



# FCC/ IC TEST REPORT

According to

## CFR47 §15.247/ RSS-247 Issue 1

|              |   |                                              |
|--------------|---|----------------------------------------------|
| Applicant    | : | Qualcomm Atheros, Inc.                       |
| Address      | : | 1700 Technology Drive, San Jose, CA 95110    |
| Manufacturer | : | Qualcomm Atheros, Inc.                       |
| Address      | : | 1700 Technology Drive, San Jose, CA 95110    |
| Equipment    | : | 802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card |
| Brand        | : | Qualcomm Atheros                             |
| Model No.    | : | QCNFA344A                                    |
| FCC ID       | : | PPD-QCNFA344AH                               |
| IC ID        | : | 4104A-QCNFA344A                              |

- The test result refers exclusively to the test presented test model / sample.
- Without written approval of **Cerpass Technology (Suzhou) Co., Ltd.** the test report shall not be reproduced except in full.

I HEREBY CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.10 – 2013** and the energy emitted by this equipment was **passed**.

**CISPR PUB. 22 and FCC Part 15** in both radiated and conducted emission class B limits. Testing was carried out on Apr.06,2017~ Apr.15,2017 at **Cerpass Technology (Suzhou) Co., Ltd.**

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Laboratory Accreditation:

Cerpass Technology Corporation Test Laboratory



|                 |          |
|-----------------|----------|
| NVLAP LAB Code: | 200954-0 |
| TAF LAB Code:   | 1439     |



Cerpass Technology (SuZhou) Co., Ltd.

|                 |          |
|-----------------|----------|
| NVLAP LAB Code: | 200814-0 |
| CNAS LAB Code:  | L5515    |



## Release History

| Attachment No. | Version | Date       | Description     |
|----------------|---------|------------|-----------------|
| SEDJ1703329    | Rev 01  | 2017-04-20 | Initial release |
|                |         |            |                 |
|                |         |            |                 |



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## 1. Report of Measurements and Examinations

### 1.1 List of Measurements and Examinations

| Performed Test Item            | Normative References                                                                                           | Test Performed | Deviation | Result |
|--------------------------------|----------------------------------------------------------------------------------------------------------------|----------------|-----------|--------|
| Radiated Emission              | FCC CFR Title 47 Part 15 Subpart C: 2014<br>Section 15.209<br>RSS-Gen Issue 4 November 2014<br>Section 6.13    | Yes            | No        | Pass   |
| Radiated Emission<br>Band Edge | FCC CFR Title 47 Part 15 Subpart C: 2014<br>15.247(d)<br>RSS-247 Issue 1 May 2015<br>Section 5.5               | Yes            | No        | Pass   |
| Output Power                   | FCC CFR Title 47 Part 15 Subpart C: 2014<br>Section 15.247(b)(3)<br>RSS-247 Issue 1 May 2015<br>Section 5.1(2) | Yes            | No        | Pass   |



## 2. Test Configuration of Equipment under Test

### 2.1 Feature of Equipment under Test

|                       |                         |
|-----------------------|-------------------------|
| BT Specification      | BT 4.0                  |
| BT Frequency          | 2402~2480MHz            |
| BT Channel Number     | 40                      |
| BT Channel Separation | 2MHz                    |
| BT Type of Modulation | GFSK                    |
| BT Data Rate          | 1Mbps(GFSK)             |
| Channel Control       | Auto                    |
| Antenna Type          | See antenna requirement |

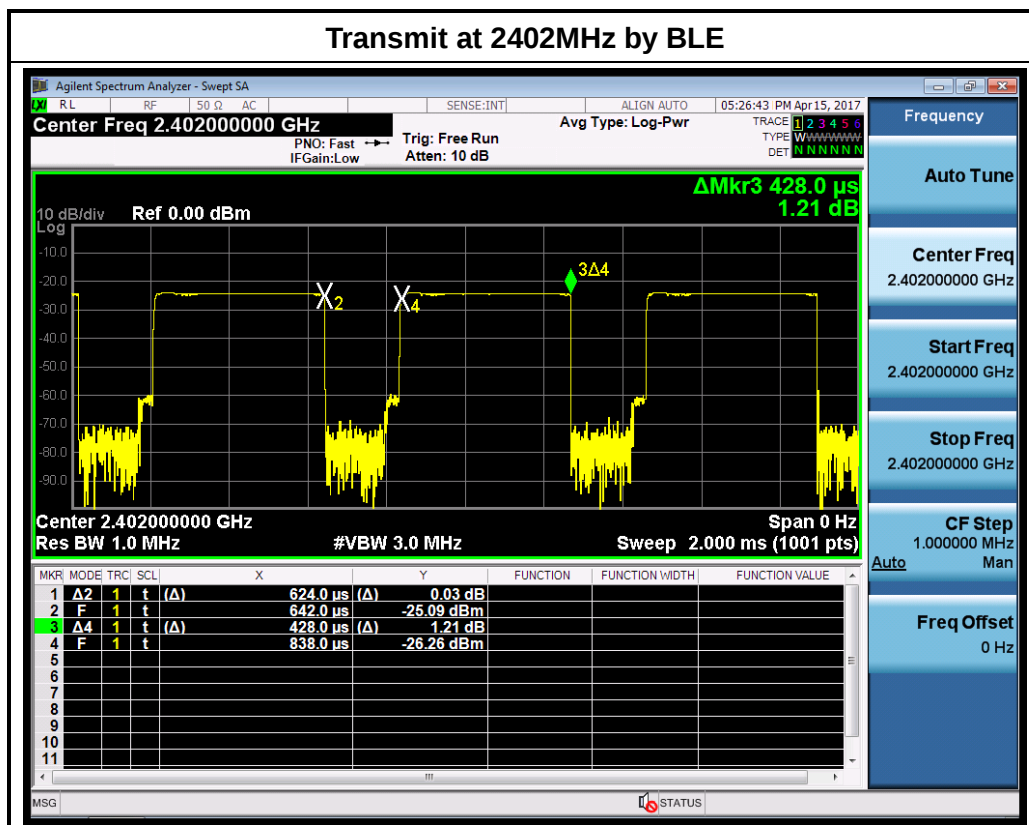
Host Details,

| Host Manufacture | Host Type         | Host Model                                                                                  |
|------------------|-------------------|---------------------------------------------------------------------------------------------|
| Lenovo           | Notebook Computer | Lenovo ideapad 720S-13IKB,<br>Lenovo ideapad 720S Touch-13IKB,<br>Lenovo ideapad 720S-13ARR |



## 2.2 Duty Cycle

| Test Mode | Frequency<br>(MHz) | Duty Cycle |
|-----------|--------------------|------------|
| BLE       | 2402               | 68.59%     |





## 2.3 Carrier Frequency of Channels

| Bluetooth Working Frequency of Each Channel: (For BLE) |           |         |           |         |           |         |           |
|--------------------------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                                                | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 00                                                     | 2402 MHz  | 01      | 2404 MHz  | 02      | 2406 MHz  | 03      | 2408 MHz  |
| 04                                                     | 2410 MHz  | 05      | 2412 MHz  | 06      | 2414 MHz  | 07      | 2416 MHz  |
| 08                                                     | 2418 MHz  | 09      | 2420 MHz  | 10      | 2422 MHz  | 11      | 2424 MHz  |
| 12                                                     | 2426 MHz  | 13      | 2428 MHz  | 14      | 2430 MHz  | 15      | 2432 MHz  |
| 16                                                     | 2434 MHz  | 17      | 2436 MHz  | 18      | 2438 MHz  | 19      | 2440 MHz  |
| 20                                                     | 2442 MHz  | 21      | 2444 MHz  | 22      | 2446 MHz  | 23      | 2448 MHz  |
| 24                                                     | 2450 MHz  | 25      | 2452 MHz  | 26      | 2454 MHz  | 27      | 2456 MHz  |
| 28                                                     | 2458 MHz  | 29      | 2460 MHz  | 30      | 2462 MHz  | 31      | 2464 MHz  |
| 32                                                     | 2466 MHz  | 33      | 2468 MHz  | 34      | 2470 MHz  | 35      | 2472 MHz  |
| 36                                                     | 2474 MHz  | 37      | 2476 MHz  | 38      | 2478 MHz  | 39      | 2480 MHz  |

## 2.4 Test Manner

| Test Manner |                                                                                                       |
|-------------|-------------------------------------------------------------------------------------------------------|
| 1           | During testing, the interface cables and equipment positions were varied according to RSS-247 Issue 1 |
| 2           | Adjust the EUT at the test mode and the test channel. Then test.                                      |
| Test mode   |                                                                                                       |
| 1           | Transmit by 802.11BLE                                                                                 |

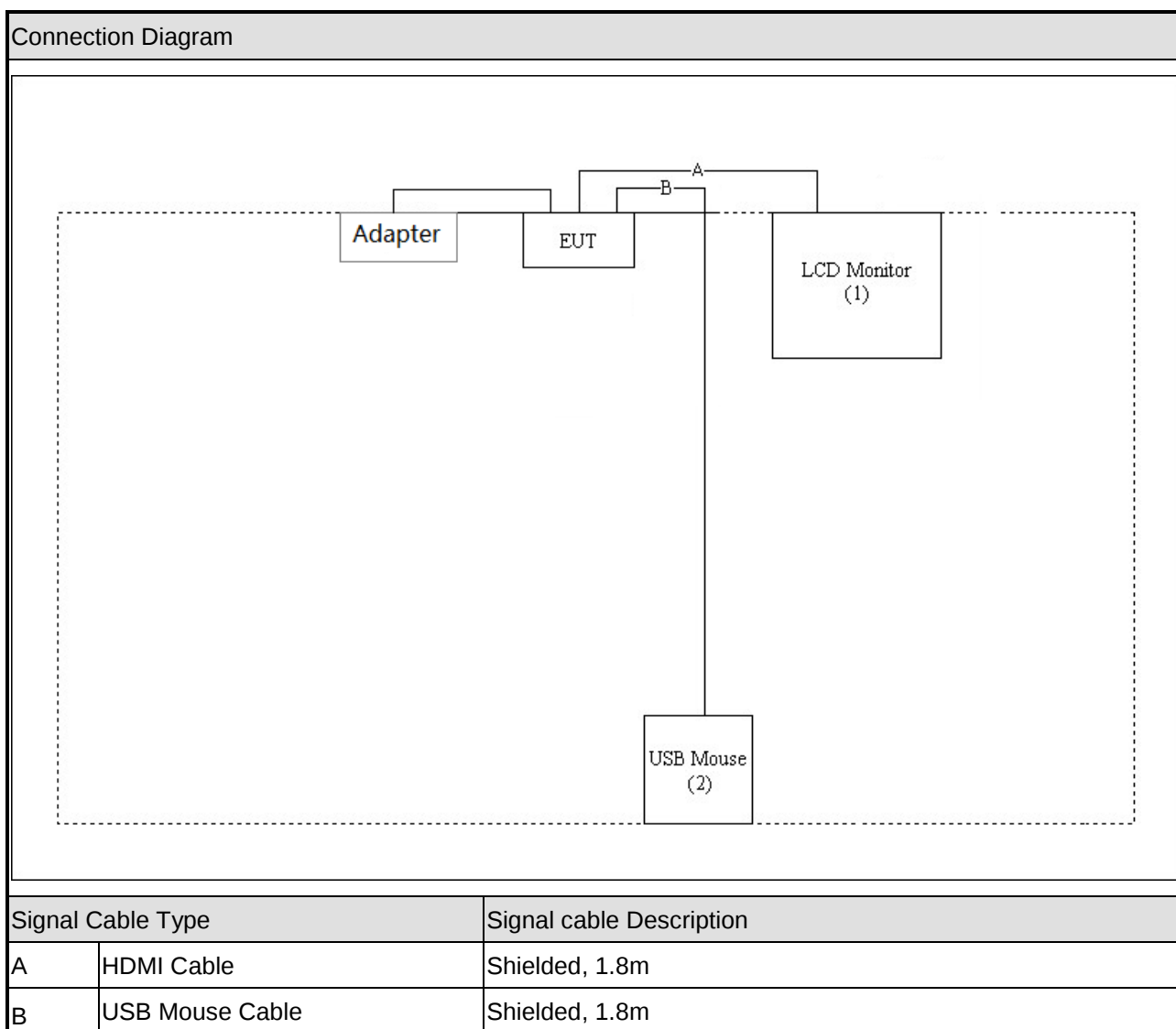


## 2.5 Description of Test System

| Product |             | Manufacturer | Model No. | Power Cord         |
|---------|-------------|--------------|-----------|--------------------|
| 1       | LCD Monitor | DELL         | U2713HMt  | Non-Shielded, 1.8m |
| 2       | USB Mouse   | LENOVO       | M-U0025-O | Power by Notebook  |



## 2.6 Configuration of Tested System





## 2.7 General Information of Test

|                           |                                                                      |
|---------------------------|----------------------------------------------------------------------|
| Test Site:                | Cerpass Technology Corp.                                             |
| Performand Location :     | No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China |
| NVLAP LAB Code :          | 200814-0                                                             |
| FCC Registration Number : | 916572, 331395                                                       |
| IC Registration Number :  | 7290A-1, 7290A-2                                                     |

## 2.8 Measurement Uncertainty

| Measurement Item          | Measurement Frequency | Polarization | Uncertainty   |
|---------------------------|-----------------------|--------------|---------------|
| Radiated Emission         | 30 MHz ~ 40GHz        | Vertical     | $\pm 4.11$ dB |
|                           |                       | Horizontal   | $\pm 4.10$ dB |
| Maximum Peak Output Power | ---                   | ---          | $\pm 1.4$ dB  |

## 2.9 Measuring Equipment

| RF Conducted Measuring Equipment-AC104 |              |           |            |                  |             |
|----------------------------------------|--------------|-----------|------------|------------------|-------------|
| Instrument/Ancillary                   | Manufacturer | Model No. | Serial No. | Calibration Date | Valid Date. |
| Peak Power Sensor                      | Booton       | 55006     | 9778       | 2016.06.08       | 2017.06.07  |
| Series Power Meter                     | ANRITSU      | ML2495A   | 1224005    | 2017.03.27       | 2018.03.26  |
| Spectrum Analyzer                      | N9010A       | Agilent   | MY53400169 | 2016.11.11       | 2017.11.11  |
| Spectrum Analyzer                      | E4407B       | Agilent   | MY44211883 | 2016.10.15       | 2017.10.14  |
| Temperature/Humidity Meter             | Zhicheng     | ZC1-11    | CEP-TH-003 | 2017.03.31       | 2018.03.30  |



| Radiated Measuring Equipment-AC102 |               |            |            |                  |             |
|------------------------------------|---------------|------------|------------|------------------|-------------|
| Instrument/Ancillary               | Manufacturer  | Model No.  | Serial No. | Calibration Date | Valid Date. |
| Loop Antenna                       | R&S           | HFH2-Z2    | 100150     | 2017.08.31       | 2018.08.30  |
| Bilog Antenna                      | Sunol Science | JB1        | A072414-1  | 2016.04.16       | 2017.04.15  |
| Broad-Band Horn Antenna            | Schwarzbeck   | BBHA9120D  | 9120D-619  | 2016.07.16       | 2017.07.15  |
| Broad-Band Horn Antenna            | Schwarzbeck   | BBHA9170   | 9170-348   | 2016.05.07       | 2017.05.06  |
| Preamplifier                       | HP            | 8447F      | 3113A05582 | 2017.03.26       | 2018.03.25  |
| Preamplifier                       | EMCI          | EMC-051835 | 980085     | 2016.09.06       | 2017.09.05  |
| Preamplifier                       | COM-POWER     | PA-840     | 711885     | 2017.03.26       | 2018.03.25  |
| EMI Test Receiver                  | R&S           | ESCI-3     | 101183     | 2016.06.29       | 2017.06.28  |
| Spectrum Analyzer                  | N9010A        | Agilent    | MY53400169 | 2016.11.11       | 2017.11.11  |
| Spectrum Analyzer                  | R&S           | FS040      | 100324     | 2017.03.26       | 2018.03.25  |
| Temperature/<br>Humidity Meter     | Zhicheng      | ZC1-11     | CEP-TH-002 | 2017.03.31       | 2018.03.30  |



### 3. Antenna Requirements

#### 3.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

#### 3.2 Antenna Construction and Directional Gain

| Antenna       | Manufacturer | Ant Type | Ant Part number | Peak Gain                                                                                                                              |
|---------------|--------------|----------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Main(chain 1) | Amphenol     | PIFA     | AM149000C10     | -2.45dBi for 2.40~2.50GHz band<br>-1.57dBi for 5.15~5.35GHz band<br>-2.69dBi for 5.47~5.725GHz band<br>-1.68dBi for 5.725~5.85GHz band |
| Aux(chain 0)  |              |          | AM149000C10     | -1.32dBi for 2.40~2.50GHz band<br>-0.79dBi for 5.15~5.35GHz band<br>-1.14dBi for 5.47~5.725GHz band<br>-1.14dBi for 5.725~5.85GHz band |
| Main(chain 1) | LUXSHARE-ICT | PIFA     | AM149000C00     | -3.65dBi for 2.40~2.50GHz band<br>-1.23dBi for 5.15~5.35GHz band<br>-0.75dBi for 5.47~5.725GHz band<br>-2.22dBi for 5.725~5.85GHz band |
| Aux(chain 0)  |              |          | AM149000C00     | 0.70dBi for 2.40~2.50GHz band<br>-0.94dBi for 5.15~5.35GHz band<br>-1.18dBi for 5.47~5.725GHz band<br>-1.18dBi for 5.725~5.85GHz band  |

Note: The EUT will collocation two kinds of antenna, we choose one of the high peak gain antenna for all RF testing.



## 4. Test of Radiated Emission

### 4.1 Test Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

| FREQUENCIES(MHz) | FIELD STRENGTH<br>(microvolts/meter) | MEASUREMENT<br>DISTANCE(meters) |
|------------------|--------------------------------------|---------------------------------|
| 0.009~0.490      | 2400/F(kHz)                          | 300                             |
| 0.490~1.705      | 24000/F(kHz)                         | 30                              |
| 1.705~30.0       | 30                                   | 30                              |
| 30~88            | 100                                  | 3                               |
| 88~216           | 150                                  | 3                               |
| 216~960          | 200                                  | 3                               |
| Above 960        | 500                                  | 3                               |

### 4.2 Test Procedures

KDB 558074 D01v04 - Section 12.0 & Section 12.1

### 4.3 Test Setting

#### Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = 120 kHz
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

#### Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

#### Average Measurements above 1GHz

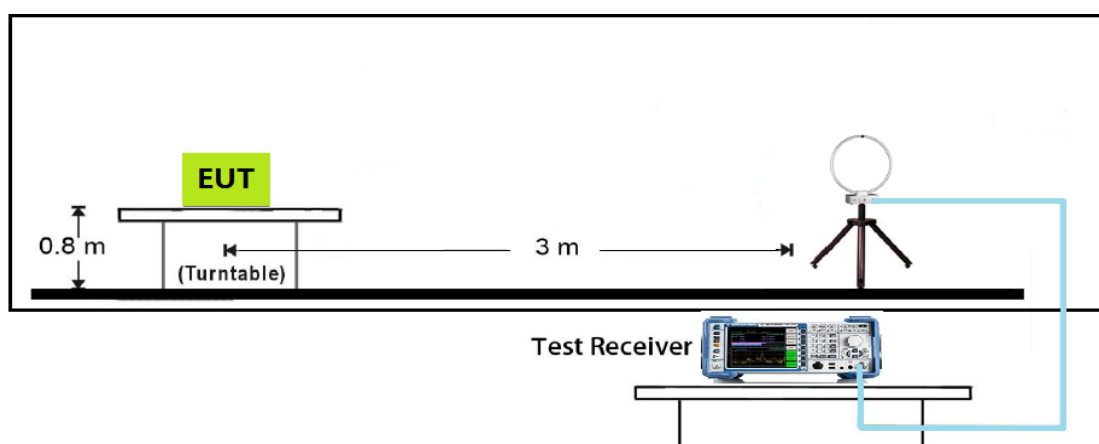


### 7.8.3. Average Field Strength Measurements

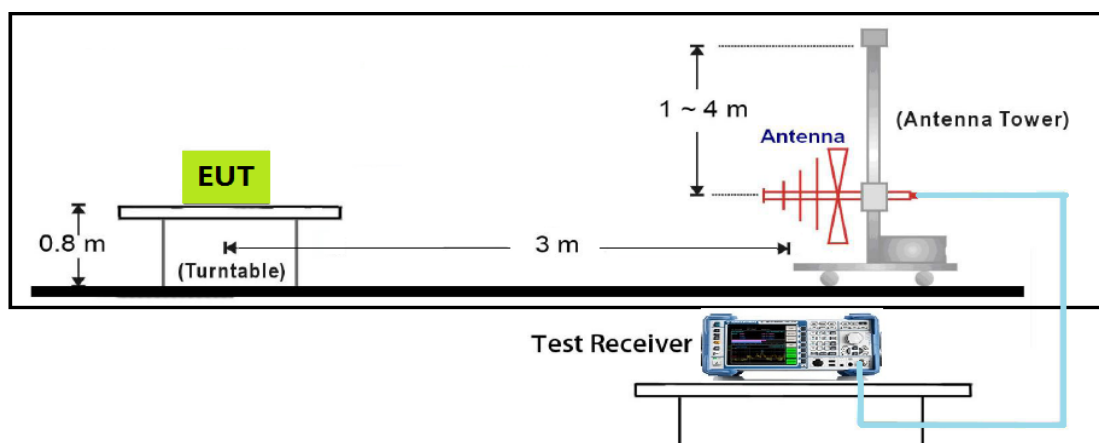
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW  $\geq 1/T$
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

## 4.4 Typical Test Setup

9kHz~30MHz Test Setup

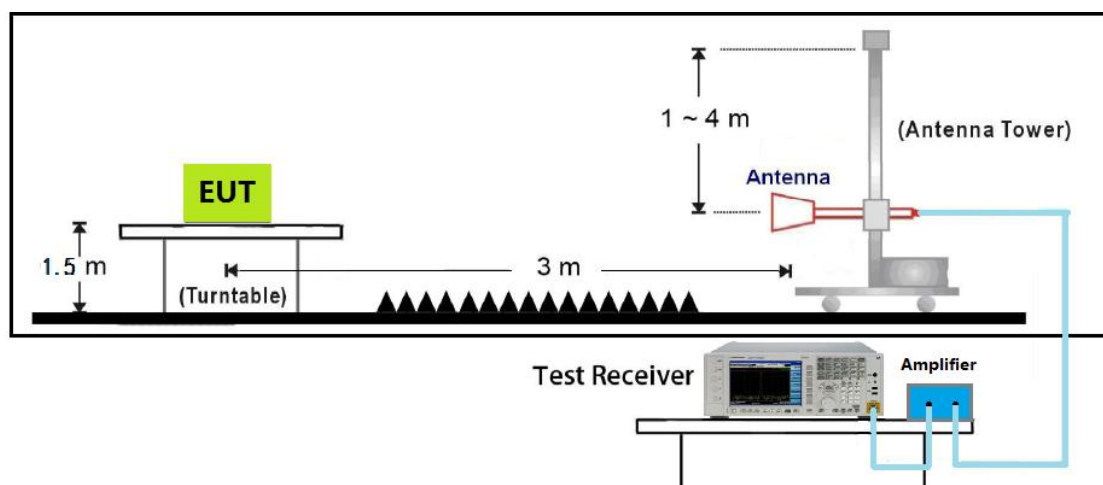


Below 1GHz Test Setup

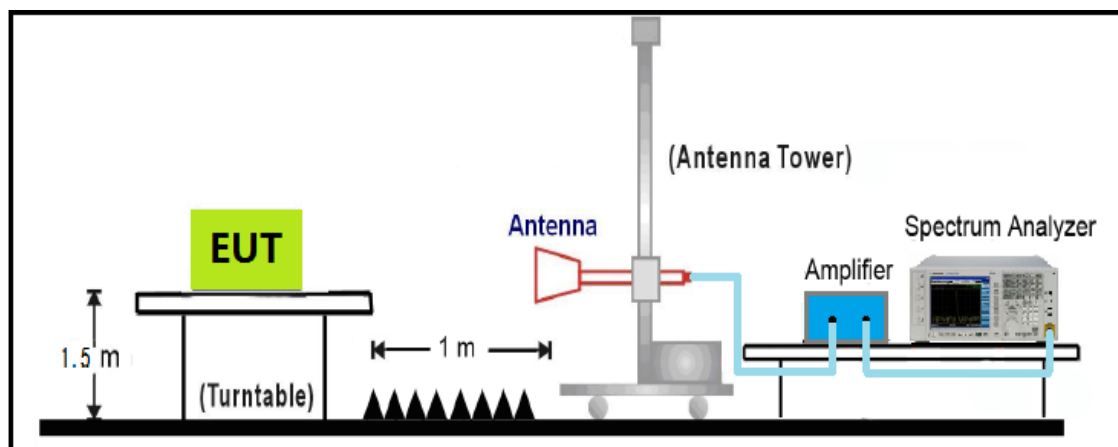




1GHz~18GHz Test Setup



18GHz~40GHz Test Setup





#### 4.5 Test Result and Data

The worst case of Radiated Emission below 1GHz:

|                            |                              |
|----------------------------|------------------------------|
| Engineer :Ternence         | Site : EMC Lab AC 102        |
| Limit : FCC_CLASS_B_03M_QP | Margin : 6                   |
| EUT : Notebook computer    | Probe : VERTICAL/ HORIZONTAL |
| Power : AC 120V/60Hz       | Note : Normal Link           |

| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. | AntPol. H/V |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|------|-------------|
| 1   | 155.1297        | -12.57        | 34.87          | 22.30          | 43.50          | -21.20      | QP   | H           |
| 2   | 201.6896        | -12.41        | 34.73          | 22.32          | 43.50          | -21.18      | QP   | H           |
| 3   | 346.2200        | -6.66         | 31.25          | 24.59          | 46.00          | -21.41      | QP   | H           |
| 4   | 428.6700        | -4.20         | 31.76          | 27.56          | 46.00          | -18.44      | QP   | H           |
| 5   | 622.6698        | -1.41         | 32.55          | 31.14          | 46.00          | -14.86      | QP   | H           |
| 6   | 667.2898        | -1.94         | 34.16          | 32.22          | 46.00          | -13.78      | QP   | H           |

| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. | AntPol. H/V |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|------|-------------|
| 1   | 202.6596        | -12.40        | 33.70          | 21.30          | 43.50          | -22.20      | QP   | V           |
| 2   | 416.0600        | -3.76         | 27.73          | 23.97          | 46.00          | -22.03      | QP   | V           |
| 3   | 511.1200        | -4.63         | 32.16          | 27.53          | 46.00          | -18.47      | QP   | V           |
| 4   | 695.4198        | 0.70          | 29.30          | 30.00          | 46.00          | -16.00      | QP   | V           |
| 5   | 709.9699        | 1.26          | 28.79          | 30.05          | 46.00          | -15.95      | QP   | V           |
| 6   | 860.3200        | 1.93          | 30.49          | 32.42          | 46.00          | -13.58      | QP   | V           |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



## Above 1G:

|                       |                                |
|-----------------------|--------------------------------|
| Engineer : Ternence   | Site : EMC Lab AC 102          |
| Limit : FCC_15_03M_PK | Margin : 6                     |
| EUT : QCNFA344A       | Probe : VERTICAL/ HORIZONTAL   |
| Power : AC 120V/60Hz  | Note : Transmit BLE at 2402MHz |

| No. | Frequency<br>(MHz) | Factor<br>(dB/m) | Reading<br>(dBuV) | Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Det. | AntPol.<br>H/V |
|-----|--------------------|------------------|-------------------|-------------------|-------------------|----------------|------|----------------|
| 1   | 4804.000           | -3.89            | 46.92             | 43.03             | 54(Note 2)        | -10.97         | peak | H              |
| 2   | 7206.000           | 0.54             | 45.34             | 45.88             | 54(Note 2)        | -8.12          | peak | H              |
| 3   | 4804.000           | -3.89            | 46.94             | 43.05             | 54(Note 2)        | -10.95         | peak | V              |
| 4   | 7206.000           | 0.54             | 45.53             | 46.07             | 54(Note 2)        | -7.93          | peak | V              |

Note 1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

3: Measurement Level = Reading Level + Correct Factor



|                       |                                |
|-----------------------|--------------------------------|
| Engineer : Ternence   | Site : EMC Lab AC 102          |
| Limit : FCC_15_03M_PK | Margin : 6                     |
| EUT : QCNFA344A       | Probe : VERTICAL/ HORIZONTAL   |
| Power : AC 120V/60Hz  | Note : Transmit BLE at 2440MHz |

| No. | Frequency<br>(MHz) | Factor<br>(dB/m) | Reading<br>(dBuV) | Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Det. | AntPol.<br>H/V |
|-----|--------------------|------------------|-------------------|-------------------|-------------------|----------------|------|----------------|
| 1   | 4880.000           | -3.84            | 46.90             | 43.06             | 54(Note 2)        | -10.94         | peak | H              |
| 2   | 7320.000           | 0.81             | 44.54             | 45.35             | 54(Note 2)        | -8.65          | peak | H              |
| 3   | 4880.000           | -3.84            | 46.48             | 42.64             | 54(Note 2)        | -11.36         | peak | V              |
| 4   | 7320.000           | 0.81             | 44.39             | 45.20             | 54(Note 2)        | -8.80          | peak | V              |

Note 1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

3: Measurement Level = Reading Level + Correct Factor



|                       |                                |
|-----------------------|--------------------------------|
| Engineer : Ternence   | Site : EMC Lab AC 102          |
| Limit : FCC_15_03M_PK | Margin : 6                     |
| EUT : QCNFA344A       | Probe : VERTICAL/ HORIZONTAL   |
| Power : AC 120V/60Hz  | Note : Transmit BLE at 2480MHz |

| No. | Frequency<br>(MHz) | Factor<br>(dB/m) | Reading<br>(dBuV) | Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Det. | AntPol.<br>H/V |
|-----|--------------------|------------------|-------------------|-------------------|-------------------|----------------|------|----------------|
| 1   | 4960.000           | -3.79            | 46.35             | 42.56             | 54(Note 2)        | -11.44         | peak | H              |
| 2   | 7440.000           | 1.10             | 44.43             | 45.53             | 54(Note 2)        | -8.47          | peak | H              |
| 3   | 4960.000           | -3.79            | 46.80             | 43.01             | 54(Note 2)        | -10.99         | peak | V              |
| 4   | 7440.000           | 1.10             | 44.60             | 45.70             | 54(Note 2)        | -8.30          | peak | V              |

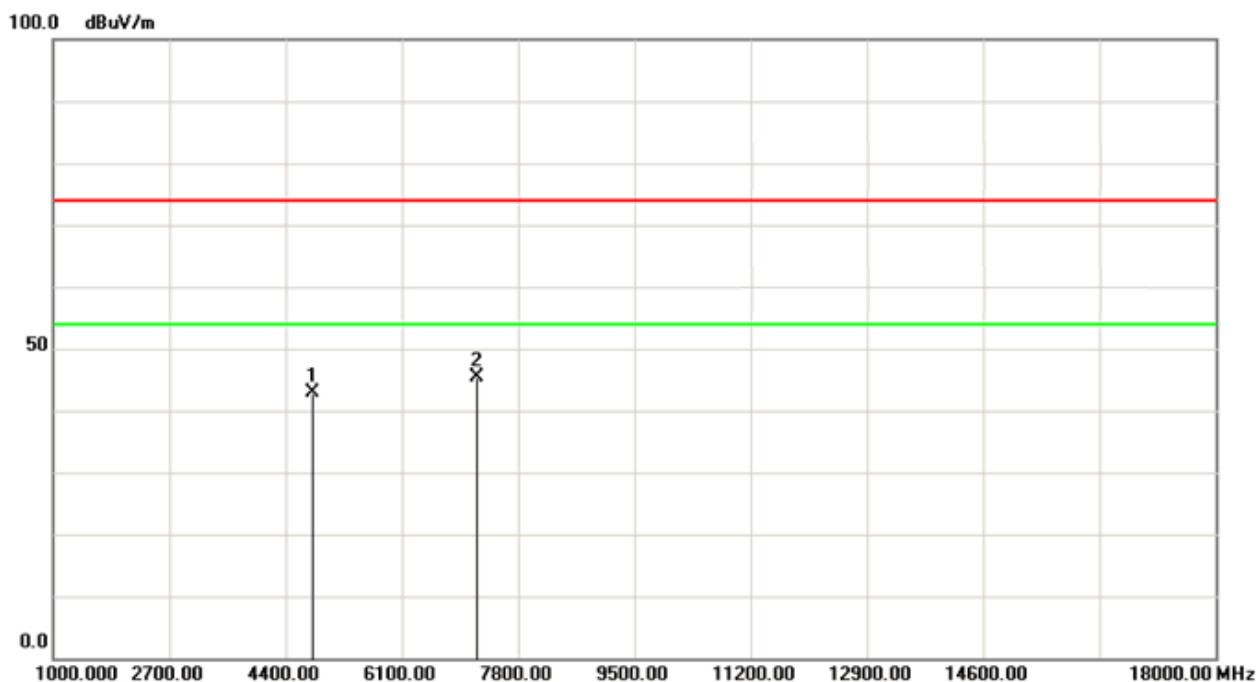
Note 1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

3: Measurement Level = Reading Level + Correct Factor

**The worst case of Radiated Emission 1~18GHz:**

|                                         |                      |
|-----------------------------------------|----------------------|
| Site: AC102                             | Time: 2017/04/09     |
| Limit: FCC_15_03M_PK                    | Margin: 0            |
| Probe: BBHA9120D_1-18GHz                | Polarity: Horizontal |
| EUT: QCNFA344A                          | Power: AC 120V/60Hz  |
| Note: Mode : Transmits at 2402Hz by BLE |                      |



| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. | AntPol. H/V |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|------|-------------|
| 1   | 4804.000        | -3.89         | 46.92          | 43.03          | 54(Note 2)     | -10.97      | peak | H           |
| 2   | 7206.000        | 0.54          | 45.34          | 45.88          | 54(Note 2)     | -8.12       | peak | H           |

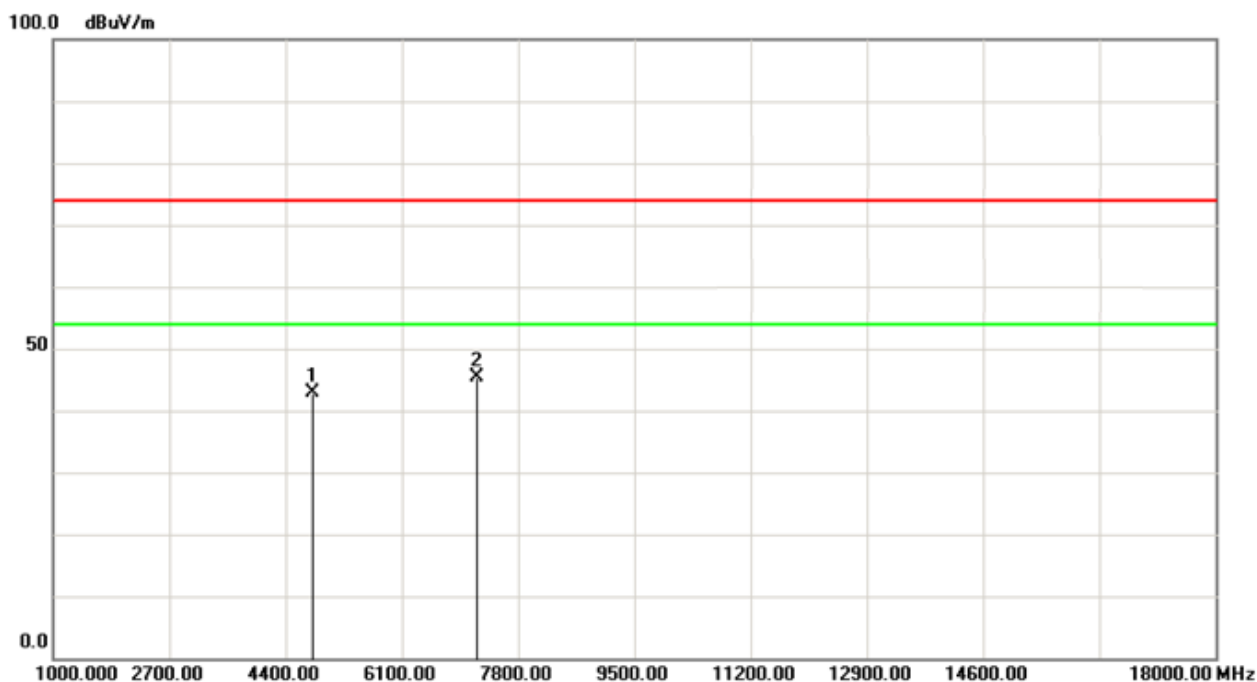
Note 1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

3: Measurement Level = Reading Level + Correct Factor



|                                         |                     |
|-----------------------------------------|---------------------|
| Site: AC102                             | Time: 2017/04/09    |
| Limit: FCC_15_03M_PK                    | Margin: 0           |
| Probe: BBHA9120D_1-18GHz                | Polarity: Vertical  |
| EUT: QCNFA344A                          | Power: AC 120V/60Hz |
| Note: Mode : Transmits at 2402Hz by BLE |                     |



| No. | Frequency (MHz) | Factor (dB/m) | Reading (dBuV) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Det. | AntPol. H/V |
|-----|-----------------|---------------|----------------|----------------|----------------|-------------|------|-------------|
| 1   | 4804.000        | -3.89         | 46.94          | 43.05          | 54(Note 2)     | -10.95      | peak | V           |
| 2   | 7206.000        | 0.54          | 45.53          | 46.07          | 54(Note 2)     | -7.93       | peak | V           |

Note 1: The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

3: Measurement Level = Reading Level + Correct Factor



## 5. Maximum Output Power

### 5.1 Test Limit

The maximum power shall be less 1Watt (30dBm).

The conducted output power limits specified in §15.247(b) are based on the use of transmit antennae with directional gains that do not exceed 6 dBi. If transmit antennae with an effective directional gain greater than 6 dBi are used, then the conducted output power from the EUT shall be reduced as specified in §15.247(b) and (c).

Per RSS247 Issue 1 Section 5.4(4), for DTSSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum conducted output power shall not exceed 1W.

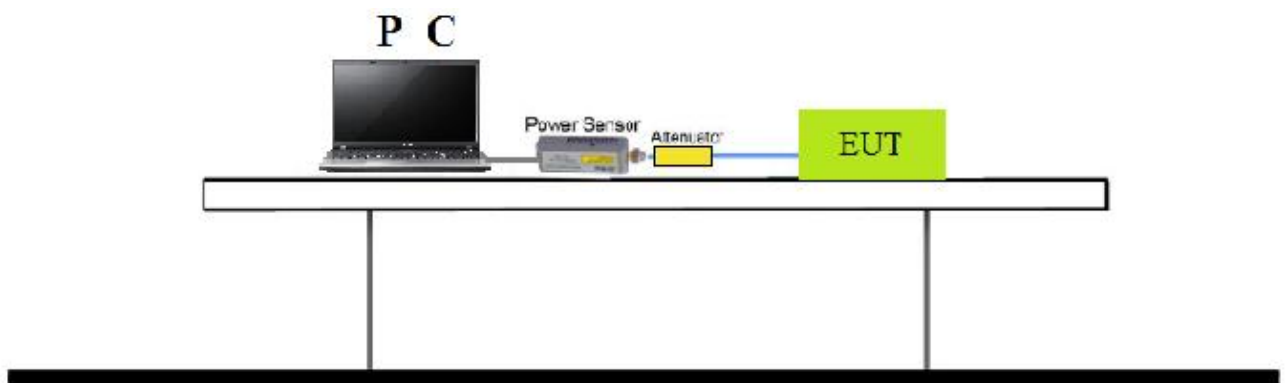
### 5.2 Test Procedure

The EUT was tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements.

The maximum conducted AVG output power using KDB 558074 D01v04 - Section 9.2.3.2 AVGPM-G Average Power Method.

The Maximum peak conducted output power using KDB 558074 D01v04 - Section 9.1.1 RBW  $\geq$  DTS bandwidth Method.

### 5.3 Test Setup Layout





## 5.4 Test Result and Data

|           |                      |
|-----------|----------------------|
| Test Item | Maximum Output Power |
| Test Mode | Transmit by BLE      |
| Test Date | 2017-04-12           |

### For Peak Power

| Channel No. | Frequency (MHz) | Peak Power (mW) | Peak Power (dBm) | Required Limit (dBm) | Result |
|-------------|-----------------|-----------------|------------------|----------------------|--------|
| 00          | 2402            | 2.4             | 3.7              | 30                   | Pass   |
| 19          | 2440            | 2.6             | 4.1              | 30                   | Pass   |
| 39          | 2480            | 2.6             | 4.2              | 30                   | Pass   |

### For Average Power

| Channel No. | Frequency (MHz) | Average Power (mW) | Average Power (dBm) | Required Limit (dBm) | Result |
|-------------|-----------------|--------------------|---------------------|----------------------|--------|
| 00          | 2402            | 2.4                | 3.8                 | 30                   | Pass   |
| 19          | 2440            | 2.7                | 4.4                 | 30                   | Pass   |
| 39          | 2480            | 2.6                | 4.1                 | 30                   | Pass   |



## 6. Band Edges Measurement

### 6.1 Test Limit

Below -20dB of the highest emission level of operating band (In 100 kHz Resolution Bandwidth)

### 6.2 Test Procedure

KDB 558074 D01v04 – Section 12.2.4 (peak power measurements)

KDB 558074 D01v04 – Section 12.2.5 (average power measurements)

### 6.3 Test Setting

#### Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

#### Average Measurements above 1GHz

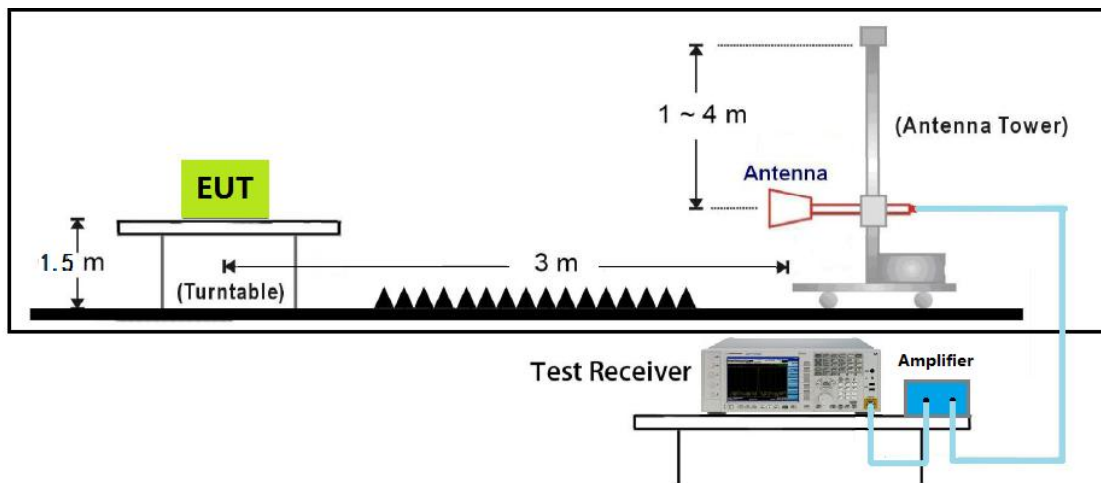
##### 7.8.3. Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 1/T
4. De As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces



## 6.4 Test Setup Layout

### Radiated





## 6.5 Test Result and Data

|                      |   |             |
|----------------------|---|-------------|
| Test Date            | : | Apr.06,2017 |
| Temperature          | : | 25°C        |
| Humidity             | : | 55%         |
| Atmospheric Pressure | : | 1020 hPa    |

Modulation Standard: BLE

Channel 0 Fundamental Frequency: 2402 MHz

| No. | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type | Antenna Pole (V/H) |
|-----|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|--------------------|
| 1   | 2390.00         | 58.13                  | 25.02                | -15.87          | 74.00          | 33.11       | PK   | H                  |
| 2   | 2390.00         | 50.51                  | 17.40                | -3.49           | 54.00          | 33.11       | AV   | H                  |
| 3   | 2390.00         | 55.60                  | 22.49                | -18.40          | 74.00          | 33.11       | PK   | V                  |
| 4   | 2390.00         | 47.04                  | 13.93                | -6.96           | 54.00          | 33.11       | AV   | V                  |

Notes:

1. Result = Meter Reading + Factor
2. Factor = Antenna Factor + Cable Loss – Amplifier

Channel 78 Fundamental Frequency: 2480 MHz

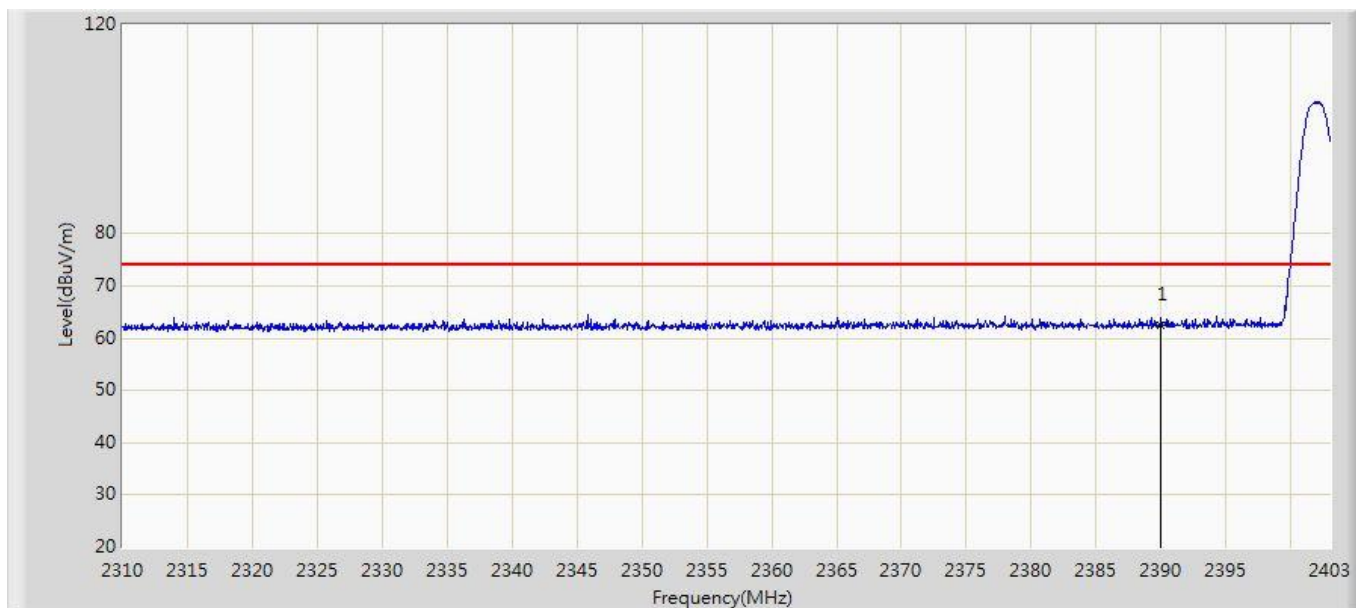
| No. | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type | Antenna Pole (V/H) |
|-----|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|--------------------|
| 1   | 2483.50         | 60.68                  | 27.19                | -13.32          | 74.00          | 33.49       | PK   | H                  |
| 2   | 2483.50         | 48.34                  | 14.85                | -5.66           | 54.00          | 33.49       | AV   | H                  |
| 3   | 2483.50         | 59.35                  | 25.86                | -14.65          | 74.00          | 33.49       | PK   | V                  |
| 4   | 2483.50         | 47.21                  | 13.72                | -6.79           | 54.00          | 33.49       | AV   | V                  |

Notes:

1. Result = Meter Reading + Factor
2. Factor = Antenna Factor + Cable Loss – Amplifier

**The worst-case plots of bandedge for each mode in each operating band:**

|                                      |                      |
|--------------------------------------|----------------------|
| Site: AC102                          | Time: 2017/04/06     |
| Limit: FCC_Part15.209_RE(3m)         | Margin: 0            |
| Probe: N/A                           | Polarity: Horizontal |
| EUT: QCNFA344A                       | Power: AC 120V/60Hz  |
| Note: Mode : Transmit BLE at 2402MHz |                      |



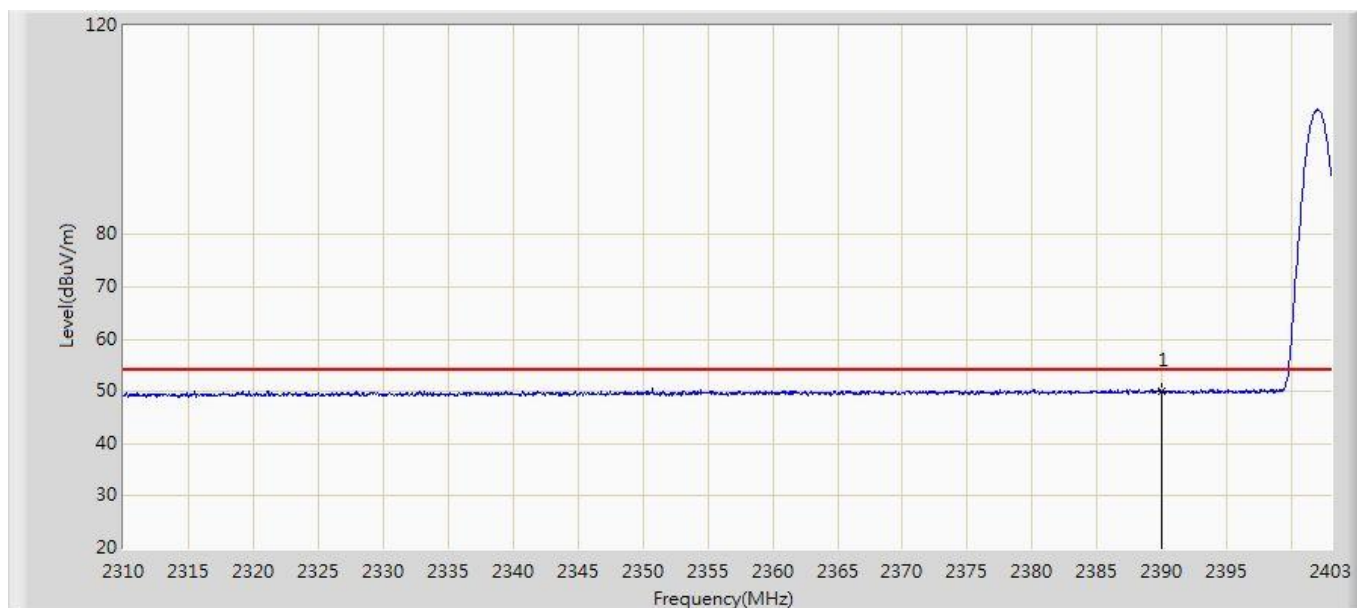
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2390.00         | 58.13                  | 25.02                | -15.87          | 74.00          | 33.11       | PK   |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



|                                      |                      |
|--------------------------------------|----------------------|
| Site: AC102                          | Time: 2017/04/06     |
| Limit: FCC_Part15.209_RE(3m)         | Margin: 0            |
| Probe: N/A                           | Polarity: Horizontal |
| EUT: QCNFA344A                       | Power: AC 120V/60Hz  |
| Note: Mode : Transmit BLE at 2402MHz |                      |



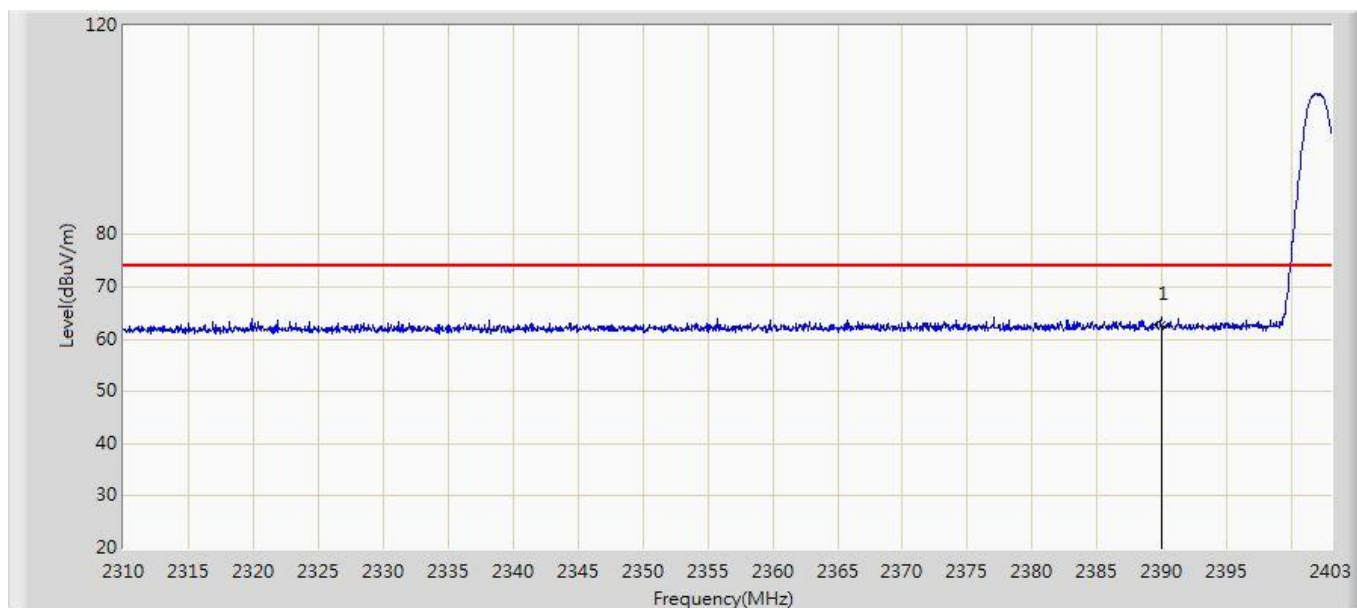
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2390.00         | 50.51                  | 17.40                | -3.49           | 54.00          | 33.11       | AV   |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



|                                      |                     |
|--------------------------------------|---------------------|
| Site: AC102                          | Time: 2017/04/06    |
| Limit: FCC_Part15.209_RE(3m)         | Margin: 0           |
| Probe: N/A                           | Polarity: Vertical  |
| EUT: QCNFA344A                       | Power: AC 120V/60Hz |
| Note: Mode : Transmit BLE at 2402MHz |                     |



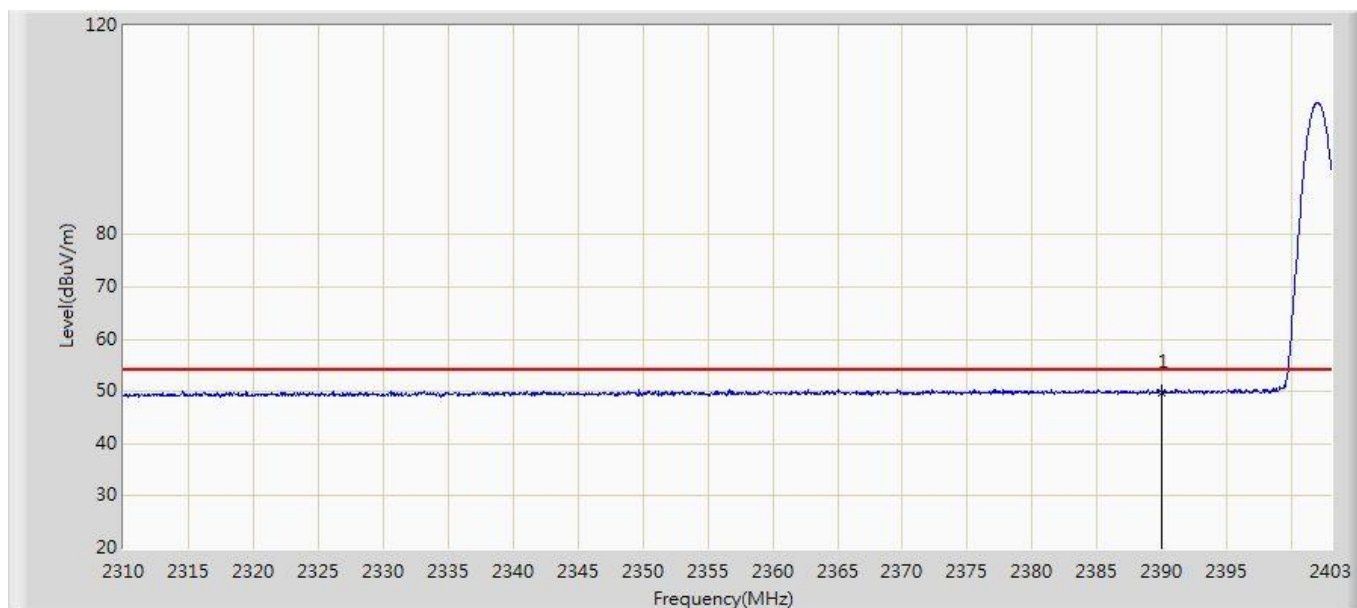
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2390.00         | 55.60                  | 22.49                | -18.40          | 74.00          | 33.11       | PK   |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



|                                      |                     |
|--------------------------------------|---------------------|
| Site: AC102                          | Time: 2017/04/06    |
| Limit: FCC_Part15.209_RE(3m)         | Margin: 0           |
| Probe: N/A                           | Polarity: Vertical  |
| EUT: QCNFA344A                       | Power: AC 120V/60Hz |
| Note: Mode : Transmit BLE at 2402MHz |                     |



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2390.00         | 47.04                  | 13.93                | -6.96           | 54.00          | 33.11       | AV   |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or AVG measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor (Correct Factor= Antenna Factor + Cable Loss – Amplifier)
3. The test trace is same as the ambient noise (the test frequency range: 9kHz~30MHz, 18GHz~40GHz), therefore no data appear in the report.



## 7. Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz             |
|---------------------|-----------------------|-----------------|-----------------|
| 0.09000 – 0.11000   | 16.42000 – 16.42300   | 399.9 – 410.0   | 4.500 – 5.250   |
| 0.49500 – 0.505**   | 16.69475 – 16.69525   | 608.0 – 614.0   | 5.350 – 5.460   |
| 2.17350 – 2.19050   | 16.80425 – 16.80475   | 960.0 – 1240.0  | 7.250 – 7.750   |
| 4.12500 – 4.12800   | 25.50000 – 25.67000   | 1300.0 – 1427.0 | 8.025 – 8.500   |
| 4.17725 – 4.17775   | 37.50000 – 38.25000   | 1435.0 – 1626.5 | 9.000 – 9.200   |
| 4.20725 – 4.20775   | 73.00000 – 74.60000   | 1645.5 – 1646.5 | 9.300 – 9.500   |
| 6.21500 – 6.21800   | 74.80000 – 75.20000   | 1660.0 – 1710.0 | 10.600 – 12.700 |
| 6.26775 – 6.26825   | 108.00000 – 121.94000 | 1718.8 – 1722.2 | 13.250 – 13.400 |
| 6.31175 – 6.31225   | 123.00000 – 138.00000 | 2200.0 – 2300.0 | 14.470 – 14.500 |
| 8.29100 – 8.29400   | 149.90000 – 150.05000 | 2310.0 – 2390.0 | 15.350 – 16.200 |
| 8.36200 – 8.36600   | 156.52475 – 156.52525 | 2483.5 – 2500.0 | 17.700 – 21.400 |
| 8.37625 – 8.38675   | 156.70000 – 156.90000 | 2655.0 – 2900.0 | 22.010 – 23.120 |
| 8.41425 – 8.41475   | 162.01250 – 167.17000 | 3260.0 – 3267.0 | 23.600 – 24.000 |
| 12.29000 – 12.29300 | 167.72000 – 173.20000 | 3332.0 – 3339.0 | 31.200 – 31.800 |
| 12.51975 – 12.52025 | 240.00000 – 285.00000 | 3345.8 – 3358.0 | 36.430 – 36.500 |
| 12.57675 – 12.57725 | 322.00000 – 335.40000 | 3600.0 – 4400.0 | Above 38.6      |
| 13.36000 – 13.41000 |                       |                 |                 |

\*\* : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

### 7.1 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.