



FCC RF Test Report

APPLICANT : SHARP CORPORATION
EQUIPMENT : Smart Phone
TYPE NAME : Type-A
Type-B
FCC ID : APYHRO00249
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Apr. 01, 2017 and testing was completed on May 11, 2017. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

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FCC ID : APYHRO00249

Page Number : 1 of 23

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REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|------------|---------|--|---------------|
| FR740121B | Rev. 01 | Initial issue of report | Jun. 12, 2017 |
| FR740121B | Rev. 02 | Remove WLAN 5GHz Band 4 information in section 1.4.2 | Jun. 14, 2017 |
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SUMMARY OF TEST RESULT

| Report Section | FCC Rule | Description | Limit | Result | Remark |
|----------------|--------------------|---|-----------------------|--------|---|
| 3.1 | 15.247(b)(3) | Peak Output Power | $\leq 30\text{dBm}$ | Pass | - |
| 3.2 | 15.247(d) | Radiated Band Edges and Spurious Emission | 15.209(a) & 15.247(d) | Pass | Under limit 12.03 dB at 2495.400 MHz |
| 3.3 | 15.207 | AC Conducted Emission | 15.207(a) | Pass | Under limit 4.60 dB at 0.518 MHz |
| 3.4 | 15.203 & 15.247(b) | Antenna Requirement | N/A | Pass | - |



1 General Description

1.1 Applicant

SHARP CORPORATION

Takumi-Cho, Sakai-Ku, Sakai-Shi, 2, Osaka 590-852, Japan

1.2 Manufacturer

SHARP CORPORATION

Takumi-Cho, Sakai-Ku, Sakai-Shi, 2, Osaka 590-852, Japan

1.3 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac, Wi-Fi 5GHz 802.11a/n/ac, NFC, and GPS

| Product Specification subjective to this standard | |
|---|--|
| Sample 1 | EUT with Memory 1 |
| Sample 2 | EUT with Memory 2 |
| Antenna Type | WWAN: ILA Antenna WLAN: ILA Antenna Bluetooth: ILA Antenna GPS/Glonass/Beidou/Galileo: ILA Antenna NFC: Loop Antenna |

Remark: The deviations between type name: Type-A and type name: Type-B which can be referred Product Equality Declaration. The deviations were switched by Hardware.



1.4 Re-use of Measured Data

1.4.1 Introduction Section

The original model (FCC ID: APYHRO00248) and the variant model (FCC ID: APYHRO00249) has identical PCB layout, antenna, SW implementation for Bluetooth/Wi-Fi/GPS. Based on their similarity, the FCC Part 15C & 15E (equipment class: DTS, DSS, DXX, NII) test data issued for original model also apply for the variant model.

The applicant takes full responsibility that the test data as referenced in section 4 below represent compliance for this FCC ID (FCC ID: APYHRO00249).

1.4.2 Difference Section

The original model (FCC ID: APYHRO00248) and the variant model (FCC ID: APYHRO00249) has identical PCB layout, antenna, SW implementation for Bluetooth/Wi-Fi/GPS. The details of similarity and difference can be found in the Operating Description.

The product specification is outlined in the following table:

| FCC ID | | | APYHRO00248 | APYHRO00249 |
|---------------|---|---------------------------------|---|-------------|
| Wireless Tech | Mode | | Frequency (MHz) | |
| GSM | GSM Voice GPRS (GMSK) EDGE (8PSK) | Multi-Slot Class 11 DTM: Yes | 850/1900 | 850/1900 |
| UMTS | AMR/RCM12.2Kbps HSDPA/HSUPA/DC-HSDPA | | B5 | B2/B4 |
| LTE | QPSK/16QAM VoLTE | | B5 | B2/B4/B17 |
| Wi-Fi | 11b/11g/11n(HT20) | | 2412-2462 MHz/ | |
| | 11a/11n(HT20)/11n(HT40) | | 5180-5240 MHz 5260-5320 MHz 5500-5700 MHz | |
| Bluetooth | BR/EDR/LE | | 2402-2480 MHz | |
| NFC | NFC | | 13.56 MHz | |



1.4.3 Spot Check Verification Data Section

Summary of the spot check:

| Test Item | Mode | APYHRO00248 Worst Result | APYHRO00249 Worst Result | Difference (dB) |
|--|-----------------------|-----------------------------|-----------------------------|-----------------|
| Average Conducted Power (dBm) | 802.11b | 14.34 | 13.84 | 0.5 |
| | 802.11g | 13.41 | 13.16 | 0.25 |
| | 11n HT20 | 13.39 | 13.21 | 0.18 |
| | 11n HT40 | 13.26 | 13.24 | 0.02 |
| | 20MHz BW 5150-5250MHz | 13.77 | 13.61 | 0.16 |
| | 20MHz BW 5250-5350MHz | 13.51 | 13.65 | -0.14 |
| | 20MHz BW 5470-5725MHz | 13.50 | 13.71 | -0.21 |
| | 40MHz BW 5150-5250MHz | 13.85 | 13.74 | 0.11 |
| | 40MHz BW 5250-5350MHz | 13.81 | 13.79 | 0.02 |
| | 40MHz BW 5470-5725MHz | 13.67 | 13.78 | -0.11 |
| | 80MHz BW 5150-5250MHz | 13.84 | 13.53 | 0.31 |
| | 80MHz BW 5250-5350MHz | 13.55 | 13.57 | -0.02 |
| | 80MHz BW 5470-5725MHz | 13.35 | 13.60 | -0.25 |
| | BT (1Mbps) | 6.15 | 5.29 | 0.86 |
| | BT (2Mbps) | 2.96 | 2.19 | 0.77 |
| | BT (3Mbps) | 2.91 | 2.10 | 0.81 |
| | BT-LE | 5.24 | 4.84 | 0.4 |
| | Test date | 2017/04/14 – 2017/05/04 | 2017/04/20 – 2017/05/12 | |
| Peak Radiated Spurious Emission (Band Edge) (dBuV/m) | 802.11b | 51.38 | 51.56 | -0.18 |
| | 802.11g | 56.65 | 56.81 | -0.16 |
| | 11n HT40 | 56.84 | 58.6 | -1.76 |
| | 20MHz BW 5150-5250MHz | 51.99 | 50.93 | 1.06 |
| | 20MHz BW 5250-5350MHz | 57.92 | 56.97 | 0.95 |
| | 20MHz BW 5470-5725MHz | 47.9 | 47.6 | 0.3 |
| | 40MHz BW 5150-5250MHz | 52.04 | 53.45 | -1.41 |
| | 40MHz BW 5250-5350MHz | 62.35 | 60.48 | 1.87 |
| | 40MHz BW 5470-5725MHz | 61.35 | 59.27 | 2.08 |
| | 80MHz BW 5150-5250MHz | 49.51 | 49.37 | 0.14 |
| | 80MHz BW 5250-5350MHz | 60.13 | 60.06 | 0.07 |
| | 80MHz BW 5470-5725MHz | 57.75 | 56.6 | 1.15 |
| | BT (1Mbps) | 42.26 | 42.63 | -0.37 |
| | BT-LE | 51.58 | 51.65 | -0.07 |
| | Test date | 2017/04/14 – 2017/05/04 | 2017/04/20 – 2017/05/12 | |
| Average Radiated Spurious Emission (Band Edge) (dBuV/m) | 802.11b | 40.10 | 40.14 | -0.04 |
| | 802.11g | 42.97 | 43.72 | -0.75 |
| | 11n HT40 | 45.24 | 47.52 | -2.28 |
| | 20MHz BW 5150-5250MHz | 41.12 | 40.45 | -0.67 |
| | 20MHz BW 5250-5350MHz | 43.9 | 42.01 | 1.89 |
| | 20MHz BW 5470-5725MHz | 43.76 | 43.26 | 0.5 |
| | 40MHz BW 5150-5250MHz | 44.73 | 43.88 | 0.85 |
| | 40MHz BW 5250-5350MHz | 50.41 | 50.53 | -0.12 |
| | 40MHz BW 5470-5725MHz | 47.14 | 46.8 | 0.34 |
| | 80MHz BW 5150-5250MHz | 41.41 | 42.24 | -0.83 |
| | 80MHz BW 5250-5350MHz | 50.02 | 50.09 | -0.07 |
| | 80MHz BW 5470-5725MHz | 48.24 | 46.97 | 1.27 |
| | BT (1Mbps) | 17.50 | 17.84 | -0.34 |
| | BT-LE | 41.90 | 41.97 | -0.07 |
| | Test date | 2017/04/14 – 2017/05/04 | 2017/04/20 – 2017/05/12 | |



| Test Item | Mode | APYHRO00248 Worst Result | APYHRO00249 Worst Result | Difference (dB) |
|--|-----------------------|-----------------------------|-----------------------------|-----------------|
| Peak Radiated Spurious Emission (Harmonic) (dBuV/m) | 802.11b | 49.89 | 49.49 | 0.4 |
| | 802.11g | 49.52 | 49.59 | -0.07 |
| | 11n HT40 | 49.62 | 49.46 | 0.16 |
| | 20MHz BW 5150-5250MHz | 46.36 | 45.78 | 0.58 |
| | 20MHz BW 5250-5350MHz | 45.13 | 45.86 | -0.73 |
| | 20MHz BW 5470-5725MHz | 45.95 | 46.66 | -0.71 |
| | 40MHz BW 5150-5250MHz | 47.29 | 46.25 | 1.04 |
| | 40MHz BW 5250-5350MHz | 45.4 | 45.68 | -0.28 |
| | 40MHz BW 5470-5725MHz | 47.28 | 47.4 | -0.12 |
| | 80MHz BW 5150-5250MHz | 47.02 | 45.91 | 1.11 |
| | 80MHz BW 5250-5350MHz | 46.85 | 48.23 | -1.38 |
| | 80MHz BW 5470-5725MHz | 49.17 | 48.18 | 0.99 |
| | BT (1Mbps) | 49.88 | 49.47 | 0.41 |
| | BT-LE | 49.36 | 49.60 | -0.24 |
| | Test date | 2017/02/11 – 2017/02/24 | 2017/03/03 – 2017/03/11 | |

Conclusion:

WLAN Radiated spurious emission test against the variant model for non-cellular part based on the worst-case condition from the original model was performed in this filing to demonstrate the test data from original model remains representative for the variant model.

Based on the spot check test result (power levels measured are within 1dB, and the worst case of RSE spot check verification based on the worst condition from the original model is within 3dB, and are compliance with the limits), the test data from the original model is representative for the variant model.

The unwanted, harmonics, radiated spurious emission is reported peak measurement only due to spurious lower than 20dB than the limit.

The detail test results can be found in this document, Appendix A, hereafter.

**1.4.4 Reference detail Section:**

| Equipment Class | Reference FCC ID | Type Grant/Permissive Change | Reference Application | Folder Test/RF Exposure | Report Title |
|-----------------|------------------|------------------------------|-----------------------|-------------------------|-------------------------|
| DTS | APYHRO00248 | Original Grant | FR740120B | Part 15C | All sections applicable |
| | | | FR740120C | Part 15C | All sections applicable |
| | | | FA740120 | RF Exposure | All sections applicable |
| DSS | APYHRO00248 | Original Grant | FR740120A | Part 15C | All sections applicable |
| | | | FA740120 | RF Exposure | All sections applicable |
| NII | APYHRO00248 | Original Grant | FR740120E FZ740120 | Part 15E | All sections applicable |
| | | | FA740120 | RF Exposure | All sections applicable |

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

| | | |
|---------------------------|--|---------|
| Test Site | SPORTON INTERNATIONAL INC. | |
| Test Site Location | No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978 | |
| Test Site No. | Sporton Site No. | |
| | TH05-HY | CO05-HY |

Note: The test site complies with ANSI C63.4 2014 requirement.

| | | |
|---------------------------|--|--|
| Test Site | SPORTON INTERNATIONAL INC. | |
| Test Site Location | No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855 | |
| Test Site No. | Sporton Site No. | |
| | 03CH10-HY | |

Note: The test site complies with ANSI C63.4 2014 requirement.

1.7 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

| Frequency Band | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|-----------------|---------|----------------|---------|----------------|
| 2400-2483.5 MHz | 0 | 2402 | 21 | 2444 |
| | 1 | 2404 | 22 | 2446 |
| | 2 | 2406 | 23 | 2448 |
| | 3 | 2408 | 24 | 2450 |
| | 4 | 2410 | 25 | 2452 |
| | 5 | 2412 | 26 | 2454 |
| | 6 | 2414 | 27 | 2456 |
| | 7 | 2416 | 28 | 2458 |
| | 8 | 2418 | 29 | 2460 |
| | 9 | 2420 | 30 | 2462 |
| | 10 | 2422 | 31 | 2464 |
| | 11 | 2424 | 32 | 2466 |
| | 12 | 2426 | 33 | 2468 |
| | 13 | 2428 | 34 | 2470 |
| | 14 | 2430 | 35 | 2472 |
| | 15 | 2432 | 36 | 2474 |
| | 16 | 2434 | 37 | 2476 |
| | 17 | 2436 | 38 | 2478 |
| | 18 | 2438 | 39 | 2480 |
| | 19 | 2440 | - | - |
| | 20 | 2442 | - | - |

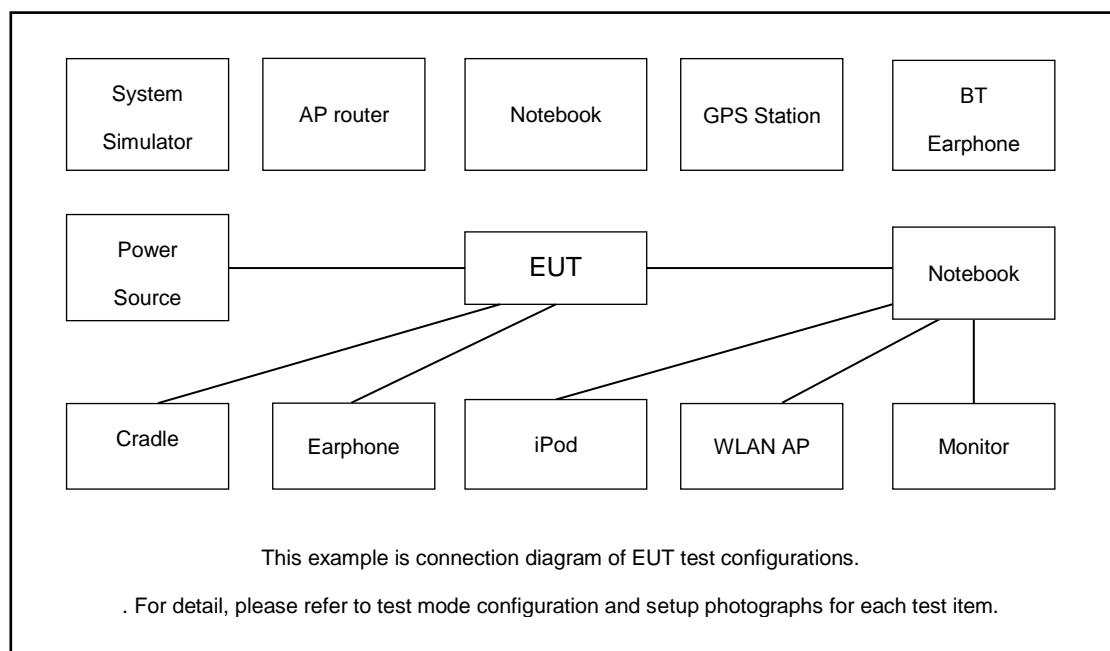
2.2 Test Mode

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

| Summary table of Test Cases | |
|--|---|
| Radiated TCs | Mode 1: Bluetooth Tx CH39_2480 MHz_1Mbps |
| AC Conducted Emission | Mode 1: LTE Band 17 Idle + Bluetooth Link + WLAN (2.4GHz) Link + Earphone + USB Cable (Charging from Adapter) + Camera (Front) for Sample 2 |
| Remark: For Radiated Test Cases, The tests were performance with Sample 1 | |

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

| Item | Equipment | Trade Name | Model Name | FCC ID | Data Cable | Power Cord |
|------|--------------------|---------------|-------------------|--|------------|--|
| 1. | System Simulator | Anritsu | MT8820C | N/A | N/A | Unshielded, 1.8 m |
| 2. | WLAN AP | ASUS | RT-AC66U | MSQ-RTAC66U | N/A | Unshielded, 1.8 m |
| 3. | Notebook | DELL | Latitude E6320 | FCC DoC/ Contains FCC ID: QDS-BRCM1054 | N/A | AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m |
| 4. | Bluetooth Earphone | Sony Ericsson | MW600 | PY7DDA-2029 | N/A | N/A |
| 5. | SD Card | SanDisk | MicroSD HC | FCC DoC | N/A | N/A |

2.5 EUT Operation Test Setup

The RF test items, programmed RF utility, "Tera Term" installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.

3 Test Result

3.1 Peak Output Power Measurement

3.1.1 Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

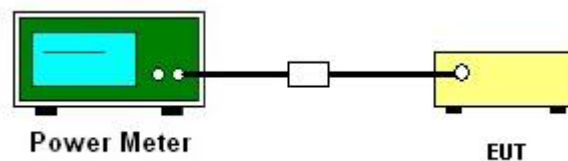
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04 section 9.1.2 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Peak Output Power

Please refer to Appendix A.



3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement 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 |

3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.



3.2.3 Test Procedures

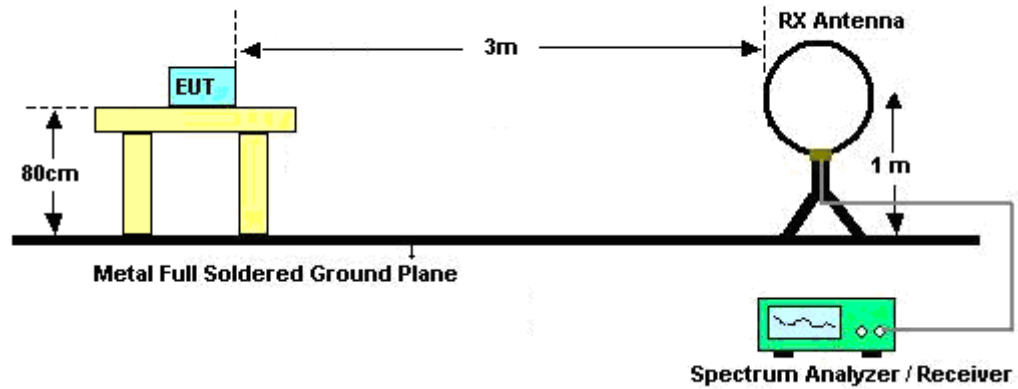
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

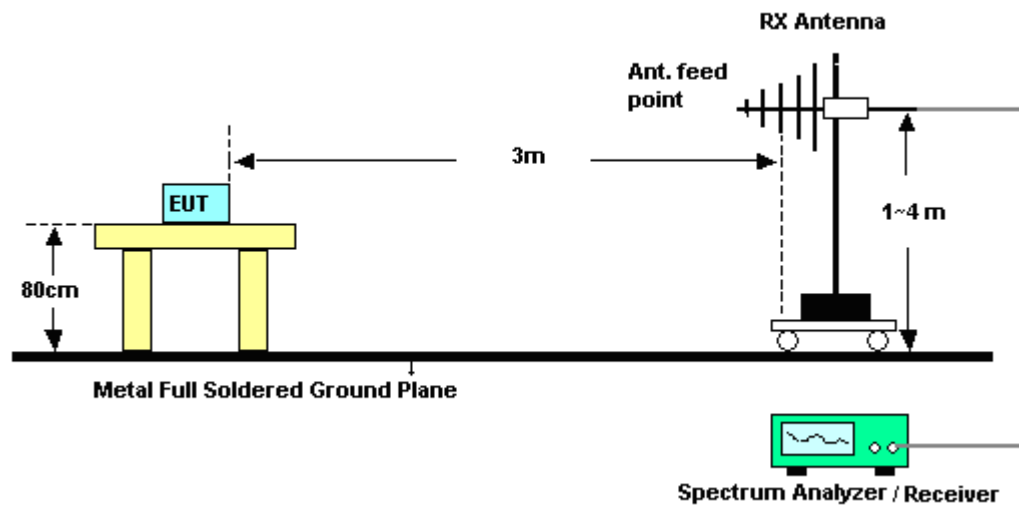
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.2.4 Test Setup

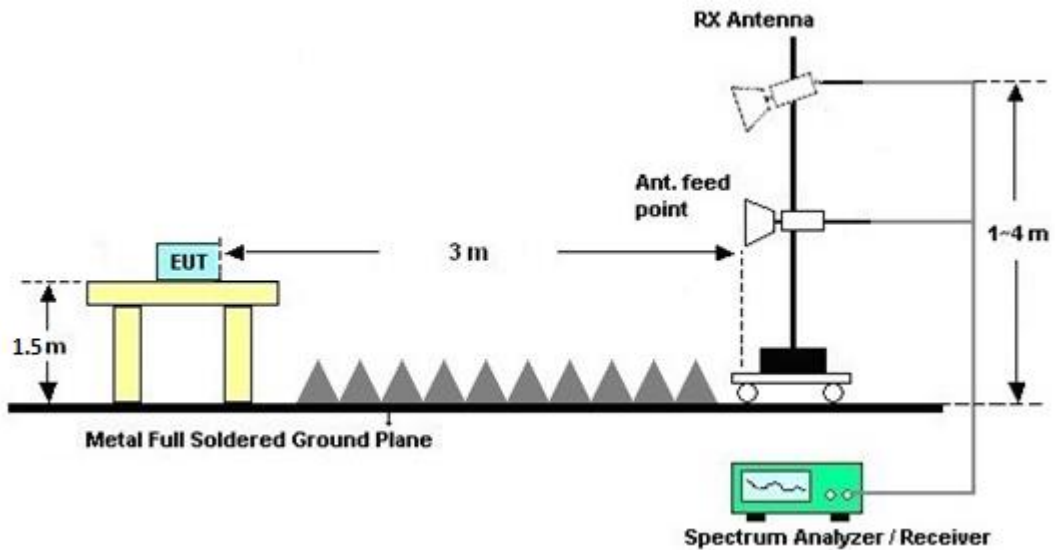
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.2.7 Duty Cycle

Please refer to Appendix E.

3.2.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.

3.3 AC Conducted Emission Measurement

3.3.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

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

*Decreases with the logarithm of the frequency.

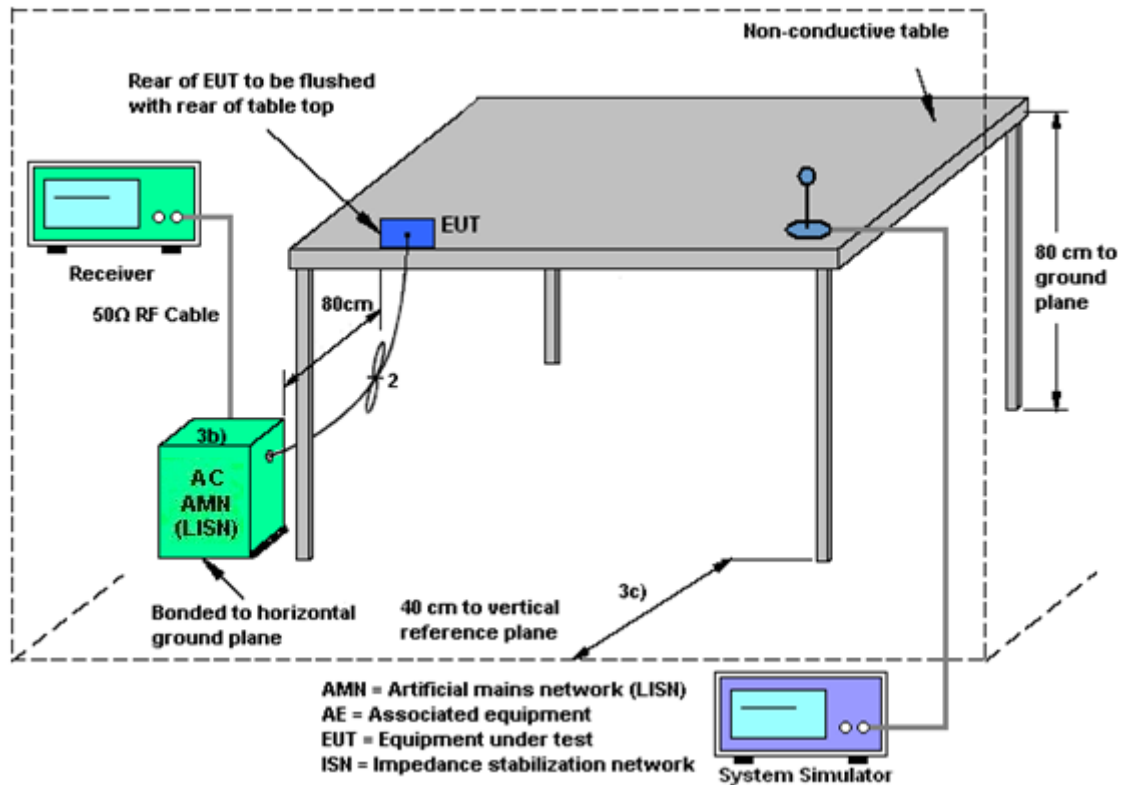
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.3.4 Test Setup



3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.4 Antenna Requirements

3.4.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.4.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|----------------------|-----------------|---------------------------------|-------------|-----------------|------------------|-----------------------------|---------------|-----------------------|
| Power Meter | Agilent | E4416A | GB41292344 | 300MHz~40GHz | Dec. 26, 2016 | Apr. 21, 2017 | Dec. 25, 2017 | Conducted (TH05-HY) |
| Power Sensor | Agilent | E9327A | US40441548 | 300MHz~40GHz | Dec. 26, 2016 | Apr. 21, 2017 | Dec. 25, 2017 | Conducted (TH05-HY) |
| Spectrum Analyzer | Rohde & Schwarz | FSP40 | 100055 | 9kHz-40GHz | Jul. 17, 2016 | Apr. 21, 2017 | Jul. 16, 2017 | Conducted (TH05-HY) |
| Amplifier | SONOMA | 310N | 187311 | 9kHz~1GHz | Oct. 26, 2016 | May 09, 2017 ~ May 11, 2017 | Oct. 25, 2017 | Radiation (03CH10-HY) |
| Bilog Antenna | TESEQ | CBL 6111D&00800 N1D01N-06 | 35413&02 | 30MHz~1GHz | Jan. 07, 2017 | May 09, 2017 ~ May 11, 2017 | Jan. 06, 2018 | Radiation (03CH10-HY) |
| Horn Antenna | SCHWARZBECK | BBHA 9120 D | 9120D-1325 | 1GHz ~ 18GHz | Sep. 30, 2016 | May 09, 2017 ~ May 11, 2017 | Sep. 29, 2017 | Radiation (03CH10-HY) |
| Preamplifier | Keysight | 83017A | MY53270078 | 1GHz~26.5GHz | Oct. 26, 2016 | May 09, 2017 ~ May 11, 2017 | Oct. 25, 2017 | Radiation (03CH10-HY) |
| Spectrum Analyzer | Keysight | N9010A | MY54200485 | 10Hz ~ 44GHz | Oct. 17, 2016 | May 09, 2017 ~ May 11, 2017 | Oct. 16, 2017 | Radiation (03CH10-HY) |
| Antenna Mast | EMEC | AM-BS-4500-B | N/A | 1~4m | N/A | May 09, 2017 ~ May 11, 2017 | N/A | Radiation (03CH10-HY) |
| Turn Table | EMEC | TT 2200 | N/A | 0~360 Degree | N/A | May 09, 2017 ~ May 11, 2017 | N/A | Radiation (03CH10-HY) |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100488 | 9 kHz~30 MHz | Oct. 20, 2016 | May 09, 2017 ~ May 11, 2017 | Oct. 19, 2018 | Radiation (03CH10-HY) |
| EMI Test Receiver | Keysight | N9038A(MXE) | MY55420170 | N/A | Mar. 03, 2017 | May 09, 2017 ~ May 11, 2017 | Mar. 02, 2018 | Radiation (03CH10-HY) |
| Preamplifier | Jet-Power | JPA00101800-30-10P | 1601180002 | 1GHz~18GHz | Jul. 27, 2016 | May 09, 2017 ~ May 11, 2017 | Jul. 26, 2017 | Radiation (03CH10-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170576 | 18GHz ~ 40GHz | Apr. 27, 2017 | May 09, 2017 ~ May 11, 2017 | Apr. 26, 2018 | Radiation (03CH10-HY) |
| Preamplifier | MITEQ | JS44-18004000-33-8P | 1840917 | 18GHz ~ 40GHz | Jun. 14, 2016 | May 09, 2017 ~ May 11, 2017 | Jun. 13, 2017 | Radiation (03CH10-HY) |
| AC Power Source | ChainTek | APC-1000W | N/A | N/A | N/A | Apr. 30, 2017 | N/A | Conduction (CO05-HY) |
| EMI Test Receiver | Rohde & Schwarz | ESCI 7 | 100724 | 9kHz~7GHz | Aug. 30, 2016 | Apr. 30, 2017 | Aug. 29, 2017 | Conduction (CO05-HY) |
| LISN | Rohde & Schwarz | ENV216 | 100080 | 9kHz~30MHz | Nov. 29, 2016 | Apr. 30, 2017 | Nov. 28, 2017 | Conduction (CO05-HY) |

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

| | |
|---|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 2.7 |
|---|-----|

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

| | |
|---|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 5.6 |
|---|-----|

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

| | |
|---|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 5.9 |
|---|-----|

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

| | |
|---|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 5.2 |
|---|-----|



Appendix A. Conducted Test Results

Bluetooth Low Energy

| | | | | |
|----------------|-----------|--------------------|-------|----|
| Test Engineer: | Allen Lin | Temperature: | 21~25 | °C |
| Test Date: | 2017/4/21 | Relative Humidity: | 51~54 | % |

TEST RESULTS DATA**Peak Power Table**

| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | Peak Conducted Power (dBm) | Conducted Power Limit (dBm) | DG (dBi) | EIRP Power (dBm) | EIRP Power Limit (dBm) | Pass /Fail |
|------|-----------|-----|-----|-------------|----------------------------|-----------------------------|----------|------------------|------------------------|------------|
| BLE | 1Mbps | 1 | 0 | 2402 | 4.66 | 30.00 | -1.80 | 2.86 | 36.00 | Pass |
| BLE | 1Mbps | 1 | 19 | 2440 | 4.69 | 30.00 | -1.80 | 2.89 | 36.00 | Pass |
| BLE | 1Mbps | 1 | 39 | 2480 | 5.00 | 30.00 | -1.80 | 3.20 | 36.00 | Pass |

TEST RESULTS DATA**Average Power Table****(Reporting Only)**

| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | Duty Factor (dB) | Average Conducted Power (dBm) |
|------|-----------|-----|-----|-------------|------------------|-------------------------------|
| BLE | 1Mbps | 1 | 0 | 2402 | 2.08 | 4.24 |
| BLE | 1Mbps | 1 | 19 | 2440 | 2.08 | 4.14 |
| BLE | 1Mbps | 1 | 39 | 2480 | 2.08 | 4.84 |



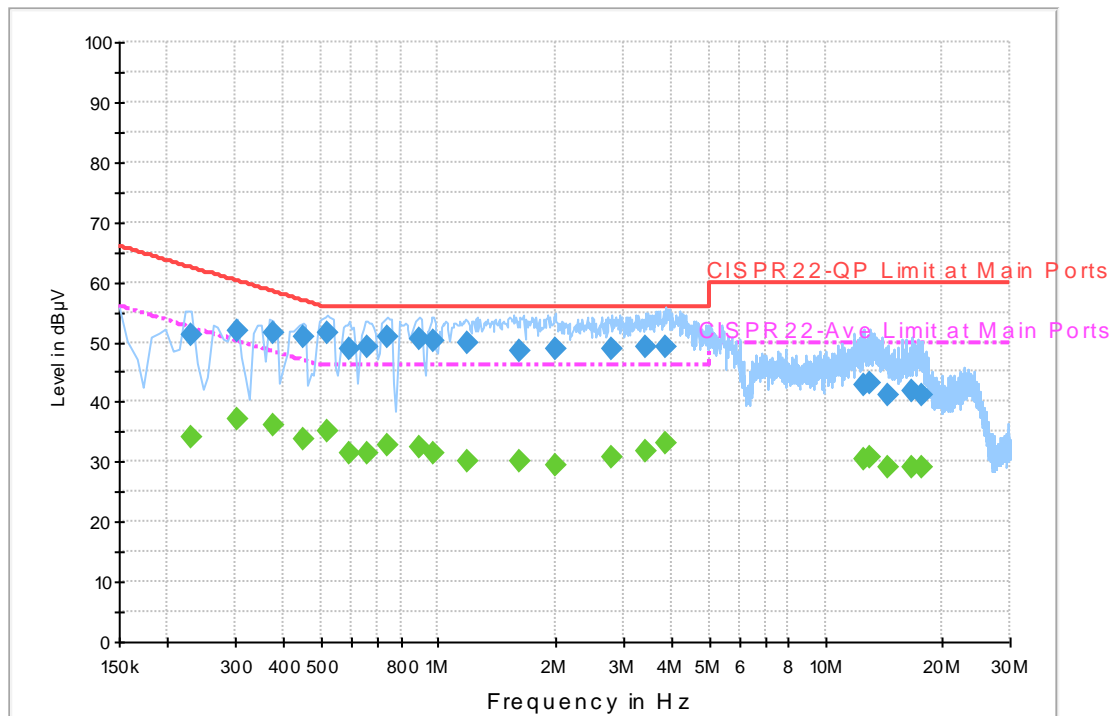
Appendix B. AC Conducted Emission Test Results

| | | | |
|-----------------|--------------|---------------------|--------|
| Test Engineer : | Arthur Hsieh | Temperature : | 22~24℃ |
| | | Relative Humidity : | 51~55% |

EUT Information

Report NO : 740121
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Line

ENV216 Auto Test FCC Power Bar - L



Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|--------|------|------------|-------------|--------------|
| 0.230000 | 51.1 | Off | L1 | 19.6 | 11.3 | 62.4 |
| 0.302000 | 51.7 | Off | L1 | 19.6 | 8.5 | 60.2 |
| 0.374000 | 51.6 | Off | L1 | 19.6 | 6.8 | 58.4 |
| 0.446000 | 51.0 | Off | L1 | 19.6 | 5.9 | 56.9 |
| 0.518000 | 51.4 | Off | L1 | 19.6 | 4.6 | 56.0 |
| 0.590000 | 48.9 | Off | L1 | 19.6 | 7.1 | 56.0 |
| 0.654000 | 49.3 | Off | L1 | 19.6 | 6.7 | 56.0 |
| 0.742000 | 50.9 | Off | L1 | 19.6 | 5.1 | 56.0 |
| 0.894000 | 50.4 | Off | L1 | 19.6 | 5.6 | 56.0 |
| 0.974000 | 50.2 | Off | L1 | 19.6 | 5.8 | 56.0 |
| 1.190000 | 49.8 | Off | L1 | 19.6 | 6.2 | 56.0 |
| 1.630000 | 48.6 | Off | L1 | 19.6 | 7.4 | 56.0 |
| 2.006000 | 48.9 | Off | L1 | 19.6 | 7.1 | 56.0 |
| 2.798000 | 48.7 | Off | L1 | 19.5 | 7.3 | 56.0 |
| 3.438000 | 49.0 | Off | L1 | 19.7 | 7.0 | 56.0 |
| 3.870000 | 49.0 | Off | L1 | 19.7 | 7.0 | 56.0 |
| 12.638000 | 42.8 | Off | L1 | 20.2 | 17.2 | 60.0 |
| 12.974000 | 43.1 | Off | L1 | 20.2 | 16.9 | 60.0 |
| 14.574000 | 41.1 | Off | L1 | 20.3 | 18.9 | 60.0 |
| 16.806000 | 41.7 | Off | L1 | 20.4 | 18.3 | 60.0 |
| 17.662000 | 41.0 | Off | L1 | 20.5 | 19.0 | 60.0 |

Final Result 2

| Frequency (MHz) | Average (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.230000 | 34.2 | Off | L1 | 19.6 | 18.2 | 52.4 |
| 0.302000 | 37.2 | Off | L1 | 19.6 | 13.0 | 50.2 |
| 0.374000 | 36.3 | Off | L1 | 19.6 | 12.1 | 48.4 |
| 0.446000 | 33.9 | Off | L1 | 19.6 | 13.0 | 46.9 |
| 0.518000 | 35.1 | Off | L1 | 19.6 | 10.9 | 46.0 |
| 0.590000 | 31.3 | Off | L1 | 19.6 | 14.7 | 46.0 |
| 0.654000 | 31.5 | Off | L1 | 19.6 | 14.5 | 46.0 |
| 0.742000 | 32.6 | Off | L1 | 19.6 | 13.4 | 46.0 |
| 0.894000 | 32.3 | Off | L1 | 19.6 | 13.7 | 46.0 |
| 0.974000 | 31.5 | Off | L1 | 19.6 | 14.5 | 46.0 |
| 1.190000 | 30.0 | Off | L1 | 19.6 | 16.0 | 46.0 |
| 1.630000 | 29.9 | Off | L1 | 19.6 | 16.1 | 46.0 |
| 2.006000 | 29.4 | Off | L1 | 19.6 | 16.6 | 46.0 |
| 2.798000 | 30.7 | Off | L1 | 19.5 | 15.3 | 46.0 |
| 3.438000 | 31.8 | Off | L1 | 19.7 | 14.2 | 46.0 |
| 3.870000 | 33.0 | Off | L1 | 19.7 | 13.0 | 46.0 |
| 12.638000 | 30.5 | Off | L1 | 20.2 | 19.5 | 50.0 |
| 12.974000 | 30.8 | Off | L1 | 20.2 | 19.2 | 50.0 |
| 14.574000 | 29.1 | Off | L1 | 20.3 | 20.9 | 50.0 |
| 16.806000 | 29.0 | Off | L1 | 20.4 | 21.0 | 50.0 |
| 17.662000 | 29.1 | Off | L1 | 20.5 | 20.9 | 50.0 |

EUT Information

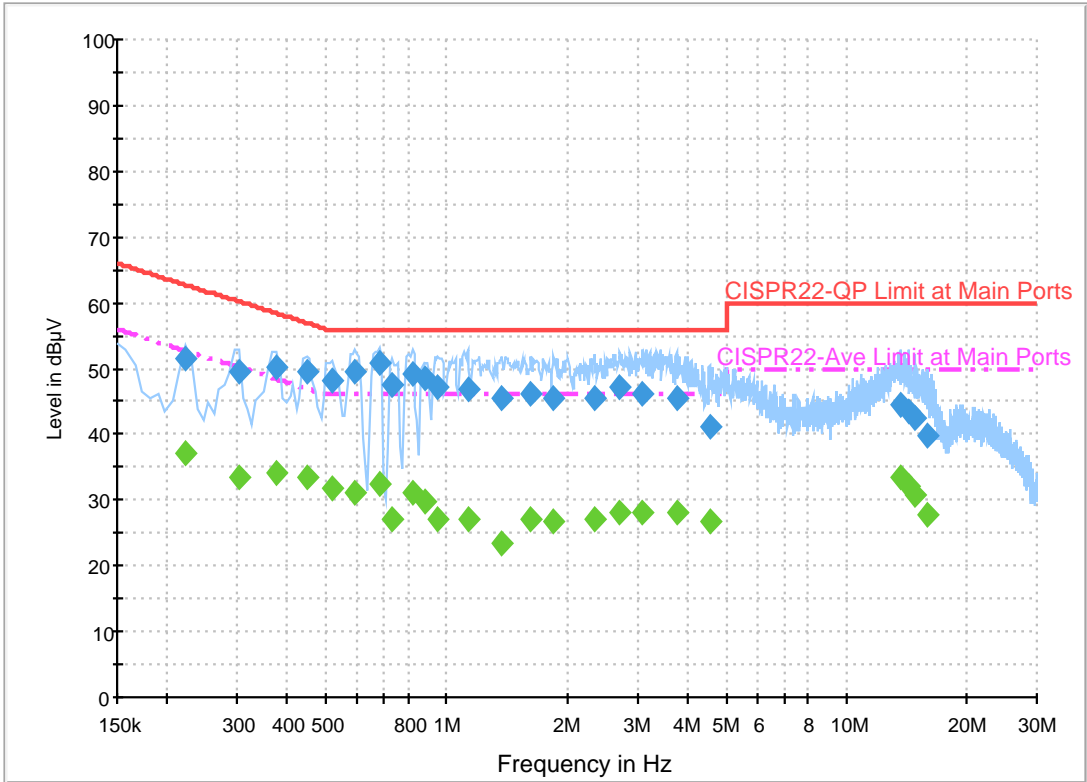
Report NO :740121

Test Mode :Mode 1

Test Voltage :120Vac/60Hz

Phase :Neutral

ENV216 Auto Test FCC Power Bar - N



Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|--------|------|------------|-------------|--------------|
| 0.222000 | 51.5 | Off | N | 19.5 | 11.2 | 62.7 |
| 0.302000 | 49.5 | Off | N | 19.5 | 10.7 | 60.2 |
| 0.374000 | 50.3 | Off | N | 19.5 | 8.1 | 58.4 |
| 0.446000 | 49.4 | Off | N | 19.5 | 7.5 | 56.9 |
| 0.518000 | 48.0 | Off | N | 19.5 | 8.0 | 56.0 |
| 0.590000 | 49.6 | Off | N | 19.5 | 6.4 | 56.0 |
| 0.678000 | 50.7 | Off | N | 19.5 | 5.3 | 56.0 |
| 0.734000 | 47.4 | Off | N | 19.5 | 8.6 | 56.0 |
| 0.822000 | 49.1 | Off | N | 19.6 | 6.9 | 56.0 |
| 0.886000 | 48.5 | Off | N | 19.5 | 7.5 | 56.0 |
| 0.950000 | 47.1 | Off | N | 19.6 | 8.9 | 56.0 |
| 1.134000 | 46.9 | Off | N | 19.6 | 9.1 | 56.0 |
| 1.374000 | 45.4 | Off | N | 19.6 | 10.6 | 56.0 |
| 1.630000 | 46.1 | Off | N | 19.6 | 9.9 | 56.0 |
| 1.854000 | 45.5 | Off | N | 19.6 | 10.5 | 56.0 |
| 2.342000 | 45.4 | Off | N | 18.9 | 10.6 | 56.0 |
| 2.718000 | 47.2 | Off | N | 19.4 | 8.8 | 56.0 |
| 3.102000 | 46.2 | Off | N | 19.6 | 9.8 | 56.0 |
| 3.758000 | 45.4 | Off | N | 19.7 | 10.6 | 56.0 |
| 4.550000 | 41.3 | Off | N | 19.7 | 14.7 | 56.0 |
| 13.638000 | 44.6 | Off | N | 20.3 | 15.4 | 60.0 |
| 14.382000 | 43.6 | Off | N | 20.3 | 16.4 | 60.0 |
| 14.902000 | 42.4 | Off | N | 20.4 | 17.6 | 60.0 |
| 16.046000 | 39.8 | Off | N | 20.5 | 20.2 | 60.0 |

Final Result 2

| Frequency (MHz) | Average (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|--------------------|-------------------|--------|------|---------------|----------------|-----------------|
| 0.222000 | 37.2 | Off | N | 19.5 | 15.5 | 52.7 |
| 0.302000 | 33.5 | Off | N | 19.5 | 16.7 | 50.2 |
| 0.374000 | 34.1 | Off | N | 19.5 | 14.3 | 48.4 |
| 0.446000 | 33.5 | Off | N | 19.5 | 13.4 | 46.9 |
| 0.518000 | 31.8 | Off | N | 19.5 | 14.2 | 46.0 |
| 0.590000 | 31.2 | Off | N | 19.5 | 14.8 | 46.0 |
| 0.678000 | 32.4 | Off | N | 19.5 | 13.6 | 46.0 |
| 0.734000 | 27.2 | Off | N | 19.5 | 18.8 | 46.0 |
| 0.822000 | 31.0 | Off | N | 19.6 | 15.0 | 46.0 |
| 0.886000 | 29.8 | Off | N | 19.5 | 16.2 | 46.0 |
| 0.950000 | 27.0 | Off | N | 19.6 | 19.0 | 46.0 |
| 1.134000 | 27.2 | Off | N | 19.6 | 18.8 | 46.0 |
| 1.374000 | 23.4 | Off | N | 19.6 | 22.6 | 46.0 |
| 1.630000 | 27.1 | Off | N | 19.6 | 18.9 | 46.0 |
| 1.854000 | 26.7 | Off | N | 19.6 | 19.3 | 46.0 |
| 2.342000 | 26.9 | Off | N | 18.9 | 19.1 | 46.0 |
| 2.718000 | 28.0 | Off | N | 19.4 | 18.0 | 46.0 |
| 3.102000 | 28.2 | Off | N | 19.6 | 17.8 | 46.0 |
| 3.758000 | 28.2 | Off | N | 19.7 | 17.8 | 46.0 |
| 4.550000 | 26.7 | Off | N | 19.7 | 19.3 | 46.0 |
| 13.638000 | 33.5 | Off | N | 20.3 | 16.5 | 50.0 |
| 14.382000 | 32.2 | Off | N | 20.3 | 17.8 | 50.0 |
| 14.902000 | 30.9 | Off | N | 20.4 | 19.1 | 50.0 |
| 16.046000 | 27.9 | Off | N | 20.5 | 22.1 | 50.0 |



Appendix C. Radiated Spurious Emission

| | | | |
|-----------------|----------------------------|---------------------|---------|
| Test Engineer : | Stan Hsieh and Kyle Chuang | Temperature : | 22~24°C |
| | | Relative Humidity : | 43~44% |

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

| BLE | Note | Frequency | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Ant Pos | Table Pos | Peak Avg. | Pol. |
|-------------------------|---|-----------|------------|------------|------------|------------|----------------|------------|---------------|---------|-----------|-----------|---------|
| | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| BLE CH 39 2480MHz | * | 2480 | 91.89 | - | - | 83.33 | 27.24 | 4.51 | 33.17 | 195 | 340 | P | H |
| | * | 2480 | 91.32 | - | - | 82.76 | 27.24 | 4.51 | 33.17 | 195 | 340 | A | H |
| | | 2491.16 | 51.19 | -22.81 | 74 | 42.55 | 27.3 | 4.53 | 33.17 | 195 | 340 | P | H |
| | | 2495.4 | 41.97 | -12.03 | 54 | 33.32 | 27.3 | 4.53 | 33.16 | 195 | 340 | A | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | * | 2480 | 96.27 | - | - | 87.71 | 27.24 | 4.51 | 33.17 | 161 | 239 | P | V |
| | * | 2480 | 95.57 | - | - | 87.01 | 27.24 | 4.51 | 33.17 | 161 | 239 | A | V |
| | | 2497.08 | 51.65 | -22.35 | 74 | 43 | 27.3 | 4.53 | 33.16 | 161 | 239 | P | V |
| | | 2483.52 | 41.88 | -12.12 | 54 | 33.3 | 27.24 | 4.53 | 33.17 | 161 | 239 | A | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| Remark | 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | |

**2.4GHz 2400~2483.5MHz****BLE (Harmonic @ 3m)**

| BLE | Note | Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|----------------------------------|---|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-------------------------------|-------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| BLE CH 39 2480MHz | | 4960 | 44.32 | -29.68 | 74 | 66.87 | 32.42 | 6.47 | 61.9 | 100 | 0 | P | H |
| | | 7440 | 49.3 | -24.7 | 74 | 65.67 | 37.32 | 8.05 | 62.09 | 100 | 0 | P | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | 4960 | 44.3 | -29.7 | 74 | 66.85 | 32.42 | 6.47 | 61.9 | 100 | 0 | P | V |
| | | 7440 | 49.6 | -24.4 | 74 | 65.97 | 37.32 | 8.05 | 62.09 | 100 | 0 | P | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| Remark | 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | |

Emission below 1GHz

2.4GHz BLE (LF)

| BLE | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. | |
|-----------------------------|--|-----------|------------|--------|------------|--------|----------|--------|--------|--------|---------|-------|-------|---|
| | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | | |
| | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) | |
| 2.4GHz BLE LF | | 31.62 | 21.52 | -18.48 | 40 | 30.32 | 23.34 | 0.53 | 32.75 | - | - | P | H | |
| | | 95.88 | 21.75 | -21.75 | 43.5 | 37.84 | 15.47 | 0.97 | 32.77 | | | P | H | |
| | | 249.51 | 22.76 | -23.24 | 46 | 35.18 | 18.36 | 1.53 | 32.73 | | | P | H | |
| | | 580 | 27.06 | -18.94 | 46 | 31.64 | 25.59 | 2.23 | 32.98 | | | P | H | |
| | | 744.5 | 30.42 | -15.58 | 46 | 32.05 | 28.21 | 2.51 | 32.95 | | | P | H | |
| | | 949.6 | 32.55 | -13.45 | 46 | 29.99 | 30.72 | 2.78 | 31.75 | 100 | 0 | P | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | 30.27 | 23.5 | -16.5 | 40 | 31.43 | 24.22 | 0.53 | 32.76 | | | | P | V |
| | | 95.88 | 21.38 | -22.12 | 43.5 | 37.47 | 15.47 | 0.97 | 32.77 | | | | P | V |
| | | 171.75 | 18.52 | -24.98 | 43.5 | 34.02 | 15.57 | 1.26 | 32.76 | | | | P | V |
| | | 566 | 26.52 | -19.48 | 46 | 30.69 | 26 | 2.21 | 32.96 | | | | P | V |
| | | 729.1 | 30.15 | -15.85 | 46 | 32.34 | 27.7 | 2.48 | 32.96 | | | | P | V |
| | | 930 | 32.32 | -13.68 | 46 | 30.84 | 29.91 | 2.77 | 31.97 | 100 | 0 | | P | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V | |
| Remark | 1. No other spurious found. 2. All results are PASS against limit line. | | | | | | | | | | | | | |



Note symbol

| | |
|-----|--|
| * | Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. |
| ! | Test result is over limit line. |
| P/A | Peak or Average |
| H/V | Horizontal or Vertical |

A calculation example for radiated spurious emission is shown as below:

| WIFI | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|---------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| Ant. | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| 1+2 | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| 802.11b | | 2390 | 55.45 | -18.55 | 74 | 54.51 | 32.22 | 4.58 | 35.86 | 103 | 308 | P | H |
| CH 01 | | | | | | | | | | | | | |
| 2412MHz | | 2390 | 43.54 | -10.46 | 54 | 42.6 | 32.22 | 4.58 | 35.86 | 103 | 308 | A | H |

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.



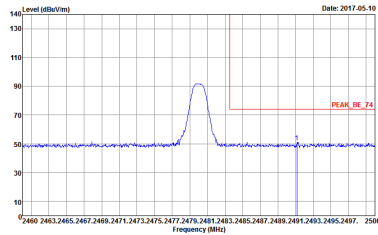
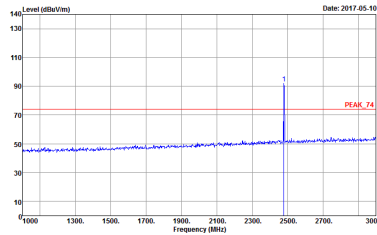
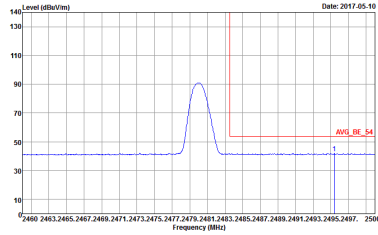
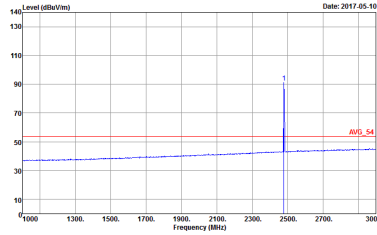
Appendix D. Radiated Spurious Emission Plots

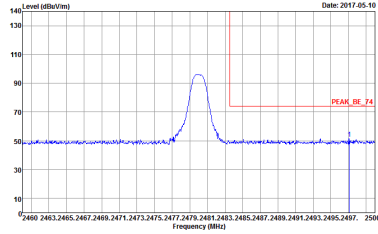
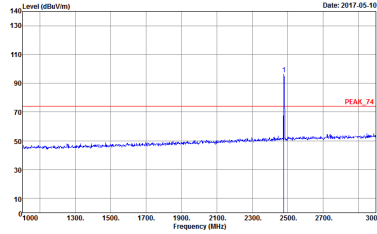
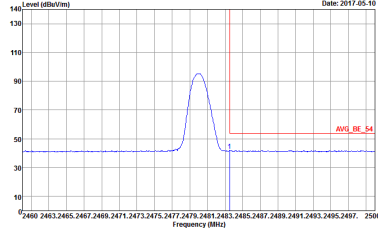
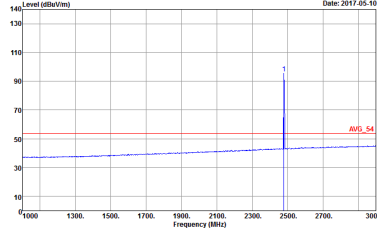
| | | | |
|------------------------|----------------------------|----------------------------|---------|
| Test Engineer : | Stan Hsieh and Kyle Chuang | Temperature : | 22~24°C |
| | | Relative Humidity : | 43~44% |

Note symbol

| | |
|----|-----------------------|
| -L | Low channel location |
| -R | High channel location |

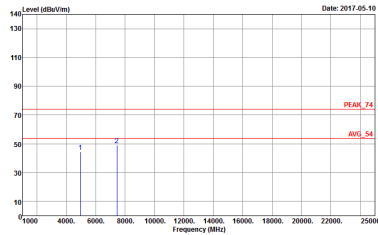
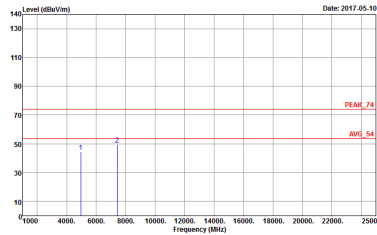
2.4GHz 2400~2483.5MHz
BLE (Band Edge @ 3m)

| BLE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-------------|--|--|
| ANT | BLE CH39 2480MHz | |
| 1+2 | Horizontal | Fundamental |
| Peak |  <p>Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2</p> |  <p>Site : 03CH10-HY Condition : PEAK_74 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2</p> |
| |  <p>Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2</p> |  <p>Site : 03CH10-HY Condition : AVG_54 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2</p> |

| BLE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|---|---|
| ANT | BLE CH39 2480MHz | |
| 1+2 | Vertical | Fundamental |
| Peak |  <p>Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2</p> |  <p>Site : 03CH10-HY Condition : PEAK_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2</p> |
| Avg. |  <p>Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2</p> |  <p>Site : 03CH10-HY Condition : AVG_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2</p> |

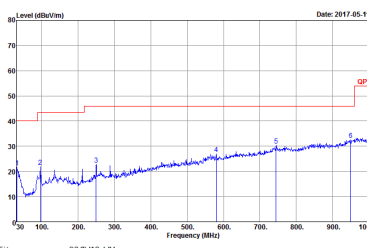
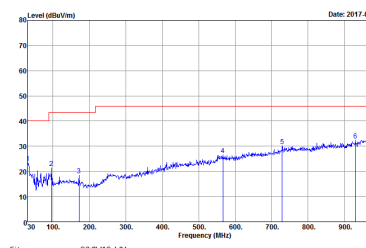
2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

| BLE | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|------|---|--|
| ANT | BLE CH39 2480MHz | |
| 1+2 | Horizontal | Vertical |
| Peak |  <p>Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 HORIZONTAL Detector : Peak Project : 740121 Mode : 2</p> |  <p>Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 VERTICAL Detector : Peak Project : 740121 Mode : 2</p> |

Emission below 1GHz

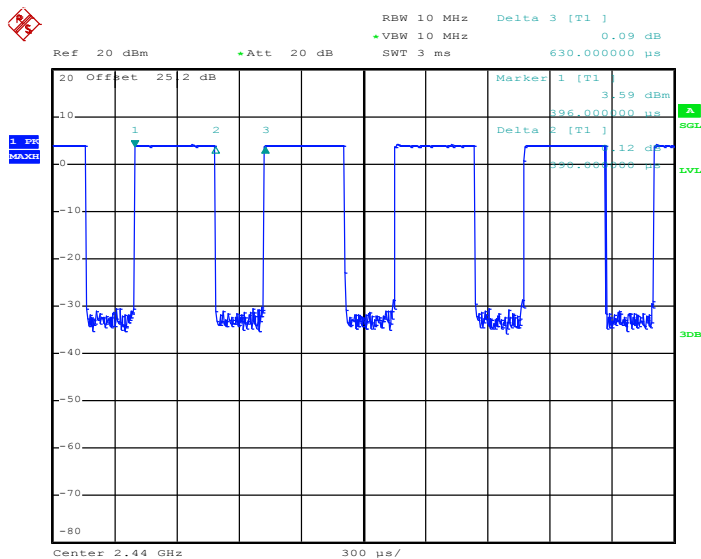
2.4GHz BLE (LF)

| BLE | 2.4GHz 2400~2483.5MHz | |
|--------------|--|---|
| ANT | BLE LF | |
| 1+2 | Horizontal | Vertical |
| QP / Peak |  <p>Site : 03CH10-HY Condition : QP 3m BT-LOG 6111D-LF HORIZONTAL Detector : Peak Project : 740121 Mode : 2</p> |  <p>Site : 03CH10-HY Condition : QP 3m BT-LOG 6111D-LF VERTICAL Detector : Peak Project : 740121 Mode : 2</p> |
| | | |

Appendix E. Duty Cycle Plots

| Band | Duty Cycle(%) | T(us) | 1/T(kHz) | VBW Setting |
|---------------|---------------|--------|----------|-------------|
| Bluetooth -LE | 61.91 | 390.00 | 2.56 | 3kHz |

Bluetooth - LE



Date: 21.APR.2017 11:47:39



Appendix G. Original Report

Please refer to Sporton report number FR740120B.



FCC RF Test Report

APPLICANT : SHARP CORPORATION
EQUIPMENT : Smart Phone
BRAND NAME : NTT docomo
MODEL NAME : SH-03J
FCC ID : APYHRO00248
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Apr. 01, 2017 and testing was completed on Apr. 29, 2017. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.



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REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|------------|---------|-------------------------------------|---------------|
| FR740120B | Rev. 01 | Initial issue of report | Jun. 02, 2017 |
| FR740120B | Rev. 02 | Revising Applicant and Manufacturer | Jun. 07, 2017 |
| | | | |
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SUMMARY OF TEST RESULT

| Report Section | FCC Rule | Description | Limit | Result | Remark |
|----------------|--------------------|--|--------------------------------|--------|--|
| 3.1 | 15.247(a)(2) | 6dB Bandwidth | $\geq 0.5\text{MHz}$ | Pass | - |
| 3.1 | - | 99% Bandwidth | - | Pass | - |
| 3.2 | 15.247(b)(3) | Peak Output Power | $\leq 30\text{dBm}$ | Pass | - |
| 3.3 | 15.247(e) | Power Spectral Density | $\leq 8\text{dBm}/3\text{kHz}$ | Pass | - |
| 3.4 | 15.247(d) | Conducted Band Edges and Spurious Emission | $\leq 20\text{dBc}$ | Pass | - |
| 3.5 | 15.247(d) | Radiated Band Edges and Spurious Emission | 15.209(a) & 15.247(d) | Pass | Under limit 12.10 dB at 2484.520 MHz |
| 3.6 | 15.207 | AC Conducted Emission | 15.207(a) | Pass | Under limit 17.40 dB at 0.502 MHz |
| 3.7 | 15.203 & 15.247(b) | Antenna Requirement | N/A | Pass | - |

1 General Description

1.1 Applicant

SHARP CORPORATION

2-13-1, Hachihonmatsu-Iida, Higashi-hiroshima-shi, Hiroshima, 739-0192, Japan

1.2 Manufacturer

SHARP CORPORATION

2-13-1, Hachihonmatsu-Iida, Higashi-hiroshima-shi, Hiroshima, 739-0192, Japan

1.3 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac, Wi-Fi 5GHz 802.11a/n/ac, NFC, and GPS

| Product Specification subjective to this standard | |
|---|--|
| Sample 1 | EUT with Memory 1 |
| Sample 2 | EUT with Memory 2 |
| Antenna Type | WWAN: ILA Antenna WLAN: ILA Antenna Bluetooth: ILA Antenna GPS/Glonass/Beidou/Galileo: ILA Antenna NFC: Loop Antenna |

1.4 Modification of EUT

No modifications are made to the EUT during all test items.

1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

| | | |
|---------------------------|--|---------|
| Test Site | SPORTON INTERNATIONAL INC. | |
| Test Site Location | No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978 | |
| Test Site No. | Sporton Site No. | |
| | TH05-HY | CO05-HY |

Note: The test site complies with ANSI C63.4 2014 requirement.

| | | |
|---------------------------|--|--|
| Test Site | SPORTON INTERNATIONAL INC. | |
| Test Site Location | No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855 | |
| Test Site No. | Sporton Site No. | |
| | 03CH10-HY | |

Note: The test site complies with ANSI C63.4 2014 requirement.

1.6 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
- ♦ ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

| Frequency Band | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|-----------------|---------|----------------|---------|----------------|
| 2400-2483.5 MHz | 0 | 2402 | 21 | 2444 |
| | 1 | 2404 | 22 | 2446 |
| | 2 | 2406 | 23 | 2448 |
| | 3 | 2408 | 24 | 2450 |
| | 4 | 2410 | 25 | 2452 |
| | 5 | 2412 | 26 | 2454 |
| | 6 | 2414 | 27 | 2456 |
| | 7 | 2416 | 28 | 2458 |
| | 8 | 2418 | 29 | 2460 |
| | 9 | 2420 | 30 | 2462 |
| | 10 | 2422 | 31 | 2464 |
| | 11 | 2424 | 32 | 2466 |
| | 12 | 2426 | 33 | 2468 |
| | 13 | 2428 | 34 | 2470 |
| | 14 | 2430 | 35 | 2472 |
| | 15 | 2432 | 36 | 2474 |
| | 16 | 2434 | 37 | 2476 |
| | 17 | 2436 | 38 | 2478 |
| | 18 | 2438 | 39 | 2480 |
| | 19 | 2440 | - | - |
| | 20 | 2442 | - | - |

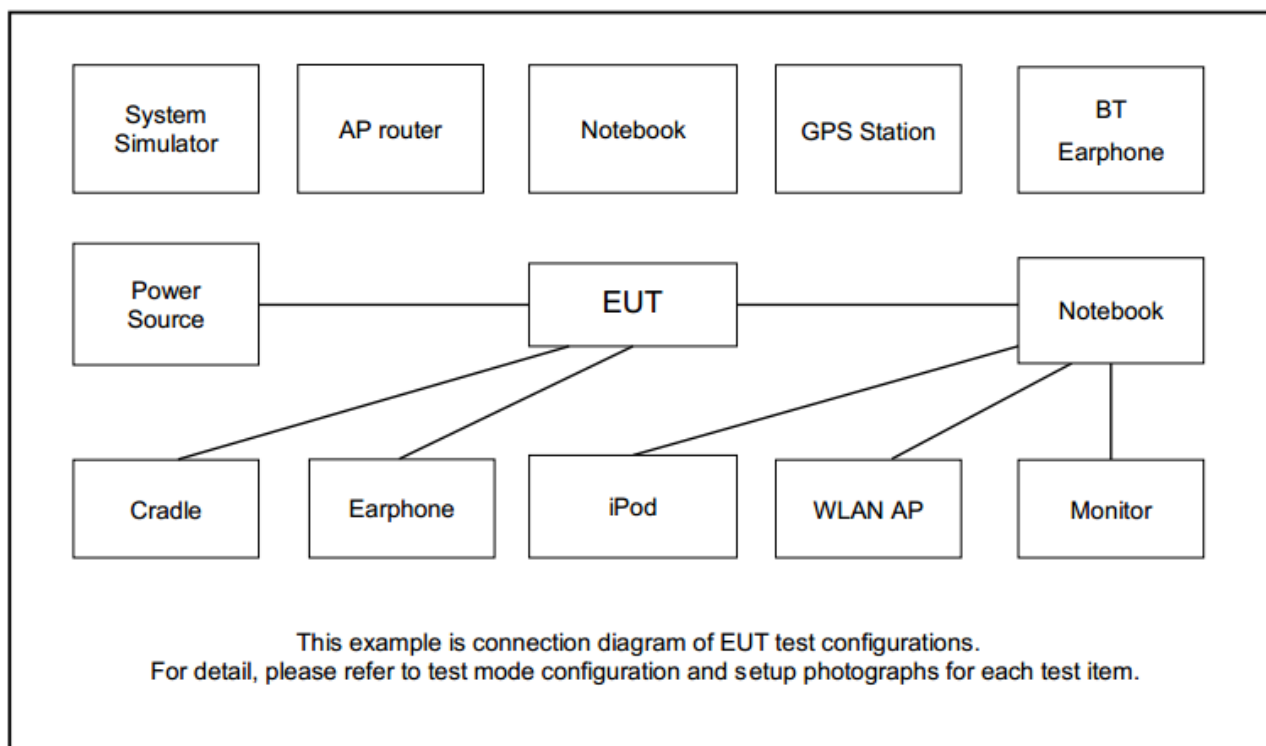
2.2 Test Mode

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).
- b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

| Summary table of Test Cases | |
|---|--|
| Test Item | Data Rate / Modulation |
| | Bluetooth – LE / GFSK |
| Conducted TCs | Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps |
| Radiated TCs | Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps |
| AC Conducted Emission | Mode 1 :GSM1900 Idle + Bluetooth Link + WLAN (2.4GHz) Link + Earphone + USB Cable (Charging from Adapter) + Camera (Rear) for Sample 1 |
| Remark: For Radiated Test Cases, The tests were performance with Sample 1. | |

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

| Item | Equipment | Trade Name | Model Name | FCC ID | Data Cable | Power Cord |
|------|--------------------|---------------|----------------|--|------------|--|
| 1. | System Simulator | Anritsu | MT8820C | N/A | N/A | Unshielded, 1.8 m |
| 2. | Bluetooth Earphone | Sony Ericsson | MW600 | PY7DDA-2029 | N/A | N/A |
| 3. | WLAN AP | ASUS | RT-AC66U | MSQ-RTAC66U | N/A | Unshielded, 1.8 m |
| 4. | Notebook | DELL | Latitude E6320 | FCC DoC/ Contains FCC ID: QDS-BRCM1054 | N/A | AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m |
| 5. | SD Card | SanDisk | MicroSD HC | FCC DoC | N/A | N/A |



2.5 EUT Operation Test Setup

The RF test items, programmed RF utility, "Tera Term" installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 + 10 = 14.2 \text{ (dB)}\end{aligned}$$

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

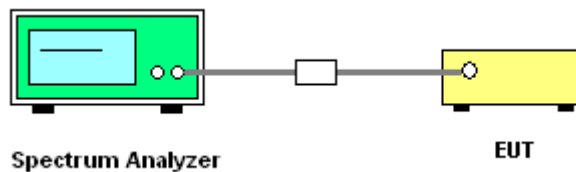
3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 30kHz and set the Video bandwidth (VBW) = 100kHz.
6. Measure and record the results in the test report.

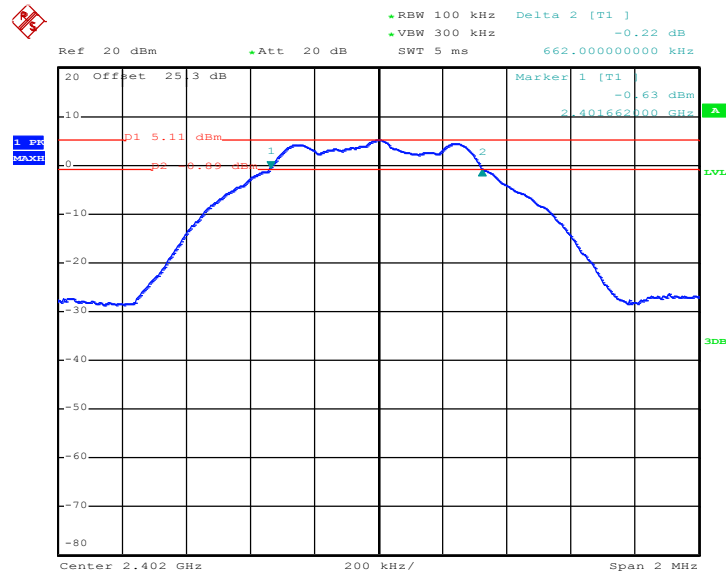
3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

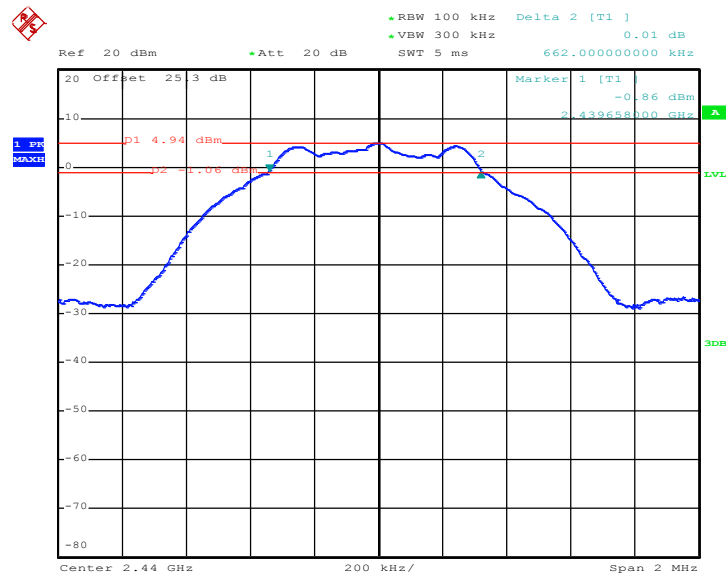
Please refer to Appendix A.

6 dB Bandwidth Plot on Channel 00



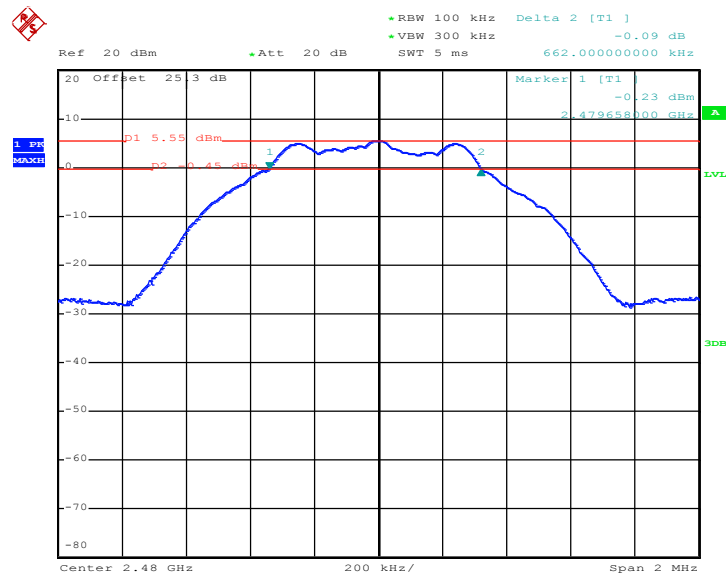
Date: 16.APR.2017 14:01:13

6 dB Bandwidth Plot on Channel 19



Date: 16.APR.2017 14:04:10

6 dB Bandwidth Plot on Channel 39



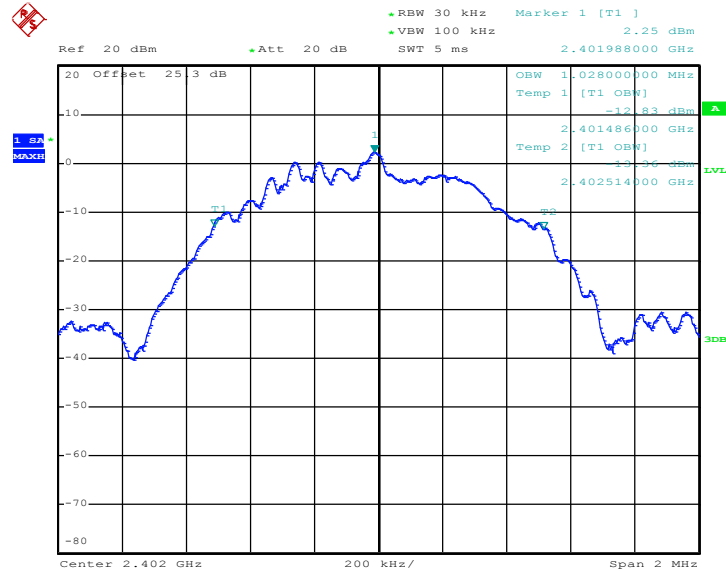
Date: 16.APR.2017 14:06:43



3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

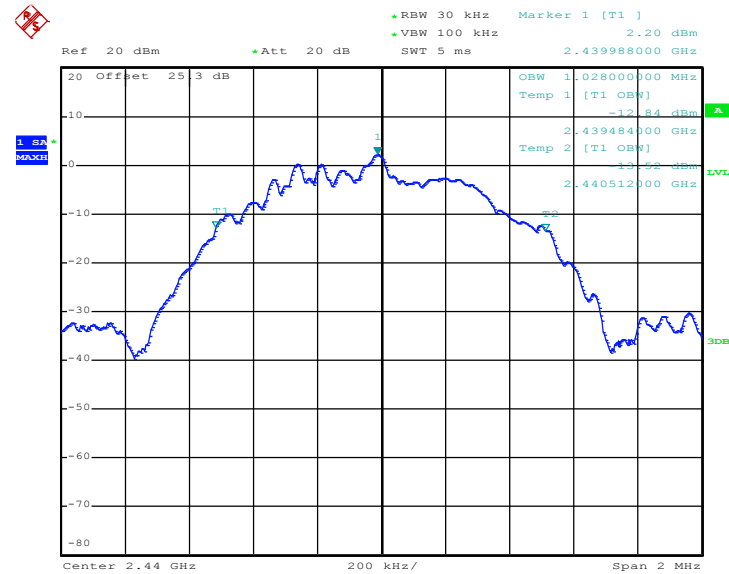
99% Bandwidth Plot on Channel 00



Date: 16.APR.2017 14:02:46

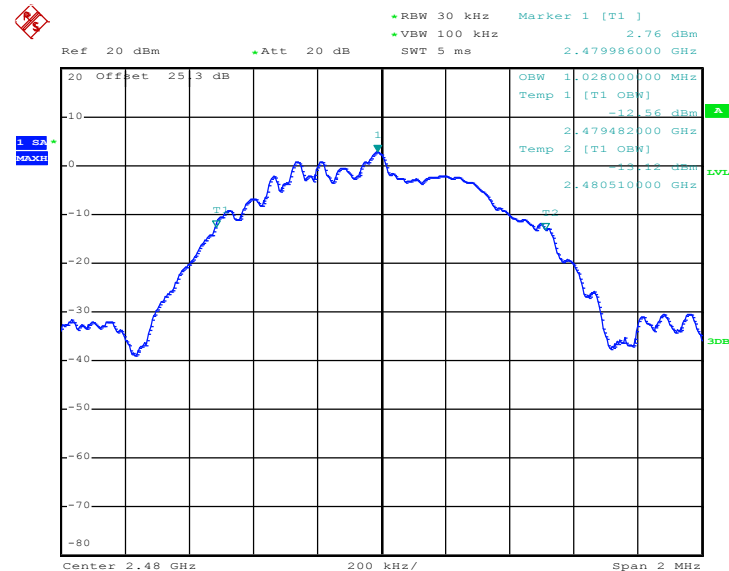


99% Occupied Bandwidth Plot on Channel 19



Date: 16.APR.2017 14:05:42

99% Occupied Bandwidth Plot on Channel 39



Date: 16.APR.2017 14:09:30

Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Peak Output Power Measurement

3.2.1 Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

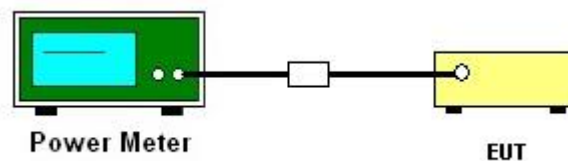
3.2.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04 section 9.1.2 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

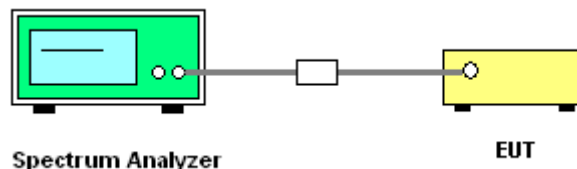
3.3.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

3.3.4 Test Setup



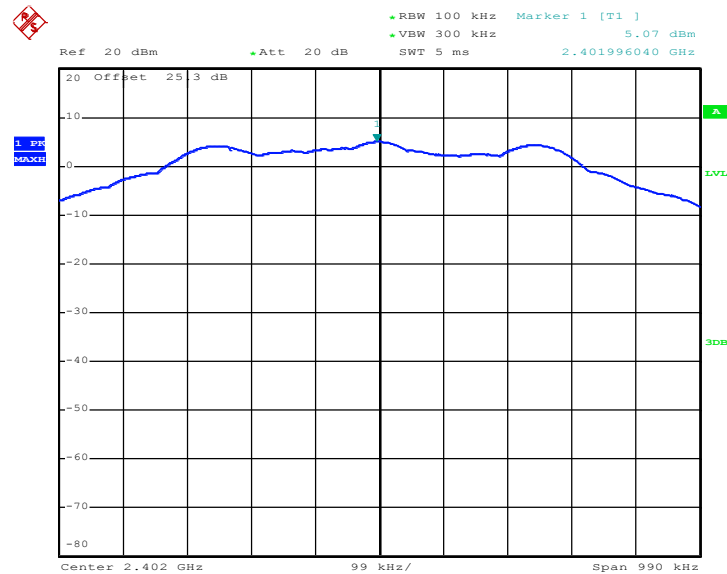


3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.3.6 Test Result of Power Spectral Density Plots (100kHz)

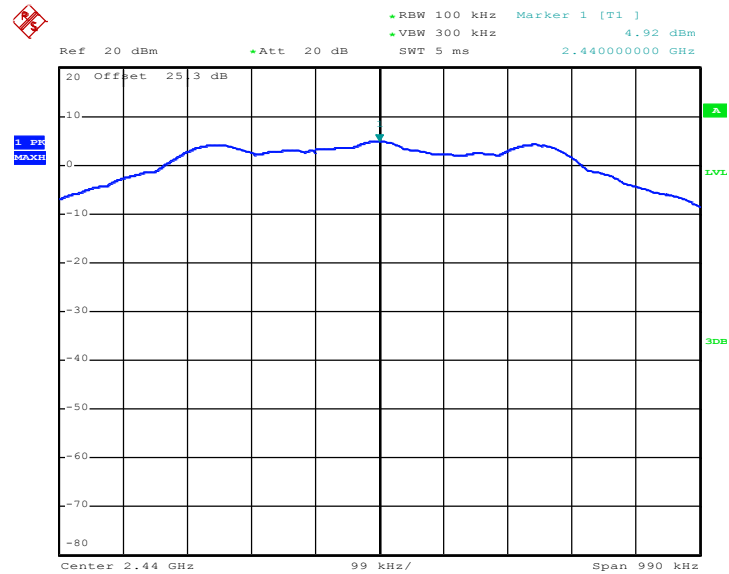
PSD 100kHz Plot on Channel 00



Date: 16.APR.2017 14:01:50

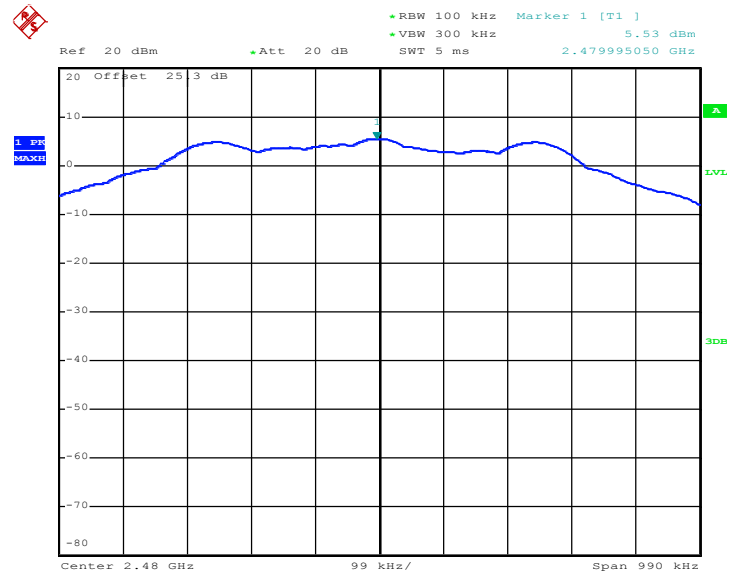


PSD 100kHz Plot on Channel 19



Date: 16.APR.2017 14:04:39

PSD 100kHz Plot on Channel 39

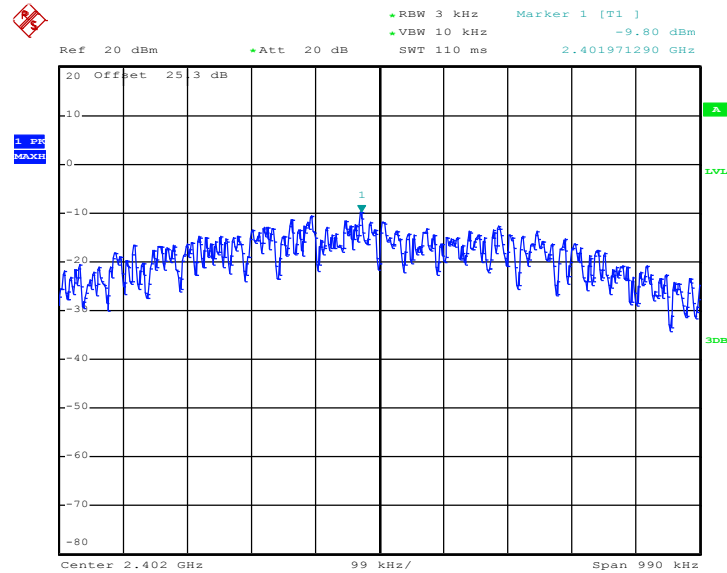


Date: 16.APR.2017 14:08:11



3.3.7 Test Result of Power Spectral Density Plots (3kHz)

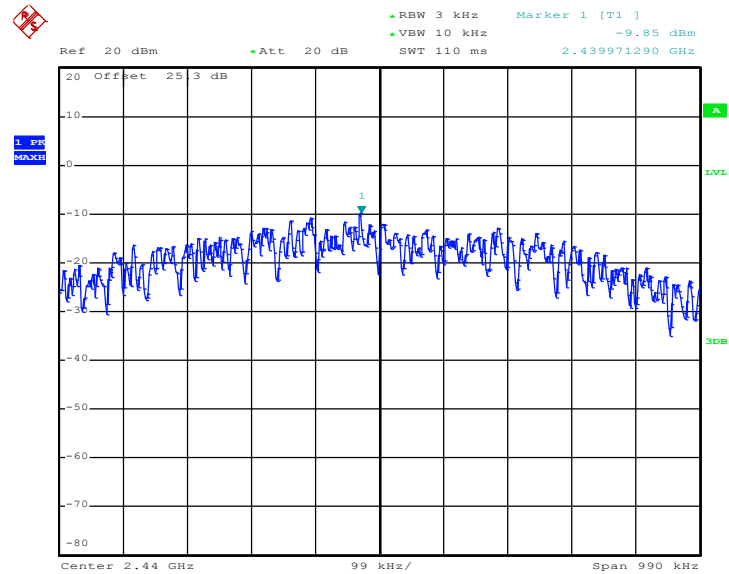
PSD 3kHz Plot on Channel 00



Date: 16.APR.2017 14:01:30

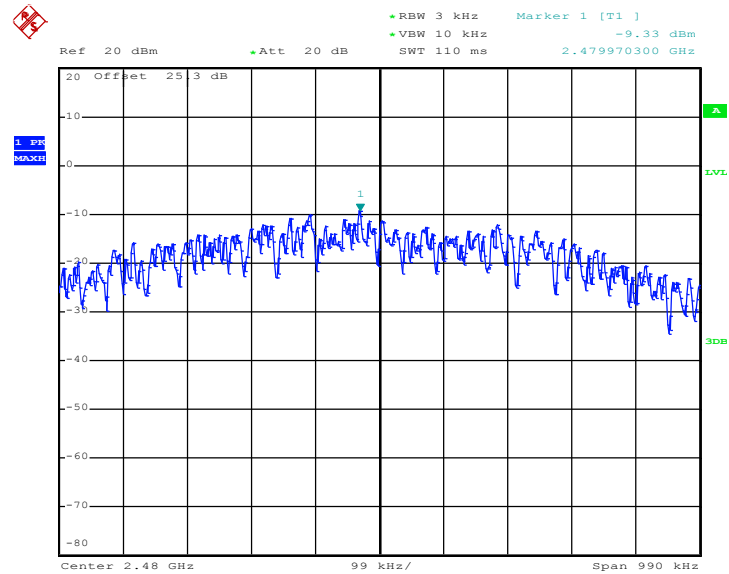


PSD 3kHz Plot on Channel 19



Date: 16.APR.2017 14:04:22

PSD 3kHz Plot on Channel 39



Date: 16.APR.2017 14:07:49

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

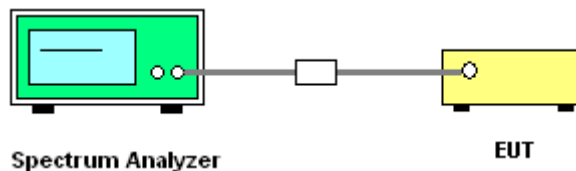
3.4.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.4.3 Test Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions 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 when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

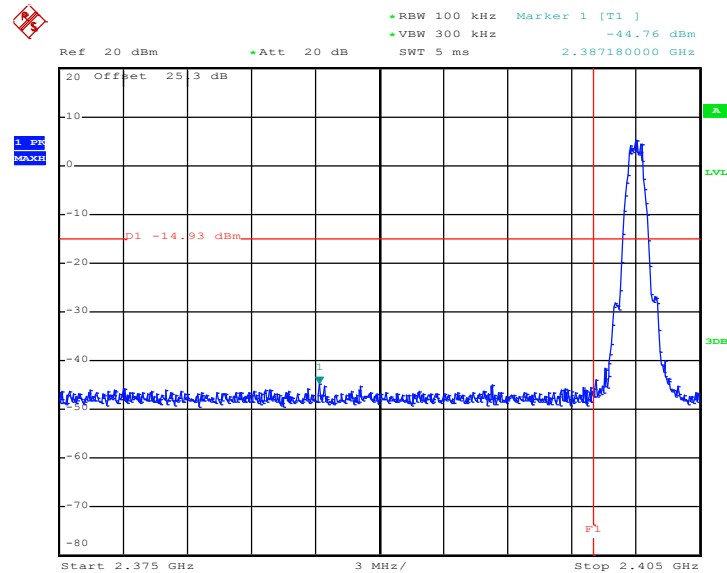
3.4.4 Test Setup





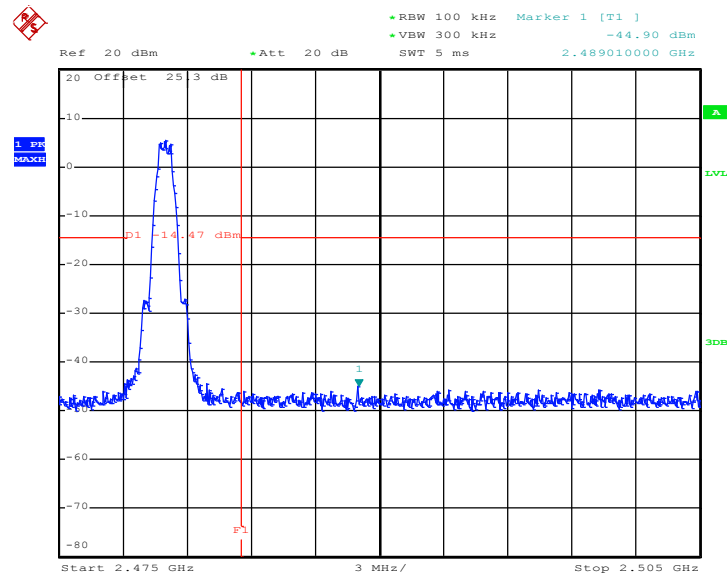
3.4.5 Test Result of Conducted Band Edges Plots

Low Band Edge Plot on Channel 00



Date: 16.APR.2017 14:02:05

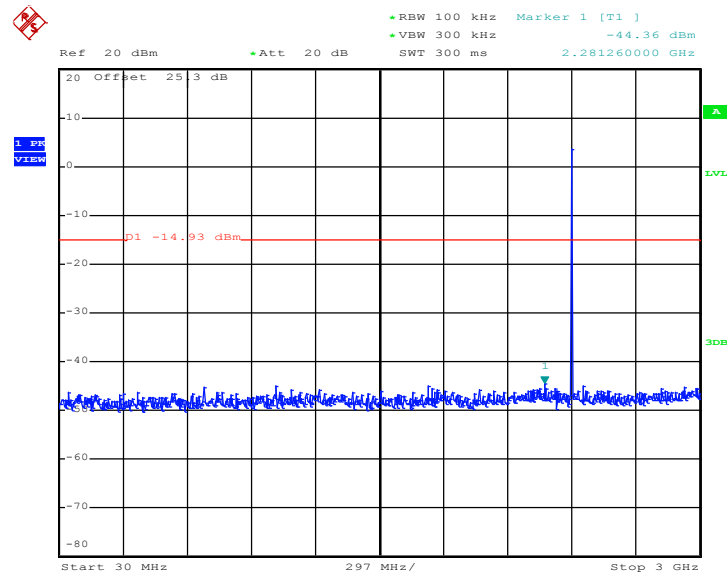
High Band Edge Plot on Channel 39



Date: 16.APR.2017 14:08:23

3.4.6 Test Result of Conducted Spurious Emission Plots

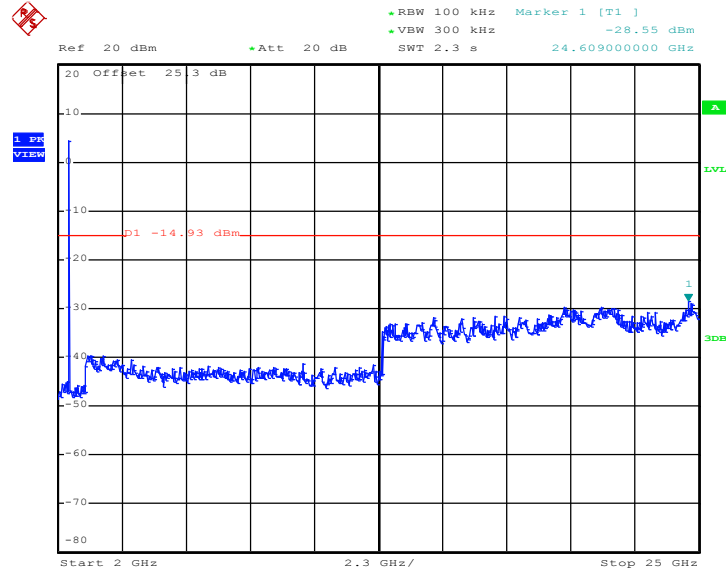
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



Date: 16.APR.2017 14:02:17



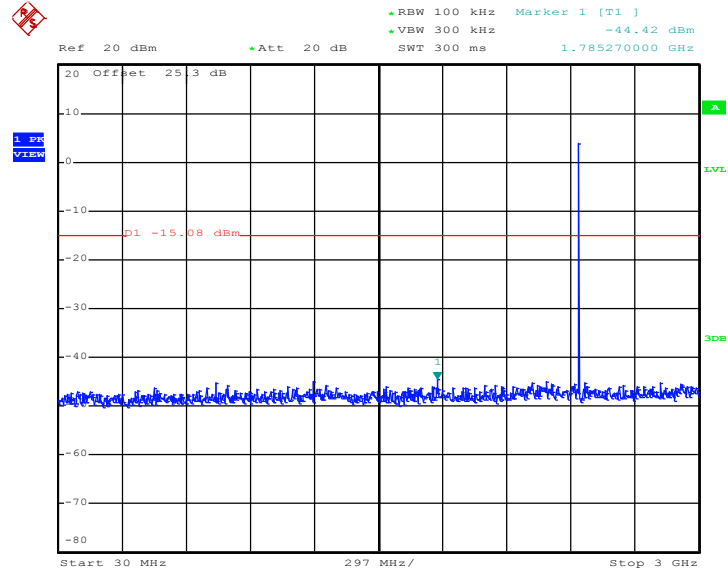
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 00



Date: 16.APR.2017 14:02:25



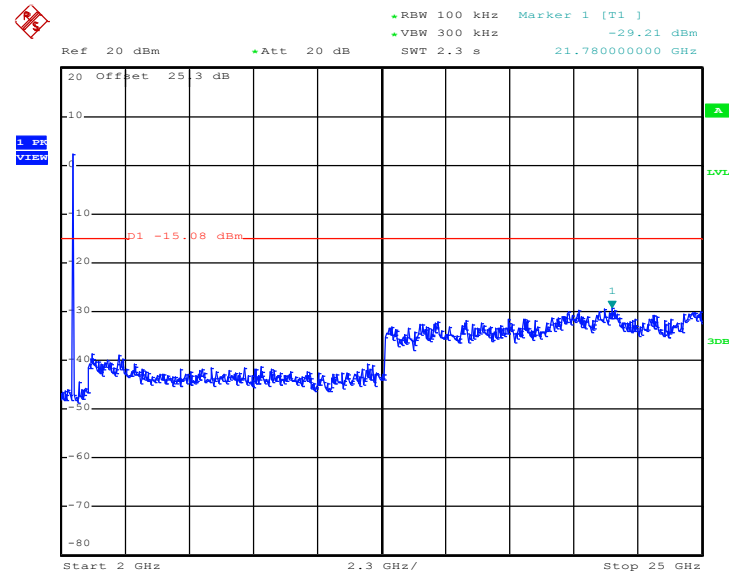
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 19



Date: 16.APR.2017 14:04:59



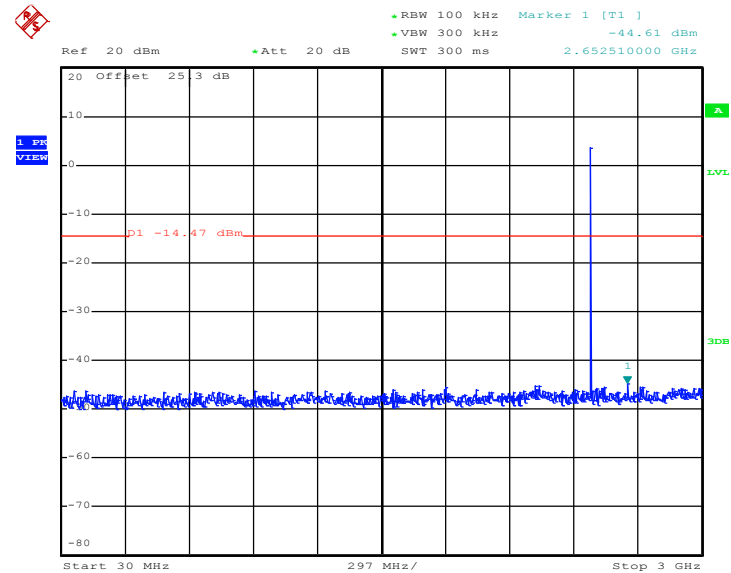
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 19



Date: 16.APR.2017 14:05:08



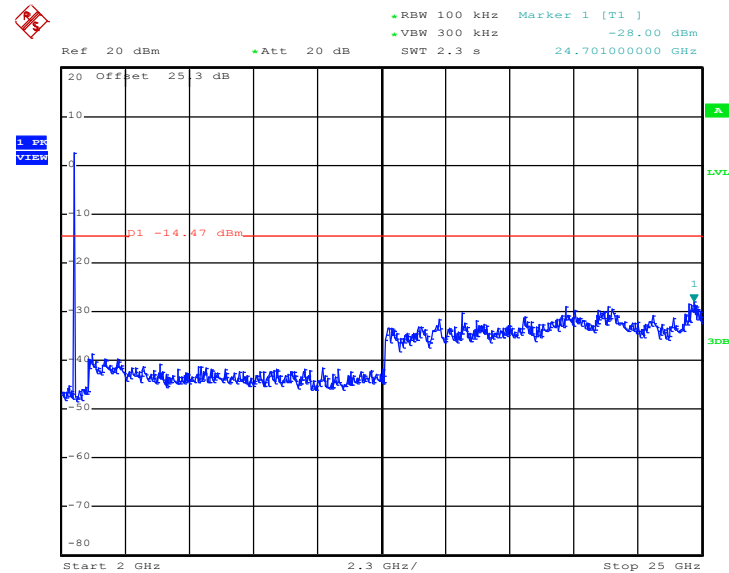
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 39



Date: 16.APR.2017 14:08:35



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 39



Date: 16.APR.2017 14:08:43

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement 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 |

3.5.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.



3.5.3 Test Procedures

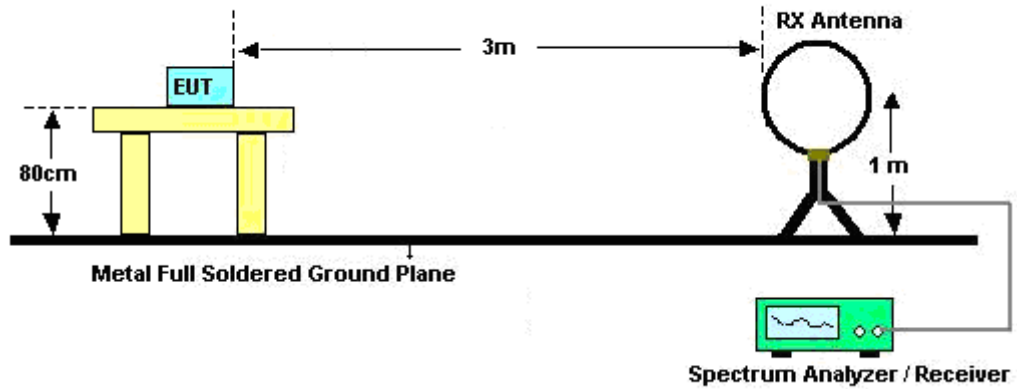
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

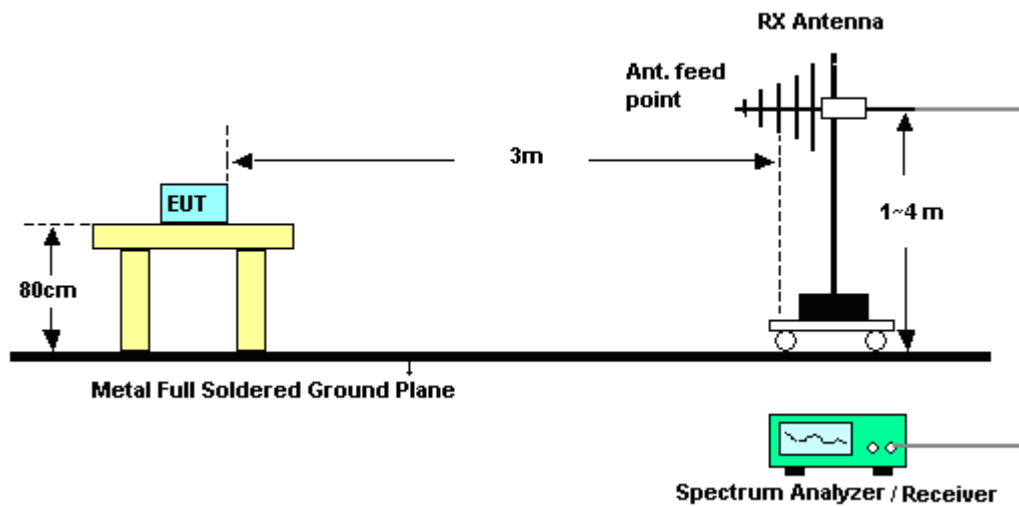
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

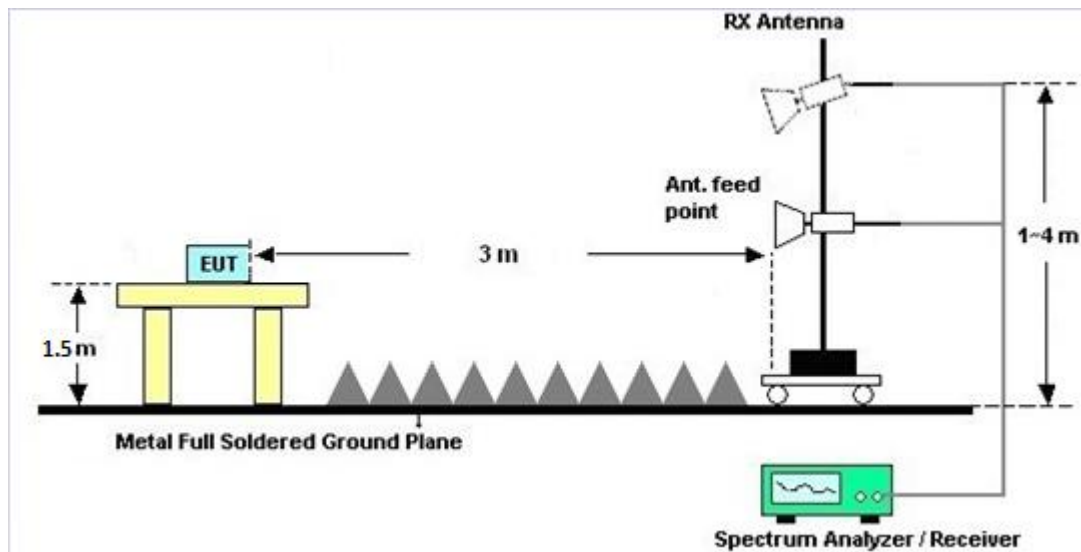
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.5.7 Duty Cycle

Please refer to Appendix E.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

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

*Decreases with the logarithm of the frequency.

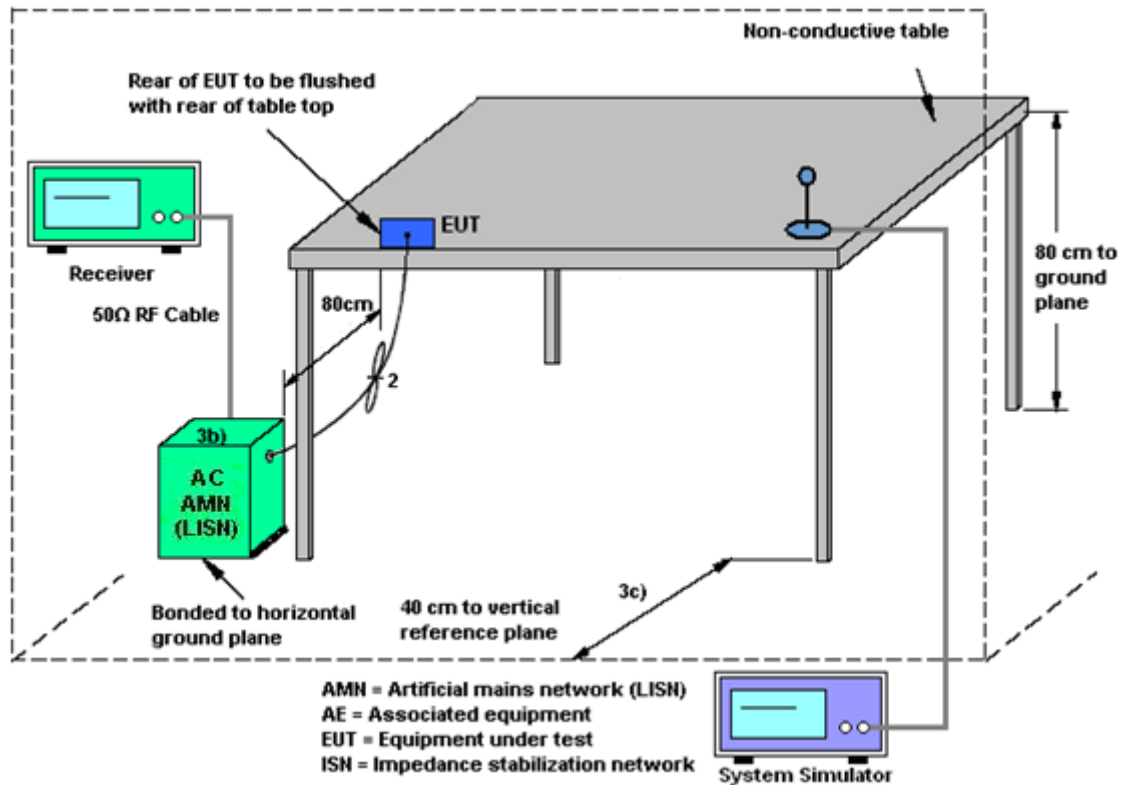
3.6.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|----------------------|-----------------|---------------------------|-------------|-----------------|------------------|-------------------------------|---------------|-----------------------|
| Power Meter | Agilent | E4416A | GB41292344 | 300MHz~40GHz | Dec. 26, 2016 | Apr. 16, 2017 | Dec. 25, 2017 | Conducted (TH05-HY) |
| Power Sensor | Agilent | E9327A | US40441548 | 300MHz~40GHz | Dec. 26, 2016 | Apr. 16, 2017 | Dec. 25, 2017 | Conducted (TH05-HY) |
| Spectrum Analyzer | Rohde & Schwarz | FSP40 | 100055 | 9kHz-40GHz | Jul. 17, 2016 | Apr. 16, 2017 | Jul. 16, 2017 | Conducted (TH05-HY) |
| AC Power Source | ChainTek | APC-1000W | N/A | N/A | N/A | Apr. 29, 2017 | N/A | Conduction (CO05-HY) |
| EMI Test Receiver | Rohde & Schwarz | ESCI 7 | 100724 | 9kHz~7GHz | Aug. 30, 2016 | Apr. 29, 2017 | Aug. 29, 2017 | Conduction (CO05-HY) |
| LISN | Rohde & Schwarz | ENV216 | 100080 | 9kHz~30MHz | Nov. 29, 2016 | Apr. 29, 2017 | Nov. 28, 2017 | Conduction (CO05-HY) |
| Amplifier | SONOMA | 310N | 187311 | 9kHz~1GHz | Oct. 26, 2016 | Apr. 21, 2017 ~ Apr. 24, 2017 | Oct. 25, 2017 | Radiation (03CH10-HY) |
| Bilog Antenna | TESEQ | CBL 6111D&00800 N1D01N-06 | 35413&02 | 30MHz~1GHz | Jan. 07, 2017 | Apr. 21, 2017 ~ Apr. 28, 2017 | Jan. 06, 2018 | Radiation (03CH10-HY) |
| Horn Antenna | SCHWARZBECK | BBHA 9120 D | 9120D-1325 | 1GHz ~ 18GHz | Sep. 30, 2016 | Apr. 21, 2017 ~ Apr. 28, 2017 | Sep. 29, 2017 | Radiation (03CH10-HY) |
| Preamplifier | Keysight | 83017A | MY53270078 | 1GHz~26.5GHz | Oct. 26, 2016 | Apr. 21, 2017 ~ Apr. 28, 2017 | Oct. 25, 2017 | Radiation (03CH10-HY) |
| Spectrum Analyzer | Keysight | N9010A | MY54200485 | 10Hz ~ 44GHz | Oct. 17, 2016 | Apr. 21, 2017 ~ Apr. 28, 2017 | Oct. 16, 2017 | Radiation (03CH10-HY) |
| Antenna Mast | EMEC | AM-BS-4500-B | N/A | 1~4m | N/A | Apr. 21, 2017 ~ Apr. 28, 2017 | N/A | Radiation (03CH10-HY) |
| Turn Table | EMEC | TT 2200 | N/A | 0~360 Degree | N/A | Apr. 21, 2017 ~ Apr. 28, 2017 | N/A | Radiation (03CH10-HY) |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100488 | 9 kHz~30 MHz | Oct. 20, 2016 | Apr. 21, 2017 ~ Apr. 28, 2017 | Oct. 19, 2018 | Radiation (03CH10-HY) |
| EMI Test Receiver | Keysight | N9038A(MXE) | MY55420170 | N/A | Mar. 03, 2017 | Apr. 21, 2017 ~ Apr. 28, 2017 | Mar. 02, 2018 | Radiation (03CH10-HY) |
| Preamplifier | Jet-Power | JPA00101800-30-10P | 1601180002 | 1GHz~18GHz | Jul. 27, 2016 | Apr. 21, 2017 ~ Apr. 28, 2017 | Jul. 26, 2017 | Radiation (03CH10-HY) |
| Preamplifier | MITEQ | JS44-18004000-33-8P | 1840917 | 18GHz ~ 40GHz | Jun. 14, 2016 | Apr. 21, 2017 ~ Apr. 28, 2017 | Jun. 13, 2017 | Radiation (03CH10-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170584 | 18GHz- 40GHz | Nov. 08, 2016 | Apr. 21, 2017 ~ Apr. 28, 2017 | Nov. 07, 2017 | Radiation (03CH10-HY) |

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

| | |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 2.70 |
|---|------|

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

| | |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 5.60 |
|---|------|

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

| | |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 5.90 |
|---|------|

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

| | |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 5.20 |
|---|------|



Appendix A. Conducted Test Results

Bluetooth Low Energy

| | | | | |
|----------------|-------------|--------------------|-------|----|
| Test Engineer: | Aking Chang | Temperature: | 21~25 | °C |
| Test Date: | 2017/4/16 | Relative Humidity: | 51~54 | % |

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

| Mod. | Data Rate | NTx | CH. | Freq. (MHz) | 99% Occupied BW (MHz) | 6dB BW (MHz) | 6dB BW Limit (MHz) | Pass/Fail |
|------|-----------|-----|-----|-------------|-----------------------|--------------|--------------------|-----------|
| BLE | 1Mbps | 1 | 0 | 2402 | 1.028 | 0.662 | 0.50 | Pass |
| BLE | 1Mbps | 1 | 19 | 2440 | 1.028 | 0.662 | 0.50 | Pass |
| BLE | 1Mbps | 1 | 39 | 2480 | 1.028 | 0.662 | 0.50 | Pass |

TEST RESULTS DATA
Peak Power Table

| Mod. | Data Rate | NTx | CH. | Freq. (MHz) | Peak Conducted Power (dBm) | Conducted Power Limit (dBm) | DG (dBi) | EIRP Power (dBm) | EIRP Power Limit (dBm) | Pass /Fail |
|------|-----------|-----|-----|-------------|----------------------------|-----------------------------|----------|------------------|------------------------|------------|
| BLE | 1Mbps | 1 | 0 | 2402 | 5.57 | 30.00 | -1.80 | 3.77 | 36.00 | Pass |
| BLE | 1Mbps | 1 | 19 | 2440 | 5.50 | 30.00 | -1.80 | 3.70 | 36.00 | Pass |
| BLE | 1Mbps | 1 | 39 | 2480 | 5.63 | 30.00 | -1.80 | 3.83 | 36.00 | Pass |

TEST RESULTS DATA
Average Power Table
(Reporting Only)

| Mod. | Data Rate | NTx | CH. | Freq. (MHz) | Duty Factor (dB) | Average Conducted Power (dBm) |
|------|-----------|-----|-----|-------------|------------------|-------------------------------|
| BLE | 1Mbps | 1 | 0 | 2402 | 2.06 | 5.21 |
| BLE | 1Mbps | 1 | 19 | 2440 | 2.06 | 5.12 |
| BLE | 1Mbps | 1 | 39 | 2480 | 2.06 | 5.24 |

TEST RESULTS DATA
Peak Power Density

| Mod. | Data Rate | NTx | CH. | Freq. (MHz) | Peak PSD (dBm /100kHz) | Peak PSD (dBm /3kHz) | DG (dBi) | Peak PSD Limit (dBm /3kHz) | Pass/Fail |
|------|-----------|-----|-----|-------------|------------------------|----------------------|----------|----------------------------|-----------|
| BLE | 1Mbps | 1 | 0 | 2402 | 5.07 | -9.80 | -1.80 | 8.00 | Pass |
| BLE | 1Mbps | 1 | 19 | 2440 | 4.92 | -9.85 | -1.80 | 8.00 | Pass |
| BLE | 1Mbps | 1 | 39 | 2480 | 5.53 | -9.33 | -1.80 | 8.00 | Pass |

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 20dBc limit.



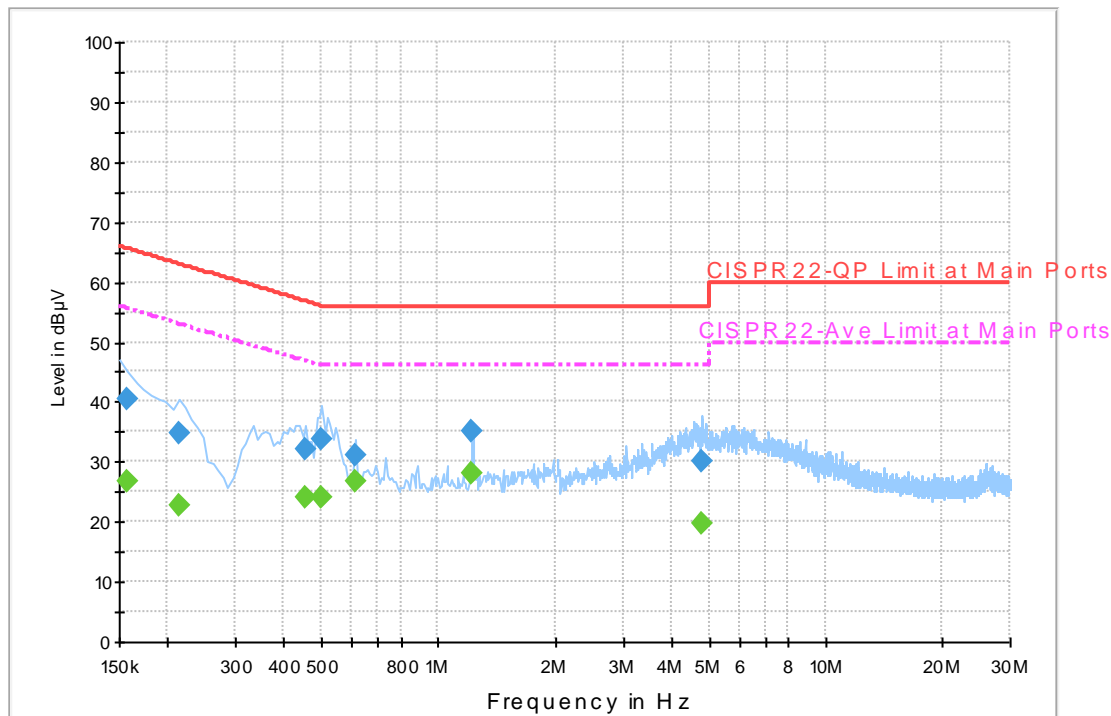
Appendix B. AC Conducted Emission Test Results

| | | | |
|------------------------|-----------|----------------------------|---------|
| Test Engineer : | Eric Jeng | Temperature : | 21~23°C |
| | | Relative Humidity : | 52~55% |

EUT Information

Report NO : 740120
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Line

ENV216 Auto Test FCC Power Bar - L



Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|--------|------|------------|-------------|--------------|
| 0.158000 | 40.6 | Off | L1 | 19.6 | 25.0 | 65.6 |
| 0.214000 | 34.7 | Off | L1 | 19.6 | 28.3 | 63.0 |
| 0.454000 | 32.0 | Off | L1 | 19.6 | 24.8 | 56.8 |
| 0.502000 | 33.8 | Off | L1 | 19.6 | 22.2 | 56.0 |
| 0.614000 | 31.2 | Off | L1 | 19.6 | 24.8 | 56.0 |
| 1.222000 | 35.0 | Off | L1 | 19.6 | 21.0 | 56.0 |
| 4.822000 | 30.1 | Off | L1 | 19.8 | 25.9 | 56.0 |

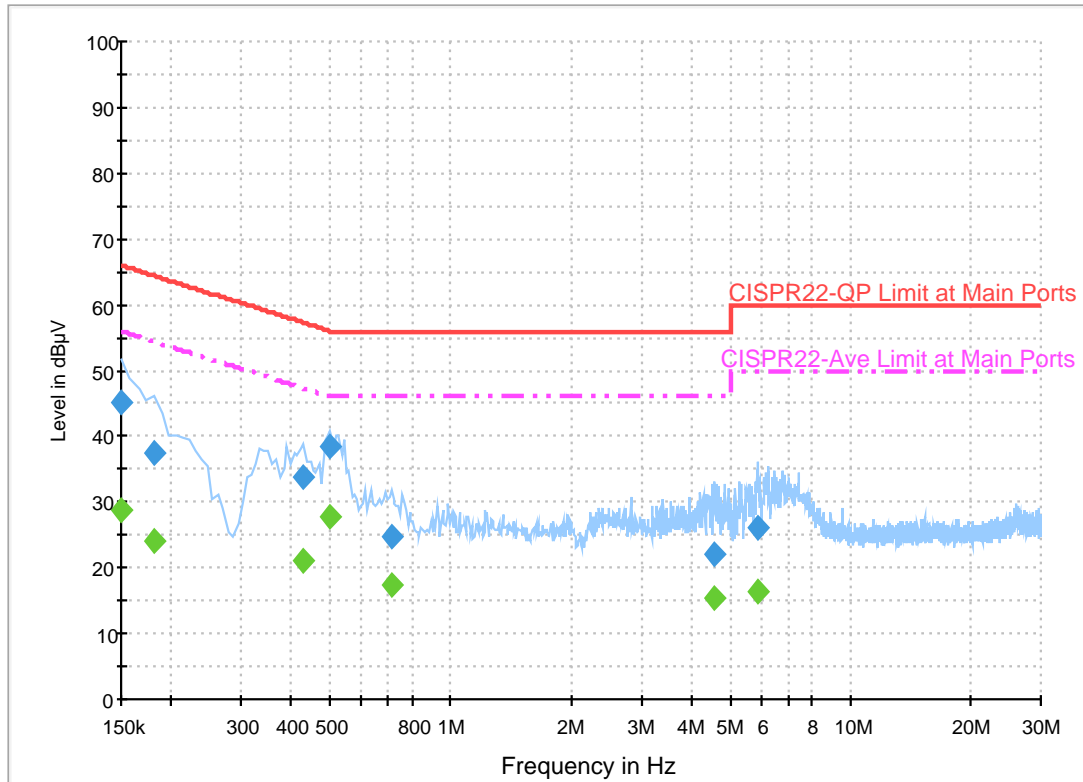
Final Result 2

| Frequency (MHz) | Average (dBµV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.158000 | 26.7 | Off | L1 | 19.6 | 28.9 | 55.6 |
| 0.214000 | 22.8 | Off | L1 | 19.6 | 30.2 | 53.0 |
| 0.454000 | 24.0 | Off | L1 | 19.6 | 22.8 | 46.8 |
| 0.502000 | 23.9 | Off | L1 | 19.6 | 22.1 | 46.0 |
| 0.614000 | 26.6 | Off | L1 | 19.6 | 19.4 | 46.0 |
| 1.222000 | 28.0 | Off | L1 | 19.6 | 18.0 | 46.0 |
| 4.822000 | 19.8 | Off | L1 | 19.8 | 26.2 | 46.0 |

EUT Information

Report NO : 740120
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Neutral

ENV216 Auto Test FCC Power Bar - N



Final Result 1

| Frequency (MHz) | QuasiPeak (dBµV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|------------------|--------|------|------------|-------------|--------------|
| 0.150000 | 45.0 | Off | N | 19.5 | 21.0 | 66.0 |
| 0.182000 | 37.5 | Off | N | 19.5 | 26.9 | 64.4 |
| 0.430000 | 33.7 | Off | N | 19.5 | 23.6 | 57.3 |
| 0.502000 | 38.6 | Off | N | 19.5 | 17.4 | 56.0 |
| 0.710000 | 24.9 | Off | N | 19.5 | 31.1 | 56.0 |
| 4.590000 | 22.0 | Off | N | 19.7 | 34.0 | 56.0 |
| 5.886000 | 25.9 | Off | N | 19.8 | 34.1 | 60.0 |

Final Result 2

| Frequency (MHz) | Average (dBµV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBµV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.150000 | 28.6 | Off | N | 19.5 | 27.4 | 56.0 |
| 0.182000 | 24.0 | Off | N | 19.5 | 30.4 | 54.4 |
| 0.430000 | 21.0 | Off | N | 19.5 | 26.3 | 47.3 |
| 0.502000 | 27.7 | Off | N | 19.5 | 18.3 | 46.0 |
| 0.710000 | 17.4 | Off | N | 19.5 | 28.6 | 46.0 |
| 4.590000 | 15.5 | Off | N | 19.7 | 30.5 | 46.0 |
| 5.886000 | 16.3 | Off | N | 19.8 | 33.7 | 50.0 |



Appendix C. Radiated Spurious Emission

| | | | |
|-----------------|----------------------------|---------------------|---------|
| Test Engineer : | Stan Hsieh and Kyle Chuang | Temperature : | 22~24°C |
| | | Relative Humidity : | 43~44% |

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

| BLE | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|-------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| BLE CH 00 2402MHz | | 2344.86 | 50.37 | -23.63 | 74 | 42.48 | 26.74 | 4.4 | 33.23 | 307 | 187 | P | H |
| | | 2365.23 | 41.49 | -12.51 | 54 | 33.51 | 26.8 | 4.42 | 33.22 | 307 | 187 | A | H |
| | * | 2402 | 94.08 | - | - | 85.93 | 26.93 | 4.45 | 33.21 | 307 | 187 | P | H |
| | * | 2402 | 93.52 | - | - | 85.37 | 26.93 | 4.45 | 33.21 | 307 | 187 | A | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | 2356.83 | 50.11 | -23.89 | 74 | 42.16 | 26.8 | 4.4 | 33.23 | 122 | 315 | P | V |
| | | 2362.605 | 41.26 | -12.74 | 54 | 33.29 | 26.8 | 4.42 | 33.23 | 122 | 315 | A | V |
| | * | 2402 | 97.56 | - | - | 89.41 | 26.93 | 4.45 | 33.21 | 122 | 315 | P | V |
| | * | 2402 | 96.91 | - | - | 88.76 | 26.93 | 4.45 | 33.21 | 122 | 315 | A | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| BLE CH 19 2440MHz | | 2362.22 | 50.18 | -23.82 | 74 | 42.21 | 26.8 | 4.42 | 33.23 | 230 | 187 | P | H |
| | | 2385.88 | 41.28 | -12.72 | 54 | 33.16 | 26.93 | 4.43 | 33.22 | 230 | 187 | A | H |
| | * | 2440 | 93.14 | - | - | 84.76 | 27.11 | 4.48 | 33.19 | 230 | 187 | P | H |
| | * | 2440 | 92.6 | - | - | 84.22 | 27.11 | 4.48 | 33.19 | 230 | 187 | A | H |
| | | 2486.14 | 51.08 | -22.92 | 74 | 42.5 | 27.24 | 4.53 | 33.17 | 230 | 187 | P | H |
| | | 2497.62 | 41.86 | -12.14 | 54 | 33.21 | 27.3 | 4.53 | 33.16 | 230 | 187 | A | H |
| | | 2347.8 | 50.25 | -23.75 | 74 | 42.36 | 26.74 | 4.4 | 33.23 | 100 | 305 | P | V |
| | | 2385.46 | 41.64 | -12.36 | 54 | 33.58 | 26.87 | 4.43 | 33.22 | 100 | 305 | A | V |
| | * | 2440 | 98.12 | - | - | 89.74 | 27.11 | 4.48 | 33.19 | 100 | 305 | P | V |
| | * | 2440 | 97.5 | - | - | 89.12 | 27.11 | 4.48 | 33.19 | 100 | 305 | A | V |
| | | 2495.1 | 51.19 | -22.81 | 74 | 42.54 | 27.3 | 4.53 | 33.16 | 100 | 305 | P | V |
| | | 2497.83 | 41.78 | -12.22 | 54 | 33.13 | 27.3 | 4.53 | 33.16 | 100 | 305 | A | V |



| | | | | | | | | | | | | | |
|----------------------------------|---|---------|-------|--------|----|-------|-------|------|-------|-----|-----|---|---|
| BLE CH 39 2480MHz | * | 2480 | 93.09 | - | - | 84.53 | 27.24 | 4.51 | 33.17 | 255 | 175 | P | H |
| | * | 2480 | 92.19 | - | - | 83.63 | 27.24 | 4.51 | 33.17 | 255 | 175 | A | H |
| | | 2495.12 | 51 | -23 | 74 | 42.35 | 27.3 | 4.53 | 33.16 | 255 | 175 | P | H |
| | | 2495.28 | 41.71 | -12.29 | 54 | 33.06 | 27.3 | 4.53 | 33.16 | 255 | 175 | A | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | * | 2480 | 97.91 | - | - | 89.35 | 27.24 | 4.51 | 33.17 | 100 | 304 | P | V |
| | * | 2480 | 97.3 | - | - | 88.74 | 27.24 | 4.51 | 33.17 | 100 | 304 | A | V |
| | | 2494.32 | 51.58 | -22.42 | 74 | 42.93 | 27.3 | 4.53 | 33.16 | 100 | 304 | P | V |
| | | 2484.52 | 41.9 | -12.1 | 54 | 33.32 | 27.24 | 4.53 | 33.17 | 100 | 304 | A | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| Remark | 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | |



2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

| BLE | Note | Frequency (MHz) | Level (dBμV/m) | Over Limit (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|-------------------------|---|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-------------------------------|-------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| BLE CH 00 2402MHz | | 4804 | 44.86 | -29.14 | 74 | 67.88 | 32.04 | 6.34 | 61.9 | 100 | 0 | P | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | 4804 | 45.07 | -28.93 | 74 | 68.09 | 32.04 | 6.34 | 61.9 | 100 | 0 | P | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| BLE CH 19 2440MHz | | 4880 | 44.05 | -29.95 | 74 | 66.85 | 32.21 | 6.41 | 61.9 | 100 | 0 | P | H |
| | | 7320 | 49.55 | -24.45 | 74 | 66.34 | 36.91 | 7.98 | 62.07 | 100 | 0 | P | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | 4880 | 45.14 | -28.86 | 74 | 67.94 | 32.21 | 6.41 | 61.9 | 100 | 0 | P | V |
| | | 7320 | 49.76 | -24.24 | 74 | 66.55 | 36.91 | 7.98 | 62.07 | 100 | 0 | P | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| BLE CH 39 2480MHz | | 4960 | 44.27 | -29.73 | 74 | 66.82 | 32.42 | 6.47 | 61.9 | 100 | 0 | P | H |
| | | 7440 | 49.04 | -24.96 | 74 | 65.41 | 37.32 | 8.05 | 62.09 | 100 | 0 | P | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | 4960 | 46.38 | -27.62 | 74 | 68.93 | 32.42 | 6.47 | 61.9 | 100 | 0 | P | V |
| | | 7440 | 49.36 | -24.64 | 74 | 65.73 | 37.32 | 8.05 | 62.09 | 100 | 0 | P | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| Remark | 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | |

Emission below 1GHz

2.4GHz BLE (LF)

| BLE | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|-----------------------------|--|-----------|------------|--------|------------|--------|----------|--------|--------|--------|---------|-------|-------|
| | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| 2.4GHz BLE LF | | 32.43 | 22.22 | -17.78 | 40 | 31.46 | 22.89 | 0.53 | 32.75 | - | - | P | H |
| | | 103.71 | 23.63 | -19.87 | 43.5 | 38.76 | 16.43 | 0.97 | 32.77 | - | - | P | H |
| | | 211.17 | 27.28 | -16.22 | 43.5 | 43.11 | 15.09 | 1.44 | 32.75 | - | - | P | H |
| | | 566 | 26.76 | -19.24 | 46 | 30.93 | 26 | 2.21 | 32.96 | - | - | P | H |
| | | 785.1 | 30.46 | -15.54 | 46 | 31.88 | 28.28 | 2.58 | 32.91 | - | - | P | H |
| | | 955.2 | 32.48 | -13.52 | 46 | 29.65 | 30.94 | 2.78 | 31.7 | 100 | 0 | P | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | 30 | 24.34 | -15.66 | 40 | 32.27 | 24.22 | 0.53 | 32.76 | - | - | P | V |
| | | 40.8 | 24.36 | -15.64 | 40 | 37.41 | 18.9 | 0.69 | 32.75 | - | - | P | V |
| | | 54.84 | 22.68 | -17.32 | 40 | 42.14 | 12.46 | 0.69 | 32.74 | - | - | P | V |
| | | 446.3 | 24.08 | -21.92 | 46 | 31.46 | 23.01 | 1.98 | 32.82 | - | - | P | V |
| | | 743.1 | 29.85 | -16.15 | 46 | 31.5 | 28.19 | 2.51 | 32.95 | - | - | P | V |
| | | 941.2 | 32.77 | -13.23 | 46 | 30.65 | 30.4 | 2.78 | 31.85 | 100 | 0 | P | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | V | |
| | | | | | | | | | | | | V | |
| Remark | 1. No other spurious found. 2. All results are PASS against limit line. | | | | | | | | | | | | |



Note symbol

| | |
|-----|--|
| * | Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. |
| ! | Test result is over limit line. |
| P/A | Peak or Average |
| H/V | Horizontal or Vertical |

A calculation example for radiated spurious emission is shown as below:

| WIFI | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|---------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| Ant. | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| 1+2 | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| 802.11b | | 2390 | 55.45 | -18.55 | 74 | 54.51 | 32.22 | 4.58 | 35.86 | 103 | 308 | P | H |
| CH 01 | | | | | | | | | | | | | |
| 2412MHz | | 2390 | 43.54 | -10.46 | 54 | 42.6 | 32.22 | 4.58 | 35.86 | 103 | 308 | A | H |

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.



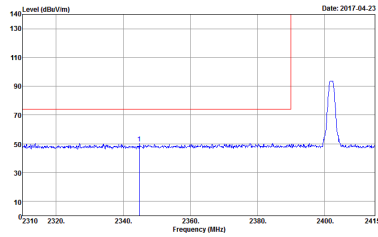
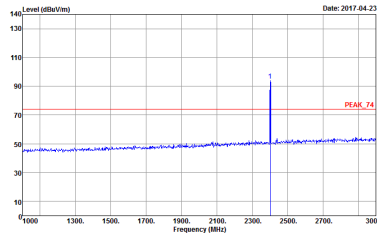
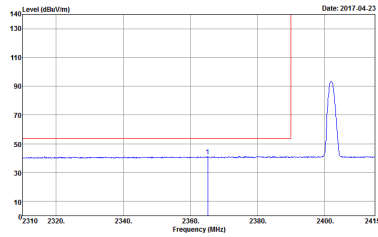
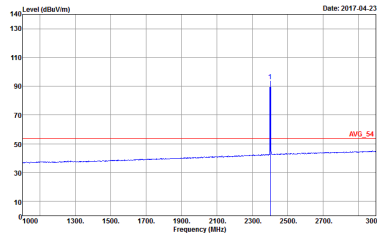
Appendix D. Radiated Spurious Emission Plots

| | | | |
|------------------------|----------------------------|----------------------------|---------|
| Test Engineer : | Stan Hsieh and Kyle Chuang | Temperature : | 22~24°C |
| | | Relative Humidity : | 43~44% |

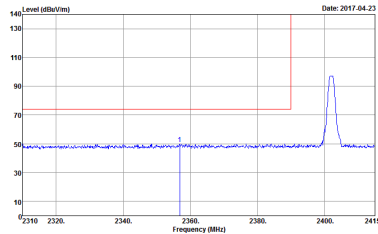
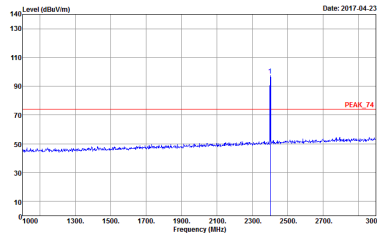
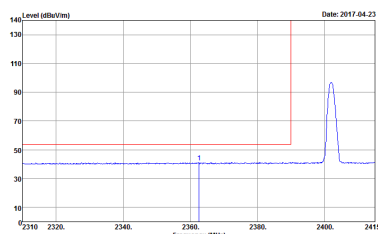
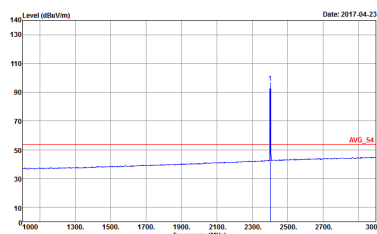
Note symbol

| | |
|----|-----------------------|
| -L | Low channel location |
| -R | High channel location |

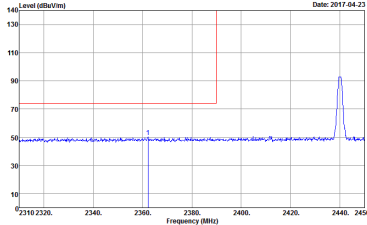
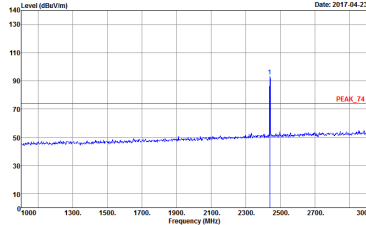
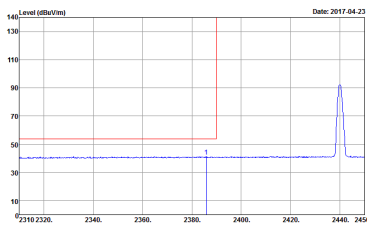
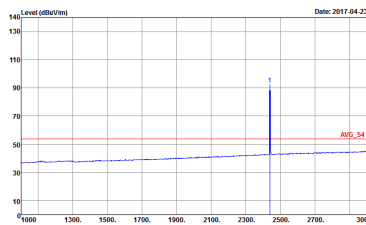
2.4GHz 2400~2483.5MHz
BLE (Band Edge @ 3m)

| BLE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|--|--|
| ANT | BLE CH00 2402MHz | |
| 1 | Horizontal | Fundamental |
| Peak |  <p> Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4 </p> |  <p> Site : 03CH10-HY Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4 </p> |
| Avg. |  <p> Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4 </p> |  <p> Site : 03CH10-HY Condition : AVG_54 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4 </p> |

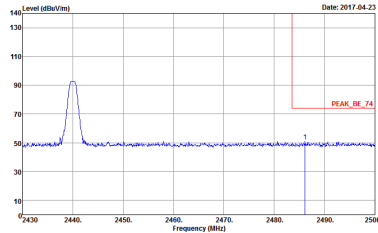
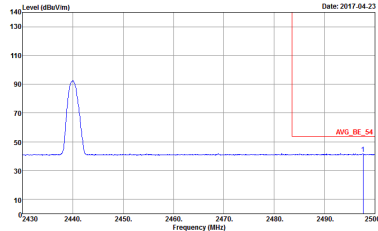


| BLE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|--|--|
| ANT | BLE CH00 2402MHz | |
| 1 | Vertical | Fundamental |
| Peak | <div><p>Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4</p></div> | <div><p>Site : 03CH10-HY Condition : PEAK_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4</p></div> |
| Avg | <div><p>Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4</p></div> | <div><p>Site : 03CH10-HY Condition : AVG_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4</p></div> |

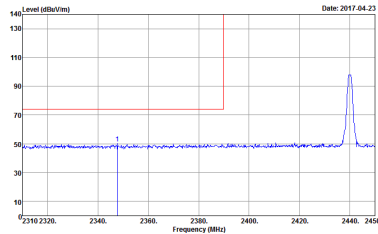
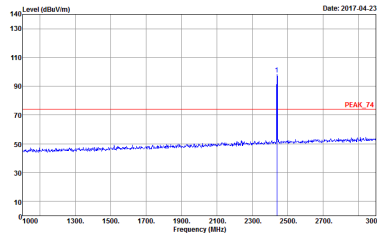
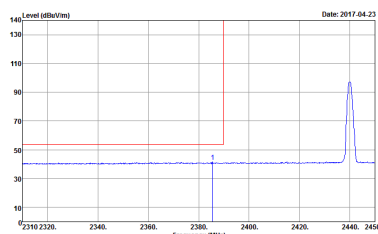
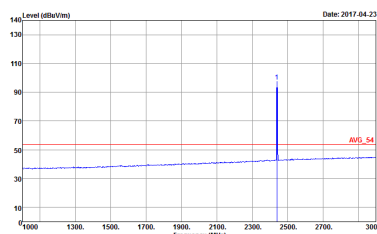


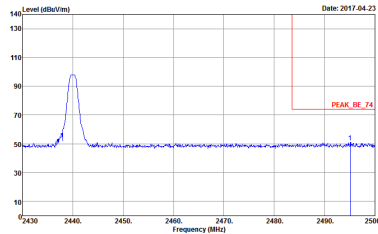
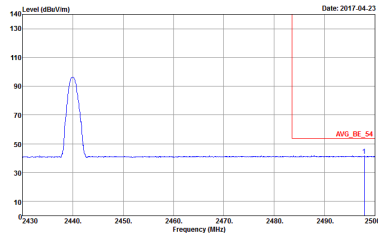
| BLE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|---|---|
| ANT | BLE CH19 2440MHz - L | |
| 1 | Horizontal | Fundamental |
| Peak | <div><p>Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL Detector : Peak Project : 740120 Mode : 5</p></div> | <div><p>Site : 03CH10-HY Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL Detector : Peak Project : 740120 Mode : 5</p></div> |
| Avg. | <div><p>Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL Detector : Peak Project : 740120 Mode : 5</p></div> | <div><p>Site : 03CH10-HY Condition : AVG_54 3m HORN 9120D-HF HORIZONTAL Detector : Peak Project : 740120 Mode : 5</p></div> |



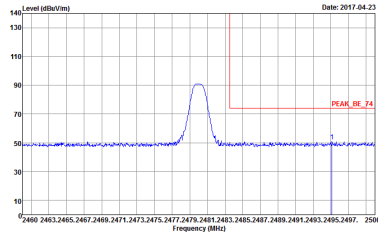
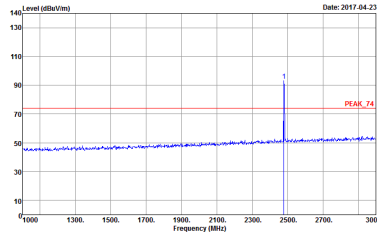
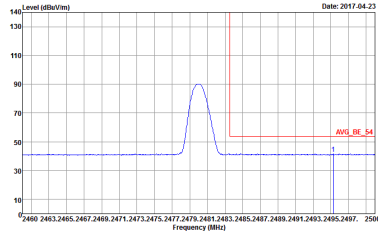
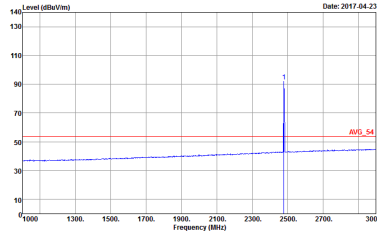
| BLE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|--|-------------|
| ANT | BLE CH19 2440MHz - R | |
| 1 | Horizontal | Fundamental |
| Peak | <div><p>Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5</p></div> | Left blank |
| Avg. | <div><p>Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5</p></div> | Left blank |



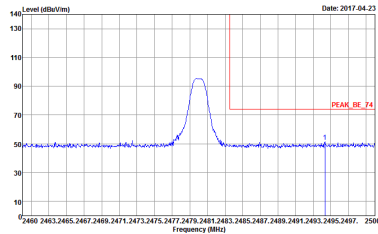
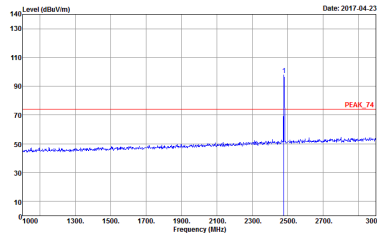
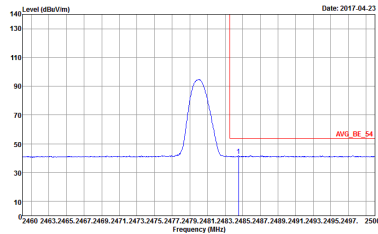
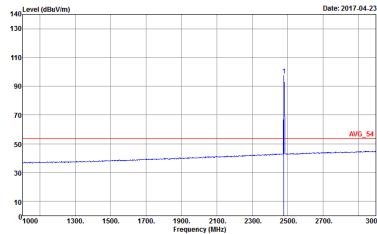
| BLE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|--|--|
| ANT | BLE CH19 2440MHz - L | |
| 1 | Vertical | Fundamental |
| Peak | <div><p>Level (dBm/1m)</p><p>Date: 2017-04-23</p><p>Frequency (MHz)</p><p>Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5</p></div> | <div><p>Level (dBm/1m)</p><p>Date: 2017-04-23</p><p>Frequency (MHz)</p><p>Site : 03CH10-HY Condition : PEAK_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5</p></div> |
| Avg. | <div><p>Level (dBm/1m)</p><p>Date: 2017-04-23</p><p>Frequency (MHz)</p><p>Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5</p></div> | <div><p>Level (dBm/1m)</p><p>Date: 2017-04-23</p><p>Frequency (MHz)</p><p>Site : 03CH10-HY Condition : AVG_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5</p></div> |

| BLE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|---|-------------|
| ANT | BLE CH19 2440MHz - R | |
| 1 | Vertical | Fundamental |
| Peak |  <p> Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5 </p> | Left blank |
| Avg. |  <p> Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5 </p> | Left blank |

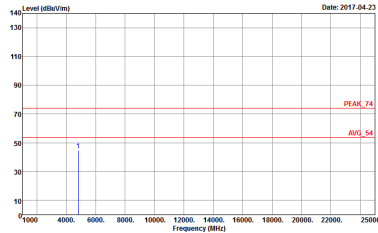
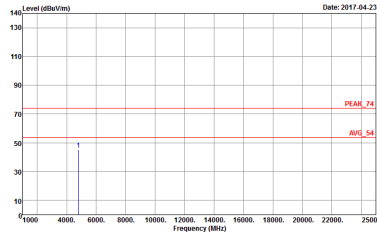


| BLE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|---|---|
| ANT | BLE CH39 2480MHz | |
| 1 | Horizontal | Fundamental |
| Peak | <div><p>Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6</p></div> | <div><p>Site : 03CH10-HY Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6</p></div> |
| Avg. | <div><p>Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6</p></div> | <div><p>Site : 03CH10-HY Condition : AVG_54 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6</p></div> |

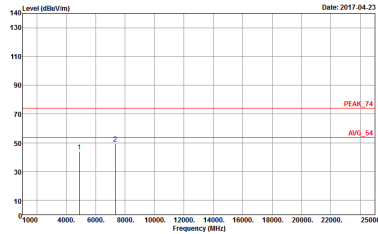
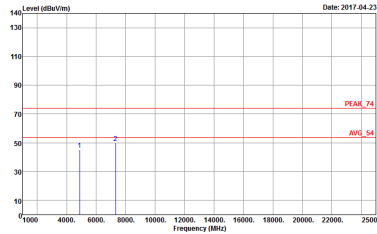


| BLE | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|--|--|
| ANT | BLE CH39 2480MHz | |
| 1 | Vertical | Fundamental |
| Peak | <div><p>Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6</p></div> | <div><p>Site : 03CH10-HY Condition : PEAK_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6</p></div> |
| | <div><p>Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6</p></div> | <div><p>Site : 03CH10-HY Condition : AVG_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6</p></div> |

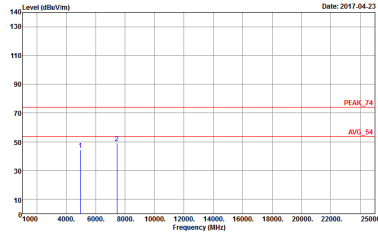
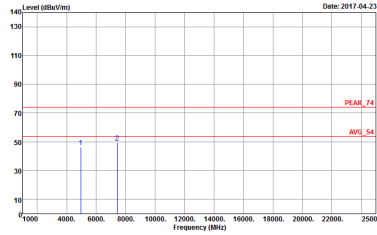
2.4GHz 2400~2483.5MHz
BLE (Harmonic @ 3m)

| BLE | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--------------------------------|---|--|
| ANT | BLE CH00 2402MHz | |
| 1 | Horizontal | Vertical |
| Peak Avg. |  <p> Site : 03CH10-14Y Condition : PEAK_74 3m HORN_9170_406_0584 HORIZONTAL Detector : Peak Project : 740120 Mode : 4 </p> |  <p> Site : 03CH10-14Y Condition : PEAK_74 3m HORN_9170_406_0584 VERTICAL Detector : Peak Project : 740120 Mode : 4 </p> |

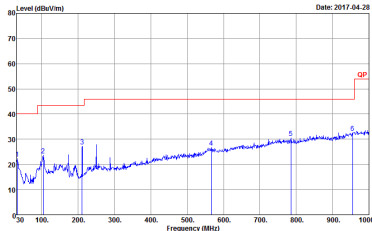
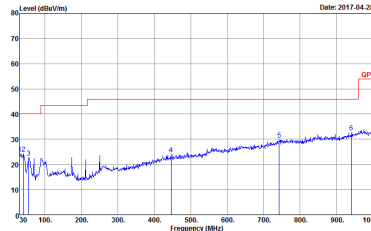


| BLE | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--------------|---|--|
| ANT | BLE CH19 2440MHz | |
| 1 | Horizontal | Vertical |
| Peak Avg. |  <p>Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 HORIZONTAL Detector : Peak Project : 740120 Mode : 5</p> |  <p>Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 VERTICAL Detector : Peak Project : 740120 Mode : 5</p> |
| | | |



| BLE | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|------|---|--|
| ANT | BLE CH39 2480MHz | |
| 1 | Horizontal | Vertical |
| Peak | <div><p>Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 HORIZONTAL Detector : Peak Project : 740120 Mode : 6</p></div> | <div><p>Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 VERTICAL Detector : Peak Project : 740120 Mode : 6</p></div> |

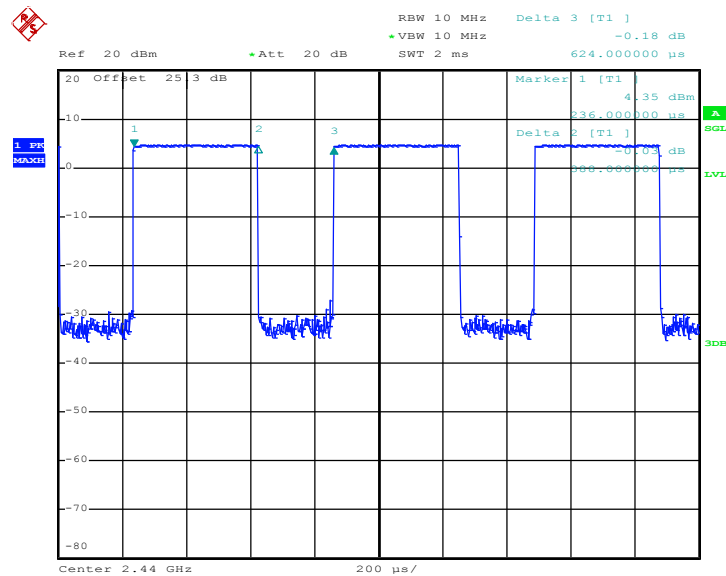
Emission below 1GHz
2.4GHz BLE (LF)

| BLE | 2.4GHz 2400~2483.5MHz | |
|--------------|---|--|
| ANT | BLE LF | |
| 1 | Horizontal | Vertical |
| QP / Peak |  <p> Site : 03CH10-14V Condition : QP 3m BLE-LOG 6111D-LF HORIZONTAL Detector : Peak Project : 740120 Mode : 20 </p> |  <p> Site : 03CH10-14V Condition : QP 3m BLE-LOG 6111D-LF VERTICAL Detector : Peak Project : 740120 Mode : 20 </p> |
| | | |

Appendix E. Duty Cycle Plots

| Band | Duty Cycle(%) | T(us) | 1/T(kHz) | VBW Setting |
|---------------|---------------|-------|----------|-------------|
| Bluetooth -LE | 62.18 | 388 | 2.58 | 3kHz |

Bluetooth - LE



Date: 16.APR.2017 10:19:53