# TEST REPORT

| | | |
|---|---|---|
| **Reference No.** ..... | : | WTX22X05110214W-1 |
| **FCC ID** ..... | : | 2A65ANL1800 |
| **Applicant** ..... | : | Shenzhen Samying High Tech Co., LTD |
| **Address** ..... | : | 302, Block 5, Fulongte Industry Park, Huaxing Road, Dalang, Longhua, Shenzhen |
| **Product Name** ..... | : | Smart Night Light |
| **Test Model**. ..... | : | NL1800, NL1801, NL1802, NL1803 |
| **Standards** ..... | : | FCC Part 15.247 |
| **Date of Receipt sample** .... | : | May 14, 2022 |
| **Date of Test** ..... | : | May 15 to May 24, 2022 |
| **Date of Issue** ..... | : | May 25 |
| **Test Result** ..... | : | **Pass** |

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

**Prepared By:**
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| Tested by: | Reviewed By: | Approved & Authorized By: |
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# TABLE OF CONTENTS

**1. GENERAL INFORMATION ..... 4**
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) ..... 4
1.2 TEST STANDARDS ..... 5
1.3 TEST METHODOLOGY ..... 5
1.4 TEST FACILITY ..... 5
1.5 EUT SETUP AND TEST MODE ..... 6
1.6 MEASUREMENT UNCERTAINTY ..... 6
1.7 TEST EQUIPMENT LIST AND DETAILS ..... 7
**2. SUMMARY OF TEST RESULTS ..... 9**
**3. ANTENNA REQUIREMENT ..... 10**
3.1 STANDARD APPLICABLE ..... 10
3.2 EVALUATION INFORMATION ..... 10
**4. POWER SPECTRAL DENSITY ..... 11**
4.1 STANDARD APPLICABLE ..... 11
4.2 TEST SETUP BLOCK DIAGRAM ..... 11
4.3 TEST PROCEDURE ..... 11
4.4 SUMMARY OF TEST RESULTS/PLOTS ..... 11
**5. DTS BANDWIDTH ..... 12**
5.1 STANDARD APPLICABLE ..... 12
5.2 TEST SETUP BLOCK DIAGRAM ..... 12
5.3 TEST PROCEDURE ..... 12
5.3 SUMMARY OF TEST RESULTS/PLOTS ..... 12
**6. RF OUTPUT POWER ..... 13**
6.1 STANDARD APPLICABLE ..... 13
6.2 TEST SETUP BLOCK DIAGRAM ..... 13
6.3 TEST PROCEDURE ..... 13
6.4 SUMMARY OF TEST RESULTS/PLOTS ..... 13
**7. FIELD STRENGTH OF SPURIOUS EMISSIONS ..... 14**
7.1 STANDARD APPLICABLE ..... 14
7.2 TEST PROCEDURE ..... 14
7.3 CORRECTED AMPLITUDE & MARGIN CALCULATION ..... 16
7.4 SUMMARY OF TEST RESULTS/PLOTS ..... 16
**8. OUT OF BAND EMISSIONS ..... 24**
8.1 STANDARD APPLICABLE ..... 24
8.2 TEST PROCEDURE ..... 24
8.3 SUMMARY OF TEST RESULTS/PLOTS ..... 25
**9. CONDUCTED EMISSIONS ..... 29**
9.1 TEST PROCEDURE ..... 29
9.2 BASIC TEST SETUP BLOCK DIAGRAM ..... 29
9.3 TEST RECEIVER SETUP ..... 29
9.4 SUMMARY OF TEST RESULTS/PLOTS ..... 29
**APPENDIX SUMMARY ..... 30**
**APPENDIX A ..... 31**
**APPENDIX B ..... 33**
**APPENDIX C ..... 35**
**APPENDIX D ..... 37**
**APPENDIX PHOTOGRAPHS ..... 40**

## Report version

| Version No. | Date of issue | Description |
|---|---|---|
| Rev.00 | May 25, 2022 | Original |
| / | / | / |

# 1. GENERAL INFORMATION

## 1.1 Product Description for Equipment Under Test (EUT)

**Client Information**

| | |
|---|---|
| Applicant: | Shenzhen Samying High Tech Co., LTD |
| Address of applicant: | 302, Block 5, Fulongte Industry Park, Huaxing Road, Dalang, Longhua, Shenzhen |
| Manufacturer: | Shenzhen Samying High Tech Co., LTD |
| Address of manufacturer: | 302, Block 5, Fulongte Industry Park, Huaxing Road, Dalang, Longhua, Shenzhen |

| **General Description of EUT** | |
|---|---|
| Product Name: | Smart Night Light |
| Brand Name: | / |
| Model No.: | NL1800 |
| Adding Model(s): | NL1801, NL1802, NL1803 |
| Rated Voltage: | DC 4.5V |
| Power Adapter: | / |
| Software Version: | / |
| Hardware Version: | / |
| Serial Number: | 612420220518A06 |
| *Note: The test data is gathered from a production sample provided by the manufacturer. provided by the manufacturer. The appearance of others models listed in the report is different from main-test model NL1800, but the circuit and the electronic construction do not change, declared by the manufacturer.* | |

| **Technical Characteristics of EUT** | |
|---|---|
| Bluetooth Version: | V5.0 BLE |
| Frequency Range: | 2402-2480MHz |
| RF Output Power: | 4.367dBm |
| Data Rate: | 1Mbps |
| Modulation: | GFSK |
| Quantity of Channels: | 40 |
| Channel Separation: | 2MHz |
| Type of Antenna: | PCB |
| Antenna Gain: | 0.5dBi |

## 1.2 Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.247:** Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
**558074 D01 15.247 Meas Guidance v05r02:** Guidance For Compliance Measurements On Digital Transmission System, Frequency Hopping Spread Spectrum System, And Hybrid System Devices Operating Under Section 15.247 Of The Fcc Rules
**ANSI C63.10-2013:** American National Standard for Testing Unlicensed Wireless Devices.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05r02.
The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

## 1.4 Test Facility

**Address of the test laboratory**
Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.
Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

**FCC – Registration No.: 125990**
Waltek Testing Group (Shenzhen) 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 maintain ed in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

## 1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

| **Test Mode List** | | |
|---|---|---|
| Test Mode | Description | Remark |
| TM1 | Low | 2402MHz |
| TM2 | Middle | 2440MHz |
| TM3 | High | 2480MHz |

| **Test software(Fix the Tx frequency)** | **Power level(Testing)** |
|---|---|
| Name | level |
| FCC assist | 10 |
| Transmit_Power 10 | |

| **Test Conditions** | |
|---|---|
| Temperature: | 22~25 °C |
| Relative Humidity: | 50~55 %. |
| ATM Pressure: | 1019 mbar |

| **EUT Cable List and Details** | | | |
|---|---|---|---|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| | | | |

| **Special Cable List and Details** | | | |
|---|---|---|---|
| Cable Description | Length (m) | Shielded/Unshielded | With / Without Ferrite |
| | | | |

| **Auxiliary Equipment List and Details** | | | |
|---|---|---|---|
| Description | Manufacturer | Model | Serial Number |
| | | | |

## 1.6 Measurement Uncertainty

| **Measurement uncertainty** | | |
|---|---|---|
| Parameter | Conditions | Uncertainty |
| RF Output Power | Conducted | ±0.42dB |
| Occupied Bandwidth | Conducted | ±1.5% |
| Power Spectral Density | Conducted | ±1.8dB |
| Conducted Spurious Emission | Conducted | ±2.17dB |

| | | |
|---|---|---|
| Conducted Emissions | Conducted | 9-150kHz ±3.74dB |
| | | 0.15-30MHz ±3.34dB |
| Transmitter Spurious Emissions | Radiated | 30-200MHz ±4.52dB |
| | | 0.2-1GHz ±5.56dB |
| | | 1-6GHz ±3.84dB |
| | | 6-18GHz ±3.92dB |

## 1.7 Test Equipment List and Details

| No. | Description | Manufacturer | Model | Serial No. | Cal Date | Due. Date |
|---|---|---|---|---|---|---|
| SEMT-1075 | Communication Tester | Rohde & Schwarz | CMW500 | 148650 | 2022-03-27 | 2024-03-26 |
| SEMT-1063 | GSM Tester | Rohde & Schwarz | CMU200 | 114403 | 2022-03-27 | 2024-03-26 |
| SEMT-1072 | Spectrum Analyzer | Agilent | E4407B | MY41440400 | 2022-03-27 | 2024-03-26 |
| SEMT-1079 | Spectrum Analyzer | Agilent | N9020A | US47140102 | 2022-03-27 | 2024-03-26 |
| SEMT-1080 | Signal Generator | Agilent | 83752A | 3610A01453 | 2022-03-27 | 2024-03-26 |
| SEMT-1081 | Vector Signal Generator | Agilent | N5182A | MY47070202 | 2022-03-27 | 2024-03-26 |
| SEMT-1028 | Power Divider | Weinschel | 1506A | PM204 | 2022-03-27 | 2024-03-26 |
| SEMT-1082 | Power Divider | RF-Lambda | RFLT4W5M18G | 14110400027 | 2022-03-27 | 2024-03-26 |
| SEMT-1031 | Spectrum Analyzer | Rohde & Schwarz | FSP30 | 836079/035 | 2022-03-27 | 2024-03-26 |
| SEMT-1007 | EMI Test Receiver | Rohde & Schwarz | ESVB | 825471/005 | 2022-03-27 | 2024-03-26 |
| SEMT-1008 | Amplifier | Agilent | 8447F | 3113A06717 | 2022-03-27 | 2024-03-26 |
| SEMT-1043 | Amplifier | C&D | PAP-1G18 | 2002 | 2022-03-27 | 2024-03-26 |
| SEMT-1069 | Loop Antenna | Schwarz beck | FMZB 1516 | 9773 | 2022-03-27 | 2024-03-26 |
| SEMT-1068 | Broadband Antenna | Schwarz beck | VULB9163 | 9163-333 | 2022-03-27 | 2024-03-26 |
| SEMT-1042 | Horn Antenna | ETS | 3117 | 00086197 | 2022-03-27 | 2024-03-26 |
| SEMT-1121 | Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170582 | 2022-03-27 | 2024-03-26 |
| SEMT-1169 | Pre-amplifier | Direction Systems Inc. | PAP-2640 | 14145-14153 | 2022-03-27 | 2024-03-26 |
| SEMT-1163 | Spectrum Analyzer | Rohde & Schwarz | FSP40 | 100612 | 2022-03-27 | 2024-03-26 |
| SEMT-1166 | Power Limiter | Agilent | N9356B | MY45450376 | 2022-03-27 | 2024-03-26 |
| SEMT-1076 | RF Switcher | Top Precision | RCS03-A2 | / | 2022-03-27 | 2024-03-26 |
| SEMT-C001 | Cable | Zheng DI | LL142-07-07-10M(A) | / | / | / |
| SEMT-C002 | Cable | Zheng DI | ZT40-2.92J-2.92J-6M | / | / | / |
| SEMT-C003 | Cable | Zheng DI | ZT40-2.92J-2.92J-2.5M | / | / | / |

| | | | | | | |
|---|---|---|---|---|---|---|
| SEMT-C004 | Cable | Zheng DI | 2M0RFC | / | / | / |
| SEMT-C005 | Cable | Zheng DI | 1M0RFC | / | / | / |
| SEMT-C006 | Cable | Zheng DI | 1M0RFC | / | / | / |

| Software List | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Version** |
| EMI Test Software (Radiated Emission)* | Farad | EZ-EMC | RA-03A1 |
| EMI Test Software (Conducted Emission)* | Farad | EZ-EMC | RA-03A1 |

*Remark: indicates software version used in the compliance certification testing

# 2. SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test Item | Result |
|---|---|---|
| §2.1093 | RF Exposure | Compliant |
| §15.203; §15.247(b)(4)(i) | Antenna Requirement | Compliant |
| §15.205 | Restricted Band of Operation | Compliant |
| §15.207(a) | Conducted Emission | N/A |
| §15.247(e) | Power Spectral Density | Compliant |
| §15.247(a)(2) | DTS Bandwidth | Compliant |
| §15.247(b)(3) | RF Output Power | Compliant |
| §15.209(a) | Radiated Emission | Compliant |
| §15.247(d) | Band Edge (Out of Band Emissions) | Compliant |

N/A: not applicable

# 3. Antenna Requirement

## 3.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

## 3.2 Evaluation Information

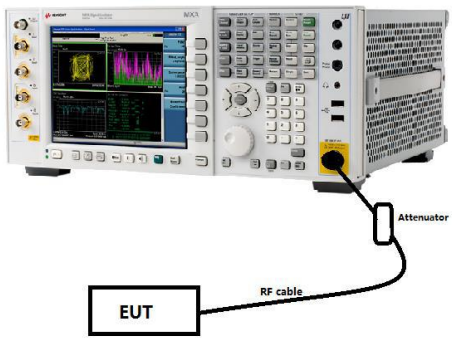
This product has a PCB antenna, fulfill the requirement of this section.

# 4. Power Spectral Density

## 4.1 Standard Applicable

According to 15.247(a)(1)(iii), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

## 4.2 Test Setup Block Diagram




## 4.3 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.10.2, the test method of power spectral density as below:

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3 × RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

## 4.4 Summary of Test Results/Plots

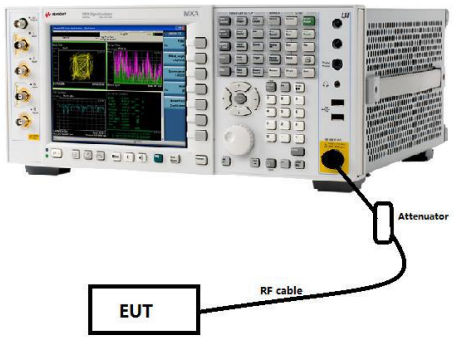
**Please refer to Appendix A**

# 5. DTS Bandwidth

## 5.1 Standard Applicable

According to 15.247(a)(2), systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

## 5.2 Test Setup Block Diagram




## 5.3 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.2 and ANSI C63.10-2013 Subclause 11.8.1, the test method of DTS Bandwidth as below:

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

## 5.3 Summary of Test Results/Plots

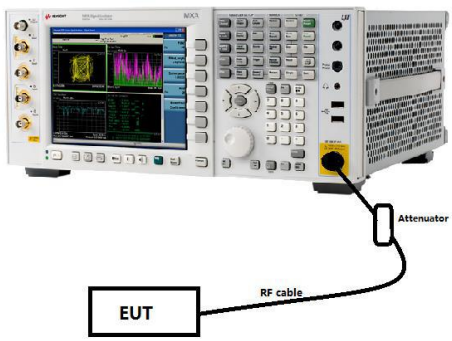
**Please refer to Appendix B**

# 6. RF Output Power

## 6.1 Standard Applicable

According to 15.247(b)(3), for systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

## 6.2 Test Setup Block Diagram




## 6.3 Test Procedure

According to the KDB-558074 D01 v05r02 Subclause 8.3.1.1 and ANSI C63.10-2013 Subclause 11.9.1.1, this procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

a) Set the RBW ⩾ DTS bandwidth.
b) Set VBW ⩾ 3 × RBW.
c) Set span ⩾ 3 x RBW
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

## 6.4 Summary of Test Results/Plots

**Please refer to Appendix C**

# 7. Field Strength of Spurious Emissions

## 7.1 Standard Applicable

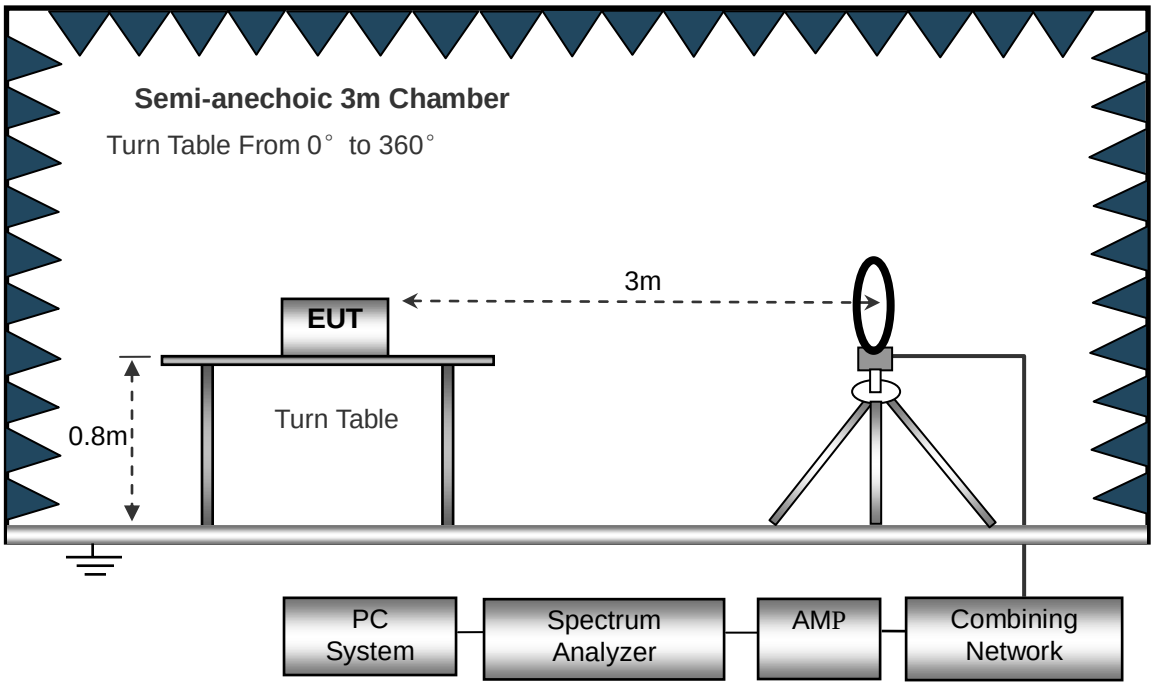
According to §15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

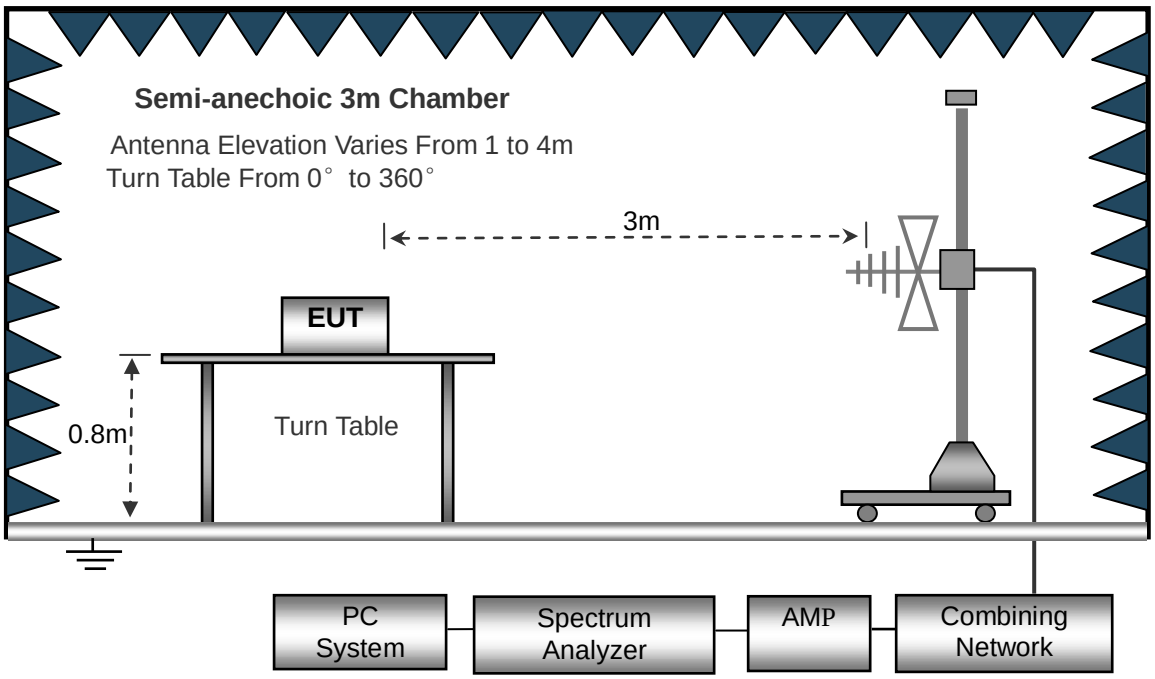
## 7.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40cm long in the middle.
The spacing between the peripherals was 10cm.

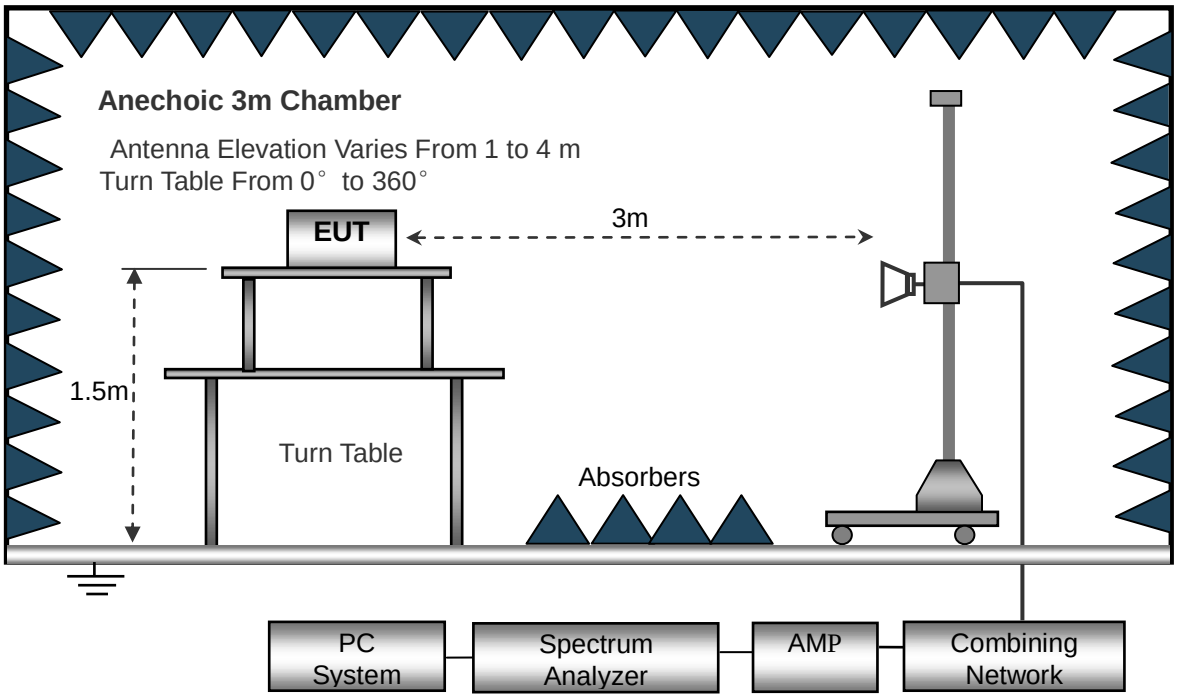
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30MHz to 1GHz.




The test setup for emission measurement above 1GHz.



| | | |
|---|---|---|
| Frequency :9kHz-30MHz | Frequency :30MHz-1GHz | Frequency :Above 1GHz |
| RBW=10KHz, | RBW=120KHz, | RBW=1MHz, |
| VBW =30KHz | VBW=300KHz | VBW=3MHz(Peak), 10Hz(AV) |
| Sweep time= Auto | Sweep time= Auto | Sweep time= Auto |
| Trace = max hold | Trace = max hold | Trace = max hold |
| Detector function = peak | Detector function = peak, QP | Detector function = peak, AV |

## 7.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Result = Indicated Reading + Correct
Correct =Ant. Factor + Cable Loss – Ampl. Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

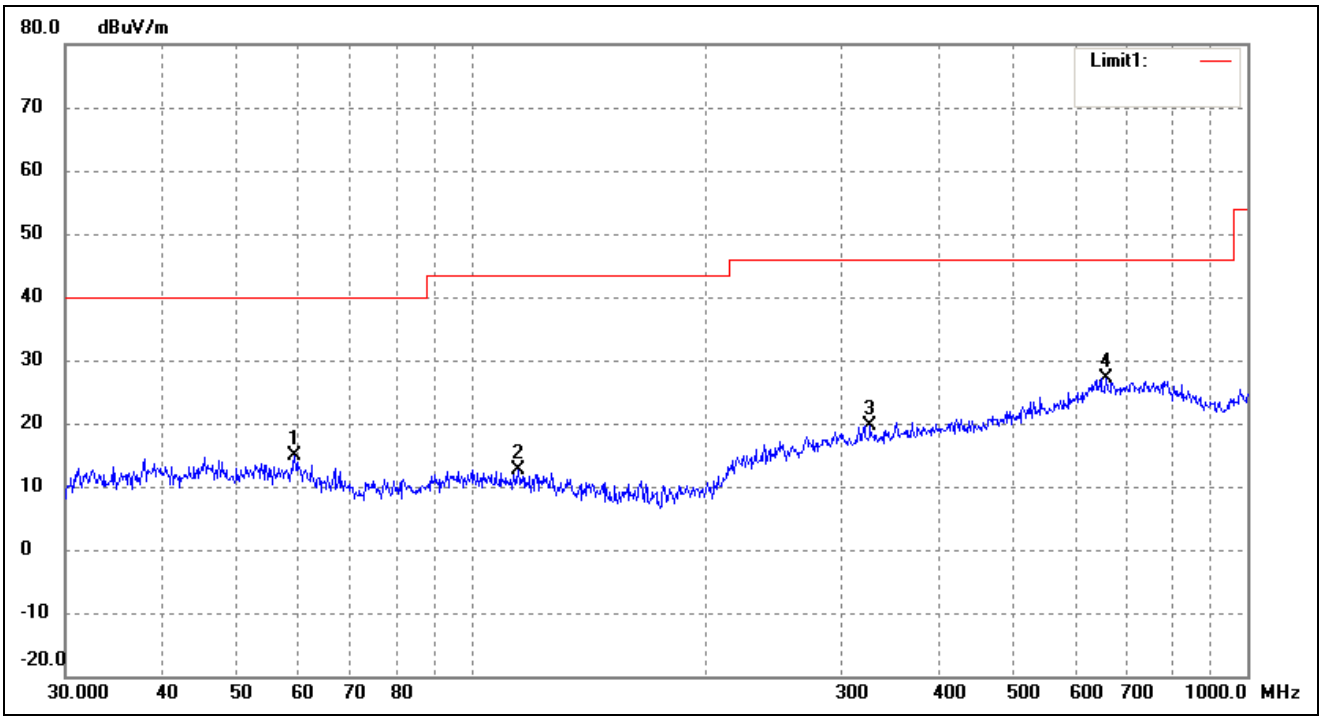
Margin = Result – FCC Part 15 Limit

## 7.4 Summary of Test Results/Plots

*Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

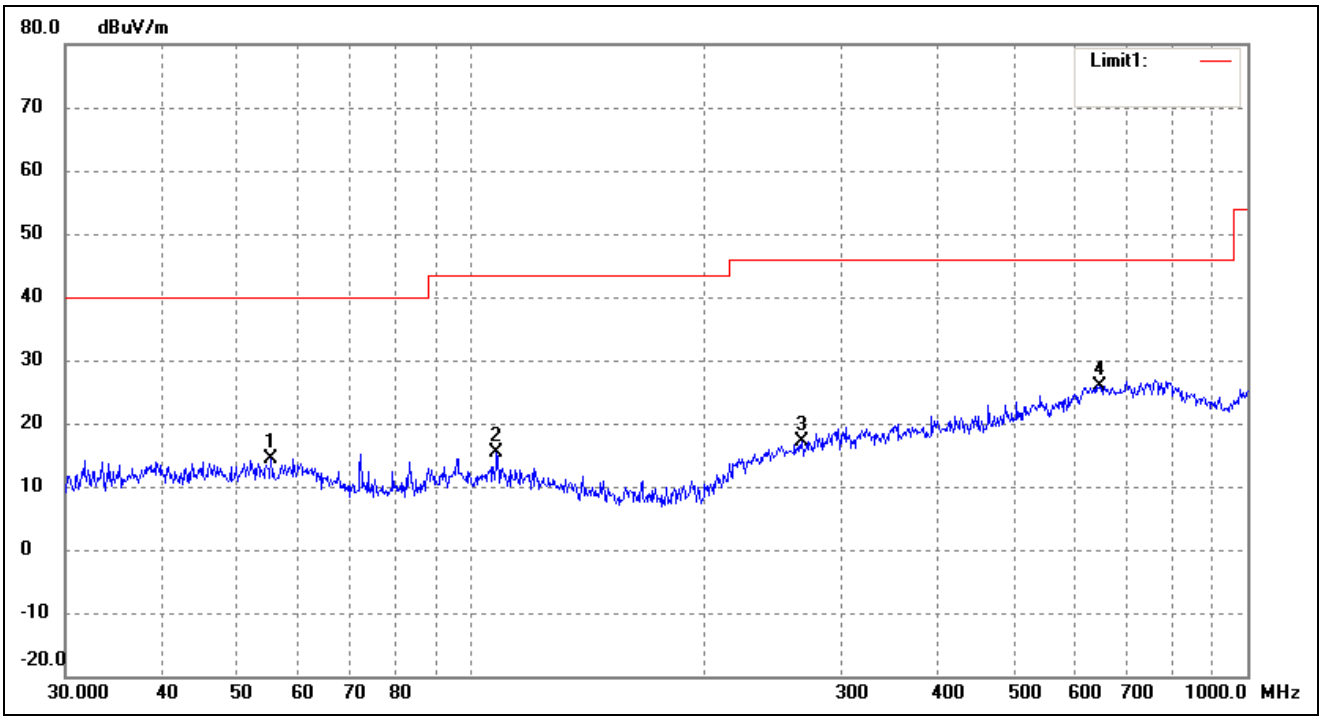
➢ Spurious Emissions Below 1GHz

| Test Channel | Low | Polarity: | Horizontal |
|---|---|---|---|



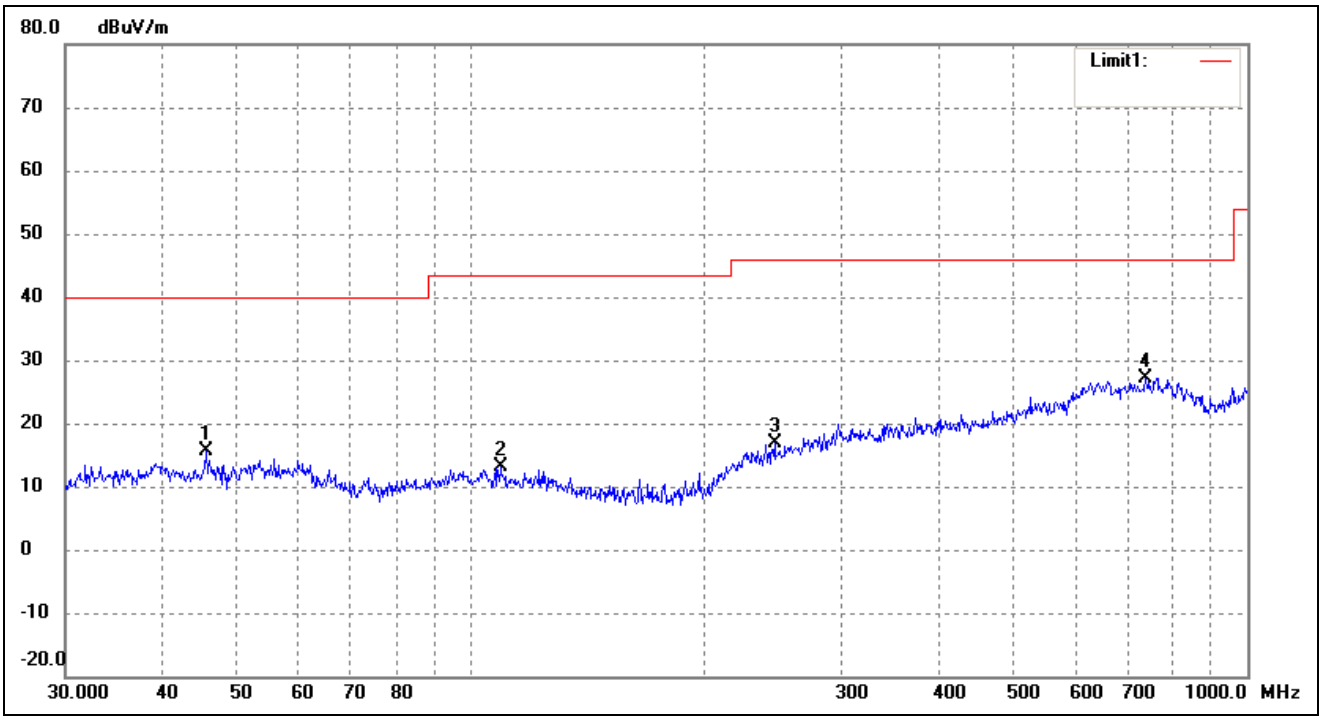

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 59.2325 | 31.46 | -16.52 | 14.94 | 40.00 | -25.06 | 343 | 100 | peak |
| 2 | 114.9169 | 29.27 | -16.64 | 12.63 | 43.50 | -30.87 | 93 | 100 | peak |
| 3 | 326.7395 | 29.16 | -9.47 | 19.69 | 46.00 | -26.31 | 91 | 100 | peak |
| 4 | 658.8362 | 28.65 | -1.47 | 27.18 | 46.00 | -18.82 | 91 | 100 | peak |

| Test Channel | Low | Polarity: | Vertical |
|---|---|---|---|



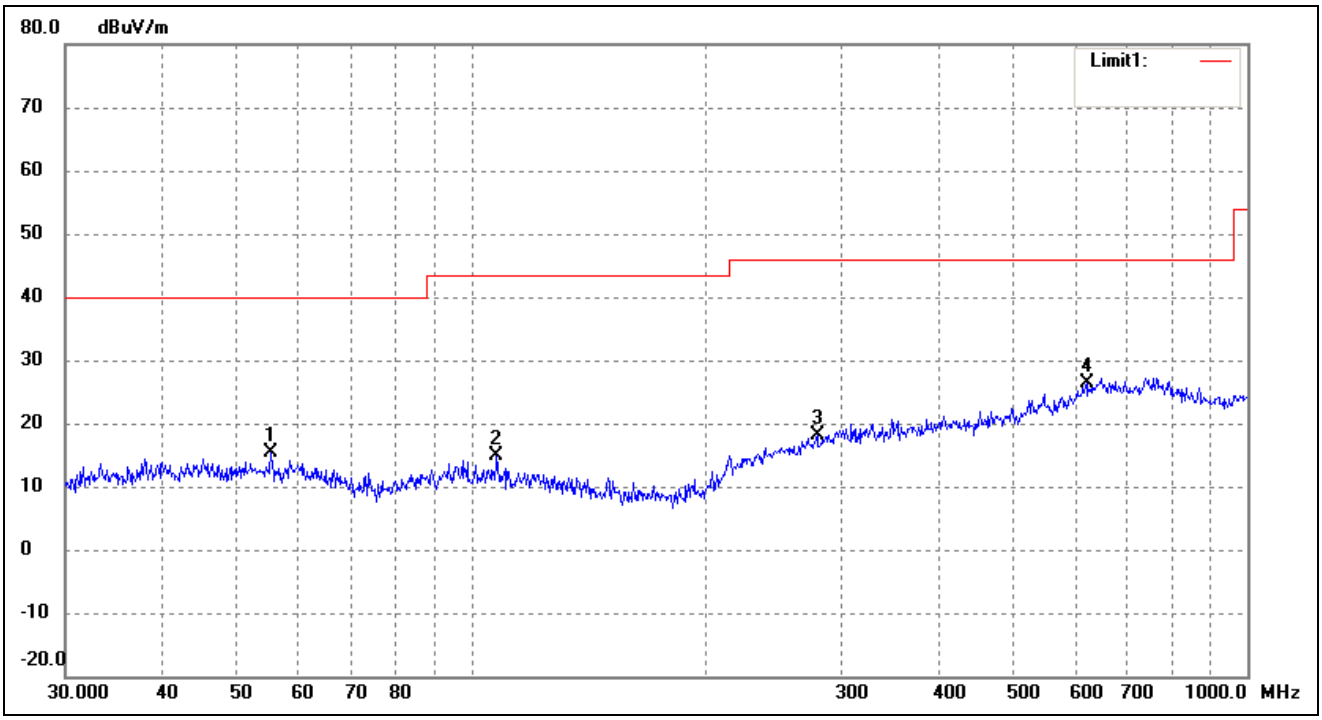

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 55.2207 | 30.81 | -16.51 | 14.30 | 40.00 | -25.70 | 232 | 100 | peak |
| 2 | 107.8877 | 31.88 | -16.61 | 15.27 | 43.50 | -28.23 | 92 | 100 | peak |
| 3 | 266.6089 | 28.34 | -11.31 | 17.03 | 46.00 | -28.97 | 223 | 100 | peak |
| 4 | 645.1195 | 27.14 | -1.15 | 25.99 | 46.00 | -20.01 | 232 | 100 | peak |

| Test Channel | Middle | Polarity: | Horizontal |
|---|---|---|---|



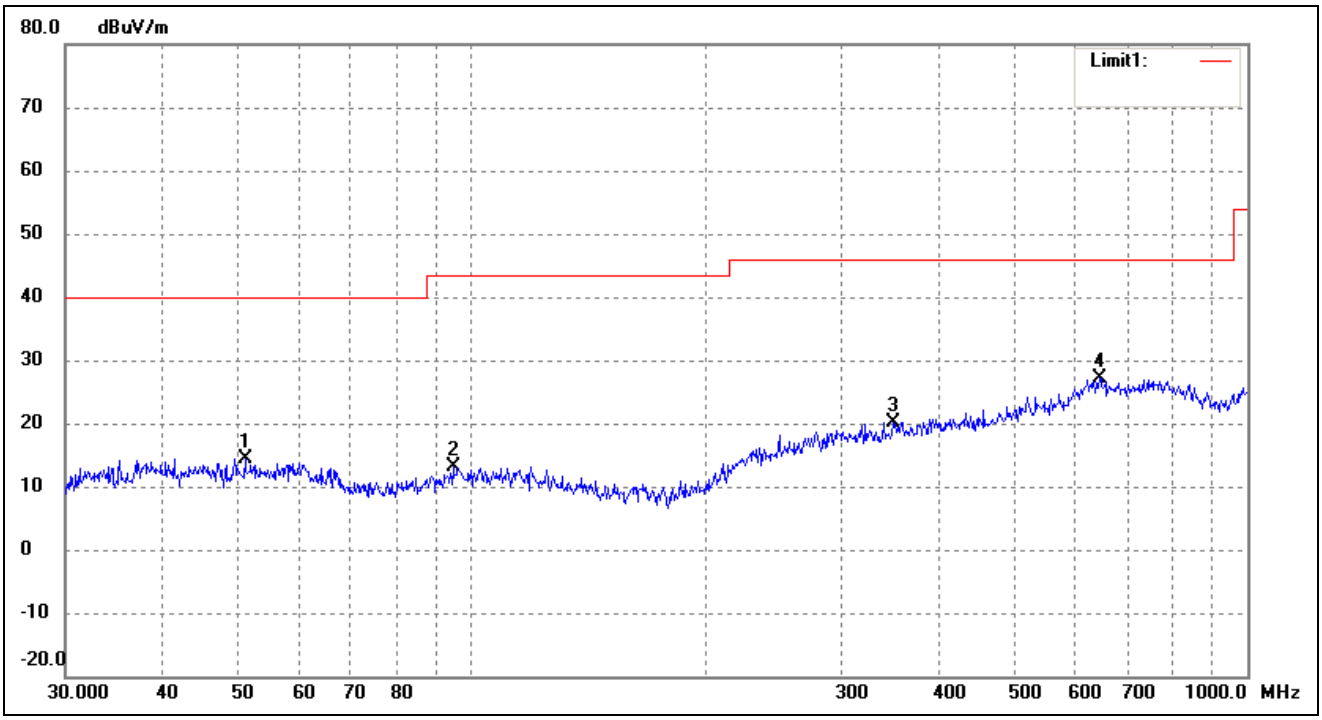

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 45.5348 | 32.24 | -16.49 | 15.75 | 40.00 | -24.25 | 58 | 100 | peak |
| 2 | 109.0286 | 29.76 | -16.62 | 13.14 | 43.50 | -30.36 | 164 | 100 | peak |
| 3 | 245.9509 | 29.20 | -12.30 | 16.90 | 46.00 | -29.10 | 284 | 100 | peak |
| 4 | 739.6605 | 27.01 | 0.15 | 27.16 | 46.00 | -18.84 | 58 | 100 | peak |

| Test Channel | Middle | Polarity: | Vertical |
|---|---|---|---|



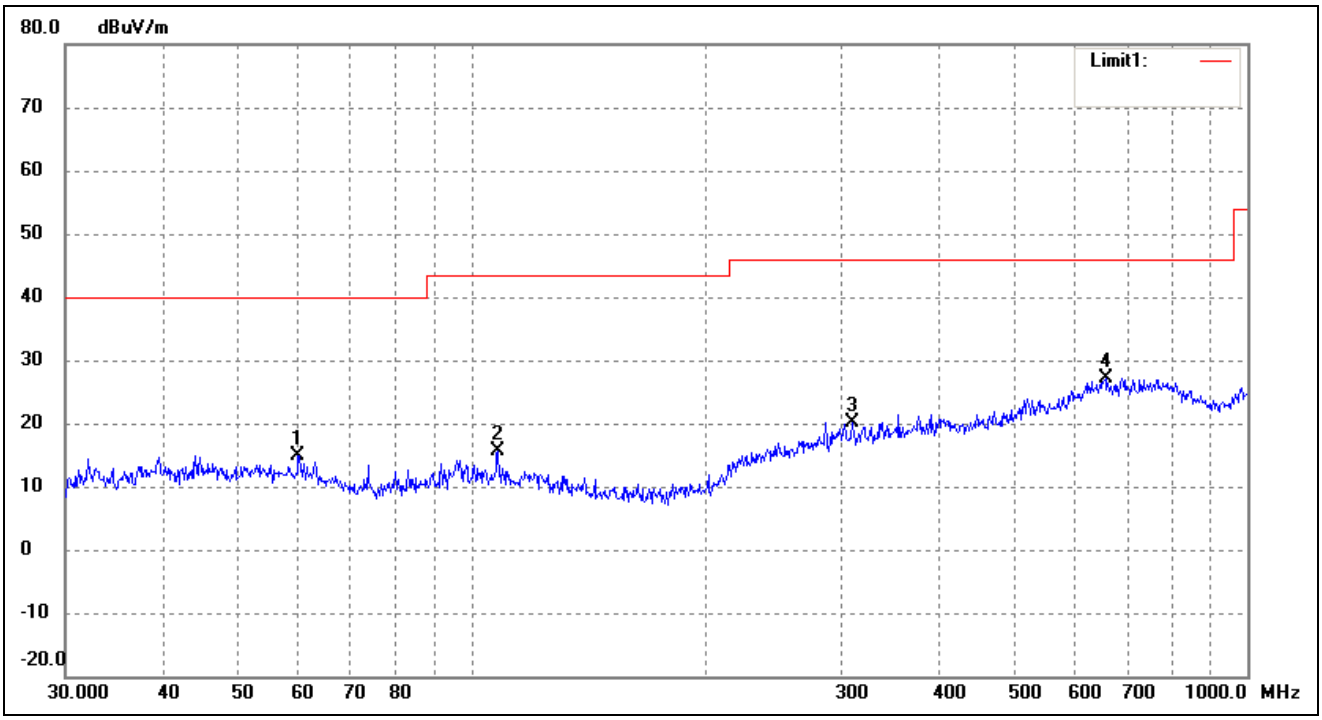

| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 55.2207 | 31.91 | -16.51 | 15.40 | 40.00 | -24.60 | 315 | 100 | peak |
| 2 | 107.8877 | 31.60 | -16.61 | 14.99 | 43.50 | -28.51 | 90 | 100 | peak |
| 3 | 279.0436 | 28.49 | -10.43 | 18.06 | 46.00 | -27.94 | 51 | 100 | peak |
| 4 | 620.7096 | 28.05 | -1.67 | 26.38 | 46.00 | -19.62 | 227 | 100 | peak |

| Test Channel | High | Polarity: | Horizontal |
|---|---|---|---|




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 51.1209 | 30.96 | -16.52 | 14.44 | 40.00 | -25.56 | 80 | 100 | peak |
| 2 | 94.7601 | 30.38 | -17.34 | 13.04 | 43.50 | -30.46 | 124 | 100 | peak |
| 3 | 350.4768 | 29.51 | -9.26 | 20.25 | 46.00 | -25.75 | 139 | 100 | peak |
| 4 | 645.1195 | 28.26 | -1.15 | 27.11 | 46.00 | -18.89 | 142 | 100 | peak |

| Test Channel | High | Polarity: | Vertical |
|---|---|---|---|




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Degree | Height | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | ( ) | (cm) | |
| 1 | 59.8588 | 31.43 | -16.51 | 14.92 | 40.00 | -25.08 | 100 | 100 | peak |
| 2 | 108.2667 | 32.24 | -16.61 | 15.63 | 43.50 | -27.87 | 86 | 100 | peak |
| 3 | 309.9977 | 29.51 | -9.46 | 20.05 | 46.00 | -25.95 | 113 | 100 | peak |
| 4 | 656.5300 | 28.50 | -1.41 | 27.09 | 46.00 | -18.91 | 100 | 100 | peak |

➢ Spurious Emissions Above 1GHz

| Frequency (MHz) | Reading (dBuV/m) | Correct dB | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Polar H/V | Detector |
|---|---|---|---|---|---|---|---|
| Low Channel-2402MHz | | | | | | | |
| 4804 | 60.23 | -3.59 | 56.64 | 74 | -17.36 | H | PK |
| 4804 | 40.73 | -3.59 | 37.14 | 54 | -16.86 | H | AV |
| 7206 | 61.39 | -0.52 | 60.87 | 74 | -13.13 | H | PK |
| 7206 | 38.79 | -0.52 | 38.27 | 54 | -15.73 | H | AV |
| 4804 | 60.95 | -3.59 | 57.36 | 74 | -16.64 | V | PK |
| 4804 | 38.95 | -3.59 | 35.36 | 54 | -18.64 | V | AV |
| 7206 | 59.1 | -0.52 | 58.58 | 74 | -15.42 | V | PK |
| 7206 | 41.06 | -0.52 | 40.54 | 54 | -13.46 | V | AV |
| Middle Channel-2440MHz | | | | | | | |
| 4880 | 60.69 | -3.49 | 57.2 | 74 | -16.8 | H | PK |
| 4880 | 40.37 | -3.49 | 36.88 | 54 | -17.12 | H | AV |
| 7320 | 60.5 | -0.47 | 60.03 | 74 | -13.97 | H | PK |
| 7320 | 39.78 | -0.47 | 39.31 | 54 | -14.69 | H | AV |
| 4880 | 61.24 | -3.49 | 57.75 | 74 | -16.25 | V | PK |
| 4880 | 39.69 | -3.49 | 36.2 | 54 | -17.8 | V | AV |
| 7320 | 61.68 | -0.47 | 61.21 | 74 | -12.79 | V | PK |
| 7320 | 41.84 | -0.47 | 41.37 | 54 | -12.63 | V | AV |
| High Channel-2480MHz | | | | | | | |
| 4960 | 60.91 | -3.41 | 57.5 | 74 | -16.5 | H | PK |
| 4960 | 39.98 | -3.41 | 36.57 | 54 | -17.43 | H | AV |
| 7440 | 58.49 | -0.42 | 58.07 | 74 | -15.93 | H | PK |
| 7440 | 38.76 | -0.42 | 38.34 | 54 | -15.66 | H | AV |
| 4960 | 61.65 | -3.41 | 58.24 | 74 | -15.76 | V | PK |
| 4960 | 40.32 | -3.41 | 36.91 | 54 | -17.09 | V | AV |
| 7440 | 60.47 | -0.42 | 60.05 | 74 | -13.95 | V | PK |
| 7440 | 38.4 | -0.42 | 37.98 | 54 | -16.02 | V | AV |

*Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

# 8. Out of Band Emissions

## 8.1 Standard Applicable

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

## 8.2 Test Procedure

According to the KDB 558074 D01 v05r02 Subclause 8.4 and ANSI C63.10-2013 Subclause 11.11, the Emissions in nonrestricted frequency bands test method as follows:

a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ [3 × RBW].
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

According to the KDB 558074 D01 v05r02 Subclause 8.5 and ANSI C63.10-2013 Subclause 11.12, the Emissions in restricted frequency bands test method as follows:

A. Radiated emission measurements:
Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)
RBW = 1MHz, VBW = 1MHz for peak value measured
RBW = 1MHz, VBW = 10Hz for average value measured
Sweep = auto; Detector function = peak/average; Trace = max hold
All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

B. Antenna-port conducted measurements

Peak emission levels are measured by setting the instrument as follows:

a) RBW = as specified in Table 9/

b) VBW ⩾ [3 × RBW].

c) Detector = peak.

d) Sweep time = auto.

e) Trace mode = max hold.

f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be lengthened for low-duty-cycle applications.)

**Table 9—RBW as a function of frequency**

| Frequency | RBW |
|---|---|
| 9 kHz to 150 kHz | 200 Hz to 300 Hz |
| 0.15 MHz to 30 MHz | 9 kHz to 10 kHz |
| 30 MHz to 1000 MHz | 100 kHz to 120 kHz |
| >1000 MHz | 1 MHz |

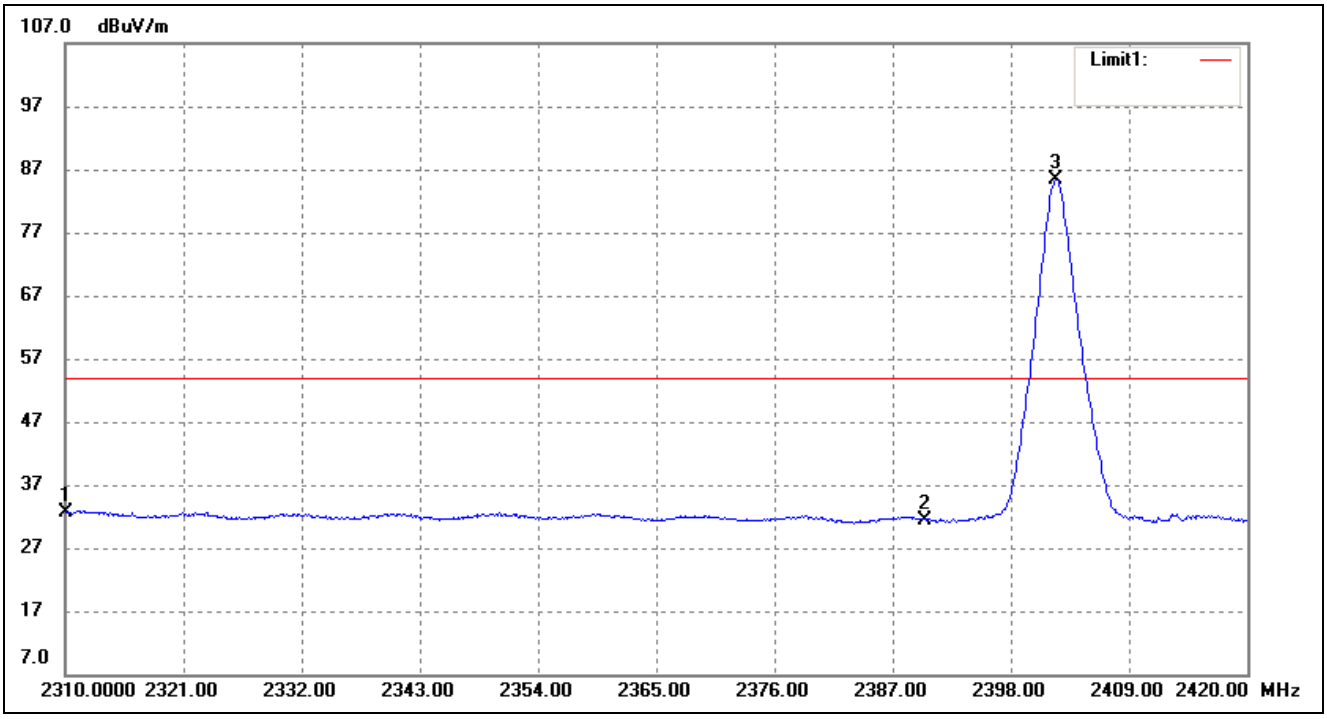
If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

## 8.3 Summary of Test Results/Plots

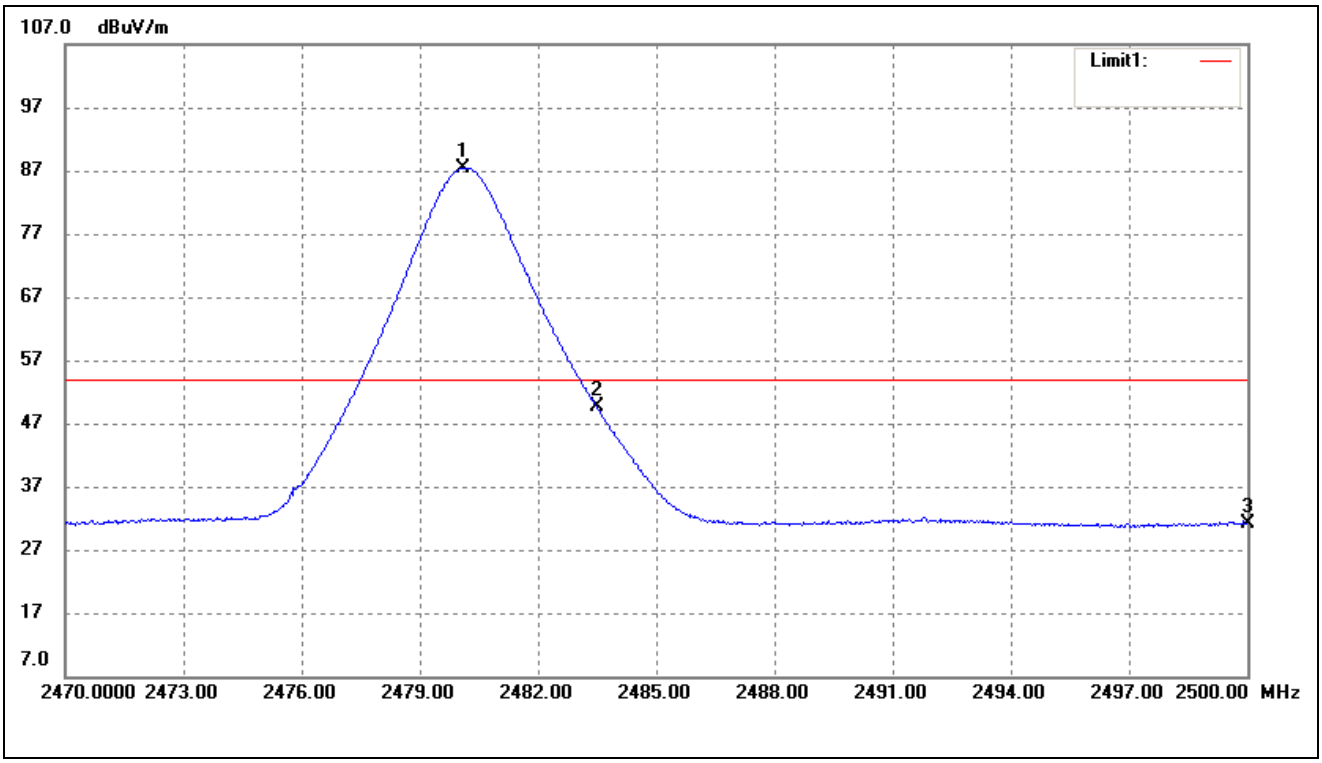
➢ Radiated test

| Test Channel | Low | Polarity: | Vertical(worst case) |
|---|---|---|---|




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | Factor(dB) | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 2310.000 | 38.89 | -6.38 | 32.51 | 54.00 | -21.49 | Average Detector |
| | 2310.000 | 52.38 | -6.38 | 46.00 | 74.00 | -28.00 | Peak Detector |
| 2 | 2390.000 | 38.73 | -7.26 | 31.47 | 54.00 | -22.53 | Average Detector |
| | 2390.000 | 54.44 | -7.26 | 47.18 | 74.00 | -26.82 | Peak Detector |
| 3 | 2402.180 | 92.77 | -7.39 | 85.38 | / | / | Average Detector |
| | 2402.400 | 97.69 | -7.40 | 90.29 | / | / | Peak Detector |

| Test Channel | High | Polarity: | Vertical(worst case) |
|---|---|---|---|




| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|---|---|---|---|---|---|---|---|
| | (MHz) | (dBuV/m) | dB/m | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 2480.110 | 94.77 | -7.28 | 87.49 | / | / | Average Detector |
| | 2480.410 | 99.95 | -7.28 | 92.67 | / | / | Peak Detector |
| 2 | 2483.500 | 56.80 | -7.28 | 49.52 | 54.00 | -4.48 | Average Detector |
| | 2483.500 | 66.31 | -7.28 | 59.03 | 74.00 | -14.97 | Peak Detector |
| 3 | 2500.000 | 38.39 | -7.25 | 31.14 | 54.00 | -22.86 | Average Detector |
| | 2500.000 | 51.92 | -7.25 | 44.67 | 74.00 | -29.33 | Peak Detector |

- Conducted test

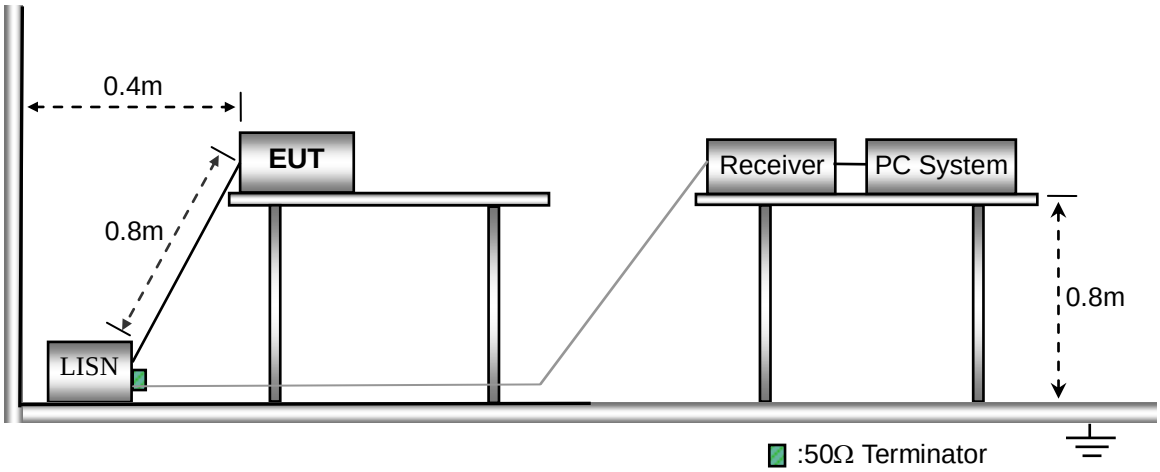
**Please refer to Appendix D**

# 9. Conducted Emissions

## 9.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
The spacing between the peripherals was 10 cm.

## 9.2 Basic Test Setup Block Diagram




## 9.3 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency ..... 150 kHz
Stop Frequency..... 30 MHz
Sweep Speed ..... Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth..... 9 kHz
Quasi-Peak Adapter Mode ..... Normal

## 9.4 Summary of Test Results/Plots

N/A, The EUT is DC supply, so this item is not applicable.

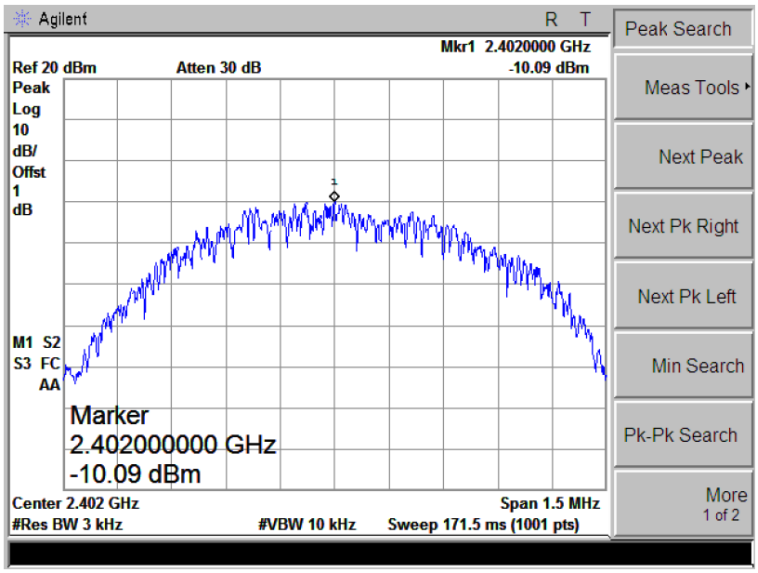
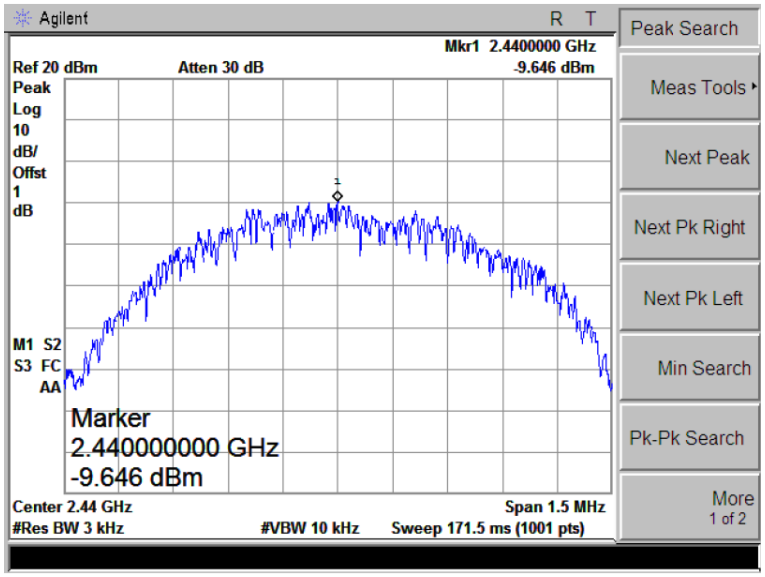
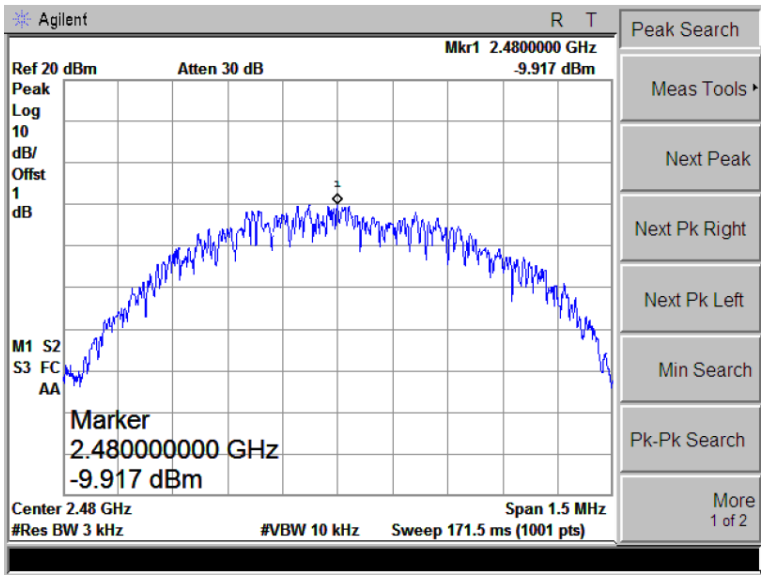
# APPENDIX SUMMARY

| | | | |
|---|---|---|---|
| Project No. | WTX22X02110201W-1 | Test Engineer | Tom Wang |
| Start date | 2022/02/11 | Finish date | 2022/02/25 |
| Temperature | 24.7℃ | Humidity | 47% |
| RF specifications | BT-BLE | | |

| APPENDIX | Description of Test Item | Result |
|---|---|---|
| A | Power Spectral Density | Compliant |
| B | DTS Bandwidth | Compliant |
| C | RF Output Power | Compliant |
| D | Conducted Out of Band Emissions | Compliant |
| E | | |

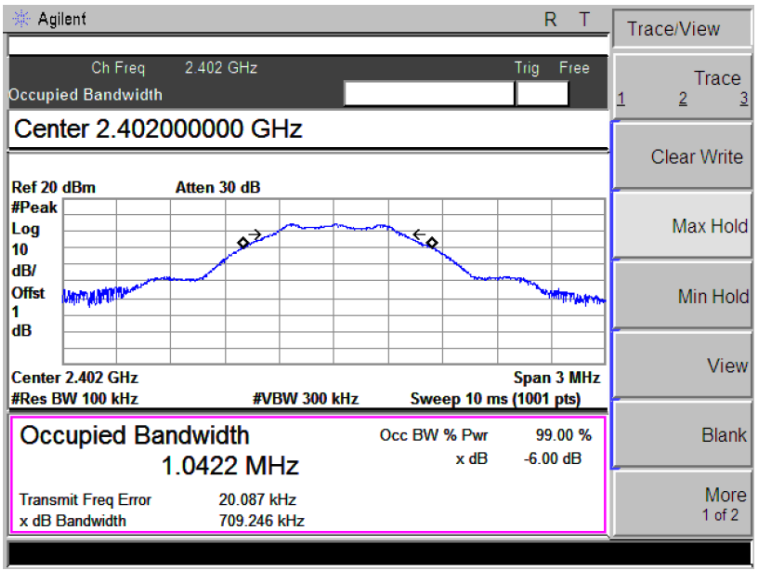
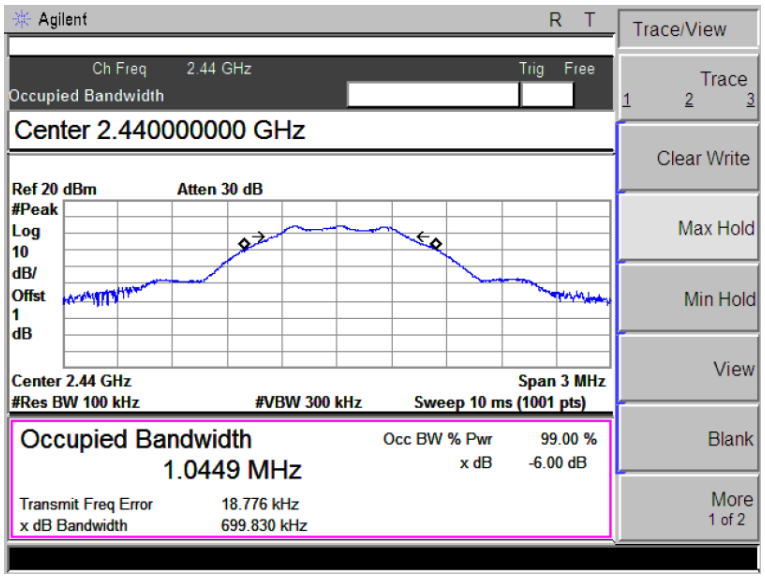
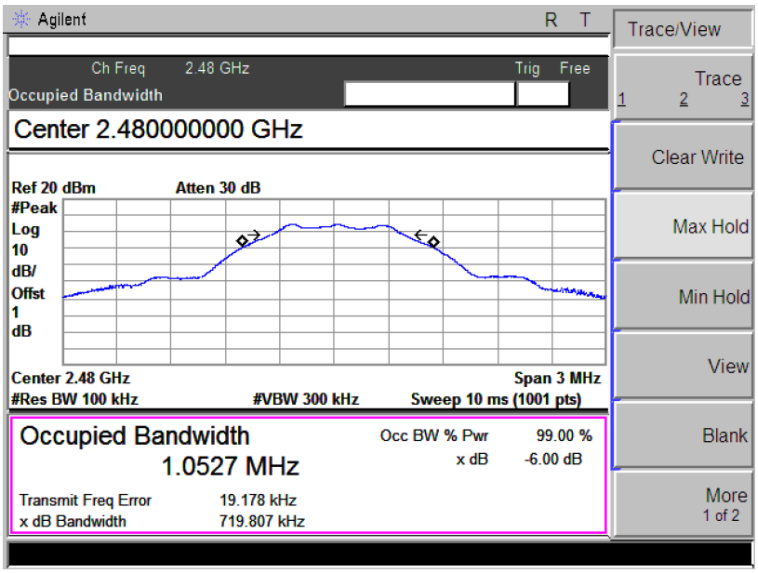
# APPENDIX A

| Power Spectral Density | | | |
|---|---|---|---|
| Test Mode | Test Channel | Power Spectral Density dBm/3kHz | Limit dBm/3kHz |
| GFSK(BLE) | Low | -10.09 | 8 |
| | Middle | -9.646 | 8 |
| | High | -9.917 | 8 |

| | |
|---|---|
| Low |  |
| Middle |  |
| High |  |

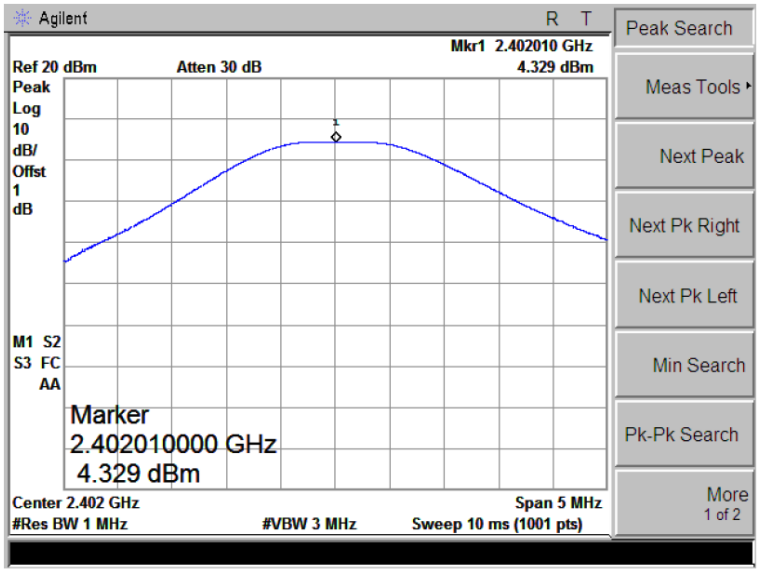
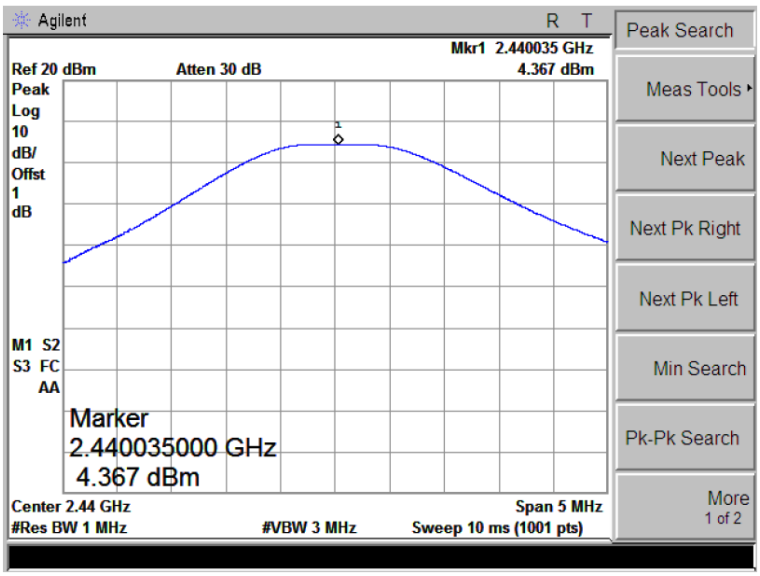
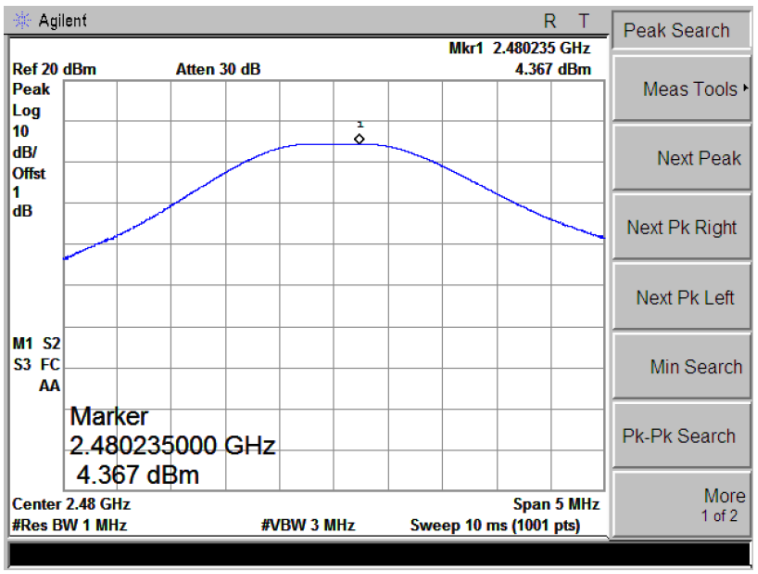
# APPENDIX B

| DTS Bandwidth | | | |
|---|---|---|---|
| Test Mode | Test Channel | 6 dB Bandwidth<br>kHz | Limit<br>kHz |
| GFSK(BLE) | Low | 709.2 | ≥500 |
| | Middle | 699.8 | ≥500 |
| | High | 719.8 | ≥500 |

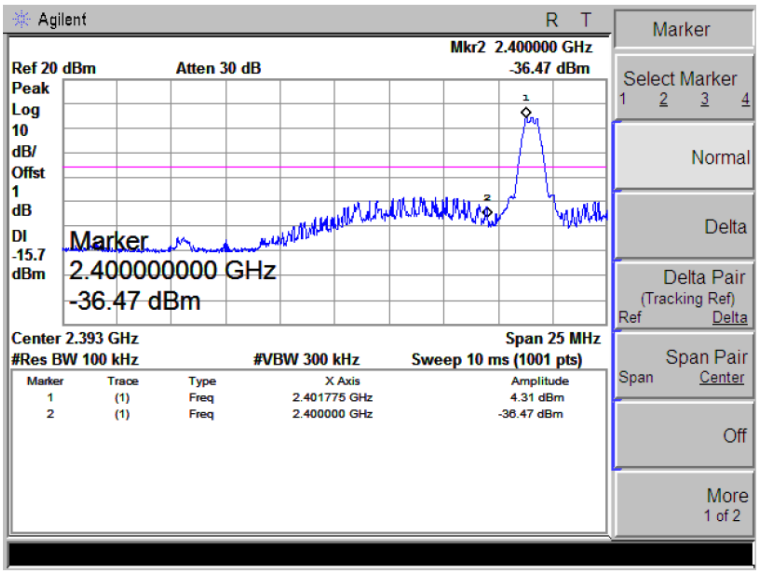
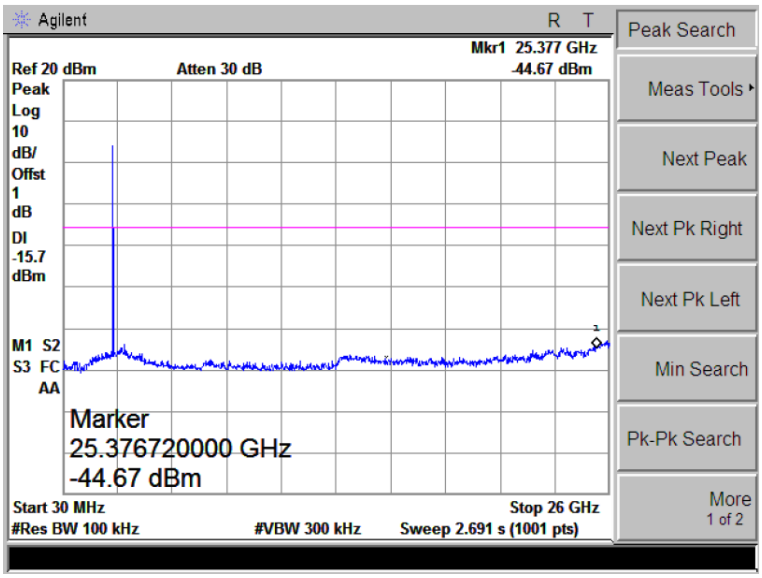
| | |
|---|---|
| Low |  |
| Middle |  |
| High |  |

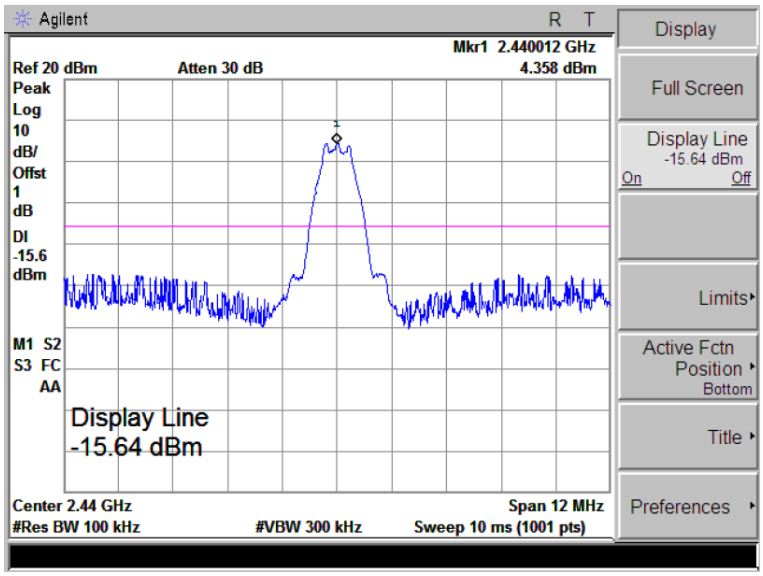
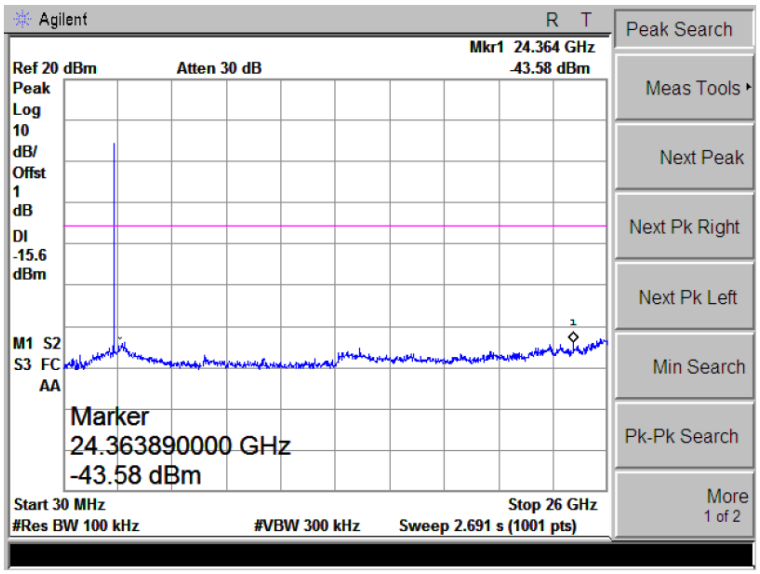
# APPENDIX C

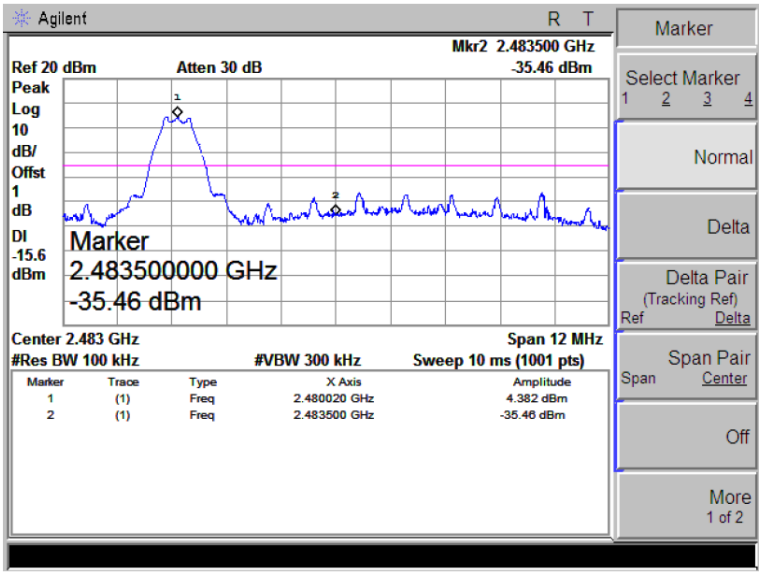
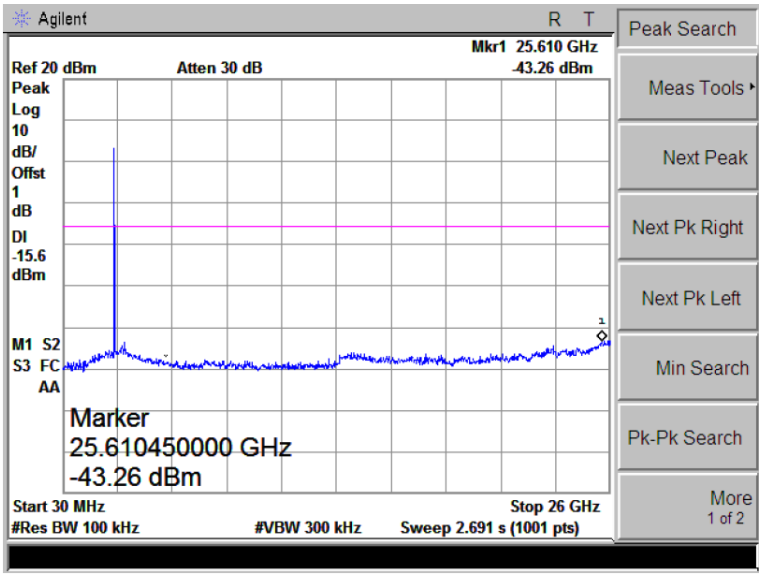
| RF Output Power | | | |
|---|---|---|---|
| Test Mode | Test Channel | Reading<br>dBm | Limit<br>dBm |
| GFSK(BLE) | Low | 4.329 | 30 |
| | Middle | 4.367 | 30 |
| | High | 4.367 | 30 |

| | |
|---|---|
| Low |  |
| Middle |  |
| High |  |

# APPENDIX D

| | |
|---|---|
| Low |  |
| |  |

| | |
|---|---|
| Middle |  Agilent<br>R T<br>Mkr1 2.440012 GHz<br>Ref 20 dBm<br>Atten 30 dB<br>4.358 dBm<br>Peak<br>Log<br>10<br>dB/<br>Offst<br>1<br>dB<br>Dl<br>-15.6<br>dBm<br>M1 S2<br>S3 FC<br>AA<br>Display Line<br>-15.64 dBm<br>Center 2.44 GHz<br>Span 12 MHz<br>#Res BW 100 kHz<br>#VBW 300 kHz<br>Sweep 10 ms (1001 pts)<br>Display<br>Full Screen<br>Display Line<br>-15.64 dBm<br>On<br>Off<br>Limits<br>Active Fctn<br>Position<br>Bottom<br>Title<br>Preferences |
| |  Agilent<br>R T<br>Mkr1 24.364 GHz<br>Ref 20 dBm<br>Atten 30 dB<br>-43.58 dBm<br>Peak<br>Log<br>10<br>dB/<br>Offst<br>1<br>dB<br>Dl<br>-15.6<br>dBm<br>M1 S2<br>S3 FC<br>AA<br>Marker<br>24.363890000 GHz<br>-43.58 dBm<br>Start 30 MHz<br>Stop 26 GHz<br>#Res BW 100 kHz<br>#VBW 300 kHz<br>Sweep 2.691 s (1001 pts)<br>Peak Search<br>Meas Tools<br>Next Peak<br>Next Pk Right<br>Next Pk Left<br>Min Search<br>Pk-Pk Search<br>More<br>1 of 2 |

| | |
|---|---|
| High |  Agilent<br>R T<br>Mkr2 2.483500 GHz<br>Ref 20 dBm<br>Atten 30 dB<br>-35.46 dBm<br>Peak<br>Log<br>10<br>dB/<br>Offst<br>1<br>dB<br>Dl<br>-15.6<br>dBm<br>Marker<br>2.483500000 GHz<br>-35.46 dBm<br>Center 2.483 GHz<br>Span 12 MHz<br>#Res BW 100 kHz<br>#VBW 300 kHz<br>Sweep 10 ms (1001 pts)<br>Marker Trace Type X Axis Amplitude<br>1 (1) Freq 2.480020 GHz 4.382 dBm<br>2 (1) Freq 2.483500 GHz -35.46 dBm<br>Marker<br>Select Marker<br>1 2 3 4<br>Normal<br>Delta<br>Delta Pair<br>(Tracking Ref)<br>Ref Delta<br>Span Pair<br>Span Center<br>Off<br>More<br>1 of 2 |
| |  Agilent<br>R T<br>Mkr1 25.610 GHz<br>Ref 20 dBm<br>Atten 30 dB<br>-43.26 dBm<br>Peak<br>Log<br>10<br>dB/<br>Offst<br>1<br>dB<br>Dl<br>-15.6<br>dBm<br>M1 S2<br>S3 FC<br>AA<br>Marker<br>25.610450000 GHz<br>-43.26 dBm<br>Start 30 MHz<br>Stop 26 GHz<br>#Res BW 100 kHz<br>#VBW 300 kHz<br>Sweep 2.691 s (1001 pts)<br>Peak Search<br>Meas Tools<br>Next Peak<br>Next Pk Right<br>Next Pk Left<br>Min Search<br>Pk-Pk Search<br>More<br>1 of 2 |

# APPENDIX PHOTOGRAPHS

Please refer to “ANNEX”

******* END OF REPORT *******