| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test report no.:* | CN213YZV (P15C-BLE) 001 | **Auftrags-Nr.:** *Order no.:* | 238517543 |  |
| **Kunden-Referenz-Nr.:** *Client reference no.:* | N/A | **Auftragsdatum:** *Order date:* | 2021-07-12 | |
| **Auftraggeber:** *Client:* | AGUILA CONVERGENCE WORLDWIDE, INC. 46168,1581 S. Perry road,Plainfield,Indiana,USA | | | |
| **Prüfgegenstand:** *Test item:* | Secure Dongle, OOB Dongle | | | |
| **Bezeichnung / Typ-Nr.:** *Identification / Type no.:* | NCT8610, NCT9610 | | | |
| **Auftrags-Inhalt:** *Order content:* | FCC Part 15C Test report (BLE) | | | |
| **Prüfgrundlage:** *Test specification:* | FCC 47CFR Part 15: Subpart C Section 15.247 | | | |
| **Wareneingangsdatum:** *Date of sample receipt:* | 2021-07-07 | | | |
| **Prüfmuster-Nr.:** *Test sample no:* | A003086990-039 A003086990-034 | | | |
| **Prüfzeitraum:** *Testing period:* | 2021-08-19 - 2021-08-31 | | | |
| **Ort der Prüfung:** *Place of testing:* | EMC/RF Taipei Testing Site | | | |
| **Prüflaboratorium:** *Testing laboratory:* | Taipei Testing Laboratories | | | |
| **Prüfergebnis*:** *Test result*:* | Pass | | | |
| **überprüft von:** *compiled by:* | David Huang | **genehmigt von:** authorized by: | Brenda Chen | |
| **Datum:** *Date:* 2021-10-19 | | **Ausstellungsdatum:** *Issue date:* 2021-10-19 | | |
| **Stellung** / *Position:* | David Huang Project Manager | **Stellung** / *Position:* | Brenda Chen Senior Project Manager | |
| **Sonstiges** / *Other:* | The model/product names are electrically identical, the differences are the package, and the color of the case and logo. | | | |
| **Zustand des Prüfgegenstandes bei Anlieferung:** *Condition of the test item at delivery:* | Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged* | | | |

| | | | | | |
|---|---|---|---|---|---|
| * Legende: | 1 = sehr gut | 2 = gut | 3 = befriedigend | 4 = ausreichend | 5 = mangelhaft |
| | P(ass) = entspricht o.g. Prüfgrundlage(n) | | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) | N/A = nicht anwendbar | N/T = nicht getestet |
| ** Legend:* | *1 = very good* | *2 = good* | *3 = satisfactory* | *4 = sufficient* | *5 = poor* |
| | *P(ass) = passed a.m. test specification(s)* | | *F(ail) = failed a.m. test specification(s)* | *N/A = not applicable* | *N/T = not tested* |

**Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.**
*This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.*
V05

# TEST SUMMARY

| Report Section | FCC Clause | Test Item | Result |
|---|---|---|---|
| 5.1.1 | 15.247(b) & 15.203 | Antenna Requirement | Pass |
| 5.1.2 | 15.247(b)(3) | Peak Output Power | Pass |
| 5.1.3 | 15.247(a)(2) | 6 dB Bandwidth | Pass |
| 5.1.3 | 2.1049 | 99% Occupied Bandwidth | Pass |
| 5.1.4 | 15.247(e) | Power Spectral Density | Pass |
| 5.1.5 | 15.247(d) | Conducted Spurious Emissions and Band Edges | Pass |
| 5.1.6 | 15.247(d) & 15.205 & 15.209 | Radiated Spurious Emissions and Band Edges | Pass |
| 5.2.1 | 15.207 | Mains Conducted Emission | Pass |

**Note:** Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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**APPENDIX A - TEST RESULT OF CONDUCTED**

**APPENDIX B - TEST RESULT OF RADIATED EMISSIONS & MAINS CONDUCTED EMISSION**

**APPENDIX SP - PHOTOGRAPHS OF TEST SETUP**

**APPENDIX EP - PHOTOGRAPHS OF EUT**

# HISTORY OF THIS TEST REPORT

| Report No. | Description | Date Issued |
|---|---|---|
| CN213YZV (P15C-BLE) 001 | Original Release | 2021-10-19 |

# 1. General Remarks

## 1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:
**Appendix A - Test Result of Conducted**
**Appendix B - Test Result of Radiated Emissions & Mains Conducted Emission**
**Appendix SP - Photographs of Test Setup**
**Appendix EP - Photographs of EUT**

### Applied Standard and Test Levels

| Radio |
|---|
| FCC 47CFR Part 15: Subpart C Section 15.247<br>FCC 47CFR Part 2: Subpart J Section 2.1049<br>ANSI C63.10:2013<br>KDB 558074 D01 15.247 Meas Guidance v05r02 |

## 1.2 Decision Rule of Conformity

The decision rule of conformity of this test report is following the requirements of the requested standard in the quotation, and agreed among testing laboratory and manufacturer (applicant) to exclude the consideration of Measurement Uncertainty, unless it is required by the specific standard.

# 2. Test Sites

## 2.1 Test Laboratory

Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

## 2.2 Test Facility

Taipei Testing Laboratories

No.458-18, Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244
Taiwan (R.O.C.)
FCC Registration No.: 226631
ISED Registration No.: 25563

## 2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

## 2.4 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

## 2.5 Measurement Uncertainty

All measurement uncertainty values are shown with a coverage factor of k=2 to indicate a 95% level of confidence.

### Emission Measurement Uncertainty

| Parameter | Uncertainty |
|---|---|
| Radiated Emission (9 kHz ~ 30 MHz) | ± 1.15 dB |
| Radiated Emission (30 MHz ~ 200 MHz) | ± 1.30 dB |
| Radiated Emission (200 MHz ~ 1 GHz) | ± 1.30 dB |
| Radiated Emission (1 GHz ~ 18 GHz) | ± 1.54 dB |
| Radiated Emission (18 GHz ~ 40 GHz) | ± 2.52 dB |
| Mains Conducted Emission | ± 1.65 dB |

# 3. General Product Information

## 3.1 Product Function and Intended Use

The EUT is a Secure Dongle, OOB Dongle. It contains a Bluetooth compatible module enabling the user to communicate data through a Wireless interface.
For details refer to the User Guide, Data Sheet and Circuit Diagram.

## 3.2 System Details and Ratings

### Basic Information of EUT

| Item | EUT information |
|---|---|
| Kind of Equipment/Test Item | Secure Dongle, OOB Dongle |
| Type Identification | NCT8610, NCT9610 |
| FCC ID | 2AZE921NCT8610 |

### Technical Specification of EUT

| Item | EUT information |
|---|---|
| Operating Frequency | 2402 MHz ~ 2480 MHz |
| Channel Number | 40 |
| Data Rate | 1Mbps, 2Mbps |
| Operation Voltage | 5 Vdc |
| Modulation | GFSK |
| Maximum Output Power (mW) | 2.47 |
| Antenna Information | Refer to 5.1.1 |
| Accessory Device | Refer to 4.4 |

## 3.3 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

## 3.4 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

# 4. Test Set-up and Operation Modes

## 4.1 Principle of Configuration Selection

The test modes were adapted accordingly in reference to the instructions for use.
During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output expected by the customer and is going to be fixed on the firmware of the final end product.

### Table for Parameters of Test Software Setting

| Frequency (MHz) | Power Setting |
|---|---|
| 2402 | Pos8dBm |
| 2440 | Pos8dBm |
| 2480 | Pos8dBm |

## 4.2 Carrier Frequency and Channel

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

## 4.3 Test Operation and Test Software

Setup for testing: Test samples are provided with an USB interface which makes it possible to control them through a test software installed on a notebook computer.
This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed as below.

| | |
|---|---|
| Test Software | QCOM_V1.6 |

The samples were used as follows:
A003086990-039
A003086990-034
Full test was applied on all test modes, but only worst case was shown.

| EUT Configure Mode | Applicable To | | | | Description |
|---|---|---|---|---|---|
| | Antenna Port Conducted Measurement | Radiated Spurious Emissions above 1 GHz | Radiated Spurious Emissions below 1 GHz | Mains Conducted Emission | |
| - | √ | √ | √ | √ | - |

Note:
1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when position on **Z-plane**.
2. "-" means no effect.

**Antenna Port Conducted Measurement**

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Available Frequency (MHz) | Tested Frequency (MHz) | Date Rate (Mbps) |
|---|---|---|---|
| - | 2402 to 2480 | 2402, 2440, 2480 | 1 |
| - | 2402 to 2480 | 2402, 2440, 2480 | 2 |

**Radiated Spurious Emissions (Above 1 GHz)**

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Available Frequency (MHz) | Tested Frequency (MHz) | Date Rate (Mbps) |
|---|---|---|---|
| - | 2402 to 2480 | 2402, 2440, 2480 | 1 |
| - | 2402 to 2480 | 2402, 2440, 2480 | 2 |

**Radiated Spurious Emissions (Below 1 GHz)**

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Available Frequency (MHz) | Tested Frequency (MHz) | Date Rate (Mbps) |
|---|---|---|---|
| - | 2402 to 2480 | 2440 | 2 |

**Mains Conducted Emission**

☒ Pre-Scan full test was applied on all test modes, but only worst case was shown.
☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Available Frequency (MHz) | Tested Frequency (MHz) | Date Rate (Mbps) |
|---|---|---|---|
| - | 2402 to 2480 | 2440 | 2 |

**Test Condition**

| Test Item | Ambient Temperature | Relative Humidity | Tested by |
|---|---|---|---|
| Conducted Measurement | 23.2-23.8 °C | 57-58 % | Stanislas Charles |
| Radiated Spurious Emissions above 1 GHz | 23.1-25.1 °C | 50-60 % | Eagle Tsai |
| Radiated Spurious Emissions below 1 GHz | 23.1-25.1 °C | 50-60 % | Eagle Tsai |
| Mains Conducted Emission | 24.3-26.2 °C | 64.4-65.1 % | Eagle Tsai |

## 4.4 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

### Accessory of EUT

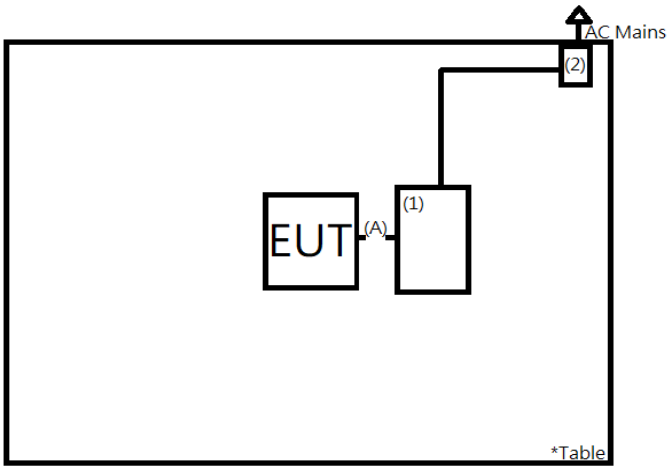
| No. | Product | Brand | Model | Description |
|---|---|---|---|---|
| A | USB Type-C Cable | ACES Electronics Co.,Ltd. | 60-6363-860-FA | 12 cm shielded cable w/o core |

### Support Unit

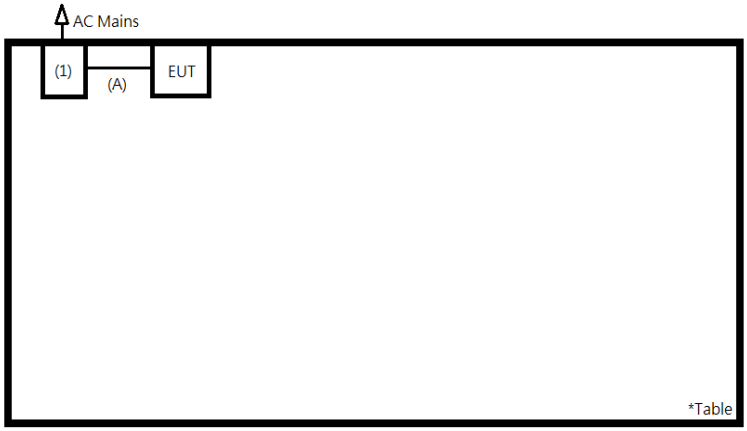
| Support Unit | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| No | Description | Brand | Model | S/N | Shielded | Ferrite Core (Qty) | Length (cm) | Remark |
| 1 | Notebook | HP | 15-da1064TX | CND911MY2 | - | - | - | Radiated |
| 2 | Adapter | HP | TPN-LA16 | N/A | NO | NO | 180 | |
| 1 | Adapter | Sony Ericsson | CAA-0002016-TW-B | 3104019 | - | - | - | Mains Conducted |
| - | Notebook | HP | TPN-C139 | CND93662WT | - | - | - | Conducted |

## 4.5 Test Setup Diagram

**<Radiated Spurious Emissions mode>**




**<Mains Conducted Emission mode>**



# 5. Test Results

## 5.1 Transmitter Requirement & Test Suites

### 5.1.1 Antenna Requirement

**Requirement** Use of approved antennas only

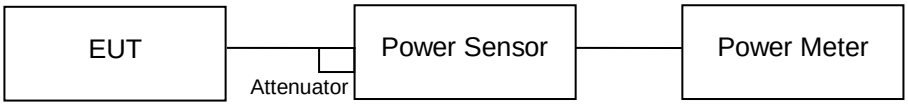
According to the manufacturer declaration, the EUT has an antenna with a directional gain of 1.16 dBi. The antenna is PCB antenna with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.
Refer to EUT photo for details.

## 5.1.2 Peak Output Power

**Limit** 1 watt (30 dBm)

**Kind of Test Site** Shielded room

**Test Setup**




**Test Instruments**

| Kind of Equipment | Manufacturer | Type | S/N | Calibration Date | Calibration Due Date | Test Date | |
|---|---|---|---|---|---|---|---|
| | | | | | | From | Until |
| Power Meter | Anritsu | ML2495A | 1901008 | 2021/3/24 | 2022/3/23 | 2021/8/19 | 2021/8/20 |
| Power Sensor | Anritsu | MA2411B | 1725269 | 2021/3/24 | 2022/3/23 | 2021/8/19 | 2021/8/20 |

**Test Procedures**

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.
Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

**Test Result**

**Peak Output Power**

**<1Mbps>**

| Channel | Channel Frequency | Peak Output Power | | Limit (dBm) |
|---|---|---|---|---|
| | (MHz) | (dBm) | (mW) | |
| Low Channel | 2402 | 3.93 | 2.47 | 30 |
| Middle Channel | 2440 | 3.01 | 2.00 | 30 |
| High Channel | 2480 | 1.79 | 1.51 | 30 |

**<2Mbps>**

| Channel | Channel Frequency | Peak Output Power | | Limit (dBm) |
|---|---|---|---|---|
| | (MHz) | (dBm) | (mW) | |
| Low Channel | 2402 | 3.91 | 2.46 | 30 |
| Middle Channel | 2440 | 3.01 | 2.00 | 30 |
| High Channel | 2480 | 1.79 | 1.51 | 30 |

**Average Power**

**<1Mbps>**

| Channel | Channel Frequency | Average Power | |
|---|---|---|---|
| | (MHz) | (dBm) | (mW) |
| Low Channel | 2402 | 3.90 | 2.45 |
| Middle Channel | 2440 | 2.97 | 1.98 |
| High Channel | 2480 | 1.75 | 1.50 |

**<2Mbps>**

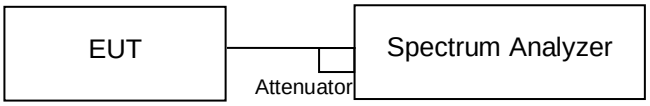
| Channel | Channel Frequency | Average Power | |
|---|---|---|---|
| | (MHz) | (dBm) | (mW) |
| Low Channel | 2402 | 3.87 | 2.44 |
| Middle Channel | 2440 | 2.97 | 1.98 |
| High Channel | 2480 | 1.75 | 1.50 |

## 5.1.3 6 dB Bandwidth and 99% Occupied Bandwidth

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

**Kind of Test Site** Shielded room

**Test Setup**




**Test Instruments**

| Kind of Equipment | Manufacturer | Type | S/N | Calibration Date | Calibration Due Date | Test Date | |
|---|---|---|---|---|---|---|---|
| | | | | | | From | Until |
| Spectrum Analyzer | R&S | FSV40 | 101512 | 2021/1/29 | 2022/1/28 | 2021/8/19 | 2021/8/20 |

**Test Procedure**

a. Set resolution bandwidth (RBW) = 100 kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
f. For 99% occupied bandwidth measurement, the transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to PEAK. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean power of a given emission.

**Test Results**

Please refer to Appendix A.

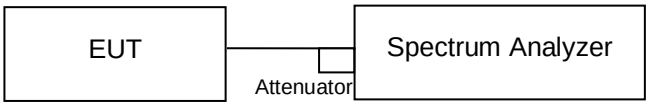
## 5.1.4 Power Spectral Density

**Limit**

The power spectral density shall not be greater than 8 dBm in any 3 kHz band.

**Kind of Test Site** Shielded room

**Test Setup**




**Test Instruments**

| Kind of Equipment | Manufacturer | Type | S/N | Calibration Date | Calibration Due Date | Test Date | |
|---|---|---|---|---|---|---|---|
| | | | | | | From | Until |
| Spectrum Analyzer | R&S | FSV40 | 101512 | 2021/1/29 | 2022/1/28 | 2021/8/19 | 2021/8/20 |

**Test Procedure**

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.

**Test Results**

Please refer to Appendix A.

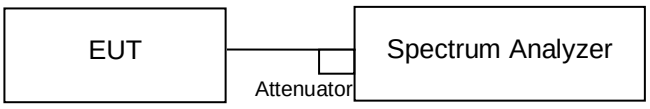
## 5.1.5 Conducted Spurious Emissions and Frequency Band Edges Measured in 100kHz Bandwidth

**Limit**

20dB (below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.)

**Kind of Test Site** Shielded room

**Test Setup**




**Test Instruments**

| Kind of Equipment | Manufacturer | Type | S/N | Calibration Date | Calibration Due Date | Test Date | |
|---|---|---|---|---|---|---|---|
| | | | | | | From | Until |
| Spectrum Analyzer | R&S | FSV40 | 101512 | 2021/1/29 | 2022/1/28 | 2021/8/19 | 2021/8/20 |

**Test Procedure**

Measurement procedure REF
1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement procedure OOBE
1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

**Test Results**

Please refer to Appendix A.

## 5.1.6 Radiated Spurious Emissions and Band Edges

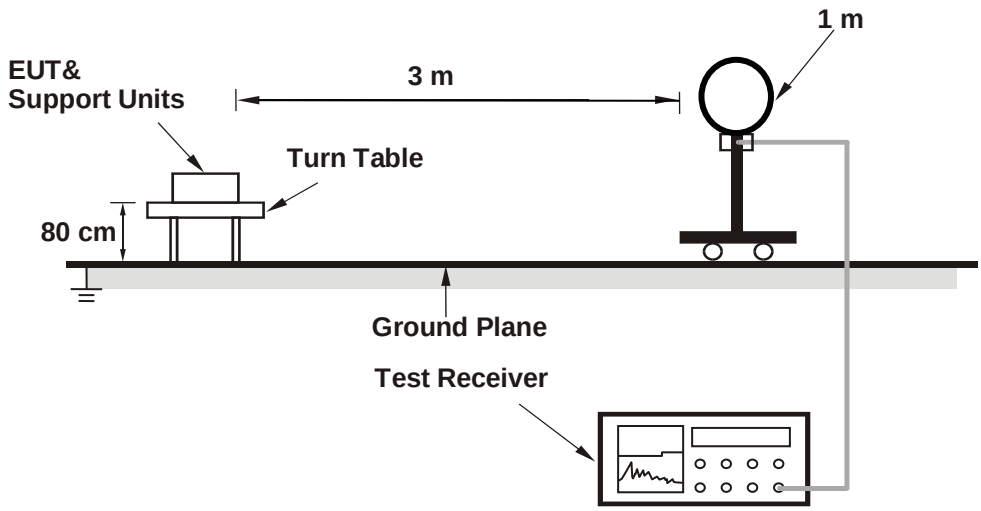
**Limit**

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must comply with the radiated emission limits specified in §15.209(a).
Emissions radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in §15.247(d).

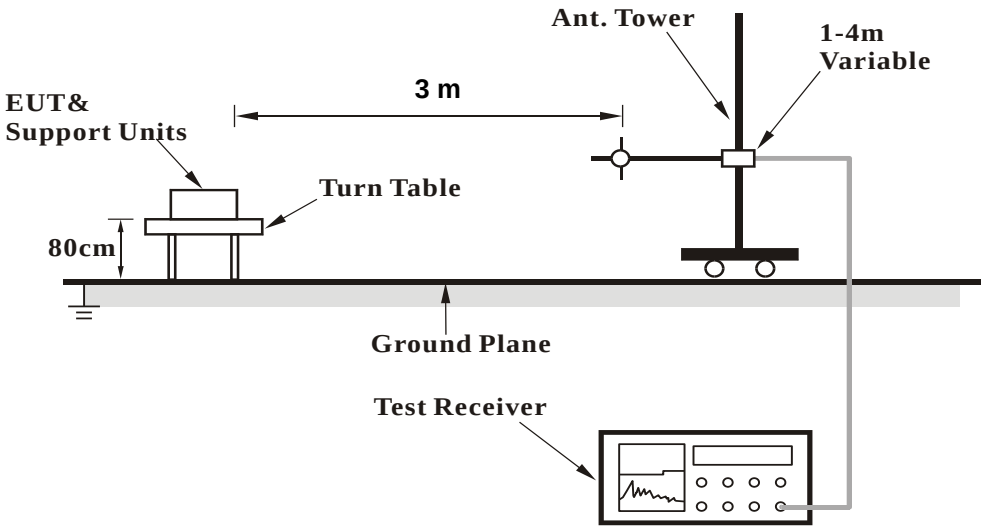
**Kind of Test Site** 3m Semi-Anechoic Chamber

**Test Setup**

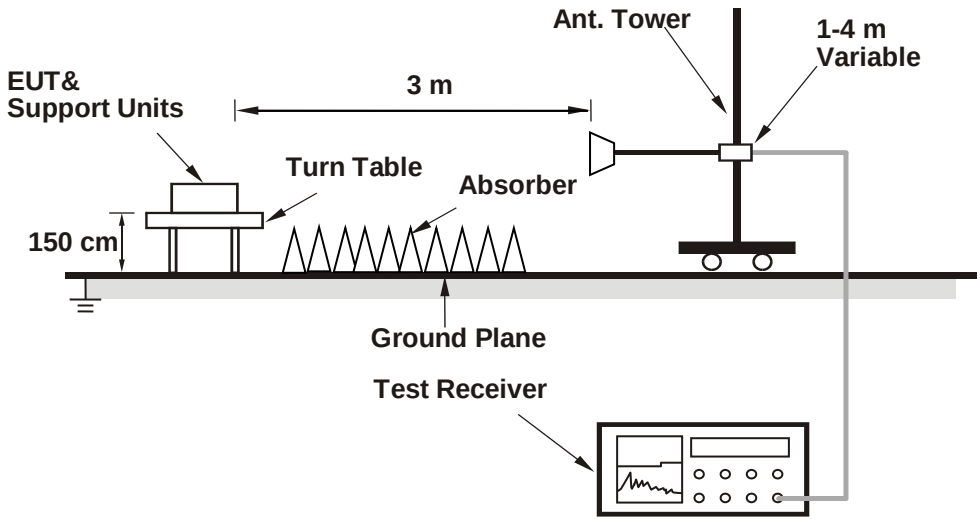
**<Radiated Emissions below 30 MHz>**




**<Radiated Emissions 30 MHz to 1 GHz>**



**<Radiated Emissions above 1 GHz>**




For the actual test configuration, please refer to the attached file (Test Setup Photo).

**Test Instruments**

| Kind of Equipment | Manufacturer | Type | S/N | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| Signal Analyzer | R&S | FSV40 | 101508 | 2021/3/16 | 2022/3/15 |
| Receiver | R&S | ESR7 | 102109 | 2021/3/16 | 2022/3/15 |
| Bilog Antenna | SCHWARZBECK | VULB-9168 | 00951 | 2021/2/18 | 2022/2/17 |
| Horn Antenna | ETS-Lindgren | 3117 | 00218930 | 2020/12/1 | 2021/11/30 |
| LF-AMP | Agilent | 8447D | 2944A10772 | 2021/2/18 | 2022/2/17 |
| HF-AMP + AC source | EMCI | EMC051845SE | 980633 | 2021/2/9 | 2022/2/8 |
| HF-AMP + AC source | EMCI | EMC184045SE | 980657 | 2021/2/1 | 2022/1/31 |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | 00887 | 2021/4/8 | 2022/4/7 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 104EA | 800056/4EA | 2021/3/17 | 2022/3/16 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 104 | 804680/4 | 2021/3/17 | 2022/3/16 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 104 | MY37202/4 | 2021/3/17 | 2022/3/16 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 102EA | 800898/2EA | 2021/4/16 | 2022/4/15 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 102EA | 800901/2EA | 2021/4/16 | 2022/4/15 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 102EA | 801027/2EA | 2021/4/16 | 2022/4/15 |
| Loop Antenna | Chance Most | EMCILPA600 +calibration | 287 | 2021/1/15 | 2022/1/14 |

**Test Procedures**

**For Radiated Emissions below 30 MHz**

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. Parallel (OPEN), perpendicular (CLOSE), and ground-parallel (GROUND) orientations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9 kHz at frequency below 30 MHz.
2. All modes of operation were investigated and the worst-case emissions are reported.

**For Radiated Emissions above 30 MHz**

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98 %) or 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The Radiated Emissions testing was performed in the X(E1), Y(H) and Z(E2) axis orientation. The worst-case Axis orientation is recorded in this test report.

**Test Results**

Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
Level (dBuV/m) = Reading (dBuV) + Factor (dB/m)

Please refer to Appendix B.

# 5.2 Mains Emission

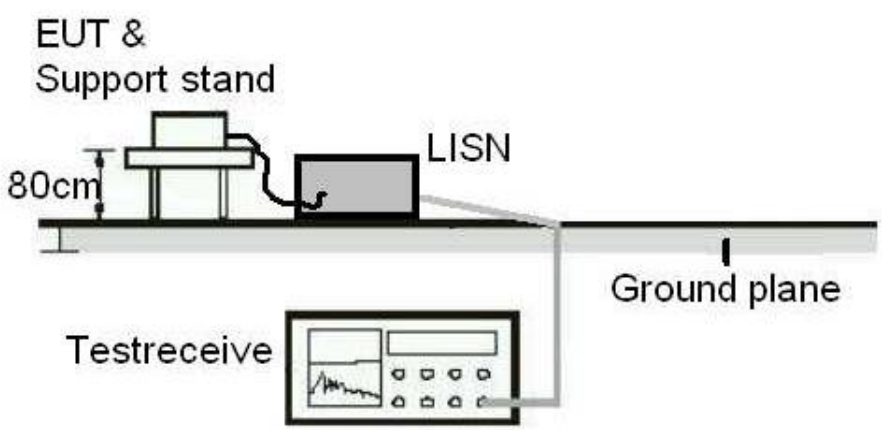
## 5.2.1 Mains Conducted Emission

**Limit**

Mains Conducted Emission as defined in §15.207 must comply with the mains conducted emission limits.

**Kind of Test Site** Shielded room

**Test Setup**




**Test Instruments**

| Kind of Equipment | Manufacturer | Type | S/N | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| TWO-LINE V-NETWORK | R&S | ENV216 | 1816064 | 2020/9/10 | 2021/9/9 |
| EMI Test Receiver | R&S | ESCI | 1816063 | 2020/11/17 | 2021/11/16 |
| RF Cable | N/A | N/A | EMC-003 | 2020/11/15 | 2021/11/14 |

**Test Procedures**

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

**Test Results**

Please refer to Appendix B.

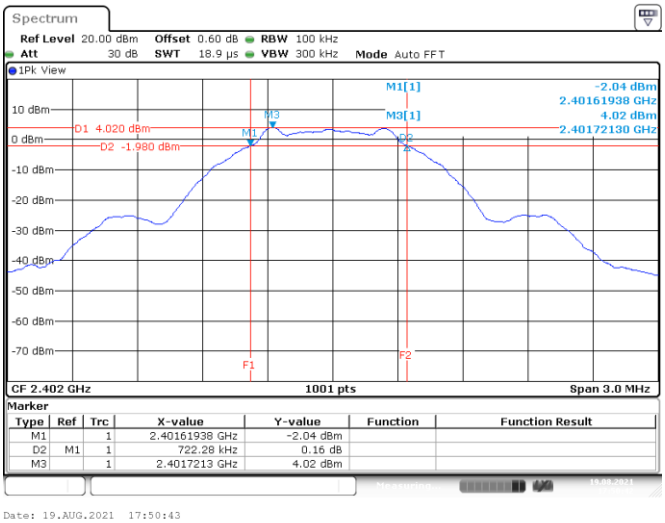
# Appendix A: Test Results of Conducted Test

## Test Result of 6 dB Bandwidth

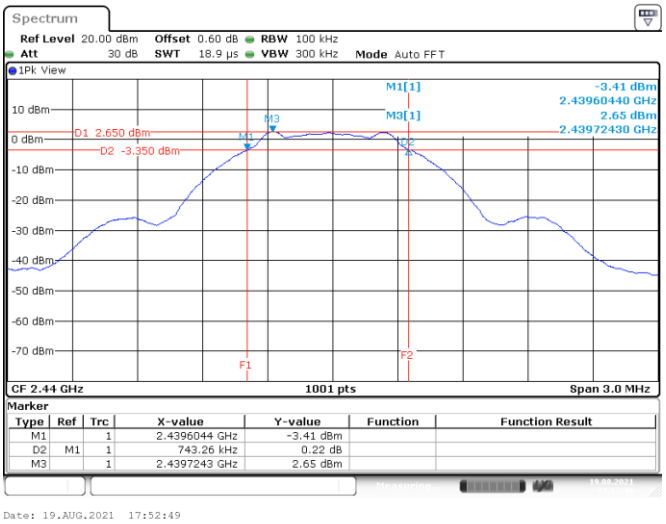
**BLE_1M**

| Channel | Channel Frequency (MHz) | 6 dB Bandwidth (kHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| Low Channel | 2402 | 722.28 | > 500 | Pass |
| Middle Channel | 2440 | 743.26 | > 500 | Pass |
| High Channel | 2480 | 704.30 | > 500 | Pass |

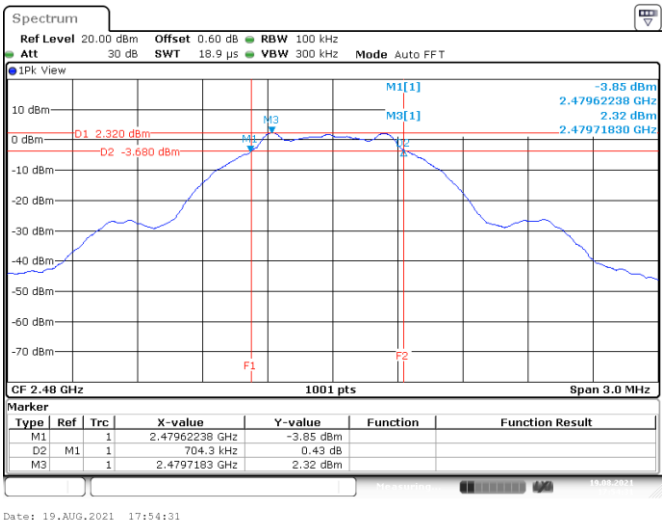
### Low Channel




### Middle Channel



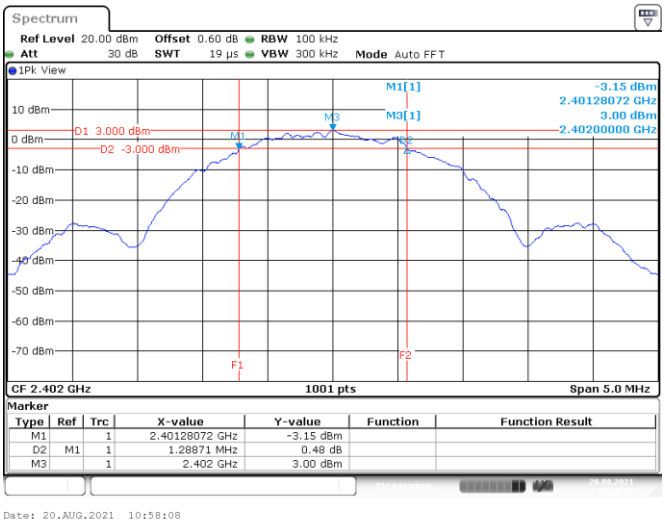

### High Channel



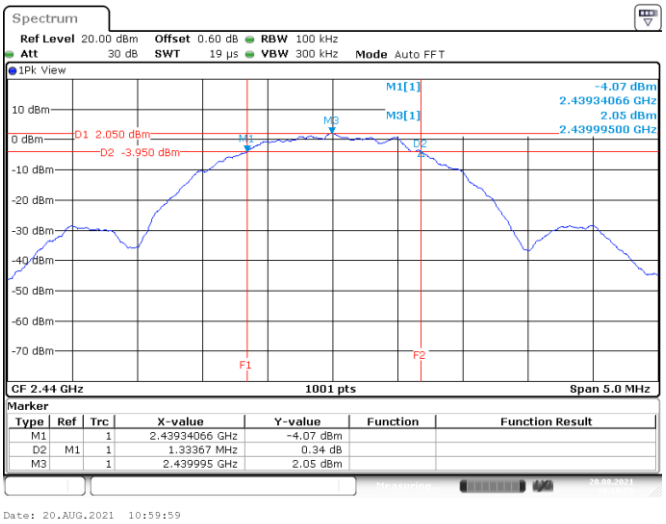
## BLE_2M

| Channel | Channel Frequency (MHz) | 6 dB Bandwidth (kHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| Low Channel | 2402 | 1288.71 | > 500 | Pass |
| Middle Channel | 2440 | 1333.67 | > 500 | Pass |
| High Channel | 2480 | 1283.72 | > 500 | Pass |

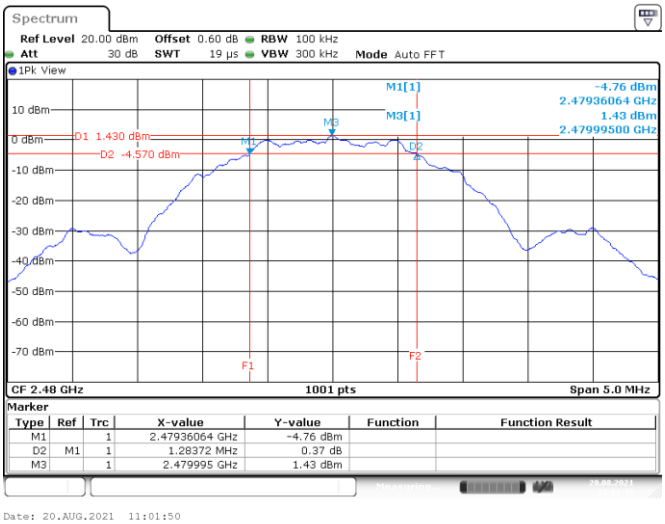
### Low Channel




### Middle Channel




### High Channel

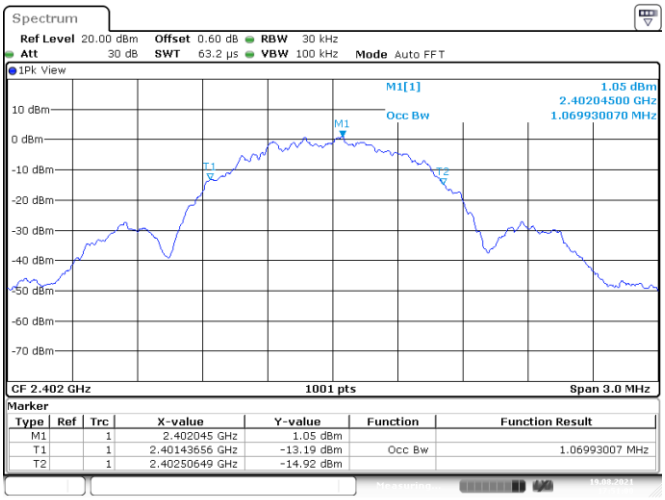


## Test Result of 99% Occupied Bandwidth

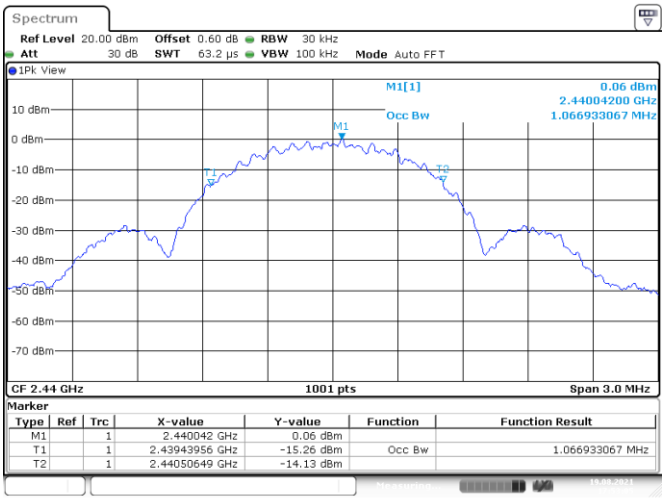
### BLE_1M

| Channel | Channel Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low Channel | 2402 | 1.07 |
| Middle Channel | 2440 | 1.07 |
| High Channel | 2480 | 1.07 |

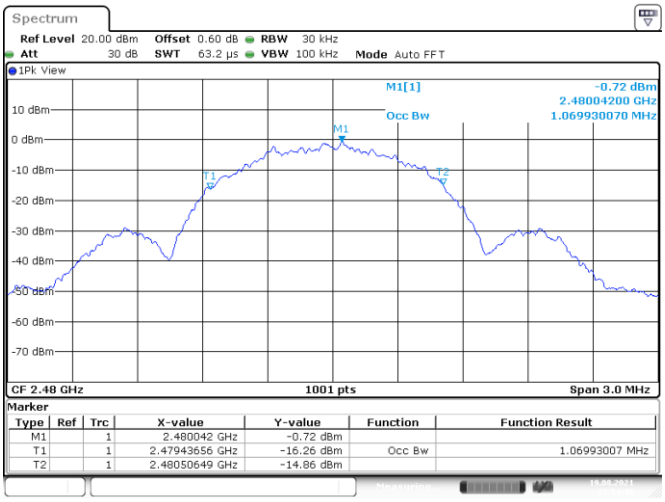
### Low Channel




### Middle Channel



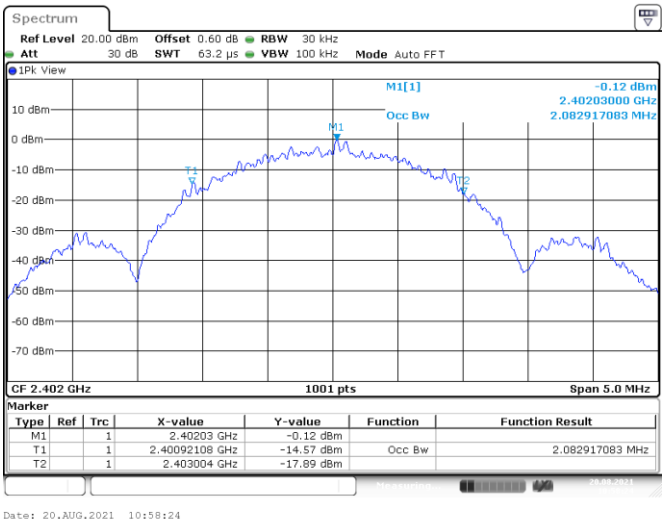

### High Channel



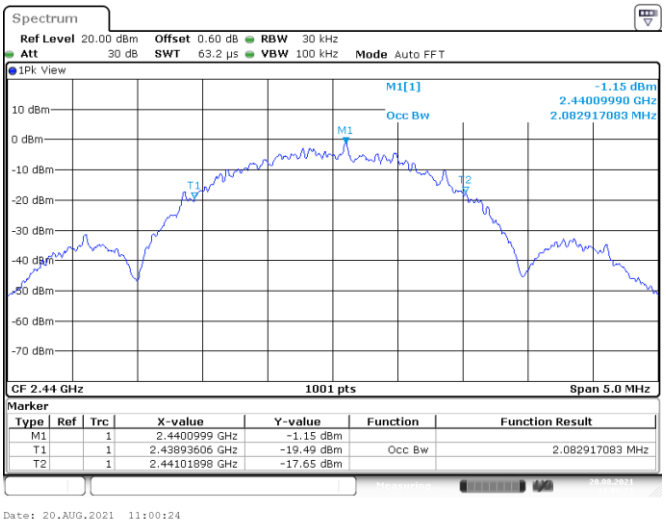
## BLE_2M

| Channel | Channel Frequency (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low Channel | 2402 | 2.08 |
| Middle Channel | 2440 | 2.08 |
| High Channel | 2480 | 2.09 |

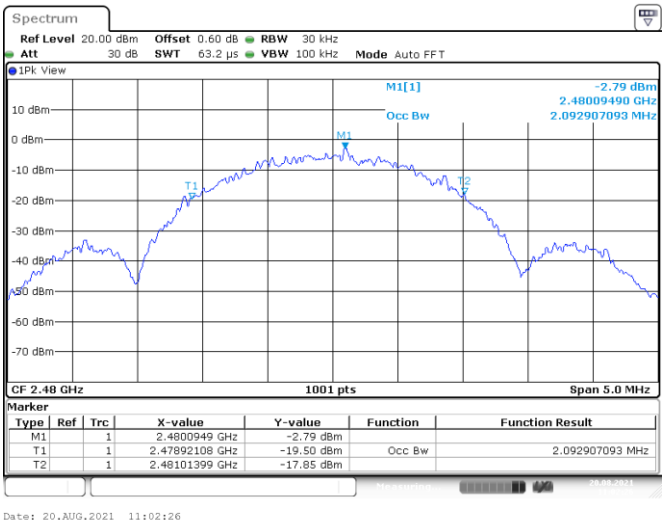
### Low Channel




### Middle Channel




### High Channel

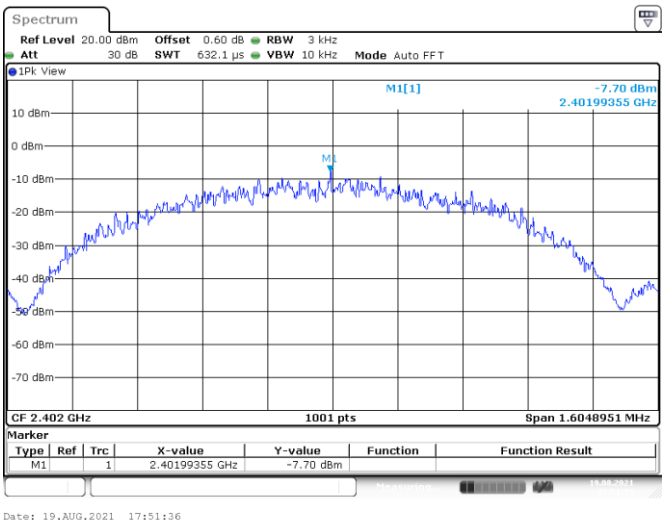


## Test Result of Power Spectral Density

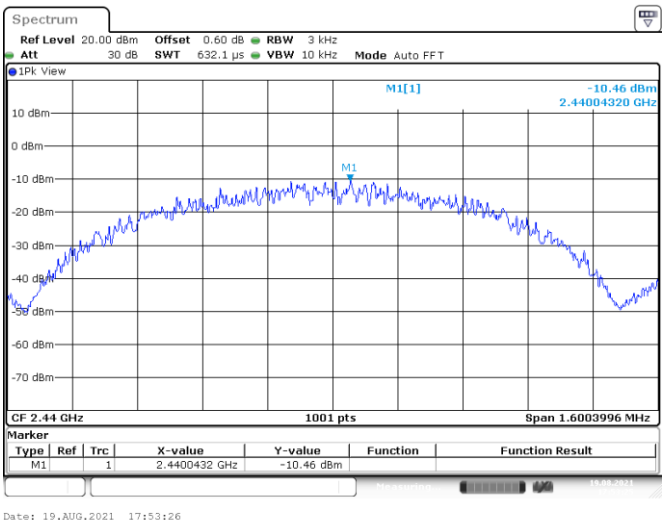
**BLE_1M**

| Channel | Channel Frequency (MHz) | Power Density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|
| Low Channel | 2402 | -7.70 | 8 | Pass |
| Middle Channel | 2440 | -10.46 | 8 | Pass |
| High Channel | 2480 | -8.78 | 8 | Pass |

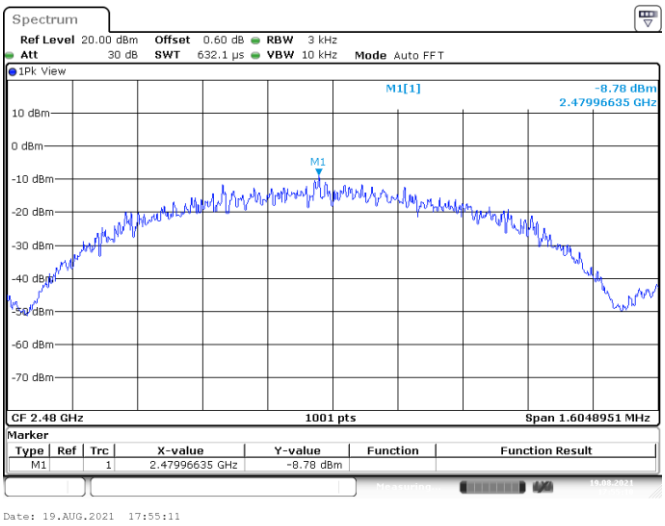
### Low Channel




### Middle Channel



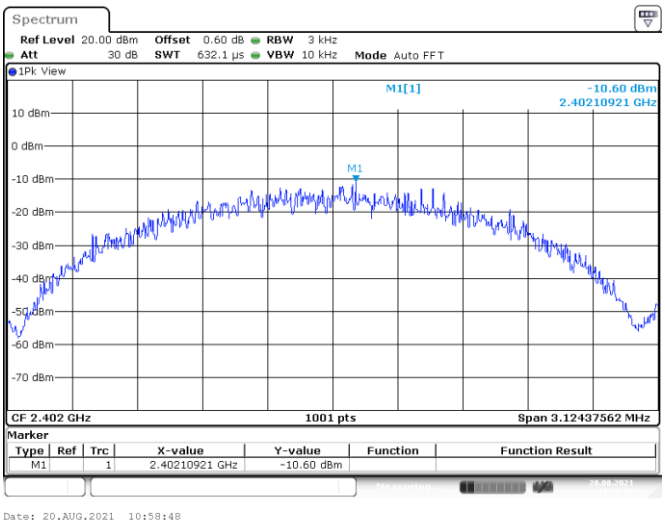

### High Channel



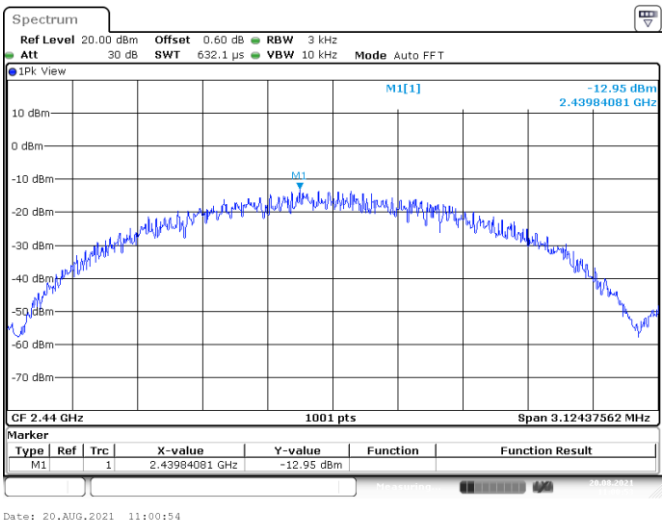
## BLE_2M

| Channel | Channel Frequency (MHz) | Power Density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---|---|---|---|---|
| Low Channel | 2402 | -10.60 | 8 | Pass |
| Middle Channel | 2440 | -12.95 | 8 | Pass |
| High Channel | 2480 | -13.19 | 8 | Pass |

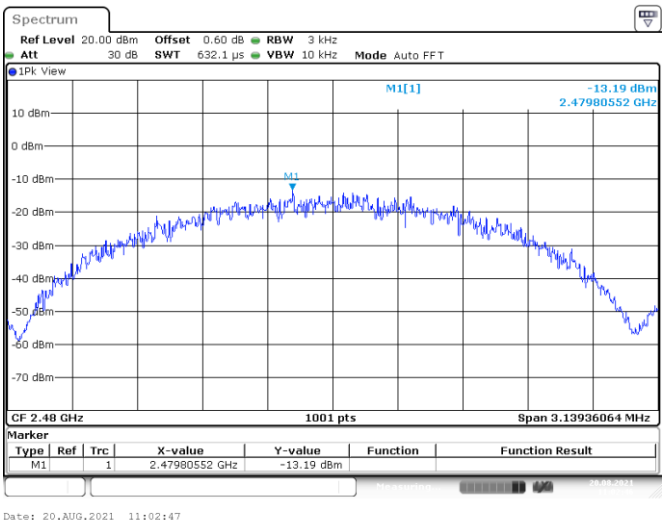
### Low Channel




### Middle Channel

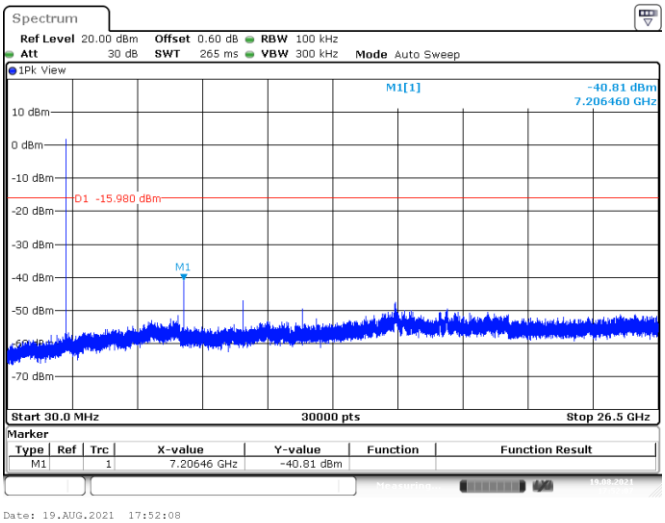
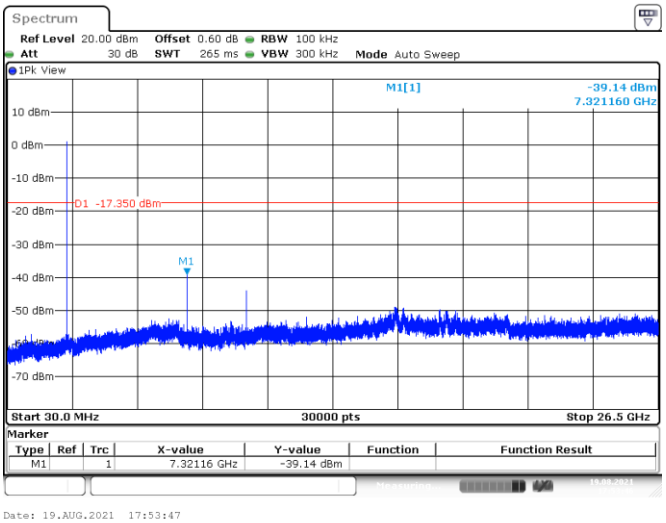
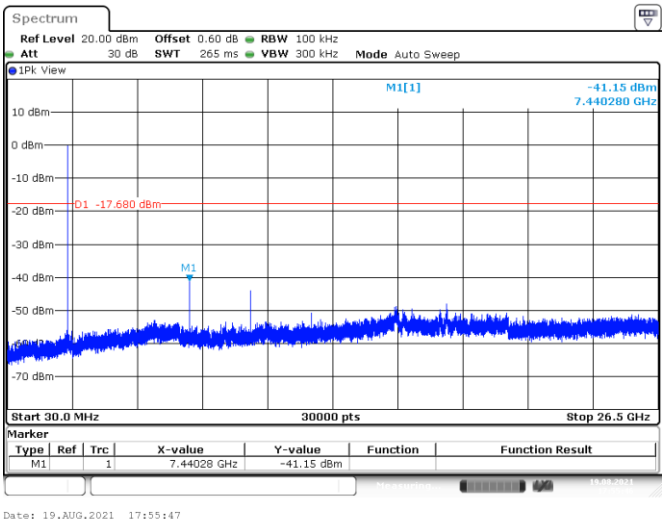



### High Channel



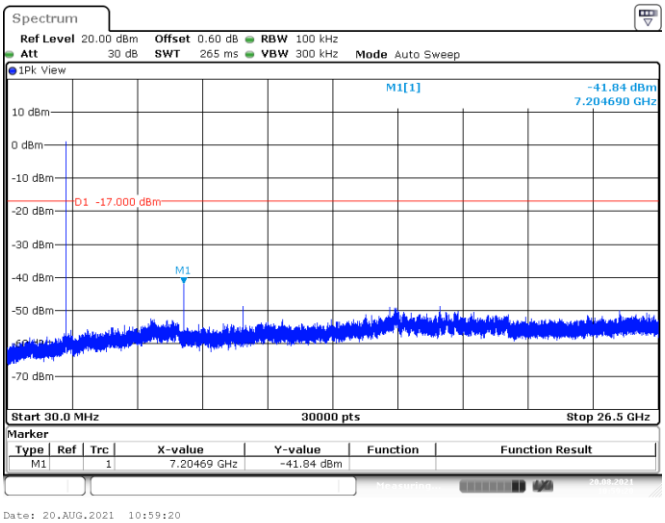
## Test Result of Conducted Spurious Emissions, Tx Mode

### BLE_1M

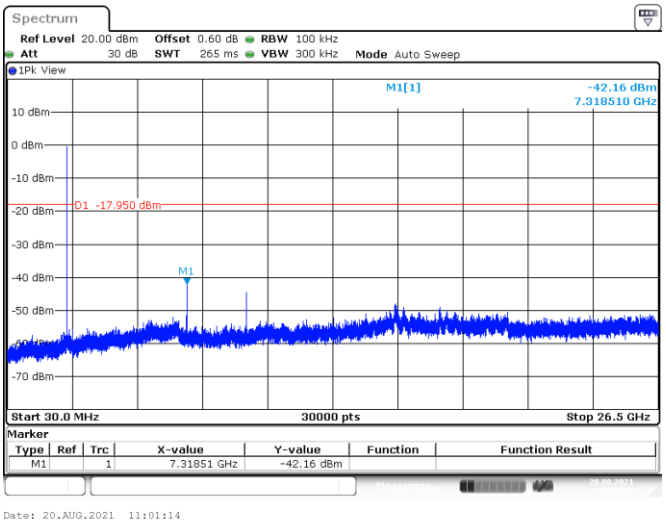
| Low Channel | Middle Channel |
|---|---|
|  |  |
| **High Channel** | |
|  | |

## BLE_2M

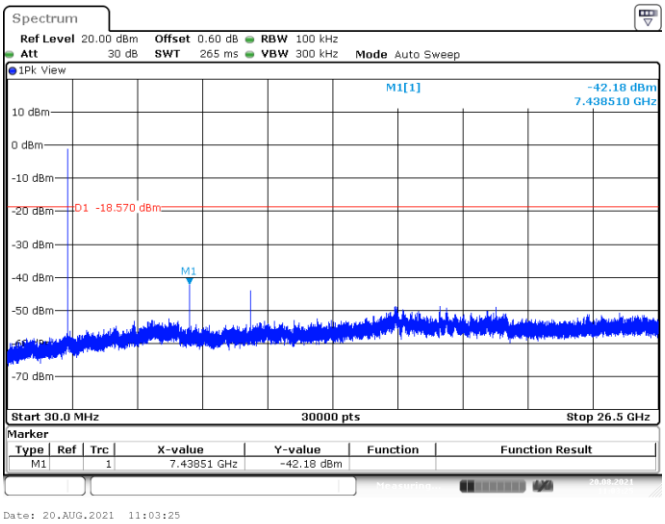
### Low Channel




### Middle Channel

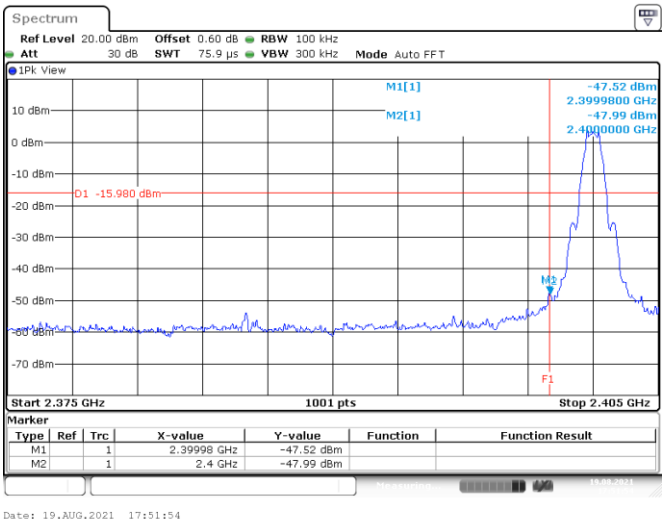
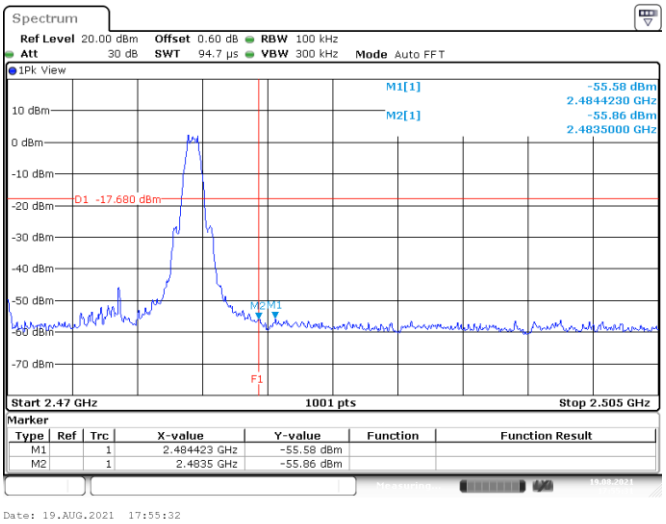



### High Channel

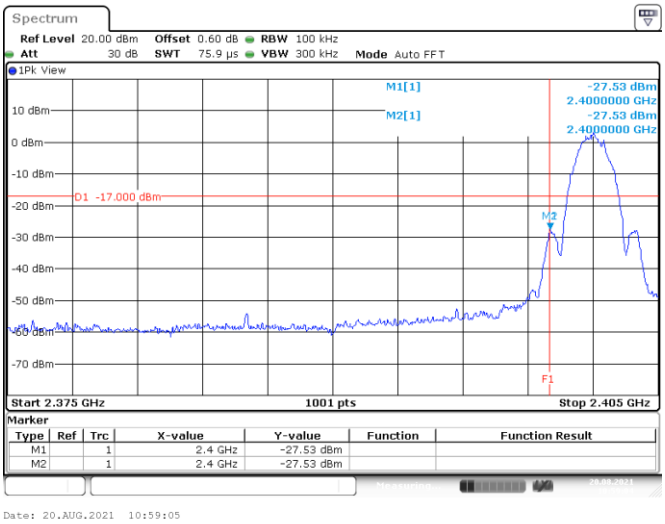
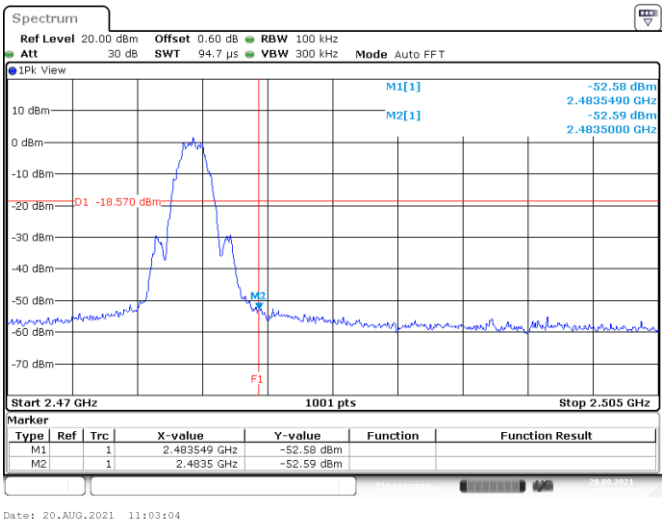


## Test Result of Conducted Band Edge, Tx Mode

### BLE_1M

| Low Channel | High Channel |
|---|---|
|  |  |

## BLE_2M

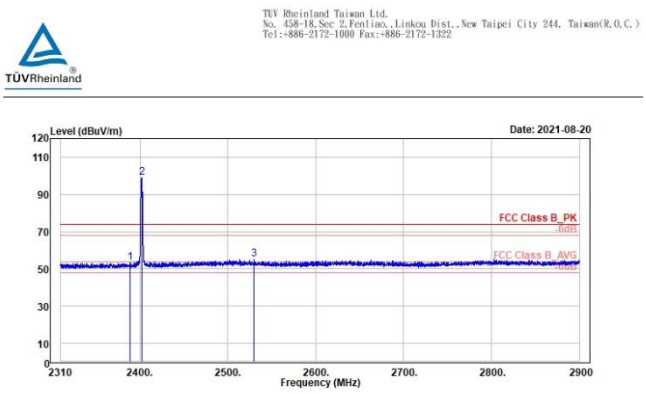
| Low Channel | High Channel |
|---|---|
|  |  |

# Appendix B: Test Results of Radiated Spurious Emissions & Mains Conducted Emission Test

## Band Edges, 2.31GHz ~ 2.9GHz

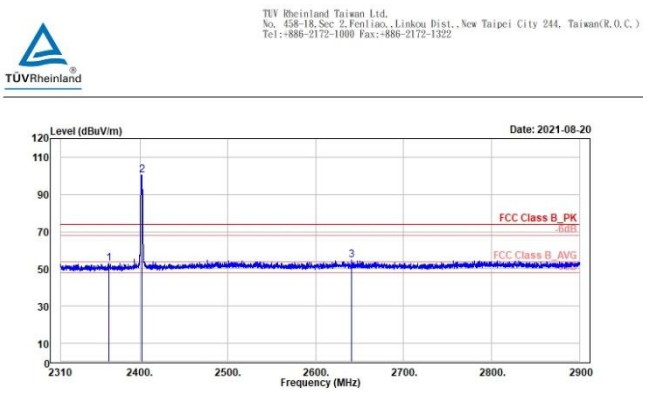
### BLE_1M

#### Low Channel (Horizontal) Peak




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2388.57 | 53.41 | 15.86 | 37.55 | 74.00 | -20.59 | 100 | 154 | Peak | Horizontal | |
| 2 * | 2402.00 | 98.79 | 61.15 | 37.64 | 74.00 | 24.79 | 100 | 154 | Peak | Horizontal | |
| 3 | 2530.15 | 55.06 | 16.89 | 38.17 | 74.00 | -18.94 | 100 | 154 | Peak | Horizontal | |

#### Low Channel (Vertical) Peak

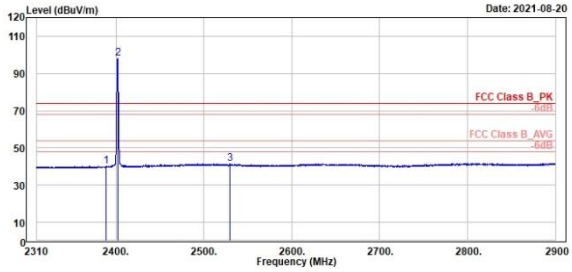



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2364.54 | 53.07 | 15.69 | 37.38 | 74.00 | -20.93 | 275 | 102 | Peak | Vertical | |
| 2 * | 2402.00 | 100.20 | 62.56 | 37.64 | 74.00 | 26.20 | 275 | 102 | Peak | Vertical | |
| 3 | 2640.75 | 54.61 | 16.57 | 38.04 | 74.00 | -19.39 | 275 | 102 | Peak | Vertical | |

## BLE_1M

### Low Channel (Horizontal) Average

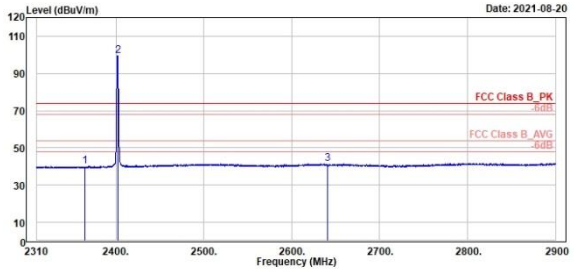
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2388.57 | 40.11 | 2.56 | 37.55 | 54.00 | -13.89 | 100 | 154 | Average | Horizontal | |
| 2 * | 2402.00 | 97.87 | 60.23 | 37.64 | 54.00 | 43.87 | 100 | 154 | Average | Horizontal | |
| 3 | 2530.15 | 41.73 | 3.56 | 38.17 | 54.00 | -12.27 | 100 | 154 | Average | Horizontal | |

### Low Channel (Vertical) Average

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

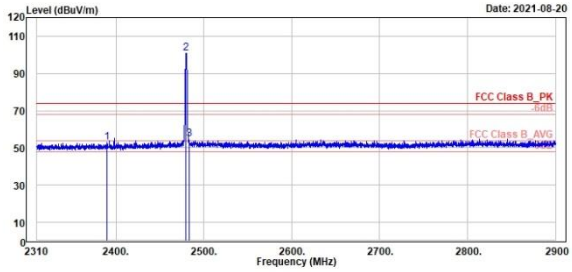



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2364.54 | 40.16 | 2.78 | 37.38 | 54.00 | -13.84 | 275 | 102 | Average | Vertical | |
| 2 * | 2402.00 | 99.27 | 61.63 | 37.64 | 54.00 | 45.27 | 275 | 102 | Average | Vertical | |
| 3 | 2640.75 | 41.70 | 3.66 | 38.04 | 54.00 | -12.30 | 275 | 102 | Average | Vertical | |

## BLE_1M

### High Channel (Horizontal) Peak

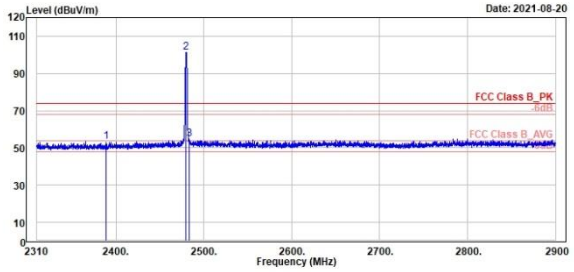
TUV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2389.51 | 52.86 | 15.30 | 37.56 | 74.00 | -21.14 | 147 | 152 | Peak | Horizontal | |
| 2 * | 2480.00 | 100.83 | 62.68 | 38.15 | 74.00 | 26.83 | 147 | 152 | Peak | Horizontal | |
| 3 | 2483.74 | 54.84 | 16.68 | 38.16 | 74.00 | -19.16 | 147 | 152 | Peak | Horizontal | |

### High Channel (Vertical) Peak

TUV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

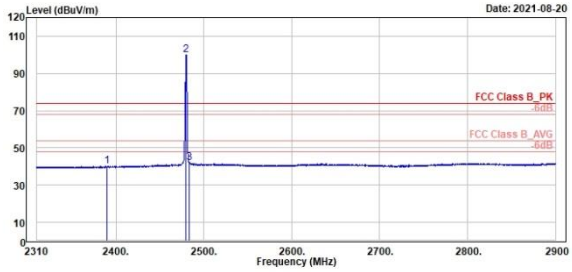



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2388.92 | 53.28 | 15.73 | 37.55 | 74.00 | -20.72 | 260 | 103 | Peak | Vertical | |
| 2 * | 2480.00 | 101.50 | 63.35 | 38.15 | 74.00 | 27.50 | 260 | 103 | Peak | Vertical | |
| 3 | 2483.50 | 54.67 | 16.51 | 38.16 | 74.00 | -19.33 | 260 | 103 | Peak | Vertical | |

## BLE_1M

### High Channel (Horizontal) Average

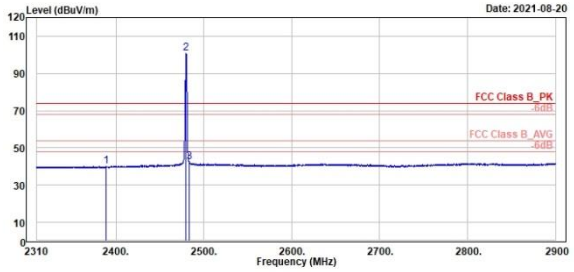
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2389.51 | 40.01 | 2.45 | 37.56 | 54.00 | -13.99 | 147 | 152 | Average | Horizontal | |
| 2 * | 2480.00 | 99.96 | 61.81 | 38.15 | 54.00 | 45.96 | 147 | 152 | Average | Horizontal | |
| 3 | 2483.74 | 42.14 | 3.98 | 38.16 | 54.00 | -11.86 | 147 | 152 | Average | Horizontal | |

### High Channel (Vertical) Average

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

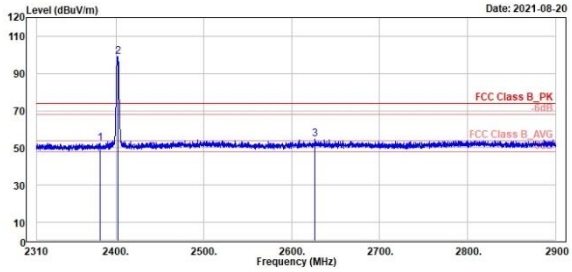



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2388.92 | 40.06 | 2.51 | 37.55 | 54.00 | -13.94 | 260 | 103 | Average | Vertical | |
| 2 * | 2480.00 | 100.61 | 62.46 | 38.15 | 54.00 | 46.61 | 260 | 103 | Average | Vertical | |
| 3 | 2483.50 | 42.34 | 4.18 | 38.16 | 54.00 | -11.66 | 260 | 103 | Average | Vertical | |

## BLE_2M

### Low Channel (Horizontal) Peak

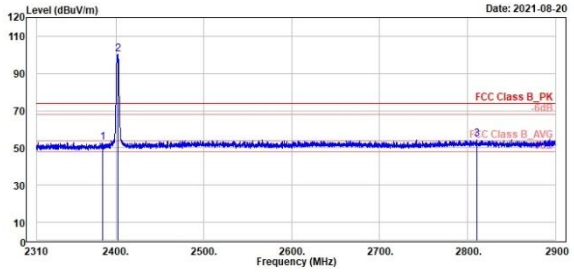
TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2381.73 | 52.38 | 14.88 | 37.50 | 74.00 | -21.62 | 161 | 156 | Peak | Horizontal | |
| 2 * | 2402.00 | 99.00 | 61.36 | 37.64 | 74.00 | 25.00 | 161 | 156 | Peak | Horizontal | |
| 3 | 2626.14 | 54.88 | 16.83 | 38.05 | 74.00 | -19.12 | 161 | 156 | Peak | Horizontal | |

### Low Channel (Vertical) Peak

TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

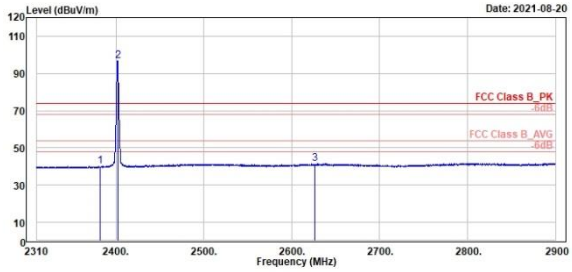



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2385.38 | 52.97 | 15.45 | 37.52 | 74.00 | -21.03 | 274 | 102 | Peak | Vertical | |
| 2 * | 2402.00 | 100.19 | 62.55 | 37.64 | 74.00 | 26.19 | 274 | 102 | Peak | Vertical | |
| 3 | 2810.13 | 54.74 | 16.42 | 38.32 | 74.00 | -19.26 | 274 | 102 | Peak | Vertical | |

## BLE_2M

### Low Channel (Horizontal) Average

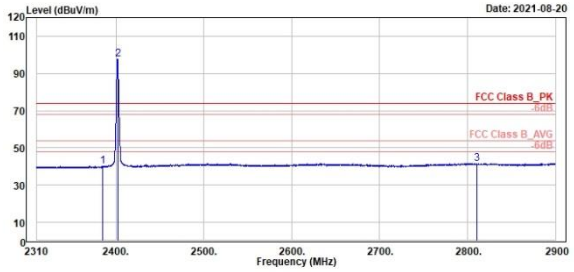
TUV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2381.73 | 40.20 | 2.70 | 37.50 | 54.00 | -13.80 | 161 | 156 | Average | Horizontal | |
| 2 * | 2402.00 | 96.60 | 58.96 | 37.64 | 54.00 | 42.60 | 161 | 156 | Average | Horizontal | |
| 3 | 2626.14 | 41.71 | 3.66 | 38.05 | 54.00 | -12.29 | 161 | 156 | Average | Horizontal | |

### Low Channel (Vertical) Average

TUV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

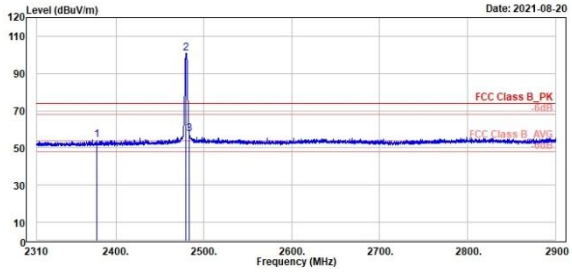



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2385.38 | 40.14 | 2.62 | 37.52 | 54.00 | -13.86 | 274 | 102 | Average | Vertical | |
| 2 * | 2402.00 | 97.77 | 60.13 | 37.64 | 54.00 | 43.77 | 274 | 102 | Average | Vertical | |
| 3 | 2810.13 | 41.74 | 3.42 | 38.32 | 54.00 | -12.26 | 274 | 102 | Average | Vertical | |

## BLE_2M

### High Channel (Horizontal) Peak

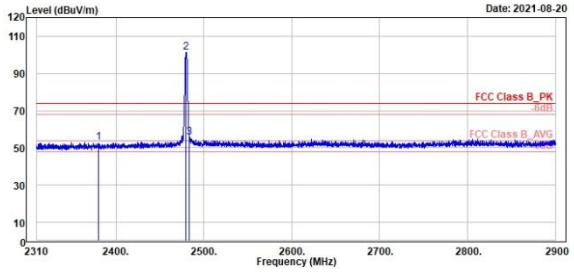
TUV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2377.96 | 54.16 | 16.68 | 37.48 | 74.00 | -19.84 | 146 | 152 | Peak | Horizontal | |
| 2 * | 2480.00 | 100.87 | 62.72 | 38.15 | 74.00 | 26.87 | 146 | 152 | Peak | Horizontal | |
| 3 | 2483.50 | 57.37 | 19.21 | 38.16 | 74.00 | -16.63 | 146 | 152 | Peak | Horizontal | |

### High Channel (Vertical) Peak

TUV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

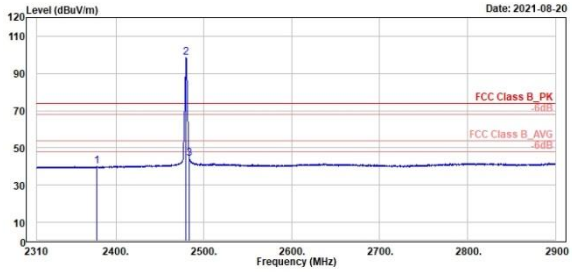



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2379.97 | 52.82 | 15.33 | 37.49 | 74.00 | -21.18 | 260 | 103 | Peak | Vertical | |
| 2 * | 2480.00 | 101.50 | 63.35 | 38.15 | 74.00 | 27.50 | 260 | 103 | Peak | Vertical | |
| 3 | 2483.50 | 55.83 | 17.67 | 38.16 | 74.00 | -18.17 | 260 | 103 | Peak | Vertical | |

## BLE_2M

### High Channel (Horizontal) Average

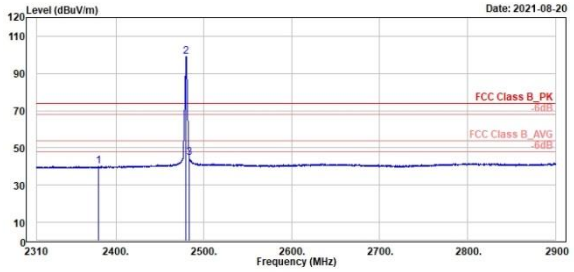
TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2377.96 | 40.21 | 2.73 | 37.48 | 54.00 | -13.79 | 146 | 152 | Average | Horizontal | |
| 2 * | 2480.00 | 98.56 | 60.41 | 38.15 | 54.00 | 44.56 | 146 | 152 | Average | Horizontal | |
| 3 | 2483.50 | 44.32 | 6.16 | 38.16 | 54.00 | -9.68 | 146 | 152 | Average | Horizontal | |

### High Channel (Vertical) Average

TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



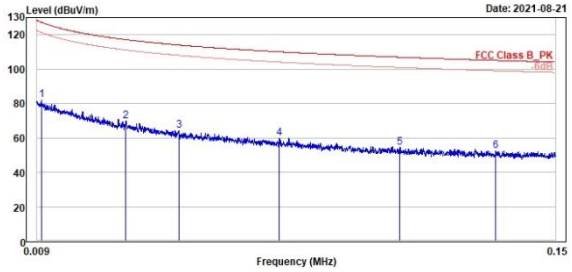

| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2379.97 | 40.16 | 2.67 | 37.49 | 54.00 | -13.84 | 260 | 103 | Average | Vertical | |
| 2 * | 2480.00 | 99.19 | 61.04 | 38.15 | 54.00 | 45.19 | 260 | 103 | Average | Vertical | |
| 3 | 2483.50 | 44.59 | 6.43 | 38.16 | 54.00 | -9.41 | 260 | 103 | Average | Vertical | |

## Spurious Emissions, Tx Mode, 9kHz ~ 30MHz

### BLE_2M

#### Middle Channel (Open) 9kHz~150kHz

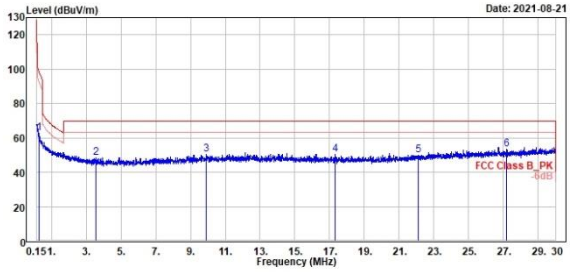
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 0.01 | 81.86 | 5.25 | 76.61 | 127.31 | -45.45 | 100 | 72 | QP | Open | |
| 2 | 0.03 | 69.88 | 1.93 | 67.95 | 117.15 | -47.27 | 100 | 223 | QP | Open | |
| 3 | 0.05 | 64.19 | -0.23 | 64.42 | 114.03 | -49.84 | 100 | 265 | QP | Open | |
| 4 | 0.07 | 59.86 | -0.70 | 60.56 | 110.10 | -50.24 | 100 | 6 | QP | Open | |
| 5 | 0.11 | 54.47 | -2.46 | 56.93 | 106.95 | -52.48 | 100 | 127 | QP | Open | |
| 6 | 0.13 | 52.42 | -3.39 | 55.81 | 105.07 | -52.65 | 100 | 84 | QP | Open | |

#### Middle Channel (Open) 150kHz~30MHz

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

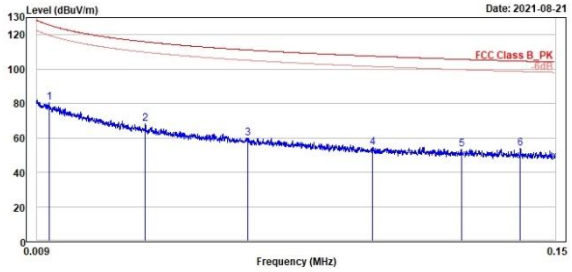



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 0.29 | 62.79 | 13.83 | 48.96 | 98.26 | -35.47 | 100 | 38 | QP | Open | |
| 2 | 3.57 | 48.60 | 11.83 | 36.77 | 69.50 | -20.90 | 100 | 35 | QP | Open | |
| 3 | 9.92 | 50.24 | 12.09 | 38.15 | 69.50 | -19.26 | 100 | 314 | QP | Open | |
| 4 | 17.32 | 50.56 | 12.92 | 37.64 | 69.50 | -18.94 | 100 | 27 | QP | Open | |
| 5 | 22.11 | 50.07 | 11.63 | 38.44 | 69.50 | -19.43 | 100 | 35 | QP | Open | |
| 6 | 27.20 | 53.57 | 12.76 | 40.81 | 69.50 | -15.93 | 100 | 300 | QP | Open | |

## BLE_2M

### Middle Channel (Close) 9kHz~150kHz

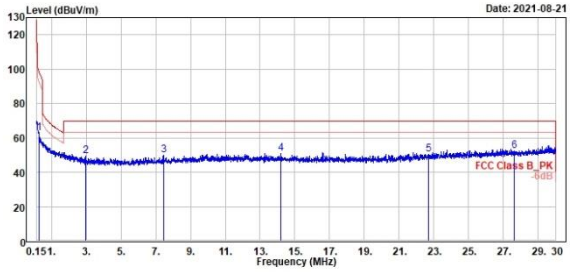
TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 0.01 | 80.55 | 4.75 | 75.80 | 125.75 | -45.20 | 100 | 322 | QP | Close | |
| 2 | 0.04 | 68.27 | 1.60 | 66.67 | 115.88 | -47.61 | 100 | 97 | QP | Close | |
| 3 | 0.07 | 60.05 | -1.63 | 61.68 | 111.14 | -51.09 | 100 | 225 | QP | Close | |
| 4 | 0.10 | 54.29 | -2.96 | 57.25 | 107.57 | -53.28 | 100 | 349 | QP | Close | |
| 5 | 0.12 | 53.39 | -2.82 | 56.21 | 105.70 | -52.31 | 100 | 253 | QP | Close | |
| 6 | 0.14 | 54.02 | -1.50 | 55.52 | 104.65 | -50.63 | 100 | 29 | QP | Close | |

### Middle Channel (Close) 150kHz~30MHz

TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



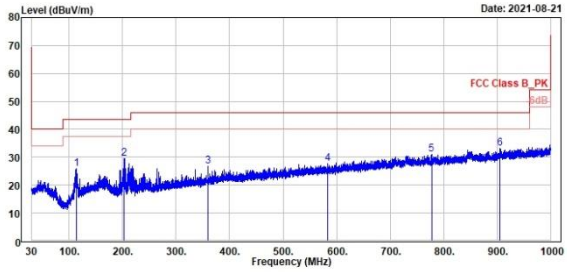

| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 0.28 | 62.64 | 13.17 | 49.47 | 98.62 | -35.98 | 100 | 20 | QP | Close | |
| 2 | 2.97 | 49.32 | 12.34 | 36.98 | 69.50 | -20.18 | 100 | 98 | QP | Close | |
| 3 | 7.44 | 49.70 | 12.46 | 37.24 | 69.50 | -19.80 | 100 | 197 | QP | Close | |
| 4 | 14.20 | 50.67 | 12.80 | 37.87 | 69.50 | -18.83 | 100 | 223 | QP | Close | |
| 5 | 22.70 | 50.64 | 11.93 | 38.71 | 69.50 | -18.86 | 100 | 150 | QP | Close | |
| 6 | 27.62 | 52.58 | 11.57 | 41.01 | 69.50 | -16.92 | 100 | 314 | QP | Close | |

## Spurious Emissions, Tx Mode, 30MHz ~ 1GHz

### BLE_2M

#### Middle Channel (Horizontal)

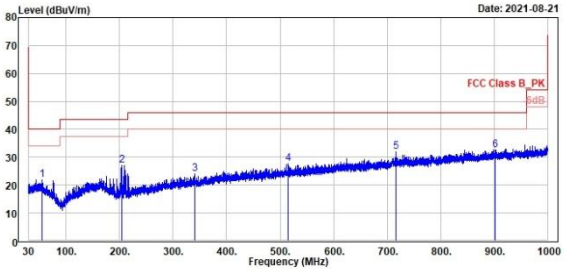
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 113.13 | 25.83 | 36.36 | -10.53 | 43.50 | -17.67 | 200 | 93 | QP | Horizontal | |
| 2 | 202.47 | 29.55 | 39.66 | -10.11 | 43.50 | -13.95 | 100 | 188 | QP | Horizontal | |
| 3 | 359.99 | 26.92 | 32.35 | -5.43 | 46.00 | -19.08 | 300 | 27 | QP | Horizontal | |
| 4 | 583.48 | 27.74 | 29.48 | -1.74 | 46.00 | -18.26 | 200 | 95 | QP | Horizontal | |
| 5 | 777.58 | 30.88 | 29.23 | 1.65 | 46.00 | -15.12 | 200 | 201 | QP | Horizontal | |
| 6 | 904.65 | 33.14 | 29.56 | 3.58 | 46.00 | -12.86 | 200 | 243 | QP | Horizontal | |

#### Middle Channel (Vertical)

TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



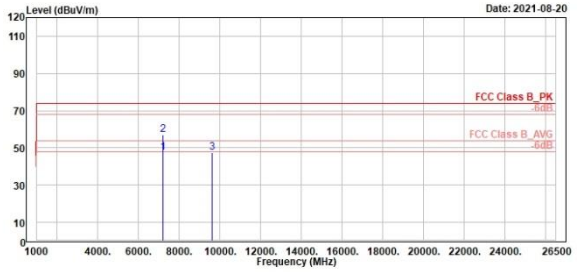

| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 55.12 | 21.90 | 29.98 | -8.08 | 40.00 | -18.10 | 100 | 130 | QP | Vertical | |
| 2 | 203.63 | 27.05 | 37.18 | -10.13 | 43.50 | -16.45 | 400 | 120 | QP | Vertical | |
| 3 | 340.01 | 24.12 | 29.76 | -5.64 | 46.00 | -21.88 | 200 | 212 | QP | Vertical | |
| 4 | 514.71 | 27.53 | 30.25 | -2.72 | 46.00 | -18.47 | 200 | 325 | QP | Vertical | |
| 5 | 716.86 | 31.93 | 31.46 | 0.47 | 46.00 | -14.07 | 200 | 74 | QP | Vertical | |
| 6 | 901.84 | 32.52 | 29.01 | 3.51 | 46.00 | -13.48 | 200 | 88 | QP | Vertical | |

## Spurious Emissions, Tx Mode, 1GHz ~ 26.5GHz

### BLE_1M

#### Low Channel (Horizontal)

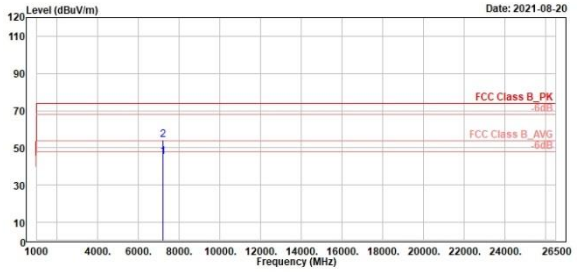
TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 7206.00 | 47.65 | 54.89 | -7.24 | 77.87 | -30.22 | 300 | 353 | Average | Horizontal | |
| 2 | 7206.00 | 56.85 | 64.09 | -7.24 | 78.79 | -21.94 | 300 | 353 | Peak | Horizontal | |
| 3 | 9608.00 | 47.26 | 52.16 | -4.90 | 78.79 | -31.53 | 100 | 242 | Peak | Horizontal | |

#### Low Channel (Vertical)

TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

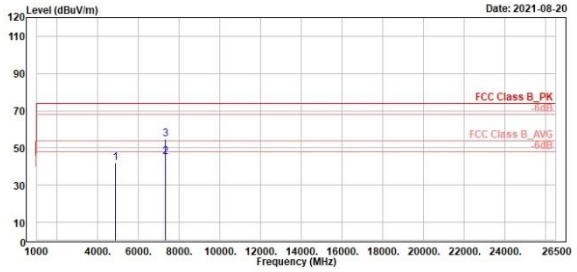



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 7206.00 | 45.14 | 52.38 | -7.24 | 79.27 | -34.13 | 262 | 84 | Average | Vertical | |
| 2 | 7206.00 | 54.31 | 61.55 | -7.24 | 80.20 | -25.89 | 262 | 84 | Peak | Vertical | |

## BLE_1M

### Middle Channel (Horizontal)

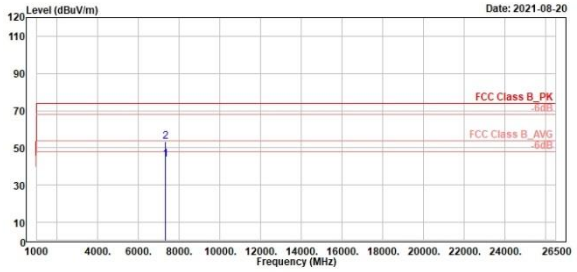
TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 4880.00 | 41.99 | 51.66 | -9.67 | 74.00 | -32.01 | 400 | 100 | Peak | Horizontal | |
| 2 | 7320.00 | 45.39 | 52.66 | -7.27 | 54.00 | -8.61 | 303 | 355 | Average | Horizontal | |
| 3 | 7320.00 | 54.79 | 62.06 | -7.27 | 74.00 | -19.21 | 303 | 355 | Peak | Horizontal | |

### Middle Channel (Vertical)

TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

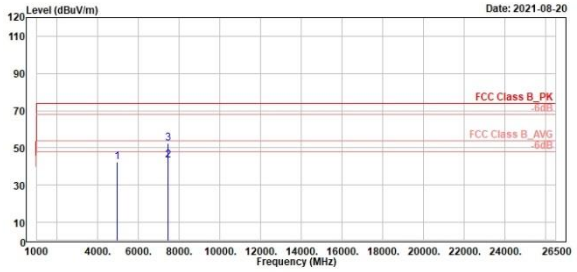



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 7320.00 | 43.66 | 50.93 | -7.27 | 54.00 | -10.34 | 100 | 86 | Average | Vertical | |
| 2 | 7320.00 | 53.17 | 60.44 | -7.27 | 74.00 | -20.83 | 100 | 86 | Peak | Vertical | |

## BLE_1M

### High Channel (Horizontal)

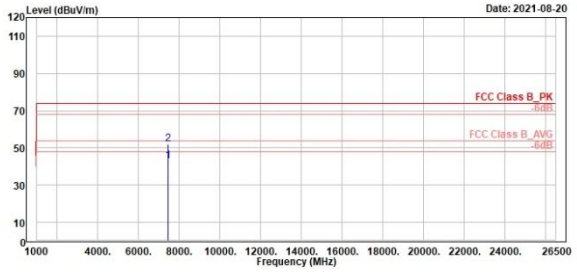
TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 4960.00 | 42.25 | 51.71 | -9.46 | 74.00 | -31.75 | 100 | 45 | Peak | Horizontal | |
| 2 | 7440.00 | 43.21 | 50.46 | -7.25 | 54.00 | -10.79 | 316 | 360 | Average | Horizontal | |
| 3 | 7440.00 | 52.39 | 59.64 | -7.25 | 74.00 | -21.61 | 316 | 360 | Peak | Horizontal | |

### High Channel (Vertical)

TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

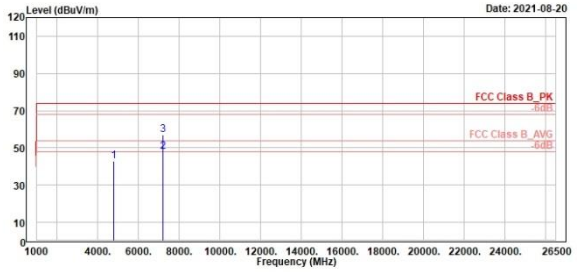



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 7440.00 | 42.80 | 50.05 | -7.25 | 54.00 | -11.20 | 100 | 87 | Average | Vertical | |
| 2 | 7440.00 | 51.80 | 59.05 | -7.25 | 74.00 | -22.20 | 100 | 87 | Peak | Vertical | |

## BLE_2M

### Low Channel (Horizontal)

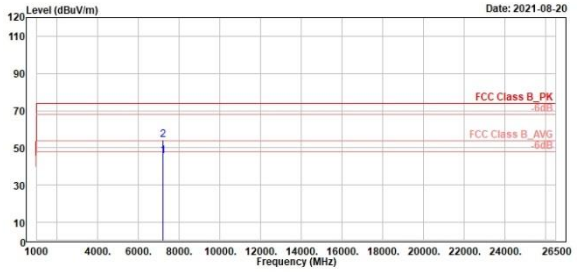
TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 4804.00 | 42.80 | 52.58 | -9.78 | 74.00 | -31.20 | 400 | 273 | Peak | Horizontal | |
| 2 | 7204.00 | 48.10 | 55.34 | -7.24 | 76.60 | -28.50 | 300 | 353 | Average | Horizontal | |
| 3 | 7204.00 | 56.87 | 64.11 | -7.24 | 79.00 | -22.13 | 300 | 353 | Peak | Horizontal | |

### Low Channel (Vertical)

TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

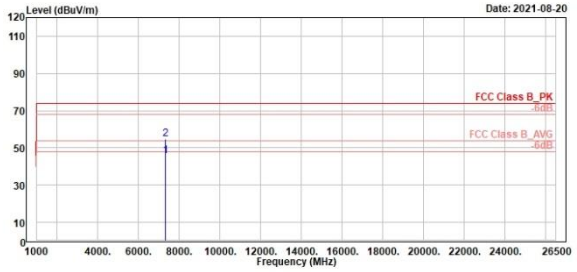



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 7204.00 | 45.40 | 52.64 | -7.24 | 77.77 | -32.37 | 262 | 81 | Average | Vertical | |
| 2 | 7204.00 | 54.27 | 61.51 | -7.24 | 80.90 | -26.63 | 262 | 81 | Peak | Vertical | |

## BLE_2M

### Middle Channel (Horizontal)

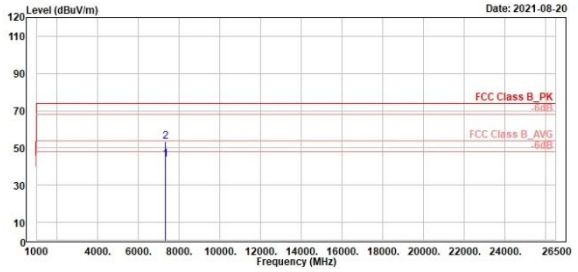
TUV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 7320.00 | 45.52 | 52.79 | -7.27 | 54.00 | -8.48 | 303 | 356 | Average | Horizontal | |
| 2 | 7320.00 | 54.78 | 62.05 | -7.27 | 74.00 | -19.22 | 303 | 356 | Peak | Horizontal | |

### Middle Channel (Vertical)

TUV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322

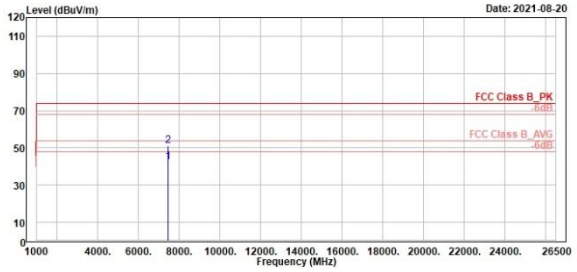



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 7320.00 | 43.73 | 51.00 | -7.27 | 54.00 | -10.27 | 101 | 86 | Average | Vertical | |
| 2 | 7320.00 | 53.41 | 60.68 | -7.27 | 74.00 | -20.59 | 101 | 86 | Peak | Vertical | |

## BLE_2M

### High Channel (Horizontal)

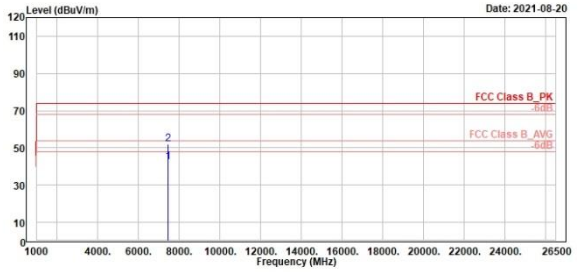
TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 7440.00 | 42.63 | 49.88 | -7.25 | 54.00 | -11.37 | 315 | 360 | Average | Horizontal | |
| 2 | 7440.00 | 50.88 | 58.13 | -7.25 | 74.00 | -23.12 | 315 | 360 | Peak | Horizontal | |

### High Channel (Vertical)

TÜV Rheinland Taiwan Ltd.
No. 458-18,Sec 2,Fenliao.,Linkou Dist.,New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322



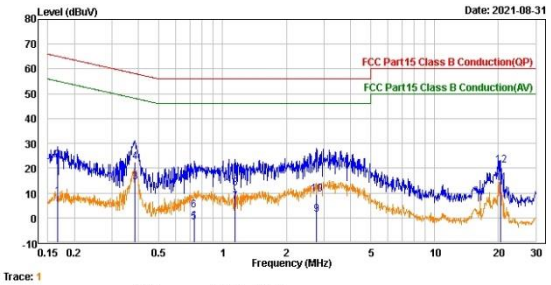

| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 7440.00 | 42.48 | 49.73 | -7.25 | 54.00 | -11.52 | 100 | 86 | Average | Vertical | |
| 2 | 7440.00 | 52.02 | 59.27 | -7.25 | 74.00 | -21.98 | 100 | 86 | Peak | Vertical | |

## Mains Conducted Emission, 150kHz ~ 30MHz

### Worst Band

### (Line)

TÜV Rheinland Taiwan Ltd(New Taipei City Branch).
No. 458-18, Sec. 2, Fenliao Rd., Linkou Dist., New Taipei City 244
Tel:+886-2172-1000 Fax:+886-2172-1322

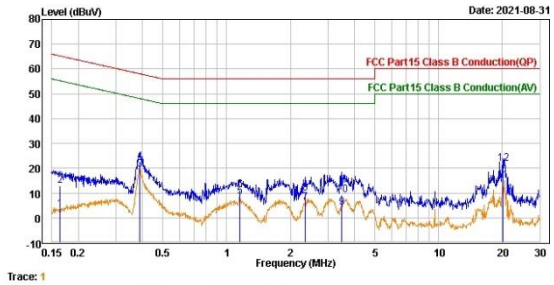



Trace: 1

| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dBuV | dB | dBuV | dB | | | |
| 1 | 0.17 | 8.43 | -1.23 | 9.66 | 55.09 | -46.66 | Average | line1 | |
| 2 | 0.17 | 23.08 | 13.42 | 9.66 | 65.09 | -42.01 | QP | line1 | |
| 3 | 0.38 | 14.42 | 4.77 | 9.65 | 48.18 | -33.76 | Average | line1 | |
| 4 | 0.38 | 22.57 | 12.92 | 9.65 | 58.18 | -35.61 | QP | line1 | |
| 5 | 0.73 | -1.66 | -11.32 | 9.66 | 46.00 | -47.66 | Average | line1 | |
| 6 | 0.73 | 2.90 | -6.76 | 9.66 | 56.00 | -53.10 | QP | line1 | |
| 7 | 1.14 | 6.41 | -3.25 | 9.66 | 46.00 | -39.59 | Average | line1 | |
| 8 | 1.14 | 11.97 | 2.31 | 9.66 | 56.00 | -44.03 | QP | line1 | |
| 9 | 2.78 | 1.38 | -8.31 | 9.69 | 46.00 | -44.62 | Average | line1 | |
| 10 | 2.78 | 9.53 | -0.16 | 9.69 | 56.00 | -46.47 | QP | line1 | |
| 11 | 20.54 | 13.88 | 4.16 | 9.72 | 50.00 | -36.12 | Average | line1 | |
| 12 | 20.54 | 20.98 | 11.26 | 9.72 | 60.00 | -39.02 | QP | line1 | |

### (Neutral)

TÜV Rheinland Taiwan Ltd(New Taipei City Branch).
No. 458-18, Sec. 2, Fenliao Rd., Linkou Dist., New Taipei City 244
Tel:+886-2172-1000 Fax:+886-2172-1322




Trace: 1

| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dBuV | dB | dBuV | dB | | | |
| 1 | 0.16 | 3.38 | -6.30 | 9.68 | 55.30 | -51.92 | Average | neutral | |
| 2 | 0.16 | 12.98 | 3.30 | 9.68 | 65.30 | -52.32 | QP | neutral | |
| 3 | 0.39 | 19.30 | 9.64 | 9.66 | 48.05 | -28.75 | Average | neutral | |
| 4 | 0.39 | 22.62 | 12.96 | 9.66 | 58.05 | -35.43 | QP | neutral | |
| 5 | 1.15 | 8.35 | -1.32 | 9.67 | 46.00 | -37.65 | Average | neutral | |
| 6 | 1.15 | 11.14 | 1.47 | 9.67 | 56.00 | -44.86 | QP | neutral | |
| 7 | 2.35 | 6.09 | -3.61 | 9.70 | 46.00 | -39.91 | Average | neutral | |
| 8 | 2.35 | 9.83 | 0.13 | 9.70 | 56.00 | -46.17 | QP | neutral | |
| 9 | 3.48 | 3.97 | -5.74 | 9.71 | 46.00 | -42.03 | Average | neutral | |
| 10 | 3.48 | 9.26 | -0.45 | 9.71 | 56.00 | -46.74 | QP | neutral | |
| 11 | 20.03 | 14.89 | 5.07 | 9.82 | 50.00 | -35.11 | Average | neutral | |
| 12 | 20.03 | 21.66 | 11.84 | 9.82 | 60.00 | -38.34 | QP | neutral | |