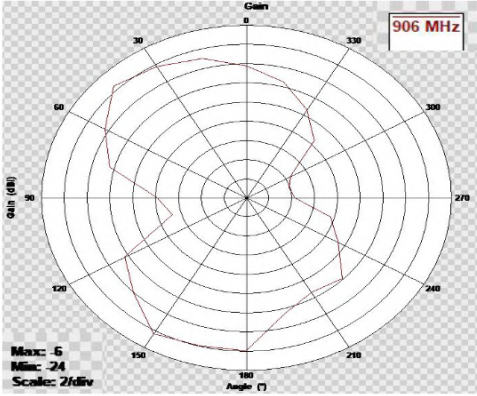
$n = 90^{\circ}$

Plane YZ

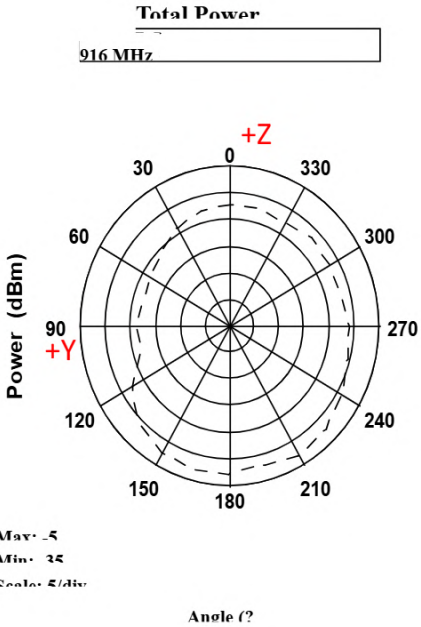
$X = 0$



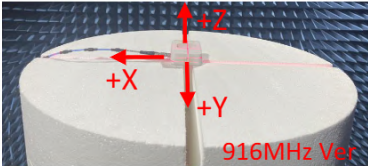
868MHz version



906MHz version



916MHz version

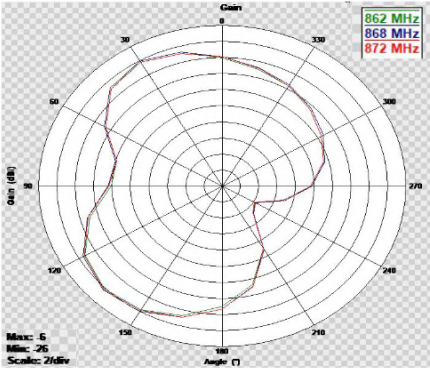
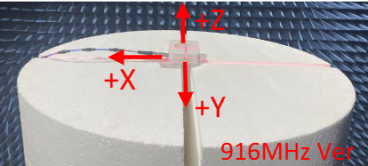
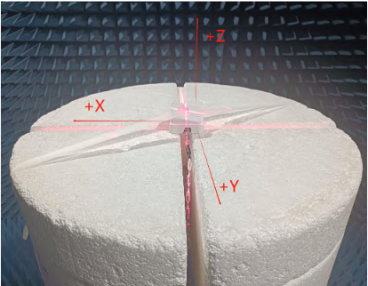


5.3 Antenna Radiation Pattern (3/3)

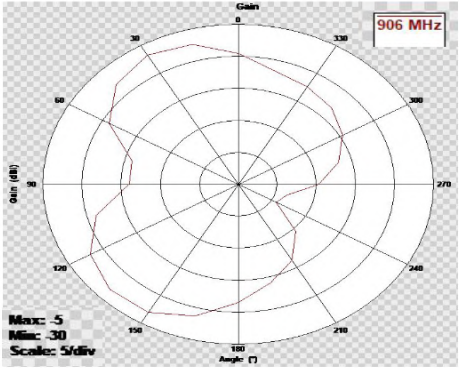
$\theta \approx 90^\circ$

Flat XY

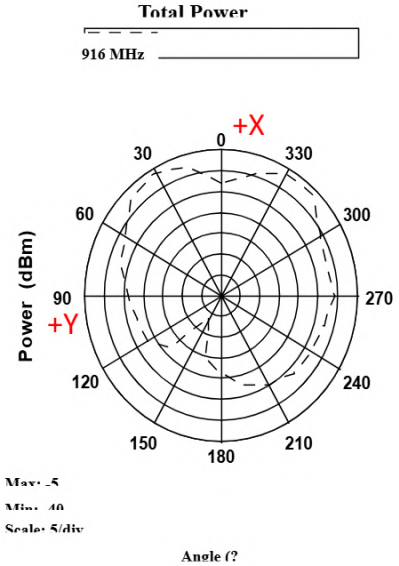
$Z = 0$



868MHz version



906MHz version



916MHz version

6. Summary

§ NN02-201 is applied to Lora application design, covering 863-930MHz, and has undergone optimized matching

Post-test results:

$$-VSWR < 1.16 \quad (868MHz)$$

§ Overall antenna efficiency: 9.06% (868MHz)

$$-VSWR < 1.10(906MHz)$$

§ Overall antenna efficiency: 9.51% (906MHz)

$$-VSWR < 1.18(916MHz)$$

§ Overall antenna efficiency: 7.93% (916MHz)

§ The above test results are obtained after the whole machine is debugged and tested

Antenna position



Get in touch.



ignion.io



info@ignion.io

Barcelona

Av. Alcalde Barnils 64-68,

Module C

Add to cart

Barcelona, 08174

Spain

+34 935 660 710

Shenzhen

Bike Technology Building

Floor 1301F

No. 9 Keyan Road, Nanshan

深圳, 518057

China

+86 138 2653 8470

Tampa

8875 Hidden River Parkway, Suite
300

Tampa, FL 33637

United
States

+1 888 726 8366