# SPECIFICATION

## G21 GSM Hercules Gen.II Penta Band Cellular Antenna

| | | |
|---|---|---|
| Part No. | : | **G21.B.301111** |
| Product Name | : | Hercules Gen.II Penta Band Cellular Antenna<br>Screw-mount (Permanent mount)<br>GSM/GPRS/CDMA/EVDO/UMTS/HSPA/WCDMA<br>850/900/1800/1900/2100 MHz |
| Features | : | Low profile - Height 29mm and diameter 49mm<br>Heavy duty screw mount<br>UV and Vandal resistant PC housing<br>IP67 & IP69K<br>3M Cable RG174 Standard<br>SMA(M) Connector Standard<br>Cable and Connector are Customizable<br>ROHS Compliant |

# 1. INTRODUCTION

The G21 (Generation II) Hercules is a high performance, steel thread-mount, Penta-band cellular antenna for external use on vehicles and outdoor assets worldwide. Omni-directional high gain across all bands ensures constant reception and transmission. The durable UV resistant PC housing is resistant to vandalism and direct attack.

With IP67 and IP69K waterproof rating, the G21 can be screw mounted on vehicles and outdoor/indoor assets via its extra thick thread. The antenna has a compact dimension at only 28.5mm in height and 49mm in diameter. The enclosure is designed to not catch on tree-branches.

Taoglas recommend a minimum cable length of 300mm when used on a ground plane to achieve an efficiency of greater than 30%.

This antenna can be mounted on metal structures.  The G21 is an ideal solution for cellular external applications where it can operate with or without the ground plane.

# 2. SPECIFICATION

| ELECTRICAL-On 30x30cm Ground Plane | | | | | | |
|---|---|---|---|---|---|---|
| **Standard** | | **AMPS** | **GSM** | **DCS** | **PCS** | **3G** |
| **Band (MHz)** | | **850** | **900** | **1800** | **1900** | **2100** |
| **Frequency (MHz)** | | **824-896** | **880-960** | **1710-1880** | **1850-1990** | **1920 –2170** |
| **Return Loss (dB)** | | | | | | |
| Cable length (meter) | 0.3 | -6.0 | -5.2 | -6.1 | -6.2 | -5.8 |
| | 1.0 | -7.8 | -8.7 | -11.4 | -15.3 | -13.7 |
| | 2.0 | -8.1 | -9.3 | -16.5 | -20.3 | -19.5 |
| | 3.0 | -11.0 | -12.4 | -17.5 | -18.3 | -18.1 |
| | 5.0 | -11.8 | -13.6 | -17.6 | -17.8 | -17.8 |
| **Efficiency (%)** | | | | | | |
| Cable length (meter) | 0.3 | 51.1 | 41.4 | 38.0 | 46.5 | 33.3 |
| | 1.0 | 39.4 | 40.2 | 42.2 | 43.4 | 31.3 |
| | 2.0 | 24.3 | 27.5 | 28.4 | 28.2 | 29.6 |
| | 3.0 | 24.6 | 27.6 | 22.0 | 23.8 | 24.6 |
| | 5.0 | 17.1 | 16.4 | 15.7 | 15.0 | 12.0 |
| **Peak Gain (dBi)** | | | | | | |
| Cable length (meter) | 0.3 | 2.0 | 1.5 | 4.0 | 4.3 | 4.2 |
| | 1.0 | 1.7 | 2.7 | 1.8 | 1.9 | 1.8 |
| | 2.0 | 1.4 | 2.1 | 0.8 | -0.3 | -0.7 |
| | 3.0 | 1.0 | 1.0 | -0.9 | -1.1 | -1.1 |
| | 5.0 | -0.8 | -0.3 | -4.2 | -3.9 | -4.2 |
| **Polarization** | | Linear | | | | |
| **Impedance** | | 50 ohms | | | | |
| **Max Input Power** | | 10 watts | | | | |
| **VSWR** | | <3.5:1 | | | | |

| ELECTRICAL-On 60x60cm Ground Plane | | | | | | |
|---|---|---|---|---|---|---|
| **Standard** | | **AMPS** | **GSM** | **DCS** | **PCS** | **3G** |
| **Band (MHz)** | | **850** | **900** | **1800** | **1900** | **2100** |
| **Frequency (MHz)** | | **824-896** | **880-960** | **1710-1880** | **1850-1990** | **1920 –2170** |
| **Return Loss (dB)** | | | | | | |
| Cable length (meter) | 0.3 | -6.0 | -5.6 | -8.8 | -8.5 | -7.8 |
| | 1.0 | -7.8 | -8.2 | -13.6 | -13.8 | -16.3 |
| | 2.0 | -8.9 | -11.1 | -16.7 | -19.6 | -19.5 |
| | 3.0 | -11.0 | -13.6 | -17.8 | -18.3 | -18.6 |
| | 5.0 | -12.3 | -14.8 | -19.1 | -19.1 | -18.2 |
| **Efficiency (%)** | | | | | | |
| Cable length (meter) | 0.3 | 31.0 | 30.3 | 47.1 | 43.6 | 41.6 |
| | 1.0 | 28.0 | 29.3 | 39.2 | 33.5 | 31.2 |
| | 2.0 | 26.3 | 28.5 | 28.8 | 29.6 | 30.7 |
| | 3.0 | 19.2 | 18.6 | 21.3 | 22.1 | 25.2 |
| | 5.0 | 11.4 | 12.8 | 13.7 | 11.6 | 12.3 |
| **Peak Gain (dBi)** | | | | | | |
| Cable length (meter) | 0.3 | 2.1 | 2.3 | 3.1 | 3.0 | 2.8 |
| | 1.0 | 1.0 | 0.6 | 1.9 | 1.6 | 0.9 |
| | 2.0 | 0.6 | 0.2 | 0.8 | -0.2 | -0.8 |
| | 3.0 | -0.5 | 0.1 | 0.2 | -0.1 | -1.1 |
| | 5.0 | -2.3 | -2.2 | -2.9 | -3.4 | -3.9 |
| **Polarization** | | Linear | | | | |
| **Impedance** | | 50 ohms | | | | |
| **Max Input Power** | | 10 watts | | | | |
| **VSWR** | | <3.5:1 | | | | |

| ELECTRICAL-FREE SPACE | | | | | | |
|---|---|---|---|---|---|---|
| **Standard** | | **AMPS** | **GSM** | **DCS** | **PCS** | **3G** |
| **Band (MHz)** | | **850** | **900** | **1800** | **1900** | **2100** |
| **Frequency (MHz)** | | **824-896** | **880-960** | **1710-1880** | **1850-1990** | **1920 –2170** |
| **Return Loss (dB)** | | | | | | |
| Cable length (meter) | 0.3 | -6.2 | -5.3 | -5.8 | -6.4 | -5.6 |
| | 1.0 | -8.1 | -8.3 | -10.9 | -15.8 | -13.2 |
| | 2.0 | -8.5 | -12.3 | -15.8 | -17.6 | -17.2 |
| | 3.0 | -11.6 | -12.9 | -16.9 | -17.9 | -18.3 |
| | 5.0 | -11.8 | -15.6 | -18.6 | -18.4 | -18.8 |
| **Efficiency (%)** | | | | | | |
| Cable length (meter) | 0.3 | 53.2 | 51.3 | 42.8 | 43.6 | 46.7 |
| | 1.0 | 24.3 | 32.6 | 32.8 | 40.2 | 27.8 |
| | 2.0 | 24.1 | 25.8 | 27.8 | 31.2 | 26.2 |
| | 3.0 | 23.3 | 24.2 | 23.4 | 22.8 | 23.6 |
| | 5.0 | 13.6 | 20.8 | 12.1 | 11.8 | 10.3 |
| **Peak Gain (dBi)** | | | | | | |
| Cable length (meter) | 0.3 | 0.4 | 0.9 | 2.4 | 2.5 | 2.2 |
| | 1.0 | 0.2 | 0.2 | 0.9 | 0.9 | 1.8 |
| | 2.0 | -1.7 | -1.3 | 1.1 | -0.4 | -1.5 |
| | 3.0 | -1.8 | -1.1 | -1.2 | -1.8 | -1.9 |
| | 5.0 | -3.3 | -2.3 | -4.1 | -4.6 | -4.7 |
| **Polarization** | | Linear | | | | |
| **Impedance** | | 50 ohms | | | | |
| **Max Input Power** | | 10 watts | | | | |
| **VSWR** | | <3.5:1 | | | | |

| MECHANICAL | |
|---|---|
| **Dimensions** | Height = 29 mm and Diameter = 49mm |
| **Cable** | 3M RG174 – Fully Customizable |
| **Connector** | SMA-Male – Fully Customizable |
| **Casing** | UV Resistant PC |
| **Base and Thread** | Nickel plated steel |
| **Thread Diameter** | 18 mm |
| **Weather proof gasket** | CR4305 foam with 3M9448B double-side adhesive |
| **Sealant** | Rubber Stopper |
| **ENVIRONMENTAL** | |
| **Protection** | IP67 & IP69K |
| **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 +85°C |
| **Humidity** | Non-condensing 65°C 95% RH |
| **Shock (Drop Test)** | 1m drop on concrete 6 axes |
| **Cable Pull** | 8 Kgf |
| **Recommended Mounting Torque** | 24.5N·m |
| **Maximum Mounting Torque** | 29.5N·m |
| **Weight** | 150g |

# 3. TEST SETUP

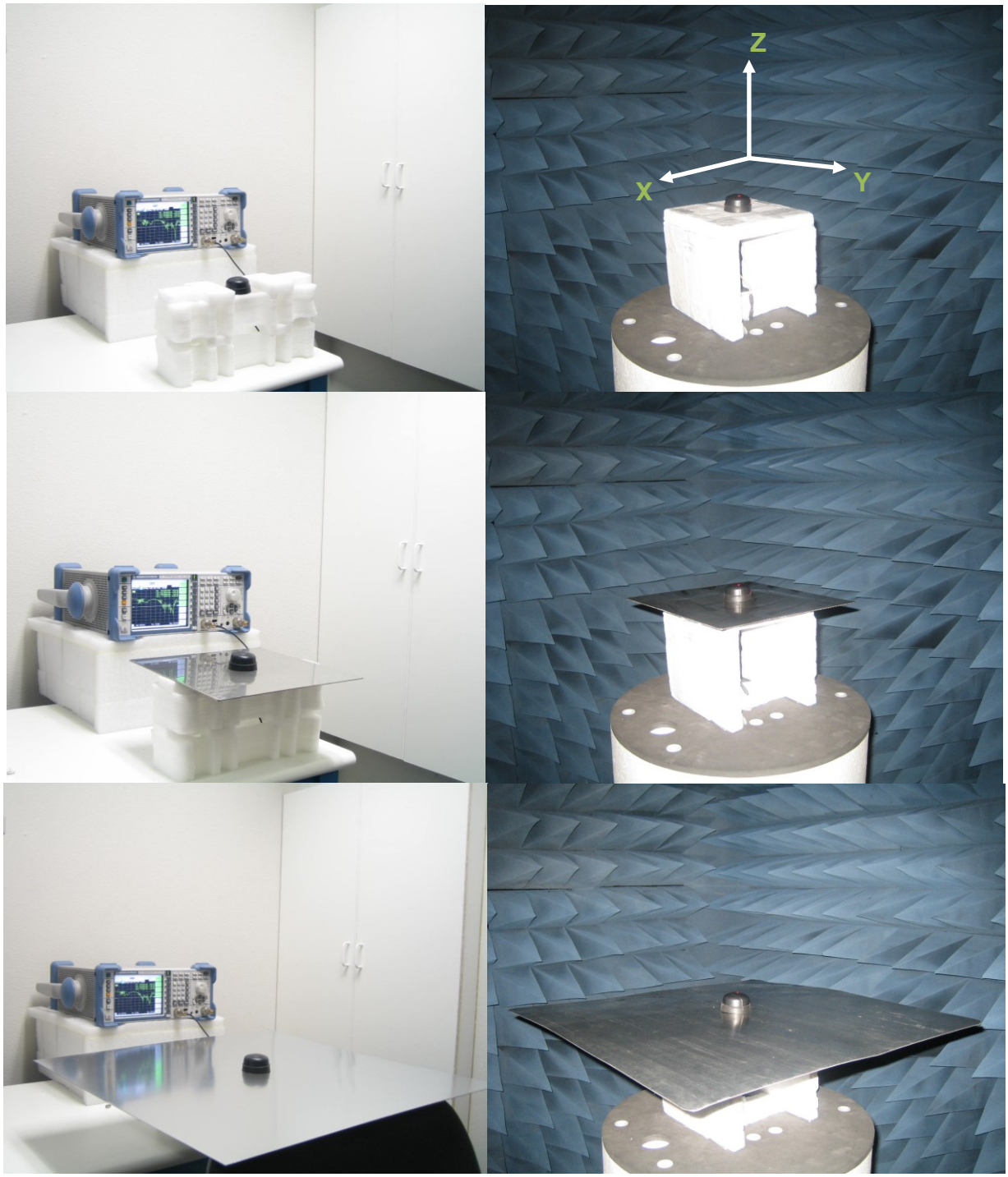



**Figure 1.** G21 Antenna test set up in free space, 30x30 cm metal plate, and 60x60 cm metal plate, R&SZVL6 VNA (left) and R&S4100 CTIA 3D Chamber (Right).

# 4. ANTENNA PARAMETERS

## 4.1 Return Loss

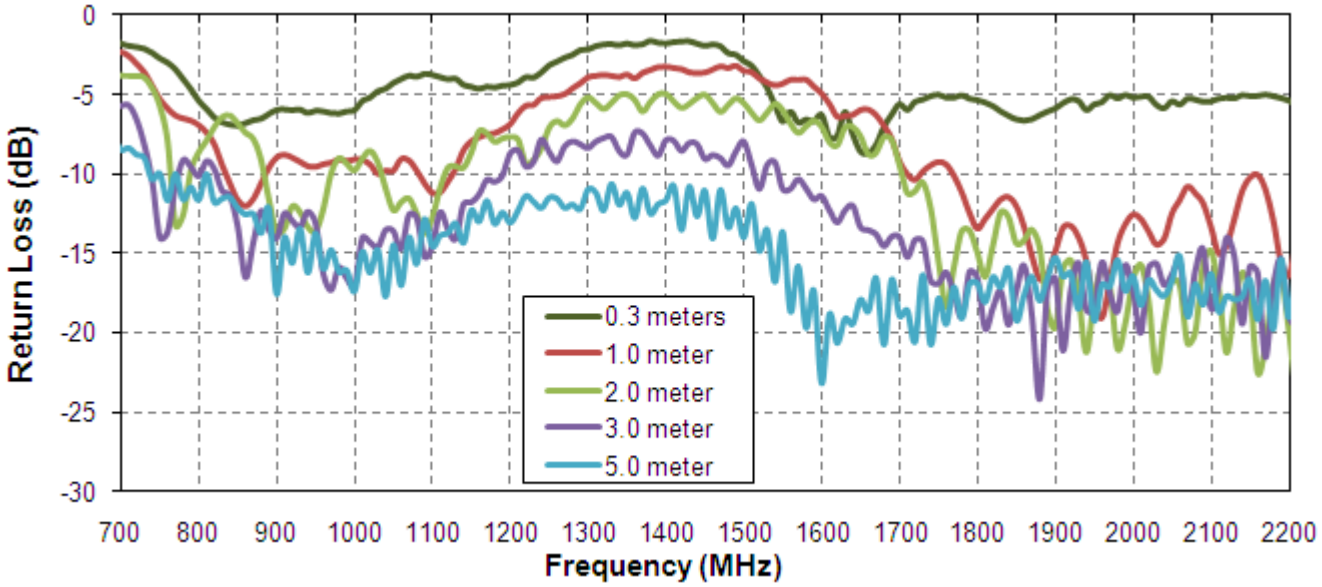



**Figure 2.** Return Loss of G21 Hercules antenna in free space.

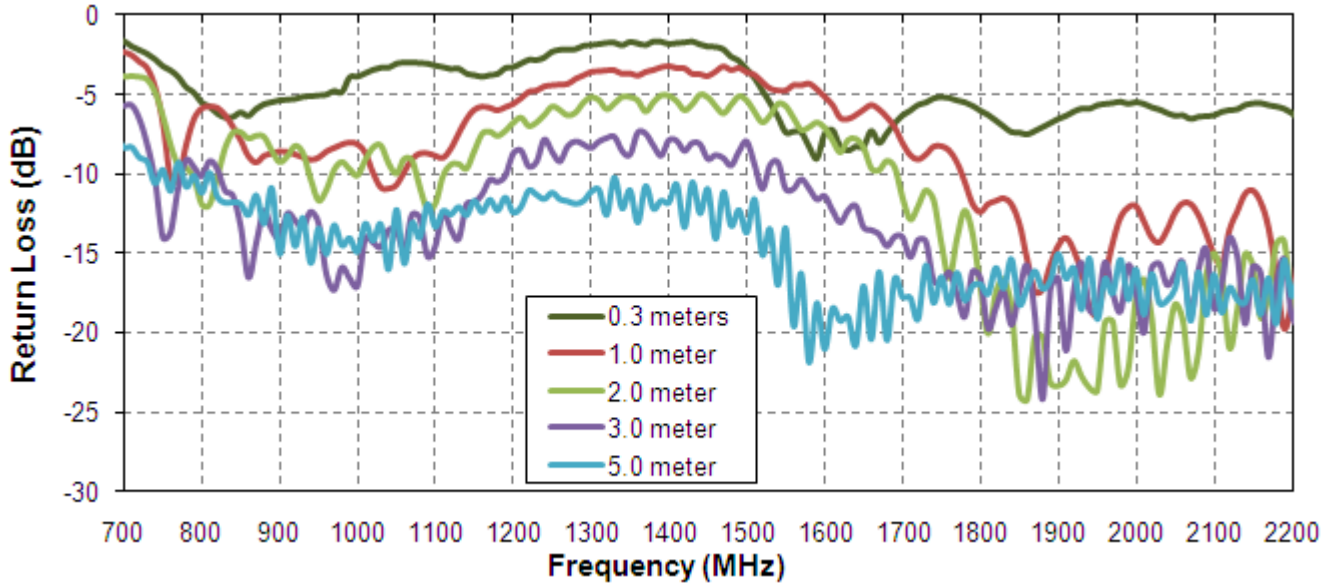



**Figure 3.** Return loss of G21 Hercules antenna on 30 cm metal plate.

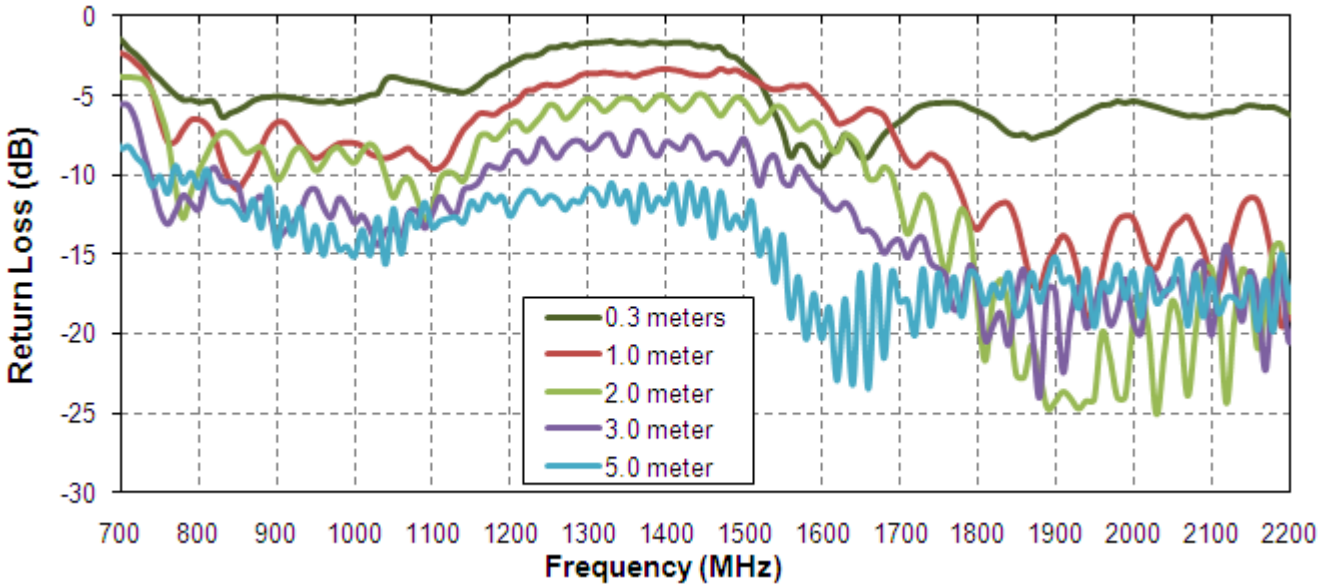



**Figure 4.** Return loss of G21 Hercules antenna on 60 cm metal plate.

## 4.2 Efficiency

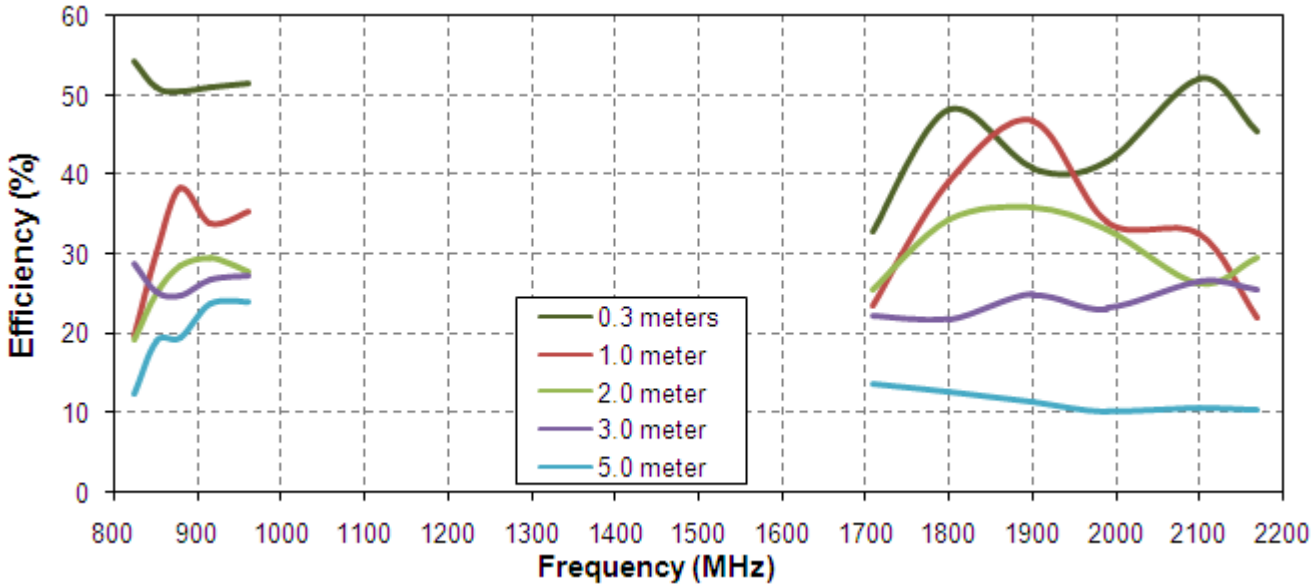



**Figure 5.** Efficiency of G21 Hercules antenna in free space.

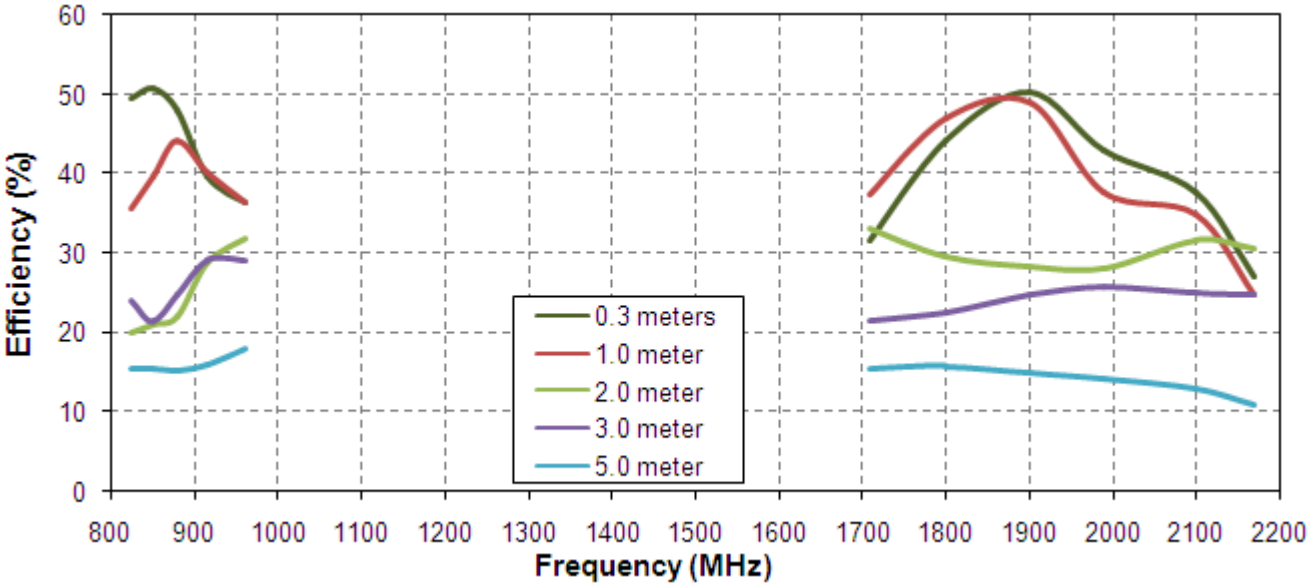



**Figure 6.** Efficiency of G21 Hercules antenna on 30 cm metal plate.

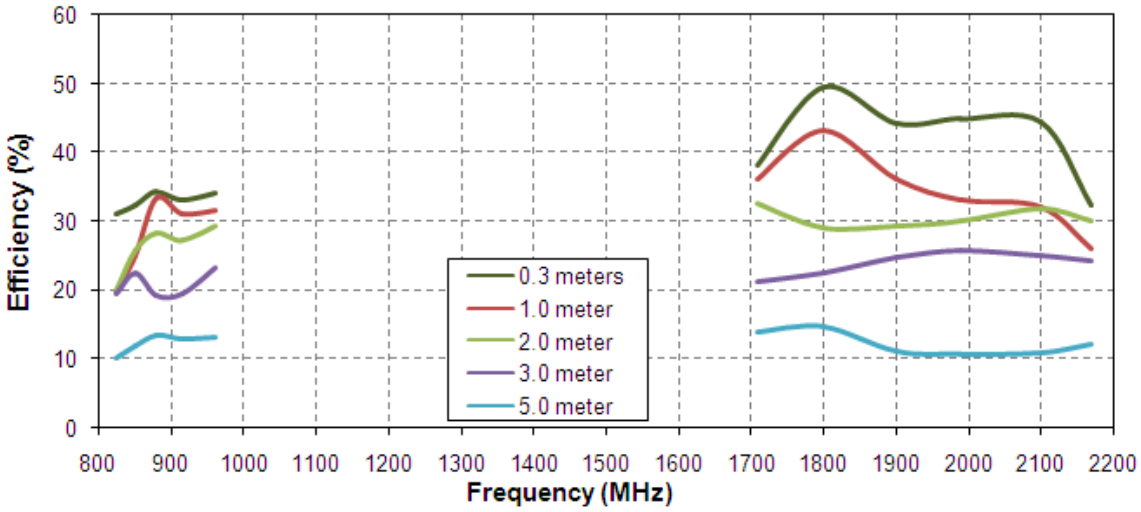



**Figure 7.** Efficiency of G21 Hercules antenna on 60 cm metal plate.

## 4.3 Peak Gain

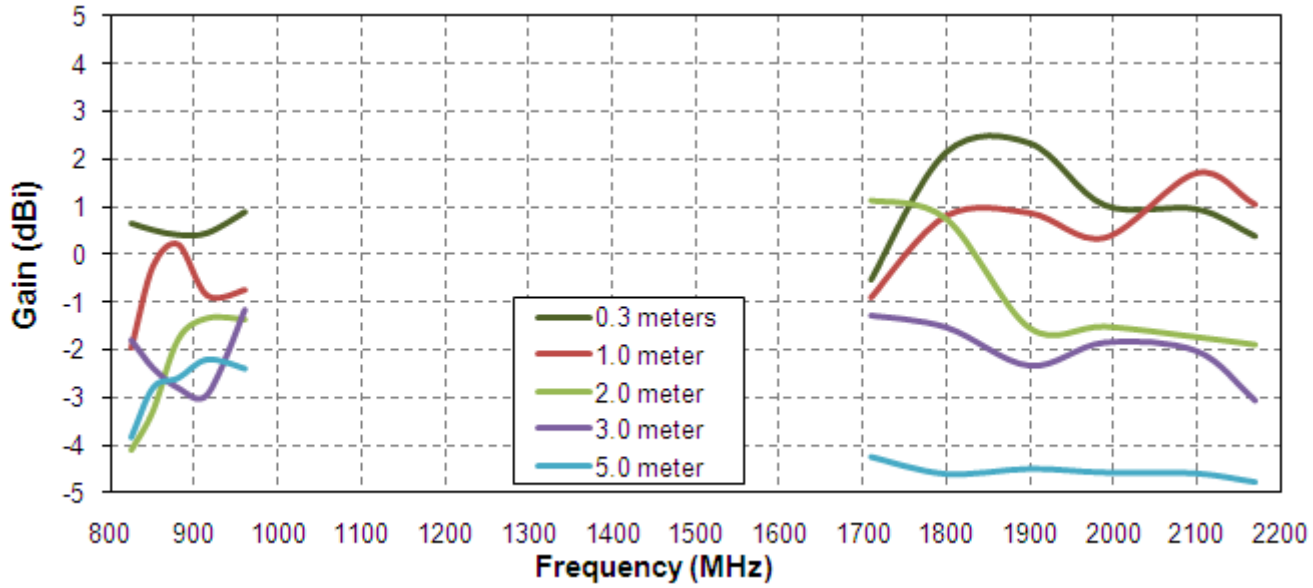



**Figure 8.** Peak Gain of G21 Hercules antenna in free space.

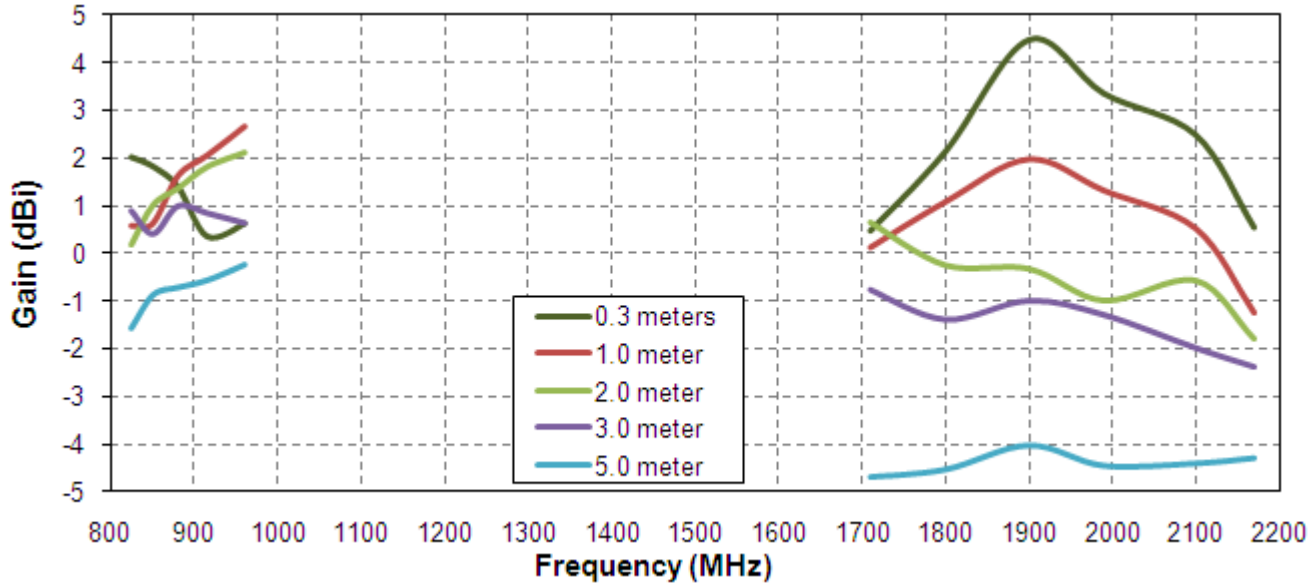



**Figure 9.** Peak Gain of G21 Hercules antenna on 30 cm metal plate.

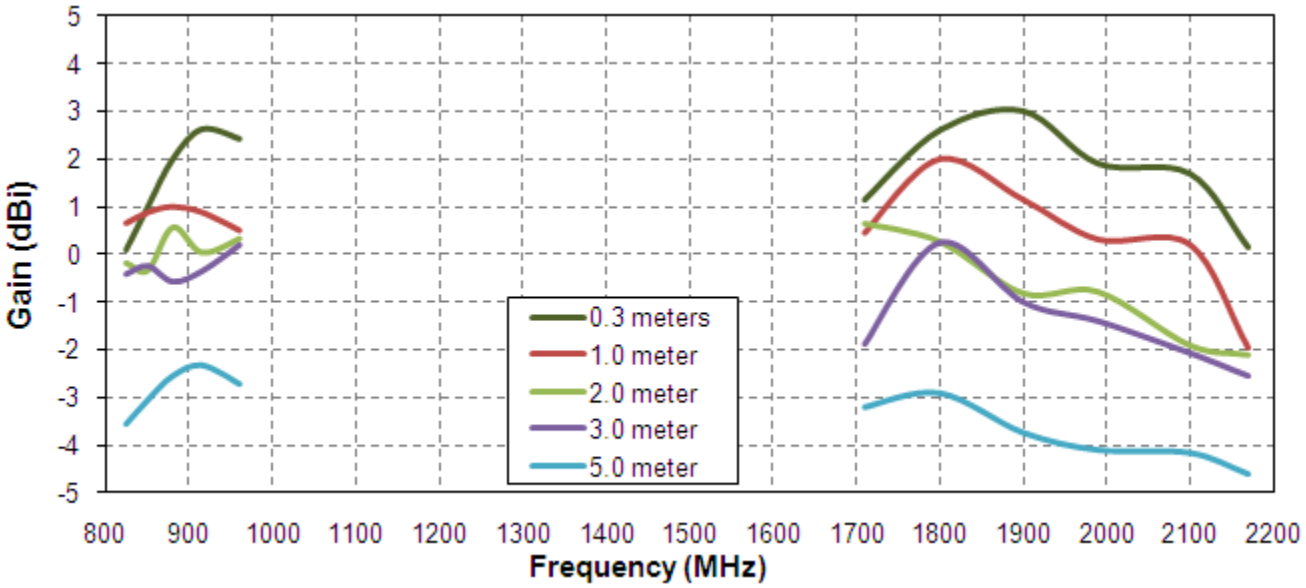



**Figure 10.** Peak Gain of G21 Hercules antenna on 60 cm metal plate.

# 5. Radiation Patterns

## 5.1 Radiation Patterns (Free Space)

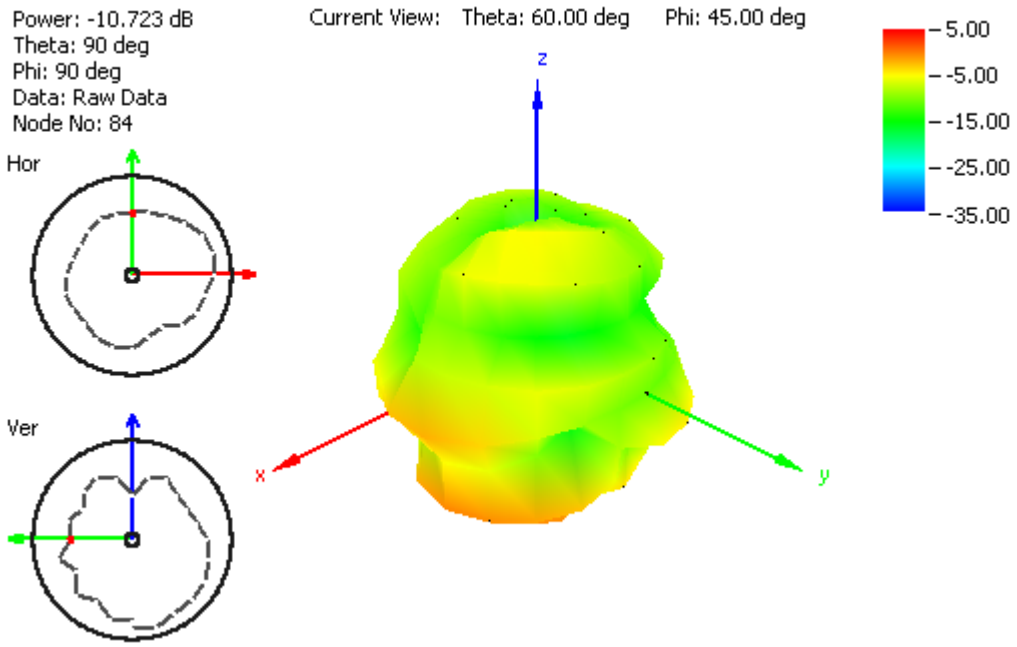



**Figure 11.** Radiation pattern at 849 MHz, Figure 1 as reference (dB), with 2m RG174 cable and free space

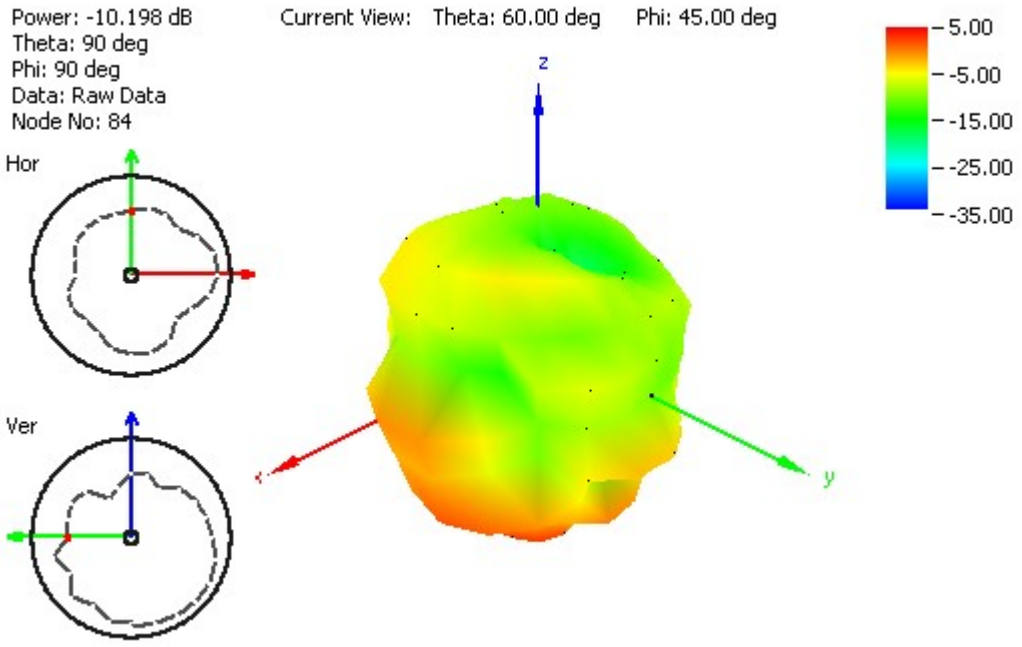



**Figure 12.** Radiation pattern at 915 MHz, Figure 1 as reference (dB), with 2m RG174 cable and free space.

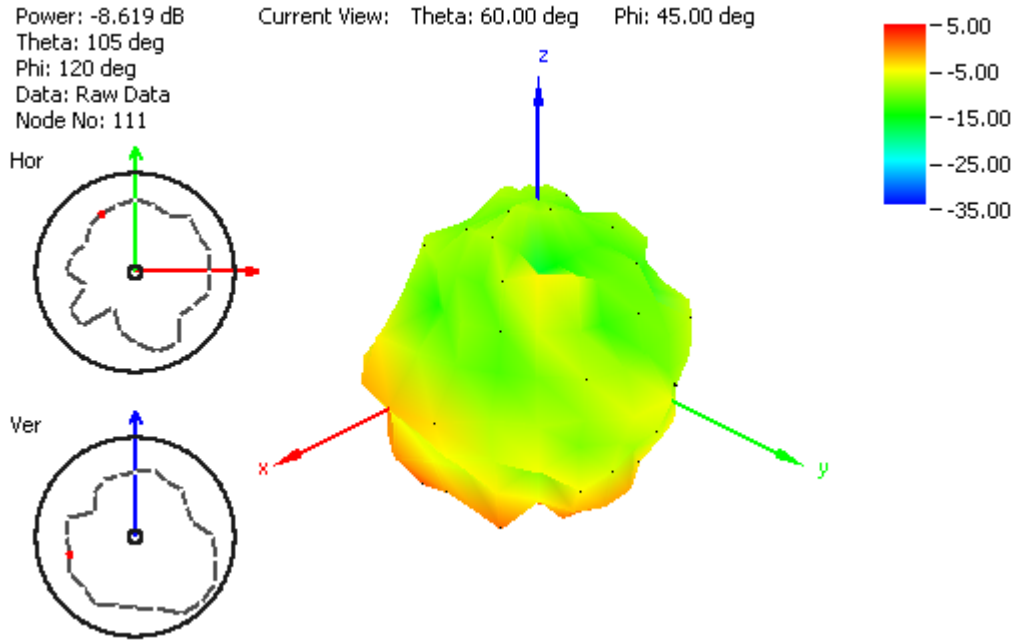



**Figure 13.** Radiation pattern at 1805 MHz, Figure 1 as reference (dB), with 2m RG174 cable and free space.

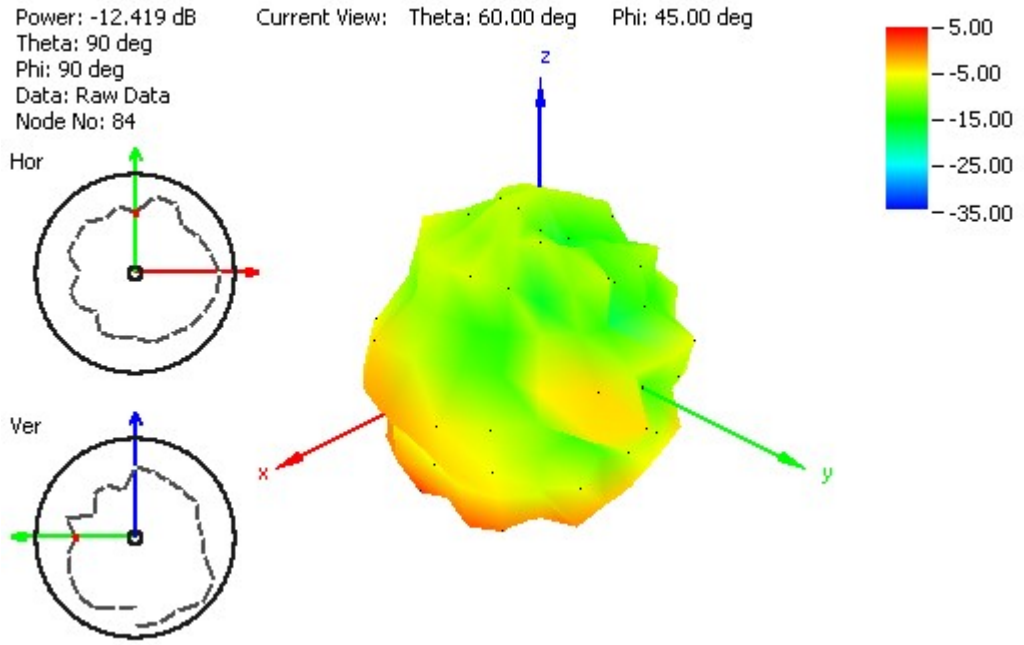



**Figure 14.** Radiation pattern at 1910 MHz, Figure 1 as reference (dB), with 2m RG174 cable and free space.

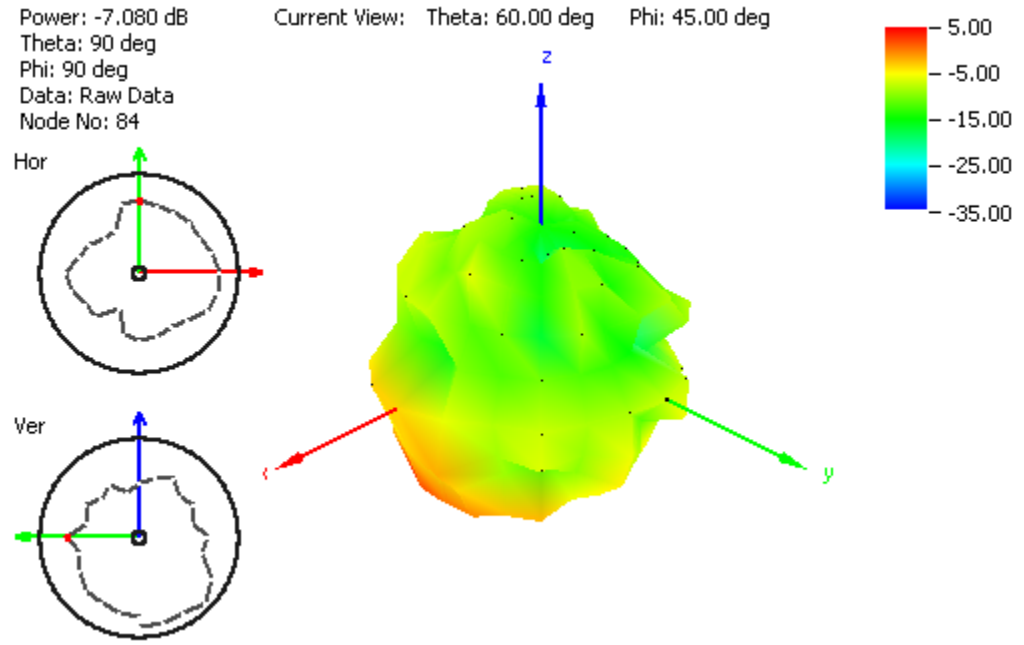



**Figure 15.** Radiation pattern at 2110 MHz, Figure 1 as reference (dB), with 2m RG174 cable and free space.

## 5.2 Radiation Patterns (30*30cm Ground Plane)

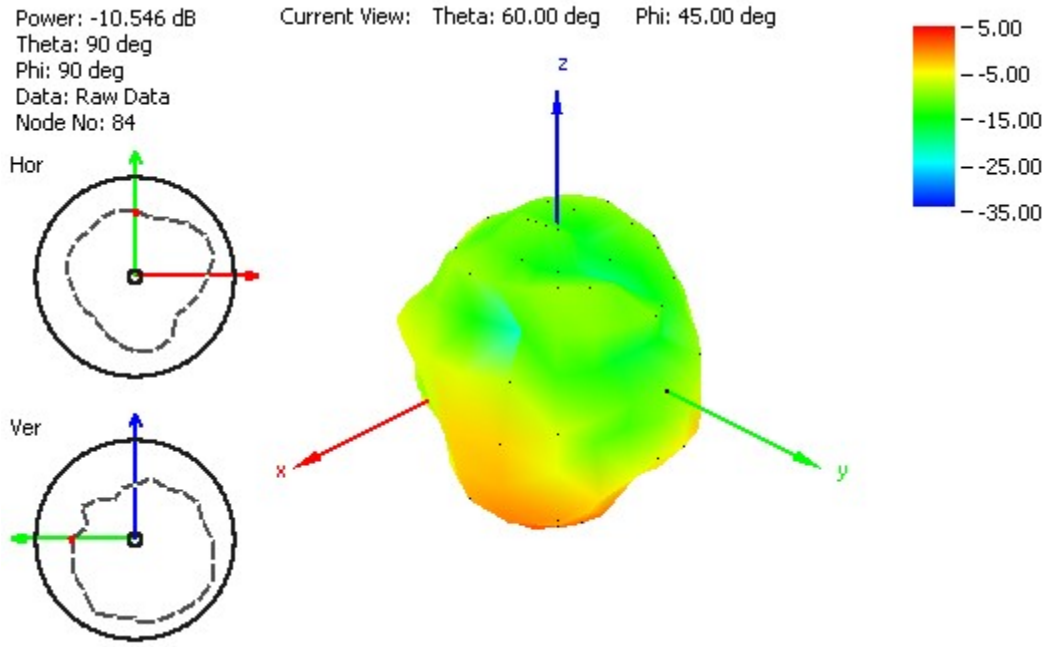



**Figure 16.** Radiation pattern at 849 MHz, Figure 1 as reference (dB), with 2m RG174 cable and 30x30 cm metal plate.

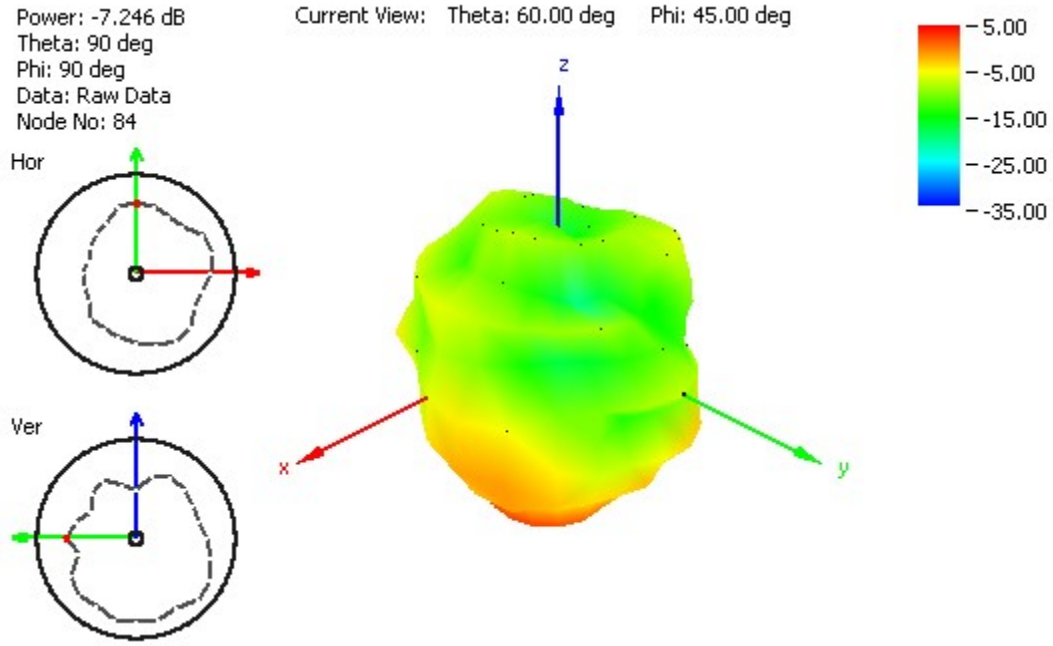



**Figure 17.** Radiation pattern at 915 MHz, Figure 1 as reference (dB), with 2m RG174 cable and 30x30 cm metal plate.

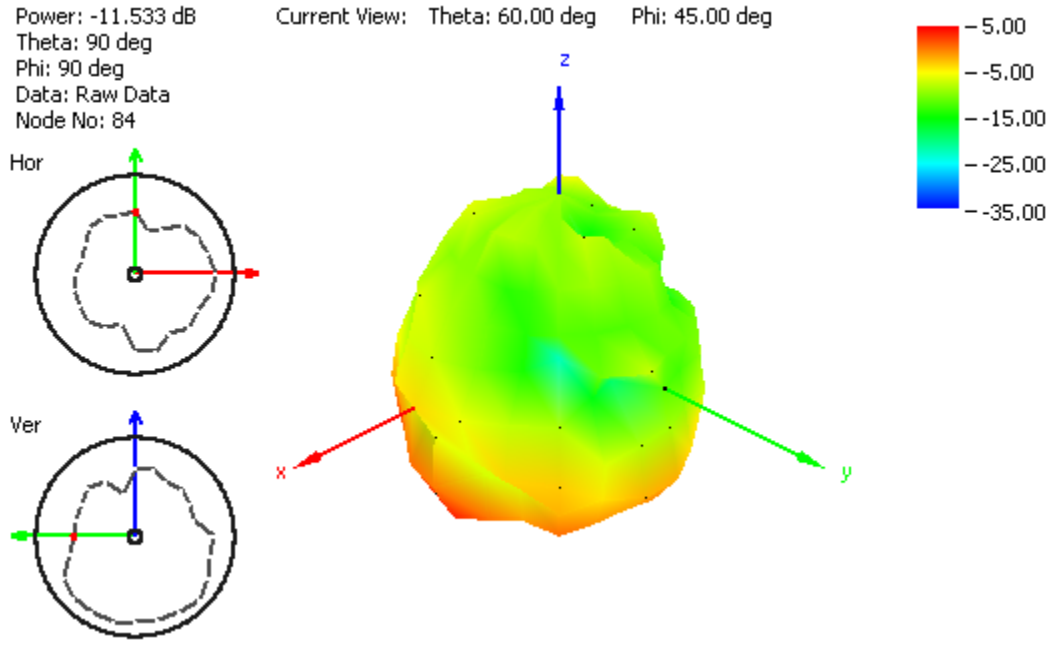



**Figure 18.** Radiation pattern at 1805 MHz, Figure 1 as reference (dB), with 2m RG174 cable and 30x30 cm metal plate.

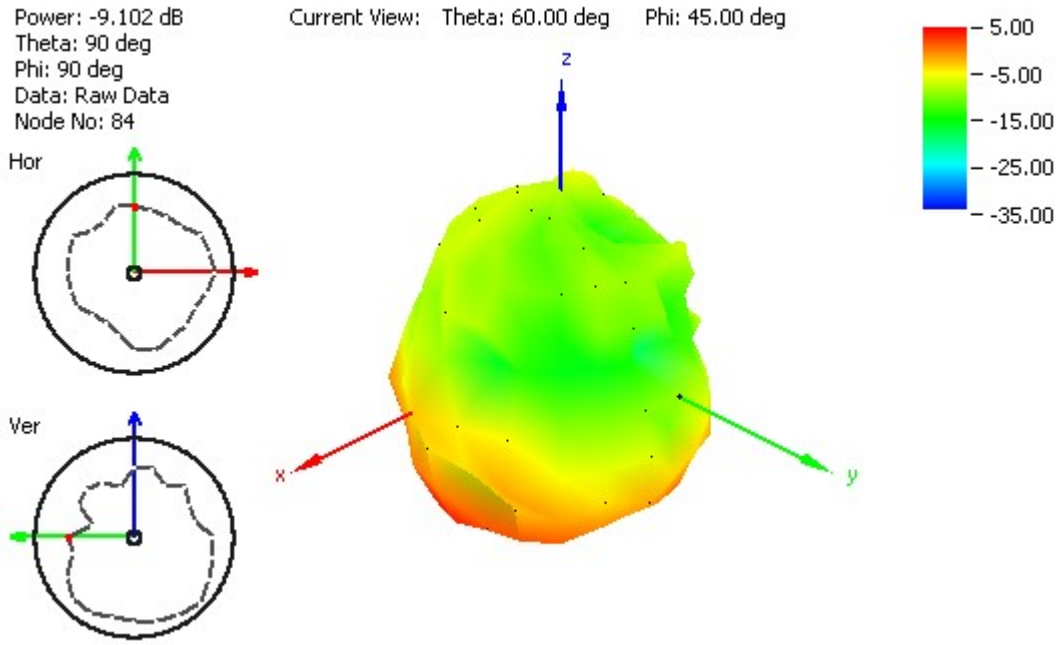



**Figure 19.** Radiation pattern at 1910 MHz, Figure 1 as reference (dB), with 2m RG174 cable and 30x30 cm metal plate.

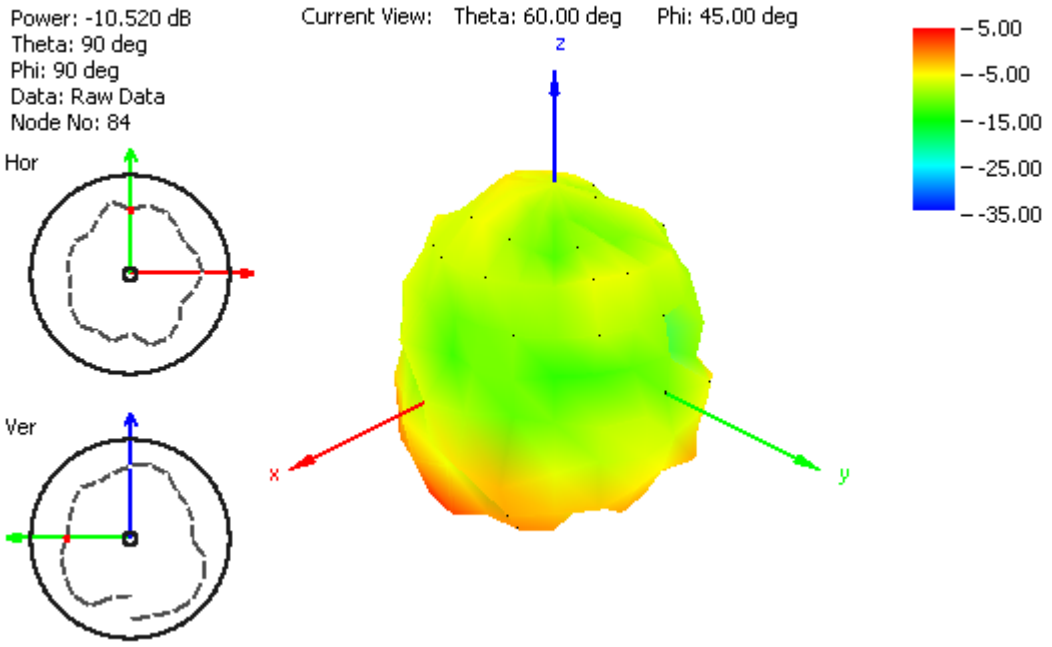



**Figure 20.** Radiation pattern at 2110 MHz, Figure 1 as reference (dB), with 2m RG174 cable and 30x30 cm metal plate.

## 5.3 Radiation Patterns (60*60cm Ground Plane)

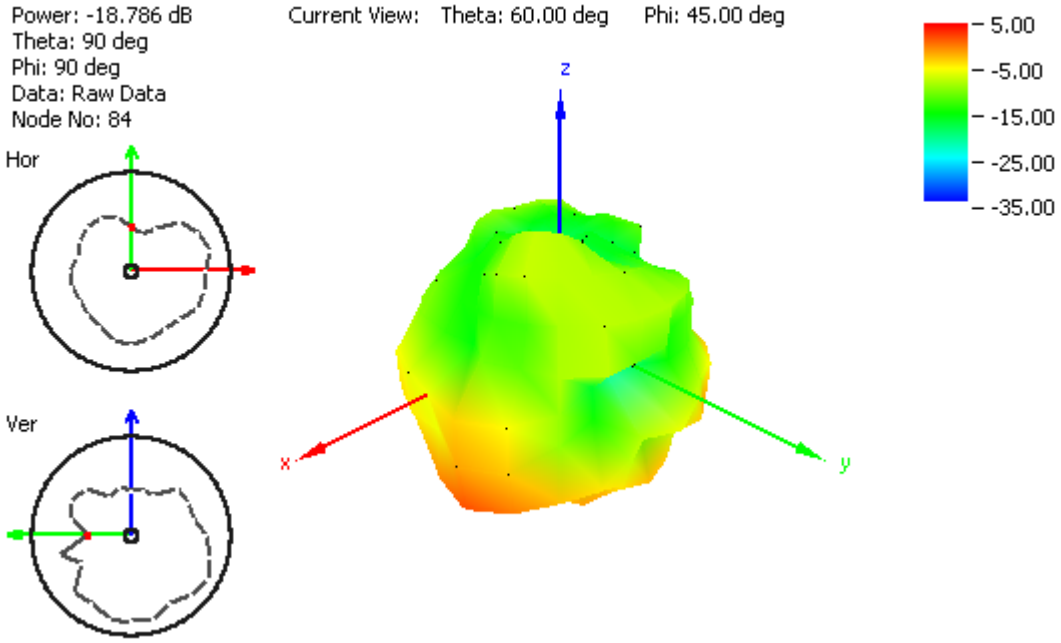



**Figure 21.** Radiation pattern at 849 MHz, Figure 1 as reference (dB), with 2m RG174 cable and 60x60 cm metal plate.

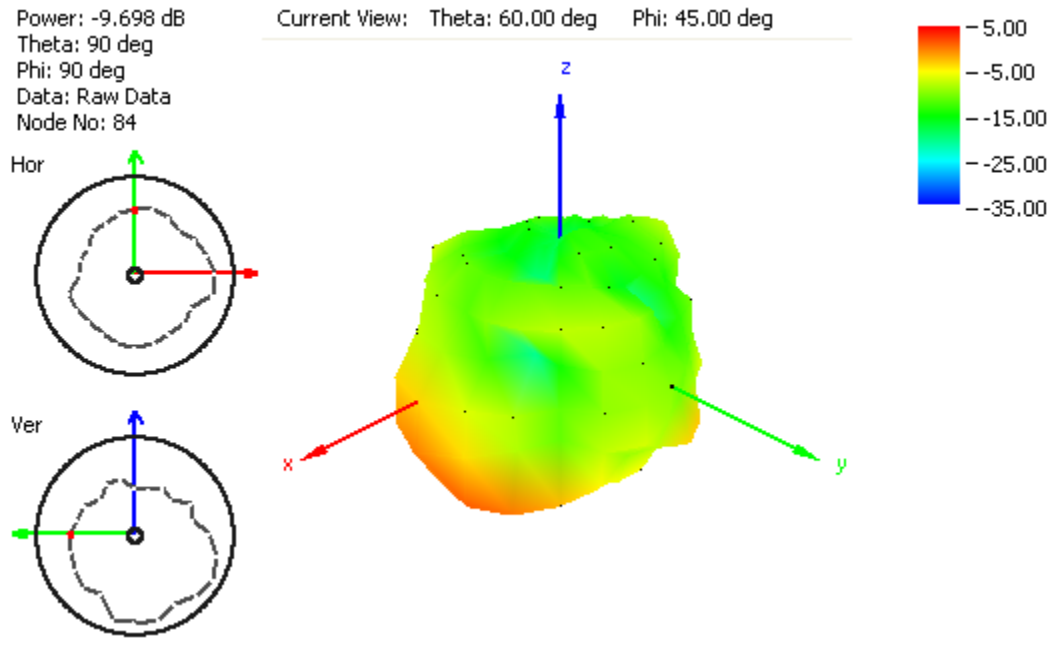



**Figure 22.** Radiation pattern at 915 MHz, Figure 1 as reference (dB), with 2m RG174 cable and 60x60 cm metal plate.

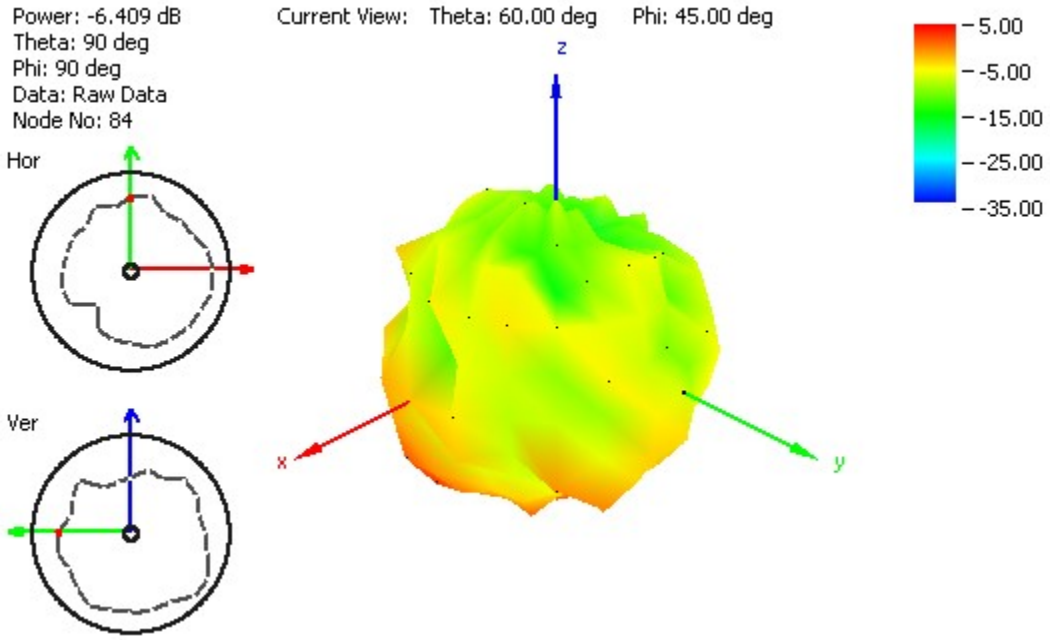



**Figure 23.** Radiation pattern at 1805 MHz, Figure 1 as reference (dB), with 2m RG174 cable and 60x60 cm metal plate.

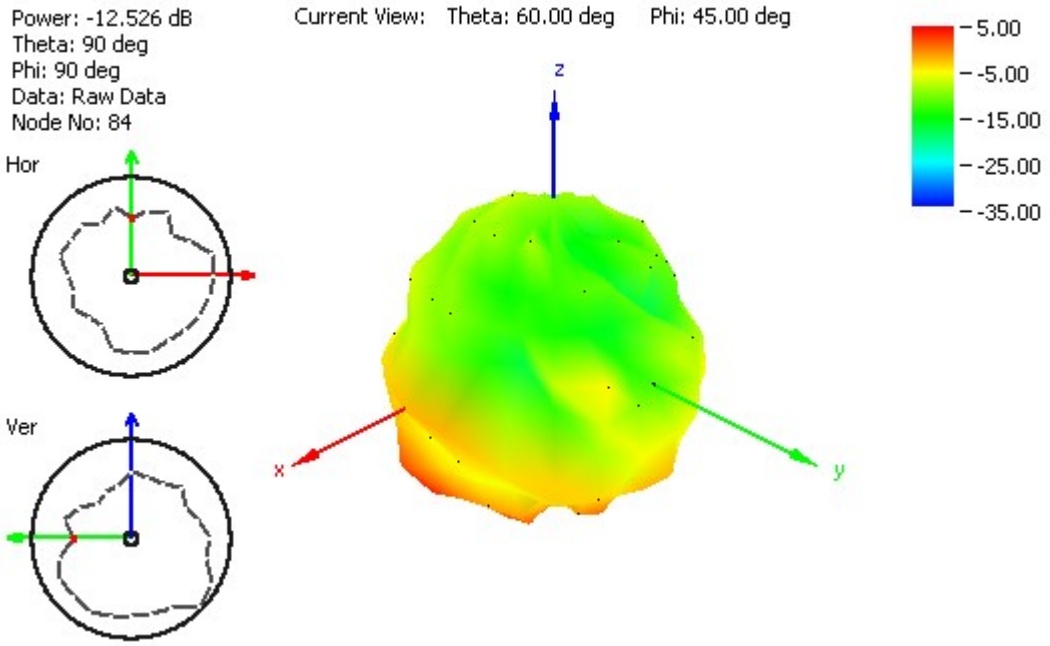



**Figure 24.** Radiation pattern at 1910 MHz, Figure 1 as reference (dB), with 2m RG174 cable and 60x60 cm metal plate.

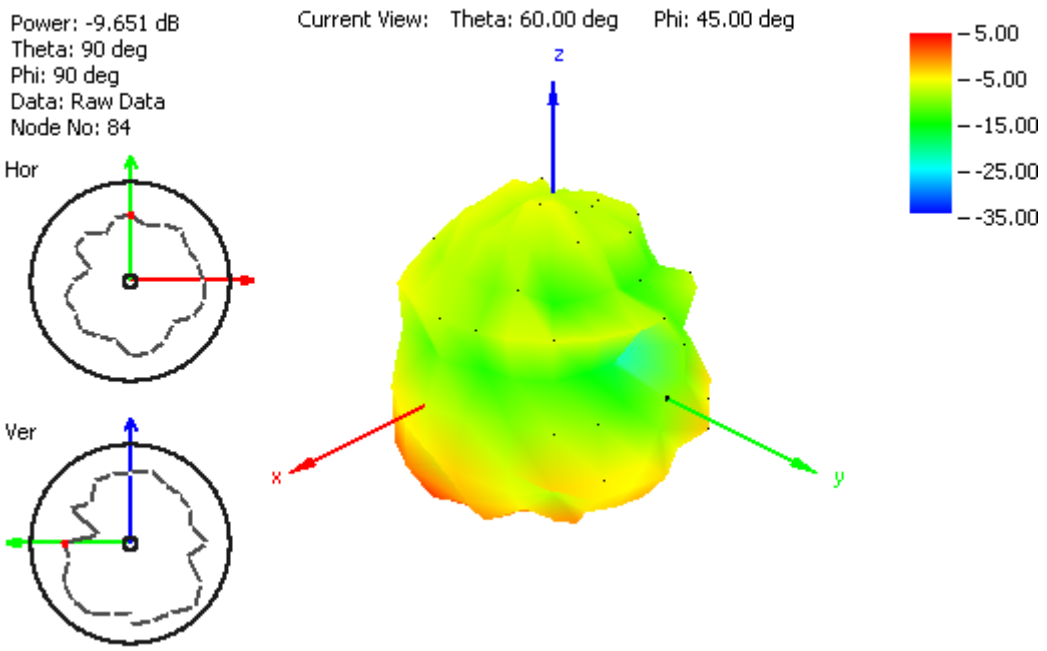
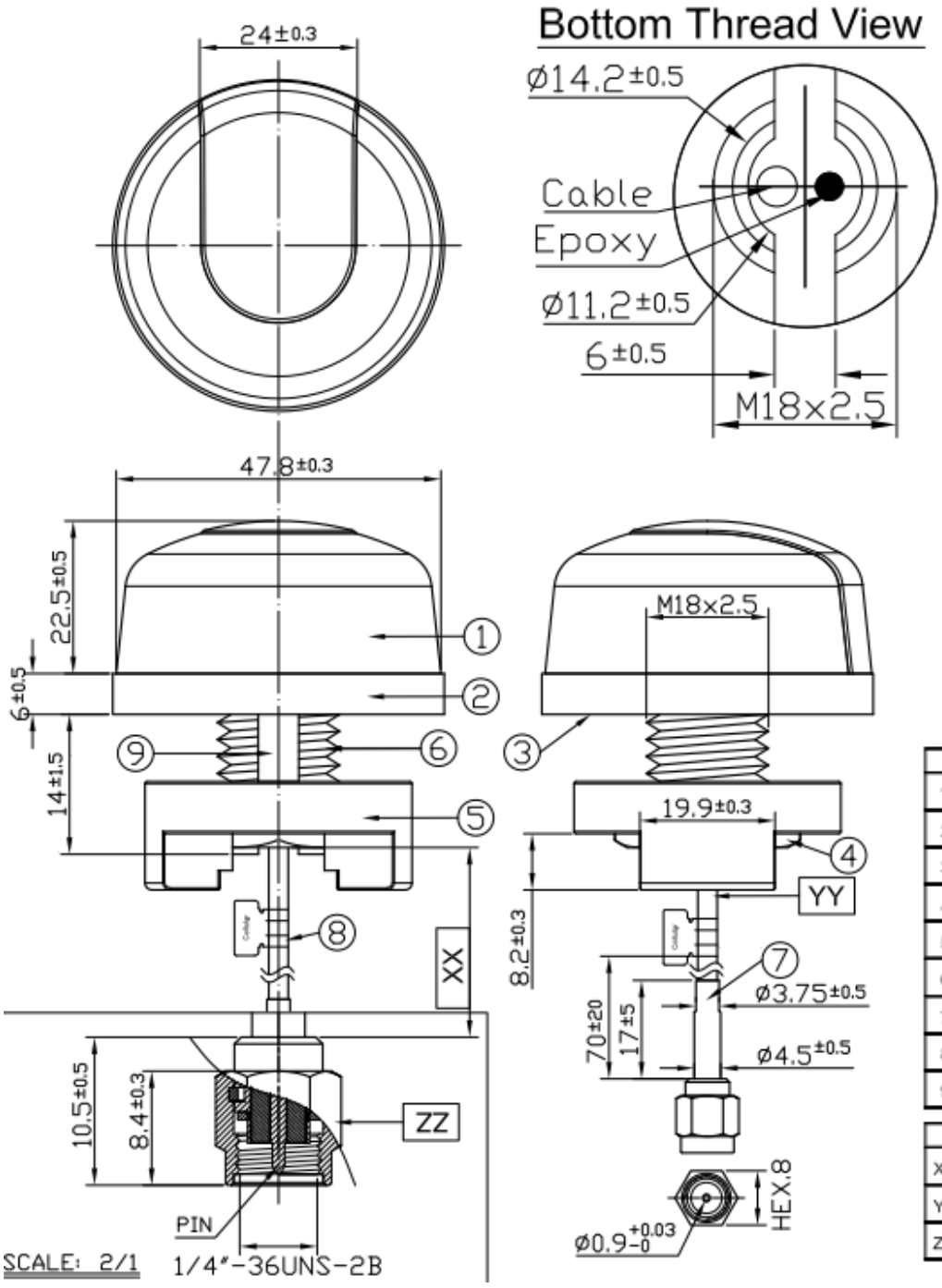



**Figure 25.** Radiation pattern at 2110 MHz, Figure 1 as reference (dB), with 2m RG174 cable and 60x60 cm metal plate.

# 6. MECHANICAL DRAWINGS

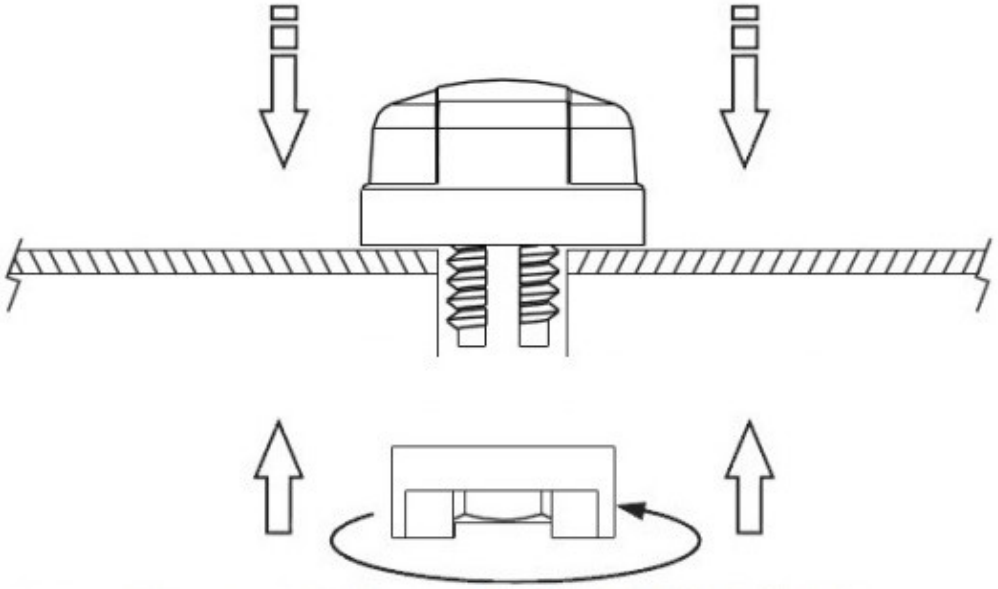



| | Name | Material | Finish | QTY |
|---|---|---|---|---|
| 1 | Housing | PC | Black | 1 |
| 2 | Closed Cell Foam | CR 4305 | Black | 1 |
| 3 | 3M Double Adhesive | 3M 9448 WC | White Liner | 1 |
| 4 | M18 Inner Nut | Carbon Steel | Ni Plated | 1 |
| 5 | Outer Nut Cover | ABS | Black | 1 |
| 6 | Bottom Base | Zinc Alloy | Ni Plated | 1 |
| 7 | Heat Shrink Tube | PE | Black | 1 |
| 8 | Cellular Label | Coated Paper | Blue | 1 |
| 9 | Rubber Stopper | Siliocn Rubber | Black | 1 |

| | Name | Spec | Finish | QTY |
|---|---|---|---|---|
| XX | Cable Length | 3000mm ±30mm | | 1 |
| YY | Cable Type | RG174 | Black | 1 |
| ZZ | Connector Type | SMA(M) | Gold | 1 |

Unit: mm

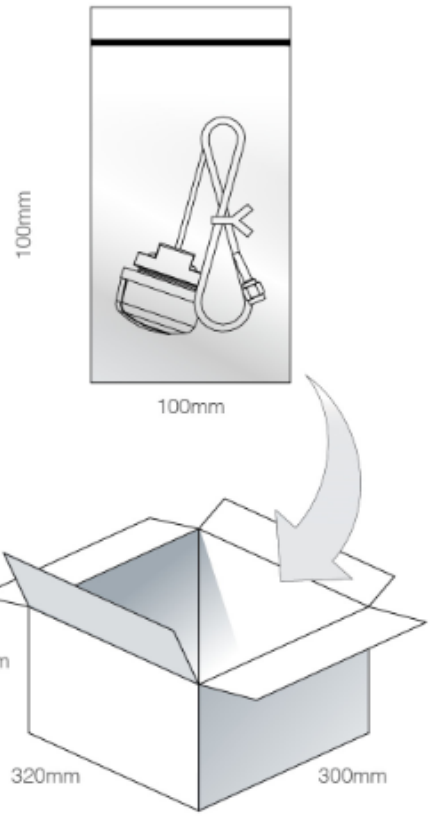
# 7. Installation



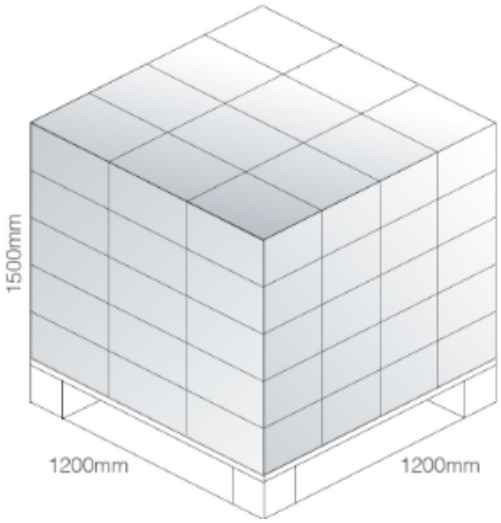
Recommended torque for Mounting is 24.5N·m
Maximum torque for mounting is 29.4 N·m

# 8. Packaging

1 G21.B.301111 per PE bag
Bag Dimensions - 300*100mm
Total Weight - 150g




60 PE bags per carton
Carton Dimensions - 320*300*260mm
Weight - 9.6Kg




Pallet Dimensions 1200*1200*1500mm
60 Cartons per pallet
12 Cartons per layer
5 Layers