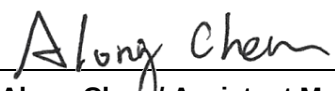


# FCC Co-Location Test Report

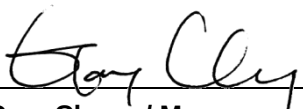
**FCC ID** : I88WAC6103D-IA  
**Equipment** : 802.11 ac Unified Pro Access Point  
(Please refer to section 1.1.1 for more details)  
**Model No.** : WAC6103D-I  
(Please refer to section 1.1.1 for more details)  
**Brand Name** : ZYXEL  
**Applicant** : Zyxel Communications Corporation  
**Address** : No.2 Industry East RD. IX, Hsinchu Science  
Park, Hsinchu 30075, Taiwan, R.O.C  
**Standard** : 47 CFR FCC Part 15.247  
47 CFR FCC Part 15.407  
**Received Date** : Jul. 04, 2019  
**Tested Date** : Nov. 27, 2019 ~ Mar. 20, 2020

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

  
Along Chen / Assistant Manager

Approved by:

  
Gary Chang / Manager



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## Release Record

| Report No.    | Version | Description   | Issued Date   |
|---------------|---------|---------------|---------------|
| FR563002-11CO | Rev. 01 | Initial issue | Jun. 08, 2020 |

## Summary of Test Results

| FCC Rules                        | Test Items         | Measured                                                  | Result |
|----------------------------------|--------------------|-----------------------------------------------------------|--------|
| 15.247(d)<br>15.407(b)<br>15.209 | Radiated Emissions | [dBuV/m at 3m]: 3348.00MHz<br>53.02 (Margin -0.98dB) - AV | Pass   |

### Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

### Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

# 1 General Description

## 1.1 Information

### 1.1.1 Product Details

The following models are provided to this EUT.

| Brand Name | Model Name     | Product Name                                          | Description           |
|------------|----------------|-------------------------------------------------------|-----------------------|
| ZYXEL      | WAC6103D-I     | 802.11 ac Unified Pro Access Point                    | For marketing purpose |
|            | NAP203         | 802.11ac Dual-Radio Nebula Cloud Managed Access Point |                       |
|            | NWA1123-AC PRO | 802.11ac Dual-Radio Dual-Mount PoE Access Point       |                       |

### 1.1.2 Specification

|                     |                                                                                            |
|---------------------|--------------------------------------------------------------------------------------------|
| Operating Frequency | 802.11b/g/n: 2412 MHz ~ 2462 MHz<br>802.11a/n/ac: 5180 MHz ~ 5240 MHz, 5745 MHz ~ 5825 MHz |
| Modulation Type     | DSSS (DBPSK / DQPSK / CCK)<br>OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)                  |

### 1.1.3 Antenna Details

| Brand / Model                                   | Ant. No. | Type   | Connector | Frequencies (MHz) / Antenna Gain (dBi) |           |           | Remark                                |
|-------------------------------------------------|----------|--------|-----------|----------------------------------------|-----------|-----------|---------------------------------------|
|                                                 |          |        |           | 2400~2483.5                            | 5150~5250 | 5725~5850 |                                       |
| SINBON /<br>2.4G & 5G<br>Metal & PCB<br>Antenna | 1        | PIFA   | UFL       | 3.28                                   | ---       | ---       | Ceiling mounted:<br>Antenna 1 / 2 / 3 |
|                                                 | 2        | PIFA   | UFL       | 3.37                                   | ---       | ---       |                                       |
|                                                 | 3        | PIFA   | UFL       | 3.15                                   | ---       | ---       |                                       |
|                                                 | 4        | Dipole | UFL       | 4.33                                   | ---       | ---       | Wall mounted:<br>Antenna 1 / 2 / 4    |
|                                                 | 5        | LOOP   | UFL       | ---                                    | 4.38      | 4.23      | Ceiling mounted:<br>Antenna 5 / 6 / 7 |
|                                                 | 6        | LOOP   | UFL       | ---                                    | 4.31      | 4.22      |                                       |
|                                                 | 7        | LOOP   | UFL       | ---                                    | 4.38      | 4.36      | Wall mounted:<br>Antenna 5 / 6 / 8    |
|                                                 | 8        | Dipole | UFL       | ---                                    | 5.12      | 5.20      |                                       |

Note:

1. The device has a hardware control switch to change operating mode as Ceiling or Wall mounted mode. The difference between both operating modes is only transmission antennas combination.
2. The antenna set includes 8 antennas as above table.

#### 1.1.4 Accessories (For Model: NWA1123-AC PRO only)

| Accessories |            |                                                                                                                                                                                                          |
|-------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No.         | Equipment  | Description                                                                                                                                                                                              |
| 1           | POE        | Brand: SHENZHEN TOPOW ELECTRONICS CO., LTD.<br>Model: TPT24S48A<br>Power Rating:<br>I/P: 100-240Vac, 50/60Hz, 0.5A MAX<br>O/P: 48Vdc, 500mA<br>Power line: AC power cord, 1.75m, non- shielded, w/o core |
| 2           | RJ45 cable | Brand: Nien-Yi<br>Model: NYS2676<br>Power line:1.45m, non-shielded, w/o core                                                                                                                             |

The above POE and RJ45 cable are not bundled in market for model WAC6103D-I and NAP203

## 1.2 The Equipment List

|                                                                     |                            |                          |                   |                         |                          |
|---------------------------------------------------------------------|----------------------------|--------------------------|-------------------|-------------------------|--------------------------|
| <b>Test Item</b>                                                    | Radiated Emission          |                          |                   |                         |                          |
| <b>Test Site</b>                                                    | 966 chamber1 / (03CH01-WS) |                          |                   |                         |                          |
| <b>Tested Date</b>                                                  | Nov. 27, 2019              |                          |                   |                         |                          |
| <b>Instrument</b>                                                   | <b>Manufacturer</b>        | <b>Model No.</b>         | <b>Serial No.</b> | <b>Calibration Date</b> | <b>Calibration Until</b> |
| Spectrum Analyzer                                                   | R&S                        | FSV40                    | 101498            | Dec. 27, 2018           | Dec. 26, 2019            |
| Receiver                                                            | R&S                        | ESR3                     | 101658            | Dec. 11, 2018           | Dec. 10, 2019            |
| Bilog Antenna                                                       | SCHWARZBECK                | VULB9168                 | VULB9168-522      | Jul. 12, 2019           | Jul. 11, 2020            |
| Horn Antenna<br>1G-18G                                              | SCHWARZBECK                | BBHA 9120 D              | BBHA 9120 D 1096  | Dec. 18, 2018           | Dec. 17, 2019            |
| Horn Antenna<br>18G-40G                                             | SCHWARZBECK                | BBHA 9170                | BBHA 9170517      | Nov. 15, 2019           | Nov. 14, 2020            |
| Loop Antenna                                                        | R&S                        | HFH2-Z2                  | 100330            | Nov. 13, 2019           | Nov. 12, 2020            |
| Loop Antenna Cable                                                  | KOAX KABEL                 | 101354-BW                | 101354-BW         | Oct. 07, 2019           | Oct. 06, 2020            |
| Preamplifier                                                        | EMC                        | EMC02325                 | 980225            | Jul. 09, 2019           | Jul. 08, 2020            |
| Preamplifier                                                        | Agilent                    | 83017A                   | MY39501308        | Oct. 08, 2019           | Oct. 07, 2020            |
| Preamplifier                                                        | EMC                        | EMC184045B               | 980192            | Aug. 01, 2019           | Jul. 31, 2020            |
| RF Cable                                                            | EMC                        | EMC104-SM-SM-80<br>00    | 181106            | Oct. 07, 2019           | Oct. 06, 2020            |
| RF Cable                                                            | HUBER+SUHNER               | SUCOFLEX104              | MY16019/4         | Oct. 07, 2019           | Oct. 06, 2020            |
| RF Cable                                                            | HUBER+SUHNER               | SUCOFLEX104              | MY16014/4         | Oct. 07, 2019           | Oct. 06, 2020            |
| LF cable 1M                                                         | EMC                        | EMCCFD400-NM-N<br>M-1000 | 160502            | Oct. 07, 2019           | Oct. 06, 2020            |
| LF cable 3M                                                         | Woken                      | CFD400NL-LW              | CFD400NL-001      | Oct. 07, 2019           | Oct. 06, 2020            |
| LF cable 10M                                                        | Woken                      | CFD400NL-LW              | CFD400NL-002      | Oct. 07, 2019           | Oct. 06, 2020            |
| Measurement<br>Software                                             | AUDIX                      | e3                       | 6.120210g         | NA                      | NA                       |
| Note: Calibration Interval of instruments listed above is one year. |                            |                          |                   |                         |                          |

|                                                                     |                            |                          |                   |                         |                          |
|---------------------------------------------------------------------|----------------------------|--------------------------|-------------------|-------------------------|--------------------------|
| <b>Test Item</b>                                                    | Radiated Emission          |                          |                   |                         |                          |
| <b>Test Site</b>                                                    | 966 chamber1 / (03CH01-WS) |                          |                   |                         |                          |
| <b>Tested Date</b>                                                  | Mar. 20, 2020              |                          |                   |                         |                          |
| <b>Instrument</b>                                                   | <b>Manufacturer</b>        | <b>Model No.</b>         | <b>Serial No.</b> | <b>Calibration Date</b> | <b>Calibration Until</b> |
| Spectrum Analyzer                                                   | R&S                        | FSV40                    | 101498            | Dec. 17, 2019           | Dec. 16, 2020            |
| Receiver                                                            | R&S                        | ESR3                     | 101657            | Feb. 14, 2020           | Feb. 13, 2021            |
| Bilog Antenna                                                       | SCHWARZBECK                | VULB9168                 | VULB9168-522      | Jul. 12, 2019           | Jul. 11, 2020            |
| Horn Antenna<br>1G-18G                                              | SCHWARZBECK                | BBHA 9120 D              | BBHA 9120 D 1096  | Dec. 12, 2019           | Dec. 11, 2020            |
| Horn Antenna<br>18G-40G                                             | SCHWARZBECK                | BBHA 9170                | BBHA 9170517      | Nov. 15, 2019           | Nov. 14, 2020            |
| Loop Antenna                                                        | R&S                        | HFH2-Z2                  | 100330            | Nov. 13, 2019           | Nov. 12, 2020            |
| Loop Antenna Cable                                                  | KOAX KABEL                 | 101354-BW                | 101354-BW         | Oct. 07, 2019           | Oct. 06, 2020            |
| Preamplifier                                                        | EMC                        | EMC02325                 | 980225            | Jul. 09, 2019           | Jul. 08, 2020            |
| Preamplifier                                                        | Agilent                    | 83017A                   | MY39501308        | Oct. 08, 2019           | Oct. 07, 2020            |
| Preamplifier                                                        | EMC                        | EMC184045B               | 980192            | Aug. 01, 2019           | Jul. 31, 2020            |
| RF Cable                                                            | EMC                        | EMC104-SM-SM-80<br>00    | 181106            | Oct. 07, 2019           | Oct. 06, 2020            |
| RF Cable                                                            | HUBER+SUHNER               | SUCOFLEX104              | MY16019/4         | Oct. 07, 2019           | Oct. 06, 2020            |
| RF Cable                                                            | HUBER+SUHNER               | SUCOFLEX104              | MY16014/4         | Oct. 07, 2019           | Oct. 06, 2020            |
| LF cable 1M                                                         | EMC                        | EMCCFD400-NM-N<br>M-1000 | 160502            | Oct. 07, 2019           | Oct. 06, 2020            |
| LF cable 3M                                                         | Woken                      | CFD400NL-LW              | CFD400NL-001      | Oct. 07, 2019           | Oct. 06, 2020            |
| LF cable 10M                                                        | Woken                      | CFD400NL-LW              | CFD400NL-002      | Oct. 07, 2019           | Oct. 06, 2020            |
| Measurement<br>Software                                             | AUDIX                      | e3                       | 6.120210g         | NA                      | NA                       |
| Note: Calibration Interval of instruments listed above is one year. |                            |                          |                   |                         |                          |

### 1.3 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247

47 CFR FCC Part 15.407

ANSI C63.10-2013

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

FCC KDB 412172 D01 Determining ERP and EIRP v01r01

### 1.4 Deviation from Test Standard and Measurement Procedure

None

### 1.5 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ( $k=2$ )).

| Measurement Uncertainty       |               |
|-------------------------------|---------------|
| Parameters                    | Uncertainty   |
| Radiated emission $\leq$ 1GHz | $\pm 3.41$ dB |
| Radiated emission $>$ 1GHz    | $\pm 4.59$ dB |

## 2 Test Configuration

### 2.1 Testing Condition

| Test Item          | Test Site | Ambient Condition | Tested By              |
|--------------------|-----------|-------------------|------------------------|
| Radiated Emissions | 03CH01-WS | 24-25°C / 61-62%  | Akun Chung<br>Roger Lu |

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- ISSED#: 10807A
- CAB identifier: TW2732

### 2.2 The Worst Test Modes and Channel Details

| Test item                | Modulation Mode          | Test Frequency (MHz) | Data Rate     | Test Configuration |
|--------------------------|--------------------------|----------------------|---------------|--------------------|
| Radiated Emissions ≤1GHz | 2.4G 11b + 5G 11ac VHT20 | CH6 + CH157          | 1Mbps + MCS 0 | 1, 2, 3, 4         |
| Radiated Emissions >1GHz | 2.4G 11b + 5G 11ac VHT20 | CH6 + CH157          | 1Mbps + MCS 0 | 1, 2               |

**NOTE:**

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** and **Z-plane** results were found as the worst case and were shown in this report as below test configuration.
2. The device was designed to be ceiling mounted or wall mounted with different group of antenna. Each group of antenna was selected to perform radiated emission test as below test configuration.
3. Test Configurations are listed as below:
  - 1) Configuration 1: Model WAC6103D-I, NAP203: Ceiling mounted, Z-plane.
  - 2) Configuration 2: Model WAC6103D-I, NAP203: Wall mounted, Y-plane
  - 3) Configuration 3: Model NWA1123-AC PRO: Ceiling mounted, Z-plane.
  - 4) Configuration 4: Model NWA1123-AC PRO: Wall mounted, Y-plane

### 3 Transmitter Test Results

#### 3.1 Unwanted Emissions into Restricted Frequency Bands

##### 3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

| Restricted Band Emissions Limit |                       |                         |                      |
|---------------------------------|-----------------------|-------------------------|----------------------|
| Frequency Range (MHz)           | Field Strength (uV/m) | Field Strength (dBuV/m) | Measure Distance (m) |
| 0.009~0.490                     | 2400/F(kHz)           | 48.5 - 13.8             | 300                  |
| 0.490~1.705                     | 24000/F(kHz)          | 33.8 - 23               | 30                   |
| 1.705~30.0                      | 30                    | 29                      | 30                   |
| 30~88                           | 100                   | 40                      | 3                    |
| 88~216                          | 150                   | 43.5                    | 3                    |
| 216~960                         | 200                   | 46                      | 3                    |
| Above 960                       | 500                   | 54                      | 3                    |

**Note 1:**  
Qusai-Peak value is measured for frequency below 1GHz except for 9~90 kHz, 110~490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

**Note 2:**  
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

##### 3.1.2 Test Procedures

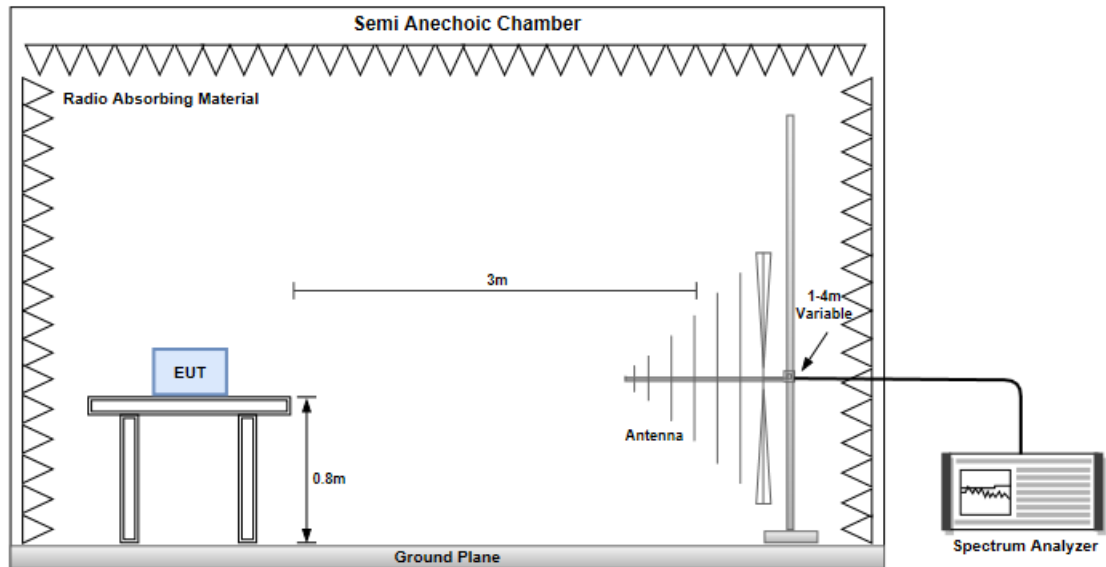
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

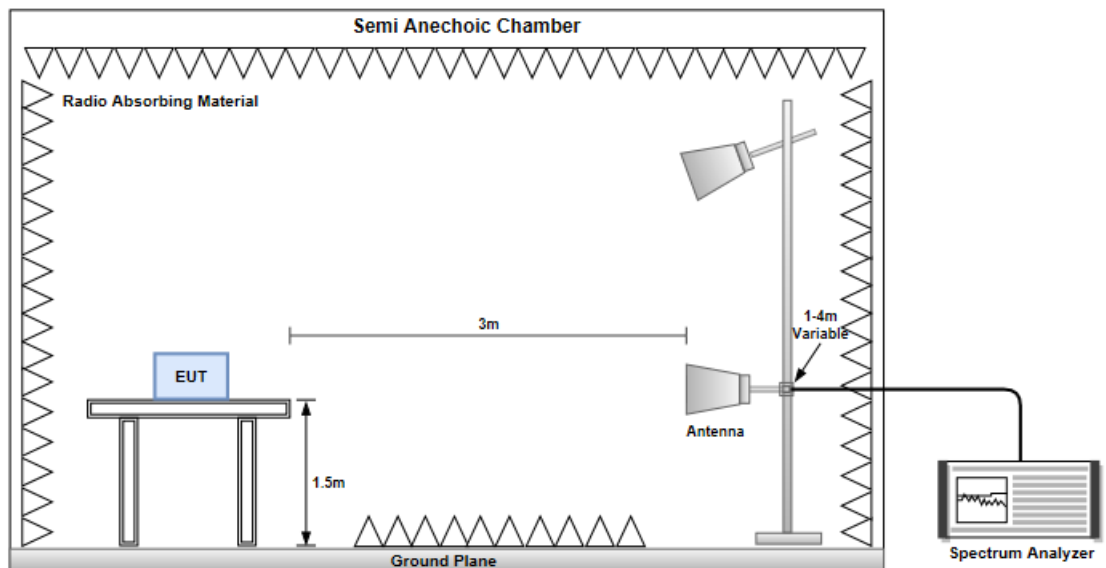
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

### 3.1.3 Test Setup

#### Radiated Emissions below 1 GHz

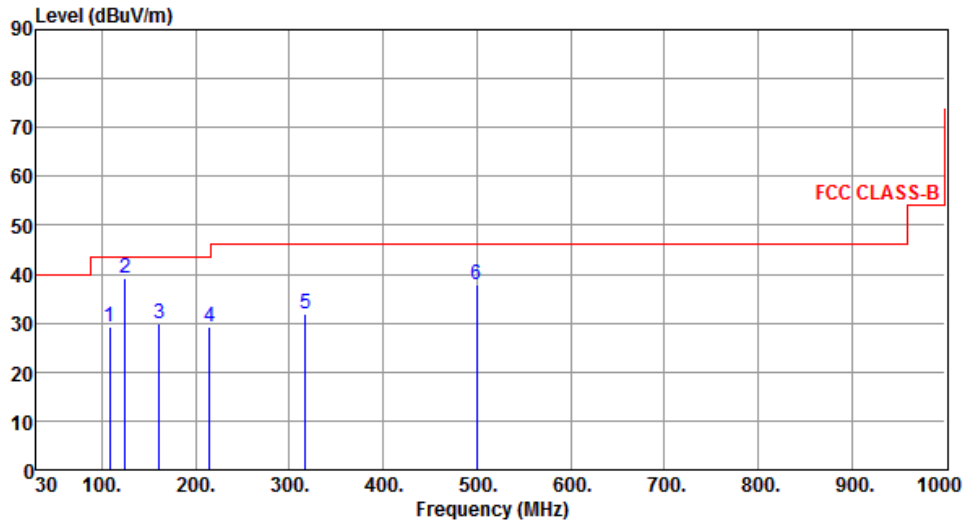


#### Radiated Emissions above 1 GHz



### 3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

|              |                          |                    |             |
|--------------|--------------------------|--------------------|-------------|
| Modulation   | 2.4G 11b + 5G 11ac VHT20 | Test Freq. (MHz)   | CH6 + CH157 |
| Polarization | Horizontal               | Test Configuration | 1           |

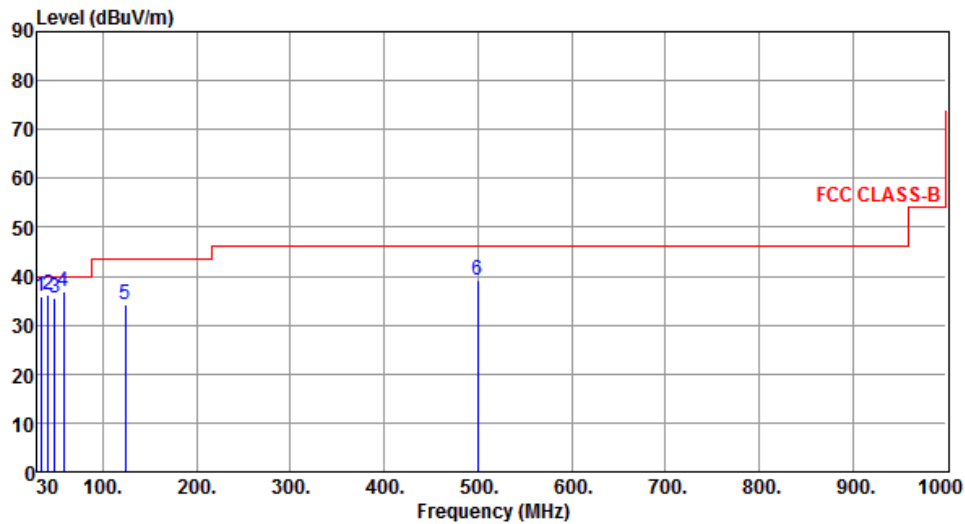
  


The graph displays the radiated unwanted emissions for a transmitter. The y-axis represents the Level in dBUV/m, ranging from 0 to 90. The x-axis represents the Frequency in MHz, ranging from 30 to 1000. A red line indicates the FCC CLASS-B limit, which is 40 dBUV/m from 30 MHz to 100 MHz, 45 dBUV/m from 100 MHz to 1000 MHz, and 55 dBUV/m from 1000 MHz to 10000 MHz. Six blue vertical lines represent measured emissions at the following frequencies: 108.57 MHz (Level 29.08 dBUV/m), 125.00 MHz (Level 39.21 dBUV/m), 160.95 MHz (Level 29.93 dBUV/m), 215.27 MHz (Level 29.36 dBUV/m), 317.12 MHz (Level 32.00 dBUV/m), and 499.48 MHz (Level 37.75 dBUV/m). All measured emissions are below the FCC CLASS-B limit.

|   | Freq.<br>MHz | Emission<br>level<br>dBUV/m | Limit<br>dBUV/m | Margin<br>dB | SA<br>reading<br>dBUV | Factor<br>dB | Remark | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|--------|-------------------|----------------------|
| 1 | 108.57       | 29.08                       | 43.50           | -14.42       | 40.77                 | -11.69       | Peak   | ---               | ---                  |
| 2 | 125.00       | 39.21                       | 43.50           | -4.29        | 49.39                 | -10.18       | QP     | 157               | 109                  |
| 3 | 160.95       | 29.93                       | 43.50           | -13.57       | 38.36                 | -8.43        | Peak   | ---               | ---                  |
| 4 | 215.27       | 29.36                       | 43.50           | -14.14       | 41.40                 | -12.04       | Peak   | ---               | ---                  |
| 5 | 317.12       | 32.00                       | 46.00           | -14.00       | 39.47                 | -7.47        | Peak   | ---               | ---                  |
| 6 | 499.48       | 37.75                       | 46.00           | -8.25        | 40.88                 | -3.13        | Peak   | ---               | ---                  |

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor\* (dB)  
\*Factor includes antenna factor , cable loss and amplifier gain  
Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).  
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

|                     |                          |                           |             |
|---------------------|--------------------------|---------------------------|-------------|
| <b>Modulation</b>   | 2.4G 11b + 5G 11ac VHT20 | <b>Test Freq. (MHz)</b>   | CH6 + CH157 |
| <b>Polarization</b> | Vertical                 | <b>Test Configuration</b> | 1           |



|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|--------|-------------------|----------------------|
| 1 | 33.75        | 35.78                       | 40.00           | -4.22        | 45.30                 | -9.52        | QP     | 100               | 162                  |
| 2 | 41.70        | 36.25                       | 40.00           | -3.75        | 44.64                 | -8.39        | QP     | 100               | 153                  |
| 3 | 48.25        | 35.64                       | 40.00           | -4.36        | 44.02                 | -8.38        | QP     | 100               | 282                  |
| 4 | 58.13        | 36.98                       | 40.00           | -3.02        | 45.89                 | -8.91        | Peak   | ---               | ---                  |
| 5 | 124.09       | 34.23                       | 43.50           | -9.27        | 44.50                 | -10.27       | Peak   | ---               | ---                  |
| 6 | 499.48       | 39.20                       | 46.00           | -6.80        | 42.33                 | -3.13        | Peak   | ---               | ---                  |

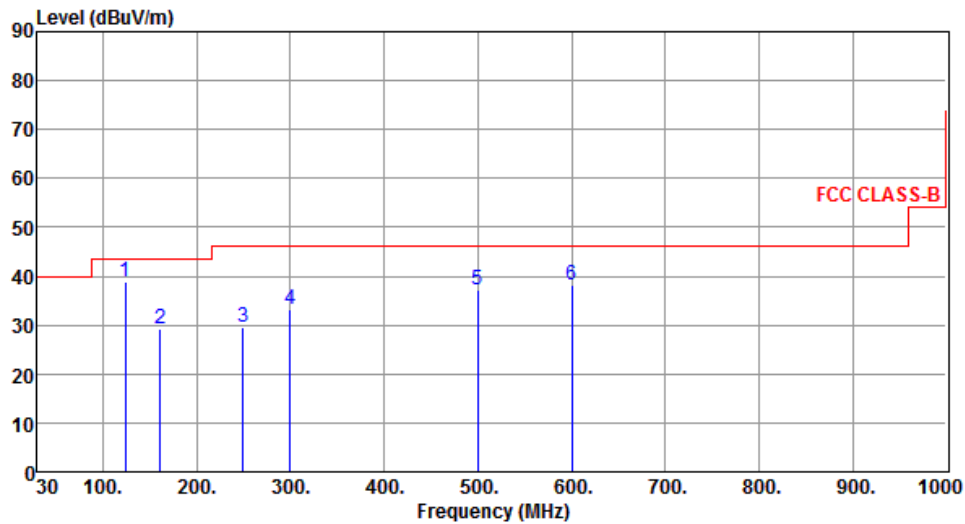
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

|              |                          |                    |             |
|--------------|--------------------------|--------------------|-------------|
| Modulation   | 2.4G 11b + 5G 11ac VHT20 | Test Freq. (MHz)   | CH6 + CH157 |
| Polarization | Horizontal               | Test Configuration | 2           |



|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|--------|-------------------|----------------------|
| 1 | 124.09       | 38.96                       | 43.50           | -4.54        | 49.23                 | -10.27       | QP     | 150               | 120                  |
| 2 | 160.95       | 29.07                       | 43.50           | -14.43       | 37.50                 | -8.43        | Peak   | ---               | ---                  |
| 3 | 249.22       | 29.55                       | 46.00           | -16.45       | 39.51                 | -9.96        | Peak   | ---               | ---                  |
| 4 | 299.66       | 33.20                       | 46.00           | -12.80       | 41.30                 | -8.10        | Peak   | ---               | ---                  |
| 5 | 499.48       | 37.04                       | 46.00           | -8.96        | 40.17                 | -3.13        | Peak   | ---               | ---                  |
| 6 | 600.36       | 38.19                       | 46.00           | -7.81        | 39.15                 | -0.96        | Peak   | ---               | ---                  |

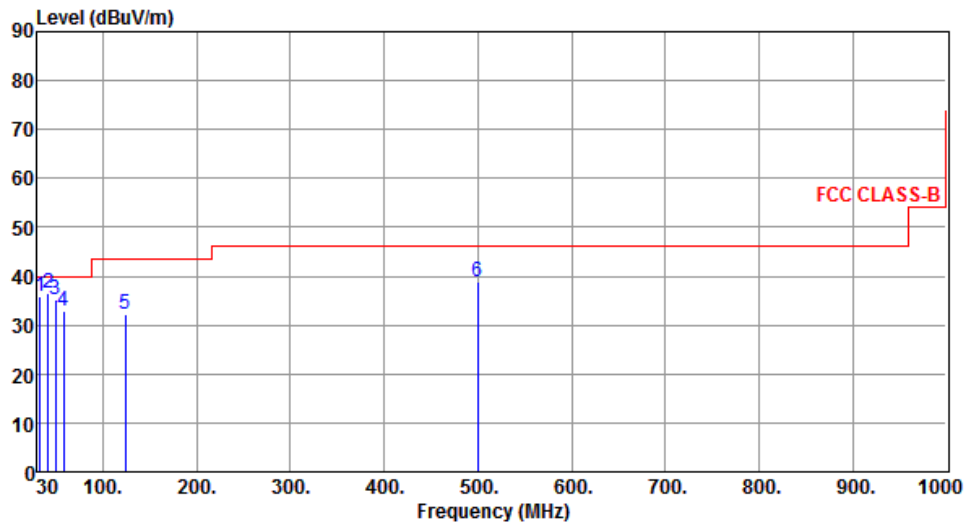
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

|                     |                          |                           |             |
|---------------------|--------------------------|---------------------------|-------------|
| <b>Modulation</b>   | 2.4G 11b + 5G 11ac VHT20 | <b>Test Freq. (MHz)</b>   | CH6 + CH157 |
| <b>Polarization</b> | Vertical                 | <b>Test Configuration</b> | 2           |



|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|--------|-------------------|----------------------|
| 1 | 32.85        | 35.74                       | 40.00           | -4.26        | 45.17                 | -9.43        | QP     | 100               | 175                  |
| 2 | 41.55        | 36.38                       | 40.00           | -3.62        | 44.80                 | -8.42        | QP     | 100               | 155                  |
| 3 | 49.34        | 35.10                       | 40.00           | -4.90        | 43.42                 | -8.32        | QP     | 100               | 274                  |
| 4 | 58.13        | 33.03                       | 40.00           | -6.97        | 41.94                 | -8.91        | Peak   | ---               | ---                  |
| 5 | 124.09       | 32.36                       | 43.50           | -11.14       | 42.63                 | -10.27       | Peak   | ---               | ---                  |
| 6 | 499.48       | 38.92                       | 46.00           | -7.08        | 42.05                 | -3.13        | Peak   | ---               | ---                  |

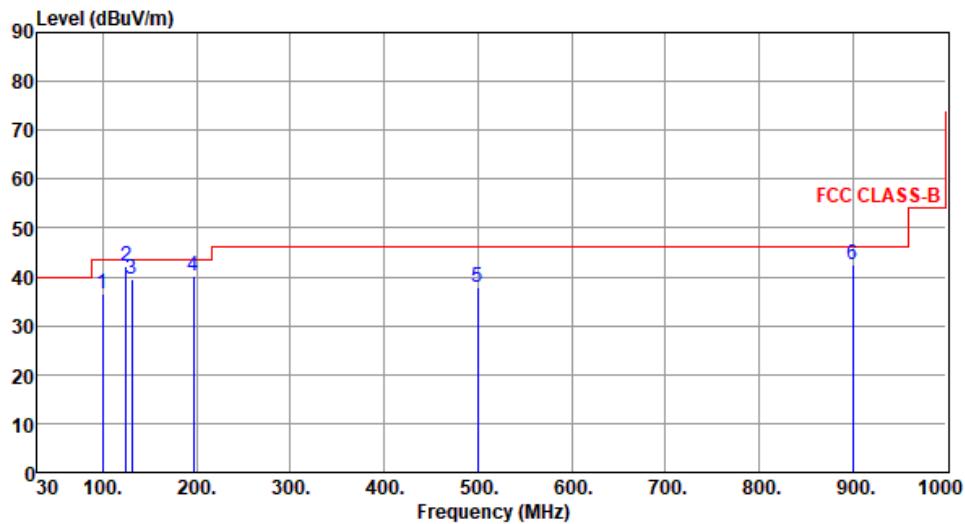
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

|                     |                          |                           |             |
|---------------------|--------------------------|---------------------------|-------------|
| <b>Modulation</b>   | 2.4G 11b + 5G 11ac VHT20 | <b>Test Freq. (MHz)</b>   | CH6 + CH157 |
| <b>Polarization</b> | Horizontal               | <b>Test Configuration</b> | 3           |



|   | Freq.<br>MHz | Emission<br>level<br>dBUV/m | Limit<br>dBUV/m | Margin<br>dB | SA<br>reading<br>dBUV | Factor<br>dB | Remark | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|--------|-------------------|----------------------|
| 1 | 99.84        | 36.50                       | 43.50           | -7.00        | 49.55                 | -13.05       | Peak   | ---               | ---                  |
| 2 | 125.00       | 42.22                       | 43.50           | -1.28        | 52.40                 | -10.18       | QP     | 131               | 102                  |
| 3 | 130.88       | 39.43                       | 43.50           | -4.07        | 49.01                 | -9.58        | Peak   | ---               | ---                  |
| 4 | 196.84       | 40.11                       | 43.50           | -3.39        | 51.90                 | -11.79       | QP     | 100               | 167                  |
| 5 | 499.48       | 37.86                       | 46.00           | -8.14        | 40.99                 | -3.13        | Peak   | ---               | ---                  |
| 6 | 900.09       | 42.53                       | 46.00           | -3.47        | 38.45                 | 4.08         | Peak   | ---               | ---                  |

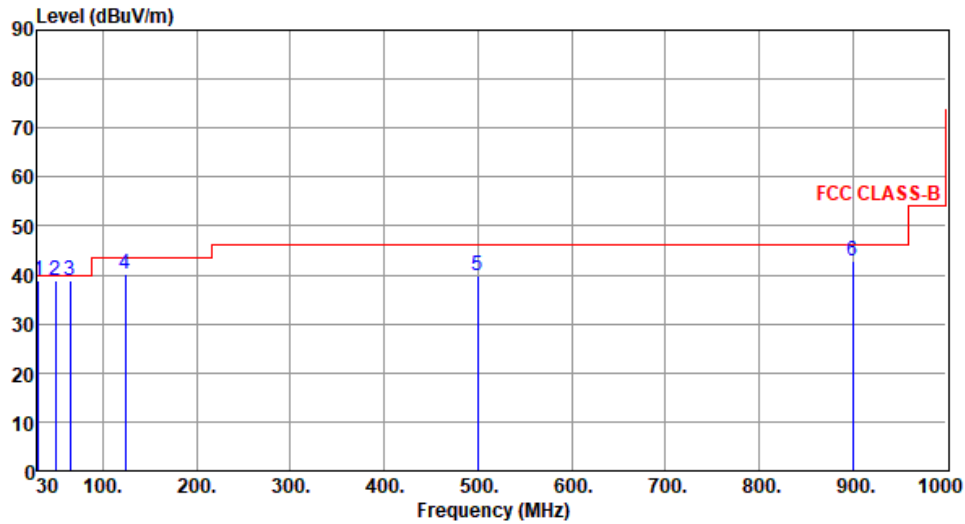
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

|                     |                          |                           |             |
|---------------------|--------------------------|---------------------------|-------------|
| <b>Modulation</b>   | 2.4G 11b + 5G 11ac VHT20 | <b>Test Freq. (MHz)</b>   | CH6 + CH157 |
| <b>Polarization</b> | Vertical                 | <b>Test Configuration</b> | 3           |



|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|--------|-------------------|----------------------|
| 1 | 30.97        | 38.99                       | 40.00           | -1.01        | 48.59                 | -9.60        | QP     | 100               | 164                  |
| 2 | 49.40        | 38.85                       | 40.00           | -1.15        | 47.18                 | -8.33        | QP     | 100               | 190                  |
| 3 | 64.92        | 38.83                       | 40.00           | -1.17        | 48.39                 | -9.56        | QP     | 100               | 199                  |
| 4 | 124.09       | 40.27                       | 43.50           | -3.23        | 50.54                 | -10.27       | Peak   | ---               | ---                  |
| 5 | 499.48       | 39.78                       | 46.00           | -6.22        | 42.91                 | -3.13        | Peak   | ---               | ---                  |
| 6 | 900.09       | 42.96                       | 46.00           | -3.04        | 38.88                 | 4.08         | Peak   | ---               | ---                  |

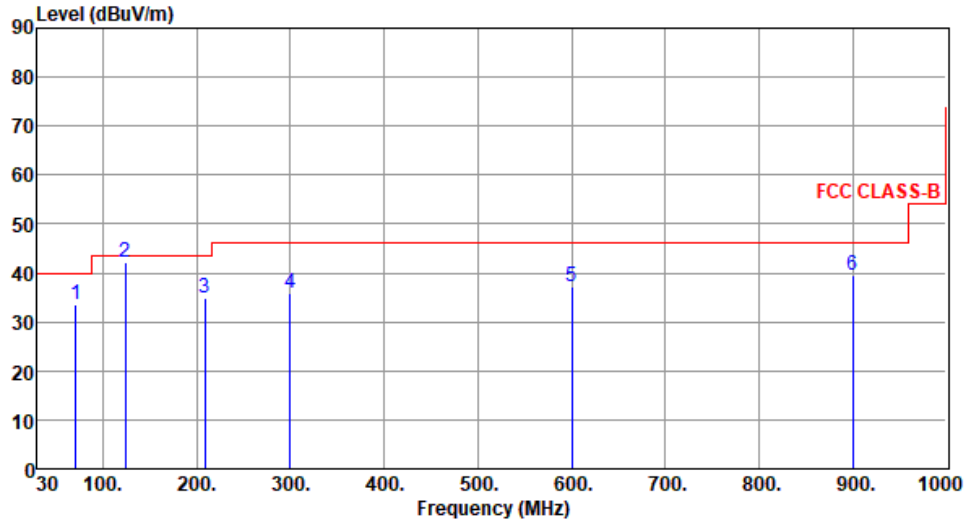
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

|                     |                          |                           |             |
|---------------------|--------------------------|---------------------------|-------------|
| <b>Modulation</b>   | 2.4G 11b + 5G 11ac VHT20 | <b>Test Freq. (MHz)</b>   | CH6 + CH157 |
| <b>Polarization</b> | Horizontal               | <b>Test Configuration</b> | 4           |



|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|--------|-------------------|----------------------|
| 1 | 70.74        | 33.70                       | 40.00           | -6.30        | 44.42                 | -10.72       | Peak   | ---               | ---                  |
| 2 | 124.09       | 42.13                       | 43.50           | -1.37        | 52.40                 | -10.27       | QP     | 151               | 134                  |
| 3 | 208.48       | 34.82                       | 43.50           | -8.68        | 46.89                 | -12.07       | Peak   | ---               | ---                  |
| 4 | 299.66       | 35.73                       | 46.00           | -10.27       | 43.83                 | -8.10        | Peak   | ---               | ---                  |
| 5 | 600.36       | 37.34                       | 46.00           | -8.66        | 38.30                 | -0.96        | Peak   | ---               | ---                  |
| 6 | 900.09       | 39.54                       | 46.00           | -6.46        | 35.46                 | 4.08         | Peak   | ---               | ---                  |

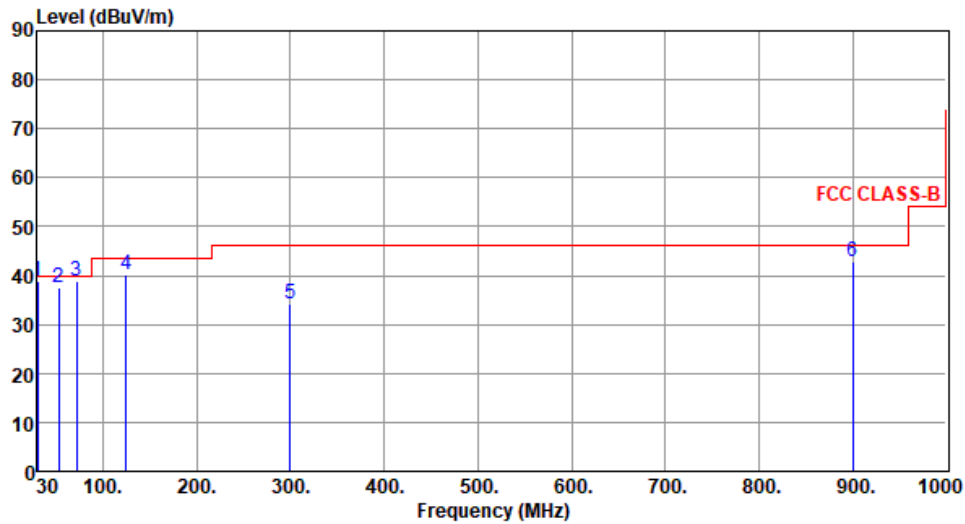
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

|                     |                          |                           |             |
|---------------------|--------------------------|---------------------------|-------------|
| <b>Modulation</b>   | 2.4G 11b + 5G 11ac VHT20 | <b>Test Freq. (MHz)</b>   | CH6 + CH157 |
| <b>Polarization</b> | Vertical                 | <b>Test Configuration</b> | 4           |



|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|--------|-------------------|----------------------|
| 1 | 30.00        | 38.84                       | 40.00           | -1.16        | 48.55                 | -9.71        | QP     | 100               | 168                  |
| 2 | 53.09        | 37.40                       | 40.00           | -2.60        | 45.80                 | -8.40        | QP     | 100               | 172                  |
| 3 | 71.65        | 38.69                       | 40.00           | -1.31        | 49.50                 | -10.81       | QP     | 100               | 146                  |
| 4 | 125.00       | 40.32                       | 43.50           | -3.18        | 50.50                 | -10.18       | QP     | 100               | 194                  |
| 5 | 299.66       | 34.10                       | 46.00           | -11.90       | 42.20                 | -8.10        | Peak   | ---               | ---                  |
| 6 | 900.09       | 42.80                       | 46.00           | -3.20        | 38.72                 | 4.08         | Peak   | ---               | ---                  |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

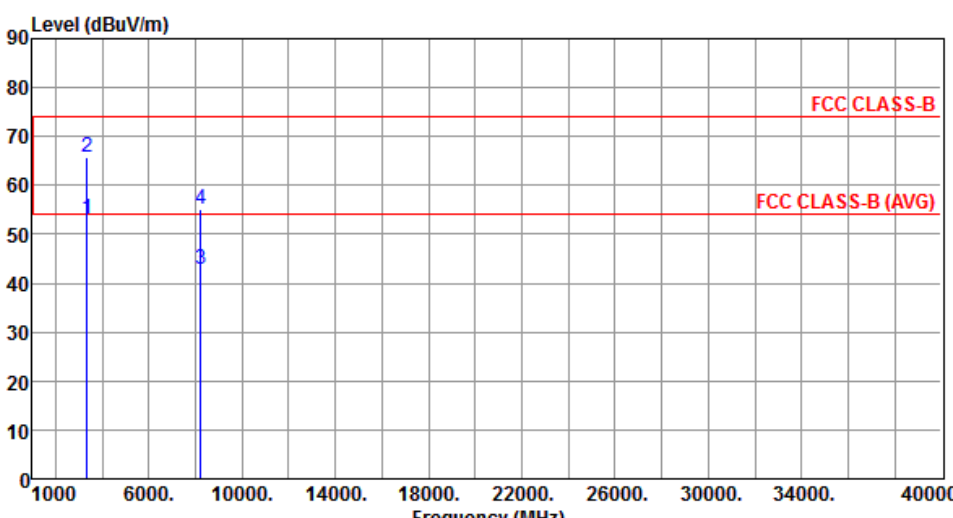
\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

### 3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

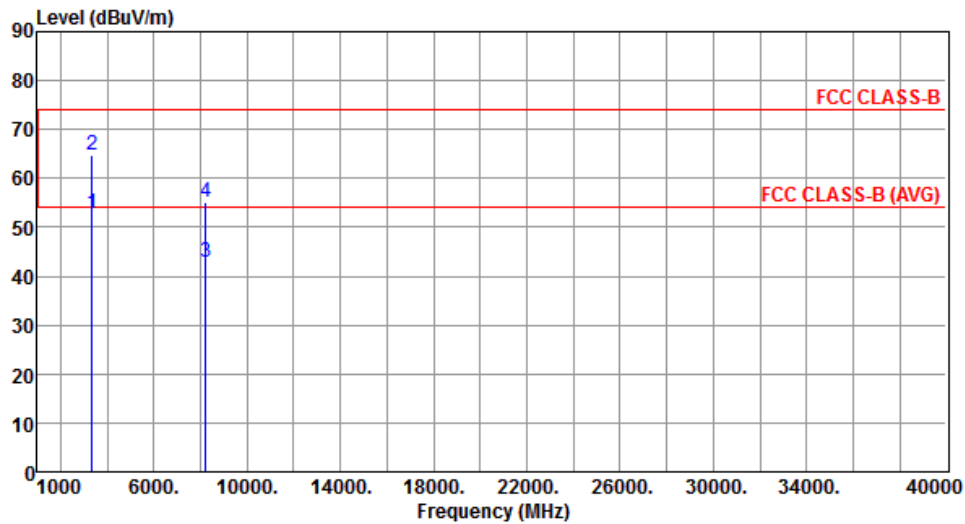
|              |                          |                    |             |
|--------------|--------------------------|--------------------|-------------|
| Modulation   | 2.4G 11b + 5G 11ac VHT20 | Test Freq. (MHz)   | CH6 + CH157 |
| Polarization | Horizontal               | Test Configuration | 1           |

|   | Freq.<br>MHz | Emission<br>level<br>dBUV/m | Limit<br>dBUV/m | Margin<br>dB | SA<br>reading<br>dBUV | Factor<br>dB | Remark  | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|---------|-------------------|----------------------|
| 1 | 3348.00      | 53.02                       | 54.00           | -0.98        | 54.19                 | -1.17        | Average | 207               | 291                  |
| 2 | 3348.00      | 65.78                       | 74.00           | -8.22        | 66.95                 | -1.17        | Peak    | 207               | 291                  |
| 3 | 8222.00      | 42.93                       | 54.00           | -11.07       | 33.35                 | 9.58         | Average | 100               | 20                   |
| 4 | 8222.00      | 55.23                       | 74.00           | -18.77       | 45.65                 | 9.58         | Peak    | 100               | 20                   |

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor\* (dB)  
 \*Factor includes antenna factor , cable loss and amplifier gain  
 Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

|                     |                          |                           |             |
|---------------------|--------------------------|---------------------------|-------------|
| <b>Modulation</b>   | 2.4G 11b + 5G 11ac VHT20 | <b>Test Freq. (MHz)</b>   | CH6 + CH157 |
| <b>Polarization</b> | Vertical                 | <b>Test Configuration</b> | 1           |



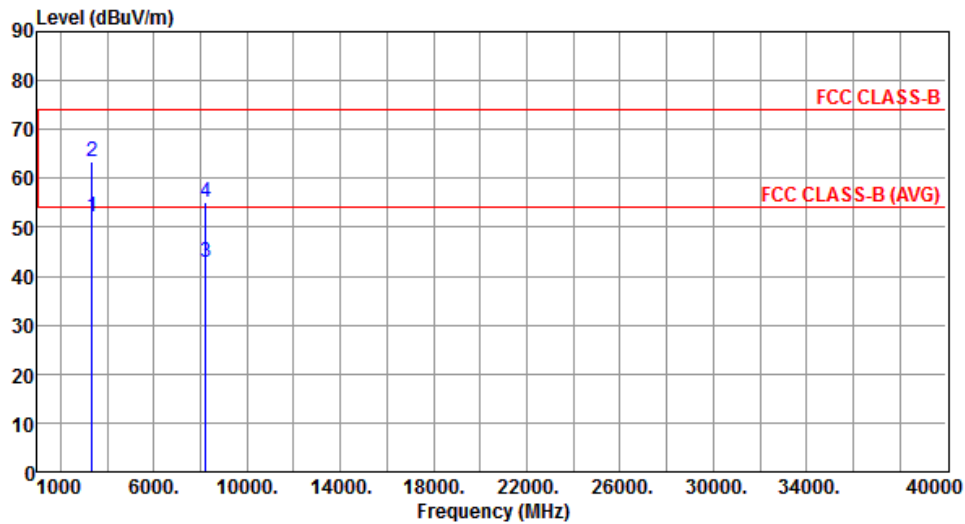
|   | Freq.<br>MHz | Emission<br>level<br>dBUV/m | Limit<br>dBUV/m | Margin<br>dB | SA<br>reading<br>dBUV | Factor<br>dB | Remark  | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|---------|-------------------|----------------------|
| 1 | 3348.00      | 52.71                       | 54.00           | -1.29        | 53.88                 | -1.17        | Average | 217               | 358                  |
| 2 | 3348.00      | 64.62                       | 74.00           | -9.38        | 65.79                 | -1.17        | Peak    | 217               | 358                  |
| 3 | 8222.00      | 42.77                       | 54.00           | -11.23       | 33.19                 | 9.58         | Average | 100               | 100                  |
| 4 | 8222.00      | 55.02                       | 74.00           | -18.98       | 45.44                 | 9.58         | Peak    | 100               | 100                  |

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

|                     |                          |                           |             |
|---------------------|--------------------------|---------------------------|-------------|
| <b>Modulation</b>   | 2.4G 11b + 5G 11ac VHT20 | <b>Test Freq. (MHz)</b>   | CH6 + CH157 |
| <b>Polarization</b> | Horizontal               | <b>Test Configuration</b> | 2           |



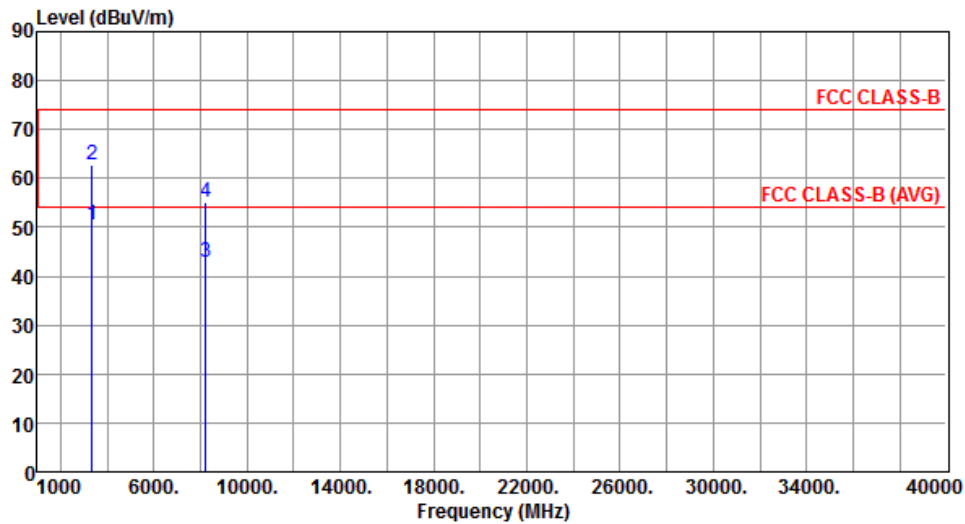
|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark  | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|---------|-------------------|----------------------|
| 1 | 3348.00      | 52.30                       | 54.00           | -1.70        | 53.47                 | -1.17        | Average | 211               | 307                  |
| 2 | 3348.00      | 63.53                       | 74.00           | -10.47       | 64.70                 | -1.17        | Peak    | 211               | 307                  |
| 3 | 8222.00      | 42.70                       | 54.00           | -11.30       | 33.12                 | 9.58         | Average | 100               | 60                   |
| 4 | 8222.00      | 55.09                       | 74.00           | -18.91       | 45.51                 | 9.58         | Peak    | 100               | 60                   |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

|                     |                          |                           |             |
|---------------------|--------------------------|---------------------------|-------------|
| <b>Modulation</b>   | 2.4G 11b + 5G 11ac VHT20 | <b>Test Freq. (MHz)</b>   | CH6 + CH157 |
| <b>Polarization</b> | Vertical                 | <b>Test Configuration</b> | 2           |



|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark  | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|---------|-------------------|----------------------|
| 1 | 3348.00      | 50.62                       | 54.00           | -3.38        | 51.79                 | -1.17        | Average | 123               | 334                  |
| 2 | 3348.00      | 62.66                       | 74.00           | -11.34       | 63.83                 | -1.17        | Peak    | 123               | 334                  |
| 3 | 8222.00      | 42.72                       | 54.00           | -11.28       | 33.14                 | 9.58         | Average | 100               | 40                   |
| 4 | 8222.00      | 55.14                       | 74.00           | -18.86       | 45.56                 | 9.58         | Peak    | 100               | 40                   |

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor\* (dB)

\*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

## 4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

### **Linkou**

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin  
Kou District, New Taipei City,  
Taiwan, R.O.C.

### **Kwei Shan**

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,  
Kwei Shan District, Tao Yuan City  
333, Taiwan, R.O.C.

### **Kwei Shan Site II**

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd  
St., Kwei Shan District, Tao Yuan  
City 333, Taiwan, R.O.C..

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC\_Service@icertifi.com.tw

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