



TELE2 Antenna reference data



Revision History

Rev. Status	Revision Date	Revised By	Description
V1	2025/10/16	WNC Kimi Lin	First release
V2	2026/04/27	WNC Tony Lien	update cellular antenna data (Radiation Pattern)
V3	2026/04/30	WNC Tony Lien	update cellular antenna data (gain /peak gain)
V4	2026/06/16	WNC Tony Lien	Add Measurement setup Add Antenna Performance summary
V5	2026/06/23	WNC Tony Lien	Add BLE Antenna peak gain



Contents

- Chamber Information
 - Test Equipment
 - Test Procedure
 - Name and Address of The Antenna Manufacture

- Antenna Vendor : WNC
- Test Date : 20251016
- Test Engineer : Jeff Sun
- Measurement System : SATIMO
SG24-L
- Software Name : Wave Studio



4

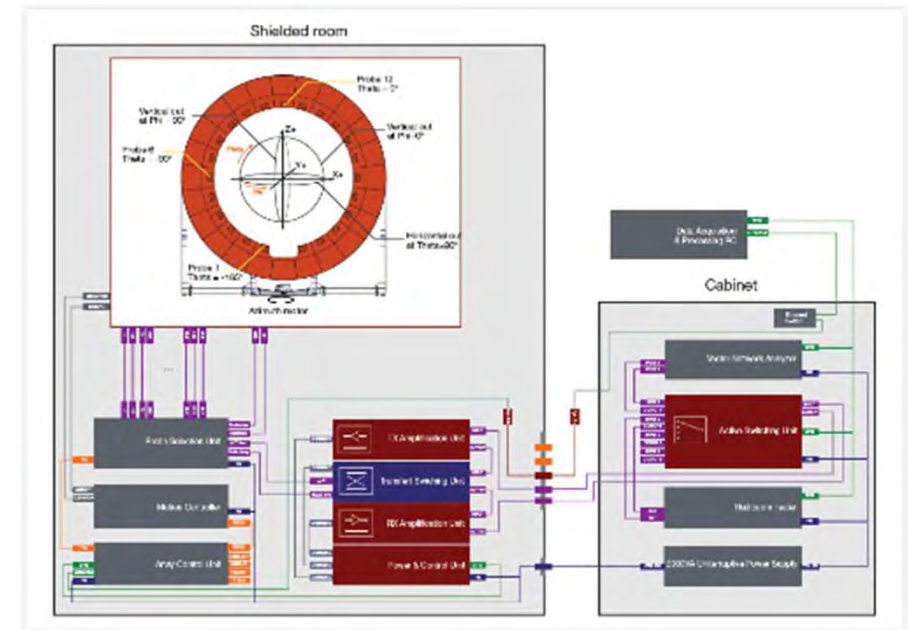
Test Equipment

■ Measurement System : SATIMO SG24-L Chamber

■ Measurement Setup

- pattern & gain measurement
 - SATIMO chamber (SG24-L)
 - SATIMO program (wave studio)
 - System overview
- Test item
 - antenna passive test 400MHz~9GHz

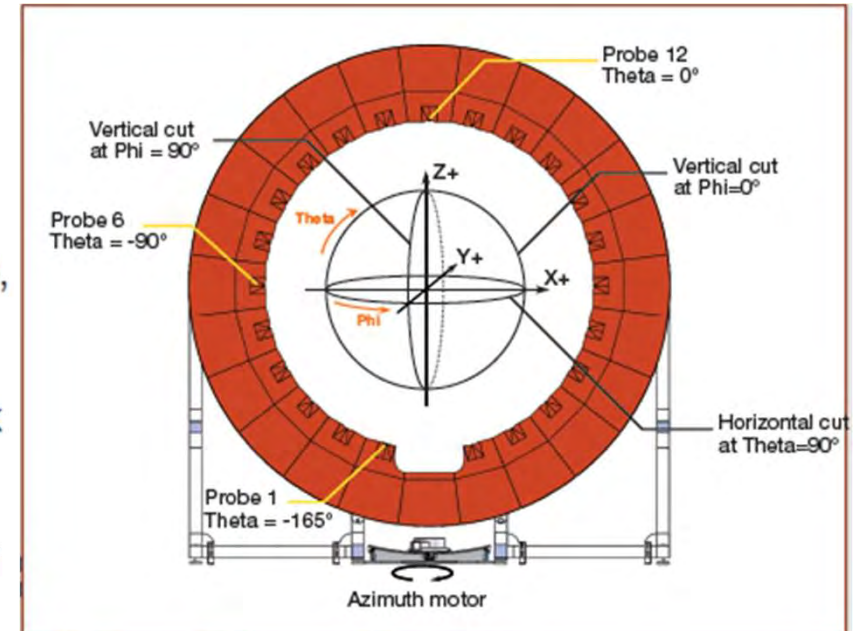
■ Calibration Information



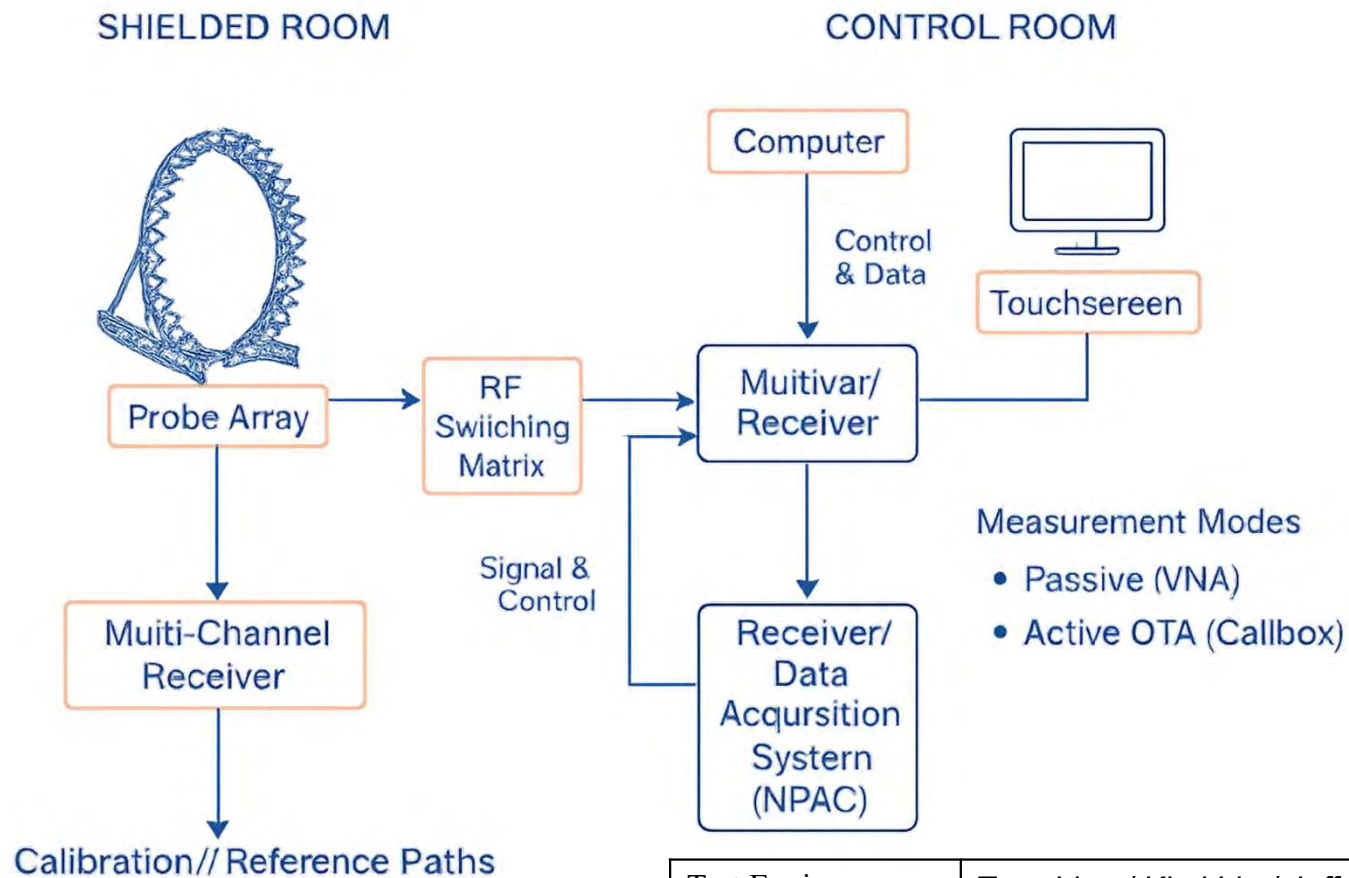
Device	Type / Model	Serial #	Manufacture	Cal. Date	Cal. Until
Antenna Measurement System	SG24-L	HKG1669S	MVG-SATIMO	2025-06-05	2026-06-04
Network Analyzer	Keysight E5080B	MY59203136	Keysight	2025-06-05	2026-06-04

Test Procedure

1. Place the device to be tested on the fixture and align it with the center of the chamber.
2. Connect the antenna cable to the RF connector of the chamber.
3. Use the SW to configure parameters (antenna name, frequency points, measurement angles, antenna dimension), and then run the test SW (wave studio).
4. By phi from 0° to 360° and theta from 0° to 180° with a step size of 3 degrees, get the 3D data, including efficiency, peak gain, 2D and 3D radiation patterns.
5. This is far field test for antenna verification.
6. This is passive measurement, which means the device is off and not in any operating mode.

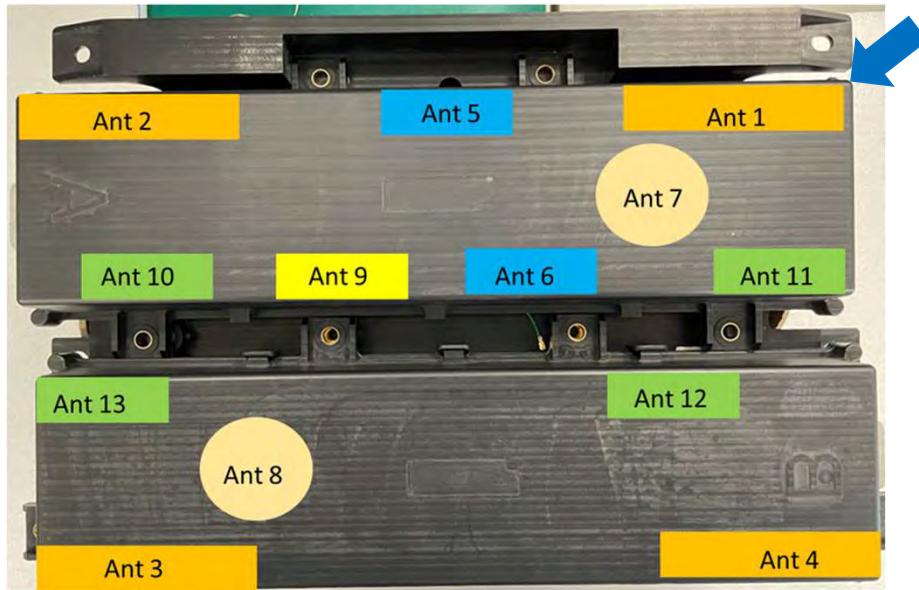


Measurement setup

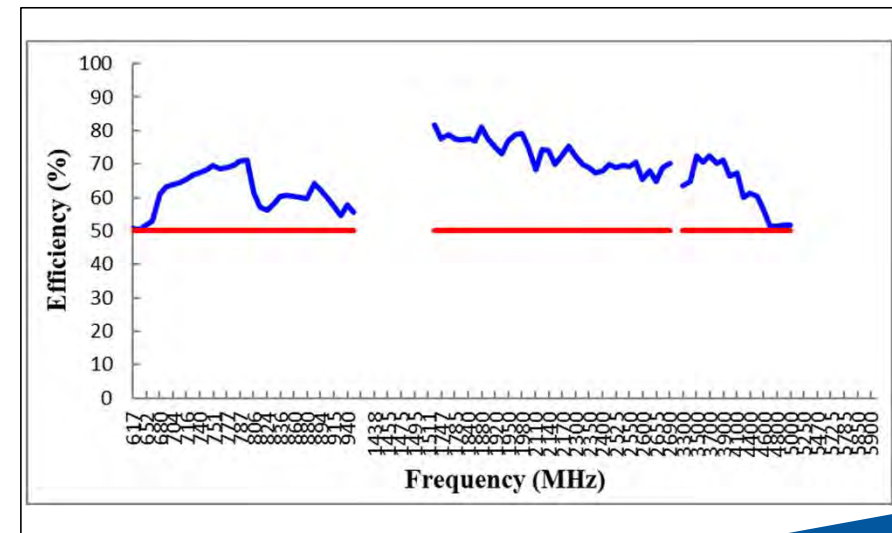
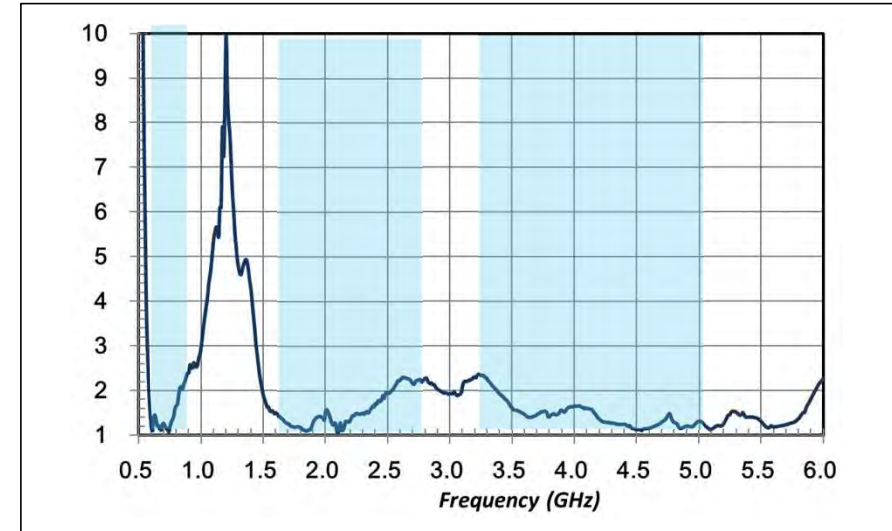


Test Engineer	Tony Lien / Kimi Lin / Jeff Sun
Measurement Date	2025/10/16

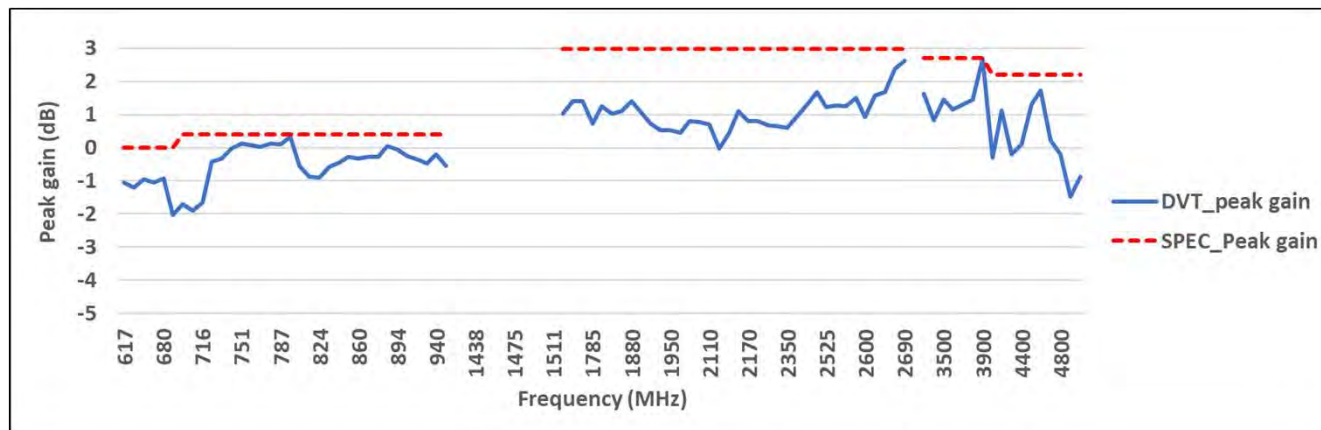
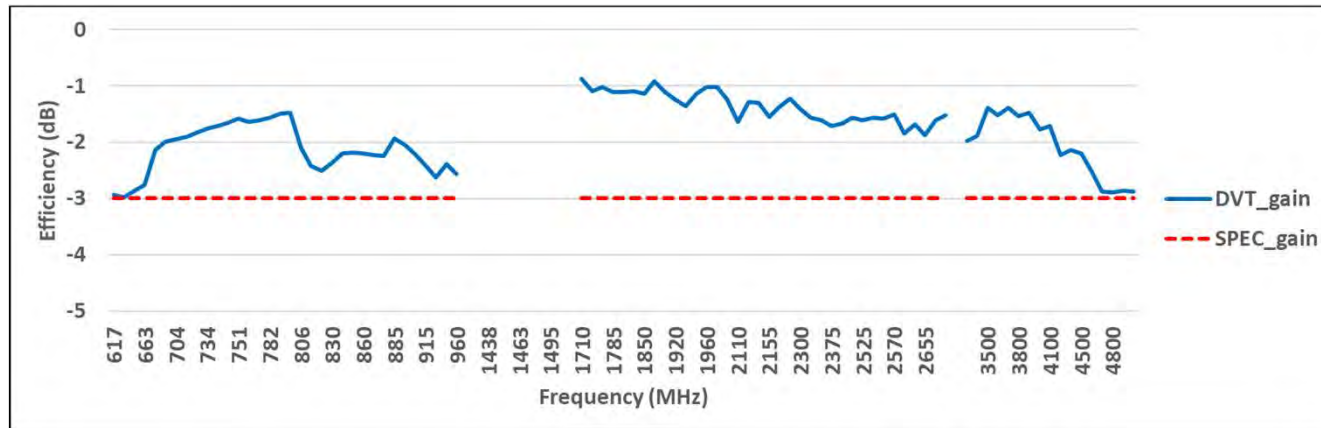
Antenna Performance – ANT1(Cellular)



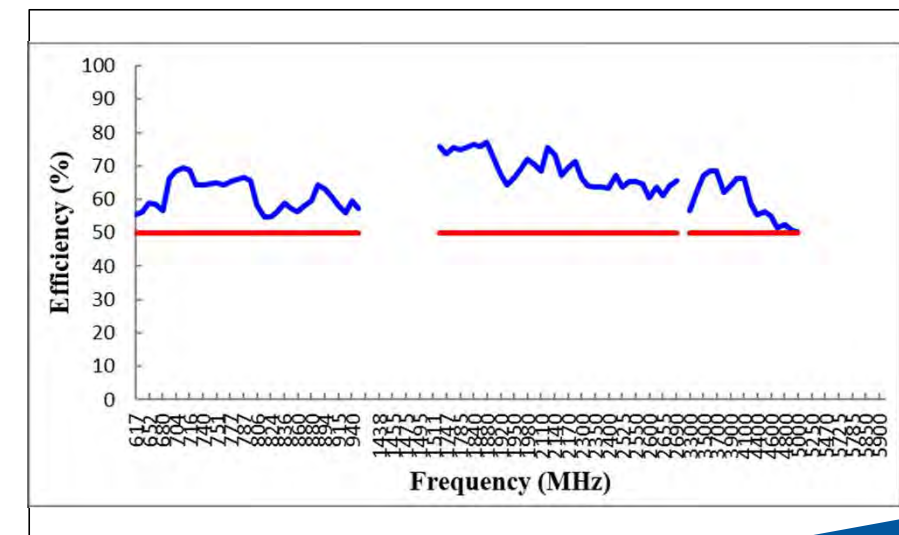
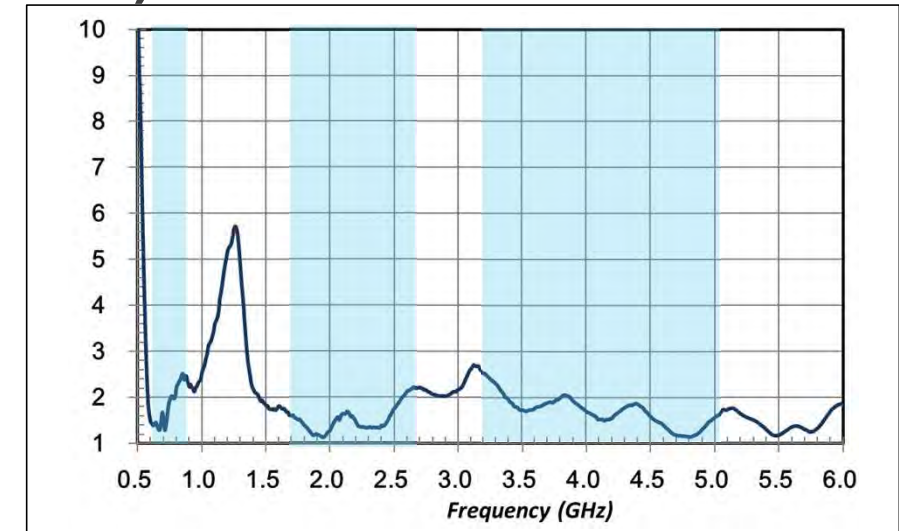
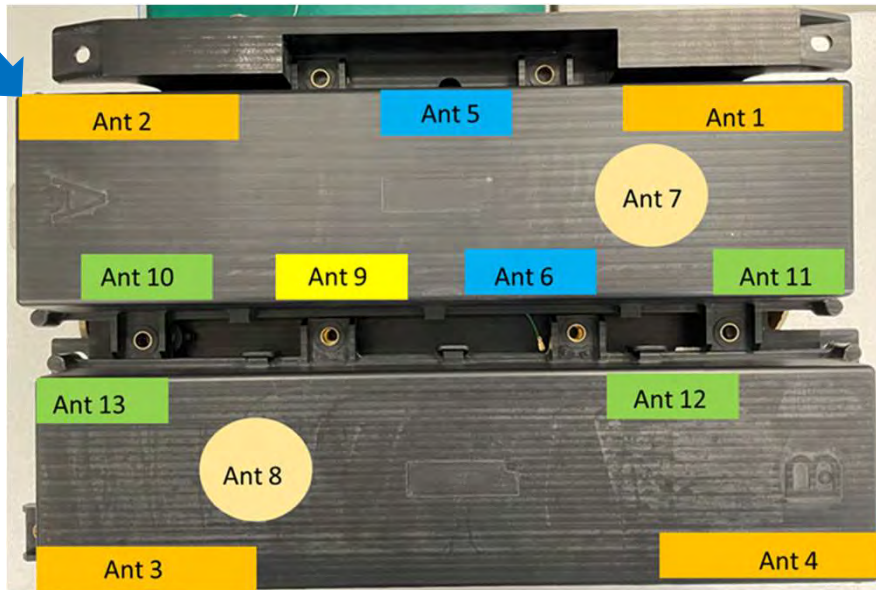
Antenna	Freq. (MHz)	VSWR	Efficiency
ANT1	617-960	< 2.5	50 - 70 %
	1710-2690	< 2.0	64 - 81 %
	3300-5000	< 2.0	51 - 72 %



Antenna Performance – ANT1(Cellular)

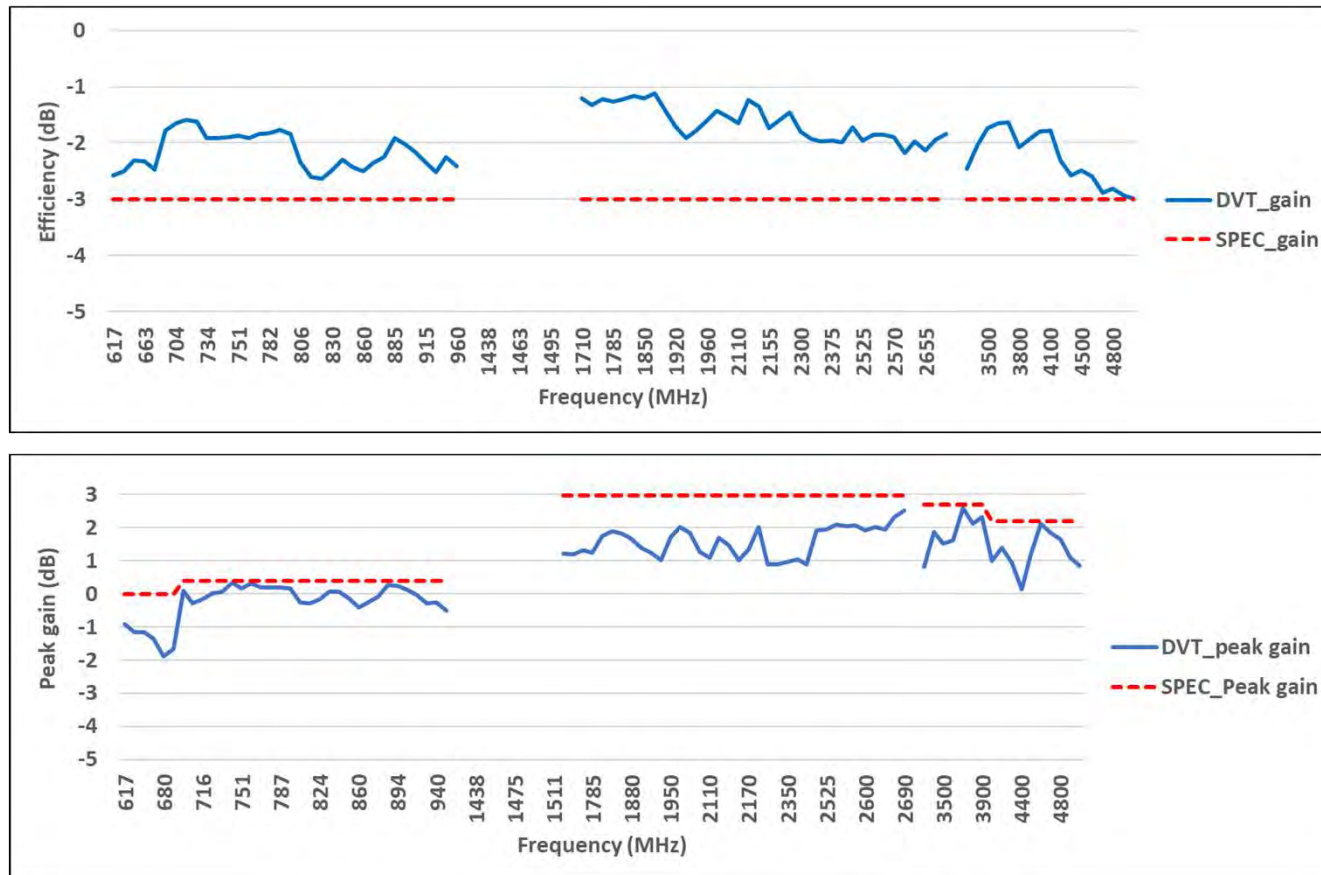


Antenna Performance – ANT2(Cellular)

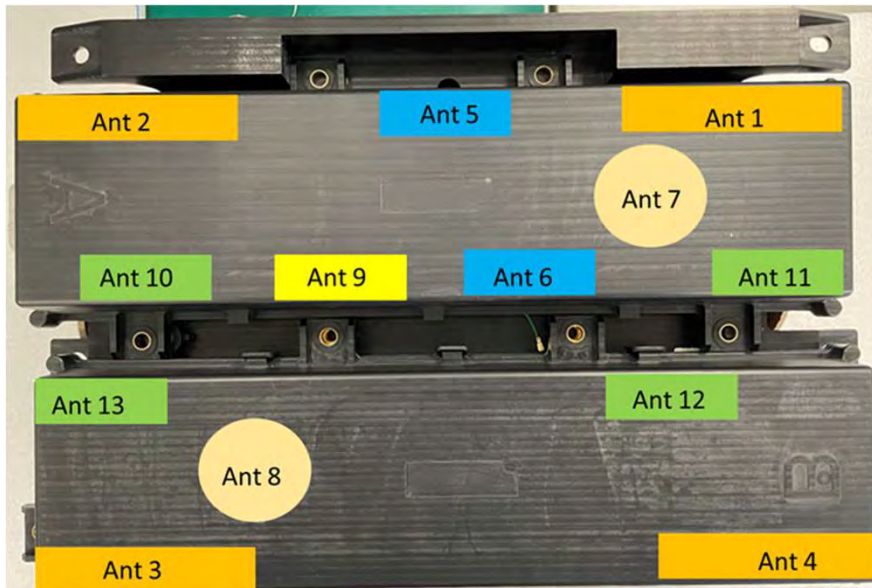


Antenna	Freq. (MHz)	VSWR	Efficiency
ANT2	617-960	< 2.5	54 - 69 %
	1710-2690	< 2.5	61 - 73 %
	3300-5000	< 2.5	51 - 68 %

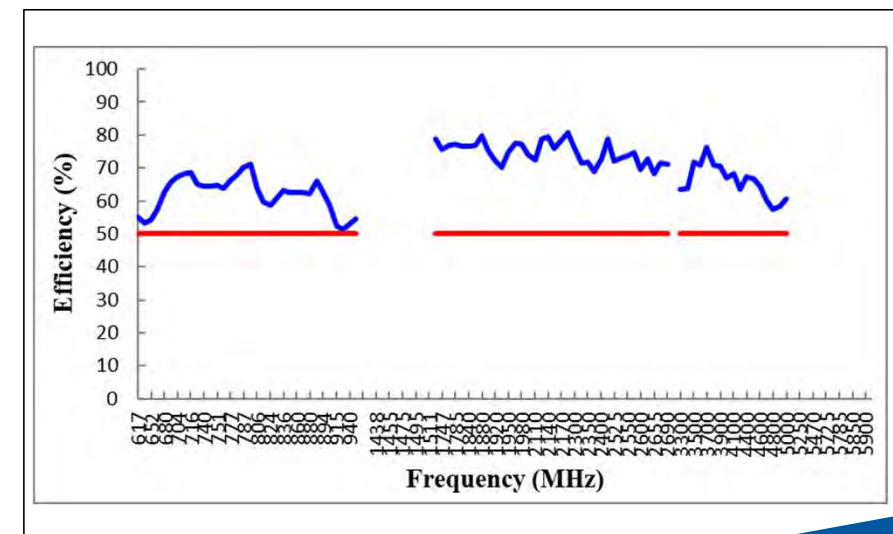
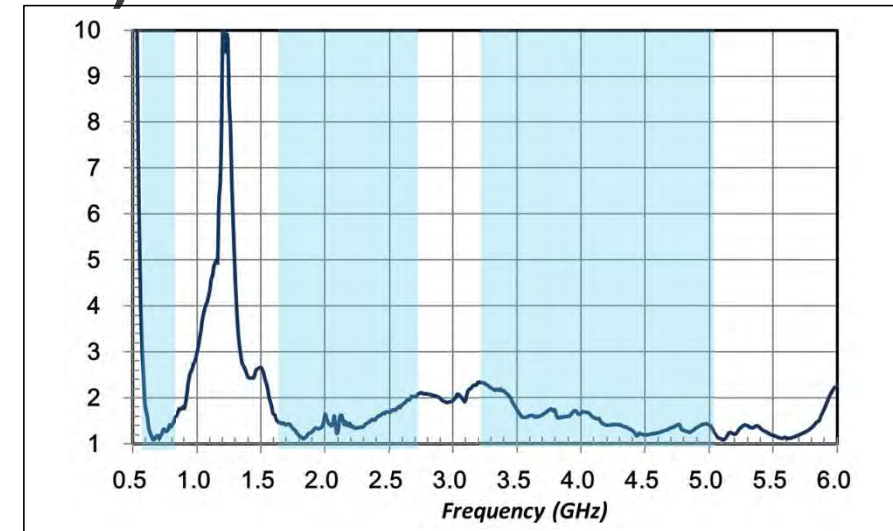
Antenna Performance – ANT2(Cellular)



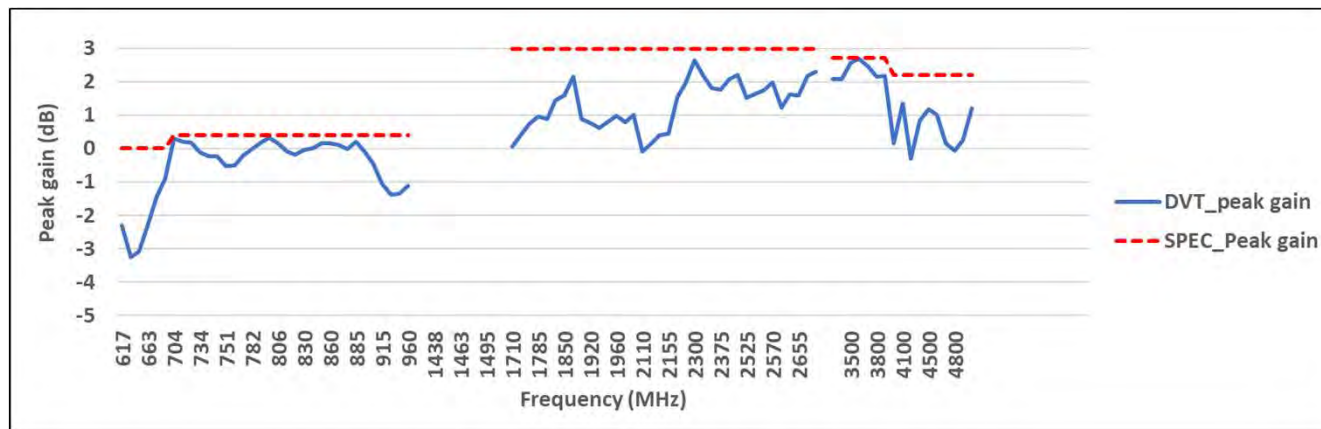
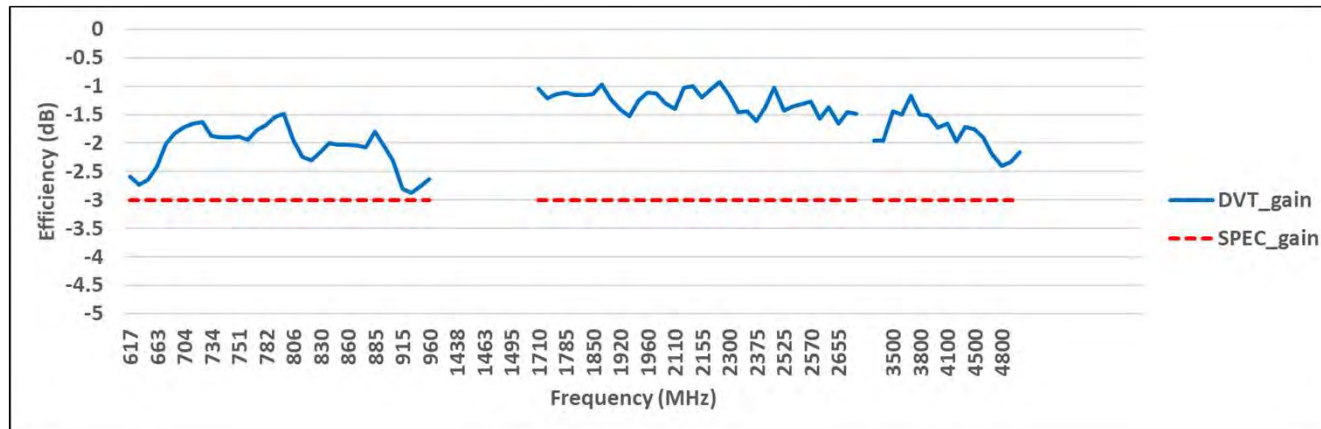
Antenna Performance – ANT3(Cellular)



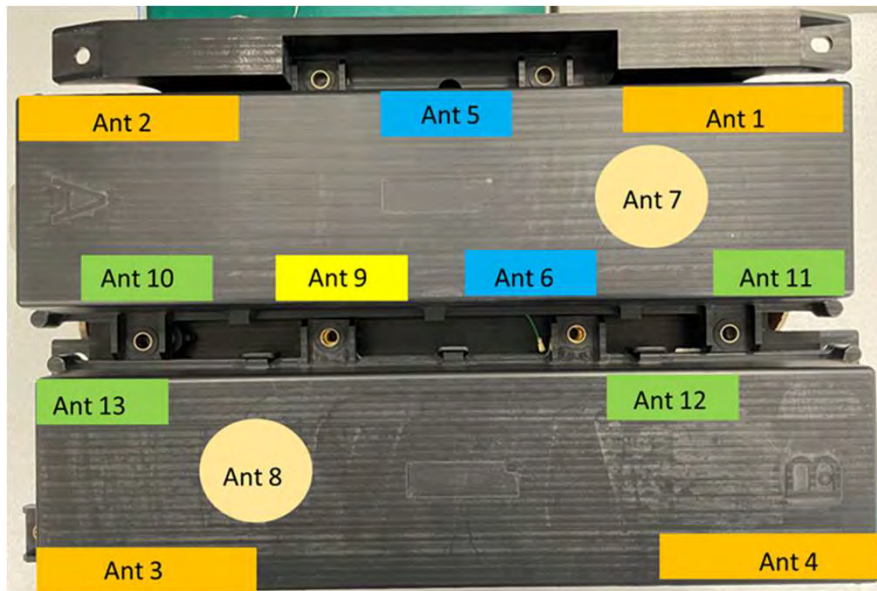
Antenna	Freq. (MHz)	VSWR	Efficiency
ANT3	617-960	< 3.0	51 - 71 %
	1710-2690	< 2.5	69 - 80 %
	3300-5000	< 2.0	57 - 76 %



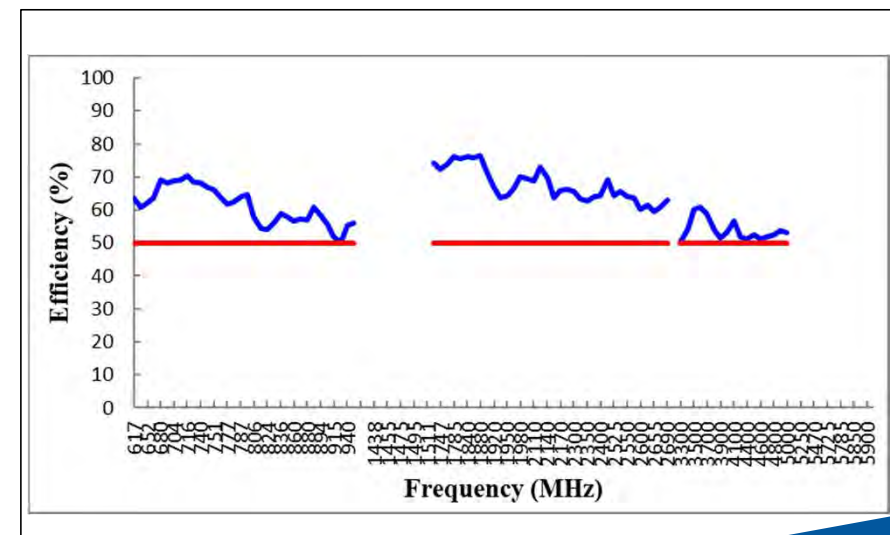
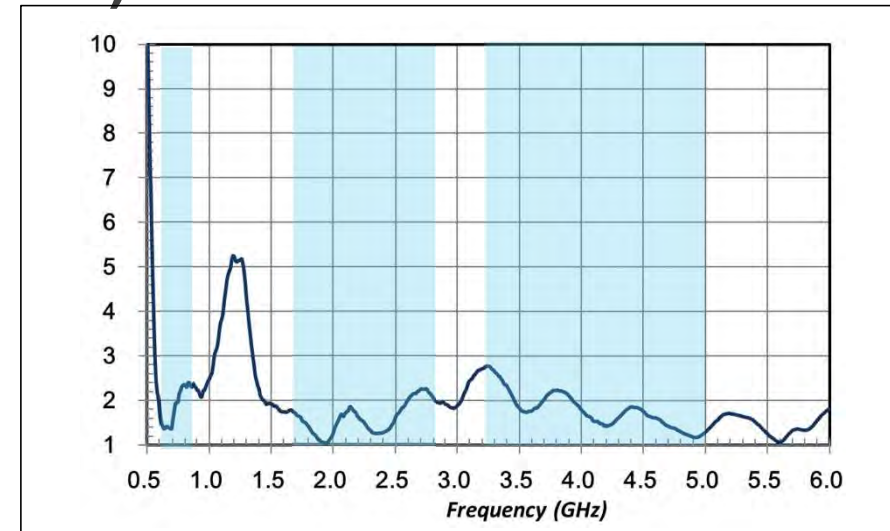
Antenna Performance – ANT3(Cellular)



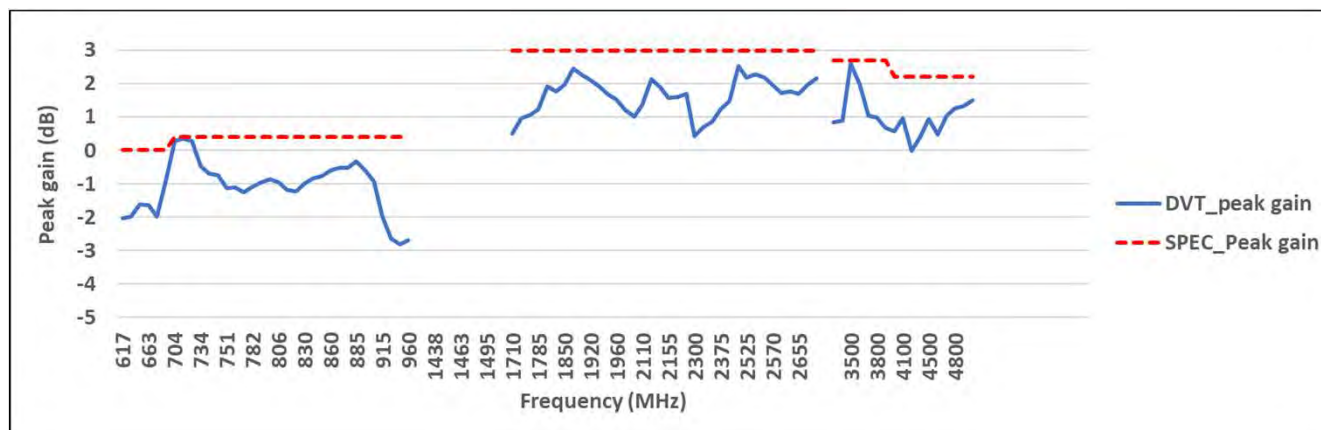
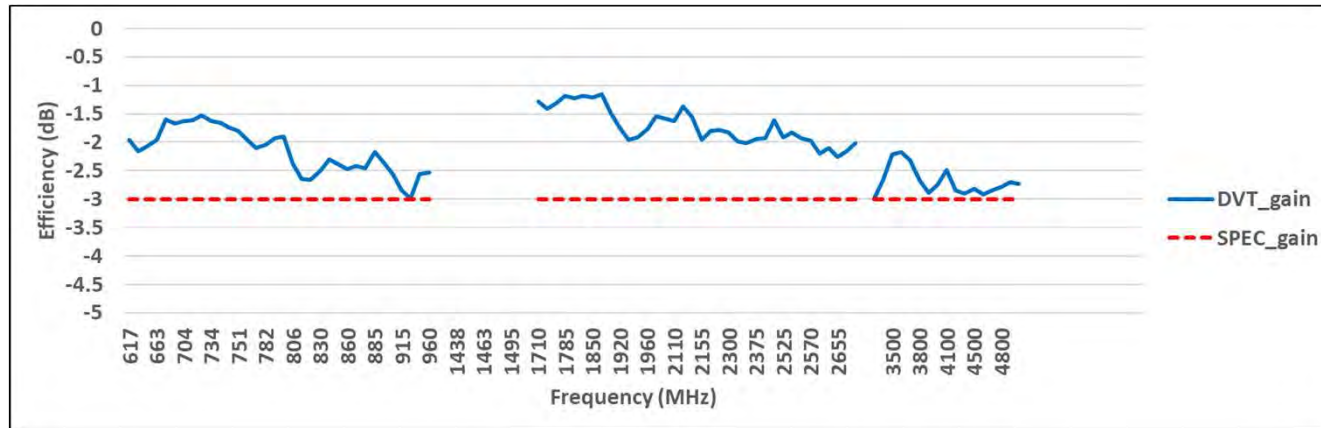
Antenna Performance – ANT4(Cellular)



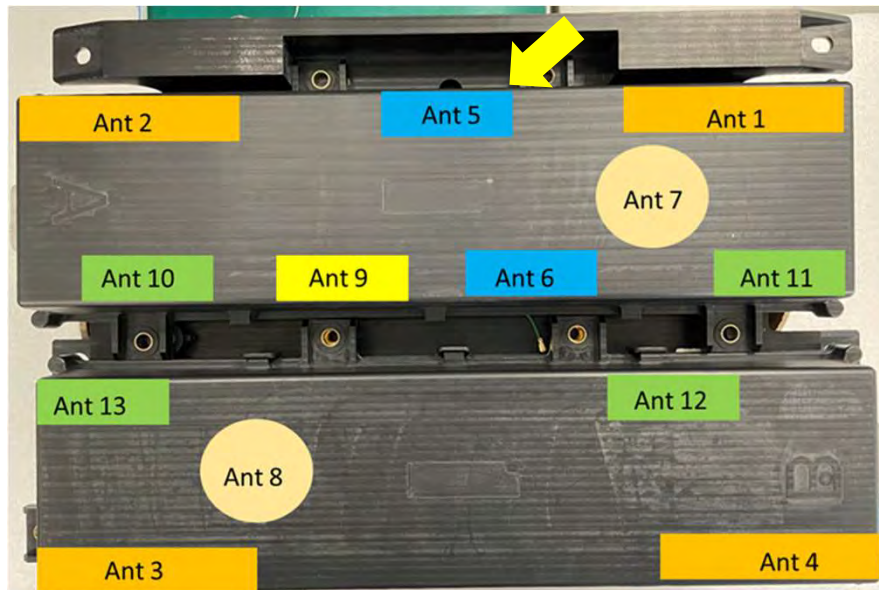
Antenna	Freq. (MHz)	VSWR	Efficiency
ANT4	617-960	< 3.0	51 - 70 %
	1710-2690	< 2.5	60 - 76 %
	3300-5000	< 2.0	50 - 60 %



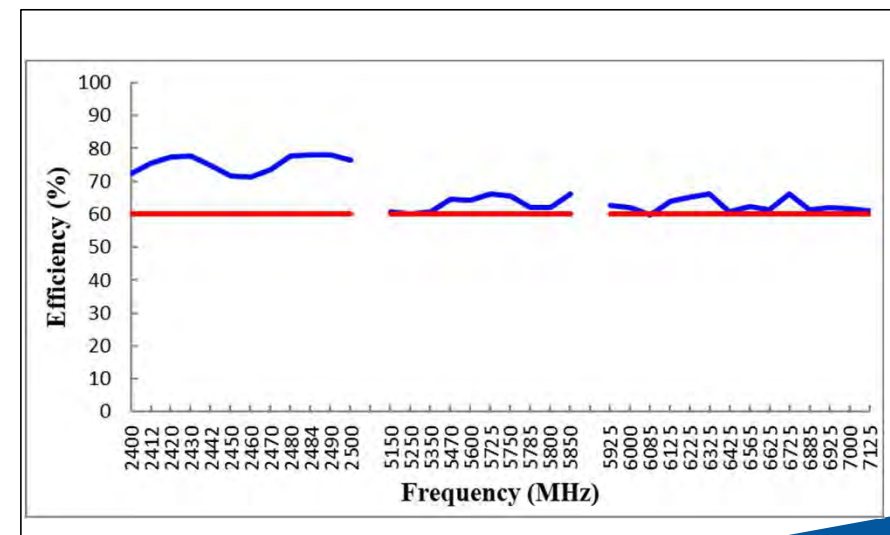
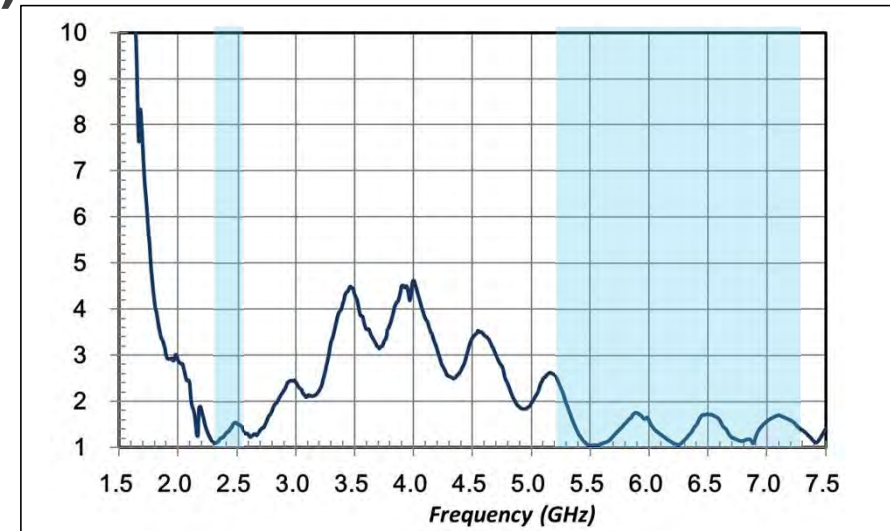
Antenna Performance – ANT4(Cellular)



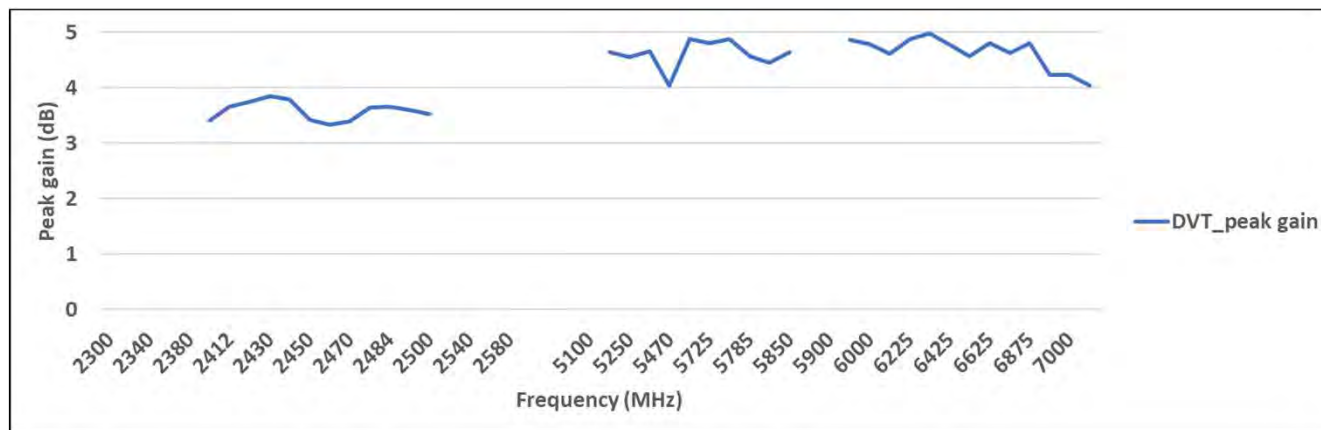
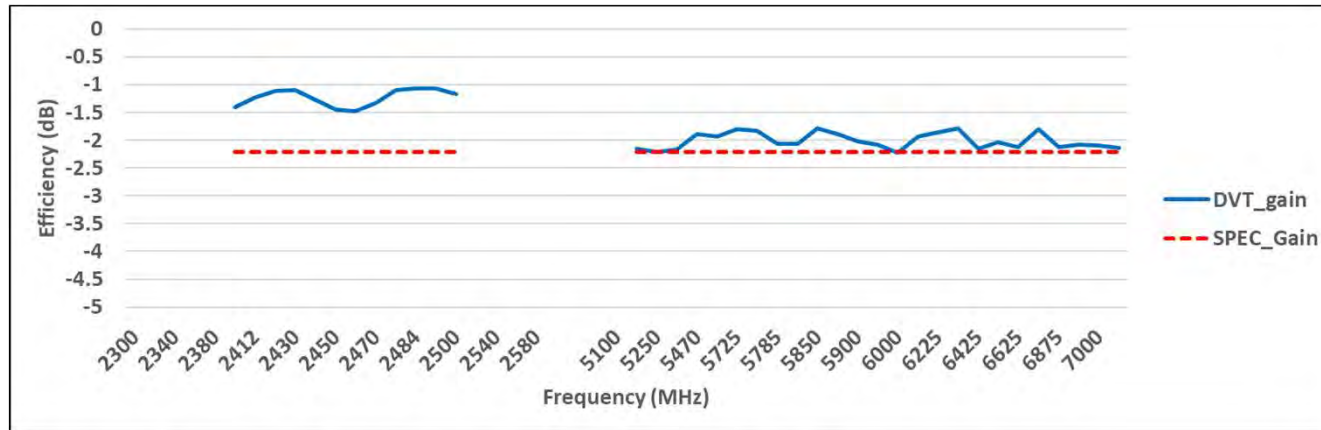
Antenna Performance – ANT5(WIFI)



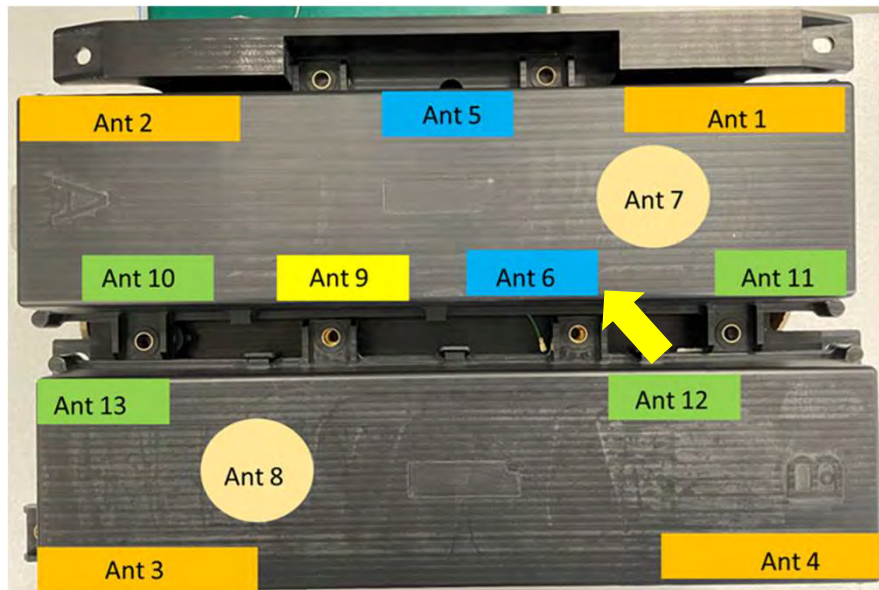
Antenna	Freq. (MHz)	VSWR	Efficiency
ANT5	2400-2495	< 2.0	71 - 78 %
	5170-5835	< 2.0	60 - 66 %
	5925-7125	<2.0	60 - 66 %



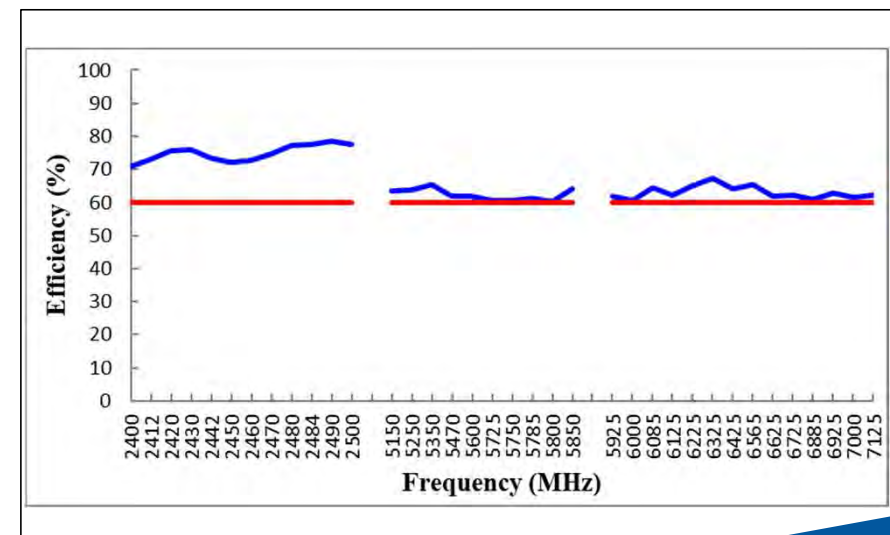
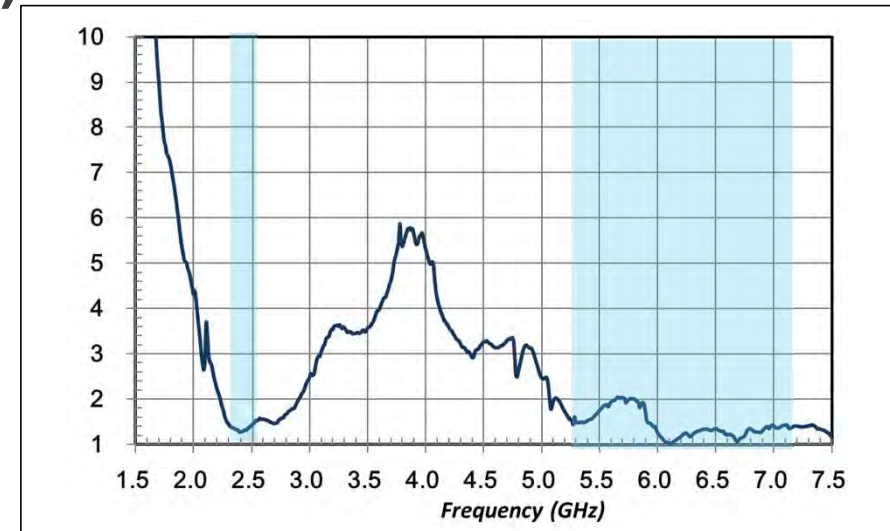
Antenna Performance – ANT5(WIFI)



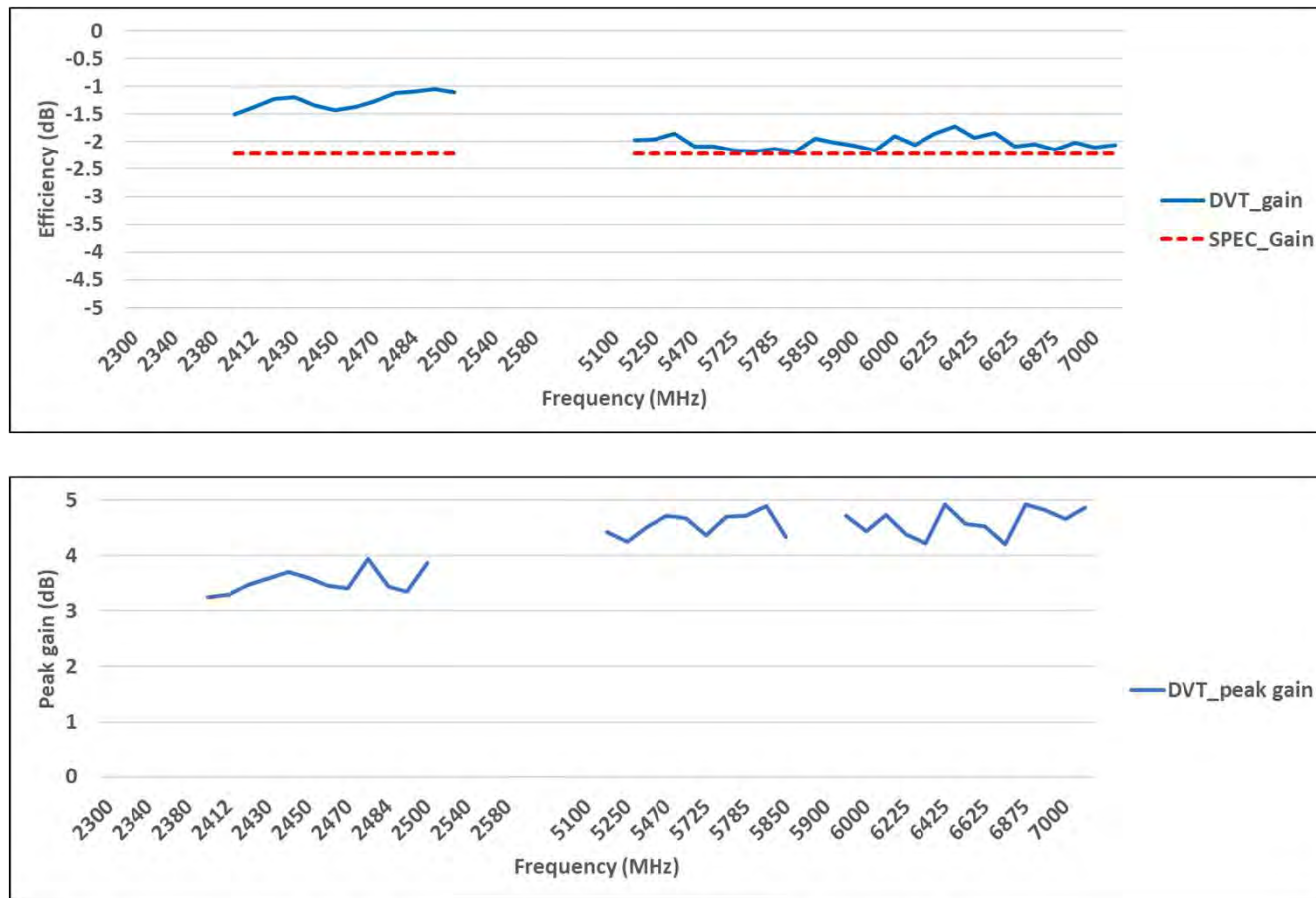
Antenna Performance – ANT6(WIFI)



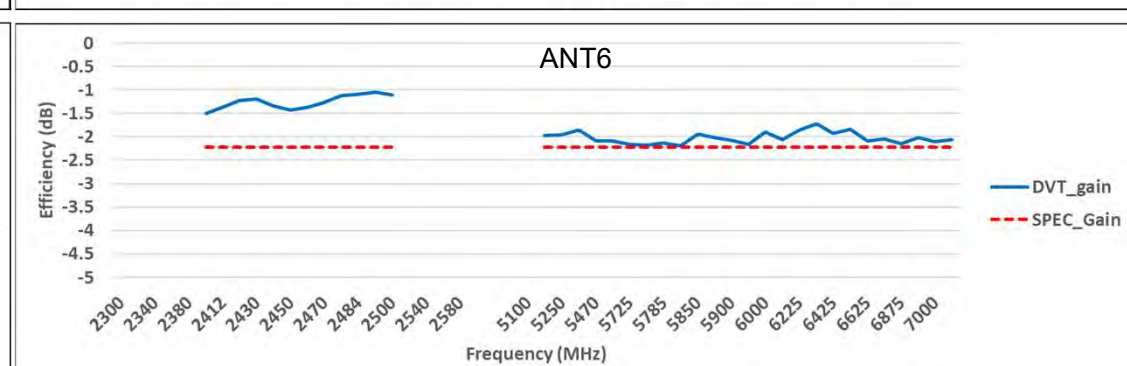
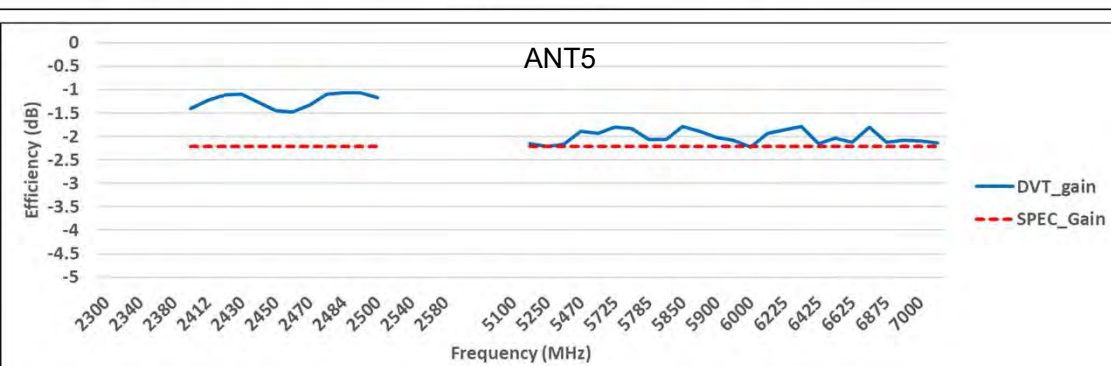
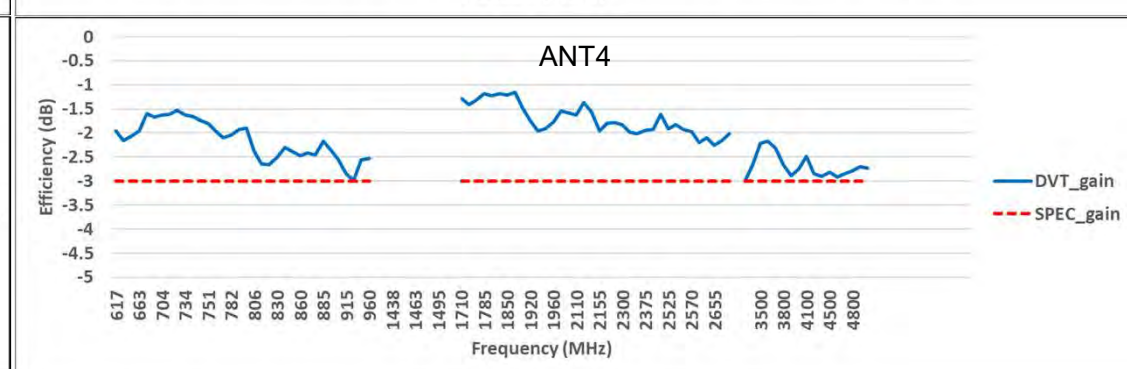
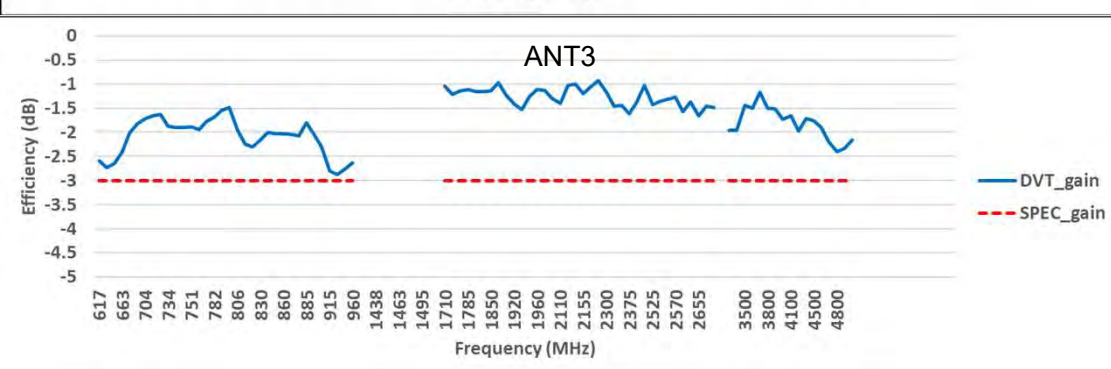
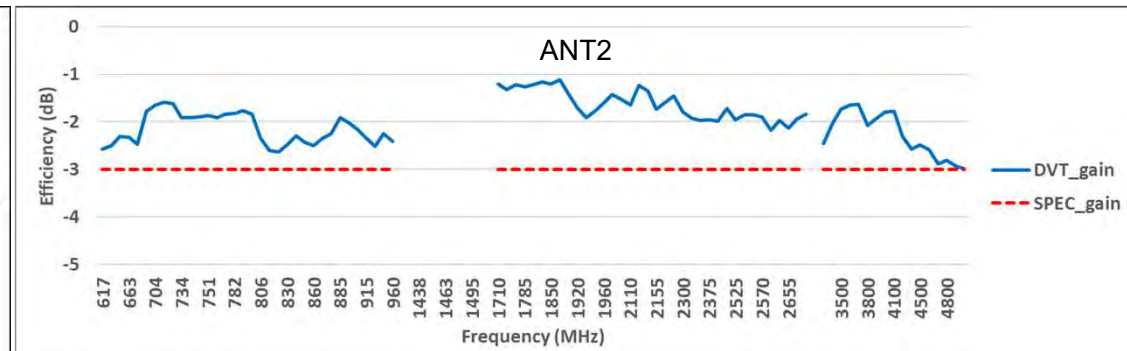
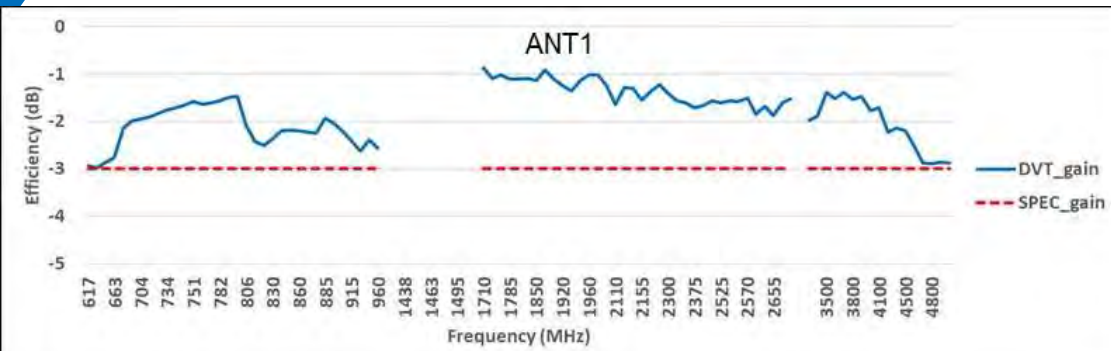
Antenna	Freq. (MHz)	VSWR	Efficiency
ANT6	2400-2495	< 2.0	70 - 77 %
	5170-5835	< 2.0	60 - 64 %
	5925-7125	<2.5	60 - 67 %



Antenna Performance – ANT6(WIFI)



Antenna Performance



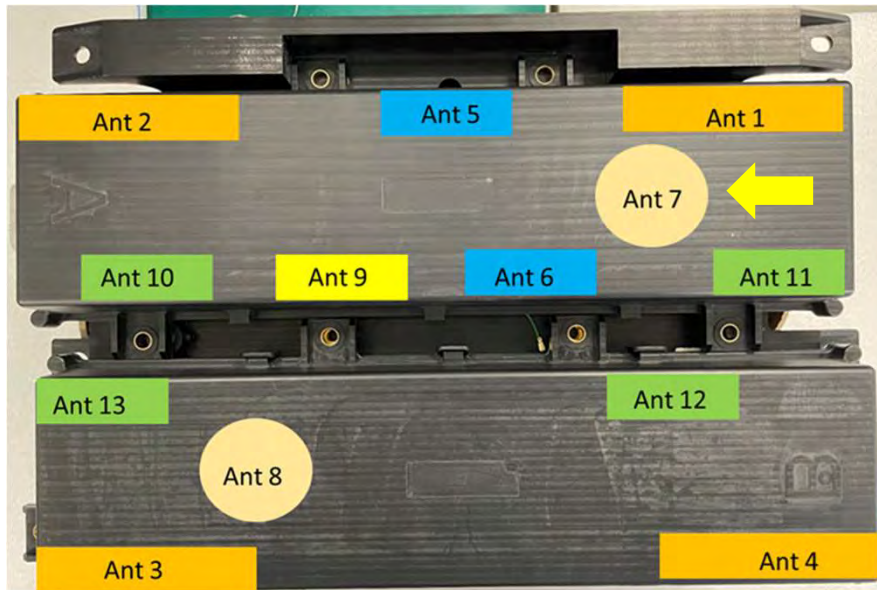
Antenna Performance

Antenna spec - 1									
Antenna 1		Support			Antenna 2		Support		
Antenna Type		PIFA			Antenna Type		PIFA		
Connector Type		none(like solder)			Connector Type		none(like solder)		
Brand		WNC			Brand		WNC		
Model		Tele-2			Model		Tele-2		
Antenna 3		N/A			Antenna 4		N/A		
Antenna Type					Antenna Type				
Connector Type					Connector Type				
Brand					Brand				
Model					Model				
Antenna 5		Support			Antenna 6		Support		
Antenna Type		PIFA			Antenna Type		PIFA		
Connector Type		none(like solder)			Connector Type		none(like solder)		
Brand		WNC			Brand		WNC		
Model		Tele-2			Model		Tele-2		
Antenna 7		N/A			Antenna 8		N/A		
Antenna Type					Antenna Type				
Connector Type					Connector Type				
Brand					Brand				
Model					Model				
Antenna gain									
Frequency Range		Ant 1 Gain (dBi)	Ant 2 Gain (dBi)	Ant 3 Gain (dBi)	Ant 4 Gain (dBi)	Ant 5 Gain (dBi)	Ant 6 Gain (dBi)	Ant 7 Gain (dBi)	Ant 8 Gain (dBi)
2.4~2.4835GHz						3.84	3.93		
5.15~5.85GHz						4.87	4.89		
5.925GHz~7.125GHz						4.98	4.92		
617~700MHz		-0.92	-0.92						
700~960MHz		0.33	0.35						
1710~2690MHz		2.63	2.53						
2700~3900MHz		2.68	2.6						
4000~5000MHz		2.12	2.11						

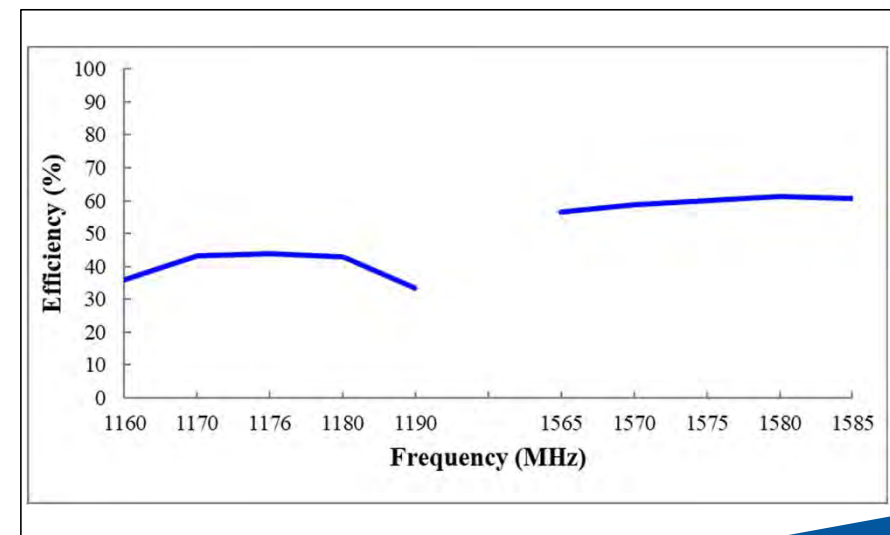
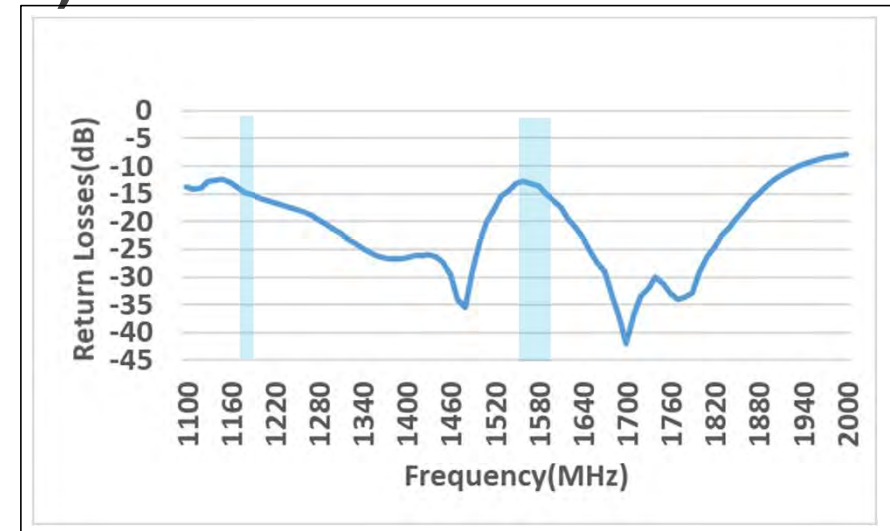
Antenna Performance

Antenna spec - 2									
Antenna 1	N/A			Antenna 2		N/A			
Antenna Type				Antenna Type					
Connector Type				Connector Type					
Brand				Brand					
Model				Model					
Antenna 3	Support			Antenna 4		Support			
Antenna Type	PIFA			Antenna Type		PIFA			
Connector Type	none(like solder)			Connector Type		none(like solder)			
Brand	WNC			Brand		WNC			
Model	Tele-2			Model		Tele-2			
Antenna 5	N/A			Antenna 6		N/A			
Antenna Type				Antenna Type					
Connector Type				Connector Type					
Brand				Brand					
Model				Model					
Antenna 7	N/A			Antenna 8		N/A			
Antenna Type				Antenna Type					
Connector Type				Connector Type					
Brand				Brand					
Model				Model					
Antenna gain									
Frequency Range	Ant 1 Gain (dBi)	Ant 2 Gain (dBi)	Ant 3 Gain (dBi)	Ant 4 Gain (dBi)	Ant 5 Gain (dBi)	Ant 6 Gain (dBi)	Ant 7 Gain (dBi)	Ant 8 Gain (dBi)	
617~700MHz			-0.92	-0.92					
700~960MHz			0.33	0.35					
1710~2690MHz			2.63	2.53					
2700~3900MHz			2.68	2.6					
4000~5000MHz			2.12	2.11					

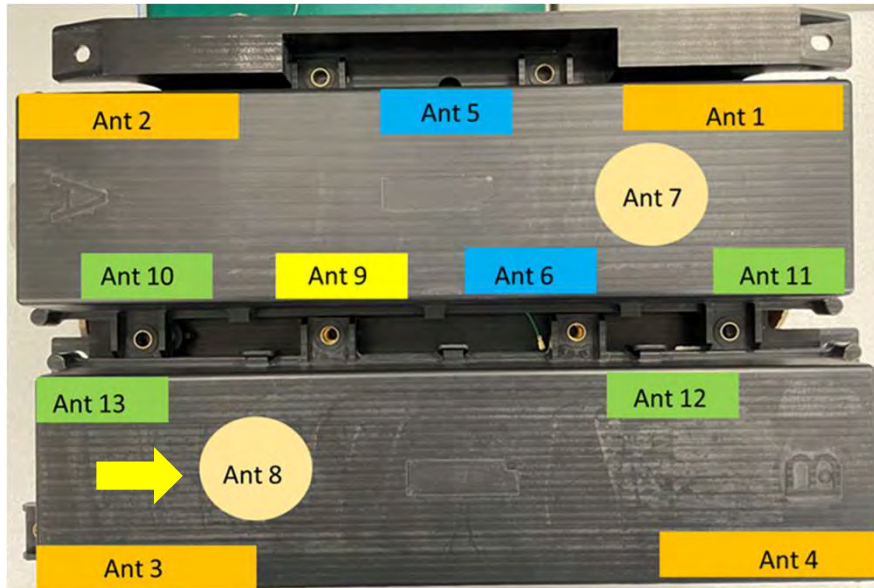
Antenna Performance – ANT7(L1+L5)



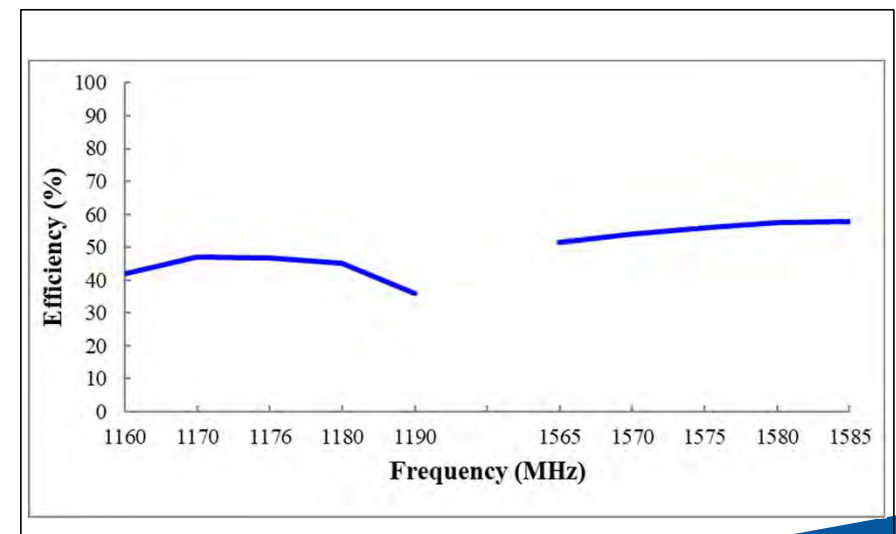
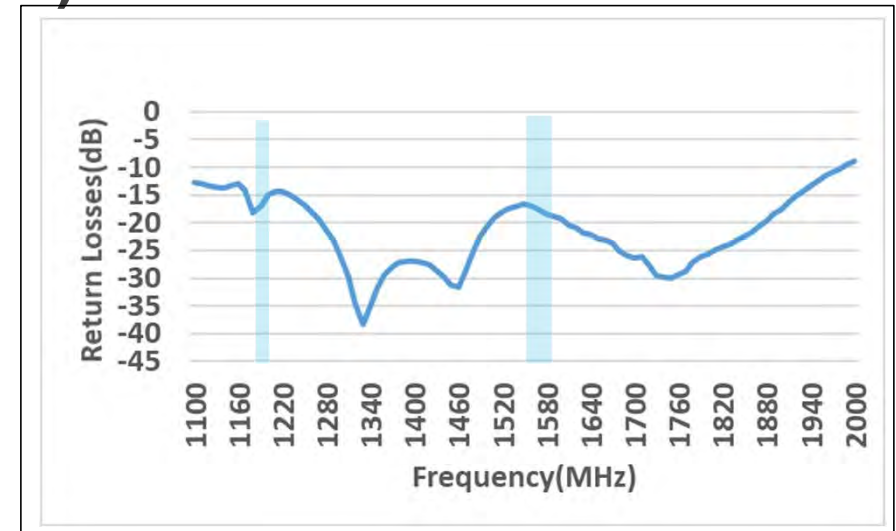
Freq. (MHz)	RL	Efficiency	RHCP Gain
1165-1185	< -10	42 - 43 %	>1.2dBic
1565-1585	< -10	59 - 60 %	>2.5dBic



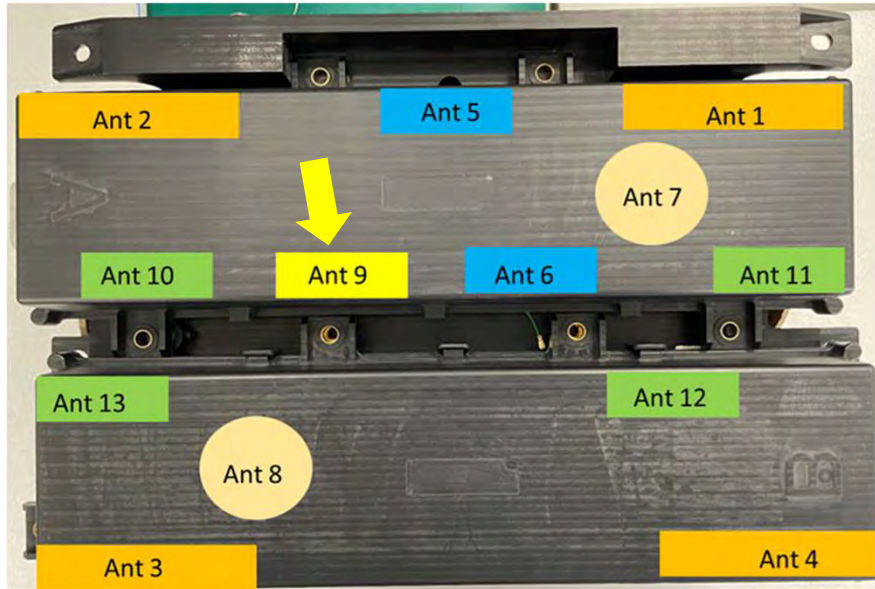
Antenna Performance – ANT8(L1+L5)



Freq. (MHz)	RL	Efficiency	RHCP Gain
1165-1185	< -10	41 - 46 %	>1.7dBic
1565-1585	< -10	54 - 57 %	>2.5dBic

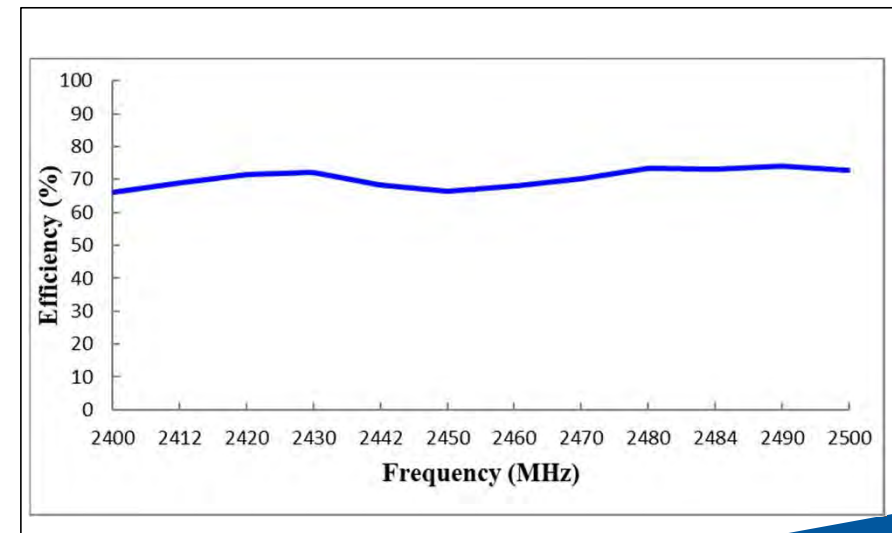
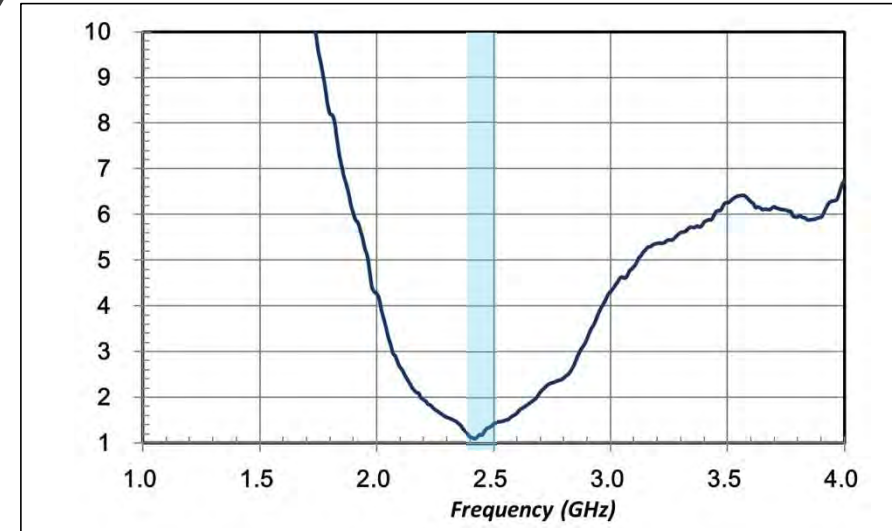


Antenna Performance – ANT9(BLE)

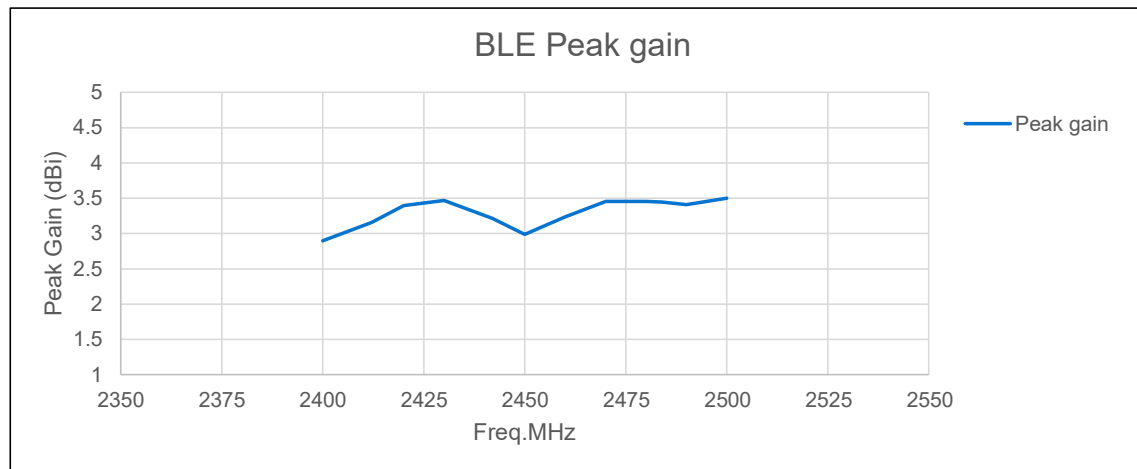
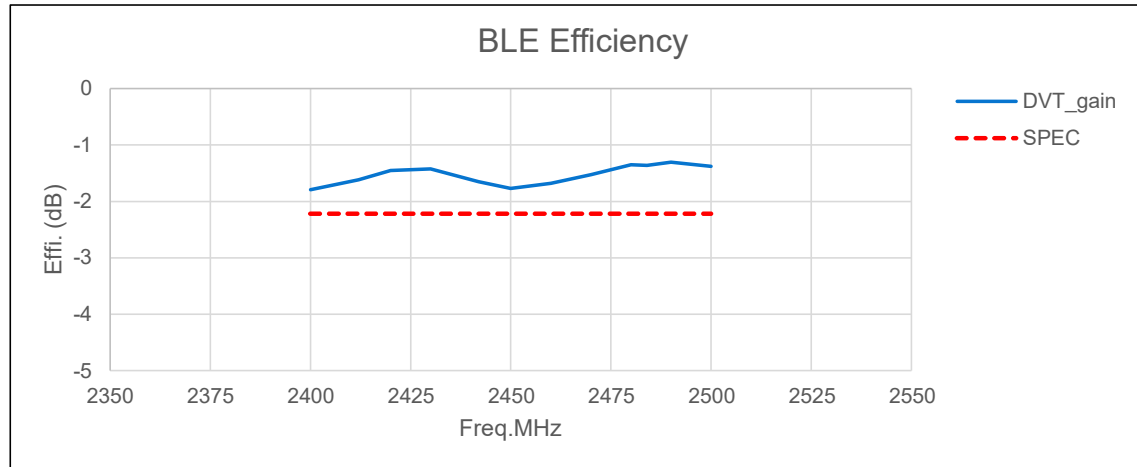


Freq. (MHz)	VSWR	Efficiency
2400-2495	< 2.0	66 - 74 %

BLE is standalone PCB antenna placed on housing

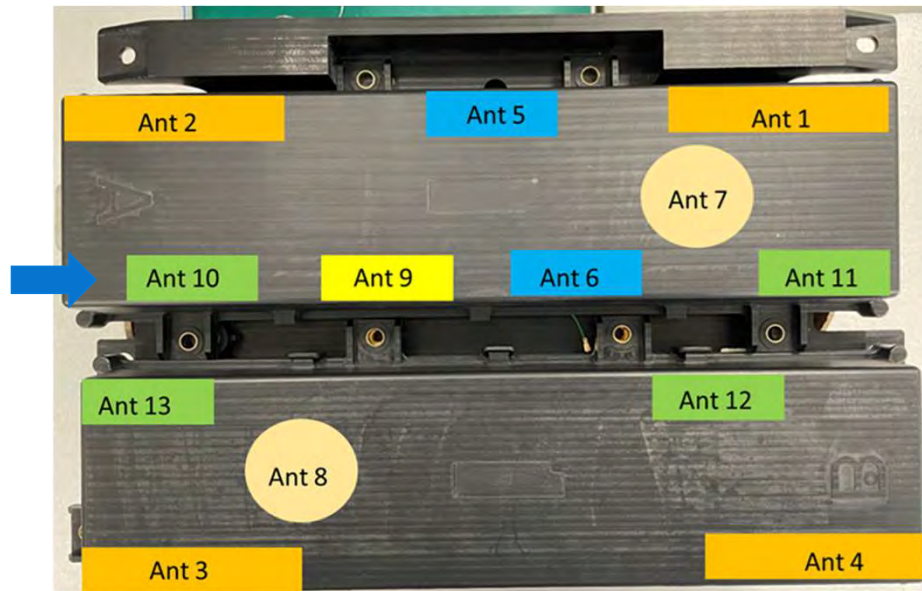


Antenna Performance – ANT9(BLE)

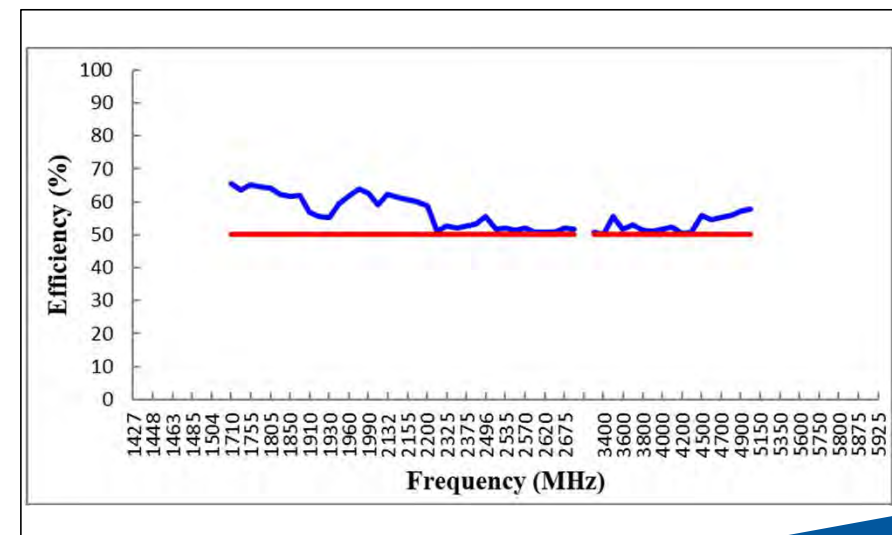
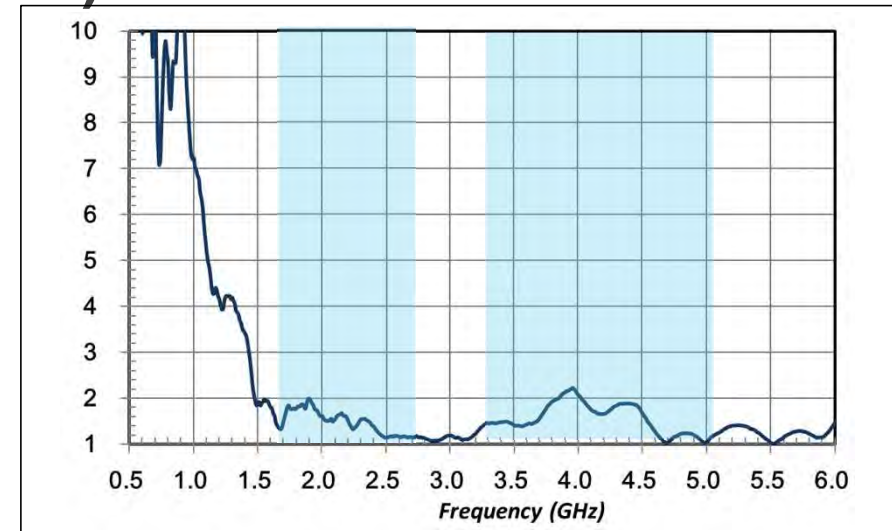


BTLE antenna gain value
(3.47dBi)

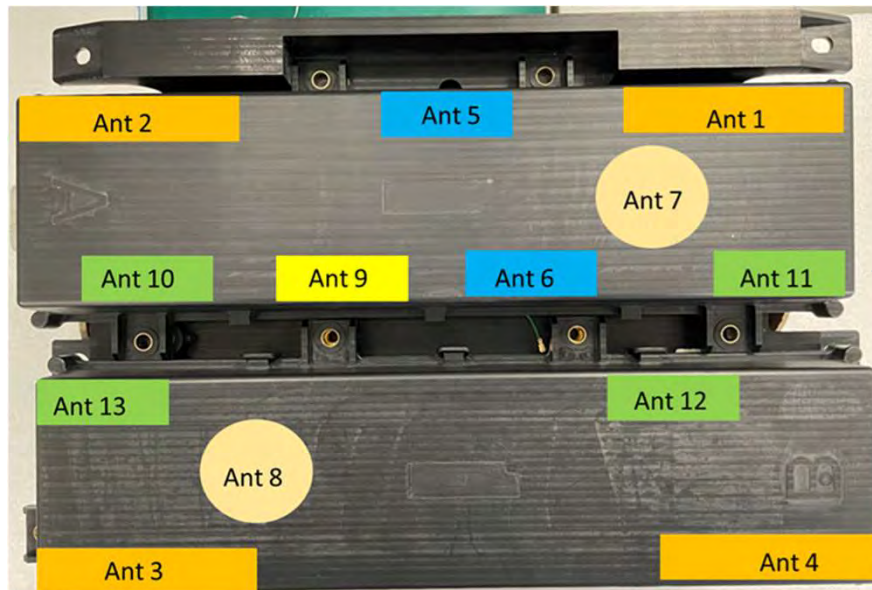
Antenna Performance – ANT10(MIMO)



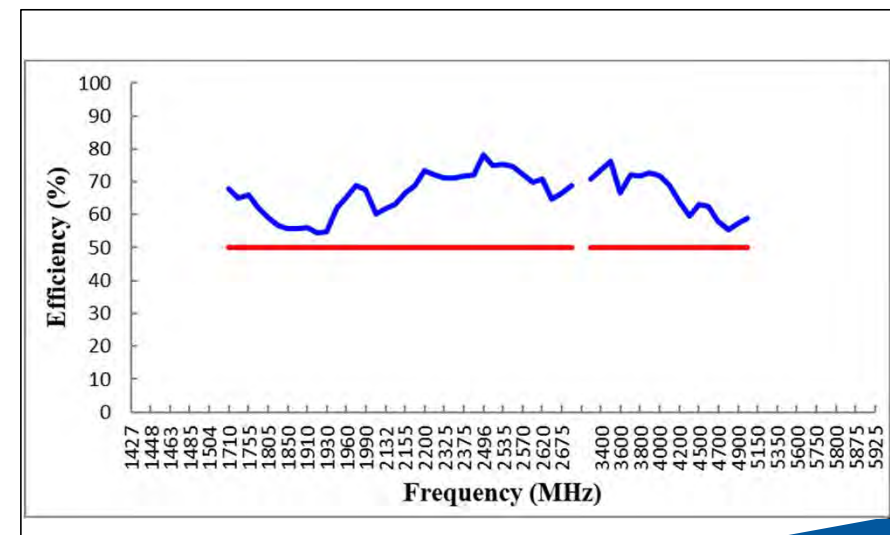
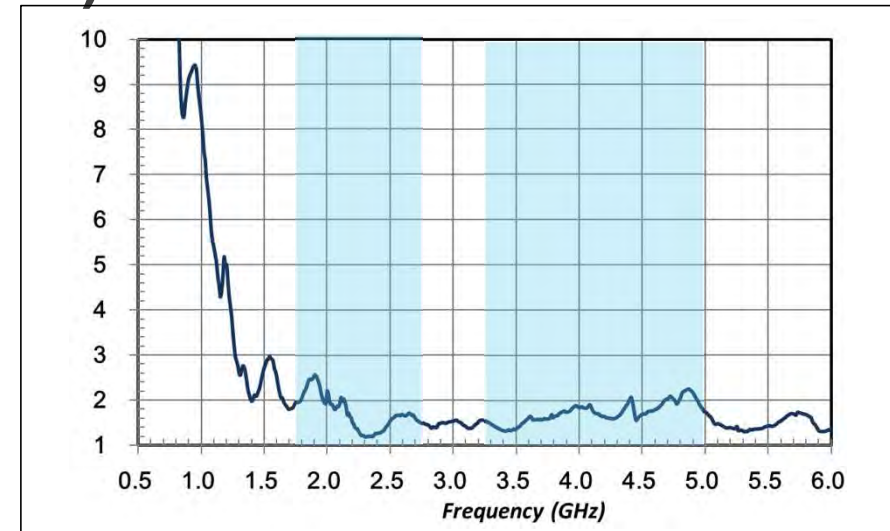
Antenna	Freq. (MHz)	VSWR	Efficiency
ANT10	1710-2690	< 2.5	51 - 65 %
	3300-5000	< 2.5	50 - 57 %



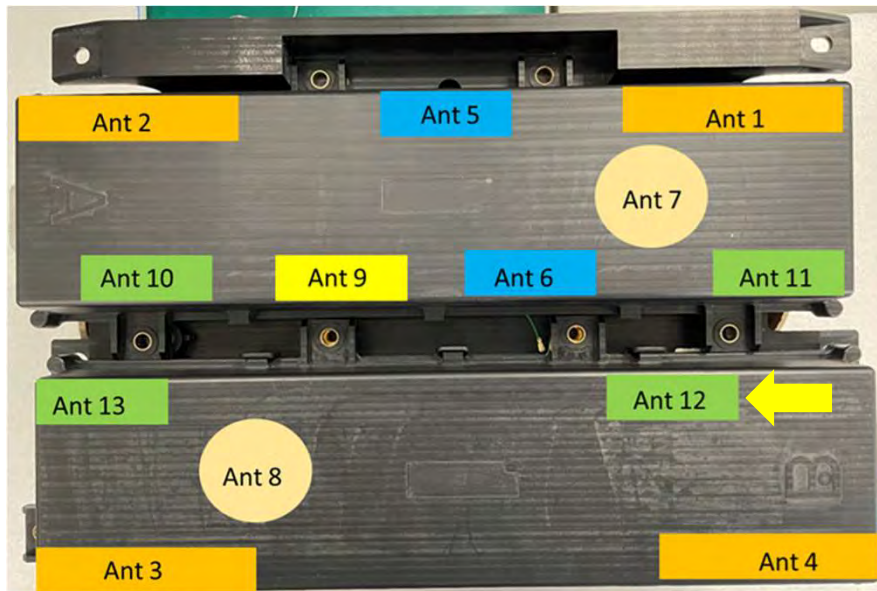
Antenna Performance – ANT11(MIMO)



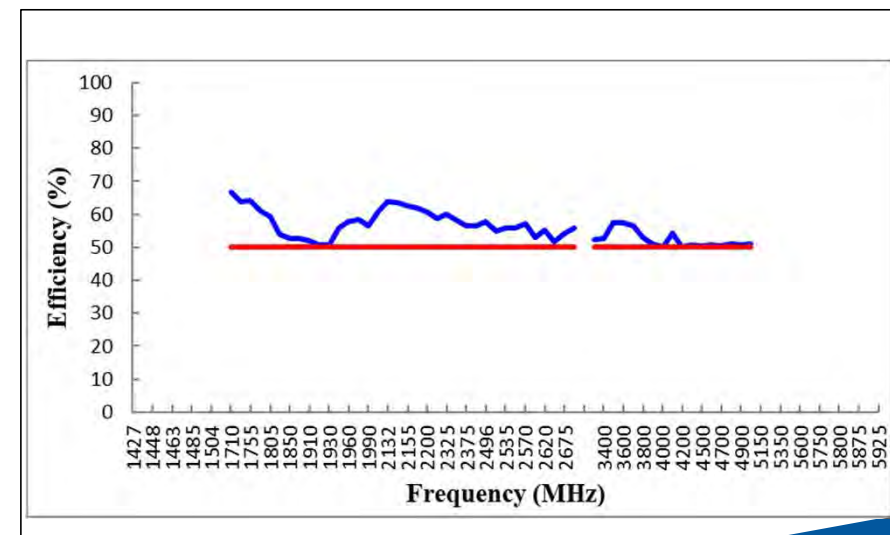
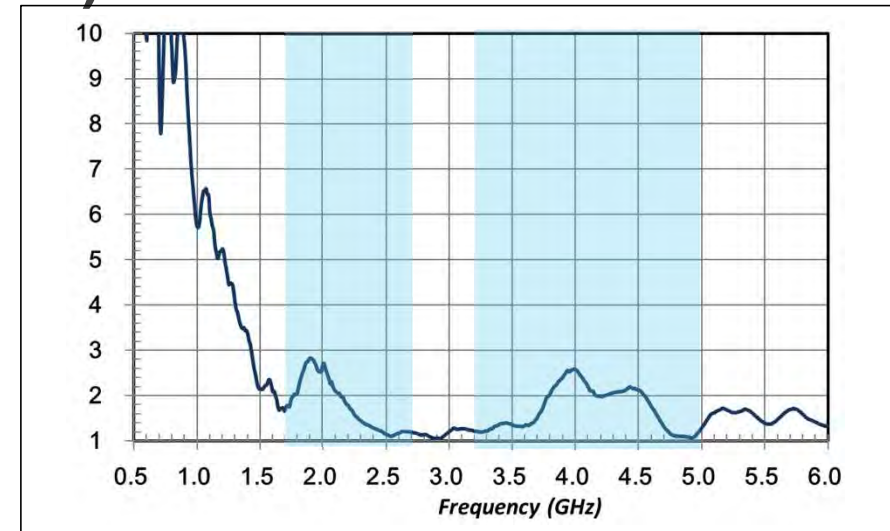
Antenna	Freq. (MHz)	VSWR	Efficiency
ANT11	1710-2690	< 2.5	55 - 75 %
	3300-5000	< 2.5	55 - 72 %



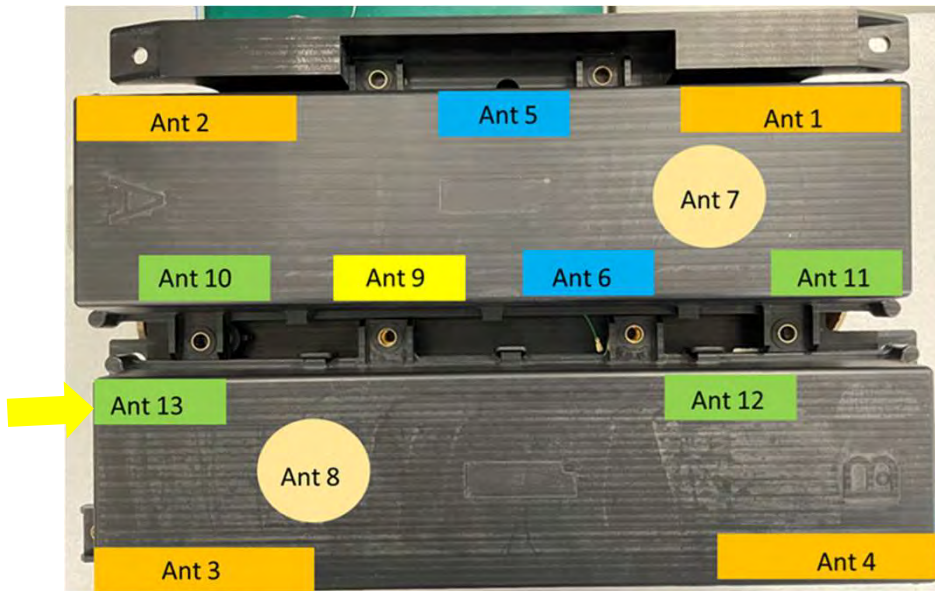
Antenna Performance – ANT12(MIMO)



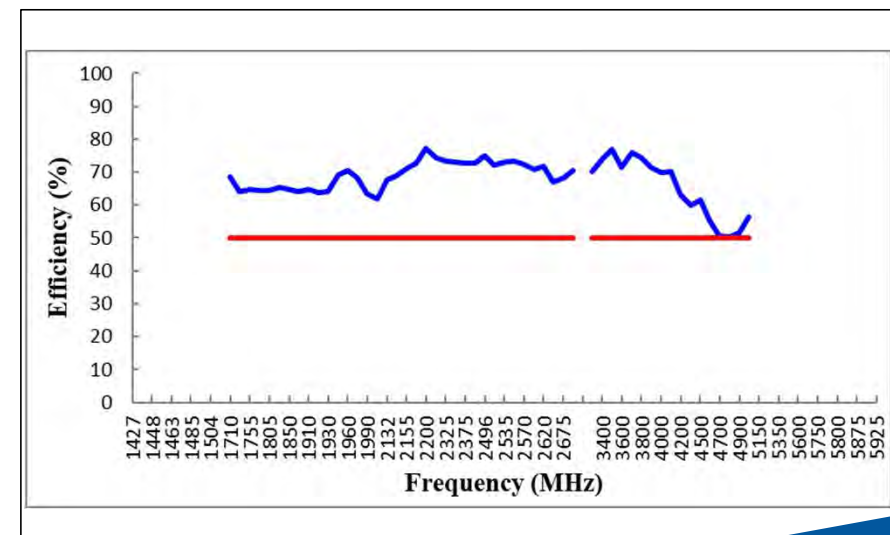
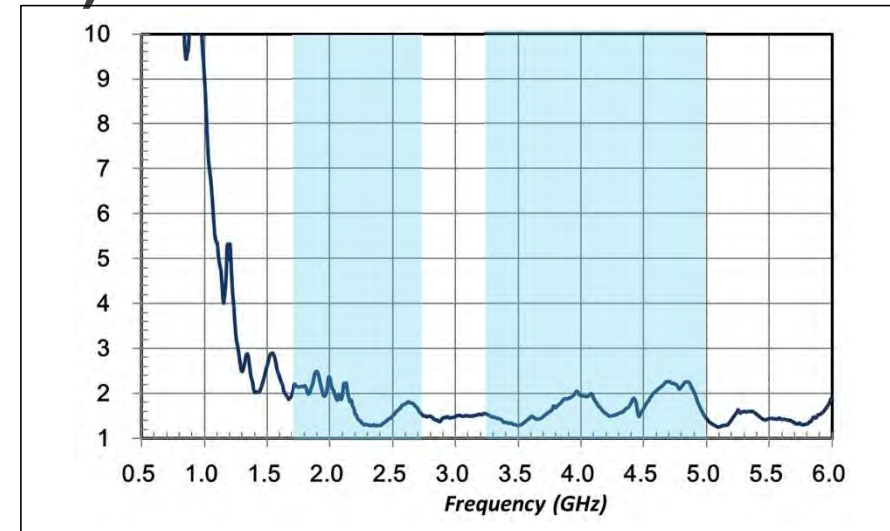
Antenna	Freq. (MHz)	VSWR	Efficiency
ANT12	1710-2690	<2.5	51 - 64 %
	3300-5000	< 2.5	50 - 57 %



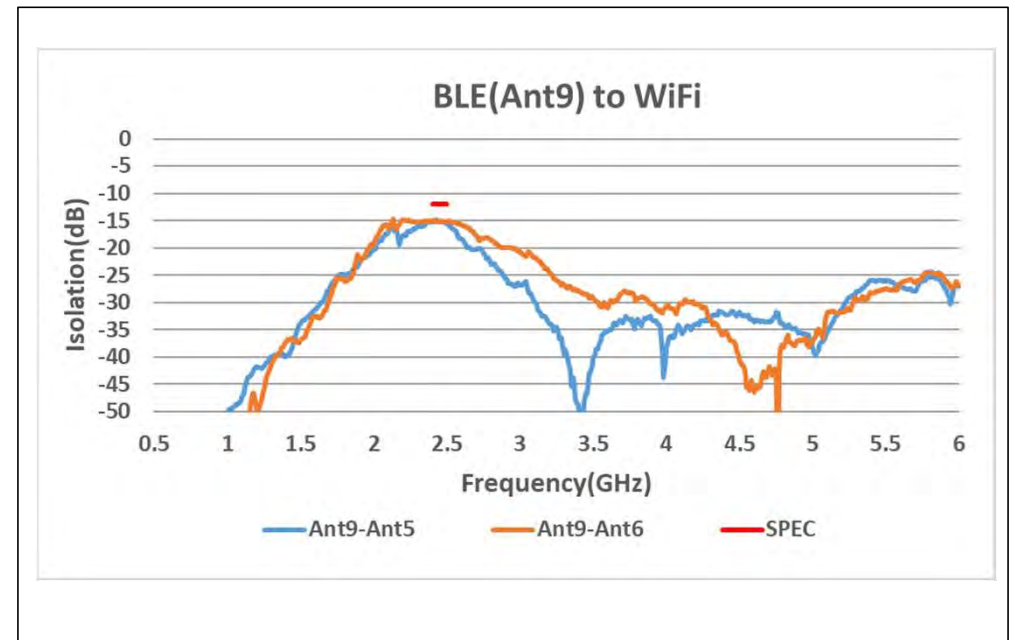
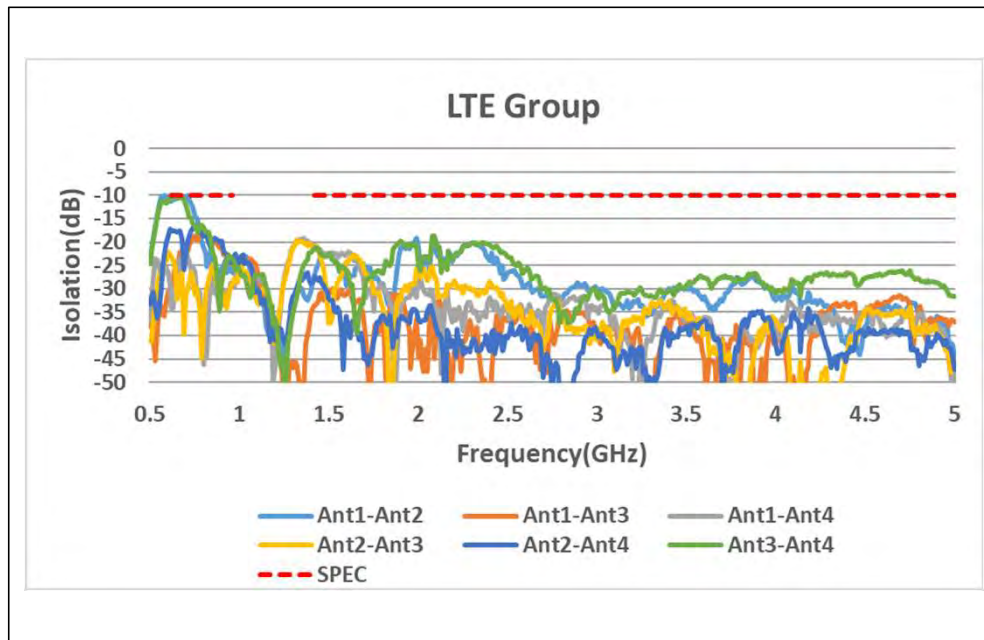
Antenna Performance – ANT13(MIMO)



Antenna	Freq. (MHz)	VSWR	Efficiency
ANT13	1710-2690	< 2.5	63 - 74 %
	3300-5000	< 2.5	50 - 74 %



Antenna Performance – Isolation between radios

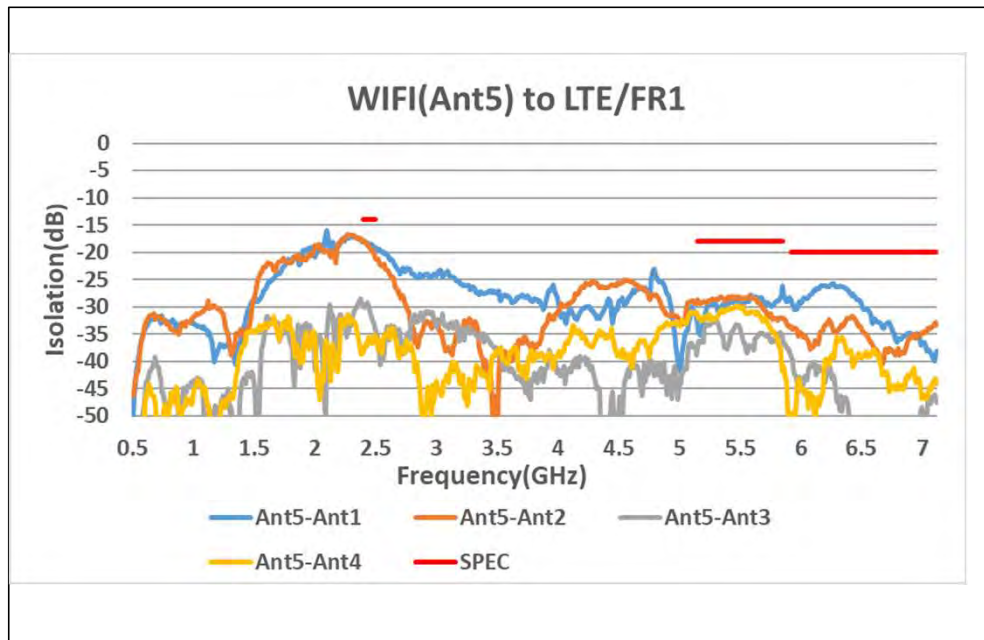


Freq. (MHz)	617-960	1710-2690	3300-5000
ANT1 to ANT2	≥ 10 dB	≥ 15 dB	≥ 25 dB
ANT1 to ANT3		≥ 20 dB	≥ 25 dB
ANT1 to ANT4		≥ 20 dB	≥ 25 dB
ANT2 to ANT3		≥ 20 dB	≥ 25 dB
ANT2 to ANT4		≥ 20 dB	≥ 25 dB
ANT3 to ANT4	≥ 10 dB	≥ 20 dB	≥ 25 dB

Freq. (MHz)	2400-2500
ANT9 to ANT5	≥ 15 dB
ANT9 to ANT6	≥ 15 dB

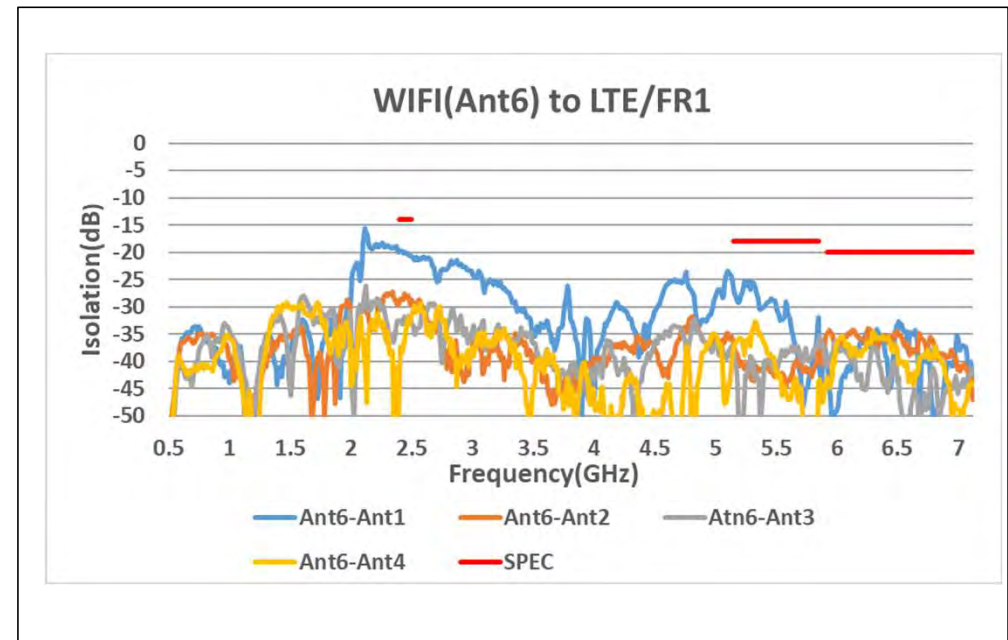
- ANT9 is BLE antenna.
- ANT5-ANT6 is Wi-Fi antenna.

Antenna Performance – Isolation between radios



Freq. (MHz)	2400-2495	5170-5835	5925-7125
ANT5 to ANT1	≥ 15 dB	≥ 20 dB	≥ 20 dB
ANT5 to ANT2	≥ 15 dB	≥ 20 dB	≥ 25 dB
ANT5 to ANT3	≥ 25 dB	≥ 30 dB	≥ 35 dB
ANT5 to ANT4	≥ 25 dB	≥ 30 dB	≥ 35 dB

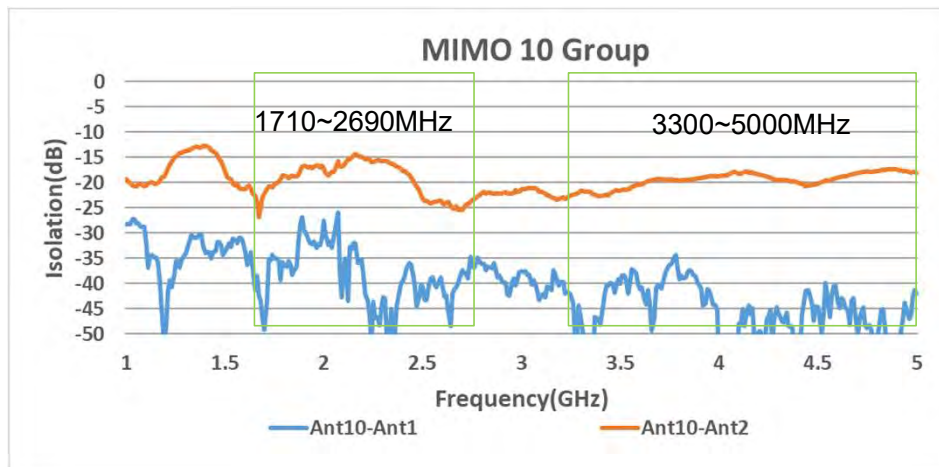
- ANT5 is Wi-Fi antenna.
- ANT1-ANT4 is LTE/FR1 antenna.



Freq. (MHz)	2400-2495	5170-5835	5925-7125
ANT6 to ANT1	≥ 15 dB	≥ 20 dB	≥ 30 dB
ANT6 to ANT2	≥ 25 dB	≥ 25 dB	≥ 30 dB
ANT6 to ANT3	≥ 25 dB	≥ 30 dB	≥ 30 dB
ANT6 to ANT4	≥ 25 dB	≥ 30 dB	≥ 30 dB

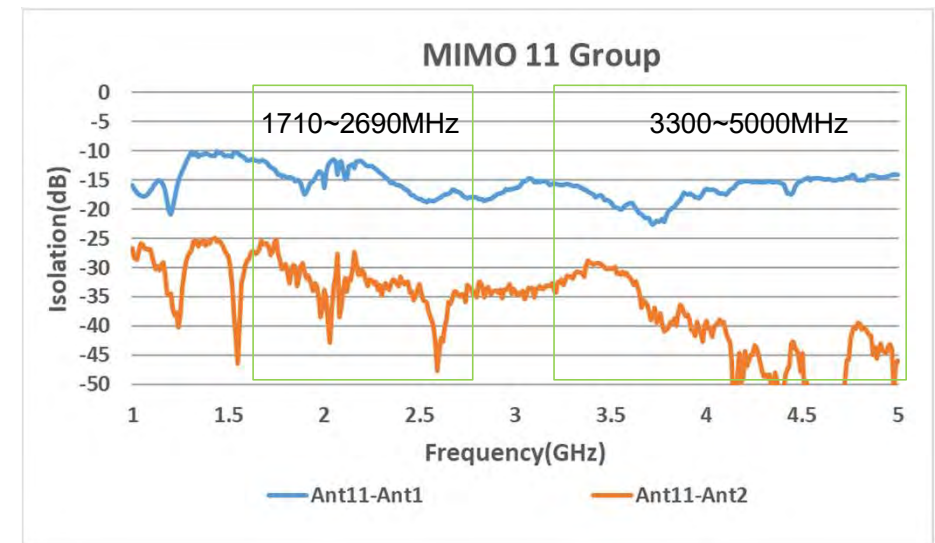
- ANT6 is Wi-Fi antenna.
- ANT1-ANT4 is LTE/FR1 antenna.

Antenna Performance – Isolation between radios



Freq. (MHz)	1710-2690	3300-5000
ANT10 to ANT1	≥ 20 dB	≥ 25 dB
ANT10 to ANT2	≥ 14 dB	≥ 15 dB

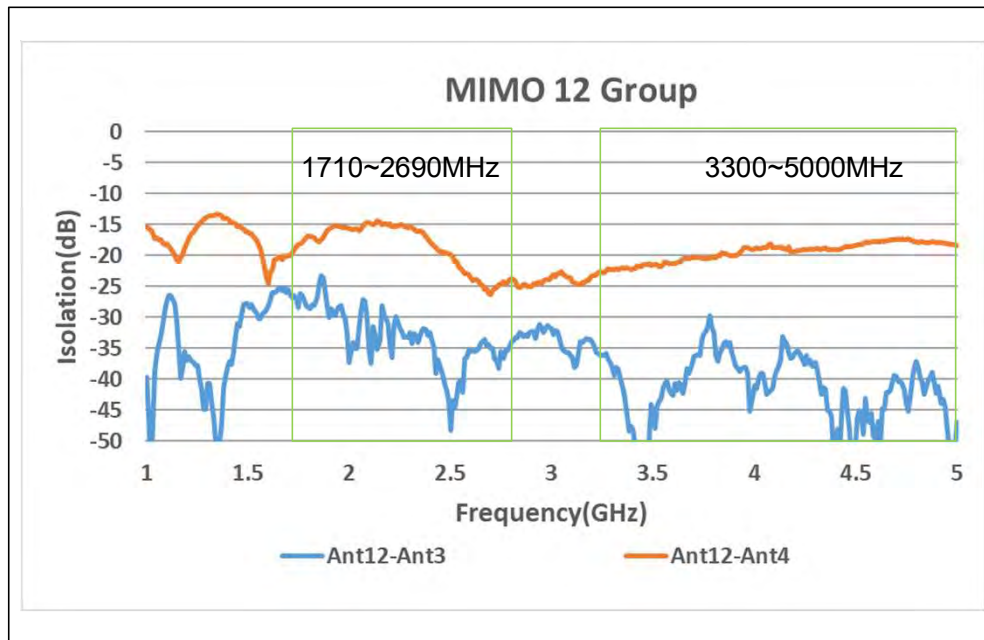
- ANT10 is MIMO antenna.
- ANT1-ANT2 is LTE/FR1 antenna.



Freq. (MHz)	1710-2690	3300-5000
ANT11 to ANT1	≥ 10 dB	≥ 15 dB
ANT11 to ANT2	≥ 20 dB	≥ 25 dB

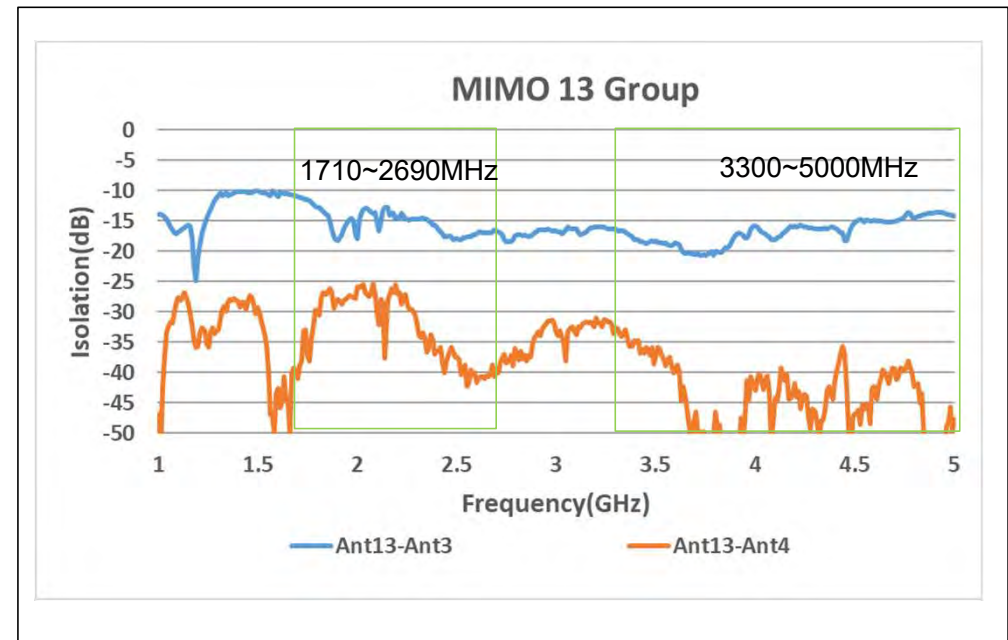
- ANT11 is MIMO antenna.
- ANT1-ANT2 is LTE/FR1 antenna.

Antenna Performance – Isolation between radios



Freq. (MHz)	1710-2690	3300-5000
ANT12 to ANT3	≥ 20 dB	≥ 25 dB
ANT12 to ANT4	≥ 14 dB	≥ 15 dB

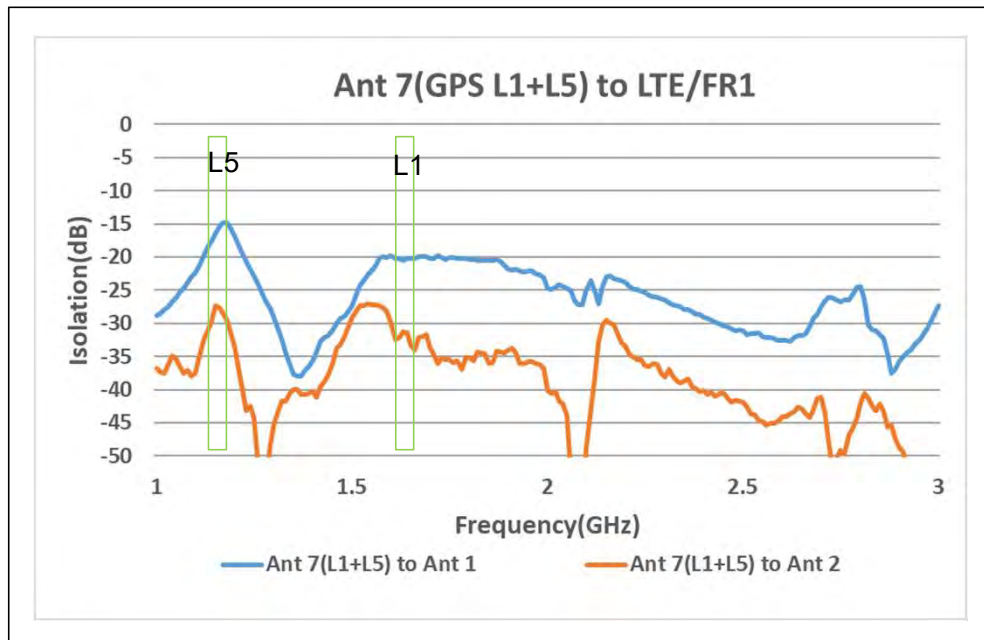
- ANT12 is MIMO antenna.
- ANT3-ANT4 is LTE/FR1 antenna.



Freq. (MHz)	1710-2690	3300-5000
ANT13 to ANT3	≥ 14 dB	≥ 15 dB
ANT13 to ANT4	≥ 25 dB	≥ 25 dB

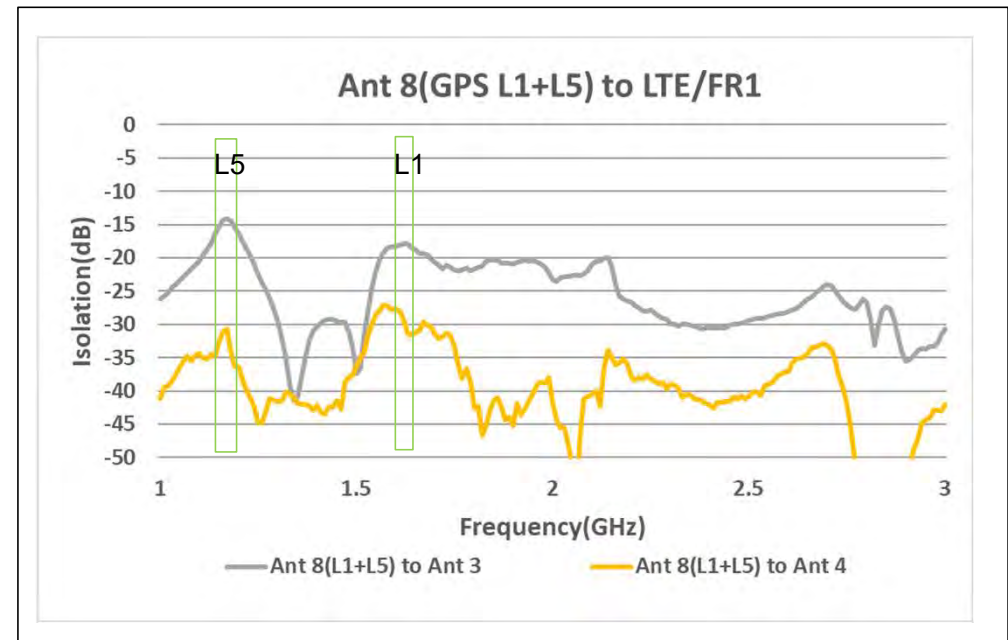
- ANT13 is MIMO antenna.
- ANT3-ANT4 is LTE/FR1 antenna.

Antenna Performance – Isolation between radios



Freq. (MHz)	1176(L5)	1575(L1)
ANT7 to ANT1	≥ 14 dB	≥ 20 dB
ANT7 to ANT2	≥ 25 dB	≥ 25 dB

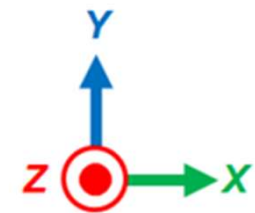
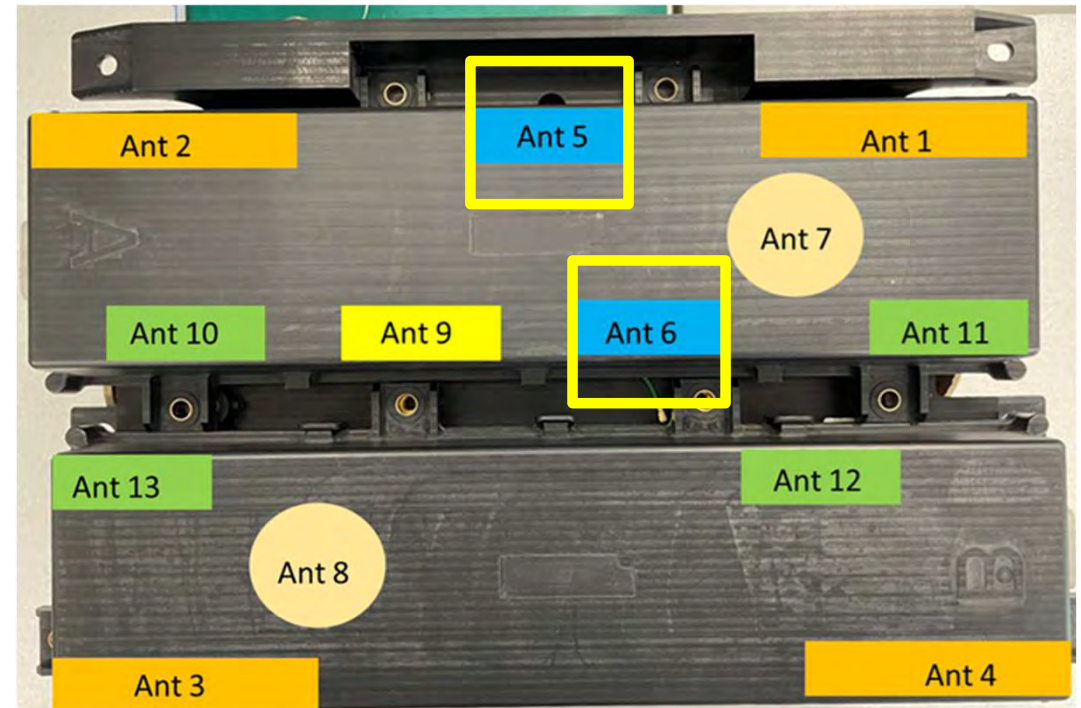
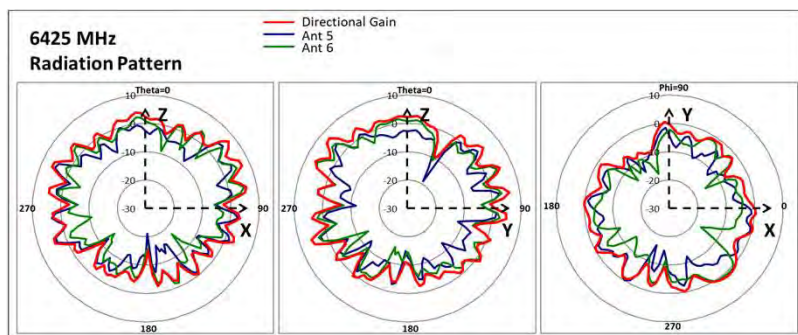
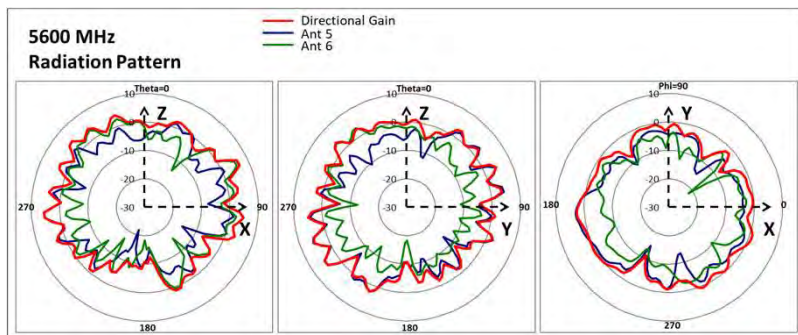
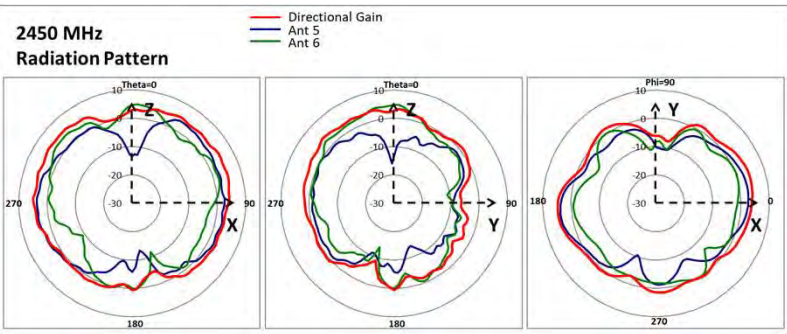
- ANT7 is GNSS antenna.
- ANT1-ANT2 is LTE/FR1 antenna.



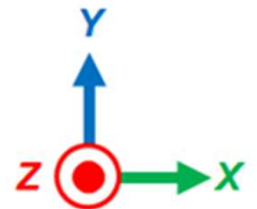
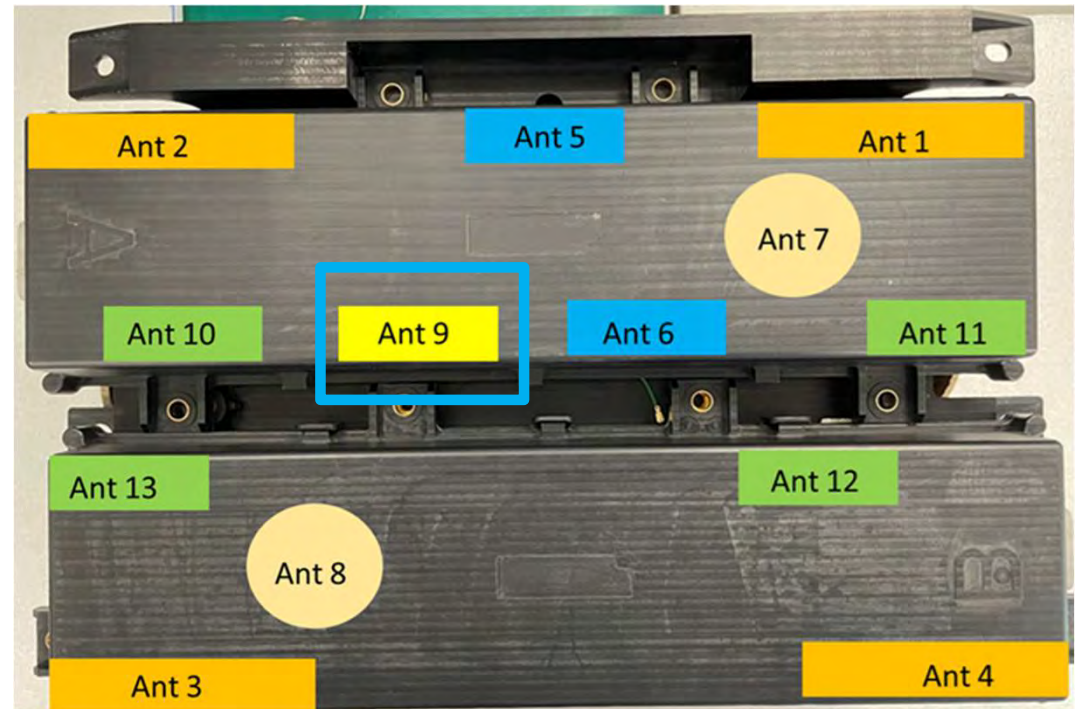
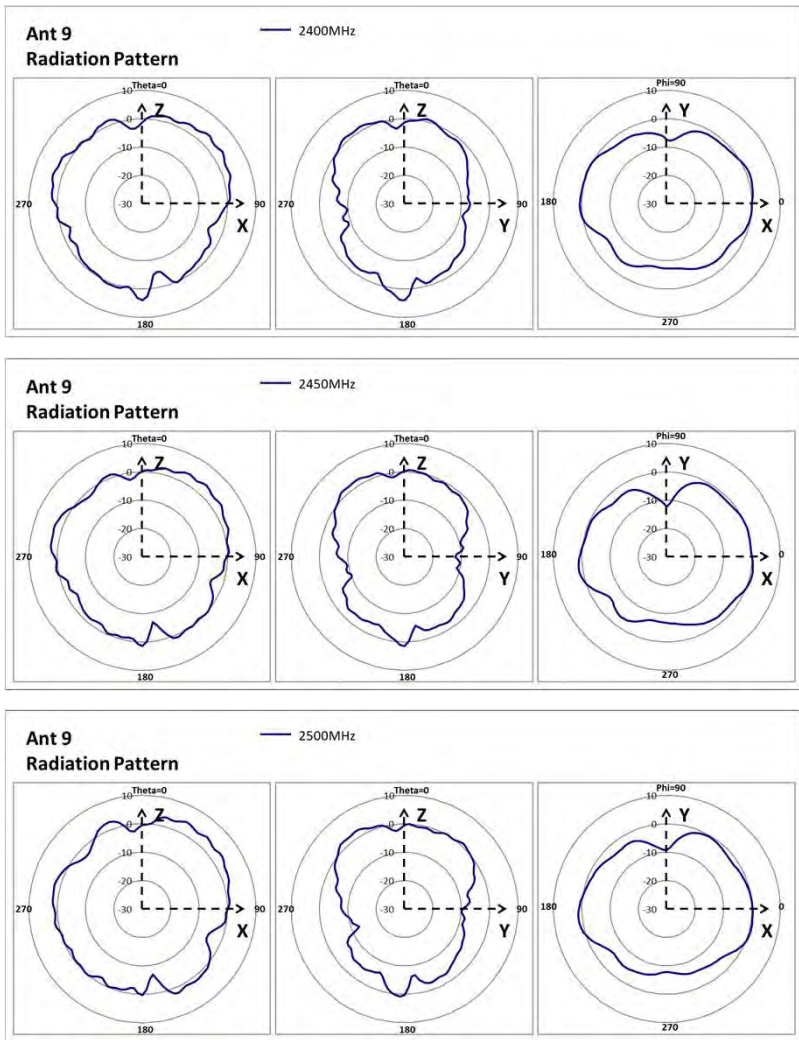
Freq. (MHz)	1176(L5)	1575(L1)
ANT8 to ANT3	≥ 14 dB	≥ 18 dB
ANT8 to ANT4	≥ 25 dB	≥ 25 dB

- ANT8 is GNSS antenna.
- ANT3-ANT4 is LTE/FR1 antenna.

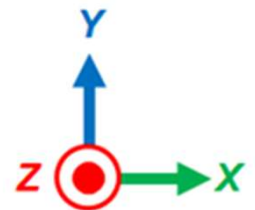
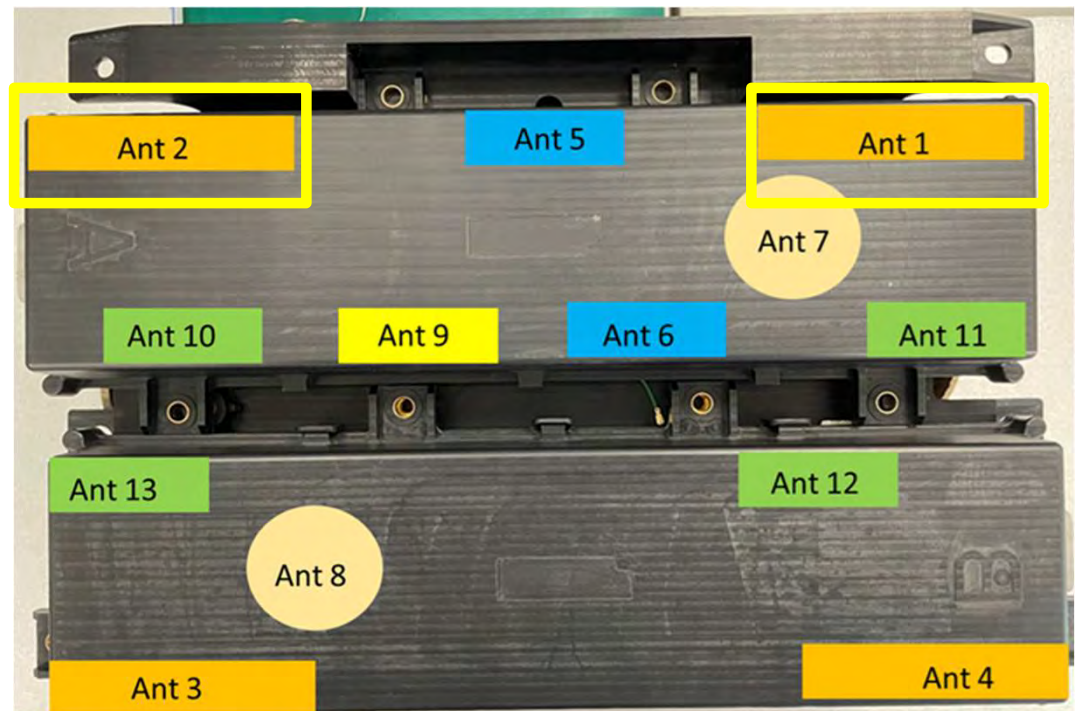
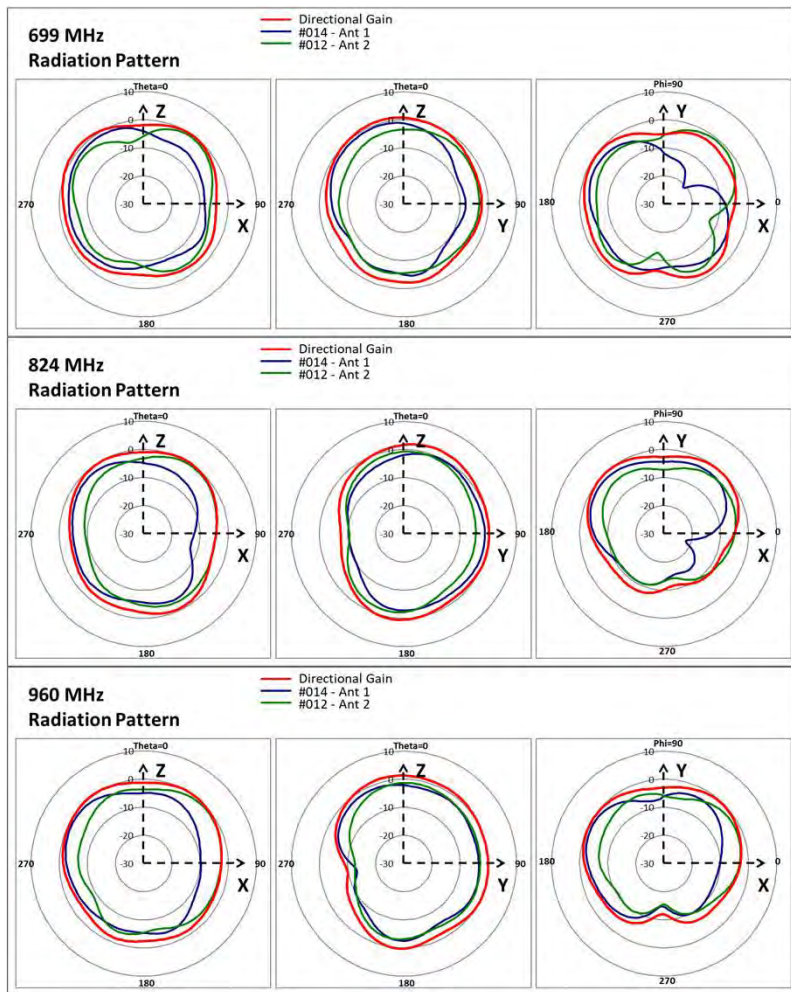
Radiation Patterns _ WIFI Antenna



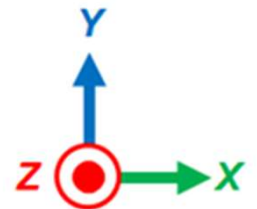
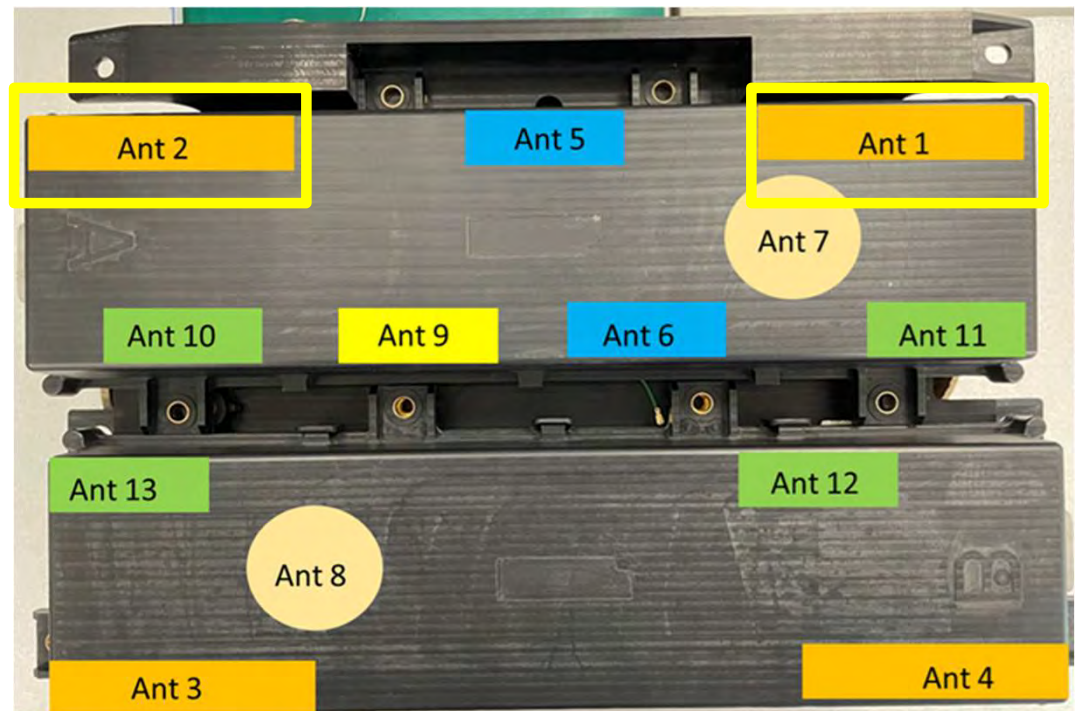
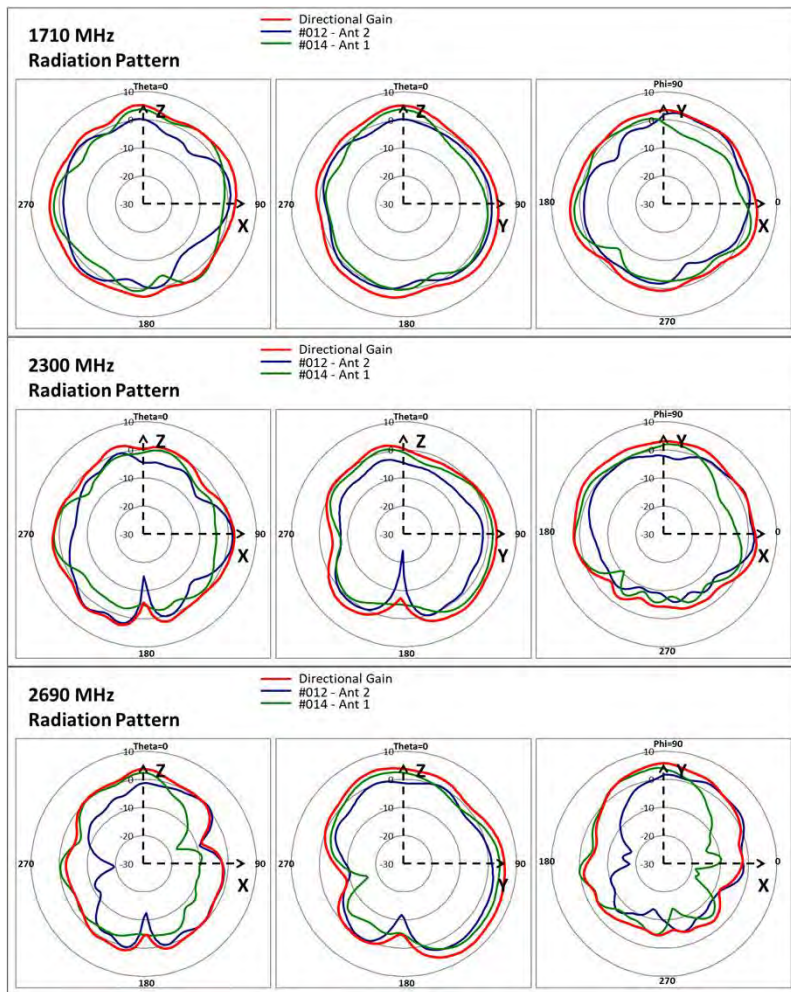
Radiation Patterns _ BLE Antenna



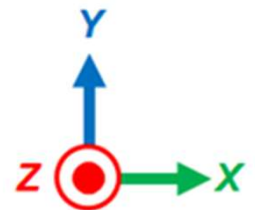
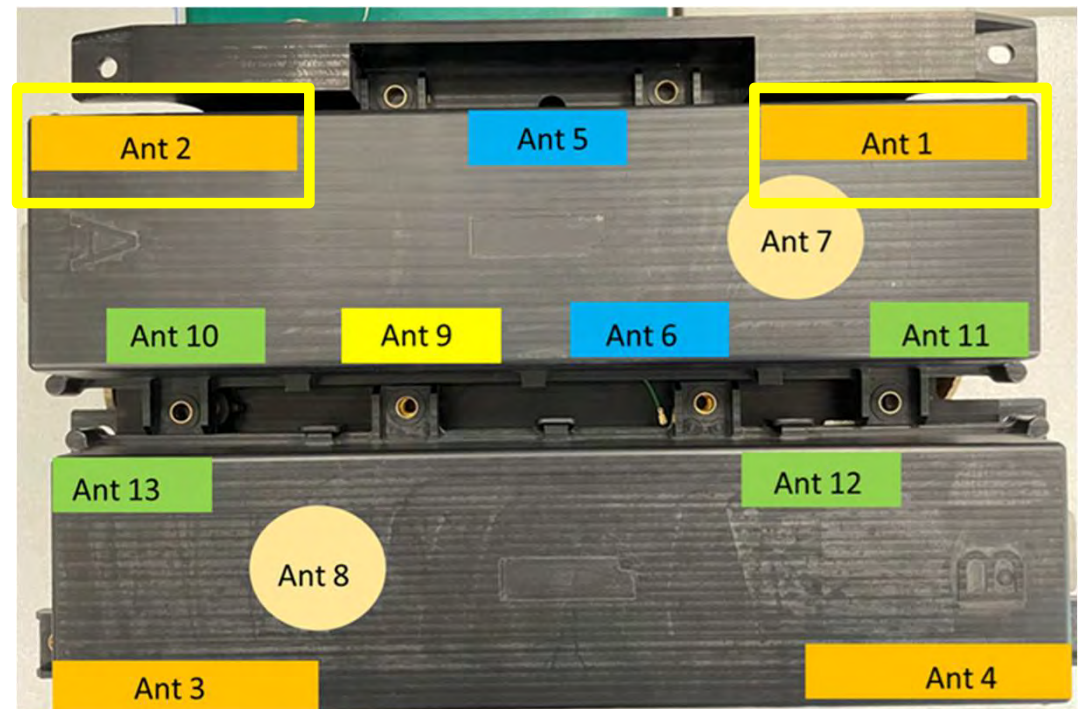
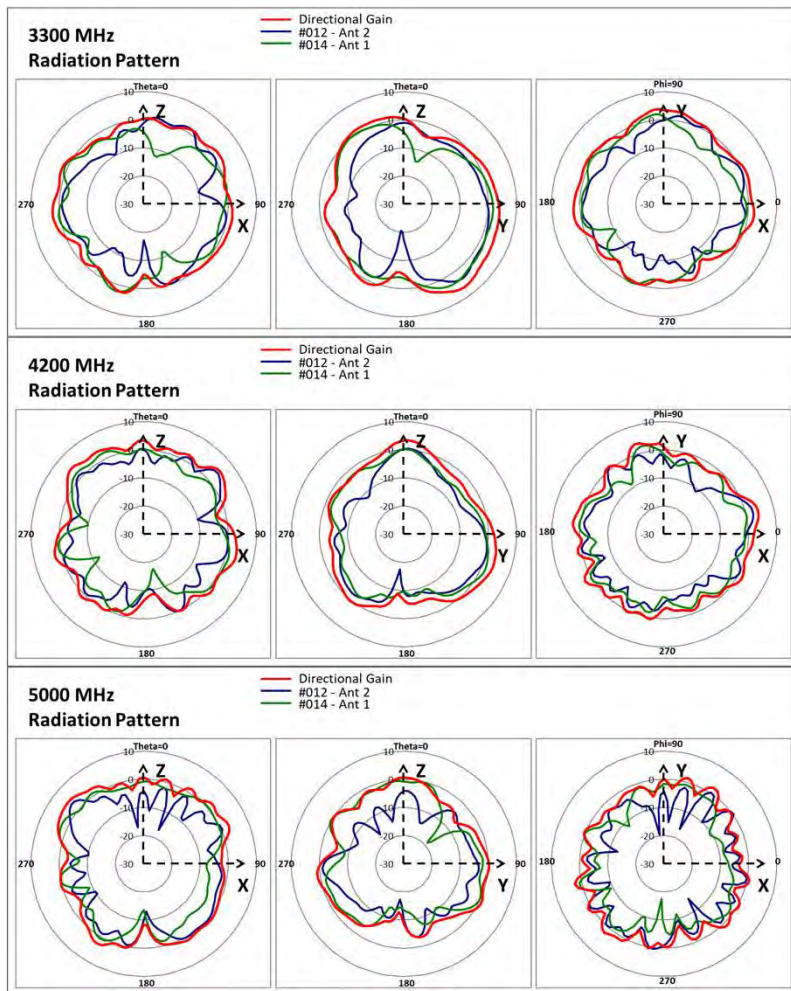
Radiation Patterns _ LTE Antenna Ant1&2 Low bands



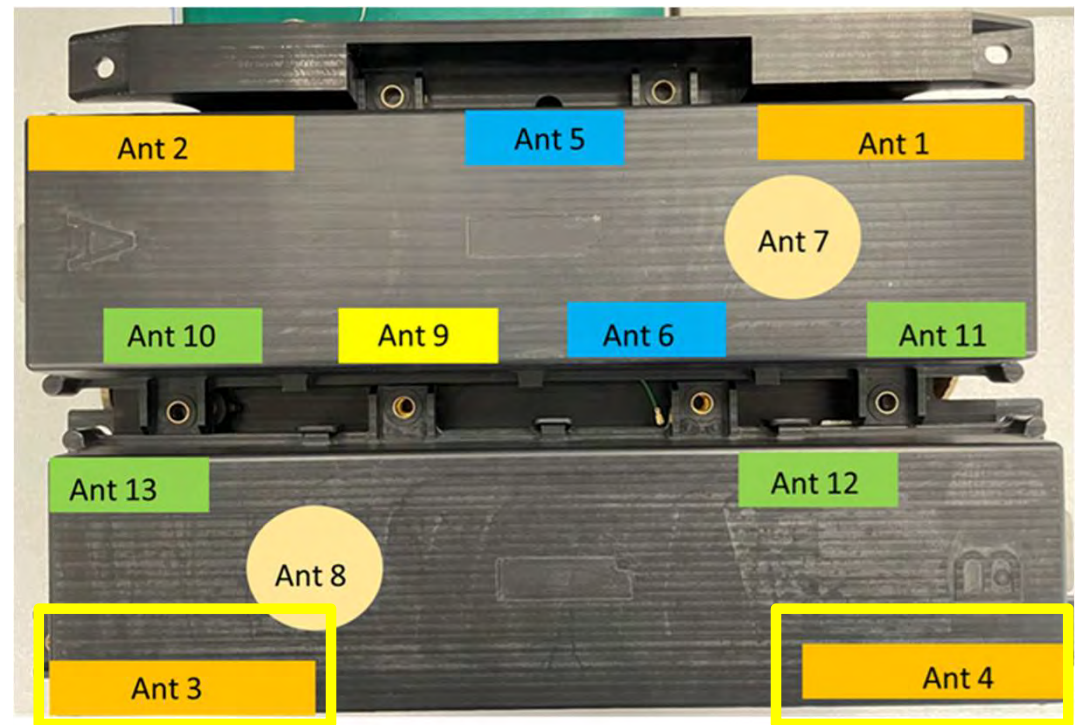
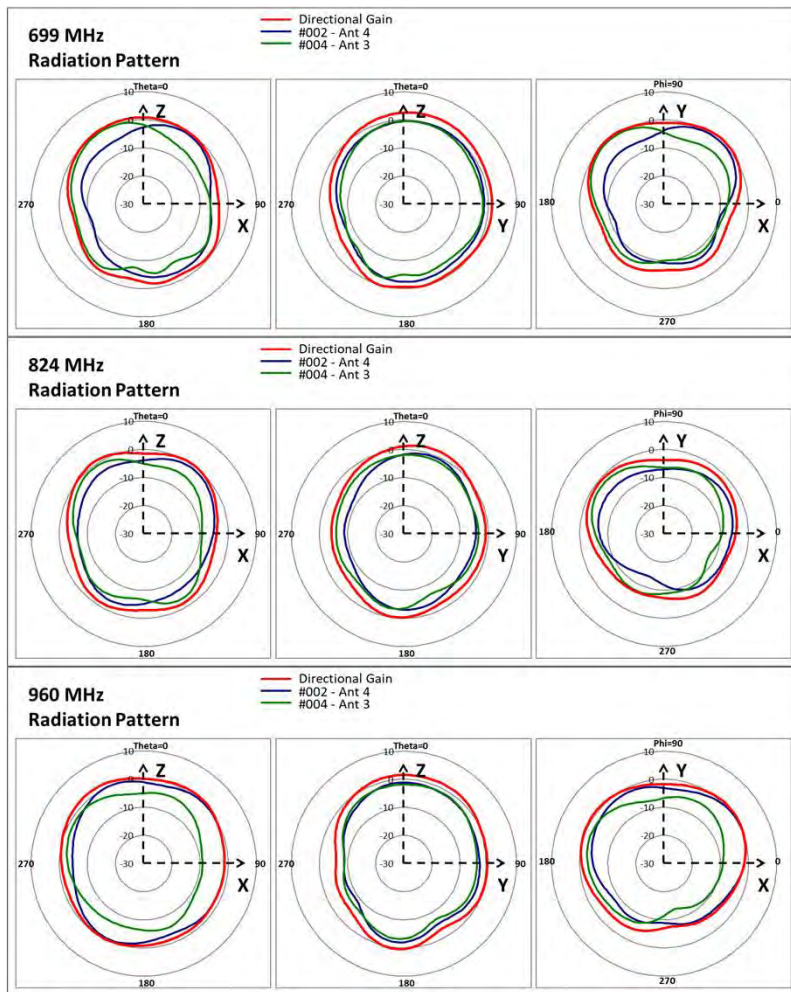
Radiation Patterns _ LTE Antenna Ant1&2 Mid bands



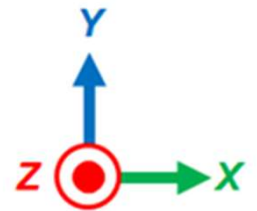
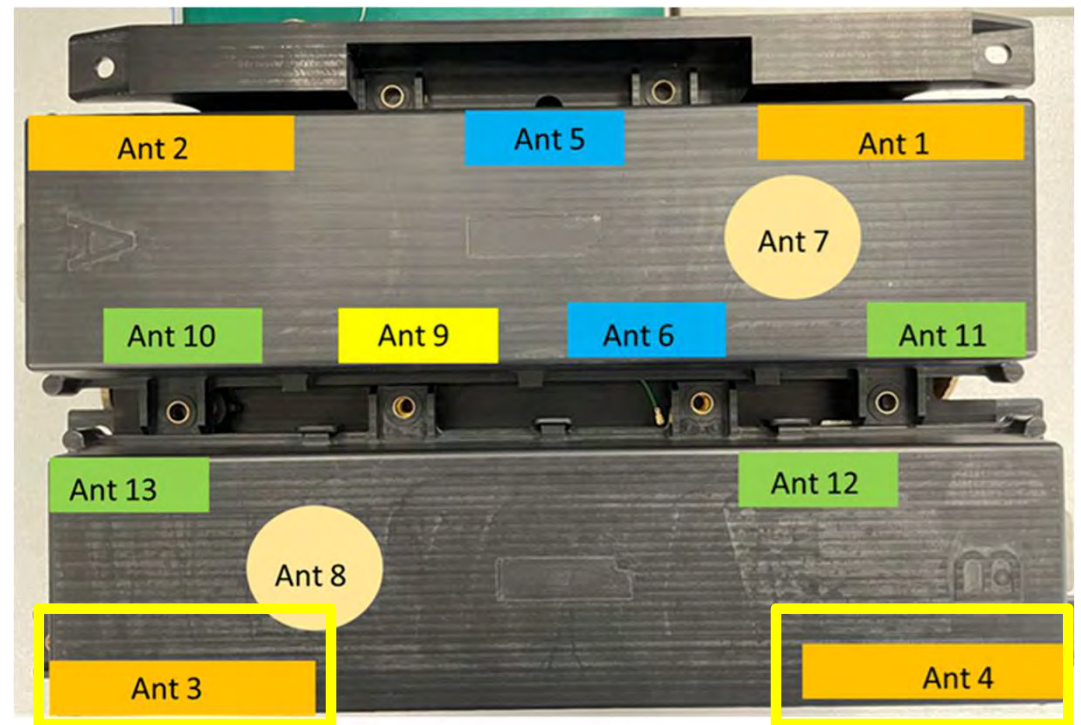
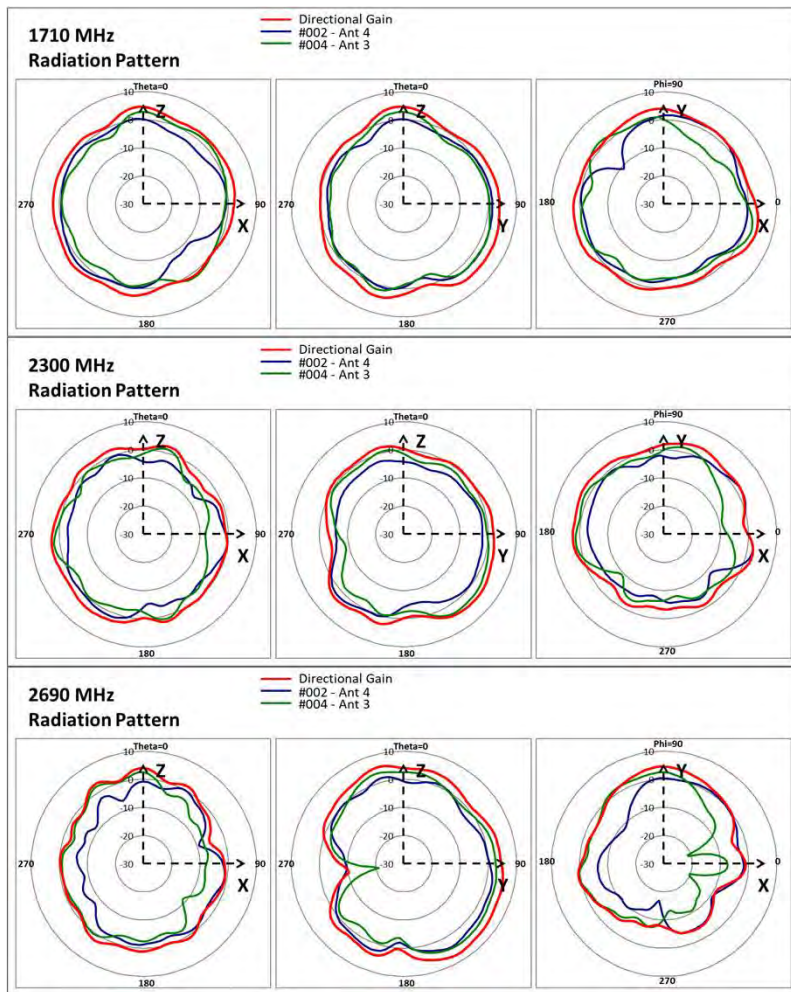
Radiation Patterns _ LTE Antenna Ant1&2 High bands



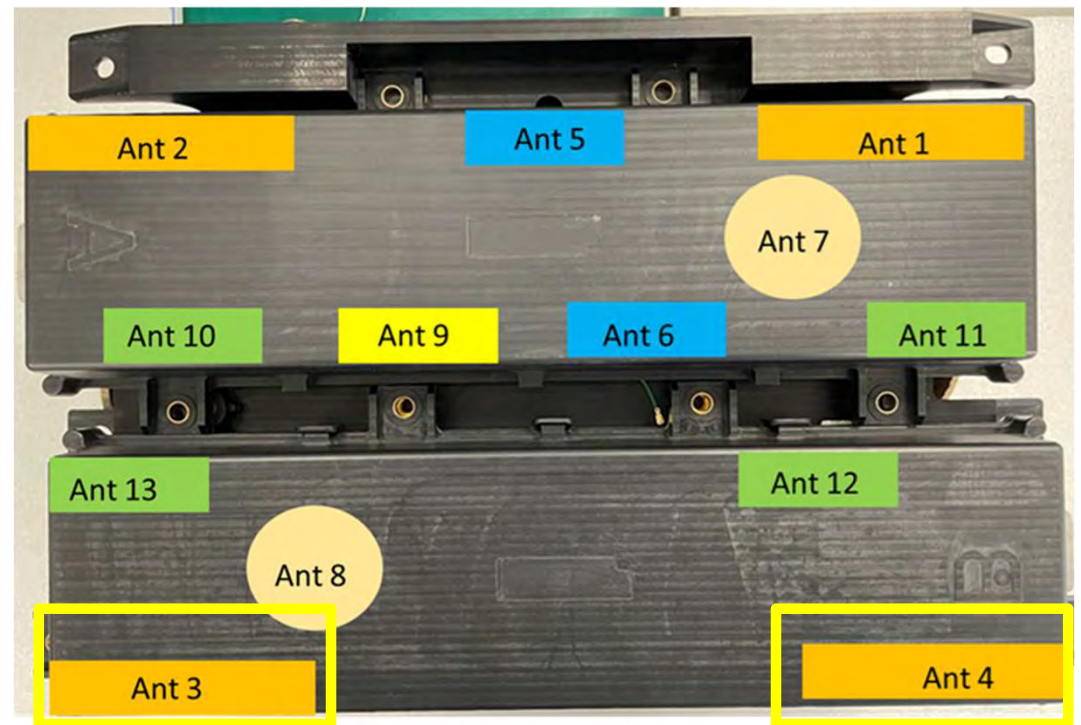
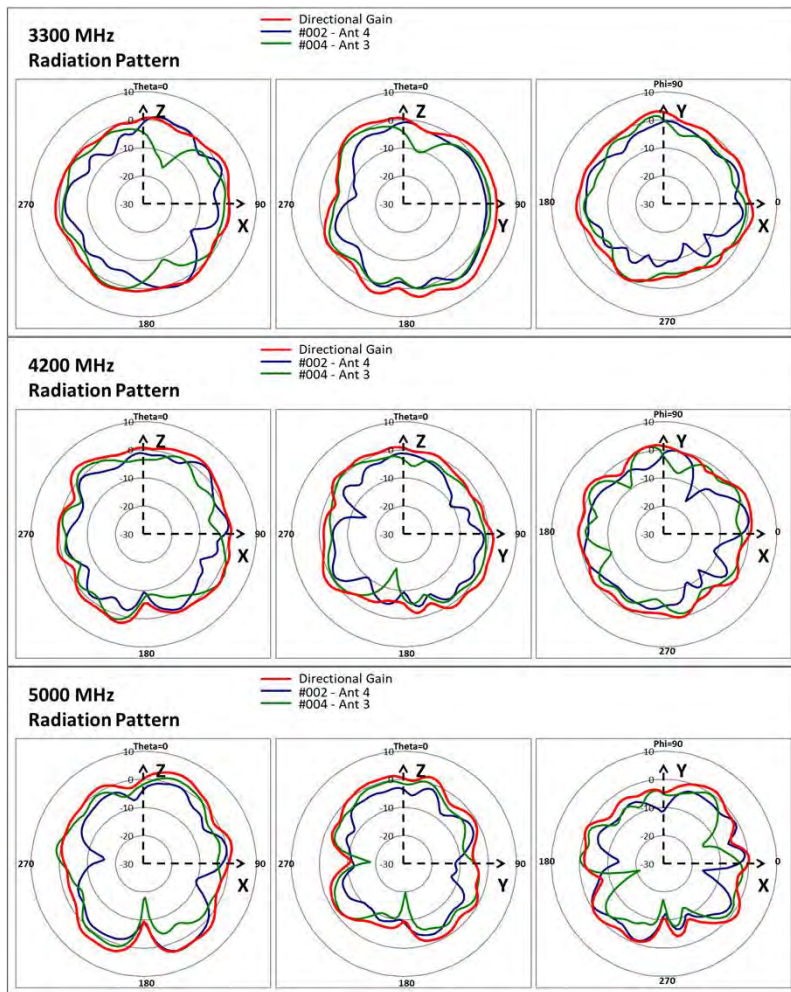
Radiation Patterns _ LTE Antenna Ant3&4 Low bands



Radiation Patterns _ LTE Antenna Ant3&4 Mid bands



Radiation Patterns _ LTE Antenna Ant3&4 High bands



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