



FCC RF Test Report

APPLICANT : Ubiquiti Networks, Inc.
EQUIPMENT : UFiber OLT
BRAND NAME : UBIQUITI
MODEL NAME : UF-OLT
FCC ID : SWX-UFOLT
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Mar. 24, 2017 and testing was completed on Apr. 18, 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



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FCC ID : SWX-UFOLT

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR710607-01	Rev. 01	Initial issue of report	Apr. 27, 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 3.06 dB at 722.100 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 17.00 dB at 1.198 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

Ubiquiti Networks, Inc.
2580 Orchard Parkway San Jose, CA 95131

1.2 Manufacturer

Ubiquiti Networks, Inc.
2580 Orchard Parkway San Jose, CA 95131

1.3 Product Feature of Equipment Under Test

Bluetooth

Product Specification subjective to this standard	
Antenna Type	Bluetooth: Internal 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.	
	03CH15-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	-	-	



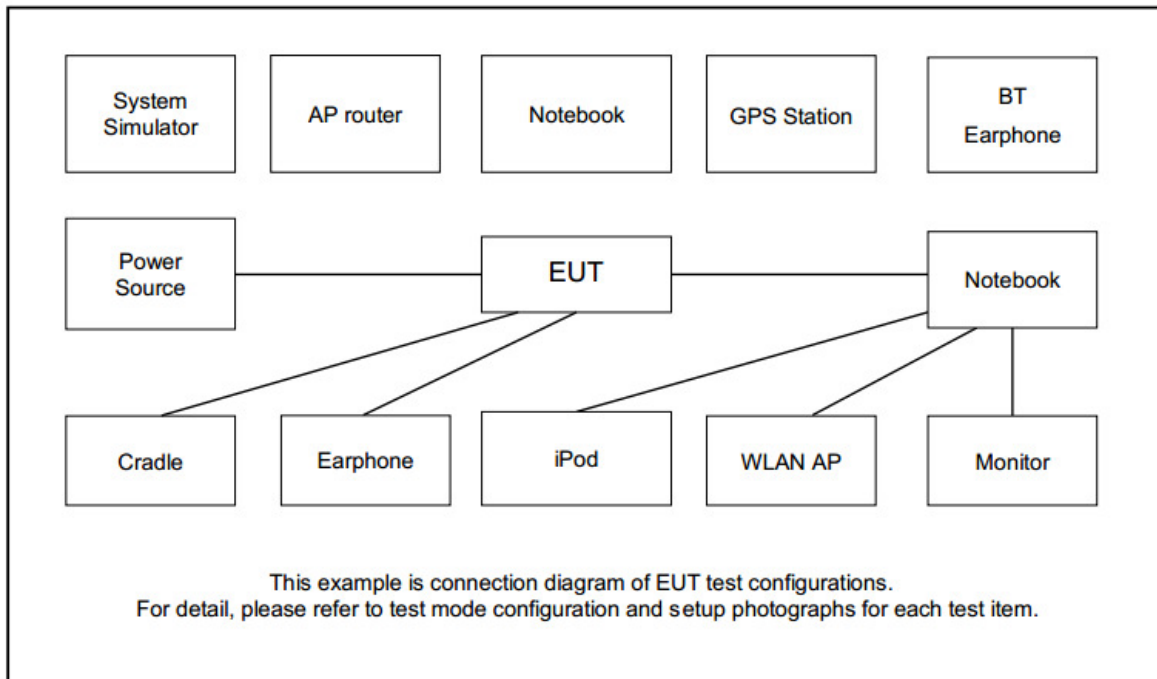
2.2 Test Mode

- 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). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X 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	
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: Bluetooth Tx + LAN Link + Fiber Link + AC Charging

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.	Notebook	DELL	P20G	FCC DoC/ Contains FCC ID: QDS-BRCM1051	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
2.	Notebook	DELL	Latitude E3340	FCC DoC/ Contains FCC ID: PD97260NGU	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Notebook	NB-26	E335	N/A	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Notebook	Dell	E5570	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	U Fiber	Ubiquiti	UF-Nano	N/A	N/A	N/A



2.5 EUT Operation Test Setup

The RF test items, programmed RF utility, “Putty” 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 measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The 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

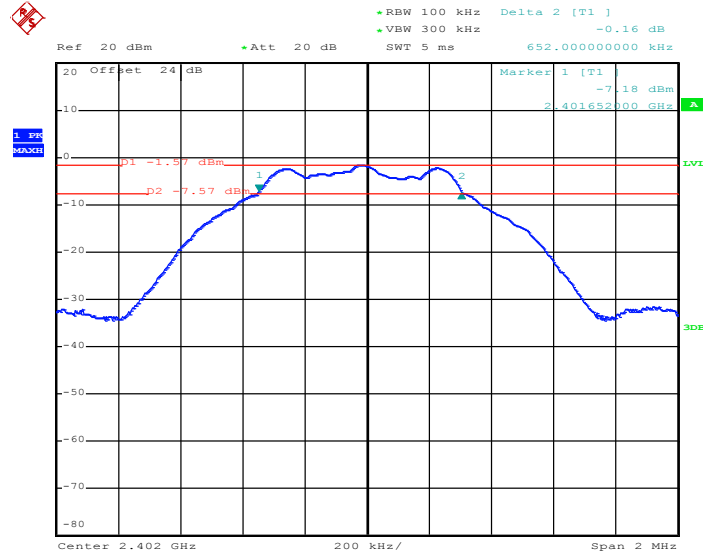




3.1.5 Test Result of 6dB Bandwidth

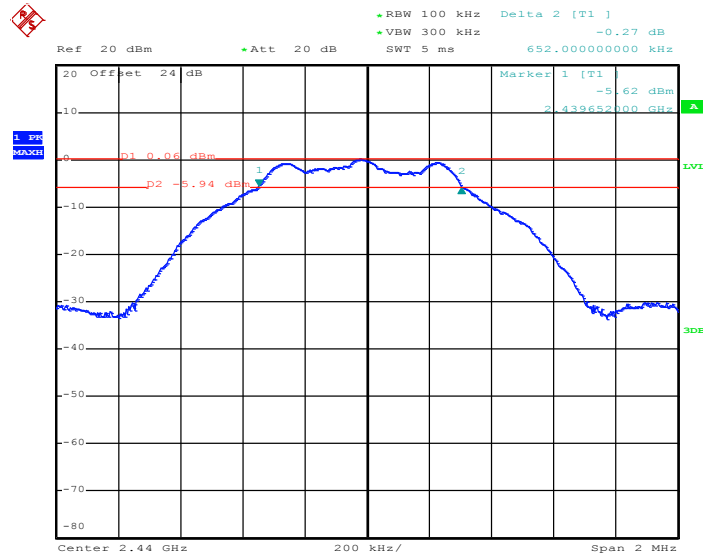
Please refer to Appendix A.

6 dB Bandwidth Plot on Channel 00



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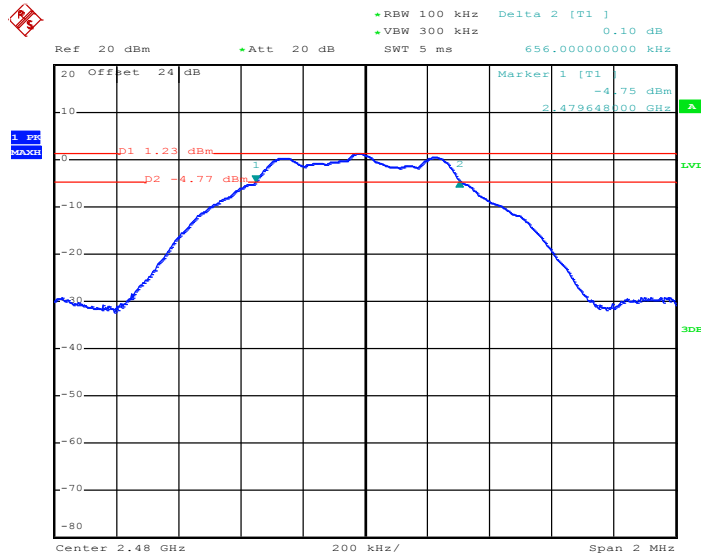
6 dB Bandwidth Plot on Channel 19



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6 dB Bandwidth Plot on Channel 39

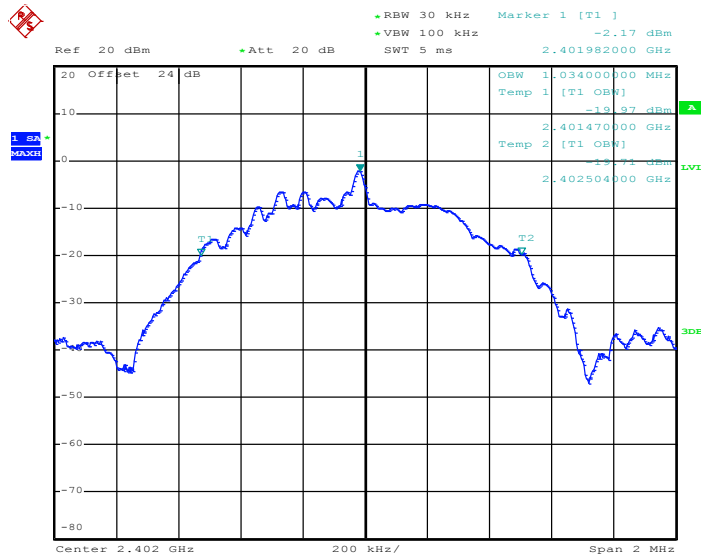


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3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

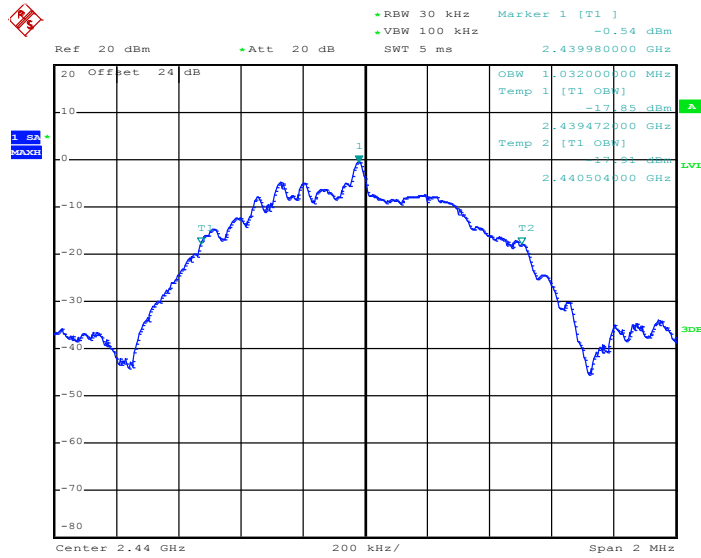
99% Bandwidth Plot on Channel 00



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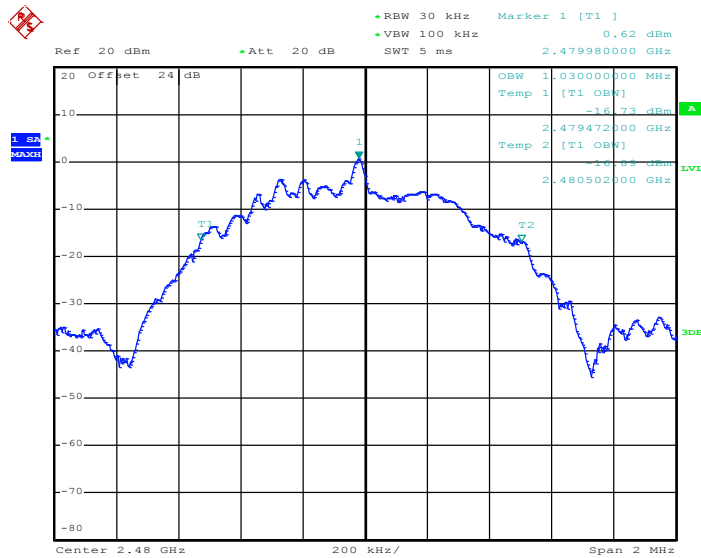


99% Occupied Bandwidth Plot on Channel 19



Date: 13.APR.2017 14:37:39

99% Occupied Bandwidth Plot on Channel 39



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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.

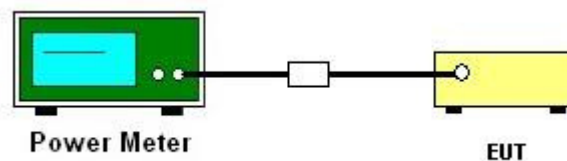
3.2.2 Measuring Instruments

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

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.

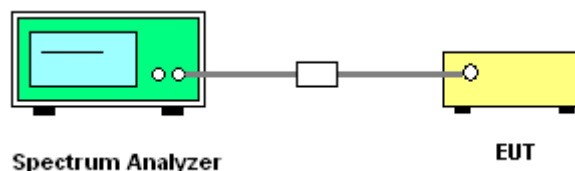
3.3.2 Measuring Instruments

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

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



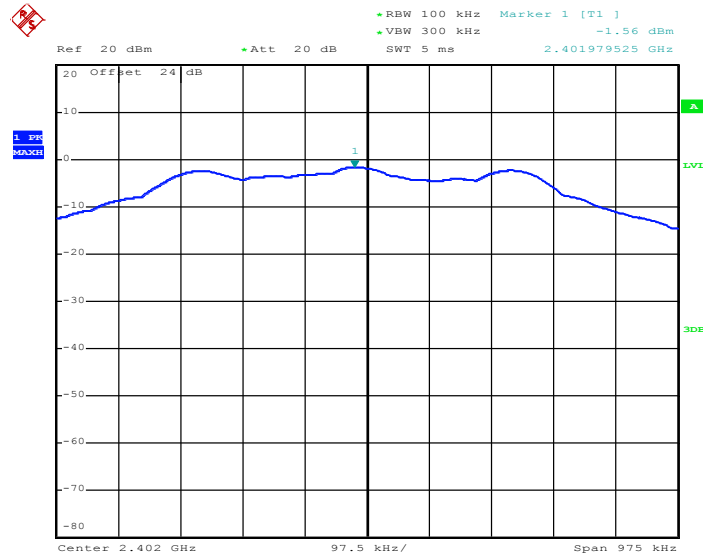
3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



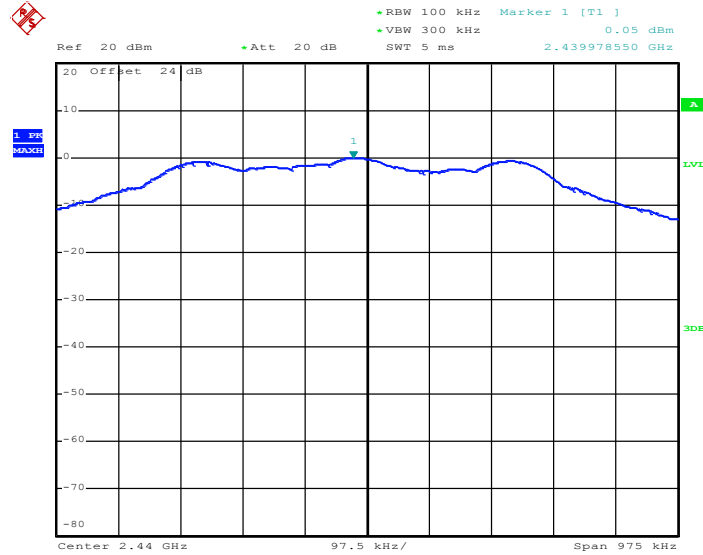
3.3.6 Test Result of Power Spectral Density Plots (100kHz)

PSD 100kHz Plot on Channel 00



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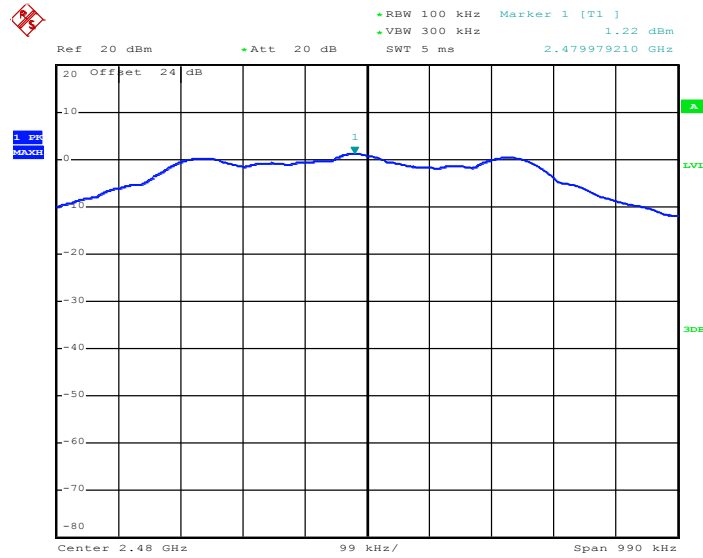
PSD 100kHz Plot on Channel 19



Date: 13.APR.2017 14:35:53



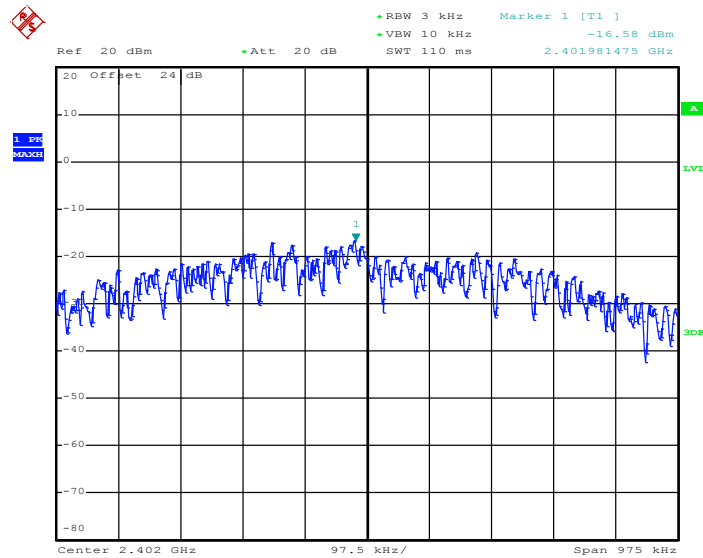
PSD 100kHz Plot on Channel 39



Date: 13.APR.2017 14:41:33

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

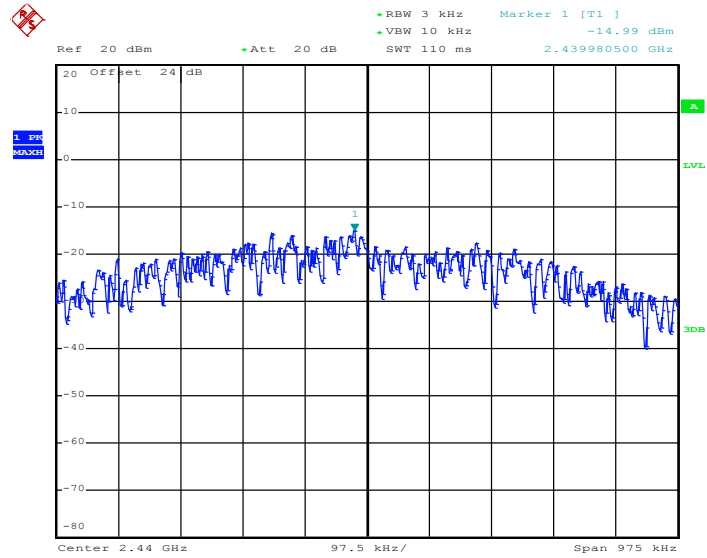
PSD 3kHz Plot on Channel 00



Date: 13.APR.2017 14:07:58

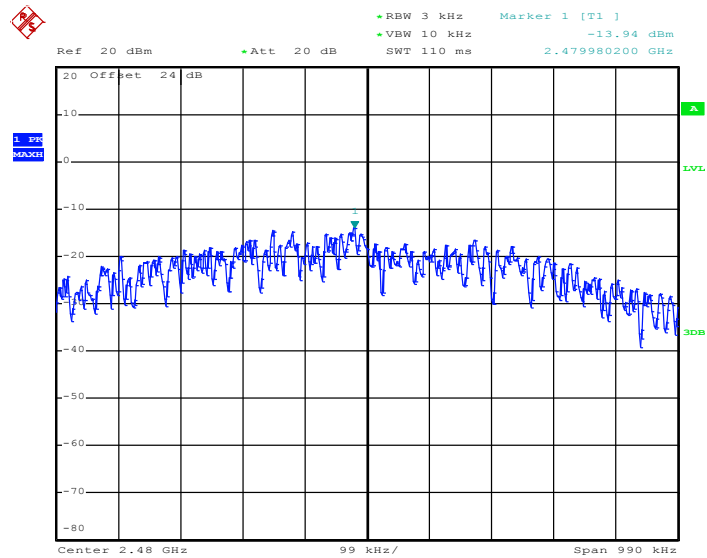


PSD 3kHz Plot on Channel 19



Date: 13.APR.2017 14:35:43

PSD 3kHz Plot on Channel 39



Date: 13.APR.2017 14:41:04

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.

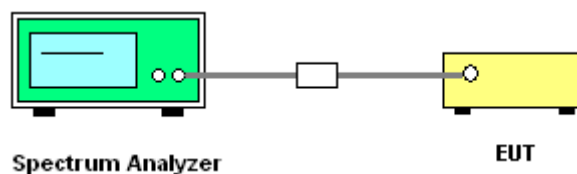
3.4.2 Measuring Instruments

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

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.

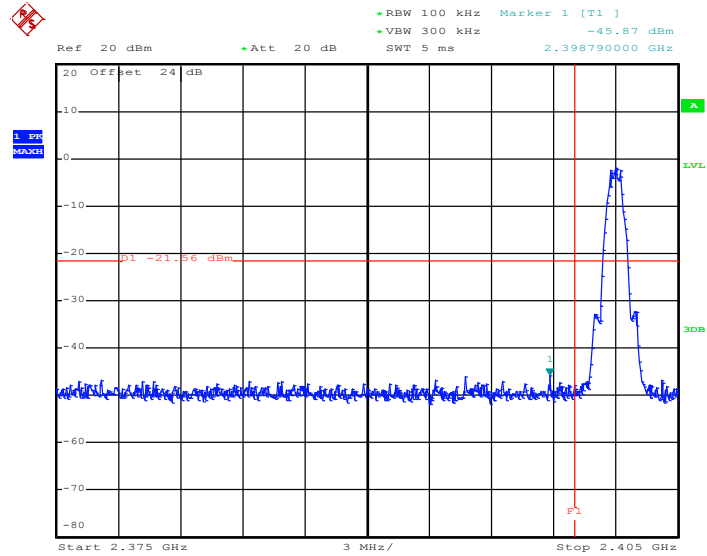
3.4.4 Test Setup





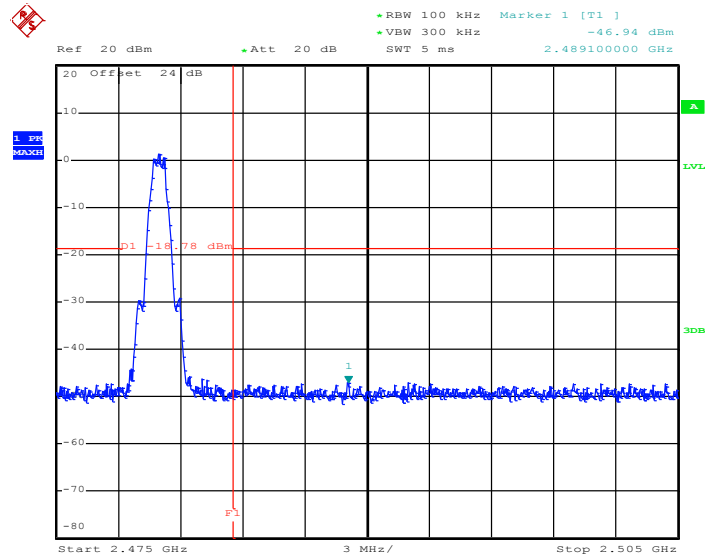
3.4.5 Test Result of Conducted Band Edges Plots

Low Band Edge Plot on Channel 00



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High Band Edge Plot on Channel 39

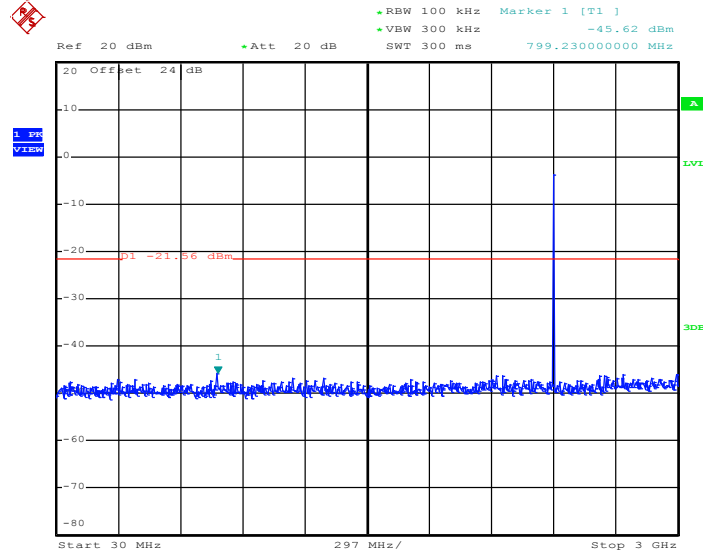


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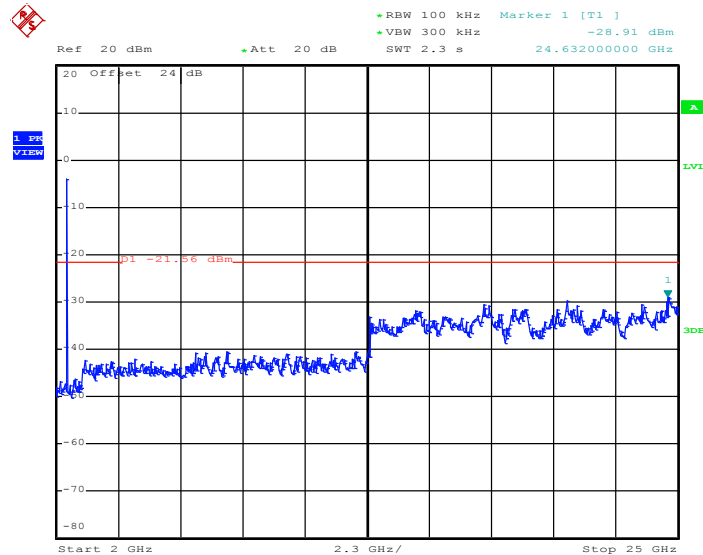
3.4.6 Test Result of Conducted Spurious Emission Plots

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



Date: 13.APR.2017 14:20:40

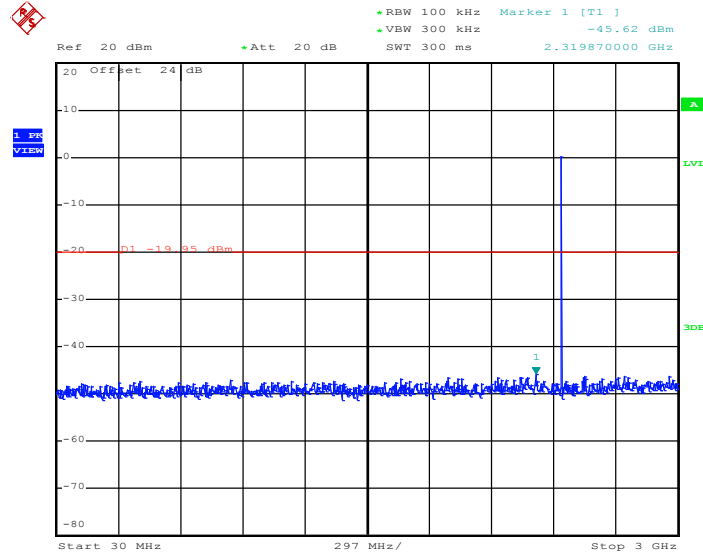
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



Date: 13.APR.2017 14:20:48

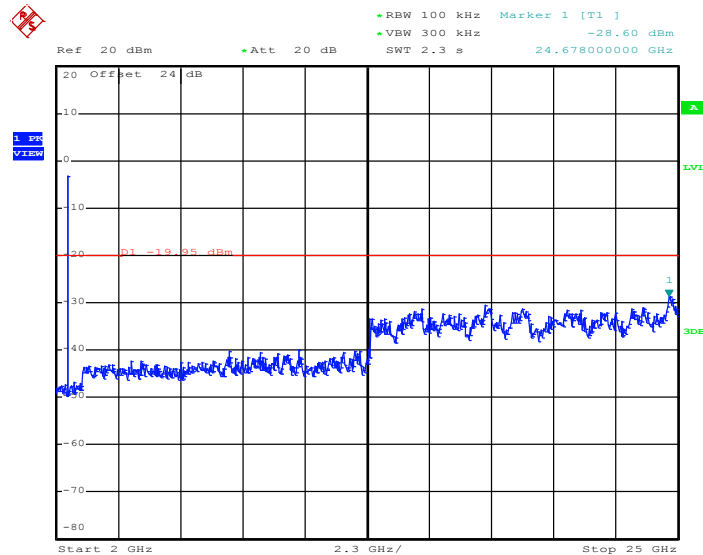


Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19



Date: 13.APR.2017 14:37:07

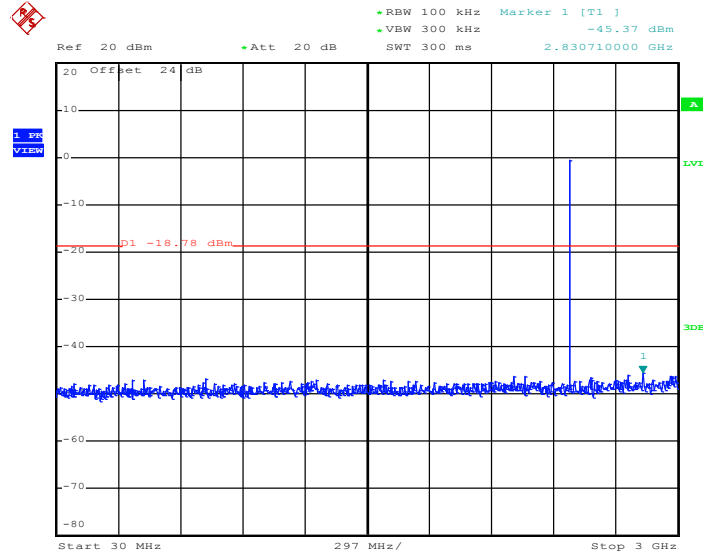
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19



Date: 13.APR.2017 14:37:15

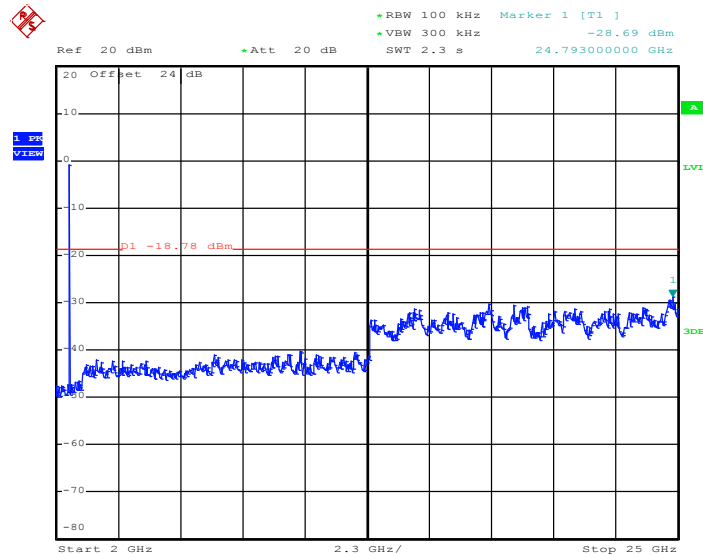


Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39



Date: 13.APR.2017 14:45:30

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



Date: 13.APR.2017 14:45:38



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

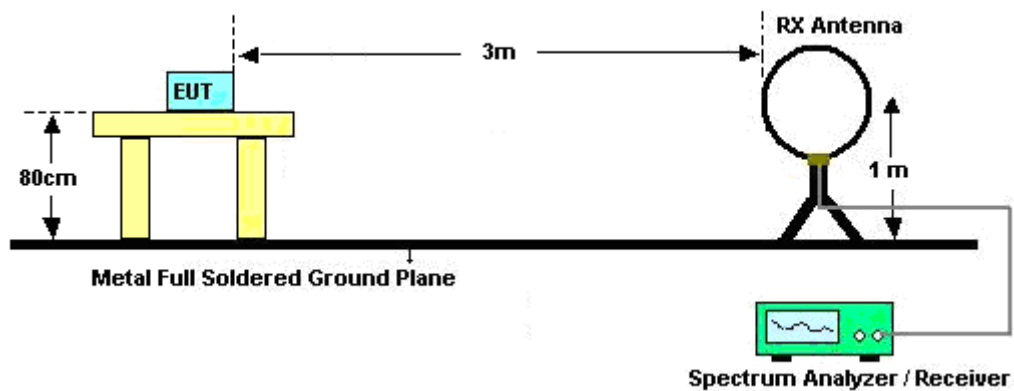
3.5.3 Test Procedures

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:

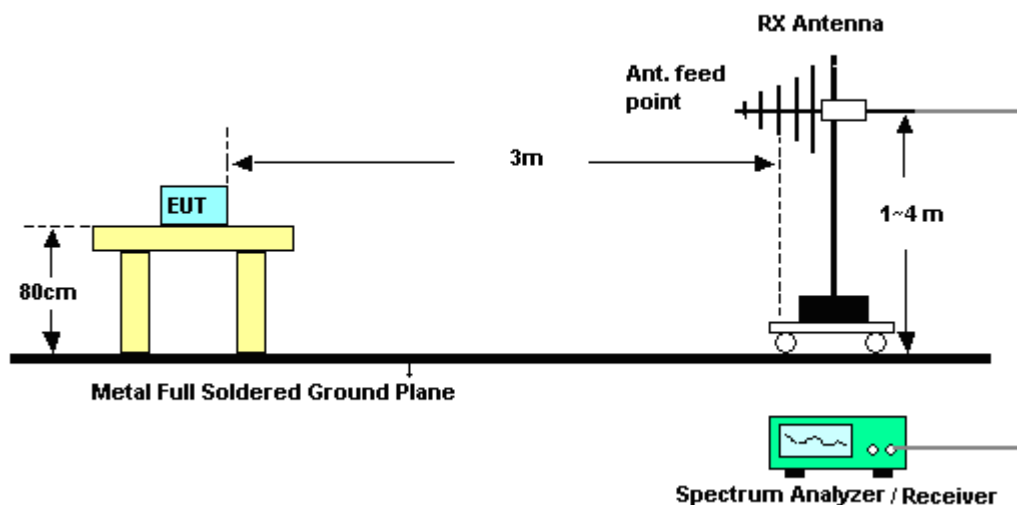
- (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.
- For average measurement:
- VBW = 10 Hz, 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

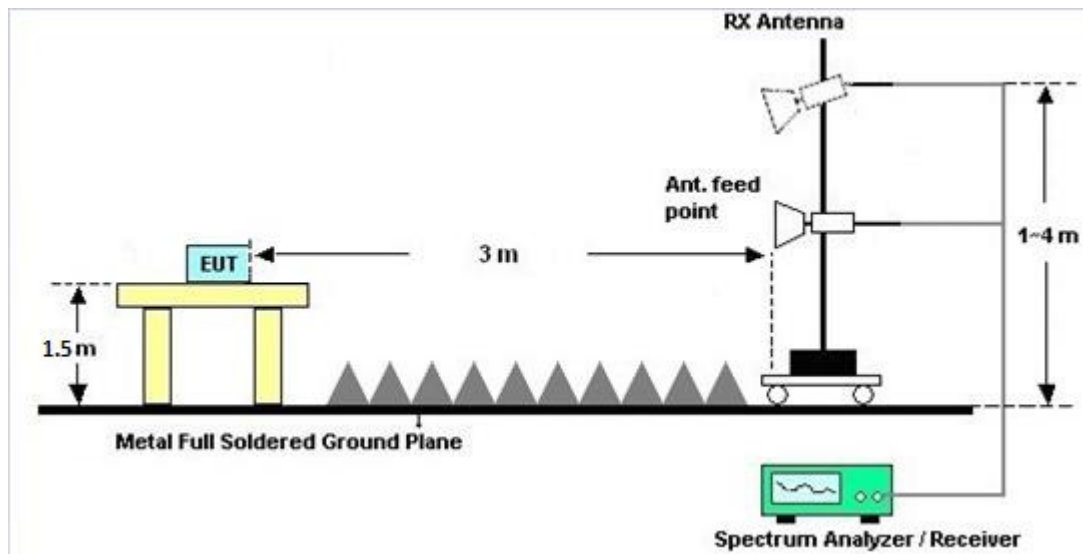
For radiated emissions below 30MHz



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.

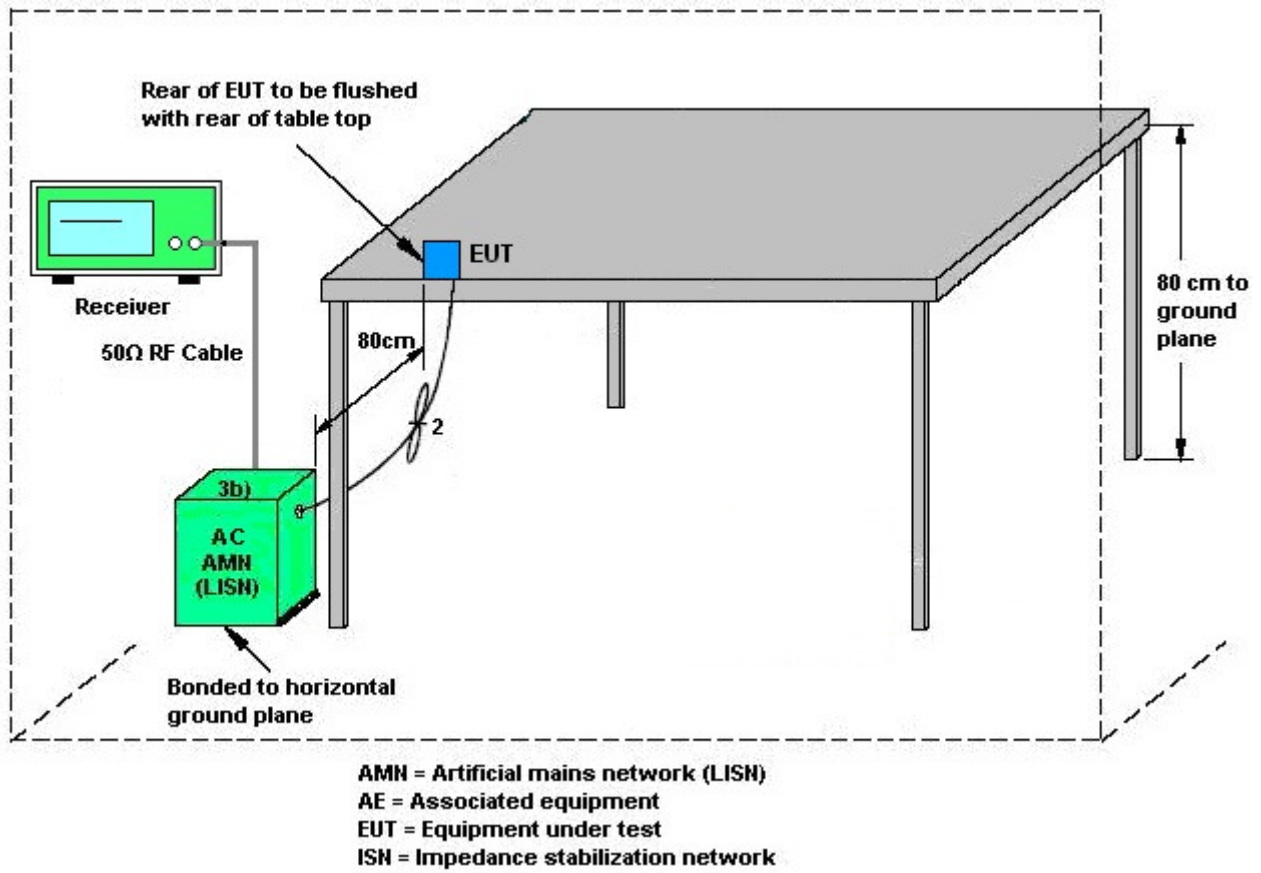
3.6.2 Measuring Instruments

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

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	GB412923 44	300MHz~40GHz	Dec. 26, 2016	Apr. 13, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US404415 48	300MHz~40GHz	Dec. 26, 2016	Apr. 13, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jul. 17, 2016	Apr. 13, 2017	Jul. 16, 2017	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Apr. 18, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Apr. 18, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Apr. 18, 2017	Nov. 28, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 06, 2016	Apr. 18, 2017	Dec. 05, 2017	Conduction (CO05-HY)
Spectrum Analyzer	Agilent	N9030A	MY523502 76	3Hz~44GHz	Mar. 23, 2017	Apr. 13, 2017 ~ Apr. 14, 2017	Mar. 22, 2018	Radiation (03CH15-HY)
EMI Test Receiver	Agilent	N9038A (MXE)	MY532900 53	20Hz to 26.5GHz	Jan. 12, 2017	Apr. 13, 2017 ~ Apr. 14, 2017	Jan. 11, 2018	Radiation (03CH15-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Nov. 09, 2016	Apr. 13, 2017 ~ Apr. 14, 2017	Nov. 08, 2017	Radiation (03CH15-HY)
Preamplifier	Keysight	83017A	MY532701 95	1GHz~26.5GHz	Aug. 24, 2016	Apr. 13, 2017 ~ Apr. 14, 2017	Aug. 23, 2017	Radiation (03CH15-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800	2025787	1G~18GHz	Feb. 13, 2017	Apr. 13, 2017 ~ Apr. 14, 2017	Feb. 12, 2018	Radiation (03CH15-HY)
Preamplifier	MITEQ	JS44-180040 00-33-8P	1840917	18GHz ~ 40GHz	Jun. 14, 2016	Apr. 13, 2017 ~ Apr. 14, 2017	Jun. 13, 2017	Radiation (03CH15-HY)
Bilog Antenna	TESEQ	CBL6111D&0 0800N1D01N- 06	41912&05	30MHz to 1GHz	Jan. 07, 2017	Apr. 13, 2017 ~ Apr. 14, 2017	Jan. 06, 2018	Radiation (03CH15-HY)
Horn Antenna	SCHWARZBE CK	BBHA 9120D	9120D-162 0	1G~18GHz	Sep. 30, 2016	Apr. 13, 2017 ~ Apr. 14, 2017	Sep. 29, 2017	Radiation (03CH15-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170 584	18GHz- 40GHz	Nov. 08, 2016	Apr. 13, 2017 ~ Apr. 14, 2017	Nov. 07, 2017	Radiation (03CH15-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Apr. 13, 2017 ~ Apr. 14, 2017	N/A	Radiation (03CH15-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Apr. 13, 2017 ~ Apr. 14, 2017	N/A	Radiation (03CH15-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% ($U = 2Uc(y)$)	5.14
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.48
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.12
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Appendix A. Conducted Test Results

Bluetooth Low Energy

Test Engineer:	Derek Hsu	Temperature:	21~25	°C
Test Date:	2017/4/13	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	1.034	0.652	0.50	Pass
BLE	1Mbps	1	19	2440	1.032	0.652	0.50	Pass
BLE	1Mbps	1	39	2480	1.030	0.656	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	1.06	30.00	0.00	1.06	36.00	Pass
BLE	1Mbps	1	19	2440	2.12	30.00	0.00	2.12	36.00	Pass
BLE	1Mbps	1	39	2480	2.74	30.00	0.00	2.74	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	1.89	-1.48
BLE	1Mbps	1	19	2440	1.89	0.10
BLE	1Mbps	1	39	2480	1.89	1.10

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	-1.56	-16.58	0.00	8.00	Pass
BLE	1Mbps	1	19	2440	0.05	-14.99	0.00	8.00	Pass
BLE	1Mbps	1	39	2480	1.22	-13.94	0.00	8.00	Pass

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



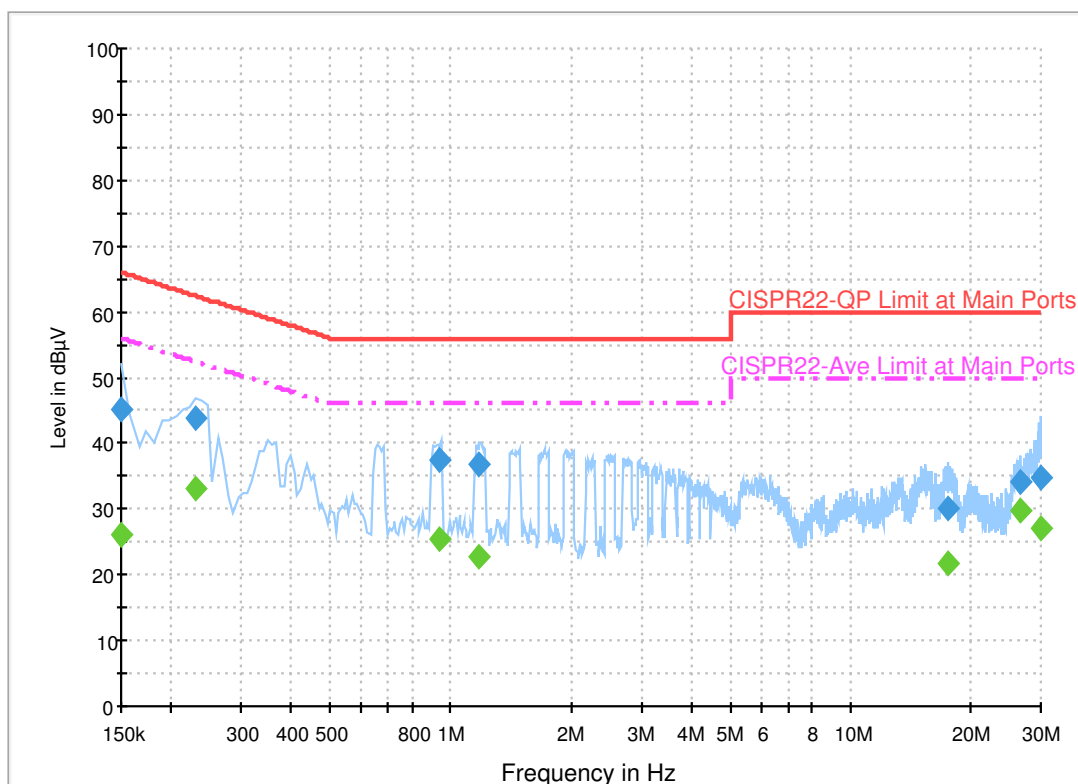
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Eric Jeng	Temperature :	22~24°C
		Relative Humidity :	56~58%

EUT Information

Report NO : 710607-1
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Line

ENV216 Auto Test-L



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	45.1	Off	L1	19.6	20.9	66.0
0.230000	43.8	Off	L1	19.5	18.6	62.4
0.934000	37.4	Off	L1	19.5	18.6	56.0
1.182000	36.8	Off	L1	19.5	19.2	56.0
17.526000	30.0	Off	L1	19.7	30.0	60.0
26.622000	34.1	Off	L1	19.8	25.9	60.0
29.902000	34.8	Off	L1	19.8	25.2	60.0

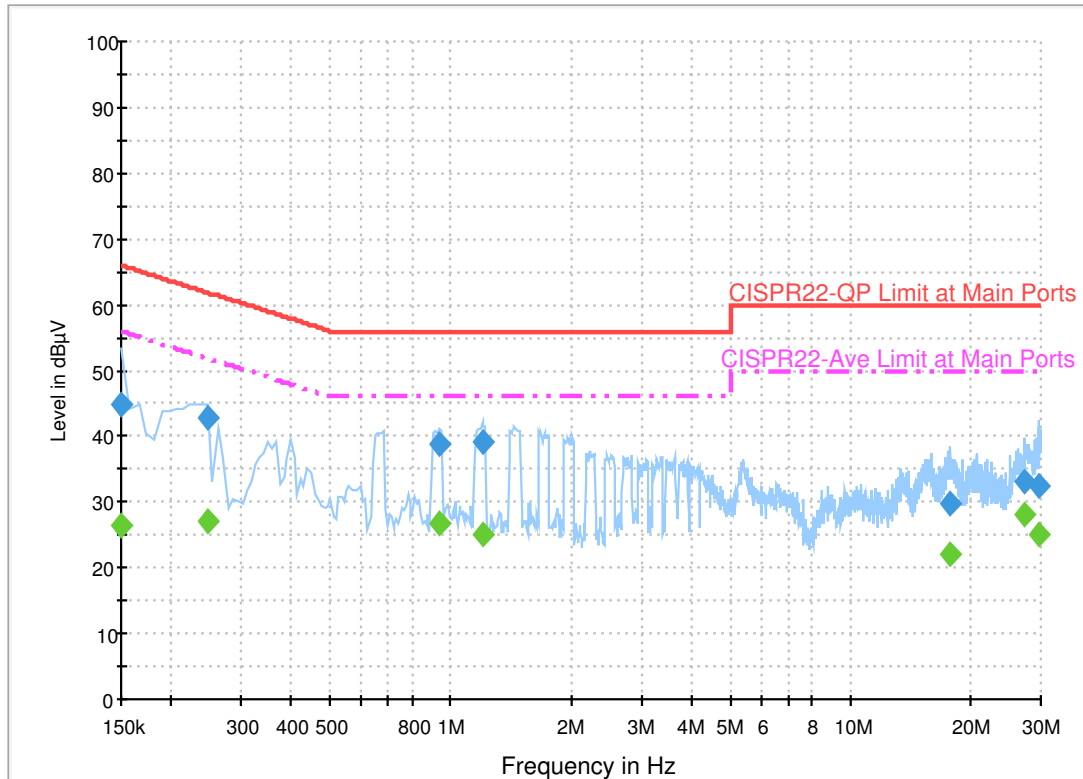
Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	26.1	Off	L1	19.6	29.9	56.0
0.230000	33.2	Off	L1	19.5	19.2	52.4
0.934000	25.3	Off	L1	19.5	20.7	46.0
1.182000	22.9	Off	L1	19.5	23.1	46.0
17.526000	21.8	Off	L1	19.7	28.2	50.0
26.622000	29.6	Off	L1	19.8	20.4	50.0
29.902000	27.0	Off	L1	19.8	23.0	50.0

EUT Information

Report NO : 710607-1
 Test Mode : Mode 1
 Test Voltage : 120Vac/60Hz
 Phase : Neutral

ENV216 Auto Test-N



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	44.9	Off	N	19.5	21.1	66.0
0.246000	42.7	Off	N	19.5	19.2	61.9
0.934000	38.9	Off	N	19.5	17.1	56.0
1.198000	39.0	Off	N	19.5	17.0	56.0
17.670000	29.9	Off	N	19.8	30.1	60.0
27.366000	33.1	Off	N	20.0	26.9	60.0
29.614000	32.5	Off	N	20.0	27.5	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	26.4	Off	N	19.5	29.6	56.0
0.246000	27.2	Off	N	19.5	24.7	51.9
0.934000	26.6	Off	N	19.5	19.4	46.0
1.198000	24.9	Off	N	19.5	21.1	46.0
17.670000	22.1	Off	N	19.8	27.9	50.0
27.366000	28.3	Off	N	20.0	21.7	50.0
29.614000	25.2	Off	N	20.0	24.8	50.0



Appendix C. Radiated Spurious Emission

Test Engineer :	Karl Hou	Temperature :	22~24°C
		Relative Humidity :	50~54%

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.	
		(MHz)	(dBμV/m)	(dB)	Limit	Level	Factor	Loss	Factor	Pos	Pos	Avg.		
					Line	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
BLE CH 00 2402MHz		2362.185	50.45	-23.55	74	40.58	26.96	3.94	30.95	108	113	P	H	
		2359.245	41.58	-12.42	54	31.71	26.96	3.94	30.95	108	113	A	H	
	*	2402	88.42	-	-	78.38	27.07	3.97	30.92	108	113	P	H	
	*	2402	87.67	-	-	77.63	27.07	3.97	30.92	108	113	A	H	
													H	
														H
			2361.135	50.38	-23.62	74	40.51	26.96	3.94	30.95	305	85	P	V
			2352.315	41.49	-12.51	54	31.64	26.96	3.92	30.95	305	85	A	V
	*		2402	85.44	-	-	75.4	27.07	3.97	30.92	305	85	P	V
	*		2402	84.8	-	-	74.76	27.07	3.97	30.92	305	85	A	V
													V	
													V	
BLE CH 19 2440MHz		2347.52	51.03	-22.97	74	41.24	26.9	3.92	30.95	125	109	P	H	
		2386.3	41.55	-12.45	54	31.53	27.07	3.96	30.93	125	109	A	H	
	*	2440	91.59	-	-	81.35	27.23	4	30.91	125	109	P	H	
	*	2440	90.92	-	-	80.68	27.23	4	30.91	125	109	A	H	
			2494.47	50.83	-23.17	74	40.35	27.4	4.04	30.88	125	109	P	H
			2495.66	42.06	-11.94	54	31.58	27.4	4.04	30.88	125	109	A	H
			2351.72	50.16	-23.84	74	40.31	26.96	3.92	30.95	298	75	P	V
			2386.72	41.58	-12.42	54	31.56	27.07	3.96	30.93	298	75	A	V
	*		2440	87.85	-	-	77.61	27.23	4	30.91	298	75	P	V
	*		2440	87.13	-	-	76.89	27.23	4	30.91	298	75	A	V
			2495.66	50.66	-23.34	74	40.18	27.4	4.04	30.88	298	75	P	V
			2492.3	42.27	-11.73	54	31.79	27.4	4.04	30.88	298	75	A	V



BLE CH 39 2480MHz	*	2480	93.89	-	-	83.49	27.34	4.03	30.89	122	113	P	H
	*	2480	93.32	-	-	82.92	27.34	4.03	30.89	122	113	A	H
		2487.4	50.87	-23.13	74	40.46	27.34	4.04	30.89	122	113	P	H
		2484.64	42.36	-11.64	54	31.95	27.34	4.04	30.89	122	113	A	H
													H
													H
	*	2480	90.63	-	-	80.23	27.34	4.03	30.89	295	76	P	V
	*	2480	89.95	-	-	79.55	27.34	4.03	30.89	295	76	A	V
		2491.32	51.29	-22.71	74	40.82	27.4	4.04	30.89	295	76	P	V
		2489.76	41.95	-12.05	54	31.48	27.4	4.04	30.89	295	76	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	41.41	-32.59	74	67.59	31.66	6.45	64.75	100	0	P	H	
													H	
													H	
													H	
			4804	38.41	-35.59	74	64.59	31.66	6.45	64.75	100	0	P	V
														V
														V
BLE CH 19 2440MHz		4880	41.6	-32.4	74	67.55	31.78	6.51	64.7	100	0	P	H	
		7320	42.92	-31.08	74	62.4	36.78	8.09	64.83	100	0	P	H	
													H	
													H	
			4880	38.93	-35.07	74	64.88	31.78	6.51	64.7	100	0	P	V
			7320	43.36	-30.64	74	62.84	36.78	8.09	64.83	100	0	P	V
														V
BLE CH 39 2480MHz		4960	41.15	-32.85	74	66.8	31.94	6.58	64.63	100	0	P	H	
		7440	43.08	-30.92	74	62.25	37.14	8.12	64.88	100	0	P	H	
													H	
													H	
			4960	39.83	-34.17	74	65.48	31.94	6.58	64.63	100	0	P	V
			7440	43.17	-30.83	74	62.34	37.14	8.12	64.88	100	0	P	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.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)	
2.4GHz BLE LF		39.18	26.77	-13.23	40	38.68	20.07	0.59	32.58	-	-	P	H	
		119.91	26.2	-17.3	43.5	40.49	17.36	0.86	32.58	-	-	P	H	
		182.28	27.82	-15.68	43.5	44.01	15.06	1.06	32.52	-	-	P	H	
		714.4	32.33	-13.67	46	35.42	27.19	2.13	32.53	-	-	P	H	
		722.1	38.14	-7.86	46	40.91	27.47	2.15	32.51	-	-	P	H	
		781.6	38.89	-7.11	46	40.49	28.38	2.22	32.36	100	0	P	H	
													H	
													H	
													H	
													H	
													H	
													H	
			37.56	36.86	-3.14	40	48.48	20.49	0.46	32.58	-	-	P	V
			56.46	32.01	-7.99	40	51.54	12.41	0.59	32.57	-	-	P	V
			59.97	31.7	-8.3	40	51.6	11.96	0.67	32.58	-	-	P	V
			713.7	30.93	-15.07	46	34.05	27.16	2.13	32.53	-	-	P	V
			722.1	42.94	-3.06	46	45.71	27.47	2.15	32.51	100	0	P	V
			780.9	34.75	-11.25	46	36.35	28.39	2.22	32.37	-	-	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	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

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

For Peak Limit @ 2390MHz:

- 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)
- Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

- 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)
- 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

Test Engineer :	Karl Hou	Temperature :	22~24°C
		Relative Humidity :	50~54%

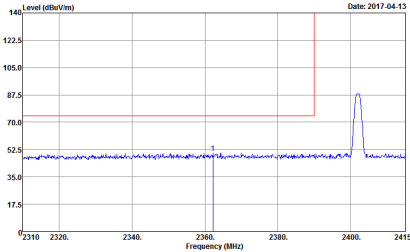
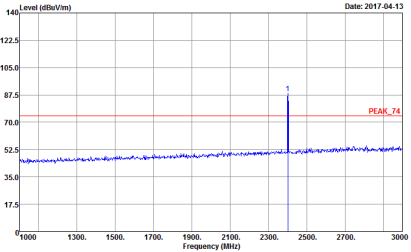
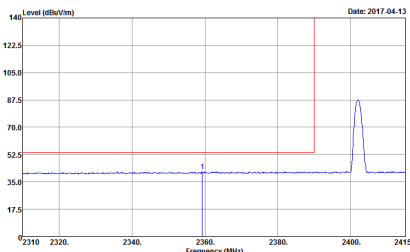
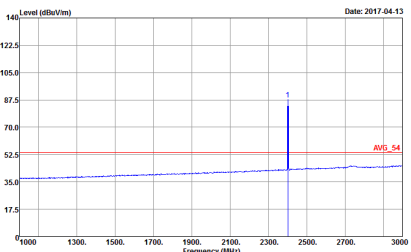
Note symbol

-L	Low channel location
-R	High channel location

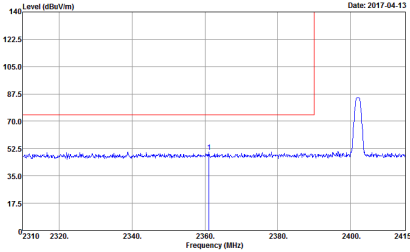
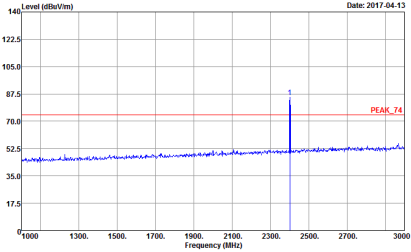
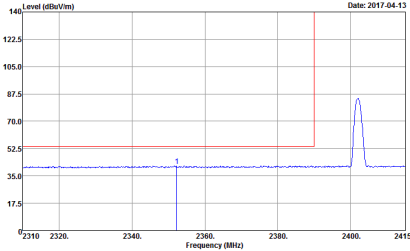
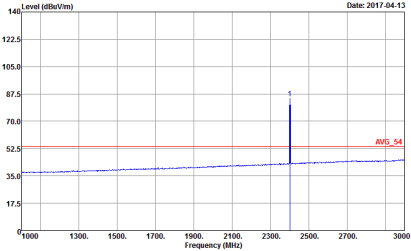


2.4GHz 2400~2483.5MHz

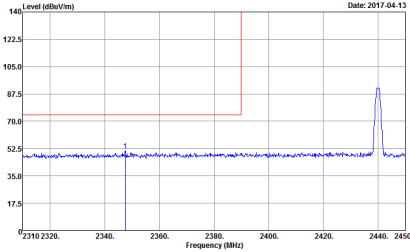
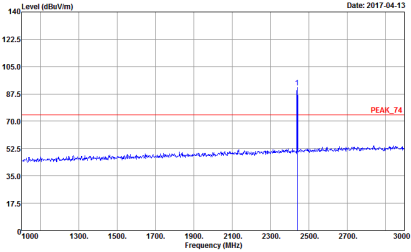
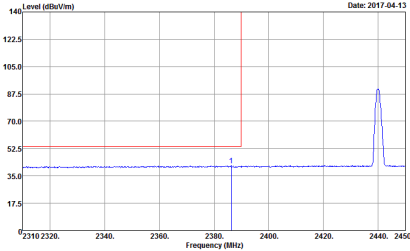
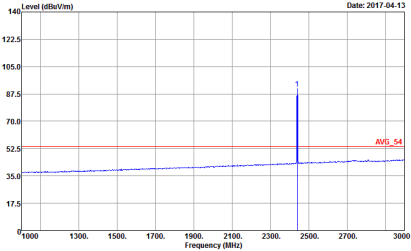
BLE (Band Edge @ 3m)

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Fundamental
Peak	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at approximately 2402 MHz. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A red horizontal line is drawn at approximately 75 dBuV/m.</p> <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 1</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at approximately 2402 MHz. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A red horizontal line is labeled 'PEAK_74' at approximately 75 dBuV/m.</p> <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 1</p>
Avg.	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing an average spectrum with a peak at approximately 2402 MHz. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A red horizontal line is drawn at approximately 55 dBuV/m.</p> <p>Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 1</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing an average spectrum with a peak at approximately 2402 MHz. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A red horizontal line is labeled 'AVG_54' at approximately 55 dBuV/m.</p> <p>Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 1</p>

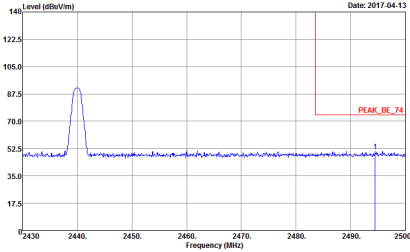
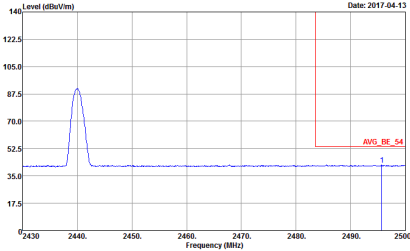


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Vertical	Fundamental
Peak	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Vertical Peak. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A significant peak is visible at approximately 2402 MHz. A red horizontal line is drawn at approximately 75 dBuV/m.</p> <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 1</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Fundamental Peak. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A significant peak is visible at approximately 2402 MHz. A red horizontal line is drawn at approximately 75 dBuV/m, labeled 'PEAK_74'.</p> <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 1</p>
Avg	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Vertical Avg. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 2310 to 2415 MHz. A peak is visible at approximately 2402 MHz. A red horizontal line is drawn at approximately 55 dBuV/m.</p> <p>Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 1</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Fundamental Avg. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A peak is visible at approximately 2402 MHz. A red horizontal line is drawn at approximately 55 dBuV/m, labeled 'AVG_54'.</p> <p>Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 1</p>

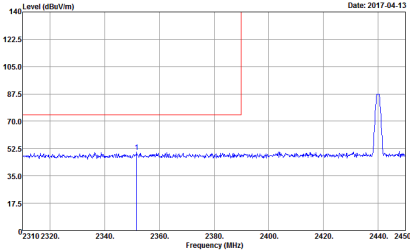
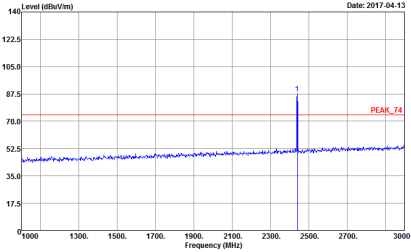
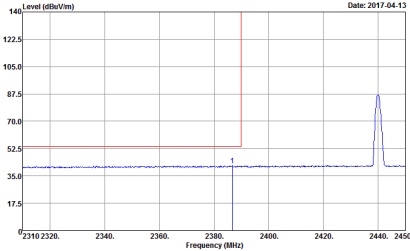
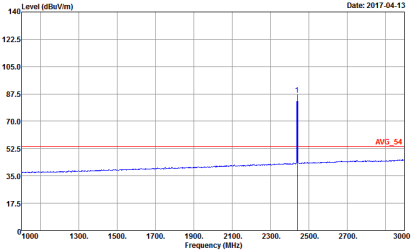


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
1	Horizontal	Fundamental
Peak	 <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 2</p>	 <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 2</p>
Avg.	 <p>Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 2</p>	 <p>Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 2</p>

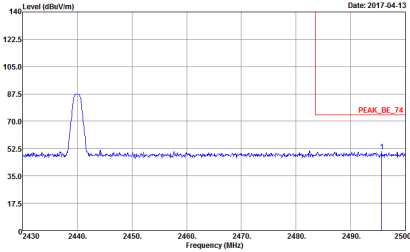
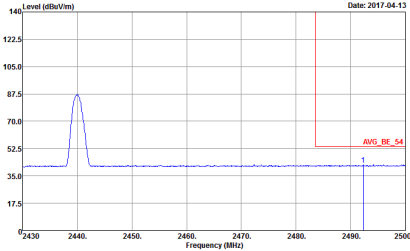


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Horizontal	Fundamental
<p>Peak</p>	 <p> Site : 03CH15-HY Condition : PEAK_BE_74 3m 9120D_15_1620 HORIZONTAL Detector : Peak Project : 710607-01 Mode : 2 </p>	<p>Left blank</p>
<p>Avg.</p>	 <p> Site : 03CH15-HY Condition : AVG_BE_54 3m 9120D_15_1620 HORIZONTAL Detector : Peak Project : 710607-01 Mode : 2 </p>	<p>Left blank</p>

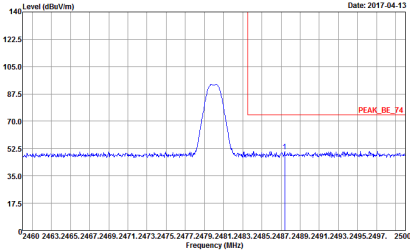
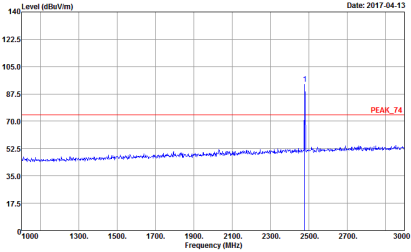
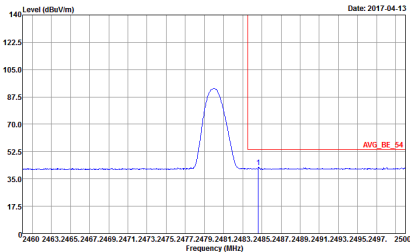
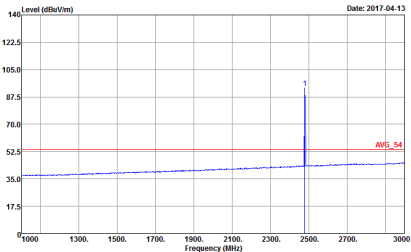


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
1	Vertical	Fundamental
Peak	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Vertical Peak. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 2310 to 2450 MHz. A sharp peak is visible at approximately 2440 MHz. A red horizontal line is drawn at approximately 70 dBuV/m.</p> <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 2</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Fundamental Peak. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A sharp peak is visible at approximately 2440 MHz. A red horizontal line is drawn at approximately 70 dBuV/m, labeled 'PEAK_74'.</p> <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 2</p>
Avg.	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Vertical Avg. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 2310 to 2450 MHz. A peak is visible at approximately 2440 MHz. A red horizontal line is drawn at approximately 55 dBuV/m.</p> <p>Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 2</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Fundamental Avg. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A peak is visible at approximately 2440 MHz. A red horizontal line is drawn at approximately 55 dBuV/m, labeled 'AVG_54'.</p> <p>Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 2</p>

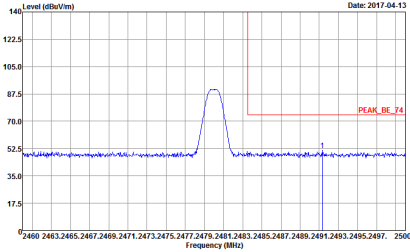
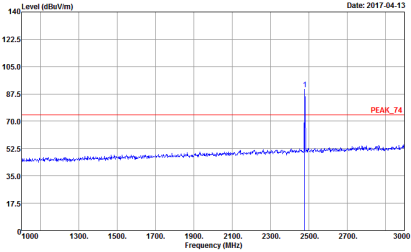
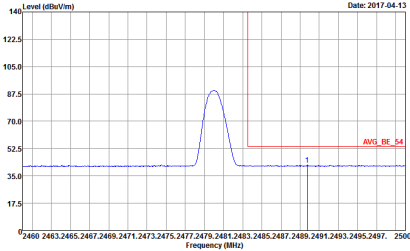
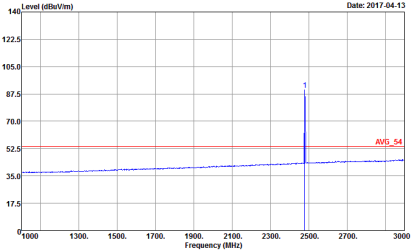


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Vertical	Fundamental
Peak	 <p>Date: 2017-04-13</p> <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 9120D_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 2</p>	Left blank
Avg.	 <p>Date: 2017-04-13</p> <p>Site : 03CH15-HY Condition : AVG_BE_54 3m 9120D_15_1620 VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 2</p>	Left blank



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Fundamental
Peak	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at 2480 MHz. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 2460 to 2500 MHz. A red horizontal line indicates the peak level at approximately 87.5 dBuV/m, labeled 'PEAK_BE_74'.</p> <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 3</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing a sharp peak at 2480 MHz. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A red horizontal line indicates the peak level at approximately 87.5 dBuV/m, labeled 'PEAK_74'.</p> <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 3</p>
Avg.	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing the average spectrum. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 2460 to 2500 MHz. A red horizontal line indicates the average level at approximately 52.5 dBuV/m, labeled 'AVG_BE_54'.</p> <p>Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 3</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot showing the average spectrum. The y-axis ranges from 17.5 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A red horizontal line indicates the average level at approximately 52.5 dBuV/m, labeled 'AVG_54'.</p> <p>Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 3</p>

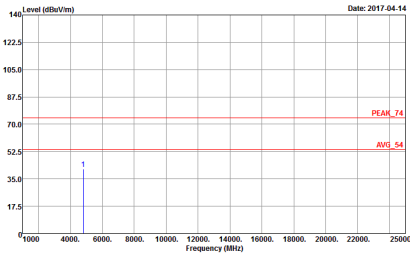
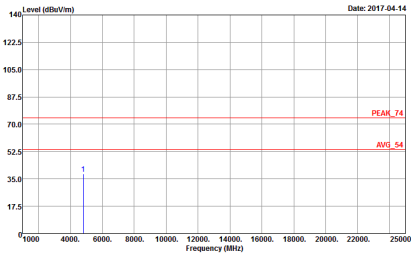


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz	
1	Vertical	Fundamental
Peak	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Vertical Peak. The plot shows a peak at approximately 2480 MHz. A red horizontal line indicates the peak level at approximately 87.5 dBuV/m. The x-axis ranges from 2460 to 2500 MHz, and the y-axis ranges from 17.5 to 140 dBuV/m.</p> <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 3</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Fundamental Peak. The plot shows a sharp peak at 2480 MHz. A red horizontal line indicates the peak level at approximately 87.5 dBuV/m. The x-axis ranges from 1000 to 3000 MHz, and the y-axis ranges from 17.5 to 140 dBuV/m.</p> <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 3</p>
Avg.	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Vertical Avg. The plot shows a peak at approximately 2480 MHz. A red horizontal line indicates the average level at approximately 52.5 dBuV/m. The x-axis ranges from 2460 to 2500 MHz, and the y-axis ranges from 17.5 to 140 dBuV/m.</p> <p>Site : 03CH15-HY Condition : AVG_BE_54 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 3</p>	 <p>Level (dBuV/m) vs Frequency (MHz) plot for Fundamental Avg. The plot shows a sharp peak at 2480 MHz. A red horizontal line indicates the average level at approximately 52.5 dBuV/m. The x-axis ranges from 1000 to 3000 MHz, and the y-axis ranges from 17.5 to 140 dBuV/m.</p> <p>Site : 03CH15-HY Condition : AVG_54 3m 91200_15_1620 VERTICAL RBW:1000.000KHz VBW:3.000KHz SWT:Auto Detector : Peak Project : 710607-01 Mode : 3</p>

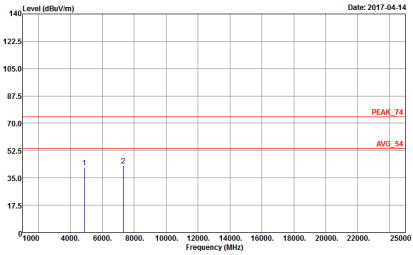
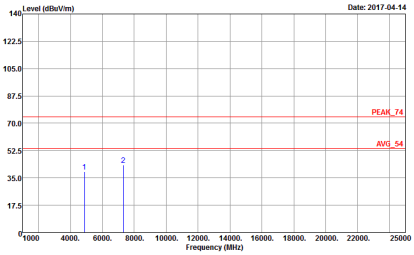


2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Vertical
<p>Peak</p> <p>Avg.</p>	 <p>Site : 03CH15-#Y Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : 710607-01 Mode : 1</p>	 <p>Site : 03CH15-#Y Condition : PEAK_74 3m 91200_15_1620 VERTICAL Detector : Peak Project : 710607-01 Mode : 1</p>



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
1	Horizontal	Vertical
<p>Peak Avg.</p>	 <p>Site : 03CH15-#Y Condition : PEAK_74 3m 91200_15_1620 HORIZONTAL Detector : Peak Project : 710607-01 Mode : 2</p>	 <p>Site : 03CH15-#Y Condition : PEAK_74 3m 91200_15_1620 VERTICAL Detector : Peak Project : 710607-01 Mode : 2</p>

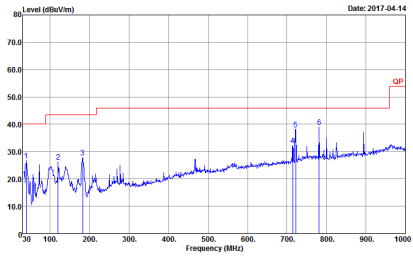
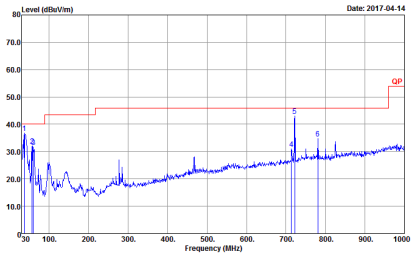


BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Vertical
Peak	<p>Horizontal Spectrum Plot (Date: 2017-04-13):</p> <ul style="list-style-type: none"> Y-axis: Level (dBuV/m) from 0 to 140 X-axis: Frequency (MHz) from 0 to 25000 Reference lines: PEAK_74 at ~75 dBuV/m, AVG_54 at ~55 dBuV/m Peaks: 1 at ~5000 MHz, 2 at ~6000 MHz Metadata: Site: 03CH15-#Y, Condition: PEAK_74 3m 91200_15_1620 HORIZONTAL, Detector: Peak, Project: 710607-01, Mode: 3 	<p>Vertical Spectrum Plot (Date: 2017-04-14):</p> <ul style="list-style-type: none"> Y-axis: Level (dBuV/m) from 0 to 140 X-axis: Frequency (MHz) from 0 to 25000 Reference lines: PEAK_74 at ~75 dBuV/m, AVG_54 at ~55 dBuV/m Peaks: 1 at ~5000 MHz, 2 at ~6000 MHz Metadata: Site: 03CH15-#Y, Condition: PEAK_74 3m 91200_15_1620 VERTICAL, Detector: Peak, Project: 710607-01, Mode: 3



Emission below 1GHz

2.4GHz BLE (LF)

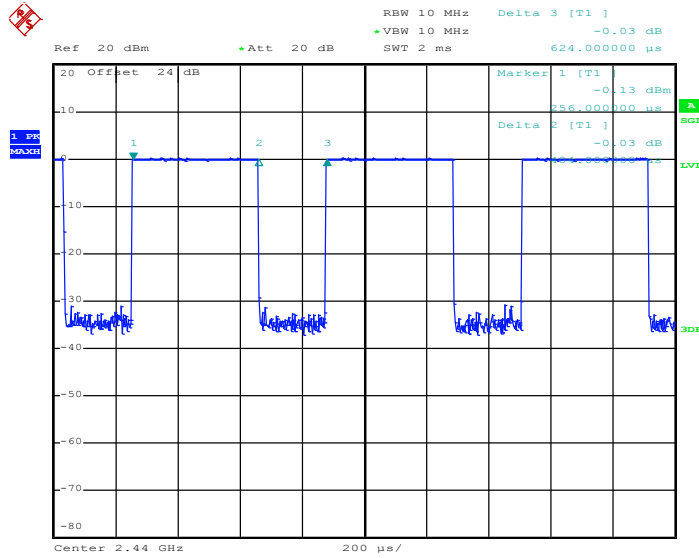
BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE LF	
1	Horizontal	Vertical
<p>QP / Peak</p>	 <p>Site : 03CH15-4HY Condition : QP 3m 81L06_15_41912 HORIZONTAL Detector : Peak Project : 710607-01 Mode : 4</p>	 <p>Site : 03CH15-4HY Condition : QP 3m 81L06_15_41912 VERTICAL Detector : Peak Project : 710607-01 Mode : 4</p>



Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth -LE	64.74	404.00	2.48	3kHz

Bluetooth - LE



Date: 13.APR.2017 11:57:57