

# measurement antenna

HX-CSX332A is a four-system full frequency built-in measurement antenna covering GPS, GLONASS, BDS, GALILEO, and can be compatible with 4G,

The BT and WIFI operating frequency bands meet the current demand for multi-system compatibility of measurement equipment. They can be widely used in geodetic surveying, marine surveying, channel surveying, dredging surveying, seismic monitoring, bridge deformation monitoring, landslide monitoring, port container operations, and other scenarios.

## **Perfect system compatibility**

The integration of GNSS antennas with 4G and BT systems enables RTK manufacturers to achieve seamless design compatibility. Through comprehensive optimization of isolation levels between system-specific antennas, the solution systematically resolves persistent electromagnetic compatibility (EMC) challenges that have long plagued RTK receivers. This advancement not only streamlines overall system design but also ensures stable and reliable product performance.

## **Key features**

Support GNSS four system full frequency band signal

Support 4G, BT, WIFI

Strong anti-interference ability, can withstand harsh working environment

Good electromagnetic compatibility, small antenna size, convenient product integration.

## **Highly stable phase center**

The antenna employs a multi-feed-point design that aligns its phase center with the geometric center, effectively minimizing measurement errors. The 4G antenna array is symmetrically arranged around the GNSS antenna, ensuring precise positioning while maintaining consistent phase alignment across all communication antennas.

## **Track in a complex environment**

The antenna unit has the characteristics of high gain and wide beamwidth of the direction chart, which ensures that the antenna still has a strong signal reception effect at low elevation Angle, guarantees that it can quickly lock on satellites and output GNSS navigation signals stably in complex environments such as forest and building occlusion.

## **High structural reliability**

The antenna performance is optimized by using a composite structure of air medium and low loss microwave plate, and the overall weight is lighter, the structure is more stable, the consistency is better, and the electrical performance is more stable and reliable.

## **Strong anti-interference performance**

The antenna LNA has excellent out-of-band suppression performance, which can suppress useless electromagnetic wave signals and avoid interference of the receiver by other wireless communication systems. It effectively reduces the risk of system loss of lock, such as electromagnetic wave interference of power grid, communication base station and radio station.

performance parameter

| antenna performance             |                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| frequency range                 | GPS L1/L2/L5<br>BDS B1I/B2I/B3I/B1C/B2a/B2b<br>GLONASS L1/L2/L3<br>GALILEO E1/E5a/E5b/E6<br>QZSS L1、 L2、 L5、 L6<br>IRNSS L5<br>L-Band<br>4G、 WIFI、 BT |
| impedance                       | 50 ohms                                                                                                                                               |
| impedance                       |                                                                                                                                                       |
| Polarization mode               | right-handed circular polarization                                                                                                                    |
| Antenna axis ratio              | ≤3dB                                                                                                                                                  |
| Horizontal plane coverage Angle | 360°                                                                                                                                                  |
| Output standing wave            | ≤2.0                                                                                                                                                  |
| maximum gain                    | GNSS: 5dBi<br>WIFI:0.5dBi<br>BT:0.5dBi<br>4G:0.5dBi                                                                                                   |
| Phase center error              | ±2mm                                                                                                                                                  |

## Low noise amplifier specifications

|                                 |                                                            |
|---------------------------------|------------------------------------------------------------|
| gain                            | L2 band: $34\pm 2\text{dB}$ L1<br>band: $32\pm 2\text{dB}$ |
| noise factor                    | $\leq 2\text{dB}$                                          |
| Output standing wave            | $\leq 2.0$                                                 |
| Flatness of the belt            | $\pm 2\text{dB}$                                           |
| working voltage                 | +3.3 ~ +12VDC                                              |
| working current                 | $\leq 45\text{mA}$                                         |
| Differential transmission delay | $\leq 5\text{ns}$                                          |

## structural property

|               |                                                                                  |
|---------------|----------------------------------------------------------------------------------|
| Antenna size  | $\Phi 118 * H15.3\text{mm}$ (excluding solder height)                            |
| Type of joint | GNSS cable connector: MCX male<br>4G/WIFI/Bluetooth cable connector:<br>IPEX Gen |

## work environment

|                     |                                                |
|---------------------|------------------------------------------------|
| working temperature | $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$ |
| Storage temperature | $-55^{\circ}\text{C} \sim +85^{\circ}\text{C}$ |
| humidity            | 95% non-condensable                            |

## 4G antenna test data

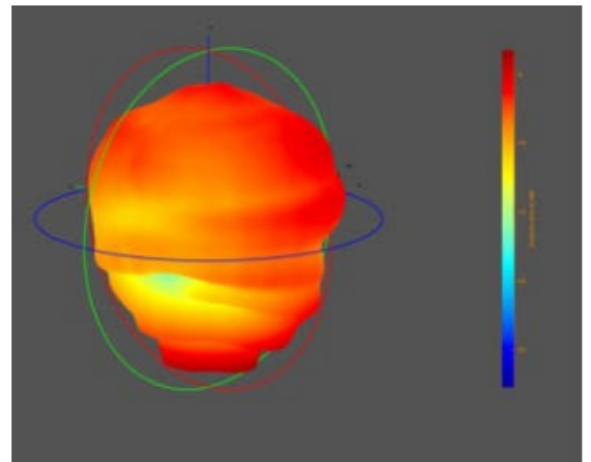
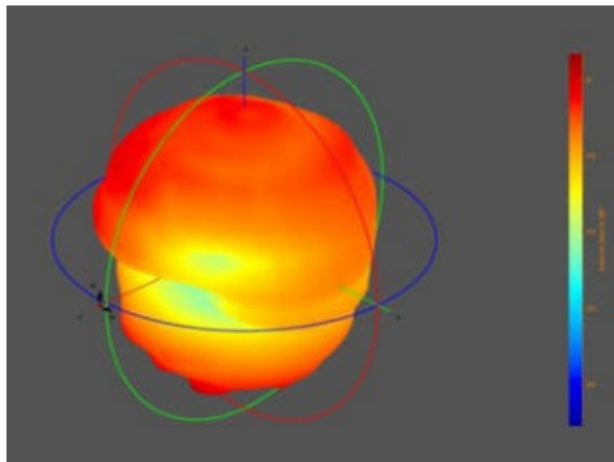
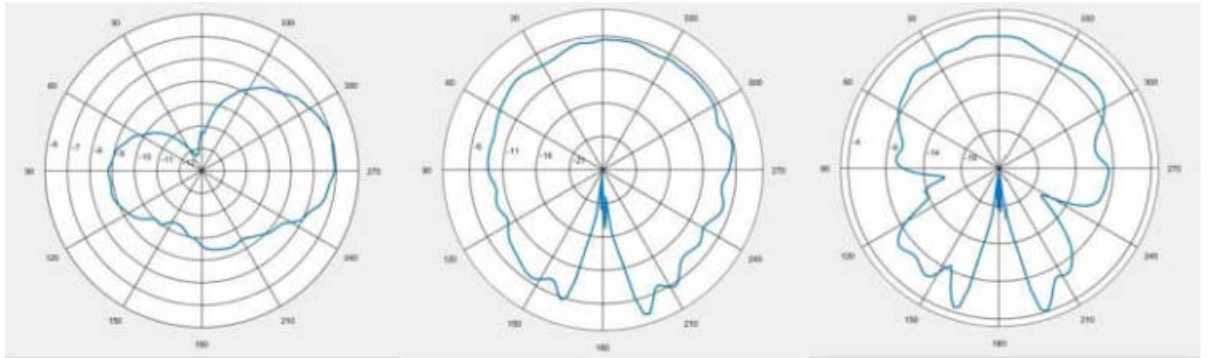
|                              |      |      |      |      |      |      |      |      |      |      |      |      |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| frequency (MHz)              | 820  | 830  | 840  | 850  | 860  | 870  | 880  | 890  | 900  | 910  | 920  | 930  |
| Directional coefficient (dB) | 5.0  | 5.1  | 5.2  | 5.0  | 4.8  | 4.8  | 4.9  | 4.9  | 4.8  | 5.0  | 5.0  | 3.8  |
| gain (dBi)                   | -3.3 | -2.2 | -1.2 | -0.7 | -0.2 | 0.0  | 0.2  | -0.5 | -1.3 | -2.6 | -4.0 | -4.8 |
| productiveness (%)           | 14.6 | 18.4 | 23.1 | 27.1 | 32.1 | 32.7 | 33.2 | 28.8 | 24.2 | 17.4 | 12.6 | 14.0 |
| frequency (MHz)              | 940  | 950  | 960  | 1710 | 1730 | 1750 | 1770 | 1790 | 1810 | 1830 | 1850 | 1870 |
| Directional coefficient (dB) | 4.0  | 3.8  | 4.1  | 5.2  | 4.7  | 5.3  | 6.0  | 5.8  | 5.9  | 6.6  | 5.8  | 5.8  |
| gain (dBi)                   | -3.5 | -4.3 | -5.4 | -2.1 | -0.5 | 0.8  | 0.2  | -0.3 | 0.5  | 0.6  | -2.7 | -5.2 |
| productiveness (%)           | 17.7 | 15.2 | 11.1 | 18.3 | 30.1 | 35.6 | 26.3 | 24.7 | 28.5 | 24.8 | 14.2 | 8.0  |
| frequency (MHz)              | 1890 | 1910 | 1930 | 1950 | 1970 | 1990 | 2010 | 2030 | 2050 | 2070 | 2090 | 2110 |
| Directional coefficient (dB) | 7.2  | 7.7  | 7.4  | 6.8  | 5.5  | 5.8  | 5.4  | 5.0  | 5.0  | 5.0  | 5.2  | 6.3  |
| gain (dBi)                   | -5.6 | -4.2 | -1.8 | -5.0 | -4.8 | -4.7 | -1.8 | 0.6  | 0.7  | -0.1 | -0.6 | -0.5 |
| productiveness (%)           | 5.3  | 6.4  | 12.0 | 6.6  | 9.4  | 9.0  | 19.4 | 36.3 | 37.2 | 31.2 | 26.1 | 21.2 |
| frequency (MHz)              | 2130 | 2150 | 2170 | 2190 | 2210 | 2230 | 2250 | 2270 | 2290 | 2310 | 2330 | 2350 |
| Directional coefficient (dB) | 6.2  | 5.7  | 5.0  | 5.4  | 5.2  | 5.7  | 5.8  | 5.4  | 6.0  | 6.4  | 6.2  | 6.0  |
| gain (dBi)                   | -0.6 | -1.2 | -1.8 | -2.0 | -3.3 | -4.1 | -4.4 | -5.4 | -4.3 | -5.1 | -6.0 | -6.1 |
| productiveness (%)           | 20.9 | 20.2 | 20.7 | 18.4 | 14.1 | 10.4 | 9.7  | 8.2  | 9.2  | 7.1  | 6.0  | 6.1  |
| frequency (MHz)              | 2370 | 2390 | 2410 | 2430 | 2450 | 2470 | 2490 | 2510 | 2530 | 2550 | 2570 | 2590 |
| Directional coefficient (dB) | 5.8  | 5.8  | 5.8  | 5.8  | 5.3  | 4.3  | 4.3  | 4.1  | 4.3  | 4.3  | 4.2  | 4.0  |
| gain (dBi)                   | -6.5 | -6.8 | -5.9 | -4.7 | -4.0 | -5.4 | -5.6 | -4.9 | -3.3 | -1.9 | -1.2 | -1.4 |
| productiveness (%)           | 5.9  | 5.6  | 6.7  | 8.8  | 11.7 | 10.8 | 10.3 | 12.6 | 17.5 | 23.9 | 28.8 | 28.6 |
| frequency (MHz)              | 2610 | 2630 | 2650 | 2670 | 2690 |      |      |      |      |      |      |      |
| Directional coefficient (dB) | 4.3  | 4.7  | 4.8  | 5.4  | 5.9  |      |      |      |      |      |      |      |
| gain (dBi)                   | -2.1 | -3.2 | -4.3 | -4.6 | -4.9 |      |      |      |      |      |      |      |
| productiveness (%)           | 23.1 | 16.5 | 12.4 | 9.9  | 8.3  |      |      |      |      |      |      |      |

## 4G-1 antenna direction diagram (sub-antenna)

X-Y plane

X-Z plane

Y-Z plane

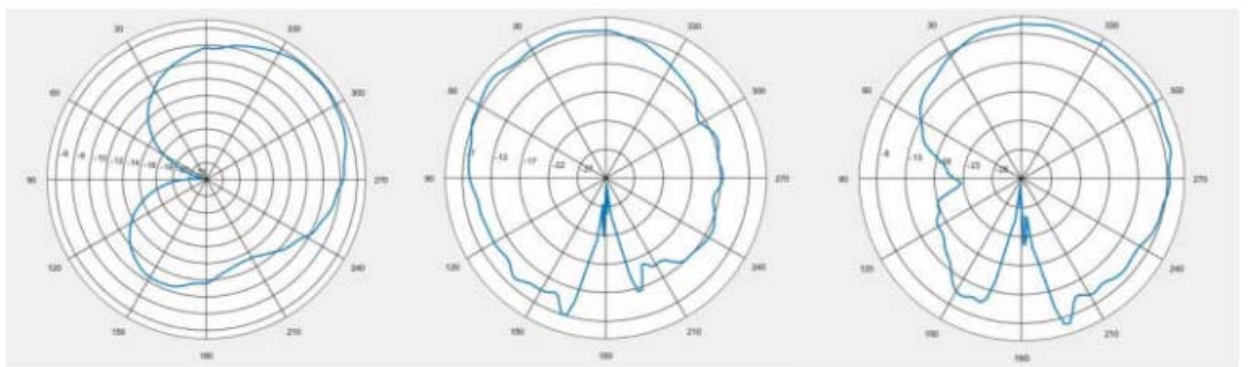


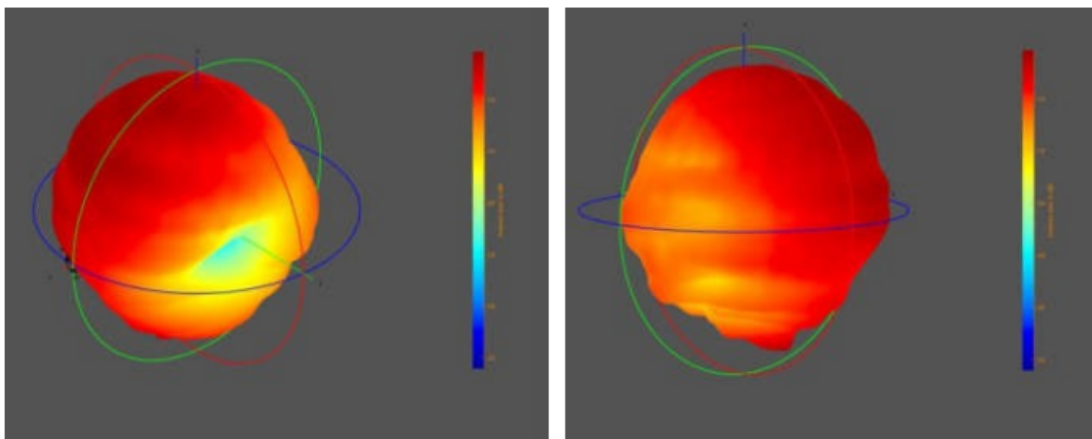
820MHz

X-Y plane

X-Z plane

Y-Z plane



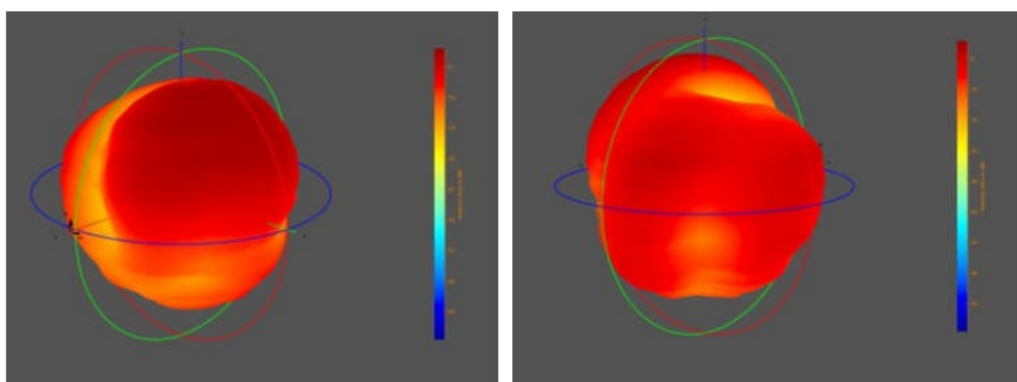
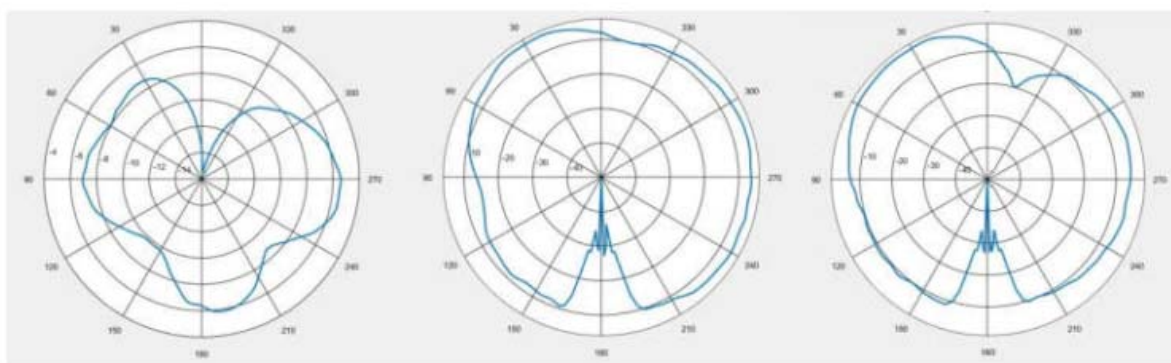


960MHz

X-Y plane

X-Z plane

Y-Z plane

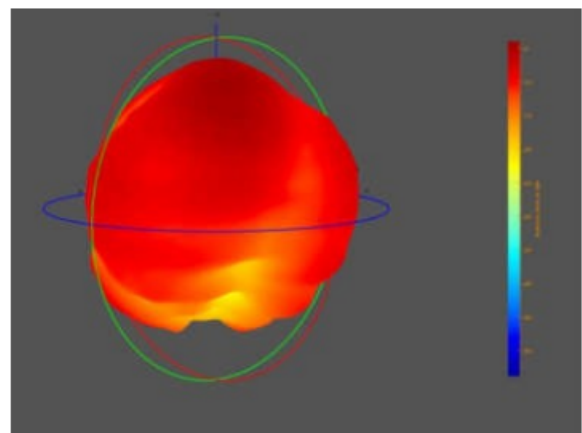
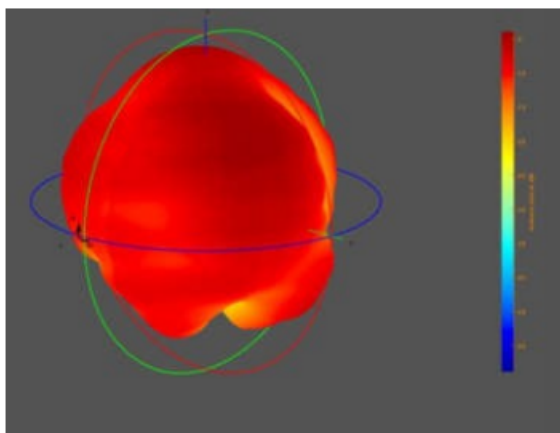
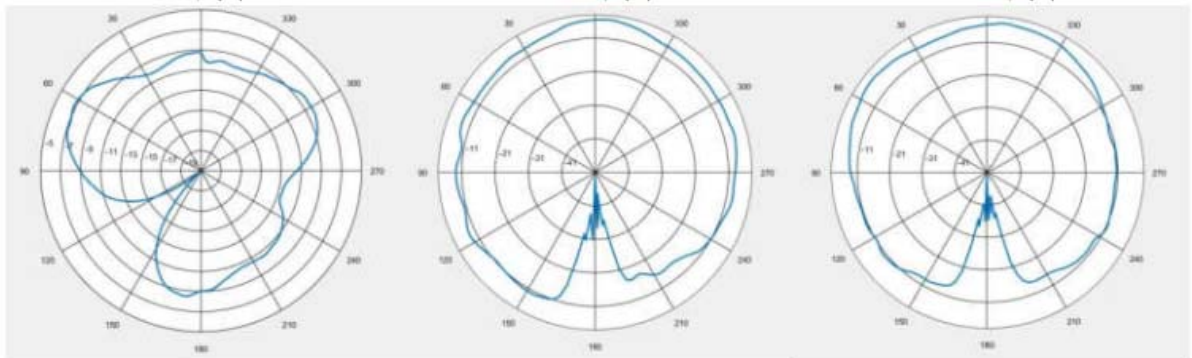


1710MHz

X-Y plane

X-Z plane

Y-Z plane

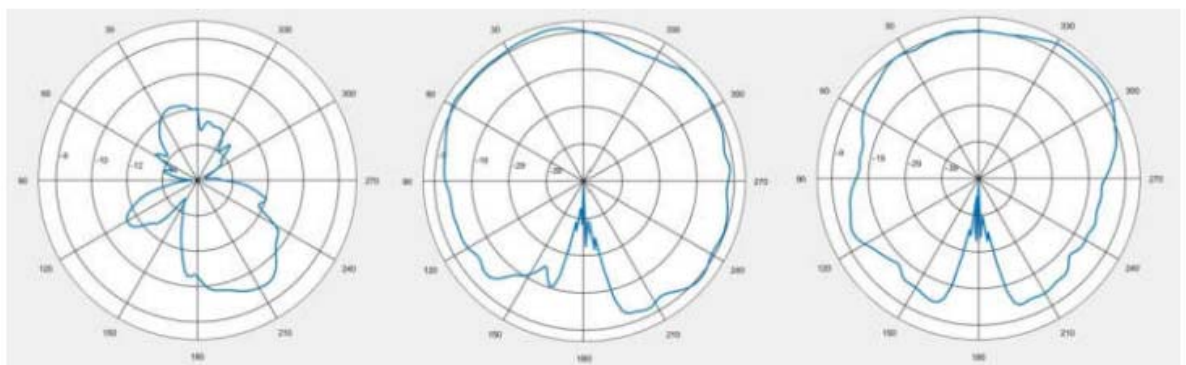


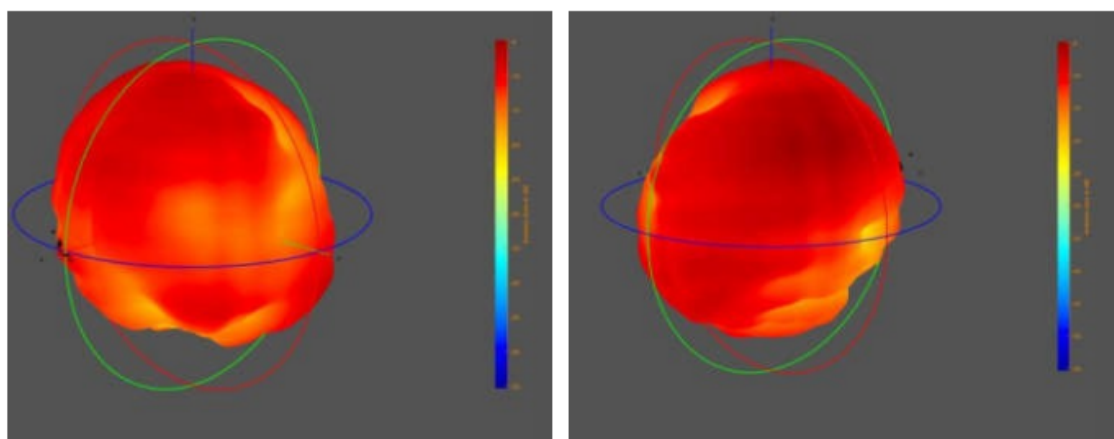
2450MHz

X-Y plane

X-Z plane

Y-Z plane





2690MHz

#### 4G-2 antenna gain (main antenna)

|                                 |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| frequency<br>(MHz)              | 820  | 830  | 840  | 850  | 860  | 870  | 880  | 890  | 900  | 910  | 920  | 930  |
| Directional<br>coefficient (dB) | 3.9  | 3.6  | 3.3  | 3.4  | 3.7  | 3.7  | 4.0  | 3.6  | 3.3  | 3.4  | 3.5  | 3.8  |
| gain (dBi)                      | -4.3 | -3.3 | -2.9 | -2.2 | -1.4 | -1.3 | -1.2 | -2.3 | -2.9 | -3.0 | -3.3 | -4.0 |
| productiveness<br>(%)           | 15.1 | 20.2 | 24.1 | 27.4 | 30.6 | 31.4 | 30.2 | 25.9 | 24.0 | 22.7 | 21.0 | 16.8 |
| frequency<br>(MHz)              | 940  | 950  | 960  | 1710 | 1730 | 1750 | 1770 | 1790 | 1810 | 1830 | 1850 | 1870 |
| Directional<br>coefficient (dB) | 4.0  | 4.8  | 4.8  | 6.5  | 7.0  | 6.5  | 6.5  | 6.9  | 6.5  | 5.8  | 5.6  | 5.7  |
| gain (dBi)                      | -4.3 | -3.4 | -4.2 | -2.9 | -3.8 | -0.4 | 1.6  | 1.9  | 0.4  | -1.6 | -2.8 | -4.2 |
| productiveness<br>(%)           | 15.0 | 15.2 | 12.8 | 11.4 | 8.3  | 20.1 | 32.1 | 31.9 | 24.4 | 18.5 | 14.5 | 10.4 |
| frequency<br>(MHz)              | 1890 | 1910 | 1930 | 1950 | 1970 | 1990 | 2010 | 2030 | 2050 | 2070 | 2090 | 2110 |
| Directional<br>coefficient (dB) | 6.6  | 7.0  | 7.4  | 7.8  | 7.0  | 6.7  | 5.7  | 5.3  | 6.2  | 5.4  | 4.8  | 5.3  |
| gain (dBi)                      | -3.5 | -3.2 | -3.1 | -1.7 | 0.1  | 0.5  | -1.0 | -0.6 | -0.4 | -0.8 | -1.2 | -3.0 |
| productiveness<br>(%)           | 9.9  | 9.5  | 9.0  | 11.2 | 20.7 | 23.9 | 21.4 | 26.2 | 22.0 | 24.3 | 24.8 | 14.7 |
| frequency<br>(MHz)              | 2130 | 2150 | 2170 | 2190 | 2210 | 2230 | 2250 | 2270 | 2290 | 2310 | 2330 | 2350 |
| Directional<br>coefficient (dB) | 5.2  | 5.9  | 6.5  | 6.8  | 7.4  | 7.0  | 6.3  | 6.0  | 6.0  | 5.9  | 5.4  | 5.0  |
| gain (dBi)                      | -3.1 | -3.7 | -3.6 | -2.3 | -2.7 | -3.3 | -3.9 | -3.4 | -2.0 | -3.0 | -3.8 | -3.9 |
| productiveness<br>(%)           | 14.9 | 11.1 | 9.8  | 12.4 | 9.9  | 9.4  | 9.5  | 11.5 | 15.8 | 13.0 | 12.0 | 12.8 |
| frequency<br>(MHz)              | 2370 | 2390 | 2410 | 2430 | 2450 | 2470 | 2490 | 2510 | 2530 | 2550 | 2570 | 2590 |
| Directional<br>coefficient (dB) | 4.6  | 4.5  | 4.6  | 4.7  | 4.9  | 5.2  | 5.1  | 5.0  | 4.8  | 4.8  | 4.8  | 5.0  |
| gain (dBi)                      | -3.8 | -2.8 | -2.2 | -2.2 | -2.4 | -2.0 | -2.0 | -2.8 | -3.4 | -3.1 | -2.6 | -2.3 |
| productiveness<br>(%)           | 14.5 | 18.8 | 20.9 | 20.3 | 18.4 | 19.2 | 19.4 | 16.8 | 15.1 | 16.1 | 18.3 | 18.7 |
| frequency<br>(MHz)              | 2610 | 2630 | 2650 | 2670 | 2690 |      |      |      |      |      |      |      |

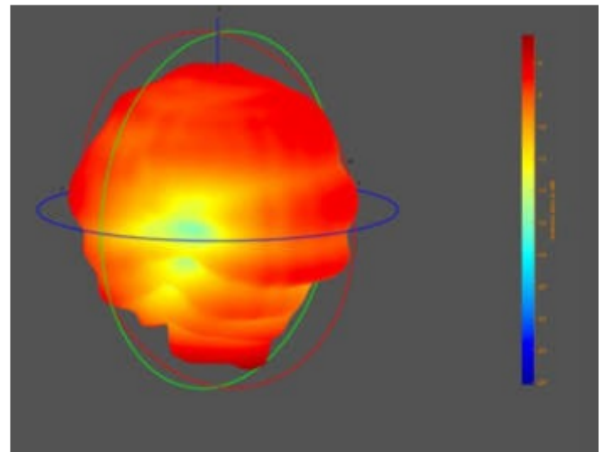
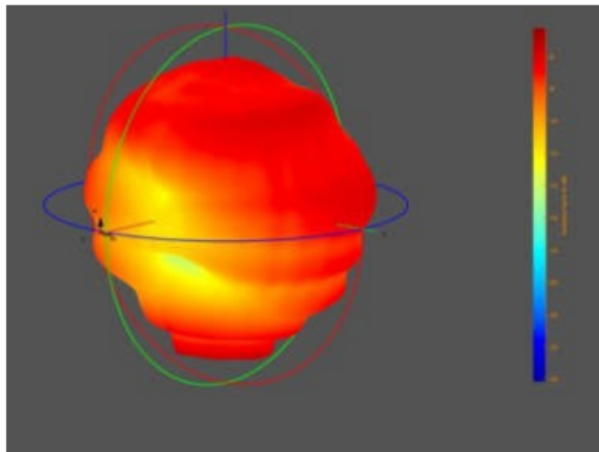
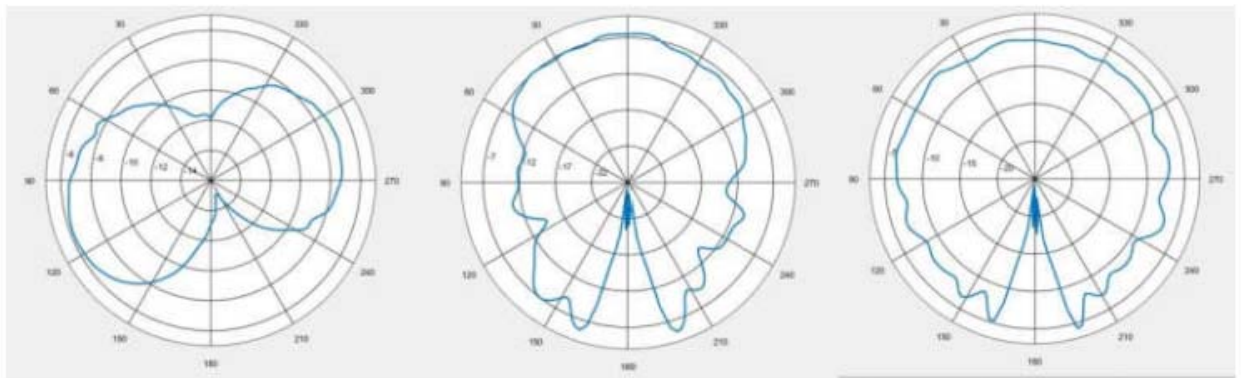
|                              |      |      |      |      |      |  |  |  |  |  |  |  |
|------------------------------|------|------|------|------|------|--|--|--|--|--|--|--|
| Directional coefficient (dB) | 5.1  | 5.0  | 4.9  | 5.2  | 5.5  |  |  |  |  |  |  |  |
| gain (dBi)                   | -2.4 | -2.2 | -2.1 | -2.4 | -2.8 |  |  |  |  |  |  |  |
| productiveness (%)           | 17.6 | 19.1 | 19.8 | 17.1 | 14.7 |  |  |  |  |  |  |  |

#### 4G-2 antenna pattern (main antenna)

X-Y plane

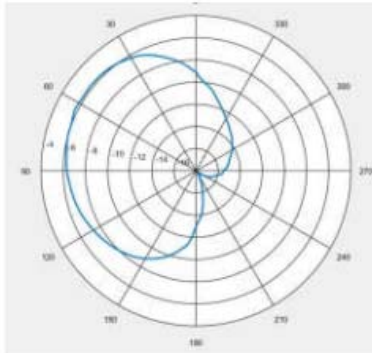
X-Z plane

Y-Z plane

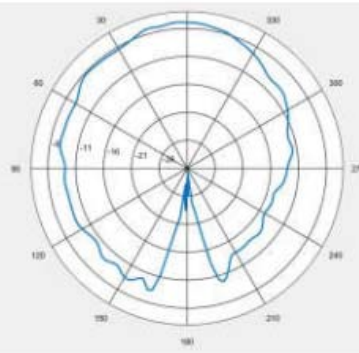


820MHz

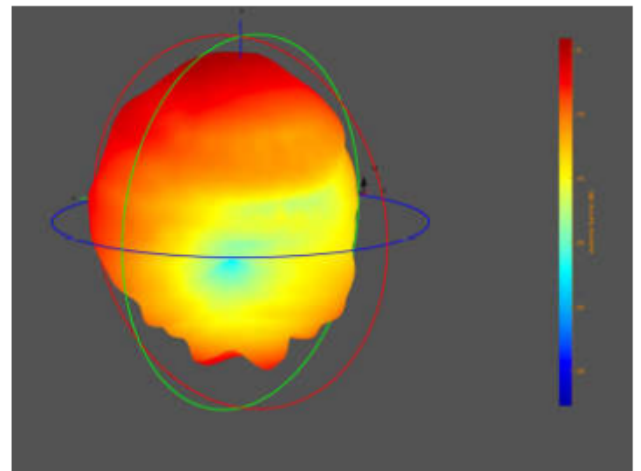
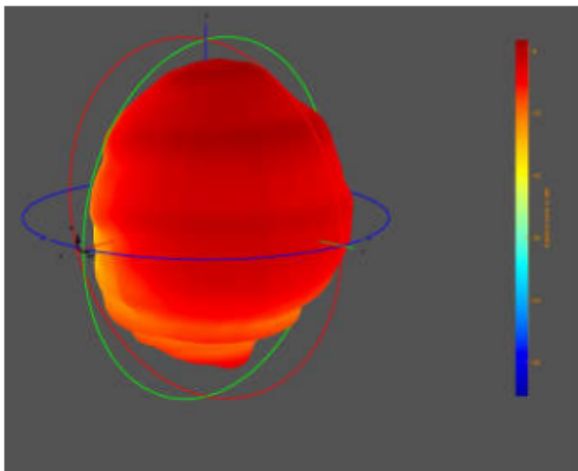
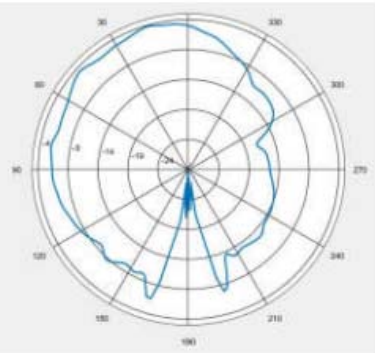
X-Y plane



X-Z plane

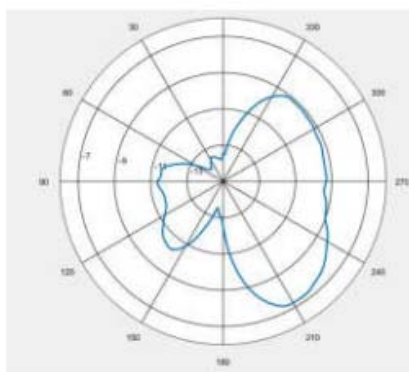


Y-Z plane

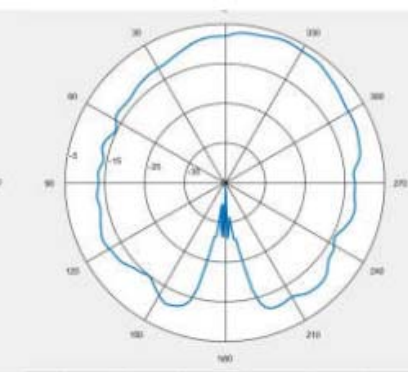


960MHz

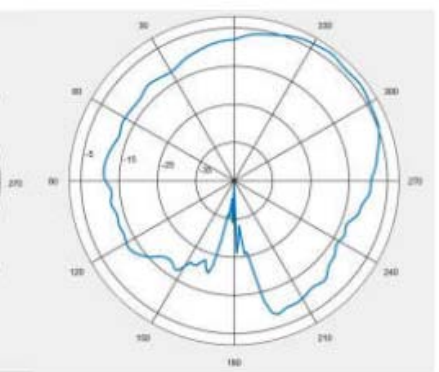
X-Y plane

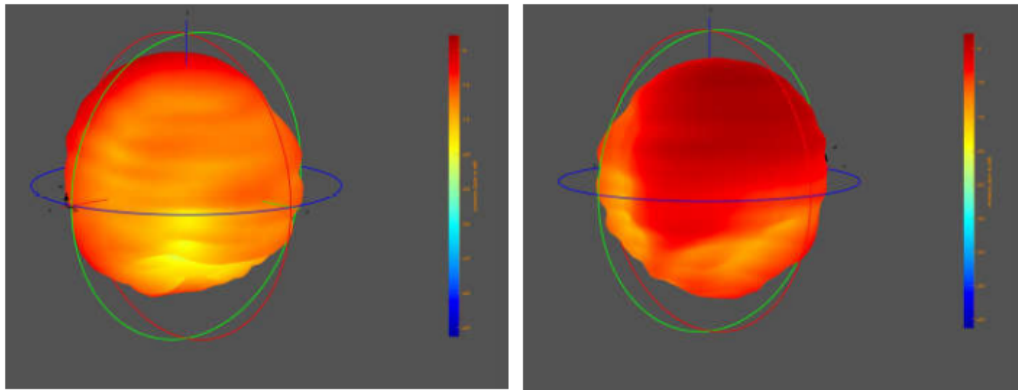


X-Z plane



Y-Z plane



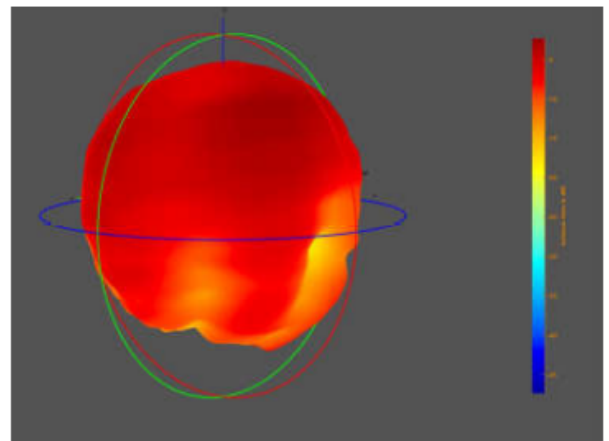
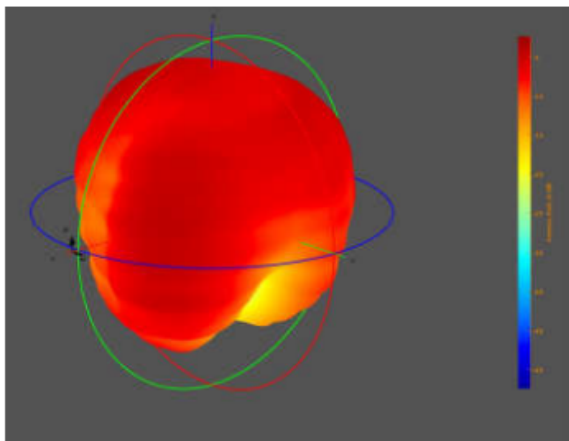
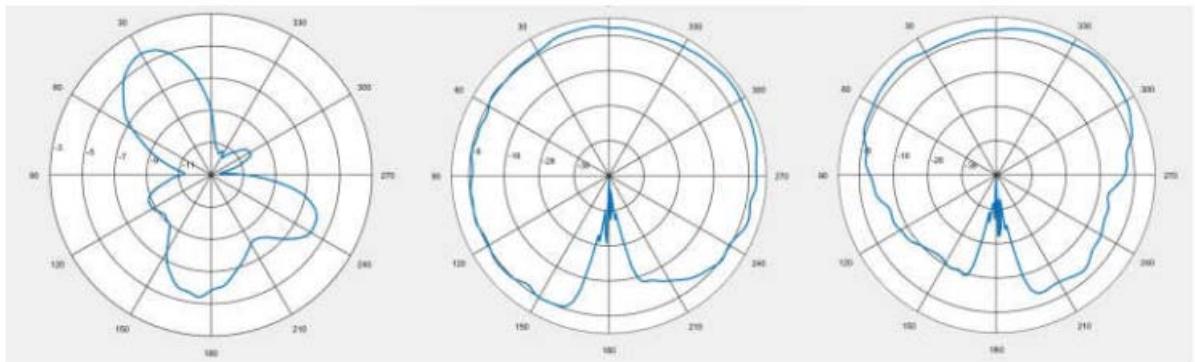


1710MHz

X-Y plane

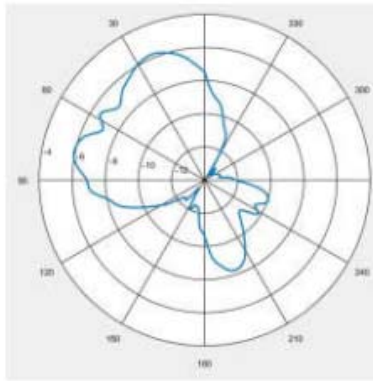
X-Z plane

Y-Z plane

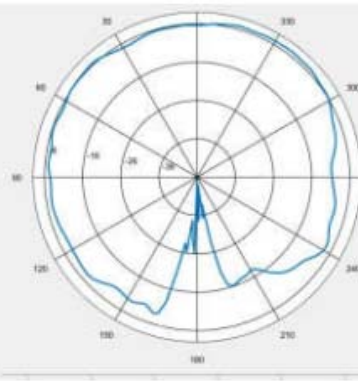


2450MHz

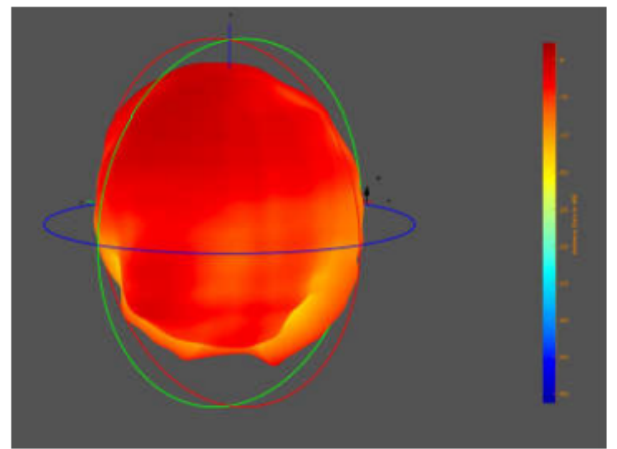
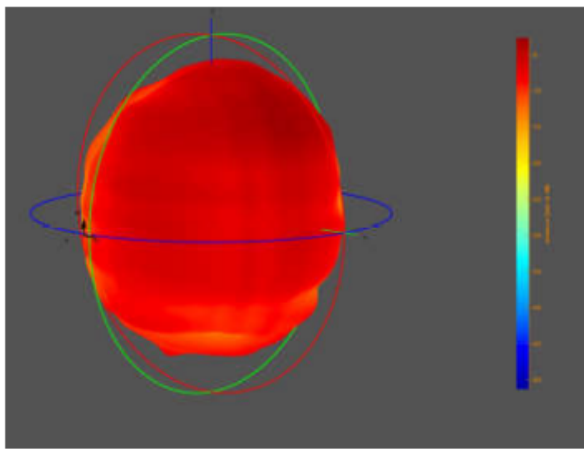
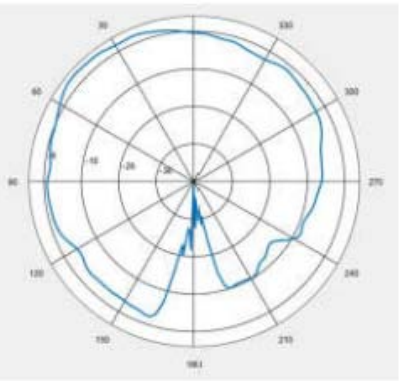
X-Y plane



X-Z plane

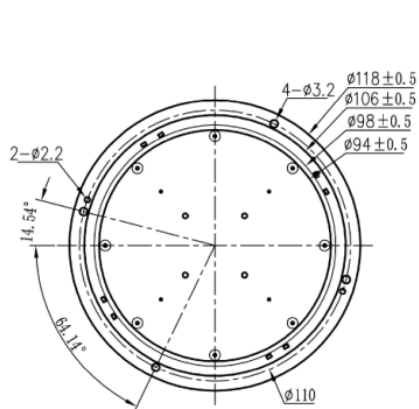


Y-Z plane

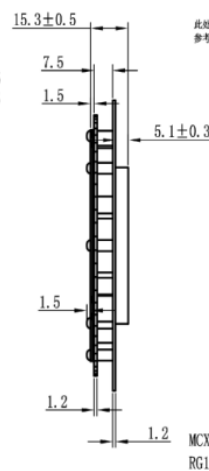


2690MHz

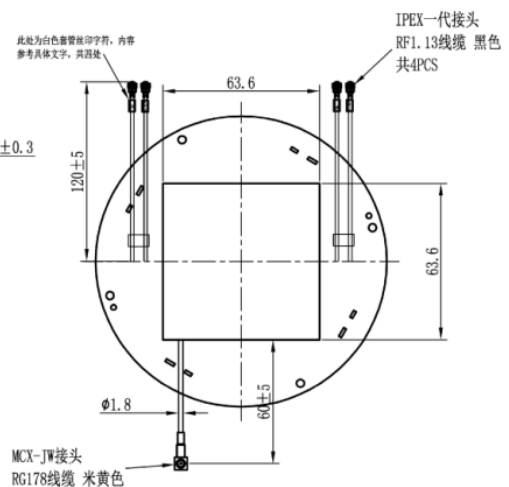
Product three views (dimensional tolerance  $\pm 0.3\text{mm}$ )



front view



side view



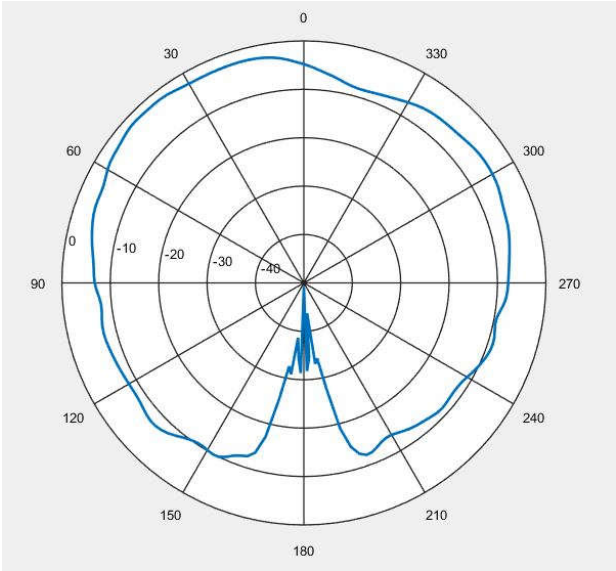
bottom view

CSX332A antenna BT and WiFi antenna gain and pattern

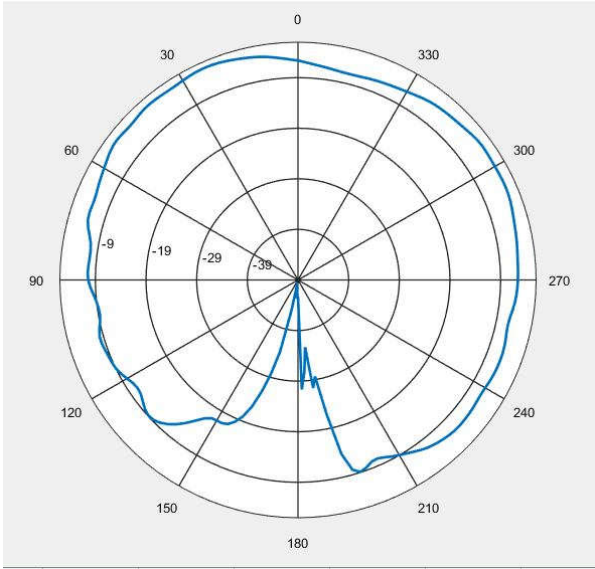
BT antenna gain

|          |      |      |      |      |      |      |      |      |
|----------|------|------|------|------|------|------|------|------|
| 频率 (MHz) | 2410 | 2420 | 2430 | 2440 | 2450 | 2460 | 2470 | 2480 |
| 增益 (dB)  | -1.0 | -0.8 | -0.2 | 0    | -0.6 | -1.2 | -1.9 | -2.0 |

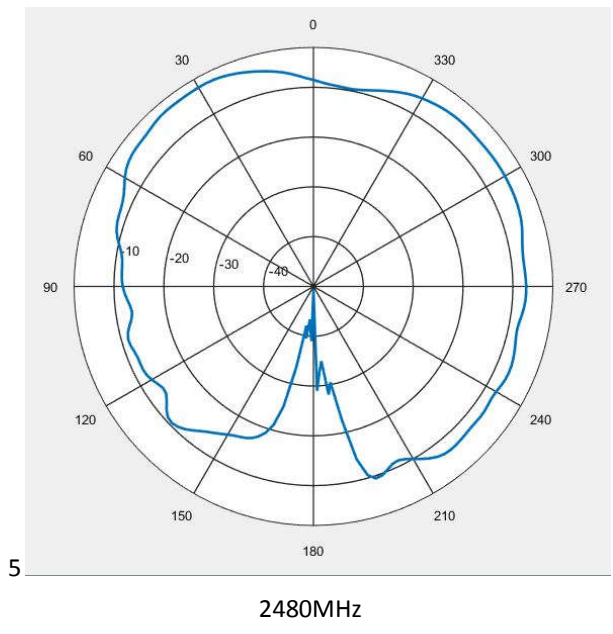
BT antenna pattern



2410MHz



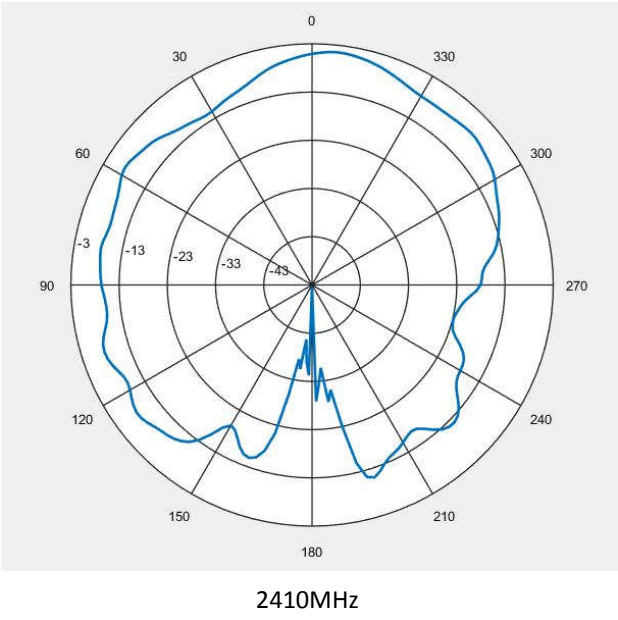
2450MHz

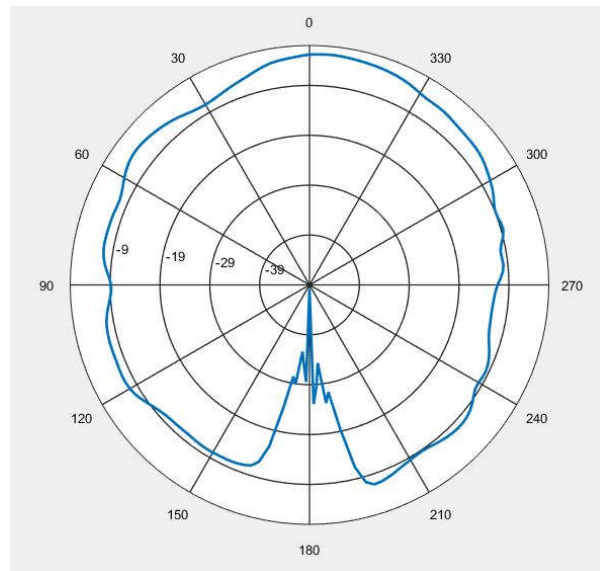


WiFi antenna gain

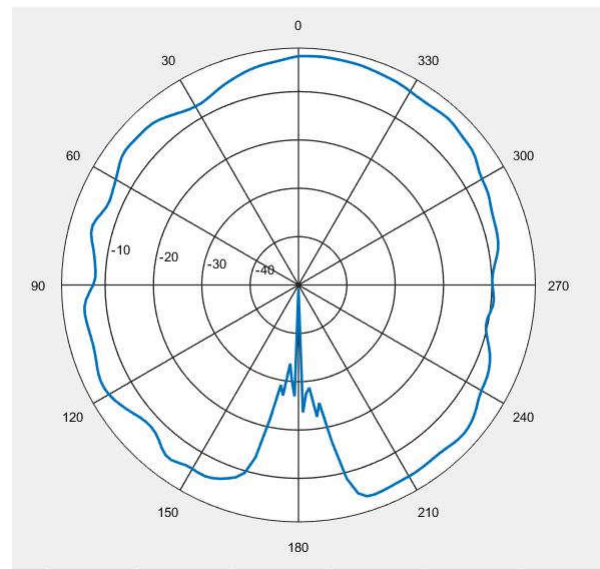
| 频率（MHz） | 2410 | 2420 | 2430 | 2440 | 2450 | 2460 | 2470 | 2480 |
|---------|------|------|------|------|------|------|------|------|
| 增益（dB）  | -0.9 | -0.6 | 0    | 0.4  | 0.7  | 0.6  | 0.5  | 0.4  |

WiFi antenna pattern





2450MHz



2480MHz