

ERO1X PRO V3

-Antenna passive pretest report

V1.2

Report version update resume



NO.	Modify description	Modifier	Date
V1.0	Initial issue	Wen	2021.1.18
V1.1	Increase combination gain	Wen	2023.9.13
V1.2	Added antenna manufacturer, antenna model, size diagram	Wen	2023.10.20

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

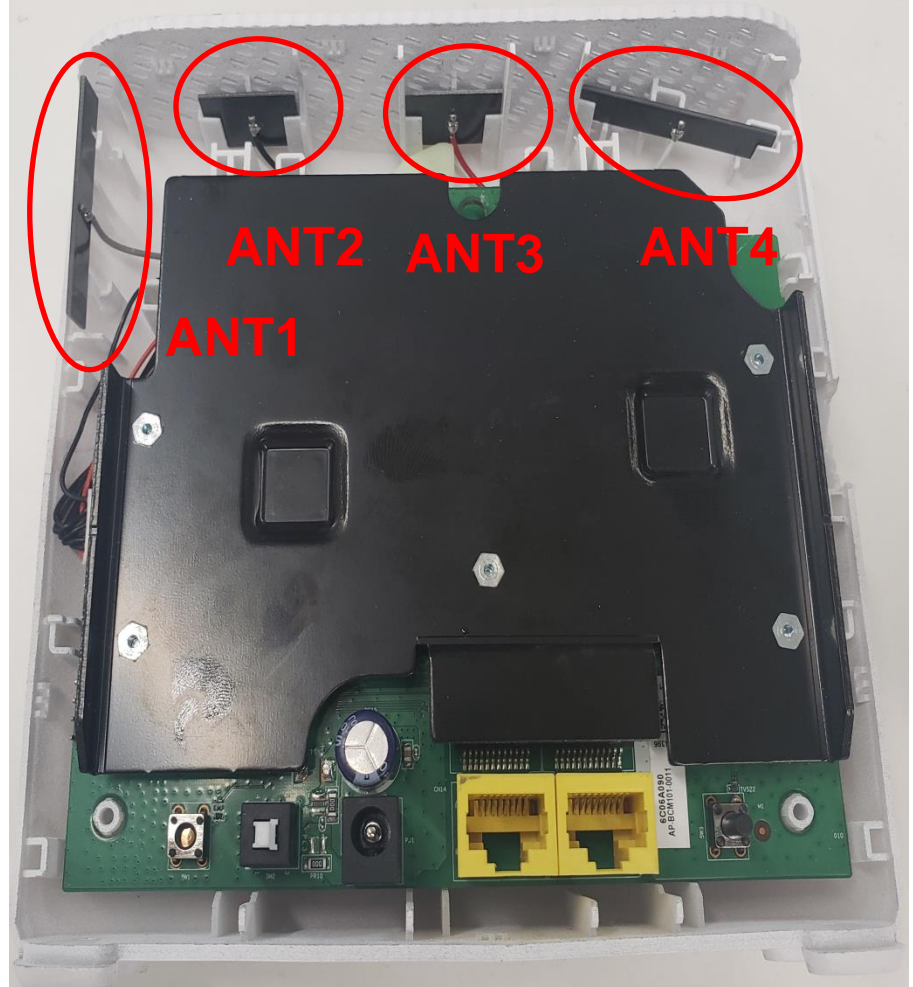
Purpose

- 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

DUT Antenna



NO.	Frequency	Polarization
ANT1	2.4GHz-2.5GHz 5.15GHz-5.85GHz	Linear polarization
ANT2	5.15GHz-5.85GHz	
ANT3	5.15GHz-5.85GHz	
ANT4	2.4GHz-2.5GHz 5.15GHz-5.85GHz	

Antenna manufacturer :

Dongguan City Xinsheng Electronics Co.,Ltd,

Manufacturer address:

No.6 Village, Datanlang District, Dalingshan, Dongguan, Guangdong, China.

Antenna product model :

EmP323h-B-I100(G) /EmP323g-B-I70(W)

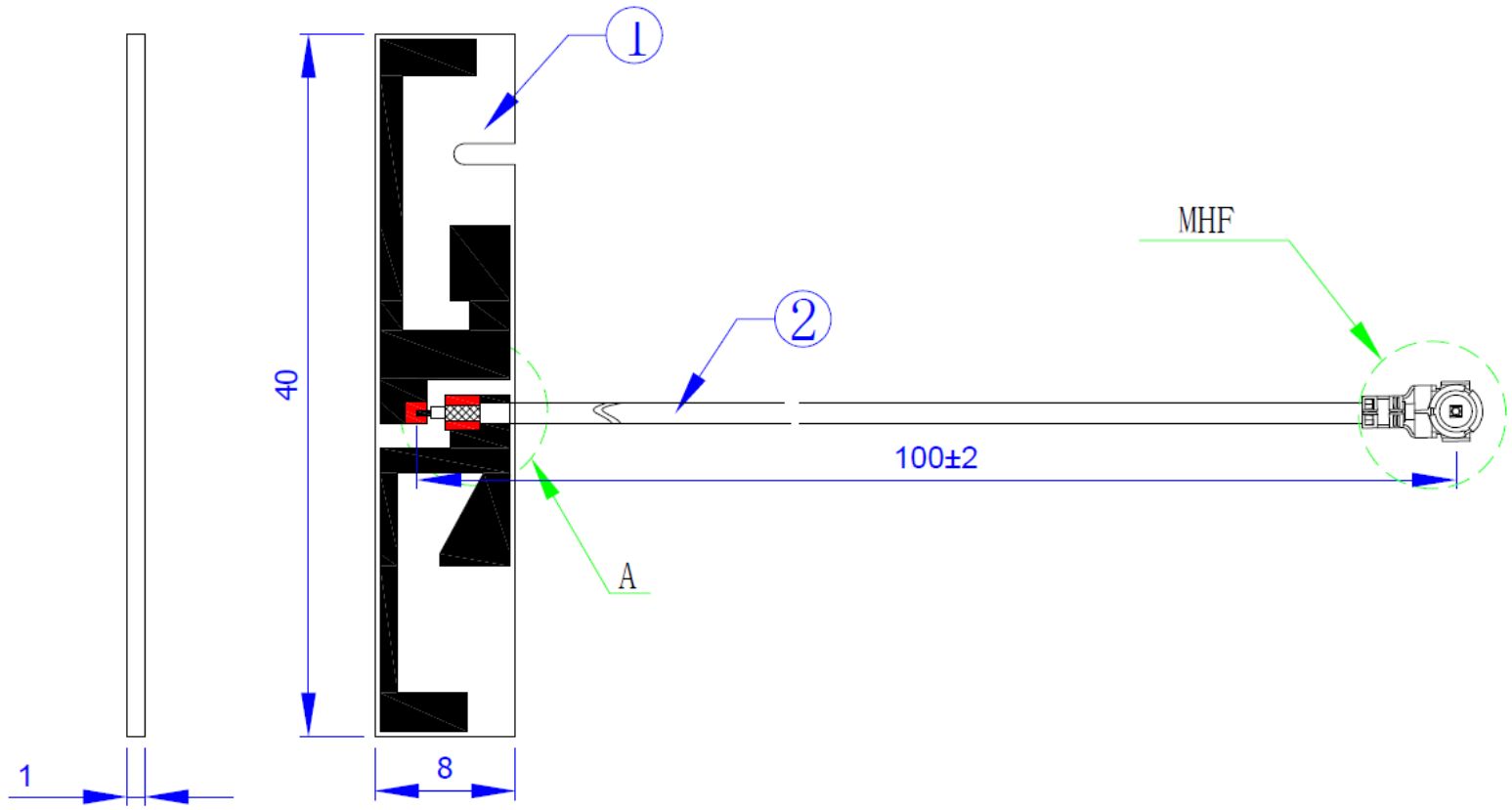
/EmP209-B-I90(R)/EmP208-B-I70(B)

DUT Antenna

ANT1

Antenna dimension:

(Remark: for EmP323h-B-I100(G) the RF cable is 100mm)

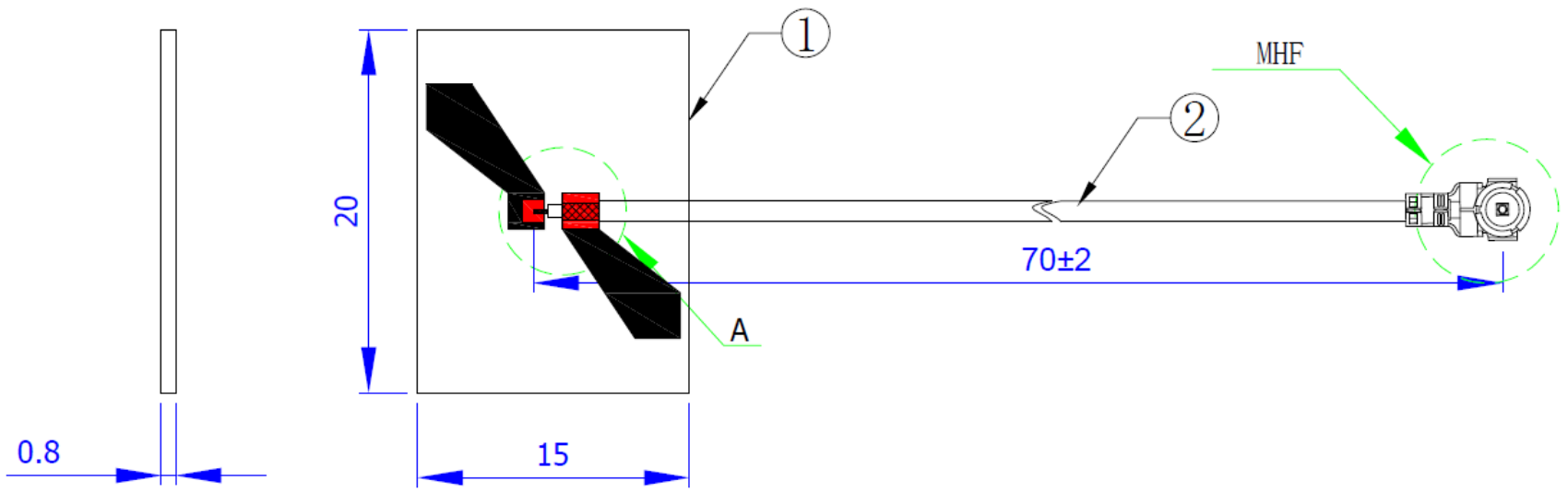


t:mm)

DUT Antenna

ANT2

Antenna dimension:
(Remark: for EmP208-B-I70(B),the RF cable is 70mm)



(Unit:mm)

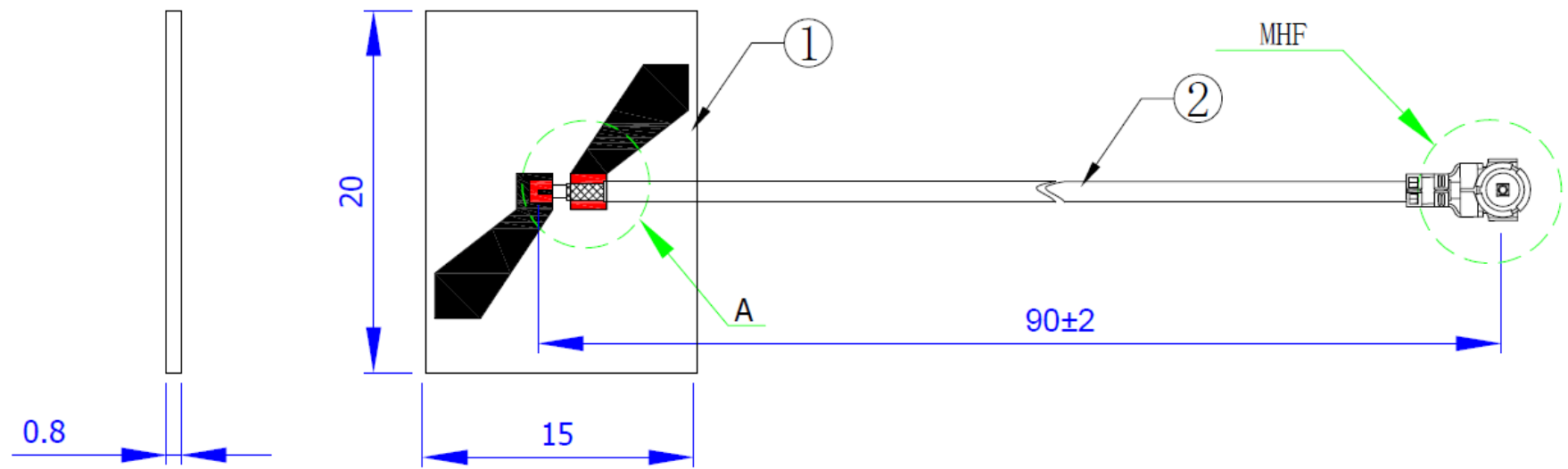
DUT Antenna



ANT3

Antenna dimension:

(Remark: for EmP209-B-I90(R) the RF cable is 90mm)



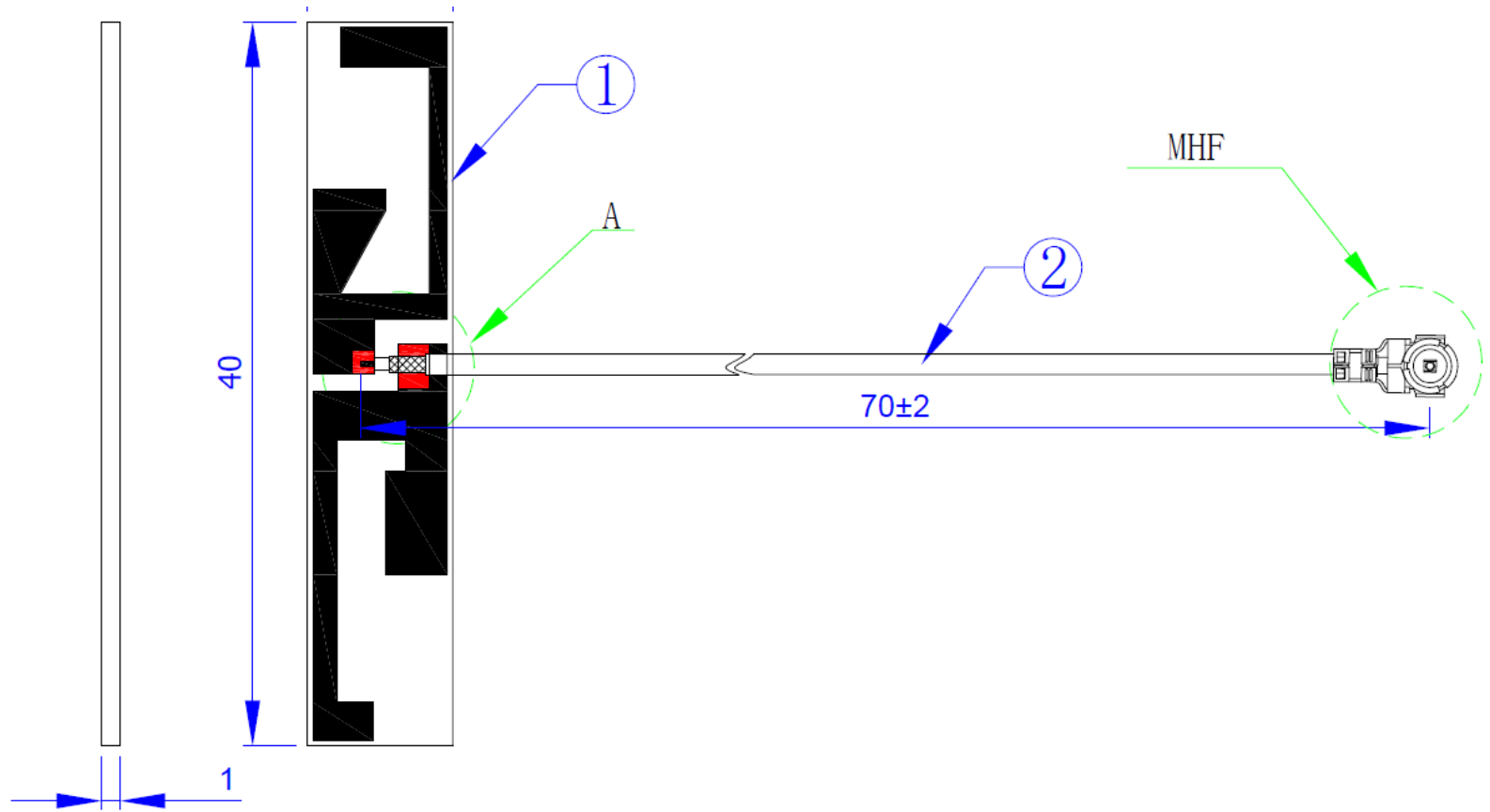
(Unit:mm)

DUT Antenna

ANT4

Antenna dimension:

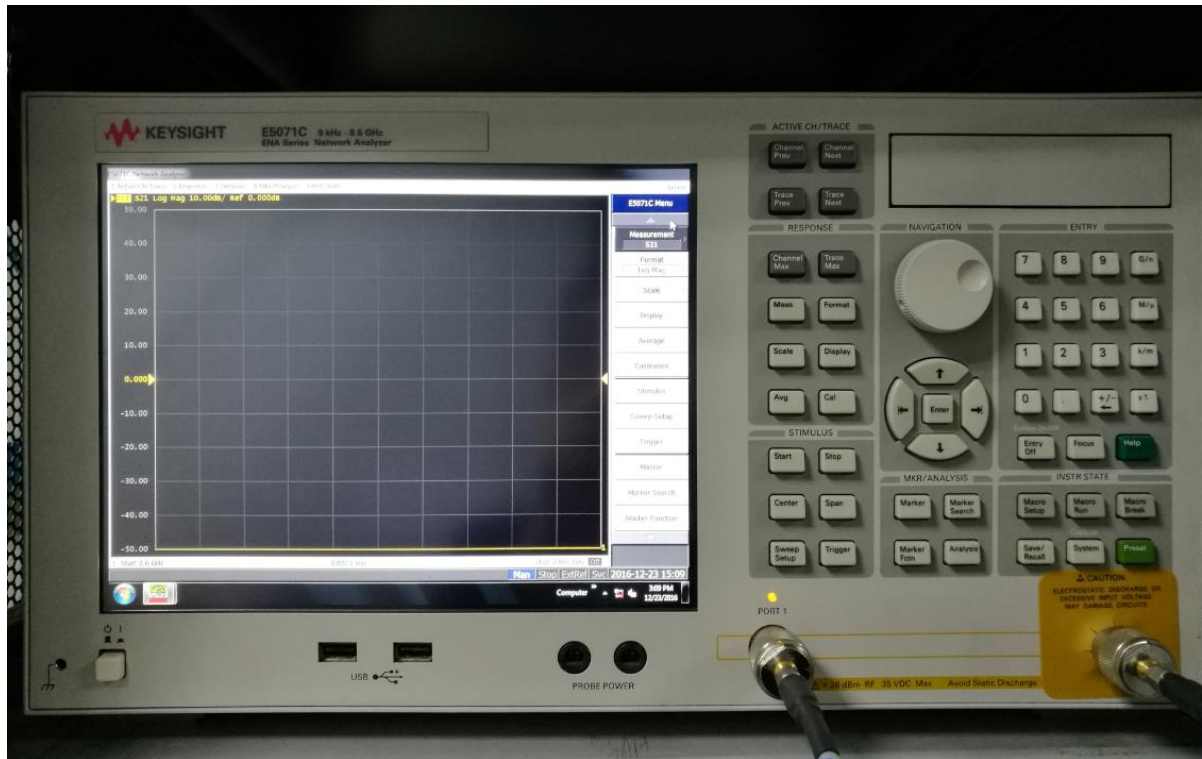
(Remark: for EmP323g-B-I70(W) the RF cable is 70mm)



(Unit:mm)

Return Loss and Isolation

Test Condition

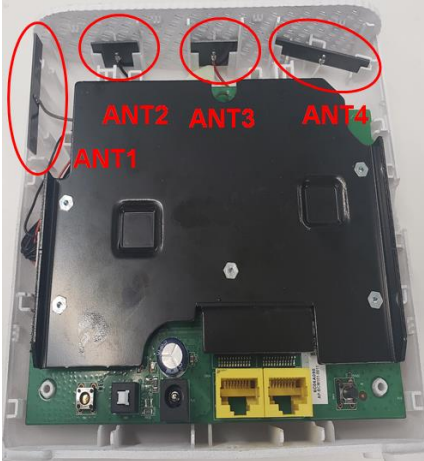
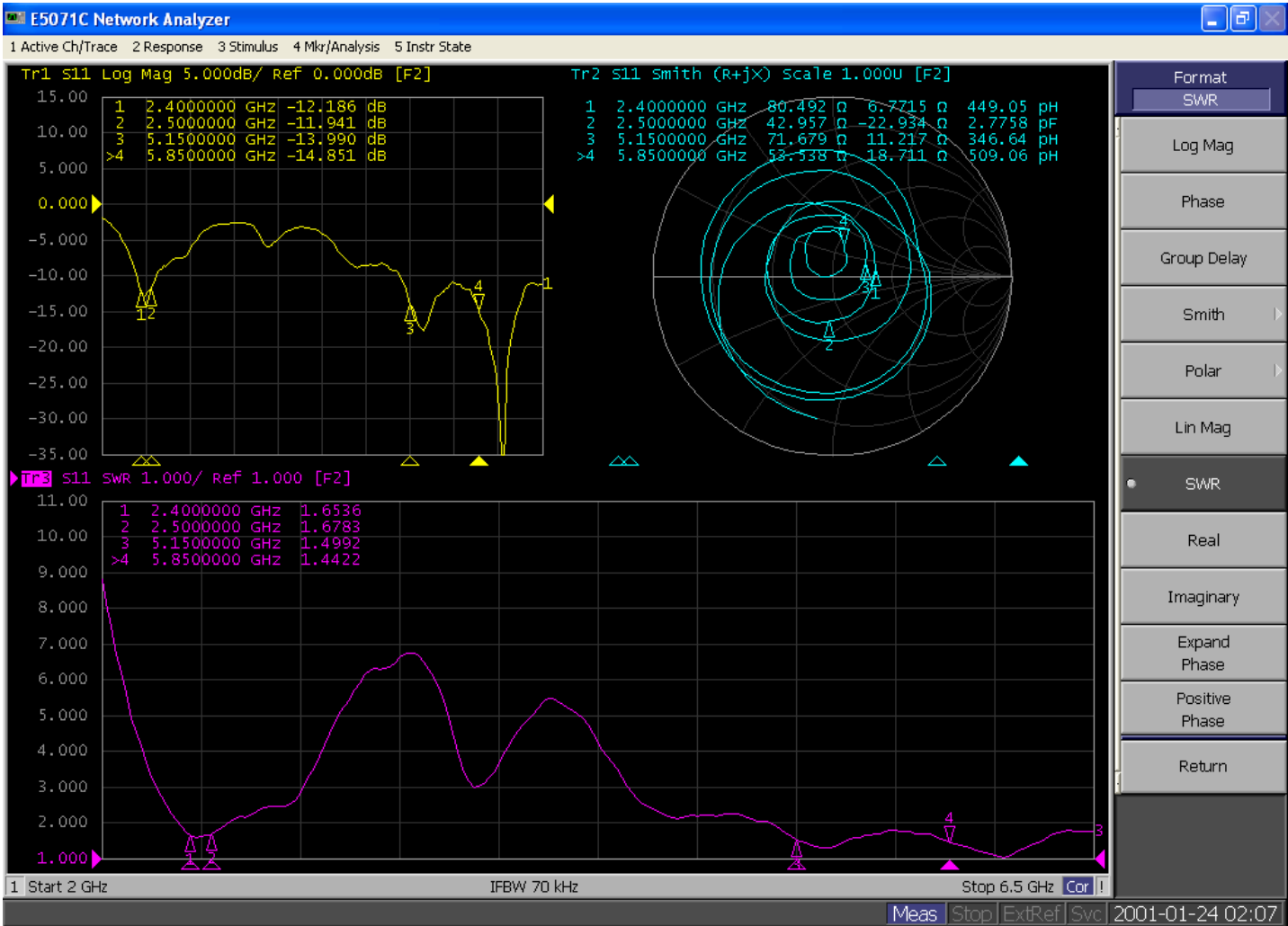


The network Analyzer

Return Loss



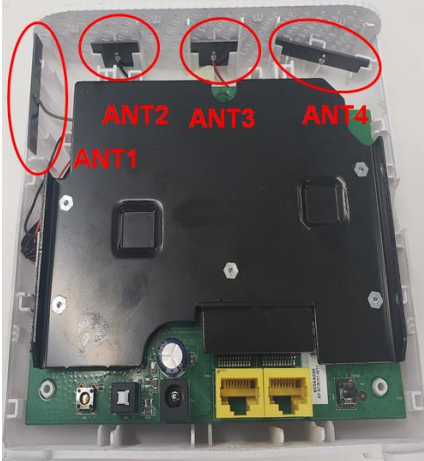
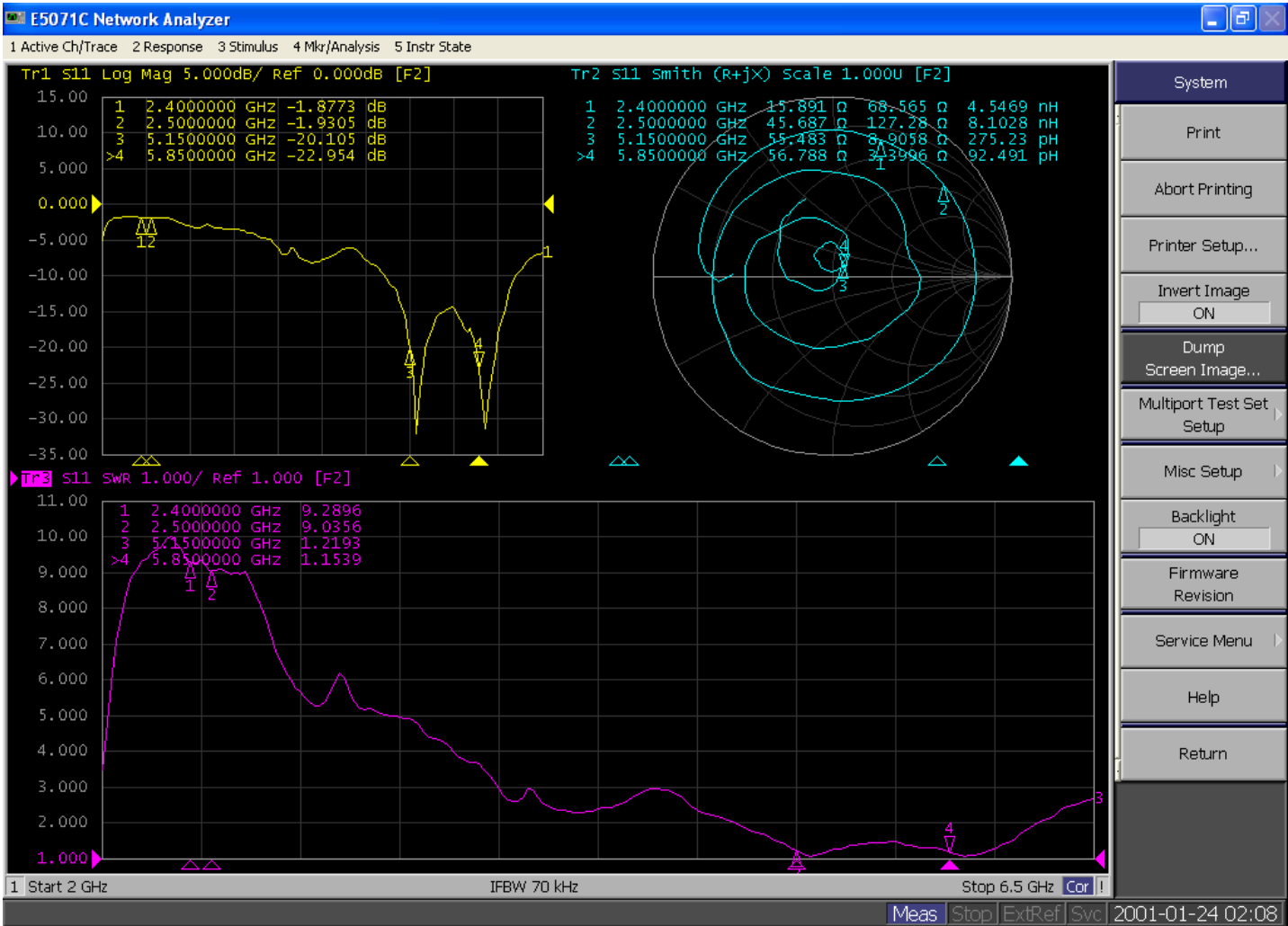
ANT1



Return Loss



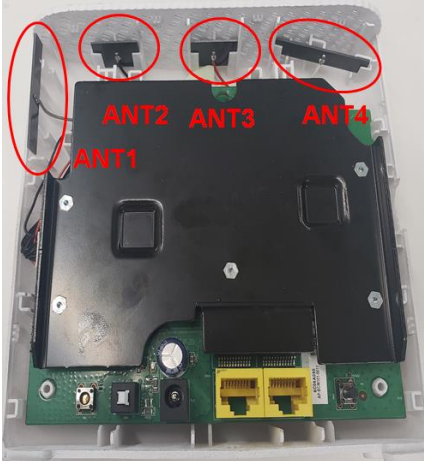
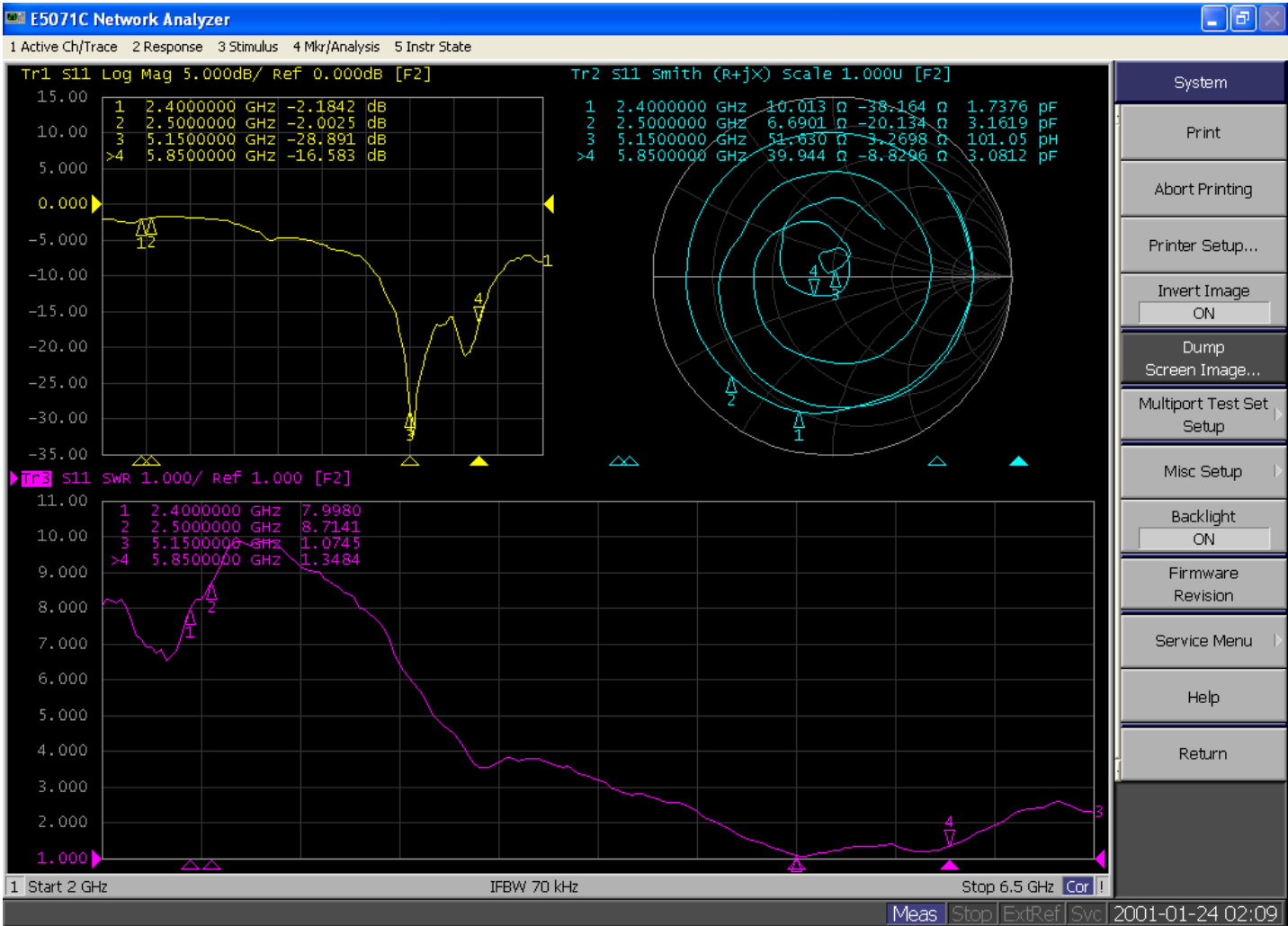
ANT2



Return Loss



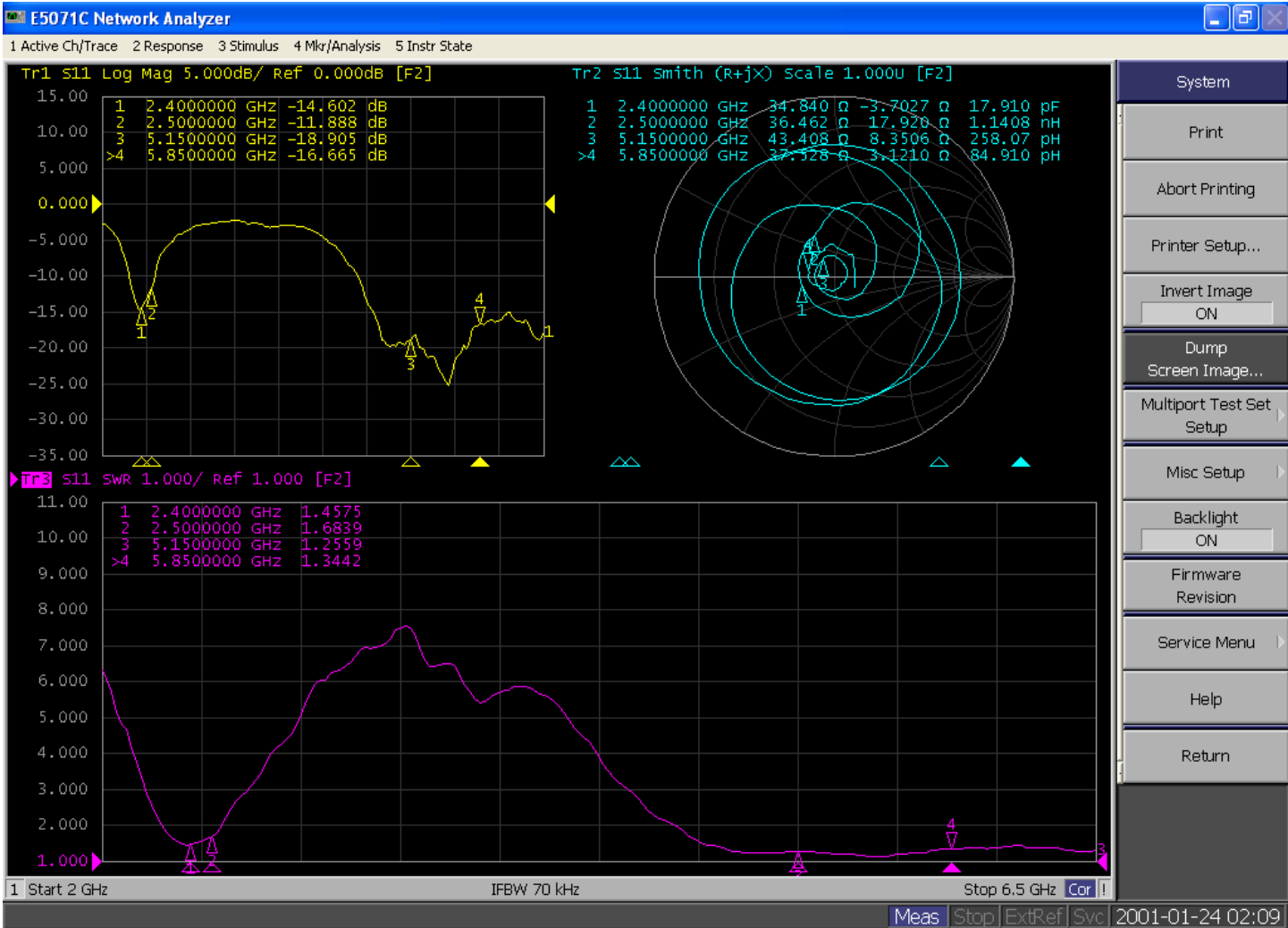
ANT3



Return Loss



ANT4



System

Print

Abort Printing

Printer Setup...

Invert Image
ON

Dump
Screen Image...

Multiport Test Set
Setup

Misc Setup

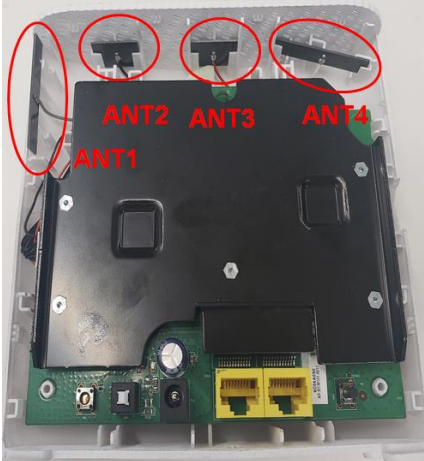
Backlight
ON

Firmware
Revision

Service Menu

Help

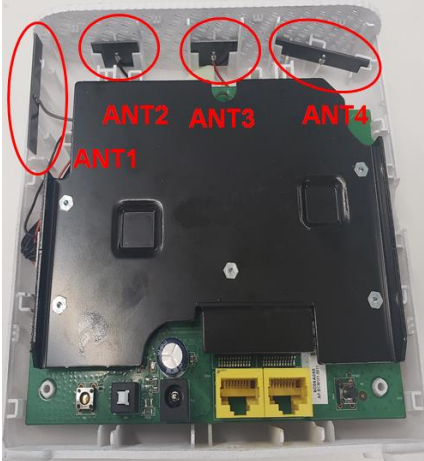
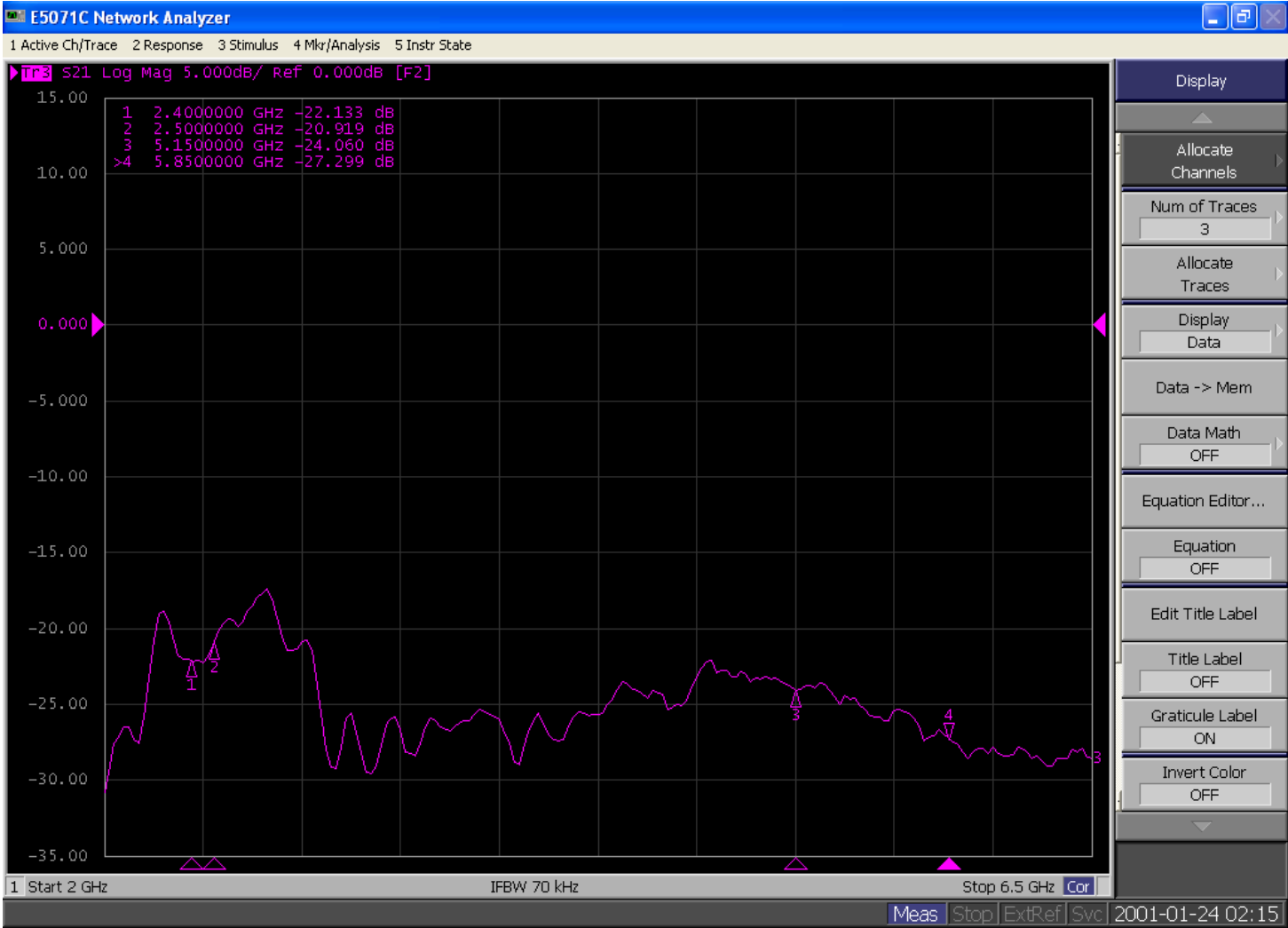
Return



Isolation



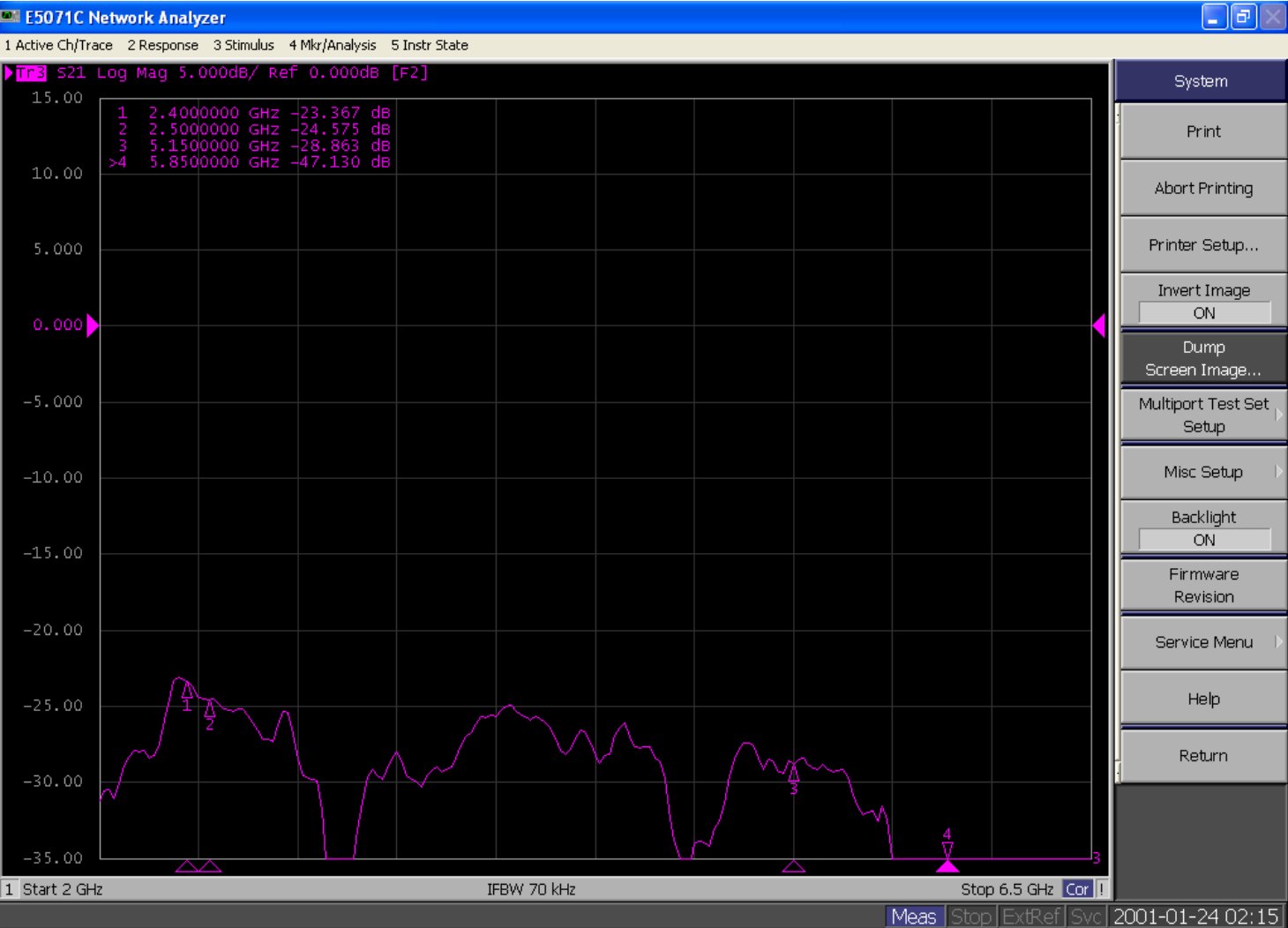
ANT1&ANT2



Isolation



ANT1&ANT3



System

Print

Abort Printing

Printer Setup...

Invert Image
ON

Dump
Screen Image...

Multiport Test Set
Setup

Misc Setup

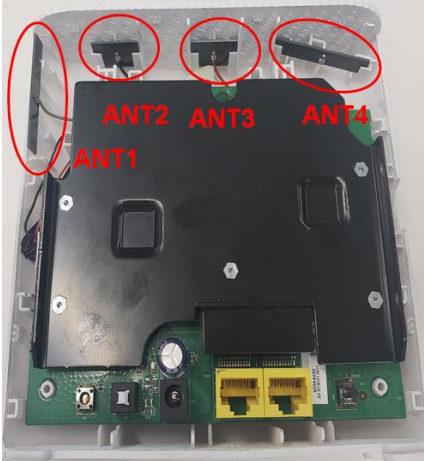
Backlight
ON

Firmware
Revision

Service Menu

Help

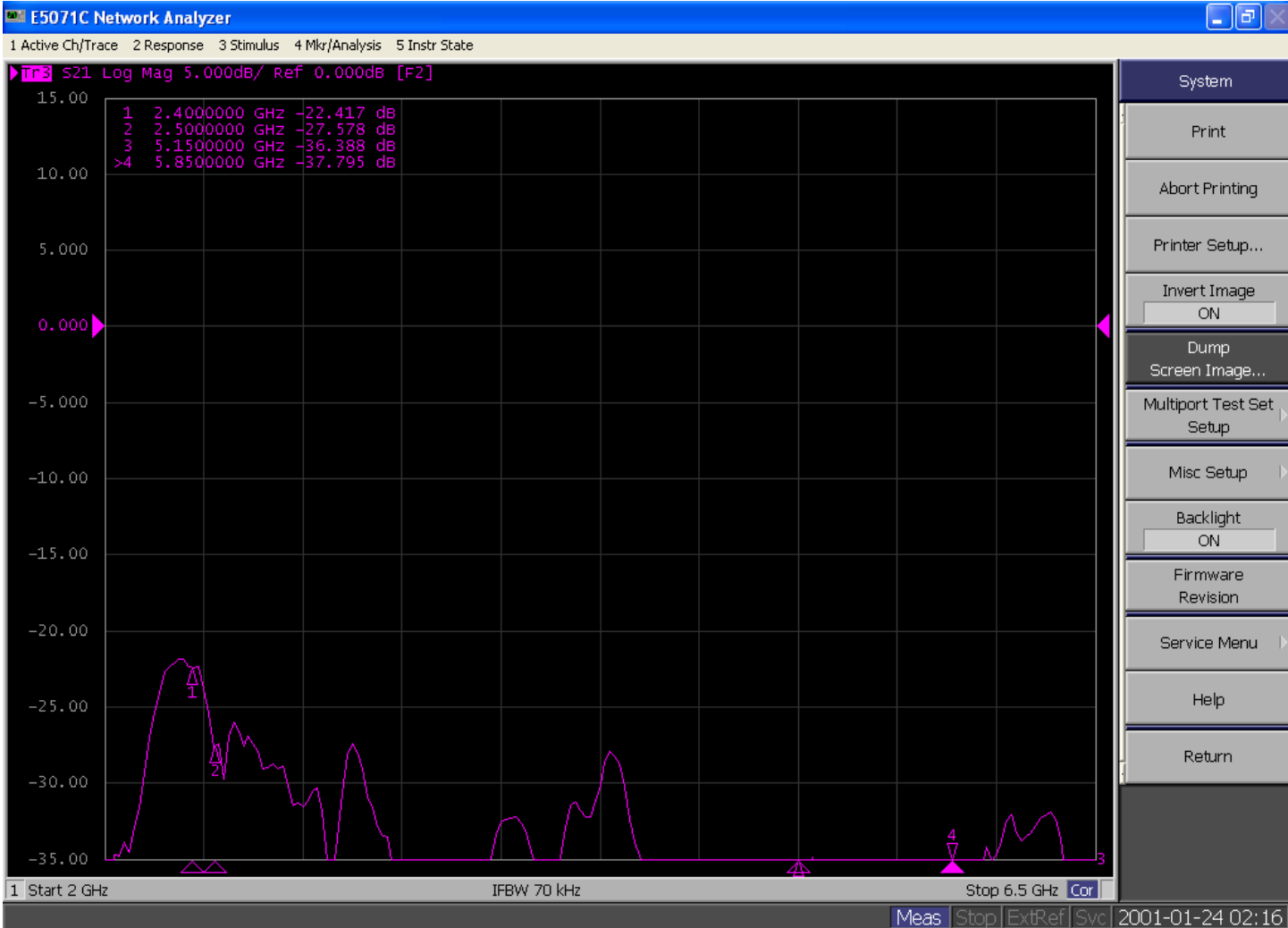
Return



Isolation



ANT1&ANT4



- System
- Print
- Abort Printing
- Printer Setup...
- Invert Image ON
- Dump Screen Image...
- Multiport Test Set Setup
- Misc Setup
- Backlight ON
- Firmware Revision
- Service Menu
- Help
- Return



Isolation



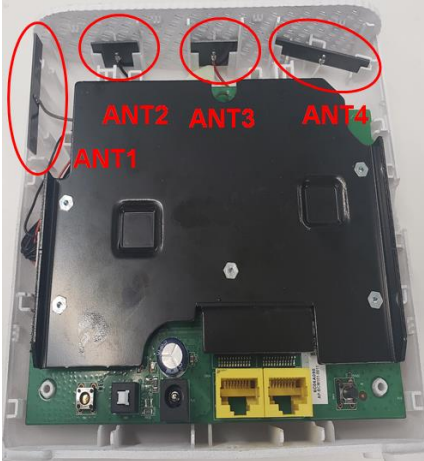
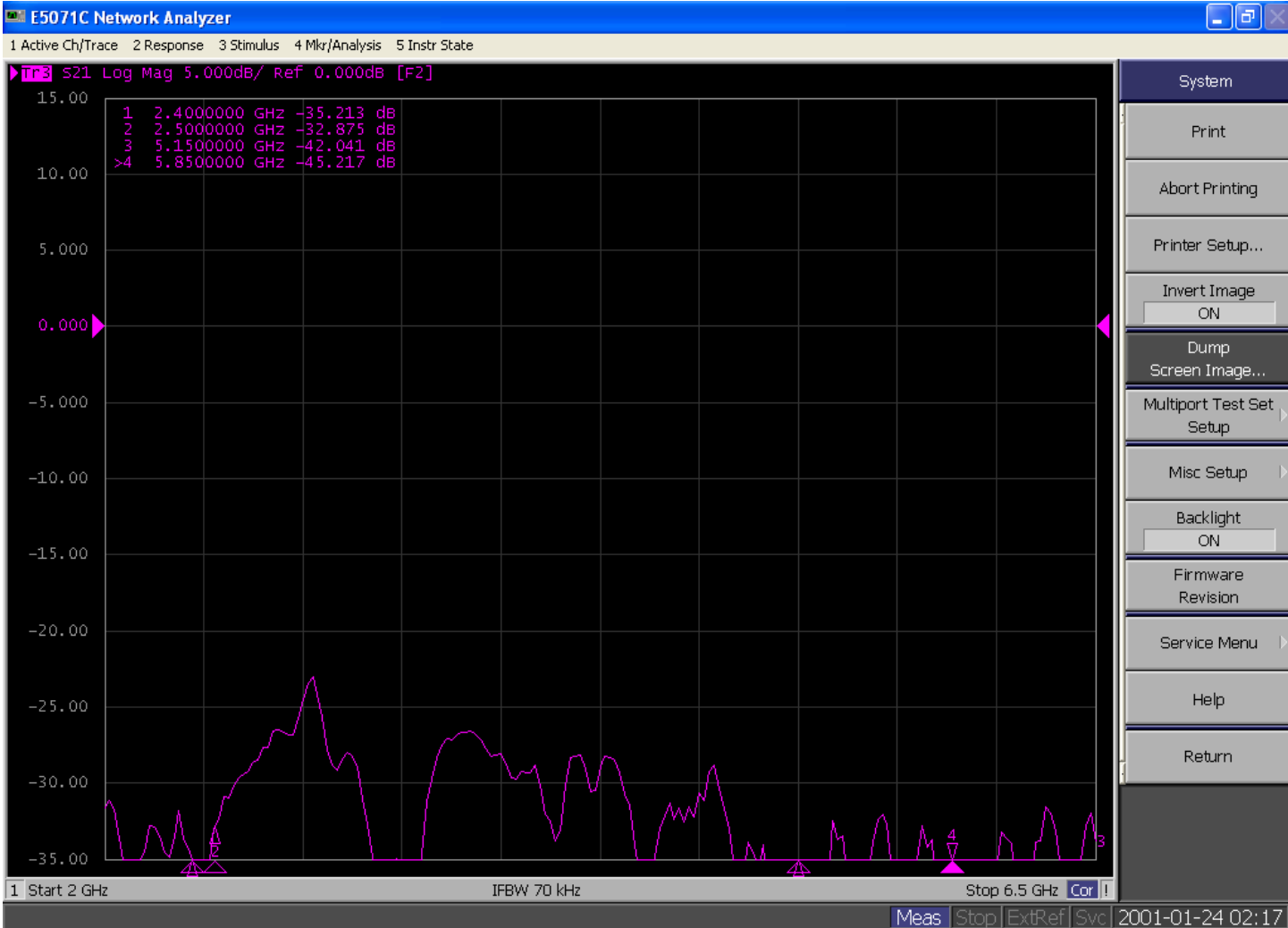
ANT2&ANT3



Isolation



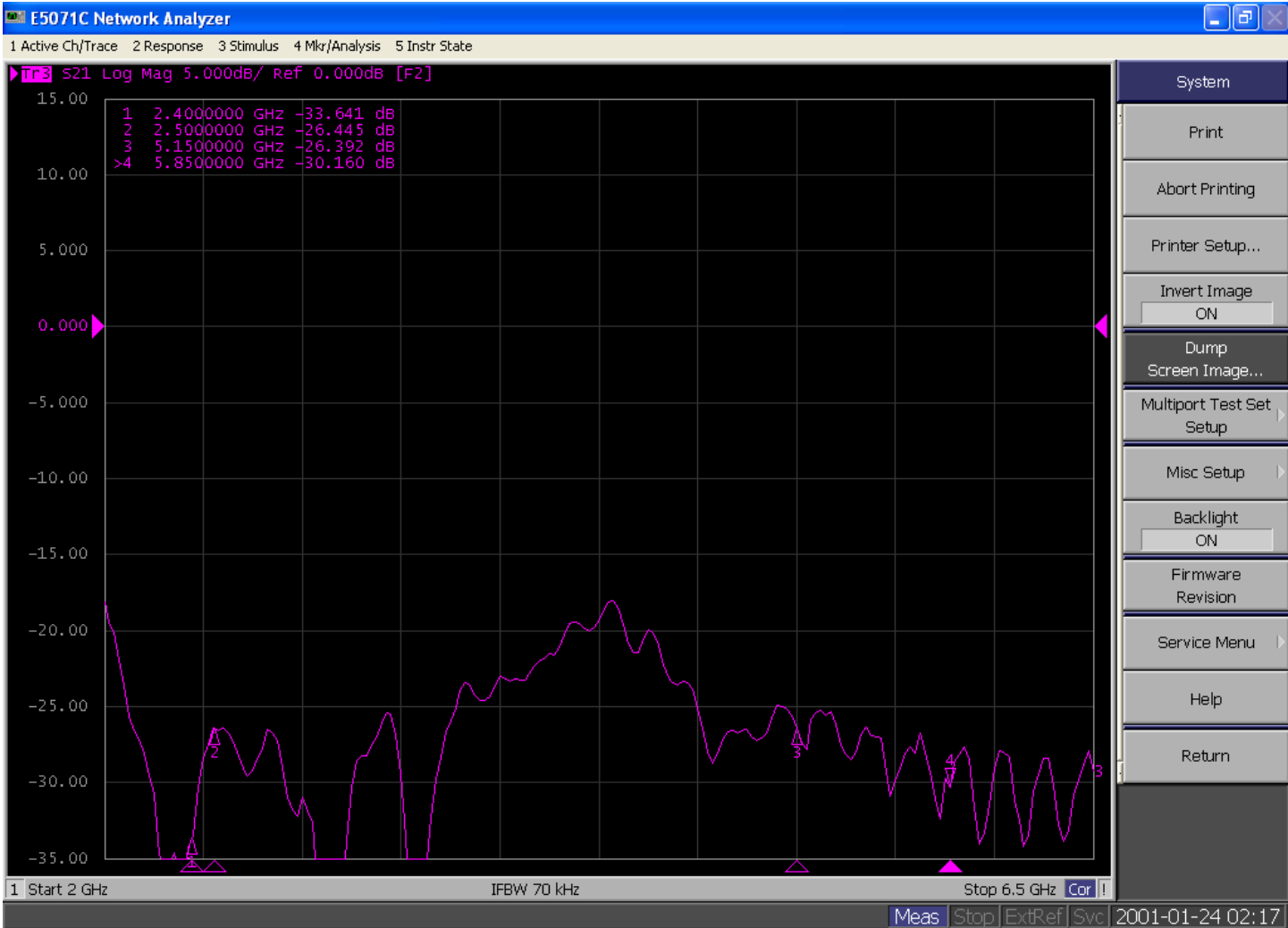
ANT2&ANT4



Isolation



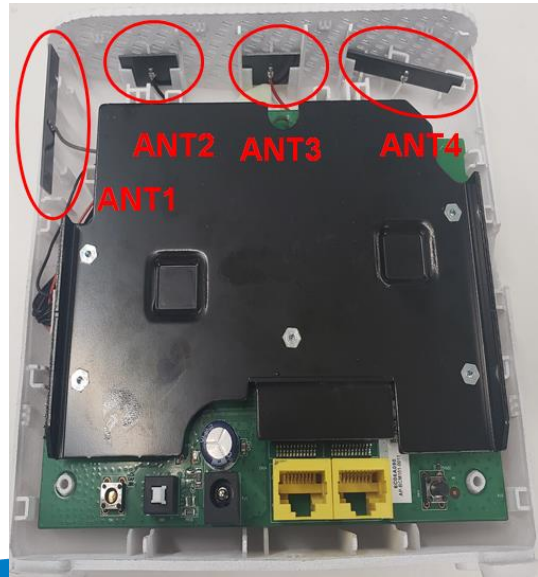
ANT3&ANT4



Return Loss and Isolation

Test results

Frequency (GHz)	Return loss		Isolation	
	2.4-2.5GHz	5.15-5.85GHz	2.4-2.5GHz	5.15-5.85GHz
ANT1	<-11dB	<-13dB	<-20dB	
ANT2	NA	<-15dB		
ANT3	NA	<-15dB		
ANT4	<-11dB	<-15dB		



Test Condition

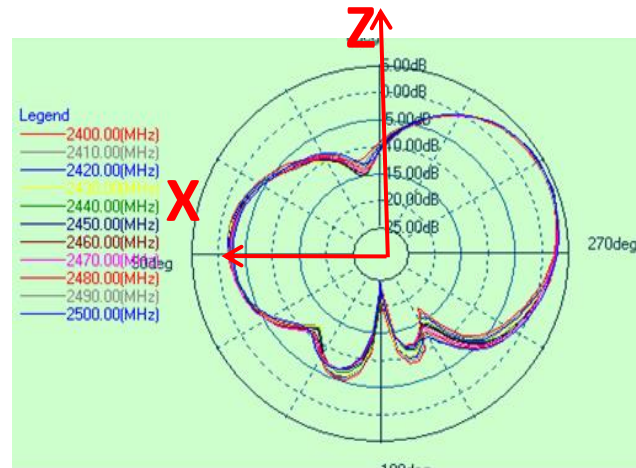
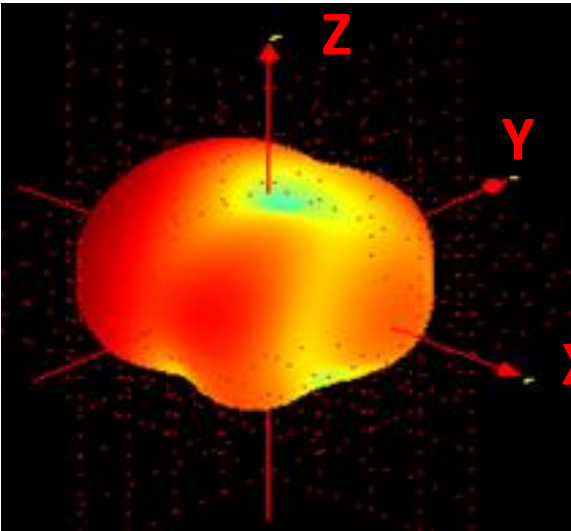
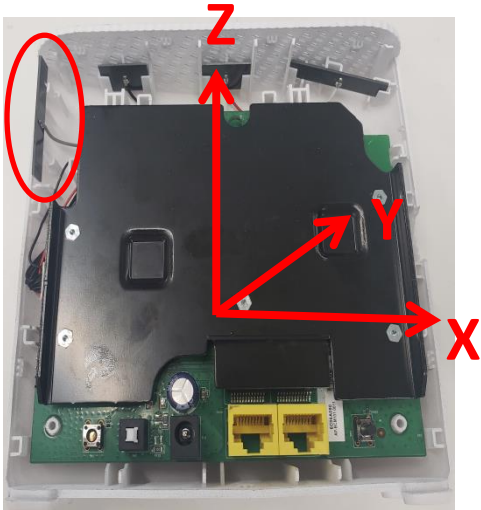


Microwave anechoic chamber

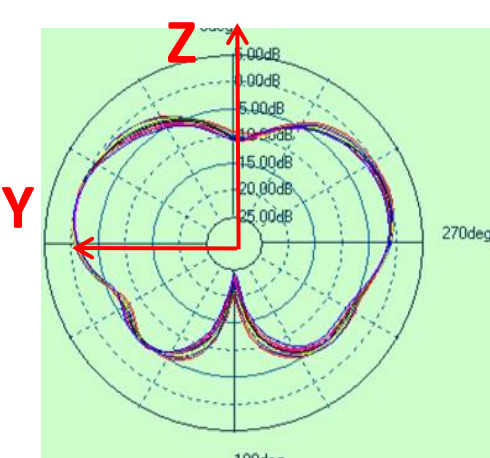
2D/3D Radiation pattern

2.4G

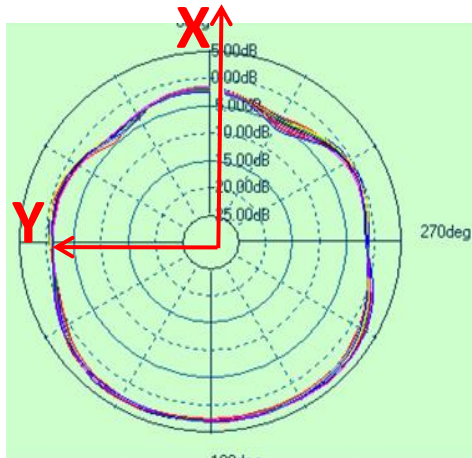
ANT1



E1 (Phi=0)



E1 (Phi=90)

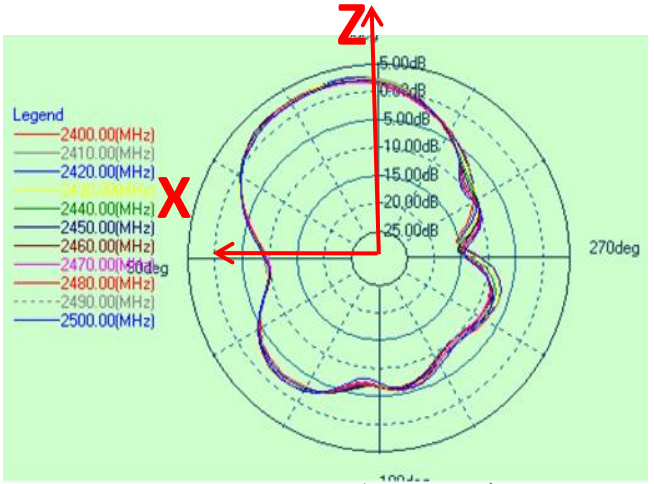
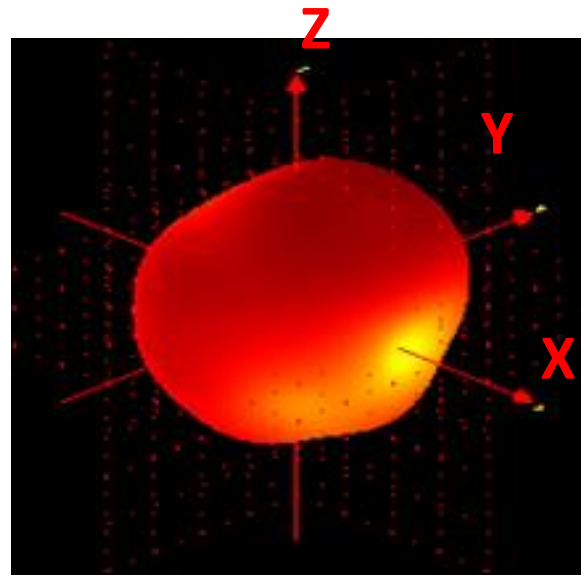
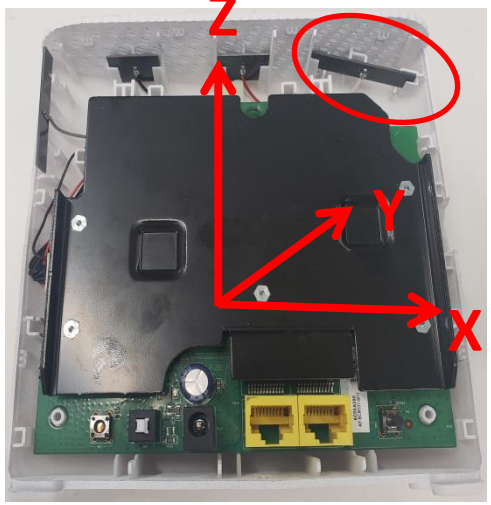


H (Theta=90)

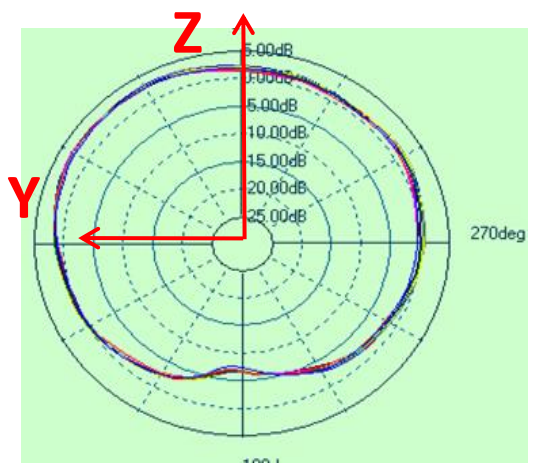
2D/3D Radiation pattern

2.4G

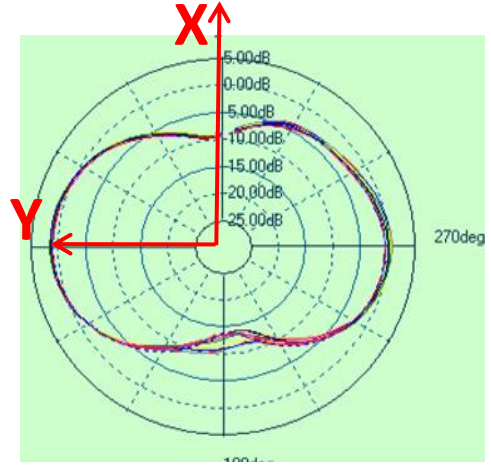
ANT4



E1 (Phi=0)



E1 (Phi=90)

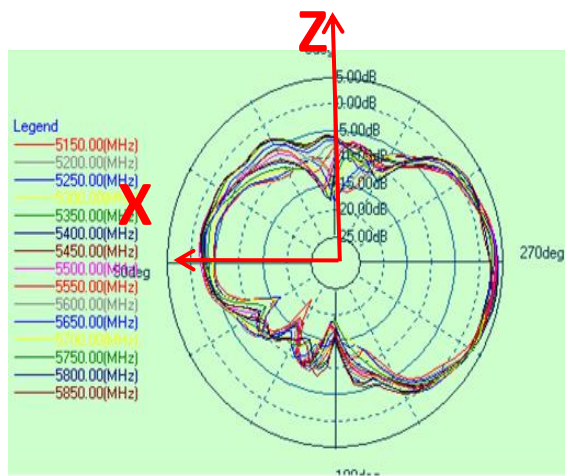
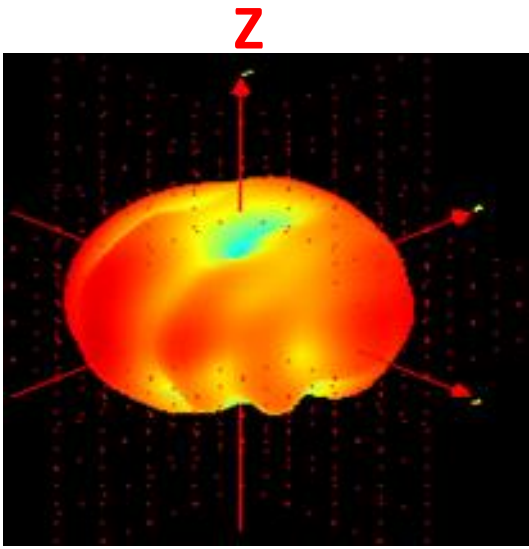
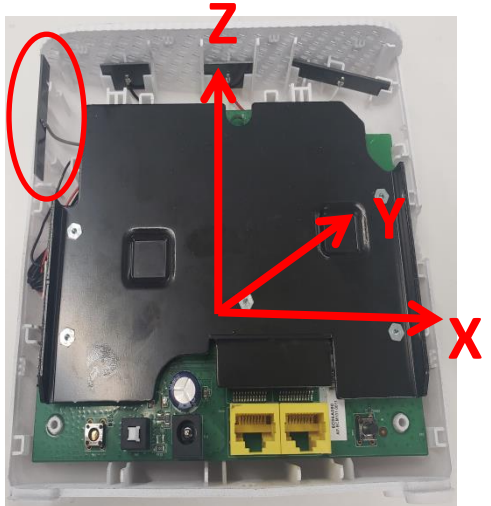


H (Theta=90)

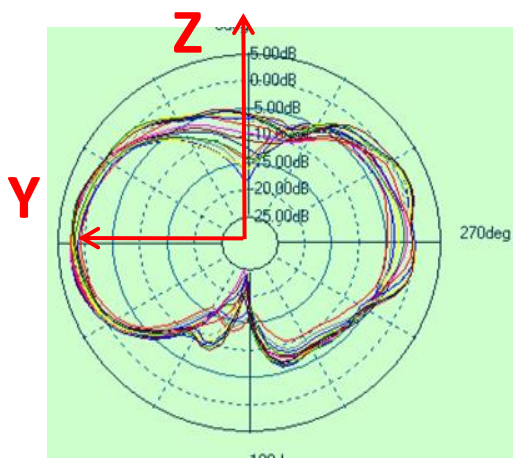
2D/3D Radiation pattern

2.4G

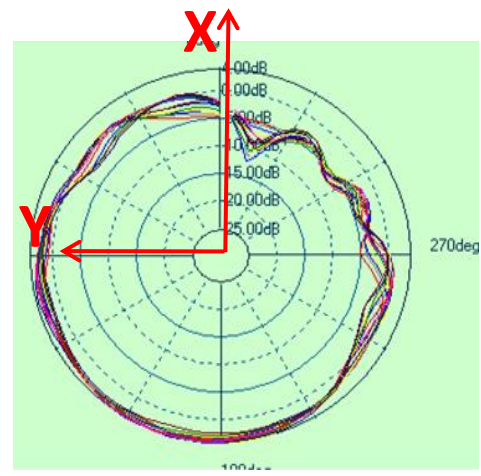
ANT1



E1 (Phi=0)



E1 (Phi=90)

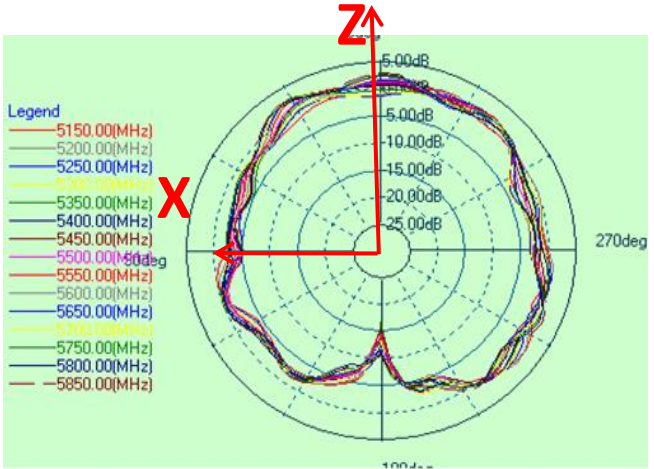
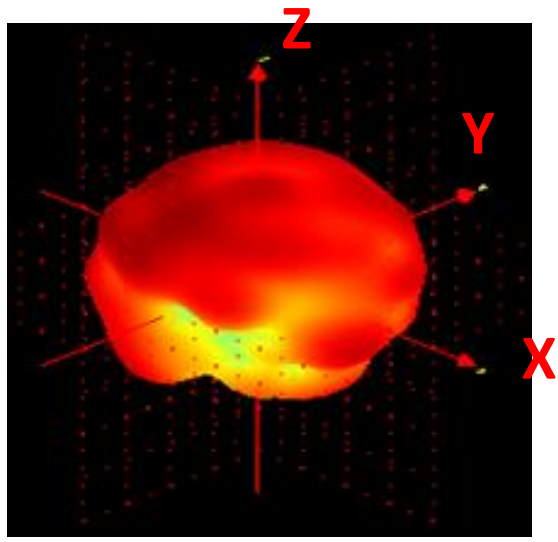
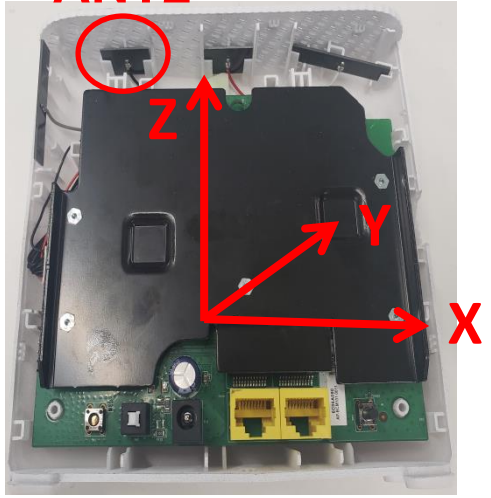


H (Theta=90)

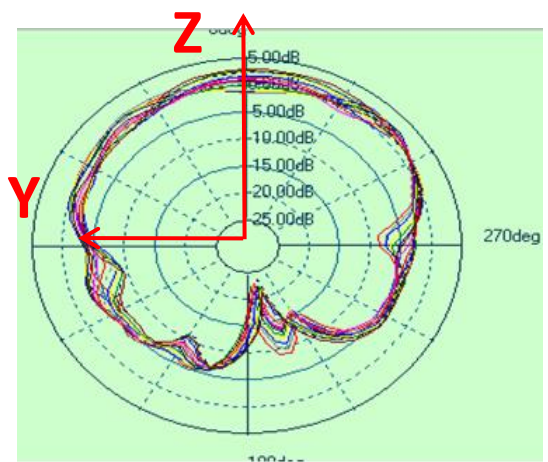
2D/3D Radiation pattern

5G

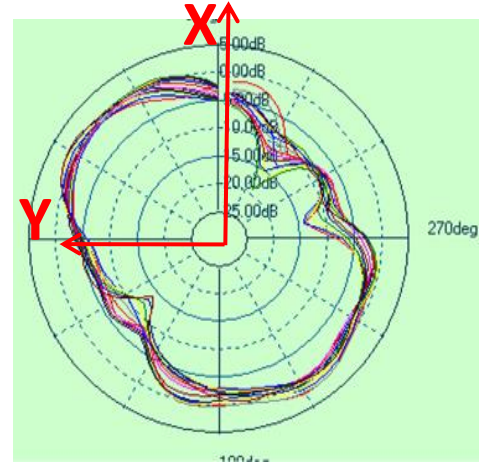
ANT2



E1 (Phi=0)



E1 (Phi=90)

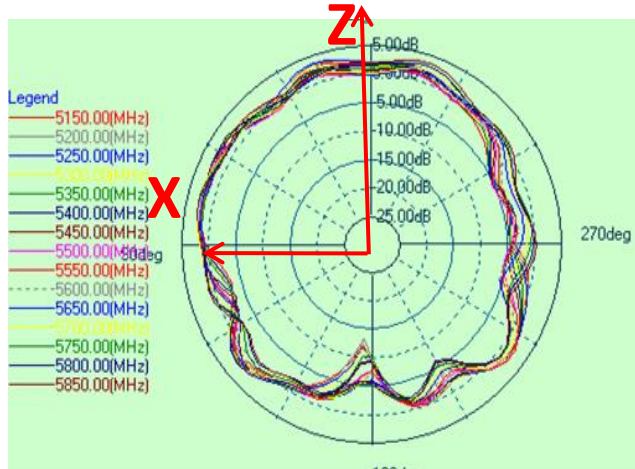
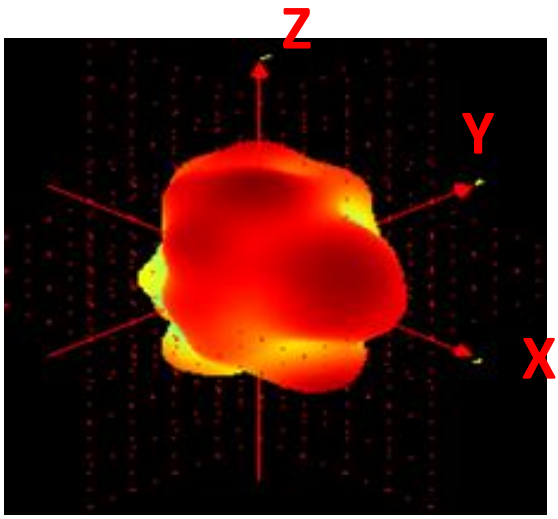
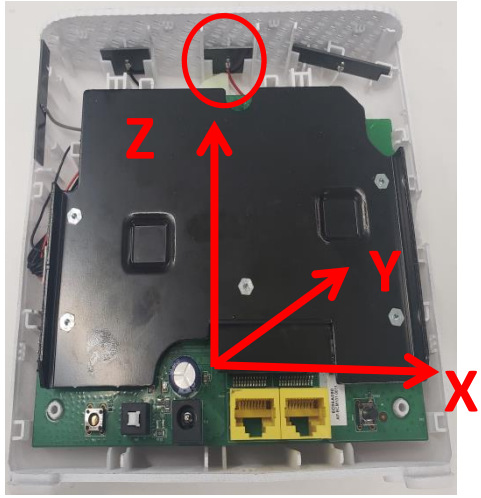


H (Theta=90)

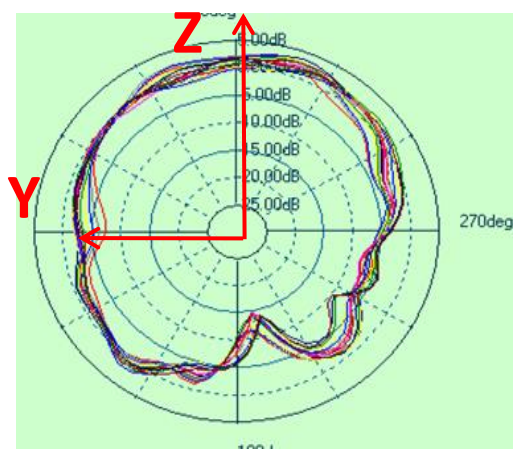
2D/3D Radiation pattern

2.4G

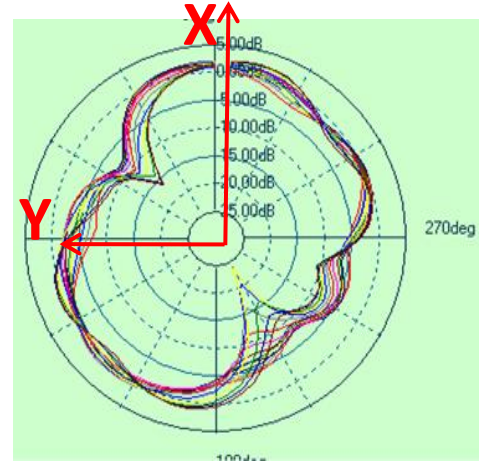
ANT3



E1 (Phi=0)



E1 (Phi=90)

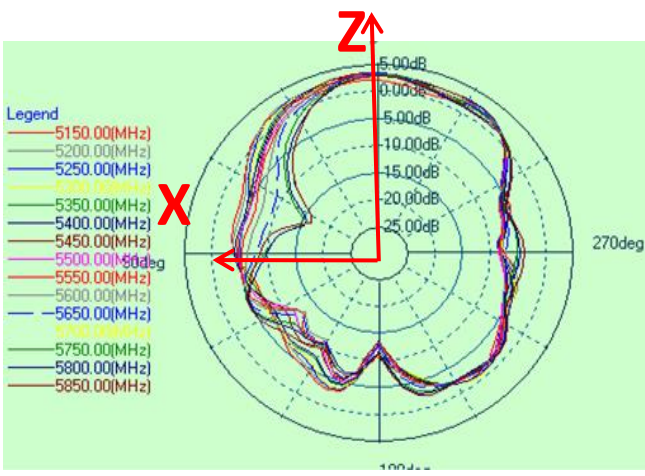
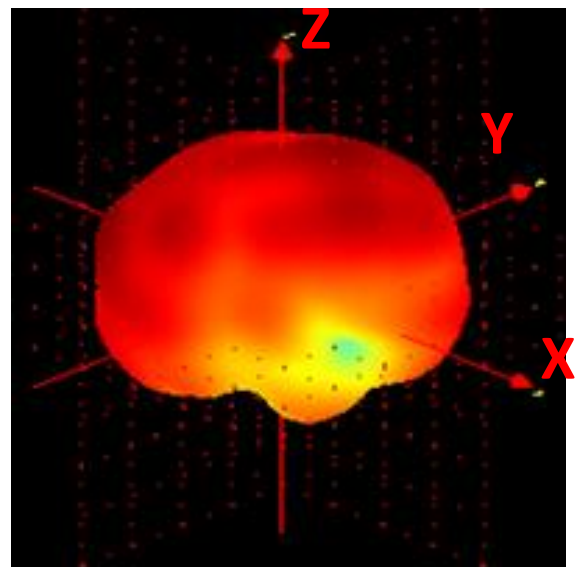
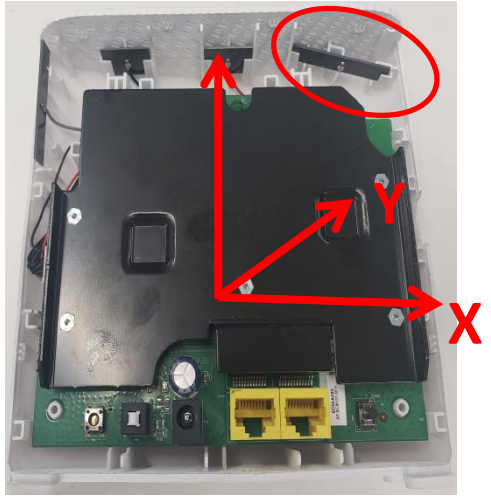


H (Theta=90)

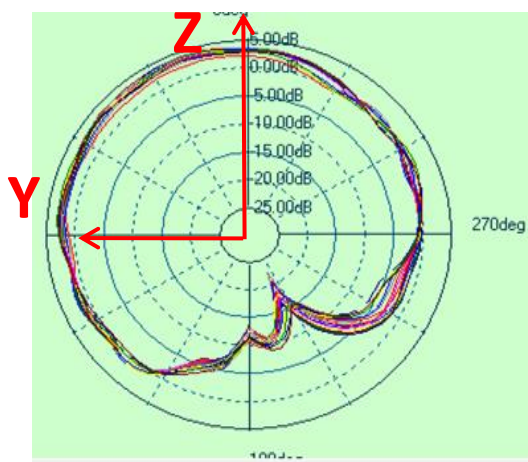
2D/3D Radiation pattern

5G

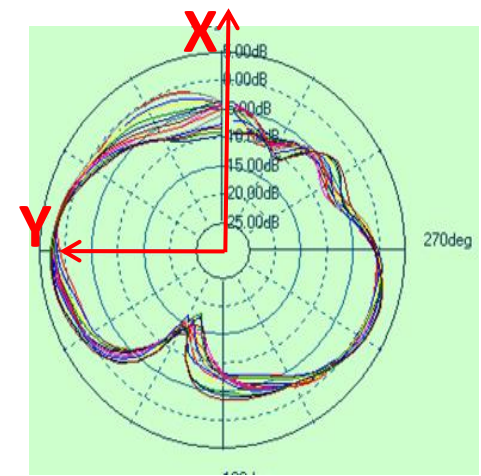
ANT4



E1 (Phi=0)



E1 (Phi=90)



H (Theta=90)

Efficiency and Peak Gain (1)



Test results

	Frequency	E Total. dB(dB)	Efficiency(%)
ANT1	2.4GHz	3.79	70.25
	2.5GHz	3.92	72.86
	5.15GHz	3.39	72.28
	5.85GHz	3.23	74.08
ANT2	5.15GHz	3.23	70.34
	5.85GHz	3.69	74.32
ANT3	5.15GHz	3.13	69.89
	5.85GHz	3.34	76.27
ANT4	2.4GHz	3.05	69.93
	2.5GHz	3.18	70.21
	5.15GHz	3.33	71.02
	5.85GHz	3.45	73.17

Based on the above data analysis, the antenna performance meets the design requirements.

Efficiency and Peak Gain(2)



Test results

Used for FCC and CE certification

Frequency (GHz)		2.400	2.412	2.422	2.437	2.452	2.462	2.500
Peak Gain (dBi)	ANT1	3.79	3.76	3.72	3.71	3.66	3.73	3.92
	ANT4	3.05	3.49	3.52	3.61	3.47	3.26	3.18
Directional Gain (dBi)	1S2T	5.41	5.27	5.19	5.45	5.55	5.33	5.44
	2S2T	2.53	2.61	2.85	2.73	2.75	2.61	2.70

Frequency (GHz)		5.15	5.18	5.19	5.25	5.31	5.32	5.5	5.51	5.745	5.755	5.85
Peak Gain (dBi)	ANT1	3.39	3.53	3.55	3.75	3.92	3.98	3.99	3.97	3.76	3.57	3.23
	ANT2	3.23	3.48	3.62	3.74	3.93	4.01	4.12	3.96	3.97	3.74	3.69
	ANT3	3.13	3.19	3.27	3.43	3.34	3.58	3.66	3.58	3.44	3.41	3.34
	ANT4	3.33	3.45	3.69	3.78	3.67	3.56	3.48	3.43	3.48	3.41	3.45
Directional Gain(dBi)	1S4T	6.82	6.94	6.88	6.87	6.93	6.82	6.91	6.83	6.94	6.96	6.88
	4S4T	2.26	2.15	2.29	2.14	2.05	2.29	2.03	2.17	2.07	2.19	1.97

1、 Correlated Directional Gain

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

2、 Uncorrelated Directional Gain

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

Thanks!

