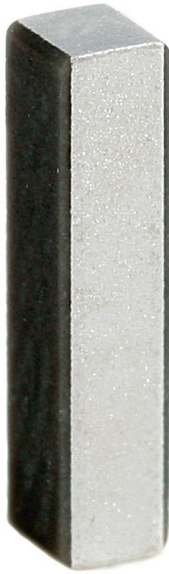


# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000



## Features

- Multipurpose for various frequencies
- Omni directional radiation
- Low profile
- Compact size W x L x H (7 x 1.6 x 1.6 mm)
- Low weight (86 mg)
- Lead free materials
- Fully SMD compatible
- Lead free soldering compatible
- Tape and reel packing
- RoHS compliant product
- MSL 1

## Applications

- Bluetooth, WLAN, WiFi
- IEEE 802.11b/g
- ZigBee IEEE 802.15.4
- 2.4 GHz WLAN
- 2.4 GHz ISM Band System
- 868 MHz ISM Band Systems
- GPS 1.575 GHz

## Electrical specifications @ +25 °C

*Note: Electrical characteristics depend on test board (GP) size and antenna positioning on GP and ground clearance area size. Matching and tuning circuit component values are case depended.*

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# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## Monopole 1.575 GHz

Typical performance

| Board              | Frequency Range [MHz] | Avg Gain [dBi]                   | Max Gain [dBi]                  | Efficiency [%] / [dB]                   | Return loss min. [dB] | Impedance [ $\Omega$ ] | Operating Temperature [ $^{\circ}$ C] |
|--------------------|-----------------------|----------------------------------|---------------------------------|---|-----------------------|------------------------|---------------------------------------|
| Case #1<br>11x40mm | 1565<br>– 1585        | -3.5 (Peak)<br>-3.9 (Band edges) | 0.1 (Peak)<br>-0.2 (Band edges) | 50/-3 (Peak)<br>45/-3.5 (Band edges)    | -12                   | 50                     | -40 to +85                            |
| Case #2<br>20x30mm |                       | -3.9 (Peak)<br>-4.1 (Band edges) | 0.3 (Peak)<br>0 (Band edges)    | 50/-3 (Peak)<br>45/-3.5 (Band edges)    | -15                   |                        |                                       |
| Case #3<br>37x80mm |                       | -2.7 (Peak)<br>-2.9 (Band edges) | 2.0 (Peak)<br>1.7 (Band edges)  | 70/-1.55 (Peak)<br>65/-1.9 (Band edges) | -18                   |                        |                                       |

## Monopole 2.4 GHz

Typical performance

| Board              | Frequency Range [MHz] | Avg Gain [dBi]                   | Max Gain [dBi]                 | Efficiency [%] / [dB]                  | Return loss min. [dB] | Impedance [ $\Omega$ ] | Operating Temperature [ $^{\circ}$ C] |
|--------------------|-----------------------|----------------------------------|--------------------------------|--|-----------------------|------------------------|---------------------------------------|
| Case #1<br>11x40mm | 2400<br>– 2483.5      | -4.1 (Peak)<br>-3.7 (Band edges) | 1.4 (Peak)<br>1.9 (Band edges) | 65/-0.3 (Peak)<br>55/-0.6 (Band edges) | -18                   | 50                     | -40 to +85                            |
| Case #2<br>20x30mm |                       | -4.0 (Peak)<br>-4.3 (Band edges) | 2.2 (Peak)<br>1.5 (Band edges) | 52/-2.9 (Peak)<br>46/-3.4 (Band edges) | -12                   |                        |                                       |

## ISM 868 MHz

Typical performance

| Board                            | Frequency Range [MHz] | Avg Gain [dBi]                   | Max Gain [dBi]                   | Efficiency [%] / [dB]                   | Return loss min. [dB] | Impedance [ $\Omega$ ] | Operating Temperature [ $^{\circ}$ C] |
|----------------------------------|-----------------------|----------------------------------|----------------------------------|---|-----------------------|------------------------|---------------------------------------|
| Case #1<br>20x40mm<br>Vertical   | 858<br>– 878          | -6.5 (Peak)<br>-7 (Band edges)   | -1.8 (Peak)<br>-2.5 (Band edges) | 29/-5.4 (Peak)<br>25/-6 (Band edges)    | -10                   | 50                     | -40 to +85                            |
| Case #2<br>20x40mm<br>Horizontal |                       | -6.5 (Peak)<br>-6.8 (Band edges) | -1.4 (Peak)<br>-2 (Band edges)   | 30/-5.3 (Peak)<br>28/-5.55 (Band edges) |                       |                        |                                       |

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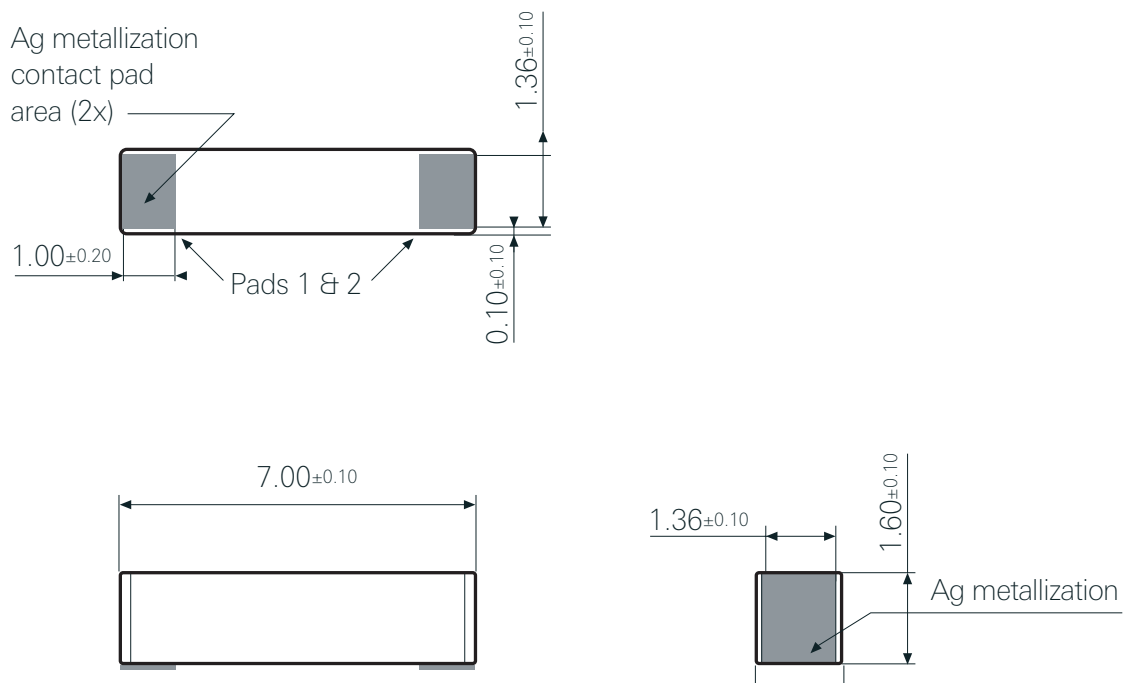
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# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## Terminal Configuration and Dimensions



## Antenna features

| No. | Terminal name | Terminal Dimensions |
|-----|---------------|---------------------|
| 1   | Feed / GND    | 1.00 x 1.36 mm      |
| 2   | Feed / GND    | 1.00 x 1.36 mm      |

Antenna is symmetrical.

Either of terminals 1 or 2 can be feed / GND

### Pulse Finland Oy

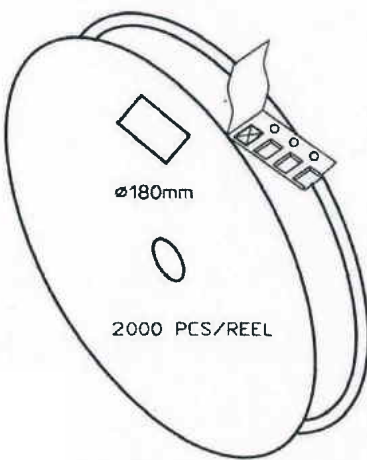
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# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## Packing Form



∅180mm  
2000 PCS/REEL

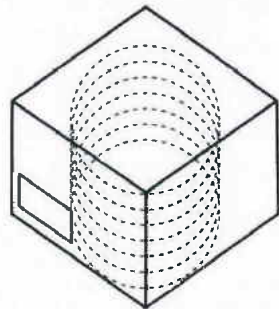
CARRIER TAPE H85-00192  
width=16,00 depth=1.70  
COVER TAPE H85-00193  
width=13.40


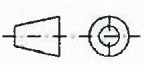
LENGTH OF TAPE:

- Leader section: min 350 mm before component section
- Trailer section: min 40 mm after component section.

Empty part cavities at leader and trailer section of the tape must be sealed with top cover tape.

|                                |            |
|--------------------------------|------------|
| BOX H85-00128<br>(182x182x125) | 1 pcs      |
| - LABEL                        | 1 pcs/BOX  |
| REEL H85-00164<br>(D180, W28)  | 6 pcs      |
| - REEL LABEL                   | 1 pcs/REEL |



|   |   |       |          |               |   |
|---|---|-------|----------|---------------|---|
| MATERIAL  |   |       |          |               |   |
| HANDLINGS   |   |       |          |               |   |
|  |  | RATIO | DRWN     | 161007 PeHa   | H |
|   |   |       | DGNER    |               | G |
|   |   |       | CHKD     |               | F |
|   |   |       | APPRD    |               | E |
|   |   |       | APPRD BY |               | D |
| PRODUCT   |   |       |          | C             |   |
| H90-OY838   |   |       |          | B             |   |
| DENOMINATION  |   |       |          | A             |   |
| PACKING FORM  |   |       | VERSION  | MOD/DATE/NAME |   |

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# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

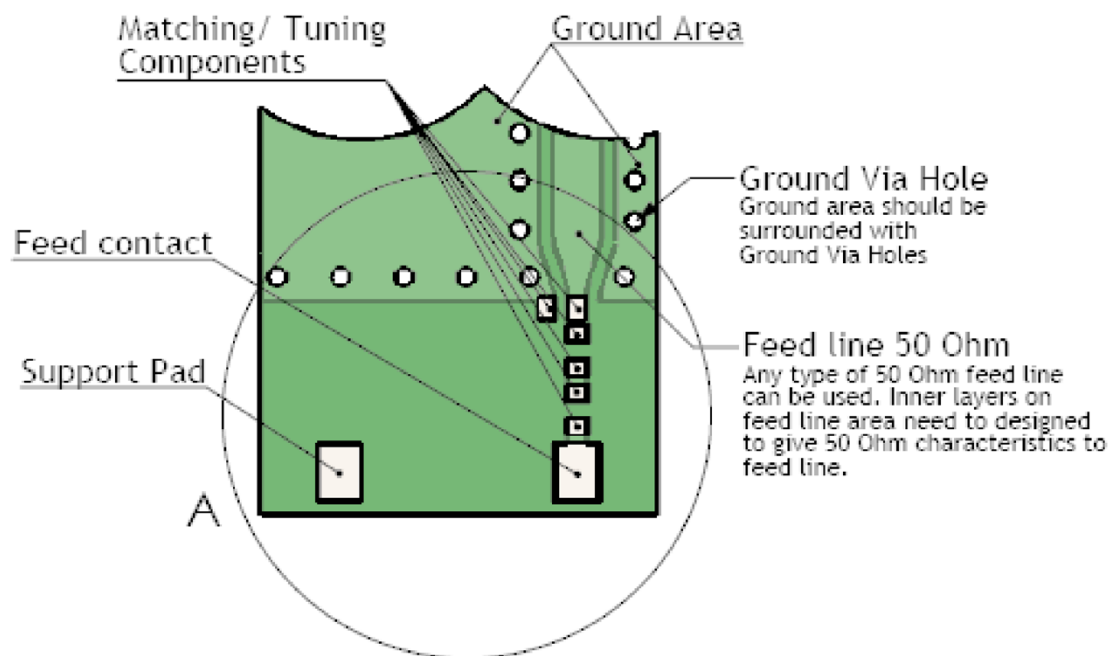
## Antenna PWB Layout Specifications

Ground cleared under antenna, clearance area 11.00 x 6.00 mm

Matching and tuning component values depend on application and surrounding mechanics / materials.  
Feed line should be designed to match 50  $\Omega$  characteristic impedance, depending on PWB material and thickness.  
Recommended test board layout for electrical characteristic measurement, test board outline size 11 x 40 mm.  
Recommended PWB manufacturing tolerances according to standard: IPC-A-600, revision G

## PWB layout for W3000 Monopole Antenna

Note: All dimensions are in metric system.



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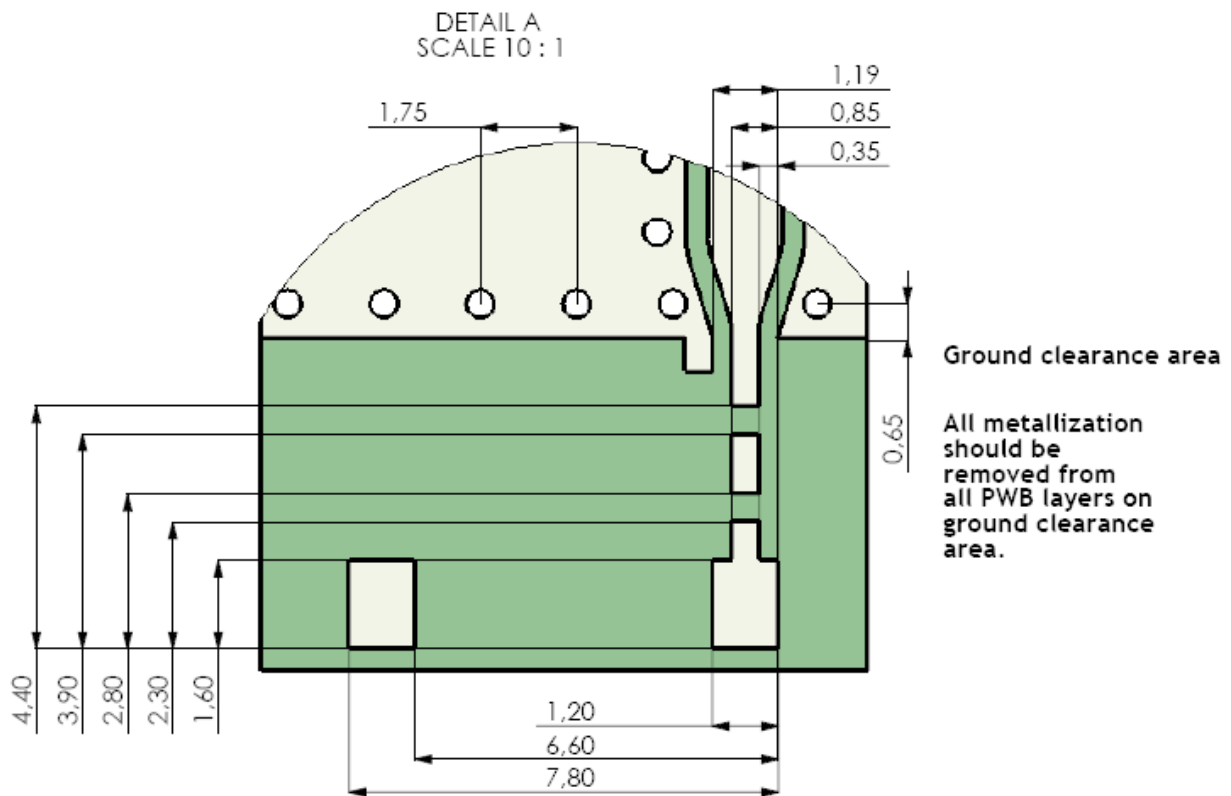
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# Ceramic Monopole Antenna

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## PWB Pad Dimensions



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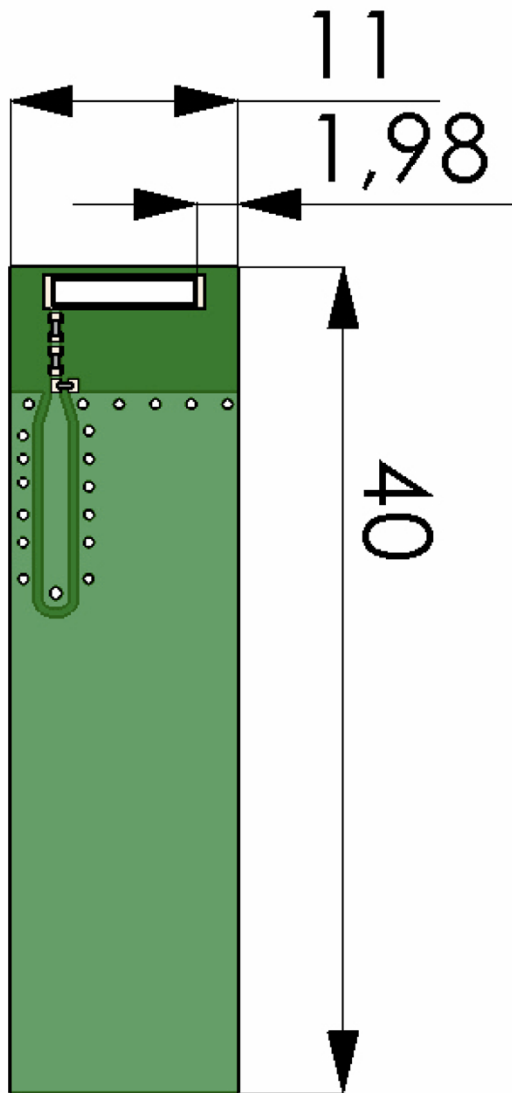
# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## GPS Antenna Case #1

### Board Size 40 x 11 mm

Recommended antenna position on PWB for W3000 MONOPOLE Antenna



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# Ceramic Monopole Antenna

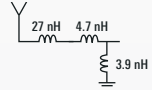
Ground cleared under antenna. Pulse Part Number: W3000

## GPS Antenna Case #1, Test Set Up and Measurement Performance

Ground cleared under antenna, clearance area 11.00 x 6.00 mm.

### Typical Electrical Characteristics (T=25 °C)

Measured on the 11 x 40 mm test board with matching circuit. Measured in antenna position1 on PWB layout, see previous page. Typical Return Loss S11/ impedance, free space efficiency and gain.



### GPS 1.575 GHz Case #1

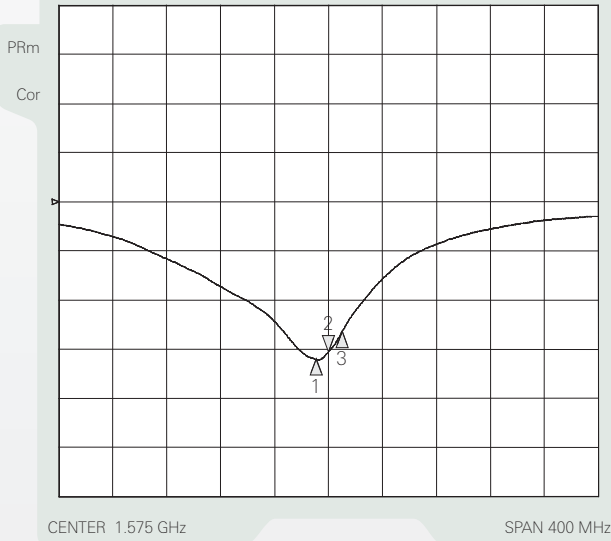
11 Feb 2009 11:44:05

CH1 Markers

- 1. -16.052 dB 1.56550 GHz
- 2. -15.252 dB 1.57500 GHz
- 3. -13.199 dB 1.58500 GHz

CH1 S11&MLOG

5 dB/REF 0 dB



CENTER 1.575 GHz

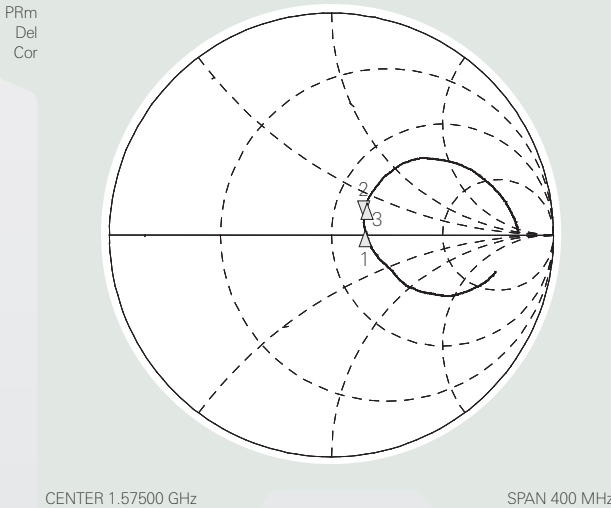
SPAN 400 MHz

### GPS 1.575 GHz #1

24 Feb 2009 12:55:57

- 1. 68.535 Ω 3.1875 Ω 1.56550 GHz
- 2. 66.637 Ω 11.031 Ω 1.1147 nH 1.57500 GHz
- 3. 65.742 Ω 20.102 Ω 1.58500 GHz

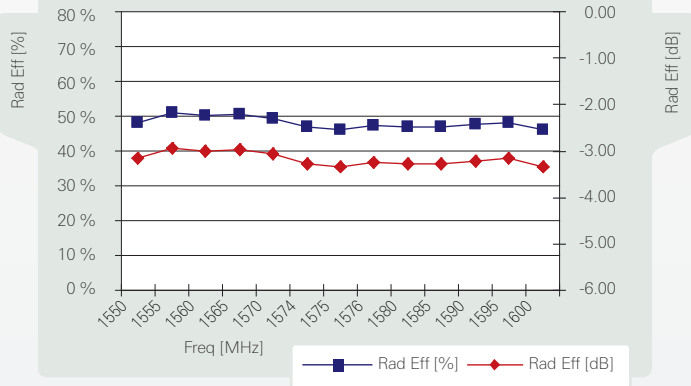
CH1 S11&M 1 U FS



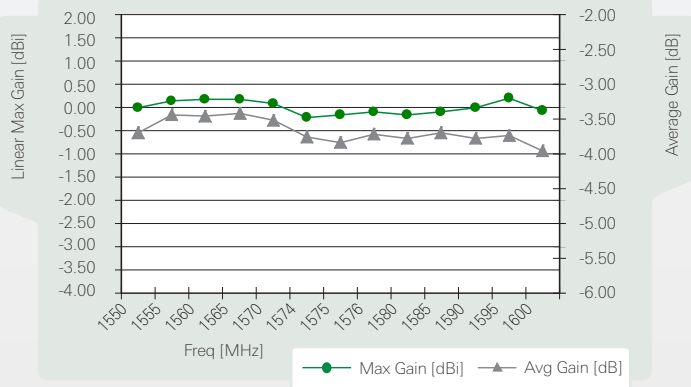
CENTER 1.57500 GHz

SPAN 400 MHz

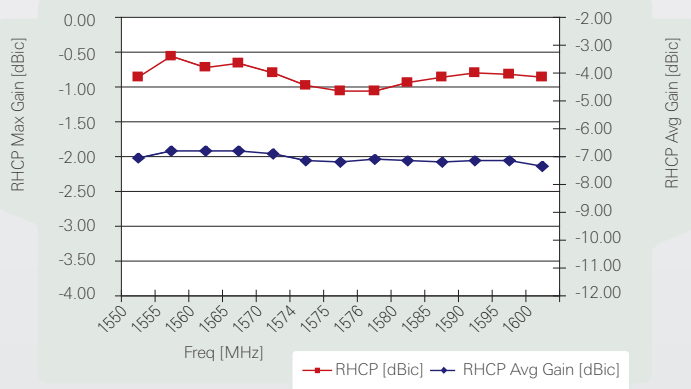
### GPS 1.575 GHz Case #1



### GPS 1.575 GHz Case #1



### GPS 1.575 GHz Case #1



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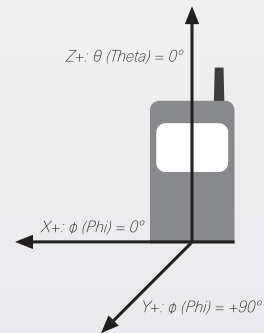
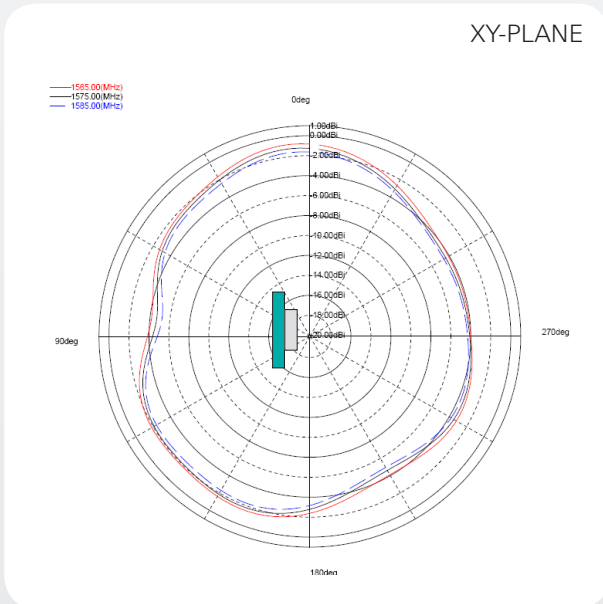
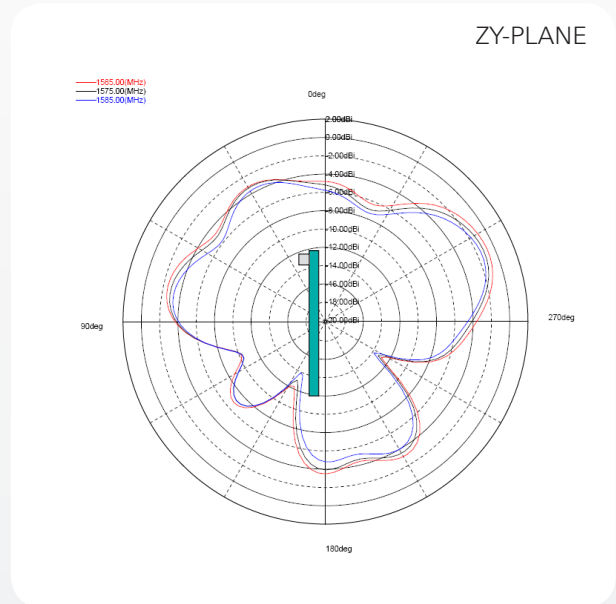
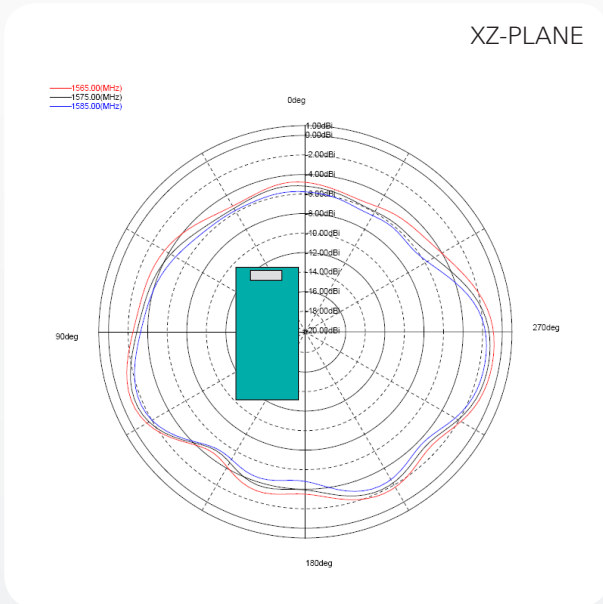


# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## GPS Antenna Case #1

### Typical Free Space Radiation Patterns



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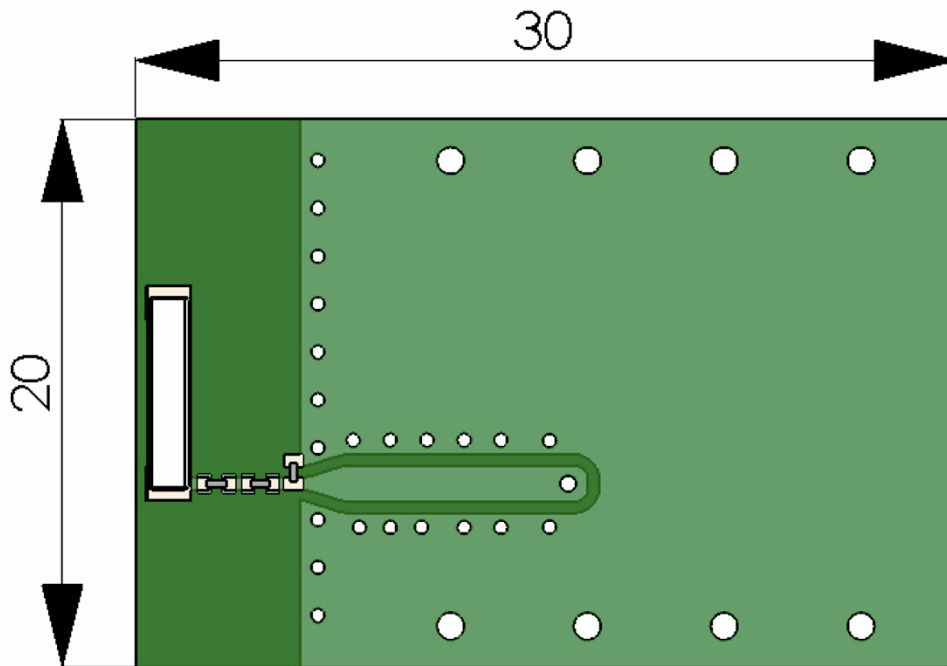
# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## GPS Antenna Case #2

### Board Size 20x30

Recommended antenna position on PWB for W3000 MONOPOLE Antenna



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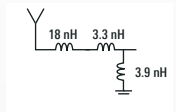


# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## GPS Antenna Case #2, Test Set Up and Measurement Performance

Ground cleared under antenna, clearance area 20.00 x 6.00 mm.



### Typical Electrical Characteristics (T=25 °C)

Measured on the 30 x 20 mm test board with matching circuit. Measured in antenna position1 on PWB layout, see previous page. Typical Return Loss S11/ impedance, free space efficiency and gain.

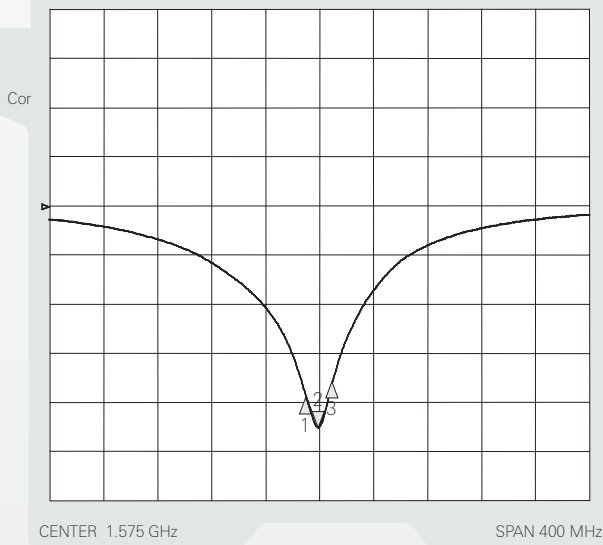
### GPS 1.575 GHz Case #2

24 Feb 2009 12:56:26

CH1:Markers

- 1. -19.333 dB 1.56550 GHz
- 2. -22.352 dB 1.57500 GHz
- 3. -17.667 dB 1.58500 GHz

CH1 S11#MLOG 5 dB/REF 0 dB

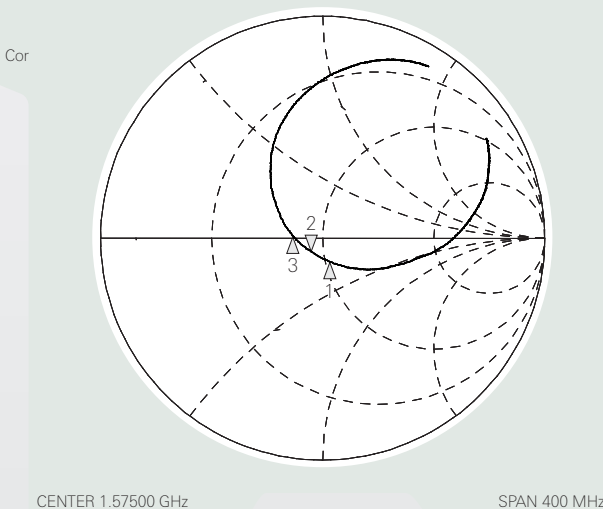


### GPS 1.575 GHz #2

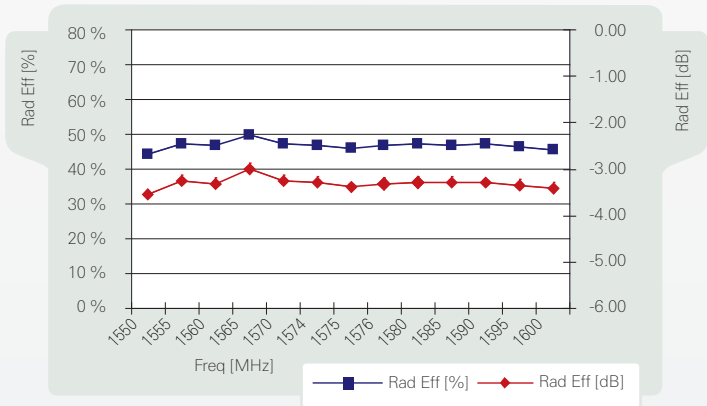
24 Feb 2009 12:56:33

- 1. 52.109 Ω -11.057 Ω 1.56550 GHz
- 2. 44.865 Ω -5.4199 Ω 18.644 pF 1.57500 GHz
- 3. 38.271 Ω 0.7773 Ω 1.58500 GHz

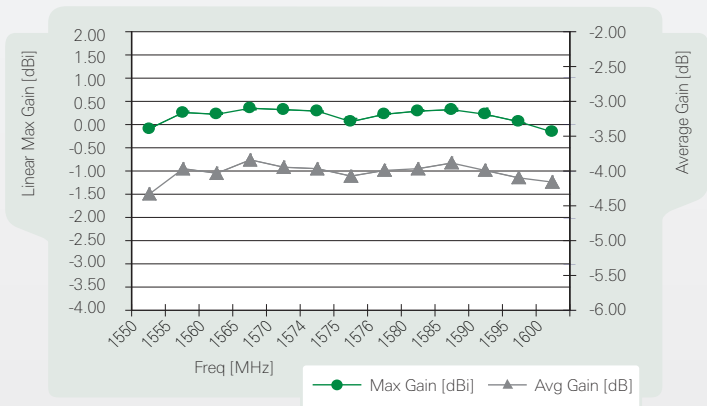
CH1 S11#M 1 U FS



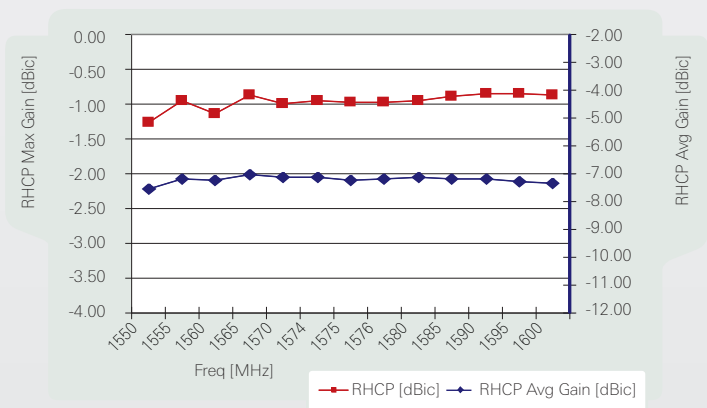
### GPS 1.575 GHz Case #2



### GPS 1.575 GHz Case #2



### GPS 1.575 GHz Case #2



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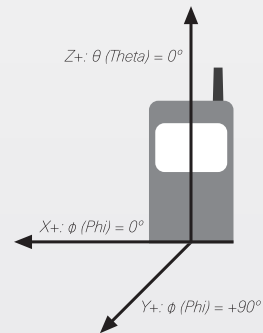
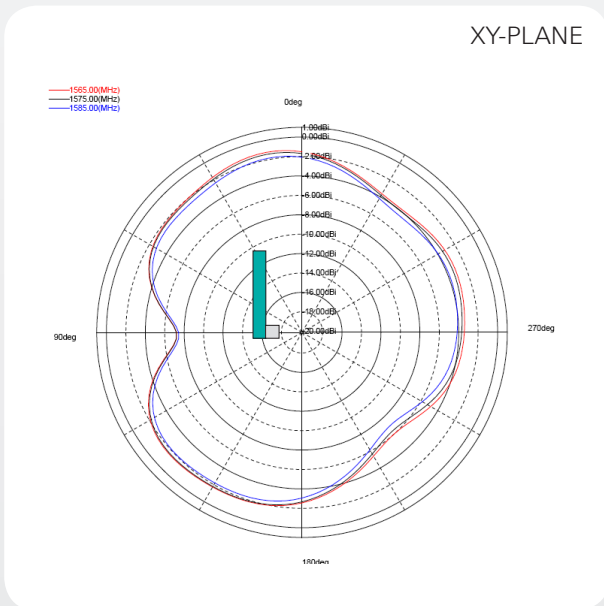
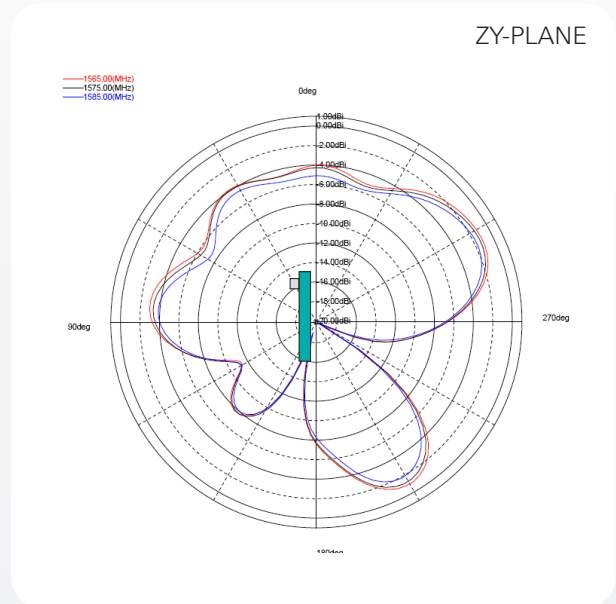
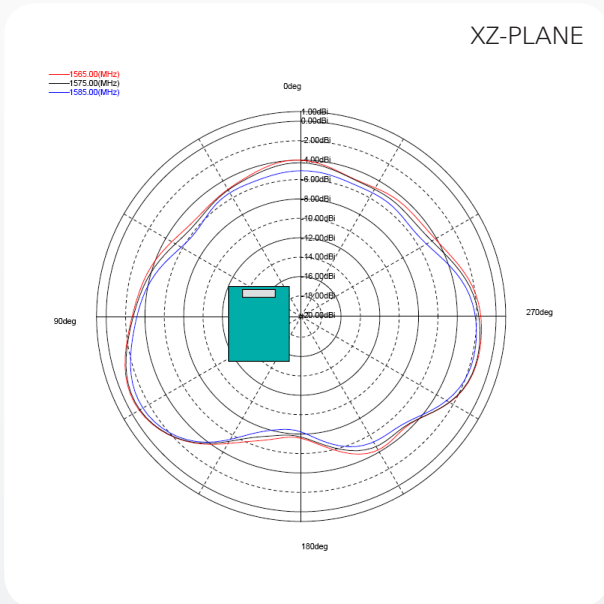


# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## GPS Antenna Case #2

### Typical Free Space Radiation Patterns



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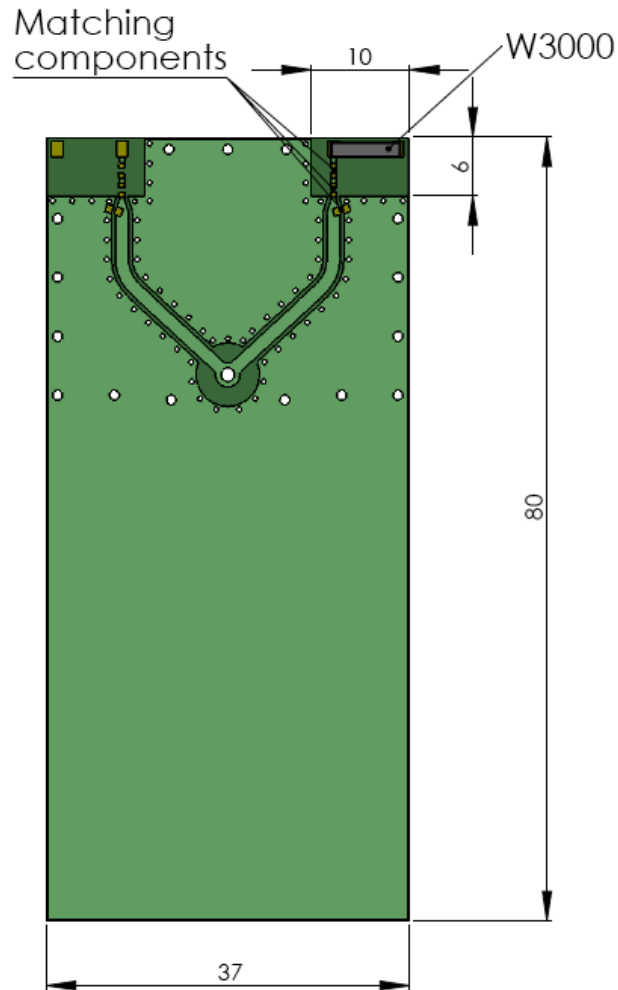
# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## GPS Antenna Case #3

**Board Size 37 x 80 mm**

Recommended antenna position on PWB for W3000 MONOPOLE Antenna



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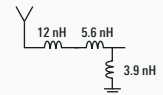


# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## GPS Antenna Case #3, Test Set Up and Measurement Performance

Ground cleared under antenna, clearance area 20.00 x 6.00 mm.



### Typical Electrical Characteristics (T=25 °C)

Measured on the 30 x 20 mm test board with matching circuit. Measured in antenna position1 on PWB layout, see previous page. Typical Return Loss S11/ impedance, free space efficiency and gain.

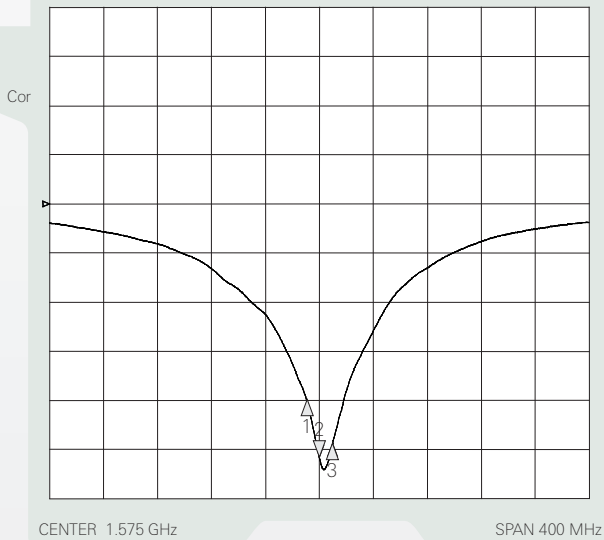
### GPS 1.575 GHz Case #3

24 Feb 2009 12:57:25

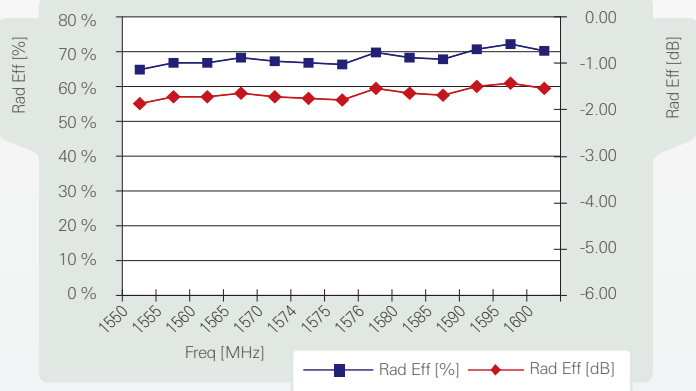
CH1 Markers

- 1. -19.931 dB 1.56550 GHz
- 2. -25.898 dB 1.57500 GHz
- 3. -24.453 dB 1.58500 GHz

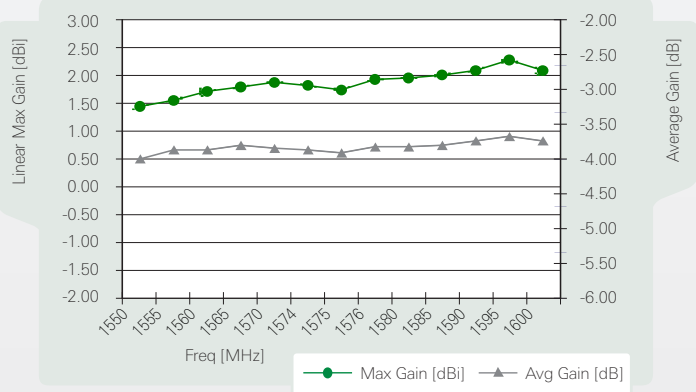
CH1 S11@MLOG 5 dB/REF 0 dB



### GPS 1.575 GHz Case #3



### GPS 1.575 GHz Case #3

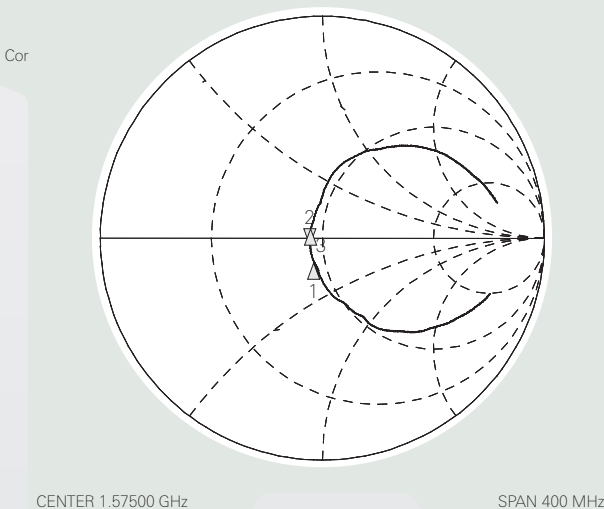


### GPS 1.575 GHz #3

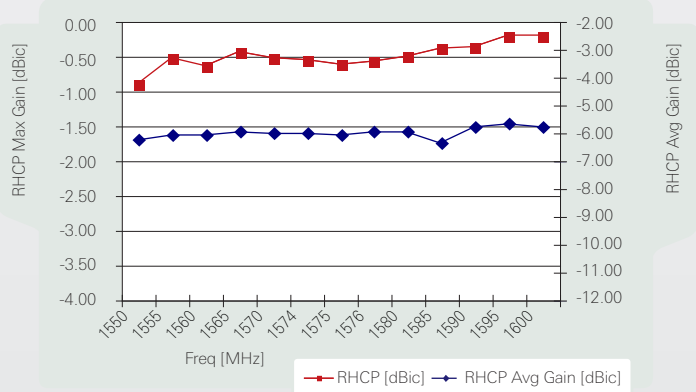
24 Feb 2008 12:55:57

- 1. 45.469 Ω -9.8496 Ω 1.56550 GHz
- 2. 44.766 Ω -3.0801 Ω 32.808 pF
- 3. 65.742 Ω 20.102 Ω 1.58500 GHz

CH1 S11@M 1 U FS



### GPS 1.575 GHz Case #3



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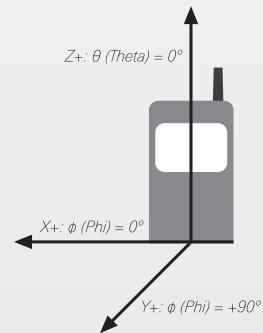
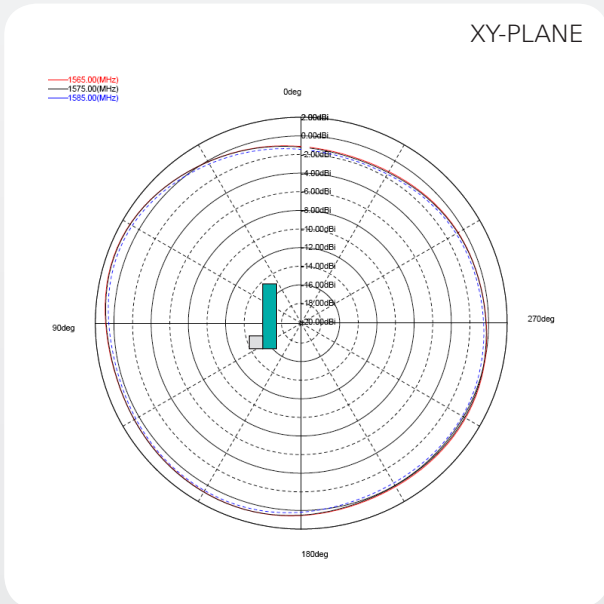
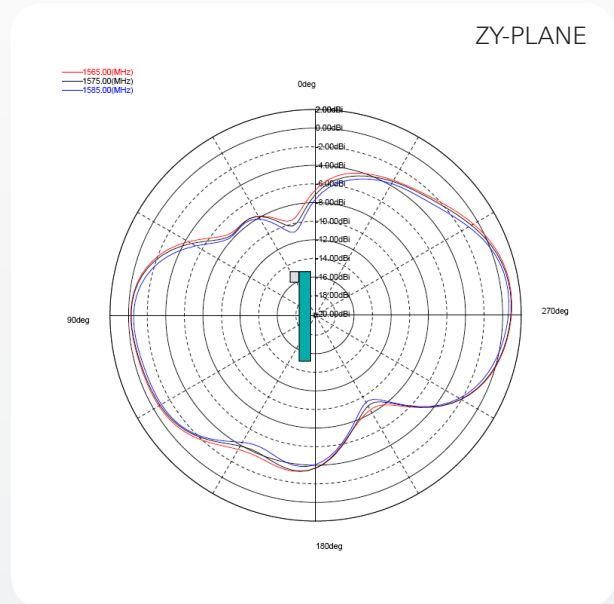
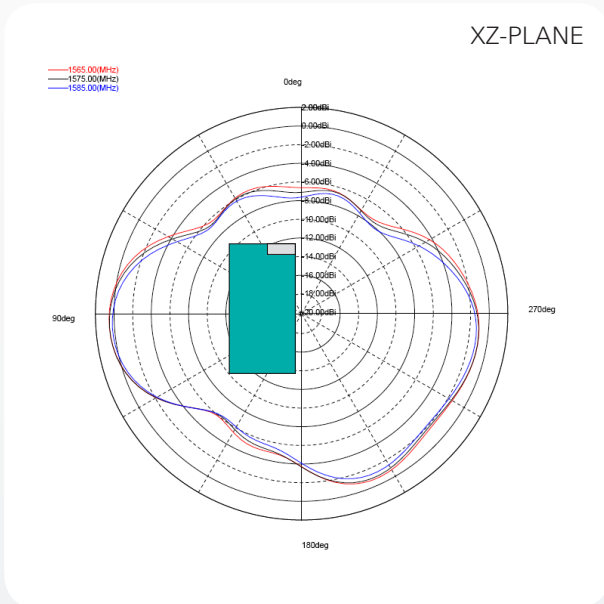


# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## GPS Antenna Case #3

### Typical Free Space Radiation Patterns



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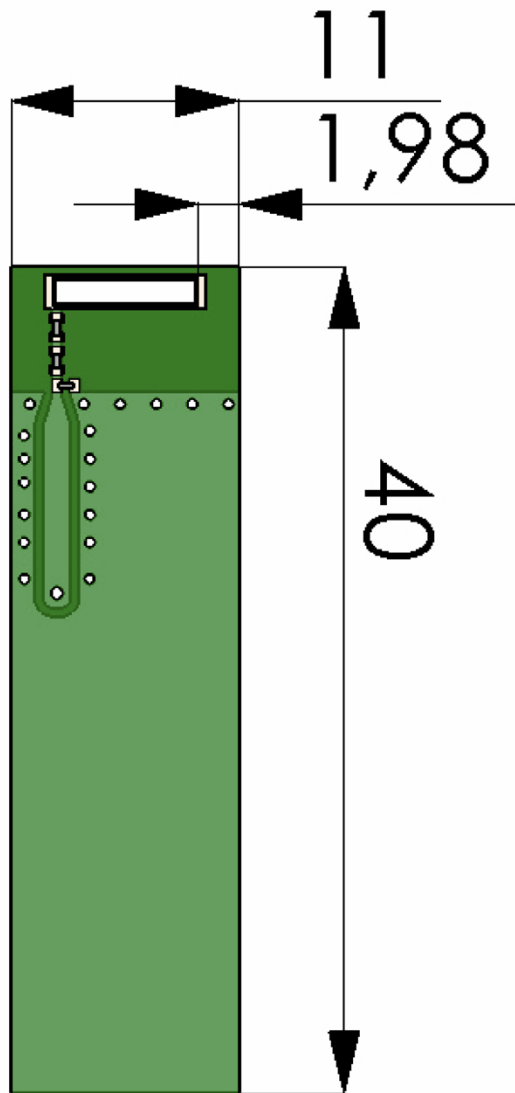
# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## WiFi Antenna Case #1

### Board Size 40 x 11 mm

Recommended antenna position on PWB for W3000 MONOPOLE Antenna



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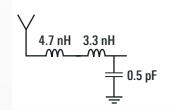


# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## WiFi Antenna Case #1, Test Set Up and Measurement Performance

Ground cleared under antenna, clearance area 11.00 x 6.00 mm.



### Typical Electrical Characteristics (T=25 °C)

Measured on the 11 x 40 mm test board with matching circuit. Measured in antenna position1 on PWB layout, see previous page. Typical Return Loss S11/ impedance, free space efficiency and gain.

### 2.4 GHz WiFi Case #1

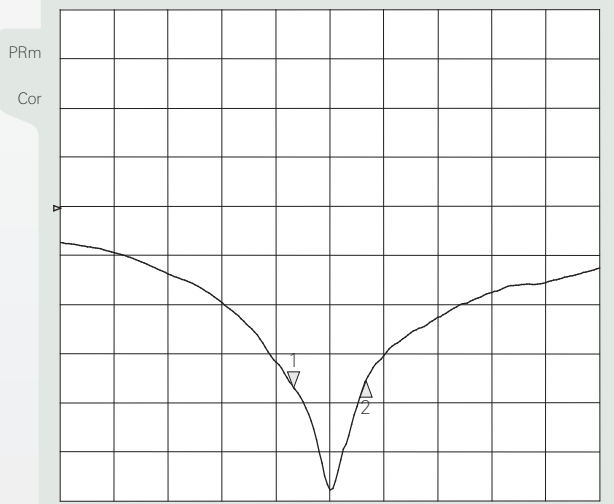
19 Oct 2008 23:52:24

CH1Markers

- 1. -21.743 dB 2.40000 GHz
- 2. -20.781 dB 2.48000 GHz

CH1 S11 LOG

6 dB/REF 0 dB



START 2140.000 000 MHz

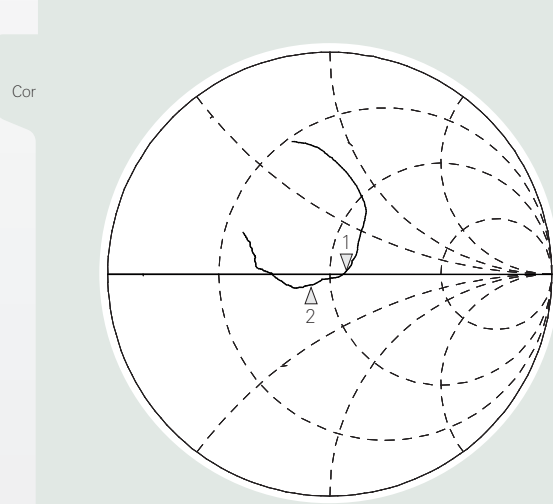
STOP 2740.000 000 MHz

### 2.4 GHz WiFi #1

11 Oct 2008 23:52:35

- 1. 58.187 Ω 1.8516 Ω 2.40000 GHz
- 2. 42.477 Ω -4.0078 Ω 2.48000 GHz
- 122.79 pH

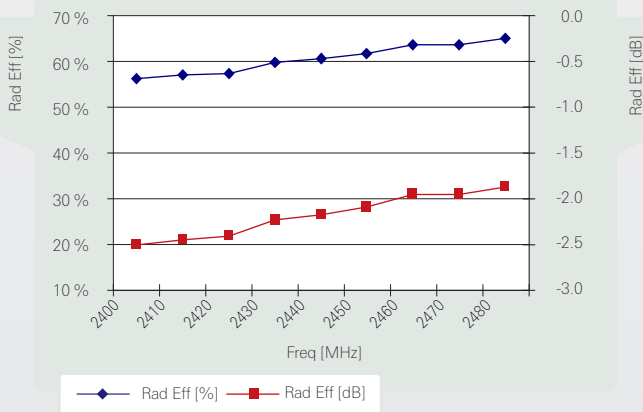
CH1 S11 1 U FS



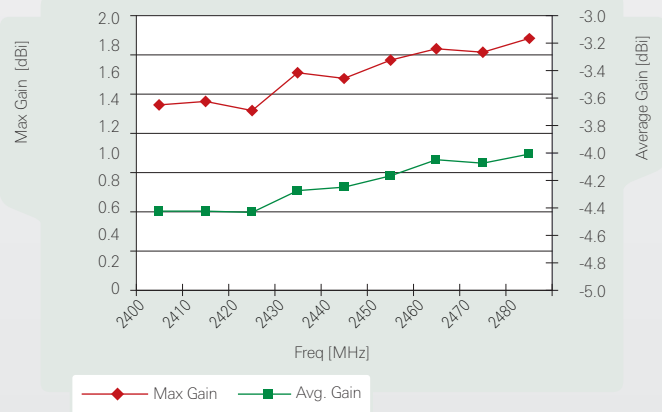
START 2140.000 MHz

STOP 2740.000 MHz

### 2.4 GHz WiFi Case #1



### 2.4 GHz WiFi Case #1



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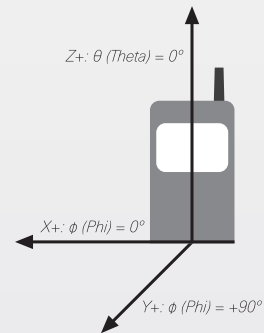
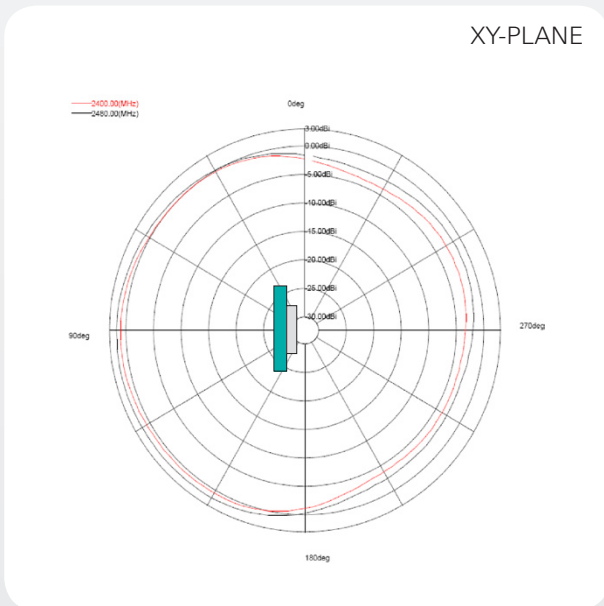
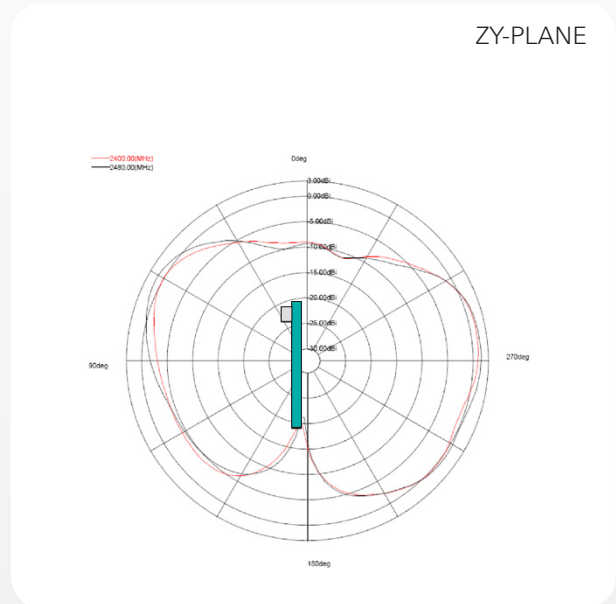
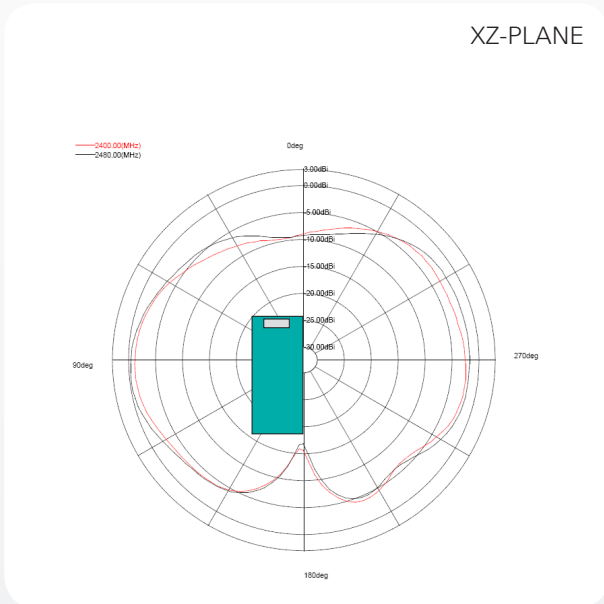


# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## WiFi Antenna Case #1

### Typical Free Space Radiation Patterns



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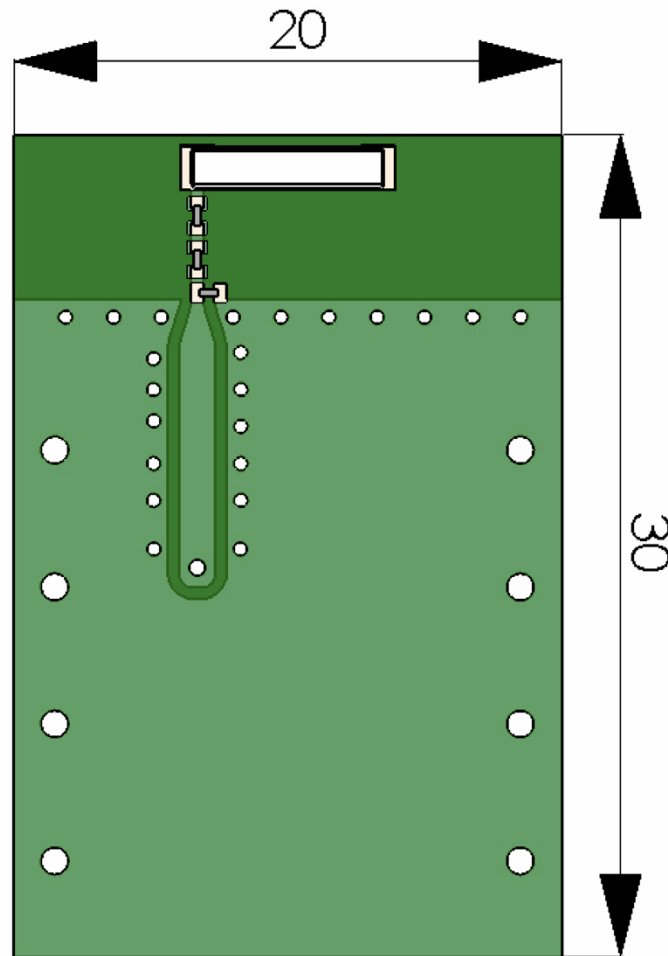
# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## WiFi Antenna Case #2

**Board Size 20 x 30 mm**

Recommended antenna position on PWB for W3000 MONOPOLE Antenna



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# Ceramic Monopole Antenna

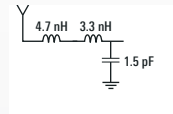
Ground cleared under antenna. Pulse Part Number: W3000

## WiFi Antenna Case #2, Test Set Up and Measurement Performance

Ground cleared under antenna, clearance area 20.00 x 6.00 mm.

### Typical Electrical Characteristics (T=25 °C)

Measured on the 30 x 20 mm test board with matching circuit. Measured in antenna position1 on PWB layout, see previous page. Typical Return Loss S11/ impedance, free space efficiency and gain.



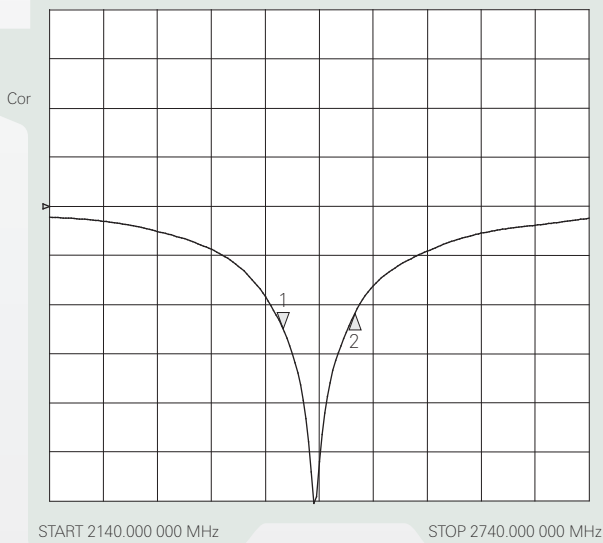
### 2.4 GHz WiFi Case #2

19 Oct 2008 23:48:18

CH1Markers

- 1. -15.093 dB 2.400 GHz
- 2. -12.933 dB 2.480 GHz

CH1 MLOG 6 dB/REF 0 dB



### 2.4 GHz WiFi #2

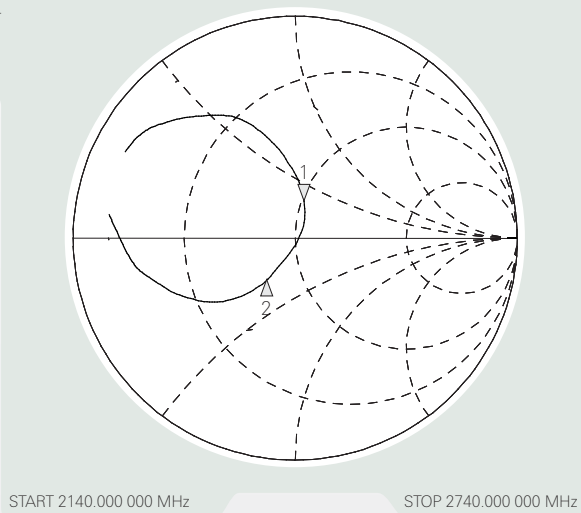
11 Feb 2008 11:47:36

CH1Markers

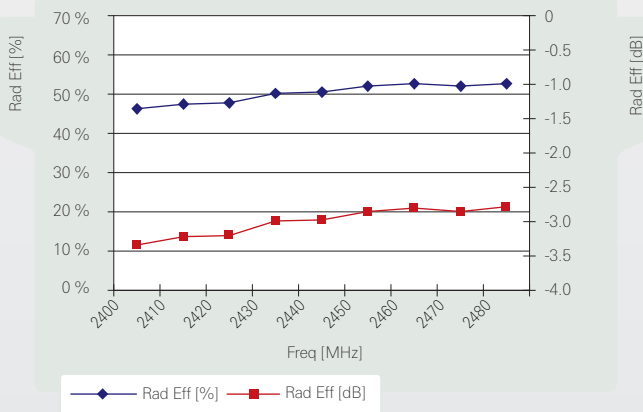
- 1. 51.129 Ω 18.035 Ω 2.40000 GHz
- 2. 36.529 Ω -14.525 Ω 2.48000 GHz
- 1.1960 nH

CH1 S11 1 U FS

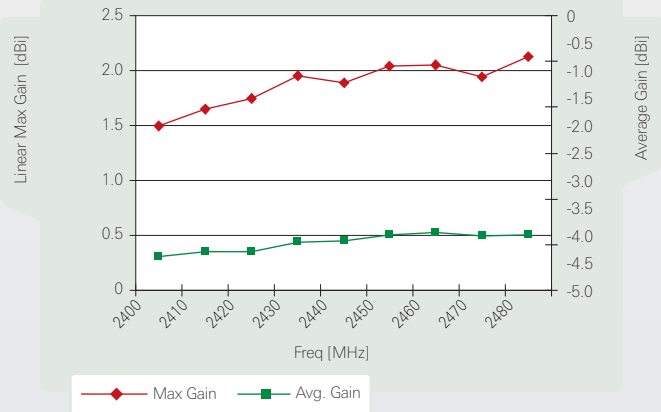
Cor



### 2.4 GHz WiFi Case #2



### 2.4 GHz WiFi Case #2



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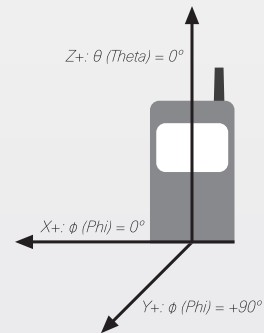
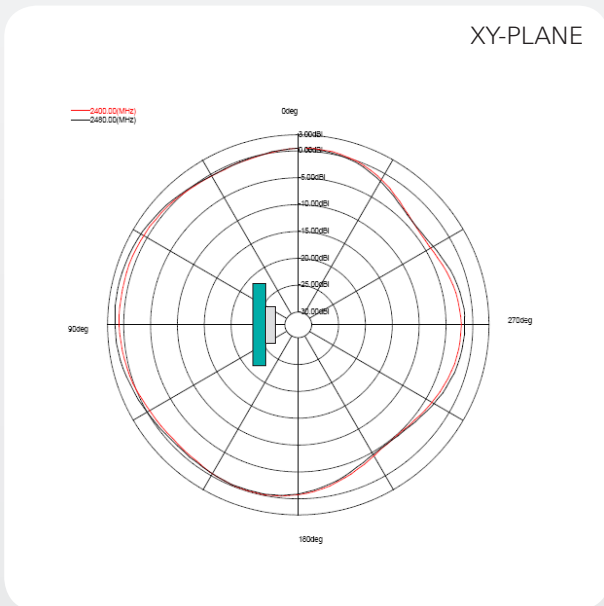
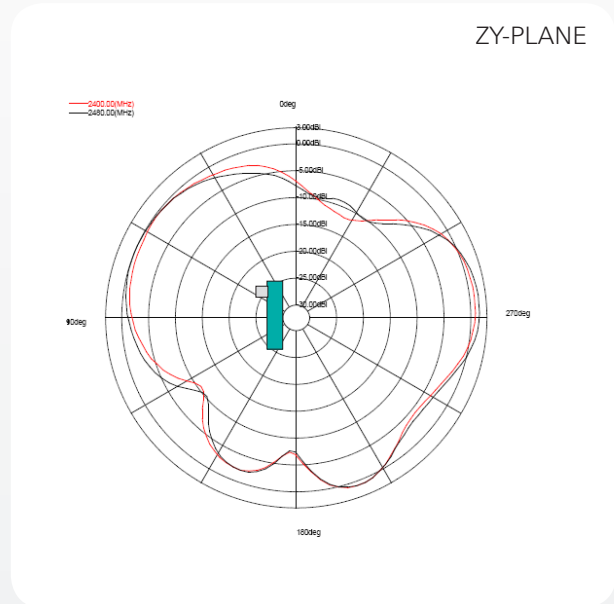
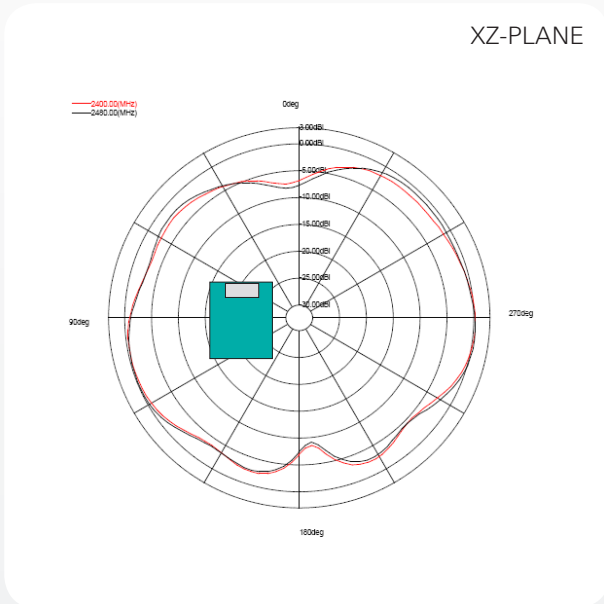


# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## WiFi Antenna Case #2

### Typical Free Space Radiation Patterns



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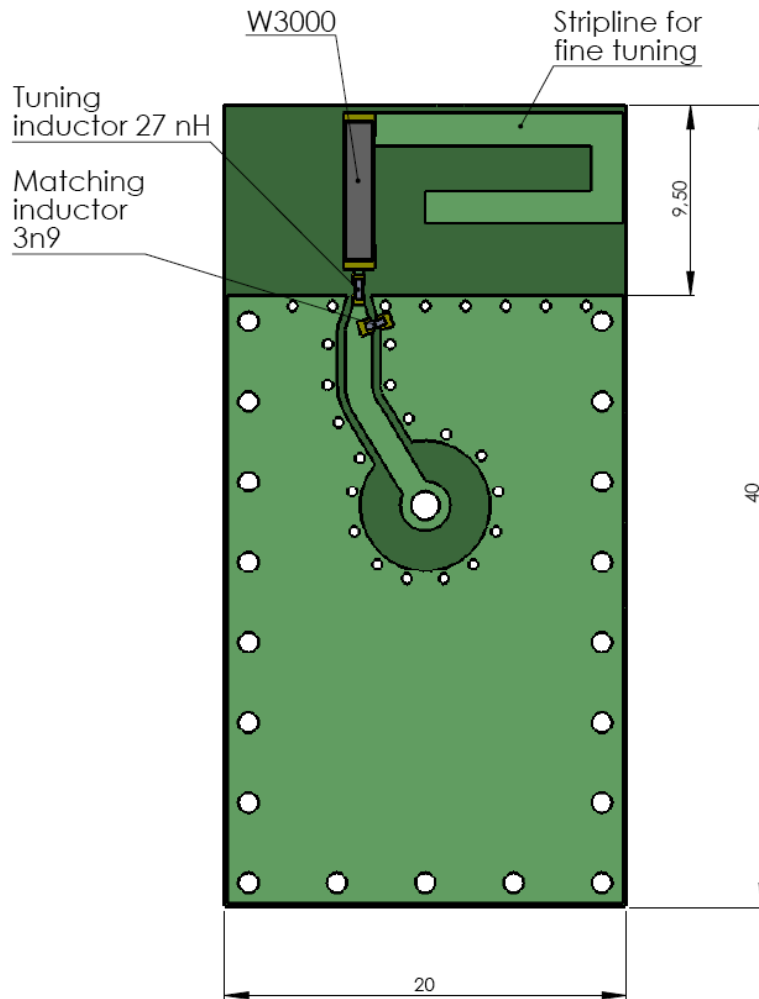
# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## ISM 868 MHz Antenna Case #1

**Board Size 20 x 40 mm**

Recommended antenna position on PWB for W3000 MONOPOLE Antenna



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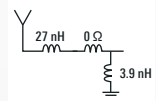
# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## ISM 868 MHz Antenna Case #1, Test Set Up and Measurement Performance

### Typical Electrical Characteristics (T=25 °C)

Measured on the 20 x 40 mm test board with matching circuit. Measured in antenna position1 on PWB layout, see previous page. Typical Return Loss S11/ impedance, free space efficiency and gain.



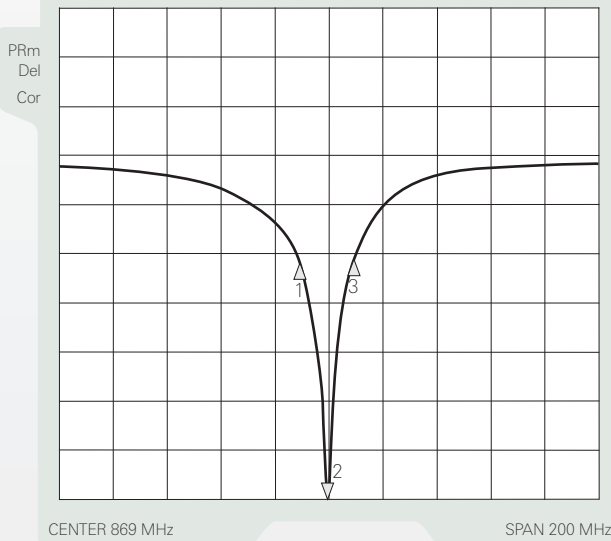
### ISM 868 MHz Case #1

24 Mar 2009 16:05:57

CH1 S11&MLOG 5 dB/REF 0 dB

CH1 Markers

- 1. -10.887 dB 858 MHz
- 2. -35.538 dB 868 MHz
- 3. -10.836 dB 878 MHz

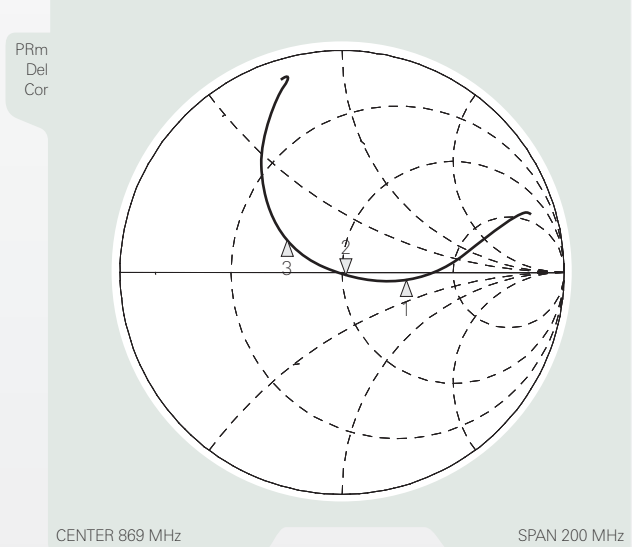


### ISM 868 MHz #1

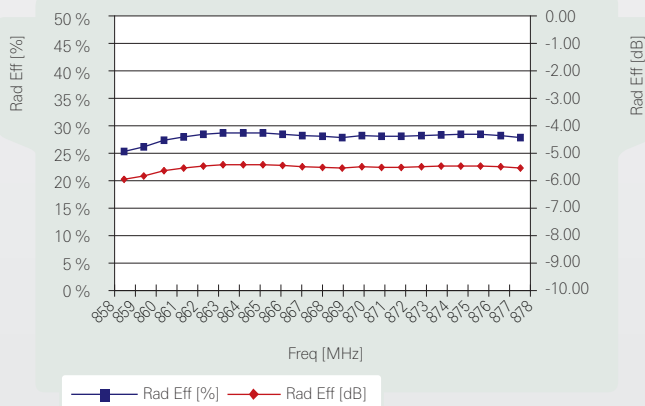
24 Mar 2009 16:06:06

CH1 S11&M 1 U FS

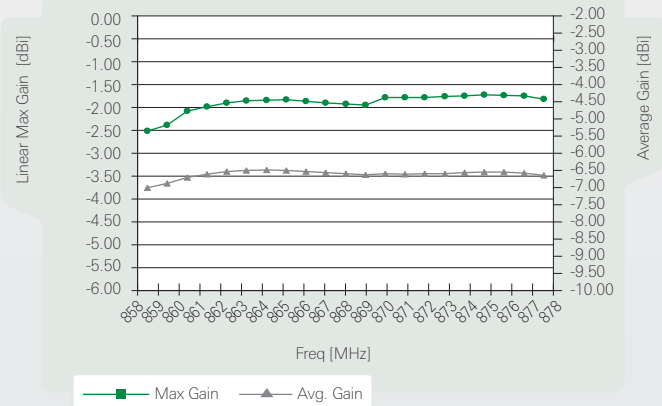
- 1. 90.109 Ω -5.8008 Ω 858 MHz
- 2. 51.600 Ω -1.2168 Ω 150.69 pF 868 MHz
- 3. 29.132 Ω -9.9443 Ω 878 MHz



### ISM 868 MHz Case #1



### ISM 868 MHz Case #1



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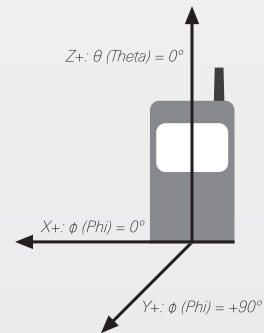
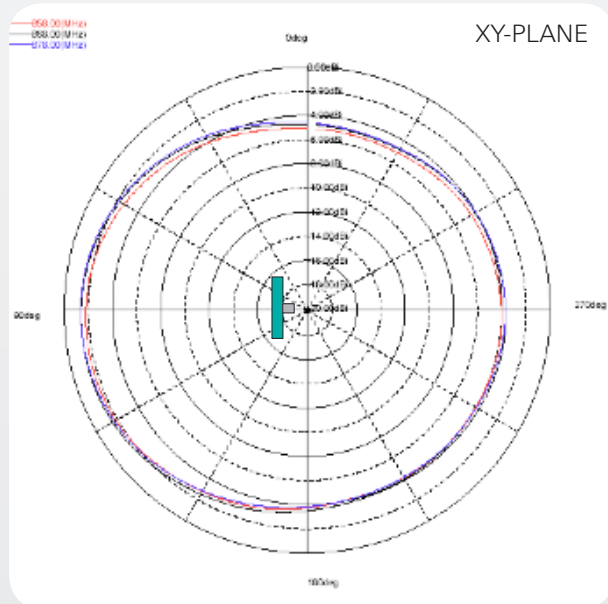
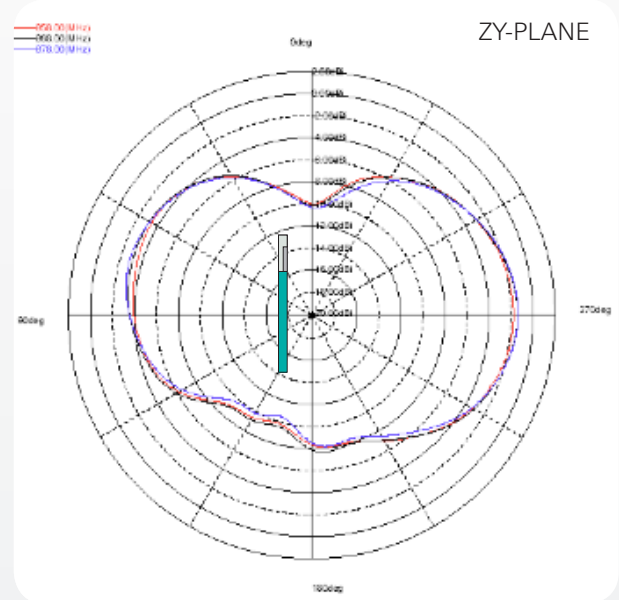
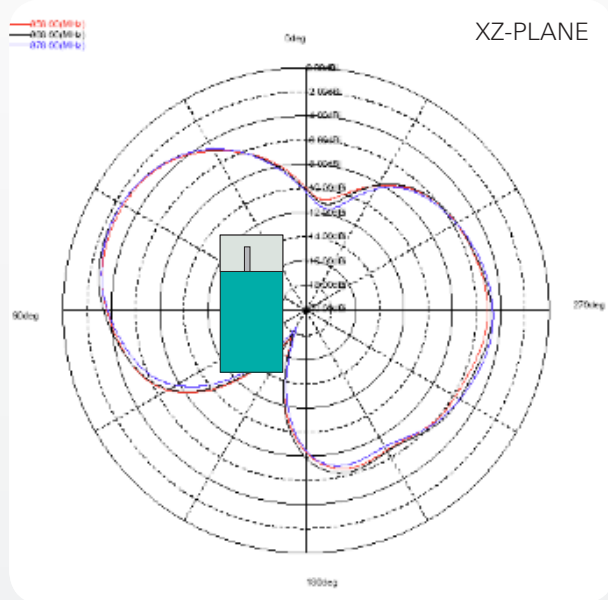
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# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## ISM 868 MHz Antenna Case #1

### Typical Free Space Radiation Patterns



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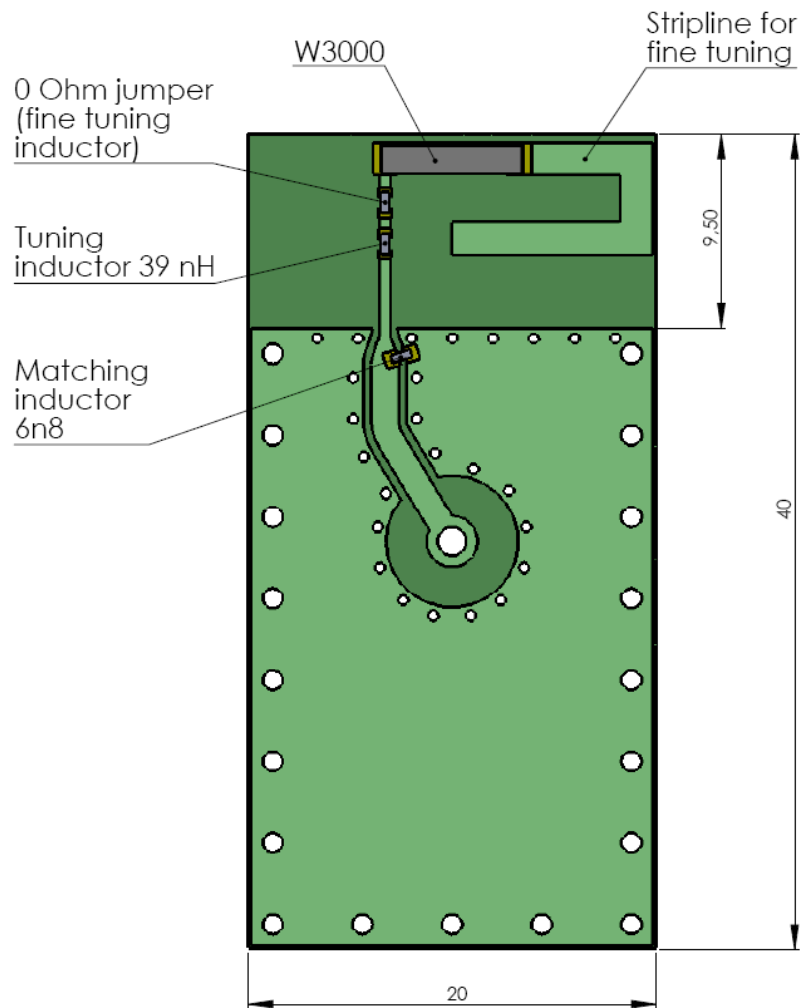
# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## ISM 868 MHz Antenna Case #2

**Board Size 20 x 40 mm**

Recommended antenna position on PWB for W3000 MONOPOLE Antenna



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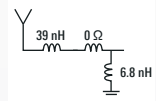
# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## ISM 868 MHz Antenna Case #2, Test Set Up and Measurement Performance

### Typical Electrical Characteristics (T=25 °C)

Measured on the 20 x 40 mm test board with matching circuit. Measured in antenna position1 on PWB layout, see previous page. Typical Return Loss S11/ impedance, free space efficiency and gain



### ISM 868 MHz Case #2

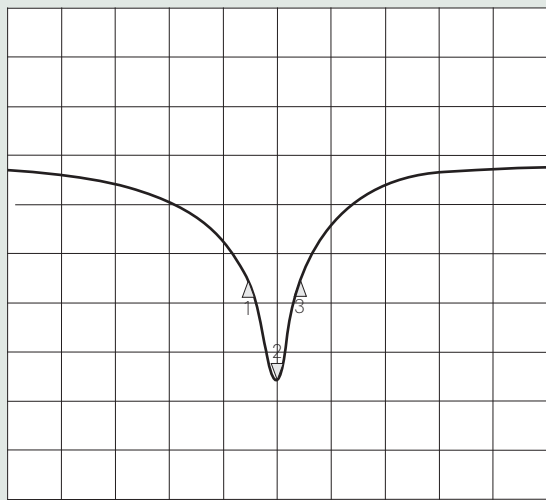
24 Mar 2009 16:07:15

CH1 S11&MLOG 5 dB/REF 0 dB

CH1Markers

- 1. -13.086 dB 858 MHz
- 2. -23.108 dB 868 MHz
- 3. -12.887 dB 878 MHz

PRm  
Del  
Cor



CENTER 440.000 000 MHz

SPAN 800.000 000 MHz

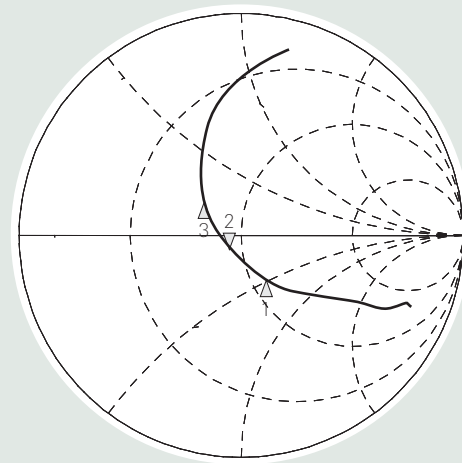
### ISM 868 MHz #2

24 Mar 2009 16:07:23

CH1 S11&M 1 U FS

- 1. 57.971 Ω -23.721 Ω 858 MHz
- 2. 45.375 Ω -5.0918 Ω 868 MHz
- 3. 35.385 Ω -11.094 Ω 878 MHz

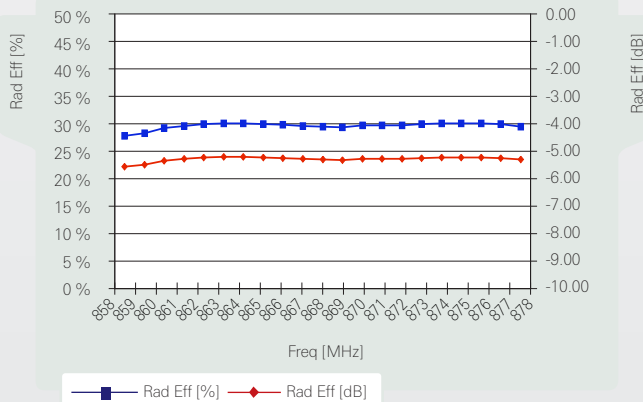
PRm  
Del  
Cor



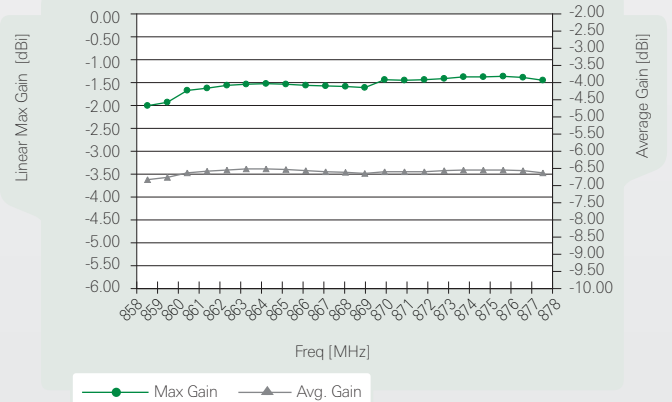
CENTER 440.000 000 MHz

SPAN 800.000 000 MHz

### ISM 868 MHz Case #2



### ISM 868 MHz Case #2



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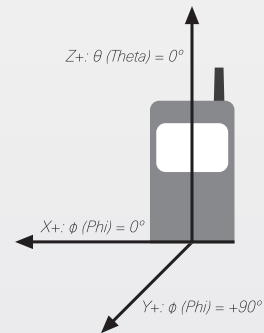
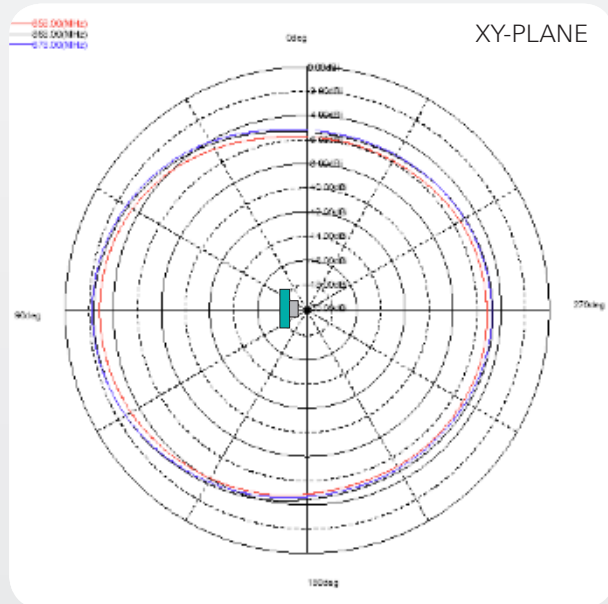
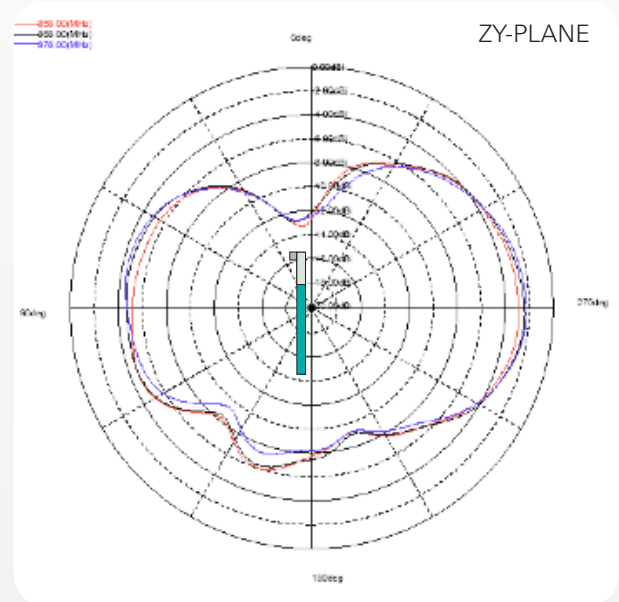
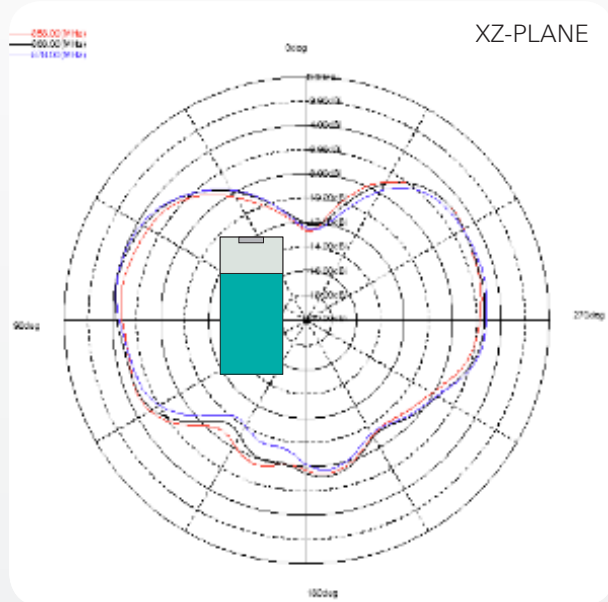
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# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

## ISM 868 MHz Antenna Case #2

### Typical Free Space Radiation Patterns



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# Ceramic Monopole Antenna

Ground cleared under antenna. Pulse Part Number: W3000

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