



Test Report

FCC Part15 Subpart C

Product Name : BlueNRG-A BLE Module
Model No. : LSD1BT-STBLEPCB
FCC ID : N8NLS1BTSTBLEPCB

Applicant : Lierda Science & Technology Group Co.,Ltd
Address : Building 1#, Lierda IOT park, No.1326 Wenyi Xi
Rd, Hangzhou City, ZheJiang, China

Date of Receipt : Sep. 06, 2017
Test Date : Sep. 09, 2017~ Nov. 15, 2017
Issued Date : Jan. 08, 2018
Report No. : 1792029R-RF-US-P06V02
Report Version : V 1.1

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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Test Report Certification

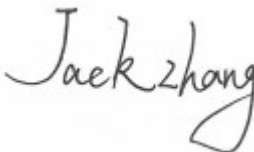
Issued Date : Jan. 08, 2018
Report No. : 1792029R-RF-US-P06V02




Product Name : BlueNRG-A BLE Module
 Applicant : Lierda Science & Technology Group Co.,Ltd
 Address : Building 1#, Lierda IOT park, No.1326 Wenyi Xi Rd, HangZhou City, ZheJiang, China
 Manufacturer : Lierda Science & Technology Group Co.,Ltd
 Address : Building 1#, Lierda IOT park, No.1326 Wenyi Xi Rd, HangZhou City, ZheJiang, China
 Model No. : LSD1BT-STBLEPCB
 FCC ID : N8NLS1BTSTBLEPCB
 EUT Voltage : DC 3.3V
 Test Voltage : AC 120V/60Hz
 Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2017
 ANSI C63.10:2013
 KDB 558074 D01v04
 Test Result : Complied
 Performed Location : DEKRA Testing & Certification (Suzhou) Co., Ltd.
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 FCC Designation Number: CN1199

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History of This Test Report

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|-----------------------|---------|--|---------------|
| 1792029R-RF-US-P06V02 | V1.0 | Initial Issued Report | Dec. 18, 2017 |
| 1792029R-RF-US-P06V02 | V1.1 | Revised the receipt date, and test date | Jan. 08, 2018 |
| | | | |
| | | | |

1. General Information

1.1. EUT Description

| | |
|-------------------------|---------------------------|
| Product Name | BlueNRG-A BLE Module |
| Model No. | LSD1BT-STBLEPCB |
| EUT Voltage | DC 3.3V |
| Test Voltage | AC 120V/60Hz |
| Bluetooth Specification | BLE 4.2 |
| Frequency Range | 2402- 2480 MHz |
| Channel Number | BLE 4.2: 40 |
| Channel Separation | BLE 4.2: 2MHz |
| Type of Modulation | BLE 4.2: GFSK |
| Data Rate | BLE 4.2: 1Mbps(GFSK) |
| Antenna Type | Reference to Antenna List |
| Peak Antenna Gain | Reference to Antenna List |

1.2. Working Frequency of Each Channel:

| 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 |

1.3. Antenna information

| | | | | | | | |
|--------------------------|-------------------------------------|-----------|-------------------------------------|----------------------------|--------------------------|-----------|--|
| Antenna manufacturer | ACX | | | | | | |
| Antenna Delivery | <input checked="" type="checkbox"/> | 1*TX+1*RX | <input type="checkbox"/> | 2*TX+2*RX | <input type="checkbox"/> | 3*TX+3*RX | |
| Antenna technology | <input checked="" type="checkbox"/> | SISO | | | | | |
| | <input type="checkbox"/> | MIMO | <input type="checkbox"/> | Basic | | | |
| | | | <input type="checkbox"/> | CDD | | | |
| <input type="checkbox"/> | | | Beam-forming | | | | |
| Antenna Type | <input type="checkbox"/> | External | <input type="checkbox"/> | Dipole | | | |
| | <input checked="" type="checkbox"/> | Internal | <input type="checkbox"/> | PIFA | | | |
| | | | <input type="checkbox"/> | PCB | | | |
| | | | <input type="checkbox"/> | Ceramic Chip Antenna | | | |
| | | | <input checked="" type="checkbox"/> | Multilayer Chip Antenna | | | |
| | | | <input type="checkbox"/> | Stamping Antenna | | | |
| | | | <input type="checkbox"/> | Metal plate type F antenna | | | |
| | | | <input type="checkbox"/> | Monopole antenna | | | |
| Antenna Gain | 0.5dBi | | | | | | |

1.4. Mode of Operation

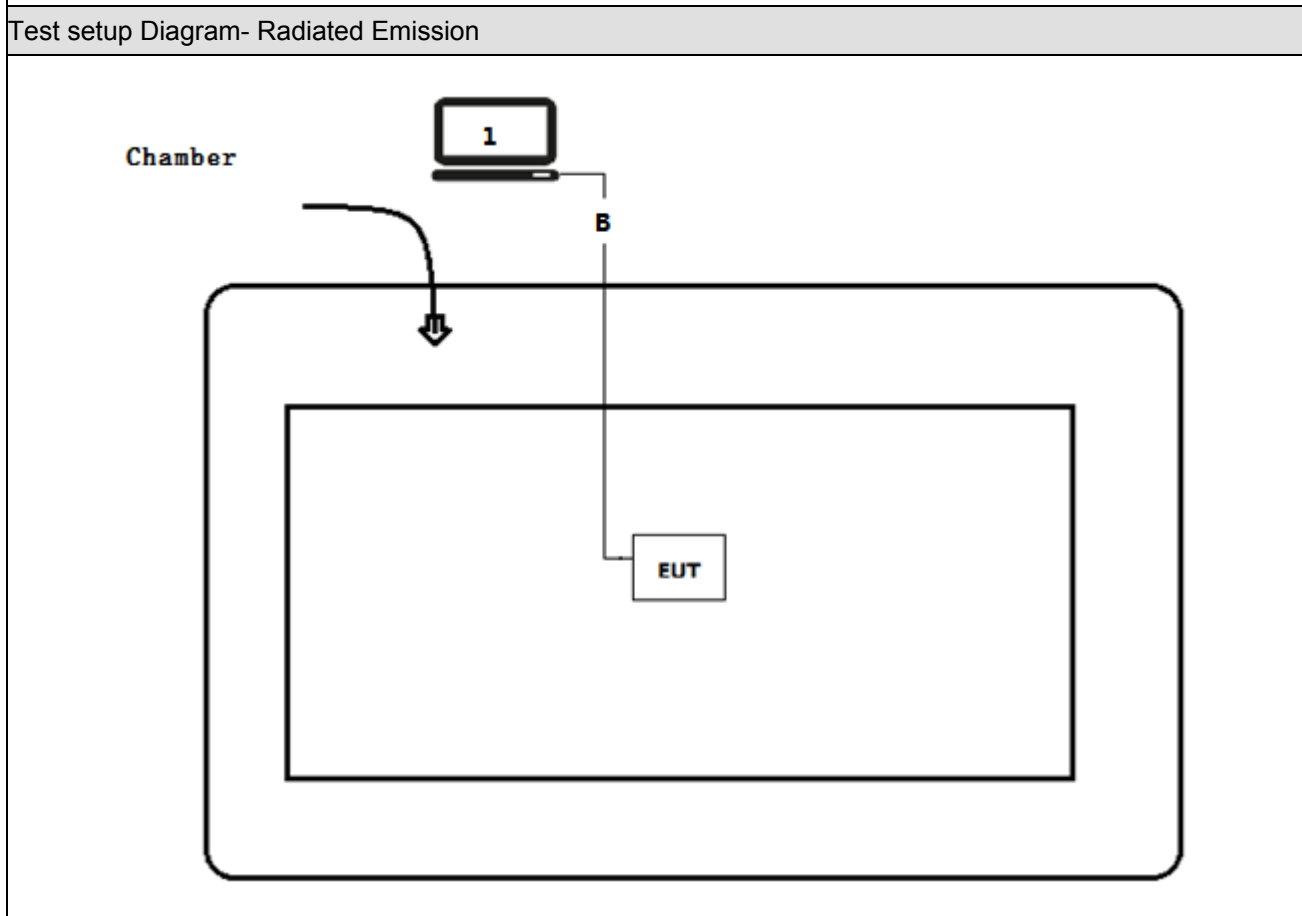
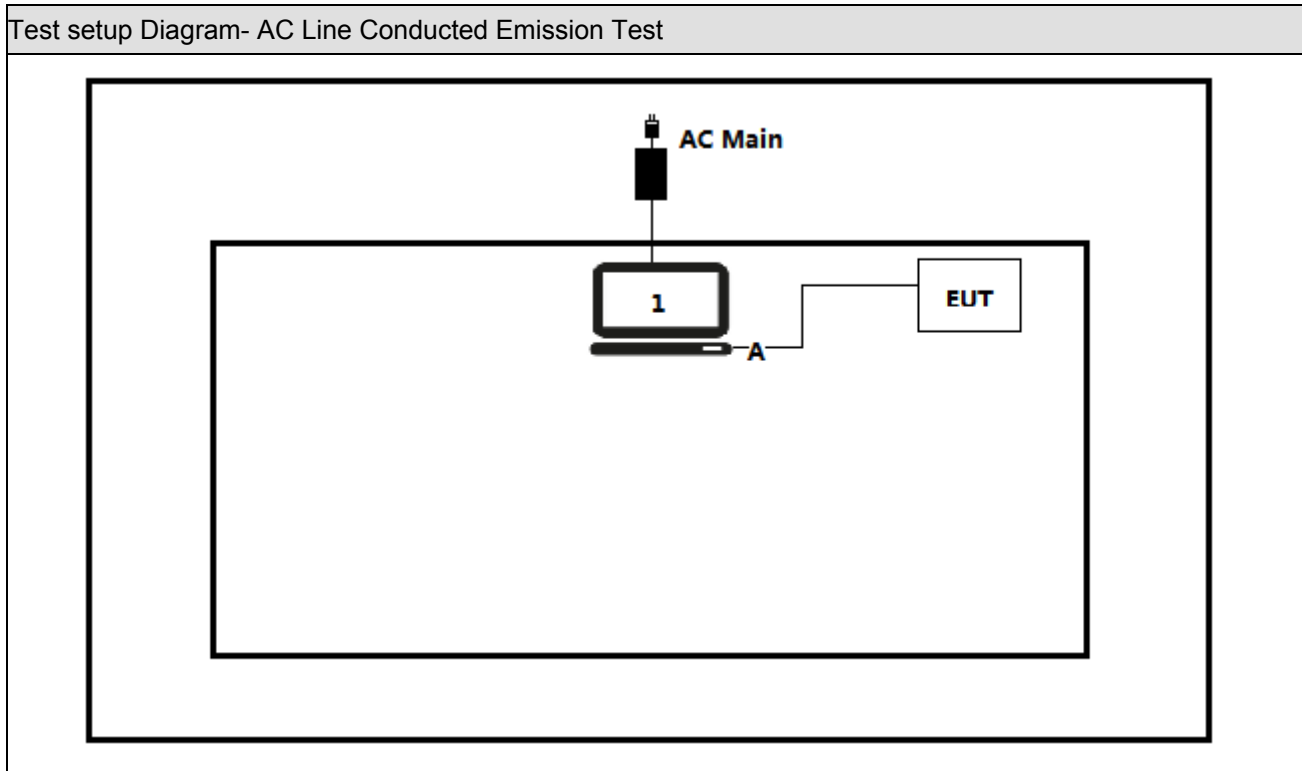
| |
|----------------------------------|
| Test Mode |
| Mode 1: Transmit-1Mbps(GFSK_BLE) |

1.5. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

| No. | Product | Manufacturer | Model No. | Serial No. | Power Cord |
|-----|-----------|--------------|-----------|------------|------------------|
| 1 | Notebook | Think Pad | 2526 | LV-A3285 | Power by adapter |
| A | USB cable | N/A | N/A | N/A | Shielded,0.5m |
| B | USB cable | N/A | N/A | N/A | Shielded,10m |

1.6. Configuration of Tested System



1.7. EUT Exercise Software

| | |
|---|---|
| 1 | Setup the EUT and simulators as shown on above. |
| 2 | Turn on the power of all equipment. |
| 3 | Run the software, and set the test mode and channel, then press OK to start continue receive. |

2. Technical Test

2.1. Summary of Test Result

For FCC

| Performed Test Item | Normative References | Limit | Result |
|---|--|--------------------------------|--------|
| AC Power Line Conducted Emission | FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.207 | FCC 15.207 | PASS |
| Emissions in restricted frequency bands | FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.209 | FCC 15.209 | PASS |
| Emissions in non-restricted frequency bands | FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(d) | $\geq 20\text{dBc}$ | PASS |
| Radiated Emission Band Edge | FCC CFR Title 47 Part 15 Subpart C: 2015 15.247(d) | FCC 15.209 | PASS |
| Occupied Bandwidth | FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(a)(2) | $\geq 500\text{kHz}$ | PASS |
| Fundamental emission output power | FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(b)(3) | $\leq 30\text{dBm}$ | PASS |
| Power Spectral Density | FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(e) | $\leq 8\text{dBm}/3\text{kHz}$ | PASS |
| Antenna Requirement | FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.203 | FCC 15.203 | PASS |

2.2. Test Frequency configuration:

| Modulation Mode | Channel | Frequency | Channel | Frequency | Channel | Frequency |
|-----------------|---------|-----------|---------|-----------|---------|-----------|
| BLE | 00 | 2402 MHz | 19 | 2440 MHz | 39 | 2480MHz |

2.3. Test Environment

| Items | Required (IEC 68-1) | Actual |
|----------------------------|---------------------|----------|
| Temperature (°C) | 15-35 | 21 |
| Humidity (%RH) | 25-75 | 50 |
| Barometric pressure (mbar) | 860-1060 | 950-1000 |

2.4. Measurement Uncertainty

| Test Items | Uncertainty |
|------------------------------------|--------------------|
| AC Power Line Conducted Emission | ±2.02dB |
| Radiated Emission | Below 1GHz ±3.8 dB |
| | Above 1GHz ±3.9 dB |
| RF Antenna Port Conducted Emission | ±1.27dB |
| Radiated Emission Band Edge | ±3.9dB |
| Occupied Bandwidth | ±1kHz |
| Power Spectral Density | ±1.27dB |

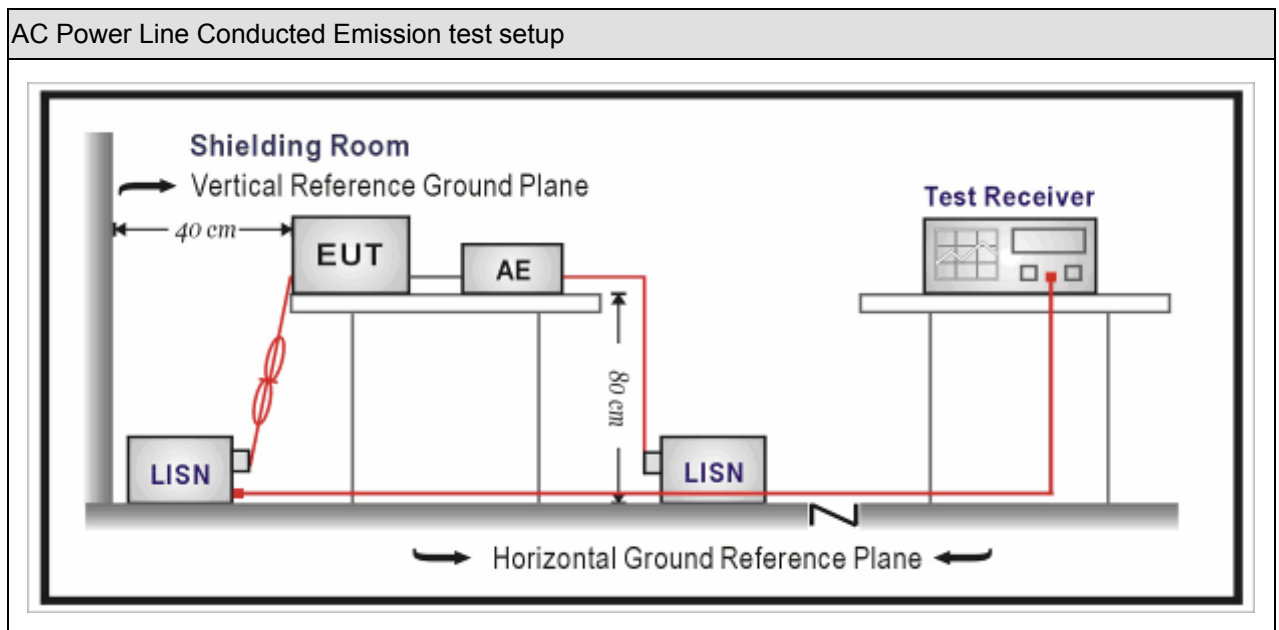
3. AC Power Line Conducted Emission

3.1. Test Equipment

| AC Power Line Conducted Emission / TR-1 | | | | | |
|---|--------------|----------|------------|------------|---------------|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| EMI Test Receiver | R&S | ESCI | 100906 | 2017.03.05 | 2018.03.04 |
| Two-Line V-Network | R&S | ENV 216 | 101189 | 2017.07.16 | 2018.07.15 |
| Two-Line V-Network | R&S | ENV 216 | 101044 | 2017.09.16 | 2018.09.15 |
| 50ohm Coaxial Switch | Anritsu | MP59B | 6200464462 | N/A | N/A |
| 50ohm Termination | SHX | TF2 | 07081402 | 2017.09.16 | 2018.09.15 |
| Temperature/Humidity Meter | Zhichen | ZC1-2 | TR1-TH | 2017.01.04 | 2018.01.03 |

Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

| Frequency of Emission (MHz) | Conducted Limit | |
|--------------------------------|-------------------------|----------------------|
| | Quasi-peak (dB μ V) | Average (dB μ V) |
| 0.15-0.5 | 66 to 56 | 56 to 46 |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

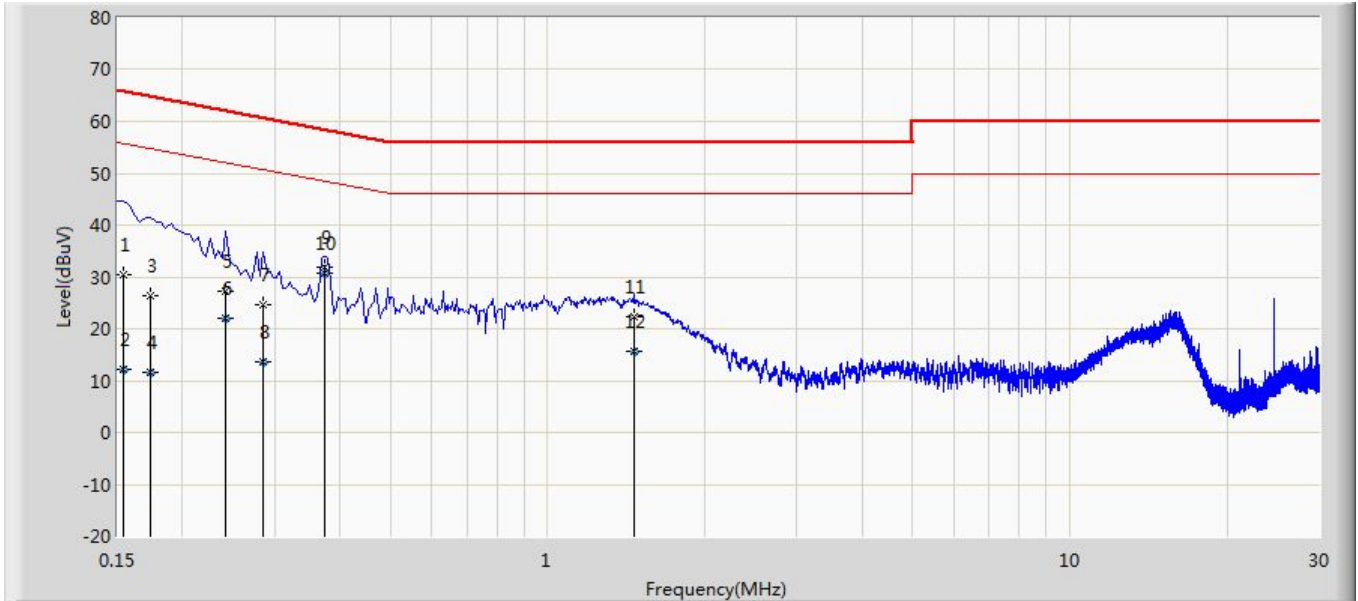
Note 1: The lower limit shall apply at the transition frequencies.
 Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

| Test Method | | | |
|-------------------------------------|------------------|---------|---|
| | References Rule | Chapter | Item |
| <input checked="" type="checkbox"/> | ANSI C63.10-2013 | 6.2 | Standard test method for ac power-line conducted emissions from unlicensed wireless devices |

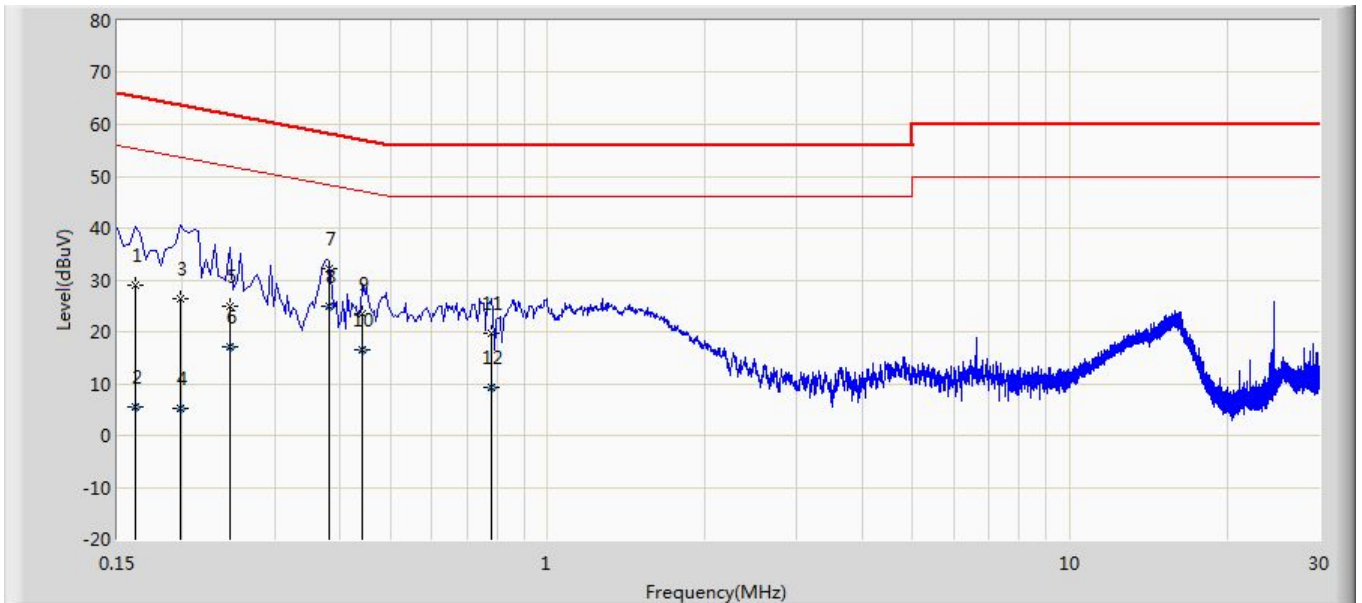
3.5. Test Result

| | |
|--|---------------------|
| Engineer: SimonSimon | |
| Site: AC5TR1 | Time: 2017/11/14 |
| Limit: FCC_Part15.207_CE_AC Power_ClassB | Margin: 0 |
| Probe: ENV216_101044(0.009-30MHz) | Polarity: Neutral |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at channel 2402MHz by BLE | |



| No | Mark | Frequency (MHz) | Measure Level (dBuV) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV) | Probe (dB) | Cable (dB) | Amp (dB) | Type |
|----|------|-----------------|----------------------|----------------------|-----------------|--------------|------------|------------|----------|------|
| 1 | | 0.154 | 30.433 | 20.829 | -35.348 | 65.781 | 9.579 | 0.025 | 0.000 | QP |
| 2 | | 0.154 | 12.318 | 2.714 | -43.463 | 55.781 | 9.579 | 0.025 | 0.000 | AV |
| 3 | | 0.174 | 26.329 | 16.727 | -38.438 | 64.767 | 9.575 | 0.027 | 0.000 | QP |
| 4 | | 0.174 | 11.595 | 1.993 | -43.172 | 54.767 | 9.575 | 0.027 | 0.000 | AV |
| 5 | | 0.242 | 27.279 | 17.677 | -34.749 | 62.027 | 9.572 | 0.030 | 0.000 | QP |
| 6 | | 0.242 | 21.980 | 12.378 | -30.047 | 52.027 | 9.572 | 0.030 | 0.000 | AV |
| 7 | | 0.286 | 24.749 | 15.142 | -35.891 | 60.640 | 9.573 | 0.034 | 0.000 | QP |
| 8 | | 0.286 | 13.490 | 3.883 | -37.150 | 50.640 | 9.573 | 0.034 | 0.000 | AV |
| 9 | | 0.374 | 31.972 | 22.359 | -26.440 | 58.412 | 9.576 | 0.037 | 0.000 | QP |
| 10 | * | 0.374 | 30.656 | 21.043 | -17.755 | 48.412 | 9.576 | 0.037 | 0.000 | AV |
| 11 | | 1.462 | 22.428 | 12.770 | -33.572 | 56.000 | 9.584 | 0.073 | 0.000 | QP |
| 12 | | 1.462 | 15.728 | 6.071 | -30.272 | 46.000 | 9.584 | 0.073 | 0.000 | AV |

| | |
|--|---------------------|
| Engineer: SimonSimon | |
| Site: AC5TR1 | Time: 2017/11/14 |
| Limit: FCC_Part15.107_CE_AC Power_ClassB | Margin: 0 |
| Probe: ENV216_101044(0.009-30MHz) | Polarity: Line |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at channel 2402MHz by BLE | |



| No | Mark | Frequency (MHz) | Measure Level (dBuV) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV) | Probe (dB) | Cable (dB) | Amp (dB) | Type |
|----|------|-----------------|----------------------|----------------------|-----------------|--------------|------------|------------|----------|------|
| 1 | | 0.162 | 29.091 | 19.467 | -36.270 | 65.361 | 9.597 | 0.026 | 0.000 | QP |
| 2 | | 0.162 | 5.383 | -4.240 | -49.977 | 55.361 | 9.597 | 0.026 | 0.000 | AV |
| 3 | | 0.198 | 26.306 | 16.686 | -37.388 | 63.694 | 9.591 | 0.029 | 0.000 | QP |
| 4 | | 0.198 | 5.240 | -4.380 | -48.454 | 53.694 | 9.591 | 0.029 | 0.000 | AV |
| 5 | | 0.246 | 24.795 | 15.175 | -37.096 | 61.891 | 9.590 | 0.031 | 0.000 | QP |
| 6 | | 0.246 | 17.207 | 7.587 | -34.684 | 51.891 | 9.590 | 0.031 | 0.000 | AV |
| 7 | | 0.382 | 32.136 | 22.508 | -26.100 | 58.236 | 9.590 | 0.038 | 0.000 | QP |
| 8 | * | 0.382 | 24.796 | 15.169 | -23.439 | 48.236 | 9.590 | 0.038 | 0.000 | AV |
| 9 | | 0.442 | 23.447 | 13.817 | -33.577 | 57.024 | 9.590 | 0.041 | 0.000 | QP |
| 10 | | 0.442 | 16.463 | 6.833 | -30.561 | 47.024 | 9.590 | 0.041 | 0.000 | AV |
| 11 | | 0.778 | 19.794 | 10.149 | -36.206 | 56.000 | 9.593 | 0.052 | 0.000 | QP |
| 12 | | 0.778 | 9.274 | -0.371 | -36.726 | 46.000 | 9.593 | 0.052 | 0.000 | AV |

4. Emissions in restricted frequency bands

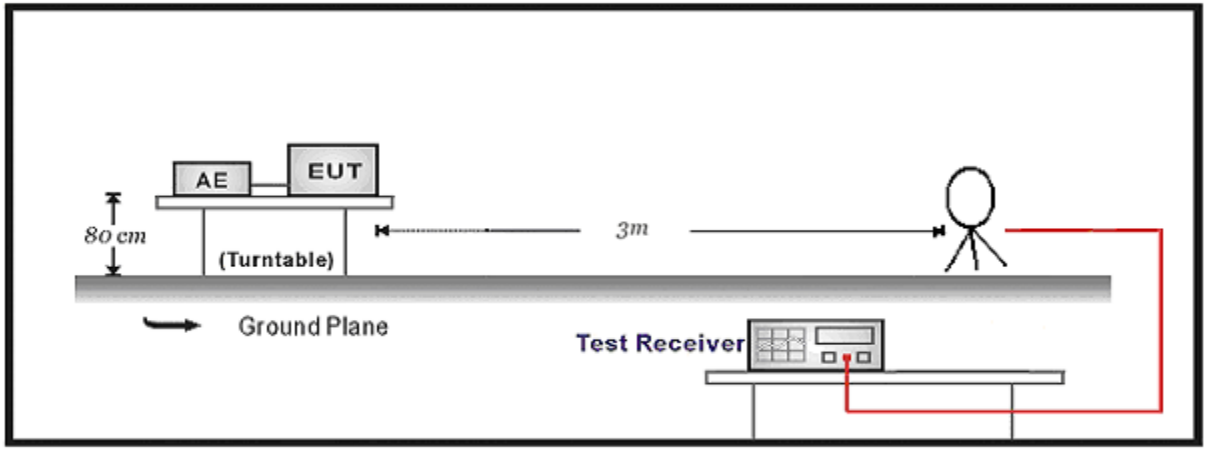
4.1. Test Equipment

| Radiated Emission(Below 1GHz) / AC-2 | | | | | |
|---|--------------|-----------------|------------|------------|---------------|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| EMI Test Receiver | R&S | ESCI | 100573 | 2017.03.29 | 2018.03.28 |
| Loop Antenna | R&S | HFH2-Z2 | 833799/003 | 2016.12.11 | 2017.12.11 |
| Bilog Antenna | Teseq GmbH | CBL6112D | 27611 | 2017.07.15 | 2018.07.15 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 106 | AC2-C | 2016.03.02 | 2018.03.01 |
| Temperature/Humidity Meter | Zhichen | ZC1-2 | AC2-TH | 2017.01.03 | 2018.01.02 |
| Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards. | | | | | |

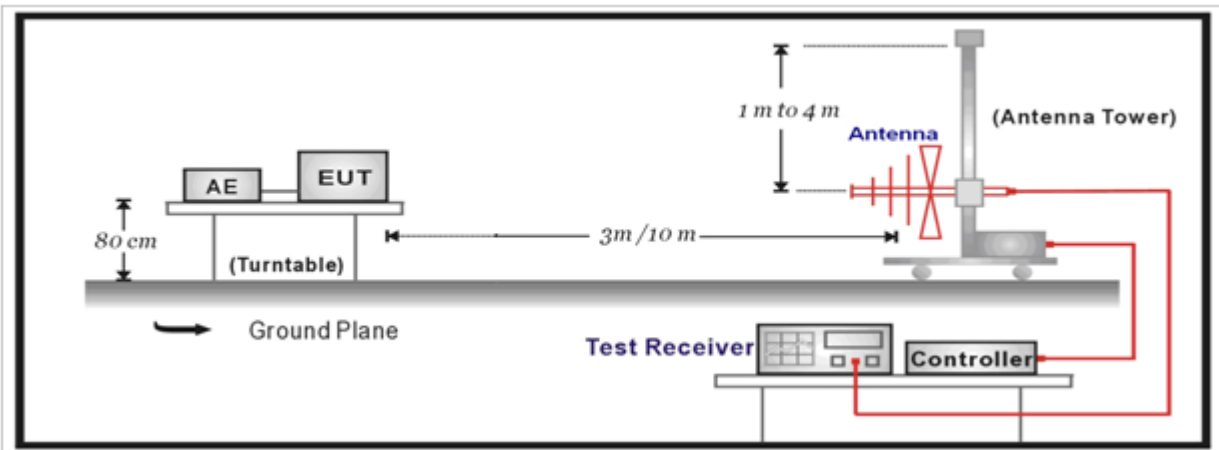
| Radiated Emission(Above 1GHz) / AC-5 | | | | | |
|---|--------------|-----------------|-------------|------------|---------------|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | E4446A | MY45300103 | 2017.01.04 | 2018.01.03 |
| Preamplifier | Miteq | NSP1800-25 | 1364185 | 2017.05.06 | 2018.05.05 |
| Preamplifier | QuieTek | AP-040G | CHM-0906001 | 2017.05.06 | 2018.05.05 |
| DRG Horn | ETS-Lindgren | 3117 | 00123988 | 2017.01.22 | 2018.01.21 |
| Broad-Band Horn Antenna | Schwarzbeck | BBHA9170 | 294 | 2017.02.23 | 2019.02.23 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 106 | AC5-C1 | 2016.03.02 | 2018.03.01 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 106 | AC5-C2 | 2016.03.02 | 2018.03.01 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 102 | AC5-C3 | 2016.03.02 | 2018.03.01 |
| EMI Receiver | Agilent | N9038A | MY51210196 | 2017.06.10 | 2018.06.09 |
| Temperature/Humidity Meter | Zhichen | ZC1-2 | AC5-TH | 2017.01.04 | 2018.01.03 |
| Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards. | | | | | |

4.2. Test Setup

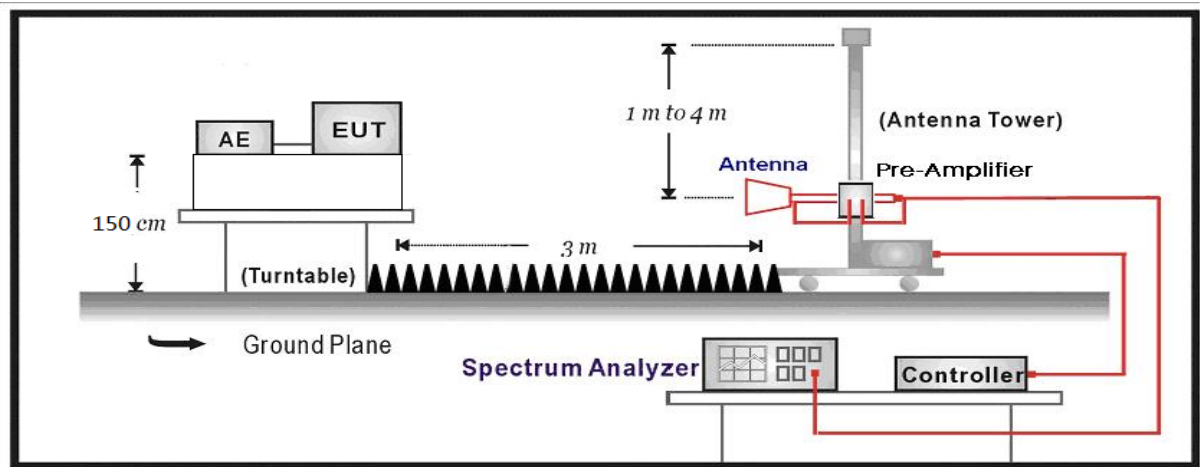
Below 30MHz Test Setup:



30MHz-1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

| Restricted Bands of operation | | | |
|-------------------------------|-----------------------|-----------------|-----------------|
| Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (GHz) |
| 0.090 – 0.110 | 16.42 – 16.423 | 399.9 – 410 | 4.5 – 5.15 |
| 0.495 – 0.505 | 16.69475 – 16.69525 | 608 – 614 | 5.35 – 5.46 |
| 2.1735 – 2.1905 | 16.80425 – 16.80475 | 960 – 1240 | 7.25 – 7.75 |
| 4.125 – 4.128 | 25.5 – 25.67 | 1300 – 1427 | 8.025 – 8.5 |
| 4.17725 – 4.17775 | 37.5 – 38.25 | 1435 – 1626.5 | 9.0 – 9.2 |
| 4.20725 – 4.20775 | 73 – 74.6 | 1645.5 – 1646.5 | 9.3 – 9.5 |
| 6.215 – 6.218 | 74.8 – 75.2 | 1660 – 1710 | 10.6 – 12.7 |
| 6.26775 – 6.26825 | 108 – 121.94 | 1718.8 – 1722.2 | 13.25 – 13.4 |
| 6.31175 – 6.31225 | 123 – 138 | 2200 – 2300 | 14.47 – 14.5 |
| 8.291 – 8.294 | 149.9 – 150.05 | 2310 – 2390 | 15.35 – 16.2 |
| 8.362 – 8.366 | 156.52475 – 156.52525 | 2483.5 – 2500 | 17.7 – 21.4 |
| 8.37625 – 8.38675 | 156.7 – 156.9 | 2690 – 2900 | 22.01 – 23.12 |
| 8.81425 – 8.81475 | 162.0125 – 167.17 | 3260 – 3267 | 23.6 – 24.0 |
| 12.29 – 12.293 | 167.72 – 173.2 | 3332 – 3339 | 31.2 – 31.8 |
| 12.51975 – 12.52025 | 240 – 285 | 3345.8 – 3358 | 36.43 – 36.5 |
| 12.57675 – 12.57725 | 322 – 335.4 | 3600 – 4400 | |
| 13.36 – 13.41 | | | |

| Restricted Band Emissions Limit | | | |
|---------------------------------|-----------------------------|-------------------------------|--------------------------|
| Frequency (MHz) | Field strength (μ V/m) | Field strength (dB μ V/m) | Measurement distance (m) |
| 0.009 - 0.49 | 2400/F(kHz) | 48.5 – 13.8 | 300 _(Note 1) |
| 0.49 - 1.705 | 24000/F(kHz) | 33.8 - 23 | 30 _(Note 1) |
| 1.705 - 30 | 30 | 29.5 | 30 _(Note 1) |
| 30 - 88 | 100 | 40 | 3 _(Note 2) |
| 88 - 216 | 150 | 43.5 | 3 _(Note 2) |
| 216 - 960 | 200 | 46 | 3 _(Note 2) |
| Above 960 | 500 | 54 | 3 _(Note 2) |

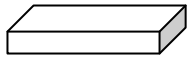
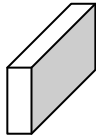
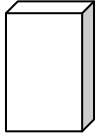

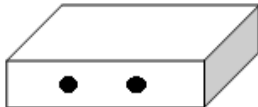
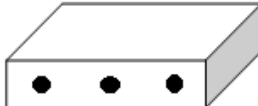
Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two 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).

Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. 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 linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

4.4. Test Procedure

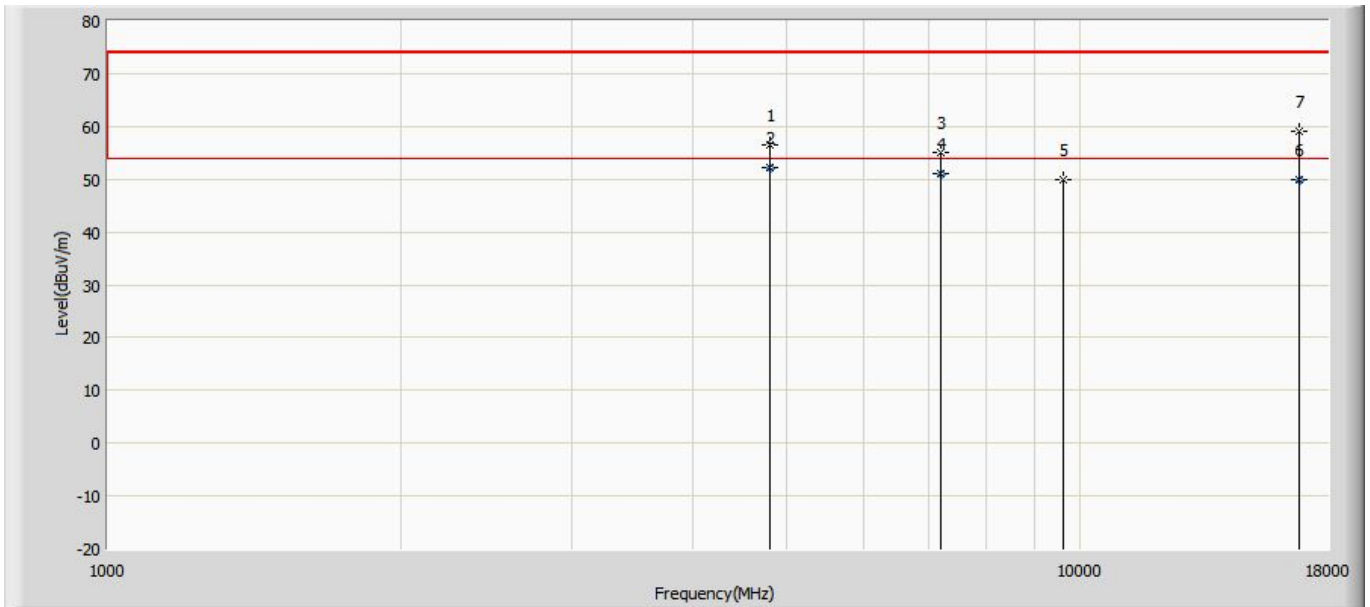
| Test Method | | | |
|-------------------------------------|---|-------------|--|
| | References Rule | Chapter | Description |
| <input type="checkbox"/> | ANSI C63.10 | 11.11 | Emissions in non-restricted frequency bands |
| | <input type="checkbox"/> ANSI C63.10 | 11.11.2 | Reference level measurement |
| | <input type="checkbox"/> ANSI C63.10 | 11.11.3 | Emission level measurement |
| <input checked="" type="checkbox"/> | ANSI C63.10 | 11.12 | Emissions in restricted frequency bands |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.1 | Radiated emission measurements |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.2.7 | Radiated spurious emission test |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 6.4 | Radiated emissions from unlicensed wireless devices below 30 MHz |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 6.5 | Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 6.6 | Radiated emissions from unlicensed wireless devices above 1 GHz |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.3 | Quasi-peak measurement procedure |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.2.4 | Peak power measurement procedure |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.2.5 | Average power measurement procedures |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.5.1 | Trace averaging with continuous EUT transmission at full power |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.5.2 | Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.2.5.3 | Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold |

4.5. EUT test Axis definition

| Item | Emissions in restricted frequency bands | | | |
|-----------------|--|--|---|---|
| Device Category | <input type="checkbox"/> | Fixed point-to-point | | |
| | <input type="checkbox"/> | Emit multiple directional beams, simultaneously or sequentially | | |
| | <input checked="" type="checkbox"/> | Other cases | | |
| Test mode | Mode 1 | | | |
| Test method | <input checked="" type="checkbox"/> | Radiated | | |
| | | X Axis | Y Axis | Z Axis |
| | |  |  |  |
| | | Worst Axis <input checked="" type="checkbox"/> | Worst Axis <input type="checkbox"/> | Worst Axis <input type="checkbox"/> |
| | <input type="checkbox"/> | Conducted | | |
| | <input type="checkbox"/> | Chain 0 | | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | Chain 2 |
| |  | | | |

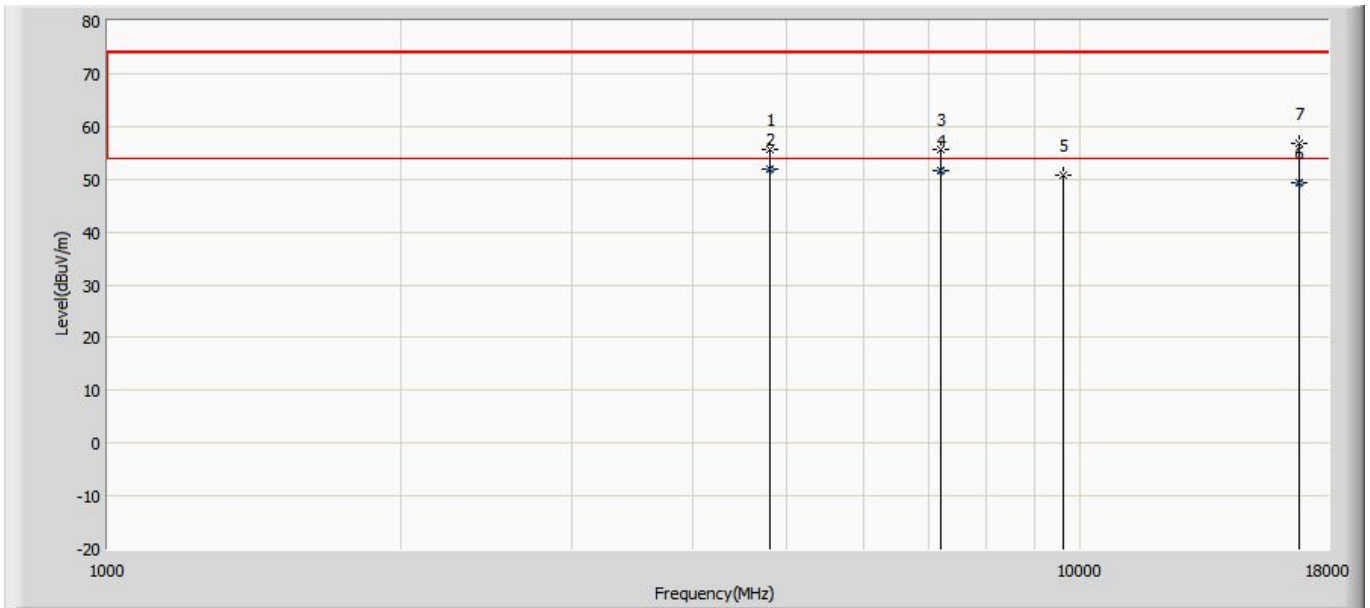
4.6. Test Result

| | |
|---|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/10/24 - 15:32 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Horizontal |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1:Transmit at 2402MHz by BLE | |



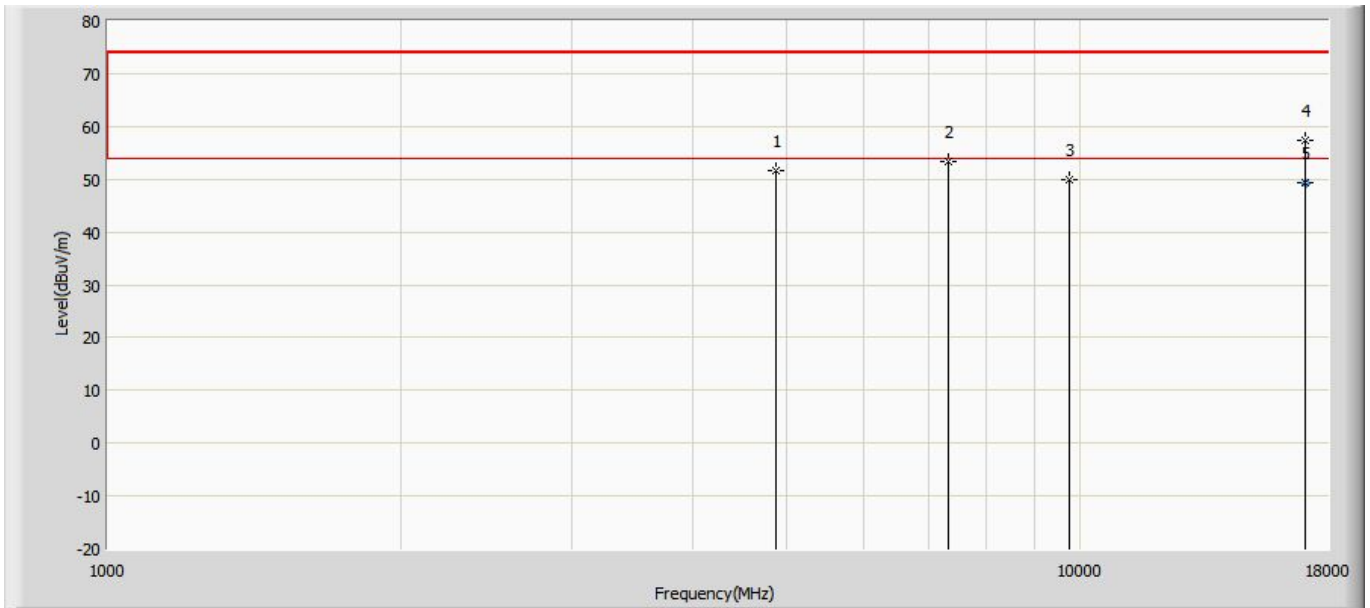
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | | 4799.500 | 56.464 | 69.474 | -17.536 | 74.000 | -13.010 | PK |
| 2 | * | 4804.000 | 52.304 | 65.314 | -1.696 | 54.000 | -13.010 | AV |
| 3 | | 7205.000 | 55.032 | 62.742 | -18.968 | 74.000 | -7.710 | PK |
| 4 | | 7206.000 | 50.973 | 58.683 | -3.027 | 54.000 | -7.710 | AV |
| 5 | | 9610.500 | 49.893 | 51.483 | -24.107 | 74.000 | -1.590 | PK |
| 6 | | 16814.000 | 49.873 | 44.483 | -4.127 | 54.000 | 5.390 | AV |
| 7 | | 16818.500 | 59.151 | 53.761 | -14.849 | 74.000 | 5.390 | PK |

| | |
|---|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/10/24 - 15:32 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Vertical |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1:Transmit at 2402MHz by BLE | |



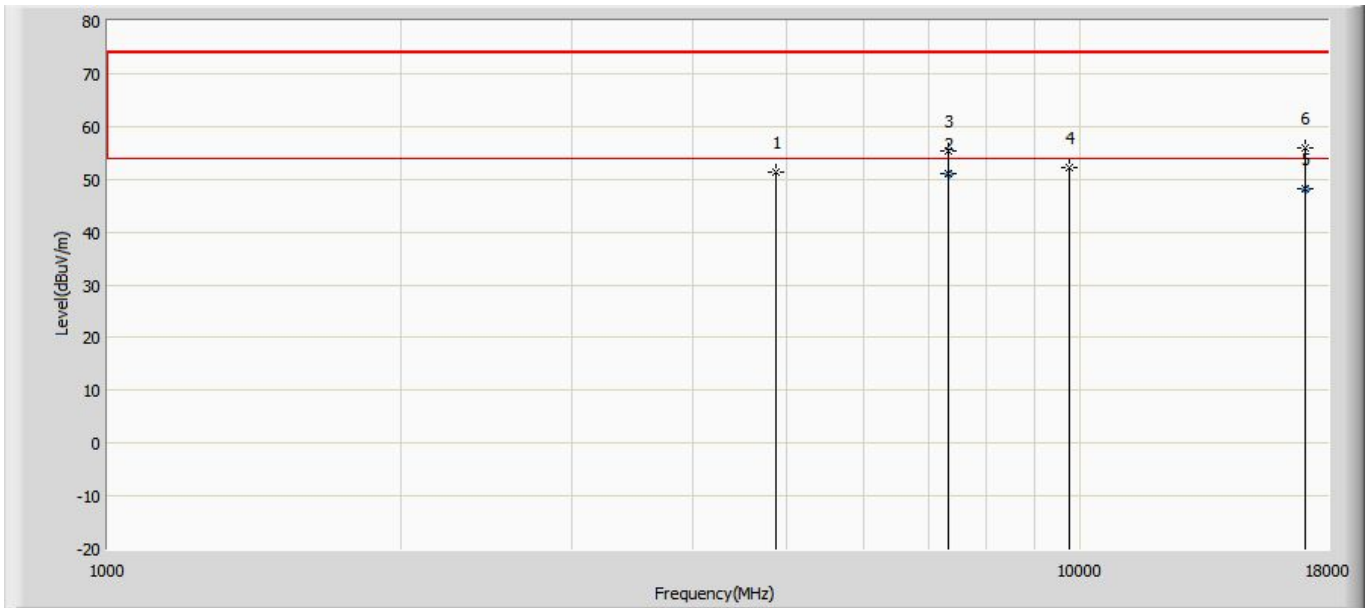
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | | 4799.500 | 55.723 | 68.733 | -18.277 | 74.000 | -13.010 | PK |
| 2 | * | 4804.000 | 51.820 | 64.830 | -2.180 | 54.000 | -13.010 | AV |
| 3 | | 7205.000 | 55.548 | 63.258 | -18.452 | 74.000 | -7.710 | PK |
| 4 | | 7206.000 | 51.614 | 59.324 | -2.386 | 54.000 | -7.710 | AV |
| 5 | | 9610.500 | 50.748 | 52.338 | -23.252 | 74.000 | -1.590 | PK |
| 6 | | 16814.000 | 49.226 | 43.836 | -4.774 | 54.000 | 5.390 | AV |
| 7 | | 16818.500 | 56.852 | 51.462 | -17.148 | 74.000 | 5.390 | PK |

| | |
|---|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/10/24 - 15:32 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Horizontal |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1:Transmit at 2440MHz by BLE | |



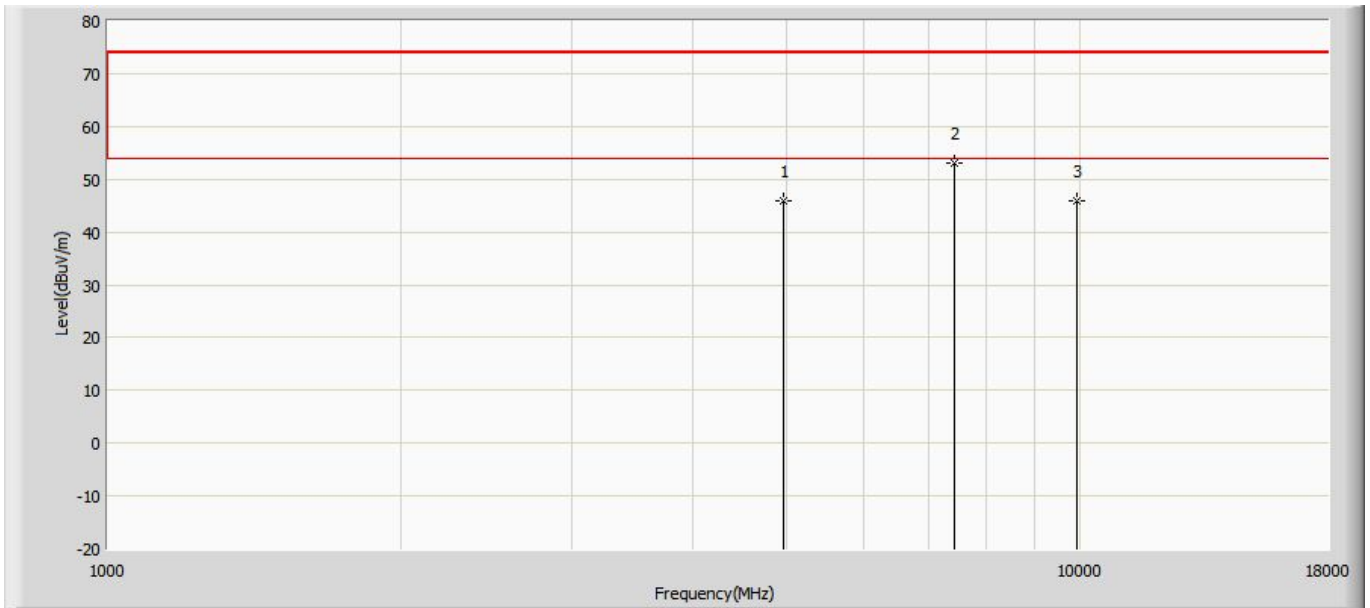
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | | 4876.000 | 51.724 | 64.734 | -22.276 | 74.000 | -13.010 | PK |
| 2 | | 7315.500 | 53.218 | 60.928 | -20.782 | 74.000 | -7.710 | PK |
| 3 | | 9763.500 | 50.052 | 51.642 | -23.948 | 74.000 | -1.590 | PK |
| 4 | | 17073.500 | 57.342 | 52.042 | -16.658 | 74.000 | 5.300 | PK |
| 5 | * | 17080.000 | 49.282 | 43.982 | -4.718 | 54.000 | 5.300 | AV |

| | |
|---|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/10/24 - 15:32 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Vertical |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1:Transmit at 2440MHz by BLE | |



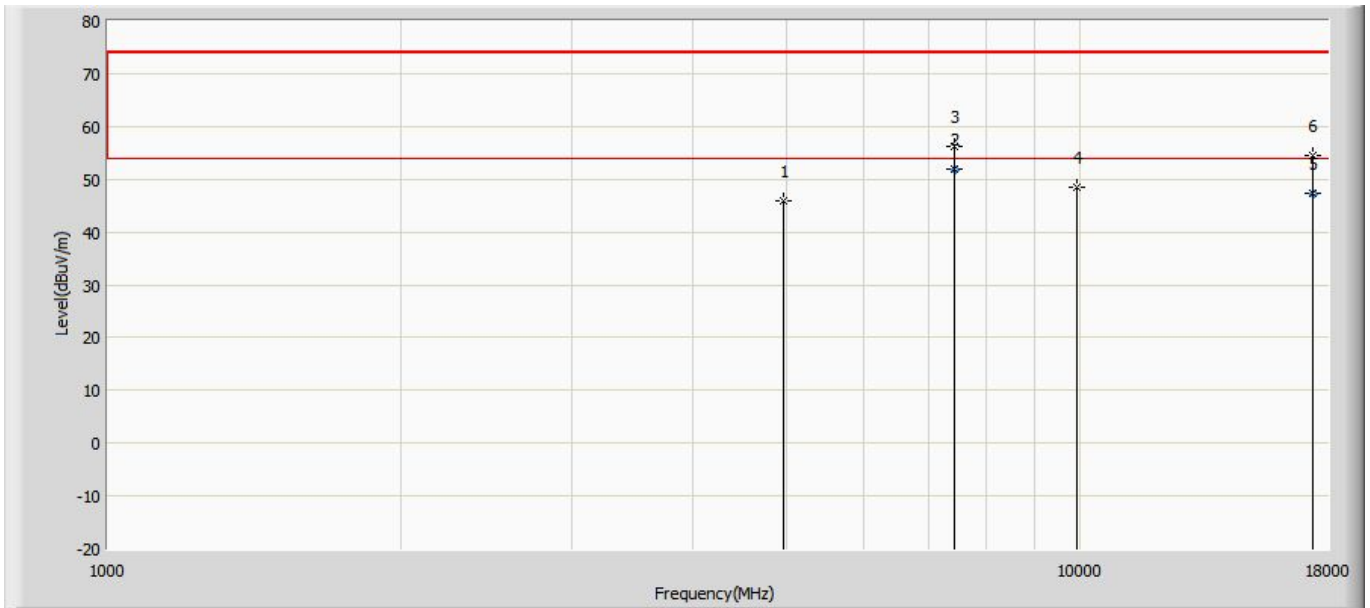
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | | 4876.000 | 51.294 | 64.304 | -22.706 | 74.000 | -13.010 | PK |
| 2 | * | 7320.000 | 51.151 | 58.861 | -2.849 | 54.000 | -7.710 | AV |
| 3 | | 7324.000 | 55.374 | 63.084 | -18.626 | 74.000 | -7.710 | PK |
| 4 | | 9763.500 | 52.136 | 53.726 | -21.864 | 74.000 | -1.590 | PK |
| 5 | | 17080.000 | 48.263 | 42.963 | -5.737 | 54.000 | 5.300 | AV |
| 6 | | 17082.000 | 55.803 | 50.503 | -18.197 | 74.000 | 5.300 | PK |

| | |
|---|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/10/24 - 15:32 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Horizontal |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1:Transmit at 2480MHz by BLE | |



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | | 4961.000 | 45.909 | 58.139 | -28.091 | 74.000 | -12.230 | PK |
| 2 | * | 7443.000 | 52.990 | 59.650 | -21.010 | 74.000 | -6.660 | PK |
| 3 | | 9920.000 | 45.898 | 47.858 | -28.102 | 74.000 | -1.960 | PK |

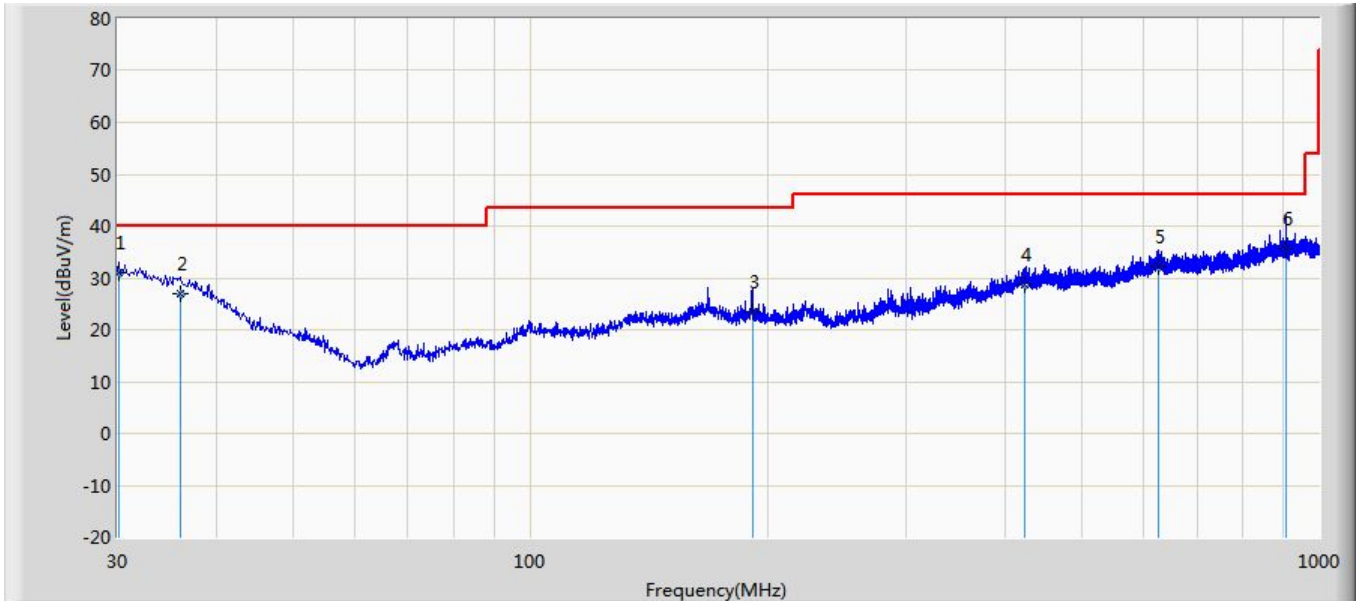
| | |
|---|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/10/24 - 15:32 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Vertical |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1:Transmit at 2480MHz by BLE | |



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | | 4961.000 | 45.923 | 58.153 | -28.077 | 74.000 | -12.230 | PK |
| 2 | * | 7440.000 | 52.021 | 58.681 | -1.979 | 54.000 | -6.660 | AV |
| 3 | | 7443.000 | 56.153 | 62.813 | -17.847 | 74.000 | -6.660 | PK |
| 4 | | 9920.000 | 48.583 | 50.543 | -25.417 | 74.000 | -1.960 | PK |
| 5 | | 17360.000 | 47.458 | 42.158 | -6.542 | 54.000 | 5.300 | AV |
| 6 | | 17362.500 | 54.528 | 49.228 | -19.472 | 74.000 | 5.300 | PK |

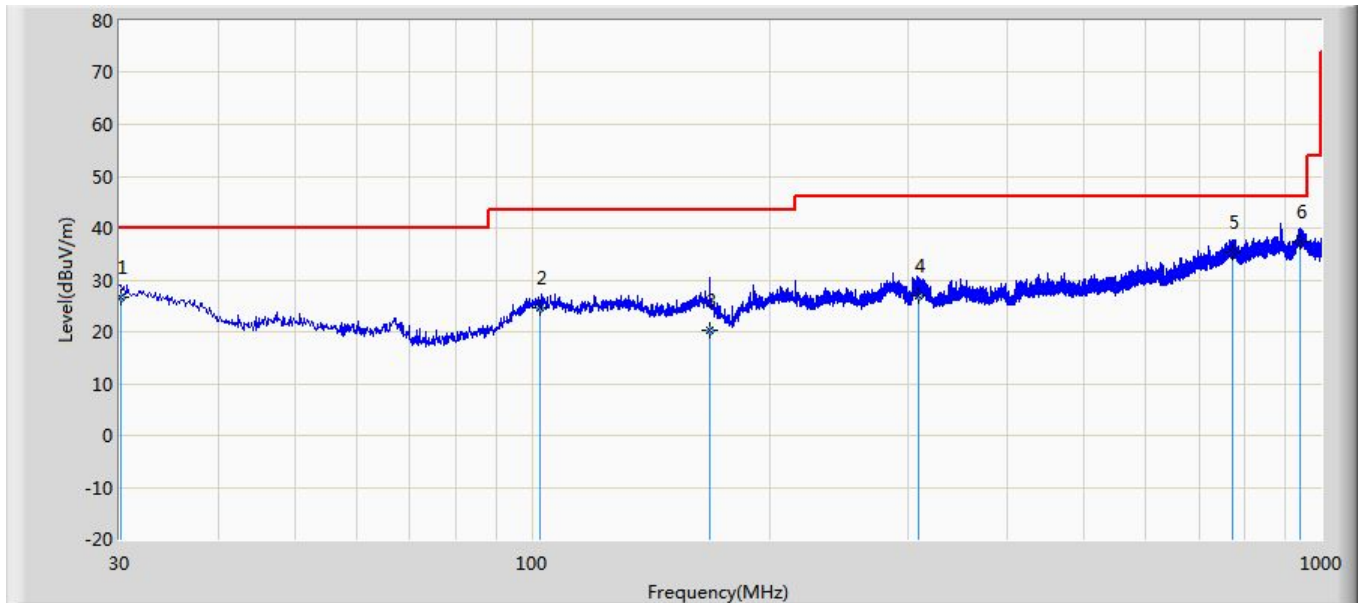
The worst case of Radiated Emission below 1GHz:

| | |
|--|--------------------------|
| Engineer: Simon | |
| Site: AC3 | Time: 2017/11/14 - 17:40 |
| Limit: FCC_Part15.109_RE(3m)_ClassB | Margin: 0 |
| Probe: AC3_3m (30-1000MHz) | Polarity: Horizontal |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at channel 2402MHz by BLE | |



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Probe (dB/m) | Cable (dB) | Amp (dB) | Ant Pos (cm) | Table Pos (deg) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|--------------|------------|----------|--------------|-----------------|------|
| 1 | * | 30.141 | 31.091 | 3.200 | -8.909 | 40.000 | 21.437 | 6.454 | 0.000 | 100 | 269 | QP |
| 2 | | 36.104 | 26.824 | 1.300 | -13.176 | 40.000 | 19.026 | 6.499 | 0.000 | 200 | 151 | QP |
| 3 | | 191.245 | 23.539 | 6.300 | -19.961 | 43.500 | 9.989 | 7.250 | 0.000 | 100 | 231 | QP |
| 4 | | 424.145 | 28.690 | 1.300 | -17.310 | 46.000 | 19.422 | 7.968 | 0.000 | 100 | 241 | QP |
| 5 | | 624.351 | 32.180 | 2.300 | -13.820 | 46.000 | 21.391 | 8.489 | 0.000 | 200 | 169 | QP |
| 6 | | 907.125 | 35.598 | 3.600 | -10.402 | 46.000 | 22.884 | 9.113 | 0.000 | 100 | 144 | QP |

| | |
|--|---------------------|
| Engineer: Simon | |
| Site: AC3 | Time: 2017/11/14 |
| Limit: FCC_Part15.109_RE(3m)_ClassB | Margin: 0 |
| Probe: AC3_3m (30-1000MHz) | Polarity: Vertical |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at channel 2402MHz by BLE | |



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Probe (dB/m) | Cable (dB) | Amp (dB) | Ant Pos (cm) | Table Pos (deg) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|--------------|------------|----------|--------------|-----------------|------|
| 1 | | 30.144 | 26.659 | 2.600 | -13.341 | 40.000 | 17.604 | 6.454 | 0.000 | 100 | 247 | QP |
| 2 | | 102.547 | 24.682 | 2.600 | -18.818 | 43.500 | 15.215 | 6.867 | 0.000 | 100 | 149 | QP |
| 3 | | 167.854 | 20.275 | 1.900 | -23.225 | 43.500 | 11.219 | 7.156 | 0.000 | 200 | 147 | QP |
| 4 | | 308.684 | 26.882 | 1.600 | -19.118 | 46.000 | 17.642 | 7.640 | 0.000 | 200 | 196 | QP |
| 5 | | 771.312 | 35.450 | 3.100 | -10.550 | 46.000 | 23.529 | 8.820 | 0.000 | 100 | 136 | QP |
| 6 | * | 939.344 | 37.421 | 3.200 | -8.579 | 46.000 | 25.041 | 9.180 | 0.000 | 100 | 251 | QP |

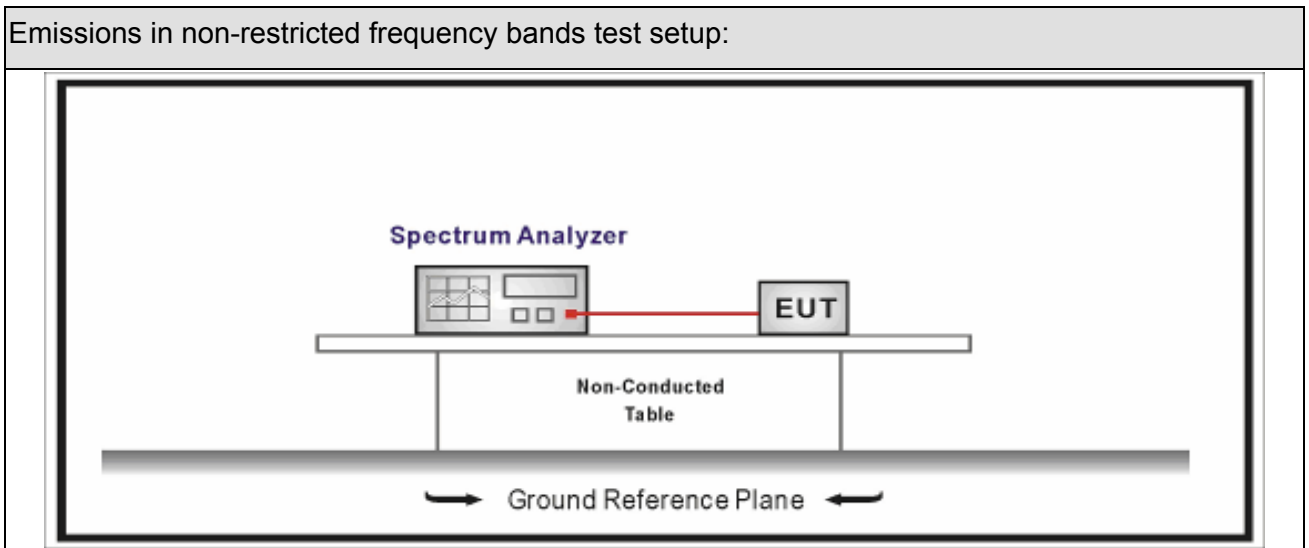
5. Emissions in non-restricted frequency bands

5.1. Test Equipment

| Emissions in non-restricted frequency bands / TR-8 | | | | | |
|--|--------------|----------|------------|------------|---------------|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | N9010A | MY48030494 | 2017.02.04 | 2018.02.03 |
| EXA Spectrum Analyzer | Keysight | N9010A | MY55370495 | 2017.04.09 | 2018.04.08 |
| MXA Signal Analyzer | Keysight | N9020A | MY56060147 | 2017.04.09 | 2018.04.08 |
| Temperature/Humidity Meter | zhichen | ZC1-2 | TR8-TH | 2017.04.10 | 2018.04.09 |

Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2. Test Setup



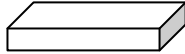
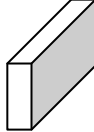
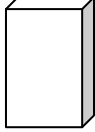



5.3. Limit

| Un-Restricted Band Emissions Limit | |
|--|------------|
| RF Output power (Detection methods) | Limit(dB) |
| RF Output power(Average detector) | 30c(Note1) |
| RF Output power(PK detector) | 20c(Note2) |
| <p>Note 1: If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 30 dBc).</p> <p>Note 2: If the maximum peak conducted output power procedure was used, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).</p> | |

5.4. Test Procedure

| Test Method | | | |
|-------------------------------------|---|-------------|--|
| | References Rule | Chapter | Description |
| <input checked="" type="checkbox"/> | ANSI C63.10 | 11.11 | Emissions in non-restricted frequency bands |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.11.2 | Reference level measurement |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.11.3 | Emission level measurement |
| <input type="checkbox"/> | ANSI C63.10 | 11.12 | Emissions in restricted frequency bands |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.1 | Radiated emission measurements |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.7 | Radiated spurious emission test |
| <input type="checkbox"/> | ANSI C63.10 | 6.4 | Radiated emissions from unlicensed wireless devices below 30 MHz |
| <input type="checkbox"/> | ANSI C63.10 | 6.5 | Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz |
| <input type="checkbox"/> | ANSI C63.10 | 6.6 | Radiated emissions from unlicensed wireless devices above 1 GHz |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.2 | Antenna-port conducted measurements |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.3 | Quasi-peak measurement procedure |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.2.4 | Peak power measurement procedure |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.5 | Average power measurement procedures |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.5.1 | Trace averaging with continuous EUT transmission at full power |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.5.2 | Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.5.3 | Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold |

5.5. EUT test Axis definition

| Item | Emissions in non-restricted frequency bands | | | |
|-----------------|--|--|---|---|
| Device Category | <input type="checkbox"/> | Fixed point-to-point | | |
| | <input type="checkbox"/> | Emit multiple directional beams, simultaneously or sequentially | | |
| | <input checked="" type="checkbox"/> | Other cases | | |
| Test mode | Mode 1 | | | |
| Test method | <input type="checkbox"/> | Radiated | | |
| | | X Axis | Y Axis | Z Axis |
| | |  |  |  |
| | | Worst Axis <input type="checkbox"/> | Worst Axis <input type="checkbox"/> | Worst Axis <input type="checkbox"/> |
| | <input checked="" type="checkbox"/> | Conducted | | |
| | <input checked="" type="checkbox"/> | Chain 0 | | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | Chain 2 |
| |  | | | |

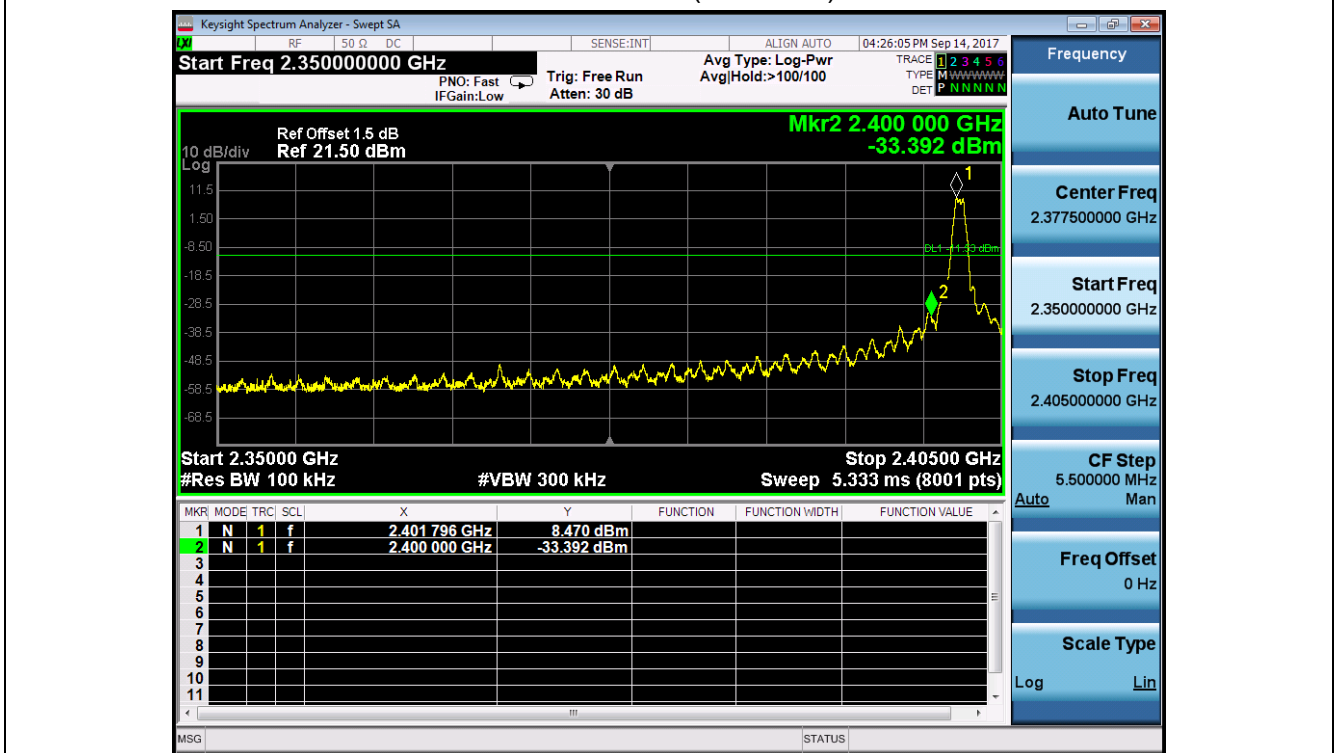
5.6. Test Result

| | | | |
|--------------|------------------------|-----------|----------------|
| Product Name | : BlueNRG-A BLE Module | Power | : AC 120V/60Hz |
| Test Mode | : Mode 1 | Test Site | : TR-8 |
| Test Date | : 2017.09.15 | | |

| Mode | Channel | Test Frequency (MHz) | In-Band PSD[a] (dBm/100kHz) | Frequency (MHz) | Out-Band PSD[b] (dBm/100kHz) | [a]-[b] (dB) | Limit (dB) | Result |
|------|---------|----------------------|-----------------------------|-----------------|------------------------------|--------------|------------|--------|
| 1 | 00 | 2402 | 8.470 | 2400.00 | -33.392 | 24.92 | >20 | Pass |
| 1 | 39 | 2480 | 8.387 | 2500.00 | -52.499 | 44.11 | >20 | Pass |

Note: The worst case of Emissions in non-restricted frequency bands as below:

Mode 1 CH00 (2402MHz)

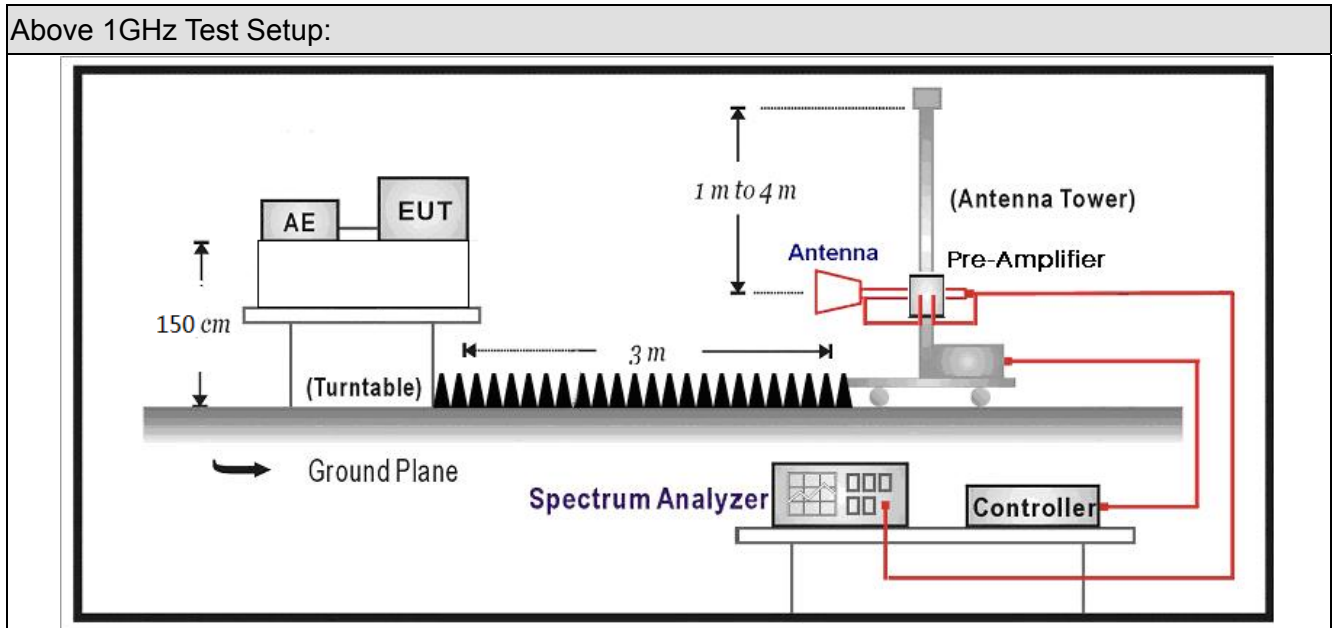


6. Radiated Emission Band Edge

6.1. Test Equipment

| Radiated Emission(Above 1GHz) / AC-5 | | | | | |
|--------------------------------------|--------------|-----------------|------------|------------|---------------|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| EMI Receiver | Agilent | N9038A | MY51210196 | 2017.07.16 | 2018.07.15 |
| Pre-Amplifier | Miteq | NSP1800-25 | 1364185 | 2017.05.03 | 2018.05.02 |
| DRG Horn Antenna | ETS-Lindgren | 3117 | 00167055 | 2017.07.12 | 2018.07.11 |
| Broad-Band Horn Antenna | Schwarzbeck | BBHA9170 | 294 | 2017.09.18 | 2018.09.17 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 106 | AC5-C1 | 2017.02.28 | 2018.02.27 |
| Coaxial Cable | Huber+Suhner | SUCOFLEX 106 | AC5-C2 | 2017.02.28 | 2018.02.27 |
| Temperature/Humidity Meter | Zhichen | ZC1-2 | AC5-TH | 2017.01.05 | 2018.01.04 |

6.2. Test Setup



6.3. Limit

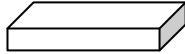
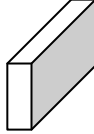
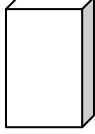


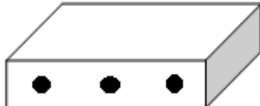
| Band edge Limit | | | | |
|-----------------------|----------|----------------------|-----------|--------------|
| Frequency bands (MHz) | Detector | Limit (dB μ V/m) | RBW (MHz) | Distance (m) |
| 2310-2390 | PK | 74 | 1 | 3 |
| 2483.5-2500 | AV | 54 | 1 | 3 |

Note: The field strength of emissions appearing within these frequency bands shall not exceed the limits.

6.4. Test Procedure

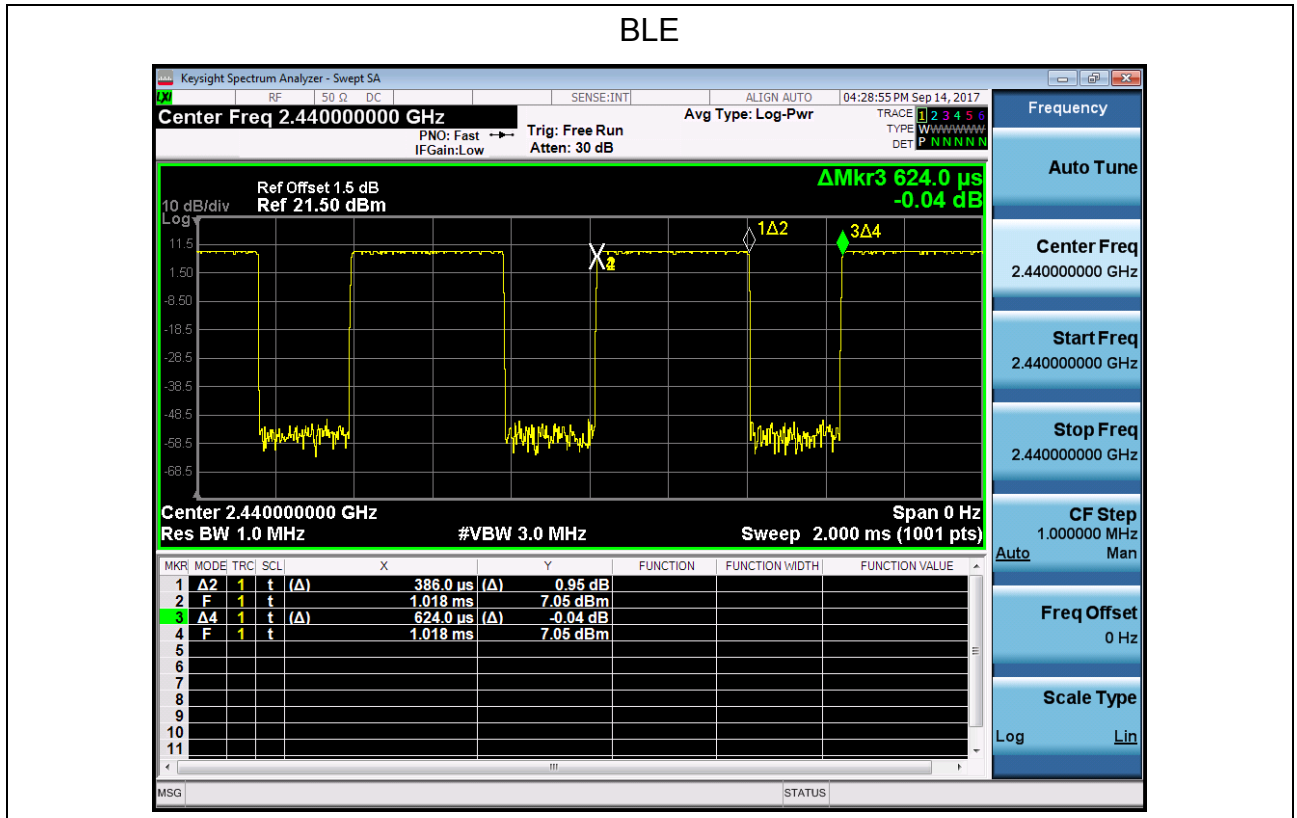
| Test Method | | | |
|-------------------------------------|---|-------------|--|
| | References Rule | Chapter | Description |
| <input checked="" type="checkbox"/> | ANSI C63.10 | 6.10 | Band-edge testing |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 6.10.5 | Restricted-band band-edge measurements |
| | <input type="checkbox"/> ANSI C63.10 | 6.10.6 | Marker-delta method |
| <input checked="" type="checkbox"/> | ANSI C63.10 | 11.12 | Emissions in restricted frequency bands |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.1 | Radiated emission measurements |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.2.7 | Radiated spurious emission test |
| <input type="checkbox"/> | ANSI C63.10 | 6.4 | Radiated emissions from unlicensed wireless devices below 30 MHz |
| <input type="checkbox"/> | ANSI C63.10 | 6.5 | Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz |
| <input checked="" type="checkbox"/> | ANSI C63.10 | 6.6 | Radiated emissions from unlicensed wireless devices above 1 GHz |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.3 | Quasi-peak measurement procedure |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.2.4 | Peak power measurement procedure |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.2.5 | Average power measurement procedures |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.5.1 | Trace averaging with continuous EUT transmission at full power |
| | <input type="checkbox"/> ANSI C63.10 | 11.12.2.5.2 | Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.12.2.5.3 | Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold |

6.5. EUT test definition

| Item | Radiated Emission Band Edge | | | |
|-----------------|--|--|--|--|
| Device Category | <input type="checkbox"/> | Fixed point-to-point | | |
| | <input type="checkbox"/> | Emit multiple directional beams, simultaneously or sequentially | | |
| | <input checked="" type="checkbox"/> | Other cases | | |
| Test mode | Mode 1 | | | |
| Test method | <input checked="" type="checkbox"/> | Radiated | | |
| | | X Axis | Y Axis | Z Axis |
| | |  |  |  |
| | | Worst Axis <input checked="" type="checkbox"/> | Worst Axis <input type="checkbox"/> | Worst Axis <input type="checkbox"/> |
| | <input type="checkbox"/> | Conducted | | |
| | <input type="checkbox"/> | Chain 0 | | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | Chain 2 |
| |  | | | |

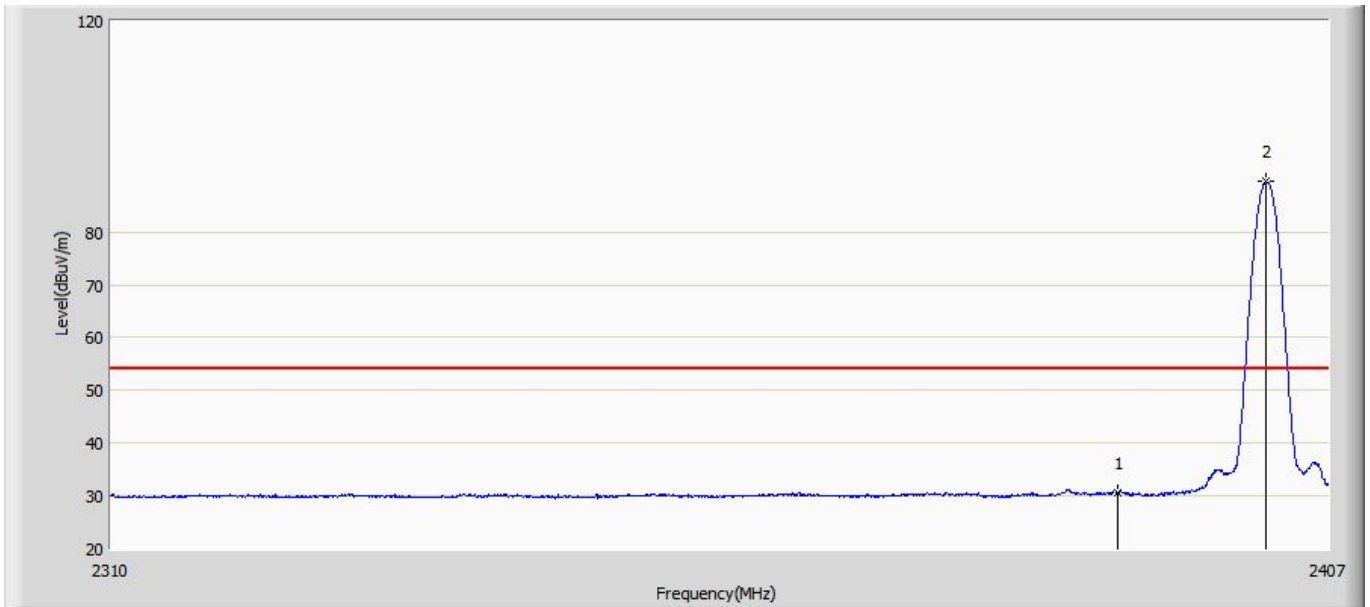
6.6. Duty Cycle

| Test Mode | Tx On (ms) | Tx Off (ms) | Reduced VBW (kHz) | Tx On + Tx Off (ms) | Duty Cycle |
|-----------|------------|-------------|-------------------|---------------------|------------|
| BLE | 0.386 | 0.238 | 2.7kHz | 0.624 | 61.86% |



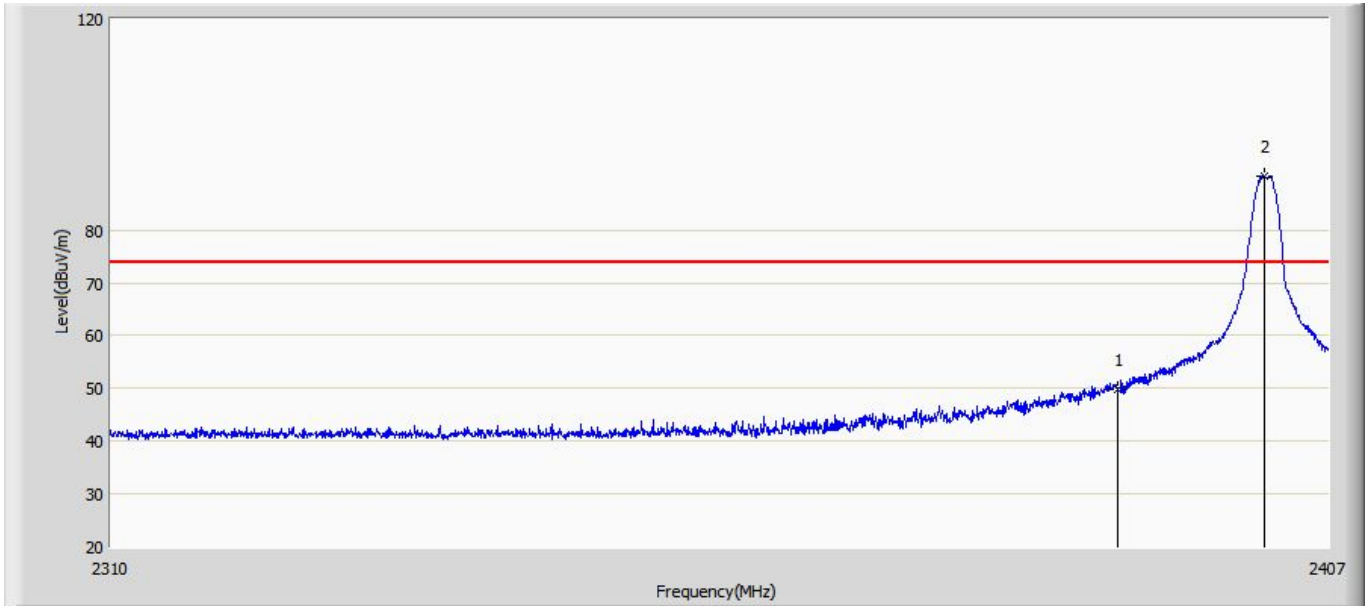
6.7 Test Result

| | |
|--|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/09/15 - 10:00 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Horizontal |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at 2402MHz by BLE | |



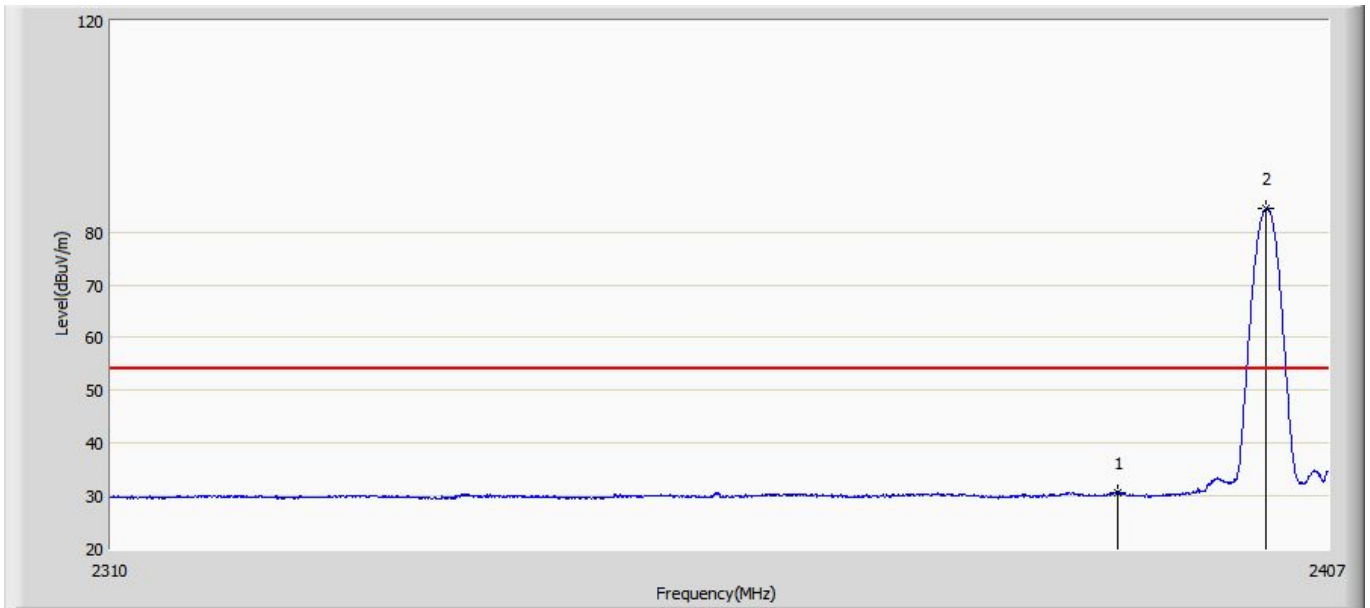
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | | 2390.000 | 30.693 | 1.645 | -23.307 | 54.000 | 29.048 | AV |
| 2 | * | 2402.004 | 89.499 | 60.539 | N/A | N/A | 28.960 | AV |

| | |
|--|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/09/15 - 10:32 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Horizontal |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at 2402MHz by BLE | |



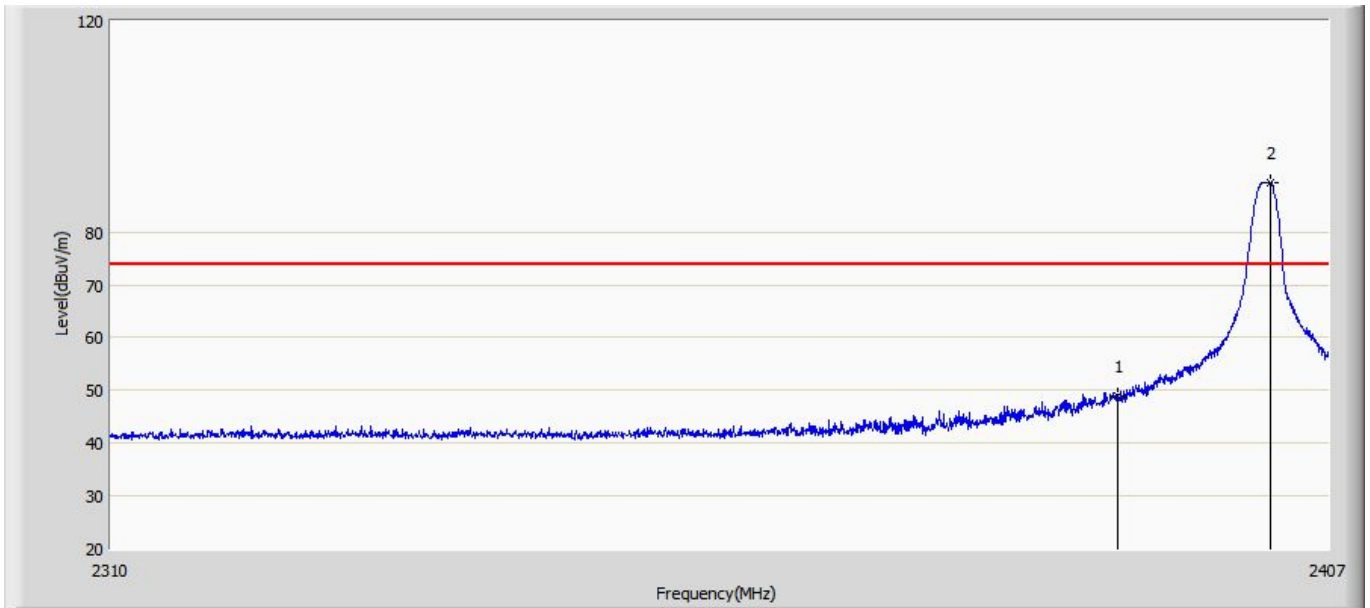
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | | 2390.000 | 49.697 | 20.649 | -24.303 | 74.000 | 29.048 | PK |
| 2 | * | 2401.859 | 90.064 | 61.102 | N/A | N/A | 28.962 | PK |

| | |
|--|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/09/15 - 10:35 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Vertical |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at 2402MHz by BLE | |



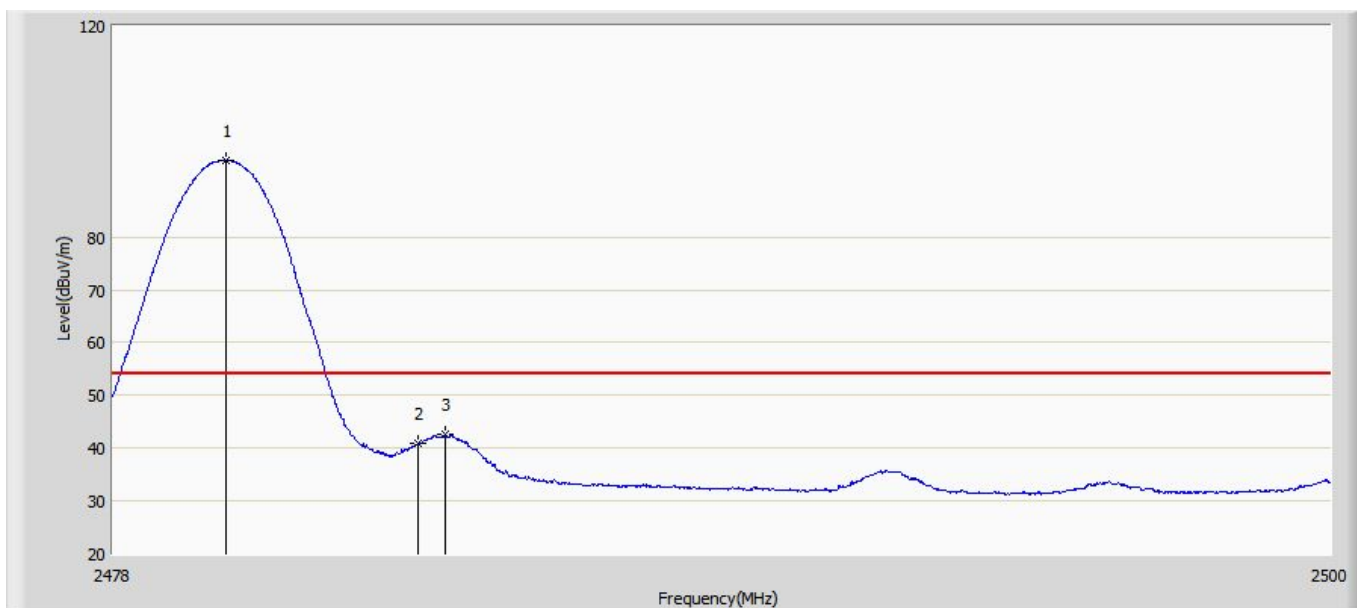
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | | 2390.000 | 30.696 | 1.648 | -23.304 | 54.000 | 29.048 | AV |
| 2 | * | 2401.956 | 84.471 | 55.510 | N/A | N/A | 28.961 | AV |

| | |
|--|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/09/15 - 10:42 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Vertical |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at 2402MHz by BLE | |



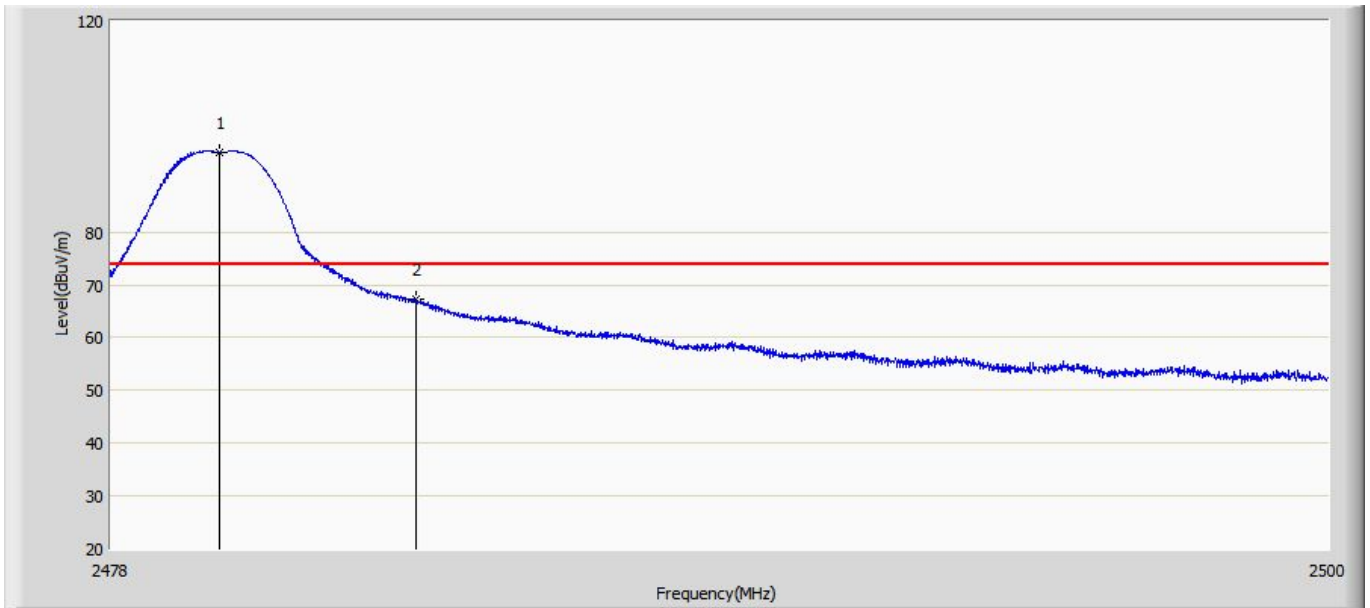
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | | 2390.000 | 48.924 | 19.876 | -25.076 | 74.000 | 29.048 | PK |
| 2 | * | 2402.295 | 89.454 | 60.497 | N/A | N/A | 28.957 | PK |

| | |
|--|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/09/15 - 11:01 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Horizontal |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at 2480MHz by BLE | |



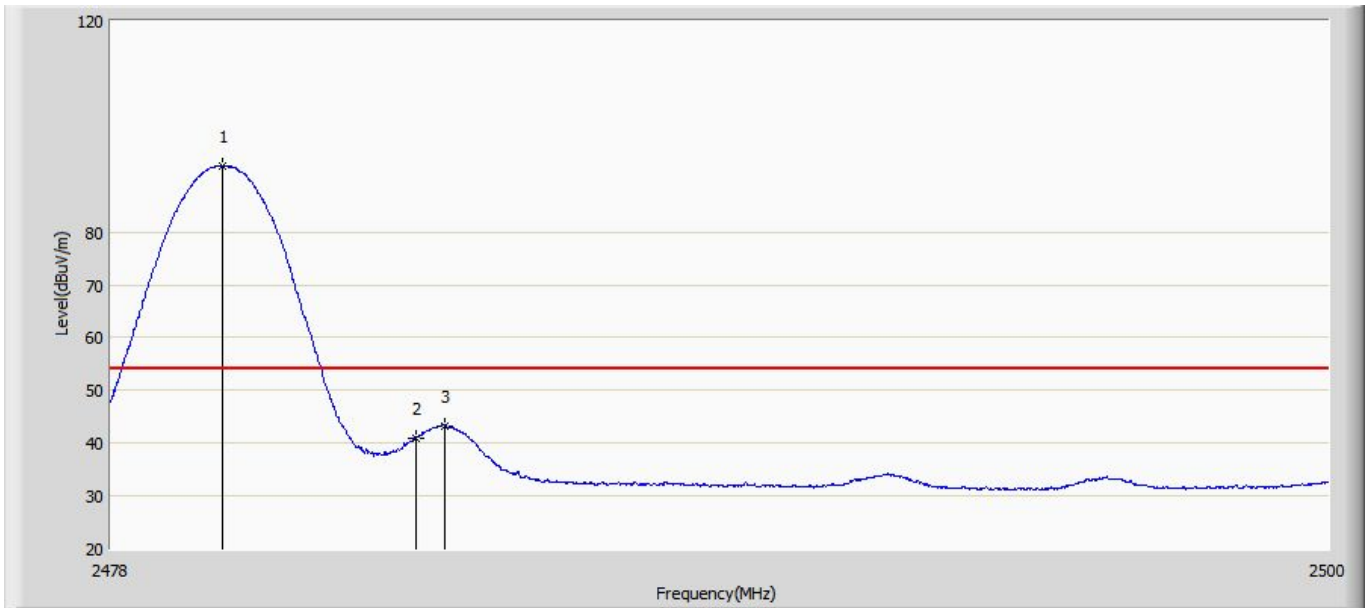
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | * | 2480.046 | 94.554 | 64.038 | N/A | N/A | 30.516 | AV |
| 2 | | 2483.500 | 41.044 | 10.560 | -12.956 | 54.000 | 30.484 | AV |
| 3 | | 2483.995 | 42.524 | 12.044 | -11.476 | 54.000 | 30.480 | AV |

| | |
|--|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/09/15 - 11:07 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Horizontal |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at 2480MHz by BLE | |



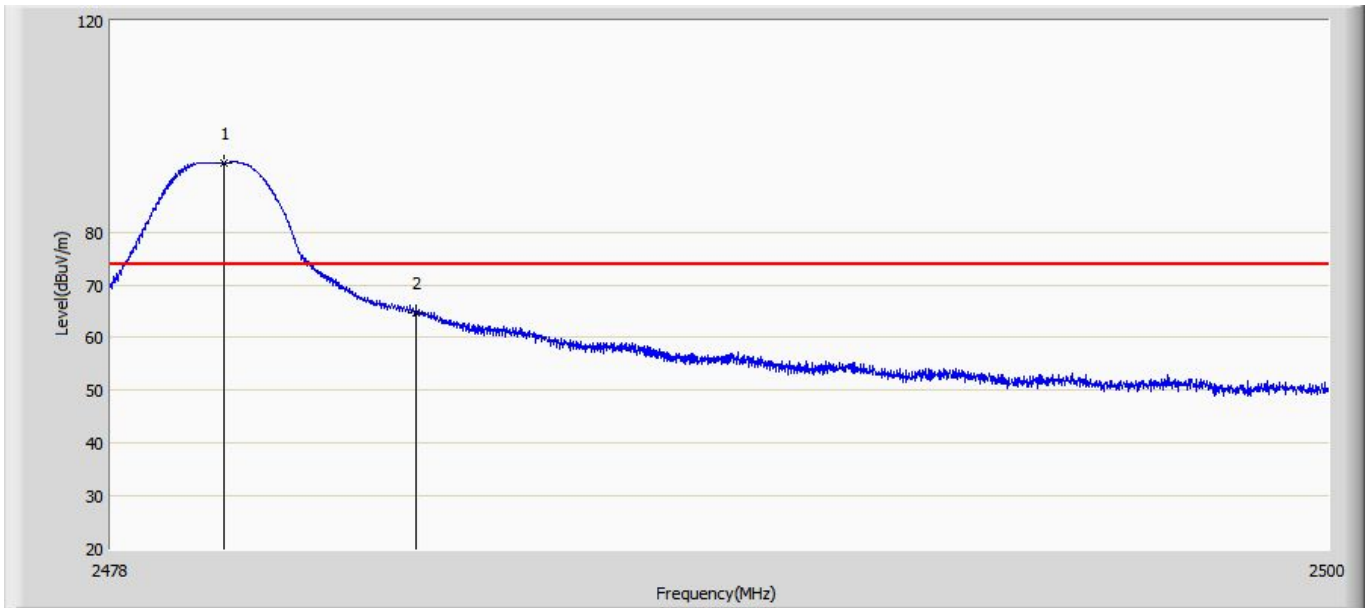
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | * | 2479.947 | 95.146 | 64.630 | N/A | N/A | 30.516 | PK |
| 2 | | 2483.500 | 67.145 | 36.661 | -6.855 | 74.000 | 30.484 | PK |

| | |
|--|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/09/15 - 11:09 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Vertical |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at 2480MHz by BLE | |



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | * | 2480.024 | 92.525 | 62.009 | N/A | N/A | 30.516 | AV |
| 2 | | 2483.500 | 40.928 | 10.444 | -13.072 | 54.000 | 30.484 | AV |
| 3 | | 2484.028 | 43.261 | 12.781 | -10.739 | 54.000 | 30.480 | AV |

| | |
|--|--------------------------|
| Engineer: Simon | |
| Site: AC5 | Time: 2017/09/15 - 11:12 |
| Limit: FCC_Part15.209_RE(3m) | Margin: 0 |
| Probe: Horn_3117_00167055(1-18GHz) | Polarity: Vertical |
| EUT: BlueNRG-A BLE Module | Power: AC 120V/60Hz |
| Note: Mode 1: Transmit at 2480MHz by BLE | |



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1 | * | 2480.046 | 93.150 | 62.634 | N/A | N/A | 30.516 | PK |
| 2 | | 2483.500 | 64.585 | 34.101 | -9.415 | 74.000 | 30.484 | PK |

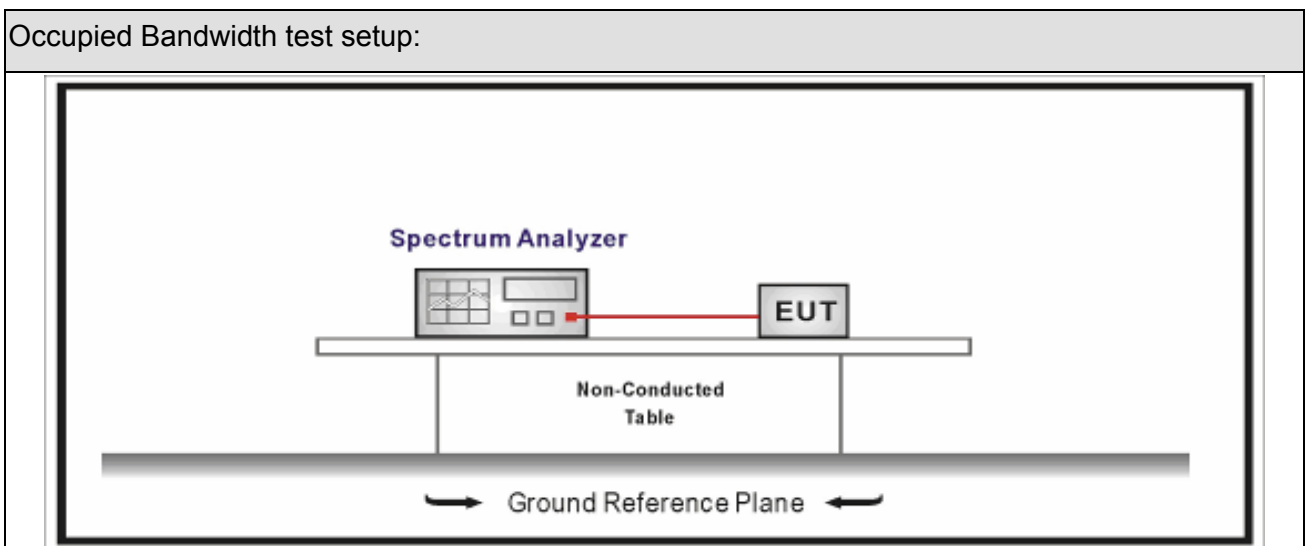
7. Occupied Bandwidth

7.1. Test Equipment

| Occupied Bandwidth / TR-8 | | | | | |
|----------------------------|--------------|----------|------------|------------|---------------|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | N9010A | MY48030494 | 2017.02.04 | 2018.02.03 |
| EXA Spectrum Analyzer | Keysight | N9010A | MY55370495 | 2017.04.09 | 2018.04.08 |
| MXA Signal Analyzer | Keysight | N9020A | MY56060147 | 2017.04.09 | 2018.04.08 |
| Temperature/Humidity Meter | zhichen | ZC1-2 | TR8-TH | 2017.04.10 | 2018.04.09 |

Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

7.2. Test Setup



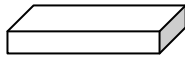
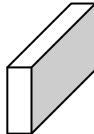
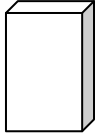
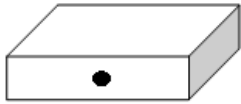
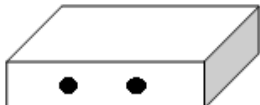

7.3. Limit

| |
|--|
| Occupied Bandwidth |
| Systems using digital modulation techniques operate in the 2400-2483.5 MHz .The minimum 6 dB bandwidth shall be at least 500 kHz |

7.4. Test Procedure

| Test Method | | | |
|-------------------------------------|---|---------|---------------|
| | Reference Rule | Chapter | Description |
| <input checked="" type="checkbox"/> | ANSI C63.10 | 11.8 | DTS bandwidth |
| | <input type="checkbox"/> ANSI C63.10 | 11.8.1 | Option 1 |
| | <input checked="" type="checkbox"/> ANSI C63.10 | 11.8.2 | Option 2 |

7.5. EUT test definition

| Item | Occupied Bandwidth | | | |
|-----------------|--|--|--|--|
| Device Category | <input type="checkbox"/> | Fixed point-to-point | | |
| | <input type="checkbox"/> | Emit multiple directional beams, simultaneously or sequentially | | |
| | <input checked="" type="checkbox"/> | Other cases | | |
| Test mode | Mode 1 | | | |
| Test method | <input type="checkbox"/> | Radiated | | |
| | | X Axis | Y Axis | Z Axis |
| | |  |  |  |
| | | Worst Axis <input type="checkbox"/> | Worst Axis <input type="checkbox"/> | Worst Axis <input type="checkbox"/> |
| | <input checked="" type="checkbox"/> | Conducted | | |
| | <input checked="" type="checkbox"/> | Chain 0 | | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | Chain 2 |
| |  | | | |

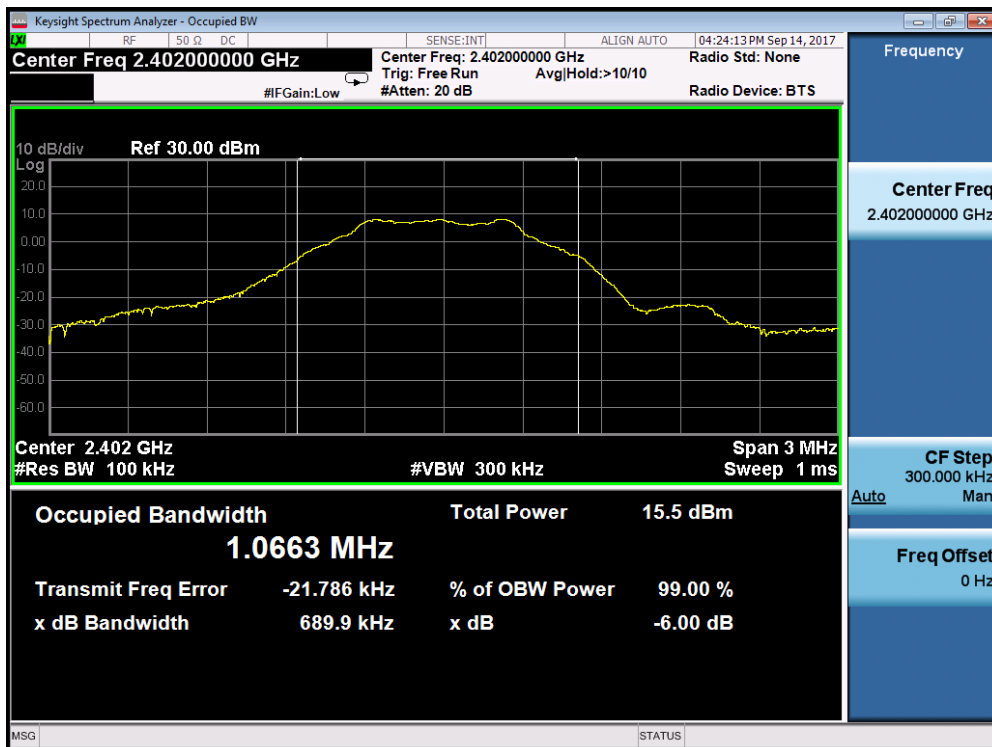
7.6. Test Result

| | | | |
|--------------|------------------------|-----------|----------------|
| Product Name | : BlueNRG-A BLE Module | Power | : AC 120V/60Hz |
| Test Mode | : Mode 1 | Test Site | : TR-8 |
| Test Date | : 2017.09.15 | | |

| Mode | CH. | Test Freq. (MHz) | 99% Occupied Bandwidth (kHz) | 6dB Occupied Bandwidth (kHz) | Limit (kHz) | Result |
|------|-----|------------------|------------------------------|------------------------------|-------------|--------|
| 1 | 00 | 2402 | 1066.3 | 689.9 | >500 | Pass |
| 1 | 19 | 2440 | 1072.2 | 699.5 | >500 | Pass |
| 1 | 39 | 2480 | 1084.3 | 721.5 | >500 | Pass |

Note : The worst case of Occupied Bandwidth as below:

Mode 1 CH19 (2402MHz)



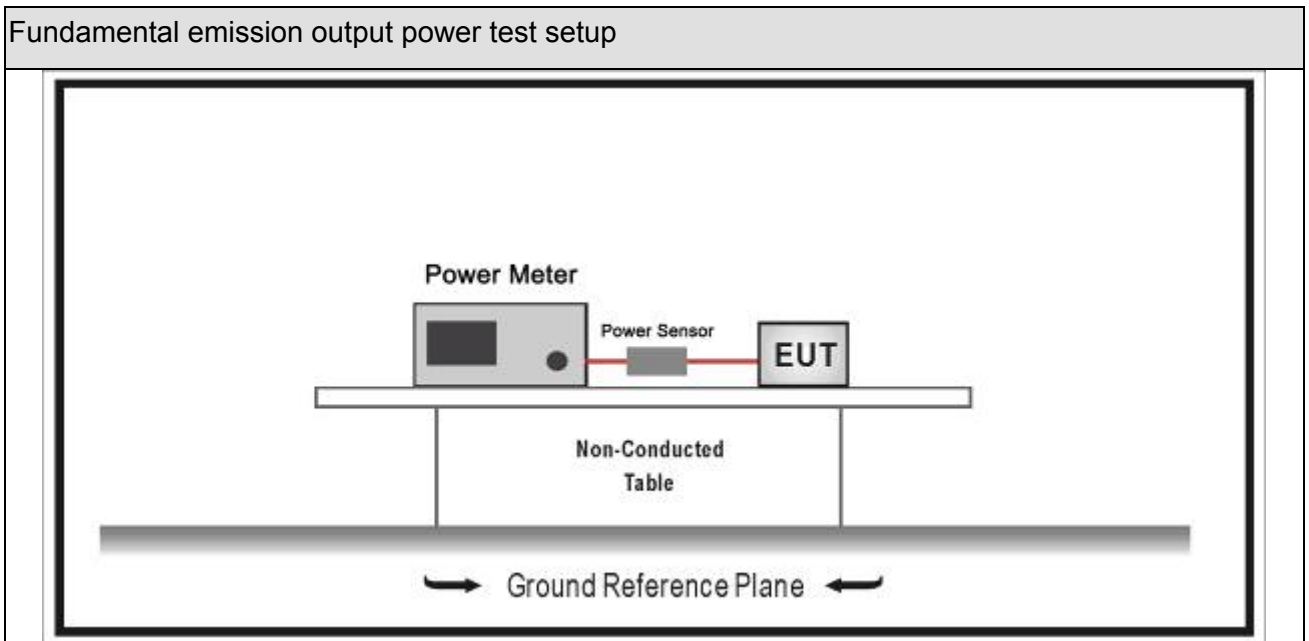
8. Fundamental emission output power

8.1. Test Equipment

| Fundamental emission output power/ TR-8 | | | | | |
|---|--------------|----------|------------|------------|---------------|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | E4446A | MY45300103 | 2017.01.04 | 2018.01.03 |
| Spectrum Analyzer | Agilent | N9010A | MY48030494 | 2017.01.04 | 2018.01.03 |
| Wideband Peak Power Meter | Anritsu | ML2495A | 0905006 | 2017.10.14 | 2018.10.13 |
| Power Sensor | Anritsu | MA2411B | 0846014 | 2017.10.14 | 2018.10.13 |
| Temperature/Humidity Meter | zhicheng | ZC1-2 | TR8-TH | 2017.04.10 | 2018.04.09 |

Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

8.2. Test Setup



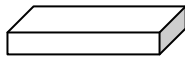
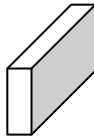
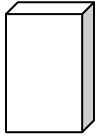

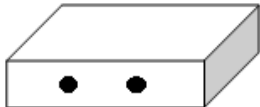
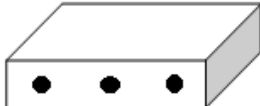
8.3. Limit

| Fundamental emission output power Limit | | |
|--|---|---|
| <input checked="" type="checkbox"/> | $G_{TX} < 6\text{dBi}$ | $P_{out} \leq 30\text{dBm}$ |
| <input type="checkbox"/> | $G_{TX} > 6\text{dBi}$ | |
| <input type="checkbox"/> | Non-Fix point-point | $P_{out} \leq 30 - (G_{TX} - 6)$ |
| <input type="checkbox"/> | Fix point-point | $P_{out} \leq 30 - [(G_{TX} - 6)]/3$ |
| <input type="checkbox"/> | Point-to-multipoint | $P_{out} \leq 30 - (G_{TX} - 6)$ |
| <input type="checkbox"/> | Overlap Beams | $P_{out} \leq 30 - [(G_{TX} - 6)]/3$ |
| <input type="checkbox"/> | Aggregate power transmitted simultaneously on all beams | $P_{out} \leq 30 - [(G_{TX} - 6)]/3$ |
| <input type="checkbox"/> | single directional beam | $P_{out} \leq 30 - [(G_{TX} - 6)]/3 + 8\text{dB}$ |
| <p>Note 1 : G_{TX} directional gain of transmitting antennas.</p> <p>Note 2 : P_{out} is maximum peak conducted output power .</p> | | |

8.4. Test Procedure

| Fundamental emission output power Test Method | | | | |
|---|-------------------------------------|-------------|------------|--|
| | References Rule | | Chapter | Description |
| <input checked="" type="checkbox"/> | ANSI C63.10 | | 11.9 | Fundamental emission output power |
| | <input checked="" type="checkbox"/> | ANSI C63.10 | 11.9.1 | Maximum peak conducted output power |
| | <input type="checkbox"/> | ANSI C63.10 | 11.9.1.1 | RBW \geq DTS bandwidth |
| | <input type="checkbox"/> | ANSI C63.10 | 11.9.1.2 | Integrated band power method |
| | <input checked="" type="checkbox"/> | ANSI C63.10 | 11.9.1.3 | PKPM1 Peak power meter method |
| | <input checked="" type="checkbox"/> | ANSI C63.10 | 11.9.2 | Maximum conducted (average) output power |
| | <input type="checkbox"/> | ANSI C63.10 | 11.9.2.2 | Measurement using a spectrum analyzer (SA) |
| | <input type="checkbox"/> | ANSI C63.10 | 11.9.2.2.2 | Method AVGSA-1(Duty cycle \geq 98%) |
| | <input type="checkbox"/> | ANSI C63.10 | 11.9.2.2.3 | Method AVGSA-1A(Duty cycle \geq 98%) |
| | <input type="checkbox"/> | ANSI C63.10 | 11.9.2.2.4 | Method AVGSA-2(Duty cycle \leq 98%) |
| | <input type="checkbox"/> | ANSI C63.10 | 11.9.2.2.5 | Method AVGSA-2A(Duty cycle \leq 98%) |
| | <input type="checkbox"/> | ANSI C63.10 | 11.9.2.2.4 | Method AVGSA-3 |
| | <input type="checkbox"/> | ANSI C63.10 | 11.9.2.2.5 | Method AVGSA-3A |
| | <input checked="" type="checkbox"/> | ANSI C63.10 | 11.9.2.3 | Measurement using a power meter (PM) |
| | <input type="checkbox"/> | ANSI C63.10 | 11.9.2.3.1 | Method AVGPM |
| | <input checked="" type="checkbox"/> | ANSI C63.10 | 11.9.2.3.2 | Method AVGPM-G |

8.5. EUT test definition

| Item | Fundamental emission output power | | | |
|-----------------|--|--|---|---|
| Device Category | <input type="checkbox"/> | Fixed point-to-point | | |
| | <input type="checkbox"/> | Emit multiple directional beams, simultaneously or sequentially | | |
| | <input checked="" type="checkbox"/> | Other cases | | |
| Test mode | Mode 1 | | | |
| Test method | <input type="checkbox"/> | Radiated | | |
| | | X Axis | Y Axis | Z Axis |
| | |  |  |  |
| | | Worst Axis <input type="checkbox"/> | Worst Axis <input type="checkbox"/> | Worst Axis <input type="checkbox"/> |
| | <input checked="" type="checkbox"/> | Conducted | | |
| | <input checked="" type="checkbox"/> | Chain 0 | | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | Chain 2 |
| |  | | | |

8.6. Test Result

| | | | |
|--------------|------------------------|-----------|----------------|
| Product Name | : BlueNRG-A BLE Module | Power | : AC 120V/60Hz |
| Test Mode | : Mode 1 | Test Site | : TR-8 |
| Test Date | : 2017.10.25 | | |

| Mode | Channel | Test Frequency (MHz) | Measurement Power Output (dBm) | Total Power Output (dBm) | Limit (dBm) | Result |
|------|---------|----------------------|--------------------------------|--------------------------|-------------|--------|
| 1 | 00 | 2402 | 8.89 | 8.89 | 30 | Pass |
| 1 | 19 | 2440 | 8.94 | 8.94 | 30 | Pass |
| 1 | 39 | 2480 | 8.78 | 8.78 | 30 | Pass |

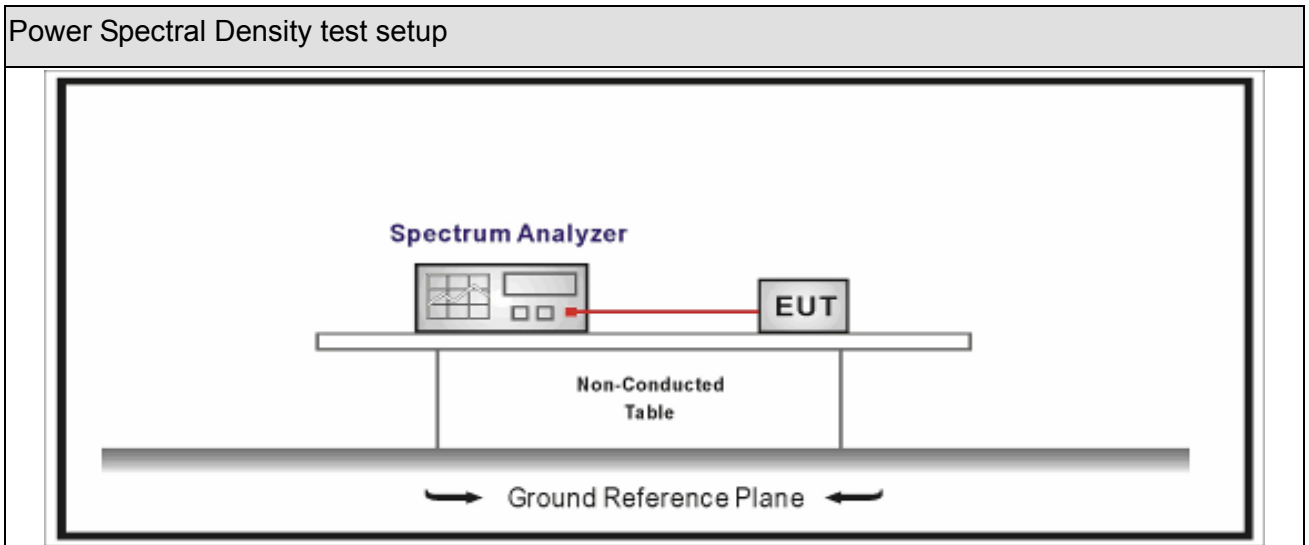
9. Power Spectral Density

9.1. Test Equipment

| Power Spectral Density / TR-8 | | | | | |
|-------------------------------|--------------|----------|------------|------------|---------------|
| Instrument | Manufacturer | Type No. | Serial No. | Cal. Date | Cal. Due Date |
| Spectrum Analyzer | Agilent | N9010A | MY48030494 | 2017.02.04 | 2018.02.03 |
| EXA Spectrum Analyzer | Keysight | N9010A | MY55370495 | 2017.04.09 | 2018.04.08 |
| MXA Signal Analyzer | Keysight | N9020A | MY56060147 | 2017.04.09 | 2018.04.08 |
| Temperature/Humidity Meter | zhichen | ZC1-2 | TR8-TH | 2017.04.10 | 2018.04.09 |

Note: All equipment are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

9.2. Test Setup



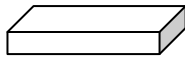
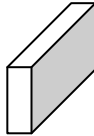
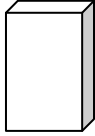
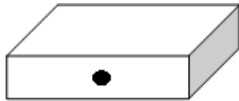
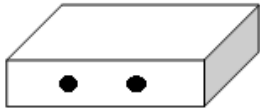
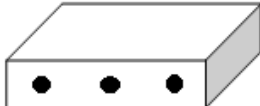
9.3. Limit

| |
|---|
| Power Spectral Density Limit |
| Power Spectral Density $\leq 8\text{dBm}/3\text{kHz}$ |

9.4. Test Procedure

| Power Spectral Density Test Method | | | |
|-------------------------------------|-----------------|---------|--|
| | References Rule | Chapter | Description |
| <input checked="" type="checkbox"/> | ANSI C63.10 | 11.10 | Maximum power spectral density level in the fundamental emission |
| <input checked="" type="checkbox"/> | ANSI C63.10 | 11.10.2 | Method PKPSD (peak PSD) |
| <input type="checkbox"/> | ANSI C63.10 | 11.10.3 | Method AVGPSD-1(Duty cycle \geq 98%) |
| <input type="checkbox"/> | ANSI C63.10 | 11.10.4 | Method AVGPSD-1A(Duty cycle \geq 98%) |
| <input type="checkbox"/> | ANSI C63.10 | 11.10.5 | Method AVGPSD-2(Duty cycle $<$ 98%) |
| <input type="checkbox"/> | ANSI C63.10 | 11.10.6 | Method AVGPSD-2A(Duty cycle $<$ 98%) |
| <input type="checkbox"/> | ANSI C63.10 | 11.10.7 | Method AVGPSD-3 |
| <input type="checkbox"/> | ANSI C63.10 | 11.10.8 | Method AVGPSD-3A |

9.5. EUT test definition

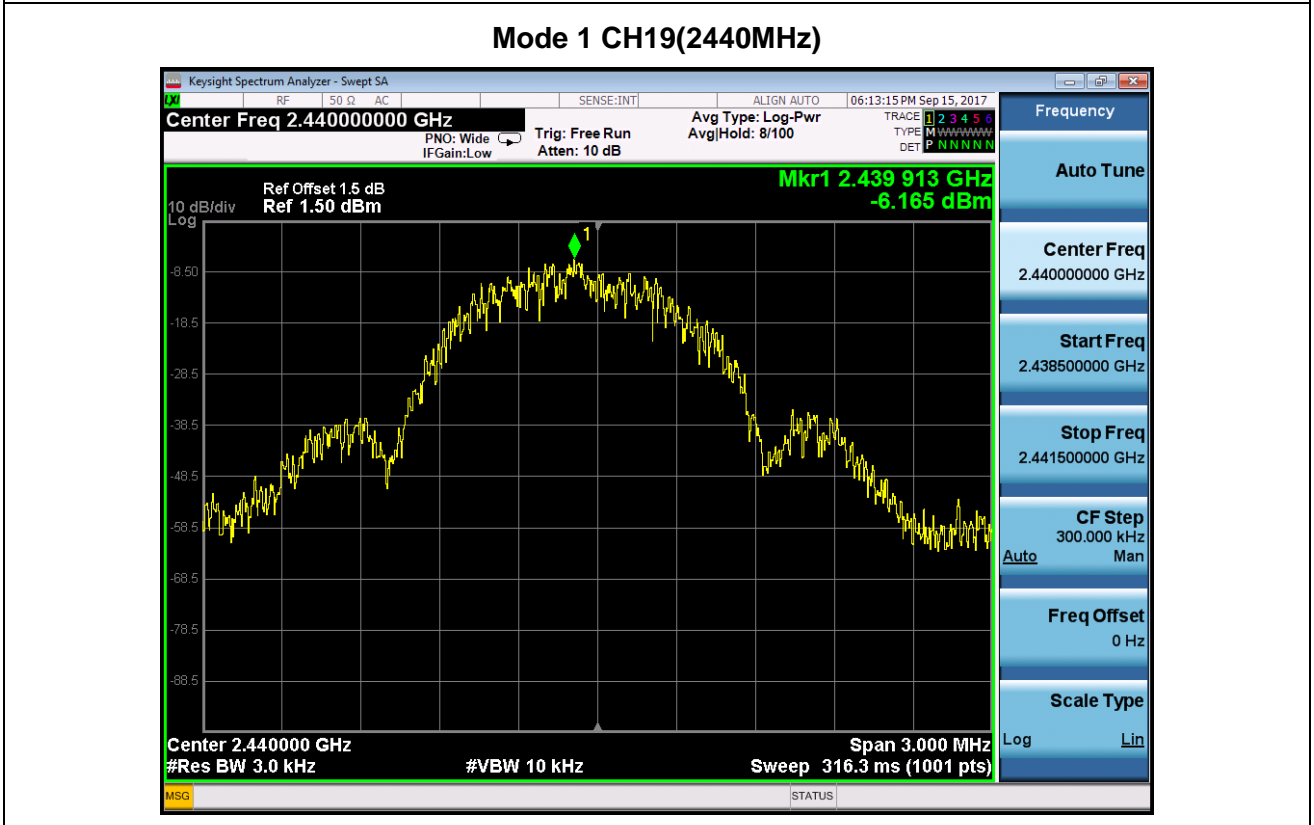
| Item | Power Spectral Density Test Method | | | |
|-----------------|--|--|--|--|
| Device Category | <input type="checkbox"/> | Fixed point-to-point | | |
| | <input type="checkbox"/> | Emit multiple directional beams, simultaneously or sequentially | | |
| | <input checked="" type="checkbox"/> | Other cases | | |
| Test mode | Mode 1 | | | |
| Test method | <input type="checkbox"/> | Radiated | | |
| | | X Axis | Y Axis | Z Axis |
| | |  |  |  |
| | | Worst Axis <input type="checkbox"/> | Worst Axis <input type="checkbox"/> | Worst Axis <input type="checkbox"/> |
| | <input checked="" type="checkbox"/> | Conducted | | |
| | <input checked="" type="checkbox"/> | Chain 0 | | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | |
| | |  | | |
| | <input type="checkbox"/> | Chain 0 | Chain 1 | Chain 2 |
| |  | | | |

9.6. Test Result

| | | | |
|--------------|------------------------|-----------|----------------|
| Product Name | : BlueNRG-A BLE Module | Power | : AC 120V/60Hz |
| Test Mode | : Mode 1 | Test Site | : TR-8 |
| Test Date | : 2017.09.15 | | |

| Mode | Channel | Test Frequency (MHz) | Measurement PSD (dBm/3kHz) | Total PSD (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|------|---------|----------------------|----------------------------|----------------------|------------------|--------|
| 1 | 00 | 2402 | -7.209 | -7.209 | 8 | Pass |
| 1 | 19 | 2440 | -6.165 | -6.165 | 8 | Pass |
| 1 | 39 | 2480 | -6.540 | -6.540 | 8 | Pass |

Note : The worst case of Power Spectral Density as below:



10. Antenna Requirement

10.1. Limit

| Antenna Requirement Limit |
|---|
| <p>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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.</p> |

10.2. Antenna Connector Construction

| Antenna Connector Construction | |
|--|--|
| <input checked="" type="checkbox"/> | The use of a permanently attached antenna |
| <input type="checkbox"/> | The antenna use of a unique coupling to the intentional radiator |
| <input type="checkbox"/> | The use of a nonstandard antenna jack or electrical connector |
| Please refer to the attached document "Internal Photograph" to show the antenna connector. | |

_____ The End _____