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	:	(DTS) Digital Transmission System

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

Testing Laboratory 1190

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
FR6O1408B	Rev. 01	Initial issue of report	Dec. 08, 2016
FR6O1408B	Rev. 02	Adding conducted emission data and describe the use of Low power SKU in section 2.1.	Dec. 19, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(b)(3)	Peak Output Power	≤ 30dBm	Pass	-
3.2	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 1.07 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	40
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)
Maximum Output Power to Antenna	5.46 dBm (0.0035 W)
Antenna Type / Gain	PIFA Antenna type with gain -0.56 dBi
Type of Modulation	Bluetooth LE : GFSK

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
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05
- 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

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.

The RF output power was recorded in the following table:

Channel	Frequency	Bluetooth – LE RF Output Power
		Data Rate / Modulation
		GFSK
		1Mbps
Ch00	2402MHz	**5.46 dBm**
Ch19	2440MHz	5.23 dBm
Ch39	2480MHz	4.74 dBm

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).

2.2 Test Mode

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

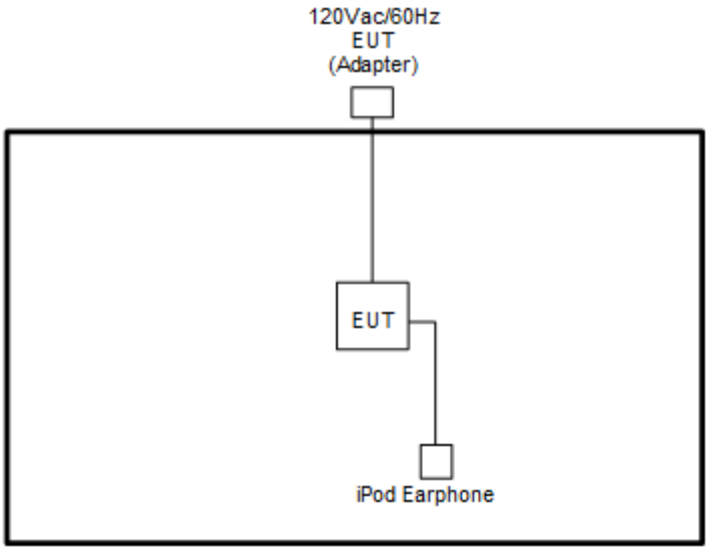
Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
	Bluetooth – LE / GFSK
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1 :WLAN (2.4GHz) Link + Bluetooth Link + TC + TF

Remark:

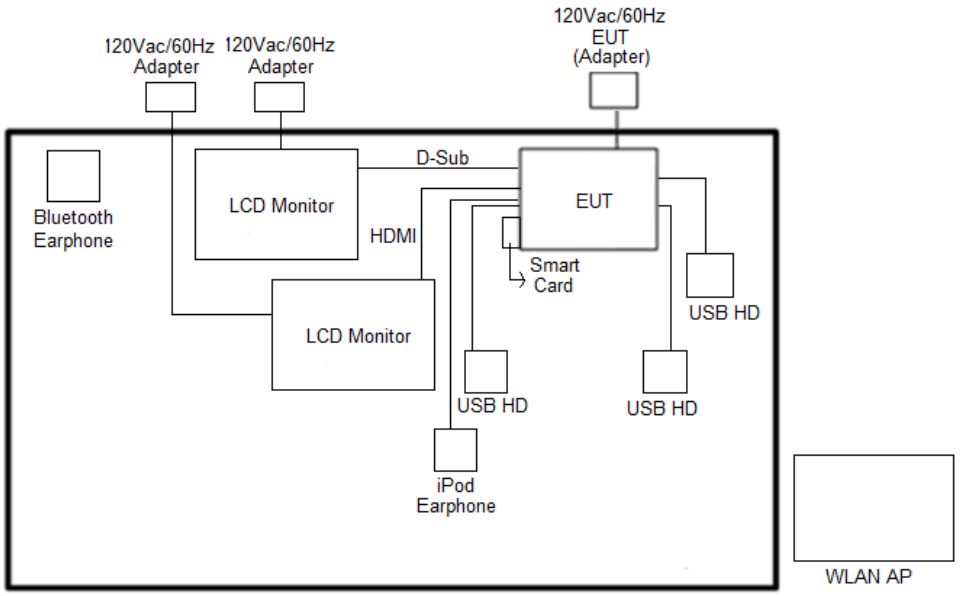
1. TC stands for Test Configuration, and consists of Adapter, USB HD, SD Card, Smart Card (Load), Earphone, D-sub and HDMI Cable.
2. TF stands for Test Configuration, and consists of MPEG4, Camera, and H Pattern.
3. HDMI Cable means media application transferred between EUT and external display.

2.3 Connection Diagram of Test System

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

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.

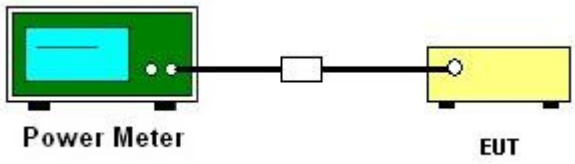
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r05 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.

3.1.4 Test Setup



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. 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 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

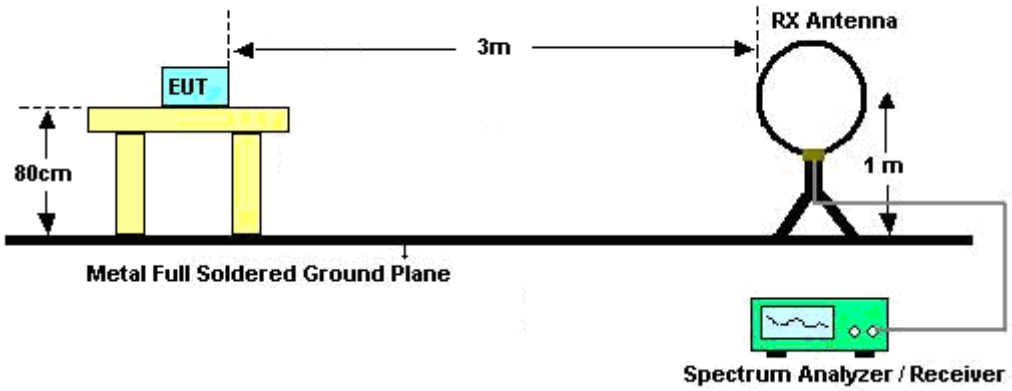
The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.2.3 Test Procedures

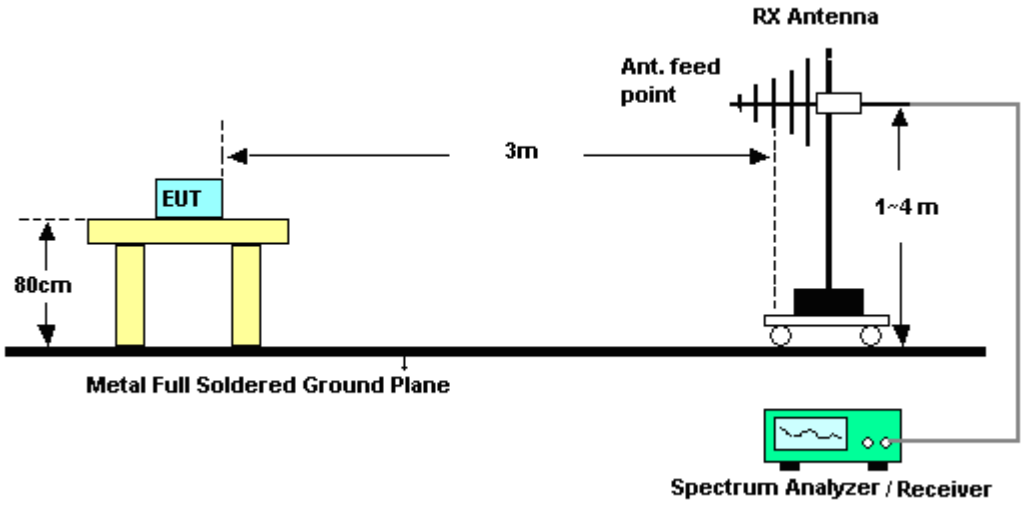
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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.

3.2.4 Test Setup

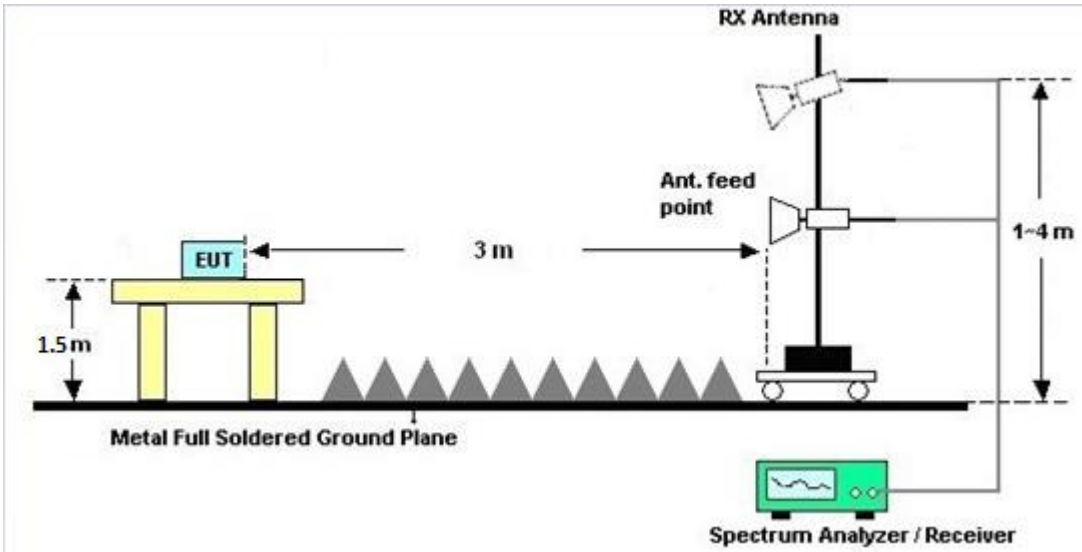
For radiated emissions below 30MHz



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 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A and B.

3.2.7 Duty Cycle

Please refer to Appendix C.

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.

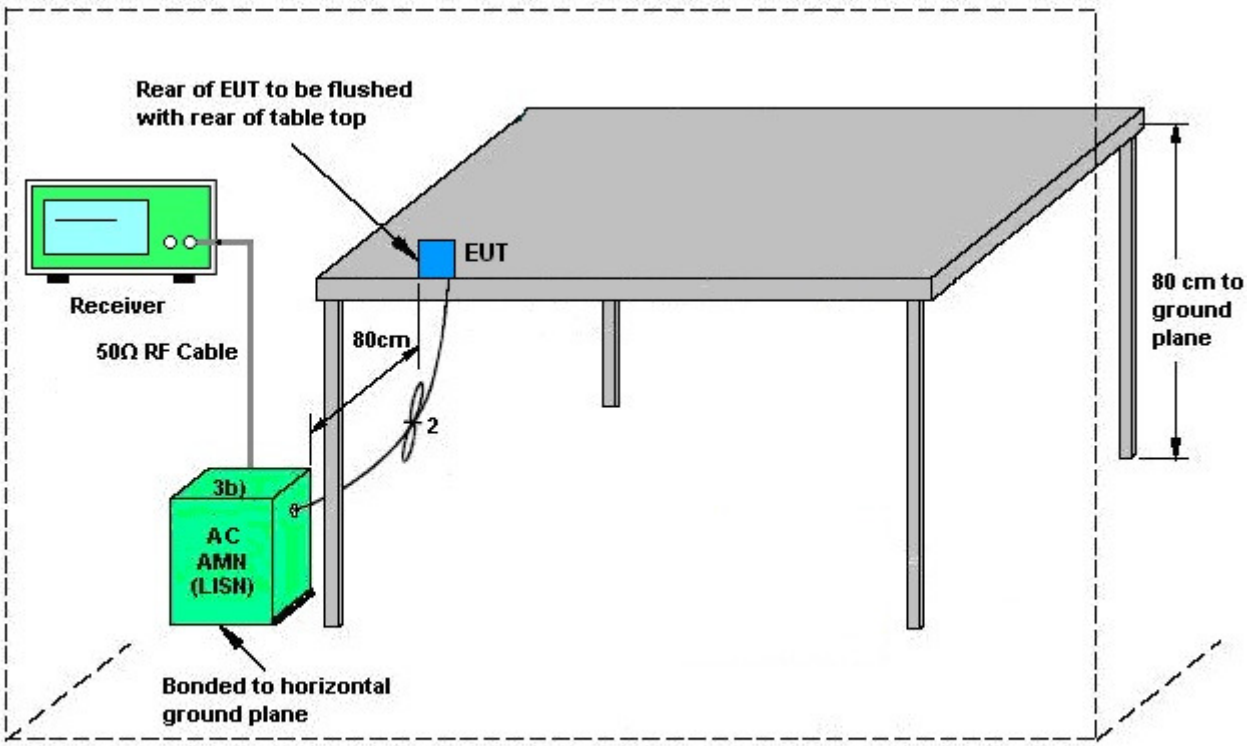
3.3.2 Measuring Instruments

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

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.

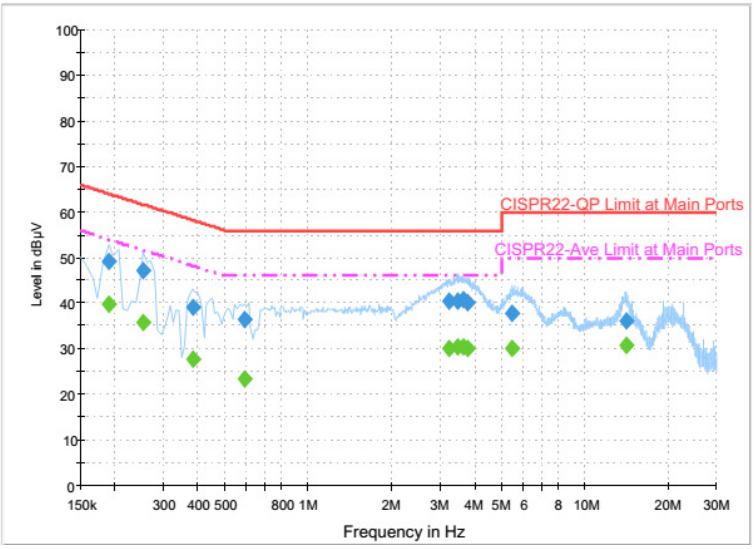
3.3.4 Test Setup



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		



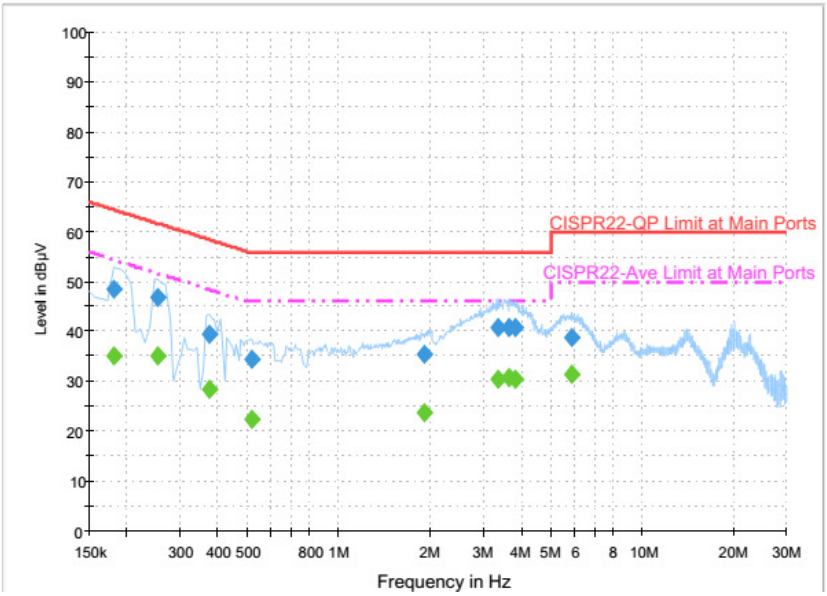
Final Result : QuasiPeak

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

BLE (Band Edge @ 3m)

BLE	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		2311.05	52.2	-21.8	74	49.7	26.94	6.86	31.3	100	42	P	H
		2321.865	44.27	-9.73	54	41.69	26.99	6.89	31.3	100	42	A	H
	*	2402	98.62	-	-	95.76	27.15	6.98	31.27	100	42	P	H
	*	2402	97.89	-	-	95.03	27.15	6.98	31.27	100	42	A	H
													H
													H
		2374.05	52.81	-21.19	74	50.02	27.11	6.96	31.28	220	82	P	V
		2321.865	43.18	-10.82	54	40.6	26.99	6.89	31.3	220	82	A	V
	*	2402	97.28	-	-	94.42	27.15	6.98	31.27	220	82	P	V
	*	2402	96.74	-	-	93.88	27.15	6.98	31.27	220	82	A	V
													V
													V
BLE CH 19 2440MHz		2359.84	53.59	-20.41	74	50.88	27.07	6.93	31.29	100	44	P	H
		2359.98	45.04	-8.96	54	42.33	27.07	6.93	31.29	100	44	A	H
	*	2440	98.14	-	-	95.09	27.28	7.03	31.26	100	44	P	H
	*	2440	97.57	-	-	94.52	27.28	7.03	31.26	100	44	A	H
		2497.83	52.48	-21.52	74	49.23	27.4	7.09	31.24	100	44	P	H
		2494.47	43.7	-10.3	54	40.45	27.4	7.09	31.24	100	44	A	H
		2380.14	52.03	-21.97	74	49.24	27.11	6.96	31.28	201	84	P	V
		2359.98	44.24	-9.76	54	41.53	27.07	6.93	31.29	201	84	A	V
	*	2440	98.04	-	-	94.99	27.28	7.03	31.26	201	84	P	V
	*	2440	97.47	-	-	94.42	27.28	7.03	31.26	201	84	A	V
		2499.16	51.96	-22.04	74	48.71	27.4	7.09	31.24	201	84	P	V
		2494.96	43.31	-10.69	54	40.06	27.4	7.09	31.24	201	84	A	V

BLE CH 39 2480MHz	*	2480	97.8	-	-	94.62	27.36	7.07	31.25	100	42	P	H
	*	2480	97.31	-	-	94.13	27.36	7.07	31.25	100	42	A	H
		2490.12	51.99	-22.01	74	48.75	27.4	7.09	31.25	100	42	P	H
		2489.88	42.98	-11.02	54	39.74	27.4	7.09	31.25	100	42	P	H
													H
													H
	*	2480	97.58	-	-	94.4	27.36	7.07	31.25	209	93	P	V
	*	2480	96.95	-	-	93.77	27.36	7.07	31.25	209	93	A	V
		2490	53.13	-20.87	74	49.89	27.4	7.09	31.25	209	93	P	V
		2489.84	43.2	-10.8	54	39.96	27.4	7.09	31.25	209	93	P	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

BLE (Harmonic @ 3m)

BLE	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	29.89	-44.11	74	39.81	31.2	10.06	51.18	100	0	P	H
													H
													H
													H
		4804	29.65	-44.35	74	39.57	31.2	10.06	51.18	100	0	P	V
													V
													V
													V
BLE CH 19 2440MHz		4880	29.79	-44.21	74	39.52	31.31	10.11	51.15	100	0	P	H
		7320	36.43	-37.57	74	38.34	36.32	12.57	50.8	100	0	P	H
													H
													H
		4880	29.62	-44.38	74	39.35	31.31	10.11	51.15	100	0	P	V
		7320	35.94	-38.06	74	37.85	36.32	12.57	50.8	100	0	P	V
													V
													V
BLE CH 39 2480MHz		4960	30.92	-43.08	74	40.43	31.44	10.17	51.12	100	0	P	H
		7440	36.72	-37.28	74	38.06	36.66	12.8	50.8	100	0	P	H
													H
													H
		4960	30.33	-43.67	74	39.84	31.44	10.17	51.12	100	0	P	V
		7440	36.86	-37.14	74	38.2	36.66	12.8	50.8	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. 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.
				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 BLE LF		72.12	33.8	-6.2	40	52.18	12.64	0.89	31.91	-	-	P	H
		216.03	37.5	-8.5	46	51.68	16.04	1.58	31.8	-	-	P	H
		264.09	41.27	-4.73	46	51.74	19.56	1.74	31.77	-	-	P	H
		311.9	44.93	-1.07	46	54.93	19.88	1.87	31.75	100	95	QP	H
	*	311.9	46.06	0.06	46	56.06	19.88	1.87	31.75	100	95	P	H
		407.8	42.34	-3.66	46	49.55	22.31	2.25	31.77	-	-	P	H
		503.7	43.35	-2.65	46	48.69	24.02	2.5	31.86	188	273	QP	H
		503.7	45.92	-0.08	46	51.26	24.02	2.5	31.86	188	273	P	H
													H
													H
													H
													H
		33.51	30.86	-9.14	40	38.5	23.66	0.65	31.95	-	-	P	V
		72.12	33.64	-6.36	40	52.02	12.64	0.89	31.91	-	-	P	V
		216.03	31.96	-14.04	46	46.14	16.04	1.58	31.8	-	-	P	V
		311.9	35.06	-10.94	46	45.06	19.88	1.87	31.75	-	-	P	V
		407.8	37.53	-8.47	46	44.74	22.31	2.25	31.77	-	-	P	V
		503.7	40.32	-5.68	46	45.66	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

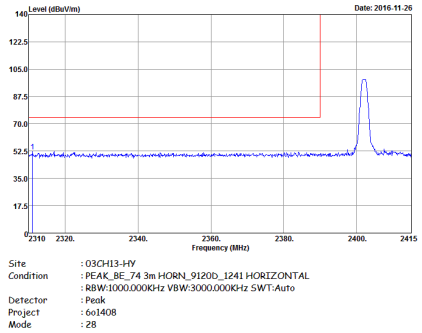
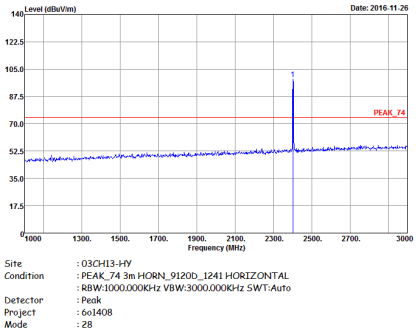
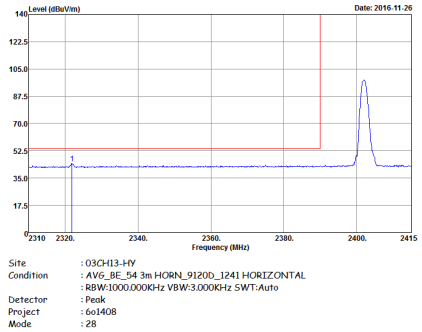
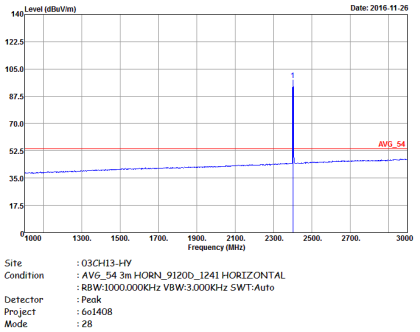
Test Engineer :	Bill Chang, Wilson Wu and Alex Jeng	**Temperature :**	25~26°C
		Relative Humidity :	40~42%

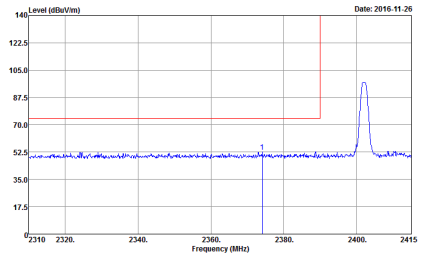
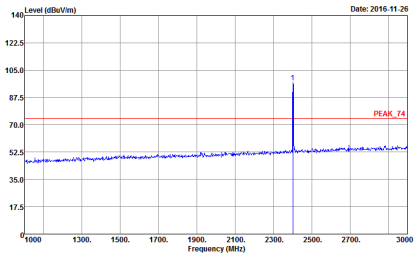
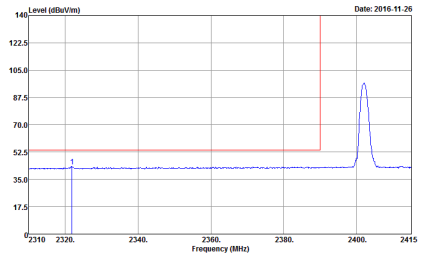
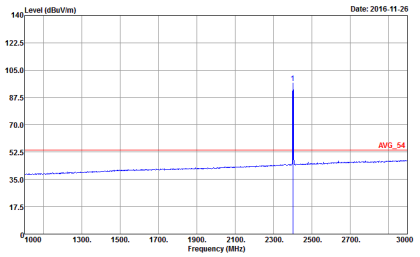
Note symbol

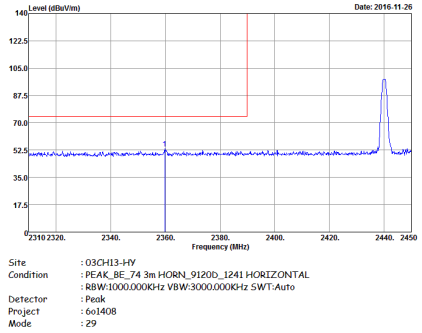
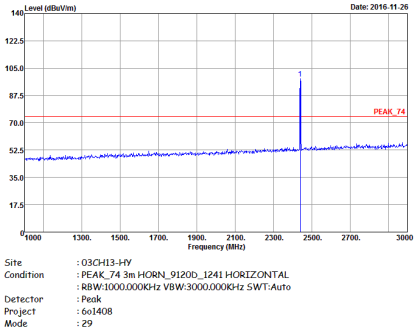
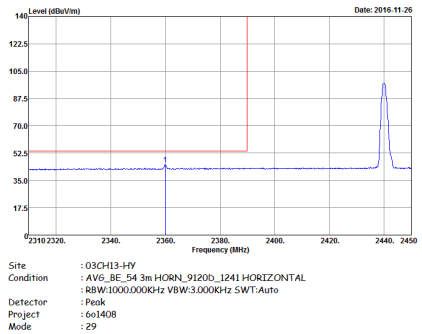
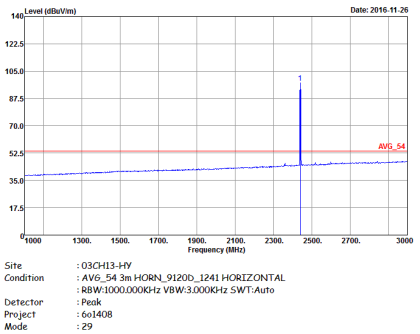
-L	**Low channel location**
-R	**High channel location**

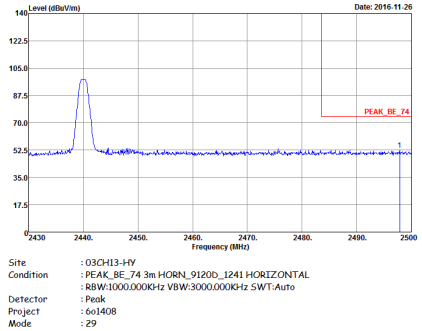
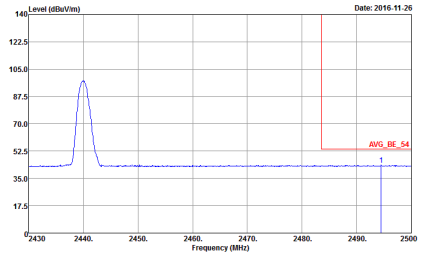
2.4GHz 2400~2483.5MHz

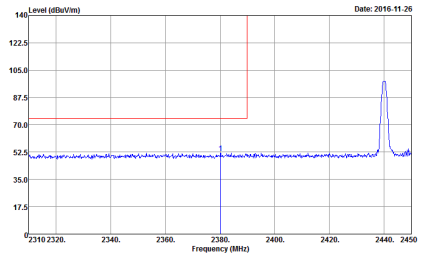
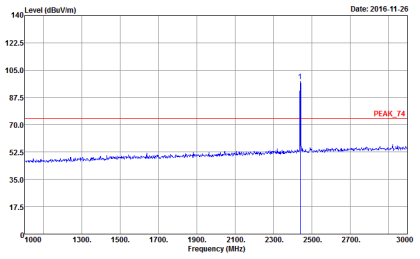
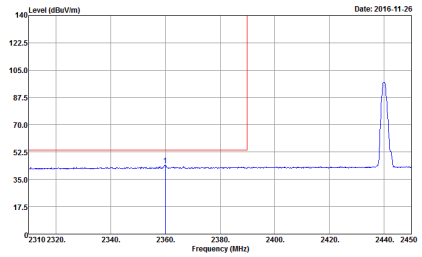
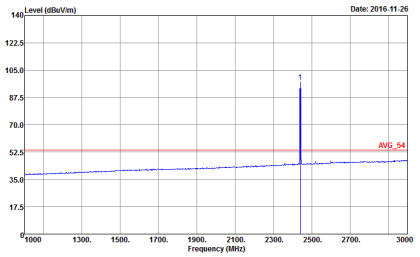
BLE (Band Edge @ 3m)

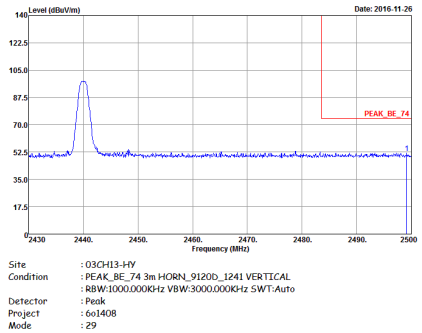
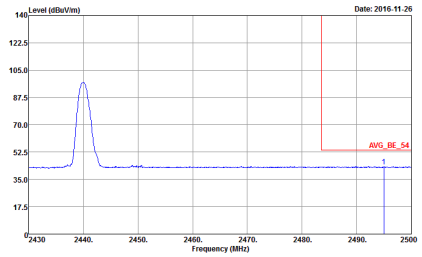
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Fundamental
Peak		
Avg.		

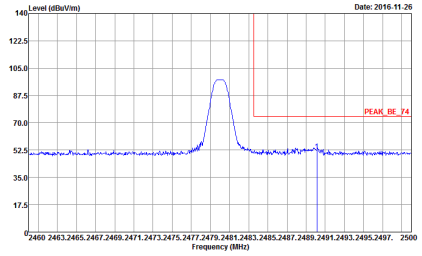
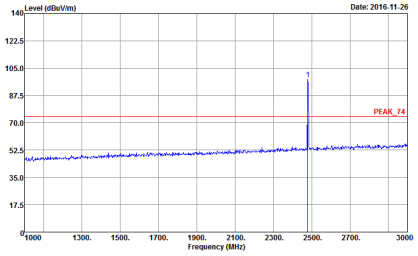
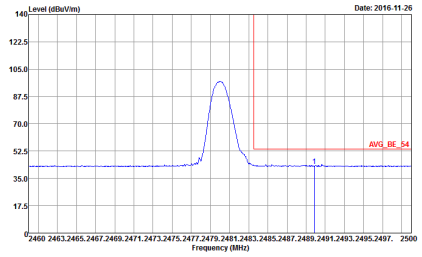
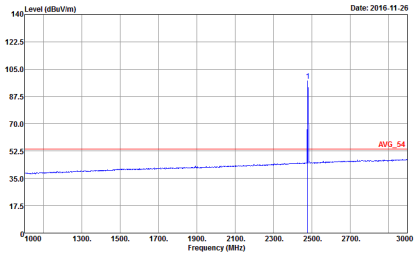
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 28	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 28
Avg	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 28	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 28

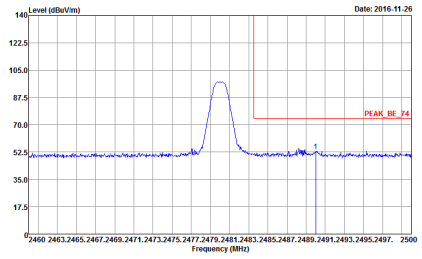
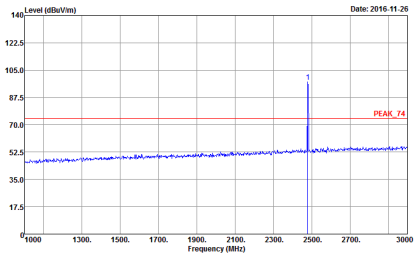
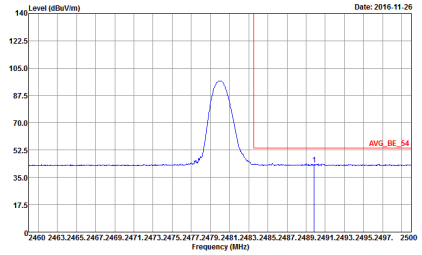
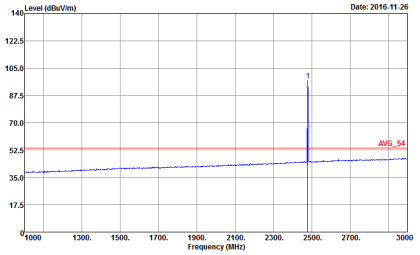
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
1	Horizontal	Fundamental
Peak		
Avg.		

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
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 : 29	Left blank
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 29	Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
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 : 29	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 29
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 29	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 29

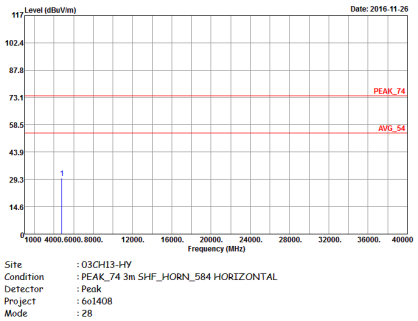
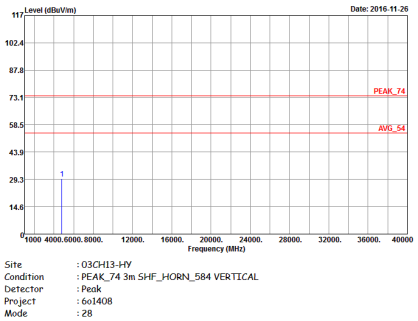
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 29	Left blank
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 29	Left blank

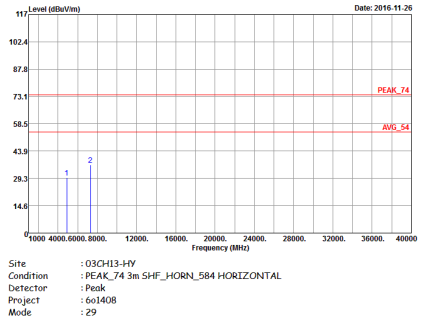
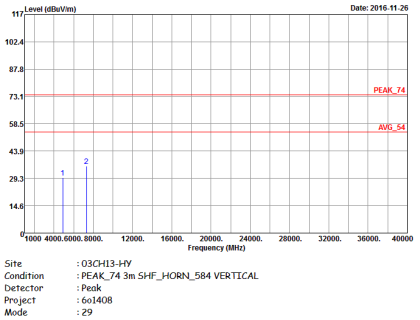
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 30	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 30
Avg.	 Site : 03CH13-HY Condition : AV6_BE_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 30	 Site : 03CH13-HY Condition : AV6_54 3m HORN_9120D_1241 HORIZONTAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 30

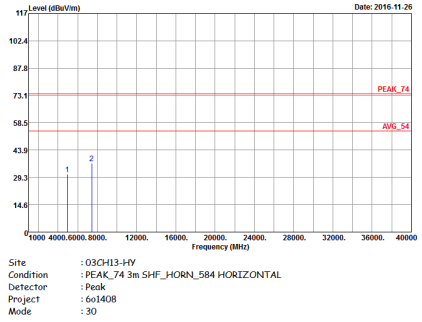
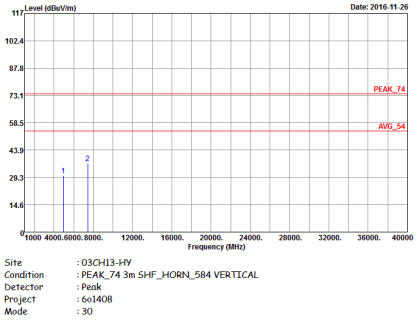
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH13-HY Condition : PEAK_BE_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 30	 Site : 03CH13-HY Condition : PEAK_74 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 30
Avg.	 Site : 03CH13-HY Condition : AVG_BE_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 30	 Site : 03CH13-HY Condition : AVG_54 3m HORN_9120D_1241 VERTICAL : RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 6o1408 Mode : 30

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

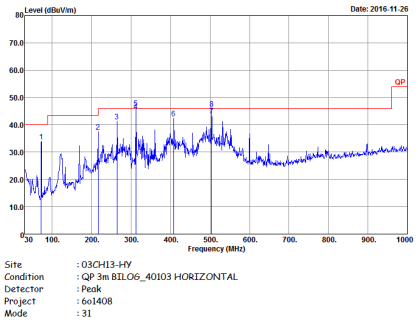
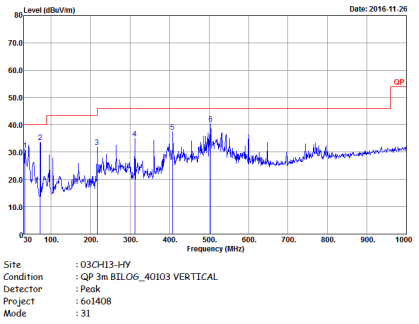
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Vertical
Peak Avg.		

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH13-HY Condition : PEAK_74 3m SHF_HORN_584 HORIZONTAL Detector : Peak Project : 6o1408 Mode : 29	 Site : 03CH13-HY Condition : PEAK_74 3m SHF_HORN_584 VERTICAL Detector : Peak Project : 6o1408 Mode : 29

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Vertical
Peak	 Site : 03CH13-HY Condition : PEAK_74 3m SHF_HORN_584 HORIZONTAL Detector : Peak Project : 6o1408 Mode : 30	 Site : 03CH13-HY Condition : PEAK_74 3m SHF_HORN_584 VERTICAL Detector : Peak Project : 6o1408 Mode : 30

Emission below 1GHz

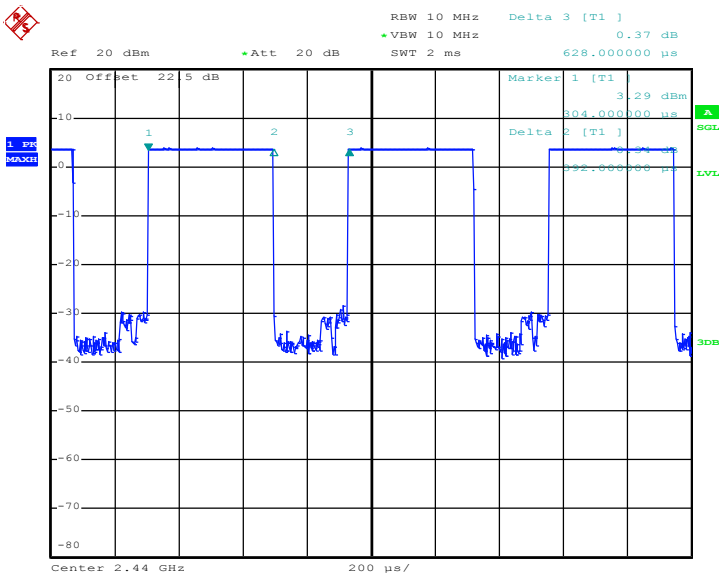
2.4GHz BLE (LF)

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

Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth – LE	62.42	392	2.55	3kHz

Bluetooth – LE



Date: 4.NOV.2016 10:38:31