



FCC RF Test Report

APPLICANT : Motorola Mobility LLC
EQUIPMENT : Mobile Cellular Phone
BRAND NAME : Motorola
MODEL NAME : XT1920-16
FCC ID : IHDT56XH1
STANDARD : FCC Part 15 Subpart C § 15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Apr. 12, 2018 and testing was completed on May 26, 2018. 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.

Approved by: James Huang / Manager



Sporton International (Kunshan) Inc.

***No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335
China***



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR841203-01C	Rev. 01	Initial issue of report	Jun. 01, 2018
FR841203-01C	Rev. 02	Added Spot Check Verification Data Section on page 7.	Jun. 05, 2018



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.04 dB at 2389.950 MHz
3.2	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 8.58 dB at 0.189 MHz
3.3	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



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	XT1920-16
FCC ID	IHDT56XH1
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/ HSPA+(16QAM uplink is not supported)/LTE/ WLAN 2.4GHz 802.11b/g/n HT20 Bluetooth v3.0 + EDR/Bluetooth v4.0 LE Bluetooth v4.1 LE/Bluetooth v4.2 LE
IMEI Code	Conduction: 355531090019253/355531090019261 Radiation: 355531090019550/355531090019568
HW Version	DVT2
SW Version	OPG28.25
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



1.4 Modification of EUT

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

1.5 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Antenna Type / Gain	PIFA Antenna with gain -3.40 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.6 Specification of Accessory

Specification of Accessory				
AC Adapter 1(EU)	Brand Name	Motorola (Acbel)	Model Name	C-P57 SPN5948A
	Power Rating	I/P: 100 - 240 Vac, 0.13A,50/60HZ O/P: 5Vdc 1000mA		
AC Adapter 1(UK)	Brand Name	Motorola (Acbel)	Model Name	C-P58 SPN5950A
	Power Rating	I/P: 100 - 240 Vac, 0.13A,50/60HZ O/P: 5Vdc 1000mA		
AC Adapter 2(EU)	Brand Name	Motorola (Chenyang)	Model Name	C-P57 SPN5985A
	Power Rating	I/P: 100 - 240 Vac, 0.13A,50/60HZ O/P: 5Vdc 1000mA		
AC Adapter 2(UK)	Brand Name	Motorola (Chenyang)	Model Name	C-P58 SPN5981A
	Power Rating	I/P: 100 - 240 Vac, 0.13A,50/60HZ O/P: 5Vdc 1000mA		
Battery	Brand Name	Motorola (Amperex)	Model Name	JE30
	Power Rating	3.8Vdc,2000/2120mAh	Type	Li-ion
Earphone 1	Brand Name	Motorola(JuWei)	Model Name	711411000731
	Signal Line Type	1.1 meter, non-shielded cable, without ferrite core		
Earphone 2	Brand Name	Motorola(New Leader)	Model Name	711411000711
	Signal Line Type	1.1 meter, non-shielded cable, without ferrite core		
USB Cable	Brand Name	Motorola (Saibao)	Model Name	711310002261
	Signal Line Type	1.0 meter, non-shielded cable, without ferrite core		



1.7 Re-use of Measured Data

1.7.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: XT1920-16, FCC ID: IHDT56XH1) is electrically identical to the reference device (Model: XT1920-18, XT1920-19, FCC ID: IHDT56XH2) for the portions of the circuitry corresponding to the data being re-used, as treated by KDB Publication 484596 D01.

1.7.2 Difference Section

For details concerning the similarity with respect to component placement, mechanical/electrical design etc., some difference of population/depopulation to enable support of different cellular bands, please refer to the Product Equality Declaration.

The re-used RF data includes the following bands provided in Appendix E (Sporton RF Report No. FR841203C for the reference device Model: XT1920-18, XT1920-19, FCC ID: IHDT56XH2):

1.7.3 Spot Check Verification Data Section

In order to confirm hardware similarity of the subject device with the reference device, spot check measurements were performed on the subject device for Conducted Power based on the judgement of applicant, the test result were consistent with FCC ID: IHDT56XH2, all the conducted test items from the original model are representative for the variant model.

Test Item	Mode	IHDT56XH2 Worst Result	IHDT56XH1 Worst Result	Difference (dB)
Peak Conducted Power (dBm)	802.11b	20.96	20.26	0.70
	802.11g	23.83	23.46	0.37
	802.11n-HT20	23.73	23.33	0.40

1.7.4 Reference detail Section

Equipment Class	Reference FCC ID	Folder Test	Report Title/Section
DTS(WLAN)	IHDT56XH2	15C(FR841203C)	All conducted sections applicable



1.8 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600155-0) and the FCC designation No. is CN5013.

Test Site	Sporton International (Kunshan) Inc.		
Test Site Location	No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.		FCC Test Firm Registration No.
	CO01-KS	03CH03-KS	630927

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

1.9 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
- ♦ ANSI C63.10-2013

Remark:

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

2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

2.1 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		



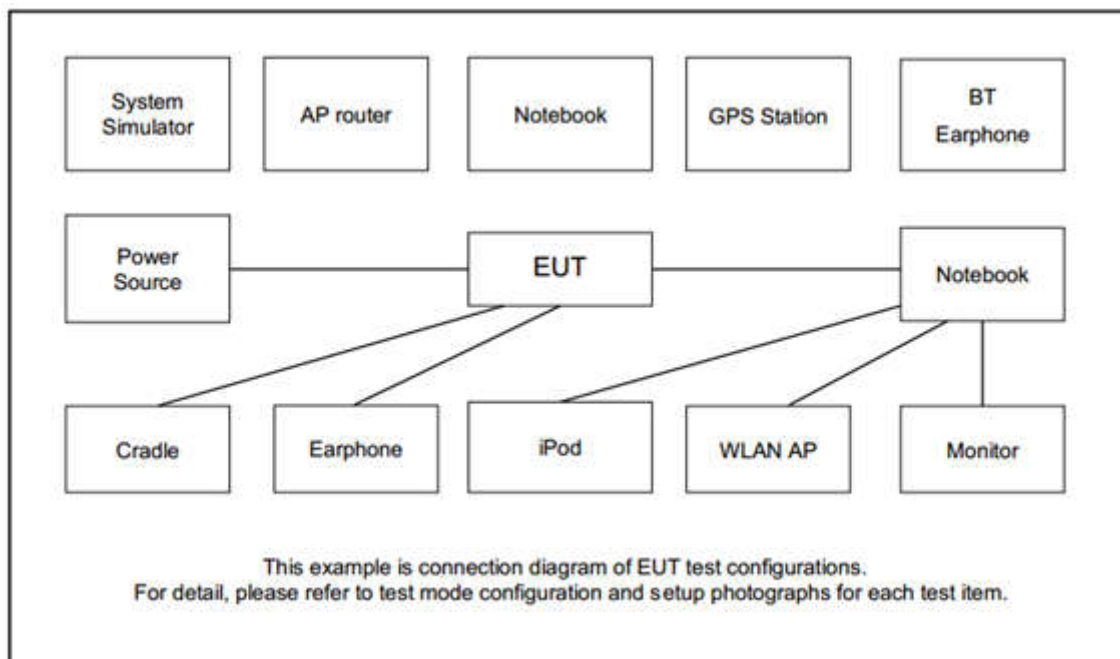
2.2 Test Mode

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

Test Cases	
AC Conducted Emission	Mode 1 :GSM850 Idle + Bluetooth Link + WLAN Link(2.4GHz) + USB Cable (Charging from Adapter 1) + Earphone 1

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8m
3.	Notebook	Lenovo	G480	FCC DoC	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A
5.	SD Card	Kingston	8GB	N/A	N/A	N/A



2.5 EUT Operation Test Setup

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

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

3 Test Result

3.1 Radiated Band Edges and Spurious Emission Measurement

3.1.1 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

3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

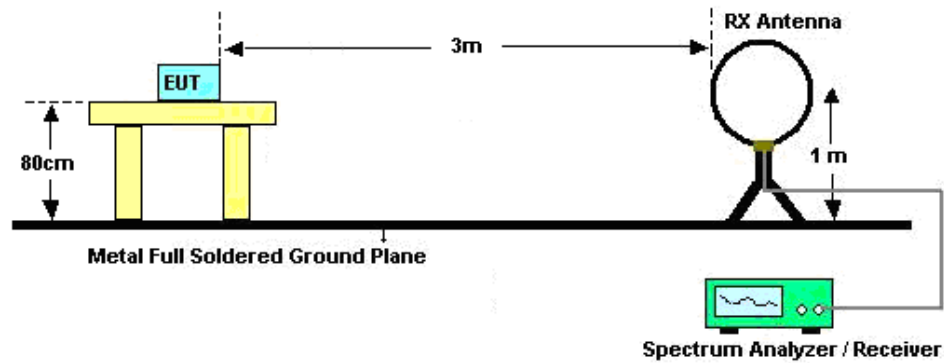
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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 average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
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 $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

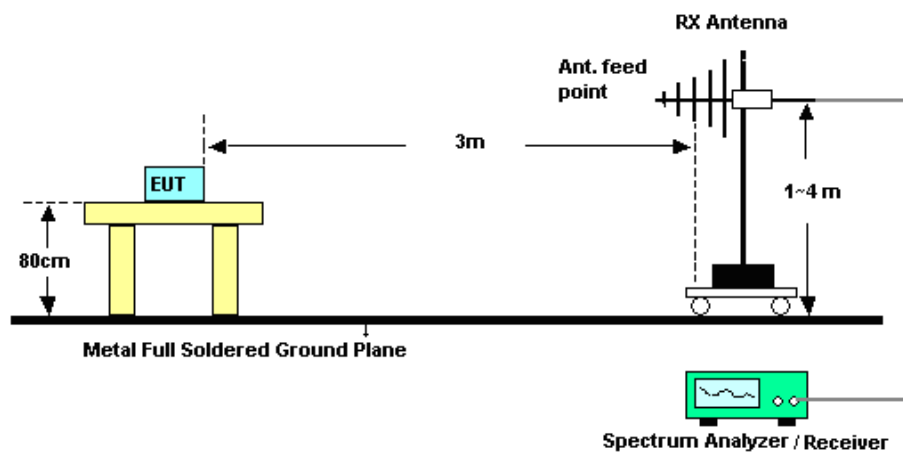
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.1.4 Test Setup

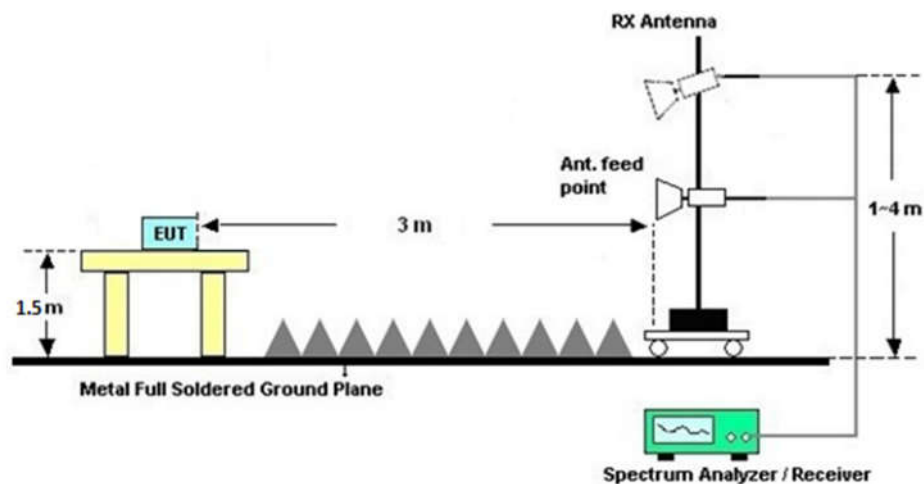
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



**3.1.5 Test Results of Radiated 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.

3.1.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

3.1.7 Duty Cycle

Please refer to Appendix C.

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

Please refer to Appendix B.

3.2 AC Conducted Emission Measurement

3.2.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

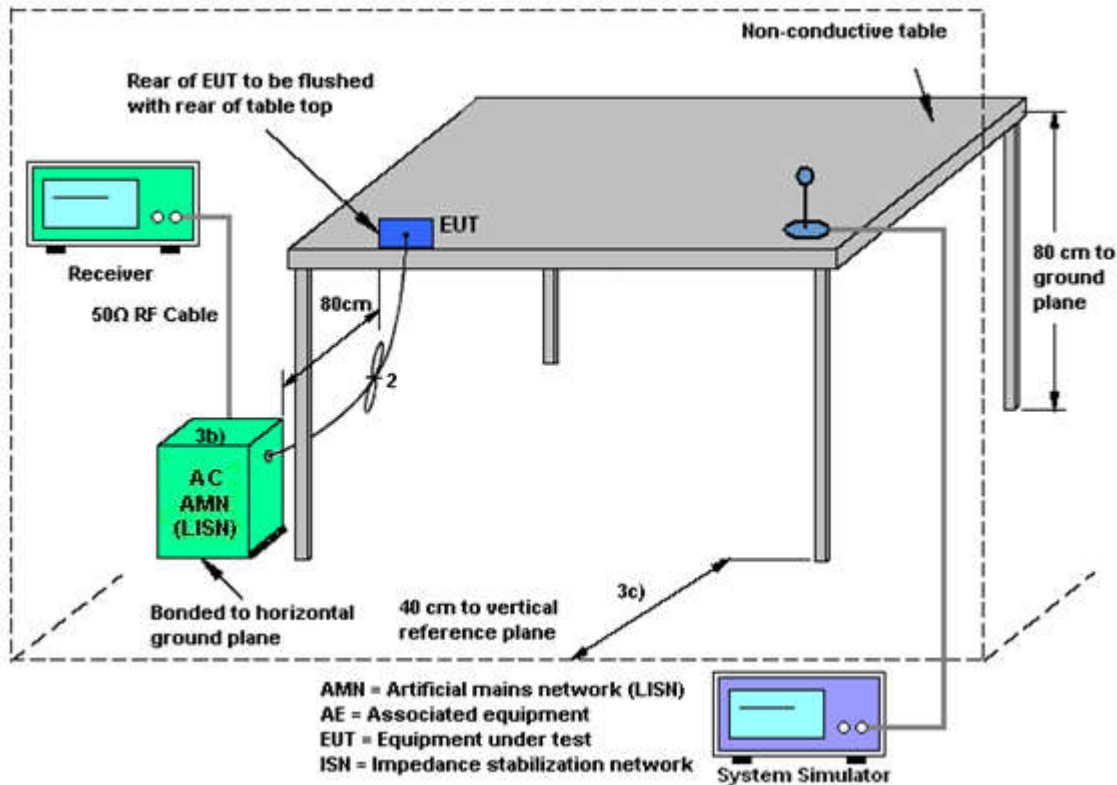
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.

3.2.4 Test Setup



3.2.5 Test Result of AC Conducted Emission

Please refer to Appendix A.



3.3 Antenna Requirements

3.3.1 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.

3.3.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.3.3 Antenna Gain

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



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 19, 2017	May 12, 2018	Oct. 18, 2018	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz~44GHz	Apr. 17, 2018	May 12, 2018	Apr. 16, 2019	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 22, 2017	May 12, 2018	Oct. 21, 2018	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	47610	30MHz~1GHz	Sep. 12, 2017	May 12, 2018	Sep. 11, 2018	Radiation (03CH03-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75959	1GHz~18GHz	Jan. 21, 2018	May 12, 2018	Jan. 20, 2019	Radiation (03CH03-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Feb. 07, 2018	May 12, 2018	Feb. 06, 2019	Radiation (03CH03-KS)
Amplifier	com-power	PA-103A	161069	1MHz~1000MHz / 32 dB	Apr. 17, 2018	May 12, 2018	Apr. 16, 2019	Radiation (03CH03-KS)
Amplifier	MITEQ	TTA1840-35-HG	1887435	18~40GHz	Oct. 12, 2017	May 12, 2018	Oct. 11, 2018	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz~18Ghz	Apr. 17, 2018	May 12, 2018	Apr. 16, 2019	Radiation (03CH03-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Oct. 12, 2017	May 12, 2018	Oct. 11, 2018	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	May 12, 2018	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	May 12, 2018	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	May 12, 2018	NCR	Radiation (03CH03-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 19, 2018	May 26, 2018	Apr. 18, 2019	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2017	May 26, 2018	Oct. 12, 2018	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 13, 2017	May 26, 2018	Oct. 12, 2018	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2017	May 26, 2018	Oct. 11, 2018	Conduction (CO01-KS)

NCR: No Calibration Required



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.9dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.5dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

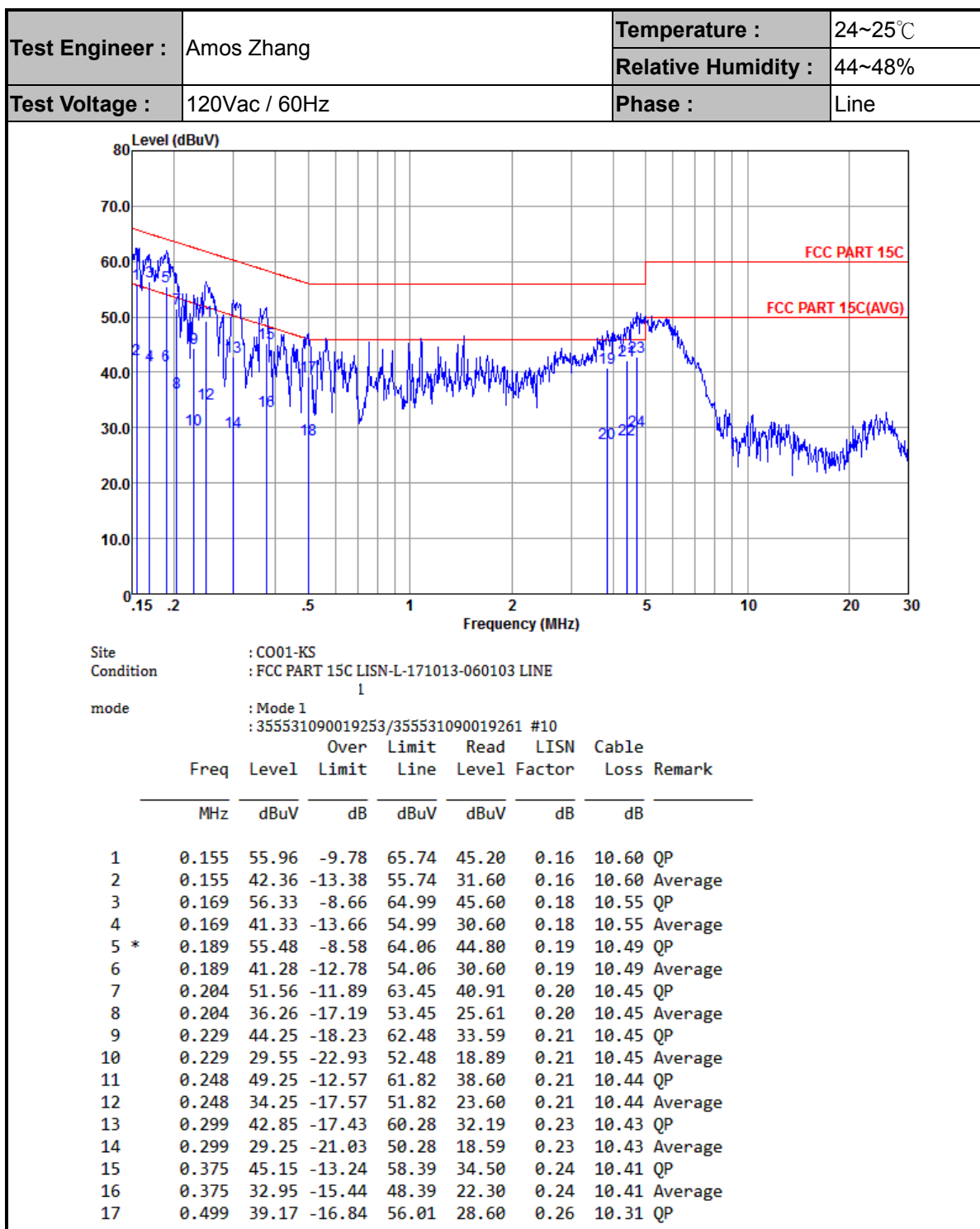
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.1dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.5dB
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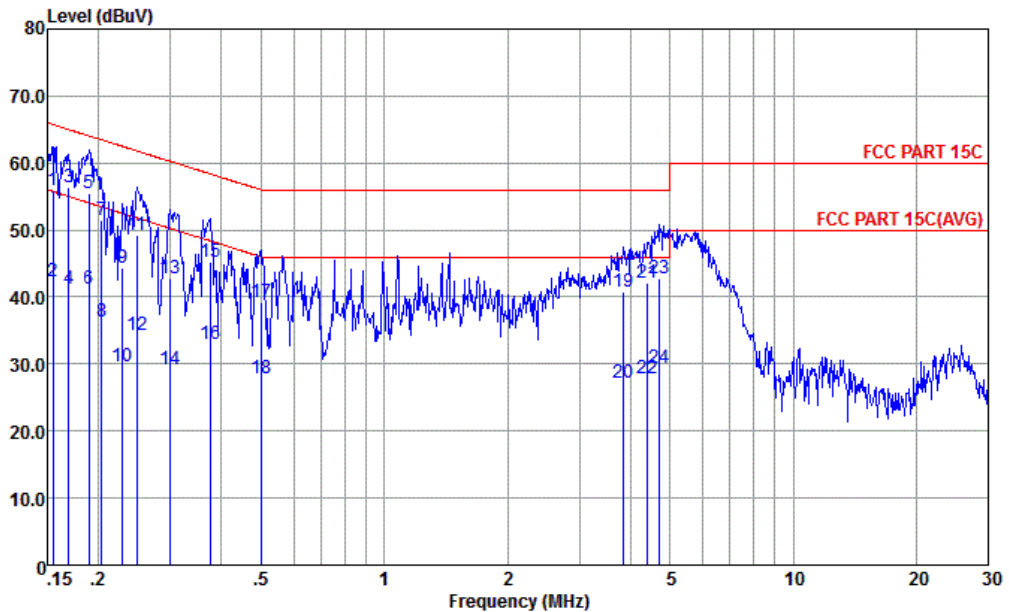


Appendix A. AC Conducted Emission Test Results





Test Engineer :	Amos Zhang	Temperature :	24~25°C
		Relative Humidity :	44~48%
Test Voltage :	120Vac / 60Hz	Phase :	Line



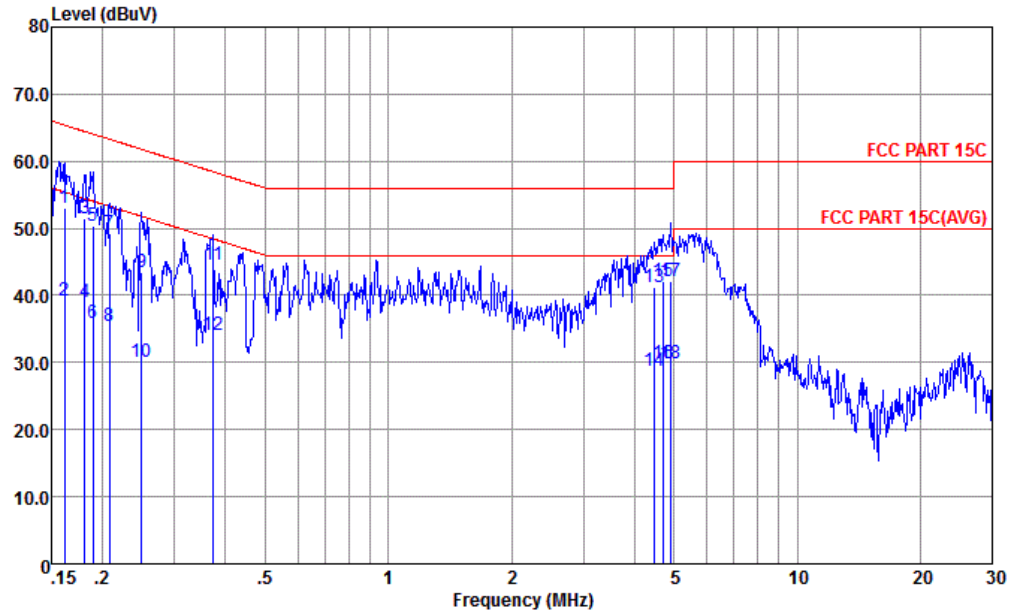
Site : C001-KS
Condition : FCC PART 15C LISN-L-171013-060103 LINE

mode : Mode 1
: 355531090019253/355531090019261 #10

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
18	0.499	27.77	-18.24	46.01	17.20	0.26	10.31	Average
19	3.840	40.81	-15.19	56.00	30.30	0.34	10.17	QP
20	3.840	27.11	-18.89	46.00	16.60	0.34	10.17	Average
21	4.384	42.05	-13.95	56.00	31.50	0.36	10.19	QP
22	4.384	27.75	-18.25	46.00	17.20	0.36	10.19	Average
23	4.721	42.88	-13.12	56.00	32.30	0.36	10.22	QP
24	4.721	29.48	-16.52	46.00	18.90	0.36	10.22	Average



Test Engineer :	Amos Zhang	Temperature :	24~25°C
		Relative Humidity :	44~48%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



Site : CO01-KS
Condition : FCC PART 15C LISN-N-171013-060103 NEUTRAL

mode : Mode 1
: 355531090019253/355531090019261 #10

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1 *	0.162	53.06	-12.32	65.38	42.20	0.28	10.58	QP
2	0.162	39.16	-16.22	55.38	28.30	0.28	10.58	Average
3	0.181	51.39	-13.07	64.46	40.60	0.28	10.51	QP
4	0.181	38.99	-15.47	54.46	28.20	0.28	10.51	Average
5	0.189	50.37	-13.69	64.06	39.60	0.28	10.49	QP
6	0.189	35.97	-18.09	54.06	25.20	0.28	10.49	Average
7	0.208	49.33	-13.94	63.27	38.60	0.28	10.45	QP
8	0.208	35.33	-17.94	53.27	24.60	0.28	10.45	Average
9	0.249	43.52	-18.26	61.78	32.80	0.28	10.44	QP
10	0.249	30.02	-21.76	51.78	19.30	0.28	10.44	Average
11	0.373	44.60	-13.83	58.43	33.90	0.29	10.41	QP
12	0.373	34.00	-14.43	48.43	23.30	0.29	10.41	Average
13	4.454	41.14	-14.86	56.00	30.60	0.34	10.20	QP
14	4.454	28.74	-17.26	46.00	18.20	0.34	10.20	Average
15	4.696	42.05	-13.95	56.00	31.50	0.34	10.21	QP
16	4.696	29.85	-16.15	46.00	19.30	0.34	10.21	Average
17	4.900	42.07	-13.93	56.00	31.50	0.34	10.23	QP
18	4.900	29.87	-16.13	46.00	19.30	0.34	10.23	Average



Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2355.11	58.21	-15.79	74	55.6	31.76	7.52	36.67	311	214	P	H
		2385.92	47.84	-6.16	54	45.1	31.8	7.59	36.65	311	214	A	H
	*	2410	104.38	-	-	101.54	31.86	7.62	36.64	311	214	P	H
	*	2410	101.19	-	-	98.35	31.86	7.62	36.64	311	214	A	H
		2387.22	58.7	-15.3	74	55.96	31.8	7.59	36.65	275	268	P	V
		2387.74	48.7	-5.3	54	45.96	31.8	7.59	36.65	275	268	A	V
	*	2412	108.01	-	-	105.17	31.86	7.62	36.64	275	268	P	V
	*	2410	104.9	-	-	102.06	31.86	7.62	36.64	275	268	A	V
802.11b CH 11 2462MHz	*	2462	106.82	-	-	103.77	32.03	7.69	36.67	261	223	P	H
	*	2460	103.6	-	-	100.55	32.03	7.69	36.67	261	223	A	H
		2487.64	58.78	-15.22	74	55.58	32.14	7.74	36.68	261	223	P	H
		2484.82	47.82	-6.18	54	44.69	32.09	7.72	36.68	261	223	A	H
	*	2462	108.89	-	-	105.84	32.03	7.69	36.67	208	271	P	V
	*	2460	105.68	-	-	102.63	32.03	7.69	36.67	208	271	A	V
		2485.12	58.52	-15.48	74	55.39	32.09	7.72	36.68	208	271	P	V
		2484.52	48.38	-5.62	54	45.25	32.09	7.72	36.68	208	271	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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	39.31	-34.69	74	58.1	34.24	11.5	64.53	100	360	P	H
		4824	39.18	-34.82	74	57.97	34.24	11.5	64.53	100	360	P	V
802.11b CH 06 2437MHz		4872	39.52	-34.48	74	58.25	34.31	11.56	64.6	100	360	P	H
		7308	41.44	-32.56	74	56.68	35.79	13.98	65.01	100	360	P	H
		4872	39.01	-34.99	74	57.74	34.31	11.56	64.6	100	360	P	V
		7308	40.35	-33.65	74	55.59	35.79	13.98	65.01	100	360	P	V
802.11b CH 11 2462MHz		4926	39.45	-34.55	74	58.13	34.38	11.62	64.68	100	360	P	H
		7386	41.1	-32.9	74	56.34	35.84	13.97	65.05	100	360	P	H
		4926	39.45	-34.55	74	58.13	34.38	11.62	64.68	100	360	P	V
		7386	40.82	-33.18	74	56.06	35.84	13.97	65.05	100	360	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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		2388.78	62.93	-11.07	74	62.3	31.8	5.48	36.65	303	44	P	H
		2389.95	49.07	-4.93	54	48.43	31.8	5.48	36.64	303	44	A	H
	*	2408	102.07	-	-	101.34	31.86	5.51	36.64	303	44	P	H
	*	2406	93.17	-	-	92.44	31.86	5.51	36.64	303	44	A	H
		2388.52	68.35	-5.65	74	67.72	31.8	5.48	36.65	153	103	P	V
		2389.95	50.96	-3.04	54	50.32	31.8	5.48	36.64	153	103	A	V
	*	2408	104.82	-	-	104.09	31.86	5.51	36.64	153	103	P	V
	*	2408	96.45	-	-	95.72	31.86	5.51	36.64	153	103	A	V
802.11g CH 11 2462MHz	*	2458	104.41	-	-	101.36	32.03	7.69	36.67	260	224	P	H
	*	2456	96.79	-	-	93.74	32.03	7.69	36.67	260	224	A	H
		2484.82	59.76	-14.24	74	56.63	32.09	7.72	36.68	260	224	P	H
		2483.51	48.31	-5.69	54	45.18	32.09	7.72	36.68	260	224	A	H
	*	2456	106.78	-	-	103.73	32.03	7.69	36.67	302	267	P	V
	*	2456	99.02	-	-	95.97	32.03	7.69	36.67	302	267	A	V
		2483.98	62.57	-11.43	74	59.44	32.09	7.72	36.68	302	267	P	V
		2483.51	48.6	-5.4	54	45.47	32.09	7.72	36.68	302	267	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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	39.27	-34.73	74	58.06	34.24	11.5	64.53	100	360	P	H
		4824	39.75	-34.25	74	58.54	34.24	11.5	64.53	100	360	P	V
802.11g CH 06 2437MHz		4872	39.27	-34.73	74	58	34.31	11.56	64.6	100	360	P	H
		7308	39.93	-34.07	74	55.17	35.79	13.98	65.01	100	360	P	H
		4872	39.4	-34.6	74	58.13	34.31	11.56	64.6	100	360	P	V
		7308	41.81	-32.19	74	57.05	35.79	13.98	65.01	100	360	P	V
802.11g CH 11 2462MHz		4926	39.82	-34.18	74	58.5	34.38	11.62	64.68	100	360	P	H
		7386	41.18	-32.82	74	56.42	35.84	13.97	65.05	100	360	P	H
		4926	38.91	-35.09	74	57.59	34.38	11.62	64.68	100	360	P	V
		7386	40.71	-33.29	74	55.95	35.84	13.97	65.05	100	360	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)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		2389.95	58.59	-15.41	74	55.84	31.8	7.59	36.64	245	224	P	H
		2389.82	48.28	-5.72	54	45.53	31.8	7.59	36.64	245	224	A	H
	*	2408	99.14	-	-	96.3	31.86	7.62	36.64	245	224	P	H
	*	2408	91.29	-	-	88.45	31.86	7.62	36.64	245	224	A	H
		2388.78	62.64	-11.36	74	59.9	31.8	7.59	36.65	275	269	P	V
		2389.69	49.8	-4.2	54	47.06	31.8	7.59	36.65	275	269	A	V
	*	2412	101.68	-	-	98.84	31.86	7.62	36.64	275	269	P	V
	*	2408	93.91	-	-	91.07	31.86	7.62	36.64	275	269	A	V
802.11n HT20 CH 02 2417MHz		2389.82	62	-12	74	59.25	31.8	7.59	36.64	244	223	P	H
		2389.56	48.83	-5.17	54	46.09	31.8	7.59	36.65	244	223	A	H
		2410	103.12	-	-	100.28	31.86	7.62	36.64	244	223	P	H
		2410	95.23	-	-	92.39	31.86	7.62	36.64	244	223	A	H
		2389.04	66.94	-7.06	74	64.2	31.8	7.59	36.65	248	270	P	V
		2389.95	50.48	-3.52	54	47.73	31.8	7.59	36.64	248	270	A	V
		2410	105.13	-	-	102.29	31.86	7.62	36.64	248	270	P	V
		2410	97.22	-	-	94.38	31.86	7.62	36.64	248	270	A	V
802.11n HT20 CH 11 2462MHz	*	2456	102.71	-	-	99.66	32.03	7.69	36.67	261	222	P	H
	*	2458	95.01	-	-	91.96	32.03	7.69	36.67	261	222	A	H
		2483.92	61.55	-12.45	74	58.42	32.09	7.72	36.68	261	222	P	H
		2483.62	48.58	-5.42	54	45.45	32.09	7.72	36.68	261	222	A	H
	*	2456	105.69	-	-	102.64	32.03	7.69	36.67	223	273	P	V
	*	2456	97.81	-	-	94.76	32.03	7.69	36.67	223	273	A	V
		2484.4	62.48	-11.52	74	59.35	32.09	7.72	36.68	223	273	P	V
		2484.16	49.06	-4.94	54	45.93	32.09	7.72	36.68	223	273	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)	Cable 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	39.35	-34.65	74	58.14	34.24	11.5	64.53	100	360	P	H
		4824	39.93	-34.07	74	58.72	34.24	11.5	64.53	100	360	P	V
s802.11n HT20 CH 02 2417MHz		4836	38.95	-35.05	74	57.71	34.27	11.52	64.55	100	360	P	H
		7248	40.42	-33.58	74	55.65	35.76	13.99	64.98	100	360	P	H
		4836	40.57	-33.43	74	59.33	34.27	11.52	64.55	100	360	P	V
		7248	40.62	-33.38	74	55.85	35.76	13.99	64.98	100	360	P	V
802.11n HT20 CH 06 2437MHz		4872	38.91	-35.09	74	57.64	34.31	11.56	64.6	100	360	P	H
		7308	41.36	-32.64	74	56.6	35.79	13.98	65.01	100	360	P	H
		4872	39.14	-34.86	74	57.87	34.31	11.56	64.6	100	360	P	V
		7308	41.01	-32.99	74	56.25	35.79	13.98	65.01	100	360	P	V
802.11n HT20 CH 11 2462MHz		4926	40.11	-33.89	74	58.79	34.38	11.62	64.68	100	360	P	H
		7386	41.38	-32.62	74	56.62	35.84	13.97	65.05	100	360	P	H
		4926	39.64	-34.36	74	58.32	34.38	11.62	64.68	100	360	P	V
		7386	40.72	-33.28	74	55.96	35.84	13.97	65.05	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz WIFI 802.11g (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11g LF		30	25.69	-14.31	40	30.62	26.8	0.56	32.29	100	214	P	H
		39.7	24.56	-15.44	40	32.93	23.2	0.64	32.21	-	-	P	H
		216.24	22.4	-23.6	46	36.01	17.07	1.53	32.21	-	-	P	H
		452.92	25.12	-20.88	46	29.56	25.28	2.22	31.94	-	-	P	H
		700.27	28.18	-17.82	46	29.03	28	2.83	31.68	-	-	P	H
		931.13	29.71	-16.29	46	28.81	29	3.29	31.39	-	-	P	H
		30	30.25	-9.75	40	35.18	26.8	0.56	32.29	-	-	P	V
		40.67	34.3	-5.7	40	43.46	22.4	0.65	32.21	100	25	P	V
		51.34	30.25	-9.75	40	45.73	16.08	0.72	32.28	-	-	P	V
		71.71	22.46	-17.54	40	39.11	14.66	0.88	32.19	-	-	P	V
		89.17	29.41	-14.09	43.5	43.13	17.58	0.96	32.26	-	-	P	V
		323.91	26.75	-19.25	46	36.32	20.61	1.9	32.08	-	-	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	P eak or A verage
H/V	H orizontal or V ertical



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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		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. Level(dBμV/m) =

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

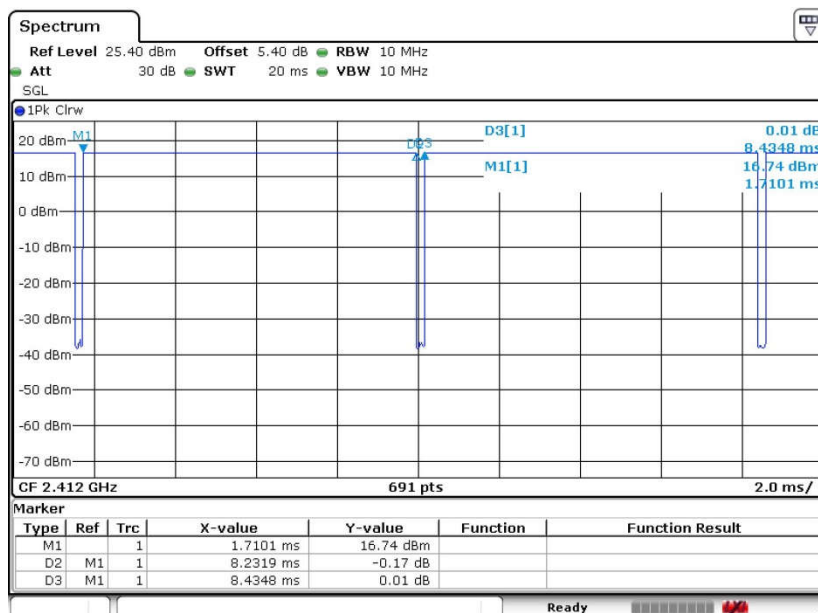
= -10.46(dB)

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

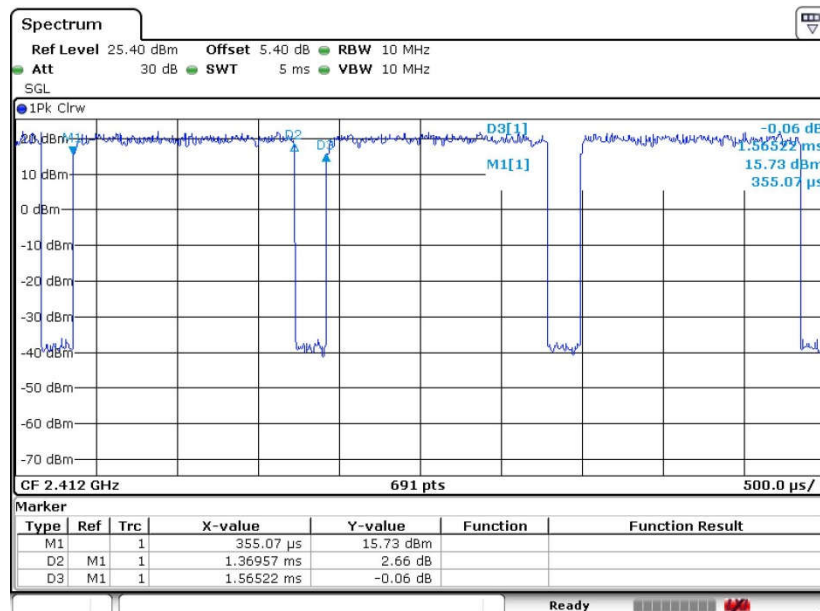
Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
11b	97.59	8.232	0.121	300Hz
11g	87.50	1.370	0.730	1kHz
11n HT20	86.76	1.283	0.780	1kHz

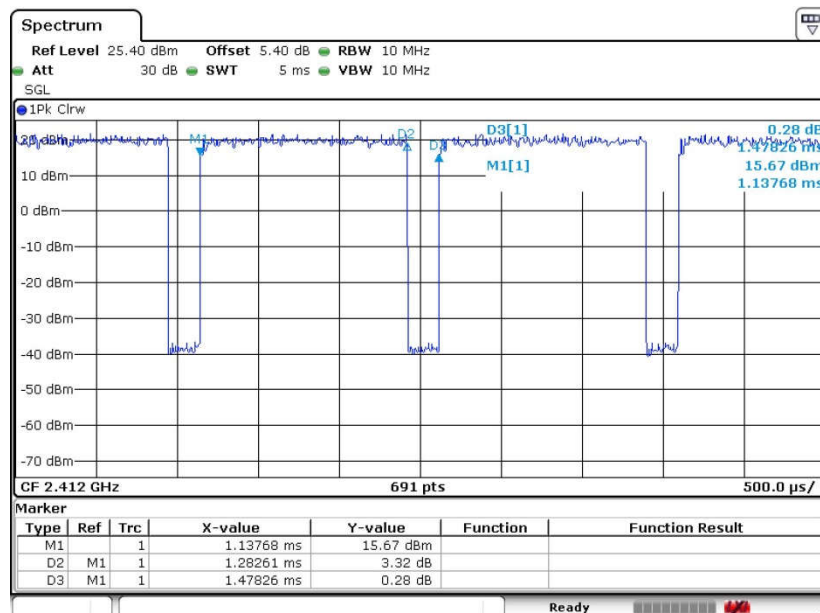
11b



11g



11n HT20





Appendix E. Reference Report

Please refer to Sporton report number FR841203C which is issued separately.