

# **HT-6766BEM,HT-6766BDM,HT-6766BE**

## **Antenna Report**

V1.0

# Report Change List



| Version | Change description | Author | date       |
|---------|--------------------|--------|------------|
| V1.0    | First version      | Wen    | 2024.08.04 |
|         |                    |        |            |
|         |                    |        |            |
|         |                    |        |            |
|         |                    |        |            |
|         |                    |        |            |

## CONTENTS

- ◆ **Purpose & Environment**
- ◆ **DUT Antenna**
- ◆ **Return Loss and Isolation**
- ◆ **2D&3D Radiation Pattern**
- ◆ **Peak Gain and Efficiency**
- ◆ **Summary**

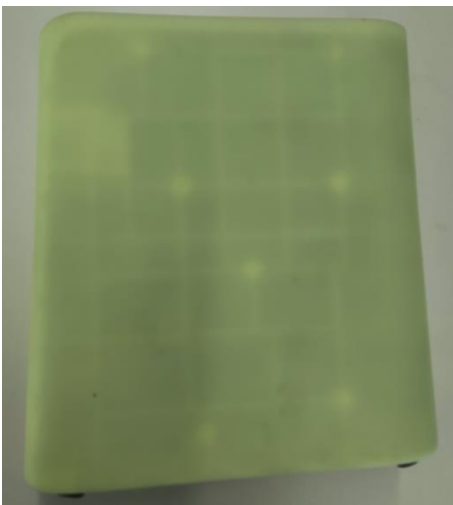
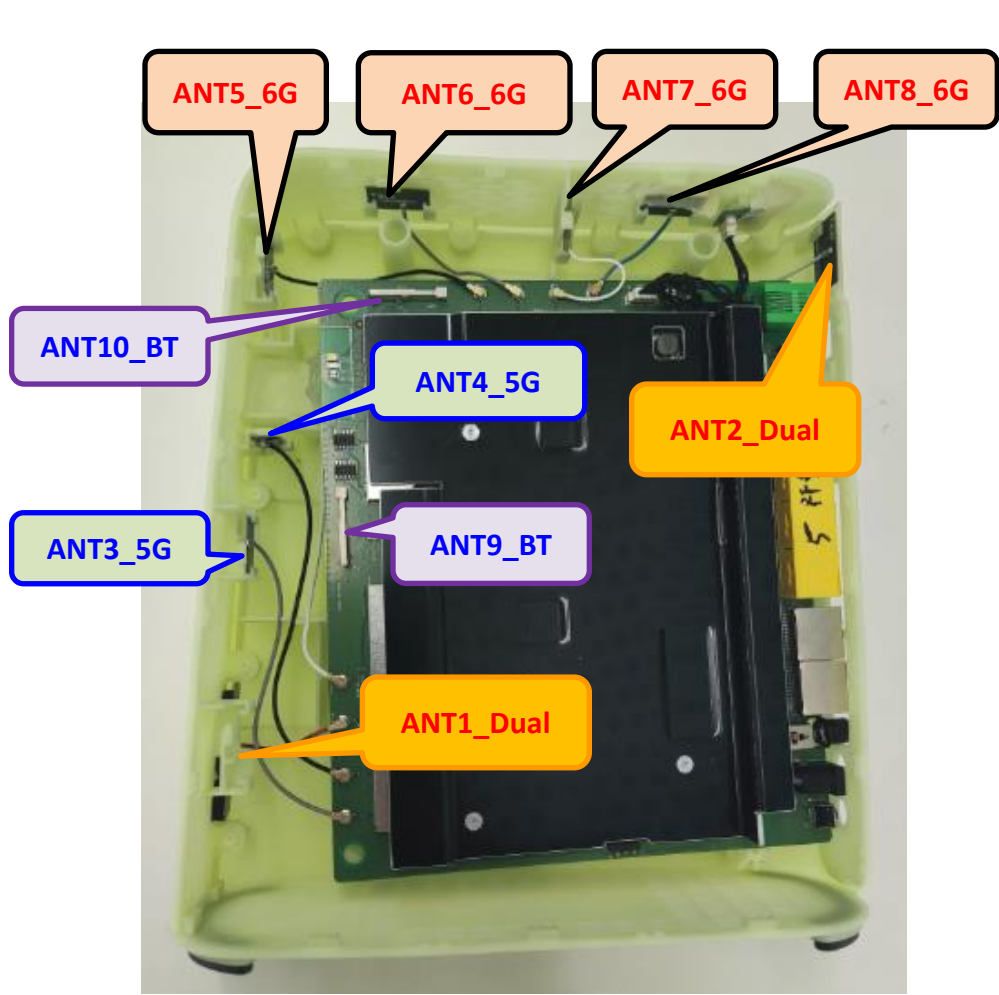
## Purpose

- Meet the electrical performance index ;
- Confirm the antenna scheme to meet the design requirements;

## Environment

- Test Condition: the network analyzer(E5071C) and SATIMO microwave anechoic chamber
- Passive measurement results are presented mock up

# Antenna Model



| ANT NO.   | Frequency (GHz)   |
|-----------|-------------------|
| ANT1-Dual | 2.4-2.5&5.15-5.85 |
| ANT2-Dual | 2.4-2.5&5.15-5.85 |
| ANT3      | 5.15-5.85         |
| ANT4      | 5.15-5.85         |
| ANT5      | 5.91-7.125        |
| ANT6      | 5.91-7.125        |
| ANT7      | 5.91-7.125        |
| ANT8      | 5.91-7.125        |
| ANT9-BT   | 2.4-2.5           |
| ANT10-BT  | 2.4-2.5           |

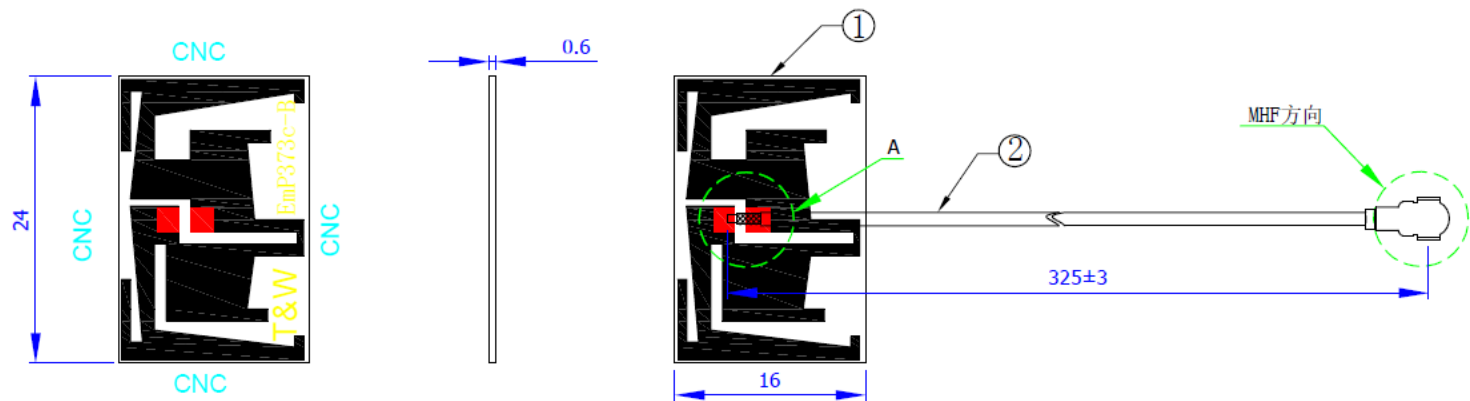
Note: 6G is only for model HT-6766BEM

Antenna manufacturer :  
ShangHai Signal Plus Technology Co.,Ltd.

Antenna manufacturer's address:  
Room 603, Building 30, No. 69, Guqing Road, Xuhui District,  
Shanghai.

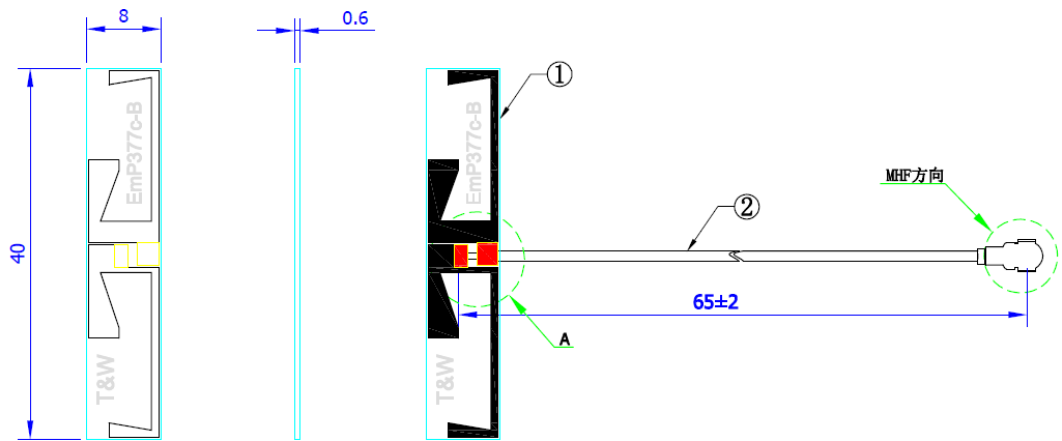
# DUT Antenna

ANT1-Dual



Antenna dimension:EmP373c-B-I325(W)  
(Remark: for White, the RF cable is 325mm)

ANT2-Dual

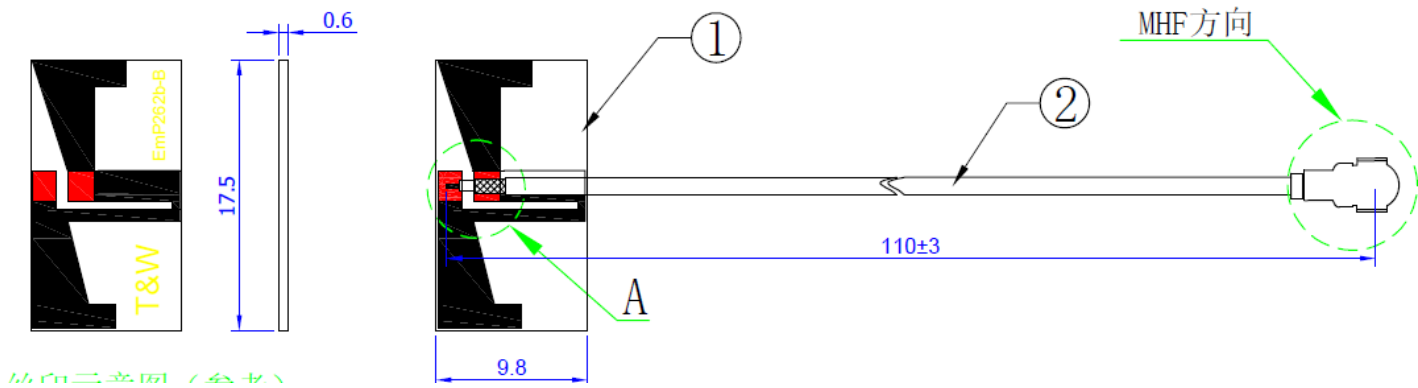


Antenna dimension:EmP377c-B-I65(R)  
(Remark: for Red, the RF cable is 65mm)

# DUT Antenna

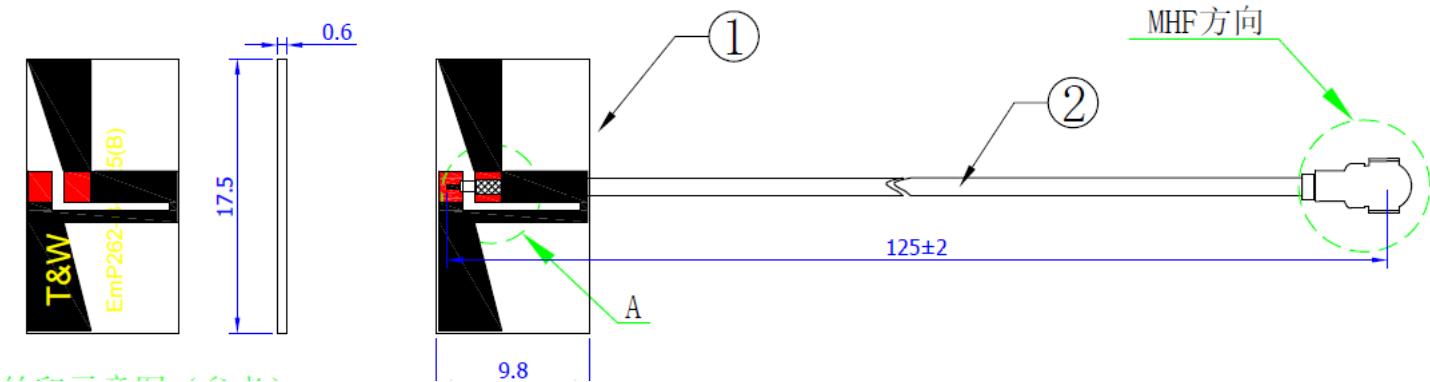


ANT3-5G



Antenna dimension:EmP262b-B-I110(G)  
(Remark: for Gray, the RF cable is 110mm)

ANT4-5G



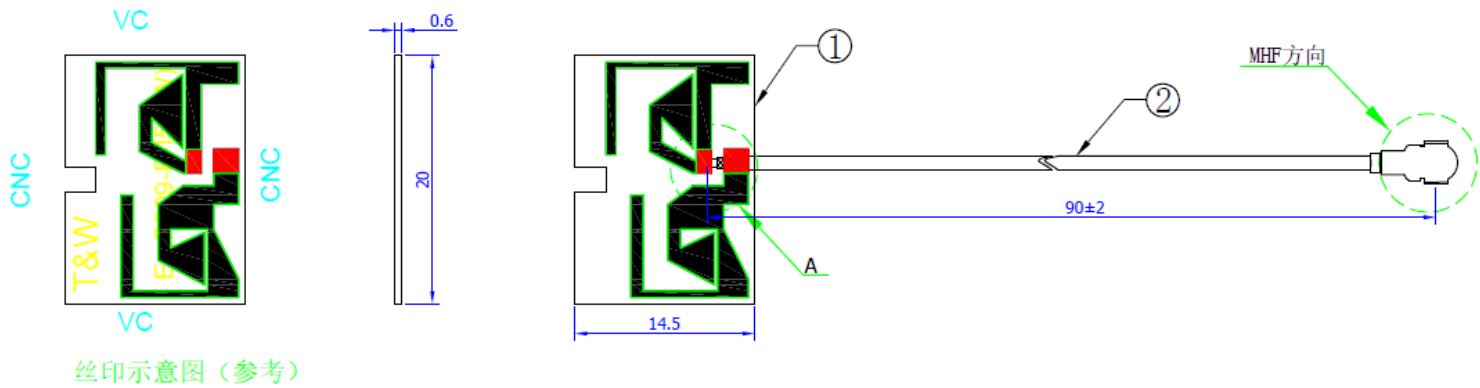
Antenna dimension:EmP262-B-I125(B)  
(Remark: for Black, the RF cable is 125mm)



# DUT Antenna

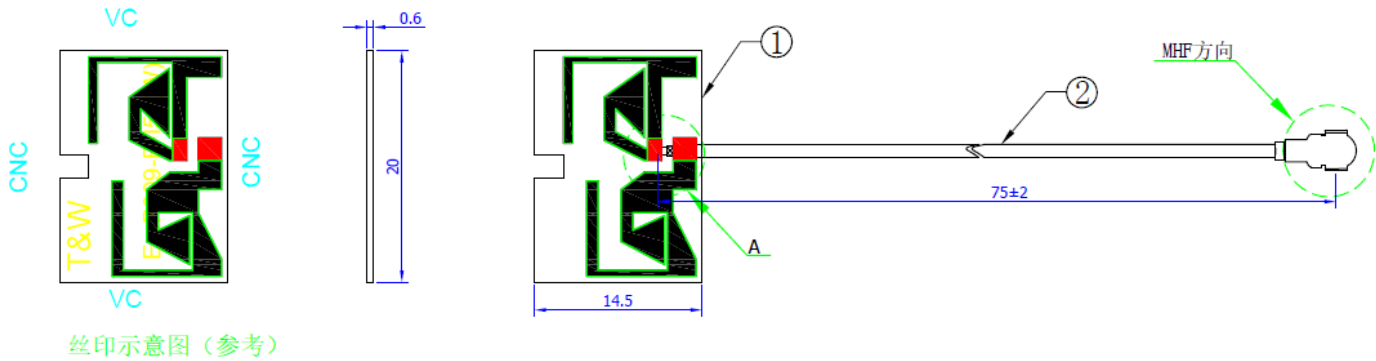


## ANT5-6G



Antenna dimension:EmP609-B-I90(B)  
(Remark: for Black, the RF cable is 90mm)

## ANT6-6G



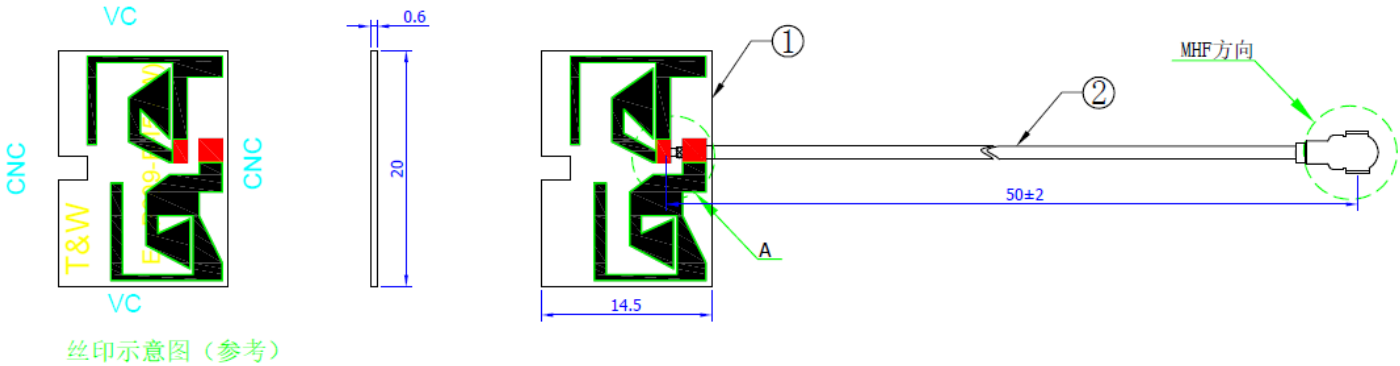
Antenna dimension:EmP609-B-I75(G)  
(Remark: for Gray, the RF cable is 75mm)

Note: 6G is only for model HT-6766BEM

# DUT Antenna

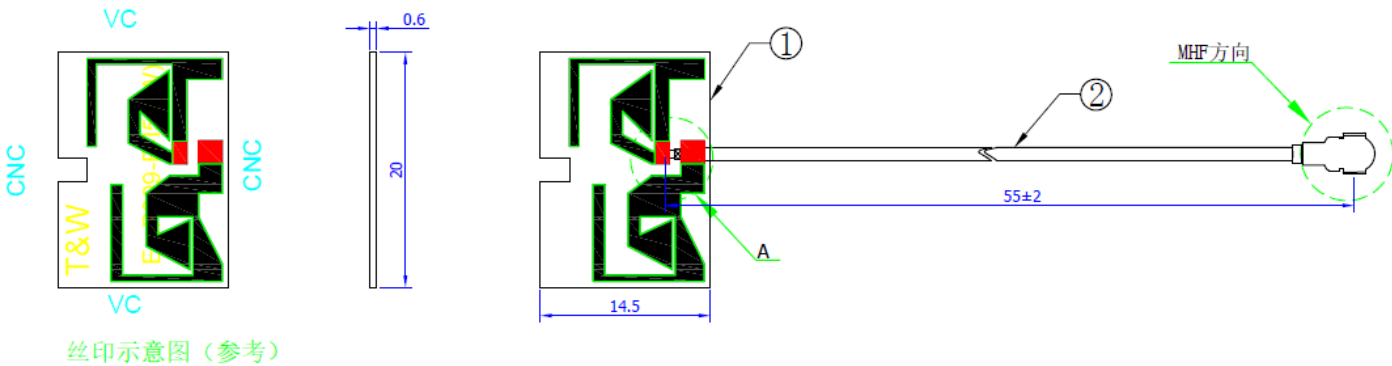


## ANT7-6G



Antenna dimension:EmP609-B-I50(W)  
(Remark: for White, the RF cable is 50mm)

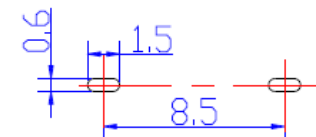
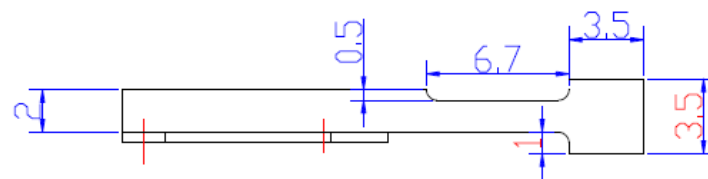
## ANT8-6G



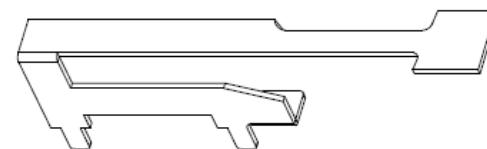
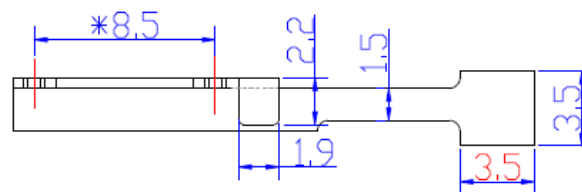
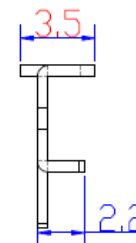
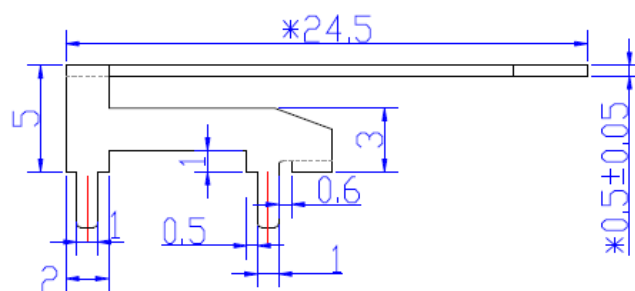
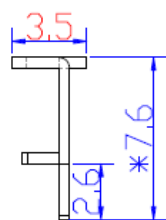
Antenna dimension:EmP609-B-I55(Blue)  
(Remark: for Blue, the RF cable is 55mm)

**Note: 6G is only for model HT-6766BEM**

# DUT Antenna



PCB参考定位结构图

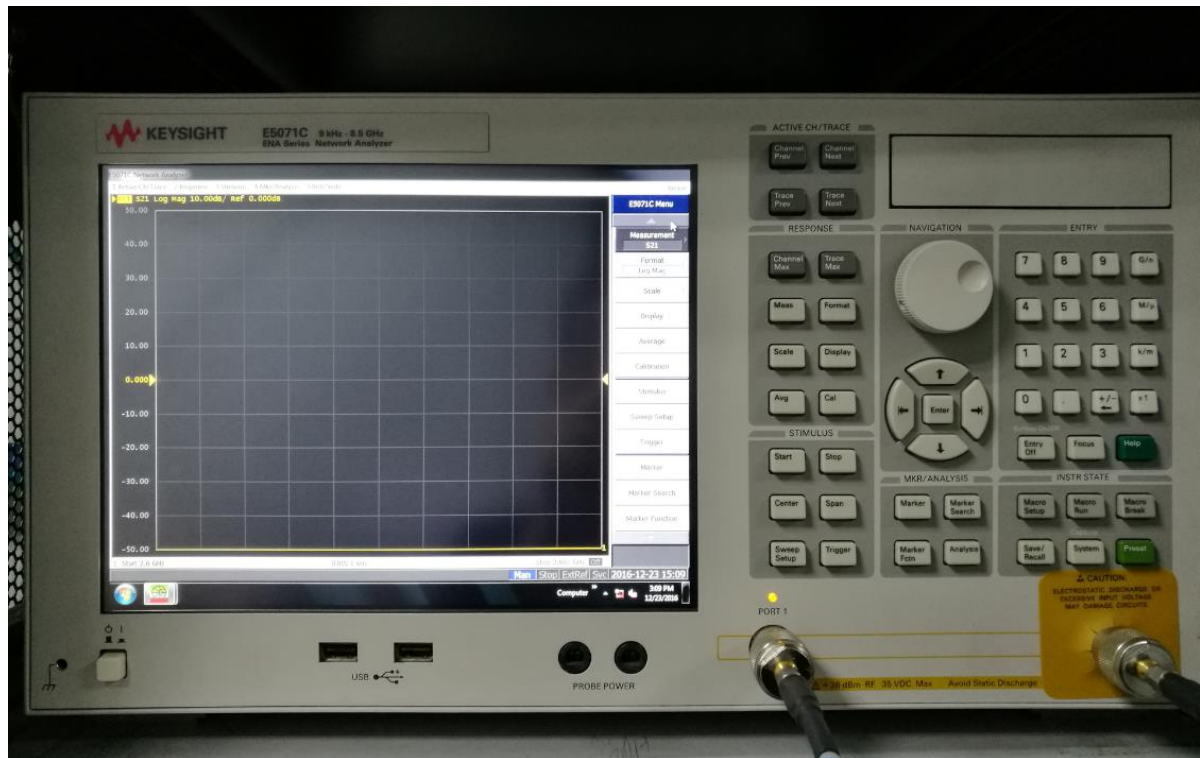


Antenna dimension:EmW101-N

ANT9-BT  
ANT10-BT

# Return Loss and Isolation

## Measurement Condition

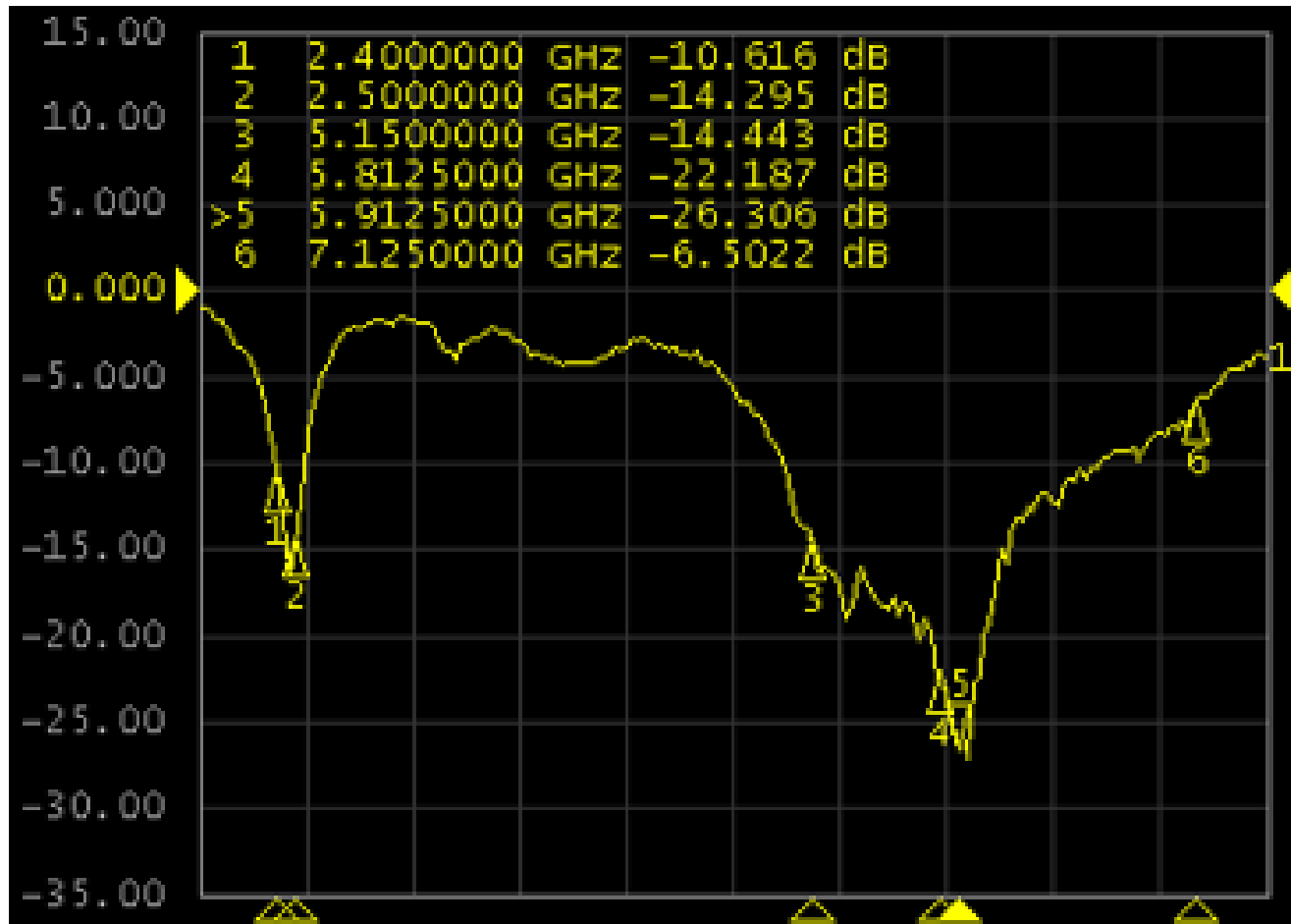


The network Analyzer

# Return loss

**ANT1-2G** (2.4-2.5GHz&5.125-5.8125GHz)

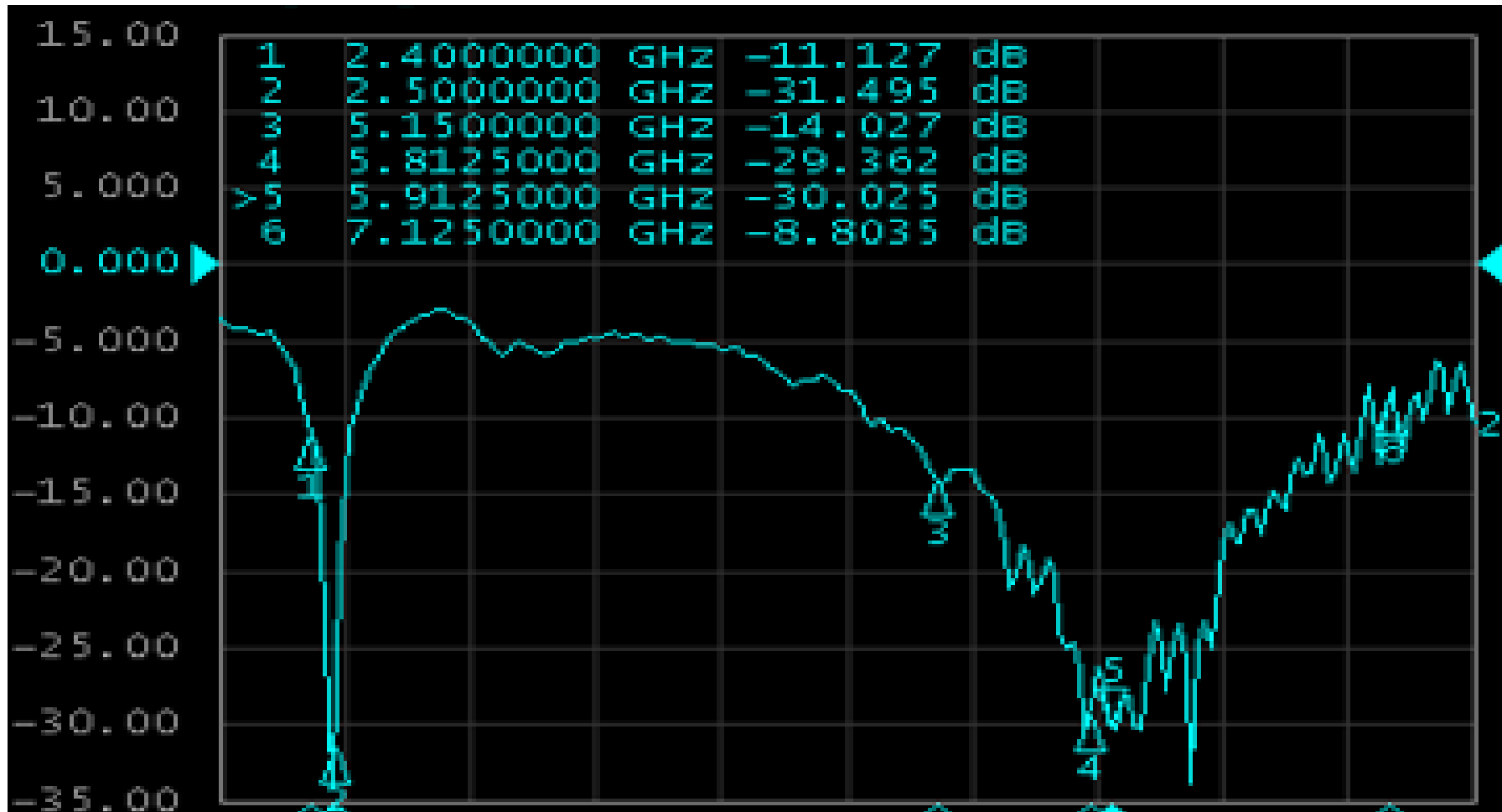
S11     Return loss 2.4G < -10dB, 5G < -22dB



# Return loss

**ANT2-5G** (2.4-2.5GHz&5.15-5.8125GHz)

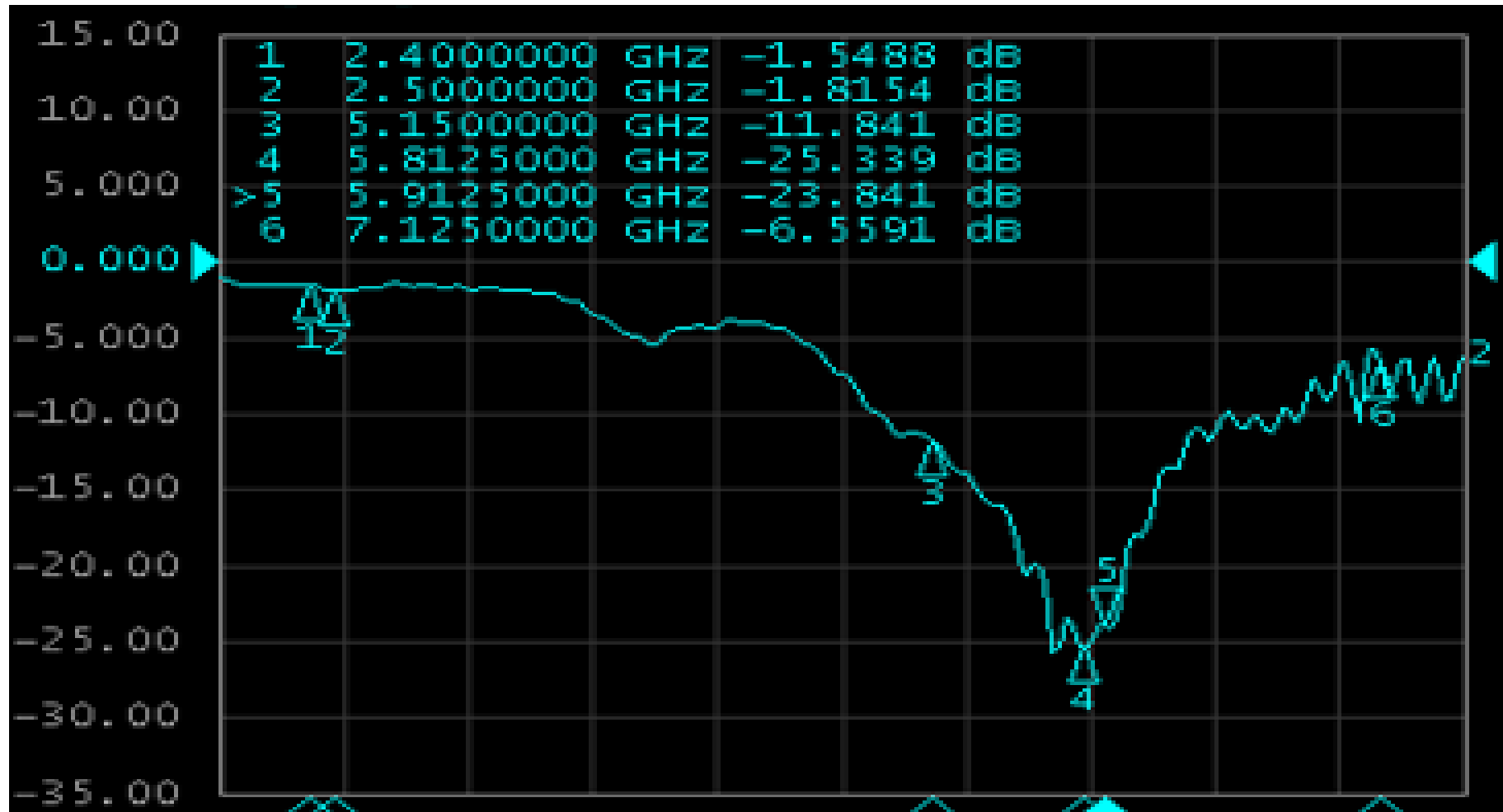
S22      Return loss 2.4G<-11dB, 5G<-29dB



# Return loss

**ANT3-5G** (5.15-5.8125GHz)

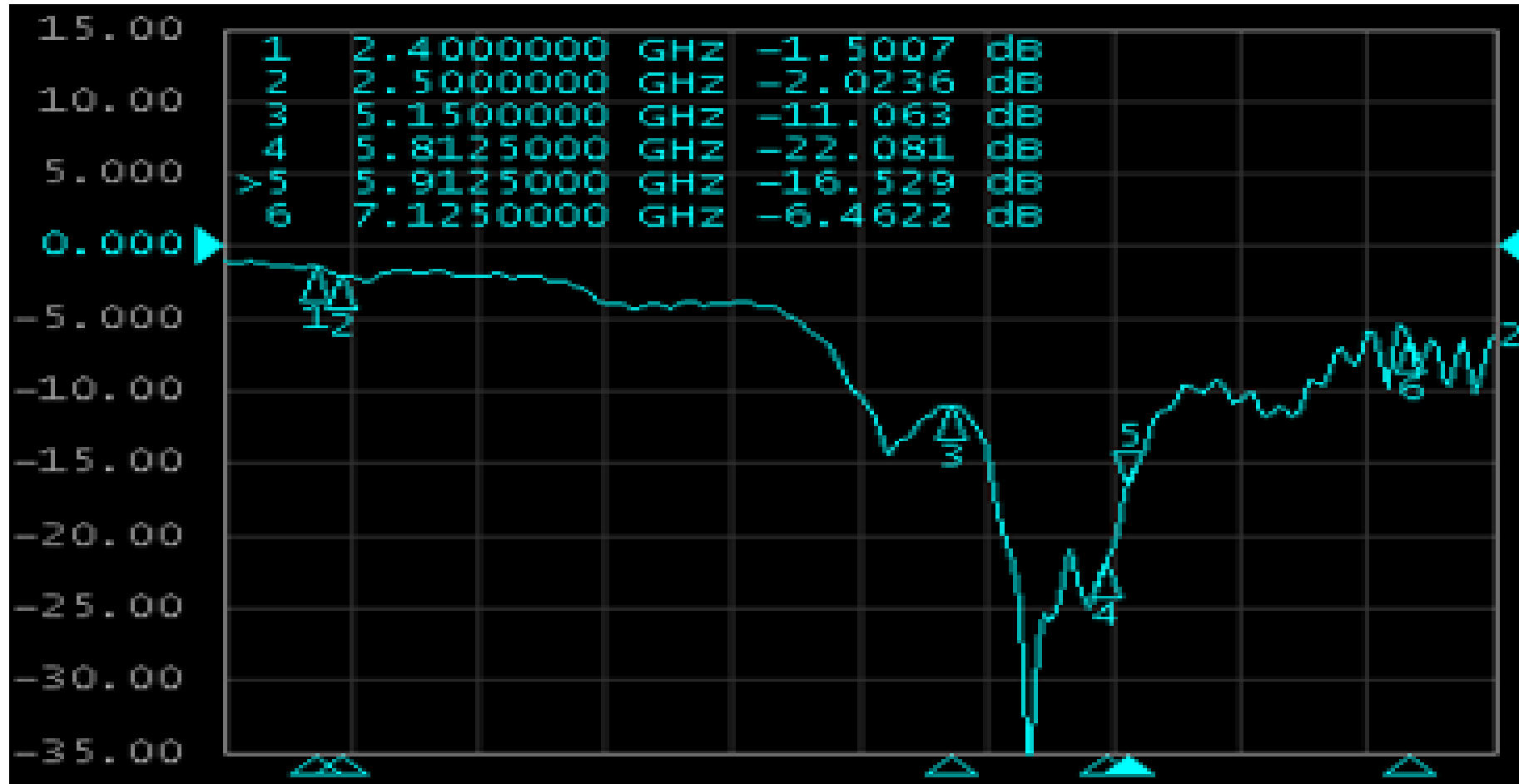
S33 Return loss <-11dB@5G



# Return loss

**ANT4-2G** (5.15-5.8125GHz)

S44      Return loss <-15dB@5GHz



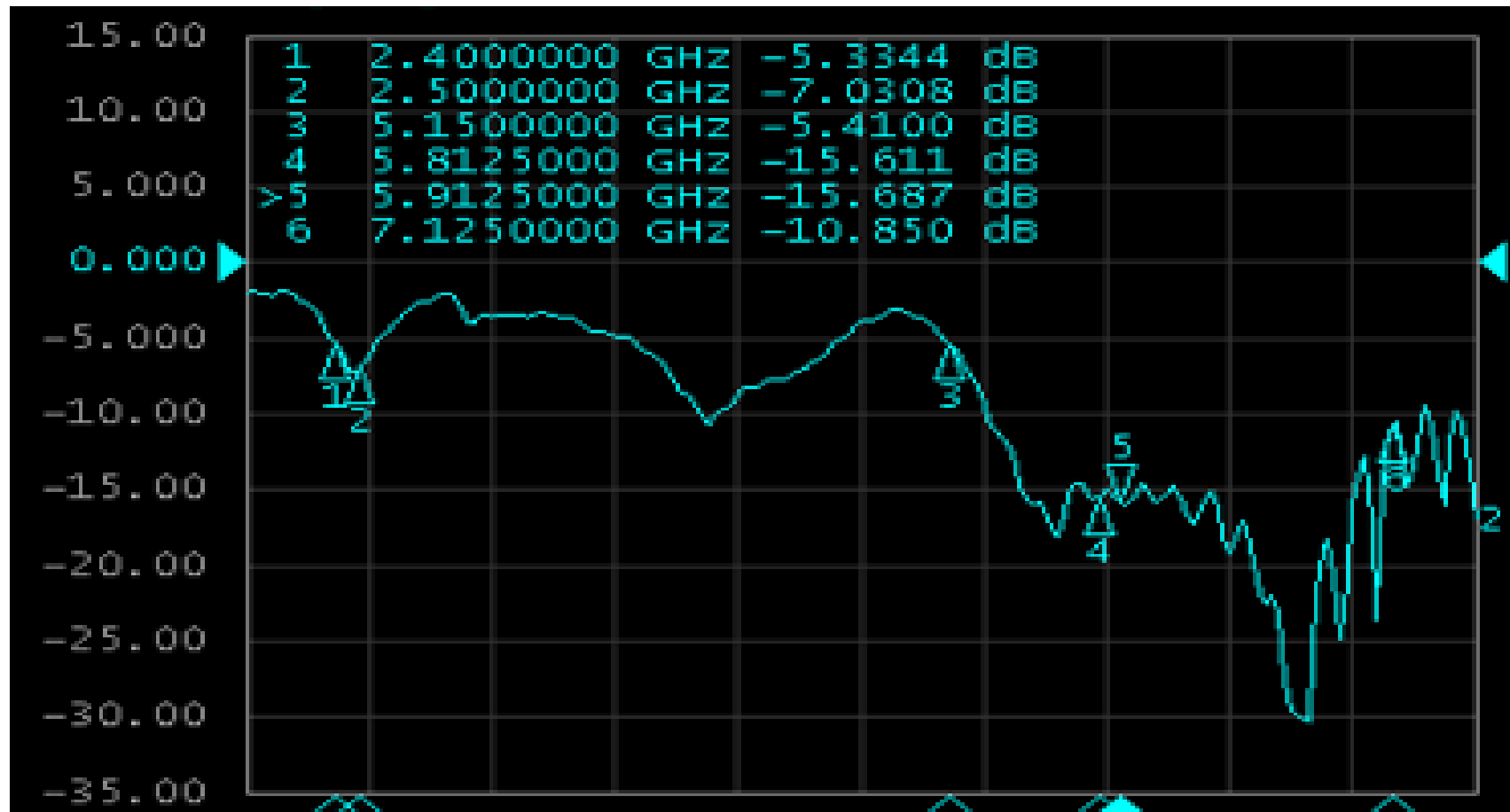


# Return loss

**ANT5-6G** (5.9125-7.125GHz)

S55

Return loss <-15dB



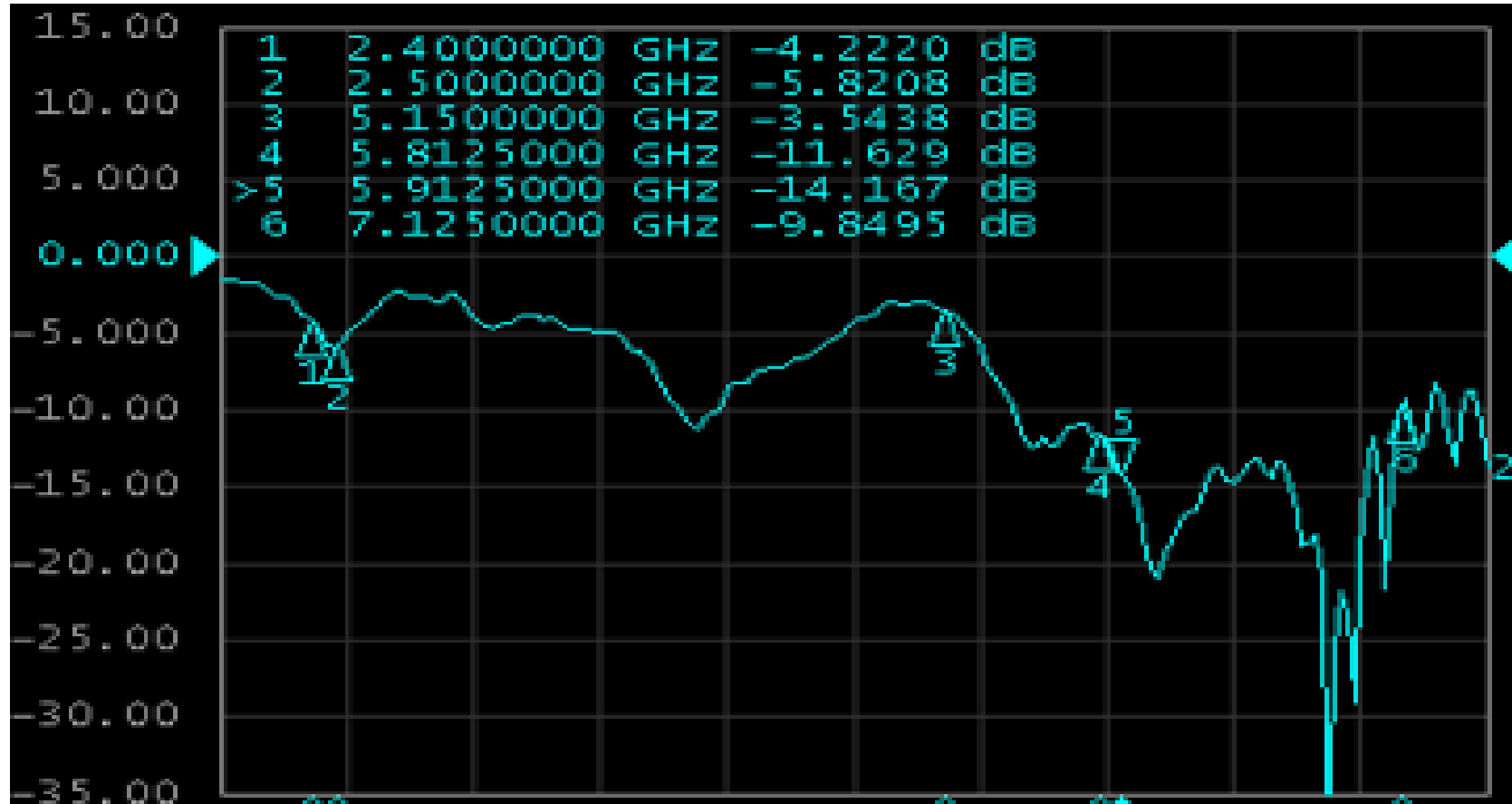
Note: 6G is only for model HT-6766BEM

# Return loss

## ANT6-6G ( 5.9125-7.125GHz)

S66

Return loss <-11dB

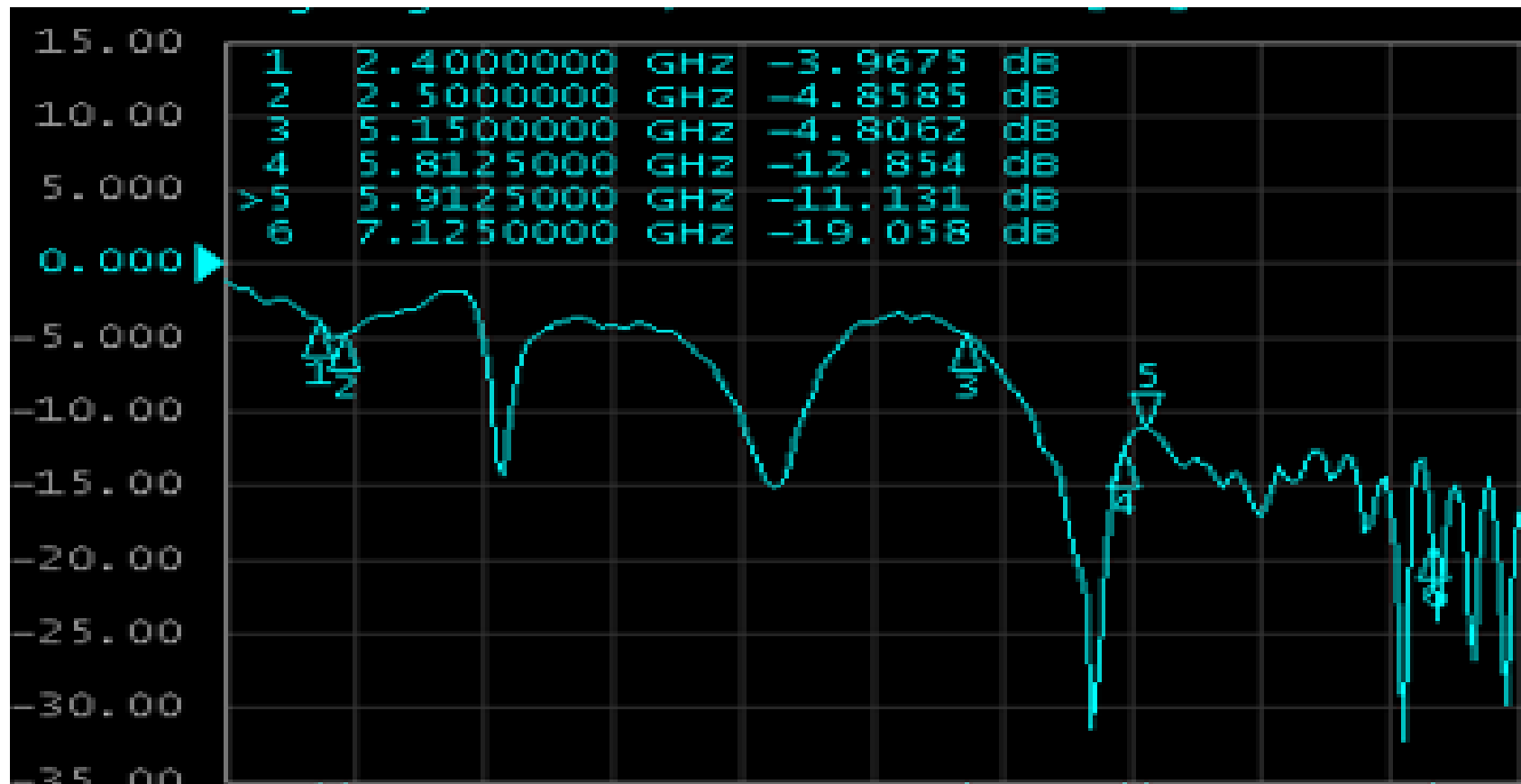


Note: 6G is only for model HT-6766BEM

# Return loss

**ANT7-6G** ( 5.9125-7.125GHz)

S77      Return loss <-11dB

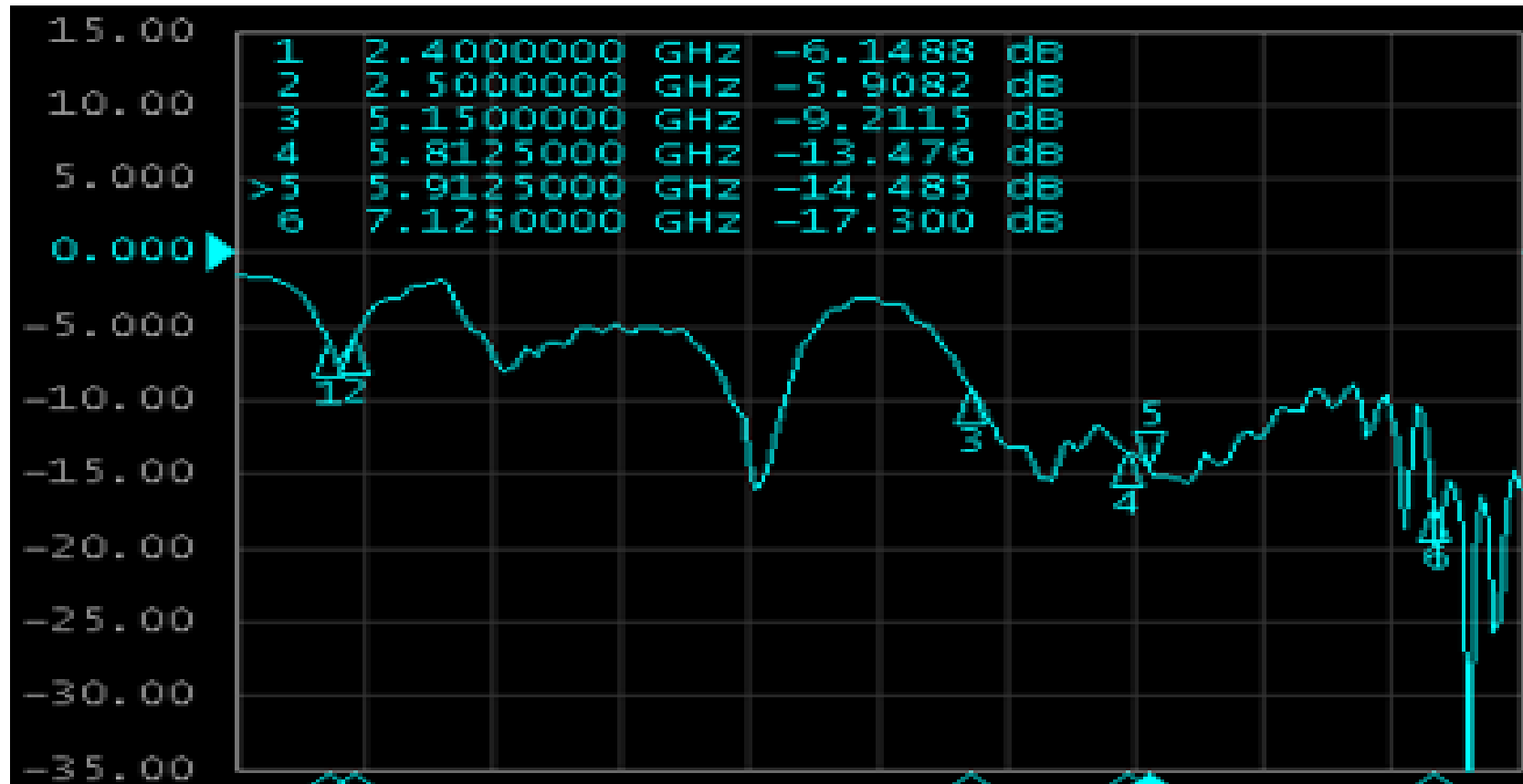


Note: 6G is only for model HT-6766BEM

# Return loss

**ANT8-6G** ( 5.9125-7.125GHz)

S88      Return loss <-14dB

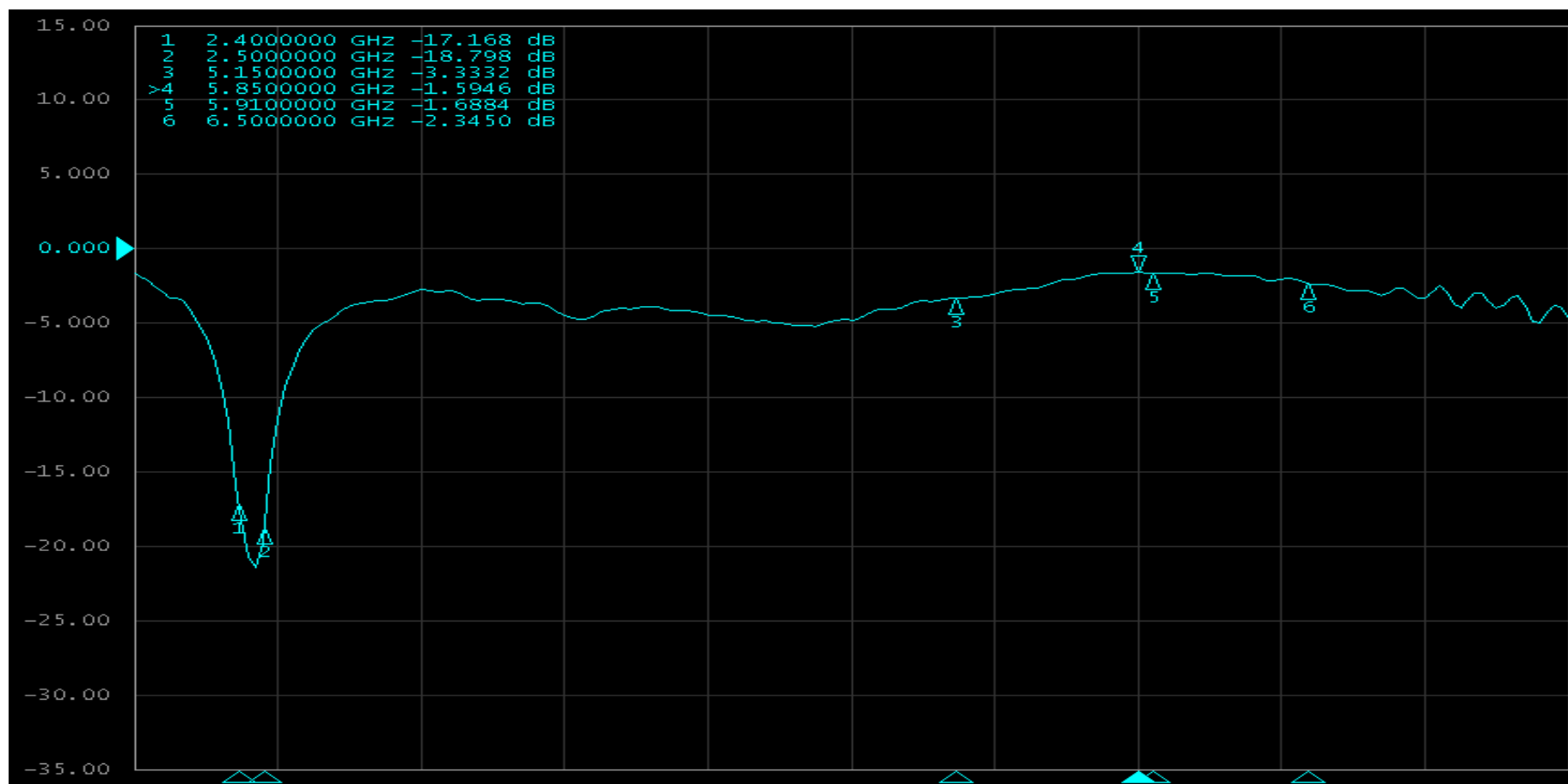


Note: 6G is only for model HT-6766BEM

# Return loss

## ANT9-2G (2.4-2.5GHz)

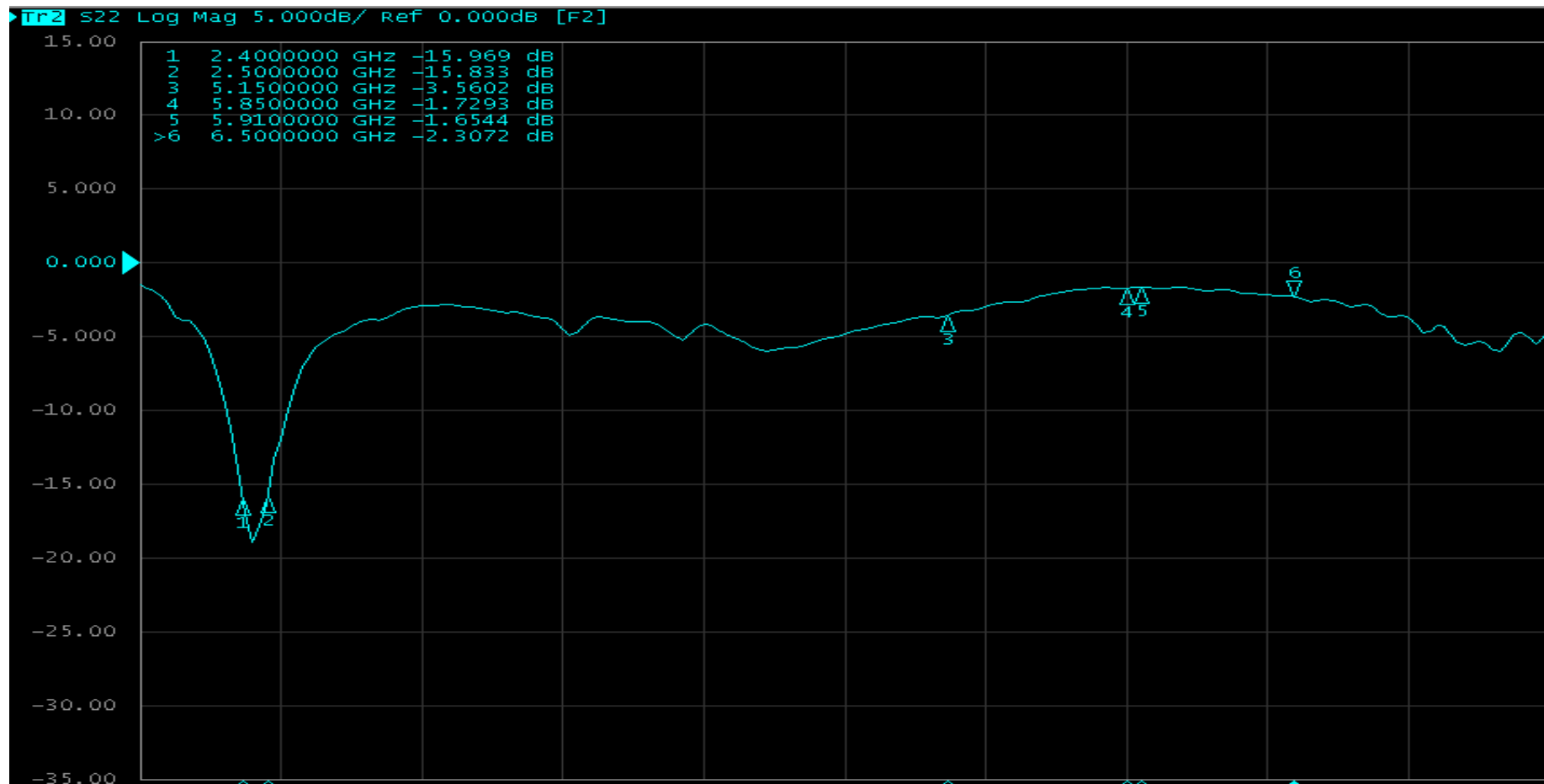
S99 Return loss <-15dB



# Return loss

## ANT10-2G (2.4-2.5GHz)

S10 10      Return loss < -15dB



# Return loss

|                 | Return loss |              |               |
|-----------------|-------------|--------------|---------------|
| Frequency (GHz) | 2.4-2.5GHz  | 5.15-5.85GHz | 5.91-7.125GHz |
| ANT1-Dual       | <-10dB      |              | -             |
| ANT2-Dual       |             |              | -             |
| ANT3-5G         | -           | <-10dB       | -             |
| ANT4-5G         | -           |              | -             |
| ANT5-6G         | -           | -            | <-10dB        |
| ANT6-6G         | -           | -            |               |
| ANT7-6G         | -           | -            |               |
| ANT8-6G         | -           | -            |               |
| ANT9-BT         | <-10dB      | -            | -             |
| ANT10-BT        |             | -            | -             |

- The WIFI 2.4G antenna's Return loss < -10dB;
- The WIFI 5G antenna's Return loss < -10dB;
- The WIFI 6G antenna's Return loss < -10dB;
- The WIFI BT antenna's Return loss < -10dB.

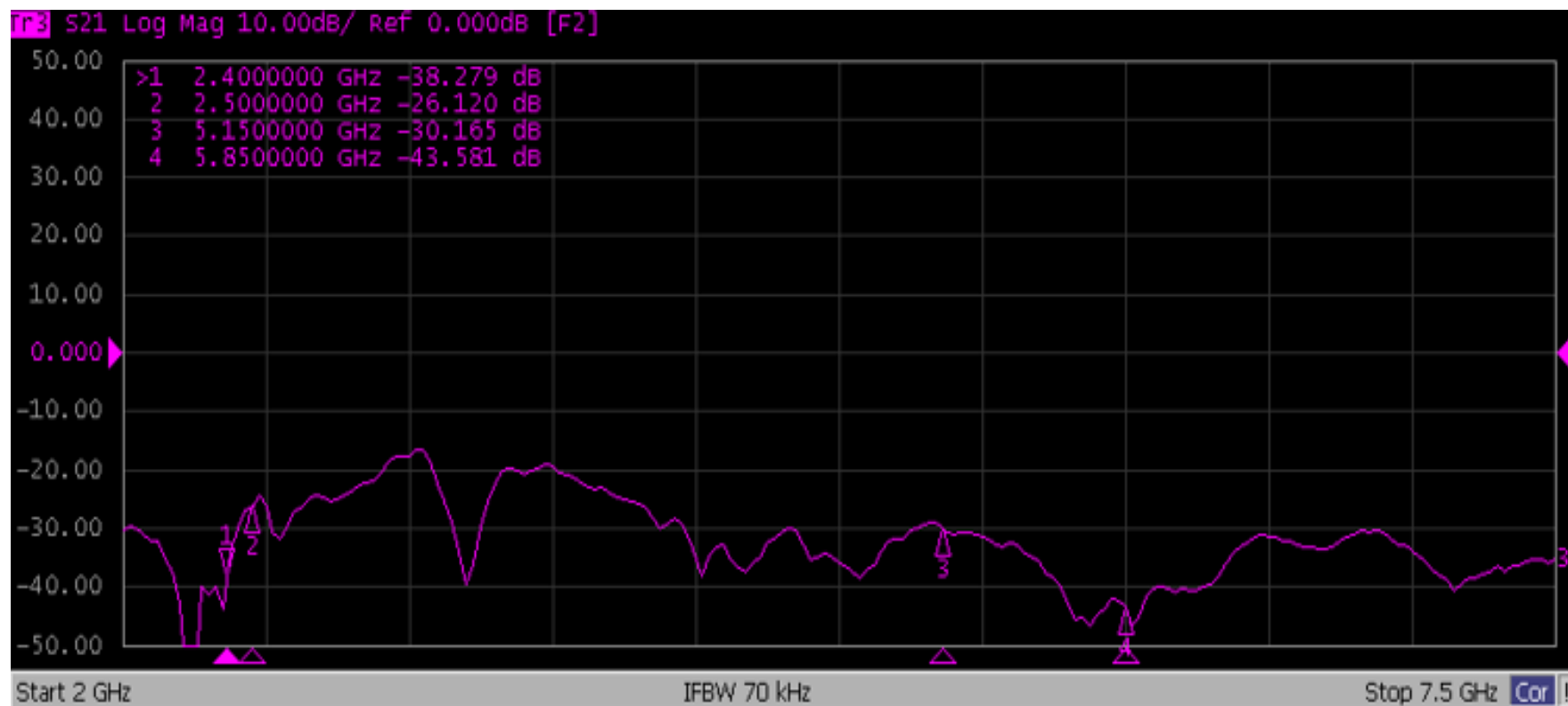
Note: 6G is only for model HT-6766BEM

# Isolation

S21

Isolation < -26dB @ 2G

Isolation < -30dB @ 5G



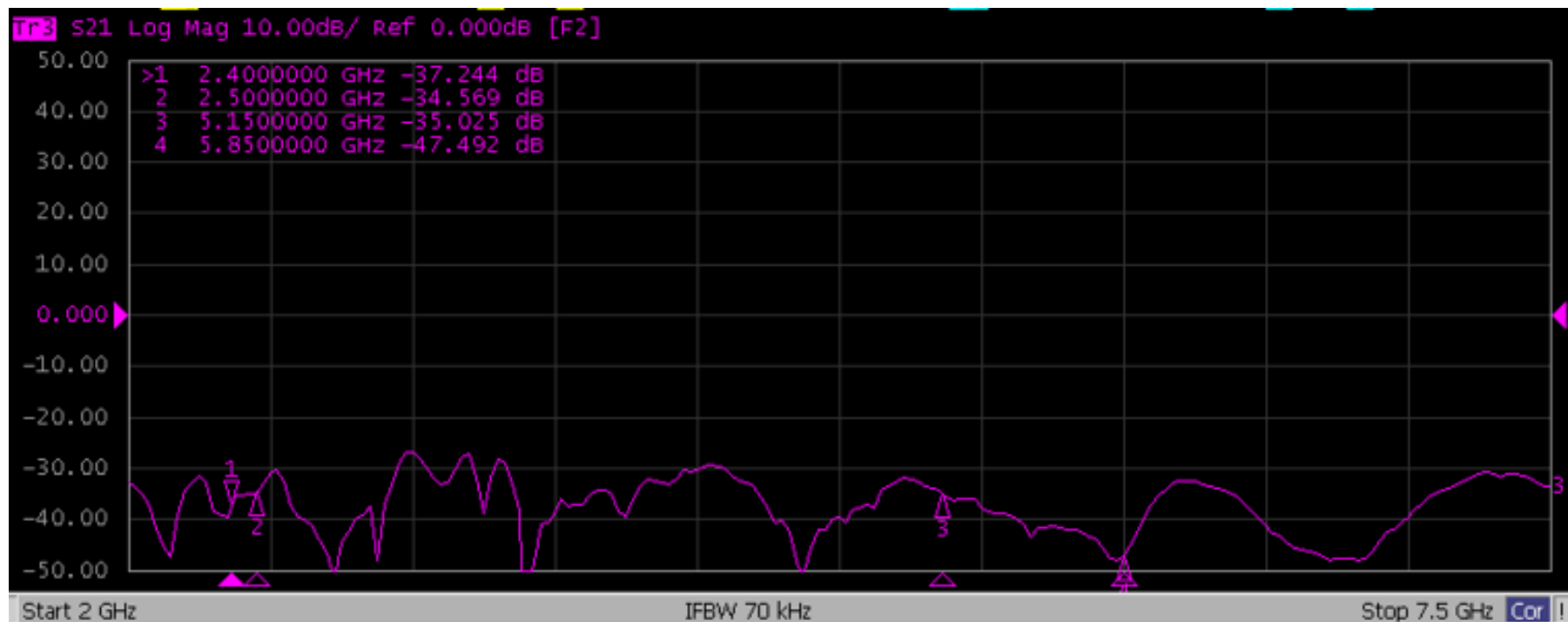


# Isolation

S31

Isolation < -26dB@2G

Isolation < -30dB@5G



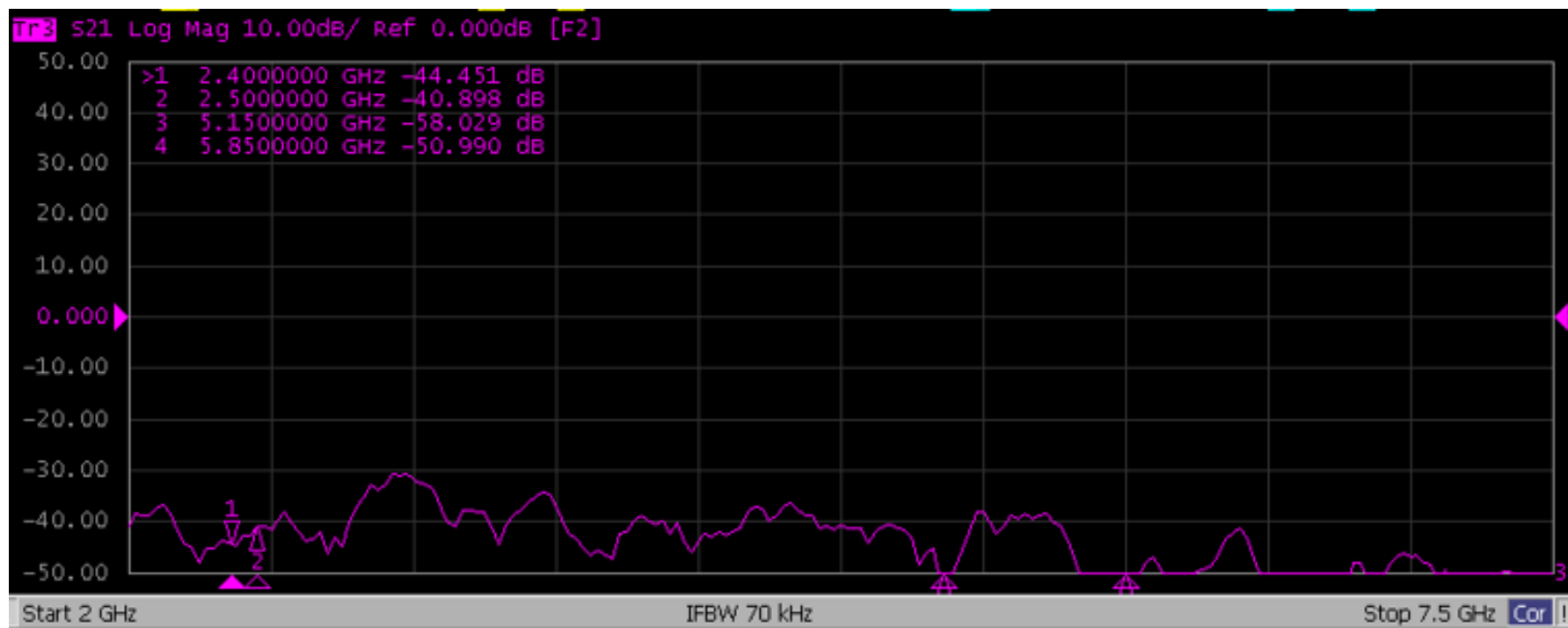
# Isolation

S41

Isolation<-40dB@2G

Isolation<-50dB@5G

Isolation<-50dB@6G



Note: 6G is only for model HT-6766BEM

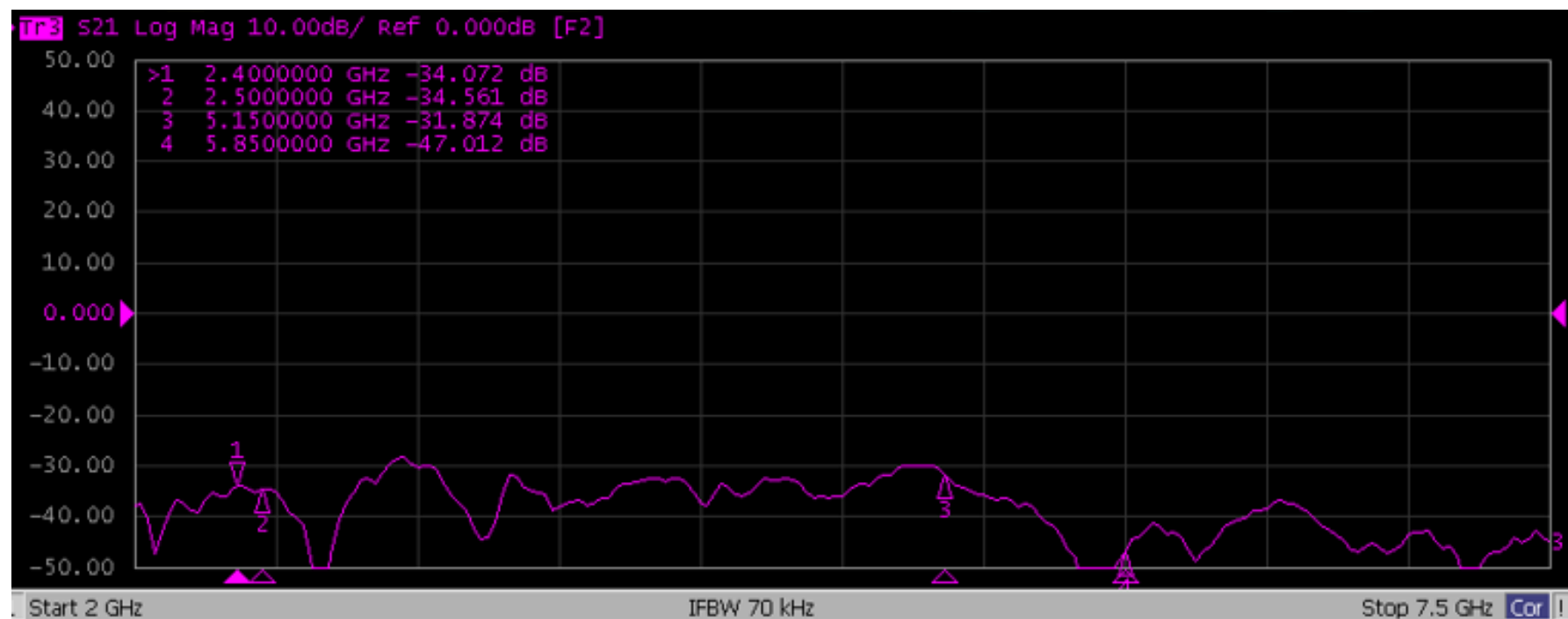
# Isolation

S51

Isolation < -40 dB @ 2G

Isolation < -50 dB @ 5G

Isolation < -50 dB @ 6G



Note: 6G is only for model HT-6766BEM

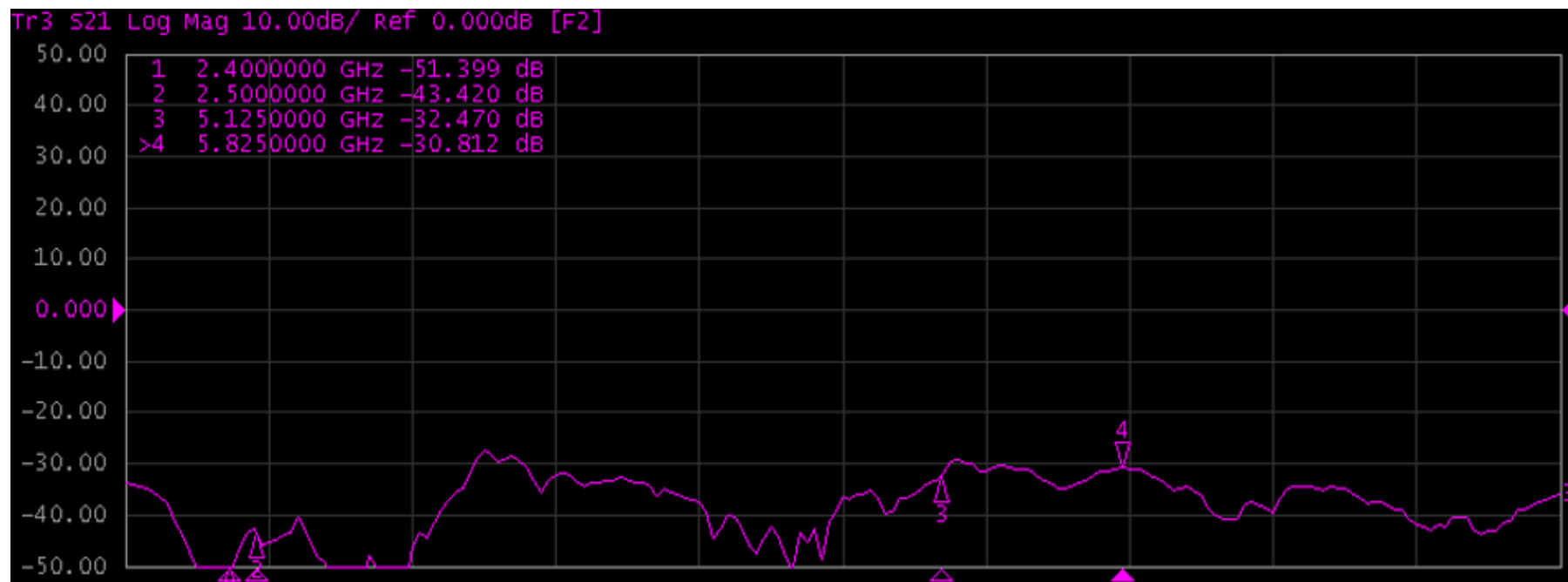
# Isolation

S61

Isolation<-40dB@2G

Isolation<-50dB@5G

Isolation<-50dB@6G



Note: 6G is only for model HT-6766BEM

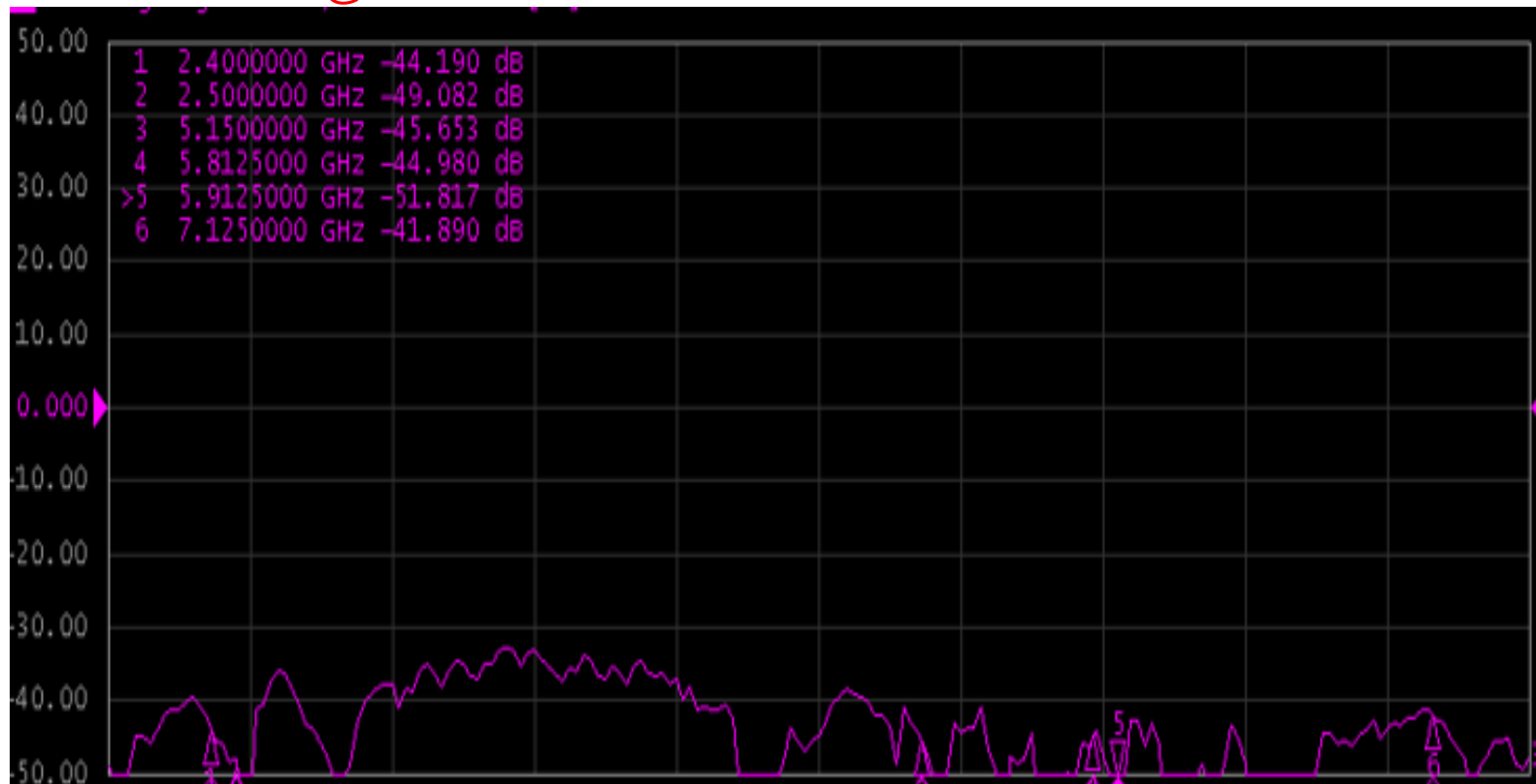
# Isolation

S71

Isolation<-44dB@2G

Isolation<-44dB@5G

Isolation<-41dB@6G

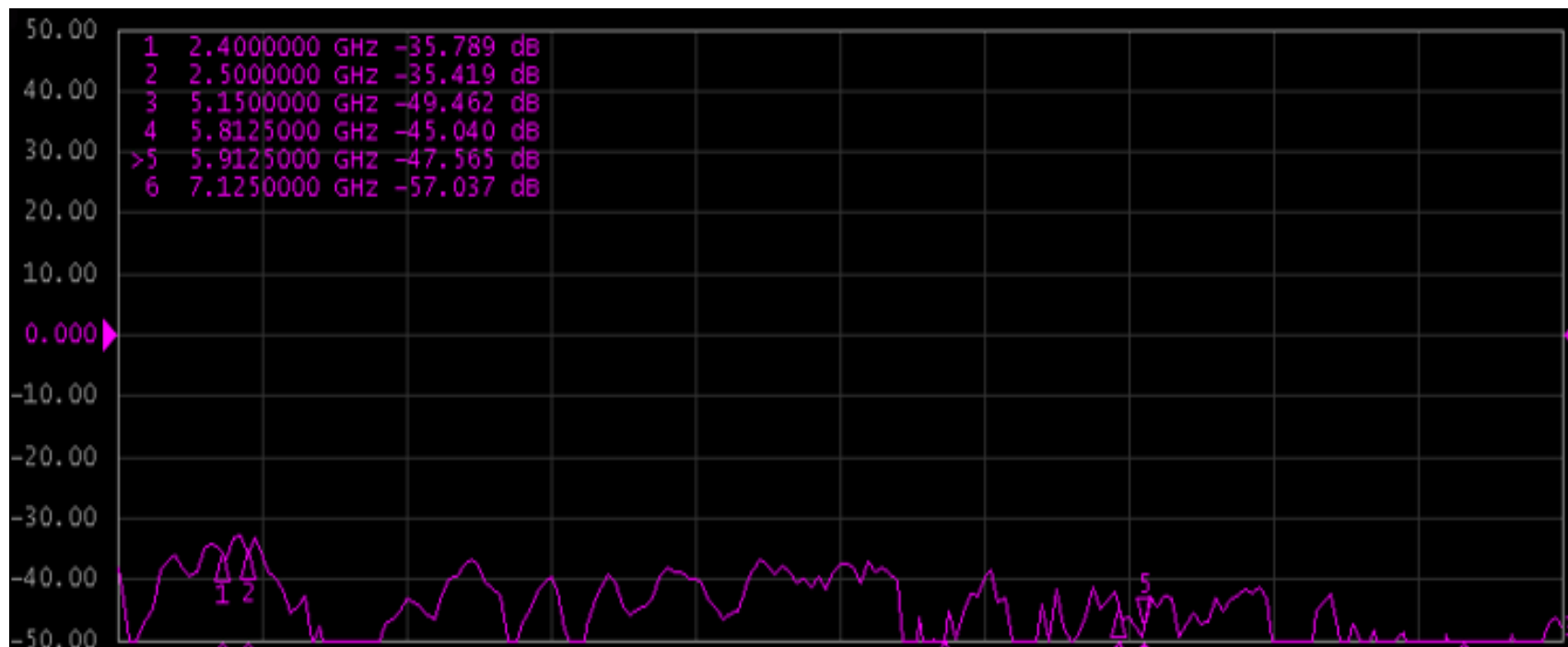


Note: 6G is only for model HT-6766BEM

S81

Isolation<-35dB@2G

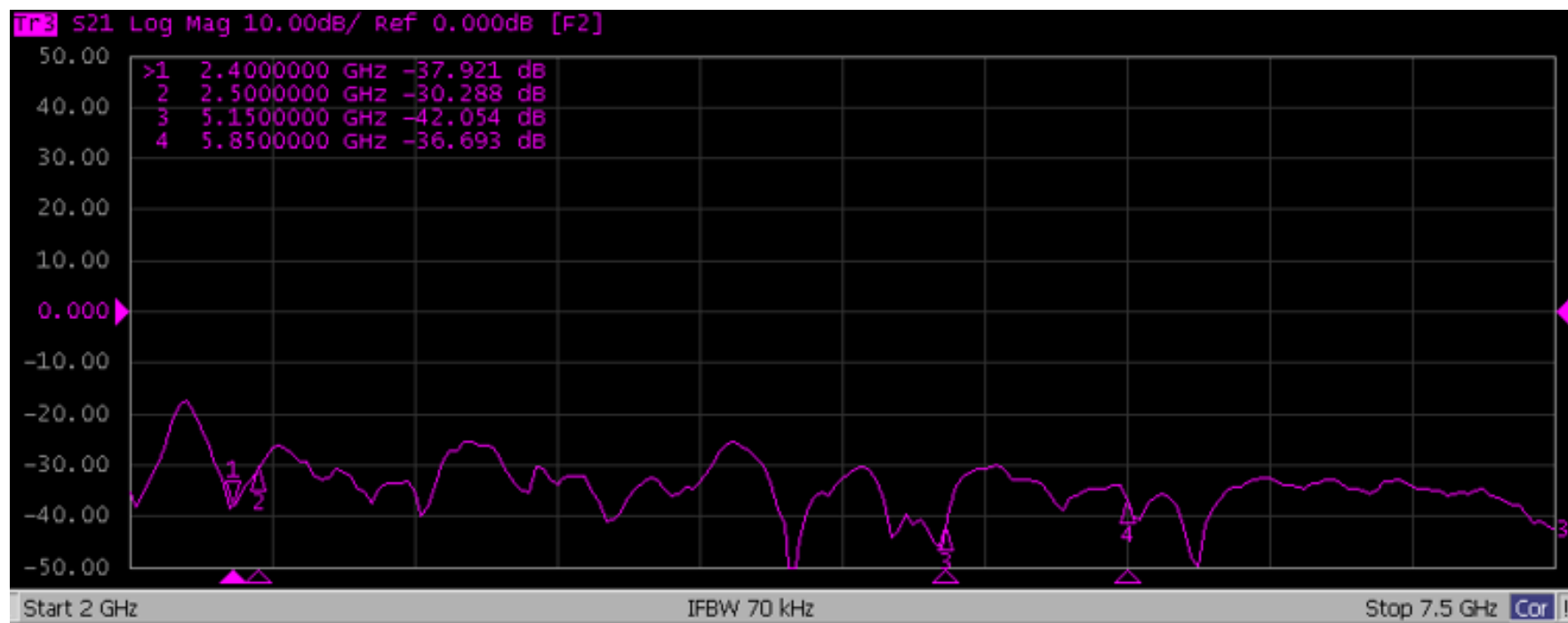
Isolation<-45dB@5G



# Isolation

S32

Isolation < -36dB@5G

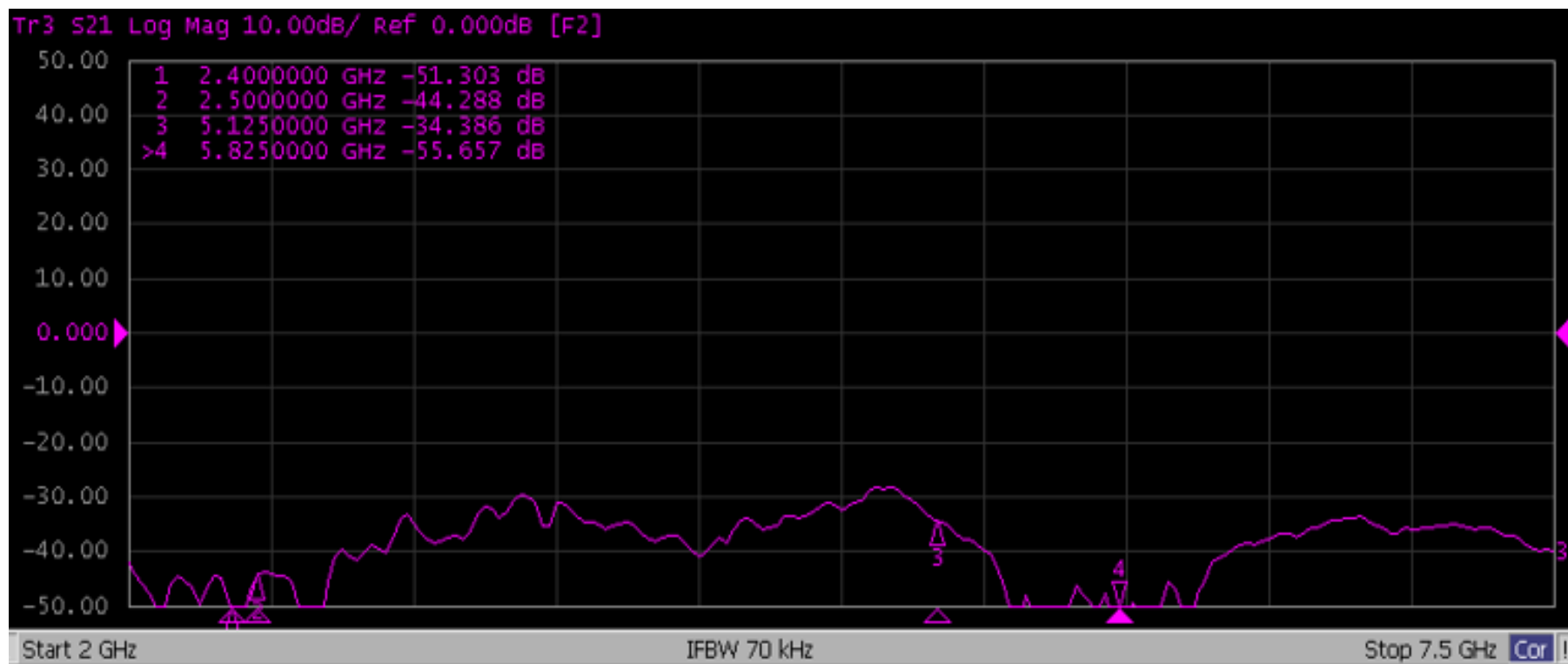


# Isolation

S42

Isolation < -44dB @ 5G

Isolation < -34dB @ 6G



Note: 6G is only for model HT-6766BEM

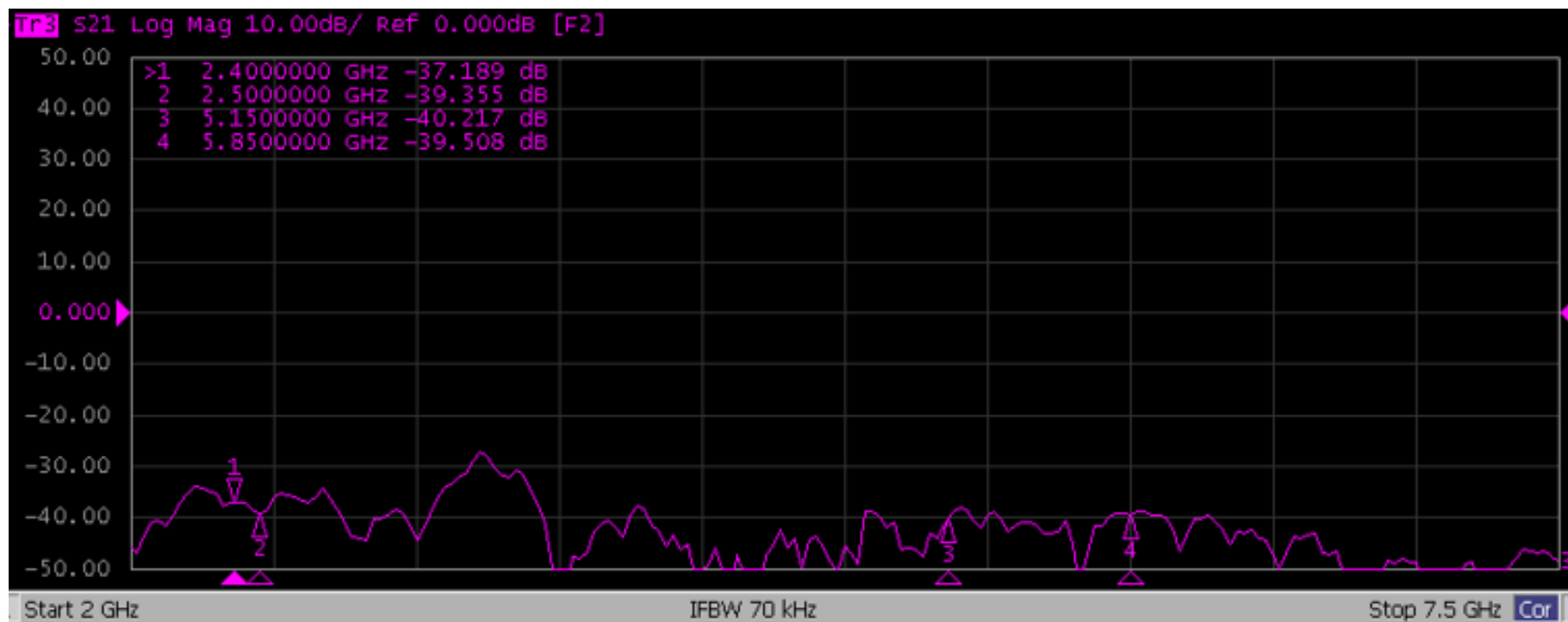


# Isolation

S52

Isolation < -37dB@5G

Isolation < -39dB@6G



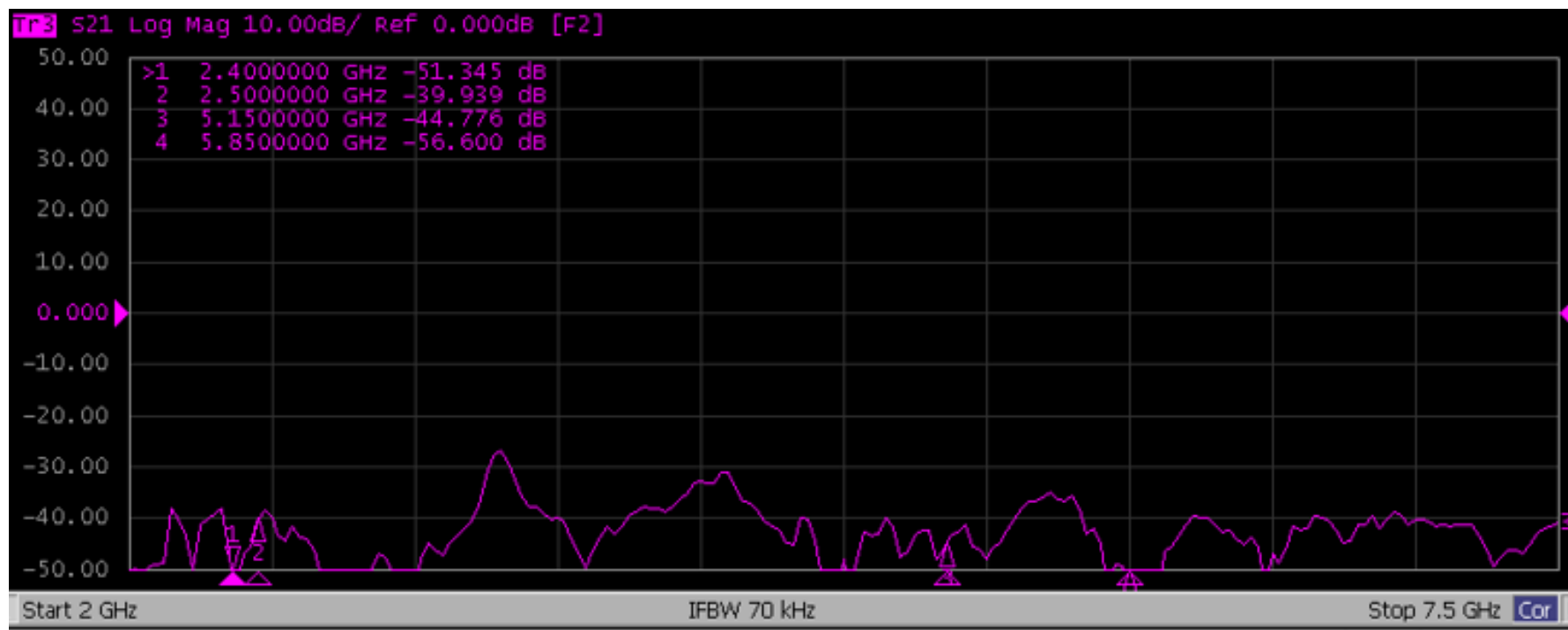
Note: 6G is only for model HT-6766BEM

# Isolation

S62

Isolation < -39dB @ 5G

Isolation < -44dB @ 6G



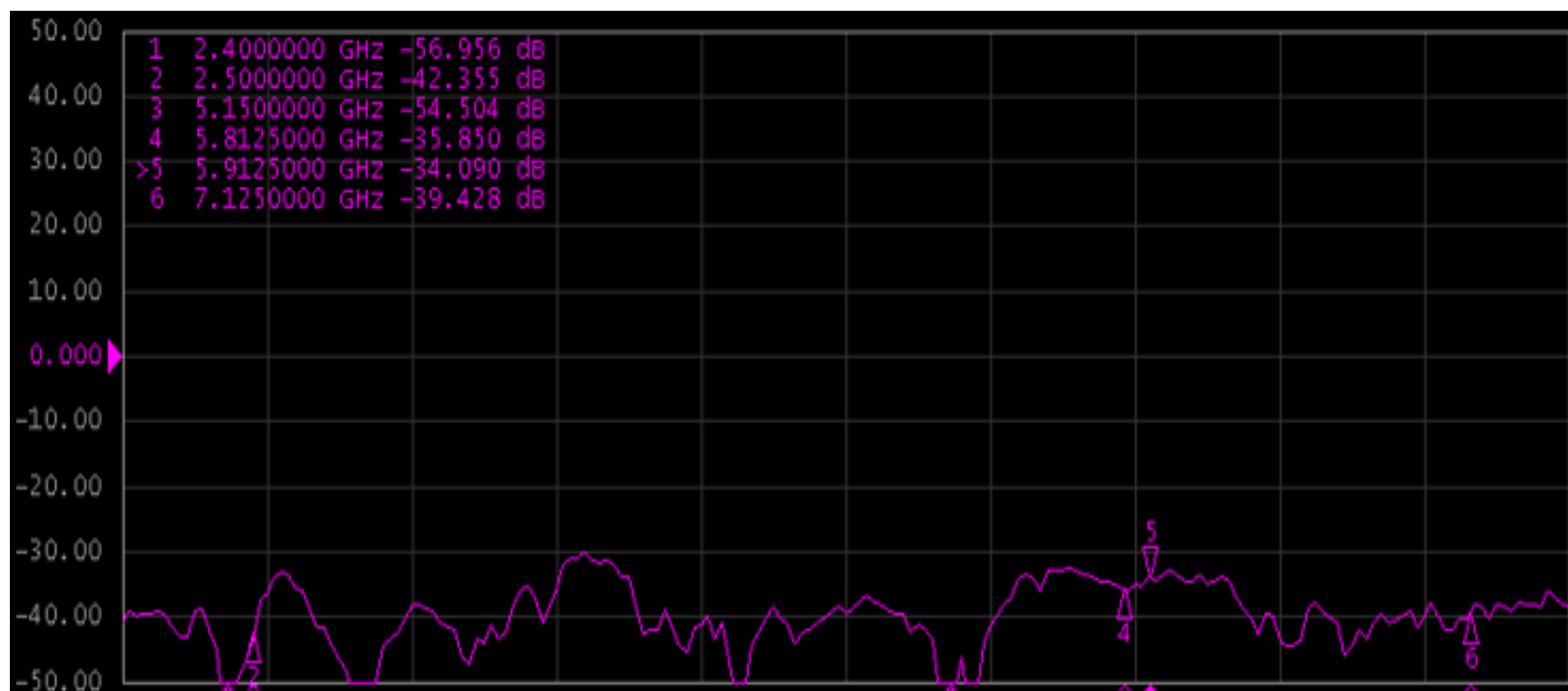
Note: 6G is only for model HT-6766BEM

# Isolation

S72

Isolation<-35dB@5G

Isolation<-34dB@6G

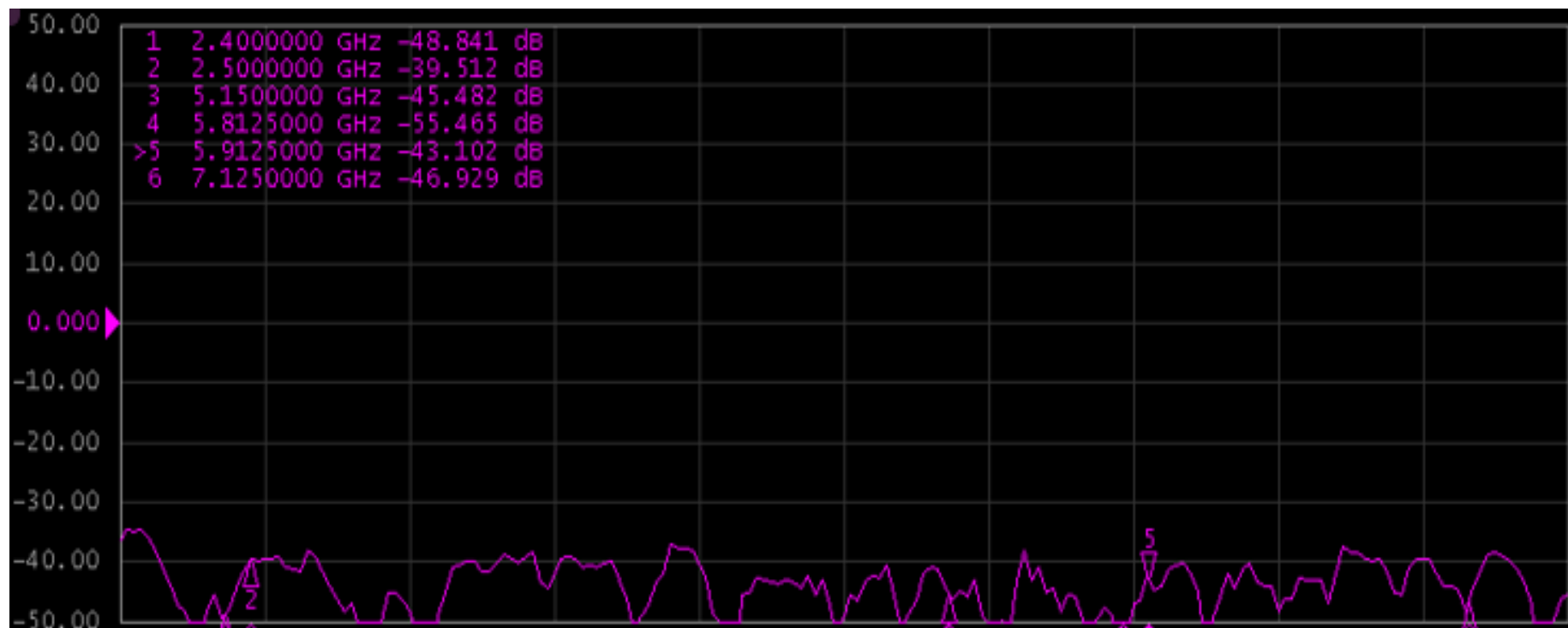


Note: 6G is only for model HT-6766BEM

S82

Isolation<-39dB@2G

Isolation<-45dB@5G

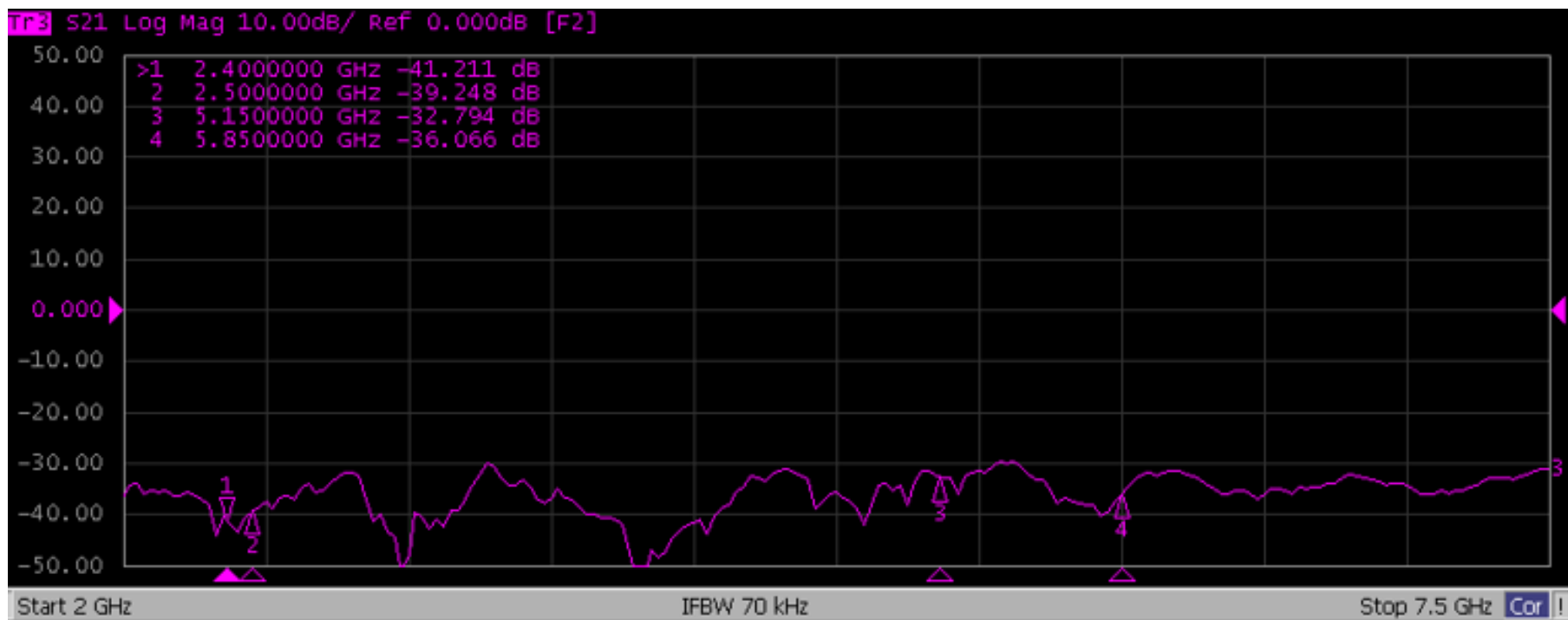


# Isolation

S43

Isolation < -39dB @ 5G

Isolation < -32dB @ 6G



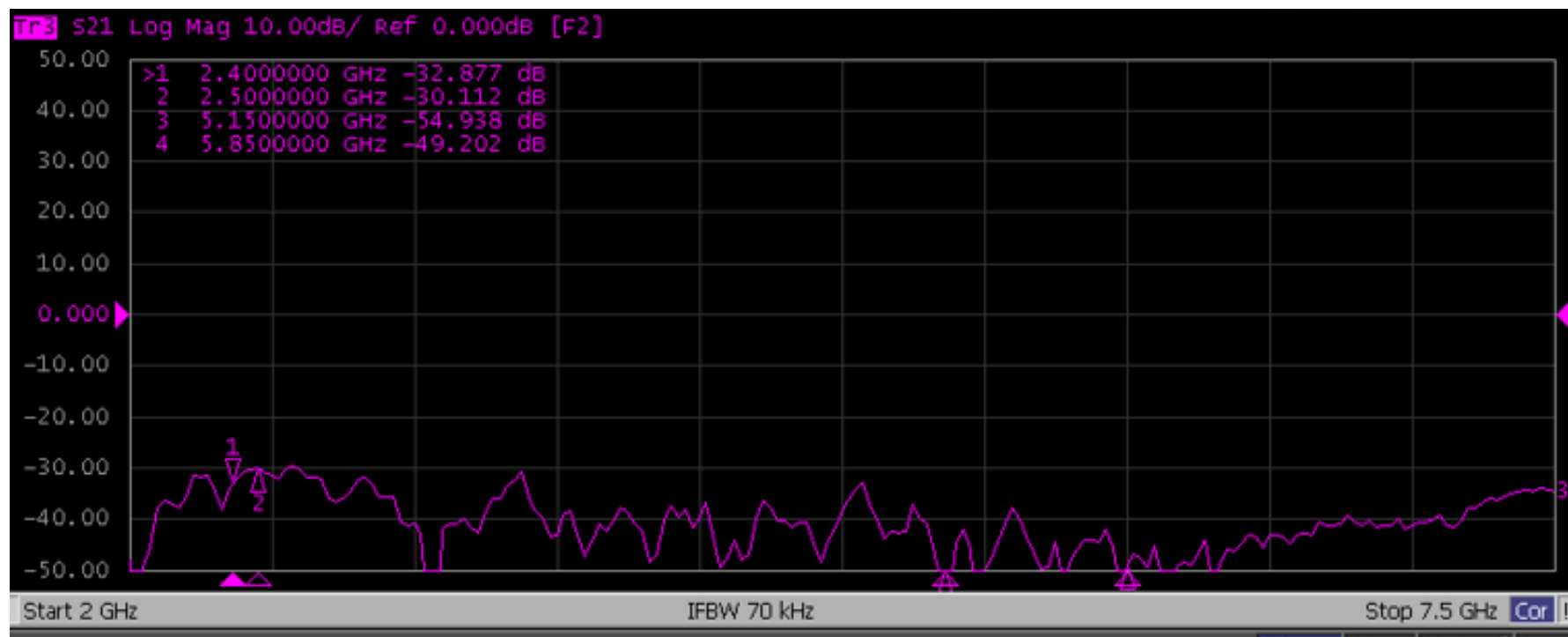
Note: 6G is only for model HT-6766BEM

# Isolation

S53

Isolation < -30dB @ 5G

Isolation < -49dB @ 6G



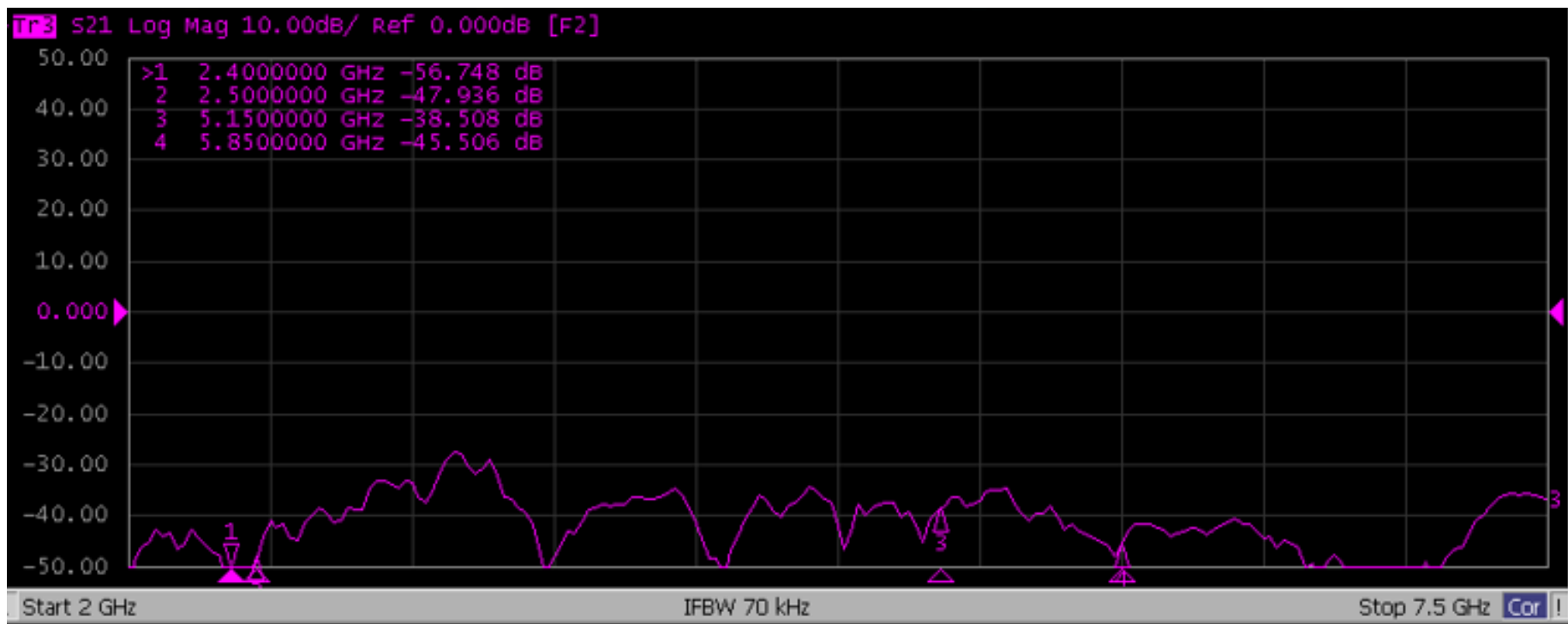
Note: 6G is only for model HT-6766BEM

# Isolation

S63

Isolation < -47dB @ 5G

Isolation < -38dB @ 6G



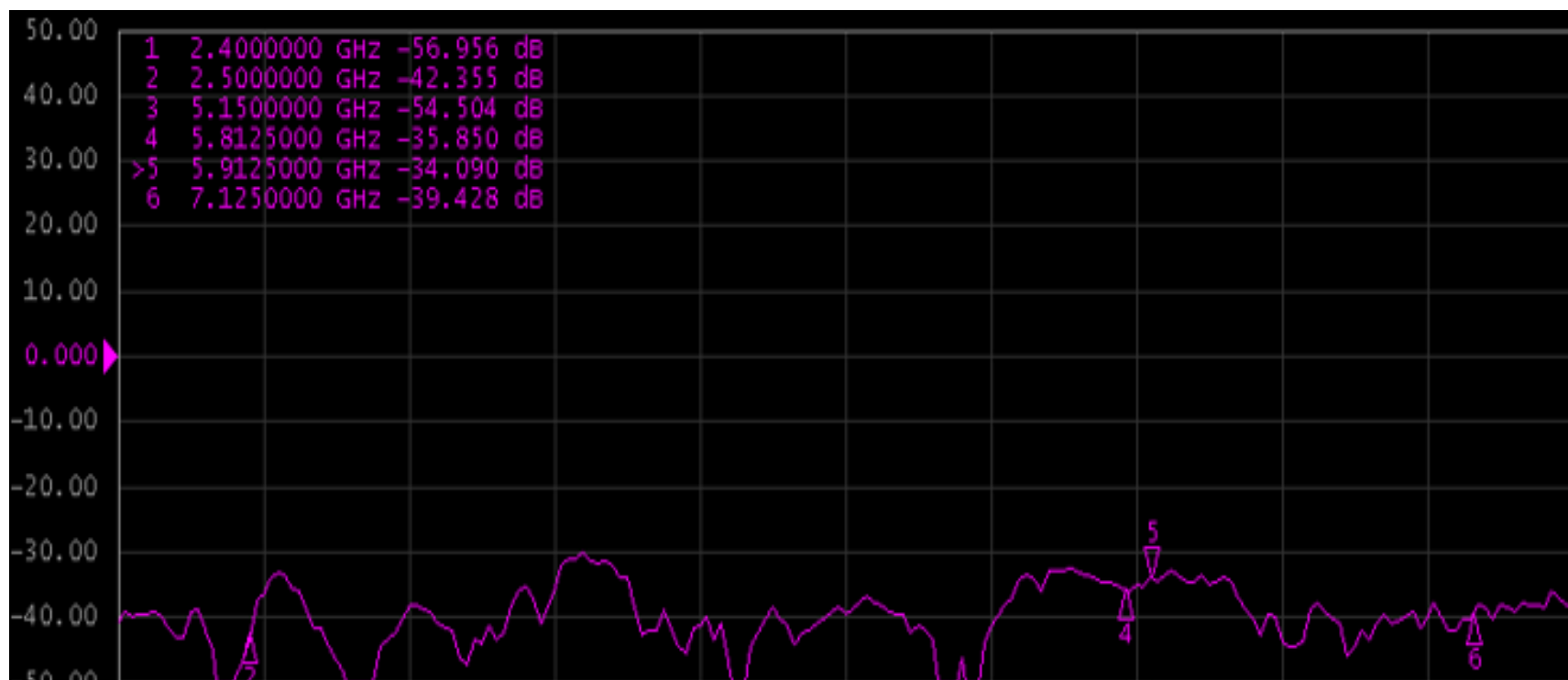
Note: 6G is only for model HT-6766BEM

# Isolation

S73

Isolation<-35dB@5G

Isolation<-34dB@6G



Note: 6G is only for model HT-6766BEM

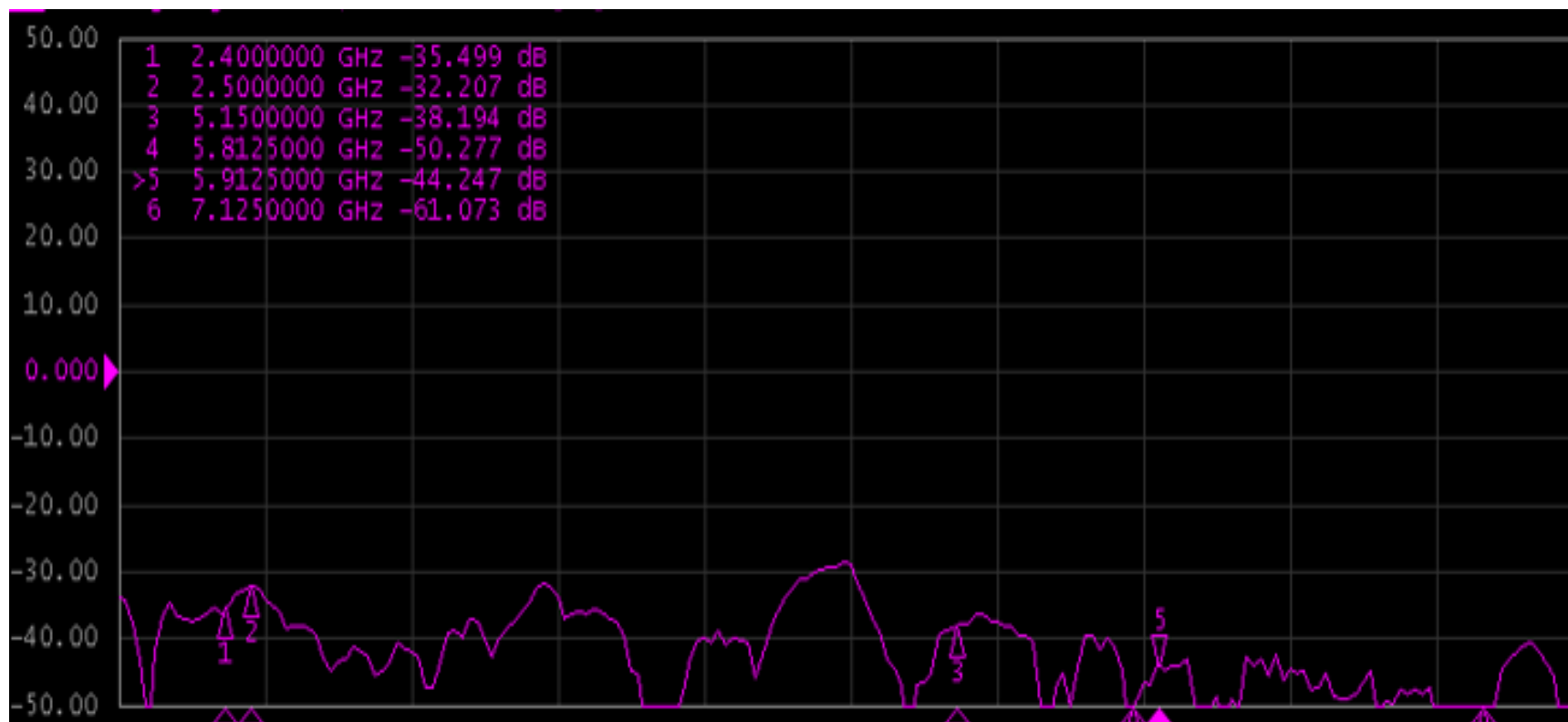


# Isolation

S83

Isolation<-32dB@2G

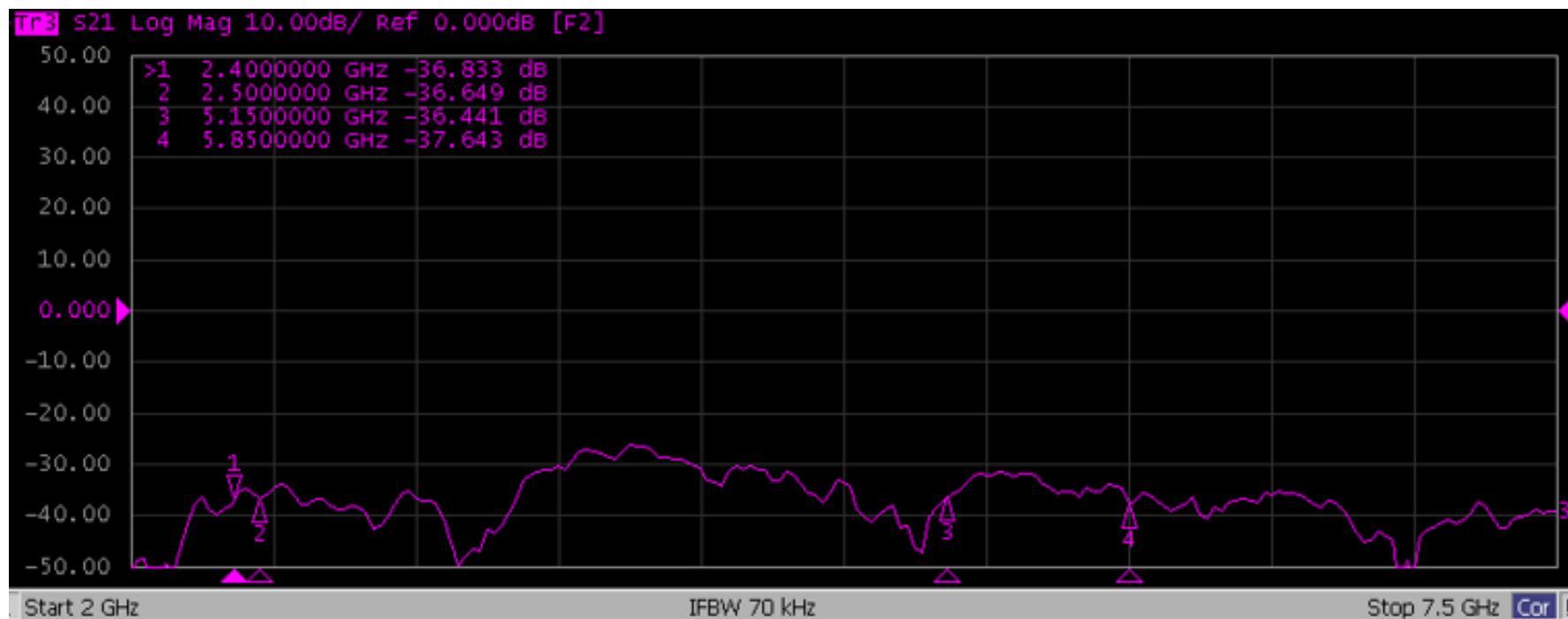
Isolation<-38dB@5G



# Isolation

S54

Isolation < -36dB @ 6G

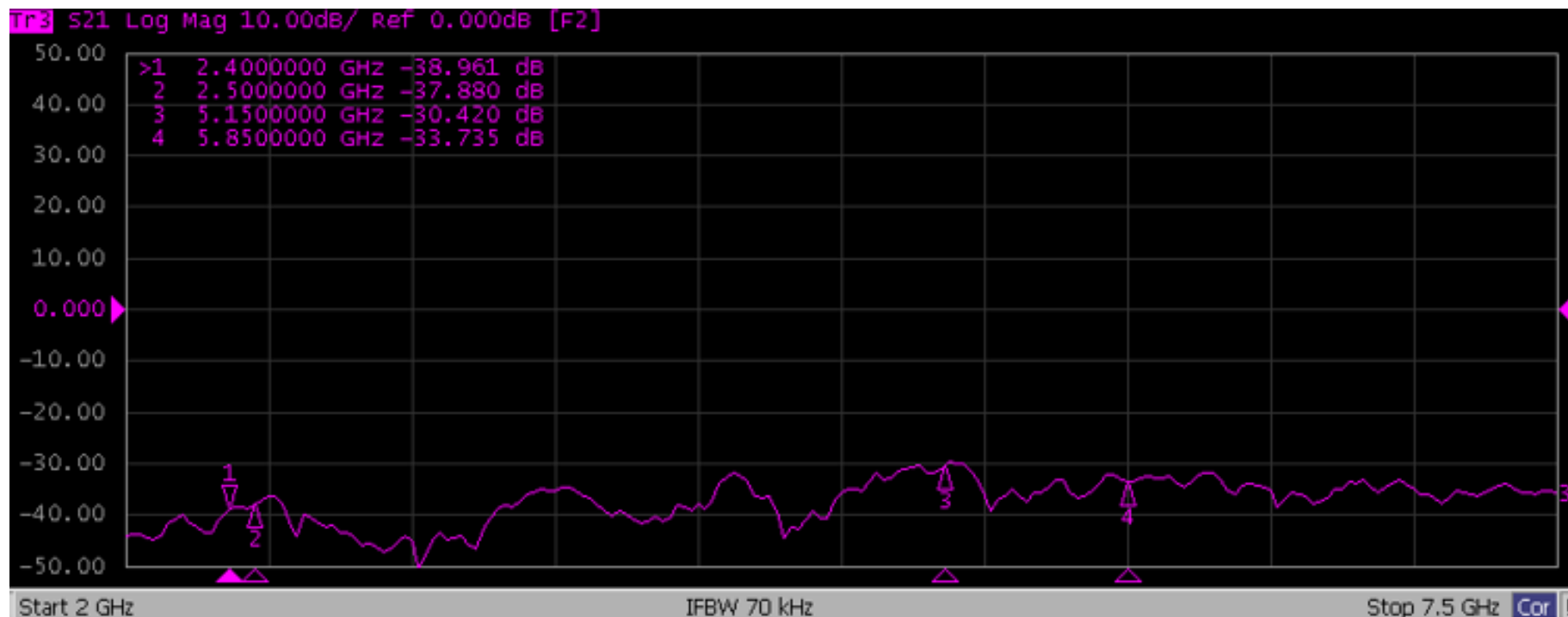


Note: 6G is only for model HT-6766BEM

# Isolation

S64

Isolation < -30dB @ 6G

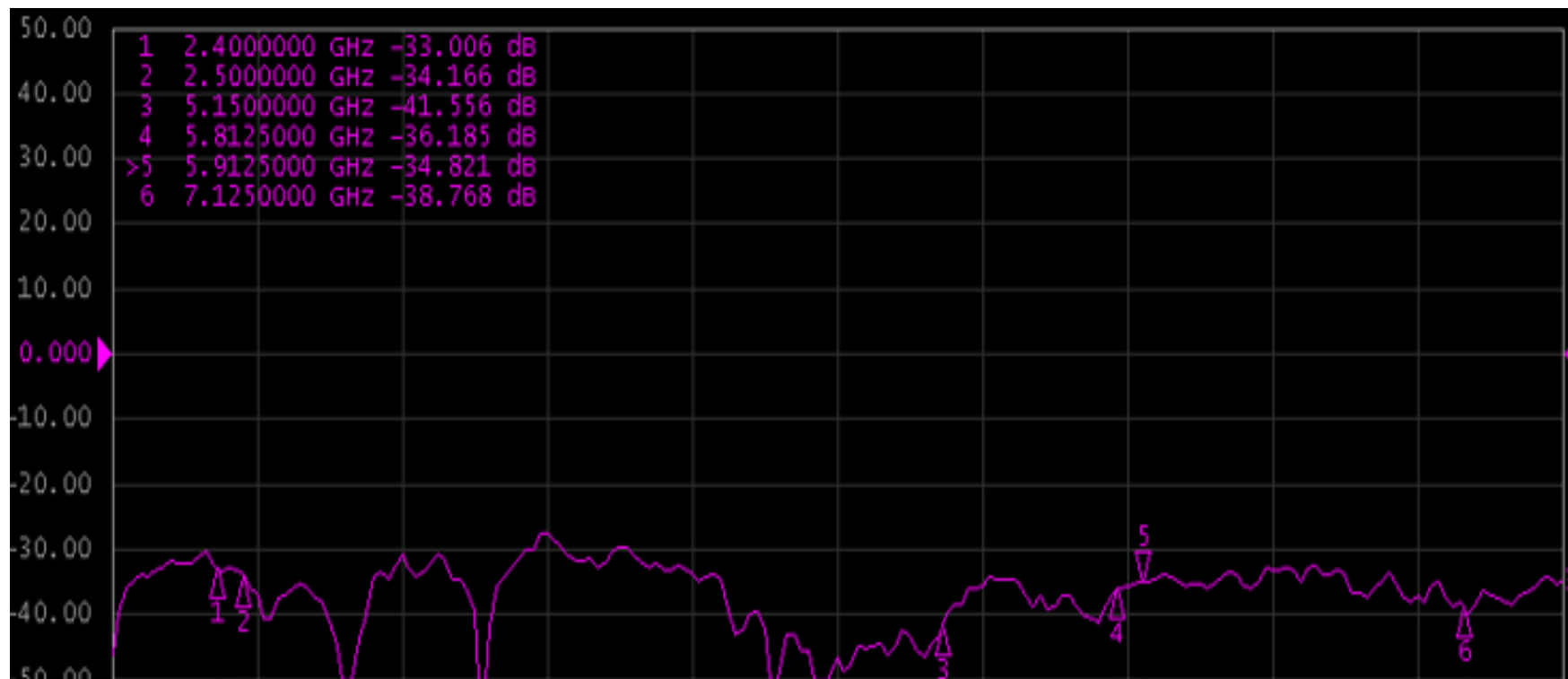


Note: 6G is only for model HT-6766BEM

# Isolation

S74

Isolation < -34dB@6G



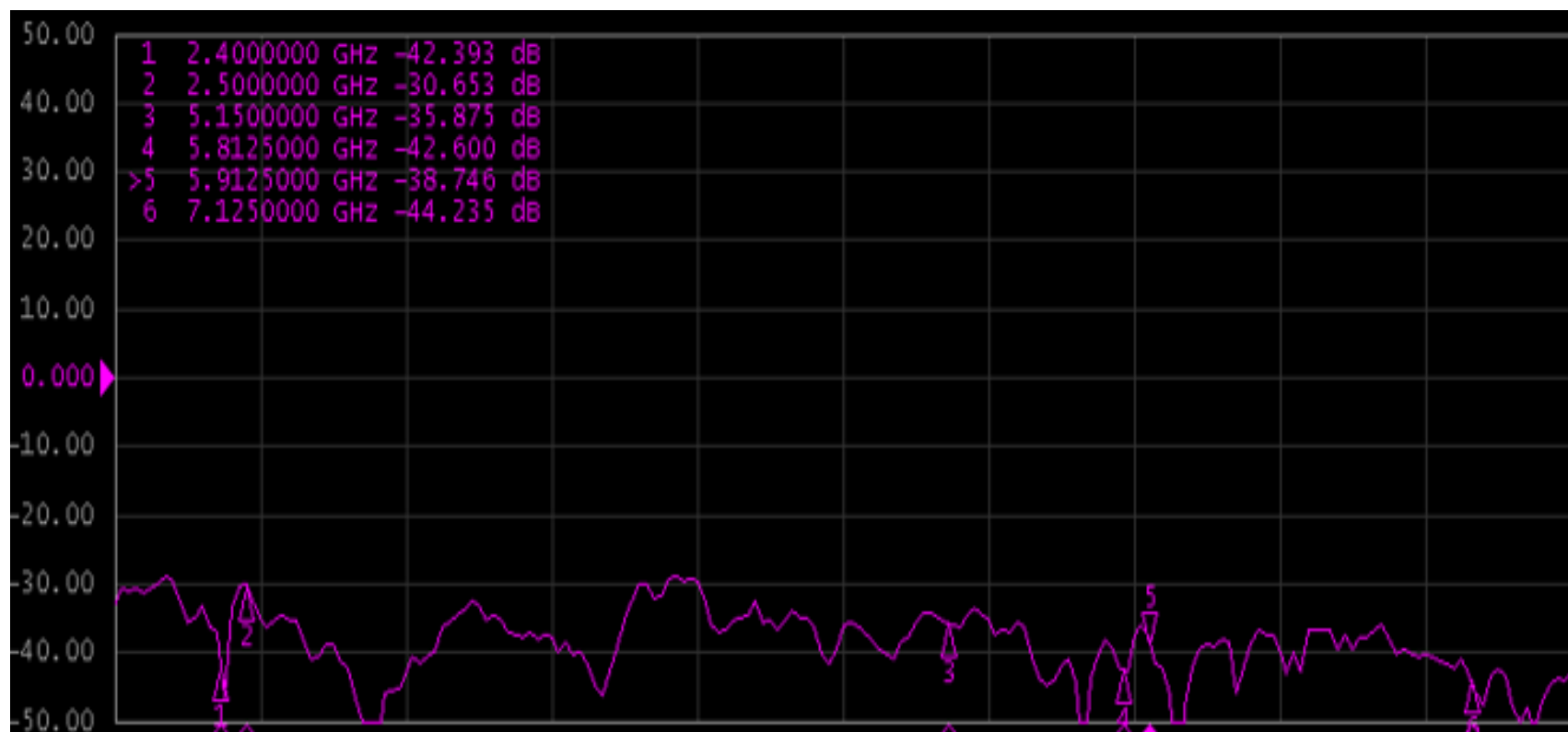
Note: 6G is only for model HT-6766BEM

# Isolation

S84

Isolation < -30dB @ 2G

Isolation < -38dB @ 6G

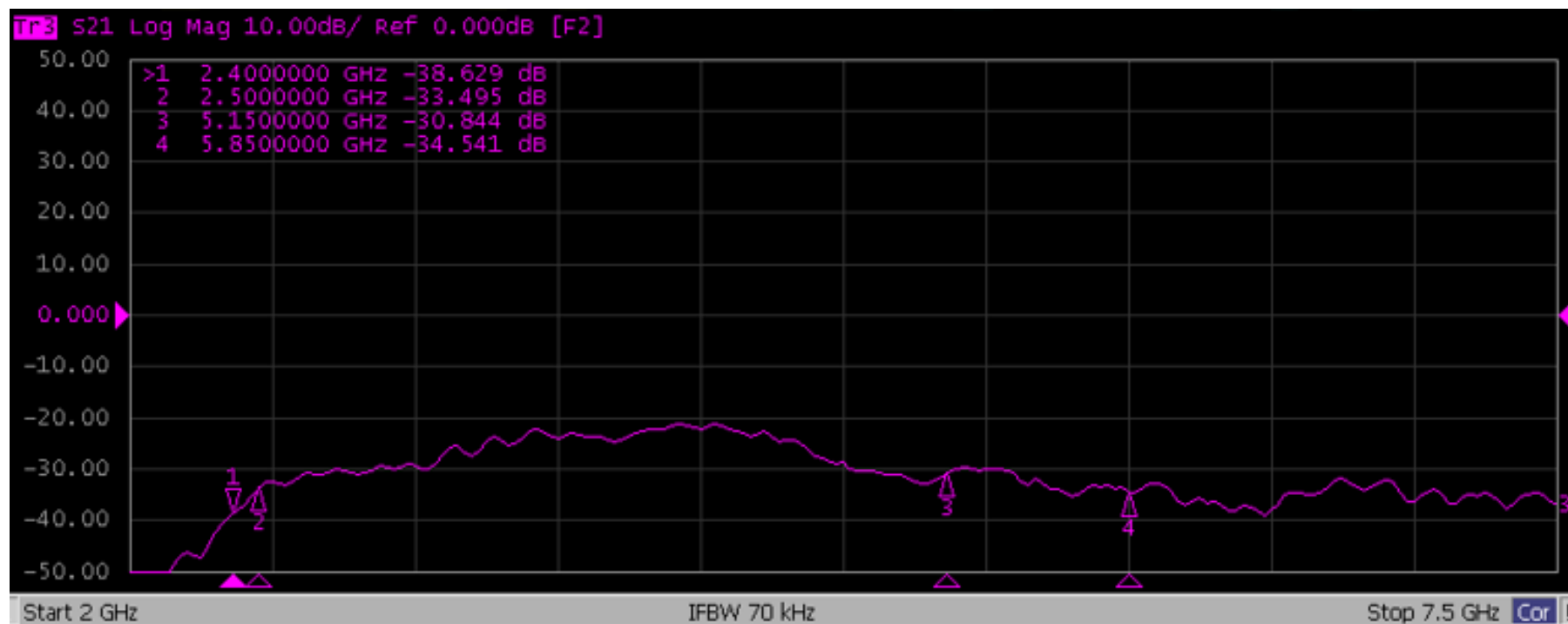


Note: 6G is only for model HT-6766BEM

# Isolation

S65

Isolation < -30dB @ 6G

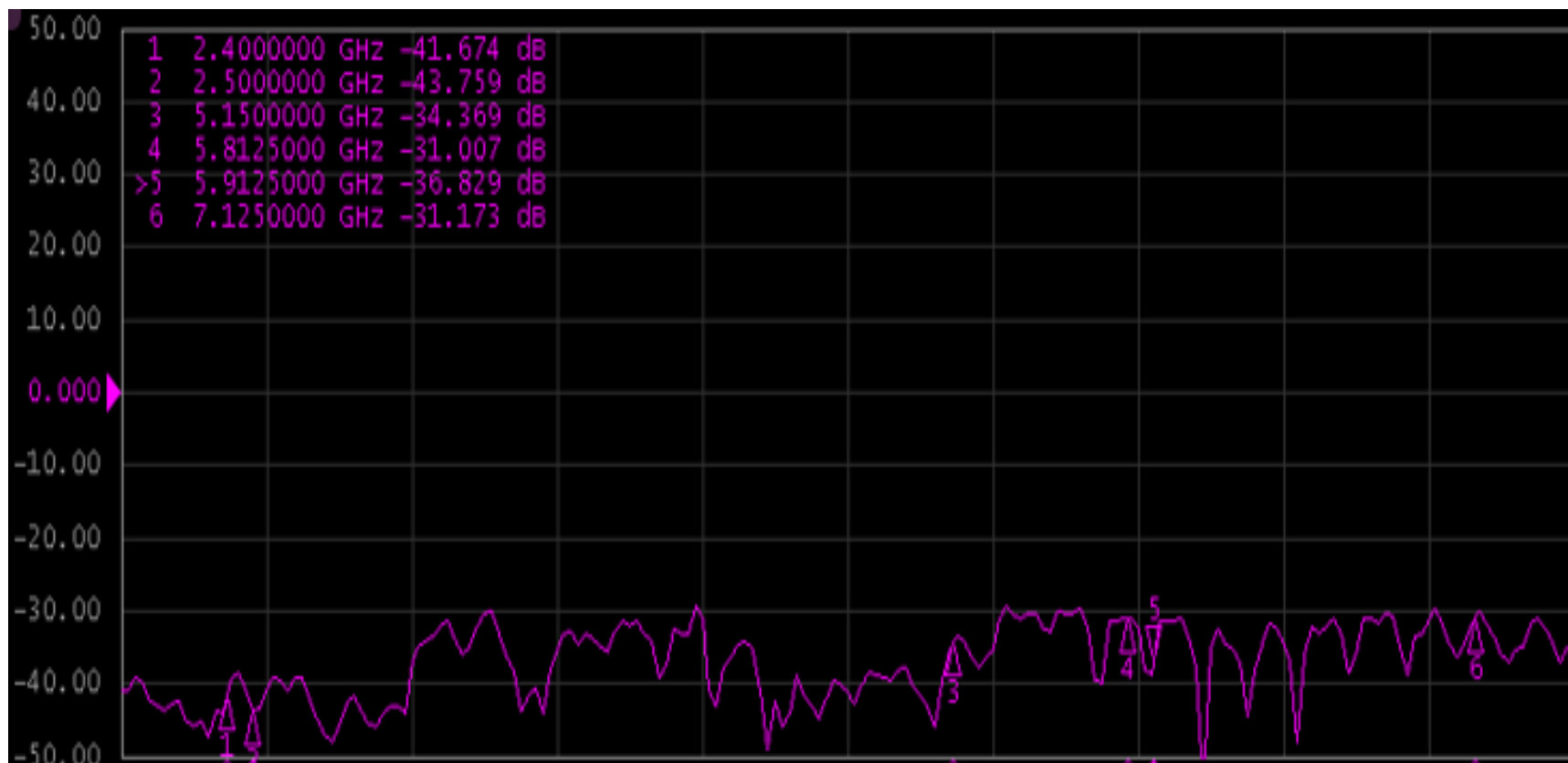


Note: 6G is only for model HT-6766BEM

# Isolation

S75

Isolation < -31dB @ 6G



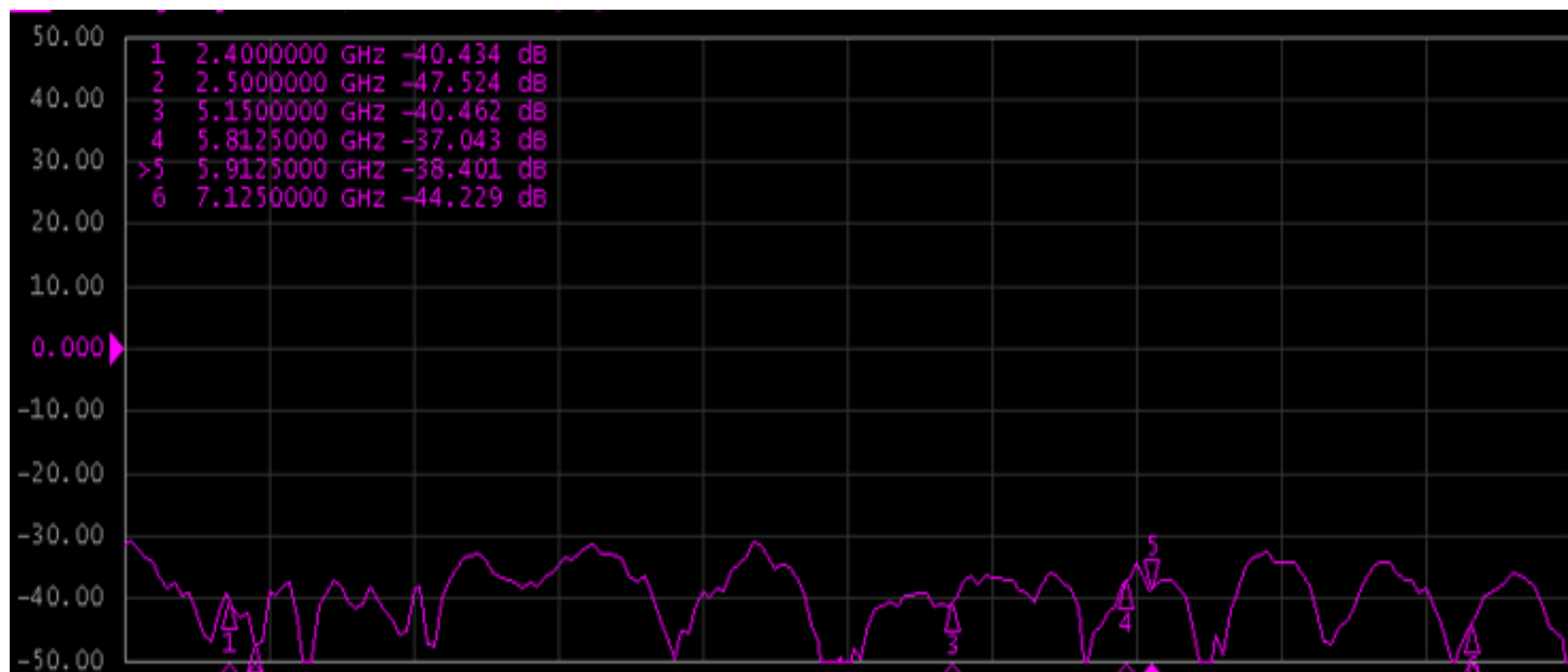
Note: 6G is only for model HT-6766BEM

# Isolation

S85

Isolation<-40dB@2G

Isolation<-38dB@6G



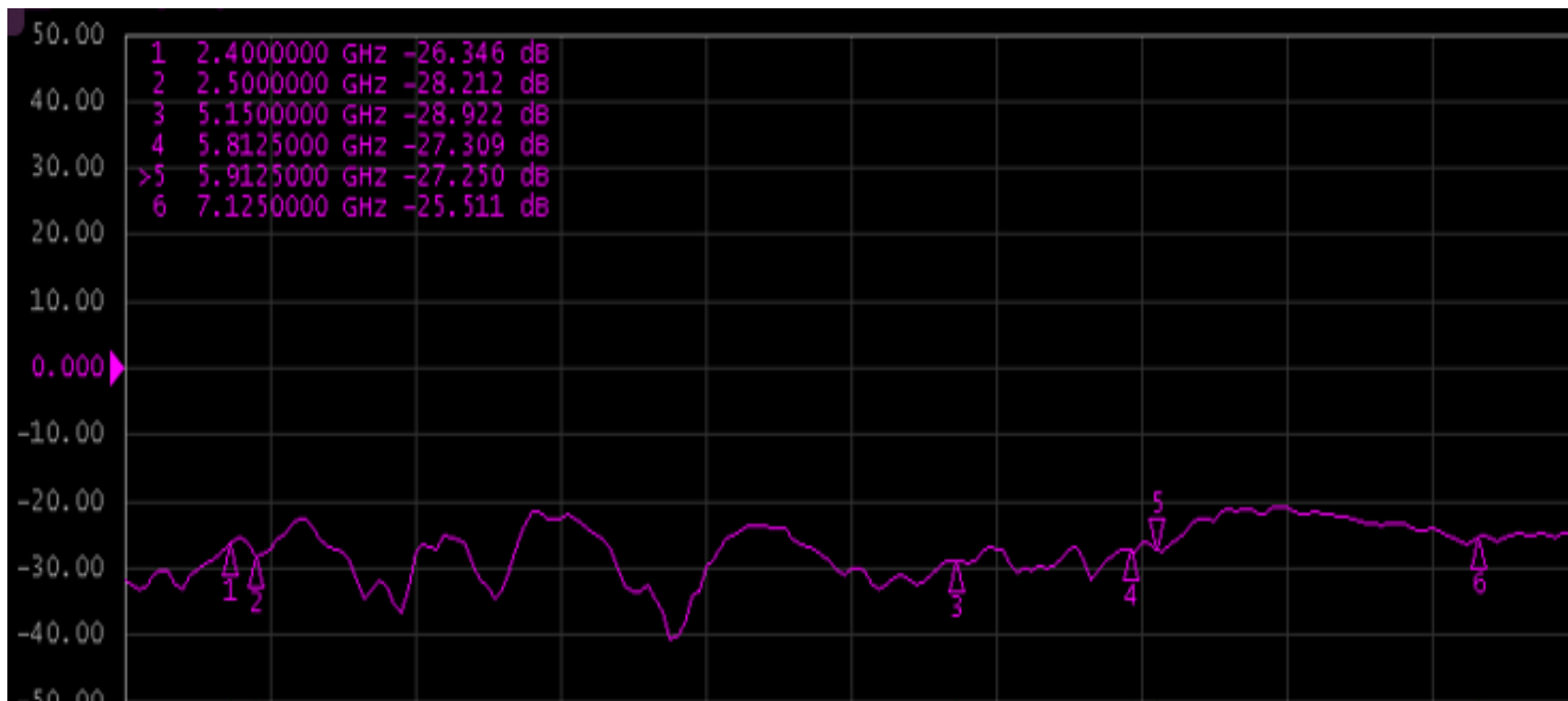
Note: 6G is only for model HT-6766BEM



# Isolation

S76

Isolation < -27dB@6G



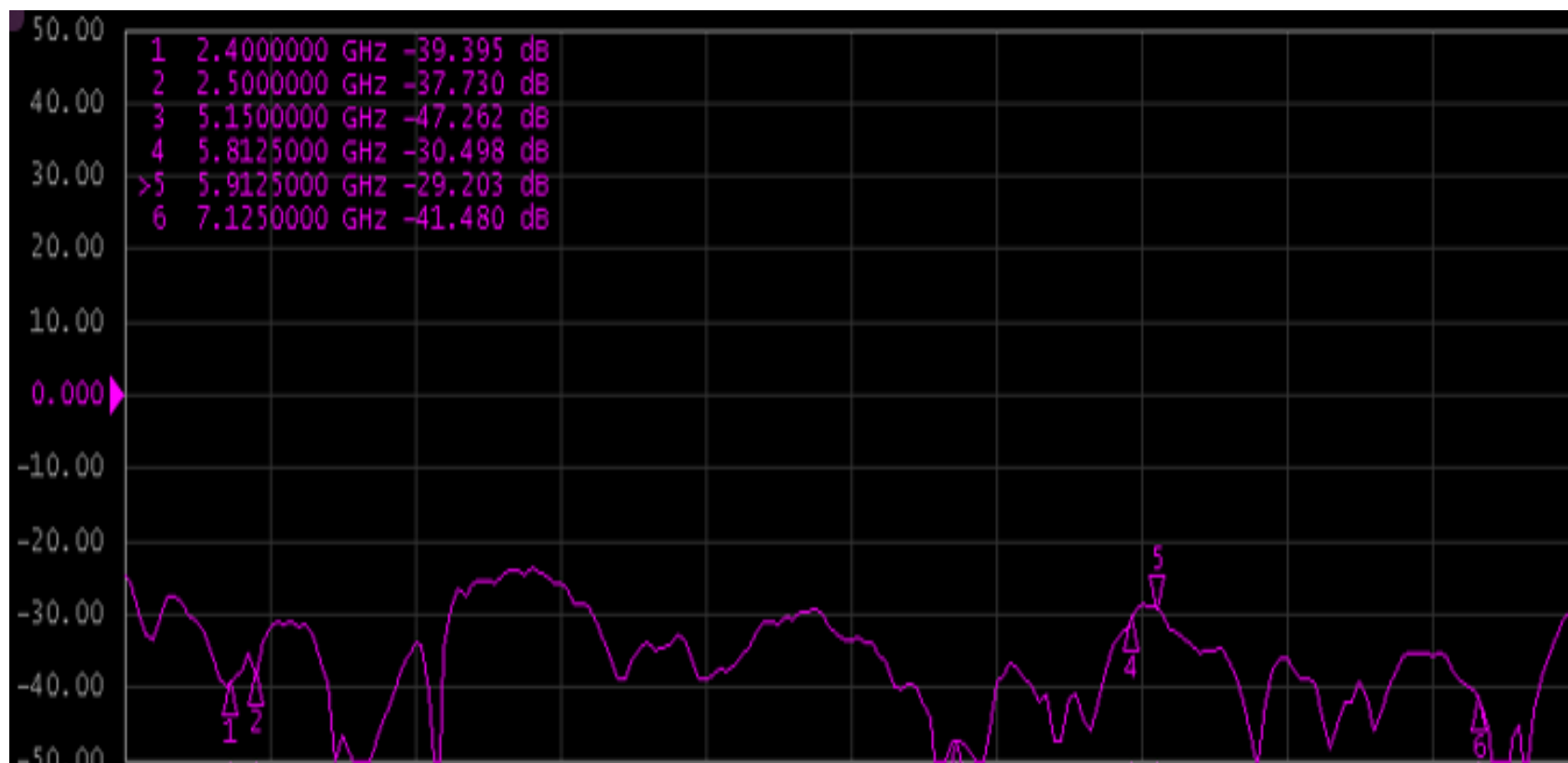
Note: 6G is only for model HT-6766BEM

# Isolation

S86

Isolation<-37dB@2G

Isolation<-29dB@6G



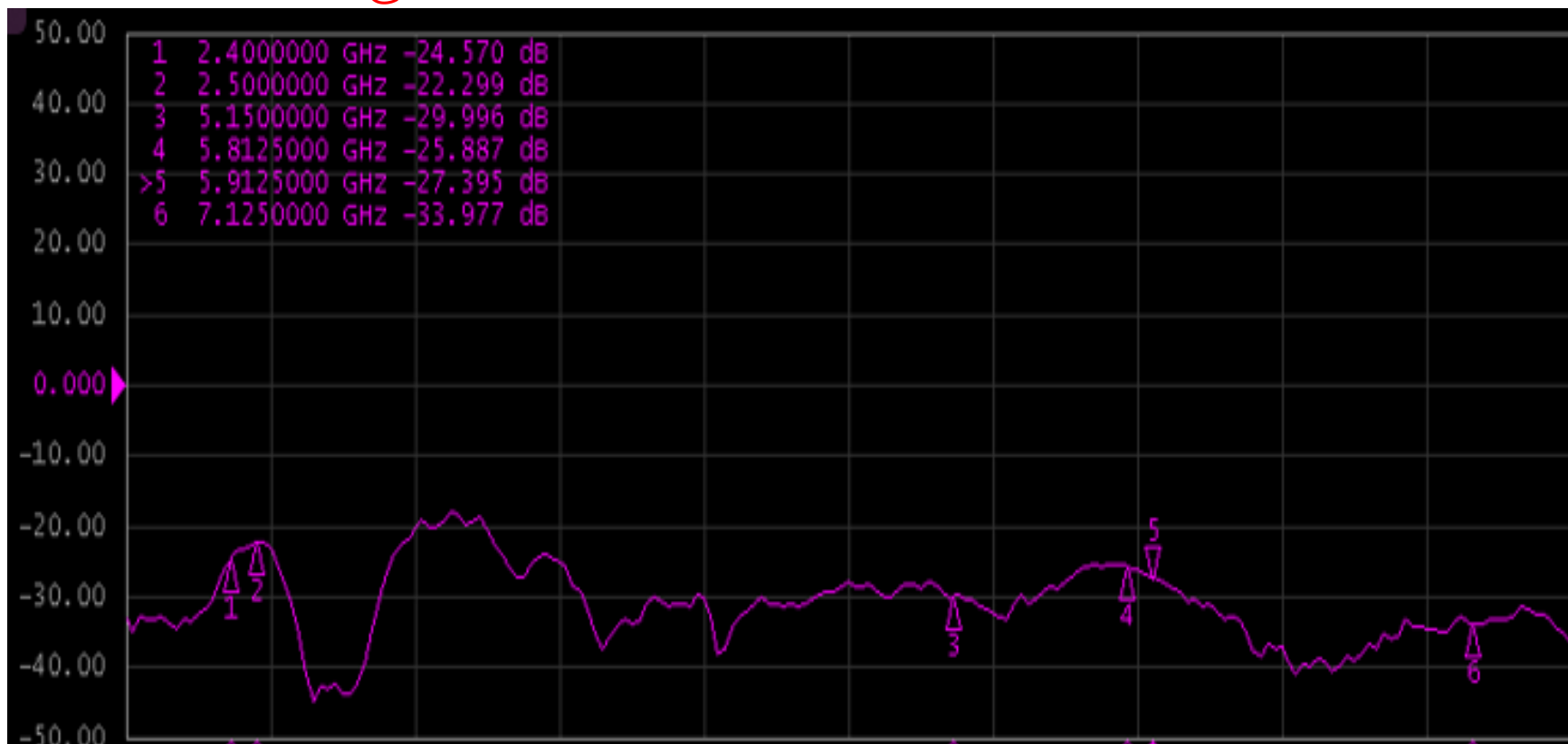
Note: 6G is only for model HT-6766BEM

# Isolation

S87

Isolation<-22dB@2G

Isolation<-25dB@6G

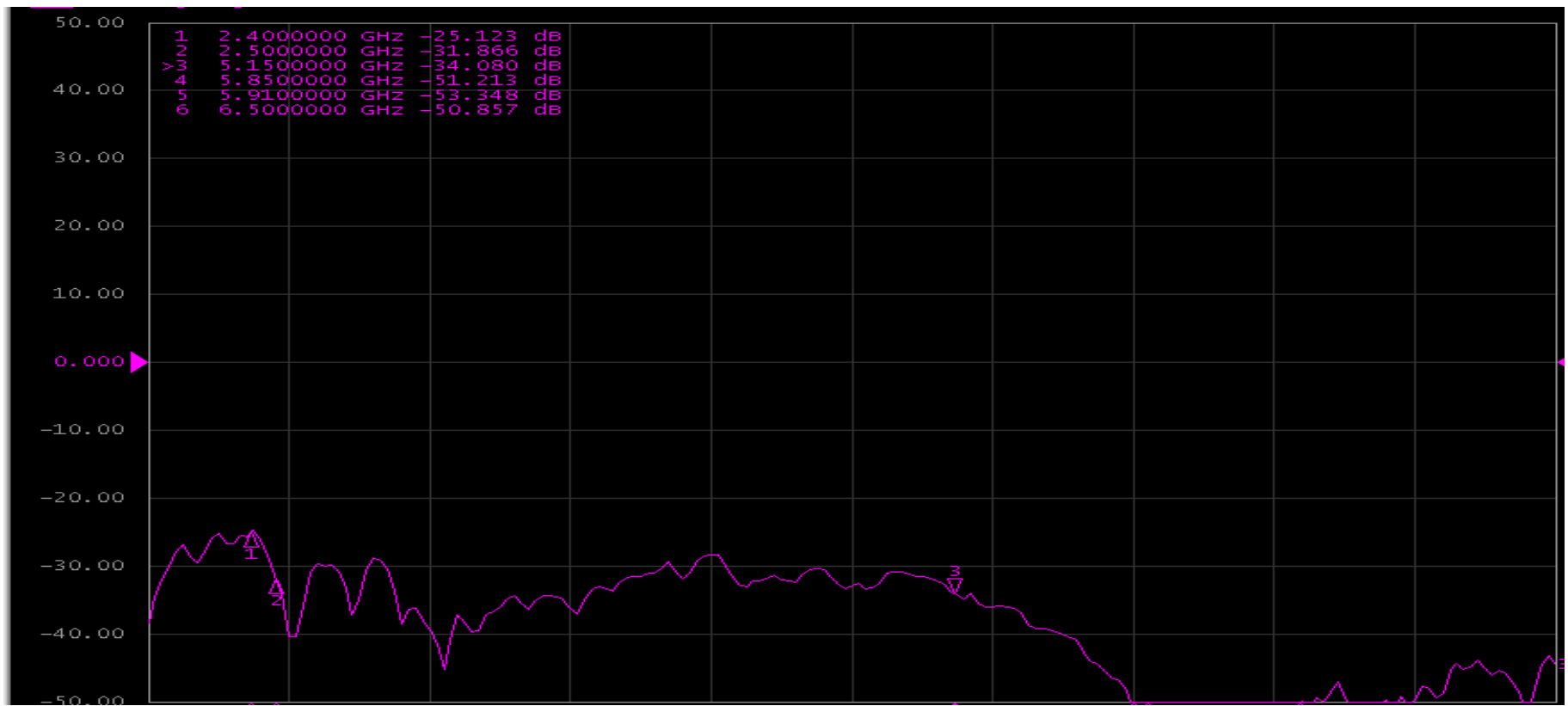


Note: 6G is only for model HT-6766BEM

# Isolation

S9 10

Isolation < -25dB@2G



# Isolation

| Isolation |               |            |              |               |
|-----------|---------------|------------|--------------|---------------|
| ANT       | Frequency/NO. | 2.4-2.5GHz | 5.15-5.85GHz | 5.91-7.125GHz |
| Dual      | ANT1-Dual     | <-20dB     |              | <-25dB        |
|           | ANT2-Dual     |            |              |               |
| 5G        | ANT3-5G       | -          | <-20dB       | <-25dB        |
|           | ANT4-5G       |            |              |               |
| 6G        | ANT5-6G       | -          | <-25dB       | <-20dB        |
|           | ANT6-6G       | -          |              |               |
|           | ANT7-6G       | -          |              |               |
|           | ANT8-6G       | -          |              |               |
| BT        | ANT9-BT       | <-20dB     | -            | -             |
|           | ANT10-BT      |            | -            | -             |

- The Isolation between WIFI 2.4G antennas < - 20dB;
- The Isolation between WIFI 5G antennas < - 20dB;
- The Isolation between WIFI 6G antennas < - 20dB;
- The Isolation between WIFI 5G &6G antennas < - 25dB;
- The Isolation between WIFI 2G &BT antennas < - 20dB.

**Note: 6G is only for model HT-6766BEM**

## Measurement Condition

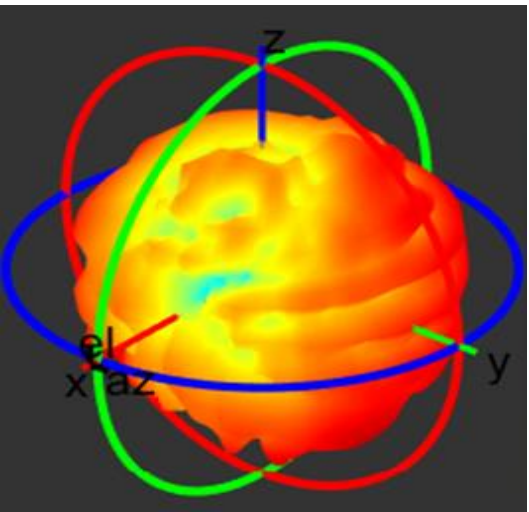


Microwave anechoic chamber

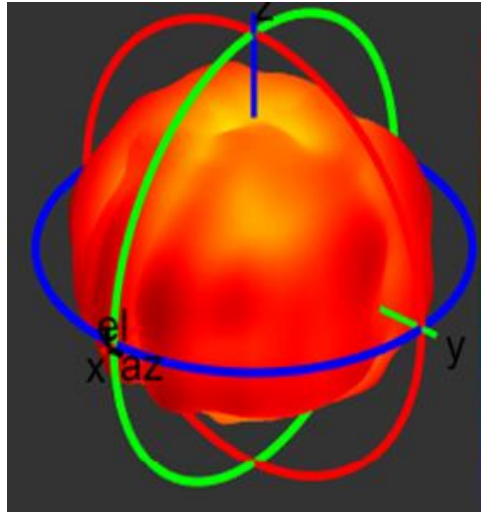
# 3D Radiation Pattern@2.45GHz



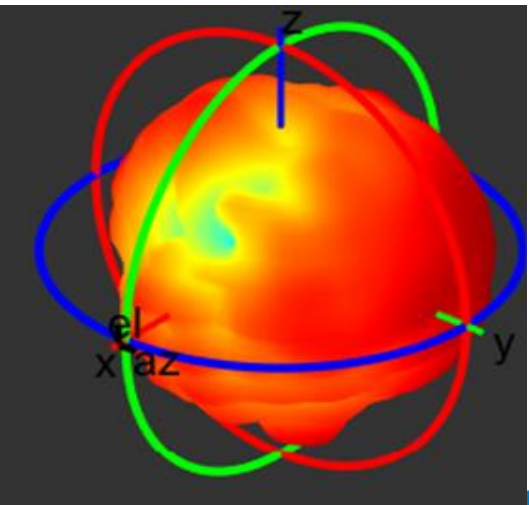
ANT1-2G



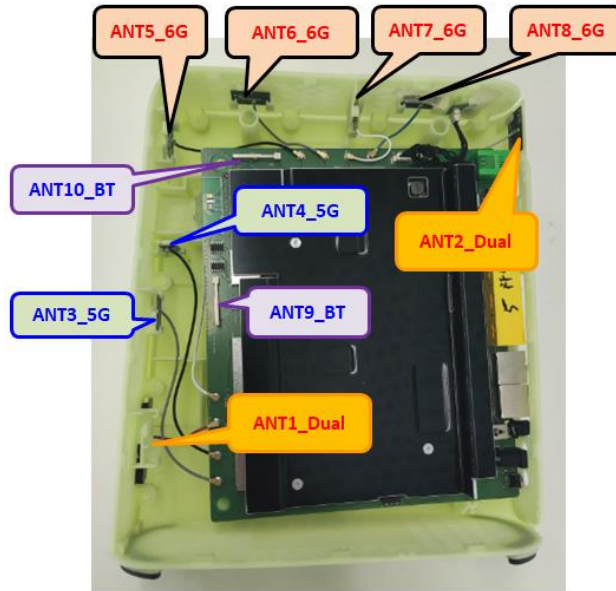
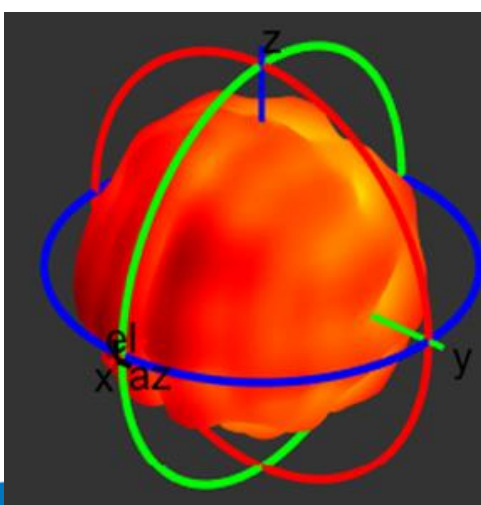
ANT2-2G



ANT9-2G (BT)



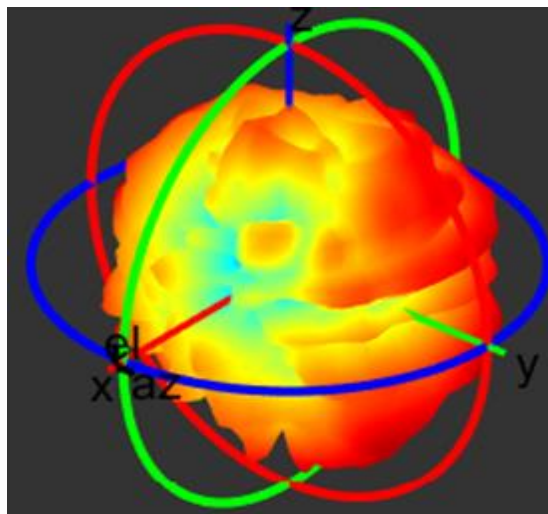
ANT10-2G (BT)



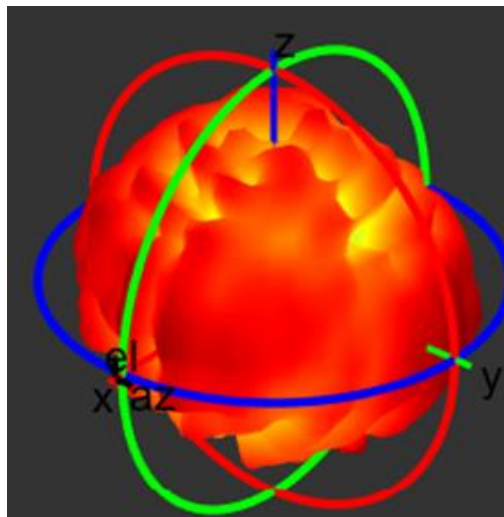


# 3D Radiation Pattern@5.5GHz

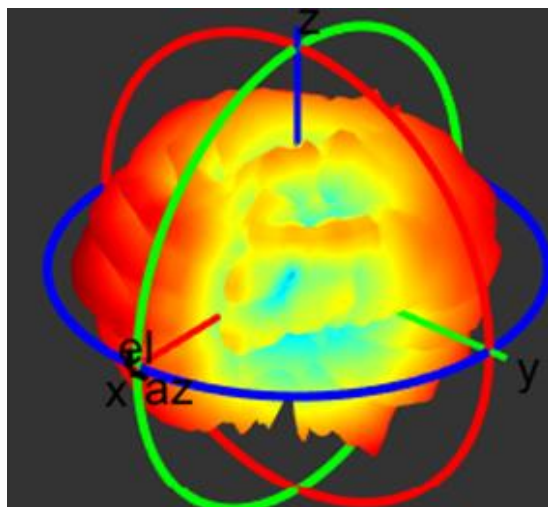
ANT1-5G



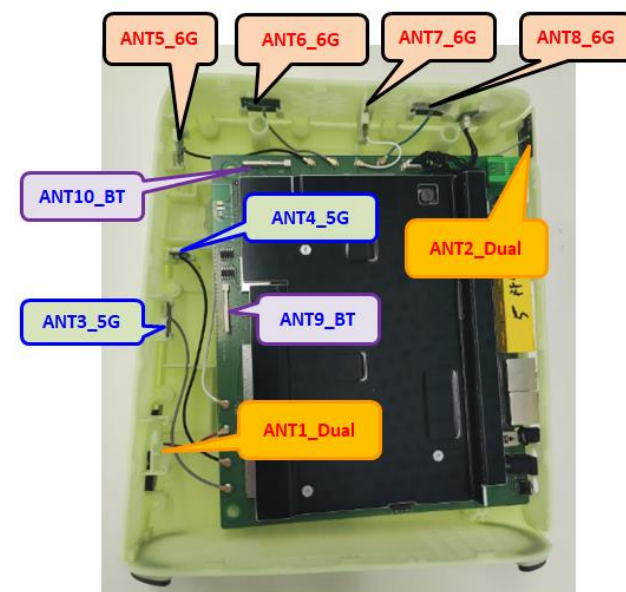
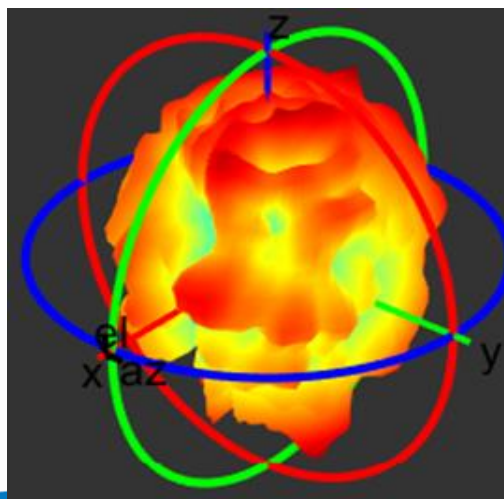
ANT2-5G



ANT3-5G



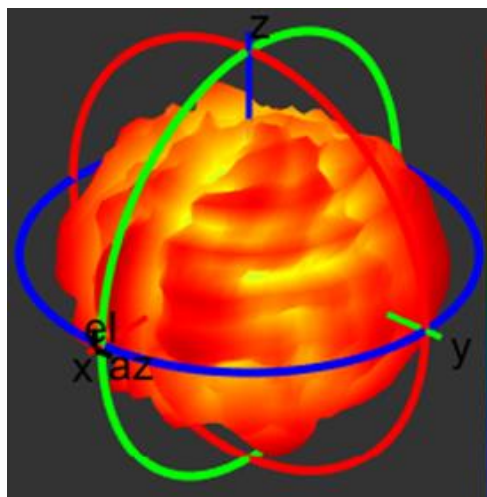
ANT4-5G



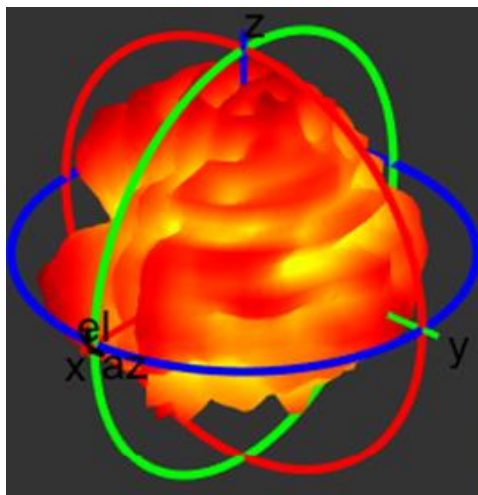


# 3D Radiation Pattern@6.5GHz

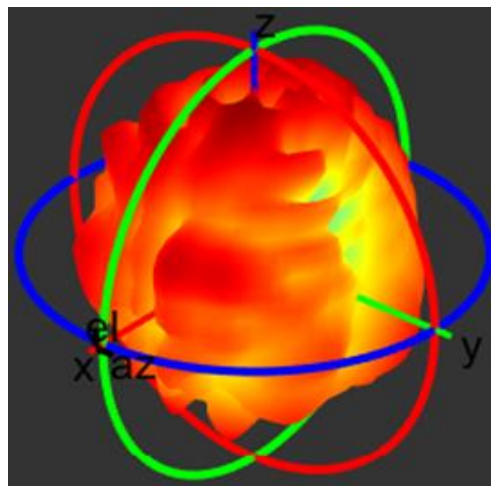
ANT5-6G



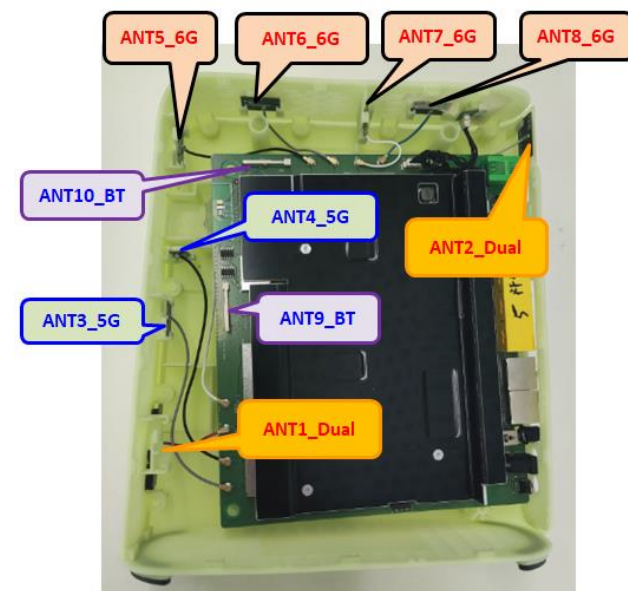
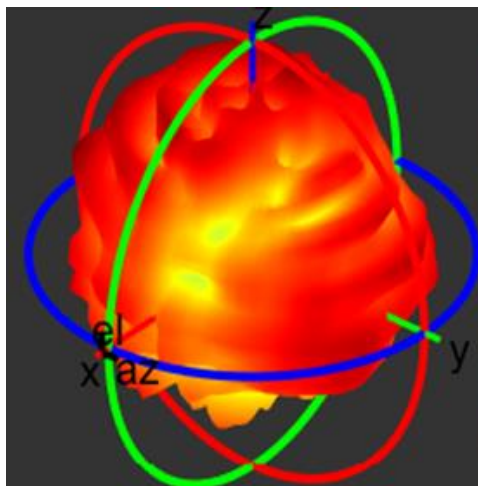
ANT6-6G



ANT7-6G



ANT8-6G



Note: 6G is only for model HT-6766BEM

# Gain & Efficiency

| ANT | NO.       | Frequency(GHz) | Gain(dBi) | Efficiency |
|-----|-----------|----------------|-----------|------------|
| 2G  | ANT1-Dual | 2.45           | 3.67      | 70.38%     |
|     | ANT2-Dual | 2.45           | 3.72      | 72.24%     |
| 5G  | ANT1-Dual | 5.5            | 4.42      | 68.78%     |
|     | ANT2-Dual | 5.5            | 4.48      | 70.13%     |
|     | ANT3-5G   | 5.5            | 4.43      | 67.81%     |
|     | ANT4-5G   | 5.5            | 4.19      | 70.32%     |
| 6G  | ANT5-6G   | 6.5            | 4.24      | 69.42%     |
|     | ANT6-6G   | 6.5            | 4.92      | 65.89%     |
|     | ANT7-6G   | 6.5            | 4.84      | 67.84%     |
|     | ANT8-6G   | 6.5            | 3.35      | 66.57%     |
| BT  | ANT9-BT   | 2.45           | 3.67      | 67.38%     |
|     | ANT10-BT  | 2.45           | 3.81      | 65.74%     |

- The WIFI 2.4G antenna's Gain < 4.0dBi, Efficiency> 70%;
- The WIFI 5G antenna's Gain < 4.5dBi, Efficiency> 65%;
- The WIFI 6G antenna's Gain < 5.0dBi, Efficiency> 60%;
- The WIFI BT antenna's Gain < 4.0dBi, Efficiency> 65%.

**Note: 6G is only for model HT-6766BEM**

# Directional Gain



Used for FCC and CE certification

| ANT | NO.       | Frequency(GHz) | Uncorrelated | Correlated |
|-----|-----------|----------------|--------------|------------|
| 2G  | ANT1-Dual | 2.45           | 1.77         | 4.76       |
|     | ANT2-Dual | 2.45           |              |            |
| 5G  | ANT1-Dual | 5.5            | 1.05         | 6.62       |
|     | ANT2-Dual | 5.5            |              |            |
|     | ANT3-5G   | 5.5            |              |            |
|     | ANT4-5G   | 5.5            |              |            |
| 6G  | ANT5-6G   | 6.5            | 1.12         | 6.6        |
|     | ANT6-6G   | 6.5            |              |            |
|     | ANT7-6G   | 6.5            |              |            |
|     | ANT8-6G   | 6.5            |              |            |

### 1、 Correlated Directional Gain

Directional gain =  $10 \log \left[ \frac{(10^{G1 \phi / 20} + 10^{G2 \phi / 20} + \dots + 10^{GN \phi / 20})^2}{N_{ANT}} + \frac{(10^{G1 \theta / 20} + 10^{G2 \theta / 20} + \dots + 10^{GN \theta / 20})^2}{N_{ANT}} \right]$  dBi

### 2、 Uncorrelated Directional Gain

Directional gain =  $10 \log \left[ \frac{10^{G1 \phi / 10} + 10^{G2 \phi / 10} + \dots + 10^{GN \phi / 10}}{N_{ANT}} + \frac{10^{G1 \theta / 10} + 10^{G2 \theta / 10} + \dots + 10^{GN \theta / 10}}{N_{ANT}} \right]$  dBi

Note: 6G is only for model HT-6766BEM

# Summary

- **Return loss**

The data on page 17 shows:

- The WIFI 2.4G antenna's Return loss  $< -10\text{dB}$ ;
- The WIFI 5G antenna's Return loss  $< -10\text{dB}$ ;
- The WIFI 6G antenna's Return loss  $< -10\text{dB}$ ;
- The WIFI BT antenna's Return loss  $< -10\text{dB}$ .

- **Isolation**

The data on page 47 shows:

- The Isolation between WIFI 2.4G antennas  $< -20\text{dB}$ ;
- The Isolation between WIFI 5G antennas  $< -20\text{dB}$ ;
- The Isolation between WIFI 6G antennas  $< -20\text{dB}$ ;
- The Isolation between WIFI 5G & 6G antennas  $< -25\text{dB}$ ;
- The Isolation between WIFI 2G & BT antennas  $< -20\text{dB}$ .

- **Gain & Efficiency**

The data on page 52 shows:

- The WIFI 2.4G antenna's Gain  $< 4.0\text{dBi}$ , Efficiency  $> 70\%$ ;
- The WIFI 5G antenna's Gain  $< 4.5\text{dBi}$ , Efficiency  $> 65\%$ ;
- The WIFI 6G antenna's Gain  $< 5.0\text{dBi}$ , Efficiency  $> 60\%$ ;
- The WIFI BT antenna's Gain  $< 4.0\text{dBi}$ , Efficiency  $> 65\%$ .



Through the above data analysis, the single antenna can meet the performance requirements.

**Note: 6G is only for model HT-6766BEM**

Thanks!

