FCC RF Test Report

APPLICANT	:	Motorola Solutions, Inc.
EQUIPMENT	:	CONCIERGE HUB
BRAND NAME	:	Motorola
MODEL NAME	:	CCHUB1
FCC ID	:	UZ7CCHUB1
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter

The product was received on Dec. 12, 2012 and completely tested on Dec. 22, 2012. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures 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

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR2D1407A	Rev. 01	Initial issue of report	Feb. 22, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	RSS-210 A8.4(2)	Number of Channels	≥ 15Chs	Pass	-
3.2	15.247(a)(1)	RSS-210 A8.1(b)	Hopping Channel Separation	≥ 2/3 of 20dB BW	Pass	-
3.3	15.247(a)(1)	RSS-210 A8.1(d)	Dwell Time of Each Channel	≤ 0.4sec in 31.6sec period	Pass	-
3.4	15.247(a)(1)	RSS-210 A8.1(a)	20dB Bandwidth	NA	Pass	-
3.4	-	RSS-Gen 4.6.1	99% Bandwidth	-	Pass	-
3.5	15.247(b)(1)	RSS-210 A8.1(b)	Peak Output Power	≤ 1 W for 1Mbps ≤ 125 mW for 2, 3Mbps	Pass	-
3.6	15.247(d)	RSS-210 A8.5	Conducted Band Edges	≤ 20dBc	Pass	-
3.7	15.247(d)	RSS-210 A8.5	Conducted Spurious Emission	≤ 20dBc	Pass	-
3.8	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 7.12 dB at 33.240 MHz
3.9	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 17.89 dB at 0.169 MHz
3.10	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Motorola Solutions, Inc.
One Motorola Plaza, Holtsville, NY 11742-1300 USA

1.2 Manufacturer

Motorola Solutions, Inc.
One Motorola Plaza, Holtsville, NY 11742-1300 USA

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	CONCIERGE HUB
Brand Name	Motorola
Model Name	CCHUB1
FCC ID	UZ7CCHUB1
EUT supports Radios application	WLAN 11abgn / Bluetooth 2.1
HW Version	EV2 (Rev 3.0)
SW Version	90-4AI17-DEV-0600-00-EV-112712
FW Version	3.0.31
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

Product Specification subjective to this standard	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	Bluetooth (1Mbps) : -1.33 dBm (0.0007 W) Bluetooth EDR (2Mbps) : -0.86 dBm (0.0008 W) Bluetooth EDR (3Mbps) : -0.29 dBm (0.0009 W)
99% Occupied Bandwidth	Bluetooth (1Mbps) : 0.860MHz Bluetooth EDR (2Mbps) : 1.192MHz Bluetooth EDR (3Mbps) : 1.204MHz
Antenna Type	PCB Antenna type with gain 3.15 dBi
Type of Modulation	Bluetooth 2.1 BDR (1Mbps) : GFSK Bluetooth 2.1 EDR (2Mbps) : π/4-DQPSK Bluetooth 2.1 EDR (3Mbps) : 8-DPSK

1.5 Testing Site

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.**
	TH02-HY	03CH05-HY	722060/4086B-1

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 30-2, Dingfu Tsuen, Linkou Shiang, New Taipei City, Taiwan 244, R.O.C. TEL: +886-2-2603-5367 / +886-2-2601-1640 FAX: +886-2-2601-1695
Test Site No.	**Sporton Site No.**
	CO01-LK

1.6 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 Public Notice DA 00-705
- ANSI C63.4-2003 and ANSI C63.10-2009
- IC RSS-210 Issue 8
- IC RSS-Gen Issue 3
- NOTICE 2012-DRS0126

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.
3. Per the section 2.2.3 of Notice of 2012-DRS0126, " Receivers Excluded from Industry Canada Requirements", only radiocommunication receivers operating in stand-alone mode within the band 30-960 MHz and scanner receivers are subject to Industry Canada requirements.

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

Preliminary tests were performed in different data rates and recorded the RF output power in the following table:

Channel	Frequency	Bluetooth RF Peak Output Power		
		GFSK / 1Mbps		
		DH1	DH3	DH5
Ch00	2402MHz	-1.97 dBm	-1.99 dBm	-1.97 dBm
Ch39	2441MHz	-1.85 dBm	-1.87 dBm	-1.88 dBm
Ch78	2480MHz	-1.39 dBm	-1.36 dBm	**-1.33** dBm

Channel	Frequency	Bluetooth RF Peak Output Power		
		π /4-DQPSK / 2Mbps		
		2DH1	2DH3	2DH5
Ch00	2402MHz	-1.53 dBm	-1.53 dBm	-1.55 dBm
Ch39	2441MHz	-1.41 dBm	-1.41 dBm	-1.38 dBm
Ch78	2480MHz	**-0.86** dBm	-0.89 dBm	-0.88 dBm

Channel	Frequency	Bluetooth RF Peak Output Power		
		8-DPSK / 3Mbps		
		3DH1	3DH3	3DH5
Ch00	2402MHz	-0.85 dBm	-0.83 dBm	-0.83 dBm
Ch39	2441MHz	-0.72 dBm	-0.72 dBm	-0.73 dBm
Ch78	2480MHz	-0.30 dBm	-0.30 dBm	**-0.29** dBm

Remark:

1. All the test data for each data rate were verified, and recorded in this report.

2. The data rate was set in 3Mbps for all the test items due to the highest RF output power.

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and ANSI C63.10-2009 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).

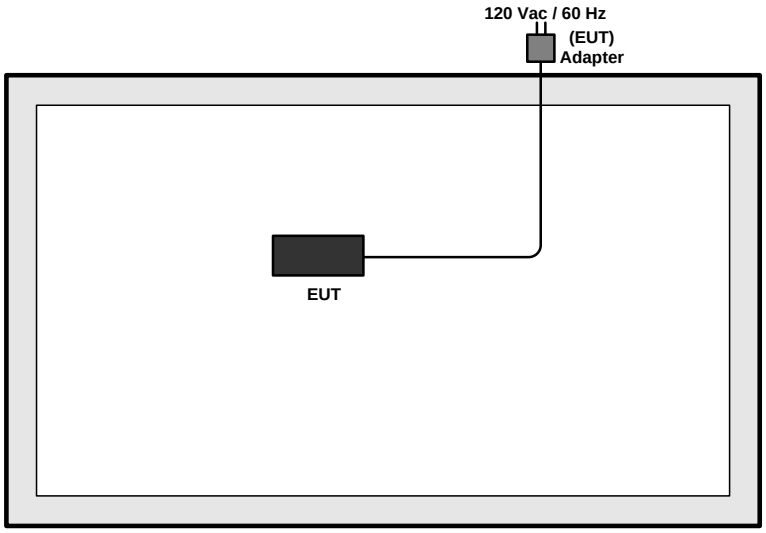
2.2 Test Mode

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

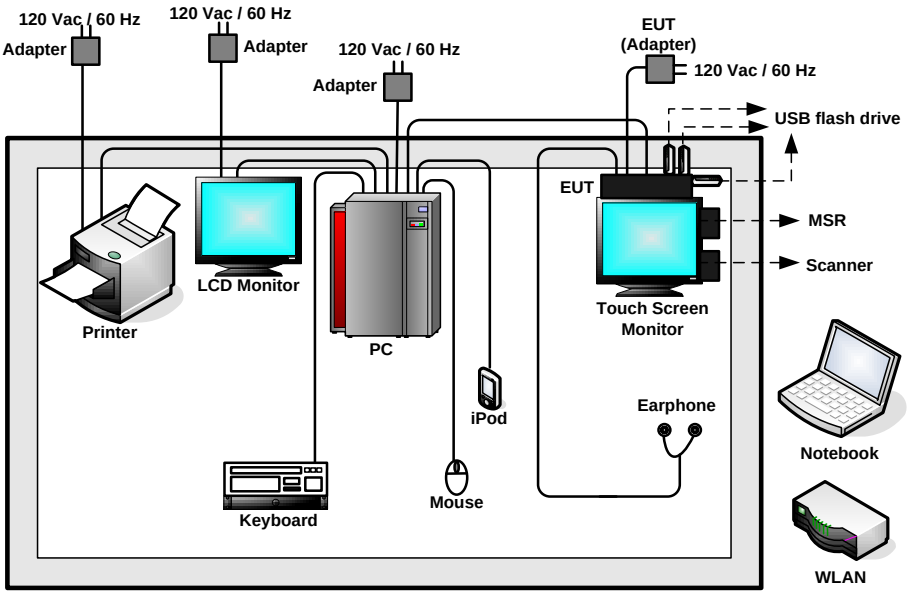
Summary table of Test Cases			
Test Item	**Data Rate / Modulation**		
	Bluetooth 1Mbps GFSK	**Bluetooth EDR 2Mbps π/4-DQPSK**	**Bluetooth EDR 3Mbps 8-DPSK**
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated Test Cases	**Bluetooth EDR 3Mbps 8-DPSK**		
	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz		
AC Conducted Emission	Mode 1 :WLAN Link + Bluetooth Link + MSR (Barcode Scanner) + Scanner (Touch Screen) + MPEG4 + Earphone (Audio In) + Camera (Video) + SD Card (Data Copy) + USB flash drive (Data Copy) + RJ45 Load		
Remark: For radiated test cases, the worst mode data rate 3Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and the conducted spurious emissions and conducted band edge measurement for each data rate are no worse than 3Mbps, and no other significantly frequencies found in conducted spurious emission.			

2.3 Connection Diagram of Test System

<Bluetooth 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.	AP	BUFFALO	WHR-HP-G54	FDI-09101577-0	N/A	N/A
2.	Bluetooth Earphone	NOKIA	BH-102	PYAHS-107W	N/A	N/A
3.	PC	DELL	DCTA	FCC DoC	N/A	Unshielded, 1.8 m
4.	PC	ASUS	AS-D795	FCC DoC	N/A	Unshielded, 1.8 m
5.	LCD Monitor	DELL	2410f	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
6.	Touch Screen Monitor	PLANAR	PX2230MW	FCC DoC	D-Shielded, 1.5m	Braid-Shielded, 0.3m
7.	CRT Monitor	SONY	GDM-17SE2T	AK8GDM17SE2T	D-Shielded, 1.15m	Unshielded, 1.8 m
8.	Printer	EPSON	C2642A	B94C2642X	Shielded, 1.8 m	Unshielded, 1.8 m
9.	(USB) Keyboard	DELL	SK-8175	FCC DoC	AL-F-Shielded, 1.8m	N/A
10.	(PS2) Keyboard	COMPAQ	6511-VA	FCC DoC	AL-F-Shielded, 1.6m	N/A
11.	USB Mouse	DELL	MOC5UO	FCC DoC	AL-F-Shielded, 1.85m	N/A
12.	Mouse	COMPAQ	M-S69	FCC DoC	AL-F-Shielded, 1.7m	N/A
13.	iPod	APPLE	A1137	FCC DoC	D-Shielded, 1.0m	N/A
14.	Earphone	Tsannkuen 3C	MIC03	N/A	Unshielded, 1.8 m	N/A
15.	USB Dongle	D-Link	DWL-G132	KA2DWLG132A1	N/A	N/A
16.	MSR	Motorola	IDRE-335133B	FCC DoC	D-Shielded, 1.9m	N/A
17.	Scanner	Motorola	CCSCN1	N/A	D-Shielded, 2m	N/A
18.	USB flash drive	Transcend	8G	N/A	N/A	N/A
19.	SD Card	SanDisk	32G	N/A	N/A	N/A
20.	IC Card	TAIWAN COOPERATIVE BANK	ATM Card	N/A	N/A	N/A

2.5 Description of RF Function Operation Test Setup

For Bluetooth function, the RF utility, “AT Command” was installed in notebook to make the EUT provides 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.

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.

Example :

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

For radiated band edges and spurious emission test :

Per part 15.35(c), the EUT Bluetooth average emission level could be determined by the peak emission level applying duty cycle correction factor, to represent averaging over the whole pulse train.

The average level is derived from the peak level corrected with “Duty cycle correction factor”.

Average Emission Level(dBμV/m) = Peak Emission Level(dBμV/m) + Duty cycle correction factor(dB)

*Duty cycle correction factor(dB) = 20 * log(Duty cycle).*
Duty cycle = On time / 100 milliseconds
On time = worst case dwell time * hopping number in 100 ms

For example : bluetooth with worst case dwell time 2.9ms and 2 hops in 100 ms, then
Duty cycle correction factor(dB) = 20 * log((2.9 * 2) / 100) = -24.73 dB

Following shows an average computation example with duty cycle correction factor = -24.73dB, and the peak emission level is 45.61 dBμV/m.

Example :
Average Emission Level(dBμV/m) = Peak Emission Level(dBμV/m) + duty cycle correction factor(dB)
= 45.61 + (-24.73) = 20.88 (dBμV/m)

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 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. Enable the EUT hopping function.
5. 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.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

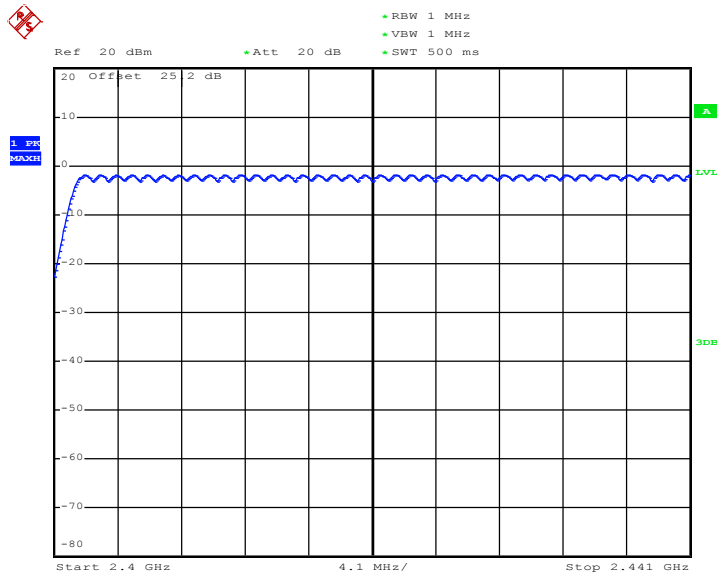
3.1.4 Test Setup

3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

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

Number of Hopping Channel Plot on Channel 00 - 78



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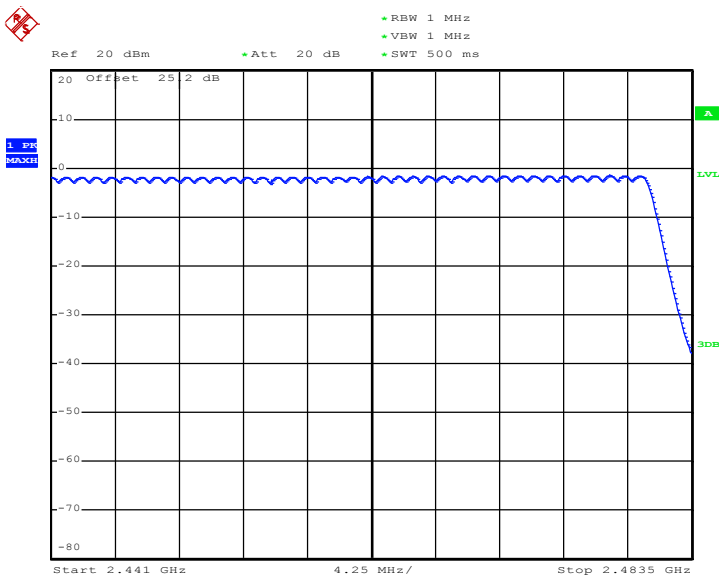

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3.2 Hopping Channel Separation Measurement

3.2.1 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.

3.2.2 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 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. Enable the EUT hopping function.
5. 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.
6. Measure and record the results in the test report.

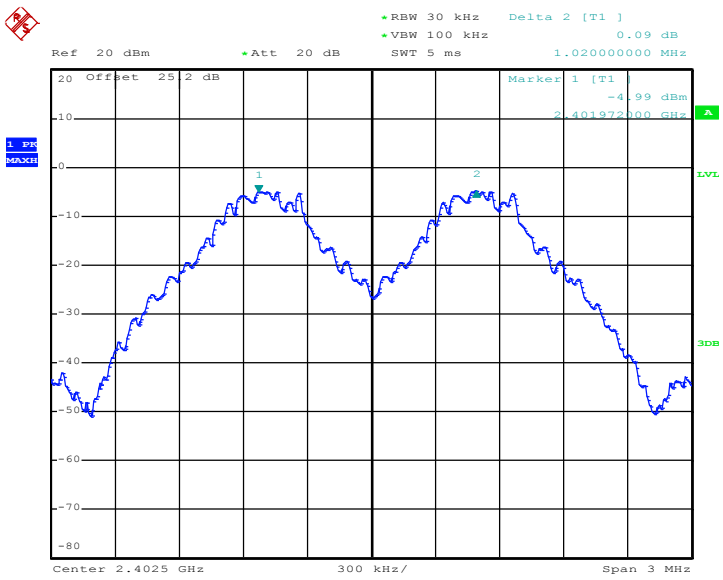
3.2.4 Test Setup

3.2.5 Test Result of Hopping Channel Separation

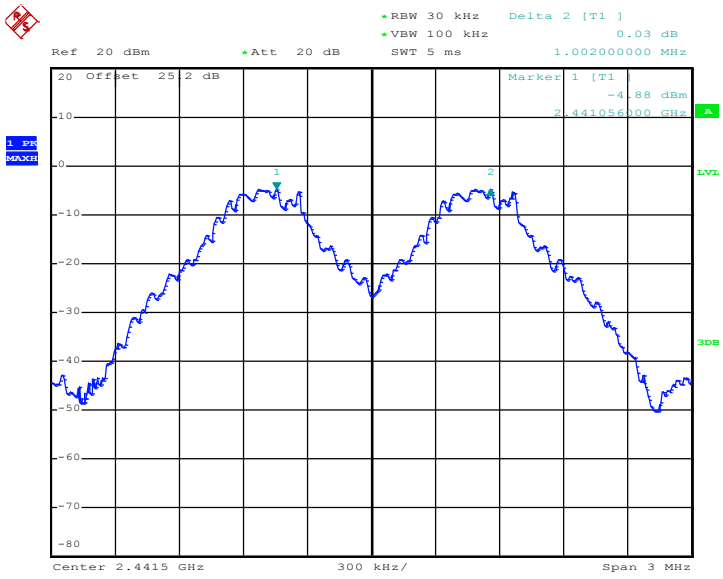
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.020	0.6373	Pass
39	2441	1.002	0.6373	Pass
78	2480	1.002	0.6347	Pass

Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



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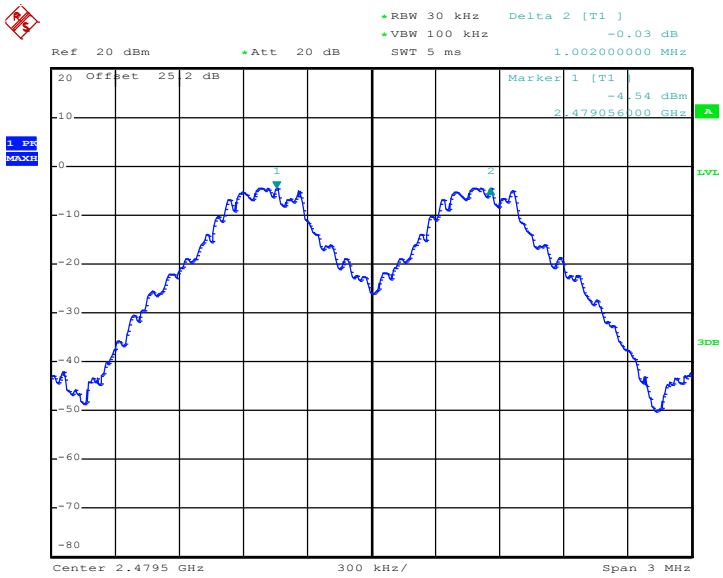
Channel Separation Plot on Channel 77 - 78



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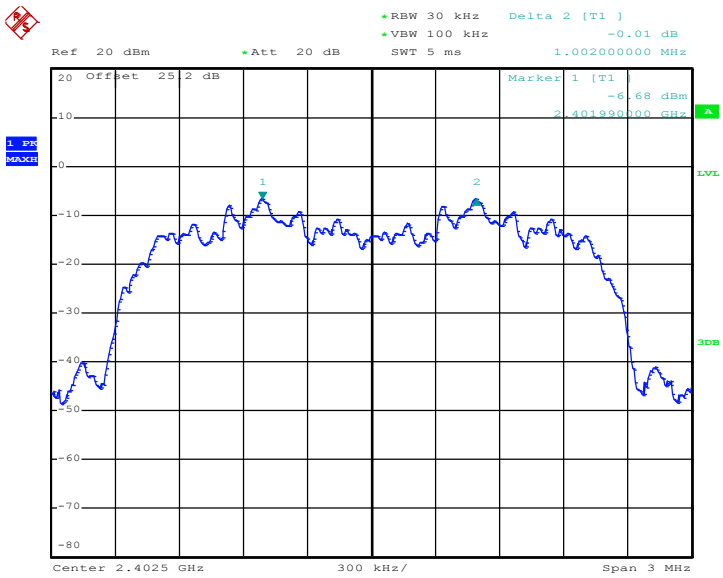
Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8840	Pass
39	2441	1.002	0.8840	Pass
78	2480	1.002	0.8840	Pass

Channel Separation Plot on Channel 00 - 01



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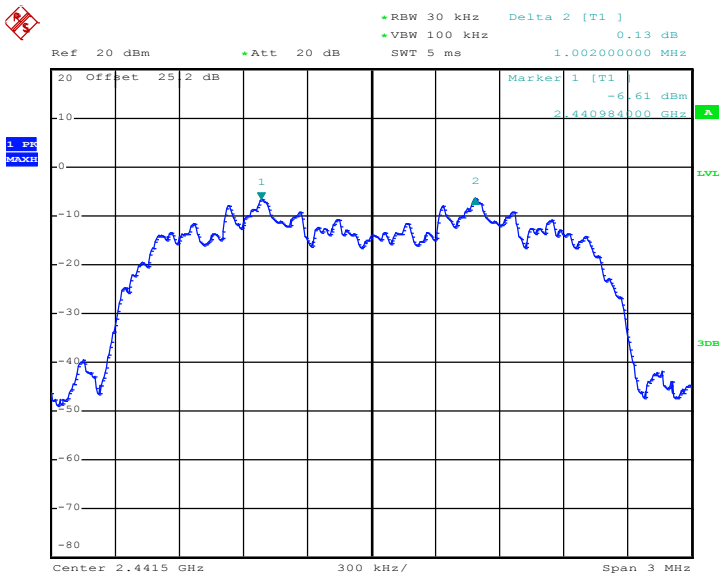
Channel Separation Plot on Channel 39 - 40



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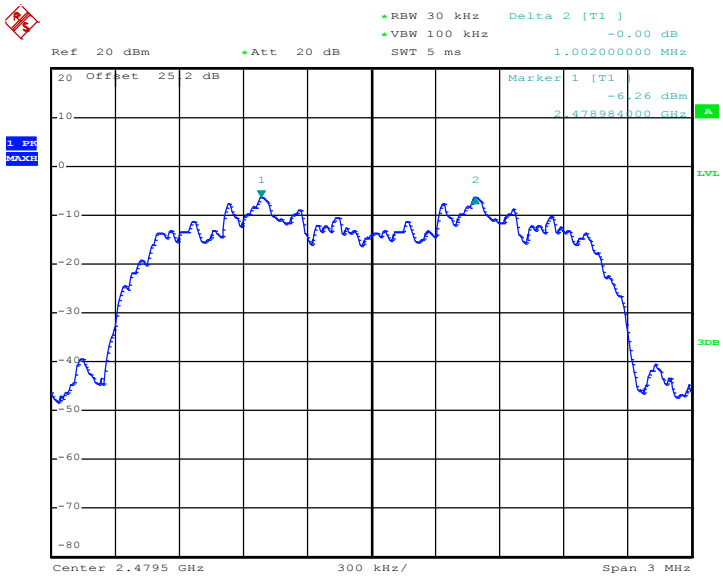
Channel Separation Plot on Channel 77 - 78



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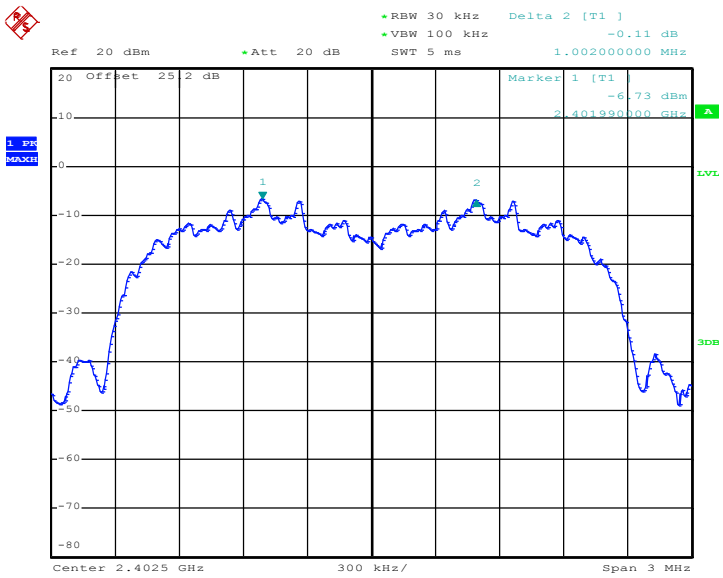
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8920	Pass
39	2441	1.002	0.8880	Pass
78	2480	1.002	0.8880	Pass

Channel Separation Plot on Channel 00 - 01



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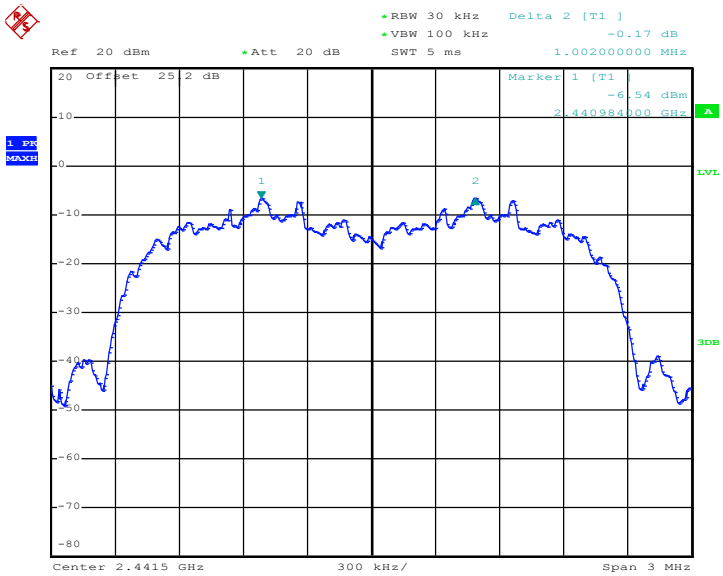
Channel Separation Plot on Channel 39 - 40



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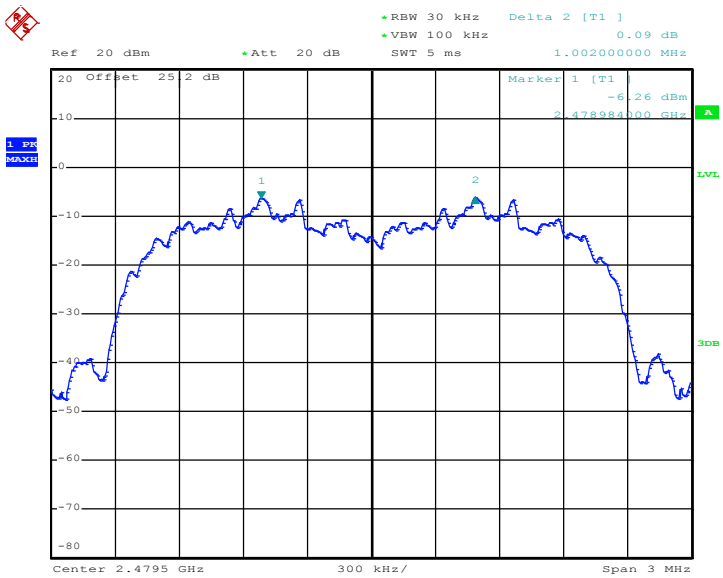
Channel Separation Plot on Channel 77 - 78



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3.3 Dwell Time Measurement

3.3.1 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.

3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 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 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. Enable the EUT hopping function.
5. 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.
6. Measure and record the results in the test report.

3.3.4 Test Setup

3.3.1 Test Result of Dwell Time

Test Mode :	DH5	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

Mode	Hopping Channel Number	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Normal	79	106.67	2.960	0.32	0.4	Pass
AFH	20	53.34	2.960	0.16	0.4	Pass

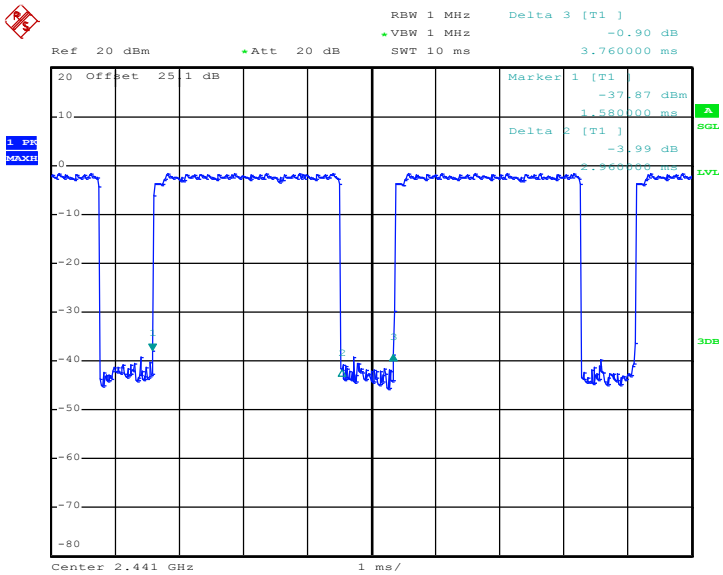
Remark:

1. In normal mode, hopping rate is 1600hops/s with 6 slots in 79 hopping channels.
With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s),
Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.

2. In AFH mode, hopping rate is 800hops/s with 6 slots in 20 hopping channels.
With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s),
Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.34 hops.

3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

Package Transfer Time Plot



3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

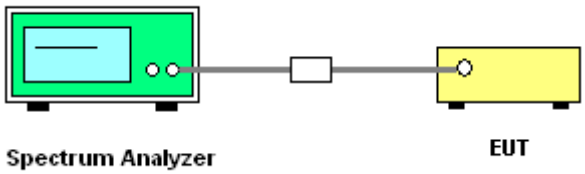
3.4.2 Measuring Instruments

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 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. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
   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. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
   For 99% Bandwidth measurement, the RBW=30kHz, and VBW = 100kHz. Sweep = auto ;
   Detector function = sample. Trace = max hold.
6. Measure and record the results in the test report.

3.4.4 Test Setup

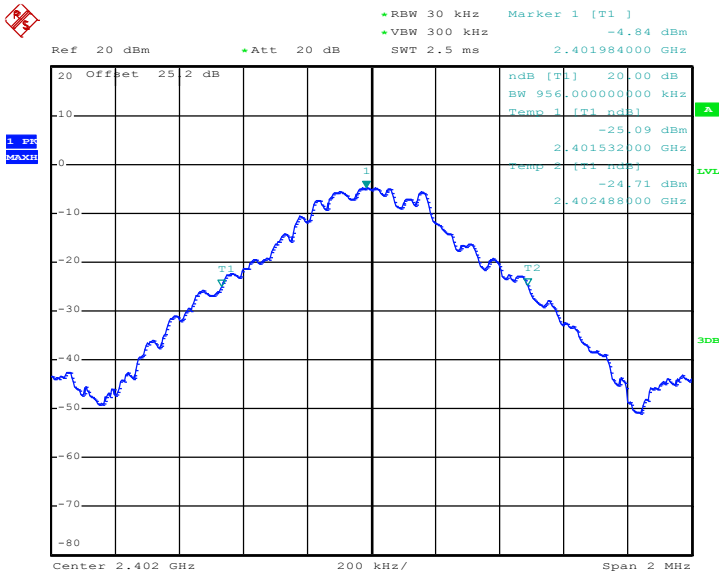


3.4.5 Test Result of 20dB Bandwidth

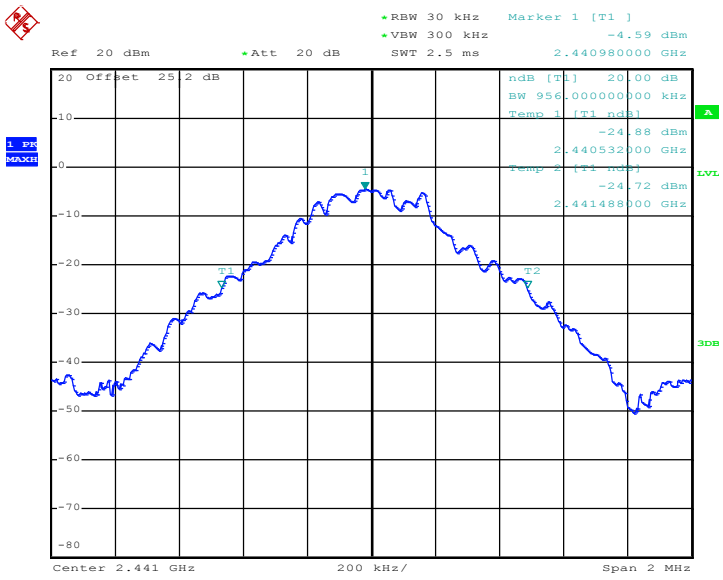
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.956
39	2441	0.956
78	2480	0.952

20 dB Bandwidth Plot on Channel 00

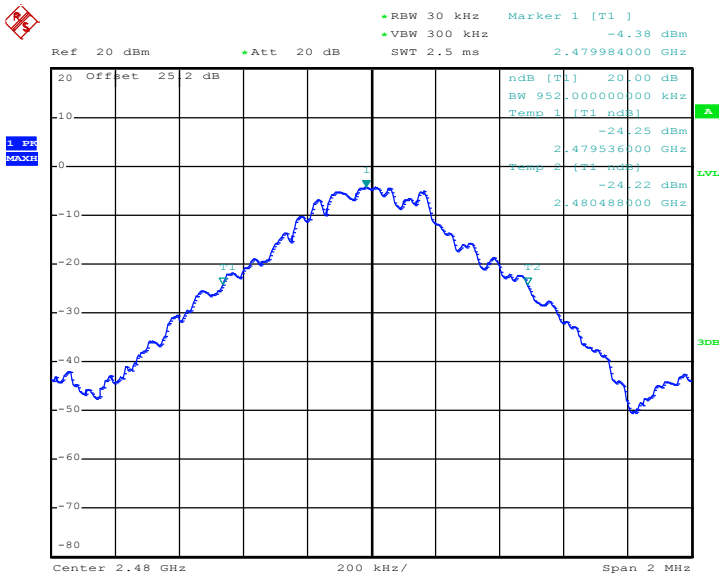


20 dB Bandwidth Plot on Channel 39



Date: 19.DEC.2012 21:01:40

20 dB Bandwidth Plot on Channel 78

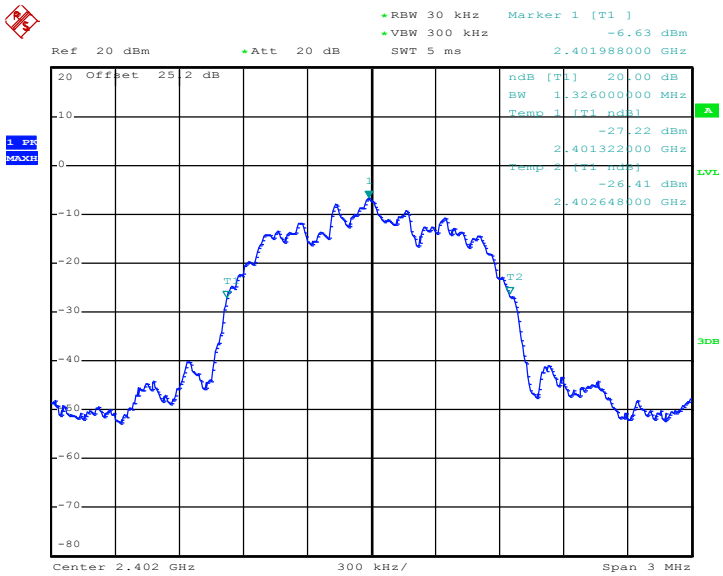


Date: 19.DEC.2012 21:02:06

Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

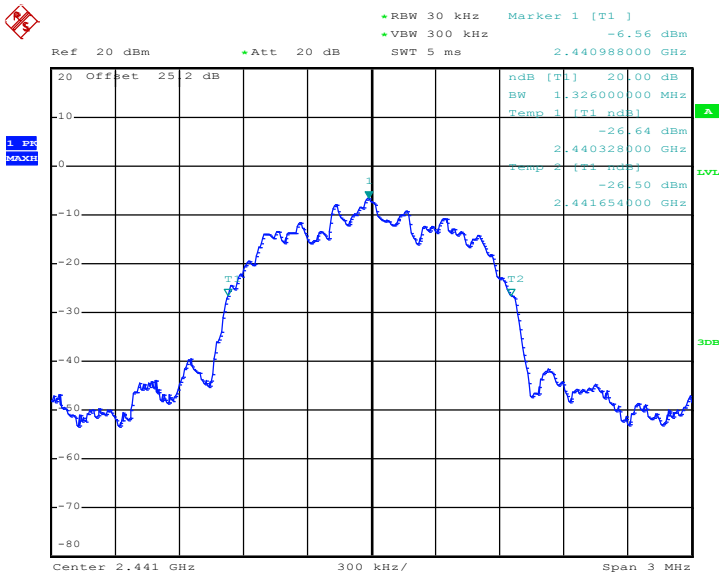
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.326
39	2441	1.326
78	2480	1.326

20 dB Bandwidth Plot on Channel 00



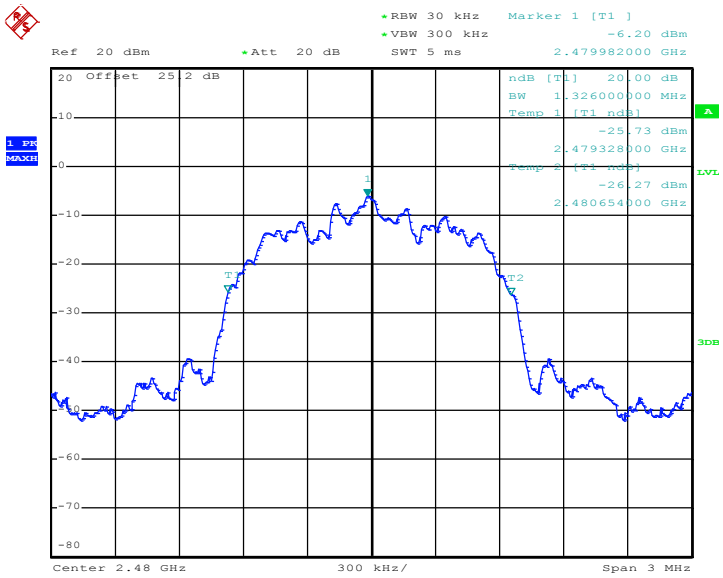
Date: 19.DEC.2012 21:02:39

20 dB Bandwidth Plot on Channel 39



Date: 19.DEC.2012 21:03:04

20 dB Bandwidth Plot on Channel 78

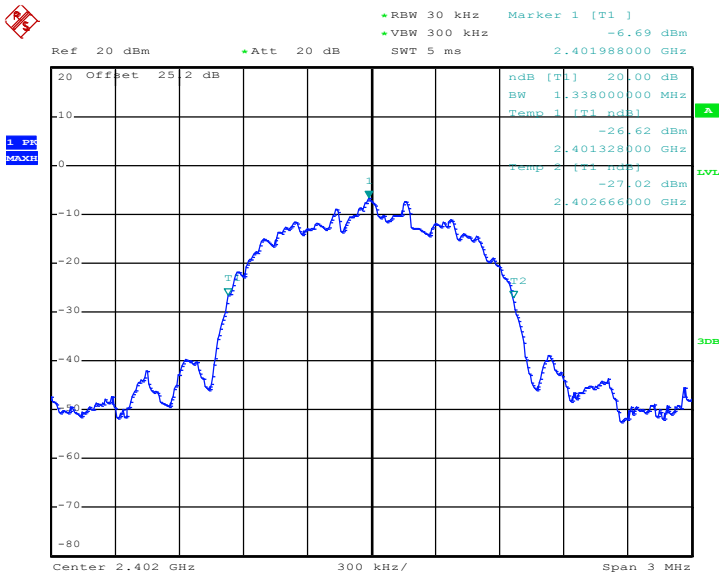


Date: 19.DEC.2012 21:03:50

Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

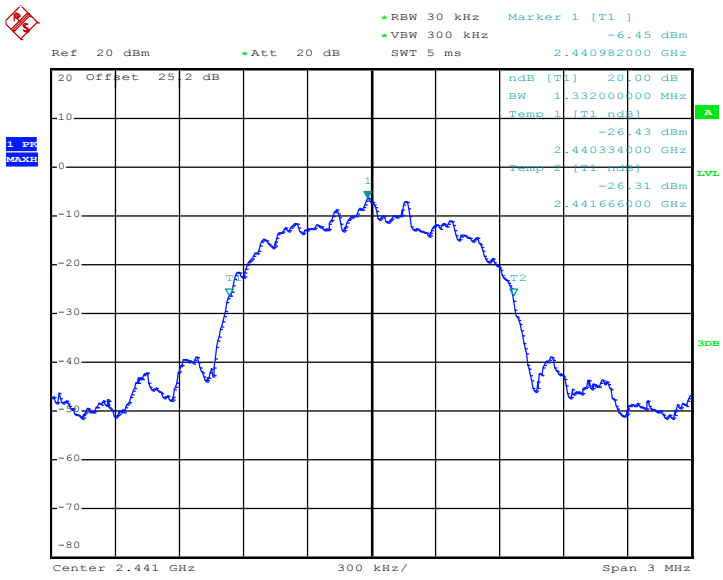
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.338
39	2441	1.332
78	2480	1.332

20 dB Bandwidth Plot on Channel 00



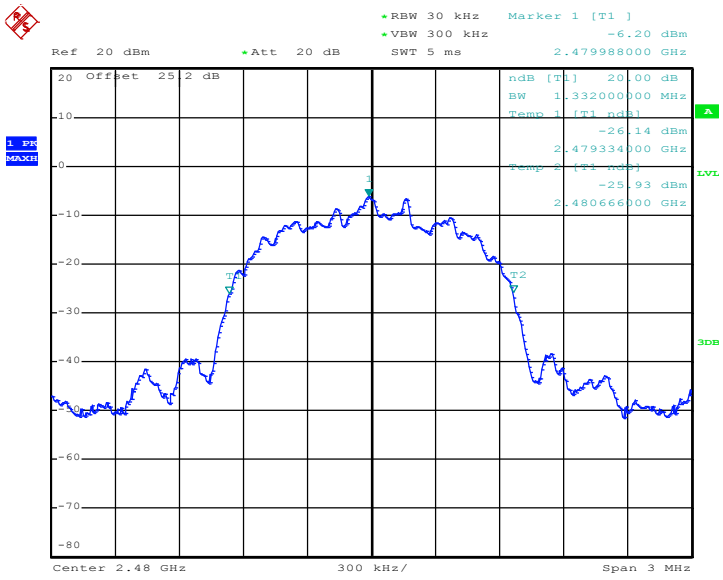
Date: 19.DEC.2012 21:04:24

20 dB Bandwidth Plot on Channel 39



Date: 19.DEC.2012 21:05:25

20 dB Bandwidth Plot on Channel 78



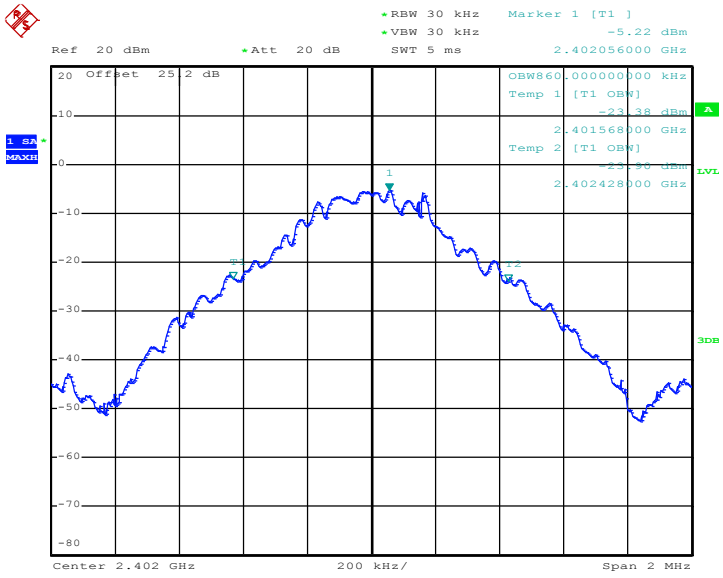
Date: 19.DEC.2012 21:06:10

3.4.6 Test Result of 99% Occupied Bandwidth

Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

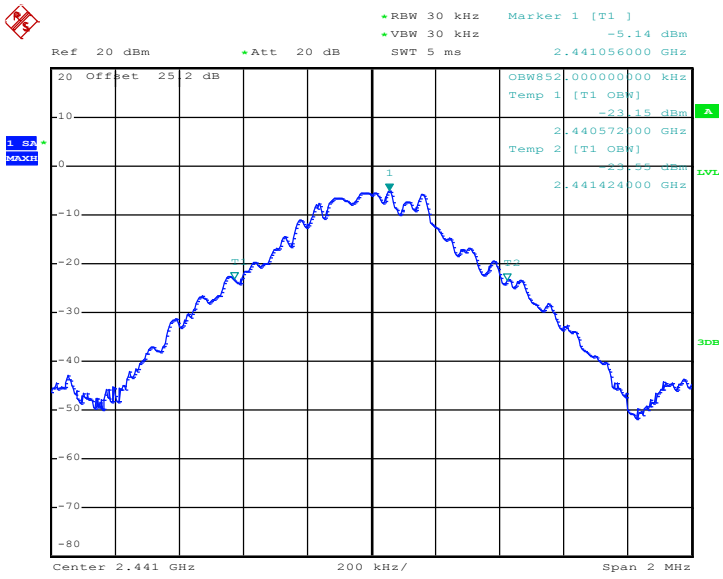
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	0.860
39	2441	0.852
78	2480	0.860

99% Bandwidth Plot on Channel 00



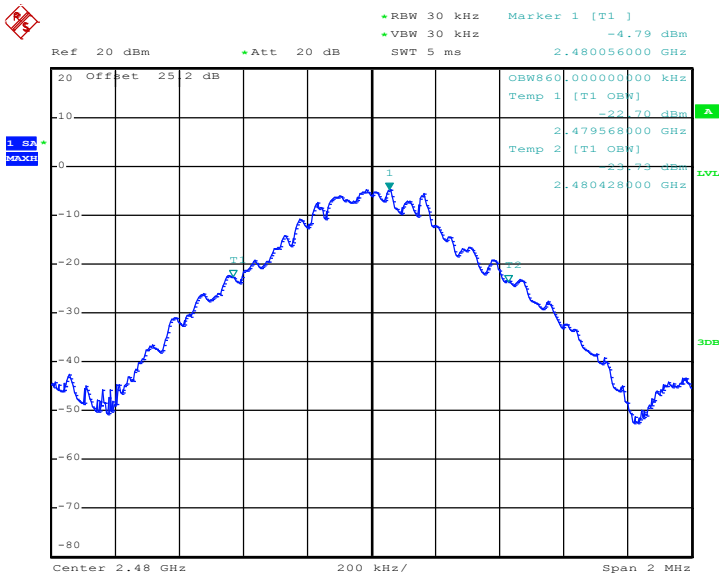
Date: 19.DEC.2012 23:02:54

99% Occupied Bandwidth Plot on Channel 39



Date: 19.DEC.2012 21:07:25

99% Occupied Bandwidth Plot on Channel 78

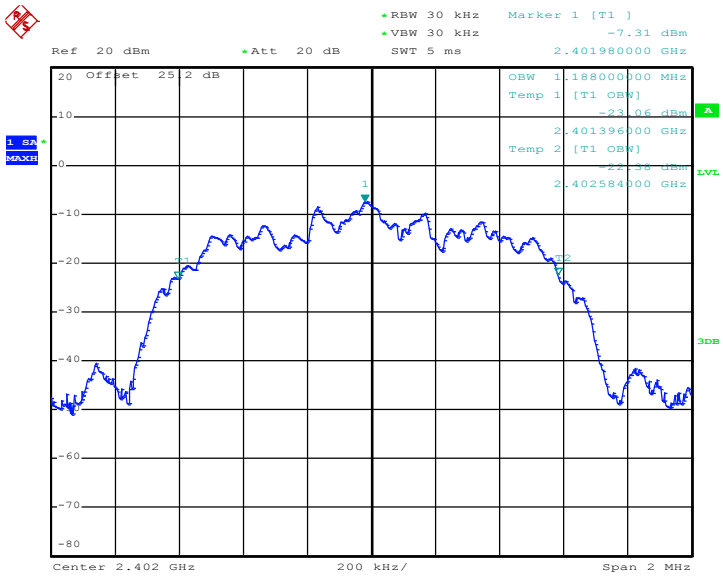


Date: 19.DEC.2012 21:08:21

Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

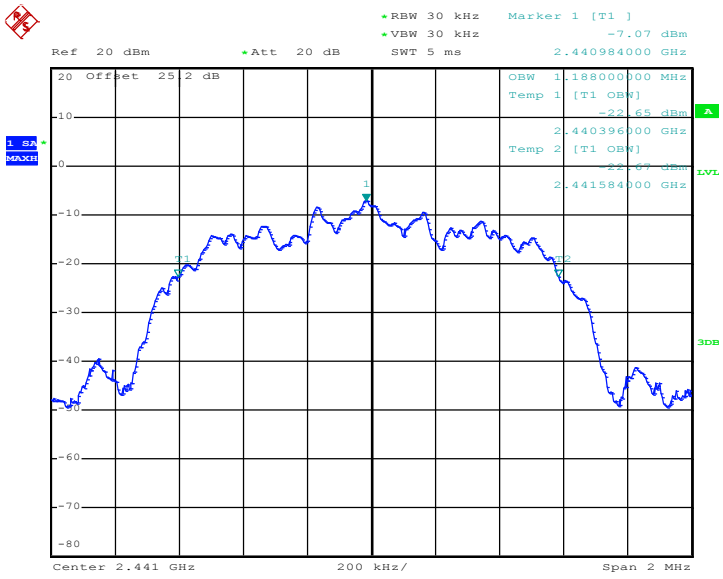
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.188
39	2441	1.188
78	2480	1.192

99% Bandwidth Plot on Channel 00



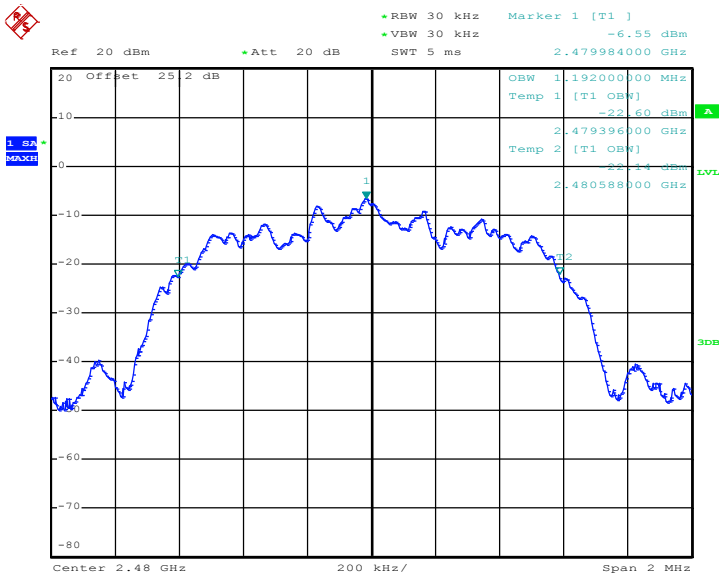
Date: 19.DEC.2012 21:08:57

99% Occupied Bandwidth Plot on Channel 39



Date: 19.DEC.2012 21:09:33

99% Occupied Bandwidth Plot on Channel 78

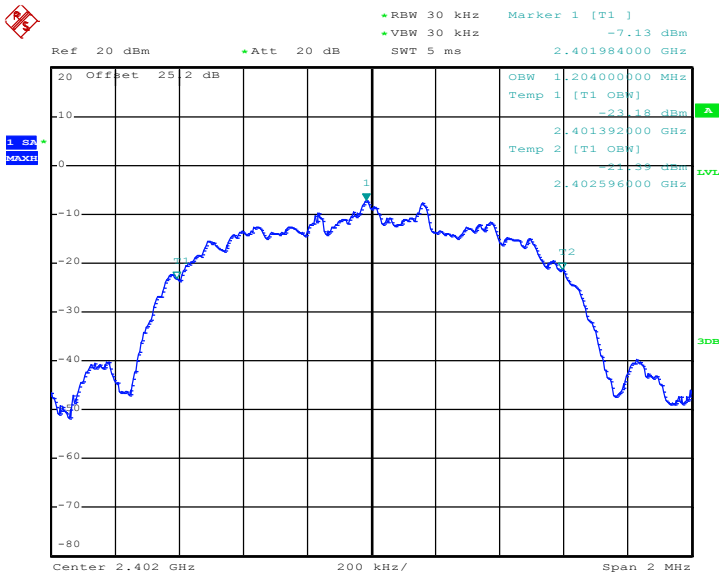


Date: 19.DEC.2012 21:10:29

Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

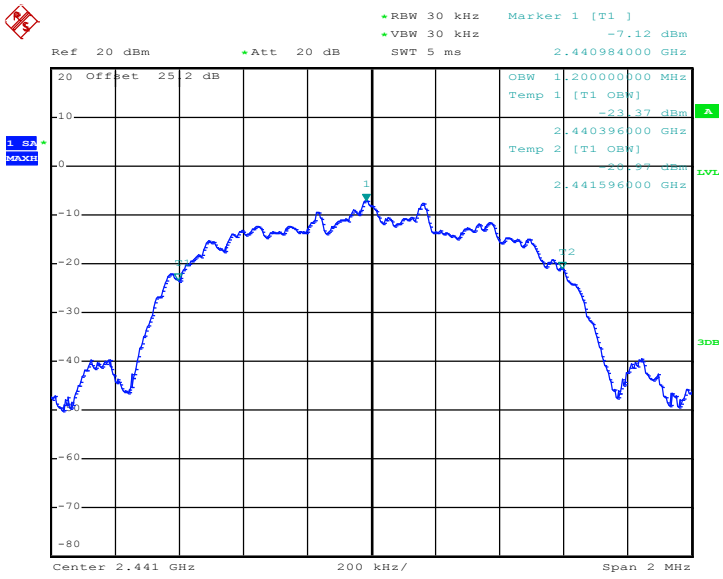
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.204
39	2441	1.200
78	2480	1.200

99% Bandwidth Plot on Channel 00



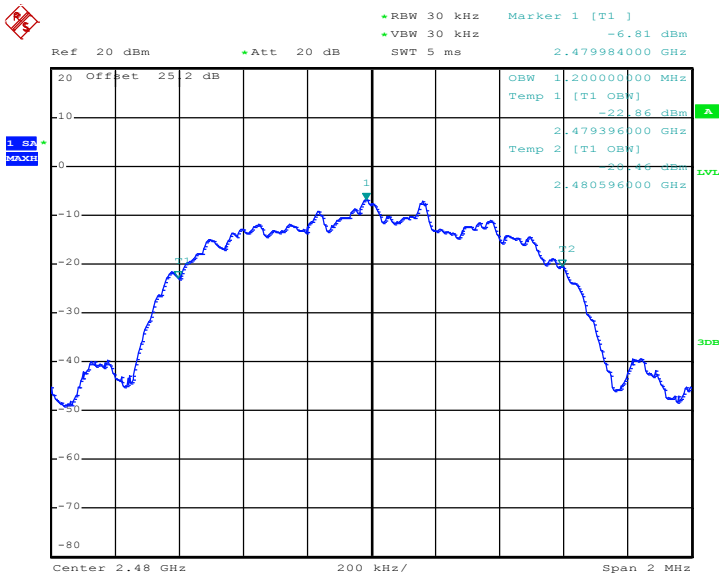
Date: 19.DEC.2012 21:11:33

99% Occupied Bandwidth Plot on Channel 39



Date: 19.DEC.2012 21:12:09

99% Occupied Bandwidth Plot on Channel 78



Date: 19.DEC.2012 21:13:23

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, 3Mbps and AFH 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 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 with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

3.5.4 Test Setup

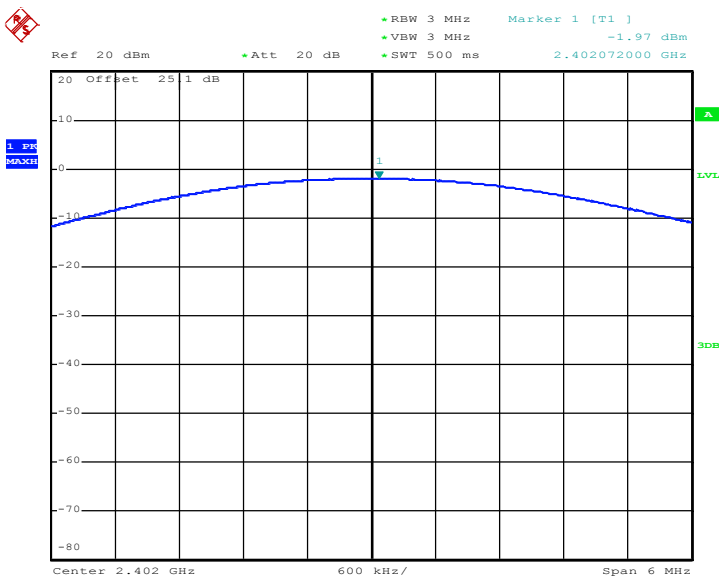
3.5.5 Test Result of Peak Output Power

Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	-1.97	20.97	Pass
39	2441	-1.88	20.97	Pass
78	2480	-1.33	20.97	Pass

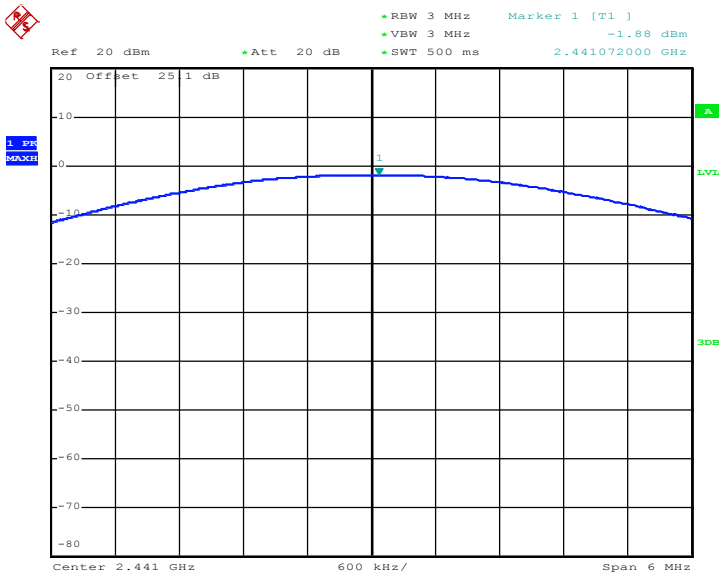
Note: For AFH mode using 20 hopping channels, the maximum output power limit is 20.97dBm.

Peak Output Power Plot on Channel 00



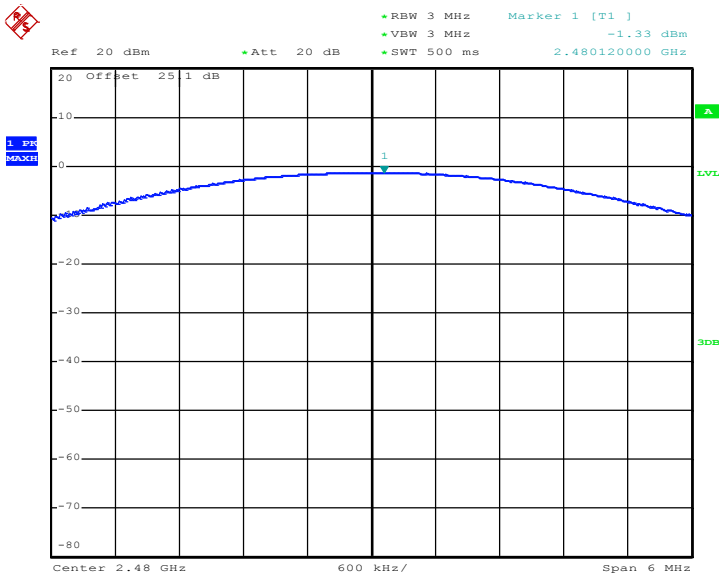
Date: 19.DEC.2012 01:43:08

Peak Output Power Plot on Channel 39



Date: 19.DEC.2012 01:44:23

Peak Output Power Plot on Channel 78

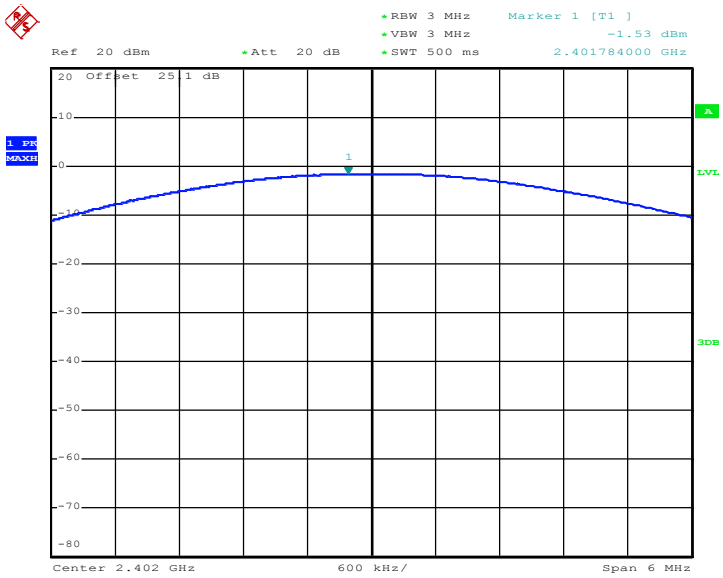


Date: 19.DEC.2012 01:45:38

Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

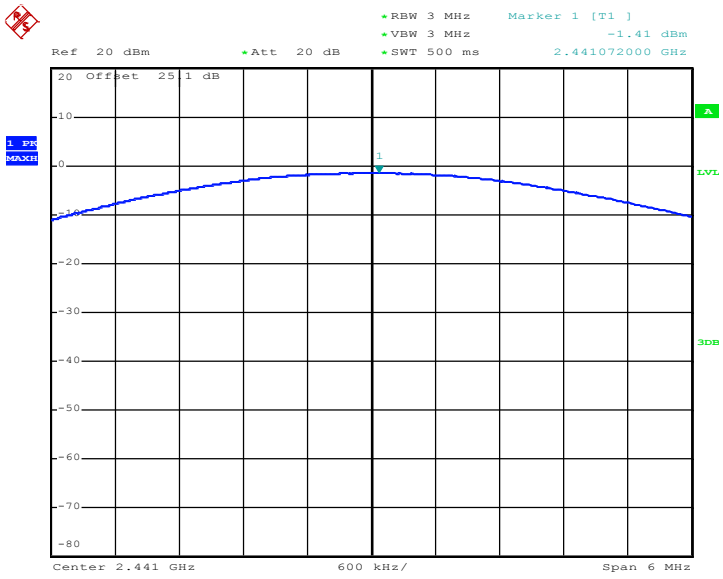
Channel	Frequency (MHz)	RF Power (dBm)		
		π /4-DQPSK	Max. Limits	Pass/Fail
		2 Mbps	(dBm)	
00	2402	-1.53	20.97	Pass
39	2441	-1.41	20.97	Pass
78	2480	-0.86	20.97	Pass

Peak Output Power Plot on Channel 00



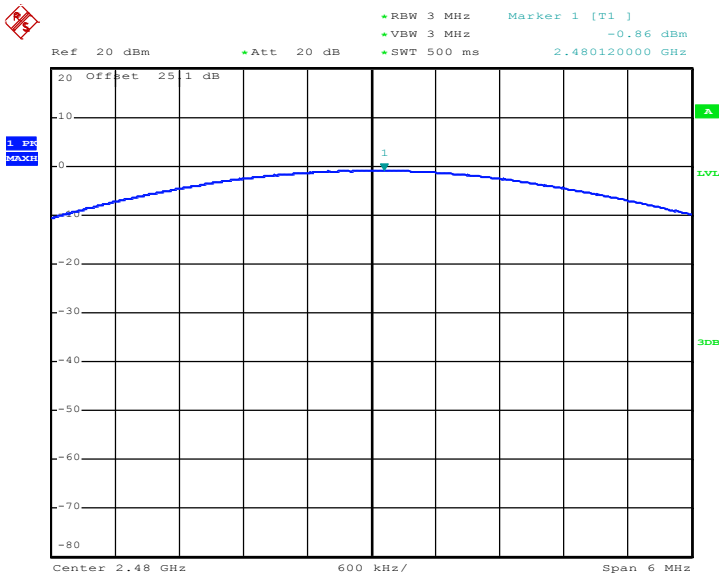
Date: 19.DEC.2012 01:43:16

Peak Output Power Plot on Channel 39



Date: 19.DEC.2012 01:44:31

Peak Output Power Plot on Channel 78

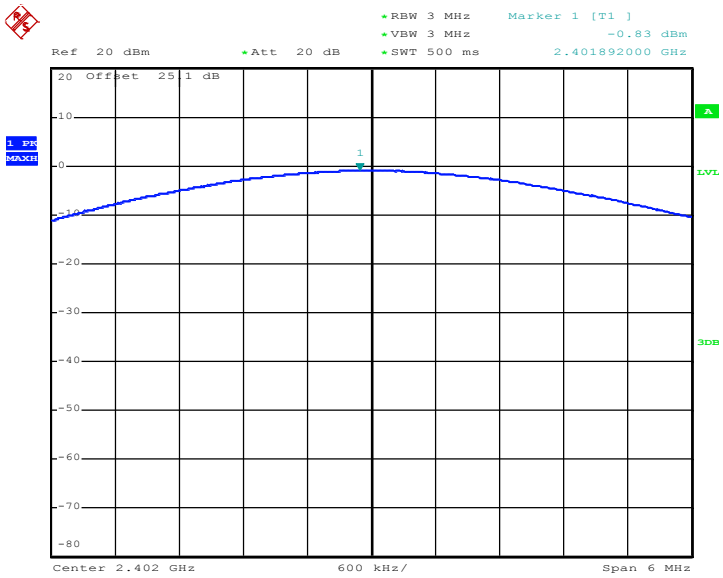


Date: 19.DEC.2012 01:45:46

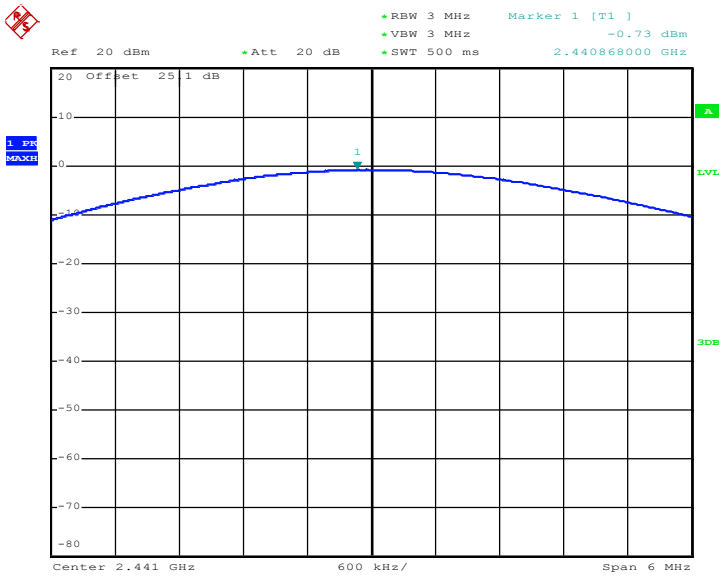
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits	Pass/Fail
		3 Mbps	(dBm)	
00	2402	-0.83	20.97	Pass
39	2441	-0.73	20.97	Pass
78	2480	-0.29	20.97	Pass

Peak Output Power Plot on Channel 00

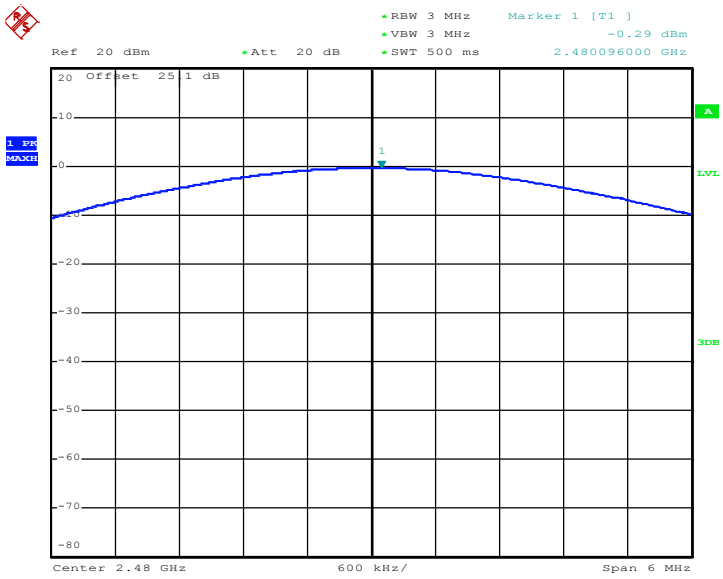


Peak Output Power Plot on Channel 39



Date: 19.DEC.2012 01:45:13

Peak Output Power Plot on Channel 78



Date: 19.DEC.2012 01:46:28

3.6 Conducted 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

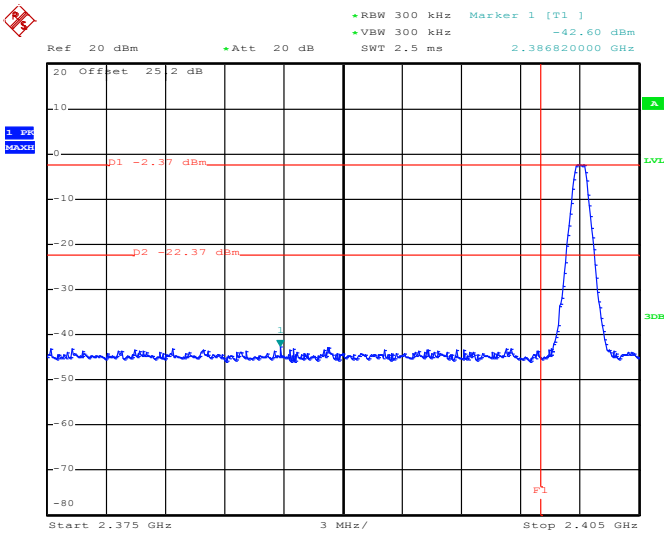
1. The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 300KHz (≥ 1% span=30MHz), VBW = 300KHz (≥ RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 300KHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2. and 3.
5. Measure and record the results in the test report.

3.6.4 Test Setup

3.6.6 Test Result of Conducted Band Edges

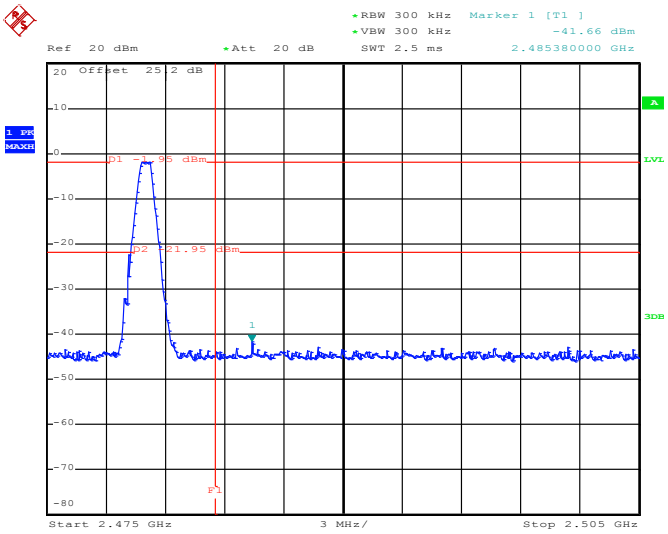
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

Low Band Edge Plot on Channel 00



Date: 19.DEC.2012 22:31:56

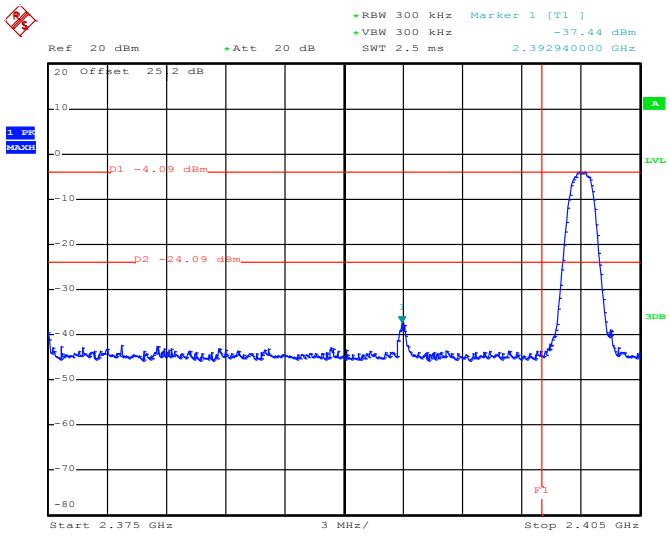
High Band Edge Plot on Channel 78



Date: 19.DEC.2012 22:34:17

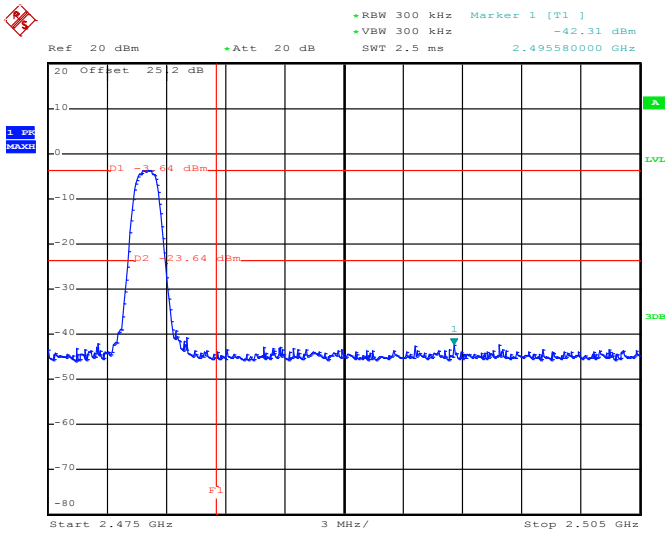
Test Mode :	2Mbps	Temperature :	24~26℃
Test Channel :	00 and 78	Relative Humidity :	50~53%
		Test Engineer :	Book Lin

Low Band Edge Plot on Channel 00



Date: 19.DEC.2012 22:41:01

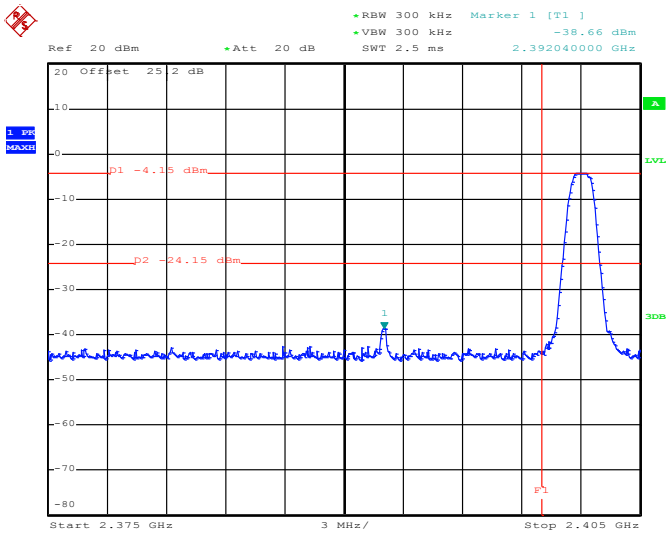
High Band Edge Plot on Channel 78



Date: 19.DEC.2012 22:37:44

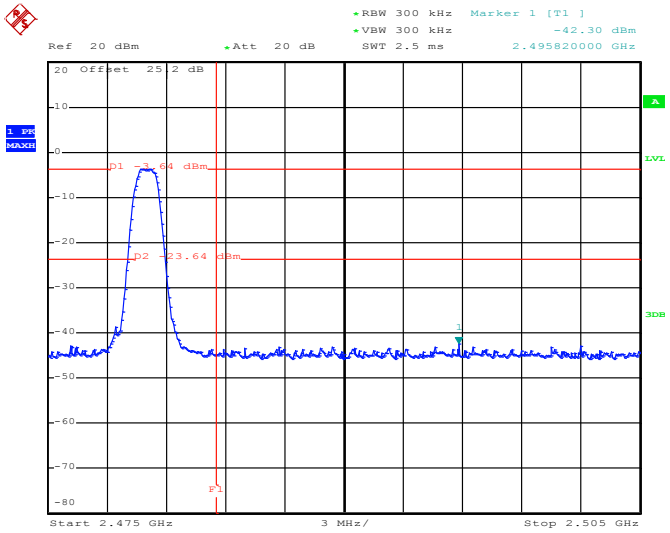
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

Low Band Edge Plot on Channel 00



Date: 19.DEC.2012 22:44:27

High Band Edge Plot on Channel 78

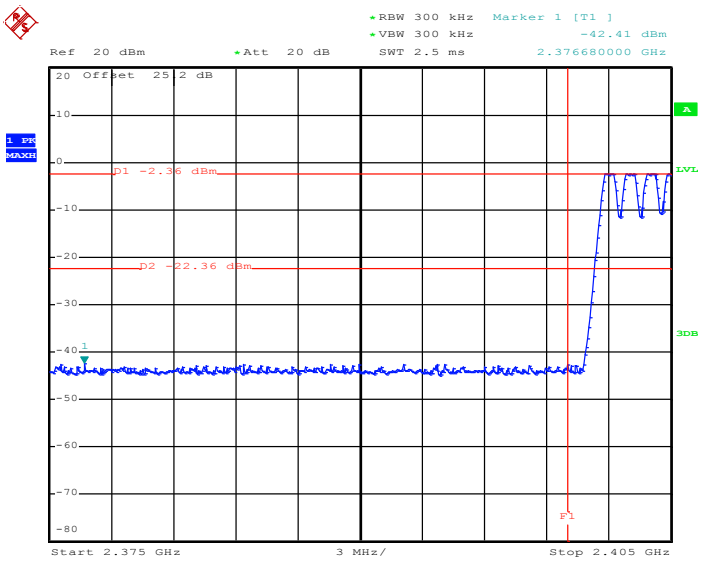


Date: 19.DEC.2012 22:52:00

3.6.7 Test Result of Conducted Hopping Mode Band Edges

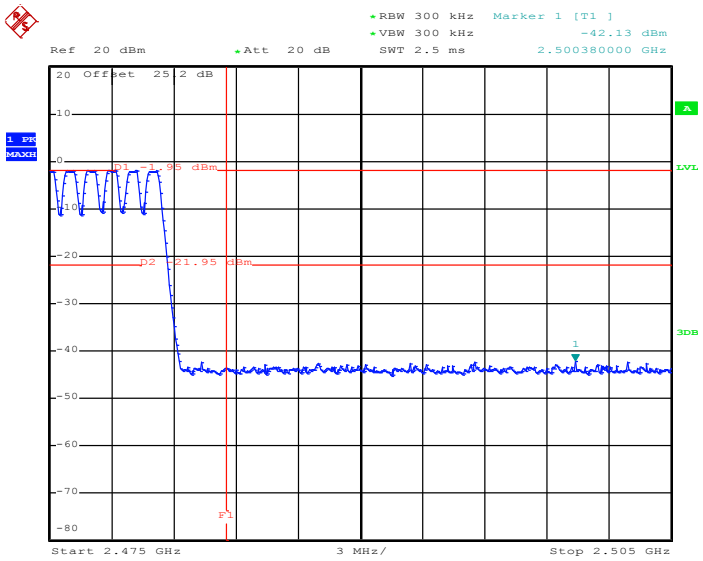
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

1Mbps Hopping Mode Low Band Edge Plot



Date: 19.DEC.2012 22:29:51

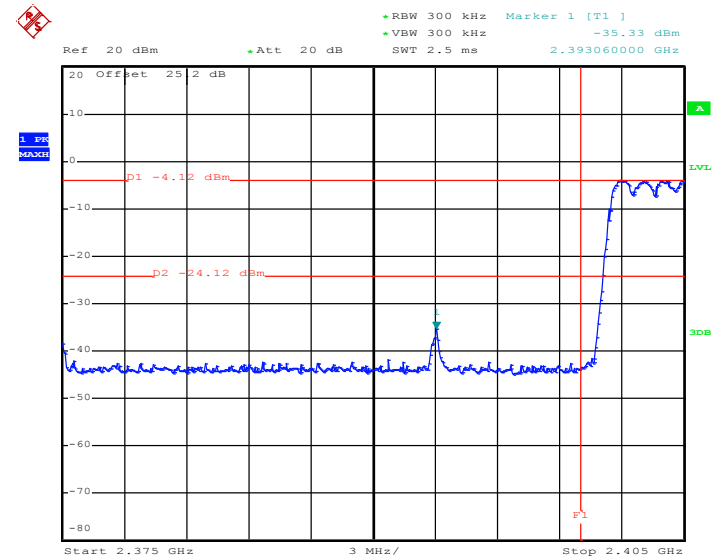
1Mbps Hopping Mode High Band Edge Plot



Date: 19.DEC.2012 22:33:56

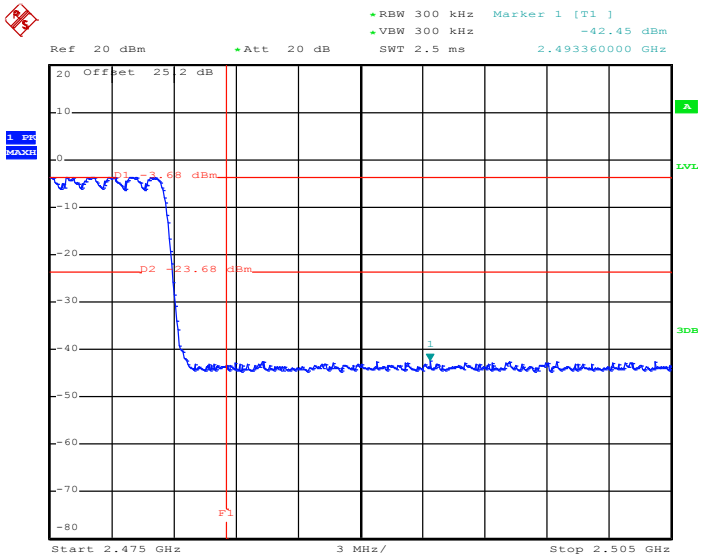
Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

2Mbps Hopping Mode Low Band Edge Plot



Date: 19.DEC.2012 22:39:51

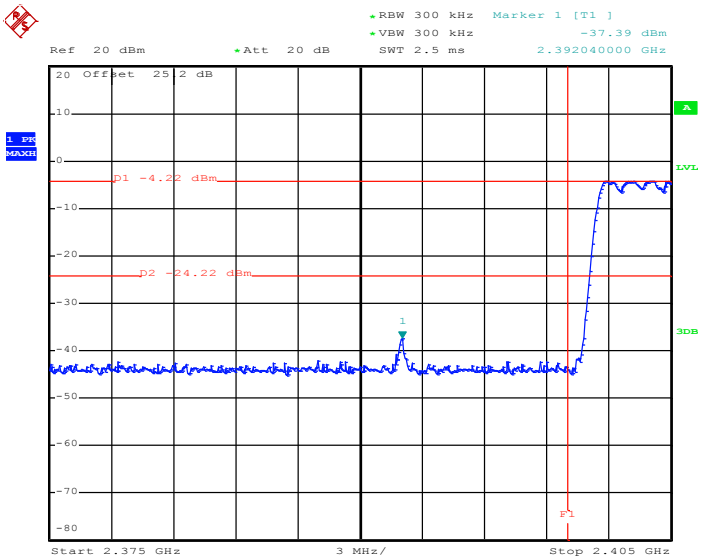
2Mbps Hopping Mode High Band Edge Plot



Date: 19.DEC.2012 22:37:24

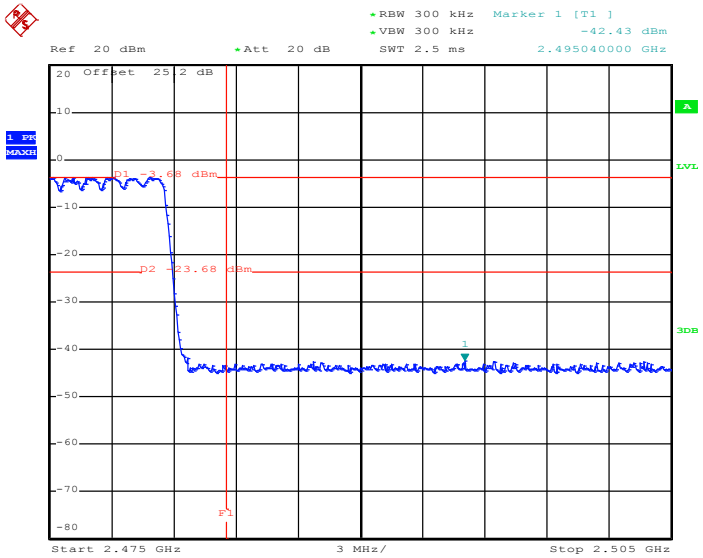
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

3Mbps Hopping Mode Low Band Edge Plot



Date: 19.DEC.2012 22:43:06

3Mbps Hopping Mode High Band Edge Plot



Date: 19.DEC.2012 22:51:38

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

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.

3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

3.7.3 Test Procedure

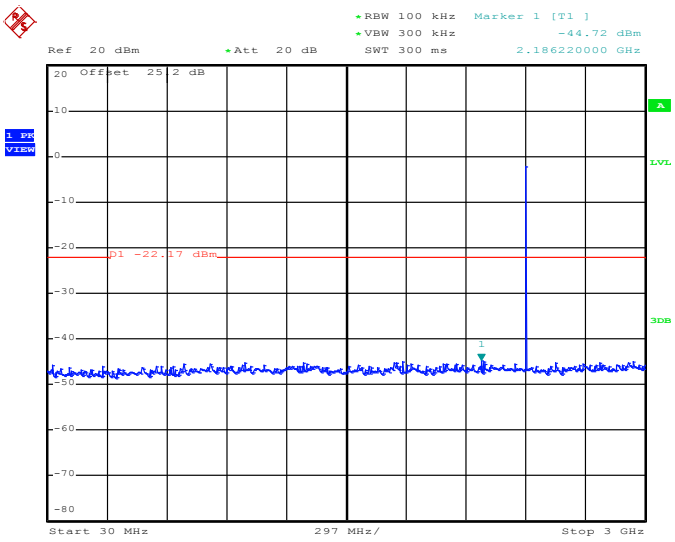
1. The testing follows the guidelines in Spurious RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 KHz, VBW = 300KHz, 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.
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.

3.7.4 Test Setup

3.7.5 Test Result

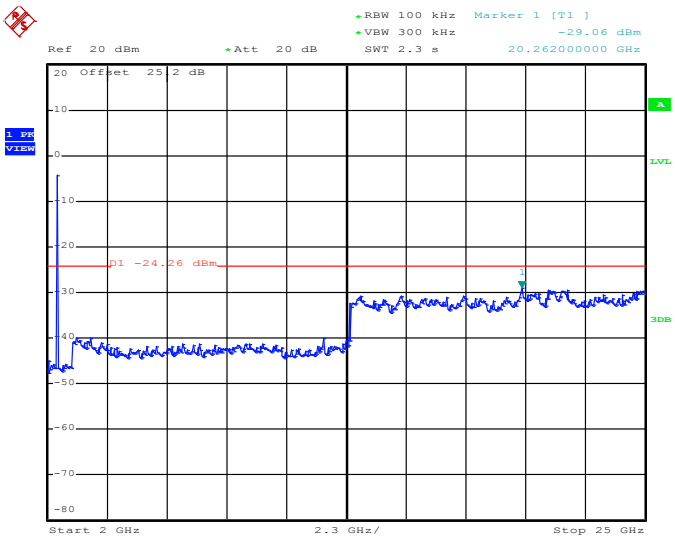
Test Mode :	1Mbps	Temperature :	24~26℃
Test Channel :	00	Relative Humidity :	50~53%
		Test Engineer :	Book Lin

1Mbps CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 19.DEC.2012 22:57:10

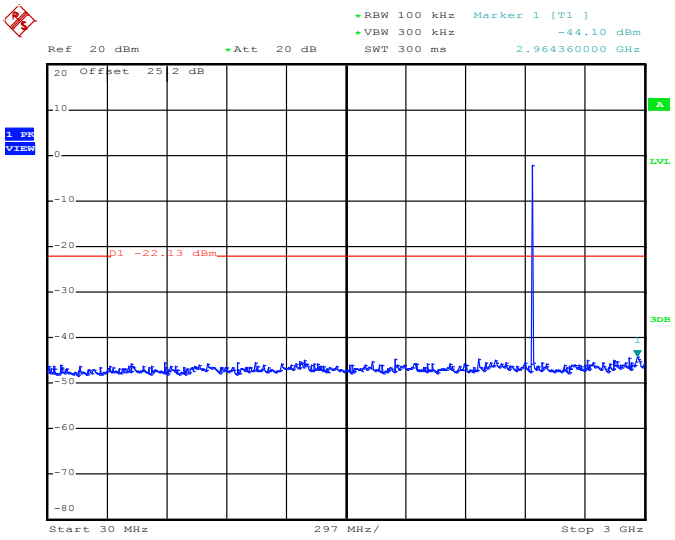
1Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 19.DEC.2012 22:57:32

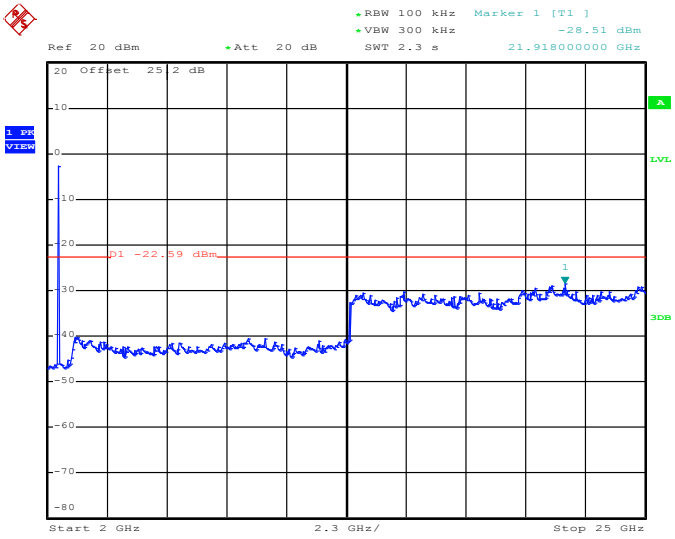
Test Mode :	1Mbps	Temperature :	24~26℃
Test Channel :	39	Relative Humidity :	50~53%
		Test Engineer :	Book Lin

1Mbps CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Date: 19.DEC.2012 22:58:21

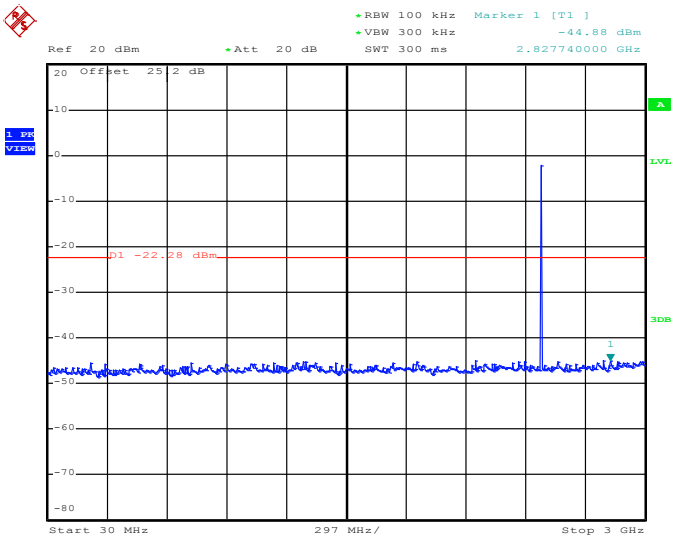
1Mbps CSE Plot on Ch 39 Plot between 2 GHz ~ 25 GHz



Date: 19.DEC.2012 22:58:43

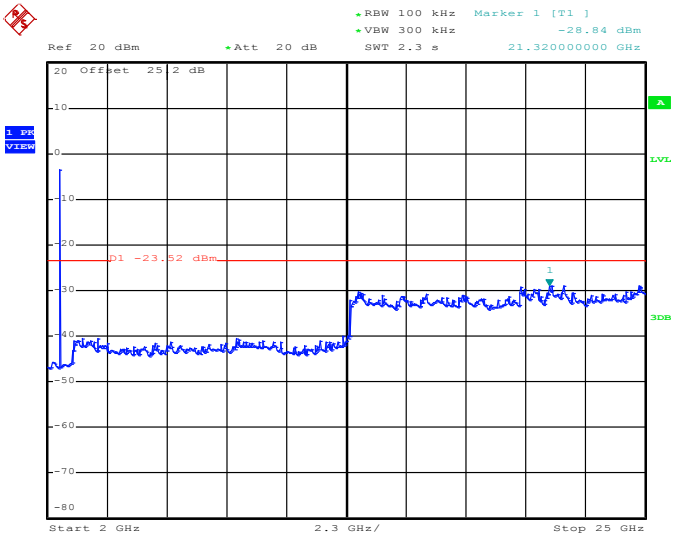
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	78	**Relative Humidity :**	50~53%
		Test Engineer :	Book Lin

1Mbps CSE Plot on Ch 78 Plot between 30MHz ~ 3 GHz



Date: 19.DEC.2012 22:59:20

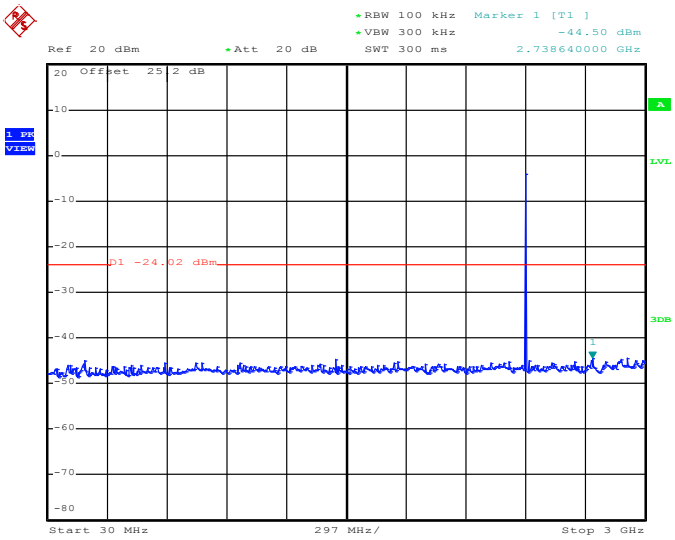
1Mbps CSE Plot on Ch 78 Plot between 2 GHz ~ 25 GHz



Date: 19.DEC.2012 22:59:41

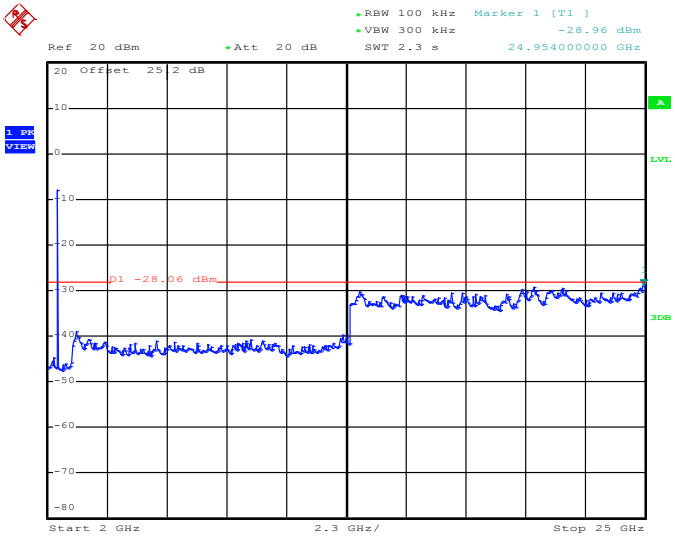
Test Mode :	2Mbps	Temperature :	24~26℃
Test Channel :	00	Relative Humidity :	50~53%
		Test Engineer :	Book Lin

2Mbps CSE Plot on Ch 00 Plot between 30MHz ~ 3 GHz



Date: 19.DEC.2012 22:55:13

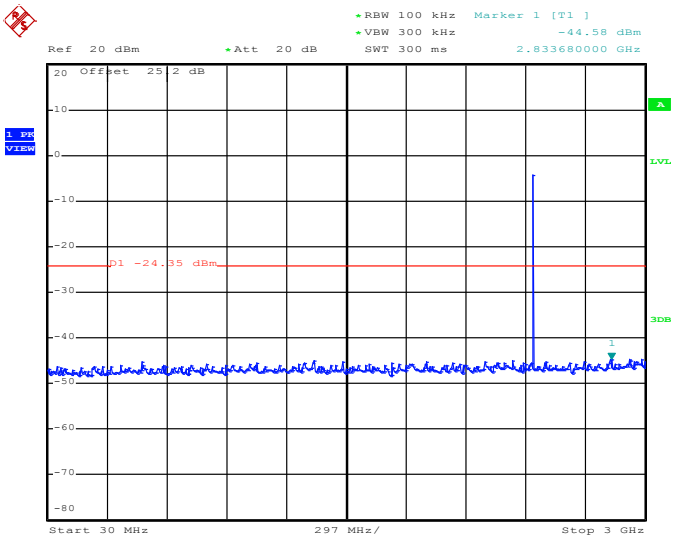
2Mbps CSE Plot on Ch 00 Plot between 2 GHz ~ 25 GHz



Date: 19.DEC.2012 22:55:35

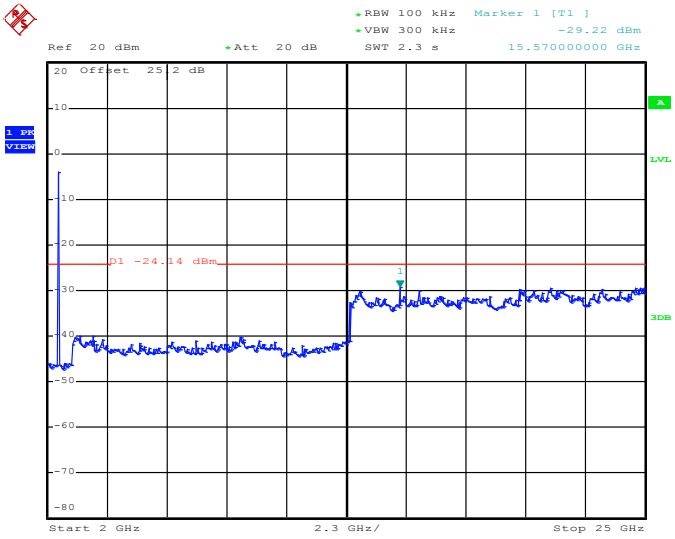
Test Mode :	2Mbps	Temperature :	24~26℃
Test Channel :	39	Relative Humidity :	50~53%
		Test Engineer :	Book Lin

2Mbps CSE Plot on Ch 39 Plot between 30MHz ~ 3 GHz



Date: 19.DEC.2012 22:54:07

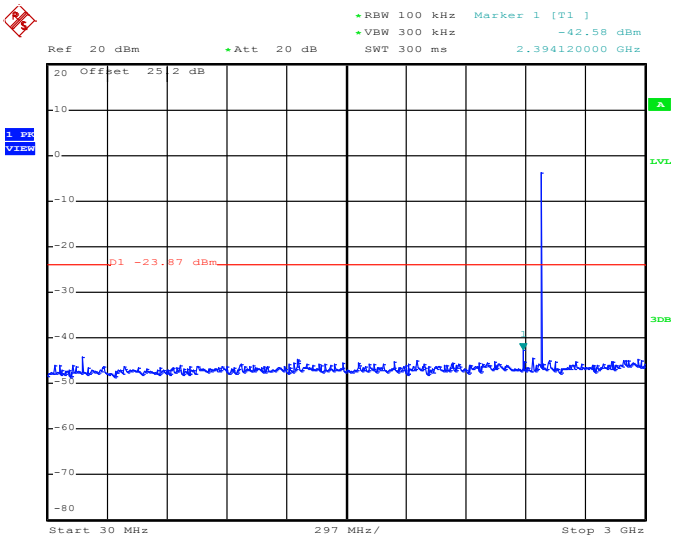
2Mbps CSE Plot on Ch 39 Plot between 2 GHz ~ 25 GHz



Date: 19.DEC.2012 22:54:29

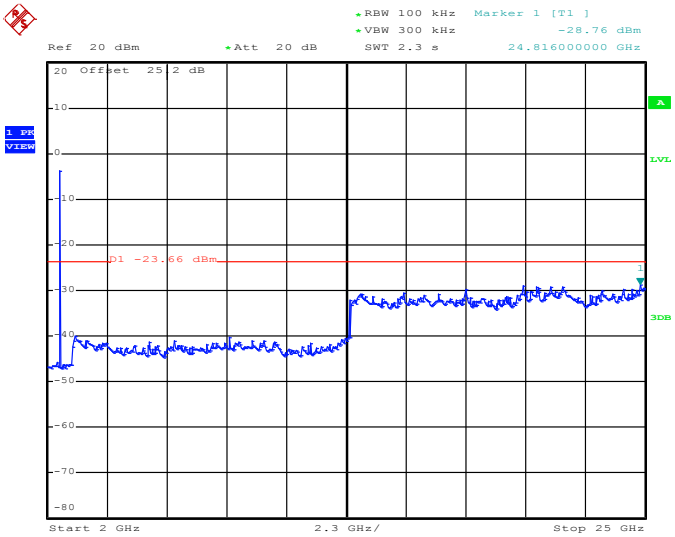
Test Mode :	2Mbps	Temperature :	24~26℃
Test Channel :	78	Relative Humidity :	50~53%
		Test Engineer :	Book Lin

2Mbps CSE Plot on Ch 78 Plot between 30MHz ~ 3 GHz



Date: 19.DEC.2012 22:53:03

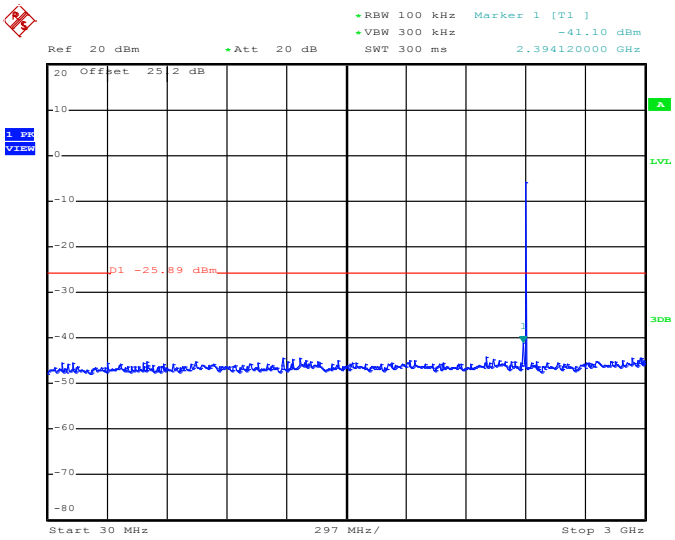
2Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 19.DEC.2012 22:53:24

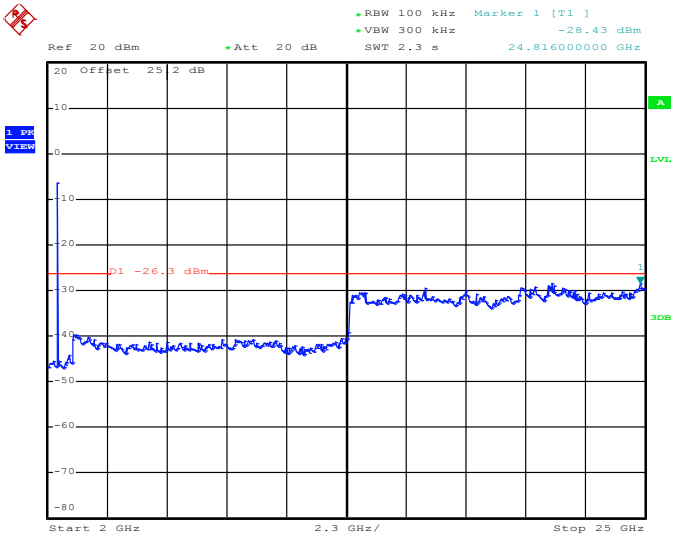
Test Mode :	3Mbps	Temperature :	24~26℃
Test Channel :	00	Relative Humidity :	50~53%
		Test Engineer :	Book Lin

3Mbps CSE Plot on Ch 00 Plot between 30MHz ~ 3 GHz



Date: 19.DEC.2012 21:16:24

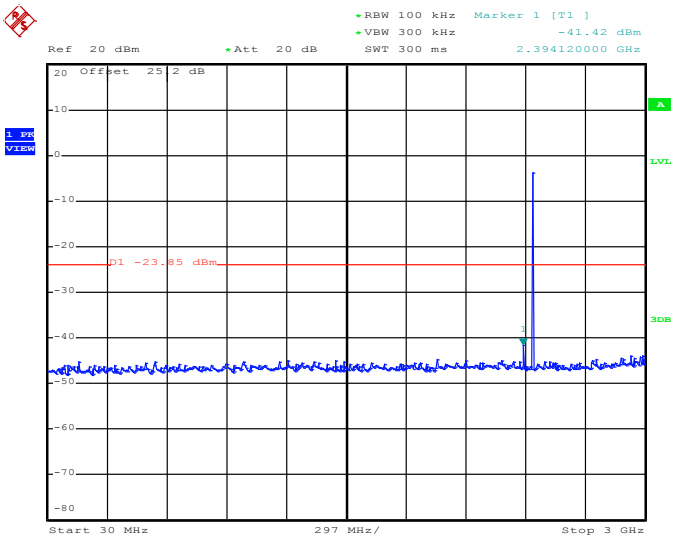
3Mbps CSE Plot on Ch 00 Plot between 2 GHz ~ 25 GHz



Date: 19.DEC.2012 21:17:16

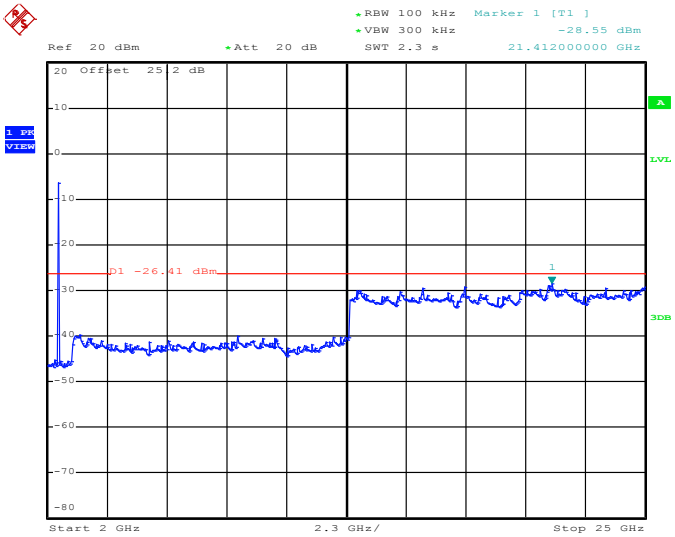
Test Mode :	3Mbps	Temperature :	24~26℃
Test Channel :	39	Relative Humidity :	50~53%
		Test Engineer :	Book Lin

3Mbps CSE Plot on Ch 39 Plot between 30MHz ~ 3 GHz



Date: 19.DEC.2012 21:18:08

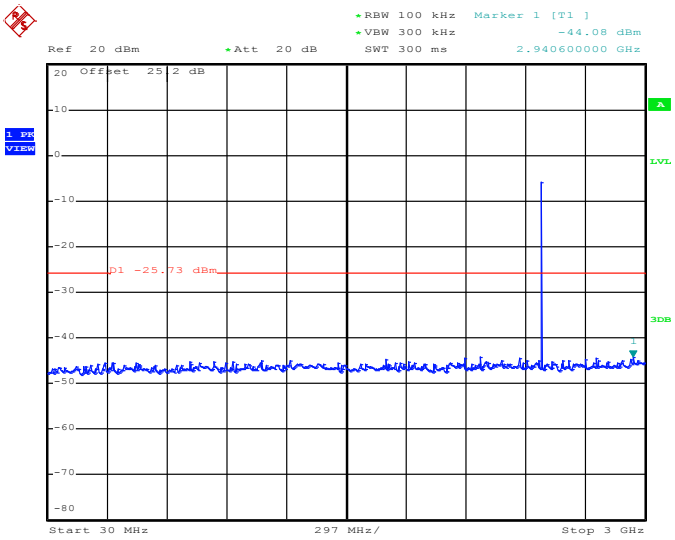
3Mbps CSE Plot on Ch 39 Plot between 2 GHz ~ 25 GHz



Date: 19.DEC.2012 21:19:00

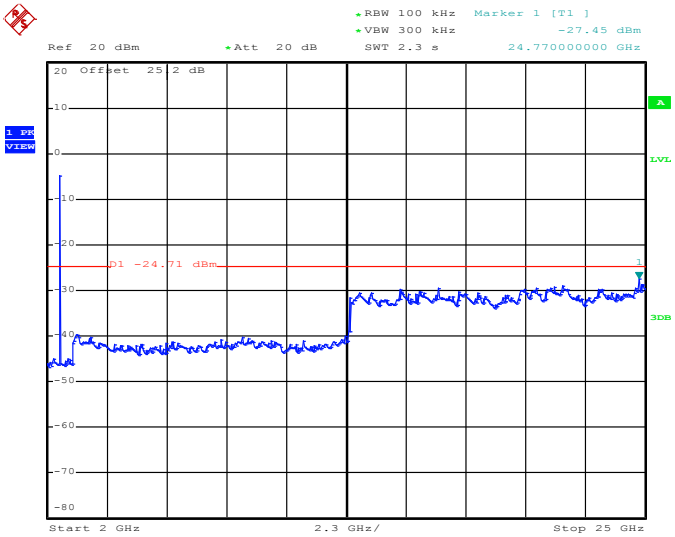
Test Mode :	3Mbps	Temperature :	24~26℃
Test Channel :	78	Relative Humidity :	50~53%
		Test Engineer :	Book Lin

3Mbps CSE Plot on Ch 78 Plot between 30MHz ~ 3 GHz



Date: 19.DEC.2012 21:19:52

3Mbps CSE Plot on Ch 78 Plot between 2 GHz ~ 25 GHz



Date: 19.DEC.2012 21:20:44

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 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. 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

3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

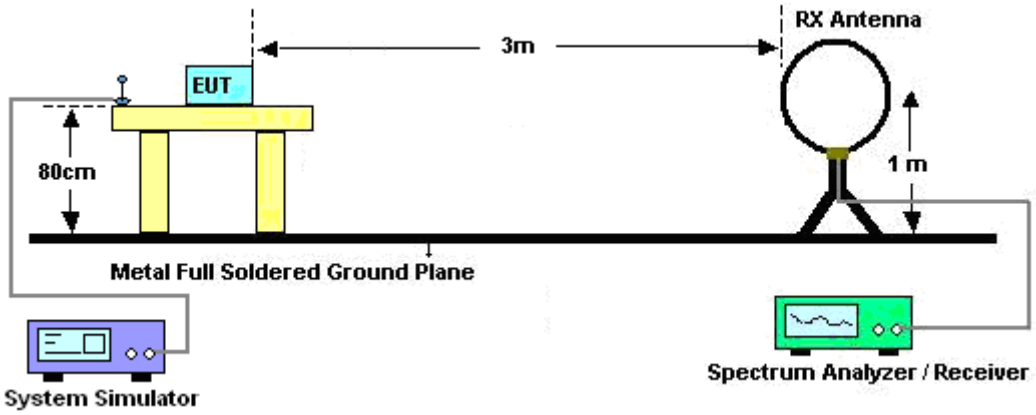
3.8.3 Test Procedures

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines and fulfills ANSI C63.4-2003 and the guidelines in ANSI C63.10-2009 test site requirement.
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. 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.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. 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, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
7. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

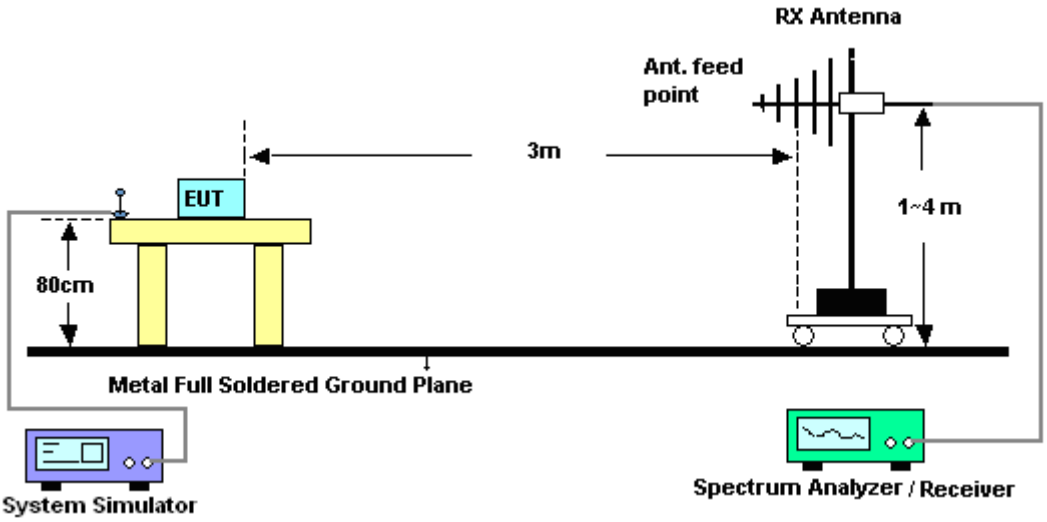
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.78dB) derived from 20log (dwell time/100ms).

3.8.4 Test Setup

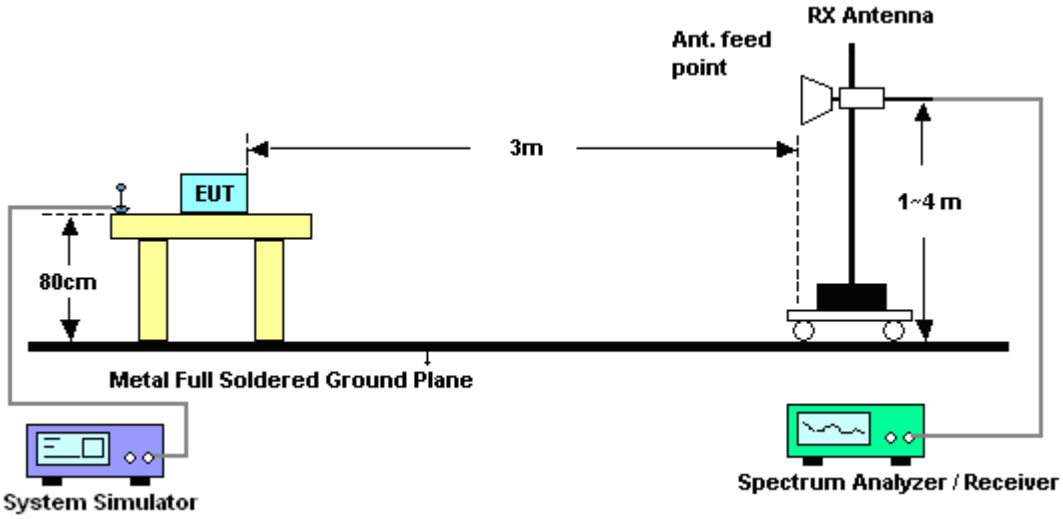
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

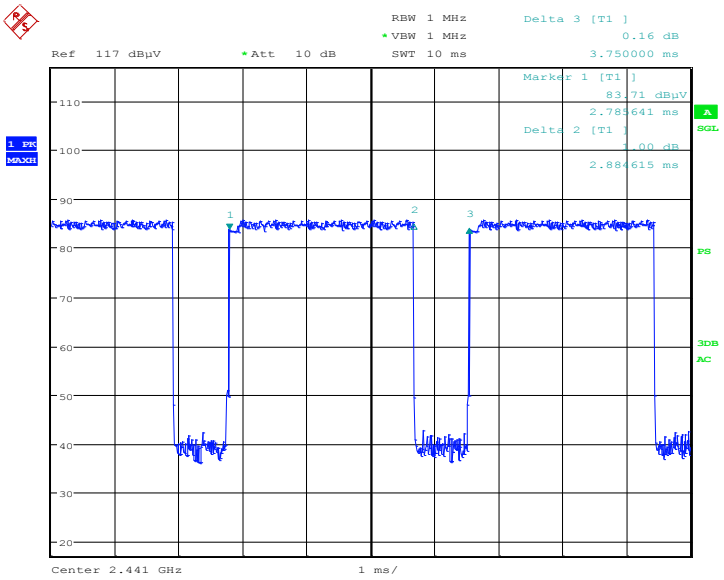


3.8.5 Test Results of Radiated Emissions (9 KHz ~ 30 MHz)

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.

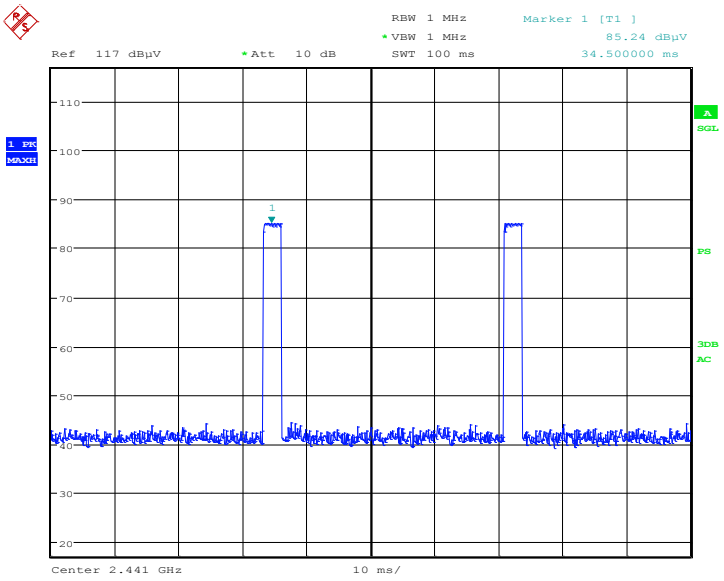
3.8.6 Duty cycle correction factor for average measurement

3DH5 on time/100ms (One Pulse) Plot on Channel 39



Date: 21.DEC.2012 05:43:35

3DH5 on time/100ms (Count Pulses) Plot on Channel 39



Date: 21.DEC.2012 05:46:12

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.88 / 100 = 5.77 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.78 dB
3. 3DH5 has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

2.88ms x 20 channels = 57.7ms

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100ms / 57.6ms] = 2 hops

Thus, the maximum possible ON time:

2.88ms x 2 = 5.77ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.77ms/100ms) = -24.78 dB

3.8.7 Test Result of Radiated Band Edges

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	00	Relative Humidity :	53~55%
		Test Engineer :	David Ke

ANTENNA POLARITY : HORIZONTAL										
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
2379.03	60.01	-13.99	74	59.16	32.16	4.57	35.88	112	239	Peak
2379.03	35.23	-18.77	54	-	-	-	-	-	-	Average

ANTENNA POLARITY : VERTICAL										
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
2379.03	57.9	-16.1	74	57.05	32.16	4.57	35.88	173	276	Peak
2379.03	33.12	-20.88	54	-	-	-	-	-	-	Average

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	53~55%
		Test Engineer :	David Ke

ANTENNA POLARITY : HORIZONTAL										
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
2487.7	58.81	-15.19	74	57.68	32.3	4.64	35.81	134	240	Peak
2487.7	34.03	-19.97	54	-	-	-	-	-	-	Average

ANTENNA POLARITY : VERTICAL										
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
2487.64	58.63	-15.37	74	57.5	32.3	4.64	35.81	159	278	Peak
2487.64	33.85	-20.15	54	-	-	-	-	-	-	Average

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

Test Mode :	3Mbps	**Temperature :**	23~25°C
Test Channel :	00	**Relative Humidity :**	53~55%
Test Engineer :	David Ke	**Polarization :**	Horizontal
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 2391 MHz, 3201 MHz, 7206 MHz and 9606 MHz are not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 98.38 dBµV/m - 20dB = 78.38dBµV/m.		

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
33.24	32.88	-7.12	40	46.71	17.08	0.72	31.63	108	296	Peak
141.51	14.87	-28.63	43.5	33.37	11.5	1.27	31.27	-	-	Peak
281.64	22.61	-23.39	46	39.21	12.83	1.74	31.17	-	-	Peak
419.7	26.04	-19.96	46	38.54	16.5	2.06	31.06	-	-	Peak
540.1	25.54	-20.46	46	35.7	18.5	2.31	30.97	-	-	Peak
780.2	25.54	-20.46	46	30.6	22.1	2.8	29.96	-	-	Peak
2391	46.06	-32.32	78.38	45.16	32.18	4.58	35.86	112	239	Peak
2402	98.38	-	-	97.48	32.18	4.58	35.86	112	239	Peak
2402	73.6	-	-	-	-	-	-	-	-	Average
3201	52.22	-26.16	78.38	72.49	32.76	5.56	58.59	100	0	Peak
4806	48.96	-25.04	74	67.25	34.26	6.51	59.06	100	0	Peak
4806	24.18	-29.82	54	-	-	-	-	-	-	Average
7206	46.98	-31.4	78.38	60.48	36.06	8.25	57.81	100	0	Peak
9606	47.53	-30.85	78.38	57	37.02	9.48	55.97	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	00	Relative Humidity :	53~55%
Test Engineer :	David Ke	Polarization :	Vertical
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 2391 MHz, 3201 MHz, 7206 MHz and 9606 MHz are not within a restricted band, and its limit line is 20dB below the highest emission level.		

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
31.62	20.24	-19.76	40	33.54	17.62	0.72	31.64	112	189	Peak
55.11	14.32	-25.68	40	38.43	6.6	0.83	31.54	-	-	Peak
215.22	19.77	-23.73	43.5	40.17	9.15	1.52	31.07	-	-	Peak
540.1	22.21	-23.79	46	32.37	18.5	2.31	30.97	-	-	Peak
599.6	25.52	-20.48	46	33.82	19.69	2.42	30.41	-	-	Peak
766.9	25.08	-20.92	46	30.26	22.1	2.78	30.06	-	-	Peak
2391	44.17	-32.62	76.79	43.27	32.18	4.58	35.86	173	276	Peak
2402	96.79	-	-	95.89	32.18	4.58	35.86	173	276	Peak
2402	72.01	-	-	-	-	-	-	-	-	Average
3201	49.81	-26.98	76.79	70.08	32.76	5.56	58.59	100	0	Peak
4806	52.16	-21.84	74	70.45	34.26	6.51	59.06	100	0	Peak
4806	27.38	-26.62	54	-	-	-	-	-	-	Average
7206	50.37	-26.42	76.79	63.87	36.06	8.25	57.81	100	0	Peak
9606	51.3	-25.49	76.79	60.77	37.02	9.48	55.97	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	**Temperature :**	23~25°C
Test Channel :	39	**Relative Humidity :**	53~55%
Test Engineer :	David Ke	**Polarization :**	Horizontal
Remark :	1. 2442 MHz is fundamental signal which can be ignored. 2. 3252 MHz and 9765 MHz are not within a restricted band, and its limit line is 20dB below the highest emission level.		

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
2442	99.39	-	-	98.37	32.24	4.61	35.83	112	237	Peak
2442	74.61	-	-	-	-	-	-	-	-	Average
3252	42.38	-37.01	79.39	62.7	32.75	5.58	58.65	100	0	Peak
4884	51.07	-22.93	74	69.13	34.28	6.54	58.88	100	0	Peak
4884	26.29	-27.71	54	-	-	-	-	-	-	Average
7323	44.18	-29.82	74	57.74	36.03	8.42	58.01	100	0	Peak
7323	19.4	-34.6	54	-	-	-	-	-	-	Average
9765	47.43	-31.96	79.39	56.58	37.23	9.5	55.88	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	39	Relative Humidity :	53~55%
Test Engineer :	David Ke	Polarization :	Vertical
Remark :	1. 2442 MHz is fundamental signal which can be ignored. 2. 9765 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level.		

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
2442	97.48	-	-	96.46	32.24	4.61	35.83	166	281	Peak
2442	72.7	-	-	-	-	-	-	-	-	Average
4881	52.19	-21.81	74	70.25	34.28	6.54	58.88	100	0	Peak
4881	27.41	-26.59	54	-	-	-	-	-	-	Average
7323	47.73	-26.27	74	61.29	36.03	8.42	58.01	100	0	Peak
7323	22.95	-31.05	54	-	-	-	-	-	-	Average
9765	49.96	-27.52	77.48	59.11	37.23	9.5	55.88	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	53~55%
Test Engineer :	David Ke	Polarization :	Horizontal
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. 3306 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level.		

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
2480	100.66	-	-	99.55	32.28	4.64	35.81	134	240	Peak
2480	75.88	-	-	-	-	-	-	-	-	Average
3306	42.86	-37.8	80.66	63.25	32.74	5.6	58.73	100	0	Peak
4962	53.4	-20.6	74	71.19	34.29	6.57	58.65	100	0	Peak
4962	28.62	-25.38	54	-	-	-	-	-	-	Average
7440	44.03	-29.97	74	57.6	36.01	8.63	58.21	100	0	Peak
7440	19.25	-34.75	54	-	-	-	-	-	-	Average

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	53~55%
Test Engineer :	David Ke	Polarization :	Vertical
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. 9918 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level.		

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
2480	98.91	-	-	97.8	32.28	4.64	35.81	159	278	Peak
2480	74.13	-	-	-	-	-	-	-	-	Average
4962	49.91	-24.09	74	67.7	34.29	6.57	58.65	100	0	Peak
4962	25.13	-28.87	54	-	-	-	-	-	-	Average
7440	45.56	-28.44	74	59.13	36.01	8.63	58.21	100	0	Peak
7440	20.78	-33.22	54	-	-	-	-	-	-	Average
9918	48.29	-30.62	78.91	57.16	37.42	9.51	55.8	100	0	Peak

Note: Other harmonics are lower than background noise.

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

*Decreases with the logarithm of the frequency.

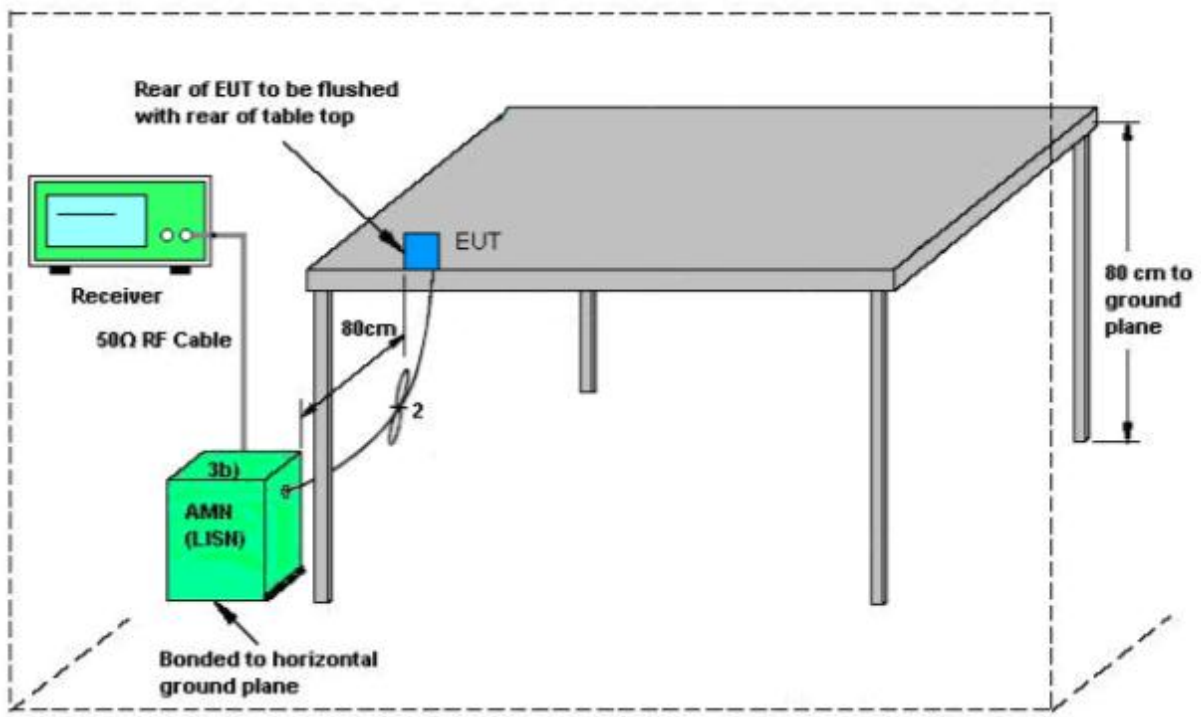
3.9.2 Measuring Instruments

See list of measuring instruments of this test report.

3.9.3 Test Procedures

1. The test follows the guidelines in ANSI C63.4-2003 and ANSI C63.10-2009 test site requirement.
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.

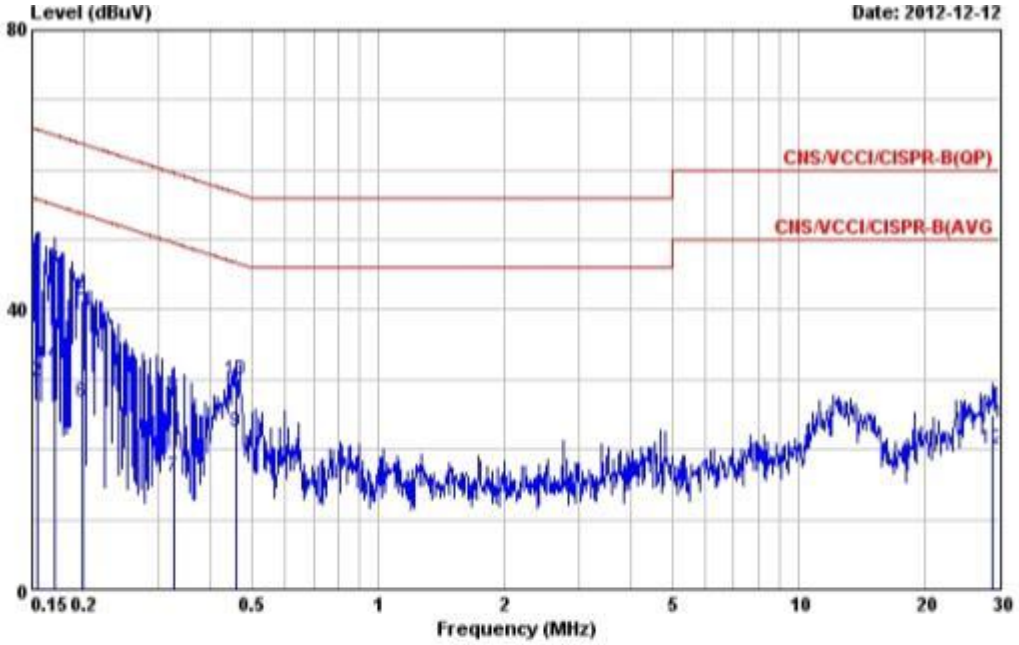
3.9.4 Test Setup



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

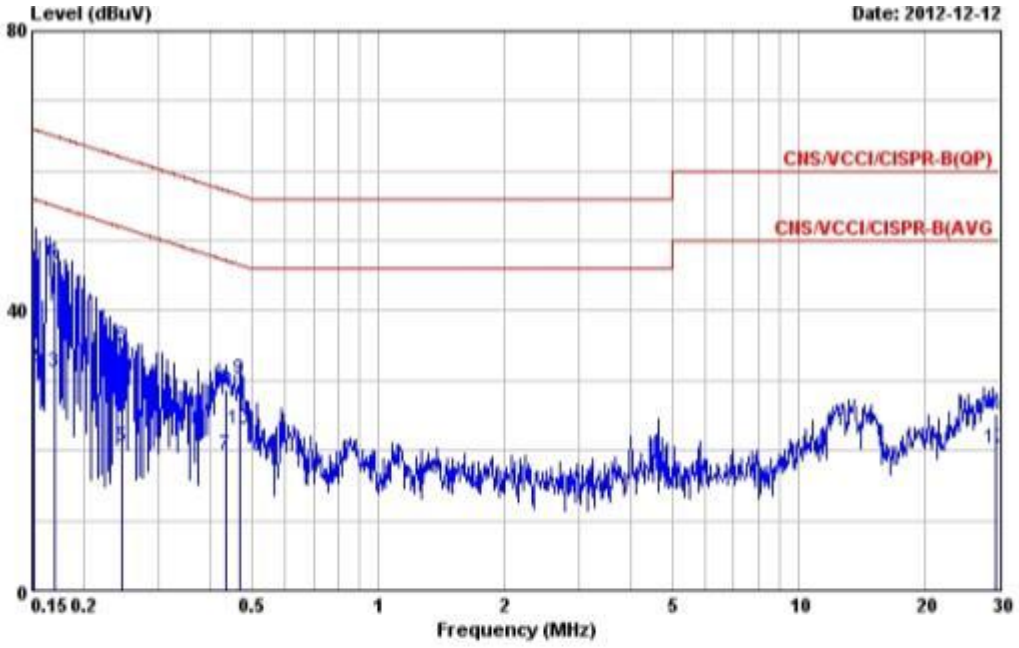
Test Mode :	Mode 1	**Temperature :**	24~25℃
Test Engineer :	Peter Lin	**Relative Humidity :**	48~49%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	WLAN Link + Bluetooth Link + MSR (Barcode Scanner) + Scanner (Touch Screen) + MPEG4 + Earphone (Audio In) + Camera (Video) + SD Card (Data Copy) + USB flash drive (Data Copy) + RJ45 Load		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-LK
Condition : LISN NNB-2/16Z 99081 LINE
EUT : CCHUB1
MODEL :
POWER : 120VAC/60Hz
MEMO : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.154	47.45	-18.33	65.78	47.27	0.14	0.04	QP
2 @	0.154	29.68	-26.10	55.78	29.50	0.14	0.04	Average
3 @	0.170	45.75	-19.21	64.96	45.57	0.14	0.04	QP
4 @	0.170	32.08	-22.88	54.96	31.90	0.14	0.04	Average
5 @	0.198	41.45	-22.24	63.69	41.27	0.14	0.04	QP
6 @	0.198	26.82	-26.87	53.69	26.64	0.14	0.04	Average
7 @	0.325	16.15	-33.43	49.58	15.95	0.15	0.05	Average
8 @	0.325	27.60	-31.98	59.58	27.40	0.15	0.05	QP
9 @	0.459	22.66	-24.05	46.71	22.42	0.15	0.09	Average
10 @	0.459	29.90	-26.81	56.71	29.66	0.15	0.09	QP
11 @	28.910	25.09	-34.91	60.00	23.95	0.54	0.60	QP
12 @	28.910	19.99	-30.01	50.00	18.85	0.54	0.60	Average

Test Mode :	Mode 1	**Temperature :**	24~25℃
Test Engineer :	Peter Lin	**Relative Humidity :**	48~49%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	WLAN Link + Bluetooth Link + MSR (Barcode Scanner) + Scanner (Touch Screen) + MPEG4 + Earphone (Audio In) + Camera (Video) + SD Card (Data Copy) + USB flash drive (Data Copy) + RJ45 Load		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-LK
Condition : LISN NNB-2/16Z 99081 NEUTRAL
EUT : CCHUB1
MODEL :
POWER : 120VAC/60Hz
MEMO : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.152	47.59	-18.30	65.89	47.40	0.15	0.04	QP
2 @	0.152	31.99	-23.90	55.89	31.80	0.15	0.04	Average
3 @	0.169	31.13	-23.88	55.01	30.94	0.15	0.04	Average
4 @	0.169	47.12	-17.89	65.01	46.93	0.15	0.04	QP
5 @	0.245	20.51	-31.43	51.94	20.32	0.15	0.04	Average
6 @	0.245	34.86	-27.08	61.94	34.67	0.15	0.04	QP
7 @	0.433	19.41	-27.78	47.19	19.19	0.15	0.07	Average
8 @	0.433	28.73	-28.46	57.19	28.51	0.15	0.07	QP
9 @	0.469	30.25	-26.28	56.53	30.01	0.15	0.09	QP
10 @	0.469	23.09	-23.44	46.53	22.85	0.15	0.09	Average
11 @	29.370	25.29	-34.71	60.00	24.85	0.64	0.60	QP
12 @	29.370	20.23	-29.77	50.00	18.99	0.64	0.60	Average

3.10 Antenna Requirements

3.10.1 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.

3.10.2 Antenna Connected Construction

Non-standard connector used.

3.10.3 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. 06, 2012	Dec. 19, 2012	Jun. 05, 2013	Conducted (TH02-HY)
Test Receiver	R&S	ESCS 30	838251/004	9 kHz ~ 2.75 GHz	Feb. 02, 2012	Dec. 12, 2012	Feb. 01, 2013	Conduction (CO01-LK)
LISN	R&S	NNB-2/16Z	99081	9 kHz ~ 30 MHz	Apr. 11, 2012	Dec. 12, 2012	Apr. 10, 2013	Conduction (CO01-LK)
RF Cable-CON	Suhner Switzerland	RG223/U	CB017	9 kHz ~ 30 MHz	Nov. 01, 2012	Dec. 12, 2012	Oct. 31, 2013	Conduction (CO01-LK)
ISN	TESEQ GMBH	ISN T400A	25669	150kHz - 30MHz	Oct. 15, 2012	Dec. 12, 2012	Oct. 14, 2013	Conduction (CO01-LK)
ISN	TESEQ GMBH	ISN T800	26105	150kHz - 30MHz	Oct. 15, 2012	Dec. 12, 2012	Oct. 14, 2013	Conduction (CO01-LK)
ISN	TESEQ GMBH	ST08	24347	150kHz~230MHz	Oct. 16, 2012	Dec. 12, 2012	Oct. 15, 2013	Conduction (CO01-LK)
Spectrum Analyzer	R&S	ESU26	100390	20Hz~26.5GHz	Dec. 14, 2012	Dec. 21, 2012	Dec. 13, 2013	Radiation (03CH05-HY)
Bilog Antenna	Schaffner	CBL6111C	2725	30MHz~2GHz	Oct. 06, 2012	Dec. 21, 2012	Oct. 05, 2013	Radiation (03CH05-HY)
Turn Table	HD	Deis HD 2000	420/611	0 ~ 360 degree	N/A	Dec. 21, 2012	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	MA 240	240/666	1 m ~ 4 m	N/A	Dec. 21, 2012	N/A	Radiation (03CH05-HY)
Horn Antenna	ESCO	3117	66584	1GHz~18GHz	Aug. 10, 2012	Dec. 21, 2012	Aug. 09, 2013	Radiation (03CH05-HY)
Pre Amplifier	Agilent	8449B	3008A02665	1GHz~26.5GHz	Aug. 28, 2012	Dec. 21, 2012	Aug. 27, 2013	Radiation (03CH05-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz ~ 40GHz	Sep. 28, 2012	Dec. 21, 2012	Sep. 27, 2013	Radiation (03CH05-HY)
Pre Amplifier	COM-POWER	PA-103	161075	10-1000MHz. 32dB.GAIN	Feb. 27, 2012	Dec. 21, 2012	Feb. 26, 2013	Radiation (03CH05-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9KHz ~ 30MHz	Jul. 03, 2012	Dec. 21, 2012	Jul. 02, 2013	Radiation (03CH05-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))	**2.26**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.54**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**