



# FCC Test Report

**Equipment** : 802.11ac Tri Band PoE Access Point  
**Brand Name** : LITE-ON, MOJO, WatchGuard  
**Model No.** : WP8333V1, C-110, AP225  
**FCC ID** : PPQ-WP8333V1  
**Standard** : 47 CFR FCC Part 15.247  
**Frequency** : 2400 MHz – 2483.5 MHz  
**Function** : ☒ Point-to-multipoint; ☐ Point-to-point  
**Applicant** : LITE-ON Technology Corp.  
Bldg. C, 90, Chien 1 Rd., Chung-Ho, New Taipei City,  
23585 Taiwan  
**Manufacturer** : Lite-On Network Communication (Dongguan) Limited  
30#Keji Rd., Yin Hu Industrial Area, Qingxi  
Town, DongGuan City, Guangdong, China

The product sample received on Apr. 17, 2017 and completely tested on Aug. 14, 2017. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

  
Cliff Chang  
SPORTON INTERNATIONAL INC.





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## Summary of Test Result

| Conformance Test Specifications |                  |                                         |                                 |          |
|---------------------------------|------------------|-----------------------------------------|---------------------------------|----------|
| Report Clause                   | Ref. Std. Clause | Description                             | Limit                           | Result   |
| 1.1.2                           | 15.203           | Antenna Requirement                     | FCC 15.203                      | Complied |
| 3.1                             | 15.247(d)        | Emissions in Restricted Frequency Bands | Restricted Bands:<br>FCC 15.209 | Complied |



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FCC ID: PPQ-WP8333V1

# 1 General Description

## 1.1 Information

### 1.1.1 RF General Information

| Frequency Range (MHz) | Bluetooth Mode | Ch. Frequency (MHz) | Channel Number |
|-----------------------|----------------|---------------------|----------------|
| 2400-2483.5           | LE             | 2402-2480           | 0-39 [40]      |

| Band          | Mode  | BWch (MHz) | Nant |
|---------------|-------|------------|------|
| 2.4-2.4835GHz | BT-LE | 1          | 1TX  |

**Note:**

- ♦ Bluetooth LE uses a GFSK (1Mbps) modulation for DSSS.
- ♦ BWch is the channel separation
- ♦ Nss-Min is the minimum number of spatial streams.
- ♦ Nant is the number of outputs. e.g., 2(2, 3) means have 2 outputs for port 2 and port 3. 2 means have 2 outputs for port 1 and port 2.

**1.1.2 Antenna Information**

| Ant. | Brand Holder                    | Model Name   | Antenna Type | Connector | Radio |
|------|---------------------------------|--------------|--------------|-----------|-------|
| 1    | Master Wave Technology CO., LTD | 98P7NPIPF000 | PCB Antenna  | I-PEX     | R1    |
| 2    | Master Wave Technology CO., LTD | 98P7NPIPF001 | PCB Antenna  | I-PEX     | R1    |
| 3    | Master Wave Technology CO., LTD | 98P7PUIPF000 | PCB Antenna  | I-PEX     | R2    |
| 4    | Master Wave Technology CO., LTD | 98P7QUIPF000 | PCB Antenna  | I-PEX     | R2    |
| 5    | Master Wave Technology CO., LTD | 98P7RPIPF000 | PCB Antenna  | I-PEX     | R3    |
| 6    | Master Wave Technology CO., LTD | 98P7RPIPF001 | PCB Antenna  | I-PEX     | R3    |
| 7    | Master Wave Technology CO., LTD | 98P7SMIPF000 | PCB Antenna  | I-PEX     | R4    |

| Ant. | Gain (dBi) |       |       |         |       |         |       |       |       |       |         |
|------|------------|-------|-------|---------|-------|---------|-------|-------|-------|-------|---------|
|      | Radio 1    |       |       | Radio 2 |       | Radio 3 |       |       |       |       | Radio 4 |
|      | 2.4G       | 5G B1 | 5G B4 | 5G B1   | 5G B4 | 2.4G    | 5G B1 | 5G B2 | 5G B3 | 5G B4 | BT      |
| 1    | 6.3        | 4.3   | 5.3   | -       | -     | -       | -     | -     | -     | -     | -       |
| 2    | 6.5        | 4.9   | 6.1   | -       | -     | -       | -     | -     | -     | -     | -       |
| 3    | -          | -     | -     | 5.6     | 5.9   | -       | -     | -     | -     | -     | -       |
| 4    | -          | -     | -     | 5.6     | 4.6   | -       | -     | -     | -     | -     | -       |
| 5    | -          | -     | -     | -       | -     | 6.5     | 4.7   | 4.7   | 5.6   | 6.0   | -       |
| 6    | -          | -     | -     | -       | -     | 6.5     | 4.8   | 5.4   | 5.8   | 5.5   | -       |
| 7    | -          | -     | -     | -       | -     | -       | -     | -     | -     | -     | 2.1     |

Note1: The EUT has seven antennas.

Note2: The EUT contain Radio 3 (2.4G)/(5G) RF module (Model Name: WM862FEMD)

FCC ID: PPQ-WM862FEMD)

**Radio 1**

**For 2.4GHz and 5GHz (For Band 1, Band 4) function**

**IEEE 802.11a/b/g/n/ac mode (2TX/2RX):**

Ant. 1 (port 1) and Ant. 2 (port 2) could transmit/receive simultaneously.

**Radio 2**

**For 5GHz function (For Band 1, Band 4)**

**IEEE 802.11a/n/ac mode (2TX/2RX):**

Ant. 3 (port 1) and Ant. 4 (port 2) could transmit/receive simultaneously.

**Radio 3**

**For 2.4GHz and 5GHz function (For Band 1~Band 4)**

**IEEE 802.11a/b/g/n/ac mode (2TX/2RX):**

Ant. 5 (port 1) and Ant. 6 (port 2) could transmit/receive simultaneously.

**Radio 4**
**For Bluetooth function / Bluetooth mode (1TX/1RX):**

Only Ant. 7 (port 1) can be used as transmitting/receiving antenna.

**1.1.3 EUT Operational Condition**

|                       |                           |
|-----------------------|---------------------------|
| <b>EUT Power Type</b> | From Power Adapter or PoE |
|-----------------------|---------------------------|

**1.1.4 Table for Multiple Listing**

The brand/model names in the following table are all refer to the identical product.

| Brand Name | Model Name   | Description                                                                                                |
|------------|--------------|------------------------------------------------------------------------------------------------------------|
| LITE-ON    | WP8333V1     | All the models are identical, the difference model name for difference brand served as marketing strategy. |
| MOJO       | C-110        |                                                                                                            |
| WatchGuard | AP225, C-110 |                                                                                                            |

From the above models, model: WP8333V1 was selected as representative model for the test and its data was recorded in this report.

**1.1.5 Table for Explanation of Flash**

| EUT No. | Brand name | Model name        | Flash   |
|---------|------------|-------------------|---------|
| 1       | winbond    | 25Q256JVFQ        | 32M+32M |
| 2       | MXIC       | MX25L51245GMI-08G | 64M     |

**1.1.6 Table for Class II Change**

This product is an extension of original one reported under Sporton project number: FR741722AD

Below is the table for the change of the product with respect to the original one.

| Modifications                                                                     | Performance Checking                                                 |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------|
| 1. Changing the location of the EUT radio 2 antenna.                              | 1. Unwanted Emissions below 1GHz<br>2. Radiated Emission Co-location |
| 2. Removing the EUT copper foil.                                                  | Unwanted Emissions below 1GHz                                        |
| 3. Adding the brand name WatchGuard and collocation two model name: AP225, C-110. | Do not effect the test results                                       |

## 1.2 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ◆ 47 CFR FCC Part 15
- ◆ ANSI C63.10-2013
- ◆ FCC KDB 558074 D01 v04

## 1.3 Testing Location Information

| Testing Location                    |        |                                                                                                                               |
|-------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/>            | HWA YA | ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.<br>TEL : 886-3-327-3456 FAX : 886-3-318-0055   |
| <input checked="" type="checkbox"/> | JHUBEI | ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.<br>TEL : 886-3-656-9065 FAX : 886-3-656-9085 |

| Test Condition | Test Site No. | Test Engineer | Test Environment | Test Date     |
|----------------|---------------|---------------|------------------|---------------|
| Radiated       | 03CH01-CB     | Mars Lin      | 22°C / 54%       | Aug. 14, 2017 |

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

## 1.4 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))

| Test Items                           | Uncertainty | Remark                   |
|--------------------------------------|-------------|--------------------------|
| Radiated Emission (30MHz ~ 1,000MHz) | 3.6 dB      | Confidence levels of 95% |
| Radiated Emission (1GHz ~ 18GHz)     | 3.7 dB      | Confidence levels of 95% |
| Radiated Emission (18GHz ~ 40GHz)    | 3.5 dB      | Confidence levels of 95% |

## 2 Test Configuration of EUT

### 2.1 Test Channel Mode

| Mode           | Power Setting |
|----------------|---------------|
| BT-LE_Nss1_1TX | -             |
| 2402MHz        | 8             |
| 2440MHz        | 8             |
| 2480MHz        | 8             |

### 2.2 The Worst Case Measurement Configuration

| The Worst Case Mode for Following Conformance Tests |                                                                                                                                                                                                                                                     |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Tests Item</b>                                   | Emissions in Restricted Frequency Bands                                                                                                                                                                                                             |
| <b>Test Condition</b>                               | Radiated measurement<br>If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type. |
| <b>Operating Mode &lt; 1GHz</b>                     | Normal Link<br>The test mode were performed according the worst case of original test report.                                                                                                                                                       |
| 1                                                   | EUT 1 in Y axis - R1 (2.4G) + R2 (5G) + R3 (2.4G) + R4 (BT) + PoE                                                                                                                                                                                   |

| The Worst Case Mode for Following Conformance Tests                           |                                                                    |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------|
| <b>Tests Item</b>                                                             | Simultaneous Transmission Analysis - Radiated Emission Co-location |
| <b>Test Condition</b>                                                         | Radiated measurement                                               |
| <b>Operating Mode</b>                                                         | Normal Link                                                        |
| 1                                                                             | EUT 2 - R1 (2.4G) + R2 (5G) + R3 (2.4G) + R4 (BT)                  |
| 2                                                                             | EUT 2 - R1 (2.4G) + R2 (5G) + R3 (5G) + R4 (BT)                    |
| 3                                                                             | EUT 2 - R1 (5G) + R2 (5G) + R3 (2.4G) + R4 (BT)                    |
| 4                                                                             | EUT 2 - R1 (5G) + R2 (5G) + R3 (5G) + R4 (BT)                      |
| For operating mode 4 is the worst case and it was record in this test report. |                                                                    |
| Refer to Appendix B for Radiated Emission Co-location.                        |                                                                    |

| The Worst Case Mode for Following Conformance Tests                                   |                                                                         |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| <b>Tests Item</b>                                                                     | Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation |
| <b>Operating Mode</b>                                                                 |                                                                         |
| 1                                                                                     | EUT 2 - R1 (2.4G) + R2 (5G) + R3 (2.4G) + R4 (BT)                       |
| 2                                                                                     | EUT 2 - R1 (2.4G) + R2 (5G) + R3 (5G) + R4 (BT)                         |
| 3                                                                                     | EUT 2 - R1 (5G) + R2 (5G) + R3 (2.4G) + R4 (BT)                         |
| 4                                                                                     | EUT 2 - R1 (5G) + R2 (5G) + R3 (5G) + R4 (BT)                           |
| Refer to Sporton Test Report No.: FA741722-03 for Co-location RF Exposure Evaluation. |                                                                         |

Note: The PoE and Adapter were for measurement only, would not be marketed.

The PoE and Adapter information as below:

| Support Unit | Brand  | Model Number  |
|--------------|--------|---------------|
| PoE          | Ruckus | 740-64214-001 |
| Adapter      | APD    | WB-18D12FU    |

## 2.3 EUT Operation during Test

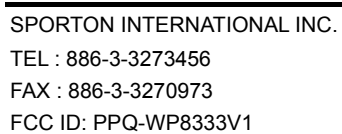
The EUT was programmed to be in continuously transmitting mode.

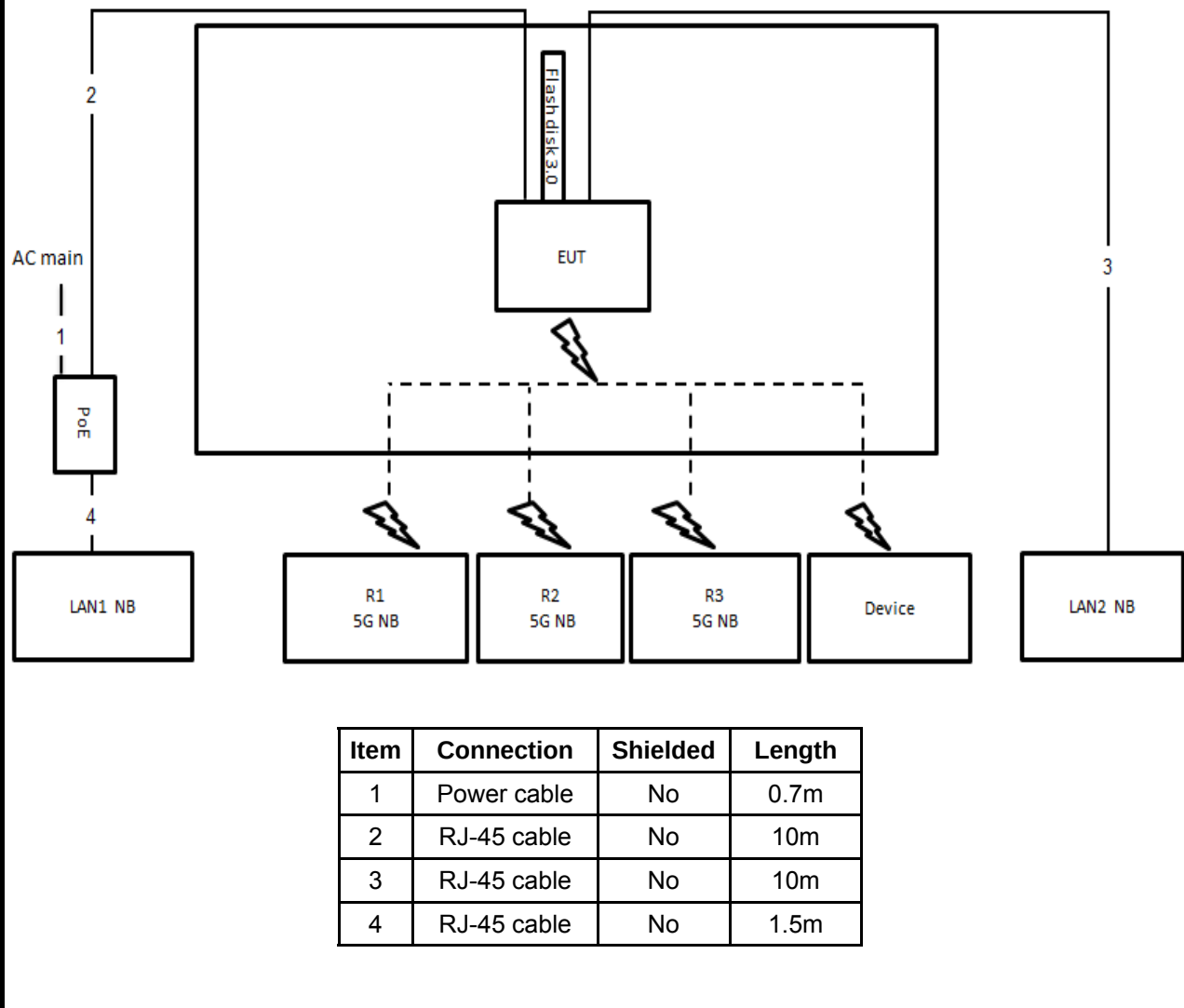
## 2.4 Accessories

N/A

## 2.5 Support Equipment

| Support Equipment |               |               |               |              |
|-------------------|---------------|---------------|---------------|--------------|
| No.               | Equipment     | Brand Name    | Model Name    | FCC ID       |
| 1                 | NB*5          | DELL          | E4300         | DoC          |
| 2                 | Device        | LITE-ON       | WP8333V1      | PPQ-WP8333V1 |
| 3                 | Flash disk3.0 | Silicon Power | B06           | DoC          |
| 4                 | PoE           | Ruckus        | 740-64214-001 | DoC          |



**Test Setup Diagram - Radiated Test > 1GHz**


### 3 Transmitter Test Result

#### 3.1 Emissions in Restricted Frequency Bands

##### 3.1.1 Emissions in Restricted Frequency Bands Limit

| 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: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB / decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

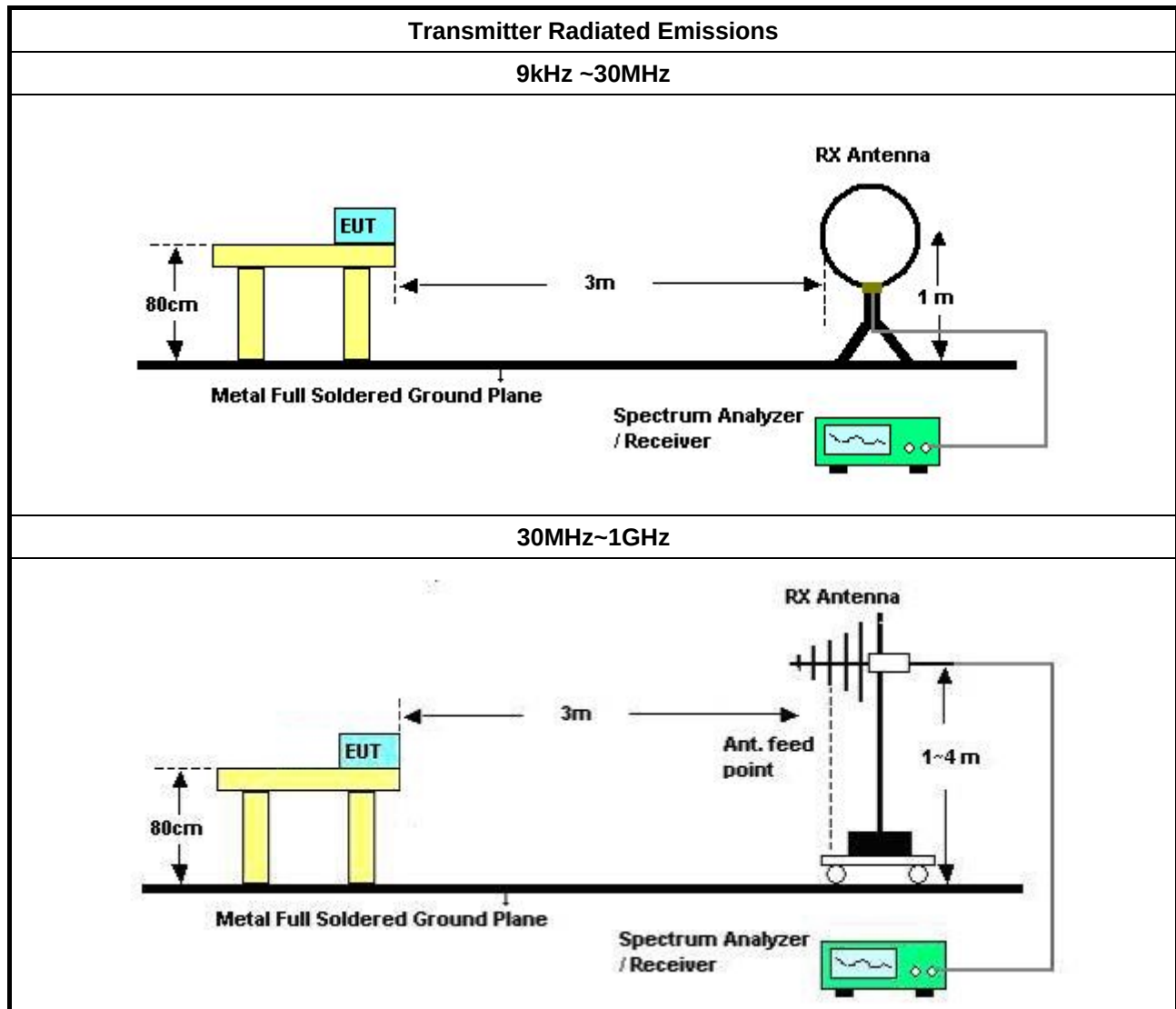
##### 3.1.2 Measuring Instruments

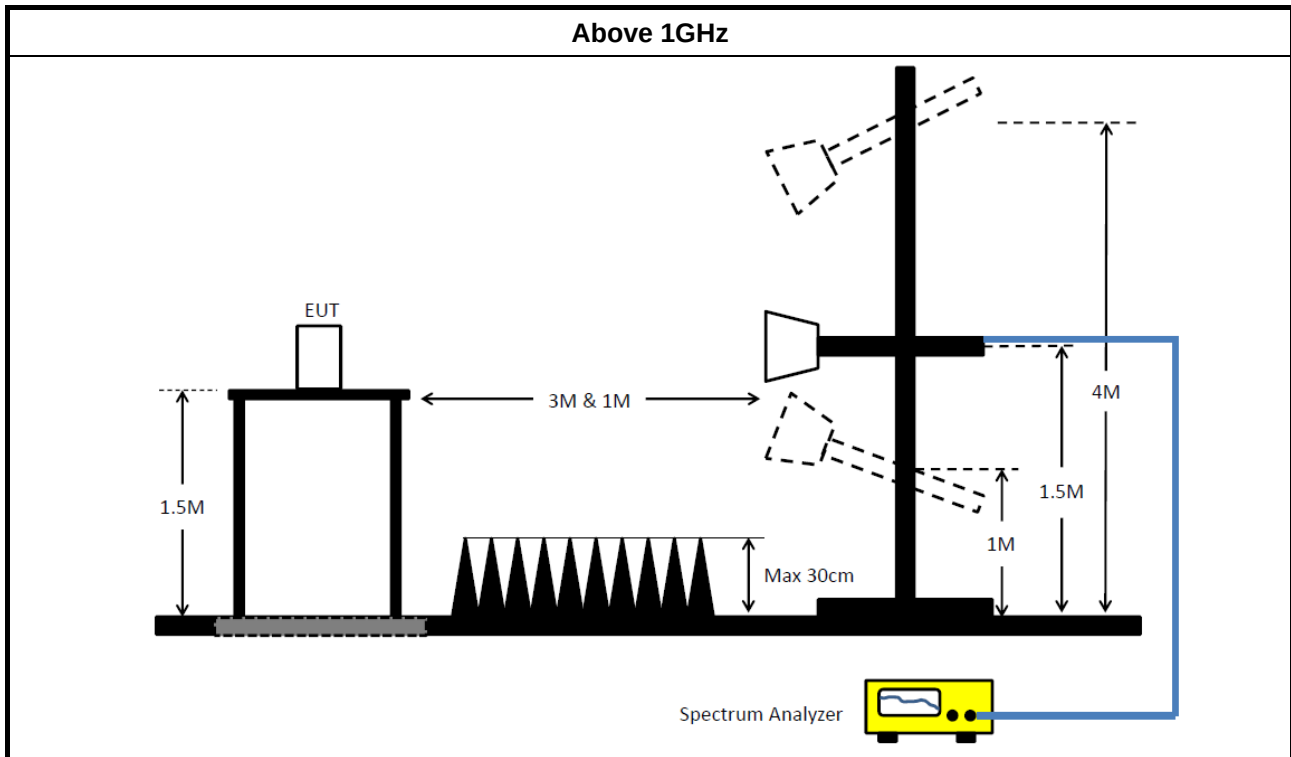
Refer a test equipment and calibration data table in this test report.

### 3.1.3 Test Procedures

| Test Method                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>The average emission levels shall be measured in [duty cycle <math>\geq 98</math> or duty factor].</li> </ul>                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                |
| <ul style="list-style-type: none"> <li>Refer as ANSI C63.10, clause 6.9.2.2 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                |
| <ul style="list-style-type: none"> <li>For the transmitter unwanted emissions shall be measured using following options below:</li> </ul>                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.</li> </ul>                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                              | <input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$ )                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                              | <input type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                              | <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW $\geq 1/T$ ).                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                              | <input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW $\geq 1/T$ , where T is pulse time.                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                              | <input type="checkbox"/> Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                              | <input checked="" type="checkbox"/> Refer as FCC KDB 558074, clause 12.2.4 measurement procedure peak limit.                                                                                                                                                                                                                                                                                   |
| <ul style="list-style-type: none"> <li>For the transmitter band-edge emissions shall be measured using following options below:</li> </ul>                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Refer as FCC KDB 558074 clause 13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.</li> </ul>                                                                                                                            |
|                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Refer as FCC KDB 558074, clause 13.2 (ANSI C63.10, clause 6.9.3) for marker-delta method for band-edge measurements.</li> </ul>                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Refer as FCC KDB 558074, clause 13.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).</li> </ul>                                                                                                                                                                                          |
| <ul style="list-style-type: none"> <li>For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2.</li> </ul>                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below:<br/>(1) Measure and sum the spectra across the outputs or<br/>(2) Measure and add <math>10 \log(N)</math> dB</li> </ul>                                                                             |
|                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.</li> </ul> |

### 3.1.4 Test Setup





### 3.1.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

### 3.1.6 Transmitter Radiated Unwanted Emissions

Refer as Appendix A

## 4 Test Equipment and Calibration Data

| Instrument                        | Manufacturer | Model No.         | Serial No.       | Characteristics | Calibration Date | Calibration Due Date | Remark                |
|-----------------------------------|--------------|-------------------|------------------|-----------------|------------------|----------------------|-----------------------|
| Loop Antenna                      | Teseq        | HLA 6120          | 24155            | 9kHz - 30 MHz   | Mar. 16, 2016*   | Mar. 15, 2018*       | Radiation (03CH01-CB) |
| BILOG ANTENNA with 6dB Attenuator | TESEQ & EMCi | CBL6112D & N-6-06 | 37880 & AT-N0609 | 20MHz ~ 2GHz    | Aug. 30, 2016    | Aug. 29, 2017        | Radiation (03CH01-CB) |
| Horn Antenna                      | EMCO         | 3115              | 00075790         | 750MHz~18GHz    | Nov. 10, 2016    | Nov. 09, 2017        | Radiation (03CH01-CB) |
| Horn Antenna                      | Schwarzbeck  | BBHA 9170         | BBHA9170252      | 15GHz ~ 40GHz   | Jul. 05, 2017    | Jul. 04, 2018        | Radiation (03CH01-CB) |
| Pre-Amplifier                     | EMCI         | EMC330N           | 980332           | 20MHz ~ 3GHz    | May 02, 2017     | May 01, 2018         | Radiation (03CH01-CB) |
| Pre-Amplifier                     | Agilent      | 8449B             | 3008A02310       | 1GHz ~ 26.5GHz  | Jan. 16, 2017    | Jan. 15, 2018        | Radiation (03CH01-CB) |
| Pre-Amplifier                     | MITEQ        | TTA1840-35-HG     | 1864479          | 18GHz ~ 40GHz   | Jul. 10, 2017    | Jul. 09, 2018        | Radiation (03CH01-CB) |
| Spectrum Analyzer                 | R&S          | FSP40             | 100056           | 9kHz ~ 40GHz    | Nov. 22, 2016    | Nov. 21, 2017        | Radiation (03CH01-CB) |
| EMI Test                          | R&S          | ESCS              | 100355           | 9kHz ~ 2.75GHz  | May 06, 2017     | May 05, 2018         | Radiation (03CH01-CB) |
| RF Cable-low                      | Woken        | Low Cable-16+17   | N/A              | 30 MHz ~ 1 GHz  | Oct. 24, 2016    | Oct. 23, 2017        | Radiation (03CH01-CB) |
| RF Cable-high                     | Woken        | High Cable-16     | N/A              | 1 GHz ~ 18 GHz  | Oct. 24, 2016    | Oct. 23, 2017        | Radiation (03CH01-CB) |
| RF Cable-high                     | Woken        | High Cable-16+17  | N/A              | 1 GHz ~ 18 GHz  | Oct. 24, 2016    | Oct. 23, 2017        | Radiation (03CH01-CB) |
| RF Cable-high                     | Woken        | High Cable-40G#1  | N/A              | 18GHz ~ 40 GHz  | Oct. 24, 2016    | Oct. 23, 2017        | Radiation (03CH01-CB) |
| RF Cable-high                     | Woken        | High Cable-40G#2  | N/A              | 18GHz ~ 40 GHz  | Oct. 24, 2016    | Oct. 23, 2017        | Radiation (03CH01-CB) |
| Test Software                     | Audix        | E3                | 6.2009-I0-7      | N/A             | N/A              | N/A                  | Radiation (03CH01-CB) |

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

\*Calibration Interval of instruments listed above is two year.

