

MEASUREMENT REPORT

FCC PART 15.247 Bluetooth-LE

FCC ID: XMR2021SC20AD
Applicant: Quectel Wireless Solutions Co., Ltd
Application Type: Certification
Product: LTE Module
Model No.: SC20-AD
Brand Name: Quectel
FCC Classification: Digital Transmission System (DTS)
FCC Rule Part(s): Part15 Subpart C (Section 15.247)
Test Procedure(s): ANSI C63.10-2013, KDB 558074 D01v05r02
Test Date: December 21 ~ 27, 2021

Reviewed By:

Sunny Sun

Approved By:

Robin Wu



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

| Report No. | Version | Description | Issue Date | Note |
|---------------|---------|----------------|------------|-------|
| 2112RSU024-U2 | Rev. 01 | Initial Report | 01-13-2022 | Valid |
| | | | | |

Note: For the difference between FCC IDs “XMR2021SC20AD” and “XMR201706SC20A”, “XMR2021SC20AD” disabled WCDMA, GSM and voice part via software and removed some small RF components which are used in WCDMA and GSM. This report is based on “XMR201706SC20A” original report to supplement the spot check related test items with worst mode.

CONTENTS

| Description | Page |
|---|-----------|
| 1. GENERAL INFORMATION | 5 |
| 1.1. Applicant | 5 |
| 1.2. Manufacturer | 5 |
| 1.3. Testing Facility | 5 |
| 1.4. Product Information | 6 |
| 1.5. RF Specification | 6 |
| 1.6. Working Frequencies for this report..... | 7 |
| 1.7. Description of Available Antennas | 错误!未定义书签。 |
| 2. TEST CONFIGURATION | 8 |
| 2.1. Test Mode..... | 8 |
| 2.2. Configuration of Test System | 8 |
| 2.3. Test Software | 8 |
| 2.4. Test Environment Condition | 8 |
| 3. ANTENNA REQUIREMENTS..... | 9 |
| 4. TEST EQUIPMENT CALIBRATION DATE..... | 10 |
| 5. MEASUREMENT UNCERTAINTY | 12 |
| 6. TEST RESULT | 13 |
| 6.1. Summary..... | 13 |
| 6.2. Output Power Measurement..... | 14 |
| 6.2.1. Test Limit | 14 |
| 6.2.2. Test Procedure Used | 14 |
| 6.2.3. Test Setting..... | 14 |
| 6.2.4. Test Setup | 15 |
| 6.2.5. Test Result..... | 16 |
| 6.3. Radiated Spurious Emission Measurement..... | 17 |
| 6.3.1. Test Limit | 17 |
| 6.3.2. Test Procedure Used | 17 |
| 6.3.3. Test Setting..... | 17 |
| 6.3.4. Test Setup | 19 |
| 6.3.5. Test Result..... | 20 |
| 6.4. Radiated Restricted Band Edge Measurement..... | 23 |
| 6.4.1. Test Limit | 23 |
| 6.4.2. Test Procedure Used | 24 |
| 6.4.3. Test Setting..... | 24 |

| | | |
|---|------------------|-----------|
| 6.4.4. | Test Setup | 25 |
| 6.4.5. | Test Result..... | 26 |
| Appendix A - Test Setup Photograph | | 30 |
| Appendix B - EUT Photograph..... | | 31 |

1. GENERAL INFORMATION

1.1. Applicant

Quectel Wireless Solutions Co., Ltd
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District,
Shanghai, China 200233

1.2. Manufacturer

Quectel Wireless Solutions Co., Ltd
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District,
Shanghai, China 200233

1.3. Testing Facility

| | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Test Site – MRT Suzhou Laboratory |
| | Laboratory Location (Suzhou – Wuzhong) D8 Building, No.2 Tian’edang Rd., Wuzhong Economic Development Zone, Suzhou, China |
| | Laboratory Location (Suzhou – SIP) 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China |
| | Laboratory Accreditations |
| | A2LA: 3628.01 CNAS: L10551 |
| | FCC: CN1166 ISED: CN0001 |
| | VCCI: <input type="checkbox"/> R-20025 <input type="checkbox"/> G-20034 <input type="checkbox"/> C-20020 <input type="checkbox"/> T-20020 |
| | <input type="checkbox"/> R-20141 <input type="checkbox"/> G-20134 <input type="checkbox"/> C-20103 <input type="checkbox"/> T-20104 |
| <input type="checkbox"/> | Test Site – MRT Shenzhen Laboratory |
| | Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China |
| | Laboratory Accreditations |
| | A2LA: 3628.02 CNAS: L10551 |
| | FCC: CN1284 ISED: CN0105 |
| <input type="checkbox"/> | Test Site – MRT Taiwan Laboratory |
| | Laboratory Location (Taiwan) No. 38, Fuxing 2 nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) |
| | Laboratory Accreditations |
| | TAF: L3261-190725 |
| | FCC: 291082, TW3261 ISED: TW3261 |

1.4. Product Information

| | |
|---|---------------------------------|
| Product Name | LTE Module |
| Model No. | SC20-AD |
| Serial No. | D1Y21L22E000063 |
| Brand Name | Quectel |
| Operating Temperature | -35 ~ 75°C |
| Wi-Fi Specification | 802.11a/b/g/n |
| Bluetooth Specification | V4.1 dual mode |
| E-UTRA Band | Band 2, 4, 5, 7, 12, 13, 25, 26 |
| Note: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer. | |

1.5. RF Specification

| | |
|---------------------|----------------------------------|
| Frequency Range | 2402~2480MHz |
| Channel Number | 40 |
| Type of Modulation | GFSK |
| Data Rate | 1Mbps |
| Antenna Information | Dipole Antenna with gain 3.0 dBi |

Note: For other features of this EUT, test report will be issued separately.

1.6. Working Frequencies for this report

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|---------|-----------|
| 00 | 2402 MHz | 01 | 2404 MHz | 02 | 2406 MHz |
| 03 | 2408 MHz | 04 | 2410 MHz | 05 | 2412 MHz |
| 06 | 2414 MHz | 07 | 2416 MHz | 08 | 2418 MHz |
| 09 | 2420 MHz | 10 | 2422 MHz | 11 | 2424 MHz |
| 12 | 2426 MHz | 13 | 2428 MHz | 14 | 2430 MHz |
| 15 | 2432 MHz | 16 | 2434 MHz | 17 | 2436 MHz |
| 18 | 2438 MHz | 19 | 2440 MHz | 20 | 2442 MHz |
| 21 | 2444 MHz | 22 | 2446 MHz | 23 | 2448 MHz |
| 24 | 2450 MHz | 25 | 2452 MHz | 26 | 2454 MHz |
| 27 | 2456 MHz | 28 | 2458 MHz | 29 | 2460 MHz |
| 30 | 2462 MHz | 31 | 2464 MHz | 32 | 2466 MHz |
| 33 | 2468 MHz | 34 | 2470 MHz | 35 | 2472 MHz |
| 36 | 2474 MHz | 37 | 2476 MHz | 38 | 2478 MHz |
| 39 | 2480 MHz | -- | -- | -- | -- |

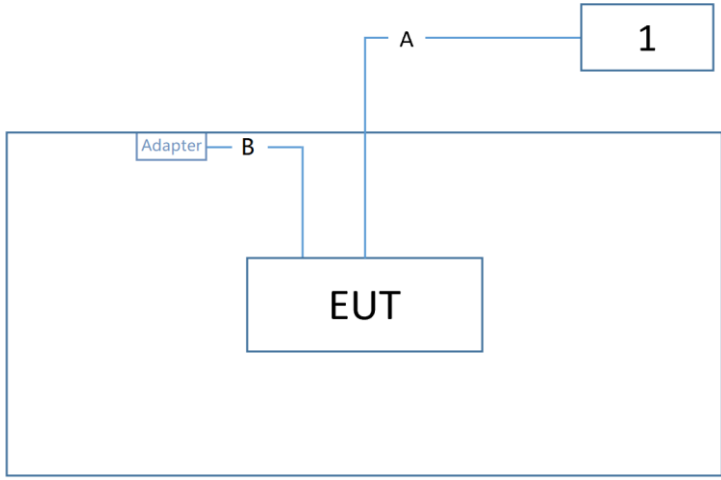
2. TEST CONFIGURATION

2.1. Test Mode

| | |
|-----------|-------------------------------|
| Test Mode | Mode 1: Transmit by BLE-1Mbps |
|-----------|-------------------------------|

2.2. Configuration of Test System

The measurement procedures and appropriate EUT setup described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) was used in the measurement.

| Connection Diagram | | | |
|---|-------------|--------------------|-----------|
|  | | | |
| Cable Type | | Cable Description | |
| A | USB Cable | Shielding, 1m | |
| B | Power Cable | Non shielded, 1.1m | |
| Product | | Manufacturer | Model No. |
| 1 | Notebook | HP | TPN-I125 |

2.3. Test Software

The test utility software used during testing was “QRCT.exe”, and the version was 3.0.268.0. Power parameter value refers to operation description.

2.4. Test Environment Condition

| | |
|---------------------|------------|
| Ambient Temperature | 15 ~ 35°C |
| Relative Humidity | 20 ~ 75%RH |

3. ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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.”

Conclusion:

The unit complies with the requirement of §15.203.

4. TEST EQUIPMENT CALIBRATION DATE

Radiated Emission (WZ-AC1)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|----------------------------|--------------|-------------|-------------|----------------|----------------|
| EMI Test Receiver | R&S | ESR7 | MRTSUE06001 | 1 year | 2022/01/04 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2022/10/28 |
| Bilog Period Antenna | Schwarzbeck | VULB 9168 | MRTSUE06172 | 1 year | 2022/08/05 |
| Horn Antenna | Schwarzbeck | BBHA 9120D | MRTSUE06023 | 1 year | 2022/9/16 |
| Horn Antenna | Schwarzbeck | BBHA9170 | MRTSUE06597 | 1 year | 2022/12/01 |
| Microwave System Amplifier | Agilent | 83017A | MRTSUE06076 | 1 year | 2022/11/12 |
| Preamplifier | Schwarzbeck | BBV 9721 | MRTSUE06121 | 1 year | 2022/06/10 |
| Thermal Hygrometer | testo | 608-H1 | MRTSUE06403 | 1 year | 2022/06/28 |
| Anechoic Chamber | TDK | Chamber-AC1 | MRTSUE06212 | 1 year | 2022/04/29 |

Radiated Emission (WZ-AC2)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|-----------------------------------|--------------|-------------|-------------|----------------|----------------|
| MXE EMI Receiver | Keysight | N9038A | MRTSUE06125 | 1 year | 2022/06/24 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | MRTSUE06025 | 1 year | 2022/10/28 |
| Bilog Period Antenna | Schwarzbeck | VULB 9162 | MRTSUE06022 | 1 year | 2022/05/24 |
| Broad-Band Horn Antenna | Schwarzbeck | BBHA 9120D | MRTSUE06171 | 1 year | 2022/10/21 |
| Horn Antenna | Schwarzbeck | BBHA9170 | MRTSUE06597 | 1 year | 2022/12/01 |
| Broadband Coaxial Preamplifier | Schwarzbeck | BBV 9718 | MRTSUE06176 | 1 year | 2022/11/12 |
| Thermal Hygrometer | Minggao | ETH529 | MRTSUE06170 | 1 year | 2022/12/01 |
| Anechoic Chamber | RIKEN | Chamber-AC2 | MRTSUE06213 | 1 year | 2022/04/29 |

Conducted Test Equipment (WZ-TR3)

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|--------------------------------|--------------|-------------|-------------|----------------|----------------|
| EXA Signal Analyzer | Agilent | N9020A | MRTSUE06106 | 1 year | 2022/04/13 |
| EXA Signal Analyzer | Keysight | N9010B | MRTSUE06607 | 1 year | 2022/01/06 |
| Power Meter | Agilent | U2021XA | MRTSUE06030 | 1 year | 2022/10/10 |
| USB wideband power sensor | Keysight | U2021XA | MRTSUE06446 | 1 year | 2022/06/08 |
| USB wideband power sensor | Keysight | U2021XA | MRTSUE06447 | 1 year | 2022/06/08 |
| Bluetooth Test Set | Anritsu | MT8852B-042 | MRTSUE06389 | 1 year | 2022/06/08 |
| Modulation Analyzer | HP | HP8901A | MRTSUE06098 | 1 year | 2022/09/12 |
| DC Power Supply | GWINSTEK | DPS-3303C | MRTSUE06064 | N/A | N/A |
| Temperature & Humidity Chamber | BAOYT | BYH-150CL | MRTSUE06051 | 1 year | 2022/10/10 |
| Thermal Hygrometer | testo | 608-H1 | MRTSUE06401 | 1 year | 2022/06/28 |

| Software | Version | Function |
|--------------|---------|-------------------|
| EMI Software | V3 | EMI Test Software |

5. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

| Radiated Disturbance |
|---|
| Measurement Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): Horizontal: 9KHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~6GHz: 6.40dB Vertical: 9KHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB |
| Output Power |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 1.13dB |

6. TEST RESULT

6.1. Summary

| FCC Part Section(s) | Test Description | Test Condition | Test Result | Reference |
|---------------------|---|----------------|-------------|------------------|
| 15.247(b)(1) | Output Power | Conducted | Pass | Section 6.2 |
| 15.205, 15.209 | General Field Strength (Restricted Bands and Radiated Emission) | Radiated | Pass | Section 6.3, 6.4 |

Notes:

- 1) The test results shown in the following sections represent the worst-case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.

6.2. Output Power Measurement

6.2.1. Test Limit

The maximum out power shall be less 1 Watt (30dBm) and the E.I.R.P shall not exceed 4 Watt (36dBm).

The conducted output power limit specified in paragraph FCC Part 15.247(b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. 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 FCC Part 15.247(b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

6.2.2. Test Procedure Used

ANSI C63.10-2013 - Section 11.9.1.3 PKPM1 Peak-reading power meter method

ANSI C63.10-2013 - Section 11.9.2.3.2 Method AVGPM-G

6.2.3. Test Setting

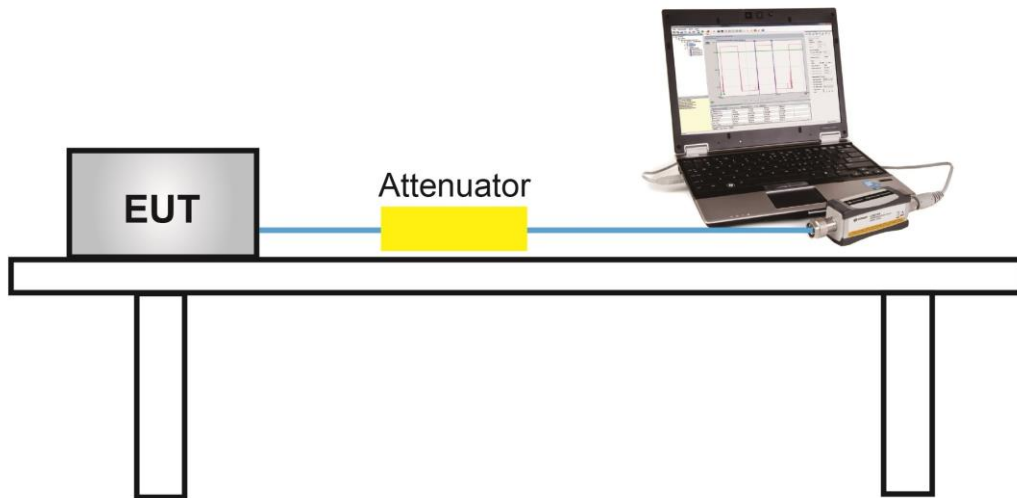
Method PKPM1 (Peak power measurement)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Method AVGPM-G (Measurement using a gated RF average-reading power meter)

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

6.2.4. Test Setup



6.2.5. Test Result

| | | | |
|-----------|------------|---------------|-----------|
| Test Site | WZ-TR3 | Test Engineer | Jeff Yang |
| Test Date | 2021/12/21 | | |

| Test Mode | Data Rate (Mbps) | Channel No. | Frequency (MHz) | Output Power (dBm) | Limit (dBm) | Result |
|----------------------|------------------|-------------|-----------------|--------------------|-------------|--------|
| Peak Output Power | | | | | | |
| BLE | 1 | 39 | 2480 | 2.50 | ≤ 30.00 | Pass |
| Average Output Power | | | | | | |
| BLE | 1 | 39 | 2480 | 2.28 | ≤ 30.00 | Pass |

6.3. Radiated Spurious Emission Measurement

6.3.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

| FCC Part 15 Subpart C Paragraph 15.209 | | |
|--|--------------------------|-------------------------------|
| Frequency [MHz] | Field Strength [uV/m] | Measured Distance [Meters] |
| 0.009 - 0.490 | 2400/F (kHz) | 300 |
| 0.490 - 1.705 | 24000/F (kHz) | 30 |
| 1.705 - 30 | 30 | 30 |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

6.3.2. Test Procedure Used

ANSI C63.10 Section 6.3, 6.4, 6.5, 6.6

6.3.3. Test Setting

Table 1 - RBW as a function of frequency

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

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Peak Measurements above 1GHz

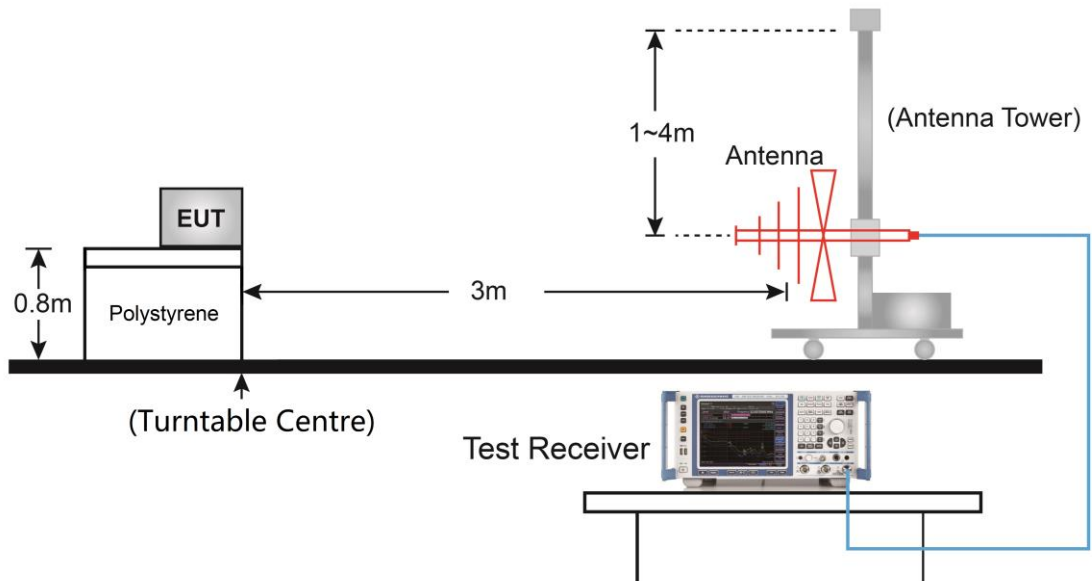
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

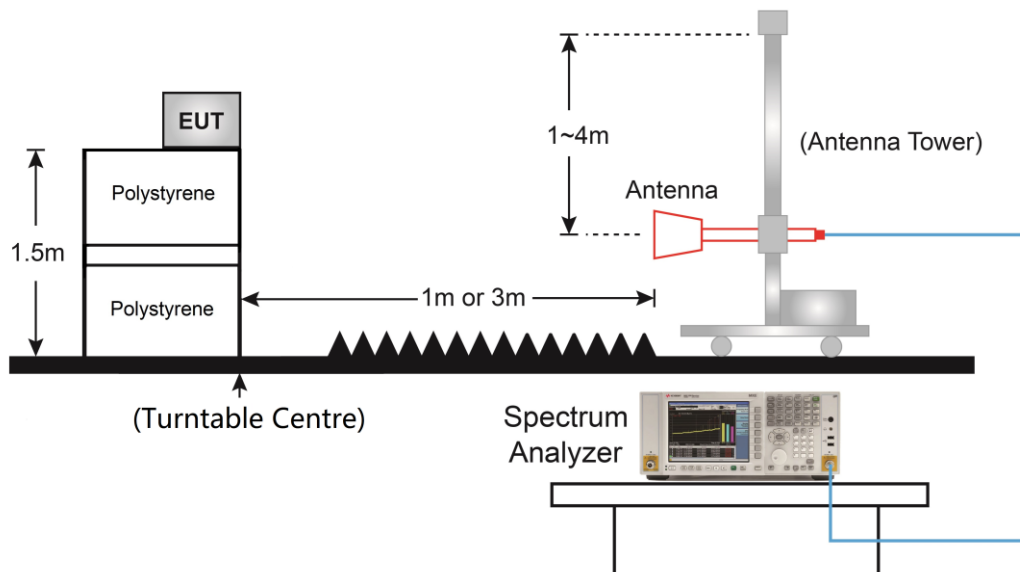
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

6.3.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.3.5. Test Result

| | | | |
|-----------|---|---------------|-----------|
| Test Site | WZ-AC2 | Test Engineer | Bob Zhang |
| Test Date | 2021/12/26 | Test Channel | 39 |
| Test Mode | BLE-1Mbps | | |
| Note | 1. Average measurement was not performed if peak level lower than average limit. 2. Other frequency was 20dB below limit line within 1-18GHz, there is not show in the report. | | |

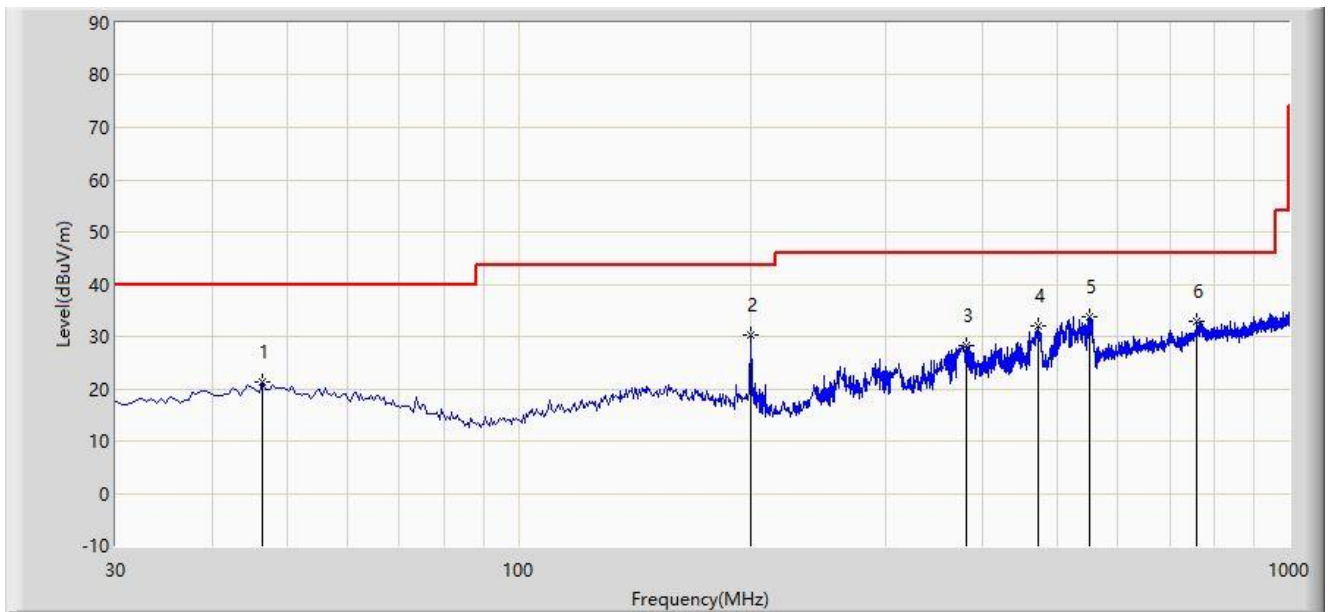
| Frequency (MHz) | Reading Level (dBμV) | Factor (dB) | Measure Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Polarization |
|-----------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| 3745.5 | 34.2 | 0.1 | 34.3 | 74.0 | -39.7 | Peak | Horizontal |
| 4009.0 | 33.2 | 0.7 | 33.9 | 74.0 | -40.1 | Peak | Horizontal |
| 4816.5 | 32.6 | 3.9 | 36.5 | 74.0 | -37.5 | Peak | Horizontal |
| 3779.5 | 33.3 | 0.1 | 33.4 | 74.0 | -40.6 | Peak | Vertical |
| 4060.0 | 34.2 | 0.8 | 35.0 | 74.0 | -39.0 | Peak | Vertical |
| 4748.5 | 31.3 | 3.7 | 35.0 | 74.0 | -39.0 | Peak | Vertical |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

The Result of Radiated Emission below 1GHz:

| | |
|---|--------------------------|
| Site: WZ-AC1 | Time: 2021/12/27 - 17:42 |
| Limit: FCC_Part15.209_RSE(3m) | Engineer: Kin Xia |
| Probe: WZ-AC1_VULB 9168 _30-1000MHz | Polarity: Horizontal |
| EUT: LTE Module | Power: AC 120V/60Hz |
| Test Mode: Transmit by BLE 1Mbps at Channel 2480MHz | |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dB μ V/m) | Reading Level (dB μ V) | Margin (dB) | Limit (dB μ V/m) | Factor (dB/m) | Type |
|----|------|------|-----------------|------------------------------|----------------------------|-------------|----------------------|---------------|------|
| 1 | | | 46.490 | 21.187 | 2.394 | -18.813 | 40.000 | 18.793 | PK |
| 2 | | | 199.750 | 30.314 | 16.002 | -13.186 | 43.500 | 14.312 | PK |
| 3 | | | 381.625 | 28.400 | 8.049 | -17.600 | 46.000 | 20.351 | PK |
| 4 | | | 472.805 | 31.993 | 9.366 | -14.007 | 46.000 | 22.627 | PK |
| 5 | | * | 551.860 | 33.643 | 9.666 | -12.357 | 46.000 | 23.977 | PK |
| 6 | | | 759.925 | 32.937 | 4.813 | -13.063 | 46.000 | 28.124 | PK |

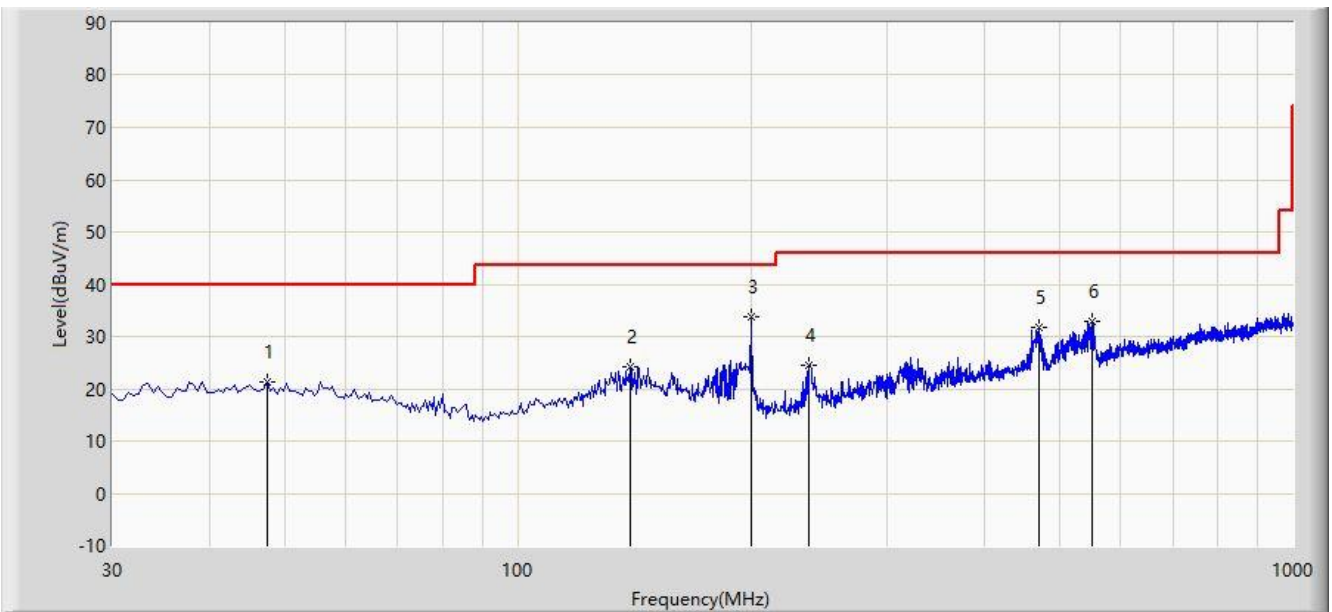
Note 1: Measure Level (dB μ V/m) = Reading Level (dB μ V) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz and 18GHz to 25GHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value.

Therefore, the data is not presented in the report.

| | |
|---|--------------------------|
| Site: WZ-AC1 | Time: 2021/12/27 - 17:47 |
| Limit: FCC_Part15.209_RSE(3m) | Engineer: Kin Xia |
| Probe: WZ-AC1_VULB 9168 _30-1000MHz | Polarity: Vertical |
| EUT: LTE Module | Power: AC 120V/60Hz |
| Test Mode: Transmit by BLE 1Mbps at Channel 2480MHz | |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Margin (dB) | Limit (dBuV/m) | Factor (dB/m) | Type |
|----|------|------|-----------------|------------------------|----------------------|-------------|----------------|---------------|------|
| 1 | | | 47.460 | 21.347 | 2.567 | -18.653 | 40.000 | 18.780 | PK |
| 2 | | | 139.610 | 24.151 | 6.735 | -19.349 | 43.500 | 17.416 | PK |
| 3 | | * | 199.750 | 33.677 | 19.365 | -9.823 | 43.500 | 14.312 | PK |
| 4 | | | 237.580 | 24.437 | 8.758 | -21.563 | 46.000 | 15.679 | PK |
| 5 | | | 470.865 | 31.699 | 9.101 | -14.301 | 46.000 | 22.598 | PK |
| 6 | | | 550.890 | 32.760 | 8.795 | -13.240 | 46.000 | 23.965 | PK |

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB/m)

Factor (dB/m) = Cable Loss (dB) + Antenna Factor (dB/m)

Note 2: The amplitude of radiated emissions (frequency range from 9kHz to 30MHz and 18GHz to 25GHz) is that proximity to ambient noise, which also are attenuated more than 20 dB below the permissible value.

Therefore, the data is not presented in the report.

6.4. Radiated Restricted Band Edge Measurement

6.4.1. Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

| Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (GHz) |
|----------------------------|-----------------------|--------------------|--------------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2690 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | (²) |
| 13.36 - 13.41 | -- | -- | -- |

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

| FCC Part 15 Subpart C Paragraph 15.209 Limits | | |
|---|--------------------------|-------------------------------|
| Frequency [MHz] | Field Strength [uV/m] | Measured Distance [Meters] |
| 0.009 - 0.490 | 2400/F (kHz) | 300 |
| 0.490 - 1.705 | 24000/F (kHz) | 30 |
| 1.705 - 30 | 30 | 30 |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

6.4.2. Test Procedure Used

ANSI C63.10 Section 6.3, 6.6

6.4.3. Test Setting

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

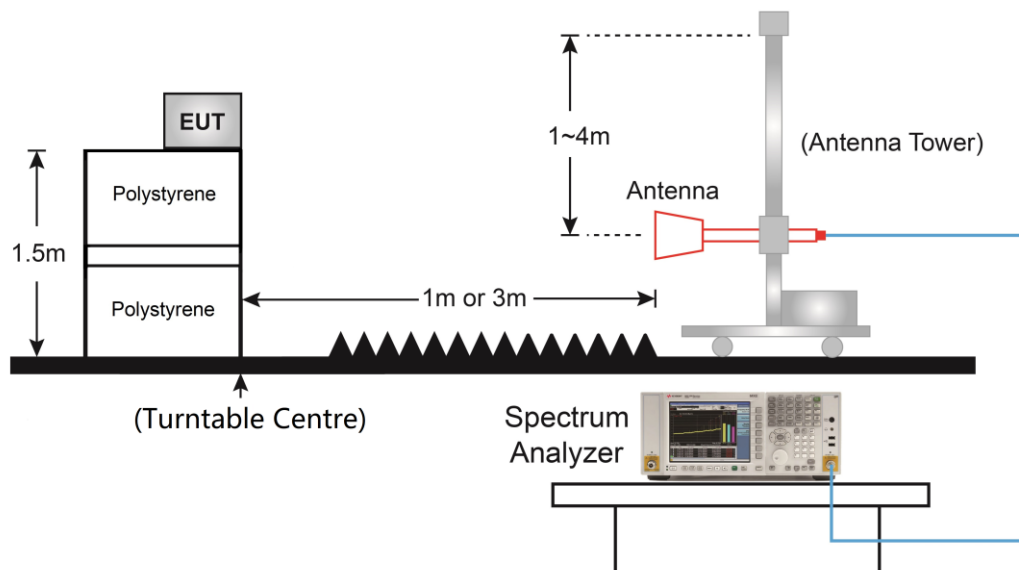
Average Measurements above 1GHz (Method VB)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.

If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.

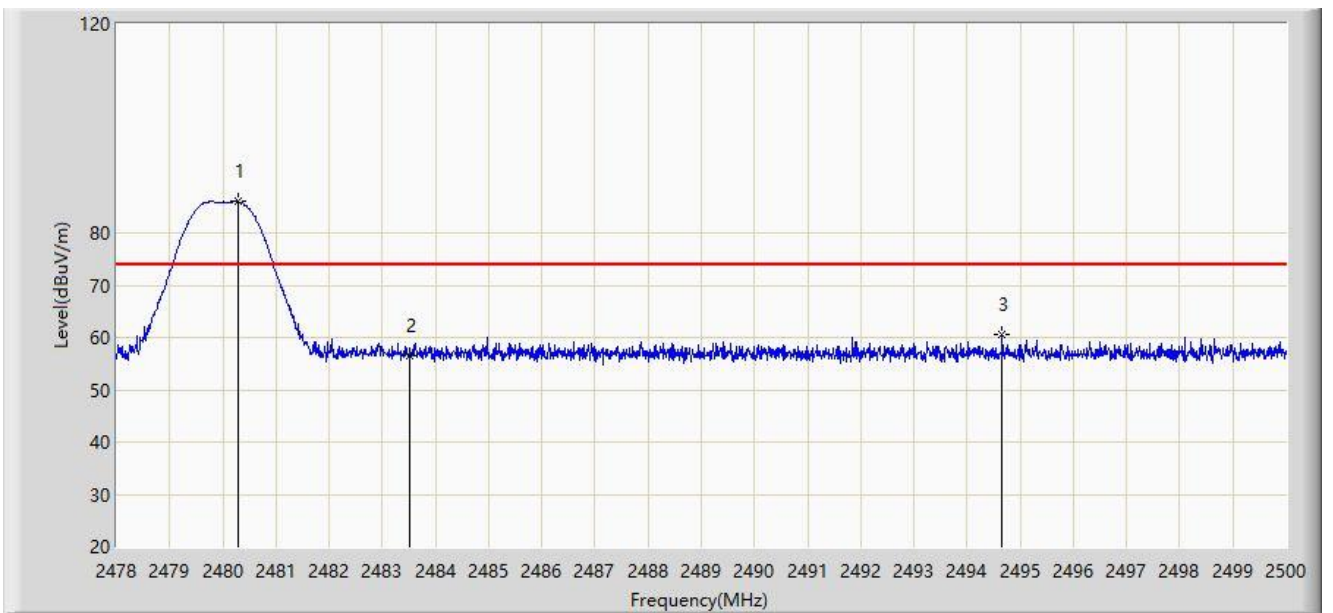
4. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

6.4.4. Test Setup



6.4.5. Test Result

| | |
|---|--------------------------|
| Site: WZ-AC2 | Time: 2021/12/26 - 15:17 |
| Limit: FCC_Part15.209_RSE(3m) | Engineer: Tommy Tang |
| Probe: WZ-AC2_BBHA9120D_1-18GHz | Polarity: Horizontal |
| EUT: LTE Module | Power: AC 120V/60Hz |
| Test Mode: Transmit by BLE at Channel 2480MHz | |

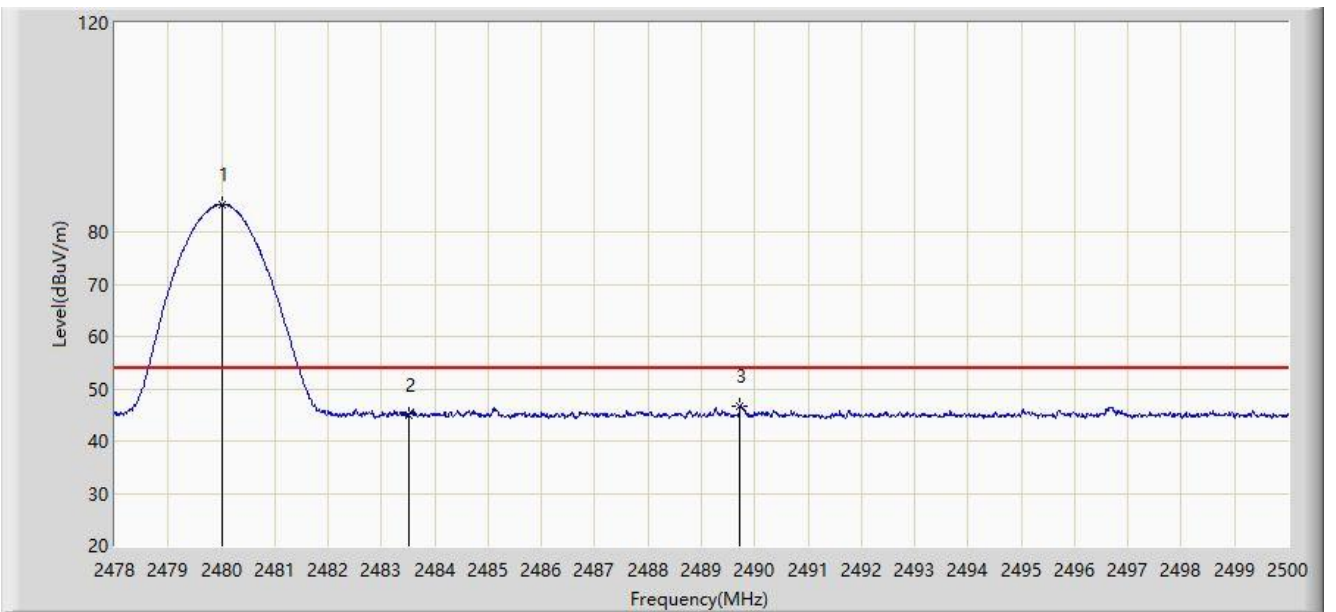


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBμV/m) | Reading Level (dBμV) | Margin (dB) | Limit (dBμV/m) | Factor (dB/m) | Type |
|----|------|------|-----------------|------------------------|----------------------|-------------|----------------|---------------|------|
| 1 | | * | 2480.277 | 86.001 | 54.082 | N/A | N/A | 31.919 | PK |
| 2 | | | 2483.500 | 56.564 | 24.652 | -17.436 | 74.000 | 31.912 | PK |
| 3 | | | 2494.665 | 60.618 | 28.715 | -13.382 | 74.000 | 31.902 | PK |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

| | |
|---|--------------------------|
| Site: WZ-AC2 | Time: 2021/12/26 - 15:21 |
| Limit: FCC_Part15.209_RSE(3m) | Engineer: Tommy Tang |
| Probe: WZ-AC2_BBHA9120D_1-18GHz | Polarity: Horizontal |
| EUT: LTE Module | Power: AC 120V/60Hz |
| Test Mode: Transmit by BLE at Channel 2480MHz | |

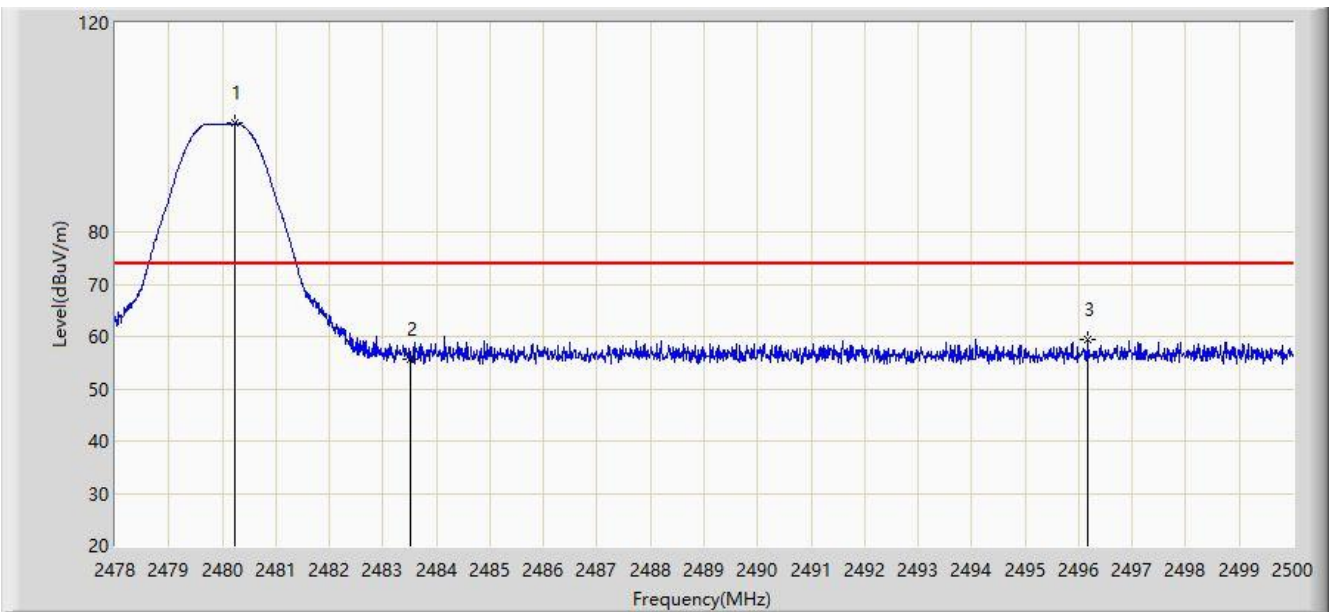


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Margin (dB) | Limit (dBuV/m) | Factor (dB/m) | Type |
|----|------|------|-----------------|------------------------|----------------------|-------------|----------------|---------------|------|
| 1 | | * | 2480.024 | 85.309 | 53.390 | N/A | N/A | 31.919 | AV |
| 2 | | | 2483.500 | 44.865 | 12.953 | -9.135 | 54.000 | 31.912 | AV |
| 3 | | | 2489.726 | 46.590 | 14.691 | -7.410 | 54.000 | 31.898 | AV |

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

| | |
|---|--------------------------|
| Site: WZ-AC2 | Time: 2021/12/26 - 15:18 |
| Limit: FCC_Part15.209_RSE(3m) | Engineer: Tommy Tang |
| Probe: WZ-AC2_BBHA9120D_1-18GHz | Polarity: Vertical |
| EUT: LTE Module | Power: AC 120V/60Hz |
| Test Mode: Transmit by BLE at Channel 2480MHz | |

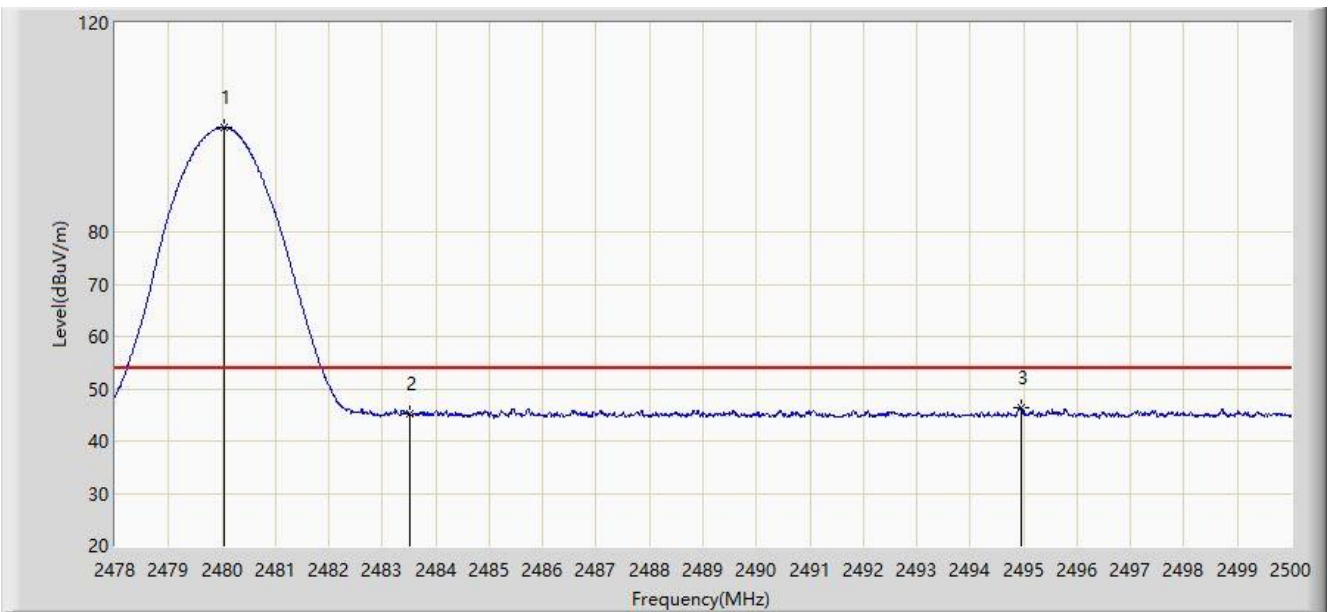


| No | Flag | Mark | Frequency (MHz) | Measure Level (dBμV/m) | Reading Level (dBμV) | Margin (dB) | Limit (dBμV/m) | Factor (dB/m) | Type |
|----|------|------|-----------------|------------------------|----------------------|-------------|----------------|---------------|------|
| 1 | | * | 2480.244 | 100.742 | 68.823 | N/A | N/A | 31.919 | PK |
| 2 | | | 2483.500 | 55.743 | 23.831 | -18.257 | 74.000 | 31.912 | PK |
| 3 | | | 2496.172 | 59.329 | 27.421 | -14.671 | 74.000 | 31.908 | PK |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

| | |
|---|--------------------------|
| Site: WZ-AC2 | Time: 2021/12/26 - 15:22 |
| Limit: FCC_Part15.209_RSE(3m) | Engineer: Tommy Tang |
| Probe: WZ-AC2_BBHA9120D_1-18GHz | Polarity: Vertical |
| EUT: LTE Module | Power: AC 120V/60Hz |
| Test Mode: Transmit by BLE at Channel 2480MHz | |



| No | Flag | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Margin (dB) | Limit (dBuV/m) | Factor (dB/m) | Type |
|----|------|------|-----------------|------------------------|----------------------|-------------|----------------|---------------|------|
| 1 | | * | 2480.046 | 99.959 | 68.040 | N/A | N/A | 31.919 | AV |
| 2 | | | 2483.500 | 45.231 | 13.319 | -8.769 | 54.000 | 31.912 | AV |
| 3 | | | 2494.962 | 46.282 | 14.378 | -7.718 | 54.000 | 31.904 | AV |

Note: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Appendix A - Test Setup Photograph

Refer to "2112RSU024-UT" file.

Appendix B - EUT Photograph

Refer to “ 2112RSU024-UE” file.

The End