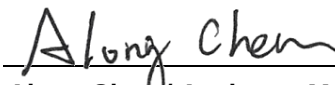


# FCC C2PC Test Report

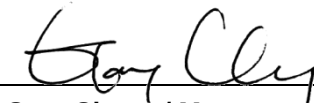
**FCC ID** : O6ZHLC0000  
**Equipment** : 8-Channel LoRa Gateway  
**Model No.** : HXQX1AM0S  
**Brand Name** : machineQ  
**Applicant** : Humax Co., Ltd.  
**Address** : HUMAX BLDG., 2, Yeongmun-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, South Korea, 17040  
**Standard** : 47 CFR FCC Part 15.247  
**Received Date** : Mar. 05, 2019  
**Tested Date** : Mar. 07 ~ Mar. 14, 2019

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   |
|-------------|---------|---------------|---------------|
| FR891201-02 | Rev. 01 | Initial issue | Mar. 26, 2019 |

## Summary of Test Results

| FCC Rules           | Test Items          | Measured                                                  | Result |
|---------------------|---------------------|-----------------------------------------------------------|--------|
| 15.207              | Conducted Emissions | [dBuV]: 18.300MHz<br>42.53 (Margin -7.47dB) - AV          | Pass   |
| 15.247(d)<br>15.209 | Radiated Emissions  | [dBuV/m at 3m]: 2483.50MHz<br>52.97 (Margin -1.03dB) - 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 values of gain for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of the gain.

# 1 General Description

## 1.1 Information

This is a Class II Permissive Change report (C2PC).

This report is issued as a supplementary report to original ICC report no. FR891201-01.

The difference is concerned with following items:

- ✧ Modification of PCB and components of non-RF section for ESD, Ethernet Port Surge and LED circuit Improvement and GPIO circuit.
- ✧ Remove matching circuit and replace by band pass filter on Lora external antenna area
- ✧ Lora External antenna connector location is moved out 3.15 mm
- ✧ Having longer screw post on heat sink for WiFi
- ✧ Remove an adapter (Brand name: PHIHONG, Model name: PSAC24A-120L6)

Conducted emission and radiated emission tests had been re-tested and presented in following sections.

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

| RF General Information |                  |                 |                |                                    |                 |
|------------------------|------------------|-----------------|----------------|------------------------------------|-----------------|
| Frequency Range (MHz)  | IEEE Std. 802.11 | Ch. Freq. (MHz) | Channel Number | Transmit Chains (N <sub>TX</sub> ) | Data Rate / MCS |
| 2400-2483.5            | b                | 2412-2462       | 1-11 [11]      | 1                                  | 1-11 Mbps       |
| 2400-2483.5            | g                | 2412-2462       | 1-11 [11]      | 1                                  | 6-54 Mbps       |
| 2400-2483.5            | n (HT20)         | 2412-2462       | 1-11 [11]      | 2                                  | MCS 0-15        |
| 2400-2483.5            | n (HT40)         | 2422-2452       | 3-9 [7]        | 2                                  | MCS 0-15        |

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.  
 Note 2: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.  
 Note 3: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.  
 Note 4: 802.11b/g supports TX diversity function.

### 1.1.2 Antenna Details

| Ant. No. | Model                   | Type     | Connector | Gain (dBi) | Remark        |
|----------|-------------------------|----------|-----------|------------|---------------|
| 1        | CON 1                   | PIFA     | UFL       | 3.76       | Wi-Fi Antenna |
| 2        | CON 2                   | PIFA     | UFL       | 3.86       | Wi-Fi Antenna |
| 3        | LoRa antenna (External) | Dipole   | SMA       | 0.96       | Lora Antenna  |
| 4        | LoRa antenna (Internal) | Monopole | UFL       | 1.02       | Lora Antenna  |

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

|                   |                    |
|-------------------|--------------------|
| Power Supply Type | 12Vdc from adapter |
|-------------------|--------------------|

#### 1.1.4 Accessories

| Accessories |            |                                                                                                                                                             |
|-------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No.         | Equipment  | Description                                                                                                                                                 |
| 1           | AC adapter | Brand: machineQ<br>Model: WB-24J12FU<br>Power Rating:<br>I/P: 100-240Vac, 50-60Hz, 0.7A Max<br>O/P: 12Vdc, 2A<br>Power Line: 1.2m non-shielded without core |
| 2           | RJ45 cable | 1m non-shielded cable without core                                                                                                                          |

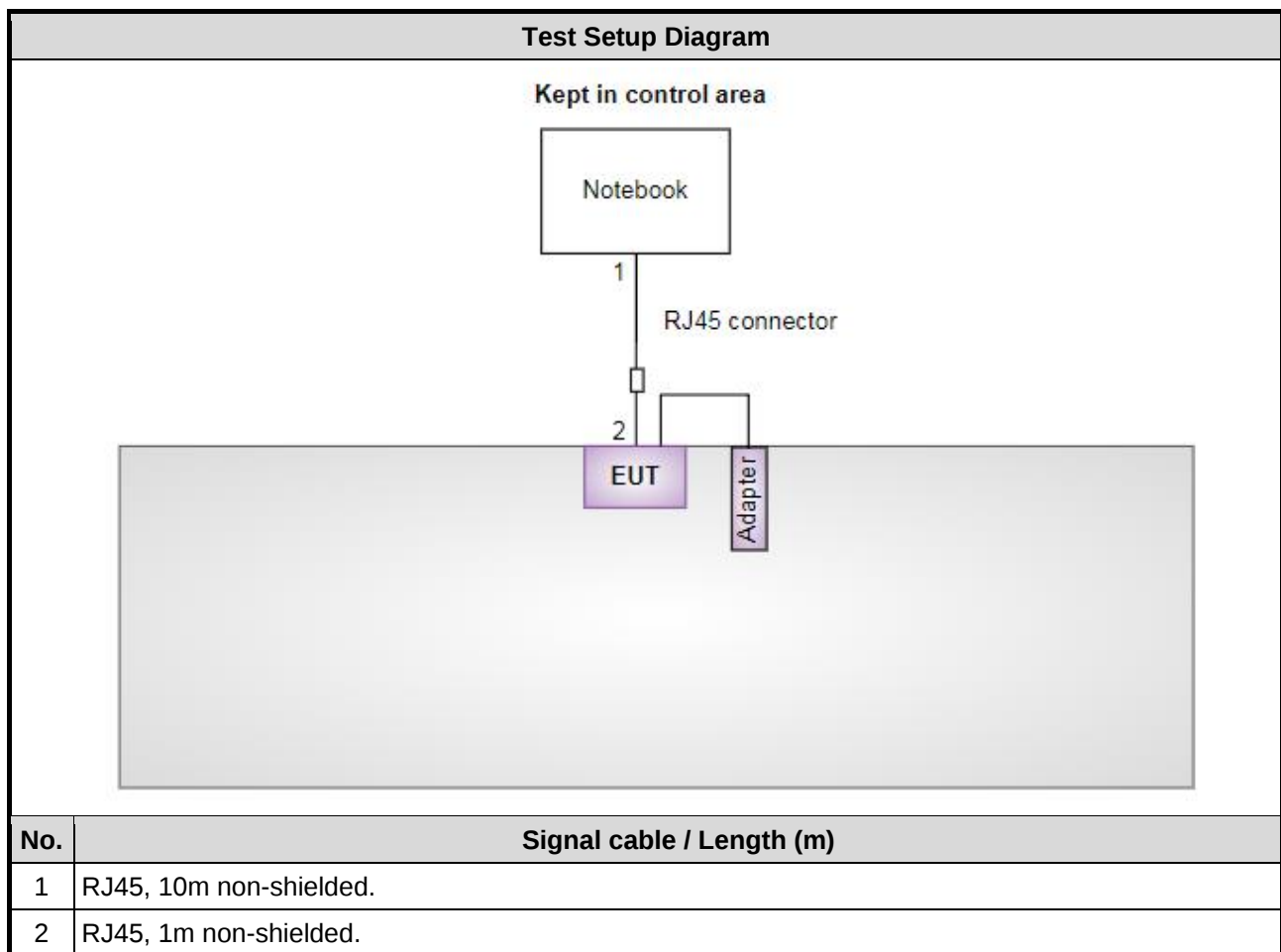
#### 1.1.5 Channel List

| Frequency band (MHz)  |                | 2400~2483.5  |                |
|-----------------------|----------------|--------------|----------------|
| 802.11 b / g / n HT20 |                | 802.11n HT40 |                |
| Channel               | Frequency(MHz) | Channel      | Frequency(MHz) |
| 1                     | 2412           | 3            | 2422           |
| 2                     | 2417           | 4            | 2427           |
| 3                     | 2422           | 5            | 2432           |
| 4                     | 2427           | 6            | 2437           |
| 5                     | 2432           | 7            | 2442           |
| 6                     | 2437           | 8            | 2447           |
| 7                     | 2442           | 9            | 2452           |
| 8                     | 2447           | ---          | ---            |
| 9                     | 2452           | ---          | ---            |
| 10                    | 2457           | ---          | ---            |
| 11                    | 2462           | ---          | ---            |

## 1.2 Local Support Equipment List

| Support Equipment List |           |       |                |        |         |
|------------------------|-----------|-------|----------------|--------|---------|
| No.                    | Equipment | Brand | Model          | FCC ID | Remarks |
| 1                      | Notebook  | DELL  | Latitude E5470 | DoC    | ---     |

## 1.3 Test Setup Chart



## 1.4 The Equipment List

|                      |                               |                  |                   |                         |                          |
|----------------------|-------------------------------|------------------|-------------------|-------------------------|--------------------------|
| <b>Test Item</b>     | Conducted Emission            |                  |                   |                         |                          |
| <b>Test Site</b>     | Conduction room 1 / (CO01-WS) |                  |                   |                         |                          |
| <b>Tested Date</b>   | Mar. 14, 2019                 |                  |                   |                         |                          |
| <b>Instrument</b>    | <b>Manufacturer</b>           | <b>Model No.</b> | <b>Serial No.</b> | <b>Calibration Date</b> | <b>Calibration Until</b> |
| Receiver             | R&S                           | ESR3             | 101657            | Jan. 08, 2019           | Jan. 07, 2020            |
| LISN                 | SCHWARZBECK                   | Schwarzbeck 8127 | 8127-667          | Nov. 05, 2018           | Nov. 04, 2019            |
| RF Cable-CON         | Woken                         | CFD200-NL        | CFD200-NL-001     | Oct. 23, 2018           | Oct. 23, 2019            |
| Measurement Software | AUDIX                         | e3               | 6.120210k         | NA                      | NA                       |

Note: Calibration Interval of instruments listed above is one year.

|                      |                             |                   |                     |                         |                          |
|----------------------|-----------------------------|-------------------|---------------------|-------------------------|--------------------------|
| <b>Test Item</b>     | Radiated Emission           |                   |                     |                         |                          |
| <b>Test Site</b>     | 966 chamber 3 / (03CH03-WS) |                   |                     |                         |                          |
| <b>Tested Date</b>   | Mar. 07 ~ Mar. 08, 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             | 101499              | Jan. 07, 2019           | Jan. 06, 2020            |
| Receiver             | R&S                         | ESR3              | 101658              | Dec. 11, 2018           | Dec. 10, 2019            |
| Bilog Antenna        | SCHWARZBECK                 | VULB9168          | VULB9168-685        | Apr. 19, 2018           | Apr. 18, 2019            |
| Horn Antenna 1G-18G  | SCHWARZBECK                 | BBHA 9120 D       | BBHA 9120 D 1206    | Jan. 07, 2019           | Jan. 06, 2020            |
| Horn Antenna 18G-40G | SCHWARZBECK                 | BBHA 9170         | BBHA 9170517        | Nov. 15, 2018           | Nov. 14, 2019            |
| Loop Antenna         | R&S                         | HFH2-Z2           | 100330              | Nov. 09, 2018           | Nov. 08, 2019            |
| Loop Antenna Cable   | KOAX KABEL                  | 101354-BW         | 101354-BW           | Oct. 08, 2018           | Oct. 07, 2019            |
| Preamplifier         | EMC                         | EMC02325          | 980187              | Aug. 24, 2018           | Aug. 23, 2019            |
| Preamplifier         | Agilent                     | 83017A            | MY53270014          | Aug. 09, 2018           | Aug. 08, 2019            |
| Preamplifier         | EMC                         | EMC184045B        | 980192              | Aug. 09, 2018           | Aug. 08, 2019            |
| RF cable-3M          | HUBER+SUHNER                | SUCOFLEX104       | MY22620/4           | Oct. 01, 2018           | Sep. 30, 2019            |
| RF cable-8M          | EMC                         | EMC104-SM-SM-8000 | 181107              | Oct. 01, 2018           | Sep. 30, 2019            |
| RF cable-1M          | HUBER+SUHNER                | SUCOFLEX104       | MY22624/4           | Oct. 01, 2018           | Sep. 30, 2019            |
| LF cable-0.8M        | EMC                         | EMC8D-NM-NM-8000  | EMC8D-NM-NM-800-001 | Oct. 01, 2018           | Sep. 30, 2019            |
| LF cable-3M          | EMC                         | EMC8D-NM-NM-3000  | 131103              | Oct. 01, 2018           | Sep. 30, 2019            |
| LF cable-13M         | EMC                         | EMC8D-NM-NM-13000 | 131104              | Oct. 01, 2018           | Sep. 30, 2019            |
| Measurement Software | AUDIX                       | e3                | 6.120210g           | NA                      | NA                       |

Note: Calibration Interval of instruments listed above is one year.

## 1.5 Test Standards

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

47 CFR FCC Part 15.247

ANSI C63.10-2013

FCC KDB 558074 D01 15.247 Meas Guidance v05r01

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

## 1.6 Deviation from Test Standard and Measurement Procedure

None

## 1.7 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    |
| Conducted emission             | $\pm 2.715$ dB |
| AC conducted emission          | $\pm 2.92$ dB  |
| Radiated emission $\leq 1$ GHz | $\pm 3.96$ dB  |
| Radiated emission $> 1$ GHz    | $\pm 4.51$ dB  |

## 2 Test Configuration

### 2.1 Testing Condition

| Test Item          | Test Site | Ambient Condition | Tested By |
|--------------------|-----------|-------------------|-----------|
| AC Conduction      | CO01-WS   | 23°C / 65%        | Alex Tsai |
| Radiated Emissions | 03CH03-WS | 20-21°C / 66%     | Roger Lu  |

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- IC site registration No.: 10807C-1

### 2.2 The Worst Test Modes and Channel Details

| Test item                | Modulation Mode | Test Frequency (MHz) | Data Rate | Test Configuration |
|--------------------------|-----------------|----------------------|-----------|--------------------|
| Conducted Emissions      | HT20            | 2437                 | MCS 0     | ---                |
| Radiated Emissions ≤1GHz | HT20            | 2437                 | MCS 0     | ---                |
| Radiated Emissions >1GHz | HT20            | 2437                 | MCS 0     | ---                |

**NOTE:**

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.

### 3 Transmitter Test Results

#### 3.1 Conducted Emissions

##### 3.1.1 Limit of Conducted Emissions

| Conducted Emissions Limit |            |           |
|---------------------------|------------|-----------|
| Frequency Emission (MHz)  | Quasi-Peak | Average   |
| 0.15-0.5                  | 66 - 56 *  | 56 - 46 * |
| 0.5-5                     | 56         | 46        |
| 5-30                      | 60         | 50        |

Note 1: \* Decreases with the logarithm of the frequency.

##### 3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50  $\Omega$  LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

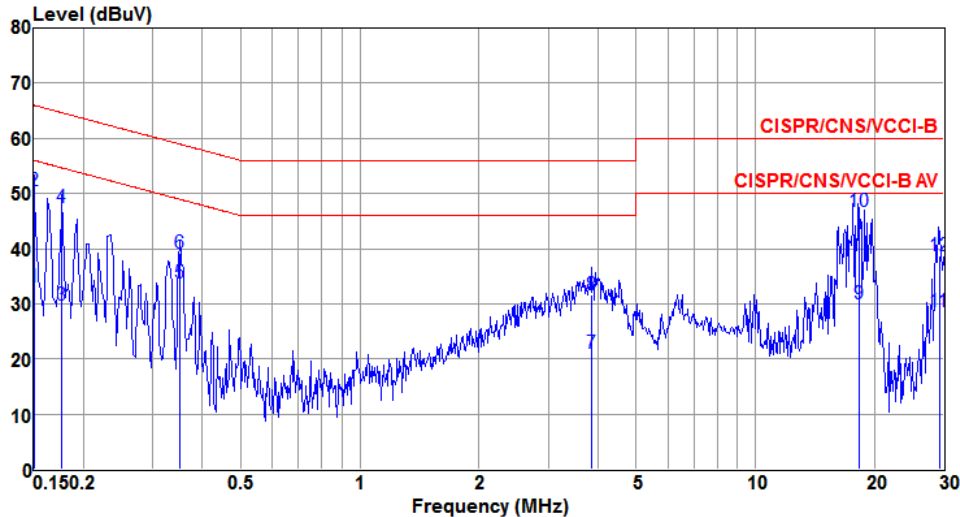
##### 3.1.3 Test Setup



- Note: 1. Support units were connected to second LISN.  
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

### 3.1.4 Test Result of Conducted Emissions

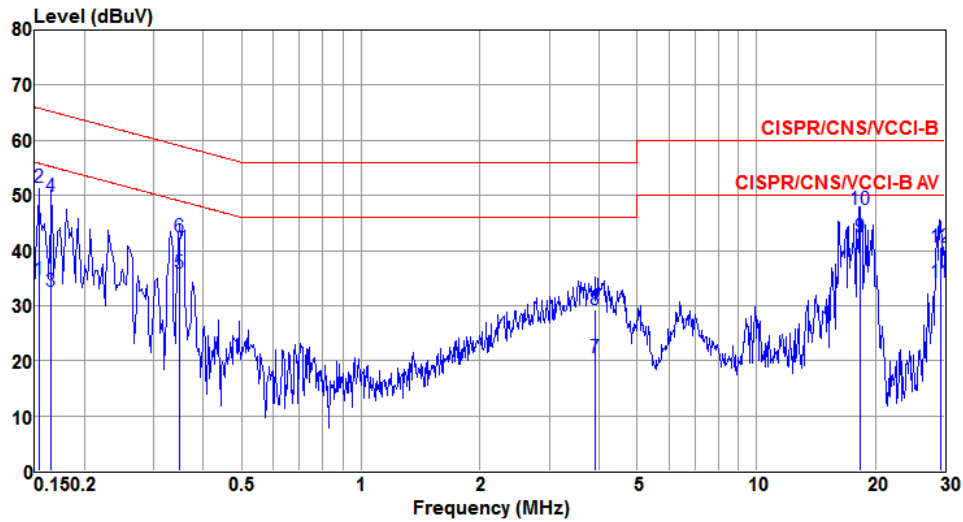
|             |      |                  |      |
|-------------|------|------------------|------|
| Modulation  | HT20 | Test Freq. (MHz) | 2437 |
| Power Phase | Line |                  |      |

|     | Freq   | Level | Limit | Over   | Read  | LISN   | cable |         |
|-----|--------|-------|-------|--------|-------|--------|-------|---------|
|     | MHz    | dBuV  | Line  | Limit  | Level | factor | loss  | Remark  |
|     |        |       | dBuV  | dB     | dBuV  | dB     | dB    |         |
| 1   | 0.150  | 32.96 | 56.00 | -23.04 | 32.72 | 0.07   | 0.05  | Average |
| 2   | 0.150  | 50.40 | 66.00 | -15.60 | 50.16 | 0.07   | 0.05  | QP      |
| 3   | 0.177  | 29.79 | 54.64 | -24.85 | 29.51 | 0.06   | 0.06  | Average |
| 4   | 0.177  | 47.48 | 64.64 | -17.16 | 47.20 | 0.06   | 0.06  | QP      |
| 5   | 0.350  | 33.82 | 48.96 | -15.14 | 33.43 | 0.06   | 0.08  | Average |
| 6   | 0.350  | 39.10 | 58.96 | -19.86 | 38.71 | 0.06   | 0.08  | QP      |
| 7   | 3.840  | 21.04 | 46.00 | -24.96 | 20.28 | 0.11   | 0.27  | Average |
| 8   | 3.840  | 31.52 | 56.00 | -24.48 | 30.76 | 0.11   | 0.27  | QP      |
| 9   | 18.296 | 29.97 | 50.00 | -20.03 | 28.58 | 0.23   | 0.59  | Average |
| 10* | 18.296 | 46.68 | 60.00 | -13.32 | 45.29 | 0.23   | 0.59  | QP      |
| 11  | 29.186 | 28.54 | 50.00 | -21.46 | 26.66 | 0.28   | 0.79  | Average |
| 12  | 29.186 | 38.76 | 60.00 | -21.24 | 36.88 | 0.28   | 0.79  | QP      |

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).  
 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

|             |         |                  |      |
|-------------|---------|------------------|------|
| Modulation  | HT20    | Test Freq. (MHz) | 2437 |
| Power Phase | Neutral |                  |      |



|    | Freq   | Level | Limit | Over   | Read  | LISN   | cable |         |
|----|--------|-------|-------|--------|-------|--------|-------|---------|
|    | MHz    | dBuV  | Line  | Limit  | Level | factor | loss  | Remark  |
|    |        |       | dBuV  | dB     | dBuV  | dB     | dB    |         |
| 1  | 0.154  | 34.78 | 55.78 | -21.00 | 34.57 | 0.05   | 0.05  | Average |
| 2  | 0.154  | 51.44 | 65.78 | -14.34 | 51.23 | 0.05   | 0.05  | QP      |
| 3  | 0.165  | 32.52 | 55.21 | -22.69 | 32.29 | 0.05   | 0.06  | Average |
| 4  | 0.165  | 49.85 | 65.21 | -15.36 | 49.62 | 0.05   | 0.06  | QP      |
| 5  | 0.348  | 35.97 | 49.00 | -13.03 | 35.72 | 0.05   | 0.08  | Average |
| 6  | 0.348  | 42.50 | 59.00 | -16.50 | 42.25 | 0.05   | 0.08  | QP      |
| 7  | 3.922  | 20.54 | 46.00 | -25.46 | 19.91 | 0.09   | 0.28  | Average |
| 8  | 3.922  | 29.20 | 56.00 | -26.80 | 28.57 | 0.09   | 0.28  | QP      |
| 9* | 18.300 | 42.53 | 50.00 | -7.47  | 41.27 | 0.25   | 0.59  | Average |
| 10 | 18.300 | 47.54 | 60.00 | -12.46 | 46.28 | 0.25   | 0.59  | QP      |
| 11 | 29.176 | 34.34 | 50.00 | -15.66 | 32.46 | 0.33   | 0.79  | Average |
| 12 | 29.176 | 40.66 | 60.00 | -19.34 | 38.78 | 0.33   | 0.79  | QP      |

Note 1: Level (dBUV) = Read Level (dBUV) + LISN Factor (dB) + Cable Loss (dB).  
 2: Over Limit (dB) = Level (dBUV) – Limit Line (dBUV).

## 3.2 Unwanted Emissions into Restricted Frequency Bands

### 3.2.1 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:**  
Quasi-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.

### 3.2.2 Test Procedures

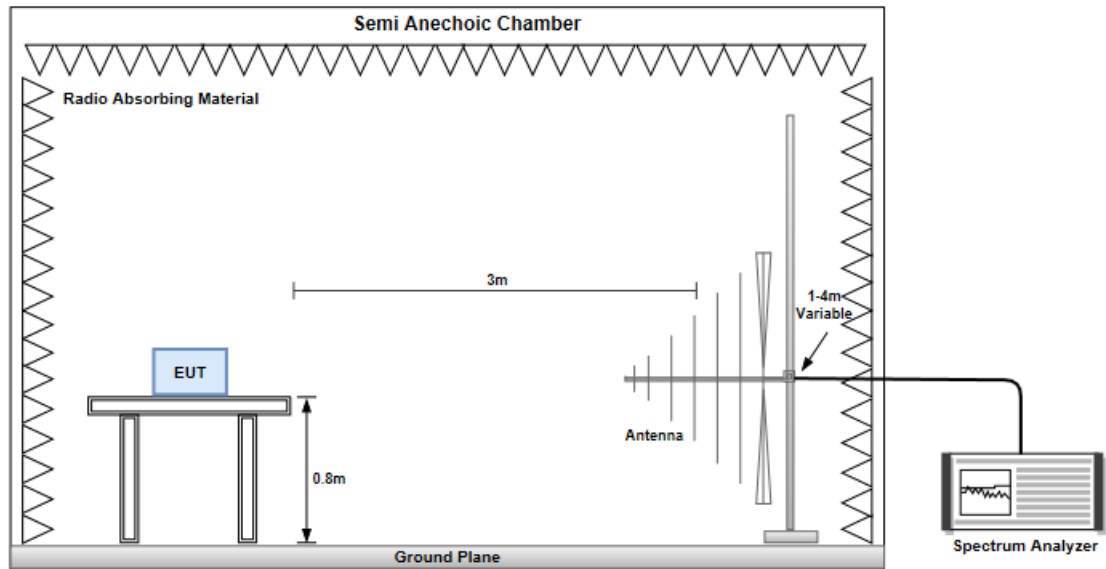
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

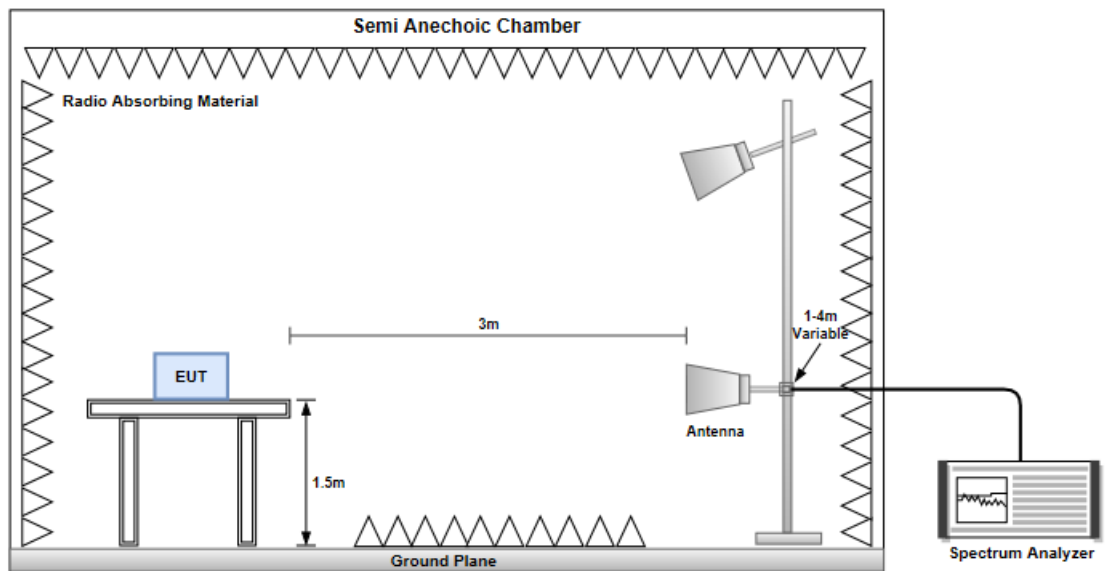
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

### 3.2.3 Test Setup

#### Radiated Emissions below 1 GHz

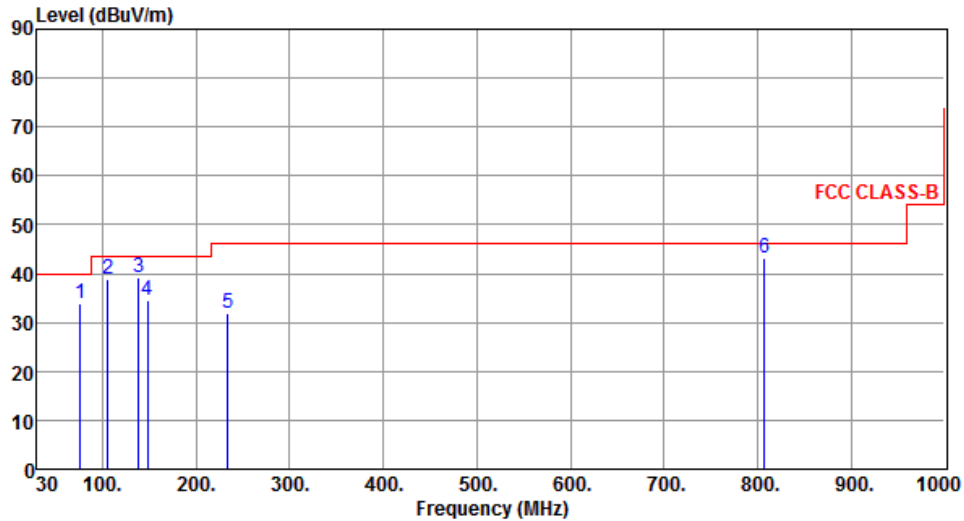


#### Radiated Emissions above 1 GHz



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

|              |            |                  |      |
|--------------|------------|------------------|------|
| Modulation   | HT20       | Test Freq. (MHz) | 2437 |
| Polarization | Horizontal |                  |      |

The graph displays the radiated unwanted emissions level in dBuV/m against frequency in MHz from 30 to 1000 MHz. A red line represents the FCC CLASS-B limit, which is 40 dBuV/m from 30 to 100 MHz, 45 dBuV/m from 100 to 200 MHz, and 50 dBuV/m from 200 to 1000 MHz. Six measured peaks are labeled with blue numbers 1 through 6. Peak 6 at 806.97 MHz is the highest, reaching 43.24 dBuV/m, which is 2.76 dB below the 46.00 dBuV/m limit at that frequency.

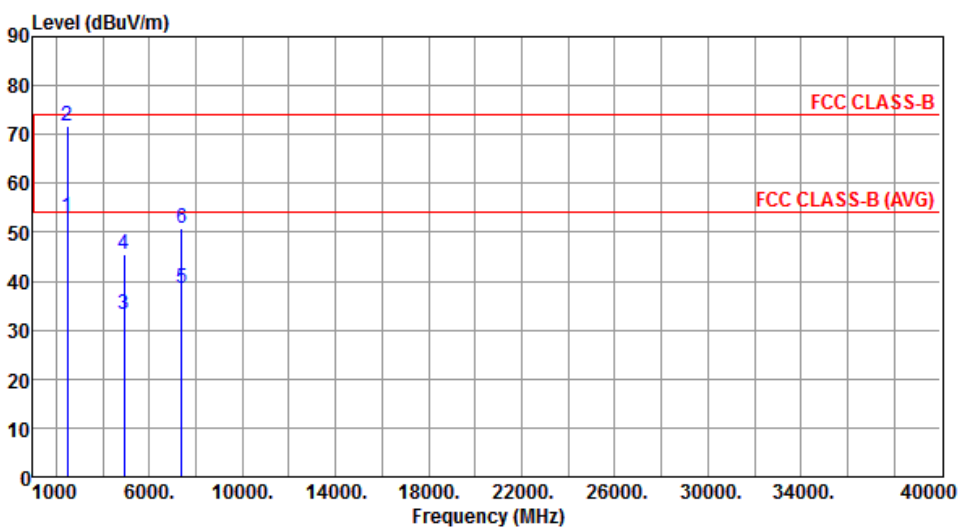
|   | Freq.<br>MHz | Emission<br>level<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | SA<br>reading<br>dBuV | Factor<br>dB | Remark | ANT<br>High<br>cm | Turn<br>Table<br>deg |
|---|--------------|-----------------------------|-----------------|--------------|-----------------------|--------------|--------|-------------------|----------------------|
| 1 | 76.56        | 33.88                       | 40.00           | -6.12        | 45.94                 | -12.06       | Peak   | ---               | ---                  |
| 2 | 105.66       | 38.96                       | 43.50           | -4.54        | 51.57                 | -12.61       | Peak   | ---               | ---                  |
| 3 | 138.64       | 39.10                       | 43.50           | -4.40        | 47.99                 | -8.89        | Peak   | ---               | ---                  |
| 4 | 148.34       | 34.53                       | 43.50           | -8.97        | 42.93                 | -8.40        | Peak   | ---               | ---                  |
| 5 | 233.70       | 32.00                       | 46.00           | -14.00       | 41.97                 | -9.97        | Peak   | ---               | ---                  |
| 6 | 806.97       | 43.24                       | 46.00           | -2.76        | 39.85                 | 3.39         | QP     | 100               | 203                  |

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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | HT20     | Test Freq. (MHz) | 2437   |        |         |          |        |        |       |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------|--------|--------|---------|----------|--------|--------|-------|--------|--------|-----|------|--|-----|-------|--------|----|---------|----|--|------|-------|--|--|--------|--|--|------|--|--|----|-----|---|-------|-------|-------|-------|-------|-------|----|-----|-----|---|-------|-------|-------|-------|-------|-------|----|-----|----|---|-------|-------|-------|-------|-------|-------|----|-----|-----|---|-------|-------|-------|-------|-------|--------|----|-----|-----|---|-------|-------|-------|-------|-------|--------|----|-----|-----|---|--------|-------|-------|-------|-------|--------|----|-----|-----|
| Polarization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Vertical |                  |        |        |         |          |        |        |       |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |
| <div><div><div>Level (dBuV/m)</div><div><div><div><div><div><div>90</div><div>80</div><div>70</div><div>60</div><div>50</div><div>40</div><div>30</div><div>20</div><div>10</div><div>0</div></div></div><div><div><div><div>1</div><div>23</div><div>4</div><div>5</div><div>6</div></div></div><div><div><div><div>30</div><div>100.</div><div>200.</div><div>300.</div><div>400.</div><div>500.</div><div>600.</div><div>700.</div><div>800.</div><div>900.</div><div>1000</div></div></div></div></div><div><div>Frequency (MHz)</div><div>FCC CLASS-B</div></div></div></div><table><tr><th></th><th>Freq.</th><th>Emission</th><th>Limit</th><th>Margin</th><th>SA</th><th>Factor</th><th>Remark</th><th>ANT</th><th>Turn</th></tr><tr><th></th><th>MHz</th><th>level</th><th>dBuV/m</th><th>dB</th><th>reading</th><th>dB</th><th></th><th>High</th><th>Table</th></tr><tr><th></th><th></th><th>dBuV/m</th><th></th><th></th><th>dBuV</th><th></th><th></th><th>cm</th><th>deg</th></tr><tr><td>1</td><td>38.52</td><td>38.02</td><td>40.00</td><td>-1.98</td><td>46.66</td><td>-8.64</td><td>QP</td><td>100</td><td>239</td></tr><tr><td>2</td><td>55.87</td><td>35.98</td><td>40.00</td><td>-4.02</td><td>44.41</td><td>-8.43</td><td>QP</td><td>100</td><td>25</td></tr><tr><td>3</td><td>66.82</td><td>36.67</td><td>40.00</td><td>-3.33</td><td>46.60</td><td>-9.93</td><td>QP</td><td>100</td><td>223</td></tr><tr><td>4</td><td>87.45</td><td>35.86</td><td>40.00</td><td>-4.14</td><td>49.92</td><td>-14.06</td><td>QP</td><td>100</td><td>295</td></tr><tr><td>5</td><td>98.12</td><td>40.55</td><td>43.50</td><td>-2.95</td><td>54.28</td><td>-13.73</td><td>QP</td><td>100</td><td>306</td></tr><tr><td>6</td><td>108.57</td><td>42.07</td><td>43.50</td><td>-1.43</td><td>54.16</td><td>-12.09</td><td>QP</td><td>100</td><td>316</td></tr></table><div><div>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)</div><div>*Factor includes antenna factor , cable loss and amplifier gain</div><div>Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</div><div>Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.</div></div></div></div></div> |          |                  |        |        | Freq.   | Emission | Limit  | Margin | SA    | Factor | Remark | ANT | Turn |  | MHz | level | dBuV/m | dB | reading | dB |  | High | Table |  |  | dBuV/m |  |  | dBuV |  |  | cm | deg | 1 | 38.52 | 38.02 | 40.00 | -1.98 | 46.66 | -8.64 | QP | 100 | 239 | 2 | 55.87 | 35.98 | 40.00 | -4.02 | 44.41 | -8.43 | QP | 100 | 25 | 3 | 66.82 | 36.67 | 40.00 | -3.33 | 46.60 | -9.93 | QP | 100 | 223 | 4 | 87.45 | 35.86 | 40.00 | -4.14 | 49.92 | -14.06 | QP | 100 | 295 | 5 | 98.12 | 40.55 | 43.50 | -2.95 | 54.28 | -13.73 | QP | 100 | 306 | 6 | 108.57 | 42.07 | 43.50 | -1.43 | 54.16 | -12.09 | QP | 100 | 316 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Freq.    | Emission         | Limit  | Margin | SA      | Factor   | Remark | ANT    | Turn  |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | MHz      | level            | dBuV/m | dB     | reading | dB       |        | High   | Table |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |          | dBuV/m           |        |        | dBuV    |          |        | cm     | deg   |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 38.52    | 38.02            | 40.00  | -1.98  | 46.66   | -8.64    | QP     | 100    | 239   |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 55.87    | 35.98            | 40.00  | -4.02  | 44.41   | -8.43    | QP     | 100    | 25    |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 66.82    | 36.67            | 40.00  | -3.33  | 46.60   | -9.93    | QP     | 100    | 223   |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 87.45    | 35.86            | 40.00  | -4.14  | 49.92   | -14.06   | QP     | 100    | 295   |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 98.12    | 40.55            | 43.50  | -2.95  | 54.28   | -13.73   | QP     | 100    | 306   |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 108.57   | 42.07            | 43.50  | -1.43  | 54.16   | -12.09   | QP     | 100    | 316   |        |        |     |      |  |     |       |        |    |         |    |  |      |       |  |  |        |  |  |      |  |  |    |     |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |       |    |     |    |   |       |       |       |       |       |       |    |     |     |   |       |       |       |       |       |        |    |     |     |   |       |       |       |       |       |        |    |     |     |   |        |       |       |       |       |        |    |     |     |

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

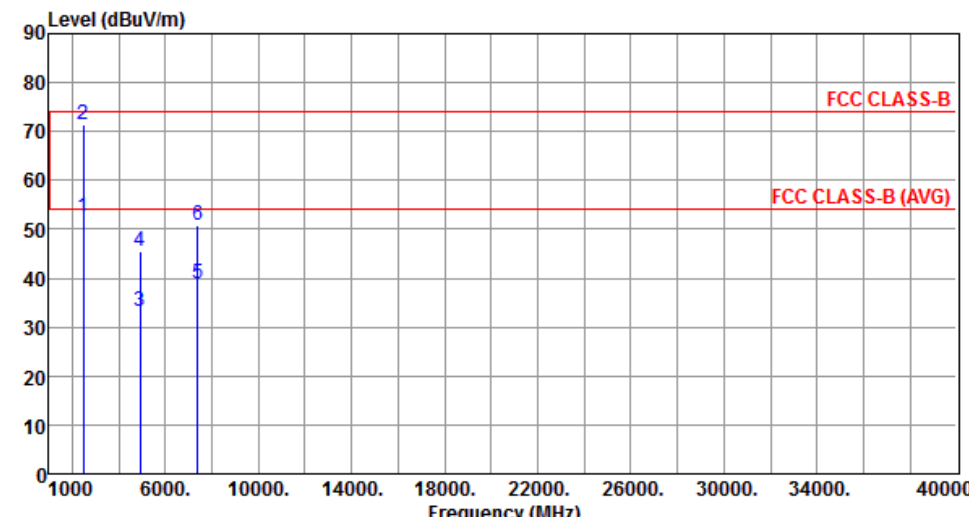
|              |            |                  |      |
|--------------|------------|------------------|------|
| Modulation   | HT20       | Test Freq. (MHz) | 2437 |
| Polarization | Horizontal |                  |      |

|   | 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 | 2483.50      | 52.97                       | 54.00           | -1.03        | 54.09                 | -1.12        | Average | 225               | 91                   |
| 2 | 2483.50      | 71.69                       | 74.00           | -2.31        | 72.81                 | -1.12        | Peak    | 225               | 91                   |
| 3 | 4924.00      | 33.13                       | 54.00           | -20.87       | 28.12                 | 5.01         | Average | 100               | 30                   |
| 4 | 4924.00      | 45.37                       | 74.00           | -28.63       | 40.36                 | 5.01         | Peak    | 100               | 30                   |
| 5 | 7386.00      | 38.60                       | 54.00           | -15.40       | 28.45                 | 10.15        | Average | 100               | 50                   |
| 6 | 7386.00      | 50.73                       | 74.00           | -23.27       | 40.58                 | 10.15        | Peak    | 100               | 50                   |

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).

|              |          |                  |      |
|--------------|----------|------------------|------|
| Modulation   | HT20     | Test Freq. (MHz) | 2437 |
| Polarization | Vertical |                  |      |

|   | 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 | 2483.50      | 52.51                       | 54.00           | -1.49        | 53.63                 | -1.12        | Average | 100               | 297                  |
| 2 | 2483.50      | 71.27                       | 74.00           | -2.73        | 72.39                 | -1.12        | Peak    | 100               | 297                  |
| 3 | 4924.00      | 33.25                       | 54.00           | -20.75       | 28.24                 | 5.01         | Average | 100               | 90                   |
| 4 | 4924.00      | 45.43                       | 74.00           | -28.57       | 40.42                 | 5.01         | Peak    | 100               | 90                   |
| 5 | 7386.00      | 38.80                       | 54.00           | -15.20       | 28.65                 | 10.15        | Average | 100               | 40                   |
| 6 | 7386.00      | 50.84                       | 74.00           | -23.16       | 40.69                 | 10.15        | 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>.

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