FCC RF Test Report

APPLICANT	:	Motorola Mobility LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	XT2229-2
FCC ID	:	IHDT56AC6
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System
TEST DATE(S)	:	Feb. 17, 2022 ~ Feb. 26, 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

Cert #5145.01

Sporton International Inc. (ShenZhen)

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055

People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR1N1011-03C	Rev. 01	Initial issue of report	Mar. 15, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
4.1	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
4.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.02 dB at 2389.905 MHz
4.3	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits.
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, 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	XT2229-2
FCC ID	IHDT56AC6
IMEI Code	Conducted: N/A Radiation: 352303500031051/352303500032208 for Sample 1 352303500035193/352303500037645 for Sample 2
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. There are two types of EUT, the difference could be referred to the XT2229-2_Operational Description of Product Equality Declaration which is exhibit separately. According to the difference, we evaluate the sample 1 to perform full test and the sample 2 verified worse cases for RSE testing.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum Output Power to antenna	802.11b : 20.48 dBm (0.1117 W) 802.11g : 25.02 dBm (0.3177 W) 802.11n HT20 : 25.23 dBm (0.3334 W)
Antenna Type / Gain	PIFA Antenna type with gain -4.8 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

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.

Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	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		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	TH01-SZ	CN1256	421272

Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	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		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	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 C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- 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(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
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 Re-use of Measured Data

2.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: XT2229-2, FCC ID: IHDT56AC6) is electrically identical to the reference device (Model: XT2231-2, FCC ID: IHDT56AC3) for the portions of the circuitry corresponding to the data being re-used. Based on their similarity, the FCC Part 15C DTS (WLAN 2.4GHz) reuse the original model's result do spot-check, following the FCC KDB 484596 D01 v01.

The applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID: IHDT56AC6 .

2.2 Model Difference Information

The **main** difference between FCC ID: IHDT56AC3 and FCC ID: IHDT56AC6 is as below:

- Remove NFC.

Other differences and all the details of similarity and difference can be found in the confidential documents (XT2229-2_Operational Description of Product Equality Declaration).

The re-used RF data includes the following bands provided in Appendix D (Sporton RF Report No. 1N1011-01 for the reference device Model: XT2231-2, FCC ID: IHDT56AC3).

2.3 Reference detail Section:

Rule Part	Equipment Class	Frequency Band (MHz)	Reference FCC ID(Parent)	Type Grant/ Permissive Change	Reference Title	FCC ID Filling (Variant)	Report Title/Section
15C	DTS (WLAN)	2400~2483.5	IHDT56AC2	Original Grant	1N1011-01	IHDT56AC6	All sections applicable except for RSE and Conducted Power
			IHDT56AC3	Data reuse			

2.4 Spot Check Verification Data Section

Conducted power test and radiated spurious emission for re-testing against the variant model based on the original model was performed in this filing.

Summary for power spot check for rule entry and technology is listed as below:

Test Item	Mode	IHDT56AC3 Parent Worst Result	IHDT56AC6 Variant Check Result	Difference (dB)
Conducted Power (dBm)	802.11b	19.42	20.48	1.06
	802.11g	24.26	25.02	0.76
	802.11n20	24.65	25.23	0.58

Conclusion:

We confirm that the test data reuse policy of FCC KDB 484596 D01 Referencing Test Data v01 has been followed and the test data for AC Conduction and Conducted test items except Conducted Power as referenced from the parent model report represents compliance with new FCC ID.

3 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 (Y plane) were recorded in this report.

3.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

3.2 Test Mode

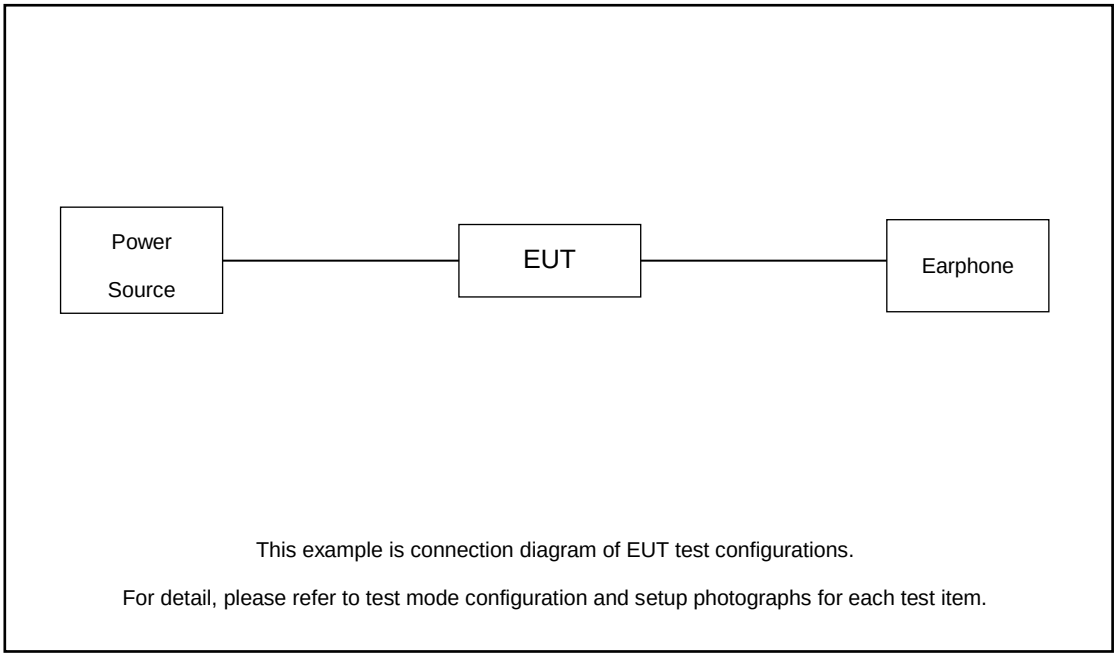
Final test modes are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11b	**1 Mbps**
802.11g	**6 Mbps**
802.11n HT20	**MCS0**

Simultaneous transmission	WIFI 802.11g CH01 + LTE Band 41 Link

Remark: For Radiated Test Cases, The tests were performed with Adapter 1, Earphone 1 and USB Cable 1.

3.3 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

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

3.4 EUT Operation Test Setup

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

4 Test Result

4.1 Output Power Measurement

4.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

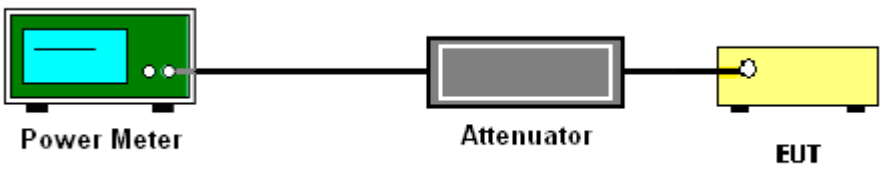
4.1.2 Measuring Instruments

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

4.1.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.2 Method AVGPM-G method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

4.1.4 Test Setup



4.1.5 Test Result of Peak Output Power

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
					Ant 1	Ant 1	Ant 1	Ant 1	Ant 1	
11b	1Mbps	1	1	2412	20.03	30.00	-4.80	15.23	36.00	Pass
11b	1Mbps	1	6	2437	20.48	30.00	-4.80	15.68	36.00	Pass
11b	1Mbps	1	11	2462	20.11	30.00	-4.80	15.31	36.00	Pass
11g	6Mbps	1	1	2412	23.64	30.00	-4.80	18.84	36.00	Pass
11g	6Mbps	1	6	2437	25.02	30.00	-4.80	20.22	36.00	Pass
11g	6Mbps	1	11	2462	23.77	30.00	-4.80	18.97	36.00	Pass
HT20	MCS0	1	1	2412	22.44	30.00	-4.80	17.64	36.00	Pass
HT20	MCS0	1	6	2437	25.23	30.00	-4.80	20.43	36.00	Pass
HT20	MCS0	1	11	2462	22.86	30.00	-4.80	18.06	36.00	Pass

Note: Measured power (dBm) has offset with cable loss.

4.1.6 Test Result of Average Output Power (Reporting Only)

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
					Ant 1	Ant 1	Ant 1	Ant 1	Ant 1	
11b	1Mbps	1	1	2412	18.80	30.00	-4.80	14.00	36.00	Pass
11b	1Mbps	1	6	2437	18.70	30.00	-4.80	13.90	36.00	Pass
11b	1Mbps	1	11	2462	18.90	30.00	-4.80	14.10	36.00	Pass
11g	6Mbps	1	1	2412	16.60	30.00	-4.80	11.80	36.00	Pass
11g	6Mbps	1	6	2437	17.90	30.00	-4.80	13.10	36.00	Pass
11g	6Mbps	1	11	2462	15.70	30.00	-4.80	10.90	36.00	Pass
HT20	MCS0	1	1	2412	14.90	30.00	-4.80	10.10	36.00	Pass
HT20	MCS0	1	6	2437	17.80	30.00	-4.80	13.00	36.00	Pass
HT20	MCS0	1	11	2462	15.40	30.00	-4.80	10.60	36.00	Pass

Note: Measured power (dBm) has offset with cable loss.

4.2 Radiated Band Edges and Spurious Emission Measurement

4.2.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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

4.2.2 Measuring Instruments

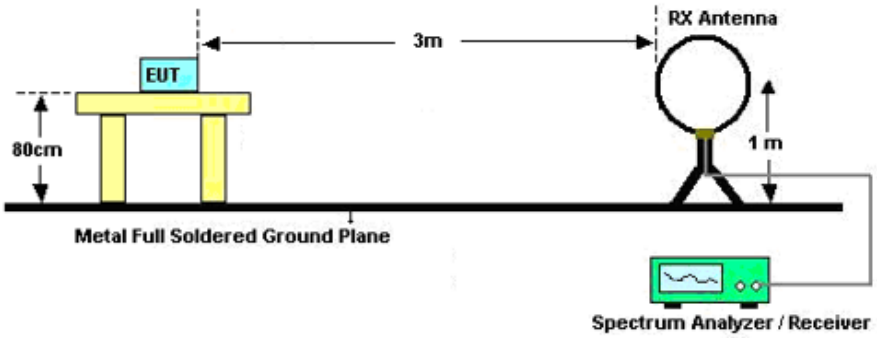
The measuring equipment is listed in the section 4 of this test report.

4.2.3 Test Procedures

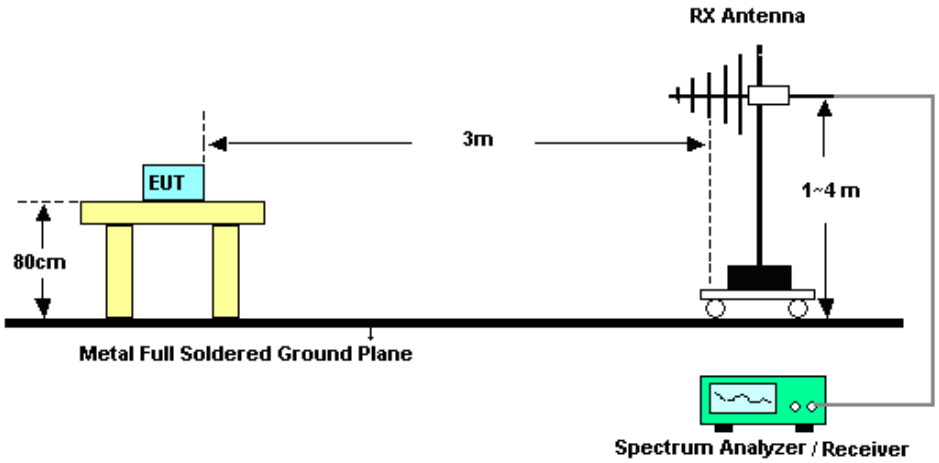
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. 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.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
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.
8. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - 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.

4.2.4 Test Setup

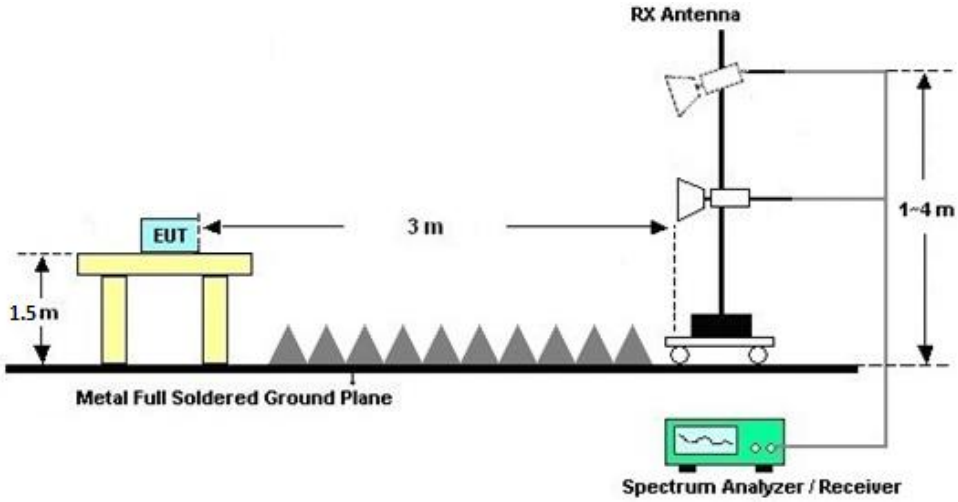
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



4.2.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)

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.

4.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

4.2.7 Duty Cycle

Please refer to Appendix B.

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

Please refer to Appendix A.

4.3 Antenna Requirements

4.3.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached Antenna or of an Antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

4.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

4.3.3 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.

5 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	Feb. 17, 2022	Apr. 07, 2022	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	Feb. 17, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	Feb. 17, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 21, 2021	Feb. 26, 2022	Jul. 20, 2022	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 22, 2021	Feb. 26, 2022	Jun. 21, 2022	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	Jul. 15, 2021	Feb. 26, 2022	Jul. 14, 2022	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Jul. 25, 2021	Feb. 26, 2022	Jul. 24, 2022	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr. 11, 2021	Feb. 26, 2022	Apr. 10, 2022	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 07, 2021	Feb. 26, 2022	Apr. 06, 2022	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 16, 2021	Feb. 26, 2022	Oct. 15, 2022	Radiation (03CH01-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270105	0.5GHz~26.5Ghz	Oct. 16, 2021	Feb. 26, 2022	Oct. 15, 2022	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 21, 2021	Feb. 26, 2022	Jul. 20, 2022	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Feb. 26, 2022	NCR	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Feb. 26, 2022	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Feb. 26, 2022	NCR	Radiation (03CH01-SZ)

NCR: No Calibration Required

6 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))	**2.48dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.53dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.02dB**

---------- THE END ----------

Appendix A. Radiated Spurious Emission

For Sample 1:

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 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)
802.11b CH 01 2412MHz		2384.76	54.64	-19.36	74	45.68	32.03	9.63	32.7	113	22	P	H
		2386.23	44.82	-9.18	54	35.89	32	9.63	32.7	113	22	A	H
		2412	106.96	-	-	97.9	32.1	9.66	32.7	113	22	P	H
		2412	104.13	-	-	95.07	32.1	9.66	32.7	113	22	A	H
		2381.4	54.65	-19.35	74	45.69	32.03	9.63	32.7	100	360	P	V
		2386.23	44.24	-9.76	54	35.31	32	9.63	32.7	100	360	A	V
		2412	104.57	-	-	95.51	32.1	9.66	32.7	100	360	P	V
		2412	102.71	-	-	93.65	32.1	9.66	32.7	100	360	A	V
802.11b CH 06 2437MHz		2373.14	54.77	-19.23	74	45.82	32.03	9.62	32.7	111	21	P	H
		2389.94	43.6	-10.4	54	34.66	32	9.64	32.7	111	21	A	H
		2437	106.31	-	-	97.02	32.3	9.69	32.7	111	21	P	H
		2437	104.44	-	-	95.15	32.3	9.69	32.7	111	21	A	H
		2486.21	53.99	-20.01	74	44.77	32.17	9.75	32.7	111	21	P	H
		2483.83	43.94	-10.06	54	34.72	32.17	9.75	32.7	111	21	A	H
		2321.2	54.35	-19.65	74	45.49	32	9.56	32.7	100	360	P	V
		2389.94	43.53	-10.47	54	34.59	32	9.64	32.7	100	360	A	V
		2437	104.61	-	-	95.32	32.3	9.69	32.7	100	360	P	V
		2437	102.69	-	-	93.4	32.3	9.69	32.7	100	360	A	V
		2486.28	55	-19	74	45.78	32.17	9.75	32.7	100	360	P	V
		2484.04	43.94	-10.06	54	34.72	32.17	9.75	32.7	100	360	A	V

802.11b CH 11 2462MHz		2462	106.38	-	-	97.13	32.23	9.72	32.7	104	28	P	H
		2462	104.44	-	-	95.19	32.23	9.72	32.7	104	28	A	H
		2486.72	56.42	-17.58	74	47.2	32.17	9.75	32.7	104	28	P	H
		2486.48	46.98	-7.02	54	37.76	32.17	9.75	32.7	104	28	A	H
		2462	105.18	-	-	95.93	32.23	9.72	32.7	108	358	P	V
		2462	103.33	-	-	94.08	32.23	9.72	32.7	108	358	A	V
		2485.76	56.24	-17.76	74	47.02	32.17	9.75	32.7	108	358	P	V
		2486.72	46	-8	54	36.78	32.17	9.75	32.7	108	358	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11b (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)
802.11b CH 01 2412MHz		4824	49.83	-24.17	74	56.11	33.85	12.01	52.14			P	H
		4824	49.55	-24.45	74	55.83	33.85	12.01	52.14			P	V
802.11b CH 06 2437MHz		4874	50.56	-23.44	74	56.89	33.73	12.04	52.1			P	H
		7311	48.36	-25.64	74	50.23	35.76	14.16	51.79			P	H
		4874	49.23	-24.77	74	55.56	33.73	12.04	52.1			P	V
		7311	48.1	-25.9	74	49.97	35.76	14.16	51.79			P	V
802.11b CH 11 2462MHz		4924	49.45	-24.55	74	55.74	33.7	12.07	52.06			P	H
		7386	47.73	-26.27	74	49.44	35.78	14.21	51.7			P	H
		4924	48.43	-25.57	74	54.72	33.7	12.07	52.06			P	V
		7386	48.21	-25.79	74	49.92	35.78	14.21	51.7			P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11g (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)
802.11g CH 01 2412MHz		2389.275	63.38	-10.62	74	54.44	32	9.64	32.7	126	1	P	H
		2389.905	50.98	-3.02	54	42.04	32	9.64	32.7	126	1	A	H
		2412	106.79	-	-	97.73	32.1	9.66	32.7	126	1	P	H
		2412	100.65	-	-	91.59	32.1	9.66	32.7	126	1	A	H
		2389.485	58.99	-15.01	74	50.05	32	9.64	32.7	106	358	P	V
		2389.905	47.91	-6.09	54	38.97	32	9.64	32.7	106	358	A	V
		2412	104.01	-	-	94.95	32.1	9.66	32.7	106	358	P	V
		2412	96.27	-	-	87.21	32.1	9.66	32.7	106	358	A	V
802.11g CH 06 2437MHz		2387.28	55.35	-18.65	74	46.42	32	9.63	32.7	110	21	P	H
		2389.94	46.91	-7.09	54	37.97	32	9.64	32.7	110	21	A	H
		2437	108.11	-	-	98.82	32.3	9.69	32.7	110	21	P	H
		2437	102.11	-	-	92.82	32.3	9.69	32.7	110	21	A	H
		2483.69	60.52	-13.48	74	51.3	32.17	9.75	32.7	110	21	P	H
		2483.55	48.35	-5.65	54	39.13	32.17	9.75	32.7	110	21	A	H
		2387	54.8	-19.2	74	45.87	32	9.63	32.7	108	192	P	V
		2389.8	45.85	-8.15	54	36.91	32	9.64	32.7	108	192	A	V
		2437	105.71	-	-	96.42	32.3	9.69	32.7	108	192	P	V
		2437	99.2	-	-	89.91	32.3	9.69	32.7	108	192	A	V
		2485.93	60.02	-13.98	74	50.8	32.17	9.75	32.7	108	192	P	V
		2485.65	48.54	-5.46	54	39.32	32.17	9.75	32.7	108	192	A	V

802.11g CH 11 2462MHz		2462	107.86	-	-	98.61	32.23	9.72	32.7	104	19	P	H
		2462	100.2	-	-	90.95	32.23	9.72	32.7	104	19	A	H
		2483.64	61.27	-12.73	74	52.05	32.17	9.75	32.7	104	19	P	H
		2483.56	50.02	-3.98	54	40.8	32.17	9.75	32.7	104	19	A	H
		2462	104.48	-	-	95.23	32.23	9.72	32.7	130	294	P	V
		2462	97.03	-	-	87.78	32.23	9.72	32.7	130	294	A	V
		2483.52	62.88	-11.12	74	53.66	32.17	9.75	32.7	130	294	P	V
		2483.52	48.45	-5.55	54	39.23	32.17	9.75	32.7	130	294	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11g (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)
802.11g CH 01 2412MHz		4824	45.68	-28.32	74	51.96	33.85	12.01	52.14			P	H
		4824	44.47	-29.53	74	50.75	33.85	12.01	52.14			P	V
802.11g CH 06 2437MHz		4874	44.28	-29.72	74	50.61	33.73	12.04	52.1			P	H
		7311	48.07	-25.93	74	49.94	35.76	14.16	51.79			P	H
		4874	44.37	-29.63	74	50.7	33.73	12.04	52.1			P	V
		7311	47.98	-26.02	74	49.85	35.76	14.16	51.79			P	V
802.11g CH 11 2462MHz		4924	45.14	-28.86	74	51.43	33.7	12.07	52.06			P	H
		7386	48.08	-25.92	74	49.79	35.78	14.21	51.7			P	H
		4924	45.07	-28.93	74	51.36	33.7	12.07	52.06			P	V
		7386	48.64	-25.36	74	50.35	35.78	14.21	51.7			P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (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)
		2389.59	63.38	-10.62	74	54.44	32	9.64	32.7	119	33	P	H
		2389.8	50.8	-3.2	54	41.86	32	9.64	32.7	119	33	A	H
802.11n		2412	106.99	-	-	97.93	32.1	9.66	32.7	119	33	P	H
HT20		2412	99.42	-	-	90.36	32.1	9.66	32.7	119	33	A	H
CH 01		2389.275	60.76	-13.24	74	51.82	32	9.64	32.7	105	360	P	V
2412MHz		2389.905	48.18	-5.82	54	39.24	32	9.64	32.7	105	360	A	V
		2412	103.4	-	-	94.34	32.1	9.66	32.7	105	360	P	V
		2412	96.55	-	-	87.49	32.1	9.66	32.7	105	360	A	V
		2389.24	56.8	-17.2	74	47.86	32	9.64	32.7	109	35	P	H
		2388.54	46.22	-7.78	54	37.28	32	9.64	32.7	109	35	A	H
		2437	109.35	-	-	100.06	32.3	9.69	32.7	109	35	P	H
		2437	102.3	-	-	93.01	32.3	9.69	32.7	109	35	A	H
802.11n		2483.62	60.92	-13.08	74	51.7	32.17	9.75	32.7	109	35	P	H
HT20		2483.97	47.23	-6.77	54	38.01	32.17	9.75	32.7	109	35	A	H
CH 06		2385.88	56.9	-17.1	74	47.97	32	9.63	32.7	117	360	P	V
2437MHz		2388.4	46.13	-7.87	54	37.19	32	9.64	32.7	117	360	A	V
		2437	106.55	-	-	97.26	32.3	9.69	32.7	117	360	P	V
		2437	99.2	-	-	89.91	32.3	9.69	32.7	117	360	A	V
		2484.6	57.14	-16.86	74	47.92	32.17	9.75	32.7	117	360	P	V
		2483.62	46.2	-7.8	54	36.98	32.17	9.75	32.7	117	360	A	V

802.11n HT20 CH 11 2462MHz		2462	107.87	-	-	98.62	32.23	9.72	32.7	105	18	P	H
		2462	101.06	-	-	91.81	32.23	9.72	32.7	105	18	A	H
		2483.68	63.83	-10.17	74	54.61	32.17	9.75	32.7	105	18	P	H
		2483.72	50.04	-3.96	54	40.82	32.17	9.75	32.7	105	18	A	H
		2462	107.05	-	-	97.8	32.23	9.72	32.7	105	206	P	V
		2462	99.91	-	-	90.66	32.23	9.72	32.7	105	206	A	V
		2483.72	62.74	-11.26	74	53.52	32.17	9.75	32.7	105	206	P	V
		2483.92	49.36	-4.64	54	40.14	32.17	9.75	32.7	105	206	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (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)
802.11n HT20 CH 01 2412MHz		4824	46.01	-27.99	74	52.29	33.85	12.01	52.14			P	H
		4824	44.48	-29.52	74	50.76	33.85	12.01	52.14			P	V
802.11n HT20 CH 06 2437MHz		4874	44.17	-29.83	74	50.5	33.73	12.04	52.1			P	H
		7311	48.07	-25.93	74	49.94	35.76	14.16	51.79			P	H
		4874	44.88	-29.12	74	51.21	33.73	12.04	52.1			P	V
		7311	48.54	-25.46	74	50.41	35.76	14.16	51.79			P	V
802.11n HT20 CH 11 2462MHz		4924	44.18	-29.82	74	50.47	33.7	12.07	52.06			P	H
		7386	47.89	-26.11	74	49.6	35.78	14.21	51.7			P	H
		4924	44.43	-29.57	74	50.72	33.7	12.07	52.06			P	V
		7386	49.46	-24.54	74	51.17	35.78	14.21	51.7			P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

Emission below 1GHz

2.4GHz WIFI 802.11g (LF)

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)
2.4GHz 802.11g LF		45.52	19.96	-20.04	40	32.65	20.25	2.12	35.06	-	-	P	H
		101.78	19.09	-24.41	43.5	36.74	15.09	2.46	35.2	-	-	P	H
		151.25	19.53	-23.97	43.5	32.77	19.3	2.56	35.1	-	-	P	H
		202.66	22.56	-20.94	43.5	38.43	16.46	2.76	35.09	-	-	P	H
		395.69	21.76	-24.24	46	31.24	22.03	3.3	34.81	-	-	P	H
		522.76	23.26	-22.74	46	30.04	24.32	3.55	34.65	-	-	P	H
		44.55	30.18	-9.82	40	42.94	20.19	2.1	35.05	-	-	P	V
		98.87	20.46	-23.04	43.5	38.59	14.6	2.47	35.2	-	-	P	V
		180.35	20.91	-22.59	43.5	35.4	17.94	2.67	35.1	-	-	P	V
		316.15	20.42	-25.58	46	32	20.12	3.2	34.9	-	-	P	V
		419.94	22.29	-23.71	46	31.28	22.46	3.31	34.76	-	-	P	V
		623.64	25.95	-20.05	46	30.48	26.08	3.89	34.5	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

For Sample 2 :

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		2389.38	62.03	-11.97	74	53.09	32	9.64	32.7	333	36	P	H
		2389.905	50.49	-3.51	54	41.55	32	9.64	32.7	333	35	A	H
		2412	105.96	-	-	96.9	32.1	9.66	32.7	333	35	P	H
		2412	99.12	-	-	90.06	32.1	9.66	32.7	333	35	A	H
		2389.905	57.66	-16.34	74	48.72	32	9.64	32.7	332	234	P	V
		2389.905	46.25	-7.75	54	37.31	32	9.64	32.7	332	234	A	V
		2412	102.14	-	-	93.08	32.1	9.66	32.7	332	234	P	V
		2412	95.31	-	-	86.25	32.1	9.66	32.7	332	234	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		4824	45.64	-28.36	74	51.92	33.85	12.01	52.14	-	-	P	H
		4824	44.68	-29.32	74	50.96	33.85	12.01	52.14	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

For Simultaneous transmission:

WIFI 802.11g CH01 + LTE Band 41 Link (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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
WIFI 802.11g CH01 + LTE Band 41 Link	*	2389.905	63.78	-10.22	74	54.84	32	9.64	32.7	100	30	P	H
	*	2389.905	49.95	-4.05	54	41.01	32	9.64	32.7	100	30	A	H
		2412	103.84	-	-	94.78	32.1	9.66	32.7	100	30	P	H
		2412	96.41	-	-	87.35	32.1	9.66	32.7	100	30	A	H
	*	2389.38	62.98	-11.02	74	54.04	32	9.64	32.7	168	213	P	V
	*	2389.8	50.75	-3.25	54	41.81	32	9.64	32.7	168	213	A	V
		2412	105.03	-	-	95.97	32.1	9.66	32.7	168	213	P	V
		2412	98.17	-	-	89.11	32.1	9.66	32.7	168	213	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

WIFI 802.11g CH01 + LTE Band 41 Link (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
WIFI 802.11g CH01 + LTE Band 41 Link		4824	44.77	-29.23	74	51.05	33.85	12.01	52.14	-	-	P	H
		4824	45.19	-28.81	74	51.47	33.85	12.01	52.14	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average 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)

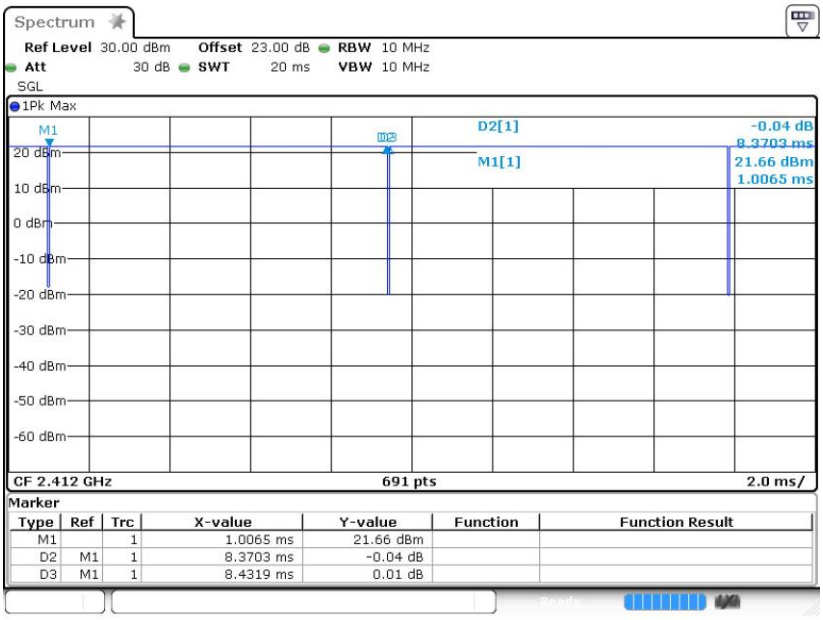
= -10.46(dB)

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

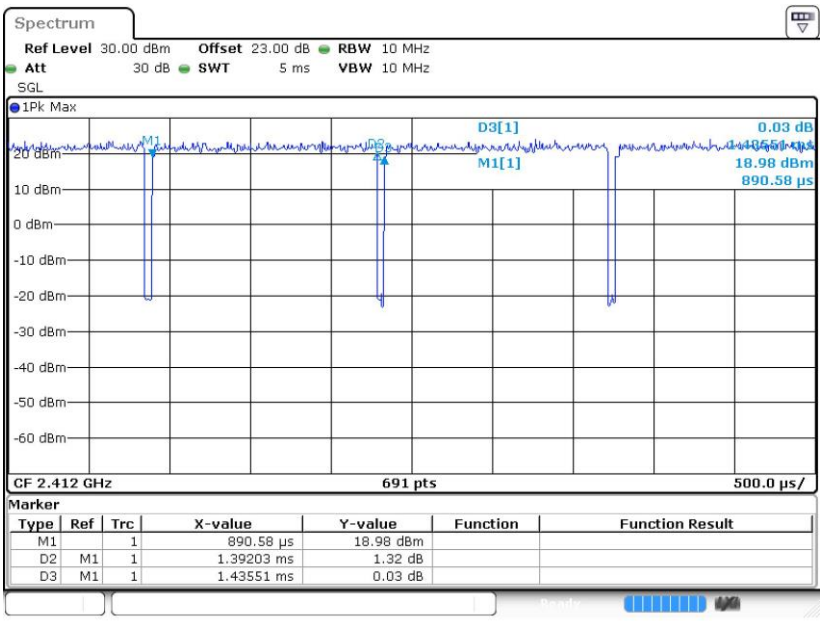
Appendix B. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	99.27	-	-	10Hz
802.11g	96.97	1.392	0.718	1kHz
802.11n HT20	96.78	1.305	0.766	1kHz

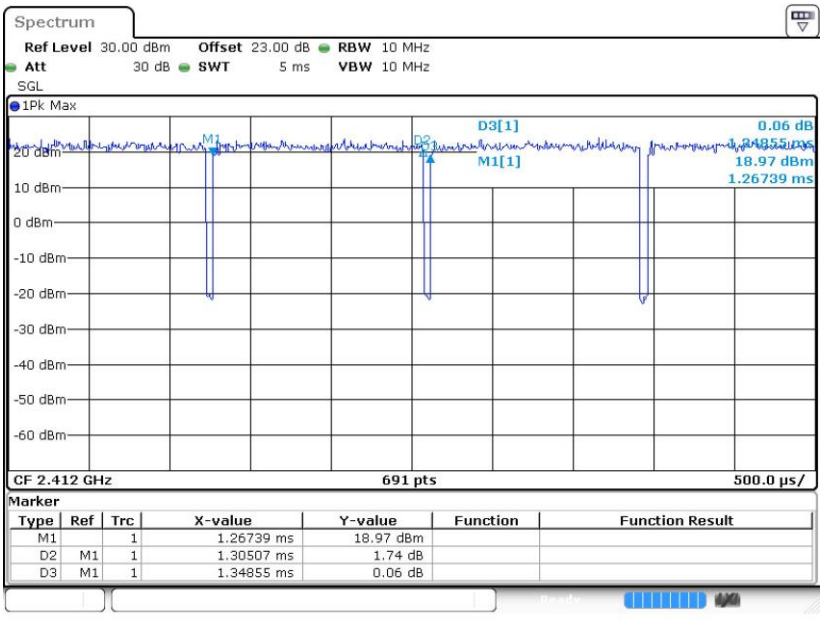
802.11b



802.11g



802.11n HT20



Appendix D. Reference Report

Please refer to Sporton report number 1N1011-01 which is issued separately.