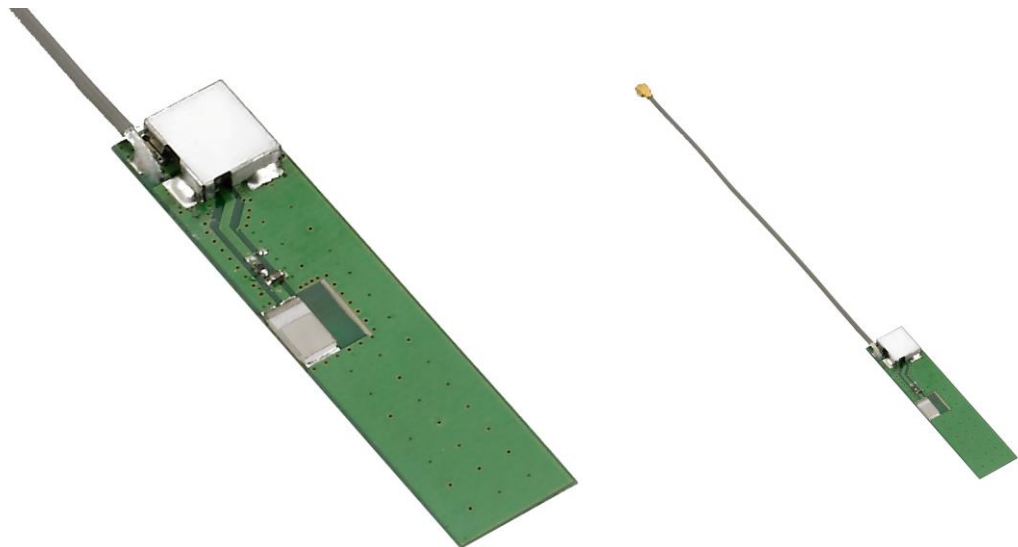# SPECIFICATION

| | | |
|---|---|---|
| Part No. | : | **ALA.01.07.0095A** |
| Product Name | : | 1575MHz GPS-GALILEO Ceramic Active Loop Module |
| Features | : | 16dB One Stage<br>GPS/GALILEO<br>PCB Dims: 45*10*2.3mmmm<br>RoHS Compliant |

# 1. Introduction

The active loop antenna ALA.01 is best suited for applications where omni-directionality is important. The average gain is similar to an 18mm active patch antenna but in a much narrower profile, only 2.3mm at its highest point, allowing this antenna to be used perpendicular to the device main-board, or placed adjacent to the top or bottom of device main board. A one stage LNA combined with a SAW filter boosts the S/N (C/N) of the GPS/GALILEO system and helps to overcome some noise effects from today's crowded device boards that passive antennas cannot resolve.

The antenna can be placed in a plastic slot in the device housing. Alternatively, adhesive foam, hot-melt, or non-conductive screws could be used to mount the antenna. The core antenna design principle of loop current flow tends to "lock-out" a lot of surface noise from close circuitry from entering the antenna.
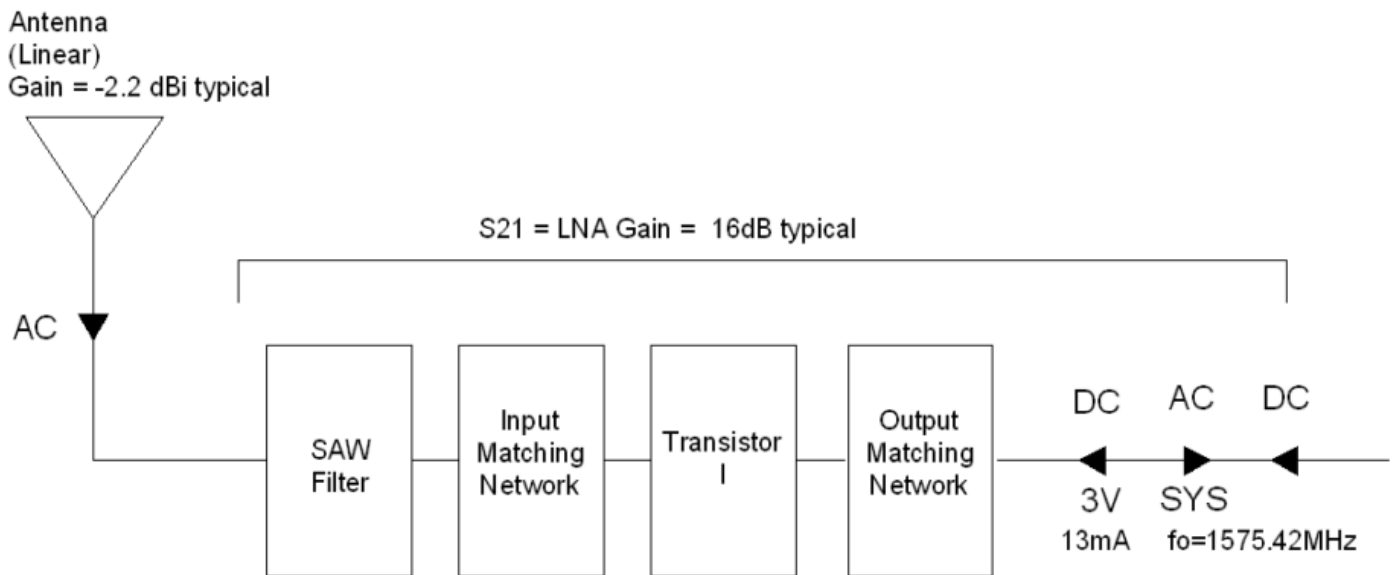
# 2. Specification

| ELECTRICAL | |
|---|---|
| Frequency | 1575.42 ± 1.023MHz |
| Bandwidth (10dB return loss) | 70MHz typical |
| Peak Gain | Typ. 3.1dBi |
| Avg. Gain | -2.2dBI |
| Polarization | Linear |
| VSWR | 2 max (depends on the special environment) |
| Dimension | 5*3*0.5mm |
| Gain (with LNA) | 16 ± 4dB @ 90° |
| Output Impedance | 50Ω |
| Polarization | Linear |
| Input Voltage | Min. 2.6V,    Typ. 3.0V,    Max. 5.0V |
| LNA | |
| Frequency | 1575.42 ± 1.023MHz |
| Gain | Typ. 16dB @ 3V<br>Typ. 17.8dB @ 5V |
| Noise Figure | Typ. 1.3dB @ 3V |
| Filter (out of band attenuation) | Saw Filter (fo=1575.42MHz)<br>40dB typ. fo±50MHz<br>45dB min. fo±100Mhz |
| Output VSWR | < 2.0 |
| Input Voltage | DC = 2.6~5.0V |
| Current | DC = 13mA at 3.0V |

| MECHANICAL | |
|---|---|
| RF Cable | 95±5mm 1.13 Coaxial Cable |
| Connector | IPEX MHF(U.FL) |
| Dimensions | 45*10*2.3mm |
| Weight | 1.35±0.5g (typical) |
| ENVIRONMENTAL | |
| Operation Temperature | -40°C to + 85°C |
| Storage Temperature | -40°C to + 90°C |
| Humidity | 10 to 95% |

# 3. Performance Measurement

## 3.1. Block Diagram

Antenna
(Linear)
Gain = -2.2 dBi typical

S21 = LNA Gain = 16dB typical

AC

| SAW Filter | Input Matching Network | Transistor I | Output Matching Network |

DC     AC     DC

3V     SYS
13mA   fo=1575.42MHz

The structure of GPS antenna module

# 4. Measurement Method

## 4.1. Chip

a) Reflection Co-efficient Measurement

    a. Equipment: Network Analyzer (Aglient E5071A)(Fig.1)

    b. Item $S_{11}$ Log Chart(Return Loss) $S_{11}$ Smith Chart (impedance)
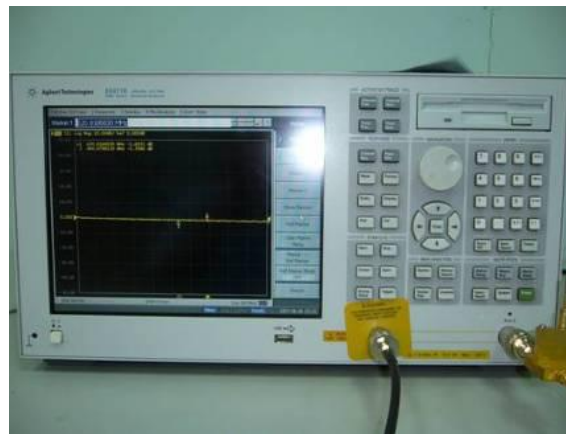


Figure 1. Network Analyzer

a) Pattern Measurement

    a. Equipment: Anechoic Chamber (Fig. 2), Network Analyzer (Aglient E8753ES)

    b.Item: Gain Pattern, Axial ratio
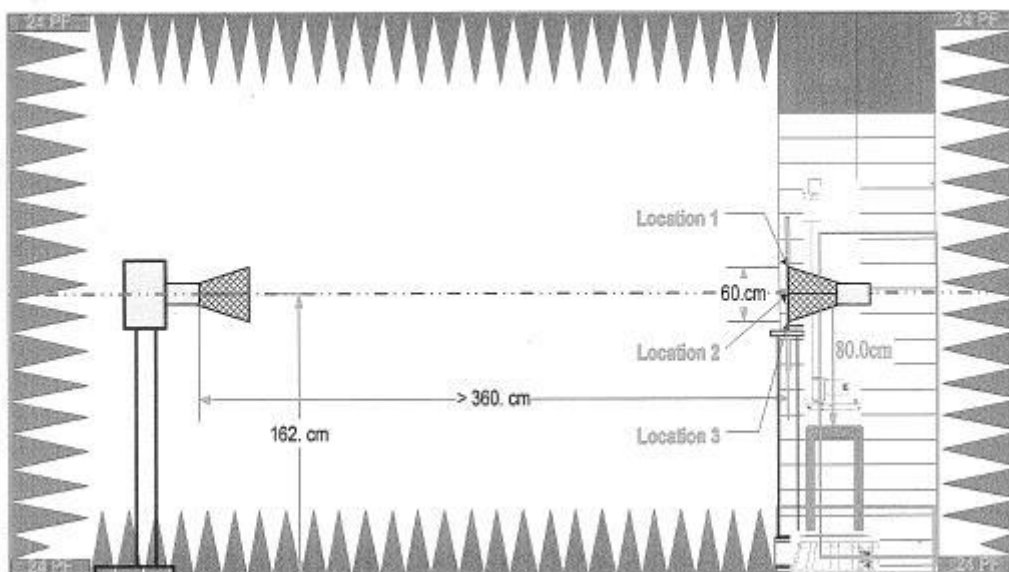


Figure 2. Quiet Room
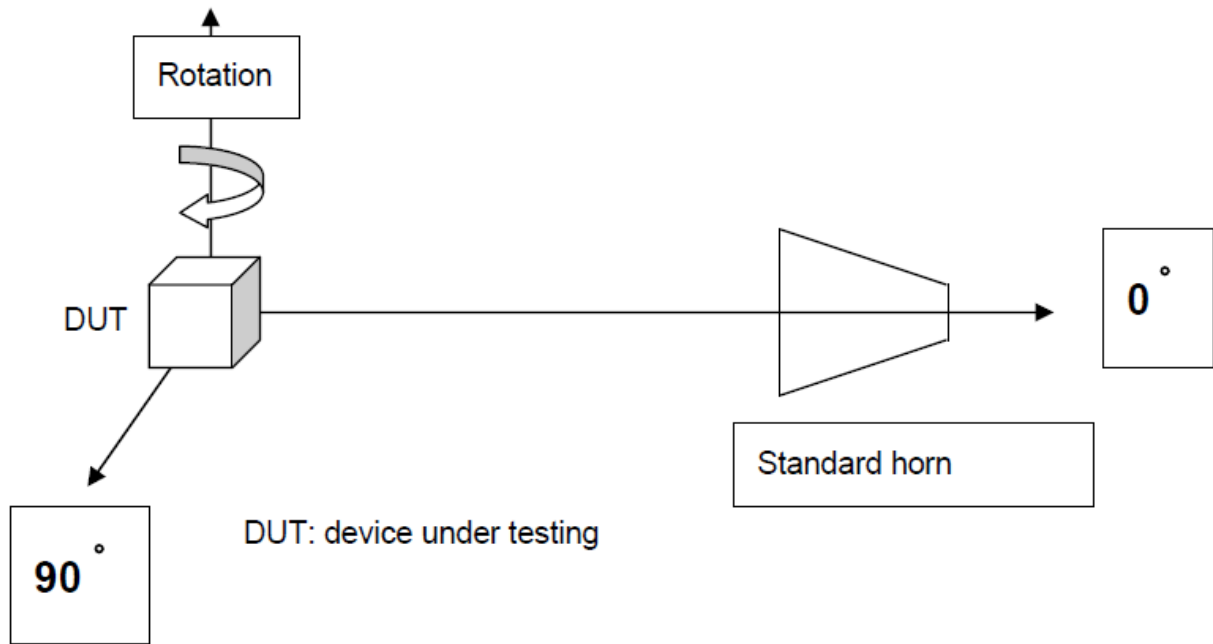
Figure 3. Schematic of measurement set-up

## 4.2. LNA

### a) Parameter Measurement
   a.  Equipment: Network Analyzer (Aglient E5071B)(Fig.4)

   b.  $S_{11}$, $S_{12}$, $S_{21}$, $S_{22}$
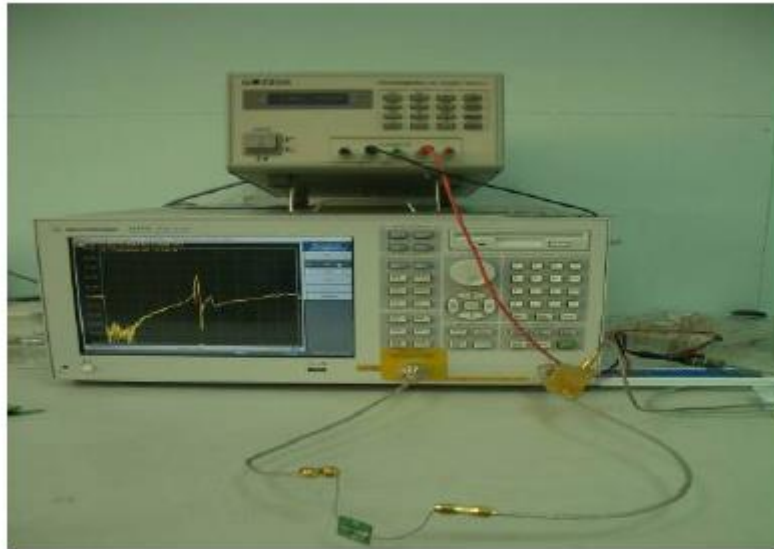


Figure 4. Network Analyzer

### a) Noise Figure Measurement
   a.  Equipment: Noise Meter (Aglient E4407B)(Fig.5)

   b.  Environment: Shielding Room (Fig. 6)

   c.  Item: N.F (Noise Figure)



Fig. 5 Noise Meter



Fig.6 Shielding Room

# 5. Measured Values

## 5.1. Chip

### 5.1.1. $S_{11}$ Smith Chart (Impedance)
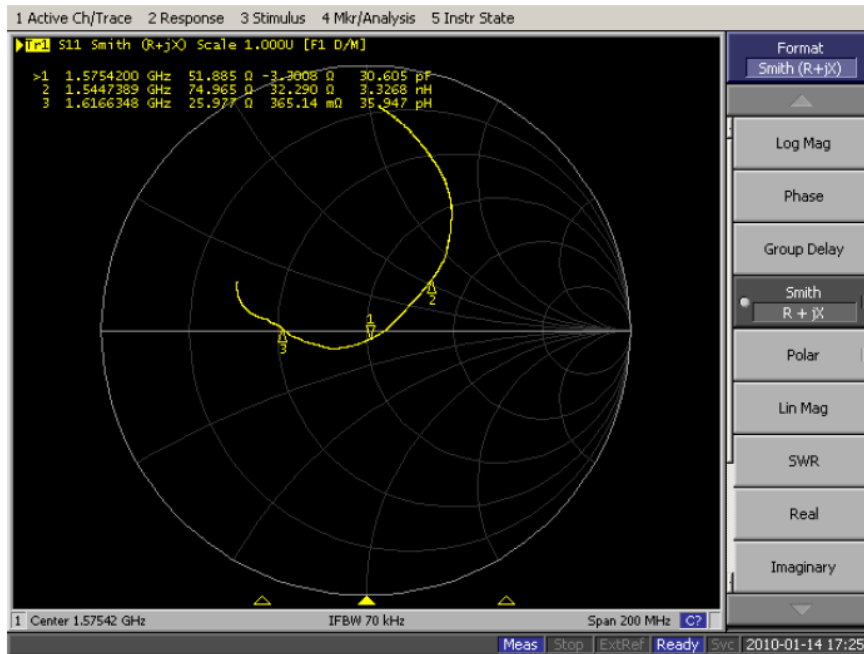


### 5.1.2. $S_{11}$ Log Chart (Return Loss): Bandwidth $S_{11}$ <-10dB
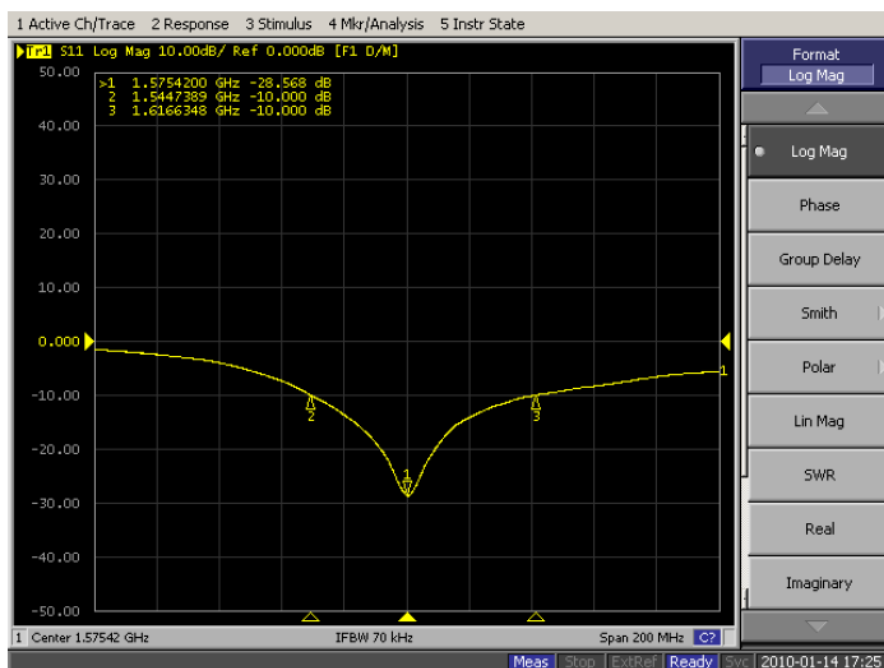
### 5.1.3. S$_{11}$ VSR
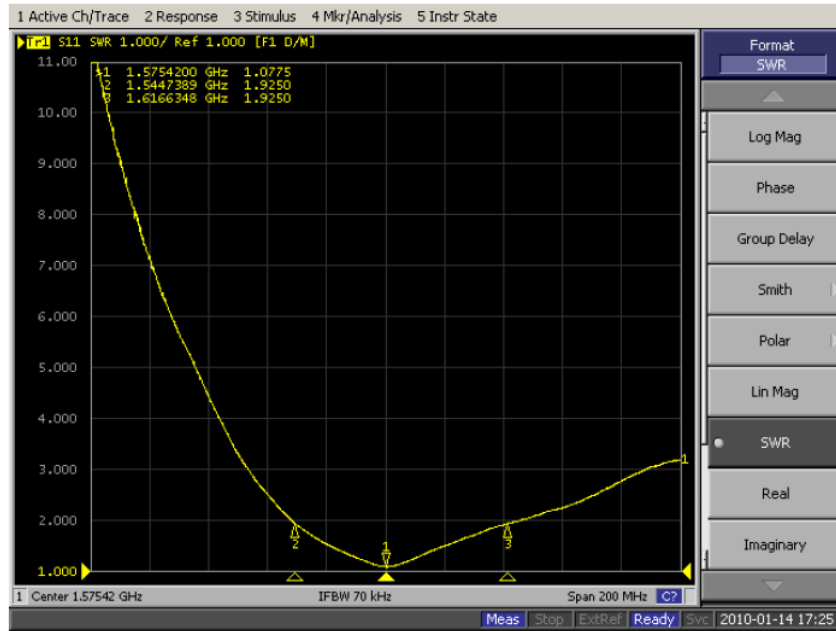


### 5.1.4. Radiation Patterns (Excluding LNA)

## XZ-plane
Far-field amplitude of XZ.nsi
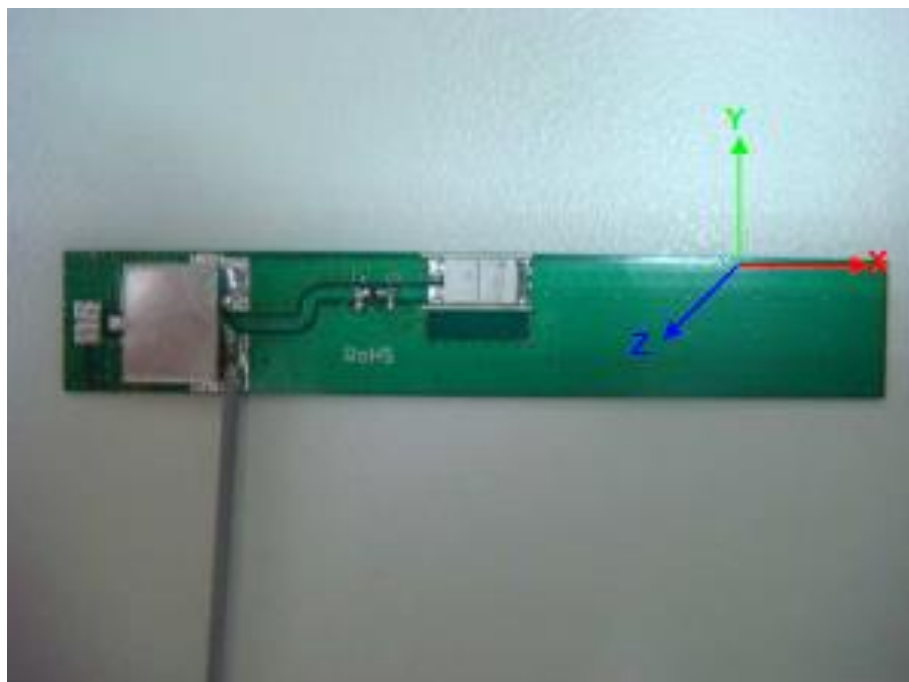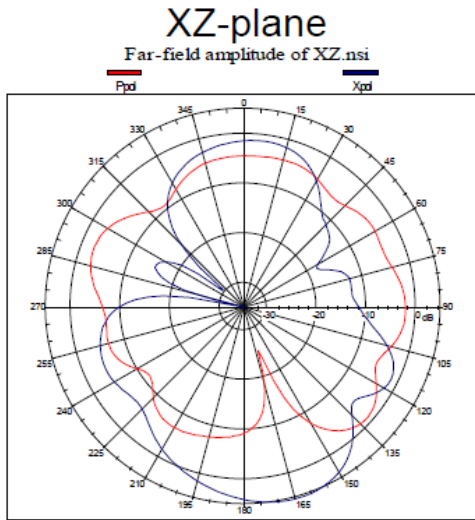


(Peak Gain =4.92 dBi, Average Gain =-1.62 dBi )

## YZ-plane
Far-field amplitude of YZ.nsi
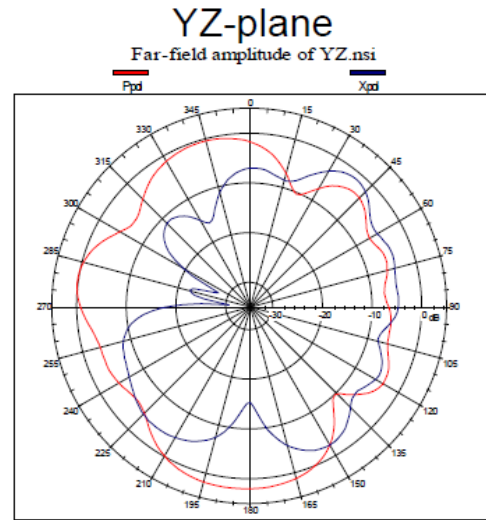


(Peak Gain =1.89dBi, Average Gain =-1.57dBi )

## XY-plane
Far-field amplitude of XY.nsi
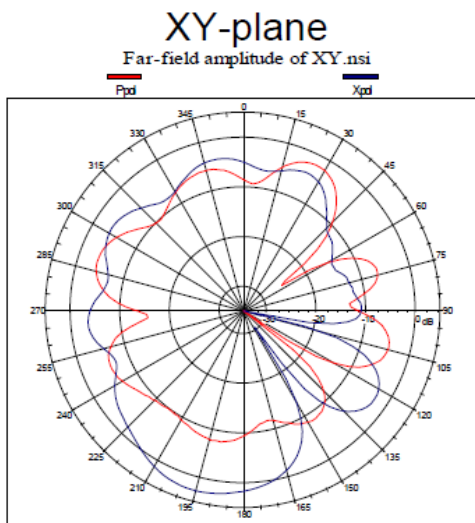


(Peak Gain =2.75dBi, Average Gain =-3.44 dBi )

| Plane | XZ | YZ | XY |
|---|---|---|---|
| Average Gain | -1.62 | -1.57 | -3.44 |
| Peak Gain | 4.92 | 1.89 | 2.75 |

Note: Total Gain = The total power of radiation pattern (exclude LNA Gain from GP8) + LNA Gain - cable

loss (1.1dB/m)

## 5.2. Low Noise Amplifier (LNA)

### 5.2.1. $S_{11}$ (network analyzer input power -40dB)
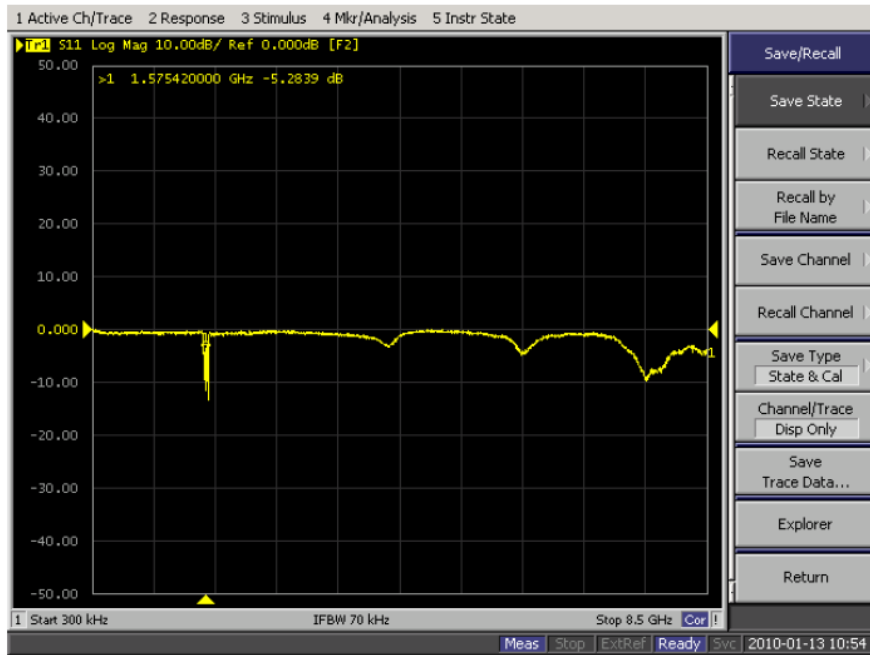


### 5.2.2. $S_{12}$ (network analyzer input power -40dB)
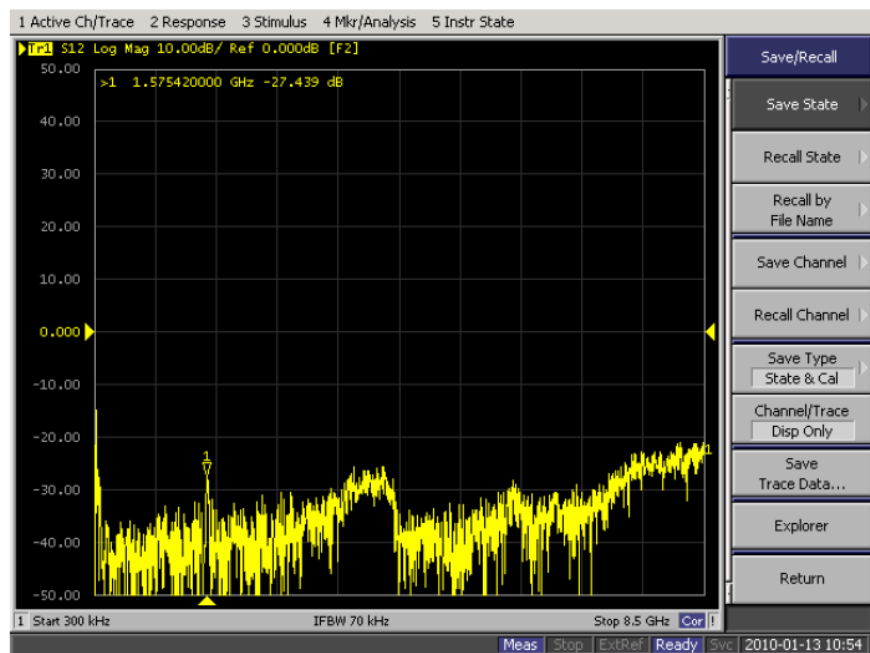
### 5.2.3. $S_{21}$ (Gain) (network analyzer input power -40dB)
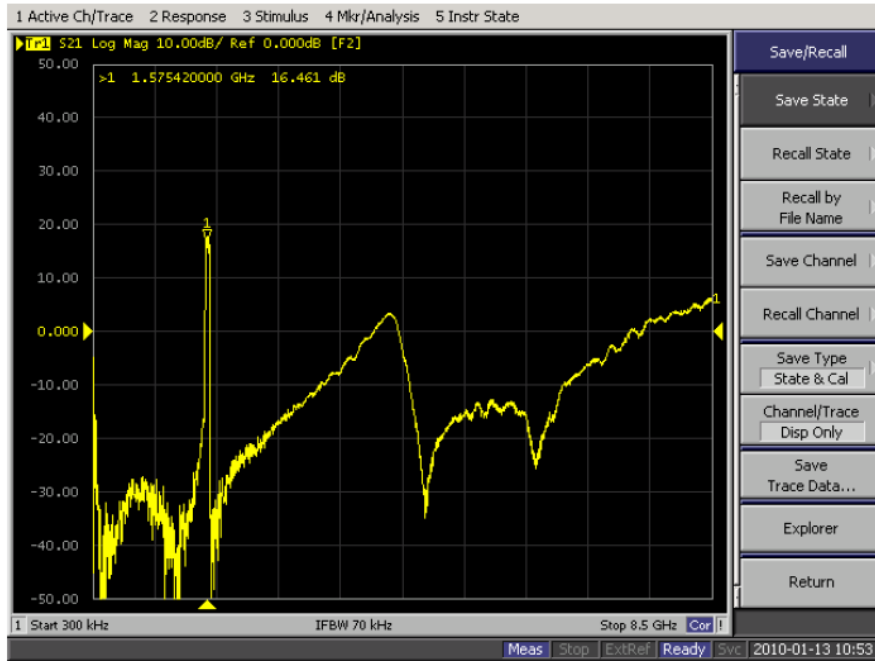


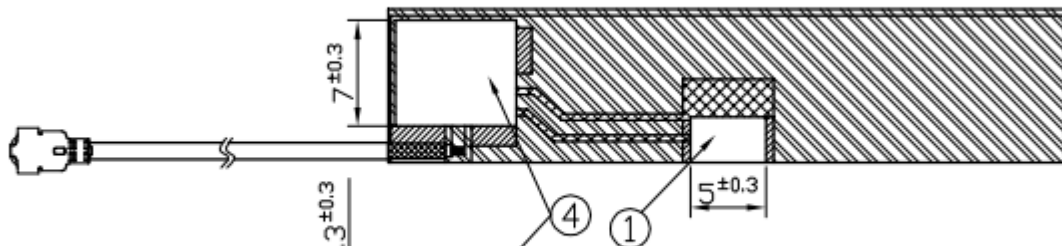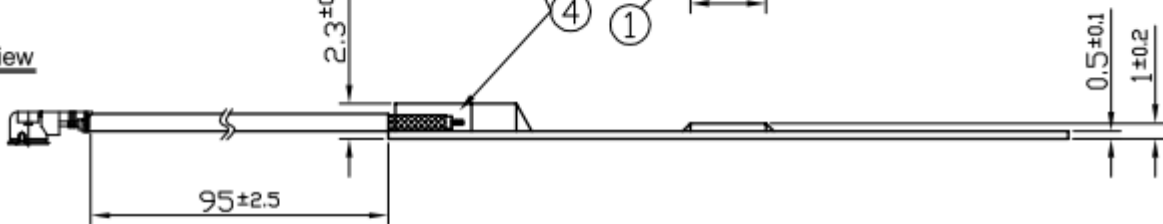### 5.2.4. $_{22}$ (Gain) (network analyzer input power -40dB)
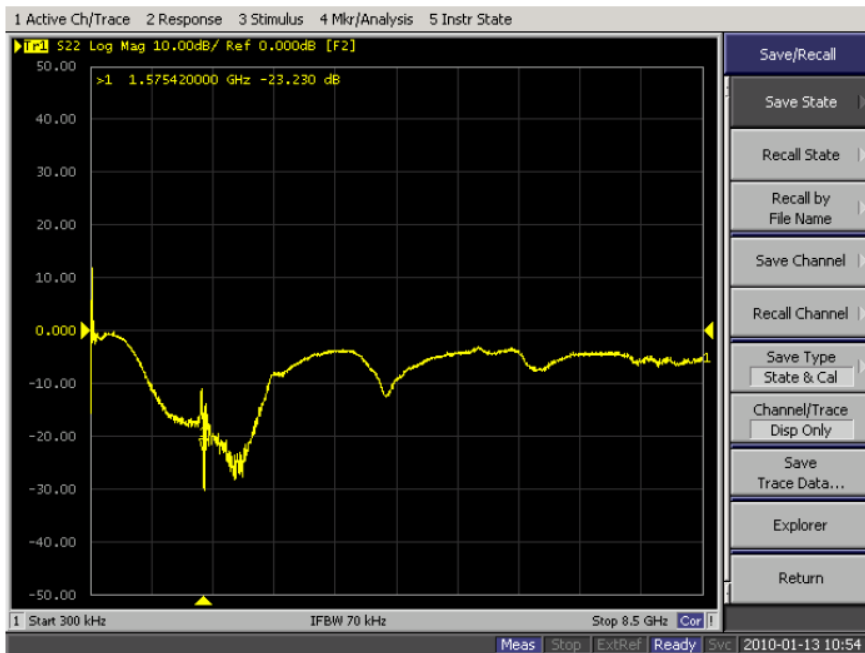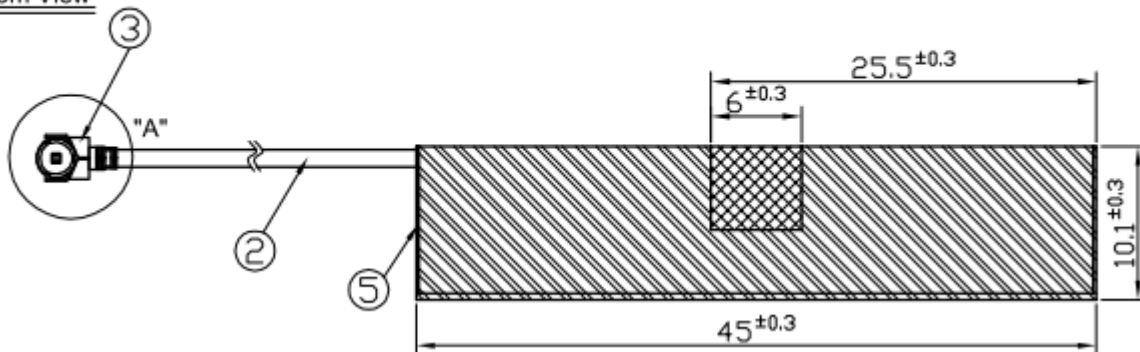
## 5.3. Noise Figure
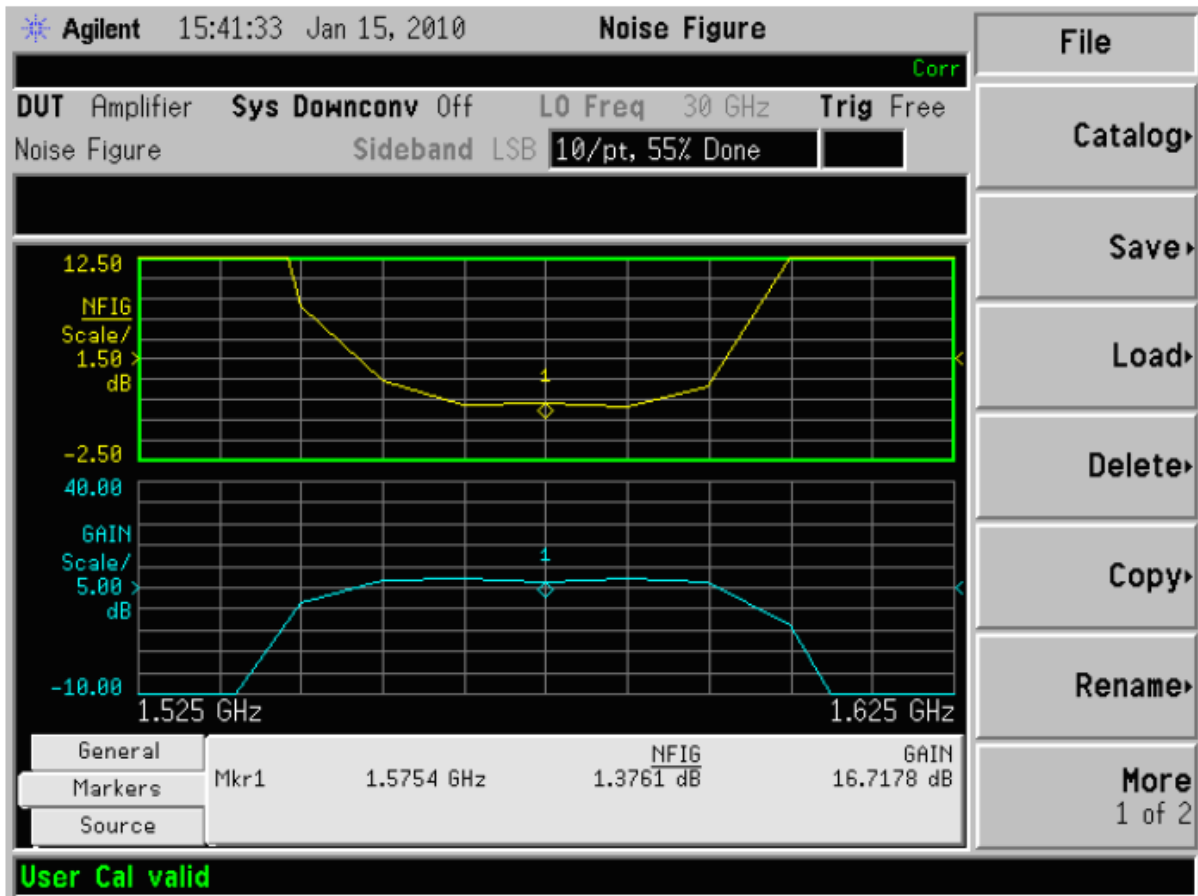
# 6. Drawing

Top View

Side View

Bottom View



| 1 | Chip Antenna: 5*3*0.5mm |
|---|---|
| 2 | Cable Ø1.13 L=95±5mm |
| 3 | IPEX MHFI(U.FL) |
| 4 | Shielding Case |
| 5 | PCB |

Note:
1. Soldered Area
2. Solder Mask Area(Green)
3. Ground Clearance