FCC RF Test Report

APPLICANT	:	Acer Incorporated
EQUIPMENT	:	Intel Module
BRAND NAME	:	acer
MODEL NAME	:	7265D2W
MARKETING NAME	:	7265D2W
FCC ID	:	HLZ7265D2
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System

The product was integrated the Notebook Computer (Brand Name: acer, Model Name: N17H2, Marketing Name: SP111-32N) during the test.

The product was received on May 05, 2017 and testing was completed on Jun. 02, 2017. We, SPORTON International (ShenZhen) 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 (ShenZhen) INC., the test report shall not be reproduced except in full.

Prepared by: Eric Shih / Manager

Approved by: Jones Tsai / Manager

Testing Laboratory 2353

SPORTON International (ShenZhen) INC.
1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan District, Shenzhen City, Guangdong Province, China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR750510B	Rev. 01	Initial issue of report	Jun. 20, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
-	15.247(a)(2)	RSS-247 5.2(a)	6dB Bandwidth	≥ 0.5MHz	Pass	1
-	-	RSS-Gen 6.6	99% Bandwidth	-	Pass	1
2.6	15.247(b)(3)	RSS-247 5.4(d)	Peak Output Power	≤ 30dBm	Pass	-
-	15.247(e)	RSS-247 5.2(b)	Power Spectral Density	≤ 8dBm/3kHz	Pass	1
-	15.247(d)	RSS-247 5.5	Conducted Band Edges and Spurious Emission	≤ 20dBc	Pass	1
2.7	15.247(d)	RSS-247 5.5	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 5.61 dB at 17355.000 MHz
2.8	15.207	RSS-GEN 8.8	AC Conducted Emission	15.207(a)	Pass	Under limit 5.77 dB at 0.440 MHz
2.9	15.203 & 15.247(b)	N/A	Antenna Requirement	N/A	Pass	-
Remark 1: All conducted test items were leverage from module RF report which can refer to Report No. "FCC_7265D2W_DTS_Report".						

1 General Description

1.1 Applicant

Acer Incorporated
8F ,88, Sec.1 Xintai 5th Rd. Xizhi, New Taipei City 221, Taiwan, R.O.C

1.2 Manufacturer

Acer Incorporated
8F ,88, Sec.1 Xintai 5th Rd. Xizhi, New Taipei City 221, Taiwan, R.O.C

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Intel Module
Brand Name	acer
Model Name	7265D2W
Marketing Name	7265D2W
FCC ID	HLZ7265D2
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0+EDR/Bluetooth v4.0 LE
HW Version	N/A
SW Version	N/A
EUT Stage	Pre-Production

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 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	40
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)
Maximum Output Power to Antenna	5.04 dBm (0.0032 W)
Antenna Type / Gain	Antenna 2: FPC PIFA Antenna with gain 1.07 dBi
Type of Modulation	Bluetooth LE : GFSK

Host Feature & Specification	
Equipment Name	Notebook Computer
Brand Name	acer
Model Name	N17H2
Marketing Name	SP111-32N
HW	N8101_MB_V3
SW	15063

1.5 Component list

Remark: There are two types of the host, the details refer the following table. According to the difference, we choose sample 1 to perform full test.

Name	Notebook Computer	
	First Source	Second Source
PCB--MB	N8101_mainboard PCB_V3.0 (EAGLE)	N8101_mainboard PCB_V3.0 (WUZHU)
CPU	N4200 (INTEL)	N3350 (INTEL)
EMMC	128G (SANDISK)	64G (Hynix)
Adapter	Adapter is split type (Delta). The US, EU adapter are the same except pin feet.	Adapter is integrated type (Chicony). The US, EU adapter are the same except pin feet.
Camera	6SF009N2 (LITE-ON)	CNFG023 (Chicony)

1.6 Modification of EUT

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

1.7 Testing Location

Test Site	SPORTON International (ShenZhen) INC.	
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan District, Shenzhen City, Guangdong Province, China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595	
Test Site No.	**Sporton Site No.**	
	CO01-SZ	

Test Site	SPORTON International (ShenZhen) INC.	
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755- 3320-2398	
Test Site No.	**Sporton Site No.**	**FCC/IC Registration No.**
	03CH03-SZ	565805/4086F

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

1.8 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
- IC RSS-247 Issue 2
- IC RSS-Gen Issue 4

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

2.1 Descriptions of Test Mode

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 (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration from all possible combinations.

b. AC power line Conducted Emission was tested under maximum output power.

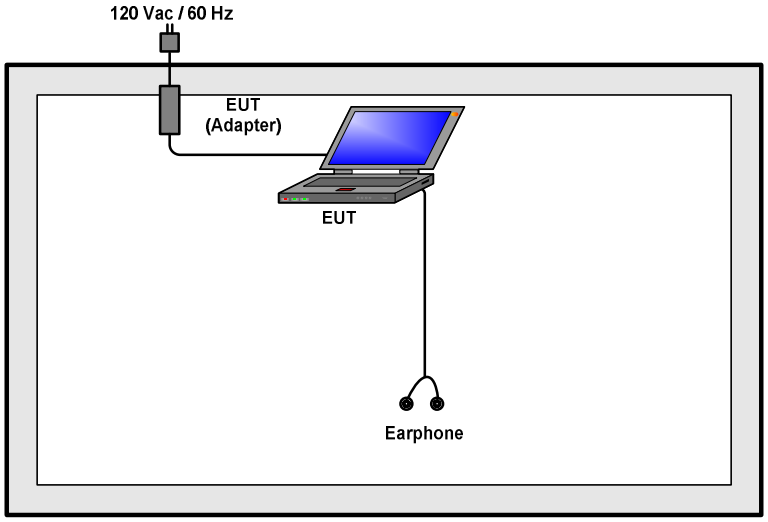
2.2 Test Mode

The following summary table is showing all test modes to demonstrate in compliance with the standard.

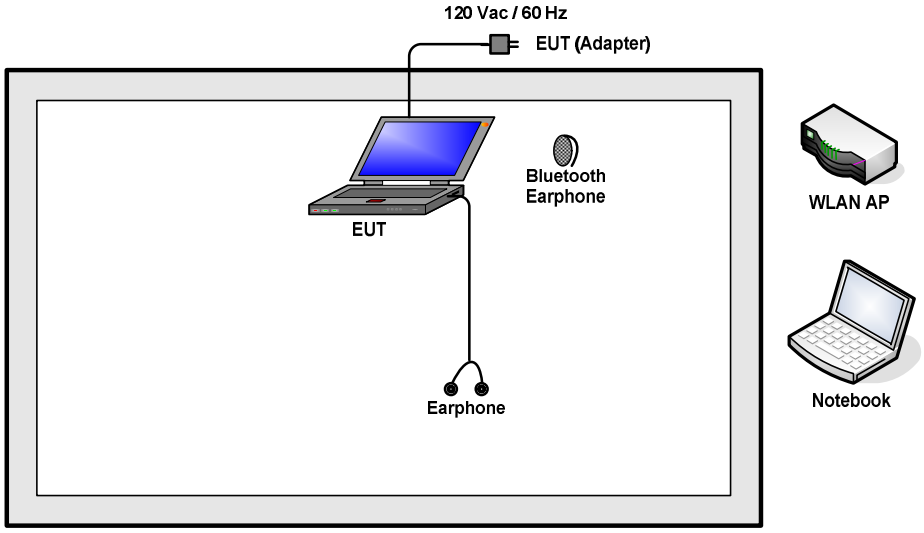
Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
	Bluetooth v4.0 LE / GFSK
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1: Bluetooth Link + WLAN Link + Earphone + Adapter 1 Mode 2: **Bluetooth Link + WLAN Link + Earphone + Adapter 2**
Remark: The worst case of conducted emission is mode 2; only the test data of it was reported.	

2.3 Connection Diagram of Test System

<Bluetooth v4.0 LE Tx Mode>



<AC Conducted Emission Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	Dlink	DIR-820L	KA2IR820LA1	N/A	Unshielded, 1.8 m
2.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Bluetooth Earphone	Nokia	BH-108	PYAHS-107W	N/A	N/A
4.	Earphone	Lenovo	LH102	N/A	Unshielded,1.2m	N/A
5.	SD Card	SanDisk	4G class 4	FCC DoC	N/A	N/A
6.	iPod Earphone	Apple	MC690ZP/A	FCC DoC	Unshielded,1.6m	N/A

2.5 EUT Operation Test Setup

For Bluetooth v4.0 LE function, the 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.

2.6 Peak Output Power Measurement

2.6.1 Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of 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.

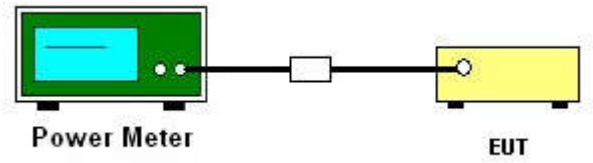
2.6.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

2.6.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04 section 9.1.2 PKPM1 Peak power meter 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.

2.6.4 Test Setup



2.6.5 Test Result of Peak Output Power

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	Pass /Fail
							Ant 2	
BLE	1Mbps	1	0	2402	4.96	30.00	1.07	Pass
BLE	1Mbps	1	19	2440	5.04	30.00	1.07	Pass
BLE	1Mbps	1	39	2480	4.83	30.00	1.07	Pass

2.7 Radiated Band Edges and Spurious Emission Measurement

2.7.1 Limit of Radiated Band Edges and Spurious Emission

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

2.7.2 Measuring Instruments

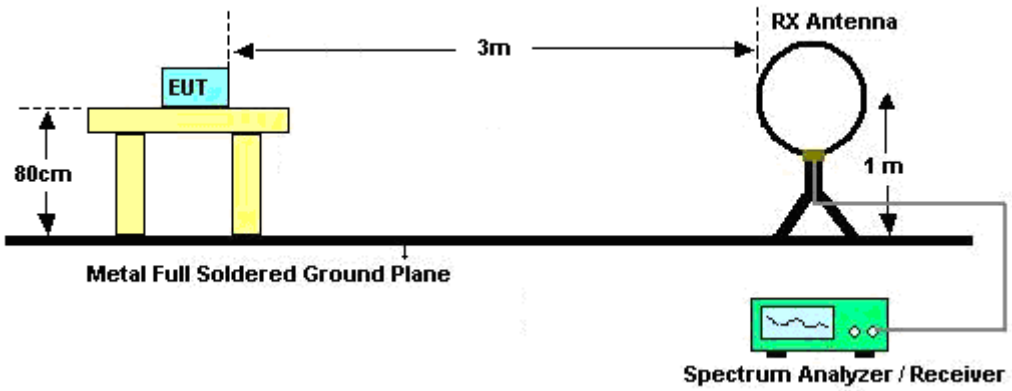
The section 4.0 of List of Measuring Equipment of this test report is used for test.

2.7.3 Test Procedures

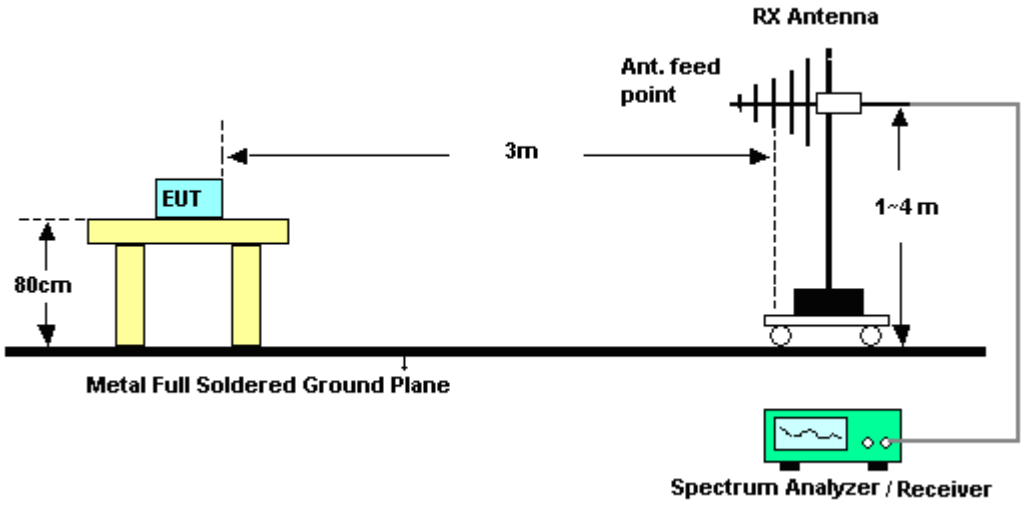
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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 measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. 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.

2.7.4 Test Setup

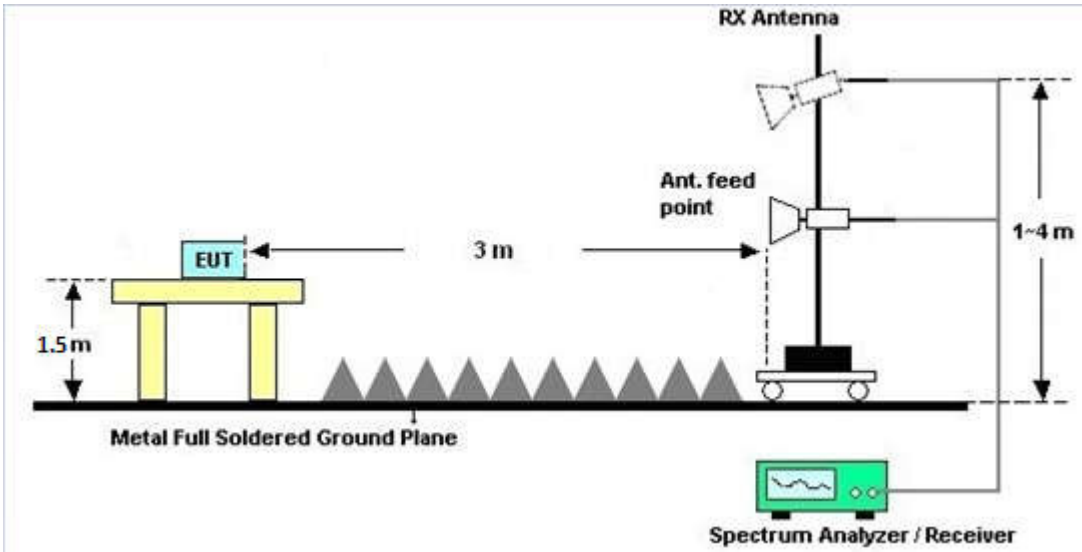
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



2.7.5 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.

2.7.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

2.7.7 Duty Cycle

Please refer to Appendix B.

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

Please refer to Appendix A.

2.7.9 Test Result of Radiated Spurious Emission (Simultaneous TX)

Please refer to Appendix A.

Note: The worst case of Single TX mode from BT3.0/BLE/WLAN2.4GHz/WLAN5GHz is evaluated for Simultaneous TX mode.

2.8 AC Conducted Emission Measurement

2.8.1 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 (dBμV)	
	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.

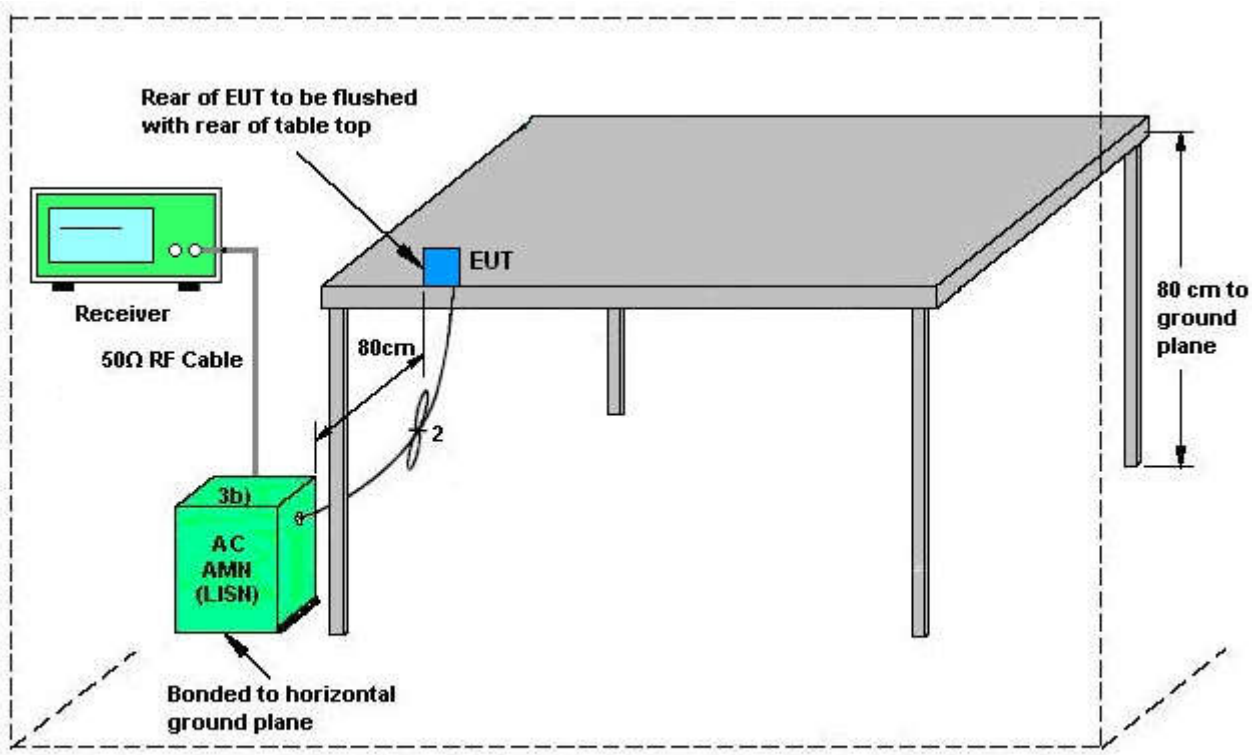
2.8.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

2.8.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room 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. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

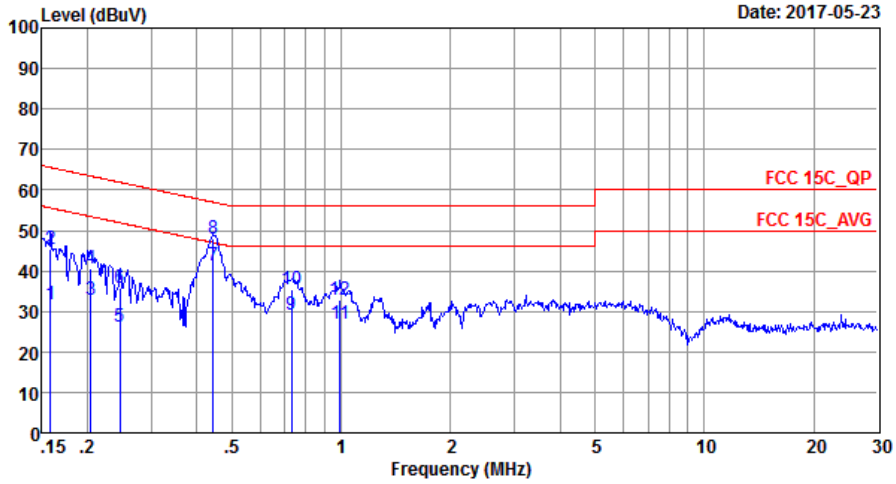
2.8.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

2.8.5 Test Result of AC Conducted Emission

Test Mode :	Mode 2	**Temperature :**	21~23℃
Test Engineer :	Tao Cheng	**Relative Humidity :**	41~42%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	Bluetooth Link + WLAN Link + Earphone + Adapter 2		

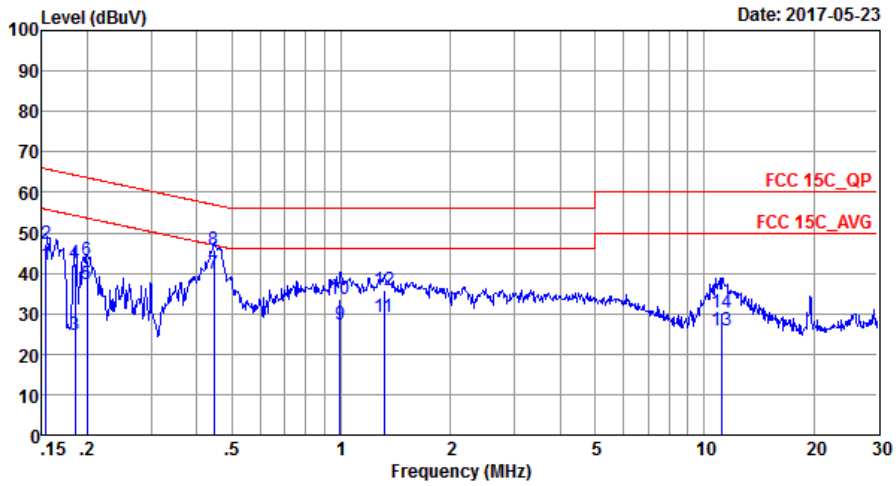


Site : CO01-SZ
Condition: FCC 15C_QP LISN_20170301_L LINE

Mode : Mode 2

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.16	31.80	-23.76	55.56	21.40	0.03	10.37	Average
2		0.16	45.30	-20.26	65.56	34.90	0.03	10.37	QP
3		0.20	32.75	-20.70	53.45	22.50	0.03	10.22	Average
4		0.20	40.55	-22.90	63.45	30.30	0.03	10.22	QP
5		0.25	26.05	-25.86	51.91	15.80	0.03	10.22	Average
6		0.25	35.65	-26.26	61.91	25.40	0.03	10.22	QP
7	*	0.44	41.21	-5.77	46.98	30.99	0.03	10.19	Average
8		0.44	48.01	-8.97	56.98	37.79	0.03	10.19	QP
9		0.73	29.09	-16.91	46.00	18.90	0.03	10.16	Average
10		0.73	35.39	-20.61	56.00	25.20	0.03	10.16	QP
11		0.99	26.82	-19.18	46.00	16.60	0.07	10.15	Average
12		0.99	32.82	-23.18	56.00	22.60	0.07	10.15	QP

Test Mode :	Mode 2	Temperature :	21~23℃
Test Engineer :	Tao Cheng	Relative Humidity :	41~42%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link + Earphone + Adapter 2		



Site : CO01-SZ
Condition: FCC 15C_QP LISN_20170301_N NEUTRAL

Mode : Mode 2

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.15	42.12	-13.66	55.78	31.70	0.03	10.39	Average
2		0.15	47.22	-18.56	65.78	36.80	0.03	10.39	QP
3		0.19	24.80	-29.44	54.24	14.50	0.03	10.27	Average
4		0.19	42.40	-21.84	64.24	32.10	0.03	10.27	QP
5		0.20	37.45	-16.17	53.62	27.20	0.03	10.22	Average
6		0.20	43.25	-20.37	63.62	33.00	0.03	10.22	QP
7	*	0.45	39.81	-7.12	46.93	29.60	0.02	10.19	Average
8		0.45	45.81	-11.12	56.93	35.60	0.02	10.19	QP
9		0.99	27.20	-18.80	46.00	17.00	0.05	10.15	Average
10		0.99	33.40	-22.60	56.00	23.20	0.05	10.15	QP
11		1.31	29.00	-17.00	46.00	18.80	0.05	10.15	Average
12		1.31	35.70	-20.30	56.00	25.50	0.05	10.15	QP
13		11.20	25.76	-24.24	50.00	15.20	0.21	10.35	Average
14		11.20	30.36	-29.64	60.00	19.80	0.21	10.35	QP

2.9 Antenna Requirements

2.9.1 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.

2.9.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

2.9.3 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.

3 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	Aug. 09, 2016	May 10, 2017	Aug. 08, 2017	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 06, 2017	May 10, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 06, 2017	May 10, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	Apr. 20, 2017	May 18, 2017~ Jun. 02, 2017	Apr.19, 2018	Radiation (03CH03-SZ)
EXA Spectrum Anaiyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz;	Apr. 20, 2017	May 18, 2017~ Jun. 02, 2017	Apr.19, 2018	Radiation (03CH03-SZ
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 14, 2017	May 18, 2017~ Jun. 02, 2017	May 13, 2018	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz-2GHz	May 14, 2017	May 18, 2017~ Jun. 02, 2017	May 13, 2018	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	May 07, 2017	May 18, 2017~ Jun. 02, 2017	May 06, 2018	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Aug.10, 2016	May 18, 2017~ Jun. 02, 2017	Aug. 09, 2017	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102210	0.01Hz ~3000MHz	Oct. 11, 2016	May 18, 2017~ Jun. 02, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 11, 2016	May 18, 2017~ Jun. 02, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 06, 2017	May 18, 2017~ Jun. 02, 2017	Jan. 05, 2018	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	May 18, 2017~ Jun. 02, 2017	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	May 18, 2017~ Jun. 02, 2017	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	May 18, 2017~ Jun. 02, 2017	NCR	Radiation (03CH03-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jan. 06, 2017	May 23, 2017	Jan. 05, 2018	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103892	9kHz~30MHz	Jan. 05, 2017	May 23, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	MessTec	3816/2SH	00103912	9kHz~30MHz	Jan. 05, 2017	May 23, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 16, 2016	May 23, 2017	Jul. 15, 2017	Conduction (CO01-SZ)
Pulse Limiter	COM-POWER	LIT-153 Transient Limiter	53139	150kHz~30MHz	Oct. 11, 2016	May 23, 2017	Oct. 10, 2017	Conduction (CO01-SZ)

NCR: No Calibration Required

4 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.5dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1dB

Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

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

Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

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

Appendix A. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	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)
BLE CH 00 2402MHz		2343.6	47.5	-26.50	74	49.45	27.31	4.98	34.24	250	226	P	H
		2384.655	38.62	-15.38	54	40.34	27.44	5.06	34.22	250	226	A	H
	*	2402	88.39	-	-	90.02	27.51	5.06	34.2	250	226	P	H
	*	2402	87.86	-	-	89.49	27.51	5.06	34.2	250	226	A	H
		2384.865	47.99	-26.01	74	49.71	27.44	5.06	34.22	151	261	P	V
		2380.875	38.52	-15.48	54	40.28	27.44	5.02	34.22	151	261	A	V
	*	2402	81.78	-	-	83.41	27.51	5.06	34.2	151	261	P	V
	*	2402	80.92	-	-	82.55	27.51	5.06	34.2	151	261	A	V
BLE CH 19 2440MHz		2358.72	47.93	-26.07	74	49.77	27.38	5.02	34.24	243	226	P	H
		2380.42	38.8	-15.20	54	40.56	27.44	5.02	34.22	243	226	A	H
	*	2440	91.51	-	-	92.87	27.7	5.12	34.18	243	226	P	H
	*	2440	91.03	-	-	92.39	27.7	5.12	34.18	243	226	A	H
		2494.4	48.39	-25.61	74	49.41	27.9	5.19	34.11	243	226	P	H
		2491.39	39.35	-14.65	54	40.39	27.9	5.19	34.13	243	226	A	H
		2314.9	47.63	-26.37	74	49.73	27.18	4.98	34.26	152	261	P	V
		2371.74	38.68	-15.32	54	40.44	27.44	5.02	34.22	152	261	A	V
	*	2440	84.63	-	-	85.99	27.7	5.12	34.18	152	261	P	V
	*	2440	84.27	-	-	85.63	27.7	5.12	34.18	152	261	A	V
		2498.18	48.23	-25.77	74	49.25	27.9	5.19	34.11	152	261	P	V
		2492.65	39.15	-14.85	54	40.17	27.9	5.19	34.11	152	261	A	V

BLE CH 39 2480MHz	*	2480	88.66	-	-	89.77	27.83	5.19	34.13	171	305	P	H
	*	2480	88.07	-	-	89.18	27.83	5.19	34.13	171	305	A	H
		2484.88	50.92	-23.08	74	52.03	27.83	5.19	34.13	171	305	P	H
		2484.88	44.26	-9.74	54	45.37	27.83	5.19	34.13	171	305	A	H
	*	2480	84.74	-	-	85.85	27.83	5.19	34.13	152	258	P	V
	*	2480	84.01	-	-	85.12	27.83	5.19	34.13	152	258	A	V
		2484.96	48.65	-25.35	74	49.76	27.83	5.19	34.13	152	258	P	V
		2484.88	41.48	-12.52	54	42.59	27.83	5.19	34.13	152	258	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE Ant. 2	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)
BLE CH 00 2402MHz		4804	39.95	-34.05	74	58.16	31.54	8.59	58.34	250	0	P	H
		4804	40.62	-33.38	74	58.83	31.54	8.59	58.34	250	0	P	V
BLE CH 19 2440MHz		4880	39.67	-34.33	74	57.69	31.71	8.6	58.33	250	0	P	H
		7320	45.97	-28.03	74	58.85	36.29	10.24	59.41	250	0	P	H
		4880	39.55	-34.45	74	57.57	31.71	8.6	58.33	250	0	P	V
		7320	45.18	-28.82	74	58.06	36.29	10.24	59.41	250	0	P	V
BLE CH 39 2480MHz		4960	40.62	-33.38	74	58.37	31.92	8.65	58.32	250	0	P	H
		7440	46.09	-27.91	74	58.87	36.44	10.25	59.47	250	0	P	H
		4960	40.7	-33.30	74	58.45	31.92	8.65	58.32	250	0	P	V
		7440	44.74	-29.26	74	57.52	36.44	10.25	59.47	250	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Simultaneous TX mode:

WIFI Ant. 1+2	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)
		4824	40.72	-33.28	74	58.88	31.59	8.59	58.34	250	0	P	H
		4960	40.08	-33.92	74	57.83	31.92	8.65	58.32	250	0	P	H
		7236	45.83	-28.17	74	58.73	36.19	10.27	59.36	250	0	P	H
BLE CH39		7440	45.36	-28.64	74	58.14	36.44	10.25	59.47	250	0	P	H
+11b CH01		4824	42.78	-31.22	74	60.94	31.59	8.59	58.34	250	0	P	V
		4960	39.73	-34.27	74	57.48	31.92	8.65	58.32	250	0	P	V
		7236	45.81	-28.19	74	58.71	36.19	10.27	59.36	250	0	P	V
		7440	45.01	-28.99	74	57.79	36.44	10.25	59.47	250	0	P	V
		4960	39.23	-34.77	74	56.98	31.92	8.65	58.32	150	360	P	H
		7440	44.31	-29.69	74	57.09	36.44	10.25	59.47	150	360	P	H
		11060	48.28	-25.72	74	56.23	39.82	11.89	59.66	150	0	P	H
BLE CH39		16590	46.4	-27.6	74	54.09	38.88	14.48	61.05	150	0	P	H
+5G CH106		4960	38.93	-35.07	74	56.68	31.92	8.65	58.32	150	360	P	V
		7440	44.44	-29.56	74	57.22	36.44	10.25	59.47	150	360	P	V
		11060	48.42	-25.58	74	56.37	39.82	11.89	59.66	150	0	P	V
		16590	46.31	-27.69	74	54	38.88	14.48	61.05	150	0	P	V
		4960	39.63	-34.37	74	57.38	31.92	8.65	58.32	150	360	P	H
		7440	44.58	-29.42	74	57.36	36.44	10.25	59.47	150	360	P	H
		11570	47.96	-26.04	74	56.3	39.24	12.07	59.65	175	198	P	H
		17355	50.96	-23.04	74	53.79	42.37	14.9	60.1	189	185	P	H
BLE CH39		4960	39.7	-34.3	74	57.45	31.92	8.65	58.32	150	360	P	V
+5G CH157		7440	44.47	-29.53	74	57.25	36.44	10.25	59.47	150	360	P	V
		11570	48.22	-25.78	74	56.56	39.24	12.07	59.65	175	198	P	V
		17355	51.38	-22.62	74	54.21	42.37	14.9	60.1	189	185	P	V
		17355	48.39	-5.61	54	51.22	42.37	14.9	60.1	189	185	A	V
Remark	3. No other spurious found. 4. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BLE LF		30.97	25.96	-14.04	40	31.11	26.28	0.57	32	-	-	P	H
		91.11	27.26	-16.24	43.5	40.15	17.9	0.98	31.77	-	-	P	H
		300.63	29.13	-16.87	46	39.55	19.12	1.82	31.36	-	-	P	H
		376.29	32.11	-13.89	46	37.96	23.36	2.05	31.26	-	-	P	H
		414.12	34.08	-11.92	46	37.47	25.68	2.16	31.23	155	120	P	H
		946.65	34.02	-11.98	46	32.48	29.35	3.39	31.2	-	-	P	H
		31.94	30.78	-9.22	40	36.33	25.86	0.59	32	130	200	P	V
		39.7	30.57	-9.43	40	39.41	22.5	0.65	31.99	-	-	P	V
		84.32	28.24	-11.76	40	42.68	16.44	0.95	31.83	-	-	P	V
		213.33	21.67	-21.83	43.5	35.25	16.25	1.52	31.35	-	-	P	V
		414.12	30.82	-15.18	46	34.21	25.68	2.16	31.23	-	-	P	V
		996.12	33.88	-20.12	54	31.33	30.32	3.47	31.24	-	-	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.	
1+2		(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. 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 B. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth v4.0 LE	63.19	0.388	2.577	3kHz

Bluetooth v4.0 LE