

# Regulatory WLAN Antenna Information (Template)

*English Language Required for Intel Regulatory Review / Approval*

**(OEM/ODM or antenna vendor is required to complete this document with platform antenna information.**

**Remove Intel references and make this your own document)**

| Platform information                                                                                                                                                 |                                          |                                                                                  |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------|---------------------------------------|----------------------------------------|
| Brand                                                                                                                                                                |                                          | ODM                                                                              |                                       | RMN                                   |                                       | Intel platform<br><small>(ex: Yes, No or NA)</small> |                                       | Platform type<br><small>(ex: regular NB, convertible PC, AIO...etc)</small> |                                       | *SAR minimum separation (mm)           |
| HP Inc.                                                                                                                                                              |                                          | Compal                                                                           |                                       | TPN-C165                              |                                       | Yes                                                  |                                       | Convertible PC                                                              |                                       | 2.58mm                                 |
| *****Please fill in exact product model name and make sure the model name is visible on product cover or any parts for end users recognize for authority inspection. |                                          |                                                                                  |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                        |
| Antenna information                                                                                                                                                  |                                          |                                                                                  |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                        |
| Vendor                                                                                                                                                               |                                          |                                                                                  | Type                                  |                                       |                                       | Antenna Part number<br><small>(Main/Tx2)</small>     |                                       | Antenna Part number<br><small>(Aux/Tx1)</small>                             |                                       |                                        |
| High-tek                                                                                                                                                             |                                          |                                                                                  | PIFA                                  |                                       |                                       | 219HCTN12274                                         |                                       | 219HCTN12275                                                                |                                       |                                        |
| Peak gain w/ cable loss (dBi)*                                                                                                                                       |                                          |                                                                                  |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                        |
|                                                                                                                                                                      | 2.4GHz<br><small>2400-2483.5 MHz</small> | 5.2GHz<br><small>5150-5250MHz</small>                                            | 5.3GHz<br><small>5250-5350MHz</small> | 5.6GHz<br><small>5470-5725MHz</small> | 5.8GHz<br><small>5725-5850MHz</small> | 5.9GHz<br><small>5850-5895MHz</small>                | 6.2GHz<br><small>5925-6425MHz</small> | 6.5GHz<br><small>6425-6525MHz</small>                                       | 6.7GHz<br><small>6525-6875MHz</small> | 7.0 GHz<br><small>6875-7125MHz</small> |
| Main                                                                                                                                                                 | 2.59                                     | 2.46                                                                             | 0.8                                   | 1.25                                  | 1.03                                  | 1.03                                                 | 1.08                                  | 1.89                                                                        | 2.19                                  | 2.81                                   |
| Aux                                                                                                                                                                  | 0.99                                     | 0.5                                                                              | 1.17                                  | 1.19                                  | 2.59                                  | 2.59                                                 | 2.98                                  | 2.32                                                                        | 2.76                                  | 2.76                                   |
| Module Information                                                                                                                                                   |                                          |                                                                                  |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                        |
| Model                                                                                                                                                                |                                          | Form factor and suffixes                                                         |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                        |
| AX211NGW                                                                                                                                                             |                                          | Intel Garfield Peak 2 AX211 Wi-Fi 6e +Bluetooth 5.2 M.2 2230 160MHz CNVi WW WLAN |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                        |

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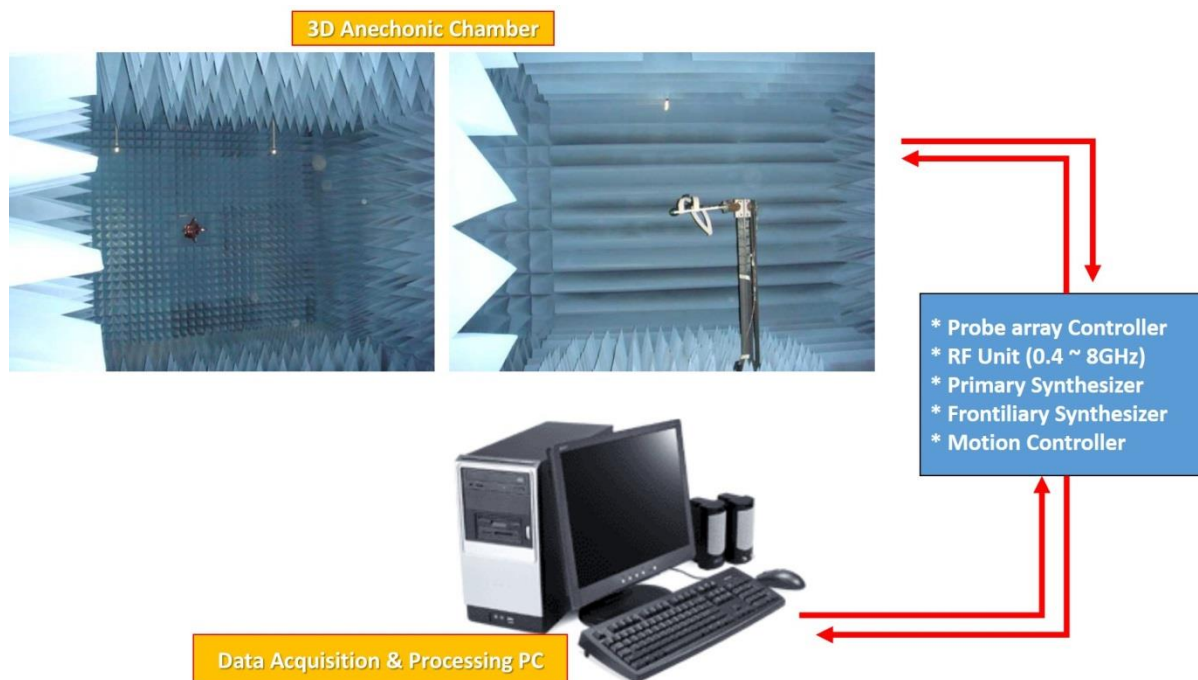
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## 1. Applicable test methods

The radiation pattern of antenna is measured in both horizontal polarization and vertical polarization. The radiation pattern measurements are performed in the three-dimensional anechoic chamber. The chamber provides less than  $-30\text{dB}$  reflectivity from 800MHz through 8GHz. The chamber is calibrated using both standard dipole antenna and horn antenna. The Gain here is expressed as dBi that standardizes the isotropic antenna. The Gain measurements and antenna radiation pattern are also performed in the same chamber described previously. Figure 2 shows the schematic diagram for measuring radiation pattern and Gain.



## 2. Test & System Description

### a. Test setup

#### 1. Frequency Range

2400~2500MHz, for WLAN application.

5150~5850MHz, for WLAN application

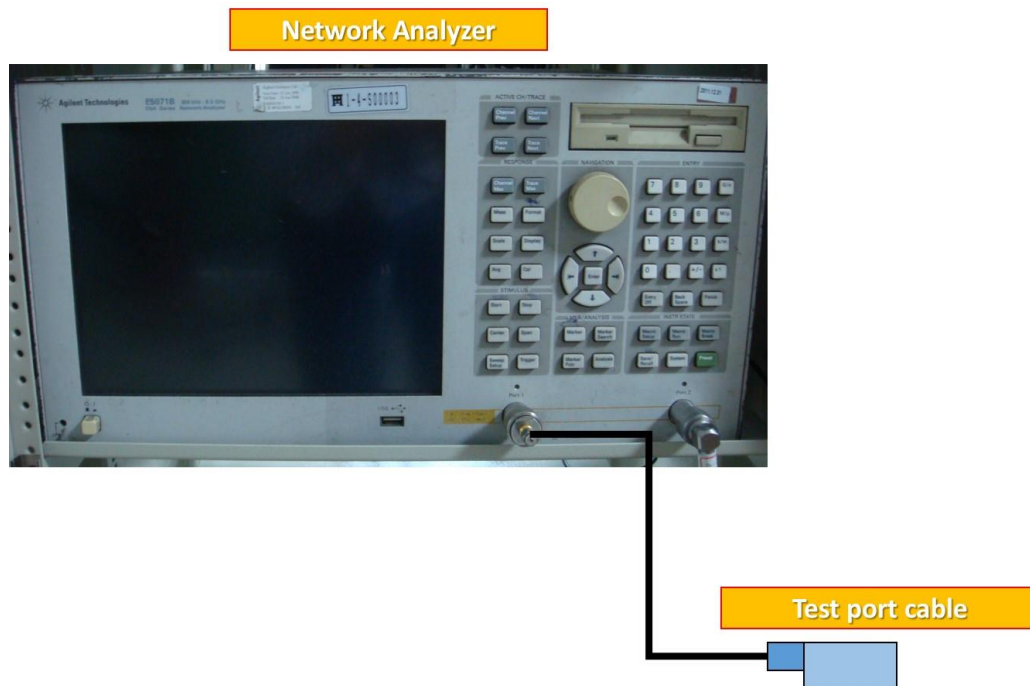
5925~7125MHz,for WLAN application

#### 2. Antenna Configuration

The antenna basically has two parts; the stamping and the cable assembly with the connector on one side. The detailed drawing is attached.

#### 3. VSWR

The VSWR is measured with network analyzer that support up to 8GHz. All the measurements are performed with the customer provided fixture. Figure 1 shows the typical schematic diagram for measuring VSWR.



**Figure 1. The schematic diagram for measuring VSWR**

**b. Equipment list**

**Test Equipment**

The equipment for the antenna measurement we used is as follows:

- A. Network Analyzer, support up to 8GHz, to measure the VSWR and input impedance of antenna.
- B. Three-dimensional anechoic chamber to measure antenna gain and radiation pattern(Standard horn antenna was used to calibrate the chamber)
- C. Digital caliper to measure the dimensions.
- D. Climatic chamber for mechanical tests.

**Radiated Setup**

| item | Device                                                                                                | Type/Model     | manufacturer | Cal. Date  | Cal. Due Date |
|------|-------------------------------------------------------------------------------------------------------|----------------|--------------|------------|---------------|
| 1    | Anechoic Chamber                                                                                      | AMS-8500       | ETS-Lindgren | 2021/12/20 | 2022/12/20    |
| 2    | Turn Table                                                                                            | ETS            | ETS-Lindgren | N/A        | N/A           |
| 3    | Measurement SW                                                                                        | EMQuest1.08    | ETS-Lindgren | N/A        | N/A           |
| 4    | Vector Network Analyzer                                                                               | Agilent E5071B | Agilent      | 2021/12/17 | 2022/12/17    |
| 5    | Receive Antenna<br>Absorber Nested Dual-<br>Polarized Dual-Vivaldi Array<br>Antenna<br>700MHz to 6GHz | EMCO 3164-08   | ETS-Lindgren | N/A        | N/A           |
| 6    | Multi Axis Positioning System<br>(MAPS™)                                                              | EMCO 2115CR    | ETS-Lindgren | N/A        | N/A           |
| 7    | MAPS™ Controller                                                                                      | MECO 2090      | ETS-Lindgren | N/A        | N/A           |
| 8    | Horn antenna                                                                                          | 3164-08        | ETS-Lindgren | 2021/12/15 | 2022/12/15    |
| 9    | Cable 0.5m - 700MHz~10GHz                                                                             | RG316          | Senyu        | 2021/12/21 | 2022/12/21    |

N/A : Not Applicable

Note : Chamber calibration included full set of implement.

# Antenna Information

## Section 1. Antenna Assembly Specifications

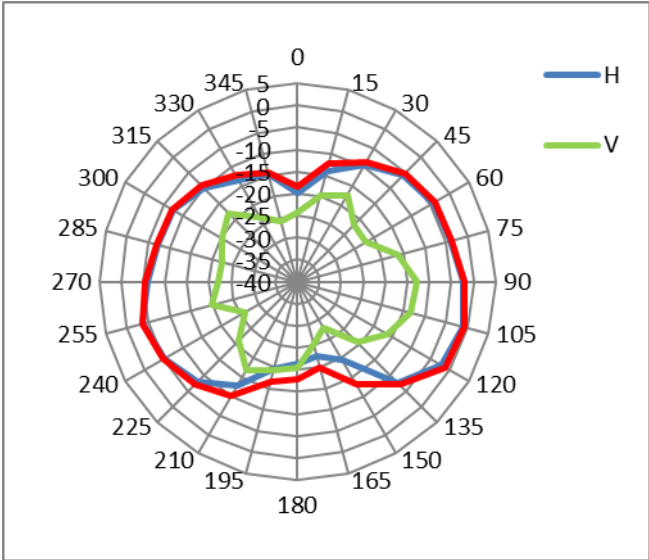
| 1A                                             | 1B                            | 1C           | 1D                                                                                                           |                | 1E                              | 1F                             | 1G       | 1H              |
|------------------------------------------------|-------------------------------|--------------|--------------------------------------------------------------------------------------------------------------|----------------|---------------------------------|--------------------------------|----------|-----------------|
| Antenna Part Number                            | Manufacturer                  | Antenna Type | Cable Assembly Part Number and Information                                                                   | Freq Range MHz | * Peak Gain W/ Cable loss (dBi) | Peak Gain w/o Cable Loss (dBi) | Max VSWR | Cable Loss (dB) |
| P/N:<br>219HCTN12274<br><br>Main Antenna (TX2) | High-Tek Electronics Co., Ltd | PIFA         | Connector: CM<br>958-C437-CM-B-YHU-AO<br><br>50 Ohm Coaxial Cable<br><br>Length: 485 mm<br>Diameter: 1.37 mm | 2400-2495      | 2.59                            | 3.62                           | 3        | 1.03            |
|                                                |                               |              |                                                                                                              | 5150-5250      | 2.46                            | 3.96                           | 3        | 1.5             |
|                                                |                               |              |                                                                                                              | 5250-5350      | 0.8                             | 2.3                            | 3        | 1.5             |
|                                                |                               |              |                                                                                                              | 5470-5725      | 1.25                            | 2.8                            | 3        | 1.55            |
|                                                |                               |              |                                                                                                              | 5725-5850      | 1.03                            | 2.65                           | 3        | 1.62            |
|                                                |                               |              |                                                                                                              | 5850-5895      | 1.03                            | 2.65                           | 3        | 1.62            |
|                                                |                               |              |                                                                                                              | 5925-6425      | 1.08                            | 2.74                           | 3        | 1.66            |
|                                                |                               |              |                                                                                                              | 6425-6525      | 1.89                            | 3.63                           | 3        | 1.74            |
|                                                |                               |              |                                                                                                              | 6525-6875      | 2.19                            | 3.95                           | 3        | 1.76            |
| P/N:<br>219HCTN12275<br><br>Aux Antenna (TX1)  | High-Tek Electronics Co., Ltd | PIFA         | Connector: CM<br>958-C437-CM-B-YHU-AO<br><br>50 Ohm Coaxial Cable<br><br>Length: 585 mm<br>Diameter: 1.37 mm | 2400-2495      | 0.99                            | 2.22                           | 3        | 1.23            |
|                                                |                               |              |                                                                                                              | 5150-5250      | 0.5                             | 2.29                           | 3        | 1.79            |
|                                                |                               |              |                                                                                                              | 5250-5350      | 1.17                            | 2.97                           | 3        | 1.8             |
|                                                |                               |              |                                                                                                              | 5470-5725      | 1.19                            | 3.04                           | 3        | 1.85            |
|                                                |                               |              |                                                                                                              | 5725-5850      | 2.59                            | 4.48                           | 3        | 1.89            |
|                                                |                               |              |                                                                                                              | 5850-5895      | 2.59                            | 4.49                           | 3        | 1.9             |
|                                                |                               |              |                                                                                                              | 5925-6425      | 2.98                            | 4.92                           | 3        | 1.94            |
|                                                |                               |              |                                                                                                              | 6425-6525      | 2.32                            | 4.34                           | 3        | 2.02            |
|                                                |                               |              |                                                                                                              | 6525-6875      | 2.76                            | 4.82                           | 3        | 2.06            |
|                                                |                               |              |                                                                                                              | 6875-7125      | 2.76                            | 4.99                           | 3        | 2.23            |

Section 3. Radiation characteristics of antenna loaded in Host Platform

Main Antenna

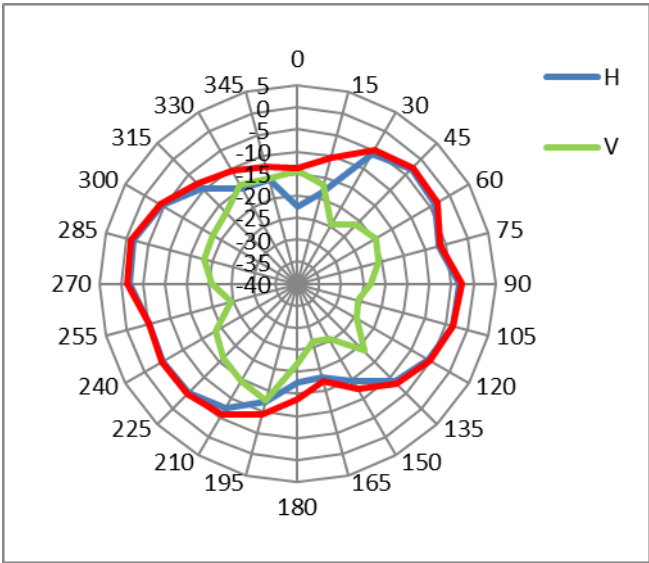
Max Antenna 2D Radiation Pattern 2400 – 2495 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 2400-2495       | 2.59                                  |



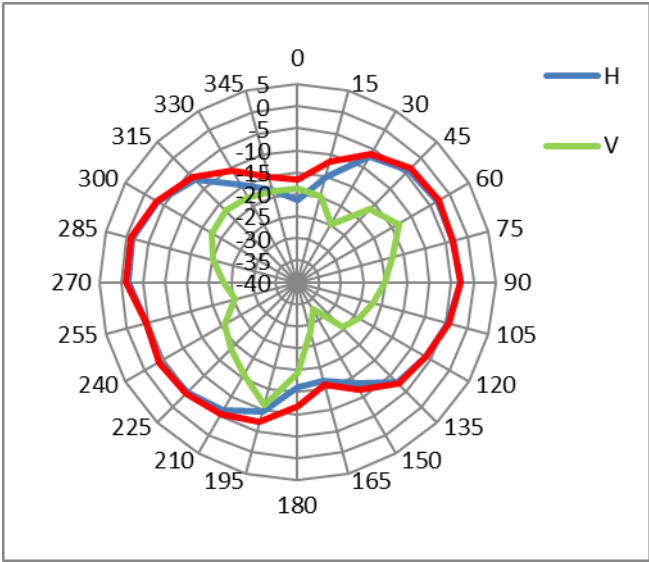
Max Antenna 2D Radiation Pattern 5150-5250 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5150-5250       | 2.46                                  |



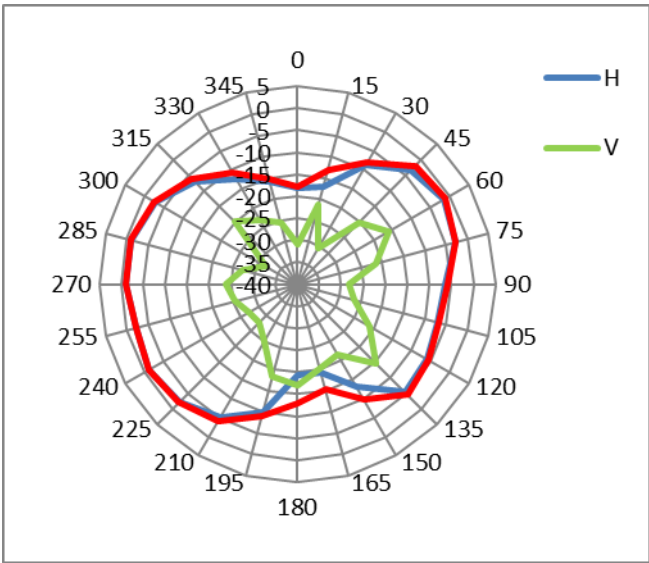
Max Antenna 2D Radiation Pattern 5250-5350 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5250-5350       | 0.8                                   |



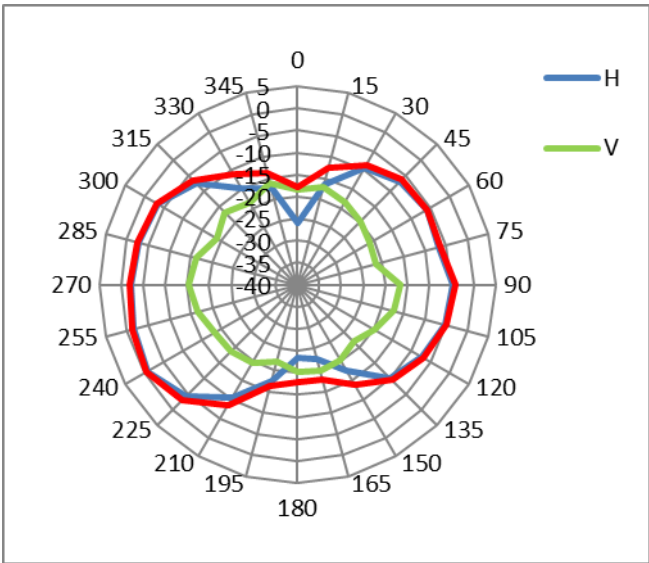
Max Antenna 2D Radiation Pattern 5470-5725 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5470-5725       | 1.25                                  |



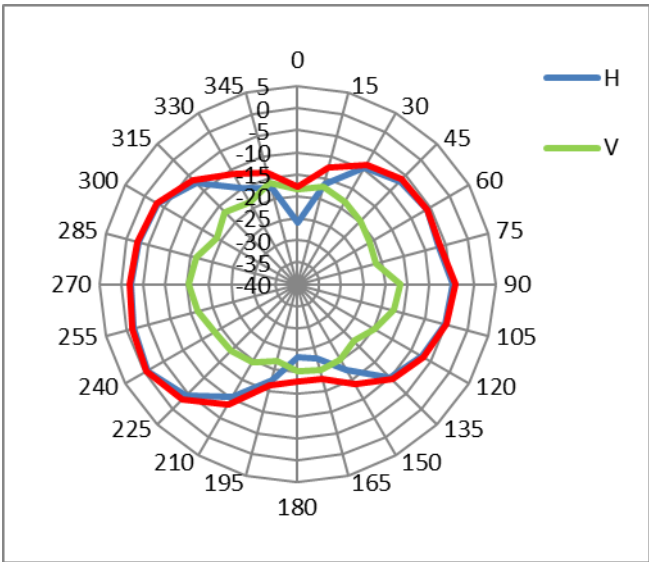
Max Antenna 2D Radiation Pattern 5725-5850 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5725-5850       | 1.03                                  |



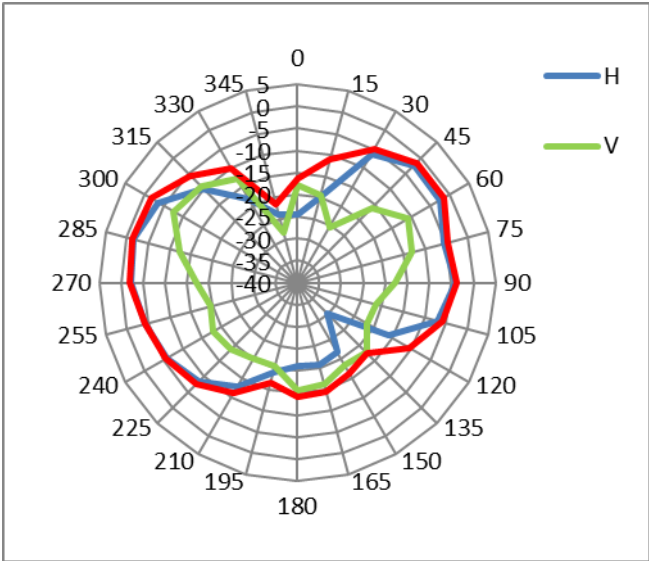
Max Antenna 2D Radiation Pattern 5850-5895 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5850-5895       | 1.03                                  |



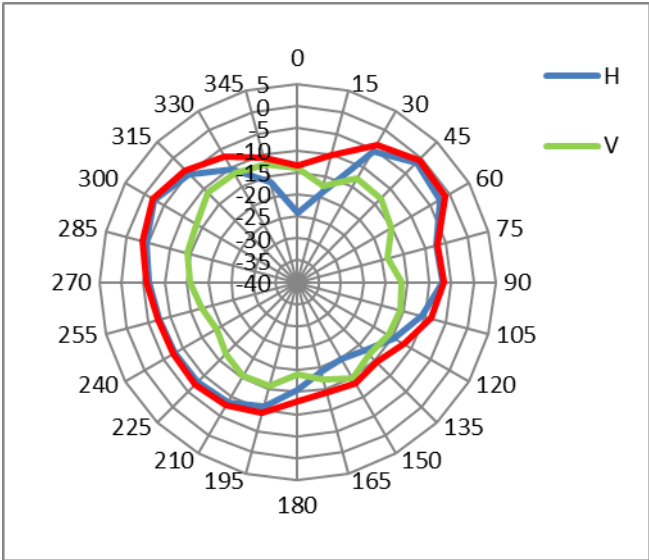
Max Antenna 2D Radiation Pattern 5925-6425 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5925-6425       | 1.08                                  |



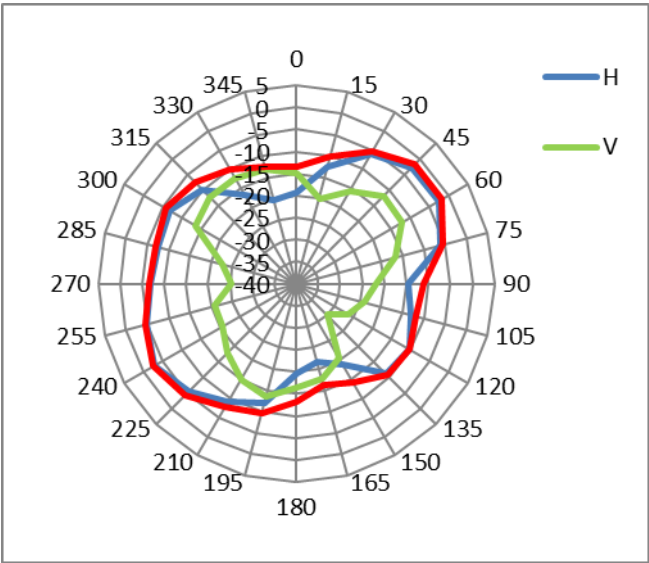
Max Antenna 2D Radiation Pattern 6425-6525 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 6425-6525       | 1.89                                  |



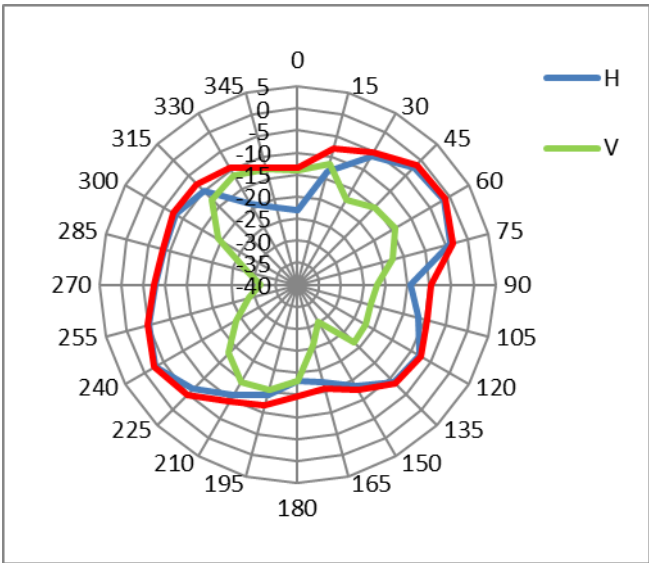
Max Antenna 2D Radiation Pattern 6525-6875 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 6525-6875       | 2.19                                  |



Max Antenna 2D Radiation Pattern 6875-7125 MHz

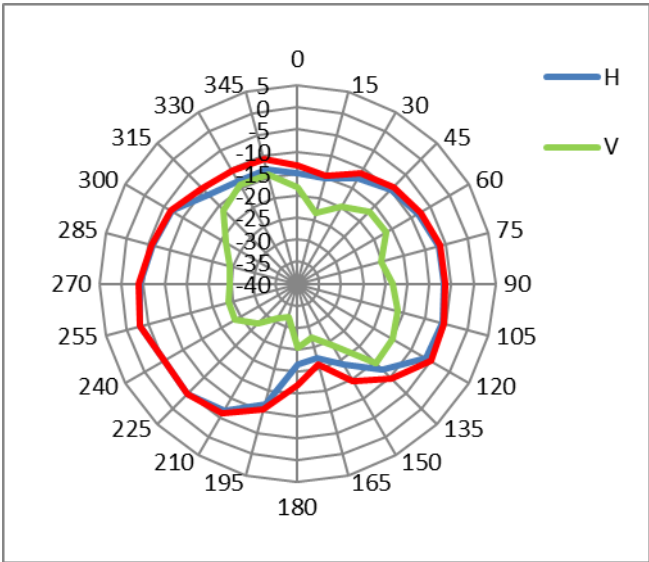
| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 6875-7125       | 2.81                                  |



Auxiliary Antenna

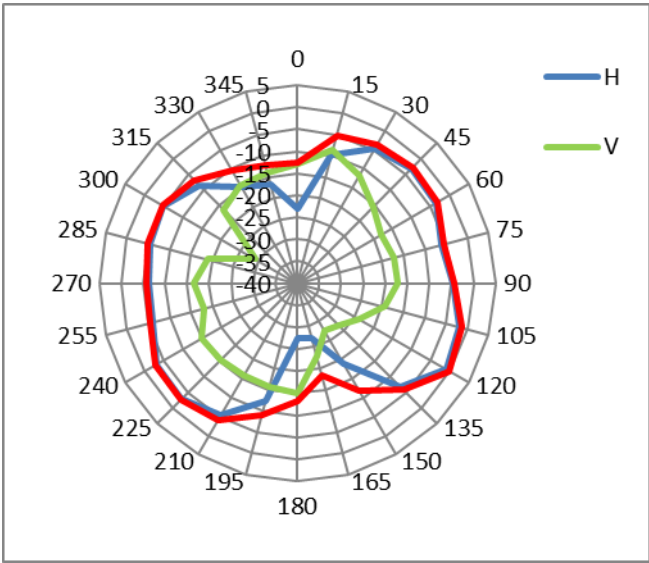
Max Antenna 2D Radiation Pattern 2400 – 2483.5 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 2400-2483.5     | 0.99                                  |



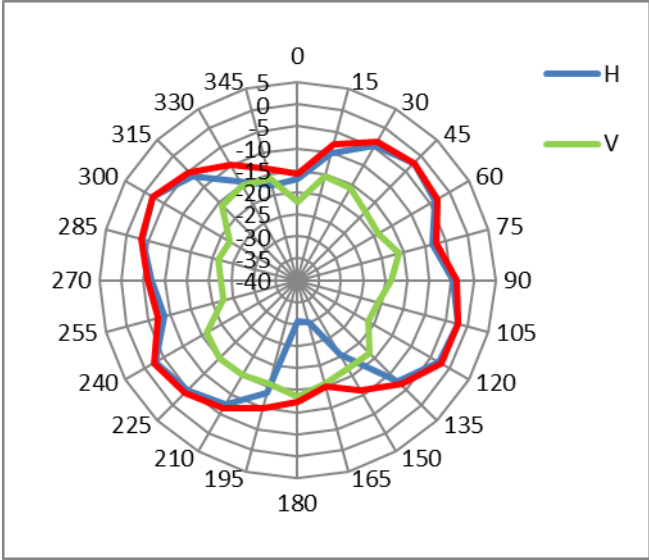
Max Antenna 2D Radiation Pattern 5150-5250 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5150-5250       | 0.5                                   |



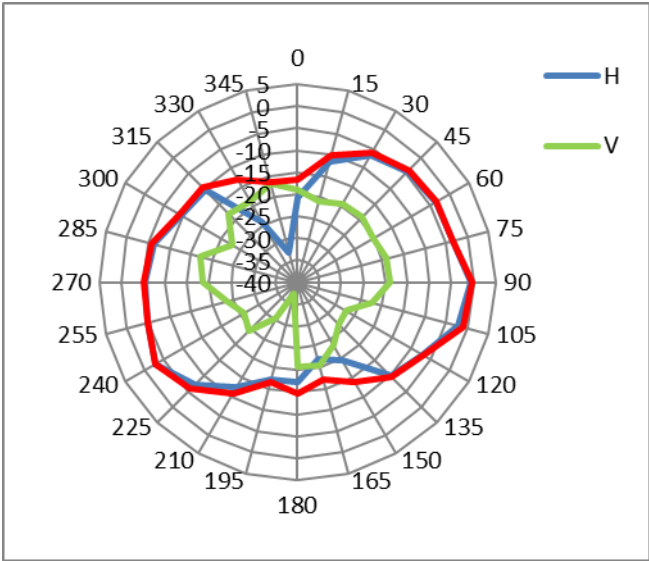
Max Antenna 2D Radiation Pattern 5250-5350 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5250-5350       | 1.17                                  |



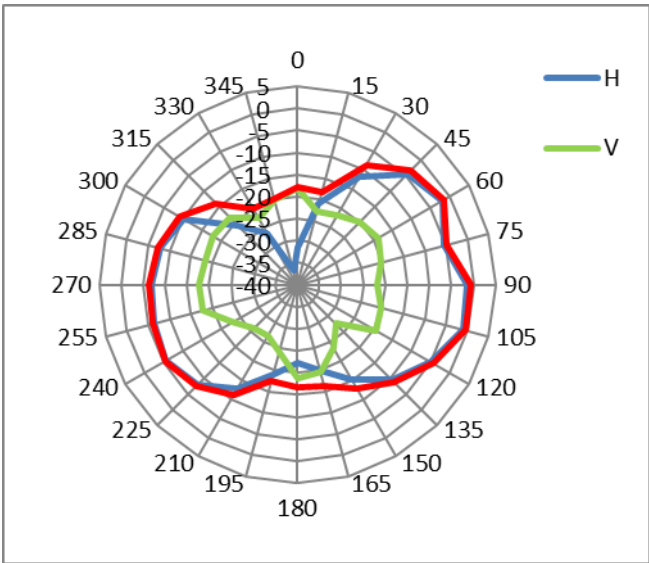
Max Antenna 2D Radiation Pattern 5470-5725 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5470-5725       | 1.19                                  |



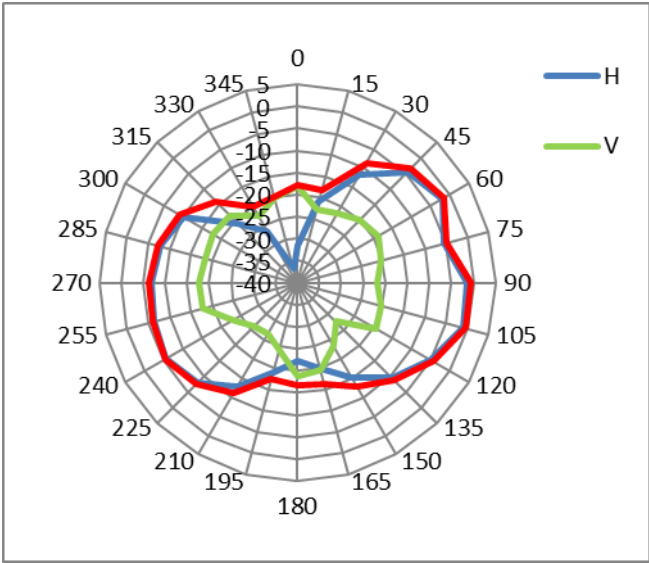
Max Antenna 2D Radiation Pattern 5725-5850 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5725-5850       | 2.59                                  |



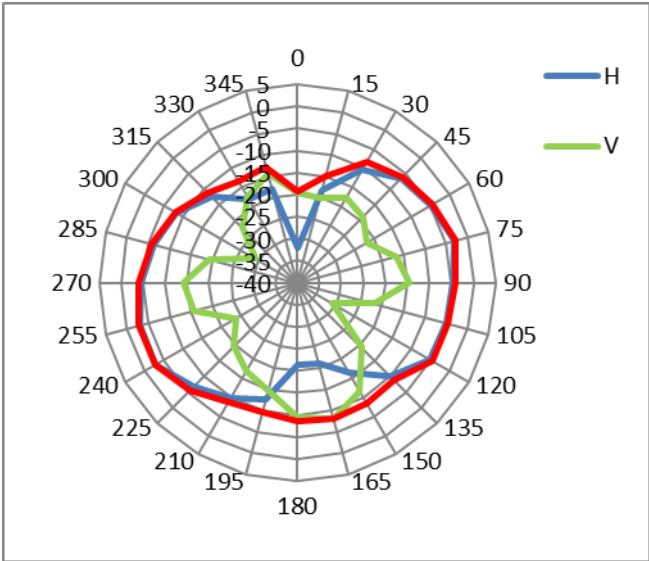
Max Antenna 2D Radiation Pattern 5850-5895 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5850-5895       | 2.59                                  |



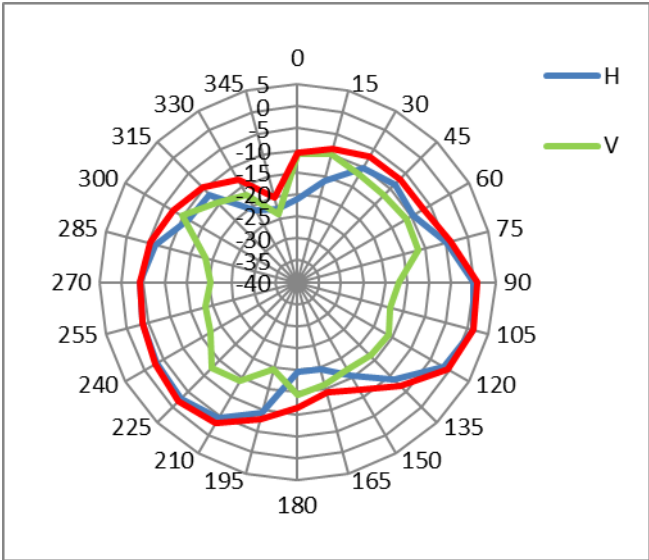
Max Antenna 2D Radiation Pattern 5925-6425 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 5925-6425       | 2.98                                  |



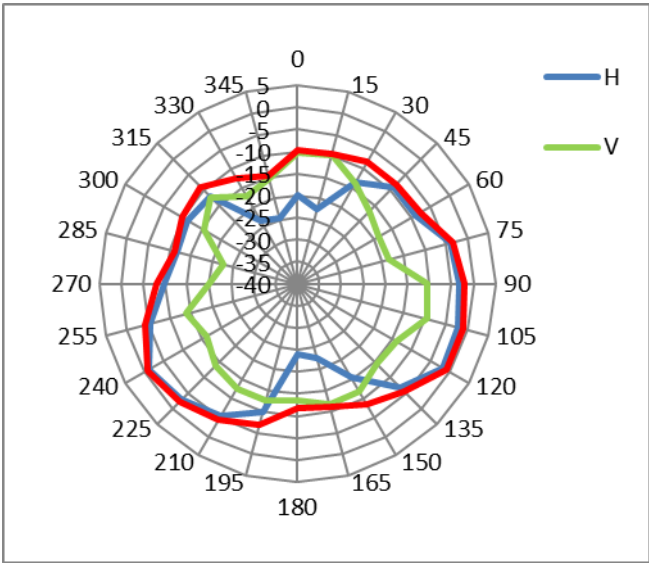
Max Antenna 2D Radiation Pattern 6425-6525 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 6425-6525       | 2.32                                  |



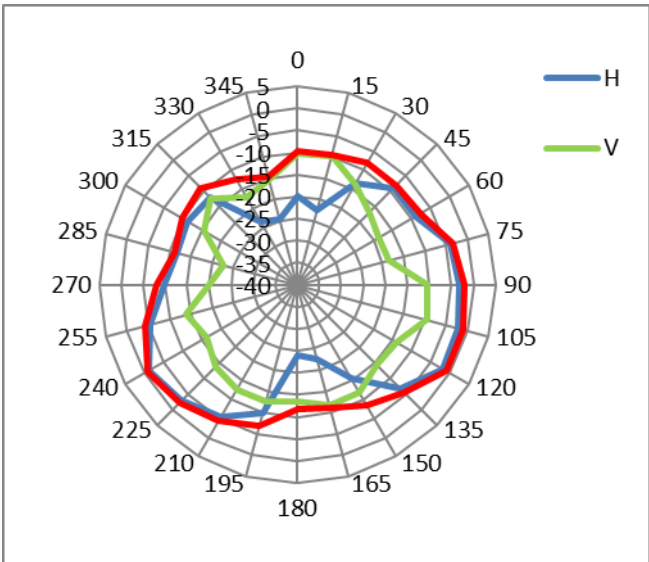
Max Antenna 2D Radiation Pattern 6525-6875 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 6525-6875       | 2.76                                  |



Max Antenna 2D Radiation Pattern 6875-7125 MHz

| Frequency (MHz) | Horizontal+ Vertical (dBi) peak (dBi) |
|-----------------|---------------------------------------|
| 6875-7125       | 2.76                                  |



## Revision History

| Revision | Description                                                                                                                                | Date               |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 10.3     | <u>Page2-5</u><br>Add Applicable test method, Test & System Description and Setup photo                                                    | July 24, 2022      |
| 10.4     | <u>Cover page</u><br>Add Intel 5.9GHz reference antenna gain<br><u>Cover page/Section1/Section3</u><br>Add 5.9GHz antenna gain information | September 15, 2022 |