# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| **FCC ID** | : | **IHDT56XP3** |
| **Equipment** | : | **Mobile Cellular Phone** |
| **Brand Name** | : | **Motorola** |
| **Model name** | : | **XT1962-5** |
| **Applicant** | : | **Motorola Mobility LLC**<br>**222 W,Merchandise Mart Plaza, Chicago IL 60654 USA** |
| **Manufacturer** | : | **Motorola Mobility LLC**<br>**222 W,Merchandise Mart Plaza, Chicago IL 60654 USA** |
| **Standard** | : | **FCC Part 15 Subpart E §15.407** |

**The product was received on Sep. 08, 2018 and testing was started from Sep. 21, 2018 and completed on Oct. 07, 2018. We, SPORTON INTERNATIONAL 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.**

**The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.**

**Approved by: Joseph Lin**

***SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory***
*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)*

# Table of Contents

**History of this test report** ..... **3**
**Summary of Test Result** ..... **4**
**1 General Description** ..... **5**
1.1 Product Feature of Equipment Under Test ..... 5
1.2 Product Specification of Equipment Under Test ..... 7
1.3 Modification of EUT ..... 7
1.4 Testing Location ..... 7
1.5 Applicable Standards ..... 8
**2 Test Configuration of Equipment Under Test** ..... **9**
2.1 Carrier Frequency and Channel ..... 9
2.2 Test Mode ..... 9
2.3 Connection Diagram of Test System ..... 10
2.4 EUT Operation Test Setup ..... 10
**3 Test Result** ..... **11**
3.1 Maximum Conducted Output Power Measurement ..... 11
3.2 Unwanted Emissions Measurement ..... 12
3.3 Automatically Discontinue Transmission ..... 17
3.4 Antenna Requirements ..... 18
**4 List of Measuring Equipment** ..... **19**
**5 Uncertainty of Evaluation** ..... **21**
**Appendix A. Conducted Test Results**
**Appendix B. Radiated Spurious Emission**
**Appendix C. Radiated Spurious Emission Plots**
**Appendix D. Duty Cycle Plots**

# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FR890804-02E | 01 | Initial issue of report | Oct. 31, 2018 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| - | 15.403 (i) | 6dB & 26dB Bandwidth | Not Required | - |
| - | 2.1049 | 99% Occupied Bandwidth | Reporting only | - |
| 3.1 | 15.407 (a) | Maximum Conducted Output Power | Pass | - |
| - | 15.407 (a) | Power Spectral Density | Not Required | - |
| 3.2 | 15.407(b) | Unwanted Emissions | Pass | Under limit 6.83 dB at 30.000 MHz |
| - | 15.207 | AC Conducted Emission | Not Required | - |
| 3.3 | 15.407 (c) | Automatically Discontinue Transmission | Pass | - |
| 3.4 | 15.203 & 15.407 (a) | Antenna Requirement | Pass | - |

**Remark:**

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report. All the test cases were performed on original report which can be referred to Sporton Report Number FR890804-01E.

**Reviewed by: Wii Chang**

**Report Producer: Natasha Hsieh**

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

| Product Feature | |
|---|---|
| **Equipment** | Mobile Cellular Phone |
| **Brand Name** | Motorola |
| **Model Name** | XT1962-5 |
| **Sample 1** | Dual SIM |
| **Sample 2** | Single SIM |
| **FCC ID** | IHDT56XP3 |
| **IMEI Code** | **Conducted :** IMEI 1: 359505090011474<br>IMEI 2: 359505090011482<br>**Radiation :** IMEI 1: 359505090017075<br>IMEI 2: 359505090017083 |
| **EUT supports Radios application** | GSM/EGPRS/WCDMA/HSPA/LTE/GNSS/NFC/FM<br>WLAN 11b/g/n HT20<br>WLAN 11a/n HT20/HT40<br>Bluetooth BR/EDR/LE |
| **HW Version** | DVT1B |
| **EUT Stage** | Identical Prototype |

**Remark:** The above EUT's information was declared by manufacturer.

| Accessory List | | |
|---|---|---|
| AC Adapter 1 | Brand Name : | Motorola |
| | Model Name : | SC-51 |
| | Manufacturer : | Salom |
| AC Adapter 1 | Brand Name : | Motorola |
| | Model Name : | SC-52 |
| | Manufacturer : | Salom |
| AC Adapter 1 | Brand Name : | Motorola |
| | Model Name : | SC-55 |
| | Manufacturer : | Salom |
| AC Adapter 1 | Brand Name : | Motorola |
| | Model Name : | SC-53 |
| | Manufacturer : | Salom |
| AC Adapter 2 | Brand Name : | Motorola |
| | Model Name : | SC-51 |
| | Manufacturer : | Chenyang |
| AC Adapter 2 | Brand Name : | Motorola |
| | Model Name : | SC-52 |
| | Manufacturer : | Chenyang |
| AC Adapter 2 | Brand Name : | Motorola |
| | Model Name : | SC-55 |
| | Manufacturer : | Chenyang |
| AC Adapter 2 | Brand Name : | Motorola |
| | Model Name : | SC-53 |
| | Manufacturer : | Chenyang |
| Battery | Brand Name : | Motorola |
| | Model Name : | JG30 |
| | Manufacturer : | Amperex |
| Earphone | Brand Name : | Motorola |
| | Model Name : | SH38C37773 |
| | Manufacturer : | Lyand |
| USB Cable 1 | Brand Name : | Cabletech |
| | Model Name : | SKN6473A |
| USB Cable 2 | Brand Name : | Saibao |
| | Model Name : | SKN6473A |
| USB Cable 3 | Brand Name : | Luxshare |
| | Model Name : | SKN6473A |

## 1.2 Product Specification of Equipment Under Test

| Standards-related Product Specification | |
|---|---|
| **Tx/Rx Channel Frequency Range** | 5745 MHz ~ 5825 MHz |
| **Maximum Output Power** | 802.11a : 14.38 dBm / 0.0274 W<br>802.11n HT20 : 14.45 dBm / 0.0279 W<br>802.11n HT40 : 14.42 dBm / 0.0277 W |
| **Antenna Type / Gain** | IFA Antenna with gain 0.0 dBi |
| **Type of Modulation** | 802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) |

## 1.3 Modification of EUT

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

## 1.4 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

| **Test Site** | SPORTON INTERNATIONAL INC. |
|---|---|
| **Test Site Location** | No.52, Huaya 1st Rd., Guishan Dist.,<br>Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |
| **Test Site No.** | **Sporton Site No.** |
| | TH05-HY |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

| **Test Site** | SPORTON INTERNATIONAL INC. |
|---|---|
| **Test Site Location** | No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist.,<br>Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-0868<br>FAX: +886-3-327-0855 |
| **Test Site No.** | **Sporton Site No.** |
| | 03CH11-HY |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

## 1.5 Applicable Standards

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

- FCC Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- 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 (X 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 |
| | - | - | 165 | 5825 |

**Note:** The above Frequency and Channel in "*" were 802.11n HT40

## 2.2 Test Mode

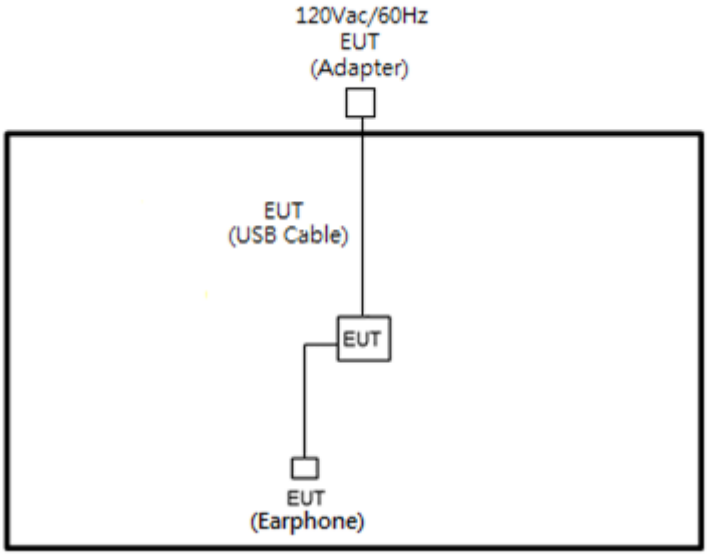
**Final test modes are considering the modulation and worse data rates as below table.**

| Modulation | Data Rate |
|---|---|
| **802.11a** | **6 Mbps** |
| **802.11n HT20** | **MCS0** |
| **802.11n HT40** | **MCS0** |

**Remark:** For Radiated Test Cases, the tests were performed with Adapter 1, USB Cable 1 Type C and Sample 1.

| Ch. # | | Band IV：5725-5850 MHz |
|---|---|---|
| | | 802.11n HT20 |
| L | Low | 149 |
| M | Middle | - |
| H | High | - |

## 2.3 Connection Diagram of Test System




## 2.4 EUT Operation Test Setup

The RF test items, utility “CMD” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

# 3 Test Result

## 3.1 Maximum Conducted Output Power Measurement

### 3.1.1 Limit of Maximum Conducted Output Power

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

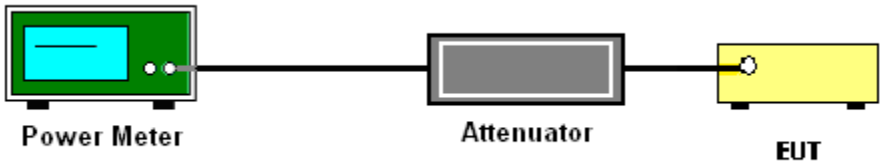
### 3.1.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.

### 3.1.4 Test Setup




### 3.1.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

## 3.2 Unwanted Emissions Measurement

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

### 3.2.1 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 |

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

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

| EIRP (dBm) | Field Strength at 3m (dBµV/m) |
|---|---|
| - 27 | 68.3 |

(3) KDB789033 D02 v02r01 G)2)c)

(i) Section 15.407(b)(1) to (b)(3) specify the unwanted emission limits for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.[3]

(ii) Section 15.407(b)(4) specifies the unwanted emission limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are in terms of a Peak detector. An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the devices using the alternative limit.[4]

**Note 3:** An out-of-band emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz peak emission limit.

**Note 4:** Only devices with antenna gains of 10 dBi or less may be approved using the emission limits specified in Section 15.247(d) till March 2, 2018; all other devices operating in this band must use the mask specified in Section 15.407(b)(4)(i).

### 3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.2.3 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

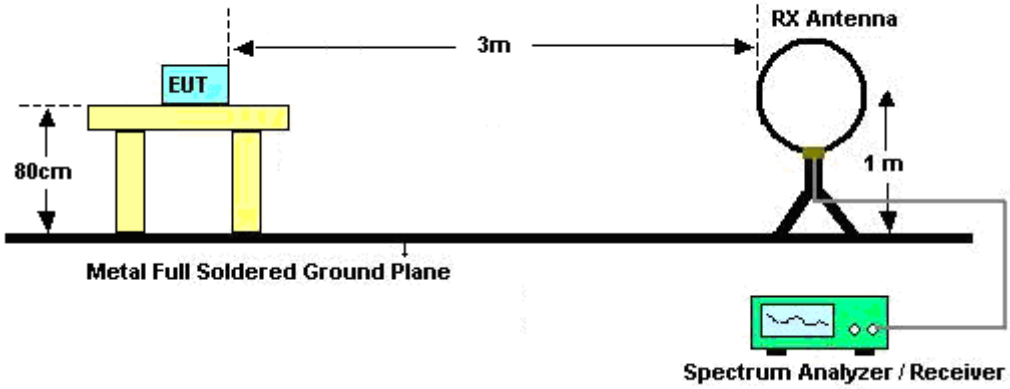
(3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

- 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.

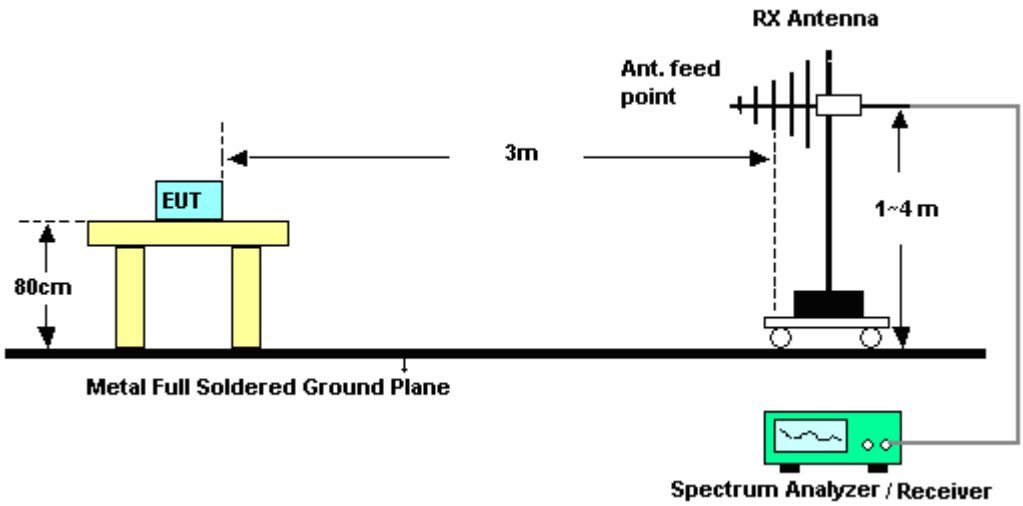
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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.

### 3.2.4 Test Setup

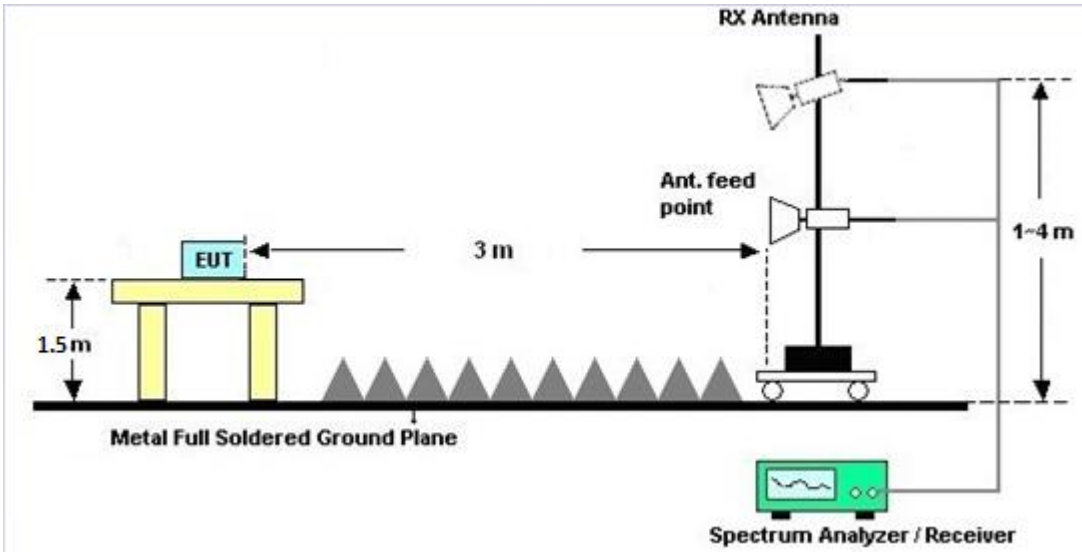
**For radiated emissions below 30MHz**




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



**For radiated emissions above 1GHz**




### 3.2.5 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 alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

### 3.2.6 Test Result of Radiated Band Edges

Please refer to Appendix B and C.

### 3.2.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix B and C.

## 3.3 Automatically Discontinue Transmission

### 3.3.1 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.

### 3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.3.3 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.

## 3.4 Antenna Requirements

### 3.4.1 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.

### 3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

### 3.4.3 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 |
|---|---|---|---|---|---|---|---|---|
| Hygrometer | Testo | DTM-303A | TP157075 | N/A | Mar. 06, 2018 | Sep. 21, 2018~ Sep. 25, 2108 | Mar. 05, 2019 | Conducted (TH05-HY) |
| Power Meter | Anritsu | ML2495A | 1132003 | N/A | Aug. 16, 2018 | Sep. 21, 2018~ Sep. 25, 2108 | Aug. 15, 2019 | Conducted (TH05-HY) |
| Power Sensor | Anritsu | MA2411B | 1126017 | 300MHz~40GHz | Aug. 16, 2018 | Sep. 21, 2018~ Sep. 25, 2108 | Aug. 15, 2019 | Conducted (TH05-HY) |
| Spectrum Analyzer | Rohde & Schwarz | FSP40 | 100057 | 9kHz-40GHz | Nov. 21, 2017 | Sep. 21, 2018~ Sep. 25, 2108 | Nov. 20, 2018 | Conducted (TH05-HY) |
| Switch Box & RF Cable | Burgeon | ETF-058 | EC1300484 | N/A | Mar. 01, 2018 | Sep. 21, 2018~ Sep. 25, 2108 | Feb. 28, 2019 | Conducted (TH05-HY) |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100488 | 9 kHz~30 MHz | Nov. 23, 2017 | Oct. 06, 2018~ Oct. 07, 2018 | Nov. 22, 2018 | Radiation (03CH11-HY) |
| Bilog Antenna | TESEQ | CBL 6111D&N-6-06 | 35414&AT-N0602 | 30MHz~1GHz | Oct. 14, 2017 | Oct. 06, 2018~ Oct. 07, 2018 | Oct. 13, 2018 | Radiation (03CH11-HY) |
| Preamplifier | Jet-Power | JPA0118-55-303K | 1710001800054002 | 1GHz~18GHz | Apr. 17, 2018 | Oct. 06, 2018~ Oct. 07, 2018 | Apr. 16, 2019 | Radiation (03CH11-HY) |
| Spectrum Analyzer | Keysight | N9010A | MY54200486 | 10Hz ~ 44GHz | Oct. 19, 2017 | Oct. 06, 2018~ Oct. 07, 2018 | Oct. 18, 2018 | Radiation (03CH11-HY) |
| Horn Antenna | SCHWARZBECK | BBHA 9120 D | 9120D-1326 | 1GHz ~ 18GHz | Oct. 16, 2017 | Oct. 06, 2018~ Oct. 07, 2018 | Oct. 15, 2018 | Radiation (03CH11-HY) |
| Hygrometer | TECPEL | DTN-303B | TP140325 | N/A | Oct. 12, 2017 | Oct. 06, 2018~ Oct. 07, 2018 | Oct. 11, 2018 | Radiation (03CH11-HY) |
| Preamplifier | Keysight | 83017A | MY53270080 | 1GHz~26.5GHz | Jan. 16, 2018 | Oct. 06, 2018~ Oct. 07, 2018 | Jan. 15, 2020 | Radiation (03CH11-HY) |
| Controller | EMEC | EM 1000 | N/A | Control Turn table & Ant Mast | N/A | Oct. 06, 2018~ Oct. 07, 2018 | N/A | Radiation (03CH11-HY) |
| Antenna Mast | EMEC | AM-BS-4500-B | N/A | 1~4m | N/A | Oct. 06, 2018~ Oct. 07, 2018 | N/A | Radiation (03CH11-HY) |
| Turn Table | EMEC | TT 2000 | N/A | 0~360 Degree | N/A | Oct. 06, 2018~ Oct. 07, 2018 | N/A | Radiation (03CH11-HY) |
| Amplifier | MITEQ | TTA1840-35-HG | 1871923 | 18GHz~40GHz, VSWR : 2.5:1 max | Jul. 16, 2018 | Oct. 06, 2018~ Oct. 07, 2018 | Jul. 15, 2019 | Radiation (03CH11-HY) |
| Amplifier | SONOMA | 310N | 187312 | 9kHz~1GHz | Jan. 16, 2018 | Oct. 06, 2018~ Oct. 07, 2018 | Jan. 15, 2019 | Radiation (03CH11-HY) |

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA 9170 | BBHA9170584 | 18GHz- 40GHz | Nov. 27, 2017 | Oct. 06, 2018~ Oct. 07, 2018 | Nov. 26, 2018 | Radiation (03CH11-HY) |
| Software | Audix | E3 6.2009-8-24 | RK-001042 | N/A | N/A | Oct. 06, 2018~ Oct. 07, 2018 | N/A | Radiation (03CH11-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | MY9837/4PE | 9kHz-30MHz | Mar. 14, 2018 | Oct. 06, 2018~ Oct. 07, 2018 | Mar. 13, 2019 | Radiation (03CH11-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | MY2859/2 | 30MHz-40GHz | Mar. 14, 2018 | Oct. 06, 2018~ Oct. 07, 2018 | Mar. 13, 2019 | Radiation (03CH11-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | MY9837/4PE | 30M-18G | Mar. 14, 2018 | Oct. 06, 2018~ Oct. 07, 2018 | Mar. 13, 2019 | Radiation (03CH11-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | MY4274/2 | 30MHz-40GHz | Mar. 14, 2018 | Oct. 06, 2018~ Oct. 07, 2018 | Mar. 13, 2019 | Radiation (03CH11-HY) |
| Filter | Wainwright | WLK4-1000-1530-8000-40SS | SN11 | 1G Low Pass | Sep. 17, 2018 | Oct. 06, 2018~ Oct. 07, 2018 | Sep. 16, 2019 | Radiation (03CH11-HY) |
| Filter | Wainwright | WHKX12-2700-3000-18000-60SS | SN3 | 2.7G High Pass | Sep. 17, 2018 | Oct. 06, 2018~ Oct. 07, 2018 | Sep. 16, 2019 | Radiation (03CH11-HY) |

# 5 Uncertainty of Evaluation

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

| | |
|---|---|
| Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y)) | 5.20 |

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

| | |
|---|---|
| Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y)) | 5.50 |

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

| | |
|---|---|
| Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y)) | 5.20 |

# Appendix A. Test Result of Conducted Test Items

| | | | | |
|---|---|---|---|---|
| Test Engineer: | Allen Lin/Shiming Liu | Temperature: | 21~25 | °C |
| Test Date: | 2018/9/21~2018/9/25 | Relative Humidity: | 51~54 | % |

Report Number : FR890804-02E

## ***TEST RESULTS DATA***
## ***Average Power Table***

| Band IV | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | Duty Factor (dB) | | Average Conducted Power (dBm) | | | FCC Conducted Power Limit (dBm) | | DG (dBi) | | Pass/Fail |
| | | | | | Ant 1 | Ant 2 | Ant 1 | Ant 2 | SUM | Ant 1 | Ant 2 | Ant 1 | Ant 2 | |
| 11a | 6Mbps | 1 | 149 | 5745 | 0.31 | - | 14.32 | - | | 30.00 | - | 0.00 | - | Pass |
| 11a | 6Mbps | 1 | 157 | 5785 | 0.31 | - | 14.38 | - | | 30.00 | - | 0.00 | - | Pass |
| 11a | 6Mbps | 1 | 165 | 5825 | 0.31 | - | 14.35 | - | | 30.00 | - | 0.00 | - | Pass |
| HT20 | MCS0 | 1 | 149 | 5745 | 0.33 | - | 14.39 | - | | 30.00 | - | 0.00 | - | Pass |
| HT20 | MCS0 | 1 | 157 | 5785 | 0.33 | - | 14.44 | - | | 30.00 | - | 0.00 | - | Pass |
| HT20 | MCS0 | 1 | 165 | 5825 | 0.33 | - | 14.45 | - | | 30.00 | - | 0.00 | - | Pass |
| HT40 | MCS0 | 1 | 151 | 5755 | 0.66 | - | 14.42 | - | | 30.00 | - | 0.00 | - | Pass |
| HT40 | MCS0 | 1 | 159 | 5795 | 0.66 | - | 14.11 | - | | 30.00 | - | 0.00 | - | Pass |

# Appendix B. Radiated Spurious Emission

| Test Engineer : | HAO HSU, Ken Wu, and Chuan Zhu | Temperature : | 21~26°C |
|---|---|---|---|
| | | Relative Humidity : | 51~56% |

**Band 4 - 5725~5850MHz**

**WIFI 802.11n HT20 (Band Edge @ 3m)**

| WIFI | Note | Frequency | Level | Over | Limit | Read | Antenna | Path | 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) |
| | | 5603.6 | 50.13 | -18.07 | 68.2 | 40.89 | 32.29 | 10.03 | 33.08 | 103 | 92 | P | H |
| | | 5693.8 | 52.05 | -48.58 | 100.63 | 42.58 | 32.44 | 10.15 | 33.12 | 103 | 92 | P | H |
| | | 5720 | 66.92 | -43.88 | 110.8 | 57.36 | 32.5 | 10.19 | 33.13 | 103 | 92 | P | H |
| | | 5724 | 74.42 | -45.5 | 119.92 | 64.86 | 32.5 | 10.19 | 33.13 | 103 | 92 | P | H |
| | * | 5745 | 103.2 | - | - | 93.6 | 32.53 | 10.22 | 33.15 | 103 | 92 | P | H |
| | * | 5745 | 94.59 | - | - | 84.99 | 32.53 | 10.22 | 33.15 | 103 | 92 | A | H |
| 802.11n | | | | | | | | | | | | | H |
| HT20 | | | | | | | | | | | | | H |
| CH 149 | | 5634.6 | 51.44 | -16.76 | 68.2 | 42.12 | 32.35 | 10.07 | 33.1 | 100 | 115 | P | V |
| 5745MHz | | 5693.2 | 56.37 | -43.82 | 100.19 | 46.9 | 32.44 | 10.15 | 33.12 | 100 | 115 | P | V |
| | | 5719.4 | 70.59 | -40.04 | 110.63 | 61.03 | 32.5 | 10.19 | 33.13 | 100 | 115 | P | V |
| | | 5724.6 | 80.05 | -41.24 | 121.29 | 70.49 | 32.5 | 10.19 | 33.13 | 100 | 115 | P | V |
| | * | 5745 | 106.08 | - | - | 96.48 | 32.53 | 10.22 | 33.15 | 100 | 115 | P | V |
| | * | 5745 | 97.56 | - | - | 87.96 | 32.53 | 10.22 | 33.15 | 100 | 115 | A | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |

## Band 4 5725~5850MHz

## WIFI 802.11n HT20 (Harmonic @ 3m)

| WIFI Ant. | Note | Frequency | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Path 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) |
| 802.11n HT20 CH 149 5745MHz | | 11490 | 46.02 | -27.98 | 74 | 51.65 | 40 | 15.97 | 61.6 | 100 | 0 | P | H |
| | | 17235 | 47.7 | -20.5 | 68.2 | 42.87 | 40.54 | 20.08 | 55.79 | 100 | 0 | P | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | 11490 | 45.81 | -28.19 | 74 | 51.44 | 40 | 15.97 | 61.6 | 100 | 0 | P | V |
| | | 17235 | 48.3 | -19.9 | 68.2 | 43.47 | 40.54 | 20.08 | 55.79 | 100 | 0 | P | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |

**Remark**

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.

## Emission below 1GHz

## 5GHz WIFI 802.11n HT20 (LF @ 3m)

| WIFI Ant. 1 | Note | Frequency ( MHz ) | Level ( dBμV/m ) | Over Limit ( dB ) | Limit Line ( dBμV/m ) | Read Level (dBμV) | Antenna Factor ( dB/m ) | Path Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Peak Avg. (P/A) | Pol. (H/V) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5GHz 802.11n HT20 LF | | 30.27 | 23.32 | -16.68 | 40 | 30.88 | 24.17 | 0.77 | 32.5 | | | P | H |
| | | 95.34 | 23.06 | -20.44 | 43.5 | 39.06 | 15.15 | 1.33 | 32.48 | | | P | H |
| | | 154.47 | 23.94 | -19.56 | 43.5 | 38.08 | 16.56 | 1.73 | 32.43 | | | P | H |
| | | 482.7 | 26.38 | -19.62 | 46 | 32.43 | 23.49 | 2.83 | 32.37 | | | P | H |
| | | 770.4 | 29.85 | -16.15 | 46 | 30.48 | 27.95 | 3.69 | 32.27 | | | P | H |
| | | 958 | 34.21 | -11.79 | 46 | 30.16 | 31.02 | 4.16 | 31.13 | 100 | 0 | P | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | 30 | 33.17 | -6.83 | 40 | 40.73 | 24.17 | 0.77 | 32.5 | 100 | 282 | P | V |
| | | 39.45 | 29.04 | -10.96 | 40 | 41.46 | 19.21 | 0.86 | 32.49 | | | P | V |
| | | 49.98 | 26.79 | -13.21 | 40 | 44.26 | 14.07 | 0.95 | 32.49 | | | P | V |
| | | 560.4 | 27.17 | -18.83 | 46 | 30.44 | 26.04 | 3.12 | 32.43 | | | P | V |
| | | 768.3 | 29.74 | -16.26 | 46 | 30.37 | 27.95 | 3.69 | 32.27 | | | P | V |
| | | 948.9 | 33.52 | -12.48 | 46 | 30.09 | 30.51 | 4.13 | 31.21 | | | P | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |

**Remark**

1. No other spurious found.
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 | Path | 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) |
| 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. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path 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) + Path 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 C. Radiated Spurious Emission Plots

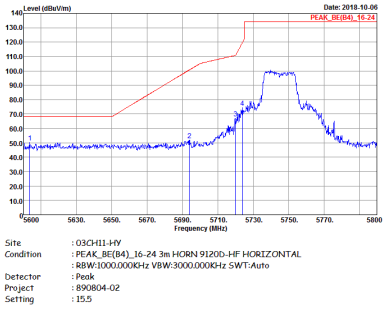
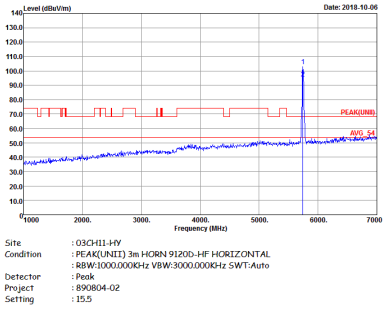
| | | | |
|---|---|---|---|
| **Test Engineer :** | HAO HSU, Ken Wu, and Chuan Zhu | **Temperature :** | 21~26°C |
| | | **Relative Humidity :** | 51~56% |

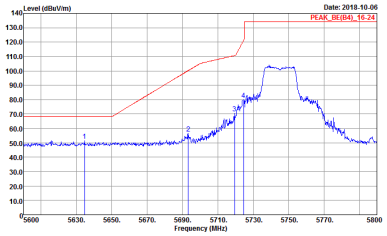
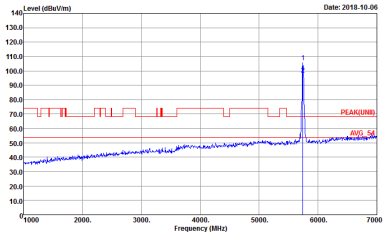
## Note symbol

| | |
|---|---|
| -L | **Low channel location** |
| -R | **High channel location** |

## Band 4 - 5725~5850MHz

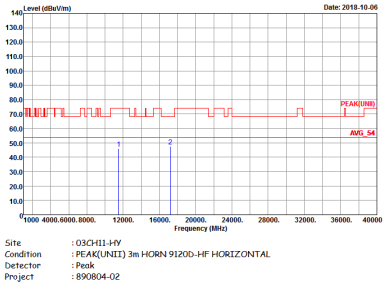
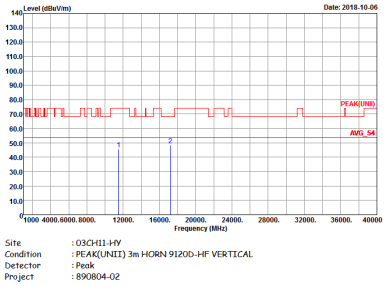
## WIFI 802.11n HT20 (Band Edge @ 3m)

| WIFI | Band 4 5725~5850MHz Band Edge @ 3m | |
|---|---|---|
| ANT | 802.11n HT20 CH149 5745MHz | |
| 1 | Horizontal | Fundamental |
| Peak |  |  |

| WIFI | Band 4 5725~5850MHz Band Edge @ 3m | |
|---|---|---|
| ANT | 802.11n HT20 CH149 5745MHz | |
| 1 | Vertical | Fundamental |
| Peak |  <br>Site : 03CH11-HY<br>Condition : PEAK_BE(B4)_16-24 3m HORN 9120D-HF VERTICAL<br>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto<br>Detector : Peak<br>Project : 890804-02<br>Setting : 15.5 |  <br>Site : 03CH11-HY<br>Condition : PEAK(UNII) 3m HORN 9120D-HF VERTICAL<br>: RBW:1000.000KHz VBW:3000.000KHz SWT:Auto<br>Detector : Peak<br>Project : 890804-02<br>Setting : 15.5 |

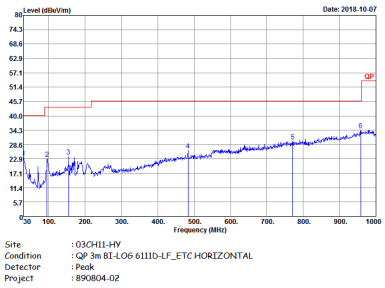
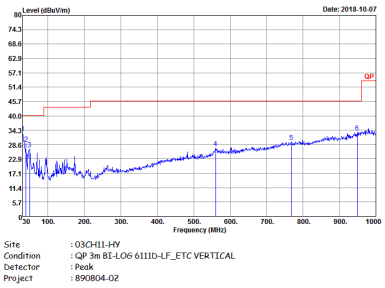
## Band 4 - 5725~5850MHz

## WIFI 802.11n HT20 (Harmonic @ 3m)

| WIFI | Band 4 5725~5850MHz Harmonic @ 3m | |
|---|---|---|
| ANT | 802.11n HT20 CH149 5745MHz | |
| 1 | Horizontal | Vertical |
| Peak<br>Avg. |  |  |

## Emission below 1GHz

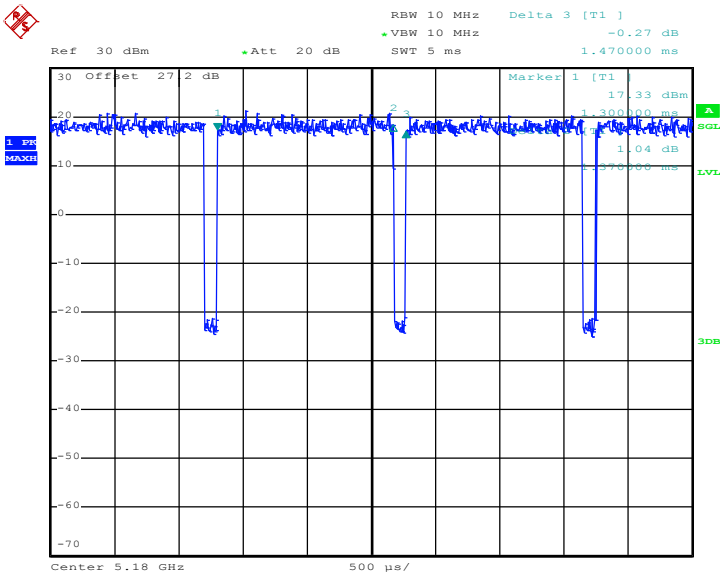
## 5GHz WIFI 802.11n HT20 (LF)

| WIFI | 5GHz 5725~5850MHz | |
|---|---|---|
| ANT | 802.11n HT20 LF | |
| 1 | Horizontal | Vertical |
| QP / Peak |  |  |

# Appendix D. Duty Cycle Plots

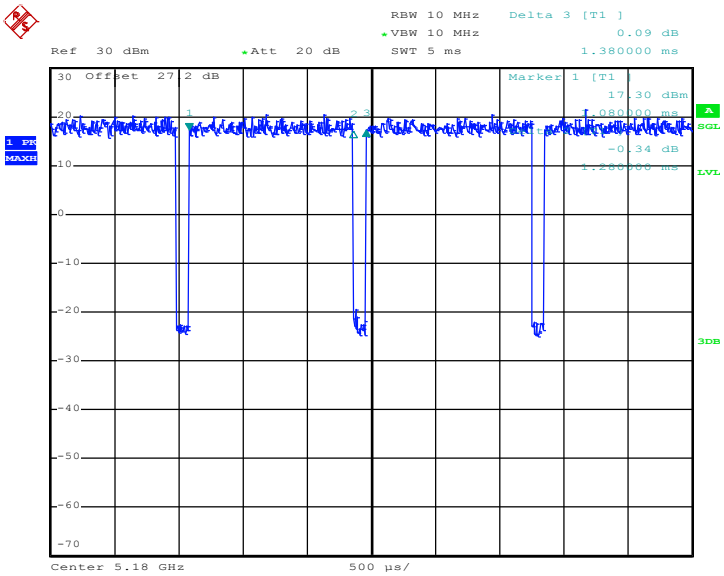
| Band | Duty Cycle (%) | T(us) | 1/T(kHz) | VBW Setting | Duty Factor(dB) |
|---|---|---|---|---|---|
| 802.11a | 93.20 | 1370 | 0.730 | 1kHz | 0.31 |
| 5GHz 802.11n HT20 | 92.75 | 1280 | 0.781 | 1kHz | 0.33 |
| 5GHz 802.11n HT40 | 85.95 | 636 | 1.572 | 3kHz | 0.66 |

**802.11a**




Date: 19.SEP.2018 10:03:57

## 802.11n HT20

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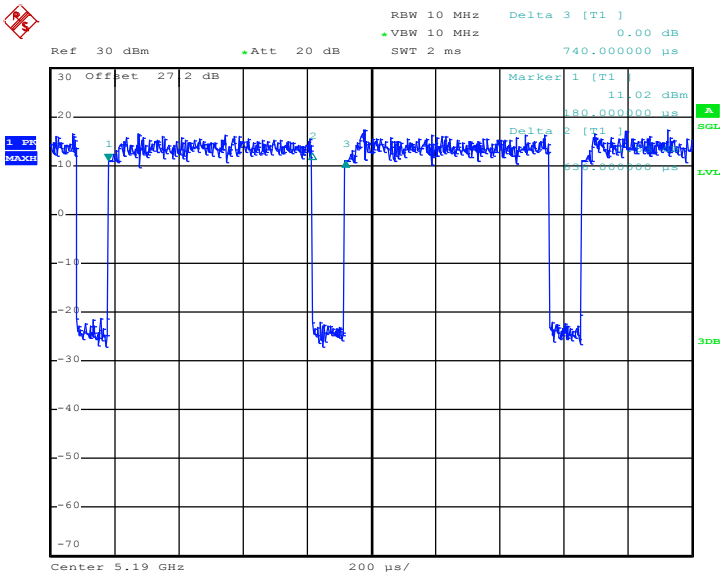
## 802.11n HT40

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THE END