

## Unlicensed Transmitters: Approved Antennas List

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<i>Manufacturer</i>	<i>Antenna</i>	<i>Description</i>	<i>Type</i>	<i>Peak Gain (dBi)</i>	<i>Min Cable loss (dB)</i>	<i><math>\Omega</math></i>	<i>Connector Type</i>	<i>Notes</i>
Quectel	YC0010AA	2400–2500 MHz	Chip antenna	4.36	0	50	NA	Metal Plane

**Notes:**

- 1) Antenna is approved by similarity with equivalent or lesser gain.
- 2) Antenna gain declared in linear terms converted from dBiC

**QUECTEL**



# Passive Antenna Testing With Antenna Matching

Build a Smarter World

17<sup>th</sup> November, 2024

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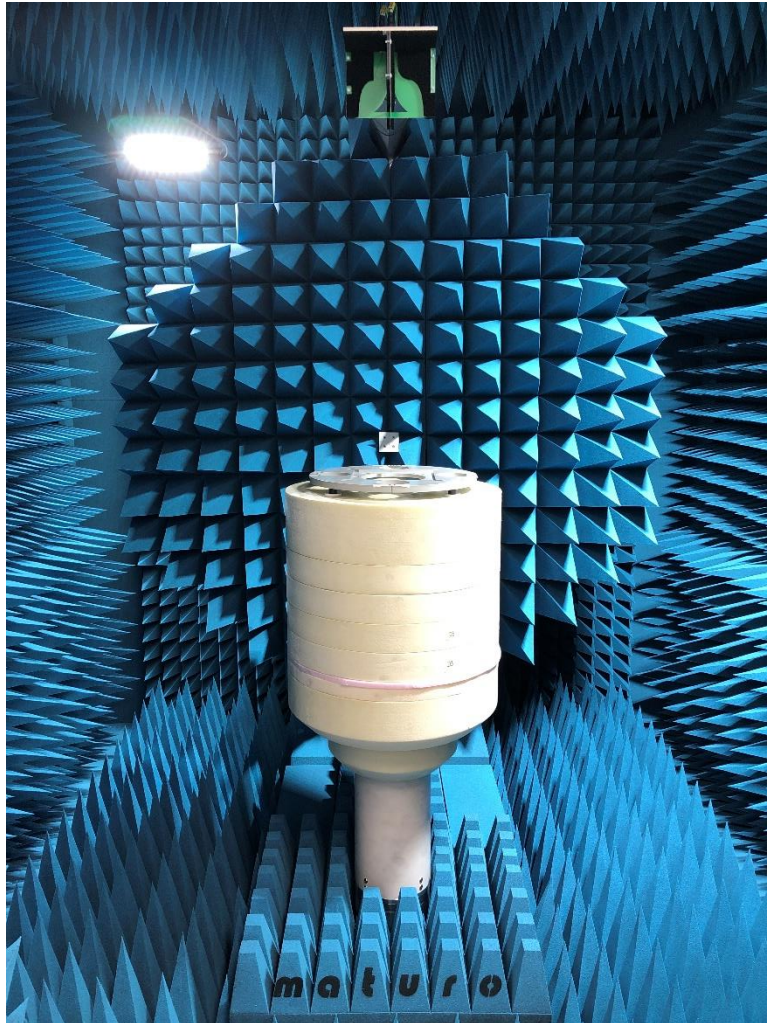
Reviewed by:  
Milivoje Miletic, section manager  
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# Efficiency Measurement Setup



## R&S WPTC-XS chamber



## R&S VNA ZNB8



\*Uncertainty of the efficiency measurement is  $\pm 1.5$  dB.

# Efficiency Measurement Setup

All antennas are tested in two scenarios:

- Free space
- Metal plane

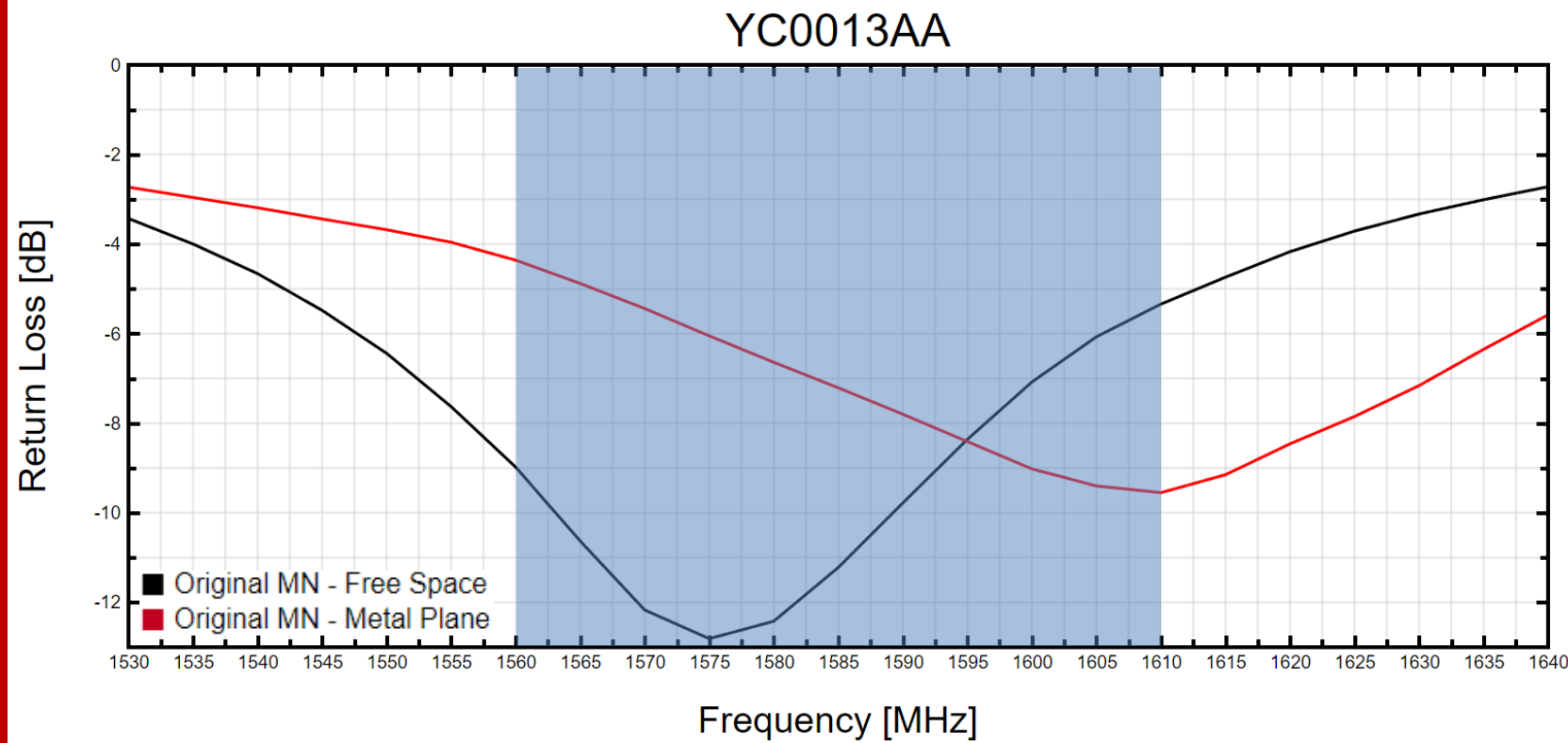
Free Space



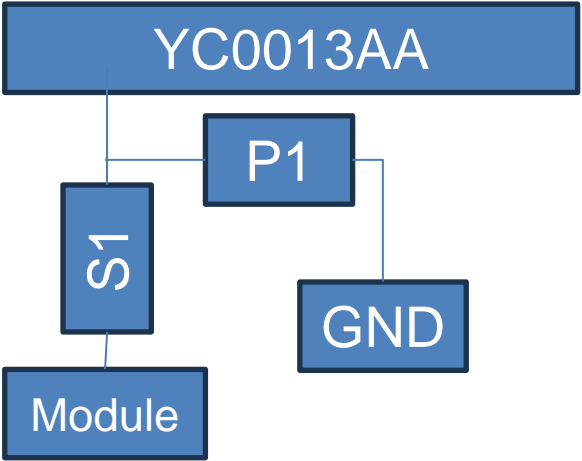
Metal plane



# YC0013AA – Return Loss Results



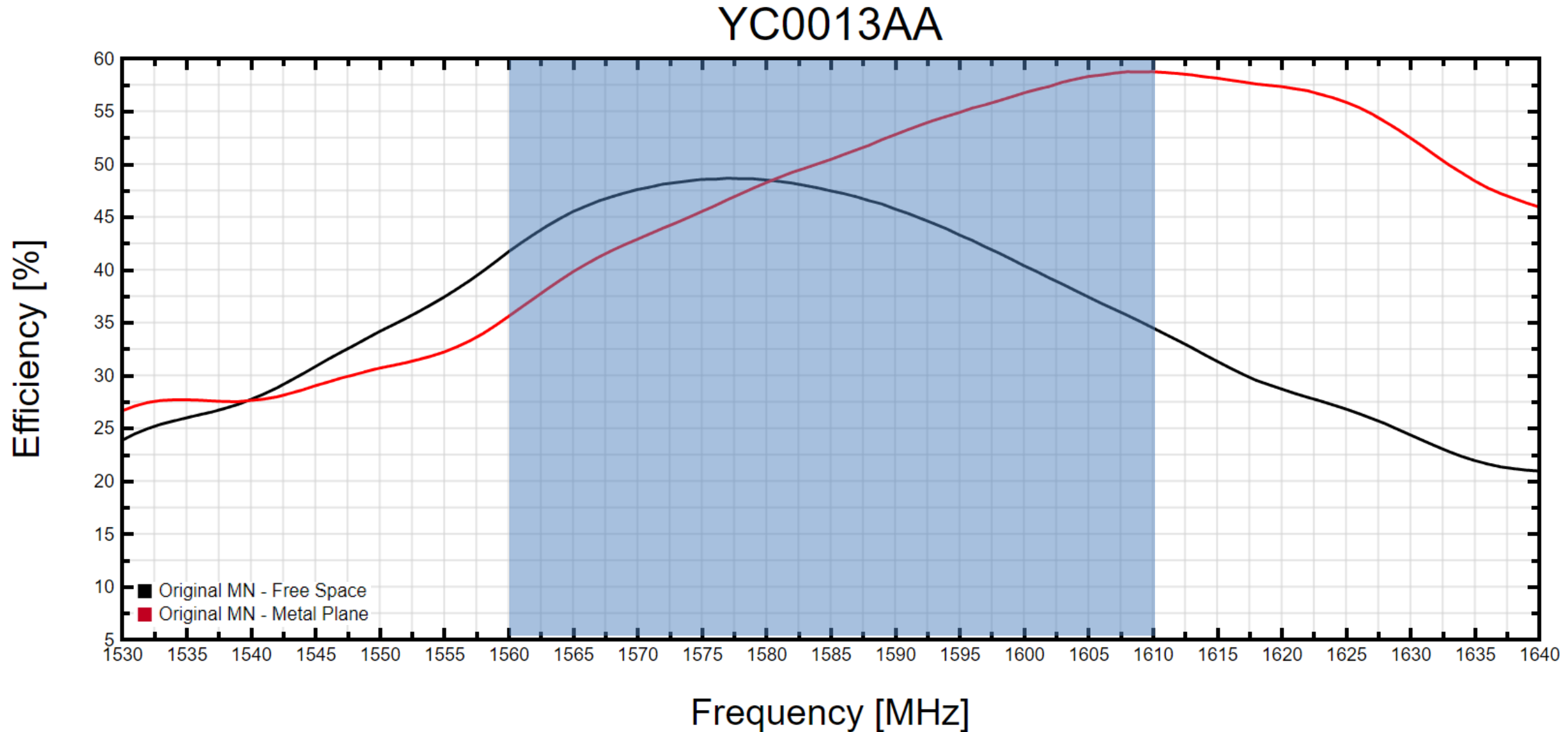
YC0013AA antenna is tested with original matching network. Antenna performance is good, so no additional matching was performed.



Matching Network 1		
Designation	Value	Part Number
P1	5.6 nH	N/A (from customer's schematics)
S1	0 Ohm	N/A (from customer's schematics)



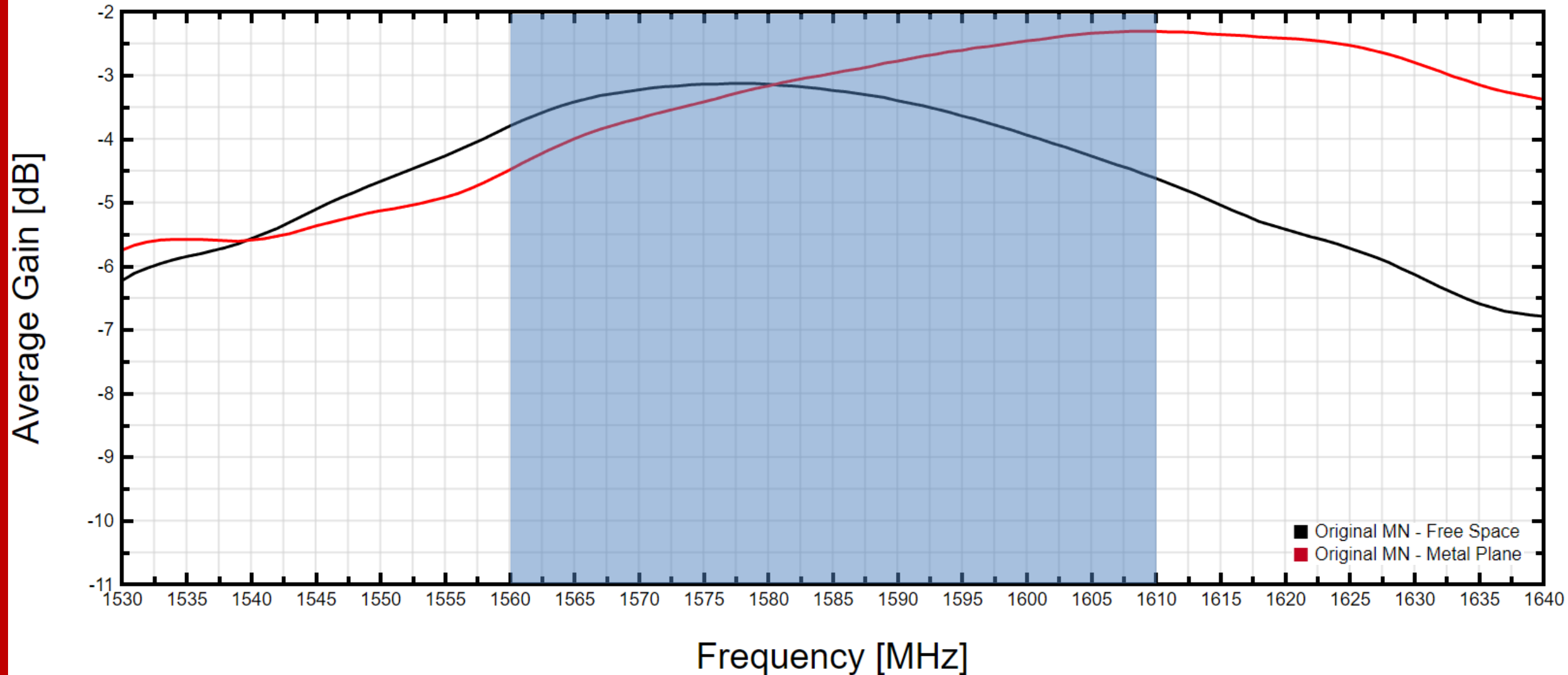
# YC0013AA – Efficiency Results



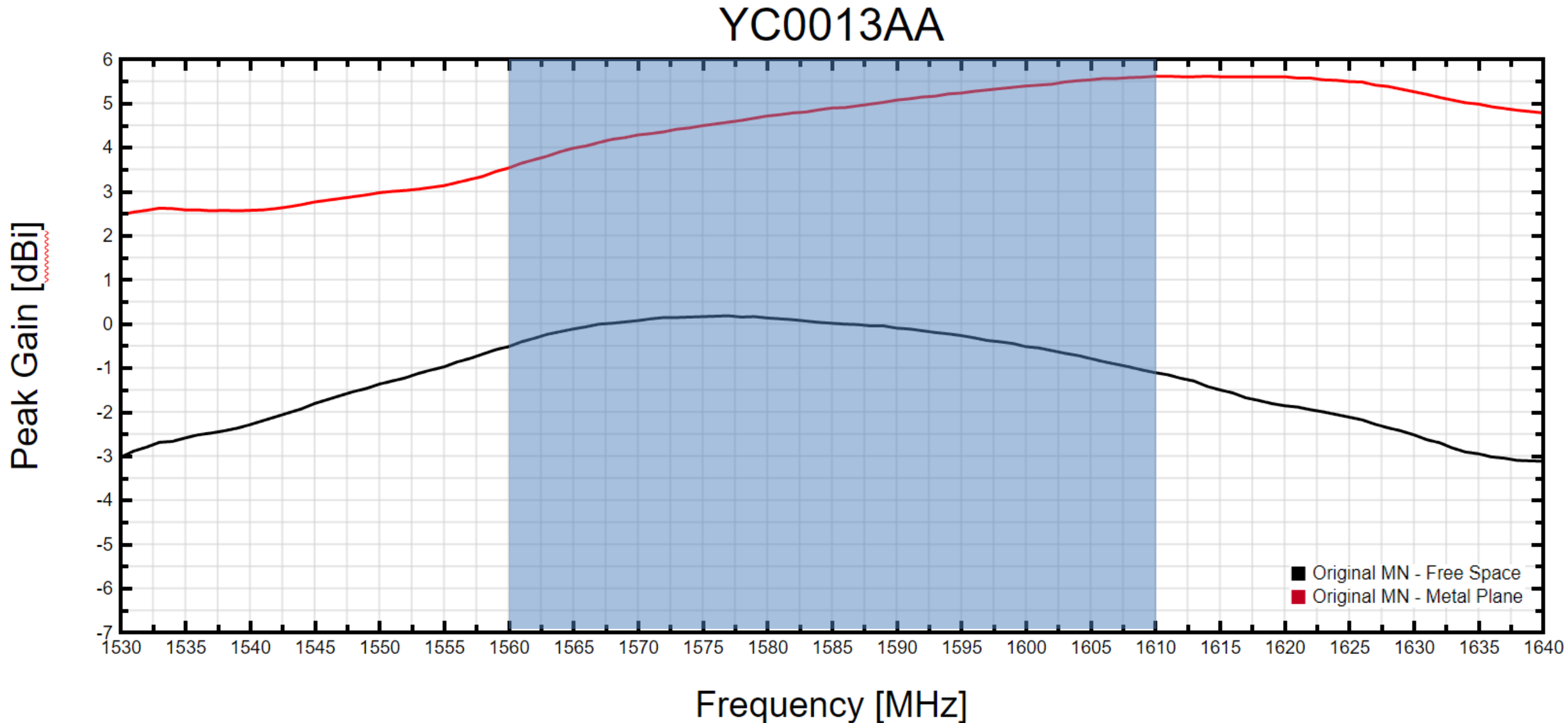
# YC0013AA – Average Gain Results



YC0013AA



# YC0013AA – Peak Gain Results

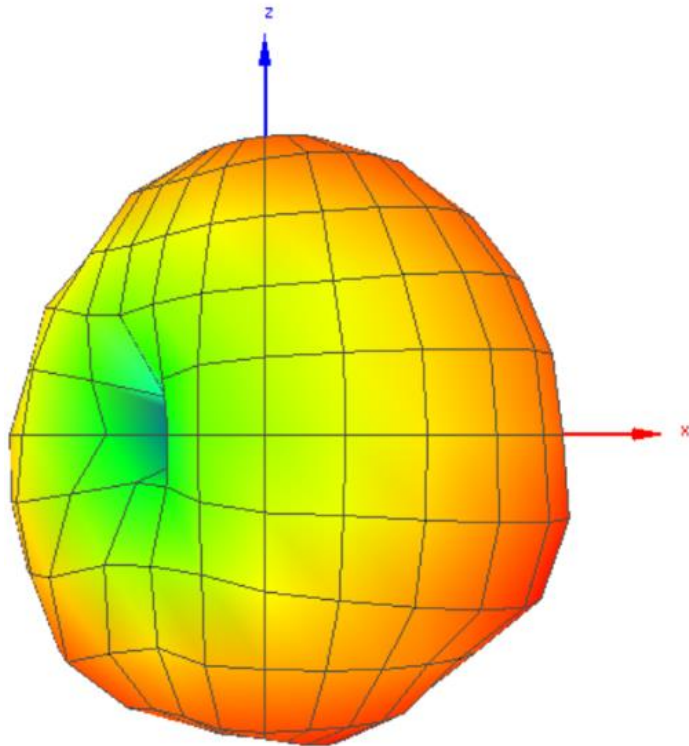
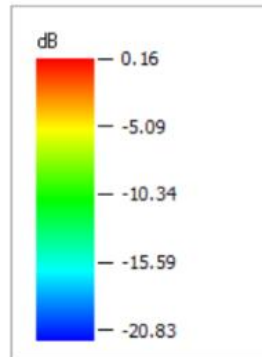




# YC0013AA – Radiation Pattern



TRP = -3.14 dB

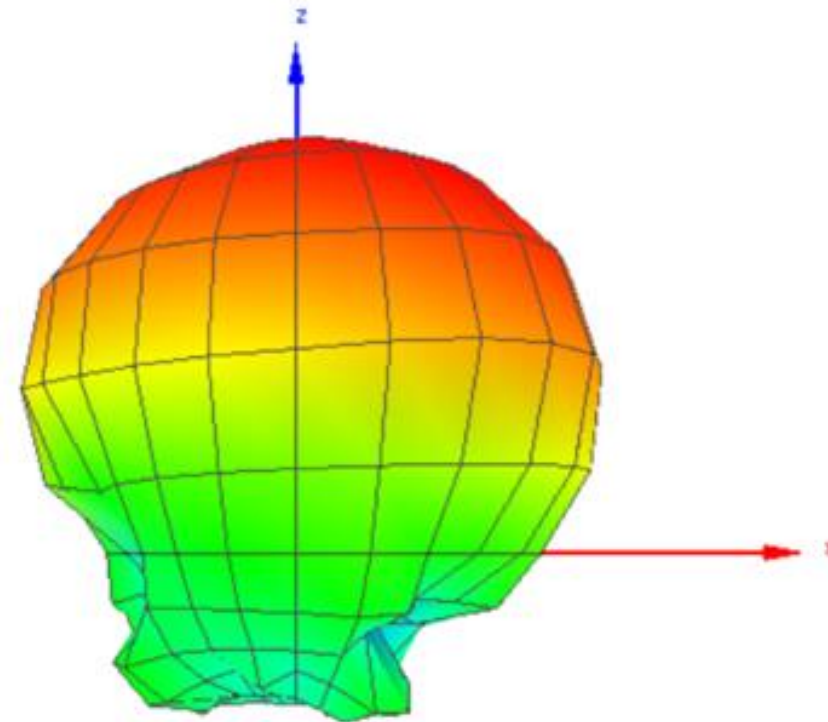
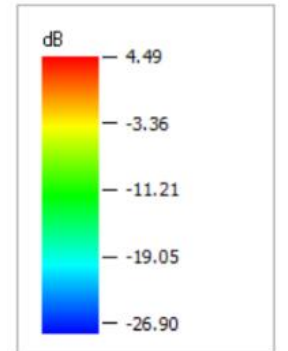


Max.: 0.16 dB  
Theta: 120.00 deg  
Phi: 0.00 deg  
Test Time: 00:03:15

Current View: Theta: 90.00 deg Phi: 270.00 deg

1575 MHz – Free Space

TRP = -3.42 dB



Max.: 4.49 dB  
Theta: 15.00 deg  
Phi: 300.00 deg  
Test Time: 00:03:15

Current View: Theta: 90.00 deg Phi: 270.00 deg

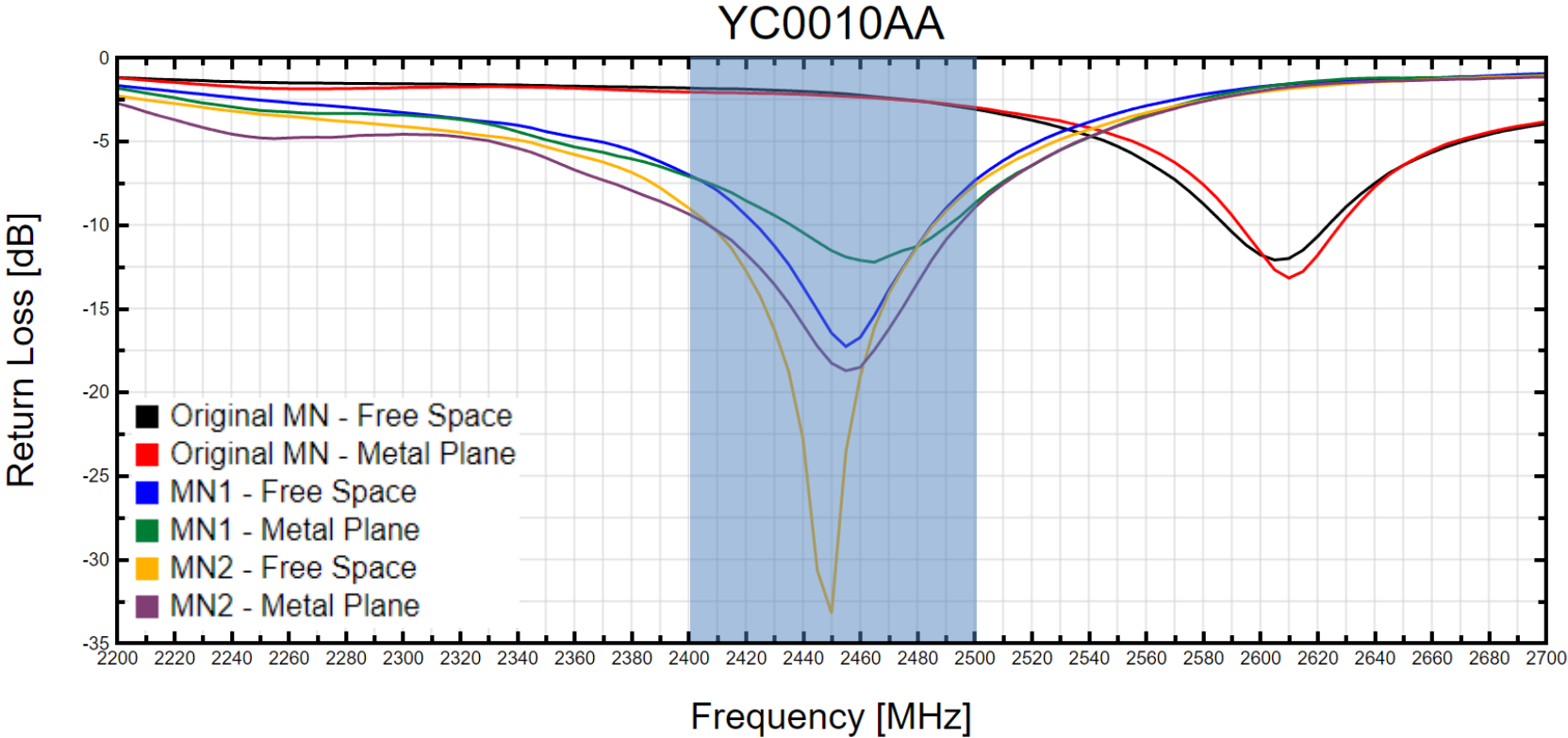
1575 MHz – Metal Plane

# YC0013AA – Results Table

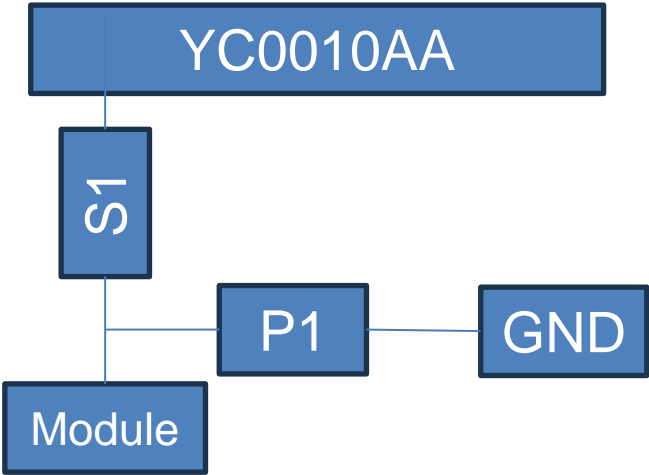


Data	Matching Network	Conditions	1575 MHz
Return Loss [dB]	Original	Free Space	-12.81
		Metal Plane	-6.05
Efficiency [%]	Original	Free Space	48.55
		Metal Plane	45.51
Peak Gain [dBi]	Original	Free Space	0.16
		Metal Plane	4.49
Average Gain [dB]	Original	Free Space	-3.14
		Metal Plane	-3.42

# YC0010AA – Return Loss Results



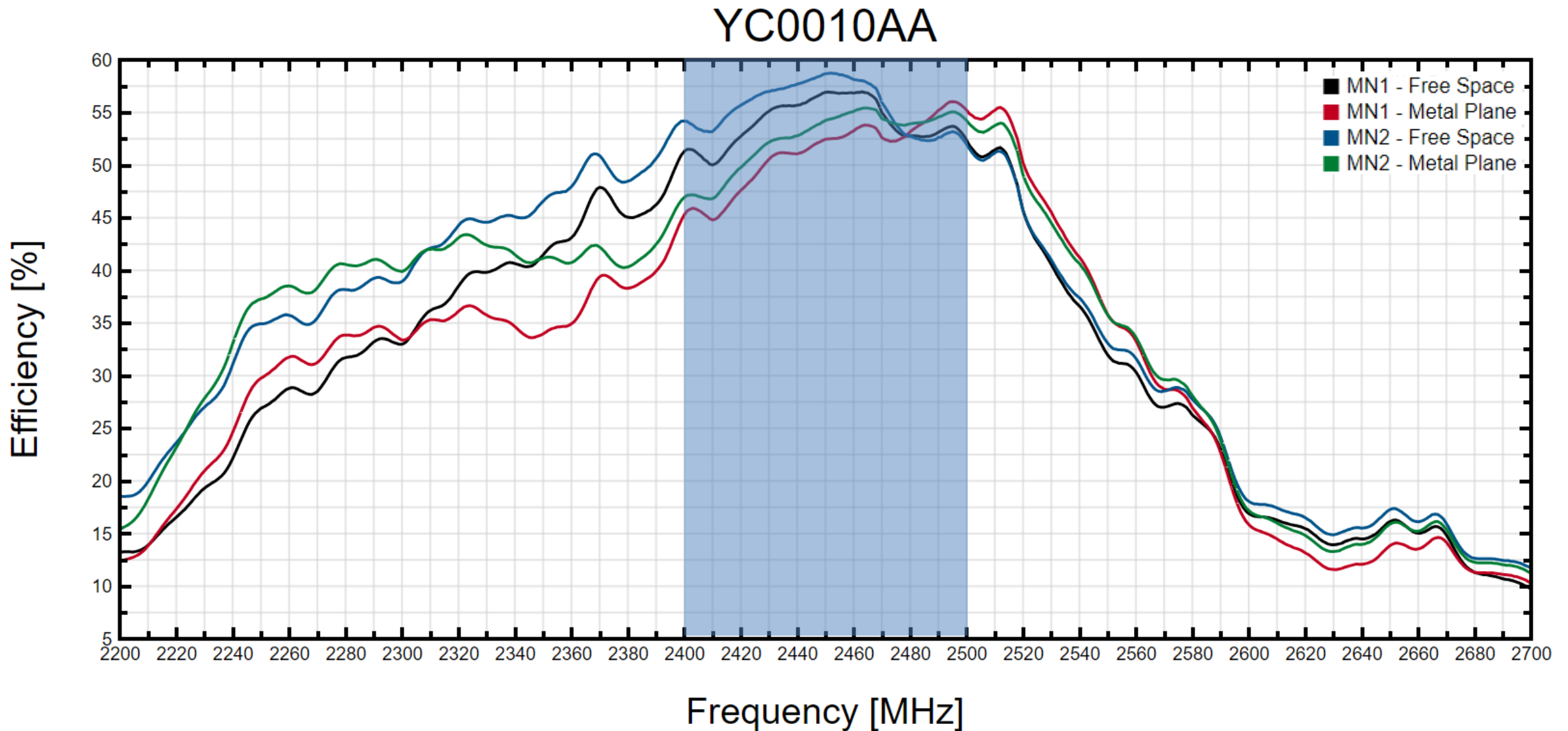
Original matching network did not give good performance, so additional matching was performed.



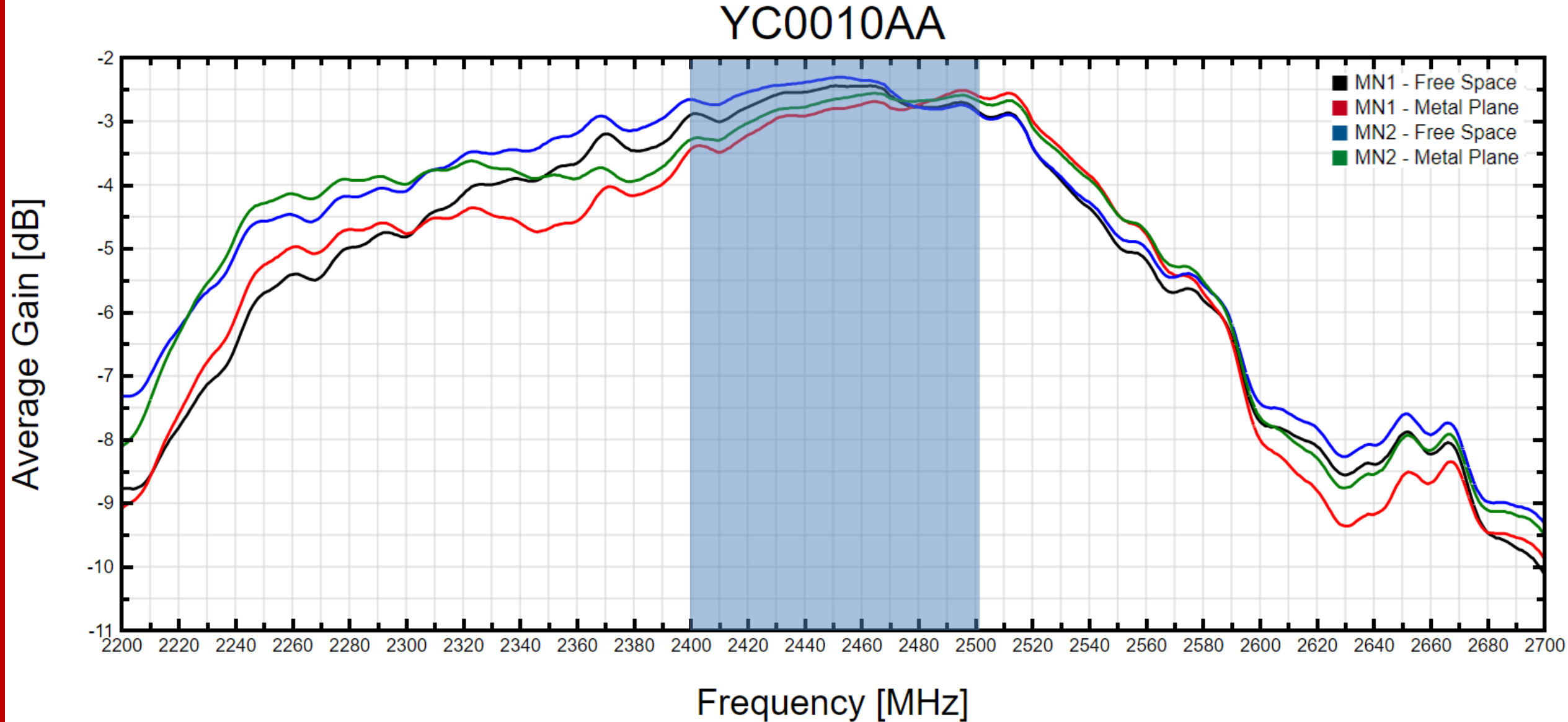
Matching Network	Components	Value	Part number
Original MN	S1	Original Values	
	P1		
MN 1	S1	4 pF	GJM1555C1H4R0BB01
	P1	1.3 nH	LQG15HS1N3B02
MN 2	S1	4 pF	GJM1555C1H4R0BB01
	P1	1.5 nH	LQG15HS1N5B02



# YC0010AA – Efficiency Results



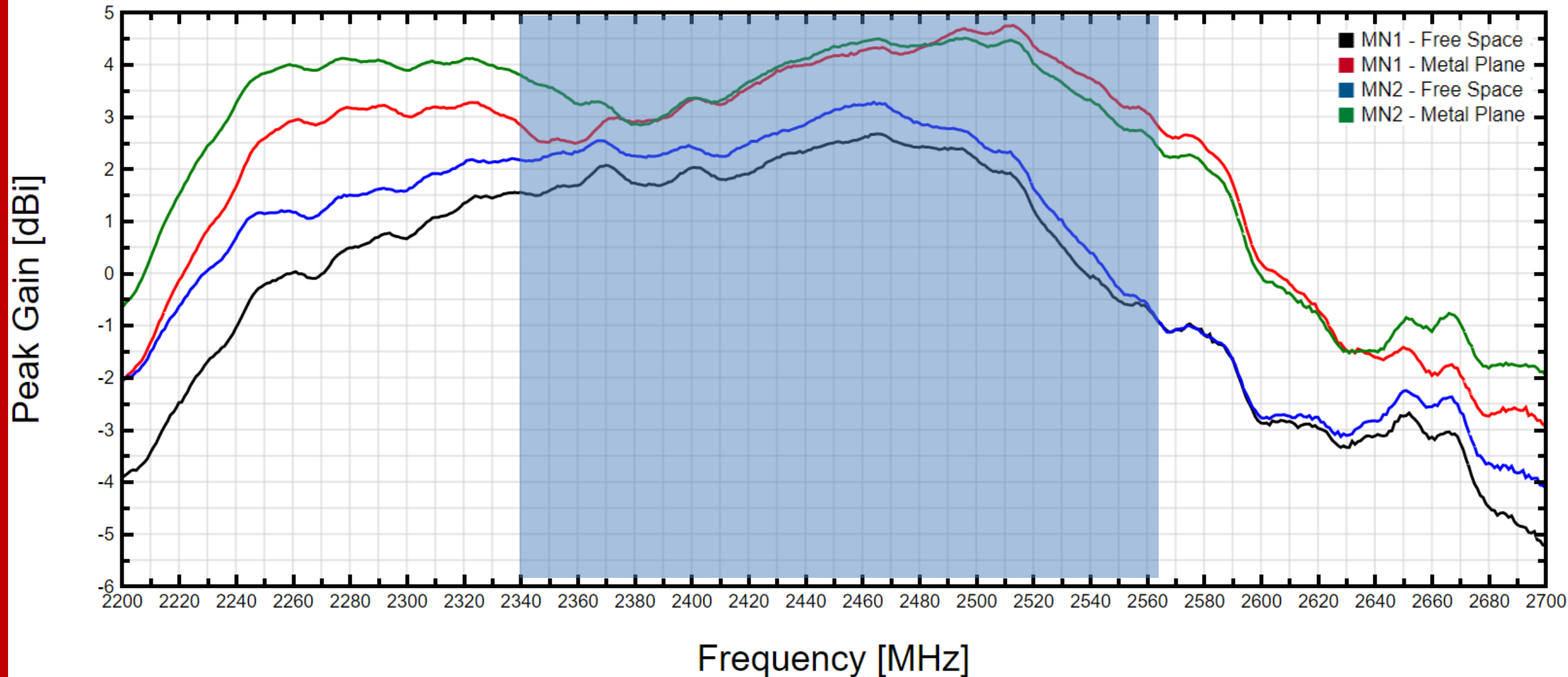
# YC0010AA – Average Gain Results



# YC0010AA – Peak Gain Results



YC0010AA



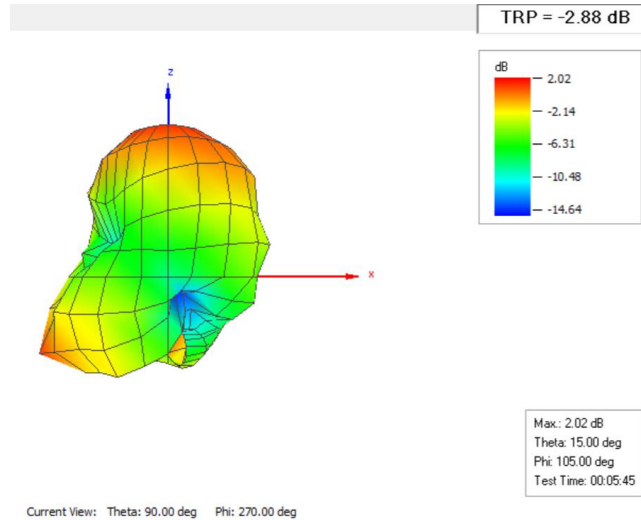


# YC0010AA (Matching Network 4) – Radiation Pattern

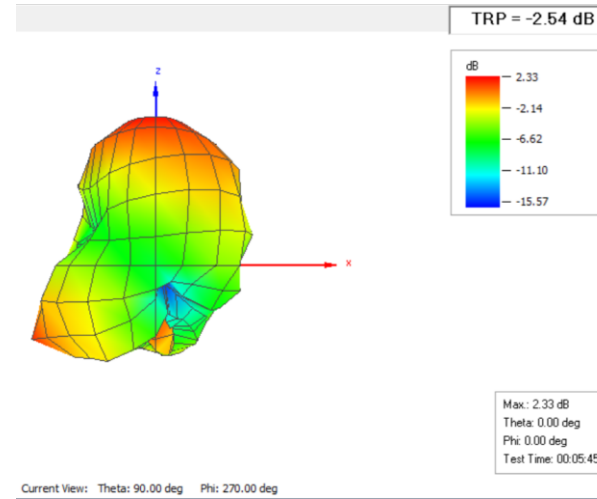


Free  
Space

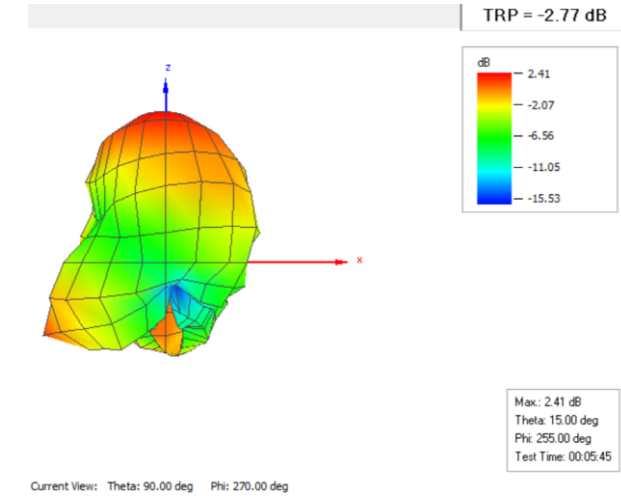
2402 MHz



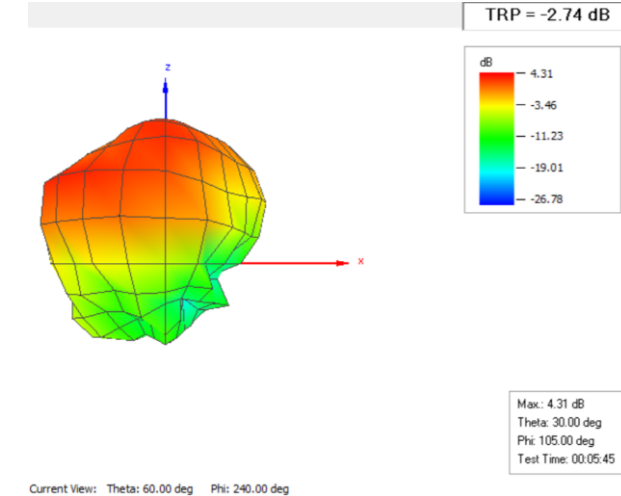
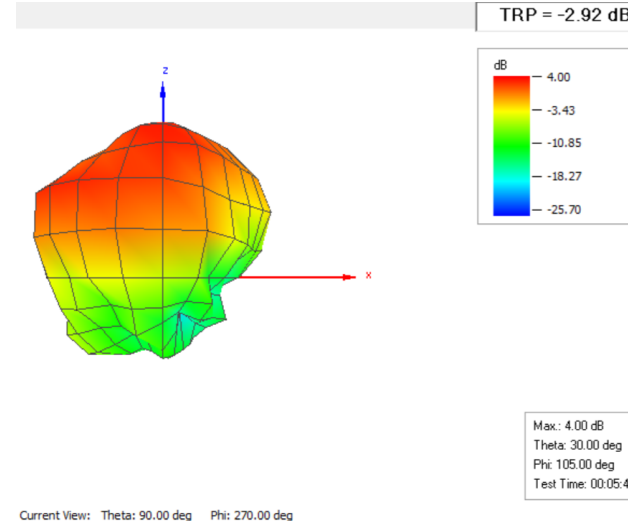
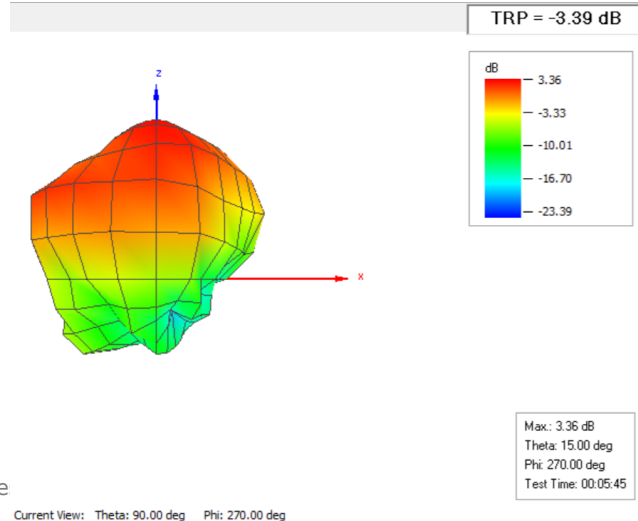
2440 MHz



2480 MHz



Metal  
Plane

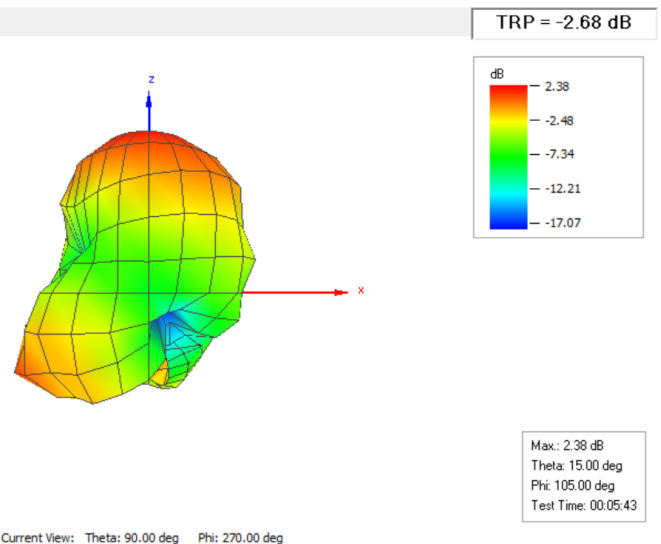


# YC0010AA (Matching Network 5) – Radiation Pattern

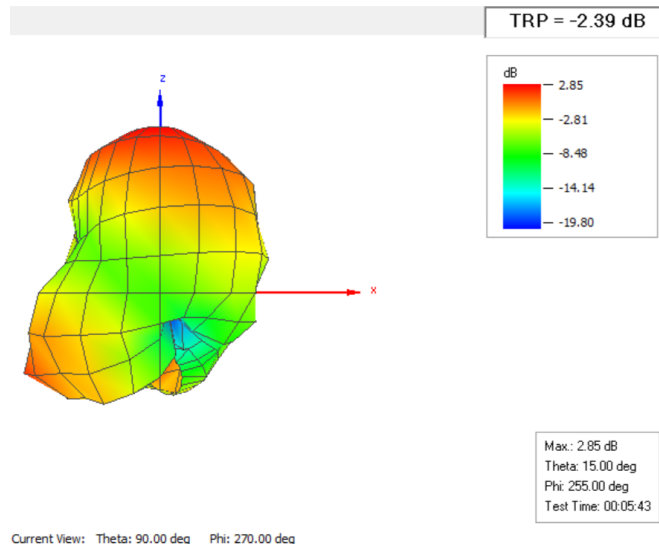


Free  
Space

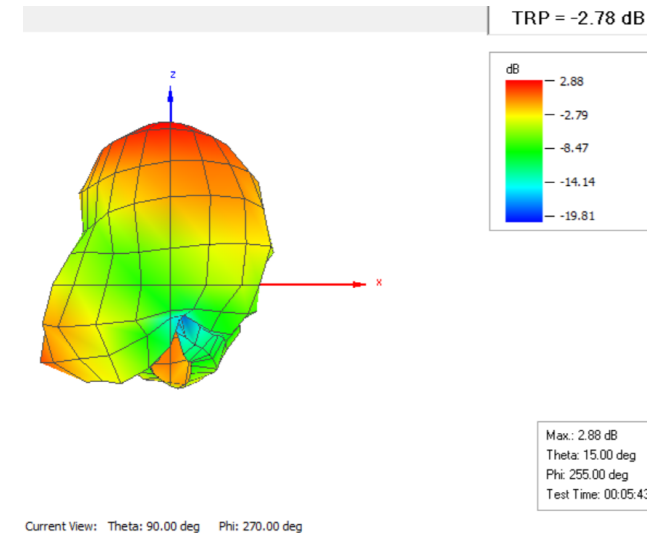
2402 MHz



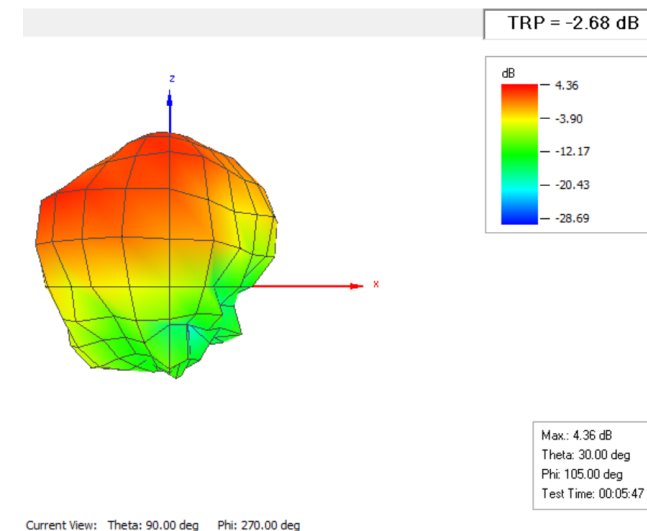
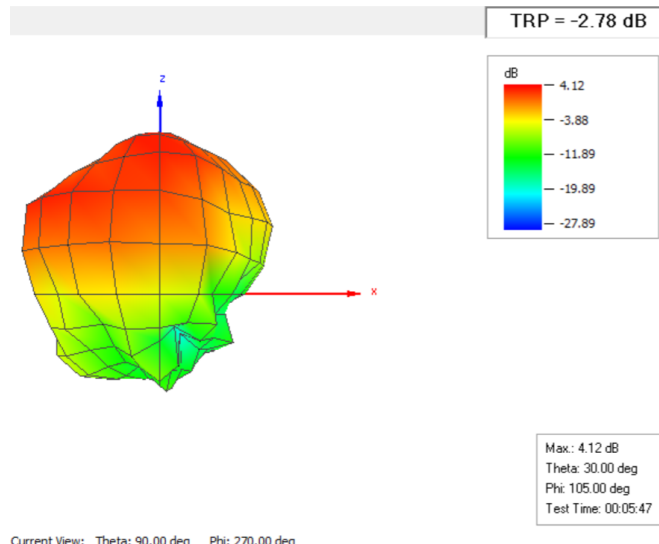
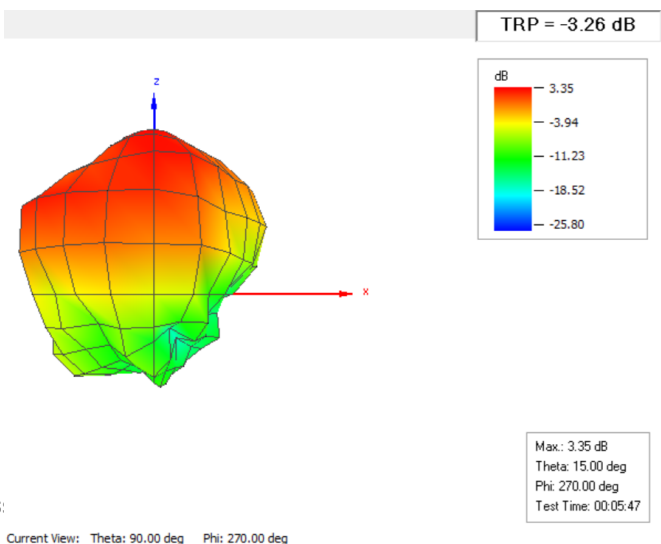
2440 MHz



2480 MHz



Metal  
Plane



# YC0010AA – Results Table



Data	Matching Network	Conditions	2402 MHz	2440 MHz	2480 MHz
Channel			Low	Mid	High
Return Loss [dB]	MN1	Free Space	-7.01	-13.70	-11.26
		Metal Plane	-7.10	-10.46	-11.27
	MN2	Free Space	-8.99	-22.80	-11.31
		Metal Plane	-9.35	-15.96	-13.49
Efficiency [%]	MN1	Free Space	51.48	55.69	52.78
		Metal Plane	45.80	51.07	53.16
	MN2	Free Space	53.96	57.69	52.73
		Metal Plane	47.16	52.78	53.92
Peak Gain [dBi]	MN1	Free Space	2.02	2.33	2.41
		Metal Plane	3.36	4.00	4.31
	MN2	Free Space	2.38	2.85	2.88
		Metal Plane	3.35	4.12	4.36
Average Gain [dB]	MN1	Free Space	-2.88	-2.54	-2.77
		Metal Plane	-3.39	-2.92	-2.74
	MN2	Free Space	-2.68	-2.39	-2.78
		Metal Plane	-3.26	-2.78	-2.68





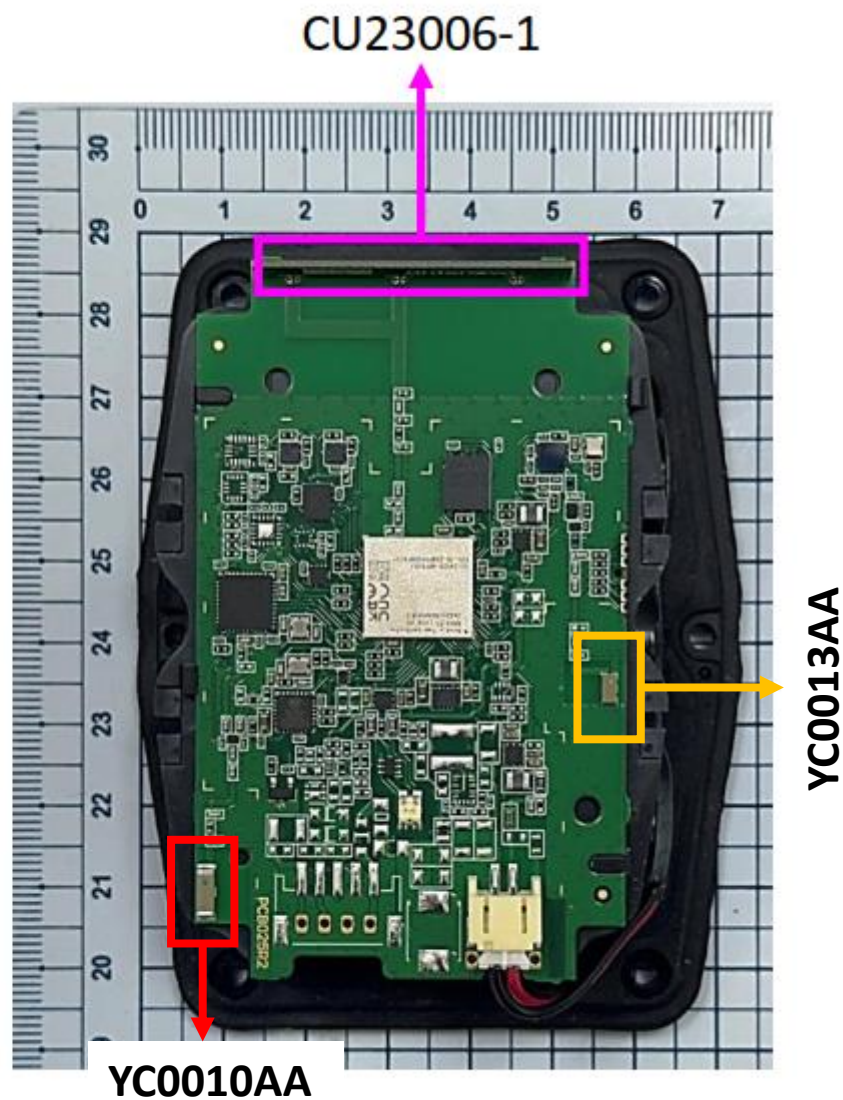
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# Thank You

Build a Smarter World

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Top view