# TEST REPORT

| | | |
|---|---|---|
| **Product** | : | WisePad 2 Plus |
| **Trade mark** | : | BBPOS |
| **Model/Type reference** | : | WPP23 |
| **Serial Number** | : | N/A |
| **Report Number** | : | EED32J00113703 |
| **FCC ID** | : | 2AB7X-WPP23 |
| **Date of Issue** | : | Jul. 11, 2017 |
| **Test Standards** | : | 47 CFR Part 15 Subpart C |
| **Test result** | : | PASS |

Prepared for:

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Prepared by:

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| | | | |
|---|---|---|---|
| Tested By: | Tom chen (Test Project) | Compiled by: | Kevin yang (Project Engineer) |
| Reviewed by: | Ware xin (Reviewer) | Approved by: | Sheek Luo (Lab supervisor) |
| Date: | Jul. 11, 2017 | | Check No.:2496595088 |

CENTRE TESTING INTERNATIONAL GROUP CO.,LTD. Report Seal

# 2 Version

| Version No. | Date | Description |
|---|---|---|
| 00 | Jul. 11, 2017 | Original |
| | | |
| | | |

# 3 Test Summary

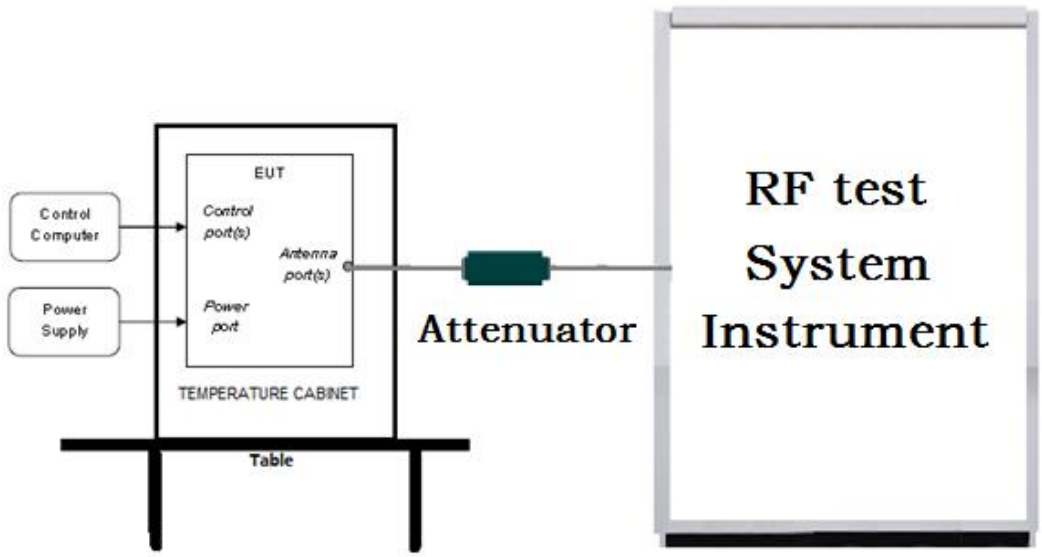
| Test Item | Test Requirement | Test method | Result |
|---|---|---|---|
| **Antenna Requirement** | 47 CFR Part 15Subpart C Section 15.203/15.247 (c) | ANSI C63.10-2013 | PASS |
| **AC Power Line Conducted Emission** | 47 CFR Part 15Subpart C Section 15.207 | ANSI C63.10-2013 | PASS |
| **Conducted Peak Output Power** | 47 CFR Part 15Subpart C Section 15.247 (b)(3) | ANSI C63.10-2013/ KDB 558074 D01v04 | PASS |
| **6dB Occupied Bandwidth** | 47 CFR Part 15Subpart C Section 15.247 (a)(2) | ANSI C63.10-2013/ KDB 558074 D01v04 | PASS |
| **Power Spectral Density** | 47 CFR Part 15Subpart C Section 15.247 (e) | ANSI C63.10-2013/ KDB 558074 D01v04 | PASS |
| **Band-edge for RF Conducted Emissions** | 47 CFR Part 15Subpart C Section 15.247(d) | ANSI C63.10-2013/ KDB 558074 D01v04 | PASS |
| **RF Conducted Spurious Emissions** | 47 CFR Part 15Subpart C Section 15.247(d) | ANSI C63.10-2013/ KDB 558074 D01v04 | PASS |
| **Radiated Spurious Emissions** | 47 CFR Part 15Subpart C Section 15.205/15.209 | ANSI C63.10-2013 | PASS |
| **Restricted bands around fundamental frequency (Radiated Emission)** | 47 CFR Part 15Subpart C Section 15.205/15.209 | ANSI C63.10-2013 | PASS |
| Remark:<br>Test according to ANSI C63.4-2014 & ANSI C63.10-2013.<br>The tested sample and the sample information are provided by the client. | | | |

# 4 Content

# 5 Test Requirement

## 5.1 Test setup

### 5.1.1 For Conducted test setup




### 5.1.2 For Radiated Emissions test setup

**Radiated Emissions setup:**

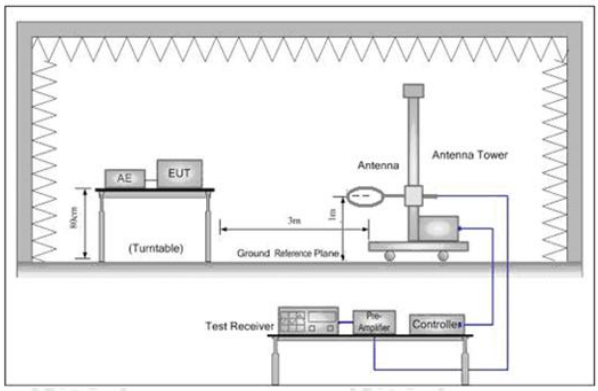



Figure 1. Below 30MHz

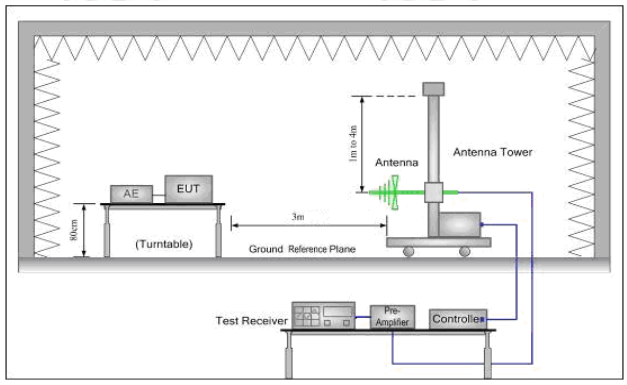



Figure 2. 30MHz to 1GHz

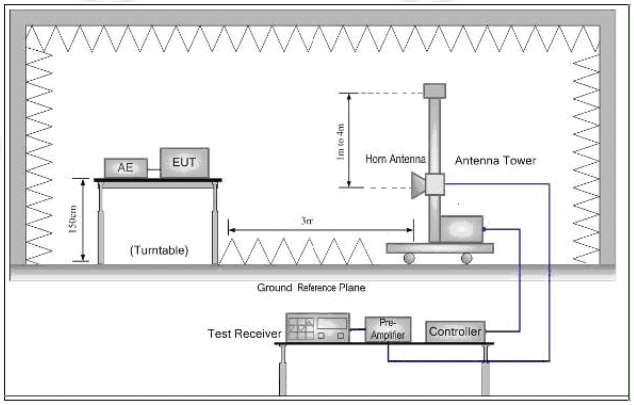
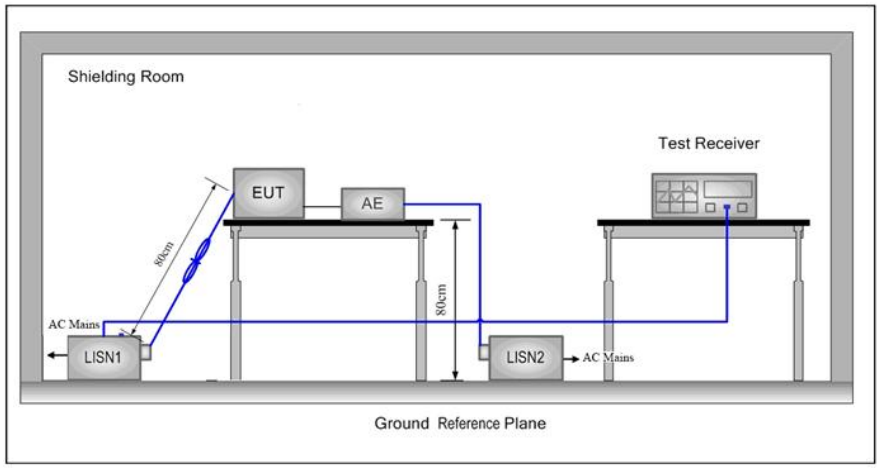



Figure 3. Above 1GHz

### 5.1.3 For Conducted Emissions test setup

**Conducted Emissions setup**




## 5.2 Test Environment

| **Operating Environment:** | |
|---|---|
| Temperature: | 21°C |
| Humidity: | 54% RH |
| Atmospheric Pressure: | 1010mbar |

## 5.3 Test Condition

Test channel:

| Test Mode | Tx | RF Channel | | |
|---|---|---|---|---|
| | | Low(L) | Middle(M) | High(H) |
| GFSK | 2402MHz ~2480 MHz | Channel 1 | Channel 20 | Channel 40 |
| | | 2402MHz | 2440MHz | 2480MHz |
| Transmitting mode: | Keep the EUT at Transmit mode. | | | |

# 6 General Information

## 6.1 Client Information

| | |
|---|---|
| Applicant: | BBPOS International Limited |
| Address of Applicant: | Suite 1602, 16/F, Tower 2, Nina Tower, No. 8 Yeung Uk Road, Tsuen Wan, NT, Hong Kong |
| Manufacturer: | BBPOS International Limited |
| Address of Manufacturer: | Suite 1602, 16/F, Tower 2, Nina Tower, No. 8 Yeung Uk Road, Tsuen Wan, NT, Hong Kong |

## 6.2 General Description of EUT

| | |
|---|---|
| Product Name: | WisePad 2 Plus |
| Mode No.(EUT): | WPP23 |
| Trade Mark: | BBPOS |
| EUT Supports Radios application: | Bluetooth V4.0 BLE |
| Firmware version of the sample: | 0.06.01.03 |
| Hardware version of the sample: | V1.0.0 |
| Power Supply: | DC 3.7V by Battery<br>DC 5V by USB port |
| Battery | Li-polymer 3.7V, 1300mAh |
| Sample Received Date: | Jun. 7, 2017 |
| Sample tested Date: | Jun. 7, 2017 to Jul. 5, 2017 |

## 6.3 Product Specification subjective to this standard

| | |
|---|---|
| Operation Frequency: | 2402MHz~2480MHz |
| Bluetooth Version: | 4.0 |
| Modulation Type: | GFSK |
| Number of Channel: | 40 |
| Sample Type: | Portable |
| Test Power Grade: | N/A |
| Test Software of EUT: | BBPOS_FCC_0713 (Version: 20160713) comes from the desk of associated laptop |
| Antenna Type: | Monopole |
| Antenna Gain: | 1dBi |
| Test Voltage: | DC 3.7V by Battery<br>DC 5V by USB port |

| Operation Frequency each of channel | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1 | 2402MHz | 11 | 2422MHz | 21 | 2442MHz | 31 | 2462MHz |
| 2 | 2404MHz | 12 | 2424MHz | 22 | 2444MHz | 32 | 2464MHz |
| 3 | 2406MHz | 13 | 2426MHz | 23 | 2446MHz | 33 | 2466MHz |
| 4 | 2408MHz | 14 | 2428MHz | 24 | 2448MHz | 34 | 2468MHz |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | 2410MHz | 15 | 2430MHz | 25 | 2450MHz | 35 | 2470MHz |
| 6 | 2412MHz | 16 | 2432MHz | 26 | 2452MHz | 36 | 2472MHz |
| 7 | 2414MHz | 17 | 2434MHz | 27 | 2454MHz | 37 | 2474MHz |
| 8 | 2416MHz | 18 | 2436MHz | 28 | 2456MHz | 38 | 2476MHz |
| 9 | 2418MHz | 19 | 2438MHz | 29 | 2458MHz | 39 | 2478MHz |
| 10 | 2420MHz | 20 | 2440MHz | 30 | 2460MHz | 40 | 2480MHz |

## 6.4 Description of Support Units

The EUT has been tested with associated equipment below.

| Description | Manufacturer | Model No. | Certification | Supplied by |
|---|---|---|---|---|
| laptop | LENOVO | E46L | FCC DOC | CTI |
| Mouse | L.Selectron | OP-200 | FCC DOC | CTI |

## 6.5 Test Facility

**Test location**

The test site a is located on *Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China.* Test site at Centre Testing International Group Co., Ltd has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

**FCC-Registration No.: 886427**

Centre Testing International Group Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 886427.

## 6.6 Deviation from Standards

None.

## 6.7 Abnormalities from Standard Conditions

None.

## 6.8 Other Information Requested by the Customer

None.

## 6.9 Measurement Uncertainty (95% confidence levels, k=2)

| No. | Item | Measurement Uncertainty |
|---|---|---|
| 1 | Radio Frequency | $7.9 \times 10^{-8}$ |
| 2 | RF power, conducted | 0.31dB (30MHz-1GHz) |
| | | 0.57dB (1GHz-18GHz) |
| 3 | Radiated Spurious emission test | 4.5dB (30MHz-1GHz) |
| | | 4.8dB (1GHz-12.75GHz) |
| 4 | Conduction emission | 3.6dB (9kHz to 150kHz) |

| | | |
|---|---|---|
| | | 3.2dB (150kHz to 30MHz) |
| 5 | Temperature test | 0.64°C |
| 6 | Humidity test | 2.8% |
| 7 | DC power voltages | 0.025% |

# 7 Equipment List

| RF test system | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Mode No.** | **Serial Number** | **Cal. Date (mm-dd-yyyy)** | **Cal. Due date (mm-dd-yyyy)** |
| Signal Generator | Keysight | E8257D | MY53401106 | 04-01-2016 | 03-13-2018 |
| Communication test set test set | Agilent | N4010A | MY51400230 | 04-01-2016 | 03-13-2018 |
| Spectrum Analyzer | Keysight | N9010A | MY54510339 | 04-01-2016 | 03-13-2018 |
| Signal Generator | Keysight | N5182B | MY53051549 | 04-01-2016 | 03-13-2018 |
| High-pass filter | Sinoscite | FL3CX03WG18 NM12-0398-002 | --- | 01-12-2016 | 01-11-2018 |
| High-pass filter | MICRO-TRONICS | SPA-F-63029-4 | --- | 01-12-2016 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX01CA09C L12-0395-001 | --- | 01-12-2016 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX01CA08C L12-0393-001 | --- | 01-12-2016 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX02CA04C L12-0396-002 | --- | 01-12-2016 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX02CA03C L12-0394-001 | --- | 01-12-2016 | 01-11-2018 |
| DC Power | Keysight | E3642A | MY54436035 | 04-01-2016 | 03-31-2018 |
| PC-1 | Lenovo | R4960d | --- | 04-01-2016 | 03-31-2018 |
| power meter & power sensor | R&S | OSP120 | 101374 | 04-01-2016 | 03-13-2018 |
| RF control unit | JS Tonscend | JS0806-2 | 158060006 | 04-01-2016 | 03-13-2018 |
| BT&WI-FI Automatic test software | JS Tonscend | JS1120-2 | --- | 04-01-2016 | 03-31-2018 |

| Conducted disturbance Test | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Mode No.** | **Serial Number** | **Cal. date (mm-dd-yyyy)** | **Cal. Due date (mm-dd-yyyy)** |
| Receiver | R&S | ESCI | 100009 | 06-16-2016 | 06-13-2018 |
| Temperature/ Humidity Indicator | TAYLOR | 1451 | 1905 | 04-27-2016 | 05-07-2018 |
| Communication test set | Agilent | E5515C | GB47050534 | 04-01-2016 | 03-13-2018 |
| Communication test set | R&S | CMW500 | 152394 | 04-01-2016 | 03-13-2018 |
| LISN | R&S | ENV216 | 100098 | 06-16-2016 | 06-12-2018 |
| LISN | schwarzbeck | NNLK8121 | 8121-529 | 06-16-2016 | 06-12-2018 |
| Voltage Probe | R&S | ESH2-Z3 | -- | 06-13-2017 | 06-12-2018 |
| Current Probe | R&S | EZ17 | 100106 | 06-16-2016 | 06-12-2018 |

| | | | | | |
|---|---|---|---|---|---|
| ISN | TESEQ GmbH | ISN T800 | 30297 | 01-29-2015 | 02-22-2018 |

| 3M Semi/full-anechoic Chamber | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Mode No.** | **Serial Number** | **Cal. date (mm-dd-yyyy)** | **Cal. Due date (mm-dd-yyyy)** |
| 3M Chamber & Accessory Equipment | TDK | SAC-3 | --- | 06-05-2016 | 06-05-2019 |
| TRILOG Broadband Antenna | SCHWARZBECK | VULB9163 | 9163-484 | 05-23-2016 | 05-22-2018 |
| Microwave Preamplifier | Agilent | 8449B | 3008A02425 | 02-04-2016 | 02-15-2018 |
| Horn Antenna | ETS-LINDGREN | 3117 | 00057410 | 06-30-2015 | 06-28-2018 |
| Horn Antenna | A.H.SYSTEMS | SAS-574 | 374 | 06-30-2015 | 06-28-2018 |
| Loop Antenna | ETS | 6502 | 00071730 | 07-30-2015 | 07-28-2017 |
| Spectrum Analyzer | R&S | FSP40 | 100416 | 06-16-2016 | 06-12-2018 |
| Receiver | R&S | ESCI | 100435 | 06-16-2016 | 06-13-2018 |
| Multi device Controller | maturo | NCD/070/10711 112 | --- | 01-12-2016 | 01-11-2018 |
| LISN | schwarzbeck | NNBM8125 | 81251547 | 06-16-2016 | 06-12-2018 |
| LISN | schwarzbeck | NNBM8125 | 81251548 | 06-16-2016 | 06-12-2018 |
| Signal Generator | Agilent | E4438C | MY45095744 | 04-01-2016 | 03-13-2018 |
| Signal Generator | Keysight | E8257D | MY53401106 | 04-01-2016 | 03-13-2018 |
| Temperature/ Humidity Indicator | TAYLOR | 1451 | 1905 | 04-27-2016 | 05-07-2018 |
| Communication test set | Agilent | E5515C | GB47050534 | 04-01-2016 | 03-13-2018 |
| Cable line | Fulai(7M) | SF106 | 5219/6A | 01-12-2016 | 01-11-2018 |
| Cable line | Fulai(6M) | SF106 | 5220/6A | 01-12-2016 | 01-11-2018 |
| Cable line | Fulai(3M) | SF106 | 5216/6A | 01-12-2016 | 01-11-2018 |
| Cable line | Fulai(3M) | SF106 | 5217/6A | 01-12-2016 | 01-11-2018 |
| Communication test set | R&S | CMW500 | 152394 | 04-01-2016 | 03-13-2018 |
| High-pass filter(3-18GHz) | Sinoscite | FL3CX03WG18 NM12-0398-002 | --- | 01-12-2016 | 01-11-2018 |
| High-pass filter(6-18GHz) | MICRO-TRONICS | SPA-F-63029-4 | --- | 01-12-2016 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX01CA09C L12-0395-001 | --- | 01-12-2016 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX01CA08C L12-0393-001 | --- | 01-12-2016 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX02CA04C L12-0396-002 | --- | 01-12-2016 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX02CA03C L12-0394-001 | --- | 01-12-2016 | 01-11-2018 |

# 8 Radio Technical Requirements Specification

**Reference documents for testing:**

| No. | Identity | Document Title |
|---|---|---|
| 1 | FCC Part15C (2015) | Subpart C-Intentional Radiators |
| 2 | ANSI C63.10-2013 | American National Standard for Testing Unlicesed Wireless Devices |

**Test Results List:**

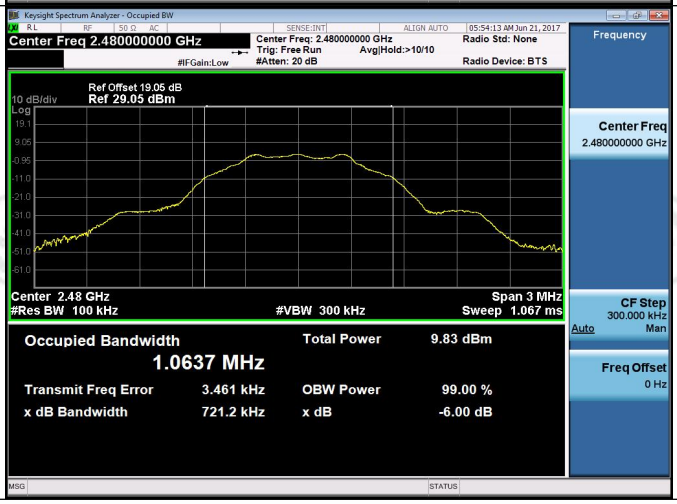
| Test Requirement | Test method | Test item | Verdict | Note |
|---|---|---|---|---|
| Part15C Section 15.247 (a)(2) | ANSI C63.10/KDB 558074 | 6dB Occupied Bandwidth | PASS | Appendix A) |
| Part15C Section 15.247 (b)(3) | ANSI C63.10/KDB 558074 | Conducted Peak Output Power | PASS | Appendix B) |
| Part15C Section 15.247(d) | ANSI C63.10/KDB 558074 | Band-edge for RF Conducted Emissions | PASS | Appendix C) |
| Part15C Section 15.247(d) | ANSI C63.10/KDB 558074 | RF Conducted Spurious Emissions | PASS | Appendix D) |
| Part15C Section 15.247 (e) | ANSI C63.10/KDB 558074 | Power Spectral Density | PASS | Appendix E) |
| Part15C Section 15.203/15.247 (c) | ANSI C63.10 | Antenna Requirement | PASS | Appendix F) |
| Part15C Section 15.207 | ANSI C63.10 | AC Power Line Conducted Emission | PASS | Appendix G) |
| Part15C Section 15.205/15.209 | ANSI C63.10 | Restricted bands around fundamental frequency (Radiated Emission) | PASS | Appendix H) |
| Part15C Section 15.205/15.209 | K ANSI C63.10 | Radiated Spurious Emissions | PASS | Appendix I) |

# Appendix A): 6dB Occupied Bandwidth

## Test Result

| Mode | Channel | 6dB Bandwidth [MHz] | 99% OBW[MHz] | Verdict | Remark |
|---|---|---|---|---|---|
| BLE | LCH | 0.7222 | 1.0655 | PASS | Peak detector |
| BLE | MCH | 0.7204 | 1.0638 | PASS | |
| BLE | HCH | 0.7212 | 1.0637 | PASS | |

## Test Graphs

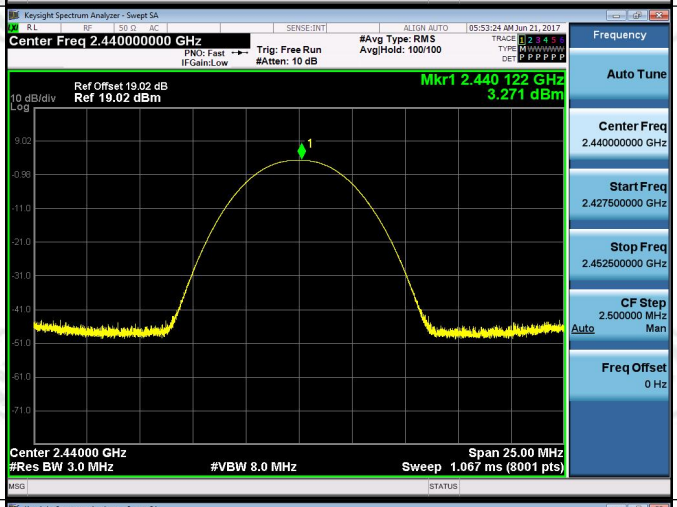
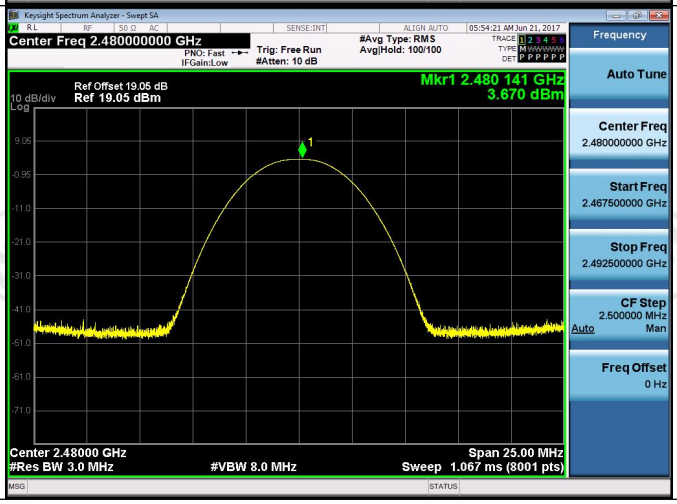
| Graphs | |
|---|---|
| LCH |  |
| MCH |  |
| HCH |  |

# Appendix B): Conducted Peak Output Power

## Test Result

| Mode | Channel | Conduct Peak Power[dBm] | Verdict |
|---|---|---|---|
| BLE | LCH | 2.745 | PASS |
| BLE | MCH | 3.271 | PASS |
| BLE | HCH | 3.670 | PASS |

## Test Graphs

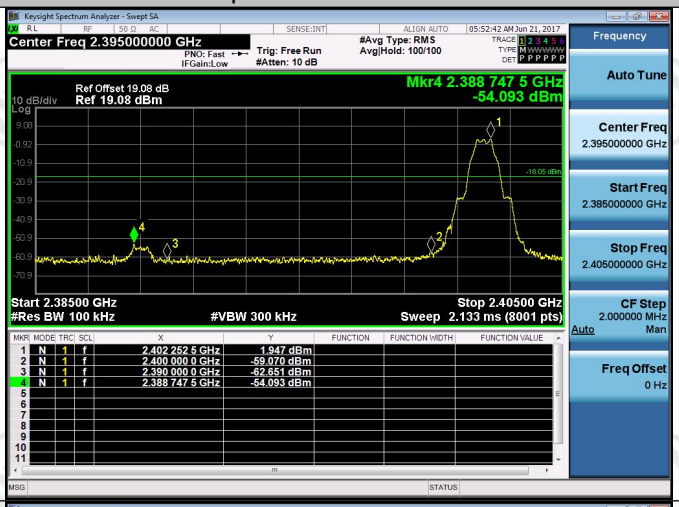
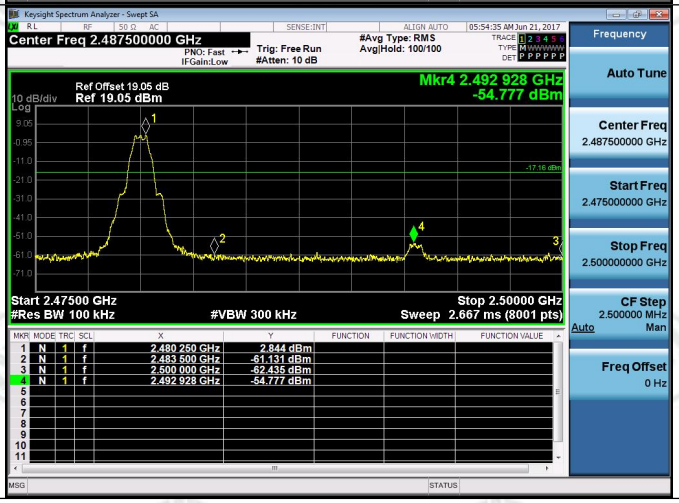
| Graphs | | |
|---|---|---|
| LCH | |  |
| MCH | |  |
| HCH | |  |

# Appendix C): Band-edge for RF Conducted Emissions

## Result Table

| Mode | Channel | Carrier Power[dBm] | Max.Spurious Level [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|---|
| BLE | LCH | 1.947 | -54.093 | -18.05 | PASS |
| BLE | HCH | 2.844 | -54.777 | -17.16 | PASS |

## Test Graphs

| Graphs | |
|---|---|
| LCH |  |
| HCH |  |

# Appendix D): RF Conducted Spurious Emissions

**Result Table**

| Mode | Channel | Pref [dBm] | Puw[dBm] | Verdict |
|---|---|---|---|---|
| BLE | LCH | 2.717 | <Limit | PASS |
| BLE | MCH | 2.243 | <Limit | PASS |
| BLE | HCH | 2.665 | <Limit | PASS |

**Test Graphs**

| BLE_LCH_Graphs | |
|---|---|
| Pref/BLE/LCH |  |
| Puw/BLE/LCH |  |

| BLE_MCH_Graphs | |
|---|---|
| Pref/BLE/MCH |  |

| | |
|---|---|
| Puw/BLE/MCH |  |

| BLE_HCH_Graphs | |
|---|---|
| Pref/BLE/HCH |  |
| Puw/BLE/HCH |  |

# Appendix E): Power Spectral Density

## Result Table

| Mode | Channel | PSD [dBm/3kHz] | Limit [dBm/3kHz] | Verdict |
|---|---|---|---|---|
| BLE | LCH | -11.686 | ≤8 | PASS |
| BLE | MCH | -11.063 | ≤8 | PASS |
| BLE | HCH | -10.645 | ≤8 | PASS |

## Test Graphs

| Graphs | |
|---|---|
| LCH |  |
| MCH |  |
| HCH |  |

# Appendix F): Antenna Requirement

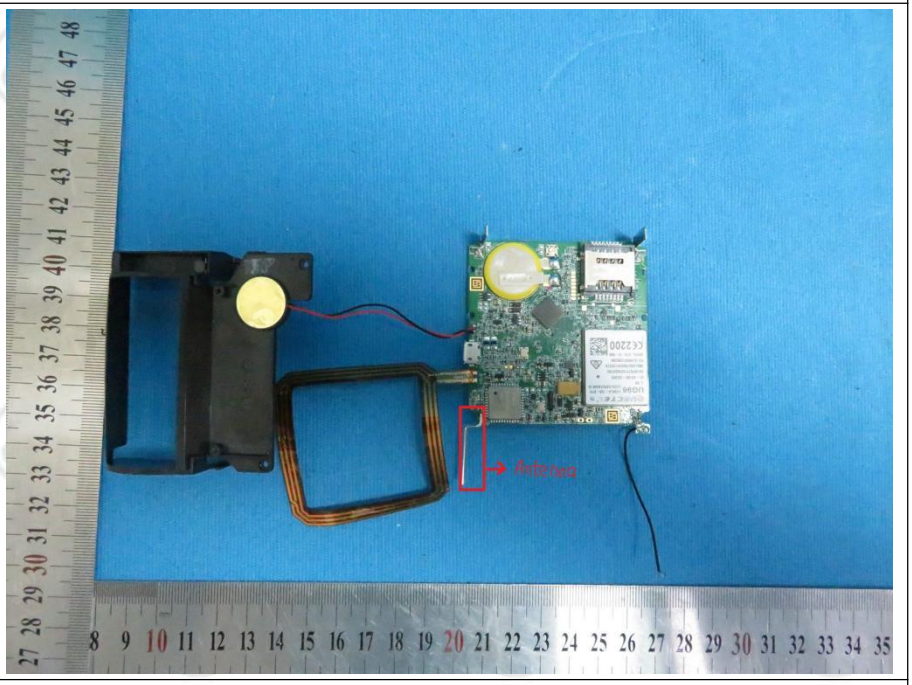
**15.203 requirement:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**EUT Antenna:**




The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 1dBi.

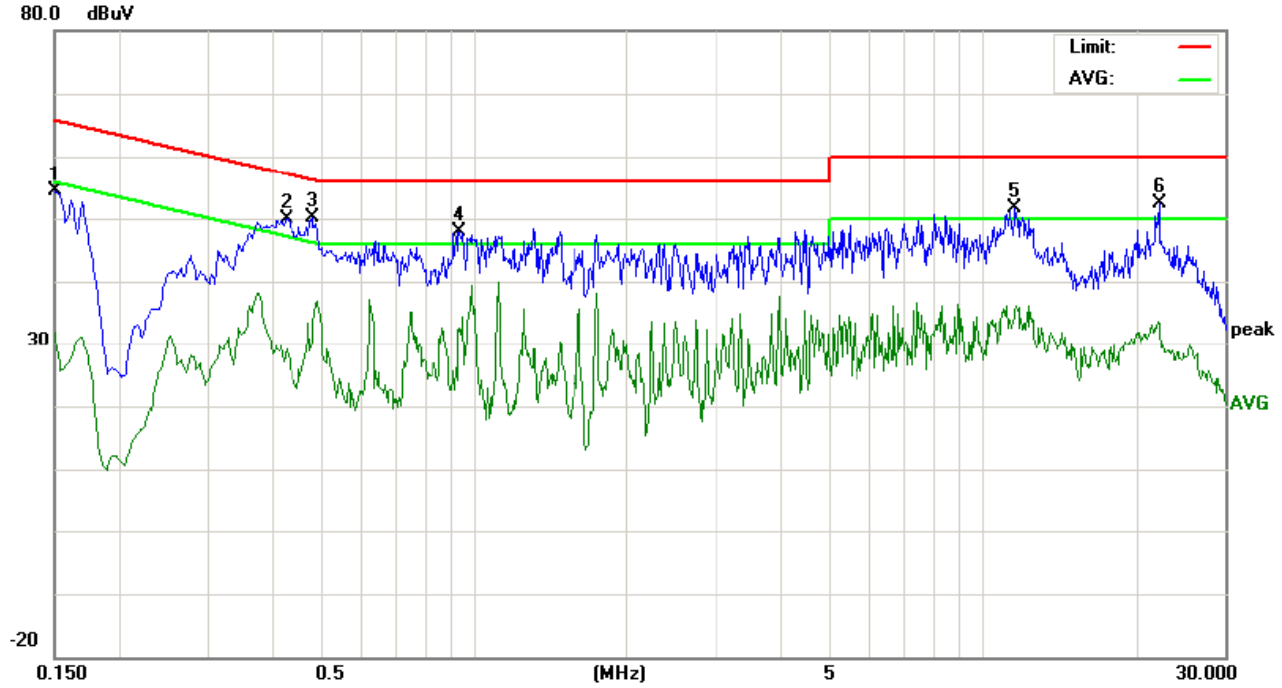
# Appendix G): AC Power Line Conducted Emission

<table>
<tr><td>Test Procedure:</td><td>Test frequency range :150KHz-30MHz<br>1)The mains terminal disturbance voltage test was conducted in a shielded room.<br>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.<br>3)The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,<br>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.<br>5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBμV)</th></tr>
<tr><th>Quasi-peak</th><th>Average</th></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.<br>NOTE : The lower limit is applicable at the transition frequency</td></tr>
</table>

**Measurement Data**

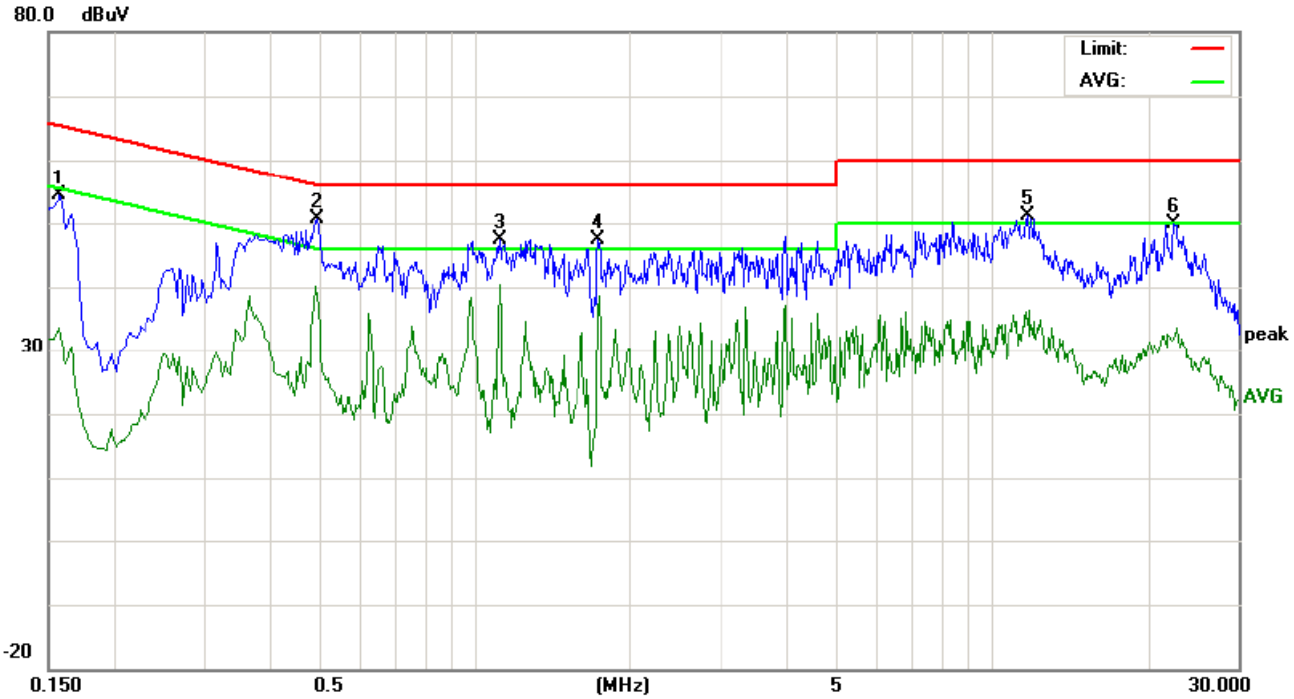
An initial pre-scan was performed on the live and neutral lines with peak detector.
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live line:




| No. | Freq. | Reading_Level (dBuV) | | | Correct Factor | Measurement (dBuV) | | | Limit (dBuV) | | Margin (dB) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | Peak | QP | AVG | dB | peak | QP | AVG | QP | AVG | QP | AVG | P/F | Comment |
| 1 | 0.1500 | 44.60 | 40.21 | 22.11 | 9.77 | 54.37 | 49.98 | 31.88 | 65.99 | 55.99 | -16.01 | -24.11 | P | |
| 2 | 0.4300 | 40.18 | 35.61 | 19.38 | 9.74 | 49.92 | 45.35 | 29.12 | 57.25 | 47.25 | -11.90 | -18.13 | P | |
| 3 | 0.4820 | 40.44 | 36.23 | 20.44 | 9.72 | 50.16 | 45.95 | 30.16 | 56.30 | 46.30 | -10.35 | -16.14 | P | |
| 4 | 0.9420 | 38.30 | 32.54 | 22.93 | 9.70 | 48.00 | 42.24 | 32.63 | 56.00 | 46.00 | -13.76 | -13.37 | P | |
| 5 | 11.6260 | 41.61 | 37.96 | 25.30 | 9.93 | 51.54 | 47.89 | 35.23 | 60.00 | 50.00 | -12.11 | -14.77 | P | |
| 6 | 22.3420 | 42.33 | 39.36 | 23.09 | 10.17 | 52.50 | 49.53 | 33.26 | 60.00 | 50.00 | -10.47 | -16.74 | P | |

Neutral line:




| No. | Freq. | Reading_Level (dBuV) | | | Correct Factor | Measurement (dBuV) | | | Limit (dBuV) | | Margin (dB) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | Peak | QP | AVG | dB | peak | QP | AVG | QP | AVG | QP | AVG | P/F | Comment |
| 1 | 0.1580 | 44.51 | 38.65 | 23.90 | 9.76 | 54.27 | 48.41 | 33.66 | 65.56 | 55.56 | -17.15 | -21.90 | P | |
| 2 | 0.4980 | 40.83 | 36.15 | 29.33 | 9.71 | 50.54 | 45.86 | 39.04 | 56.03 | 46.03 | -10.17 | -6.99 | P | |
| 3 | 1.1180 | 37.83 | 32.51 | 30.67 | 9.63 | 47.46 | 42.14 | 40.30 | 56.00 | 46.00 | -13.86 | -5.70 | P | |
| 4 | 1.7420 | 37.67 | 31.35 | 26.80 | 9.69 | 47.36 | 41.04 | 36.49 | 56.00 | 46.00 | -14.96 | -9.51 | P | |
| 5 | 11.7980 | 42.30 | 38.65 | 21.96 | 9.93 | 52.23 | 48.58 | 31.89 | 60.00 | 50.00 | -11.42 | -18.11 | P | |
| 6 | 22.5580 | 39.62 | 32.74 | 21.71 | 10.17 | 49.79 | 42.91 | 31.88 | 60.00 | 50.00 | -17.09 | -18.12 | P | |

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

3. AC120V and 240V are tested and found the worst case is 120V, So only the 120V data were shown in the above.

# Appendix H): Restricted bands around fundamental frequency (Radiated)

Receiver Setup:

| Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|
| 30MHz-1GHz | Quasi-peak | 120kHz | 300kHz | Quasi-peak |
| Above 1GHz | Peak | 1MHz | 3MHz | Peak |
| | Peak | 1MHz | 10Hz | Average |

Test Procedure:

**Below 1GHz test procedure as below:**

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel

**Above 1GHz test procedure as below:**

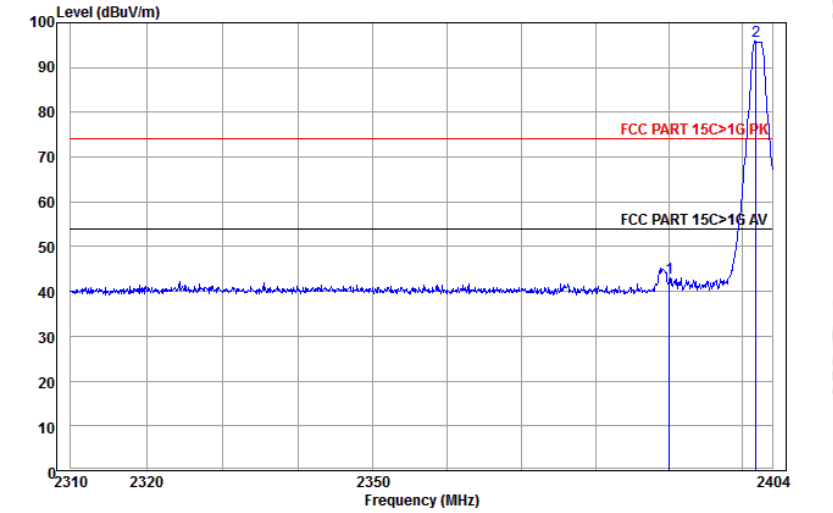
g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter( Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. . Test the EUT in the lowest channel , the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

| Frequency | Limit (dBμV/m @3m) | Remark |
|---|---|---|
| 30MHz-88MHz | 40.0 | Quasi-peak Value |
| 88MHz-216MHz | 43.5 | Quasi-peak Value |
| 216MHz-960MHz | 46.0 | Quasi-peak Value |
| 960MHz-1GHz | 54.0 | Quasi-peak Value |
| Above 1GHz | 54.0 | Average Value |
| | 74.0 | Peak Value |

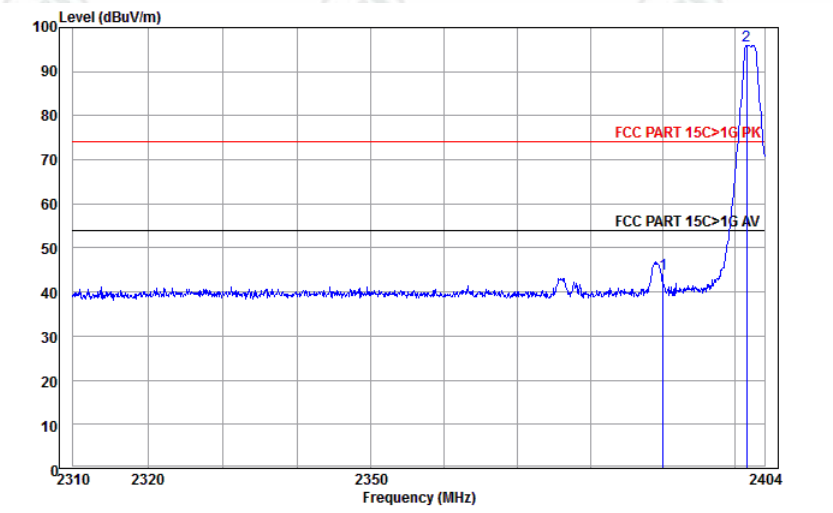
**Test plot as follows:**

| Worse case mode: | GFSK | | |
|---|---|---|---|
| Frequency: 2390.0MHz | Test channel: Lowest | Polarization: Horizontal | Remark: PK |



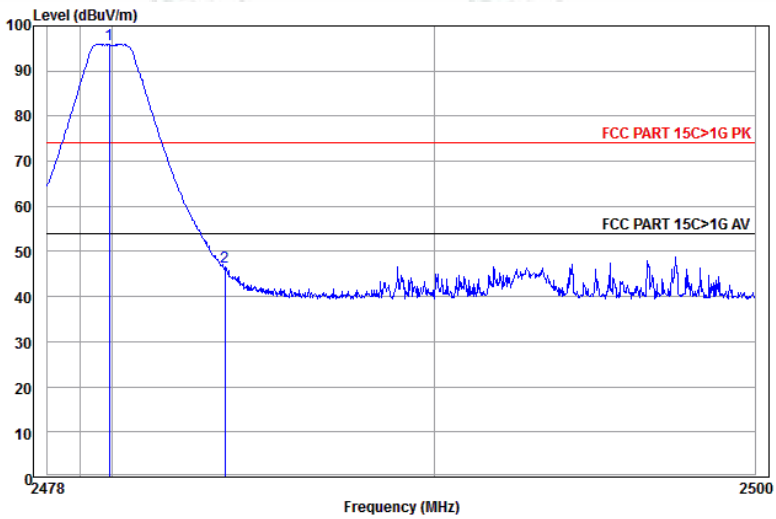

| | Freq | Ant Factor | Cable Loss | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dB | dB | dBuV | dBuV/m | dBuV/m | dB | | |
| 1 | 2390.000 | 32.53 | 3.07 | 44.03 | 51.54 | 43.11 | 74.00 | -30.89 | Horizontal | |
| 2 pp | 2401.796 | 32.56 | 3.07 | 44.04 | 104.25 | 95.84 | 74.00 | 21.84 | Horizontal | |

| Worse case mode: | GFSK | | |
|---|---|---|---|
| Frequency: 2390.0MHz | Test channel: Lowest | Polarization: Vertical | Remark: PK |



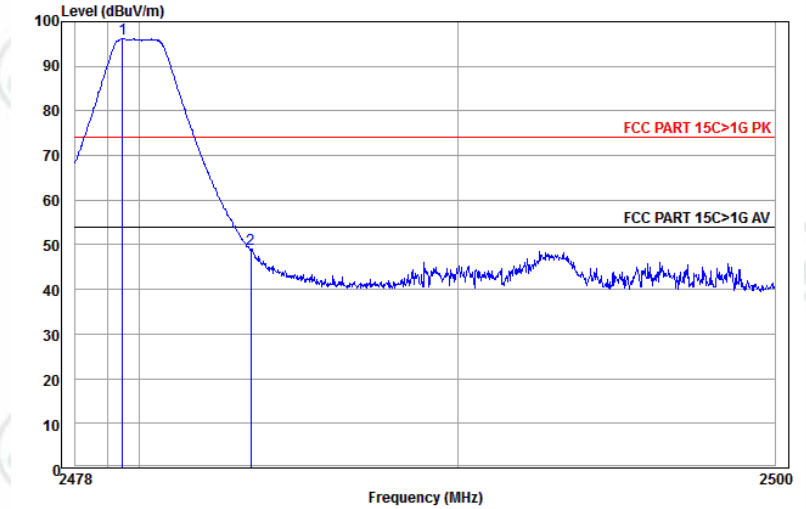

| | Freq | Ant Factor | Cable Loss | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dB | dB | dBuV | dBuV/m | dBuV/m | dB | | |
| 1 | 2390.000 | 32.53 | 3.07 | 44.03 | 52.69 | 44.26 | 74.00 | -29.74 | Vertical | |
| 2 pp | 2401.508 | 32.56 | 3.07 | 44.04 | 104.46 | 96.05 | 74.00 | 22.05 | Vertical | |

| Worse case mode: | GFSK | | |
|---|---|---|---|
| Frequency: 2483.5MHz | Test channel: Highest | Polarization: Horizontal | Remark: PK |




| | Freq | Ant Factor | Cable Loss | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dB | dB | dBuV | dBuV/m | dBuV/m | dB | | |
| 1 pp | 2479.906 | 32.71 | 3.12 | 44.14 | 104.32 | 96.01 | 74.00 | 22.01 | Horizontal | |
| 2 | 2483.500 | 32.71 | 3.12 | 44.14 | 54.98 | 46.67 | 74.00 | -27.33 | Horizontal | |

| Worse case mode: | GFSK | | |
|---|---|---|---|
| Frequency: 2483.5MHz | Test channel: Highest | Polarization: Vertical | Remark: PK |




| | Freq | Ant Factor | Cable Loss | Preamp Factor | Read Level | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dB | dB | dBuV | dBuV/m | dBuV/m | dB | | |
| 1 pp | 2479.468 | 32.71 | 3.12 | 44.14 | 104.50 | 96.19 | 74.00 | 22.19 | Vertical | |
| 2 | 2483.500 | 32.71 | 3.12 | 44.14 | 57.32 | 49.01 | 74.00 | -24.99 | Vertical | |

Note:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

# Appendix I): Radiated Spurious Emissions

**Receiver Setup:**

| Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|
| 0.009MHz-0.090MHz | Peak | 10kHz | 30kHz | Peak |
| 0.009MHz-0.090MHz | Average | 10kHz | 30kHz | Average |
| 0.090MHz-0.110MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak |
| 0.110MHz-0.490MHz | Peak | 10kHz | 30kHz | Peak |
| 0.110MHz-0.490MHz | Average | 10kHz | 30kHz | Average |
| 0.490MHz -30MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak |
| 30MHz-1GHz | Quasi-peak | 120kHz | 300kHz | Quasi-peak |
| Above 1GHz | Peak | 1MHz | 3MHz | Peak |
| | Peak | 1MHz | 10Hz | Average |

**Test Procedure:**

**Below 1GHz test procedure as below:**

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, whichwas mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

**Above 1GHz test procedure as below:**

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter( Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

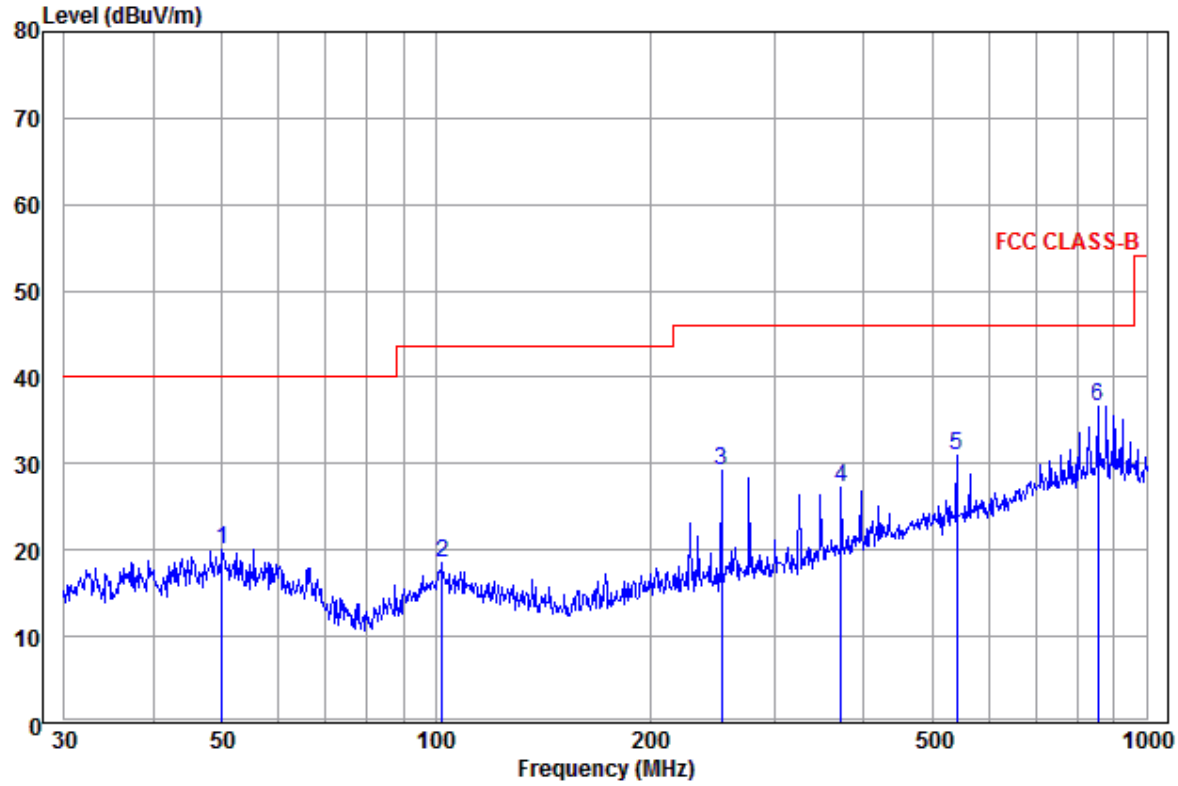
| Frequency | Field strength (microvolt/meter) | Limit (dBμV/m) | Remark | Measurement distance (m) |
|---|---|---|---|---|
| 0.009MHz-0.490MHz | 2400/F(kHz) | - | - | 300 |
| 0.490MHz-1.705MHz | 24000/F(kHz) | - | - | 30 |
| 1.705MHz-30MHz | 30 | - | - | 30 |
| 30MHz-88MHz | 100 | 40.0 | Quasi-peak | 3 |
| 88MHz-216MHz | 150 | 43.5 | Quasi-peak | 3 |
| 216MHz-960MHz | 200 | 46.0 | Quasi-peak | 3 |
| 960MHz-1GHz | 500 | 54.0 | Quasi-peak | 3 |
| Above 1GHz | 500 | 54.0 | Average | 3 |

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

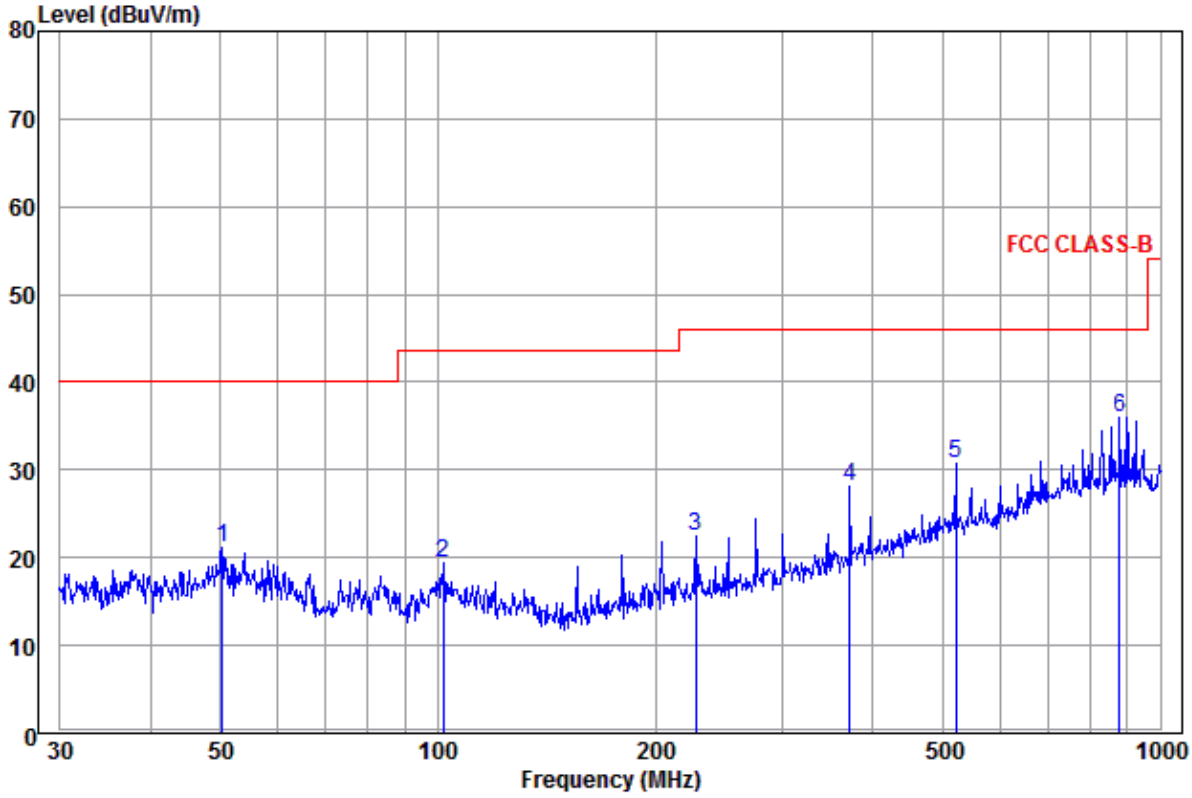
# Radiated Spurious Emissions test Data:

## Radiated Emission below 1GHz

30MHz~1GHz (QP)




| | Freq | Ant Factor | Cable Loss | Read Level | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | | |
| 1 | 50.057 | 15.09 | 0.11 | 4.83 | 20.03 | 40.00 | -19.97 | Horizontal | |
| 2 | 102.001 | 13.03 | 0.59 | 4.81 | 18.43 | 43.50 | -25.07 | Horizontal | |
| 3 | 252.063 | 12.45 | 1.33 | 15.32 | 29.10 | 46.00 | -16.90 | Horizontal | |
| 4 | 372.005 | 15.48 | 1.32 | 10.50 | 27.30 | 46.00 | -18.70 | Horizontal | |
| 5 | 541.373 | 18.57 | 1.54 | 10.89 | 31.00 | 46.00 | -15.00 | Horizontal | |
| 6 pp | 854.025 | 21.94 | 2.45 | 12.21 | 36.60 | 46.00 | -9.40 | Horizontal | |




| | Freq | Ant Factor | Cable Loss | Read Level | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dB/m | dB | dBuV | dBuV/m | dBuV/m | dB | | |
| 1 | 50.232 | 15.07 | 0.11 | 5.98 | 21.16 | 40.00 | -18.84 | Vertical | |
| 2 | 101.644 | 13.06 | 0.59 | 5.72 | 19.37 | 43.50 | -24.13 | Vertical | |
| 3 | 227.691 | 12.06 | 1.24 | 9.08 | 22.38 | 46.00 | -23.62 | Vertical | |
| 4 | 372.005 | 15.48 | 1.32 | 11.24 | 28.04 | 46.00 | -17.96 | Vertical | |
| 5 | 520.888 | 18.49 | 1.53 | 10.69 | 30.71 | 46.00 | -15.29 | Vertical | |
| 6 pp | 878.322 | 22.19 | 2.47 | 11.36 | 36.02 | 46.00 | -9.98 | Vertical | |

**Transmitter Emission above 1GHz**

| Worse case mode: | | GFSK | | Test channel: | | Lowest | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Gain (dB) | Read Level (dBμV) | Level (dBμV/m) | Limit Line (dBμV/m) | Over Limit (dB) | Result | Antenna Polaxis |
| 3057.166 | 33.55 | 5.61 | 44.69 | 43.28 | 37.75 | 74.00 | -36.25 | Pass | Horizontal |
| 3367.661 | 33.28 | 5.55 | 44.66 | 45.03 | 39.20 | 74.00 | -34.80 | Pass | Horizontal |
| 3757.208 | 32.97 | 5.48 | 44.62 | 46.03 | 39.86 | 74.00 | -34.14 | Pass | Horizontal |
| 4804.000 | 34.69 | 5.11 | 44.60 | 38.86 | 34.06 | 74.00 | -39.94 | Pass | Horizontal |
| 7206.000 | 36.42 | 6.66 | 44.77 | 40.73 | 39.04 | 74.00 | -34.96 | Pass | Horizontal |
| 9608.000 | 37.88 | 7.73 | 45.58 | 37.20 | 37.23 | 74.00 | -36.77 | Pass | Horizontal |
| 3096.325 | 33.51 | 5.60 | 44.69 | 46.31 | 40.73 | 74.00 | -33.27 | Pass | Vertical |
| 3367.661 | 33.28 | 5.55 | 44.66 | 46.77 | 40.94 | 74.00 | -33.06 | Pass | Vertical |
| 3738.129 | 32.99 | 5.48 | 44.62 | 45.50 | 39.35 | 74.00 | -34.65 | Pass | Vertical |
| 4804.000 | 34.69 | 5.11 | 44.60 | 39.36 | 34.56 | 74.00 | -39.44 | Pass | Vertical |
| 7206.000 | 36.42 | 6.66 | 44.77 | 40.40 | 38.71 | 74.00 | -35.29 | Pass | Vertical |
| 9608.000 | 37.88 | 7.73 | 45.58 | 36.91 | 36.94 | 74.00 | -37.06 | Pass | Vertical |

| Worse case mode: | | GFSK | | Test channel: | | Middle | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Gain (dB) | Read Level (dBμV) | Level (dBμV/m) | Limit Line (dBμV/m) | Over Limit (dB) | Result | Antenna Polaxis |
| 1913.838 | 31.57 | 3.17 | 43.58 | 43.74 | 34.90 | 74.00 | -39.10 | Pass | Horizontal |
| 2657.761 | 33.03 | 4.91 | 44.34 | 42.30 | 35.90 | 74.00 | -38.10 | Pass | Horizontal |
| 3072.770 | 33.53 | 5.61 | 44.69 | 43.11 | 37.56 | 74.00 | -36.44 | Pass | Horizontal |
| 4880.000 | 34.85 | 5.08 | 44.60 | 44.48 | 39.81 | 74.00 | -34.19 | Pass | Horizontal |
| 7320.000 | 36.43 | 6.77 | 44.87 | 43.16 | 41.49 | 74.00 | -32.51 | Pass | Horizontal |
| 9760.000 | 38.05 | 7.60 | 45.55 | 43.63 | 43.73 | 74.00 | -30.27 | Pass | Horizontal |
| 2825.193 | 33.32 | 5.27 | 44.52 | 45.27 | 39.34 | 74.00 | -34.66 | Pass | Vertical |
| 3359.099 | 33.29 | 5.55 | 44.66 | 45.91 | 40.09 | 74.00 | -33.91 | Pass | Vertical |
| 4223.950 | 33.36 | 5.34 | 44.60 | 44.58 | 38.68 | 74.00 | -35.32 | Pass | Vertical |
| 4880.000 | 34.85 | 5.08 | 44.60 | 42.46 | 37.79 | 74.00 | -36.21 | Pass | Vertical |
| 7320.000 | 36.43 | 6.77 | 44.87 | 41.37 | 39.70 | 74.00 | -34.30 | Pass | Vertical |
| 9760.000 | 38.05 | 7.60 | 45.55 | 42.84 | 42.94 | 74.00 | -31.06 | Pass | Vertical |

| Worse case mode: | | GFSK | | Test channel: | | Highest | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Gain (dB) | Read Level (dBμV) | Level (dBμV/m) | Limit Line (dBμV/m) | Over Limit (dB) | Result | Antenna Polaxis |
| 2825.193 | 33.32 | 5.27 | 44.52 | 44.49 | 38.56 | 74.00 | -35.44 | Pass | Horizontal |
| 3316.617 | 33.32 | 5.56 | 44.67 | 45.24 | 39.45 | 74.00 | -34.55 | Pass | Horizontal |
| 3747.656 | 32.98 | 5.48 | 44.62 | 46.05 | 39.89 | 74.00 | -34.11 | Pass | Horizontal |
| 4960.000 | 35.02 | 5.05 | 44.60 | 41.98 | 37.45 | 74.00 | -36.55 | Pass | Horizontal |
| 7440.000 | 36.45 | 6.88 | 44.97 | 42.93 | 41.29 | 74.00 | -32.71 | Pass | Horizontal |
| 9920.000 | 38.22 | 7.47 | 45.52 | 40.37 | 40.54 | 74.00 | -33.46 | Pass | Horizontal |
| 2825.193 | 33.32 | 5.27 | 44.52 | 43.15 | 37.22 | 74.00 | -36.78 | Pass | Vertical |
| 3299.775 | 33.34 | 5.56 | 44.67 | 44.16 | 38.39 | 74.00 | -35.61 | Pass | Vertical |
| 3747.656 | 32.98 | 5.48 | 44.62 | 47.10 | 40.94 | 74.00 | -33.06 | Pass | Vertical |
| 4960.000 | 35.02 | 5.05 | 44.60 | 41.06 | 36.53 | 74.00 | -37.47 | Pass | Vertical |
| 7440.000 | 36.45 | 6.88 | 44.97 | 42.16 | 40.52 | 74.00 | -33.48 | Pass | Vertical |
| 9920.000 | 38.22 | 7.47 | 45.52 | 40.34 | 40.51 | 74.00 | -33.49 | Pass | Vertical |

Note:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

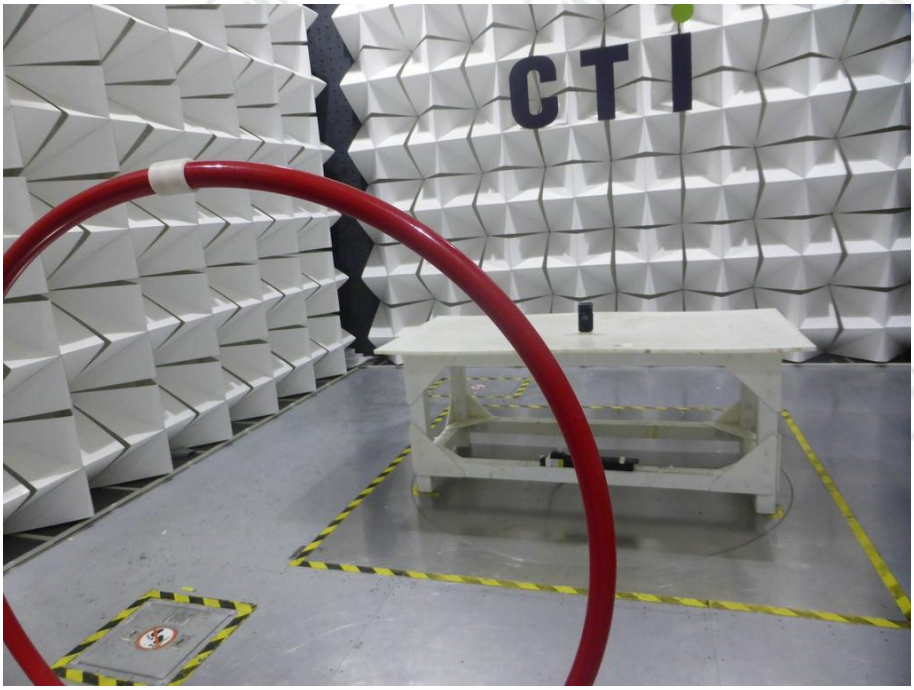
Final Test Level =Receiver Reading -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

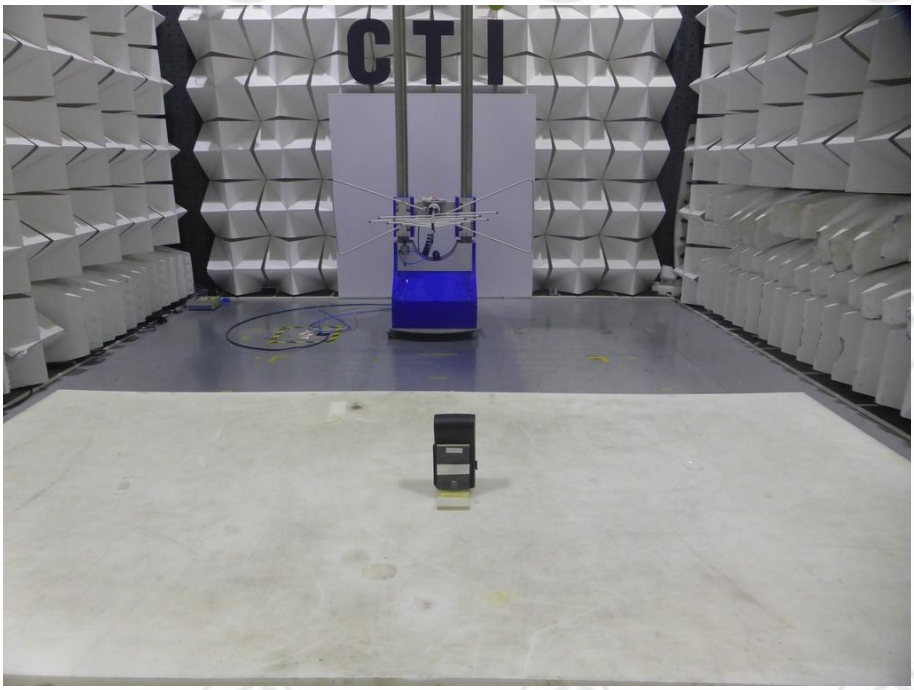
2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

# PHOTOGRAPHS OF TEST SETUP

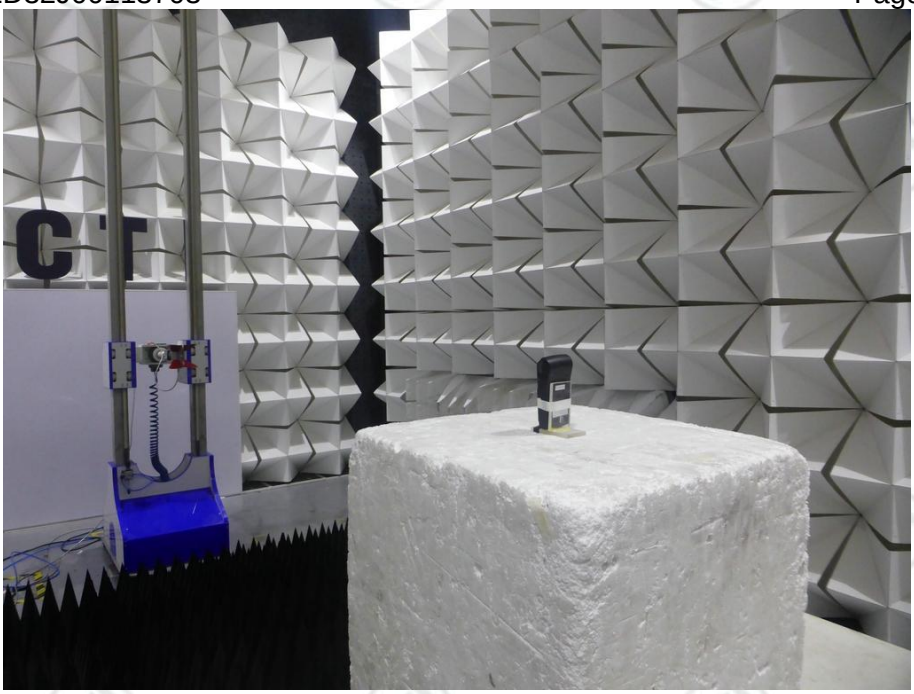
Test mode No.: WPP23



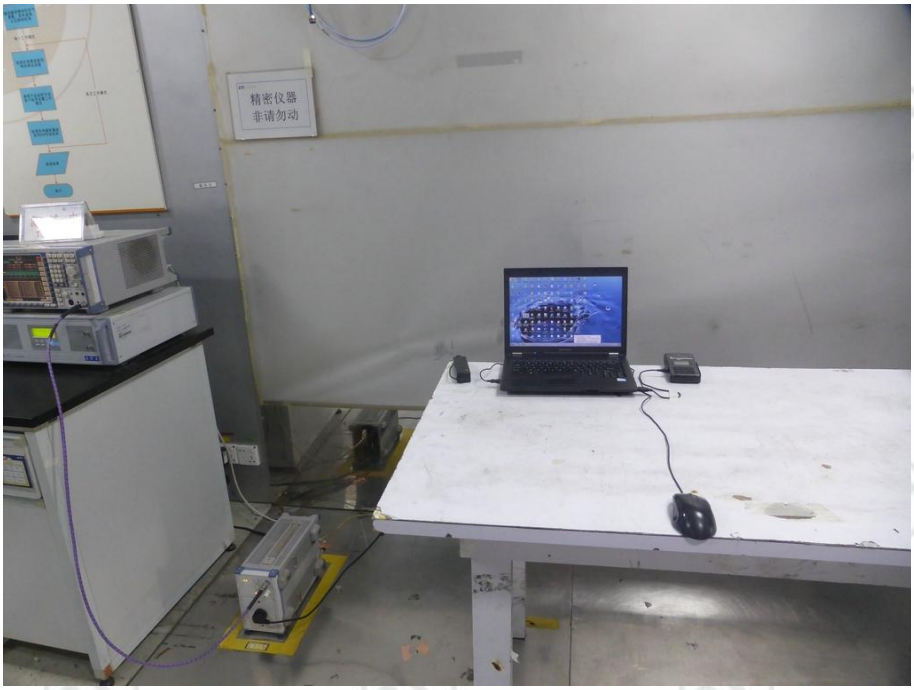

**Radiated spurious emission Test Setup-1(9kHz-30MHz)**




**Radiated spurious emission Test Setup-2(30MHz-1GHz)**



**Radiated spurious emission Test Setup-3(Above 1GHz)**




**Conducted Emissions Test Setup**

# PHOTOGRAPHS OF EUT Constructional Details

Refer to Report No. EED32J00113702 for EUT external and internal photos.

*** End of Report ***