

# **Brilliant Technology Antennas**

## **I. Single Channel Unit**

February 20, 2024

**Allwave Corporation**  
3860 Del Amo Blvd., Suite 404  
Torrance, CA 90503

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## **A. Test Summary**

### **1. Antenna Under Test**

Brilliant Technology: Single channel unit

Three antennas, BLE, Wifi, and Embedded antennas

### **2. Frequencies**

S-band: 2.40, 2.44, 2.48 GHz for BLE, WiFi, and Embedded

C-band: 5.15, 5.35, 5.50, 5.725 GHz for WiFi, and Embedded

### **3. Test Facility**

Allwave's Antenna Chamber B, February 12-15, 2024

### **4. Measurement Method**

Direct Far Field Measurement

### **5. Test Results**

2D elevation and azimuth cuts, YZ, XZ, XY planes, gain calibration and 3D plots

# Direct Far Field Measurement

Transmit

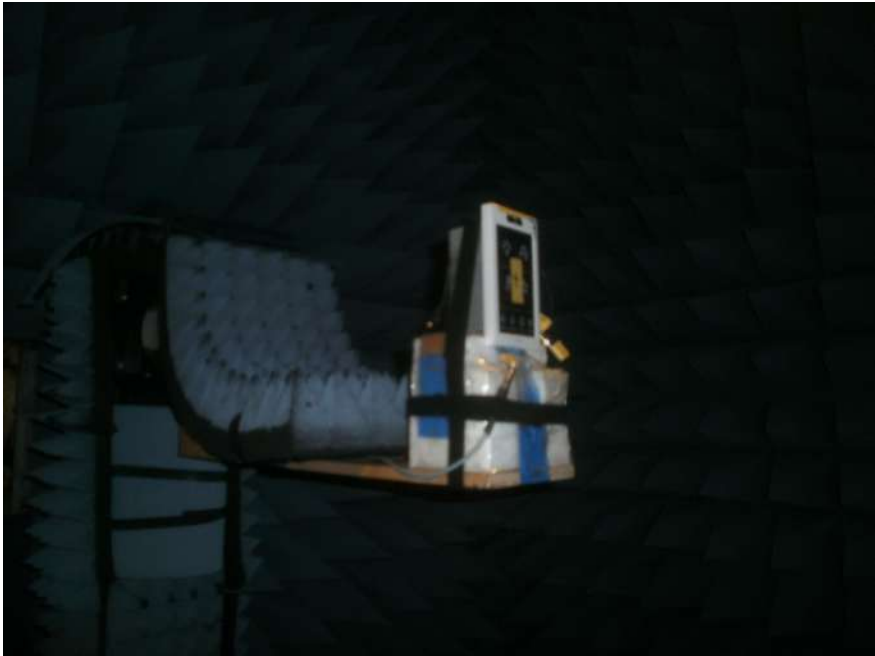


Receive

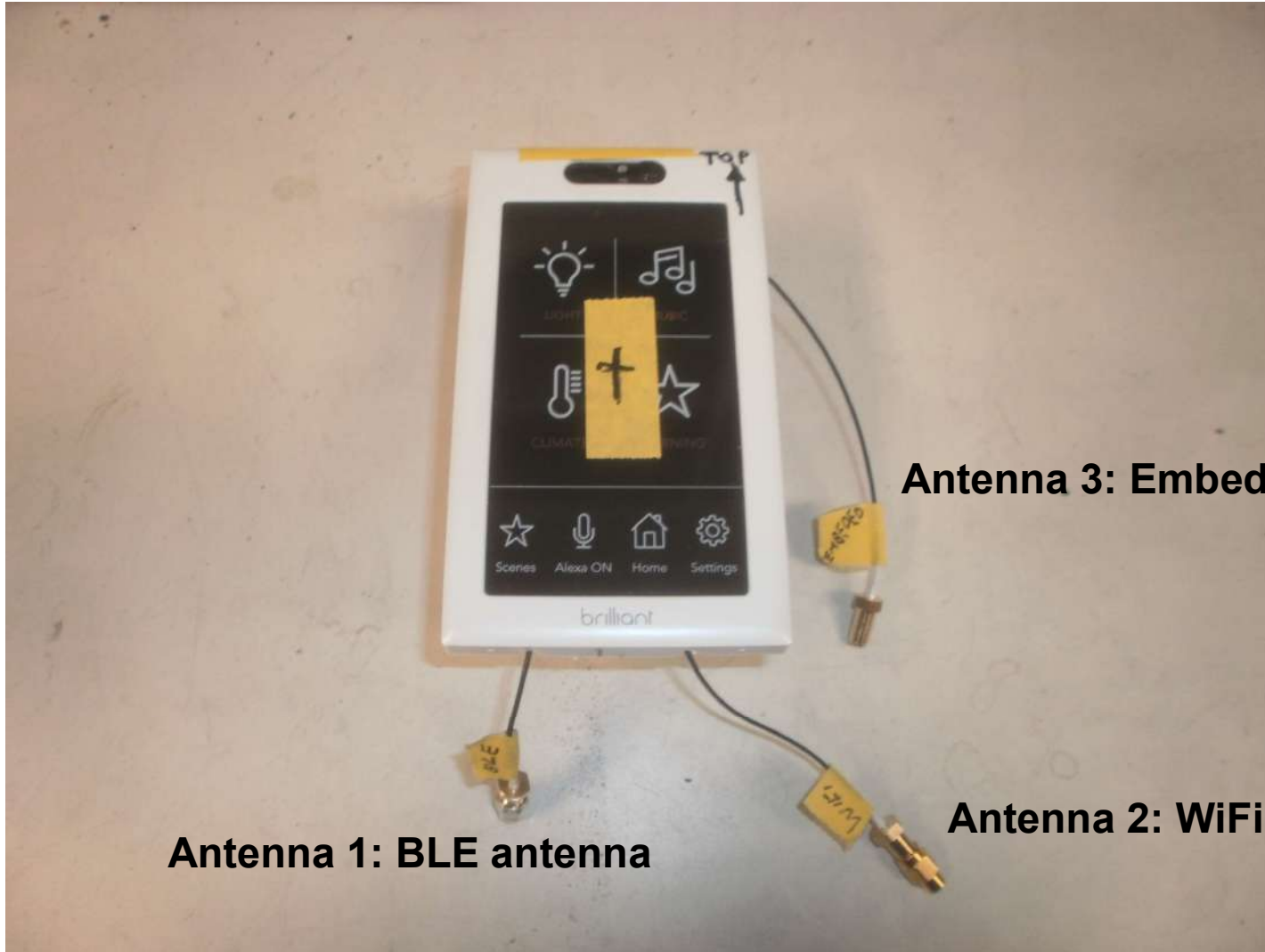


# Direct Far Field Measurement

## Antenna under test



## Single channel unit: Three antennas

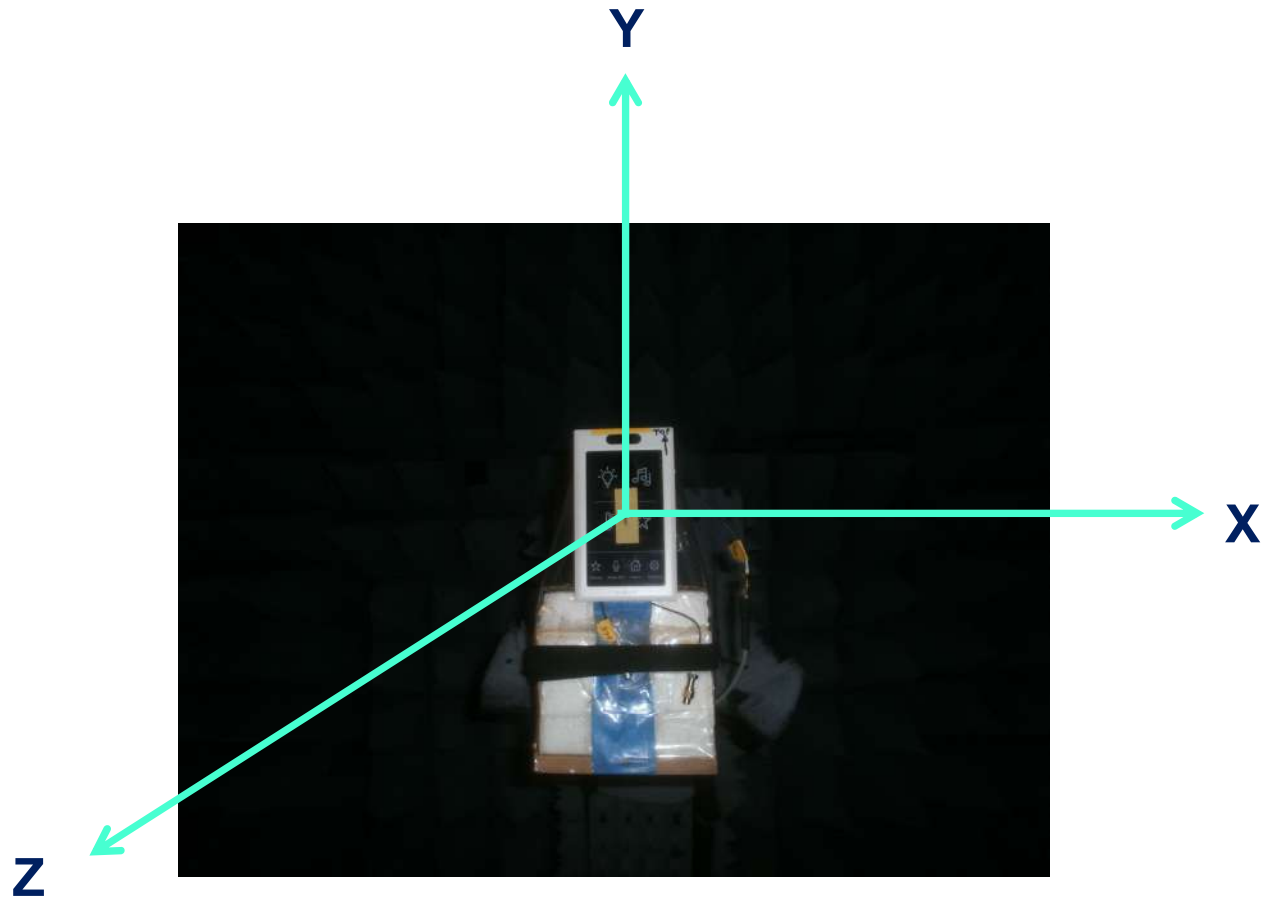


**Antenna 1: BLE antenna**

**Antenna 3: Embedded antenna**

**Antenna 2: WiFi antenna**

## Coordinates of antenna patterns



## **B. Test Results**

**B.1 Gain Measurements**

**B.2 Far Field Patterns**



## B.1 Gain Measurements

1-CH Antenna	1. BLE	2. WiFi	3. Embedded
Freq (GHz)	Gain (dB)	Gain (dB)	Gain (dB)
2.40	- 2.2	- 0.8	0.4
2.44	- 3.0	- 1.6	- 0.4
2.48	- 1.7	- 1.4	1.7
5.15	NA	- 0.4	0.5
5.35	NA	- 2.4	1.3
5.50	NA	- 3.8	1.8
5.725	NA	- 4.7	1.5

## B.2 Far Field patterns

1. BLE antenna, S-band
2. WiFi antenna, S-, C-band
3. Embedded antenna, S-, C-band
  - a) 2D Elevation cuts, ZX- and ZY-plane
  - b) 2D Azimuth cut: XY-Plane
  - c) 3D plots

S-band: 2.40, 2.44, 2.48 GHz

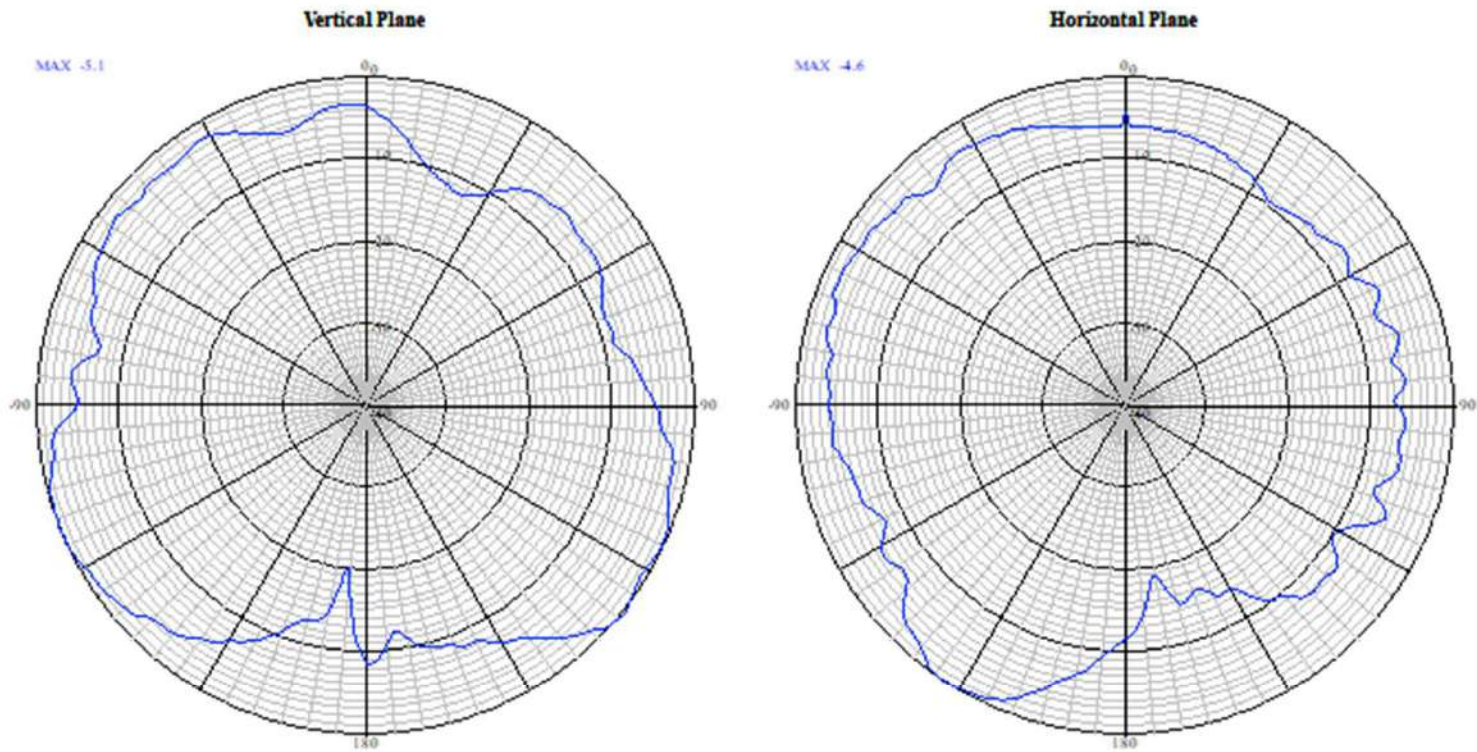
C-band: 5.15, 5.35, 5.50, 5.725 GHz

# 1. BLE antenna

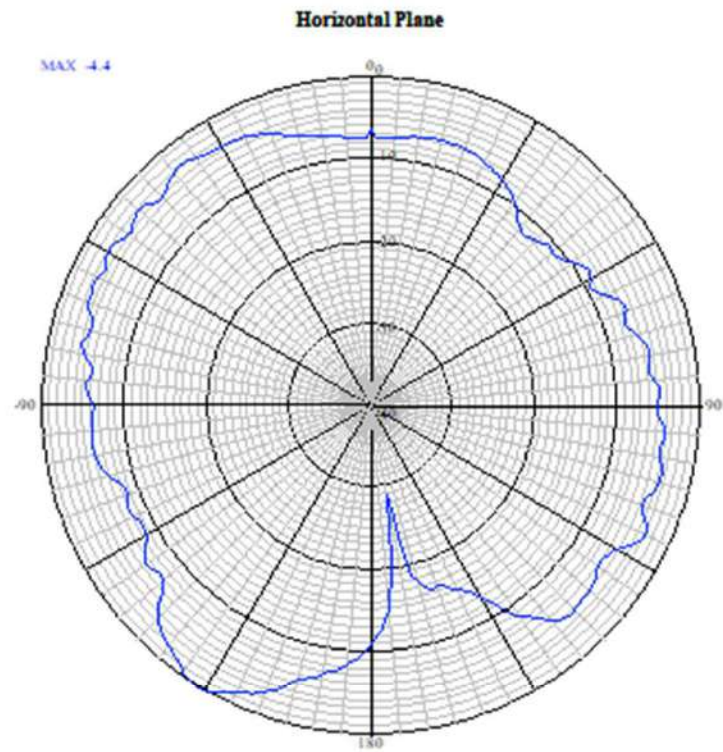
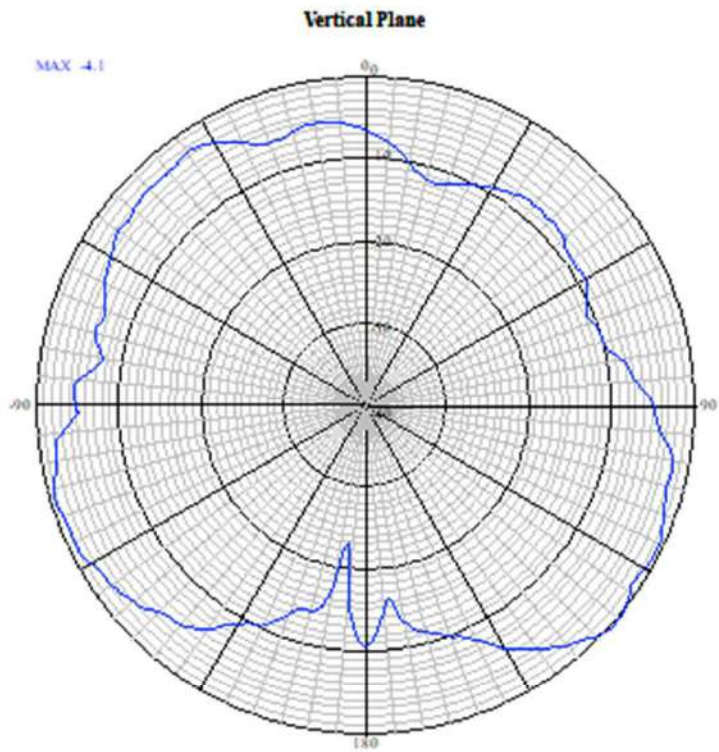
## a) 2D Elevation cuts, ZX- and ZY-plane

Freq = 2.40, 2.44, 2.48 GHz

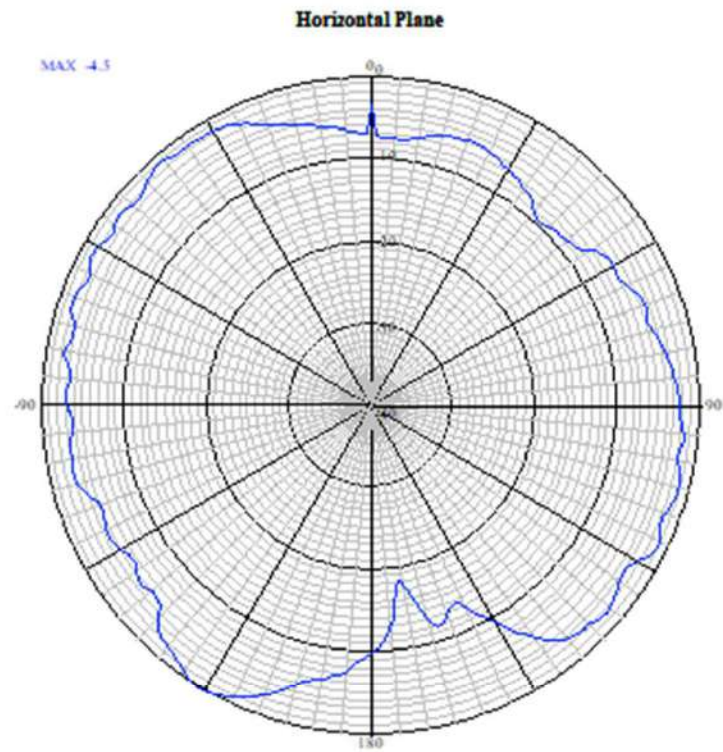
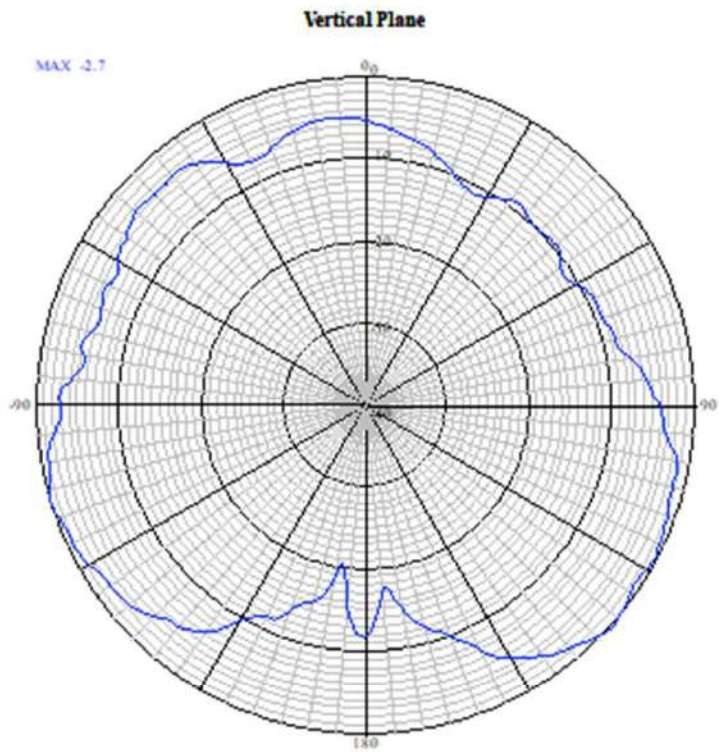
**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns  
Frequency: 2.400000



**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns  
Frequency: 2.440000



**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns  
Frequency: 2.480000



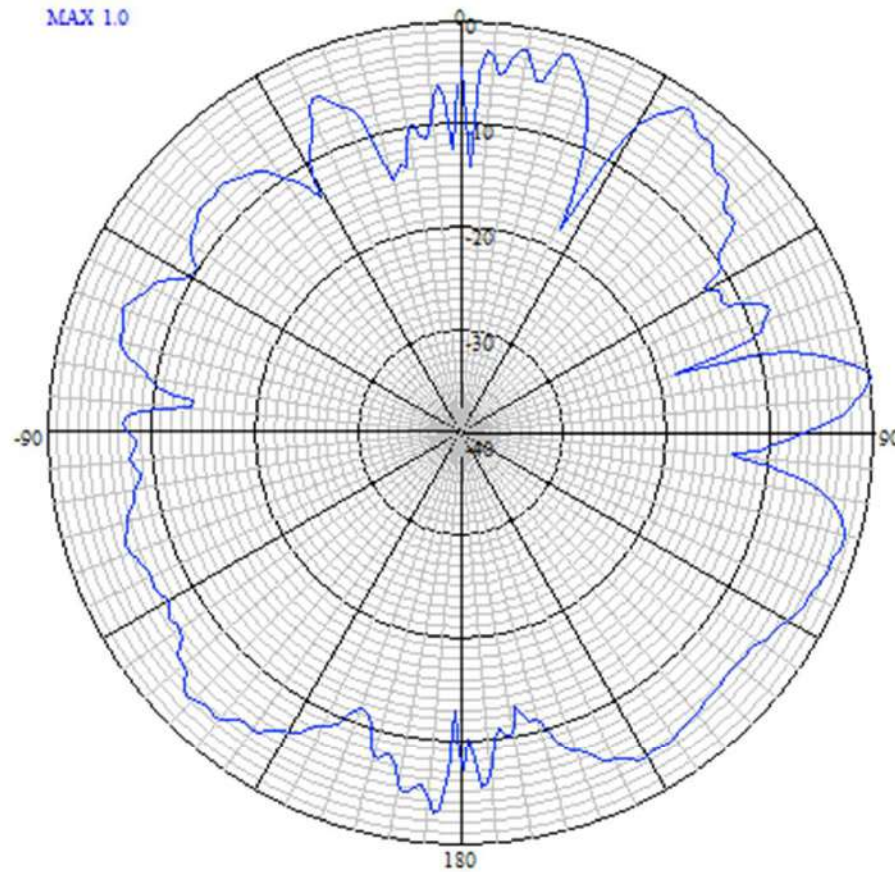
# **1. BLE antenna**

## **b) 2D Azimuth cut: XY-Plane**

Freq = 2.40, 2.44, 2.48 GHz

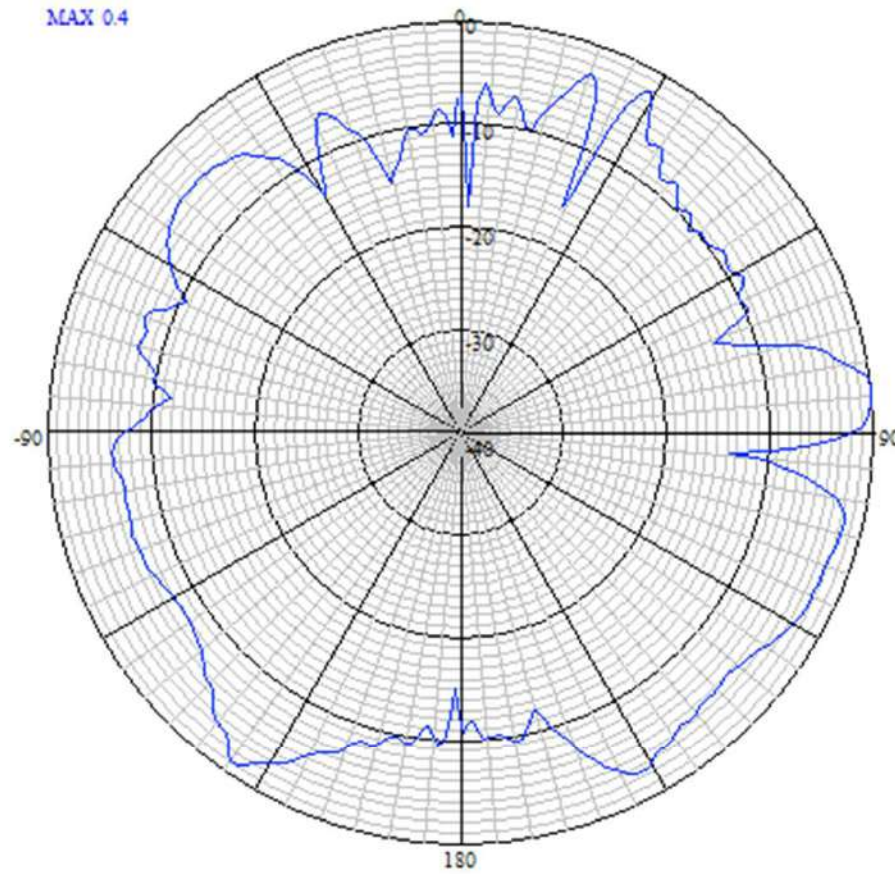


**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 2.400000  
**Azimuth Cut - XY Plane**

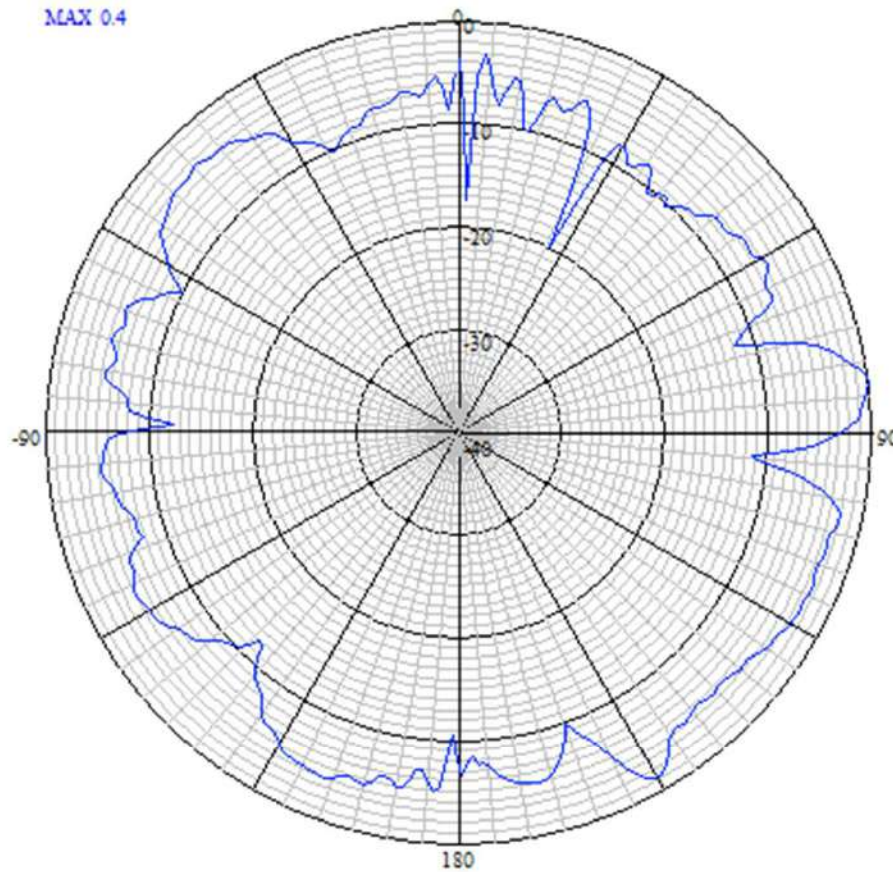




**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 2.440000  
**Azimuth Cut - XY Plane**



**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 2.480000  
**Azimuth Cut - XY Plane**

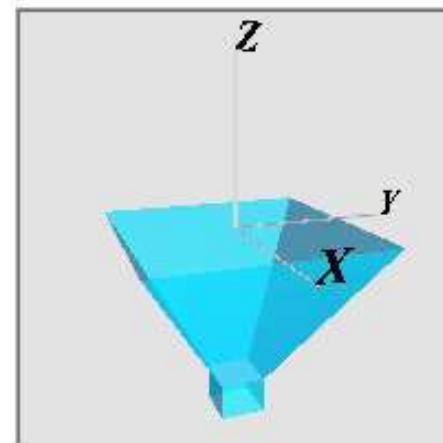
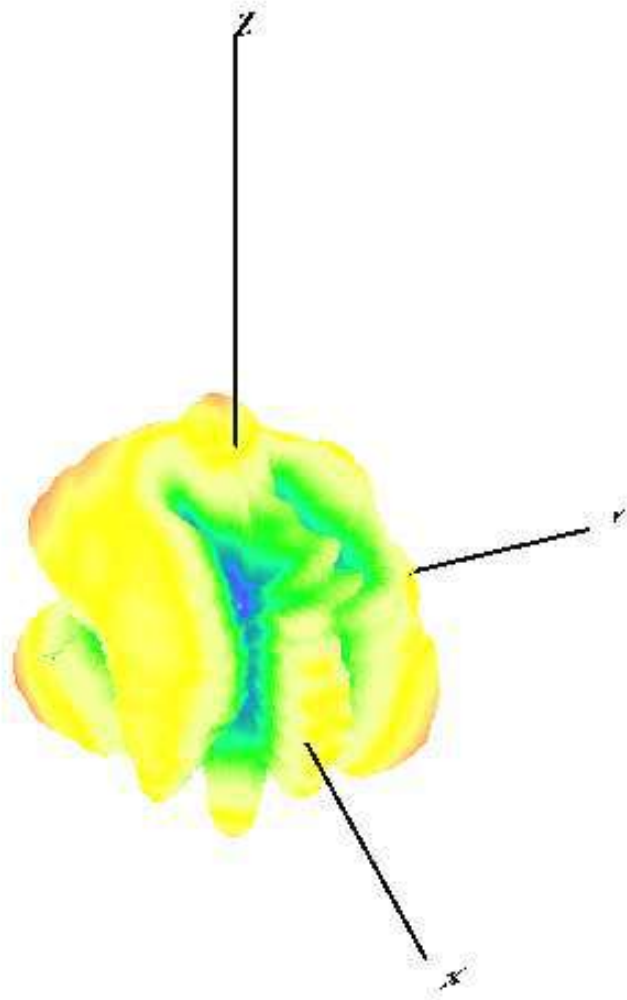


# **1. BLE antenna**

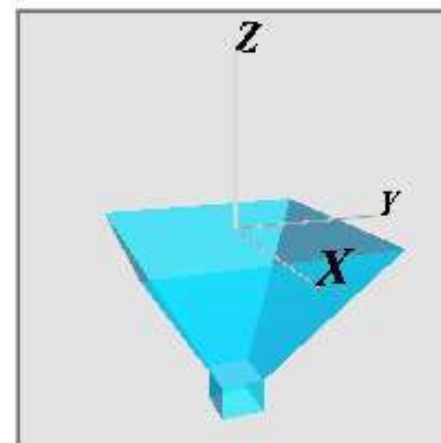
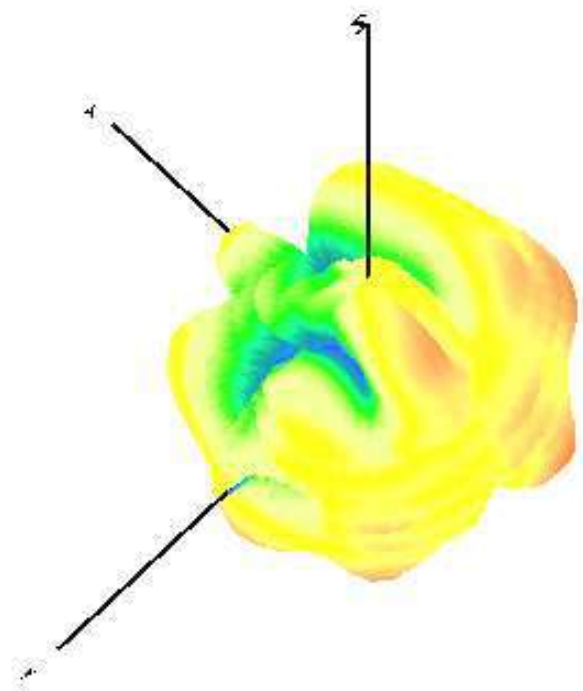
## **c) 3D plots**

Freq = 2.40, 2.44, 2.48 GHz

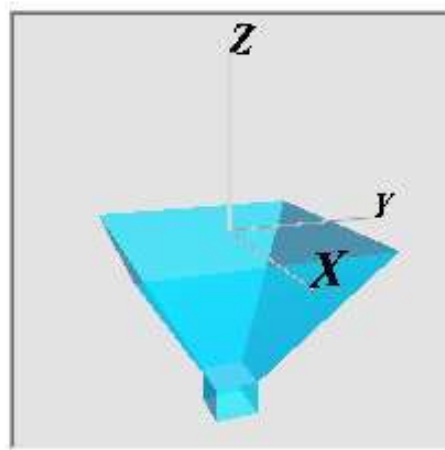
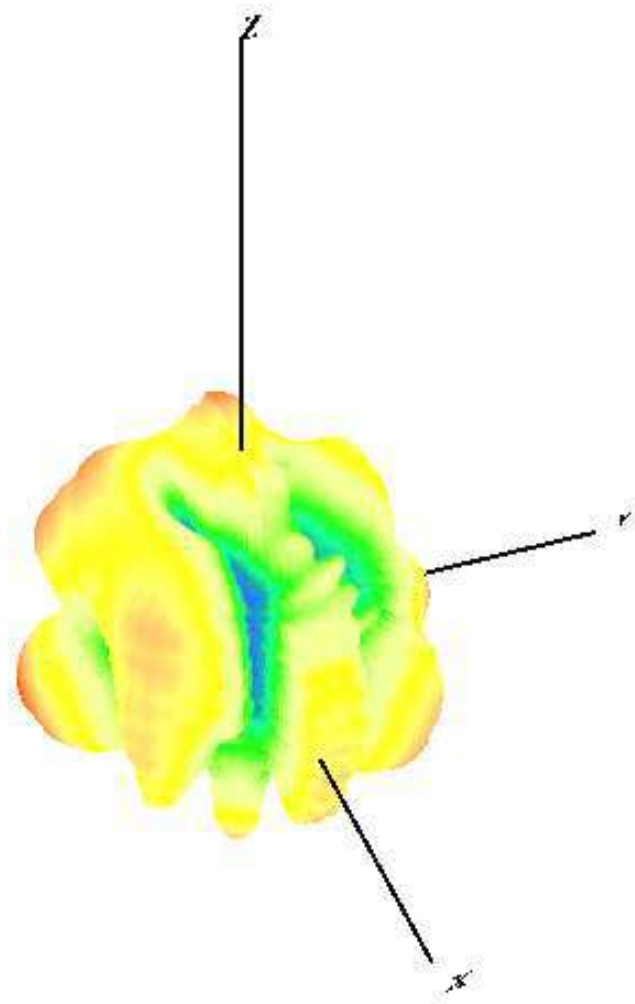
**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.400000



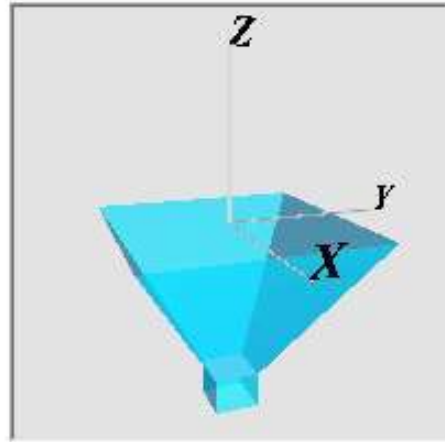
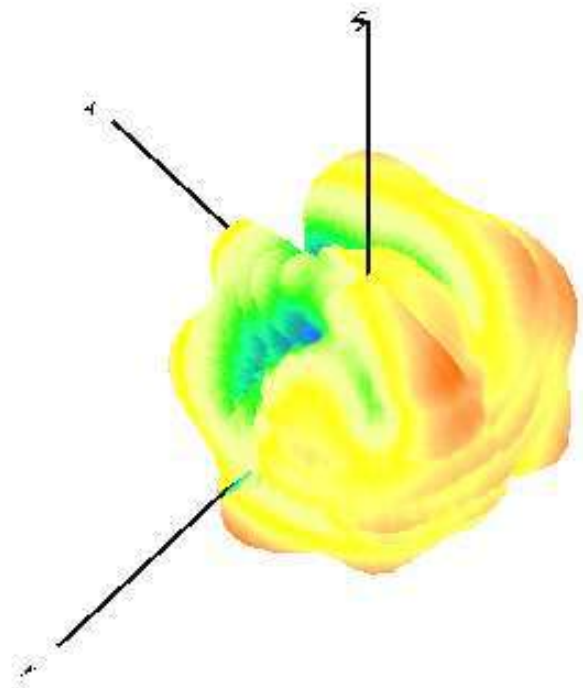
**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.400000



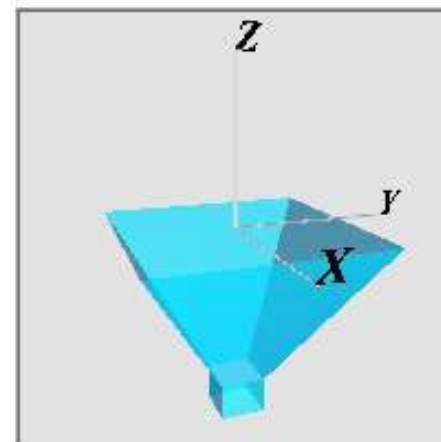
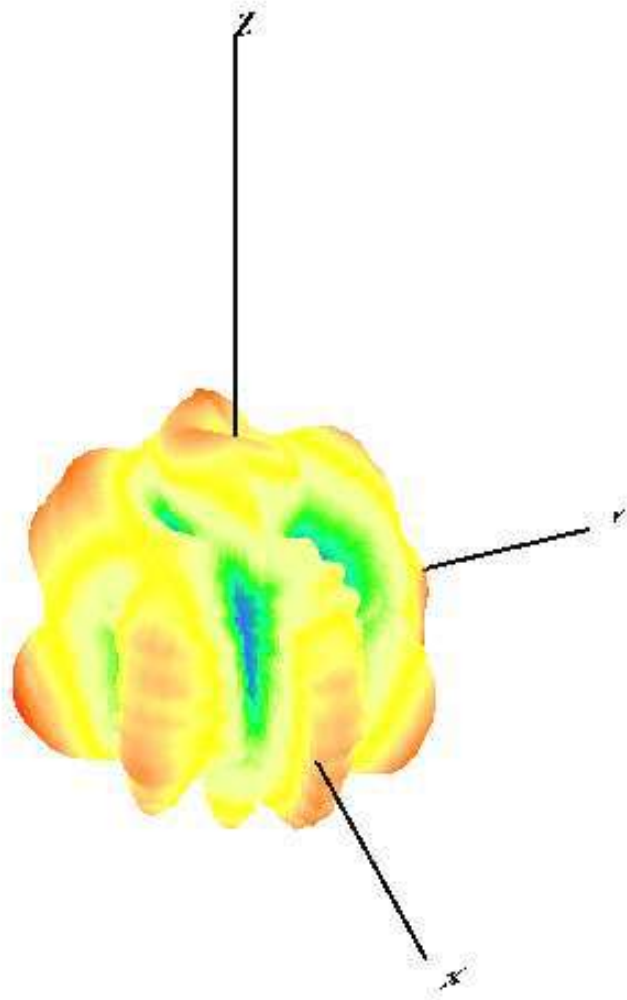
**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.440000



**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.440000

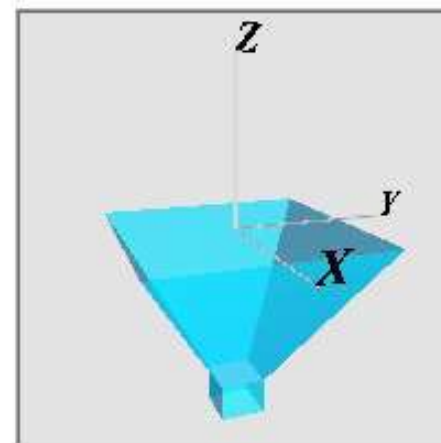
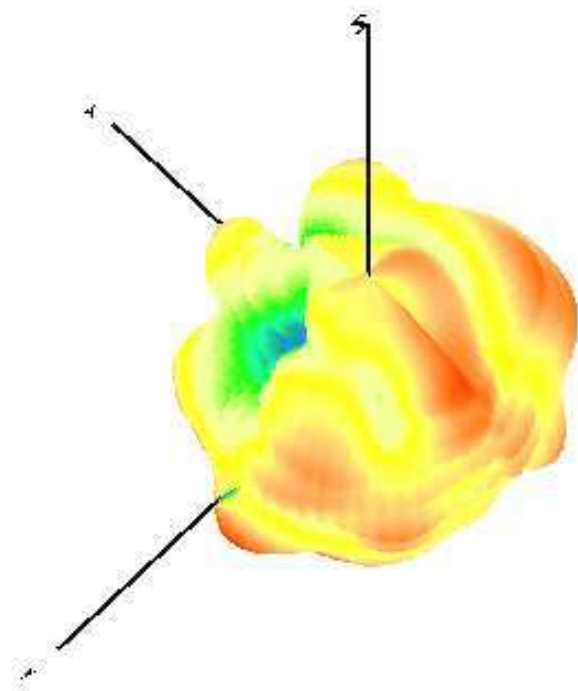


**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.480000





**Single Channel Unit**  
**Antenna 1: BLE antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.480000



## **2. Wifi antenna**

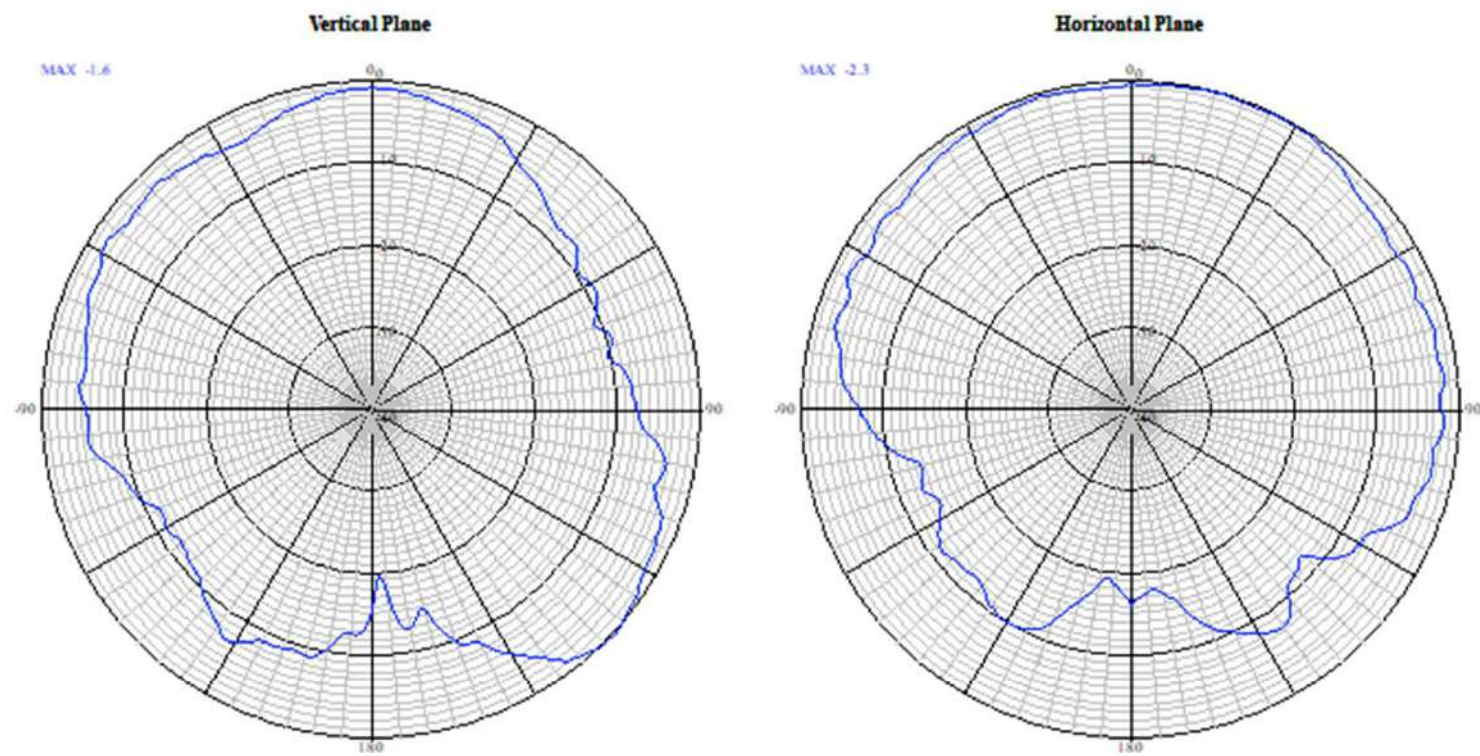
### **a) 2D Elevation cuts, ZX- and ZY-plane**

**Freq = 2.40, 2.44, 2.48, 5.15, 5.35, 5.5, 5.725 GHz**

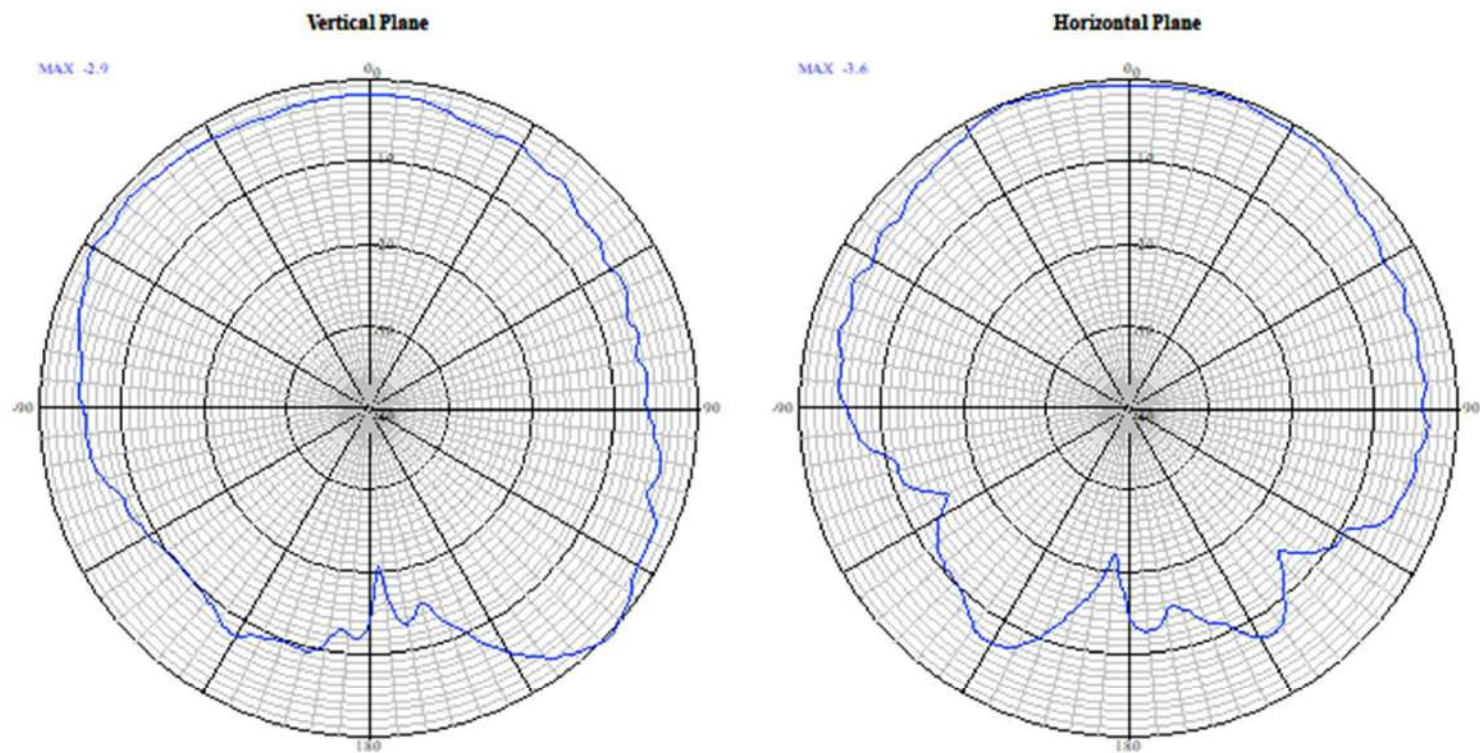
**Single Channel Unit**  
**Antenna 2: WiFi antenna**

Far-Field Patterns

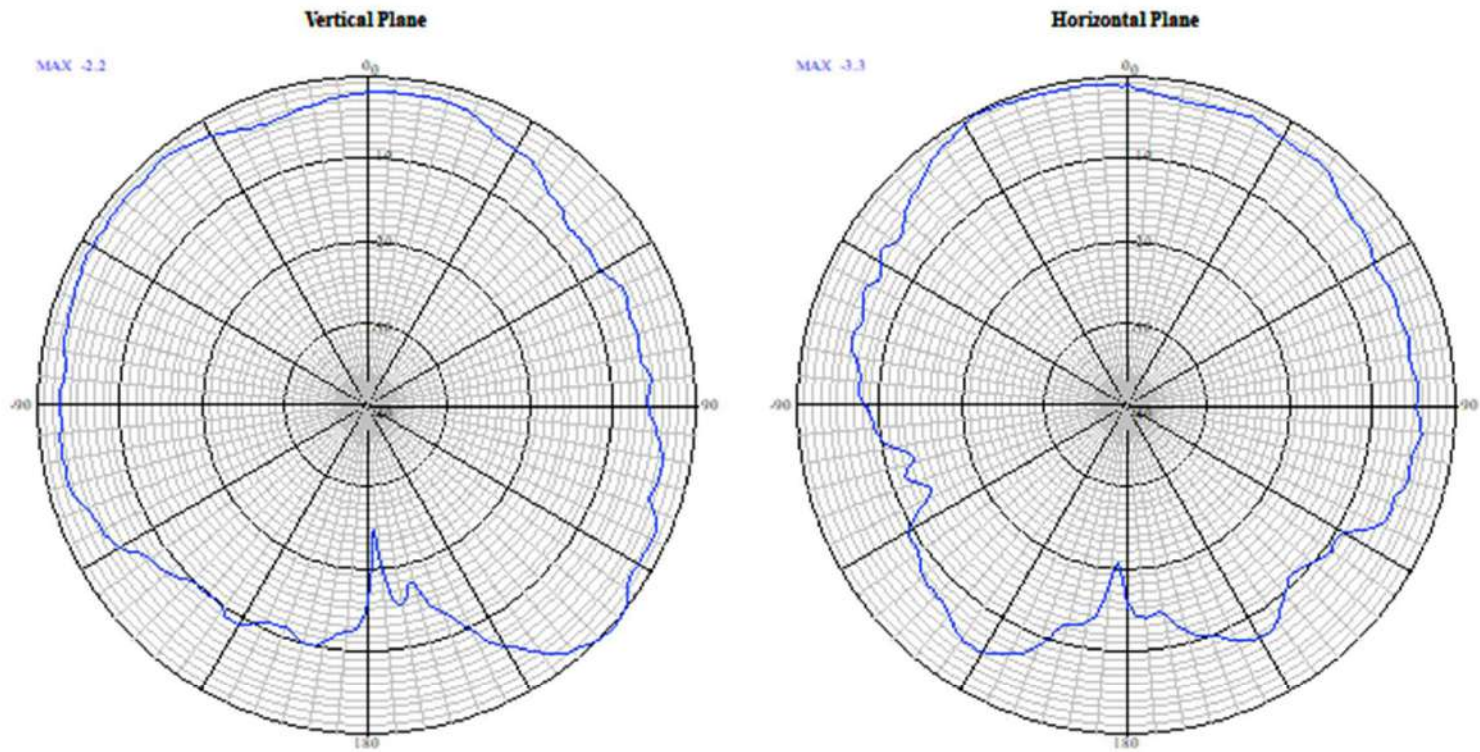
Frequency: 2.400000



**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns  
Frequency: 2.440000

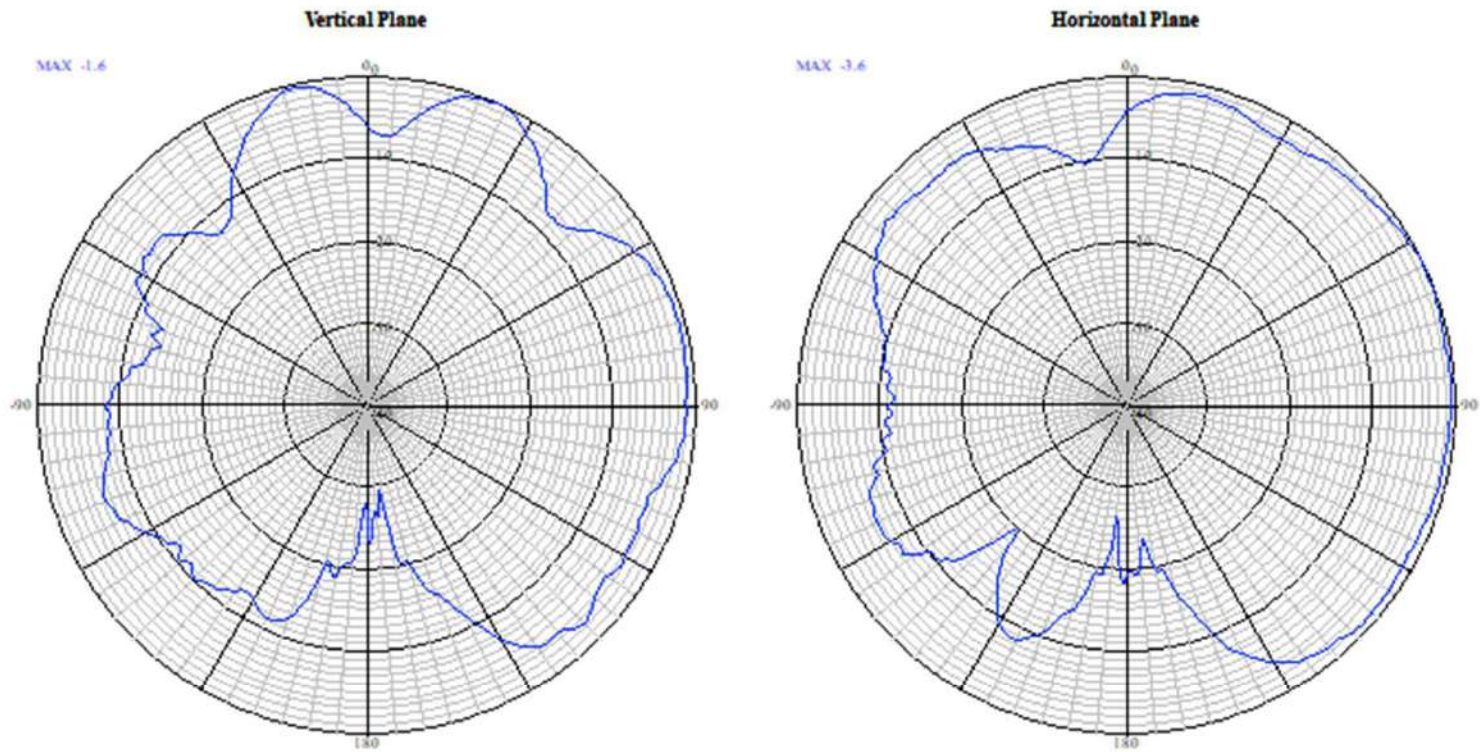


**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns  
Frequency: 2.480000

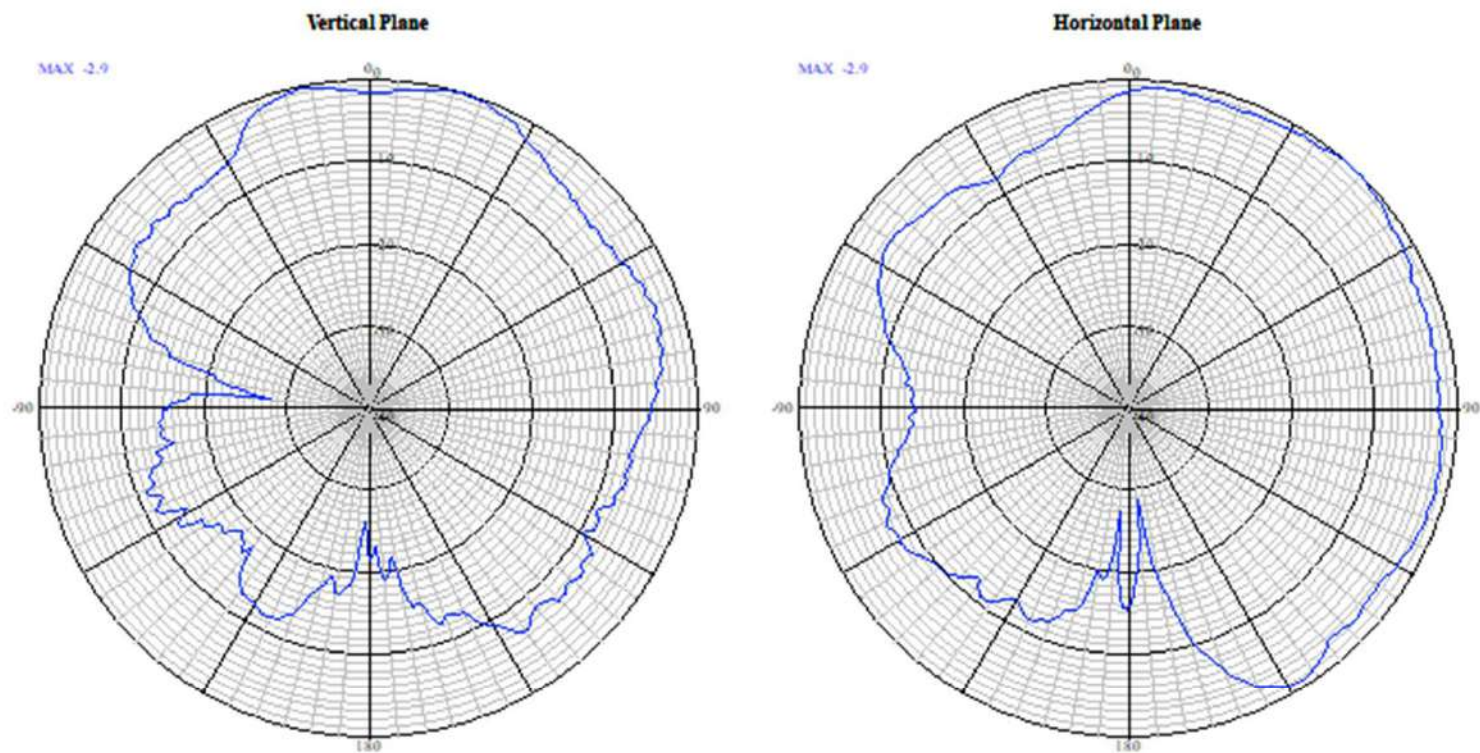




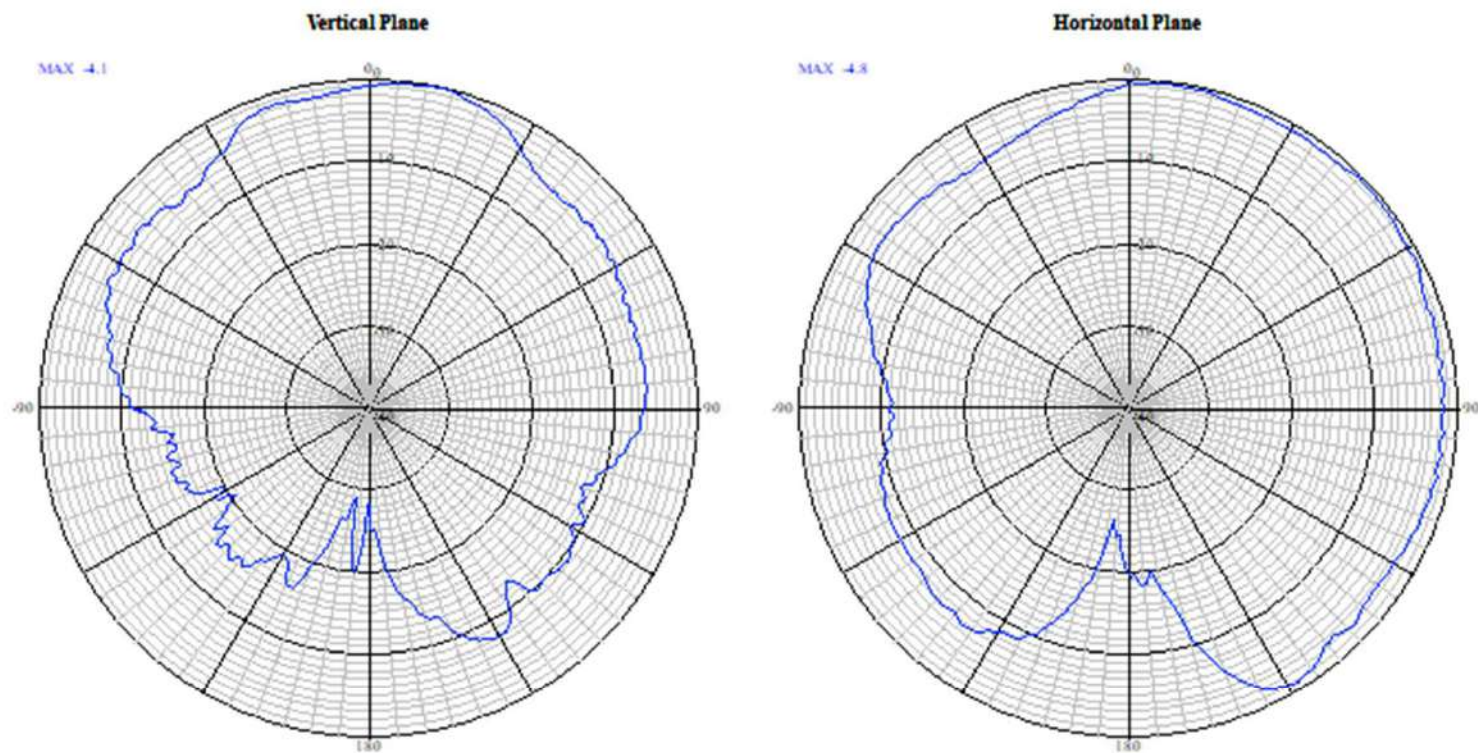
**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns  
Frequency: 5.150000



**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns  
Frequency: 5.350000

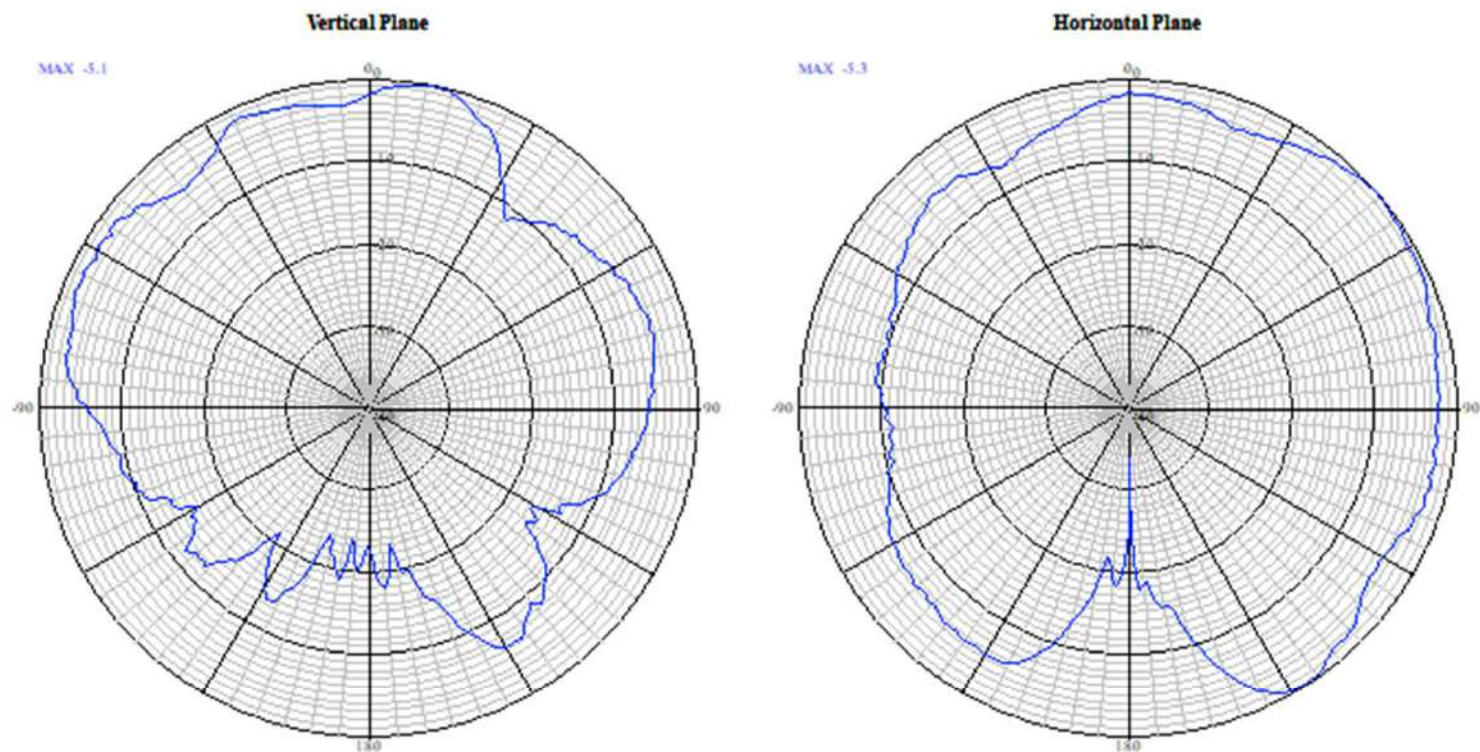


**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns  
Frequency: 5.500000





**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns  
Frequency: 5.725000

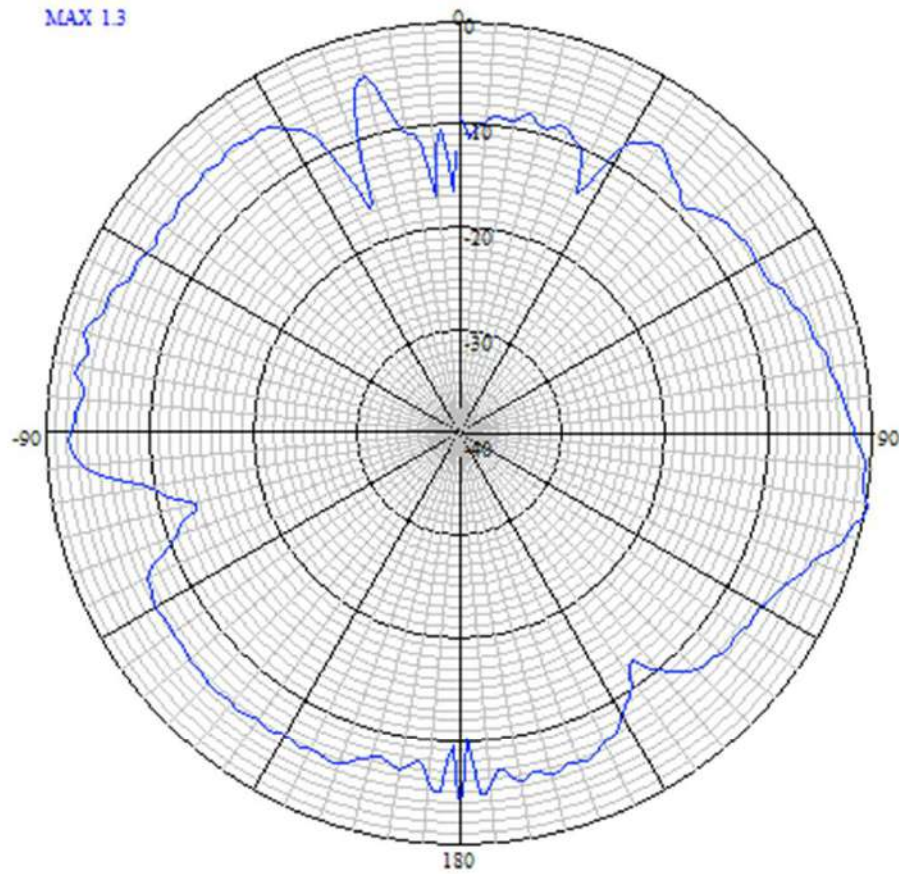


## **2. WiFi antenna**

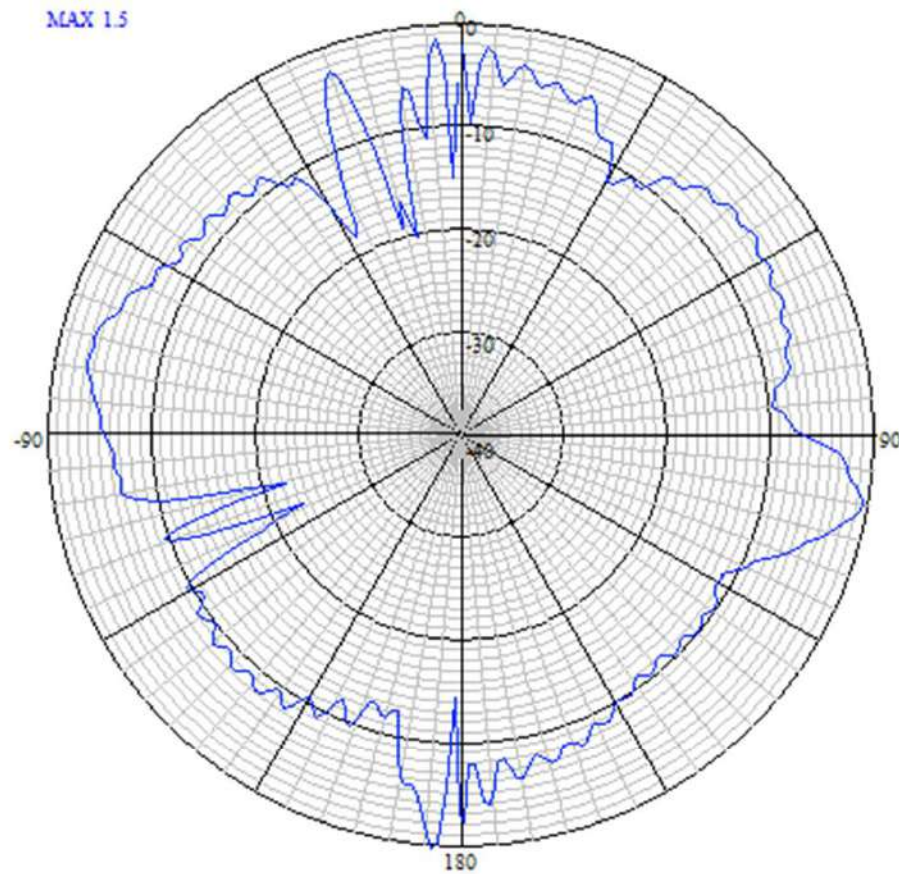
### **b) 2D Azimuth cut: XY-Plane**

Freq = 2.40, 2.44, 2.48, 5.15, 5.35, 5.5, 5.725 GHz

**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 2.400000  
**Azimuth Cut - XY Plane**

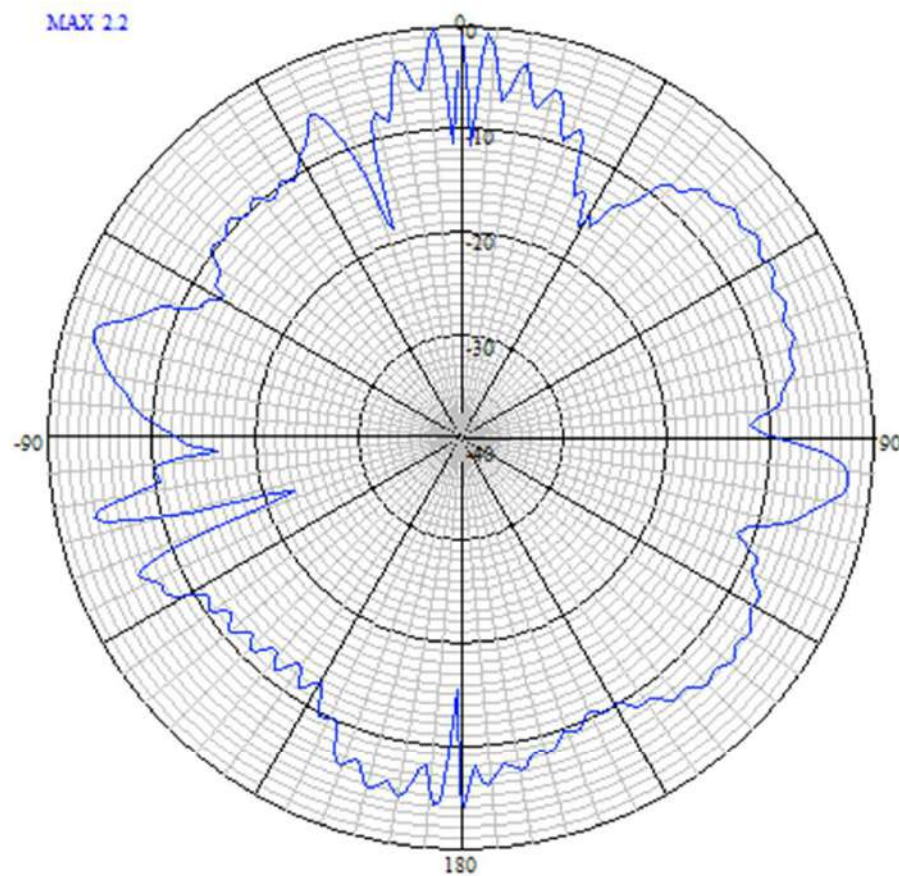


**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 2.440000  
**Azimuth Cut - XY Plane**

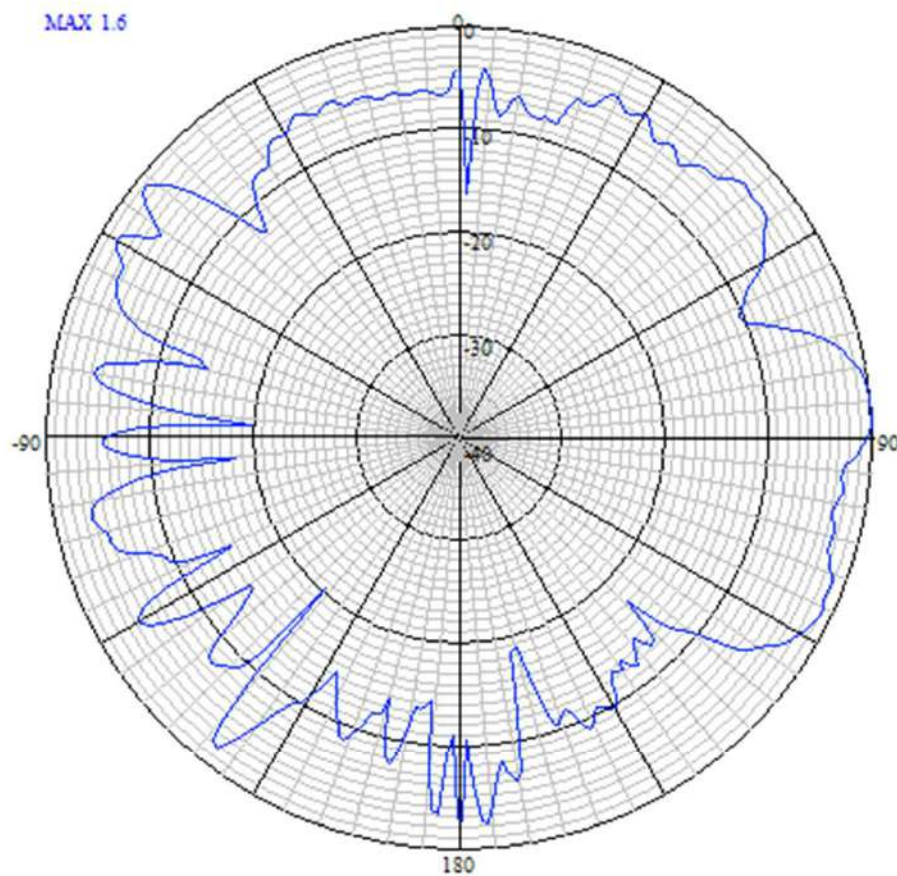




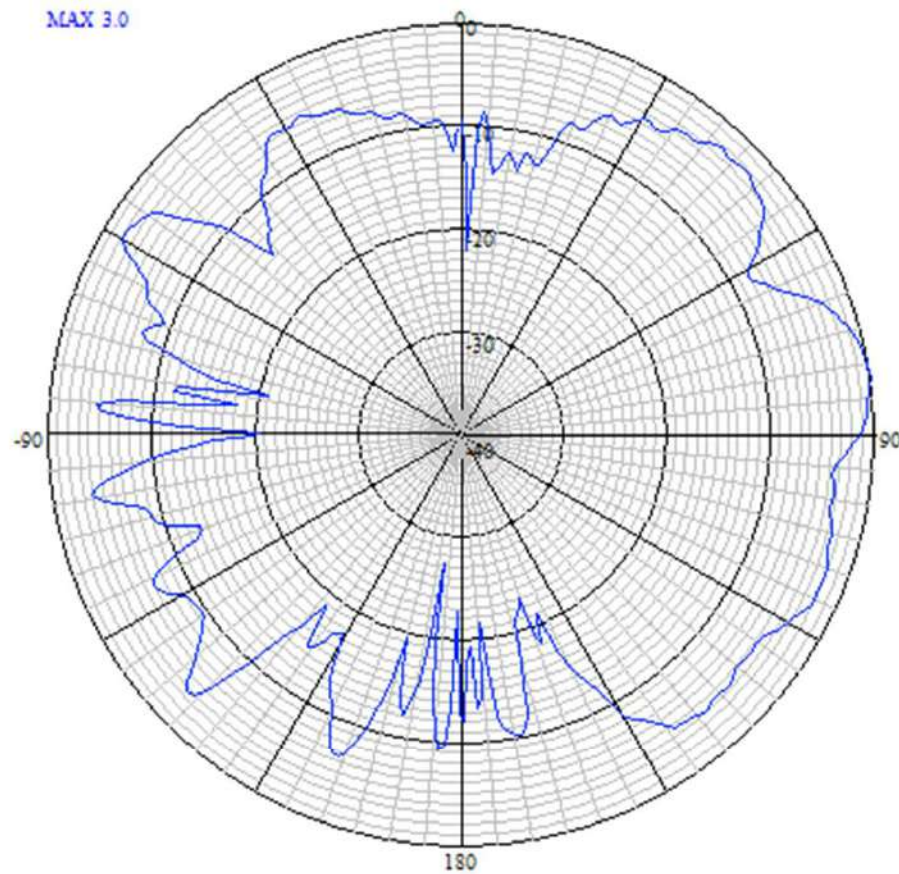
**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 2.480000  
**Azimuth Cut - XY Plane**



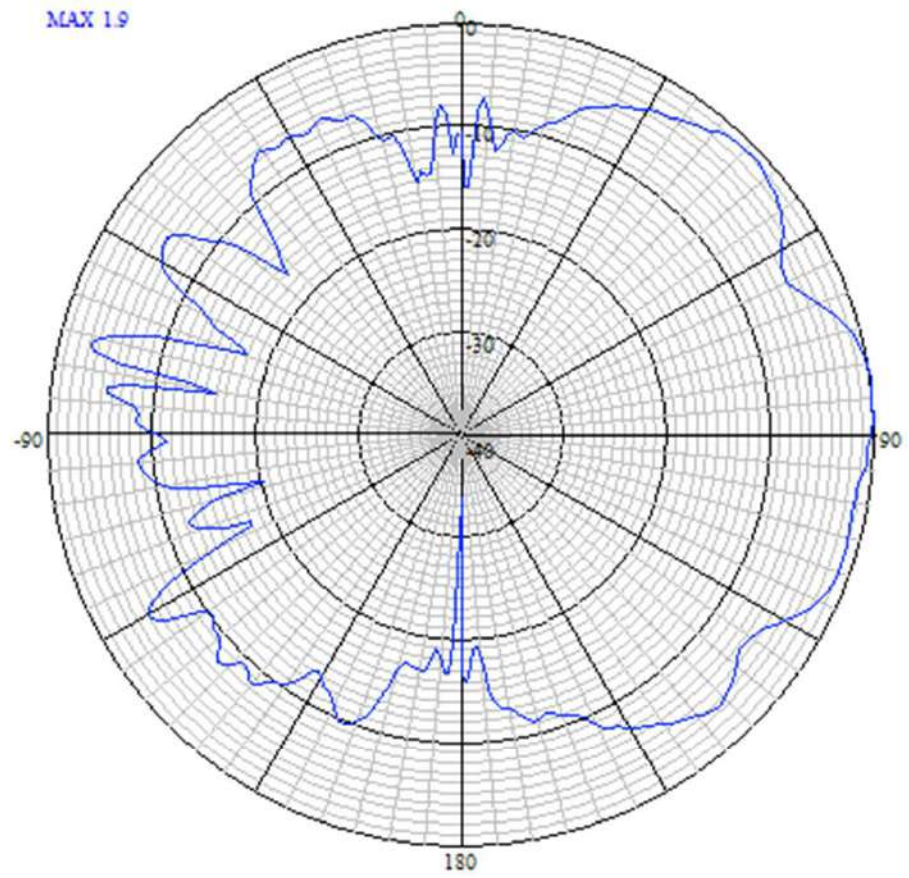
**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 5.150000  
**Azimuth Cut - XY Plane**



**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 5.350000  
**Azimuth Cut - XY Plane**

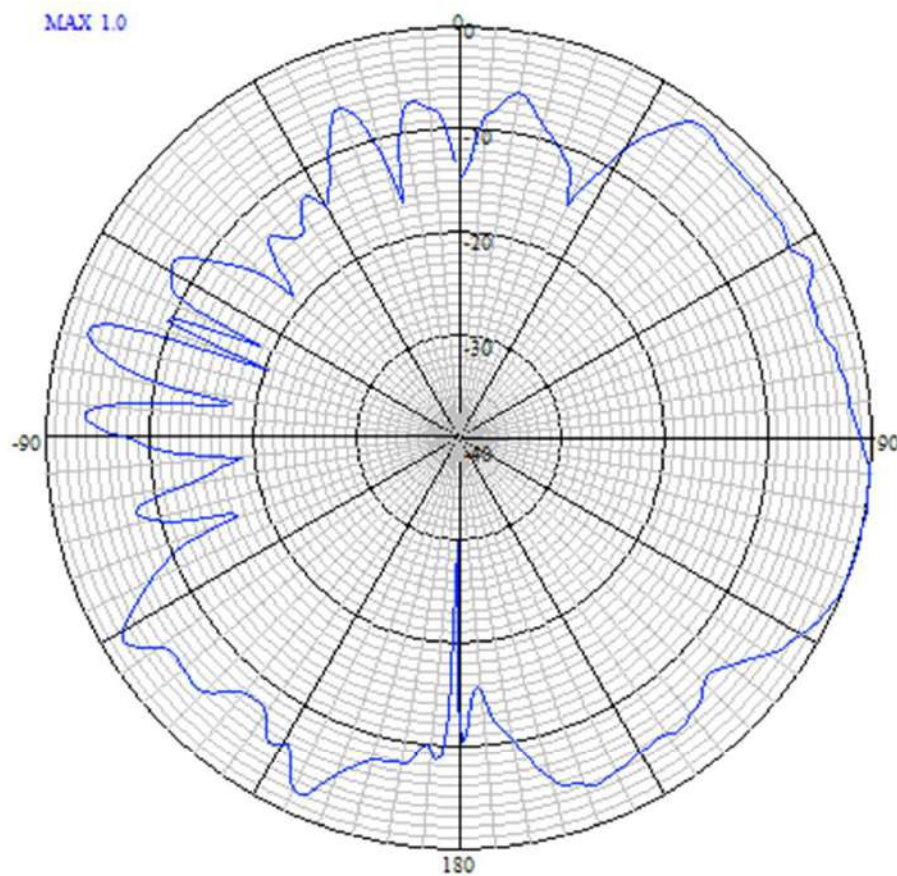


**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 5.500000  
**Azimuth Cut - XY Plane**





**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 5.725000  
**Azimuth Cut - XY Plane**

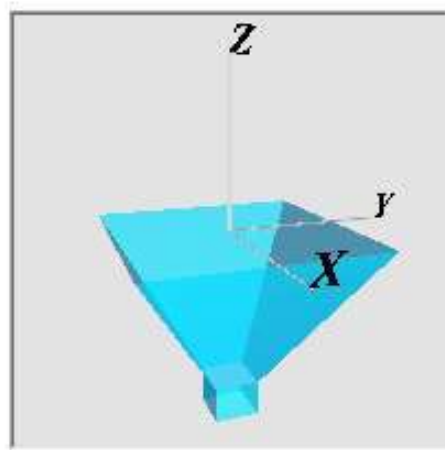
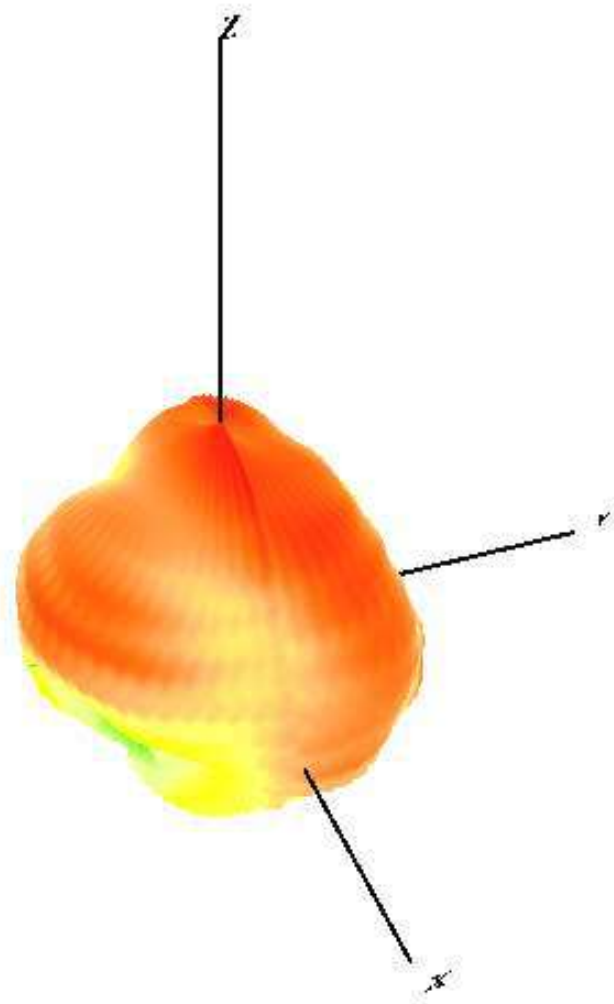


## **2. WiFi antenna**

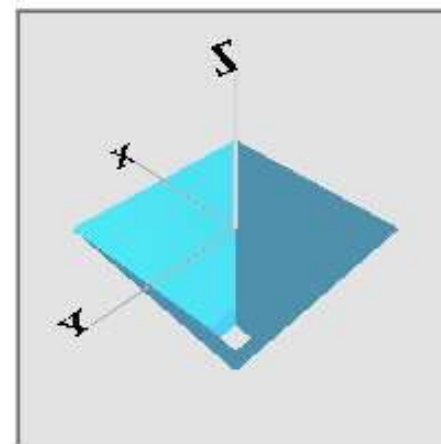
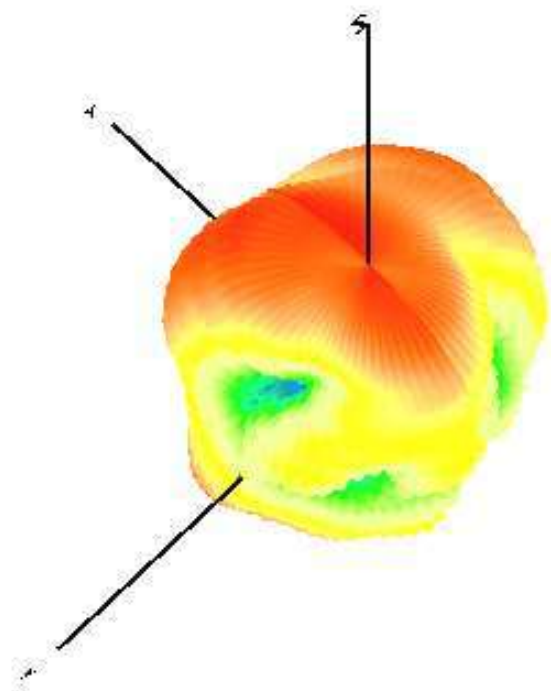
### **c) 3D plots**

Freq = 2.40, 2.44, 2.48, 5.15, 5.35, 5.5, 5.725 GHz

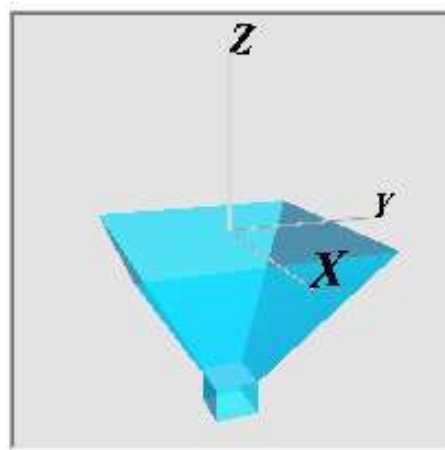
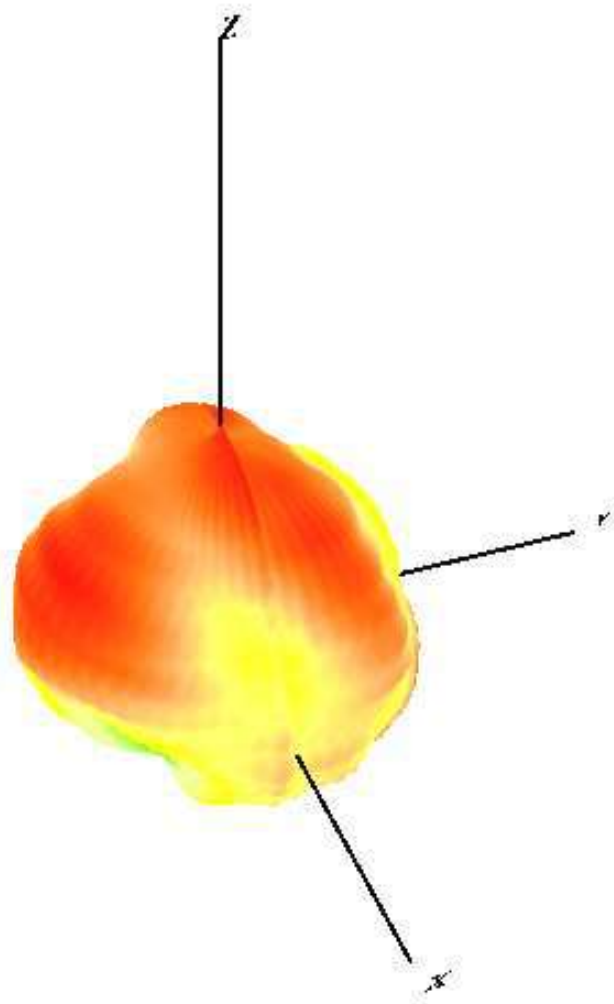
Single Channel Unit  
Antenna 2: WiFi antenna  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.400000



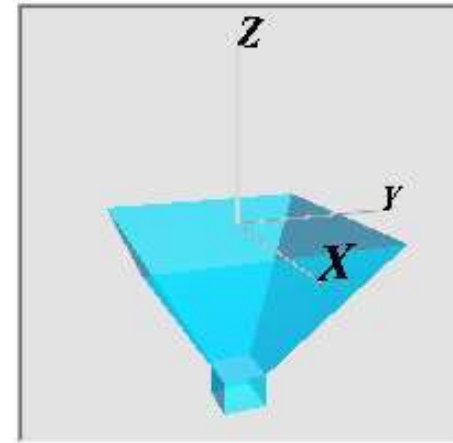
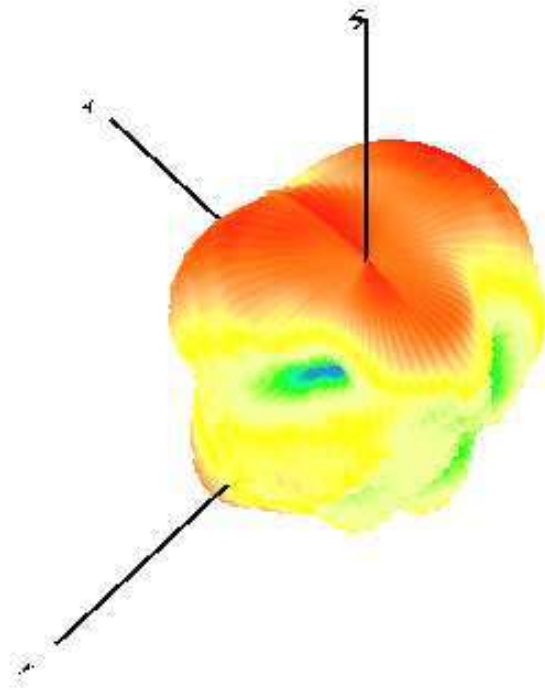
**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.400000



**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.440000

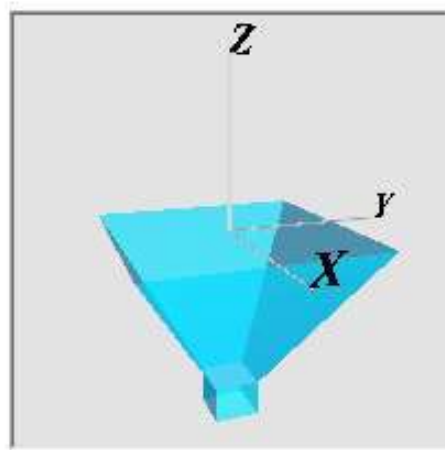
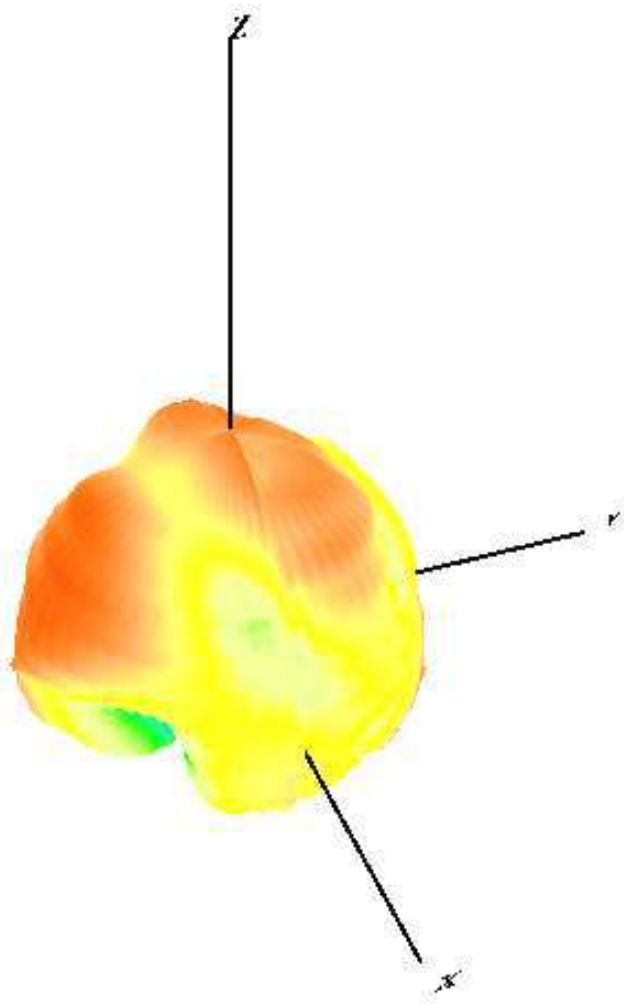


**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.440000

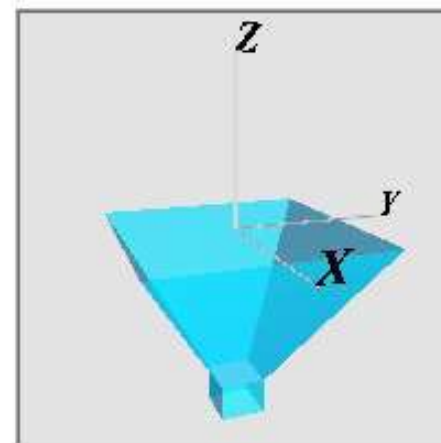
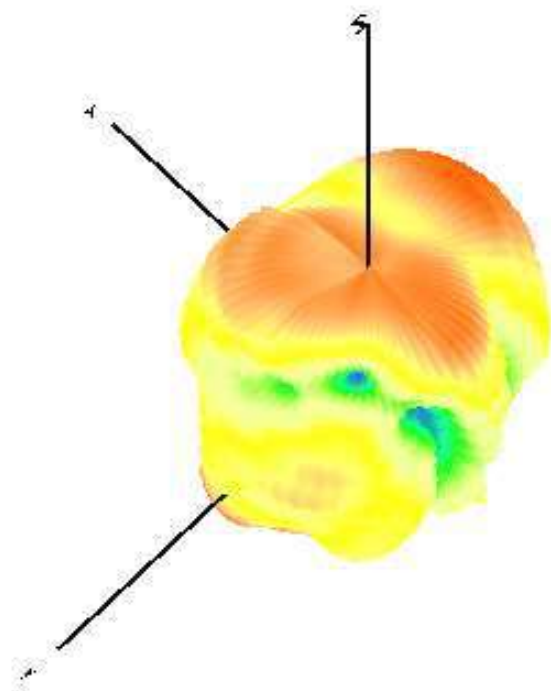




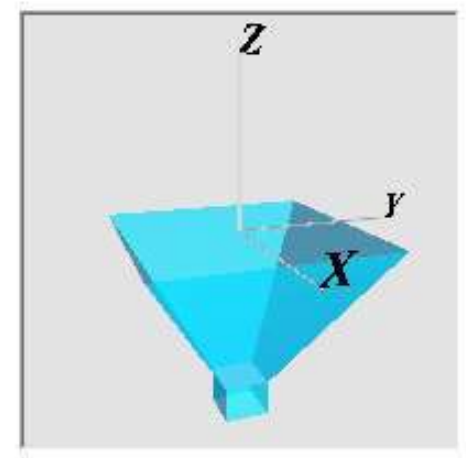
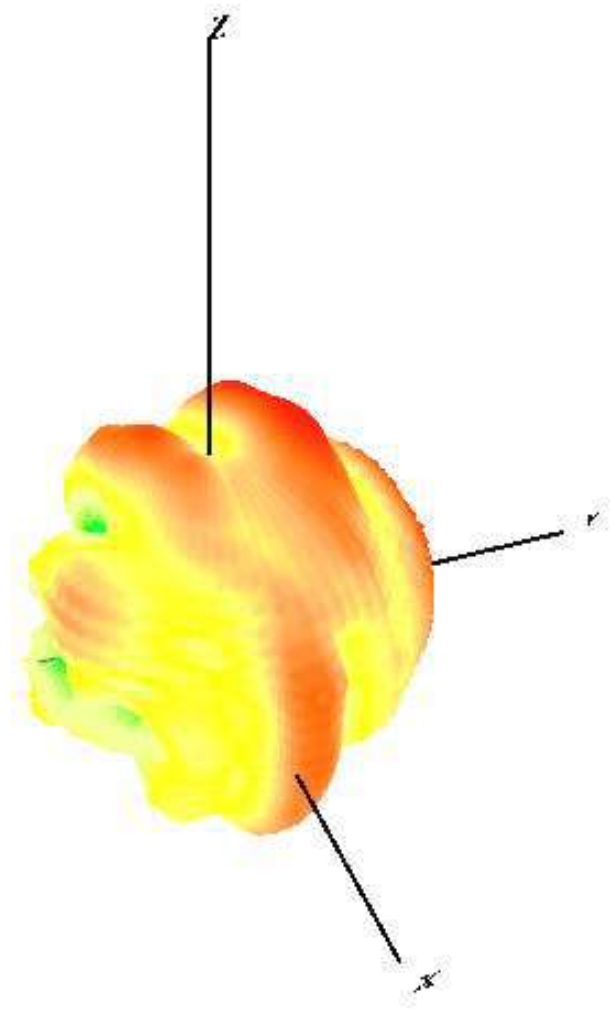
**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.480000



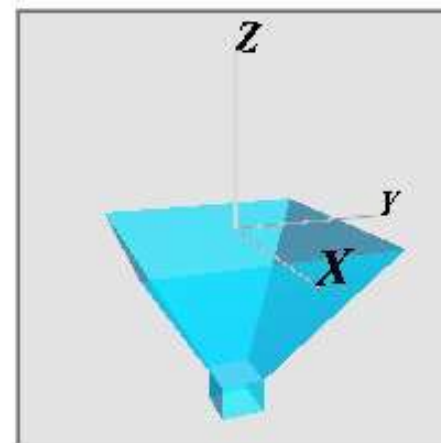
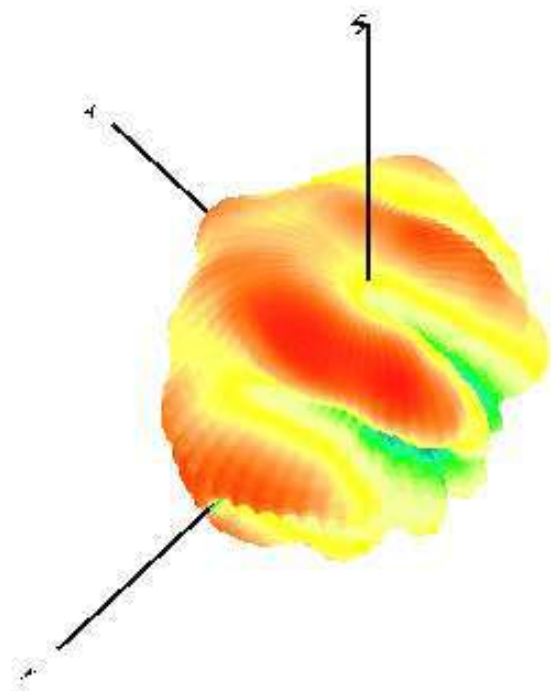
**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.480000



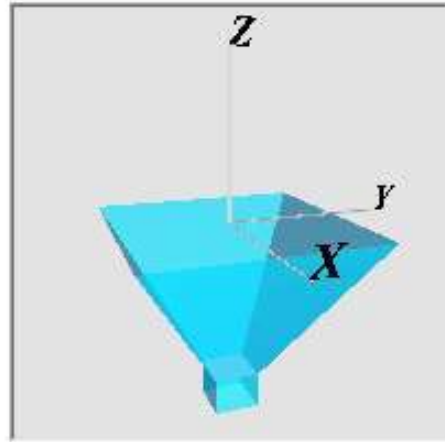
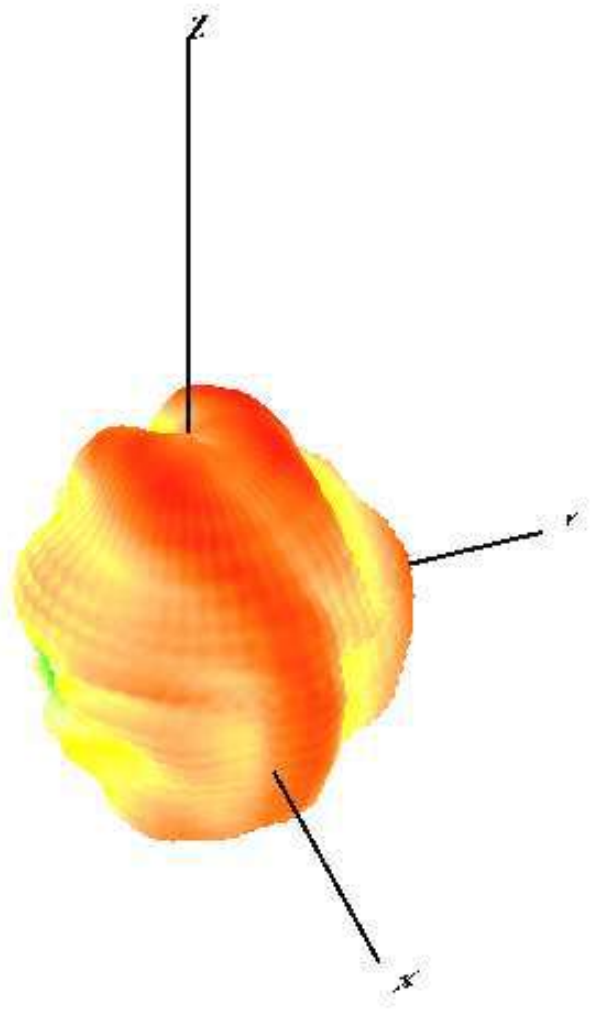
**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.150000



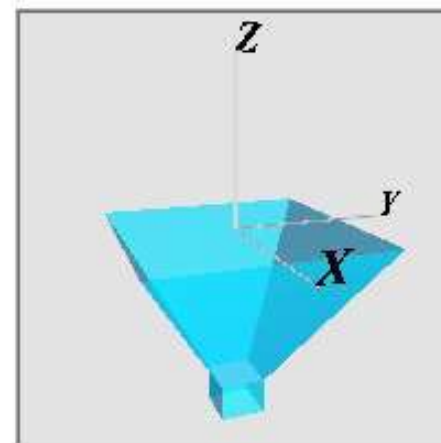
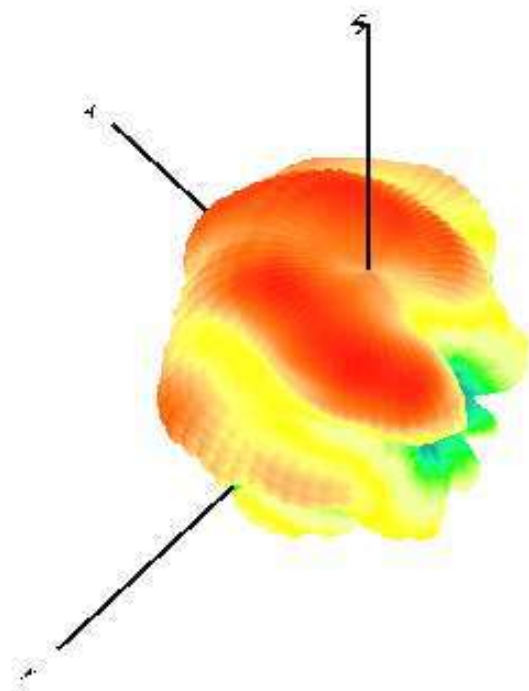
**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.150000



**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.350000

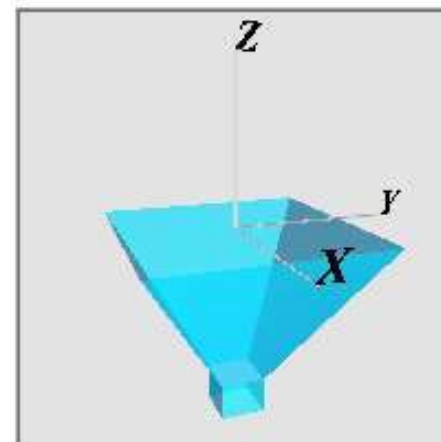
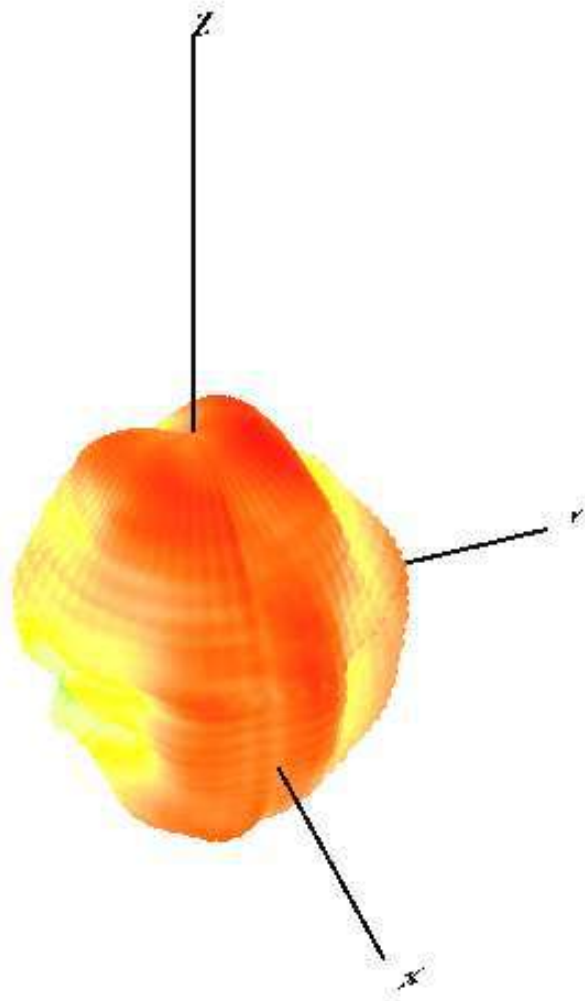


**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.350000

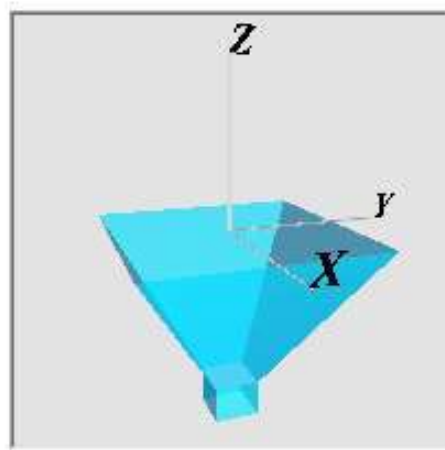
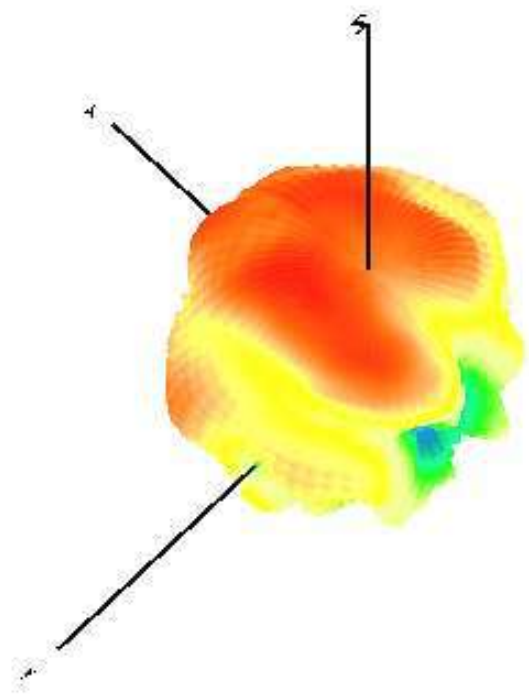




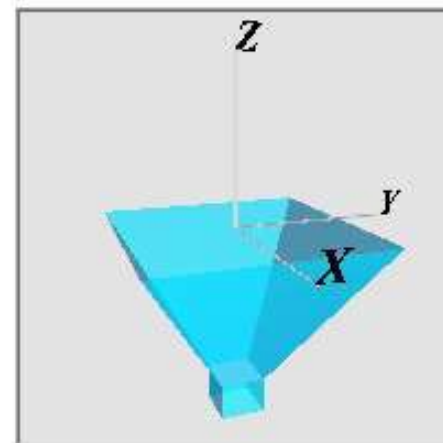
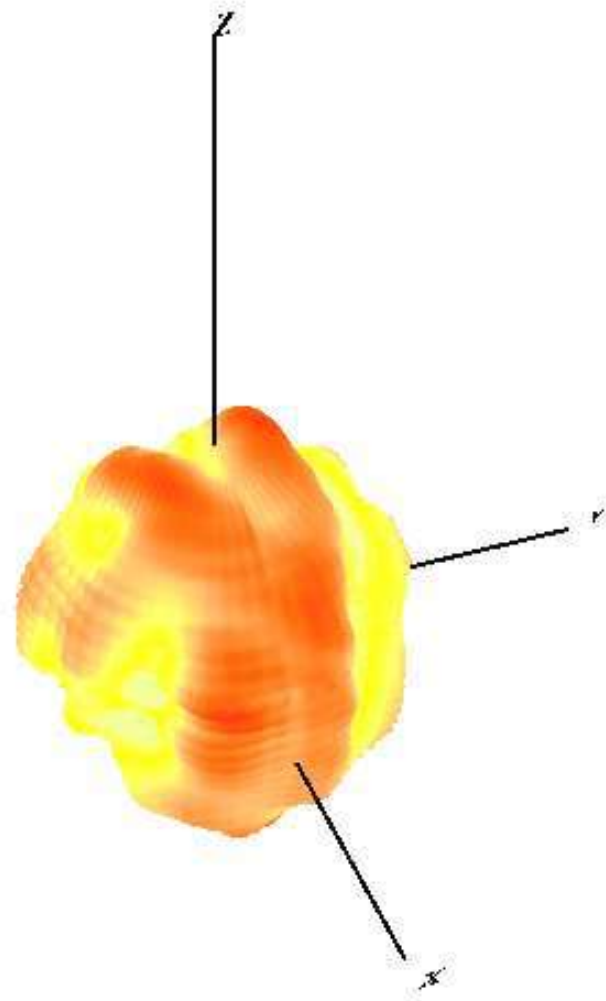
**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.500000



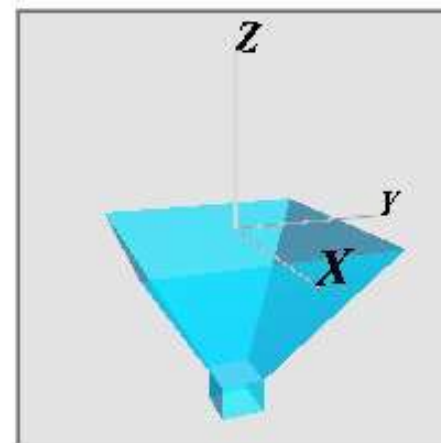
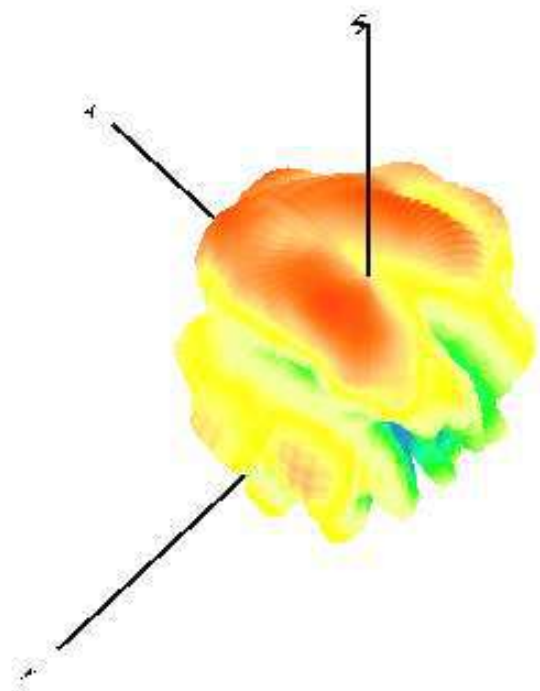
Single Channel Unit  
Antenna 2: WiFi antenna  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.500000



**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.725000



**Single Channel Unit**  
**Antenna 2: WiFi antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.725000

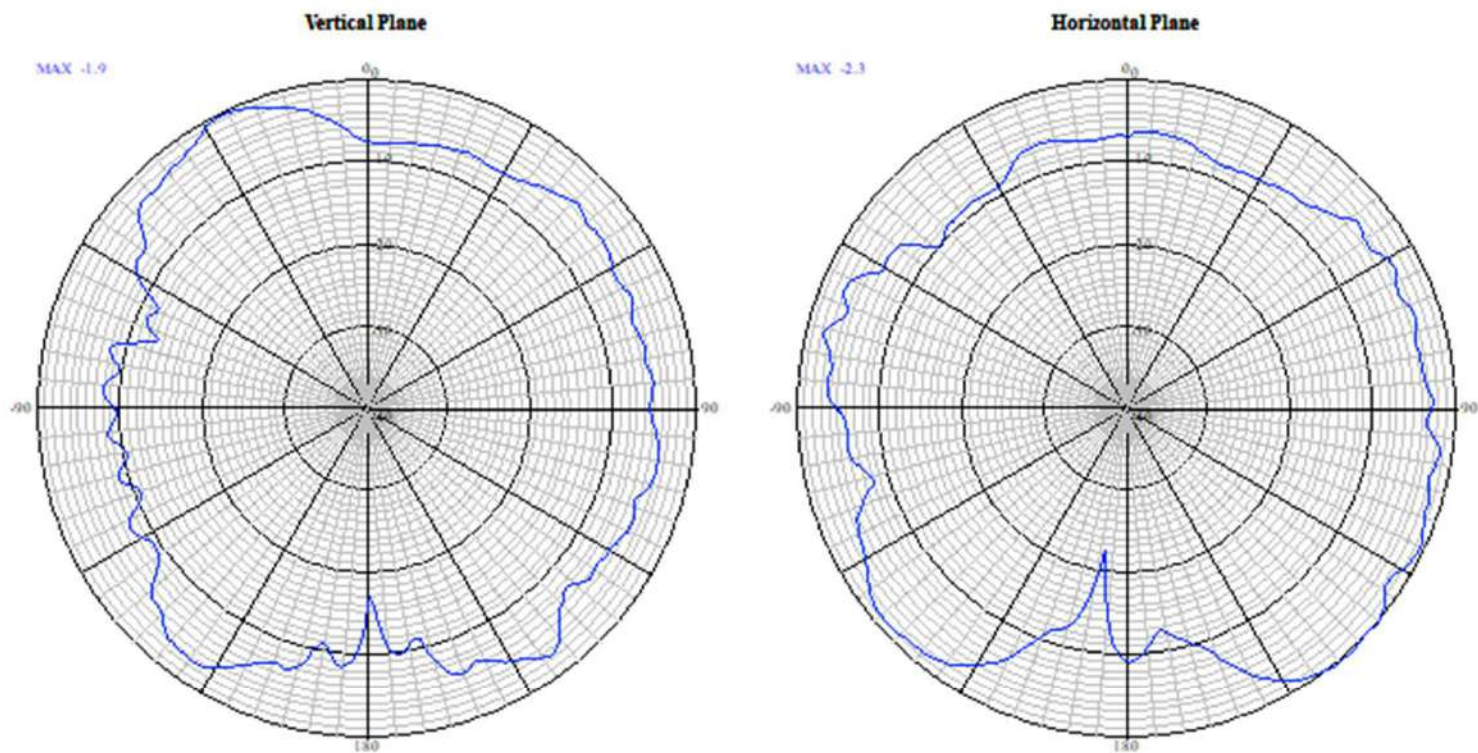


### **3. Embedded antenna**

#### **a) 2D Elevation cuts, ZX- and ZY-plane**

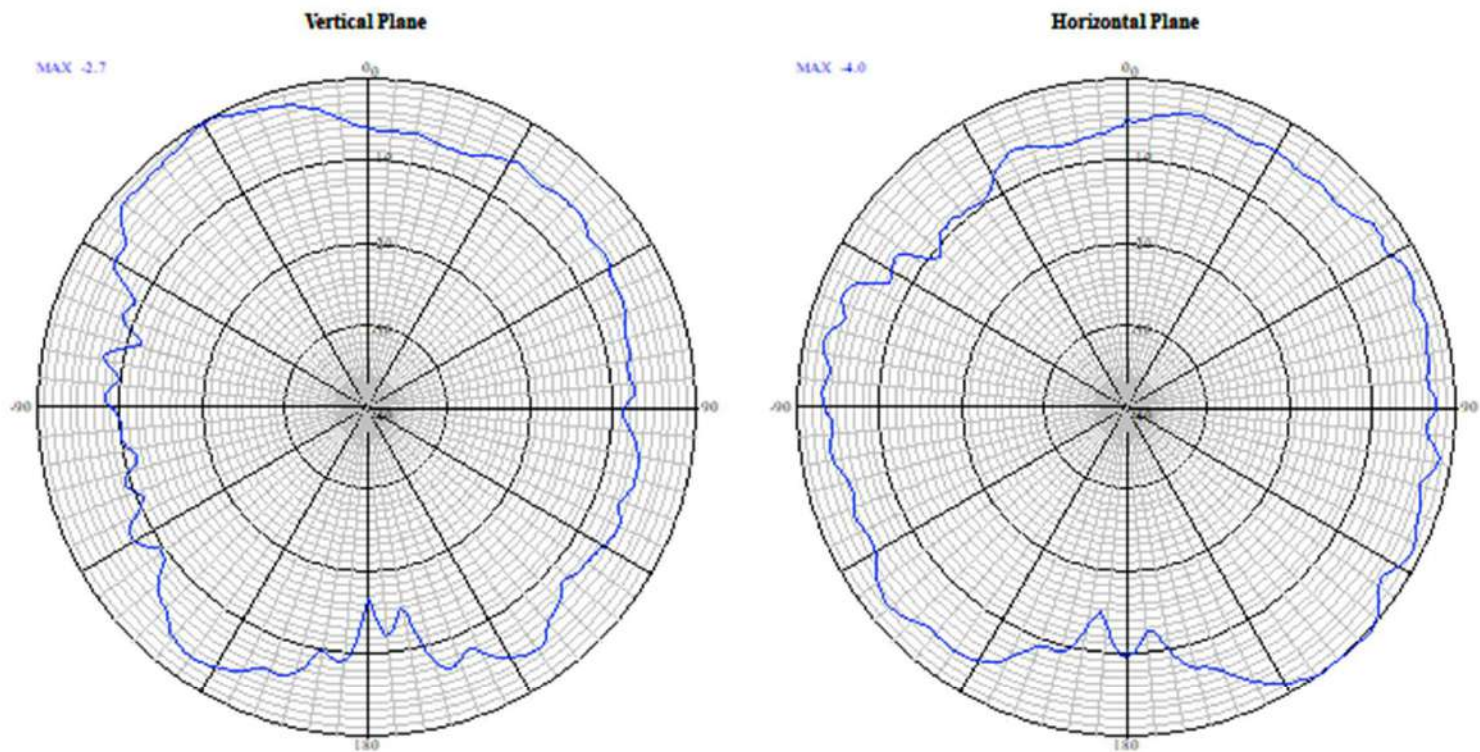
Freq = 2.40, 2.44, 2.48, 5.15, 5.35, 5.5, 5.725 GHz

**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns  
Frequency: 2.400000

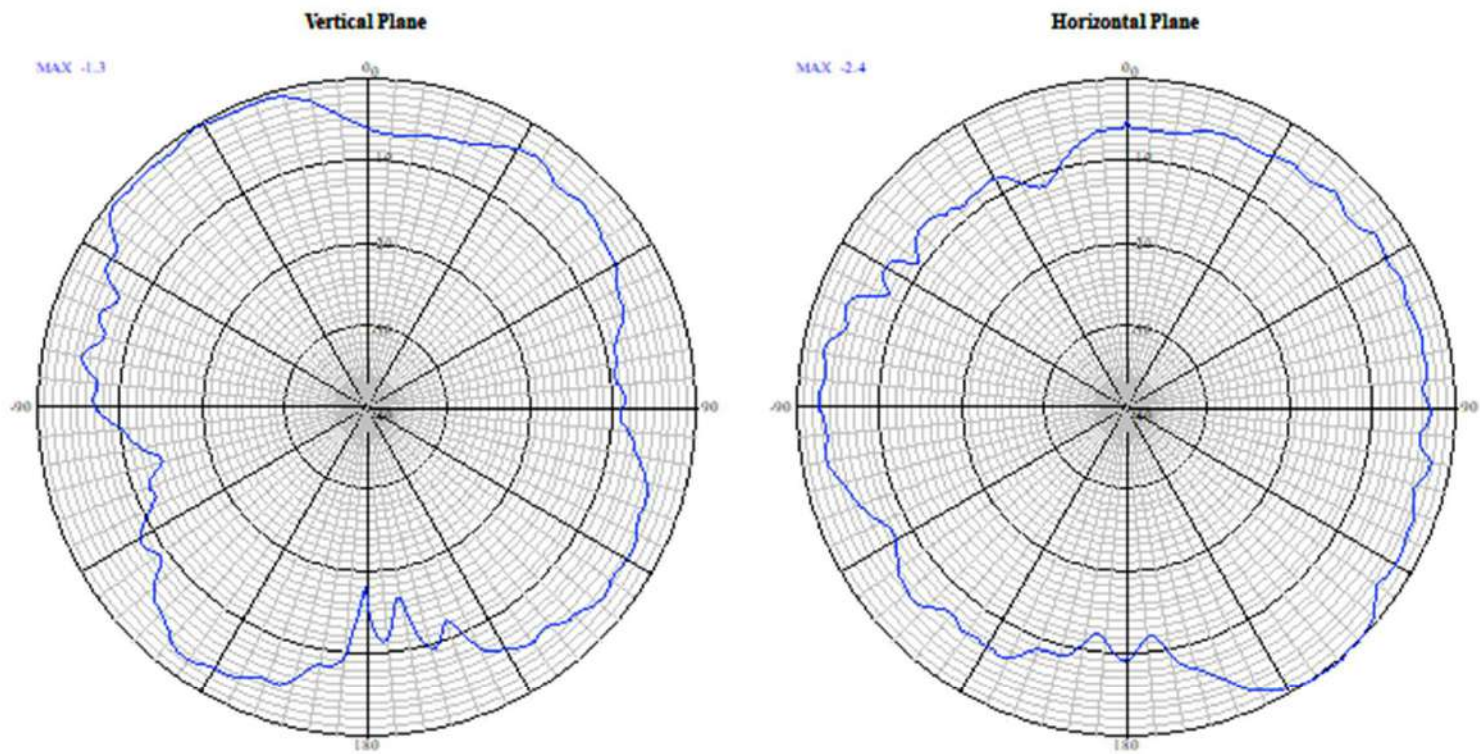




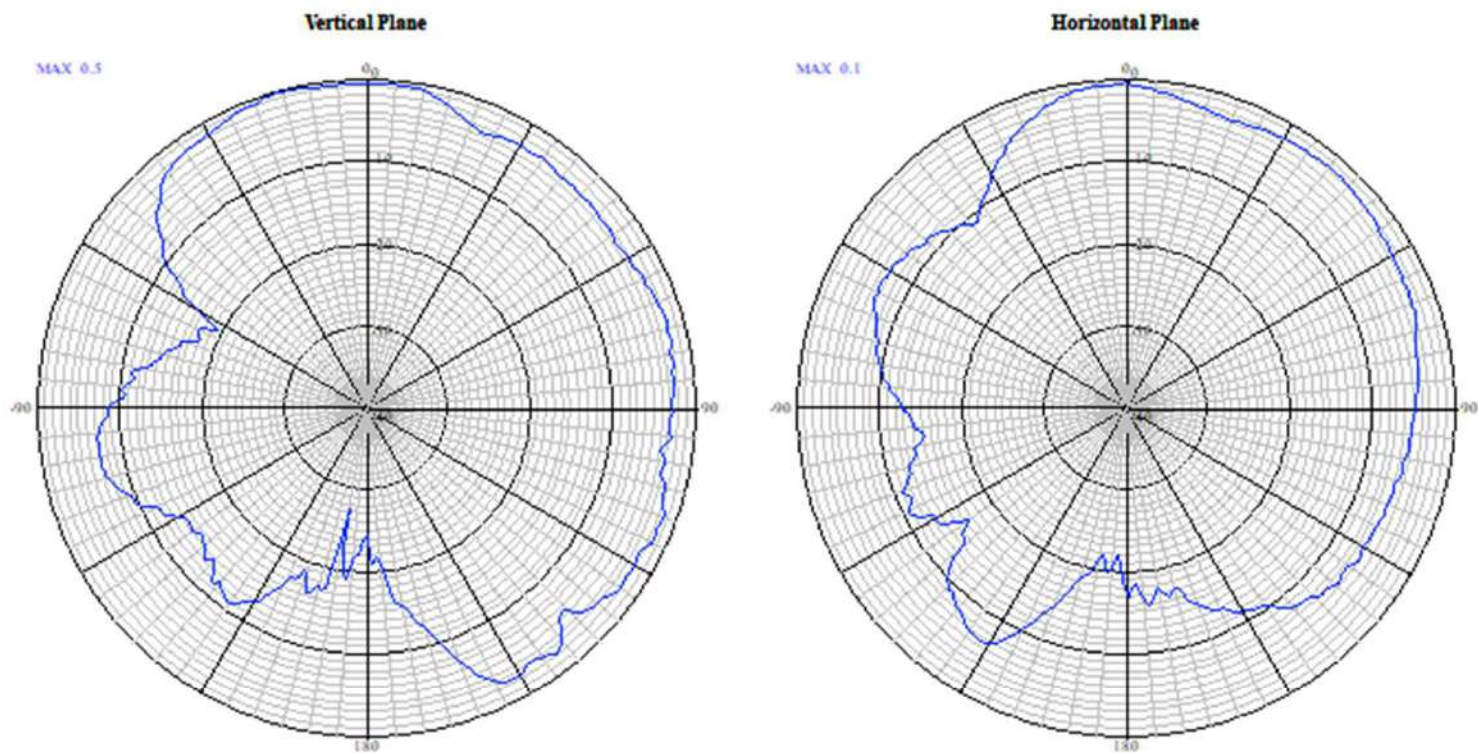
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns  
Frequency: 2.440000



**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns  
Frequency: 2.480000

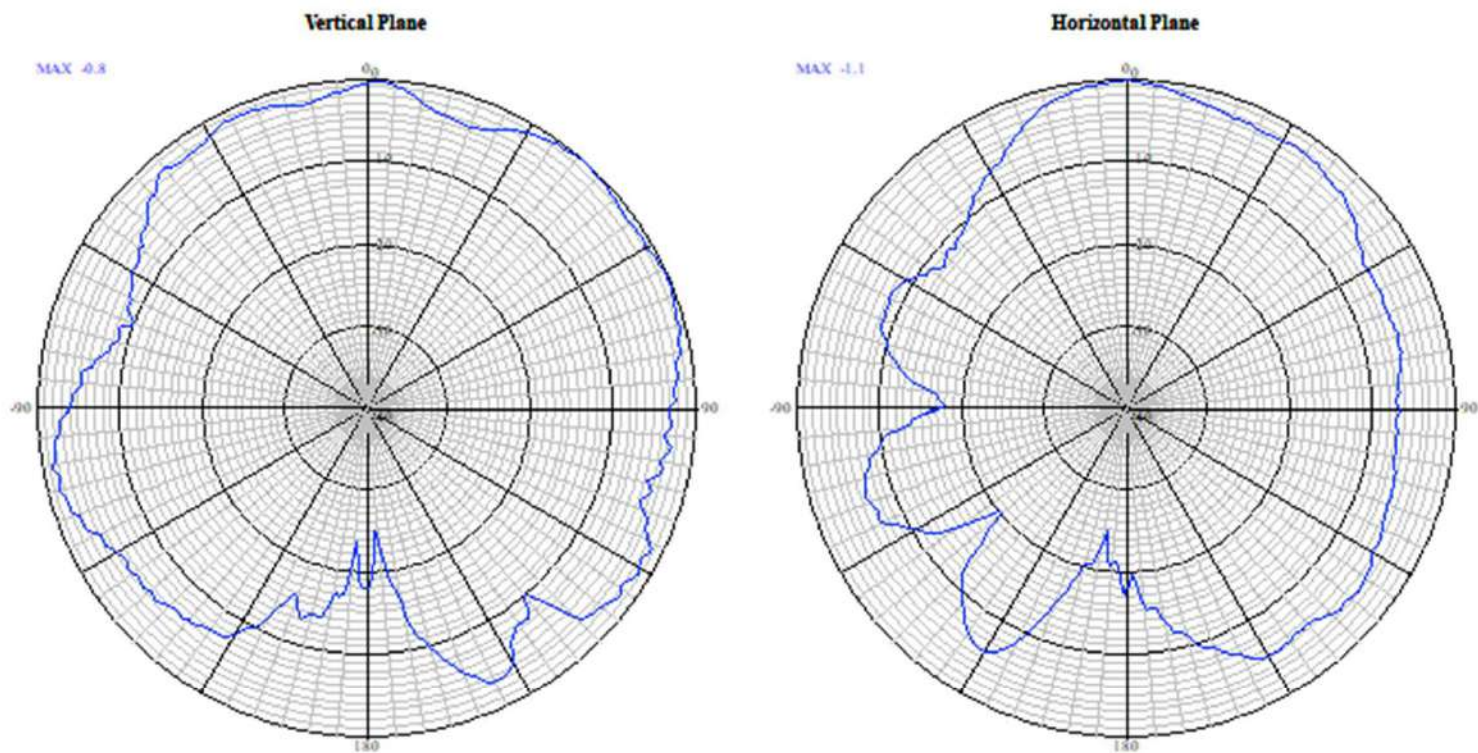


**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns  
Frequency: 5.150000

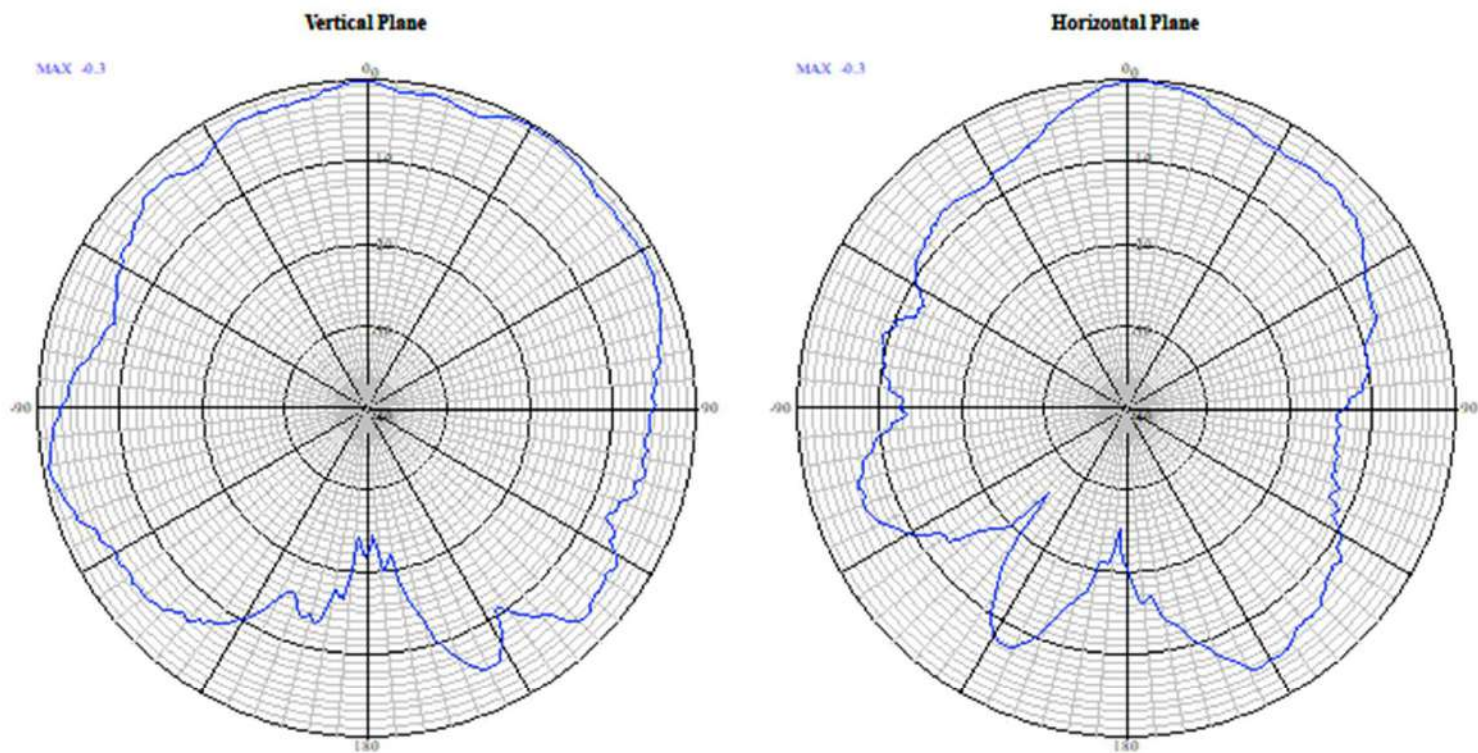




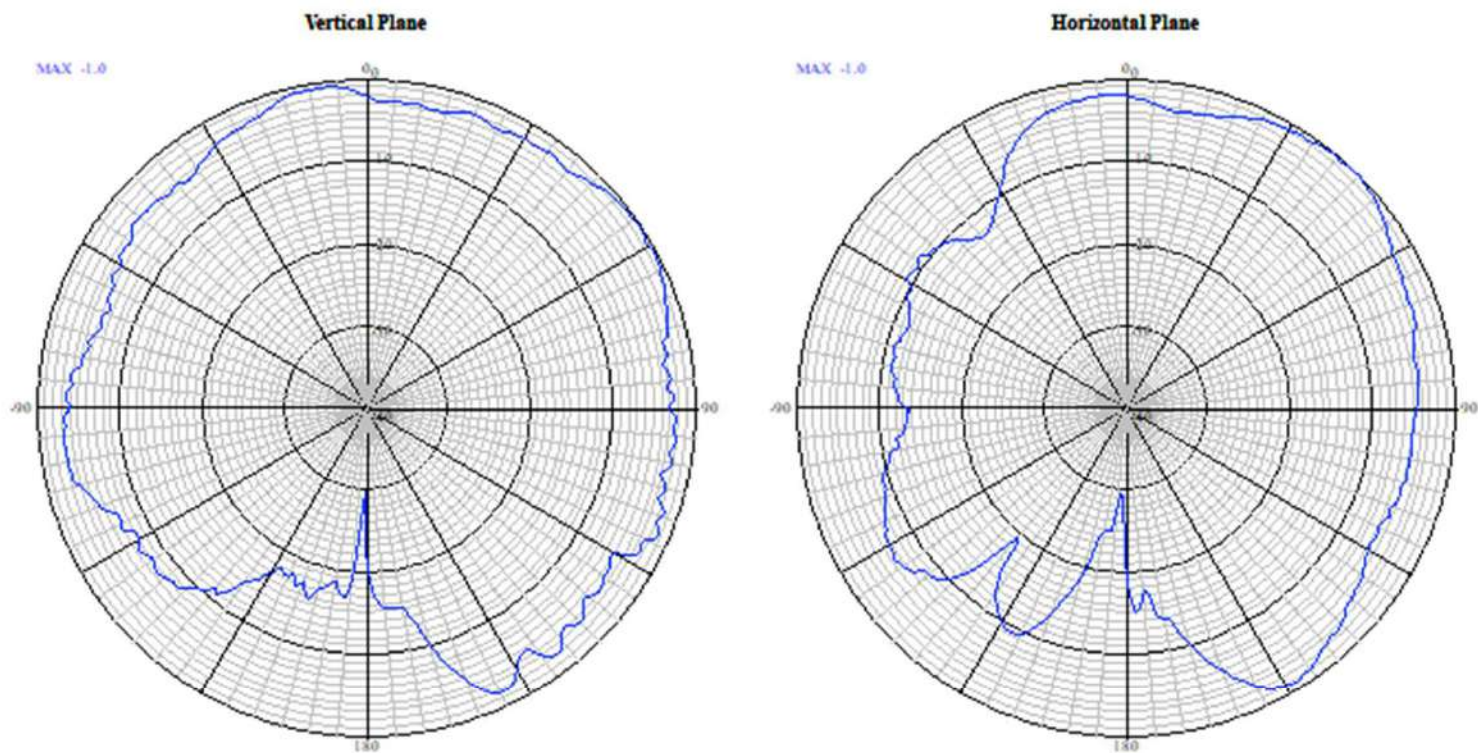
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns  
Frequency: 5.350000



**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns  
Frequency: 5.500000



**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns  
Frequency: 5.725000



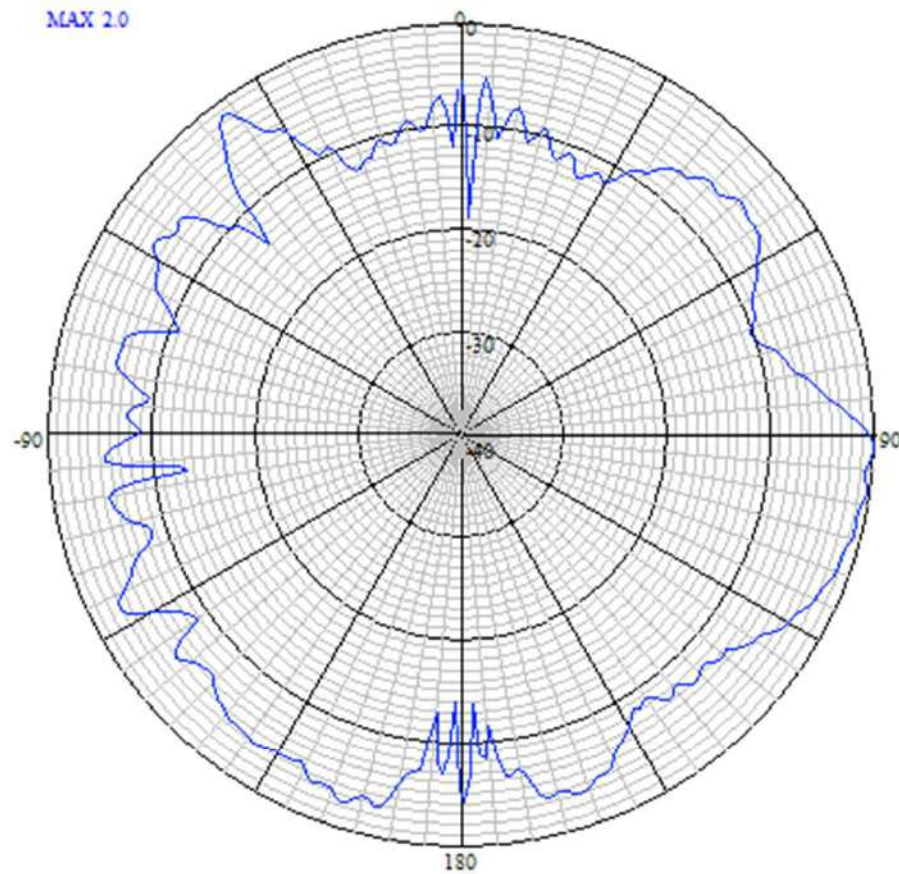


### **3. Embedded antenna**

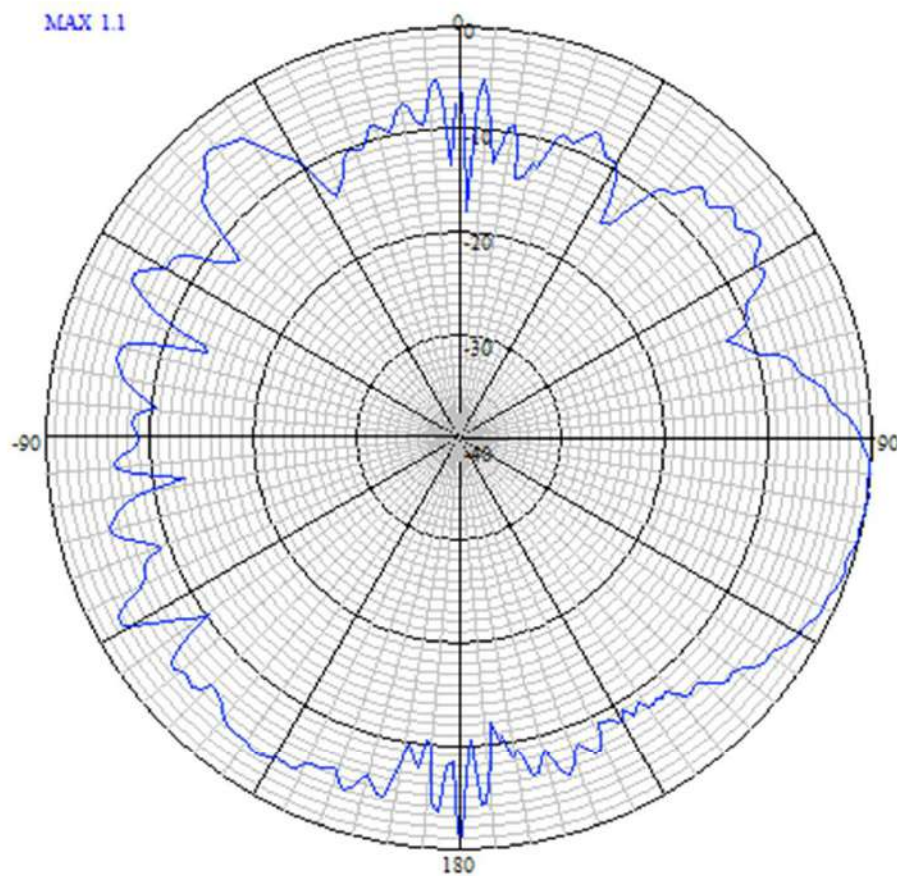
#### **b) 2D Azimuth cut: XY-Plane**

Freq = 2.40, 2.44, 2.48, 5.15, 5.35, 5.5, 5.725 GHz

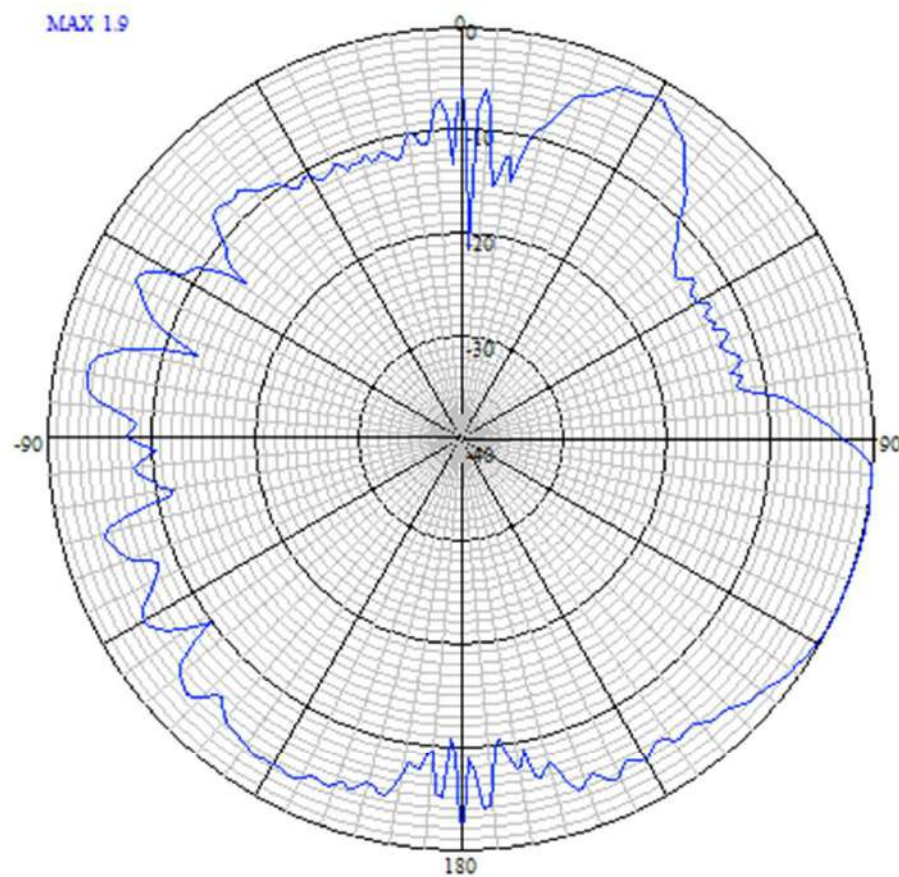
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 2.400000  
**Azimuth Cut - XY Plane**



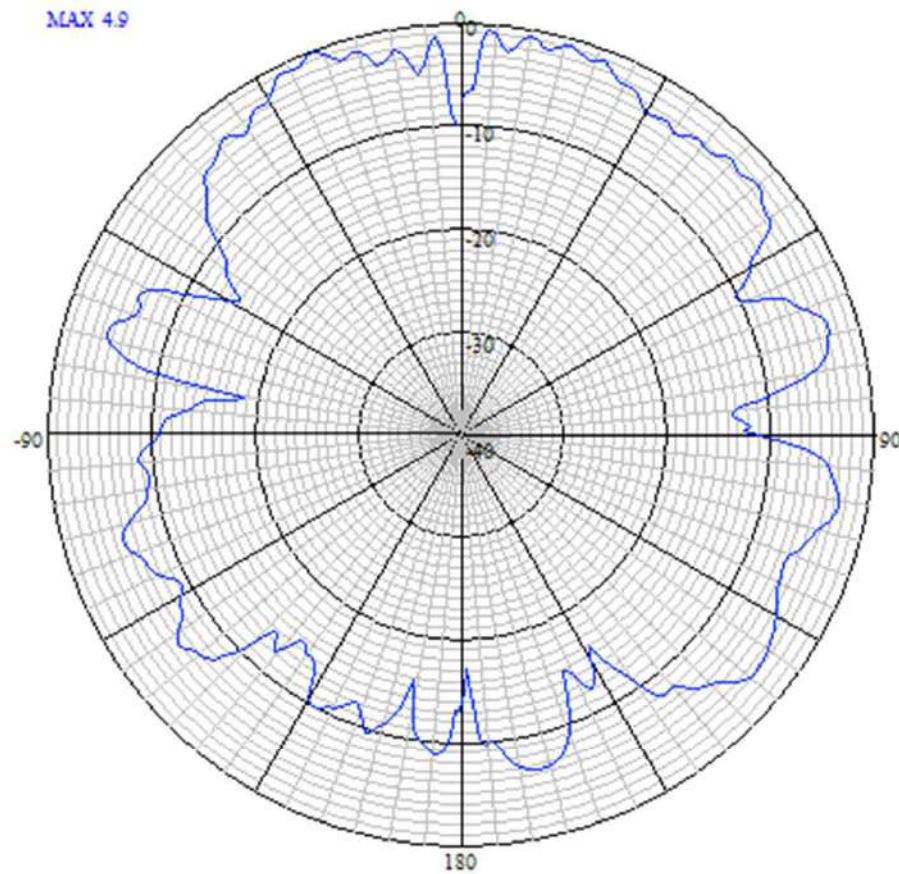
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 2.440000  
**Azimuth Cut - XY Plane**



**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 2.480000  
**Azimuth Cut - XY Plane**

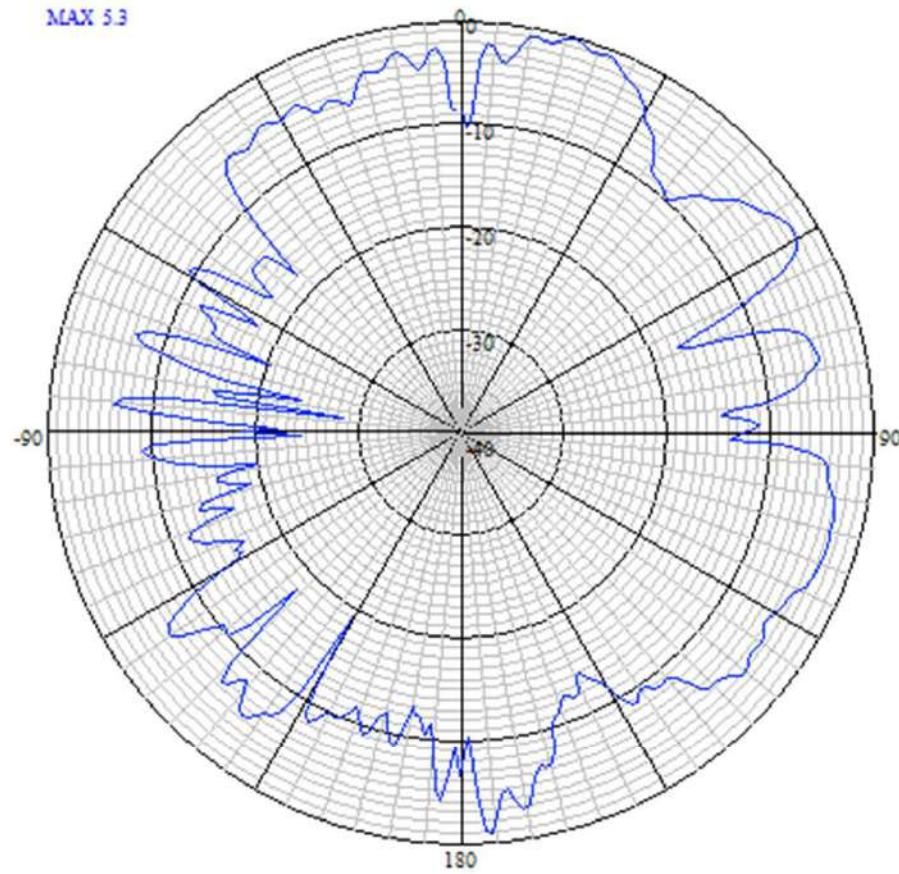


**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 5.150000  
**Azimuth Cut - XY Plane**



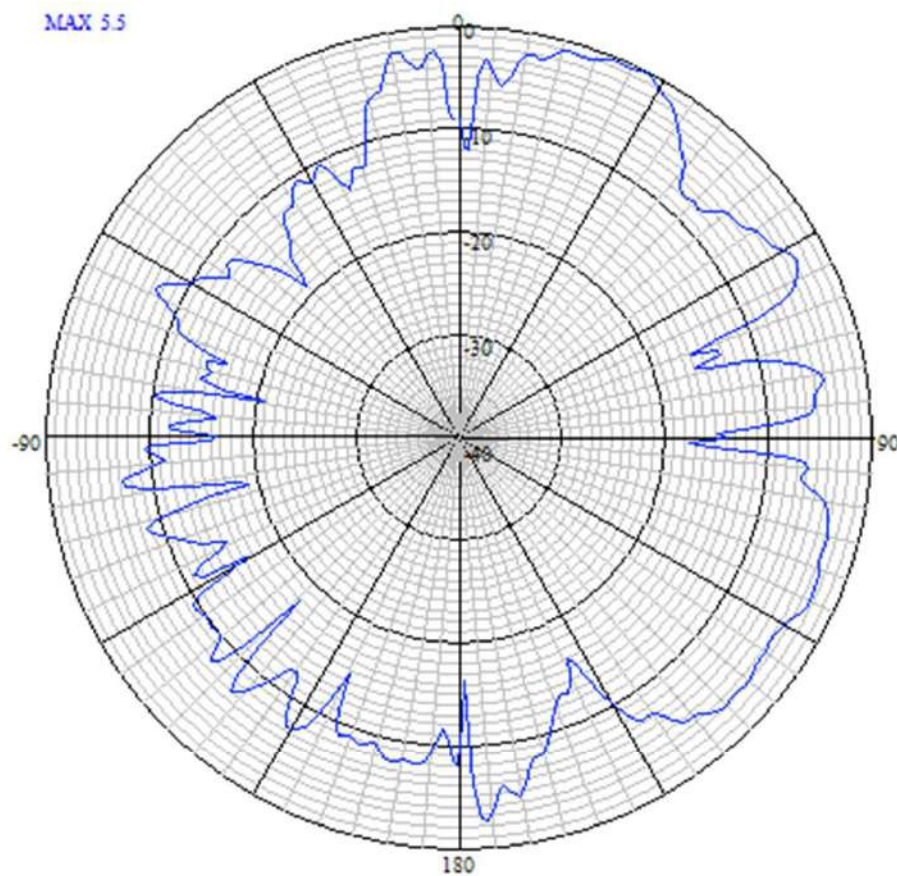


**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 5.350000  
**Azimuth Cut - XY Plane**

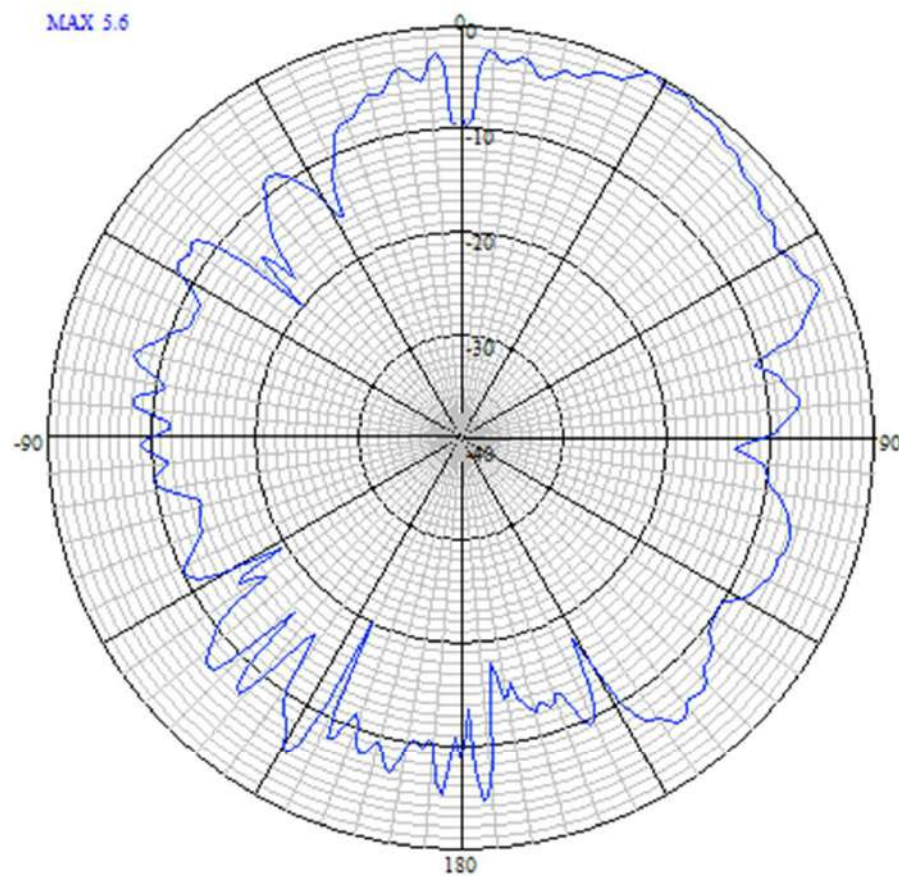




**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 5.500000  
**Azimuth Cut - XY Plane**



**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : 4 Cuts - 2 Radial, 2 Angular  
Frequency: 5.725000  
**Azimuth Cut - XY Plane**

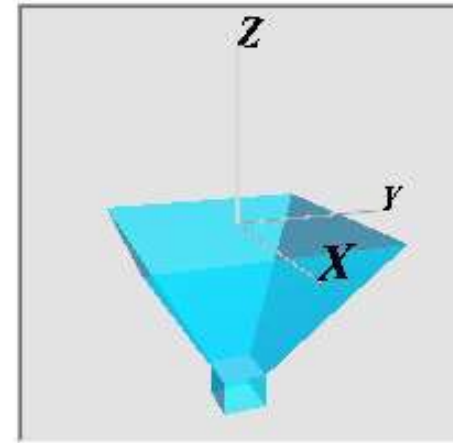
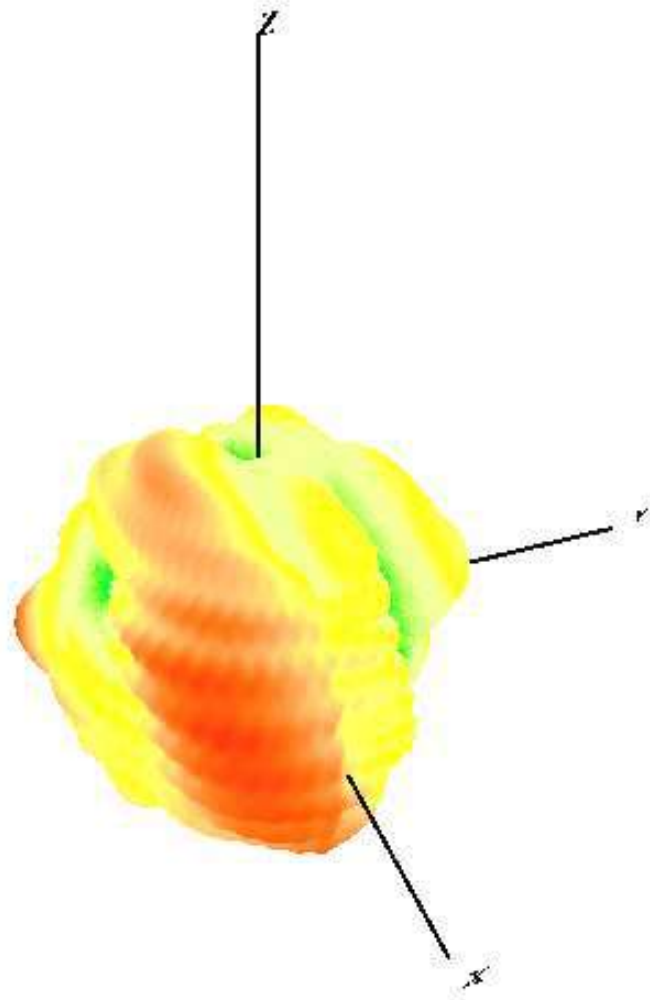


## **3. Embedded antenna**

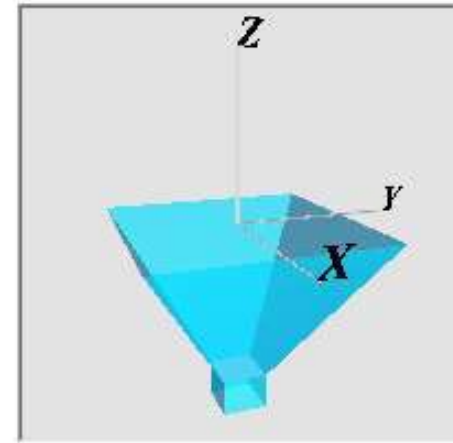
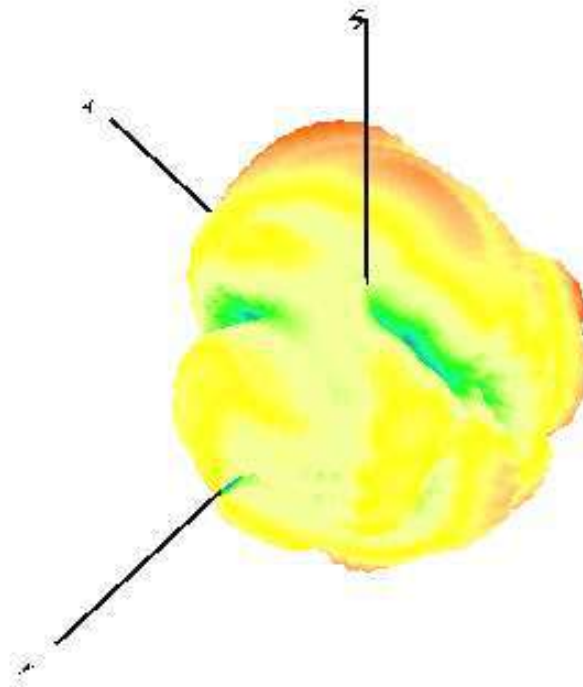
### **c) 3D plots**

Freq = 2.40, 2.44, 2.48, 5.15, 5.35, 5.5, 5.725 GHz

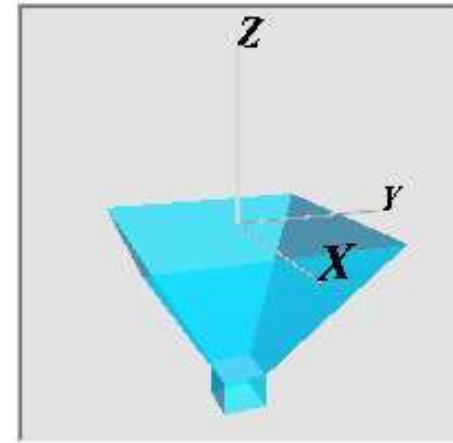
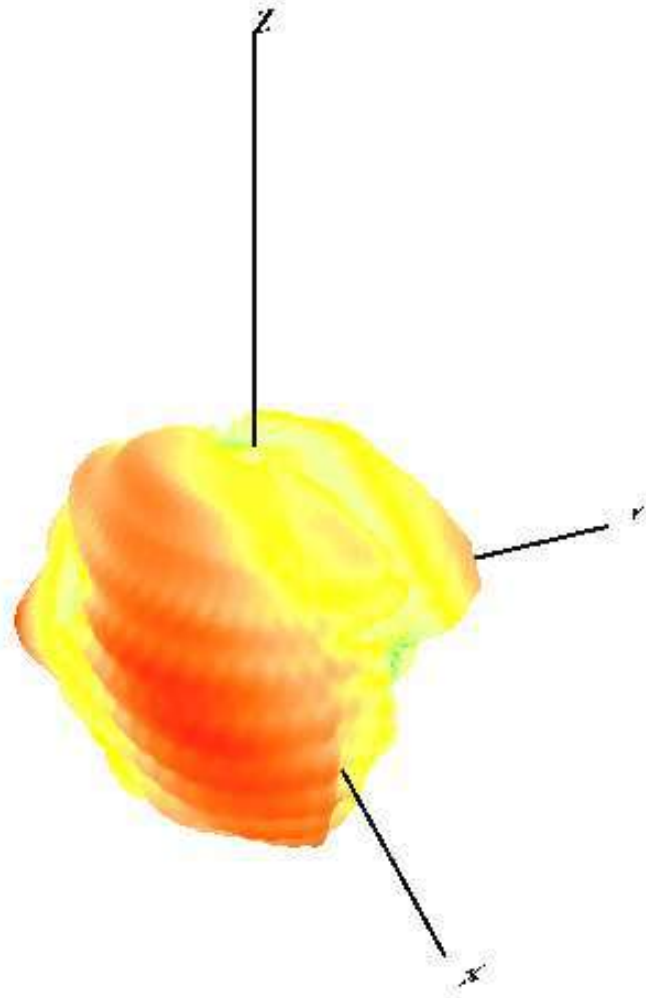
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.400000



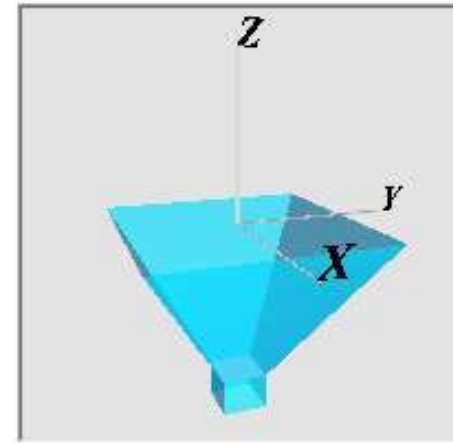
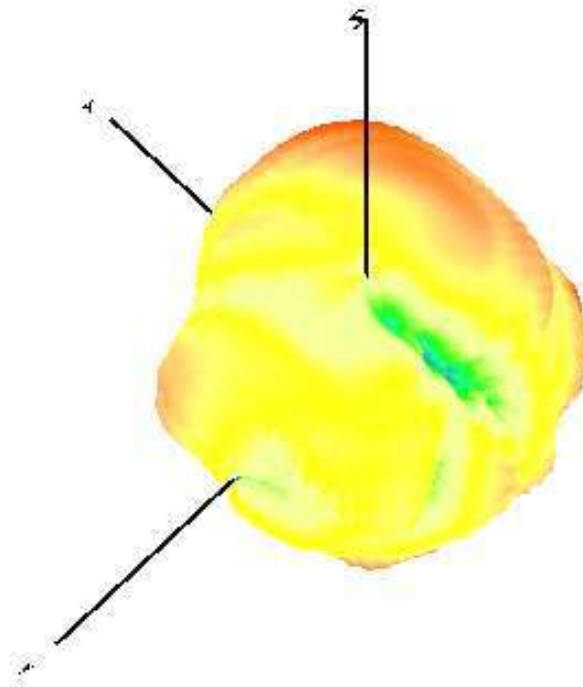
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.400000



**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.440000

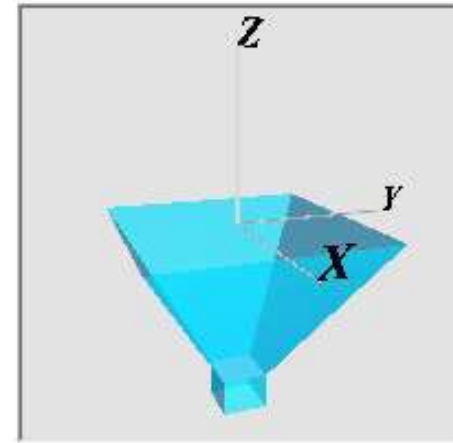
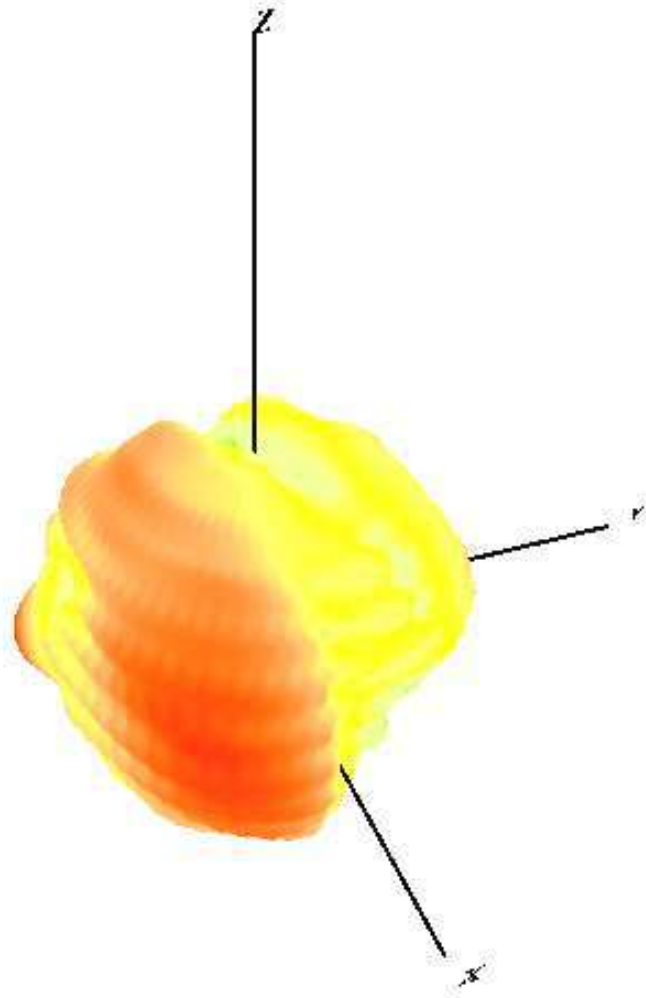


**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.440000

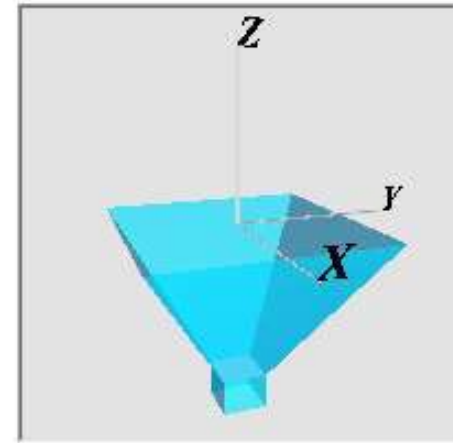
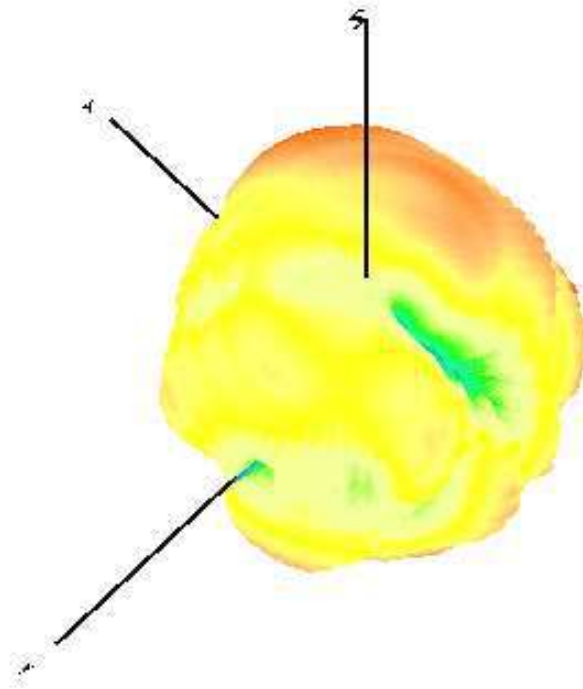




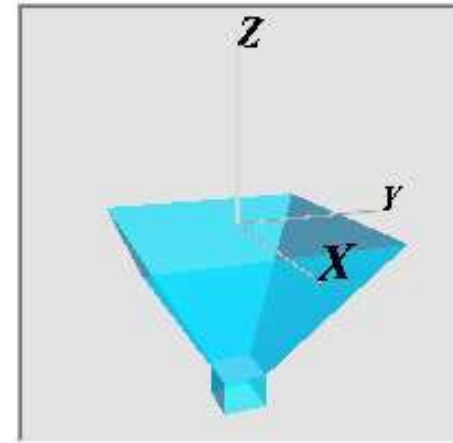
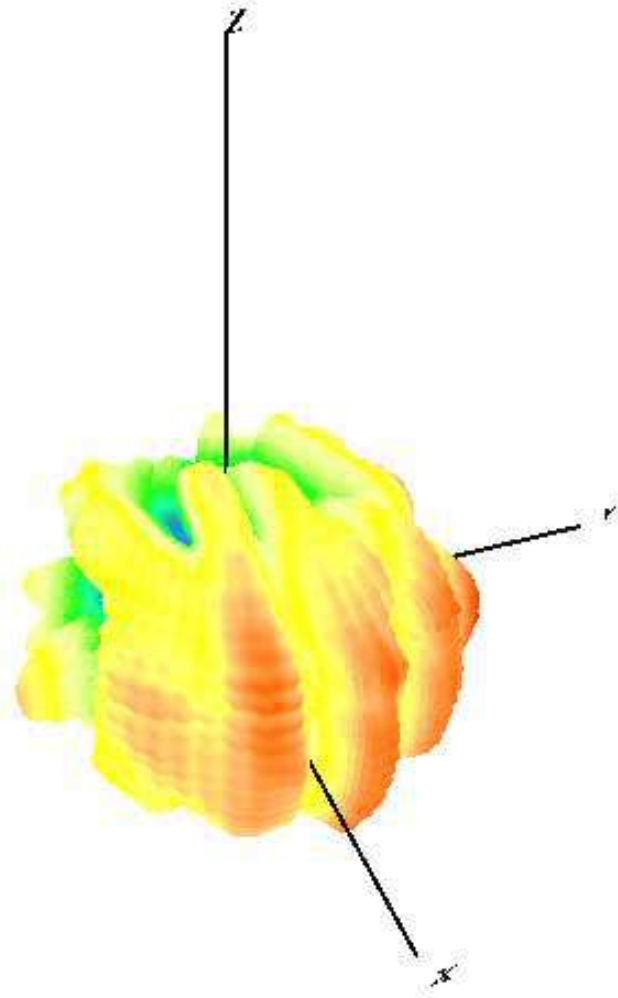
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.480000



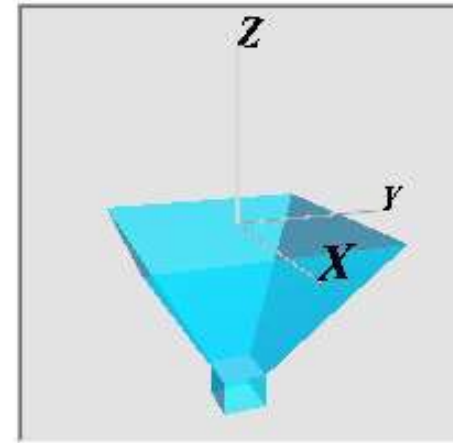
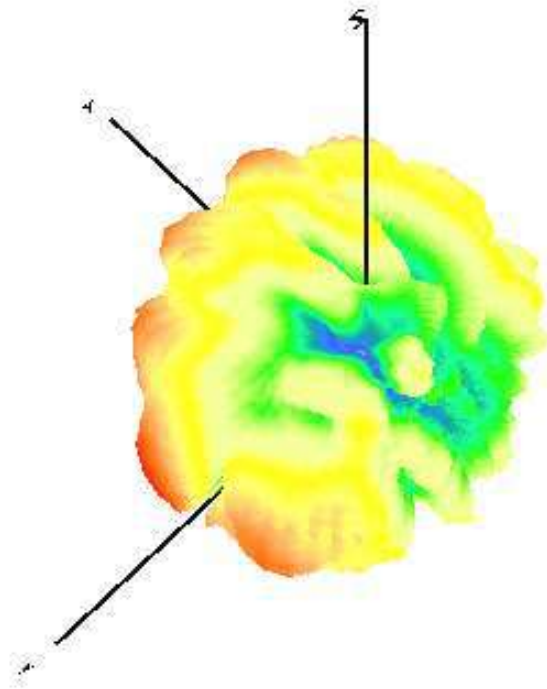
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 2.480000



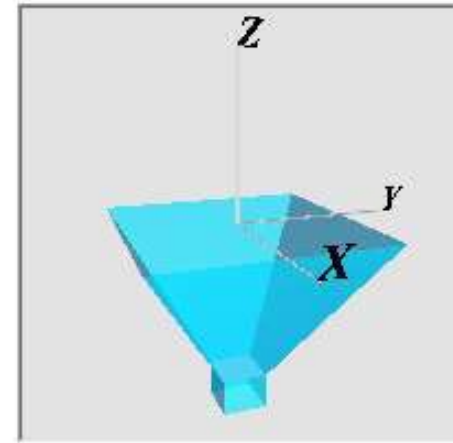
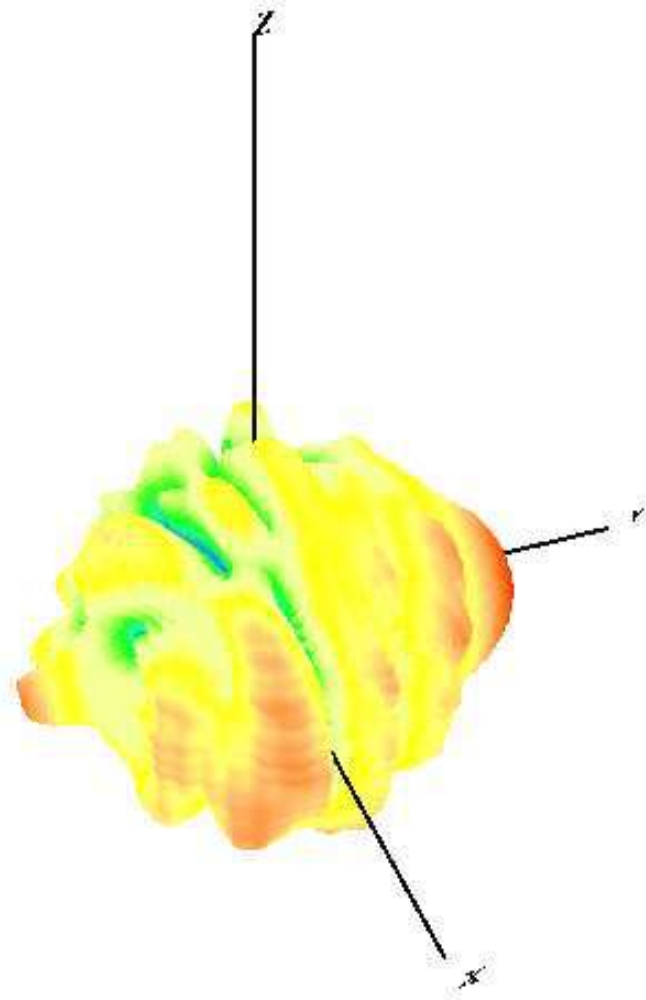
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.150000



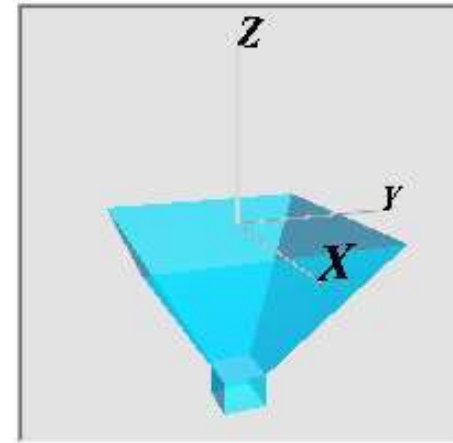
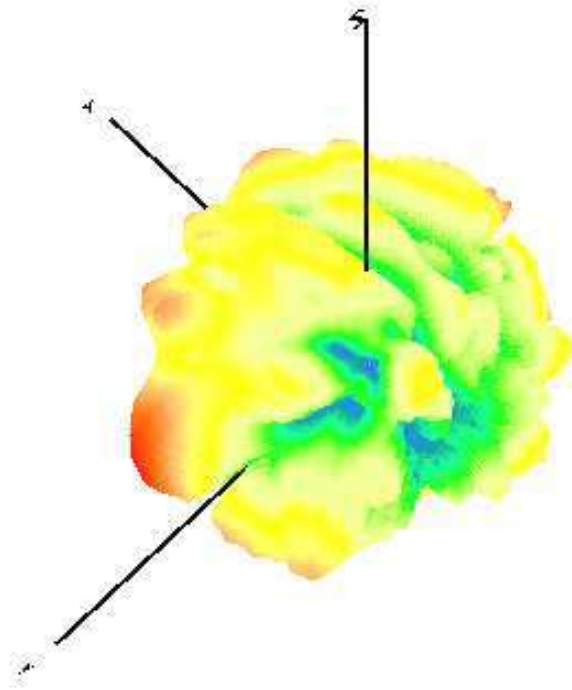
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.150000



**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.350000

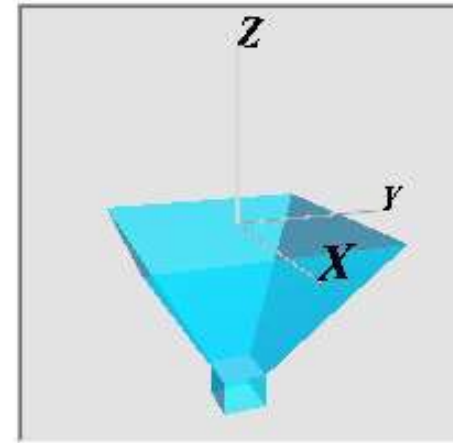
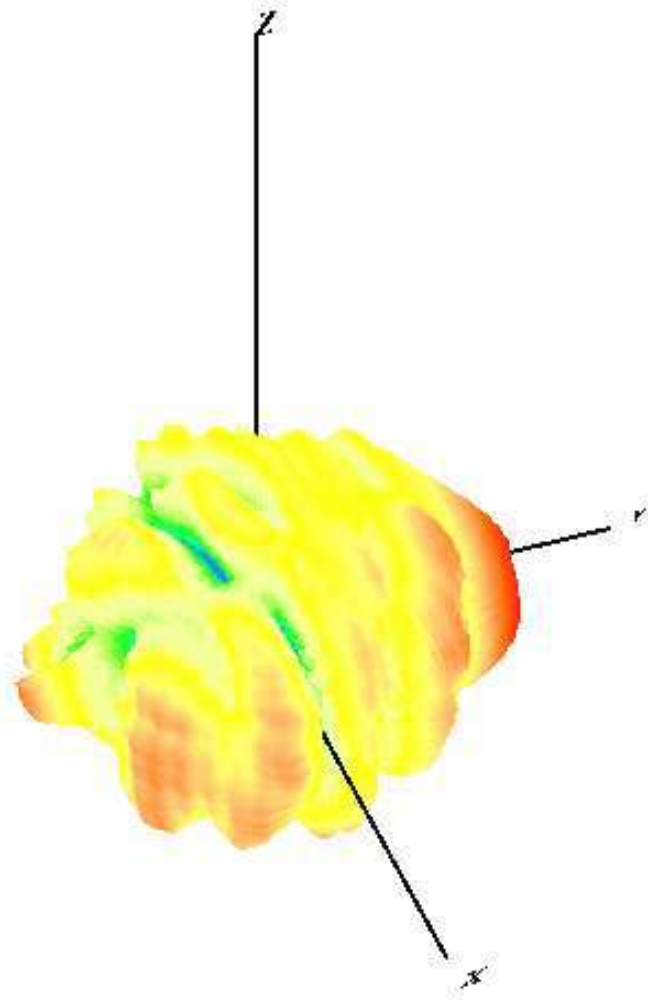


**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.350000

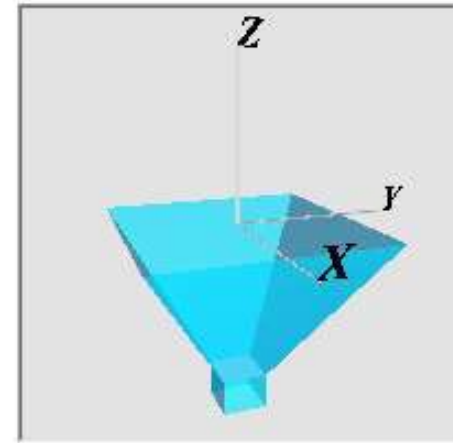
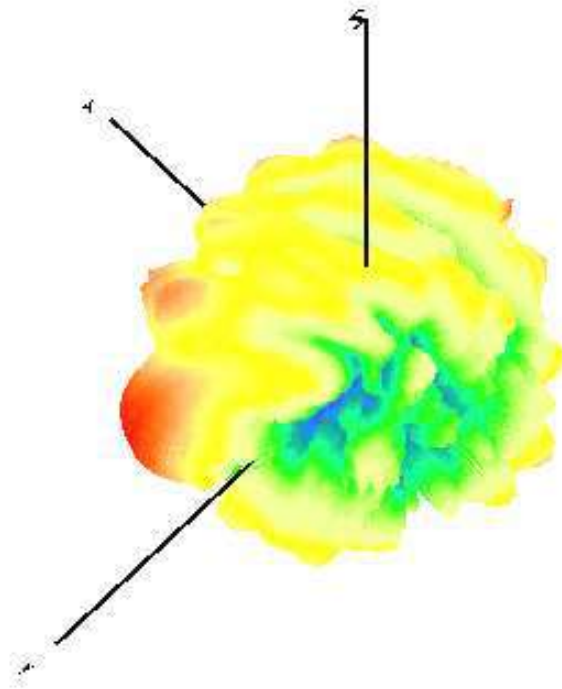




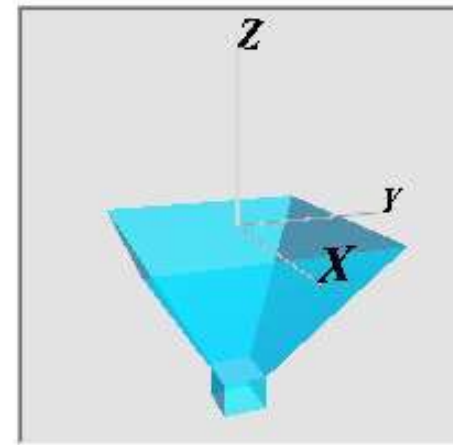
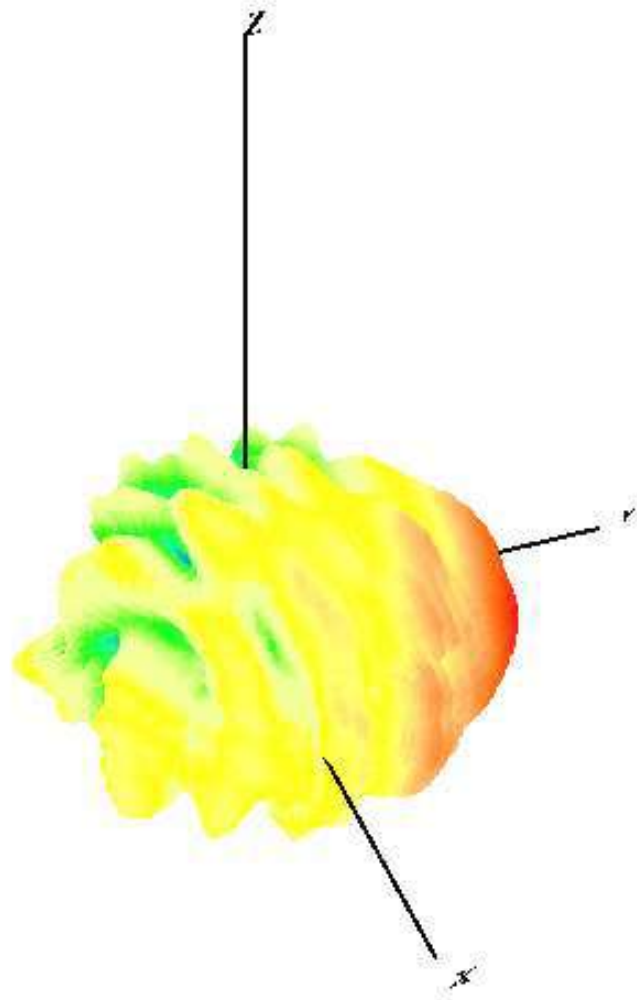
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.500000



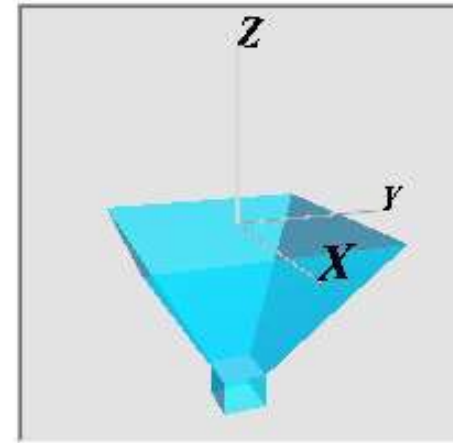
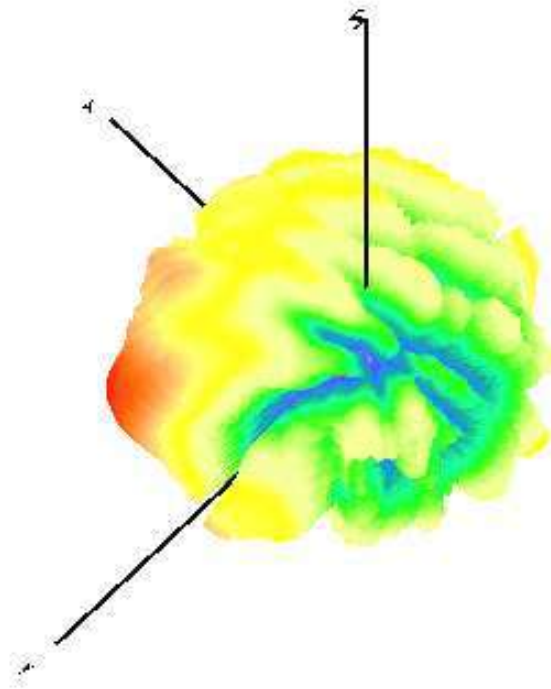
**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.500000



**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.725000



**Single Channel Unit**  
**Antenna 3: Embedded antenna**  
Far-Field Patterns : Co - pol, Amp  
Frequency: 5.725000



**End of Files**