



Free walk Technology

深圳自由行通信技术有限公司

天线测试报告

Antenna Test Report

Project :WLS261

Data:2021-10-11

Ver.1.0



Introduction to prototype

Customer name		both wings		both wings		WLS261	
NO.	ITEMS		DETAILS				
1	Frequency band		WiFi （2.4GHz+5GHz ）				
2	model		Router				
3	Antenna type		External				
4	Antenna implementation form		2.4GHz External antenna （PCB+Spring） 5GHz External antenna （PCB+Spring）				
5	Antenna material		PCB+Spring				
6							
7							
8							
RF			李文科				
ME							

Test system :

Test Equipment & Conditions

Network Analyzers :

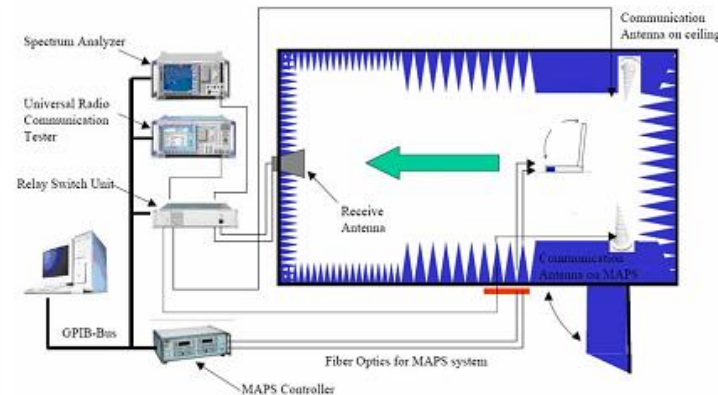
Agilent 5071C

Communications Test Set:

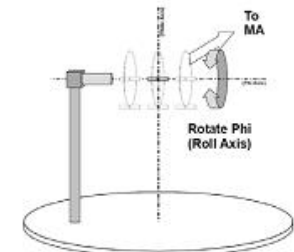
CMW500

3D Chamber Test System:

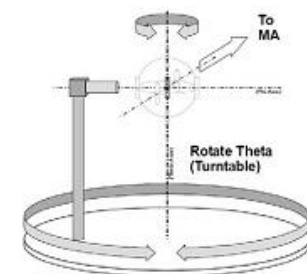
ETS



(Testing by 3D anechoic chamber)

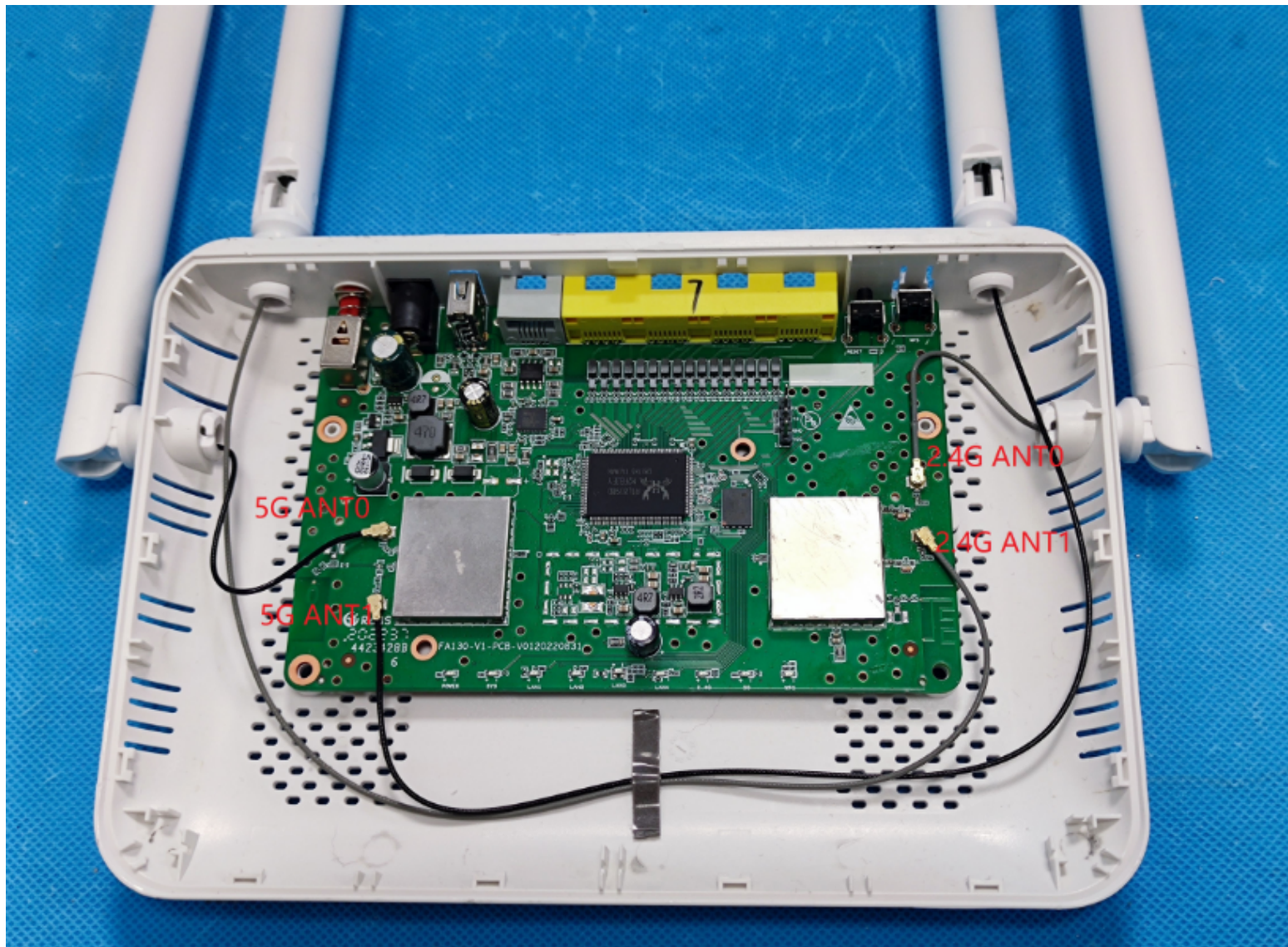


Phi axis test

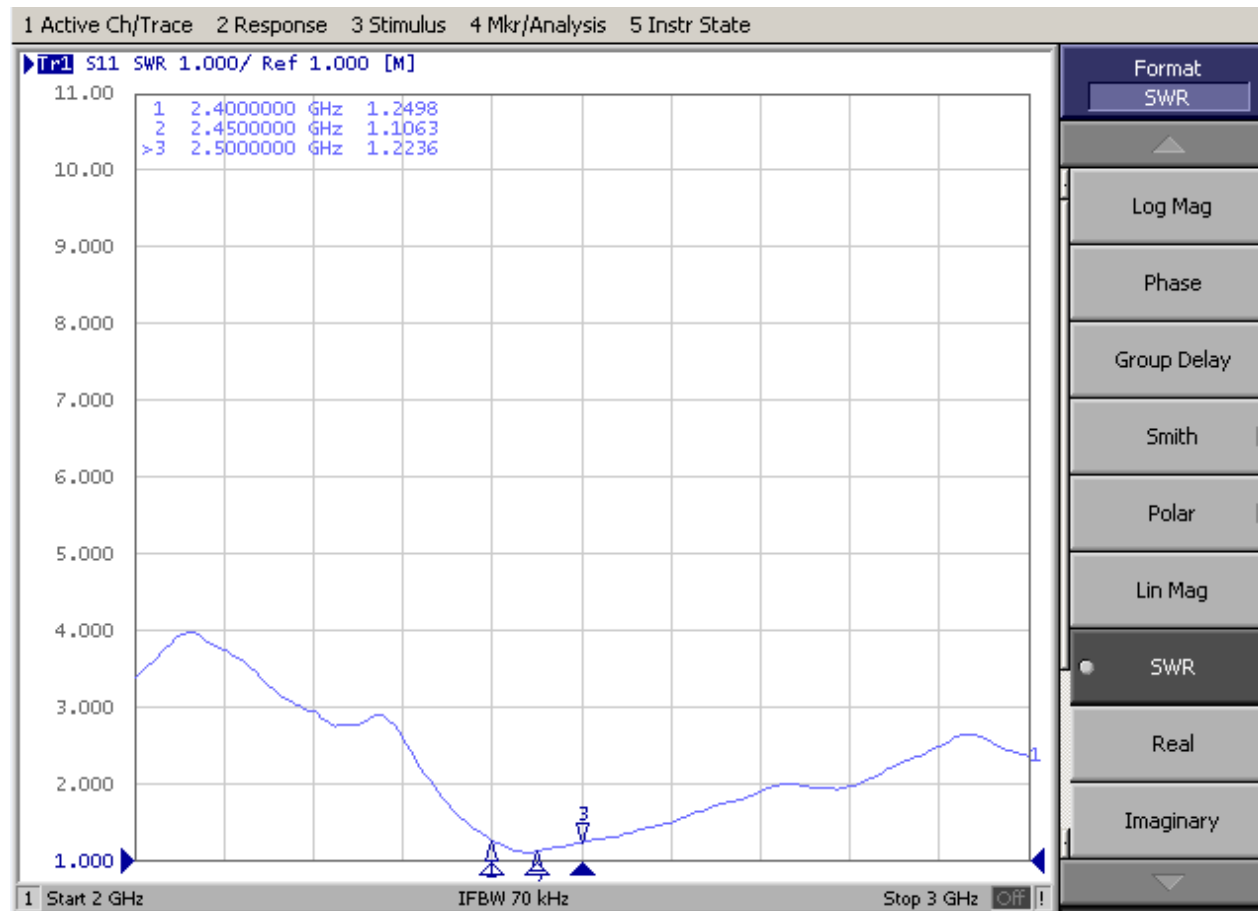


Theta axis test

Antenna position

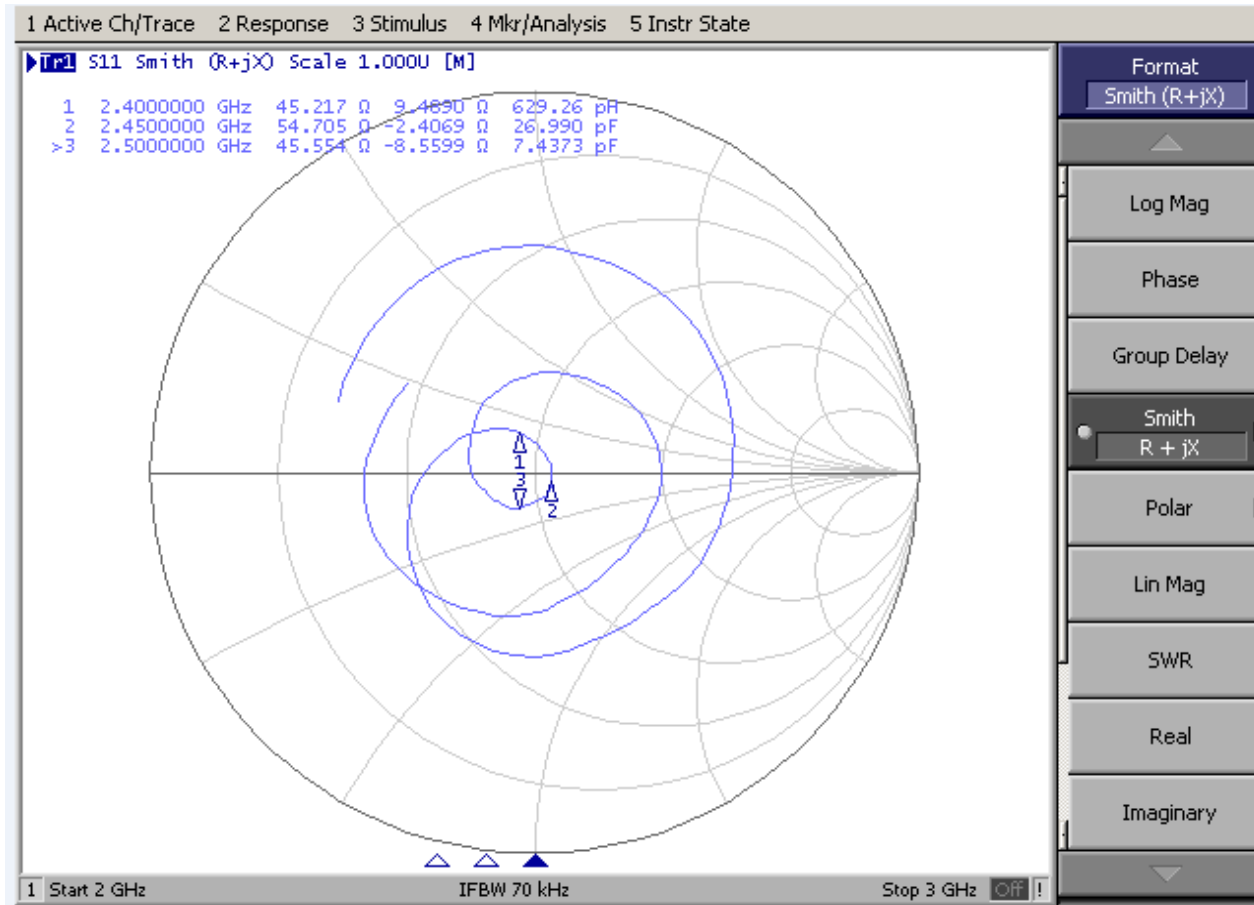


2.4G-0 SWR



Test equipment : Agilent E5071B

2.4G-0 Smith(R+jx)



Test equipment : Agilent E5071B

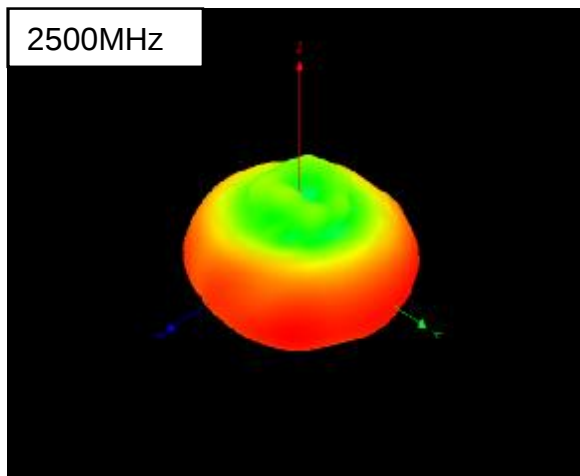
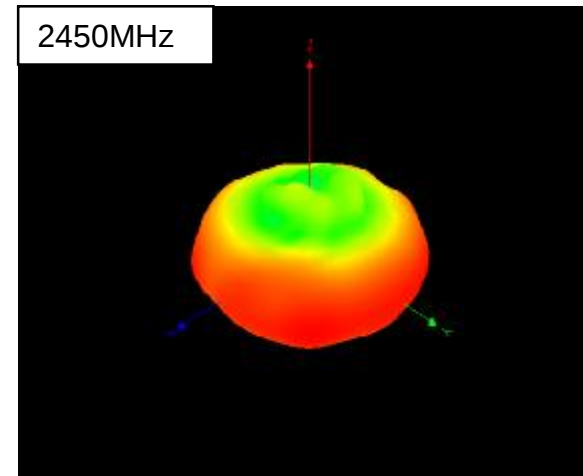
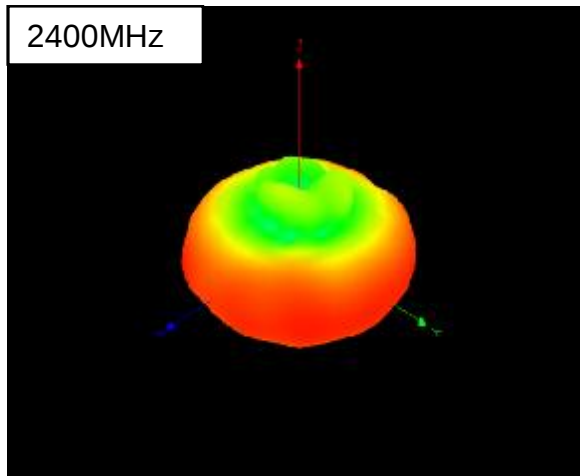
2.4G test data

Antenna efficiency and gain

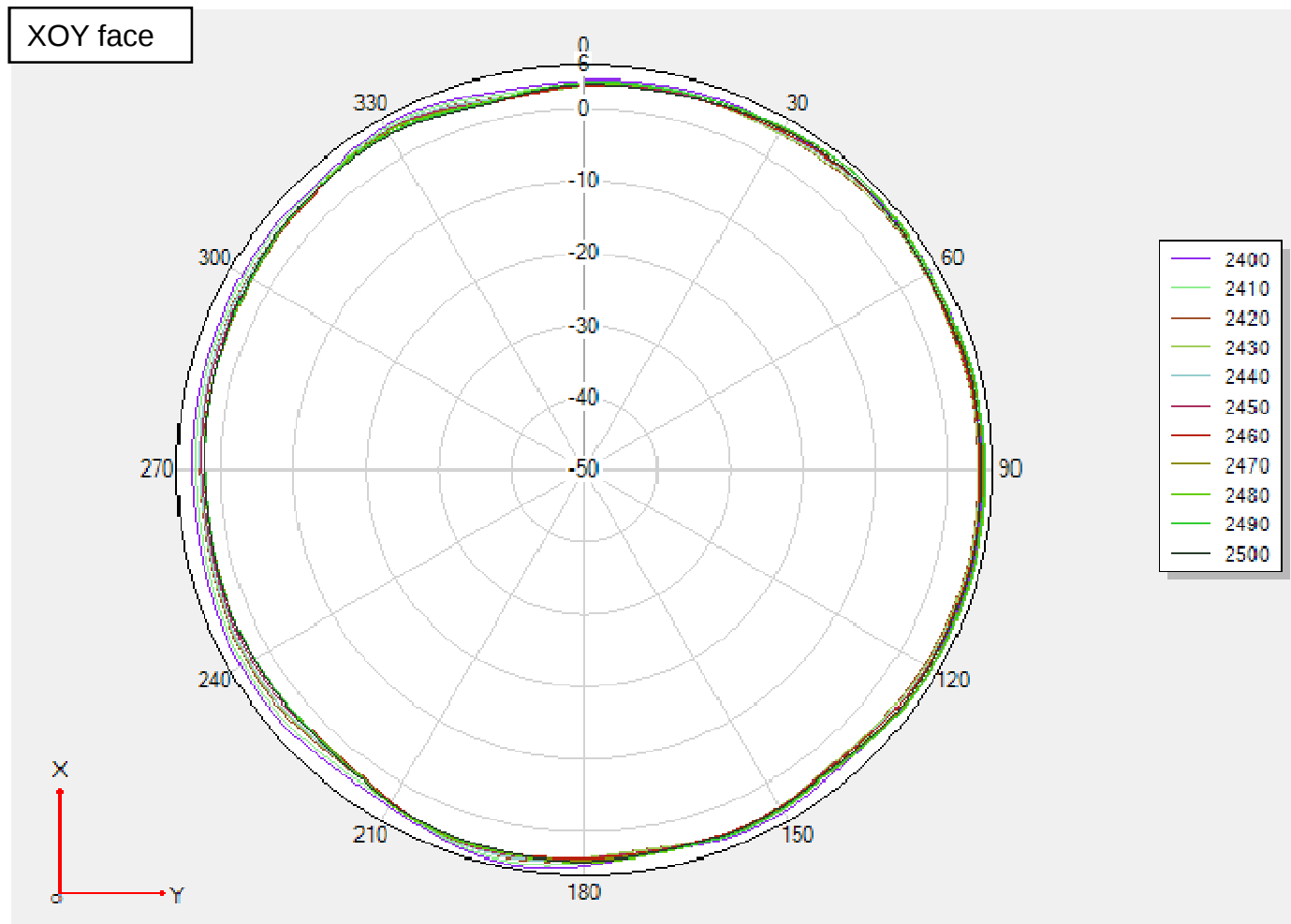
2.4G Efficiency and gain

Frequency / MHz	Efficiency / %	Gain/ dBi
2400	73.68	5.59
2410	74.45	5.22
2420	73.07	4.73
2430	74.92	4.66
2440	76.12	4.66
2450	75.39	4.71
2460	73.83	4.70
2470	72.92	5.17
2480	71.71	5.23
2490	72.92	5.15
2500	70.39	4.77

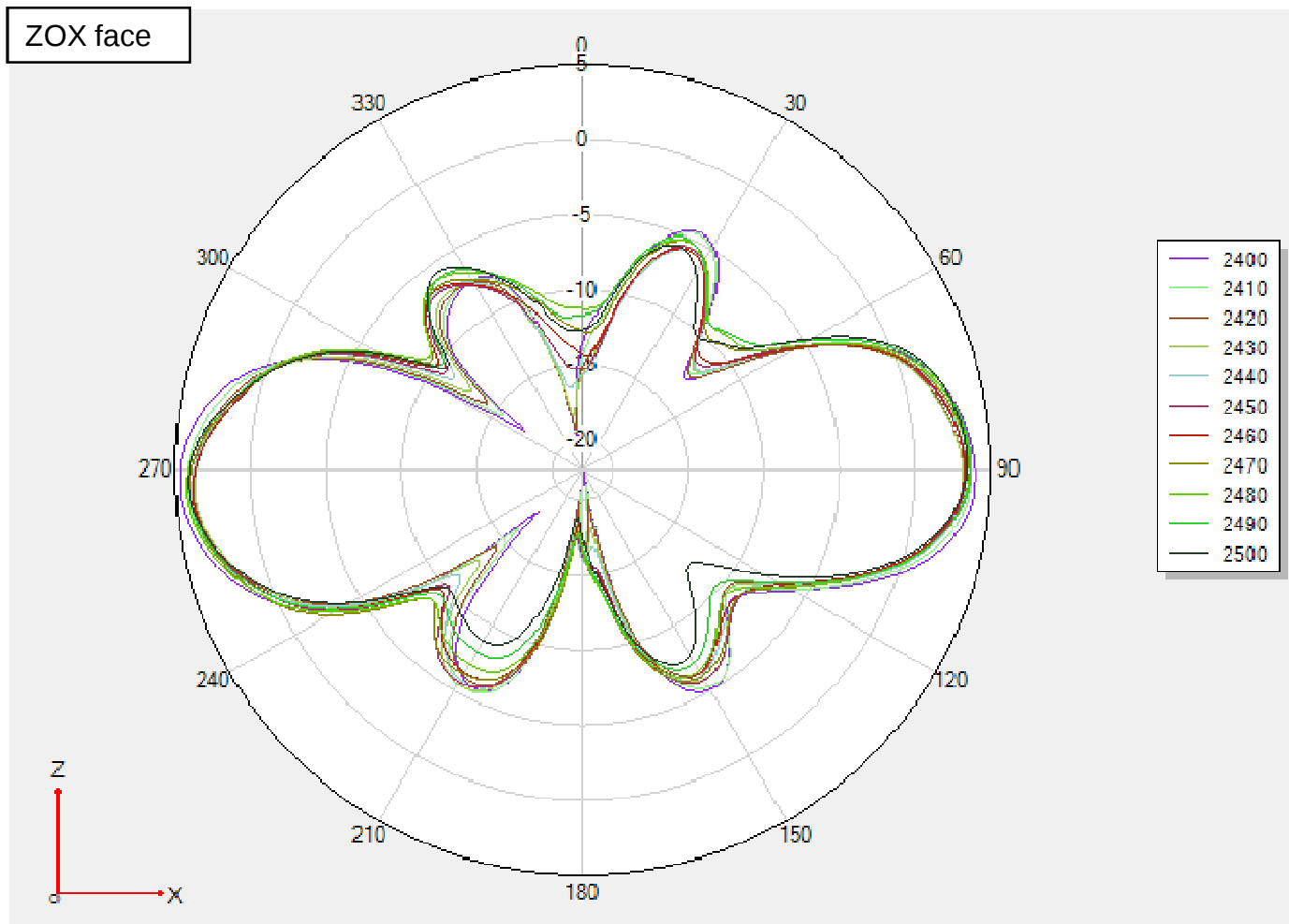
3D diagram



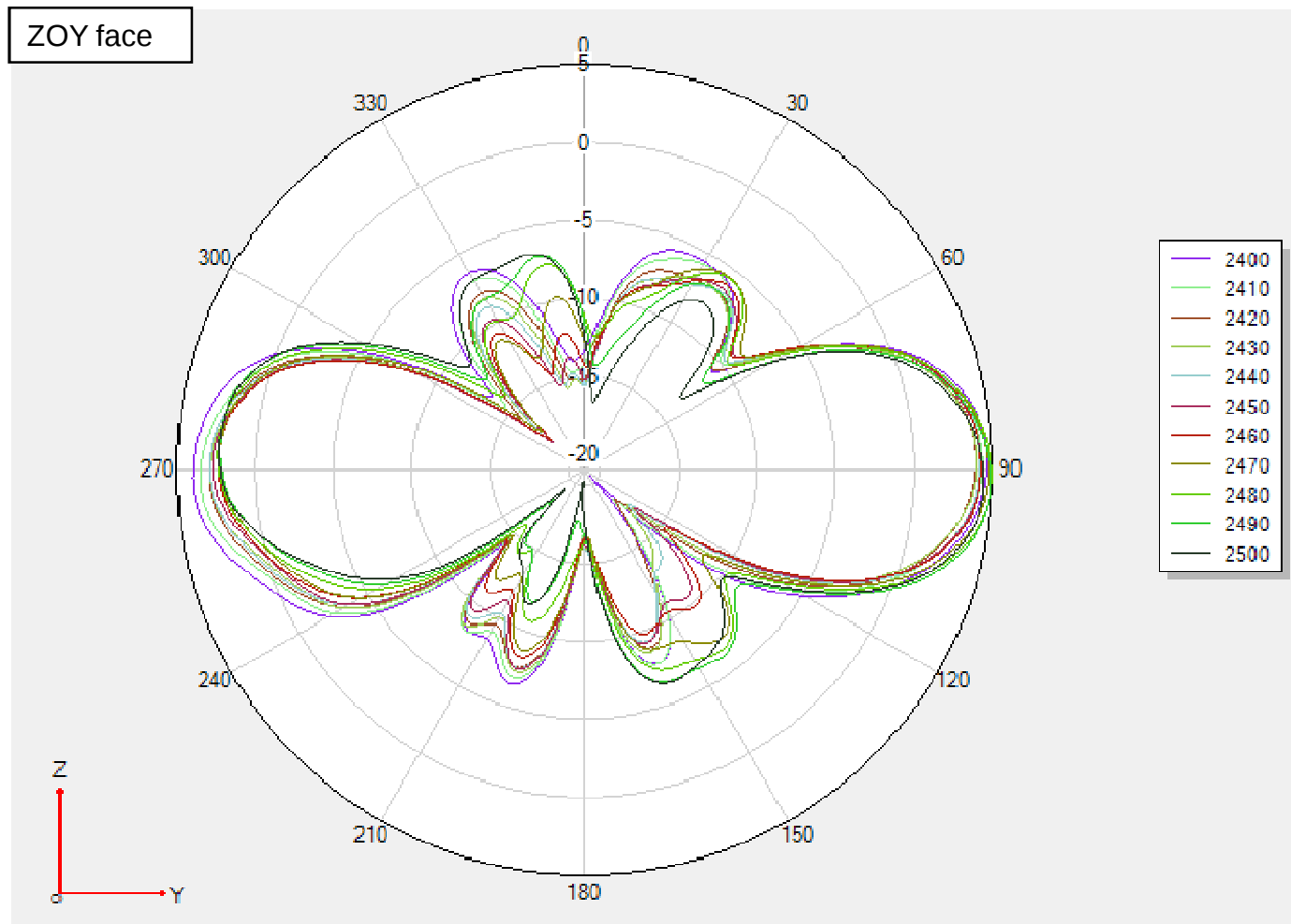
2D diagram



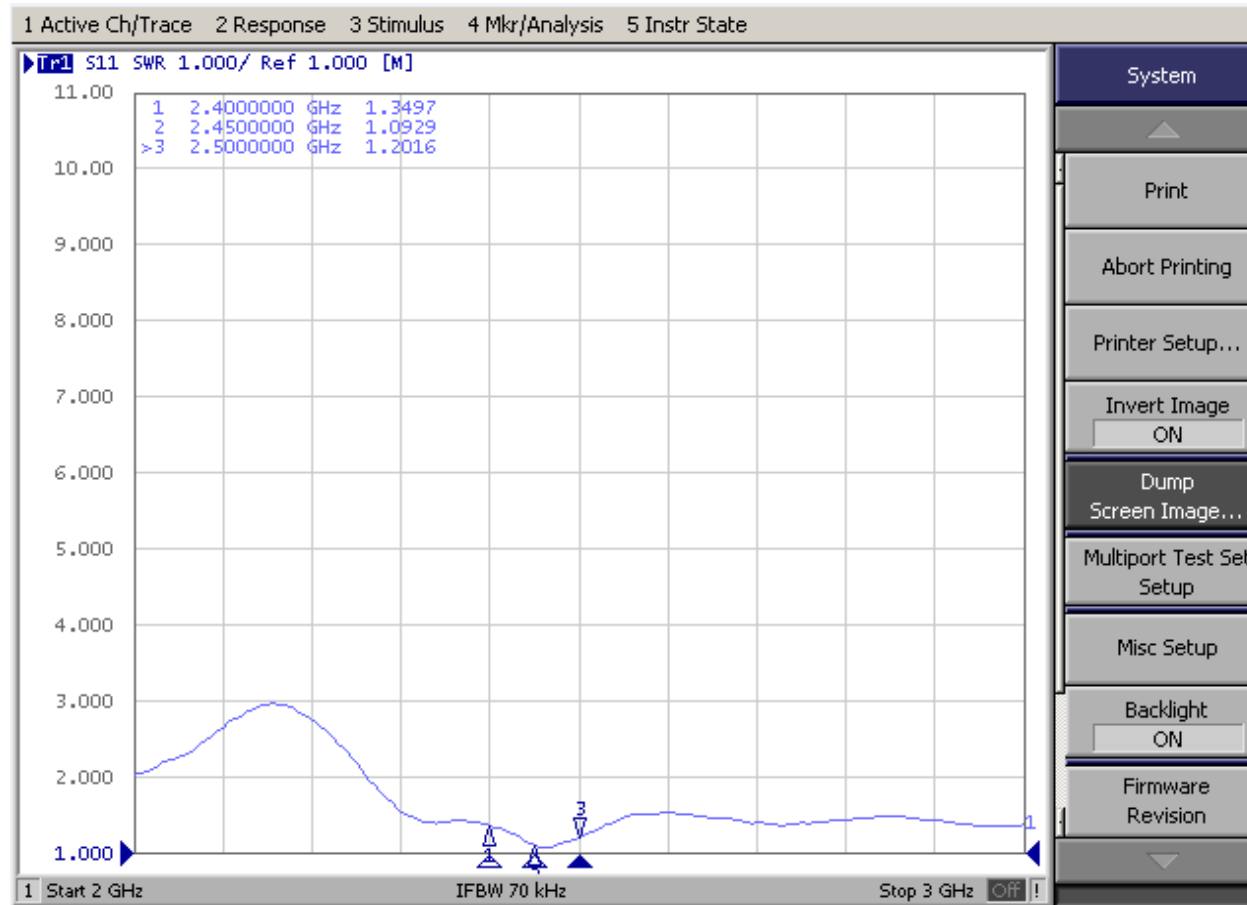
2D diagram



2D diagram

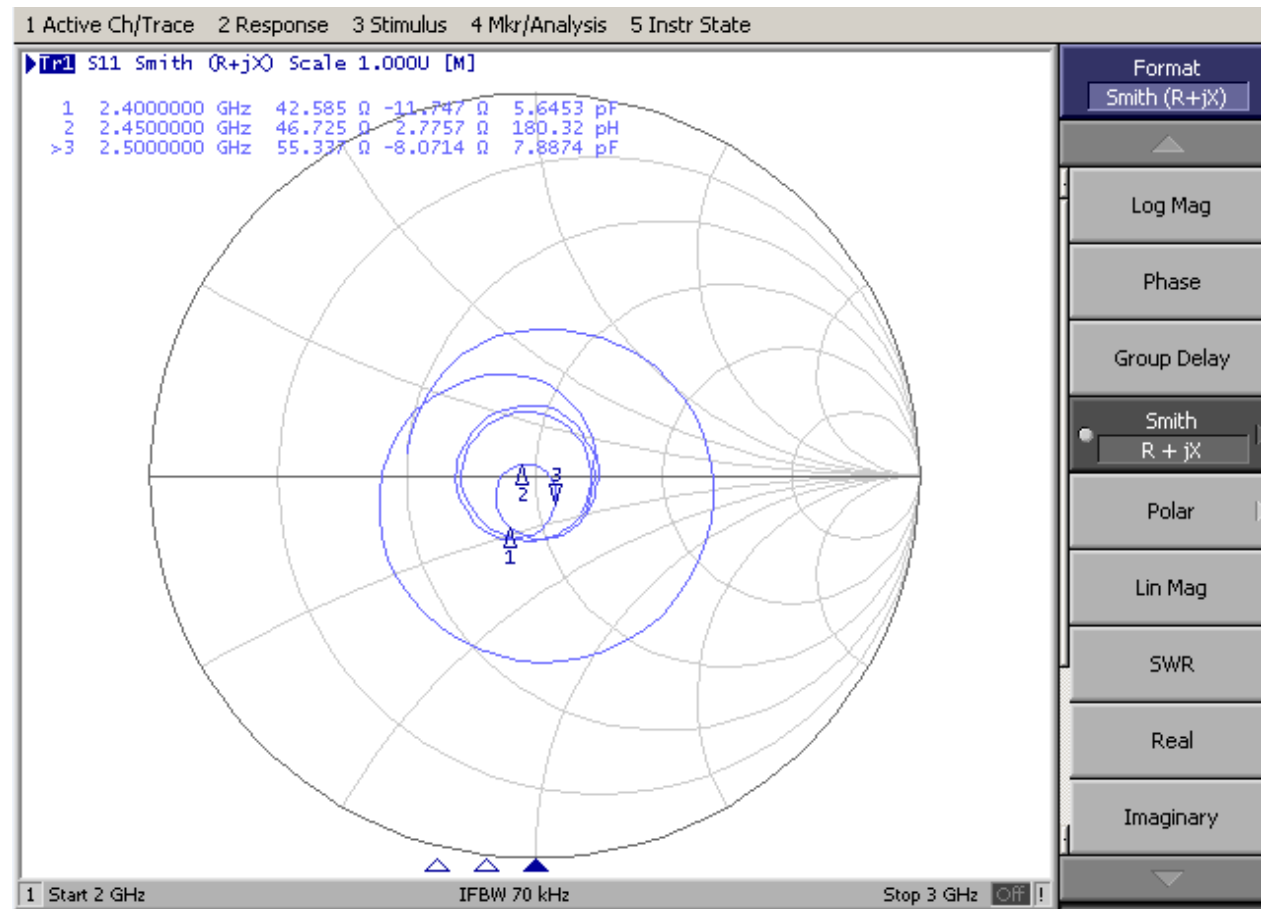


2.4G-1 SWR



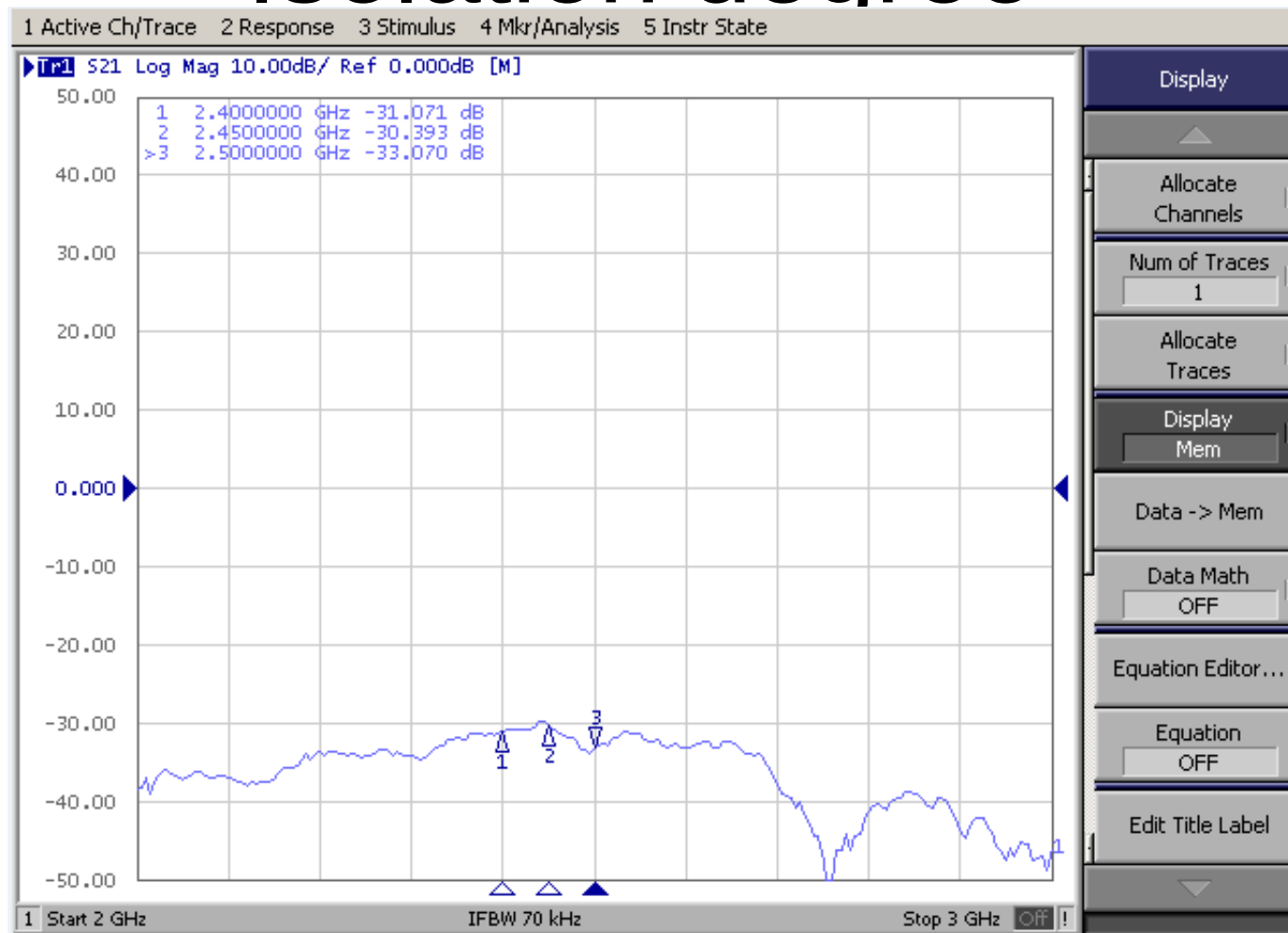
Test equipment : Agilent E5071B

2.4G-1 Smith(R+jx)



Test equipment : Agilent E5071B

Isolation degree



frequency (MHz)	2400	2450	2500
Isolation degree	-31.701	-30.393	-33.070

Test equipment : Agilent E5071B

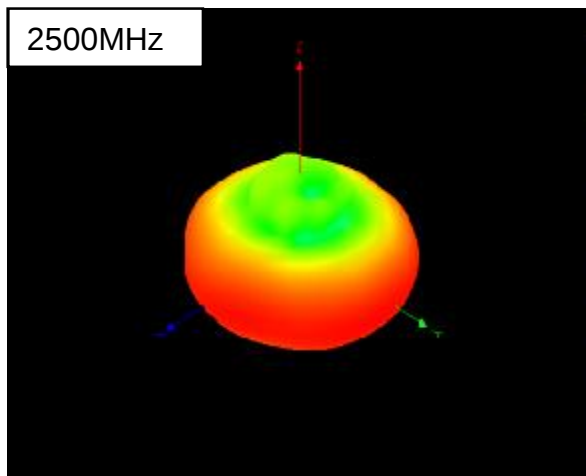
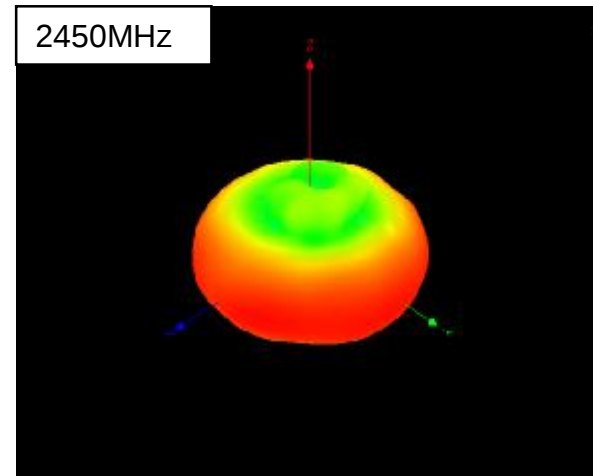
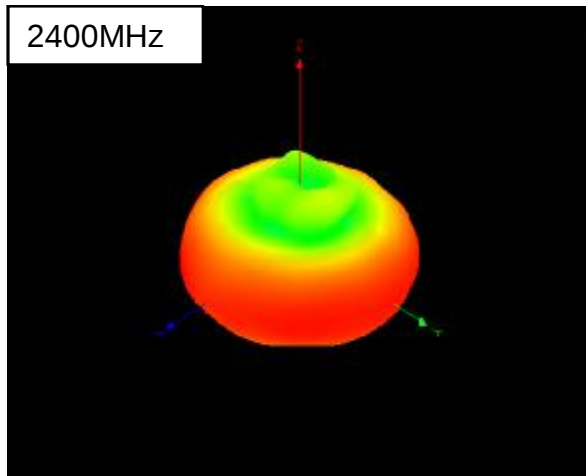
2.4G test data

Antenna efficiency and gain

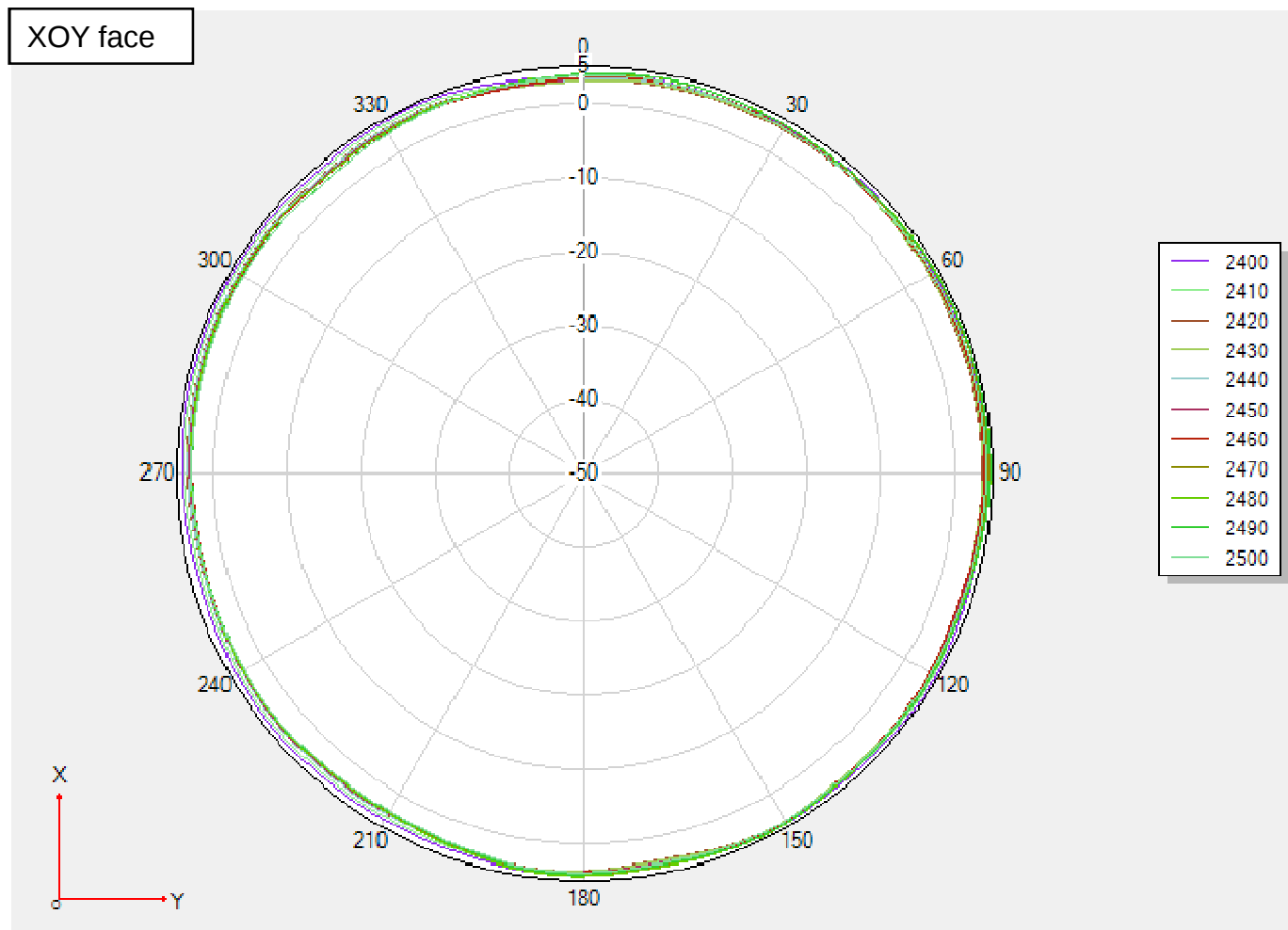
2.4G Efficiency and gain

Frequency / MHz	Efficiency / %	Gain/ dBi
2400	71.77	5.14
2410	73.14	4.94
2420	72.37	4.70
2430	74.23	4.72
2440	77.12	4.90
2450	74.55	4.89
2460	72.83	4.80
2470	71.77	5.10
2480	69.83	5.12
2490	70.71	4.99
2500	68.09	4.77

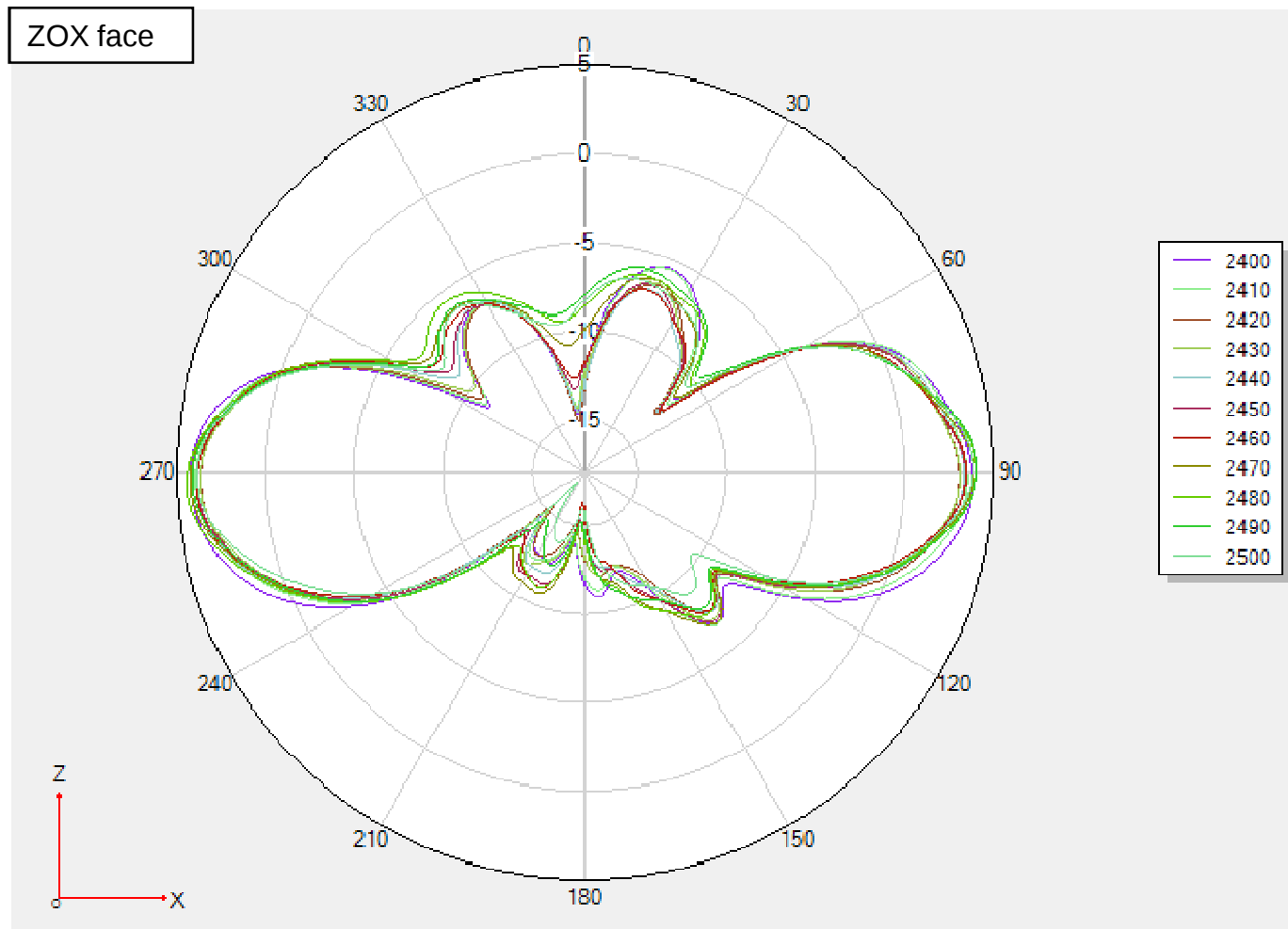
3D diagram



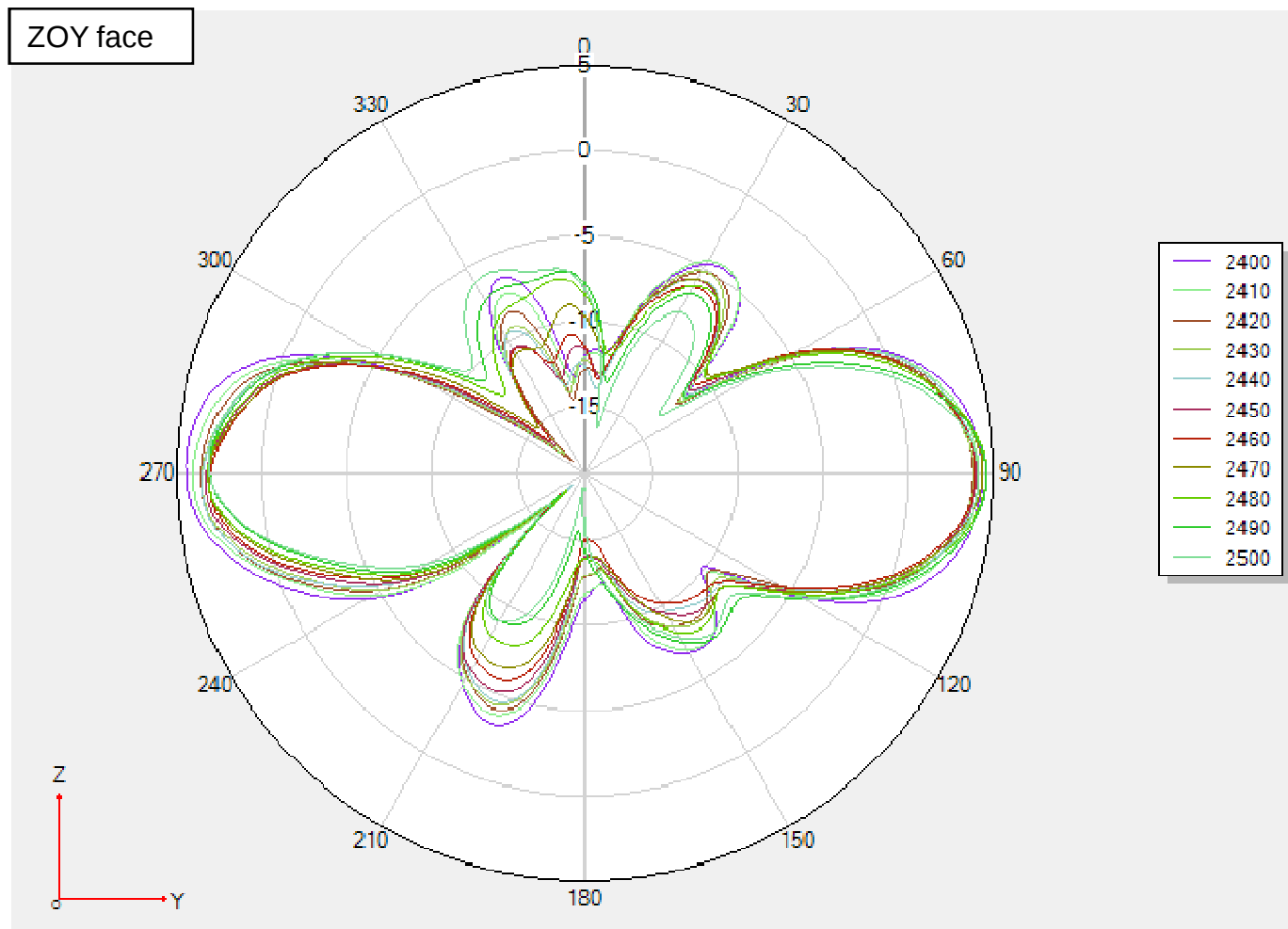
2D diagram



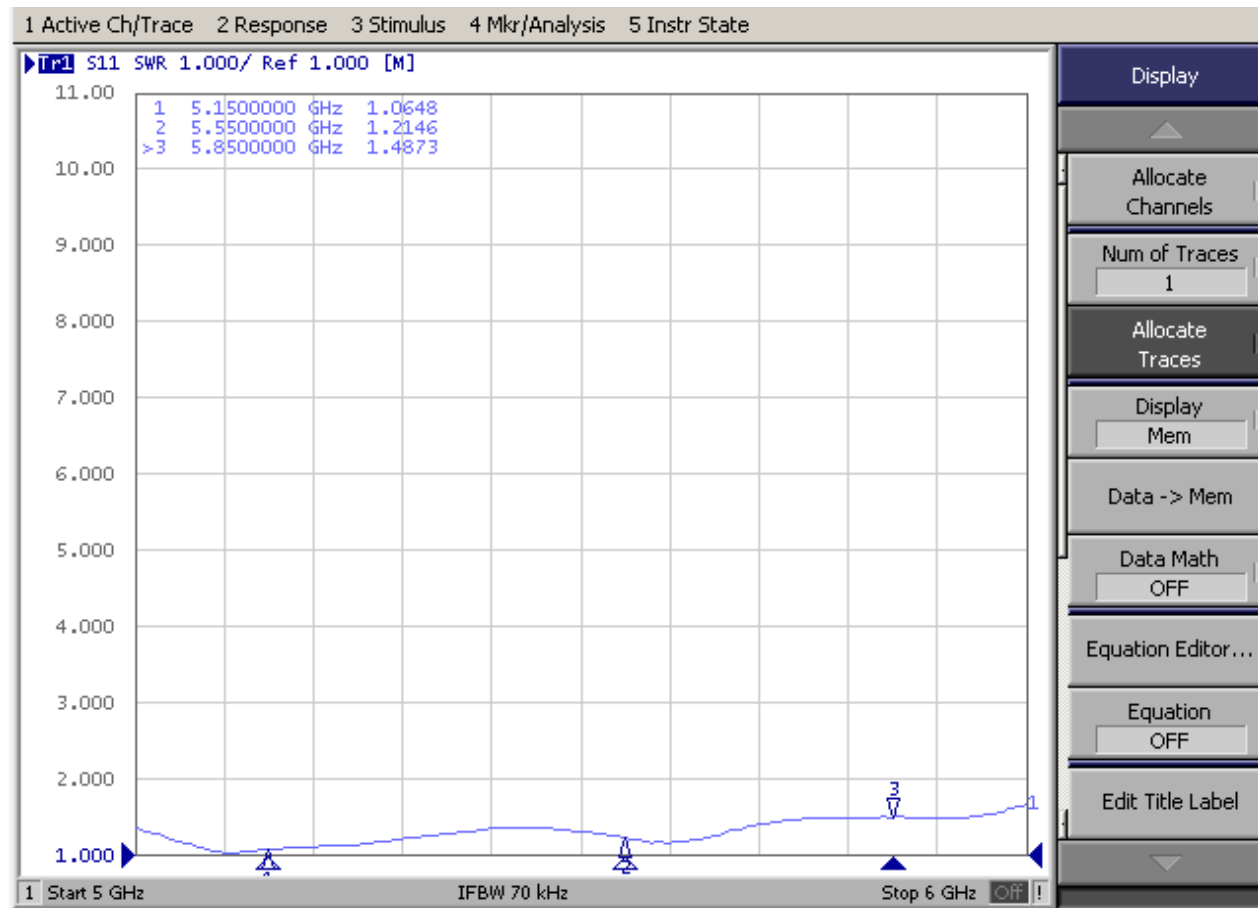
2D diagram



2D diagram

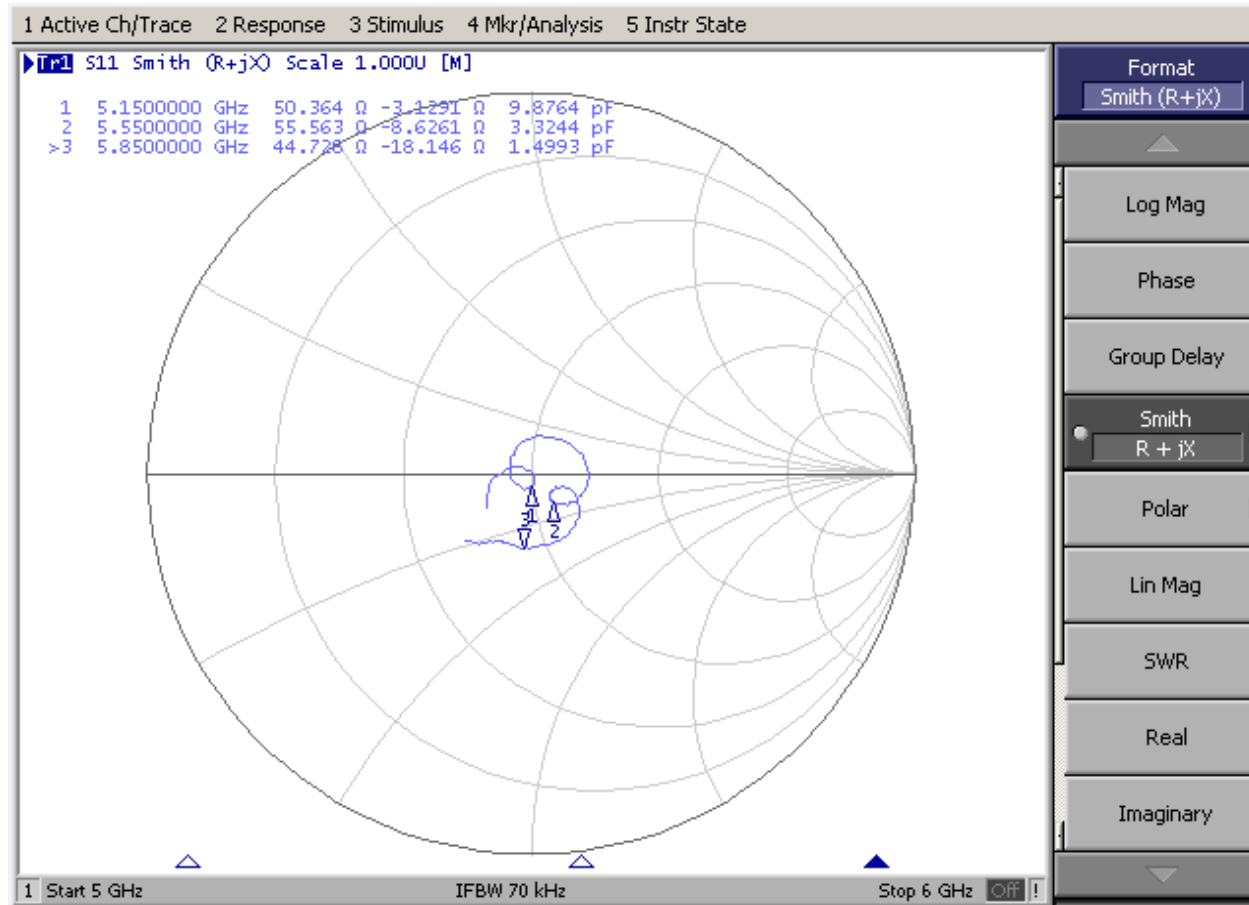


5G-0 SWR



Test equipment : Agilent E5071B

5G-0 Smith(R+jx)



Test equipment : Agilent E5071B

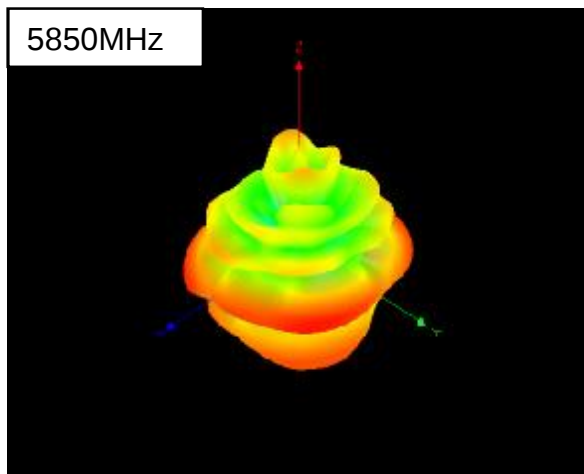
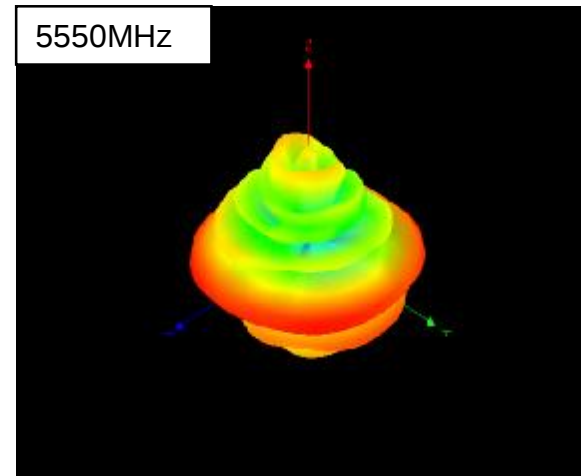
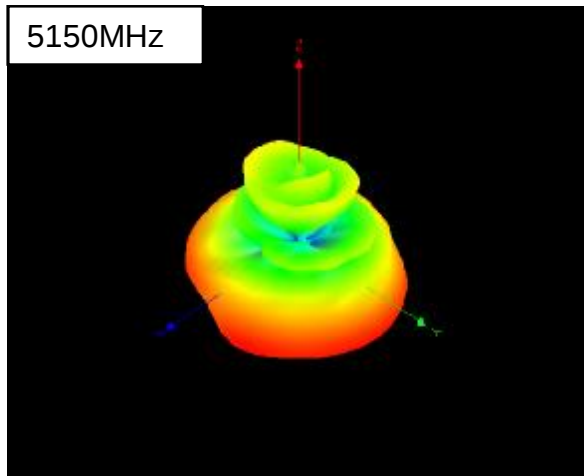
5G test data

Antenna efficiency and gain

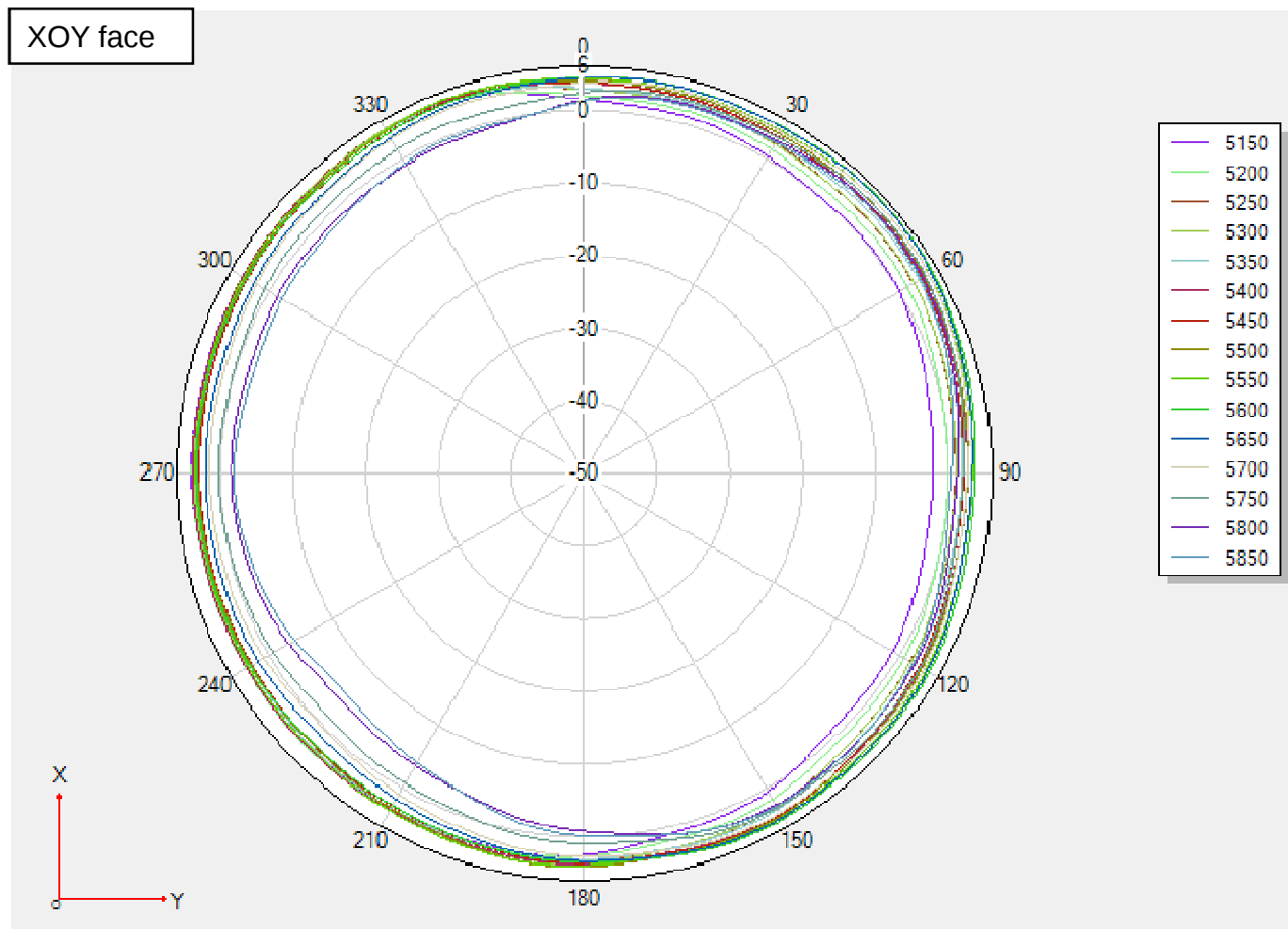
5G Efficiency and gain

Frequency / MHz	Efficiency / %	Gain/ dBi
5150	76.55	5.42
5200	74.37	5.38
5250	75.29	5.47
5300	74.22	4.93
5350	70.09	4.79
5400	79.61	4.88
5450	73.31	4.72
5500	72.57	4.89
5550	73.61	5.10
5600	74.37	5.66
5650	74.37	5.57
5700	69.24	5.12
5750	72.27	4.83
5800	68.39	4.68
5850	70.81	4.50

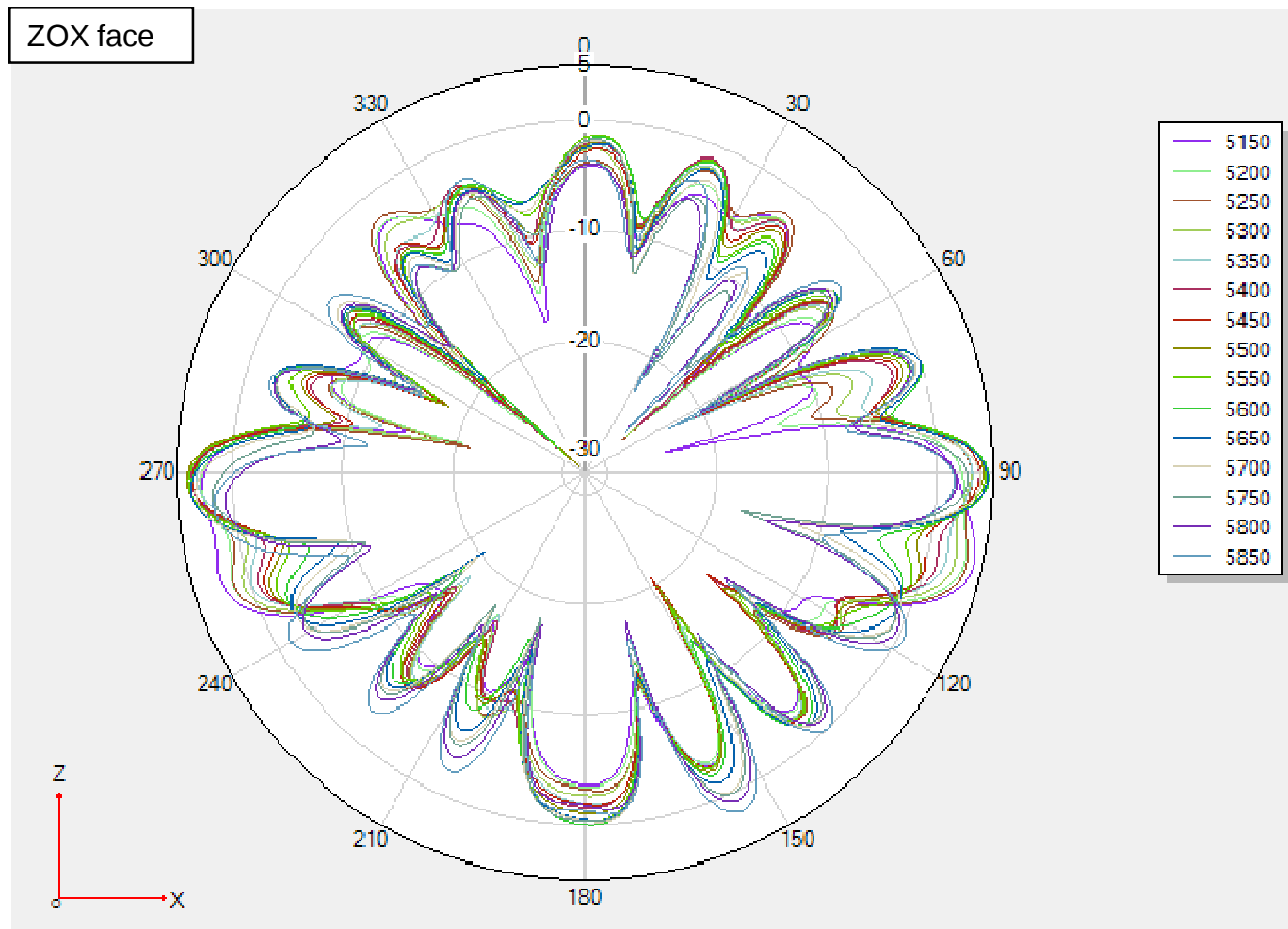
3D diagram



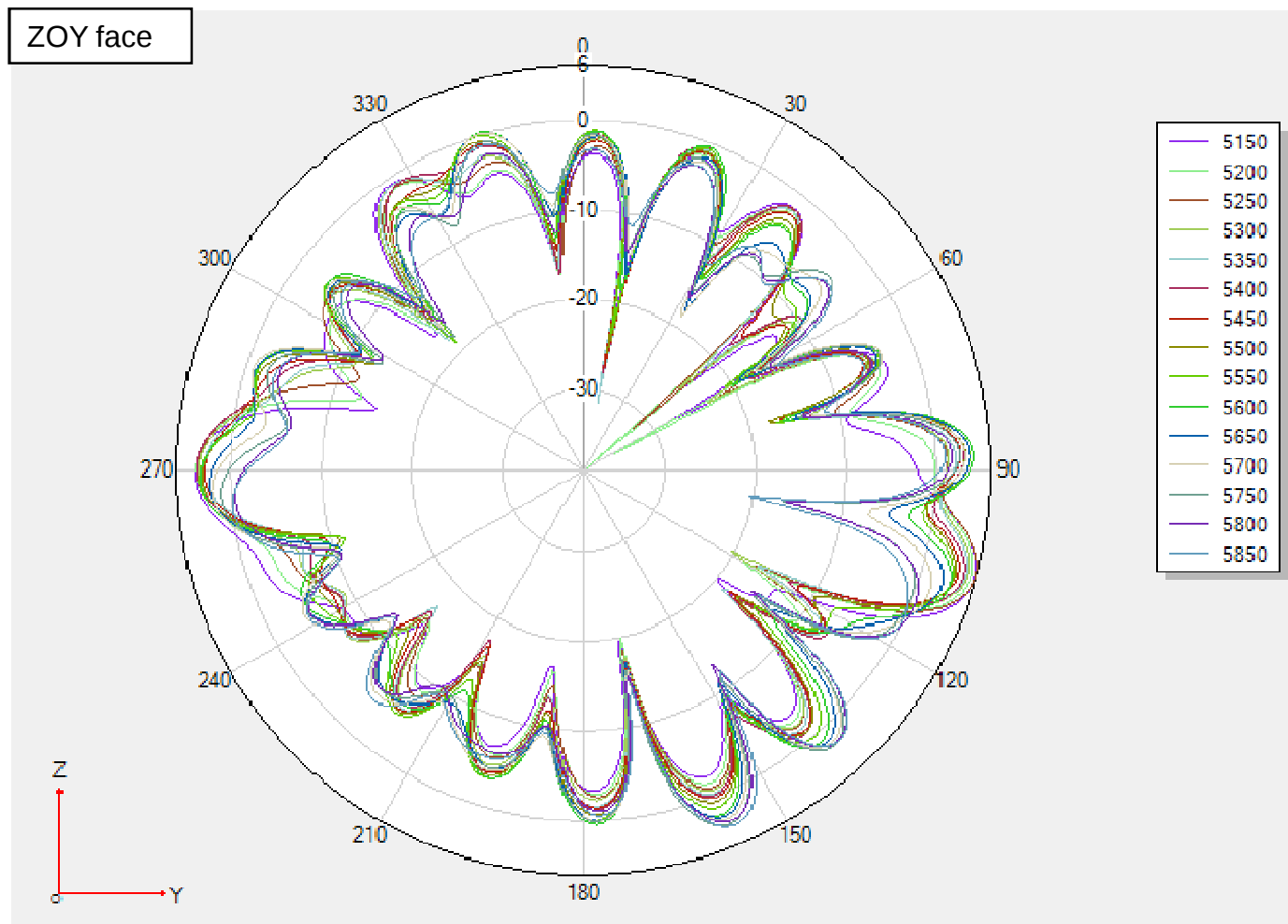
2D diagram



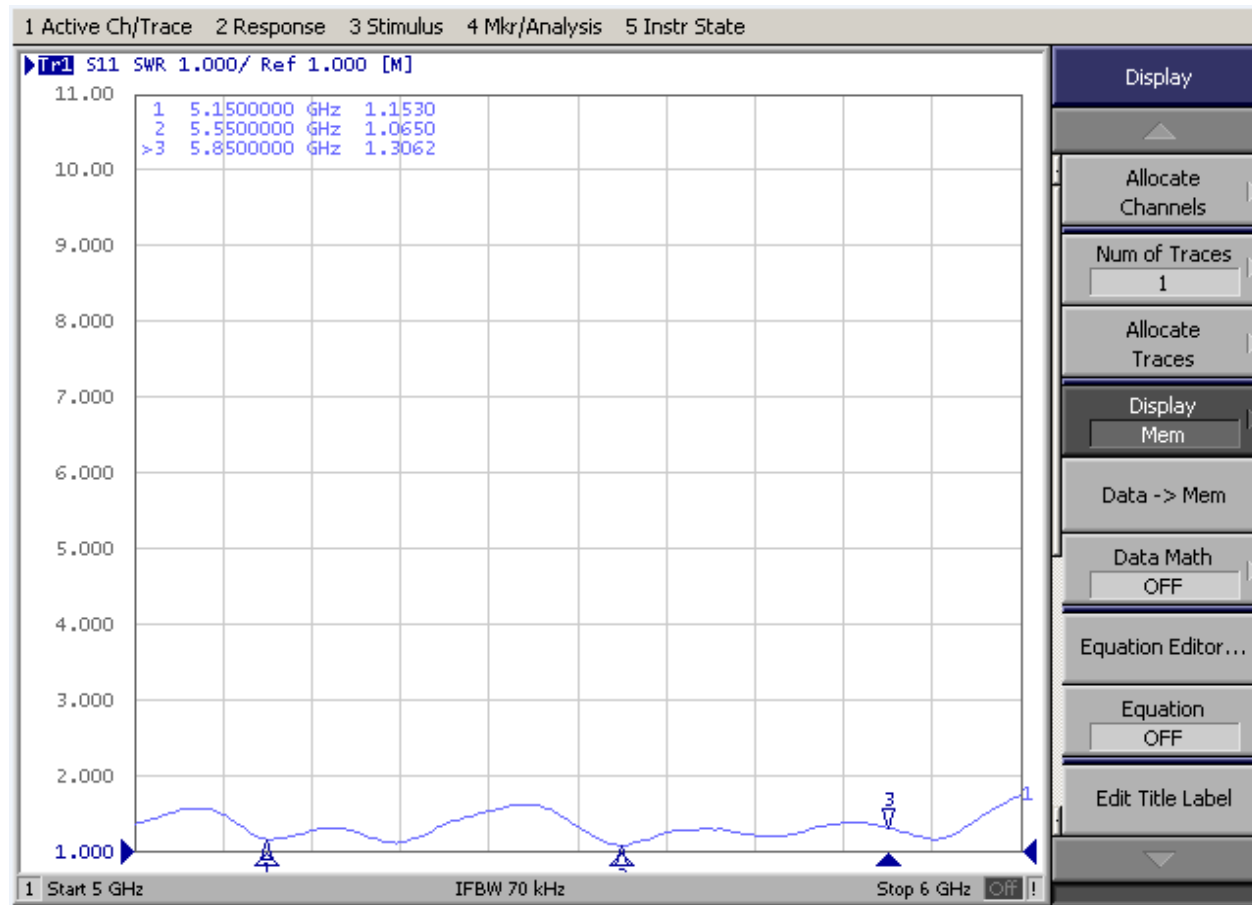
2D diagram



2D diagram

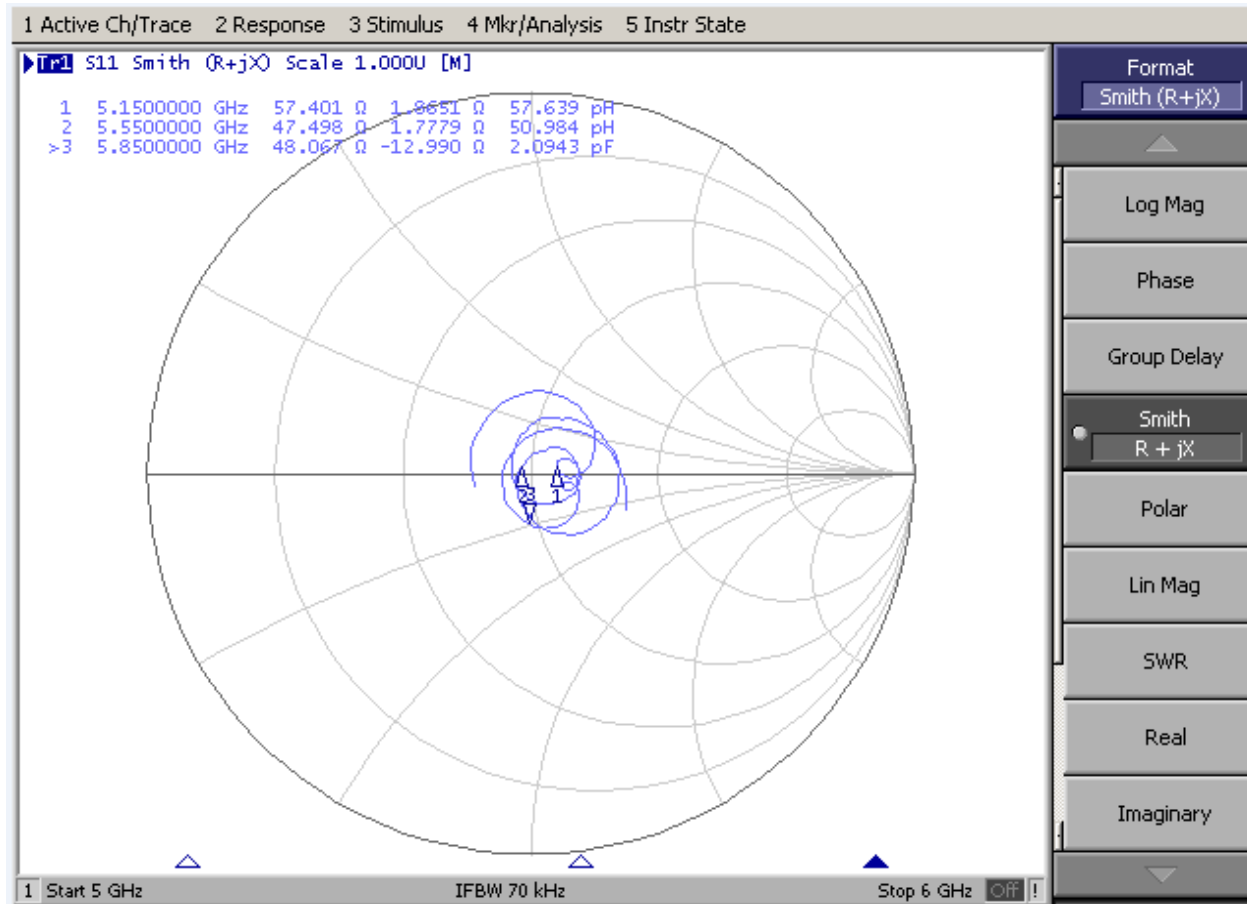


5G-1 SWR



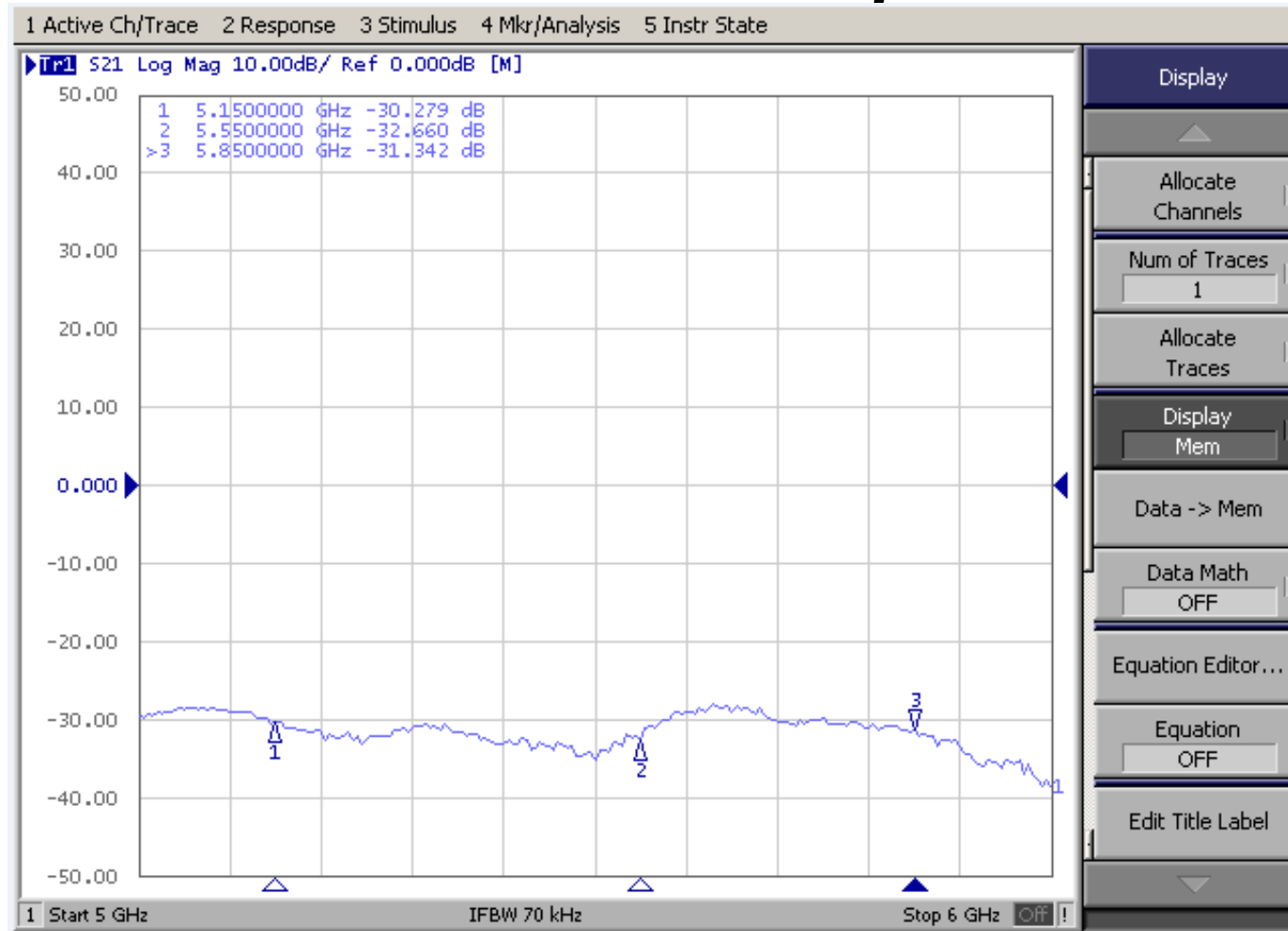
Test equipment : Agilent E5071B

5G-1 Smith(R+jx)



Test equipment : Agilent E5071B

Isolation degree



frequency (MHz)	5150	5550	5850
Isolation degree	-30.279	-32.660	-31.342

Test equipment : Agilent E5071B

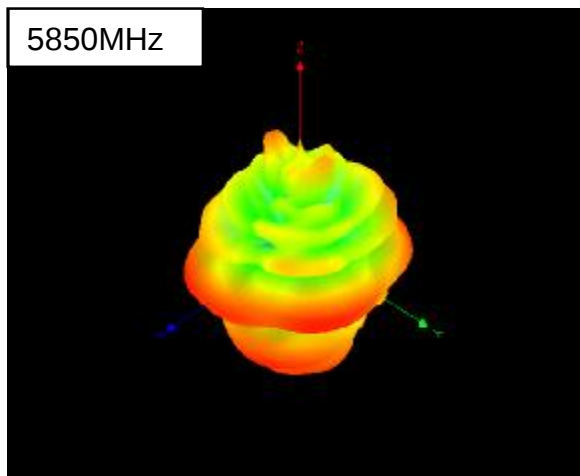
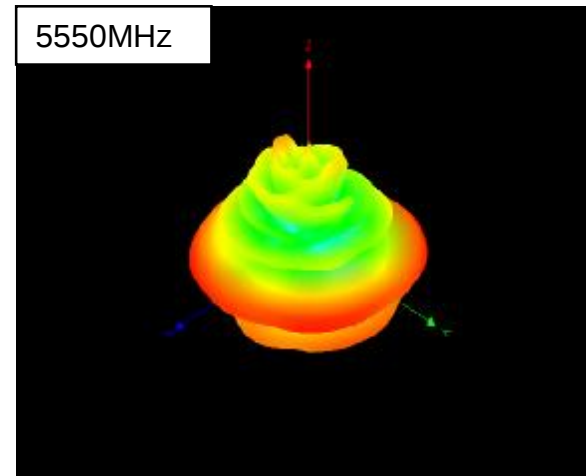
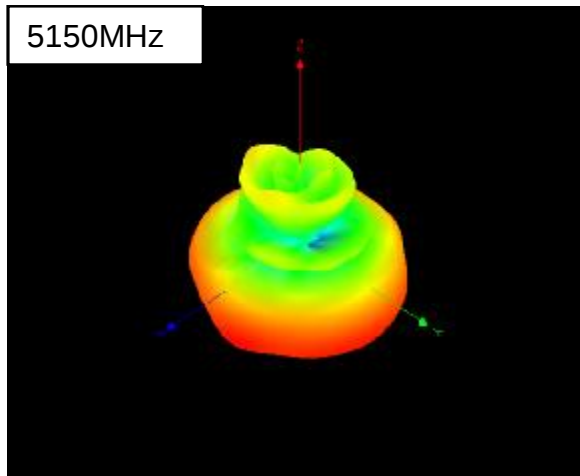
5G test data

Antenna efficiency and gain

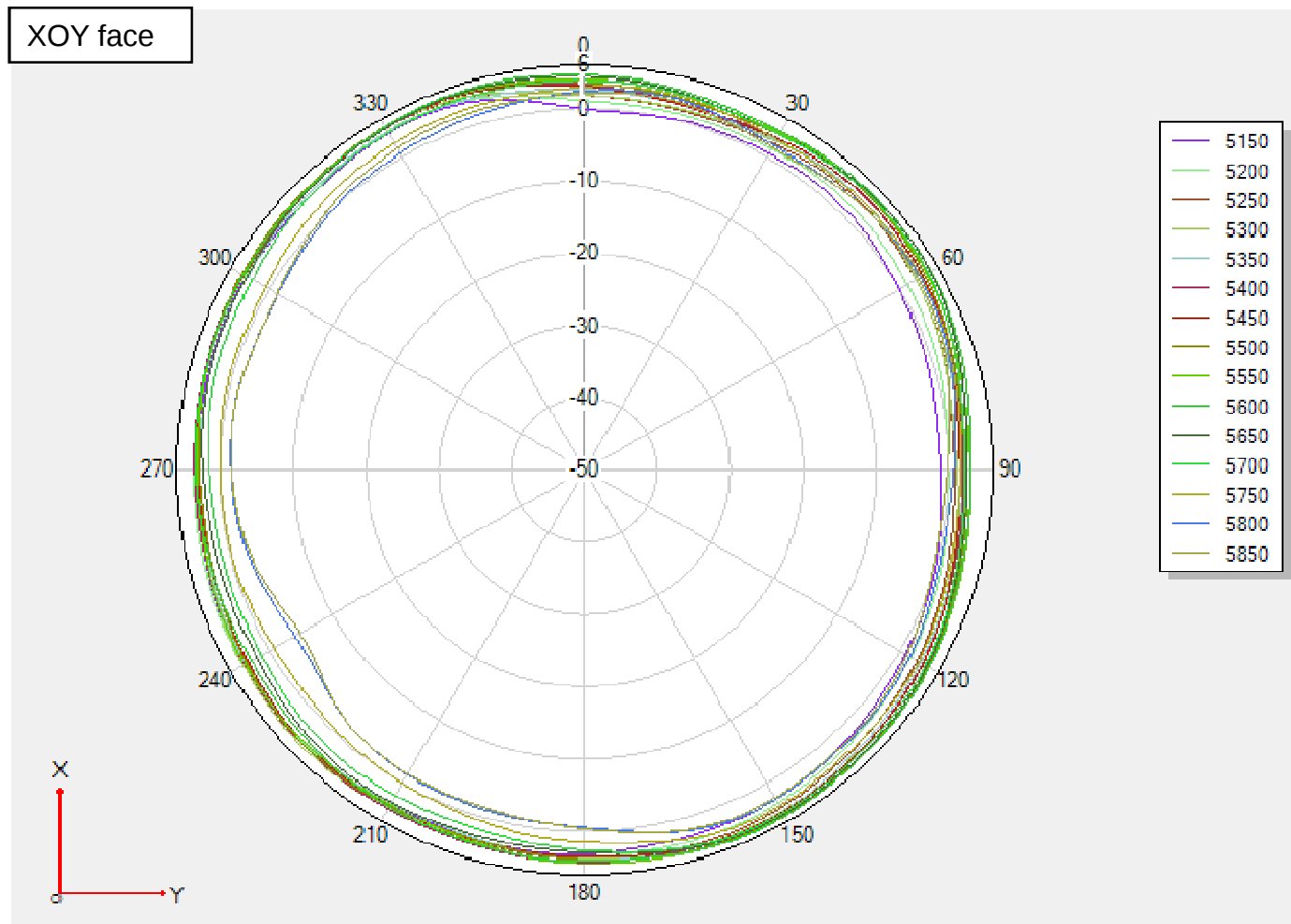
5G Efficiency and gain

Frequency / MHz	Efficiency / %	Gain/ dBi
5150	74.39	5.48
5200	72.37	5.37
5250	75.98	5.55
5300	72.99	4.79
5350	68.37	4.51
5400	76.63	4.96
5450	70.71	4.79
5500	70.57	5.02
5550	71.46	5.17
5600	71.46	5.29
5650	71.16	5.14
5700	68.52	4.82
5750	69.68	4.77
5800	67.43	4.45
5850	68.52	4.77

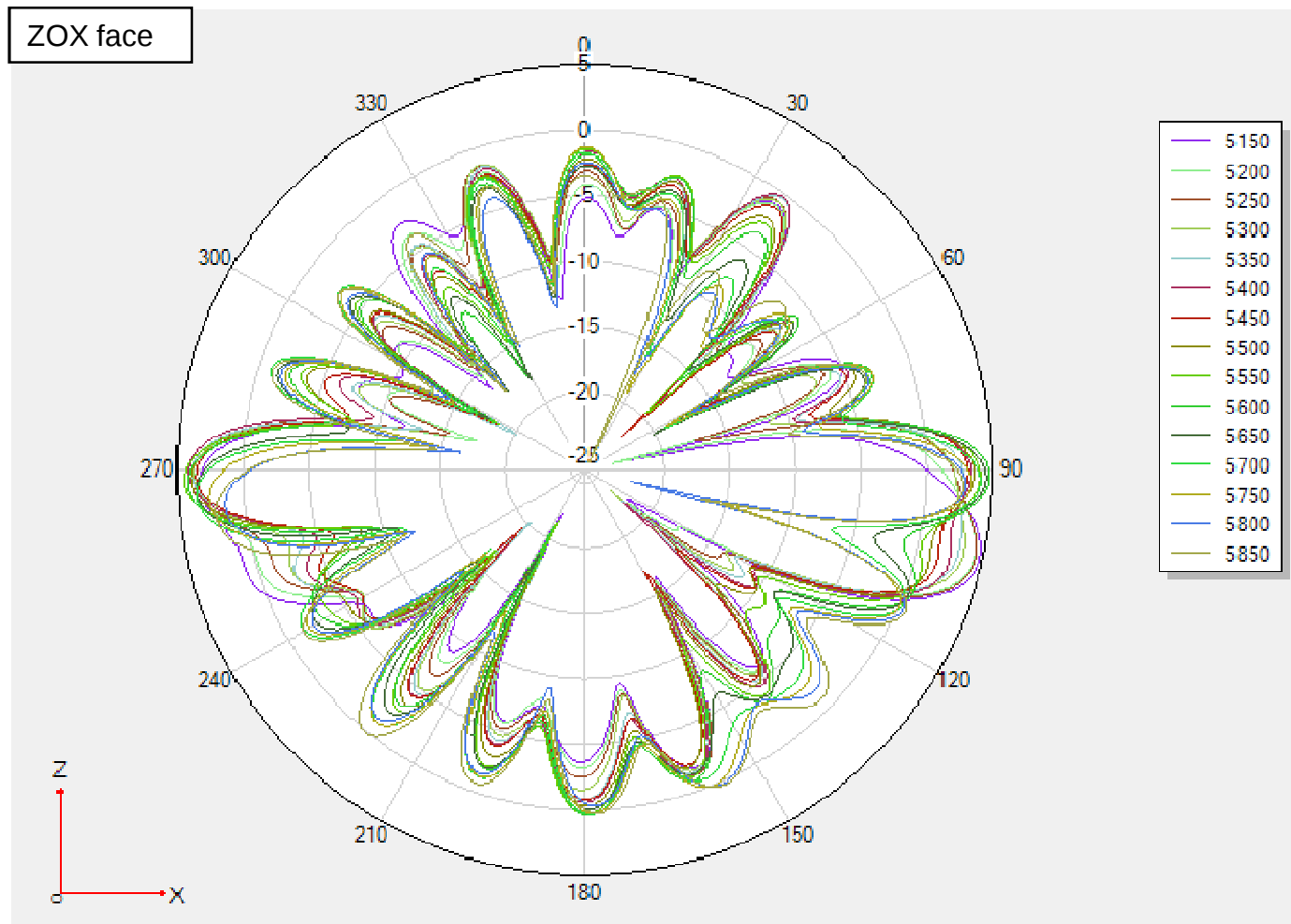
3D diagram



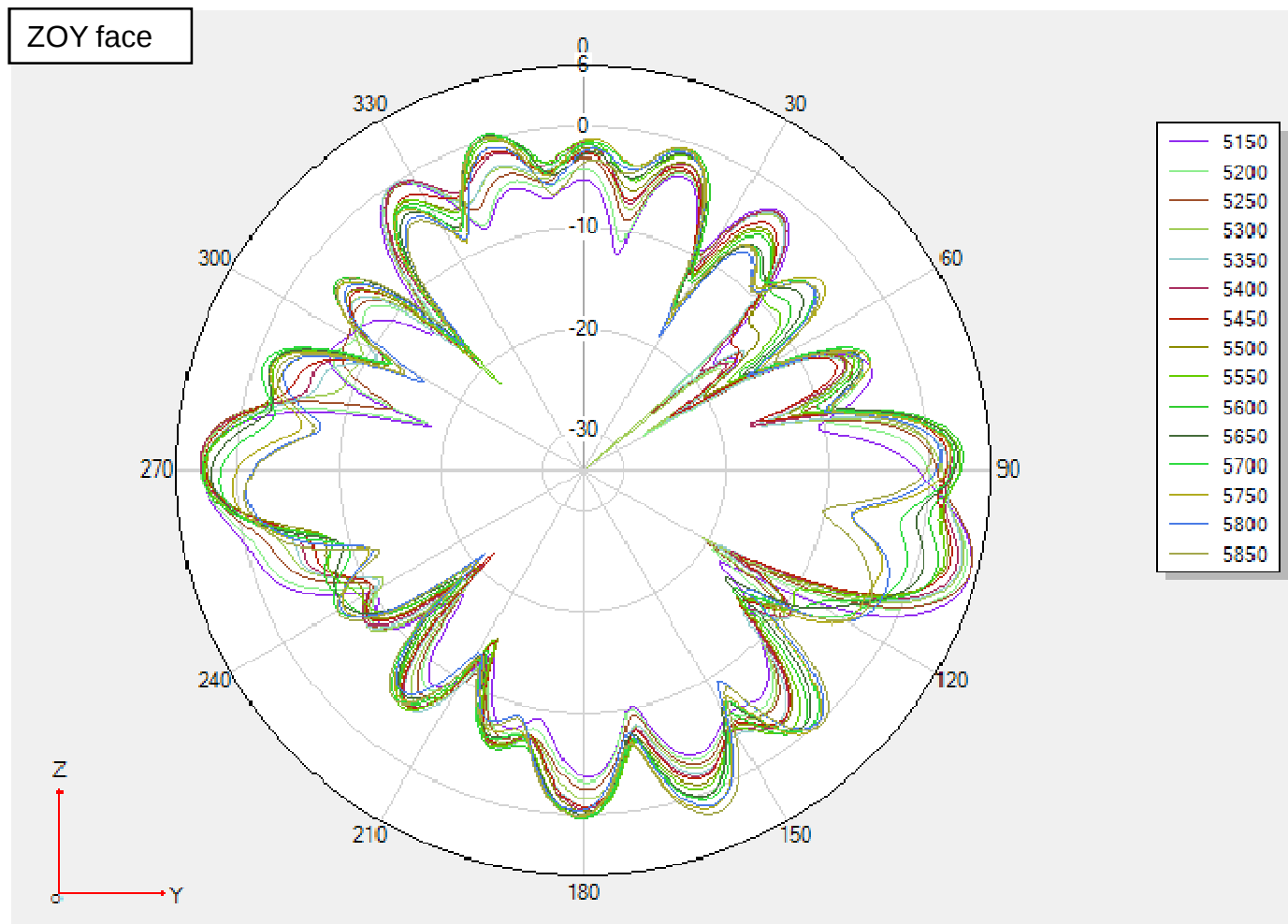
2D diagram



2D diagram



2D diagram



2.4GHz TRP TIS test data

Paste copper foil on the back of the main board

Test mode : 802.11b 11Mbps

Test Result	Wifi 2G TRP		
	1	6	11
Frequency (MHz)	2412	2437	2462
TRP (dBm)	19.3	20.01	19.96

Test Result	Wifi 2G TIS		
	1	6	11
Frequency (MHz)	2412	2437	2462
TIS (dBm)	-84.14	-85.17	-85.98

Test mode : 802.11g 54Mbps

Test Result	Wifi 2G TRP		
	1	6	11
Frequency (MHz)	2412	2437	2462
TRP (dBm)	20.47	19.96	20.22

Test Result	Wifi 2G TIS		
	1	6	11
Frequency (MHz)	2412	2437	2462
TIS (dBm)	-76.48	-75.09	-75.72

Test mode : 802.11n MCS7 20M

Test Result	Wifi 2G TRP		
	1	6	11
Frequency (MHz)	2412	2437	2462
TRP (dBm)	19.75	19.59	20.29

Test Result	Wifi 2G TIS		
	1	6	11
Frequency (MHz)	2412	2437	2462
TIS (dBm)	-70.25	-70.99	-71.21



5GHz TRP TIS test data

Paste copper foil on the back of the main board

Test mode : 802.11A 54M

Test	Wifi 5G TRP			
Result	36	48	149	161
Frequency (MHz)	5180	5240	5745	5805
TRP (dBm)	21.07	20.9	23.15	23.39

Test	Wifi 5G TIS			
Result	36	48	149	161
Frequency (MHz)	5180	5240	5745	5805
TIS (dBm)	-76.92	-75.57	-75.48	-75.81



Throughput test environment

Test equipment :

Lenovo computer win10 system (Gigabit wired network card)

HP computer win10 system (ASUS wireless network card (model : PCE-AX58BT)

testing software :

IxChariot (edition 670)

testing environment :

ETS 3D darkroom (4 * 4 * 3): the distance between the machine and the network card antenna is 1.5 meters

Throughput test settings: Router mode: 2.4G (Mixed 11b/g/n) 5G (Mixed 11ac/n/a/AX)

Router bandwidth: 2.4G (HT20/HT40) 5G (HT40/HT80)

Test code stream: 10

Test angle: rotate once every 90 degrees

Test attenuation: 0~90 (once every 5dB)

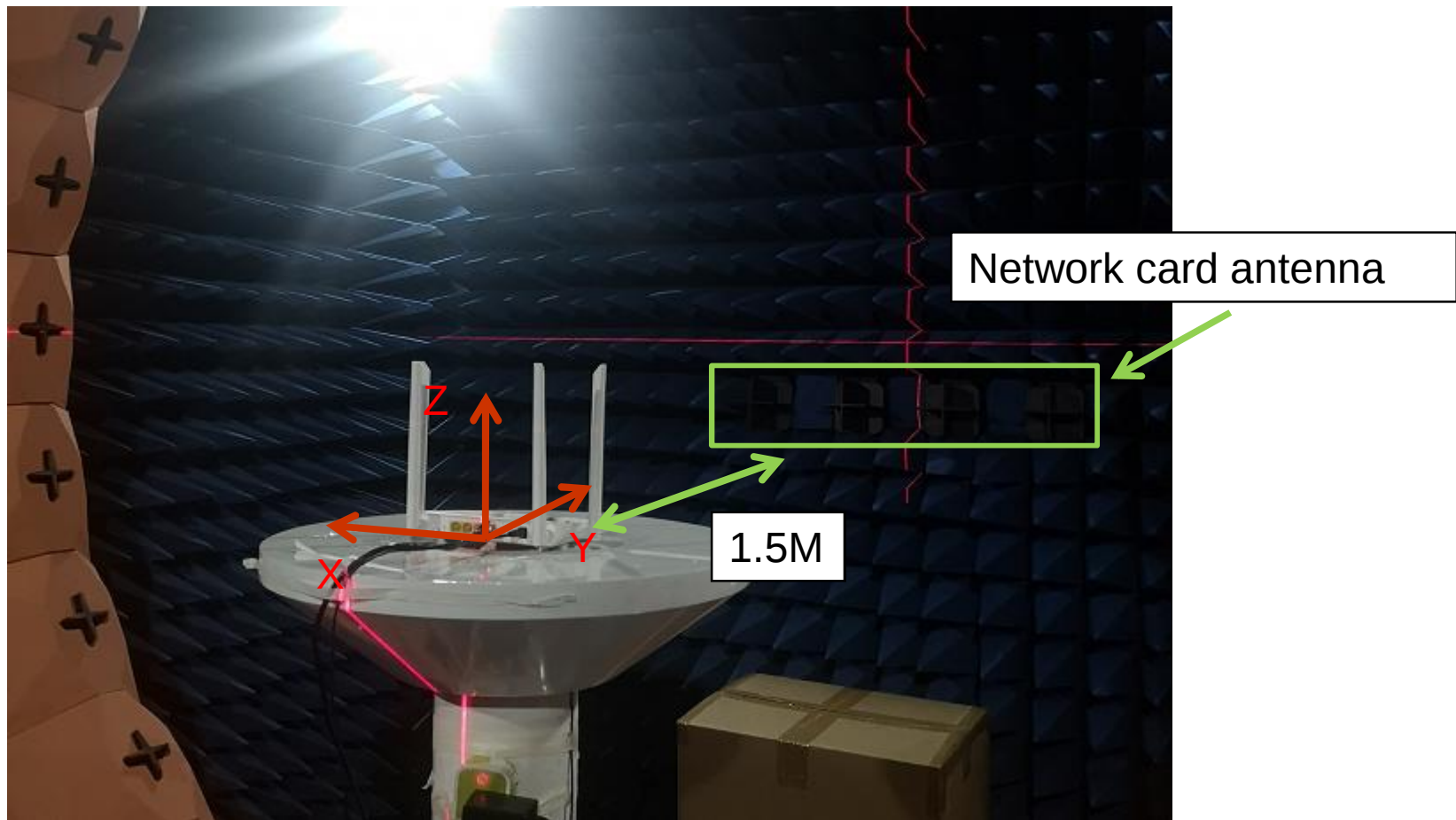
Test time: 1 minute for each point

PC1 IPAddr: 192.168.1.2

PC2 IPAddr: 192.168.1.3

Test time: October 11, 2021

Test placement





throughput(2.4G HT20 CH6)

Tx(Mbps)-CH6					
Atten(dB)	0°	90°	180°	270°	Aver
0	108.5	107.5	108.2	109.4	108.4
5	108.4	109.2	109.9	108.7	109.1
10	108.2	108.2	108.3	109.8	108.6
15	108.9	107.2	109.0	110.8	109.0
20	108.4	109.0	110.8	109.0	109.3
25	109.0	110.3	110.9	111.1	110.4
30	110.9	104.8	112.4	111.4	109.9
35	111.2	109.9	112.7	112.4	111.6
40	111.6	109.6	111.7	111.7	111.2
45	111.0	112.7	111.6	110.9	111.5
50	111.0	111.1	111.1	111.6	111.2
55	110.9	102.3	111.8	111.8	109.2
60	89.5	72.3	88.6	81.0	82.8
65	60.9	55.1	61.9	62.0	60.0
70	49.8	40.4	59.5	40.2	47.5
75	29.3	27.7	29.1	29.3	28.8
80	8.8	9.9	9.3	10.0	9.5

Rx(Mbps)-CH6					
Atten(dB)	0°	90°	180°	270°	Aver
0	116.6	112.7	116.2	115.7	115.3
5	116.5	112.4	116.8	114.2	115.0
10	116.8	113.6	116.2	114.8	115.4
15	115.4	115.7	116.2	114.1	115.4
20	115.9	115.7	116.3	116.0	116.0
25	116.1	114.0	115.5	115.9	115.4
30	116.7	112.0	116.3	114.2	114.8
35	115.8	110.5	116.4	114.1	114.2
40	116.8	113.4	115.6	113.9	114.9
45	115.5	114.9	116.3	110.3	114.3
50	116.1	100.8	114.6	100.9	108.1
55	106.8	89.2	94.4	86.6	94.2
60	70.6	68.7	70.3	70.3	70.0
65	46.4	35.4	48.5	35.8	41.5
70	24.2	25.4	22.0	26.1	24.4
75	11.6	16.1	11.6	17.0	14.1
80	5.6	9.9	5.0	5.7	6.5



throughput(2.4G HT40 CH6)

Tx(Mbps)-CH6					
Atten(dB)	0°	90°	180°	270°	Aver
0	205.2	202.2	204.2	206.5	204.5
5	208.0	207.3	205.8	207.5	207.2
10	204.6	205.0	207.9	206.1	205.9
15	202.8	204.4	204.9	204.1	204.0
20	204.4	207.5	208.7	205.1	206.4
25	207.3	205.1	206.9	205.6	206.2
30	208.9	207.1	204.5	204.7	206.3
35	207.7	207.0	211.0	209.9	208.9
40	207.3	207.8	208.5	206.8	207.6
45	209.9	211.2	210.5	210.0	210.4
50	205.5	202.0	211.7	208.8	207.0
55	206.2	182.8	209.1	172.8	192.7
60	152.5	146.0	157.2	141.7	149.3
65	123.6	107.6	118.9	102.6	113.2
70	78.0	55.8	55.4	56.6	61.4
75	38.4	36.8	38.0	37.7	37.7
80	15.2	16.0	12.3	14.6	14.5

Rx(Mbps)-CH6					
Atten(dB)	0°	90°	180°	270°	Aver
0	218.7	211.5	219.1	219.0	217.1
5	221.0	214.8	221.0	219.7	219.1
10	219.4	213.2	218.8	218.8	217.6
15	220.7	214.8	219.9	219.2	218.6
20	218.8	213.2	221.0	220.6	218.4
25	218.1	215.3	219.6	220.7	218.4
30	220.3	217.5	215.3	215.4	217.1
35	219.3	210.2	221.6	220.5	217.9
40	219.3	214.6	221.1	217.8	218.2
45	219.7	214.6	221.7	217.9	218.5
50	189.7	169.0	182.8	160.4	175.5
55	139.8	119.4	139.3	114.1	128.2
60	73.7	89.0	72.9	90.6	81.6
65	46.2	61.1	39.4	61.5	52.0
70	23.9	29.1	24.4	25.3	25.7
75	11.1	20.5	11.6	13.2	14.1

throughput(5G HT40 CH44)

Tx(Mbps)-CH44					
Atten(dB)	0°	90°	180°	270°	Aver
0	479.0	478.0	482.2	482.5	480.4
5	481.9	482.1	479.2	478.6	480.5
10	482.9	483.2	470.9	495.9	483.2
15	482.6	483.4	471.3	482.3	479.9
20	479.6	483.1	483.2	482.9	482.2
25	479.4	478.5	482.7	482.4	480.7
30	471.5	476.1	485.4	482.1	478.8
35	483.0	455.1	480.1	458.6	469.2
40	402.8	387.9	422.5	394.4	401.9
45	371.9	352.1	375.9	351.8	362.9
50	253.0	241.3	282.9	252.5	257.4
55	210.9	198.0	218.9	191.4	204.8
60	165.2	148.6	163.0	143.3	155.0
65	88.2	76.0	81.2	82.7	82.0
70	23.9	19.2	32.7	28.3	26.0

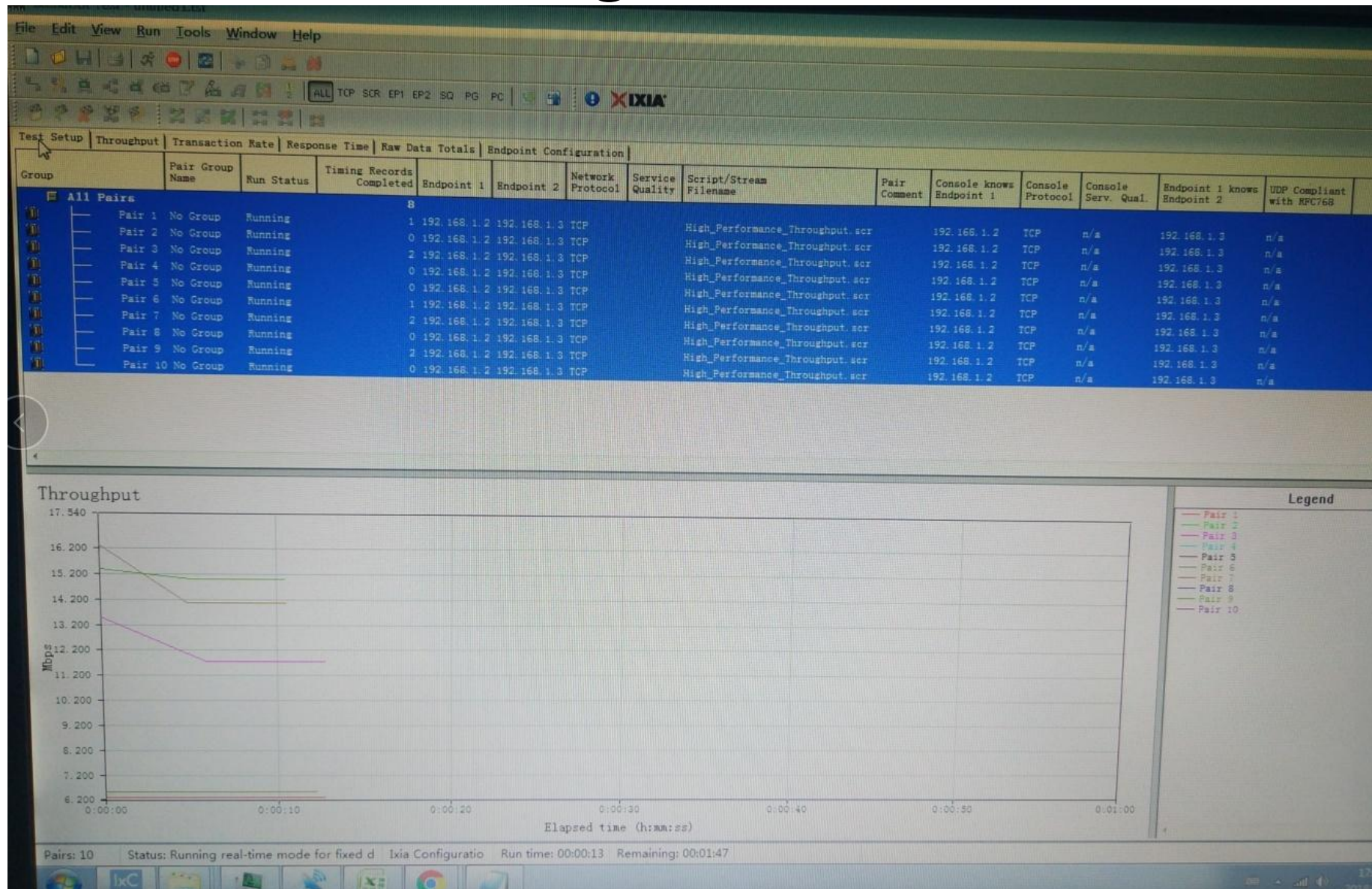
Rx(Mbps)-CH44					
Atten(dB)	0°	90°	180°	270°	Aver
0	453.1	424.5	451.7	427.9	439.3
5	455.4	427.2	459.5	429.4	442.8
10	441.2	424.6	459.9	423.3	437.2
15	455.1	427.8	453.8	422.7	439.8
20	451.1	428.0	446.1	421.9	436.7
25	449.7	411.9	446.3	415.0	430.7
30	401.8	383.9	421.8	385.9	398.3
35	341.2	329.6	360.3	331.7	340.7
40	318.2	290.1	337.3	290.3	309.0
45	246.6	222.8	269.8	220.8	240.0
50	166.2	135.8	168.3	132.7	150.8
55	96.6	81.7	104.7	99.1	95.5
60	51.2	41.3	59.6	52.3	51.1
65	25.6	17.6	36.3	31.4	27.7
70	10.0	8.7	13.2	17.6	12.4

throughput(5G HT80 CH44)

Tx(Mbps)-CH44					
Atten(dB)	0°	90°	180°	270°	Aver
0	916.5	903.3	910.2	915.5	911.4
5	918.2	908.9	923.7	903.6	913.6
10	916.4	908.6	915.8	914.1	913.7
15	908.2	906.0	922.7	915.8	913.2
20	902.7	921.2	926.8	916.7	916.9
25	912.7	909.6	922.2	918.0	915.6
30	924.5	866.6	915.1	853.8	890.0
35	834.7	808.3	854.5	805.8	825.8
40	768.6	693.0	764.0	719.0	736.1
45	691.6	649.1	702.9	677.2	680.2
50	575.1	528.0	593.1	555.9	563.0
55	344.5	303.7	373.7	350.3	343.0
60	233.1	194.0	252.6	206.4	221.5
65	162.7	116.5	175.5	119.0	143.4
70	68.2	47.8	65.3	59.5	60.2
75	12.3	5.6	10.9	17.3	11.5

Rx(Mbps)-CH44					
Atten(dB)	0°	90°	180°	270°	Aver
0	907.4	887.0	910.8	880.5	896.4
5	907.2	881.3	907.7	881.7	894.5
10	908.0	884.4	905.0	879.7	894.3
15	906.7	886.4	912.3	884.4	897.4
20	880.6	879.4	880.4	878.7	879.7
25	874.0	885.6	876.6	880.5	879.2
30	873.7	827.1	868.1	812.3	845.3
35	802.0	738.7	797.9	726.2	766.2
40	712.3	662.2	702.6	667.1	686.1
45	561.0	507.2	587.1	522.9	544.5
50	436.9	396.9	459.7	385.2	419.7
55	274.4	244.9	302.1	256.4	269.5
60	153.4	139.3	167.0	169.5	157.3
65	81.6	60.1	83.9	84.7	77.6
70	24.2	23.6	48.6	42.2	34.7
75	5.8	3.2	5.0	10.7	6.2

testing software



Thank you!

