

# Regulatory WLAN Antenna Information

| Platform information                                                                                                                                                           |                                          |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                       |                                        |                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------|---------------------------------------|---------------------------------------|----------------------------------------|------------------------------------------|
| Brand                                                                                                                                                                          | ODM                                      |                                       | ****End product model name            |                                       | 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)          |                                        |                                          |
| Lenovo                                                                                                                                                                         | LCFC                                     |                                       | 500e                                  |                                       | Yes                                                  |                                       | Convertible PC                                                              |                                       | 4mm                                   |                                        |                                          |
| *****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 (Main)                           |                                       |                                                                             | Antenna Part number (Aux)             |                                       |                                        |                                          |
| ZTX                                                                                                                                                                            |                                          | PIFA                                  |                                       |                                       | DC33001Z900                                          |                                       |                                                                             | DC33001Z910                           |                                       |                                        |                                          |
| 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                                                                                                                                                                           | 0.15                                     | 0.71                                  | 0.55                                  | 0.63                                  | 0.59                                                 | 0.47                                  | 1.05                                                                        | 0.53                                  | 0.32                                  | -0.58                                  |                                          |
| Aux                                                                                                                                                                            | 0.26                                     | 0.27                                  | -0.21                                 | 0.35                                  | -0.14                                                | -0.61                                 | 0.34                                                                        | -0.27                                 | 0.90                                  | 1.03                                   |                                          |
| Intel Reference Gain/Type/ Separation distance                                                                                                                                 |                                          |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                       |                                        |                                          |
| Antenna Type                                                                                                                                                                   | Antenna Peak gain (In dBi)*              |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                       |                                        | Distance to the end user (mm)            |
|                                                                                                                                                                                | 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> | 7.0GHz<br><small>6875-7125MHz</small>  | Generic: refer to modular FCC SAR report |
| Design                                                                                                                                                                         | 3.00                                     | 5.00                                  | 5.00                                  | 5.00                                  | 5.00                                                 | 5.00                                  | 5.00                                                                        | 5.00                                  | 5.00                                  | 5.00                                   | Mid-power: ≥ 8 mm<br>Low power: ≥ 5 mm   |
| PIFA                                                                                                                                                                           | 3.24                                     | 3.64                                  | 3.73                                  | 4.77                                  | 4.97                                                 | 4.72                                  | 4.83                                                                        | 4.30                                  | 5.37                                  | 5.59                                   |                                          |
| Dipole                                                                                                                                                                         | 2.89                                     | 2.92                                  | 3.19                                  | 4.41                                  | 4.22                                                 | 4.22                                  | 4.83                                                                        | 4.30                                  | 4.49                                  | 5.34                                   |                                          |
| Notes (marked with *)                                                                                                                                                          |                                          |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                       |                                        |                                          |
| * SAR minimum separation (mm)                                                                                                                                                  |                                          |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                       |                                        |                                          |
| - Regular NB: Minimum antenna-to-body (from antenna bottom to the bottom of the device)                                                                                        |                                          |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                       |                                        |                                          |
| - Tablet / Convertible PC: Minimum antenna-to-edge (5 sides of the device)                                                                                                     |                                          |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                       |                                        |                                          |
| - Mini-tablet: Minimum antenna-to-edge (6 sides of the device)                                                                                                                 |                                          |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                       |                                        |                                          |
| * 3D Peak Antenna gain should be equal or greater than -2 dBi                                                                                                                  |                                          |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                       |                                        |                                          |
| - If a host integrator plans to use a lower gain antenna of the same type, additional CBP(FCC)/EDT(EU) testing need to be performed while the module is installed in the host. |                                          |                                       |                                       |                                       |                                                      |                                       |                                                                             |                                       |                                       |                                        |                                          |

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## 1. Applicable test methods

<insert test description here for test method>

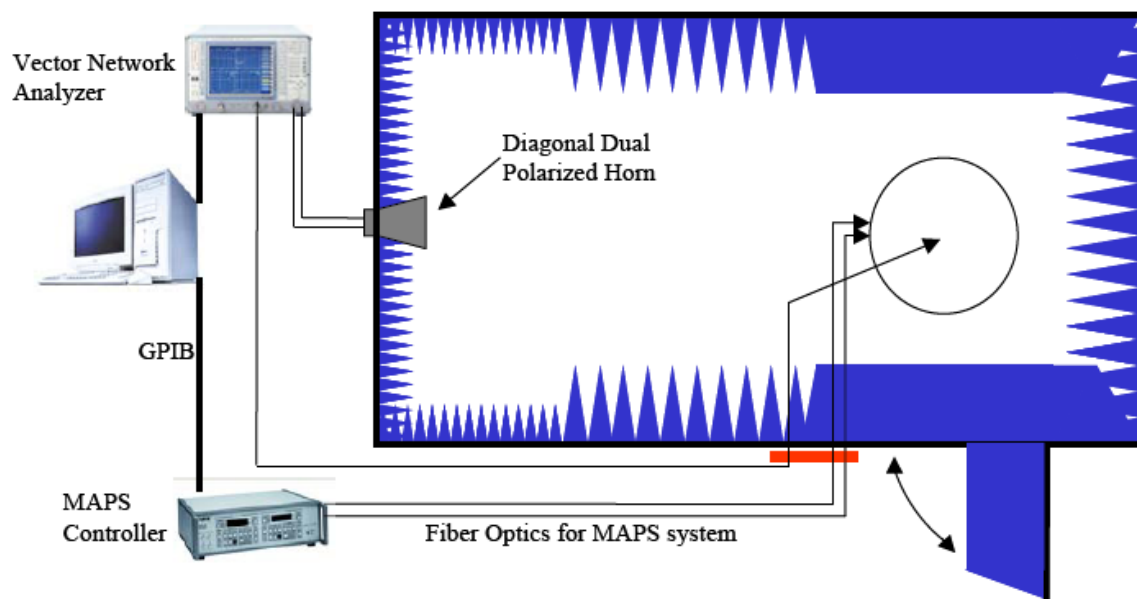
This test report is prepared for host antenna testing under a Full Anechoic Chamber.

This test with host with fixed position and allow to UUT turn different angels.

## 2. Test & System Description

### a. Test setup

ETS-8500



## b. Equipment list

&lt;insert test diagram here for test site utilized&gt;

| Device                            | Type/Model            | Serial#                | Manufacturer         | Cal. Date | Cal. Due Date |
|-----------------------------------|-----------------------|------------------------|----------------------|-----------|---------------|
| Anechoic Chamber                  | AMS-8500              | 1191                   | ETS-Lindgren         | 2022/3/9  | 2024/3/9      |
| Turn Table                        | 2090                  | -                      | ETS-Lindgren         | N/A       | N/A           |
| Switch & Positioning systems      | 7001-002              | 116599                 | ETS-Lindgren         | N/A       | N/A           |
| Measurement SW                    | EMQuest v1.0.8        | 1352                   | ETS-Lindgren         | N/A       | N/A           |
| Boresight antenna mast            | 2090                  | -                      | ETS-Lindgren         | N/A       | N/A           |
| Spectrum Analyzer                 | N9010A                | X16-96096              | Agilent Technologies | 2021/7/25 | 2023/7/25     |
| Horn antenna                      | 3164-08               | 00143257               | ETS-Lindgren         | 2022/4/3  | 2024/4/3      |
| Horn antenna + Amplifier + HPF6.4 | 115195                | 00117614               | ETS-Lindgren         | 2021/8/18 | 2023/8/18     |
| Cable 2.5m - 30MHz to 18GHz       | 0500990992500KE       | 19.23.395              | Radial               | 2022/1/10 | 2024/1/10     |
| Cable 1.2m - 18 to 40GHz          | UFA147A-0-0480-200200 | MFR<br>64639223720-003 | Micro-caox           | 2022/1/10 | 2024/1/10     |
| Cable 1m - 1GHz to 18GHz          | UFA147A               | -                      | Utileflex            | 2022/1/10 | 2024/1/10     |
| Cable 2m - 26.5MHz to 40GHz       | 794-9191-200A         | E00327                 | Atem                 | 2022/1/10 | 2024/1/10     |
| Cable 1m - 30MHz to 18GHz         | UFB311A-0-0590-50U50U | MFR<br>64639223230-001 | Micro-caox           | 2022/1/10 | 2024/1/10     |
| Cable 7m - DC-18GHz               | 0501051057000GX       | 19.35.850              | Radial               | 2022/1/10 | 2024/1/10     |
| Cable 7m - 18GHz to 40GHz         | R286304009            | -                      | Radial               | 2022/1/10 | 2024/1/10     |
| Cable 1.5m - DC-18GHz             | CBL-1.5M-SMSM+        | 202879                 | Mini-Circuits        | 2022/1/10 | 2024/1/10     |
| Temp & Humidity Logger            | GM-108A               | -                      |                      | 2021/5/2  | 2023/5/2      |

# 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: DC33001Z900)<br>Main Antenna | ZTX          | PIFA         | (P/N: 20565-001R-13)<br>50 ohm Coaxial length: 34.0cm<br>diameter: 1.1mm<br>Connector Type: i-pex(MHF) | 2400-2483.5    | 0.15                            | 1.13                           | 3.0 max  | 0.98            |
|                                    |              |              |                                                                                                        | 5150-5250      | 0.71                            | 2.24                           | 3.0 max  | 1.53            |
|                                    |              |              |                                                                                                        | 5250-5350      | 0.55                            | 2.08                           | 3.0 max  | 1.53            |
|                                    |              |              |                                                                                                        | 5470-5725      | 0.63                            | 2.21                           | 3.0 max  | 1.58            |
|                                    |              |              |                                                                                                        | 5725-5850      | 0.59                            | 2.19                           | 3.0 max  | 1.60            |
|                                    |              |              |                                                                                                        | 5850-5895      | 0.47                            | 2.07                           | 3.0 max  | 1.60            |
|                                    |              |              |                                                                                                        | 5925-6425      | 1.05                            | 2.71                           | 3.0 max  | 1.66            |
|                                    |              |              |                                                                                                        | 6425-6525      | 0.53                            | 2.24                           | 3.0 max  | 1.71            |
|                                    |              |              |                                                                                                        | 6525-6875      | 0.32                            | 2.07                           | 3.0 max  | 1.75            |
|                                    |              |              |                                                                                                        | 6875-7125      | -0.58                           | 1.22                           | 3.0 max  | 1.80            |
| (P/N: DC33001Z910)<br>Aux Antenna  | ZTX          | PIFA         | (P/N: 20565-001R-13)<br>50 ohm Coaxial length: 45.4cm<br>diameter: 1.1mm<br>Connector Type: i-pex(MHF) | 2400-2483.5    | 0.26                            | 1.56                           | 3.0 max  | 1.30            |
|                                    |              |              |                                                                                                        | 5150-5250      | 0.27                            | 2.3                            | 3.0 max  | 2.03            |
|                                    |              |              |                                                                                                        | 5250-5350      | -0.21                           | 1.82                           | 3.0 max  | 2.03            |
|                                    |              |              |                                                                                                        | 5470-5725      | 0.35                            | 2.44                           | 3.0 max  | 2.09            |
|                                    |              |              |                                                                                                        | 5725-5850      | -0.14                           | 1.98                           | 3.0 max  | 2.12            |
|                                    |              |              |                                                                                                        | 5850-5895      | -0.61                           | 1.51                           | 3.0 max  | 2.12            |
|                                    |              |              |                                                                                                        | 5925-6425      | 0.34                            | 2.53                           | 3.0 max  | 2.19            |
|                                    |              |              |                                                                                                        | 6425-6525      | -0.27                           | 1.99                           | 3.0 max  | 2.26            |
|                                    |              |              |                                                                                                        | 6525-6875      | 0.90                            | 3.22                           | 3.0 max  | 2.32            |
|                                    |              |              |                                                                                                        | 6875-7125      | 1.03                            | 3.42                           | 3.0 max  | 2.39            |

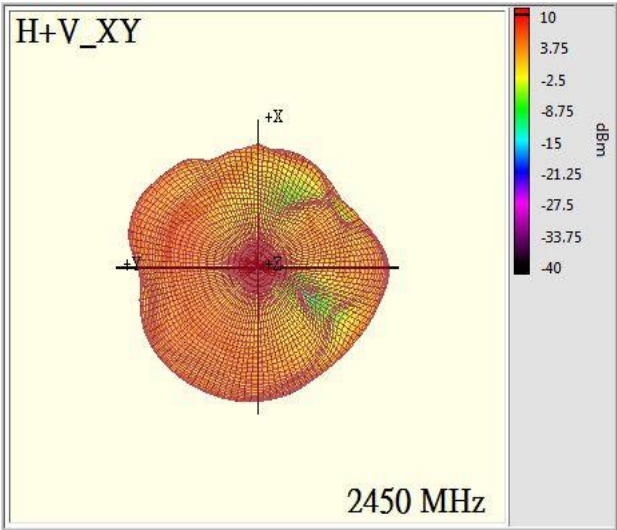
- 3D Antenna Peak Gain required being test in system basis.

Section 3. Radiation characteristics of antenna loaded in Host Platform

Main Antenna

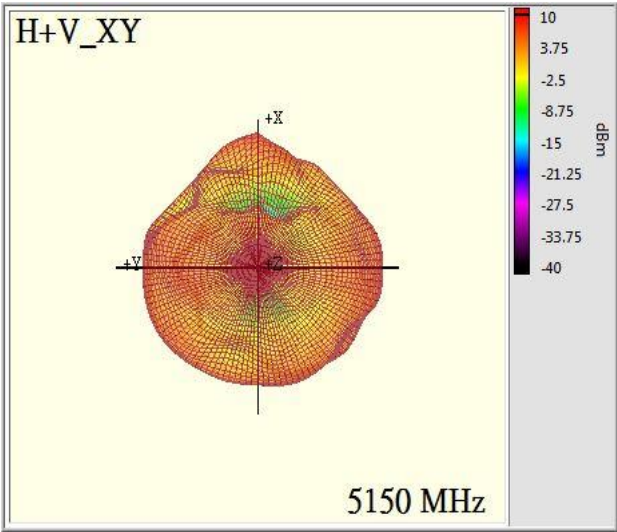
Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 2400-2483.5     | 0.15                          |



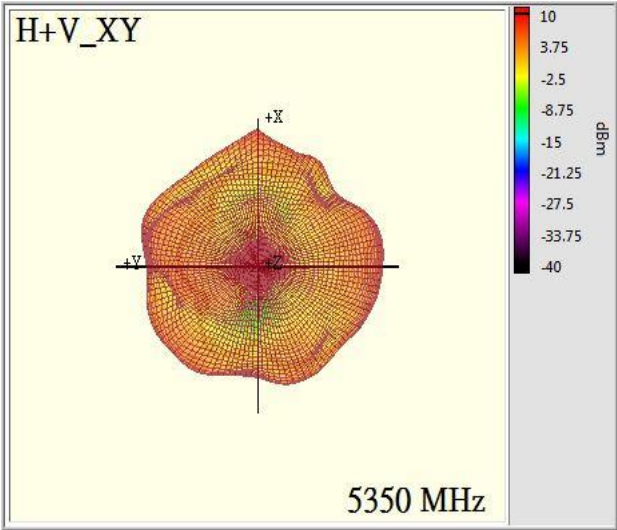
Max Antenna 3D Radiation Pattern 5150-5250 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5150-5250       | 0.71                          |



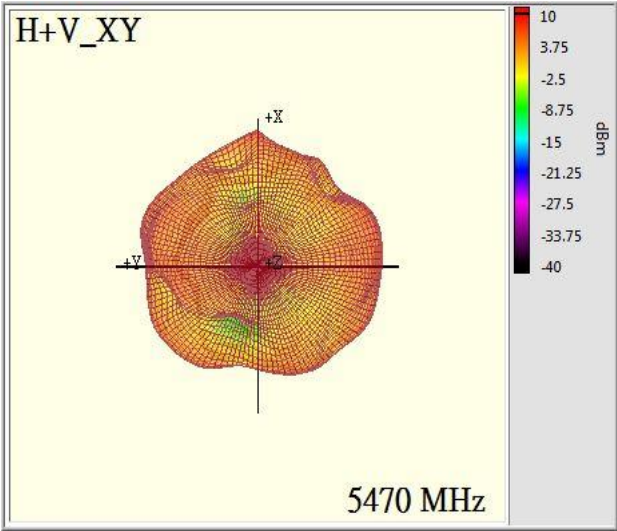
Max Antenna 3D Radiation Pattern 5250-5350 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5250-5350       | 0.55                          |



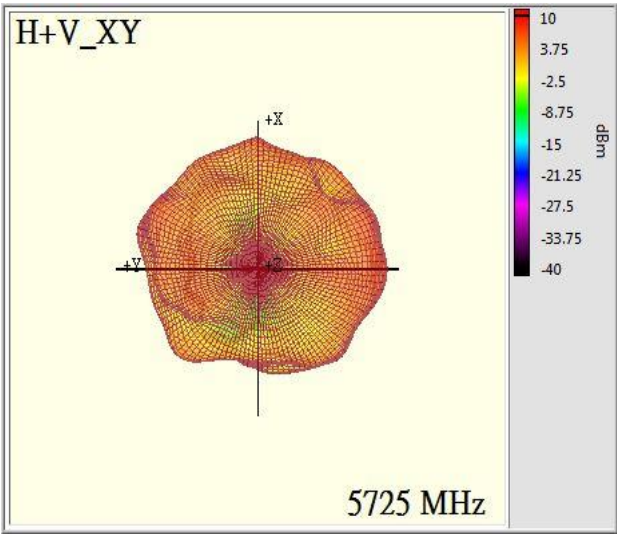
Max Antenna 3D Radiation Pattern 5470-5725 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5470-5725       | 0.63                          |



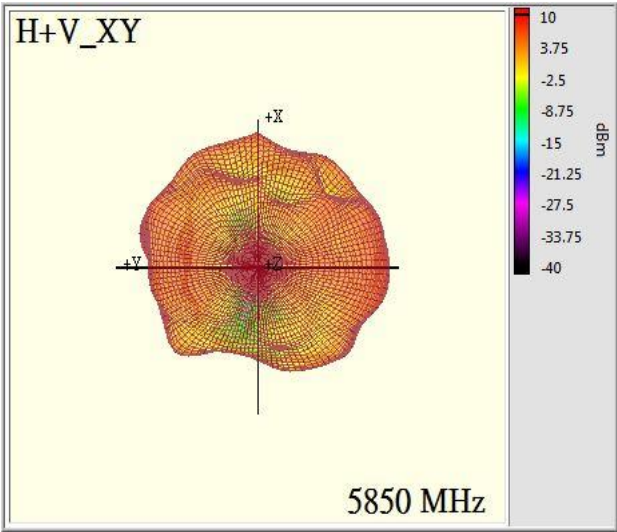
Max Antenna 3D Radiation Pattern 5725-5850 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5725-5850       | 0.59                          |



Max Antenna 3D Radiation Pattern 5850-5895 MHz

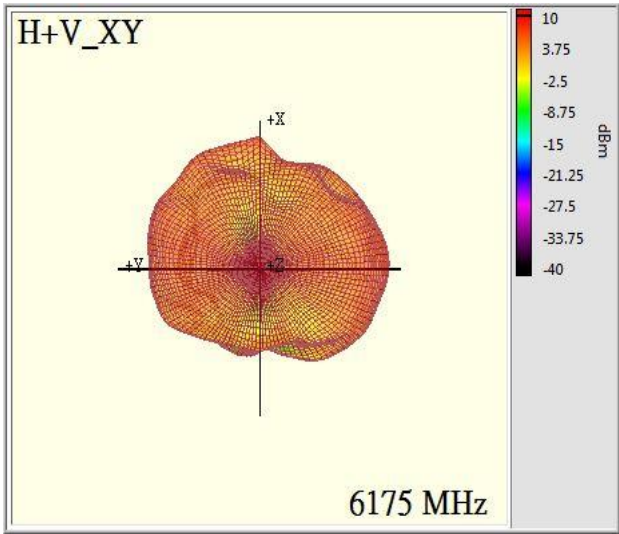
| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5850-5895       | 0.47                          |





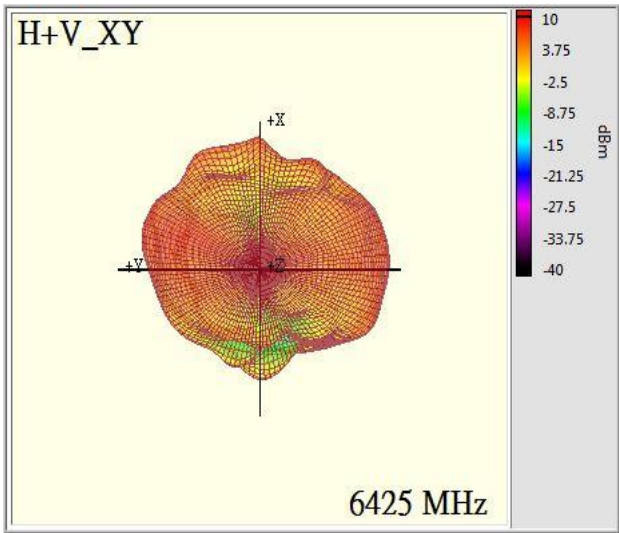
Max Antenna 3D Radiation Pattern 5925-6425 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5925-6425       | 1.05                          |



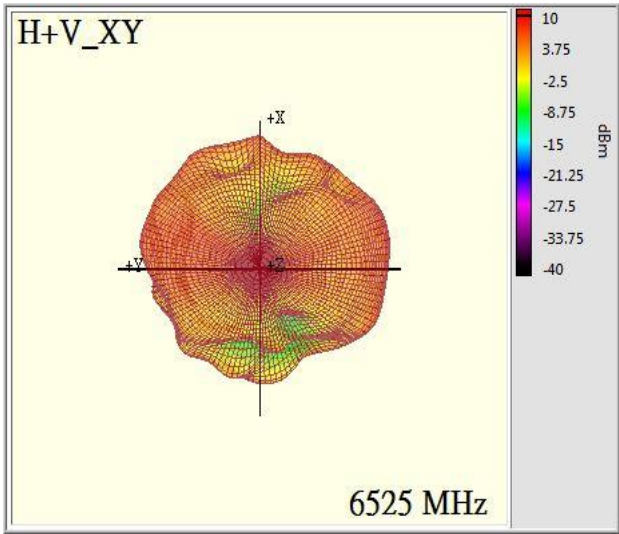
Max Antenna 3D Radiation Pattern 6425-6525 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6425-6525       | 0.53                          |



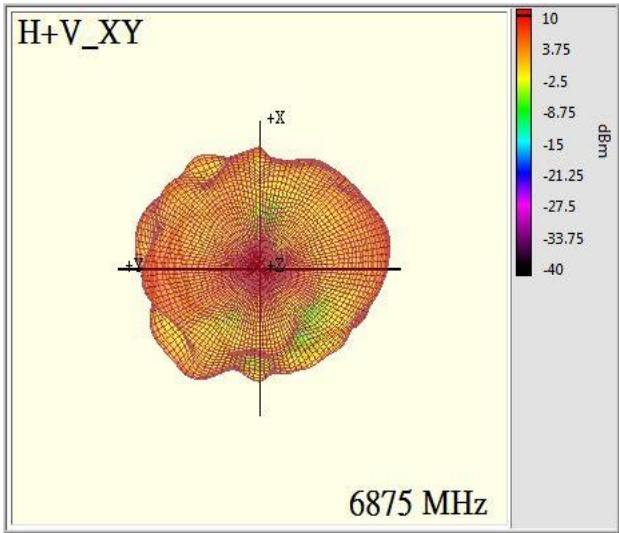
Max Antenna 3D Radiation Pattern 6525-6875 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6525-6875       | 0.32                          |



Max Antenna 3D Radiation Pattern 6875-7125 MHz

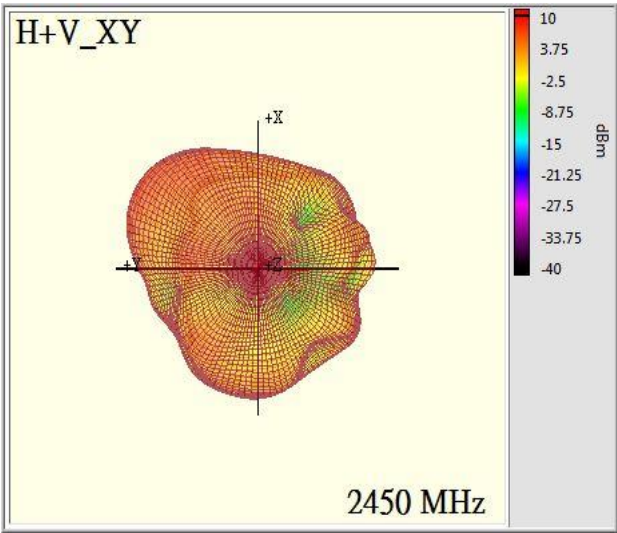
| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6875-7125       | -0.58                         |



Auxiliary Antenna

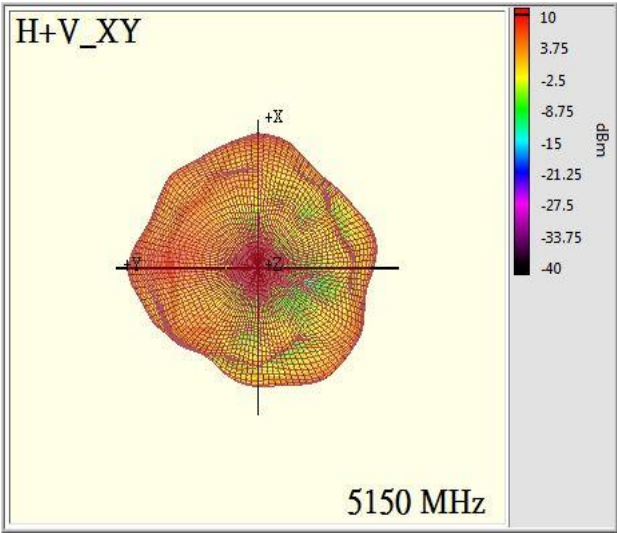
Max Antenna 3D Radiation Pattern 2400 – 2483.5 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 2400-2483.5     | 0.26                          |



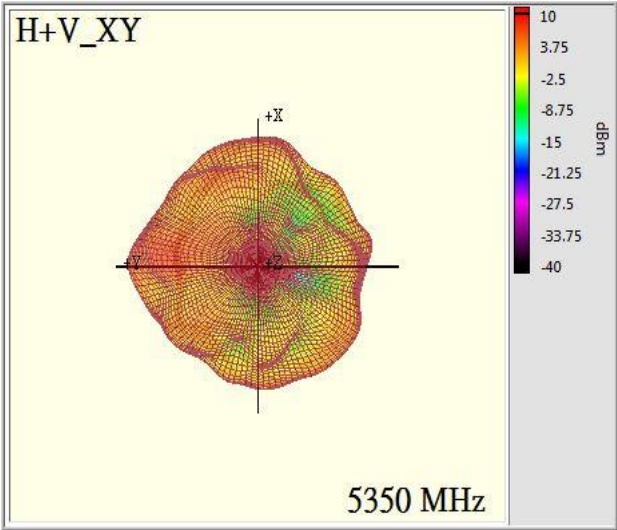
Max Antenna 3D Radiation Pattern 5150-5250 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5150-5250       | 0.27                          |



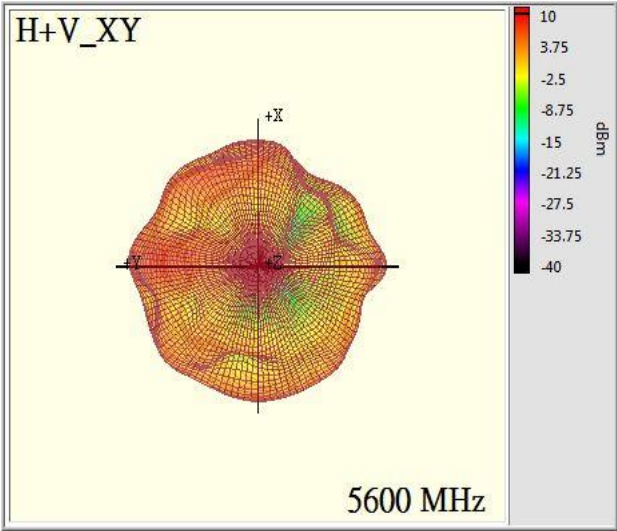
Max Antenna 3D Radiation Pattern 5250-5350 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5250-5350       | -0.21                         |



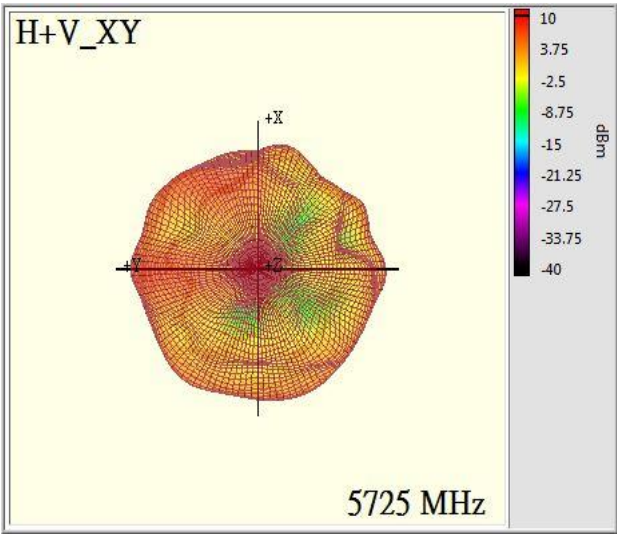
Max Antenna 3D Radiation Pattern 5470-5725 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5470-5725       | 0.35                          |



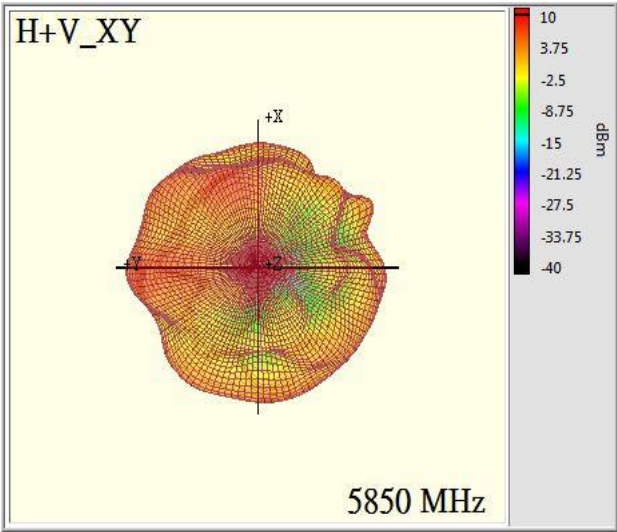
Max Antenna 3D Radiation Pattern 5725-5850 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5725-5850       | -0.14                         |



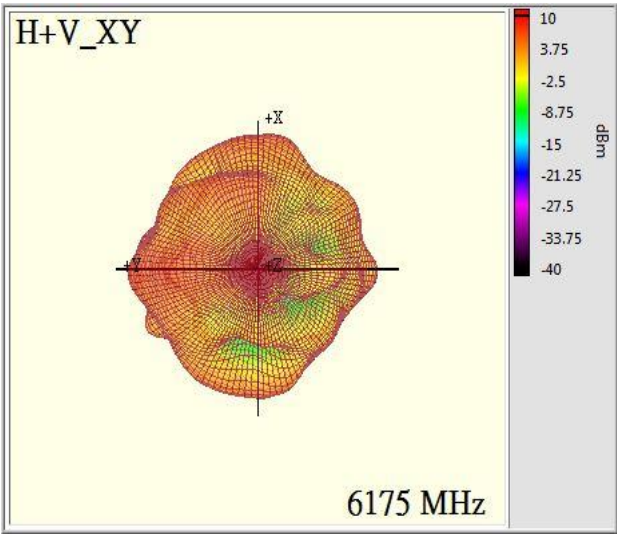
Max Antenna 3D Radiation Pattern 5850-5895 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5850-5895       | -0.61                         |



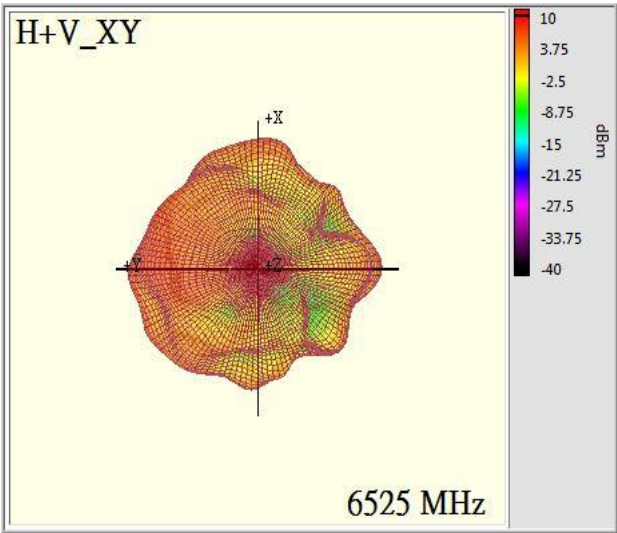
Max Antenna 3D Radiation Pattern 5925-6425 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 5925-6425       | 0.34                          |



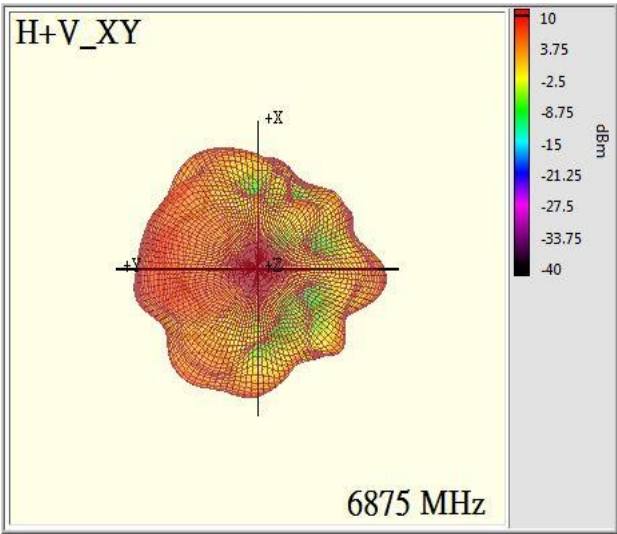
Max Antenna 3D Radiation Pattern 6425-6525 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6425-6525       | -0.27                         |



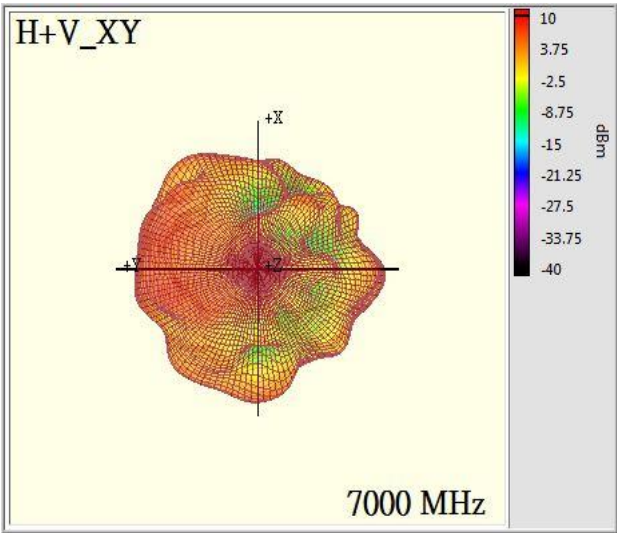
Max Antenna 3D Radiation Pattern 6525-6875 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6525-6875       | 0.90                          |



Max Antenna 3D Radiation Pattern 6875-7125 MHz

| Frequency (MHz) | Peak Gain w/ Cable Loss (dBi) |
|-----------------|-------------------------------|
| 6875-7125       | 1.03                          |



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 |