TMO-Gen5

XC33BE4443T-F100-T0

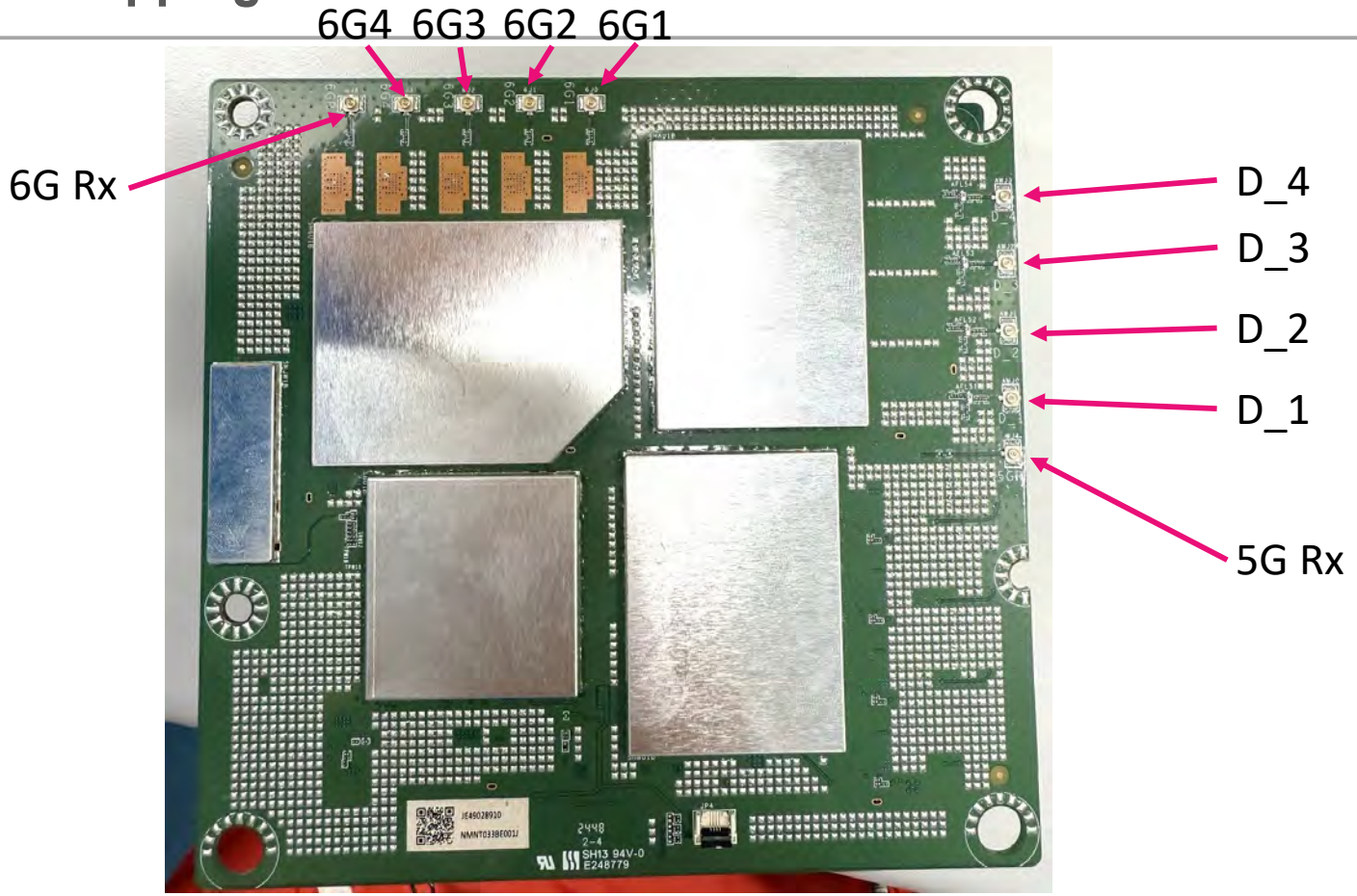
Antenna Passive Performance Report

28th Mar, 2025

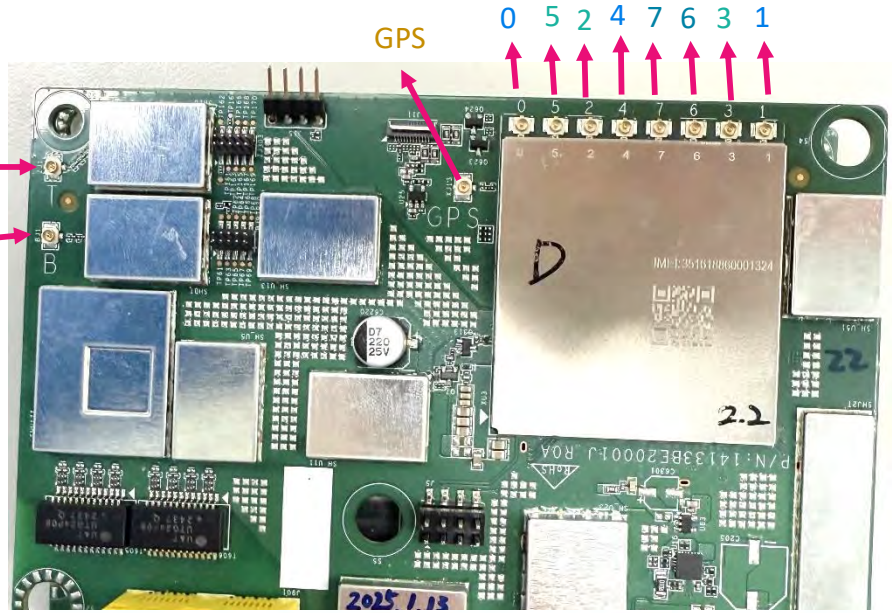
Peko

Version R01

Antenna Port Mapping on Wi-Fi PCBA



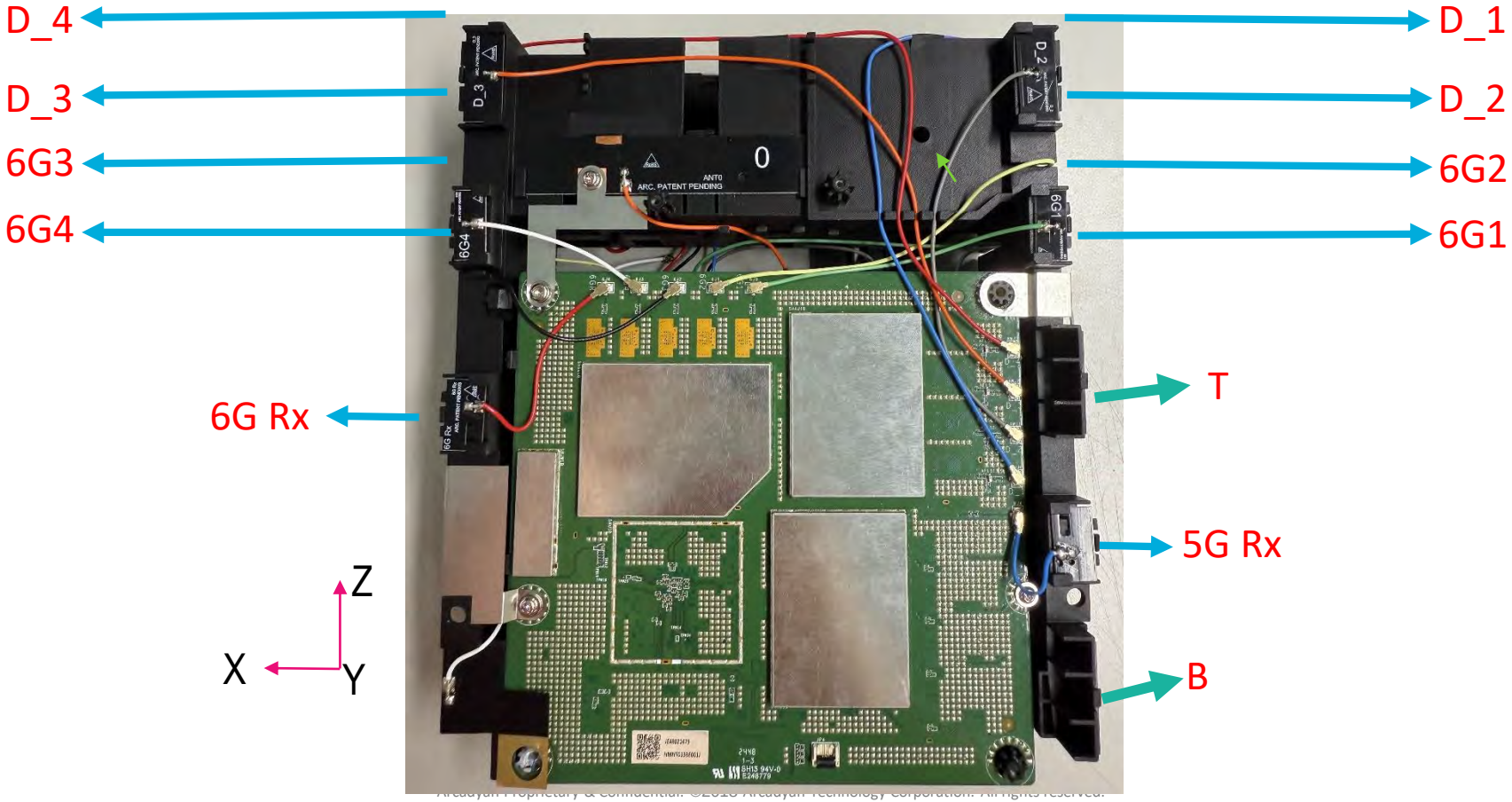
Antenna Port Mapping on Main PCBA



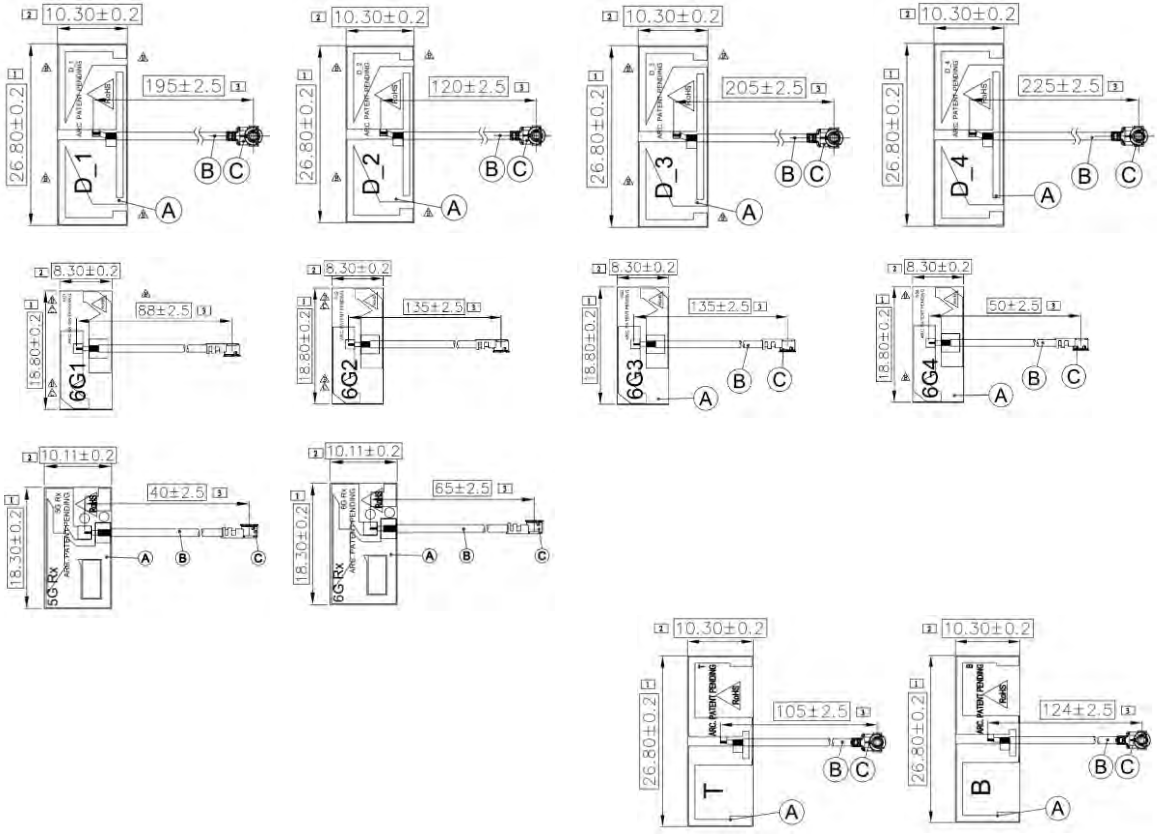
Frequency		Ant_8	Ant_7	Ant_6	Ant_5	Ant_4	Ant_3	Ant_2	Ant_1	Ant_0
LB	600–960MHz		Tx0/PRX		PRX2				DRX2	Tx1[1]/DRX
MB	1710–2690MHz		Tx0/DRX	PRX4[2]	DRX3[2]	PRX2	DRX4[2]	PRX3[2]	DRX2	Tx1[1]/PRX
n41	2496-2690		DRX4[2]	PRX3[2]	Tx0/DRX	PRX2	DRX3[2]	PRX4[2]	DRX2	Tx1[1]/PRX
n77	3300–5000MHz		PRX3[2]	PRX4[2]	Tx0/PRX	PRX2	DRX3[2]	DRX4[2]	DRX2	Tx1[1]/DRX
GPS L1	1575–1610MHz	Rx	0	5	2	4	7	6	3	1
GPS L5	1176MHz	Rx								

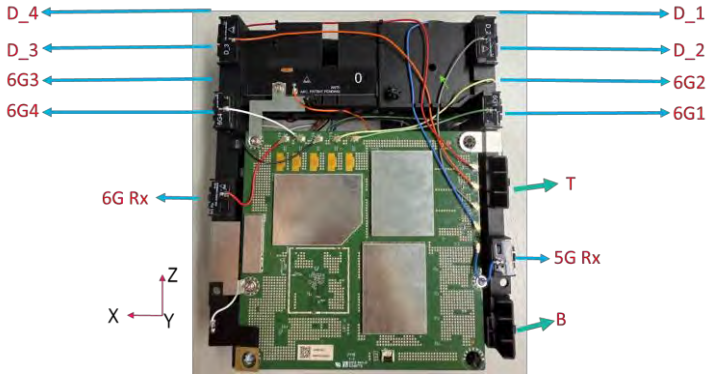
Antenna Location of WiFi & 5G Rx/ 6G Rx/ BLE / IoT+Matter

- *WiFi / 2.4G+5G / 6G / 5G Rx / 6G Rx*



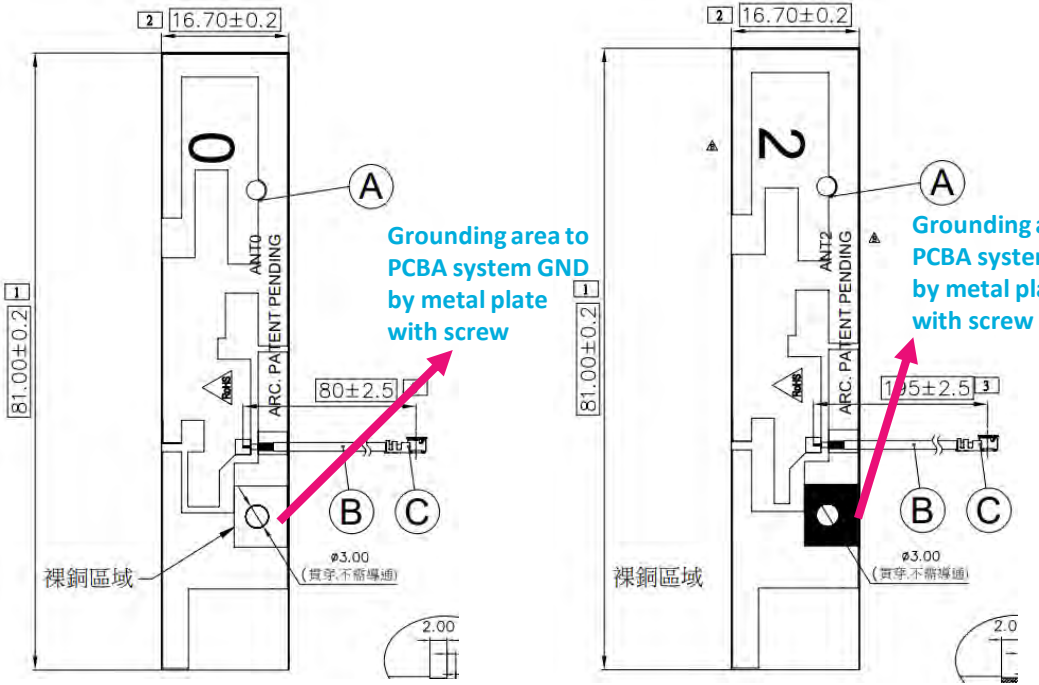
Antenna Location of Wi-Fi

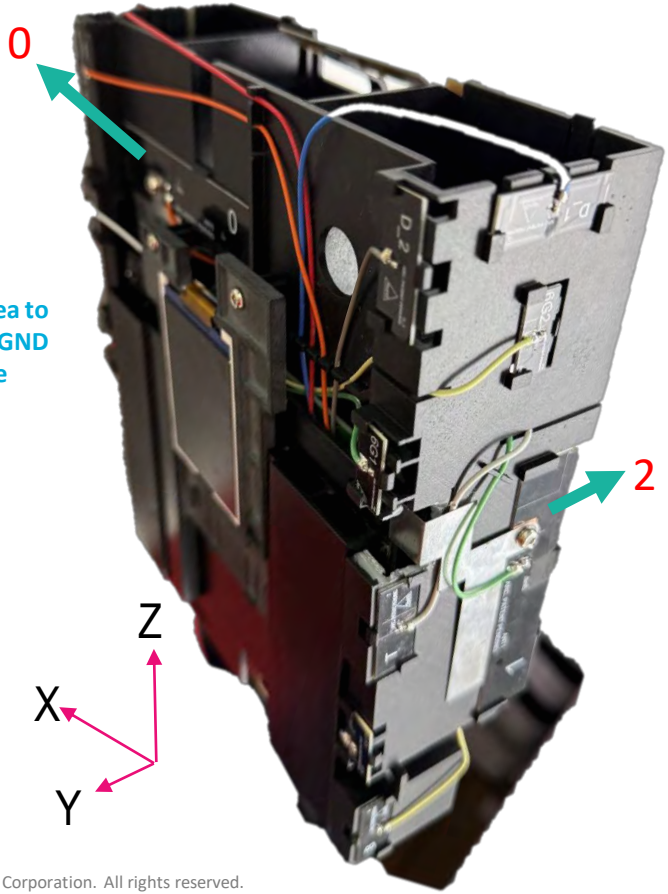




Antenna Location of LTE/5G

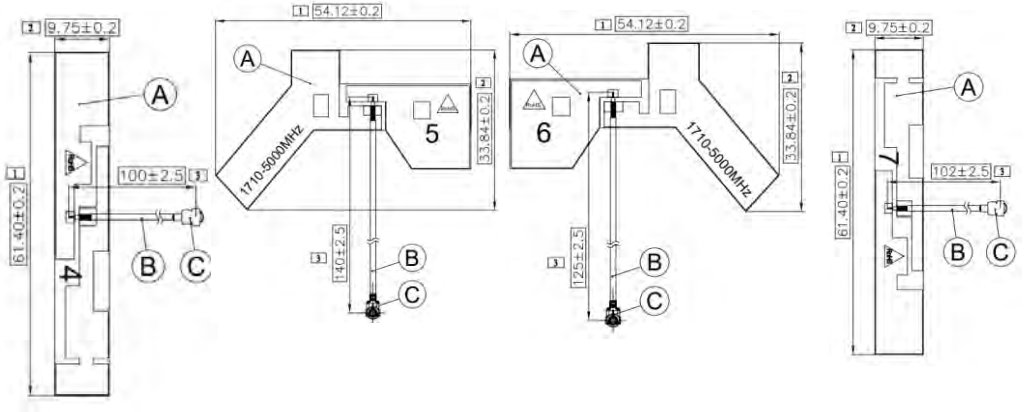
- *LTE/5G NR*

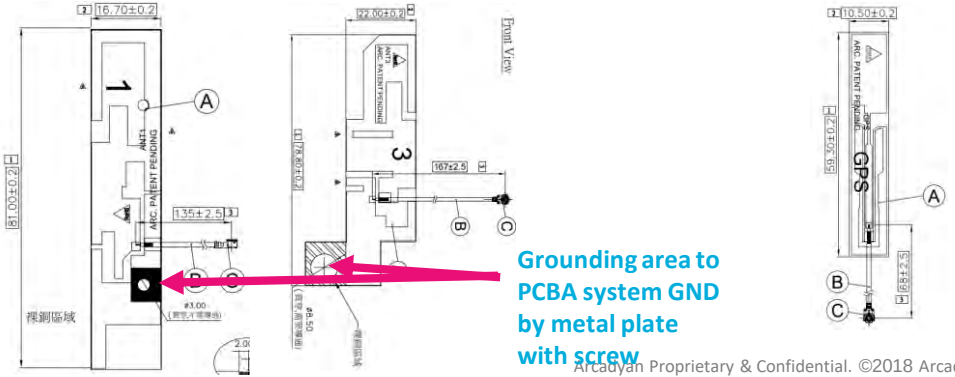




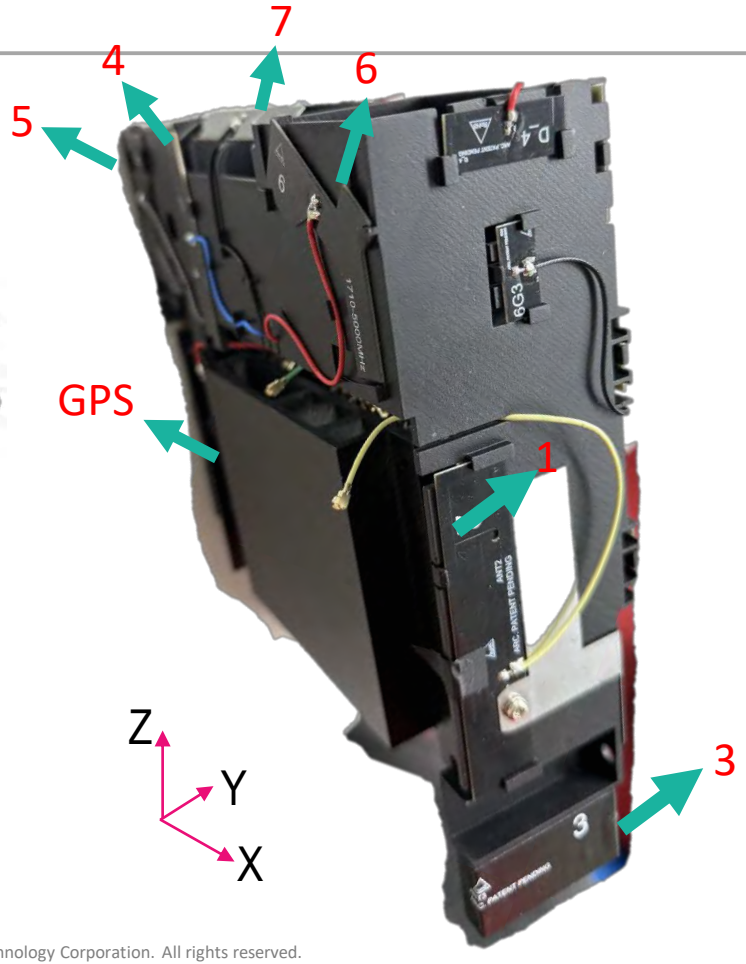
Antenna Location of LTE/5G

- *LTE/5G NR*





Grounding area to PCBA system GND by metal plate with screw



Antenna Model Name/ Part Number /Vendor

- *Vendor : Arcadyan*
- *Company Address:*

No. 8, Section 2, Guangfu Rd, East District, Hsinchu City, 300

ARC P/N	Ant Name	天線規格描述
120800157500J	D_1	??ANT 2.4G/5G PCB+CABLE CCT 195mm/LL:1.13 BLUE PSA
120800157600J	D_2	??ANT 2.4G/5G PCB+CABLE CCT 120mm/LL:1.13 DARK GRAY PSA
120800157700J	D_3	??ANT 2.4G/5G PCB+CABLE CCT 205mm/LL:1.13 ORANGE PSA
120800157800J	D_4	??ANT 2.4G/5G PCB+CABLE CCT 225mm/LL:1.13 RED PSA
120800157900J	6G2	??ANT 6G PCB+CABLE CCT 135mm/LL:1.13 YELLOW PSA
120800158000J	6G1	??ANT 6G PCB+CABLE CCT 88mm/LL:1.13 GREEN PSA
120800158100J	6G3	??ANT 6G PCB+CABLE CCT 135mm/LL:1.13 BLACK PSA
120800158200J	6G4	??ANT 6G PCB+CABLE CCT 50mm/LL:1.13 WHITE PSA
120800158300J	5G_Rx	??ANT 5GR PCB+CABLE CCT 40mm/LL:1.13 BLUE PSA
120800158400J	6G_Rx	??ANT 6GR PCB+CABLE CCT 65mm/LL:1.13 RED PSA
120800158500J	B	??ANT 2.4G BT PCB+CABLE CCT 124mm/LL:1.13 YELLOW PSA
120800158600J	T	??ANT 2.4G IoT PCB+CABLE CCT 105mm/LL:1.13 WHITE PSA
120800158700J	ANT0	??ANT Full Band PCB+CABLE CCT 80mm/LL:1.13 ORANGE PSA
120800158800J	ANT1	??ANT Full Band PCB+CABLE CCT 135mm/LL:1.13 YELLOW PSA
120800158900J	ANT2	??ANT Full Band PCB+CABLE CCT 195mm/LL:1.13 GREEN PSA
120800159000J	ANT3	??ANT Full Band FPC+CABLE CCT 167mm/LL:1.13 WHITE PSA
120800159100J	ANT4	??ANT MHC Band PCB+CABLE CCT 100mm/LL:1.13 BLUE PSA
120800159200J	ANT5	??ANT MHC Band PCB+CABLE CCT 140mm/LL:1.13 DARK GRAY PSA
120800159400J	ANT6	??ANT MHC Band PCB+CABLE CCT 125mm/LL:1.13 RED PSA
120800159500J	ANT7	??ANT MHC Band PCB+CABLE CCT 102mm/LL:1.13 BLACK PSA
120800159300J	GPS	??ANT GPS PCB+CABLE CCT 68mm/LL:1.13 RED PSA

Test Equipment and Calibration

Equipment Item	Equipment Manufacture	Equipment Serial Number	Equipment FW Serial Number	Frequency Span Range	Calibrated Date (last time)	Calibrated Date(latest time)
ENA Series Network Analyzer	AGILENT	E5071C	MY46419201	100kHz~8.5GHz	Aug. 23, 2024	Feb. 11, 2025
VNA Calibration Kit	TS RF	TS85033E-F	-	DC~9GHz	N.C.R.	N.C.R.

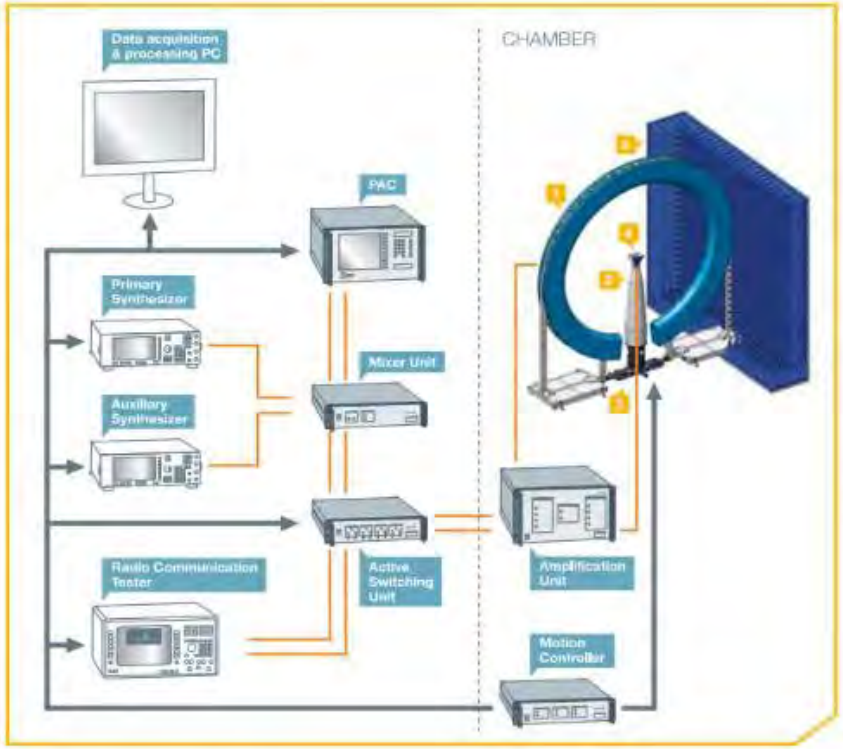
Test Date

28th Mar, 2025

Test Engineer

Peko Lee

Test Equipment and Calibration



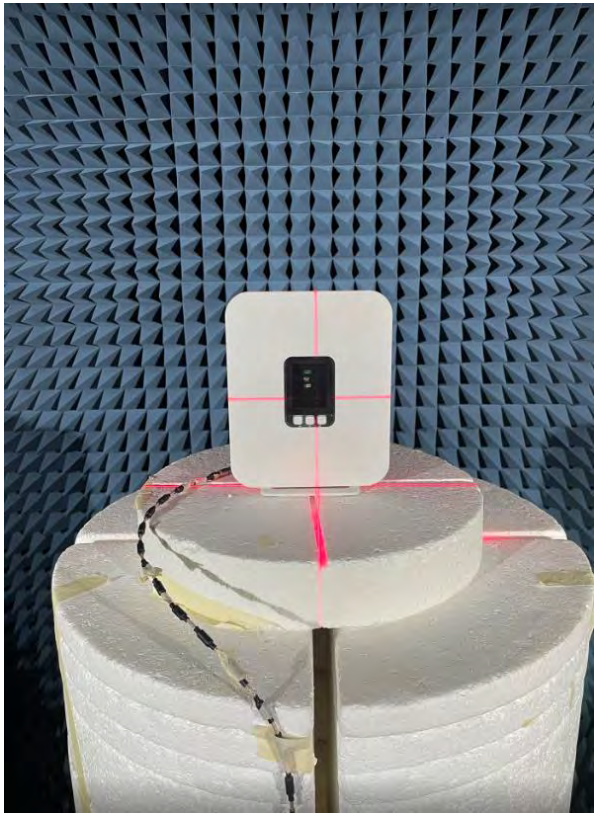
SG 64 uses analog RF signal generators to emit EM waves from the probe array to the antenna under test (AUT) or vice versa.

It uses the NPAC as an RF receiver for antenna measurements. The NPAC also drives the electronic scanning of the probe array.

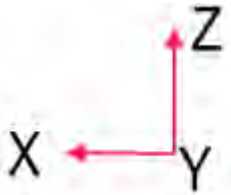
The NPAC includes the fastest and most accurate sources and receivers on the market.

Test Equipment and Calibration

Device	Type/Model	Serial#	Manufacturer	Calibrated Date	Calibrated Until
SG64 Chamber	Standard	SG64	MVG	2024/12/12	2025/12/12
Turn Table	Customization	-	Machinery Dept.	2024/12/12	2025/12/12
New Probe Array Controller	N/A	1102341-4535	MVG	2024/12/12	2025/12/12
Power Supply Unit	N/A	1103211-13204	MVG	2024/12/12	2025/12/12
Activve Switching Unit	N/A	1102347-7214	MVG	2024/12/12	2025/12/12
TX Amplification Unit	N/A	1102527-5909	MVG	2024/12/12	2025/12/12
RX Amplification Unit	N/A	1102536-3823	MVG	2024/12/12	2025/12/12
Transfer Swittching Unit	N/A	1102183-3351	MVG	2024/12/12	2025/12/12
Mixer Unit	N/A	1102545-7208	MVG	2024/12/12	2025/12/12
Power And Control Unit	N/A	1102706-7209	MVG	2024/12/12	2025/12/12
Antenna Probe	DP 400-6000	-	MVG	2024/12/12	2025/12/12
Cable 13.7m - 400MHz to 18GHz	SS402	00100A1F5A1XXS	Woken	2024/12/12	2025/12/12



- Place the device at the center of the chamber.
- Connect the antenna cable to RF cable of the chamber
- Run : MVG SG64 SW test
- Get 3D data in 2.8125 degree step from phi 0°~360°and theta -90°~ +90°, including efficiency, peak gain, 2D & 3D radiation pattern.



Outlines

- *Antenna Definition and Distribution*
- *Antenna Return Loss*

  -- WiFi 2+5G / 6G / 5G Rx / 6G Rx

  -- BLE/IoT/GPS

  -- LTE/5G NR
- *Antenna WiFi to WiFi Isolation*
- *Antenna WiFi to BLE Isolation*
- *Antenna LTE/5G NR to LTE/5G NR Isolation*
- *Antenna LTE/5G NR to WiFi Isolation*
- *Antenna Efficiency & Peak Gain*

  -- WiFi/BLE/IoT/GPS

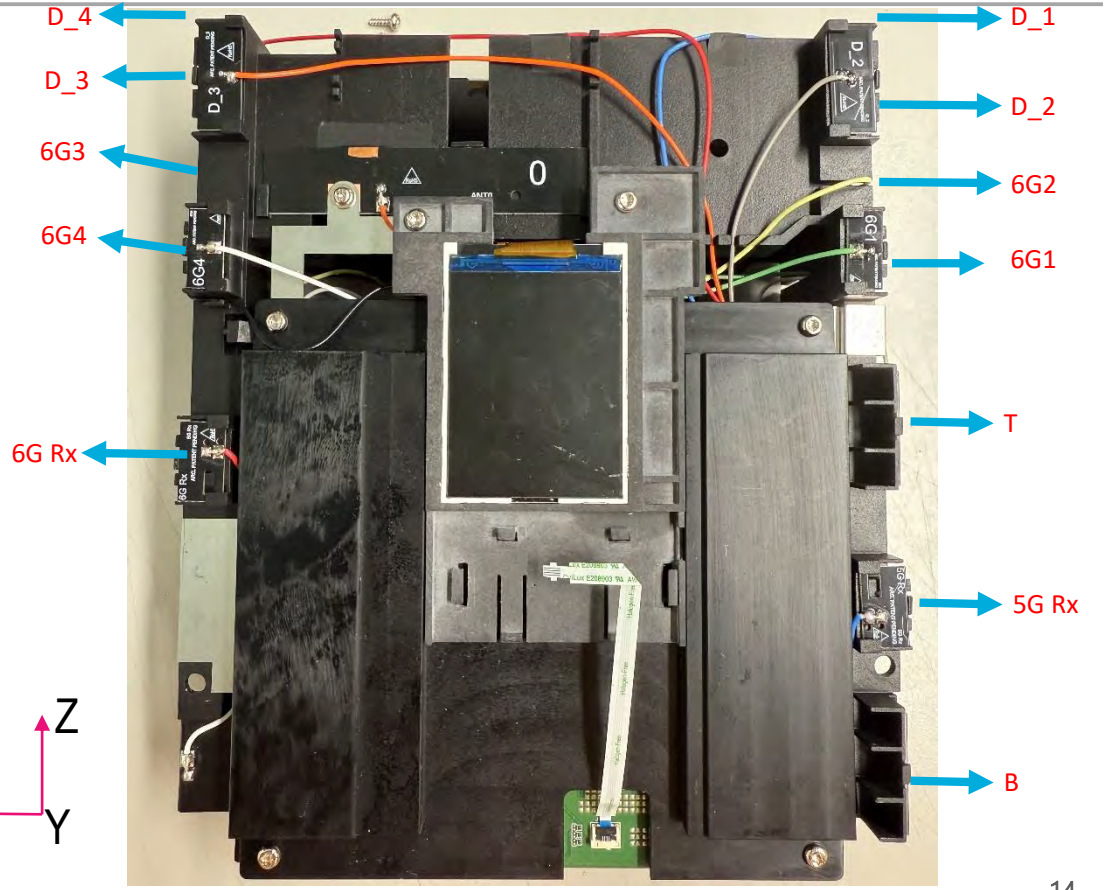
  -- LTE/5G NR
- *Antenna Radiation of WiFi*
- *Antenna Radiation of LTE/5G NR*

Antenna Definition

- *Antenna Definition and Distribution*

Antenna Definition of Wi-Fi Portion

	Antenna	Frequency(MHz)
WiFi	D_1	2400-2500 ; 5150-5850
	D_2	2400-2500 ; 5150-5850
	D_3	2400-2500 ; 5150-5850
	D_4	2400-2500 ; 5150-5850
	6G1	*5915~7125*
	6G2	*5915~7125*
	6G3	*5915~7125*
	6G4	*5915~7125*
	5G Rx	*5150~5850*
	6G Rx	*5925~7125*
IoT	***B(BLE)***	***2400-2500***
	T(IoT/Matter)	***2400-2500***



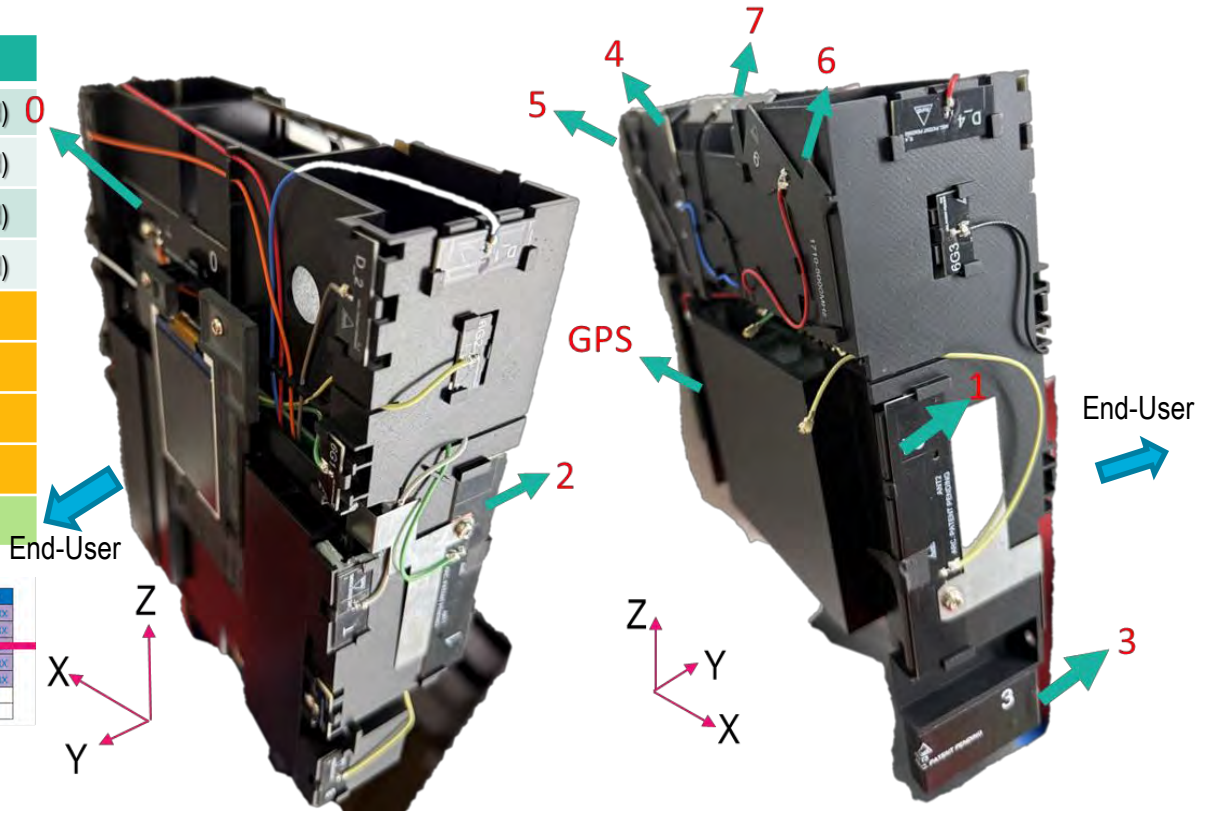
Antenna Definition

- *Antenna Definition and Distribution*

Antenna Definition of LTE/5G NR Portion

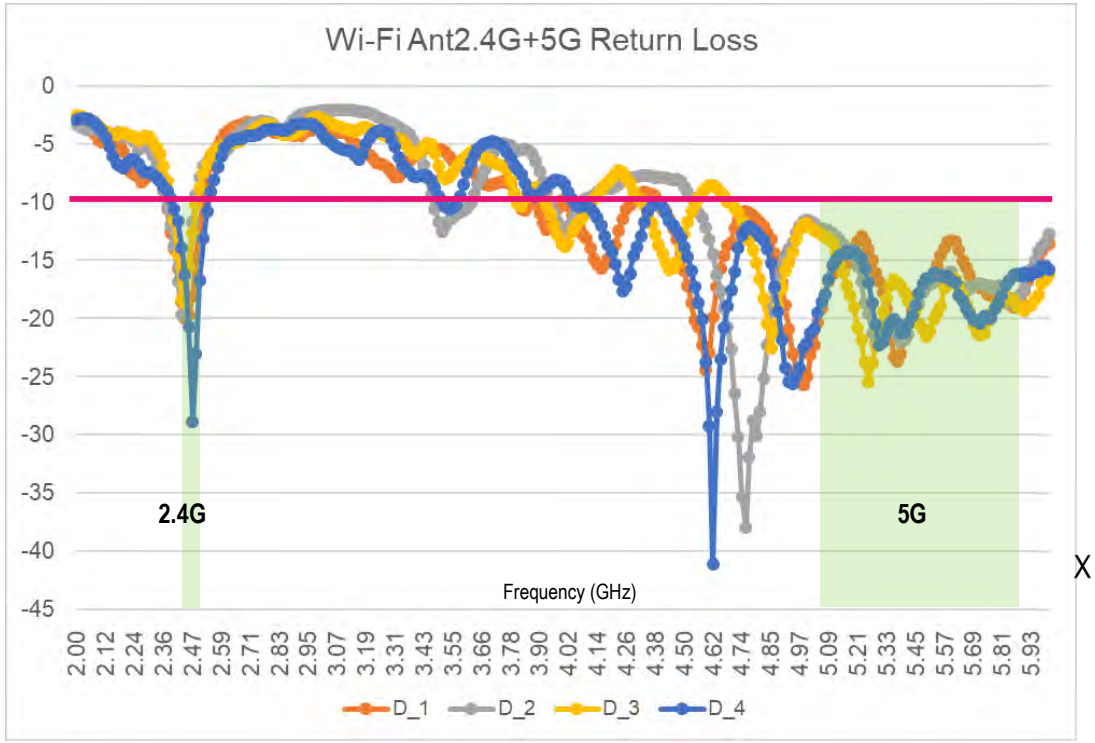
	ARC Antenna	Frequency(MHz)
LTE/5G NR	0 (Compal ANT7)	617-3980 (L/M/H/UH/C-Band)
	1 (Compal ANT0)	617-3980 (L/M/H/UH/C-Band)
	2 (Compal ANT5)	617-3980 (L/M/H/UH/C-Band)
	3 (Compal ANT1)	617-3980 (L/M/H/UH/C-Band)
	4 (Compal ANT4)	*1710-3980(UH/C-Band)*
	5 (Compal ANT2)	*1710-3980(UH/C-Band)*
	6 (Compal ANT5)	*1710-3980(UH/C-Band)*
	7 (Compal ANT3)	*1710-3980(UH/C-Band)*
GPS	*GPS*	*L1+L5*

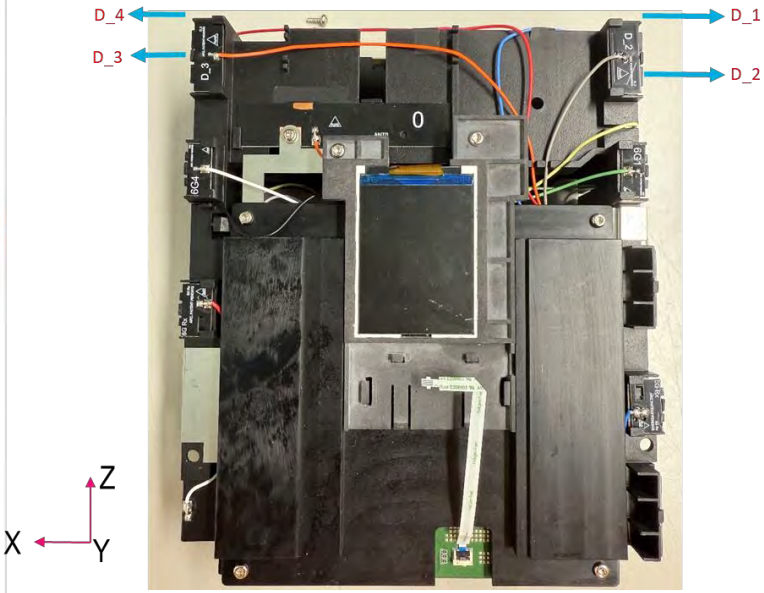
Frequency		Ant_8	Ant_7	Ant_6	Ant_5	Ant_4	Ant_3	Ant_2	Ant_1	Ant_0
LB	600~960MHz		Tx0/PRX		PRX2				DRX2	Tx1[2]/DRX
MB	1710~2690MHz		Tx0/DRX	PRX4[2]	DRX3[2]	PRX2	DRX4[2]	PRX3[2]	DRX2	Tx1[2]/PRX
n41	2496-2690		DRX4[2]	PRX3[2]	Tx0/DRX	PRX2	DRX3[2]	PRX4[2]	DRX2	Tx1[2]/PRX
n77	3300~5000MHz		PRX3[2]	PRX4[2]	Tx0/PRX	PRX2	DRX3[2]	DRX4[2]	DRX2	Tx1[2]/DRX
GPS L1	1575~1610MHz	Rx	0	5	2	4	7	6	3	1
GPS L5	1176MHz	Rx								



Antenna Return Loss of WiFi 2.4G/5G

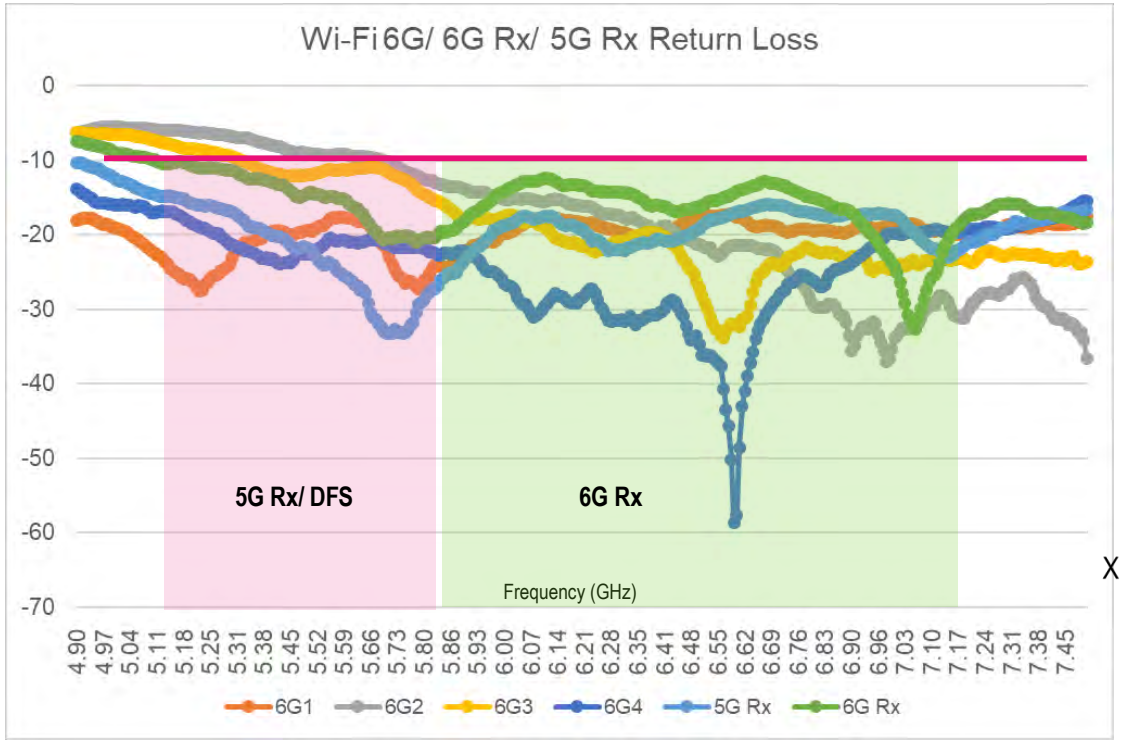
- *WiFi / 2.4G+5G*
  - *Antenna Return Loss of Ant1 ~4 are less than -10dB in operating band*

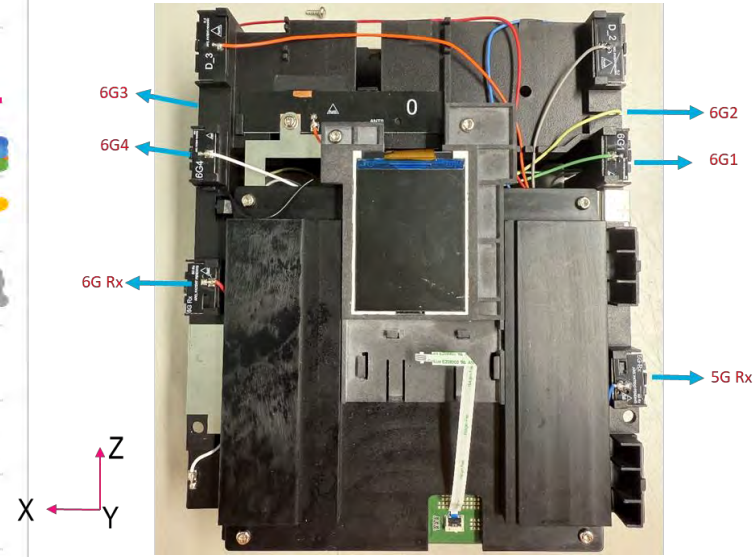




Antenna Return Loss of WiFi 6G/ 6G Rx/ 5G Rx

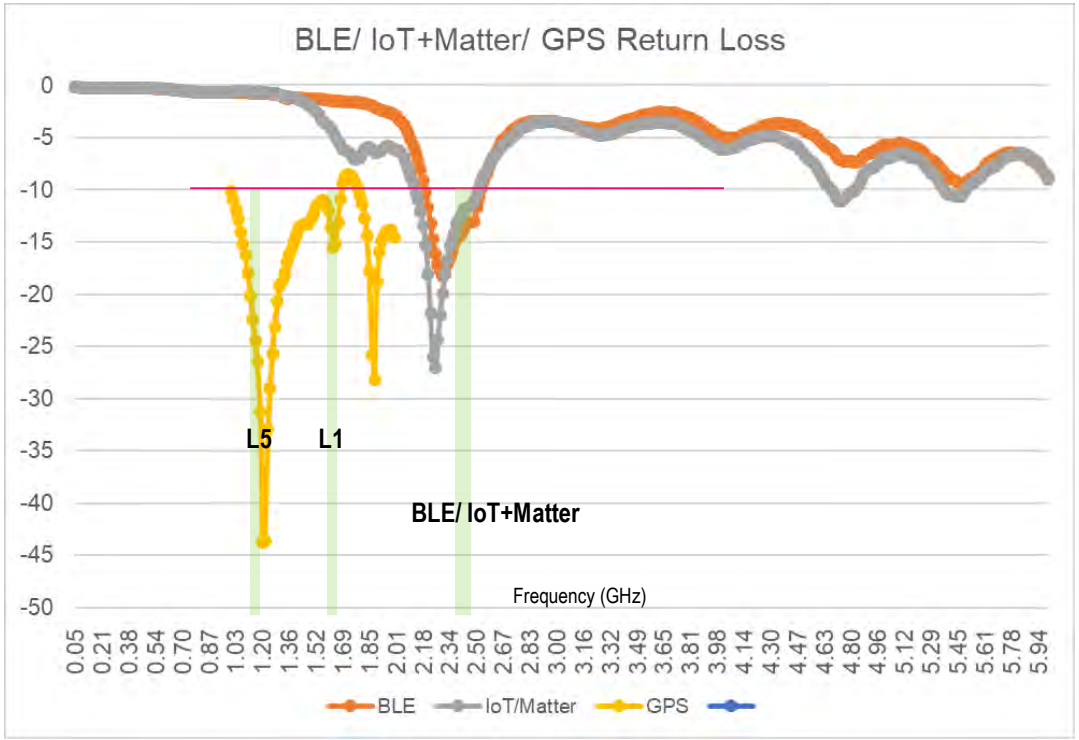
- *WiFi / 6G / 6G Rx/ 5G Rx*
  - *Antenna Return Loss of Ant1 ~4, Rx are less than -10dB in operating band*

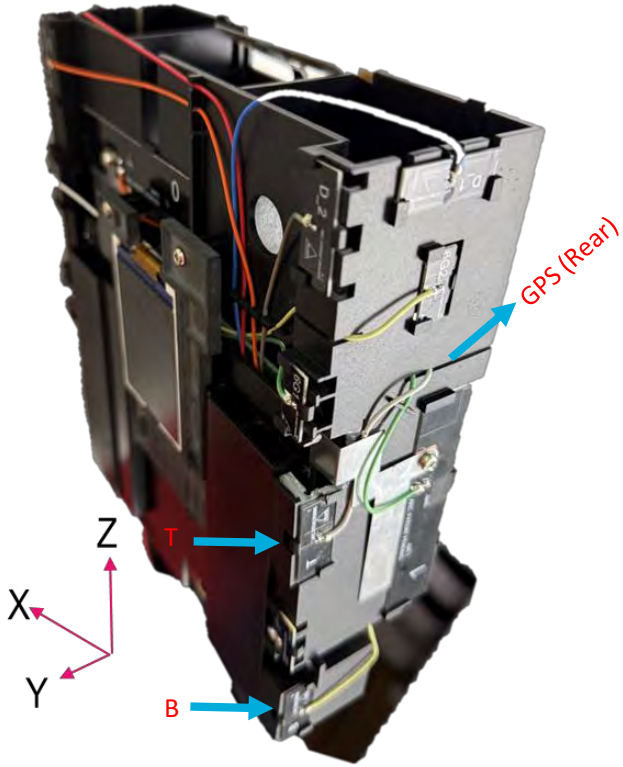




Antenna Return Loss of BLE/IoT+Matter & GPS

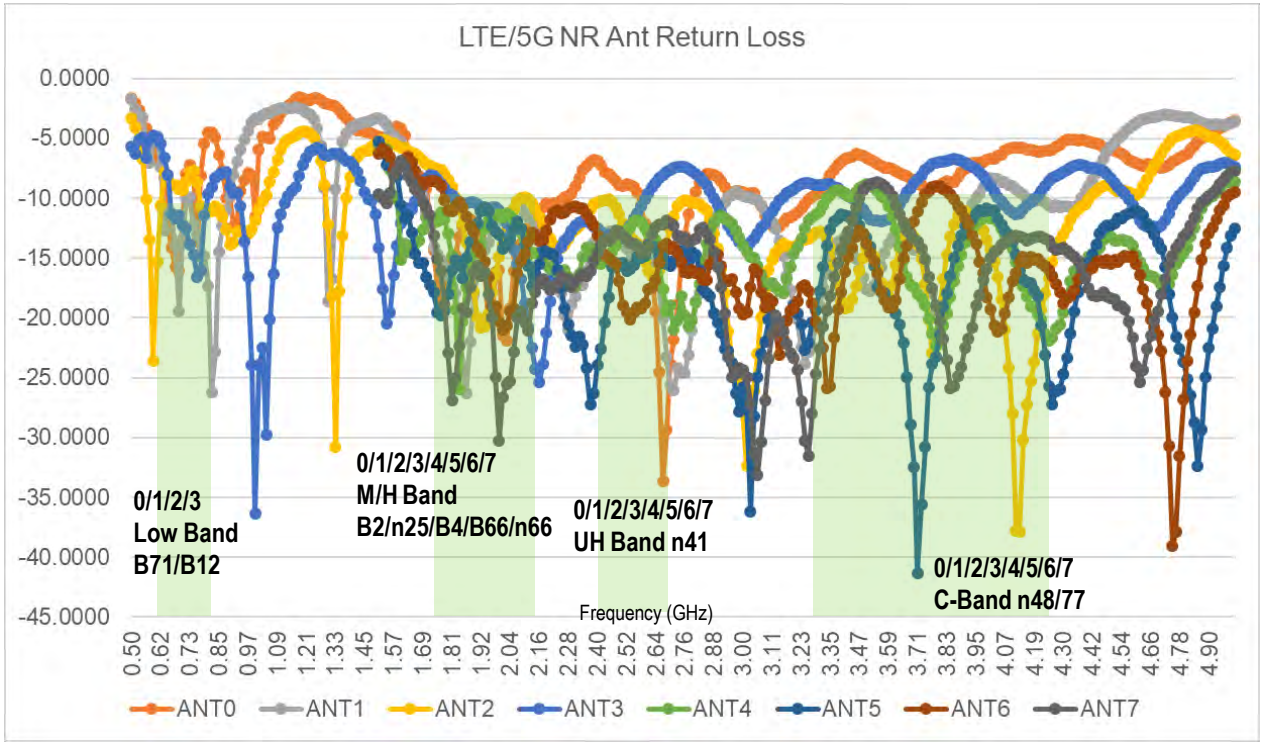
- *BLE/IoT+Matter & GPS*
  - *Antenna Return Loss of BLE/IoT+Matter &GPS*

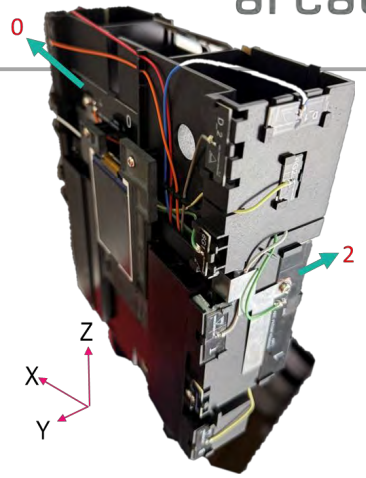


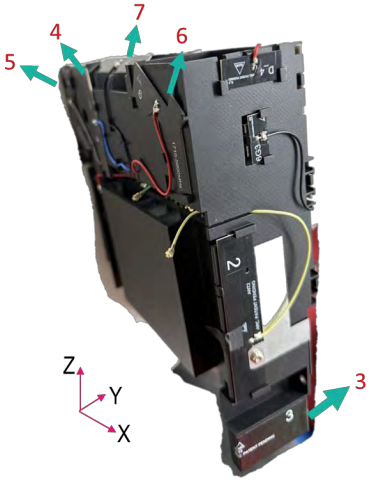


Antenna Return Loss of LTE/5G NR

- *LTE/5G NR*
  - *Antenna Return Loss of Ant 0/1/2/3/4/5/6/7*

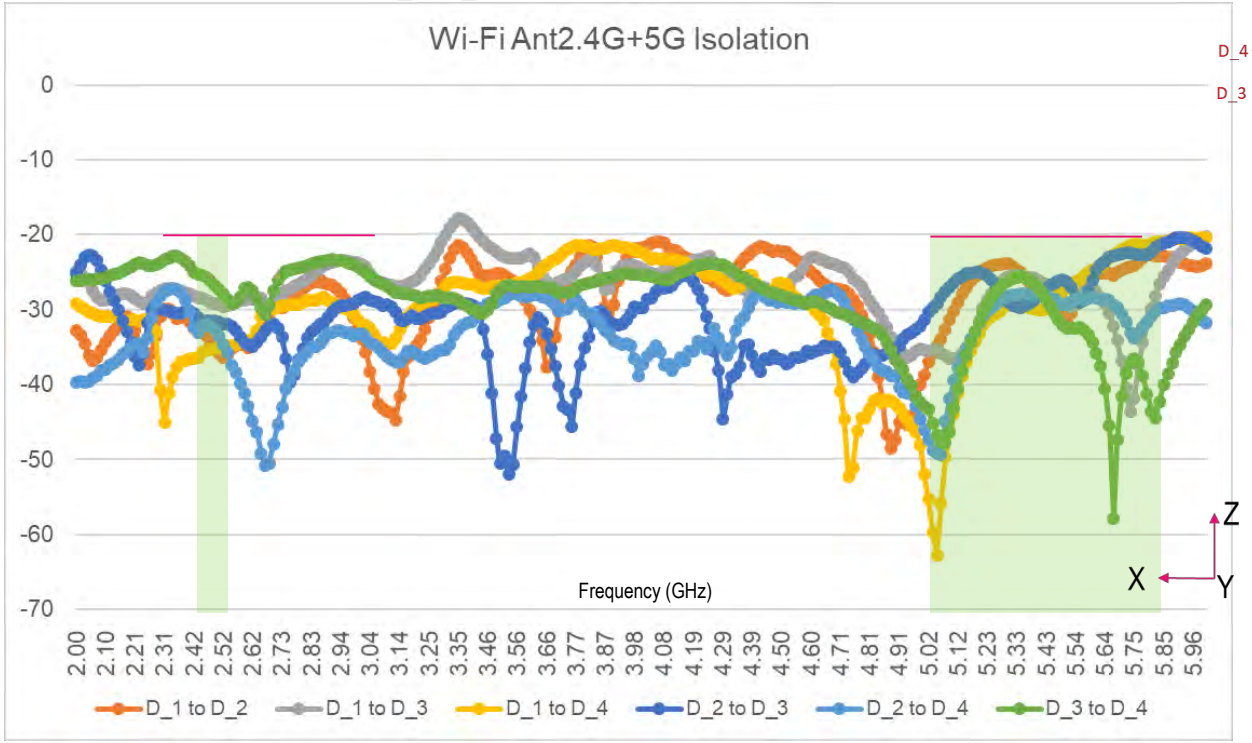


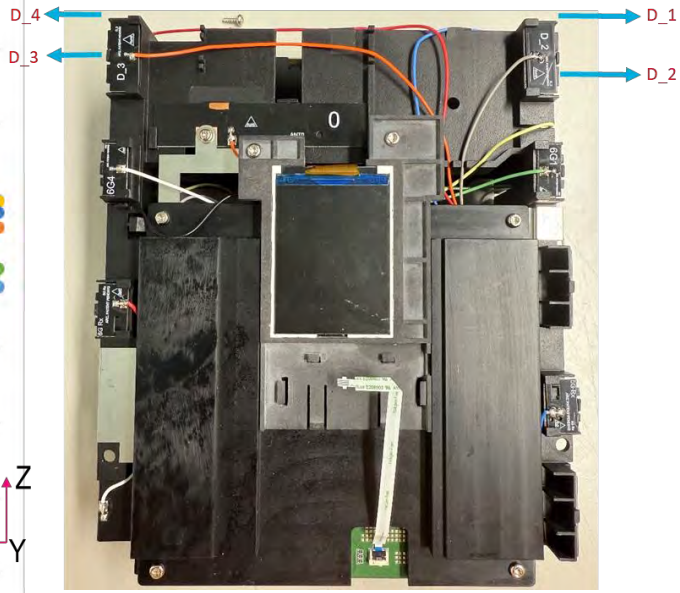




Antenna Isolation of WiFi 2.4G/5G to WiFi 2.4G/5G

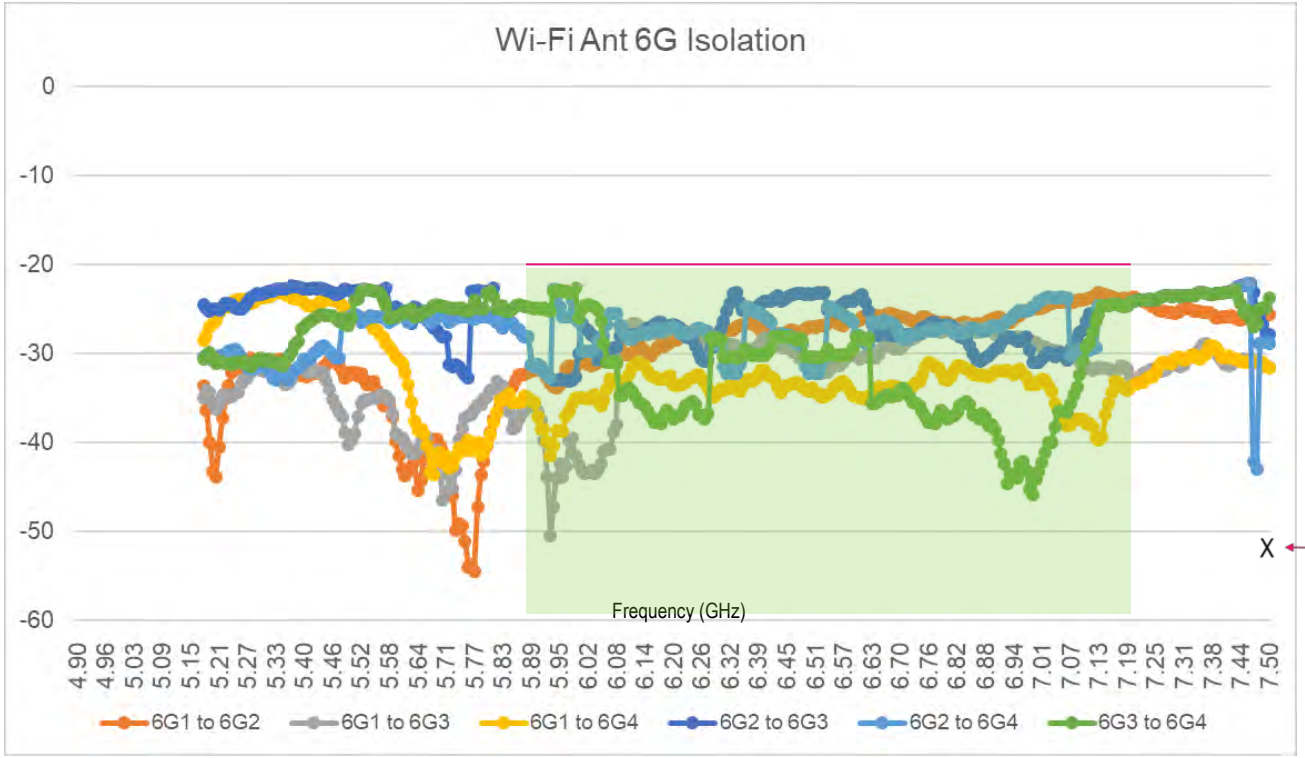
- *WiFi / 2.4G & 5G isolation*
  - *Antenna Isolation of D_1~D_4 are less than -20dB*

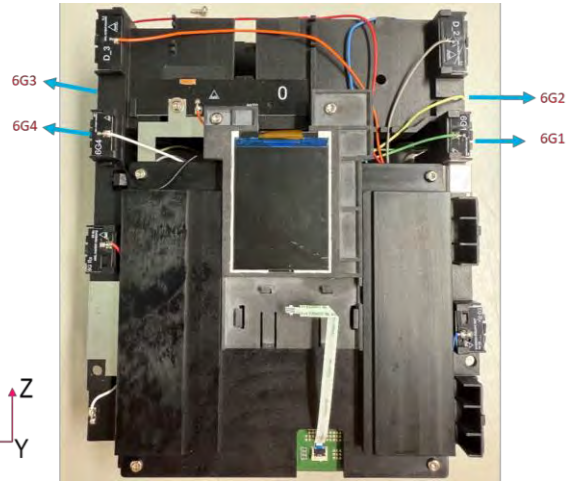




Antenna Isolation of WiFi 6G to WiFi 6G

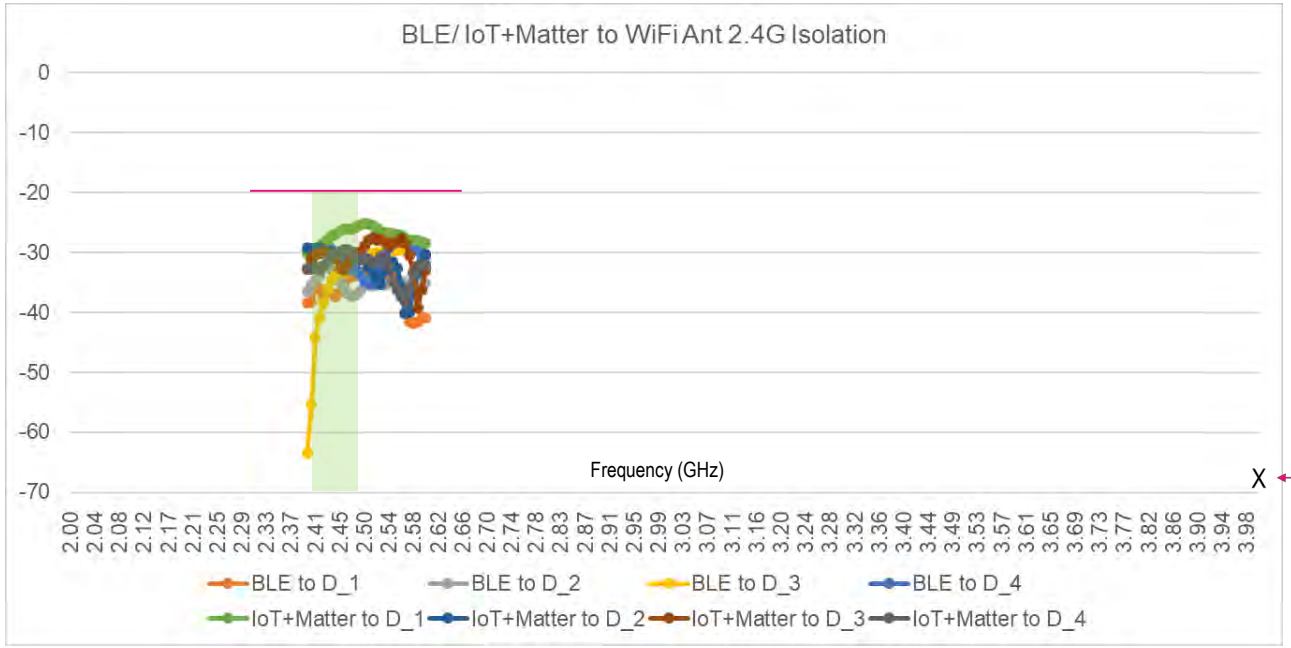
- *WiFi / 6G isolation*
  - *Antenna Isolation of 6G1~6G4 are less than -20dB*

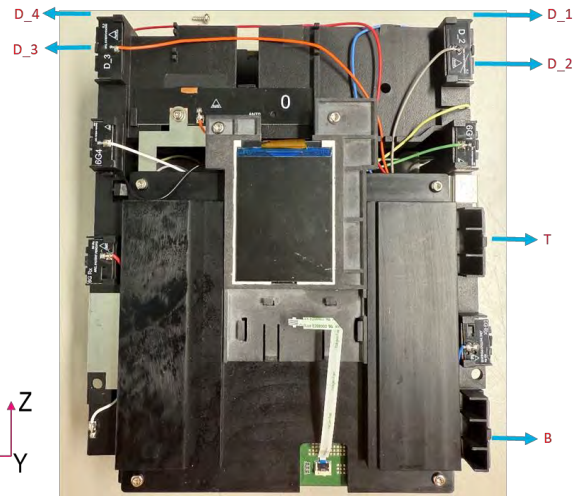




Antenna Isolation of BLE/ IoT+Matter to WiFi 2.4G

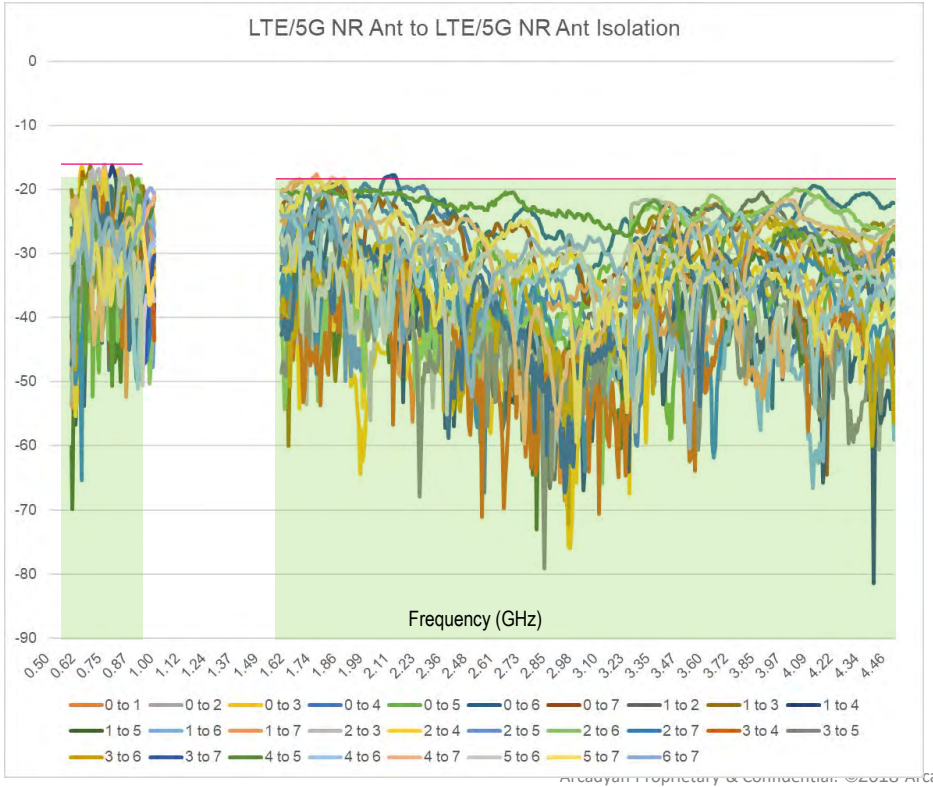
- *BLE/IoT+Matter to WiFi Isolation @ 2.4GHz*
  - *Antenna Isolation of BLE/ IoT+Matter to D_1~D_4 are less than -20dB @2.4G*

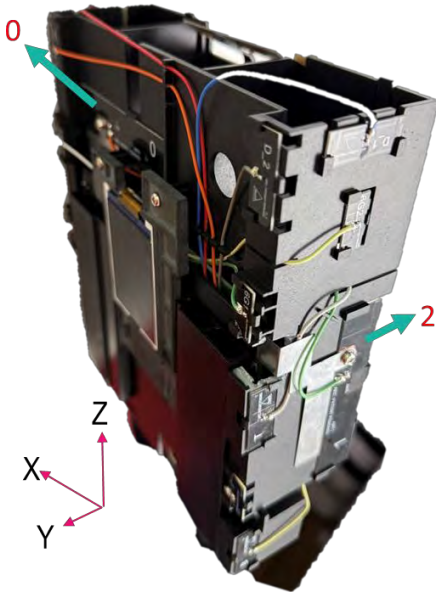


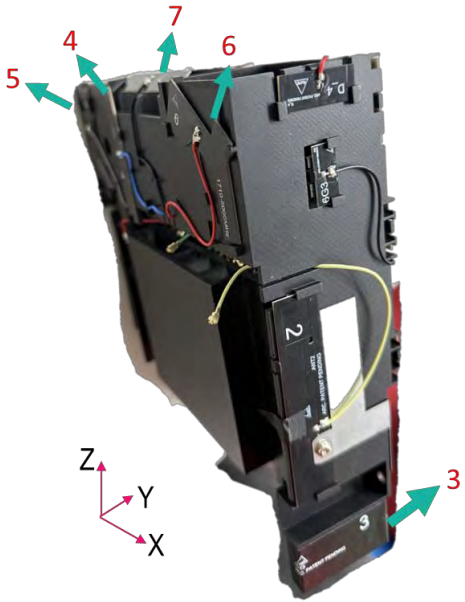


Antenna Isolation of LTE/5G NR to LTE/5G NR

- *LTE/5G NR*
  - *Antenna Isolation of Ant 0/1/2/3 low band are less than or around -18dB, Ant0/1/2/3/4/5/6/7 M/H/UH/C-band are less than -18dB even -20dB*

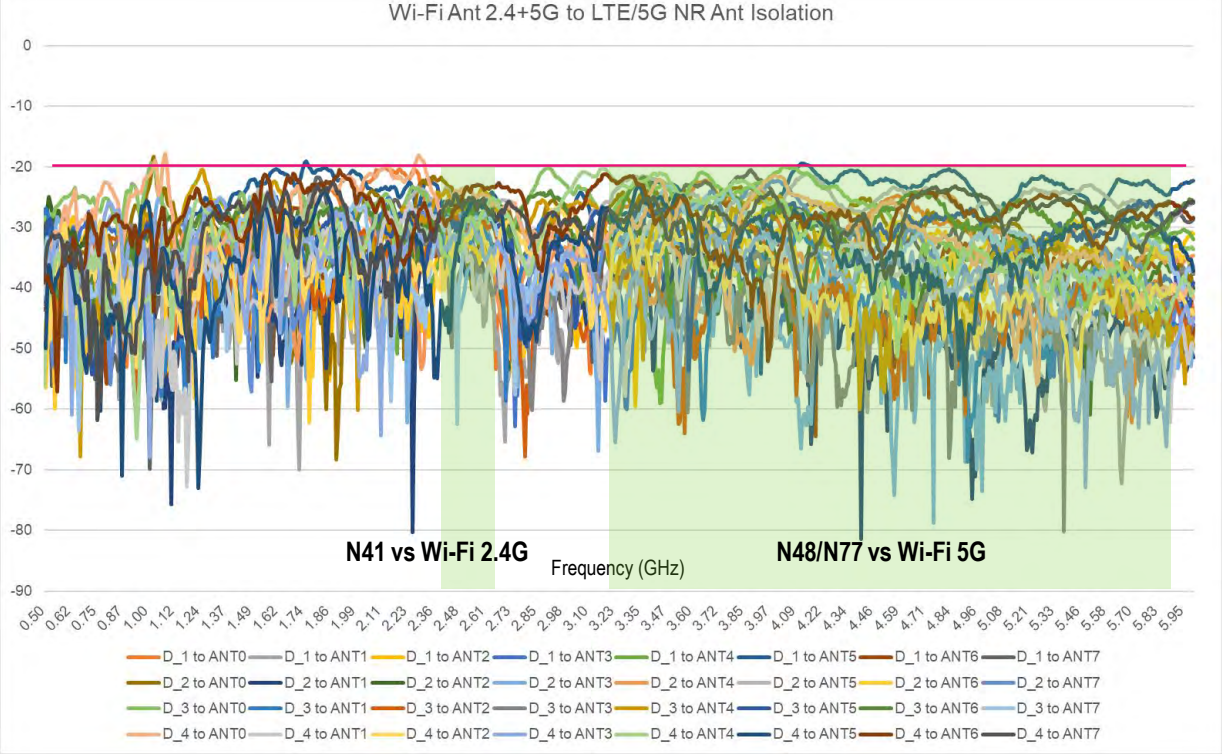






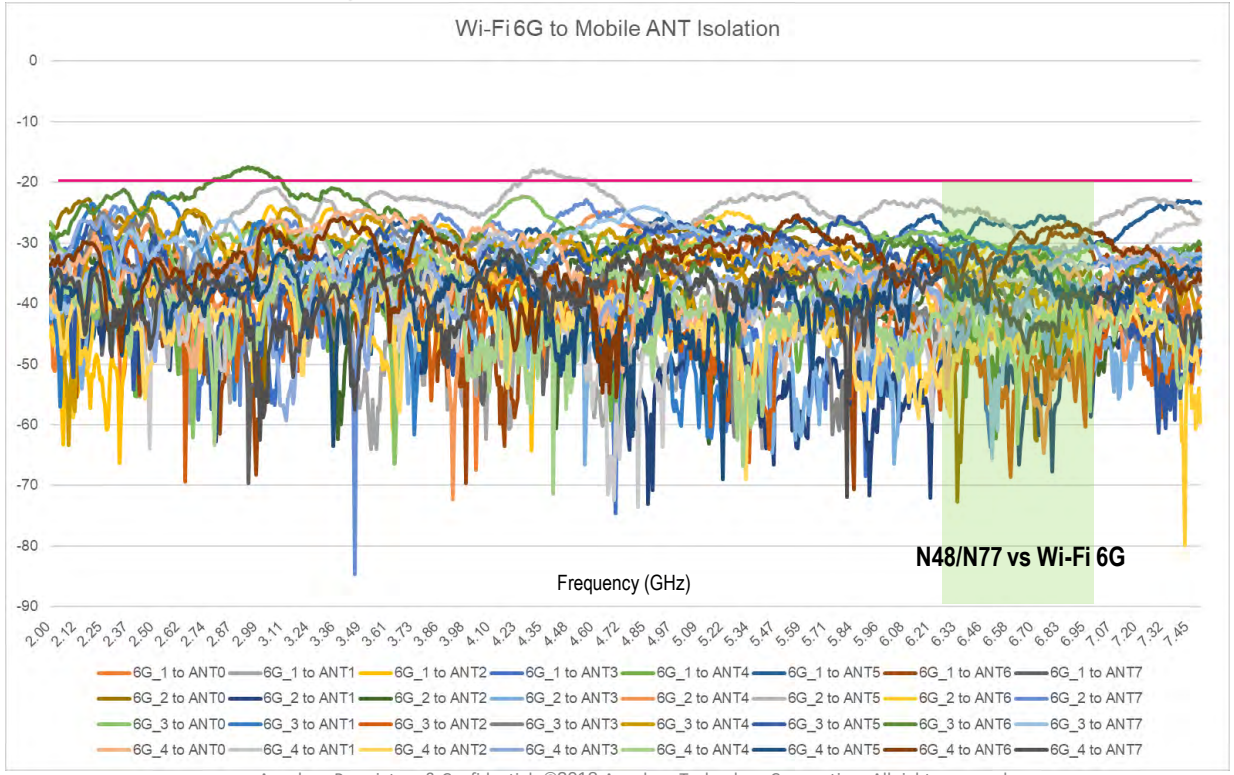
Antenna Isolation of LTE/5G NR to WiFi 2.4G/5G

- *LTE/5G NR to WiFi*
  - *Antenna Isolation of LTE/5G NR to WiFi 2.4G/5G, 2.4G Isolation are less than -25dB, 5G isolation are less than -20dB*



Antenna Isolation of LTE/5G NR to WiFi 6G

- *LTE/5G NR to WiFi*
  - *Antenna Isolation of LTE/5G NR to WiFi 6G, 6G Isolation are less than -25dB*



Antenna Efficiency of WiFi 2.4G/ 5G/ 5G Rx/ BLE/ IoT+Matter/ GPS

- *WiFi / 2.4G+5G*
  - *Antenna Efficiency Table of WiFi D_1~D_4*

WIFI Ant	2.4G (Effi./Peak Gain)			5G (Effi./Peak Gain)					
Frequency	2412	2442	2484	5150	5350	5550	5650	5850	MHz
D_1	67%/3.42	69%/3.43	70%/3.12	72%/3.21	71%/3.40	74%/3.12	71%/3.24	70%/3.67	
D_2	65%/3.05	68%/2.93	65%/3.51	70%/4.02	73%/3.78	71%/3.57	71%/2.70	75%/3.56	
D_3	72%/3.56	67%/3.67	65%/3.56	73%/4.08	70%/4.13	73%/4.51	72%/4.62	75%/4.23	
D_4	65%/3.46	69%/3.57	65%/3.12	70%/3.45	71%/3.45	70%/3.51	71%/3.52	75%/3.55	
5G Rx				72%/4.77	70%/4.65	74%/5.22	75%/5.21	73%/5.01	
BLE	62%/4.69	66%/4.93	67%/5.32						
IoT+Matter	60%/3.56	62%/2.65	63%/2.87						

- *GPS L1+L5*
  - *Antenna Efficiency Table of GPS*

GPS Ant	L1+L5	
Frequency	1176MHz	1575.42MHz
GPS	47%/2.07	52%/3.81

Antenna Efficiency of WiFi 6G/ 6G Rx

- *WiFi / 6G / 6G Rx*
  - *Antenna Efficiency Table of WiFi 6G1~6G4/ 6G Rx*

	6G (Effi./ PeakGain)								
Frequency	6175		6475		6700		7000		MHz
6G.1	66%	4.17	67%	4.06	68%	4.09	69%	4.07	
6G.2	67%	3.90	70%	4.23	72%	4.12	72%	4.12	
6G.3	70%	3.89	67%	4.19	70%	4.05	71%	4.21	
6G.4	68%	4.39	69%	4.35	71%	4.08	74%	4.13	
6G Rx	70%	4.57	66%	5.01	72%	5.08	74%	4.99	

Antenna Efficiency of LTE/5G NR-Low Band

- LTE/5G NR Low Band: 71/12/5
  - Antenna **0** Efficiency & Peak Gain Table

Frequency (MHz)	n71	B12	B5
Efficiency (dB)	-2.30231	-1.90076	-2.31630
Efficiency (%)	58.8531	64.5541	58.6637
Gain (dBi)	1.89643	2.45596	2.05542
Min. Gain	1.29065	2.16498	2.00453

- LTE/5G NR Low Band: 71/12/5
  - Antenna **1** Efficiency & Peak Gain Table

Frequency (MHz)	n71	B12	B5
Efficiency (dB)	-1.91141	-2.90143	-2.97206
Efficiency (%)	64.3959	51.2692	50.4421
Gain (dBi)	3.54431	1.54991	1.67732
Min. Gain	3.34251	1.24457	1.45521

- LTE/5G NR Low Band: 71/12/5
  - Antenna **2** Efficiency & Peak Gain Table

Frequency (MHz)	n71	B12	B5
Efficiency (dB)	-1.98292	-2.30926	-2.69439
Efficiency (%)	63.3444	58.759	53.7725
Gain (dBi)	2.15727	2.35794	2.13586
Min. Gain	2.13666	2.04578	2.05243

- LTE/5G NR Low Band: 71/12/5
  - Antenna **3** Efficiency & Peak Gain Table

Frequency (MHz)	n71	B12	B5
Efficiency (dB)	-2.23263	-2.16542	-2.5467
Efficiency (%)	59.8049	60.7376	55.6321
Gain (dBi)	2.86946	2.0838	1.7854
Min. Gain	2.67785	1.76742	1.6994

Antenna Efficiency of LTE/5G NR-M/H/UH/C-Band

- LTE/5G NR M/H/UH Band: 2/25/4/66/41/48/n77
  - Antenna **0** Efficiency & Peak Gain Table

Frequency (MHz)	B2/n25	B4/B66 (n66)	n41	n48	n77
Efficiency (dB)	-1.41966	-2.2018	-2.23233	-1.72843	-1.72843
Efficiency (%)	72.1164	60.231	59.809	67.1671	67.1671
Gain (dBi)	0.94500	1.01854	3.92999	3.78784	3.78784
Min. Gain	0.91341	0.85457	3.25773	3.44422	3.44422

- LTE/5G NR M/H/UH Band: 2/25/4/66/41/48/n77
  - Antenna **1** Efficiency & Peak Gain Table

Frequency (MHz)	B2/n25	B4/B66 (n66)	n41	n48	n77
Efficiency (dB)	-1.4649	-1.4816	-1.21478	-1.28477	-1.28477
Efficiency (%)	71.369	71.0951	75.6001	74.3914	74.3914
Gain (dBi)	1.08349	0.94521	1.03624	0.99626	0.79462
Min. Gain	1.06363	0.87833	1.03523	0.85361	0.75743

- LTE/5G NR M/H/UH Band: 2/25/4/66/41/48/n77
  - Antenna **2** Efficiency & Peak Gain Table

Frequency (MHz)	B2/n25	B4/B66 (n66)	n41	n48	n77
Efficiency (dB)	-1.19394	-1.70304	-1.52243	-1.84238	-1.84238
Efficiency (%)	75.9637	67.5611	70.4299	65.4278	65.4278
Gain (dBi)	5.12694	4.50754	1.04731	0.72136	0.96136
Min. Gain	4.56447	4.11134	1.01378	0.70525	0.83524

- LTE/5G NR M/H/UH Band: 2/25/4/66/41/48/n77
  - Antenna **3** Efficiency & Peak Gain Table

Frequency (MHz)	B2/n25	B4/B66 (n66)	n41	n48	n77
Efficiency (dB)	-1.78135	-2.28796	-1.92189	-1.63688	-1.63688
Efficiency (%)	66.3537	59.0478	64.2408	68.5981	68.5981
Gain (dBi)	1.63026	4.69995	2.04043	4.16167	4.16167
Min. Gain	1.43786	4.27964	2.00235	3.96315	3.96315

Antenna Efficiency of LTE/5G NR-M/H/UH/C-Band

- LTE/5G NR M/H/UH Band: 2/25/4/66/41/48/n77
  - Antenna **4** Efficiency & Peak Gain Table

Frequency (MHz)	B2/n25	B4/B66 (n66)	n41	n48	n77
Efficiency (dB)	-1.85705	-1.34312	-1.58924	-1.52987	-1.52987
Efficiency (%)	65.2071	73.3987	69.3547	70.3093	70.3093
Gain (dBi)	4.65511	3.77441	3.45002	4.31759	4.31759
Min. Gain	4.25231	3.52361	3.16235	4.04234	4.14252

- LTE/5G NR M/H/UH Band: 2/25/4/66/41/48/n77
  - Antenna **5** Efficiency & Peak Gain Table

Frequency (MHz)	B2/n25	B4/B66 (n66)	n41	n48	n77
Efficiency (dB)	-1.47366	-1.43373	-1.14145	-1.15955	-1.15955
Efficiency (%)	71.2253	71.8831	76.8875	76.5676	76.5676
Gain (dBi)	3.9501	5.3477	4.88667	3.4995	3.4995
Min. Gain	3.33451	5.04423	4.36836	3.16273	3.21637

- LTE/5G NR M/H/UH Band: 2/25/4/66/41/48/n77
  - Antenna **6** Efficiency & Peak Gain Table

Frequency (MHz)	B2/n25	B4/B66 (n66)	n41	n48	n77
Efficiency (dB)	-1.22581	-1.3677	-1.01565	-1.74392	-1.74392
Efficiency (%)	75.4082	72.9843	79.147	66.928	66.928
Gain (dBi)	5.86704	4.39714	4.76001	3.43739	3.43739
Min. Gain	5.62352	4.03525	4.36278	3.13524	3.26231

- LTE/5G NR M/H/UH Band: 2/25/4/66/41/48/n77
  - Antenna **7** Efficiency & Peak Gain Table

Frequency (MHz)	B2/n25	B4/B66 (n66)	n41	n48	n77
Efficiency (dB)	-1.05428	-1.69728	-1.28781	-1.32726	-1.32726
Efficiency (%)	78.4461	67.6507	74.3394	73.6671	73.6671
Gain (dBi)	4.78578	4.61531	5.64368	3.8762	3.8762
Min. Gain	4.23571	4.52171	5.35621	3.23773	3.16346

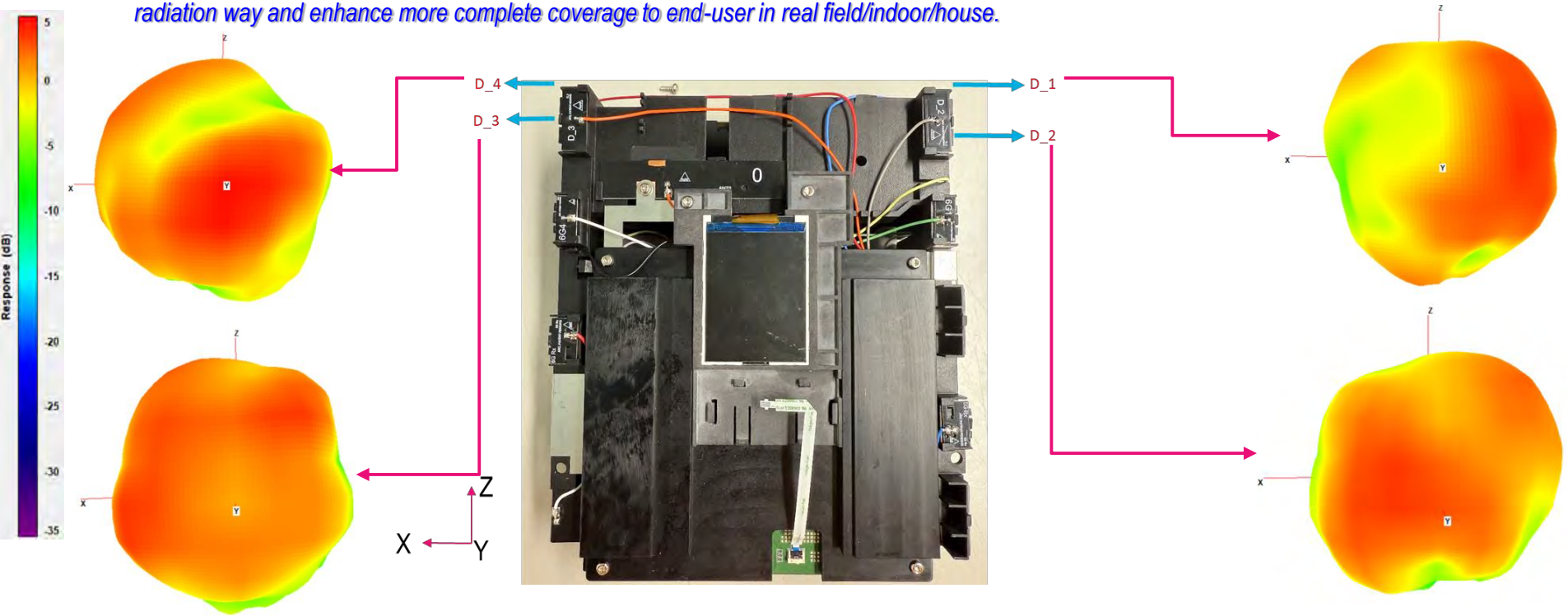
ECC for LTE/NR Band & Wi-Fi 2.4G/5G/6G

- *ECC*

ECC / ANT	
Wi-Fi 2.4G	0.16
Wi-Fi 5G	0.09
Wi-Fi 6G	0.07
Band 4/66	0.12
Band 12	0.28
Band 2/25	0.13
Band 71	0.34
NR41	0.10
NR48	0.11
NR77	0.11

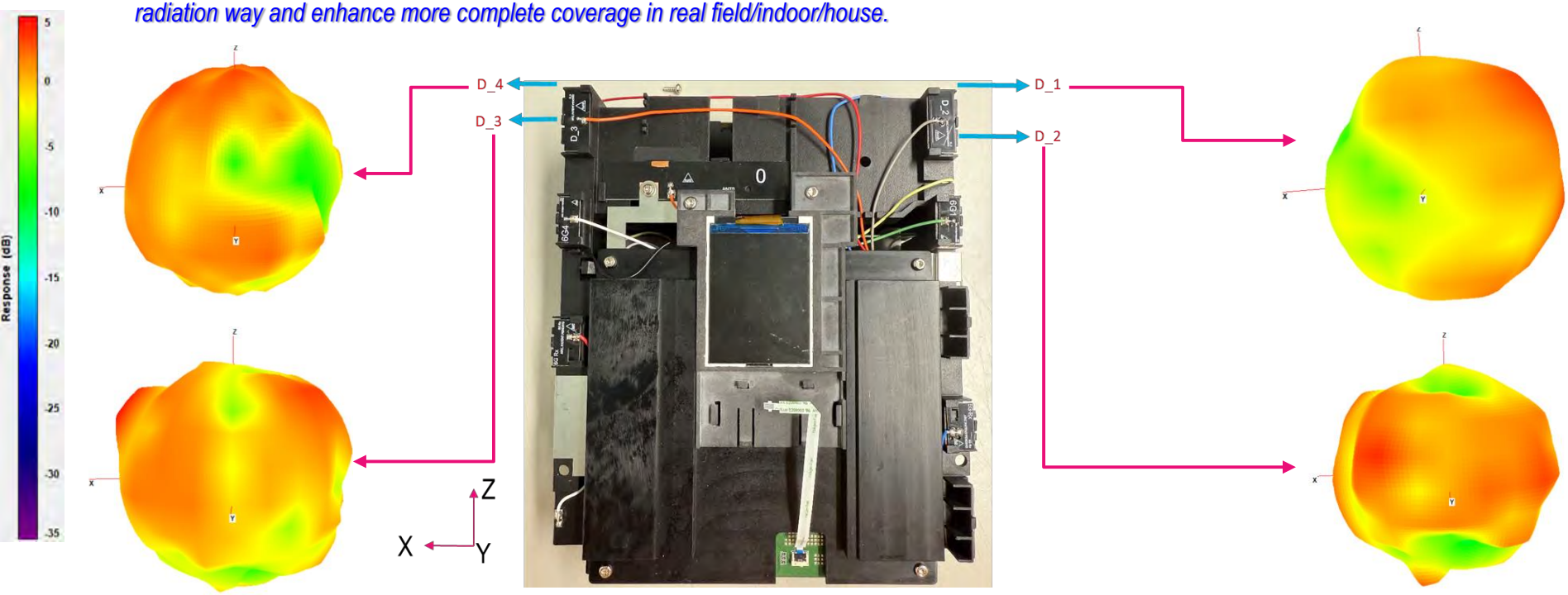
Antenna Radiation of WiFi 2.4G

- *WiFi/ 2.4G*
  - *Antenna Radiation of WiFi 2.4G, four dual band antennas provide 2 vertical +2 horizontal polarization and place the top of device to generate different radiation way and enhance more complete coverage to end-user in real field/indoor/house.*



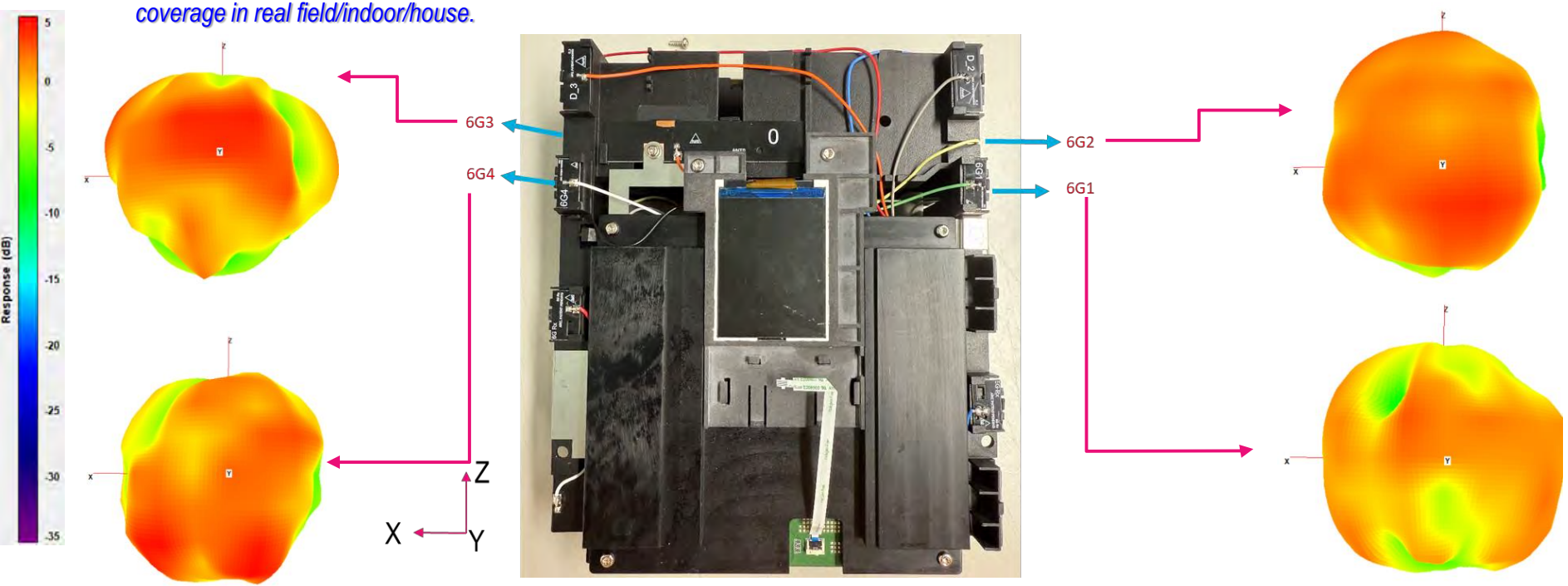
Antenna Radiation of WiFi 5G

- *WiFi/ 5G*
  - *Antenna Radiation of WiFi 5G, four dual band antennas provide 2 vertical +2 horizontal polarization and place the top of device to generate different radiation way and enhance more complete coverage in real field/indoor/house.*



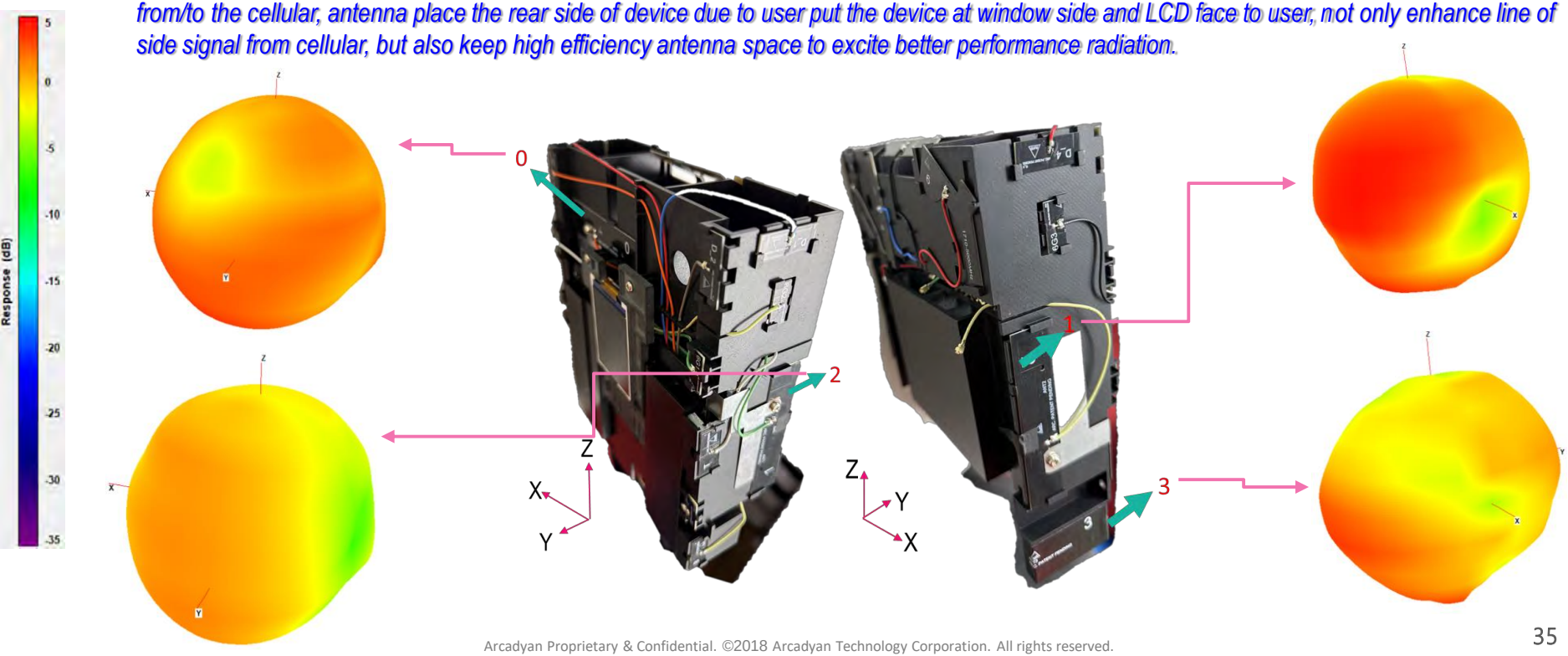
Antenna Radiation of WiFi 6G

- *WiFi/ 6G*
  - *Antenna Radiation of WiFi 6G, four dual band antennas provide 4 vertical polarization and place the top of device to generate best complete coverage in real field/indoor/house.*



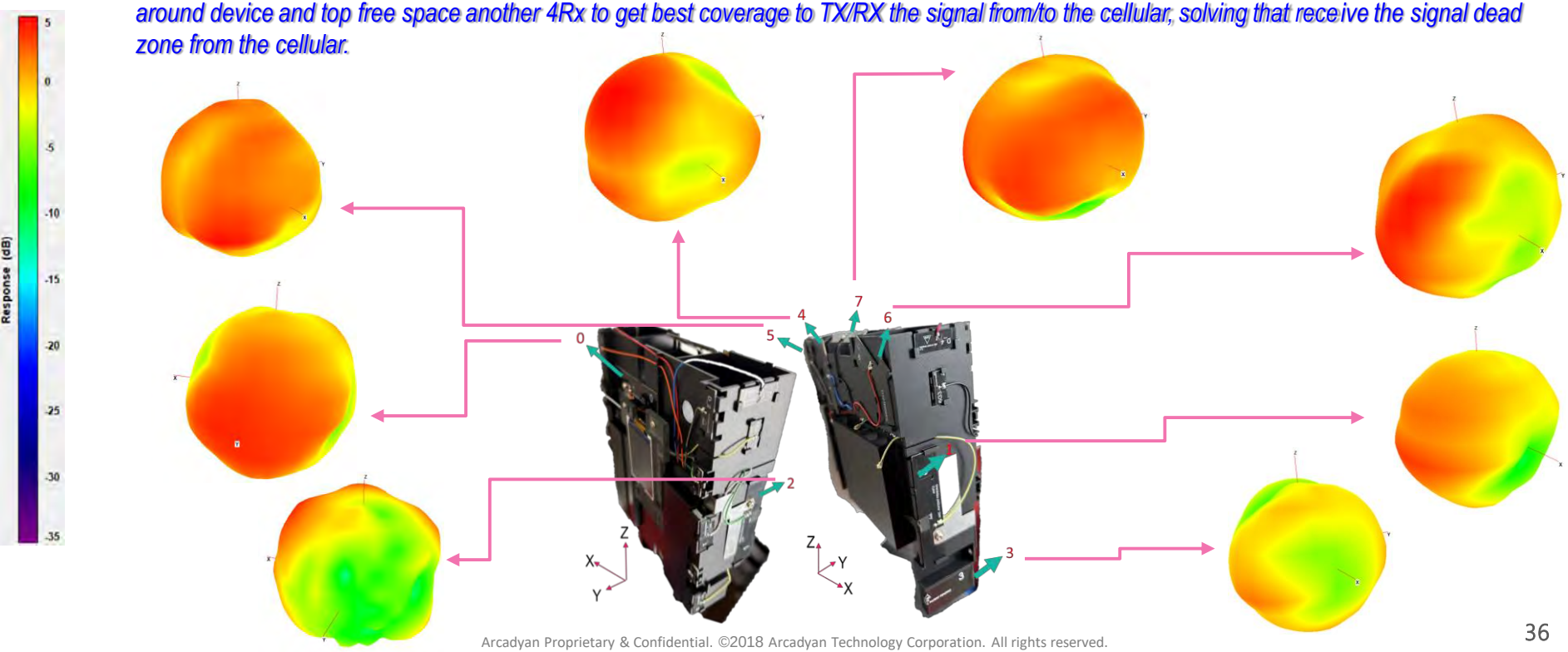
Antenna Radiation of LTE/5G NR

- *LTE/5G NR Low Band*
  - *Antenna Radiation of LTE/5G NR Low Band, B71/12 4x4 antenna provide Omni-direction radiation to get better coverage to TX/RX the signal from/to the cellular, antenna place the rear side of device due to user put the device at window side and LCD face to user, not only enhance line of side signal from cellular, but also keep high efficiency antenna space to excite better performance radiation.*



Antenna Radiation of LTE/5G NR

- *LTE/5G NR M/H Band*
  - *Antenna Radiation of LTE/5G NR B2(n25)/B4/B66(n66) band, 8x8 mid & high band antenna provide Omni-direction radiation and place four side around device and top free space another 4Rx to get best coverage to TX/RX the signal from/to the cellular, solving that receive the signal dead zone from the cellular.*



Antenna Radiation of LTE/5G NR

- *LTE/5G NR UH/C Band*
  - *Antenna Radiation of LTE/5G NR n41/n48/n77, 8x8 antenna provide* **Omni***-direction radiation and all place top/left/right side of device, wifi2G overlap the n41, antenna concern the isolation between 2G band, antenna placement with different polarization and keep more distance away from wifi2G, balance 2G radio performance.*