



FCC RF Test Report

APPLICANT : SHARP CORPORATION
EQUIPMENT : Smart Phone
TYPE NAME : Type-A
Type-B
FCC ID : APYHRO00249
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Apr. 01, 2017 and testing was completed on May 11, 2017. 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.

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FCC ID : APYHRO00249

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR740121B	Rev. 01	Initial issue of report	Jun. 12, 2017
FR740121B	Rev. 02	Remove WLAN 5GHz Band 4 information in section 1.4.2	Jun. 14, 2017



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(b)(3)	Peak Output Power	$\leq 30\text{dBm}$	Pass	-
3.2	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 12.03 dB at 2495.400 MHz
3.3	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 4.60 dB at 0.518 MHz
3.4	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

SHARP CORPORATION

Takumi-Cho, Sakai-Ku, Sakai-Shi, 2, Osaka 590-852, Japan

1.2 Manufacturer

SHARP CORPORATION

Takumi-Cho, Sakai-Ku, Sakai-Shi, 2, Osaka 590-852, Japan

1.3 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac, Wi-Fi 5GHz 802.11a/n/ac, NFC, and GPS

Product Specification subjective to this standard	
Sample 1	EUT with Memory 1
Sample 2	EUT with Memory 2
Antenna Type	WWAN: ILA Antenna WLAN: ILA Antenna Bluetooth: ILA Antenna GPS/Glonass/Beidou/Galileo: ILA Antenna NFC: Loop Antenna

Remark: The deviations between type name: Type-A and type name: Type-B which can be referred Product Equality Declaration. The deviations were switched by Hardware.



1.4 Re-use of Measured Data

1.4.1 Introduction Section

The original model (FCC ID: APYHRO00248) and the variant model (FCC ID: APYHRO00249) has identical PCB layout, antenna, SW implementation for Bluetooth/Wi-Fi/GPS. Based on their similarity, the FCC Part 15C & 15E (equipment class: DTS, DSS, DXX, NII) test data issued for original model also apply for the variant model.

The applicant takes full responsibility that the test data as referenced in section 4 below represent compliance for this FCC ID (FCC ID: APYHRO00249).

1.4.2 Difference Section

The original model (FCC ID: APYHRO00248) and the variant model (FCC ID: APYHRO00249) has identical PCB layout, antenna, SW implementation for Bluetooth/Wi-Fi/GPS. The details of similarity and difference can be found in the Operating Description.

The product specification is outlined in the following table:

FCC ID			APYHRO00248	APYHRO00249
Wireless Tech	Mode		Frequency (MHz)	
GSM	GSM Voice GPRS (GMSK) EDGE (8PSK)	Multi-Slot Class 11 DTM: Yes	850/1900	850/1900
UMTS	AMR/RCM12.2Kbps HSDPA/HSUPA/DC-HSDPA		B5	B2/B4
LTE	QPSK/16QAM VoLTE		B5	B2/B4/B17
Wi-Fi	11b/11g/11n(HT20)		2412-2462 MHz/	
	11a/11n(HT20)/11n(HT40)		5180-5240 MHz 5260-5320 MHz 5500-5700 MHz	
Bluetooth	BR/EDR/LE		2402-2480 MHz	
NFC	NFC		13.56 MHz	



1.4.3 Spot Check Verification Data Section

Summary of the spot check:

Test Item	Mode	APYHRO00248 Worst Result	APYHRO00249 Worst Result	Difference (dB)
Average Conducted Power (dBm)	802.11b	14.34	13.84	0.5
	802.11g	13.41	13.16	0.25
	11n HT20	13.39	13.21	0.18
	11n HT40	13.26	13.24	0.02
	20MHz BW 5150-5250MHz	13.77	13.61	0.16
	20MHz BW 5250-5350MHz	13.51	13.65	-0.14
	20MHz BW 5470-5725MHz	13.50	13.71	-0.21
	40MHz BW 5150-5250MHz	13.85	13.74	0.11
	40MHz BW 5250-5350MHz	13.81	13.79	0.02
	40MHz BW 5470-5725MHz	13.67	13.78	-0.11
	80MHz BW 5150-5250MHz	13.84	13.53	0.31
	80MHz BW 5250-5350MHz	13.55	13.57	-0.02
	80MHz BW 5470-5725MHz	13.35	13.60	-0.25
	BT (1Mbps)	6.15	5.29	0.86
	BT (2Mbps)	2.96	2.19	0.77
	BT (3Mbps)	2.91	2.10	0.81
	BT-LE	5.24	4.84	0.4
	Test date	2017/04/14 – 2017/05/04	2017/04/20 – 2017/05/12	
Peak Radiated Spurious Emission (Band Edge) (dBuV/m)	802.11b	51.38	51.56	-0.18
	802.11g	56.65	56.81	-0.16
	11n HT40	56.84	58.6	-1.76
	20MHz BW 5150-5250MHz	51.99	50.93	1.06
	20MHz BW 5250-5350MHz	57.92	56.97	0.95
	20MHz BW 5470-5725MHz	47.9	47.6	0.3
	40MHz BW 5150-5250MHz	52.04	53.45	-1.41
	40MHz BW 5250-5350MHz	62.35	60.48	1.87
	40MHz BW 5470-5725MHz	61.35	59.27	2.08
	80MHz BW 5150-5250MHz	49.51	49.37	0.14
	80MHz BW 5250-5350MHz	60.13	60.06	0.07
	80MHz BW 5470-5725MHz	57.75	56.6	1.15
	BT (1Mbps)	42.26	42.63	-0.37
	BT-LE	51.58	51.65	-0.07
	Test date	2017/04/14 – 2017/05/04	2017/04/20 – 2017/05/12	
Average Radiated Spurious Emission (Band Edge) (dBuV/m)	802.11b	40.10	40.14	-0.04
	802.11g	42.97	43.72	-0.75
	11n HT40	45.24	47.52	-2.28
	20MHz BW 5150-5250MHz	41.12	40.45	-0.67
	20MHz BW 5250-5350MHz	43.9	42.01	1.89
	20MHz BW 5470-5725MHz	43.76	43.26	0.5
	40MHz BW 5150-5250MHz	44.73	43.88	0.85
	40MHz BW 5250-5350MHz	50.41	50.53	-0.12
	40MHz BW 5470-5725MHz	47.14	46.8	0.34
	80MHz BW 5150-5250MHz	41.41	42.24	-0.83
	80MHz BW 5250-5350MHz	50.02	50.09	-0.07
	80MHz BW 5470-5725MHz	48.24	46.97	1.27
	BT (1Mbps)	17.50	17.84	-0.34
	BT-LE	41.90	41.97	-0.07
	Test date	2017/04/14 – 2017/05/04	2017/04/20 – 2017/05/12	



Test Item	Mode	APYHRO00248 Worst Result	APYHRO00249 Worst Result	Difference (dB)
Peak Radiated Spurious Emission (Harmonic) (dBuV/m)	802.11b	49.89	49.49	0.4
	802.11g	49.52	49.59	-0.07
	11n HT40	49.62	49.46	0.16
	20MHz BW 5150-5250MHz	46.36	45.78	0.58
	20MHz BW 5250-5350MHz	45.13	45.86	-0.73
	20MHz BW 5470-5725MHz	45.95	46.66	-0.71
	40MHz BW 5150-5250MHz	47.29	46.25	1.04
	40MHz BW 5250-5350MHz	45.4	45.68	-0.28
	40MHz BW 5470-5725MHz	47.28	47.4	-0.12
	80MHz BW 5150-5250MHz	47.02	45.91	1.11
	80MHz BW 5250-5350MHz	46.85	48.23	-1.38
	80MHz BW 5470-5725MHz	49.17	48.18	0.99
	BT (1Mbps)	49.88	49.47	0.41
	BT-LE	49.36	49.60	-0.24
	Test date	2017/02/11 – 2017/02/24	2017/03/03 – 2017/03/11	

Conclusion:

WLAN Radiated spurious emission test against the variant model for non-cellular part based on the worst-case condition from the original model was performed in this filing to demonstrate the test data from original model remains representative for the variant model.

Based on the spot check test result (power levels measured are within 1dB, and the worst case of RSE spot check verification based on the worst condition from the original model is within 3dB, and are compliance with the limits), the test data from the original model is representative for the variant model.

The unwanted, harmonics, radiated spurious emission is reported peak measurement only due to spurious lower than 20dB than the limit.

The detail test results can be found in this document, Appendix A, hereafter.

**1.4.4 Reference detail Section:**

Equipment Class	Reference FCC ID	Type Grant/Permissive Change	Reference Application	Folder Test/RF Exposure	Report Title
DTS	APYHRO00248	Original Grant	FR740120B	Part 15C	All sections applicable
			FR740120C	Part 15C	All sections applicable
			FA740120	RF Exposure	All sections applicable
DSS	APYHRO00248	Original Grant	FR740120A	Part 15C	All sections applicable
			FA740120	RF Exposure	All sections applicable
NII	APYHRO00248	Original Grant	FR740120E FZ740120	Part 15E	All sections applicable
			FA740120	RF Exposure	All sections applicable

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. TW0007 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 1 st 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.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855	
Test Site No.	Sporton Site No.	
	03CH10-HY	

Note: The test site complies with ANSI C63.4 2014 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 v04
- ♦ ANSI C63.10-2013

Remark:

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



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-

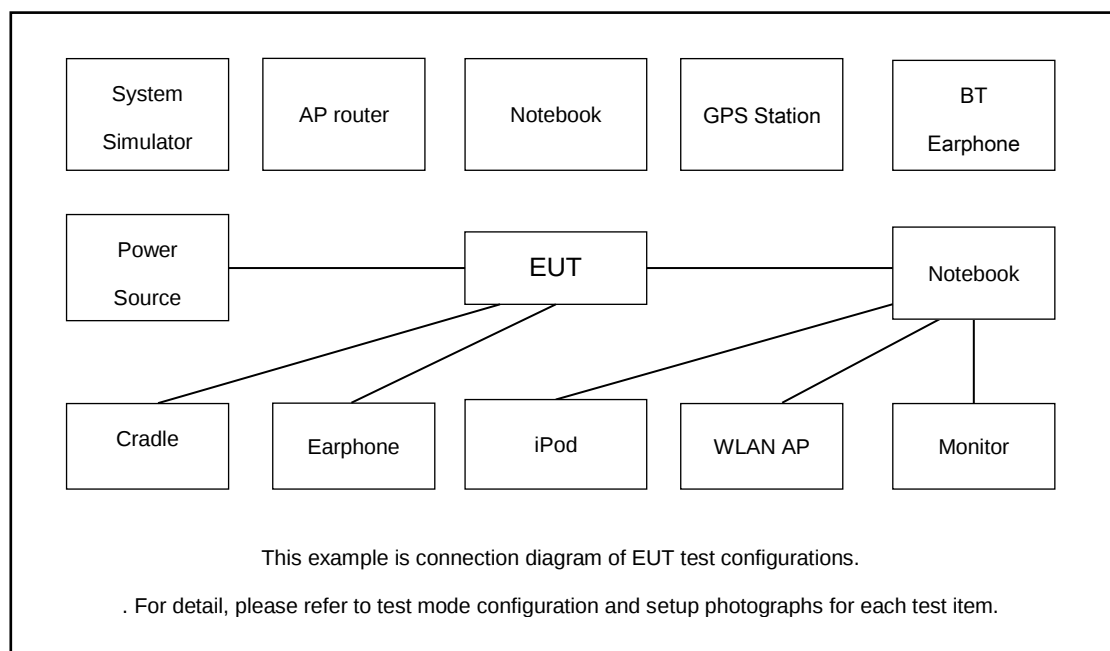
2.2 Test Mode

- 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 emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

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

Summary table of Test Cases	
Radiated TCs	Mode 1: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1: LTE Band 17 Idle + Bluetooth Link + WLAN (2.4GHz) Link + Earphone + USB Cable (Charging from Adapter) + Camera (Front) for Sample 2
Remark: For Radiated Test Cases, The tests were performance with Sample 1	

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
3.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
5.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, programmed RF utility, "Tera Term" installed in the notebook make the EUT provide functions like channel selection and power level 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.

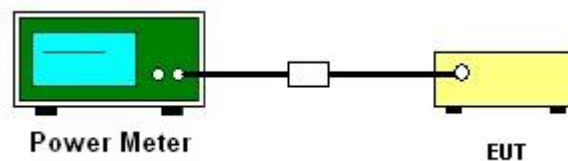
3.1.2 Measuring Instruments

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

3.1.3 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.

3.1.4 Test Setup



3.1.5 Test Result of Peak Output Power

Please refer to Appendix A.



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 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.

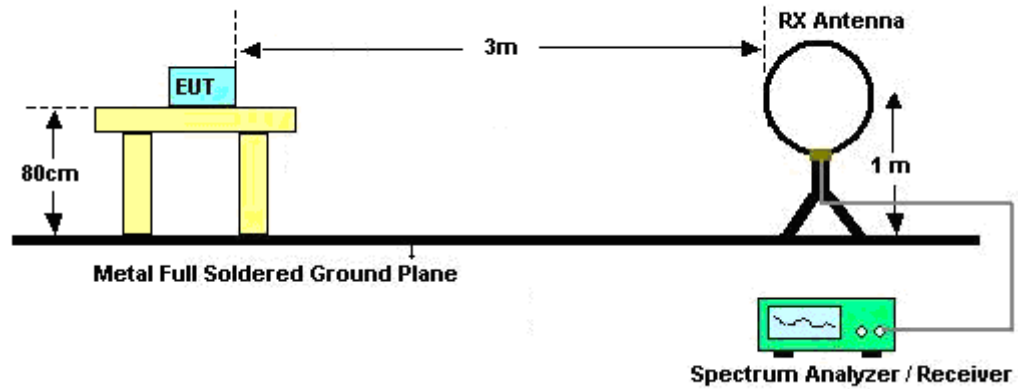


3.2.3 Test Procedures

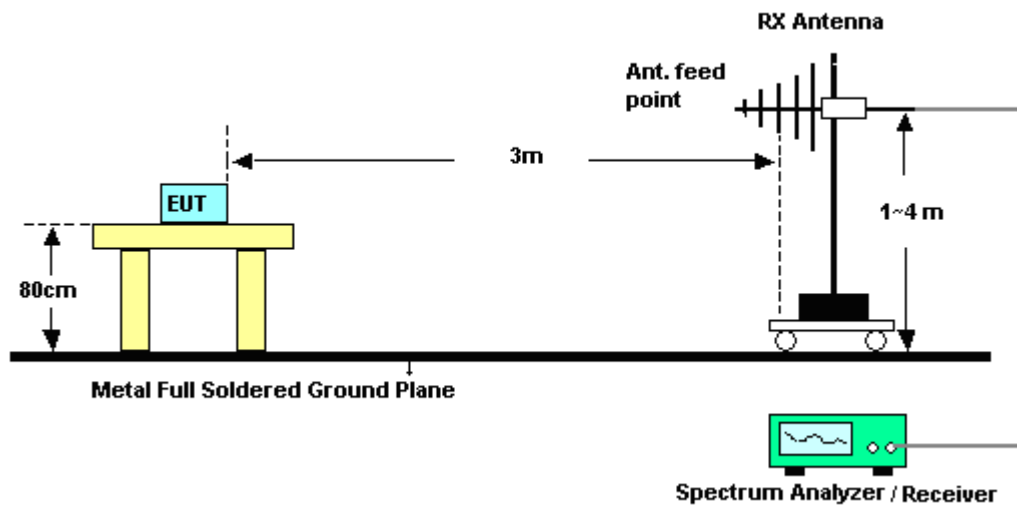
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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 $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.
For average measurement:
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.2.4 Test Setup

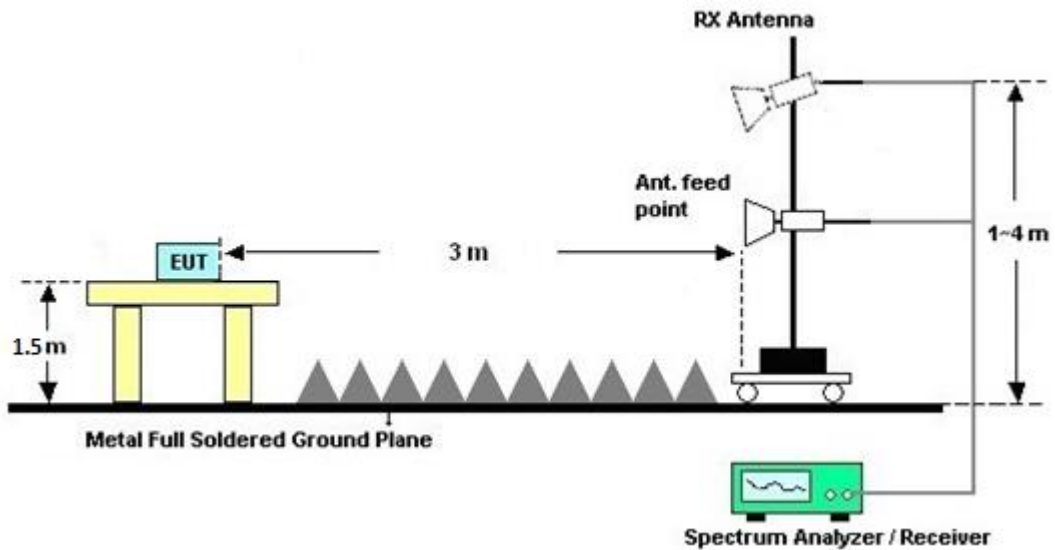
For radiated emissions below 30MHz



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 was not reported.

3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.2.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

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 (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

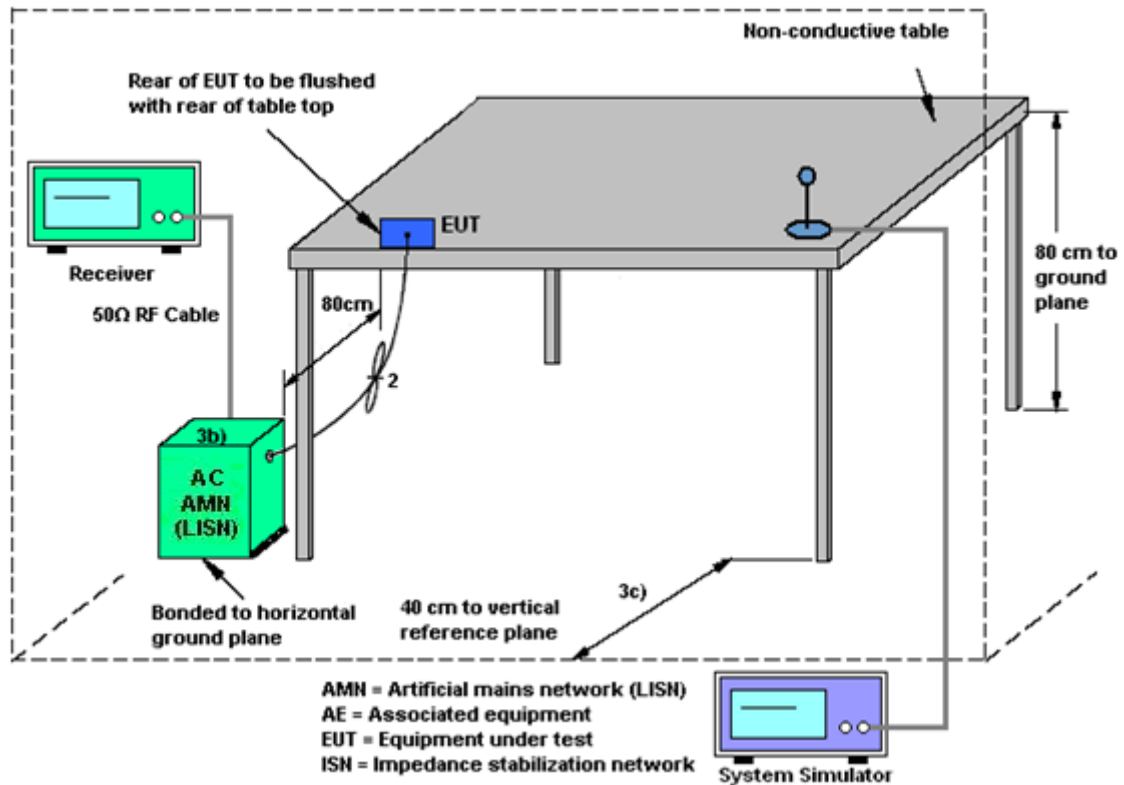
3.3.2 Measuring Instruments

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



3.3.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



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 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	Dec. 26, 2016	Apr. 21, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Dec. 26, 2016	Apr. 21, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Jul. 17, 2016	Apr. 21, 2017	Jul. 16, 2017	Conducted (TH05-HY)
Amplifier	SONOMA	310N	187311	9kHz~1GHz	Oct. 26, 2016	May 09, 2017 ~ May 11, 2017	Oct. 25, 2017	Radiation (03CH10-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	35413&02	30MHz~1GHz	Jan. 07, 2017	May 09, 2017 ~ May 11, 2017	Jan. 06, 2018	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1325	1GHz ~ 18GHz	Sep. 30, 2016	May 09, 2017 ~ May 11, 2017	Sep. 29, 2017	Radiation (03CH10-HY)
Preamplifier	Keysight	83017A	MY53270078	1GHz~26.5GHz	Oct. 26, 2016	May 09, 2017 ~ May 11, 2017	Oct. 25, 2017	Radiation (03CH10-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200485	10Hz ~ 44GHz	Oct. 17, 2016	May 09, 2017 ~ May 11, 2017	Oct. 16, 2017	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	May 09, 2017 ~ May 11, 2017	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0~360 Degree	N/A	May 09, 2017 ~ May 11, 2017	N/A	Radiation (03CH10-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Oct. 20, 2016	May 09, 2017 ~ May 11, 2017	Oct. 19, 2018	Radiation (03CH10-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	N/A	Mar. 03, 2017	May 09, 2017 ~ May 11, 2017	Mar. 02, 2018	Radiation (03CH10-HY)
Preamplifier	Jet-Power	JPA00101800-30-10P	1601180002	1GHz~18GHz	Jul. 27, 2016	May 09, 2017 ~ May 11, 2017	Jul. 26, 2017	Radiation (03CH10-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz ~ 40GHz	Apr. 27, 2017	May 09, 2017 ~ May 11, 2017	Apr. 26, 2018	Radiation (03CH10-HY)
Preamplifier	MITEQ	JS44-18004000-33-8P	1840917	18GHz ~ 40GHz	Jun. 14, 2016	May 09, 2017 ~ May 11, 2017	Jun. 13, 2017	Radiation (03CH10-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Apr. 30, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Apr. 30, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Apr. 30, 2017	Nov. 28, 2017	Conduction (CO05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.7
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.6
---	-----

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.9
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2
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Appendix A. Conducted Test Results

Bluetooth Low Energy

Test Engineer:	Allen Lin	Temperature:	21~25	°C
Test Date:	2017/4/21	Relative Humidity:	51~54	%

TEST RESULTS DATA**Peak Power Table**

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	4.66	30.00	-1.80	2.86	36.00	Pass
BLE	1Mbps	1	19	2440	4.69	30.00	-1.80	2.89	36.00	Pass
BLE	1Mbps	1	39	2480	5.00	30.00	-1.80	3.20	36.00	Pass

TEST RESULTS DATA**Average Power Table****(Reporting Only)**

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
BLE	1Mbps	1	0	2402	2.08	4.24
BLE	1Mbps	1	19	2440	2.08	4.14
BLE	1Mbps	1	39	2480	2.08	4.84



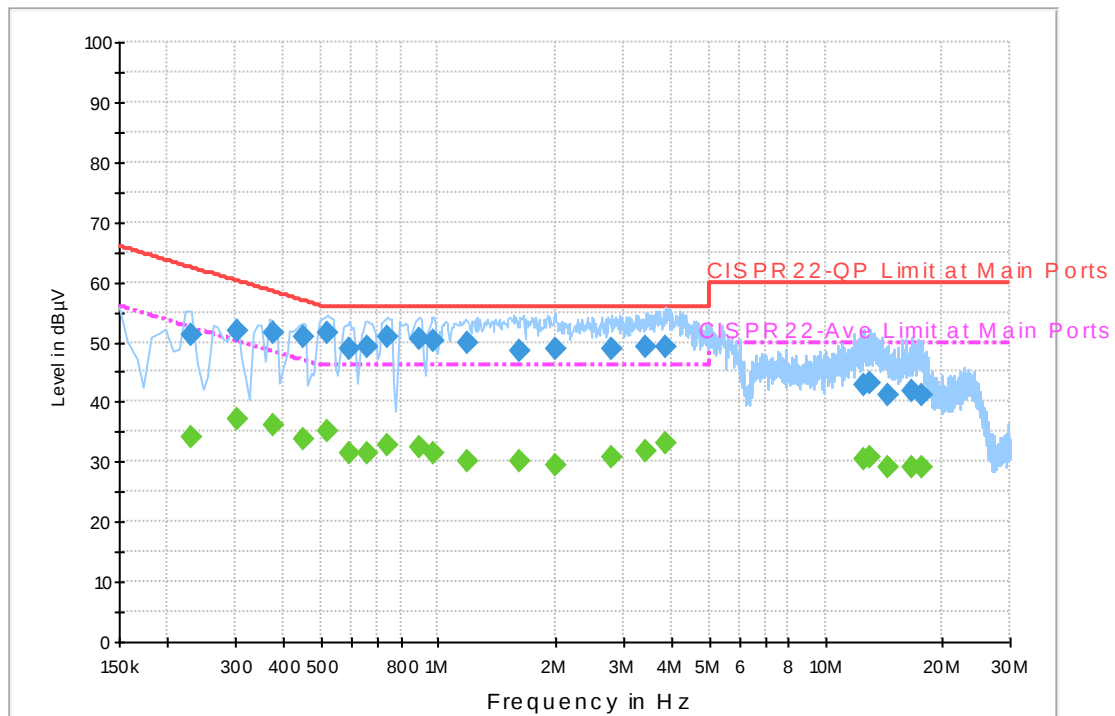
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Arthur Hsieh	Temperature :	22~24℃
		Relative Humidity :	51~55%

EUT Information

Report NO : 740121
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Line

ENV216 Auto Test FCC Power Bar - L



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.230000	51.1	Off	L1	19.6	11.3	62.4
0.302000	51.7	Off	L1	19.6	8.5	60.2
0.374000	51.6	Off	L1	19.6	6.8	58.4
0.446000	51.0	Off	L1	19.6	5.9	56.9
0.518000	51.4	Off	L1	19.6	4.6	56.0
0.590000	48.9	Off	L1	19.6	7.1	56.0
0.654000	49.3	Off	L1	19.6	6.7	56.0
0.742000	50.9	Off	L1	19.6	5.1	56.0
0.894000	50.4	Off	L1	19.6	5.6	56.0
0.974000	50.2	Off	L1	19.6	5.8	56.0
1.190000	49.8	Off	L1	19.6	6.2	56.0
1.630000	48.6	Off	L1	19.6	7.4	56.0
2.006000	48.9	Off	L1	19.6	7.1	56.0
2.798000	48.7	Off	L1	19.5	7.3	56.0
3.438000	49.0	Off	L1	19.7	7.0	56.0
3.870000	49.0	Off	L1	19.7	7.0	56.0
12.638000	42.8	Off	L1	20.2	17.2	60.0
12.974000	43.1	Off	L1	20.2	16.9	60.0
14.574000	41.1	Off	L1	20.3	18.9	60.0
16.806000	41.7	Off	L1	20.4	18.3	60.0
17.662000	41.0	Off	L1	20.5	19.0	60.0

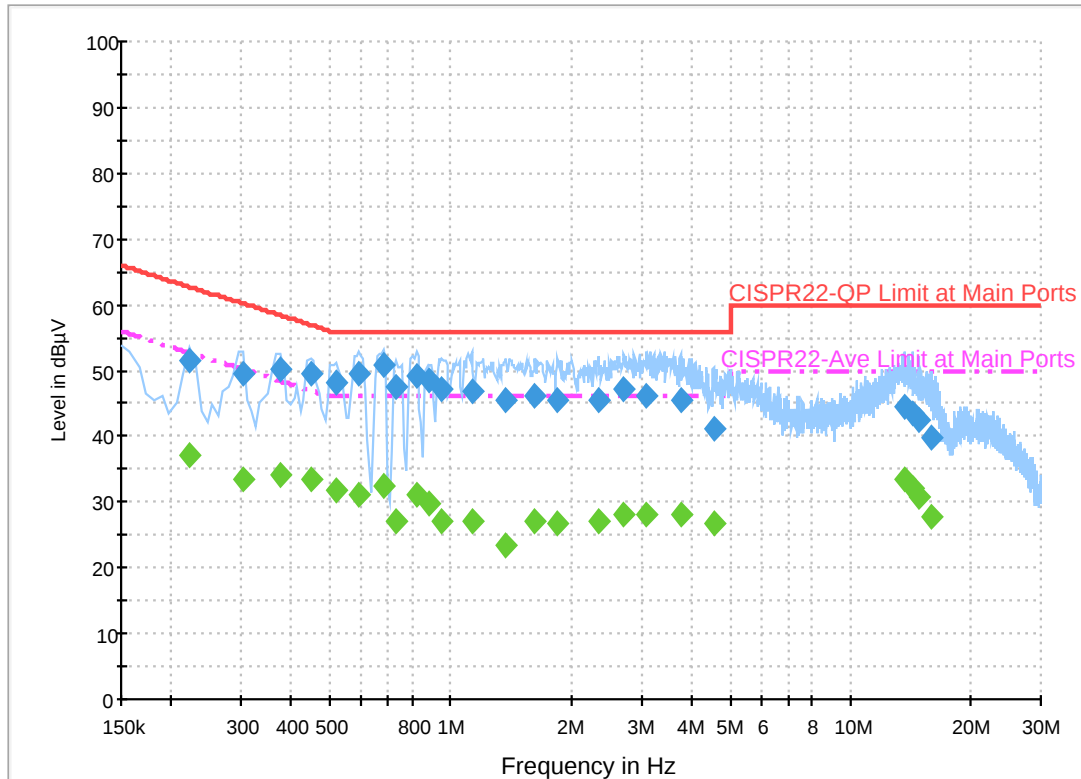
Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.230000	34.2	Off	L1	19.6	18.2	52.4
0.302000	37.2	Off	L1	19.6	13.0	50.2
0.374000	36.3	Off	L1	19.6	12.1	48.4
0.446000	33.9	Off	L1	19.6	13.0	46.9
0.518000	35.1	Off	L1	19.6	10.9	46.0
0.590000	31.3	Off	L1	19.6	14.7	46.0
0.654000	31.5	Off	L1	19.6	14.5	46.0
0.742000	32.6	Off	L1	19.6	13.4	46.0
0.894000	32.3	Off	L1	19.6	13.7	46.0
0.974000	31.5	Off	L1	19.6	14.5	46.0
1.190000	30.0	Off	L1	19.6	16.0	46.0
1.630000	29.9	Off	L1	19.6	16.1	46.0
2.006000	29.4	Off	L1	19.6	16.6	46.0
2.798000	30.7	Off	L1	19.5	15.3	46.0
3.438000	31.8	Off	L1	19.7	14.2	46.0
3.870000	33.0	Off	L1	19.7	13.0	46.0
12.638000	30.5	Off	L1	20.2	19.5	50.0
12.974000	30.8	Off	L1	20.2	19.2	50.0
14.574000	29.1	Off	L1	20.3	20.9	50.0
16.806000	29.0	Off	L1	20.4	21.0	50.0
17.662000	29.1	Off	L1	20.5	20.9	50.0

EUT Information

Report NO : 740121
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Neutral

ENV216 Auto Test FCC Power Bar - N



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.222000	51.5	Off	N	19.5	11.2	62.7
0.302000	49.5	Off	N	19.5	10.7	60.2
0.374000	50.3	Off	N	19.5	8.1	58.4
0.446000	49.4	Off	N	19.5	7.5	56.9
0.518000	48.0	Off	N	19.5	8.0	56.0
0.590000	49.6	Off	N	19.5	6.4	56.0
0.678000	50.7	Off	N	19.5	5.3	56.0
0.734000	47.4	Off	N	19.5	8.6	56.0
0.822000	49.1	Off	N	19.6	6.9	56.0
0.886000	48.5	Off	N	19.5	7.5	56.0
0.950000	47.1	Off	N	19.6	8.9	56.0
1.134000	46.9	Off	N	19.6	9.1	56.0
1.374000	45.4	Off	N	19.6	10.6	56.0
1.630000	46.1	Off	N	19.6	9.9	56.0
1.854000	45.5	Off	N	19.6	10.5	56.0
2.342000	45.4	Off	N	18.9	10.6	56.0
2.718000	47.2	Off	N	19.4	8.8	56.0
3.102000	46.2	Off	N	19.6	9.8	56.0
3.758000	45.4	Off	N	19.7	10.6	56.0
4.550000	41.3	Off	N	19.7	14.7	56.0
13.638000	44.6	Off	N	20.3	15.4	60.0
14.382000	43.6	Off	N	20.3	16.4	60.0
14.902000	42.4	Off	N	20.4	17.6	60.0
16.046000	39.8	Off	N	20.5	20.2	60.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.222000	37.2	Off	N	19.5	15.5	52.7
0.302000	33.5	Off	N	19.5	16.7	50.2
0.374000	34.1	Off	N	19.5	14.3	48.4
0.446000	33.5	Off	N	19.5	13.4	46.9
0.518000	31.8	Off	N	19.5	14.2	46.0
0.590000	31.2	Off	N	19.5	14.8	46.0
0.678000	32.4	Off	N	19.5	13.6	46.0
0.734000	27.2	Off	N	19.5	18.8	46.0
0.822000	31.0	Off	N	19.6	15.0	46.0
0.886000	29.8	Off	N	19.5	16.2	46.0
0.950000	27.0	Off	N	19.6	19.0	46.0
1.134000	27.2	Off	N	19.6	18.8	46.0
1.374000	23.4	Off	N	19.6	22.6	46.0
1.630000	27.1	Off	N	19.6	18.9	46.0
1.854000	26.7	Off	N	19.6	19.3	46.0
2.342000	26.9	Off	N	18.9	19.1	46.0
2.718000	28.0	Off	N	19.4	18.0	46.0
3.102000	28.2	Off	N	19.6	17.8	46.0
3.758000	28.2	Off	N	19.7	17.8	46.0
4.550000	26.7	Off	N	19.7	19.3	46.0
13.638000	33.5	Off	N	20.3	16.5	50.0
14.382000	32.2	Off	N	20.3	17.8	50.0
14.902000	30.9	Off	N	20.4	19.1	50.0
16.046000	27.9	Off	N	20.5	22.1	50.0



Appendix C. Radiated Spurious Emission

Test Engineer :	Stan Hsieh and Kyle Chuang	Temperature :	22~24°C
		Relative Humidity :	43~44%

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 39 2480MHz	*	2480	91.89	-	-	83.33	27.24	4.51	33.17	195	340	P	H
	*	2480	91.32	-	-	82.76	27.24	4.51	33.17	195	340	A	H
		2491.16	51.19	-22.81	74	42.55	27.3	4.53	33.17	195	340	P	H
		2495.4	41.97	-12.03	54	33.32	27.3	4.53	33.16	195	340	A	H
													H
													H
	*	2480	96.27	-	-	87.71	27.24	4.51	33.17	161	239	P	V
	*	2480	95.57	-	-	87.01	27.24	4.51	33.17	161	239	A	V
		2497.08	51.65	-22.35	74	43	27.3	4.53	33.16	161	239	P	V
		2483.52	41.88	-12.12	54	33.3	27.24	4.53	33.17	161	239	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****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 39 2480MHz		4960	44.32	-29.68	74	66.87	32.42	6.47	61.9	100	0	P	H
		7440	49.3	-24.7	74	65.67	37.32	8.05	62.09	100	0	P	H
													H
													H
		4960	44.3	-29.7	74	66.85	32.42	6.47	61.9	100	0	P	V
		7440	49.6	-24.4	74	65.97	37.32	8.05	62.09	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		31.62	21.52	-18.48	40	30.32	23.34	0.53	32.75	-	-	P	H
		95.88	21.75	-21.75	43.5	37.84	15.47	0.97	32.77			P	H
		249.51	22.76	-23.24	46	35.18	18.36	1.53	32.73			P	H
		580	27.06	-18.94	46	31.64	25.59	2.23	32.98			P	H
		744.5	30.42	-15.58	46	32.05	28.21	2.51	32.95			P	H
		949.6	32.55	-13.45	46	29.99	30.72	2.78	31.75	100	0	P	H
													H
													H
													H
													H
													H
													H
													H
		30.27	23.5	-16.5	40	31.43	24.22	0.53	32.76			P	V
		95.88	21.38	-22.12	43.5	37.47	15.47	0.97	32.77			P	V
		171.75	18.52	-24.98	43.5	34.02	15.57	1.26	32.76			P	V
		566	26.52	-19.48	46	30.69	26	2.21	32.96			P	V
		729.1	30.15	-15.85	46	32.34	27.7	2.48	32.96			P	V
		930	32.32	-13.68	46	30.84	29.91	2.77	31.97	100	0	P	V
													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	Peak or Average
H/V	Horizontal or Vertical



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		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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



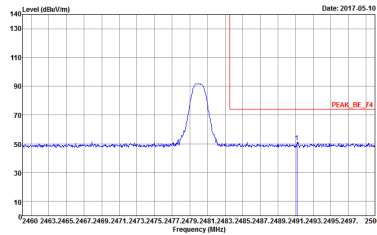
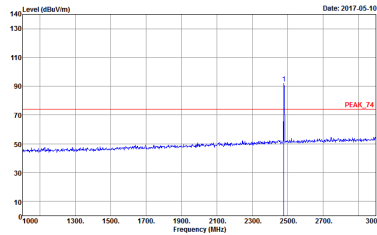
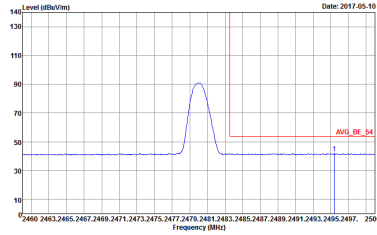
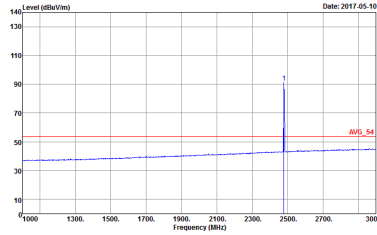
Appendix D. Radiated Spurious Emission Plots

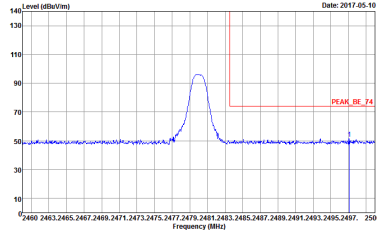
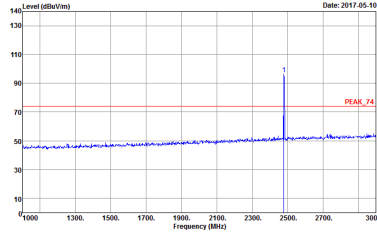
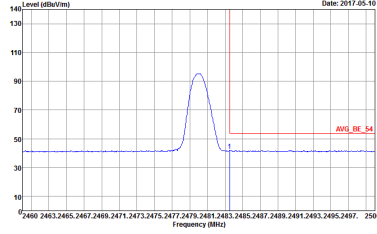
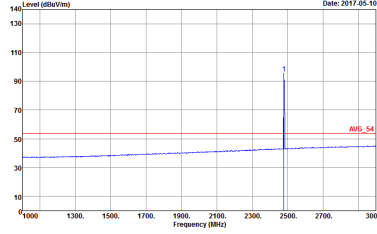
Test Engineer :	Stan Hsieh and Kyle Chuang	Temperature :	22~24°C
		Relative Humidity :	43~44%

Note symbol

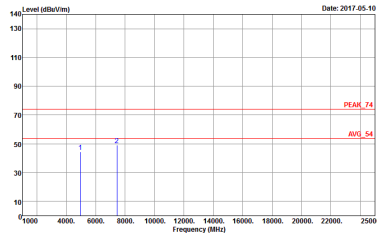
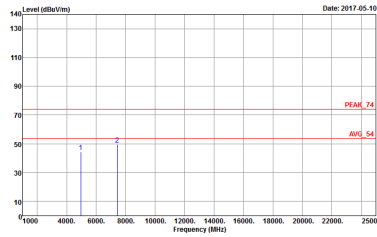
-L	Low channel location
-R	High channel location

2.4GHz 2400~2483.5MHz
BLE (Band Edge @ 3m)

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1+2	Horizontal	Fundamental
Peak	 Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2	 Site : 03CH10-HY Condition : PEAK_74 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2
Avg.	 Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2	 Site : 03CH10-HY Condition : AVG_54 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2

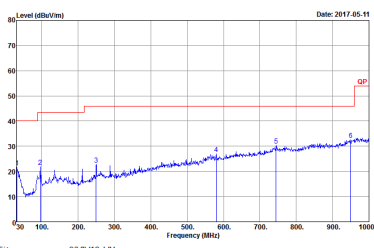
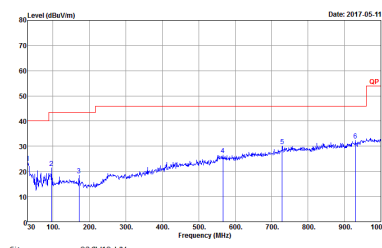
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1+2	Vertical	Fundamental
Peak	 Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2	 Site : 03CH10-HY Condition : PEAK_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2
Avg.	 Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2	 Site : 03CH10-HY Condition : AVG_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 740121 Mode : 2

2.4GHz 2400~2483.5MHz
BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
1+2	Horizontal	Vertical
Peak	 Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 HORIZONTAL Detector : Peak Project : 740121 Mode : 2	 Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 VERTICAL Detector : Peak Project : 740121 Mode : 2

Emission below 1GHz

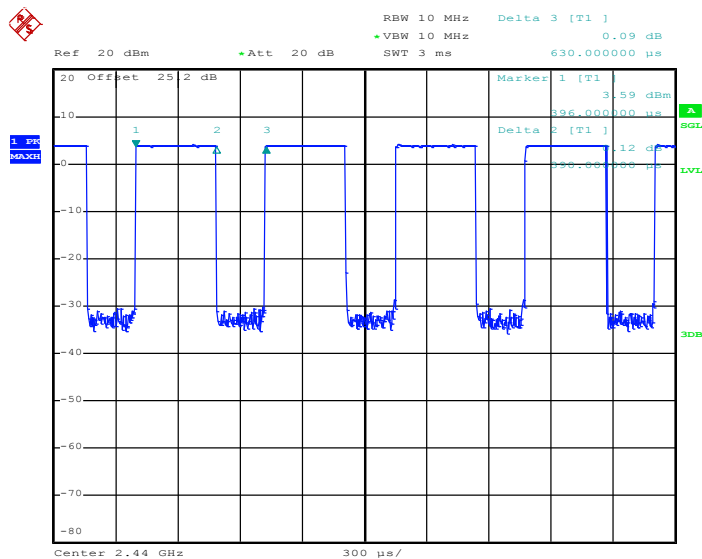
2.4GHz BLE (LF)

BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE LF	
1+2	Horizontal	Vertical
QP / Peak	 Site : 03CH10-HY Condition : QP 3m BT-LOG 6111D-LF HORIZONTAL Detector : Peak Project : 740121 Mode : 2	 Site : 03CH10-HY Condition : QP 3m BT-LOG 6111D-LF VERTICAL Detector : Peak Project : 740121 Mode : 2

Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth -LE	61.91	390.00	2.56	3kHz

Bluetooth - LE



Date: 21.APR.2017 11:47:39



Appendix G. Original Report

Please refer to Sporton report number FR740120B.

FCC RF Test Report

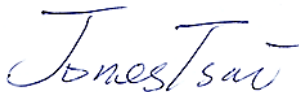
APPLICANT : SHARP CORPORATION
EQUIPMENT : Smart Phone
BRAND NAME : NTT docomo
MODEL NAME : SH-03J
FCC ID : APYHRO00248
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Apr. 01, 2017 and testing was completed on Apr. 29, 2017. 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
FR740120B	Rev. 01	Initial issue of report	Jun. 02, 2017
FR740120B	Rev. 02	Revising Applicant and Manufacturer	Jun. 07, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	99% Bandwidth	-	Pass	-
3.2	15.247(b)(3)	Peak Output Power	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	$\leq 20\text{dBc}$	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 12.10 dB at 2484.520 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 17.40 dB at 0.502 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

SHARP CORPORATION

2-13-1, Hachihonmatsu-Iida, Higashi-hiroshima-shi, Hiroshima, 739-0192, Japan

1.2 Manufacturer

SHARP CORPORATION

2-13-1, Hachihonmatsu-Iida, Higashi-hiroshima-shi, Hiroshima, 739-0192, Japan

1.3 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac, Wi-Fi 5GHz 802.11a/n/ac, NFC, and GPS

Product Specification subjective to this standard	
Sample 1	EUT with Memory 1
Sample 2	EUT with Memory 2
Antenna Type	WWAN: ILA Antenna WLAN: ILA Antenna Bluetooth: ILA Antenna GPS/Glonass/Beidou/Galileo: ILA Antenna NFC: Loop Antenna

1.4 Modification of EUT

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

1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW0007 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 1 st 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.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855	
Test Site No.	Sporton Site No.	
	03CH10-HY	

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

1.6 Applicable Standards

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

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

Remark:

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



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-

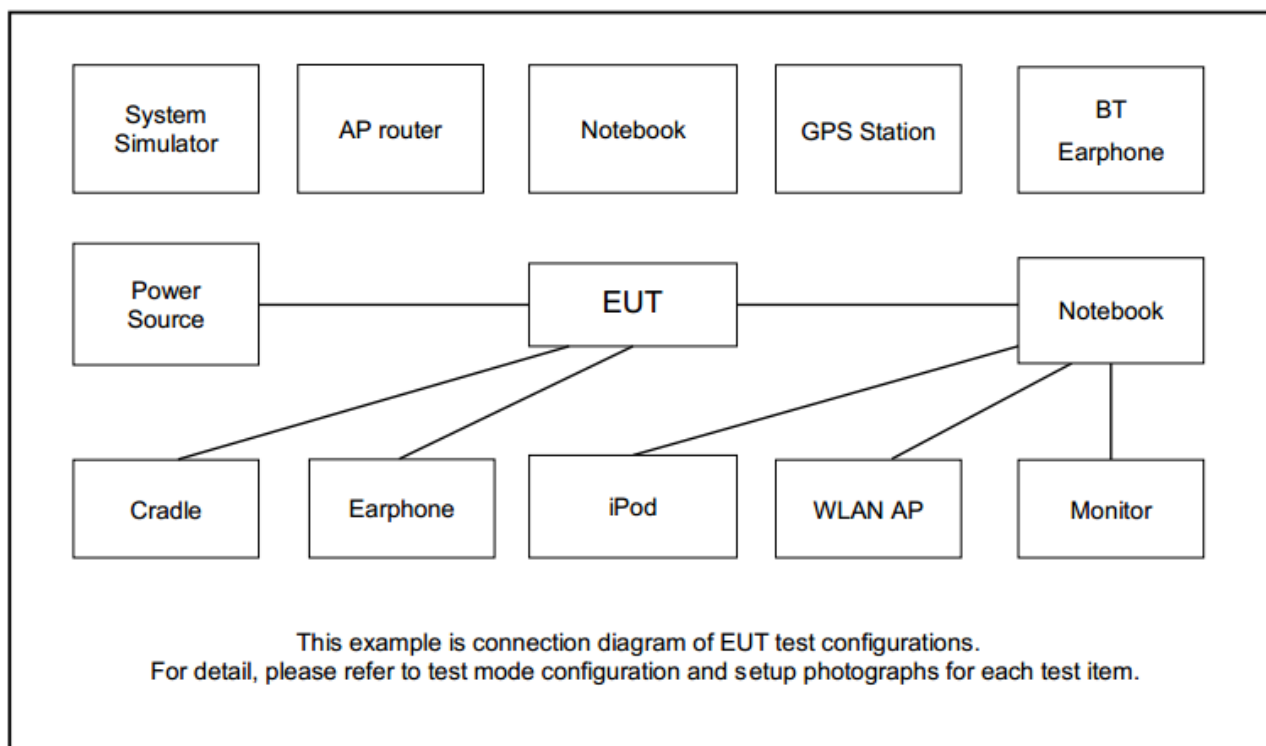
2.2 Test Mode

- 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 emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).
- b. AC power line Conducted Emission was tested under maximum output power.

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
Conducted 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
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 :GSM1900 Idle + Bluetooth Link + WLAN (2.4GHz) Link + Earphone + USB Cable (Charging from Adapter) + Camera (Rear) for Sample 1
Remark: For Radiated Test Cases, The tests were performance with Sample 1.	

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	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.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A



2.5 EUT Operation Test Setup

The RF test items, programmed RF utility, "Tera Term" installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 + 10 = 14.2 \text{ (dB)}\end{aligned}$$

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

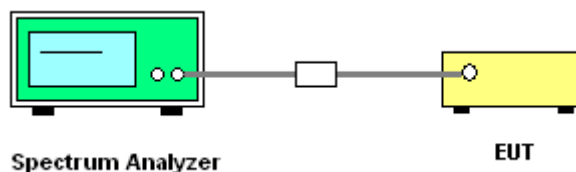
3.1.2 Measuring Instruments

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 FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The RF output of EUT was connected to the spectrum analyzer 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. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 30kHz and set the Video bandwidth (VBW) = 100kHz.
6. Measure and record the results in the test report.

3.1.4 Test Setup

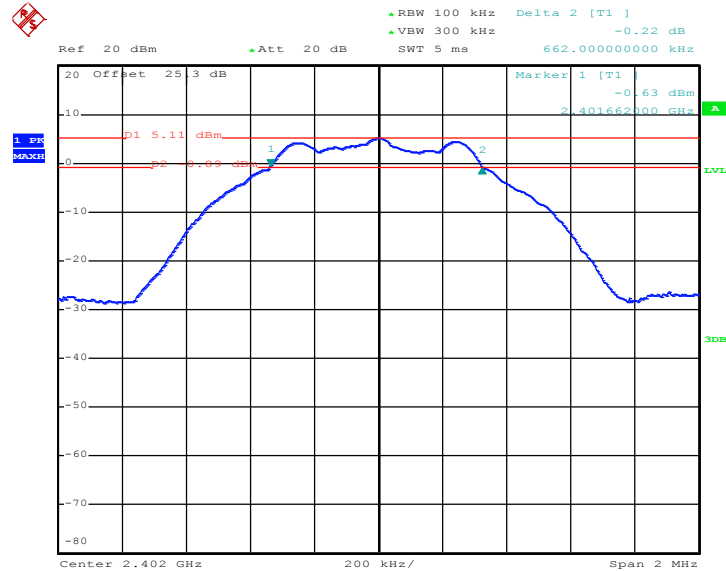




3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

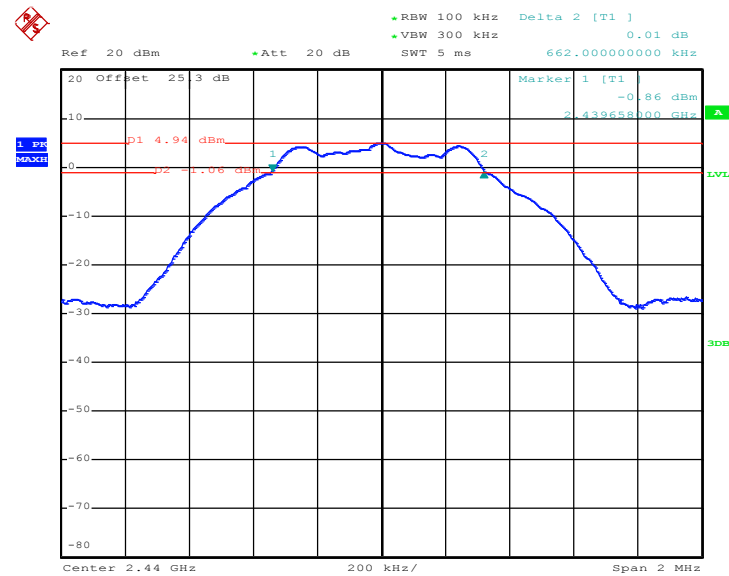
6 dB Bandwidth Plot on Channel 00



Date: 16.APR.2017 14:01:13

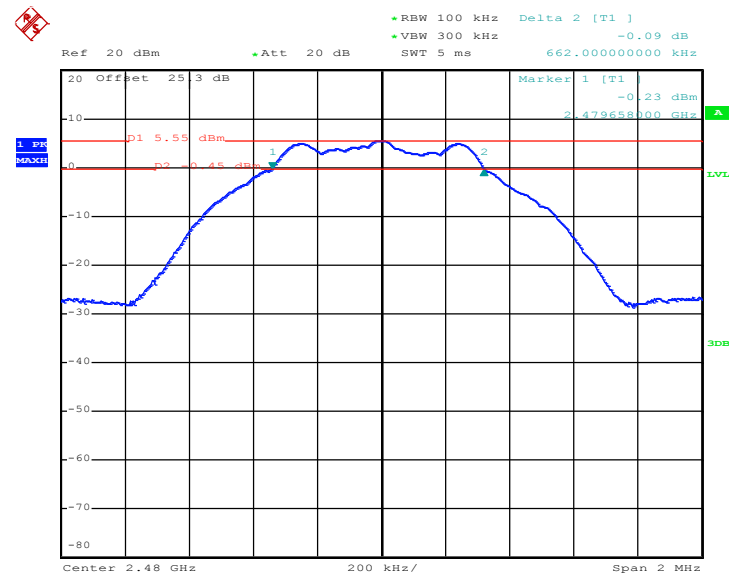


6 dB Bandwidth Plot on Channel 19



Date: 16.APR.2017 14:04:10

6 dB Bandwidth Plot on Channel 39



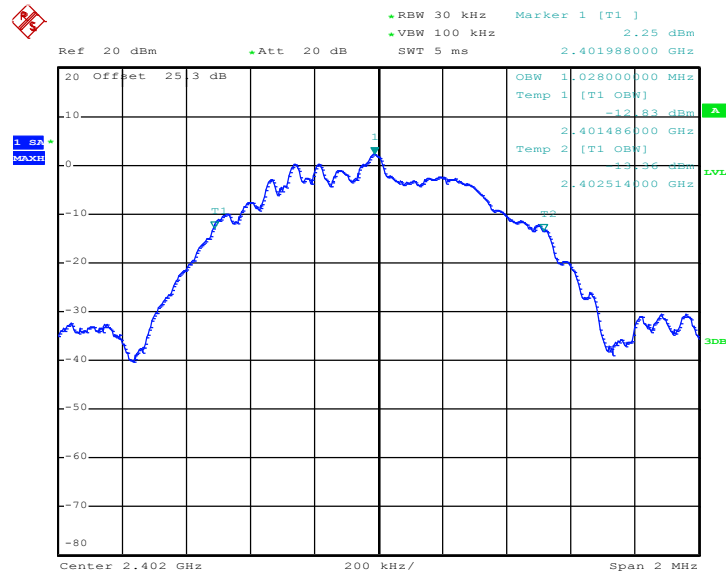
Date: 16.APR.2017 14:06:43



3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

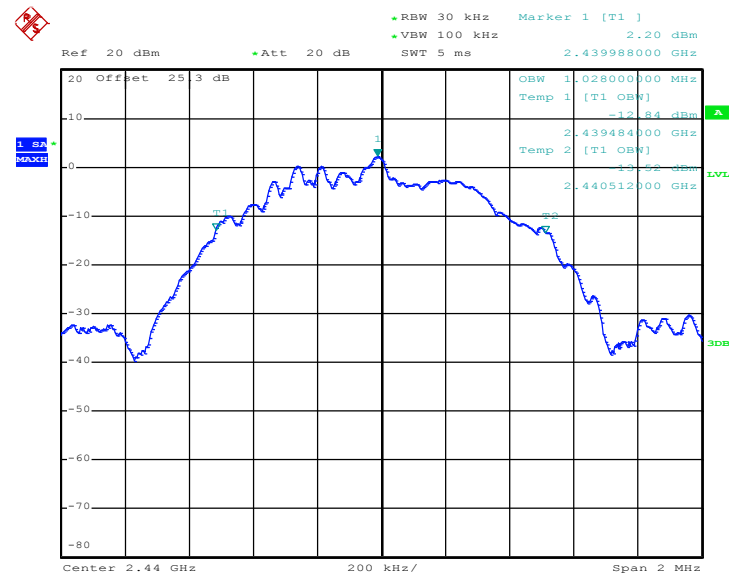
99% Bandwidth Plot on Channel 00



Date: 16.APR.2017 14:02:46

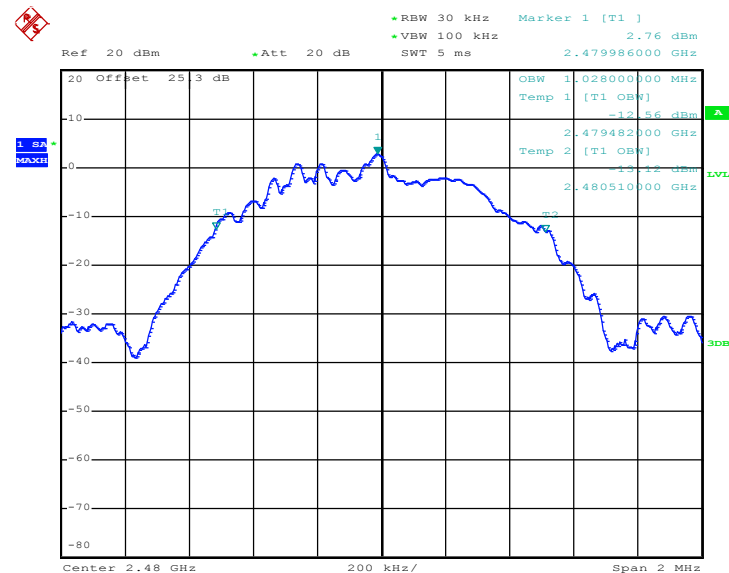


99% Occupied Bandwidth Plot on Channel 19



Date: 16.APR.2017 14:05:42

99% Occupied Bandwidth Plot on Channel 39



Date: 16.APR.2017 14:09:30

Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Peak Output Power Measurement

3.2.1 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.

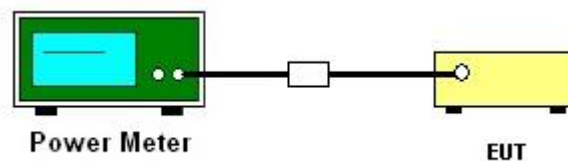
3.2.2 Measuring Instruments

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 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.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

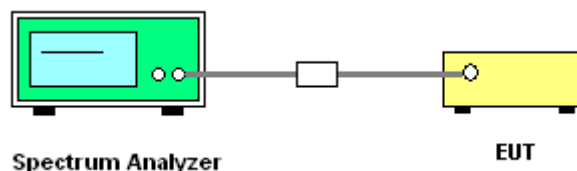
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
2. The RF output of EUT was connected to the spectrum analyzer 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. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

3.3.4 Test Setup



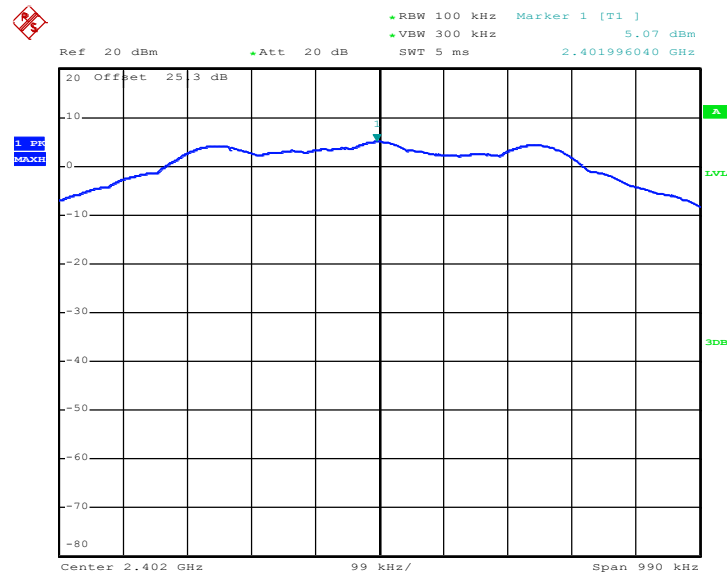


3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.3.6 Test Result of Power Spectral Density Plots (100kHz)

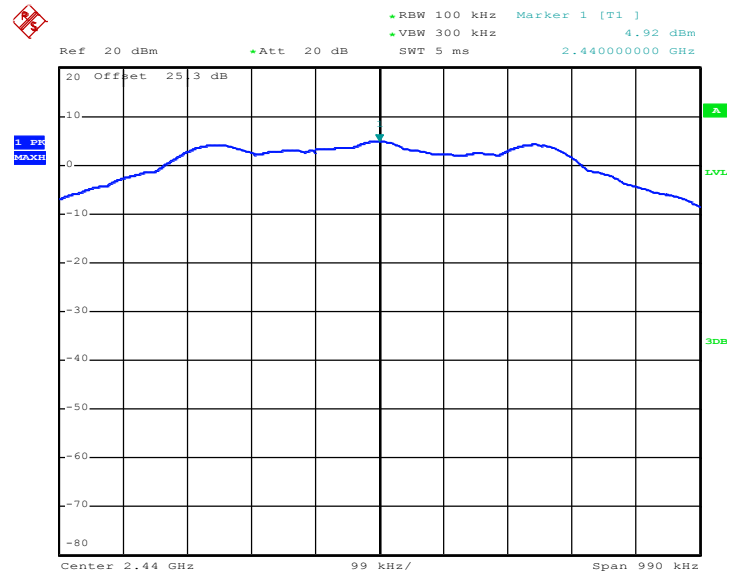
PSD 100kHz Plot on Channel 00



Date: 16.APR.2017 14:01:50

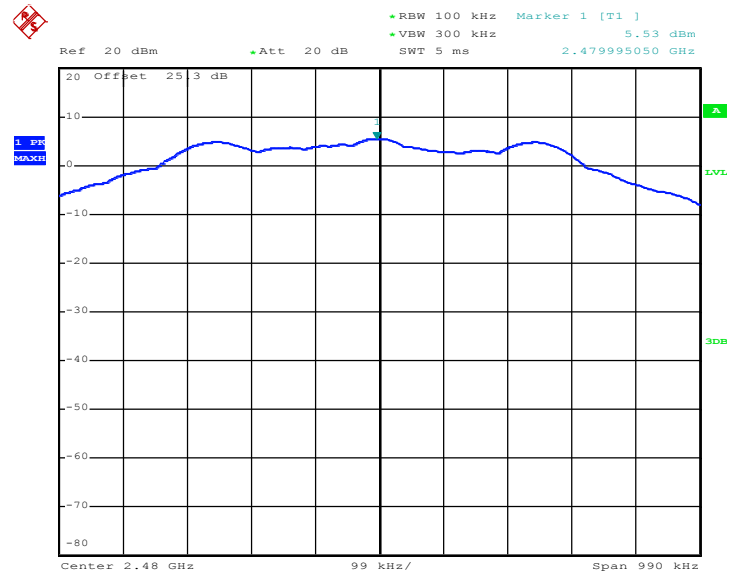


PSD 100kHz Plot on Channel 19



Date: 16.APR.2017 14:04:39

PSD 100kHz Plot on Channel 39

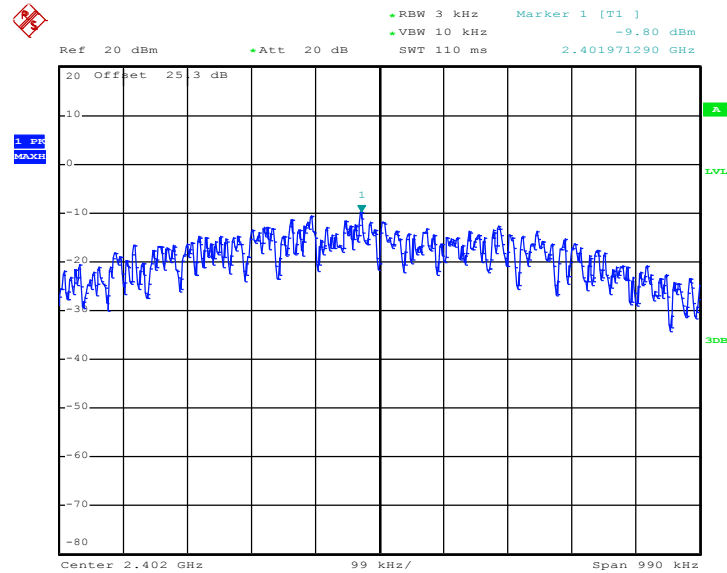


Date: 16.APR.2017 14:08:11



3.3.7 Test Result of Power Spectral Density Plots (3kHz)

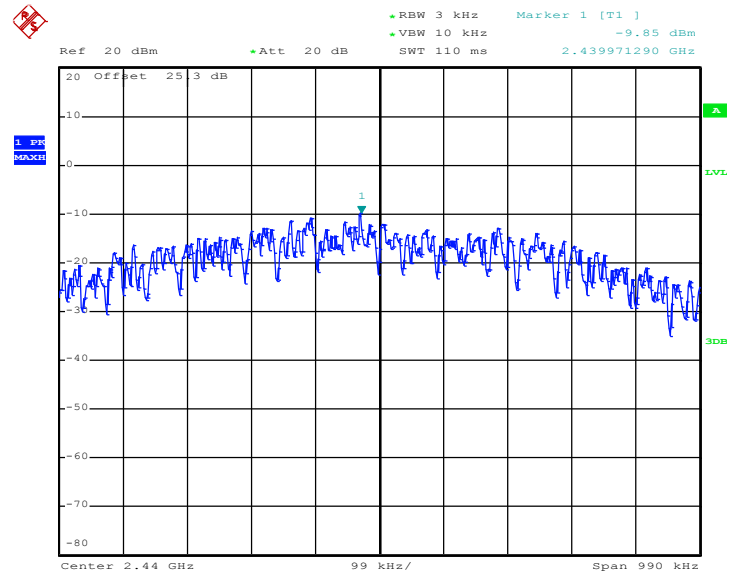
PSD 3kHz Plot on Channel 00



Date: 16.APR.2017 14:01:30

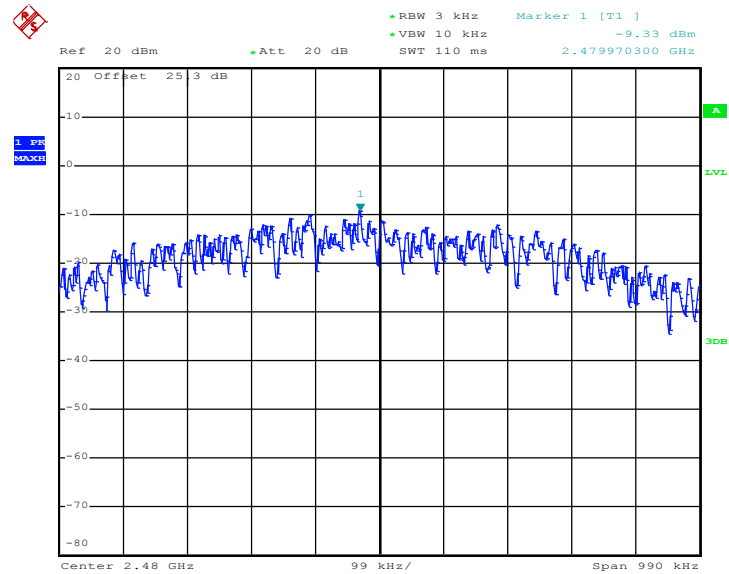


PSD 3kHz Plot on Channel 19



Date: 16.APR.2017 14:04:22

PSD 3kHz Plot on Channel 39



Date: 16.APR.2017 14:07:49

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

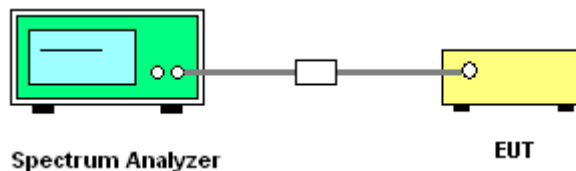
3.4.2 Measuring Instruments

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

3.4.3 Test Procedure

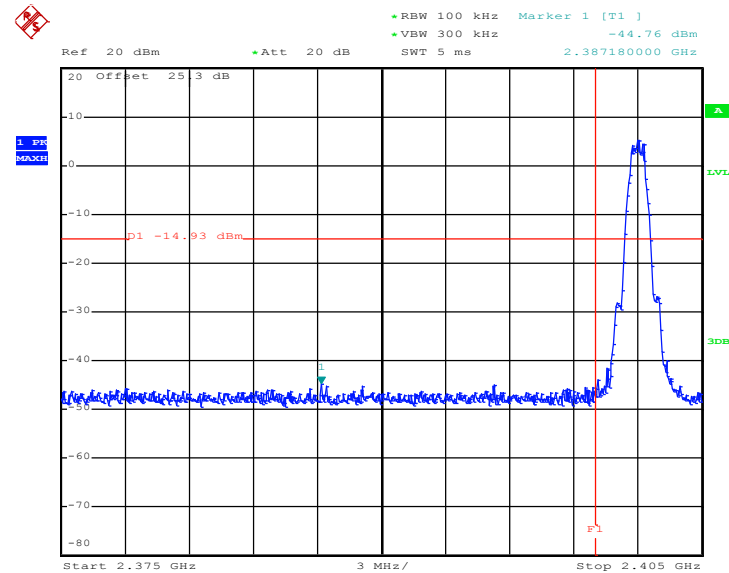
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup



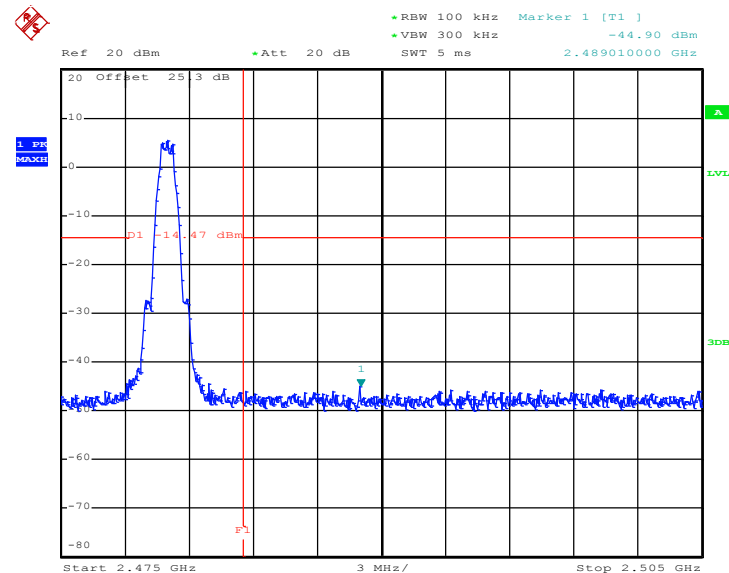
3.4.5 Test Result of Conducted Band Edges Plots

Low Band Edge Plot on Channel 00



Date: 16.APR.2017 14:02:05

High Band Edge Plot on Channel 39

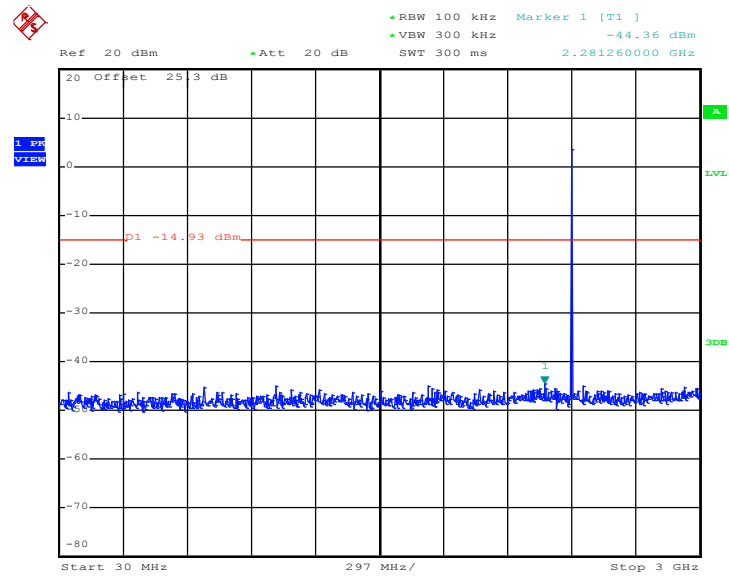


Date: 16.APR.2017 14:08:23



3.4.6 Test Result of Conducted Spurious Emission Plots

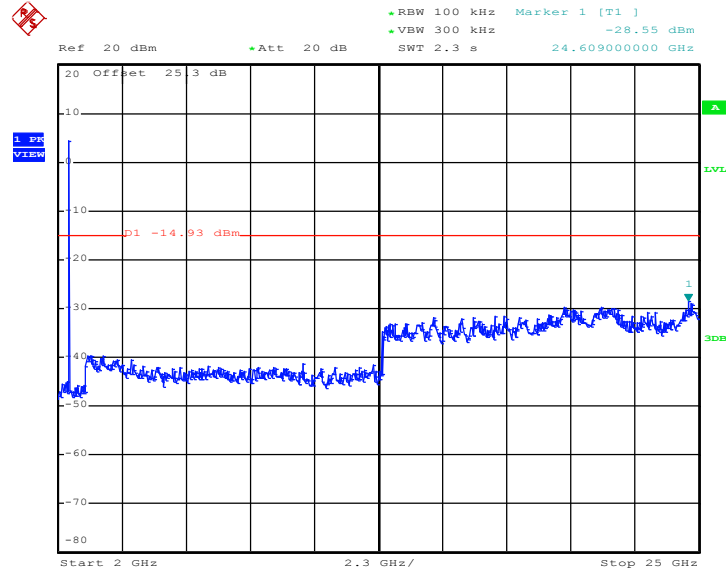
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



Date: 16.APR.2017 14:02:17



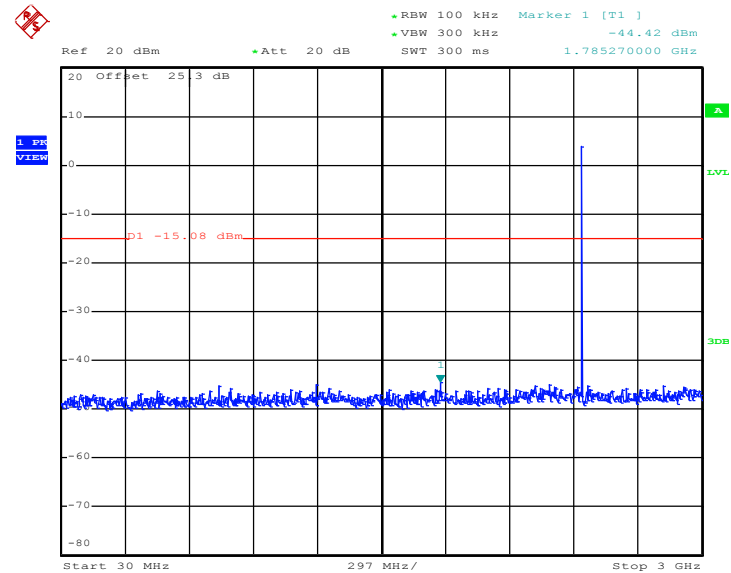
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 00



Date: 16.APR.2017 14:02:25



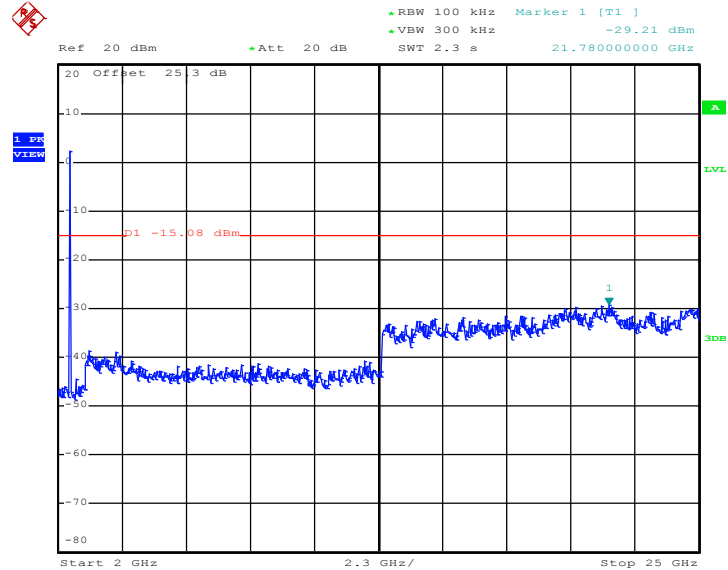
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 19



Date: 16.APR.2017 14:04:59



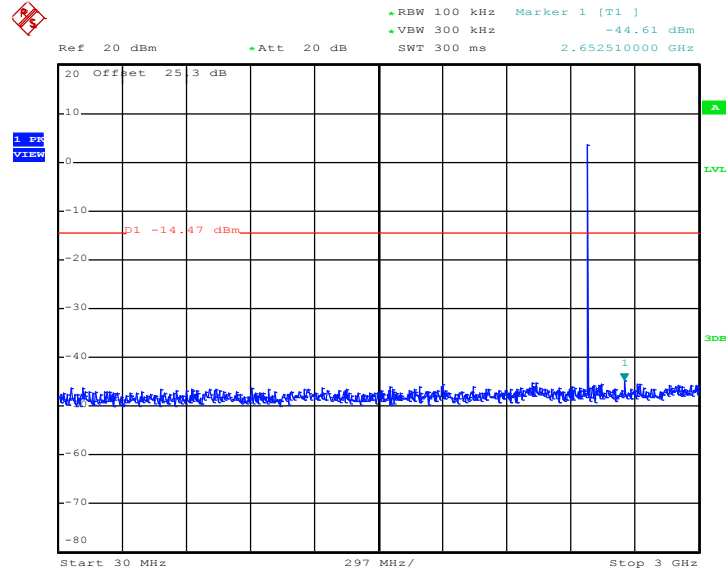
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 19



Date: 16.APR.2017 14:05:08



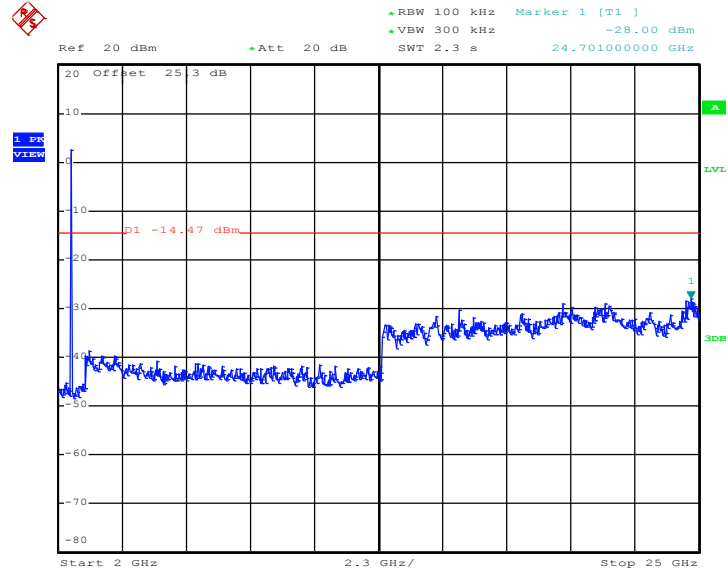
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 39



Date: 16.APR.2017 14:08:35



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps
GFSK Channel 39



Date: 16.APR.2017 14:08:43



3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 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

3.5.2 Measuring Instruments

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



3.5.3 Test Procedures

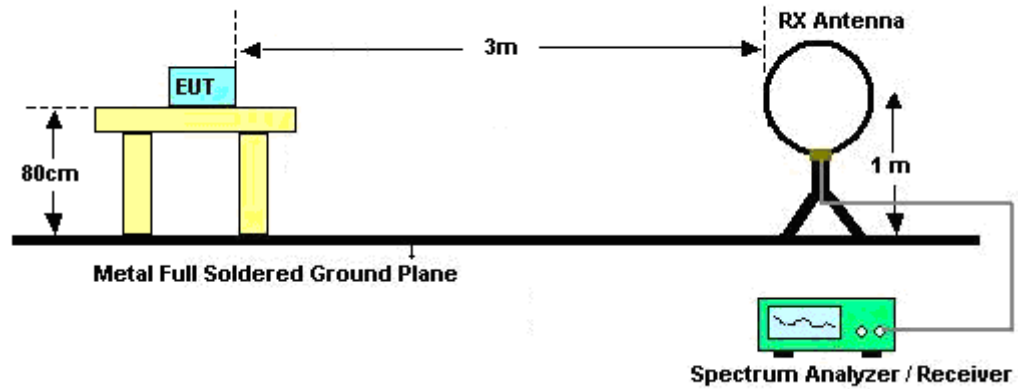
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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 $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

For average measurement:

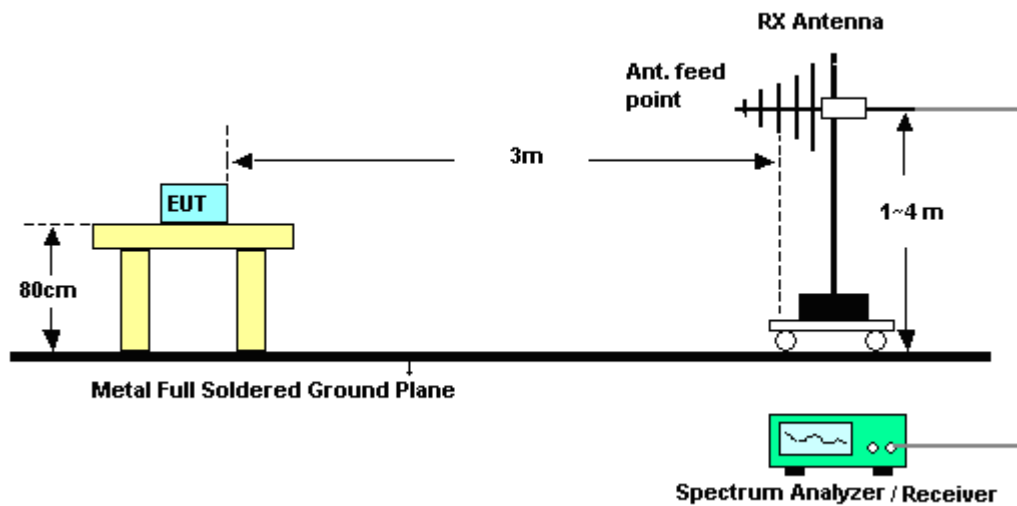
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

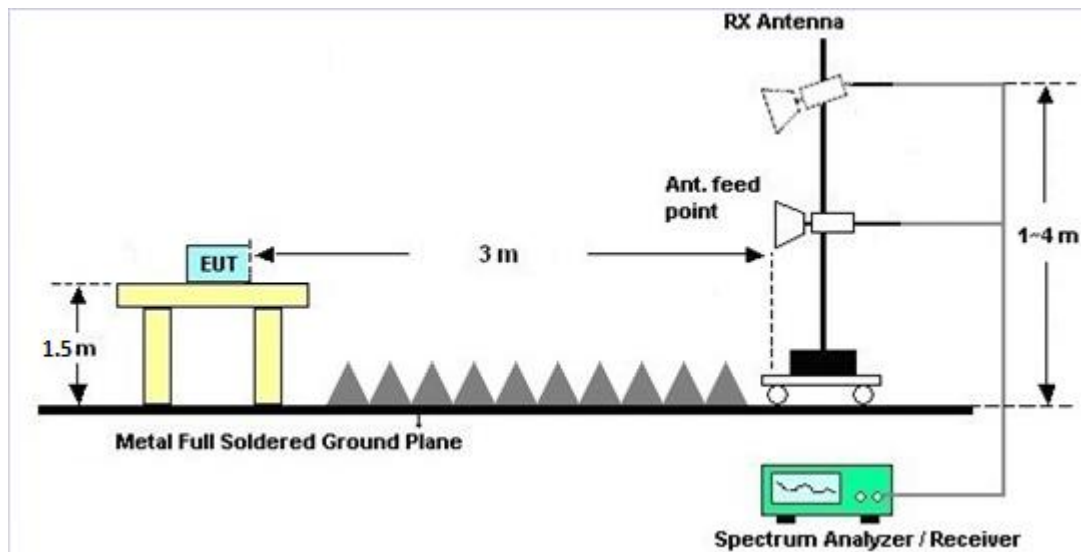
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 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.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.5.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

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

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

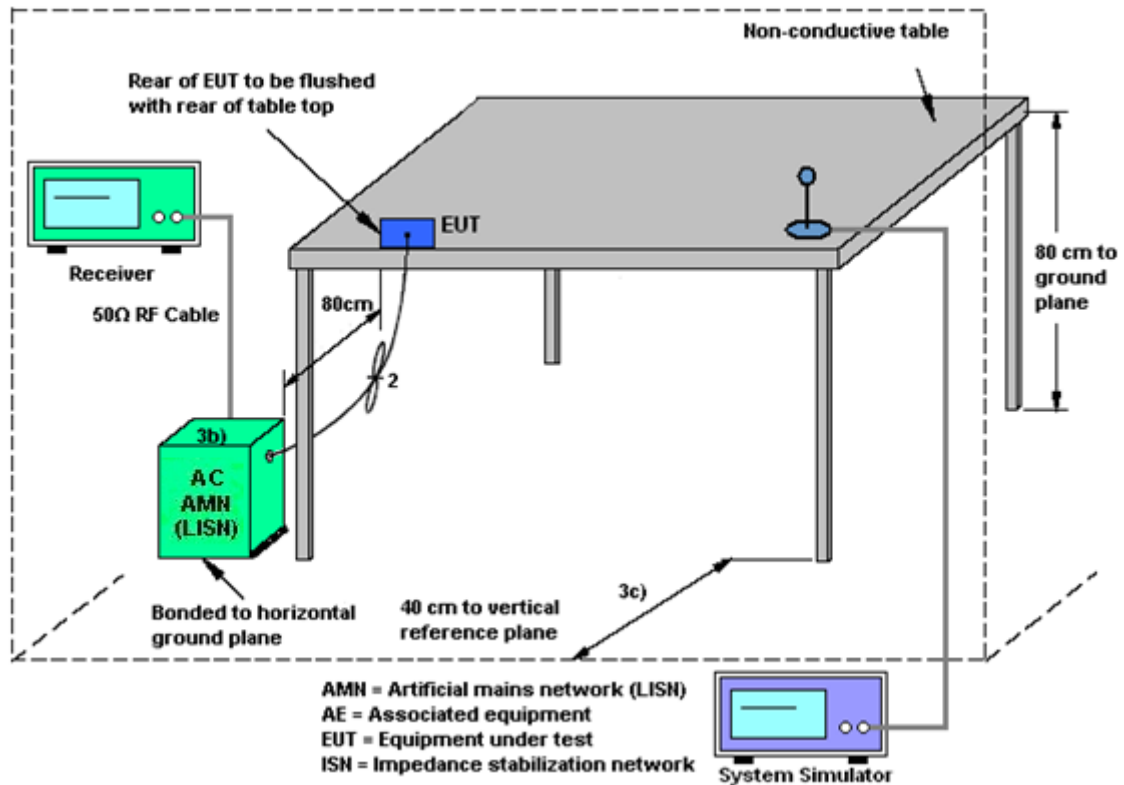
3.6.2 Measuring Instruments

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

3.6.3 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.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.7 Antenna Requirements

3.7.1 Standard Applicable

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

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 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	Dec. 26, 2016	Apr. 16, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Dec. 26, 2016	Apr. 16, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Jul. 17, 2016	Apr. 16, 2017	Jul. 16, 2017	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Apr. 29, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Apr. 29, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Apr. 29, 2017	Nov. 28, 2017	Conduction (CO05-HY)
Amplifier	SONOMA	310N	187311	9kHz~1GHz	Oct. 26, 2016	Apr. 21, 2017 ~ Apr. 24, 2017	Oct. 25, 2017	Radiation (03CH10-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	35413&02	30MHz~1GHz	Jan. 07, 2017	Apr. 21, 2017 ~ Apr. 28, 2017	Jan. 06, 2018	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1325	1GHz ~ 18GHz	Sep. 30, 2016	Apr. 21, 2017 ~ Apr. 28, 2017	Sep. 29, 2017	Radiation (03CH10-HY)
Preamplifier	Keysight	83017A	MY53270078	1GHz~26.5GHz	Oct. 26, 2016	Apr. 21, 2017 ~ Apr. 28, 2017	Oct. 25, 2017	Radiation (03CH10-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200485	10Hz ~ 44GHz	Oct. 17, 2016	Apr. 21, 2017 ~ Apr. 28, 2017	Oct. 16, 2017	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Apr. 21, 2017 ~ Apr. 28, 2017	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0~360 Degree	N/A	Apr. 21, 2017 ~ Apr. 28, 2017	N/A	Radiation (03CH10-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Oct. 20, 2016	Apr. 21, 2017 ~ Apr. 28, 2017	Oct. 19, 2018	Radiation (03CH10-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	N/A	Mar. 03, 2017	Apr. 21, 2017 ~ Apr. 28, 2017	Mar. 02, 2018	Radiation (03CH10-HY)
Preamplifier	Jet-Power	JPA00101800-30-10P	1601180002	1GHz~18GHz	Jul. 27, 2016	Apr. 21, 2017 ~ Apr. 28, 2017	Jul. 26, 2017	Radiation (03CH10-HY)
Preamplifier	MITEQ	JS44-18004000-33-8P	1840917	18GHz ~ 40GHz	Jun. 14, 2016	Apr. 21, 2017 ~ Apr. 28, 2017	Jun. 13, 2017	Radiation (03CH10-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 08, 2016	Apr. 21, 2017 ~ Apr. 28, 2017	Nov. 07, 2017	Radiation (03CH10-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.70
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.60
---	------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.90
---	------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.20
---	------



Appendix A. Conducted Test Results

Bluetooth Low Energy

Test Engineer:	Aking Chang	Temperature:	21~25	°C
Test Date:	2017/4/16	Relative Humidity:	51~54	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTx	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	1Mbps	1	0	2402	1.028	0.662	0.50	Pass
BLE	1Mbps	1	19	2440	1.028	0.662	0.50	Pass
BLE	1Mbps	1	39	2480	1.028	0.662	0.50	Pass

TEST RESULTS DATA
Peak Power Table

Mod.	Data Rate	NTx	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	5.57	30.00	-1.80	3.77	36.00	Pass
BLE	1Mbps	1	19	2440	5.50	30.00	-1.80	3.70	36.00	Pass
BLE	1Mbps	1	39	2480	5.63	30.00	-1.80	3.83	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

Mod.	Data Rate	NTx	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
BLE	1Mbps	1	0	2402	2.06	5.21
BLE	1Mbps	1	19	2440	2.06	5.12
BLE	1Mbps	1	39	2480	2.06	5.24

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTx	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	1	0	2402	5.07	-9.80	-1.80	8.00	Pass
BLE	1Mbps	1	19	2440	4.92	-9.85	-1.80	8.00	Pass
BLE	1Mbps	1	39	2480	5.53	-9.33	-1.80	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 20dBc limit.



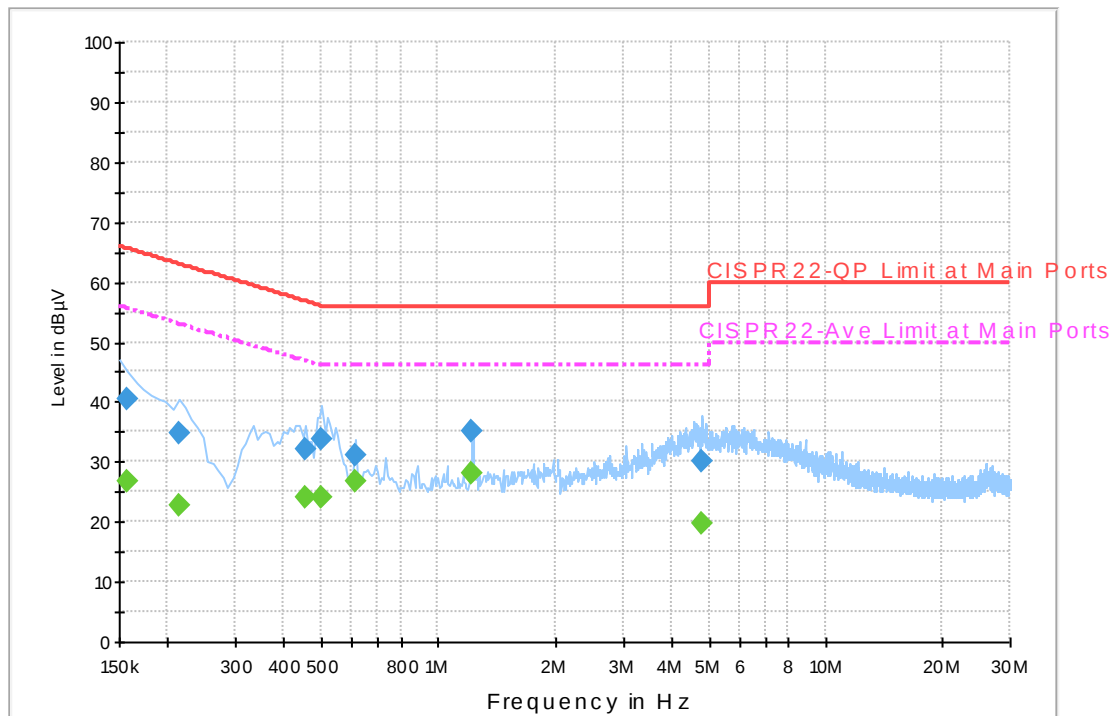
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Eric Jeng	Temperature :	21~23°C
		Relative Humidity :	52~55%

EUT Information

Report NO : 740120
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Line

ENV216 Auto Test FCC Power Bar - L



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	40.6	Off	L1	19.6	25.0	65.6
0.214000	34.7	Off	L1	19.6	28.3	63.0
0.454000	32.0	Off	L1	19.6	24.8	56.8
0.502000	33.8	Off	L1	19.6	22.2	56.0
0.614000	31.2	Off	L1	19.6	24.8	56.0
1.222000	35.0	Off	L1	19.6	21.0	56.0
4.822000	30.1	Off	L1	19.8	25.9	56.0

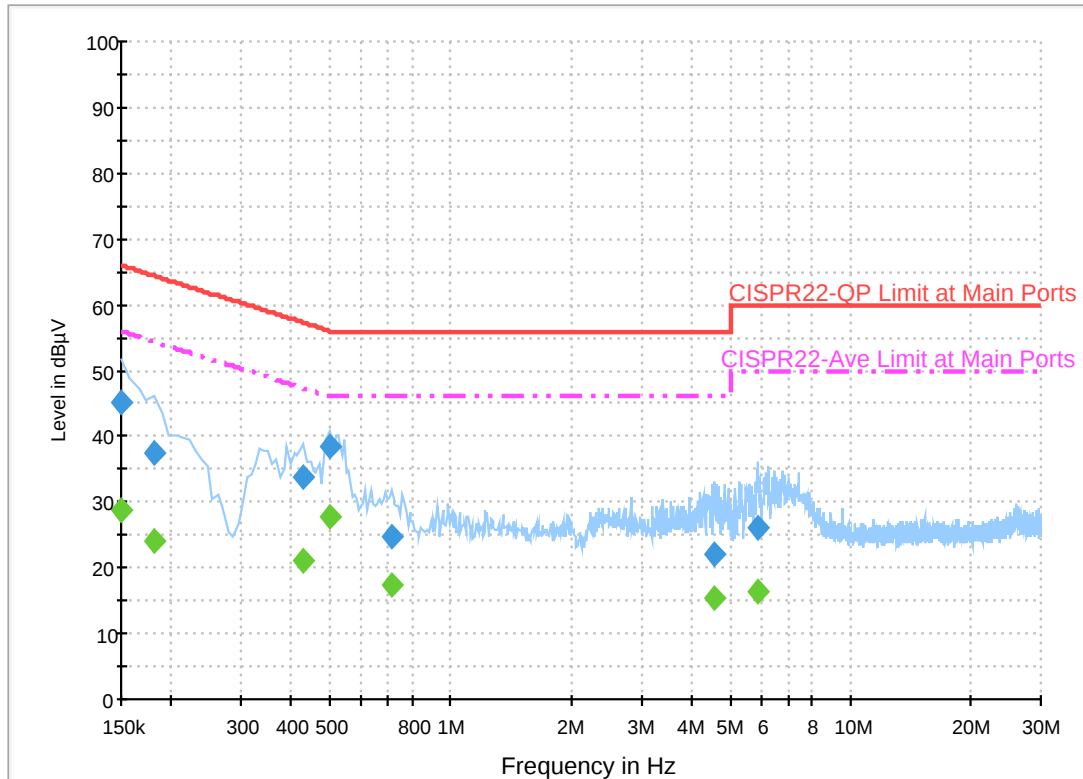
Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	26.7	Off	L1	19.6	28.9	55.6
0.214000	22.8	Off	L1	19.6	30.2	53.0
0.454000	24.0	Off	L1	19.6	22.8	46.8
0.502000	23.9	Off	L1	19.6	22.1	46.0
0.614000	26.6	Off	L1	19.6	19.4	46.0
1.222000	28.0	Off	L1	19.6	18.0	46.0
4.822000	19.8	Off	L1	19.8	26.2	46.0

EUT Information

Report NO : 740120
Test Mode : Mode 1
Test Voltage : 120Vac/60Hz
Phase : Neutral

ENV216 Auto Test FCC Power Bar - N



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	45.0	Off	N	19.5	21.0	66.0
0.182000	37.5	Off	N	19.5	26.9	64.4
0.430000	33.7	Off	N	19.5	23.6	57.3
0.502000	38.6	Off	N	19.5	17.4	56.0
0.710000	24.9	Off	N	19.5	31.1	56.0
4.590000	22.0	Off	N	19.7	34.0	56.0
5.886000	25.9	Off	N	19.8	34.1	60.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	28.6	Off	N	19.5	27.4	56.0
0.182000	24.0	Off	N	19.5	30.4	54.4
0.430000	21.0	Off	N	19.5	26.3	47.3
0.502000	27.7	Off	N	19.5	18.3	46.0
0.710000	17.4	Off	N	19.5	28.6	46.0
4.590000	15.5	Off	N	19.7	30.5	46.0
5.886000	16.3	Off	N	19.8	33.7	50.0



Appendix C. Radiated Spurious Emission

Test Engineer :	Stan Hsieh and Kyle Chuang	Temperature :	22~24°C
		Relative Humidity :	43~44%

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

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)
BLE CH 00 2402MHz		2344.86	50.37	-23.63	74	42.48	26.74	4.4	33.23	307	187	P	H
		2365.23	41.49	-12.51	54	33.51	26.8	4.42	33.22	307	187	A	H
	*	2402	94.08	-	-	85.93	26.93	4.45	33.21	307	187	P	H
	*	2402	93.52	-	-	85.37	26.93	4.45	33.21	307	187	A	H
													H
													H
		2356.83	50.11	-23.89	74	42.16	26.8	4.4	33.23	122	315	P	V
		2362.605	41.26	-12.74	54	33.29	26.8	4.42	33.23	122	315	A	V
	*	2402	97.56	-	-	89.41	26.93	4.45	33.21	122	315	P	V
	*	2402	96.91	-	-	88.76	26.93	4.45	33.21	122	315	A	V
													V
													V
BLE CH 19 2440MHz		2362.22	50.18	-23.82	74	42.21	26.8	4.42	33.23	230	187	P	H
		2385.88	41.28	-12.72	54	33.16	26.93	4.43	33.22	230	187	A	H
	*	2440	93.14	-	-	84.76	27.11	4.48	33.19	230	187	P	H
	*	2440	92.6	-	-	84.22	27.11	4.48	33.19	230	187	A	H
		2486.14	51.08	-22.92	74	42.5	27.24	4.53	33.17	230	187	P	H
		2497.62	41.86	-12.14	54	33.21	27.3	4.53	33.16	230	187	A	H
		2347.8	50.25	-23.75	74	42.36	26.74	4.4	33.23	100	305	P	V
		2385.46	41.64	-12.36	54	33.58	26.87	4.43	33.22	100	305	A	V
	*	2440	98.12	-	-	89.74	27.11	4.48	33.19	100	305	P	V
	*	2440	97.5	-	-	89.12	27.11	4.48	33.19	100	305	A	V
		2495.1	51.19	-22.81	74	42.54	27.3	4.53	33.16	100	305	P	V
		2497.83	41.78	-12.22	54	33.13	27.3	4.53	33.16	100	305	A	V



BLE CH 39 2480MHz	*	2480	93.09	-	-	84.53	27.24	4.51	33.17	255	175	P	H
	*	2480	92.19	-	-	83.63	27.24	4.51	33.17	255	175	A	H
		2495.12	51	-23	74	42.35	27.3	4.53	33.16	255	175	P	H
		2495.28	41.71	-12.29	54	33.06	27.3	4.53	33.16	255	175	A	H
													H
													H
	*	2480	97.91	-	-	89.35	27.24	4.51	33.17	100	304	P	V
	*	2480	97.3	-	-	88.74	27.24	4.51	33.17	100	304	A	V
		2494.32	51.58	-22.42	74	42.93	27.3	4.53	33.16	100	304	P	V
		2484.52	41.9	-12.1	54	33.32	27.24	4.53	33.17	100	304	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

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	44.86	-29.14	74	67.88	32.04	6.34	61.9	100	0	P	H
													H
													H
													H
		4804	45.07	-28.93	74	68.09	32.04	6.34	61.9	100	0	P	V
													V
													V
													V
BLE CH 19 2440MHz		4880	44.05	-29.95	74	66.85	32.21	6.41	61.9	100	0	P	H
		7320	49.55	-24.45	74	66.34	36.91	7.98	62.07	100	0	P	H
													H
													H
		4880	45.14	-28.86	74	67.94	32.21	6.41	61.9	100	0	P	V
		7320	49.76	-24.24	74	66.55	36.91	7.98	62.07	100	0	P	V
													V
													V
BLE CH 39 2480MHz		4960	44.27	-29.73	74	66.82	32.42	6.47	61.9	100	0	P	H
		7440	49.04	-24.96	74	65.41	37.32	8.05	62.09	100	0	P	H
													H
													H
		4960	46.38	-27.62	74	68.93	32.42	6.47	61.9	100	0	P	V
		7440	49.36	-24.64	74	65.73	37.32	8.05	62.09	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		32.43	22.22	-17.78	40	31.46	22.89	0.53	32.75	-	-	P	H
		103.71	23.63	-19.87	43.5	38.76	16.43	0.97	32.77	-	-	P	H
		211.17	27.28	-16.22	43.5	43.11	15.09	1.44	32.75	-	-	P	H
		566	26.76	-19.24	46	30.93	26	2.21	32.96	-	-	P	H
		785.1	30.46	-15.54	46	31.88	28.28	2.58	32.91	-	-	P	H
		955.2	32.48	-13.52	46	29.65	30.94	2.78	31.7	100	0	P	H
													H
													H
													H
													H
													H
													H
		30	24.34	-15.66	40	32.27	24.22	0.53	32.76	-	-	P	V
		40.8	24.36	-15.64	40	37.41	18.9	0.69	32.75	-	-	P	V
		54.84	22.68	-17.32	40	42.14	12.46	0.69	32.74	-	-	P	V
		446.3	24.08	-21.92	46	31.46	23.01	1.98	32.82	-	-	P	V
		743.1	29.85	-16.15	46	31.5	28.19	2.51	32.95	-	-	P	V
		941.2	32.77	-13.23	46	30.65	30.4	2.78	31.85	100	0	P	V
													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	Peak or Average
H/V	Horizontal or Vertical



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		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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



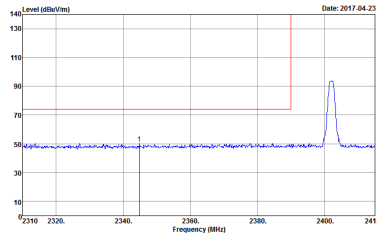
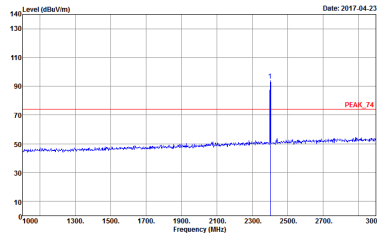
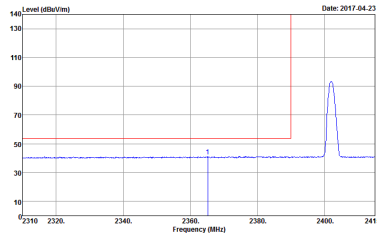
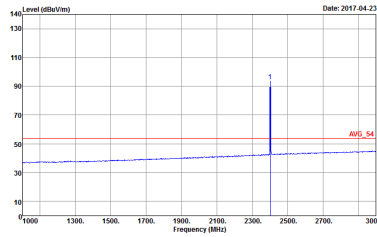
Appendix D. Radiated Spurious Emission Plots

Test Engineer :	Stan Hsieh and Kyle Chuang	Temperature :	22~24°C
		Relative Humidity :	43~44%

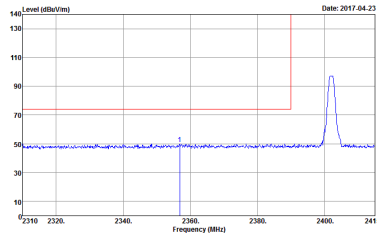
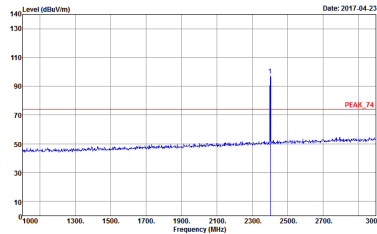
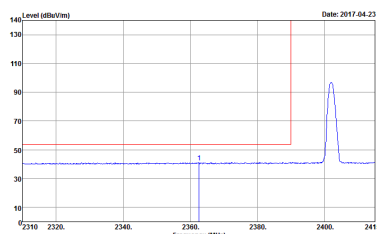
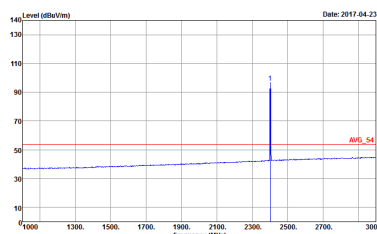
Note symbol

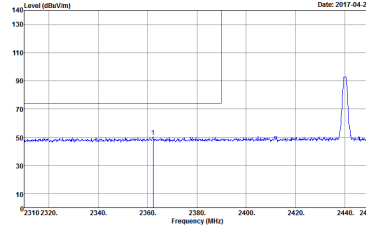
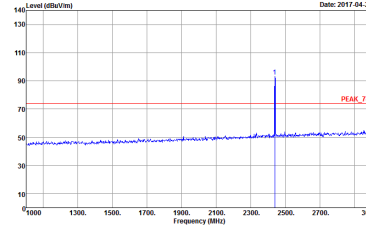
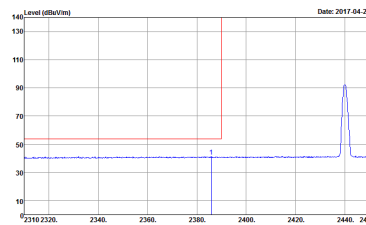
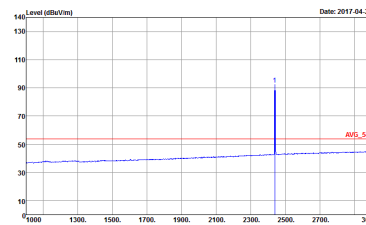
-L	Low channel location
-R	High channel location

2.4GHz 2400~2483.5MHz
BLE (Band Edge @ 3m)

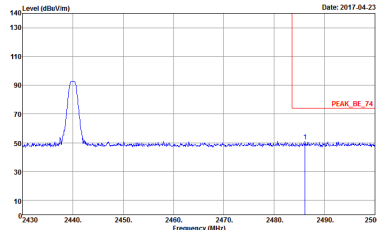
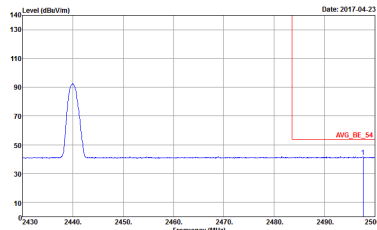
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4	 Site : 03CH10-HY Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4
	 Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4	 Site : 03CH10-HY Condition : AVG_54 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4



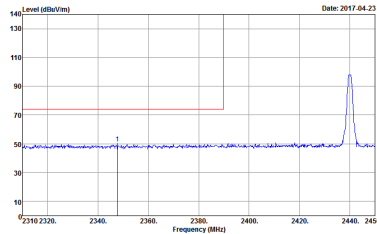
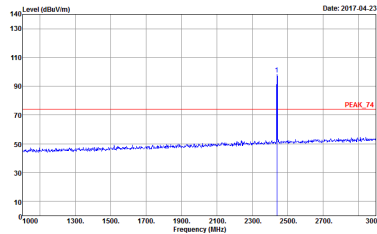
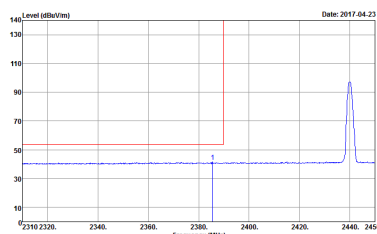
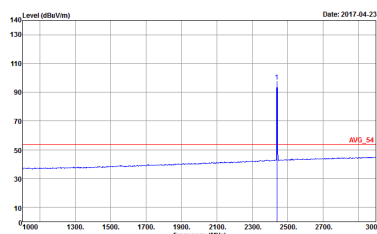
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4	 Site : 03CH10-HY Condition : PEAK_74 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4
Avg	 Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4	 Site : 03CH10-HY Condition : AVG_54 3m HORN 9120D-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 4

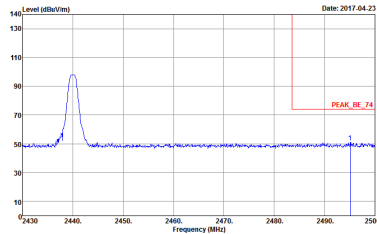
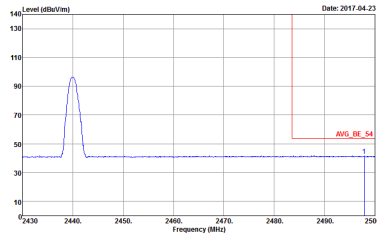
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
1	Horizontal	Fundamental
Peak	 Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL Detector : Peak Project : 740120 Mode : 5	 Site : 03CH10-HY Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL Detector : Peak Project : 740120 Mode : 5
	 Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL Detector : Peak Project : 740120 Mode : 5	 Site : 03CH10-HY Condition : AVG_54 3m HORN 9120D-HF HORIZONTAL Detector : Peak Project : 740120 Mode : 5



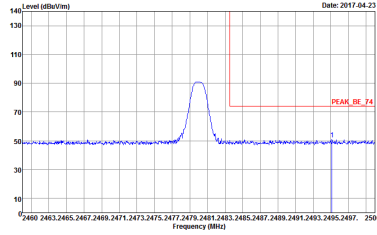
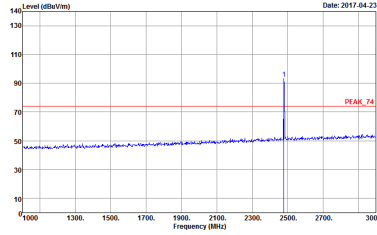
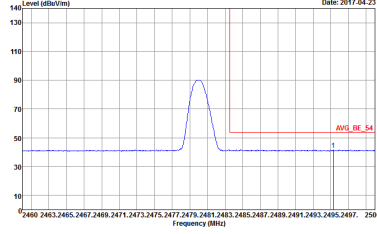
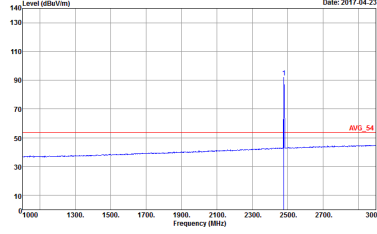
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Horizontal	Fundamental
Peak	 Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5	Left blank
Avg.	 Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5	Left blank

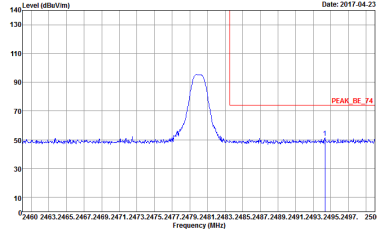
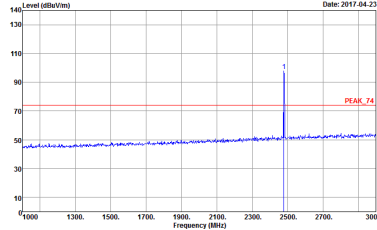
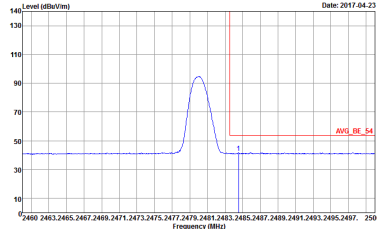
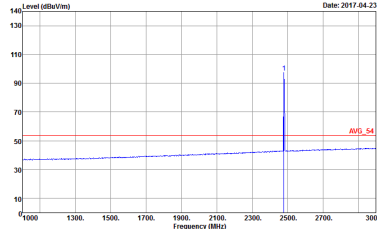


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
1	Vertical	Fundamental
Peak	 Level (dBm/Vm) vs Frequency (MHz) Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5	 Level (dBm/Vm) vs Frequency (MHz) Site : 03CH10-HY Condition : PEAK_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5
Avg.	 Level (dBm/Vm) vs Frequency (MHz) Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5	 Level (dBm/Vm) vs Frequency (MHz) Site : 03CH10-HY Condition : AVG_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5

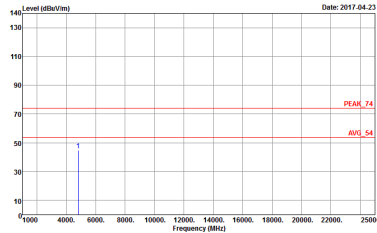
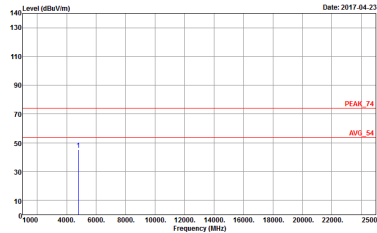
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Vertical	Fundamental
Peak	 Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5	Left blank
Avg.	 Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 5	Left blank



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6	 Site : 03CH10-HY Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6
Avg.	 Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6	 Site : 03CH10-HY Condition : AVG_54 3m HORN 9120D-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1	Vertical	Fundamental
Peak	 Site : 03CH10-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6	 Site : 03CH10-HY Condition : PEAK_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6
	 Site : 03CH10-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6	 Site : 03CH10-HY Condition : AVG_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 740120 Mode : 6

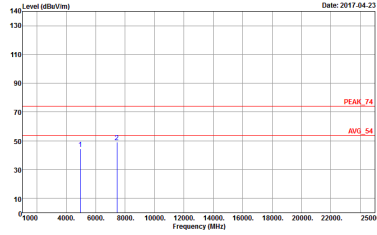
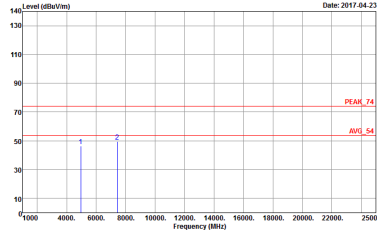
2.4GHz 2400~2483.5MHz
BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH10-14Y Condition : PEAK_74 3m HORN_9170_406_0584 HORIZONTAL Detector : Peak Project : 740120 Mode : 4	 Site : 03CH10-14Y Condition : PEAK_74 3m HORN_9170_406_0584 VERTICAL Detector : Peak Project : 740120 Mode : 4

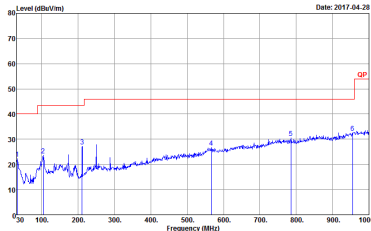
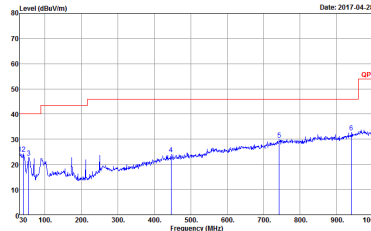


BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
1	Horizontal	Vertical
Peak Avg.	Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 HORIZONTAL Detector : Peak Project : 740120 Mode : 5	Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 VERTICAL Detector : Peak Project : 740120 Mode : 5



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Vertical
Peak	 Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 HORIZONTAL Detector : Peak Project : 740120 Mode : 6	 Site : 03CH10-11Y Condition : PEAK_74 3m HORN_9170_406_0584 VERTICAL Detector : Peak Project : 740120 Mode : 6

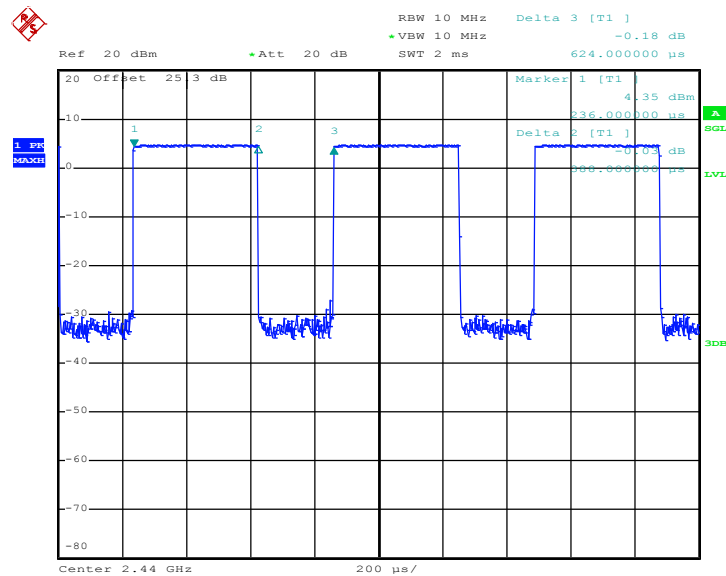
Emission below 1GHz
2.4GHz BLE (LF)

BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE LF	
1	Horizontal	Vertical
QP / Peak	 Site : 03CH10-14V Condition : QP 3m BE-LOG 6111D-LF HORIZONTAL Detector : Peak Project : 740120 Mode : 20	 Site : 03CH10-14V Condition : QP 3m BE-LOG 6111D-LF VERTICAL Detector : Peak Project : 740120 Mode : 20

Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth -LE	62.18	388	2.58	3kHz

Bluetooth - LE



Date: 16.APR.2017 10:19:53