# RADIO TEST REPORT
## FCC 47 CFR PART 15 SUBPART C

| | |
|---|---|
| **Test Standard** | **FCC Part 15.247** |
| **Product name** | **QTAX56** |
| **Model No.** | **QTAX56** |
| **Test Result** | **Pass** |
| **Statements of Conformity** | **Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.** |

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.( Wugu Laboratory)

Approved by:

Kevin Tsai
Deputy Manager

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
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# Revision History

| Rev. | Issue Date | Revisions | Effect Page | Revised By |
|---|---|---|---|---|
| 00 | September 29, 2020 | Initial Issue | ALL | Allison Chen |

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# 1. GENERAL INFORMATION

## 1.1 EUT INFORMATION

| | |
|---|---|
| Applicant | Quanta Computer Inc.<br>No.188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan |
| Manufacturer | Quanta Computer Inc.<br>No.188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan |
| Equipment | QTAX56 |
| Model No. | QTAX56 |
| Model Discrepancy | N/A |
| Received Date | August 21, 2020 |
| Date of Test | September 10 ~ 18, 2020 |
| Power Supply | 1. Powered from adapter<br>Model No.: CYSM06-050120-UL<br>Supplier: JIANGSU CHENYANG ELECTRON CO., LTD<br>I/P: 100-240Vac, 50/60Hz, 0.2A<br>O/P: 5Vdc, 1.2A<br>2. Powered from battery. (Lithium Polymer)<br>Model No.: P0963, Supplier: EVE<br>Rating: 3.85V / 495mAh / 1.91Wh |
| HW Version | X56_D2B |
| SW Version | QTAX56_30A11 |

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## 1.2 EUT CHANNEL INFORMATION

| | |
|---|---|
| Frequency Range | 2402MHz-2480MHz |
| Modulation Type | GFSK for BLE-1Mbps |
| Number of channel | 40 Channels |

**Remark:**
Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 for test channels

| Number of frequencies to be tested | | |
|---|---|---|
| **Frequency range in which device operates** | **Number of frequencies** | **Location in frequency range of operation** |
| ☐ 1 MHz or less | 1 | Middle |
| ☐ 1 MHz to 10 MHz | 2 | 1 near top and 1 near bottom |
| ☒ More than 10 MHz | 3 | 1 near top, 1 near middle, and 1 near bottom |

## 1.3 ANTENNA INFORMATION

| | |
|---|---|
| **Antenna Specification** | Monopole Antenna |
| **Antenna Gain** | -2.37 dBi |
| **Antenna connector** | N/A |

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## 1.4 MEASUREMENT UNCERTAINTY

| PARAMETER | UNCERTAINTY |
|---|---|
| AC Powerline Conducted Emission | +/- 1.2575 |
| Emission bandwidth, 20dB bandwidth | +/- 0.0014 |
| RF output power, conducted | +/- 1.14 |
| Power density, conducted | +/- 1.40 |
| 3M Semi Anechoic Chamber / 30M~200M | +/- 4.12 |
| 3M Semi Anechoic Chamber / 200M~1000M | +/- 4.68 |
| 3M Semi Anechoic Chamber / 1G~8G | +/- 5.18 |
| 3M Semi Anechoic Chamber / 8G~18G | +/- 5.47 |
| 3M Semi Anechoic Chamber / 18G~26G | +/- 3.81 |
| 3M Semi Anechoic Chamber / 26G~40G | +/- 3.87 |

**Remark**:
1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

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## 1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.)

| Test site | Test Engineer | Remark |
|---|---|---|
| AC Conduction Room | Rick Lee | - |
| Radiation | Jerry Chang | - |
| RF Conducted | Jane Wang | - |

***Remark:*** *The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.*

## 1.6 INSTRUMENT CALIBRATION

| RF Conducted Test Site | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| Coaxial Cable | Woken | WC12 | CC001 | 06/29/2020 | 06/28/2021 |
| Signal Analyzer | R&S | FSV 40 | 101073 | 09/25/2019 | 09/24/2020 |
| Power Meter | Anritsu | ML2487A | 6K00003260 | 05/21/2020 | 05/20/2021 |
| Power Seneor | Anritsu | MA2490A | 032910 | 05/21/2020 | 05/20/2021 |
| Software | N/A | | | | |

| 3M 966 Chamber Test Site | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **S/N** | **Cal Date** | **Cal Due** |
| Band Reject Filters | MICRO TRONICS | BRM 50702 | 120 | 02/25/2020 | 02/24/2021 |
| Bilog Antenna | Sunol Sciences | JB3 | A030105 | 07/24/2020 | 07/23/2021 |
| Coaxial Cable | HUBER SUHNER | SUCOFLEX 104PEA | 20995 | 02/25/2020 | 02/24/2021 |
| Coaxial Cable | EMCI | EMC105 | 190914+25111 | 09/20/2019 | 09/19/2020 |
| Digital Thermo-Hygro Meter | WISEWIND | 1206 | D07 | 01/15/2020 | 01/14/2021 |
| double Ridged Guide Horn Antenna | ETC | MCTD 1209 | DRH13M02003 | 10/04/2019 | 10/03/2020 |
| Loop Ant | COM-POWER | AL-130 | 121051 | 03/27/2020 | 03/26/2021 |
| Pre-Amplifier | EMEC | EM330 | 060609 | 02/25/2020 | 02/24/2021 |
| Pre-Amplifier | HP | 8449B | 3008A00965 | 02/25/2020 | 02/24/2021 |
| PSA Series Spectrum Analyzer | Agilent | E4446A | MY46180323 | 07/24/2020 | 07/23/2021 |
| Antenna Tower | CCS | CC-A-1F | N/A | N.C.R | N.C.R |
| Controller | CCS | CC-C-1F | N/A | N.C.R | N.C.R |
| Turn Table | CCS | CC-T-1F | N/A | N.C.R | N.C.R |
| Software | e3 6.11-20180413 | | | | |

**Remark:** Each piece of equipment is scheduled for calibration once a year.

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| AC Conducted Emission Room # B | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| CABLE | EMCI | CFD300-NL | CERF | 06/29/2020 | 06/28/2021 |
| EMI Test Receiver | R&S | ESCI | 100064 | 07/17/2020 | 07/16/2021 |
| LISN | SCHAFFNER | NNB 41 | 03/10013 | 02/13/2020 | 02/12/2021 |
| Software | EZ-EMC(CCS-3A1-CE-wugu) | | | | |

**Remark:** Each piece of equipment is scheduled for calibration once a year.

## 1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

| EUT Accessories Equipment | | | | | |
|---|---|---|---|---|---|
| **No.** | **Equipment** | **Brand** | **Model** | **Series No.** | **FCC ID** |
| | N/A | | | | |

| Support Equipment | | | | | |
|---|---|---|---|---|---|
| **No.** | **Equipment** | **Brand** | **Model** | **Series No.** | **FCC ID** |
| 1 | DC Power Supplies | GW Instek | SPS-3610 | GPE880163 | N/A |
| 2 | NB(J) | TOSHIBA | PT345T-00L002 | N/A | PD97260H |

## 1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, KDB 558074 D01.

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# 2. TEST SUMMERY

| FCC Standard Section | Report Section | Test Item | Result |
|---|---|---|---|
| 15.203 | 1.3 | Antenna Requirement | Pass |
| 15.207(a) | 4.1 | AC Conducted Emission | Pass |
| 15.247(a)(2) | 4.2 | 6 dB Bandwidth | Pass |
| - | 4.2 | Occupied Bandwidth (99%) | Pass |
| 15.247(b)(3) | 4.3 | Output Power Measurement | Pass |
| 15.247(e) | 4.4 | Power Spectral Density | Pass |
| 15.247(d) | 4.5 | Conducted Band Edge | Pass |
| 15.247(d) | 4.5 | Conducted Spurious Emission | Pass |
| 15.247(d) | 4.6 | Radiation Band Edge | Pass |
| 15.247(d) | 4.6 | Radiation Spurious Emission | Pass |

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# 3. DESCRIPTION OF TEST MODES

## 3.1 THE WORST MODE OF OPERATING CONDITION

| | |
|---|---|
| Operation mode | BT4.0 Mode (1Mbps) |
| Test Channel Frequencies | 1.Lowest Channel : 2402MHz<br>2.Middle Channel : 2440MHz<br>3.Highest Channel : 2480MHz |

Remark:
1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.
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## 3.2 THE WORST MODE OF MEASUREMENT

| AC Power Line Conducted Emission | |
|---|---|
| Test Condition | AC Power line conducted emission for line and neutral |
| Power supply Mode | Mode 1: EUT power by Adapter |
| Worst Mode | ☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4 |

| Radiated Emission Measurement Above 1G | |
|---|---|
| Test Condition | Radiated Emission Above 1G |
| Power supply Mode | Mode 1: EUT power by Adapter |
| Worst Mode | ☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4 |
| Worst Position | ☐ Placed in fixed position.<br>☐ Placed in fixed position at X-Plane (E2-Plane)<br>☐ Placed in fixed position at Y-Plane (E1-Plane)<br>☒ Placed in fixed position at Z-Plane (H-Plane) |

| Radiated Emission Measurement Below 1G | |
|---|---|
| Test Condition | Radiated Emission Below 1G |
| Power supply Mode | Mode 1: EUT power by Adapter<br>Mode 2: EUT power by Battery |
| Worst Mode | ☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4 |

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(Z-Plane) were recorded in this report
3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

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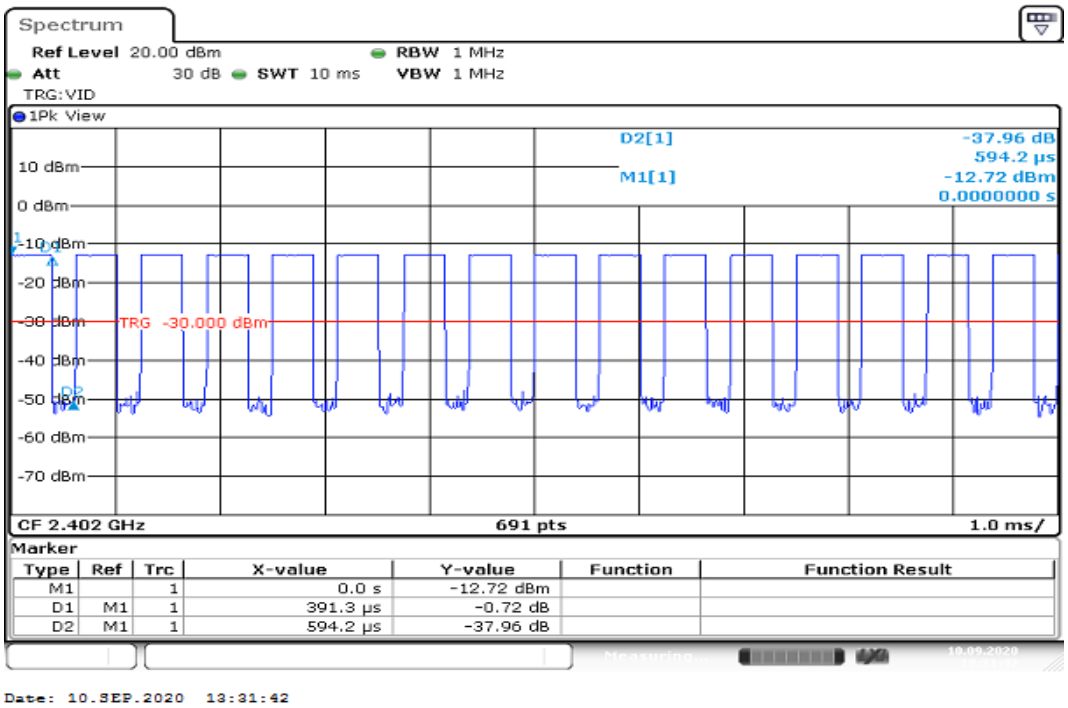
## 3.3 EUT DUTY CYCLE

**Temperature:** 24℃ **Humidity:** 50% RH

**Tested by:** Jane Wang

| Duty Cycle | | | | |
|---|---|---|---|---|
| Configuration | Duty Cycle (%) | Duty Factor (dB) =10*log (1/Duty Cycle) | 1/T (kHz) | VBW setting (kHz) |
| BLE-1Mbps | 65.85% | 1.81 | 2.56 | 3.00 |

BLE

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# 4. TEST RESULT

## 4.1 AC POWER LINE CONDUCTED EMISSION

### 4.1.1 Test Limit

According to §15.207(a),

| Frequency Range (MHz) | Limits(dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

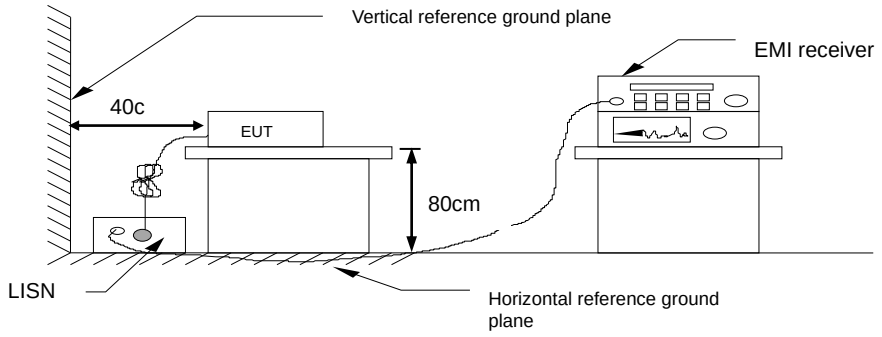
* Decreases with the logarithm of the frequency.

### 4.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

### 4.1.3 Test Setup




### 4.1.4 Test Result

**Pass**

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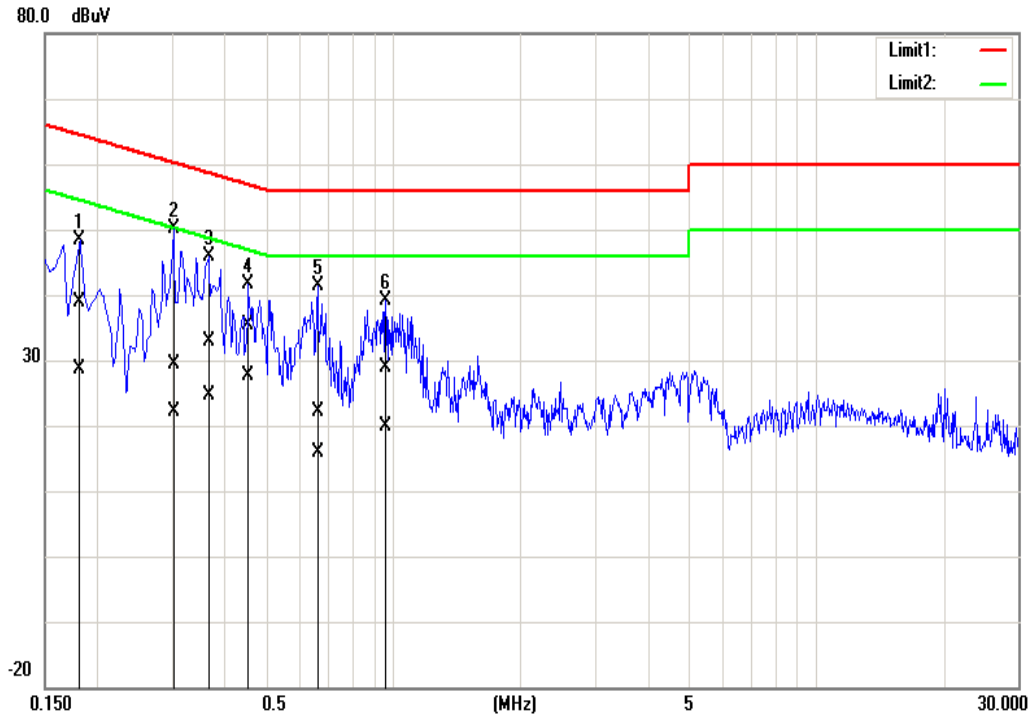
## Test Data

| Test Mode: | Mode 1 | Temp/Hum | 24(℃)/ 50%RH |
|---|---|---|---|
| Phase: | Line | Test Date | September 15, 2020 |
| Test Voltage: | 120Vac, 60Hz | Test Engineer | Rick Lee |




| Frequency (MHz) | Quasi Peak reading (dBuV) | Average reading (d uV) | Correction factor (dB) | Quasi Peak result (dBuV) | Average result (dBuV) | Quasi Peak limit (dBuV) | Average limit (dBuV) | Quasi Peak margin (dB) | Average margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.1820 | 28.73 | 18.45 | 10.21 | 38.94 | 28.66 | 64.39 | 54.39 | -25.45 | -25.73 | Pass |
| 0.3020 | 19.06 | 11.92 | 10.22 | 29.28 | 22.14 | 60.19 | 50.19 | -30.91 | -28.05 | Pass |
| 0.3660 | 22.75 | 14.51 | 10.22 | 32.97 | 24.73 | 58.59 | 48.59 | -25.62 | -23.86 | Pass |
| 0.4540 | 25.25 | 17.34 | 10.22 | 35.47 | 27.56 | 56.80 | 46.80 | -21.33 | -19.24 | Pass |
| 0.6620 | 12.01 | 5.78 | 10.22 | 22.23 | 16.00 | 56.00 | 46.00 | -33.77 | -30.00 | Pass |
| 0.9620 | 18.54 | 9.73 | 10.24 | 28.78 | 19.97 | 56.00 | 46.00 | -27.22 | -26.03 | Pass |

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| Test Mode: | Mode 1 | Temp/Hum | 24(℃)/ 50%RH |
|---|---|---|---|
| Phase: | Neutral | Test Date | September 15, 2020 |
| Test Voltage: | 120Vac, 60Hz | Test Engineer | Rick Lee |

| Frequency (MHz) | Quasi Peak reading dBuV) | Average reading (dBuV) | Correction factor (dB) | Quasi Peak result (dBuV) | Average result (dBuV) | Quasi Peak limit (dBuV) | Average limit (dBuV) | Quasi Peak margin (dB) | Average margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.1500 | 31.91 | 21.37 | 10.18 | 42.09 | 31.55 | 66.00 | 56.00 | -23.91 | -24.45 | Pass |
| 0.1700 | 28.89 | 19.90 | 10.18 | 39.07 | 30.08 | 64.96 | 54.96 | -25.89 | -24.88 | Pass |
| 0.1900 | 27.75 | 19.53 | 10.19 | 37.94 | 29.72 | 64.04 | 54.04 | -26.10 | -24.32 | Pass |
| 0.2900 | 19.81 | 11.02 | 10.19 | 30.00 | 21.21 | 60.52 | 50.52 | -30.52 | -29.31 | Pass |
| 0.3140 | 19.42 | 13.06 | 10.19 | 29.61 | 23.25 | 59.86 | 49.86 | -30.25 | -26.61 | Pass |
| 0.3620 | 23.77 | 14.63 | 10.19 | 33.96 | 24.82 | 58.68 | 48.68 | -24.72 | -23.86 | Pass |

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# 4.2 6dB BANDWIDTH AND OCCUPIED BANDWIDTH(99%)

## 4.2.1 Test Limit

According to §15.247(a)(2)

**6 dB Bandwidth** ：

| | |
|---|---|
| Limit | Shall be at least 500kHz |

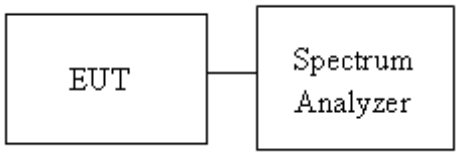
**Occupied Bandwidth(99%)** ： For reporting purposes only.

## 4.2.2 Test Procedure

Test method Refer as KDB 558074 D01 and ANSI C63.10: 2013 clause 6.9.2.

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW =100KHz , VBW = 300KHz and Detector = Peak, to measurement 6dB Bandwidth
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

## 4.2.3 Test Setup




## 4.2.4 Test Result

**Temperature:** 24℃ **Humidity:** 50% RH

**Tested by:** Jane Wang

| Test mode: BLE mode / 2402-2480 MHz | | | | |
|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **OBW(99%) (MHz)** | **6dB BW (MHz)** | **6dB limit (kHz)** |
| Low | 2402 | 1.0593 | 0.6739 | >500 |
| Mid | 2440 | 1.0593 | 0.6695 | |
| High | 2480 | 1.0593 | 0.6695 | |

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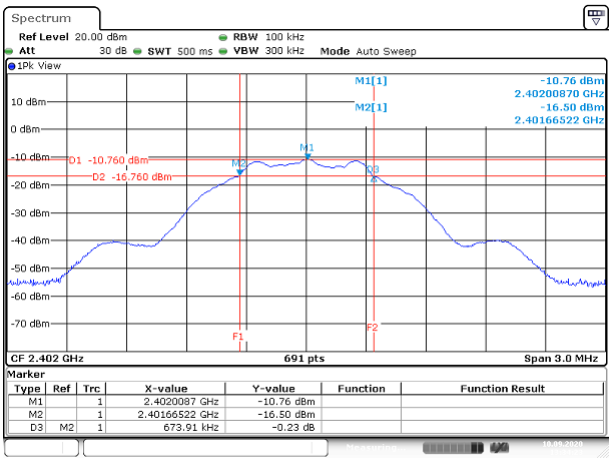
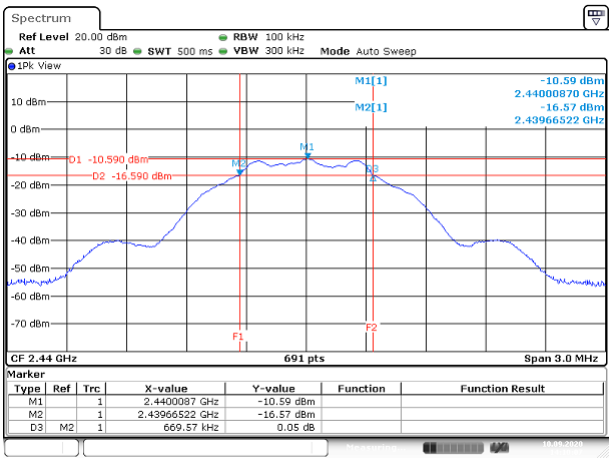
## Test Data (6dB BANDWIDTH)

### BLE mode

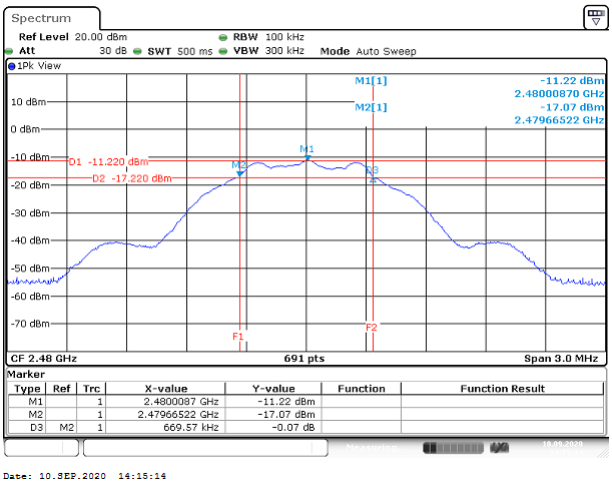
#### Low CH




#### Mid CH




#### High CH

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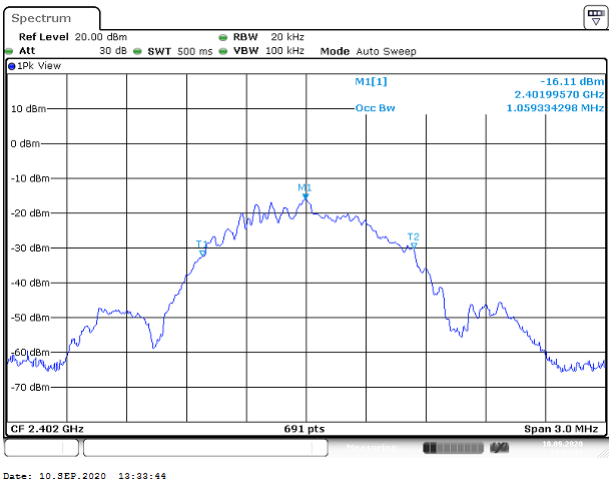
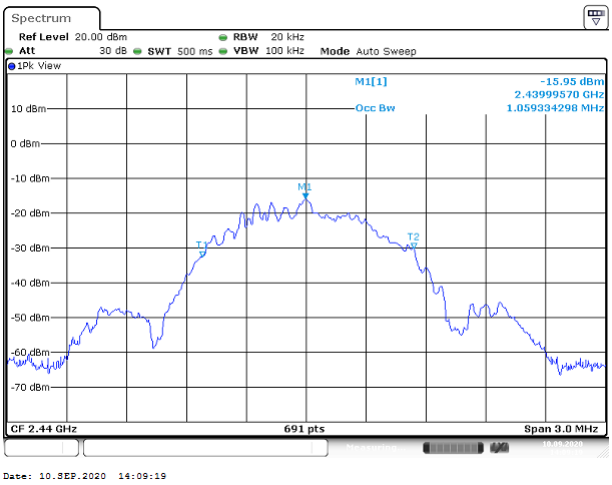
## Test Data (BANDWIDTH 99%)

### BLE mode

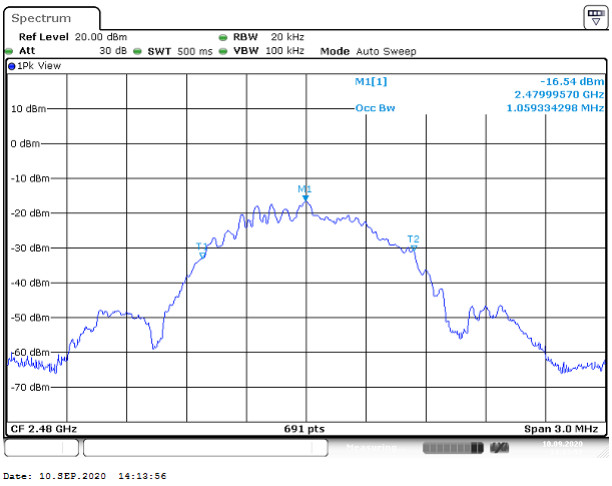
#### Low CH




#### Mid CH




#### High CH

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# 4.3 OUTPUT POWER MEASUREMENT

## 4.3.1 Test Limit

According to §15.247(b)(3)

**Peak output power**：

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

| | |
|---|---|
| Limit | ☒ Antenna not exceed 6 dBi：30dBm<br>☐ Antenna with DG greater than 6 dBi<br>[ Limit = 30 – (DG – 6) ]<br>☐ Point-to-point operation |

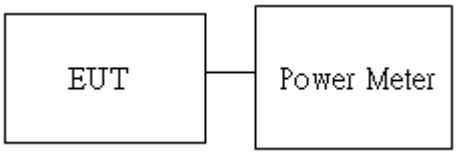
**Average output power**：For reporting purposes only.

## 4.3.2 Test Procedure

Test method Refer as KDB 558074 D01

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

## 4.3.3 Test Setup

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### 4.3.4 Test Result

**Temperature:** 24℃ **Humidity:** 50% RH

**Tested by:** Jane Wang **Test Date:** September 10, 2020

**Peak output power**：

| BLE Mode | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Config.** | **CH** | **Freq. (MHz)** | **Power setting** | **PK Power (dBm)** | **PK Power (W)** | **Ant. Gain (dBi)** | **Limit (dBm)** |
| BLE Data rate: 1Mbps | 0 | 2402 | Default | 2.40 | 0.0017 | -2.37 | 30 |
| | 19 | 2440 | Default | **2.48** | 0.0018 | | |
| | 39 | 2480 | Default | 2.20 | 0.0017 | | |

**Average output power**：

| BLE Mode | | | | |
|---|---|---|---|---|
| **Config.** | **CH** | **Freq. (MHz)** | **Power setting** | **AV Power (dBm)** |
| BLE Data rate: 1Mbps | 0 | 2402 | Default | 1.39 |
| | 19 | 2440 | Default | 1.74 |
| | 39 | 2480 | Default | 1.33 |

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# 4.4 POWER SPECTRAL DENSITY

## 4.4.1 Test Limit

According to §15.247(e)

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.

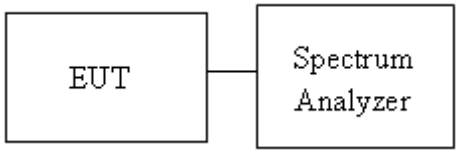
| | |
|---|---|
| Limit | ☒ Antenna not exceed 6 dBi：8dBm<br>☐ Antenna with DG greater than 6 dBi<br>[ Limit = 8 – (DG – 6) ]<br>☐ Point-to-point operation： |

## 4.4.2 Test Procedure

Test method Refer as KDB 558074 D01

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 30kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss was compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

## 4.4.3 Test Setup

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## 4.4.4 Test Result

**Temperature:** 24℃ **Humidity:** 50% RH

**Tested by:** Jane Wang

| Test mode: BLE mode / 2402-2480 MHz | | | |
|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **PSD (dBm)** | **IC/FCC limit (dBm)** |
| Low | 2402 | -17.61 | 8 |
| Mid | 2440 | -17.20 | |
| High | 2480 | -17.93 | |

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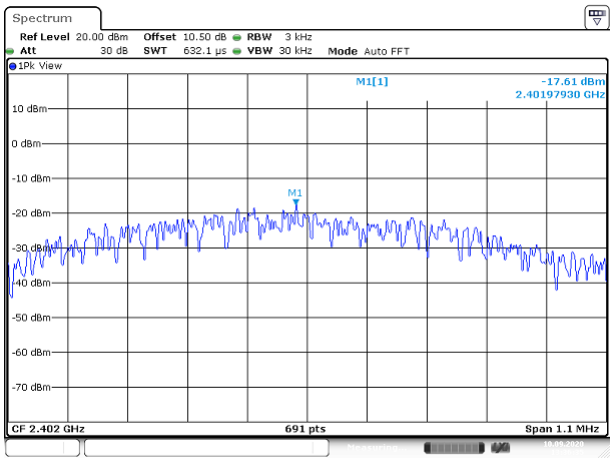
# Test Data

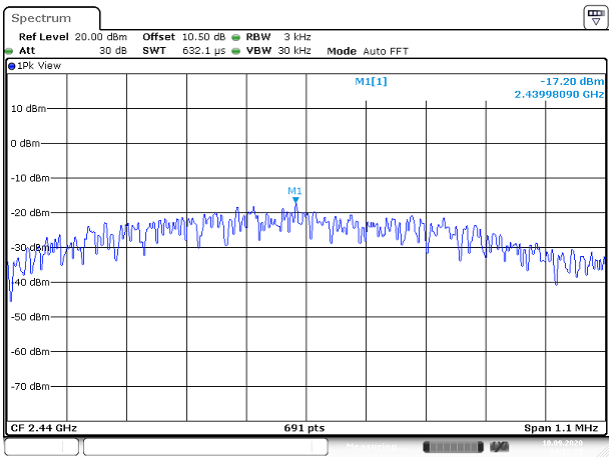
## BLE mode

### Low CH



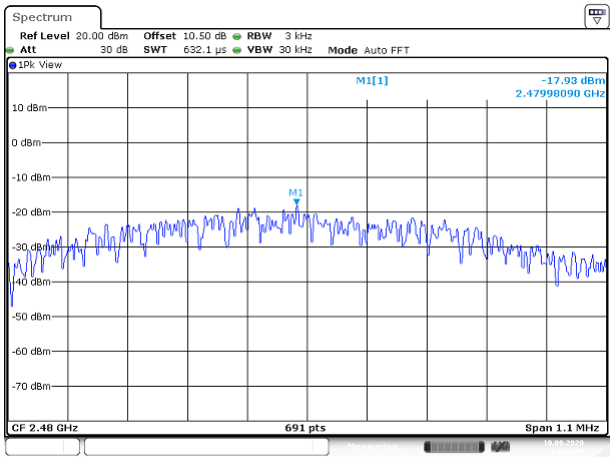

Date: 10.SEP.2020 13:36:35

### Mid CH




Date: 10.SEP.2020 14:12:29

### High CH




Date: 10.SEP.2020 14:18:30

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# 4.5 CONDUCTED BAND EDGE AND SPURIOUS EMISSION

## 4.5.1 Test Limit

According to §15.247(d)

In any 100 kHz bandwidth outside the authorized frequency band,

Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement 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).

## 4.5.2 Test Procedure

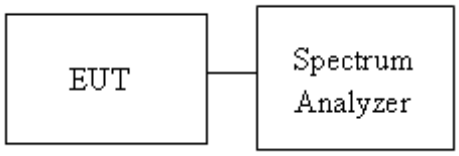
Test method Refer as KDB 558074 D01

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted 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.

## 4.5.3 Test Setup

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## 4.5.4 Test Result

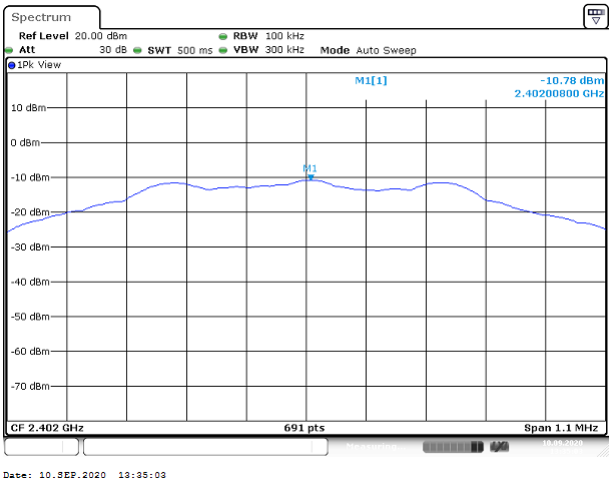
**Temperature:** 24℃ **Humidity:** 50% RH

**Tested by:** Jane Wang

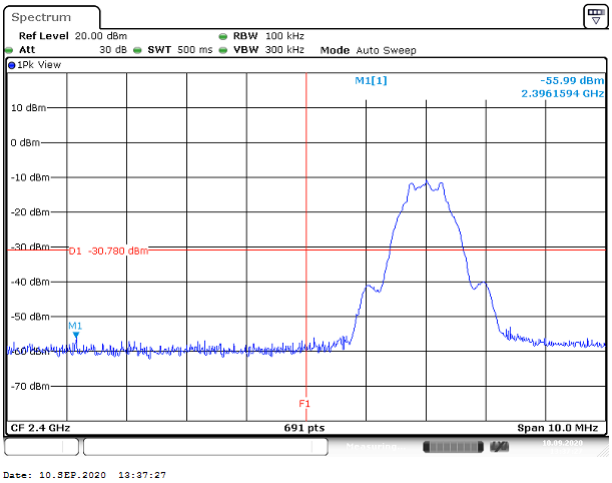
## Test Data

**BLE mode Low CH**

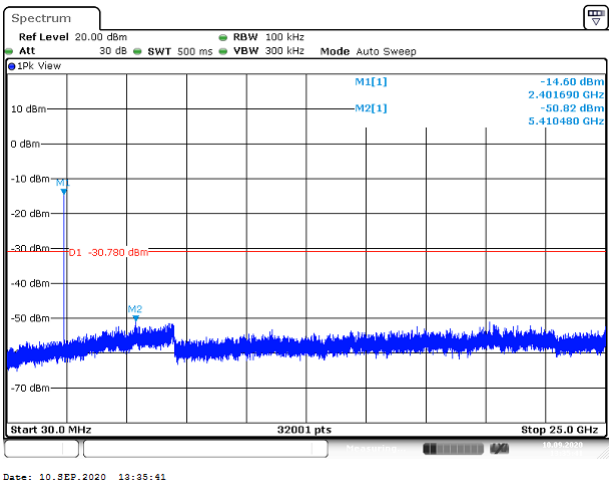
**Reference Level of PSD in 100kHz**




**Band Edge**




**Spurious Emission 30MHz-25GHz**

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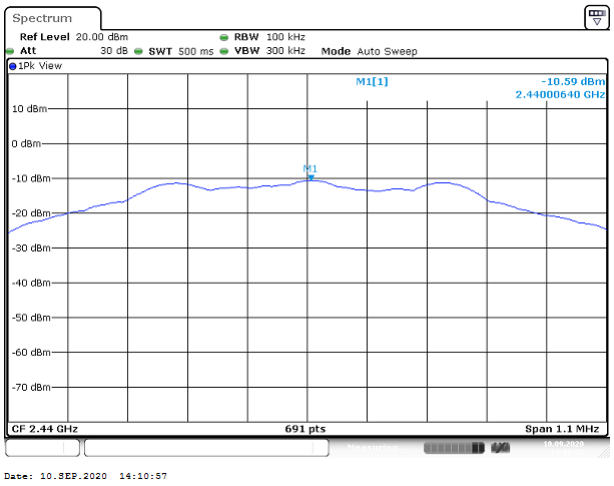
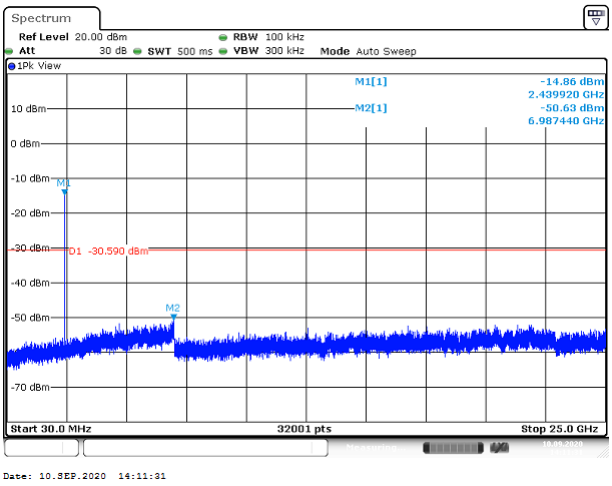
| BLE mode Mid CH | |
|---|---|
| **Reference Level of PSD in 100kHz** | **Spurious Emission 30MHz-25GHz** |
|   |   |

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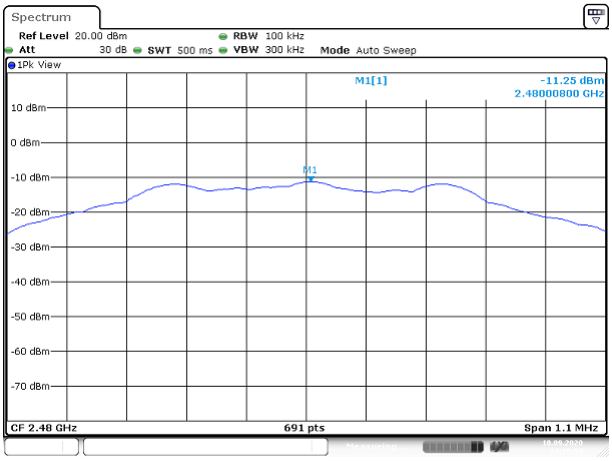
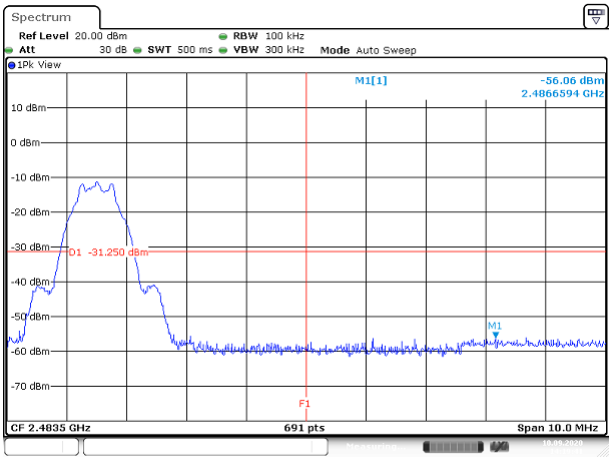
## BLE mode High CH

### Reference Level of PSD in 100kHz



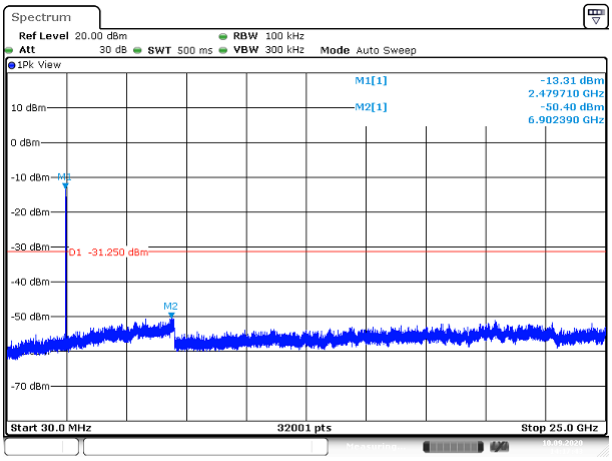

Date: 10.SEP.2020 14:15:59

### Band Edge




Date: 10.SEP.2020 14:19:41

### Spurious Emission 30MHz-25GHz




Date: 10.SEP.2020 14:17:43

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# 4.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

## 4.6.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

**Below 30 MHz**

| Frequency | Field Strength (microvolts/m) | Magnetic H-Field (microamperes/m) | Measurement Distance (metres) |
|---|---|---|---|
| 9-490 kHz | 2,400/F (F in kHz) | 2,400/F (F in kHz) | 300 |
| 490-1,705 kHz | 24,000/F (F in kHz) | 24,000/F (F in kHz) | 30 |
| 1.705-30 MHz | 30 | N/A | 30 |

**Above 30 MHz**

| Frequency (MHz) | Field Strength microvolts/m at 3 metres (watts, e.i.r.p.) | |
|---|---|---|
| | Transmitters | Receivers |
| 30-88 | 100 (3 nW) | 100 (3 nW) |
| 88-216 | 150 (6.8 nW) | 150 (6.8 nW) |
| 216-960 | 200 (12 nW) | 200 (12 nW) |
| Above 960 | 500 (75 nW) | 500 (75 nW) |

Remark:
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

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### 4.6.2 Test Procedure

Test method Refer as KDB 558074 D01

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 9KHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

4. No emission found between lowest internal used/generated frequency to 30MHz (9KHz~30MHz)

Remark:

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

5. The SA setting following：

(1) Below 1G：RBW = 100kHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2) Above 1G：

(2.1) For Peak measurement：RBW = 1MHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2.2) For Average measurement：RBW = 1MHz, VBW

˙If Duty Cycle ≥ 98%, VBW=10Hz.

˙If Duty Cycle < 98%, VBW=1/T.

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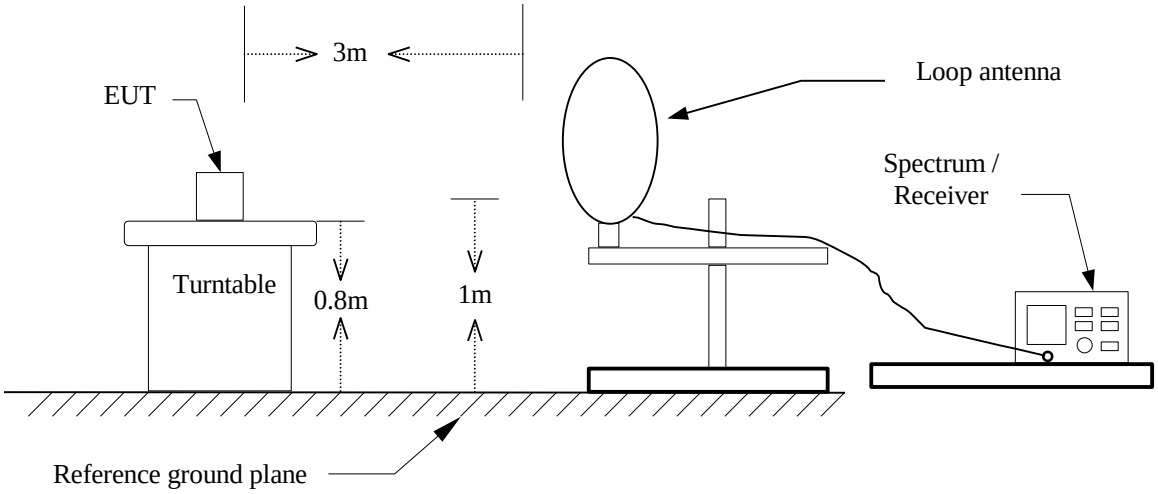
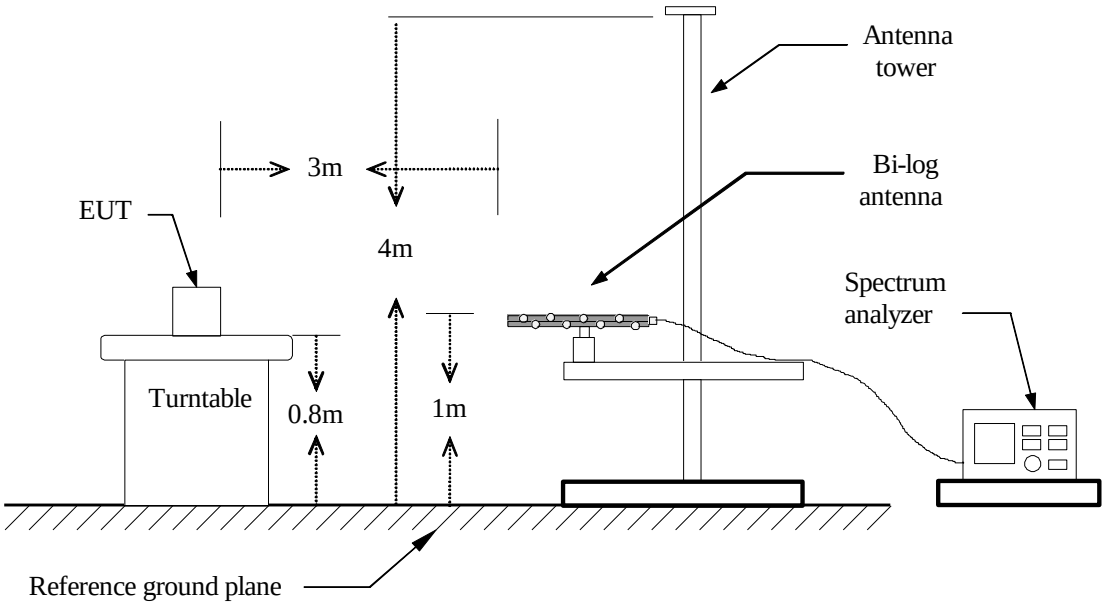
### 4.6.3 Test Setup

**9kHz ~ 30MHz**




**30MHz ~ 1GHz**

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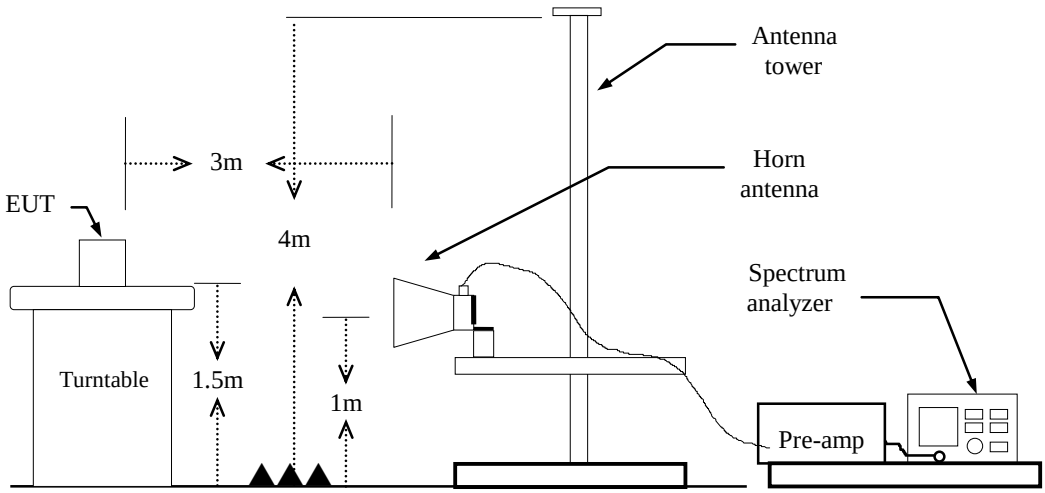
**Above 1 GHz**

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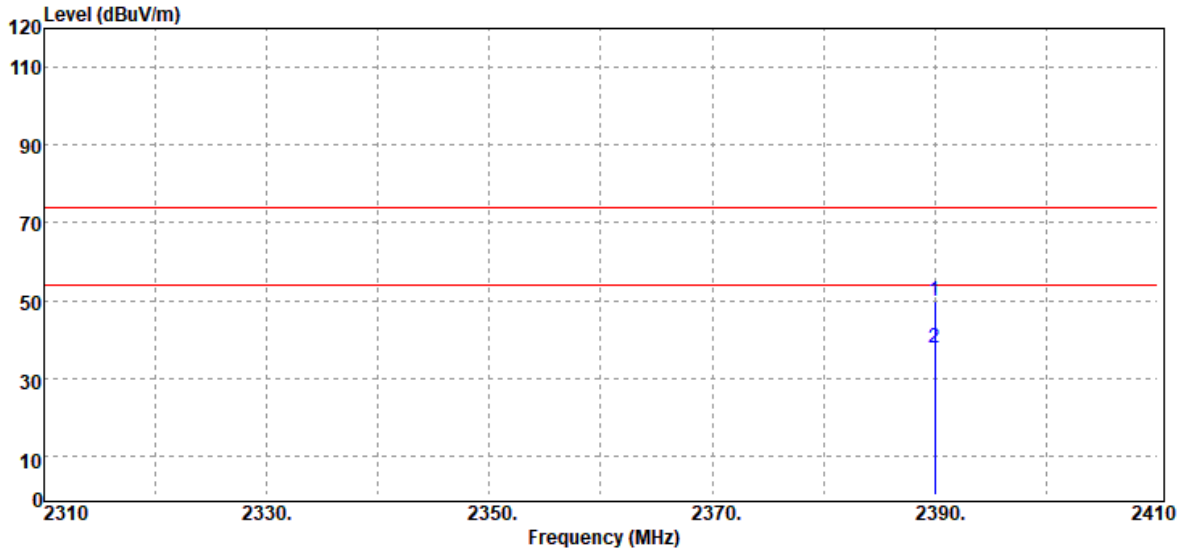
## 4.6.4 Test Result

**Band Edge Test Data**

| Test Mode: | BLE Low CH | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | September 11, 2020 |
| Polarize | Vertical | Test Engineer | Jerry Chang |
| Detector | Peak / Average | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2390.00 | Peak | 52.85 | -3.17 | 49.68 | 74.00 | -24.32 |
| 2390.00 | Average | 40.88 | -3.17 | 37.71 | 54.00 | -16.29 |

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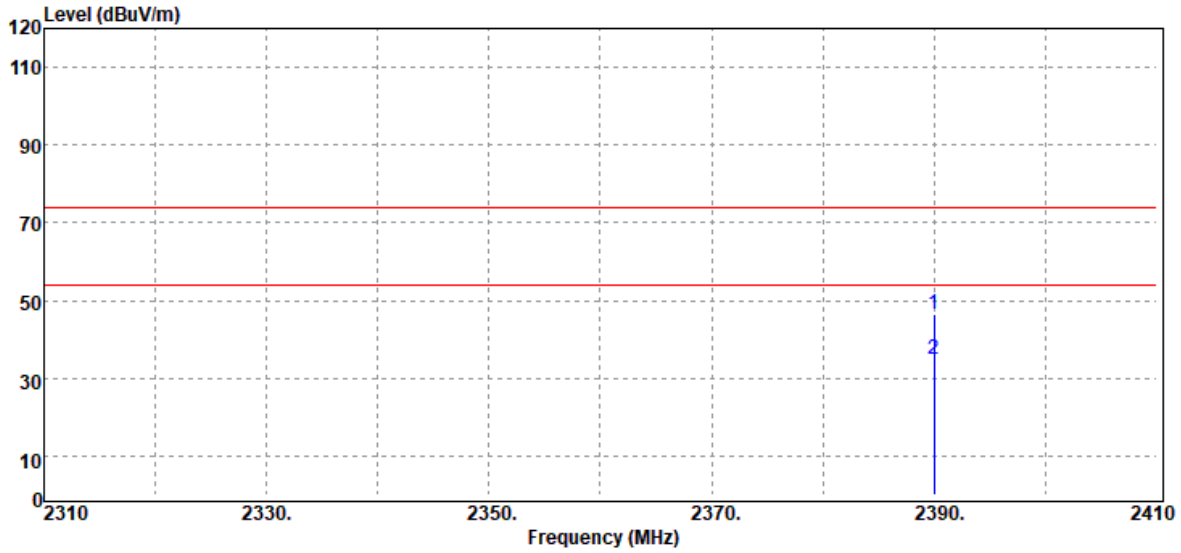
| Test Mode: | BLE Low CH | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | September 11, 2020 |
| Polarize | Horizontal | Test Engineer | Jerry Chang |
| Detector | Peak / Average | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2390.00 | Peak | 49.71 | -3.17 | 46.54 | 74.00 | -27.46 |
| 2390.00 | Average | 37.87 | -3.17 | 34.70 | 54.00 | -19.30 |

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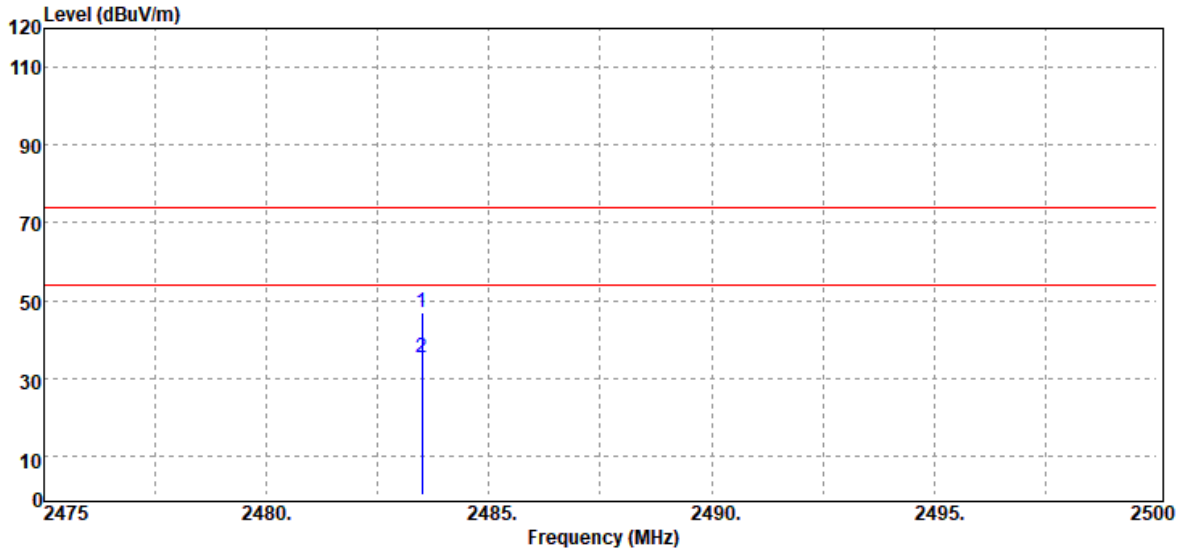
| Test Mode: | BLE High CH | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | September 11, 2020 |
| Polarize | Vertical | Test Engineer | Jerry Chang |
| Detector | Peak / Average | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2483.50 | Peak | 49.73 | -2.71 | 47.02 | 74.00 | -26.98 |
| 2483.50 | Average | 38.03 | -2.71 | 35.32 | 54.00 | -18.68 |

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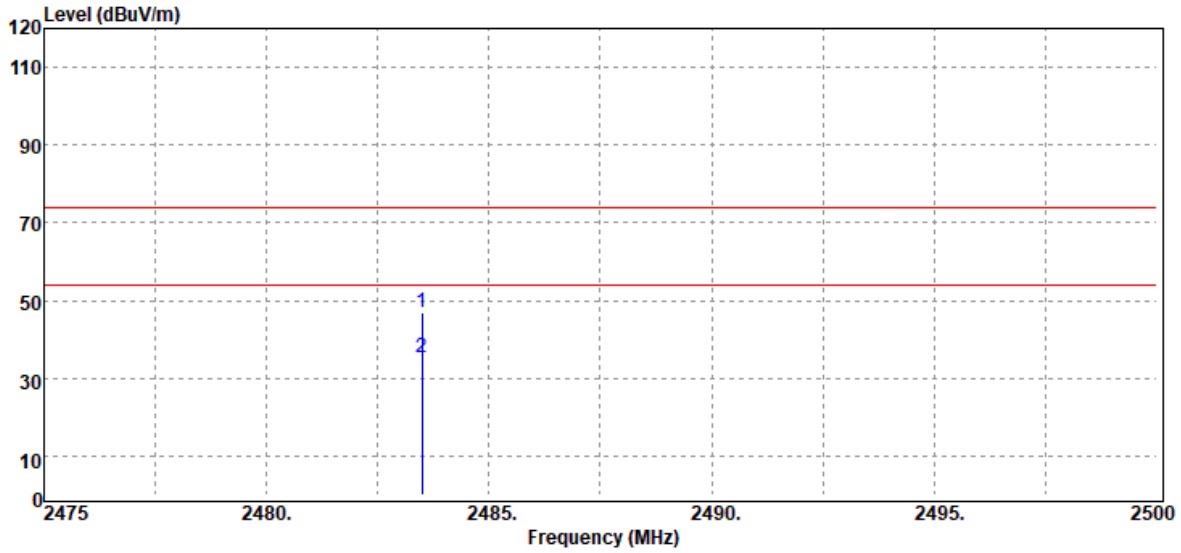
| Test Mode: | BLE High CH | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | September 11, 2020 |
| Polarize | Horizontal | Test Engineer | Jerry Chang |
| Detector | Peak / Average | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 2483.50 | Peak | 49.74 | -2.71 | 47.03 | 74.00 | -26.97 |
| 2483.50 | Average | 37.94 | -2.71 | 35.23 | 54.00 | -18.77 |

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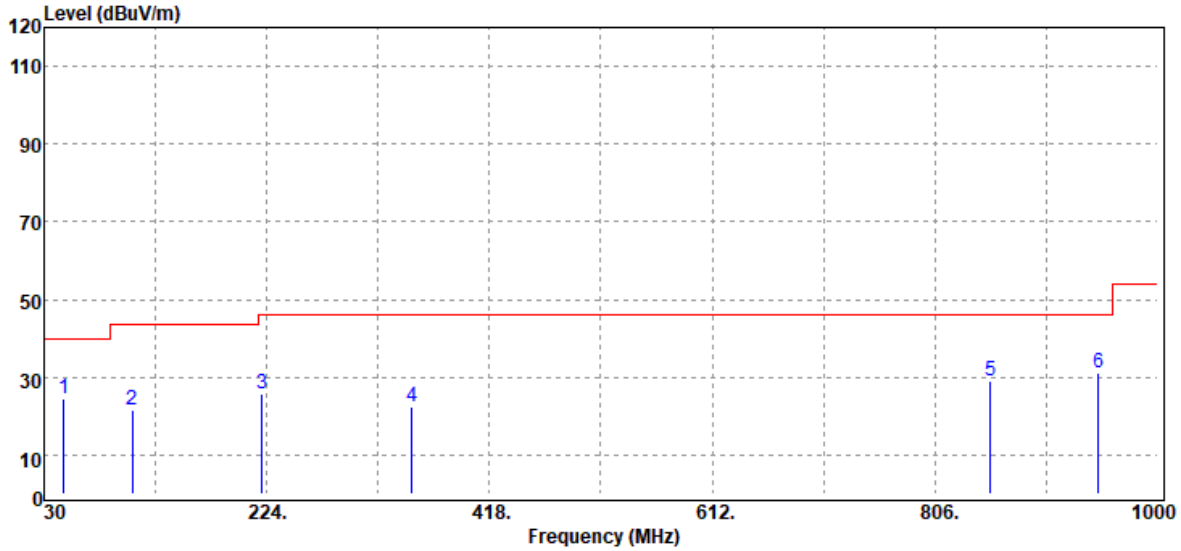
## Below 1G Test Data

| Test Mode: | Mode 1 | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | 30MHz-1GHz | Test Date | September 11, 2020 |
| Polarize | Vertical | Test Engineer | Jerry Chang |
| Detector | Peak | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 47.46 | Peak | 38.92 | -14.32 | 24.60 | 40.00 | -15.40 |
| 106.63 | Peak | 32.49 | -11.05 | 21.44 | 43.50 | -22.06 |
| 220.12 | Peak | 37.47 | -11.74 | 25.73 | 46.00 | -20.27 |
| 350.10 | Peak | 29.77 | -7.28 | 22.49 | 46.00 | -23.51 |
| 854.50 | Peak | 26.65 | 2.39 | 29.04 | 46.00 | -16.96 |
| 948.59 | Peak | 26.65 | 4.34 | 30.99 | 46.00 | -15.01 |

**Note:** No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

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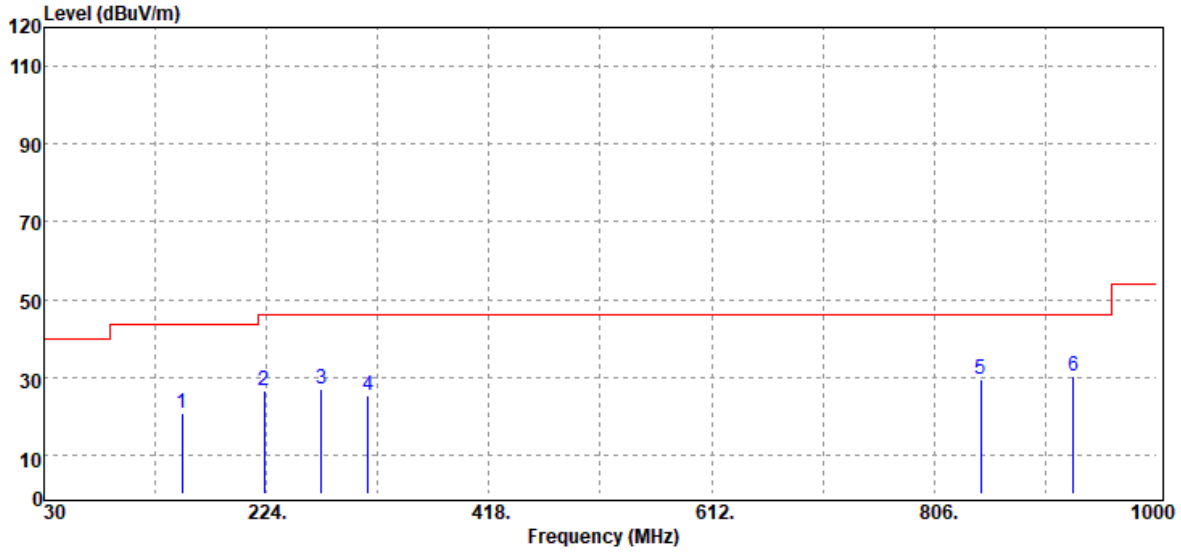
| Test Mode: | Mode 1 | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | 30MHz-1GHz | Test Date | September 11, 2020 |
| Polarize | Horizontal | Test Engineer | Jerry Chang |
| Detector | Peak | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 150.28 | Peak | 31.07 | -10.39 | 20.68 | 43.50 | -22.82 |
| 222.06 | Peak | 38.08 | -11.63 | 26.45 | 46.00 | -19.55 |
| 271.53 | Peak | 36.08 | -8.91 | 27.17 | 46.00 | -18.83 |
| 312.27 | Peak | 33.47 | -8.12 | 25.35 | 46.00 | -20.65 |
| 846.74 | Peak | 27.18 | 2.47 | 29.65 | 46.00 | -16.35 |
| 927.25 | Peak | 26.71 | 3.46 | 30.17 | 46.00 | -15.83 |

**Note:** No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

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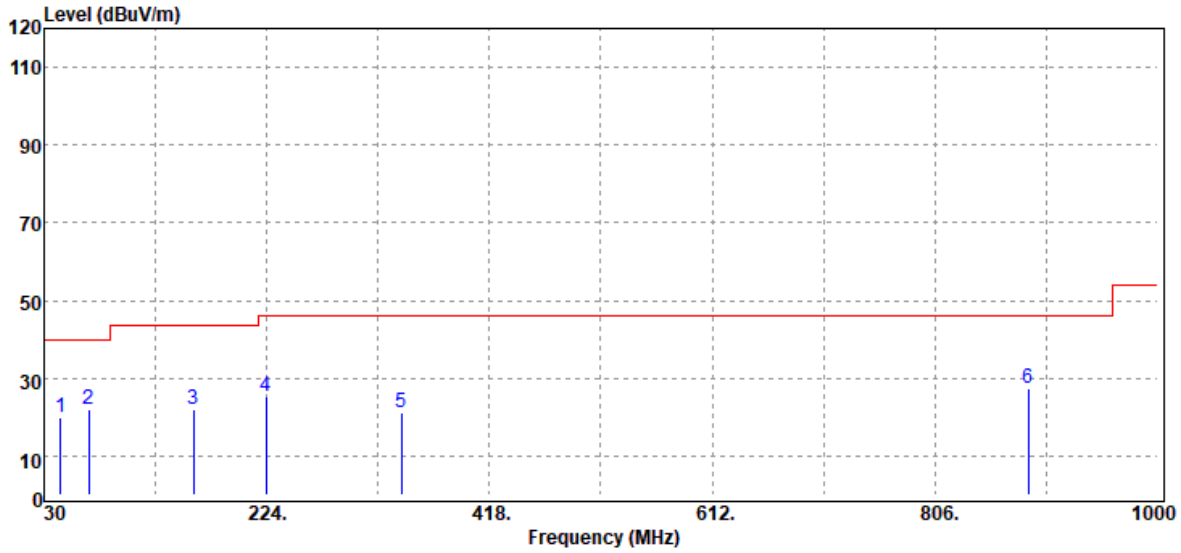
| Test Mode: | Mode 2 | Temp/Hum | 25.0(℃)/ 42%RH |
|---|---|---|---|
| Test Item | 30MHz-1GHz | Test Date | September 18, 2020 |
| Polarize | Vertical | Test Engineer | Jerry Chang |
| Detector | Peak | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 44.55 | Peak | 32.79 | -12.85 | 19.94 | 40.00 | -20.06 |
| 68.80 | Peak | 36.98 | -15.06 | 21.92 | 40.00 | -18.08 |
| 159.98 | Peak | 32.39 | -10.20 | 22.19 | 43.50 | -21.31 |
| 223.03 | Peak | 36.87 | -11.58 | 25.29 | 46.00 | -20.71 |
| 341.37 | Peak | 28.90 | -7.71 | 21.19 | 46.00 | -24.81 |
| 887.48 | Peak | 24.61 | 2.68 | 27.29 | 46.00 | -18.71 |

**Note:** No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

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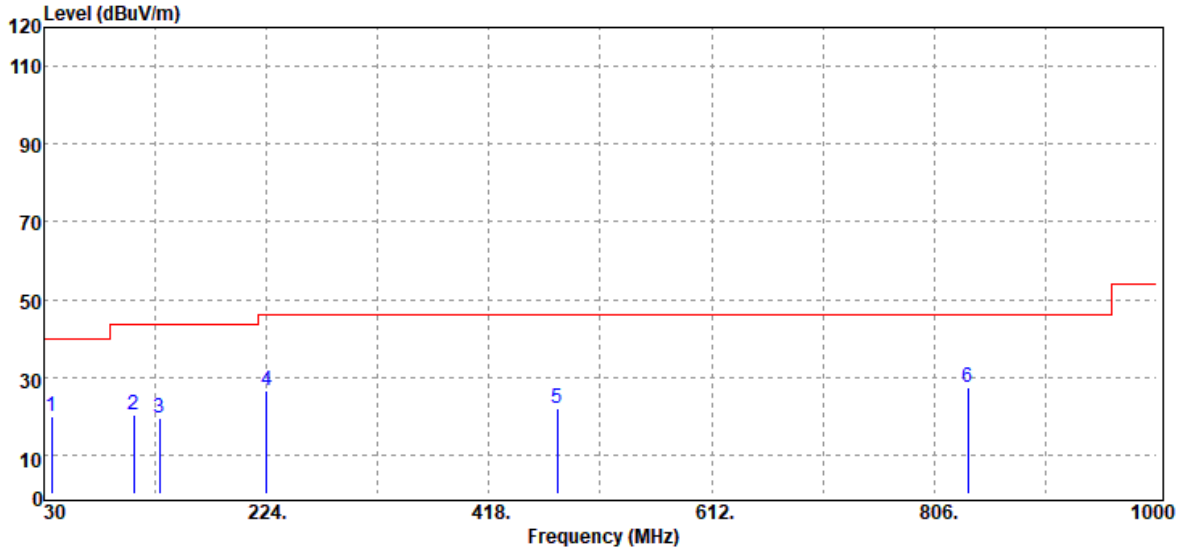
| Test Mode: | Mode 2 | Temp/Hum | 25.0(℃)/ 42%RH |
|---|---|---|---|
| Test Item | 30MHz-1GHz | Test Date | September 18, 2020 |
| Polarize | Horizontal | Test Engineer | Jerry Chang |
| Detector | Peak | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 36.79 | Peak | 27.38 | -7.36 | 20.02 | 40.00 | -19.98 |
| 108.57 | Peak | 30.97 | -10.80 | 20.17 | 43.50 | -23.33 |
| 130.88 | Peak | 28.61 | -9.16 | 19.45 | 43.50 | -24.05 |
| 224.00 | Peak | 38.28 | -11.52 | 26.76 | 46.00 | -19.24 |
| 477.17 | Peak | 25.57 | -3.43 | 22.14 | 46.00 | -23.86 |
| 835.10 | Peak | 25.26 | 2.13 | 27.39 | 46.00 | -18.61 |

**Note:** No emission found between lowest internal used/generated frequency to 30MHz(9KHz~30MHz)

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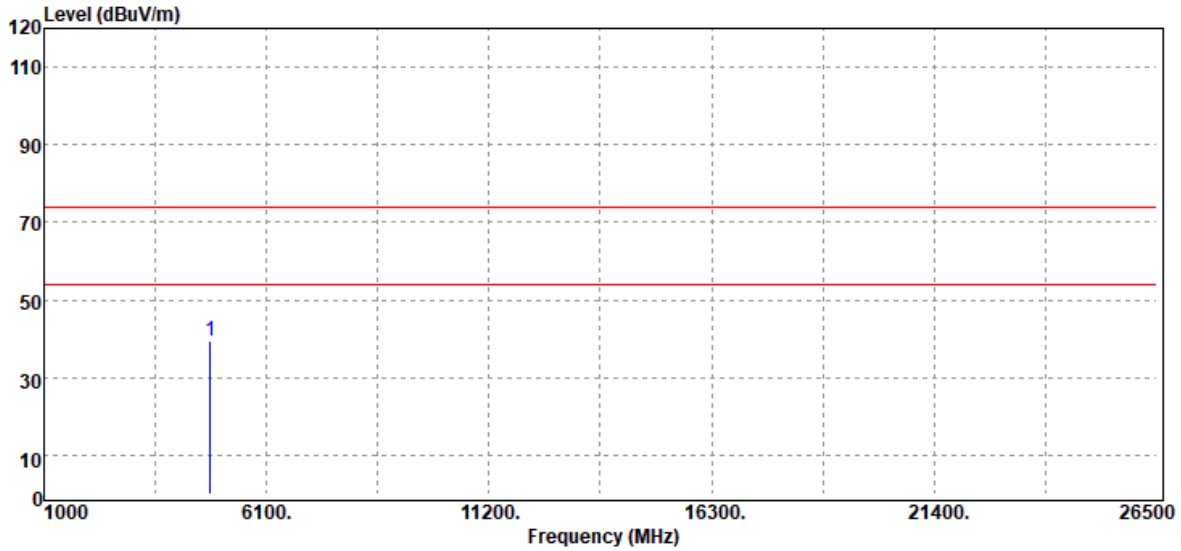
**Above 1G Test Data**

| Test Mode: | BLE Low CH | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | September 11, 2020 |
| Polarize | Vertical | Test Engineer | Jerry Chang |
| Detector | Peak | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4804.00 | Peak | 36.12 | 3.36 | 39.48 | 74.00 | -34.52 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit

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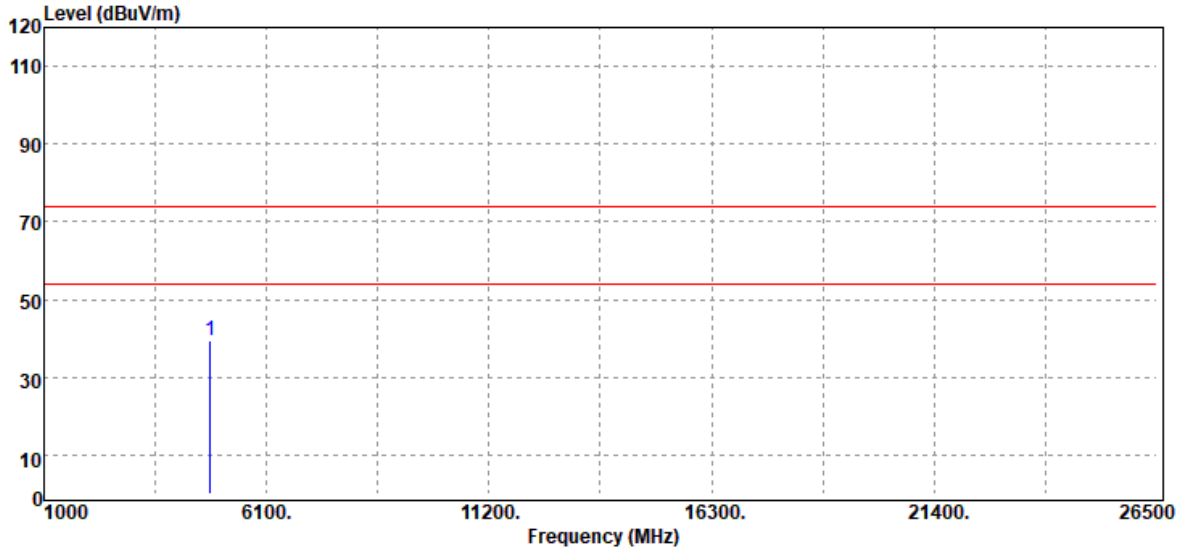
| Test Mode: | BLE Low CH | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | September 11, 2020 |
| Polarize | Horizontal | Test Engineer | Jerry Chang |
| Detector | Peak | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4804.00 | Peak | 36.18 | 3.36 | 39.54 | 74.00 | -34.46 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit

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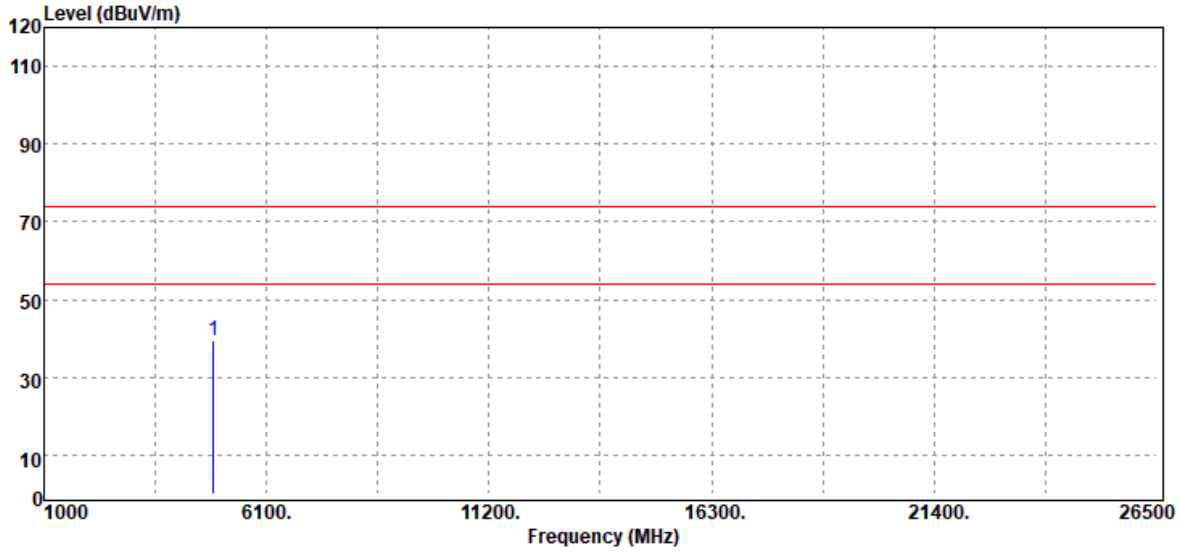
| Test Mode: | BLE Mid CH | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | September 11, 2020 |
| Polarize | Vertical | Test Engineer | Jerry Chang |
| Detector | Peak | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4880.00 | Peak | 36.01 | 3.51 | 39.52 | 74.00 | -34.48 |
| N/A | | | | | | |
| | | | | | | |
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**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit

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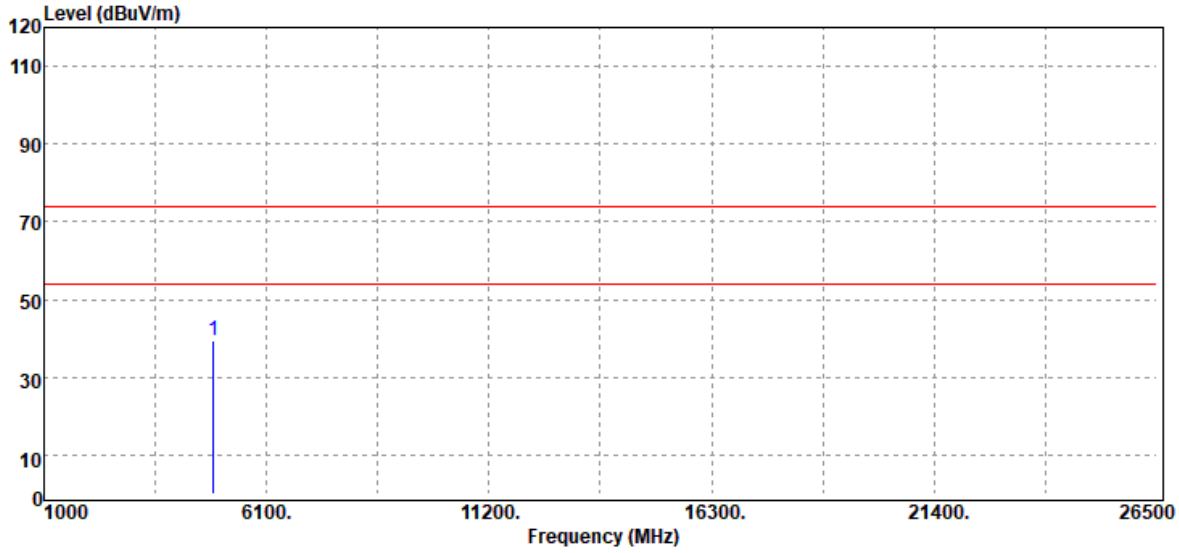
| Test Mode: | BLE Mid CH | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | September 11, 2020 |
| Polarize | Horizontal | Test Engineer | Jerry Chang |
| Detector | Peak | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4880.00 | Peak | 36.04 | 3.51 | 39.55 | 74.00 | -34.45 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit

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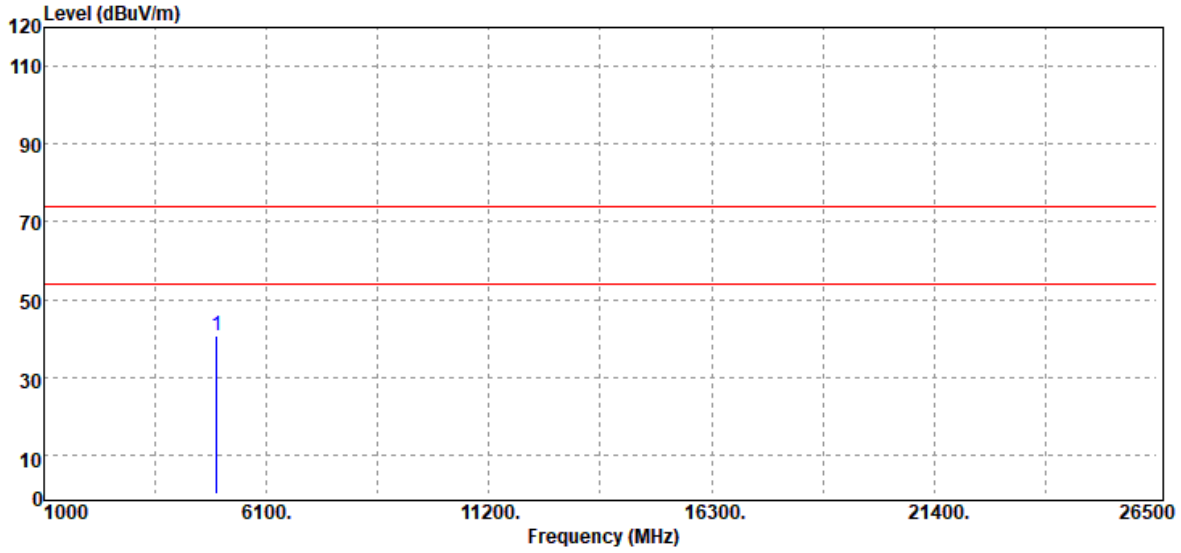
| Test Mode: | BLE High CH | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | September 11, 2020 |
| Polarize | Vertical | Test Engineer | Jerry Chang |
| Detector | Peak | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4960.00 | Peak | 36.36 | 4.46 | 40.82 | 74.00 | -33.18 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit

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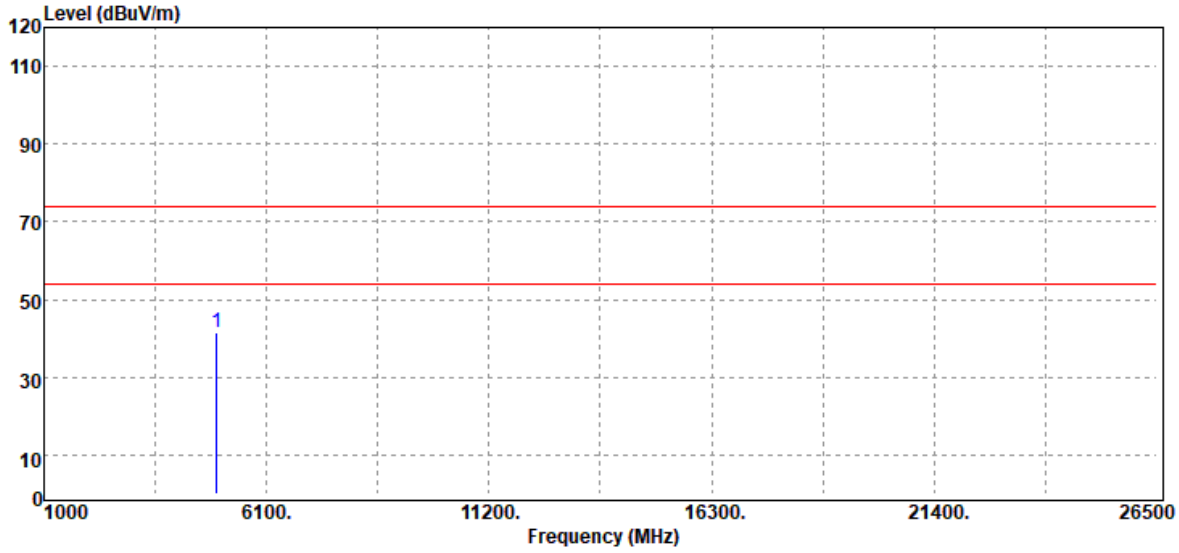
| Test Mode: | BLE High CH | Temp/Hum | 22.5(℃)/ 59%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | September 11, 2020 |
| Polarize | Horizontal | Test Engineer | Jerry Chang |
| Detector | Peak | | |




| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|---|---|---|---|---|---|---|
| 4960.00 | Peak | 37.07 | 4.46 | 41.53 | 74.00 | -32.47 |
| N/A | | | | | | |
| | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit

**--End of Test Report--**

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