Specification

Part No.	:	**FMA103.A.AF.001**
Product Name	:	Hercules Response 2 in 1 GPS/Galileo & First Net Permanent Mount Antenna
Features	:	GPS/GALILEO – Two Stage 28dB+ LNA FirstNet Band 14 Coverage Low Profile, IP69K Rated Enclosure Heavy Duty, UV and Vandal Resistant PC Housing Permanent / Screw Mounting Cables: 3M RG174 / TGC200 Connector: SMA(M) Dimensions: H: 29mm x ∅49mm RoHS Compliant

1. Introduction

The Hercules Response FMA103 GPS/GALILEO & FirstNet Combination Antenna is a combination high performance GPS/GALILEO and an LTE antenna that includes coverage on the FirstNet, Band 14 frequency.

FirstNet also known as Band 14 or PS-LTE (Public Service LTE) is a dedicated communications tool for First Responders in the US. It is an isolated network for providing faster critical information and data-sharing between blue light service providers and their agencies. New FirstNet devices are being deployed to allow for the multitude of services and applications which will be using the network for the following mission critical applications:

- Computer-aided dispatch (vehicle location)
- EMS Electronic Patient Care Reporting
- Vehicle Mounted RMS/ Citations/ Scanners
- Video Streaming

This antenna demonstrates extremely high efficiency also ensuring longer Battery life for high RF power handsets.

This antenna demonstrates extremely high efficiency which helps increase battery life for high RF power handsets. It is an ideal solution for reliable asset tracking, remote monitoring and public safety.

The durable, UV repellent PC housing helps resist vandalism and direct attacks. At just 29mm in height and a diameter of 49 mm, the Hercules can be mounted on metal or non-metal structures as it has a metal ground-plane base internally.

Cables and connectors are fully customizable, contact you regional Taoglas Sales Office for more information.

2. Specification

ELECTRICAL CELLULAR						
Standard		AMPS	GSM	PCS	DCS	3G
Band (MHz)		850	900	1900	1800	2100
Frequency (MHz)		824-896	880-960	1850-1990	1710-1880	1920 –2170
Return Loss (dB)						
Cable length (meter)	0.3	-6.5	-6.0	-7	-8	-5
	1.0	-9.5	-8	-17	-16	-15
	2.0	-10	-9	-20	-21	-18
	3.0	-13	-11	-21	-21	-19
	5.0	-14	-14	-25	-25	-23
Efficiency (%)						
Cable length (meter)	0.3	38	54	58	54	50
	1.0	31	35	36	42	31
	2.0	23	20	23	32	21
	3.0	25	29	23	22	18
	5.0	11	11.5	12	11	11
Peak Gain (dBi)						
Cable length (meter)	0.3	2.0	3.3	4.0	3.6	3.0
	1.0	1.2	1.3	2	1.8	1.2
	2.0	0.5	-0.35	0	1.5	-0.1
	3.0	0.1	1.6	0.6	0.1	-0.9
	5.0	-2.5	-2.4	-2.3	-3.0	-2.0
Polarization		Linear				
Impedance		50 Ohms				
Input Power		10 Watts max.				
VSWR		<3.5.0:1				

ELECTRICAL GPS/GALILEO			
Frequency	1575.42MHz ± 1.023MHz		
Impedance	50 ohm		
VSWR	2.0 Max		
GPS/GALILEO Patch Gain	2.0dB Passive Gain @ Zenith -1.0dBi Gain @ 10 degrees elevation		
Axial ratio	3.0 dB max		
Polarization	RHCP		
Out Band Rejection	fo = 1575.42MHz fo ± 30 MHz 5dB Min. fo ± 50 MHz 20dB Min. fo ± 100 MHz 25dB Min.		
Input Voltage	Min:1.8V	Typ. 3.0V	Max: 5.5V
Total Gain @ Zenith	25dBic	30dBic	32dBic
Current Consumption	6mA	12mA	30mA
Noise Figure	2.7dB	3.0dB	3.7dB

MECHANICAL	
Dimensions	Height 29mm x Diameter 49mm
Casing	UV resistant PC
Base and thread	Nickel plated steel
Thread diameter	18mm
Weather proof gasket	CR4305 foam with 3M9448B double-side adhesive
Cable pull	8 Kgf
Recommended Mounting Torque	24.5N·m
Max Mounting Torque	29.4N·m
Weight	200g

ENVIRONMENTAL	
Waterproof	IP-67 & IP-69K
Corrosion	5% NaCl for 48hrs - Nickel plated steel base and thread
Temperature Range	-40°C to +85°C
Thermal Shock	100 cycles -40°C to +80°C
Humidity	Non-condensing 65°C 95% RH
Shock (drop test)	1m drop on concrete 6 axes

*Note: The return loss, efficiency and gain measurements in the above table, were taken for the antenna mounted on a 30x30 cm metal plate. For a specific case performance refers to the below plots.

3. Test Setup

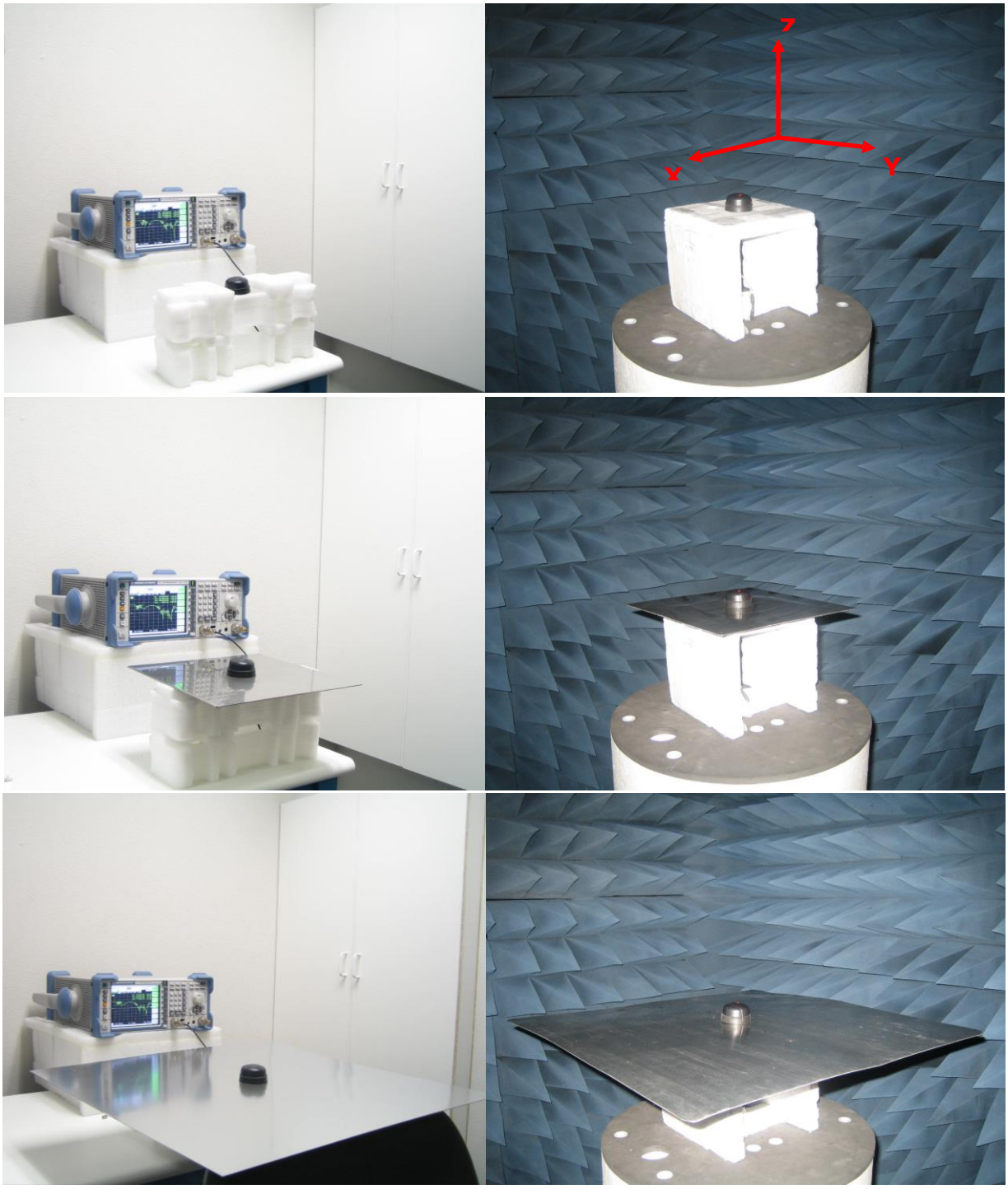


Figure 1. FMA103 Antenna test set up in free space, 30x30 cm metal plate and 60x60 cm

4. Antenna Parameters

4.1 Return Loss

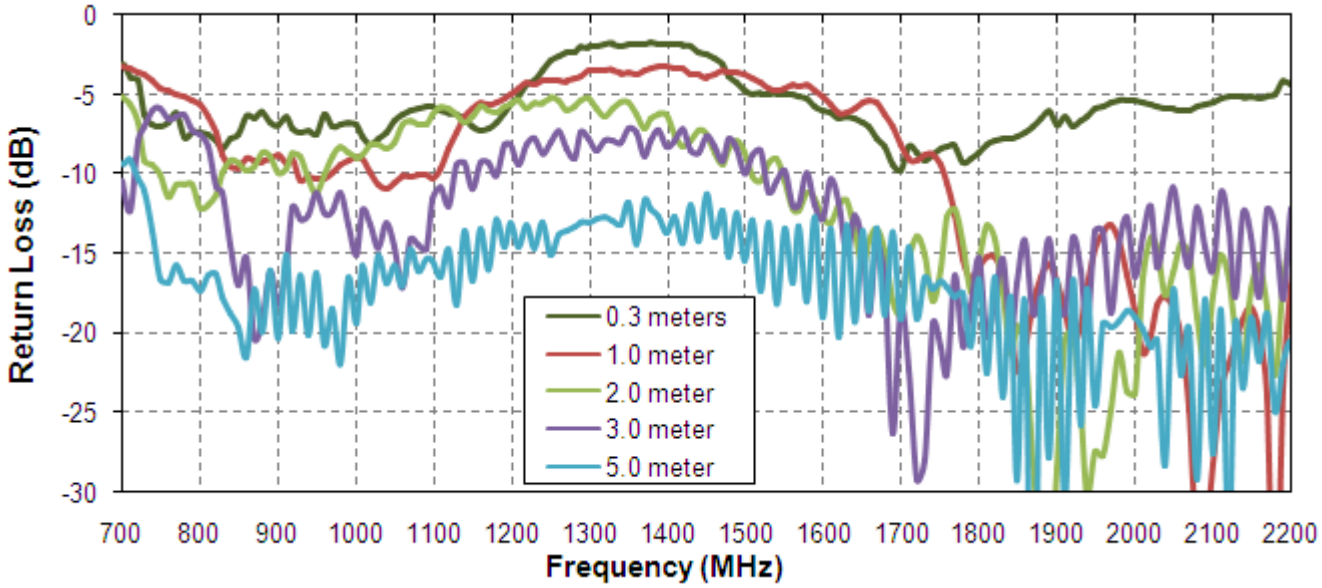


Figure 2. Return Loss of the FMA103 antenna in free space

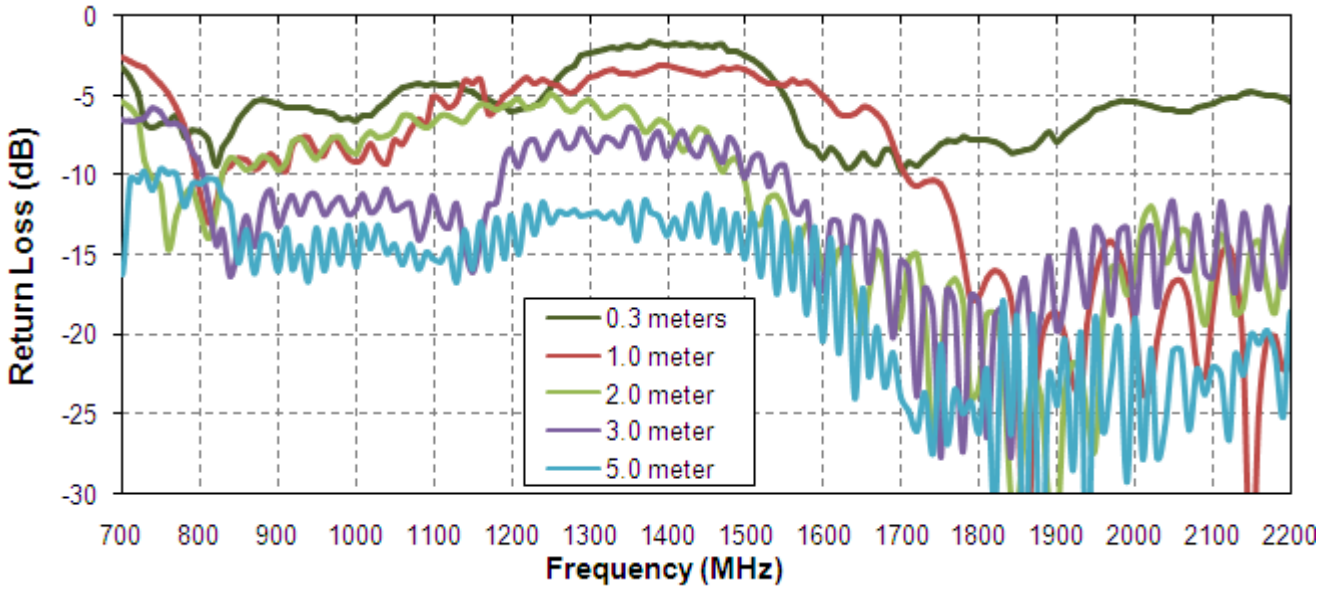


Figure 3. Return Loss of the FMA103 antenna on 30*30cm metal plate

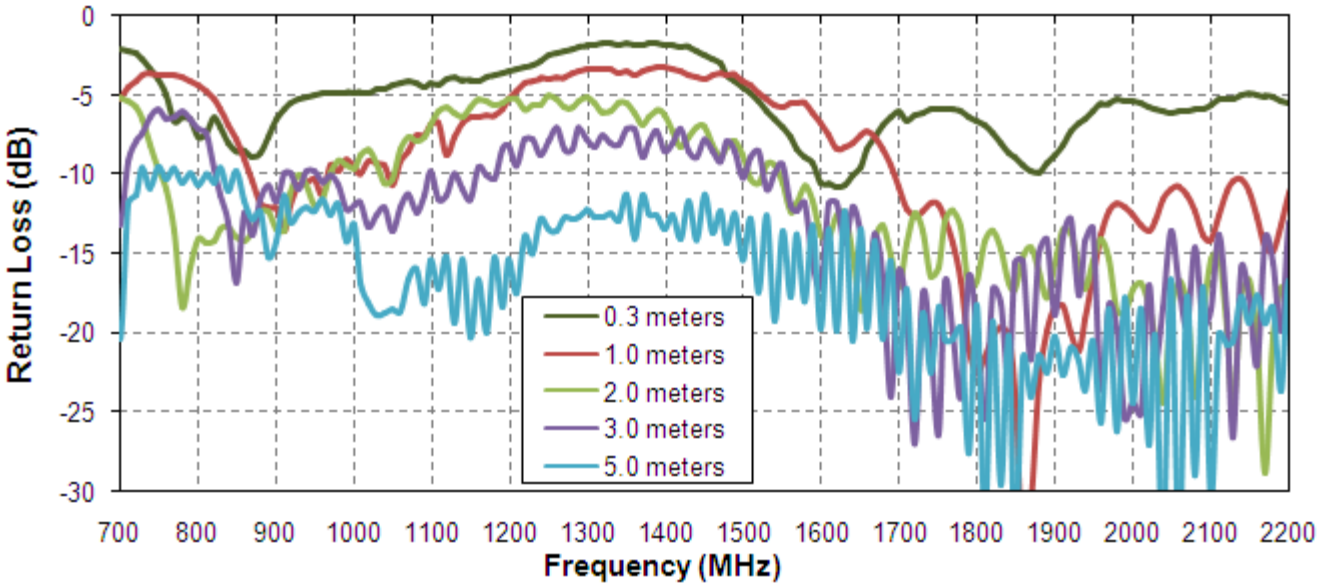


Figure 4. Return Loss of the FMA103 antenna on 60*60cm metal plate

4.2 Efficiency

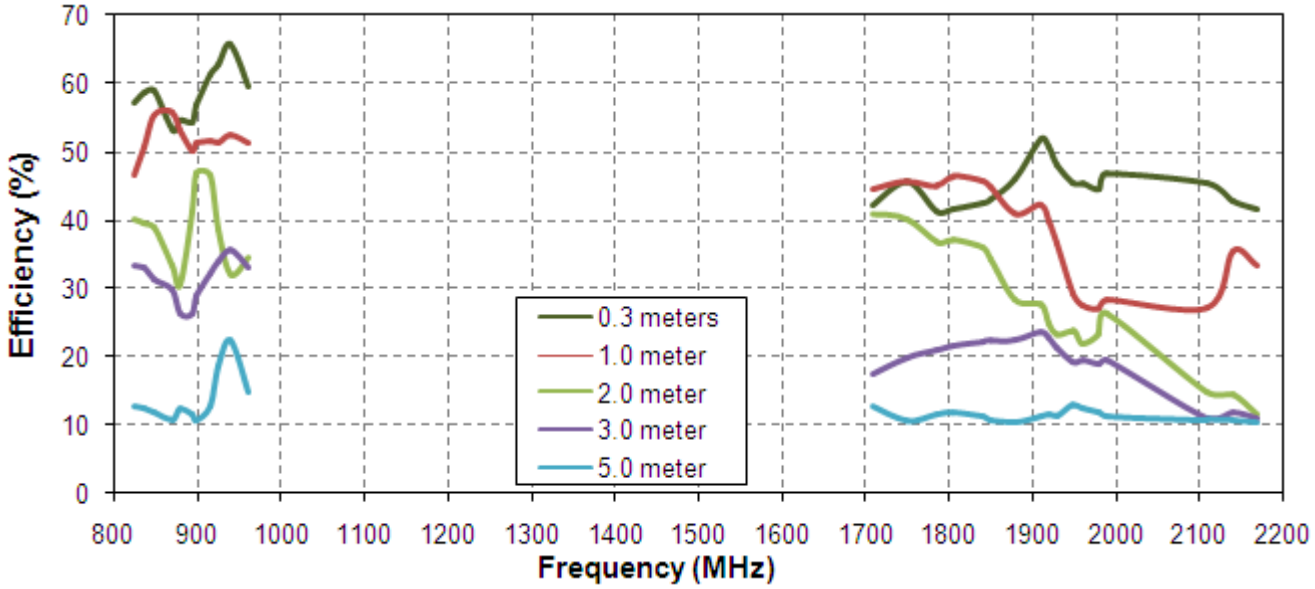


Figure 5. Efficiency of the FMA103 antenna in free space

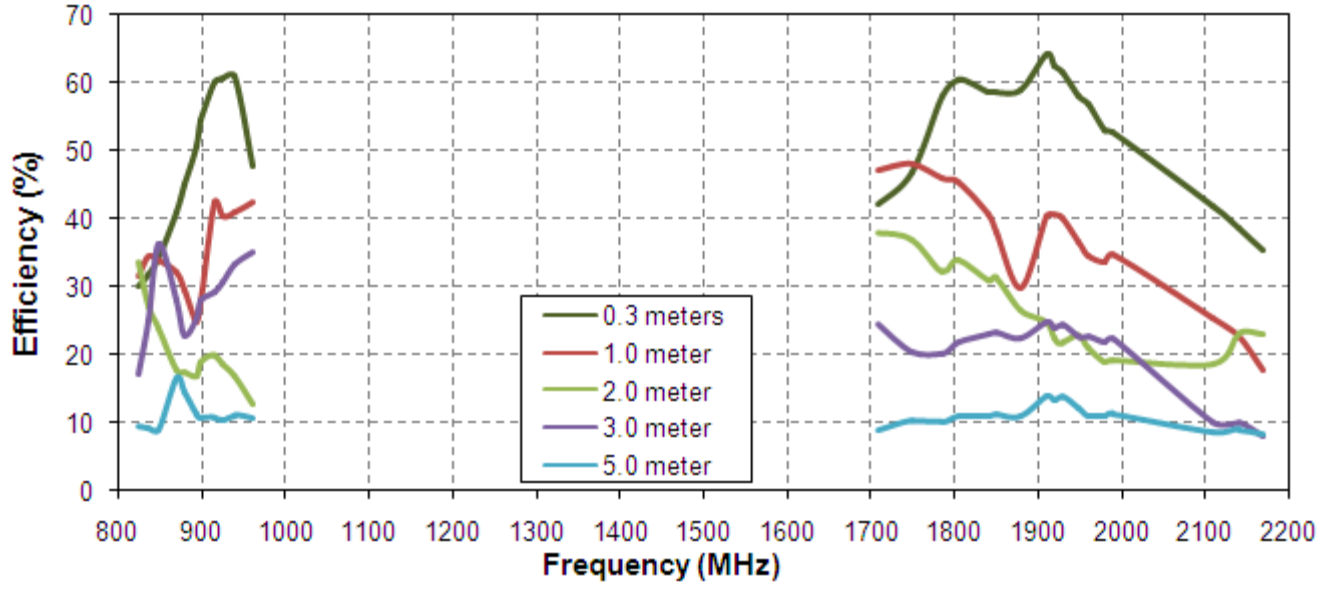


Figure 6. Efficiency of the FMA103 antenna on 30*30cm metal plate

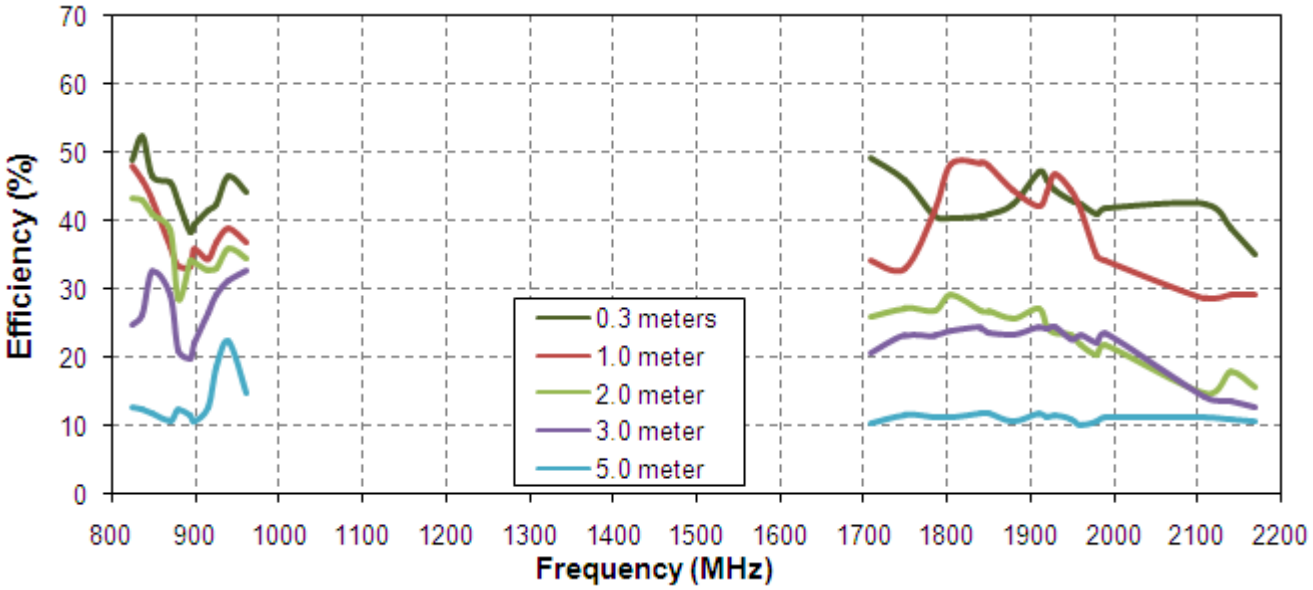


Figure 7. Efficiency of the FMA103 antenna on 60*60cm metal plate.

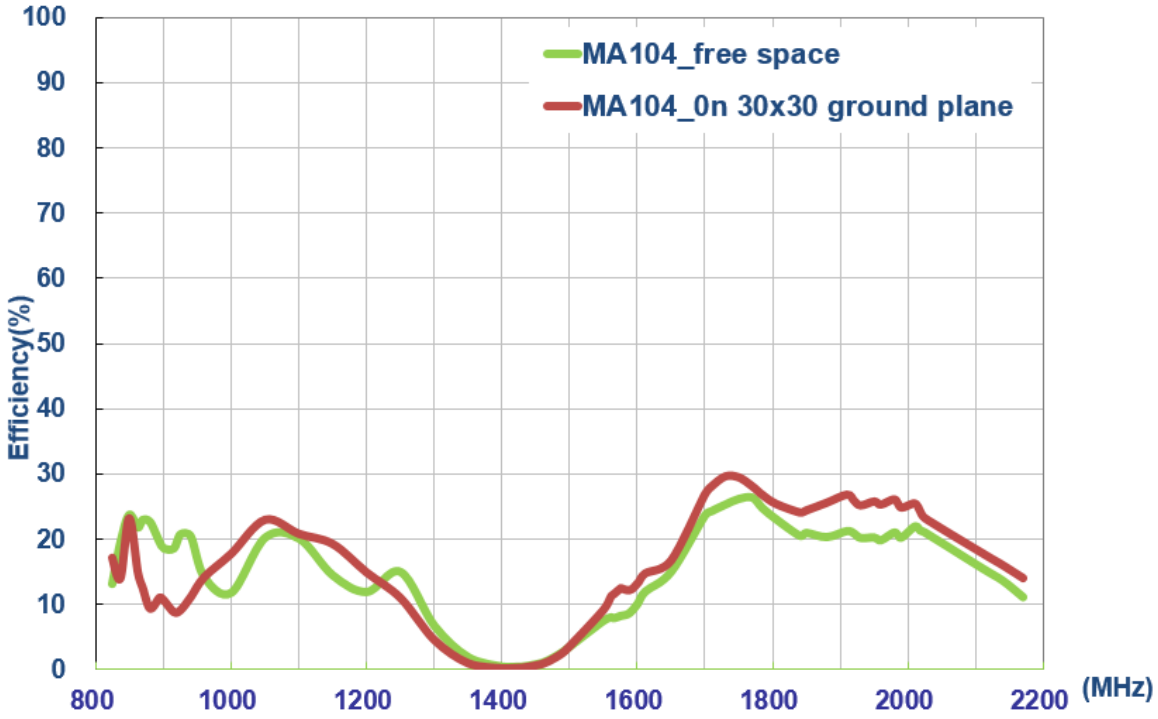


Figure 8. Efficiency of the FMA103 antenna with 960~1700MHz

4.3 Peak Gain

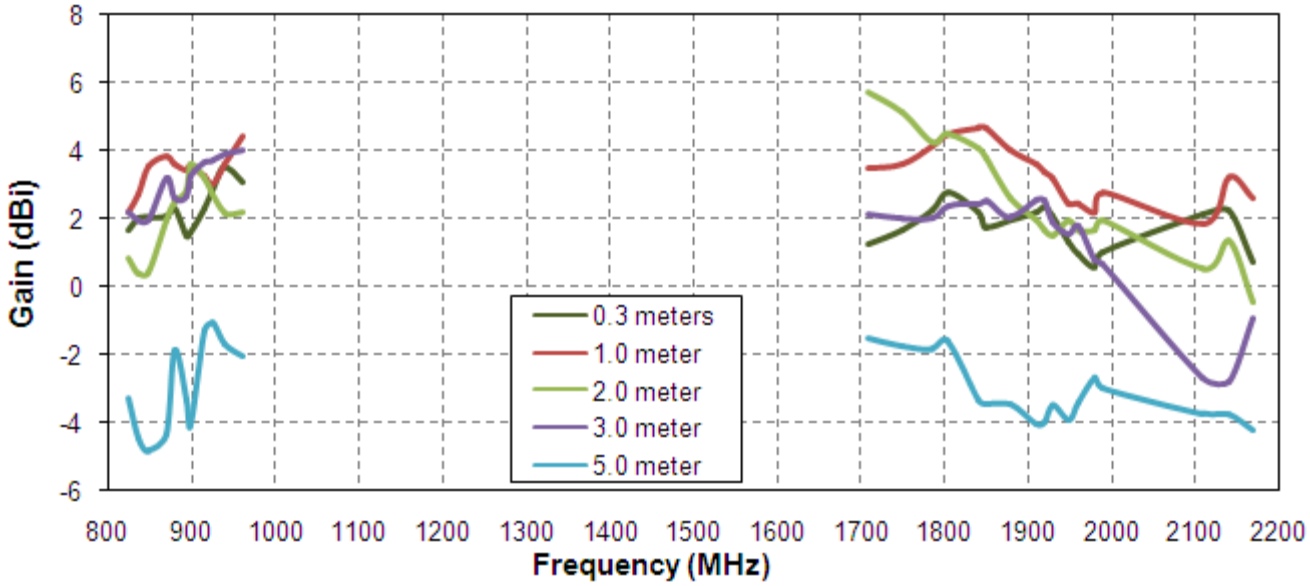


Figure 9. Gain of the FMA103 antenna in free space

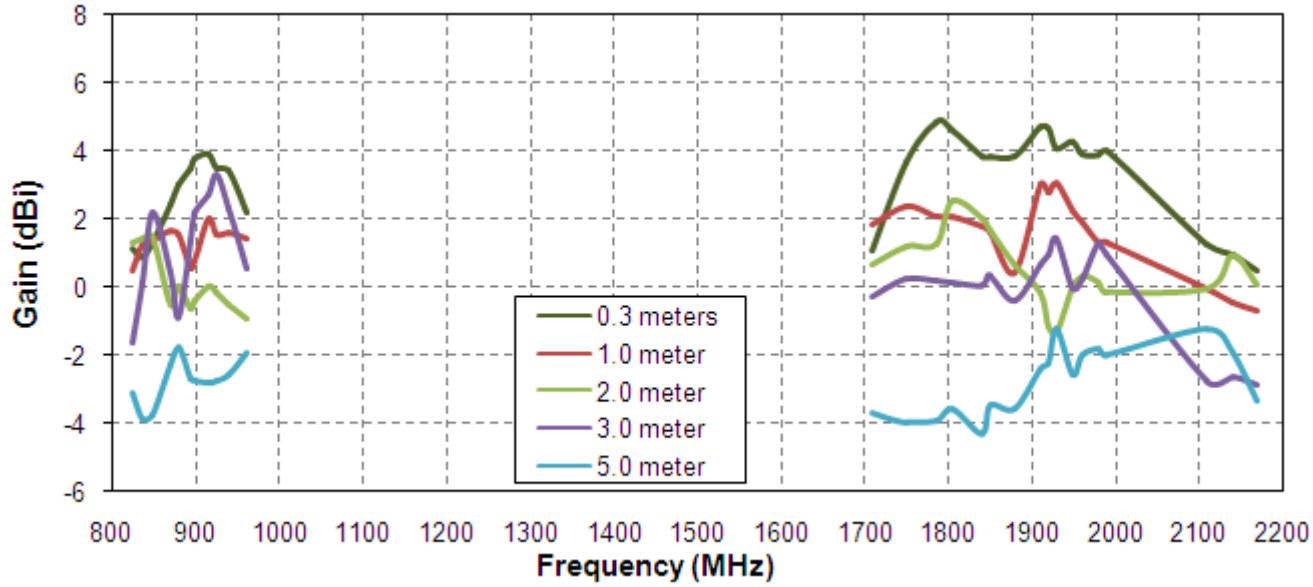


Figure 10. Gain of the FMA103 antenna on 30*30cm metal plate

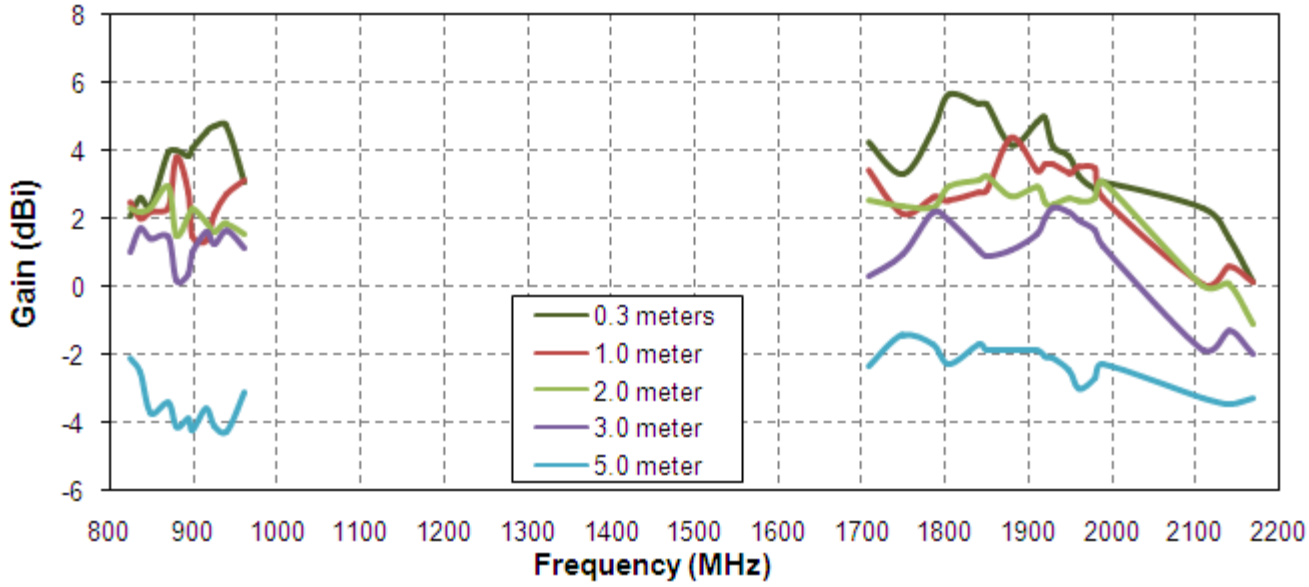


Figure 11. Gain of the FMA103 antenna on 60*60cm metal plate

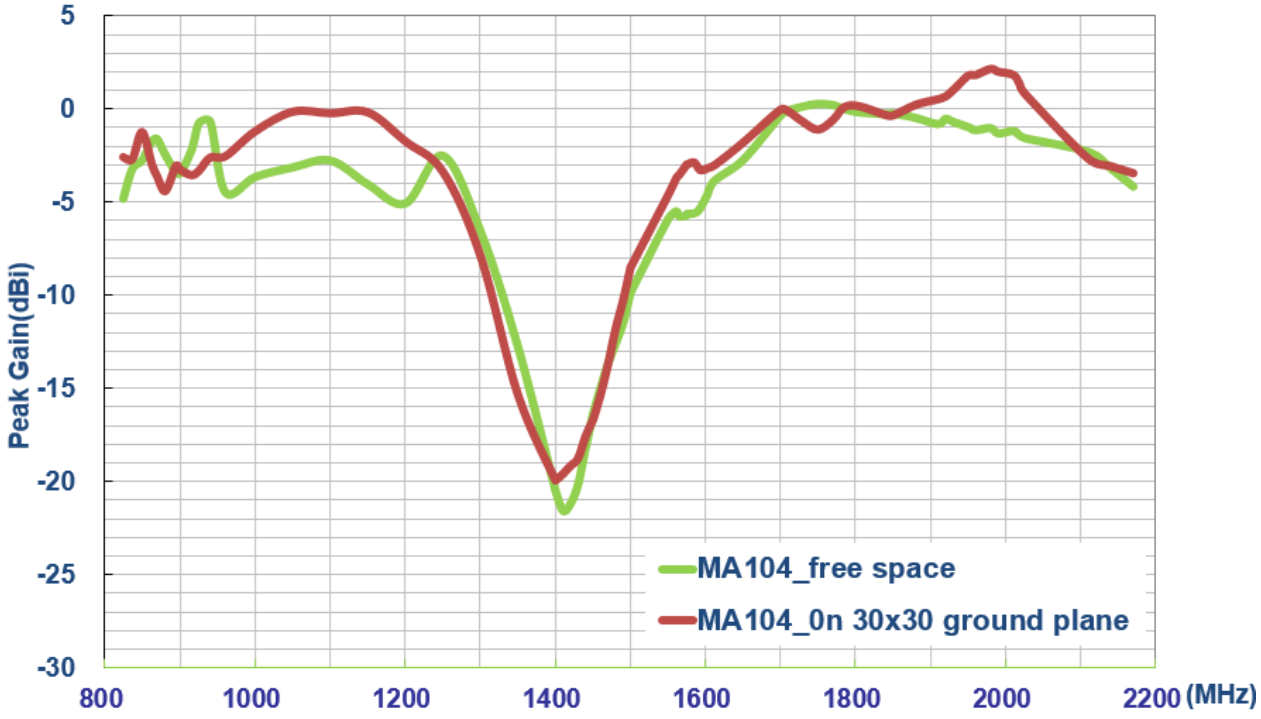


Figure 12. Gain of the FMA103 antenna from 960~1700MHz

4.4 Radiation pattern

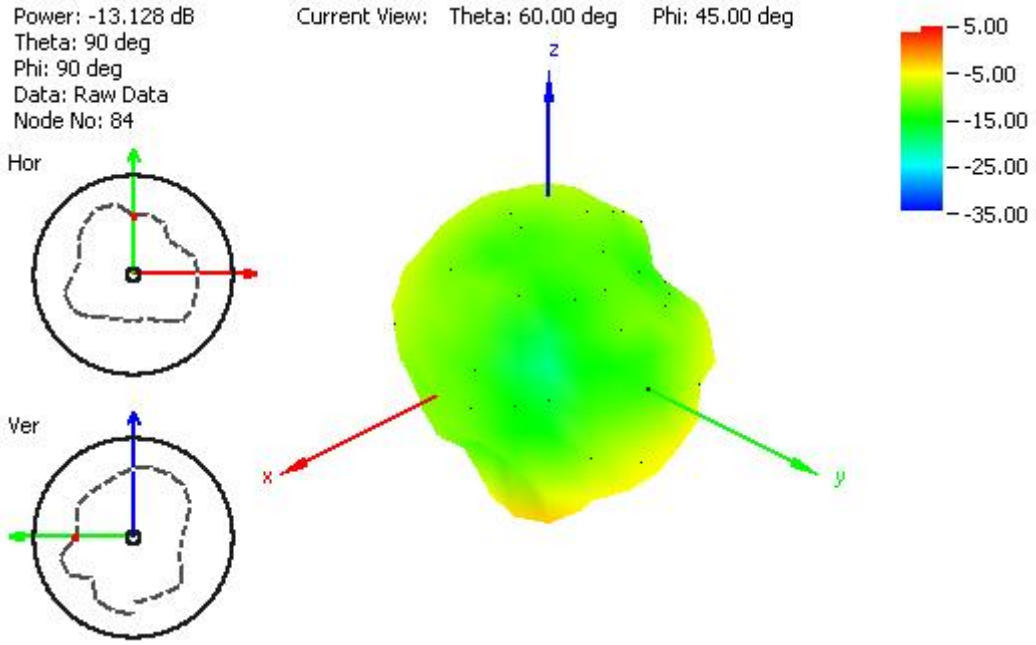


Figure 13. Radiation pattern at 849 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and free space

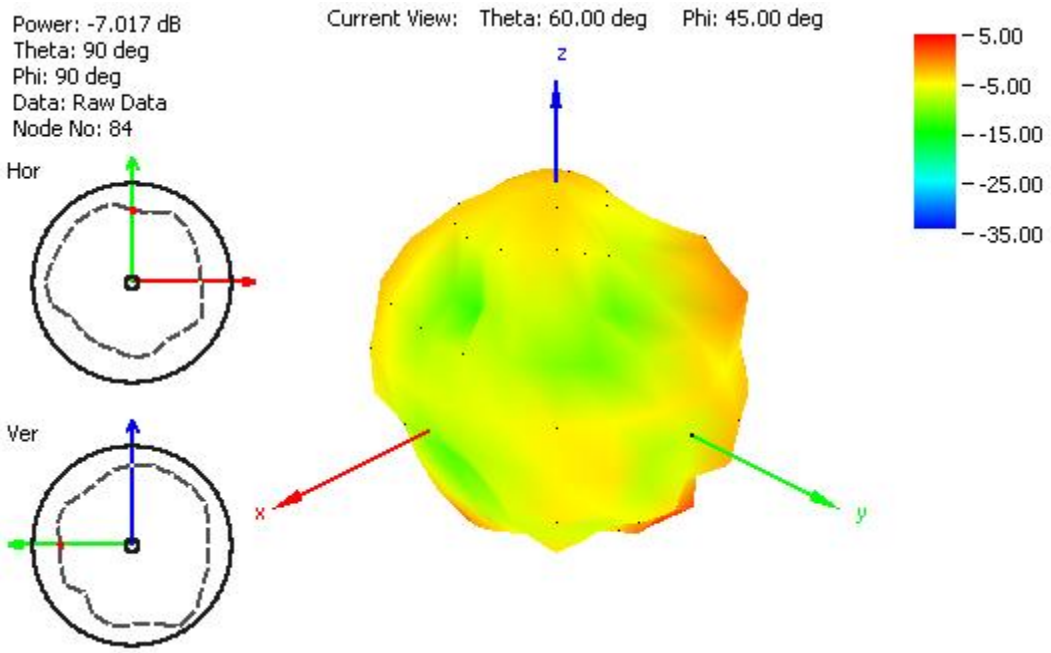


Figure 14. Radiation pattern at 915 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and free space

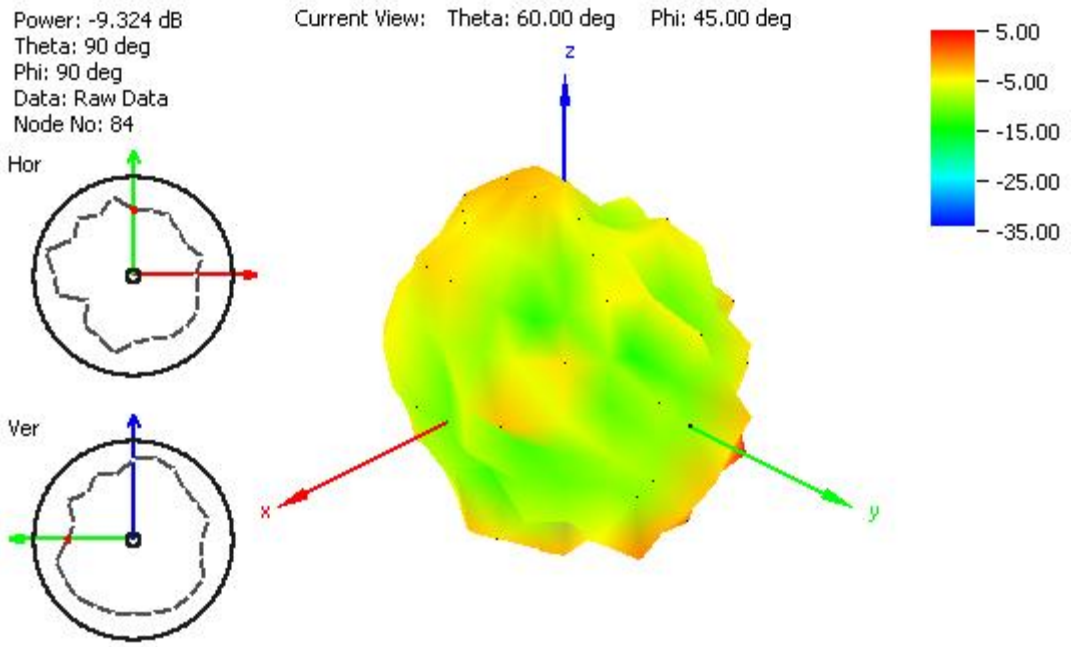


Figure 15. Radiation pattern at 1805 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and free space

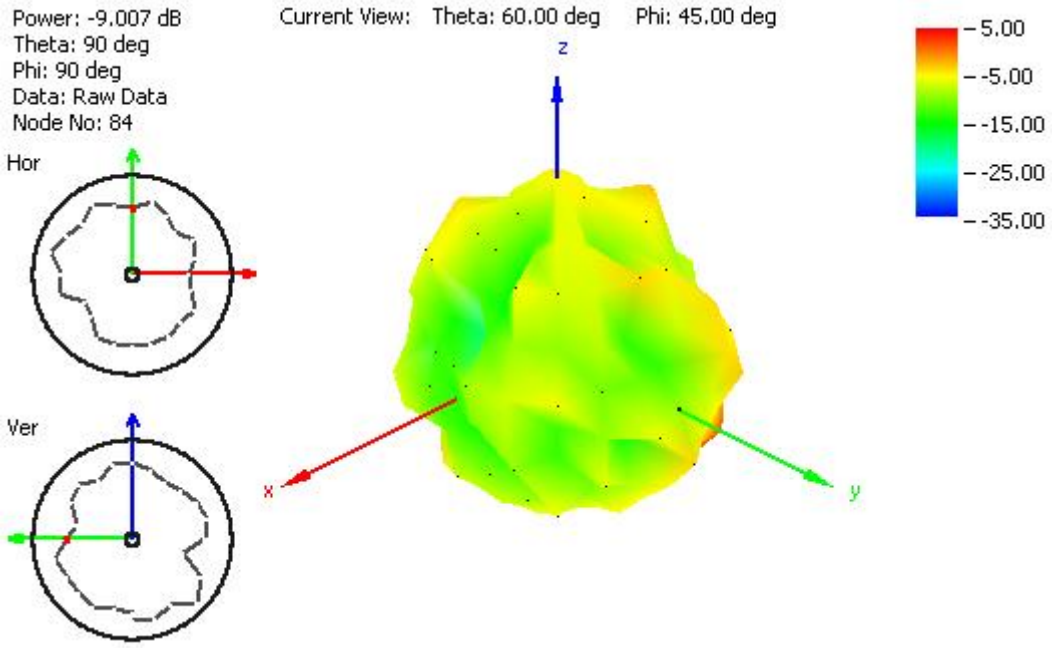


Figure 16. Radiation pattern at 1910 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and free space

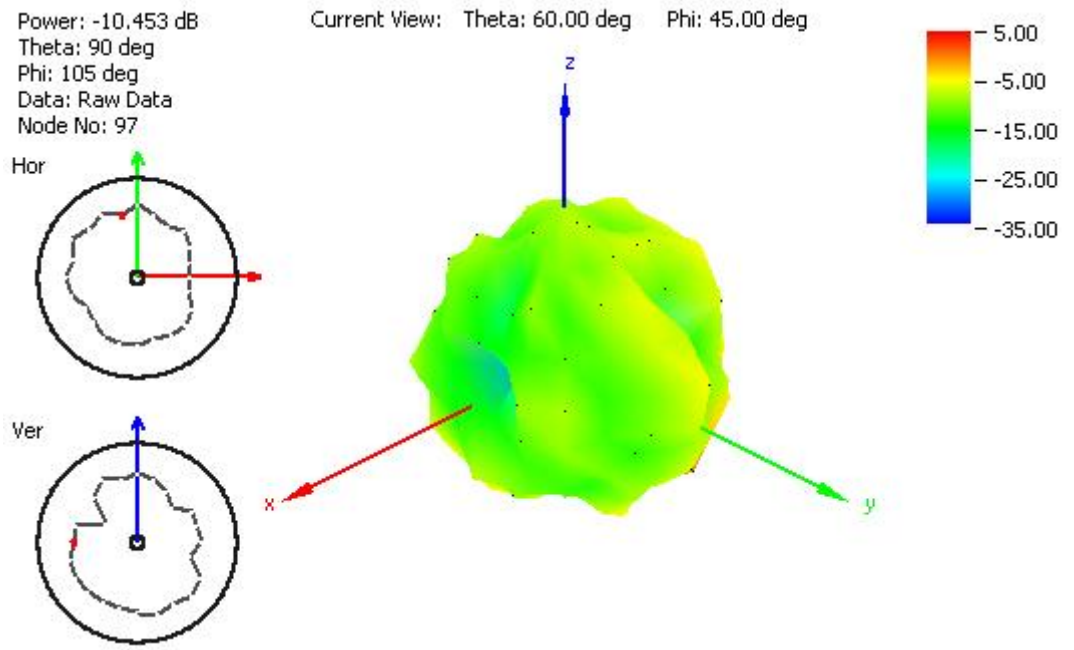


Figure 17. Radiation pattern at 2110 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and free space.

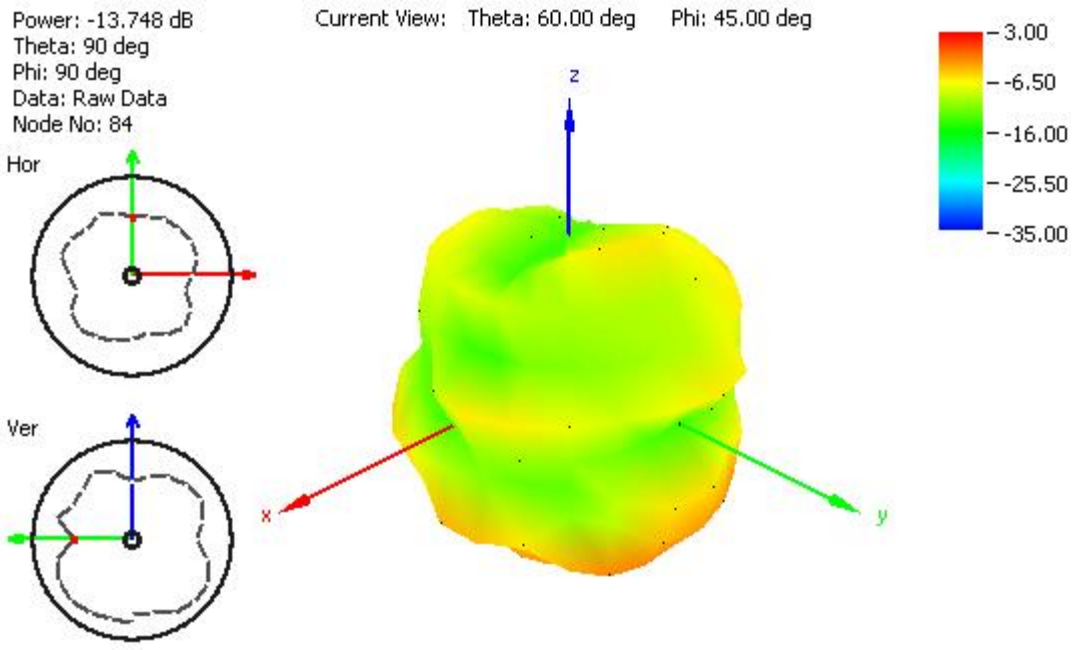


Figure 18. Radiation pattern at 849 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and 30x30 cm metal plate

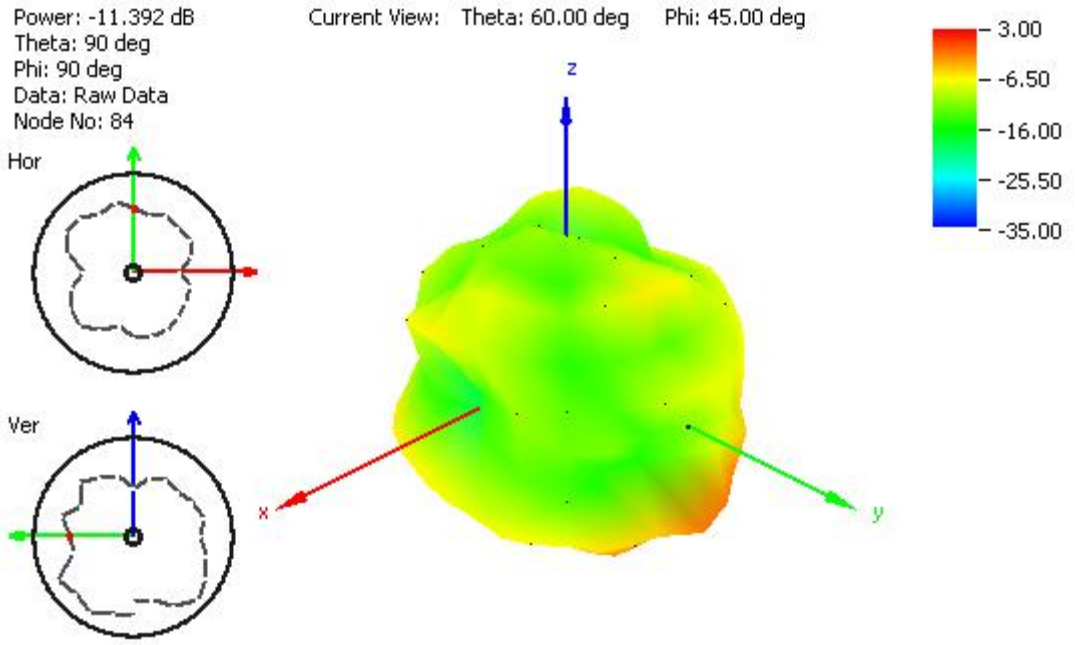


Figure 19. Radiation pattern at 915 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and 30x30 cm metal plate

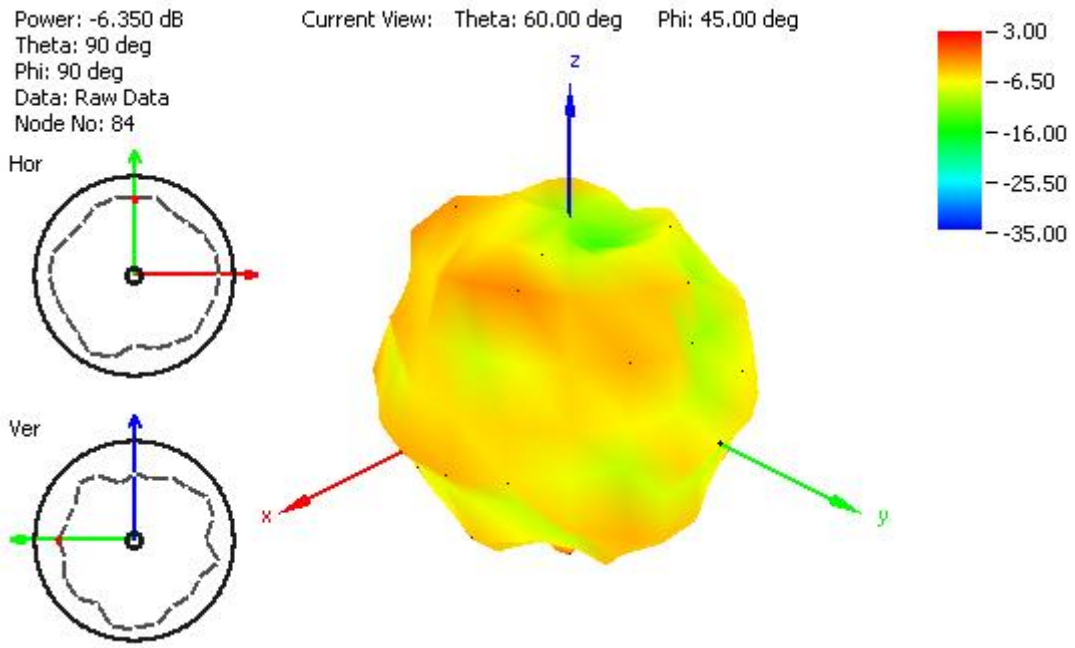


Figure 20. Radiation pattern at 1805 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and 30x30 cm metal plate

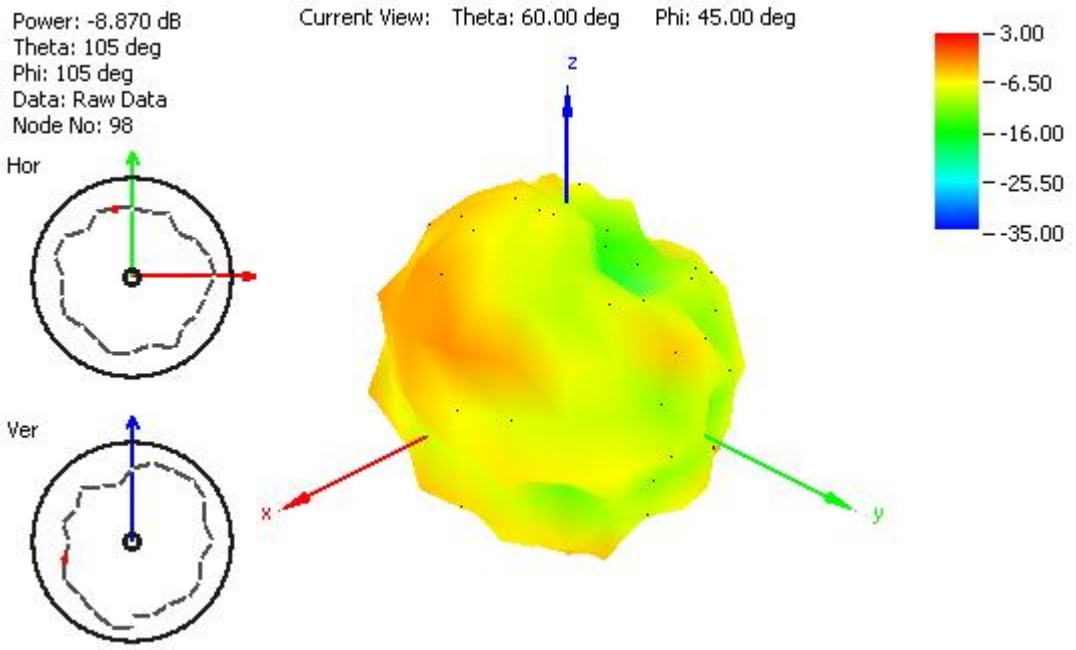


Figure 21. Radiation pattern at 1910 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and 30x30 cm metal plate

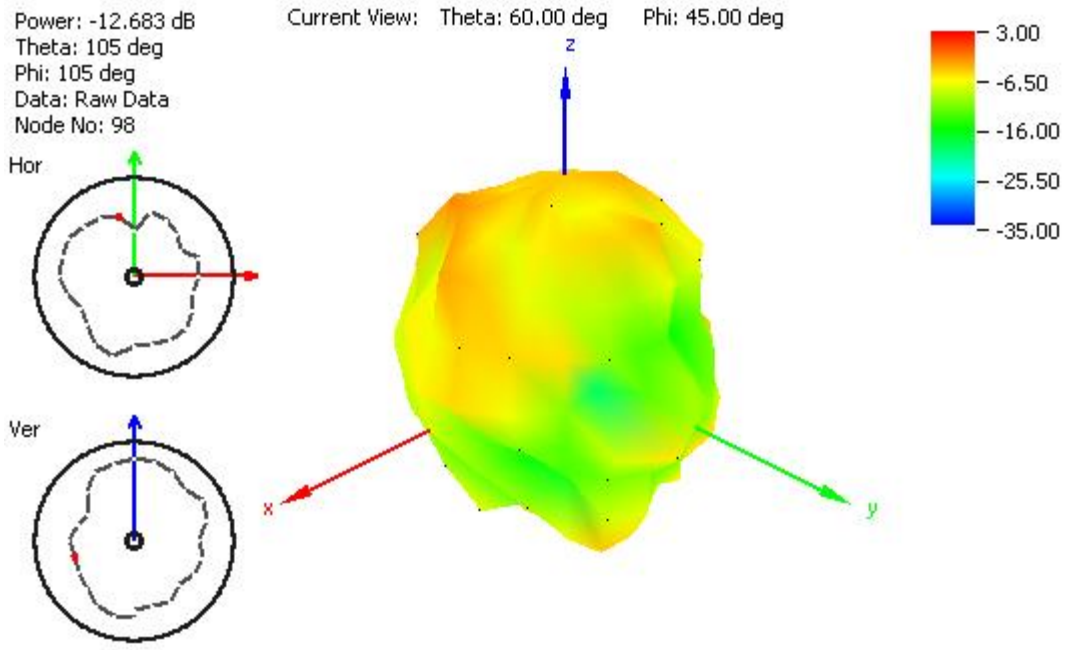


Figure 22. Radiation pattern at 2110 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and 30x30 cm metal plate

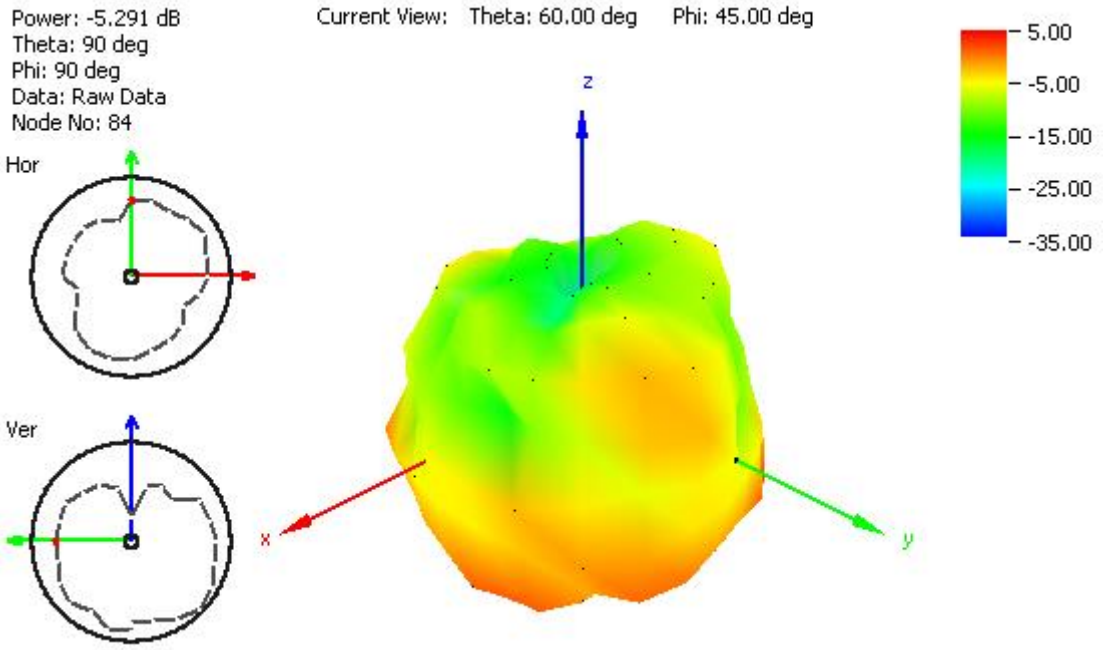


Figure 23. Radiation pattern at 849 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and 60x60 cm metal plate

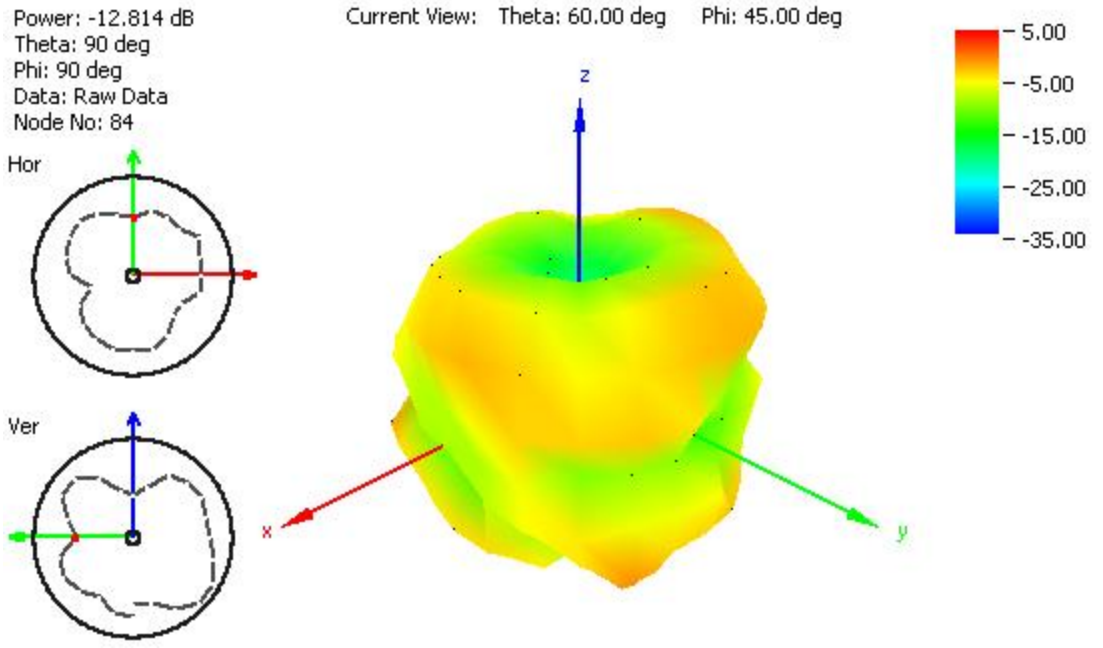


Figure 24. Radiation pattern at 915 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and 60x60 cm metal plate

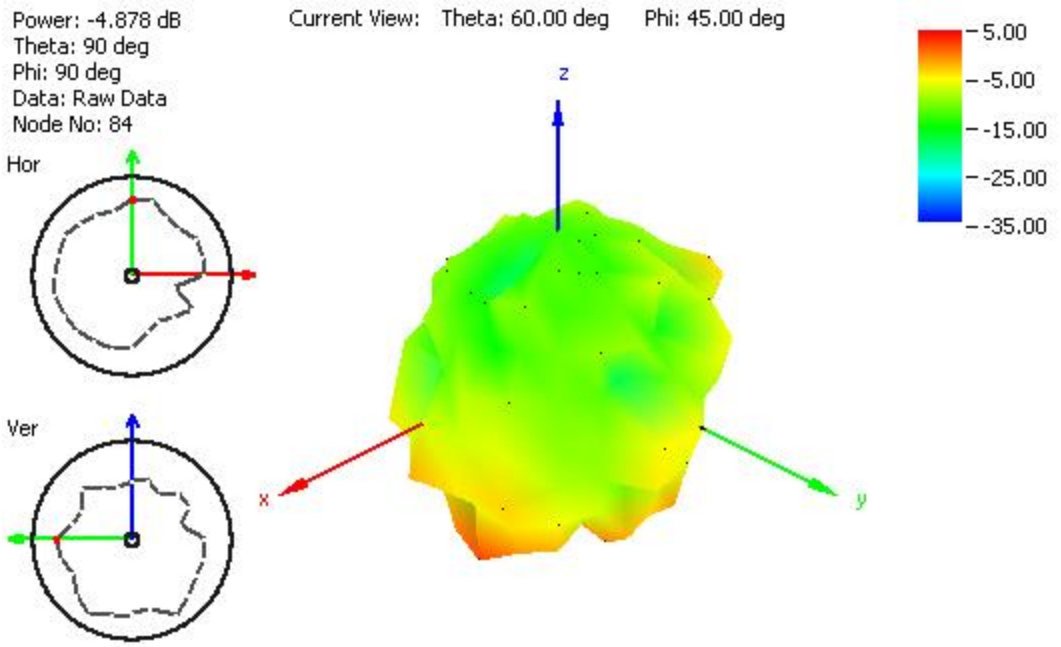


Figure 25. Radiation pattern at 1805 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and 60x60 cm metal plate

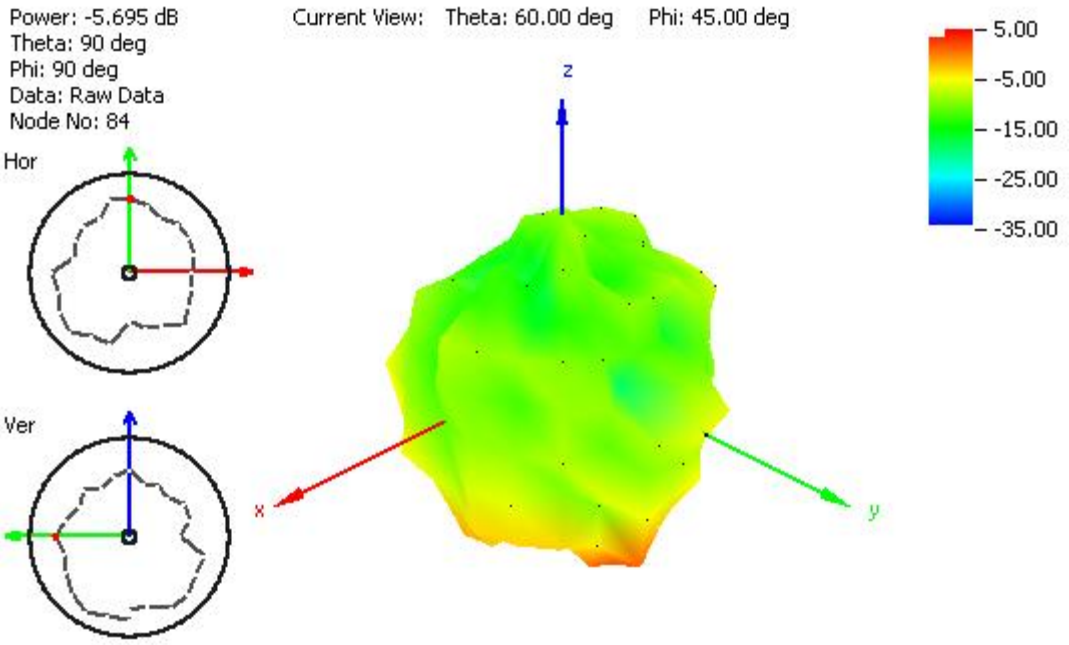


Figure 26. Radiation pattern at 1910 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and 60x60 cm metal plate

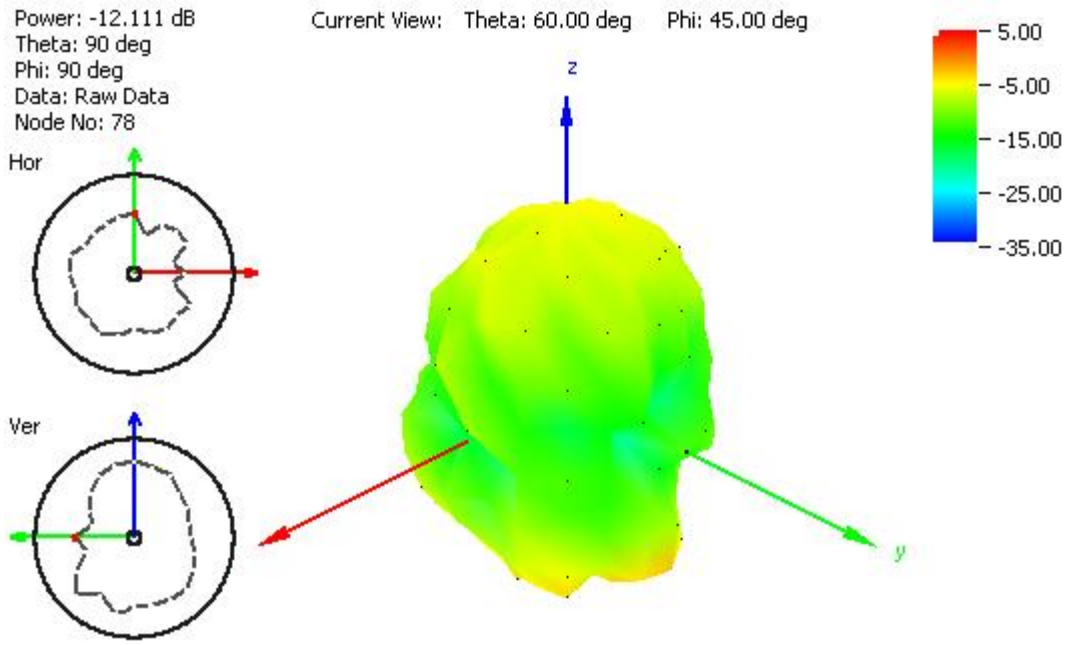
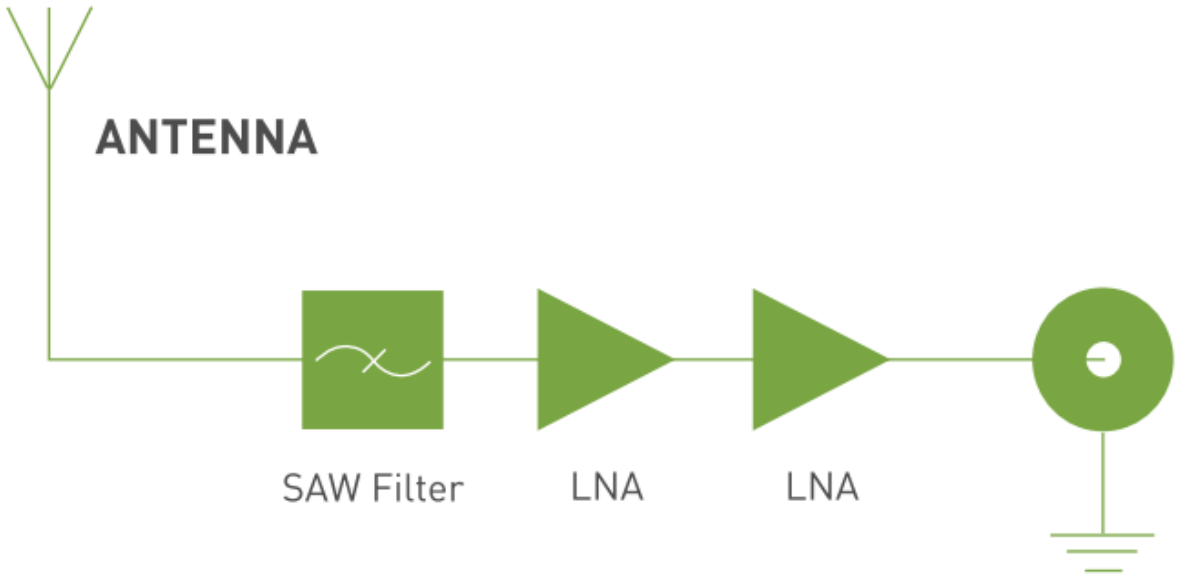
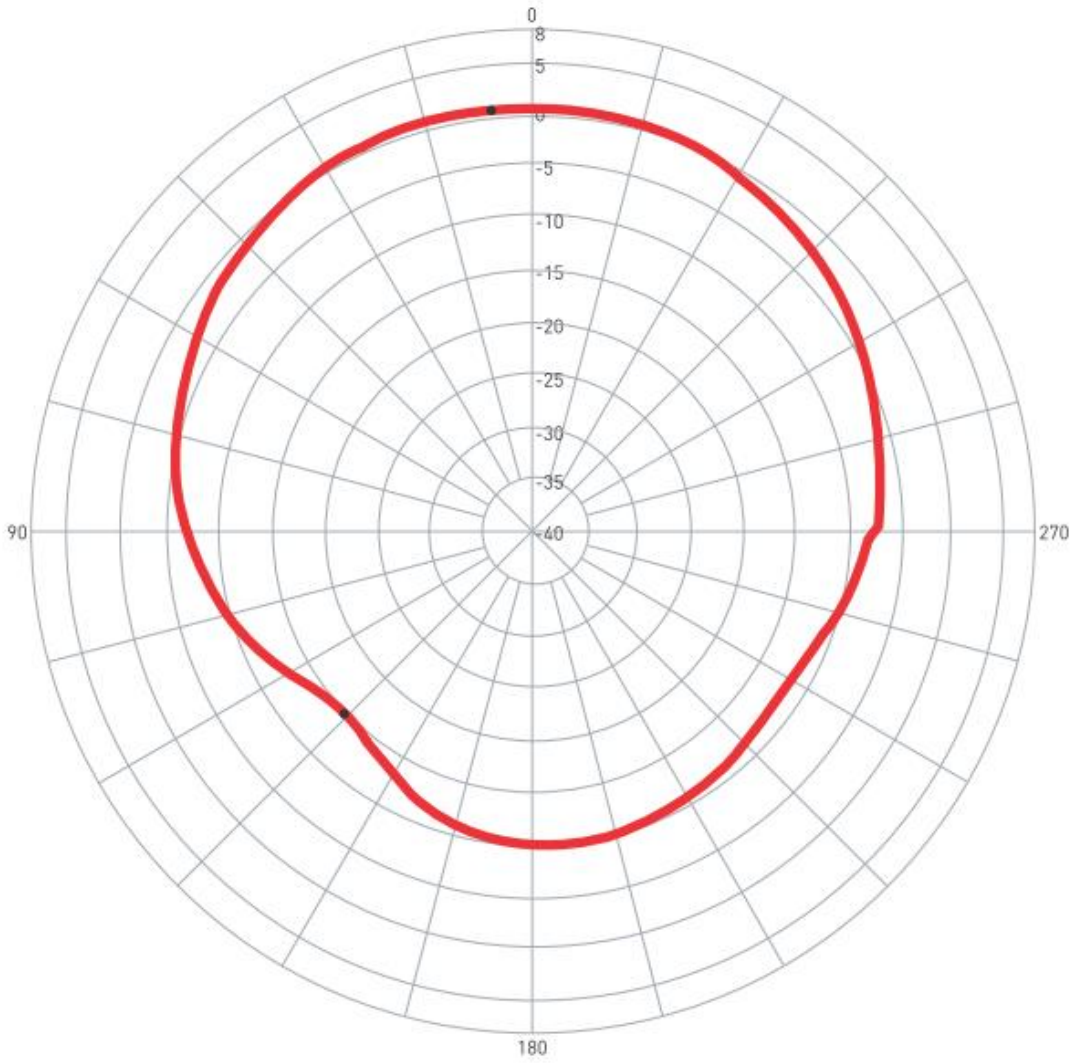


Figure 27. Radiation pattern at 2110 MHz, Figure 1 as reference (dB), with 2 m RG174 cable and 60x60 cm metal plate

5. System Block Diagram



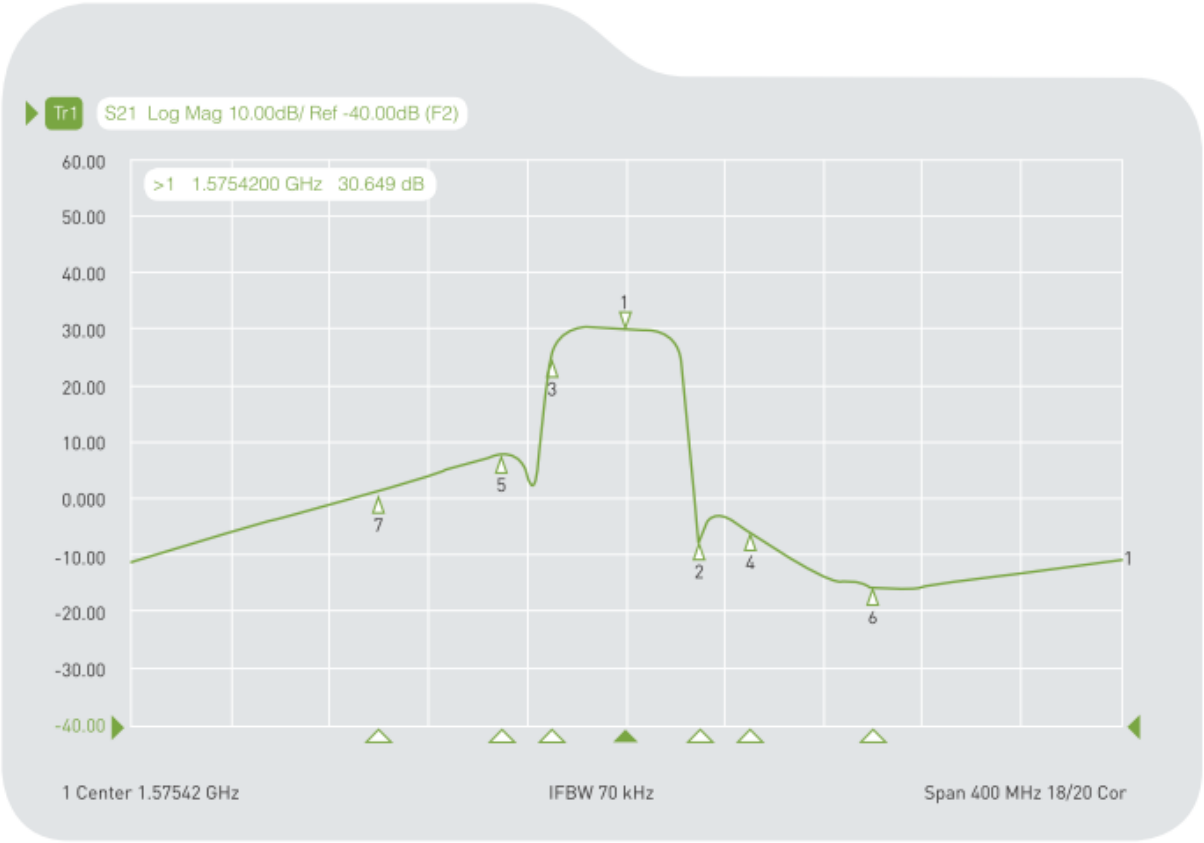
6. GPS/GALILEO Patch Radiation Pattern



0 degree is the top of Hercules.

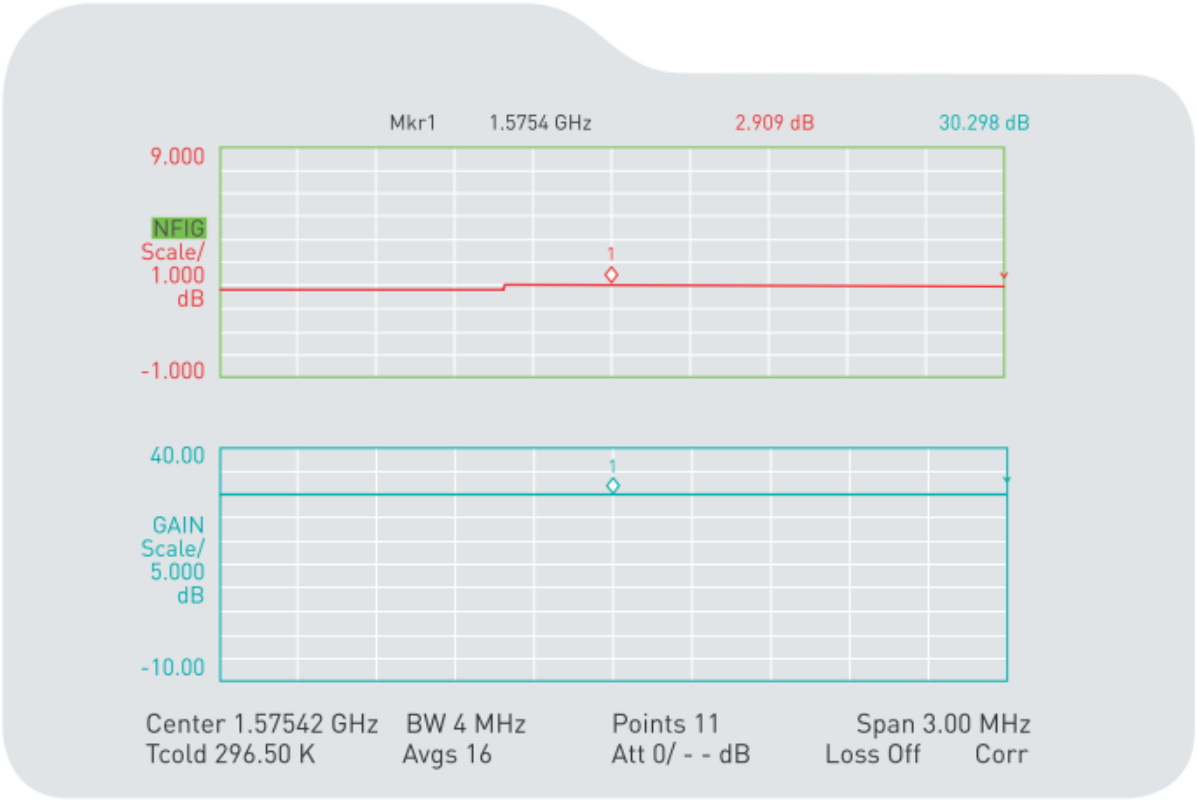
7. LNA Properties

7.1 LNA Gain and Out-band Rejection @ 3.0V

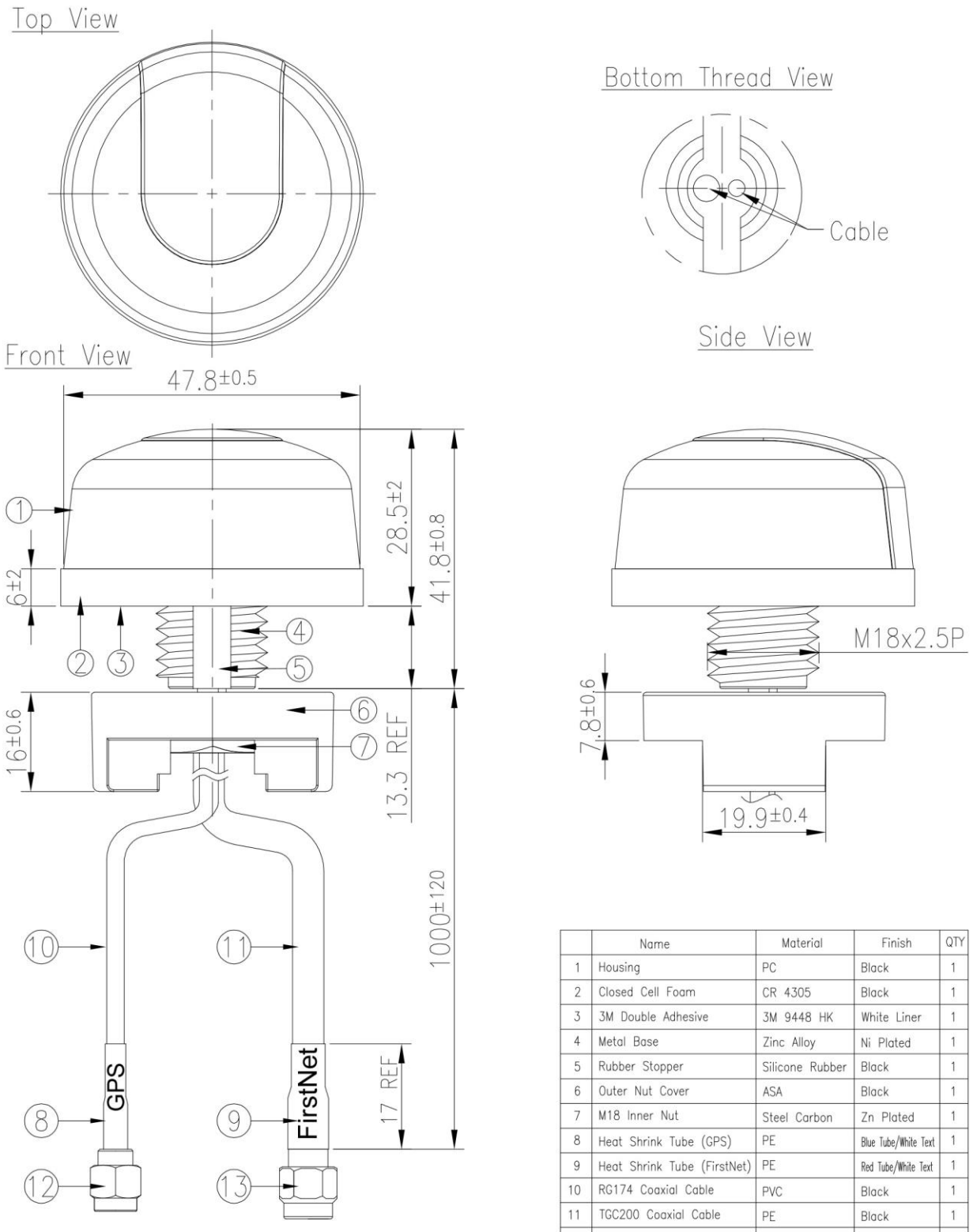


Cg1 Tr1 S21	>1	1.5754200 GHz	30.649	dB
Cg1 Tr1 S21	2	1.6054200 GHz	-6.7098	dB
Cg1 Tr1 S21	3	1.5454200 GHz	24.584	dB
Cg1 Tr1 S21	4	1.6254200 GHz	-5.6354	dB
Cg1 Tr1 S21	5	1.5254200 GHz	8.0734	dB
Cg1 Tr1 S21	6	1.6754200 GHz	-15.436	dB
Cg1 Tr1 S21	7	1.4754200 GHz	-1.5714	dB

7.2 Noise Figure

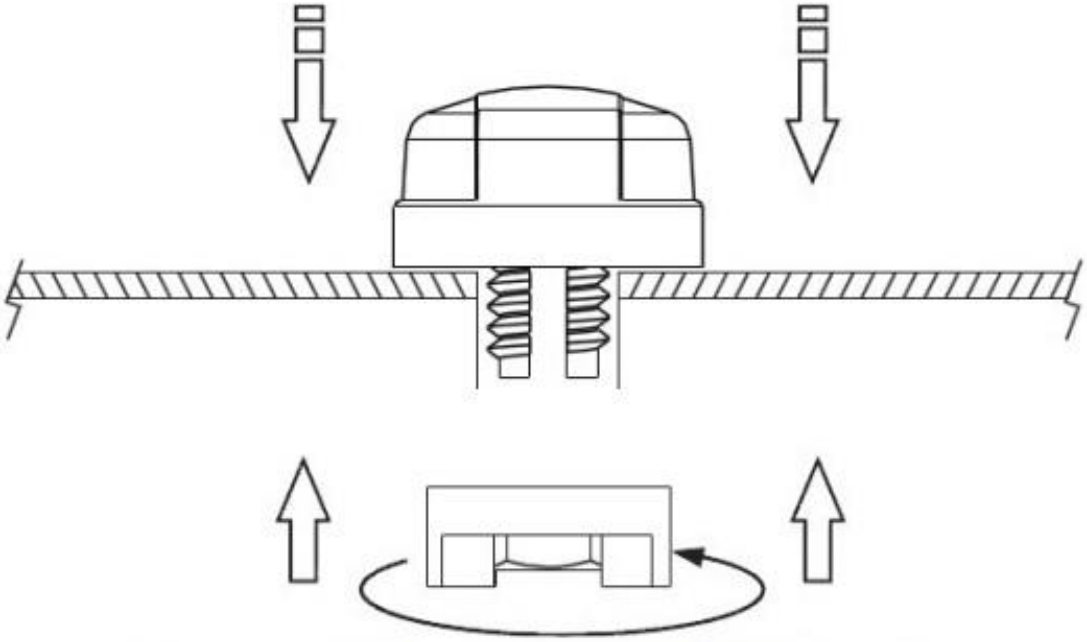


8. Drawing (Unit: mm)



	Name	Material	Finish	QTY
1	Housing	PC	Black	1
2	Closed Cell Foam	CR 4305	Black	1
3	3M Double Adhesive	3M 9448 HK	White Liner	1
4	Metal Base	Zinc Alloy	Ni Plated	1
5	Rubber Stopper	Silicone Rubber	Black	1
6	Outer Nut Cover	ASA	Black	1
7	M18 Inner Nut	Steel Carbon	Zn Plated	1
8	Heat Shrink Tube (GPS)	PE	Blue Tube/White Text	1
9	Heat Shrink Tube (FirstNet)	PE	Red Tube/White Text	1
10	RG174 Coaxial Cable	PVC	Black	1
11	TGC200 Coaxial Cable	PE	Black	1
12	SMA(M)ST for RG174	Brass	Au Plated	1
13	SMA(M)ST for TGC200	Brass	Au Plated	1

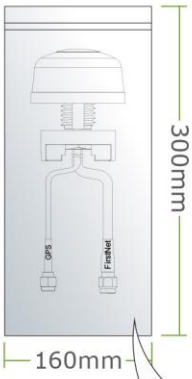
9. Installation



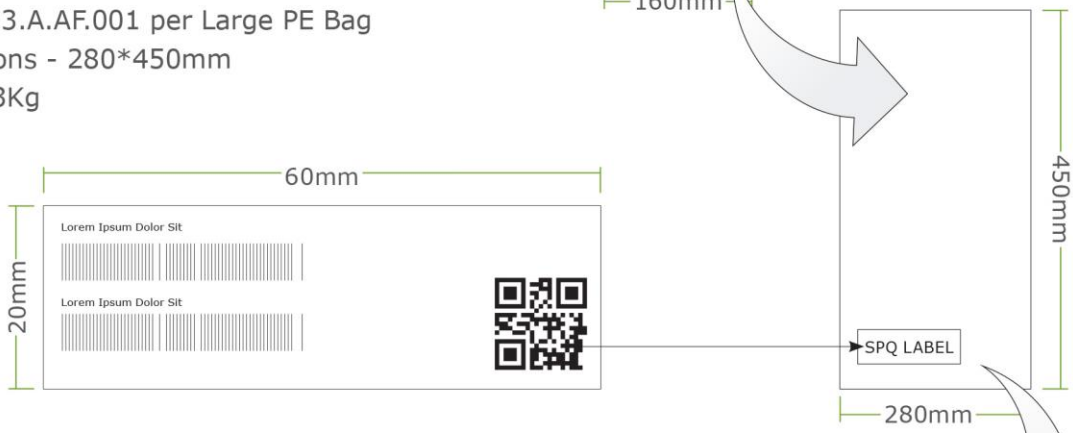
Recommended torque for Mounting is 24.5N·m
Maximum torque for mounting is 29.4N·m

10. Packaging

1pcs FMA103.A.AF.001 per Small PE Bag
Bag Dimensions - 160*300mm
Weight - 193g



10pcs FMA103.A.AF.001 per Large PE Bag
Bag Dimensions - 280*450mm
Weight - 1.93Kg



60pcs FMA103.A.AF.001 per carton
Carton - 390*260*330mm
Weight - 12Kg