



# Radio Test Report

**FCC ID:2AA2K-Z4C****Original Grant**

**Report No.** : TBR-C-202512-0340-31  
**Applicant** : CANSONIC INC.  
**Equipment Under Test (EUT)**  
**EUT Name** : Dash cam  
**Model No.** : Z4C  
**Series Model No.** : Z4  
**Brand Name** : UltraDash  
**Sample ID** : HC-C-202512-0340-01-01# & HC-C-202512-0340-01-02#  
**Receipt Date** : 2025-12-31  
**Test Date** : 2025-12-31 to 2026-01-30  
**Issue Date** : 2026-01-30  
**Standards** : FCC Part 15 Subpart E 15.407  
**Test Method** : ANSI C63.10: 2020+Cor.1:2023+C63.10a: 2024+Errata to C63.10a: 2024  
KDB 789033 D02 General UNII Test Procedures New Rules v02r01  
**Conclusions** : **PASS**

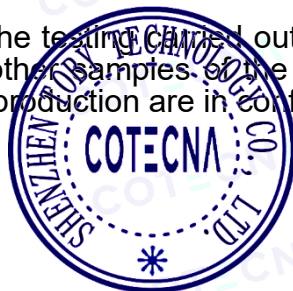
In the configuration tested, the EUT complied with the standards specified above.

**Tested By** : Kael Li Kael Li

**Reviewed By** : Camille Li Camille Li

**Approved By** : Ivan Su Ivan Su

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.



## Contents

|                                                              |           |
|--------------------------------------------------------------|-----------|
| <b>CONTENTS</b>                                              | <b>2</b>  |
| <b>1. GENERAL INFORMATION ABOUT EUT</b>                      | <b>6</b>  |
| 1.1 Client Information                                       | 6         |
| 1.2 General Description of EUT (Equipment Under Test)        | 6         |
| 1.3 Block Diagram Showing the Configuration of System Tested | 8         |
| 1.4 Description of Support Units                             | 8         |
| 1.5 Description of Test Mode                                 | 9         |
| 1.6 Description of Test Software Setting                     | 10        |
| 1.7 Measurement Uncertainty                                  | 11        |
| 1.8 Test Facility                                            | 12        |
| <b>2. TEST SUMMARY</b>                                       | <b>13</b> |
| <b>3. TEST SOFTWARE</b>                                      | <b>13</b> |
| <b>4. TEST EQUIPMENT AND TEST SITE</b>                       | <b>14</b> |
| <b>5. CONDUCTED EMISSION TEST</b>                            | <b>15</b> |
| 5.1 Test Standard and Limit                                  | 15        |
| 5.2 Test Setup                                               | 15        |
| 5.3 Test Procedure                                           | 15        |
| 5.4 Deviation From Test Standard                             | 16        |
| 5.5 EUT Operating Mode                                       | 16        |
| 5.6 Test Data                                                | 16        |
| <b>6. RADIATED AND CONDUCTED UNWANTED EMISSIONS</b>          | <b>17</b> |
| 6.1 Test Standard and Limit                                  | 17        |
| 6.2 Test Setup                                               | 19        |
| 6.3 Test Procedure                                           | 20        |
| 6.4 Deviation From Test Standard                             | 21        |
| 6.5 EUT Operating Mode                                       | 21        |
| 6.6 Test Data                                                | 21        |
| <b>7. RESTRICTED BANDS AND BAND EDGE REQUIREMENT</b>         | <b>22</b> |
| 7.1 Test Standard and Limit                                  | 22        |
| 7.2 Test Setup                                               | 23        |
| 7.3 Test Procedure                                           | 23        |
| 7.4 Deviation From Test Standard                             | 24        |
| 7.5 EUT Operating Mode                                       | 24        |



|                                               |           |
|-----------------------------------------------|-----------|
| 7.6 Test Data.....                            | 24        |
| <b>8. BANDWIDTH TEST.....</b>                 | <b>25</b> |
| 8.1 Test Standard and Limit.....              | 25        |
| 8.2 Test Setup.....                           | 25        |
| 8.3 Test Procedure.....                       | 25        |
| 8.4 Deviation From Test Standard.....         | 27        |
| 8.5 EUT Operating Mode .....                  | 27        |
| 8.6 Test Data.....                            | 27        |
| <b>9. MAXIMUM CONDUCTED OUTPUT POWER.....</b> | <b>28</b> |
| 9.1 Test Standard and Limit.....              | 28        |
| 9.2 Test Setup.....                           | 29        |
| 9.3 Test Procedure.....                       | 29        |
| 9.4 Deviation From Test Standard.....         | 29        |
| 9.5 EUT Operating Mode .....                  | 29        |
| 9.6 Test Data.....                            | 29        |
| <b>10. POWER SPECTRAL DENSITY TEST .....</b>  | <b>30</b> |
| 10.1 Test Standard and Limit .....            | 30        |
| 10.2 Test Setup.....                          | 30        |
| 10.3 Test Procedure.....                      | 30        |
| 10.4 Deviation From Test Standard.....        | 31        |
| 10.5 Antenna Connected Construction .....     | 31        |
| 10.6 Test Data.....                           | 31        |
| <b>11. FREQUENCY STABILITY .....</b>          | <b>32</b> |
| 11.1 Test Standard and Limit .....            | 32        |
| 11.2 Test Setup.....                          | 32        |
| 11.3 Test Procedure.....                      | 32        |
| 11.4 Deviation From Test Standard.....        | 33        |
| 11.5 Antenna Connected Construction .....     | 33        |
| 11.6 Test Data.....                           | 33        |
| <b>12. ANTENNA REQUIREMENT.....</b>           | <b>34</b> |
| 12.1 Test Standard and Limit .....            | 34        |
| 12.2 Deviation From Test Standard.....        | 34        |
| 12.3 Antenna Connected Construction .....     | 34        |
| 12.4 Test Data.....                           | 34        |
| <b>13. DUTY CYCLE .....</b>                   | <b>35</b> |
| 13.1 Test Standard and Limit .....            | 35        |



|                                          |    |
|------------------------------------------|----|
| 13.2 Test Setup.....                     | 35 |
| 13.3 Test Procedure.....                 | 35 |
| 13.4 Deviation From Test Standard.....   | 35 |
| 13.5 Antenna Connected Construction..... | 35 |
| 13.6 Test Data.....                      | 35 |

|                                                    |           |
|----------------------------------------------------|-----------|
| <b>ATTACHMENT A-- UNWANTED EMISSIONS DATA.....</b> | <b>36</b> |
|----------------------------------------------------|-----------|



## Revision History

| Report No.           | Version | Description             | Issued Date |
|----------------------|---------|-------------------------|-------------|
| TBR-C-202512-0340-31 | Rev.01  | Initial issue of report | 2026-01-30  |
|                      |         |                         |             |
|                      |         |                         |             |
|                      |         |                         |             |
|                      |         |                         |             |
|                      |         |                         |             |
|                      |         |                         |             |
|                      |         |                         |             |
|                      |         |                         |             |
|                      |         |                         |             |



# 1. General Information about EUT

## 1.1 Client Information

|                     |   |                                                                                                                                              |
|---------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>    | : | CANSONIC INC.                                                                                                                                |
| <b>Address</b>      | : | 10F., No.359, Dehe Rd., Yonghe Dist. New Taipei City Taiwan                                                                                  |
| <b>Manufacturer</b> | : | Cansonic Company Limited                                                                                                                     |
| <b>Address</b>      | : | 3/F, Building 1, Guanlan Industrial Park, Grain Group, 299 Guanping Road, Nan Dafu Community, Guanlan, Longhua New District, Shenzhen, China |

## 1.2 General Description of EUT (Equipment Under Test)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                      |                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>EUT Name</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          | :                    | Dash cam                                                                                                          |
| <b>Models No.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        | :                    | Z4C, Z4                                                                                                           |
| <b>Model Different</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | :                    | All these models are identical in the same PCB, layout and electrical circuit, The only difference is model name. |
| <b>Product Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                               | Operation Frequency: | U-NII-1: 5180MHz~5240MHz                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Modulation Type:     | 802.11ac: OFDM (QPSK, BPSK, 16QAM, 64QAM, 256QAM)                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Antenna Gain:        | 2.95dBi FPC Antenna                                                                                               |
| <b>Power Rating</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | :                    | DC 12-24V                                                                                                         |
| <b>Software Version</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  | :                    | Z4_1.4_BEABZD_H                                                                                                   |
| <b>Hardware Version</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  | :                    | Z4_NT98530_MAIN_V1.0                                                                                              |
| <b>Remark:</b><br>(1)The antenna gain provided by the applicant, the verified for the RF conduction test provided by TOBY test lab.<br>(2)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.<br>(3)The above antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible. |                      |                                                                                                                   |



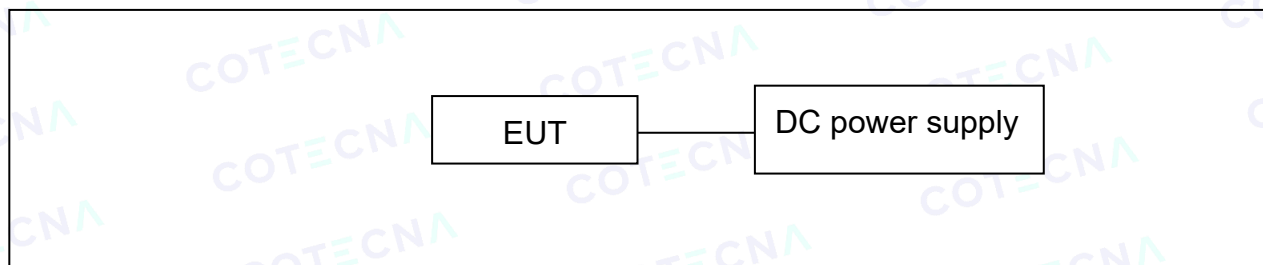
## (4)Channel List:

| Frequency Band                                                                              | Channel No. | Frequency | Channel No. | Frequency |
|---------------------------------------------------------------------------------------------|-------------|-----------|-------------|-----------|
| 5180~5240MHz<br>(U-NII-1)                                                                   | 36          | 5180 MHz  | 44          | 5220 MHz  |
|                                                                                             | 38          | 5190 MHz  | 46          | 5230 MHz  |
|                                                                                             | 40          | 5200 MHz  | 48          | 5240 MHz  |
|                                                                                             | 42          | 5210 MHz  |             |           |
| For 20 MHz Bandwidth, use channel 36, 40, 44, 48. For 40 MHz Bandwidth, use channel 38, 46. |             |           |             |           |

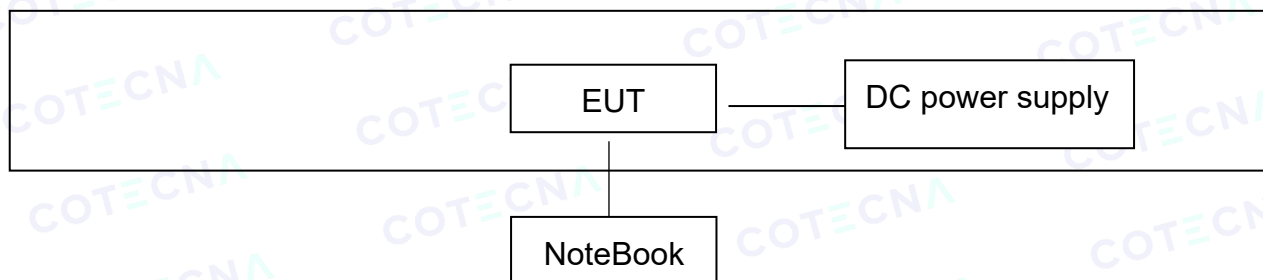


### 1.3 Block Diagram Showing the Configuration of System Tested

#### Radiated Test



#### Conducted Measurements Test



### 1.4 Description of Support Units

| Equipment Information |               |              |              |          |
|-----------------------|---------------|--------------|--------------|----------|
| Name                  | Model         | FCC ID/SDOC  | Manufacturer | Used “√” |
| Notebook              | --            | --           | DELL         | √        |
| Cable Information     |               |              |              |          |
| Number                | Shielded Type | Ferrite Core | Length       | Note     |
| ----                  | ----          | ----         | ----         | ----     |



## 1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

| For Radiated Test Below 1GHz                                                                                                      |                 |                                               |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------------|
| Final Test Mode                                                                                                                   |                 | Description                                   |
| Mode 1                                                                                                                            |                 | TX Mode 802.11ac(VHT20) (5180MHz)             |
| For Radiated Above 1GHz and RF Conducted Test                                                                                     |                 |                                               |
| Test Band                                                                                                                         | Final Test Mode | Description                                   |
| U-NII-1                                                                                                                           | Mode 2          | TX Mode 802.11ac(VHT20) Mode Channel 36/40/48 |
|                                                                                                                                   | Mode 3          | TX Mode 802.11ac(VHT40) Mode Channel 38/46    |
| Note: Radiated Unwanted Emissions U-NII-1,<br>All When the radiation exceeds 1GHz, only the worst mode ac20M frequency is tested. |                 |                                               |

### Note:

- (1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:

802.11ac(VHT20) Mode: MCS 0/ Nss1

802.11ac(VHT40) Mode: MCS 0/ Nss1

- (2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.
- (3) The EUT is considered a Mobile unit; in normal use it was positioned on X-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.



## 1.6 Description of Test Software Setting

During testing channel& 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 power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF setting.

| Test Software: SecureCRT |                 |            |
|--------------------------|-----------------|------------|
| U-NII-1                  |                 |            |
| Mode                     | Frequency (MHz) | Parameters |
| 802.11ac(VHT20)          | 5180            | 18         |
|                          | 5200            | 18         |
|                          | 5240            | 18         |
| 802.11ac(VHT40)          | 5190            | 18         |
|                          | 5230            | 18         |



## 1.7 Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

| Test Item                        | Parameters                                            | Expanded Uncertainty ( $U_{Lab}$ ) |
|----------------------------------|-------------------------------------------------------|------------------------------------|
| Conducted Emission               | Level Accuracy:<br>9kHz~150kHz<br>150kHz to 30MHz     | $\pm 3.50$ dB<br>$\pm 3.10$ dB     |
| Radiated Emission                | Level Accuracy:<br>9kHz to 30 MHz                     | $\pm 4.60$ dB                      |
| Radiated Emission                | Level Accuracy:<br>30MHz to 1000 MHz                  | $\pm 4.50$ dB                      |
| Radiated Emission                | Level Accuracy:<br>Above 1000MHz                      | $\pm 4.20$ dB                      |
| RF Power-Conducted               | Level Accuracy:<br>Above 1000MHz                      | $\pm 0.95$ dB                      |
| Power Spectral Density-Conducted | Level Accuracy:<br>Above 1000MHz                      | $\pm 3$ dB                         |
| Occupied Bandwidth               | Level Accuracy:<br>30MHz to 1000 MHz<br>Above 1000MHz | $\pm 3.8\%$                        |
| Unwanted Emission-Conducted      | Level Accuracy:<br>30MHz to 1000 MHz<br>Above 1000MHz | $\pm 2.72$ dB                      |
| Temperature                      | /                                                     | $\pm 0.6^{\circ}\text{C}$          |
| Humidity                         | /                                                     | $\pm 4\%$                          |
| Supply voltages                  | /                                                     | $\pm 2\%$                          |
| Time                             | /                                                     | $\pm 4\%$                          |



## 1.8 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1/F., Building 6, Rundongsheng Industrial Zone, Longzhu, Xixiang, Bao'an District, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

### **CNAS (L5813)**

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

### **A2LA Certificate No.: 4750.01**

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.FCC Accredited Test Site Number: 854351. Designation Number: CN1223.

### **IC Registration No.: (11950A)**

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A. CAB identifier: CN0056.



## 2. Test Summary

| Standard Section       | Test Item                      | Test Sample(s)          | Judgment | Remark |
|------------------------|--------------------------------|-------------------------|----------|--------|
| FCC                    |                                |                         |          |        |
| FCC 15.207(a)          | Conducted Emission             | /                       | N/A      | N/A    |
| FCC 15.209 & 15.407(b) | Radiated Unwanted Emissions    | HC-C-202512-0340-01-02# | PASS     | N/A    |
| FCC 15.203             | Antenna Requirement            | HC-C-202512-0340-01-01# | PASS     | N/A    |
| FCC 15.407(a)          | -26dB Emission Bandwidth       | HC-C-202512-0340-01-01# | PASS     | N/A    |
| FCC 15.407(a)          | 99% Occupied Bandwidth         | HC-C-202512-0340-01-01# | PASS     | N/A    |
| FCC 15.407(e)          | -6dB Min Emission Bandwidth    | HC-C-202512-0340-01-01# | PASS     | N/A    |
| FCC 15.407(a)          | Maximum Conducted Output Power | HC-C-202512-0340-01-01# | PASS     | N/A    |
| FCC 15.407(a)          | Power Spectral Density         | HC-C-202512-0340-01-01# | PASS     | N/A    |
| FCC 15.407(b)& 15.205  | Emissions in Restricted Bands  | HC-C-202512-0340-01-01# | PASS     | N/A    |
| FCC 15.407(b)&15.209   | Conducted Unwanted Emissions   | HC-C-202512-0340-01-01# | PASS     | N/A    |
| FCC 15.407(g)          | Frequency Stability            | HC-C-202512-0340-01-01# | PASS     | N/A    |
| /                      | On Time and Duty Cycle         | HC-C-202512-0340-01-02# | /        | N/A    |

**Note:** N/A is an abbreviation for Not Applicable.

## 3. Test Software

| Test Item                | Test Software | Manufacturer | Version No.       |
|--------------------------|---------------|--------------|-------------------|
| Conducted Emission       | EZ-EMC        | EZ           | Ver.EMC-CON3A1.1+ |
| Radiation Emission       | EZ-EMC        | EZ           | Ver.GARAD-3A1.1+  |
| Radiation Emission       | EZ-EMC        | EZ           | Ver.GARAD-3A1.1+  |
| Radiation Emission       | TS+           | Tonscend     | 5.0.5             |
| RF Conducted Measurement | MTS-8310      | MWRFTtest    | V2.0.0.0          |
| RF Test System           | JS1120        | Tonscend     | V3.6.21           |



## 4. Test Equipment and Test Site

| Test Site   |                        |              |                   |      |
|-------------|------------------------|--------------|-------------------|------|
| No.         | Test Site              | Manufacturer | Specification     | Used |
| TB-EMCSR001 | Shielding Chamber #1   | YIHENG       | 7.5*4.0*3.0 ( m ) | X    |
| TB-EMCSR002 | Shielding Chamber #2   | YIHENG       | 8.0*4.0*3.0 ( m ) | √    |
| TB-EMCCA001 | 3m Anechoic Chamber #A | ETS          | 9.0*6.0*6.0 ( m ) | X    |
| TB-EMCCB002 | 3m Anechoic Chamber #B | YIHENG       | 9.0*6.0*6.0 ( m ) | √    |

| Conducted Emission Test |                                  |             |            |               |               |
|-------------------------|----------------------------------|-------------|------------|---------------|---------------|
| Equipment               | Manufacturer                     | Model No.   | Serial No. | Last Cal.     | Cal. Due Date |
| EMI Test Receiver       | Rohde & Schwarz                  | ESCI        | 100321     | Jun. 16, 2025 | Jun. 15, 2026 |
| RF Switching Unit       | Compliance Direction Systems Inc | RSU-A4      | 34403      | Jun. 16, 2025 | Jun. 15, 2026 |
| AMN                     | SCHWARZBECK                      | NNBL 8226-2 | 8226-2/164 | Jun. 16, 2025 | Jun. 15, 2026 |
| LISN                    | Rohde & Schwarz                  | ENV216      | 101131     | Jun. 16, 2025 | Jun. 15, 2026 |

| Radiation Emission Test(B Site) |                 |                    |             |               |               |
|---------------------------------|-----------------|--------------------|-------------|---------------|---------------|
| Equipment                       | Manufacturer    | Model No.          | Serial No.  | Last Cal.     | Cal. Due Date |
| Spectrum Analyzer               | Agilent         | N9020A             | MY49100060  | Aug. 27, 2025 | Aug. 26, 2026 |
| Spectrum Analyzer               | Rohde & Schwarz | FSV40-N            | 102197      | Jun. 16, 2025 | Jun. 15, 2026 |
| EMI Test Receiver               | Rohde & Schwarz | ESU-8              | 100472/008  | Feb. 20, 2025 | Feb. 19, 2026 |
| Bilog Antenna                   | SCHWARZBECK     | VULB 9168          | 1225        | Oct. 18, 2025 | Oct. 17, 2027 |
| Horn Antenna                    | SCHWARZBECK     | BBHA 9120 D        | 2463        | Jun. 16, 2025 | Jun. 15, 2026 |
| Horn Antenna                    | SCHWARZBECK     | BBHA 9170          | 1118        | Feb. 27, 2024 | Feb.26, 2026  |
| Loop Antenna                    | SCHWARZBECK     | FMZB 1519 B        | 1519B-059   | Jun. 16, 2025 | Jun. 15, 2026 |
| HF Amplifier                    | Tonscend        | TAP9E6343          | AP21C806117 | Aug. 27, 2025 | Aug. 26, 2026 |
| HF Amplifier                    | Tonscend        | TAP051845          | AP21C806141 | Aug. 27, 2025 | Aug. 26, 2026 |
| HF Amplifier                    | Tonscend        | TAP0184050         | AP21C806129 | Aug. 27, 2025 | Aug. 26, 2026 |
| Pre-amplifier                   | HP              | 8449B              | 3008A00849  | Feb. 20, 2025 | Feb. 19, 2026 |
| Highpass Filter                 | CD              | HPM-6.4/18G        | ---         | N/A           | N/A           |
| Highpass Filter                 | CD              | HPM-2.8/18G        | ---         | N/A           | N/A           |
| Highpass Filter                 | XINBO           | XBLBQ-HTA67(8-25G) | 22052702-1  | N/A           | N/A           |

| Antenna Conducted Emission |                    |                   |               |               |               |
|----------------------------|--------------------|-------------------|---------------|---------------|---------------|
| Equipment                  | Manufacturer       | Model No.         | Serial No.    | Last Cal.     | Cal. Due Date |
| Spectrum Analyzer          | Rohde & Schwarz    | FSV40-N           | 102197        | Jun. 16, 2025 | Jun. 15, 2026 |
| MXA Signal Analyzer        | Agilent            | N9020A            | MY49100060    | Aug. 27, 2025 | Aug. 26, 2026 |
| Spectrum Analyzer          | KEYSIGHT           | N9020B            | MY60110172    | Aug. 27, 2025 | Aug. 26, 2026 |
| RF Power Sensor            | DARE!! Instruments | RadiPowerRPR3006W | 17I00015SNO26 | Aug. 27, 2025 | Aug. 26, 2026 |
|                            | DARE!! Instruments | RadiPowerRPR3006W | 17I00015SNO29 | Aug. 27, 2025 | Aug. 26, 2026 |
|                            | DARE!! Instruments | RadiPowerRPR3006W | 17I00015SNO31 | Aug. 27, 2025 | Aug. 26, 2026 |
|                            | DARE!! Instruments | RadiPowerRPR3006W | 17I00015SNO33 | Aug. 27, 2025 | Aug. 26, 2026 |
| RF Control Unit            | Tonsced            | JS0806-2          | 21F8060439    | Aug. 27, 2025 | Aug. 26, 2026 |
| Power Control Box          | Tonsced            | JS0806-4ADC       | 21C8060387    | N/A           | N/A           |



## 5. Conducted Emission Test

### 5.1 Test Standard and Limit

#### 5.1.1 Test Standard

##### FCC Part 15.207

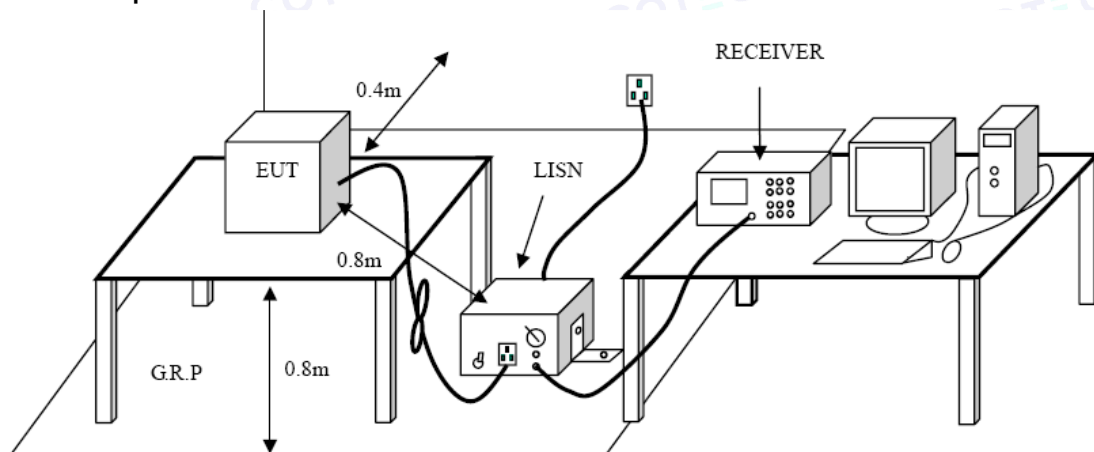
#### 5.1.2 Test Limit

| Frequency     | Maximum RF Line Voltage (dBμV) |               |
|---------------|--------------------------------|---------------|
|               | Quasi-peak Level               | Average Level |
| 150kHz~500kHz | 66 ~ 56 *                      | 56 ~ 46 *     |
| 500kHz~5MHz   | 56                             | 46            |
| 5MHz~30MHz    | 60                             | 50            |

#### Notes:

- (1) \*Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 5.2 Test Setup



### 5.3 Test Procedure

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- The bandwidth of EMI test receiver is set at 9 kHz, and the test frequency band is from



0.15MHz to 30MHz.

#### 5.4 Deviation From Test Standard

No deviation

#### 5.5 EUT Operating Mode

Please refer to the description of test mode.

#### 5.6 Test Data

N/A.



## 6. Radiated and Conducted Unwanted Emissions

### 6.1 Test Standard and Limit

#### 6.1.1 Test Standard

**FCC Part 15.209 & FCC Part 15.407(b)**

#### 6.1.2 Test Limit

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

| General field strength limits at frequencies Below 30MHz |                                  |                               |
|----------------------------------------------------------|----------------------------------|-------------------------------|
| Frequency (MHz)                                          | Field Strength (microvolt/meter) | Measurement Distance (meters) |
| 0.009~0.490                                              | 2400/F(KHz)                      | 300                           |
| 0.490~1.705                                              | 24000/F(KHz)                     | 30                            |
| 1.705~30.0                                               | 30                               | 30                            |

**Note:** 1, The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

| General field strength limits at frequencies above 30 MHz |                              |                               |
|-----------------------------------------------------------|------------------------------|-------------------------------|
| Frequency (MHz)                                           | Field strength (μV/m at 3 m) | Measurement Distance (meters) |
| 30~88                                                     | 100                          | 3                             |
| 88~216                                                    | 150                          | 3                             |
| 216~960                                                   | 200                          | 3                             |
| Above 960                                                 | 500                          | 3                             |

| General field strength limits at frequencies Above 1000MHz |                         |         |
|------------------------------------------------------------|-------------------------|---------|
| Frequency (MHz)                                            | Distance of 3m (dBuV/m) |         |
|                                                            | Peak                    | Average |
| Above 1000                                                 | 74                      | 54      |

**Note:**

- (1) The tighter limit applies at the band edges.
- (2) Emission Level(dBuV/m)=20log Emission Level(uV/m)
- (3) For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

#### Limits of unwanted emission out of the restricted bands

| Frequency (MHz) | EIRP Limits (dBm) | Equivalent Field Strength at 3m (dBuV/m) |
|-----------------|-------------------|------------------------------------------|
| 5150~5250       | -27               | 68.3                                     |
| 5250~5350       | -27               | 68.3                                     |
| 5470~5725       | -27               | 68.3                                     |
| 5725~5825       | -27(Note 2)       | 68.3                                     |
|                 | 10(Note 2)        | 105.3                                    |
|                 | 15.6(Note 2)      | 110.9                                    |
|                 | 27(Note 2)        | 122.3                                    |

**NOTE:**

1, The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:



$$E = \frac{1000000\sqrt{30P}}{3} \text{ uV/m, where P is the eirp (Watts)}$$

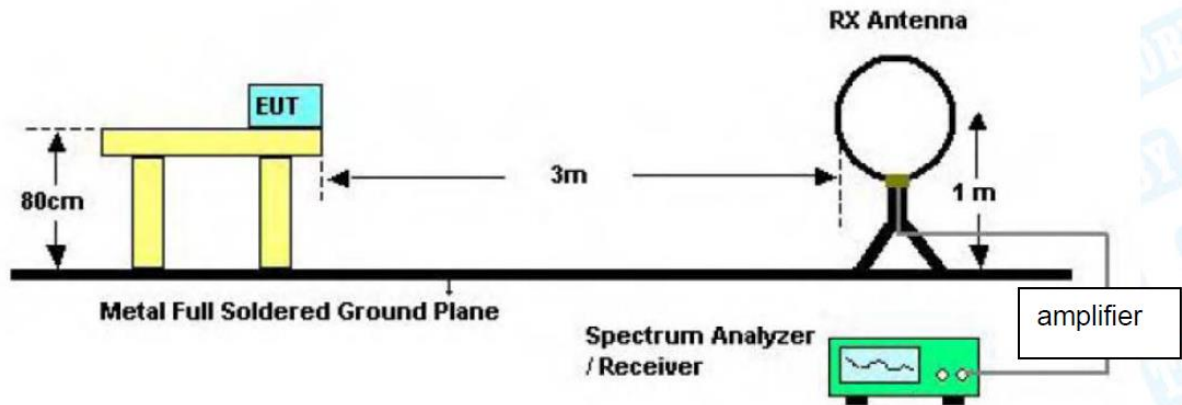
2, According to FCC 16-24, All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.

3, For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

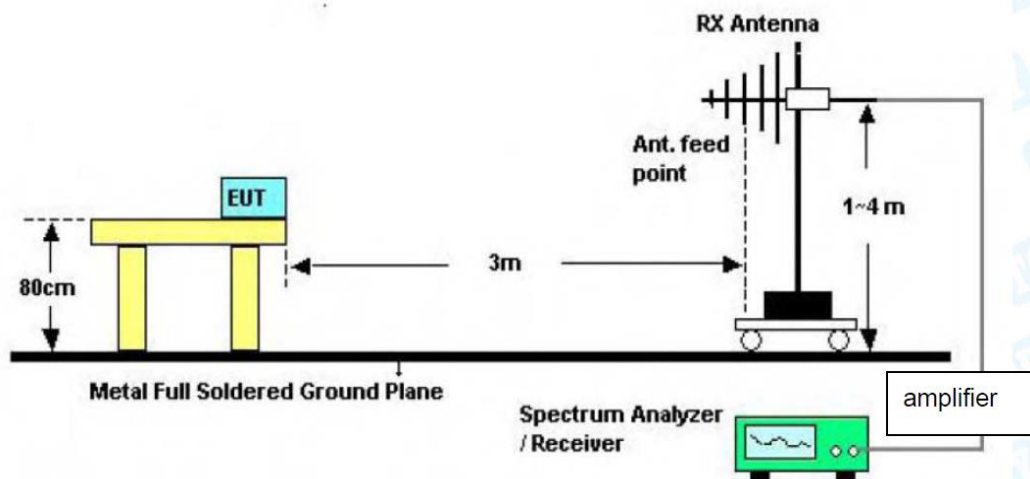


## 6.2 Test Setup

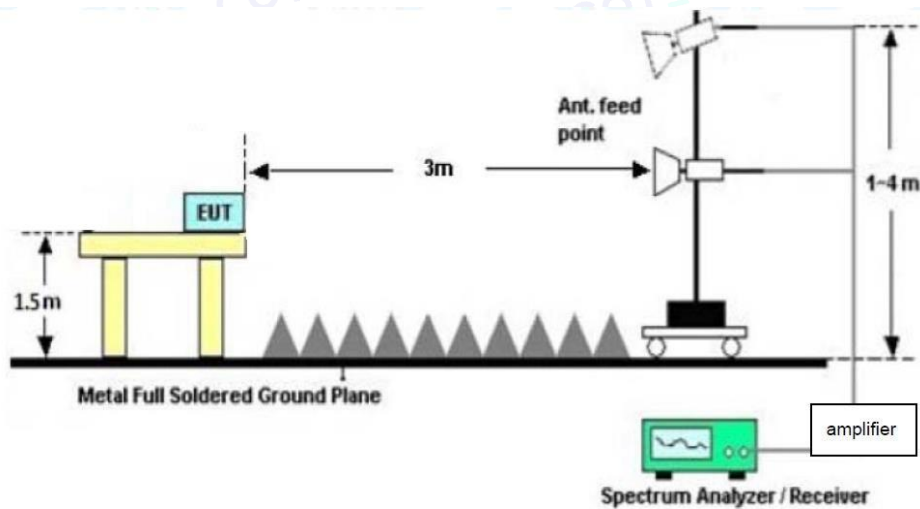
## Radiated measurement

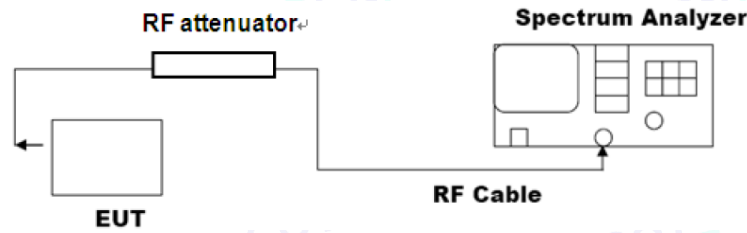


## Below 30MHz Test Setup



## Below 1000MHz Test Setup

Above 1GHz Test Setup  
Conducted measurement



### 6.3 Test Procedure

#### ---Radiated measurement

- The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Below 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- Testing frequency range 30MHz-1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection. Testing frequency range 9KHz-150Hz the measuring instrument use VBW=200Hz with Quasi-peak detection. Testing frequency range 9KHz-30MHz the measuring instrument use VBW=9kHz with Quasi-peak detection.
- Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- For the actual test configuration, please see the test setup photo.



**--- Conducted measurement****● Reference level measurement**

Establish a reference level by using the following procedure:

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to  $\geq 1.5$  times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW  $\geq [3 \times \text{RBW}]$ .
- 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 PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

**● Emission level measurement**

Establish an emission level by using the following procedure:

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

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

**6.4 Deviation From Test Standard**

No deviation

**6.5 EUT Operating Mode**

Please refer to the description of test mode.

**6.6 Test Data**

Radiated measurement please refer to the Attachment B inside test report.

Conducted measurement please refer to the external appendix report of 5G Wi-Fi.



## 7. Restricted Bands and Band Edge Requirement

### 7.1 Test Standard and Limit

#### 7.1.1 Test Standard

#### FCC Part 15.205 & FCC Part 15.407(b)

#### 7.1.2 Test Limit

| Frequency (MHz) | EIRP Limits (dBm) | Equivalent Field Strength at 3m (dBuV/m) |
|-----------------|-------------------|------------------------------------------|
| 5150~5250       | -27               | 68.3                                     |
| 5250~5350       | -27               | 68.3                                     |
| 5470~5725       | -27               | 68.3                                     |
| 5725~5825       | -27(Note 2)       | 68.3                                     |
|                 | 10(Note 2)        | 105.3                                    |
|                 | 15.6(Note 2)      | 110.9                                    |
|                 | 27(Note 2)        | 122.3                                    |

**NOTE:**

1, The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \text{ uV/m, where P is the eirp (Watts)}$$

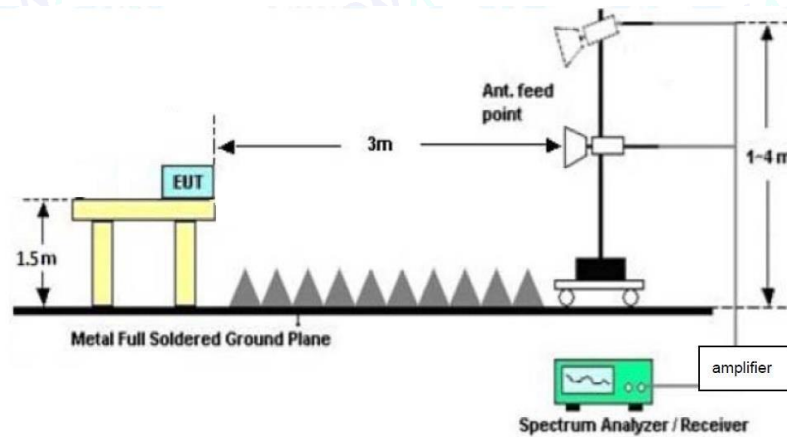
2, According to FCC 16-24, All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.

**Note:** According the ANSI C63.10 11.12.2 antenna-port conducted measurements may also be used as an alternative to radiated measurements for determining compliance in the restricted frequency bands requirements. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test forcabinet/case emissions is required.

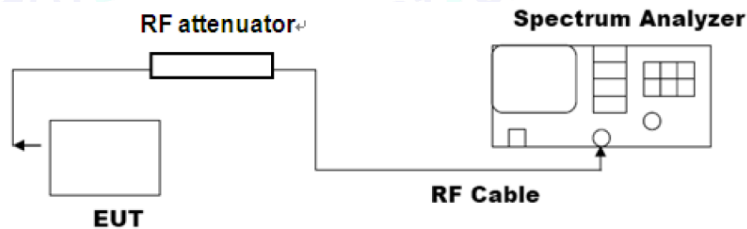


## 7.2 Test Setup

### Radiated measurement



### Conducted measurement



## 7.3 Test Procedure

### ---Radiated measurement

- Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- The Peak Value and average value both need to comply with applicable limit above 1 GHz.
- Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- For the actual test configuration, please see the test setup photo.



**--- Conducted measurement**

- a) Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 11.12.2.3 through 11.12.2.5 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
- b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP (see 11.12.2.6 for guidance on determining the applicable antenna gain).
- c) Add the appropriate maximum ground reflection factor to the EIRP (6 dB for frequencies  $\leq 30$  MHz; 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive; and 0 dB for frequencies  $> 1000$  MHz).
- d) For MIMO devices, measure the power of each chain and sum the EIRP of all chains in linear terms (i.e., watts and mW).
- e) Convert the resultant EIRP to an equivalent electric field strength using the following relationship:

$$E = \text{EIRP} - 20 \log d + 104.8$$

where

$E$  is the electric field strength in dBuV/m

EIRP is the equivalent isotropically radiated power in dBm

$d$  is the specified measurement distance in m

- f) Compare the resultant electric field strength level with the applicable regulatory limit.
- g) Perform the radiated spurious emission test.

**7.4 Deviation From Test Standard**

No deviation

**7.5 EUT Operating Mode**

Please refer to the description of test mode.

**7.6 Test Data**

Remark: The test uses antenna-port conducted measurements as an alternative to radiated measurements for determining compliance in the restricted frequency bands requirements.

please refer to the external appendix report of 5G Wi-Fi.



## 8. Bandwidth Test

### 8.1 Test Standard and Limit

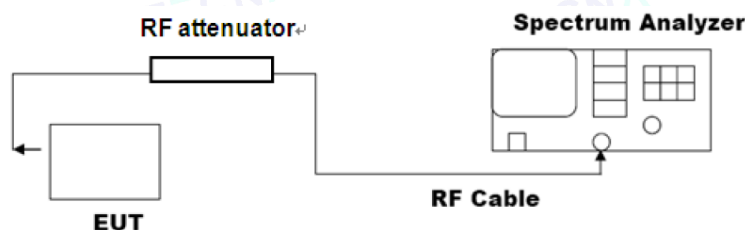
#### 8.1.1 Test Standard

**FCC Part 15.407(a) & FCC Part 15.407(e)**

#### 8.1.2 Test Limit

| Test Item      | Limit   | Frequency Range (MHz) |
|----------------|---------|-----------------------|
| 26 Bandwidth   | N/A     | 5150~5250             |
|                |         | 5250~5350             |
|                |         | 5500~5725             |
| 6 dB Bandwidth | >500kHz | 5725~5850             |
| 99% Bandwidth  | N/A     | 5150~5250             |
|                |         | 5250~5350             |
|                |         | 5500~5725             |
|                |         | 5725~5850             |

### 8.2 Test Setup



### 8.3 Test Procedure

#### ---Emission bandwidth

● The procedure for this method is as follows:

- Set RBW = approximately 1% of the emission bandwidth.
- Set the VBW > RBW.
- Detector = peak.
- Trace mode = max hold.
- Measure the maximum width of the emission that is 26 dB down from the peak of the emission.

Compare this with the RBW setting of the instrument. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

NOTE—The automatic bandwidth measurement capability of a spectrum analyzer or an EMI receiver may be employed if it implements the functionality described in the preceding items.



**---DTS bandwidth**

● The steps for the first option are as follows:

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

**---occupied bandwidth**

● The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

- a) The instrument center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW, and VBW shall be approximately three times the RBW, unless otherwise specified by the applicable requirement.
- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than  $[10 \log (OBW/RBW)]$  below the reference level. Specific guidance is given in 4.1.5.2.
- d) Step a) through step c) might require iteration to adjust within the specified range.
- e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
- f) Use the 99% power bandwidth function of the instrument (if available) and report the measured bandwidth.
- g) If the instrument does not have a 99% power bandwidth function, then the trace data points are recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The



process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is the difference between these two frequencies.

h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled.

Tabular data may be reported in addition to the plot(s).

#### 8.4 Deviation From Test Standard

No deviation

#### 8.5 EUT Operating Mode

Please refer to the description of test mode.

#### 8.6 Test Data

Please refer to the external appendix report of 5G Wi-Fi.



## 9. Maximum Conducted Output Power

### 9.1 Test Standard and Limit

#### 9.1.1 Test Standard

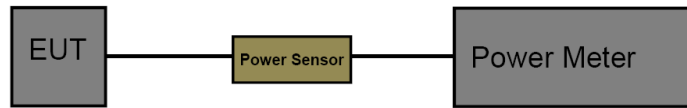
##### FCC Part 15.407(a)

#### 9.1.2 Test Limit

| Limit                     | Frequency Range(MHz)                                                                                           |                                                                                     |           |                                    |
|---------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------|------------------------------------|
|                           | 5150~5250                                                                                                      | 5250~5350                                                                           | 5500~5725 | 5725~5850                          |
| Max Conducted<br>TX Power | Master Device: 1 Watt(30dBm) Client<br>Device: 250mW(24dBm)                                                    | 24dBm (250 mW) or 11 dBm+ 10<br>log B, whichever is lower (B= 26-dB<br>emission BW) |           | 1 Watt (30dBm)                     |
| Max E.I.R.P               | 4 W (36 dBm) with 6 dBi antenna                                                                                | 1 W (30 dBm) with 6 dBi antenna                                                     |           | 4 W (36 dBm) with<br>6 dBi antenna |
|                           | 200 W (53 dBm) for fixed P-t-P application<br>with 23 dBi antenna                                              |                                                                                     |           |                                    |
|                           | Additional rule for outdoor operation:<br>Max_EIRP< 125 mW(21 dBm) at any<br>elevation angle > 30°from horizon |                                                                                     |           |                                    |
| TPC                       | NO                                                                                                             | YES, if Max_EIRP ≥ 500 mW (27<br>dBm) and able to lower EIRP below<br>24dBm         |           | NO                                 |
|                           |                                                                                                                | NO, if Max_EIRP < 500mW<br>(27dBm)                                                  |           |                                    |



## 9.2 Test Setup



## 9.3 Test Procedure

● Method AVGPM is a measurement using an RF average power meter, as follows:

a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:

- 1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
- 2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
- 3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

b) If the transmitter does not transmit continuously, measure the duty cycle,  $D$ , of the transmitter output signal as described in 11.6.

c) Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.

d) Adjust the measurement in dBm by adding  $[10 \log (1 / D)]$ , where  $D$  is the duty cycle.

## 9.4 Deviation From Test Standard

No deviation

## 9.5 EUT Operating Mode

Please refer to the description of test mode.

## 9.6 Test Data

Please refer to the external appendix report of 5G Wi-Fi.



## 10. Power Spectral Density Test

### 10.1 Test Standard and Limit

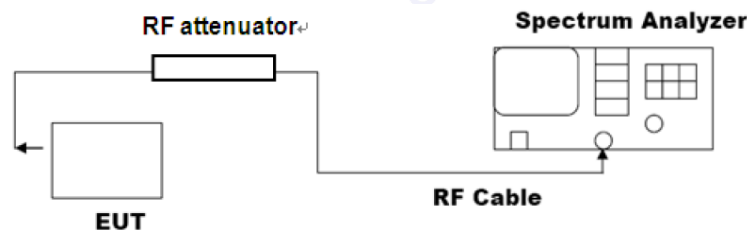
#### 10.1.1 Test Standard

##### FCC Part 15.407(a)

#### 10.1.2 Test Limit

| Test Item              | Limit |                                                      | Frequency Range(MHz) |
|------------------------|-------|------------------------------------------------------|----------------------|
| Power Spectral Density | FCC   | Master Device: 17dBm/MHz<br>Client Device: 11dBm/MHz | 5150~5250            |
|                        |       | 11dBm/MHz                                            | 5250~5350            |
|                        |       | 11dBm/MHz                                            | 5500~5725            |
|                        |       | 30dBm/500kHz                                         | 5725~5850            |

### 10.2 Test Setup



### 10.3 Test Procedure

Method SA-2 uses trace averaging across ON and OFF times of the EUT transmissions, followed by duty cycle correction. The procedure for this method is as follows:

- Measure the duty cycle  $D$  of the transmitter output signal as described in 12.2.
- Set span to encompass the entire 99% OBW of the signal.
- Set RBW = 1MHz. 5.8G Set RBW = 500KHz.
- Set VBW = 3MHz. 5.8G Set VBW = 2MHz.
- Number of points in sweep  $\geq [2 \times \text{span} / \text{RBW}]$ . (This gives bin-to-bin spacing  $\leq \text{RBW} / 2$ , so that narrowband signals are not lost between frequency bins.)
- Sweep time = auto.
- Detector = Power averaging (rms), if available. Otherwise, use sample detector mode.
- Do not use sweep triggering. Allow the sweep to “free run.”
- Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the ON and OFF periods of the transmitter.



j) Compute power by integrating the spectrum across the 99% OBW of the signal using the instrument's band-power measurement function with band limits set equal to the EBW or OBW band-edges. If the instrument does not have a band-power function, then sum the spectrum levels (in power units) at 1 MHz intervals extending across the 99% OBW of the spectrum.

k) Add  $[10 \log (1 / D)]$ , where  $D$  is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission).

For example, add  $[10 \log (1 / 0.25)] = 6$  dB if the duty cycle is 25%.

#### 10.4 Deviation From Test Standard

No deviation

#### 10.5 Antenna Connected Construction

Please refer to the description of test mode.

#### 10.6 Test Data

Please refer to the external appendix report of 5G Wi-Fi.



## 11. Frequency Stability

### 11.1 Test Standard and Limit

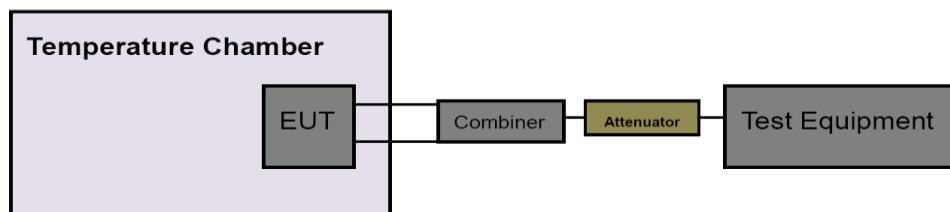
#### 11.1.1 Test Standard

##### **FCC Part 15.407(g)**

#### 11.1.2 Test Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user manual.

### 11.2 Test Setup



### 11.3 Test Procedure

- Determining compliance with the peak excursion requirement shall be done by confirming that the ratio of the maximum of the peak-max-hold spectrum to the maximum of the average spectrum for continuous transmission does not exceed the regulatory requirement.<sup>96</sup> The procedure for this method is as follows:
  - a) The following guidance for limiting the number of tests applies only to peak excursion measurements:
    - 1) Testing each modulation mode on a single channel in a single operating band is sufficient to determine compliance with the peak excursion requirement. (If all modulation modes are not available on a single channel in a single band, then testing must be extended to other channels and bands as needed to ensure that all modulation modes are tested.)
    - 2) Tests must include all variations in signal structure, such as:
      - i) All signal types [e.g., direct sequence spread spectrum (DSSS) and OFDM].
      - ii) All modulation types [e.g., binary phase-shift keying (BPSK), quadrature phase-shift keying (QPSK), 16-QAM, 64-QAM, and 256-QAM].
      - iii) All bandwidth modes.
      - iv) All variations in signal parameters (e.g., changes in subcarrier spacing or number of subcarriers).
    - 3) For a given signal structure, testing of multiple error-correction coding rates is not required (e.g., 1/2, 2/3, and 3/4).
    - 4) For MIMO devices, testing of a single output port is sufficient to determine compliance



with the peak excursion requirement. If a given signal structure can be exercised with various combinations of spatial multiplexing (such as different numbers of spatial streams), beamforming, and cyclic delay diversity, peak excursion tests are not required to include those variations.

b) The procedure is as follows:

- 1) Set the span of the spectrum analyzer or EMI receiver to view the entire emission bandwidth or occupied bandwidth.
- 2) Find the maximum of the peak-max-hold spectrum:
  - i) Set RBW = 1MHz.
  - ii) VBW = 3MHz.
  - iii) Detector = peak.
  - iv) Trace mode = max-hold.
  - v) Allow the sweeps to continue until the trace stabilizes.
  - vi) Use the peak search function to find the peak of the spectrum.
- 3) Use the procedure found in 12.5 to measure the PPSD.
- 4) Compute the ratio of the maximum of the peak-max-hold spectrum to the PPSD.

#### 11.4 Deviation From Test Standard

No deviation

#### 11.5 Antenna Connected Construction

Please refer to the description of test mode.

#### 11.6 Test Data

Please refer to the external appendix report of 5G Wi-Fi.



## 12. Antenna Requirement

### 12.1 Test Standard and Limit

#### 12.1.1 Test Standard

##### **FCC Part 15.203**

#### 12.1.2 Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### 12.2 Deviation From Test Standard

No deviation

### 12.3 Antenna Connected Construction

The gains of the antenna used for transmitting is 2.95dBi, and the antenna de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

### 12.4 Test Data

The EUT antenna is a FPC Antenna. It complies with the standard requirement.

| Antenna Type                                                   |
|----------------------------------------------------------------|
| <input checked="" type="checkbox"/> Permanent attached antenna |
| <input type="checkbox"/> Unique connector antenna              |
| <input type="checkbox"/> Professional installation antenna     |



## 13. Duty cycle

### 13.1 Test Standard and Limit

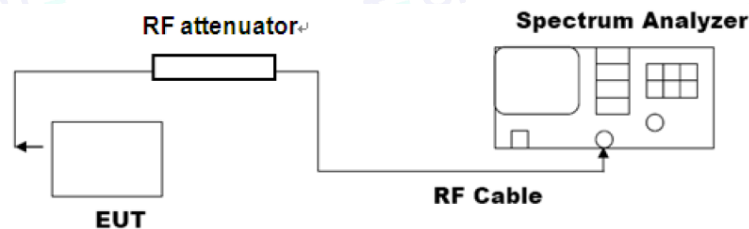
#### 13.1.1 Test Standard

/

#### 13.1.2 Test Limit

/

### 13.2 Test Setup



### 13.3 Test Procedure

● Measurements of duty cycle and transmission duration shall be performed using below techniques. The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:

- 1) Set the center frequency of the instrument to the center frequency of the transmission.
- 2) Span=0Hz
- 3) Set RBW=10MHz.
- 4) Set RBW=10MHz.
- 5) Set Detector= peak.
- 6) Trace mode = clear write.

### 13.4 Deviation From Test Standard

No deviation

### 13.5 Antenna Connected Construction

Please refer to the description of test mode.

### 13.6 Test Data

Please refer to the external appendix report of 5G Wi-Fi.



## Attachment A-- Unwanted Emissions Data

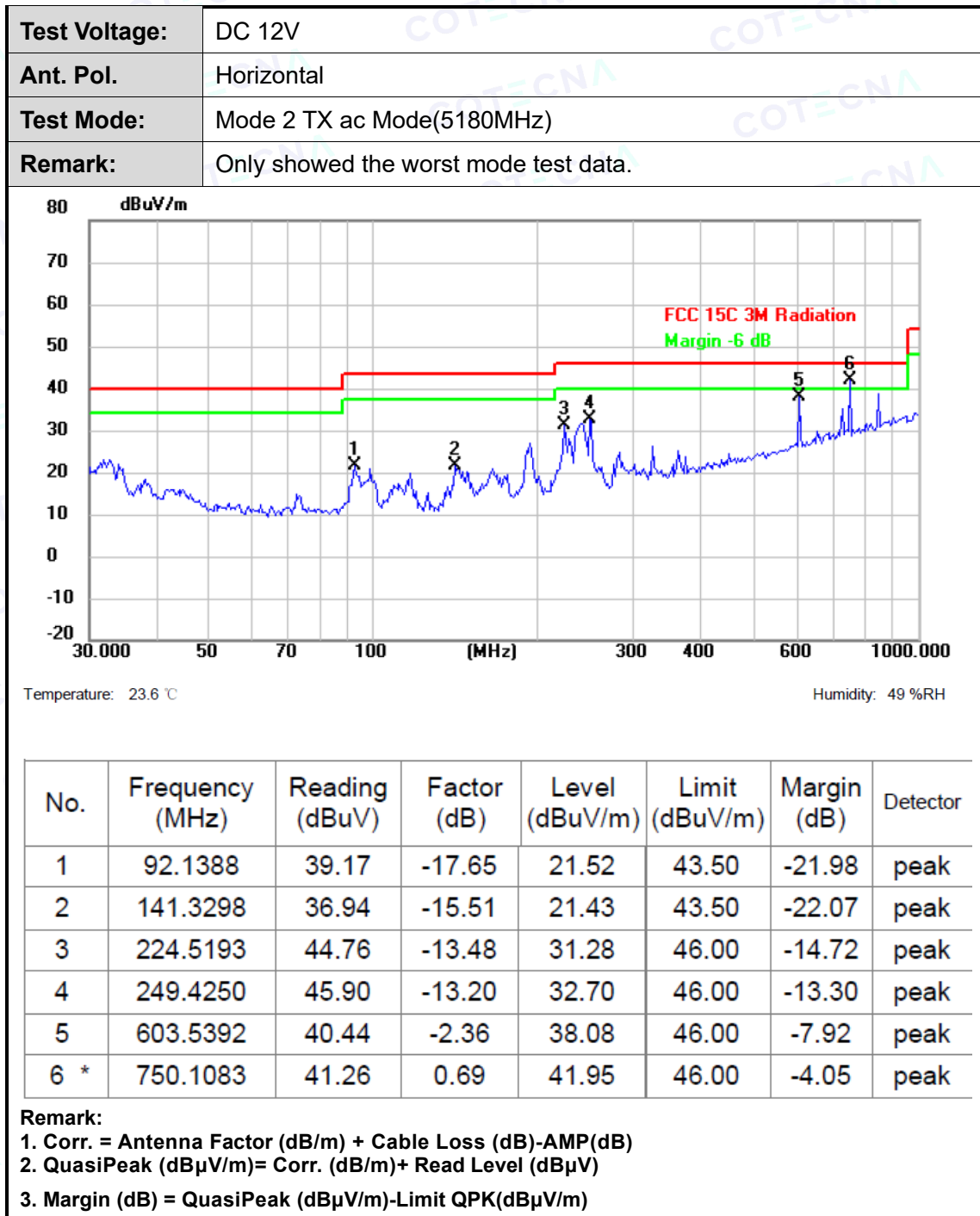
### ---Radiated Unwanted Emissions

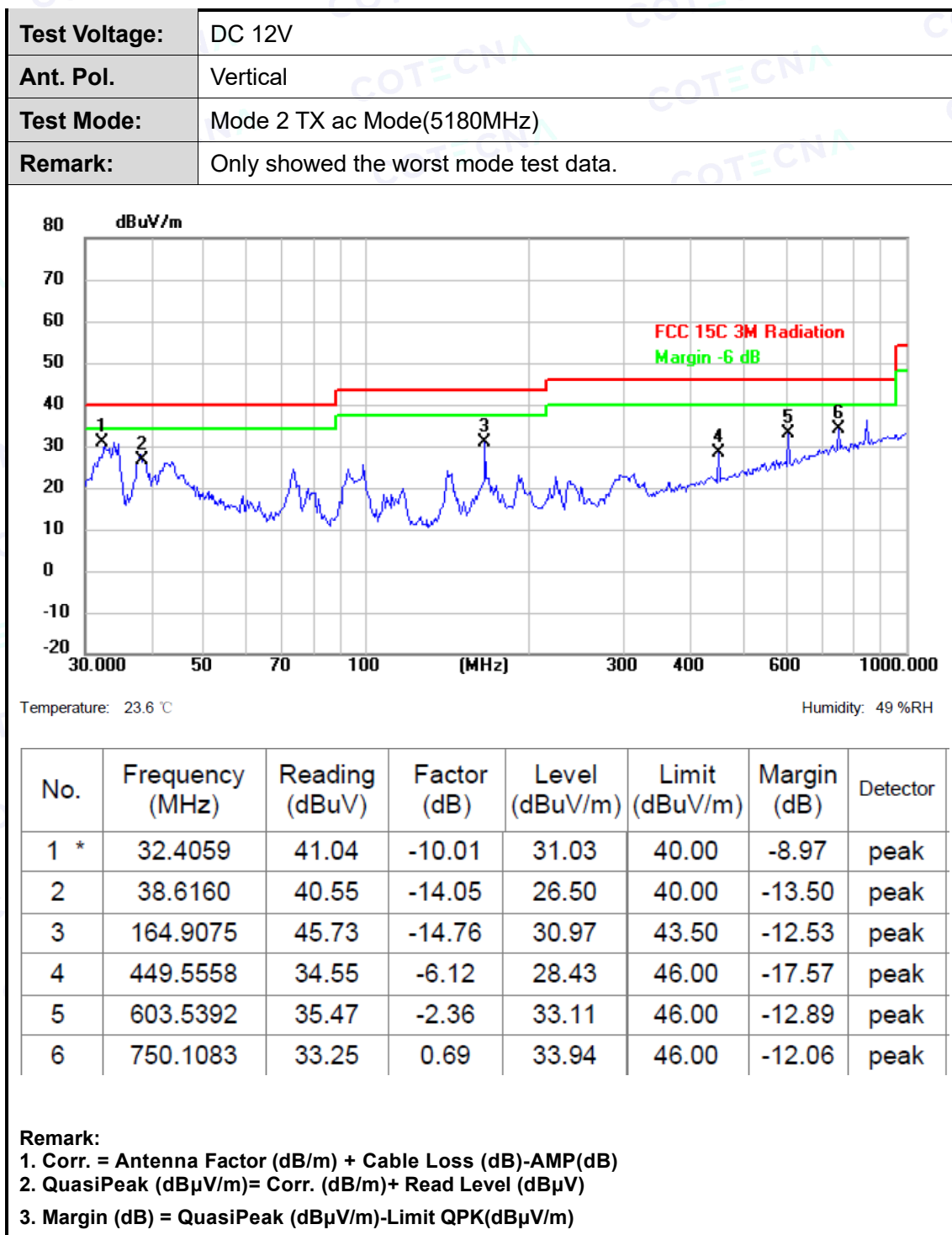
#### 9 KHz~30 MHz

From 9 KHz to 30 MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB Below the permissible value has no need to be reported.

#### 30MHz~1GHz





**Above 1GHz**

Only showed the worst mode test data.

| <b>Test Voltage:</b> |                 | DC 12V                             |               |                |                |             |          |
|----------------------|-----------------|------------------------------------|---------------|----------------|----------------|-------------|----------|
| <b>Ant. Pol.</b>     |                 | Horizontal                         |               |                |                |             |          |
| <b>Test Mode:</b>    |                 | TX 802.11ac Mode 5180MHz (U-NII-1) |               |                |                |             |          |
| No.                  | Frequency (MHz) | Reading (dBuV)                     | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 1 *                  | 9483.0000       | 44.12                              | 0.42          | 44.54          | 74.00          | -29.46      | peak     |
| 2                    | 16827.0000      | 38.92                              | 5.25          | 44.17          | 74.00          | -29.83      | peak     |

**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)-AMP(dB)
2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = Peak/AVG (dBμV/m)-Limit PK/AVG(dBμV/m)
4. The tests evaluated 1-40GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency. Test with high pass filter (Pass Frequency: 2.8-18G and 18GHz-40GHz) is the noise, No other signals were detected.
5. Results below the limit by 20 dB were not recorded in the table.

| <b>Test Voltage:</b> |                 | DC 12V                             |               |                |                |             |          |
|----------------------|-----------------|------------------------------------|---------------|----------------|----------------|-------------|----------|
| <b>Ant. Pol.</b>     |                 | Vertical                           |               |                |                |             |          |
| <b>Test Mode:</b>    |                 | TX 802.11ac Mode 5180MHz (U-NII-1) |               |                |                |             |          |
| No.                  | Frequency (MHz) | Reading (dBuV)                     | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 1                    | 9517.0000       | 42.98                              | 6.45          | 49.43          | 68.30          | -18.87      | peak     |
| 2                    | 9517.0000       | 36.12                              | 6.45          | 42.57          | 54.00          | -11.43      | AVG      |
| 3                    | 14846.5000      | 39.13                              | 10.38         | 49.51          | 68.30          | -18.79      | peak     |
| 4 *                  | 14846.5000      | 32.28                              | 10.38         | 42.66          | 54.00          | -11.34      | AVG      |

**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)-AMP(dB)
2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = Peak/AVG (dBμV/m)-Limit PK/AVG(dBμV/m)
4. The tests evaluated 1-40GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency. Test with high pass filter (Pass Frequency: 2.8-18G and 18GHz-40GHz) is the noise, No other signals were detected.
5. Results below the limit by 20 dB were not recorded in the table.



| <b>Test Voltage:</b> |                 | DC 12V                             |               |                |                |             |          |
|----------------------|-----------------|------------------------------------|---------------|----------------|----------------|-------------|----------|
| <b>Ant. Pol.</b>     |                 | Horizontal                         |               |                |                |             |          |
| <b>Test Mode:</b>    |                 | TX 802.11ac Mode 5200MHz (U-NII-1) |               |                |                |             |          |
| No.                  | Frequency (MHz) | Reading (dBuV)                     | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 1                    | 9338.5000       | 44.91                              | 5.13          | 50.04          | 68.30          | -18.26      | peak     |
| 2 *                  | 9338.5000       | 37.62                              | 5.13          | 42.75          | 54.00          | -11.25      | AVG      |
| 3                    | 14719.0000      | 38.33                              | 9.65          | 47.98          | 68.30          | -20.32      | peak     |
| 4                    | 14719.0000      | 32.18                              | 9.65          | 41.83          | 54.00          | -12.17      | AVG      |

**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)-AMP(dB)
2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = Peak/AVG (dBμV/m)-Limit PK/AVG(dBμV/m)
4. The tests evaluated 1-40GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency. Test with high pass filter (Pass Frequency: 2.8-18G and 18GHz-40GHz) is the noise, No other signals were detected.
5. Results below the limit by 20 dB were not recorded in the table.

| <b>Test Voltage:</b> |                 | DC 12V                             |               |                |                |             |          |
|----------------------|-----------------|------------------------------------|---------------|----------------|----------------|-------------|----------|
| <b>Ant. Pol.</b>     |                 | Vertical                           |               |                |                |             |          |
| <b>Test Mode:</b>    |                 | TX 802.11ac Mode 5200MHz (U-NII-1) |               |                |                |             |          |
| No.                  | Frequency (MHz) | Reading (dBuV)                     | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 1                    | 9415.0000       | 44.61                              | 5.88          | 50.49          | 68.30          | -17.81      | peak     |
| 2 *                  | 9415.0000       | 37.24                              | 5.88          | 43.12          | 54.00          | -10.88      | AVG      |
| 3                    | 14846.5000      | 38.33                              | 10.38         | 48.71          | 68.30          | -19.59      | peak     |
| 4                    | 14846.5000      | 31.39                              | 10.38         | 41.77          | 54.00          | -12.23      | AVG      |

**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)-AMP(dB)
2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = Peak/AVG (dBμV/m)-Limit PK/AVG(dBμV/m)
4. The tests evaluated 1-40GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency. Test with high pass filter (Pass Frequency: 2.8-18G and 18GHz-40GHz) is the noise, No other signals were detected.
5. Results below the limit by 20 dB were not recorded in the table.



| <b>Test Voltage:</b> |                 | DC 12V                             |               |                |                |             |          |
|----------------------|-----------------|------------------------------------|---------------|----------------|----------------|-------------|----------|
| <b>Ant. Pol.</b>     |                 | Horizontal                         |               |                |                |             |          |
| <b>Test Mode:</b>    |                 | TX 802.11ac Mode 5240MHz (U-NII-1) |               |                |                |             |          |
| No.                  | Frequency (MHz) | Reading (dBuV)                     | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 1                    | 9389.5000       | 44.42                              | 5.62          | 50.04          | 68.30          | -18.26      | peak     |
| 2 *                  | 9389.5000       | 37.67                              | 5.62          | 43.29          | 54.00          | -10.71      | AVG      |
| 3                    | 10919.5000      | 43.33                              | 6.15          | 49.48          | 68.30          | -18.82      | peak     |
| 4                    | 10919.5000      | 36.52                              | 6.15          | 42.67          | 54.00          | -11.33      | AVG      |

**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)-AMP(dB)
2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = Peak/AVG (dBμV/m)-Limit PK/AVG(dBμV/m)
4. The tests evaluated 1-40GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency. Test with high pass filter (Pass Frequency: 2.8-18G and 18GHz-40GHz) is the noise, No other signals were detected.
5. Results below the limit by 20 dB were not recorded in the table.

| <b>Test Voltage:</b> |                 | DC 12V                             |               |                |                |             |          |
|----------------------|-----------------|------------------------------------|---------------|----------------|----------------|-------------|----------|
| <b>Ant. Pol.</b>     |                 | Vertical                           |               |                |                |             |          |
| <b>Test Mode:</b>    |                 | TX 802.11ac Mode 5240MHz (U-NII-1) |               |                |                |             |          |
| No.                  | Frequency (MHz) | Reading (dBuV)                     | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 1                    | 9440.5000       | 43.23                              | 6.27          | 49.50          | 68.30          | -18.80      | peak     |
| 2 *                  | 9440.5000       | 36.59                              | 6.27          | 42.86          | 54.00          | -11.14      | AVG      |
| 3                    | 10970.5000      | 42.55                              | 6.34          | 48.89          | 68.30          | -19.41      | peak     |
| 4                    | 10970.5000      | 35.33                              | 6.34          | 41.67          | 54.00          | -12.33      | AVG      |

**Remark:**

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)-AMP(dB)
2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
3. Margin (dB) = Peak/AVG (dBμV/m)-Limit PK/AVG(dBμV/m)
4. The tests evaluated 1-40GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency. Test with high pass filter (Pass Frequency: 2.8-18G and 18GHz-40GHz) is the noise, No other signals were detected.
5. Results below the limit by 20 dB were not recorded in the table.

-----END OF THE REPORT-----

