



FCC RF Test Report

APPLICANT : Honeywell International Inc.
EQUIPMENT : CN75WAN mobile computer
BRAND NAME : Honeywell
MODEL NAME : CN75WAN
MARKETING NAME : CN75
FCC ID : HD5-CN75WAN
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Dec. 28, 2016 and testing was completed on Feb. 02, 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 : HD5-CN75WAN

Page Number : 1 of 43

Report Issued Date : Mar. 08, 2017

Report Version : Rev. 01

Report Template No.: BU5-FR15CBT4.0 Version 1.3



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR6D2819B	Rev. 01	Initial issue of report	Mar. 08, 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 6.18 dB at 2386.440 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 7.40 dB at 3.526 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

Honeywell International Inc.
9680 Old Bailes Road, Fort Mill, SC 29707 USA

1.2 Manufacturer

Honeywell International Inc.
9680 Old Bailes Road, Fort Mill, SC 29707 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	CN75WAN mobile computer
Brand Name	Honeywell
Model Name	CN75WAN
Marketing Name	CN75
FCC ID	HD5-CN75WAN
Sample 1	CN75 WWAN-Q5 WWAN_Q5 keypad
Sample 2	CN75 WWAN-N5 WWAN_N5 keypad
Sample 3	CN75E WWAN-N7 WWAN_N7 keypad
Sample 4	CN75E WWAN-Q6 WWAN_Q6 keypad
EUT supports Radios application	CDMA/EV-DO/GSM/EGPRS/WCDMA/HSPA WLAN 11a/b/g/n HT20 Bluetooth BR/EDR/LE
HW Version	v1.1
SW Version	W03.320
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	40
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)
Maximum Output Power to Antenna	6.76 dBm (0.0047 W)
99% Occupied Bandwidth	1.04MHz
Antenna Type / Gain	PIFA Antenna type with gain 2.29 dBi
Type of Modulation	Bluetooth LE : GFSK



1.5 Modification of EUT

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

1.6 Testing Location

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

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 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.	
	03CH11-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 v03r05
- ♦ 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 Descriptions of Test Mode

The RF output power was recorded in the following table:

Channel	Frequency	Bluetooth – LE RF Output Power
		Data Rate / Modulation
		GFSK
		1Mbps
Ch00	2402MHz	6.76 dBm
Ch19	2440MHz	6.72 dBm
Ch39	2480MHz	6.60 dBm

- The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration (Y plane as worst plane) from all possible combinations.
- AC power line Conducted Emission was tested under maximum output power.

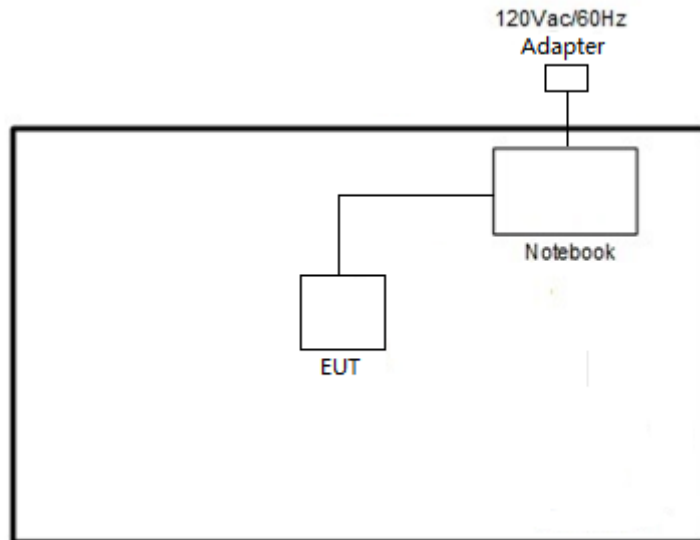
2.2 Test Mode

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

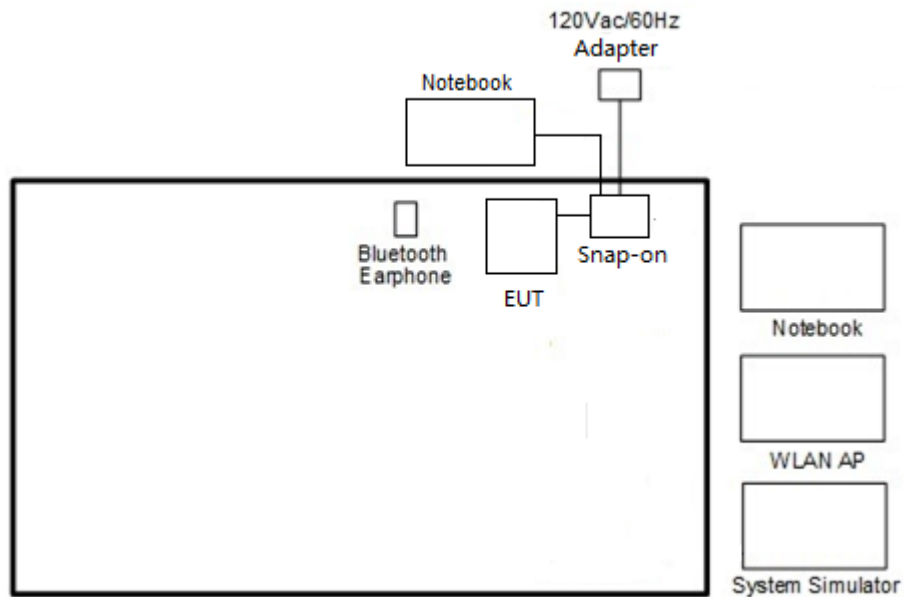
Summary table of Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth – LE / GFSK
Conducted TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps
	Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps
	Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps
	Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps
	Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC Conducted Emission	Mode 1: WCDMA Band V Idle + Bluetooth Link + WLAN (2.4GHz) Link + MPEG4 + Scanner + Snap-on 1 + RJ-45 Cable Link with Notebook + Adapter + SD Card for Sample 3
Remark:	
1. Snap-on 1: Ethernet Snap-On 1000AA01	
2. Adapter: Level V (for Snap-on)	
3. All the radiated test cases were performance with Sample 1.	

2.3 Connection Diagram of Test System

<Bluetooth – LE Tx Mode>



<AC Conducted Emission Mode>





2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	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,1.8m
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
6.	CN75A/CN75E Vehicle dock	intermec technologies corp	1000AV01	FCC DoC	NA	NA
7.	CK75 Vehicle dock	intermec technologies corp	1001AV01	FCC DoC	NA	NA
8.	car charger	intermec technologies corp	852-057-005	Verification	NA	Unshielded, 1.2m
9.	Snap-on(LAN)	intermec technologies corp	1000AA01	FCC DoC	NA	NA
10.	Snap-on(RS232)	intermec technologies corp	1000AA03	FCC DoC	NA	NA
11.	Snap-On (VoCollect)	intermec technologies corp	1000AA05	FCC DoC	NA	NA
12.	Snap-on (USB)	intermec technologies corp	1000AA07	FCC DoC	NA	NA
13.	Snap-on adapter	intermec technologies corp	9001AE01	FCC DoC	NA	AC IP: Unshielded, 1.8m DC OP: Shielded, 1.8m
14.	Earphone	Honeywell	Vocollect SR-20	FCC DoC	1.1 meter, shielded cable	NA
15.	USB Cable	intermec technologies corp	VE011-2018	FCC DoC	NA	1.4 meter, shielded cable, w/t ferrite core
16.	Battery	intermec technologies corp	1000AB02	NA	NA	NA



2.5 EUT Operation Test Setup

For Bluetooth function, programmed RF utility, "CMD" 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 v03r05.
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

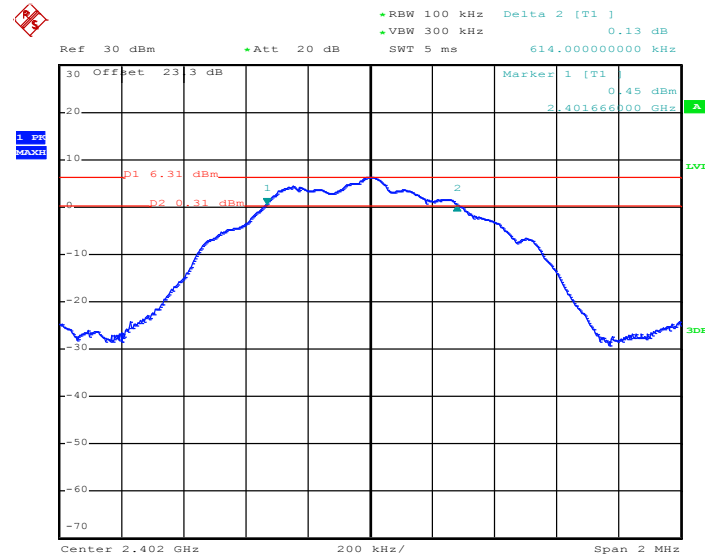




3.1.5 Test Result of 6dB Bandwidth

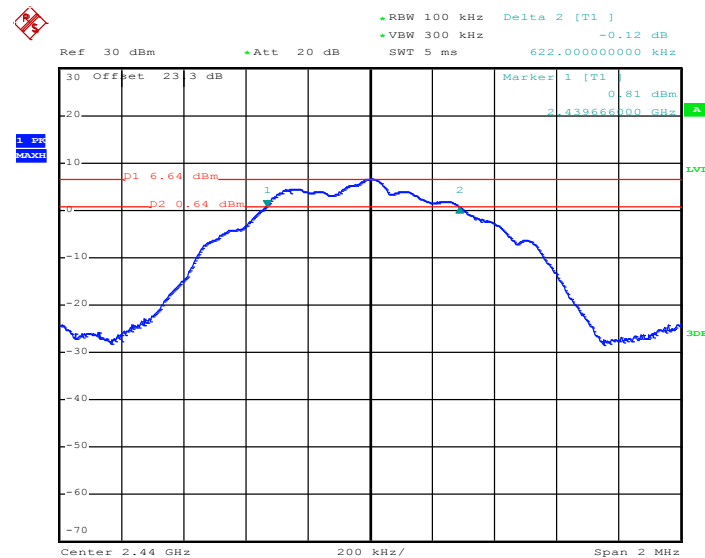
Test data refer to Appendix A.

6 dB Bandwidth Plot on Channel 00



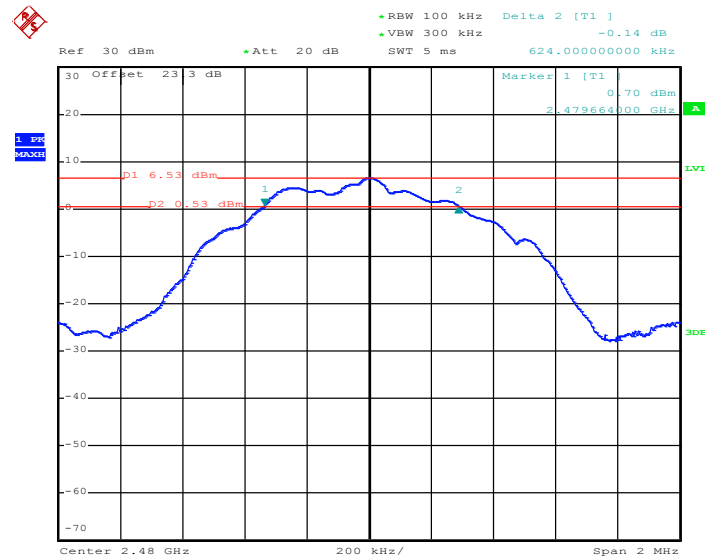
Date: 13.JAN.2017 22:54:22

6 dB Bandwidth Plot on Channel 19



Date: 13.JAN.2017 22:59:16

6 dB Bandwidth Plot on Channel 39

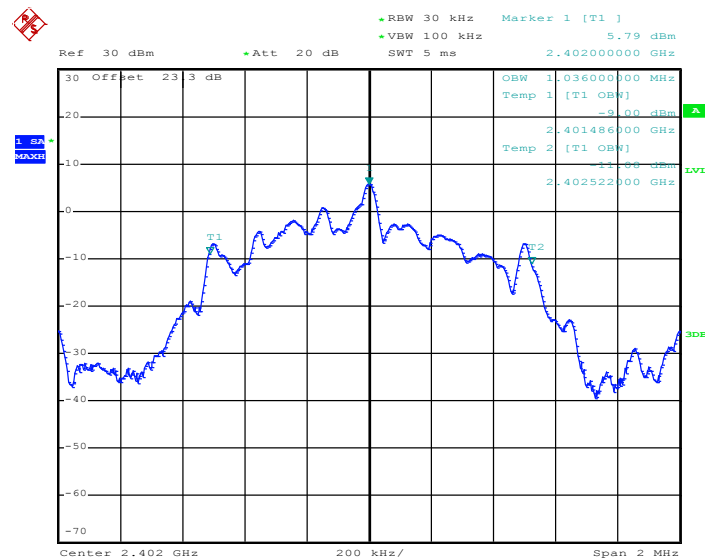


Date: 13.JAN.2017 23:06:08

3.1.6 Test Result of 99% Occupied Bandwidth

Test data refer to Appendix A.

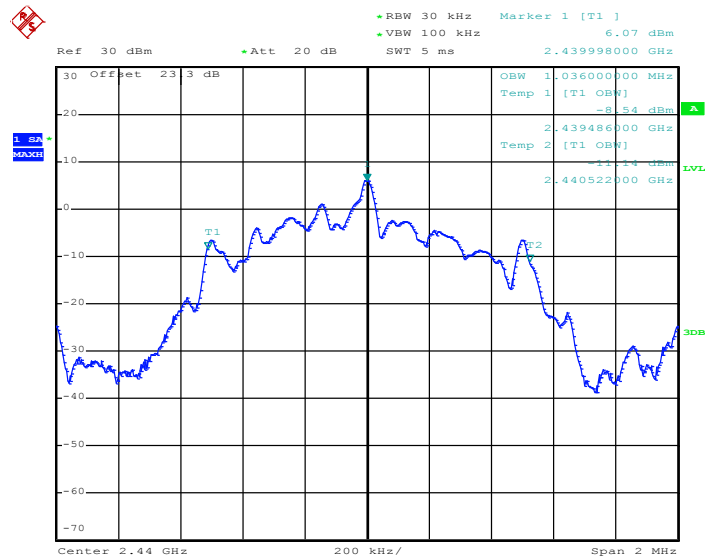
99% Bandwidth Plot on Channel 00



Date: 13.JAN.2017 22:57:06

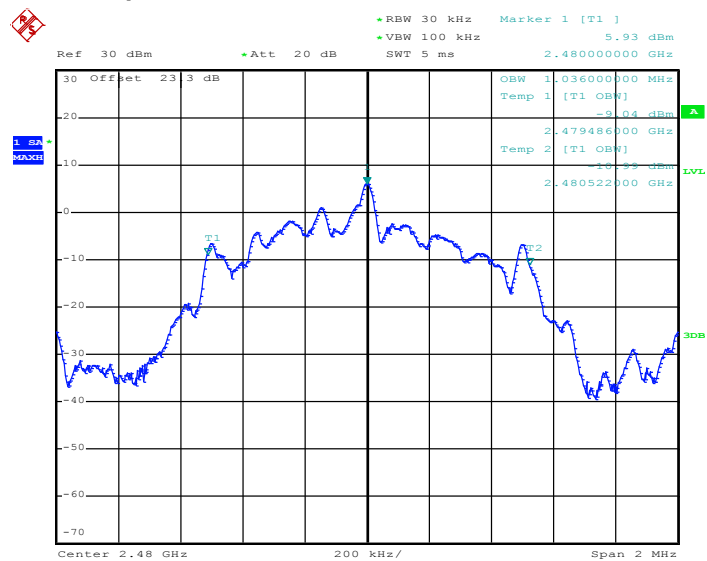


99% Occupied Bandwidth Plot on Channel 19



Date: 13.JAN.2017 23:01:31

99% Occupied Bandwidth Plot on Channel 39



Date: 13.JAN.2017 23:11:33

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.

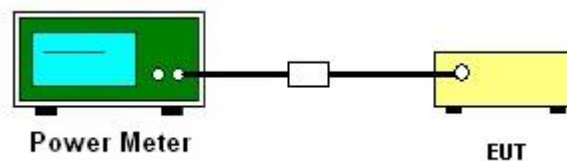
3.2.2 Measuring Instruments

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 v03r05 section 9.1.2 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Test data refers 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.

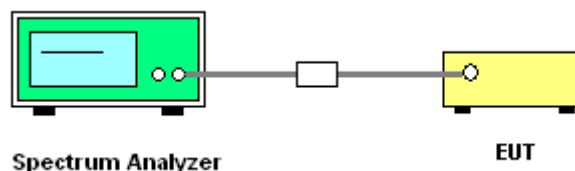
3.3.2 Measuring Instruments

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 v03r05
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



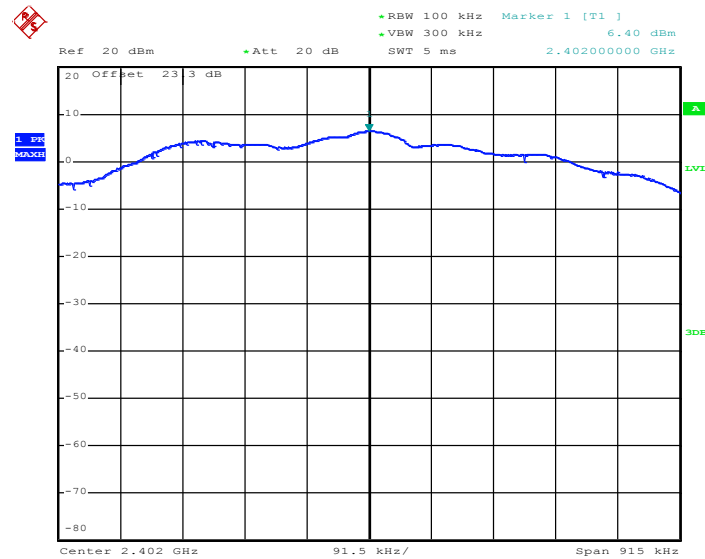
3.3.5 Test Result of Power Spectral Density

Test data refers to Appendix A.



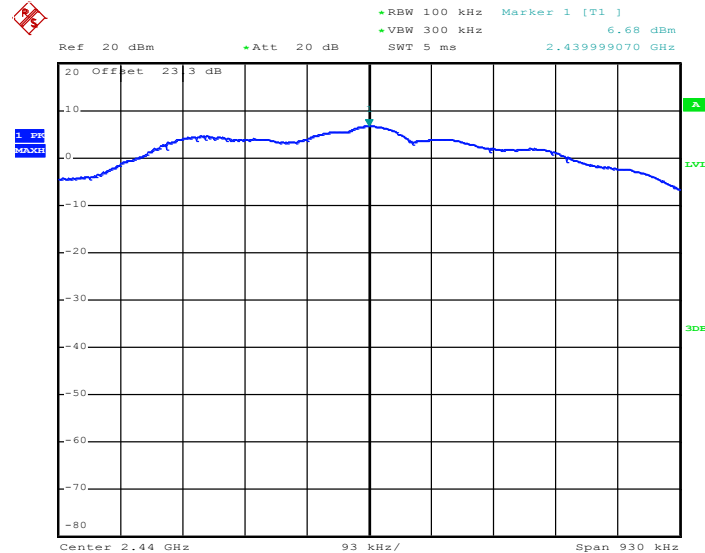
3.3.6 Test Result of Power Spectral Density Plots (100kHz)

PSD 100kHz Plot on Channel 00



Date: 13.JAN.2017 22:55:09

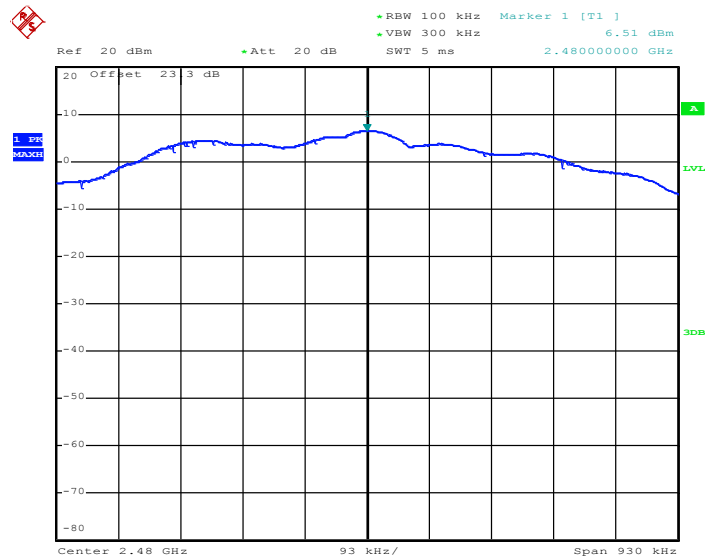
PSD 100kHz Plot on Channel 19



Date: 13.JAN.2017 22:59:51



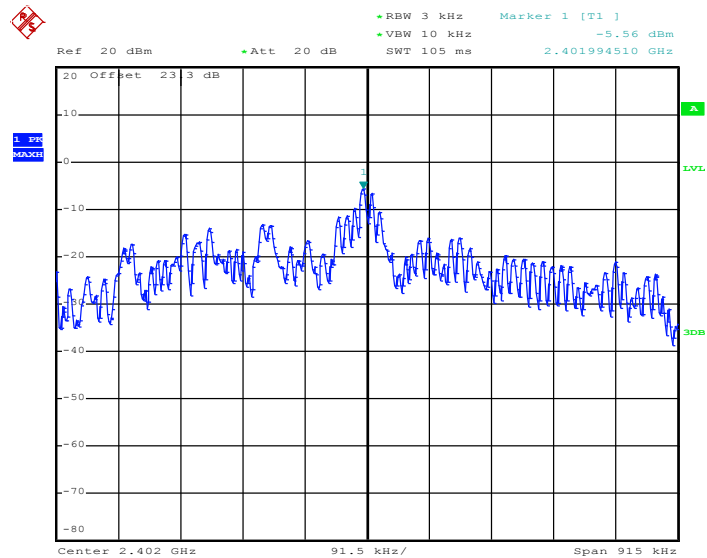
PSD 100kHz Plot on Channel 39



Date: 13.JAN.2017 23:06:39

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

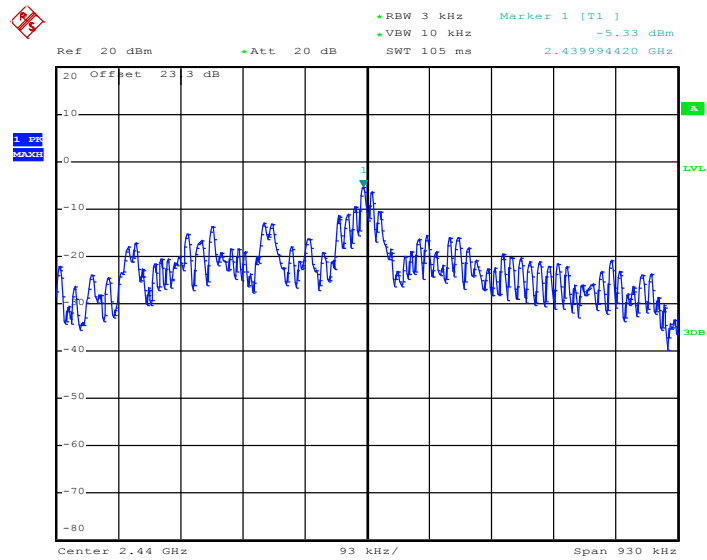
PSD 3kHz Plot on Channel 00



Date: 13.JAN.2017 22:54:51

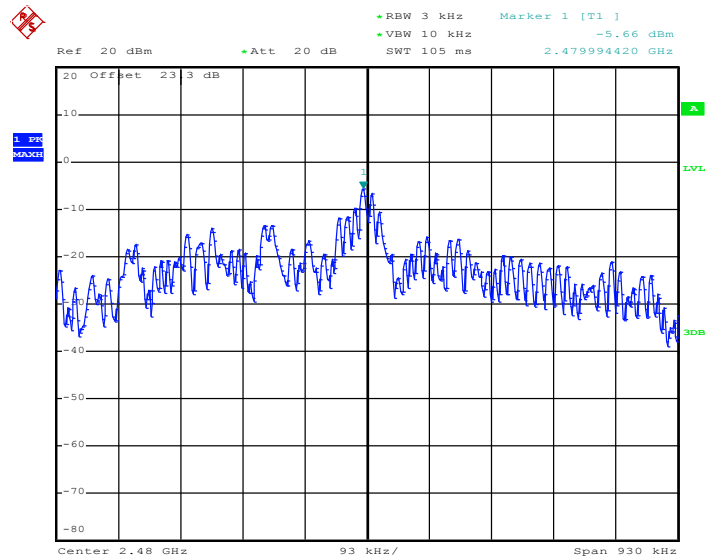


PSD 3kHz Plot on Channel 19



Date: 13.JAN.2017 22:59:34

PSD 3kHz Plot on Channel 39



Date: 13.JAN.2017 23:06:22

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.

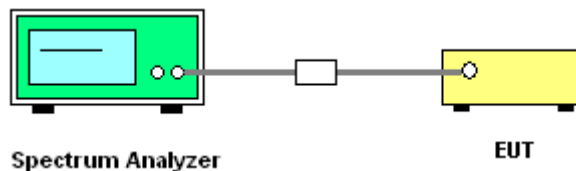
3.4.2 Measuring Instruments

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 v03r05.
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 per 15.247(d).
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.

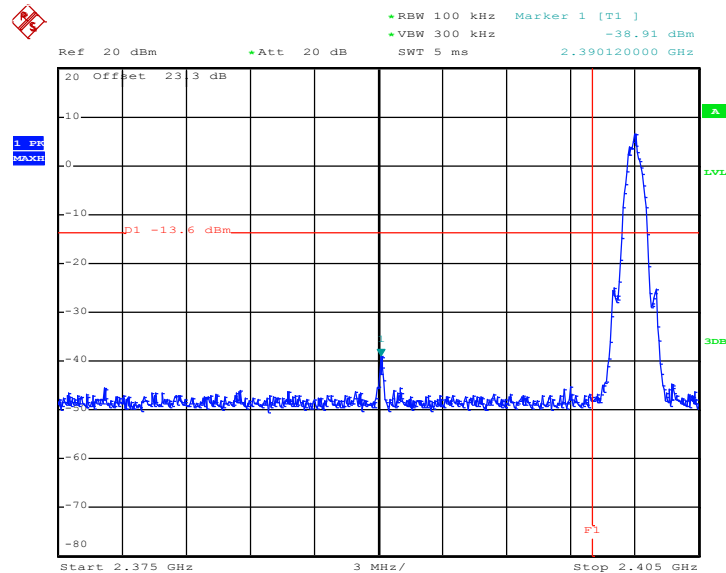
3.4.4 Test Setup





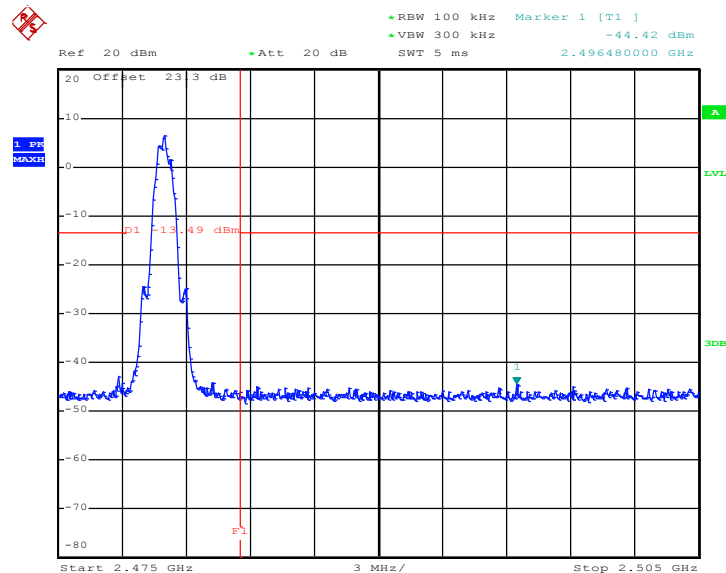
3.4.5 Test Result of Conducted Band Edges Plots

Low Band Edge Plot on Channel 00



Date: 13.JAN.2017 22:55:40

High Band Edge Plot on Channel 39



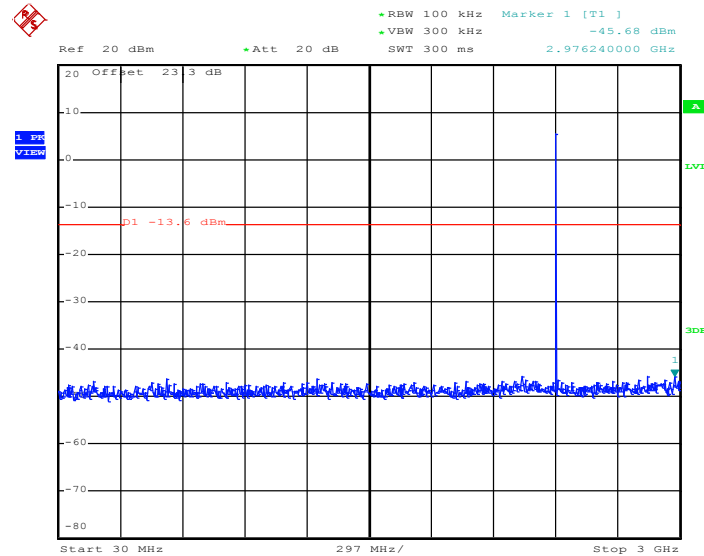
Date: 13.JAN.2017 23:10:10



3.4.6 Test Result of Conducted Spurious Emission Plots

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

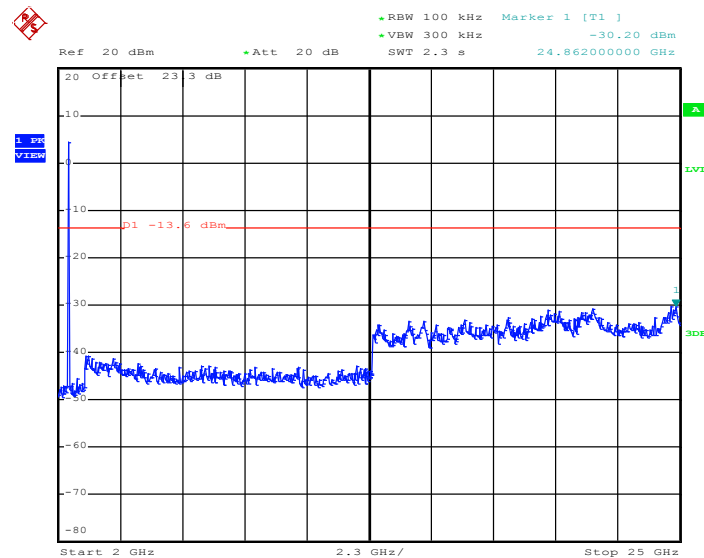
GFSK Channel 00



Date: 13.JAN.2017 22:55:53

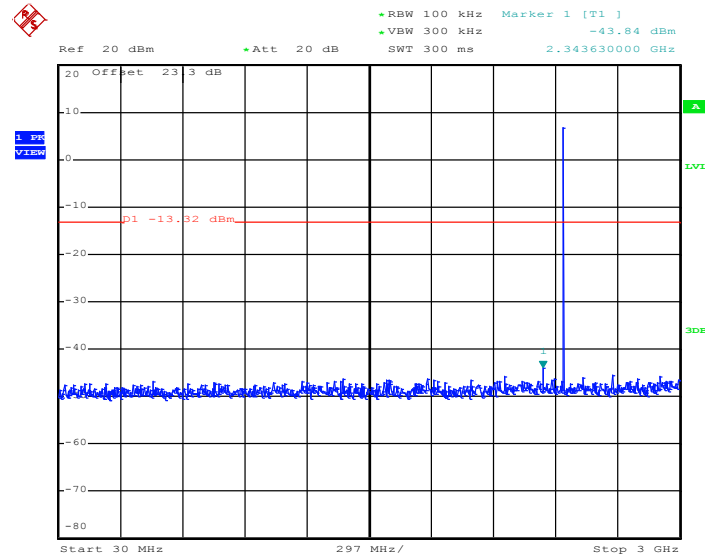
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 00



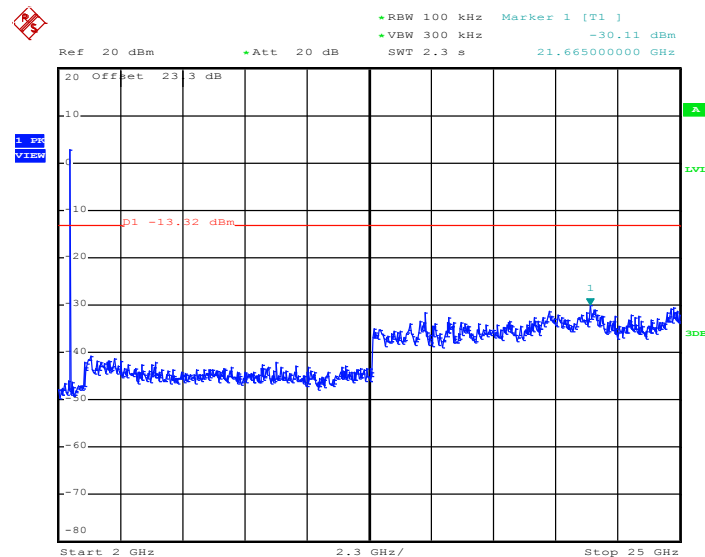
Date: 13.JAN.2017 22:56:01

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



Date: 13.JAN.2017 23:00:45

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

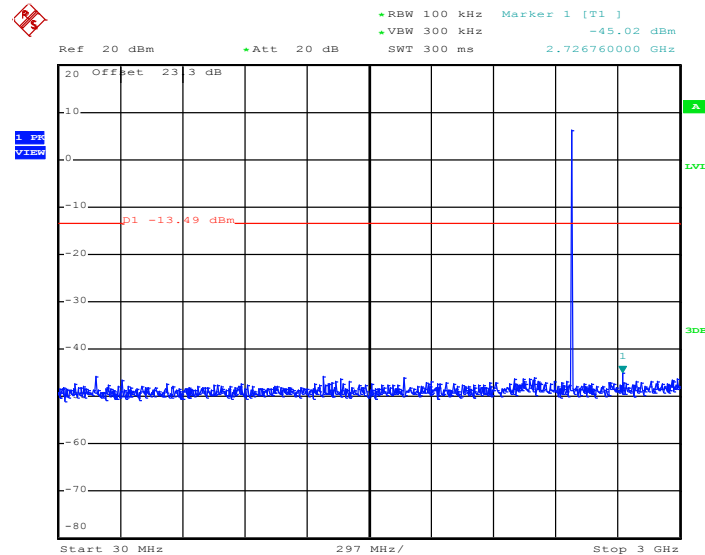


Date: 13.JAN.2017 23:00:54



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

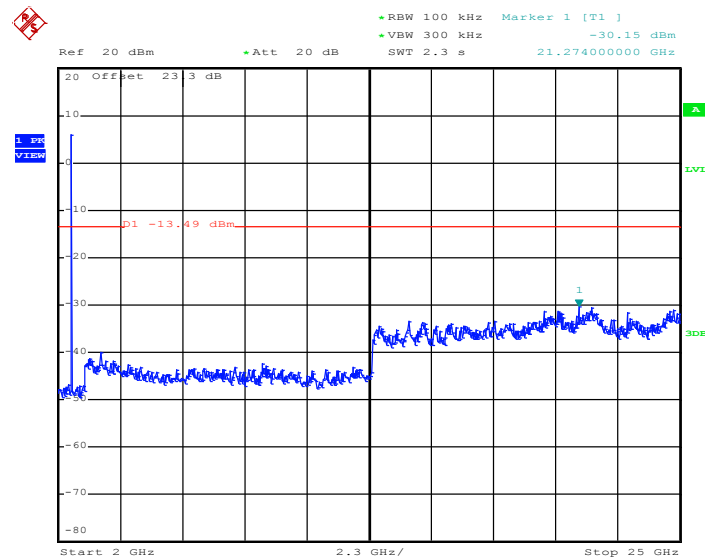
GFSK Channel 39



Date: 13.JAN.2017 23:12:00

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39



Date: 13.JAN.2017 23:12:08



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 FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

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

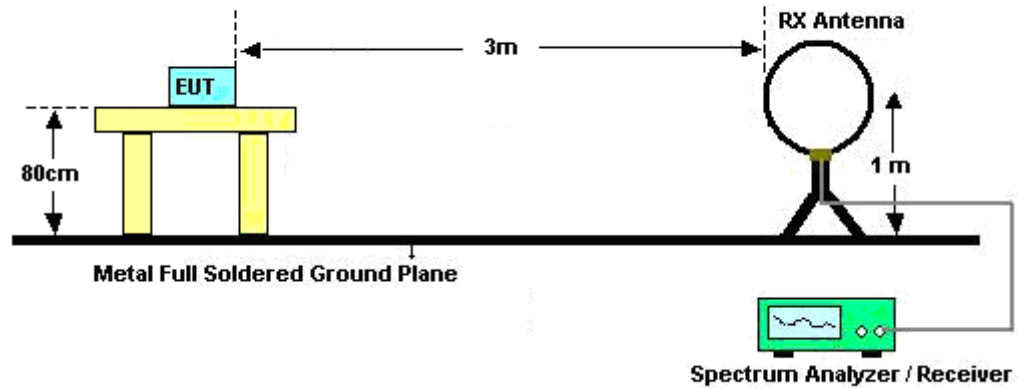


3.5.3 Test Procedures

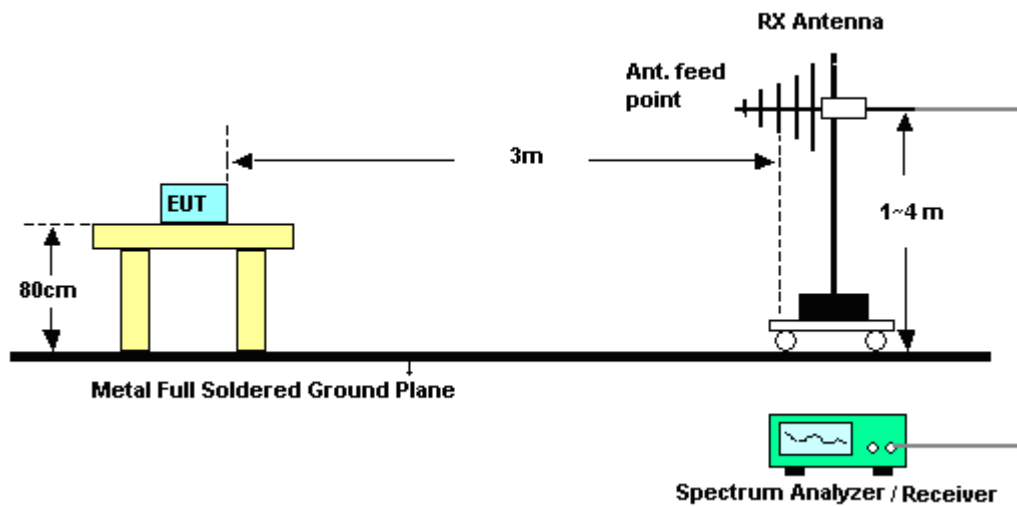
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW $\geq$ 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

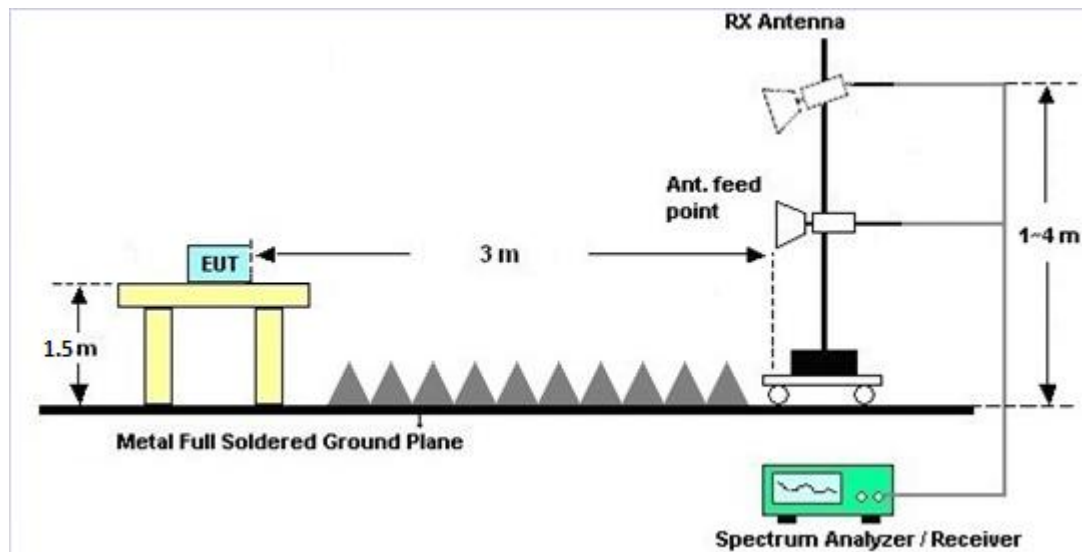
For radiated emissions below 30MHz



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 per 15.31(o) was not reported.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

3.5.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix B and C.

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.

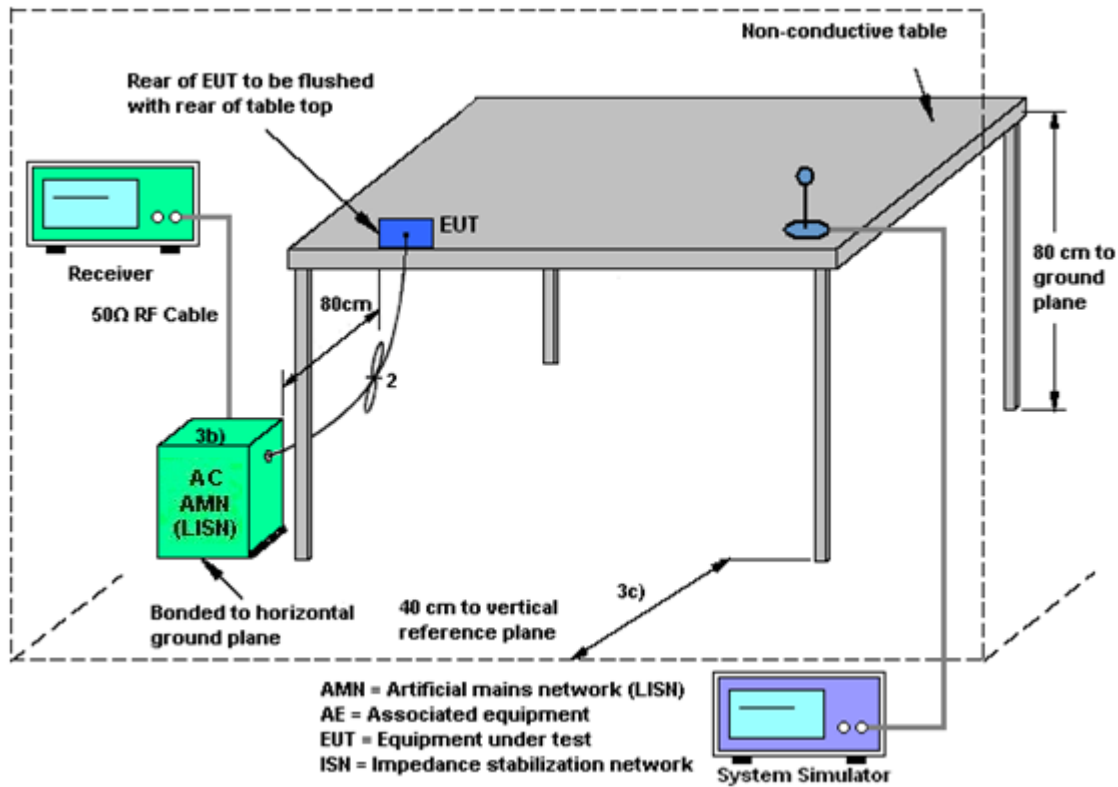
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

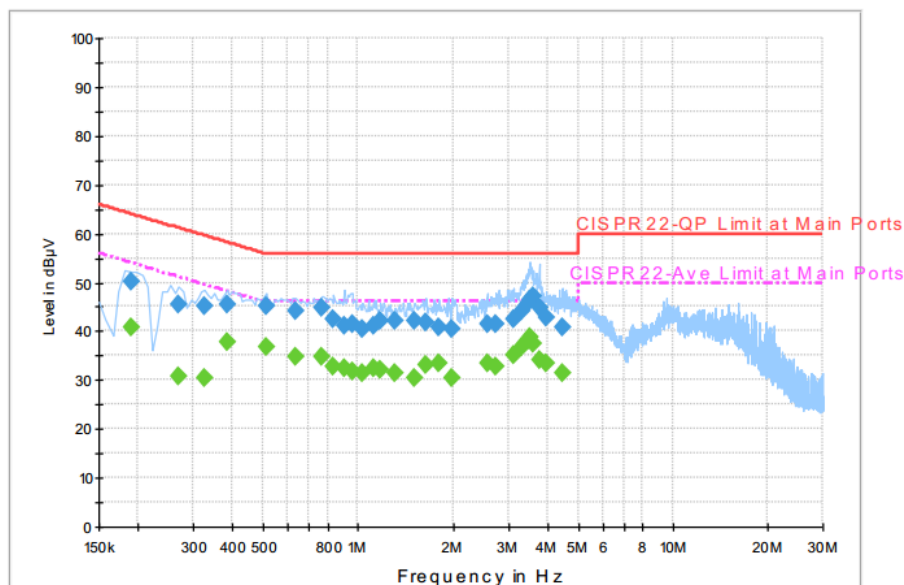
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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

Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Arthur Hsieh	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WCDMA Band V Idle + Bluetooth Link + WLAN (2.4GHz) Link + MPEG4 + Scanner + Snap-on 1 + RJ-45 Cable Link with Notebook + Adapter + SD Card for Sample 3		

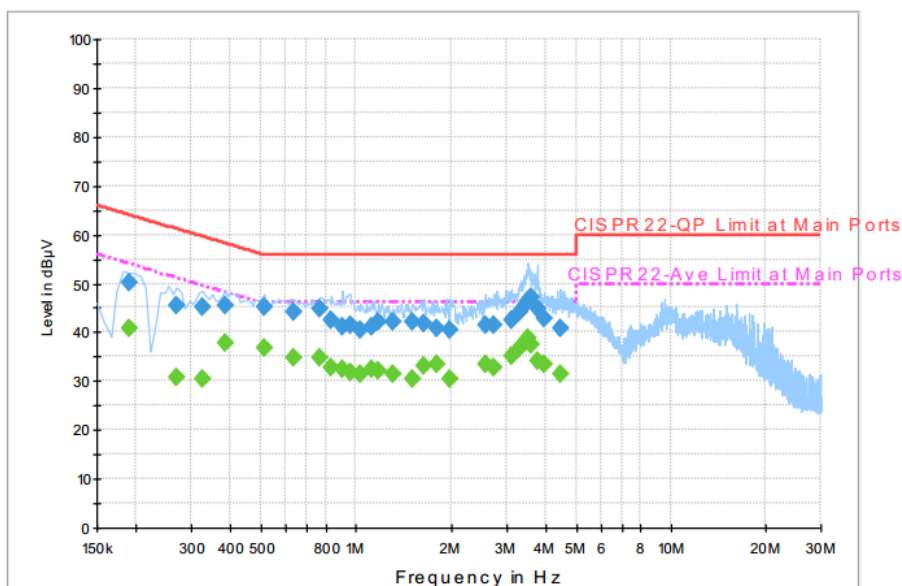


Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	50.0	Off	L1	19.6	14.0	64.0
0.270000	45.5	Off	L1	19.6	15.6	61.1
0.326000	45.0	Off	L1	19.6	14.6	59.6
0.382000	45.5	Off	L1	19.6	12.7	58.2
0.510000	45.0	Off	L1	19.6	11.0	56.0
0.630000	44.1	Off	L1	19.5	11.9	56.0
0.766000	44.8	Off	L1	19.6	11.2	56.0
0.838000	42.6	Off	L1	19.6	13.4	56.0
0.902000	41.2	Off	L1	19.6	14.8	56.0
0.958000	41.5	Off	L1	19.6	14.5	56.0
1.038000	40.4	Off	L1	19.6	15.6	56.0
1.118000	41.0	Off	L1	19.6	15.0	56.0
1.182000	42.1	Off	L1	19.6	13.9	56.0
1.310000	42.1	Off	L1	19.6	13.9	56.0
1.502000	42.2	Off	L1	19.6	13.8	56.0
1.646000	41.7	Off	L1	19.6	14.3	56.0



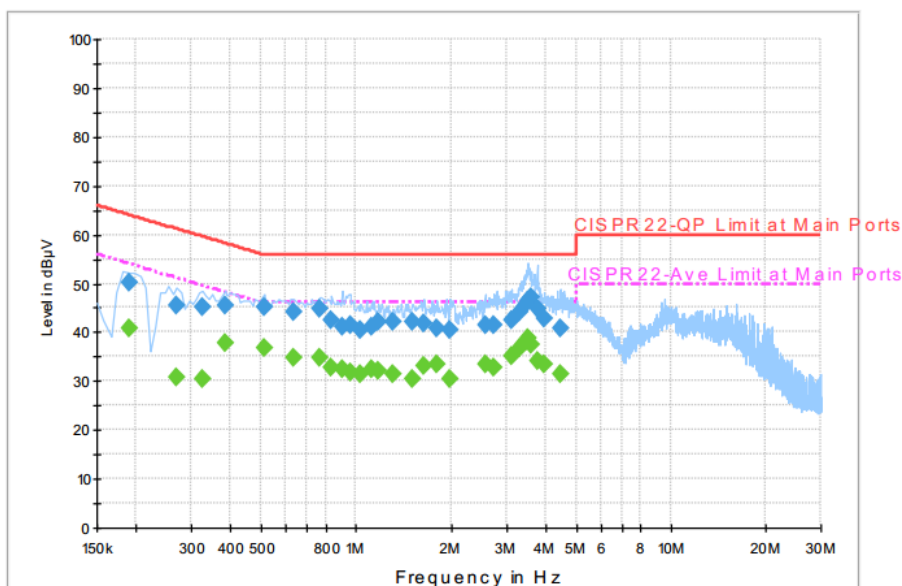
Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Arthur Hsieh	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WCDMA Band V Idle + Bluetooth Link + WLAN (2.4GHz) Link + MPEG4 + Scanner + Snap-on 1 + RJ-45 Cable Link with Notebook + Adapter + SD Card for Sample 3		

**Final Result : Quasi-Peak**

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
1.814000	40.6	Off	L1	19.6	15.4	56.0
1.990000	40.5	Off	L1	19.6	15.5	56.0
2.574000	41.4	Off	L1	19.2	14.6	56.0
2.734000	41.4	Off	L1	19.3	14.6	56.0
3.134000	42.6	Off	L1	19.5	13.4	56.0
3.318000	44.2	Off	L1	19.5	11.8	56.0
3.478000	45.9	Off	L1	19.5	10.1	56.0
3.526000	46.5	Off	L1	19.5	9.5	56.0
3.614000	47.2	Off	L1	19.5	8.8	56.0
3.758000	44.7	Off	L1	19.6	11.3	56.0
3.974000	42.8	Off	L1	19.6	13.2	56.0
4.462000	40.9	Off	L1	19.6	15.1	56.0

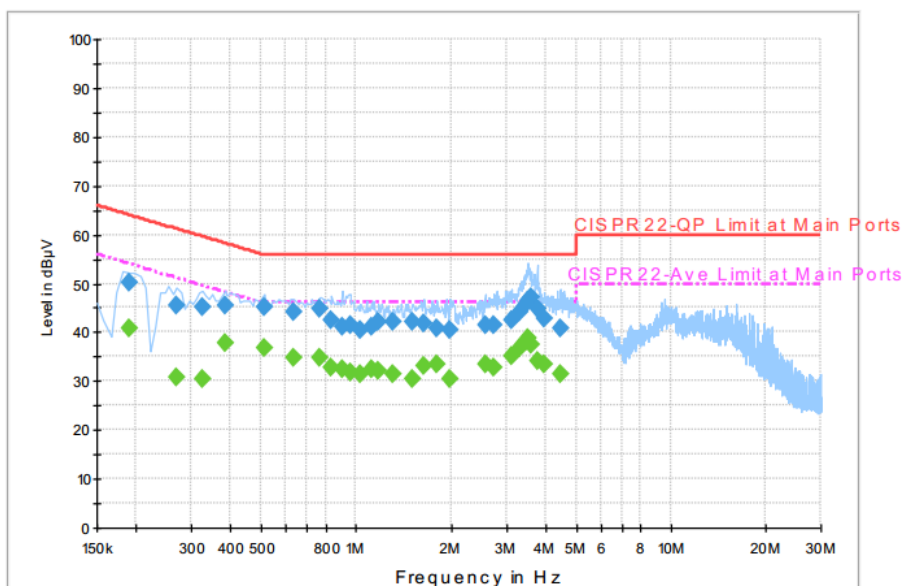


Test Mode :	Mode 1	Temperature :	21~23°C
Test Engineer :	Arthur Hsieh	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WCDMA Band V Idle + Bluetooth Link + WLAN (2.4GHz) Link + MPEG4 + Scanner + Snap-on 1 + RJ-45 Cable Link with Notebook + Adapter + SD Card for Sample 3		

**Final Result : Average**

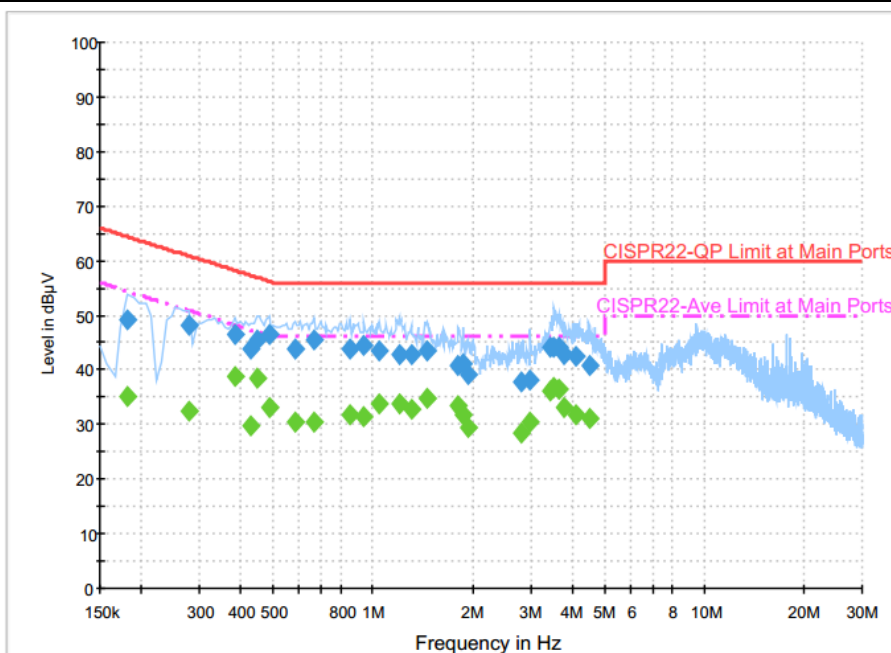
Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	40.7	Off	L1	19.6	13.3	54.0
0.270000	30.8	Off	L1	19.6	20.3	51.1
0.326000	30.5	Off	L1	19.6	19.1	49.6
0.382000	37.7	Off	L1	19.6	10.5	48.2
0.510000	36.7	Off	L1	19.6	9.3	46.0
0.630000	34.7	Off	L1	19.5	11.3	46.0
0.766000	34.9	Off	L1	19.6	11.1	46.0
0.838000	32.7	Off	L1	19.6	13.3	46.0
0.902000	32.4	Off	L1	19.6	13.6	46.0
0.958000	31.9	Off	L1	19.6	14.1	46.0
1.038000	31.3	Off	L1	19.6	14.7	46.0
1.118000	32.4	Off	L1	19.6	13.6	46.0
1.182000	32.0	Off	L1	19.6	14.0	46.0
1.310000	31.5	Off	L1	19.6	14.5	46.0
1.502000	30.4	Off	L1	19.6	15.6	46.0
1.646000	33.2	Off	L1	19.6	12.8	46.0

Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Arthur Hsieh	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WCDMA Band V Idle + Bluetooth Link + WLAN (2.4GHz) Link + MPEG4 + Scanner + Snap-on 1 + RJ-45 Cable Link with Notebook + Adapter + SD Card for Sample 3		


Final Result : Average

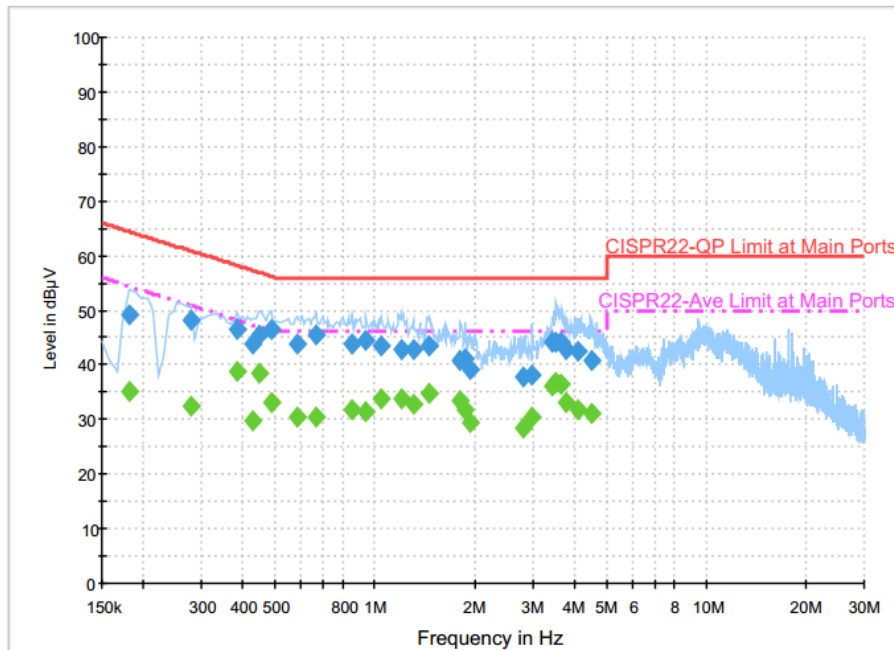
Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
1.814000	33.6	Off	L1	19.6	12.4	46.0
1.990000	30.6	Off	L1	19.6	15.4	46.0
2.574000	33.4	Off	L1	19.2	12.6	46.0
2.734000	32.8	Off	L1	19.3	13.2	46.0
3.134000	35.0	Off	L1	19.5	11.0	46.0
3.318000	36.7	Off	L1	19.5	9.3	46.0
3.478000	38.1	Off	L1	19.5	7.9	46.0
3.526000	38.6	Off	L1	19.5	7.4	46.0
3.614000	37.5	Off	L1	19.5	8.5	46.0
3.758000	34.1	Off	L1	19.6	11.9	46.0
3.974000	33.4	Off	L1	19.6	12.6	46.0
4.462000	31.5	Off	L1	19.6	14.5	46.0

Test Mode :	Mode 1	Temperature :	21~23°C
Test Engineer :	Arthur Hsieh	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WCDMA Band V Idle + Bluetooth Link + WLAN (2.4GHz) Link + MPEG4 + Scanner + Snap-on 1 + RJ-45 Cable Link with Notebook + Adapter + SD Card for Sample 3		


Final Result : Quasi-Peak

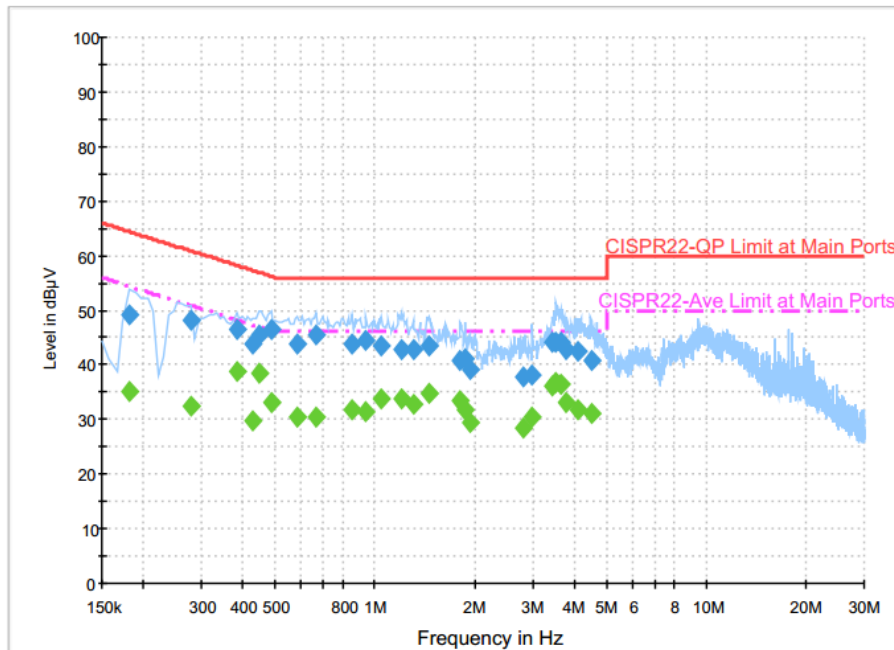
Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.182000	49.0	Off	N	19.5	15.4	64.4
0.278000	48.2	Off	N	19.5	12.7	60.9
0.382000	46.4	Off	N	19.5	11.8	58.2
0.430000	43.8	Off	N	19.5	13.5	57.3
0.446000	45.6	Off	N	19.5	11.3	56.9
0.486000	46.4	Off	N	19.6	9.8	56.2
0.582000	43.8	Off	N	19.5	12.2	56.0
0.662000	45.4	Off	N	19.5	10.6	56.0
0.854000	43.9	Off	N	19.5	12.1	56.0
0.942000	44.4	Off	N	19.5	11.6	56.0

Test Mode :	Mode 1	Temperature :	21~23°C
Test Engineer :	Arthur Hsieh	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WCDMA Band V Idle + Bluetooth Link + WLAN (2.4GHz) Link + MPEG4 + Scanner + Snap-on 1 + RJ-45 Cable Link with Notebook + Adapter + SD Card for Sample 3		


Final Result : Quasi-Peak

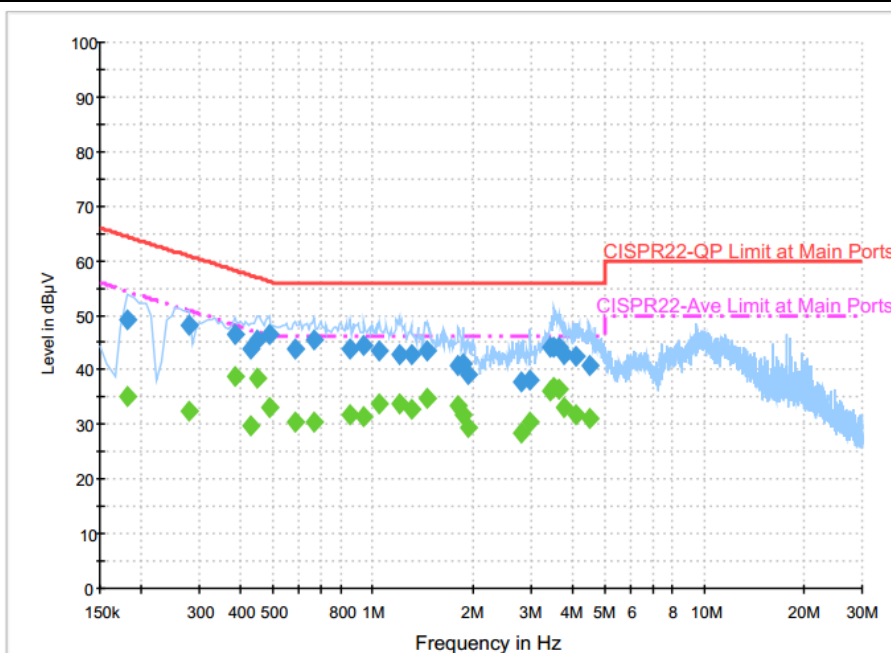
Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
1.046000	43.3	Off	N	19.6	12.7	56.0
1.198000	42.9	Off	N	19.6	13.1	56.0
1.302000	42.8	Off	N	19.6	13.2	56.0
1.454000	43.4	Off	N	19.6	12.6	56.0
1.814000	40.9	Off	N	19.6	15.1	56.0
1.870000	41.1	Off	N	19.6	14.9	56.0
1.950000	39.2	Off	N	19.6	16.8	56.0
2.814000	37.9	Off	N	19.4	18.1	56.0
2.990000	38.2	Off	N	19.4	17.8	56.0
3.454000	44.1	Off	N	19.5	11.9	56.0
3.534000	44.0	Off	N	19.5	12.0	56.0
3.630000	44.2	Off	N	19.5	11.8	56.0
3.782000	42.7	Off	N	19.6	13.3	56.0
4.102000	42.6	Off	N	19.6	13.4	56.0
4.518000	40.9	Off	N	19.6	15.1	56.0

Test Mode :	Mode 1	Temperature :	21~23°C
Test Engineer :	Arthur Hsieh	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WCDMA Band V Idle + Bluetooth Link + WLAN (2.4GHz) Link + MPEG4 + Scanner + Snap-on 1 + RJ-45 Cable Link with Notebook + Adapter + SD Card for Sample 3		


Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	35.0	Off	N	19.5	19.4	54.4
0.278000	32.6	Off	N	19.5	18.3	50.9
0.382000	38.9	Off	N	19.5	9.3	48.2
0.430000	29.7	Off	N	19.5	17.6	47.3
0.446000	38.4	Off	N	19.5	8.5	46.9
0.486000	33.2	Off	N	19.6	13.0	46.2
0.582000	30.5	Off	N	19.5	15.5	46.0
0.662000	30.6	Off	N	19.5	15.4	46.0
0.854000	31.8	Off	N	19.5	14.2	46.0
0.942000	31.3	Off	N	19.5	14.7	46.0

Test Mode :	Mode 1	Temperature :	21~23°C
Test Engineer :	Arthur Hsieh	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WCDMA Band V Idle + Bluetooth Link + WLAN (2.4GHz) Link + MPEG4 + Scanner + Snap-on 1 + RJ-45 Cable Link with Notebook + Adapter + SD Card for Sample 3		


Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
1.046000	33.9	Off	N	19.6	12.1	46.0
1.198000	33.6	Off	N	19.6	12.4	46.0
1.302000	32.7	Off	N	19.6	13.3	46.0
1.454000	34.9	Off	N	19.6	11.1	46.0
1.814000	33.3	Off	N	19.6	12.7	46.0
1.870000	31.9	Off	N	19.6	14.1	46.0
1.950000	29.3	Off	N	19.6	16.7	46.0
2.814000	28.4	Off	N	19.4	17.6	46.0
2.990000	30.4	Off	N	19.4	15.6	46.0
3.454000	36.0	Off	N	19.5	10.0	46.0
3.534000	36.9	Off	N	19.5	9.1	46.0
3.630000	36.5	Off	N	19.5	9.5	46.0
3.782000	33.2	Off	N	19.6	12.8	46.0
4.102000	31.9	Off	N	19.6	14.1	46.0
4.518000	31.0	Off	N	19.6	15.0	46.0



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 FCC 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	Jan. 13, 2017 ~ Jan. 14, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Dec. 26, 2016	Jan. 13, 2017 ~ Jan. 14, 2017	Dec. 25, 2017	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Jul. 17, 2016	Jan. 13, 2017 ~ Jan. 14, 2017	Jul. 16, 2017	Conducted (TH05-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Nov. 10, 2016	Jan. 17, 2017 ~ Feb. 02, 2017	Nov. 09, 2017	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Jan. 17, 2017 ~ Feb. 02, 2017	Sep. 01, 2017	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D	35414	30MHz~1GHz	Oct. 15, 2016	Jan. 17, 2017 ~ Feb. 02, 2017	Oct. 14, 2017	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1522	1GHz ~ 18GHz	Mar. 30, 2016	Jan. 17, 2017 ~ Feb. 02, 2017	Mar. 31, 2017	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270080	1GHz~26.5GHz	Nov. 10, 2016	Jan. 17, 2017 ~ Feb. 02, 2017	Nov. 09, 2017	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY52350276	10Hz ~ 44GHZ	Mar. 21, 2016	Jan. 17, 2017 ~ Feb. 02, 2017	Mar. 20, 2017	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Jan. 17, 2017 ~ Feb. 02, 2017	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Jan. 17, 2017 ~ Feb. 02, 2017	N/A	Radiation (03CH11-HY)
Preamplifier	MITEQ	TTA0204	1872107	2GHz~40GHz	Feb. 15, 2016	Jan. 17, 2017 ~ Feb. 02, 2017	Feb. 14, 2017	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 08, 2016	Jan. 17, 2017 ~ Feb. 02, 2017	Nov. 07, 2017	Radiation (03CH11-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jan. 17, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Jan. 17, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Jan. 17, 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% ($U = 2Uc(y)$)	5.2
--	-----

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.5
--	-----

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2
--	-----



Appendix A. Conducted Test Results

Bluetooth Low Energy

Test Engineer:	Aking Chang	Temperature:	21~25	°C
Test Date:	2017/01/13 ~ 2017/01/14	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	1.04	0.61	0.50	Pass
BLE	1Mbps	1	19	2440	1.04	0.62	0.50	Pass
BLE	1Mbps	1	39	2480	1.04	0.62	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	6.76	30.00	2.29	9.05	36.00	Pass
BLE	1Mbps	1	19	2440	6.72	30.00	2.29	9.01	36.00	Pass
BLE	1Mbps	1	39	2480	6.60	30.00	2.29	8.89	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	6.37	6.74
BLE	1Mbps	1	19	2440	6.37	6.69
BLE	1Mbps	1	39	2480	6.37	6.58

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	6.40	-5.56	2.29	8.00	Pass
BLE	1Mbps	1	19	2440	6.68	-5.33	2.29	8.00	Pass
BLE	1Mbps	1	39	2480	6.51	-5.66	2.29	8.00	Pass

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



Appendix B. Radiated Spurious Emission

Test Engineer :	Jacky Hung and Ken Wu	Temperature :	20~24°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.
				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		2373.84	54.25	-19.75	74	51.89	27.14	8.82	33.6	168	323	P	H
		2381.61	46.41	-7.59	54	43.98	27.14	8.89	33.6	168	323	A	H
	*	2402	95.83	-	-	93.34	27.19	8.89	33.59	168	323	P	H
	*	2402	95.41	-	-	92.92	27.19	8.89	33.59	168	323	A	H
													H
													H
		2330.055	54.27	-19.73	74	52.15	26.98	8.75	33.61	329	360	P	V
		2330.895	46.93	-7.07	54	44.81	26.98	8.75	33.61	329	360	A	V
	*	2402	98.65	-	-	96.16	27.19	8.89	33.59	329	360	P	V
	*	2402	98.37	-	-	95.88	27.19	8.89	33.59	329	360	A	V
													V
													V
BLE CH 19 2440MHz		2333.94	54.36	-19.64	74	52.24	26.98	8.75	33.61	161	329	P	H
		2382.8	46.66	-7.34	54	44.23	27.14	8.89	33.6	161	329	A	H
	*	2440	98.83	-	-	96.14	27.34	8.94	33.59	161	329	P	H
	*	2440	98.45	-	-	95.76	27.34	8.94	33.59	161	329	A	H
		2495.66	54.92	-19.08	74	52.01	27.5	8.98	33.57	161	329	P	H
		2491.11	47.04	-6.96	54	44.14	27.5	8.98	33.58	161	329	A	H
		2364.46	53.95	-20.05	74	51.64	27.09	8.82	33.6	321	359	P	V
		2329.18	46.51	-7.49	54	44.39	26.98	8.75	33.61	321	359	A	V
	*	2440	100.05	-	-	97.36	27.34	8.94	33.59	321	359	P	V
	*	2440	99.71	-	-	97.02	27.34	8.94	33.59	321	359	A	V
		2488.87	54.65	-19.35	74	51.75	27.5	8.98	33.58	321	359	P	V
		2488.59	46.88	-7.12	54	43.98	27.5	8.98	33.58	321	359	A	V



BLE CH 39 2480MHz		2358.58	54.03	-19.97	74	51.72	27.09	8.82	33.6	152	328	P	H
		2386.44	47.82	-6.18	54	45.34	27.19	8.89	33.6	152	328	A	H
	*	2480	98.06	-	-	95.21	27.45	8.98	33.58	152	328	P	H
	*	2480	97.77	-	-	94.92	27.45	8.98	33.58	152	328	A	H
		2490.69	54.26	-19.74	74	51.36	27.5	8.98	33.58	152	328	P	H
		2496.5	46.86	-7.14	54	43.95	27.5	8.98	33.57	152	328	A	H
		2361.38	54.94	-19.06	74	52.63	27.09	8.82	33.6	306	359	P	V
		2386.02	47.67	-6.33	54	45.19	27.19	8.89	33.6	306	359	A	V
	*	2480	99.28	-	-	96.43	27.45	8.98	33.58	306	359	P	V
	*	2480	98.82	-	-	95.97	27.45	8.98	33.58	306	359	A	V
		2485.3	54.41	-19.59	74	51.56	27.45	8.98	33.58	306	359	P	V
		2498.11	47.13	-6.87	54	44.22	27.5	8.98	33.57	306	359	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	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	34.27	-39.73	74	43.05	31.66	10.65	51.09	100	0	P	H
													H
													H
													H
		4804	37.05	-36.95	74	45.83	31.66	10.65	51.09	100	0	P	V
													V
													V
													V
BLE CH 19 2440MHz		4880	35.37	-38.63	74	43.77	31.78	10.88	51.06	100	0	P	H
		7320	37.9	-36.1	74	38.33	37.29	12.79	50.51	100	0	P	H
													H
													H
		4880	37.42	-36.58	74	45.82	31.78	10.88	51.06	100	0	P	V
		7320	38.8	-35.2	74	39.23	37.29	12.79	50.51	100	0	P	V
													V
													V
BLE CH 39 2480MHz		4960	34.31	-39.69	74	42.28	31.94	11.12	51.03	100	0	P	H
		7440	37.88	-36.12	74	38.07	37.44	12.88	50.51	100	0	P	H
													H
													H
		4960	36.08	-37.92	74	44.05	31.94	11.12	51.03	100	0	P	V
		7440	37.77	-36.23	74	37.96	37.44	12.88	50.51	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		67.26	25.05	-14.95	40	43.78	12.25	1.51	32.49	-	-	P	H
		246.54	28.99	-17.01	46	40.96	18.34	2.34	32.65	-	-	P	H
		269.49	28.41	-17.59	46	39.06	19.3	2.58	32.53	-	-	P	H
		481.3	28.26	-17.74	46	33.56	23.79	3.28	32.37	-	-	P	H
		622.7	30.85	-15.15	46	33.58	25.93	3.8	32.46	-	-	P	H
		958	33.36	-12.64	46	29.22	30.58	4.69	31.13	100	35	P	H
													H
													H
													H
													H
													H
													H
													H
		46.74	26.55	-13.45	40	41.12	16.63	1.29	32.49	-	-	P	V
		63.48	29.07	-10.93	40	47.95	12.1	1.51	32.49	100	58	P	V
		77.25	28.39	-11.61	40	46.01	13.35	1.51	32.48	-	-	P	V
		538.7	27.99	-18.01	46	32.38	24.64	3.38	32.41	-	-	P	V
		804.7	31.18	-14.82	46	30.71	28.36	4.26	32.15	-	-	P	V
		944.7	32.95	-13.05	46	29.05	30.46	4.69	31.25	-	-	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

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 C. Radiated Spurious Emission Plots

Test Engineer :	Jacky Hung and Ken Wu	Temperature :	20~24°C
		Relative Humidity :	50~54%

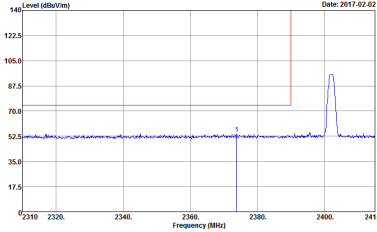
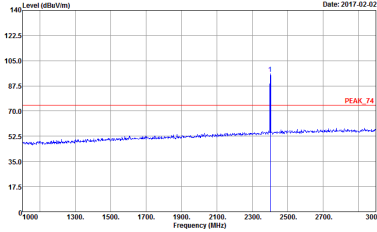
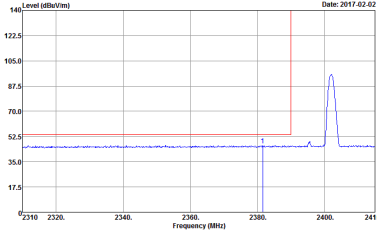
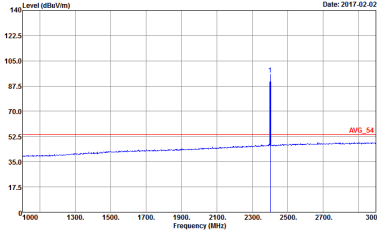
Note symbol

-L	Low channel location
-R	High channel location



2.4GHz 2400~2483.5MHz

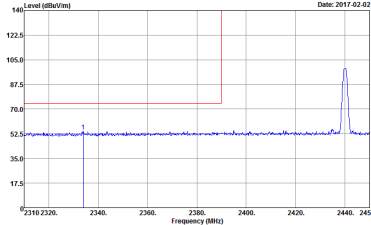
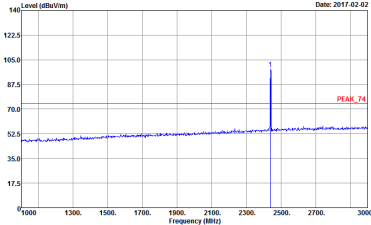
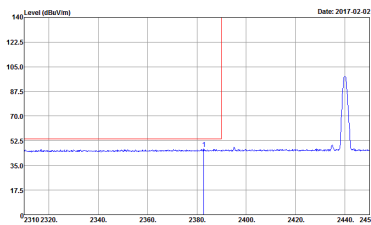
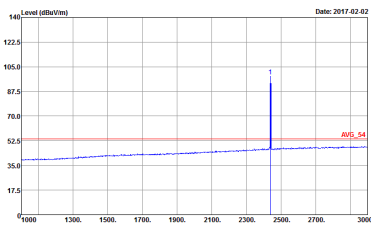
BLE (Band Edge @ 3m)

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Horizontal	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 6D2819	 Site : 03CH11-HY Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 6D2819
Avg.	 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : 6D2819	 Site : 03CH11-HY Condition : AVG_54 3m HORN 9120D-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : 6D2819

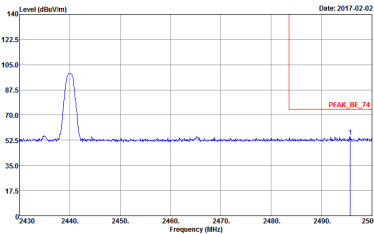
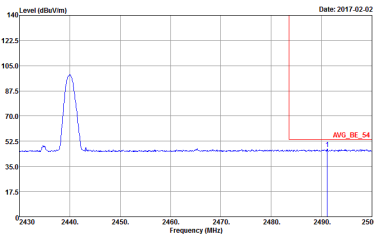


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH00 2402MHz	
1	Vertical	Fundamental
Peak	Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak 6D2819	Site : 03CH11-HY Condition : PEAK_74 3m HORN 9120D-HF VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak 6D2819
	Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 9120D-HF VERTICAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak 6D2819	Site : 03CH11-HY Condition : AVG_54 3m HORN 9120D-HF VERTICAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak 6D2819

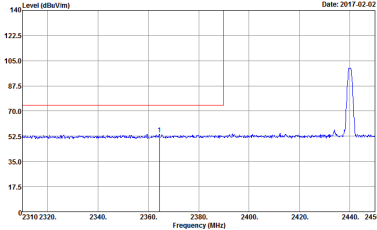
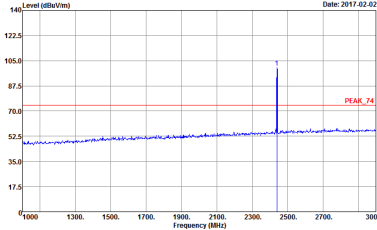
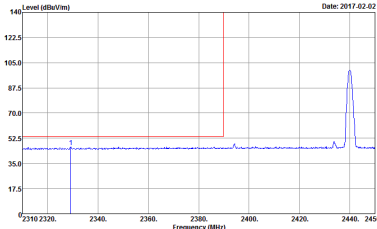
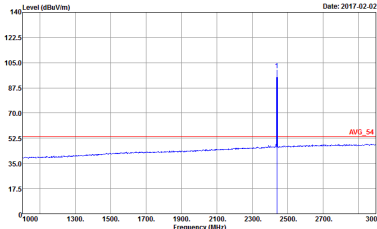


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
1	Horizontal	Fundamental
Peak	 Level (dBm/100Hz) vs Frequency (MHz) plot for Peak Horizontal. The plot shows a sharp peak at 2440 MHz. The y-axis ranges from 0 to 140 dBm/100Hz, and the x-axis ranges from 2310 to 2450 MHz. A red line indicates the noise floor at approximately 70 dBm/100Hz. Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 602819	 Level (dBm/100Hz) vs Frequency (MHz) plot for Peak Fundamental. The plot shows a sharp peak at 2440 MHz. The y-axis ranges from 0 to 140 dBm/100Hz, and the x-axis ranges from 1000 to 3000 MHz. A red line indicates the noise floor at approximately 70 dBm/100Hz. Site : 03CH11-HY Condition : PEAK_74 3m HORN 91200-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : 602819
Avg.	 Level (dBm/100Hz) vs Frequency (MHz) plot for Avg Horizontal. The plot shows a sharp peak at 2440 MHz. The y-axis ranges from 0 to 140 dBm/100Hz, and the x-axis ranges from 2310 to 2450 MHz. A red line indicates the noise floor at approximately 70 dBm/100Hz. Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 91200-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : 602819	 Level (dBm/100Hz) vs Frequency (MHz) plot for Avg Fundamental. The plot shows a sharp peak at 2440 MHz. The y-axis ranges from 0 to 140 dBm/100Hz, and the x-axis ranges from 1000 to 3000 MHz. A red line indicates the noise floor at approximately 70 dBm/100Hz. Site : 03CH11-HY Condition : AVG_54 3m HORN 91200-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : 602819

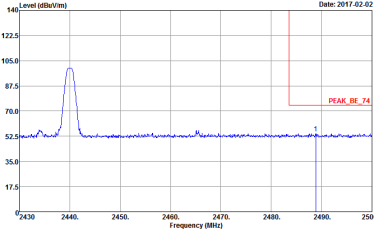
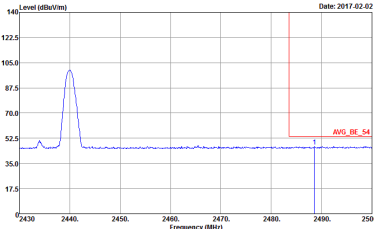


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Horizontal	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6D2819	Left blank
Avg.	 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 91200-HF HORIZONTAL RBW:1000.000KHz VBW:10.000KHz SWT:Auto Detector : Peak Project : 6D2819	Left blank



BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - L	
1	Vertical	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak 6D2819	 Site : 03CH11-HY Condition : PEAK_74 3m HORN 9120D-HF VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak 6D2819
Avg.	 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 9120D-HF VERTICAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak 6D2819	 Site : 03CH11-HY Condition : AVG_54 3m HORN 9120D-HF VERTICAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak 6D2819

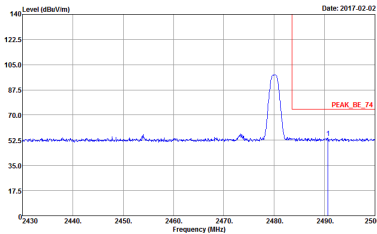
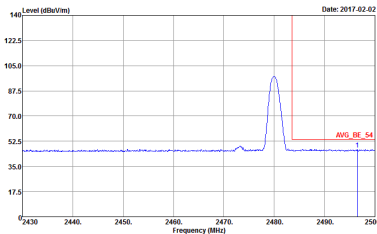


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH19 2440MHz - R	
1	Vertical	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6D2819	Left blank
Avg.	 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:10.000KHz SWT:Auto Detector : Peak Project : 6D2819	Left blank

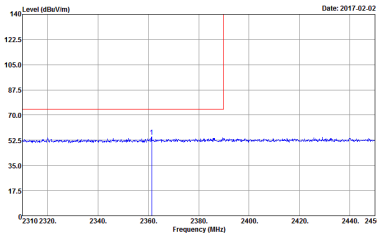
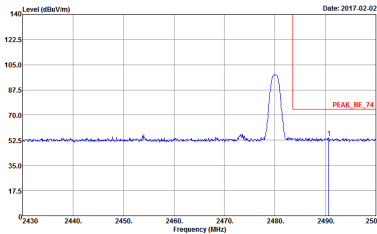
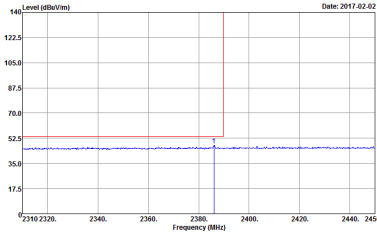
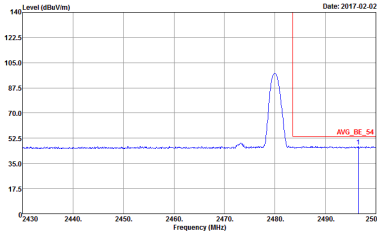


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz - L	
1	Horizontal	Fundamental
Peak	Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak 6D2819	Site : 03CH11-HY Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak 6D2819
Avg.	Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak 6D2819	Site : 03CH11-HY Condition : AVG_54 3m HORN 9120D-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak 6D2819

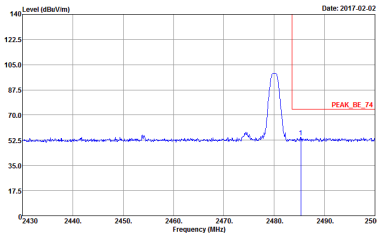
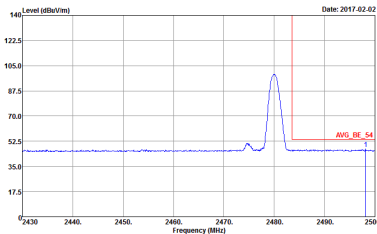


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz - L	
1	Horizontal	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-HF HORIZONTAL Detector : Peak Project : 6D2819	Left blank
Avg.	 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 91200-HF HORIZONTAL Detector : Peak Project : 6D2819	Left blank

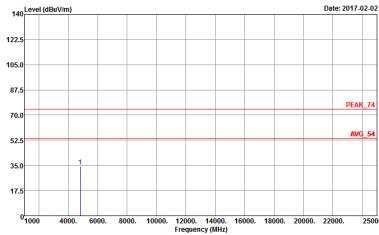
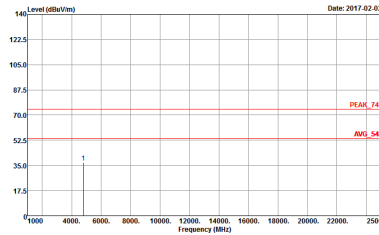


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz - R	
1	Vertical	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak 6D2819	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Project : Peak 6D2819
Avg.	 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 9120D-HF VERTICAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak 6D2819	 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto Project : Peak 6D2819

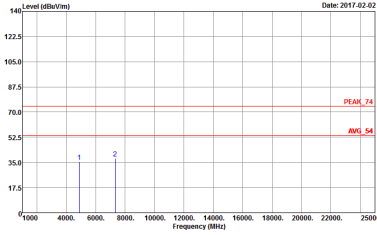
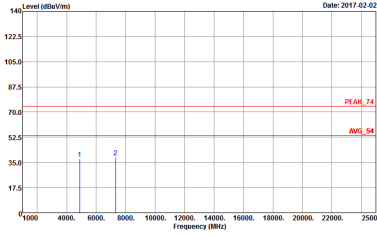


BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	BLE CH39 2480MHz - R	
1	Vertical	Fundamental
Peak	 Site : 03CH11-HY Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 6D2819	Left blank
Avg.	 Site : 03CH11-HY Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL RBW:1000.000KHz VBW:10.000KHz SWT:Auto Detector : Peak Project : 6D2819	Left blank

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 : 03CH11-HY Condition : PEAK_74 3m 9170 SHF HORM_150809 HORIZONTAL Project : 6D2819	 Site : 03CH11-HY Condition : PEAK_74 3m 9170 SHF HORM_150809 VERTICAL Project : 6D2819

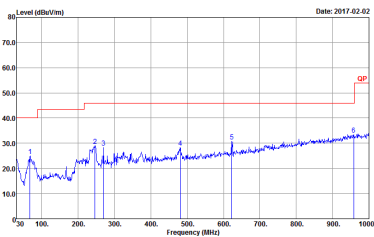
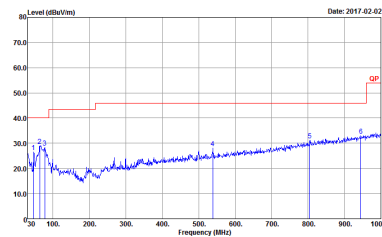


BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH19 2440MHz	
1	Horizontal	Vertical
Peak Avg.	 Site : 03CH11-19Y Condition : PEAK_74 3m 9170 SHF HORM_150809 HORIZONTAL Project : 6D2819	 Site : 03CH11-19Y Condition : PEAK_74 3m 9170 SHF HORM_150809 VERTICAL Project : 6D2819



BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	BLE CH39 2480MHz	
1	Horizontal	Vertical
Peak	Site : 03CH11-19Y Condition : PEAK_74 3m 9170 SHF HORM_150809 HORIZONTAL Project : 6D2819	Site : 03CH11-19Y Condition : PEAK_74 3m 9170 SHF HORM_150809 VERTICAL Project : 6D2819

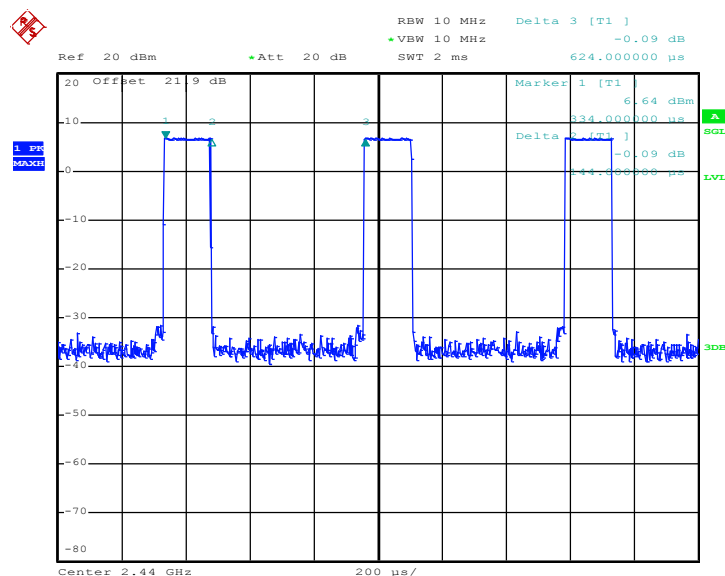
Emission below 1GHz
2.4GHz BLE (LF)

BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE LF	
1	Horizontal	Vertical
QP / Peak	 Site : 03CH11-HY Condition : QP 3m BE-LOG 6111D-LF_ETC HORIZONTAL Project : 6D2819	 Site : 03CH11-HY Condition : QP 3m BE-LOG 6111D-LF_ETC VERTICAL Project : 6D2819

Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth -LE	23.08	144.00	6.944	10kHz

Bluetooth - LE



Date: 13.JAN.2017 13:01:15