

AN-2659-1

AN-2659-2

AN-2659-3

IEEE 802.15.4z UWB IoT Antenna

Antenna Test Report

Rev. C

(For Standard)

Manufacturer:

AzureWave Technologies, Inc.

10F., No.94, Baozhong Rd., Xindian Dist., New Taipei City, Taiwan 231

Revision History

Version	Revision Date	Description
A	2024/11/15	● Initial version
B	2024/11/27	● Tuning based on Ver. A PCB
C	2025/02/12	● Based on V03 module
D	2025/03/13	● Updated 3. S-Parameters

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1. Customer Specification

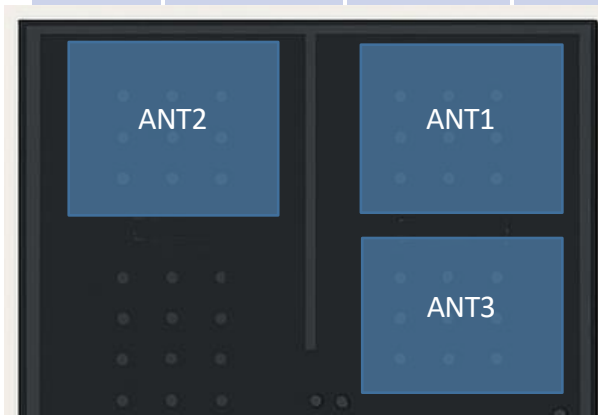
Ant. No.	Model	Type	Function	Operating Freq.
Ant.1	AN-2659-1	Printed	UWB CH5&CH9	6489.6MHz 7987.2MHz
Ant.2	AN-2659-2	Printed	UWB CH5&CH9	6489.6MHz 7987.2MHz
Ant.3	AN-2659-3	Printed	UWB CH5&CH9	6489.6MHz 7987.2MHz

Target Performance:

Parameter	Ch5	Ch9
Gain (peak)	>0dBi	>0dBi
3dB Beamwidth	+/-45°	+/-45°
Cross-pol rejection	>20dB	>20dB
Front-to-back ratio (FTBR)	>20dB	>15dB
Return Loss BW (-7dB)	>100MHz	>200MHz
Efficiency	50%	60%
Gain BW (-6dB)	>400 MHz	>400MHz

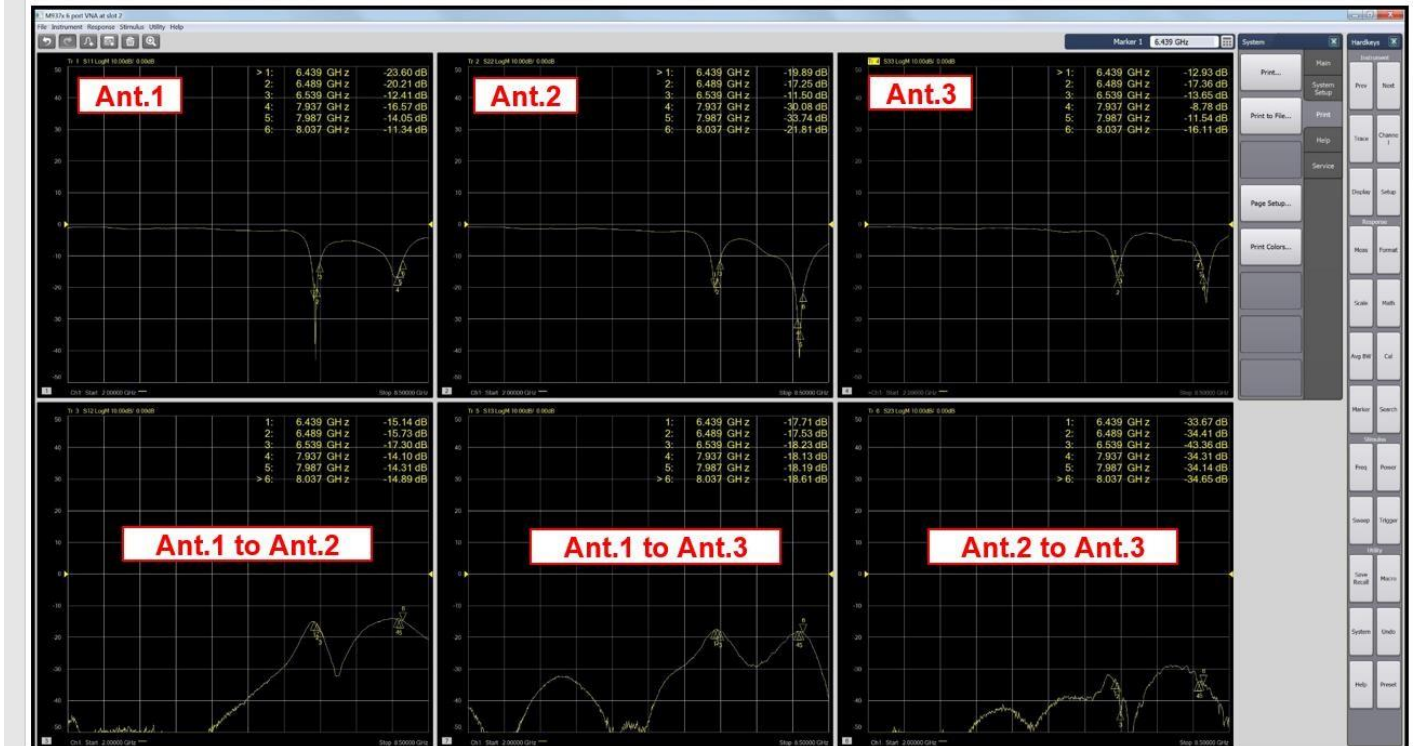
2. Antenna Placement

No.	Function	Material	Dimension(mm)	Frequency(MHz)	Remark
Ant.1	UWB CH5&CH9	Printed	NA	6489.6 7987.2	
Ant.2	UWB CH5&CH9	Printed	NA	6489.6 7987.2	
Ant.3	UWB CH5&CH9	Printed	NA	6489.6 7987.2	



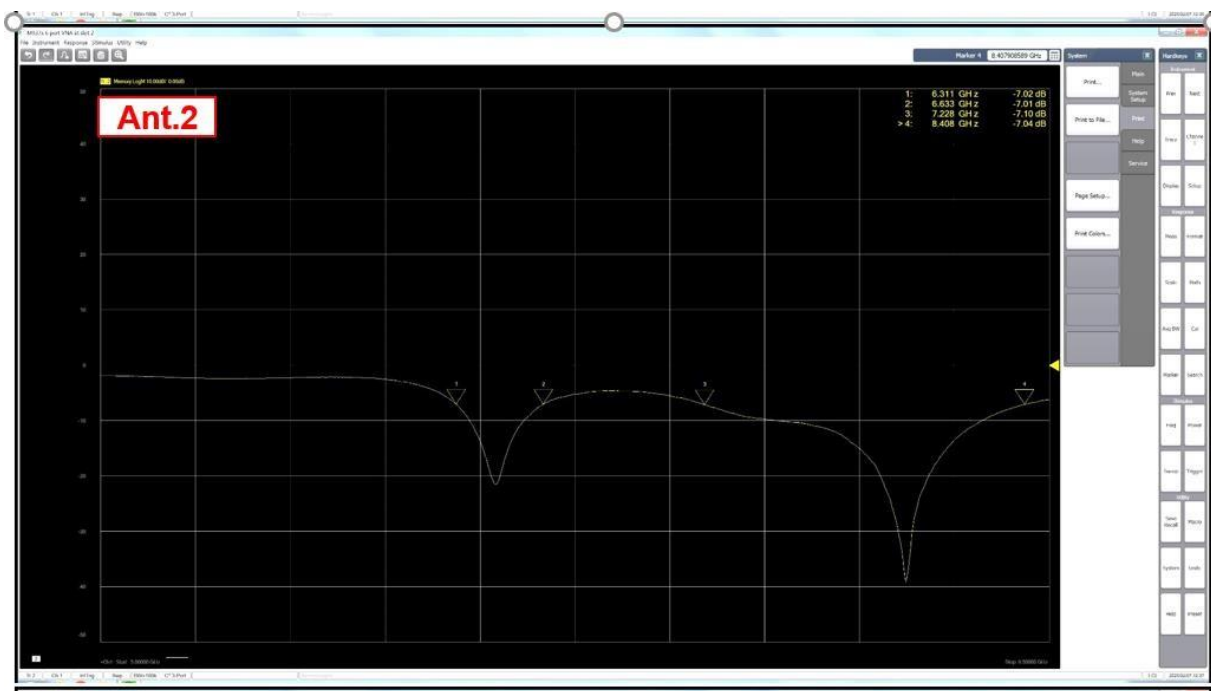
3. S-Parameters

Ant.1&Ant.2&Ant.3 (UWB)-



Return Loss BW(-7dB) – Ant.1&Ant.2&Ant.3 (UWB)





4. Gain Table

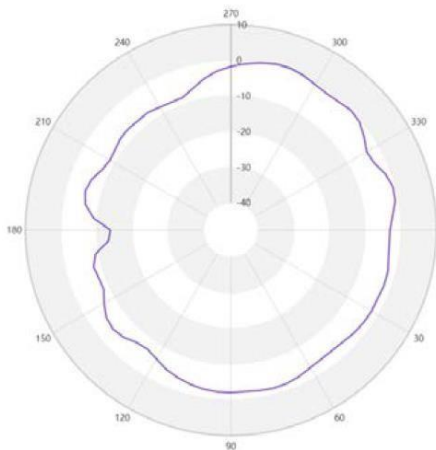
UWB	Frequency(MHz)	6439	6489	6539	7937	7987	8037
Ant.1	Peak Gain(dBi)	3.4	3.6	3.6	4.4	3.5	3.7
	Efficiency(%)	51	53	53	63	62	60
Ant.2	Peak Gain(dBi)	4.4	3.5	3.7	4.5	4.7	4.6
	Efficiency(%)	52	53	50	63	64	60

Ant.3	Peak Gain(dBi)	4.5	4.5	4.3	4.0	4.6	5.3
	Efficiency(%)	53	54	51	58	60	64

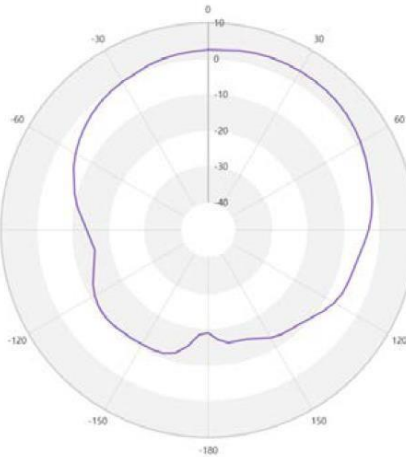
5. Radiation Pattern

Ant.1 (UWB CH5)

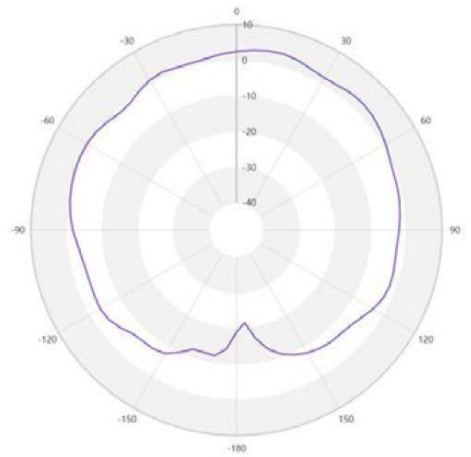
Azimuth Plane
Theta = 90



Elevation Plane
phi = 0

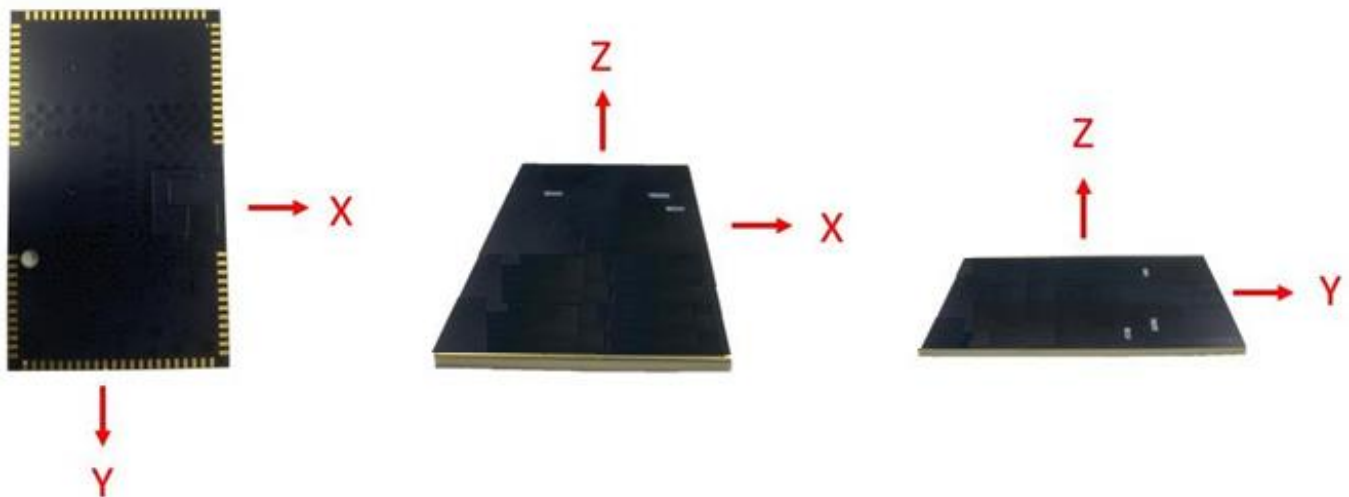


Elevation Plane
phi = 90



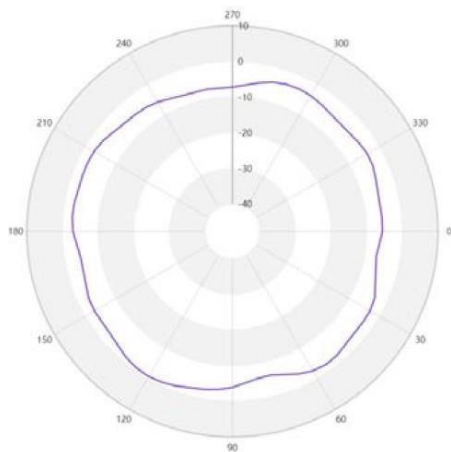
	Phi=0	Phi=90
Front	2.51	2.51
Back	-19.03	-19.03
FTBR	21.54	21.54

Setup :

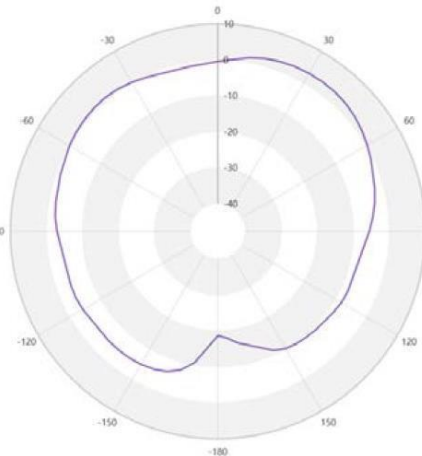


Ant.1 (UWB CH9)

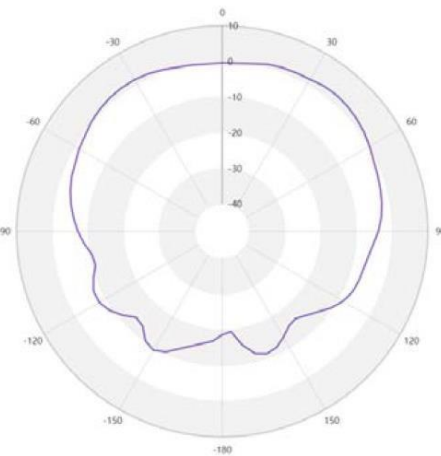
Azimuth Plane
Theta = 90



Elevation Plane
phi = 0

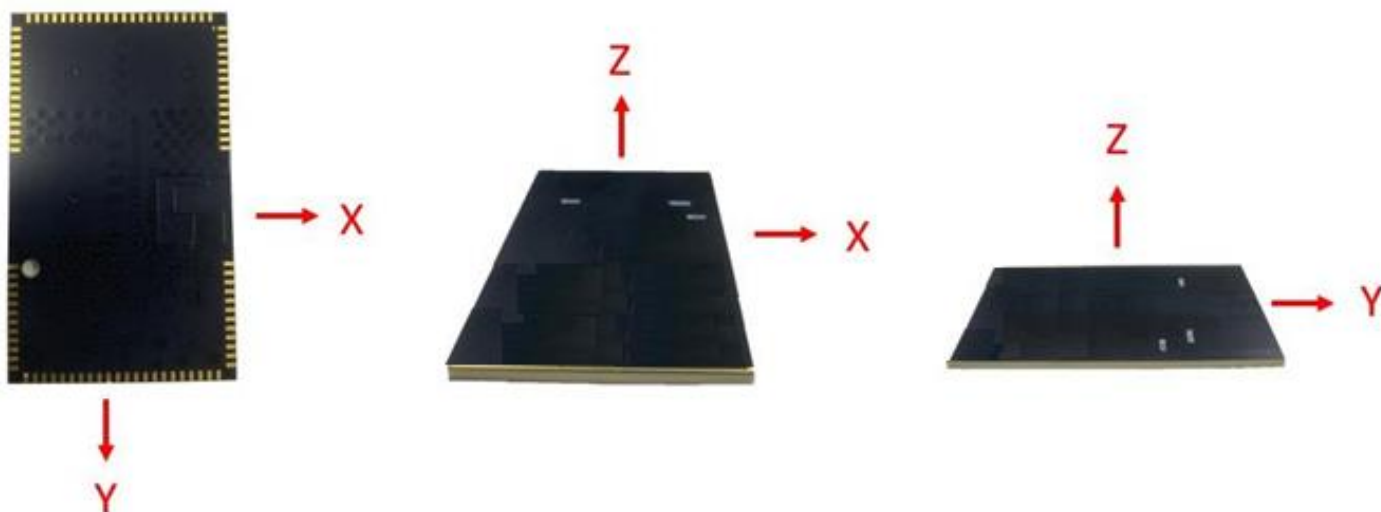


Elevation Plane
phi = 90

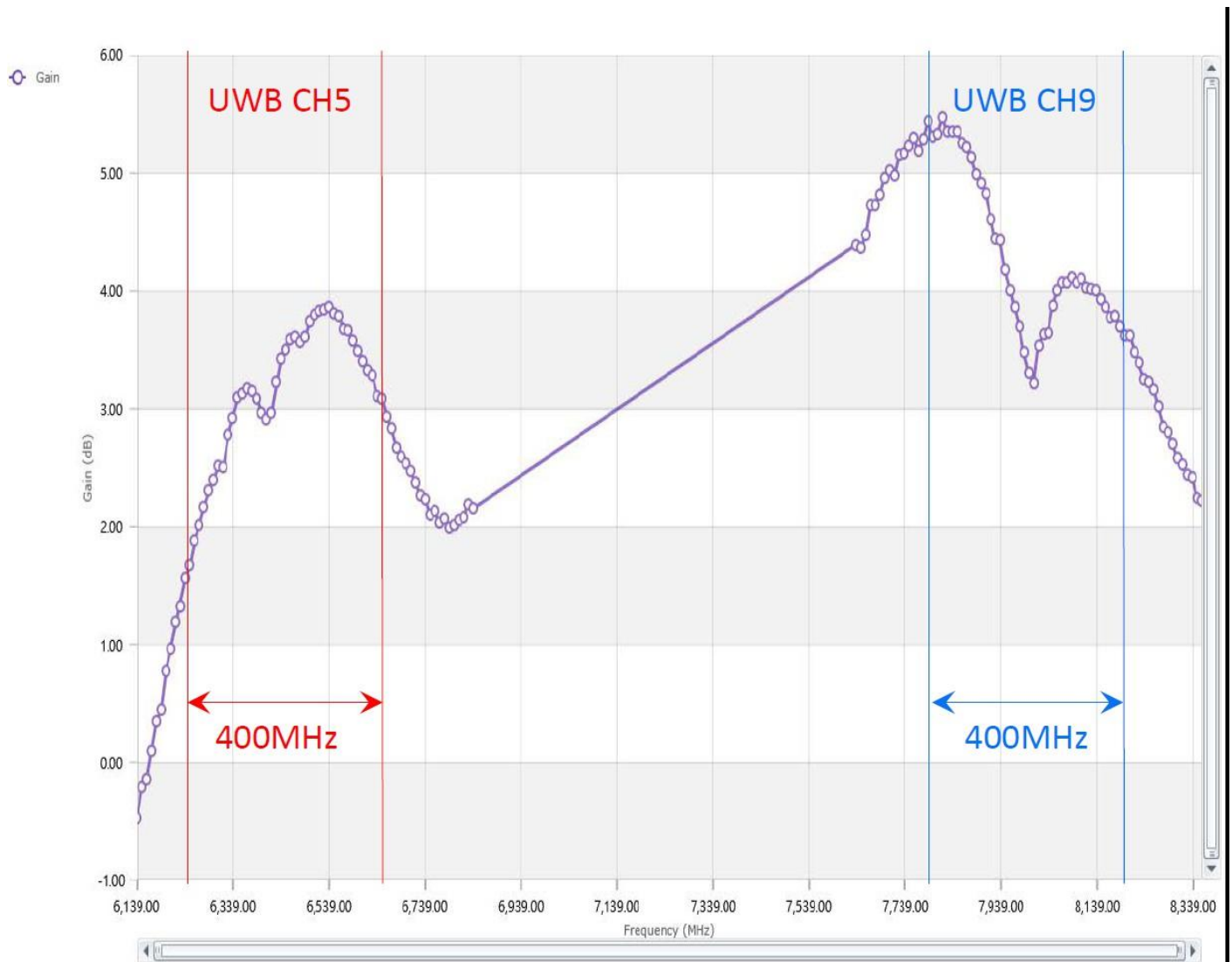


	Phi=0	Phi=90
Front	-0.44	-0.44
Back	-18.67	-18.67
FTBR	18.23	18.23

Setup :

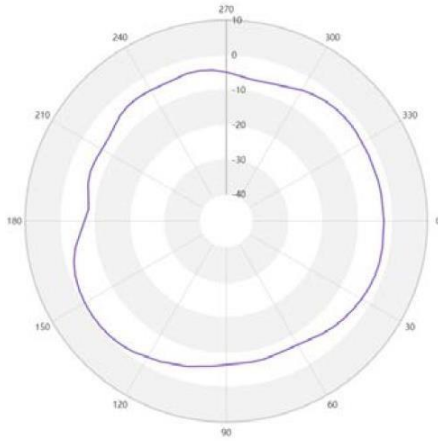


Ant.1 Gain BW (UWB CH5, CH9)

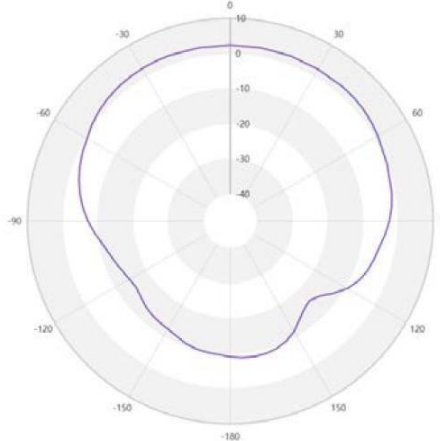


Ant.2 (UWB CH5)

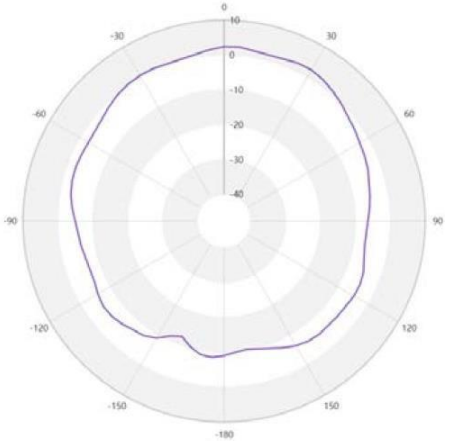
Azimuth Plane
Theta = 90



Elevation Plane
phi = 0

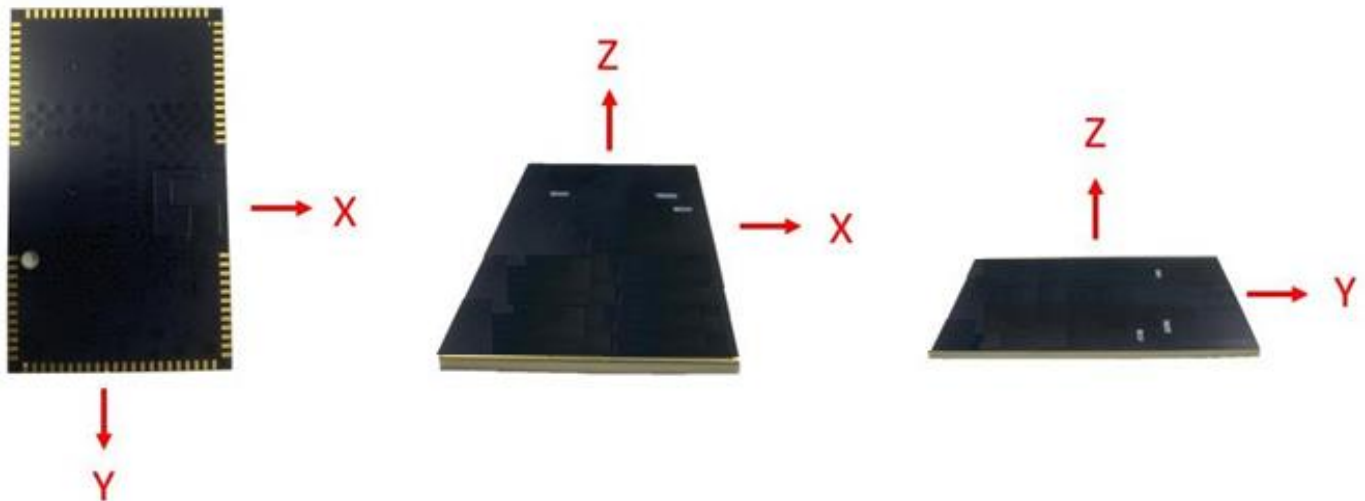


Elevation Plane
phi = 90



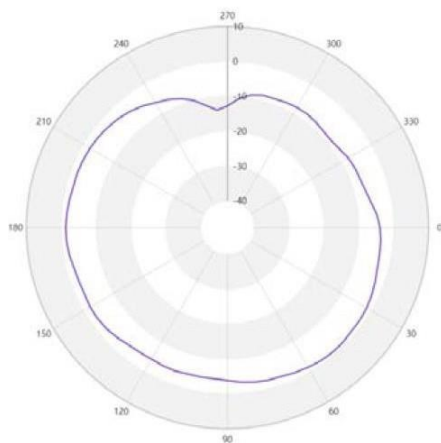
	Phi=0	Phi=90
Front	2.40	2.40
Back	-9.04	-9.04
FTBR	11.44	11.44

Setup :

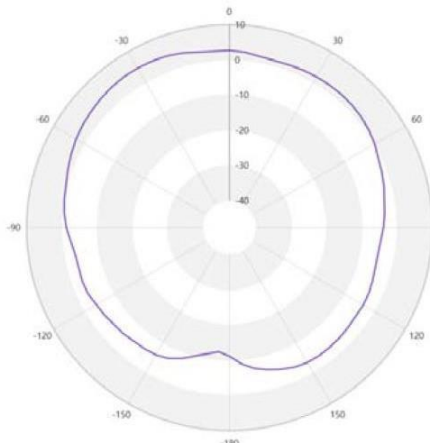


Ant.2 (UWB CH9)

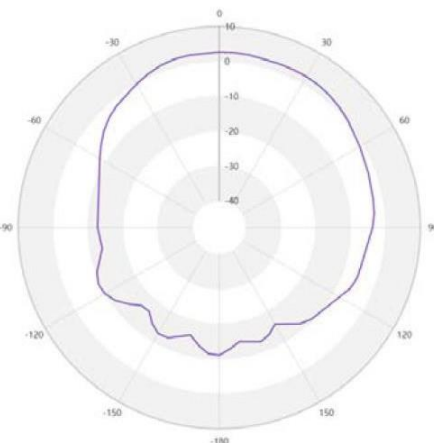
Azimuth Plane
Theta = 90



Elevation Plane
phi = 0

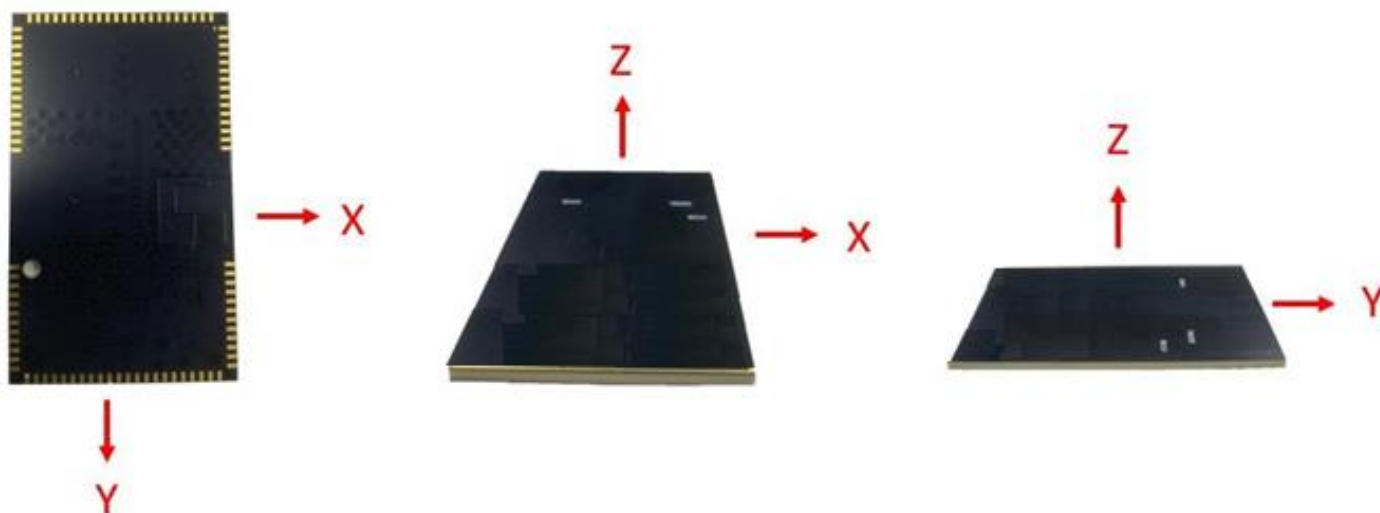


Elevation Plane
phi = 90

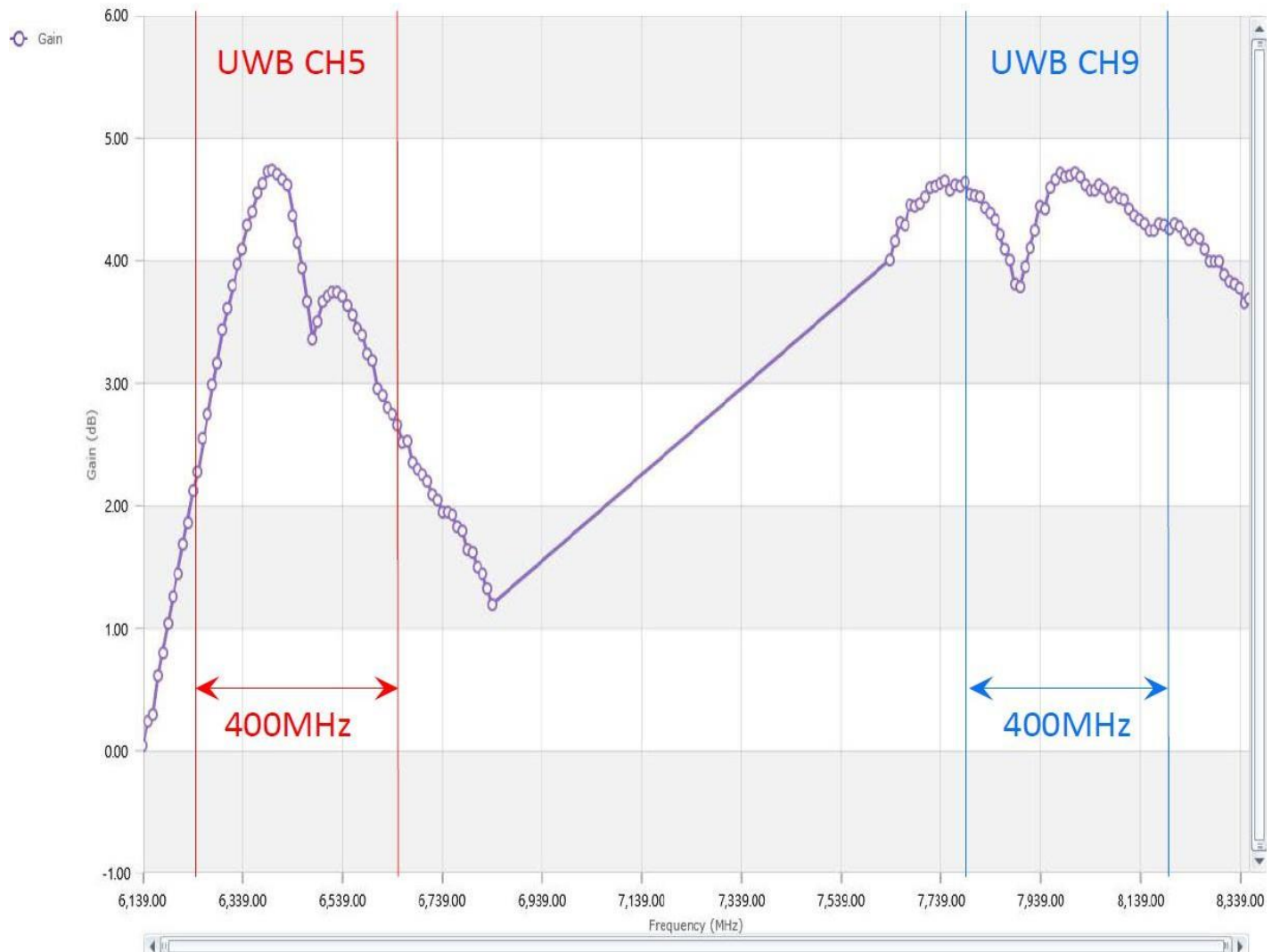


	Phi=0	Phi=90
Front	2.70	2.70
Back	-11.13	-11.13
FTBR	13.83	13.83

Setup :

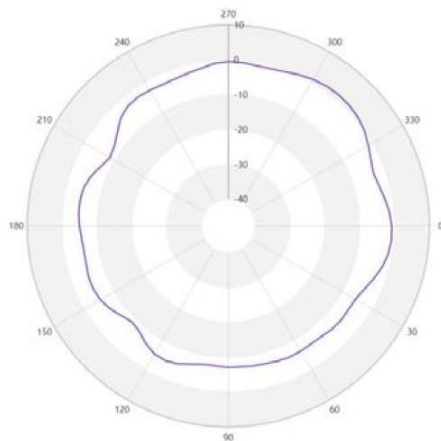


Ant.2 Gain BW (UWB CH5, CH9)

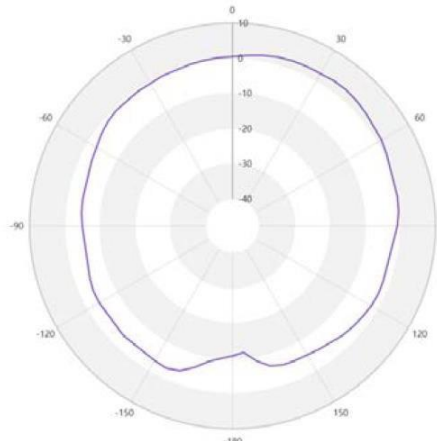


Ant.3 (UWB CH5)

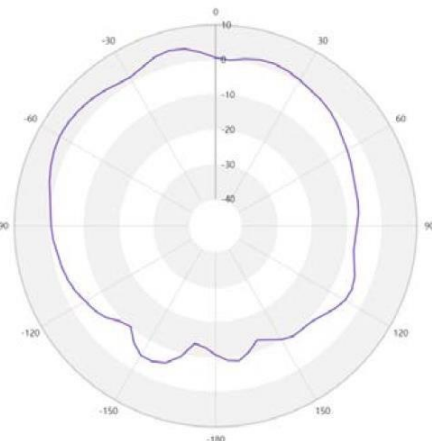
Azimuth Plane
Theta = 90



Elevation Plane
phi = 0

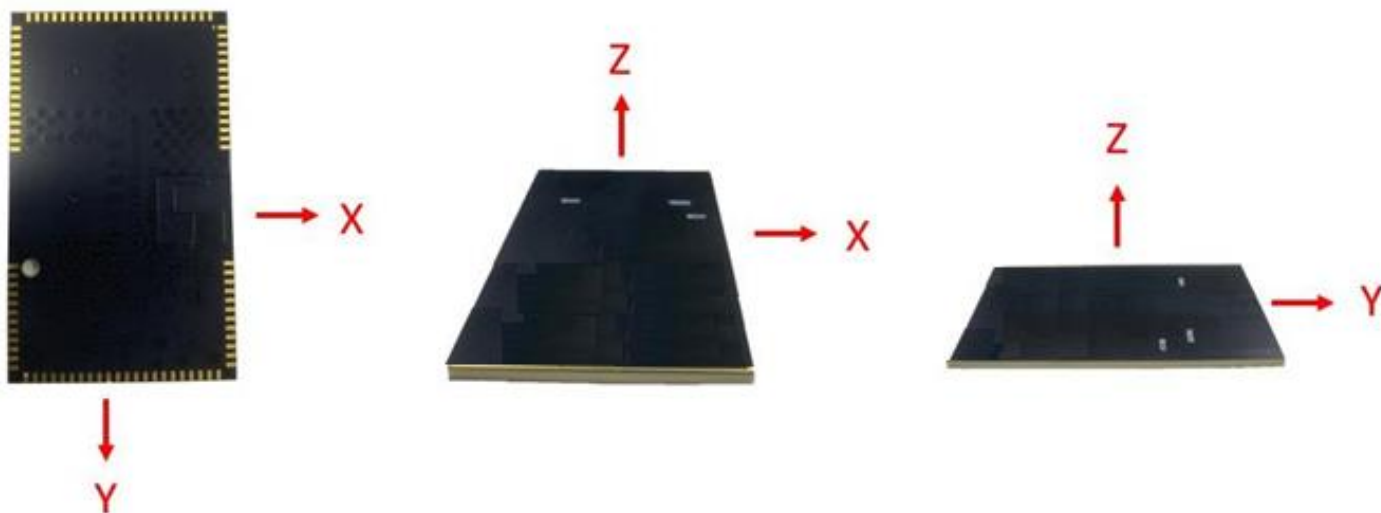


Elevation Plane
phi = 90



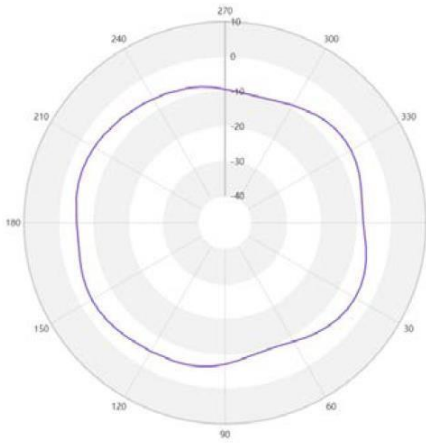
	Phi=0	Phi=90
Front	0.55	0.55
Back	-10.72	-10.72
FTBR	11.27	11.27

Setup :

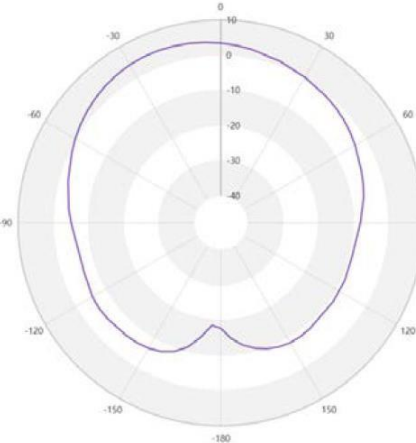


Ant.3 (UWB CH9)

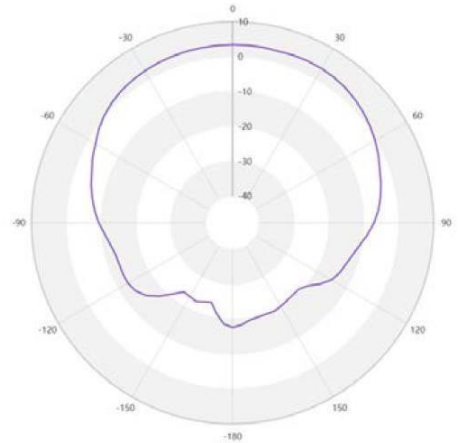
Azimuth Plane
Theta = 90



Elevation Plane
phi = 0

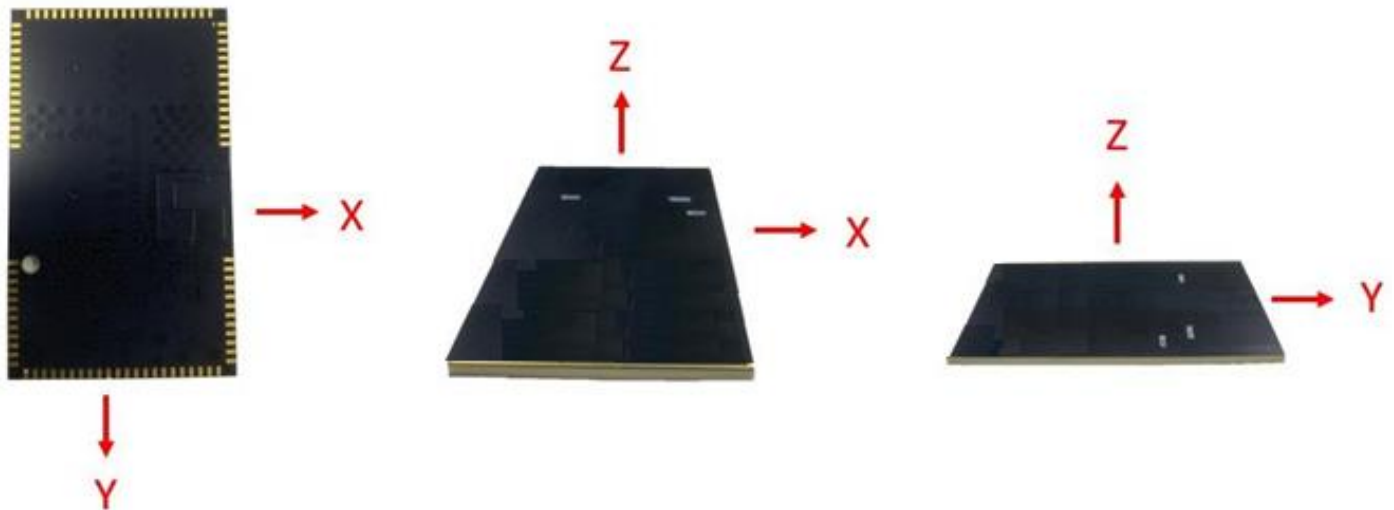


Elevation Plane
phi = 90

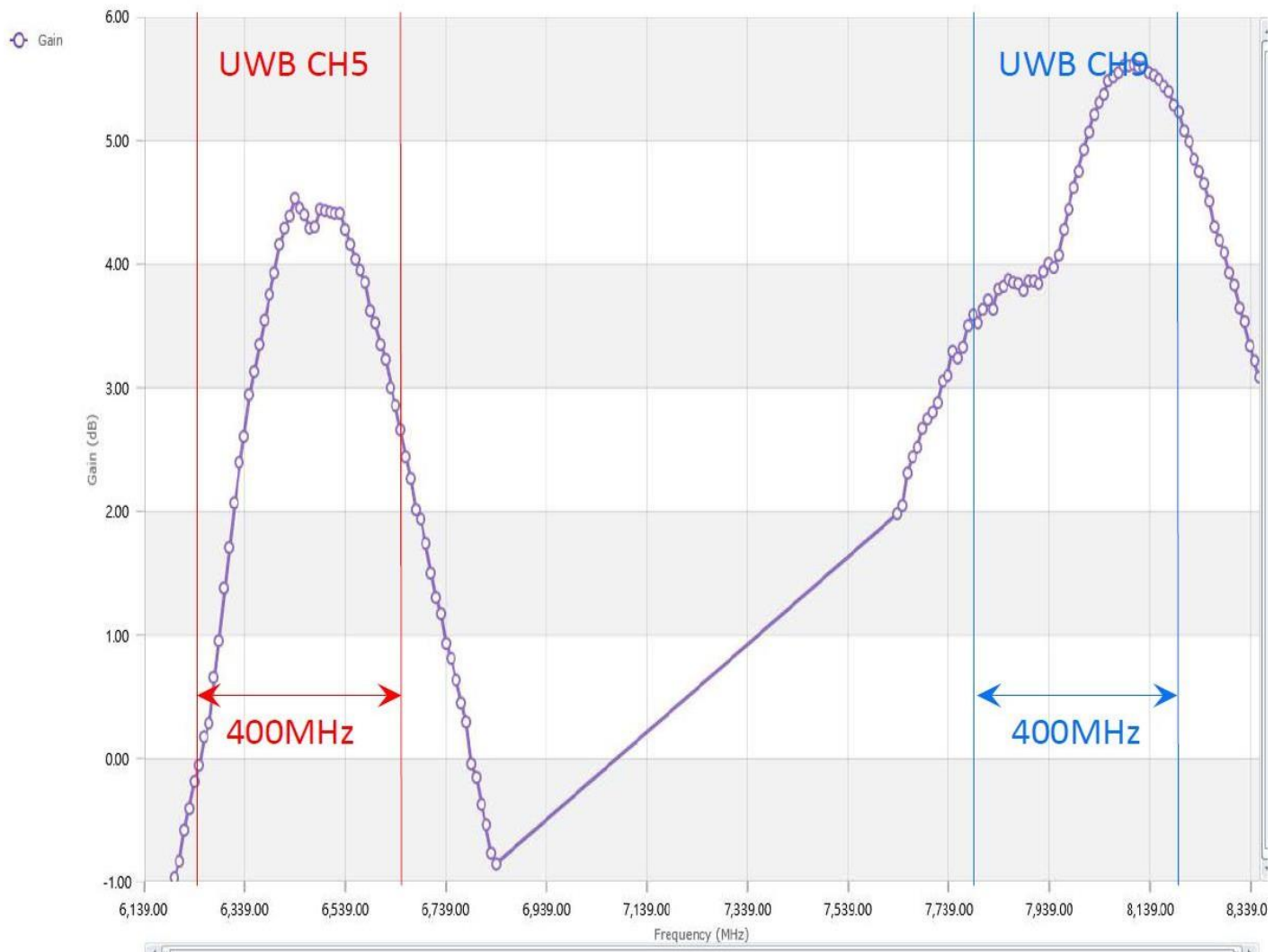


	Phi=0	Phi=90
Front	3.44	3.44
Back	-17.68	-17.68
FTBR	21.12	21.12

Setup :

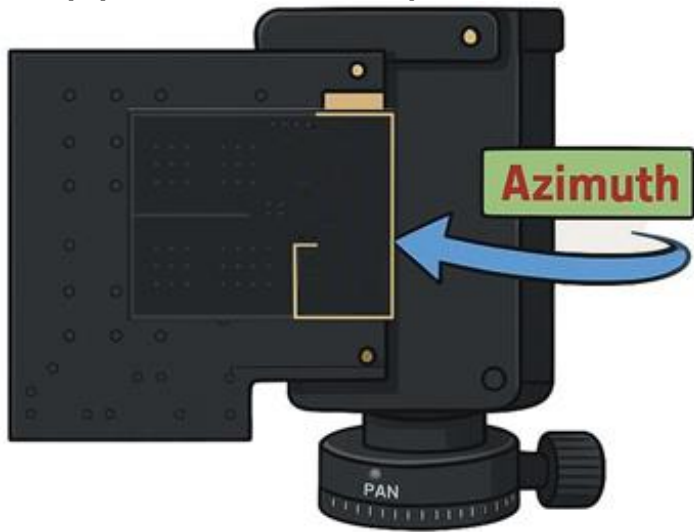


Ant.3 Gain BW (UWB CH5, CH9)

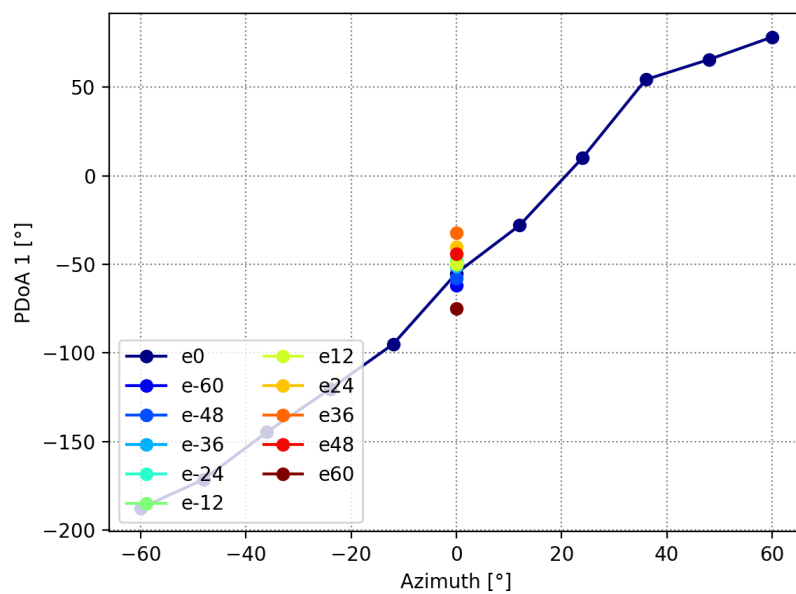


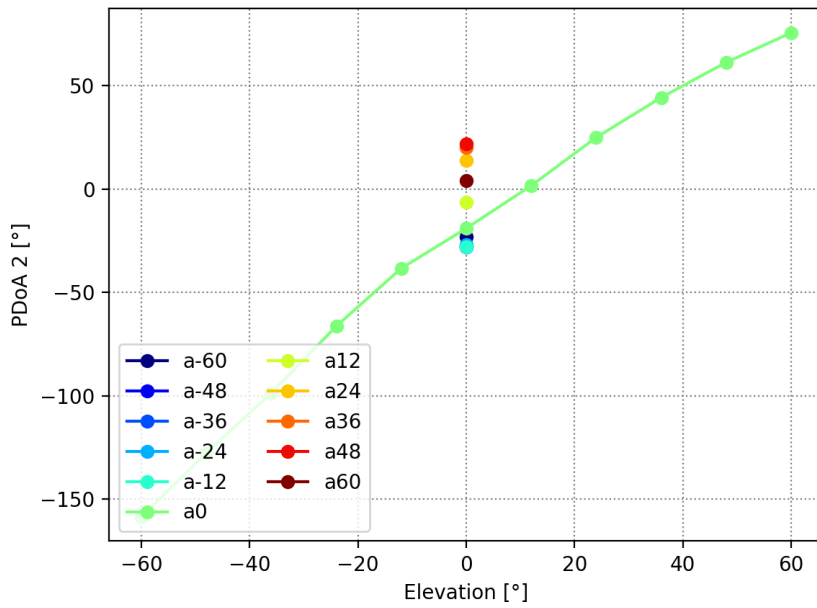
6. PDoA v. AoA

Setup (active measurement):

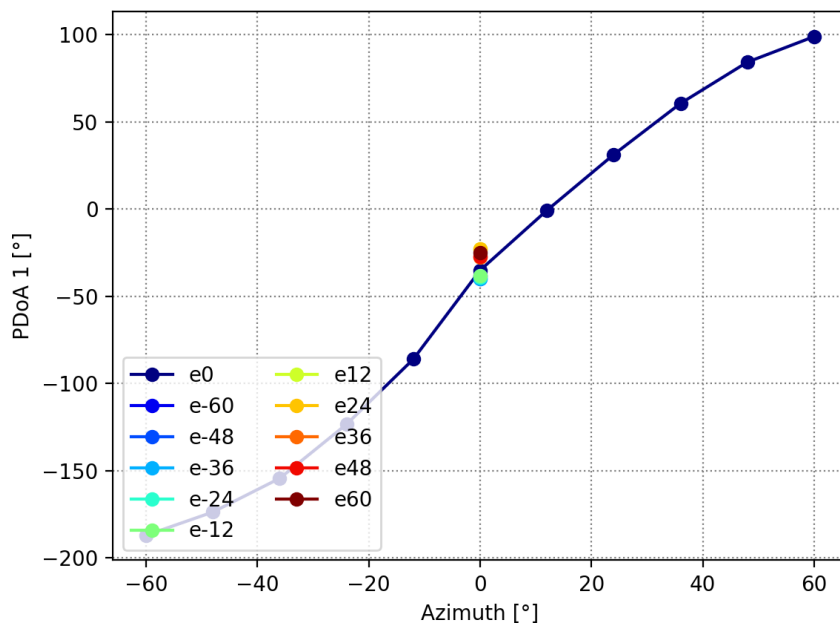


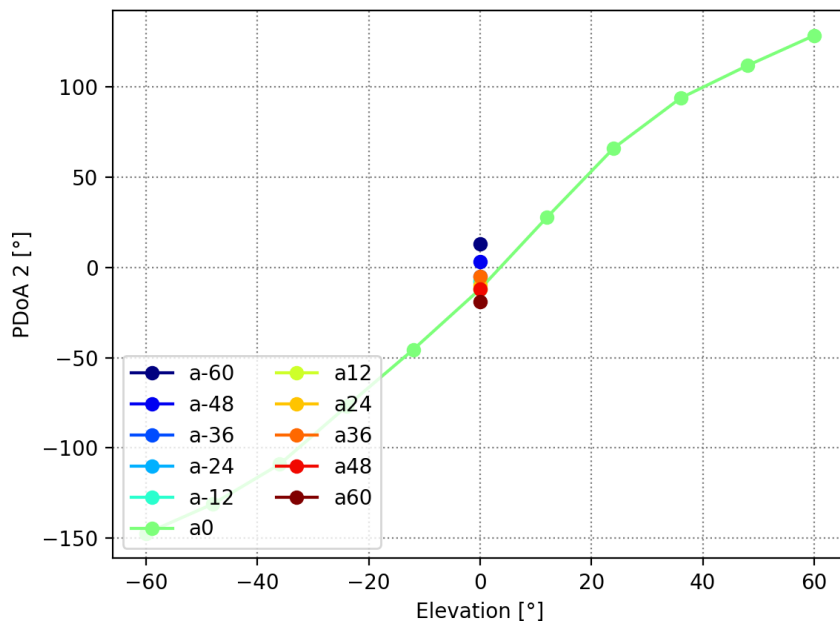
6.1 Channel 5 cross 3D AOA





6.2 Channel 9 cross 3D AOA





7. Summary

Summary	Ant.1	Ant.2	Ant.3
Return Loss – UWB CH5 band	< -10dB	< -10dB	< -10dB
Return Loss – UWB CH9 band	< -10dB	< -10dB	< -8dB
Efficiency – UWB CH5 band	> 50%	> 50%	> 50%
Efficiency – UWB CH9 band	> 60%	> 60%	> 60%
Peak Gain – UWB CH5 band	3.4 – 3.6dBi	3.5 – 4.4dBi	4.3 – 4.5dBi
Peak Gain – UWB CH9 band	3.5 – 4.4dBi	4.5 – 4.7dBi	4.0 – 5.3dBi
3D Directivity – UWB CH5 band	5.5 – 5.9dBi	5.7 – 6.6dBi	6.3 – 6.4dBi
3D Directivity – UWB CH9 band	5.5 – 6.3dBi	6.0 – 6.3dBi	6.7 – 7.2dBi
3dB Beamwidth – UWB CH5 band	ZX plane: 85°	ZX plane: 129°	ZX plane: 102°
	YZ plane: 83°	YZ plane: 80°	YZ plane: 63°
3dB Beamwidth – UWB CH9 band	ZX plane: 53°	ZX plane: 79°	ZX plane: 69°
	YZ plane: 110°	YZ plane: 79°	YZ plane: 97°
Cross-pol rejection – UWB CH5 band	15.1	11.2	16.5
Cross-pol rejection – UWB CH9 band	8.6	22.7	16.4
Front-to-back ratio – UWB CH5 band	21.5	11.4	11.2
Front-to-back ratio – UWB CH9 band	18.2	13.8	21.1
Return Loss BW (-7dB) –	>100MHz	>100MHz	>100MHz

UWB CH5 band			
Return Loss BW(-7dB) – UWB CH9 band	>200MHz	>200MHz	>200MHz
Gain BW (-6dB) – UWB CH5 band	>400MHz	>400MHz	>400MHz
Gain BW(-6dB) – UWB CH9 band	>400MHz	>400MHz	>400MHz