| | | | | |
|---|---|---|---|---|
| **Prüfbericht-Nr.:** *Test report no.:* | CN212BVU (P15C-WiFi) 001 | **Auftrags-Nr.:** *Order no.*: | 238494114 | Seite 1 von 24 *Page 1 of 24* |
| **Kunden-Referenz-Nr.:** *Client reference no.:* | N/A | **Auftragsdatum:** *Order date:* | 2020-11-12 | |
| **Auftraggeber:** *Client:* | AURES TECHNOLOGIES S.A.<br>24 bis rue Léonard de Vinci 91090 Lisses FRANCE | | | |
| **Prüfgegenstand:** *Test item:* | 7" Integrated Handy POS | | | |
| **Bezeichnung / Typ-Nr.:** *Identification / Type no.:* | TMC7200 | | | |
| **Auftrags-Inhalt:** *Order content*: | FCC Part 15C Test report (WiFi 2.4GHz) | | | |
| **Prüfgrundlage:** *Test specification:* | FCC 47CFR Part 15: Subpart C Section 15.247 | | | |

| | |
|---|---|
| **Wareneingangsdatum:** *Date of sample receipt:* | 2021-08-04 |
| **Prüfmuster-Nr.:** *Test sample no:* | A003104126-001 |
| **Prüfzeitraum:** *Testing period:* | 2021-08-19 - 2021-09-01 |
| **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:* | | **genehmigt von:** authorized by: | |
| **Datum:** *Date:* 2021-09-08 | Ryan Chen | **Ausstellungsdatum:** *Issue date:* 2021-09-08 | Brenda Chen |
| **Stellung** / *Position:* | Senior Project Manager | **Stellung** / *Position:* | Senior Project Manager |

**Sonstiges** / *Other:* This report only evaluated Output Power, RSE and Mains Conducted Emissions tests. The other test results are referred to the module report no.: CN210UH4 (P15C-WiFi) 001.

**Zustand des Prüfgegenstandes bei Anlieferung:** Prüfmuster vollständig und unbeschädigt
*Condition of the test item at delivery:* *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* |

# 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 |
| - | 15.247(a)(2) | 6 dB Bandwidth | N/A (Note 1) |
| - | 2.1049 | 99% Occupied Bandwidth | N/A (Note 1) |
| - | 15.247(e) | Power Spectral Density | N/A (Note 1) |
| - | 15.247(d) | Conducted Spurious Emissions and Band Edges | N/A (Note 1) |
| 5.1.3 | 15.247(d) & 15.205 & 15.209 | Radiated Spurious Emissions and Band Edges | Pass |
| 5.2.1 | 15.207 | Mains Conducted Emission | Pass |

**Note:**

1. Refer to module report no.: CN210UH4 (P15C-WiFi) 001 for the details.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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APPENDIX SP - PHOTOGRAPHS OF TEST SETUP

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# HISTORY OF THIS TEST REPORT

| Report No. | Description | Date Issued |
|---|---|---|
| CN212BVU (P15C-WiFi) 001 | Original Release | 2021-09-08 |

# 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 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 |
| FCC 47CFR Part 2: Subpart J Section 2.1049 |
| ANSI C63.10:2013 |
| KDB 558074 D01 15.247 Meas Guidance v05r02 |
| KDB 662911 D01 Multiple Transmitter Output v02r01 |

## 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) | ± 1.32 dB |
| Radiated Emission (200 MHz ~ 1 GHz) | ± 1.31 dB |
| Radiated Emission (1 GHz ~ 18 GHz) | ± 1.53 dB |
| Radiated Emission (18 GHz ~ 40 GHz) | ± 2.50 dB |
| Mains Conducted Emission | ± 1.65 dB |

# 3. General Product Information

## 3.1 Product Function and Intended Use

The EUT is a 7" Integrated Handy POS. It contains a WLAN 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 | 7" Integrated Handy POS |
| Type Identification | TMC7200 |
| FCC ID | 2AMRAP-WFBT-AP6356 |

### Technical Specification of EUT

| Item | EUT information |
|---|---|
| Operating Frequency | 2412 MHz ~ 2462 MHz |
| Channel Number | 802.11b/g/n HT20: 11 |
| Data Rate | 802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps<br>802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps<br>802.11n: up to MCS7 |
| Operation Voltage | 3.85 Vdc |
| Modulation | DSSS (DBPSK, DQPSK, CCK)<br>OFDM (BPSK, QPSK, 16QAM, 64QAM) |
| Maximum Output Power (mW) | 802.11b: 207.49<br>802.11g: 392.64<br>802.11n HT20: 384.59 |
| 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

| 802.11b | | 802.11g | | 802.11n HT20 | |
|---|---|---|---|---|---|
| Channel | Power Setting | Channel | Power Setting | Channel | Power Setting |
| 1 | 70 | 1 | 63 | 1 | 62 |
| 6 | 70 | 6 | 70 | 6 | 70 |
| 11 | 63 | 11 | 57 | 11 | 60 |

## 4.2 Carrier Frequency and Channel

802.11b, 802.11g and 802.11n HT20:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---|---|---|---|
| 1 | 2412 | 8 | 2447 |
| 2 | 2417 | 9 | 2452 |
| 3 | 2422 | 10 | 2457 |
| 4 | 2427 | 11 | 2462 |
| 5 | 2432 | | |
| 6 | 2437 | | |
| 7 | 2442 | | |

## 4.3 Test Operation and Test Software

Setup for testing: Test samples is a windows systems which makes it possible to control them through a test software installed on it.
It was used to enable the operation modes listed as below.

| | |
|---|---|
| Test Software | wl.exe |

The samples were used as follows:
A003104126-001

Full test was applied on all test modes, but only worst case was shown.
The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and receivers.

| Modulation Mode | Tx Function |
|---|---|
| 802.11b | 2TX (MIMO) |
| 802.11g | 2TX (MIMO) |
| 802.11n HT20 | 2TX (MIMO) |

| EUT Configure Mode | Applicable To | | | | Description |
|---|---|---|---|---|---|
| | Output Power | 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 **X-plane**.
2. "-" means no effect.
3. The NFC is enable.

**Output Power**

☒ 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 | Mode | Available Channel | Tested Channel | Date Rate (Mbps) |
|---|---|---|---|---|
| - | 802.11b | 1 to 11 | 1, 6, 11 | 1.0 |
| - | 802.11g | 1 to 11 | 1, 6, 11 | 6.0 |
| - | 802.11n HT20 | 1 to 11 | 1, 6, 11 | MCS0 |

**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 | Mode | Available Channel | Tested Channel | Date Rate (Mbps) |
|---|---|---|---|---|
| - | 802.11n HT20 | 1 to 11 | 6 | MCS0 |

**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 | Mode | Available Channel | Tested Channel | Date Rate (Mbps) |
|---|---|---|---|---|
| - | 802.11n HT20 | 1 to 11 | 6 | MCS0 |

**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 | Mode | Available Channel | Tested Channel | Date Rate (Mbps) |
|---|---|---|---|---|
| - | 802.11n HT20 | 1 to 11 | 6 | MCS0 |

**Test Condition**

| Test Item | Ambient Temperature | Relative Humidity | Tested by |
|---|---|---|---|
| Output Power | 25 °C | 60 % | Chun Wu |
| Radiated Spurious Emissions above 1 GHz | 20.5-23.3 °C | 59.3-63.1 % | Simon Tsai |
| Radiated Spurious Emissions below 1 GHz | 20.5-23.3 °C | 59.3-63.1 % | Simon Tsai |
| Mains Conducted Emission | 21.9 °C | 59 % | Simon Tsai |

## 4.4 Special Accessories and Auxiliary Equipment

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

### Accessory of EUT

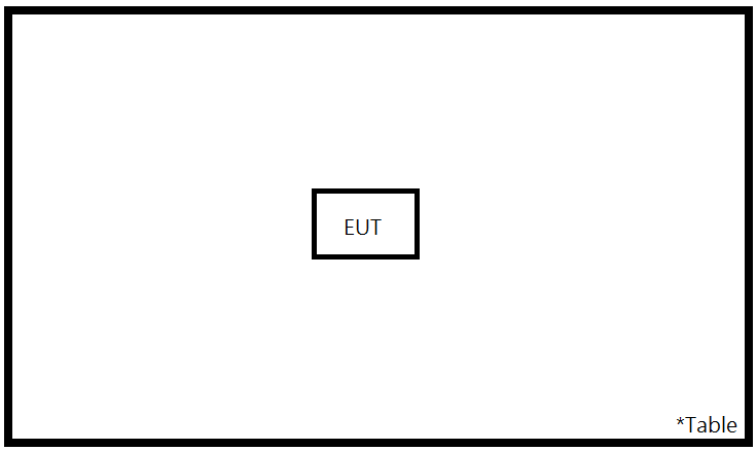
| No. | Product | Brand | Model | Description |
|---|---|---|---|---|
| A | Adapter | TUE | GQ-24-120200-AX | I/P: 100-240 Vac, 1000 mA<br>O/P: 12 Vdc, 2000 A<br>150cm non-shielded cable w/o core |
| B | Charger | AURES | TMC7000-Charger | -- |
| - | Battery | APACK TECHNOLOGY CO., LTD. | APP00272 | 3.85 Vdc, 7400 mAh |

### Support Unit

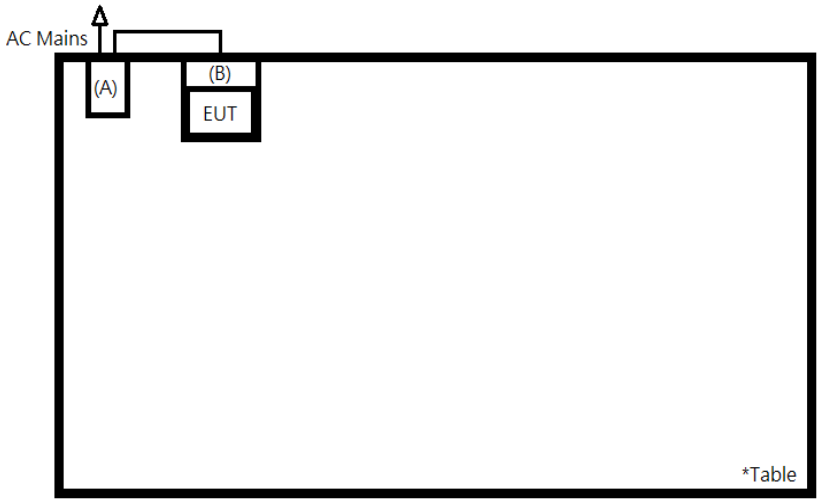
None

## 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 antenna information is as listed below. The antenna is with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

| ANT | Brand | Product No. | Product Name | Antenna Gain (dBi) | Antenna Type | Antenna Position | Remark |
|---|---|---|---|---|---|---|---|
| ANT1 | Radiation Technology, Inc. | C0486-ANG0016 | MT-5750 2.4G/5G Antenna | 2.5 | PIFA | Main Antenna | Tested antenna |
| ANT2 | Joymax Electronics Co., Ltd. | TBF-RT03MPB-W70 | MT-5751 WiFi/BT Antenna B | 2.24 | PIFA | Aux. Antenna | - |

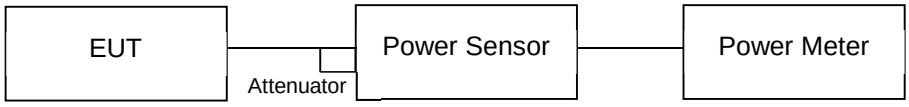
Refer to EUT photo for details.

## 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 | 2021/9/1 | 2021/9/1 |
| Power Sensor | Anritsu | MA2411B | 1725269 | 2021/3/24 | 2022/3/23 | 2021/9/1 | 2021/9/1 |

**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**

**<802.11b>**

| Channel | Channel Frequency (MHz) | Peak Output Power (dBm) | | Total Power | | Limit (dBm) |
|---|---|---|---|---|---|---|
| | | Ant 1 | Ant 2 | (dBm) | (mW) | |
| 1 | 2412 | 19.61 | 19.68 | 22.66 | 184.50 | 30 |
| 6 | 2437 | 20.07 | 20.25 | 23.17 | 207.49 | 30 |
| 11 | 2462 | 18.33 | 18.16 | 21.26 | 133.66 | 30 |

**<802.11g>**

| Channel | Channel Frequency (MHz) | Peak Output Power (dBm) | | Total Power | | Limit (dBm) |
|---|---|---|---|---|---|---|
| | | Ant 1 | Ant 2 | (dBm) | (mW) | |
| 1 | 2412 | 20.93 | 20.81 | 23.88 | 244.34 | 30 |
| 6 | 2437 | 22.78 | 23.08 | 25.94 | 392.64 | 30 |
| 11 | 2462 | 20.28 | 20.58 | 23.44 | 220.80 | 30 |

**<802.11n HT20>**

| Channel | Channel Frequency (MHz) | Peak Output Power (dBm) | | Total Power | | Limit (dBm) |
|---|---|---|---|---|---|---|
| | | Ant 1 | Ant 2 | (dBm) | (mW) | |
| 1 | 2412 | 20.67 | 20.11 | 23.41 | 219.28 | 30 |
| 6 | 2437 | 22.71 | 22.96 | 25.85 | 384.59 | 30 |
| 11 | 2462 | 20.85 | 20.11 | 23.51 | 224.39 | 30 |

**Average Power**

**<802.11b>**

| Channel | Channel Frequency (MHz) | Average Power (dBm) | | Total Power | |
|---|---|---|---|---|---|
| | | Ant 1 | Ant 2 | (dBm) | (mW) |
| 1 | 2412 | 16.66 | 16.63 | 19.66 | 92.90 |
| 6 | 2437 | 17.15 | 17.33 | 20.25 | 105.93 |
| 11 | 2462 | 15.13 | 14.92 | 18.04 | 65.46 |

**<802.11g>**

| Channel | Channel Frequency (MHz) | Average Power (dBm) | | Total Power | |
|---|---|---|---|---|---|
| | | Ant 1 | Ant 2 | (dBm) | (mW) |
| 1 | 2412 | 14.64 | 14.67 | 17.67 | 120.50 |
| 6 | 2437 | 18.03 | 18.45 | 21.26 | 203.24 |
| 11 | 2462 | 13.59 | 13.85 | 16.73 | 114.29 |

**<802.11n HT20>**

| Channel | Channel Frequency (MHz) | Average Power (dBm) | | Total Power | |
|---|---|---|---|---|---|
| | | Ant 1 | Ant 2 | (dBm) | (mW) |
| 1 | 2412 | 14.38 | 14.79 | 17.60 | 102.57 |
| 6 | 2437 | 18.21 | 18.93 | 21.60 | 197.70 |
| 11 | 2462 | 14.41 | 14.55 | 17.49 | 102.57 |

## 5.1.3 Radiated Spurious Emissions and Band Edges

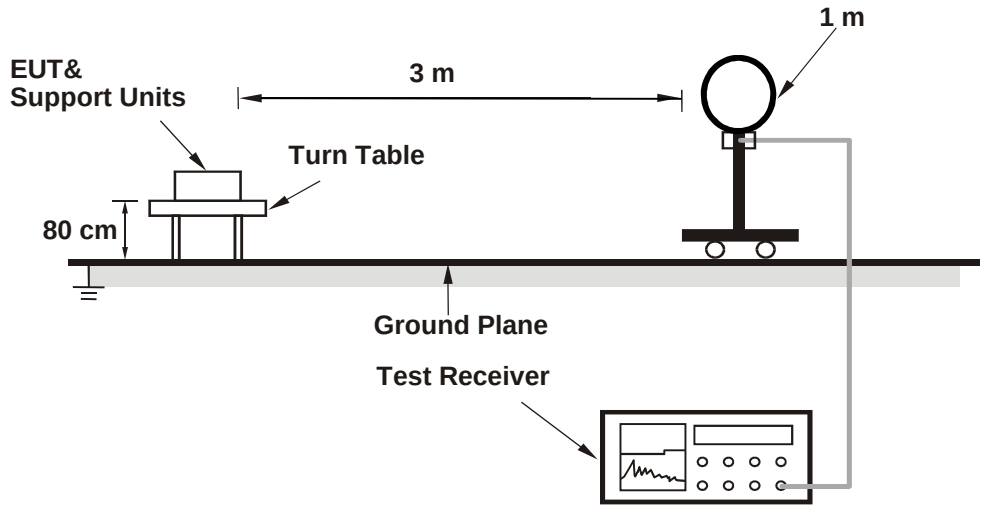
**Limit**

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).

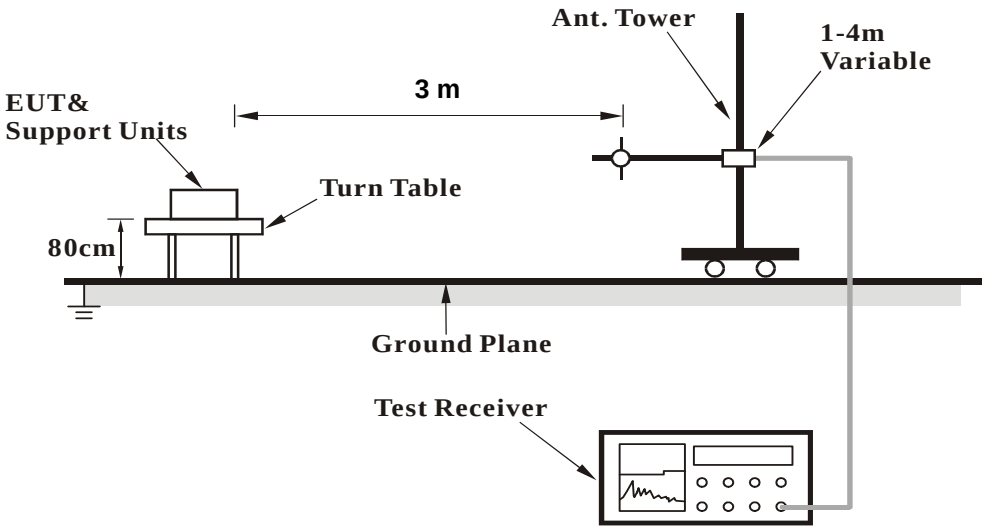
**Kind of Test Site** 3m Semi-Anechoic Chamber

**Test Setup**

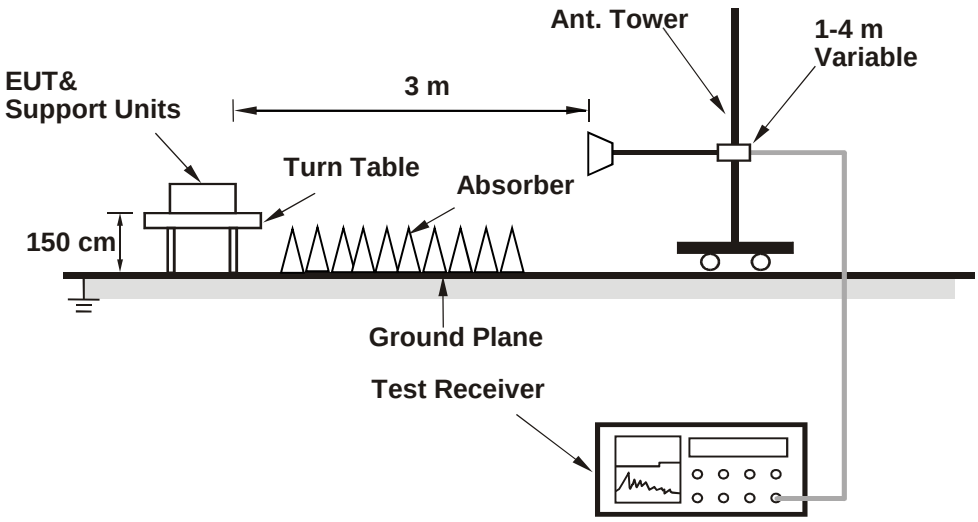
**<Radiated Emissions below 30 MHz>**




**<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 | 101509 | 2021/3/24 | 2022/3/23 |
| Receiver | R&S | ESR7 | 102108 | 2021/3/17 | 2022/3/16 |
| Bilog Antenna | SCHWARZBECK | VULB-9168 | 00950 | 2021/1/25 | 2022/1/24 |
| Horn Antenna | ETS-Lindgren | 3117 | 00218929 | 2020/11/6 | 2021/11/5 |
| LF-AMP | Agilent | 8447D | 2727A05146 | 2021/2/1 | 2022/1/31 |
| HF-AMP + AC source | EMCI | EMC051845SE | 980635 | 2021/2/1 | 2022/1/31 |
| HF-AMP + AC source | EMCI | EMC184045SE | 980656 | 2021/2/9 | 2022/2/8 |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | 00890 | 2021/4/14 | 2022/4/13 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 104EA | 800057/4EA | 2021/4/14 | 2022/4/13 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 104 | 802244/4 | 2021/4/14 | 2022/4/13 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 104 | MY37203/4 | 2021/4/14 | 2022/4/13 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 102EA | 800897/2EA | 2021/3/11 | 2022/3/10 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 102EA | 800902/2EA | 2021/3/11 | 2022/3/10 |
| Microwave Cable | HUBER+SUHNER | SUCOFLEX 102EA | 801026/2EA | 2021/3/11 | 2022/3/10 |
| Loop Antenna | Chance Most | EMCILPA600 +calibration | 287 | 2021/1/18 | 2022/1/17 |

**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 A.

# 5.2 Mains Emission

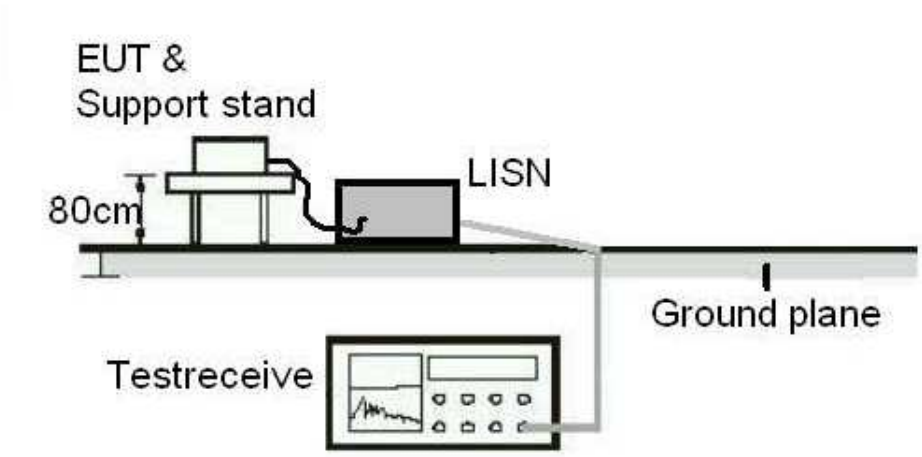
## 5.2.1 Mains Conducted Emission

**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**

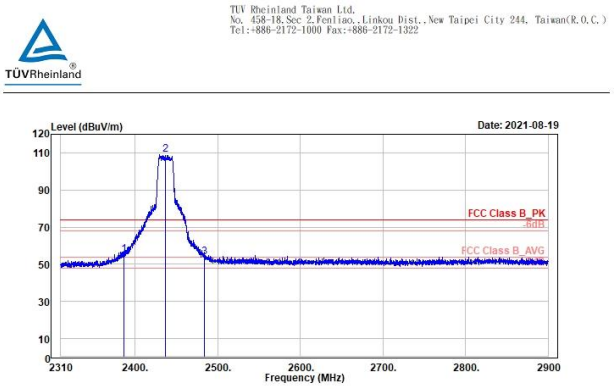
Please refer to Appendix A.

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

## Band Edges, 2.31GHz ~ 2.9GHz

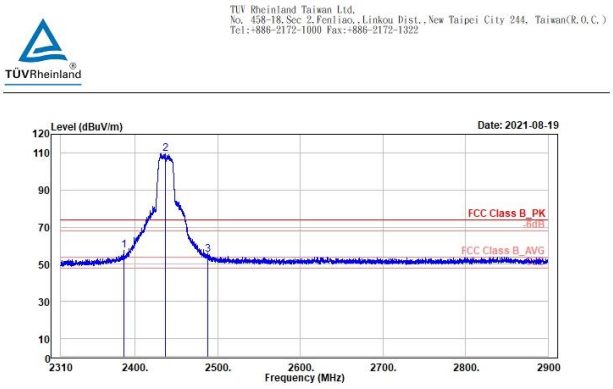
### 802.11n HT20

#### Middle 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 | 2386.21 | 55.25 | 17.95 | 37.30 | 74.00 | -18.75 | 239 | 103 | Peak | Horizontal | |
| 2 * | 2437.00 | 108.84 | 71.41 | 37.43 | 74.00 | 34.84 | 239 | 103 | Peak | Horizontal | |
| 3 | 2483.50 | 53.98 | 16.27 | 37.71 | 74.00 | -20.02 | 239 | 103 | Peak | Horizontal | |

#### Middle Channel (Vertical) Peak

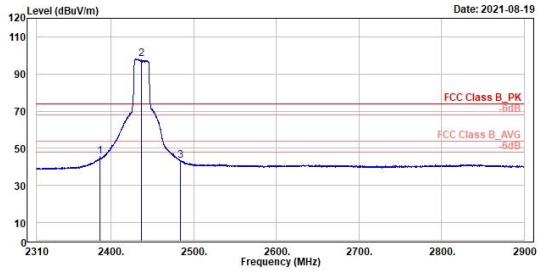



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 2386.33 | 57.40 | 20.10 | 37.30 | 74.00 | -16.60 | 282 | 14 | Peak | Vertical | |
| 2 * | 2437.00 | 109.68 | 72.25 | 37.43 | 74.00 | 35.68 | 282 | 14 | Peak | Vertical | |
| 3 | 2487.86 | 55.13 | 17.38 | 37.75 | 74.00 | -18.87 | 282 | 14 | Peak | Vertical | |

## 802.11n HT20

### Middle Channel (Horizontal) Average

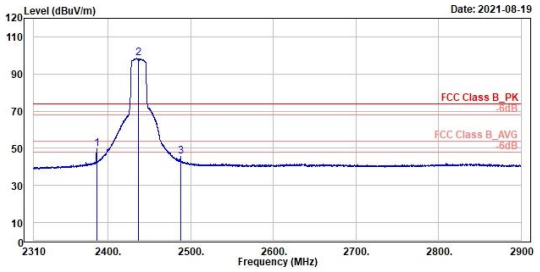
TÜV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao, Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | 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 | 2386.21 | 45.52 | 8.22 | 37.30 | 54.00 | -8.48 | 239 | 103 | Average | Horizontal | |
| 2 * | 2437.00 | 98.03 | 60.60 | 37.43 | 54.00 | 44.03 | 239 | 103 | Average | Horizontal | |
| 3 | 2483.50 | 43.52 | 5.81 | 37.71 | 54.00 | -10.48 | 239 | 103 | Average | Horizontal | |

### Middle 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



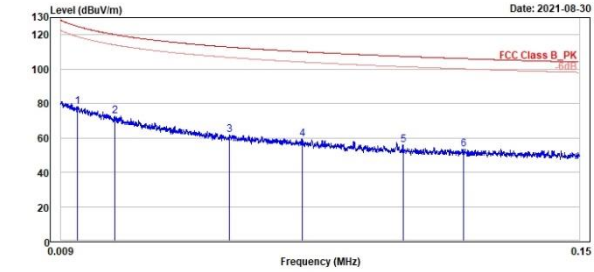

| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 ! | 2386.33 | 49.68 | 12.38 | 37.30 | 54.00 | -4.32 | 282 | 14 | Average | Vertical | |
| 2 * | 2437.00 | 98.42 | 60.99 | 37.43 | 54.00 | 44.42 | 282 | 14 | Average | Vertical | |
| 3 | 2487.86 | 45.45 | 7.70 | 37.75 | 54.00 | -8.55 | 282 | 14 | Average | Vertical | |

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

### 802.11n20

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

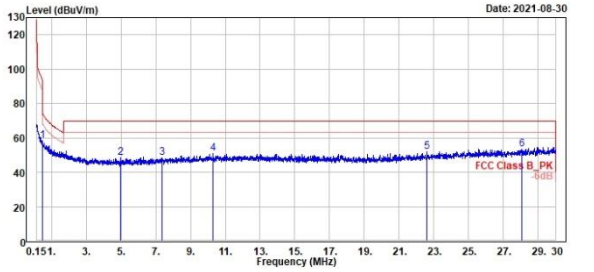
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. ,Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | 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 | 0.01 | 78.17 | 2.85 | 75.32 | 124.95 | -46.78 | 100 | 249 | QP | Open | |
| 2 | 0.02 | 72.51 | 1.21 | 71.30 | 120.13 | -47.62 | 100 | 185 | QP | Open | |
| 3 | 0.05 | 61.73 | -1.49 | 63.22 | 112.82 | -51.09 | 100 | 304 | QP | Open | |
| 4 | 0.07 | 59.18 | -1.41 | 60.59 | 110.13 | -50.95 | 100 | 312 | QP | Open | |
| 5 | 0.10 | 55.84 | -1.33 | 57.17 | 107.42 | -51.58 | 100 | 60 | QP | Open | |
| 6 | 0.12 | 53.44 | -3.03 | 56.47 | 106.13 | -52.69 | 100 | 278 | QP | Open | |

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

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

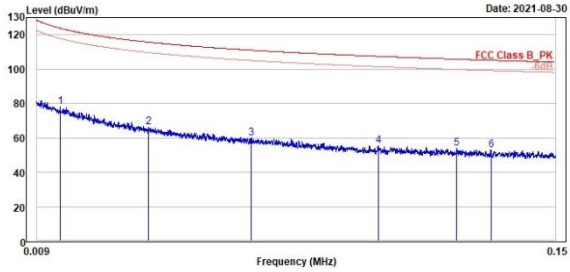



| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 0.48 | 58.40 | 13.01 | 45.39 | 94.01 | -35.61 | 100 | 327 | QP | Open | |
| 2 | 4.96 | 48.44 | 12.08 | 36.36 | 69.50 | -21.06 | 100 | 265 | QP | Open | |
| 3 | 7.37 | 48.63 | 11.42 | 37.21 | 69.50 | -20.87 | 100 | 272 | QP | Open | |
| 4 | 10.29 | 50.68 | 12.52 | 38.16 | 69.50 | -18.82 | 100 | 264 | QP | Open | |
| 5 | 22.59 | 51.95 | 13.29 | 38.66 | 69.50 | -17.55 | 100 | 270 | QP | Open | |
| 6 | 28.07 | 53.21 | 11.99 | 41.22 | 69.50 | -16.29 | 100 | 42 | QP | Open | |

## 802.11n20

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

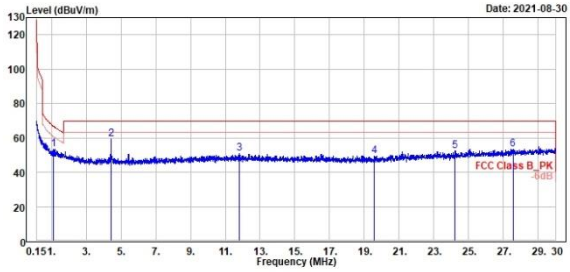
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | 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 | 0.02 | 78.31 | 3.72 | 74.59 | 123.85 | -45.54 | 100 | 327 | QP | Close | |
| 2 | 0.04 | 66.28 | -0.16 | 66.44 | 115.68 | -49.40 | 100 | 182 | QP | Close | |
| 3 | 0.07 | 59.63 | -1.93 | 61.56 | 111.02 | -51.39 | 100 | 169 | QP | Close | |
| 4 | 0.10 | 55.45 | -1.73 | 57.18 | 107.44 | -51.99 | 100 | 241 | QP | Close | |
| 5 | 0.12 | 53.71 | -2.56 | 56.27 | 105.79 | -52.08 | 100 | 251 | QP | Close | |
| 6 | 0.13 | 52.87 | -3.00 | 55.87 | 105.16 | -52.29 | 100 | 8 | QP | Close | |

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

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



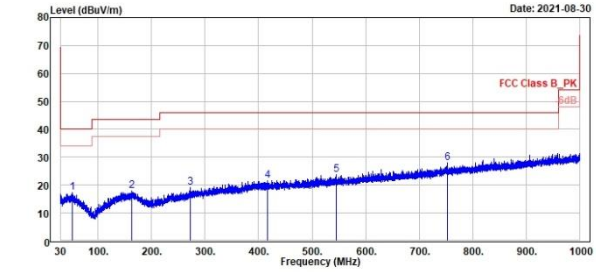

| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 1.11 | 53.53 | 12.65 | 40.88 | 66.69 | -13.16 | 100 | 352 | QP | Close | |
| 2 | 4.44 | 59.36 | 22.85 | 36.51 | 69.50 | -10.14 | 100 | 199 | QP | Close | |
| 3 | 11.79 | 50.92 | 12.87 | 38.05 | 69.50 | -18.58 | 100 | 168 | QP | Close | |
| 4 | 19.55 | 49.65 | 12.16 | 37.49 | 69.50 | -19.85 | 100 | 19 | QP | Close | |
| 5 | 24.23 | 52.19 | 12.77 | 39.42 | 69.50 | -17.31 | 100 | 209 | QP | Close | |
| 6 | 27.55 | 53.26 | 12.28 | 40.98 | 69.50 | -16.24 | 100 | 313 | QP | Close | |

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

### 802.11n20

#### Middle Channel (Horizontal)

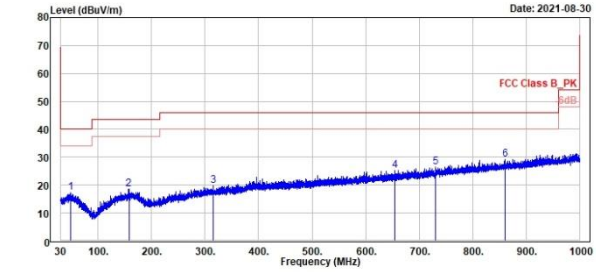
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao. ,Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | 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 | 51.63 | 17.25 | 24.86 | -7.61 | 40.00 | -22.75 | 236 | 89 | QP | Horizontal | |
| 2 | 162.31 | 18.06 | 25.19 | -7.13 | 43.50 | -25.44 | 211 | 56 | QP | Horizontal | |
| 3 | 272.69 | 19.13 | 26.39 | -7.26 | 46.00 | -26.87 | 136 | 256 | QP | Horizontal | |
| 4 | 416.93 | 21.47 | 25.65 | -4.18 | 46.00 | -24.53 | 233 | 56 | QP | Horizontal | |
| 5 | 544.97 | 23.69 | 25.90 | -2.21 | 46.00 | -22.31 | 111 | 79 | QP | Horizontal | |
| 6 | 752.94 | 28.12 | 26.77 | 1.35 | 46.00 | -17.88 | 100 | 89 | QP | 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



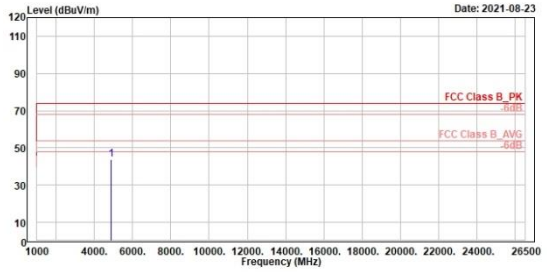

| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 48.24 | 17.49 | 25.20 | -7.71 | 40.00 | -22.51 | 100 | 23 | QP | Vertical | |
| 2 | 157.36 | 18.45 | 25.74 | -7.29 | 43.50 | -25.05 | 200 | 36 | QP | Vertical | |
| 3 | 315.08 | 19.86 | 25.98 | -6.12 | 46.00 | -26.14 | 133 | 89 | QP | Vertical | |
| 4 | 654.49 | 25.18 | 25.66 | -0.48 | 46.00 | -20.82 | 300 | 89 | QP | Vertical | |
| 5 | 730.63 | 26.38 | 25.58 | 0.80 | 46.00 | -19.62 | 122 | 96 | QP | Vertical | |
| 6 | 861.39 | 29.28 | 26.47 | 2.81 | 46.00 | -16.72 | 122 | 44 | QP | Vertical | |

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

### 802.11n HT20

#### Middle Channel (Horizontal)

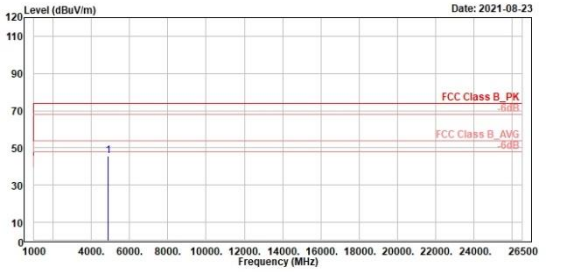
TUV Rheinland Taiwan Ltd.
No. 458-18, Sec 2, Fenliao., Linkou Dist., New Taipei City 244, Taiwan(R.O.C.)
Tel:+886-2172-1000 Fax:+886-2172-1322




| | 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 | 4874.00 | 43.71 | 53.05 | -9.34 | 74.00 | -30.29 | 200 | 243 | 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



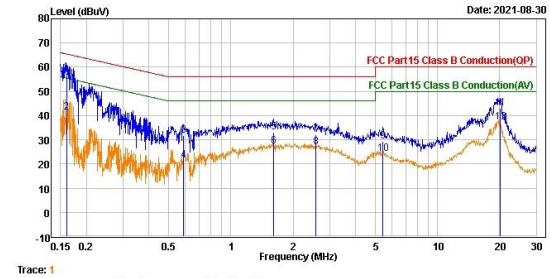

| | Freq | Level | Read Level | Factor | Limit Line | Over Limit | APos | TPos | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV | dB/m | dBuV/m | dB | cm | deg | | | |
| 1 | 4874.00 | 45.63 | 54.97 | -9.34 | 74.00 | -28.37 | 300 | 147 | Peak | Vertical | |

## Mains Conducted Emission, 150kHz ~ 30MHz

### Worst Band

#### (Line)

TUV Rheinland Taiwan Ltd. (New Taipei Branch)
No. 458-18 & 458-19, Sec. 2, Fenliao Rd., Linkou Dist., New Taipei City 244
Tel:+886-2172-1000 Fax:+886-2172-1322

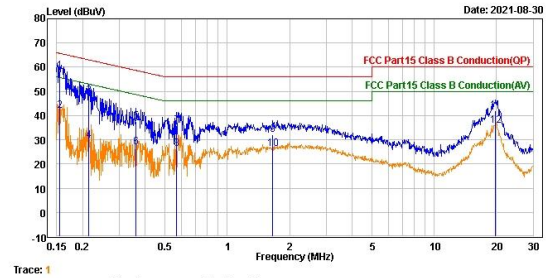



Trace: 1

| | Freq | Read Level | Factor | Limit Line | Over Limit | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dB | | | |
| 1 | 0.160 | 48.21 | 9.66 | 65.46 | -7.59 | QP | line1 | |
| 2 | 0.160 | 31.71 | 9.66 | 55.46 | -14.09 | Average | line1 | |
| 3 | 0.588 | 21.97 | 9.65 | 56.00 | -24.38 | QP | line1 | |
| 4 | 0.588 | 11.96 | 9.65 | 46.00 | -24.39 | Average | line1 | |
| 5 | 1.609 | 23.43 | 9.67 | 56.00 | -22.90 | QP | line1 | |
| 6 | 1.609 | 17.47 | 9.67 | 46.00 | -18.86 | Average | line1 | |
| 7 | 2.570 | 22.35 | 9.68 | 56.00 | -23.97 | QP | line1 | |
| 8 | 2.570 | 17.18 | 9.68 | 46.00 | -19.14 | Average | line1 | |
| 9 | 5.428 | 19.77 | 9.72 | 60.00 | -30.51 | QP | line1 | |
| 10 | 5.428 | 14.48 | 9.72 | 50.00 | -25.80 | Average | line1 | |
| 11 | 20.035 | 33.16 | 9.73 | 60.00 | -17.11 | QP | line1 | |
| 12 | 20.035 | 27.39 | 9.73 | 50.00 | -12.88 | Average | line1 | |

#### (Neutral)

TUV Rheinland Taiwan Ltd. (New Taipei Branch)
No. 458-18 & 458-19, Sec. 2, Fenliao Rd., Linkou Dist., New Taipei City 244
Tel:+886-2172-1000 Fax:+886-2172-1322




Trace: 1

| | Freq | Read Level | Factor | Limit Line | Over Limit | Remark | Pol/Phase | Note |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dB | | | |
| 1 | 0.155 | 48.63 | 9.68 | 65.71 | -7.40 | QP | neutral | |
| 2 | 0.155 | 32.48 | 9.68 | 55.71 | -13.55 | Average | neutral | |
| 3 | 0.215 | 38.43 | 9.67 | 63.02 | -14.92 | QP | neutral | |
| 4 | 0.215 | 20.06 | 9.67 | 53.02 | -23.29 | Average | neutral | |
| 5 | 0.362 | 27.96 | 9.66 | 58.67 | -21.05 | QP | neutral | |
| 6 | 0.362 | 17.21 | 9.66 | 48.67 | -21.80 | Average | neutral | |
| 7 | 0.568 | 26.07 | 9.66 | 56.00 | -20.27 | QP | neutral | |
| 8 | 0.568 | 16.61 | 9.66 | 46.00 | -19.73 | Average | neutral | |
| 9 | 1.658 | 22.34 | 9.69 | 56.00 | -23.97 | QP | neutral | |
| 10 | 1.658 | 16.61 | 9.69 | 46.00 | -19.70 | Average | neutral | |
| 11 | 19.737 | 32.04 | 9.82 | 60.00 | -18.14 | QP | neutral | |
| 12 | 19.737 | 26.18 | 9.82 | 50.00 | -14.00 | Average | neutral | |