



FCC RF Test Report

APPLICANT : Motorola Mobility LLC
EQUIPMENT : Mobile Cellular Phone
BRAND NAME : Motorola
MODEL NAME : XT2211-1, XT2211-2, XT2211DL
FCC ID : IHDT56AA2
STANDARD : FCC Part 15 Subpart E §15.407
CLASSIFICATION : (NII) Unlicensed National Information Infrastructure
TEST DATE(S) : Dec. 03, 2021

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

Alex Wang

Approved by: Alex Wang / Manager



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
FR181714-02A	Rev. 01	Initial issue of report	Dec. 07, 2021



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 3.33 dB at 5149.760 MHz
3.3	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(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

Motorola Mobility LLC
222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC
222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2211-1, XT2211-2, XT2211DL
FCC ID	IHDT56AA2
IMEI Code	Radiation: 358116610019822 for Sample 1 358116610026462 for Sample 2
HW Version	PVT
SW Version	RRDE31.Q3-58
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 XT2211-1, XT2211-2, XT2211DL. The change note could be referred to the XT2211-1, XT2211-2, XT2211DL_Operational Description of Product Equality Declaration which is exhibit separately. Based on the similarity between current and previous project, only conducted power and the worst case of RSE from original test report (Sporton Report Number FR181714D) were verified for the differences.



1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	5180 MHz ~ 5240 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5720 MHz
Antenna Type / Gain	<5150 MHz ~ 5250 MHz> IFA Antenna with gain -3.75 dBi <5250 MHz ~ 5350 MHz> IFA Antenna with gain -3.72 dBi <5470 MHz ~ 5725 MHz> IFA Antenna with gain -3.73 dBi
Type of Modulation	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 (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 Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	TH01-KS 03CH05-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH05-KS	AUDIX	E3	6.2009-8-24al



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:

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.

1.9 Specification of Accessory

Specification of Accessory				
AC Adapter 1	Brand Name	Motorola(Salcomp)	Model Name	MC-101
AC Adapter 2	Brand Name	Motorola(AOHAI)	Model Name	MC-101
AC Adapter 3	Brand Name	Motorola(Chenyang)	Model Name	MC-101
Battery 1	Brand Name	Motorola(ATL)	Model Name	MD50
Battery 2	Brand Name	Motorola(SCUD)	Model Name	MD50
USB Cable 1	Brand Name	Motorola(Saibao)	Model Name	SC18D22297
USB Cable 2	Brand Name	Motorola(Cabletech)	Model Name	SC18D22298
USB Cable 3	Brand Name	Motorola(Luxshare)	Model Name	SC18D22299
Earphone	Brand Name	Motorola(NLD)	Model Name	NLD-EM313A-05SF



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 [#]	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 [#]	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 [#]	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 [#]	5610	128	5640



Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channel	138 [#]	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 "#" were 802.11ac VHT80.

2.2 Test Mode

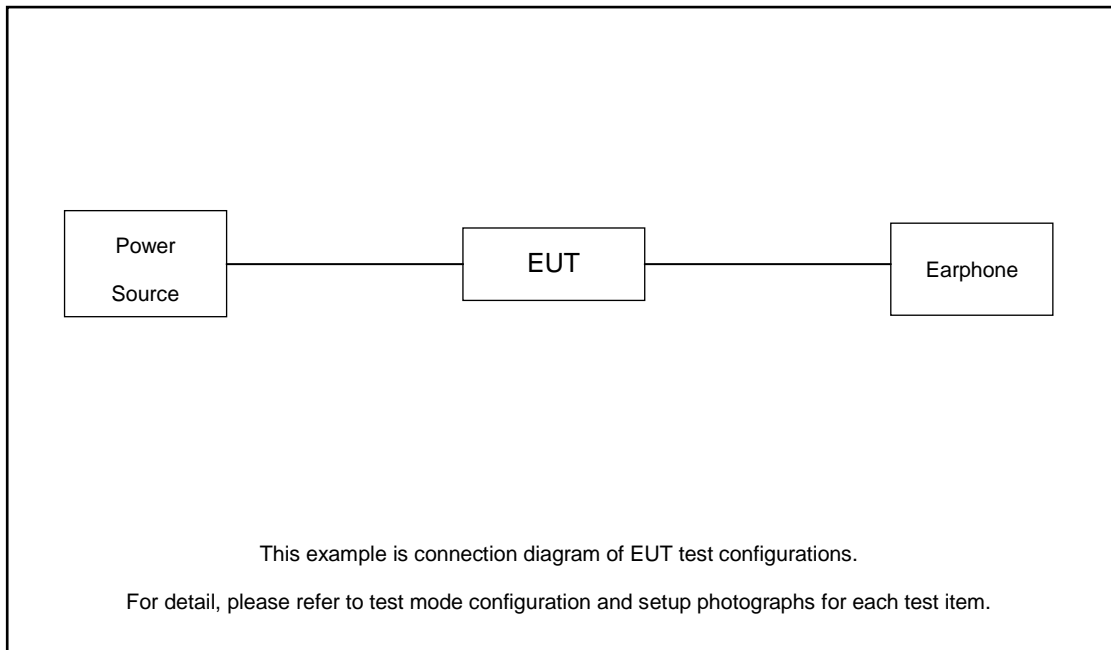
Final test modes are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11ac VHT80	MCS0

Ch. #		U-NII-2A : 5250-5350 MHz
		802.11a
H	High	64

Ch. #		U-NII-1 : 5150-5250 MHz	U-NII-2C : 5470-5725MHz
		802.11ac VHT80	802.11ac VHT80
L	Low	-	106
M	Middle	42	-

2.3 Connection Diagram of Test System



2.4 EUT Operation Test Setup

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



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 $11 + 10 \log B$, dBm, where B is the 26 dB emission bandwidth in megahertz.

For the 5.47–5.6 GHz and 5.65–5.725 GHz band, the maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever power is less. The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever is less. B is the 99% 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

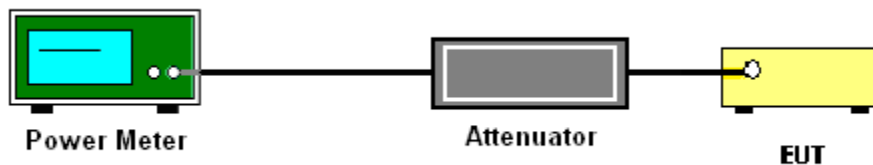
The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

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	0.00	18.02	24.00	-3.75	Pass
11a	6Mbps	1	44	5220	0.00	18.36	24.00	-3.75	Pass
11a	6Mbps	1	48	5240	0.00	18.42	24.00	-3.75	Pass
HT20	MCS0	1	36	5180	0.00	17.88	24.00	-3.75	Pass
HT20	MCS0	1	44	5220	0.00	18.21	24.00	-3.75	Pass
HT20	MCS0	1	48	5240	0.00	18.28	24.00	-3.75	Pass
HT40	MCS0	1	38	5190	0.00	17.81	24.00	-3.75	Pass
HT40	MCS0	1	46	5230	0.00	17.75	24.00	-3.75	Pass
VHT20	MCS0	1	36	5180	0.00	18.77	24.00	-3.75	Pass
VHT20	MCS0	1	44	5220	0.00	17.98	24.00	-3.75	Pass
VHT20	MCS0	1	48	5240	0.00	18.21	24.00	-3.75	Pass
VHT40	MCS0	1	38	5190	0.00	17.64	24.00	-3.75	Pass
VHT40	MCS0	1	46	5230	0.00	17.73	24.00	-3.75	Pass
VHT80	MCS0	1	42	5210	0.00	15.32	24.00	-3.75	Pass

U-NII-2A										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	EIRP Power Limit (dBm)	Pass/Fail
11a	6M bps	1	52	5260	0.00	17.02	23.98	-3.72	26.99	Pass
11a	6M bps	1	60	5300	0.00	17.15	23.98	-3.72	26.99	Pass
11a	6M bps	1	64	5320	0.00	17.22	23.98	-3.72	26.99	Pass
HT20	MCS 0	1	52	5260	0.00	16.74	23.98	-3.72	26.99	Pass
HT20	MCS 0	1	60	5300	0.00	17.09	23.98	-3.72	26.99	Pass
HT20	MCS 0	1	64	5320	0.00	17.04	23.98	-3.72	26.99	Pass
HT40	MCS 0	1	54	5270	0.00	17.03	23.98	-3.72	26.99	Pass
HT40	MCS 0	1	62	5310	0.00	16.97	23.98	-3.72	26.99	Pass
VHT20	MCS 0	1	52	5260	0.00	16.56	23.98	-3.72	26.99	Pass
VHT20	MCS 0	1	60	5300	0.00	16.95	23.98	-3.72	26.99	Pass
VHT20	MCS 0	1	64	5320	0.00	16.90	23.98	-3.72	26.99	Pass
VHT40	MCS 0	1	54	5270	0.00	16.81	23.98	-3.72	26.99	Pass
VHT40	MCS 0	1	62	5310	0.00	16.98	23.98	-3.72	26.99	Pass
VHT80	MCS 0	1	58	5290	0.00	17.25	23.98	-3.72	26.99	Pass



U-NII-2C										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	EIRP Power Limit (dBm)	Pass/Fail
11a	6M bps	1	100	5500	0.00	17.51	23.98	-3.73	26.99	Pass
11a	6M bps	1	116	5580	0.00	17.79	23.98	-3.73	26.99	Pass
11a	6M bps	1	140	5700	0.00	17.85	23.98	-3.73	26.99	Pass
11a	6M bps	1	144	5720	0.00	17.62	23.98	-3.73	26.99	Pass
HT20	MCS 0	1	100	5500	0.00	17.37	23.98	-3.73	26.99	Pass
HT20	MCS 0	1	116	5580	0.00	17.75	23.98	-3.73	26.99	Pass
HT20	MCS 0	1	140	5700	0.00	17.90	23.98	-3.73	26.99	Pass
HT20	MCS 0	1	144	5720	0.00	17.20	23.98	-3.73	26.99	Pass
HT40	MCS 0	1	102	5510	0.00	17.63	23.98	-3.73	26.99	Pass
HT40	MCS 0	1	110	5550	0.00	17.36	23.98	-3.73	26.99	Pass
HT40	MCS 0	1	134	5670	0.00	18.06	23.98	-3.73	26.99	Pass
HT40	MCS 0	1	142	5710	0.00	18.09	23.98	-3.73	26.99	Pass
VHT20	MCS 0	1	100	5500	0.00	17.20	23.98	-3.73	26.99	Pass
VHT20	MCS 0	1	116	5580	0.00	17.63	23.98	-3.73	26.99	Pass
VHT20	MCS 0	1	140	5700	0.00	17.84	23.98	-3.73	26.99	Pass
VHT20	MCS 0	1	144	5720	0.00	17.25	23.98	-3.73	26.99	Pass
VHT40	MCS 0	1	102	5510	0.00	17.63	23.98	-3.73	26.99	Pass
VHT40	MCS 0	1	110	5550	0.00	17.31	23.98	-3.73	26.99	Pass
VHT40	MCS 0	1	134	5670	0.00	17.83	23.98	-3.73	26.99	Pass
VHT40	MCS 0	1	142	5710	0.00	17.97	23.98	-3.73	26.99	Pass
VHT80	MCS 0	1	106	5530	0.00	15.01	23.98	-3.73	26.99	Pass
VHT80	MCS 0	1	122	5610	0.00	18.11	23.98	-3.73	26.99	Pass
VHT80	MCS 0	1	138	5690	0.00	18.00	23.98	-3.73	26.99	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_{Meas} is the field strength of the emission at the measurement distance, in dBµV/m

d_{Meas} is the measurement distance, in m

3.2.2 Measuring Instruments

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

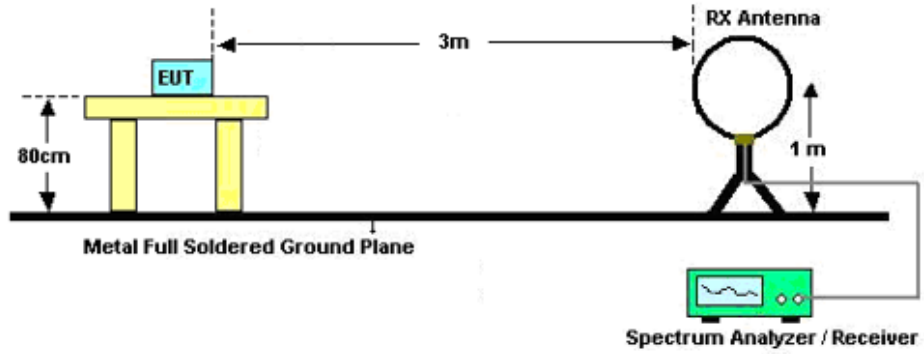


3.2.3 Test Procedures

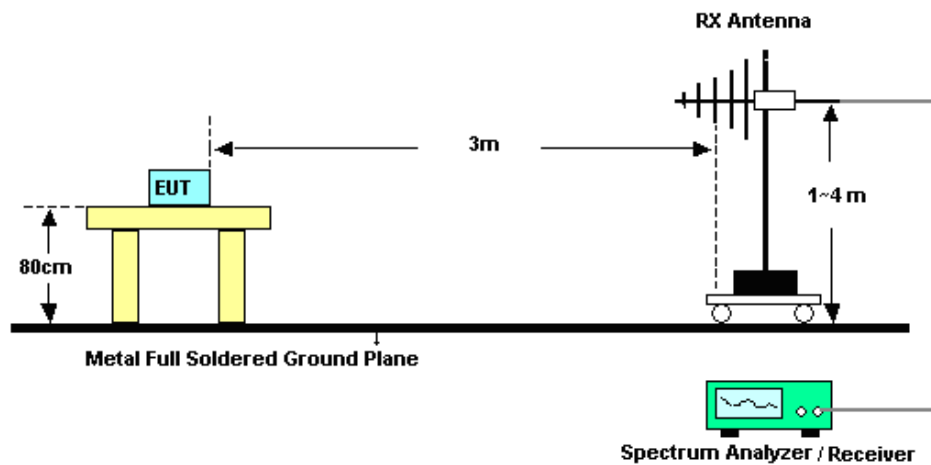
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.
 - (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
 - RBW = 120 kHz
 - VBW = 300 kHz
 - Detector = Peak
 - Trace mode = max hold
 - (2) Procedure for Peak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

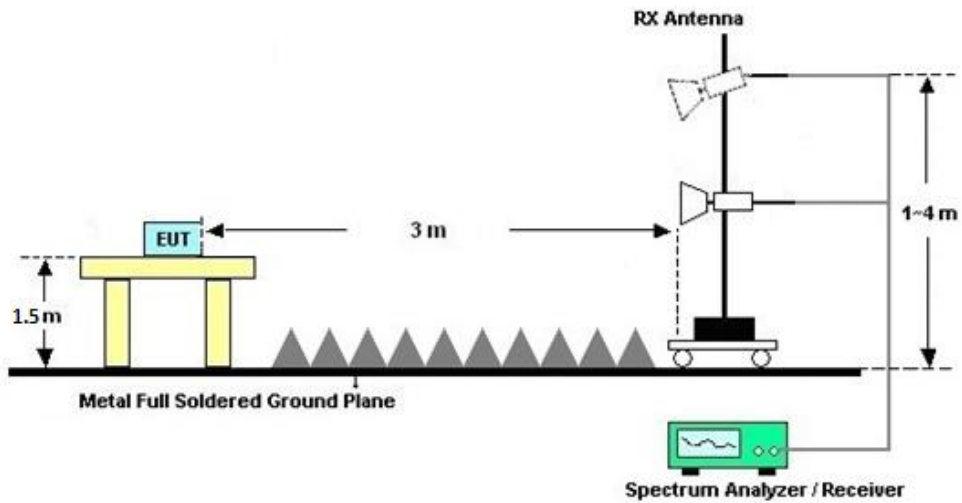
For radiated emissions below 30MHz



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	101040	10Hz~40GHz	Oct. 14, 2021	Dec. 03, 2021	Oct. 13, 2022	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 07, 2021	Dec. 03, 2021	Jan. 06, 2022	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 07, 2021	Dec. 03, 2021	Jan. 06, 2022	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 12, 2021	Dec. 03, 2021	Jul. 11, 2022	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 16, 2021	Dec. 03, 2021	Oct. 15, 2022	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz~44G,MAX 30dB	Apr.13, 2021	Dec. 03, 2021	Apr. 12, 2022	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Dec. 03, 2021	Oct. 29, 2022	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Jun. 04, 2021	Dec. 03, 2021	Jun. 03, 2022	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218652	1GHz~18GHz	Apr. 24, 2021	Dec. 03, 2021	Apr. 23, 2022	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 09, 2021	Dec. 03, 2021	Nov. 08, 2022	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Apr. 12, 2021	Dec. 03, 2021	Apr. 11, 2022	Radiation (03CH05-KS)
Amplifier	MITEQ	EM18G40GG A	060728	18~40GHz	Jan. 07, 2021	Dec. 03, 2021	Jan. 06, 2022	Radiation (03CH05-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2012228	1Ghz-18Ghz	Oct. 16, 2021	Dec. 03, 2021	Oct. 15, 2022	Radiation (03CH05-KS)
Amplifier	Keysight	83017A	MY53270316	500MHz~26.5GHz	Oct. 16, 2021	Dec. 03, 2021	Oct. 15, 2022	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Dec. 03, 2021	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Dec. 03, 2021	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Dec. 03, 2021	NCR	Radiation (03CH05-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 Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.0dB
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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))	5.0dB
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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))	5.0dB
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———— THE END ————



Appendix A. Radiated Spurious Emission

Test Engineer :	Henry Li	Temperature :	27~30°C
		Relative Humidity :	41~42%

Sample1--UNII 1 - 5150~5250MHz

WIFI 802.11ac80+LTE B13 (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)
802.11ac80 CH 42 5210MHz		5149.92	58.31	-15.69	74	46.12	35.03	11.6	34.44	100	255	P	H
		5149.92	50.05	-3.95	54	37.86	35.03	11.6	34.44	100	255	A	H
	*	5218	97.26	-	-	84.73	35.09	11.67	34.23	100	255	P	H
		5218	88.78	-	-	76.25	35.09	11.67	34.23	100	255	A	H
		5380.92	54.35	-19.65	74	40.78	35.26	11.84	33.53	100	255	P	H
		5379.66	45.64	-8.36	54	32.07	35.26	11.84	33.53	100	255	A	H
		5149.76	57.33	-16.67	74	45.14	35.03	11.6	34.44	333	71	P	V
		5149.76	48.2	-5.8	54	36.01	35.03	11.6	34.44	333	71	A	V
	*	5218	95.89	-	-	83.36	35.09	11.67	34.23	333	71	P	V
		5218	88.12	-	-	75.59	35.09	11.67	34.23	333	71	A	V
		5378.4	53.97	-20.03	74	40.4	35.26	11.84	33.53	333	71	P	V
		5393.52	45.53	-8.47	54	31.96	35.26	11.84	33.53	333	71	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Sample1-UNII 1 5150~5250MHz

WIFI 802.11ac80+LTE 13 (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)
802.11ac80		10418.42	44.5	-23.8	68.3	56.14	38.34	17.01	66.99	300	0	P	H
CH 42 5210MHz		10418.42	44.94	-23.36	68.3	56.58	38.34	17.01	66.99	300	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Sample1--UNII 2A - 5250~5350MHz

WIFI 802.11a (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)
802.11a CH 64 5320MHz		5352.8	58.06	-15.94	74	44.67	35.22	11.8	33.63	100	247	P	H
		5350.2	47.97	-6.03	54	34.58	35.22	11.8	33.63	100	247	A	H
	*	5320	108.83	-	-	95.7	35.19	11.77	33.83	100	247	P	H
		5320	101.4	-	-	88.27	35.19	11.77	33.83	100	247	A	H
		5352	55.69	-18.31	74	42.3	35.22	11.8	33.63	100	180	P	V
		5386.5	45.67	-8.33	54	32.1	35.26	11.84	33.53	100	180	A	V
	*	5320	103.15	-	-	90.02	35.19	11.77	33.83	100	180	P	V
		5320	95.73	-	-	82.6	35.19	11.77	33.83	100	180	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Sample1--UNII 2A 5250~5350MHz
WIFI 802.11a (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)
802.11a		10638.63	44.14	-29.86	74	55.35	38.41	17.2	66.82	300	0	P	H
CH 64 5320MHz		10638.63	44.69	-29.31	74	55.9	38.41	17.2	66.82	300	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Sample1--UNII 2C 5470~5725MHz
WIFI 802.11ac VHT80 (Band Edge @ 3m)

Table with 14 columns: 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). Rows include test data for 802.11ac VHT80 CH 106 5530MHz and a Remark section.



Sample1--UNII 2C 5470~5725MHz
WIFI 802.11ac VHT80 (Harmonic @ 3m)

Table with 14 columns: 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). Rows include data for 802.11ac VHT80 CH 106 5530MHz and a Remark section.



Sample2--UNII 1 - 5150~5250MHz

WIFI 802.11ac80+LTE B13 (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)
802.11ac80 CH 42 5210MHz		5139.2	59.23	-14.77	74	47.18	35.01	11.58	34.54	100	71	P	H
		5149.28	48.66	-5.34	54	36.47	35.03	11.6	34.44	100	71	A	H
	*	5218	96.46	-	-	83.93	35.09	11.67	34.23	100	71	P	H
		5218	88.88	-	-	76.35	35.09	11.67	34.23	100	71	A	H
		5379.48	53.81	-20.19	74	40.24	35.26	11.84	33.53	100	71	P	H
		5398.2	45.52	-8.48	54	31.92	35.27	11.86	33.53	100	71	A	H
		5140.32	60.68	-13.32	74	48.59	35.03	11.6	34.54	100	285	P	V
		5149.76	50.67	-3.33	54	38.48	35.03	11.6	34.44	100	285	A	V
	*	5218	100.15	-	-	87.62	35.09	11.67	34.23	100	285	P	V
		5218	92.56	-	-	80.03	35.09	11.67	34.23	100	285	A	V
		5367.78	54.63	-19.37	74	41.2	35.24	11.82	33.63	100	285	P	V
		5387.58	45.69	-8.31	54	32.12	35.26	11.84	33.53	100	285	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Sample2--UNII 1 5150~5250MHz
WIFI 802.11ac80+LTE B13 (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)
802.11ac80		10418.42	44.16	-24.14	68.3	55.8	38.34	17.01	66.99	300	0	P	H
CH 42 5210MHz		10418.42	44.74	-23.56	68.3	56.38	38.34	17.01	66.99	300	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Sample2--UNII 2A - 5250~5350MHz

WIFI 802.11a (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)
802.11a CH 64 5320MHz		5352.8	59.16	-14.84	74	45.77	35.22	11.8	33.63	174	5	P	H
		5350.3	48.38	-5.62	54	34.99	35.22	11.8	33.63	174	5	A	H
	*	5320	109.57	-	-	96.44	35.19	11.77	33.83	174	5	P	H
		5320	101.65	-	-	88.52	35.19	11.77	33.83	174	5	A	H
		5352.6	56.62	-17.38	74	43.23	35.22	11.8	33.63	284	115	P	V
		5350.3	46.65	-7.35	54	33.26	35.22	11.8	33.63	284	115	A	V
	*	5320	105.25	-	-	92.12	35.19	11.77	33.83	284	115	P	V
		5320	97.62	-	-	84.49	35.19	11.77	33.83	284	115	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Sample2--UNII 2A 5250~5350MHz
WIFI 802.11a (Harmonic @ 3m)

Table with 14 columns: WIFI Ant., 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). Contains two data rows and a Remark section.



Sample2--UNII 2C 5470~5725MHz
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 106 5530MHz		5452.24	56.1	-17.9	74	42.2	35.32	11.91	33.33	291	116	P	H
		5467.12	57.2	-11.1	68.3	43.16	35.34	11.93	33.23	291	116	P	H
		5458.64	47.26	-6.74	54	33.26	35.32	11.91	33.23	291	116	A	H
	*	5524	92.35	-	-	78.01	35.39	11.97	33.02	291	116	P	H
		5524	85.2	-	-	70.86	35.39	11.97	33.02	291	116	A	H
		5753.08	55.74	-12.56	68.3	40.81	35.72	12.18	32.97	291	116	P	H
		5456.72	60.79	-13.21	74	46.79	35.32	11.91	33.23	100	356	P	V
		5468.4	60.74	-7.56	68.3	46.7	35.34	11.93	33.23	100	356	P	V
		5458.32	50.06	-3.94	54	36.06	35.32	11.91	33.23	100	356	A	V
	*	5524	98.58	-	-	84.24	35.39	11.97	33.02	100	356	P	V
		5524	90.77	-	-	76.43	35.39	11.97	33.02	100	356	A	V
		5749.24	56.8	-11.5	68.3	41.93	35.68	12.16	32.97	100	356	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Sample2--UNII 2C 5470~5725MHz
WIFI 802.11ac VHT80 (Harmonic @ 3m)

Table with 14 columns: 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). Rows include data for 802.11ac VHT80 and CH 106 5530MHz, and a Remark section.



Emission below 1GHz
5GHz WIFI 802.11ac80 (LF)

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)
5GHz 802.11ac80 LF		46.49	26.96	-13.04	40	49.32	16.53	1.03	39.92	-	-	P	H
		100.81	23.69	-19.81	43.5	42.77	18.09	1.52	38.69	-	-	P	H
		173.56	30.65	-12.85	43.5	50.63	16.94	2	38.92	-	-	P	H
		186.17	33.67	-9.83	43.5	53.69	16.63	2.07	38.72	-	-	P	H
		230.79	32.45	-13.55	46	50.42	18.21	2.32	38.5	-	-	P	H
		264.74	31.3	-14.7	46	47.56	19.64	2.48	38.38	-	-	P	H
		47.46	30.4	-9.6	40	53.13	16.15	1.04	39.92	-	-	P	V
		109.54	29.12	-14.38	43.5	48.36	17.98	1.58	38.8	-	-	P	V
		187.14	30.34	-13.16	43.5	50.35	16.61	2.08	38.7	-	-	P	V
		238.55	30.54	-15.46	46	48	18.68	2.36	38.5	-	-	P	V
		397.63	23.48	-22.52	46	35.18	22.65	3.04	37.39	-	-	P	V
	667.29	25.26	-20.74	46	30.43	25.83	3.95	34.95	-	-	P	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	Peak or Average
H/V	Horizontal or Vertical



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)

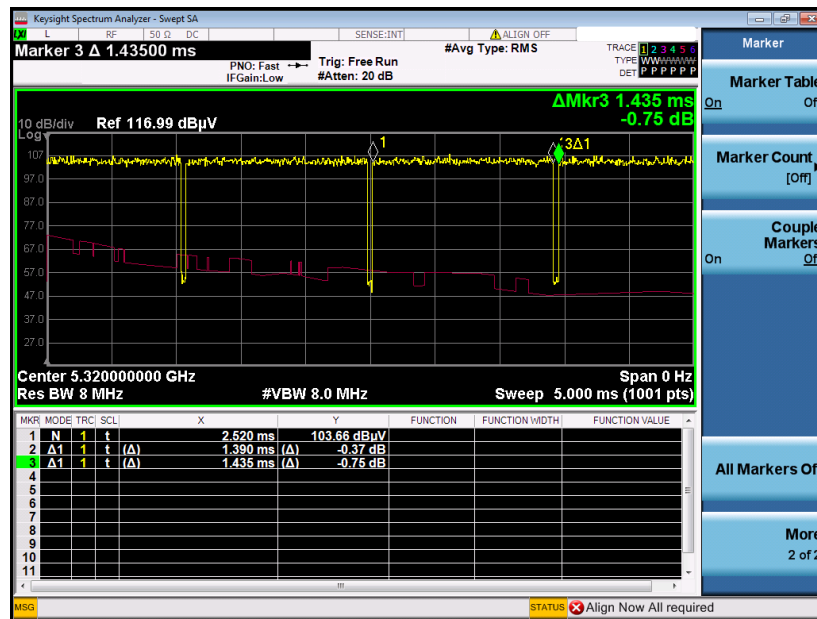
Both peak and average measured complies with the limit line, so test result is “PASS”.



Appendix B. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11a	96.86	1.390	0.719	0.75kHz
802.11ac VHT80	88.04	0.324	3.086	3.3kHz

802.11a





802.11ac VHT80

