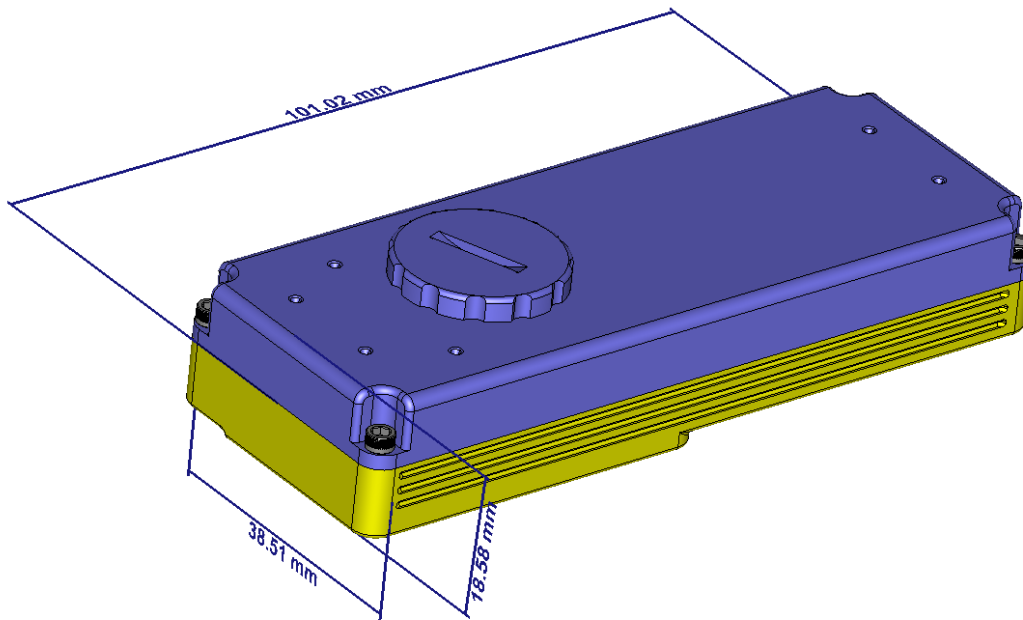


5G Mi-Fi

LDS Antenna Specification

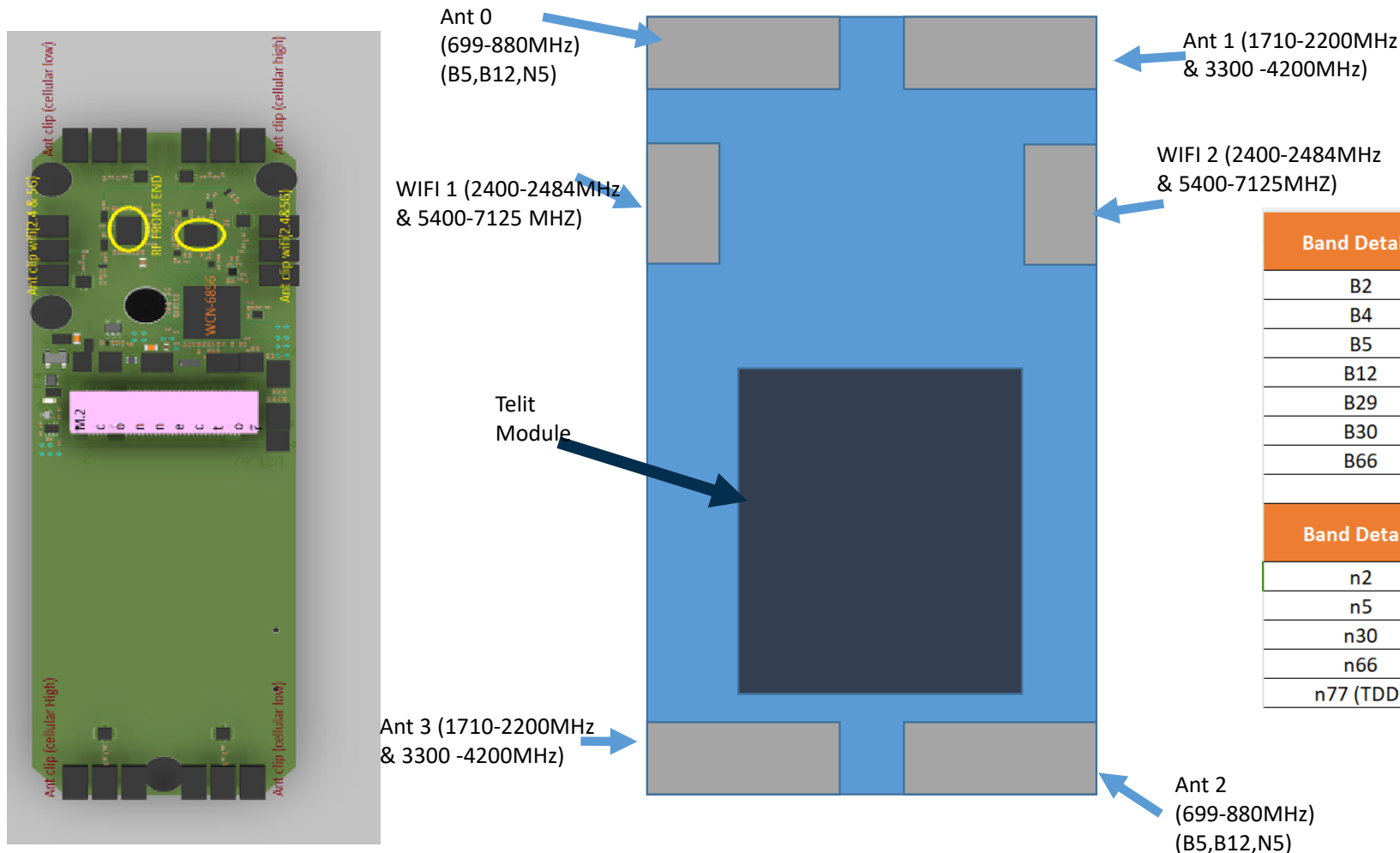
- Antenna Location & Pattern
 - Antenna Return loss, Gain & 3D Plots
-

Simulation Model



- o The latest model is used for the simulation shared by customer .
- o The Total size of device is 101 x 38.5 x 18.58mm
- o ABS Plastic is used for enclosure having permittivity 2.84 and loss tangent 0.005 is used.
- o Antennas are designed Based on LDS Technology.
- o The Materials are assigned as below
 - o PCB : Copper
 - o Enclosure : ABS plastic
 - o Components : Steel
 - o Antenna clearance : Fr4

Antenna Architecture

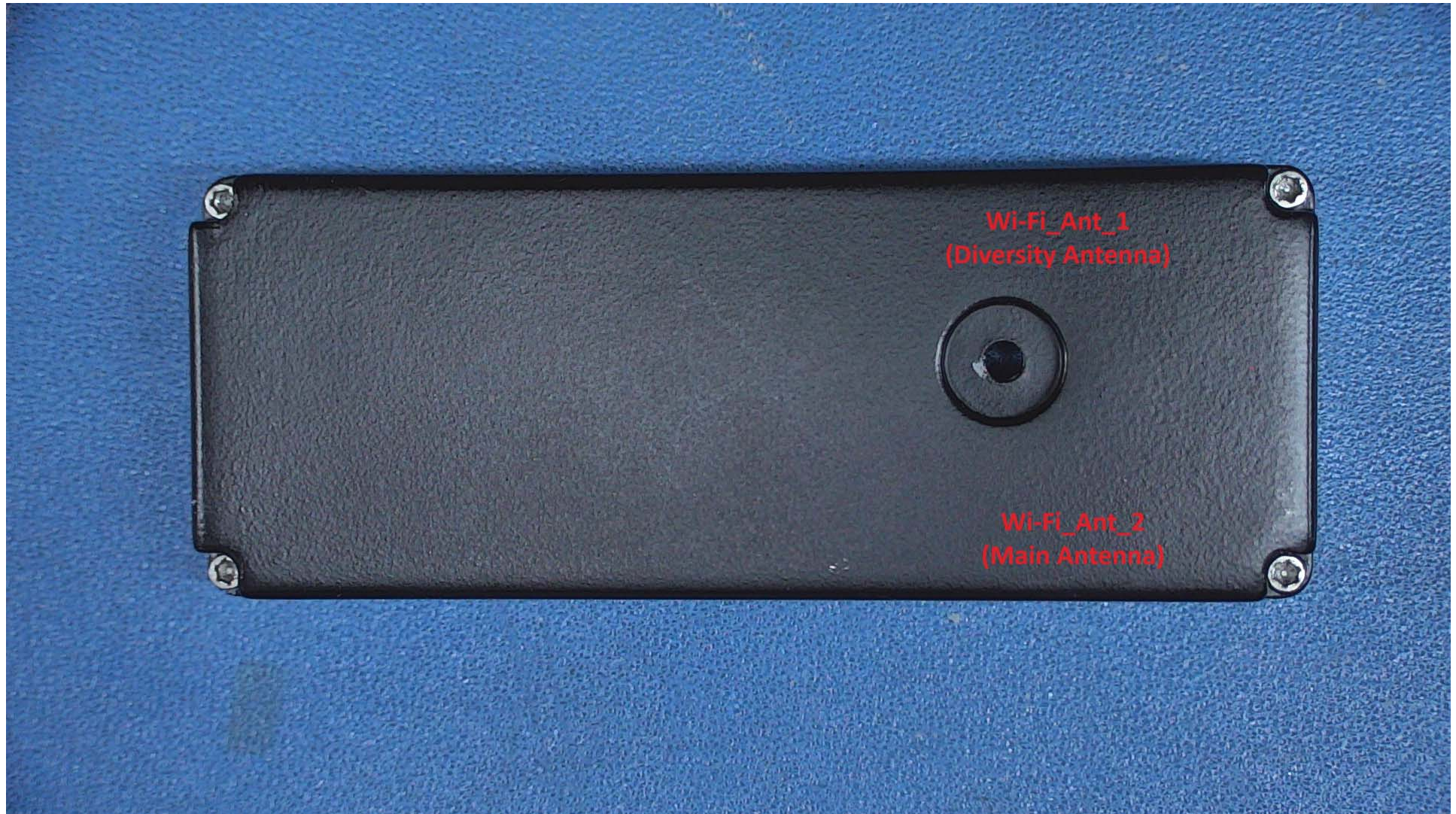


Band Details	Uplink Freq (MHz)	Downlink Freq (MHz)
B2	1850-1910	1930-1990
B4	1710-1755	2110-2155
B5	824-849	869-894
B12	699-716	729-746
B29	NA	717-728
B30	2305-2315	2350-2360
B66	1710-1780	2110-2200
Band Details	Uplink Freq (MHz)	Downlink Freq (MHz)
n2	1850-1910	1930-1990
n5	824-849	869-894
n30	2305-2315	2350-2360
n66	1710-1780	2110-2200
n77 (TDD)	3300-4200	3300-4200

Note:1 Wi-Fi Antenna 2 is primary & Wi-Fi Ant 1 is directivity Antenna.

Note:2 Cellular Antenna 0 PRx/Tx0 & Antenna 2 is DRx(Directivity)

Antenna Specifications



Antenna Specifications table

For Wi-Fi Antenna: We have two Antennas i.e., Primary & Diversity Antenna (details are in PPT)

For Cellular Antenna : We have 4 Antennas. Ant 0 is primary (PRx/Tx) and Ant 2 is Diversity (DRx) & other two supports MIMO & different config.

Below mention table will give more clarity.

BANDS	Antenna 0	Antenna 1	Antenna 2	Antenna 3
LTE FDD B2	PRx/Tx0	MIMO1	DRx/Tx1	MIMO2
LTE FDD B4	PRx/Tx0	MIMO1	DRx/Tx1	MIMO2
LTE FDD B5	PRx/Tx0	NA	DRx	NA
LTE FDD B12	PRx/Tx0	NA	DRx	NA
LTE FDD B29 (DL only)	PRx	NA	DRx	NA
LTE FDD B30	PRx/Tx0	MIMO1	DRx	MIMO2
LTE FDD B66	PRx/Tx0	MIMO1	DRx/Tx1	MIMO2
NR FDD n2	PRx/Tx0	MIMO1	DRx/Tx1	MIMO2
NR FDD n5	PRx/Tx0	NA	DRx	NA
NR FDD n30	PRx/Tx0	MIMO1	DRx	MIMO2
NR FDD n66	PRx/Tx0	MIMO1	DRx/Tx1	MIMO2
NR TDD n77	DRx	MIMO2/Tx1	MIMO1	PRx/Tx0

Power class and Frequency Bands(3GPP spec)

Power class mentioned below as per Telit Module

TX power follows the measurement conditions and specifications defined in 3GPP.

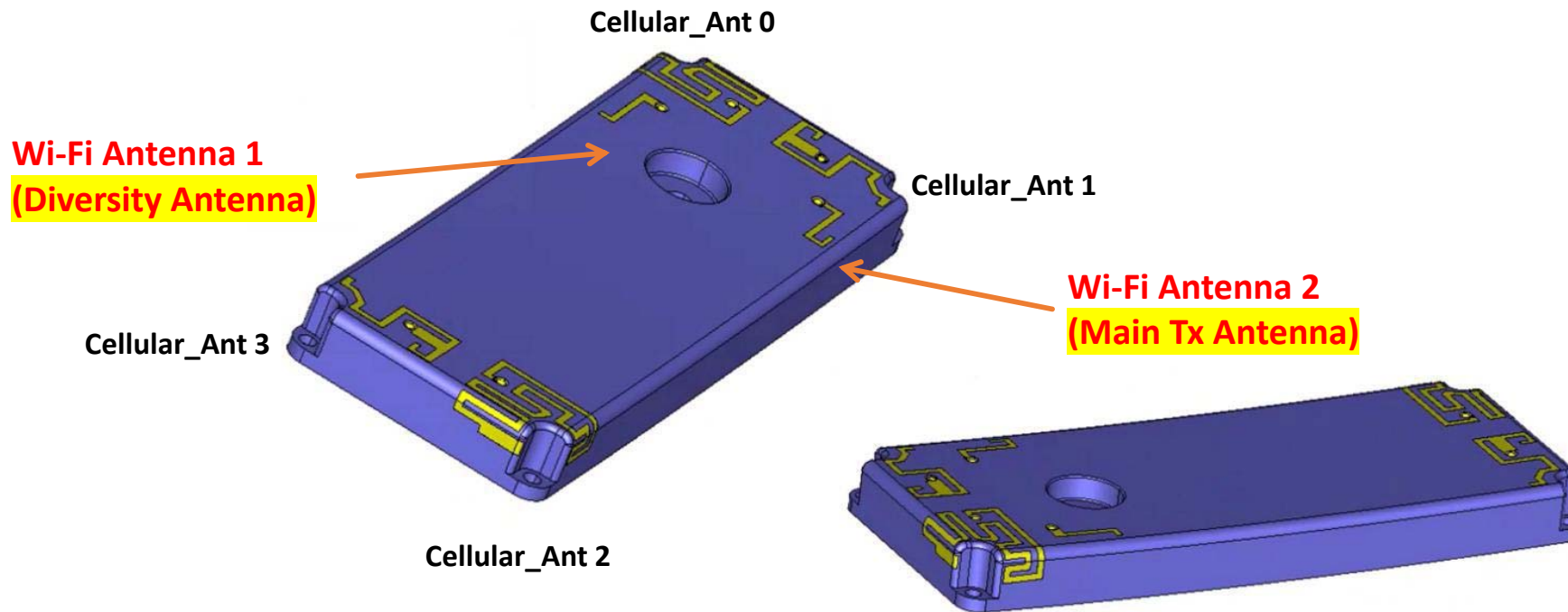
Band	Power class	RF Power (dBm)
5G NR Sub-6 n1, n2, n3, n5, n7, n8, n20, n25, n28, n30, n38, n40, n41, n48, n66, n71, n77, n78, n79	3 (0.2W)	23 (+2dB / -2dB)
5G NR Sub-6 n41, n77, n78, n79 Supports Power Class 2	2 (0.4W)	26 (+2dB / -2dB)

Bands and UL/DL freq mentioned below as per AT&T

5G Band	Uplink Freq (MHz)	Downlink Freq (MHz)	Ant 0	Ant 1	Ant 2	Ant 3
n2	1850-1910	1930-1990	Y	Y	Y	Y
n5	824-849	869-894	Y	N	Y	N
n30	2305-2315	2350-2360	Y	Y	Y	Y
n66	1710-1780	2110-2200	Y	Y	Y	Y
n77 (TTD)	3300-4200	3300-4200	Y	Y	Y	Y

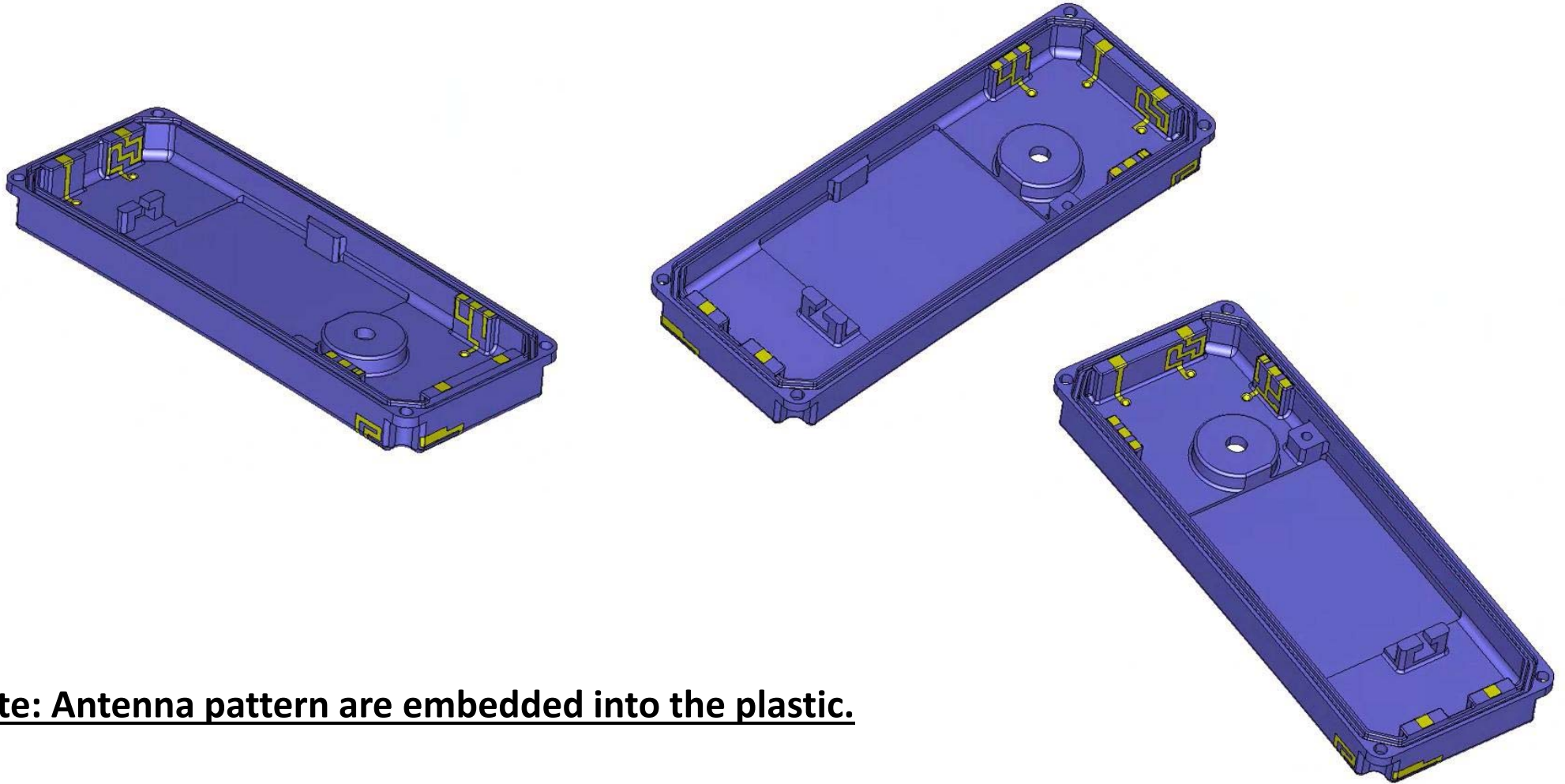
LTE			Ant 0	Ant 1	Ant 2	Ant 3
B2	1850-1910	1930-1990	Y	Y	Y	Y
B4	1710-1755	2110-2155	Y	Y	Y	Y
B5	824-849	869-894	Y	N	Y	N
B12	699-716	729-746	Y	N	Y	N
B29	NA	717-728	Y	N	Y	N
B30	2305-2315	2350-2360	Y	Y	Y	Y
B66	1710-1780	2110-2200	Y	Y	Y	Y

Antenna Pattern (Top View)



Note: Antenna pattern are embedded into the plastic.

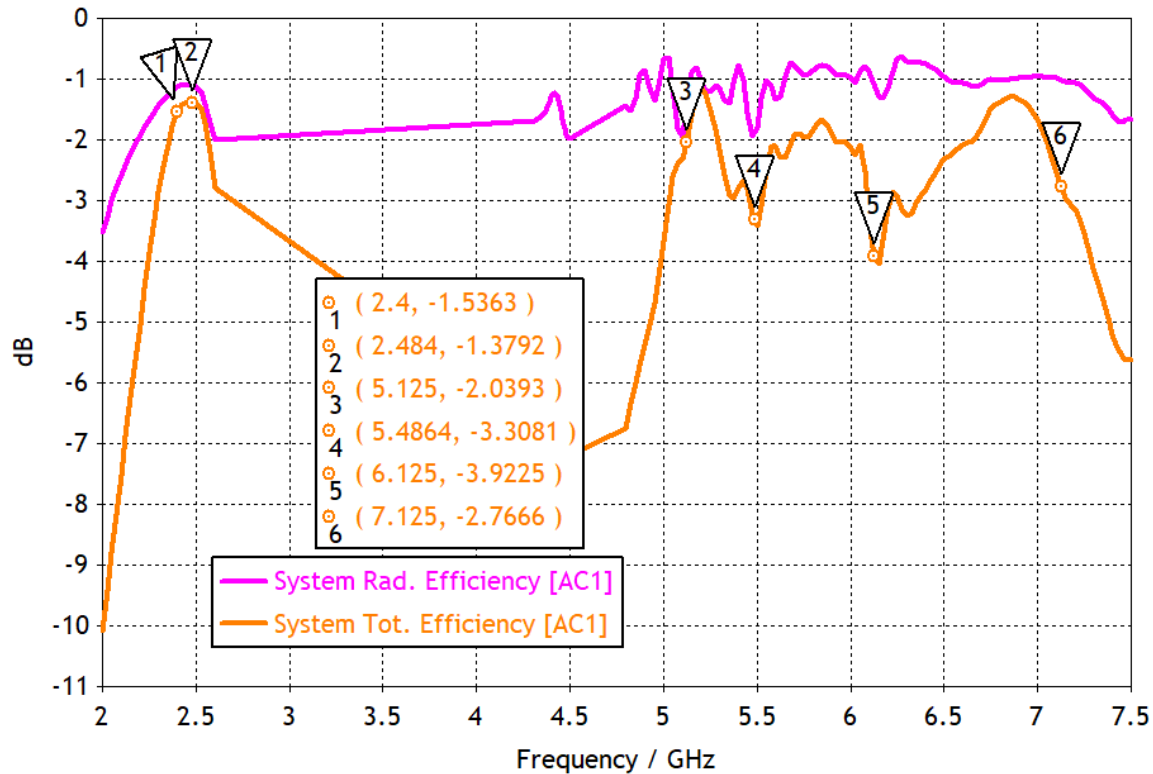
Antenna Pattern (Inside View)



Note: Antenna pattern are embedded into the plastic.

Wi-Fi -1 Efficiency

1D Results\Efficiencies [Magnitude in dB]



o The Wi-Fi 1 antenna has Radiation efficiency above:

-2 dB for frequency band of 2400 - 2484 MHz

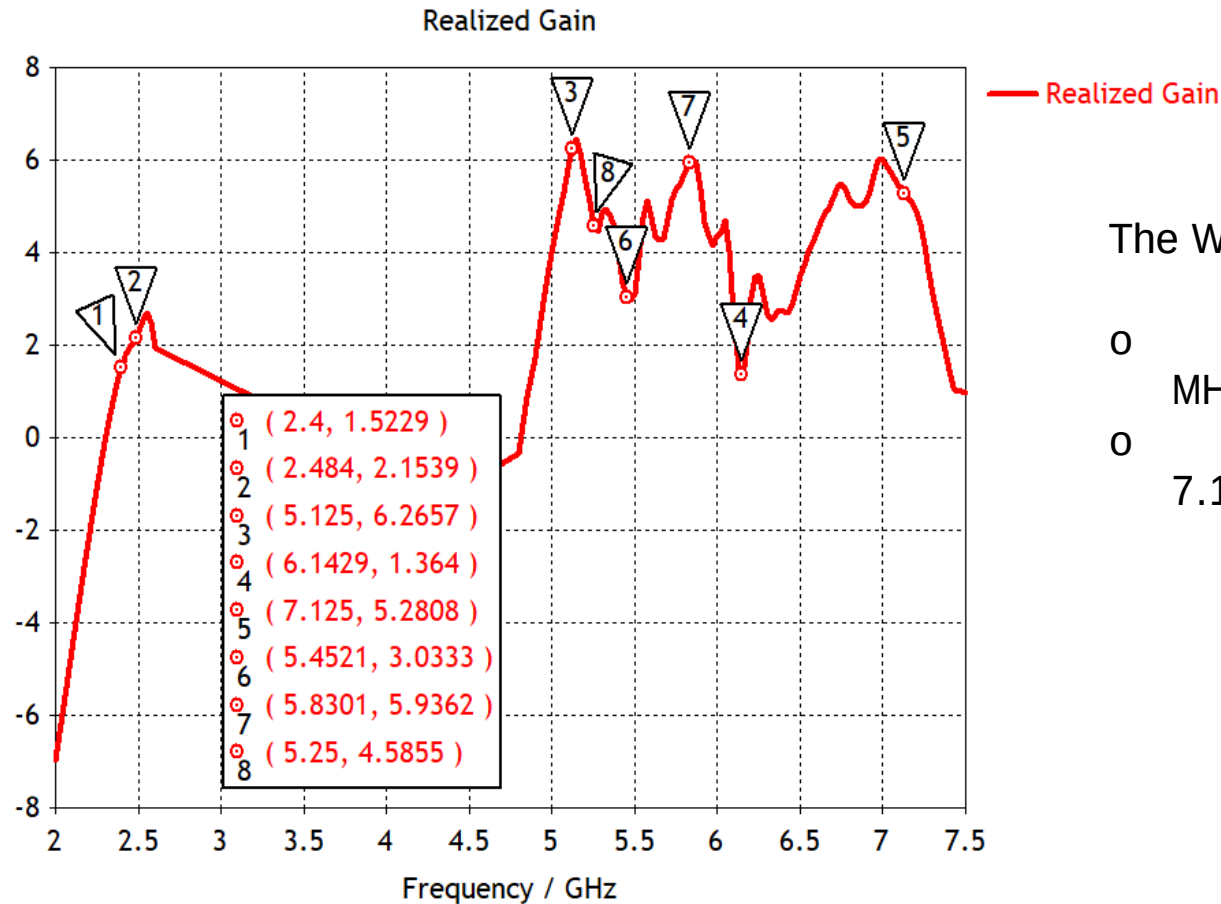
-2 dB for frequency band of 5.125GHz - 7.125GHz.

o The Wi-Fi 1 antenna has Total efficiency above:

-1.37 dB (70.20%) for frequency band of 2400 - 2484 MHz

-3.92 dB (40.50%) for frequency band of 5.125GHz - 7.125GHz.

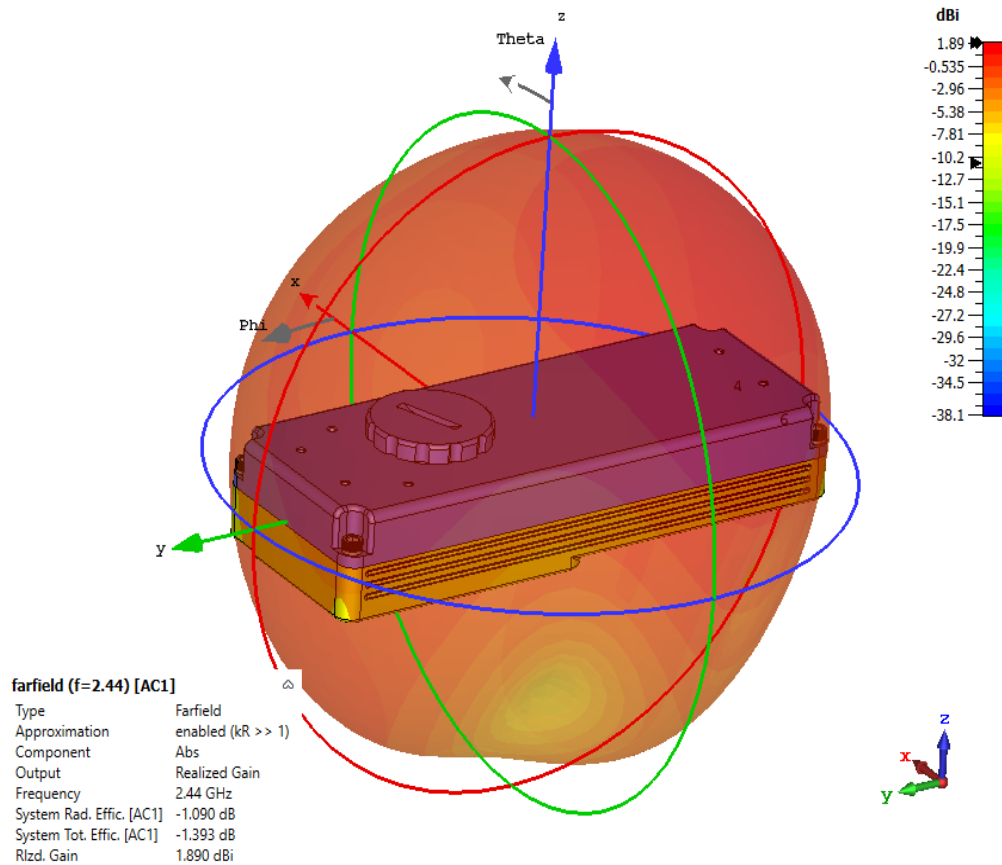
Wi-Fi-1 Gain



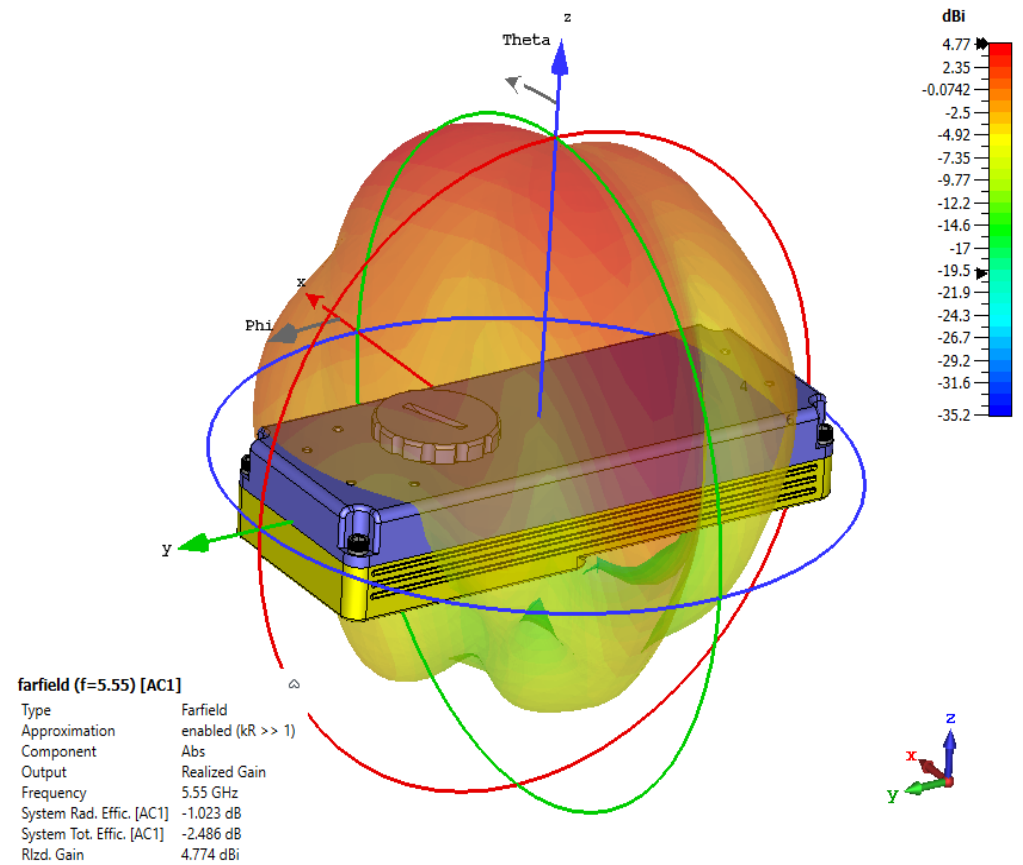
The Wi-Fi 1 antenna has Realized Gain above:

- o -1.52dBi for frequency band of 2400 – 2484 MHz.
- o -1.36 dBi for frequency band of 5.125GHz – 7.125GHz.

Wi-Fi-1 3D Radiation Pattern

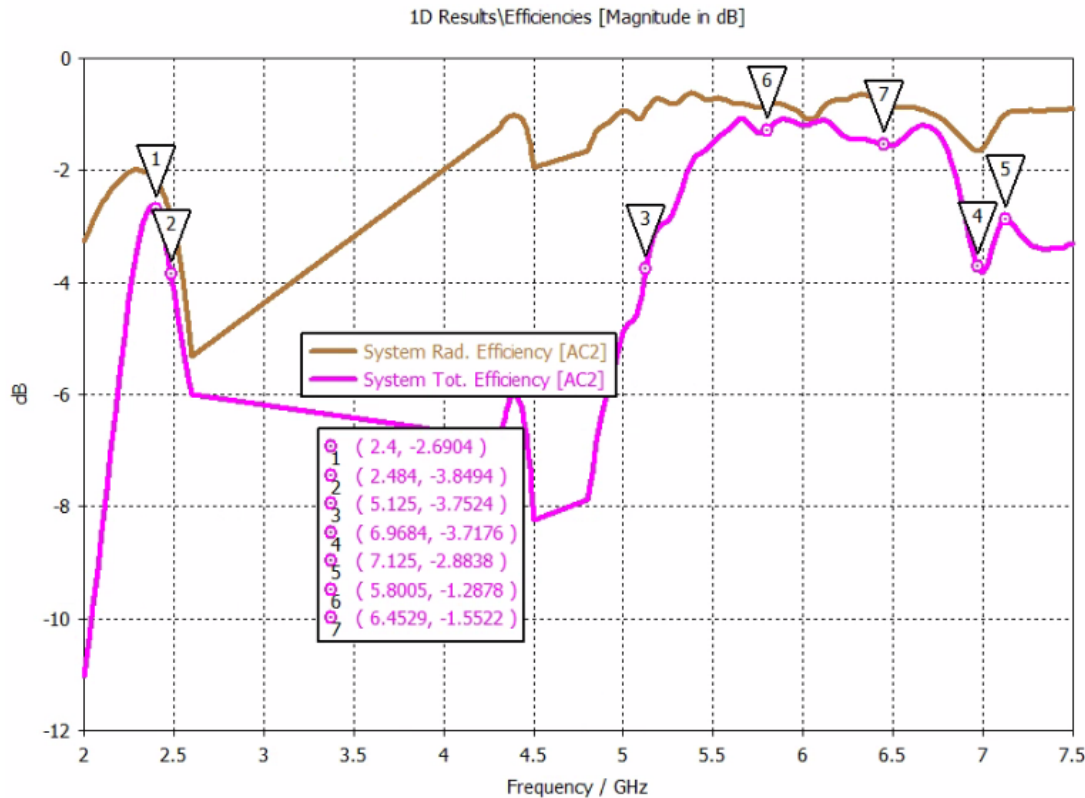


Radiation Pattern @ 2400 MHz



Radiation Pattern @ 5550 MHz

Wi-Fi-2 Efficiency



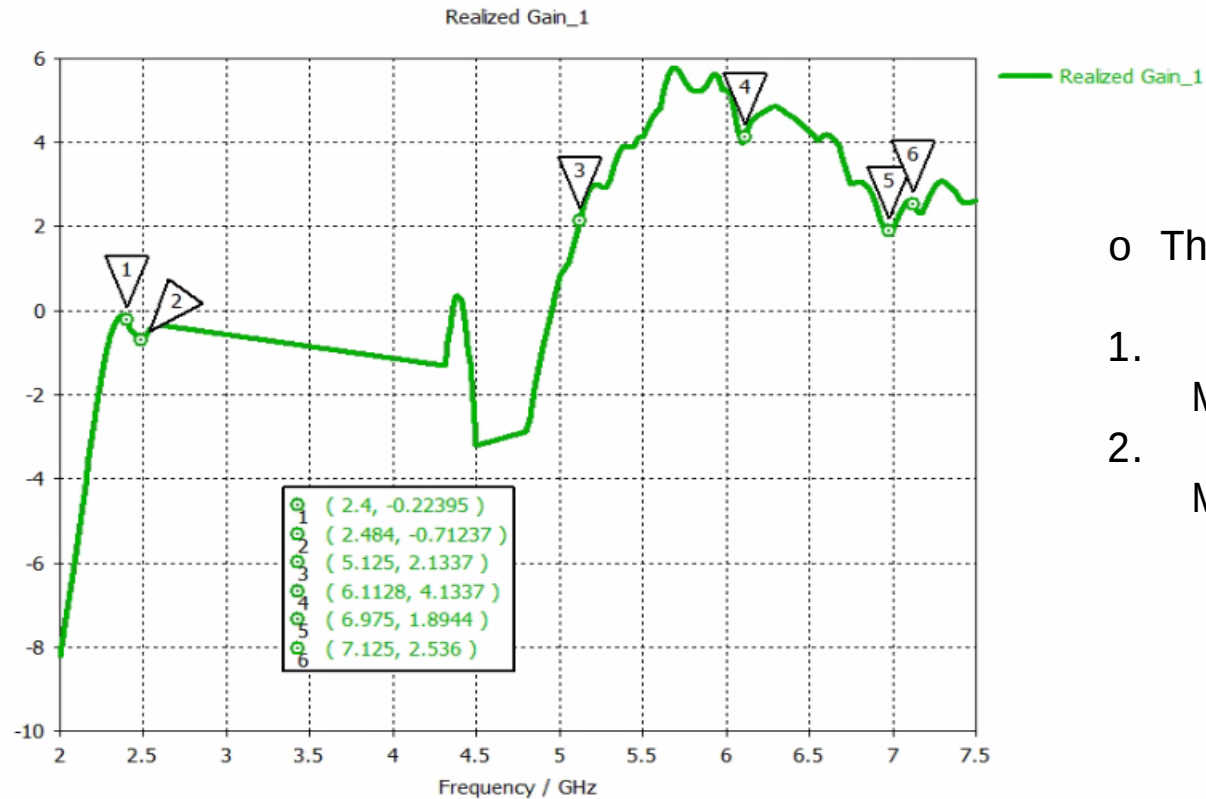
o The Wi-Fi 2 antenna has Radiation efficiency above:

-3.5 dB for frequency band of 2400 - 2484 MHz
-1.9 dB for frequency band of 5.125GHz - 7.125GHz.

o The Wi-Fi 2 antenna has Total efficiency above:

-3.84 dB (41.22%) for frequency band of 2400 - 2484 MHz
-3.75 dB (42.14%) for frequency band of 5.125GHz - 7.125GHz.

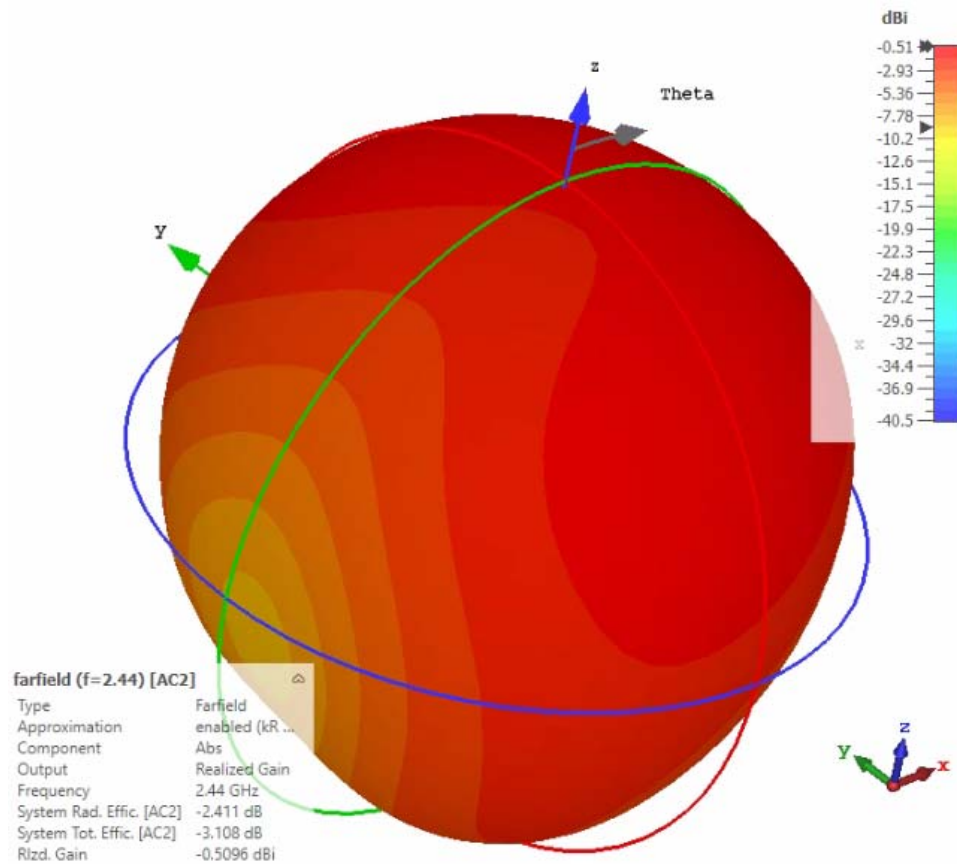
Wi-Fi-2 Gain



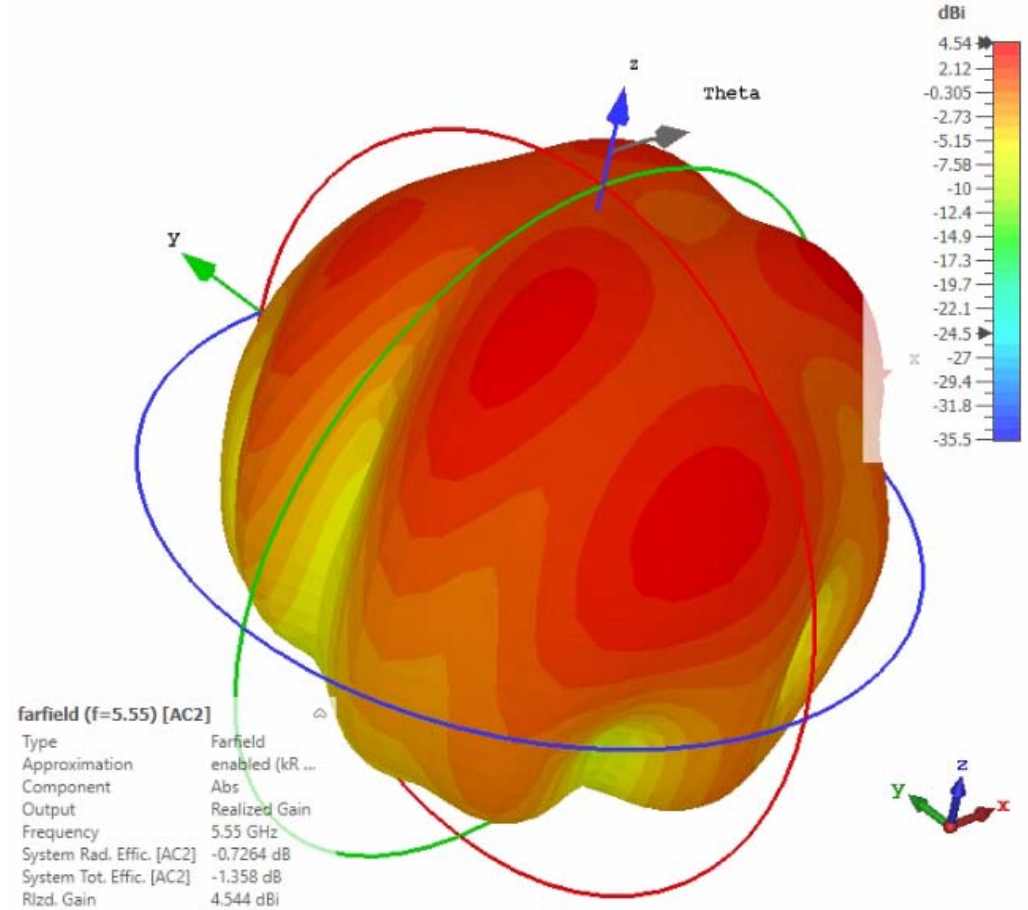
o The Wi-Fi 2 antenna has Realized Gain above:

1. -0.71 dBi for frequency band of 2400 – 2484 MHz
2. 1.89 dBi for frequency band of 5400 – 5800 MHz, Maximum gain is about -5.4 dBi.

Wi-Fi-2 3D Radiation Pattern



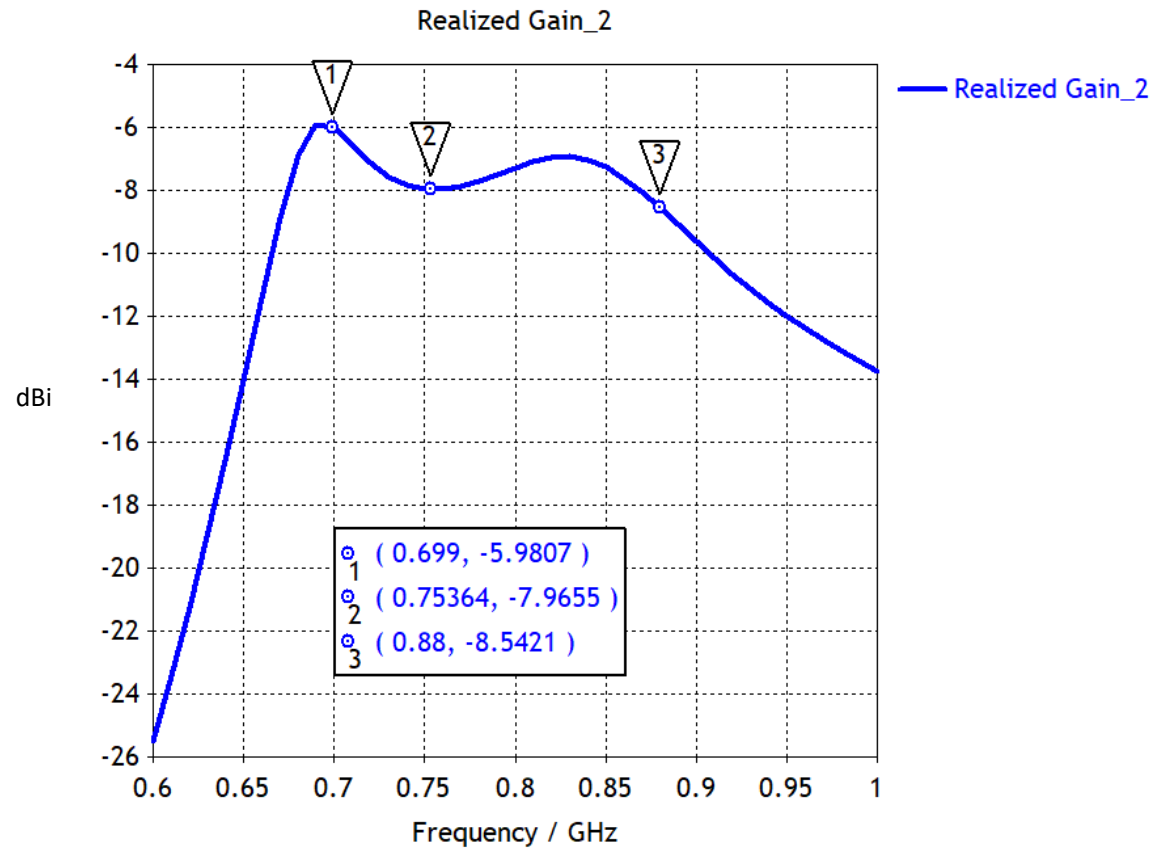
Radiation Pattern @ 2400 MHz



Radiation Pattern @ 5550 MHz

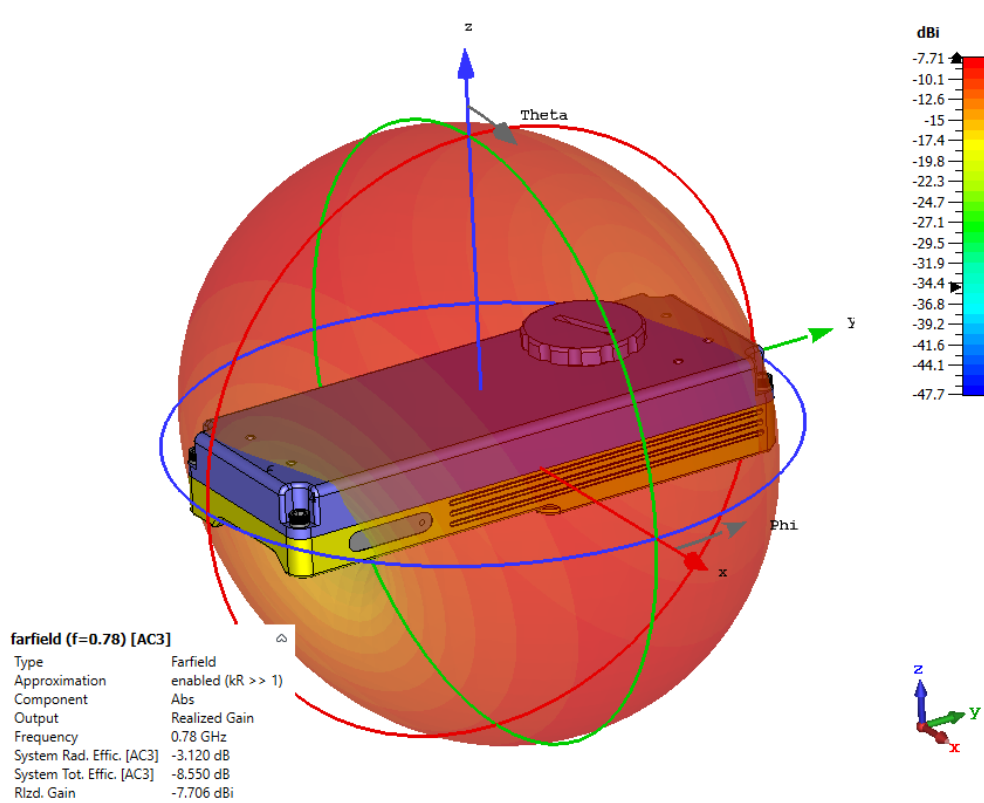
WWAN Antenna Gain & 3-D Plots

Realized Gain: Ant0

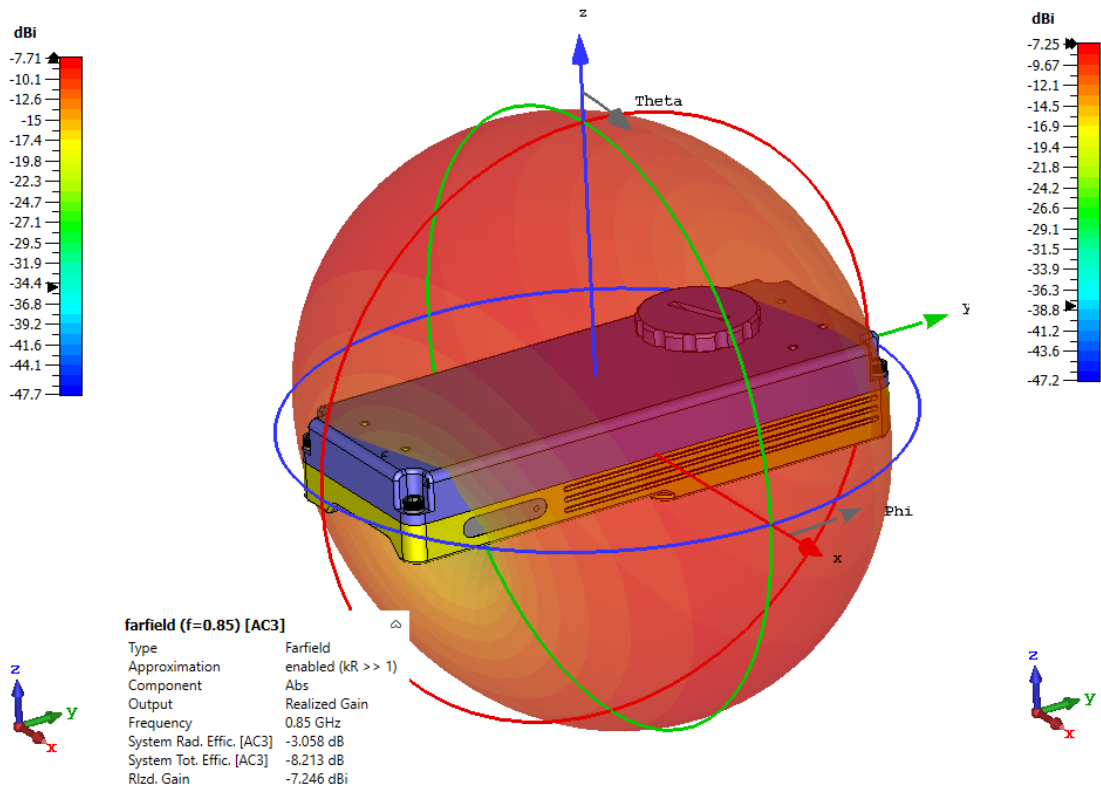


- o The Realized Gain is about -8.54dBi ,in the frequency band 698MHz – 880MHZ.

3D Radiation Pattern: Ant0

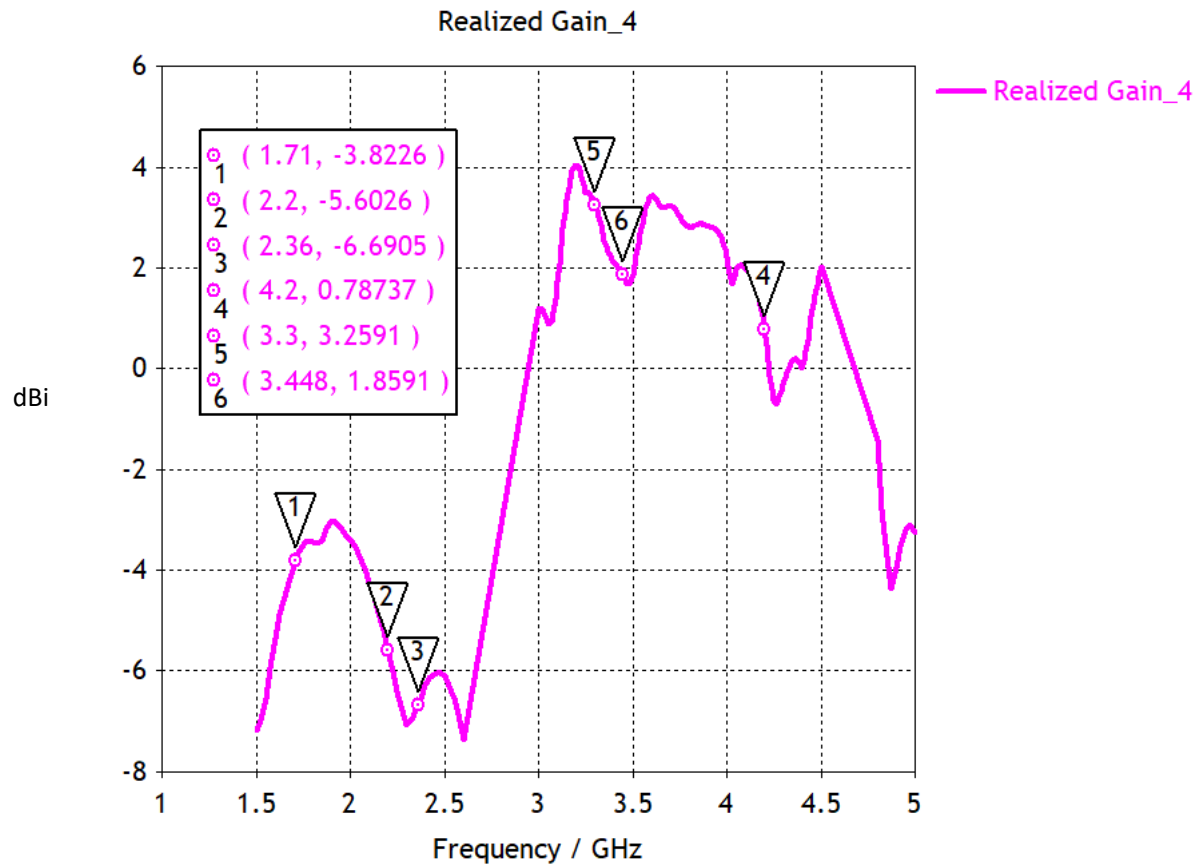


Radiation pattern @ 780MHz



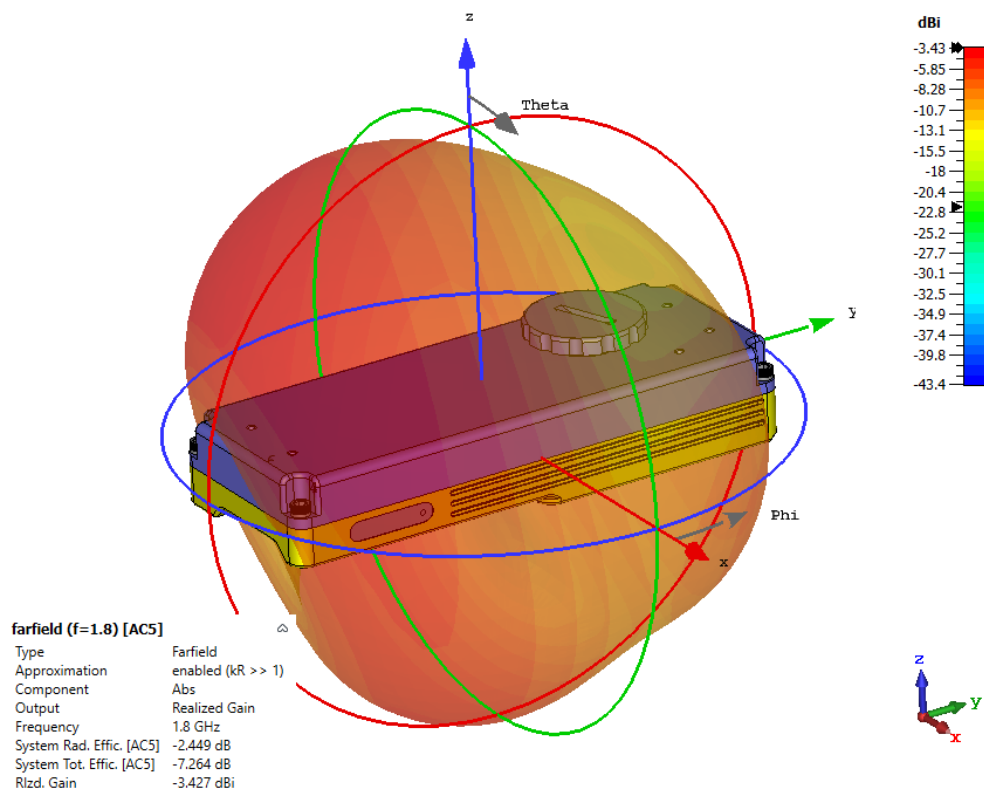
Radiation pattern @ 850MHz

Realized Gain: Ant1

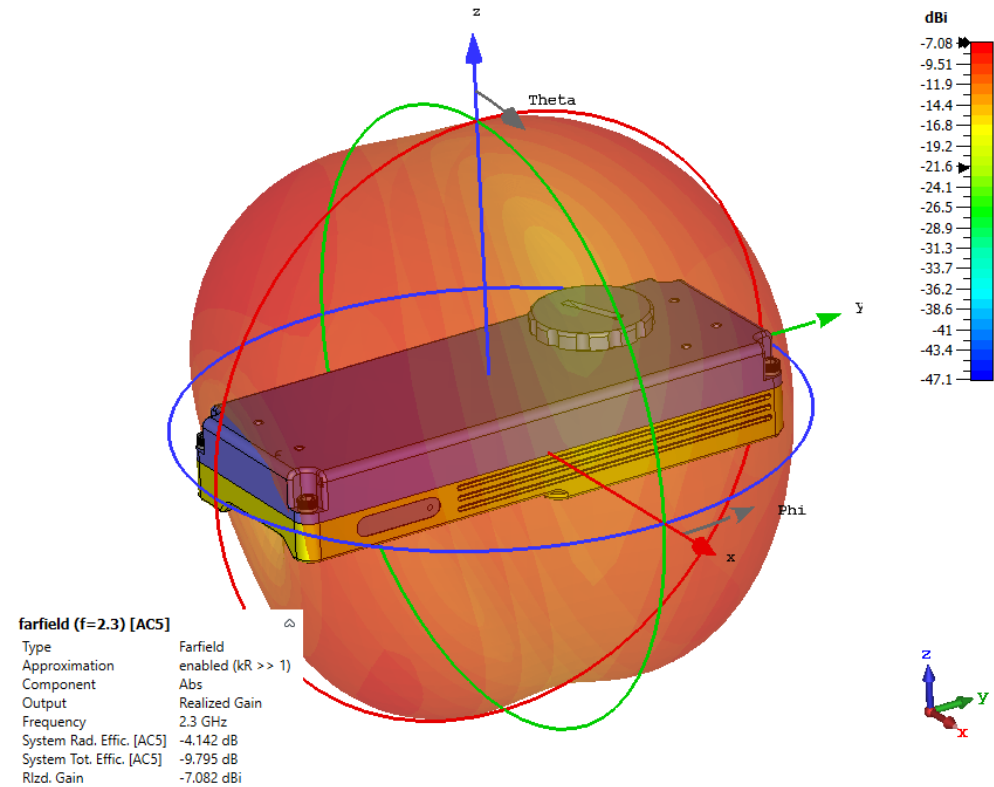


- o The Gain is about -5.60dBi , -6.69dBi , 0.78dBi in the frequency band 1710MHz – 2200MHz, 2300MHz – 2360MHz, 3300MHz – 4200MHz.

3D Radiation Pattern: Ant1

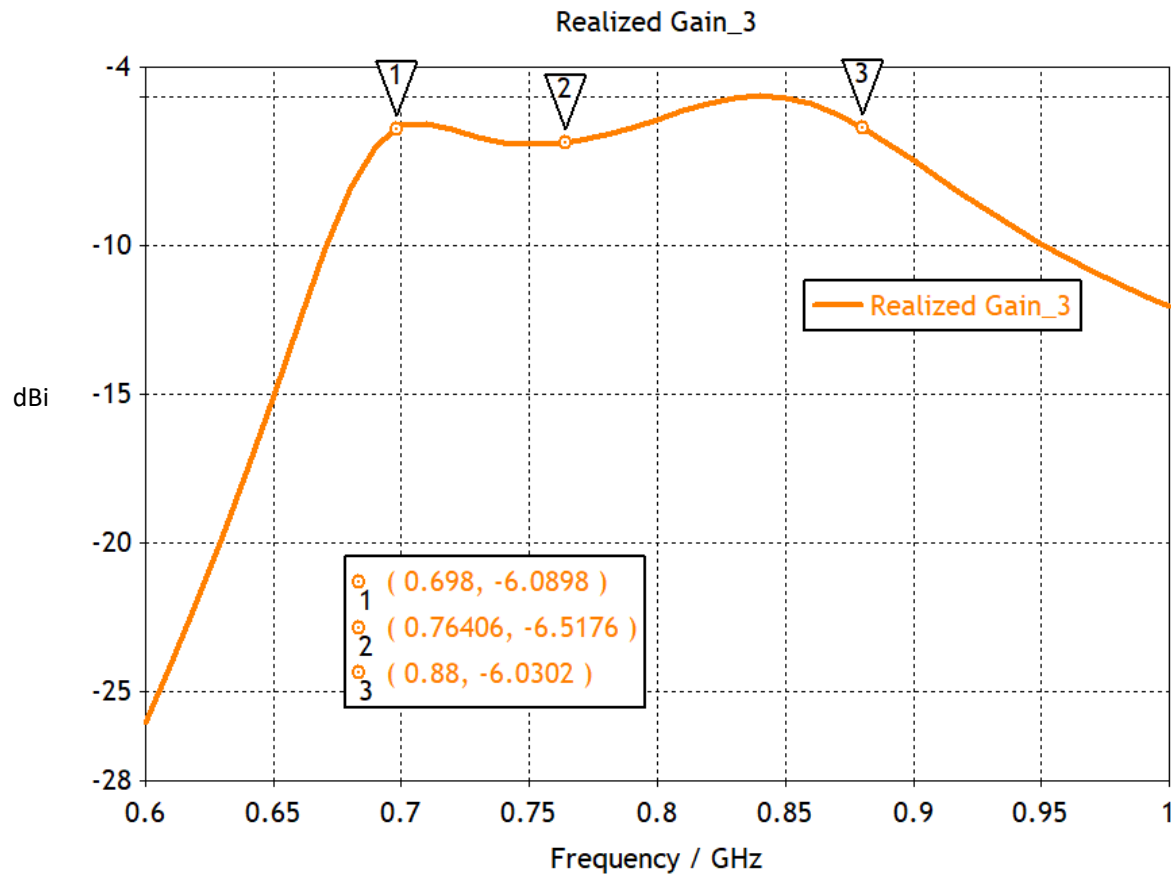


Radiation pattern @ 1800MHz



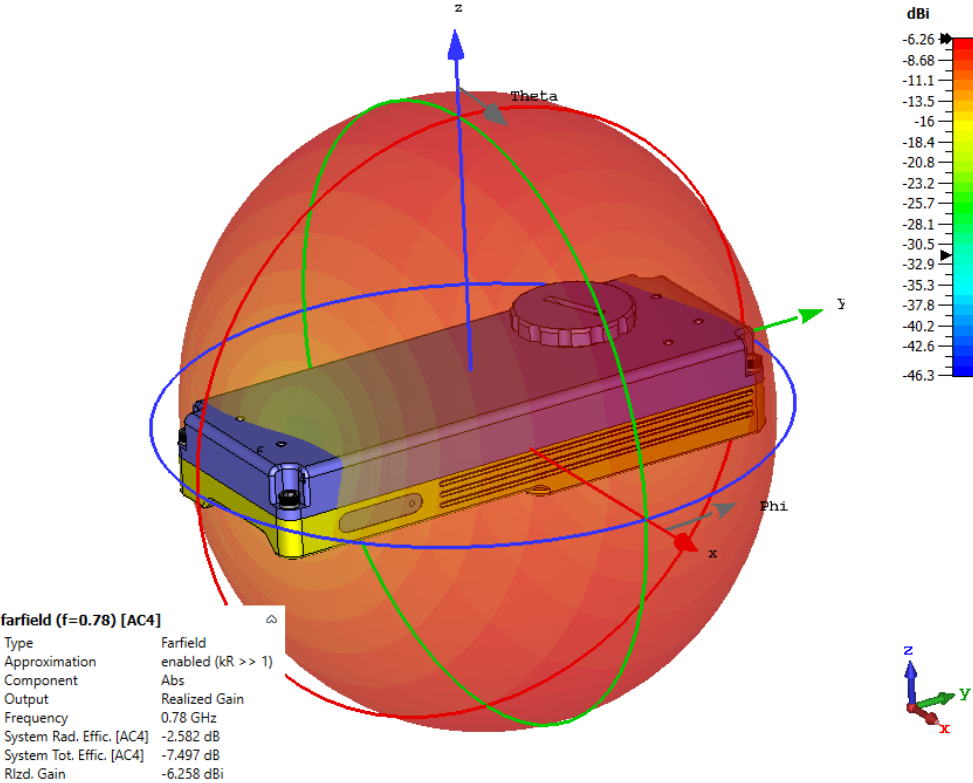
Radiation pattern @ 2300MHz

Realized Gain: Ant2

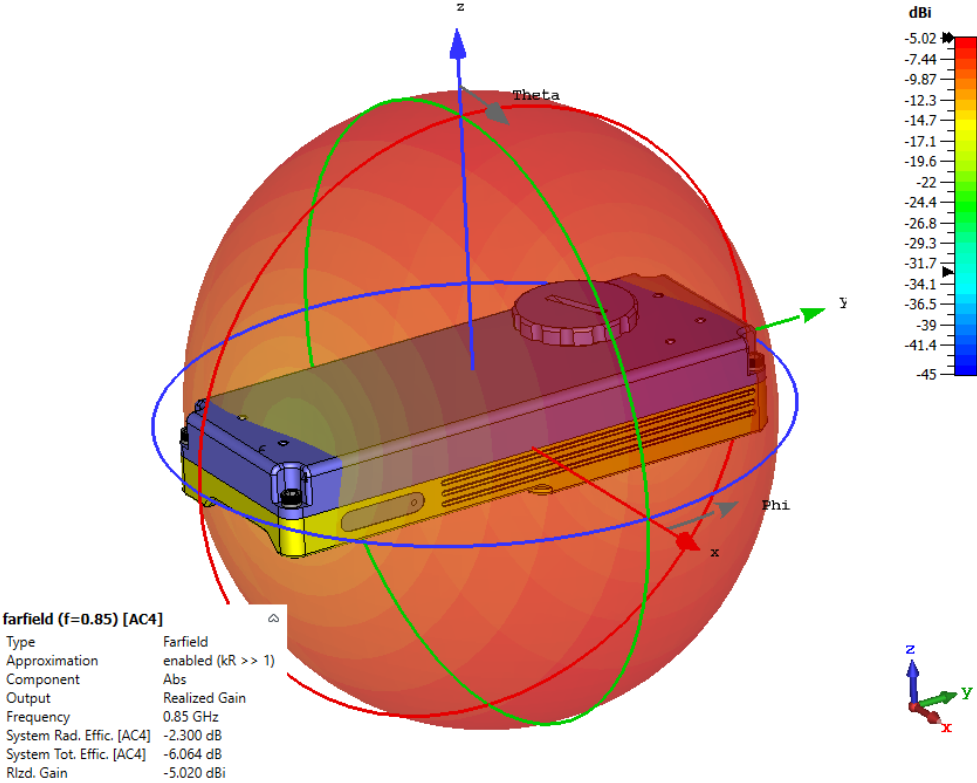


- o The Realized Gain is about -6.51dBi ,in the frequency band 698MHz – 880MHZ.

3D Radiation Pattern: Ant2

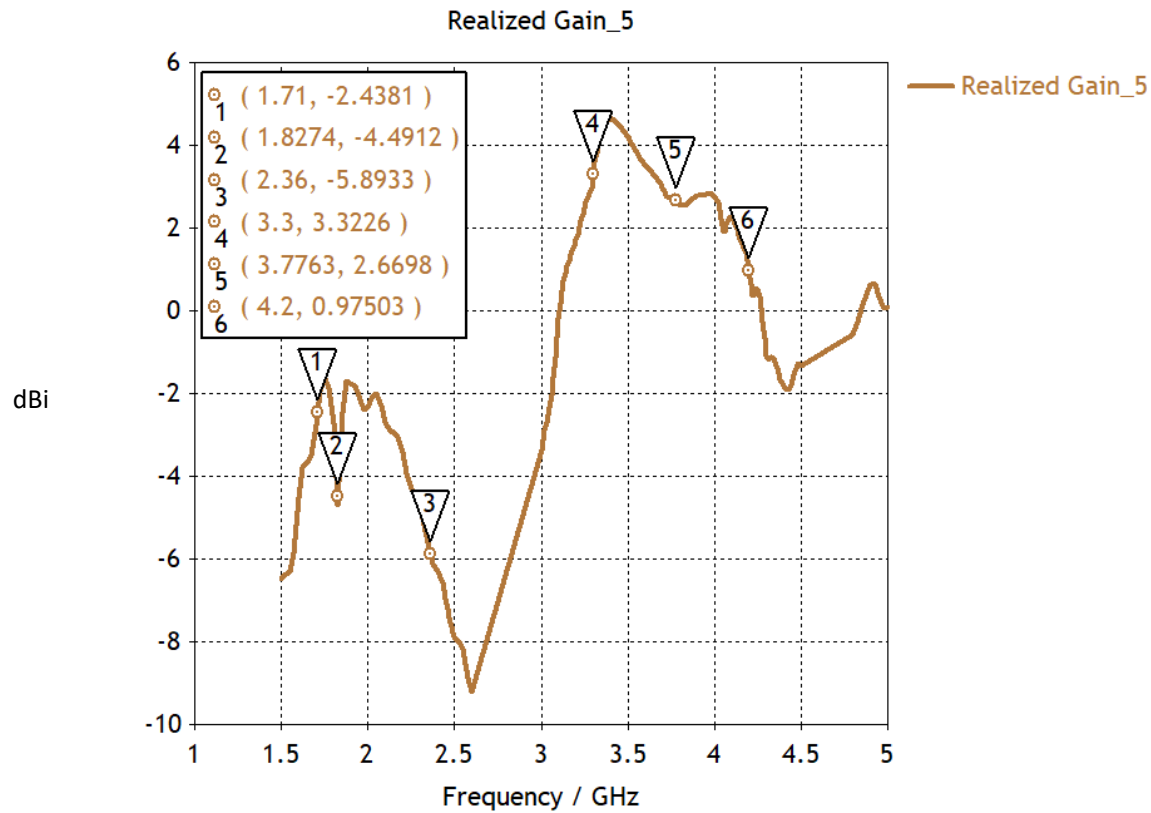


Radiation pattern @ 780MHz



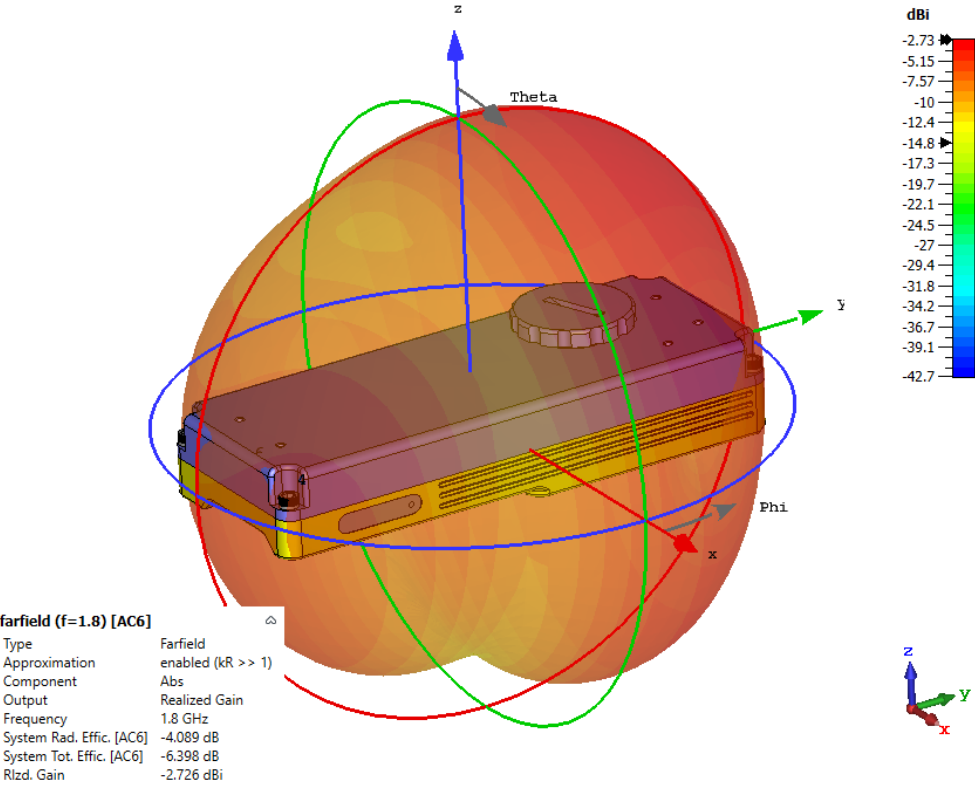
Radiation pattern @ 850MHz

Realized Gain: Ant3

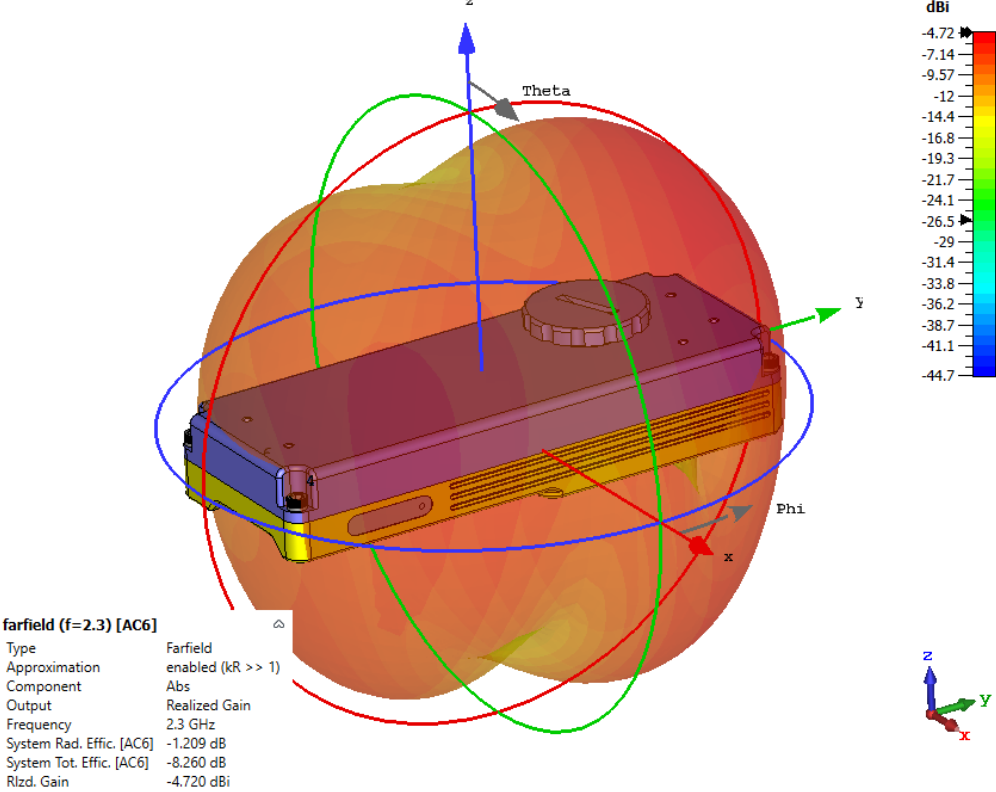


- o The Gain is about -4.49dBi , -5.89dBi , 0.97dBi in the frequency band 1710MHz - 2200MHz, 2300MHz - 2360MHz, 3300MHz - 4200MHz.

3D Radiation Pattern: Ant3



Radiation pattern @ 1800MHz



Radiation pattern @ 2300MHz

Thank You!