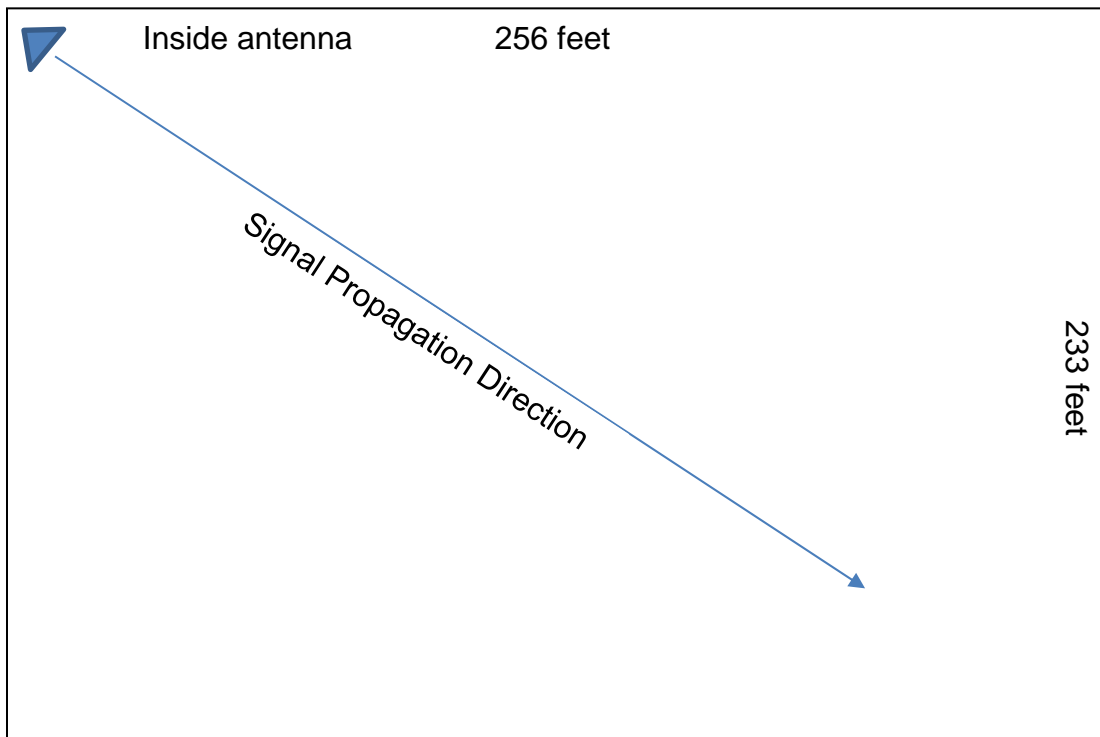


PSA Airlines Hangar Test System for Airframe GPS Receivers

Hangar 1 (Antenna 1)

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 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 -143dBm.



GPS Networking Link Budget Calculator

PSA Airlines DAY Hangar 1

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	233	-140.44	-143.5418174	
GPS Carrier Frequency MHz	1575	Total System Gain	63	Range in Miles	0.04	Total Signal Power @ Range in Watts	9.0E-18
Avg Receive Power L1 dBm North America	-130	Range in Meters	72.62	Radiated Power dBm	-67	Free Space loss with Isotropic Antennas	-73.44
Range in Kilometers	0.07	Transmitted Power (W)	100.0E-12	Effective Radiated Power (W)	199.5E-12	Effective Radiated Power (dBW)	-97

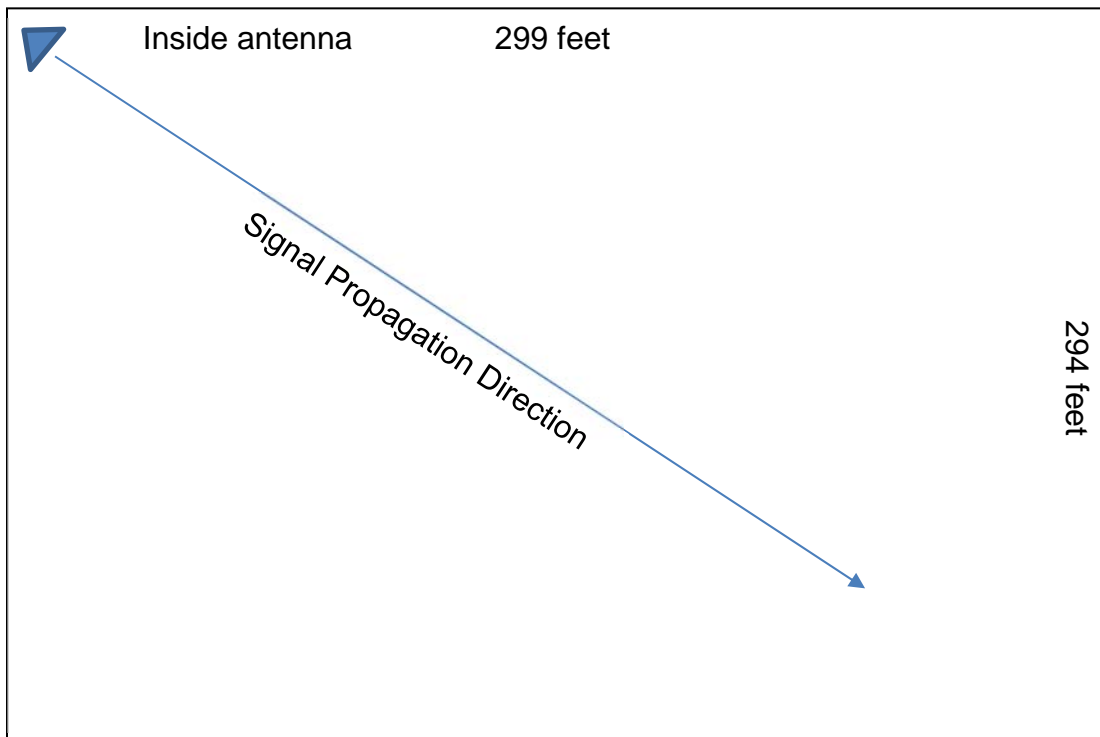
System Receive Antenna			
Part Number	Gain/Loss (dB)		
L1GPSA-N	33		
Passive Components (Cause Loss)			
Part Number	Gain/Loss (dB)		
Amplified Components (Cause Gain)			
Part Number	Gain/Loss (dB)		
LA30RPDC	30		
Repeating Antennas			
Part Number	Gain/Loss (dB)		
L1PRRKA-S	3		
Cable Runs			
Cable Type	Loss Per 100 Feet (LMR400)	Feet of Cable	Cable Losses
LMR400	-6	50	-3
			0

PSA Airlines Hangar Test System for Airframe GPS Receivers

Hangar 2 (Antenna 2)

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 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 -145dBm.



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GPS Networking Link Budget Calculator

PSA Airlines DAY Hangar 2

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	294	-142.46	-145.0028571	
GPS Carrier Frequency MHz	1575	Total System Gain	63	Range in Miles	0.06	Total Signal Power @ Range in Watts	5.7E-18
Avg Receive Power L1 dBm North America	-130	Free Space loss with Isotropic Antennas	-75.46	Range in Meters	91.63	Radiated Power dBm	-67
				Range in Kilometers	0.09	Transmitted Power (W)	100.0E-12
						Effective Radiated Power (W)	199.5E-12
						Effective Radiated Power (dBW)	-97

System Receive Antenna

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

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
			0



GPS-ITS

GPS Indoor Testing Solution Technical Product Data



Features

- **Amplified Roof Antenna**
Gain \geq 35dB
- **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. ⁽¹⁾			50		Ω
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		Ω
Gain ⁽¹⁾		0		30	dB
Input SWR ⁽²⁾	J1 - 50 Ω			1.8:1	-
Output SWR	Ant - 50 Ω			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	

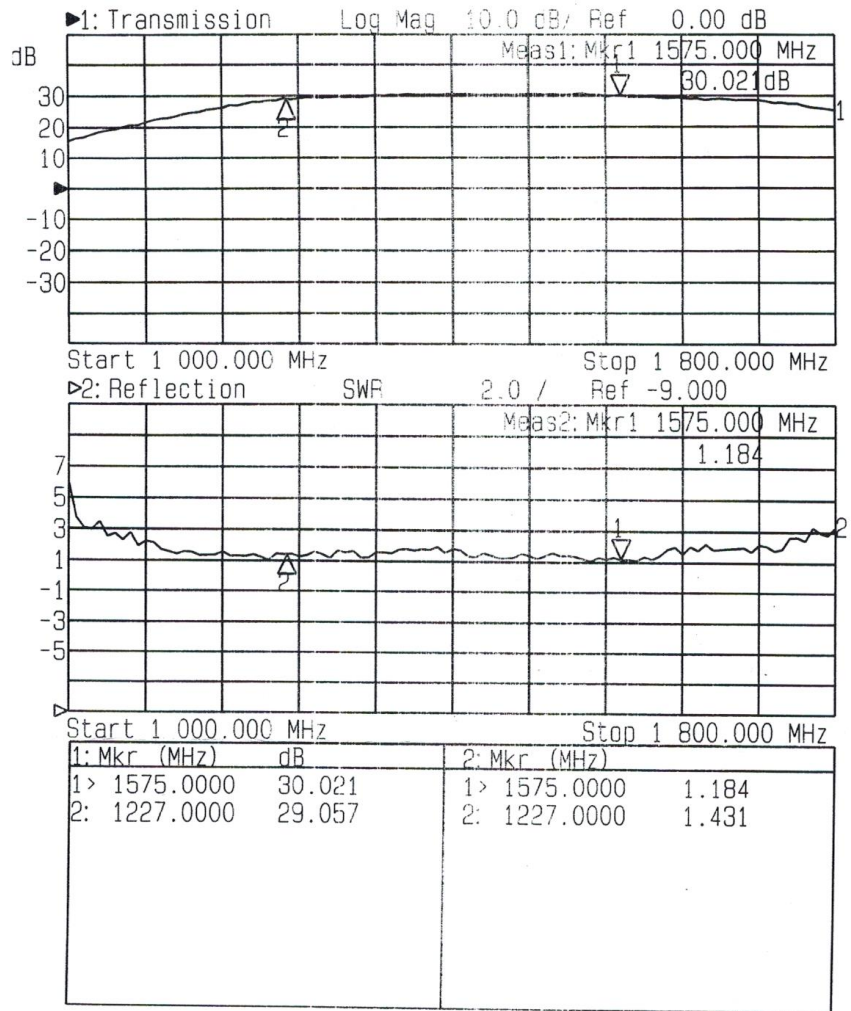
Re-Radiating Antenna Electrical Specifications, $T_A = 25^{\circ}\text{C}$

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

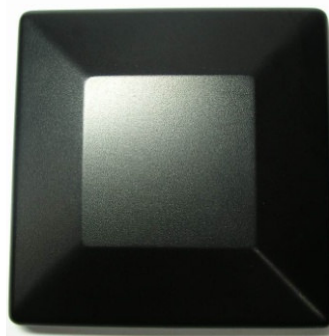
Performance:

ITS (Re-Radiating Kit Max Gain)

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



ALLISCOM PA175 GPS ANTENNA Data Sheet



Model No. PA175

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

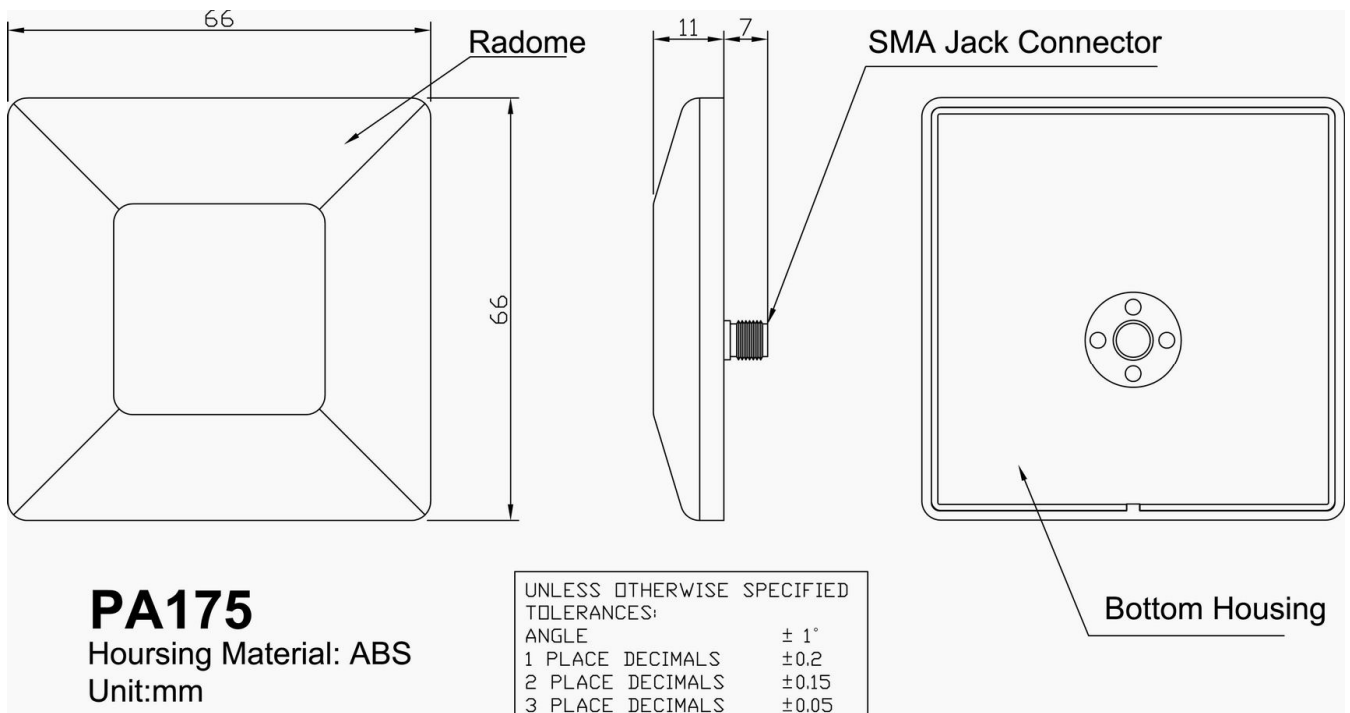
Description **Allis Communications 1.575 MHz Antenna is an ideal solution for GPS reception. The Antenna is a GPS Passive Antenna for rebroadcasting GPS signal inside a building.**

1. Specifications

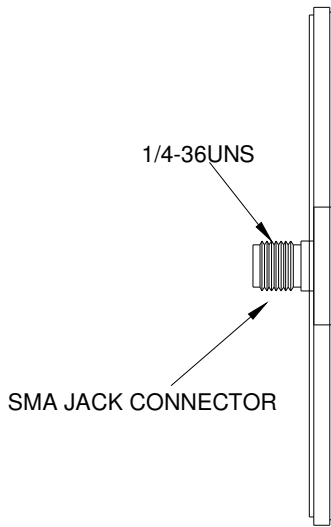
Antenna:	
Frequency	1575.42±3 MHz
VSWR	1.5 Max.
Bandwidth	20 MHz Min. @ -10 dB
Impedance	50 Ω
Efficiency	90.1% @1575MHz
Axial Ratio	3 dB Max. θ=0°
Peak Gain	4 dBic Min.
Mechanical:	
Weight (Without Cable)	48 grams Max.
Size	66X 66 X18 mm
Connector	SMA Jack (Female)
Housing Color	Black
Housing Material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

2. Shape and Dimension

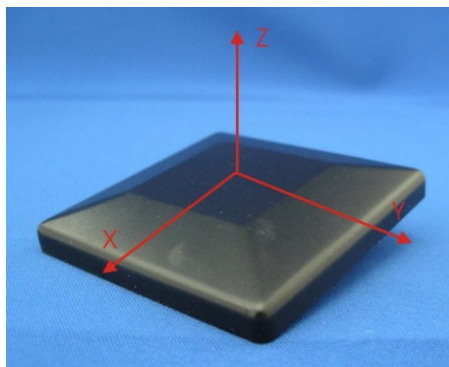
a. Dimension



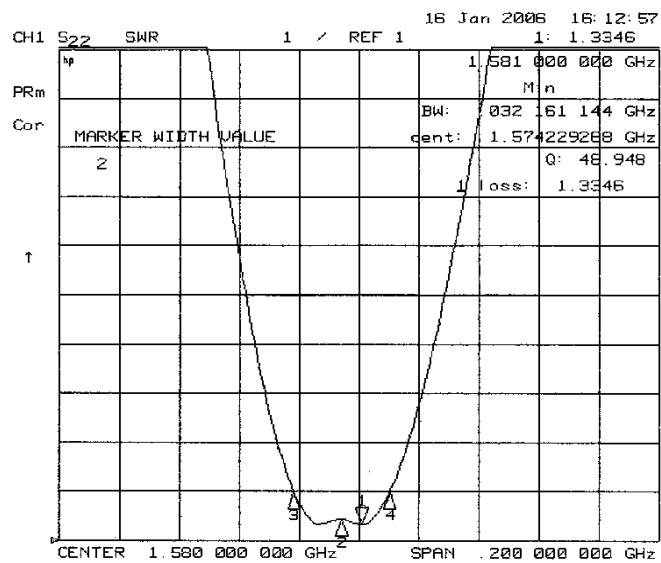
b. SMA Jack (Female) Connector



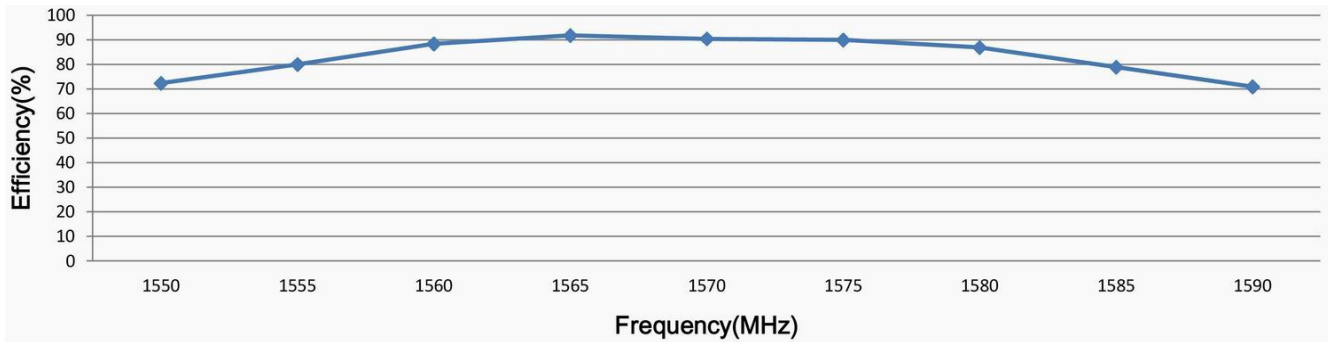
3. Antenna Characteristics



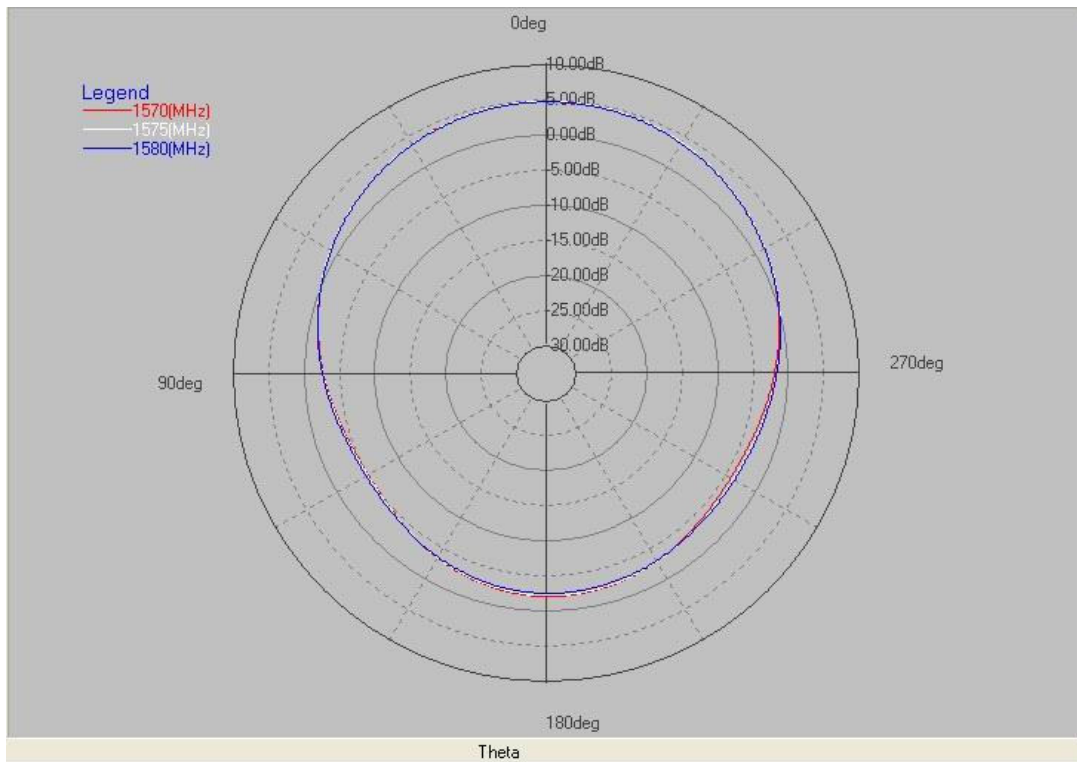
a. VSWR



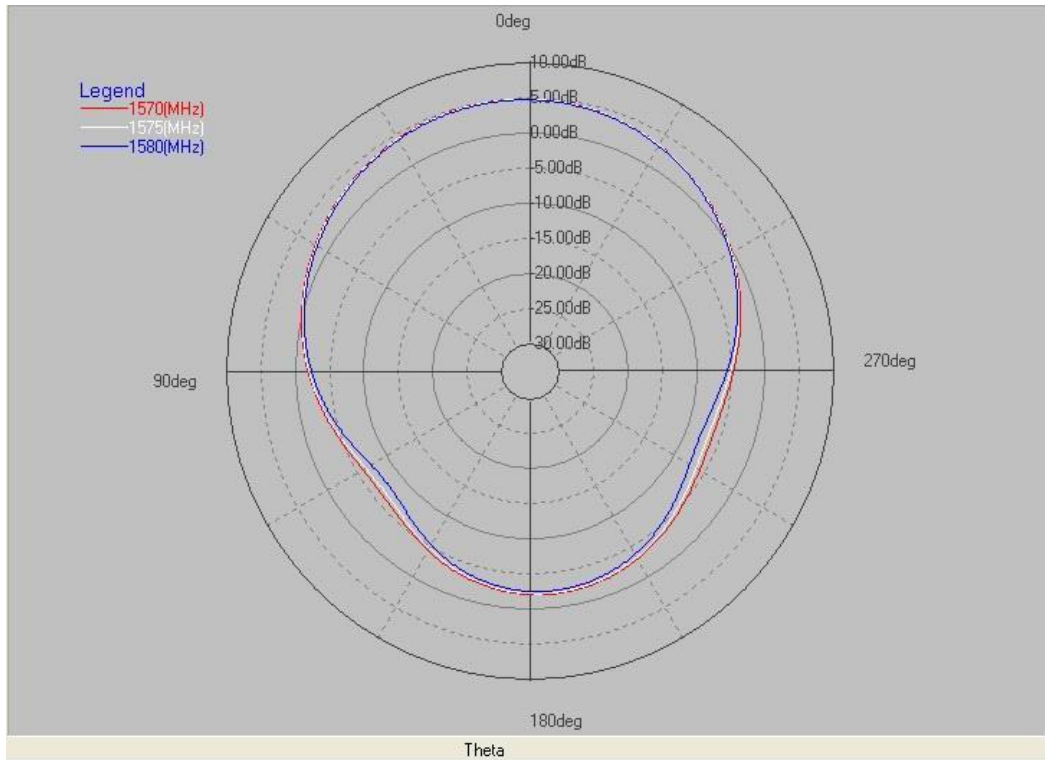
b. Efficiency



c. X-Z Plane



d. Y-Z Plane



e. Axial Ratio: 0.8dB

Polar plot

File: ant.dat
Allis Com.

