



# FCC RF Test Report

**APPLICANT** : Motorola Mobility LLC  
**EQUIPMENT** : Mobile Cellular Phone  
**BRAND NAME** : Motorola  
**MODEL NAME** : XT2231-2  
**FCC ID** : IHDT56AC3  
**STANDARD** : FCC Part 15 Subpart E §15.407  
**CLASSIFICATION** : (NII) Unlicensed National Information Infrastructure  
**TEST DATE(S)** : Dec. 12, 2021 ~ Feb. 16, 2022

We, Sporton International Inc. (Shenzhen), 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 Inc. (Shenzhen), the test report shall not be reproduced except in full.

Reviewed by: Derreck Chen / Supervisor

Approved by: Eric Shih / Manager



**Sporton International Inc. (ShenZhen)**

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 People's Republic of China



# TABLE OF CONTENTS

**REVISION HISTORY..... 3**

**SUMMARY OF TEST RESULT ..... 4**

**1 GENERAL DESCRIPTION ..... 5**

    1.1 Applicant ..... 5

    1.2 Manufacturer ..... 5

    1.3 Product Feature of Equipment Under Test ..... 5

    1.4 Product Specification of Equipment Under Test ..... 6

    1.5 Modification of EUT ..... 6

    1.6 Testing Location ..... 7

    1.7 Test Software ..... 7

    1.8 Applicable Standards ..... 7

    1.9 Specification of Accessory ..... 8

**2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST ..... 9**

    2.1 Carrier Frequency and Channel ..... 9

    2.2 Test Mode ..... 10

    2.3 Connection Diagram of Test System ..... 11

**3 TEST RESULT ..... 12**

    3.1 Maximum Conducted Output Power Measurement ..... 12

    3.2 Unwanted Emissions Measurement ..... 15

    3.3 Antenna Requirements ..... 20

**4 LIST OF MEASURING EQUIPMENT ..... 21**

**5 UNCERTAINTY OF EVALUATION ..... 22**

**APPENDIX A. RADIATED SPURIOUS EMISSION**

**APPENDIX B. DUTY CYCLE PLOTS**

**APPENDIX C. SETUP PHOTOGRAPHS**



### REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR1N1011-06B	Rev. 01	Initial issue of report	Feb. 16, 2022



### SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.407(a)	Maximum Conducted Output Power	≤ 24 dBm	Pass	-
3.2	15.407(b)	Unwanted Emissions	15.407(b) & 15.209(a)	Pass	Under limit 5.15 dB at 5148.720 MHz
3.3	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(a)	Pass	-

<b>Declaration of Conformity:</b>
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
<b>Comments and Explanations:</b>
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

Motorola Mobility LLC  
222 W,Merchandise Mart Plaza,Chicago,IL60654 USA

## 1.2 Manufacturer

Motorola Mobility LLC  
222 W,Merchandise Mart Plaza,Chicago,IL60654 USA

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2231-2
FCC ID	IHDT56AC3
IMEI Code	Conducted: 359986690032831/359986690038317 Radiation : 359178850000366/359178850001521
HW Version	DVT2
SW Version	STA32.48
EUT Stage	Identical Prototype

**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 for XT2231-2. The change note could be referred to the XT2231-2\_Class II Permissive Change letter which is exhibit separately. Based on the similarity between current and previous project, only related test cases were verified for the differences from original test report (Sporton Report Number 1N1011-01)



### 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
<b>Tx/Rx Frequency Range</b>	5180 MHz ~ 5240 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5720 MHz
<b>Maximum Output Power to Antenna</b>	<b>&lt;5180 MHz ~ 5240 MHz&gt;</b> 802.11a : 16.25 dBm / 0.0422 W 802.11n HT20 : 15.44 dBm / 0.0350 W 802.11n HT40 : 14.32 dBm / 0.0270 W 802.11ac VHT20 : 14.34 dBm / 0.0272 W 802.11ac VHT40 : 14.25 dBm / 0.0266 W 802.11ac VHT80 : 12.20 dBm / 0.0166 W
<b>Antenna Type / Gain</b>	<b>&lt;5180 MHz ~ 5240 MHz&gt;</b> PIFA Antenna with gain -6.50 dBi <b>&lt;5260 MHz ~ 5320 MHz&gt;</b> PIFA Antenna with gain -5.90 dBi <b>&lt;5500 MHz ~ 5720 MHz&gt;</b> PIFA Antenna with gain -5.80 dBi
<b>Type of Modulation</b>	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)

### 1.5 Modification of EUT

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



### 1.6 Testing Location

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

<b>Test Firm</b>	Sporton International Inc. (Shenzhen)		
<b>Test Site Location</b>	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People’s Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	TH01-SZ	CN1256	421272

<b>Test Firm</b>	Sporton International Inc. (Shenzhen)		
<b>Test Site Location</b>	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City Guangdong Province China 518103 TEL: +86-755-33202398		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	03CH01-SZ	CN1256	421272

### 1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH01-SZ	AUDIX	E3	6.2009-8-24

### 1.8 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:** All test items were verified and recorded according to the standards and without any deviation during the test.



### 1.9 Specification of Accessory

Specification of Accessory				
AC Adapter 1(US)	Brand Name	Motorola(Chenyang)	Model Name	MC-201
AC Adapter 1(EU)	Brand Name	Motorola(Chenyang)	Model Name	MC-202
AC Adapter 1(AR)	Brand Name	Motorola(Chenyang)	Model Name	MC-206
AC Adapter 2(US)	Brand Name	Motorola(Acbel)	Model Name	MC-201
AC Adapter 2(EU)	Brand Name	Motorola(Acbel)	Model Name	MC-202
AC Adapter 2(AR)	Brand Name	Motorola(Acbel)	Model Name	MC-206
AC Adapter 2(CHILE)	Brand Name	Motorola(Acbel)	Model Name	MC-209
AC Adapter 3(IN)	Brand Name	Motorola(Chenyang)	Model Name	MC-204
AC Adapter 4(IN)	Brand Name	Motorola(Aohai)	Model Name	MC-204
AC Adapter 5(BR)	Brand Name	Motorola(Flex)	Model Name	MC-207
AC Adapter 6(BR)	Brand Name	Motorola(Salcomp)	Model Name	MC-207
AC Adapter 7(US)	Brand Name	Motorola(Chenyang)	Model Name	MC-101
AC Adapter 7(EU)	Brand Name	Motorola(Chenyang)	Model Name	MC-102
AC Adapter 7(UK)	Brand Name	Motorola(Chenyang)	Model Name	MC-103
AC Adapter 7(AU)	Brand Name	Motorola(Chenyang)	Model Name	MC-105
AC Adapter 8(US)	Brand Name	Motorola(Salcomp)	Model Name	MC-101
AC Adapter 8(EU)	Brand Name	Motorola(Salcomp)	Model Name	MC-102
AC Adapter 8(UK)	Brand Name	Motorola(Salcomp)	Model Name	MC-103
AC Adapter 8(AU)	Brand Name	Motorola(Salcomp)	Model Name	MC-105
AC Adapter 9(US)	Brand Name	Motorola(Aohai)	Model Name	MC-101
AC Adapter 9(EU)	Brand Name	Motorola(Aohai)	Model Name	MC-102
AC Adapter 9(UK)	Brand Name	Motorola(Aohai)	Model Name	MC-103
AC Adapter 10(IN)	Brand Name	Motorola(Chenyang)	Model Name	MC-104
AC Adapter 11(IN)	Brand Name	Motorola(Aohai)	Model Name	MC-104
AC Adapter 12(AU)	Brand Name	Motorola(Aohai)	Model Name	MC-105
AC Adapter 13(EU)	Brand Name	Motorola(Salom)	Model Name	SC-42
AC Adapter 14(UK)	Brand Name	Motorola(Chenyang)	Model Name	SC-43
Earphone 1	Brand Name	Motorola(Lyand)	Model Name	LYM239-76C-003
Earphone 2	Brand Name	Motorola(LCHSE)	Model Name	MEND1432B875000
Earphone 3	Brand Name	Motorola(New Leader)	Model Name	MH202
USB Cable 1	Brand Name	Motorola(Yihuaxing)	Model Name	T365-011B
USB Cable 2	Brand Name	Motorola (SUNTOPS)	Model Name	336258
USB Cable 3	Brand Name	Motorola (SUNTOPS)	Model Name	336281
USB Cable 4	Brand Name	Motorola (I SHENG)	Model Name	SC18D33506
USB Cable 5	Brand Name	Motorola (Yihuaxing)	Model Name	T365-012B
Battery 1	Brand Name	Motorola(Sunwoda)	Model Name	NH50
Battery 2	Brand Name	Motorola (SCUD)	Model Name	NH50





## 2 Test Configuration of Equipment Under Test

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 (Y plane) were recorded in this report.

### 2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5150-5250 MHz U-NII-1	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42 <sup>#</sup>	5210		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5250-5350 MHz U-NII-2A	52	5260	60	5300
	54*	5270	62*	5310
	56	5280	64	5320
	58 <sup>#</sup>	5290		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5470-5725 MHz U-NII-2C	100	5500	112	5560
	102*	5510	116	5580
	104	5520	132	5660
	106 <sup>#</sup>	5530	134*	5670
	108	5540	136	5680
	110*	5550	140	5700



Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
TDWR Channel	118*	5590	124	5620
	120	5600	126*	5630
	122 <sup>#</sup>	5610	128	5640

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channel	138 <sup>#</sup>	5690	144	5720
	142*	5710		

Note:

1. The above Frequency and Channel in "\*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "<sup>#</sup>" were 802.11ac VHT80.

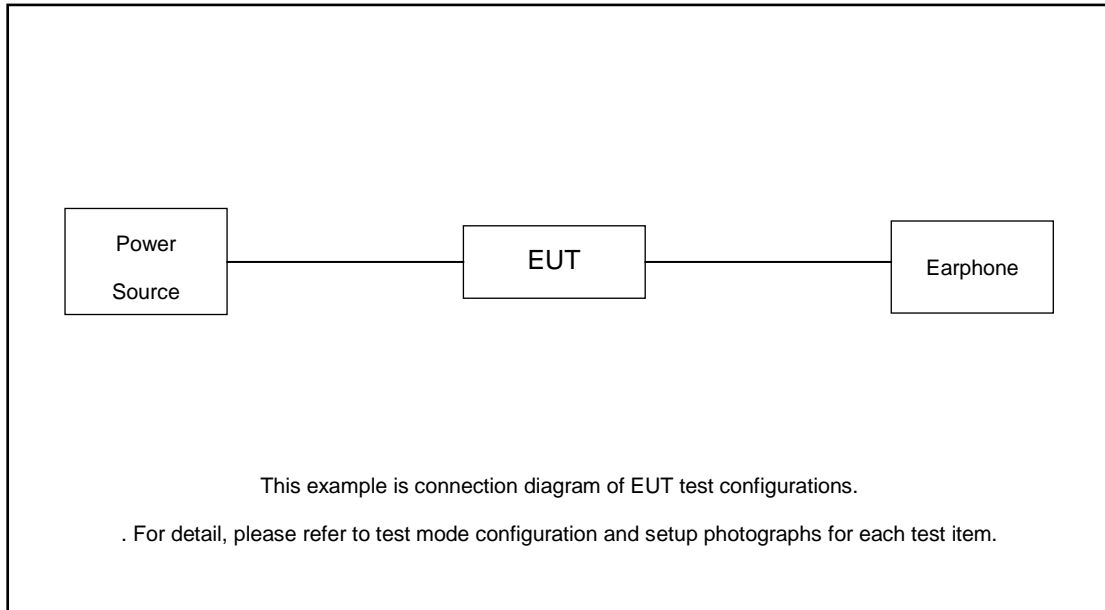
## 2.2 Test Mode

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

Modulation	Data Rate
802.11ac VHT80	MCS0

Ch. #		U-NII-1 : 5180-5240 MHz	U-NII-1 : 5180-5240 MHz	U-NII-1 : 5180-5240 MHz	U-NII-1 : 5180-5240 MHz
		802.11a	802.11n HT20	802.11n HT40	802.11ac VHT80
L	Low	36	36	38	-
M	Middle	44	44	-	42
H	High	48	48	46	-

## 2.3 Connection Diagram of Test System





### 3 Test Result

#### 3.1 Maximum Conducted Output Power Measurement

##### 3.1.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW.

For the 5.25–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or  $11 \text{ dBm} + 10 \log B$ , where B is the 26 dB emission bandwidth in megahertz.

For Straddle Channel, According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

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.

Note that U-NII-2 band, devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

##### 3.1.2 Measuring Instruments

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

### 3.1.3 Test Procedures

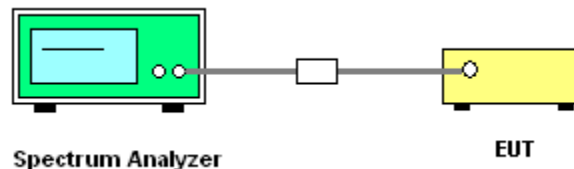
The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

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.
4. For MIMO mode, the measure-and-sum technique should be used for measuring the in-band transmit power of a device.

For Straddle Channel, According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

### 3.1.4 Test Setup





3.1.5 Test Result of Maximum Conducted Output Power

U-NII-1									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	Pass/Fail
11a	6Mbps	1	36	5180	0.13	15.30	24.00	-6.50	Pass
11a	6Mbps	1	44	5220	0.13	16.16	24.00	-6.50	Pass
11a	6Mbps	1	48	5240	0.13	16.25	24.00	-6.50	Pass
HT20	MCS0	1	36	5180	0.14	15.25	24.00	-6.50	Pass
HT20	MCS0	1	44	5220	0.14	15.43	24.00	-6.50	Pass
HT20	MCS0	1	48	5240	0.14	15.44	24.00	-6.50	Pass
HT40	MCS0	1	38	5190	0.30	12.54	24.00	-6.50	Pass
HT40	MCS0	1	46	5230	0.30	14.32	24.00	-6.50	Pass
VHT20	MCS0	1	36	5180	0.12	14.18	24.00	-6.50	Pass
VHT20	MCS0	1	44	5220	0.12	14.23	24.00	-6.50	Pass
VHT20	MCS0	1	48	5240	0.12	14.34	24.00	-6.50	Pass
VHT40	MCS0	1	38	5190	0.28	12.49	24.00	-6.50	Pass
VHT40	MCS0	1	46	5230	0.28	14.25	24.00	-6.50	Pass
VHT80	MCS0	1	42	5210	0.57	12.20	24.00	-6.50	Pass



### 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 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27dBm/MHz.

For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5150-5250 MHz band.

For transmitters operating in the 5470-5725 MHz band: all emissions outside of the 5470-5725 MHz band shall not exceed an EIRP of -27 dBm/MHz.

- (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	68.3

**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<sub>Meas</sub> is the field strength of the emission at the measurement distance, in dBµV/m

d<sub>Meas</sub> is the measurement distance, in m

(3) ANSI C63.10-2013 clause 12.7.3 note 97

As specified by regulatory requirements, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit. However, an out-of-band emission that complies with both the average and peak general regulatory limits is not required to satisfy the peak emission limit.

### 3.2.2 Measuring Instruments

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



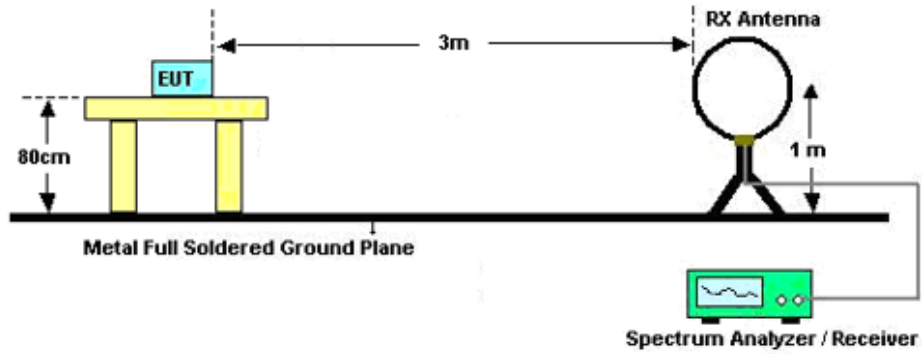


### 3.2.3 Test Procedures

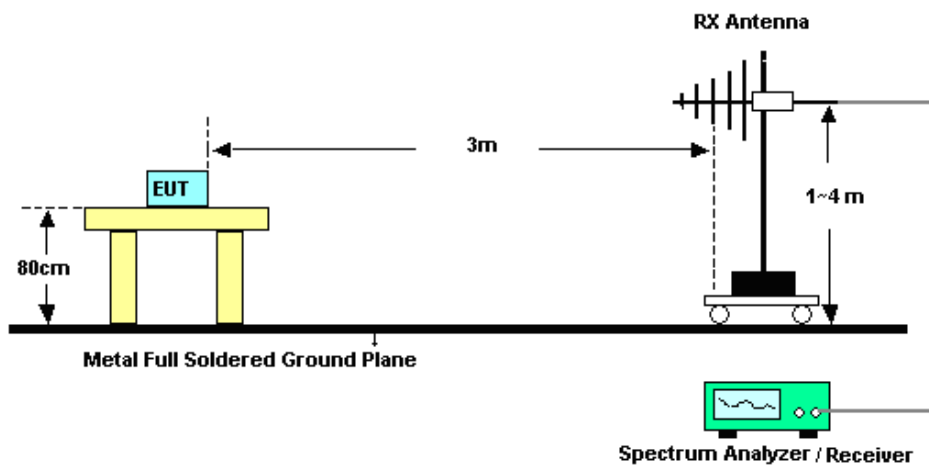
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.
  - (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
    - RBW = 120 kHz
    - VBW = 300 kHz
    - Detector = Peak
    - Trace mode = max hold
  - (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
    - RBW = 1 MHz
    - VBW  $\geq$  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  $\geq$  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 peak 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

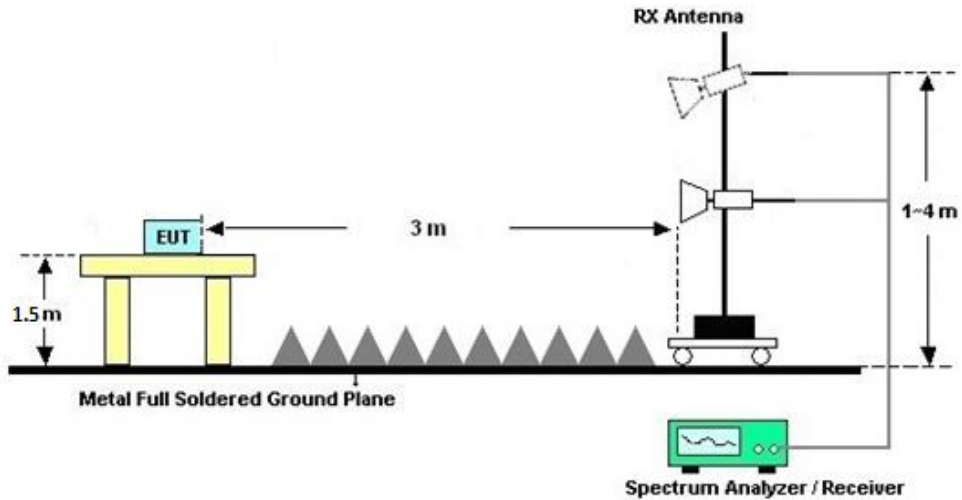
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.2.5 Test Results of Radiated Spurious 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.

### 3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

### 3.2.7 Duty Cycle

Please refer to Appendix B.

### 3.2.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix A.



### **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
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 08, 2021	Dec. 12, 2021	Apr. 07, 2022	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 25, 2020	Dec. 12, 2021	Dec. 24, 2021	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 25, 2020	Dec. 12, 2021	Dec. 24, 2021	Conducted (TH01-SZ)
EMI Test Receiver&SA	Agilent	N9038A	MY52260185	20Hz~26.5GHz	Dec. 02, 2021	Feb. 16, 2022	Dec. 01, 2022	Radiation (03CH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 21, 2021	Feb. 16, 2022	Jul. 20, 2022	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 22, 2021	Feb. 16, 2022	Jun. 21, 2022	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz~2GHz	Jul. 15, 2021	Feb. 16, 2022	Jul. 14, 2022	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Jul. 25, 2021	Feb. 16, 2022	Jul. 24, 2022	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz~40GHz	Apr. 11, 2021	Feb. 16, 2022	Apr. 10, 2022	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 07, 2021	Feb. 16, 2022	Apr. 06, 2022	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P-R	1943528	1GHz~18GHz	Oct. 16, 2021	Feb. 16, 2022	Oct. 15, 2022	Radiation (03CH01-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270105	0.5GHz~26.5GHz	Oct. 16, 2021	Feb. 16, 2022	Oct. 15, 2022	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 21, 2021	Feb. 16, 2022	Jul. 20, 2022	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Feb. 16, 2022	NCR	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Feb. 16, 2022	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Feb. 16, 2022	NCR	Radiation (03CH01-SZ)

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 Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.2dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5dB
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.3dB
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----- THE END -----



### Appendix A. Radiated Spurious Emission

Test Engineer :	Xiaoshi Tan	Temperature :	24~25°C
		Relative Humidity :	48~49%

#### U-NII-1 - 5180~5240MHz

#### WIFI 802.11ac VHT80 (Band Edge @ 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 )
802.11ac VHT80 CH 42 5210MHz		5146.12	56.8	-17.2	74	43.18	34	12.15	32.53	373	200	P	H
		5148.72	48.85	-5.15	54	35.23	34	12.15	32.53	373	200	A	H
		5210	93.69	-	-	79.83	34.23	12.17	32.54	373	200	P	H
		5210	84.91	-	-	71.05	34.23	12.17	32.54	373	200	A	H
		5352.96	53.01	-20.99	74	38.97	34.4	12.21	32.57	373	200	P	H
		5383.2	44.27	-9.73	54	30.23	34.4	12.22	32.58	373	200	A	H
		5144.82	56.19	-17.81	74	42.57	34	12.15	32.53	394	91	P	V
		5144.56	47.53	-6.47	54	33.91	34	12.15	32.53	394	91	A	V
		5210	90.56	-	-	76.7	34.23	12.17	32.54	394	91	P	V
		5210	83.69	-	-	69.83	34.23	12.17	32.54	394	91	A	V
		5459.52	52.1	-21.9	74	38.05	34.4	12.24	32.59	394	91	P	V
	5392.8	44.42	-9.58	54	30.38	34.4	12.22	32.58	394	91	A	V	



U-NII-1 - 5150~5250MHz  
WIFI 802.11ac (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 )	Path Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. (P/A)	Pol. (H/V)
802.11ac		10420	49.75	-18.55	68.3	48.07	37.43	15.32	51.07	-	-	P	H
VHT80		15630	50.04	-23.96	74	44.9	40.17	17.82	52.85	-	-	P	H
CH 42		10420	50.44	-17.86	68.3	48.76	37.43	15.32	51.07	-	-	P	V
5210MHz		15630	49.07	-24.93	74	43.93	40.17	17.82	52.85	-	-	P	V
<b>Remark</b>	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												





Emission below 1GHz

WiFi 802.11ac VHT80 (LF @ 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 )
802.11ac VHT80 LF		45.52	22.36	-17.64	40	36.31	16.31	1.24	31.5	-	-	P	H
		96.93	29.57	-13.93	43.5	42.91	16.46	1.8	31.6	-	-	P	H
		151.25	24.89	-18.61	43.5	37.51	16.54	2.23	31.39	-	-	P	H
		308.39	22.53	-23.47	46	31.2	19.55	3.16	31.38	-	-	P	H
		649.83	27.08	-18.92	46	28.38	25.51	4.59	31.4	-	-	P	H
		974.78	31.3	-22.7	54	29.44	27.49	5.62	31.25	-	-	P	H
		44.55	29.6	-10.4	40	43.27	16.6	1.23	31.5	-	-	P	V
		95.96	23.95	-19.55	43.5	37.6	16.16	1.79	31.6	-	-	P	V
		217.21	20.64	-25.36	46	33.98	15.43	2.67	31.44	-	-	P	V
		384.05	21.94	-24.06	46	28.55	21.22	3.53	31.36	-	-	P	V
		762.35	26.88	-19.12	46	26.88	26.19	4.97	31.16	-	-	P	V
	920.46	29.51	-16.49	46	28.68	26.79	5.46	31.42	-	-	P	V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



**Note symbol**

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is <b>over limit</b> line.
P/A	<b>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



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		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		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 B. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11ac VHT80	87.77	0.323	3.101	10KHZ

### 802.11ac VHT80

