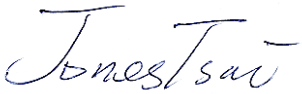
FCC RF Test Report

APPLICANT	:	FUJITSU LIMITED
EQUIPMENT	:	LIFEBOOK T series
BRAND NAME	:	FUJITSU
MODEL NAME	:	T937
FCC ID	:	EJE-WB0101
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter

This is a partial report which is included the RF conducted power and radiated emission test items. The product was received on Oct. 14, 2016 and testing was completed on Dec. 19, 2016. We, SPORTON INTERNATIONAL 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 INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager

SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR6O1408A	Rev. 01	Initial issue of report	Dec. 08, 2016
FR6O1408A	Rev. 02	Adding conducted emission data and describe the use of Low power SKU in section 3.1.5.	Dec. 19, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(b)(1)	Peak Output Power	≤ 125 mW	Pass	-
3.2	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 1.80 dB at 311.900 MHz for Quasi-Peak
3.3	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 14.30 dB at 0.190 MHz
3.4	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

FUJITSU LIMITED

1-1, Kamikonadaka 4-chome, Nakahara-ku, Kawasaki, 211-8588 Japan

1.2 Manufacturer

FUJITSU LIMITED

1-1, Kamikonadaka 4-chome, Nakahara-ku, Kawasaki, 211-8588 Japan

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	LIFEBOOK T series
Brand Name	FUJITSU
Model Name	T937
FCC ID	EJE-WB0101
Integrated the WLAN Module	Brand Name: Intel Model Name: 8265NGW FCC ID: PD98265NG, PD98265NGU
EUT supports Radios application	WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
EUT Stage	Pre-Production Unit

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	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	Bluetooth BR(1Mbps) : 10.15 dBm (0.0104 W) Bluetooth EDR (2Mbps) : 8.63 dBm (0.0073 W) Bluetooth EDR (3Mbps) : 8.12 dBm (0.0065 W)
Antenna Type / Gain	PIFA Antenna type with gain -0.56 dBi
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) :π/4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK

1.5 Modification of EUT

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

1.6 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	**Sporton Site No.**	
	TH05-HY	CO05-HY

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

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	03CH13-HY

Note: The test site complies with ANSI C63.4 2009 requirement.

1.7 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
- ANSI C63.10-2013

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

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

Preliminary tests were performed in different data rates and recorded the RF output power in the following table:

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	10.04 dBm	8.42 dBm	7.94 dBm
Ch39	2441MHz	**10.15 dBm**	8.63 dBm	8.12 dBm
Ch78	2480MHz	9.91 dBm	8.35 dBm	7.92 dBm

Remark:

1. All the test data for each data rate were verified, but only the worst case was reported.
2. The data rate was set in 1Mbps for all the test items due to the highest RF output power.

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 (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).The worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.

2.2 Test Mode

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

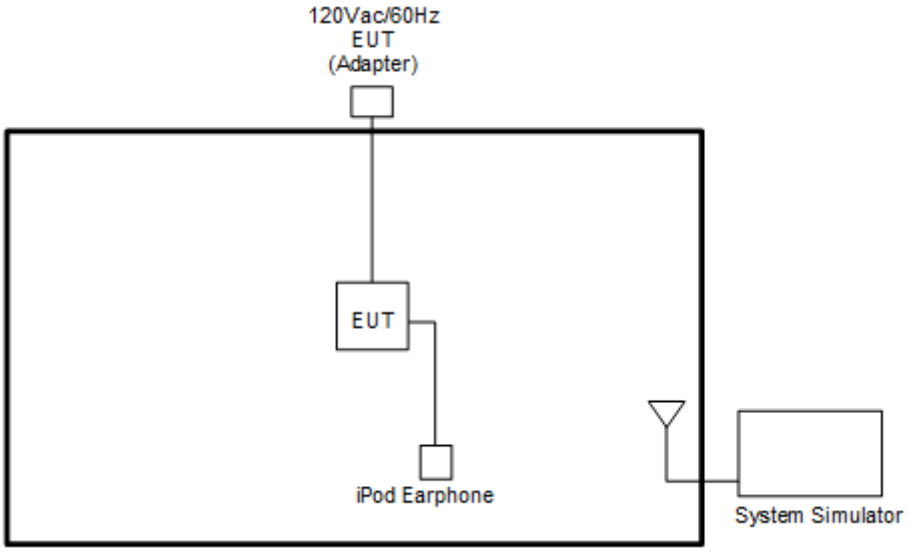
Summary table of Test Cases			
Test Item	Data Rate / Modulation		
	Bluetooth BR 1Mbps GFSK	Bluetooth EDR 2Mbps π/4-DQPSK	Bluetooth EDR 3Mbps 8-DPSK
Radiated Test Cases	Bluetooth BR 1Mbps GFSK		
	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz		
AC Conducted Emission	Mode 1 :WLAN (2.4GHz) Link + Bluetooth Link + TC + TF		

Remark:

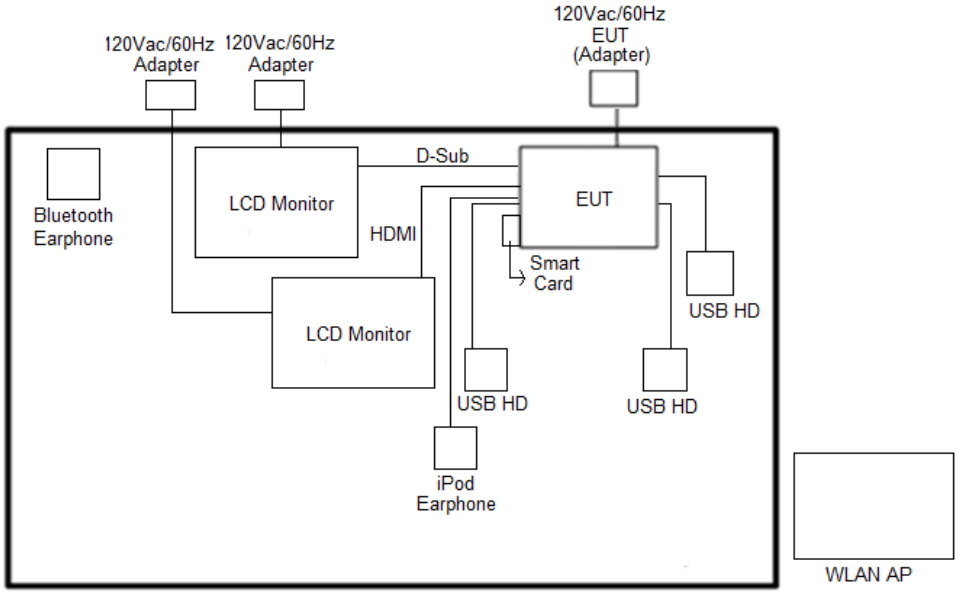
1. For radiated test cases, the worst mode data rate 1Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and the conducted spurious emissions and conducted band edge measurement for each data rate are no worse than 1Mbps, and no other significantly frequencies found in conducted spurious emission.
2. TC stands for Test Configuration, and consists of Adapter, USB HD, SD Card, Smart Card (Load), Earphone, D-sub and HDMI Cable.
3. TF stands for Test Configuration, and consists of MPEG4, Camera, and H Pattern.
4. HDMI Cable means media application transferred between EUT and external display.

2.3 Connection Diagram of Test System

<Bluetooth 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.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
4.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
5.	LCD Monitor	DELL	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
6.	USB HD	PQI	H568V	FCC DoC	Shielded, 0.5 m	N/A
7.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
8.	Smart Card	N/A	N/A	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For Bluetooth function, the RF utility, “DRTU.exe” was installed in EUT which was programmed in order to make the EUT get into the engineering modes to contact with Bluetooth base station for continuous transmitting and receiving signals.

3 Test Result

3.1 Peak Output Power Measurement

3.1.1 Limit of Peak Output Power

Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts. The power limit for 1Mbps, 2Mbps, 3Mbps and AFH modes are 0.125 watts.

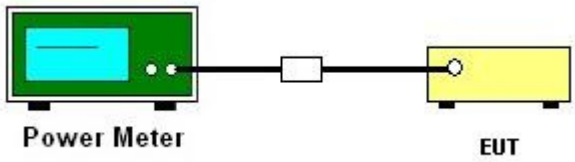
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.5.
1. 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.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Measure the conducted output power with cable loss and record the results in the test report.
4. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Peak Output Power

The host integrated a 8265NGW module, FCC ID: PD98265NG, which has 2 SKUs. The original power SKU is certified by certification body and the data was performed in the original test report. The second one is low power SKU which also has the same FCC ID, and the result of power table performed below is measuring with the host integrated with the low power SKU module.

Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Aking Chang	Relative Humidity :	48~51%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	10.04	20.97	Pass
39	2441	10.15	20.97	Pass
78	2480	9.91	20.97	Pass

Note: For AFH mode using 20 hopping channels, the maximum output power limit is 20.97dBm.

Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Aking Chang	Relative Humidity :	48~51%

Channel	Frequency (MHz)	RF Power (dBm)		
		π/4-DQPSK	Max. Limits (dBm)	Pass/Fail
		2 Mbps		
00	2402	8.42	20.97	Pass
39	2441	8.63	20.97	Pass
78	2480	8.35	20.97	Pass

Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Aking Chang	Relative Humidity :	48~51%

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	7.94	20.97	Pass
39	2441	8.12	20.97	Pass
78	2480	7.92	20.97	Pass

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 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. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 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

3.2.2 Measuring Instruments

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

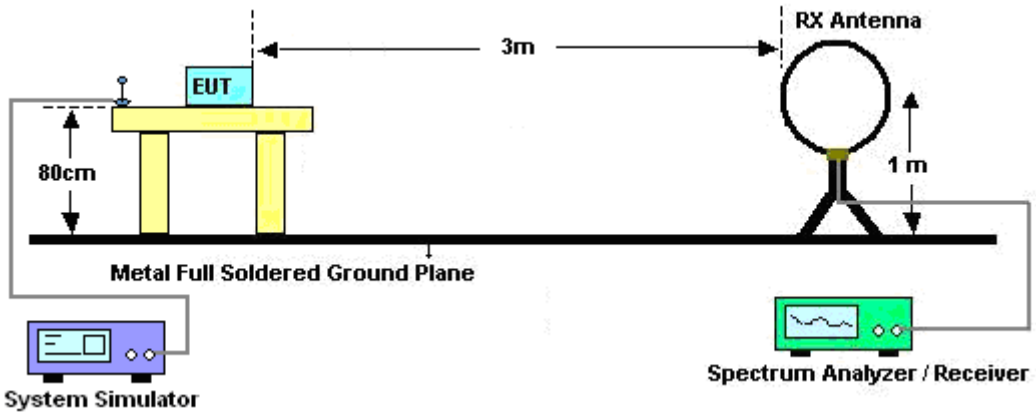
3.2.3 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, 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 to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. 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, RBW=1MHz for f>1GHz ; VBW RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

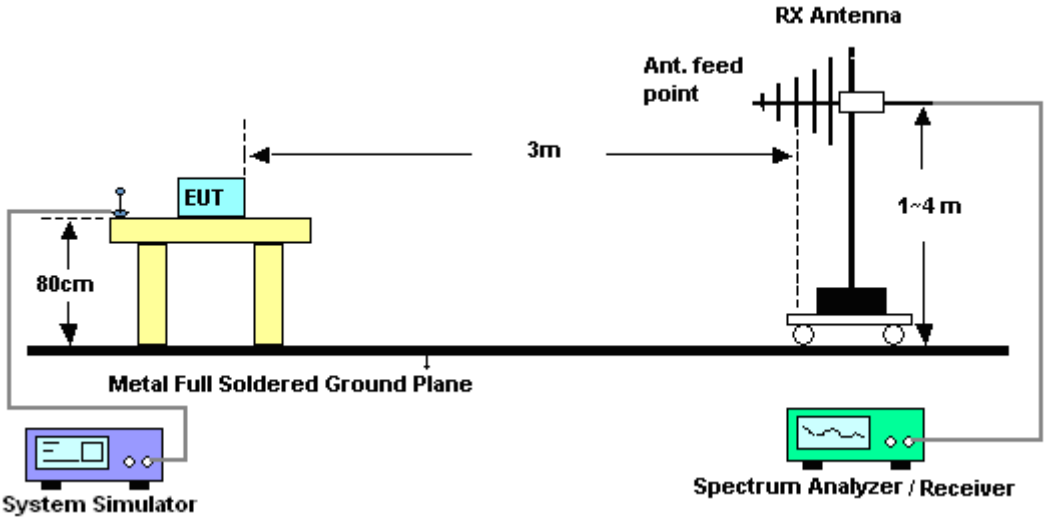
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.79dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.2.4 Test Setup

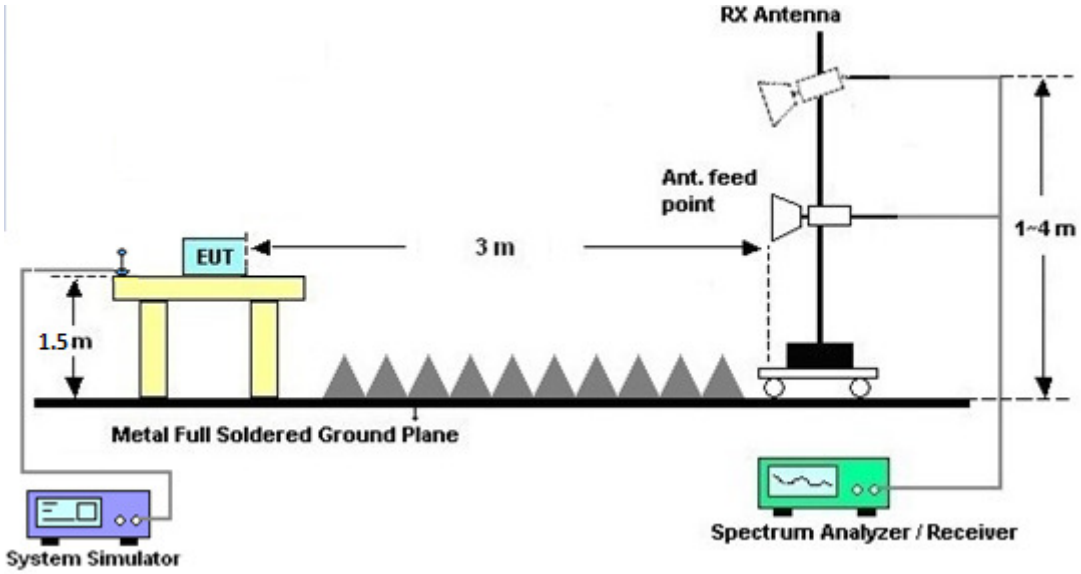
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

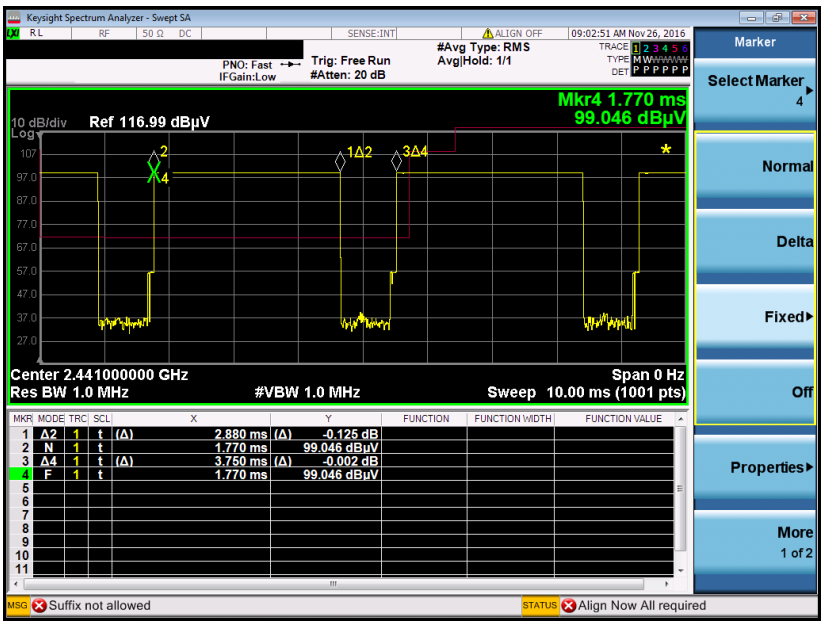


3.2.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

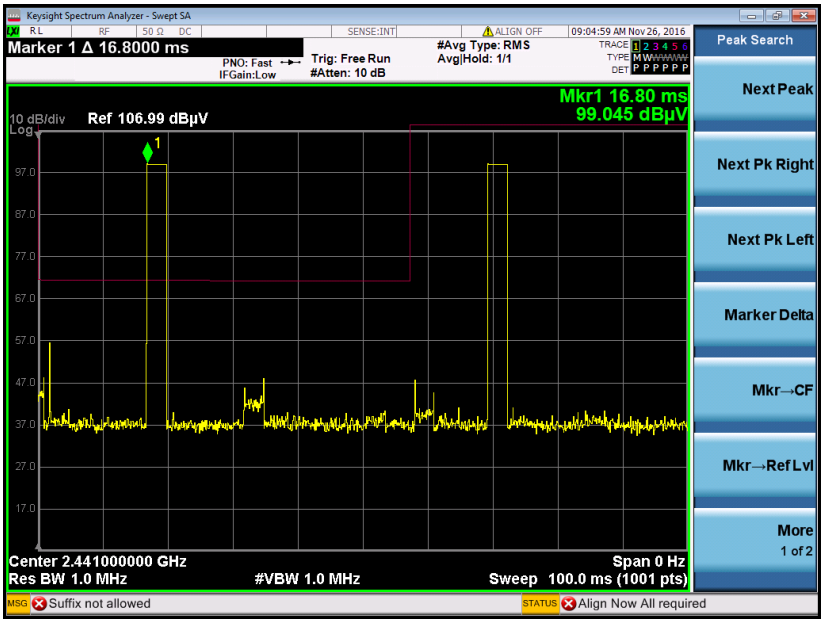
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.2.6 Duty cycle correction factor for average measurement

DH5 on time (One Pulse) Plot on Channel 39



DH5 on time (Count Pulses) Plot on Channel 39



Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.88 / 100 = 5.76 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.79 dB
3. DH5 has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

2.88 ms x 20 channels = 57.6 ms

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100ms / 57.6ms] = 2 hops

Thus, the maximum possible ON time:

2.88 ms x 2 = 5.76 ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.76 ms/100ms) = -24.79 dB

3.2.7 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

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

Please refer to Appendix A and B.

3.3 AC Conducted Emission Measurement

3.3.1 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.

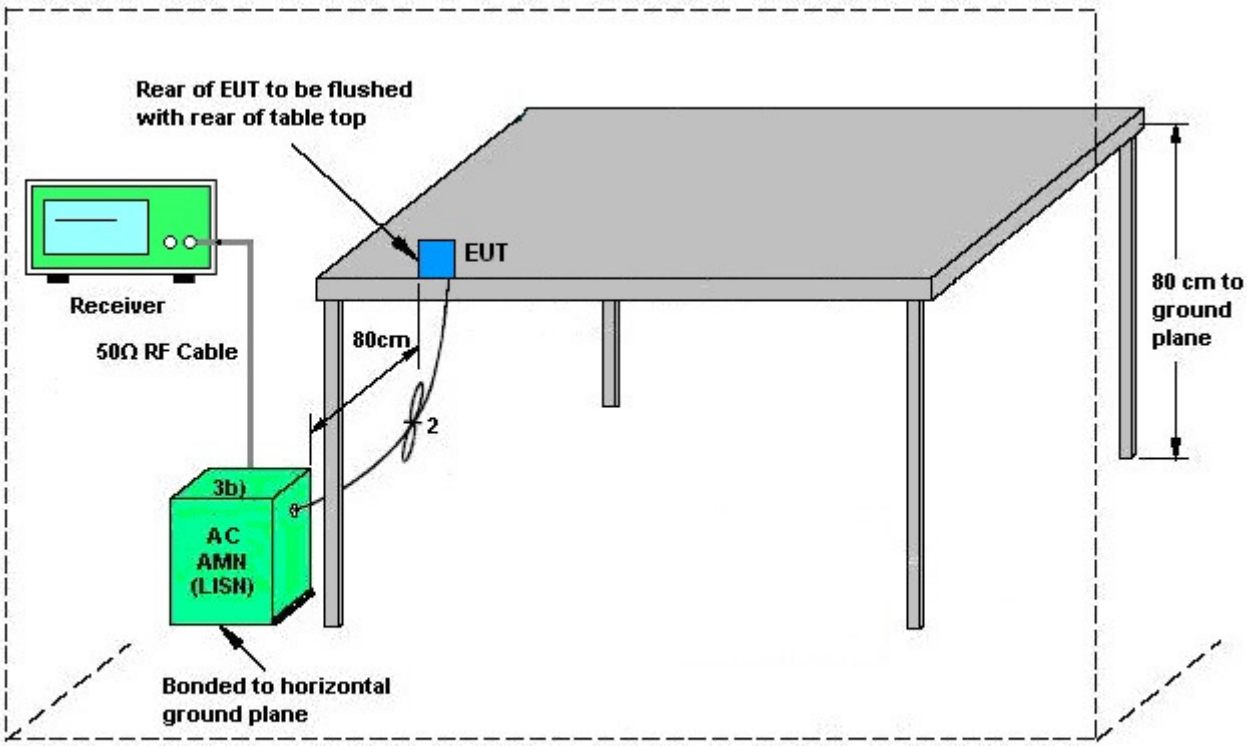
3.3.2 Measuring Instruments

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

3.3.3 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.

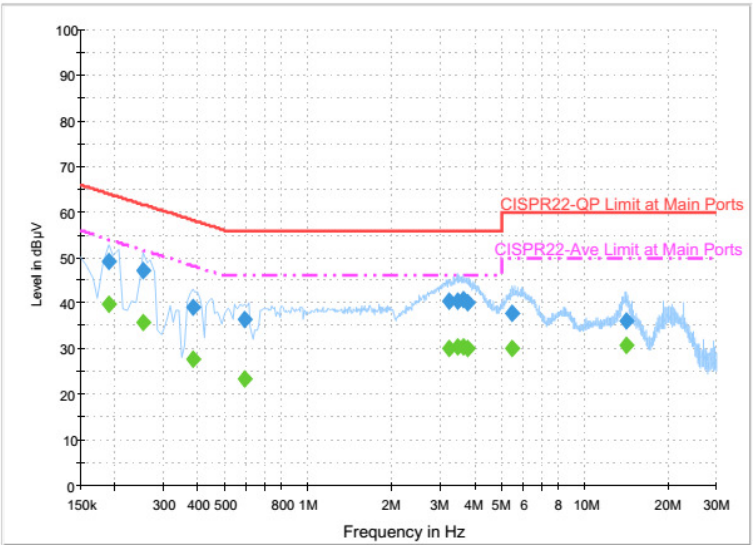
3.3.4 Test Setup



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

3.3.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	23~24℃
Test Engineer :	Kai-Chun Chu	Relative Humidity :	48~49%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN (2.4GHz) Link + Bluetooth Link + TC + TF		



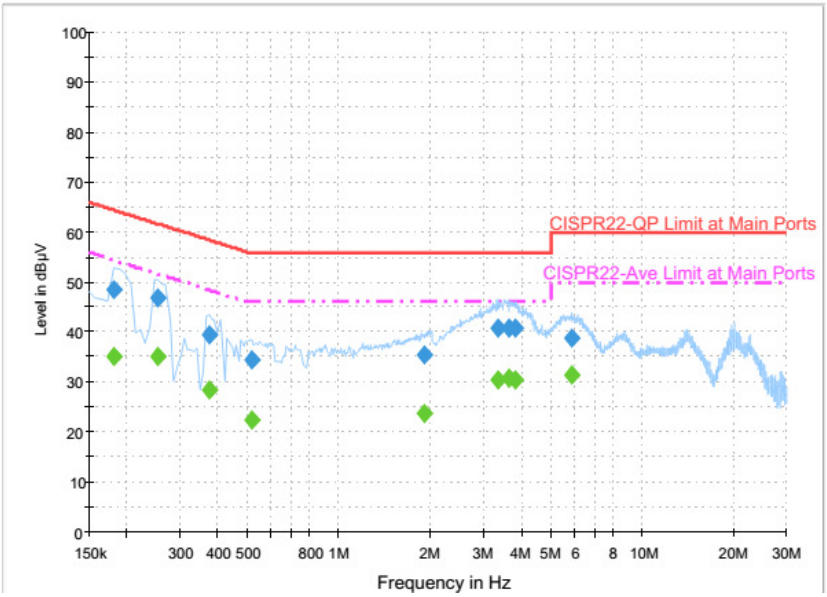
Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	49.3	Off	L1	19.6	14.7	64.0
0.254000	47.2	Off	L1	19.6	14.4	61.6
0.382000	39.3	Off	L1	19.6	18.9	58.2
0.590000	36.5	Off	L1	19.6	19.5	56.0
3.246000	40.5	Off	L1	19.5	15.5	56.0
3.462000	40.6	Off	L1	19.6	15.4	56.0
3.638000	40.7	Off	L1	19.6	15.3	56.0
3.790000	40.1	Off	L1	19.6	15.9	56.0
5.494000	37.7	Off	L1	19.7	22.3	60.0
14.126000	36.3	Off	L1	19.7	23.7	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	39.7	Off	L1	19.6	14.3	54.0
0.254000	35.8	Off	L1	19.6	15.8	51.6
0.382000	27.8	Off	L1	19.6	20.4	48.2
0.590000	23.4	Off	L1	19.6	22.6	46.0
3.246000	30.1	Off	L1	19.5	15.9	46.0
3.462000	30.5	Off	L1	19.6	15.5	46.0
3.638000	30.4	Off	L1	19.6	15.6	46.0
3.790000	30.2	Off	L1	19.6	15.8	46.0
5.494000	30.0	Off	L1	19.7	20.0	50.0
14.126000	30.6	Off	L1	19.7	19.4	50.0

Test Mode :	Mode 1	Temperature :	23~24℃
Test Engineer :	Kai-Chun Chu	Relative Humidity :	48~49%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN (2.4GHz) Link + Bluetooth Link + TC + TF		



Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	48.4	Off	N	19.5	16.0	64.4
0.254000	47.0	Off	N	19.5	14.6	61.6
0.374000	39.4	Off	N	19.5	19.0	58.4
0.518000	34.5	Off	N	19.5	21.5	56.0
1.910000	35.4	Off	N	19.6	20.6	56.0
3.374000	40.9	Off	N	19.5	15.1	56.0
3.654000	40.8	Off	N	19.6	15.2	56.0
3.830000	40.7	Off	N	19.6	15.3	56.0
5.838000	38.8	Off	N	19.7	21.2	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	35.3	Off	N	19.5	19.1	54.4
0.254000	35.2	Off	N	19.5	16.4	51.6
0.374000	28.4	Off	N	19.5	20.0	48.4
0.518000	22.6	Off	N	19.5	23.4	46.0
1.910000	23.8	Off	N	19.6	22.2	46.0
3.374000	30.4	Off	N	19.5	15.6	46.0
3.654000	30.7	Off	N	19.6	15.3	46.0
3.830000	30.5	Off	N	19.6	15.5	46.0
5.838000	31.4	Off	N	19.7	18.6	50.0

3.4 Antenna Requirements

3.4.1 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 FCC rule.

3.4.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.4.3 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
Power Meter	Agilent	E4416A	GB41292344	300MHz~40GHz	Jan. 08, 2016	Nov. 02, 2016 ~ Nov. 07, 2016	Jan. 07, 2017	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Jan. 07, 2016	Nov. 02, 2016 ~ Nov. 07, 2016	Jan. 06, 2017	Conducted (TH05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Nov. 08, 2016 ~ Nov. 27, 2016	Sep. 01, 2017	Radiation (03CH13-HY)
Preamplifier	MITEQ	TTA0204	1872107	2GHz~40GHz	Feb. 15, 2016	Nov. 08, 2016 ~ Nov. 27, 2016	Feb. 14, 2017	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz ~ 40GHz	Apr. 15, 2016	Nov. 08, 2016 ~ Nov. 27, 2016	Apr. 14, 2017	Radiation (03CH13-HY)
Amplifier	Sonoma-Instrument	310 N	187282	9KHz~1GHz	Dec. 31, 2015	Nov. 08, 2016 ~ Nov. 27, 2016	Dec. 30, 2016	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800N1D01N-06	40103&04	30MHz to 1GHz	Jan. 13, 2016	Nov. 08, 2016 ~ Nov. 27, 2016	Jan. 12, 2017	Radiation (03CH13-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	N/A	Mar. 10, 2016	Nov. 08, 2016 ~ Nov. 27, 2016	Mar. 09, 2017	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz ~ 18GHz	Apr. 25, 2016	Nov. 08, 2016 ~ Nov. 27, 2016	Apr. 24, 2017	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Jan. 30, 2016	Nov. 08, 2016 ~ Nov. 27, 2016	Jan. 29, 2017	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	N/A	Mar. 14, 2016	Nov. 08, 2016 ~ Nov. 27, 2016	Mar. 13, 2017	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Nov. 08, 2016 ~ Nov. 27, 2016	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Nov. 08, 2016 ~ Nov. 27, 2016	N/A	Radiation (03CH13-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Dec. 19, 2016	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Dec. 19, 2016	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Dec. 19, 2016	Nov. 28, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 06, 2016	Dec. 19, 2016	Dec. 05, 2017	Conduction (CO05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.7**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.9**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.4**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.3**

Appendix A. Radiated Spurious Emission

Test Engineer :	Bill Chang, Wilson Wu and Alex Jeng	Temperature :	25~26°C
		Relative Humidity :	40~42%

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	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)
BT CH00 2402MHz		2322.075	40.28	-33.72	74	37.7	26.99	6.89	31.3	100	42	P	H
		2322.075	15.49	-38.51	54	-	-	-	-	-	-	A	H
	*	2402	101.96	-	-	99.1	27.15	6.98	31.27	100	42	P	H
	*	2402	77.17	-	-	-	-	-	-	-	-	A	H
													H
													H
		2321.97	40.78	-33.22	74	38.2	26.99	6.89	31.3	215	88	P	V
		2321.97	15.99	-38.01	54	-	-	-	-	-	-	A	V
	*	2402	100.85	-	-	97.99	27.15	6.98	31.27	215	88	P	V
	*	2402	76.06	-	-	-	-	-	-	-	-	A	V
													V
													V
BT CH 39 2441MHz		2360.82	40.31	-33.69	74	37.6	27.07	6.93	31.29	100	41	P	H
		2360.82	15.52	-38.48	54	-	-	-	-	-	-	A	H
	*	2441	102.18	-	-	99.13	27.28	7.03	31.26	100	41	P	H
	*	2441	77.39	-	-	-	-	-	-	-	-	A	H
		2484.6	41.93	-32.07	74	38.75	27.36	7.07	31.25	100	41	P	H
		2484.6	17.14	-36.86	54	-	-	-	-	-	-	A	H
		2360.82	40.42	-33.58	74	37.71	27.07	6.93	31.29	211	90	P	V
		2360.82	15.63	-38.37	54	-	-	-	-	-	-	A	V
	*	2441	102.46	-	-	99.41	27.28	7.03	31.26	211	90	P	V
	*	2441	77.67	-	-	-	-	-	-	-	-	A	V
		2487.19	42.36	-31.64	74	39.18	27.36	7.07	31.25	211	90	P	V
		2487.19	17.57	-36.43	54	-	-	-	-	-	-	A	V

BT CH 78 2480MHz	*	2480	103.28	-	-	100.1	27.36	7.07	31.25	100	42	P	H
	*	2480	78.49	-	-	-	-	-	-	-	-	A	H
		2490.2	40.13	-33.87	74	36.89	27.4	7.09	31.25	100	42	P	H
		2490.2	15.34	-38.66	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	102.64	-	-	99.46	27.36	7.07	31.25	210	89	P	V
	*	2480	77.85	-	-	-	-	-	-	-	-	A	V
		2489.96	41.21	-32.79	74	37.97	27.4	7.09	31.25	210	89	P	V
		2489.96	16.42	-37.58	54	-	-	-	-	-	-	A	V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	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)
BT CH 00 2402MHz		4804	31.8	-42.2	74	41.72	31.2	10.06	51.18	100	0	P	H
		4804	7.01	-46.99	54	-	-	-	-	-	-	A	H
													H
													H
		4804	30.46	-43.54	74	40.38	31.2	10.06	51.18	100	0	P	V
		4804	5.67	-48.33	54	-	-	-	-	-	-	A	V
													V
													V
BT CH 39 2441MHz		4882	30.22	-43.78	74	39.95	31.31	10.11	51.15	100	0	P	H
		4882	5.43	-48.57	54							A	H
		7323	40.63	-33.37	74	42.54	36.32	12.57	50.8	100	0	P	H
		7323	15.84	-38.16	54							A	H
		4882	29.64	-44.36	74	39.37	31.31	10.11	51.15	100	0	P	V
		4882	4.85	-49.15	54							A	V
		7323	39.34	-34.66	74	41.25	36.32	12.57	50.8	100	0	P	V
		7323	14.55	-39.45	54							A	V
BT CH 78 2480MHz		4960	29.79	-44.21	74	39.3	31.44	10.17	51.12	100	0	P	H
		4960	5	-49	54	-	-	-	-	-	-	A	H
		7440	39.51	-34.49	74	40.85	36.66	12.8	50.8	100	0	P	H
		7440	14.72	-39.28	54	-	-	-	-	-	-	A	H
		4960	29.95	-44.05	74	39.46	31.44	10.17	51.12	100	0	P	V
		4960	5.16	-48.84	54	-	-	-	-	-	-	A	V
		7440	38.95	-35.05	74	40.29	36.66	12.8	50.8	100	0	P	V
		7440	14.16	-39.84	54	-	-	-	-	-	-	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		72.12	33.82	-6.18	40	52.2	12.64	0.89	31.91	-	-	P	H
		216.03	38.33	-7.67	46	52.51	16.04	1.58	31.8	-	-	P	H
		264.09	39.95	-6.05	46	50.42	19.56	1.74	31.77	-	-	P	H
		311.9	44.2	-1.8	46	54.2	19.88	1.87	31.75	100	100	QP	H
		311.9	45.43	-0.57	46	55.43	19.88	1.87	31.75	100	100	P	H
		407.8	42.32	-3.68	46	49.53	22.31	2.25	31.77	-	-	P	H
		503.7	43.35	-2.65	46	48.69	24.02	2.5	31.86	205	284	QP	H
	*	503.7	46.09	0.09	46	51.43	24.02	2.5	31.86	205	284	P	H
													H
													H
													H
													H
		42.69	34.16	-5.84	40	46.92	18.52	0.65	31.93	-	-	P	V
		72.12	33.09	-6.91	40	51.47	12.64	0.89	31.91	-	-	P	V
		249.24	36.78	-9.22	46	48.24	18.61	1.71	31.78	-	-	P	V
		311.9	33.06	-12.94	46	43.06	19.88	1.87	31.75	-	-	P	V
		407.8	38.35	-7.65	46	45.56	22.31	2.25	31.77	-	-	P	V
		503.7	40.89	-5.11	46	46.23	24.02	2.5	31.86	100	0	P	V
													V
													V
													V
													V
													V
													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)

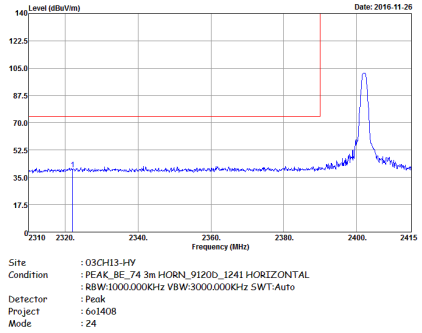
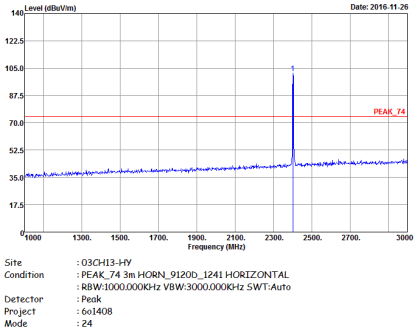
Both peak and average measured complies with the limit line, so test result is "PASS".

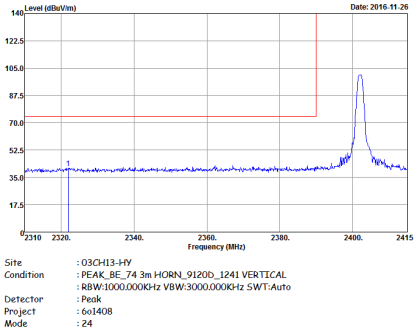
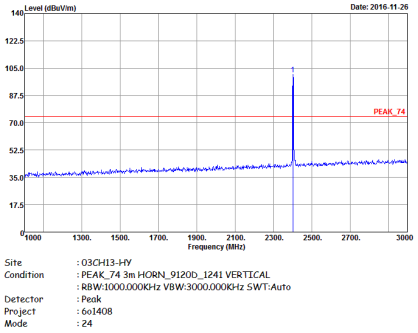
Appendix B. Radiated Spurious Emission Plots

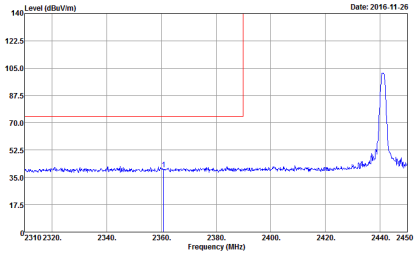
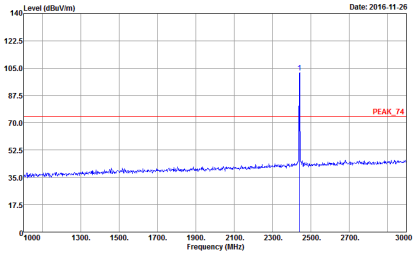
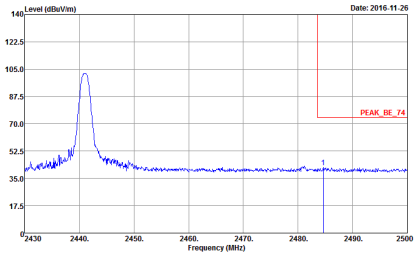
Test Engineer :	Bill Chang, Wilson Wu and Alex Jeng	**Temperature :**	25~26°C
		Relative Humidity :	40~42%

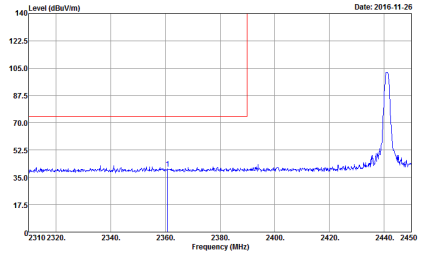
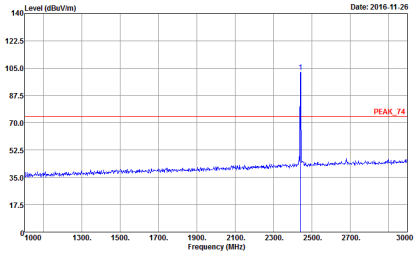
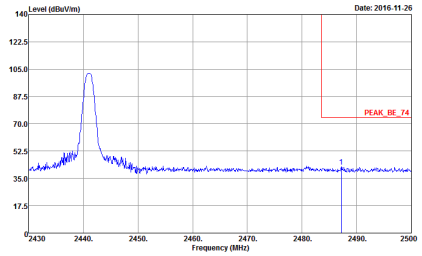
2.4GHz 2400~2483.5MHz

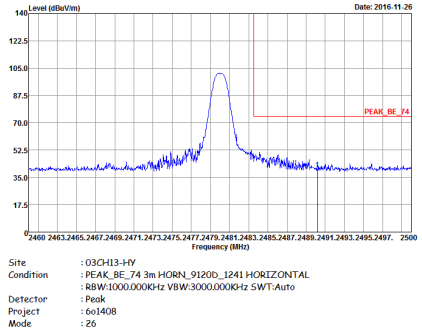
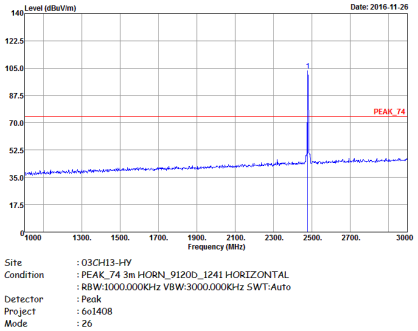
BT (Band Edge @ 3m)

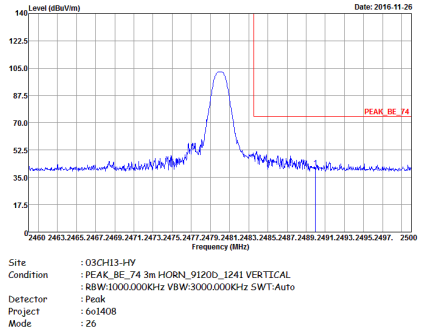
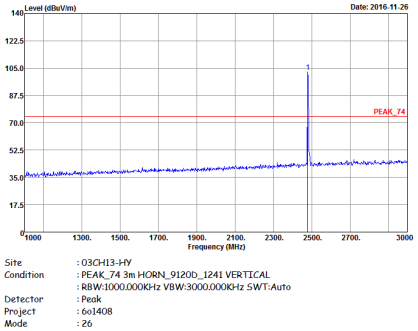
BT	**2.4GHz 2400~2483.5MHz Band Edge @ 3m**	
ANT	**BT CH00 2402MHz**	
1	**Horizontal**	**Fundamental**
Peak		

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH00 2402MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 24	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 24

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH39 2441MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 25	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 25
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 25	Left blank

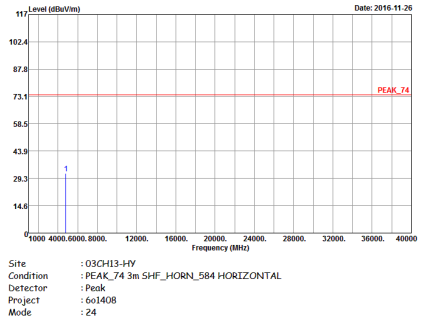
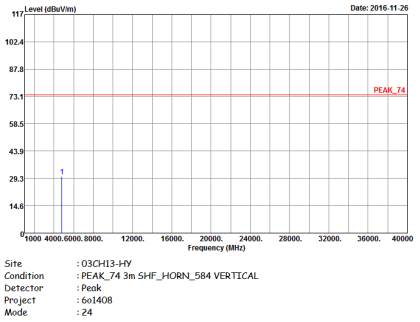
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH39 2441MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 25	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 25
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 25	Left blank

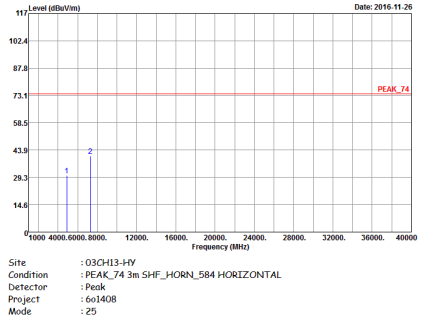
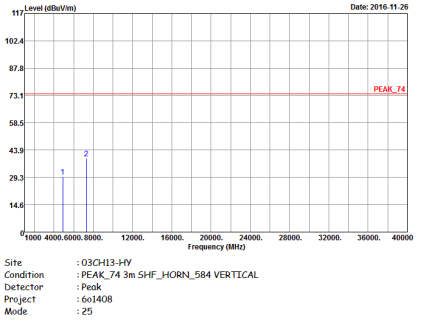
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 26	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 26

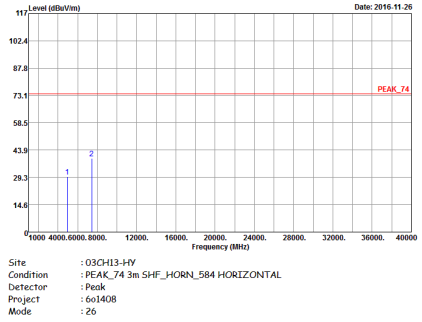
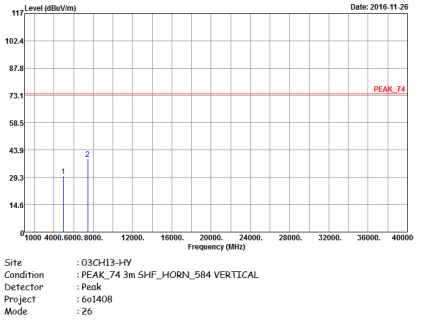
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BT CH78 2480MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 26	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 26

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH00 2402MHz	
1	Horizontal	Vertical
Peak Avg.		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH39 2441MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m SHF_HORN_584 HORIZONTAL Detector : Peak Project : 6o1408 Mode : 25	 Site : 03CH13-HY Condition : PEAK_74 3m SHF_HORN_584 VERTICAL Detector : Peak Project : 6o1408 Mode : 25

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BT CH78 2480MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m SHF_HORN_584 HORIZONTAL Detector : Peak Project : 6o1408 Mode : 26	 Site : 03CH13-HY Condition : PEAK_74 3m SHF_HORN_584 VERTICAL Detector : Peak Project : 6o1408 Mode : 26

Emission below 1GHz

2.4GHz BT (LF)

BT	2.4GHz 2400~2483.5MHz	
ANT	BT LF	
1	Horizontal	Vertical
QP / Peak