FCC/IC RF Test Report

APPLICANT	**:**	**Qualcomm Atheros, Inc.**
EQUIPMENT	**:**	**1X1 802.11b/g/n – BT4.0 Combo PCIe minicard**
BRAND NAME	**:**	**Qualcomm Atheros**
MODEL NAME	**:**	**QCWB335**
FCC ID	**:**	**PPD-QCWB335**
IC	**:**	**4104A-QCWB335**
STANDARD	**:**	**FCC Part 15 Subpart C §15.247**
		IC RSS-210 Issue 8

The WiFi + Bluetooth module was tested on extended card inserted to a host laptop PC. The product was received on Apr. 03, 2012 and completely tested on May 14, 2012. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the 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:

Jones Tsai

Jones Tsai / Manager

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR240322A	Rev. 01	Initial issue of report	May 18, 2012
FR240322A	Rev. 02	Update report of revising antenna information, conducted power, number of channel, conducted hopping mode band edges, and radiated emission, and removing Bluetooth and WLAN Co-location Measurement.	May 25, 2012

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	A8.4(2)	Number of Channels	≥ 15Chs	Pass	-
3.2	15.247(a)(1)	A8.1(a)	20dB Bandwidth	NA	Pass	-
3.2	-	Gen 4.6.1	99% Bandwidth	-	Pass	-
3.3	15.247(a)(1)	A8.1(b)	Channel Separation	≥ 2/3 of 20dB BW	Pass	-
3.4	15.247(a)(1)	A8.1(d)	Dwell Time of Each Channel	≤ 0.4sec in 31.6sec period	Pass	-
3.5	15.247(b)(1)	A8.1(b)	Peak Output Power	≤ 125 mW	Pass	-
3.6	15.247(d)	A8.5	Frequency Band Edges	≤ 20dBc	Pass	-
3.6.7	15.247(d)	A8.5	Spurious Emission	< 20 dBc	Pass	-
3.8	15.207	Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 15.30 dB at 7.806 MHz
3.10	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.02 dB at 2483.500 MHz
3.11	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Qualcomm Atheros, Inc.
1700 Technology Drive, San Jose, CA95110

1.2 Manufacturer

Qualcomm Atheros, Inc.
1700 Technology Drive, San Jose, CA95110

1.3 Testing Site Facilities

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978		
Test Site No.	**Sporton Site No.**		**FCC/IC Registration No.**
	CO05-HY	03CH05-HY	722060/4086B-1

1.4 Applied 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 DR01
- KDB 453039 Bluetooth device DTS filing
- FCC Public Notice DA 00-705
- ANSI C63.4-2003
- IC RSS-210 Issue 8
- IC RSS-Gen Issue 3

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.

1.5 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY70DA2029	N/A	N/A
3.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
4.	Notebook	DELL	Studio	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	LCD Monitor	Lenovo	6135-AB1	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m

2 Test Configuration of Equipment Under Test

2.1 General Information of EUT

Product Feature & Specification	
Equipment	1X1 802.11b/g/n – BT4.0 Combo PCIe minicard
Brand Name	Qualcomm Atheros
Model Name	QCWB335
FCC ID	PPD-QCWB335
IC	4104A-QCWB335
Tx/Rx Frequency Range	2400 MHz ~ 2483.5 MHz
Number of Channels	79 for Bluetooth 40 for Bluetooth 4.0
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78 for Bluetooth 2.1+EDR 40 Channel(37 hopping + 3 advertising channel) for Bluetooth 4.0
Channel Spacing	1 MHz for Bluetooth 2 MHz for Bluetooth 4.0
Maximum Output Power to Antenna	**Antenna port 0** **<Low Energy Bluetooth>** Bluetooth : 8.37 dBm (0.0069 W) **<Standard Bluetooth >** Bluetooth (1Mbps) : 6.02 dBm (0.0040 W) Bluetooth EDR (2Mbps) : 8.52 dBm (0.0071 W) Bluetooth EDR (3Mbps) : 9.09 dBm (0.0081 W) **Antenna port 1** **<Low Energy Bluetooth>** Bluetooth : 8.49 dBm (0.0071 W) **<Standard Bluetooth >** Bluetooth (1Mbps) : 8.82 dBm (0.0076 W) Bluetooth EDR (2Mbps) : 11.24 dBm (0.0133 W) Bluetooth EDR (3Mbps) : 11.85 dBm (0.0153 W)
Antenna Type	Antenna 1 : PIFA Antenna with gain 3.62 dBi Antenna 2: Dipole Antenna with gain 3.20 dBi
Type of Modulation	**<Low Energy Bluetooth>** Bluetooth 4.0 : GFSK **<Standard Bluetooth>** Bluetooth (1Mbps) : GFSK Bluetooth 2.1 EDR (2Mbps) : π/4-DQPSK Bluetooth 2.1 EDR (3Mbps) : 8-DPSK Bluetooth 3.0 EDR (1Mbps) : GFSK, π/4-DQPSK, 8-DPSK
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.

2.2 RF Output Power

2.2.1 Peak Power

<For Antenna port 0>

<Low Energy Bluetooth>

The device has the maximum peak power as below:

Channel	Frequency	Bluetooth RF Output Power
		Data Rate / Modulation
		GFSK
		1Mbps
Ch00	2402MHz	6.65 dBm
Ch19	2440MHz	**8.37 dBm**
Ch39	2480MHz	7.93 dBm

<Standard Bluetooth>

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	4.34 dBm	6.82 dBm	7.38 dBm
Ch39	2441MHz	6.02 dBm	8.52 dBm	**9.09 dBm**
Ch78	2480MHz	5.53 dBm	8.00 dBm	8.52 dBm

<For Antenna port 1>

<Low Energy Bluetooth>

The device has the maximum peak power as below:

Channel	Frequency	Bluetooth RF Output Power
		Data Rate / Modulation
		GFSK
		1Mbps
Ch00	2402MHz	7.92 dBm
Ch19	2440MHz	**8.49 dBm**
Ch39	2480MHz	8.19 dBm

<Standard Bluetooth>

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	8.32 dBm	10.72 dBm	11.25 dBm
Ch39	2441MHz	8.82 dBm	11.24 dBm	**11.85 dBm**
Ch78	2480MHz	8.51 dBm	10.96 dBm	11.48 dBm

2.2.2 Average Power

<For Antenna port 0>

<Low Energy Bluetooth>

The device has the maximum average power as below:

Channel	Frequency	Bluetooth RF Output Power
		Data Rate / Modulation
		GFSK
		1Mbps
Ch00	2402MHz	7.42 dBm
Ch19	2440MHz	7.86 dBm
Ch39	2480MHz	8.40 dBm

<Standard Bluetooth>

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	4.83 dBm	5.00 dBm	5.06 dBm
Ch39	2441MHz	5.23 dBm	5.39 dBm	5.38 dBm
Ch78	2480MHz	5.89 dBm	6.01 dBm	6.07 dBm

<For Antenna port 1>

<Low Energy Bluetooth>

The device has the maximum average power as below:

Channel	Frequency	Bluetooth RF Output Power
		Data Rate / Modulation
		GFSK
		1Mbps
Ch00	2402MHz	8.11 dBm
Ch19	2440MHz	8.21 dBm
Ch39	2480MHz	8.43 dBm

<Standard Bluetooth>

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	8.28 dBm	8.37 dBm	8.39 dBm
Ch39	2441MHz	8.39 dBm	8.55 dBm	8.51 dBm
Ch78	2480MHz	8.55 dBm	8.78 dBm	8.77 dBm

2.3 Antenna Information

Brand / Model Name	Type	Frequency Range (MHz)	Antenna Gain (dBi)
Wistron Neweb Corporation / EBJ Aux	PIFA	2400 ~ 2483.5	3.62
INPAQ / DAMA1BM30000402	Dipole	2400 ~ 2483.5	3.20

	Antenna port 0	Antenna port 1
Single antenna	WLAN/BT timely coexistence	RX diversity or terminated
Dual antenna	WLAN TX/RX	Bluetooth TX/RX

2.4 Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 KHz to 30 MHz), radiated emission (30 MHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

For radiated: The EUT's antenna was pre-tested under the following modes:

Test Mode	Description
Mode A	X-Y axis
Mode B	**Y-Z axis**
Mode C	X-Z axis

From the above modes, the worst case was found in Mode B. Therefore only the test data of the mode was recorded in this report.

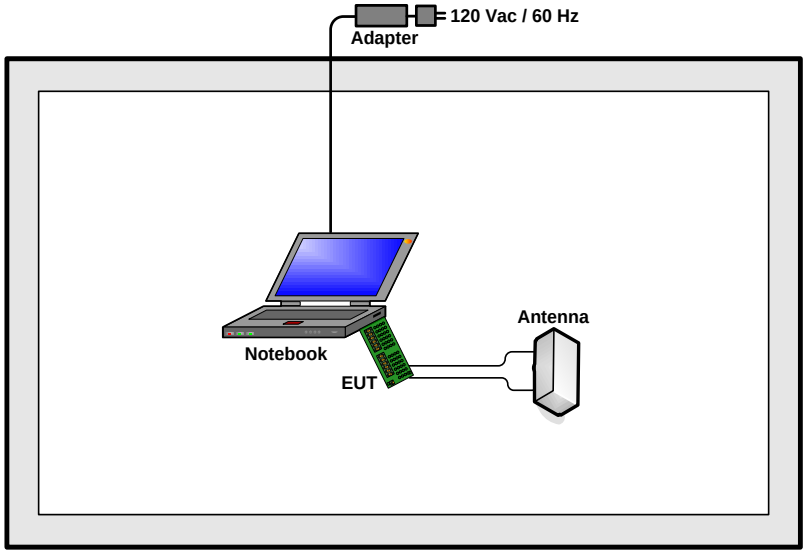
The details of test channels and bandwidth for RF conductive measurement and Radiated Spurious Emissions are listed next tables.

Ant.	Antenna type	Gain (dBi)	Power	Conducted	Radiated Spurious Emissions	
					RE<1G	RE≥1G
1	**PIFA**	3.62	✓	✓	✓	✓
2	**Dipole**	3.20	✓		✓	✓

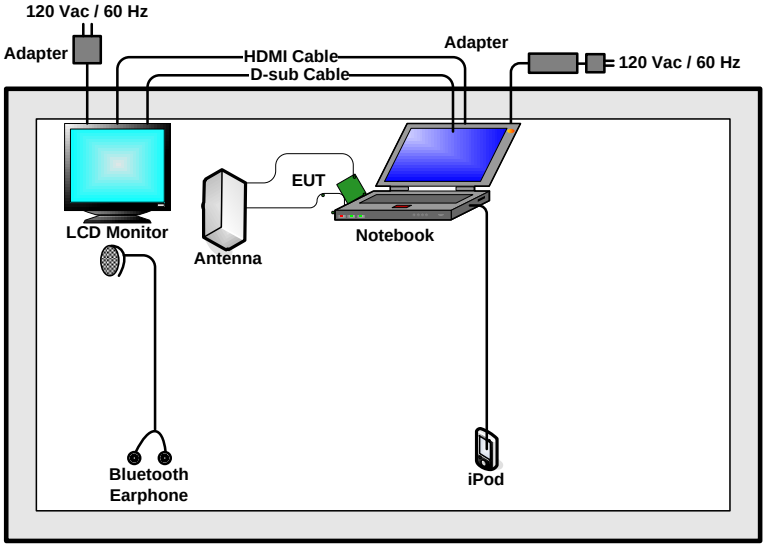
Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth 4.0 / GFSK Bluetooth 1Mbps / GFSK Bluetooth EDR 2Mbps / π /4-DQPSK Bluetooth EDR 3Mbps / 8-DPSK
Conducted TCs	**<Low Energy Bluetooth>** Mode 1: Bluetooth LE Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth LE Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth LE Tx CH39_2480 MHz_1Mbps **<Standard Bluetooth>** Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH39_2441 MHz_1Mbps Mode 3: Bluetooth Tx CH78_2480 MHz_1Mbps Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps Mode 5: Bluetooth Tx CH39_2441 MHz_2Mbps Mode 6: Bluetooth Tx CH78_2480 MHz_2Mbps Mode 7: Bluetooth Tx CH00_2402 MHz_3Mbps Mode 8: Bluetooth Tx CH39_2441 MHz_3Mbps Mode 9: Bluetooth Tx CH78_2480 MHz_3Mbps
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_3Mbps for PIFA Antenna port 1 Mode 2: Bluetooth Tx CH39_2441 MHz_3Mbps for PIFA Antenna port 1 Mode 3: Bluetooth Tx CH78_2480 MHz_3Mbps for PIFA Antenna port 1 Mode 4: Bluetooth Tx CH78_2480 MHz_3Mbps for PIFA Antenna port 0 Mode 5: Bluetooth Tx CH00_2402 MHz_3Mbps for Dipole Antenna port 1 Mode 6: Bluetooth Tx CH39_2441 MHz_3Mbps for Dipole Antenna port 1 Mode 7: Bluetooth Tx CH78_2480 MHz_3Mbps for Dipole Antenna port 1 Mode 8: Bluetooth Tx CH78_2480 MHz_3Mbps for Dipole Antenna port 0
AC Conducted Emission	Mode 1 :WLAN (2.4G) Link + Bluetooth Link for Antenna 1
Remark: For radiated TCs, the data rate was set in 3Mbps for Antenna 1 due to the highest RF output power; only the data of these modes was reported.	

2.5 Connection Diagram of Test System

<Bluetooth Tx Mode>



<AC Conducted Emission Mode>



2.6 RF Utility

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

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

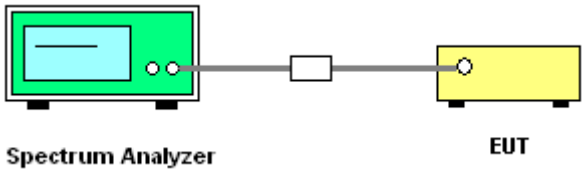
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. The modulation types of EUT are irrelevant to number of hopping channels deviation.
4. The EUT must have its hopping function enabled. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW ≥ 1% of the span; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
5. The number of hopping frequency used is defined as the device has the numbers of total channel.

3.1.4 Test Setup



3.1.5 Test Result of Number of Hopping Frequency

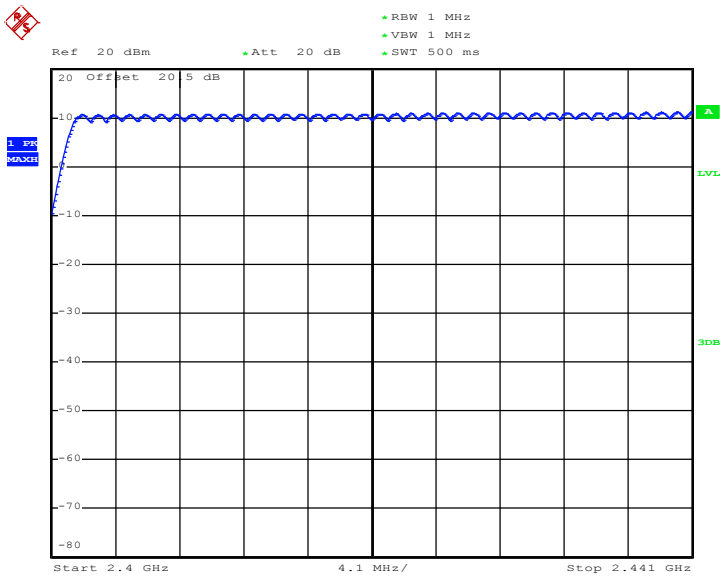
<Standard Bluetooth>

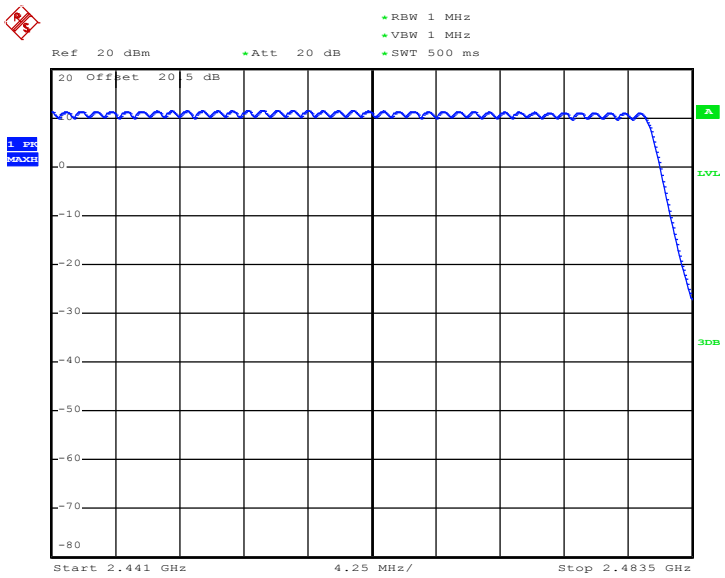
Test Mode :	Bluetooth EDR 3Mbps 8-DPSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

Number of Hopping Channels (Channel)	Adaptive Frequency Hopping Limits (Channel)	Limits (Channel)	Pass/Fail
79	> 20	> 15	Pass

Remark: During AFH mode, the minimum number of hopping channels is 20. The requirement of minimum of 15 channels is met.

Number of Hopping Channel Plot on Channel 00 - 78





Date: 14.MAY.2012 21:04:52

3.2 20dB and 99% Bandwidth Measurement

3.2.1 Limit of 20dB Bandwidth

N/A

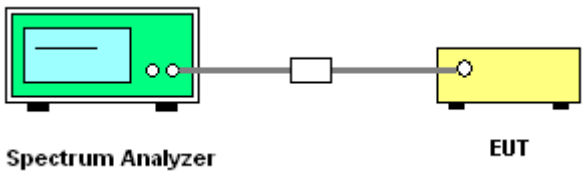
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. The EUT should be transmitting at its maximum data rate as the worst cases.
4. Use the following spectrum analyzer settings:
   Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel;
   RBW ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
5. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

3.2.4 Test Setup



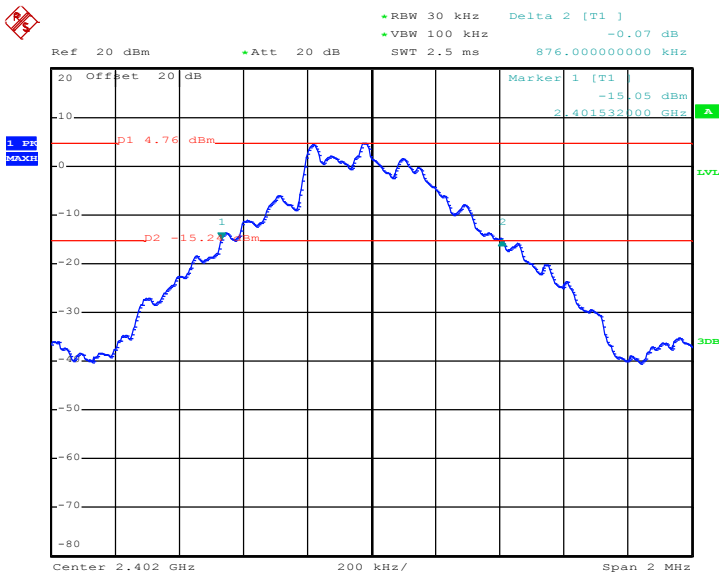
3.2.5 Test Result of 20dB Bandwidth

<Standard Bluetooth>

Test Mode :	Bluetooth 1Mbps GFSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

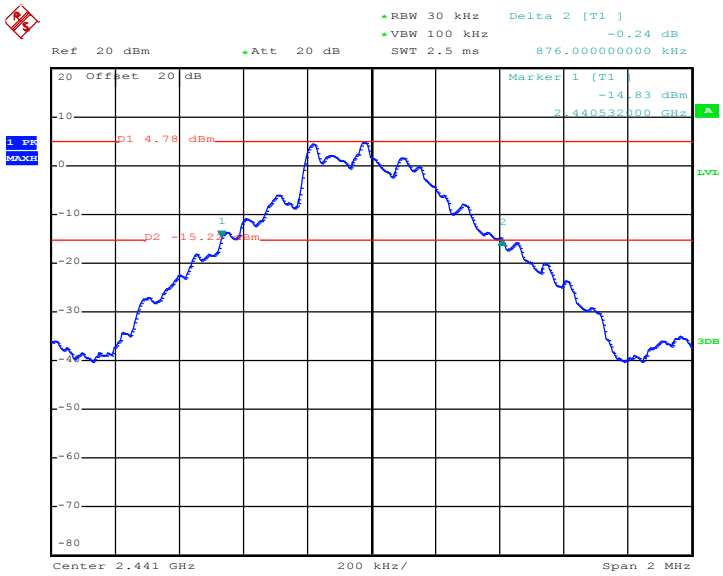
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.876
39	2441	0.876
78	2480	0.878

20 dB Bandwidth Plot on Channel 00



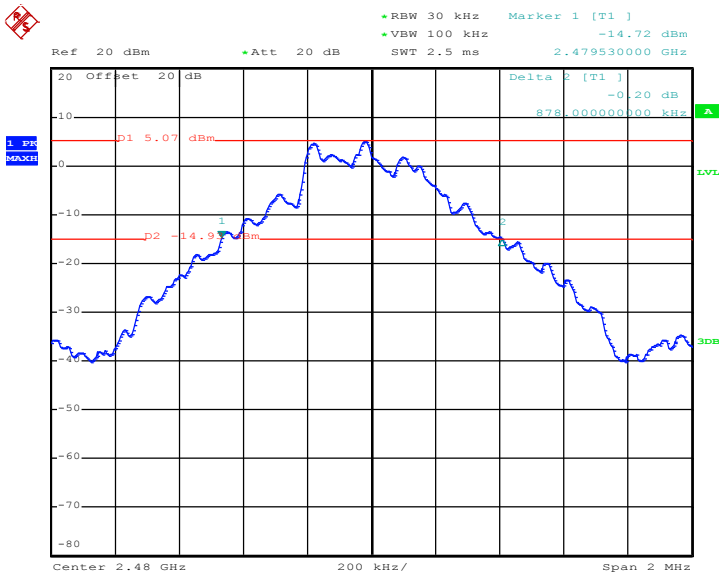
Date: 23.MAY.2012 19:04:56

20 dB Bandwidth Plot on Channel 39



Date: 23.MAY.2012 19:03:46

20 dB Bandwidth Plot on Channel 78

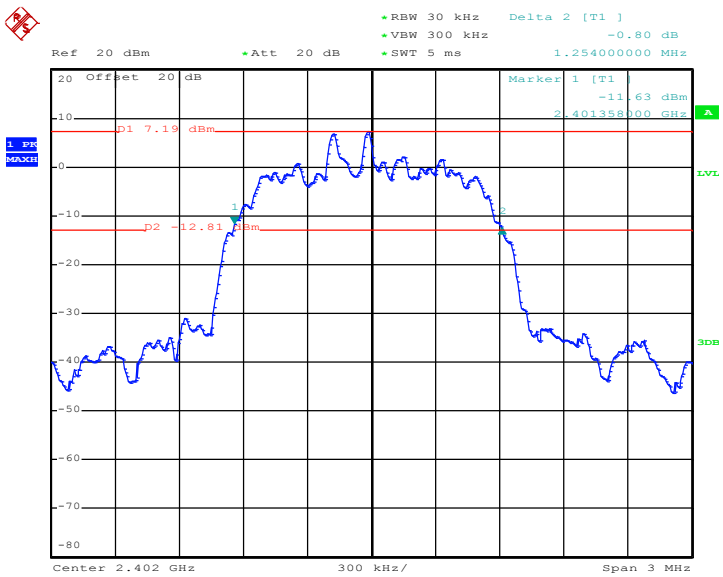


Date: 23.MAY.2012 19:02:52

Test Mode :	Bluetooth EDR 2Mbps π/4-DQPSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

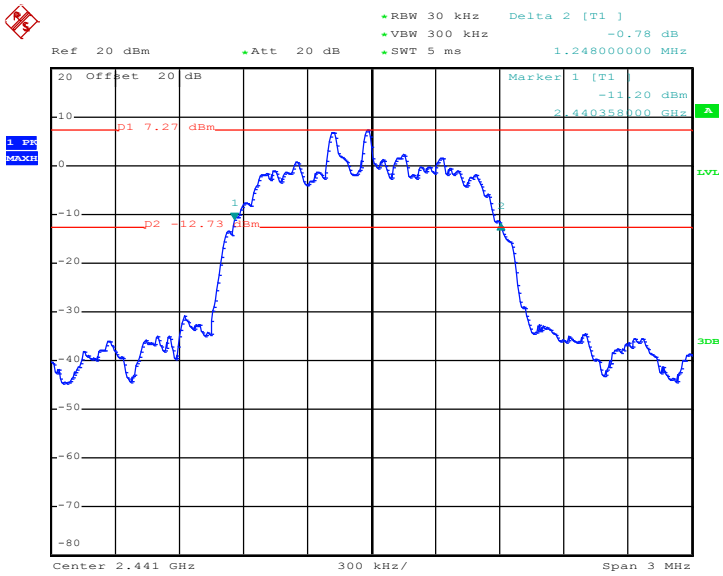
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.254
39	2441	1.248
78	2480	1.260

20 dB Bandwidth Plot on Channel 00



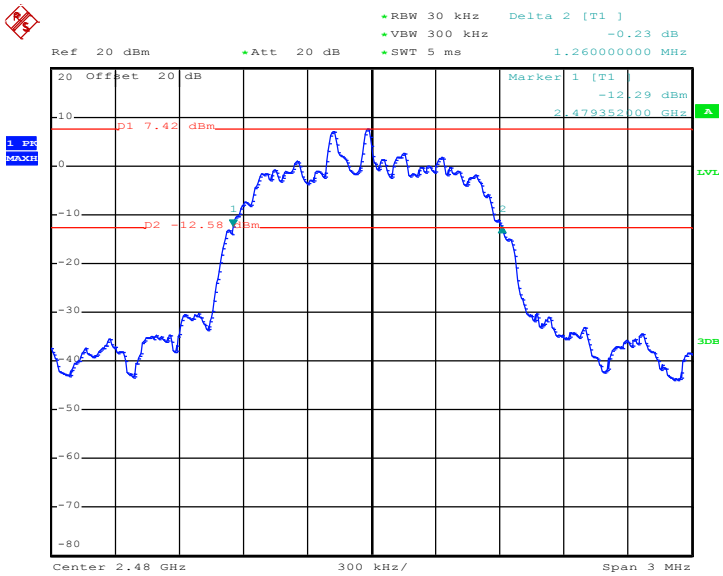
Date: 23.MAY.2012 18:29:11

20 dB Bandwidth Plot on Channel 39



Date: 23.MAY.2012 18:28:14

20 dB Bandwidth Plot on Channel 78

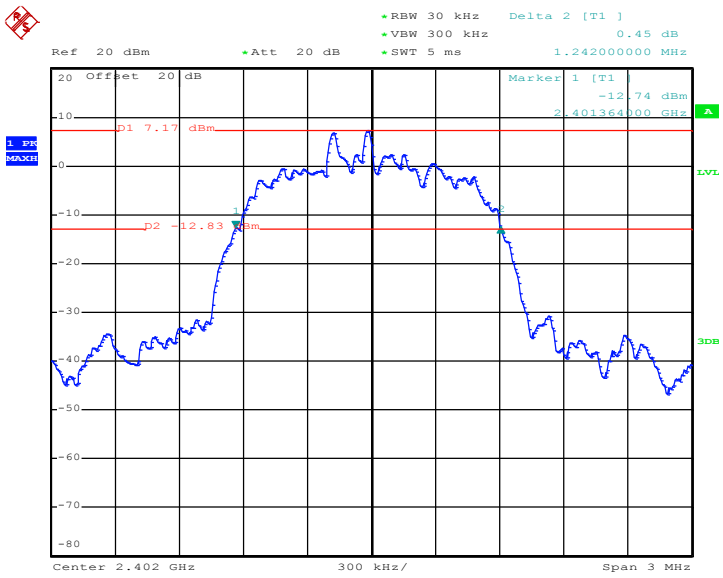


Date: 23.MAY.2012 18:27:26

Test Mode :	Bluetooth EDR 3Mbps 8-DPSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

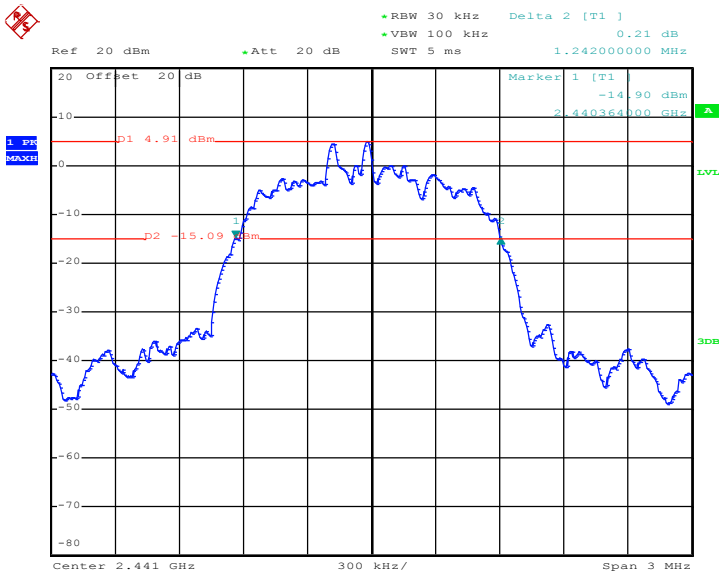
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.242
39	2441	1.242
78	2480	1.248

20 dB Bandwidth Plot on Channel 00



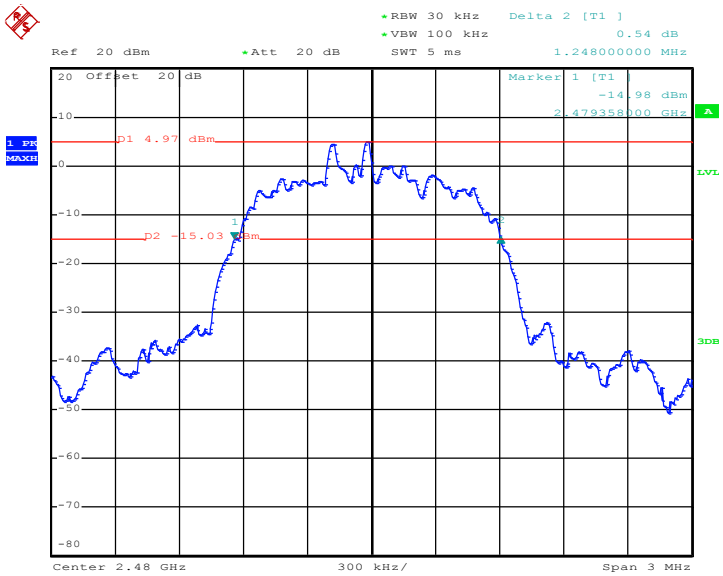
Date: 23.MAY.2012 18:18:50

20 dB Bandwidth Plot on Channel 39



Date: 23.MAY.2012 18:50:13

20 dB Bandwidth Plot on Channel 78



Date: 23.MAY.2012 18:51:15

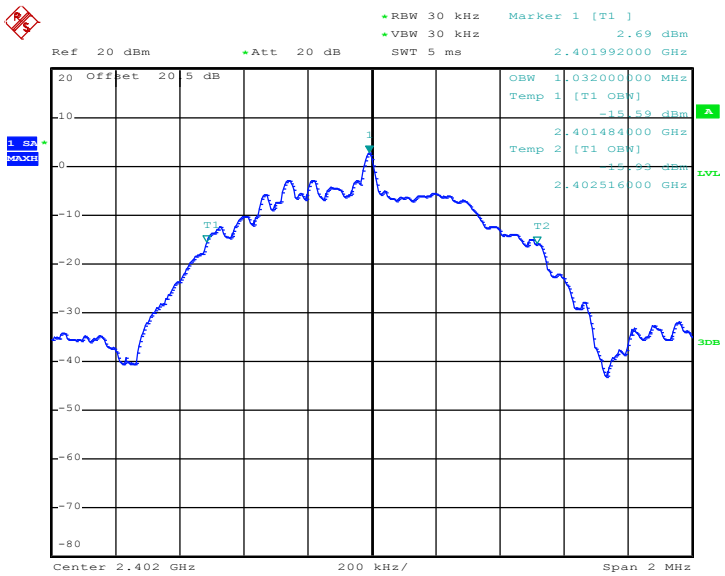
3.2.6 Test Result of 99% Occupied Bandwidth

<Low Energy Bluetooth>

Test Mode :	Bluetooth LE 1Mbps GFSK L/M/H channel	**Temperature :**	24~26℃
Test Engineer :	Book Lin	**Relative Humidity :**	58~61%

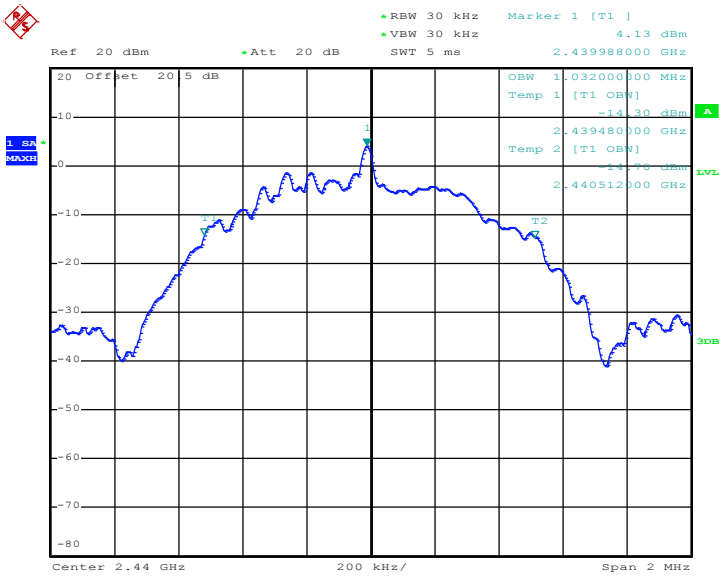
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.032
19	2440	1.032
39	2480	1.032

99% Bandwidth Plot on Channel 00



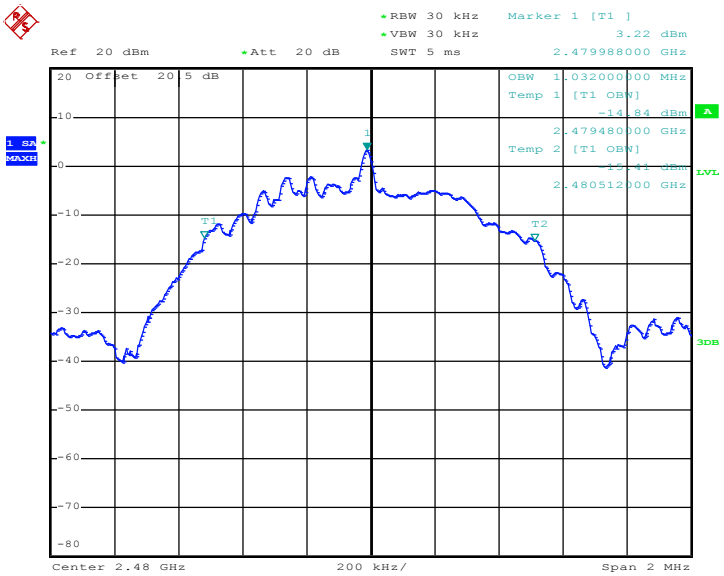
Date: 25.APR.2012 16:24:13

99% Occupied Bandwidth Plot on Channel 19



Date: 25.APR.2012 16:57:52

99% Occupied Bandwidth Plot on Channel 39



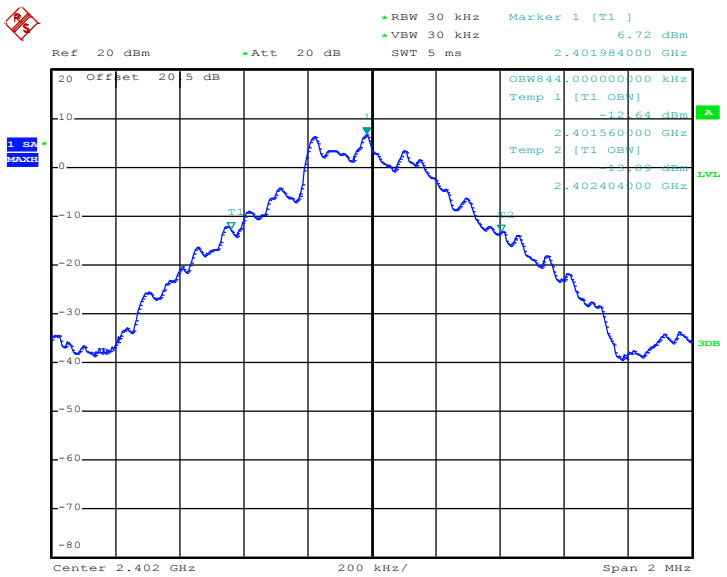
Date: 25.APR.2012 16:43:11

<Standard Bluetooth>

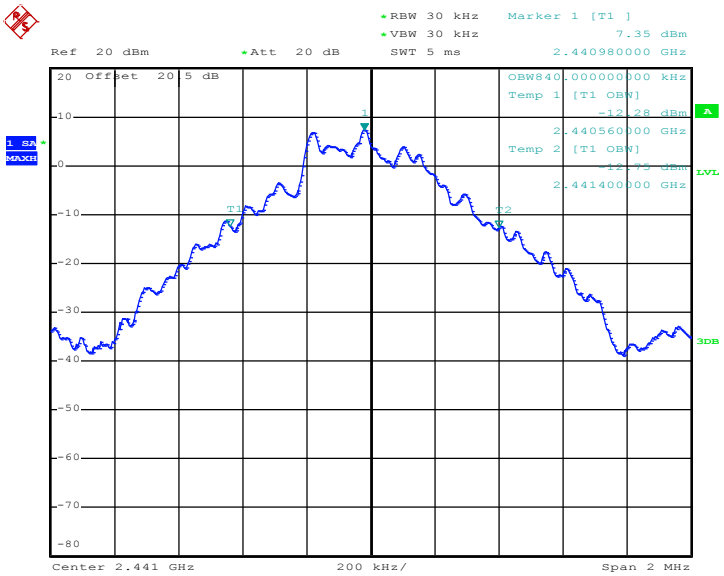
Test Mode :	Bluetooth 1Mbps GFSK L/M/H channel	**Temperature :**	24~26℃
Test Engineer :	Book Lin	**Relative Humidity :**	50~53%

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	0.844
39	2441	0.840
78	2480	0.844

99% Bandwidth Plot on Channel 00

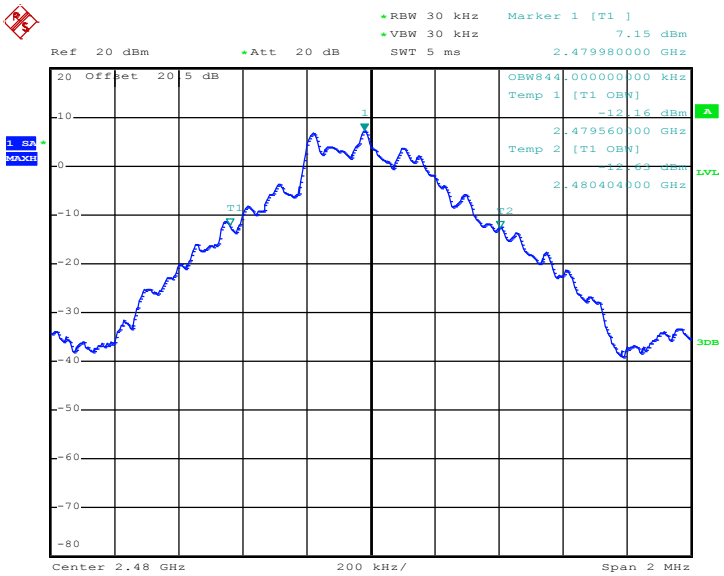


99% Occupied Bandwidth Plot on Channel 39



Date: 14.MAY.2012 20:32:51

99% Occupied Bandwidth Plot on Channel 78

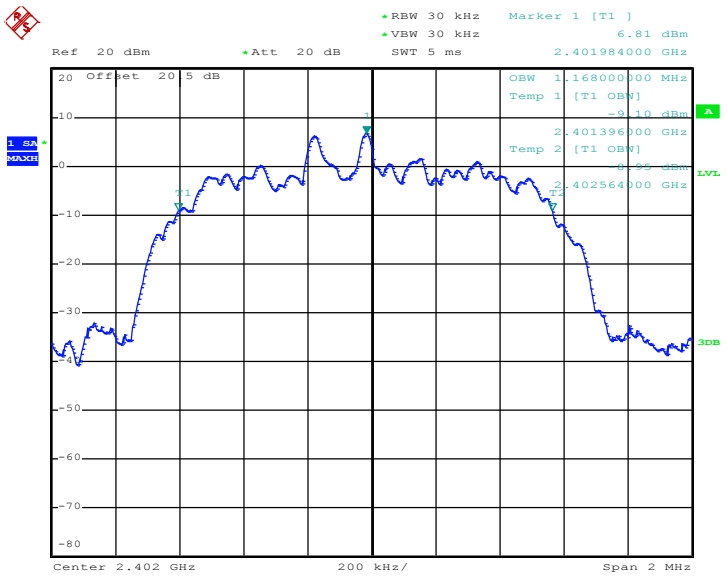


Date: 14.MAY.2012 20:34:40

Test Mode :	Bluetooth EDR 2Mbps π/4-DQPSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

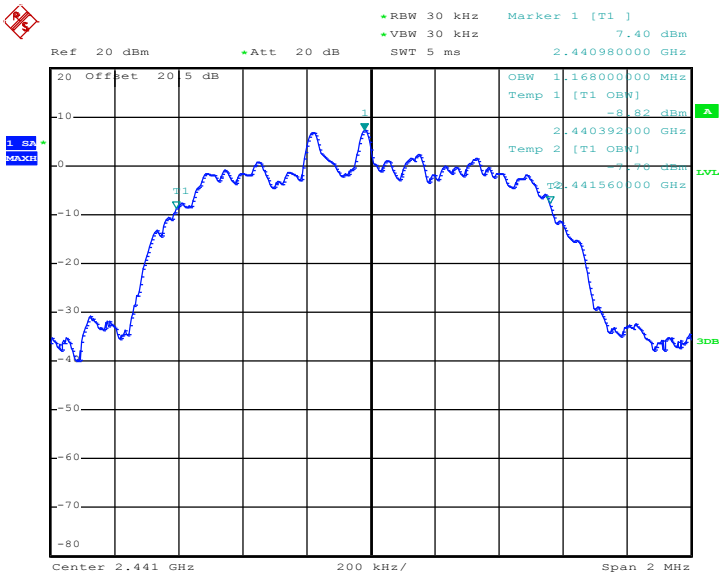
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.168
39	2441	1.168
78	2480	1.172

99% Bandwidth Plot on Channel 00



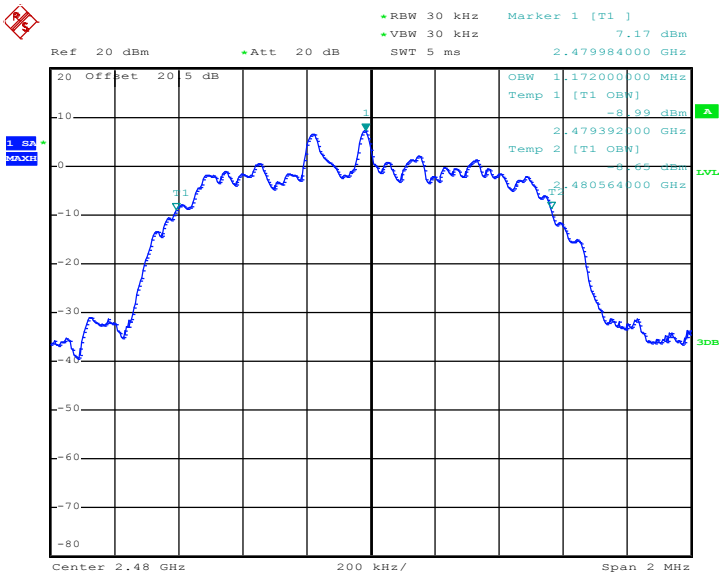
Date: 14.MAY.2012 20:39:52

99% Occupied Bandwidth Plot on Channel 39



Date: 14.MAY.2012 20:37:41

99% Occupied Bandwidth Plot on Channel 78

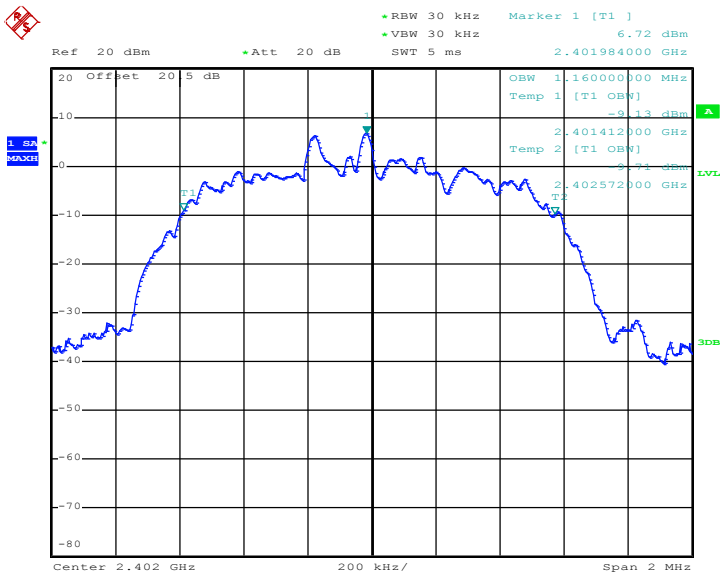


Date: 14.MAY.2012 20:36:17

Test Mode :	Bluetooth EDR 3Mbps 8-DPSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

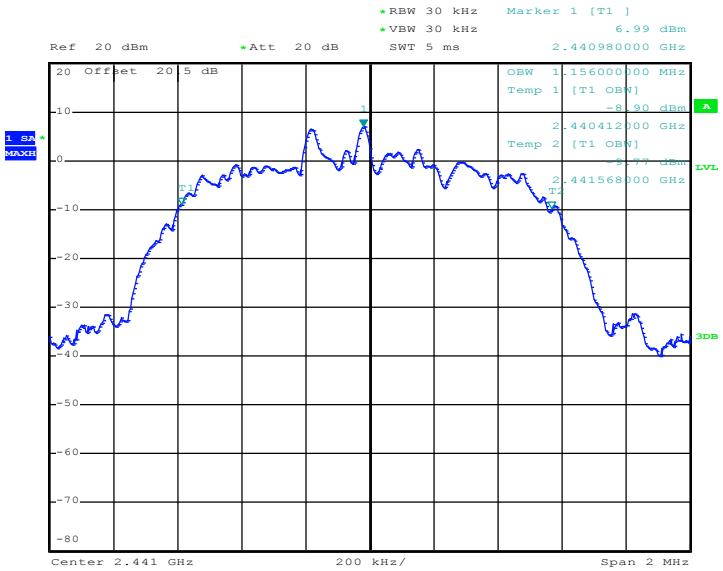
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.160
39	2441	1.156
78	2480	1.164

99% Bandwidth Plot on Channel 00



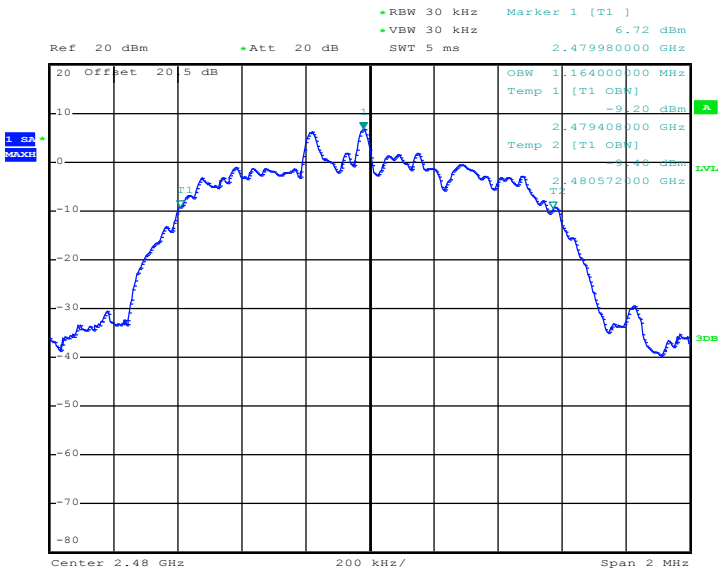
Date: 14.MAY.2012 20:42:10

99% Occupied Bandwidth Plot on Channel 39



Date: 14.MAY.2012 20:27:31

99% Occupied Bandwidth Plot on Channel 78



Date: 14.MAY.2012 20:30:02

3.3 Hopping Channel Separation Measurement

3.3.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 KHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. Please refer FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. The EUT should be transmitting at its maximum data rate as the worst cases.
4. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels; RBW ≥ 1% of the span; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
5. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

3.3.4 Test Setup

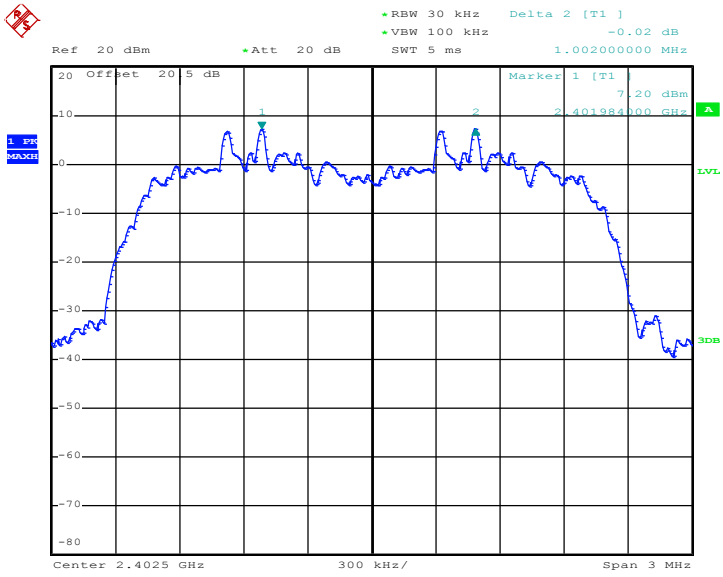
3.3.5 Test Result of Hopping Channel Separation

<Standard Bluetooth>

Test Mode :	Bluetooth EDR 3Mbps 8-DPSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

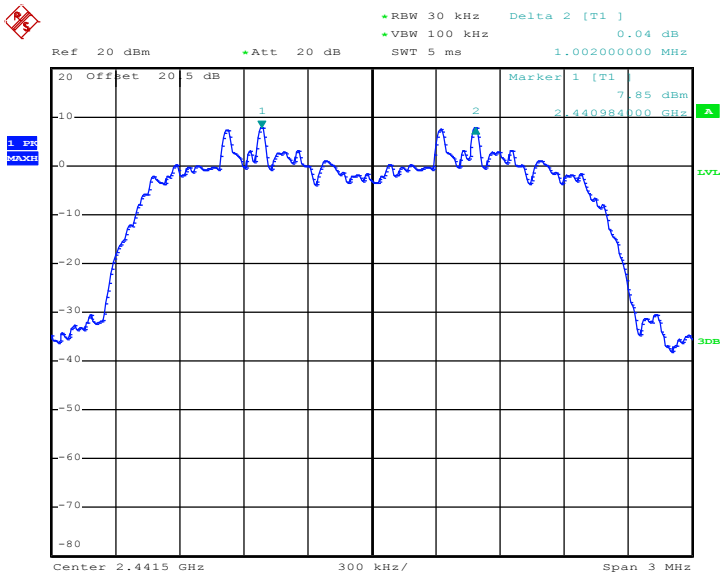
Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8160	Pass
39	2441	1.002	0.8160	Pass
78	2480	1.002	0.8200	Pass

Channel Separation Plot on Channel 00 - 01



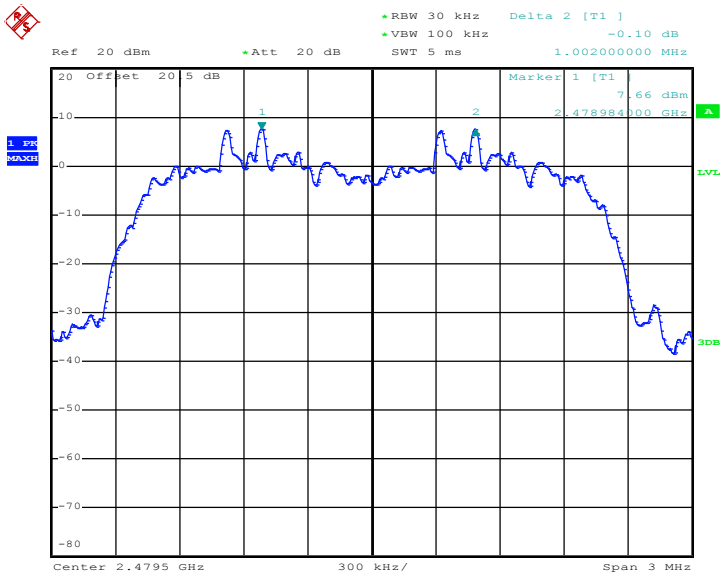
Date: 14.MAY.2012 20:15:35

Channel Separation Plot on Channel 39 - 40



Date: 14.MAY.2012 20:16:59

Channel Separation Plot on Channel 77 - 78



Date: 14.MAY.2012 20:20:26

3.4 Dwell Time Measurement

3.4.1 Limit of Dwell Time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

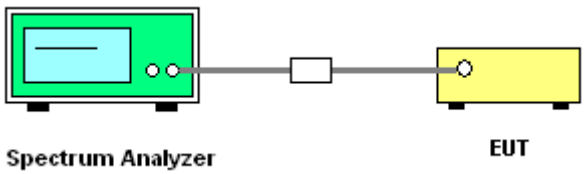
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. The EUT should be transmitting at its maximum data rate as the worst cases.
4. The EUT must have its hopping function enabled. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
5. Use the marker-delta function to calculate the dwell time.

3.4.4 Test Setup



3.4.5 Test Result of Dwell Time

<Standard Bluetooth>

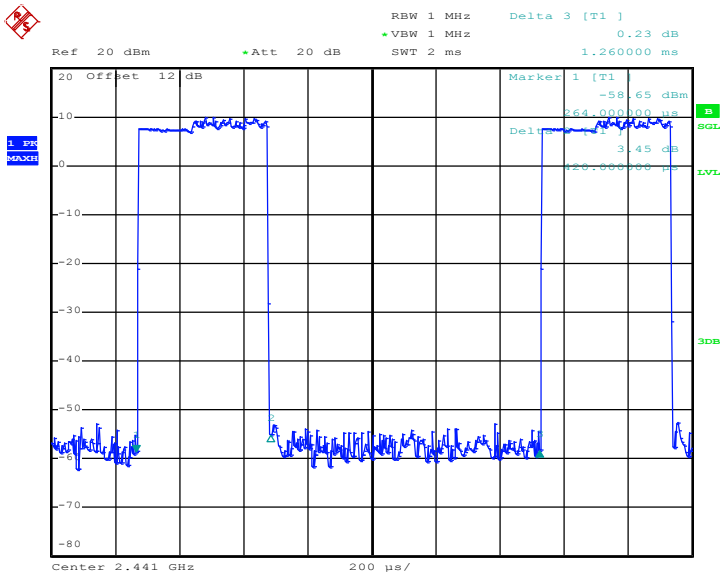
Test Mode :	Bluetooth EDR 3Mbps 8-DPSK L/M/H channel	**Temperature :**	24~26℃
Test Engineer :	Book Lin	**Relative Humidity :**	50~53%

Package Mode	Average Hopping Channel	Package Transfer Time (usec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
3DH1	7.60	420.00	0.10	0.4	Pass
3DH3	4.40	1680.00	0.23	0.4	Pass
3DH5	3.10	2954.00	0.29	0.4	Pass

Remark:

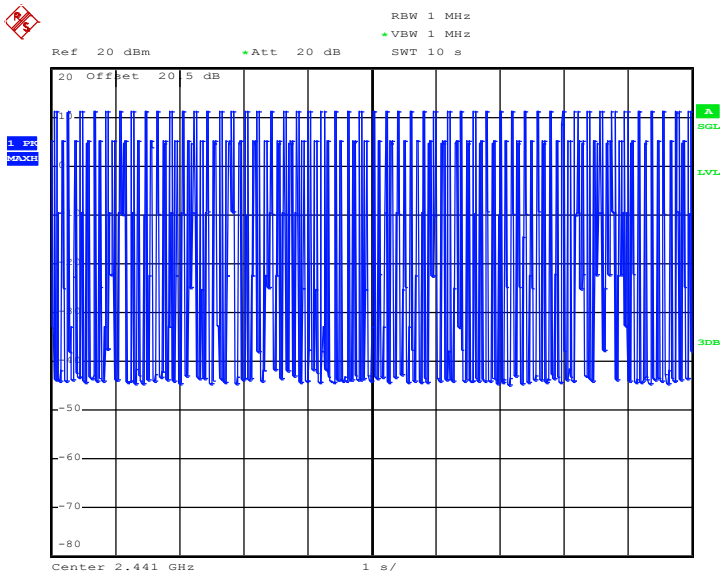
1. Dwell Time=79(channels) x 0.4(s) x average hopping channel x package transfer time
2. 79 channels come from the Hopping Channel number.
3. Average Hopping Channel = hops/sweep time
4. t: Package Transfer Time(us)
5. In Bluetooth hopping operation, basic and AFH mode, the hopping rate is 1600Hz. The largest dwell time 3DH1/3DH3/3DH5 is 0.29 second of 3DH5, and the average time of occupancy on any channel would not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

3DH1 Dwell Time (One Pulse) Plot on Channel 39



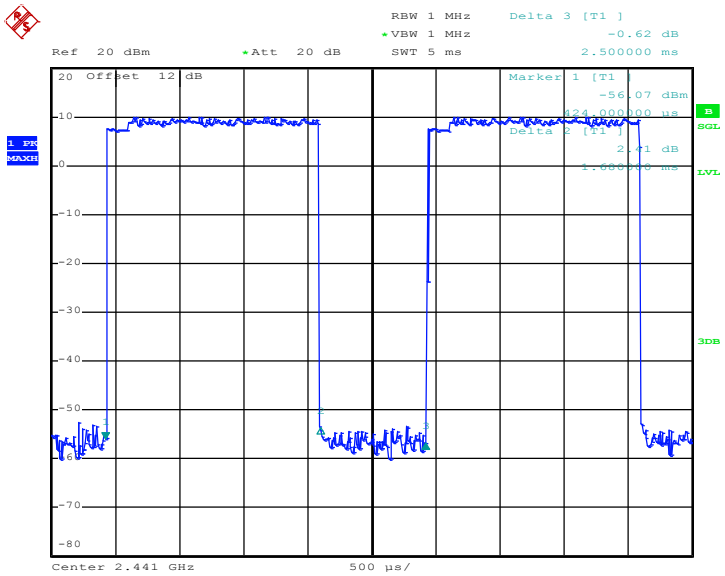
Date: 13.MAY.2012 17:33:48

3DH1 Dwell Time (Count Pulses) Plot on Channel 39



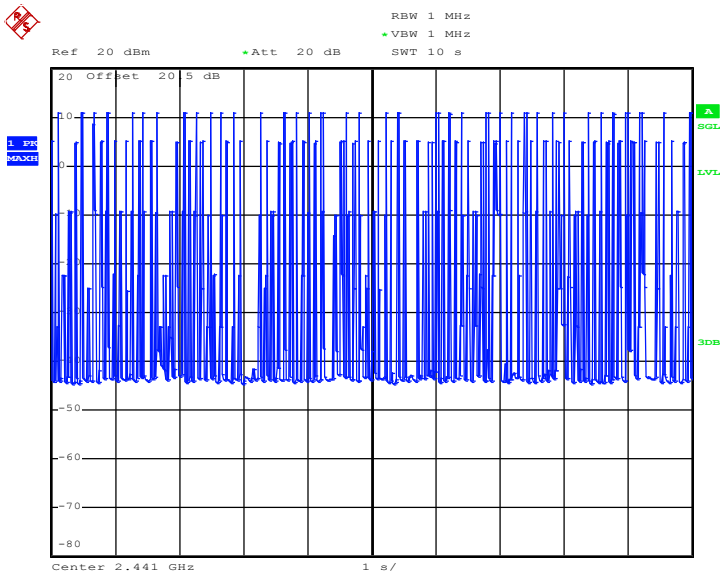
Date: 14.MAY.2012 20:43:17

3DH3 Dwell Time (Count Pulses) Plot on Channel 39



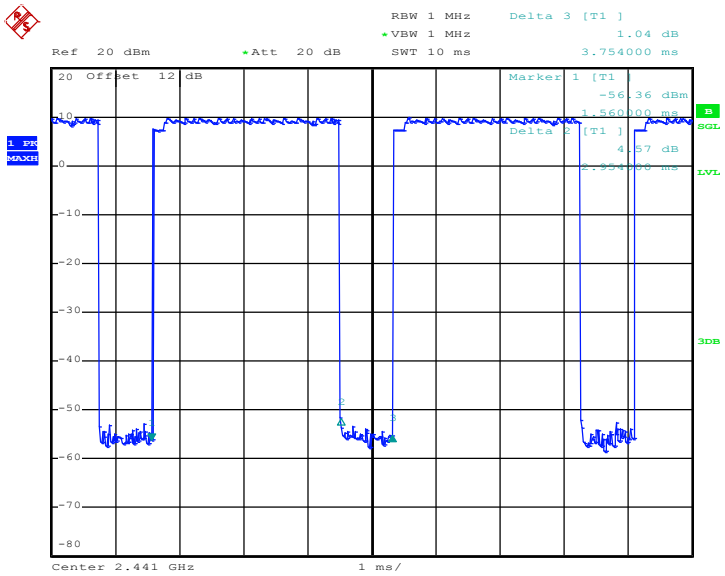
Date: 13.MAY.2012 17:35:43

3DH3 Dwell Time (Count Pulses) Plot on Channel 39



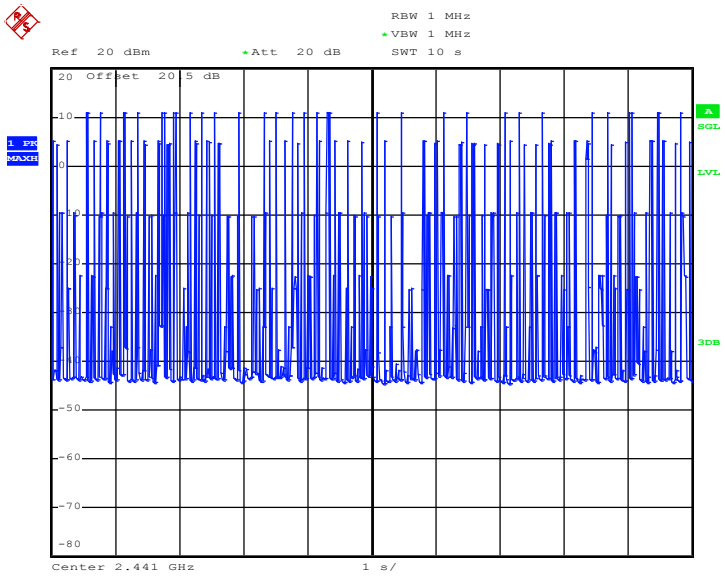
Date: 14.MAY.2012 20:43:44

3DH5 Dwell Time (One Pulse) Plot on Channel 39



Date: 13.MAY.2012 17:43:58

3DH5 Dwell Time (Count Pulses) Plot on Channel 39



Date: 14.MAY.2012 20:44:12

3.5 Peak Output Power Measurement

3.5.1 Limit of Peak Output Power

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

3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.

3.5.4 Test Setup

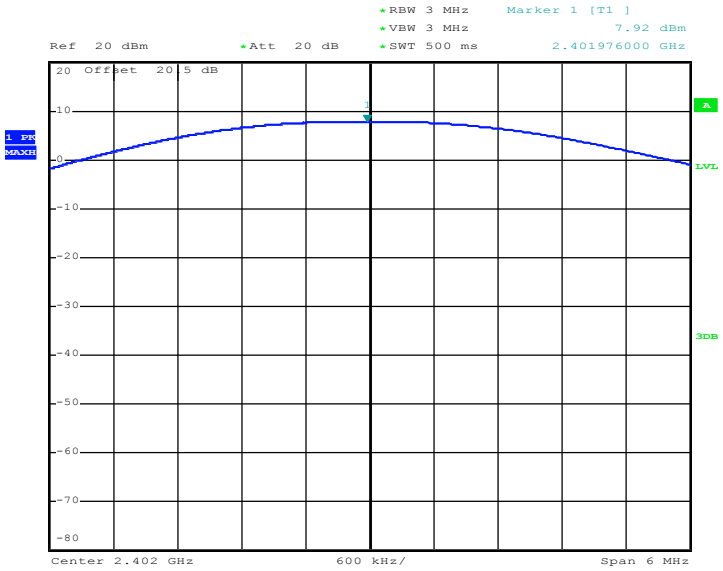
3.5.5 Test Result of Peak Output Power

<Low Energy Bluetooth>

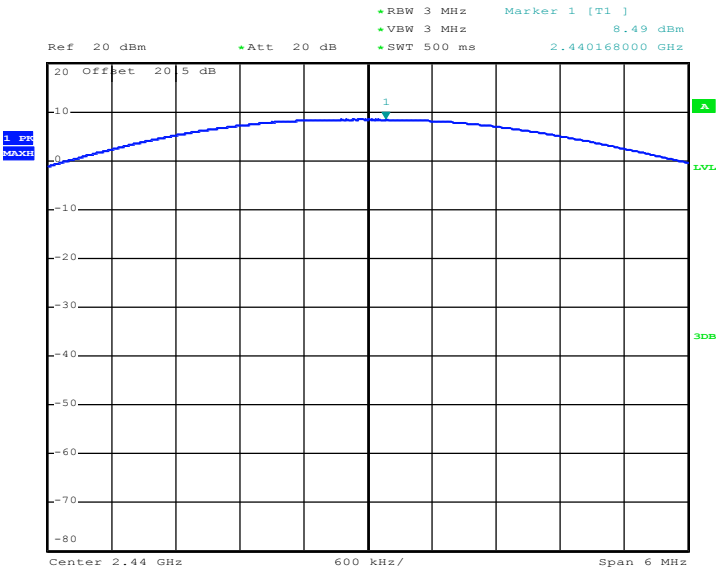
Test Mode :	Bluetooth LE 1Mbps GFSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	58~61%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	7.92	30.00	Pass
19	2440	8.49	30.00	Pass
39	2480	8.19	30.00	Pass

Peak Output Power Plot on Channel 00

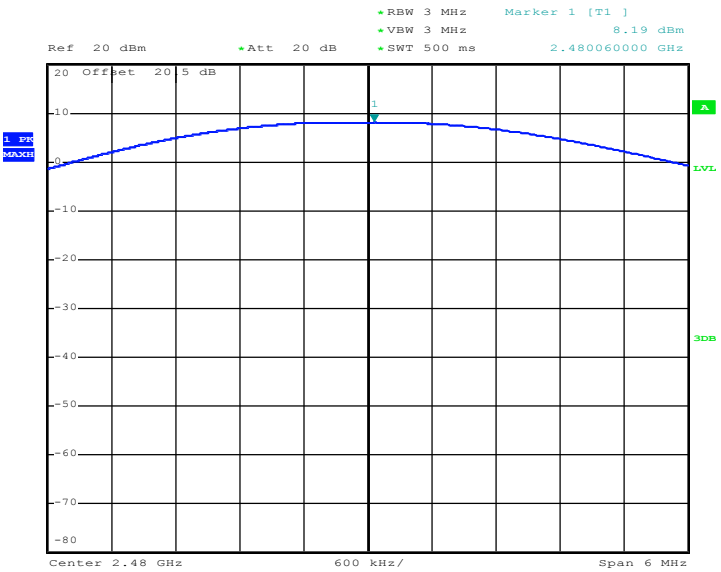


Peak Output Power Plot on Channel 19



Date: 14.MAY.2012 22:07:48

Peak Output Power Plot on Channel 39



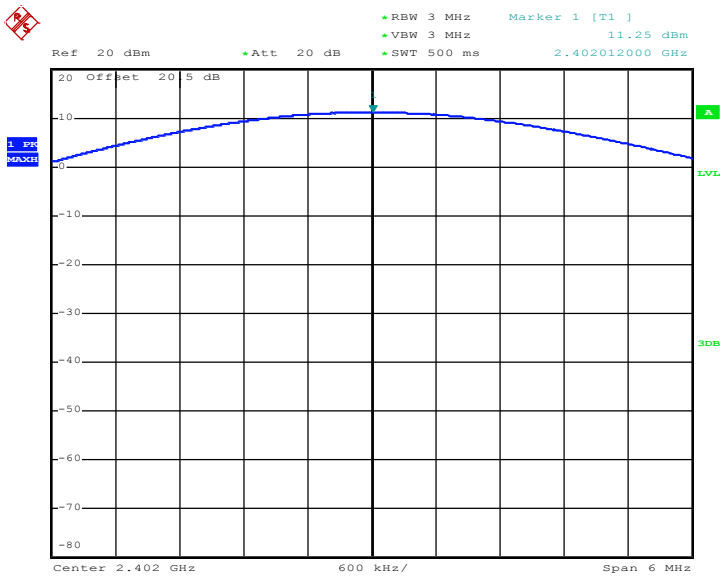
Date: 14.MAY.2012 22:08:23

<Standard Bluetooth>

Test Mode :	Bluetooth EDR 3Mbps 8-DPSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

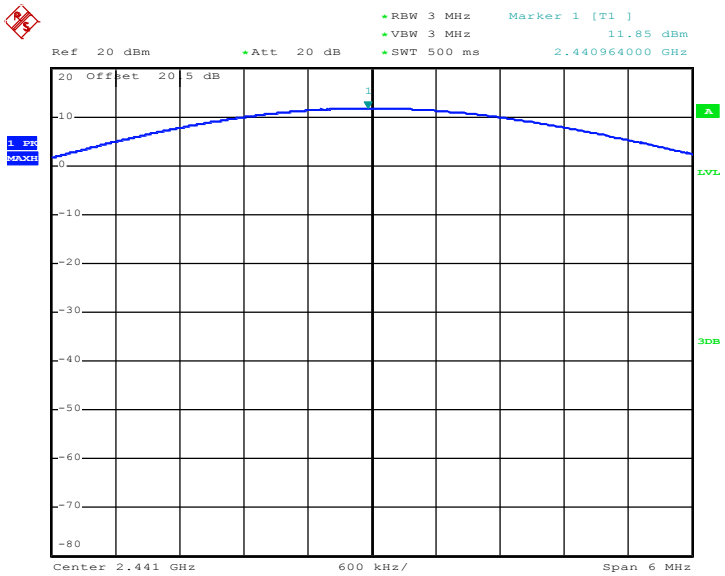
Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	11.25	30.00	Pass
39	2441	11.85	30.00	Pass
78	2480	11.48	30.00	Pass

Peak Output Power Plot on Channel 00



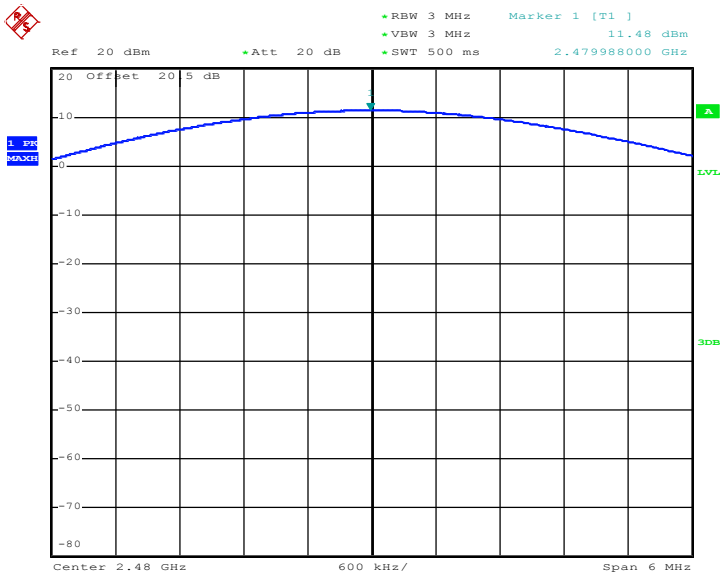
Date: 14.MAY.2012 19:35:53

Peak Output Power Plot on Channel 39



Date: 14.MAY.2012 19:37:56

Peak Output Power Plot on Channel 78



Date: 14.MAY.2012 19:39:55

3.6 Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 KHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

3.6.2 Measuring Instruments

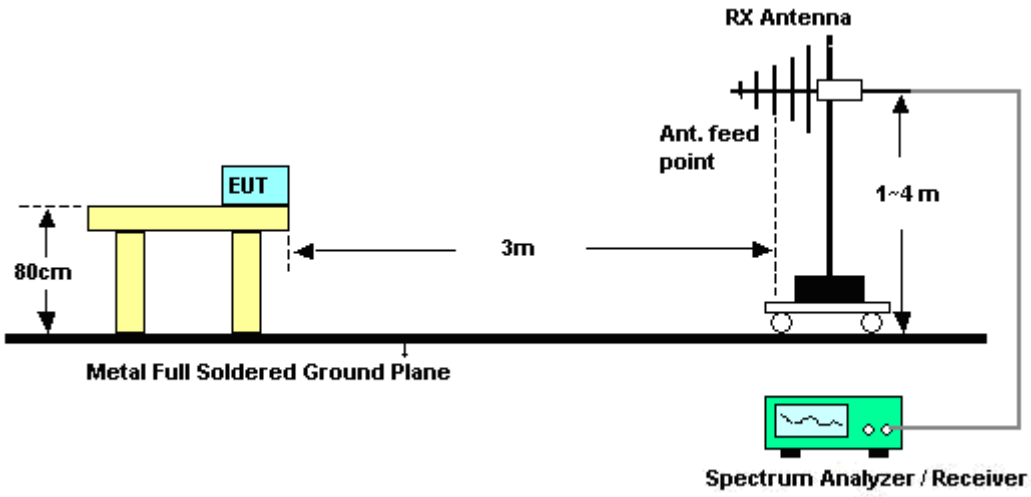
See list of measuring instruments of this test report.

3.6.3 Test Procedures

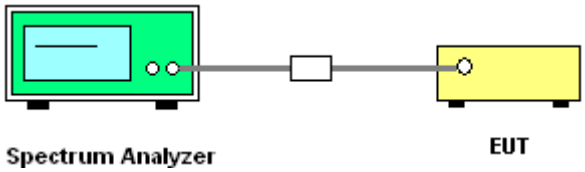
1. The testing follows the guidelines in ANSI C63.4-2003 and FCC Public Notice DA 00-705 Measurement Guidelines.
2. RF antenna conducted test: Set RBW = 300KHz, Video bandwidth (VBW) ≥ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 300k Hz RBW. Note: If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB.
3. Radiated emission test: Applies to band edge emissions that fall in the restricted bands listed in FCC Section 15.205. The maximum permitted average field strength is listed in FCC Section 15.209. A pre-amp is necessary for this measurement. For measurements above 1 GHz, set RBW = 1MHz, VBW = 1MHz, Sweep: Auto for Peak; set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto for Average. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation. See FCC Section 15.35(b) and (c).
4. In case the emission is fail due to the used RBW / VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

3.6.4 Test Setup

<Radiated Band Edges>



<Conducted Band Edges>



3.6.5 Test Result of Radiated Band Edges

<For Antenna 1>

Test Mode :	Mode 1	**Temperature :**	23~24°C
Test Channel :	00	**Relative Humidity :**	45~46%
		Test Engineer :	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2321.4	47.47	-26.53	74	46.88	31.96	4.53	35.9	193	290	Peak
2321.4	37.13	-16.87	54	36.54	31.96	4.53	35.9	193	290	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2347.62	46.79	-27.21	74	46.15	31.98	4.55	35.89	185	360	Peak
2347.62	35.24	-18.76	54	34.6	31.98	4.55	35.89	185	360	Average

Test Mode :	Mode 3	**Temperature :**	23~24°C
Test Channel :	78	**Relative Humidity :**	45~46%
		Test Engineer :	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	63.11	-10.89	74	62.19	32.09	4.64	35.81	102	253	Peak
2483.5	50.83	-3.17	54	49.91	32.09	4.64	35.81	102	253	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	61.4	-12.6	74	60.48	32.09	4.64	35.81	111	7	Peak
2483.5	49.53	-4.47	54	48.61	32.09	4.64	35.81	111	7	Average

Test Mode :	Mode 4	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
		Test Engineer :	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	59.88	-14.12	74	58.96	32.09	4.64	35.81	137	201	Peak
2483.5	48.6	-5.4	54	47.68	32.09	4.64	35.81	137	201	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	63.33	-10.67	74	62.41	32.09	4.64	35.81	100	161	Peak
2483.5	50.98	-3.02	54	50.06	32.09	4.64	35.81	100	161	Average

<For Antenna 2>

Test Mode :	Mode 5	Temperature :	23~24°C
Test Channel :	00	Relative Humidity :	45~46%
		Test Engineer :	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2321.78	54.65	-19.35	74	54.06	31.96	4.53	35.9	117	163	Peak
2321.78	47.55	-6.45	54	46.96	31.96	4.53	35.9	117	163	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2321.59	48.94	-25.06	74	48.35	31.96	4.53	35.9	147	127	Peak
2321.59	39.25	-14.75	54	38.66	31.96	4.53	35.9	147	127	Average

Test Mode :	Mode 7	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
		Test Engineer :	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	57.95	-16.05	74	57.03	32.09	4.64	35.81	113	22	Peak
2483.5	48.34	-5.66	54	47.42	32.09	4.64	35.81	113	22	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	49.4	-24.6	74	48.48	32.09	4.64	35.81	172	93	Peak
2483.5	41.08	-12.92	54	40.16	32.09	4.64	35.81	172	93	Average

Test Mode :	Mode 8	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
		Test Engineer :	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	57.57	-16.43	74	56.65	32.09	4.64	35.81	110	160	Peak
2483.5	47.86	-6.14	54	46.94	32.09	4.64	35.81	110	160	Average

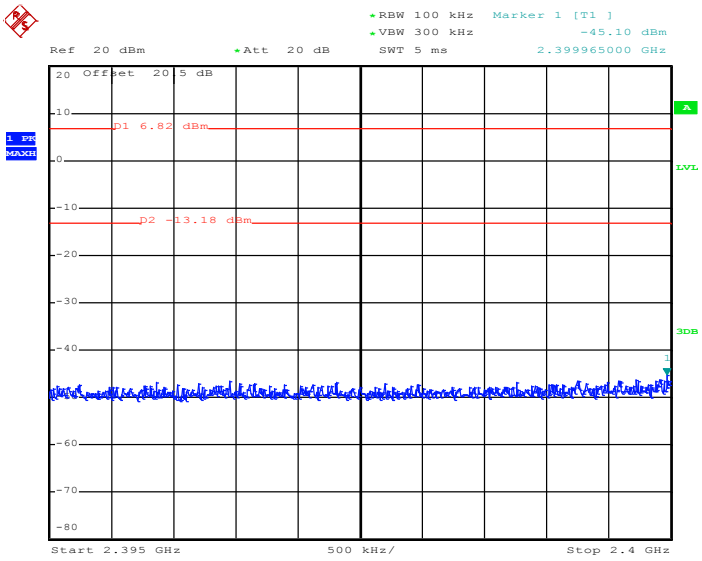
ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	48.12	-25.88	74	47.2	32.09	4.64	35.81	127	130	Peak
2483.5	39.97	-14.03	54	39.05	32.09	4.64	35.81	127	130	Average

3.6.6 Test Result of Conducted Band Edges

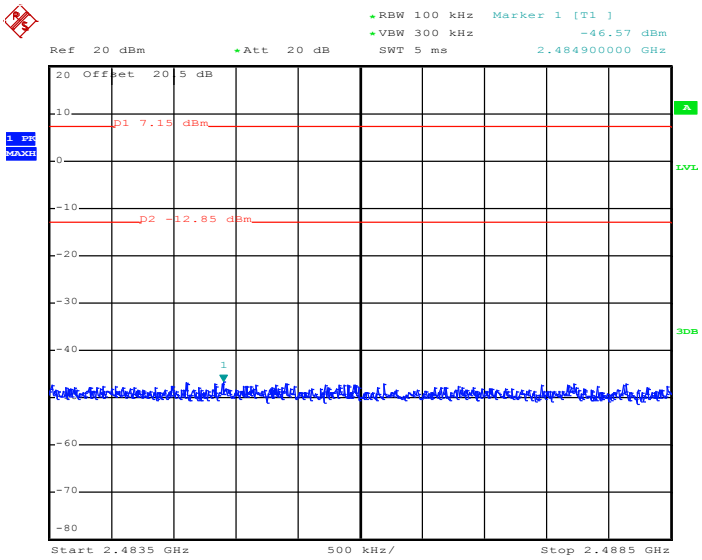
<Low Energy Bluetooth>

Test Mode :	Bluetooth LE 1Mbps GFSK Low/High channel	**Temperature :**	24~26℃
Test Channel :	00 and 39	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

Low Band Edge Plot on Channel 01



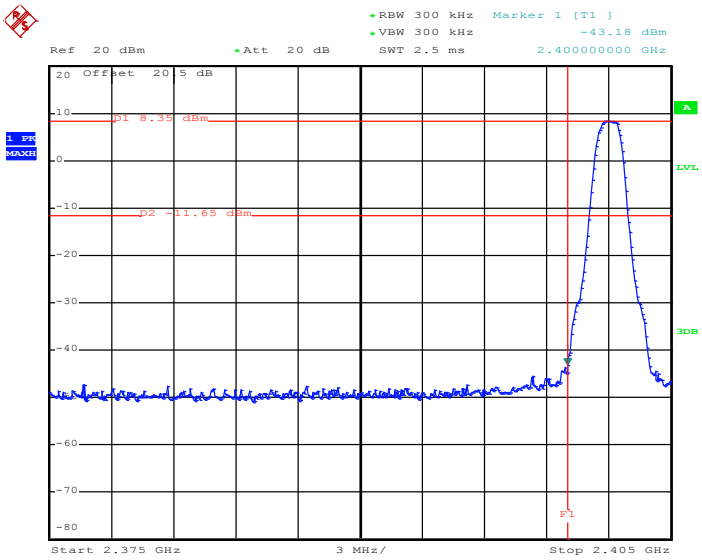
High Band Edge Plot on Channel 39



<Standard Bluetooth>

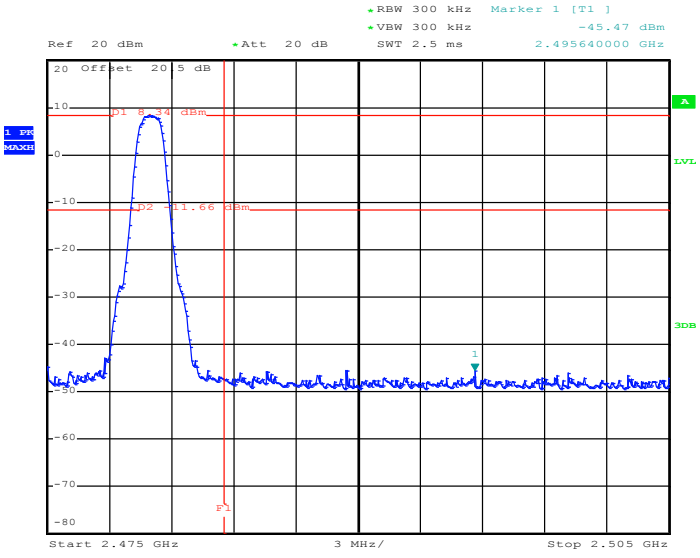
Test Mode :	Bluetooth EDR 3Mbps 8-DPSK Low/High channel	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

Low Band Edge Plot on Channel 00



Date: 14.MAY.2012 20:41:09

High Band Edge Plot on Channel 78



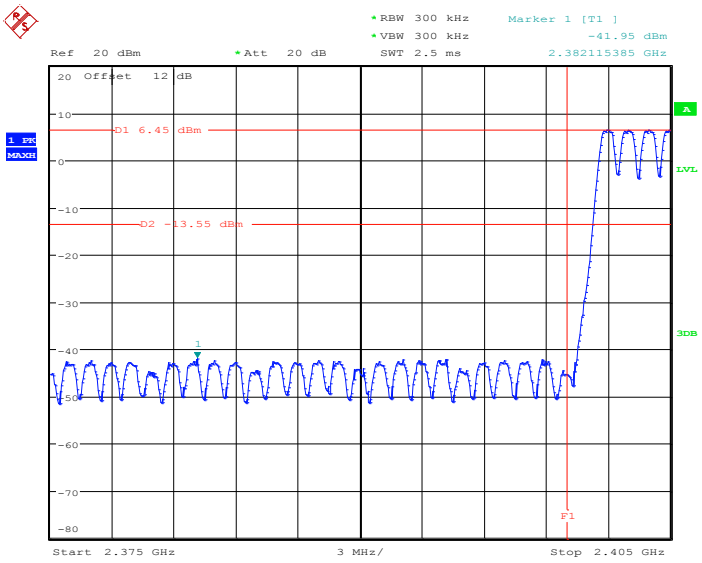
Date: 14.MAY.2012 20:31:07

3.6.7 Test Result of Conducted Hopping Mode Band Edges

<Standard Bluetooth>

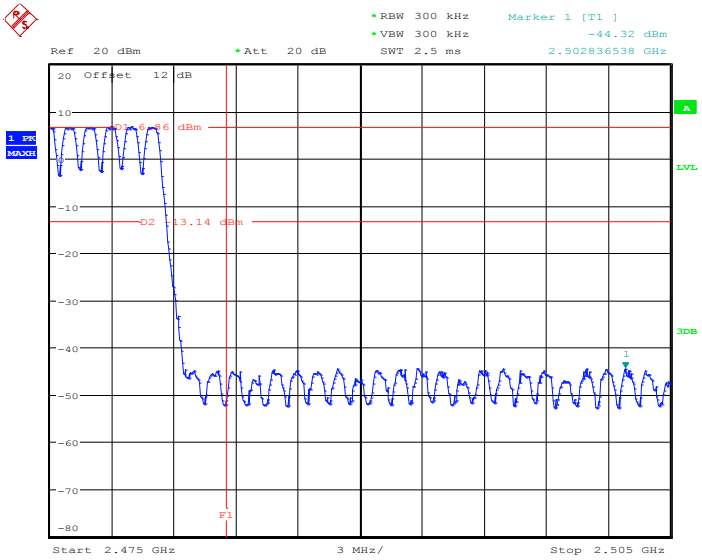
Test Mode :	Bluetooth 1Mbps GFSK Low/High channel	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

Hopping Mode Band Edge Plot on Channel 00



Date: 23.MAY.2012 16:34:44

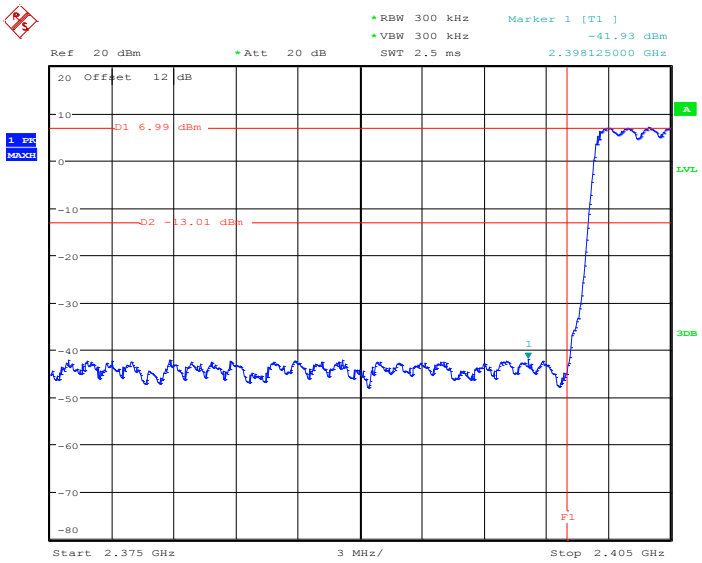
Hopping Mode Band Edge Plot on Channel 78



Date: 23.MAY.2012 16:38:59

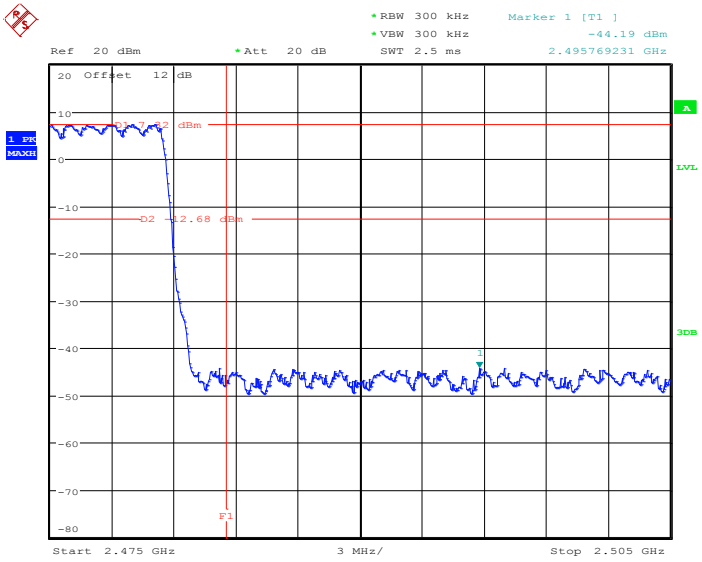
Test Mode :	Bluetooth EDR 2Mbps π/4-DQPSK Low/High channel	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

Hopping Mode Band Edge Plot on Channel 00



Date: 23.MAY.2012 16:43:36

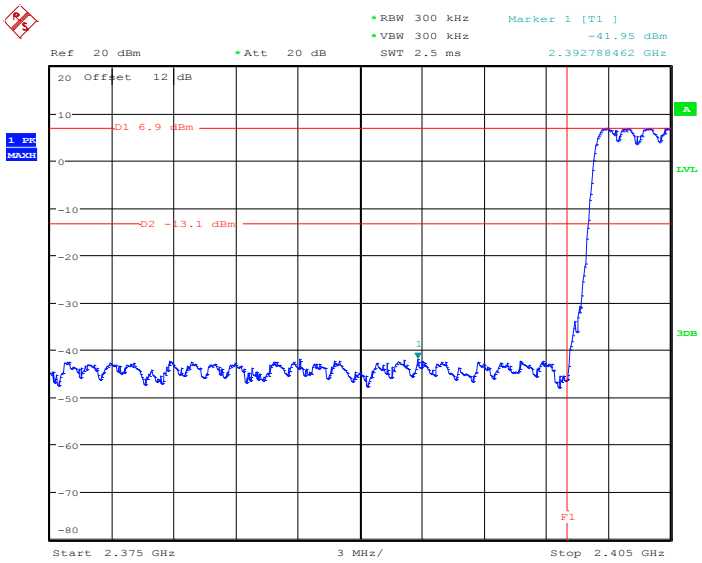
Hopping Mode Band Edge Plot on Channel 78



Date: 23.MAY.2012 16:40:57

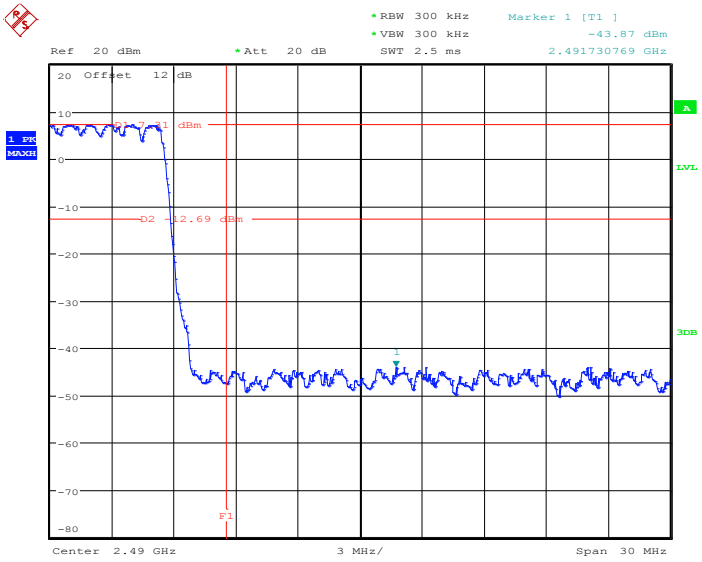
Test Mode :	Bluetooth EDR 3Mbps 8-DPSK Low/High channel	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

Hopping Mode Band Edge Plot on Channel 00



Date: 23.MAY.2012 16:50:41

Hopping Mode Band Edge Plot on Channel 78



Date: 23.MAY.2012 16:48:18

3.7 Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

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

3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

3.7.3 Test Procedure

1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set RBW = 100 KHz, Video bandwidth (VBW) ≥ RBW, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 KHz RBW.

3.7.4 Test Setup

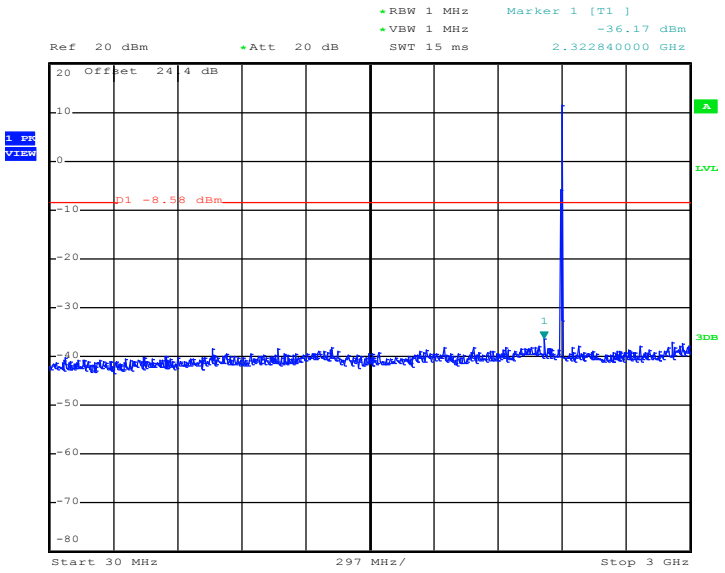
3.7.5 Test Result

<Low Energy Bluetooth>

Test Mode :	Bluetooth LE 1Mbps GFSK Low channel	**Temperature :**	24~26℃
Test Channel :	00	**Relative Humidity :**	58~61%
		Test Engineer :	Book Lin

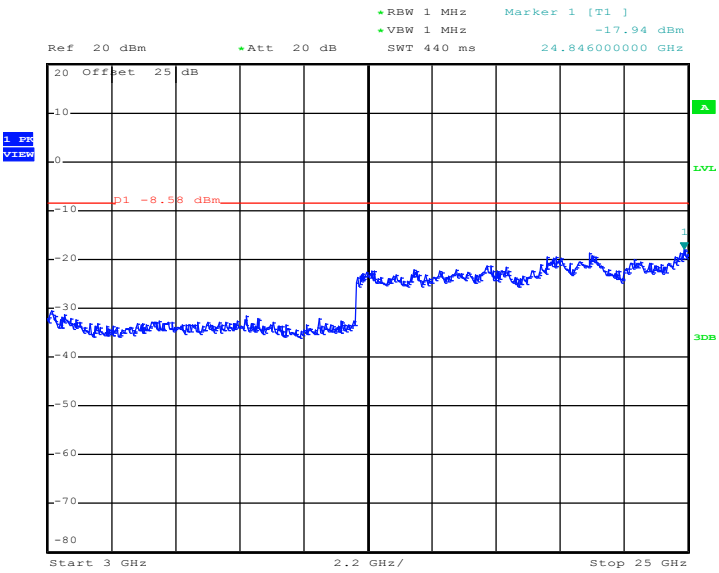
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 00



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 00

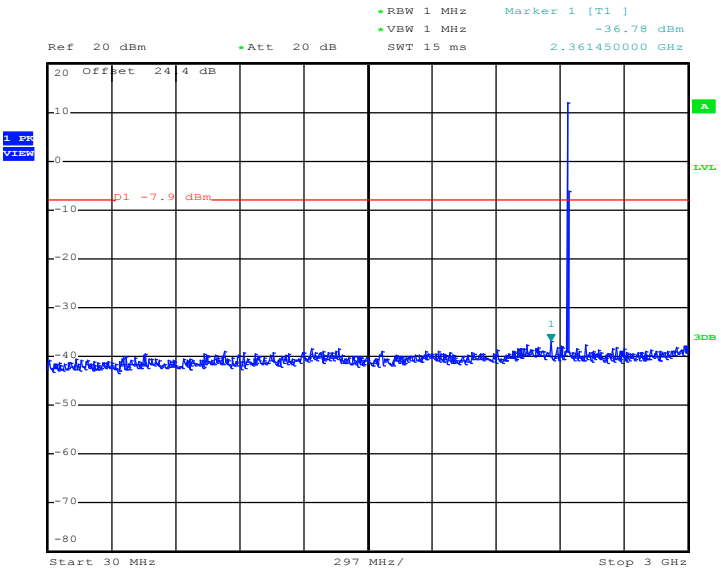


Date: 14.MAY.2012 22:30:40

Test Mode :	Bluetooth LE 1Mbps GFSK Middle channel	**Temperature :**	24~26℃
Test Channel :	19	**Relative Humidity :**	58~61%
		Test Engineer :	Book Lin

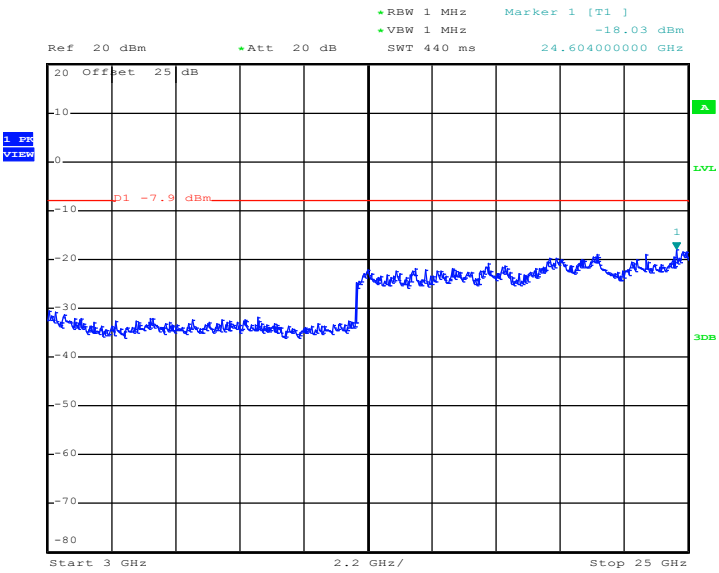
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 19



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 19

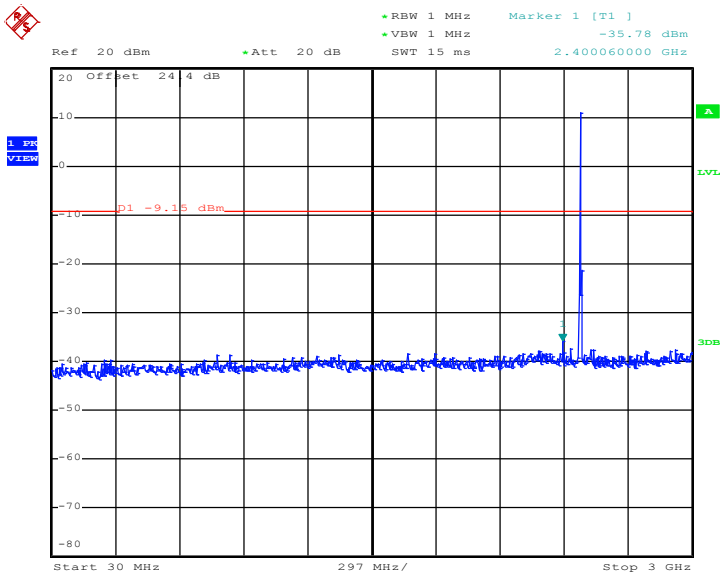


Date: 14.MAY.2012 22:37:28

Test Mode :	Bluetooth LE 1Mbps GFSK High channel	**Temperature :**	24~26℃
Test Channel :	39	**Relative Humidity :**	58~61%
		Test Engineer :	Book Lin

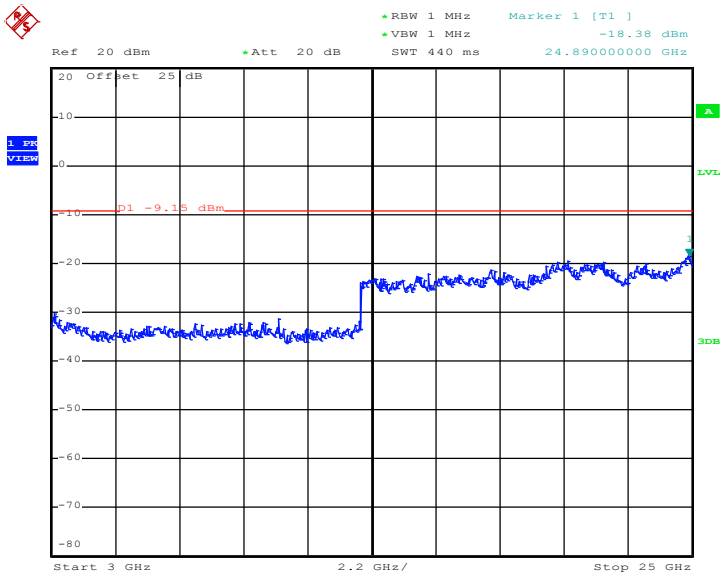
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39



Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

GFSK Channel 39



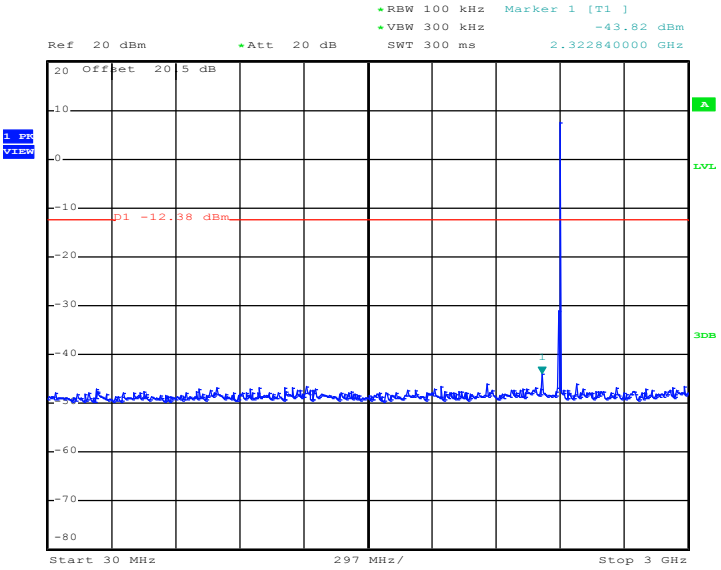
Date: 15.MAY.2012 19:54:19

<Standard Bluetooth>

Test Mode :	Bluetooth EDR 3Mbps 8-DPSK L/M/H channel	**Temperature :**	24~26℃
Test Channel :	00	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

Conducted Spurious Emission Plot on Bluetooth 3Mbps

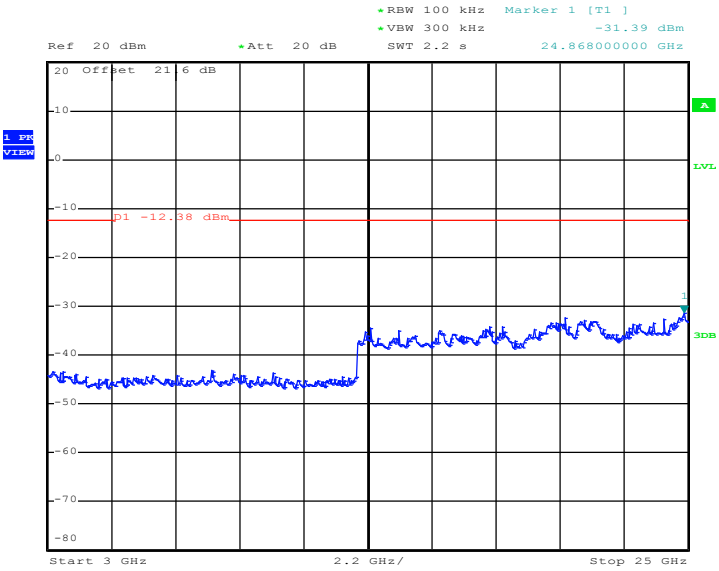
GFSK Channel 00



Date: 14.MAY.2012 20:31:59

Conducted Spurious Emission Plot on Bluetooth 3Mbps

GFSK Channel 00

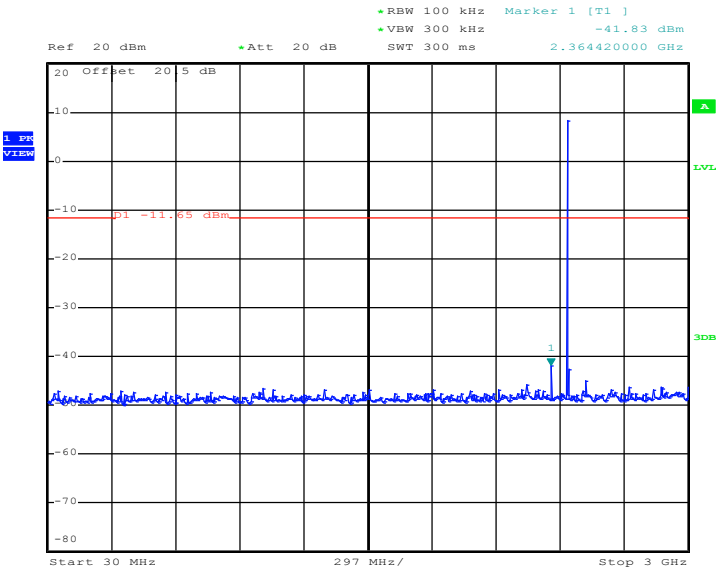


Date: 14.MAY.2012 20:32:21

Test Mode :	Bluetooth EDR 3Mbps 8-DPSK L/M/H channel	**Temperature :**	24~26℃
Test Channel :	39	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

Conducted Spurious Emission Plot on Bluetooth 3Mbps

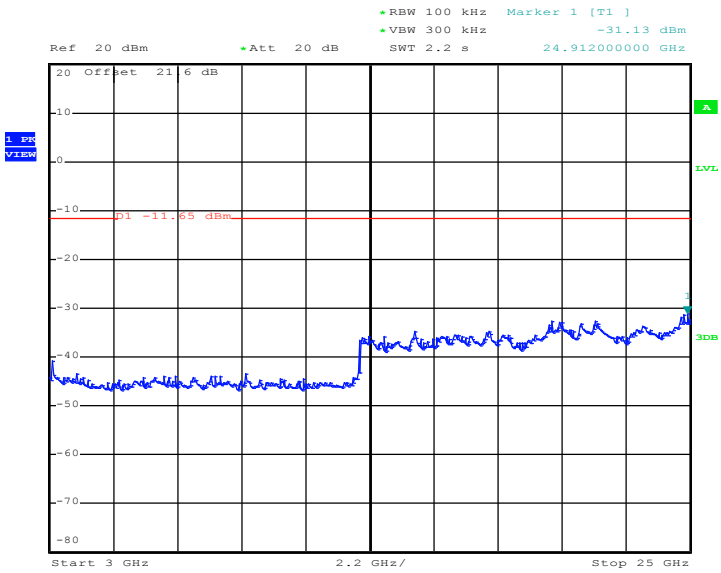
GFSK Channel 39



Date: 14.MAY.2012 20:28:19

Conducted Spurious Emission Plot on Bluetooth 3Mbps

GFSK Channel 39

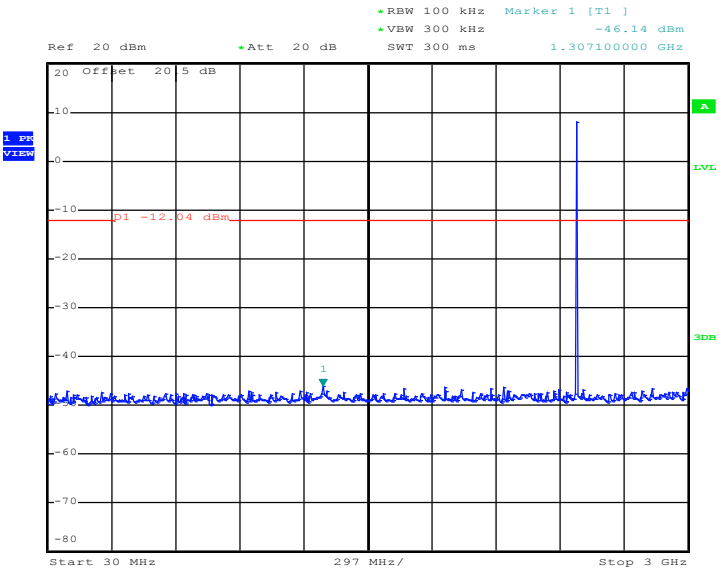


Date: 14.MAY.2012 20:28:41

Test Mode :	Bluetooth EDR 3Mbps 8-DPSK L/M/H channel	**Temperature :**	24~26℃
Test Channel :	78	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

Conducted Spurious Emission Plot on Bluetooth 3Mbps

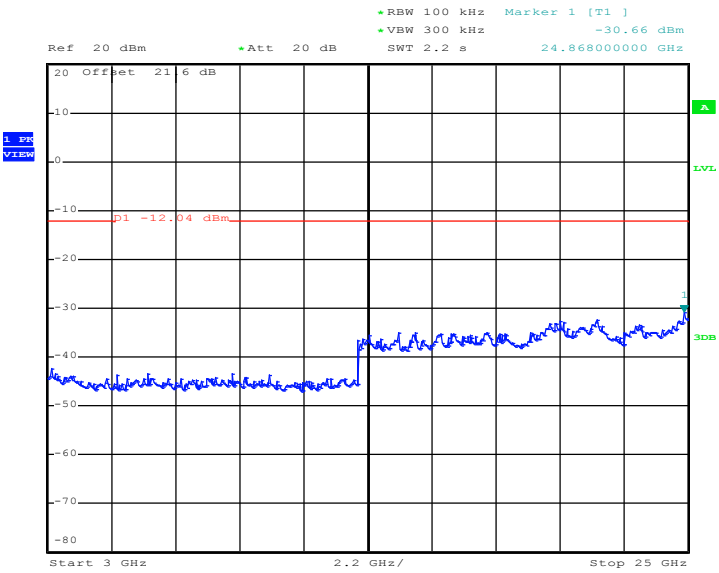
GFSK Channel 78



Date: 14.MAY.2012 20:30:27

Conducted Spurious Emission Plot on Bluetooth 3Mbps

GFSK Channel 78



Date: 14.MAY.2012 20:30:49

3.8 Bluetooth 4.0 be tested in DTS requirement

3.8.1 6dB Bandwidth Measurement

3.8.1.1 Limit of 6dB Bandwidth

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

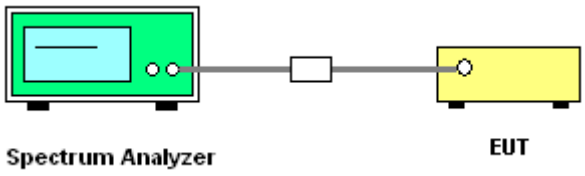
3.8.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.8.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v01.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable. The path loss was compensated to the results for each measurement.
3. 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.
4. The marker-delta reading at this point is the 6 dB bandwidth of the emission.

3.8.1.4 Test Setup



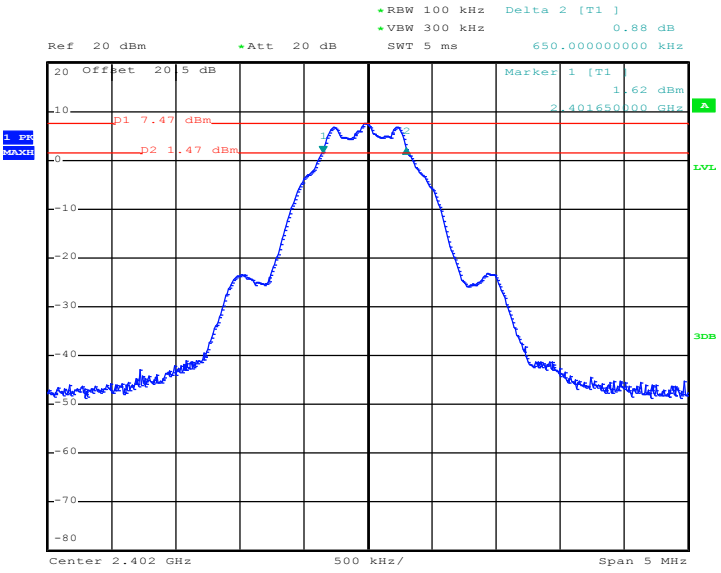
3.8.1.5 Test Result of 6dB Bandwidth

<Low Energy Bluetooth>

Test Mode :	Bluetooth LE 1Mbps GFSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	58~61%

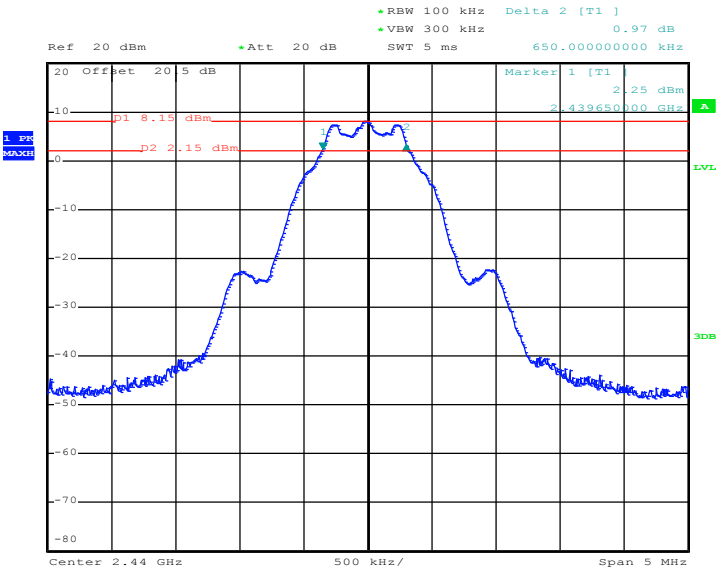
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
00	2402	0.650	0.5	Pass
19	2440	0.650	0.5	Pass
39	2480	0.645	0.5	Pass

6dB Bandwidth Plot on Channel 00



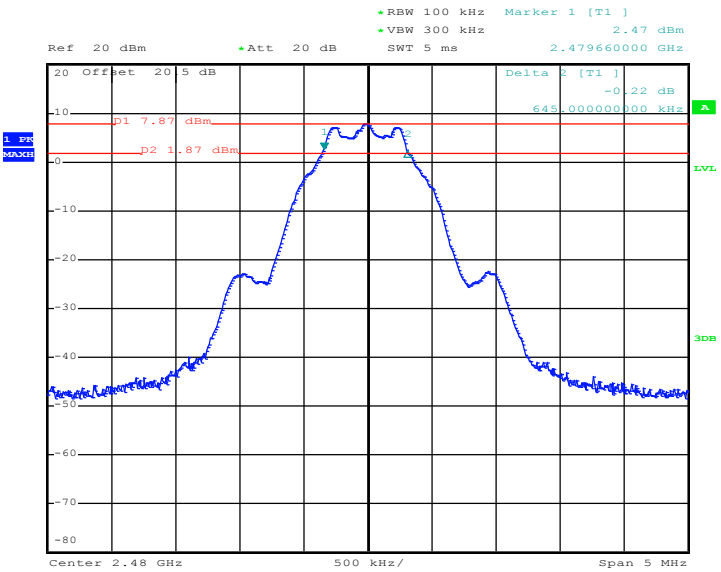
Date: 14.MAY.2012 22:52:40

6dB Occupied Bandwidth Plot on Channel 19



Date: 14.MAY.2012 22:49:57

6dB Occupied Bandwidth Plot on Channel 39



Date: 14.MAY.2012 22:48:20

3.8.2 Power Spectral Density Measurement

3.8.2.1 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.

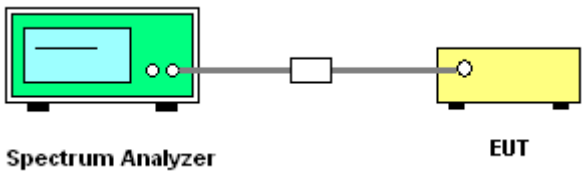
3.8.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.8.2.3 Test Procedures

1. The testing follows Measurement Procedure PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v01.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable. The path loss was compensated to the results for each measurement.
3. Record the measurement data derived from spectrum analyzer.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 KHz. Video bandwidth (VBW) >= 300 KHz In order to make an accurate measurement, set the span to 5-30% greater than Emission Bandwidth (EBW)
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 in any 100 kHz band segment within the fundamental EBW.
6. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).

3.8.2.4 Test Setup



3.8.2.5 Test Result of Power Spectral Density

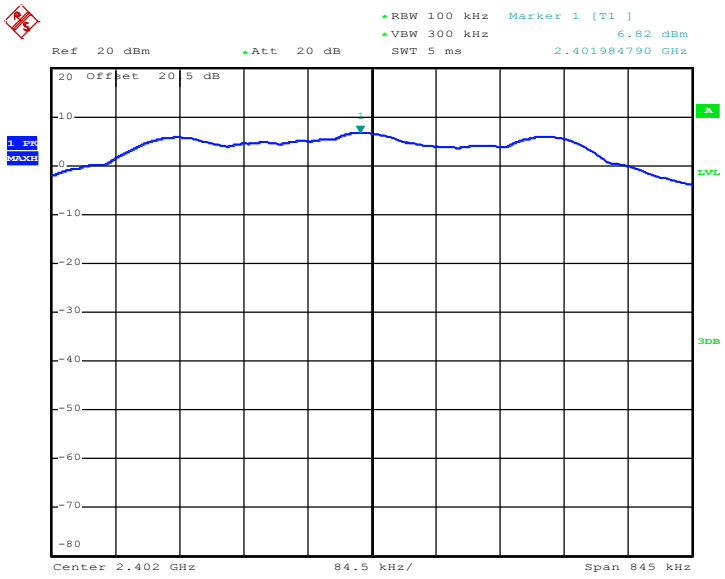
Test Mode :	Bluetooth LE 1Mbps GFSK L/M/H channel	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	58~61%

Channel	Frequency (MHz)	Power Density		Max. Limits (dBm)	Pass/Fail
		Measured PSD/100KHz (dBm)	PSD/3KHz (dBm)		
00	2402	6.82	-8.38	8	Pass
19	2440	8.14	-7.06	8	Pass
39	2480	7.15	-8.05	8	Pass

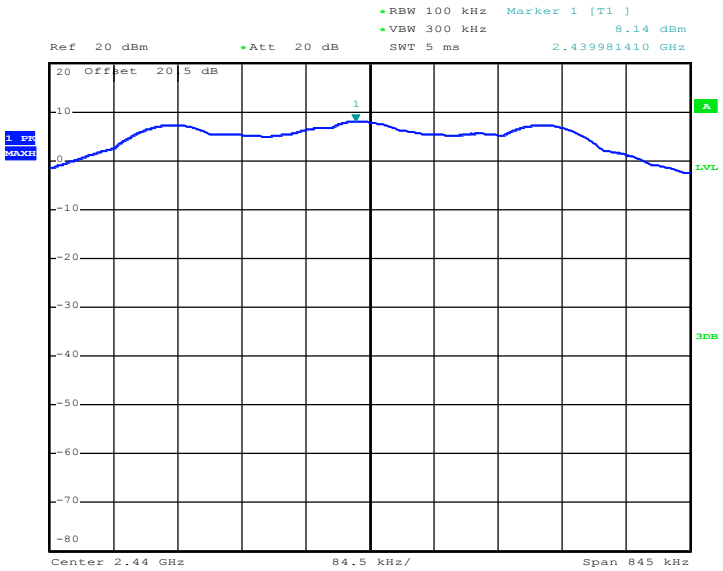
Note:

1. *Measured power density (dBm) has offset with cable loss.*
2. *BWCF (dB) = 10 log (3k/100k) = -15.2 dB*
3. *Power Density/ 3kHz (dBm)= Measured power density/ 100KHz (dBm) + BWCF (dB)*

Bluetooth LE PSD Plot on Channel 00

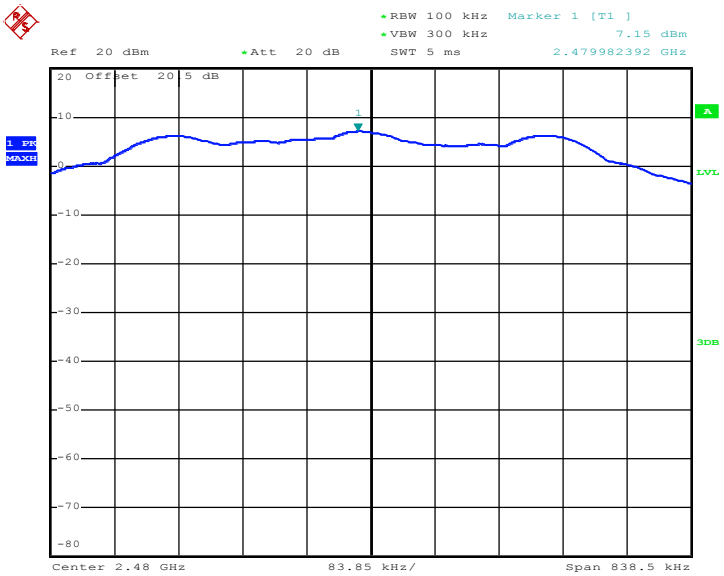


Bluetooth LE PSD Plot on Channel 19



Date: 14.MAY.2012 22:56:00

Bluetooth LE PSD Plot on Channel 39



Date: 15.MAY.2012 19:32:43

3.9 AC Conducted Emission Measurement

3.9.1 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 (dBuV)	
	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.

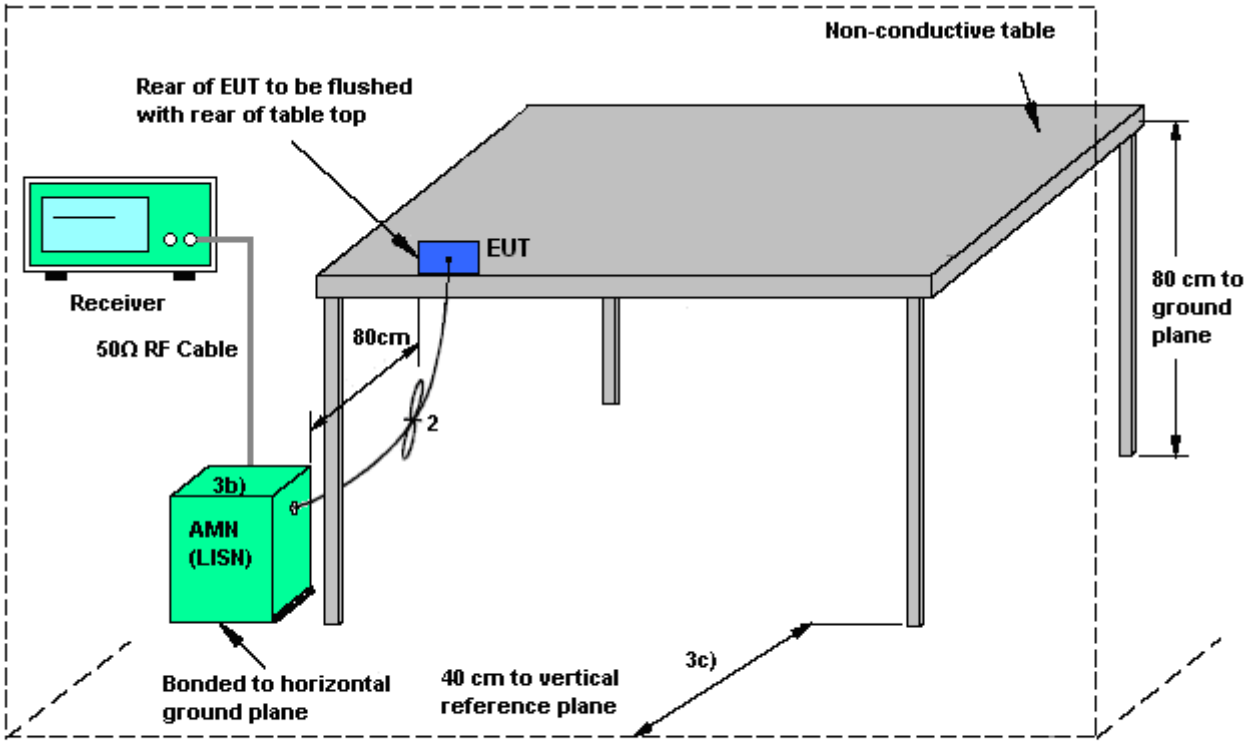
3.9.2 Measuring Instruments

See list of measuring instruments of this test report.

3.9.3 Test Procedures

1. Please follow the guidelines in ANSI C63.4-2003.
2. 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.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 KHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

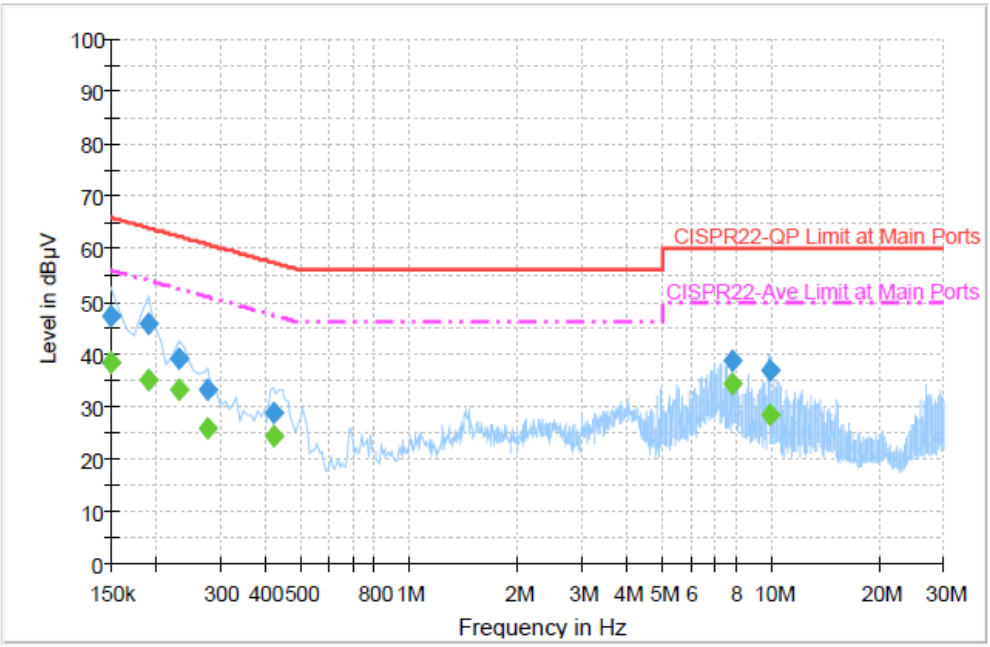
3.9.4 Test Setup



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

3.9.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	**Temperature :**	20~22℃
Test Engineer :	Slash Huang	**Relative Humidity :**	45~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	WLAN (2.4G) Link + Bluetooth Link for Antenna 1		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



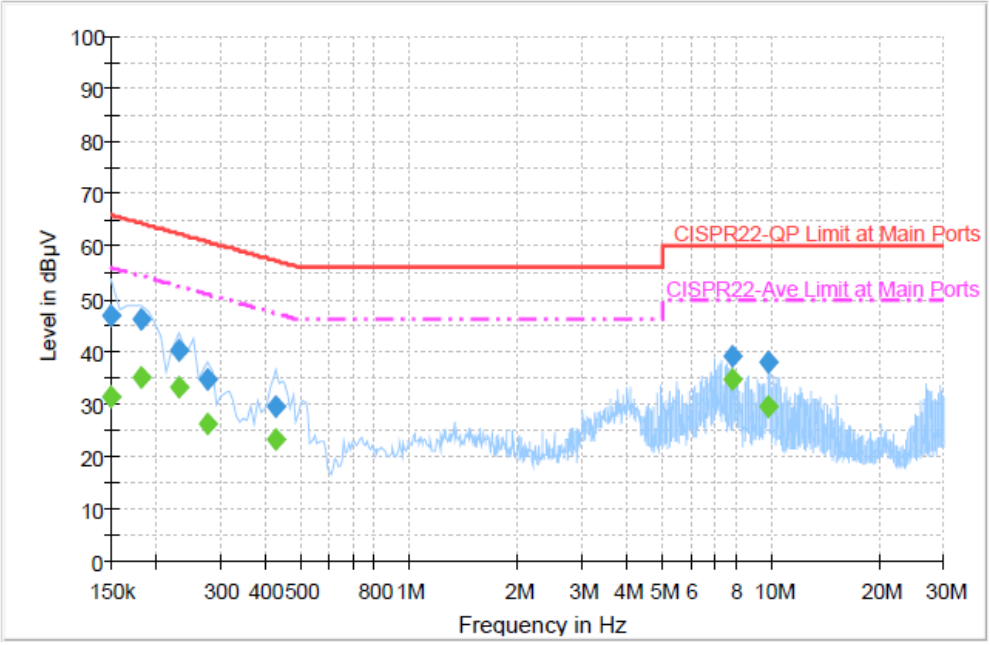
Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	47.2	Off	L1	19.4	18.8	66.0
0.190000	45.7	Off	L1	19.4	18.3	64.0
0.230000	39.3	Off	L1	19.4	23.1	62.4
0.278000	33.1	Off	L1	19.4	27.8	60.9
0.422000	28.6	Off	L1	19.5	28.8	57.4
7.806000	38.9	Off	L1	19.5	21.1	60.0
9.902000	36.9	Off	L1	19.6	23.1	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	38.5	Off	L1	19.4	17.5	56.0
0.190000	34.9	Off	L1	19.4	19.1	54.0
0.230000	33.0	Off	L1	19.4	19.4	52.4
0.278000	25.8	Off	L1	19.4	25.1	50.9
0.422000	24.5	Off	L1	19.5	22.9	47.4
7.806000	34.4	Off	L1	19.5	15.6	50.0
9.902000	28.3	Off	L1	19.6	21.7	50.0

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN (2.4G) Link + Bluetooth Link for Antenna 1		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Final Result : QuasiPeak

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	46.7	Off	N	19.4	19.3	66.0
0.182000	46.2	Off	N	19.4	18.2	64.4
0.230000	40.2	Off	N	19.5	22.2	62.4
0.278000	34.6	Off	N	19.4	26.3	60.9
0.430000	29.6	Off	N	19.5	27.7	57.3
7.806000	39.1	Off	N	19.6	20.9	60.0
9.846000	38.0	Off	N	19.6	22.0	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	31.5	Off	N	19.4	24.5	56.0
0.182000	35.0	Off	N	19.4	19.4	54.4
0.230000	33.3	Off	N	19.5	19.1	52.4
0.278000	26.1	Off	N	19.4	24.8	50.9
0.430000	23.1	Off	N	19.5	24.2	47.3
7.806000	34.7	Off	N	19.6	15.3	50.0
9.846000	29.6	Off	N	19.6	20.4	50.0

3.10 Radiated Emission Measurement

3.10.1 Limit of Radiated Emission

In any 100 KHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.10.2 Measuring Instruments

See list of measuring instruments of this test report.

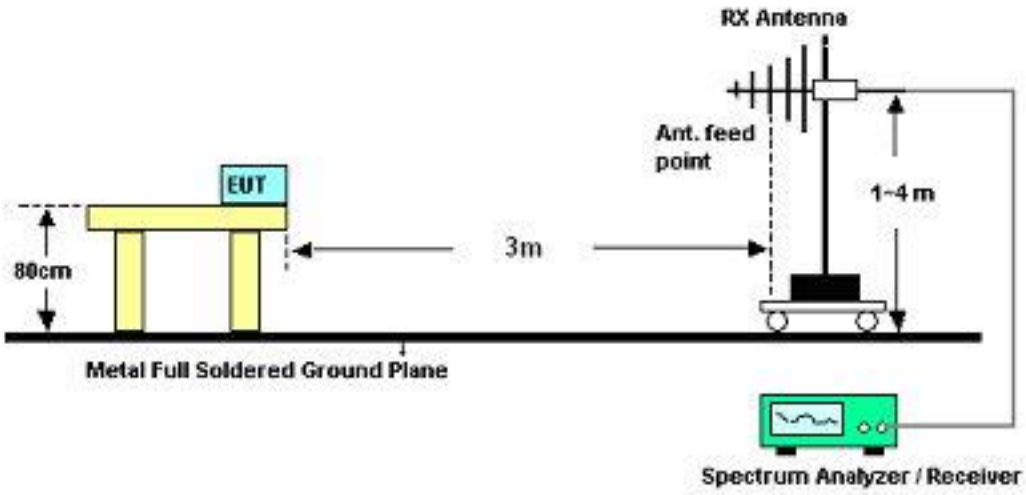
3.10.3 Test Procedures

1. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines in ANSI C63.4-2003.
2. The EUT was placed on a turntable with 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest radiation.
5. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW = 1 MHz for f ≥ 1 GHz, 100 KHz for f < 1 GHz; VBW ≥RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Measurement above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB per decade from 3m to 1m.

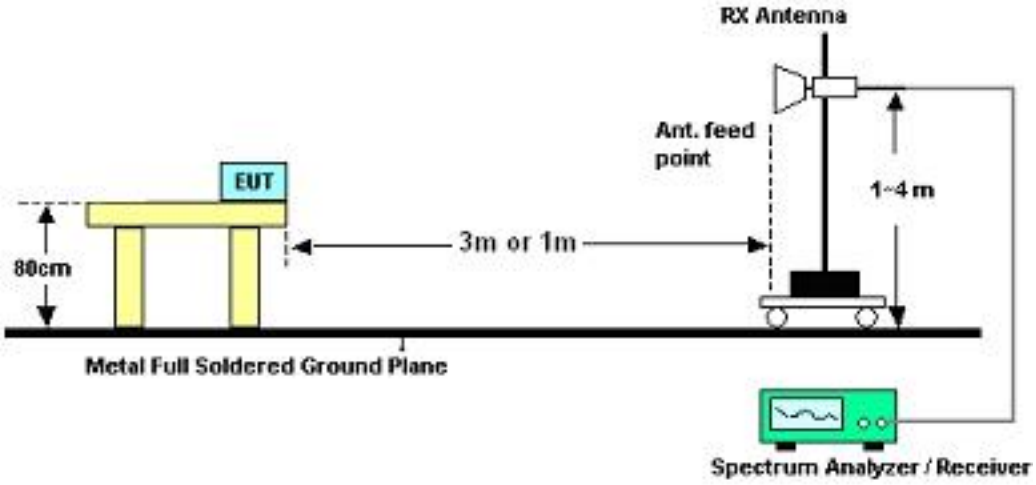
   Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. If the emission level of the EUT measured by the peak detector is more than 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported

3.10.4 Test Setup

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

Test Mode :	Mode 1	Temperature :	23~24°C
Test Channel :	00	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	2402 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2321.4	37.84	-16.16	54	46.88	31.96	4.53	35.9	193	290	Average
2321.4	47.47	-26.53	74	46.88	31.96	4.53	35.9	193	290	Peak
2402	81.96	-	-	81.22	32.02	4.58	35.86	193	290	Average
2402	99.22	-	-	98.48	32.02	4.58	35.86	193	290	Peak
2484	35.32	-18.68	54	34.4	32.09	4.64	35.81	193	290	Average
2484	47.81	-26.19	74	46.89	32.09	4.64	35.81	193	290	Peak

Test Mode :	Mode 1	Temperature :	23~24°C
Test Channel :	00	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	2402 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2347.62	35.24	-18.76	54	34.6	31.98	4.55	35.89	185	360	Average
2347.62	46.79	-27.21	74	46.15	31.98	4.55	35.89	185	360	Peak
2402	79.49	-	-	78.75	32.02	4.58	35.86	185	360	Average
2402	96.1	-	-	95.36	32.02	4.58	35.86	185	360	Peak
2498	34.97	-19.03	54	34.03	32.1	4.64	35.8	185	360	Average
2498	47.79	-26.21	74	46.85	32.1	4.64	35.8	185	360	Peak

Test Mode :	Mode 2	Temperature :	23~24°C
Test Channel :	39	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	2441 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2362	38.53	-15.47	54	37.86	31.99	4.57	35.89	102	236	Average
2362	48.23	-25.77	74	47.56	31.99	4.57	35.89	102	236	Peak
2441	84.52	-	-	83.68	32.06	4.61	35.83	102	236	Average
2441	102.25	-	-	101.41	32.06	4.61	35.83	102	236	Peak
2490	37.4	-16.6	54	36.47	32.1	4.64	35.81	102	236	Average
2490	47.61	-26.39	74	46.68	32.1	4.64	35.81	102	236	Peak

Test Mode :	Mode 2	Temperature :	23~24°C
Test Channel :	39	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	2441 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2362	36.46	-17.54	54	35.79	31.99	4.57	35.89	113	6	Average
2362	46.95	-27.05	74	46.28	31.99	4.57	35.89	113	6	Peak
2441	81.29	-	-	80.45	32.06	4.61	35.83	113	6	Average
2441	98.28	-	-	97.44	32.06	4.61	35.83	113	6	Peak
2490	35.6	-18.4	54	34.67	32.1	4.64	35.81	113	6	Average
2490	46.43	-27.57	74	45.5	32.1	4.64	35.81	113	6	Peak

Test Mode :	Mode 3	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30.27	22.73	-17.27	40	33.87	19.8	0.7	31.64	-	-	Peak
199.29	40.35	-3.15	43.5	60.91	9.1	1.46	31.12	100	24	Peak
300	40.73	-5.27	46	56.49	13.4	1.78	30.94	-	-	Peak
332.9	40.24	-5.76	46	55.56	13.88	1.86	31.06	-	-	Peak
435.1	36.48	-9.52	46	48.56	16.81	2.1	30.99	-	-	Peak
720	28.8	-17.2	46	34.71	21.6	2.69	30.2	-	-	Peak
2348	35.52	-18.48	54	34.88	31.98	4.55	35.89	102	253	Average
2348	47.06	-26.94	74	46.42	31.98	4.55	35.89	102	253	Peak
2480	85.34	-	-	84.42	32.09	4.64	35.81	102	253	Average
2480	103.57	-	-	102.65	32.09	4.64	35.81	102	253	Peak
2483.5	50.83	-3.17	54	49.91	32.09	4.64	35.81	102	253	Average
2483.5	63.11	-10.89	74	62.19	32.09	4.64	35.81	102	253	Peak

Test Mode :	Mode 3	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
39.45	33.48	-6.52	40	51.02	13.3	0.75	31.59	100	36	Peak
69.15	29.14	-10.86	40	53.54	6.22	0.9	31.52	-	-	Peak
213.6	30.82	-12.68	43.5	51.2	9.23	1.51	31.12	-	-	Peak
620.6	30.8	-15.2	46	38.08	20.51	2.49	30.28	-	-	Peak
656.3	33.65	-12.35	46	40.94	20.23	2.6	30.12	-	-	Peak
720	31.23	-14.77	46	37.14	21.6	2.69	30.2	-	-	Peak
2354	35.19	-18.81	54	34.54	31.99	4.55	35.89	111	7	Average
2354	46.62	-27.38	74	45.97	31.99	4.55	35.89	111	7	Peak
2480	84.36	-	-	83.44	32.09	4.64	35.81	111	7	Average
2480	102.02	-	-	101.1	32.09	4.64	35.81	111	7	Peak
2483.5	49.53	-4.47	54	48.61	32.09	4.64	35.81	111	7	Average
2483.5	61.4	-12.6	74	60.48	32.09	4.64	35.81	111	7	Peak

Test Mode :	Mode 4	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
162.03	22.79	-20.71	43.5	42.29	10.34	1.35	31.19	-	-	Peak
199.29	40.13	-3.37	43.5	60.69	9.1	1.46	31.12	-	-	Peak
300	41.38	-4.62	46	57.14	13.4	1.78	30.94	-	-	Peak
331.5	42.9	-3.1	46	58.22	13.85	1.86	31.03	100	73	Peak
396.6	36.1	-9.9	46	49.42	15.85	2	31.17	-	-	Peak
766.2	28.86	-17.14	46	33.91	22.24	2.78	30.07	-	-	Peak
2362	34.98	-19.02	54	34.31	31.99	4.57	35.89	137	201	Average
2362	46.93	-27.07	74	46.26	31.99	4.57	35.89	137	201	Peak
2480	83.27	-	-	82.35	32.09	4.64	35.81	137	201	Average
2480	100.54	-	-	99.62	32.09	4.64	35.81	137	201	Peak
2483.5	48.6	-5.4	54	47.68	32.09	4.64	35.81	137	201	Average
2483.5	59.88	-14.12	74	58.96	32.09	4.64	35.81	137	201	Peak
4960	49.03	-24.97	74	67.3	33.81	6.57	58.65	100	0	Peak

Test Mode :	Mode 4	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
39.72	33.42	-6.58	40	50.96	13.3	0.75	31.59	100	52	Peak
68.88	29.46	-10.54	40	53.86	6.22	0.9	31.52	-	-	Peak
212.79	28.07	-15.43	43.5	48.46	9.22	1.51	31.12	-	-	Peak
332.2	31.85	-14.15	46	47.15	13.88	1.86	31.04	-	-	Peak
621.3	32.17	-13.83	46	39.43	20.52	2.49	30.27	-	-	Peak
664	33.39	-12.61	46	40.67	20.25	2.61	30.14	-	-	Peak
2330	36.82	-17.18	54	36.23	31.96	4.53	35.9	100	161	Average
2330	46.74	-27.26	74	46.15	31.96	4.53	35.9	100	161	Peak
2480	85.8	-	-	84.88	32.09	4.64	35.81	100	161	Average
2480	103.82	-	-	102.9	32.09	4.64	35.81	100	161	Peak
2483.5	50.98	-3.02	54	50.06	32.09	4.64	35.81	100	161	Average
2483.5	63.33	-10.67	74	62.41	32.09	4.64	35.81	100	161	Peak
4960	46.6	-27.4	74	64.87	33.81	6.57	58.65	100	0	Peak

Test Mode :	Mode 5	Temperature :	23~24°C
Test Channel :	00	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	2402 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2321.78	47.55	-6.45	54	46.96	31.96	4.53	35.9	117	163	Average
2321.78	54.65	-19.35	74	54.06	31.96	4.53	35.9	117	163	Peak
2402	85.55	-	-	84.81	32.02	4.58	35.86	117	163	Average
2402	100.47	-	-	99.73	32.02	4.58	35.86	117	163	Peak
2496	35.44	-18.56	54	34.5	32.1	4.64	35.8	117	163	Average
2496	48.73	-25.27	74	47.79	32.1	4.64	35.8	117	163	Peak
4995	44.03	-29.97	74	62.21	33.8	6.58	58.56	100	0	Peak

Test Mode :	Mode 5	Temperature :	23~24°C
Test Channel :	00	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	2402 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2321.59	39.25	-14.75	54	38.66	31.96	4.53	35.9	147	127	Average
2321.59	48.94	-25.06	74	48.35	31.96	4.53	35.9	147	127	Peak
2402	77.61	-	-	76.87	32.02	4.58	35.86	147	127	Average
2402	89.8	-	-	89.06	32.02	4.58	35.86	147	127	Peak
2492	34.9	-19.1	54	33.96	32.1	4.64	35.8	147	127	Average
2492	46.07	-27.93	74	45.13	32.1	4.64	35.8	147	127	Peak
4989	46.77	-27.23	74	64.95	33.8	6.58	58.56	100	0	Peak

Test Mode :	Mode 6	Temperature :	23~24°C
Test Channel :	39	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	2441 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2362	46.38	-7.62	54	45.71	31.99	4.57	35.89	113	161	Average
2362	53.58	-20.42	74	52.91	31.99	4.57	35.89	113	161	Peak
2441	85.02	-	-	84.18	32.06	4.61	35.83	113	161	Average
2441	99.83	-	-	98.99	32.06	4.61	35.83	113	161	Peak
2496	36.3	-17.7	54	35.36	32.1	4.64	35.8	113	161	Average
2496	50.01	-23.99	74	49.07	32.1	4.64	35.8	113	161	Peak
4983	44.38	-29.62	74	62.61	33.8	6.58	58.61	100	0	Peak

Test Mode :	Mode 6	Temperature :	23~24°C
Test Channel :	39	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	2441 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2362	35.18	-18.82	54	34.51	31.99	4.57	35.89	144	84	Average
2362	48.46	-25.54	74	47.79	31.99	4.57	35.89	144	84	Peak
2441	78.07	-	-	77.23	32.06	4.61	35.83	144	84	Average
2441	90.81	-	-	89.97	32.06	4.61	35.83	144	84	Peak
2498	35.18	-18.82	54	34.24	32.1	4.64	35.8	144	84	Average
2498	47.66	-26.34	74	46.72	32.1	4.64	35.8	144	84	Peak
4998	47.48	-26.52	74	65.65	33.8	6.59	58.56	100	0	Peak

Test Mode :	Mode 7	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2358	34.98	-19.02	54	34.31	31.99	4.57	35.89	113	22	Average
2358	47.12	-26.88	74	46.45	31.99	4.57	35.89	113	22	Peak
2480	84.84	-	-	83.92	32.09	4.64	35.81	113	22	Average
2480	99.17	-	-	98.25	32.09	4.64	35.81	113	22	Peak
2483.5	48.34	-5.66	54	47.42	32.09	4.64	35.81	113	22	Average
2483.5	57.95	-16.05	74	57.03	32.09	4.64	35.81	113	22	Peak
4983	43.76	-30.24	74	61.99	33.8	6.58	58.61	100	0	Peak

Test Mode :	Mode 7	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2382	34.67	-19.33	54	33.97	32	4.58	35.88	172	93	Average
2382	46.83	-27.17	74	46.13	32	4.58	35.88	172	93	Peak
2480	77.09	-	-	76.17	32.09	4.64	35.81	172	93	Average
2480	89.76	-	-	88.84	32.09	4.64	35.81	172	93	Peak
2483.5	41.08	-12.92	54	40.16	32.09	4.64	35.81	172	93	Average
2483.5	49.4	-24.6	74	48.48	32.09	4.64	35.81	172	93	Peak
4980	47.4	-26.6	74	65.63	33.8	6.58	58.61	100	0	Peak

Test Mode :	Mode 8	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2386	32.36	-21.64	54	31.64	32.02	4.58	35.88	110	160	Average
2386	45.19	-28.81	74	44.47	32.02	4.58	35.88	110	160	Peak
2480	84.1	-	-	83.18	32.09	4.64	35.81	110	160	Average
2480	99.58	-	-	98.66	32.09	4.64	35.81	110	160	Peak
2483.5	47.86	-6.14	54	46.94	32.09	4.64	35.81	110	160	Average
2483.5	57.57	-16.43	74	56.65	32.09	4.64	35.81	110	160	Peak
4995	44.13	-29.87	74	62.31	33.8	6.58	58.56	100	0	Peak

Test Mode :	Mode 8	Temperature :	23~24°C
Test Channel :	78	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2336	31.88	-22.12	54	31.25	31.98	4.55	35.9	127	130	Average
2336	45.66	-28.34	74	45.03	31.98	4.55	35.9	127	130	Peak
2480	76.3	-	-	75.38	32.09	4.64	35.81	127	130	Average
2480	89.01	-	-	88.09	32.09	4.64	35.81	127	130	Peak
2483.5	39.97	-14.03	54	39.05	32.09	4.64	35.81	127	130	Average
2483.5	48.12	-25.88	74	47.2	32.09	4.64	35.81	127	130	Peak
4995	45.89	-28.11	74	64.07	33.8	6.58	58.56	100	0	Peak

3.11 Antenna Requirements

3.11.1 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.

3.11.2 Antenna Connected Construction

The antennas type used in this product is Antenna 1 : PIFA Antenna with IPEX connector and Antenna 2 : Dipole Antenna with Reverse-SMA type RF connector. And it is considered to meet antenna requirement.

3.11.3 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
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 13, 2011	Apr. 25, 2012 ~ May 14, 2012	Jun. 12, 2012	Conducted (TH02-HY)
EMI Test Receive	R&S	ESCS 30	100356	9KHz ~ 2.75GHz	Oct. 27, 2011	Apr. 26, 2012	Oct. 26, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz ~ 30MHz	Dec. 09, 2011	Apr. 26, 2012	Dec. 08, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz ~ 30MHz	Dec. 06, 2011	Apr. 26, 2012	Dec. 05, 2012	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Apr. 26, 2012	N/A	Conduction (CO05-HY)
Spectrum Analyzer	R&S	ESU26	100390	20Hz ~ 26.5GHz	Dec. 22, 2011	Apr. 14, 2012 ~ May 18, 2012	Dec. 21, 2012	Radiation (03CH05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2725	30MHz ~ 2GHz	Oct. 22, 2011	Apr. 14, 2012 ~ May 18, 2012	Oct. 21, 2012	Radiation (03CH05-HY)
Turn Table	HD	Deis HD 2000	420/611	0 ~ 360 degree	N/A	Apr. 14, 2012 ~ May 18, 2012	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	MA 240	240/666	1 m ~ 4 m	N/A	Apr. 14, 2012 ~ May 18, 2012	N/A	Radiation (03CH05-HY)
Horn Antenna	ESCO	3117	66584	1GHz ~ 18GHz	Aug. 04, 2011	Apr. 14, 2012 ~ May 18, 2012	Aug. 03, 2012	Radiation (03CH05-HY)
Pre Amplifier	COM-POWER	PA-103A	161075	10Hz ~ 1000MHz Gain:32dB	Feb. 27, 2012	Apr. 14, 2012 ~ May 18, 2012	Feb. 26, 2013	Radiation (03CH05-HY)
Pre Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	159087	1GHz~18GHz	Feb. 27, 2012	Apr. 14, 2012 ~ May 18, 2012	Feb. 26, 2013	Radiation (03CH05-HY)
Pre Amplifier	Agilent	8449B	3008A019 17	1GHz~26.5GHz	Aug. 30, 2011	Apr. 14, 2012 ~ May 18, 2012	Aug. 29, 2012	Radiation (03CH05-HY)

5 Uncertainty of Evaluation

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.10	Normal (k=2)	0.05
Cable Loss	0.10	Normal (k=2)	0.05
AMN Insertion Loss	2.50	Rectangular	0.63
Receiver Specification	1.50	Rectangular	0.43
Site Imperfection	1.39	Rectangular	0.80
Mismatch	+0.34 / -0.35	U-Shape	0.24
Combined Standard Uncertainty Uc(y)	**1.13**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.26**		

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
Combined Standard Uncertainty Uc(y)	**1.27**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.54**		

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Contribution	Uncertainty of X_i		$u(X_i)$	C_i	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	±0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	±1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	±0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site Imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR Γ1 = 0.197 Antenna VSWR Γ2 = 0.194 Uncertainty = 20Log(1-Γ1*Γ2)	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty Uc(y)	**2.36**				
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**				

Appendix A. Photographs of EUT

Please refer to Sporton report number EP240322 as below.