# FCC Co-Location Test Report

| | | |
|---|---|---|
| **FCC ID** | : | **2AL6XWAP581** |
| **Equipment** | : | **802.11ax 2x2 2-Streams Dual Concurrent Dual radios Wall Plate Access Point**<br>**(Please refer to section 1.1.1 for more details)** |
| **Model No.** | : | **WAP581**<br>**(Please refer to section 1.1.1 for more details)** |
| **Brand Name** | : | **Emplus**<br>**(Please refer to section 1.1.1 for more details)** |
| **Applicant** | : | **Emplus Technologies, Inc** |
| **Address** | : | **Bld B, 10F, No.209, Sec.1, Nangang Rd. Taipei City Taiwan** |
| **Standard** | : | **47 CFR FCC Part 15.247**<br>**47 CFR FCC Part 15.407** |
| **Received Date** | : | **Dec. 08, 2021** |
| **Tested Date** | : | **Apr. 29, 2022** |

**We, International Certification Corporation, 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 shall not be reproduced except in full without the written approval of our laboratory.**

| **Reviewed by:** | **Approved by:** |
|---|---|
| **Along Chen / Assistant Manager** | **Gary Chang / Manager** |

# Table of Contents

# Release Record

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FR1D0803CO | Rev. 01 | Initial issue | Jun. 02, 2022 |

# Summary of Test Results

| FCC Rules | Test Items | Measured | Result |
|---|---|---|---|
| 15.247(d)<br>15.407(b)<br>15.209 | Unwanted Emissions | [dBuV/m at 3m]: 70.74MHz<br>36.48 (Margin -3.52dB) - PK | 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 |
|---|---|---|---|
| Emplus | WAP581 | 802.11ax 2x2 2-Streams Dual Concurrent Dual radios Wall Plate Access Point | For marketing purpose. |
| EnGenius | ECW215 | 802.11ax Cloud Managed AP | |

- ✦ All models are electrically identical, different model names are for marketing purpose.
- ✦ The above models, model **WAP581** was selected as a representative one for the final test and only its data was recorded in this report.

### 1.1.2 Specification of the Equipment under Test (EUT)

| | |
|---|---|
| **Operating Frequency** | 802.11b/g/n/ax: 2412 MHz ~ 2462 MHz<br>802.11a/n/ac/ax: 5180 MHz ~ 5240 MHz; 5745 ~ 5825 MHz |
| **Modulation Type** | 802.11b: DSSS (DBPSK / DQPSK / CCK)<br>802.11a/g/n/ac/ax: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM) |

### 1.1.3 Antenna Details

| Ant. No. | Model | Type | Connector | Operating Frequencies (MHz) / Antenna Gain (dBi) | | |
|---|---|---|---|---|---|---|
| | | | | 2400~2483.5 | 5150~5250 | 5725~5850 |
| 1 | 2.4G-1 | Dipole | UFL | 4.7 | --- | --- |
| 2 | 2.4G-2 | Dipole | UFL | 4.2 | --- | --- |
| 3 | 5G-1 | Dipole | UFL | --- | 6.1 | 7 |
| 4 | 5G-2 | Dipole | UFL | --- | 6.5 | 6.1 |

### 1.1.4 Power Supply Type of Equipment under Test (EUT)

| | |
|---|---|
| **Power Supply Type** | 12V⎓ from AC adapter<br>54V⎓ from POE |

## 1.2 The Equipment List

| Test Item | Radiated Emission | | | | |
|---|---|---|---|---|---|
| Test Site | 966 chamber3 / (03CH03-WS) | | | | |
| Tested Date | Apr. 29, 2022 | | | | |
| **Instrument** | **Brand** | **Model No.** | **Serial No.** | **Calibration Date** | **Calibration Until** |
| Receiver | R&S | ESR3 | 101657 | Mar. 15, 2022 | Mar. 14, 2023 |
| Spectrum Analyzer | R&S | FSV40 | 101499 | Mar. 08, 2022 | Mar. 07, 2023 |
| Loop Antenna | R&S | HFH2-Z2 | 100330 | Nov. 08, 2021 | Nov. 07, 2022 |
| Bilog Antenna | SCHWARZBECK | VULB9168 | VULB9168-685 | May. 06, 2021 | May. 05, 2022 |
| Horn Antenna 1G-18G | SCHWARZBECK | BBHA 9120 D | BBHA 9120 D 1206 | Dec. 20, 2021 | Dec. 19, 2022 |
| Horn Antenna 18G-40G | SCHWARZBECK | BBHA 9170 | BBHA 9170508 | Jan. 11, 2022 | Jan. 10, 2023 |
| Preamplifier | EMC | EMC02325 | 980187 | Jul. 26, 2021 | Jul. 25, 2022 |
| Preamplifier | Agilent | 83017A | MY39501309 | Sep. 06, 2021 | Sep. 05, 2022 |
| Preamplifier | EMC | EMC184045B | 980192 | Jul. 14, 2021 | Jul. 13, 2022 |
| Loop Antenna Cable | KOAX KABEL | 101354-BW | 101354-BW | Oct. 05, 2021 | Oct. 04, 2022 |
| LF cable-0.8M | EMC | EMC8D-NM-NM-800 | EMC8D-NM-NM-800 -001 | Sep. 24, 2021 | Sep. 23, 2022 |
| LF cable-3M | EMC | EMC8D-NM-NM-300 0 | 131103 | Sep. 24, 2021 | Sep. 23, 2022 |
| LF cable-13M | EMC | EMC8D-NM-NM-130 00 | 131104 | Sep. 24, 2021 | Sep. 23, 2022 |
| RF cable-3M | HUBER+SUHNER | SUCOFLEX104 | MY22620/4 | Sep. 24, 2021 | Sep. 23, 2022 |
| RF cable-8M | EMC | EMC104-SM-SM-80 00 | 181107 | Sep. 24, 2021 | Sep. 23, 2022 |
| Measurement Software | AUDIX | e3 | 6.120210g | NA | NA |
| Note: Calibration Interval of instruments listed above is one year. | | | | | |

## 1.3 Test Standards

47 CFR FCC Part 15.247
47 CFR FCC Part 15.407
ANSI C63.10-2013

## 1.4 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
FCC KDB 412172 D01 Determining ERP and EIRP v01r01
FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

## 1.5 Deviation from Test Standard and Measurement Procedure

None

## 1.6 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

| Measurement Uncertainty | |
|---|---|
| **Parameters** | **Uncertainty** |
| Unwanted Emission ≤ 1GHz | ±3.96 dB |
| Unwanted Emission > 1GHz | ±4.51 dB |

# 2 Test Configuration

## 2.1 Testing Facility

| | |
|---|---|
| **Test Laboratory** | International Certification Corporation |
| **Test Site** | 03CH03-WS |
| **Address of Test Site** | No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 333, Taiwan (R.O.C.) |

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISED#: 10807C
- CAB identifier: TW2732

## 2.2 The Worst Test Modes and Channel Details

| Test item | Modulation Mode | Test Configuration |
|---|---|---|
| Unwanted Emissions ≤1GHz | 2.4G 11g CH06 + 5G 11A CH48 | 1, 2 |
| Unwanted Emissions >1GHz | 2.4G 11g CH06 + 5G 11A CH48 | 1 |

**NOTE:**
**1.** The selected channel is the maximum power channel of Wi-Fi mode.
2. Test configurations are listed as below:
1) Configuration 1: Adapter mode
2) Configuration 2: POE mode

# 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

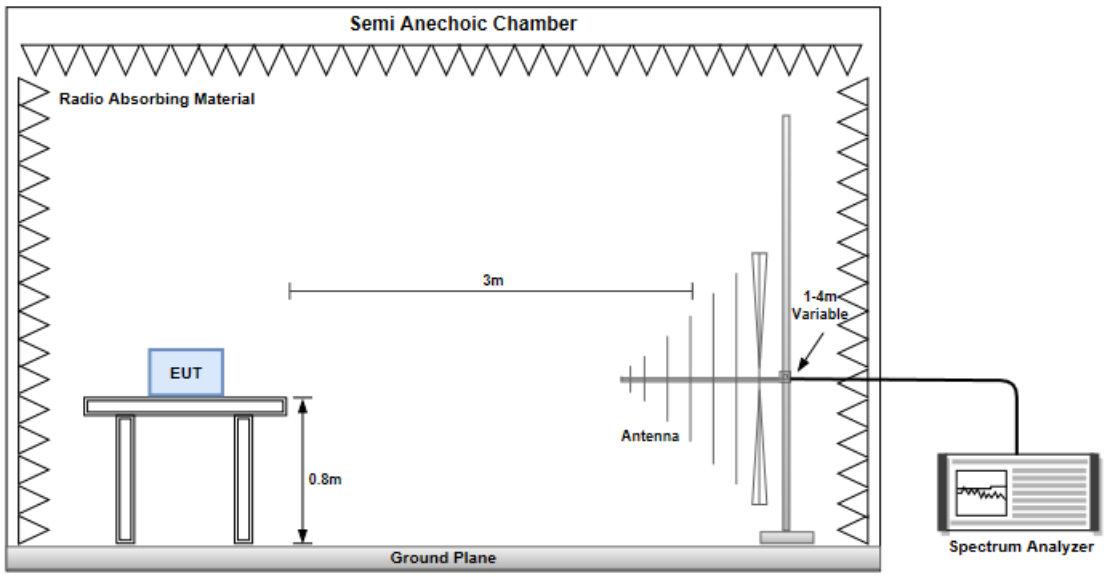
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

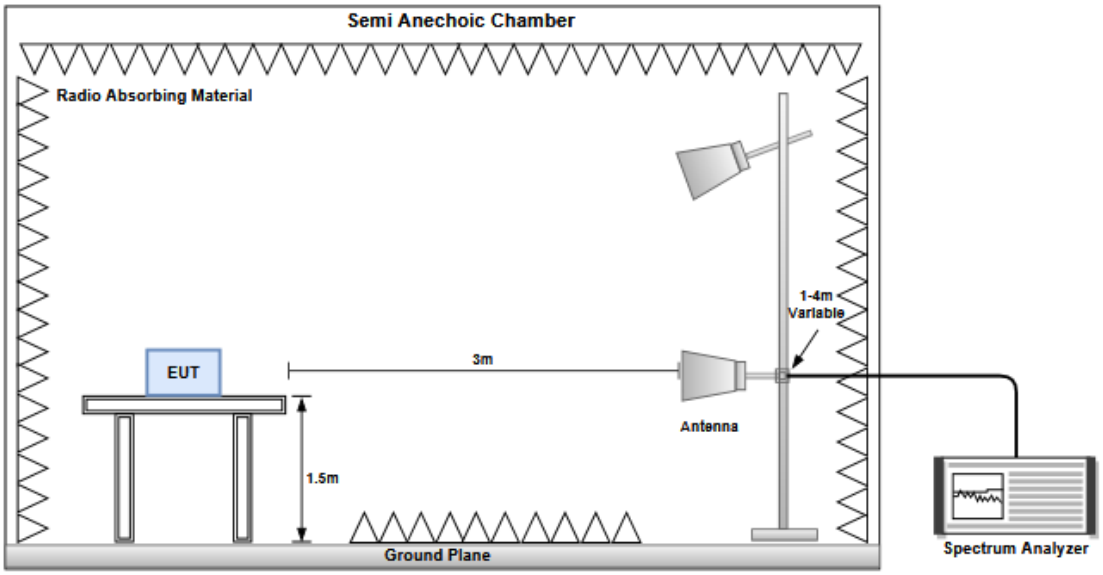
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

### 3.1.3 Test Setup

**Radiated Emissions below 1 GHz**




**Radiated Emissions above 1 GHz**




### 3.1.4 Test Results

Refer to Appendix A.

# 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 Corporation (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 Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

No.2-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

**Kwei Shan Site II**

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., 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: 886-3-318-0345
Email: ICC_Service@icertifi.com.tw

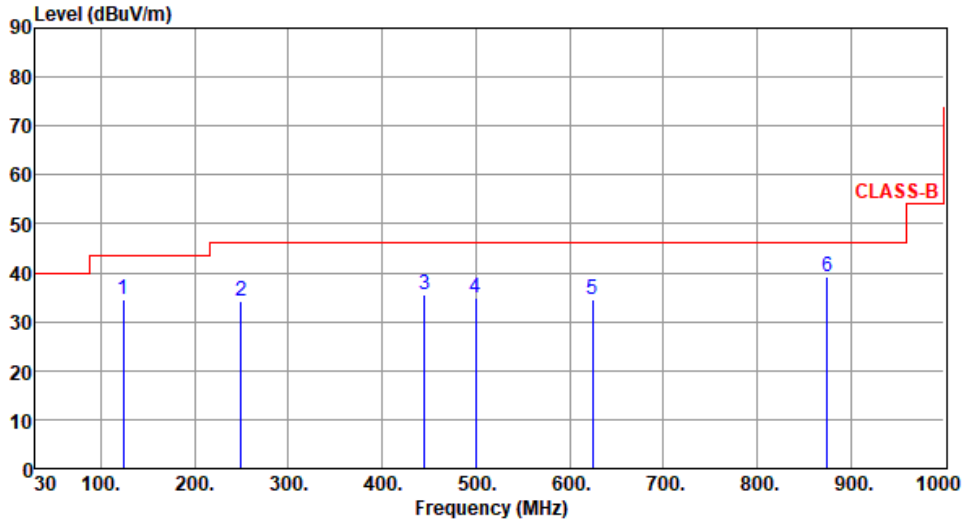
**==END==**

## *Configuration 1: Adapter mode*

### Unwanted Emissions (Below 1GHz)

| | |
|---|---|
| **Test Mode** | 2.4G 11g CH06 + 5G 11A CH48 |
| **Polarization** | Horizontal |

Test By :Brad Wu Temperature(℃):24 Humidity(%):63

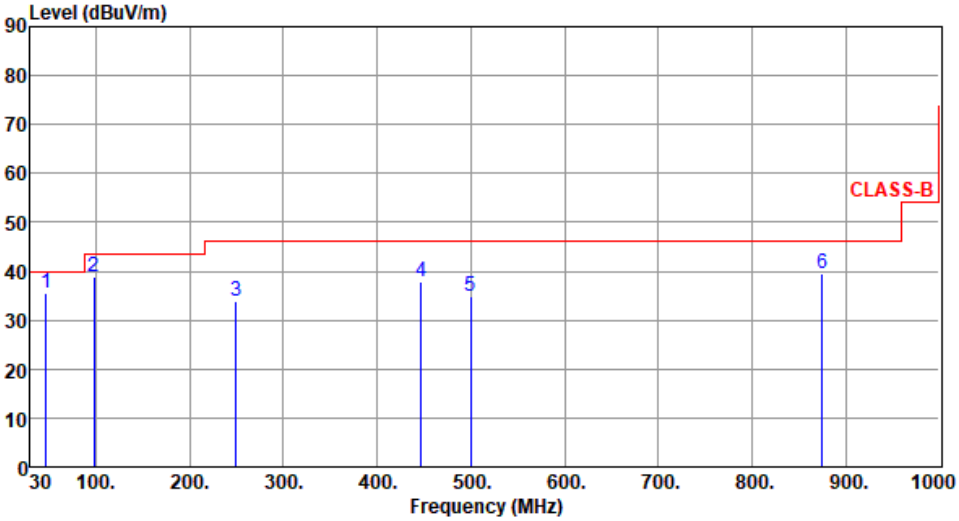



| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB/m | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 124.09 | 34.55 | 43.50 | -8.95 | 44.99 | -10.44 | Peak | --- | --- |
| 2 | 249.22 | 34.36 | 46.00 | -11.64 | 44.16 | -9.80 | Peak | --- | --- |
| 3 | 445.16 | 35.58 | 46.00 | -10.42 | 39.46 | -3.88 | Peak | --- | --- |
| 4 | 499.48 | 34.88 | 46.00 | -11.12 | 37.63 | -2.75 | Peak | --- | --- |
| 5 | 624.61 | 34.50 | 46.00 | -11.50 | 34.28 | 0.22 | Peak | --- | --- |
| 6 | 874.87 | 39.22 | 46.00 | -6.78 | 34.73 | 4.49 | Peak | --- | --- |

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

| | |
|---|---|
| **Test Mode** | 2.4G 11g CH06 + 5G 11A CH48 |
| **Polarization** | Vertical |

Test By :Brad Wu Temperature(℃):24 Humidity(%):63



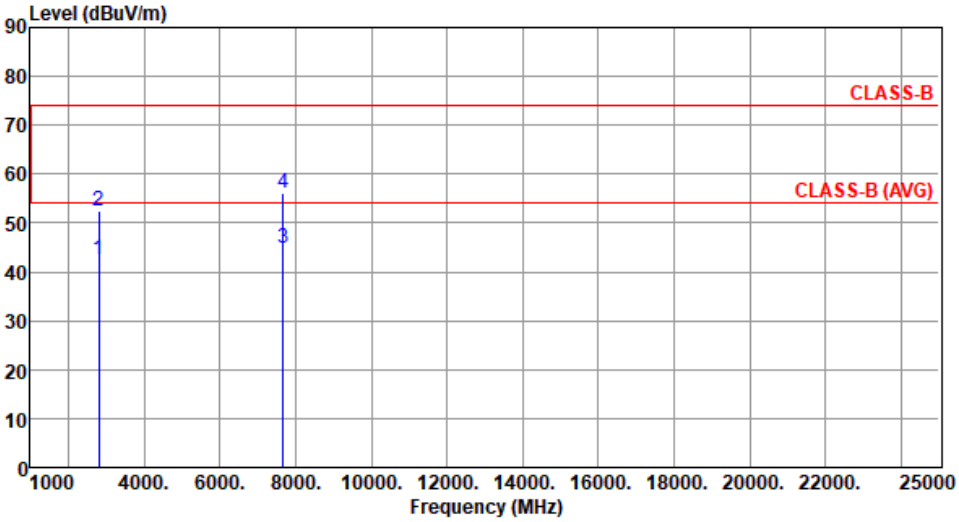

| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB/m | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 46.49 | 35.40 | 40.00 | -4.60 | 44.21 | -8.81 | QP | 100 | 291 |
| 2 | 97.90 | 38.76 | 43.50 | -4.74 | 52.71 | -13.95 | Peak | --- | --- |
| 3 | 249.22 | 33.96 | 46.00 | -12.04 | 43.76 | -9.80 | Peak | --- | --- |
| 4 | 447.10 | 37.83 | 46.00 | -8.17 | 41.65 | -3.82 | Peak | --- | --- |
| 5 | 499.48 | 34.95 | 46.00 | -11.05 | 37.70 | -2.75 | Peak | --- | --- |
| 6 | 874.87 | 39.59 | 46.00 | -6.41 | 35.10 | 4.49 | Peak | --- | --- |

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

## Unwanted Emissions (Above 1GHz)

| | |
|---|---|
| **Test Mode** | 2.4G 11g CH06 + 5G 11A CH48 |
| **Polarization** | Horizontal |

Test By :Akun Chung Temperature(℃):24 Humidity(%):63

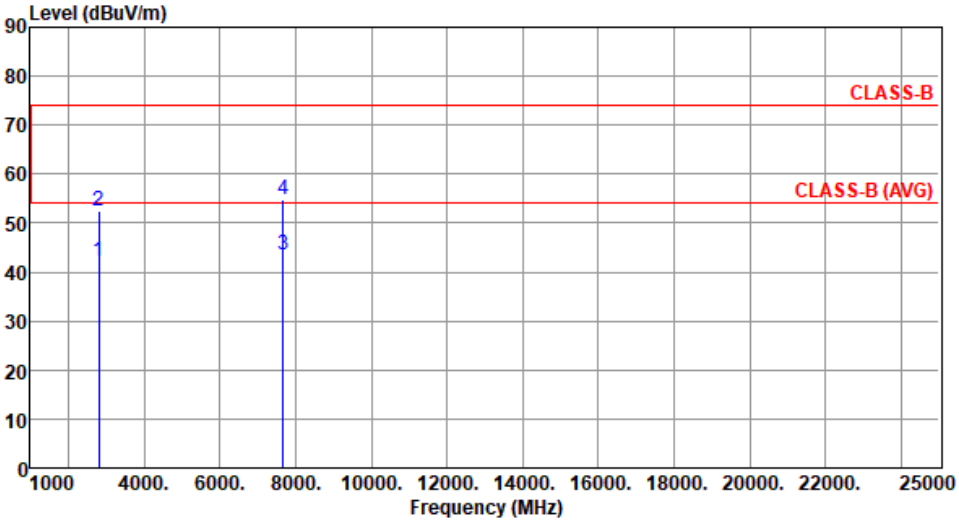



| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB/m | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2803.00 | 42.46 | 54.00 | -11.54 | 42.95 | -0.49 | Average | 100 | 315 |
| 2 | 2803.00 | 52.50 | 74.00 | -21.50 | 52.99 | -0.49 | Peak | 100 | 315 |
| 3 | 7677.00 | 44.98 | 54.00 | -9.02 | 34.88 | 10.10 | Average | 100 | 320 |
| 4 | 7677.00 | 56.09 | 74.00 | -17.91 | 45.99 | 10.10 | Peak | 100 | 320 |

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

| | |
|---|---|
| **Test Mode** | 2.4G 11g CH06 + 5G 11A CH48 |
| **Polarization** | Vertical |

Test By :Akun Chung Temperature(℃):24 Humidity(%):63




| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB/m | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2803.00 | 42.07 | 54.00 | -11.93 | 42.56 | -0.49 | Average | 100 | 15 |
| 2 | 2803.00 | 52.36 | 74.00 | -21.64 | 52.85 | -0.49 | Peak | 100 | 15 |
| 3 | 7677.00 | 43.59 | 54.00 | -10.41 | 33.49 | 10.10 | Average | 100 | 28 |
| 4 | 7677.00 | 54.86 | 74.00 | -19.14 | 44.76 | 10.10 | Peak | 100 | 28 |

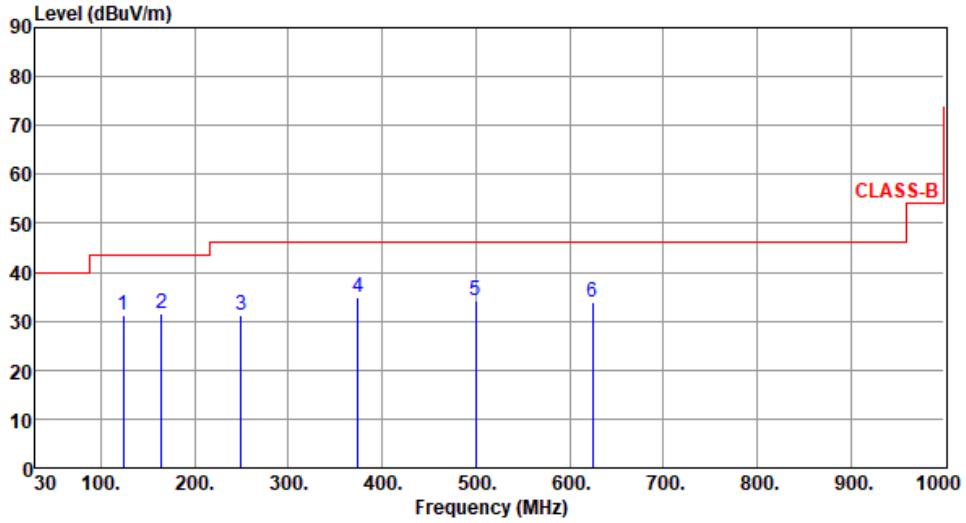
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

## *Configuration 2: POE mode*

### Unwanted Emissions (Below 1GHz)

| | |
|---|---|
| **Test Mode** | 2.4G 11g CH06 + 5G 11A CH48 |
| **Polarization** | Horizontal |

Test By :Brad Wu Temperature(℃):24 Humidity(%):63

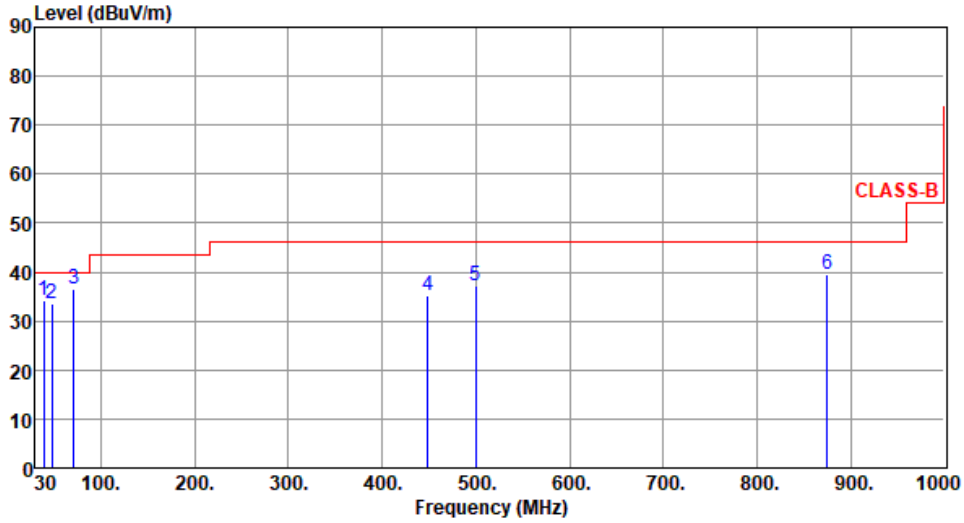



| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB/m | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 124.09 | 31.08 | 43.50 | -12.42 | 41.52 | -10.44 | Peak | --- | --- |
| 2 | 164.83 | 31.40 | 43.50 | -12.10 | 40.06 | -8.66 | Peak | --- | --- |
| 3 | 249.22 | 31.20 | 46.00 | -14.80 | 41.00 | -9.80 | Peak | --- | --- |
| 4 | 374.35 | 34.96 | 46.00 | -11.04 | 41.17 | -6.21 | Peak | --- | --- |
| 5 | 499.48 | 34.05 | 46.00 | -11.95 | 36.80 | -2.75 | Peak | --- | --- |
| 6 | 624.61 | 33.99 | 46.00 | -12.01 | 33.77 | 0.22 | Peak | --- | --- |

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

| | |
|---|---|
| **Test Mode** | 2.4G 11g CH06 + 5G 11A CH48 |
| **Polarization** | Vertical |

Test By :Brad Wu Temperature(℃):24 Humidity(%):63




| | Freq. MHz | Emission level dBuV/m | Limit dBuV/m | Margin dB | SA reading dBuV | Factor dB/m | Remark | ANT High cm | Turn Table deg |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 38.73 | 34.12 | 40.00 | -5.88 | 43.45 | -9.33 | QP | 100 | 96 |
| 2 | 47.46 | 33.69 | 40.00 | -6.31 | 42.48 | -8.79 | QP | 100 | 192 |
| 3 | 70.74 | 36.48 | 40.00 | -3.52 | 47.51 | -11.03 | Peak | --- | --- |
| 4 | 449.04 | 35.20 | 46.00 | -10.80 | 38.97 | -3.77 | Peak | --- | --- |
| 5 | 499.48 | 37.05 | 46.00 | -8.95 | 39.80 | -2.75 | Peak | --- | --- |
| 6 | 874.87 | 39.45 | 46.00 | -6.55 | 34.96 | 4.49 | Peak | --- | --- |

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