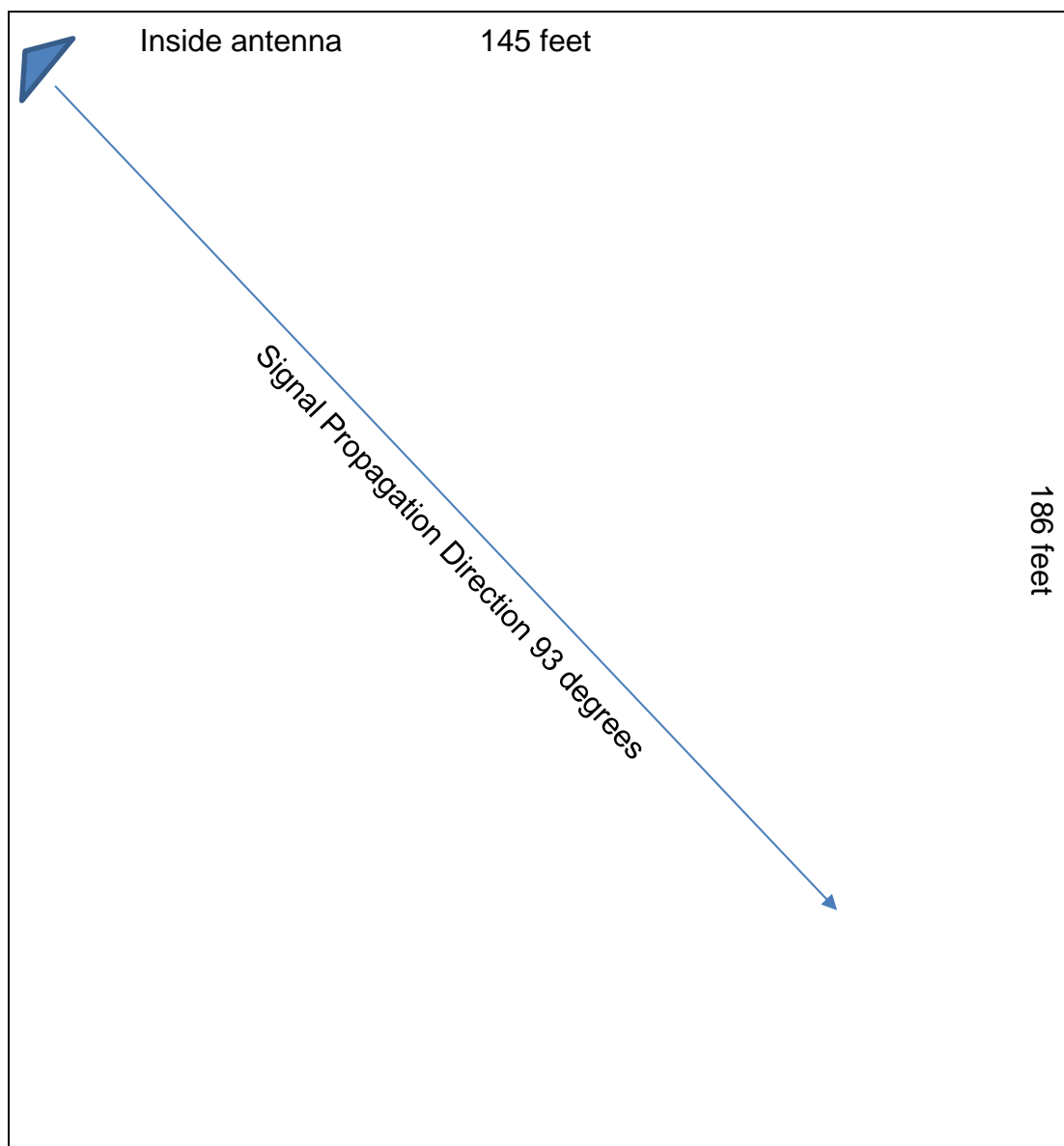


## PSA Airlines Hangar Test System for Airframe GPS Receivers

### CAK Hangar

PSA intends to use a GPS Repeater system, the GPS Networking model GPS-ITS, that receives GPS from an outside antenna and re-transmits the signal **inside the all metal** PSA Hangar. Signal levels will be kept to a minimum and will not exceed -140dBm 100 feet outside of hangar.

PSA intends to use this to test aircraft GPS receivers while aircraft are undergoing repairs and recertification and has determined that this is the safest and best way without having to move a disabled and disassembled aircraft to the outside of the hangar.



Directional antenna transmits signal towards opposite corner. Signal outside hangar at 100 feet: less than -140dBm.



Source for quality GNSS Networking Solutions and Design Services, Now!



## GPS Networking Link Budget Calculator

PSA Airlines CAK Hangar

FRN:0004415857

The following spreadsheet calculates the effective radiated power for a GPS Networking reradiating system as well as the effective signal power at given range in dBm. Enter the components for the strongest repeating path in your system into the section with the **red** border. NTIA regulations require that the repeated signal be weaker than -140 dBm when measured 100 FT outside of the reradiated structure. Please feel free to reach out to GPS Networking if you need assistance.

| Receive Ant Gain | Ant Cable Insertion Loss | Repeater Amp Gain | Repeater Ant Gain Best Case | Building Length (Feet) | Repeated Signal Power @ End of Building In dBm | Repeated Signal Power @ 100' Outside of Building In dBm |
|------------------|--------------------------|-------------------|-----------------------------|------------------------|--|---|
| 33               | -3                       | 30                | 3                           | 145                    | -136.32  | -140.8762544  |

GPS Carrier Frequency MHz

1575

Total System Gain

63

Range in Miles

0.03

Total Signal Power @ Range in Watts

23.3E-18

Avg Receive Power L1 dBm North America

-130

Range in Meters

45.19

Radiated Power dBm

-67

Free Space loss with Isotropic Antennas

-69.32

Range in Kilometers

0.05

Transmitted Power (W)

100.0E-12

### System Receive Antenna

| Part Number | Gain/Loss (dB) |
|-------------|----------------|
| L1GPSA-N    | 33             |

Effective Radiated Power (W)

199.5E-12

Effective Radiated Power (dBW)

-97

### Passive Components (Cause Loss)

| Part Number | Gain/Loss (dB) |
|-------------|----------------|
|-------------|----------------|

### Amplified Components (Cause Gain)

| Part Number | Gain/Loss (dB) |
|-------------|----------------|
| LA30RPDC    | 30             |

### Repeating Antennas

| Part Number | Gain/Loss (dB) |
|-------------|----------------|
| L1PRRKA-S   | 3              |

### Cable Runs

| Cable Type | Loss Per 100 Feet (LMR400) = -6 | Feet of Cable | Cable Losses |
|------------|---------------------------------|---------------|--------------|
| LMR400     | -6                              | 50            | -3<br>0      |



# ***GPS-ITS***

## ***GPS Indoor Testing Solution Technical Product Data***



### Features

- **Amplified Roof Antenna**  
Gain  $\geq 35\text{dB}$
- **Mounting Kit Hardware**  
Roof Antenna Mount & Adjustable Re-Radiating Mount
- **Variable Gain Amplifier with LCD Display**  
Push Button Control in 1dB Increments 0-30dB gain
- **LMR 400 Ultra Flex Cable 50 ft**  
(Custom Lengths available at additional cost)

### Description

The GPS ITS (GPS Indoor Testing Solution) is a complete re-radiating system that allows re-radiation of the GPS L1 signal indoors. The GPS-ITS consists of an active roof antenna, a re-radiating amplifier with a wall mount plug-in transformer that powers the entire system, and a passive re-radiating antenna. The GPS L1 signal from the roof antenna is amplified and radiated indoors. Thus, if a receiver has line of sight with the re-radiating antenna, it can receive the GPS signal indoors up to 100 feet.

## Roof Antenna Specifications, $T_A = 25^{\circ}\text{C}$

| Parameter                 | Conditions | Min | Typ   | Max   | Units    |
|---------------------------|------------|-----|-------|-------|----------|
| Frequency                 | L1         |     | 1.575 |       | GHz      |
| Bandwidth                 |            |     | 20    |       | MHz      |
| Out Imped. <sup>(1)</sup> |            |     | 50    |       | $\Omega$ |
| Pre-Amp Gain              |            |     | 35    | 38    | dB       |
| Noise Figure              |            |     | 2.75  |       | dB       |
| Output SWR                |            |     |       | 2.0:1 | -        |
| Filtering                 | 1626 MHz   | -20 |       |       | dB       |
|                           | 1500 MHz   | -10 |       |       | dB       |
| Req. DC Input V.          |            | 4.5 |       | 5.5   | Vdc      |
| Current                   |            |     | 22    |       | mA       |

| RF Connector Options |                 |        |
|----------------------|-----------------|--------|
| Connector Options    | CONNECTOR STYLE | CHARGE |
|                      | Type N-female   | NC     |

## Re-Radiating Amplifier Electrical Specifications, $T_A = 25^{\circ}\text{C}$

| Parameter                | Conditions                               | Min | Typ | Max   | Units    |
|--------------------------|--|-----|-----|-------|----------|
| Freq. Range              | Ant – J1                                 | 1.1 |     | 1.7   | GHz      |
| In/Out Imped.            | Ant, J1                                  |     | 50  |       | $\Omega$ |
| Gain <sup>(1)</sup>      |  | 0   |     | 30    | dB       |
| Input SWR <sup>(2)</sup> | J1 - 50 $\Omega$                         |     |     | 1.8:1 | -        |
| Output SWR               | Ant - 50 $\Omega$                        |     |     | 1.8:1 | -        |
| Noise Figure             | Ant – J1                                 |     | 3.3 | 3.5   | dB       |
| Current                  |  |     |     | 20    | mA       |
| Gain Flatness            | L1 – L2   ; Ant – J1                     |     | 0.5 | 1     | dB       |
| Reverse Isolation        | J1 – Ant                                 | 35  |     |       | dB       |
| Group delay Flatness     | $\tau_{d,max} - \tau_{d,min}$ : Ant – J1 |     |     | 1     | ns       |

| Re-Radiating Amp System Power Supply Options |  |                          |
|--|--|--------------------------|
| Source Voltage Options                       | VOLTAGE INPUT  | STYLE                    |
|  | 110VAC   | Transformer (Wall Mount) |
|  | 220 VAC  | Transformer (Wall Mount) |
|  | 240 VAC (United Kingdom)                                     | Transformer (Wall Mount) |
|  | Customer Supplied DC 9-32 VDC                                | Military Style Connector |
| Re-Radiating Amp Gain Control                |  |                          |
| Variable Gain with LCD Display               | 0-30dB gain range with push button control in 1dB increments |                          |

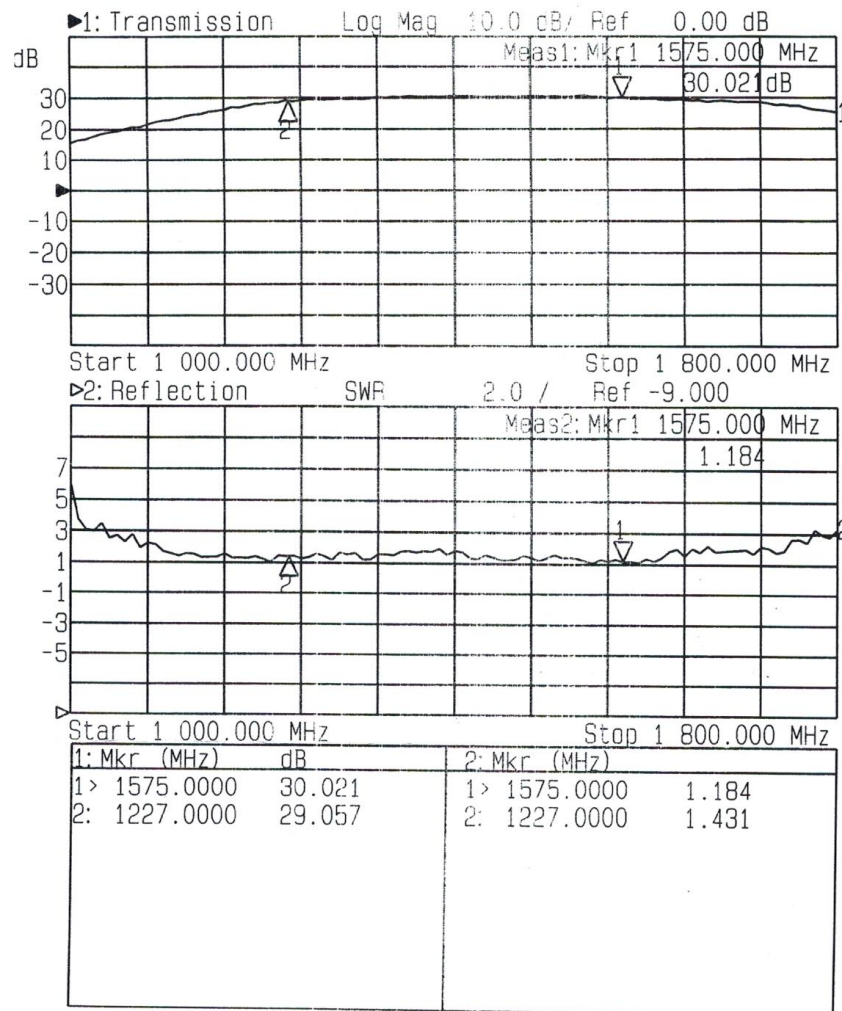
## Re-Radiating Antenna Electrical Specifications, $T_A = 25^{\circ}\text{C}$

| Parameter    | Conditions | Min | Typ   | Max   | Units    |
|--------------|------------|-----|-------|-------|----------|
| Frequency    | L1         |     | 1.575 |       | GHz      |
| Bandwidth    |            |     |       | 20    | MHz      |
| Impedance    |            |     | 50    |       | $\Omega$ |
| Peak Gain    |            |     | 3     |       | dBic     |
| Output SWR   |            |     |       | 1.5:1 | -        |
| Polarization |            |     | RHCP  |       | -        |

## Performance:

### ITS (Re-Radiating Kit Max Gain)

Input SWR (Ant. Port) and Frequency Response: Ant. To J1) (Typical, type N connectors):



## Mechanical

### Re-Radiating Kit Amplifier

Dimensions: Height: 1.3"

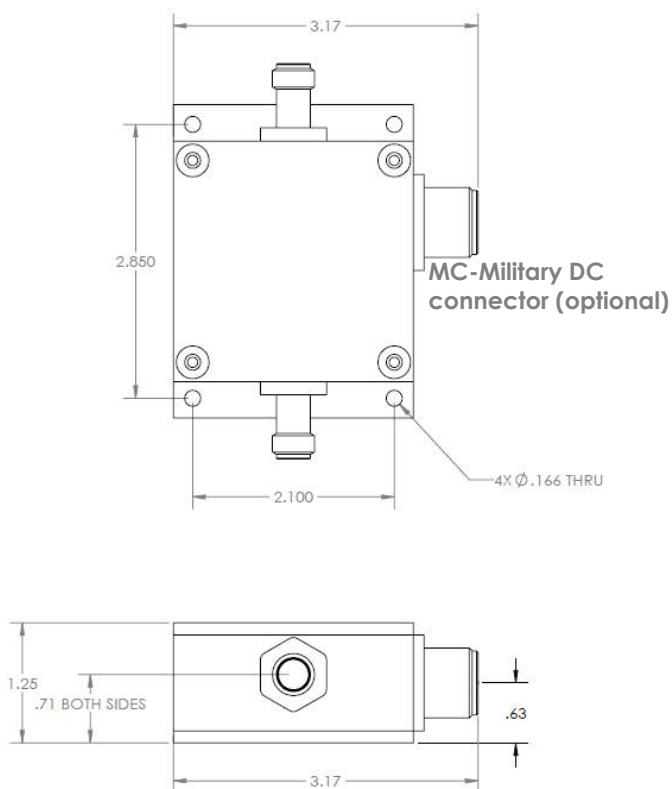
Length (not including connectors) Body: 2.5"  
Base Plate: 3.25"

Width (not including connectors): 2.5"

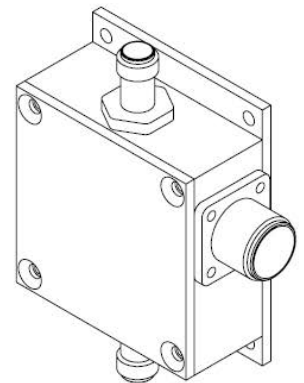
Weight: 11 oz. (316 grams)

Operating Temp. Range: -40° to + 75°C

Finish Housing and Base Plate: ELECTROLESS NICKEL PLATED  
MIL-C-26074C CLASS 1, .0001-.0003 MAX  
Finish Lid: ANODIZE, TYPE II, CLASS 2, BLACK, per MIL-A-8625



| REVISIONS |      |                 |         |      |
|-----------|------|-----------------|---------|------|
| ZONE      | REV. | DESCRIPTION     | REV. BY | DATE |
| 1         | A    | INITIAL RELEASE | 1       | ---  |



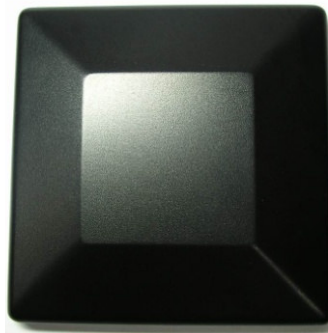
| GPS NETWORKING |                    | ASSY, 1X1 STANDARD |          |           |        | Do Not Scale Drawing<br>Remove All Burrs<br>And Sharp Edges<br>To .000 Round Max |
|----------------|--------------------|--------------------|----------|-----------|--------|--|
| Design         | BPC                | Date               | 09/04/15 | Design By | Eng    |  |
| Checked By     |                    | Scale              |          | Qty       | 1      | Material   |
| Notes          | See Note           |                    |          |           |        | 3.0 ± .000<br>3.5 ± .005<br>3.00 ± .005  |
| Part Approval  |                    | Material           |          | Part Key  |        | Angle 90°<br>Surface Finish<br>Unless Noted                                      |
| Design Number  | ASSY, 1X1 STANDARD |                    |          |           |        | Part Dimensions<br>Unless Noted  |
| DES            | B                  | REV                | A        | SHEET     | 1 OF 1 |  |

# **ALLISCOM**

## **PA175**

### **GPS ANTENNA**

### **Data Sheet**



**Model No. PA175**

**Feature**      **High Efficiency - 90%**  
                     **Low Profile Design**  
                     **Low Loss - 0.2%**

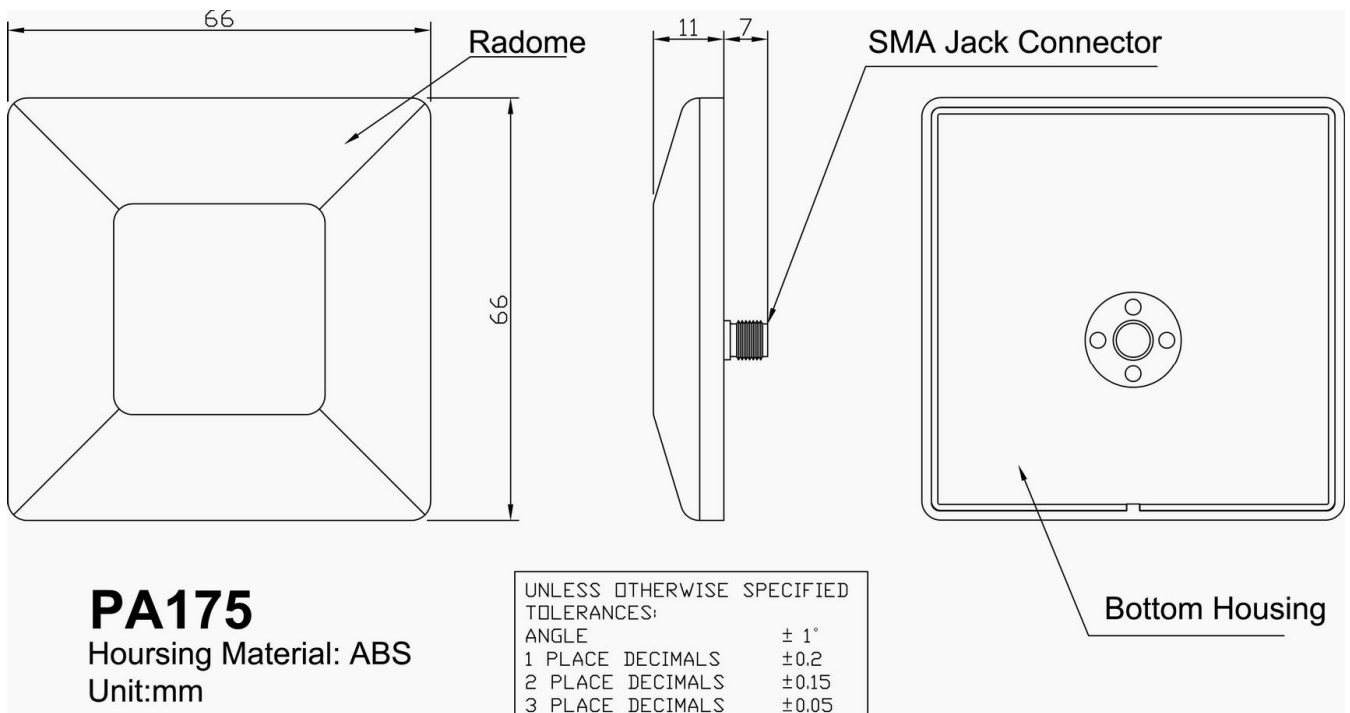
**Description**    **Allis Communications 1.575 MHz Antenna is an ideal solution for GPS reception. The Antenna is a GPS Passive Antenna for rebroadcasting GPS signal inside a building.**

## 1. Specifications

|                        |                              |
|------------------------|------------------------------|
| Antenna:               |                              |
| Frequency              | 1575.42±3 MHz                |
| VSWR                   | 1.5 Max.                     |
| Bandwidth              | 20 MHz Min. @ -10 dB         |
| Impedance              | 50 Ω                         |
| Efficiency             | 90.1% @1575MHz               |
| Axial Ratio            | 3 dB Max. $\theta=0^{\circ}$ |
| Peak Gain              | 4 dBic Min.                  |
| Mechanical:            |                              |
| Weight (Without Cable) | 48 grams Max.                |
| Size                   | 66X 66 X18 mm                |
| Connector              | SMA Jack ( Female )          |
| Housing Color          | Black                        |
| Housing Material       | ABS                          |
| Environmental:         |                              |
| Working Temperature    | -40°C < T < +85°C            |
| Storage Temperature    | -50°C < T < +95°C            |

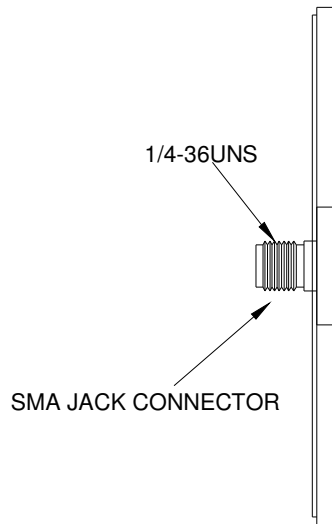
## 2. Shape and Dimension

### a. Dimension

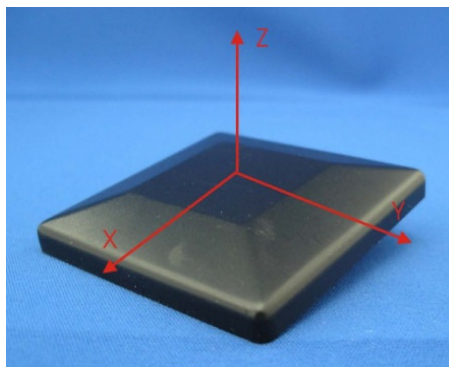




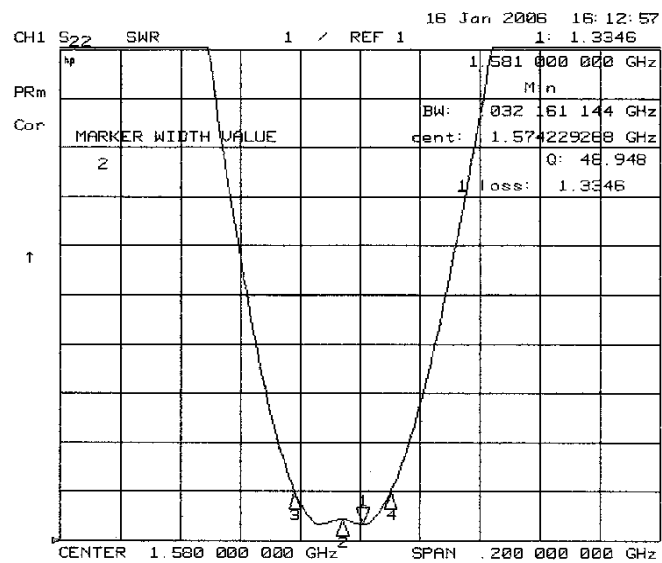
## b. SMA Jack (Female) Connector



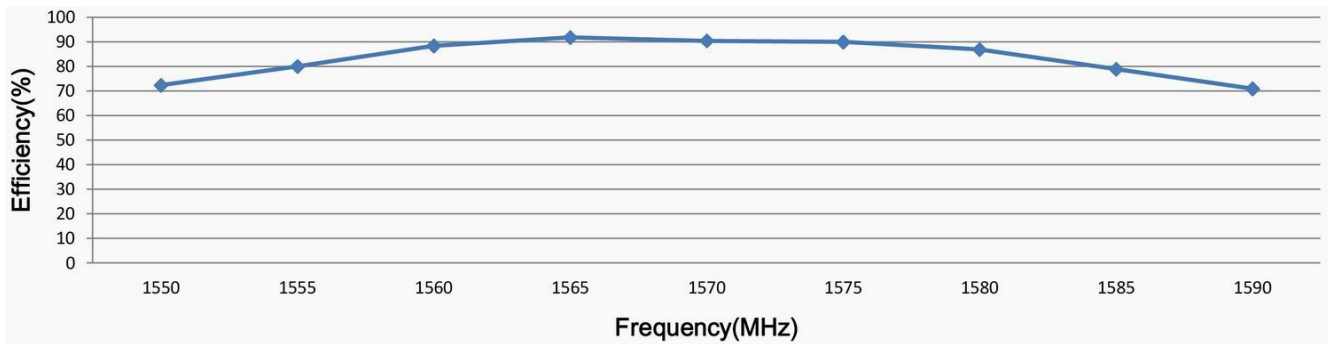
## 3. Antenna Characteristics



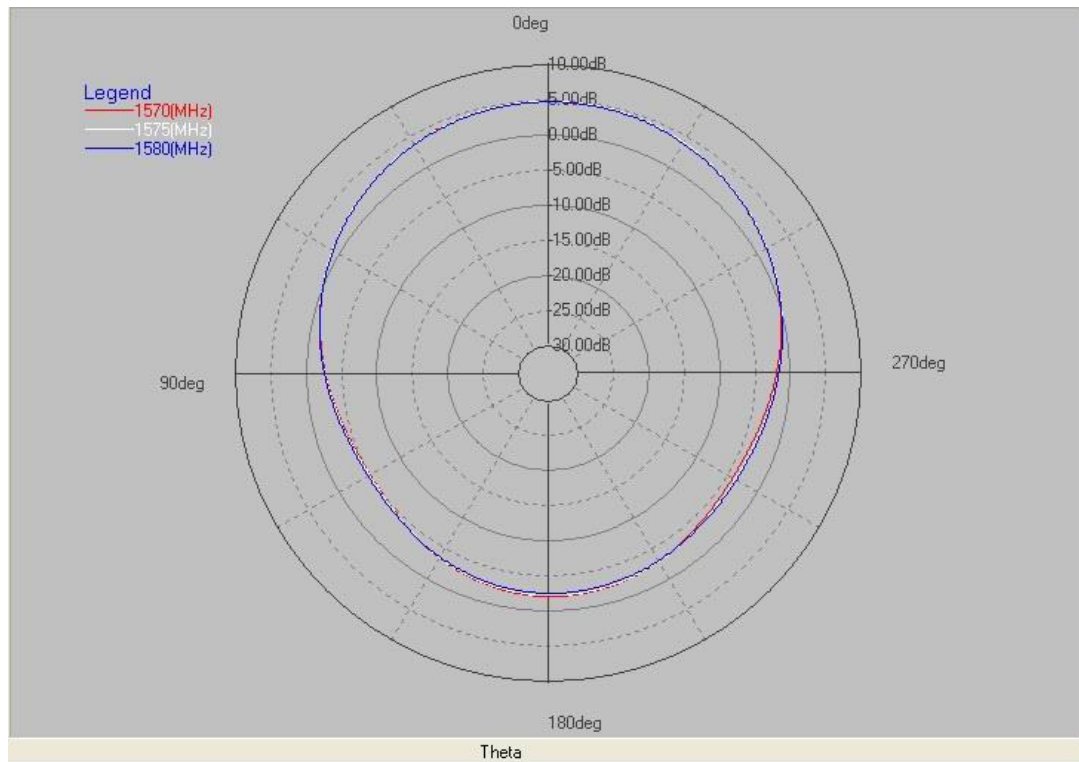
### a. VSWR



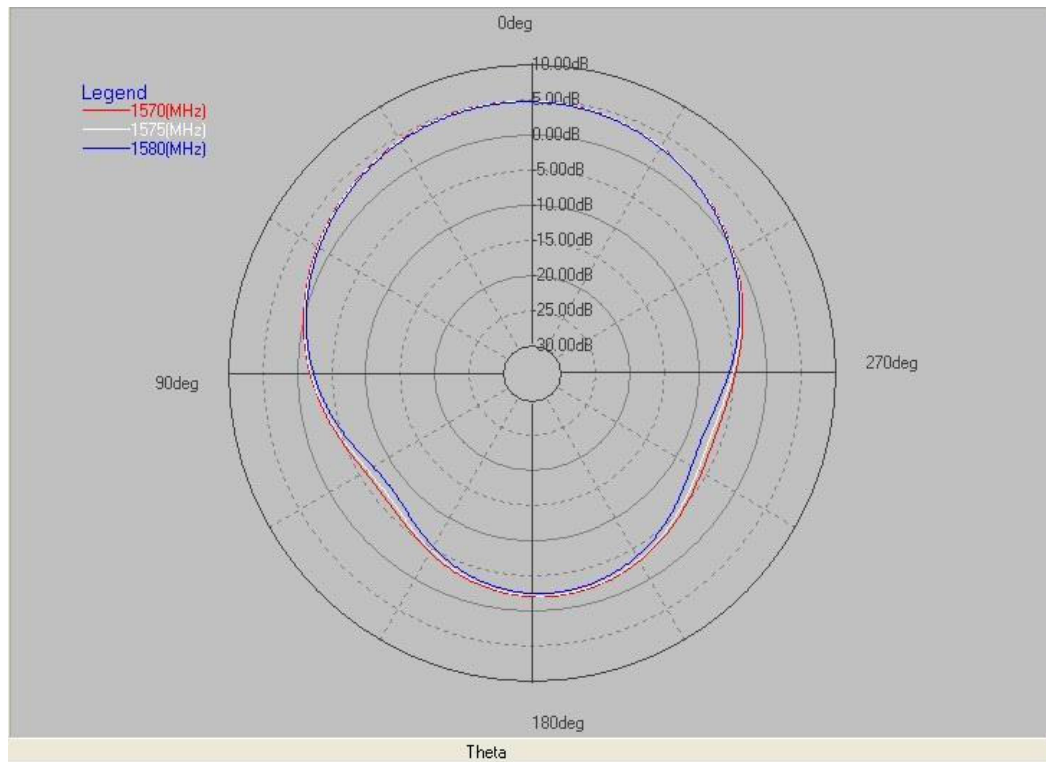
## b.Efficiency



## c.X-Z Plane



#### d.Y-Z Plane



#### e. Axial Ratio: 0.8dB

##### *Polar plot*

File: ant.dat  
Allis Com.

