# FCC RF Test Report

| | | |
|---|---|---|
| APPLICANT | : | LITE-ON Technology Corp. |
| EQUIPMENT | : | 802.11 a/b/g/n/ac 2T2R+BT V4.2LE combo module |
| BRAND NAME | : | LITE-ON |
| MODEL NAME | : | WCBN3510A |
| FCC ID | : | PPQ-WCBN3510A |
| STANDARD | : | FCC Part 15 Subpart E §15.407 |
| CLASSIFICATION | : | (NII) Unlicensed National Information Infrastructure |

**The product was installed into Lenovo Smart Display, Lenovo ThinkSmart View (Brand Name: Lenovo, ThinkSmart, Model Name: Lenovo CD-18781Y) during test.**

**The product was received on Sep. 05, 2019 and testing was completed on Nov. 22, 2019. We, Sporton International (Kunshan) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.**

Jason Jia

**Reviewed by: Jason Jia / Supervisor**

James Huang

**Approved by: James Huang / Manager**

ACCREDITED Cert #5145.02

***Sporton International (Kunshan) Inc.***
***No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300***
***People's Republic of China***

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# REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|---|---|---|---|
| FR990505E | Rev. 01 | Initial issue of report | Dec. 19, 2019 |
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# SUMMARY OF TEST RESULT

| Report Section | FCC Rule | Description | Limit | Result | Remark |
|---|---|---|---|---|---|
| 3.1 | 15.407(b) | Unwanted Emissions | 15.407(b)(4)(i) &15.209(a) | Pass | Under limit 3.39 dB at 31.940 MHz |
| 3.2 | 15.407(c) | Automatically Discontinue Transmission | Discontinue Transmission | Pass | - |
| 3.3 | 15.203 & 15.407(a) | Antenna Requirement | N/A | Pass | - |

| **Declaration of Conformity:** |
|---|
| The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. |
| **Comments and Explanations:** |
| The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification. |

# 1 General Description

## 1.1 Applicant

**LITE-ON Technology Corp.**
Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C

## 1.2 Manufacturer

**LITE-ON TECHNOLOGY (Changzhou) CO., LTD**
A9 Building, No.88 Yanghu Road, Wujin Hi-Tech Industrial Development Zone, Changzhou City, Jiangsu Province 213100 China

## 1.3 Product Feature of Equipment Under Test

| Product Feature | |
|---|---|
| **Equipment** | 802.11 a/b/g/n/ac 2T2R+BT V4.2LE combo module |
| **Brand Name** | LITE-ON |
| **Model Name** | WCBN3510A |
| **FCC ID** | PPQ-WCBN3510A |
| **EUT supports Radios application** | WLAN 2.4GHz 802.11b/g/n HT20/HT40<br>WLAN 5GHz 802.11a/n HT20/HT40<br>WLAN 5GHz 802.11ac VHT20/VHT40/VHT80<br>Bluetooth BR / EDR/ LE |
| **EUT Stage** | Identical Prototype |

| Host Feature & Specification | |
|---|---|
| **Equipment** | Lenovo Smart Display, Lenovo ThinkSmart View |
| **Brand Name** | Lenovo, ThinkSmart |
| **Model Name** | Lenovo CD-18781Y |
| **Applicant** | **Lenovo (Shanghai) Electronics Technology Co., Ltd.**<br>Section 304-305, Building No. 4, # 222, Meiyue Road, China (Shanghai) Pilot Free Trade Zone |
| **Manufacturer** | **Lenovo PC HK Limited**<br>23/F, Lincoln House, Taikoo Place, 979 King's Road, Quarry Bay Hong Kong P.R.China |

**Remark:**

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. This is a variant report, the change note could be referred to the product equality declaration which is exhibit separately. Based on the similarity between current and previous project, only the worst cases of RSE from original test report (Sporton Report Number FR820813E) were verified for the differences.

## 1.4 Product Specification of Equipment Under Test

| Standards-related Product Specification | |
|---|---|
| **Tx/Rx Channel Frequency Range** | 5745 MHz ~ 5825 MHz |
| **Type of Modulation** | 802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)<br>802.11ac：OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM) |
| **Antenna Type / Gain** | PIFA Antenna with gain 3.81 dBi |

## 1.5 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.6 Component List

| Object | Specifications | Supplier |
|---|---|---|
| CPU | APQ-8053-A-792NSP-MT-01-1-AA | Qualcomm |
| Memory | KLM8G1GETF-B041 | Samsung |
| Panel | P080DDD-AB4 W134.2*H202.05*3.5MM 3.3V 800*RGB*1280 | longhai |
| | TV080WXM-LL4 L201.95*W134.1*H3.4mm 1.8V 800*128 | BOE |
| Camera | FX505AA S5KC505A | Qtech |
| Loudspeaker | 1.75" 6Ω 10W fullrange driver | sanfu |
| PCB | L102*W91*T0.8MM 94 V0 | HannStar Board |
| Module | WCBN3510A QCA9379-3 WIFI and Bluetooth combo | Liteon |

## 1.7 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

| | | | |
|---|---|---|---|
| **Test Firm** | Sporton International (Kunshan) Inc. | | |
| **Test Site Location** | No. 1098, Pengxi North Road, Kunshan Economic Development Zone<br>Jiangsu Province 215300 People's Republic of China<br>TEL : +86-512-57900158<br>FAX : +86-512-57900958 | | |
| **Test Site No.** | **Sporton Site No.** | **FCC Designation No.** | **FCC Test Firm Registration No.** |
| | 03CH06-KS | CN1257 | 314309 |

## 1.8 Test Software

| Item | Site | Manufactor | Name | Version |
|---|---|---|---|---|
| 1. | 03CH06-KS | AUDIX | E3 | 6.2009-8-24al |

## 1.9 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ANSI C63.10-2013

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

# 2 Test Configuration of Equipment Under Test

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.

## 2.1 Carrier Frequency and Channel

| Frequency Band | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---|---|---|---|---|
| 5725-5850 MHz Band 4 (U-NII-3) | 149 | 5745 | 157 | 5785 |
| | 151* | 5755 | 159* | 5795 |
| | 153 | 5765 | 161 | 5805 |
| | 155# | 5775 | 165 | 5825 |

**Note:**

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "#" were 802.11ac VHT80.

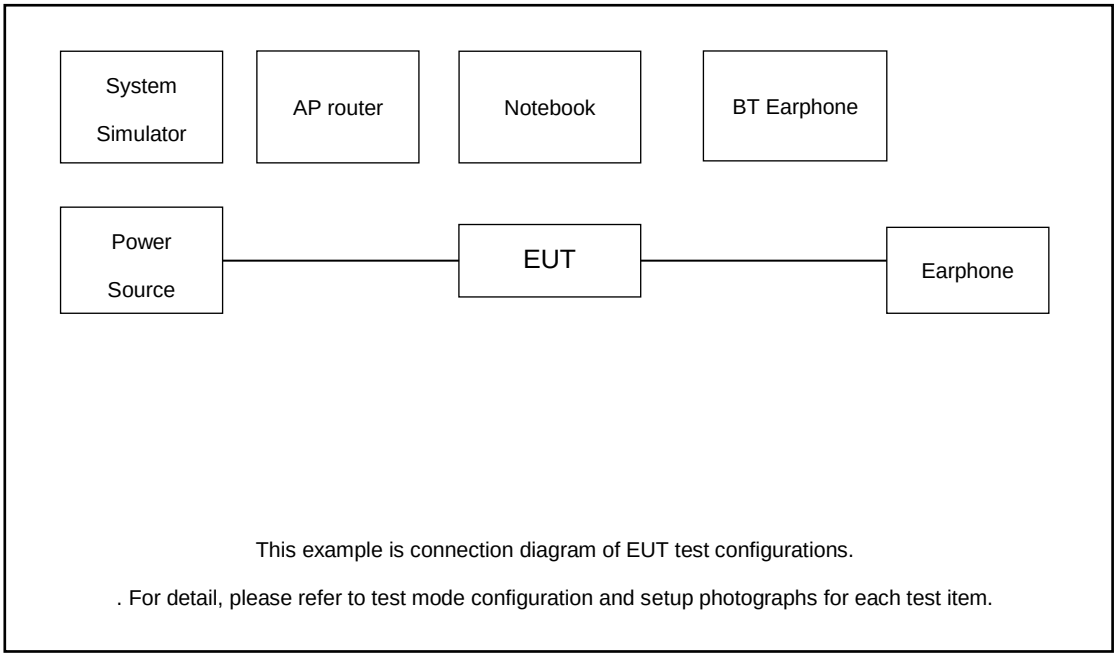
## 2.2 Test Mode

**Final test modes are considering the modulation and worse data rates as below table.**

| Modulation | Data Rate |
|---|---|
| 802.11ac VHT20 | MCS0 |

| Ch. # | | Band IV：5725-5850 MHz |
|---|---|---|
| | | 802.11ac VHT20 |
| H | High | 165 |

## 2.3 Connection Diagram of Test System




This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

## 2.4 Support Unit used in test configuration and system

| Item | Equipment | Trade Name | Model Name | FCC ID | Data Cable | Power Cord |
|---|---|---|---|---|---|---|
| 1. | LTE Base Station | Anritsu | MT8820C | N/A | N/A | Unshielded,1.8m |
| 2. | Bluetooth Earphone | Lenovo | LBH308 | N/A | N/A | N/A |
| 3. | WLAN AP | D-link | DIR-655 | KA21R655B1 | N/A | Unshielded,1.8m |
| 4. | Notebook | Lenovo | G480 | QDS-BRCM1050I | N/A | AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m |
| 5. | SD Card | Kingston | 8GB | N/A | N/A | N/A |

## 2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuously transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

# 3 Test Result

## 3.1 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

### 3.1.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5.725-5.85 GHz band:
15.407(b)(4)(i) 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 25 MHz 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 27 dBm/MHz at the band edge.

(2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

| Frequency (MHz) | Field Strength (microvolts/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 |
| 30 – 88 | 100 | 3 |
| 88 – 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

| EIRP (dBm) | Field Strength at 3m (dBμV/m) |
|---|---|
| - 27 | 68.2 |

**Note:** The following formula is used to convert the EIRP to field strength.

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$

where

EIRP is the equivalent isotropically radiated power, in dBm

$E_{Meas}$ is the field strength of the emission at the measurement distance, in dBμV/m

$d_{Meas}$ is the measurement distance, in m

### 3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.

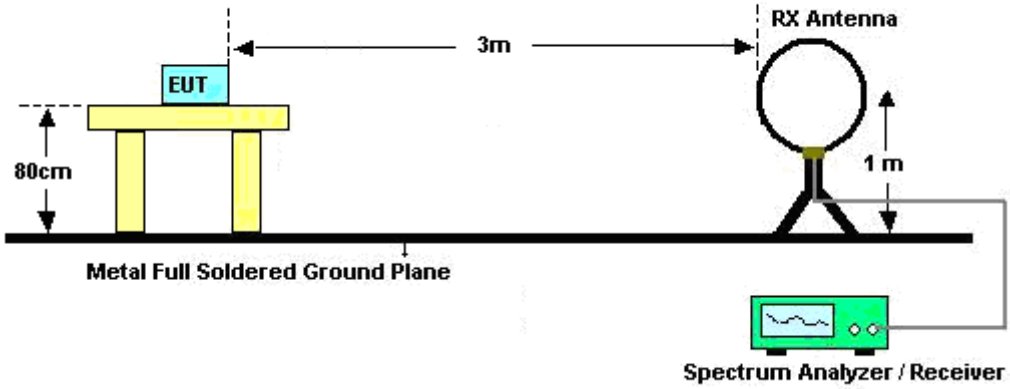
   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

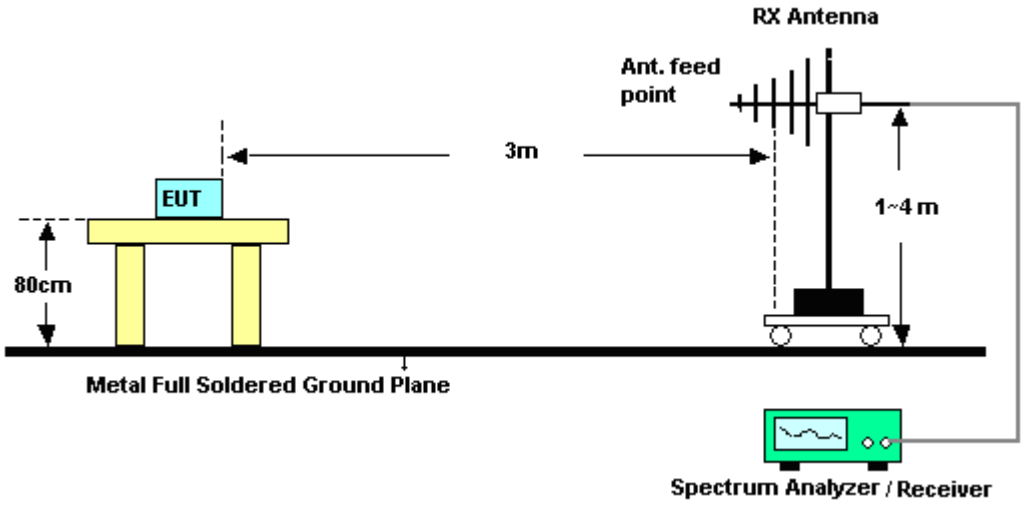
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

### 3.1.4 Test Setup

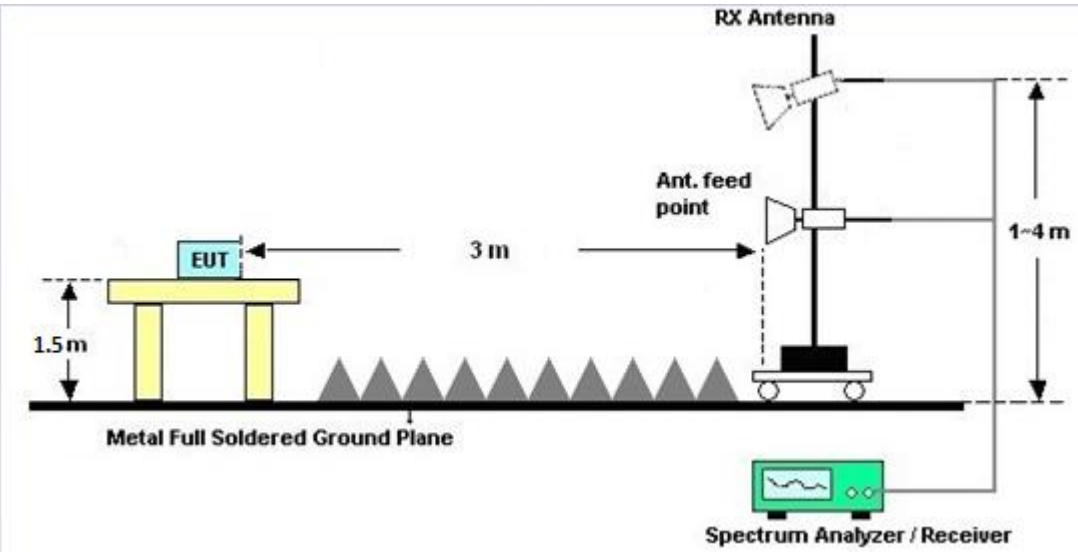
**For radiated emissions below 30MHz**




**For radiated emissions from 30MHz to 1GHz**



**For radiated emissions above 1GHz**




### 3.1.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### 3.1.6 Test Result of Radiated Band Edges

Please refer to Appendix A.

### 3.1.7 Duty Cycle

Please refer to Appendix B.

### 3.1.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix A.

## 3.2 Automatically Discontinue Transmission

### 3.2.1 Limit of Automatically Discontinue Transmission

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

### 3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.2.3 Test Result of Automatically Discontinue Transmission

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

## 3.3 Antenna Requirements

### 3.3.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

### 3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

# 4 List of Measuring Equipment

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| EMI Test Receiver | Keysight | N9038A | MY57290157 | 3Hz~8.5GHz;Max 30dBm | Jul. 18, 2019 | Nov. 22, 2019 | Jul. 17, 2020 | Radiation (03CH06-KS) |
| EXA Spectrum Analyzer | Keysight | N9010A | MY55150208 | 10Hz-44GHz | Apr. 16, 2019 | Nov. 22, 2019 | Apr. 18, 2020 | Radiation (03CH06-KS) |
| Loop Antenna | R&S | HFH2-Z2 | 100321 | 9kHz~30MHz | Oct. 18, 2019 | Nov. 22, 2019 | Oct. 17, 2020 | Radiation (03CH06-KS) |
| Bilog Antenna | TeseQ | CBL6111D | 44483 | 30MHz-1GHz | Dec. 28, 2018 | Nov. 22, 2019 | Dec. 27, 2019 | Radiation (03CH06-KS) |
| Double Ridge Horn Antenna | ETS-Lindgren | 3117 | 75959 | 1GHz~18GHz | Jan. 27, 2019 | Nov. 22, 2019 | Jan. 26, 2020 | Radiation (03CH06-KS) |
| SHF-EHF Horn | Com-power | AH-840 | 101070 | 18GHz~40GHz | Jan. 05, 2019 | Nov. 22, 2019 | Jan. 04, 2020 | Radiation (03CH06-KS) |
| Amplifier | SONOMA | 310N | 187289 | 9KHz ~1GHZ | Aug. 06, 2019 | Nov. 22, 2019 | Aug. 05, 2020 | Radiation (03CH06-KS) |
| Amplifier | MITEQ | TTA1840-35-HG | 2014749 | 18~40GHz | Jan. 14, 2019 | Nov. 22, 2019 | Jan.13, 2020 | Radiation (03CH06-KS) |
| high gain Amplifier | MITEQ | AMF-7D-00101800-30-10P | 2025788 | 1Ghz-18Ghz | Aug.16.2019 | Nov. 22, 2019 | Aug.15,2020 | Radiation (03CH06-KS) |
| Amplifier | Keysight | 83017A | MY53270203 | 500MHz~26.5GHz | Apr. 15, 2019 | Nov. 22, 2019 | Apr. 14, 2020 | Radiation (03CH06-KS) |
| AC Power Source | Chroma | 61601 | F104090004 | N/A | NCR | Nov. 22, 2019 | NCR | Radiation (03CH06-KS) |
| Turn Table | ChamPro | EM 1000-T | 060762-T | 0~360 degree | NCR | Nov. 22, 2019 | NCR | Radiation (03CH06-KS) |
| Antenna Mast | ChamPro | EM 1000-A | 060762-A | 1 m~4 m | NCR | Nov. 22, 2019 | NCR | Radiation (03CH06-KS) |

NCR: No Calibration Required

# 5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

**Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **2.9dB** |

**Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **5.0dB** |

**Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **5.0dB** |

**Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **5.0dB** |

# Appendix A. Radiated Spurious Emission

## Band 4 - 5725~5850MHz

| WIFI Ant. | Note | Frequency | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Ant Pos | Table Pos | Peak Avg. | Pol. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | ( MHz ) | ( dBµV/m ) | ( dB ) | ( dBµV/m ) | ( dBµV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |
| 802.11ac VHT20 CH 165 5825MHz | | 5851.2 | 80.63 | -38.93 | 119.56 | 65.67 | 35 | 10.29 | 30.33 | 190 | 10 | P | H |
| | | 5855.6 | 77.95 | -32.78 | 110.73 | 62.98 | 35.03 | 10.27 | 30.33 | 190 | 10 | P | H |
| | | 5875.8 | 65.14 | -39.57 | 104.71 | 50.14 | 35.07 | 10.27 | 30.34 | 190 | 10 | P | H |
| | | 5986.8 | 55.68 | -12.62 | 68.3 | 40.34 | 35.27 | 10.49 | 30.42 | 190 | 10 | P | H |
| | | 5830 | 113.94 | -8.36 | 122.3 | 97.52 | 34.97 | 11.76 | 30.31 | 190 | 10 | P | H |
| | | 5830 | 106.2 | - | - | 89.78 | 34.97 | 11.76 | 30.31 | 190 | 10 | A | H |
| | | 5850.2 | 74.77 | -47.07 | 121.84 | 59.81 | 35 | 10.29 | 30.33 | 125 | 332 | P | V |
| | | 5856.8 | 72.74 | -37.66 | 110.4 | 57.77 | 35.03 | 10.27 | 30.33 | 125 | 332 | P | V |
| | | 5875.6 | 60.97 | -43.88 | 104.85 | 45.97 | 35.07 | 10.27 | 30.34 | 125 | 332 | P | V |
| | | 5959.6 | 54.87 | -13.43 | 68.3 | 39.66 | 35.23 | 10.37 | 30.39 | 125 | 332 | P | V |
| | | 5830 | 108.55 | -13.75 | 122.3 | 92.13 | 34.97 | 11.76 | 30.31 | 125 | 332 | P | V |
| | | 5830 | 101.07 | - | - | 84.65 | 34.97 | 11.76 | 30.31 | 125 | 332 | A | V |
| **Remark** | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | |

## Band 4 5725~5850MHz

## WIFI 802.11ac VHT20 (Harmonic @ 3m)

| WIFI Ant. 1 | Note | Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level ( dBµV ) | Antenna Factor ( dB/m ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 802.11ac | | 11650 | 51.23 | -22.77 | 74 | 60.92 | 38.24 | 14.69 | 62.62 | 103 | 117 | P | H |
| VHT20 | | 11650 | 43.16 | -10.84 | 54 | 52.85 | 38.24 | 14.69 | 62.62 | 103 | 117 | A | H |
| CH 165 | | 11650 | 51.79 | -22.21 | 74 | 61.48 | 38.24 | 14.69 | 62.62 | 100 | 4 | P | V |
| 5825MHz | | 11650 | 43.49 | -10.51 | 54 | 53.18 | 38.24 | 14.69 | 62.62 | 100 | 4 | A | V |
| **Remark** | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | |

## Emission below 1GHz

## 5GHz WIFI 802.11n VHT20 (LF @ 3m)

| WIFI | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ant. | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| 1 | | ( MHz ) | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | (dBμV) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |
| 5GHz 802.11n VHT20 LF | | 46.49 | 18.75 | -21.25 | 40 | 35.02 | 15.5 | 1.19 | 32.96 | - | - | P | H |
| | | 117.3 | 30.48 | -13.02 | 43.5 | 43.65 | 18.01 | 1.75 | 32.93 | - | - | P | H |
| | | 215.27 | 32.29 | -11.21 | 43.5 | 47.54 | 15.37 | 2.31 | 32.93 | 100 | 0 | P | H |
| | | 285.11 | 33.69 | -12.31 | 46 | 45.06 | 18.98 | 2.66 | 33.01 | - | - | P | H |
| | | 380.17 | 29.65 | -16.35 | 46 | 38.52 | 21.21 | 3.03 | 33.11 | - | - | P | H |
| | | 504.33 | 27.49 | -18.51 | 46 | 33.79 | 23.54 | 3.41 | 33.25 | - | - | P | H |
| | | 31.94 | 36.61 | -3.39 | 40 | 45.54 | 22.94 | 1.1 | 32.97 | 100 | 360 | P | V |
| | | 92.08 | 24.97 | -18.53 | 43.5 | 41.42 | 15.22 | 1.25 | 32.92 | - | - | P | V |
| | | 159.98 | 28.6 | -14.9 | 43.5 | 43.73 | 15.8 | 2.02 | 32.95 | - | - | P | V |
| | | 252.13 | 33.58 | -12.42 | 46 | 45.18 | 18.89 | 2.5 | 32.99 | - | - | P | V |
| | | 326.82 | 24.97 | -21.03 | 46 | 35.33 | 19.88 | 2.82 | 33.06 | - | - | P | V |
| | | 524.7 | 27.31 | -18.69 | 46 | 33.56 | 23.77 | 3.25 | 33.27 | - | - | P | V |
| **Remark** | 1. No other spurious found.<br>2. All results are PASS against limit line. | | | | | | | | | | | | |

**Note symbol**

| | |
|---|---|
| * | **Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. |
| ! | Test result is **over limit** line. |
| P/A | **P**eak or **A**verage |
| H/V | **H**orizontal or **V**ertical |

## A calculation example for radiated spurious emission is shown as below:

| WIFI | Note | Frequency | Level | Over | Limit | Read | Antenna | Cable | Preamp | Ant | Table | Peak | Pol. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ant. | | | | Limit | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| 2 | | ( MHz ) | ( dBµV/m ) | ( dB ) | ( dBµV/m ) | ( dBµV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |
| 802.11b CH 01 2412MHz | | 2390 | 55.45 | -18.55 | 74 | 54.51 | 32.22 | 4.58 | 35.86 | 103 | 308 | P | H |
| | | 2390 | 43.54 | -10.46 | 54 | 42.6 | 32.22 | 4.58 | 35.86 | 103 | 308 | A | H |

1. Level(dBµV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBµV/m) – Limit Line(dBµV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBµV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBµV) – 35.86 (dB)

= 55.45 (dBµV/m)

2. Over Limit(dB)

= Level(dBµV/m) – Limit Line(dBµV/m)

= 55.45(dBµV/m) – 74(dBµV/m)

= -18.55(dB)

**For Average Limit @ 2390MHz:**

1. Level(dBµV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBµV) – 35.86 (dB)

= 43.54 (dBµV/m)

2. Over Limit(dB)

= Level(dBµV/m) – Limit Line(dBµV/m)

= 43.54(dBµV/m) – 54(dBµV/m)

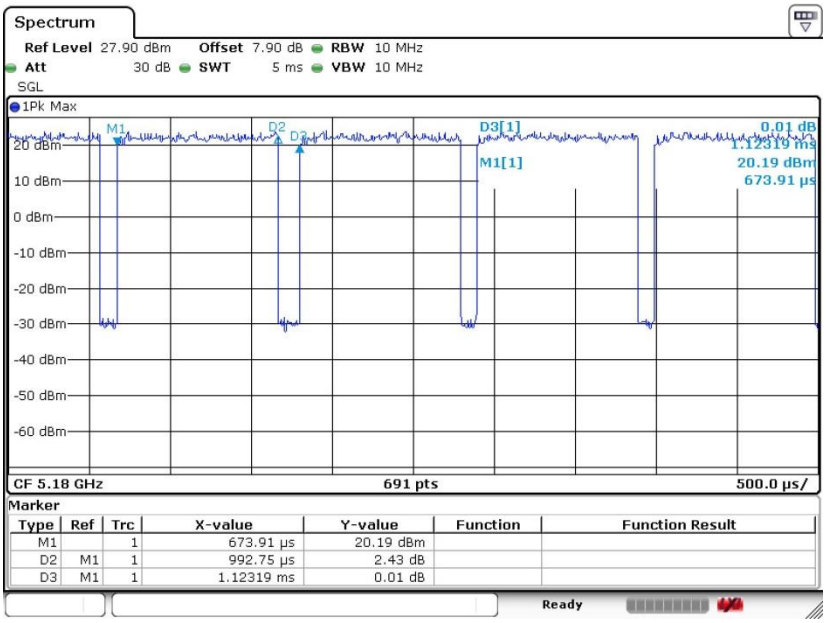
= -10.46(dB)

**Both peak and average measured complies with the limit line, so test result is "PASS".**

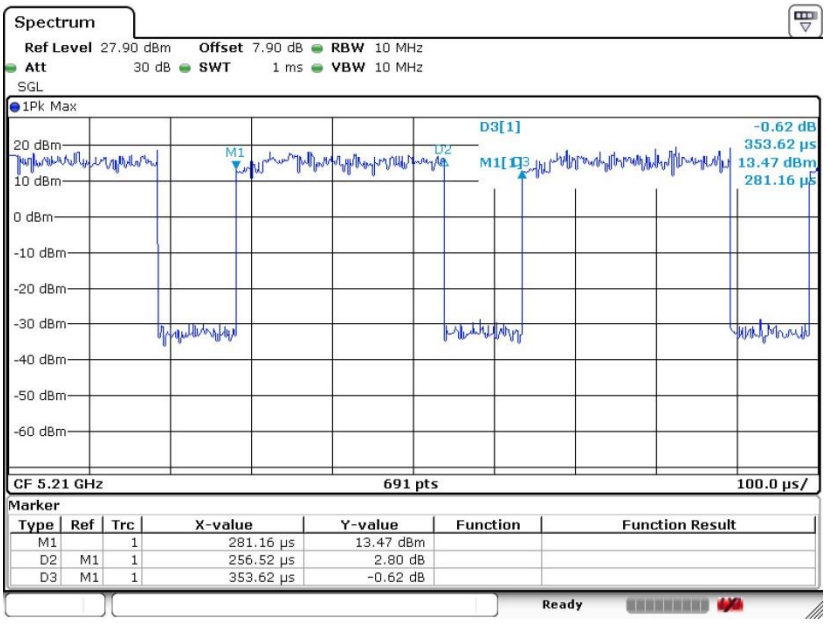
# Appendix B. Duty Cycle Plots

| Band | Duty Cycle(%) | T(ms) | 1/T(kHz) | VBW Setting |
|---|---|---|---|---|
| 802.11ac VHT20 | 88.39 | 0.993 | 1.007 | 1.1KHz |
| 802.11ac VHT80 | 72.54 | 0.257 | 3.898 | 3.9KHz |

**802.11ac VHT20**



**802.11ac VHT80**

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