JUNIPER AP36 ANTENNA REPORT

Brand: Juniper

Model: AP36

Juniper driven by Mist AI

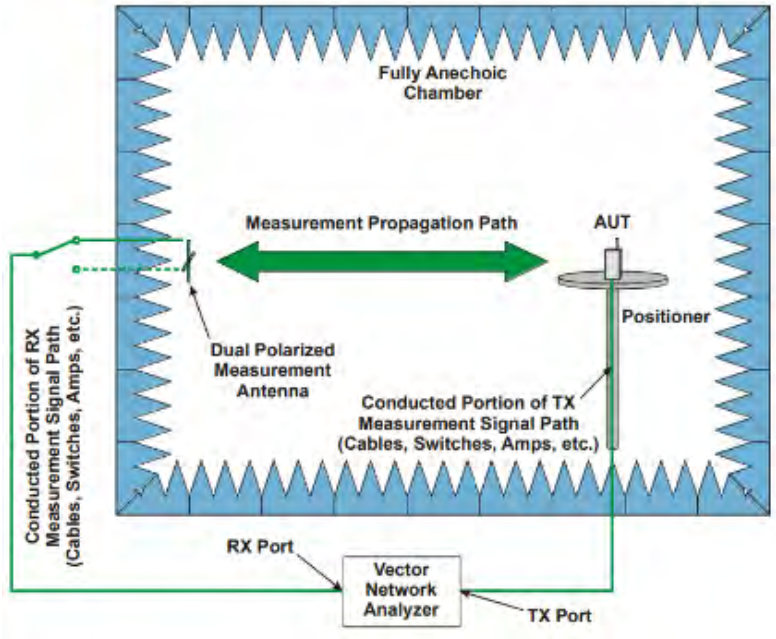
Contents

Chamber Information

- Test Date：2025/05/21
- Test Engineer：LiKai Kuo
- Measurement System：ETS-AMS-8500
- Software Name：EMQuest
- Software Version：V1.0.8

Test Equipment

- Measurement System：ETS-AMS-8500
- Size:7.32(L)x3.66(W)x3.66(H)m
- Measurement Setup
  - pattern & gain measurement
    - ETS-Lindgren chamber (AMS-8500)
    - ETS-Lindgren program (EMQuest)
    - System overview
  - Test item
    - antenna passive test 700MHz~10GHz
- Calibration Information

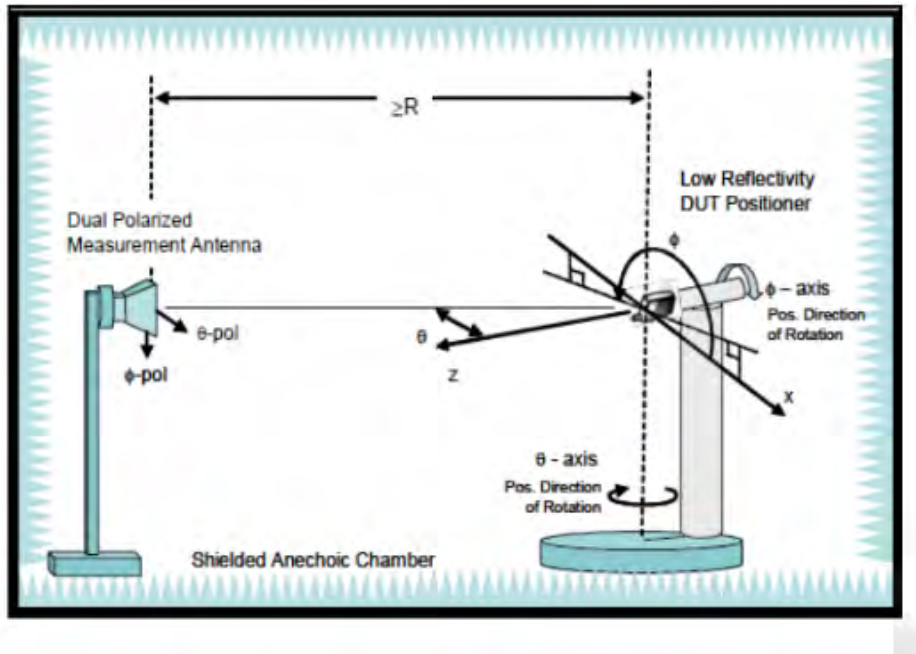


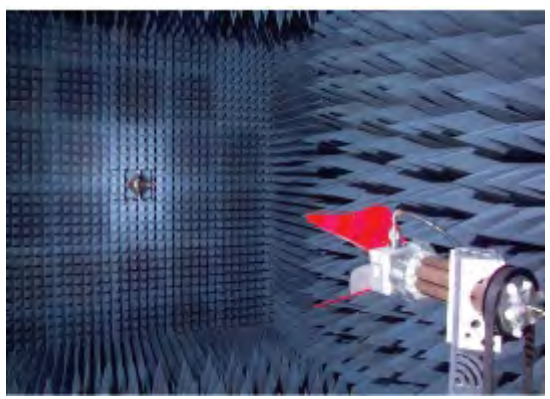
Device	Type / Model	Serial #	Manufacture	Cal. Date	Cal. Until
Full Anechoic Wireless Test chamber	ETS-Lindgren/AMS-8500	1380	ETS-Lindgren	N.C.R	N.C.R
Test Software	EMQuest™	98165	ETS-Lindgren	N.C.R	N.C.R
Dual Polarized Measurement Antenna	ETS-Lindgren/3164-08	920253	ETS-Lindgren	N.C.R	N.C.R
Vector Network Analyzer	Keysight– E5071C	MY46733006	Keysight	2024-09-12	2025-09-12
Positioner	EMCO – 2090	412HA	ETS-Lindgren	N.C.R	N.C.R

Note: N.C.R. = No Calibration Request.

Test Procedure

1. Place the device under test (DUT) on the fixture and align it with the center of the chamber.
2. Connect the antenna cable to the RF connector inside the chamber.
3. Use the software to configure parameters (such as antenna name, frequency points, and measurement angles), then launch the test software (EMQ).
4. Perform a scan with phi (Φ) from 0° to 360° and theta (θ) from 0° to 180° in 3-degree steps to obtain 3D data, including efficiency, peak gain, and 2D/3D radiation patterns.
5. This is a far-field test for antenna verification.
6. This is a passive measurement, meaning the device is powered off and not in operating mode.



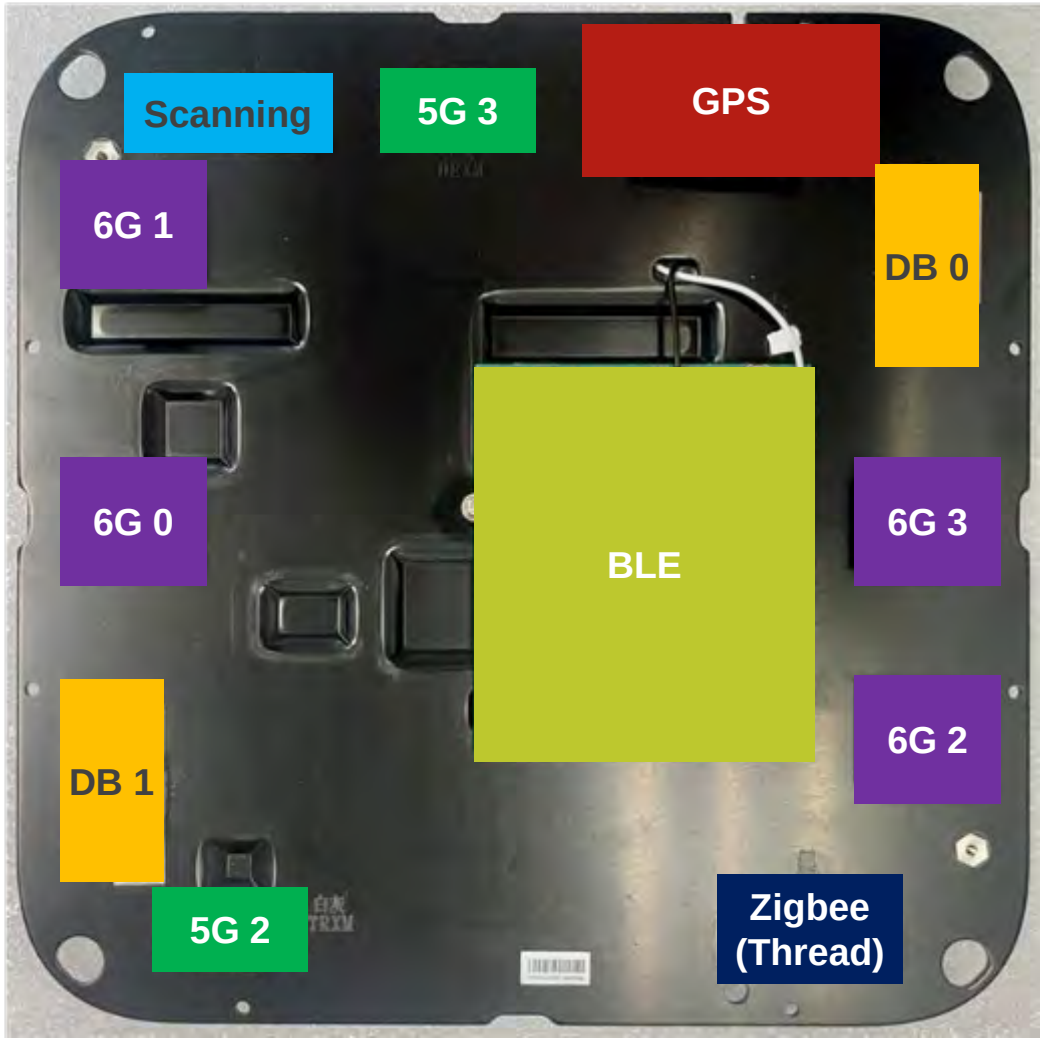


Summary

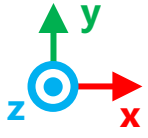
The summary of antenna performance are shown in below.

- Radiation efficiency
  - ~61% for 2.4GHz Wi-Fi 2G antennas [DB0, DB1]
  - ~71% for 5GHz Wi-Fi 5G antennas [DB0, DB1, 5G2, 5G3]
  - ~57% for 6GHz Wi-Fi 6G antennas [6G0, 6G1, 6G2, 6G3]
  - ~69% for 2.4GHz ~72% for 5GHz, ~65% for 6GHz Scanning antennas [Scanning]
  - ~63% for 2.4GHz Zigbee(Thread) antenna [Zigbee(Thread)]
  - ~65% for L1, ~49% for L5 GPS antenna [GPS]
  - ~60% for 2.4GHz Omni BLE
- Peak gain
  - 4.5dBi for 2.4GHz Wi-Fi Dual-band antennas [DB0, DB1]
  - 5.5dBi for 5GHz Wi-Fi 5G antennas [DB0, DB1, 5G2, 5G3]
  - 5.4dBi for 6GHz Wi-Fi 6G antennas [6G0, 6G1, 6G2, 6G3]
  - 4.8dBi for 2.4GHz, 5.9dBi for 5GHz, 6.0dBi for 6GHz Scanning antennas [Scanning]
  - 4.3dBi for 2.4GHz Zigbee(Thread) antenna [Zigbee(Thread)]
  - 4.8dBi for L1, 3.2dBi for L5 GPS antenna [GPS]
  - 4.6dBi for 2.4GHz Omni BLE

Antenna Placement



Brand	Antenna Type
DB(0-1)	PIFA
5G(2-3)	PIFA
6G(0-3)	Alford loop
Scanning	PIFA
Zigbee(Thread)	PIFA
GPS	PIFA
BLE	PIFA



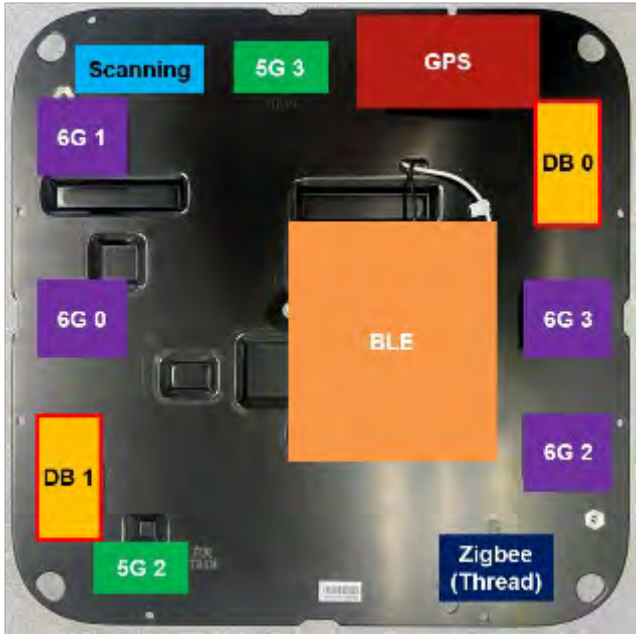
Antenna Plate: 221x221mm

Peak Gain Table

Zigbee(Thread)	Peak Gain	Position of Peak Gain (θ, ϕ)
Zigbee(Thread)	4.3 dBi	θ = 33.8° , ϕ = 36.6°

BLE	Peak Gain	Position of Peak Gain (θ, ϕ)
BLE	4.6 dBi	θ =120.9 ° , ϕ = 47.8°

Wi-Fi 2G



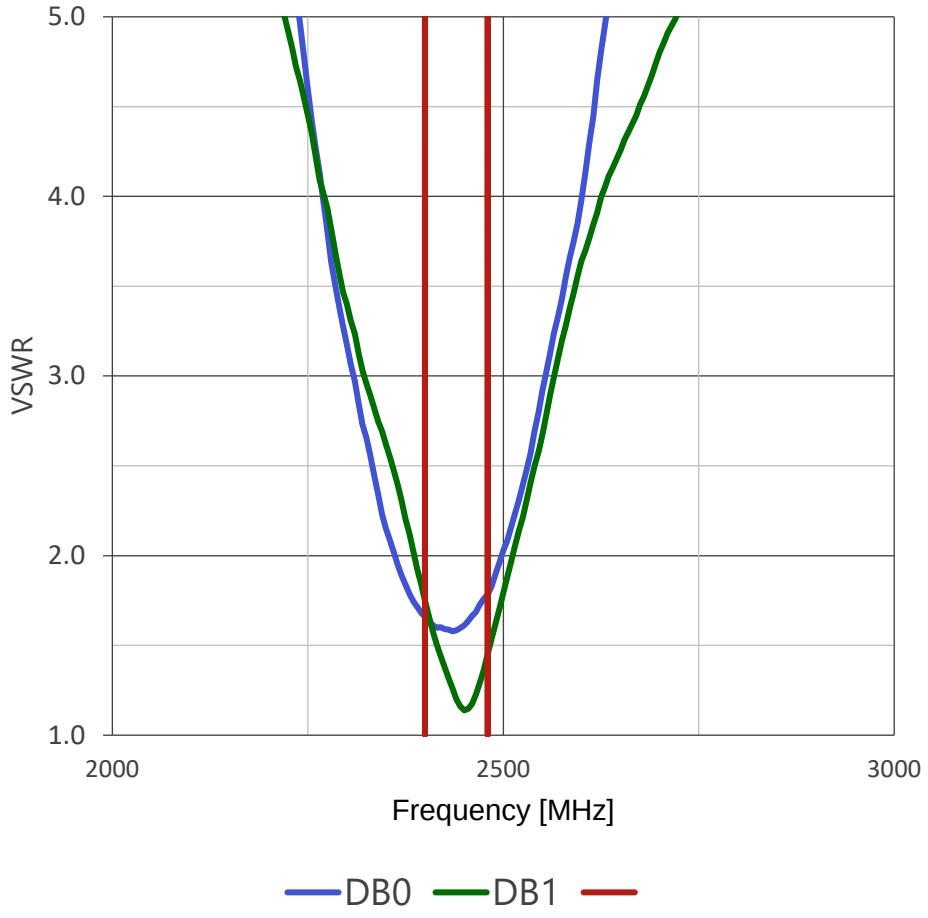
- **Maximum VSWR**
  - 2.0:1 on 2.4GHz
- **Minimum Isolation**
  - 28.4dB on 2.4GHz
- **Average Efficiency**
  - ~61% on 2.4GHz
- **Peak Gain**
  - 4.5dBi on 2.4GHz

■ **Cable Length**

DB0：131mm

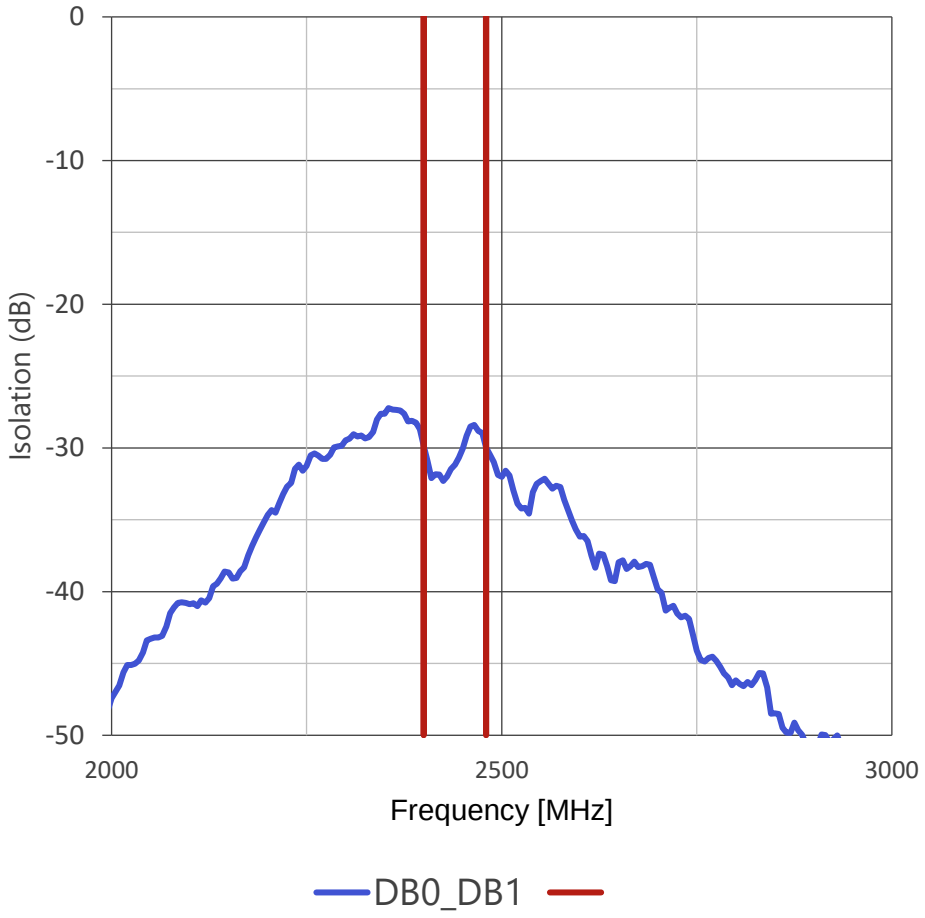
DB1：231mm

VSWR Wi-Fi 2G



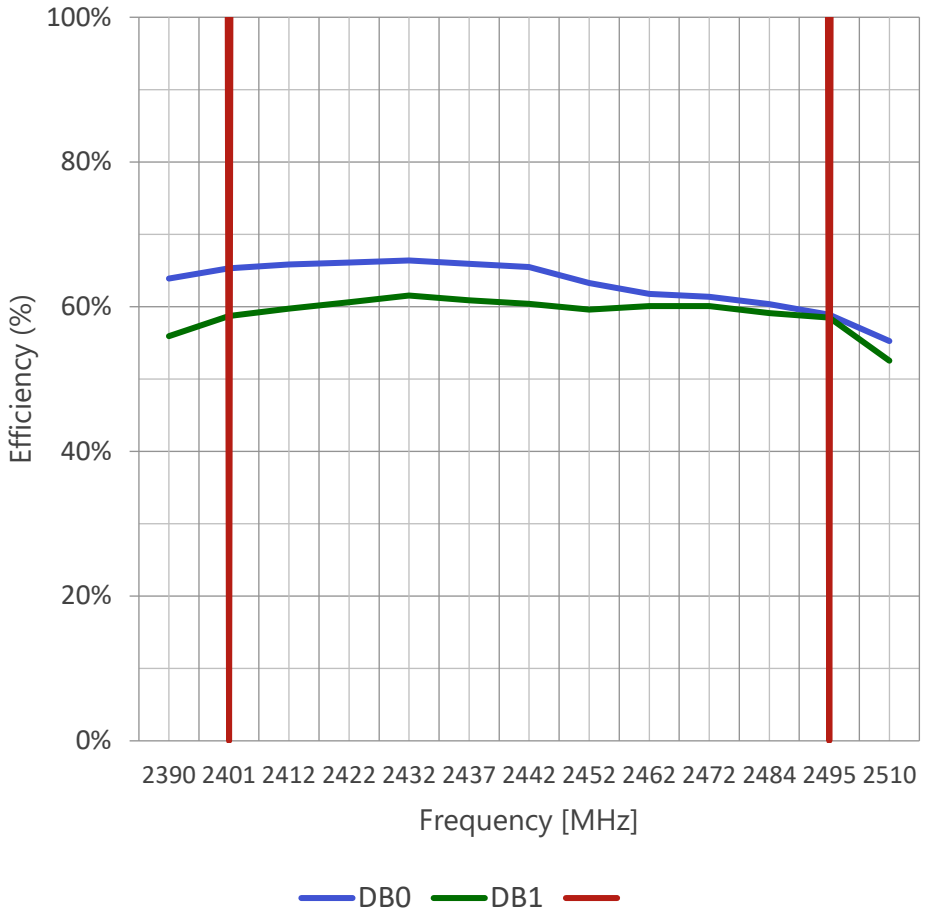
2.4GHz	Max	Mean	Min
DB0	2.0	1.7	1.6
DB1	1.8	1.4	1.1
Summary	2.0	1.6	1.1

Isolation Wi-Fi 2G



2.4GHz	Max	Mean	Min
DB0_DB1	-28.4	-30.6	-32.3

Efficiency Wi-Fi 2G



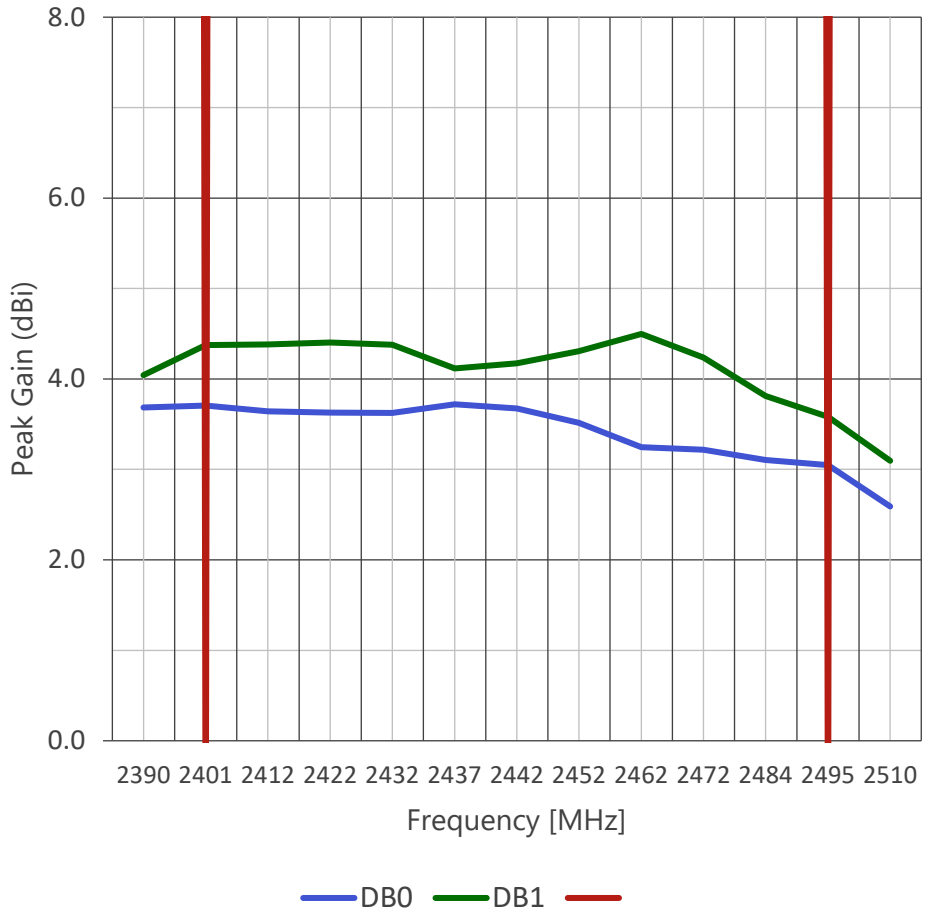
2.4GHz	Max	Mean	Min
DB0	66%	63%	55 %
DB1	62 %	59 %	58 %
Summary	66 %	61 %	65 %

- **Cable Length**

  DB0：131mm

  DB1：231mm

Peak Gain Wi-Fi 2G



2.4GHz	Max	Mean	Min
DB0	3.7 dBi	3.5 dBi	3.0 dBi
DB1	4.5 dBi	4.1 dBi	3.1 dBi
Summary	4.5 dBi	3.8 dBi	3.0 dBi

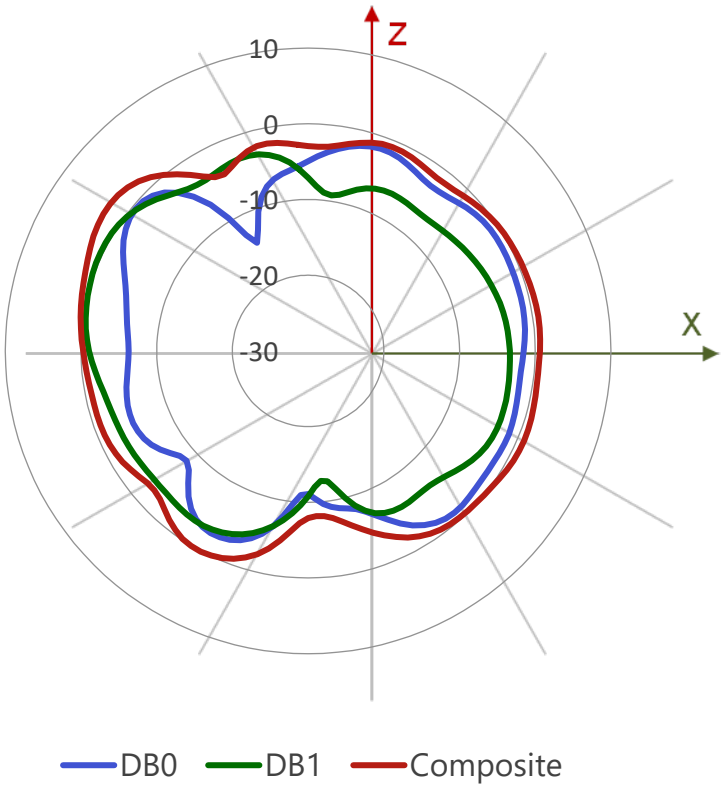
- **Cable Length**

  DB0：131mm

  DB1：231mm

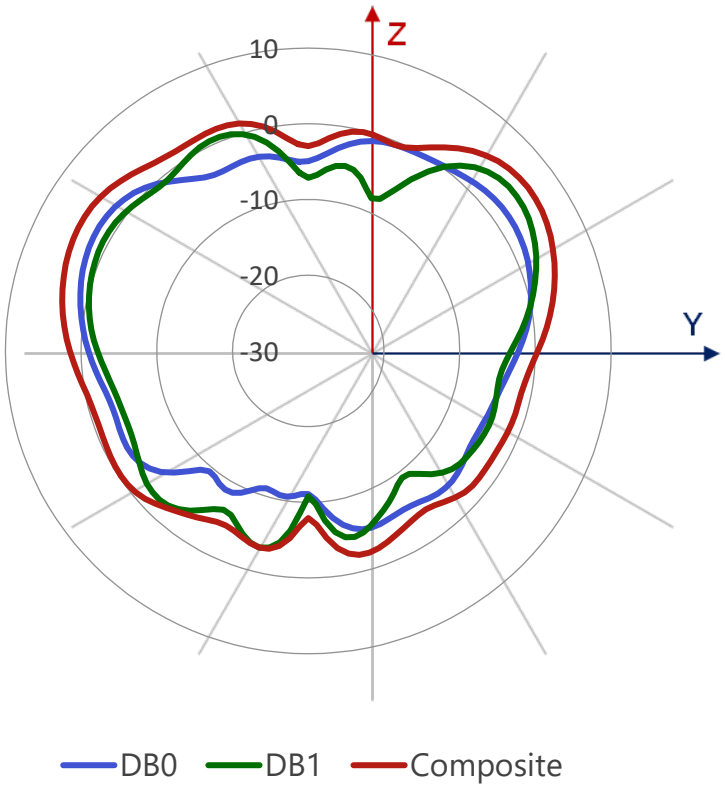
Realized Gain Pattern Wi-Fi 2G @2.4G_V+H

phi = 0



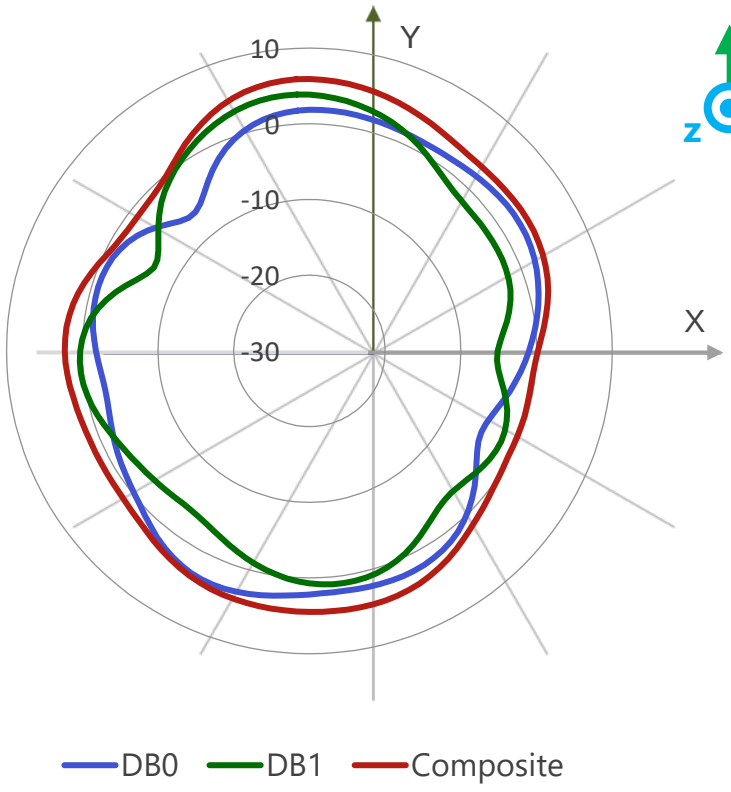
DB0 DB1 Composite

phi = 90

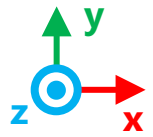


DB0 DB1 Composite

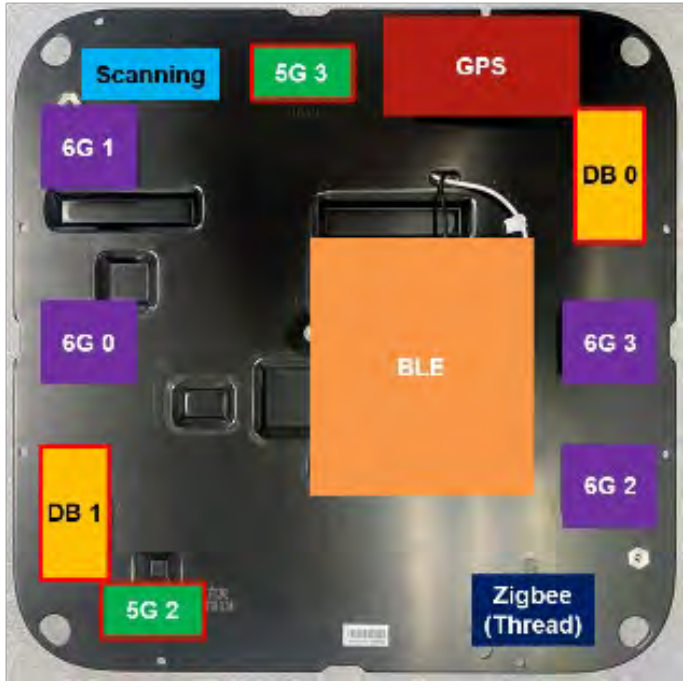
theta = 60



DB0 DB1 Composite



Wi-Fi 5G



- **Maximum VSWR**
  - 2.0:1 on 5GHz
- **Minimum Isolation**
  - 20.7dB on 5GHz
- **Average Efficiency**
  - ~71% on 5GHz
- **Peak Gain**
  - 5.5dBi on 5GHz

■ **Cable Length**

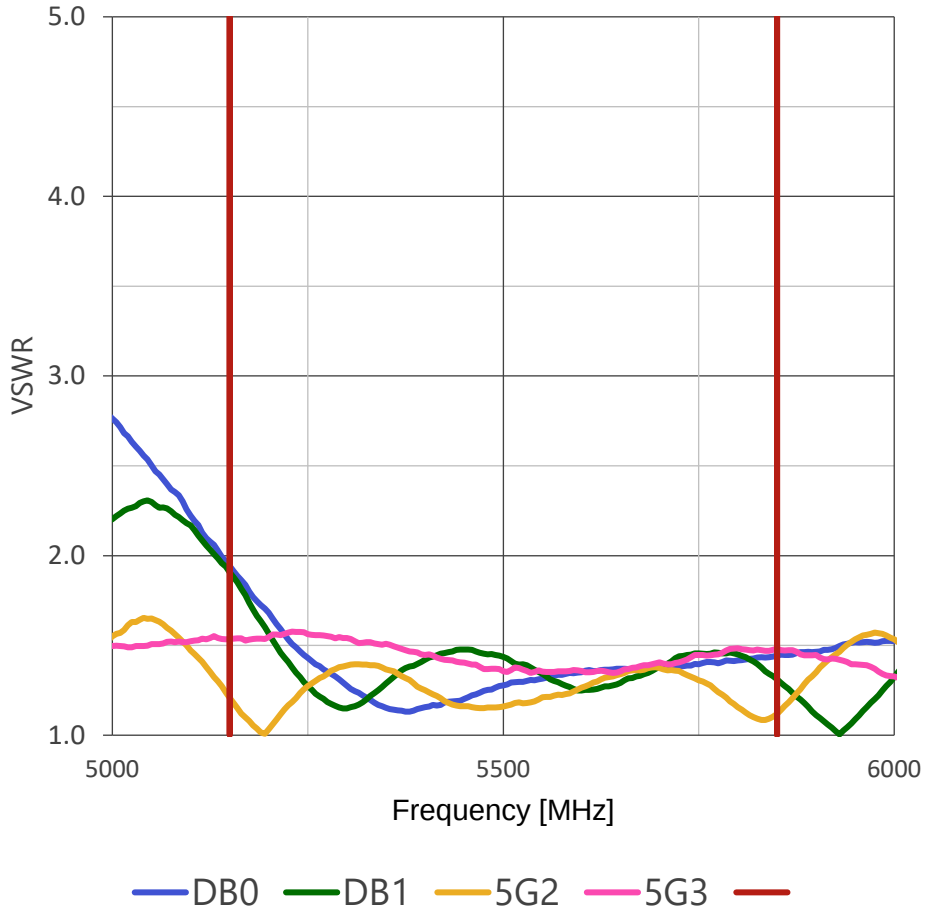
DB0：131mm

DB1：232mm

5G2：379mm

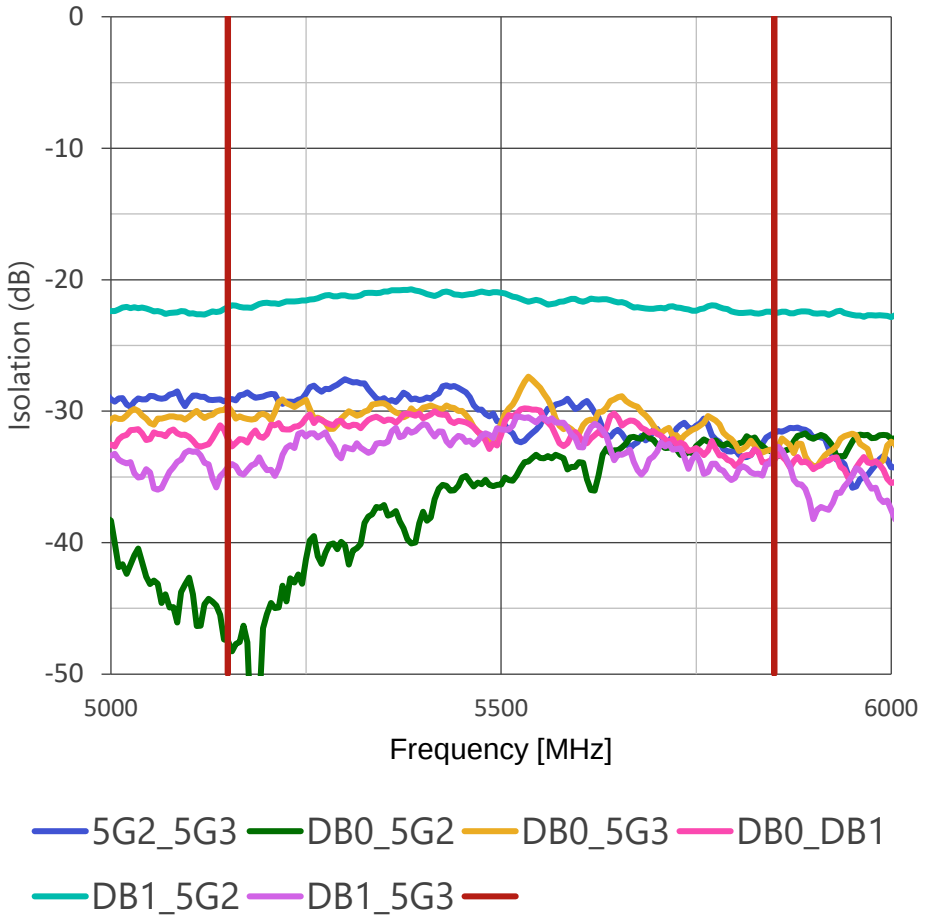
5G3：101mm

VSWR Wi-Fi 5G



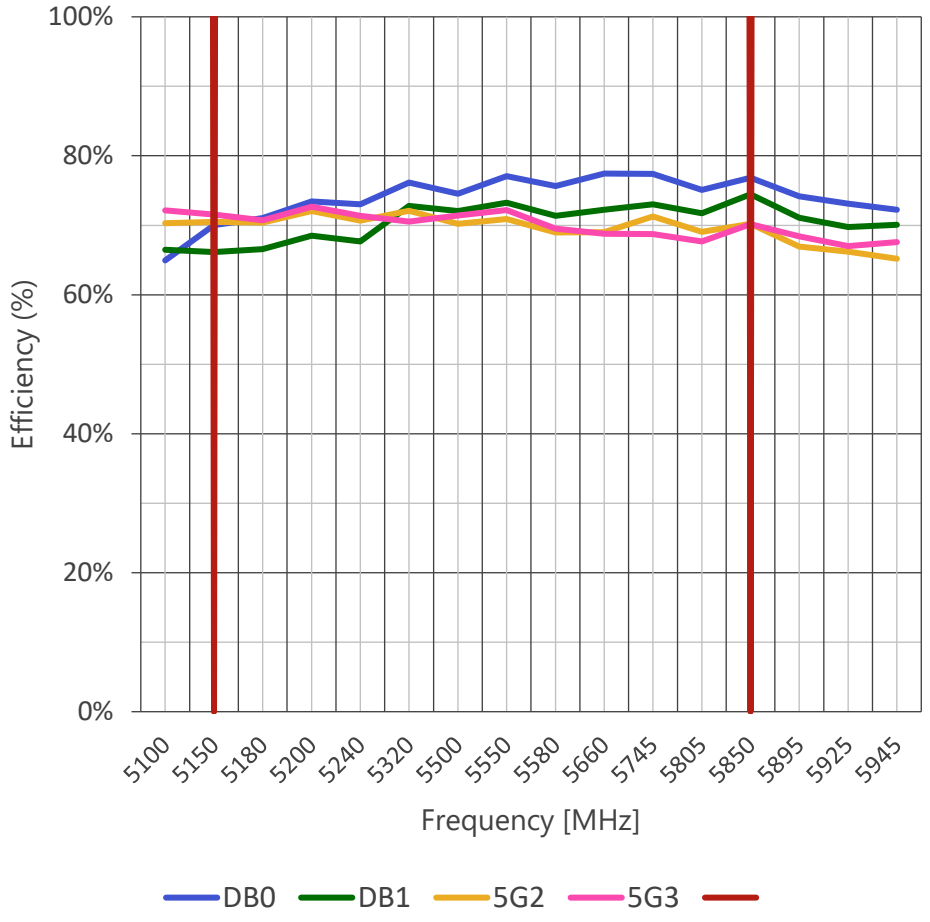
5GHz	Max	Mean	Min
DB0	2.0	1.4	1.1
DB1	2.0	1.4	1.1
5G2	1.4	1.2	1.0
5G3	1.6	1.4	1.3
Summary	2.0	1.4	1.0

Isolation Wi-Fi 5G



5GHz	Max	Mean	Min
5G2_5G3	-27.6	-30.2	-33.5
DB0_5G2	-31.7	-36.8	-55.1
DB0_5G3	-27.4	-30.5	-33.2
DB0_DB1	-29.8	-31.5	-34.2
DB1_5G2	-20.7	-21.6	-22.6
DB1_5G3	-30.4	-32.7	-35.2
Summary	-20.7	-30.2	-55.1

Efficiency Wi-Fi 5G



5GHz	Max	Mean	Min
DB0	68 %	65 %	63 %
DB1	72 %	70 %	68 %
5G2	76 %	69 %	61 %
5G3	72 %	66 %	60 %
Summary	76 %	71 %	60 %

- **Cable Length**

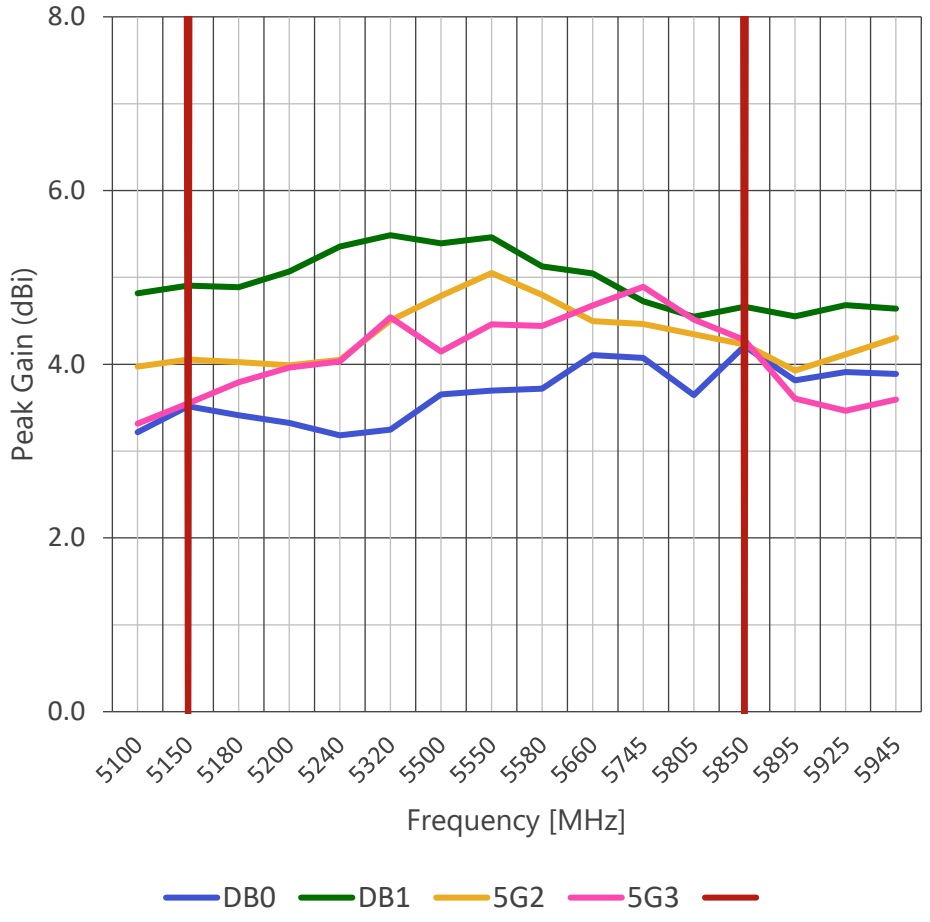
  DB0：131mm

  DB1：232mm

  5G2：379mm

  5G3：101mm

Peak Gain Wi-Fi 5G



5GHz	Max	Mean	Min
DB0	4.2 dBi	3.6 dBi	3.2 dBi
DB1	5.5 dBi	5.1 dBi	4.5 dBi
5G2	5.1 dBi	4.4 dBi	4.0 dBi
5G3	4.9 dBi	4.3 dBi	3.5 dBi
Summary	5.5 dBi	4.3 dBi	3.2 dBi

- **Cable Length**

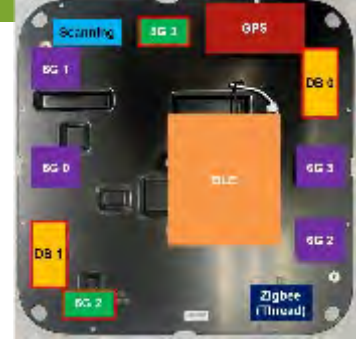
  DB0：131mm

  DB1：232mm

  5G2：379mm

  5G3：101mm

Realized Gain Pattern Wi-Fi 5G @5G_V+H



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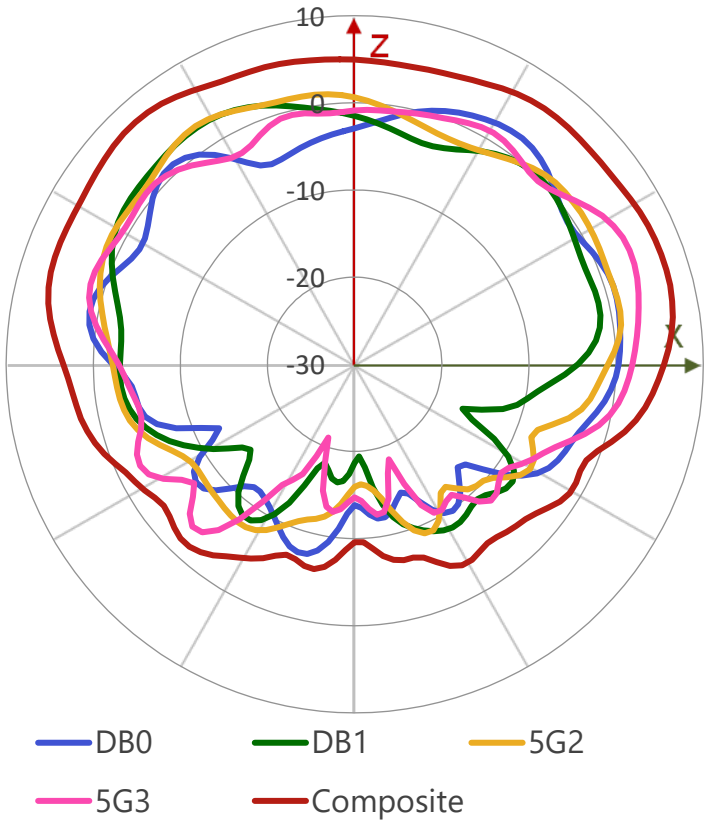
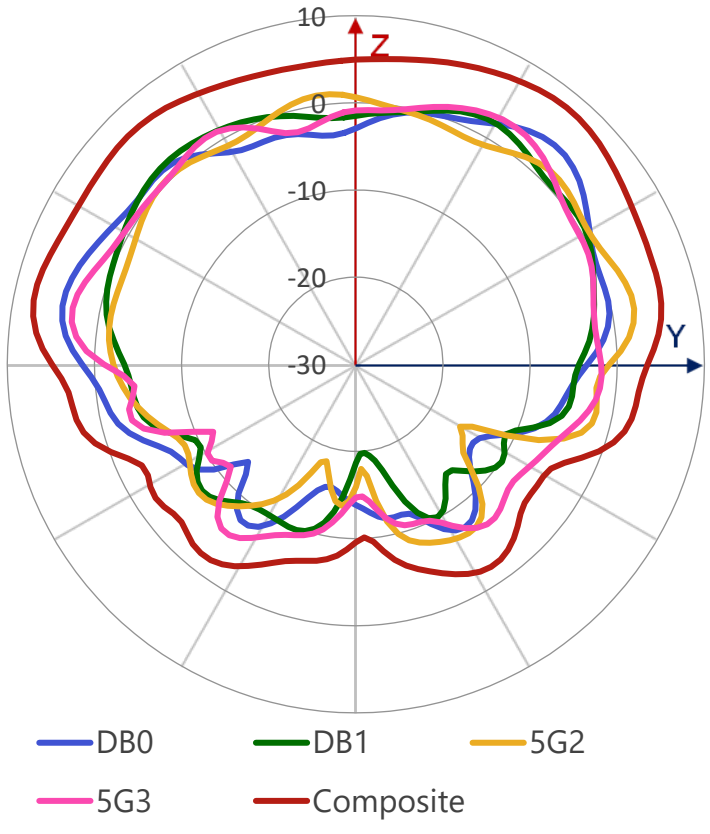
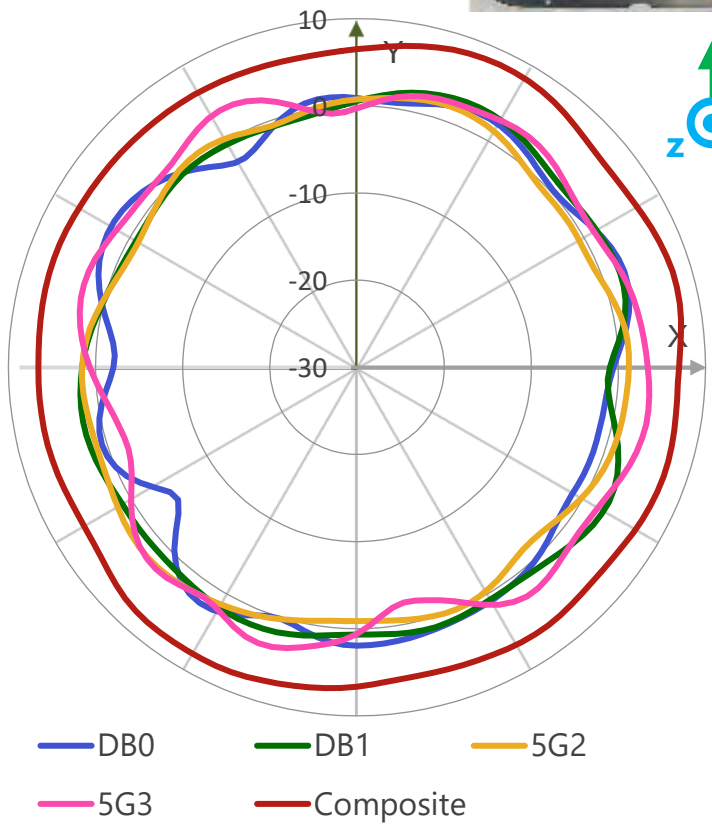
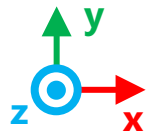


phi = 90

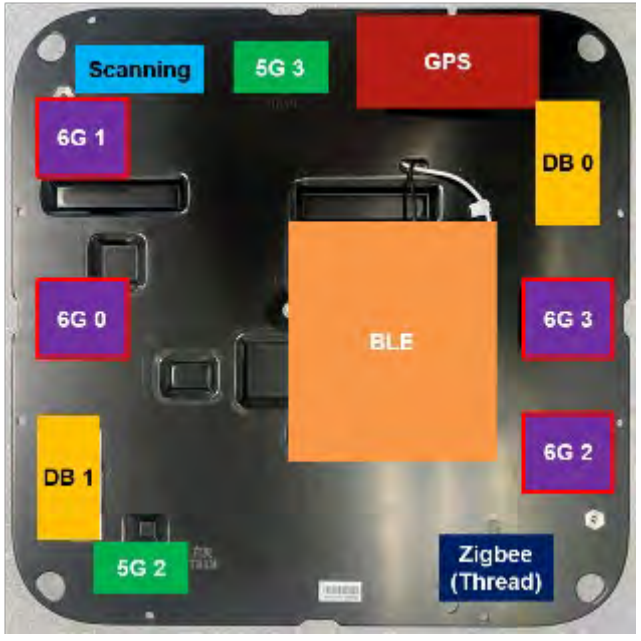


theta = 60





Wi-Fi 6G



- **Maximum VSWR**
  - 2.0:1 on 6GHz
- **Minimum Isolation**
  - 25.2dB on 6GHz
- **Average Efficiency**
  - ~57% on 6GHz
- **Peak Gain**
  - 5.4dBi on 6GHz

■ **Cable Length**

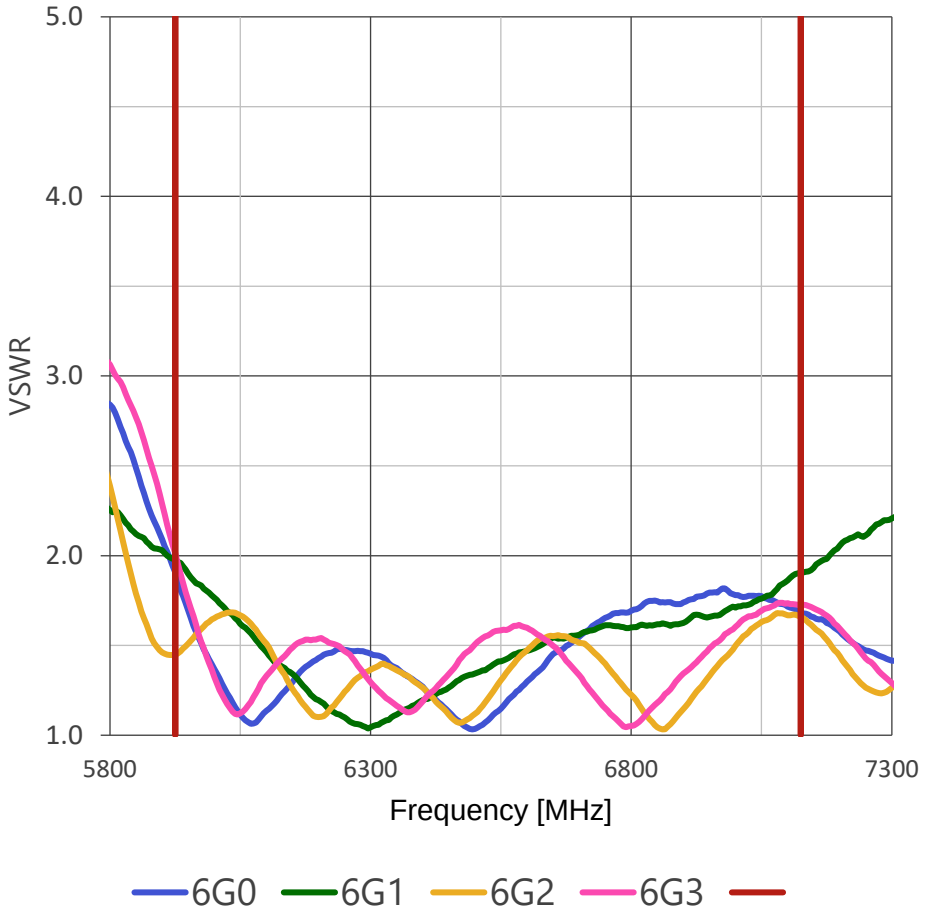
6G0：133mm

6G1：57mm

6G2：267mm

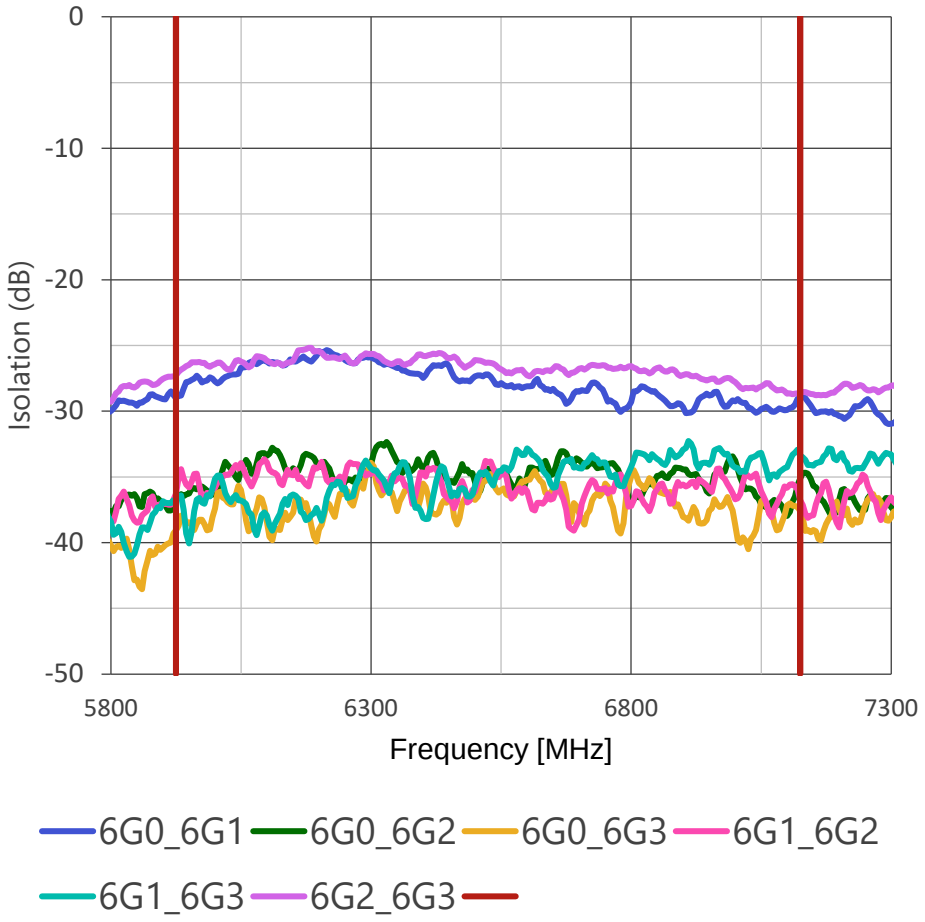
6G3：207mm

VSWR Wi-Fi 6G



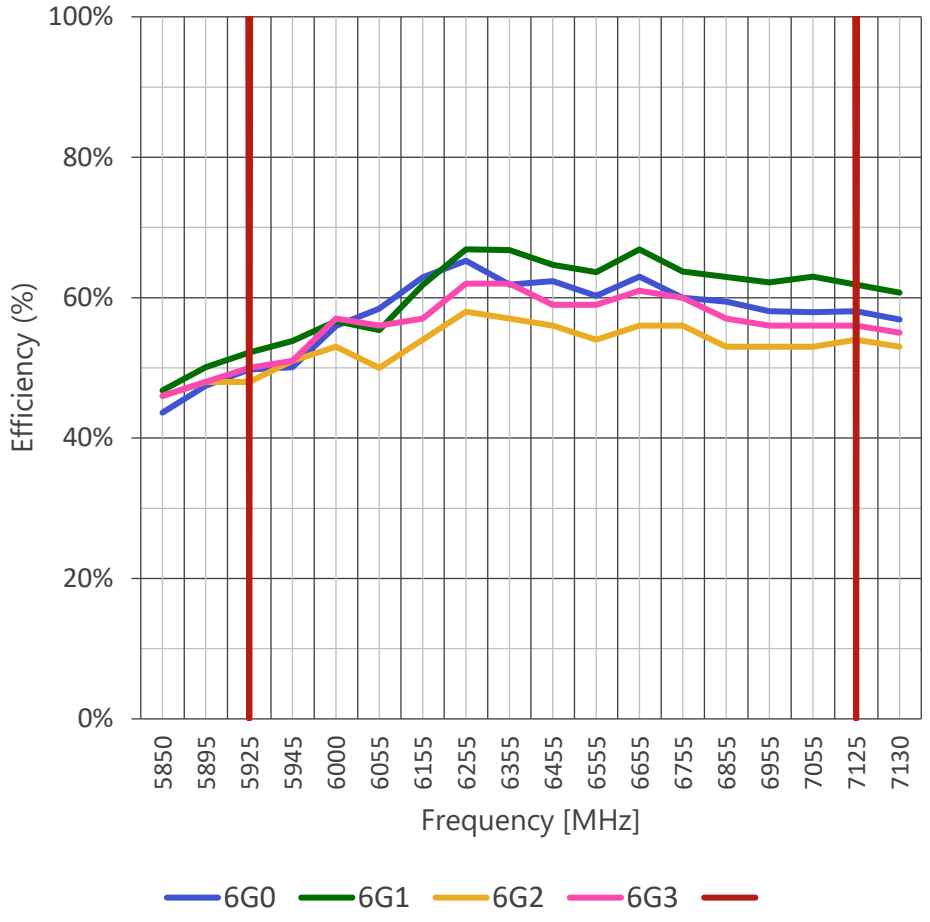
6GHz	Max	Mean	Min
6G0	1.9	1.5	1.0
6G1	2.0	1.5	1.0
6G2	1.7	1.4	1.0
6G3	2.0	1.4	1.0
Summary	2.0	1.4	1.0

Isolation Wi-Fi 6G



6GHz	Max	Mean	Min
6G0_6G1	-25.4	-27.8	-30.1
6G0_6G2	-32.3	-34.8	-38.0
6G0_6G3	-33.9	-37.1	-40.5
6G1_6G2	-33.7	-35.6	-39.1
6G1_6G3	-32.3	-35.2	-40.1
6G2_6G3	-25.2	-26.7	-28.7
Summary	-25.2	-32.2	-40.5

Efficiency Wi-Fi 6G



6GHz	Max	Mean	Min
6G0	65 %	57 %	50 %
6G1	67 %	60 %	52 %
6G2	58 %	53 %	48 %
6G3	62 %	56 %	50 %
Summary	67 %	57 %	48 %

- **Cable Length**

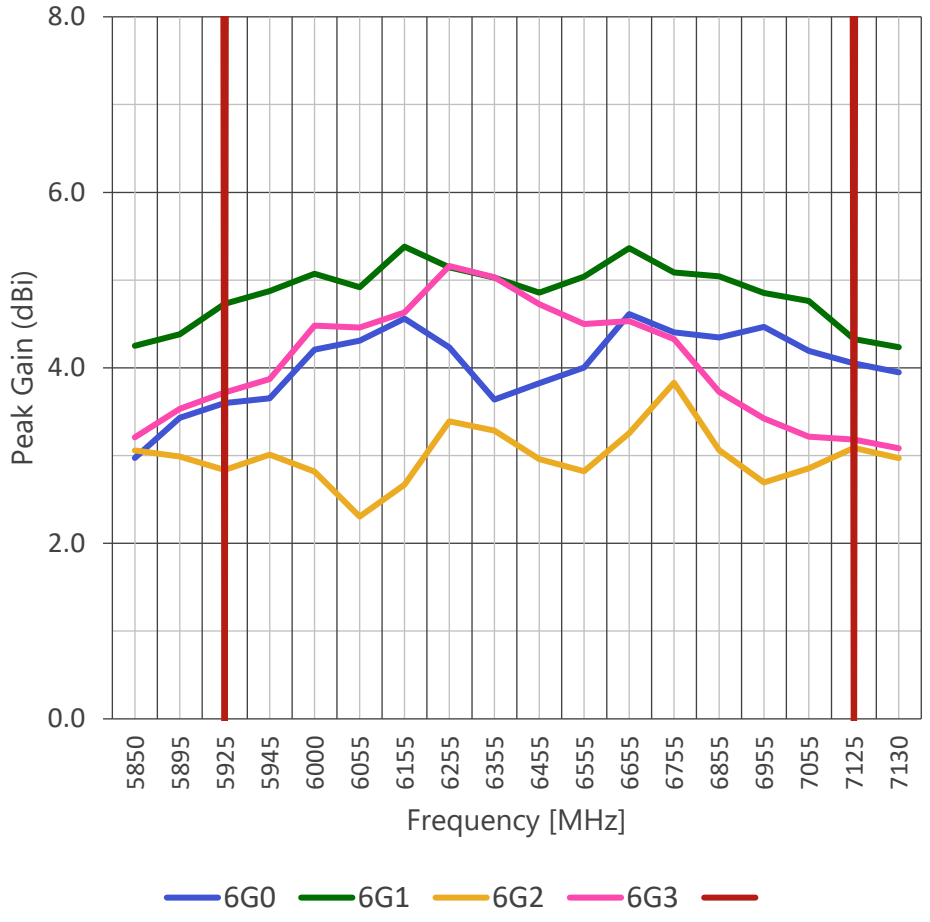
  6G0：133mm

  6G1：57mm

  6G2：267mm

  6G3：207mm

Peak Gain Wi-Fi 6G

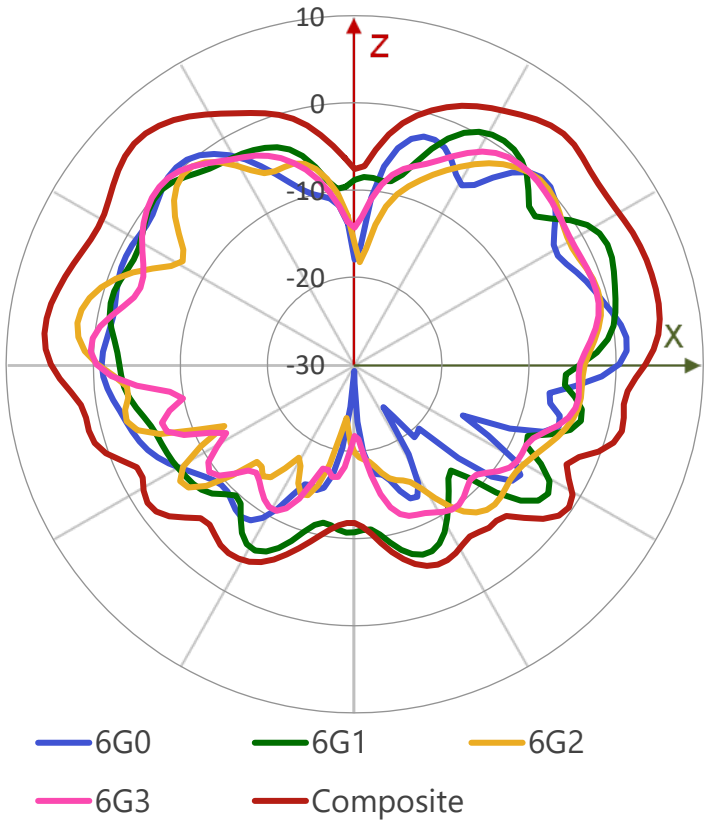


6GHz	Max	Mean	Min
6G0	4.6 dBi	4.0 dBi	3.6 dBi
6G1	5.4 dBi	4.9 dBi	4.3 dBi
6G2	3.8 dBi	3.0 dBi	2.3 dBi
6G3	5.2 dBi	4.0 dBi	3.2 dBi
Summary	5.4 dBi	4.0 dBi	2.3 dBi

- **Cable Length**
  - **6G0：133mm**
  - **6G1：57mm**
  - **6G2：267mm**
  - **6G3：207mm**

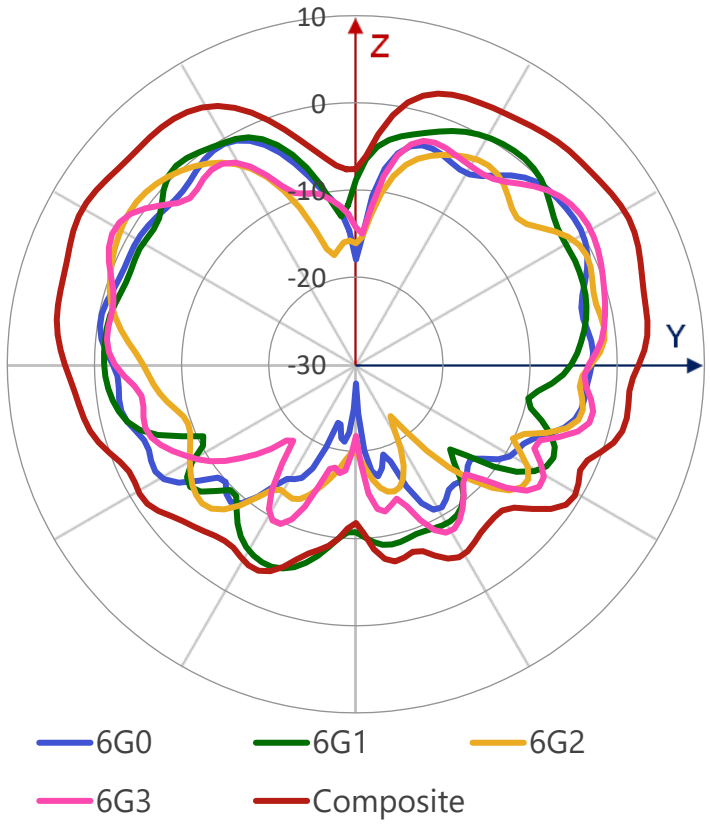
Realized Gain Pattern Wi-Fi 6G @6G_V+H

phi = 0



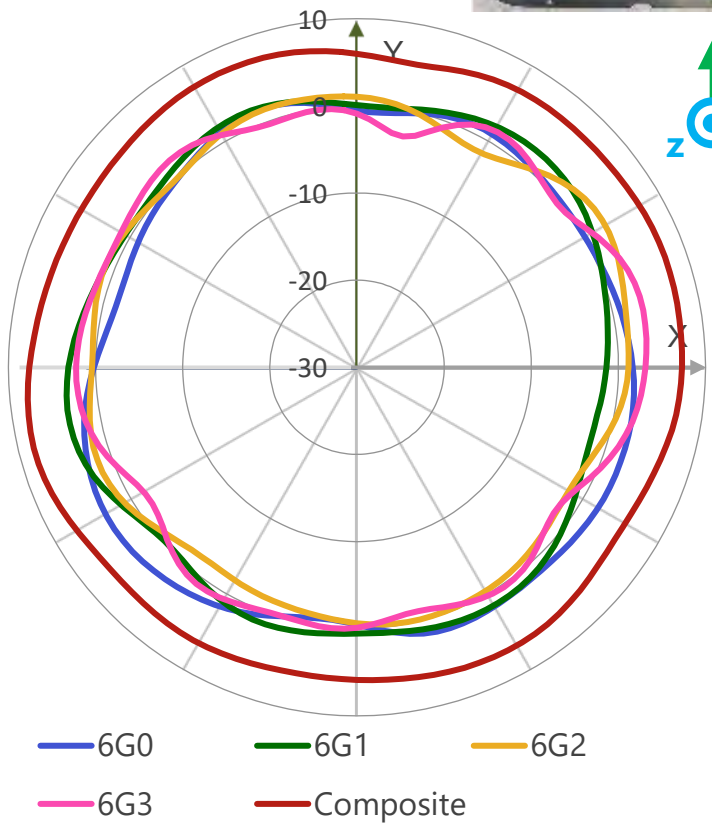
6G0 6G1 6G2
6G3 Composite

phi = 90

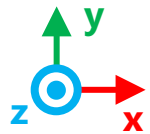


6G0 6G1 6G2
6G3 Composite

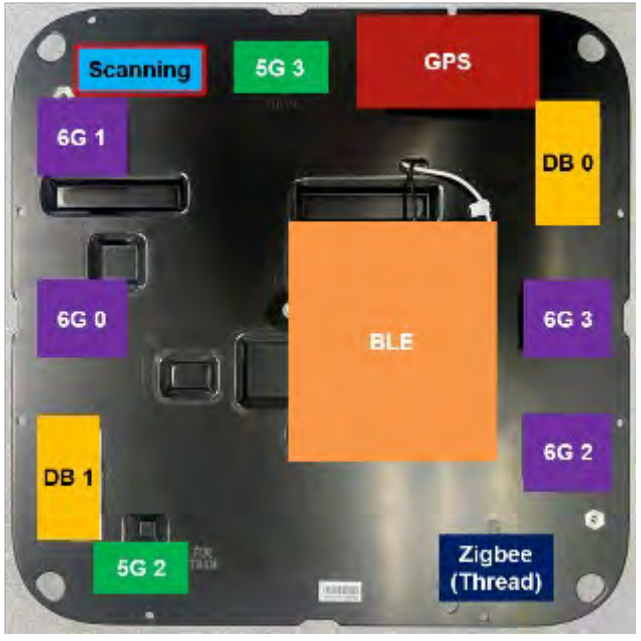
theta = 60



6G0 6G1 6G2
6G3 Composite



Scanning Radio

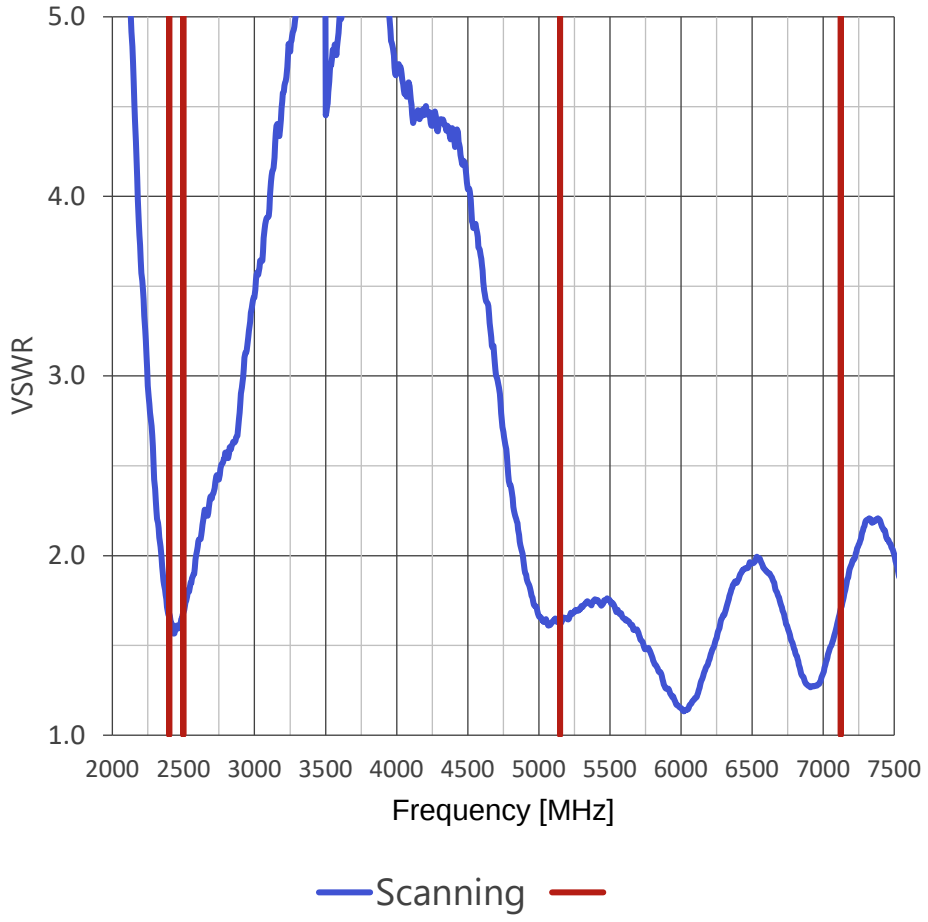


- **Maximum VSWR**
  - 1.7:1 on 2.4GHz / 2.0:1 on 5/6GHz
- **Average Efficiency**
  - ~69% on 2.4GHz / ~72% on 5GHz / ~65% on 6GHz
- **Peak Gain**
  - 4.8dBi on 2.4GHz / 5.9dBi on 5GHz / 6.0dBi on 6GHz

■ **Cable Length**

Scanning：104mm

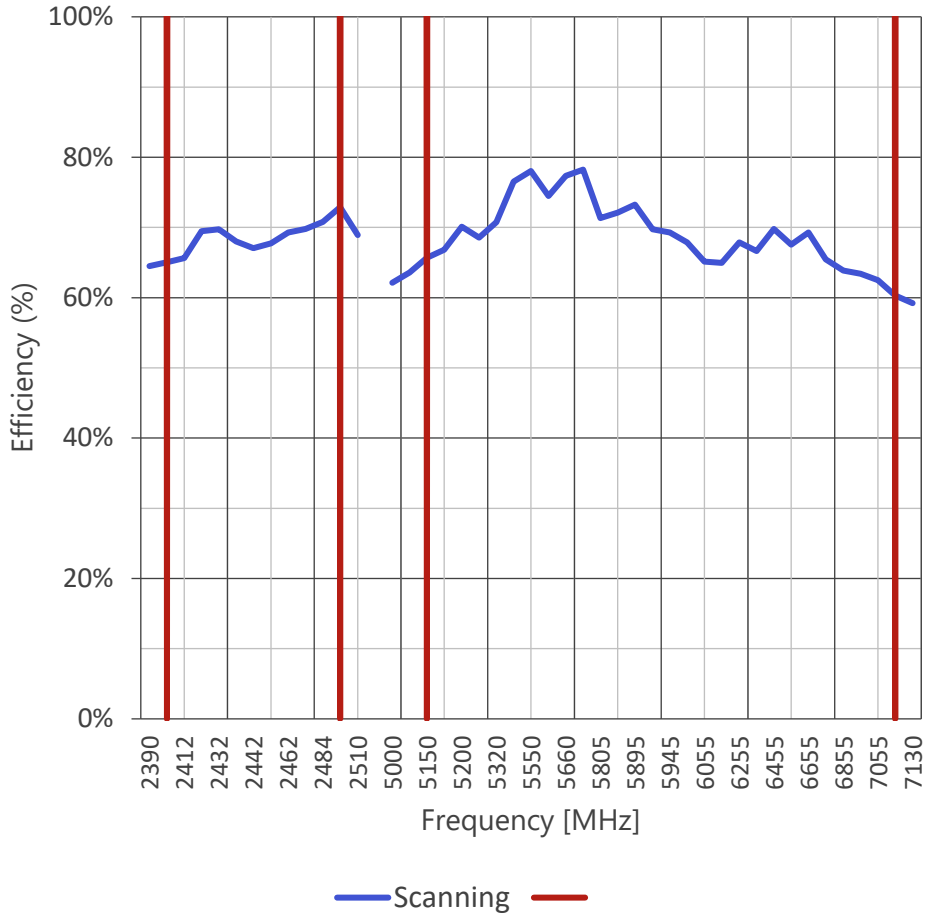
VSWR Scanning Radio



2.4GHz	Max	Mean	Min
Scanning	1.7	1.6	1.6

5/6GHz	Max	Mean	Min
Scanning	2.0	1.6	1.1

Efficiency Scanning Radio



2.4GHz	Max	Mean	Min
Scanning	73 %	69 %	65 %

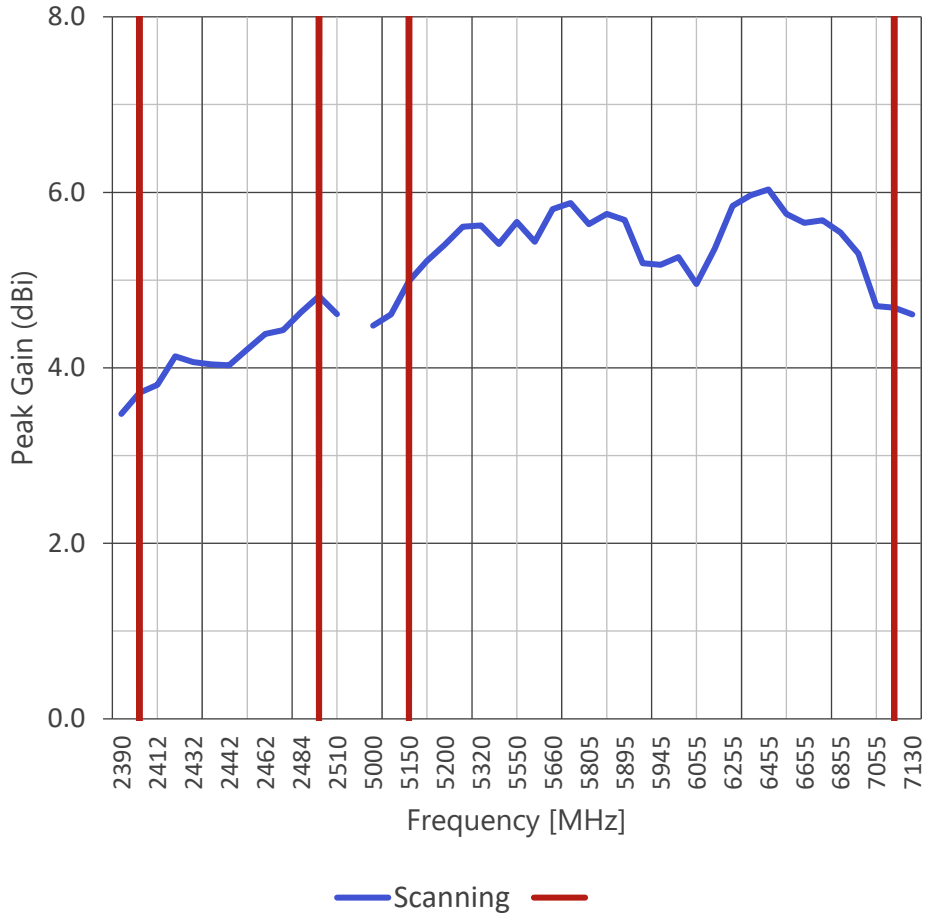
5GHz	Max	Mean	Min
Scanning	78 %	72 %	62 %

6GHz	Max	Mean	Min
Scanning	70 %	65 %	62 %

- **Cable Length**

  Scanning：104mm

Peak Gain Scanning Radio



2.4GHz	Max	Mean	Min
Scanning	4.8 dBi	4.2 dBi	3.5 dBi

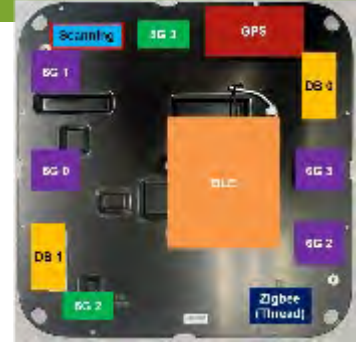
5GHz	Max	Mean	Min
Scanning	5.9 dBi	5.5 dBi	5.0 dBi

6GHz	Max	Mean	Min
Scanning	6.0 dBi	5.4 dBi	4.7 dBi

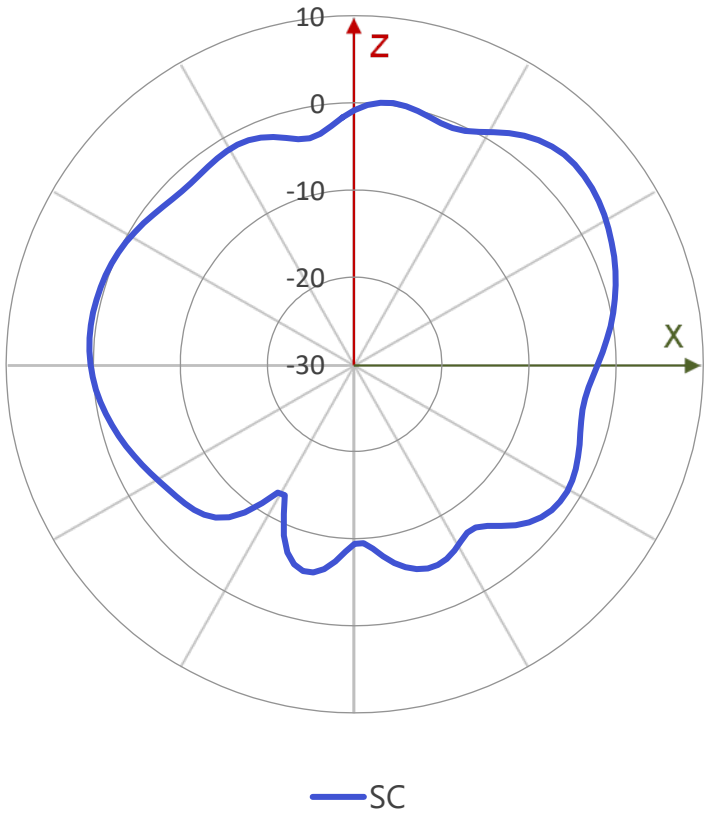
- **Cable Length**

  Scanning：104mm

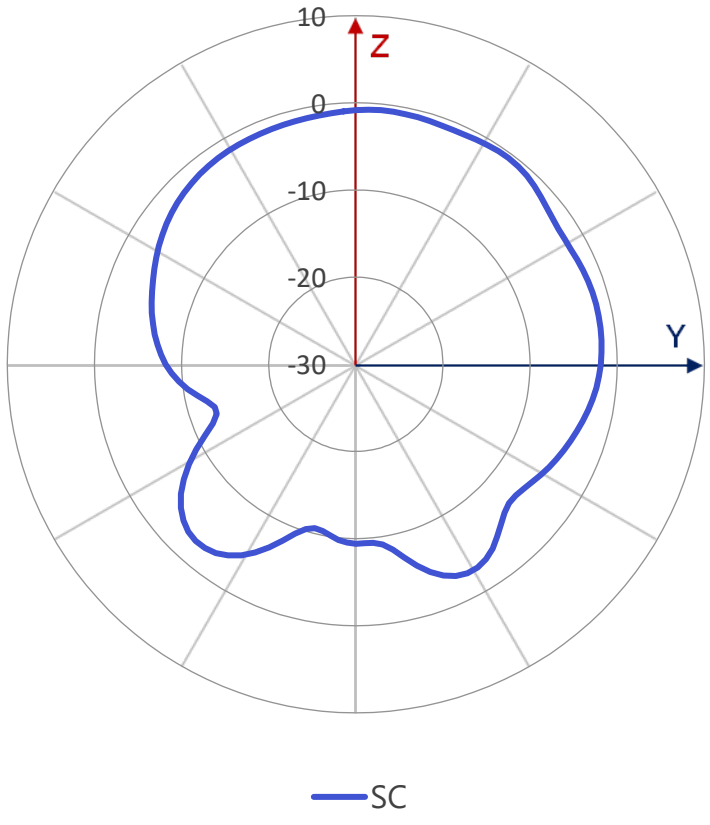
Realized Gain Pattern Scanning Radio @2.4G_V+H



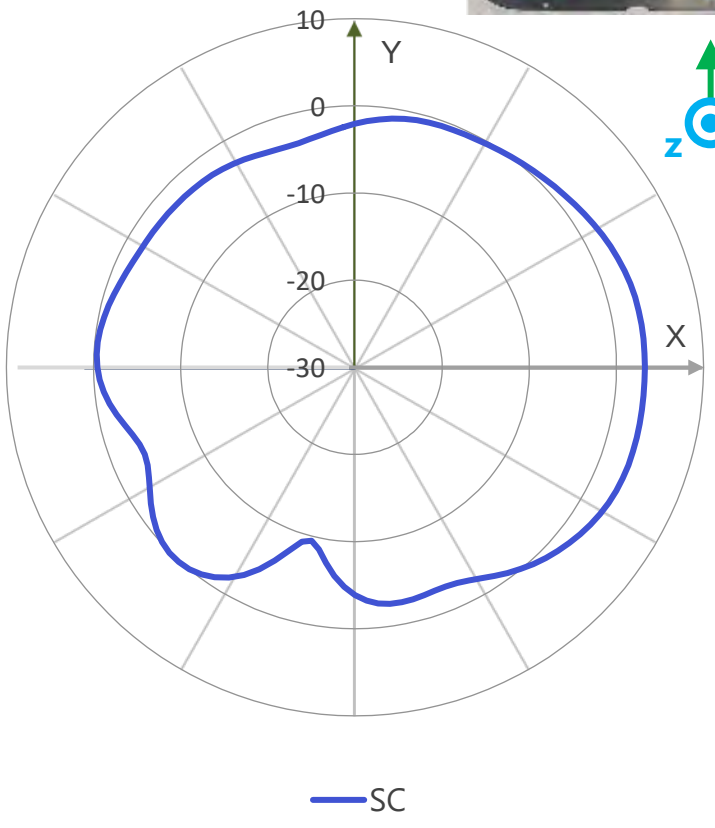
phi = 0

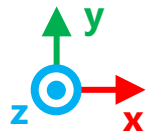


phi = 90

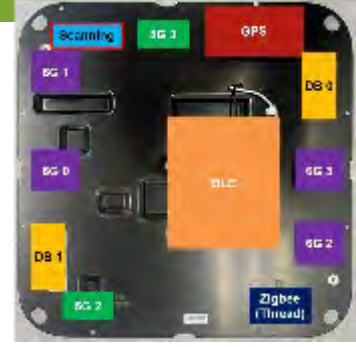


theta = 60

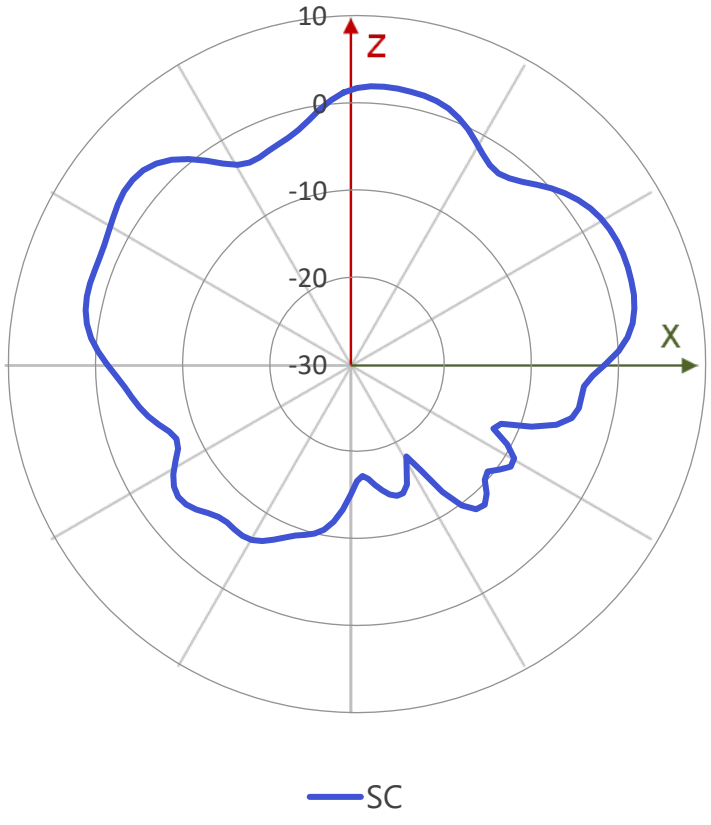




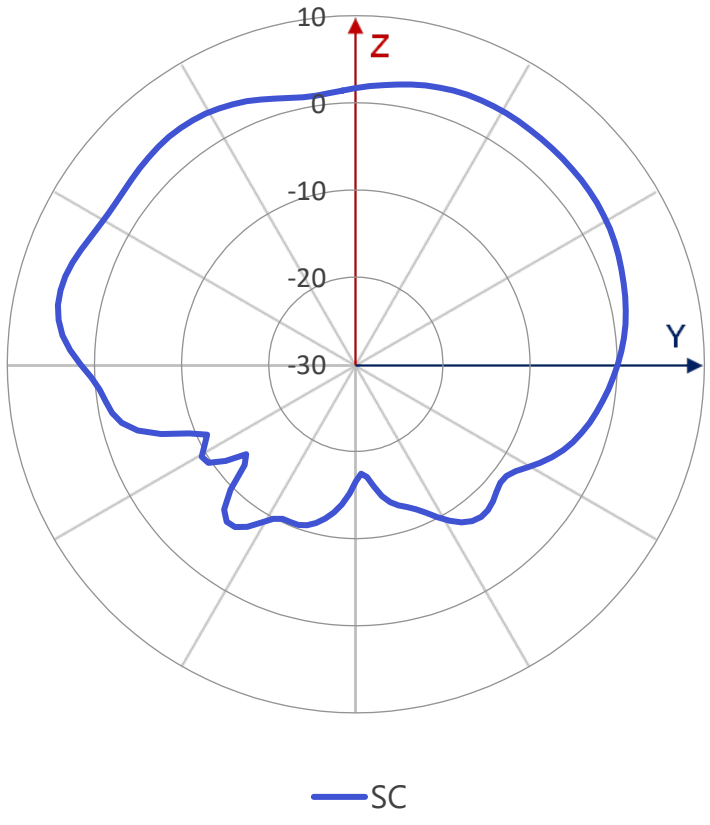
Realized Gain Pattern Scanning Radio @5G_V+H



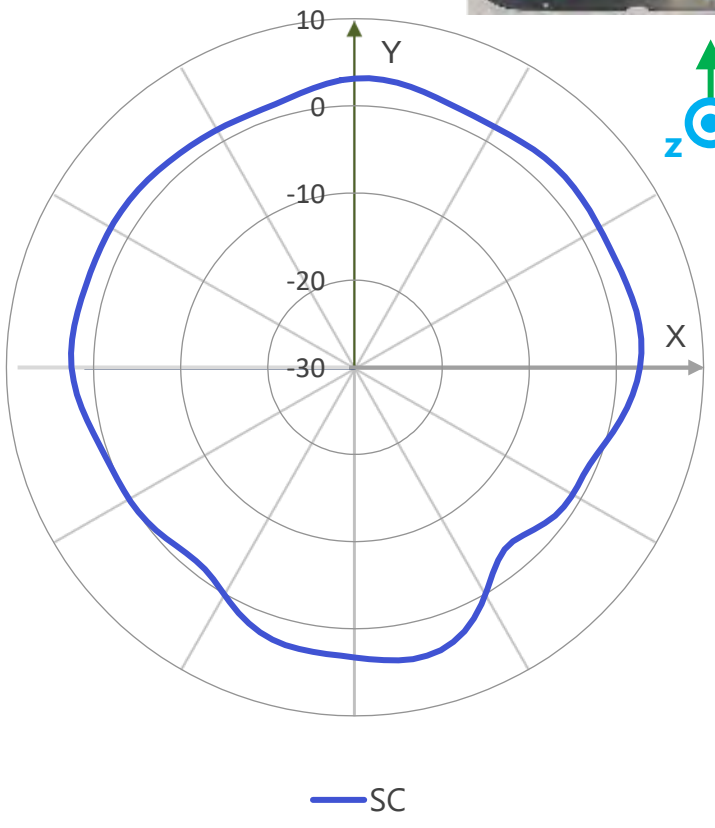
phi = 0

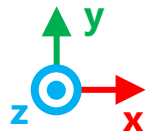


phi = 90

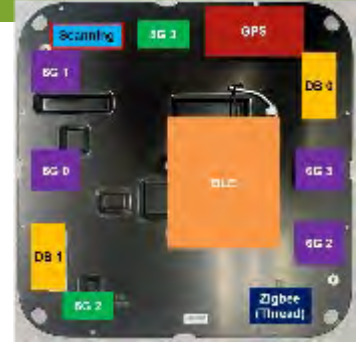


theta = 60

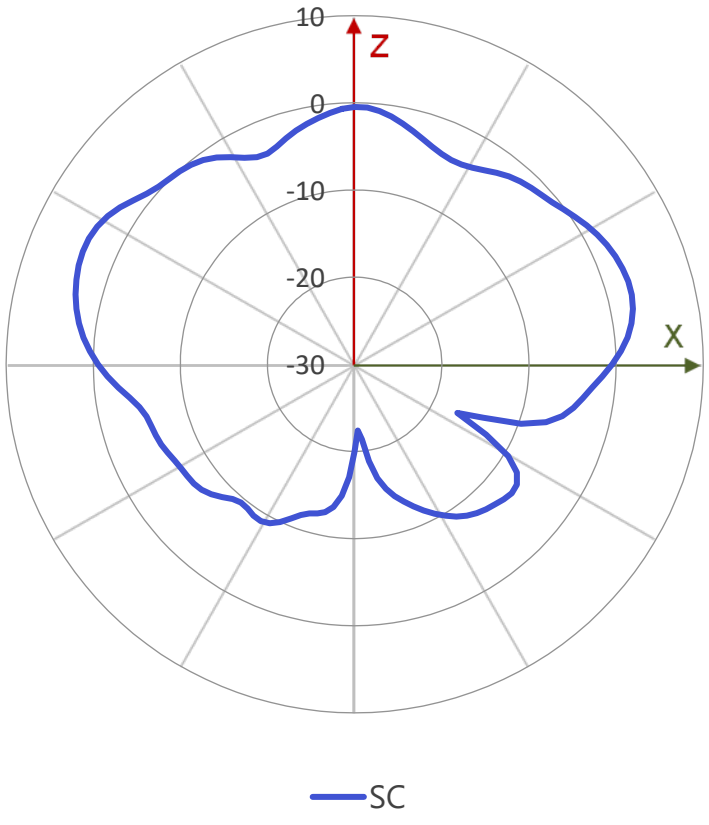




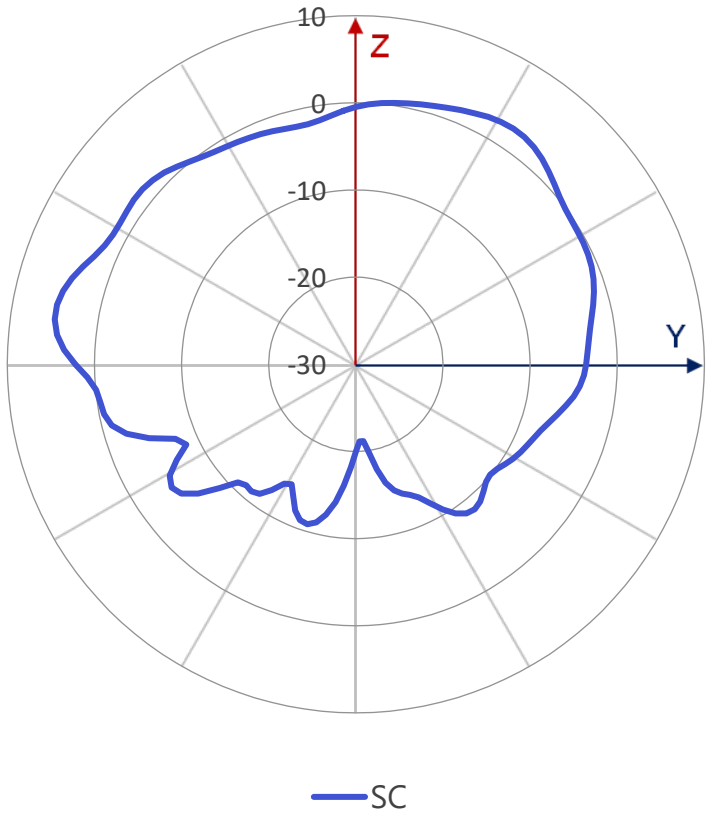
Realized Gain Pattern Scanning Radio @6G_V+H



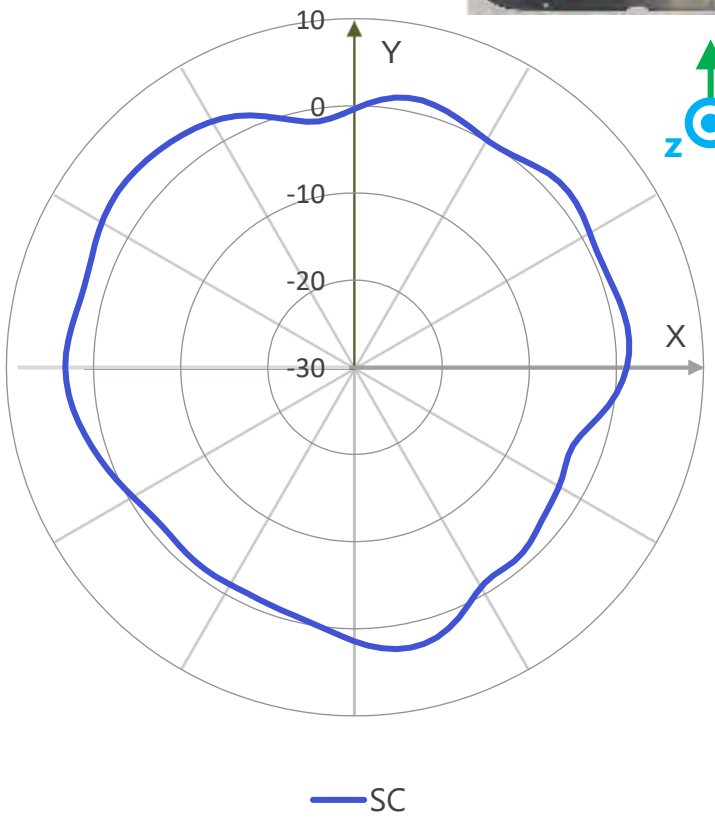
phi = 0

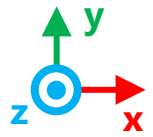


phi = 90

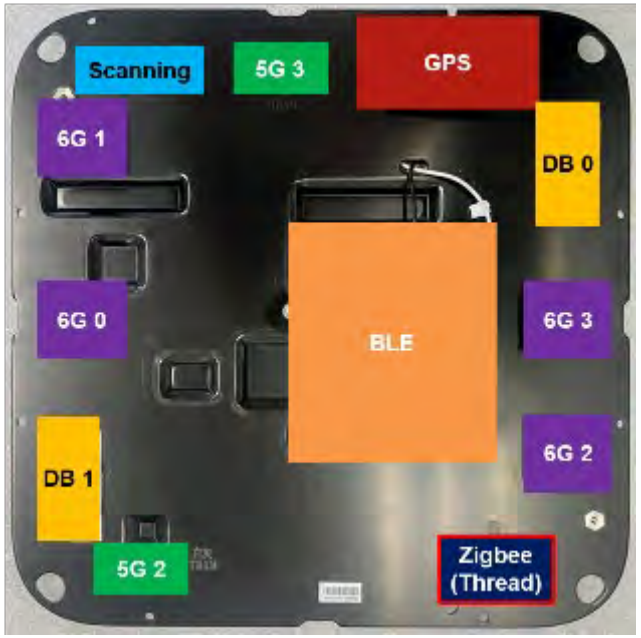


theta = 60





Zigbee(Thread)

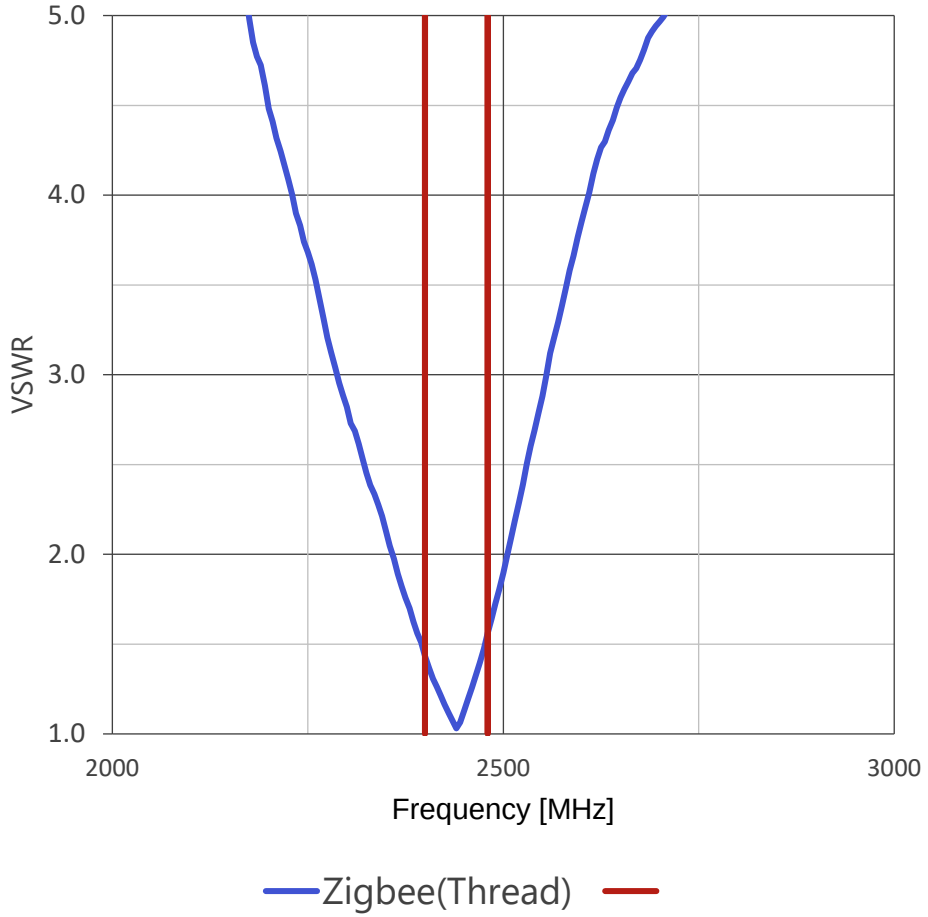


- **Maximum VSWR**
  - 1.9:1 on 2.4GHz
- **Average Efficiency**
  - ~63% on 2.4GHz
- **Peak Gain**
  - 4.3dBi on 2.4GHz

■ **Cable Length**

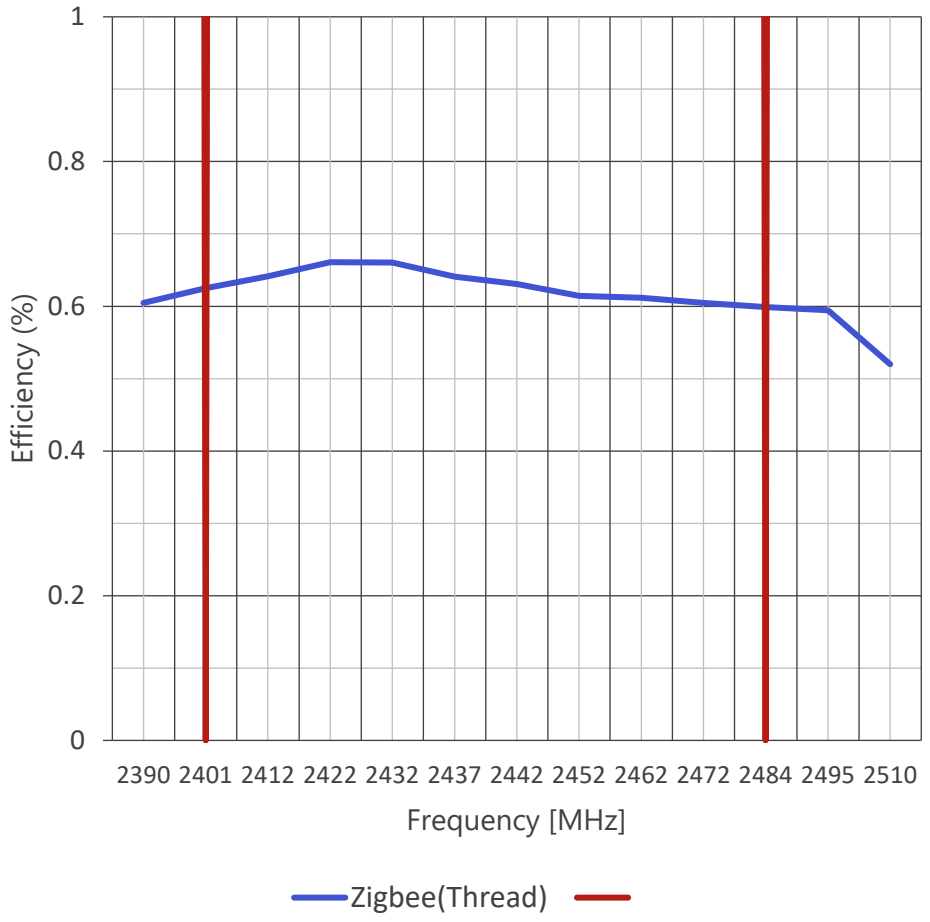
Zigbee(Thread)：231mm

VSWR Zigbee(Thread)



2.4GHz	Max	Mean	Min
Zigbee(Thread)	1.9	1.4	1.0

Efficiency Zigbee(Thread)

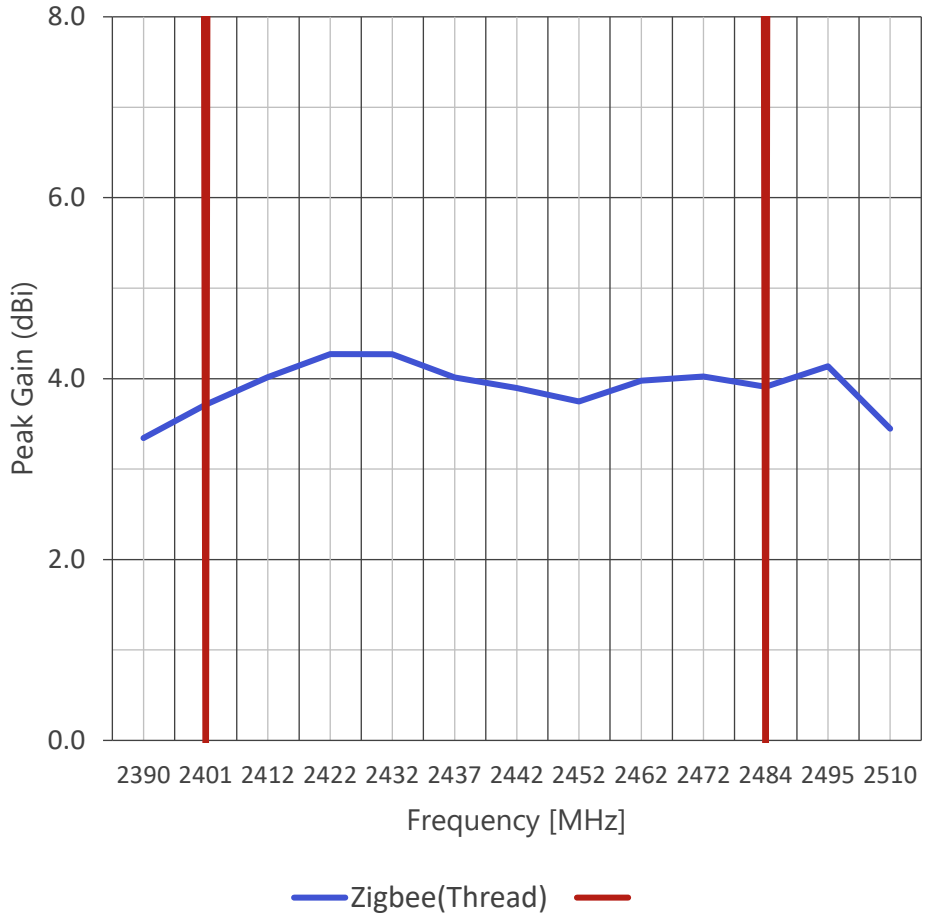


2.4GHz	Max	Mean	Min
Zigbee(Thread)	66 %	63 %	60 %

■ **Cable Length**

Zigbee(Thread)：231mm

Peak Gain Zigbee(Thread)

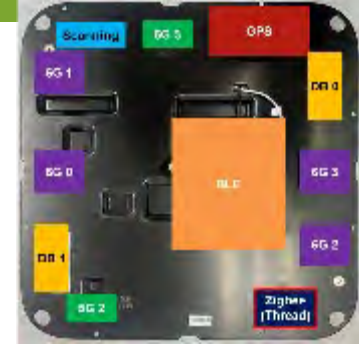


2.4GHz	Max	Mean	Min
Zigbee(Thread)	4.3 dBi	4.0 dBi	3.7 dBi

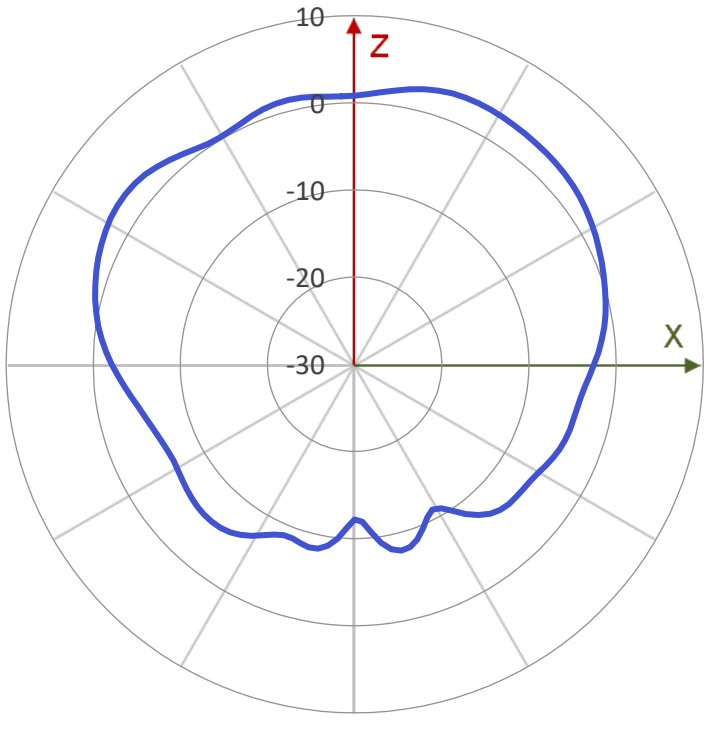
- **Cable Length**

  Zigbee(Thread)：231mm

Realized Gain Pattern Zigbee(Thread) @2.4G_V+H

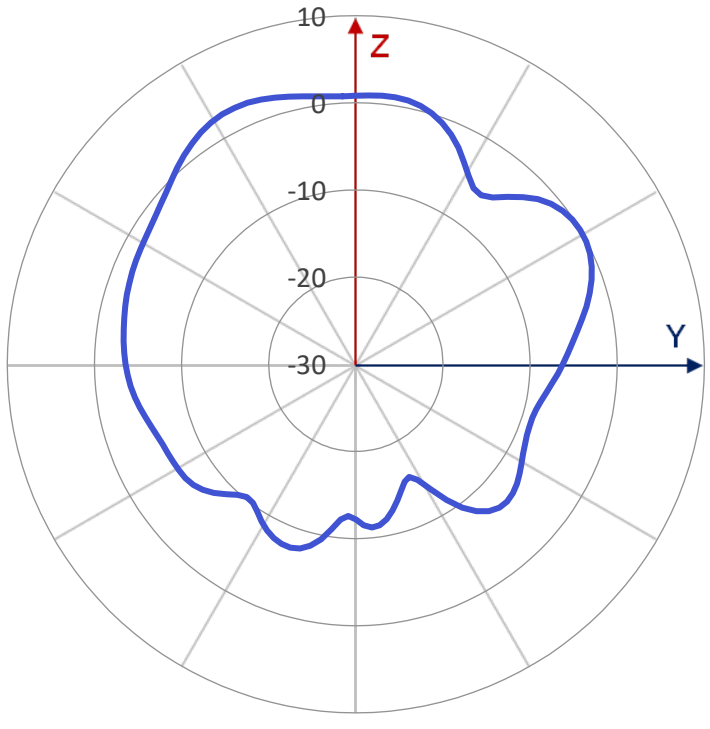


phi = 0



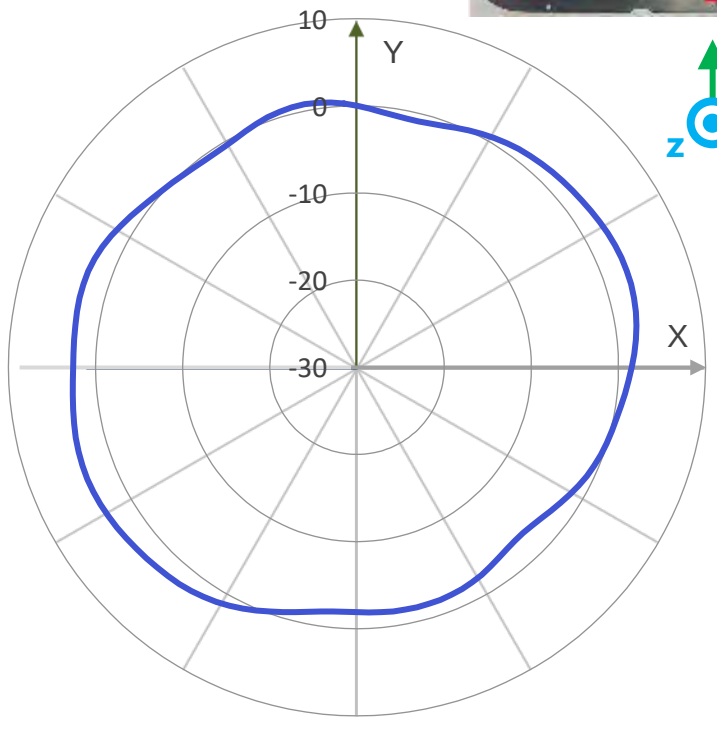
Zigbee(Thread)

phi = 90

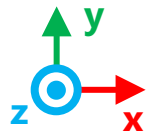


Zigbee(Thread)

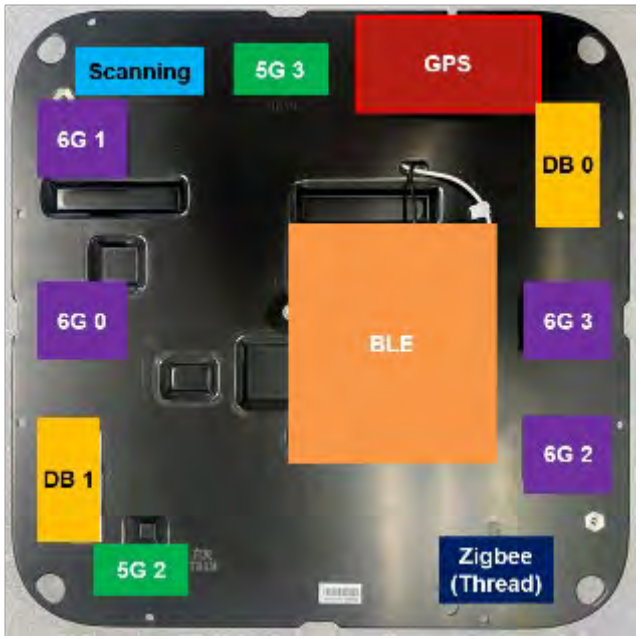
theta = 60



Zigbee(Thread)



GPS

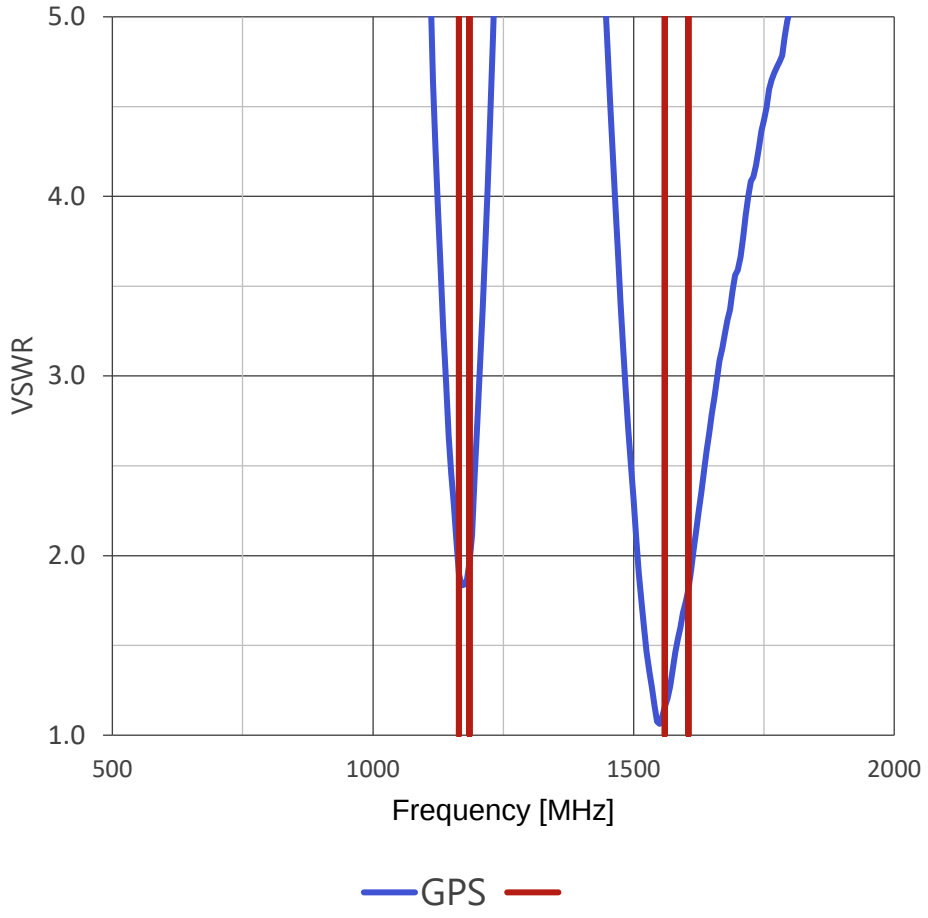


- **Maximum VSWR**
  - 1.9:1 on L1 / 2.0:1 on L5
- **Minimum Isolation**
  - 33.5dB on L1 / 37.6dB on L5 / 24.6dB on 2.4G
- **Average Efficiency**
  - ~65% on L1 / ~49% on L5
- **Peak Gain**
  - 4.8dBi on L1 / 3.2dBi on L5

■ **Cable Length**

GPS：112mm

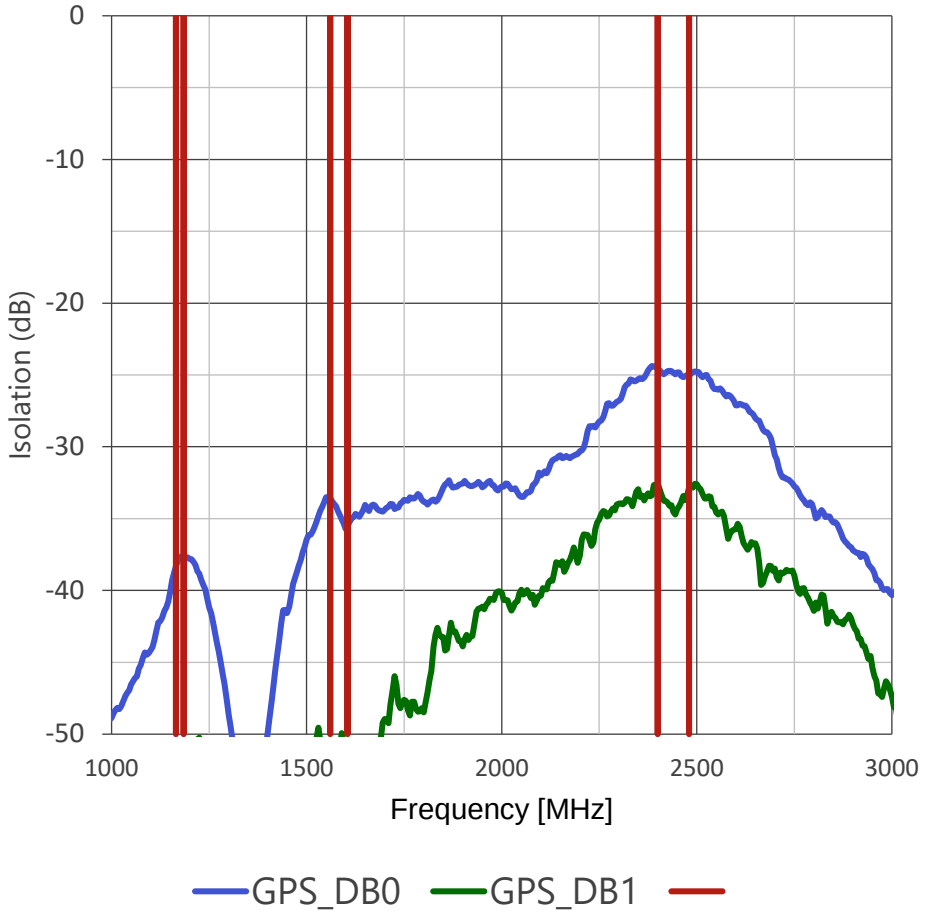
VSWR GPS



L1	Max	Mean	Min
GPS	2.0	1.9	1.8

L5	Max	Mean	Min
GPS	1.9	1.5	1.2

Isolation GPS

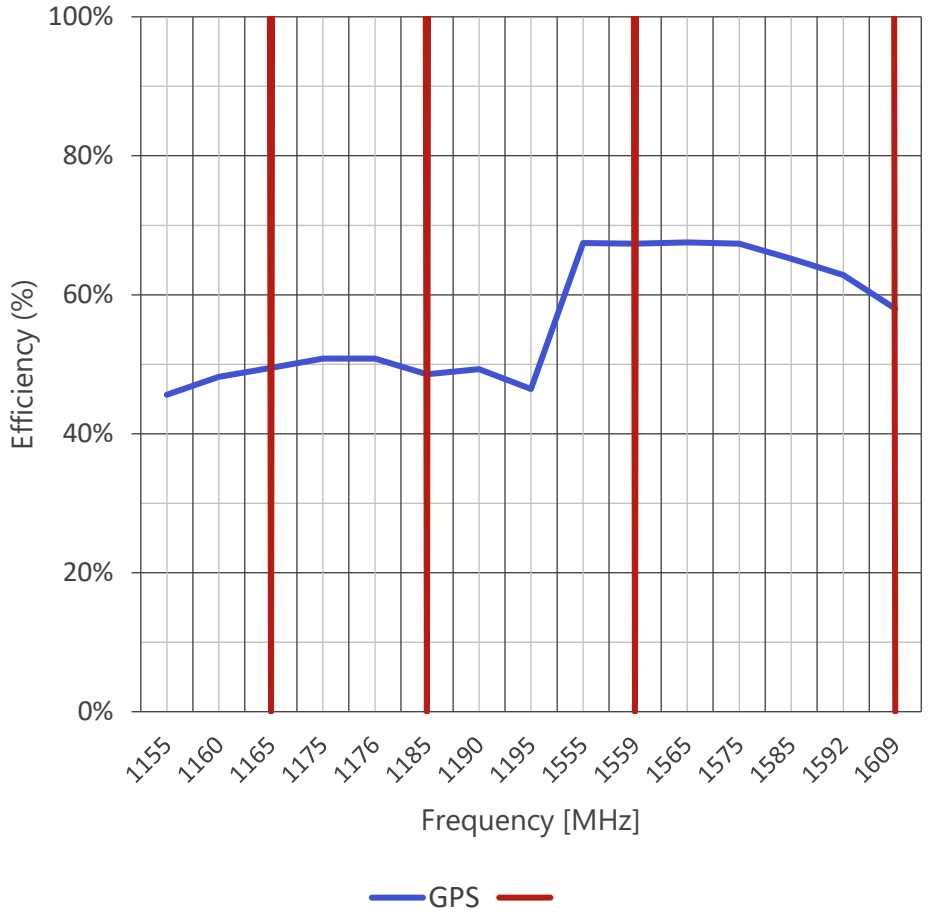


L1	Max	Mean	Min
GPS_DB0	-33.5	-42.6	-60.0
GPS_DB1	-49.6	-56.0	-64.9
Summary	-33.5	-49.3	-64.9

L5	Max	Mean	Min
GPS_DB0	-37.6	-37.8	-38.3
GPS_DB1	-55.7	-56.8	-57.6
Summary	-37.6	-47.3	-57.6

2.4GHz	Max	Mean	Min
GPS_DB0	-24.6	-24.9	-25.1
GPS_DB1	-32.5	-33.5	-34.7
Summary	-24.6	-29.2	-34.7

Efficiency GPS



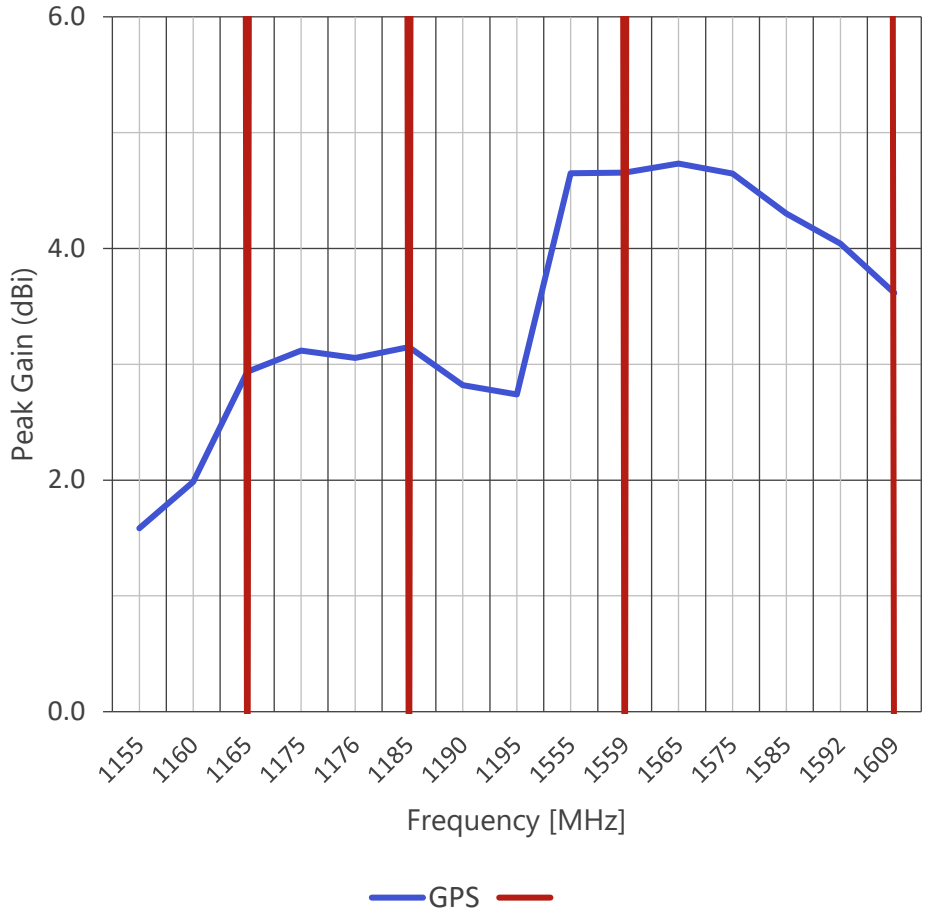
L1	Max	Mean	Min
GPS	68 %	65 %	58 %

L5	Max	Mean	Min
GPS	51 %	49 %	46 %

■ **Cable Length**

GPS：112mm

Peak Gain GPS



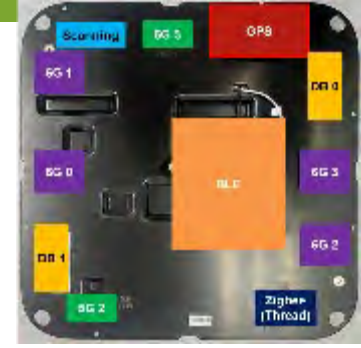
L1	Max	Mean	Min
GPS	4.8 dBi	4.7 dBi	4.2 dBi

L5	Max	Mean	Min
GPS	3.2 dBi	2.9 dBi	2.2 dBi

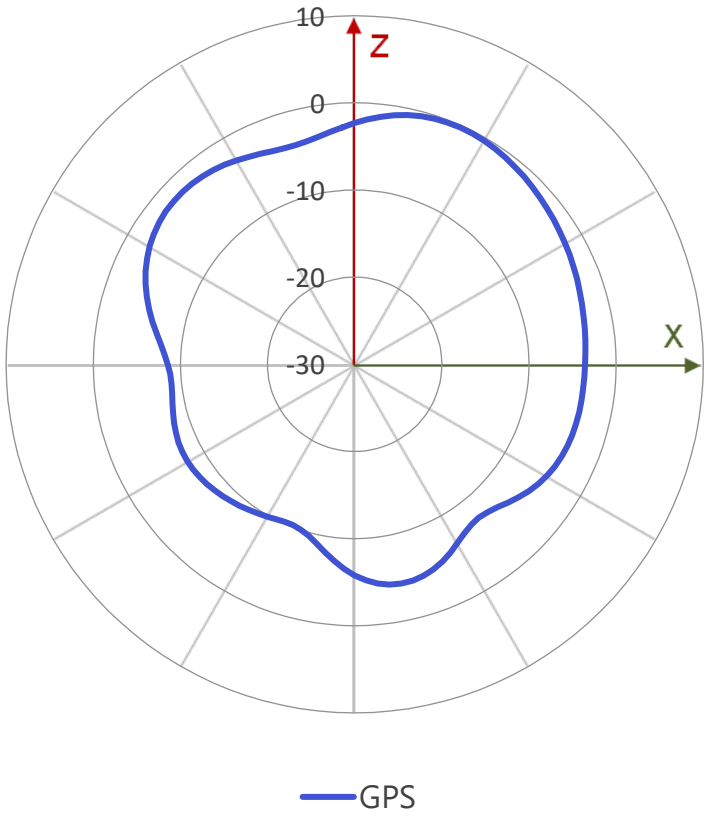
■ **Cable Length**

GPS：112mm

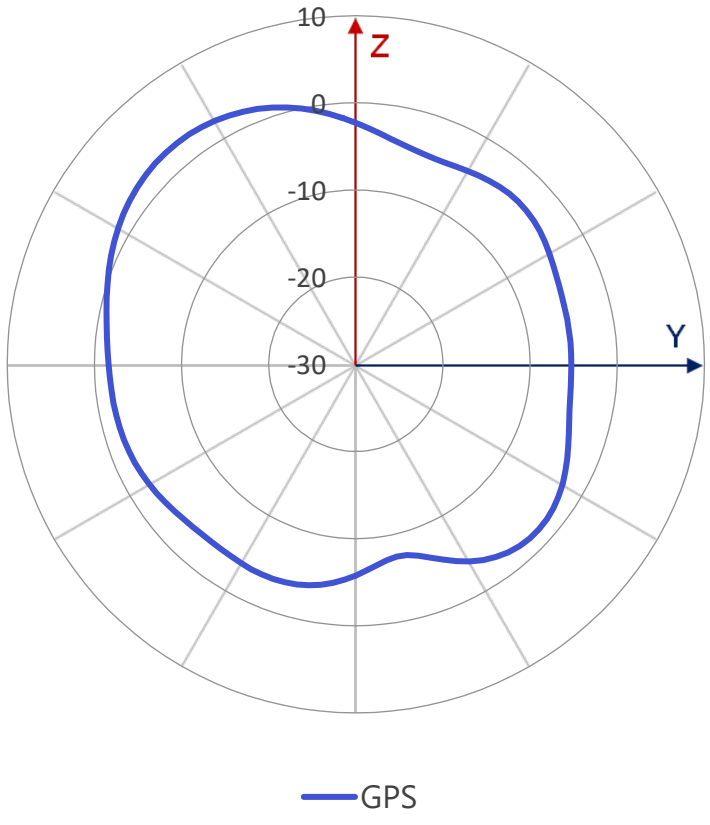
Realized Gain Pattern GPS @L5_V+H



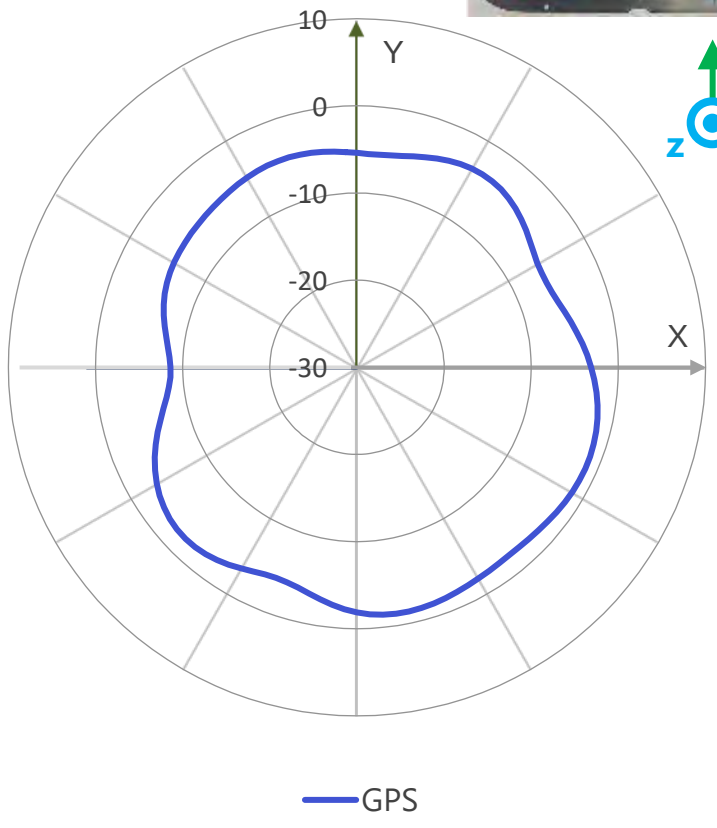
phi = 0

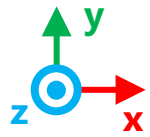


phi = 90



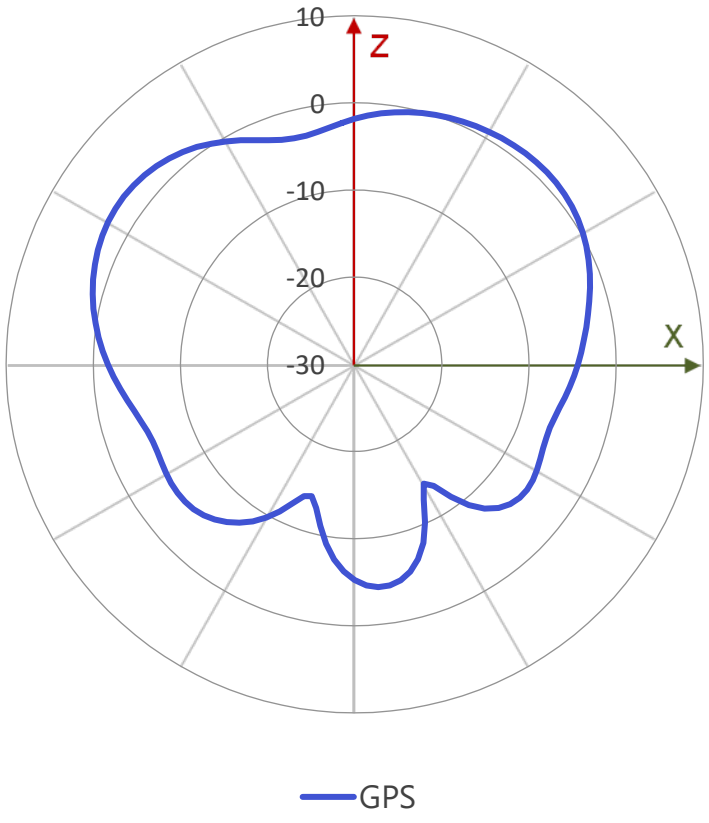
theta = 90



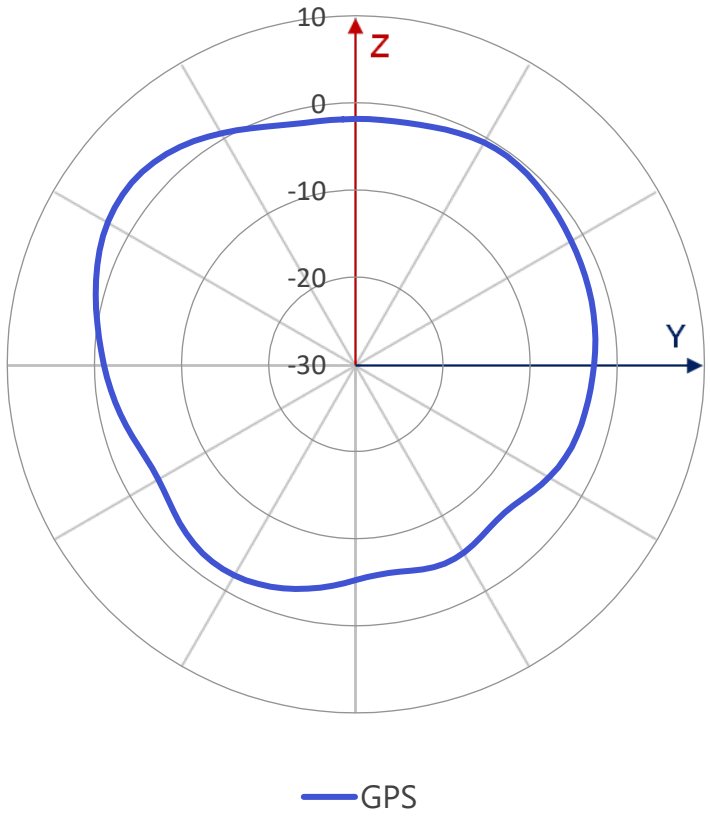


Realized Gain Pattern GPS @L1_V+H

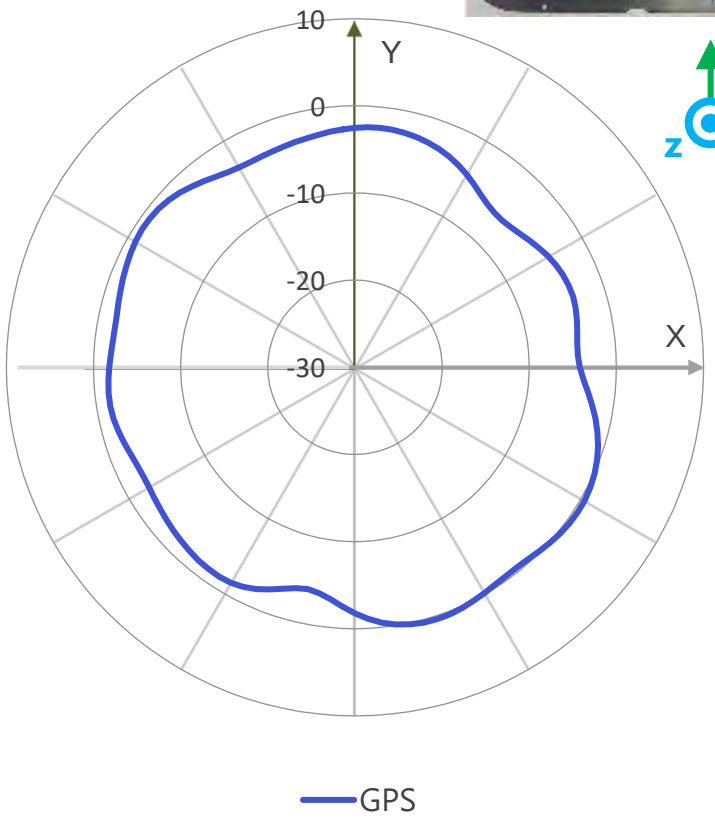
phi = 0

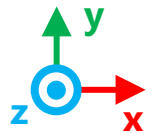


phi = 90

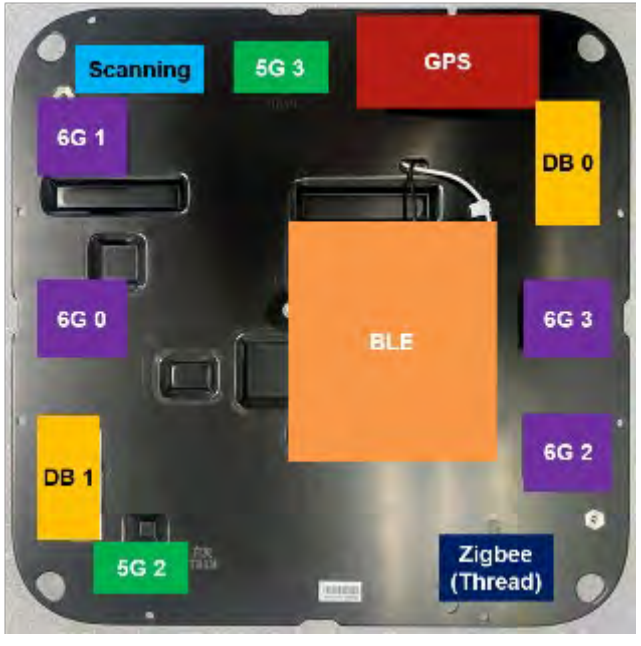


theta = 90



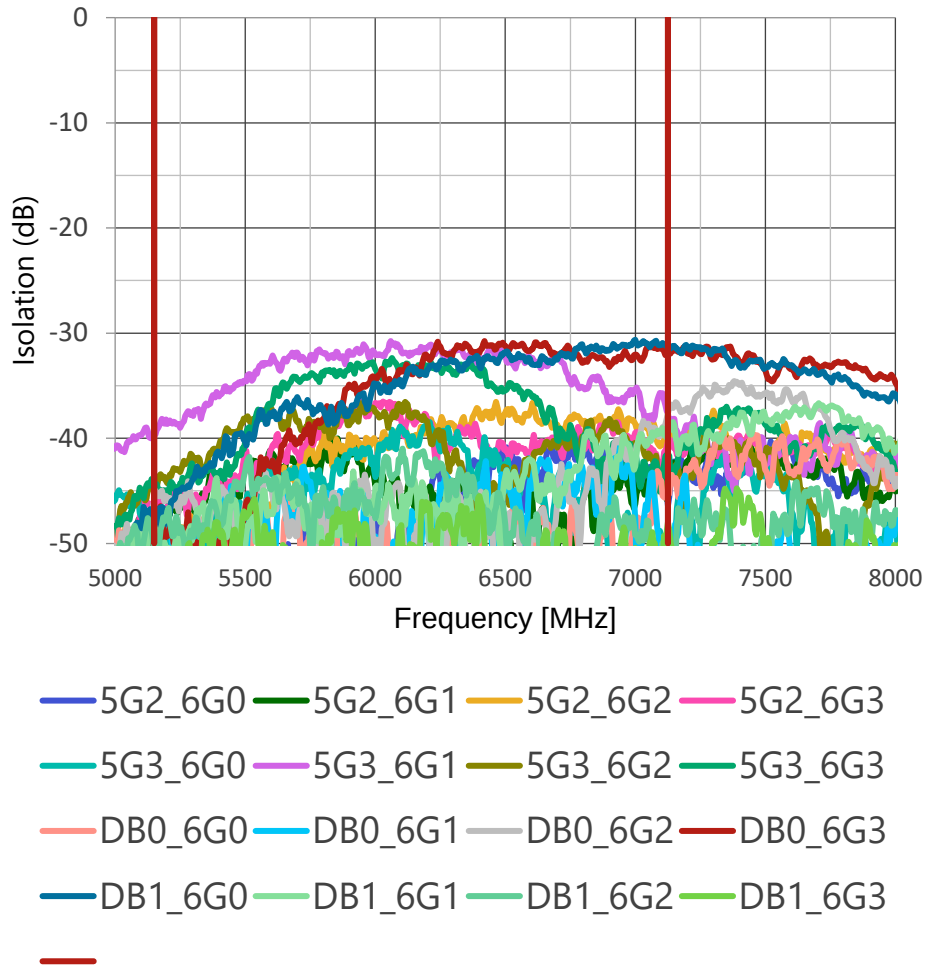


Isolation among Radio

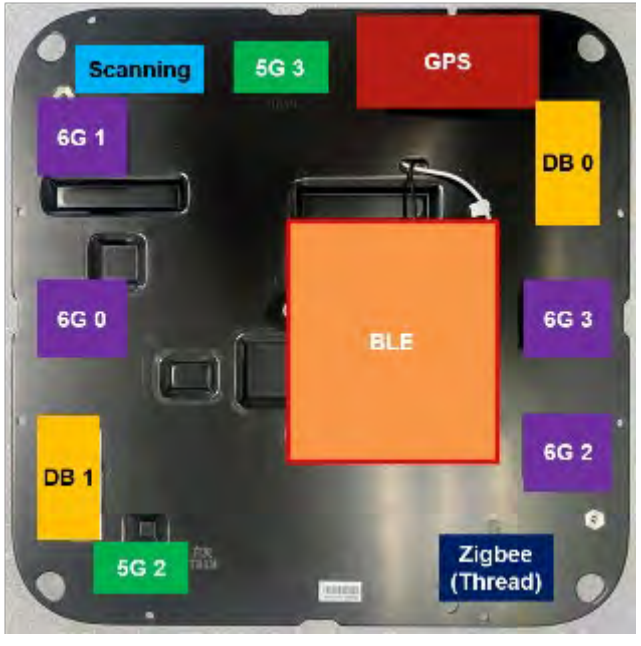


- **Wi-Fi 6G to Wi-Fi 5G**
  - 30.0dB on 5-7GHz

Isolation Wi-Fi 5G to Wi-Fi 6G

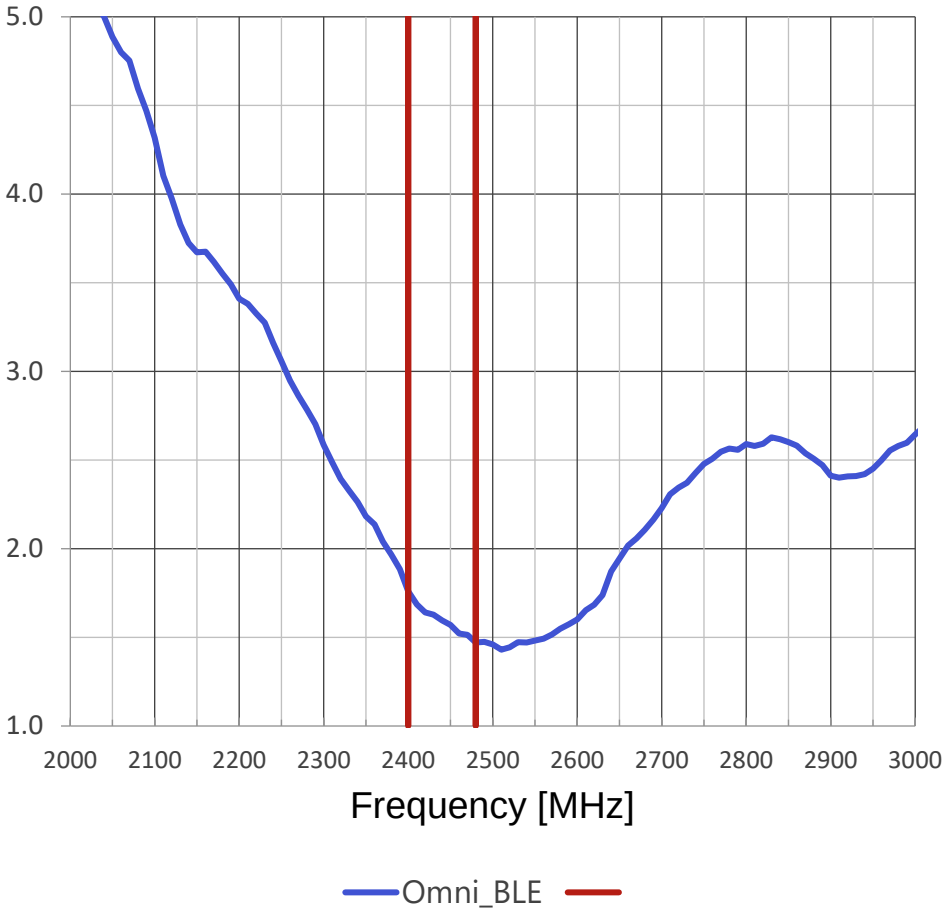


Omni BLE



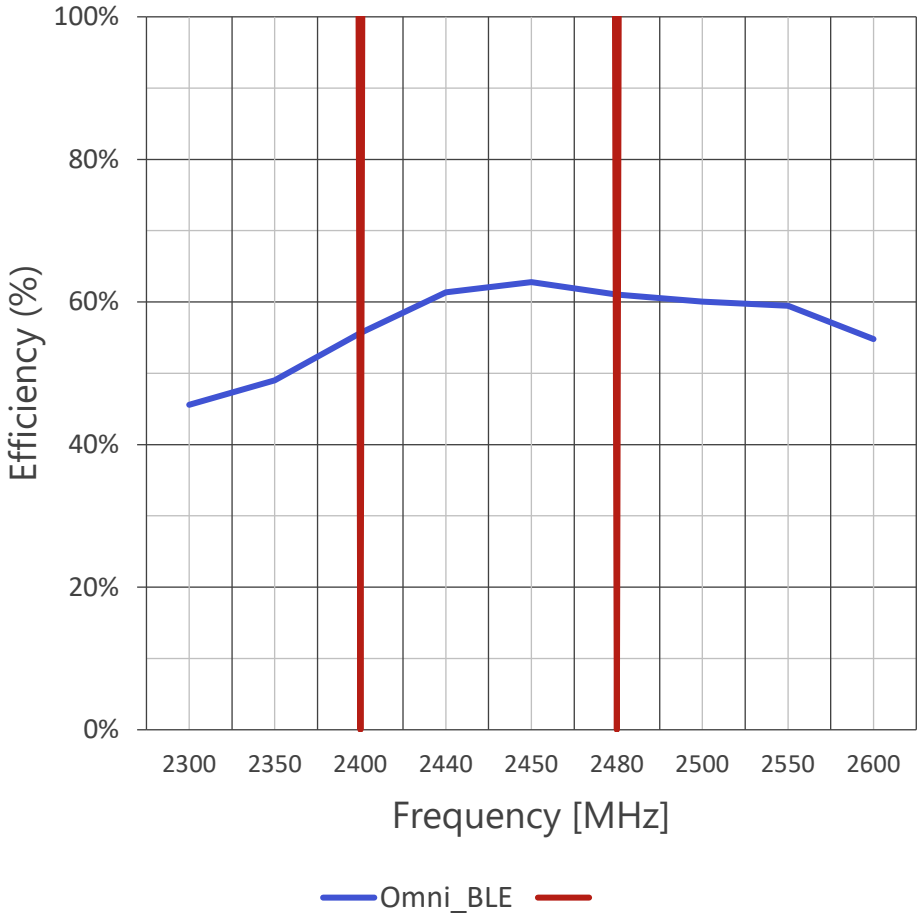
- **Maximum VSWR**
  - 1.8:1 on 2.4GHz
- **Average Efficiency**
  - ~60% on 2.4GHz
- **Peak Gain**
  - 4.6dBi on 2.4GHz

VSWR Omni BLE



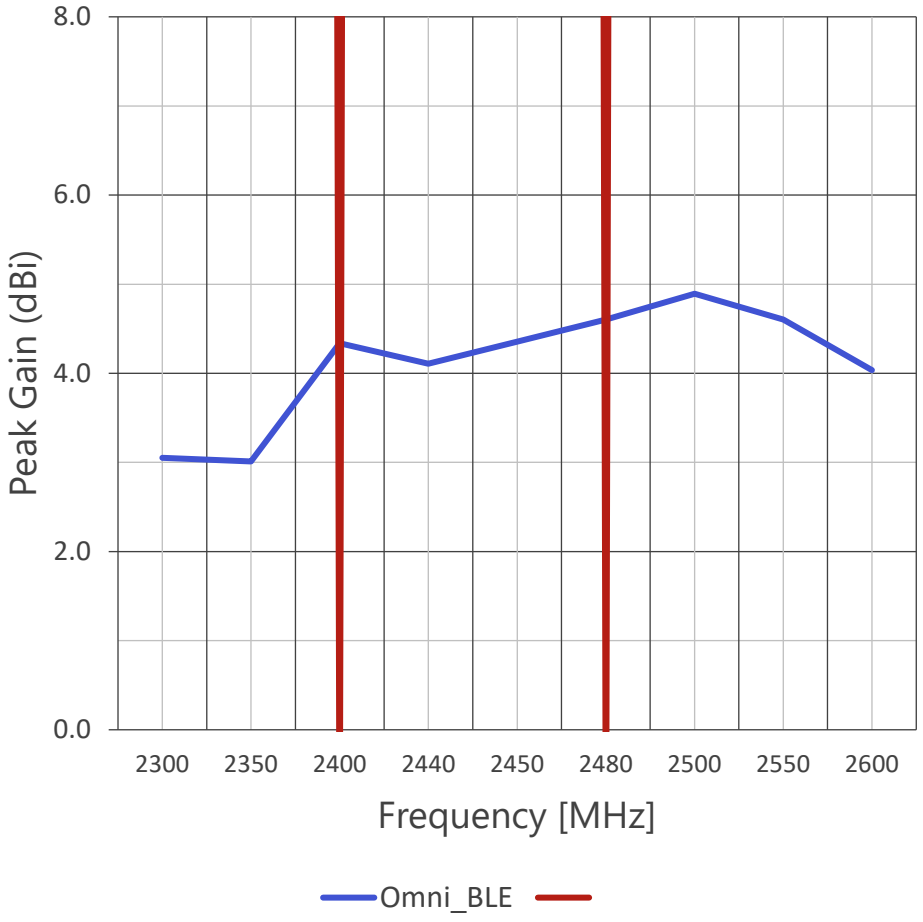
2.4GHz	Max	Mean	Min
Omni_BLE	1.8	1.6	1.5

Efficiency Omni BLE



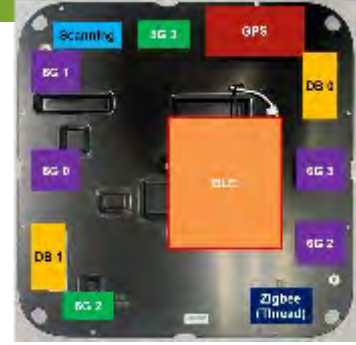
2.4GHz	Max	Mean	Min
Omni_BLE	63 %	60 %	56 %

Peak Gain Omni BLE

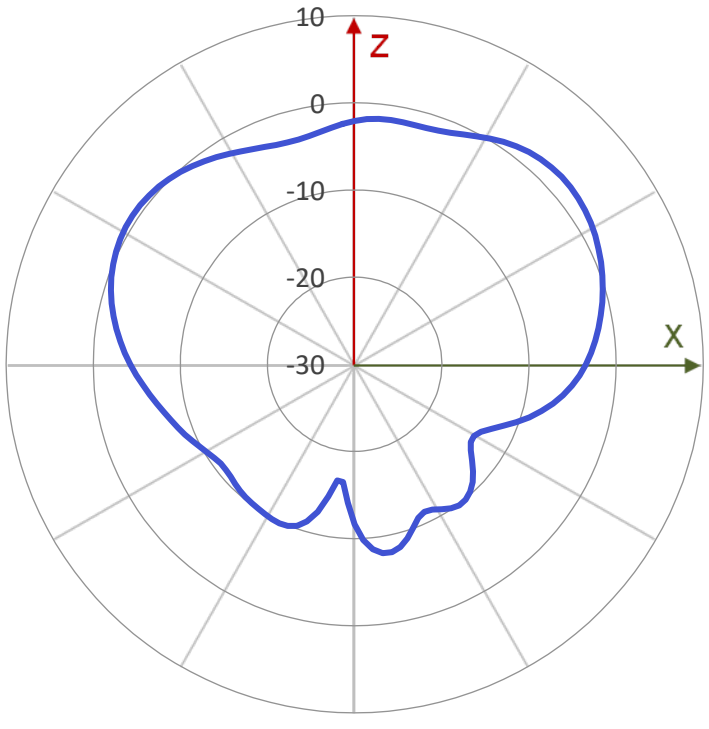


2.4GHz	Max	Mean	Min
Omni_BLE	4.6 dBi	4.4 dBi	4.1 dBi

Realized Gain Pattern Omni BLE@2G V+H

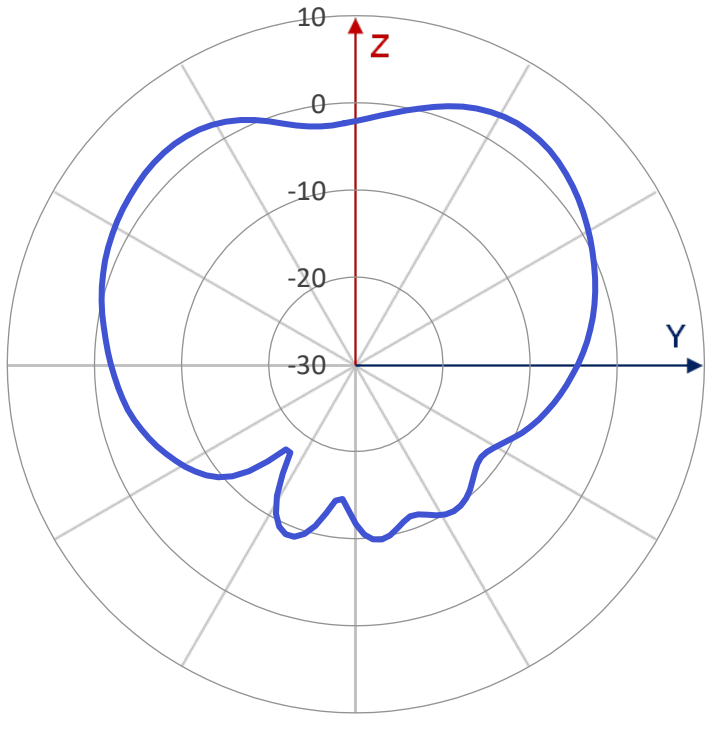


phi = 0



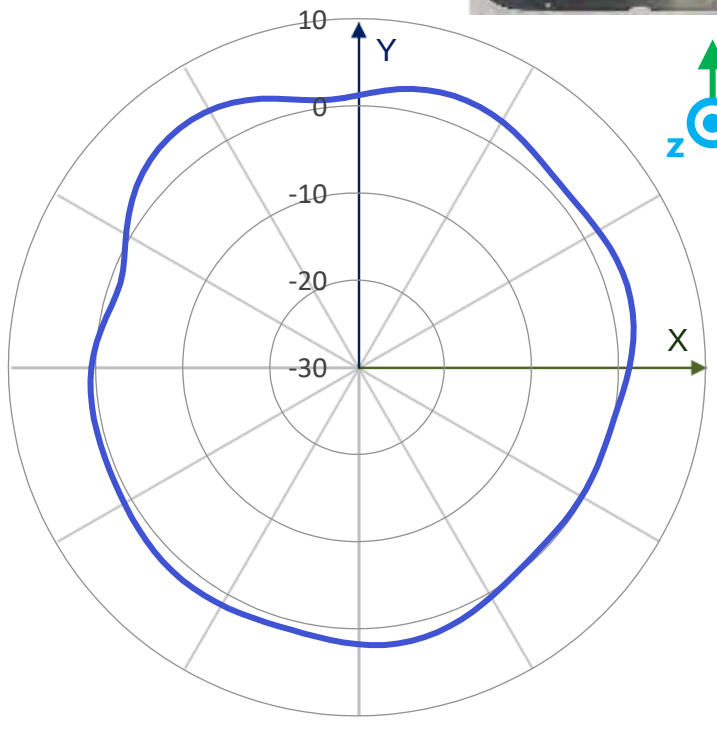
Omni_BLE

phi = 90



Omni_BLE

theta = 60



Omni_BLE