

# Regulatory WLAN Antenna Information

## 2.4/5GHz Dell Diaz Series Multiple Band Antennas with Cable & Connector For IEEE802.11 a/g/n

(English Language Required for Intel Regulatory Review / Approval)

|                    |                                           |
|--------------------|-------------------------------------------|
| <b>Platform</b>    |                                           |
| Platform Owner     | DELL                                      |
| Brand Name         | DELL                                      |
| Model Name         | Diaz                                      |
| ODM                |                                           |
| Target Launch Date | 2008/02/22                                |
|                    |                                           |
| <b>Antenna</b>     |                                           |
| Brand Name         |                                           |
| Part Number        | ■ Tx1 Antenna: Main -2023816-1            |
|                    | ■ Tx2 Antenna:Aux – 2023816-1             |
|                    | ■ Tx3 (or Rx3) Antenna : MIMO – 2023816-1 |
|                    |                                           |
|                    |                                           |
| <b>Module</b>      | ■ 512AN_HMW                               |
| With WLAN Module   | ■ 533AN_HMW                               |
| (Check Box)        |                                           |
|                    |                                           |
|                    |                                           |
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|                    |                                           |
|                    |                                           |
|                    |                                           |

## Antenna Sample / Antenna Data

### Requirements for worldwide regulatory approval

| Section | Description of Required OEM / ODM Antenna Information                                                                                                                                                        | US / IC  | EU       | Japan    | Taiwan            | S.Korea           |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|-------------------|-------------------|
| 1A      | Part Number for Antenna only                                                                                                                                                                                 | Required | Required | Required | Required          | Required          |
| 1B      | Antenna Manufacturer Name                                                                                                                                                                                    | Required | Required | Required | Required          | Required          |
| 1C      | Description of Antenna Type                                                                                                                                                                                  | Required | N/A      | N/A      | N/A               | N/A               |
| 1D      | Part number of Antenna Assembly / cable impedance, length & diameter.                                                                                                                                        | Required | Desired  | Desired  | Desired           | Desired           |
| 1E      | Tx1, Tx2 & Tx3 antenna (Peak Gain W/ cable loss) *                                                                                                                                                           | Required | Required | Required | Required          | Required          |
|         | 1E OR 1F, 1G, 1H                                                                                                                                                                                             |          |          |          |                   |                   |
| 1F      | Tx1, Tx2 & Tx3 antenna (Peak Gain only) *                                                                                                                                                                    | Required | Required | Required | Required          | Required          |
| 1G      | VSWR of cable including connector                                                                                                                                                                            | Required | Required | Required | Required          | Required          |
| 1H      | Tx1, Tx2 & Tx3 antenna (Cable loss W/ connector) *                                                                                                                                                           | Required | Required | Required | Required          | Required          |
| 2       | Dimensioned Photographs and Drawings of Tx1, Tx2, and Tx3 (or Rx3) antennas                                                                                                                                  | Required | Required | Required | Required          | Required          |
| 3       | Radiation patterns of antennas loaded in the host platform.                                                                                                                                                  | Required | Desired  | Required | N/A               | Required          |
| 4       | Platform model name / number - correlated to antenna manufacturer and antenna part number                                                                                                                    | Required | Required | Desired  | Required          | Desired           |
| 5       | Photograph(s) or Drawings showing location of antennas in platform. (S. Korea requires photographs of antennas for approval submission). Taiwan requires pictures of each antenna type shown in the system.  | Required | Required | Desired  | Required (Photos) | Required (Photos) |
| 6       | Mech. drawings / photos with dimensions of antenna locations and distance from end-user (For evaluation of SAR testing requirement).                                                                         | Required | N/A      | N/A      | N/A               | N/A               |
| 7       | Photograph(s) or Drawings showing the location of all antennas (WLAN, other) and distance between those transmitting antennas. Information will be used to evaluate whether co-location testing is required. | Required | N/A      | N/A      | N/A               | N/A               |
| 8       | Local representative contact information for LMA/ PARS process.                                                                                                                                              | Required | N/A      | N/A      | N/A               | N/A               |

**NOTE:**

(\*) if 3<sup>rd</sup> antenna is Rx only (e.g. receive only for 4965AGN) then peak gain and cable loss not required

# Antenna Information

## Section 1. Antenna Assembly Specifications

### Antenna Assembly Summary:

| 1A<br>Antenna Part Number                                   | 1B<br>Manufacture                 | 1C<br>Antenna Type | 1D<br>Cable Assembly Part Number and Information                                                         | 1E<br>*Peak Gain W/ Cable loss (dBi)     | 1F<br>Peak Gain w/o Cable Loss (dBi)    | 1G<br>VSWR                     | 1H<br>Cable Loss (dBi)                  |
|-------------------------------------------------------------|-----------------------------------|--------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------------|--------------------------------|-----------------------------------------|
| <b>2023816-1</b><br>Tx1<br>Antenna<br>Main<br>White         | <b>TYCO</b><br><b>Electronics</b> | PIFA               | (P/N: U.FL-LP-068)<br>50 ohm coaxial<br>length: 475mm<br>diameter: 1.13mm<br>Connector: U.FL<br>White    | 2412-2462MHz<br><b>-0.67</b> dBi (peak)  | 2412-2462MHz<br><b>1.83</b> dBi (peak)  | 2412-2462MHz<br><u>2</u> max   | 2412-2462MHz<br><b>2.5</b> dBi (peak)   |
|                                                             |                                   |                    |                                                                                                          | 2500-2700MHz<br><b>0.58</b> dBi (peak)   | 2500-2700MHz<br><b>3.08</b> dBi (peak)  | 2500-2700MHz<br><u>2</u> max   | 2500-2700MHz<br><b>2.5</b> dBi (peak)   |
|                                                             |                                   |                    |                                                                                                          | 5150-5470MHz<br><b>0.72</b> dBi (peak)   | 5150-5470MHz<br><b>4.32</b> dBi (peak)  | 5150-5470MHz<br><u>2</u> max   | 5150-5470MHz<br><b>3.6</b> dBi (peak)   |
|                                                             |                                   |                    |                                                                                                          | 5725-5850MHz<br><b>1.21</b> dBi (peak)   | 5725-5850MHz<br><b>4.81</b> dBi (peak)  | 5725-5850MHz<br><u>2</u> max   | 5725-5850MHz<br><b>3.6</b> dBi (peak)   |
| <b>2023816-1</b><br>Tx2<br>antenna<br>Aux<br>Black          | <b>TYCO</b><br><b>Electronics</b> | PIFA               | (P/N: U.FL-LP-068)<br>50 ohm coaxial<br>length: 475mm<br>diameter: 1.13mm<br>Connector: U.FL<br>black    | 2412-2462MHz<br><b>0.58</b> dBi (peak)   | 2412-2462MHz<br><b>3.08</b> dBi (peak)  | 2412-2462MHz<br><u>2</u> max   | 2412-2462MHz<br><b>2.5</b> dBi (peak)   |
|                                                             |                                   |                    |                                                                                                          | 2500-2700MHz<br><b>1.73</b> dBi (peak)   | 2500-2700MHz<br><b>4.23</b> dBi (peak)  | 2500-2700MHz<br><u>2</u> max   | 2500-2700MHz<br><b>2.5</b> dBi (peak)   |
|                                                             |                                   |                    |                                                                                                          | 5150-5470MHz<br><b>0.37</b> dBi (peak)   | 5150-5470MHz<br><b>3.97</b> dBi (peak)  | 5150-5470MHz<br><u>2</u> max   | 5150-5470MHz<br><b>3.6</b> dBi (peak)   |
|                                                             |                                   |                    |                                                                                                          | 5725-5850MHz<br><b>0.11</b> dBi (peak)   | 5725-5850MHz<br><b>3.71</b> dBi (peak)  | 5725-5850MHz<br><u>2</u> max   | 5725-5850MHz<br><b>3.6</b> dBi (peak)   |
| <b>2023816-1</b><br>Tx3 (or Rx3)<br>antenna<br>Gray<br>MIMO | <b>TYCO</b><br><b>Electronics</b> | PIFA               | (P/N: U.FL-LP-068)<br>50 ohm coaxial<br>length: 275mm<br><br>diameter: 1.13mm<br>Connector: U.FL<br>Gray | 2412-2462MHz<br><b>0.16</b> dBi (peak)   | 2412-2462MHz<br><b>2.66</b> dBi (peak)  | 2412-2462MHz<br><u>2</u> max   | 2412-2462MHz<br><b>2.5</b> dBi (peak)   |
|                                                             |                                   |                    |                                                                                                          | 2500-2700MHz<br>dBi (peak)               | 2500-2700MHz<br>dBi (peak)              | 2500-2700MHz<br>max            | 2500-2700MHz<br>dBi (peak)              |
|                                                             |                                   |                    |                                                                                                          | 5150-5470MHz<br><b>2.16</b> dBi (peak)   | 5150-5470MHz<br><b>5.76</b> dBi (peak)  | 5150-5470MHz<br><u>2</u> max   | 5150-5470MHz<br><b>3.6</b> dBi (peak)   |
|                                                             |                                   |                    |                                                                                                          | 5725-5850MHz<br><b>2.30</b> dBi (peak) * | 5725-5850MHz<br><b>5.9</b> dBi (peak) * | 5725-5850MHz<br><u>2</u> max * | 5725-5850MHz<br><b>3.6</b> dBi (peak) * |

#### NOTE:

(\*) If Rx3 only (3<sup>rd</sup> antenna receives only, e.g. for 4965AGN) then the information marked with \* is not required

**Antenna Peak Gain Table:**

| Freq.<br>(MHz) | WLAN Antenna–White(MAIN) |       |       | WLAN Antenna–Black(AUX) |       |       | MIMO Antenna–Gray |       |       |
|----------------|--------------------------|-------|-------|-------------------------|-------|-------|-------------------|-------|-------|
|                | H                        | V     | H + V | H                       | V     | H + V | H                 | V     | H + V |
|                | dBi                      | dBi   | dBi   | dBi                     | dBi   | dBi   | dBi               | dBi   | dBi   |
| 2412           | –3.46                    | –3.60 | –0.77 | –3.81                   | –4.16 | –2.50 | –2.21             | –0.97 | 0.16  |
| 2437           | –3.35                    | –3.22 | –0.71 | –2.55                   | –2.55 | –0.82 | –2.32             | –0.60 | 0.01  |
| 2462           | –3.08                    | –2.80 | –0.67 | –1.78                   | –1.28 | 0.58  | –2.66             | –0.66 | 0.11  |
| 2500           | –2.36                    | –2.92 | 0.13  | –1.71                   | –0.26 | 1.10  |                   |       |       |
| 2600           | –1.34                    | –1.95 | 0.58  | –1.33                   | –0.55 | 0.63  |                   |       |       |
| 2700           | –1.20                    | –1.43 | 0.15  | –0.40                   | 0.30  | 1.73  |                   |       |       |
| 5150           | –1.65                    | –7.40 | –1.49 | –0.47                   | –7.58 | –0.11 | –0.47             | –1.03 | 1.12  |
| 5350           | –0.50                    | –5.89 | –0.25 | –0.08                   | –5.49 | 0.37  | 0.20              | 0.03  | 2.16  |
| 5470           | 0.66                     | –3.53 | 0.72  | –0.58                   | –4.65 | 0.11  | 0.11              | –0.58 | 1.57  |
| 5725           | 1.04                     | –4.00 | 1.21  | –1.66                   | –3.61 | –0.35 | –3.17             | –0.35 | 0.83  |
| 5875           | 0.40                     | –2.92 | 0.59  | –1.43                   | –2.56 | 0.11  | –0.04             | 0.34  | 2.30  |

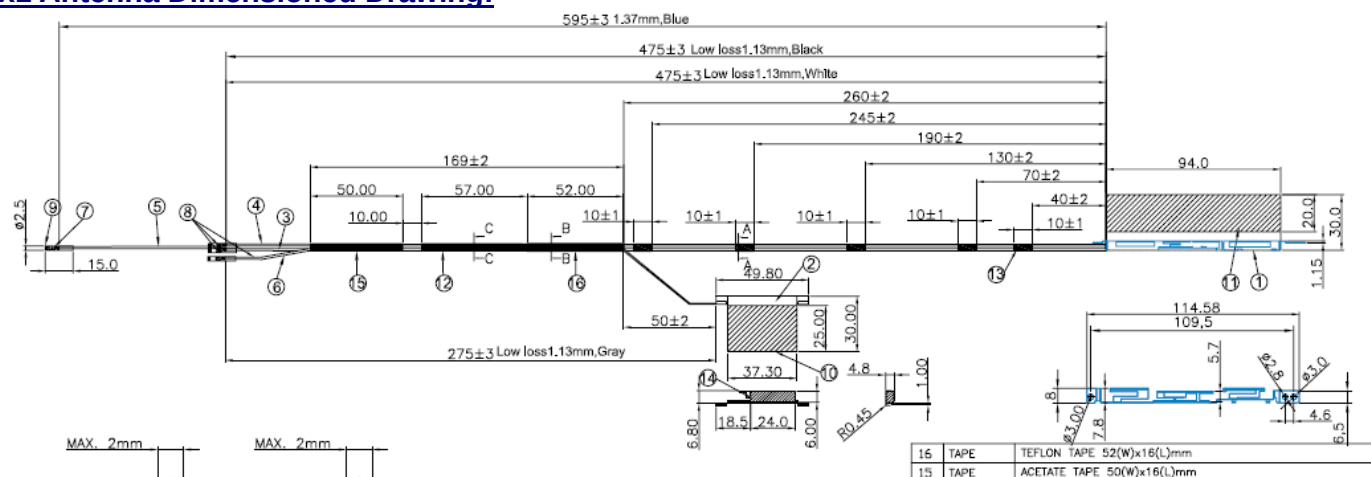
Antenna Peak Gain required being test in system basis.

- 1E frame content absolutely peak antenna gain include H/V
- If Rx3 only (3<sup>rd</sup> antenna receives only, e.g. for 4965AGN) then the information is not required for Rx3.

## Section 2. Dimensioned Photos or Drawings of Antennas

**Include a dimensioned photo and dimensioned drawing of Tx1 antenna here.**

### Tx1 Antenna Dimensioned Drawing:



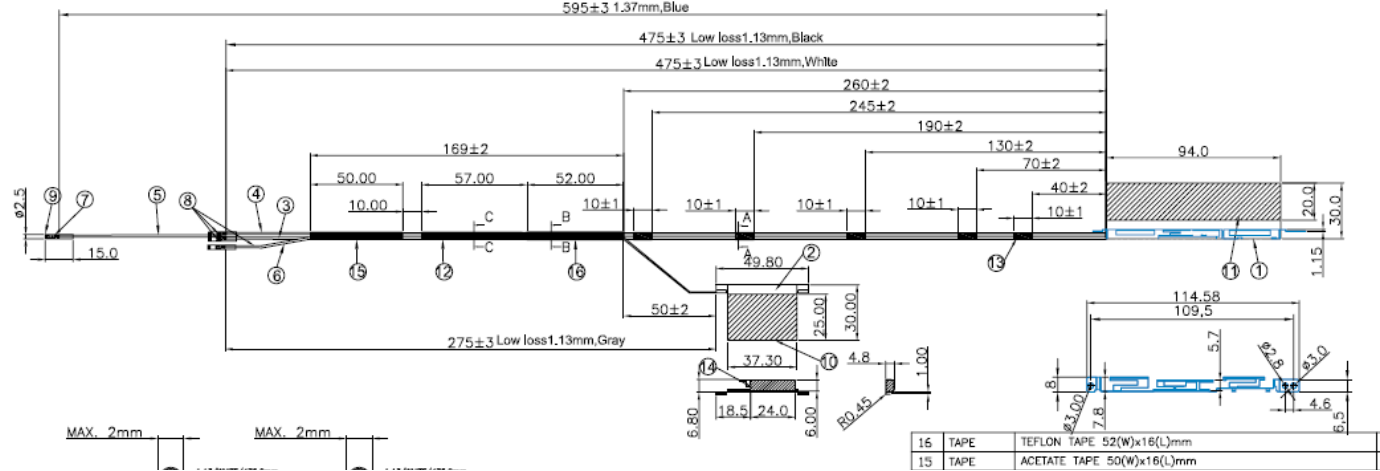
### Tx1 Antenna Photo:-MAIN



[illegible]

Include a dimensioned photo and dimensioned drawing of Tx3 (or Rx3) antenna here.

Tx3 (or Rx3) Antenna Dimensioned Drawing:



Tx3 (or Rx3) Antenna Photo:



**Include front view photo of all 3 antennas here.**

Antenna Manufacturer: Tyco Electronics

Antenna Part Number:

(Tx1), 2023816-1

(Tx2), 2023816-1

(Rx3), 2023816-1



**Include back view photo of all 3 antennas here.**

Antenna Manufacturer: Tyco Electronics

Antenna Part Number:

(Tx1), 2023816-1

(Tx2), 2023816-1

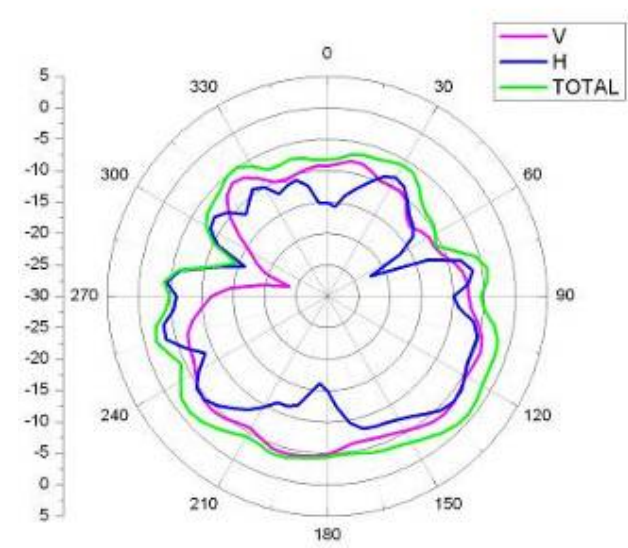
(Rx3), 2023816-1



**Section 3. Radiation characteristics of antennae Loaded in Host Platform**

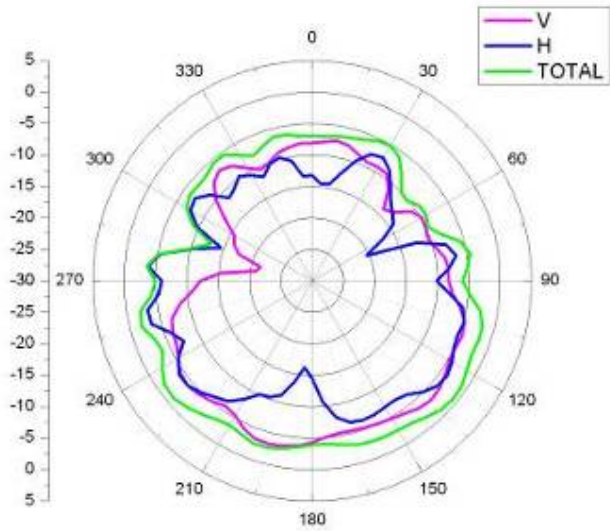
**2412-2562MHz radiation characteristic**

**MAIN antenna: 2412 MHz**



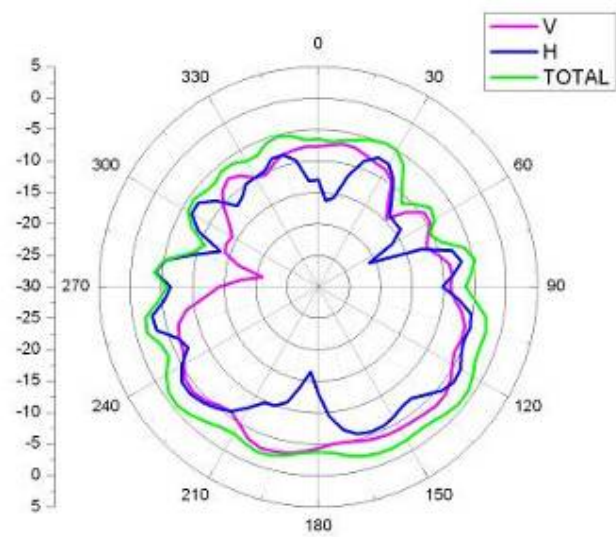
|                       |          |
|-----------------------|----------|
| Center Frequency      | 2412 MHz |
| Horizontal (dBi) peak | -3.46    |
| Vertical (dBi) peak   | -3.59    |
| H+V (dBi) peak        | -0.76    |

MAIN antenna: 2437 MHz



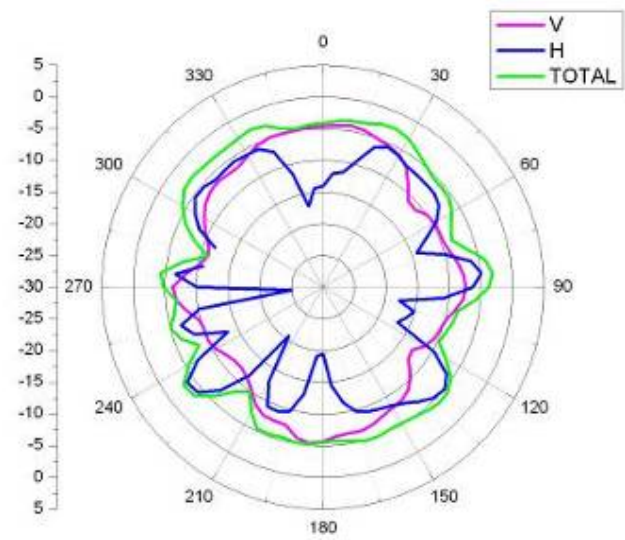
|                       |          |
|-----------------------|----------|
| Center Frequency      | 2437 MHz |
| Horizontal (dBi) peak | -3.35    |
| Vertical (dBi) peak   | -3.22    |
| H+V (dBi) peak        | -0.70    |

MAIN antenna: 2462 MHz



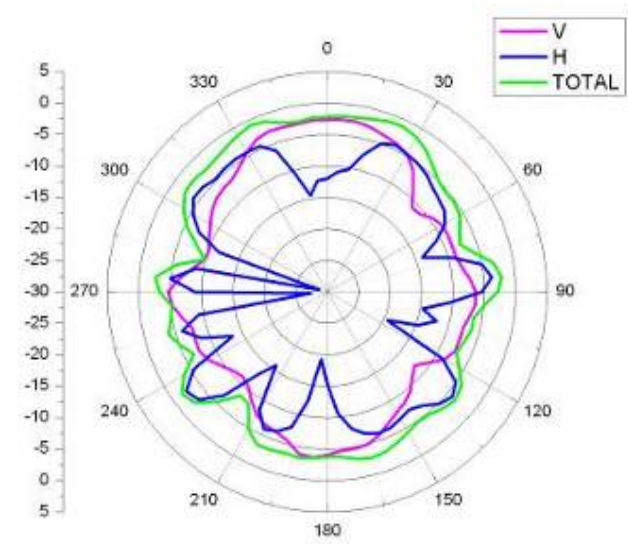
|                       |          |
|-----------------------|----------|
| Center Frequency      | 2462 MHz |
| Horizontal (dBi) peak | -3.06    |
| Vertical (dBi) peak   | -2.80    |
| H+V (dBi) peak        | -0.66    |

AUX antenna: 2412 MHz



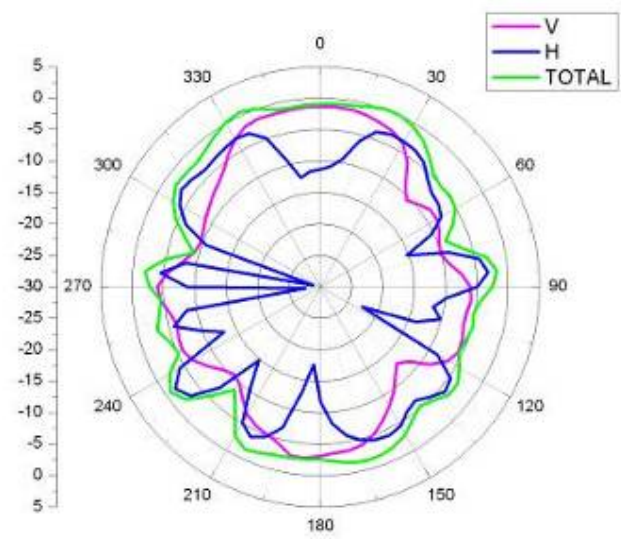
|                       |          |
|-----------------------|----------|
| Center Frequency      | 2412 MHz |
| Horizontal (dBi) peak | -3.81    |
| Vertical (dBi) peak   | -4.16    |
| H+V (dBi) peak        | -2.50    |

AUX antenna: 2437MHz

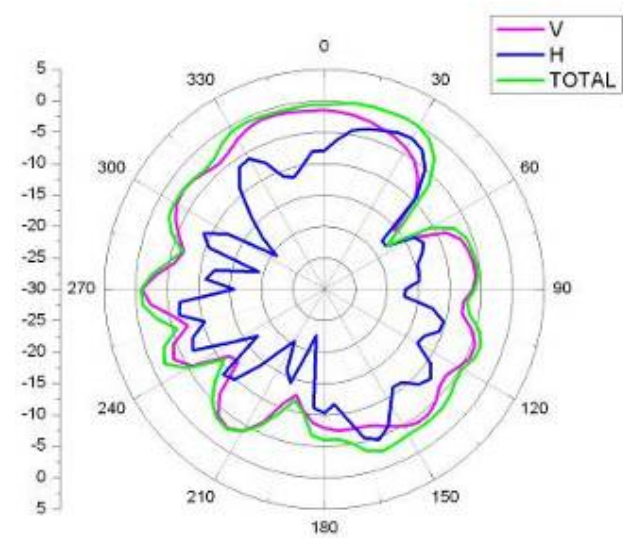


|                       |          |
|-----------------------|----------|
| Center Frequency      | 2437 MHz |
| Horizontal (dBi) peak | -2.55    |
| Vertical (dBi) peak   | -2.54    |
| H+V (dBi) peak        | -0.82    |

AUX antenna: 2462 MHz

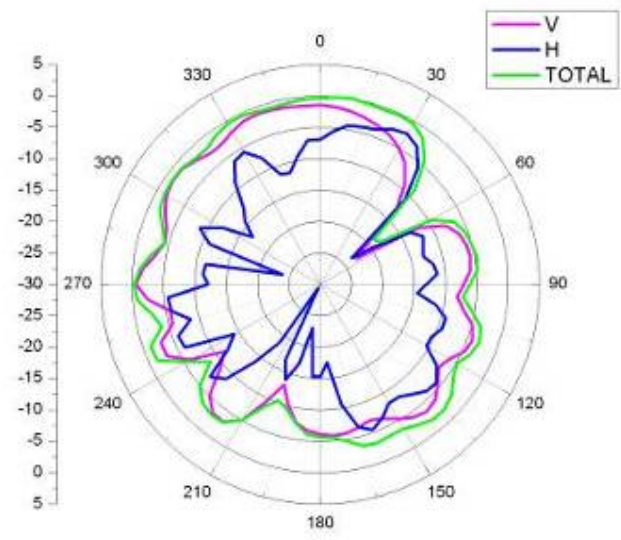


|                       |          |
|-----------------------|----------|
| Center Frequency      | 2462 MHz |
| Horizontal (dBi) peak | -1.78    |
| Vertical (dBi) peak   | -1.28    |
| H+V (dBi) peak        | 0.57     |



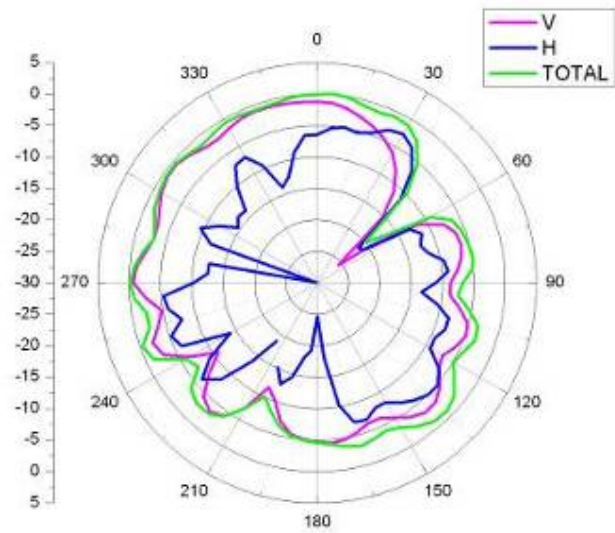
|                       |          |
|-----------------------|----------|
| Center Frequency      | 2412 MHz |
| Horizontal (dBi) peak | -2.21    |
| Vertical (dBi) peak   | -0.96    |
| H+V (dBi) peak        | 0.15     |

MIMO antenna: 2437 MHz



|                       |          |
|-----------------------|----------|
| Center Frequency      | 2437 MHz |
| Horizontal (dBi) peak | -2.31    |
| Vertical (dBi) peak   | -0.59    |
| H+V (dBi) peak        | 0.01     |

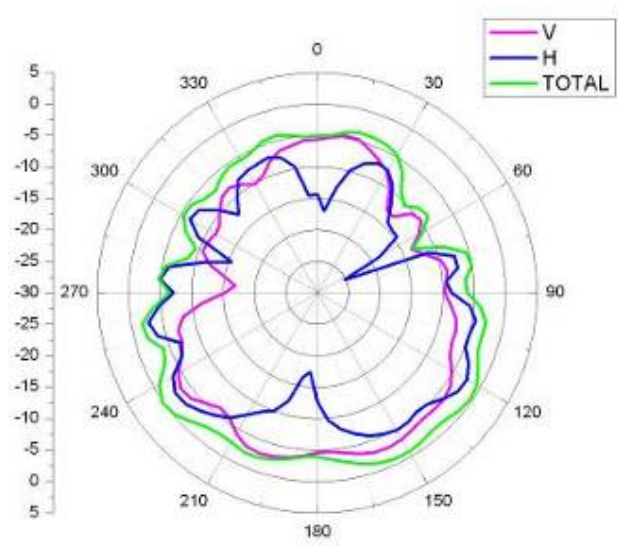
MIMO antenna: 2462 MHz



|                       |          |
|-----------------------|----------|
| Center Frequency      | 2462 MHz |
| Horizontal (dBi) peak | -2.66    |
| Vertical (dBi) peak   | -0.66    |
| H+V (dBi) peak        | 0.11     |

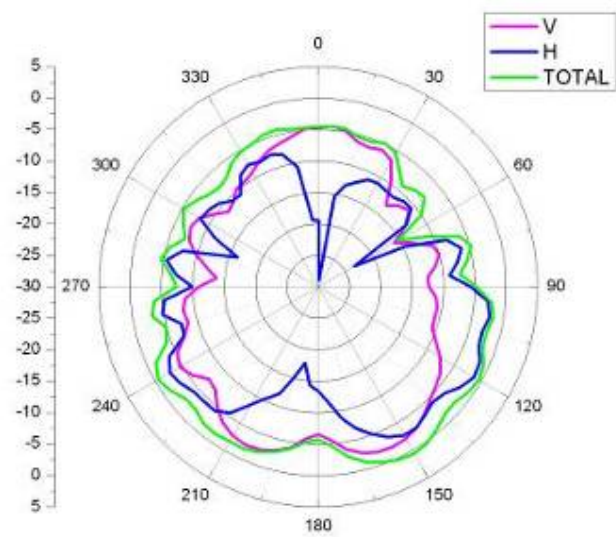
2500-2700MHz radiation characteristic

MAIN antenna: 2500MHz



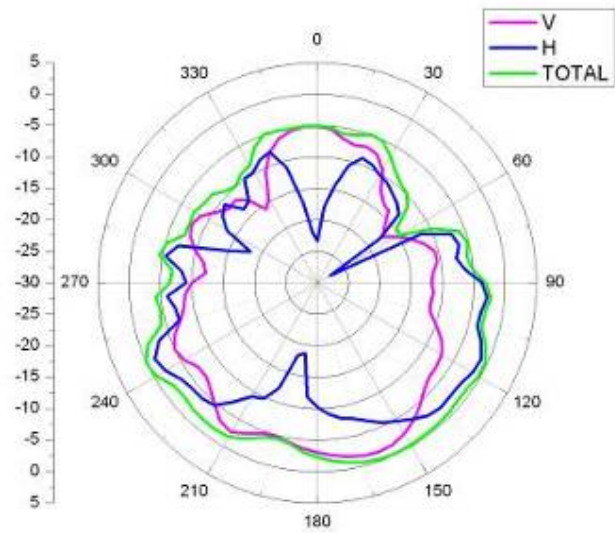
|                       |          |
|-----------------------|----------|
| Center Frequency      | 2500 MHz |
| Horizontal (dBi) peak | -2.36    |
| Vertical (dBi) peak   | -2.91    |
| H+V (dBi) peak        | 0.12     |

MAIN antenna: 2600 MHz

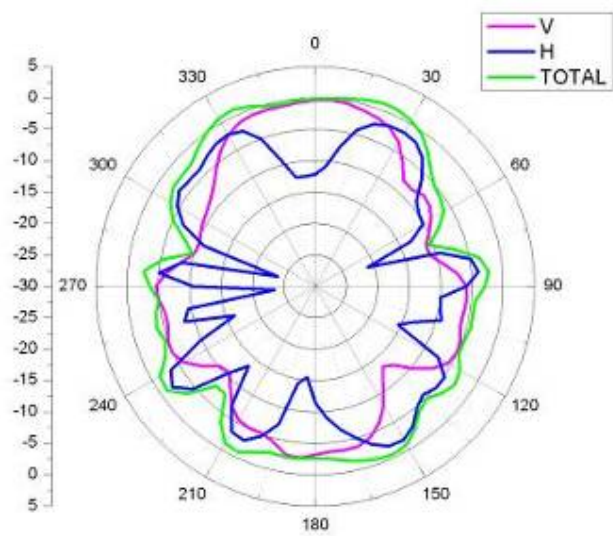


|                       |          |
|-----------------------|----------|
| Center Frequency      | 2600 MHz |
| Horizontal (dBi) peak | -1.33    |
| Vertical (dBi) peak   | -1.94    |
| H+V (dBi) peak        | 0.58     |

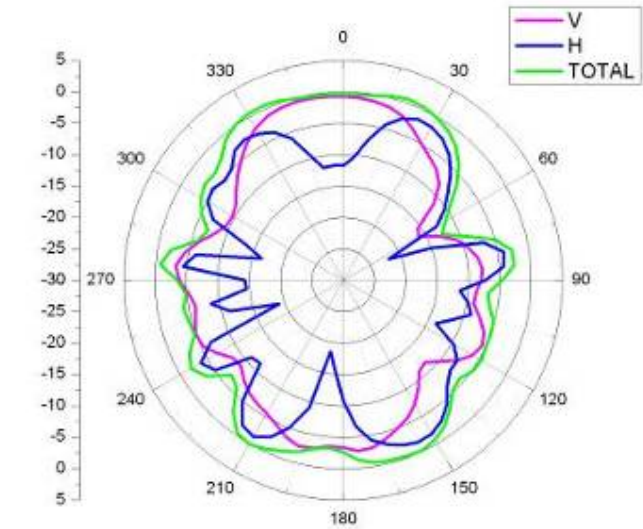
MAIN antenna:2700 MHz



|                       |          |
|-----------------------|----------|
| Center Frequency      | 2700 MHz |
| Horizontal (dBi) peak | -1.19    |
| Vertical (dBi) peak   | -1.42    |
| H+V (dBi) peak        | 0.14     |

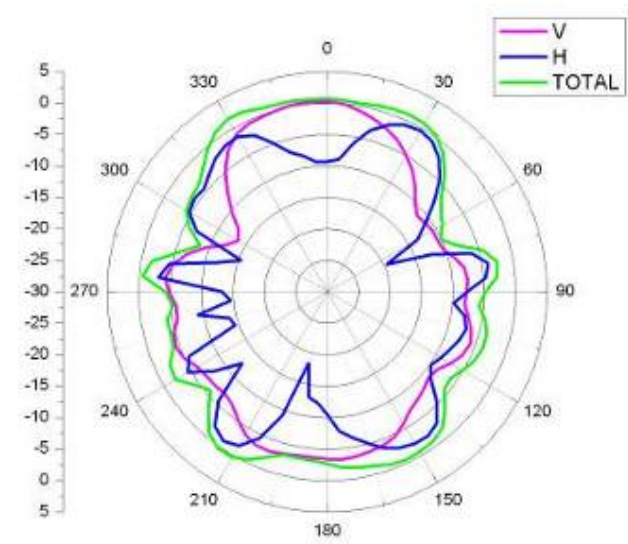


|                       |          |
|-----------------------|----------|
| Center Frequency      | 2500 MHz |
| Horizontal (dBi) peak | -1.70    |
| Vertical (dBi) peak   | -0.26    |
| H+V (dBi) peak        | 1.10     |



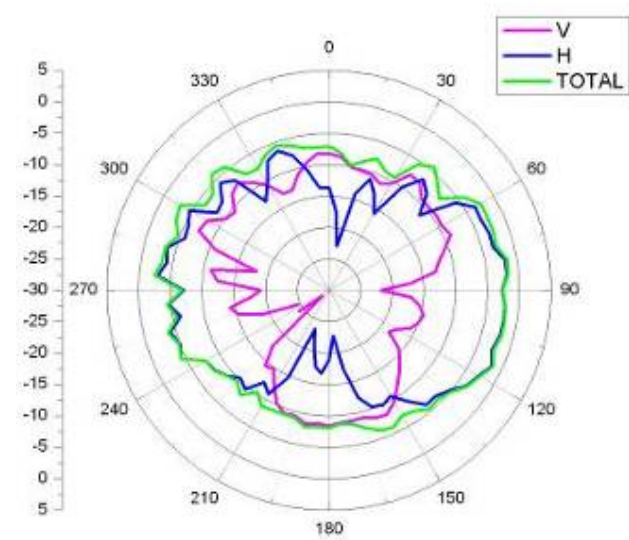
|                       |          |
|-----------------------|----------|
| Center Frequency      | 2600 MHz |
| Horizontal (dBi) peak | -1.33    |
| Vertical (dBi) peak   | -0.54    |
| H+V (dBi) peak        | 0.62     |

AUX antenna: 2700 MHz



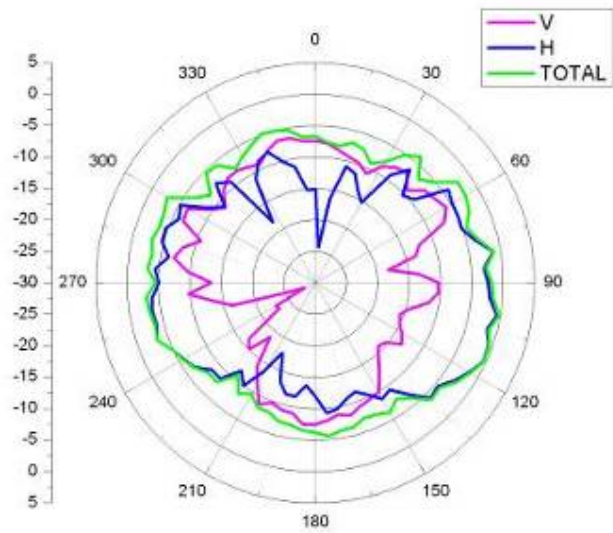
|                       |          |
|-----------------------|----------|
| Center Frequency      | 2700 MHz |
| Horizontal (dBi) peak | -0.39    |
| Vertical (dBi) peak   | 0.30     |
| H+V (dBi) peak        | 1.72     |

MAIN antenna: 5150 MHz



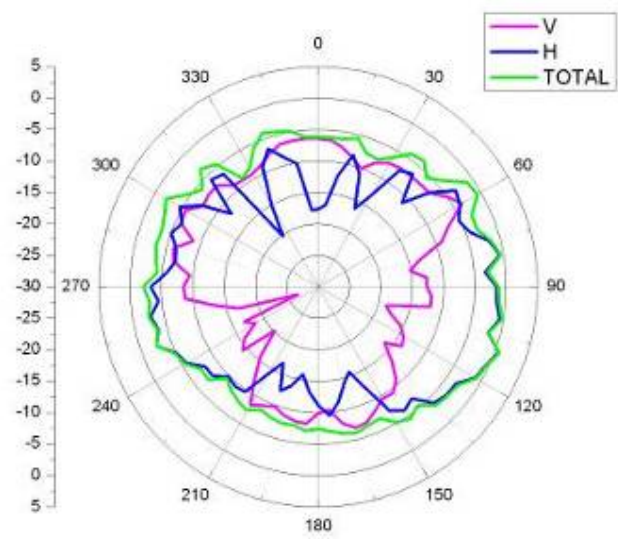
|                       |          |
|-----------------------|----------|
| Center Frequency      | 5150 MHz |
| Horizontal (dBi) peak | -1.64    |
| Vertical (dBi) peak   | -7.40    |
| H+V (dBi) peak        | -1.48    |

MAIN antenna: 5350 MHz

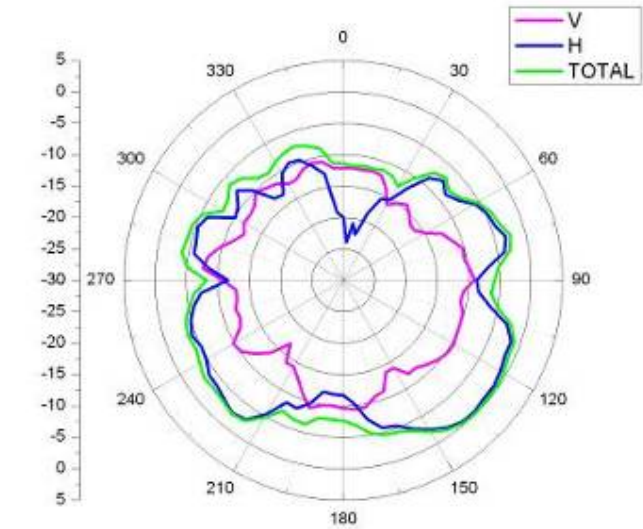


|                       |          |
|-----------------------|----------|
| Center Frequency      | 5350 MHz |
| Horizontal (dBi) peak | -0.50    |
| Vertical (dBi) peak   | -5.89    |
| H+V (dBi) peak        | -0.24    |

MAIN antenna: 5470 MHz

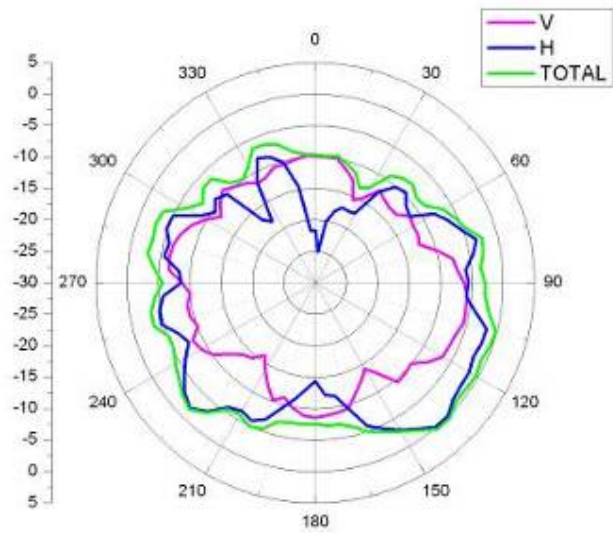


|                       |          |
|-----------------------|----------|
| Center Frequency      | 5470 MHz |
| Horizontal (dBi) peak | 0.65     |
| Vertical (dBi) peak   | -3.52    |
| H+V (dBi) peak        | 0.71     |



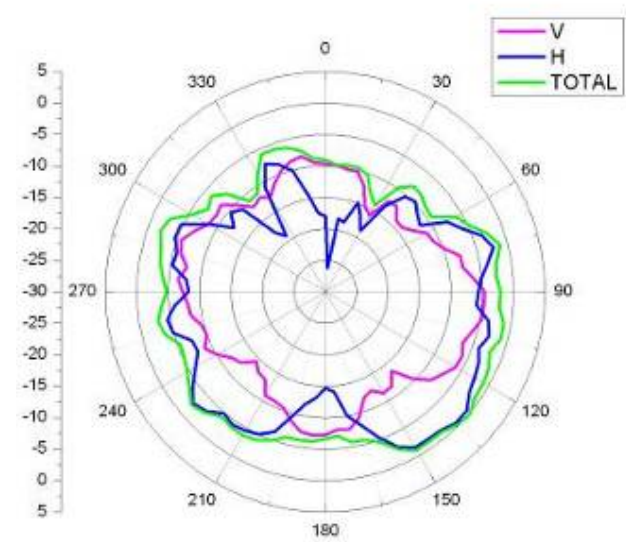
|                       |          |
|-----------------------|----------|
| Center Frequency      | 5150 MHz |
| Horizontal (dBi) peak | -0.47    |
| Vertical (dBi) peak   | -7.58    |
| H+V (dBi) peak        | -0.10    |

AUX antenna: 5350 MHz



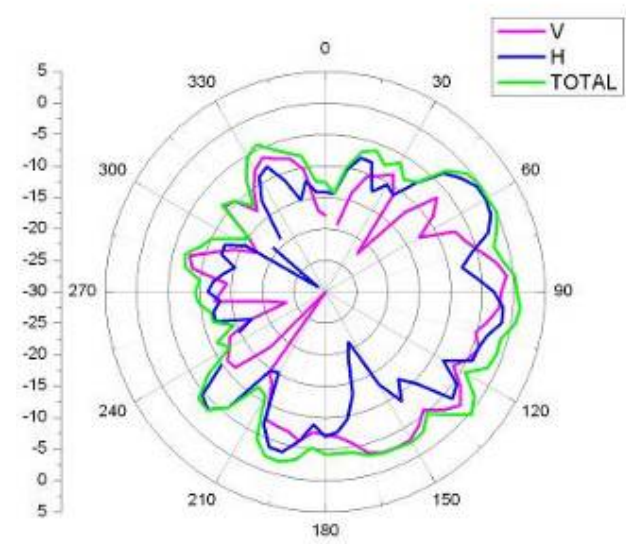
|                       |          |
|-----------------------|----------|
| Center Frequency      | 5350 MHz |
| Horizontal (dBi) peak | -0.07    |
| Vertical (dBi) peak   | -5.49    |
| H+V (dBi) peak        | 0.36     |

AUX antenna: 5470 MHz



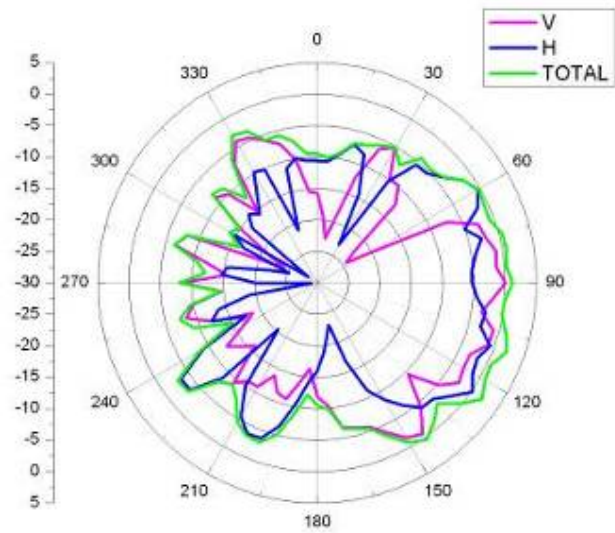
|                       |          |
|-----------------------|----------|
| Center Frequency      | 5470 MHz |
| Horizontal (dBi) peak | -0.57    |
| Vertical (dBi) peak   | -4.65    |
| H+V (dBi) peak        | 0.11     |

MIMO antenna: 5150 MHz



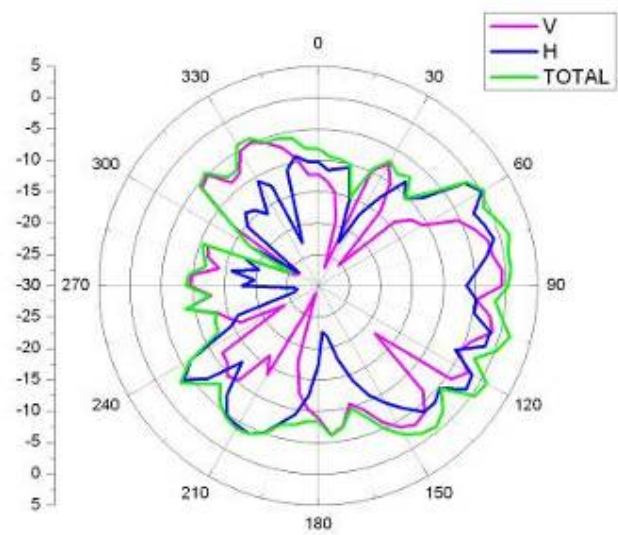
|                       |                 |
|-----------------------|-----------------|
| Center Frequency      | <b>5150 MHz</b> |
| Horizontal (dBi) peak | <b>-0.47</b>    |
| Vertical (dBi) peak   | <b>-1.02</b>    |
| H+V (dBi) peak        | <b>1.12</b>     |

MIMO antenna: 5350 MHz



|                       |          |
|-----------------------|----------|
| Center Frequency      | 5350 MHz |
| Horizontal (dBi) peak | 0.19     |
| Vertical (dBi) peak   | 0.02     |
| H+V (dBi) peak        | 2.15     |

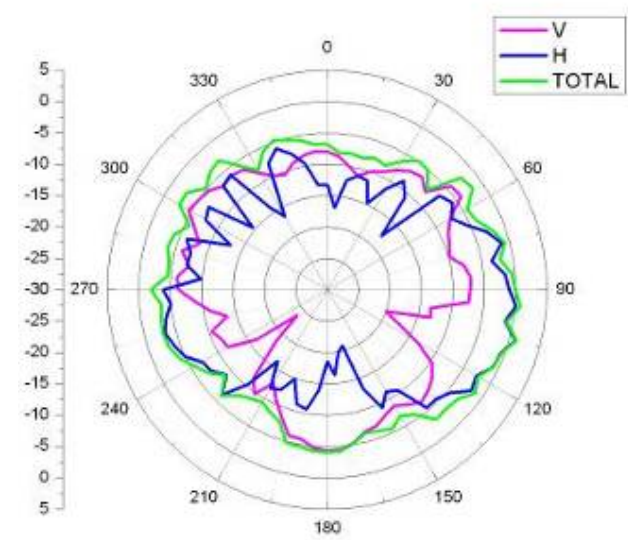
MIMO antenna: 5470 MHz



|                       |          |
|-----------------------|----------|
| Center Frequency      | 5470 MHz |
| Horizontal (dBi) peak | 0.10     |
| Vertical (dBi) peak   | -0.57    |
| H+V (dBi) peak        | 1.56     |

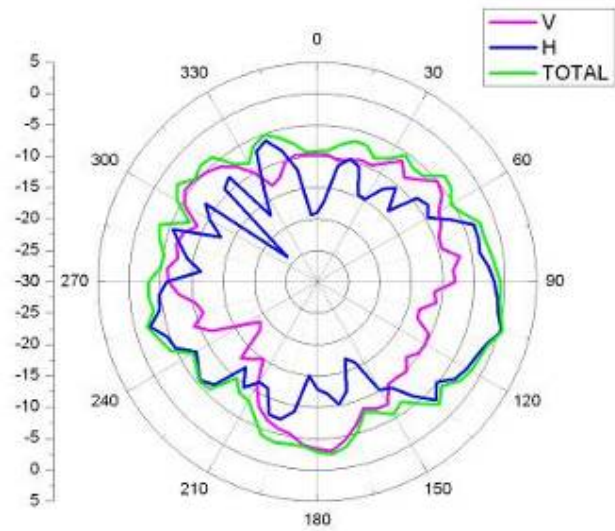
5725-5875 MHz radiation characteristic

MAIN antenna : 5725 MHz



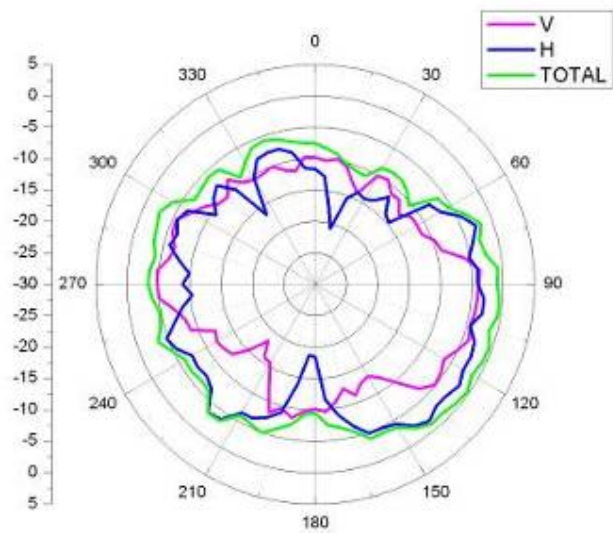
|                       |          |
|-----------------------|----------|
| Center Frequency      | 5725 MHz |
| Horizontal (dBi) peak | 1.04     |
| Vertical (dBi) peak   | -3.99    |
| H+V (dBi) peak        | 1.21     |

MAIN antenna: 5875 MHz



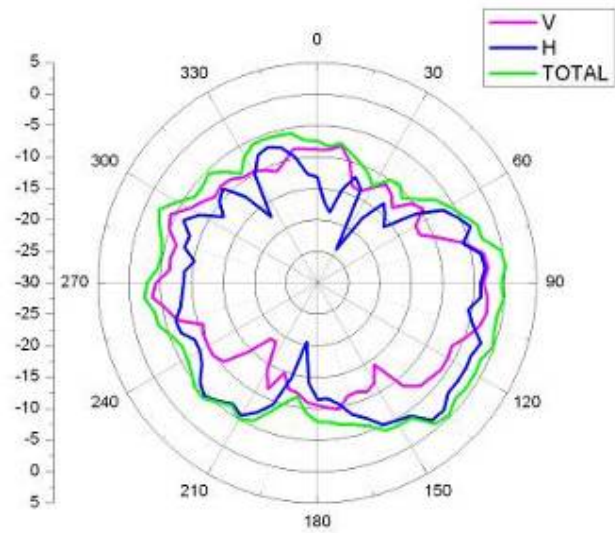
|                       |          |
|-----------------------|----------|
| Center Frequency      | 5875 MHz |
| Horizontal (dBi) peak | 0.39     |
| Vertical (dBi) peak   | -2.91    |
| H+V (dBi) peak        | 0.58     |

AUX antenna : 5725 MHz



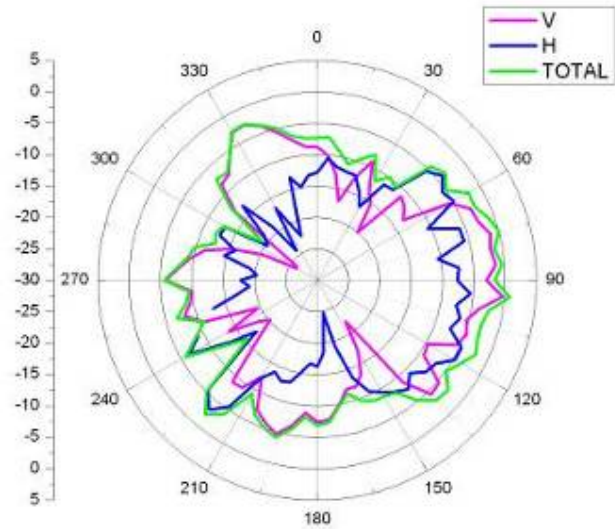
|                       |          |
|-----------------------|----------|
| Center Frequency      | 5725 MHz |
| Horizontal (dBi) peak | -1.65    |
| Vertical (dBi) peak   | -3.60    |
| H+V (dBi) peak        | -0.35    |

AUX antenna : 5875 MHz



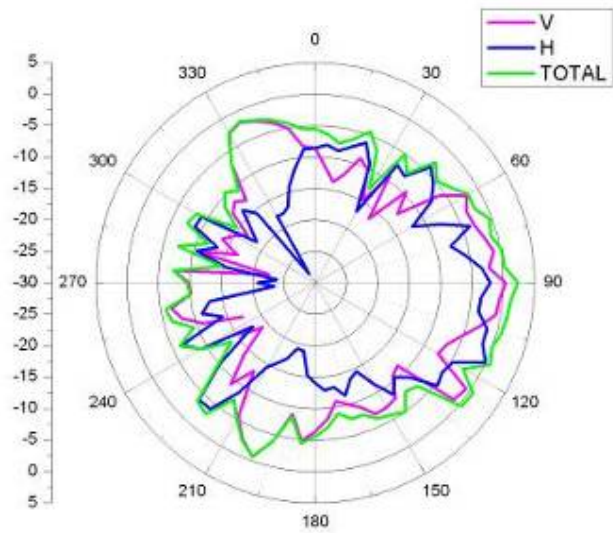
|                       |          |
|-----------------------|----------|
| Center Frequency      | 5875 MHz |
| Horizontal (dBi) peak | -1.42    |
| Vertical (dBi) peak   | -2.55    |
| H+V (dBi) peak        | 0.11     |

MIMO antenna : 5725 MHz



|                       |          |
|-----------------------|----------|
| Center Frequency      | 5725 MHz |
| Horizontal (dBi) peak | -3.16    |
| Vertical (dBi) peak   | -0.34    |
| H+V (dBi) peak        | 0.83     |

MIMO antenna : 5875 MHz



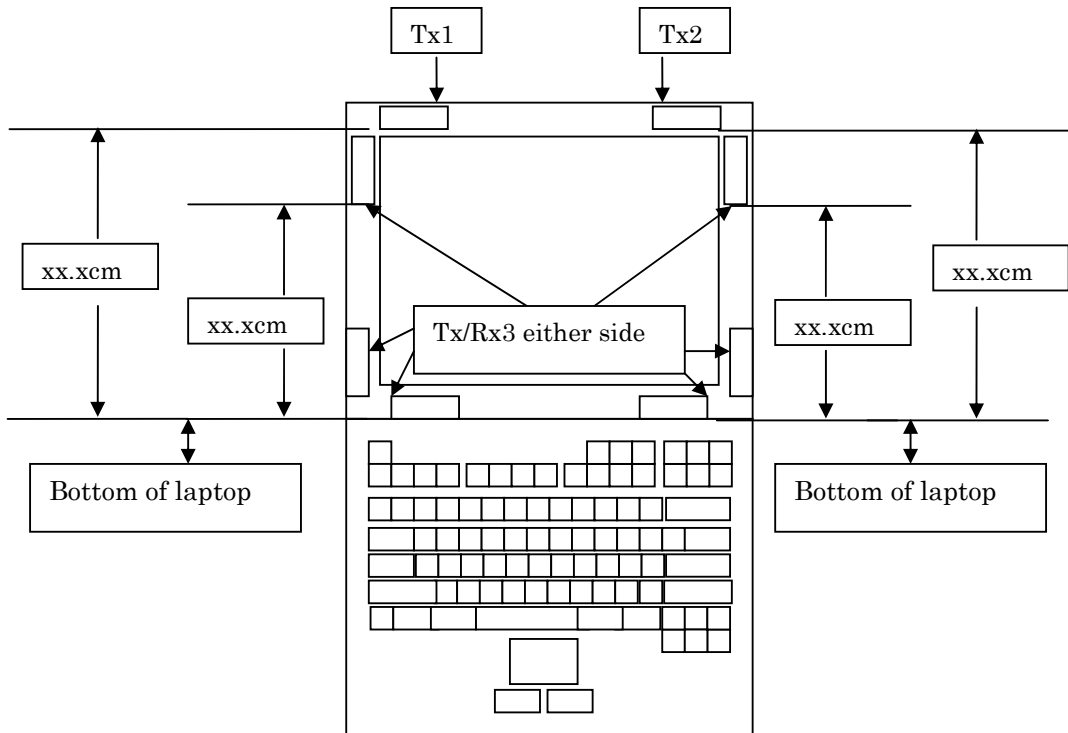
|                       |          |
|-----------------------|----------|
| Center Frequency      | 5875 MHz |
| Horizontal (dBi) peak | -0.03    |
| Vertical (dBi) peak   | 0.33     |
| H+V (dBi) peak        | 2.29     |

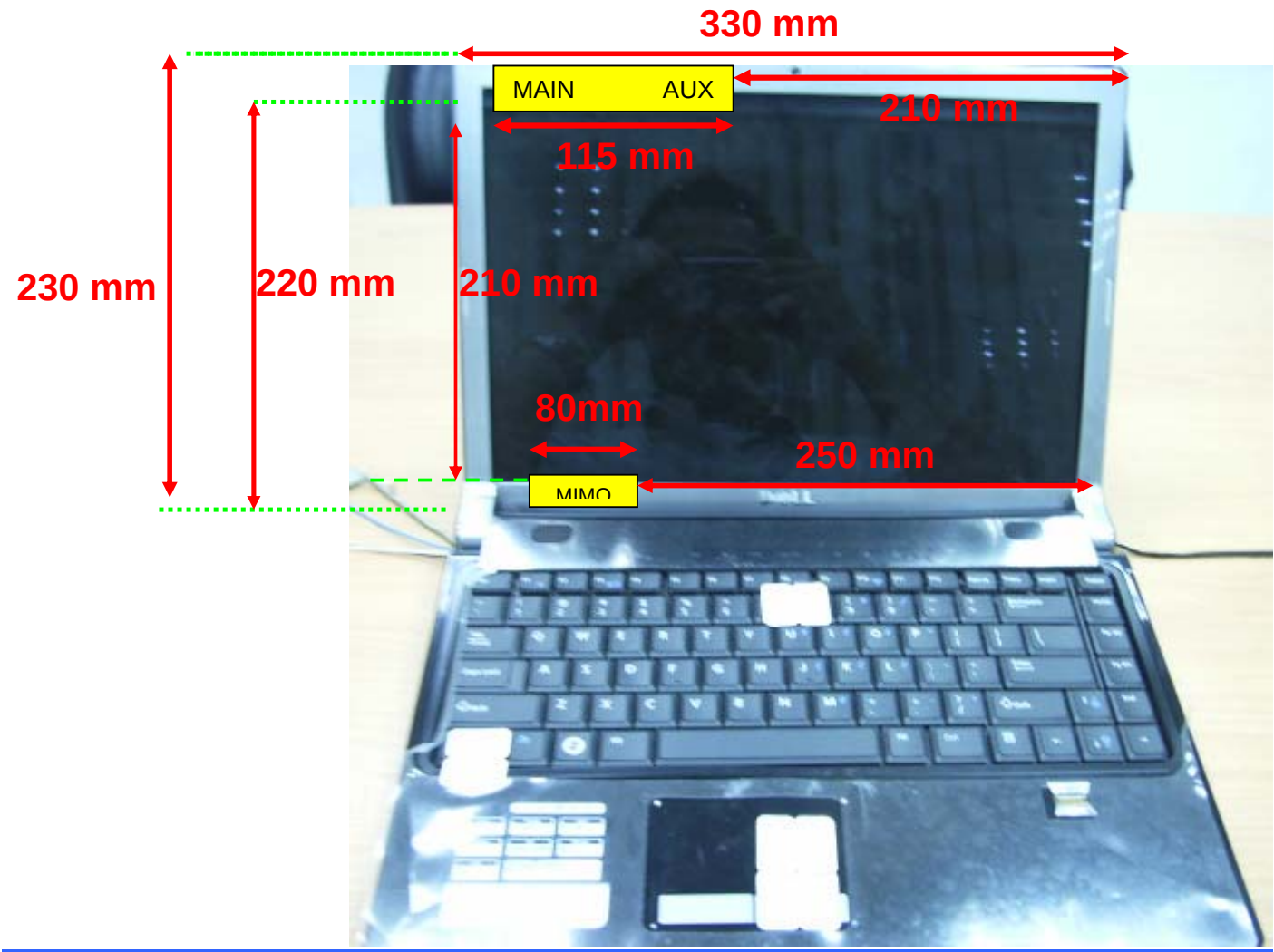
**Section 4. Host Platform Information**

OEM / ODM Host platform: (XXXXXXX) platform correlated to antenna data  
**Rating Label Photo:**

## Section 5. Antenna Host Platform Location Information

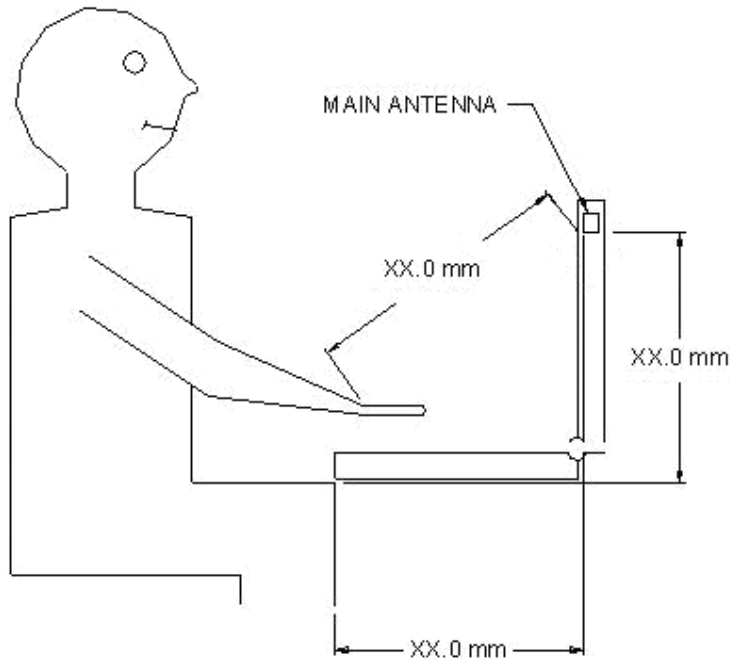
Include a **dimensioned photo or dimensioned drawing** of Tx1, Tx2 and Tx3 antenna placements (measurements are not required for receive-only antenna). Any antenna that transmits must show dimensions to bottom of laptop.





## Section 6. Antenna dimensional information for SAR evaluation

Include a **dimensioned photo or dimensioned drawing** showing the distance (mm) between the transmit antennas and the user (excluding hands, wrist, feet, lap/ thigh, and ankle)



**Antenna distance to Keyboard <7&8>**

**L main =275mm**

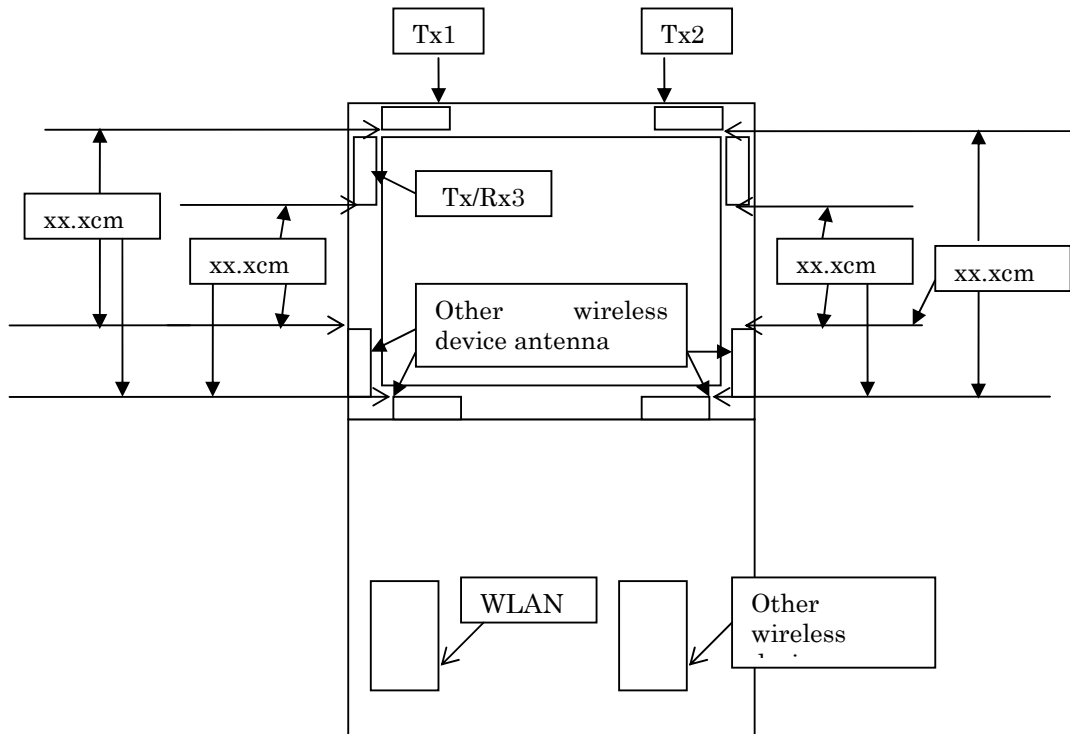
**L aux=270 mm**

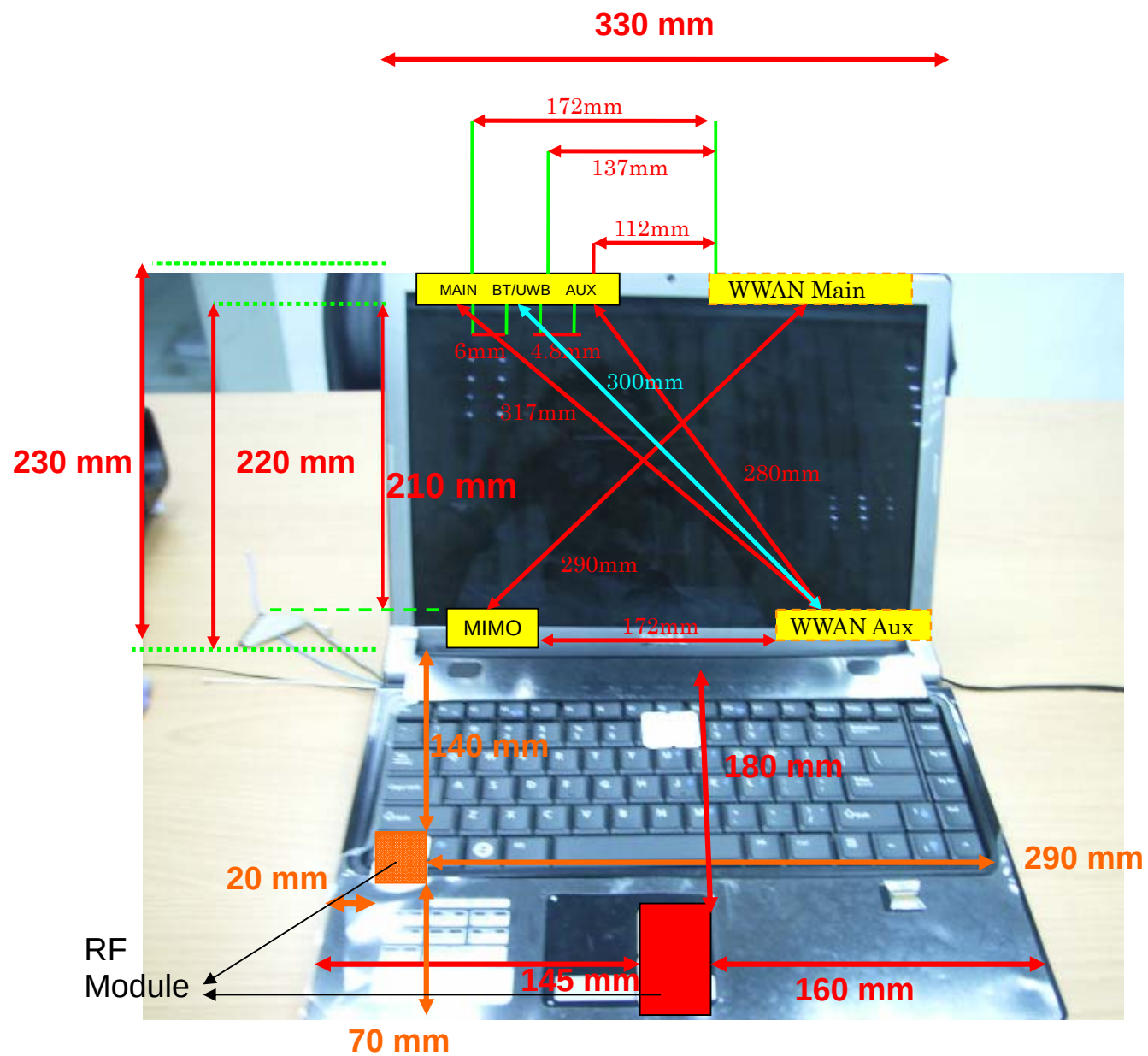
**Lmimo=150mm**

## Section 7. Diagram Example of Co-Location Antenna Separation

Include a **dimensioned photo or dimensioned drawing** showing the distance (mm) between all WLAN transmit antennas and other co-located radiator transmit antenna such as Bluetooth, WWAN,..

(Note: Due to the evolving rules regarding co-location, each platform will need to be reviewed on a case by case basis)





## **Section 8. Local representative contact information**

[Joseph\\_hoo@asus.com.tw](mailto:Joseph_hoo@asus.com.tw)

**Local representative contact information is required for regulatory support for target countries below.**