Specification

Part No.	:	HA.31.A
Description	:	915MHz 2dBi Embedded Helical Monopole Antenna
Features	:	Quarter wave-length Monopole Helical Antenna 915MHz ISM Band 2dBi peak gain and 68% efficiency Direct mounted on board design Mechanically sturdy in a compact size Dimensions: 10.7mm, Ø10.2mm RoHS and Reach compliant

1. Introduction

The HA.31.A is an ISM 915MHz quarter wave-length monopole antenna. This helical coil antenna is perfect for your smart meter, smart security system, remote asset monitoring, and other wireless communication devices.

The helical coil antenna has a 2dBi Peak gain and a 68% efficiency at 915MHz on a 126.8 x 80.1mm ground plane with matching components (orthogonally mounted to ground plane, see HAD.B.31 performance).

Made of copper alloy, the helical coil is mechanically sturdy, with a wide-bandwidth. It can be easily mounted on the surface of your device main board by soldering. The antenna must be connected to a ground-plane to radiate efficiently.

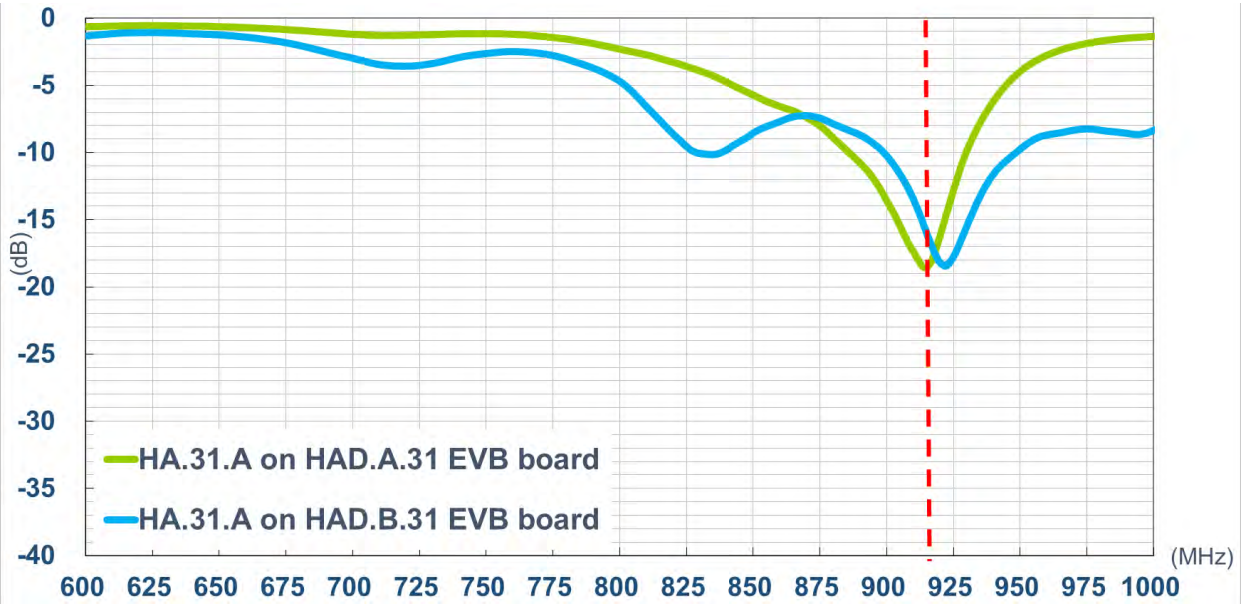
Taoglas provides HAD.A.31 and HAD.B.31 evaluation boards to show performance when two antennas are parallel mounted or orthogonally mounted to the ground plane. Small embedded antennas can easily detune and/or have reduced efficiency in different device environments. Taoglas provides matching, and other custom tuning, design and support services, subject to MOQ and NRE. For further information on how to integrate this antenna into your device please contact your regional Taoglas customer support team.

2. Specification

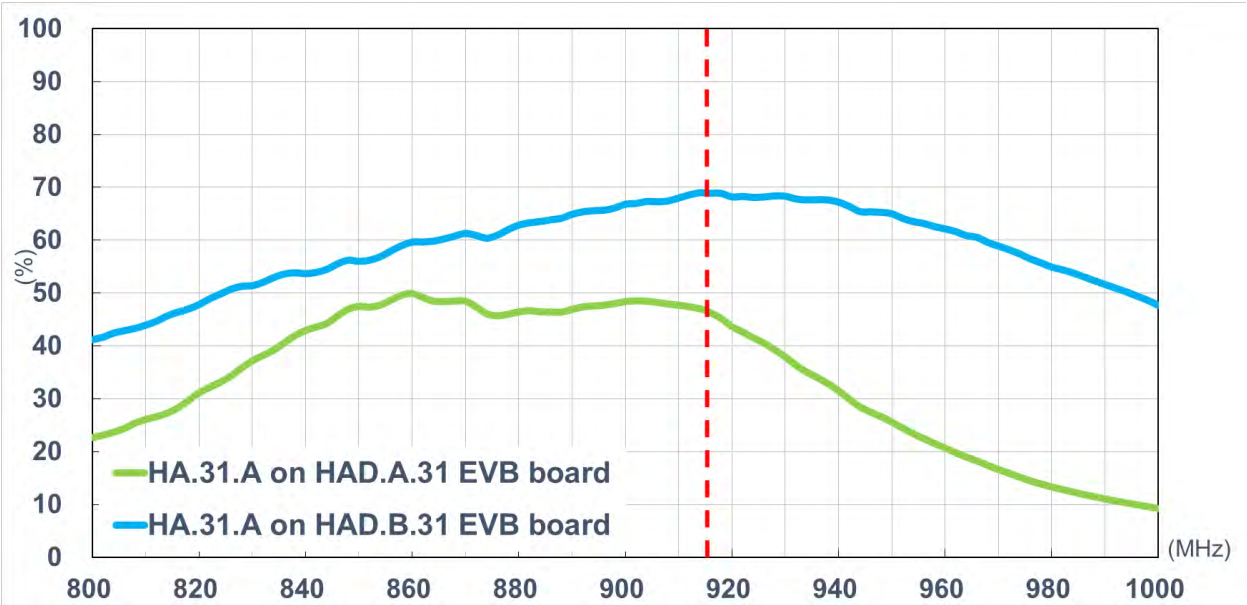
ELECTRICAL						
Application Bands	ISM 915MHz					
Mounting Direction	HAD.A.31			HAD.B.31		
Frequency (MHz)	902	915	928	902	915	928
Return Loss (dB)	<-10					
Peak Gain (dBi)	0.41	0.05	-0.74	1.89	2.09	2.04
Average Gain (dBi)	-3.14	-3.30	-4.05	-1.74	-1.61	-1.65
Efficiency (%)	48.51	46.73	39.28	66.95	68.94	68.37
Polarization	Linear					
Impedance	50 ohms					
MECHANICAL						
Helical Coil Dimension (mm)	L: 10.7mm, Ø10.2mm					
Weight (g)	0.7					
ENVIRONMENTAL						
Operation Temperature	-40°C to 85°C					
Humidity	Non-condensing 65°C 95% RH					

3. Antenna Characteristics

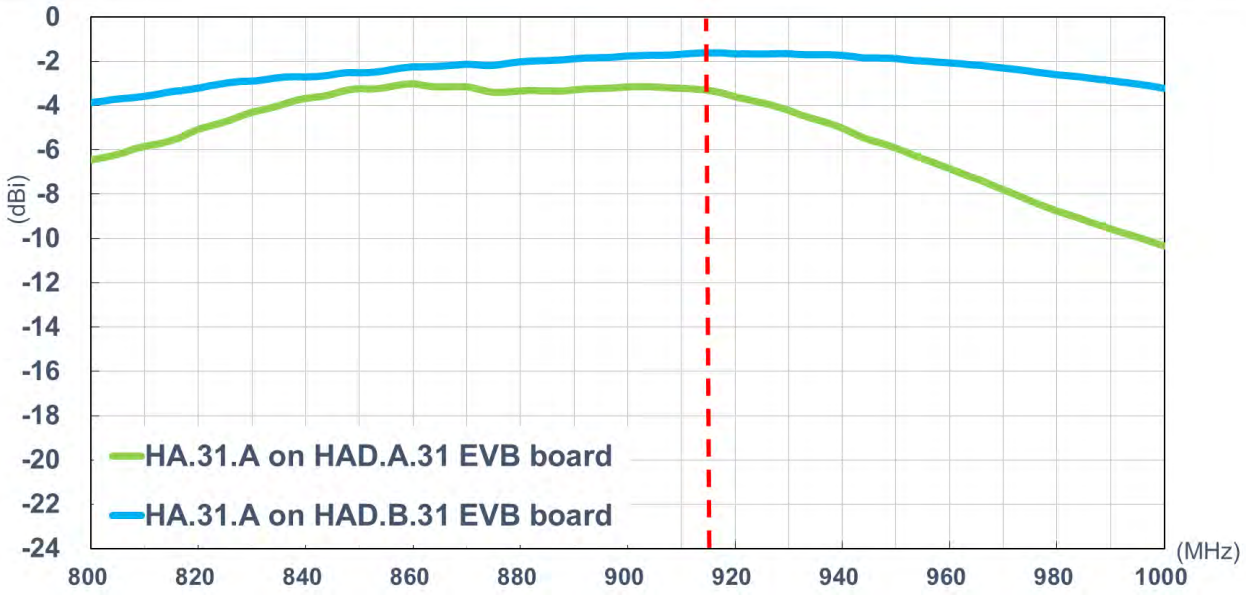
3.1 Return Loss



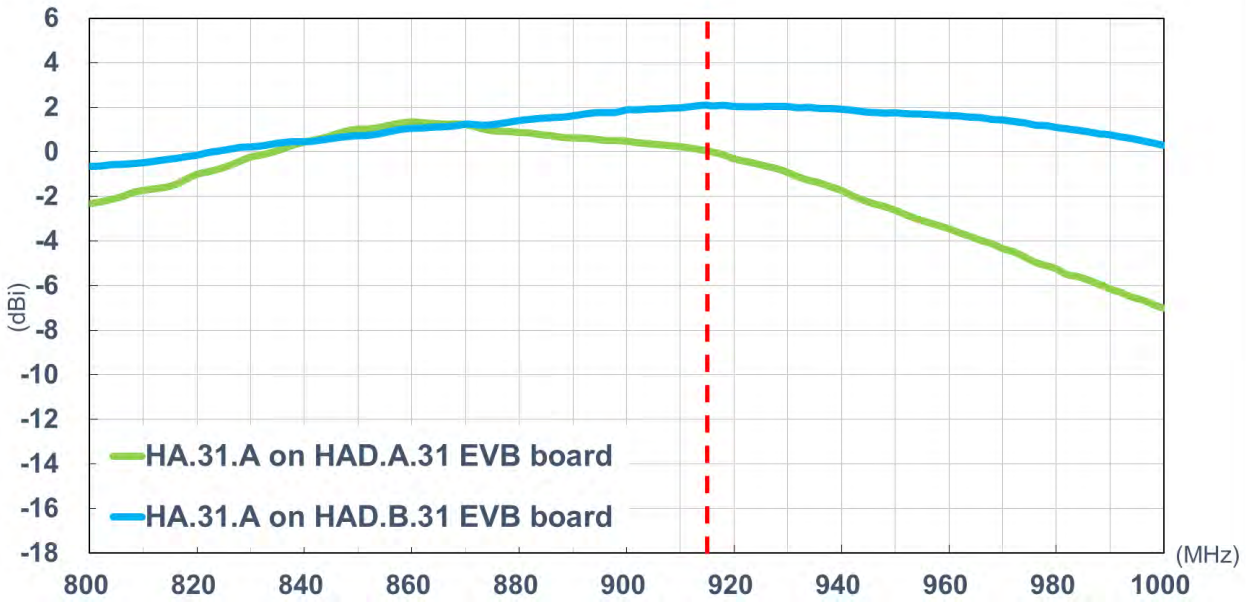
3.2 Efficiency



3.3 Average Gain



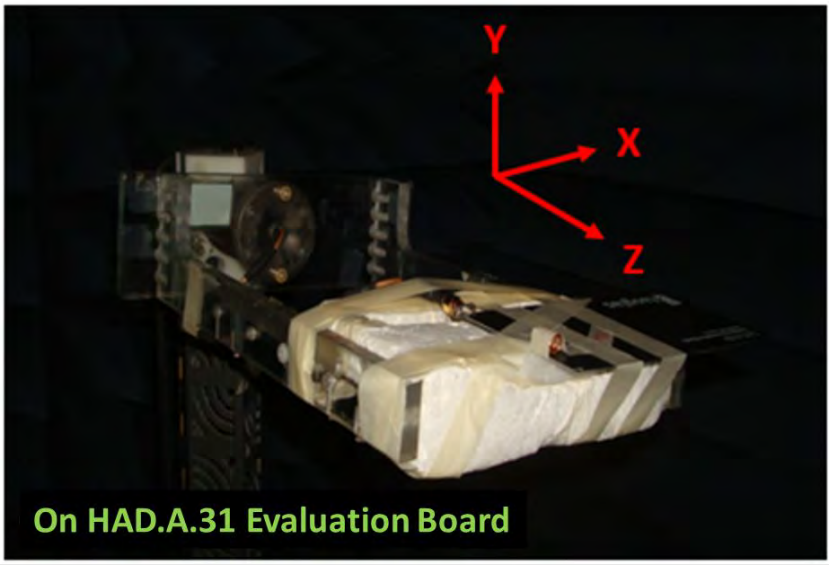
3.4 Peak Gain



4. Antenna Radiation Pattern

4.1. Measurement Setup

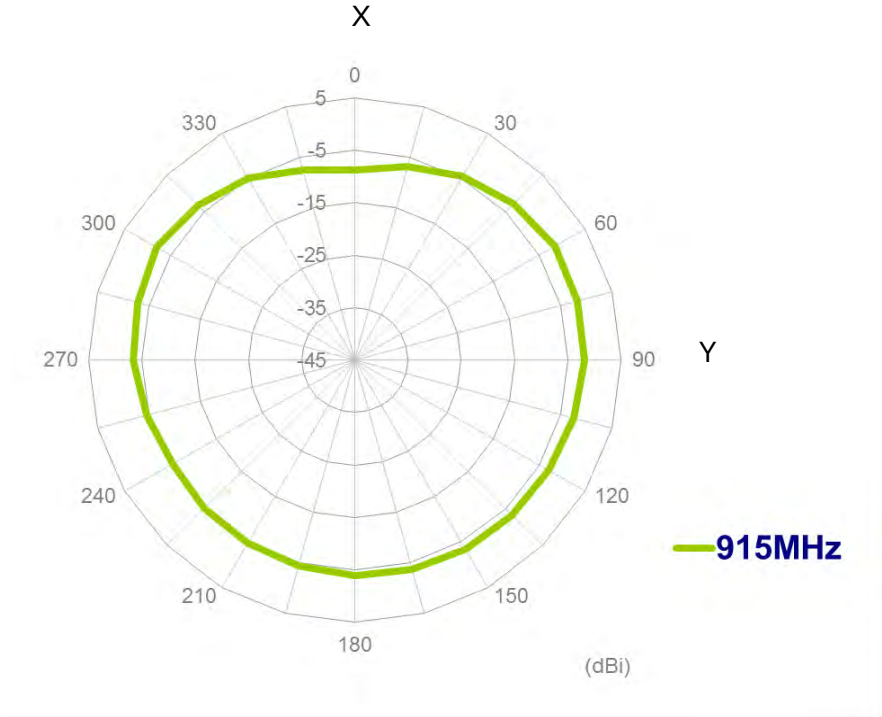
The HA.31 antenna is tested on HAD.A.31 and HAD.B.31in a CTIA certified ETS-Lindgren Anechoic Chamber. The test setup is shown below.



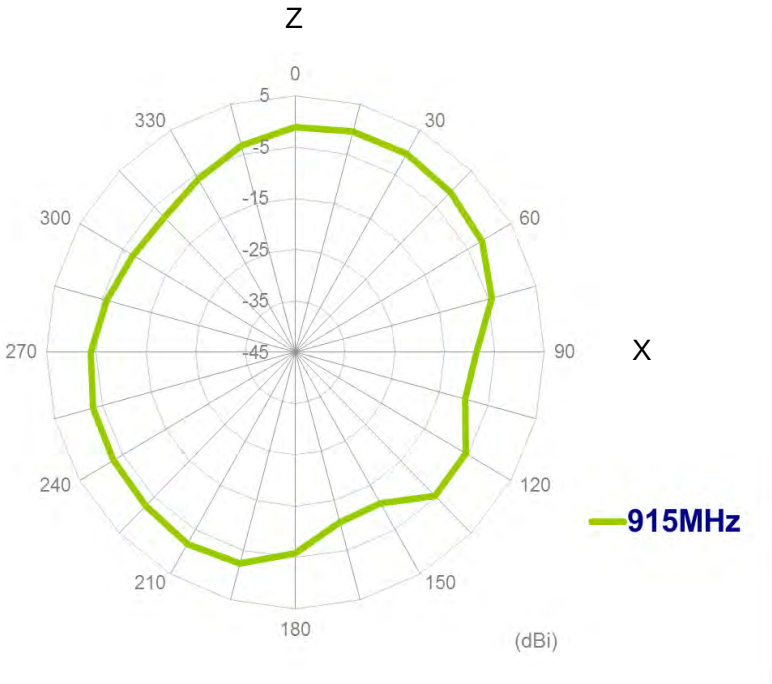
4.2. 2D Radiation Pattern

- On HAD.A.31

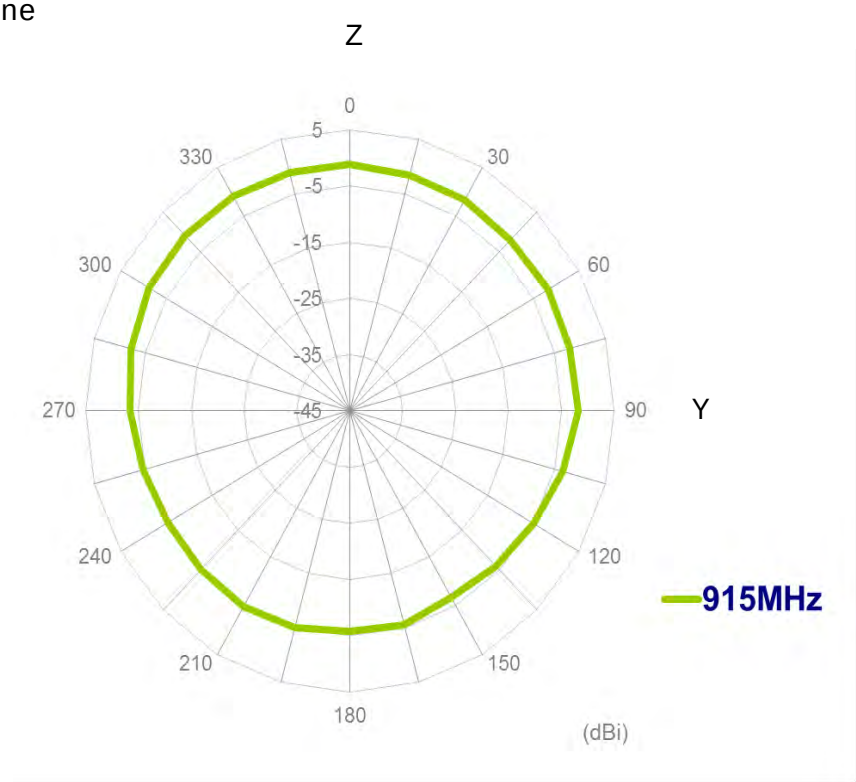
XY Plane



XZ Plane

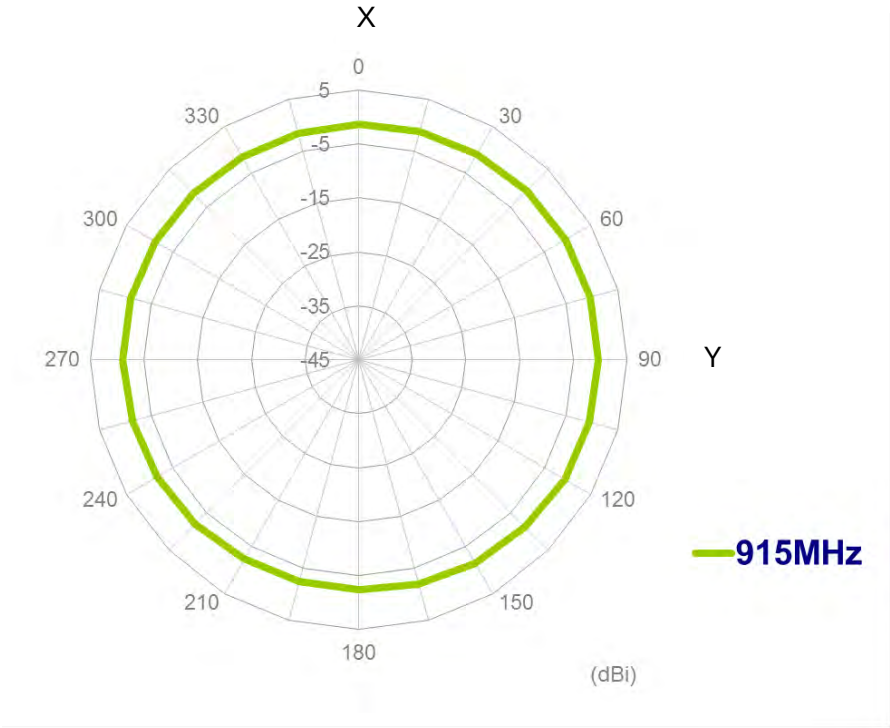


YZ Plane

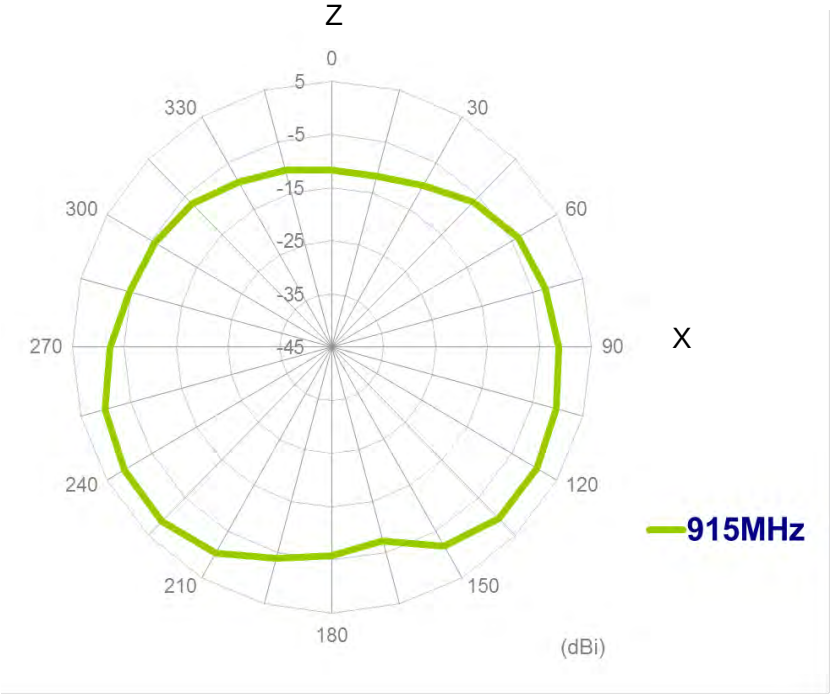


On HAD.B.21

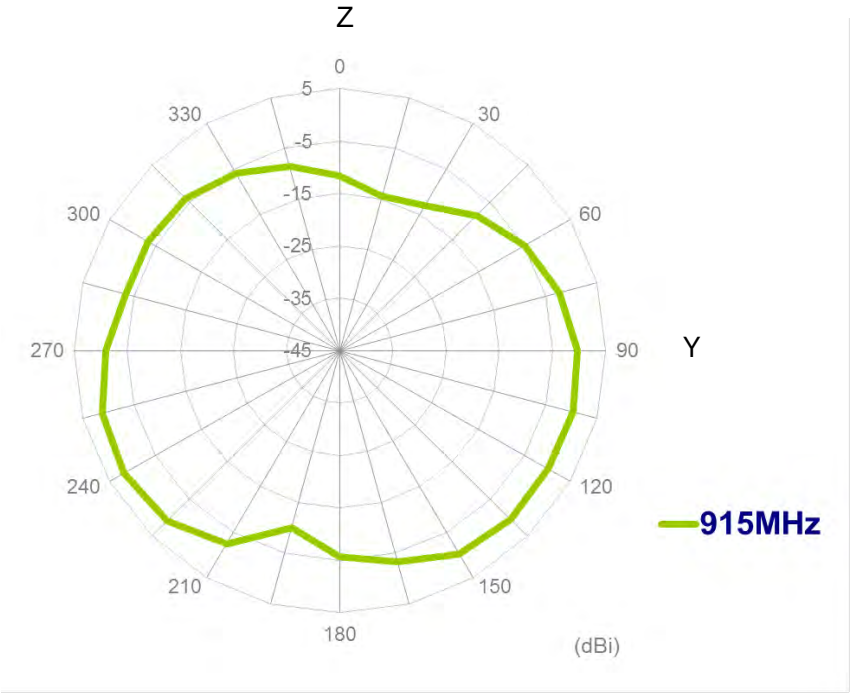
XY Plane



XZ Plane



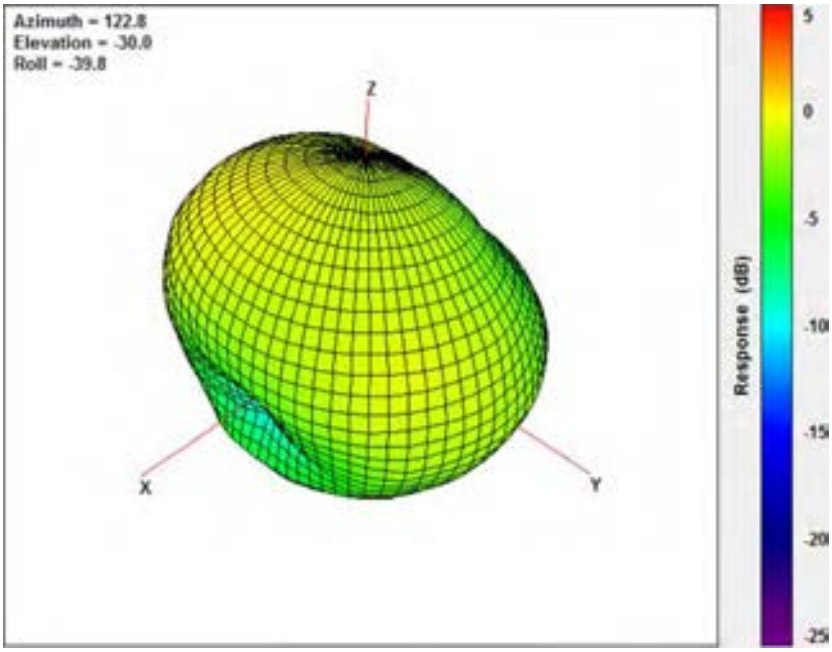
YZ Plane



4.3. 3D Radiation Pattern

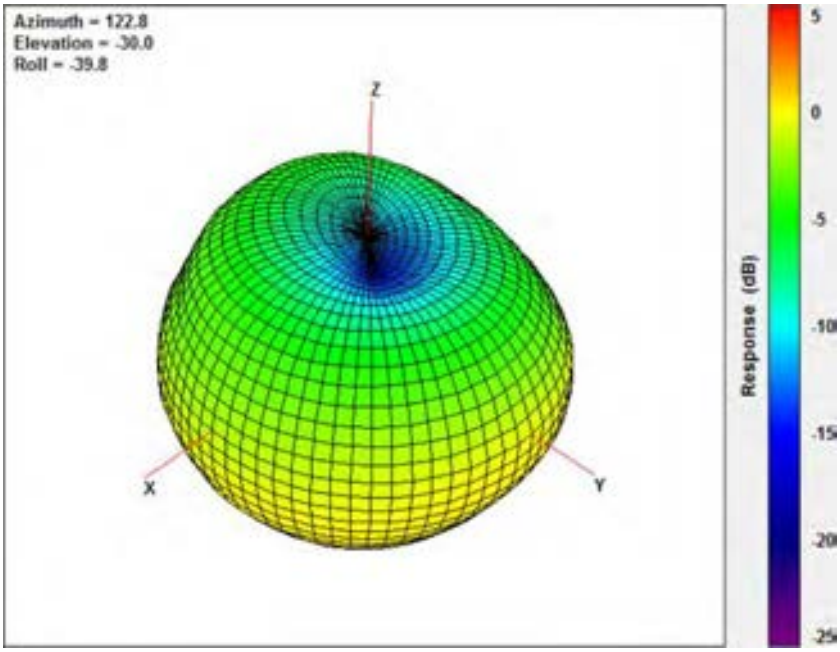
- On HAD.A.31

@915MHz



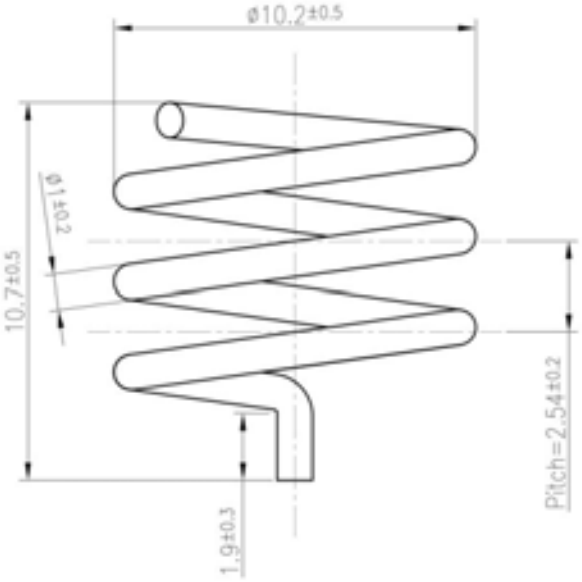
- On HAD.B.31

@915MHz

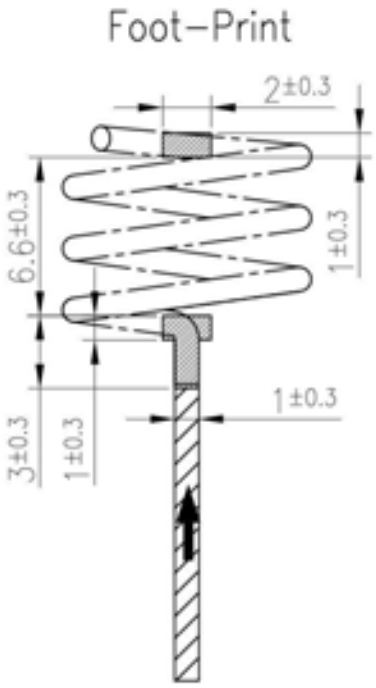


5. Mechanical Drawing (Unit: mm)

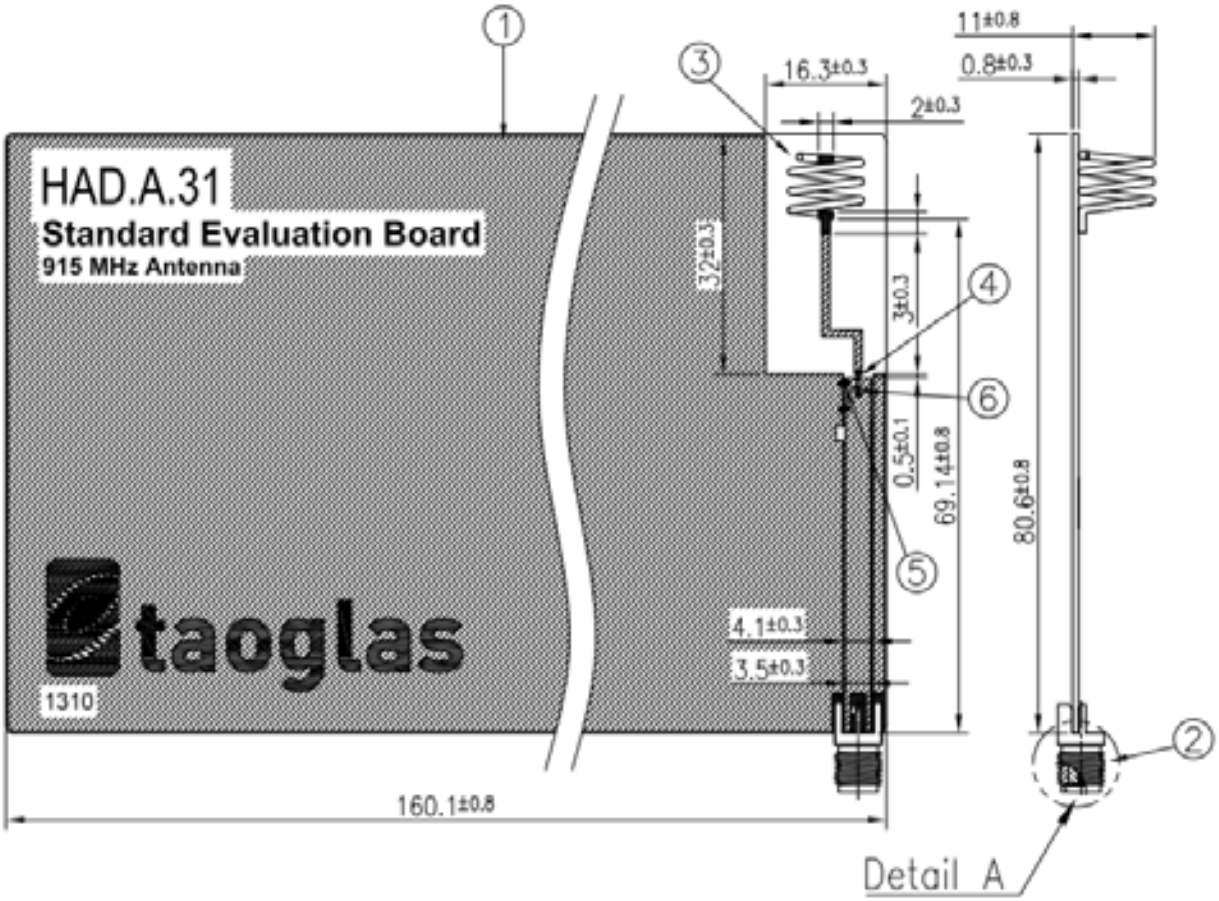
5.1 HA.31.A Antenna

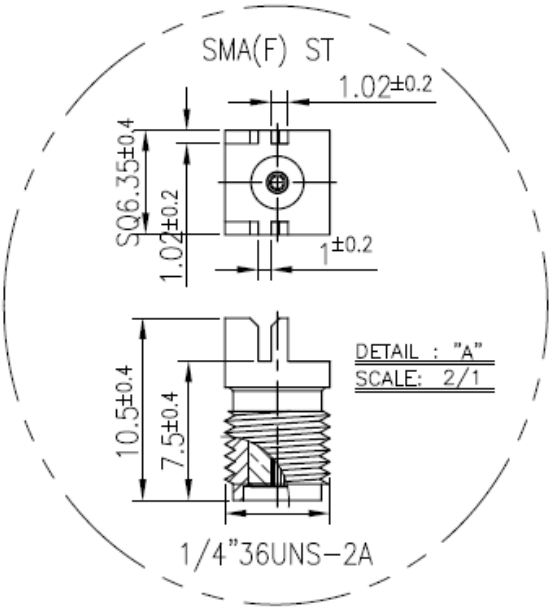


PCB Footprint



5.2 HAD.A.31 Evaluation Board

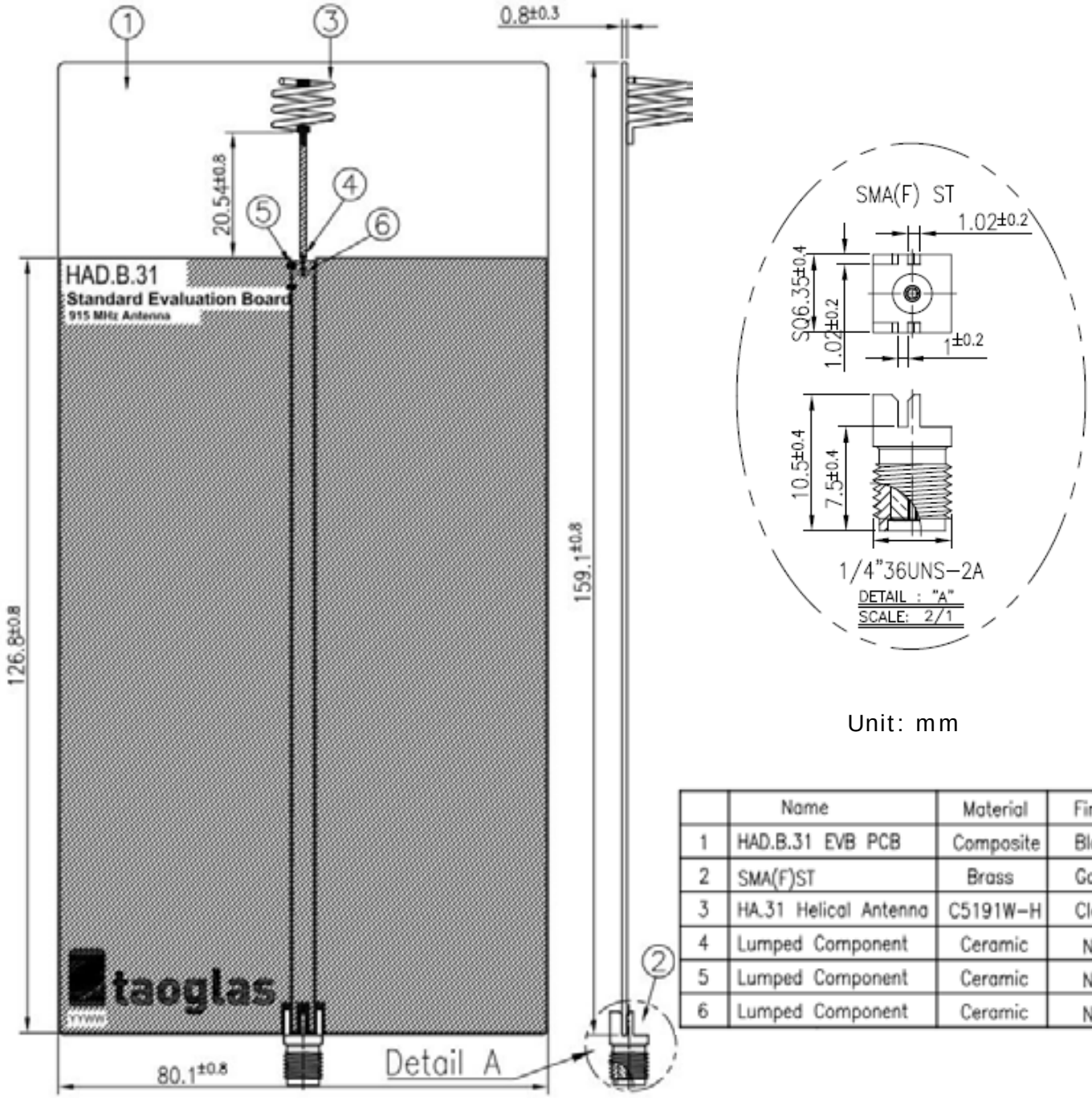




Unit: mm

	Name	Material	Finish	QTY
1	HAD.A.31 EVB PCB	Composite	Black	1
2	SMA(F)ST	Brass	Gold	1
3	HA.31 Helical Antenna	C5191W-H	Clear	1
4	Lumped Component	Ceramic	N/A	1
5	Lumped Component	Ceramic	N/A	1
6	Lumped Component	Ceramic	N/A	1

5.3 HAD.B.31 Evaluation Board



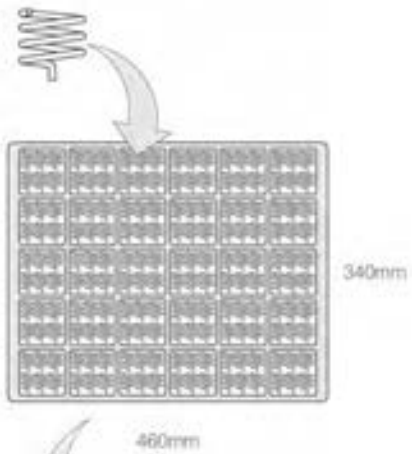
Unit: mm

	Name	Material	Finish	QTY
1	HAD.B.31 EVB PCB	Composite	Black	1
2	SMA(F)ST	Brass	Gold	1
3	HA.31 Helical Antenna	C5191W-H	Clear	1
4	Lumped Component	Ceramic	N/A	1
5	Lumped Component	Ceramic	N/A	1
6	Lumped Component	Ceramic	N/A	1

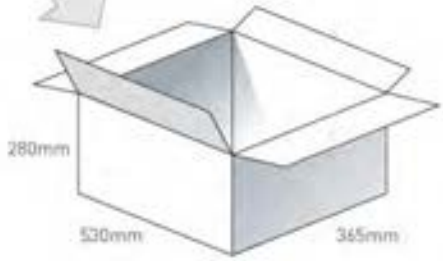
6. Packaging

6.1. HA.31.A Antenna

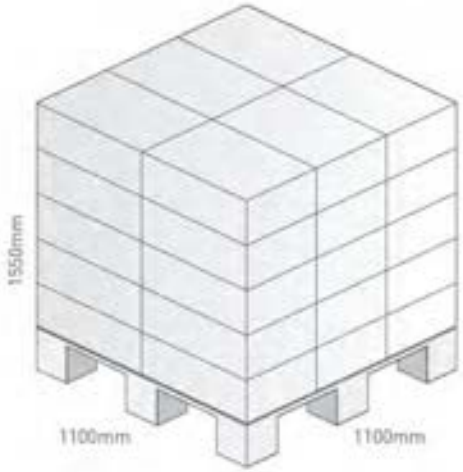
180 pcs HA.31.A per tray
Tray Dimensions - 460x340mm
Weight - 223g



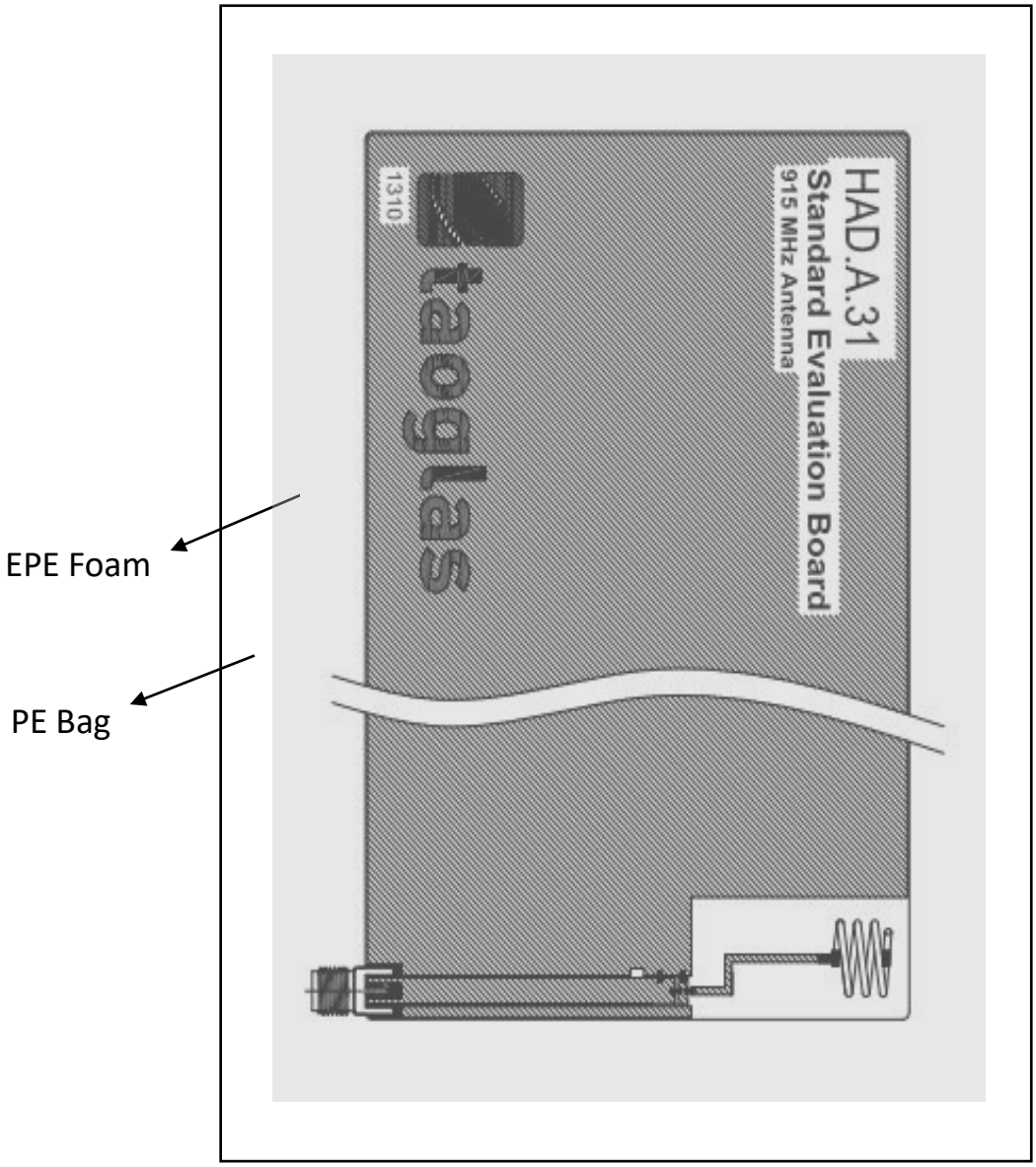
30 trays / 5400 pcs HA.31.A per carton
Carton dimensions - 530x365x280mm
Weight - 8Kg



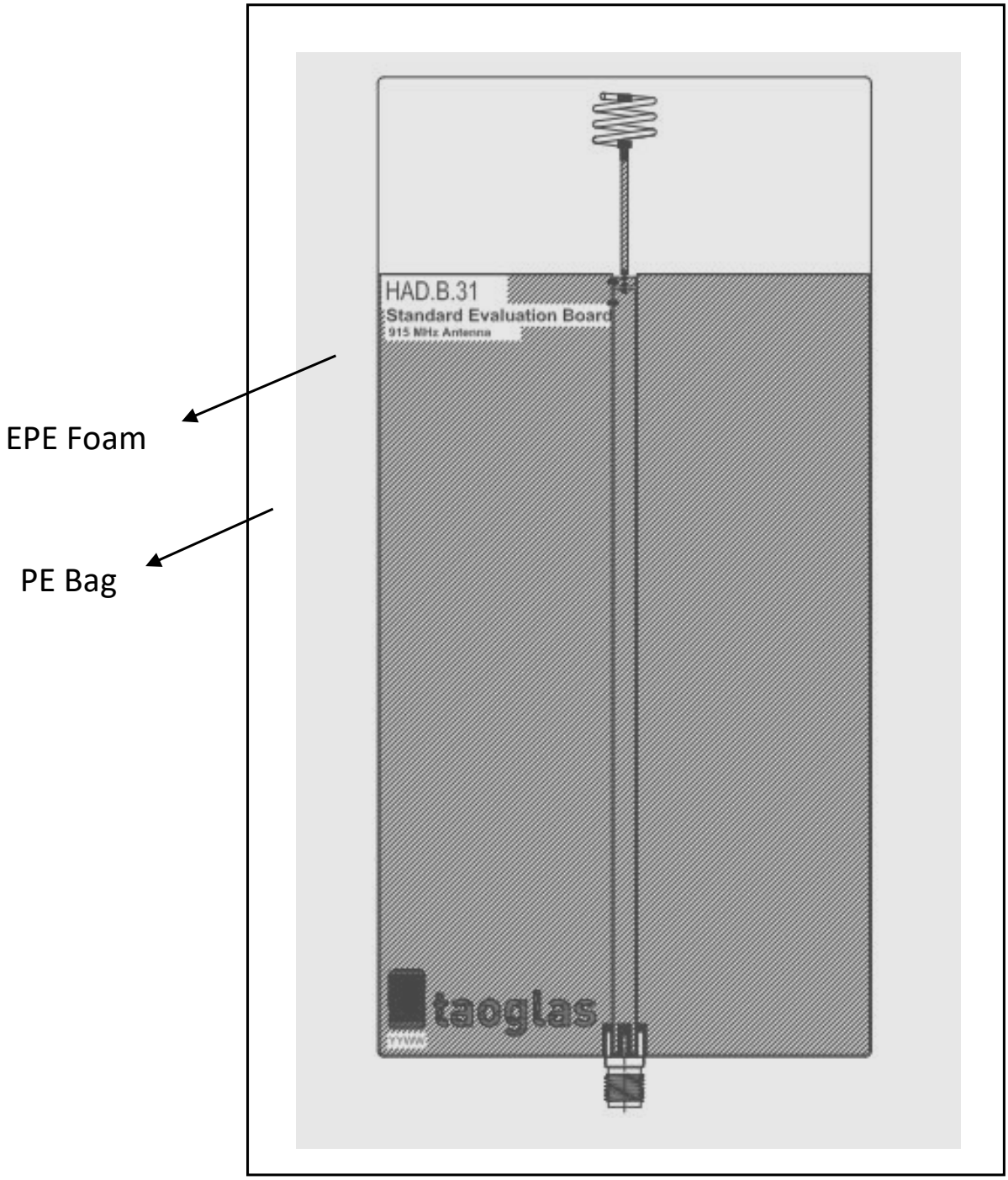
Pallet Dimensions 1100*1100*1550mm
30 Cartons per Pallet
6 Cartons per layer
5 Layers



6.2. HAD.A.31


HAD.A.31
Standard Evaluation Board
915 MHz Antenna
taoglas
1310
EPE Foam
PE Bag

6.3. HAD.B.31


EPE Foam
PE Bag
HAD.B.31
Standard Evaluation Board
915 MHz Antenna
taoglas

7. Antenna Application Note

7.1 Matching Circuit for Different Ground Plane Variation

7.1.1 HAD.A.31 EVB Board

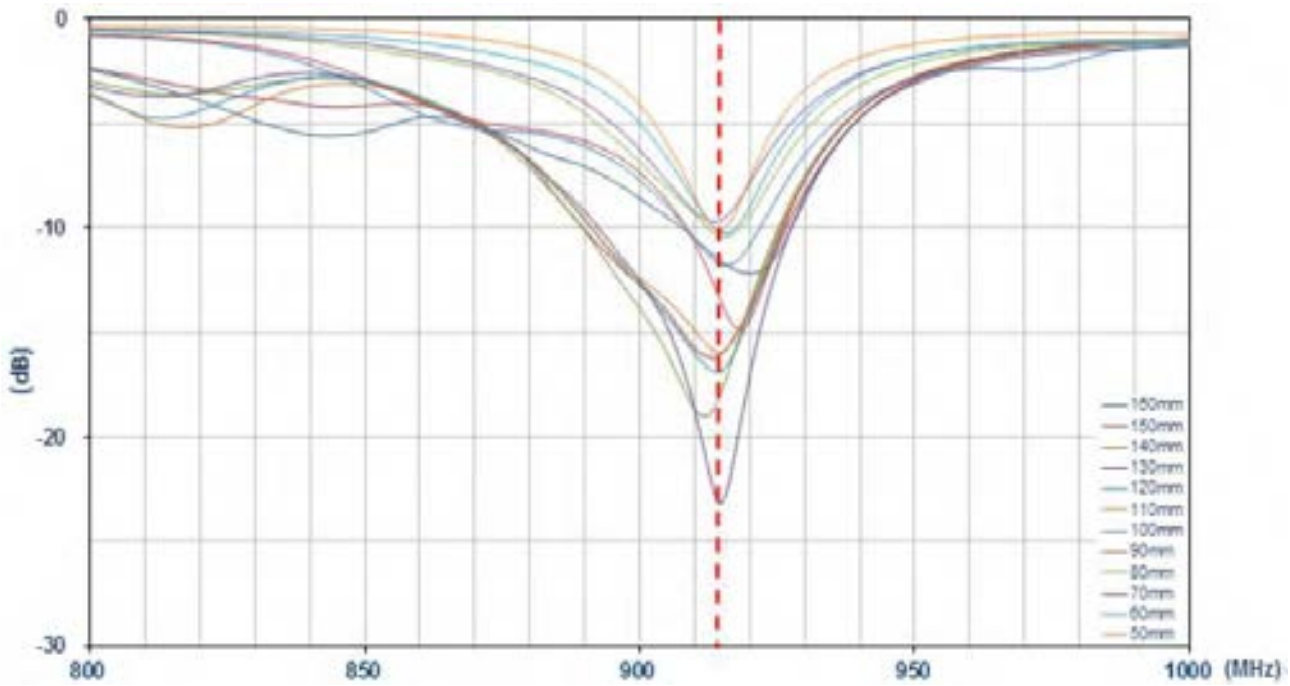
HAD.A.31	Ceramic 4	Ceramic 5	Ceramic 6
160mm	0 ohm	3pF	1.5pF
150mm	0 ohm	3.3pF	1.5pF
140mm	0 ohm	3.6pF	1.5pF
130mm	0 ohm	3.9pF	1.5pF
120mm	0 ohm	3.9pF	1.5pF
110mm	0 ohm	3.9pF	1.5pF
100mm	0.5pF	2pF	1.5pF
90mm	0.5pF	1pF	1.5pF
80mm	0.5pF	open	5.1nH
70mm	0.75pF	open	3.9pF
60mm	0.75pF	open	2.7pF
50mm	1pF	open	1pF

7.1.1 HAD.B.31 EVB Board

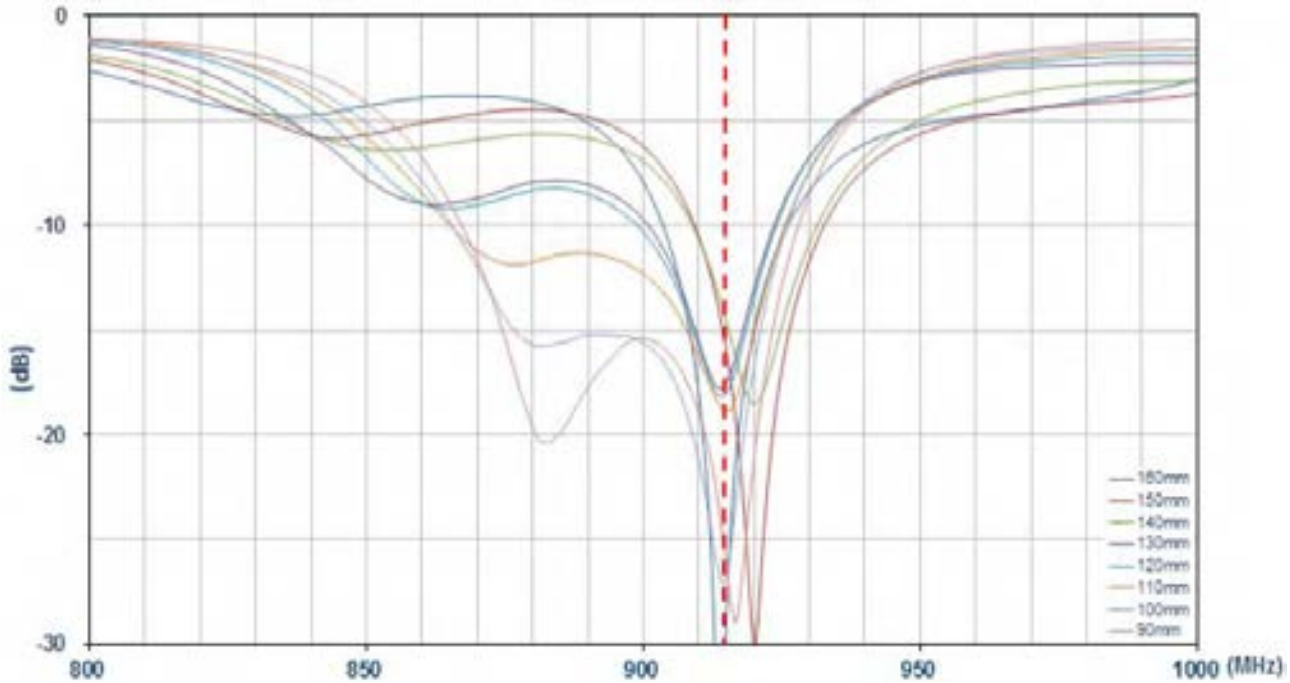
HAD.B.31	Ceramic 4	Ceramic 5	Ceramic 6
160mm	0 ohm	open	2.2pF
150mm	0 ohm	open	2.7pF
140mm	0 ohm	open	3pF
130mm	0 ohm	open	3pF
120mm	0 ohm	open	3pF
110mm	0 ohm	open	3.9pF
100mm	3.3pF	open	0 ohm
90mm	4.7pF	open	0 ohm

7.2 Return Loss

7.2.1 HAD.A.31 EVB Board (Different Ground Lengths)

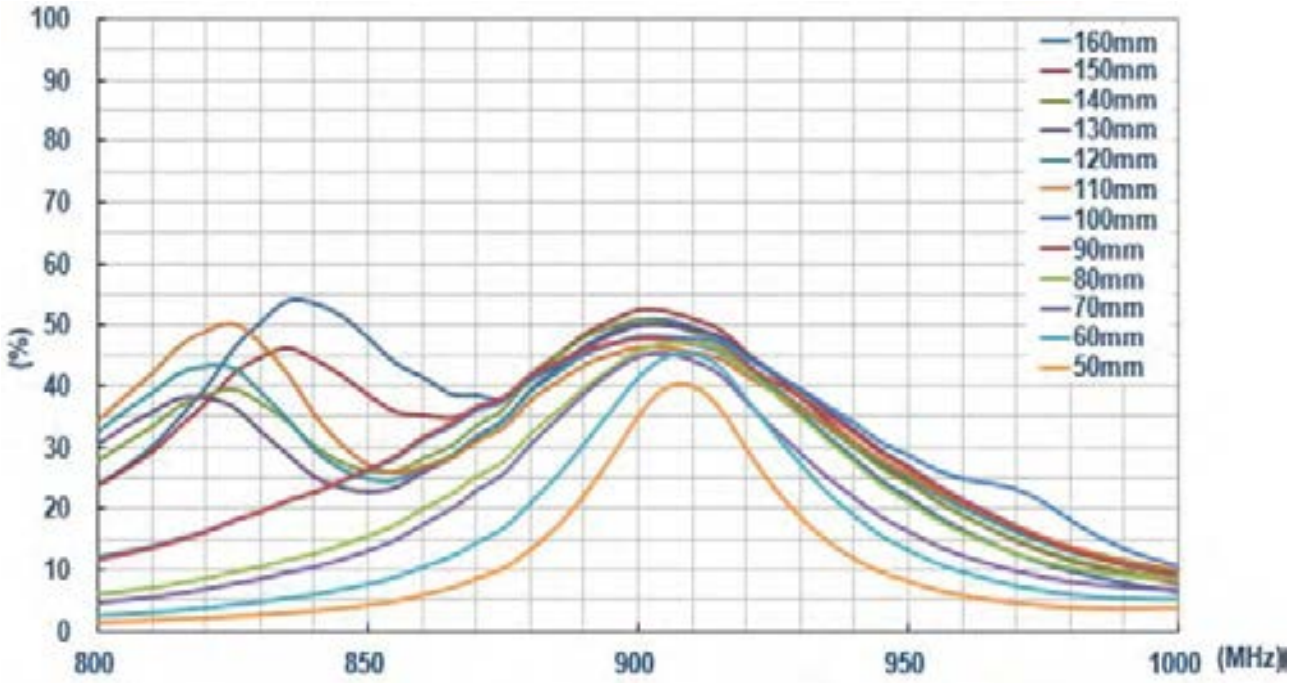


7.2.2 HAD.B.31 EVB Board (Different Ground Lengths)

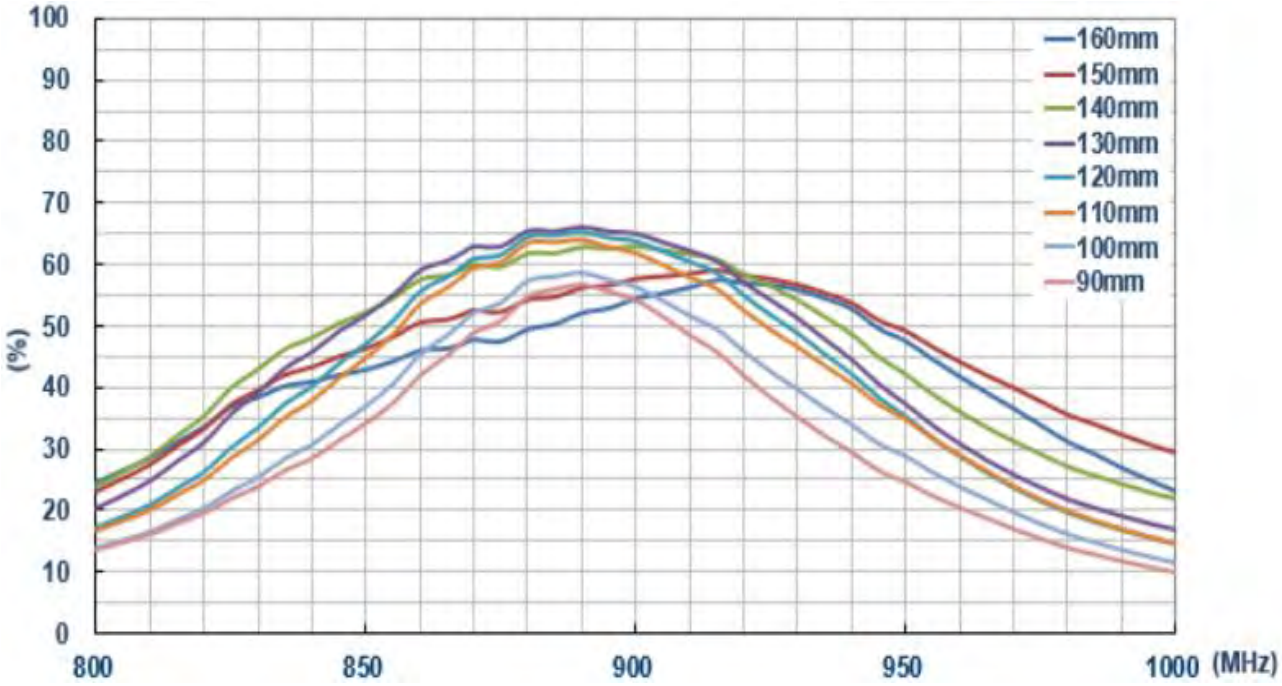


7.3 Efficiency

7.3.1 HAD.A.31 EVB Board (Different Ground Lengths)

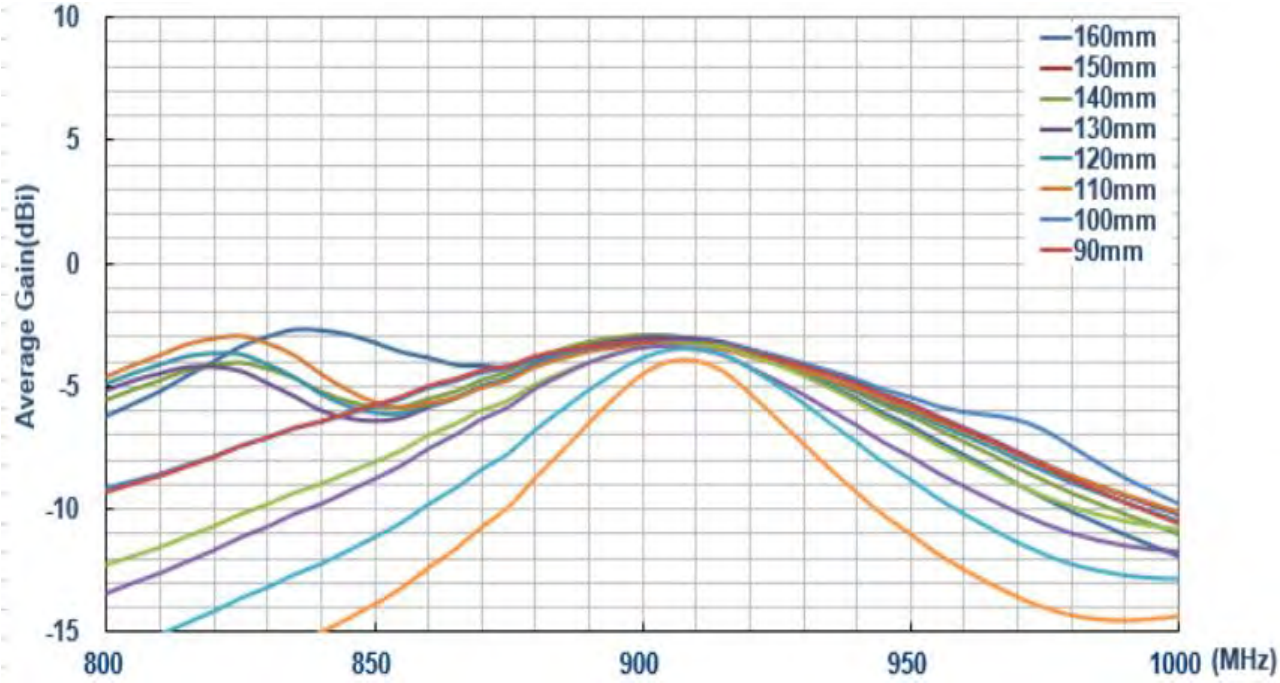


7.3.2 HAD.B.31 EVB Board (Different Ground Lengths)

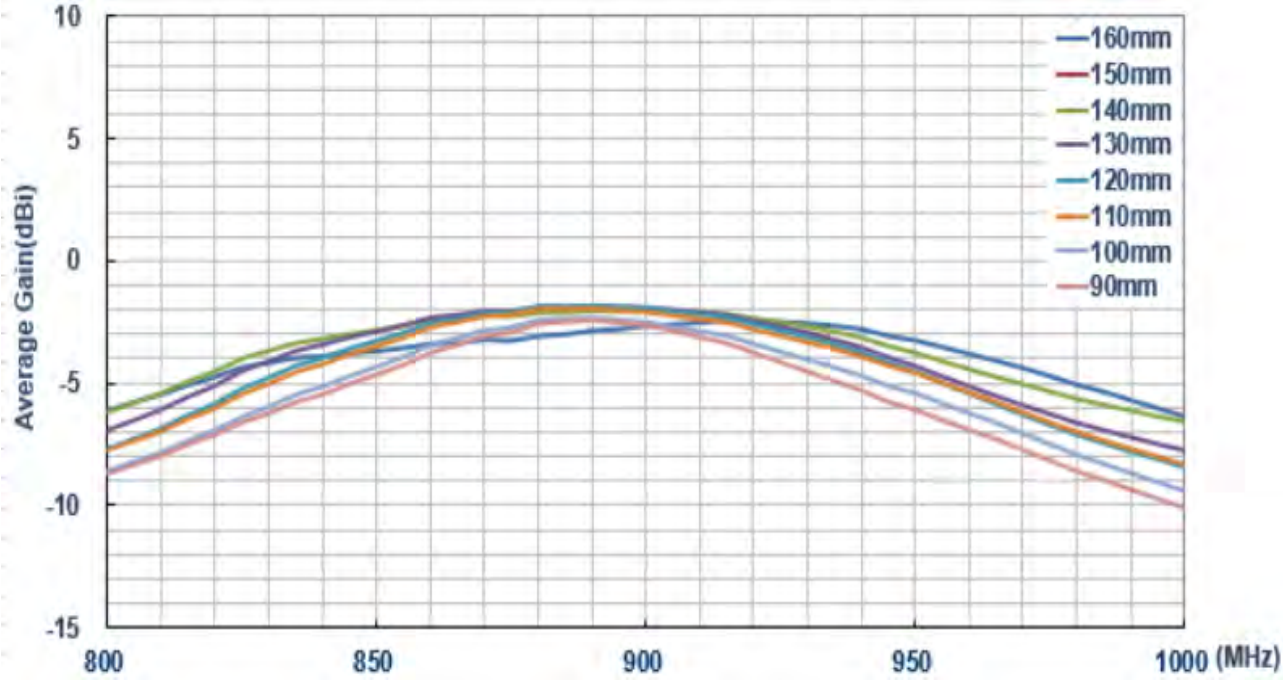


7.4 Average Gain

7.4.1 HAD.A.31 EVB Board (Different Ground Lengths)

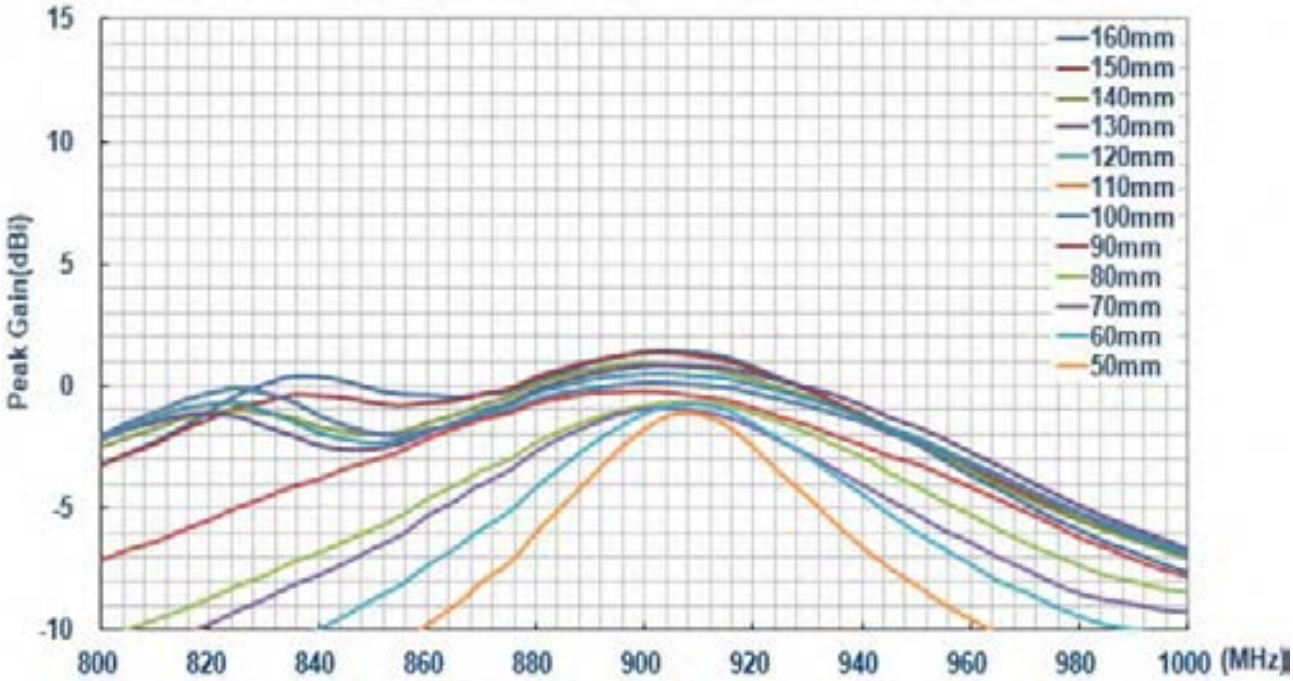


7.4.2 HAD.B.31 EVB Board (Different Ground Lengths)

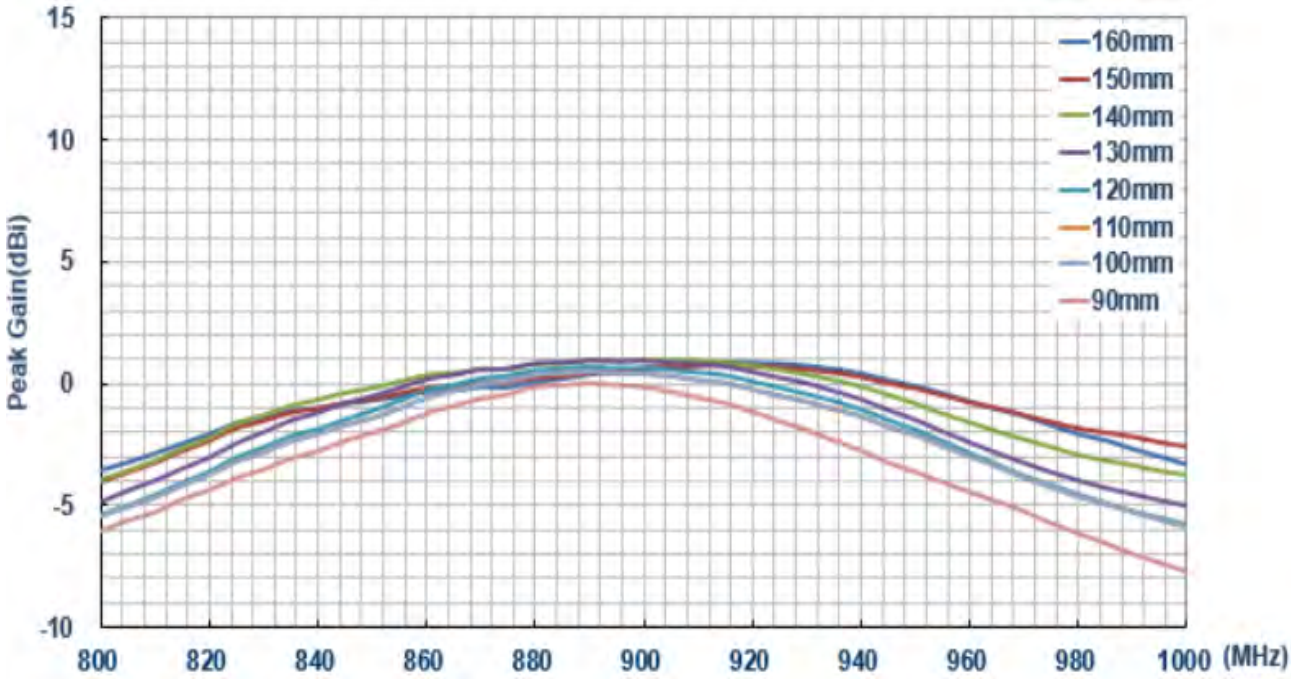


7.5 Peak Gain

7.5.1 HAD.A.31 EVB Board (Different Ground Lengths)



7.5.2 HAD.B.31 EVB Board (Different Ground Lengths)



7.6 Antenna Performance Table

ELECTRICAL						
Application Bands	ISM 915MHz					
Mounting Direction	HAD.A.31			HAD.B.31		
Frequency (MHz)	902	915	928	902	915	928
Efficiency						
Ground plane length 160mm	50.92	47.74	35.70	54.59	57.56	56.01
Ground plane length 150mm	52.62	49.34	38.06	57.57	58.93	56.60
Ground plane length 140mm	51.00	47.03	36.57	63.01	60.90	54.24
Ground plane length 130mm	50.09	48.24	39.18	65.03	60.52	51.18
Ground plane length 120mm	48.20	45.61	36.69	63.62	58.40	48.61
Ground plane length 110mm	46.34	44.42	36.39	61.72	55.90	46.48
Ground plane length 100mm	48.16	47.19	39.63	56.23	49.34	39.48
Ground plane length 90mm	47.83	46.16	38.14	53.94	45.51	34.89
Ground plane length 80mm	45.88	46.00	35.12	X	X	X
Ground plane length 70mm	44.96	41.97	29.04	X	X	X
Ground plane length 60mm	41.46	43.03	27.19	X	X	X
Ground plane length 50mm	35.34	36.39	18.52	X	X	X
Average Gain(dBi)						
Ground plane length 160mm	-2.93	-3.21	-4.47	-2.62	-2.40	-2.51
Ground plane length 150mm	-2.78	-3.07	-4.19	-2.39	-2.30	-2.47
Ground plane length 140mm	-2.92	-3.28	-4.36	-2.00	-2.15	-2.65
Ground plane length 130mm	-3.02	-3.17	-4.06	-1.86	-2.18	-2.90
Ground plane length 120mm	-3.16	-3.41	-4.35	-1.96	-2.34	-3.13
Ground plane length 110mm	-3.34	-3.52	-4.38	-2.09	-2.53	-3.32
Ground plane length 100mm	-3.17	-3.26	-4.02	-2.49	-3.07	-4.03
Ground plane length 90mm	-3.20	-3.36	-4.18	-2.68	-0.83	-4.57
Ground plane length 80mm	-3.38	-3.37	-4.54	X	X	X
Ground plane length 70mm	-3.47	-3.77	-5.37	X	X	X
Ground plane length 60mm	-3.82	-3.66	-5.65	X	X	X
Ground plane length 50mm	-4.51	-4.39	-7.32	X	X	X

Peak Gain(dBi)						
Ground plane length 160mm	1.37	1.13	-0.19	0.62	0.87	0.74
Ground plane length 150mm	1.33	1.02	-0.18	0.62	0.79	0.59
Ground plane length 140mm	0.94	0.58	-0.42	0.99	0.90	0.40
Ground plane length 130mm	0.75	0.67	-0.12	0.89	0.66	-0.02
Ground plane length 120mm	0.45	0.29	-0.54	0.67	0.37	-0.41
Ground plane length 110mm	0.15	-0.04	-0.78	0.42	0.05	-0.72
Ground plane length 100mm	-0.29	-0.40	-0.97	-0.15	-0.66	-1.60
Ground plane length 90mm	-0.26	-0.64	-1.64	-0.15	-0.83	-1.92
Ground plane length 80mm	-0.80	-0.77	-1.91	X	X	X
Ground plane length 70mm	-0.94	-1.27	-2.80	X	X	X
Ground plane length 60mm	-1.09	-0.96	-2.87	X	X	X
Ground plane length 50mm	-1.77	-1.65	-4.56	X	X	X

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