FCC/IC RF Test Report

APPLICANT	**:**	**Mosby LLC**
EQUIPMENT	**:**	**Tablet PC**
MODEL NAME	**:**	**GU045RW**
FCC ID	**:**	**S5R-2670**
IC	**:**	**10911A-2670**
STANDARD	**:**	**FCC Part 15 Subpart C §15.247** **IC RSS-210 issue 8**
CLASSIFICATION	**:**	**(DSS) Spread Spectrum Transmitter**

The product testing was completed on Sep. 05, 2013. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown to be compliant with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

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.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR332727-04A	Rev. 01	Initial issue of report	Sep. 06, 2013
FR332727-04A	Rev. 02	1. Revise BT output power limit to 125mW. 2. Add description about the WIFI AC power line conducted emission configuration.	Sep. 20, 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	≤ 125 mW	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 9.54 dB at 51.330 MHz
3.9	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 7.40 dB at 0.198 MHz
3.10	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Mosby LLC
2825 E. Cottonwood Parkway
Suite 500
Salt Lake City, Utah 84121

1.2 Feature of Equipment Under Test

Product Feature	
Equipment	Tablet PC
Model Name	GU045RW
FCC ID	S5R-2670
IC	10911A-2670
EUT supports Radios application	WLAN 11b/g/n (HT20) WLAN 11a/n (HT20/HT40) Bluetooth v3.0

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

1.3 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 BR(1Mbps) : 7.5 dBm (0.0056 W) Bluetooth EDR (2Mbps) : 8.0 dBm (0.0063 W) Bluetooth EDR (3Mbps) : 8.3 dBm (0.0068 W)
99% Occupied Bandwidth	Bluetooth BR(1Mbps) : 1.004MHz Bluetooth EDR (2Mbps) : 1.096MHz Bluetooth EDR (3Mbps) : 1.128MHz
Antenna Type	Fixied Internal Antenna with gain 2.10 dBi
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π /4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK

1.4 Modification of EUT

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

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	CO05-HY	03CH07-HY	722060/4086B-1

Note: The test site complies with ANSI C63.4 2003 requirement.

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
- 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 Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	7.3 dBm	7.7 dBm	**8.3** dBm
Ch39	2441MHz	7.5 dBm	8.0 dBm	8.3 dBm
Ch78	2480MHz	7.2 dBm	7.4 dBm	7.8 dBm

Remark:

1. All the test data for each data rate were verified, but only the worst case was reported.
2. The worse data rate was 3Mbps for Radiated Spurious Emissions and all the data rate were tested for RF conducted items and reported.
3. For AFH mode, the power and other characteristics remain the same as 1Mbps data rate.

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels, and different data rates were conducted to determine the final configuration (Z plane as worst plane) from all possible combinations, and the worst mode of radiated spurious emissions is Bluetooth 3Mbps mode, and recorded in this report.

b. AC power line Conducted Emission was tested under maximum output power.

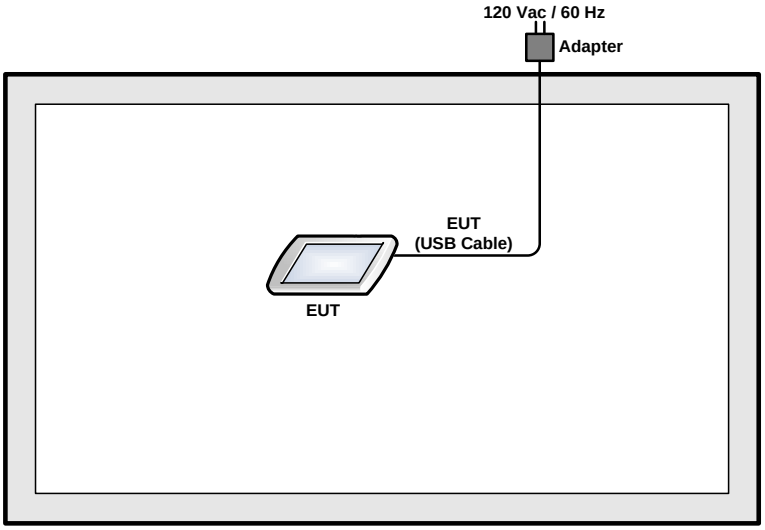
2.2 Test Mode

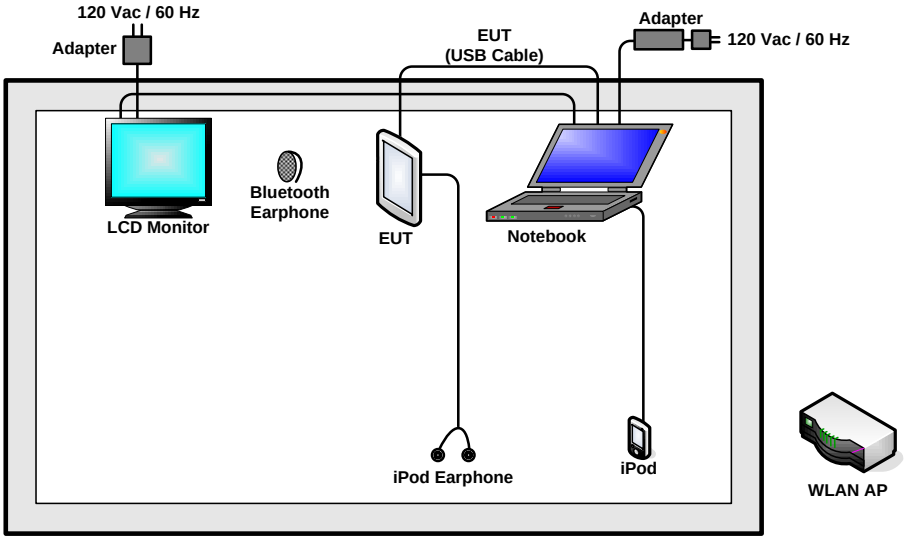
The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases			
Test Item	**Data Rate / Modulation**		
	Bluetooth BR 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 (2.4GHz, 11b, Ch06, 1Mbps) Link + Bluetooth Link + Earphone + USB Cable (Data Link with Notebook) + Camera <Fig. 1> Mode 2 : WLAN (5GHz, 11a, Ch157, 6Mbps) Link + Bluetooth Link + Earphone + USB Cable (Data Link with Notebook) + Camera <Fig. 1> Mode 3 : WLAN (2.4GHz, 11b, Ch06, 1Mbps) MIMO Tx + Earphone + USB Cable (Data Link with Notebook) + Camera <Fig. 2> Mode 4 : WLAN (5GHz, 11a, Ch157, 6Mbps) MIMO Tx + Earphone + USB Cable (Data Link with Notebook) + Camera <Fig. 2>		
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 .			

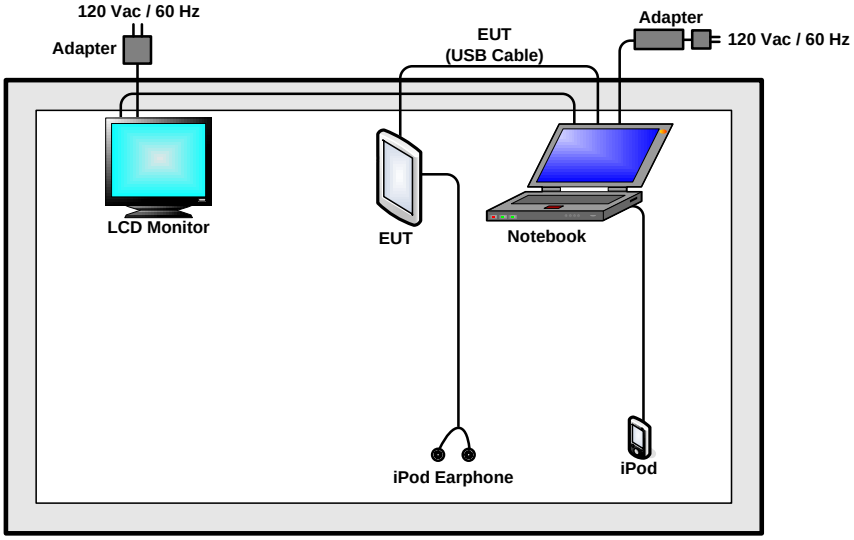
2.3 Connection Diagram of Test System

<Bluetooth Tx Mode>





<Fig. 1>



<Fig. 2>

2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
2.	iPod Earphone	Apple	N/A	N/A	Unshielded, 1.0 m	N/A
3.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	LCD Monitor	DELL	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
6.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
7.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
8.	Adapter	Foxlink	PE98ED	Verification	N/A	N/A
9.	Adapter	Foxlink	A02710	Verification	N/A	N/A

2.5 EUT Operation Test Setup

For Bluetooth function, programmed RF utility, “ADB” installed in the notebook make the EUT provides functions like channel selection and power level for continuous transmitting signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

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

Example:

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

Offset = RF cable loss + attenuator factor.

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

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

= 4.2 + 10 = 14.2 (dB)

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.

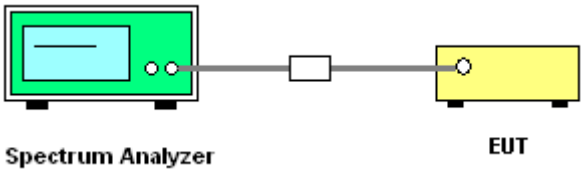
3.1.2 Measuring Instruments

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

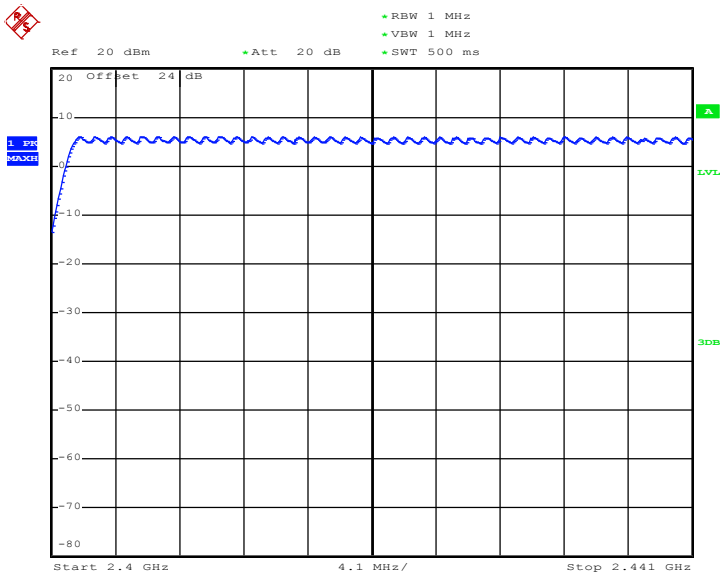


3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Engineer :	Reece Lee	**Relative Humidity :**	48~51%

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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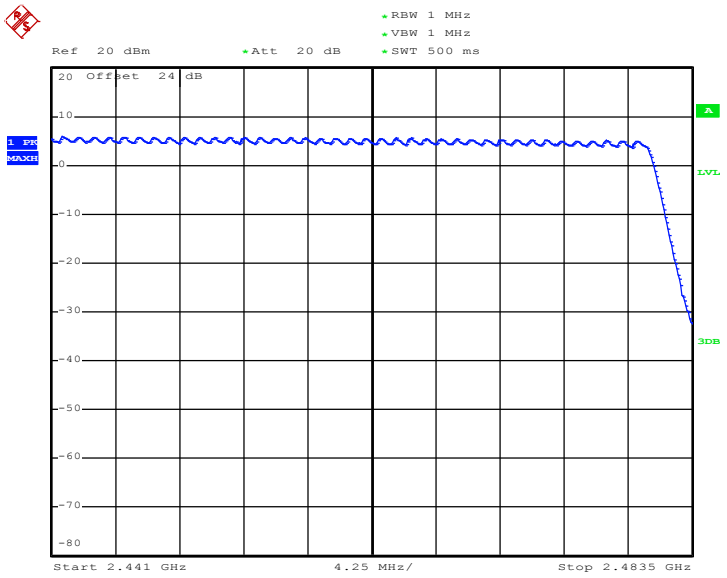

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3.2 Hopping Channel Separation Measurement

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.

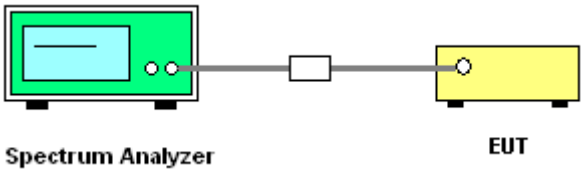
3.2.2 Measuring Instruments

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

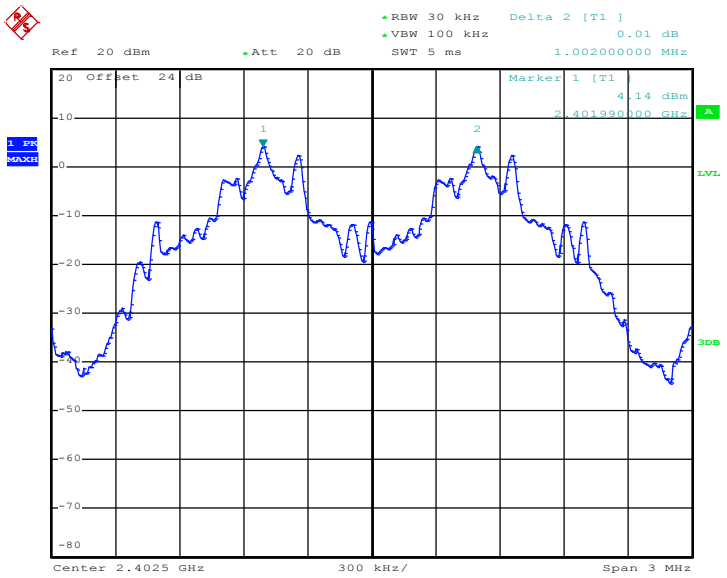


3.2.5 Test Result of Hopping Channel Separation

Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Engineer :	Reece Lee	**Relative Humidity :**	48~51%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.5040	Pass
39	2441	1.002	0.5067	Pass
78	2480	1.002	0.5067	Pass

Channel Separation Plot on Channel 00 - 01



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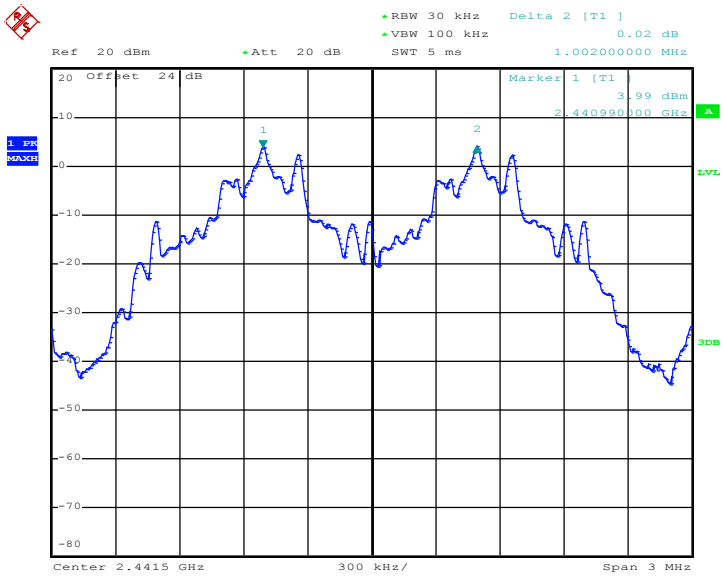
Channel Separation Plot on Channel 39 - 40



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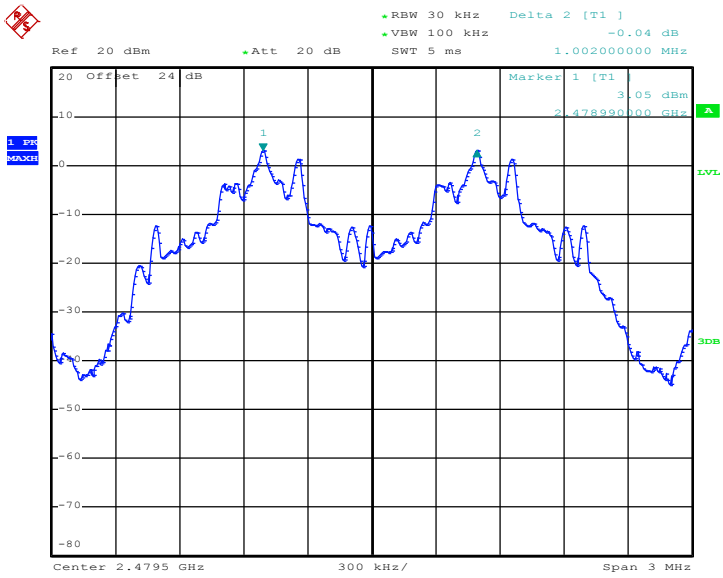
Channel Separation Plot on Channel 77 - 78



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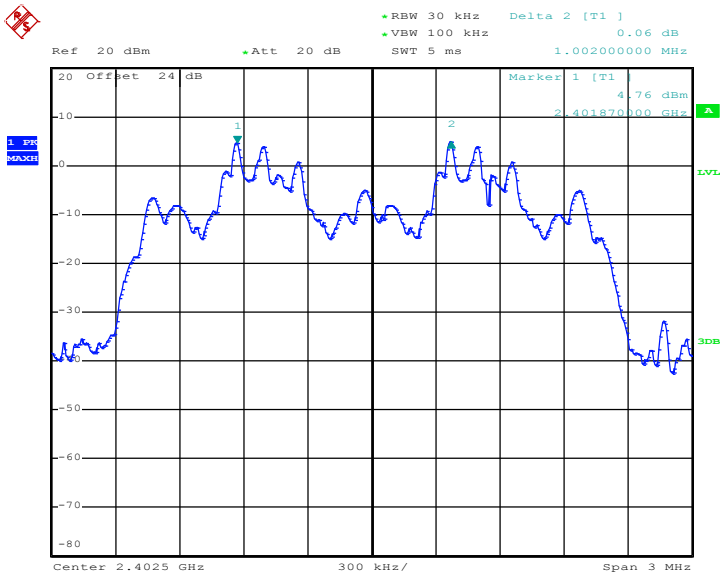
Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Reece Lee	Relative Humidity :	48~51%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.5840	Pass
39	2441	1.002	0.7680	Pass
78	2480	1.002	0.7680	Pass

Channel Separation Plot on Channel 00 - 01



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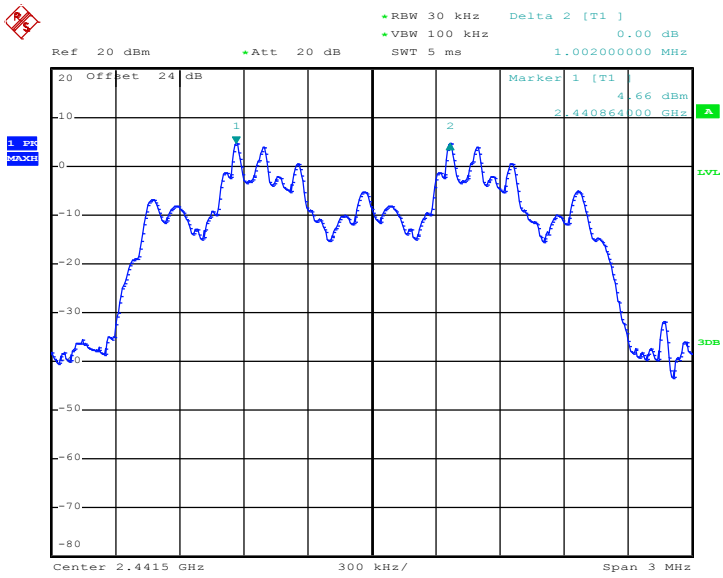
Channel Separation Plot on Channel 39 - 40



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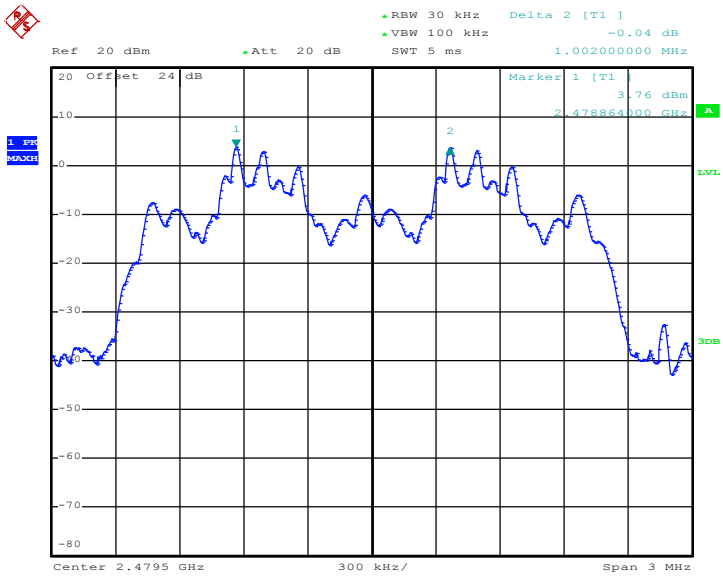
Channel Separation Plot on Channel 77 - 78

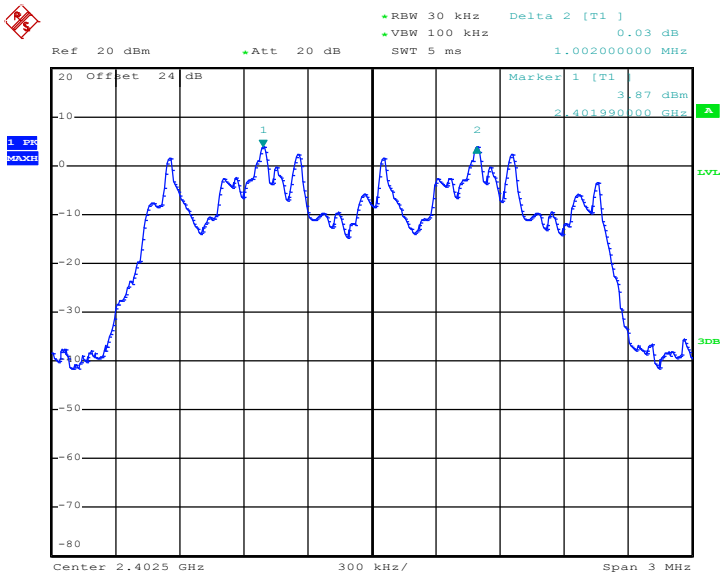


Date: 9.AUG.2013 20:05:11

Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Reece Lee	Relative Humidity :	48~51%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.7920	Pass
39	2441	1.002	0.7880	Pass
78	2480	1.008	0.7920	Pass

Channel Separation Plot on Channel 00 - 01



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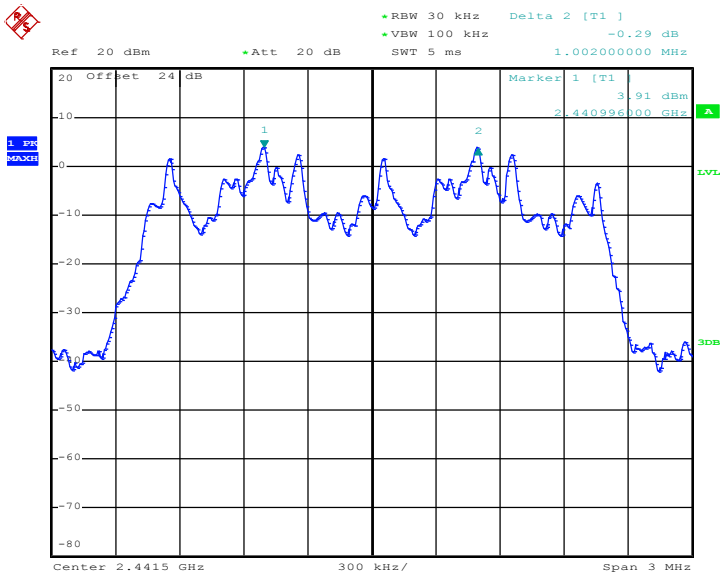
Channel Separation Plot on Channel 39 - 40



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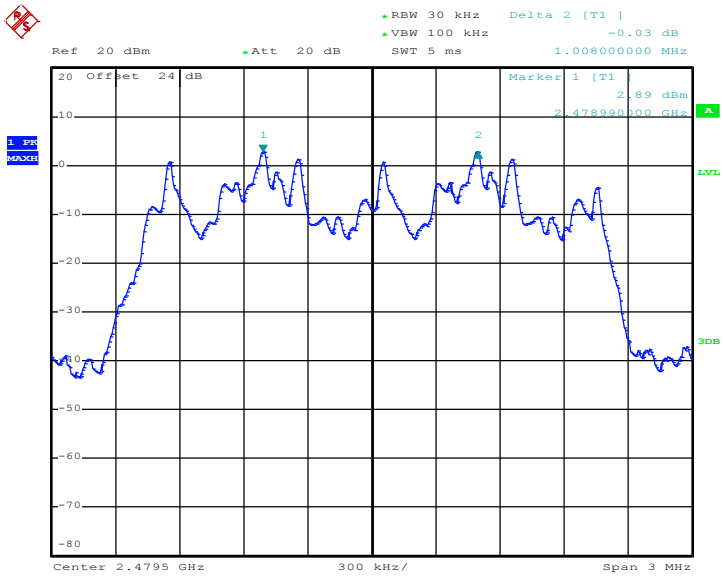
Channel Separation Plot on Channel 77 - 78



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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.

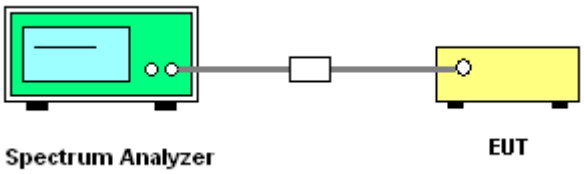
3.3.2 Measuring Instruments

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



3.3.5 Test Result of Dwell Time

Test Mode :	DH5	**Temperature :**	24~26℃
Test Engineer :	Reece Lee	**Relative Humidity :**	48~51%

Mode	Hopping Channel Number	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Normal	79	106.67	2.92	0.31	0.4	Pass
AFH	20	53.33	2.92	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.

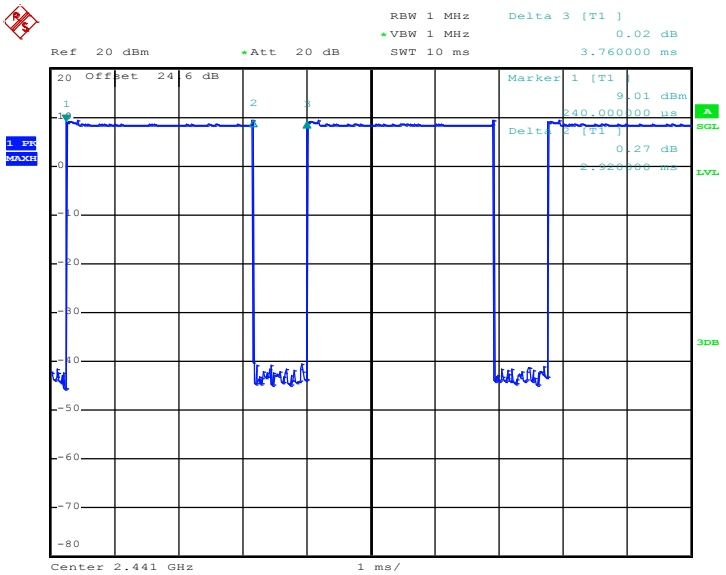
2. In AFH mode, hopping rate is 800hops/s with 6 slots in 20 hopping channels.

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) = 53.33 hops.

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

Package Transfer Time Plot



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3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

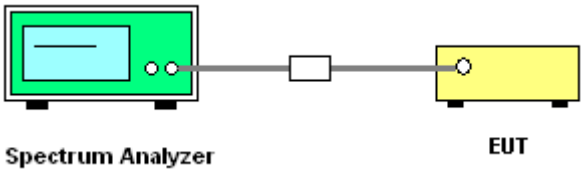
3.4.2 Measuring Instruments

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

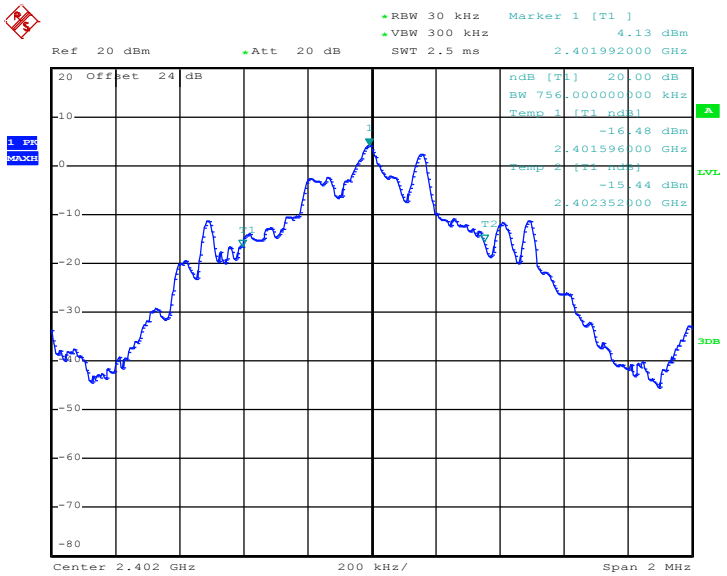


3.4.5 Test Result of 20dB Bandwidth

Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Reece Lee	Relative Humidity :	48~51%

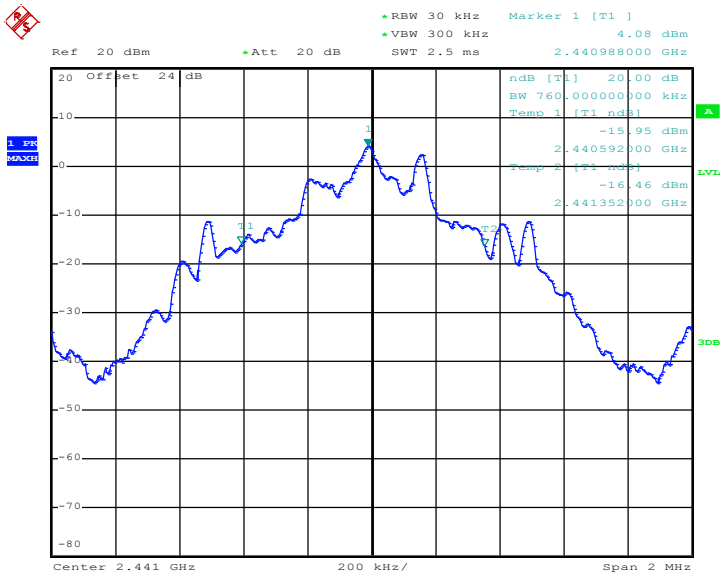
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.756
39	2441	0.760
78	2480	0.760

20 dB Bandwidth Plot on Channel 00



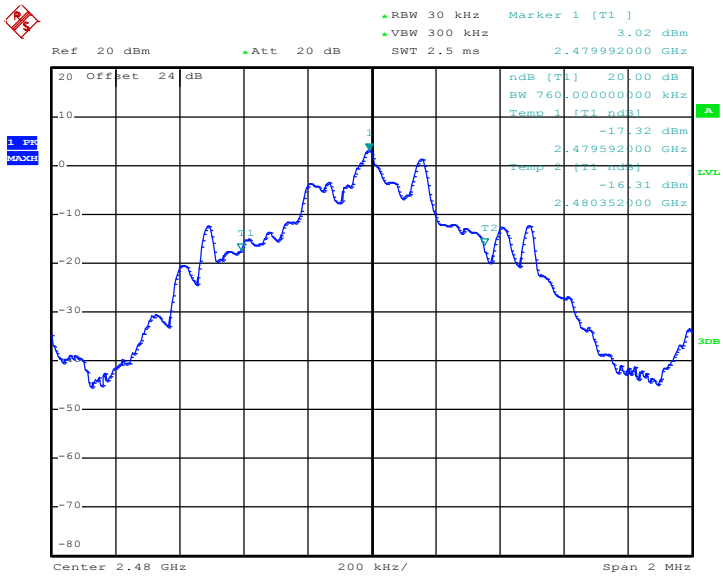
Date: 9.AUG.2013 20:40:32

20 dB Bandwidth Plot on Channel 39



Date: 9.AUG.2013 20:47:32

20 dB Bandwidth Plot on Channel 78

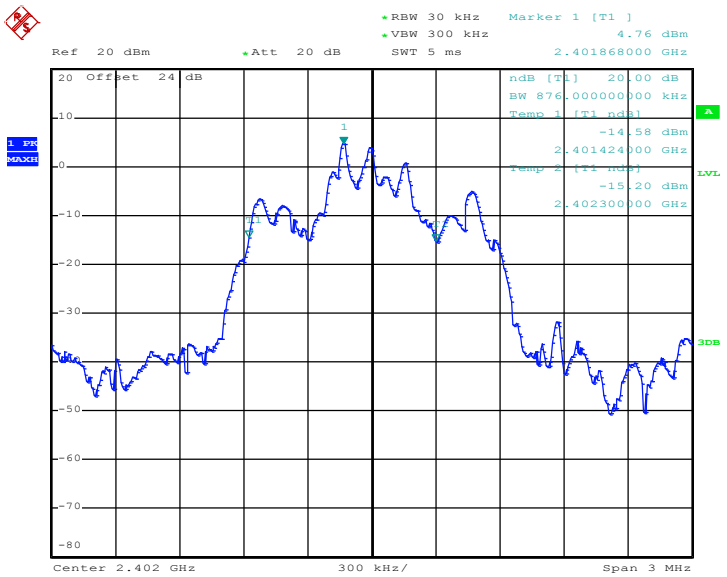


Date: 9.AUG.2013 21:17:22

Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Reece Lee	Relative Humidity :	48~51%

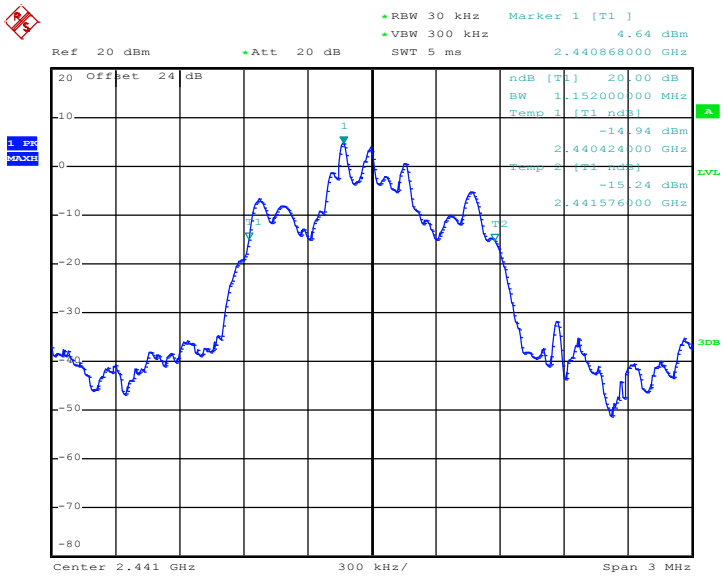
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.876
39	2441	1.152
78	2480	1.152

20 dB Bandwidth Plot on Channel 00



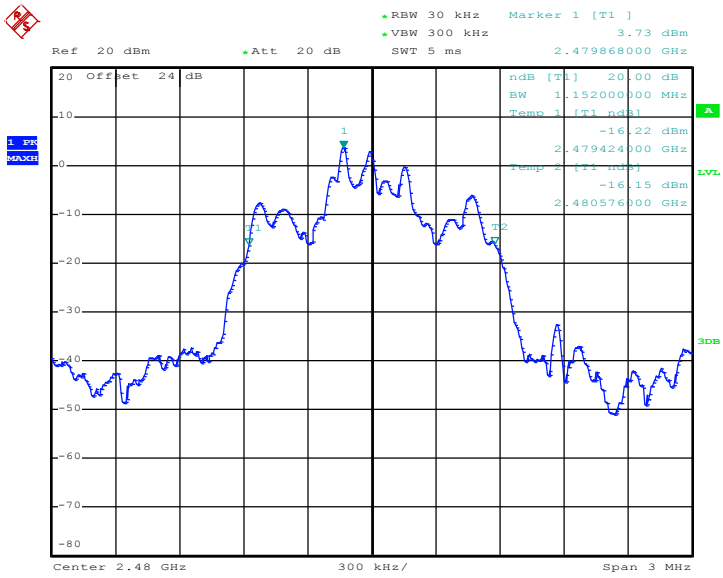
Date: 9.AUG.2013 20:24:00

20 dB Bandwidth Plot on Channel 39



Date: 9.AUG.2013 20:18:40

20 dB Bandwidth Plot on Channel 78

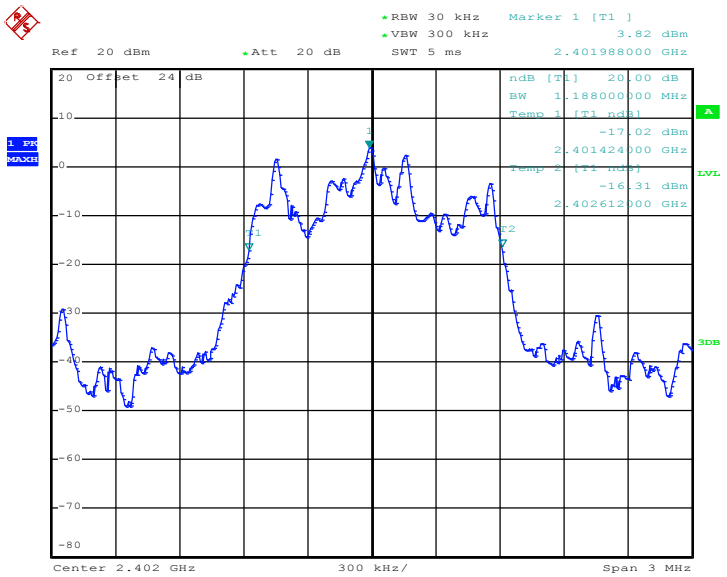


Date: 9.AUG.2013 20:06:26

Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Reece Lee	Relative Humidity :	48~51%

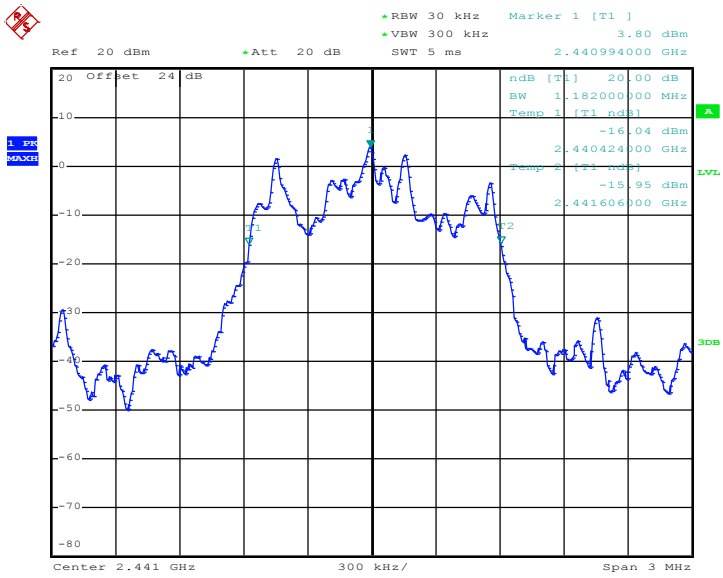
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.188
39	2441	1.182
78	2480	1.188

20 dB Bandwidth Plot on Channel 00



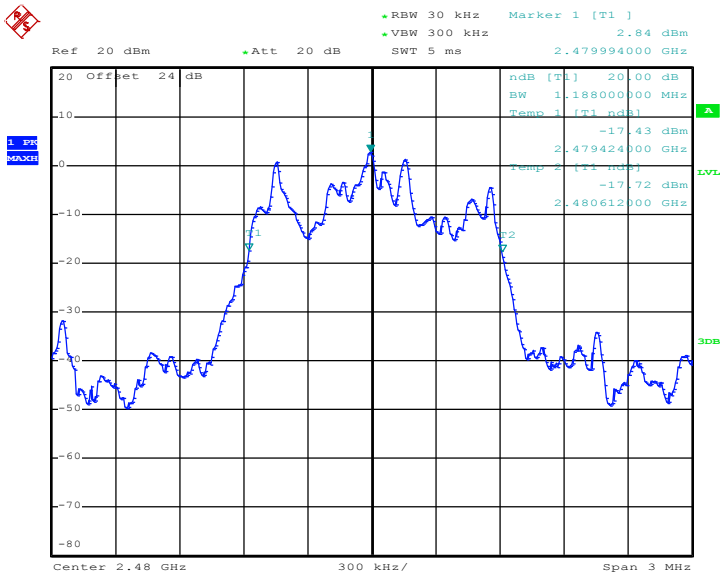
Date: 9.AUG.2013 19:34:10

20 dB Bandwidth Plot on Channel 39



Date: 9.AUG.2013 19:39:54

20 dB Bandwidth Plot on Channel 78



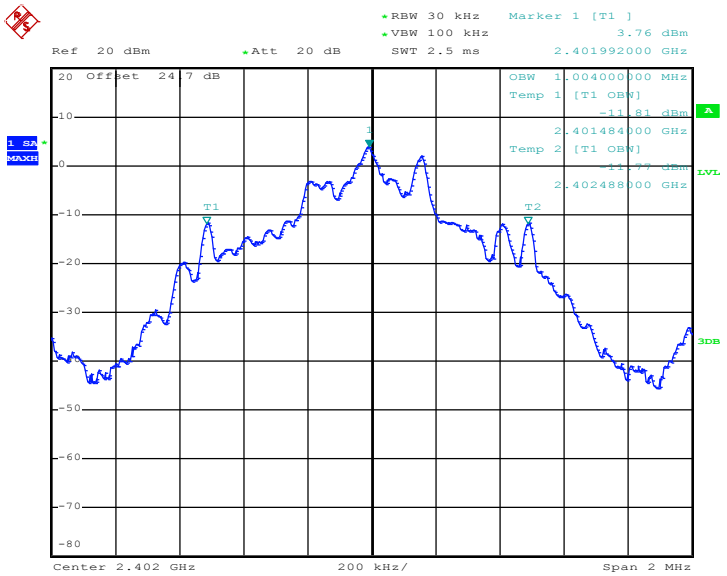
Date: 9.AUG.2013 19:48:03

3.4.6 Test Result of 99% Occupied Bandwidth

Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Engineer :	Reece Lee	**Relative Humidity :**	48~51%

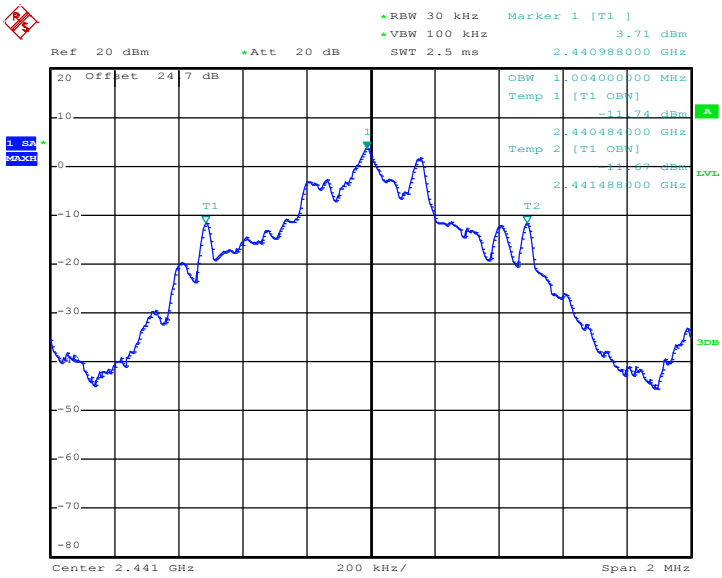
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.004
39	2441	1.004
78	2480	1.004

99% Occupied Bandwidth Plot on Channel 00



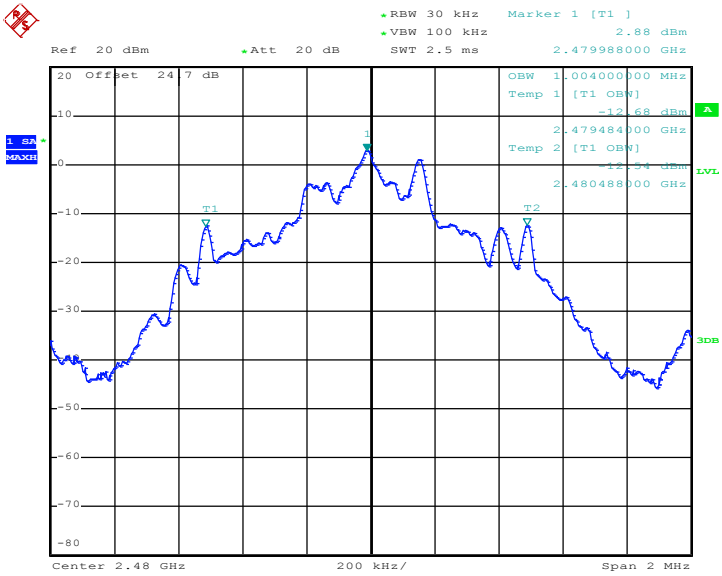
Date: 5.SEP.2013 18:04:51

99% Occupied Bandwidth Plot on Channel 39



Date: 5.SEP.2013 18:05:54

99% Occupied Bandwidth Plot on Channel 78

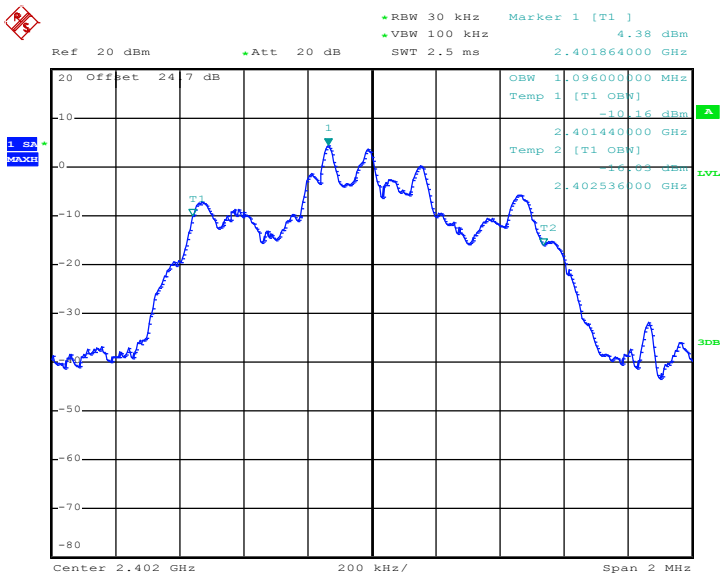


Date: 5.SEP.2013 18:07:22

Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Reece Lee	Relative Humidity :	48~51%

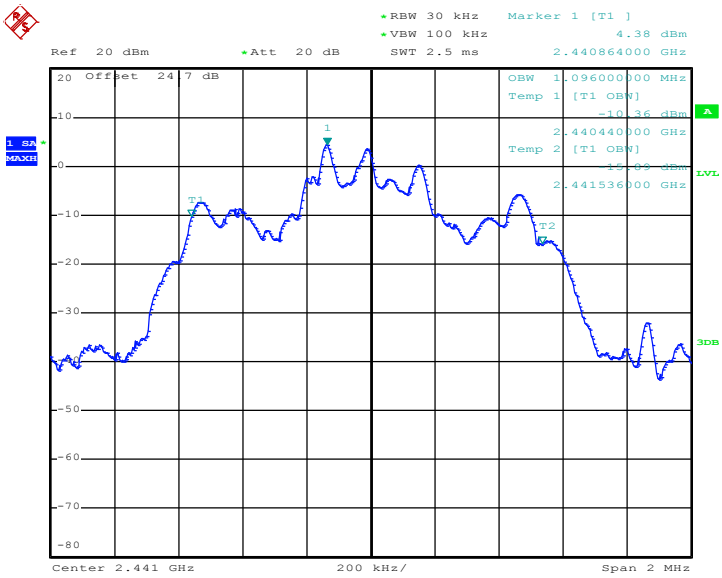
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.096
39	2441	1.096
78	2480	1.096

99% Occupied Bandwidth Plot on Channel 00



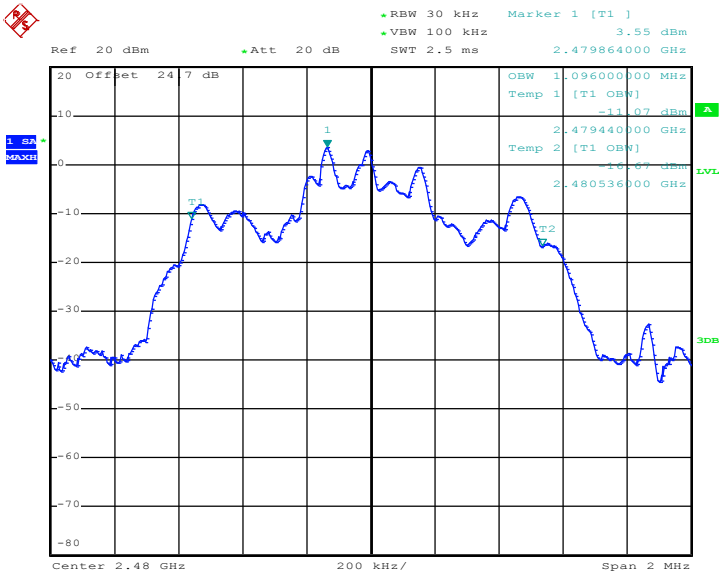
Date: 5.SEP.2013 18:09:54

99% Occupied Bandwidth Plot on Channel 39



Date: 5.SEP.2013 18:09:08

99% Occupied Bandwidth Plot on Channel 78

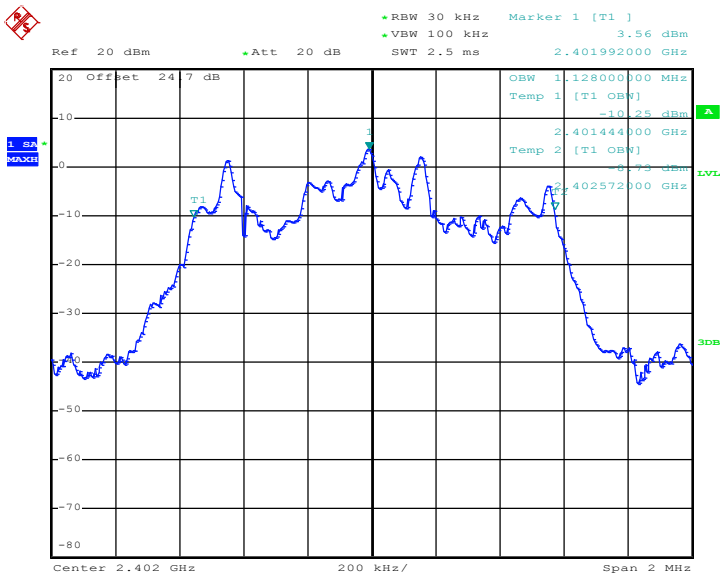


Date: 5.SEP.2013 18:08:08

Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Reece Lee	Relative Humidity :	48~51%

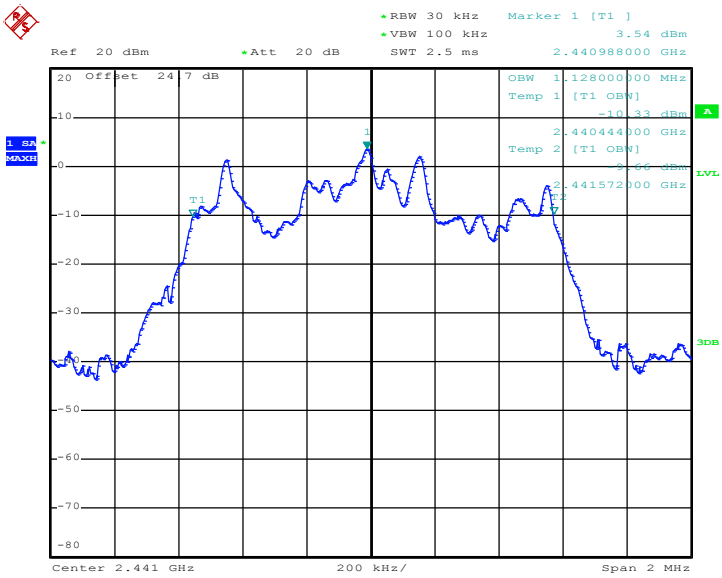
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.128
39	2441	1.128
78	2480	1.124

99% Occupied Bandwidth Plot on Channel 00



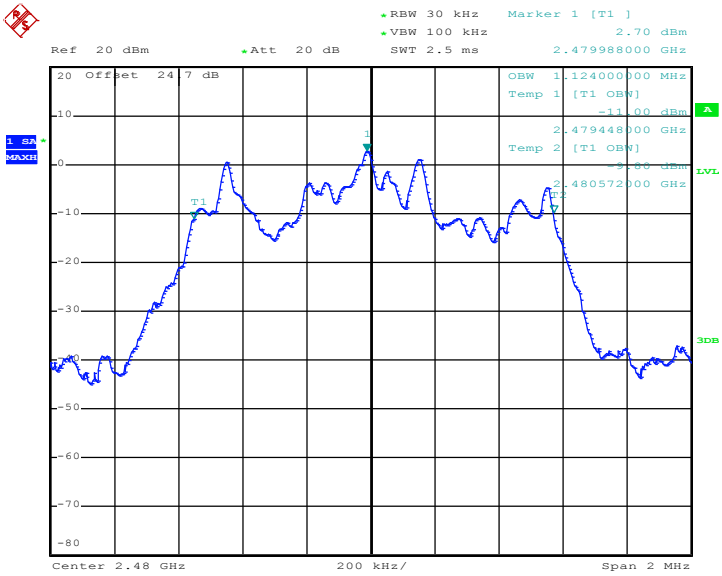
Date: 5.SEP.2013 18:10:43

99% Occupied Bandwidth Plot on Channel 39



Date: 5.SEP.2013 18:11:37

99% Occupied Bandwidth Plot on Channel 78



Date: 5.SEP.2013 18:12:24

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.

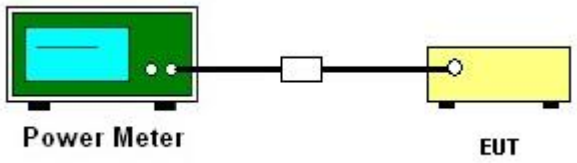
3.5.2 Measuring Instruments

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 power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power 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 :	Reece Lee	**Relative Humidity :**	48~51%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	7.3	20.97	Pass
39	2441	7.5	20.97	Pass
78	2480	7.2	20.97	Pass

Note:

1. For AFH mode using 20 hopping channels, the maximum output power limit is 20.97dBm.
2. For AFH mode, the power and other characteristics remain the same as 1Mbps data rate.

Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Engineer :	Reece Lee	**Relative Humidity :**	48~51%

Channel	Frequency (MHz)	RF Power (dBm)		
		π /4-DQPSK	Max. Limits (dBm)	Pass/Fail
		2 Mbps		
00	2402	7.7	20.97	Pass
39	2441	8.0	20.97	Pass
78	2480	7.4	20.97	Pass

Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Engineer :	Reece Lee	**Relative Humidity :**	48~51%

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	8.3	20.97	Pass
39	2441	8.3	20.97	Pass
78	2480	7.8	20.97	Pass

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.

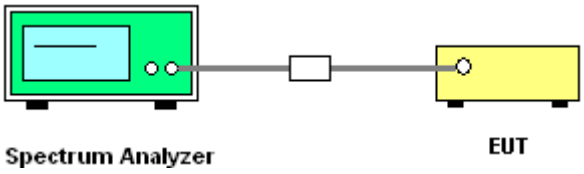
3.6.2 Measuring Instruments

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 = 100kHz (≥ 1% span=10MHz), 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 100kHz 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.

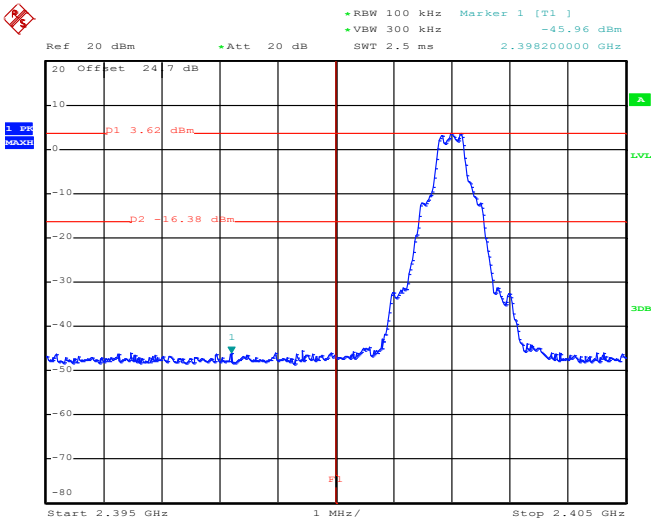
3.6.4 Test Setup



3.6.6 Test Result of Conducted Band Edges

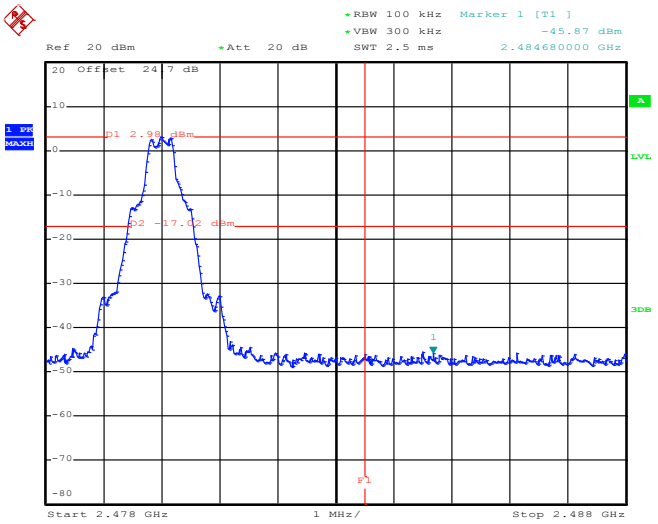
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

Low Band Edge Plot on Channel 00



Date: 3.SEP.2013 15:05:40

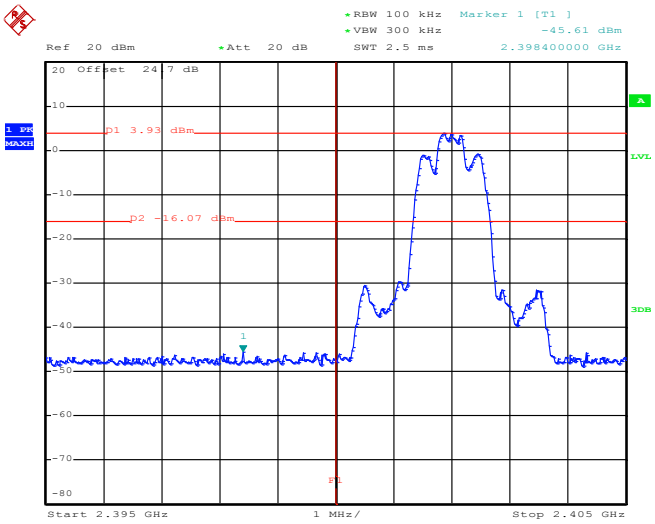
High Band Edge Plot on Channel 78



Date: 3.SEP.2013 15:06:57

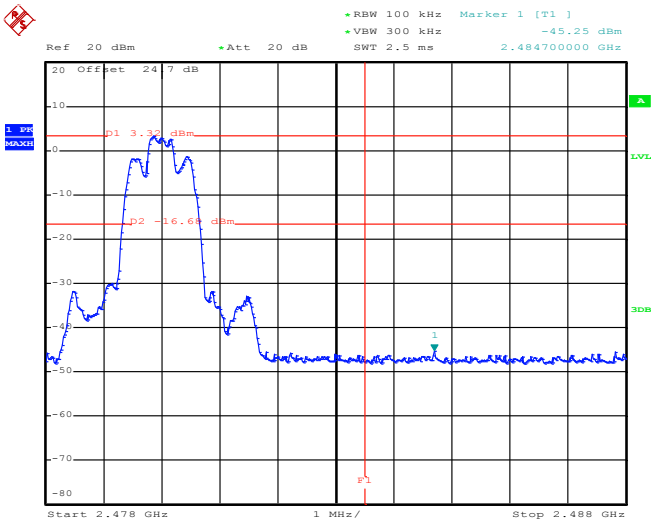
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

Low Band Edge Plot on Channel 00



Date: 3.SEP.2013 15:11:07

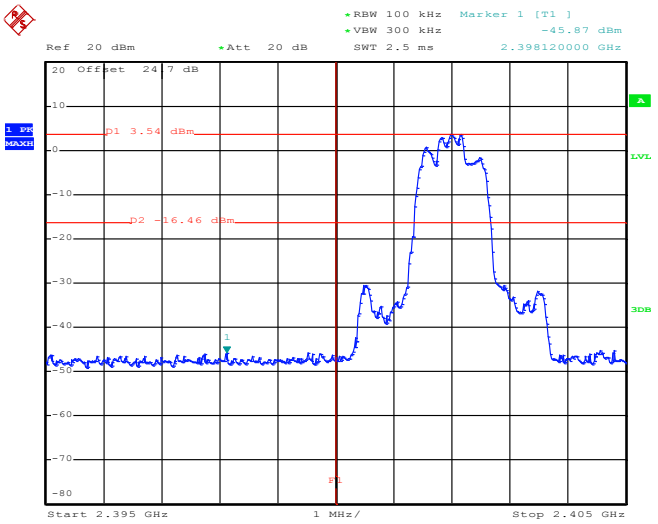
High Band Edge Plot on Channel 78



Date: 3.SEP.2013 15:09:31

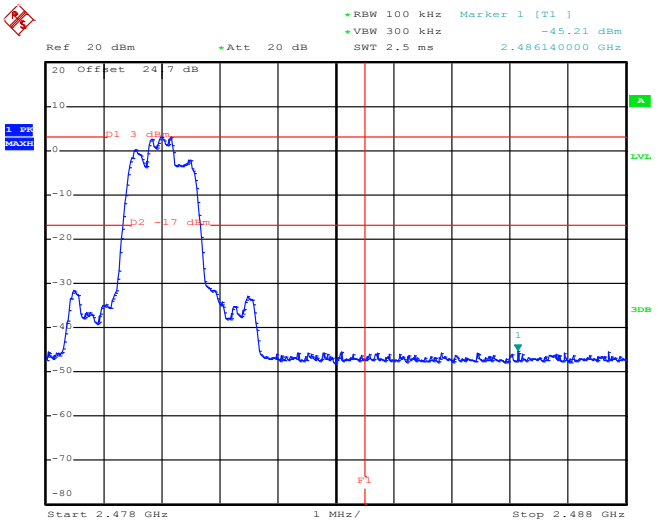
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

Low Band Edge Plot on Channel 00



Date: 3.SEP.2013 15:12:29

High Band Edge Plot on Channel 78

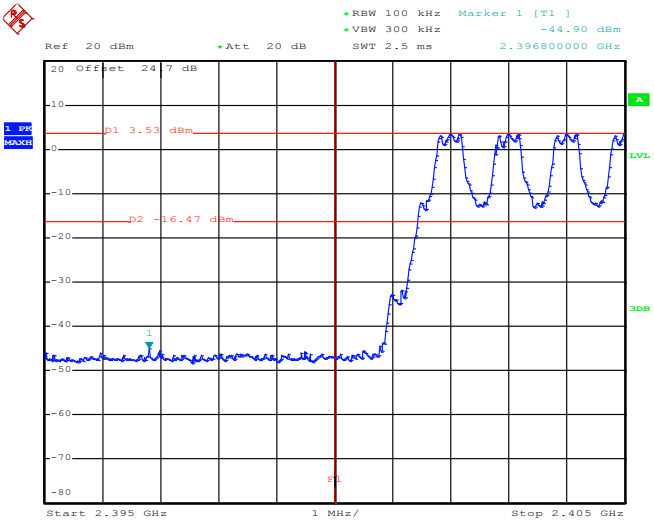


Date: 3.SEP.2013 16:04:17

3.6.7 Test Result of Conducted Hopping Mode Band Edges

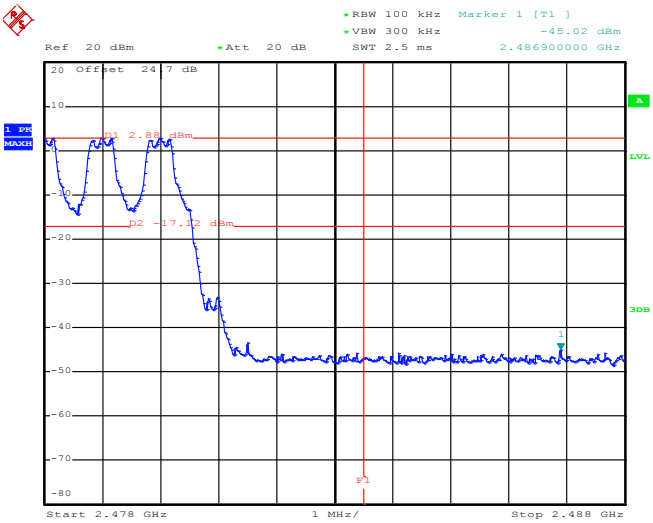
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Reece Lee	Relative Humidity :	48~51%

1Mbps Hopping Mode Low Band Edge Plot



Date: 3.SEP.2013 15:23:06

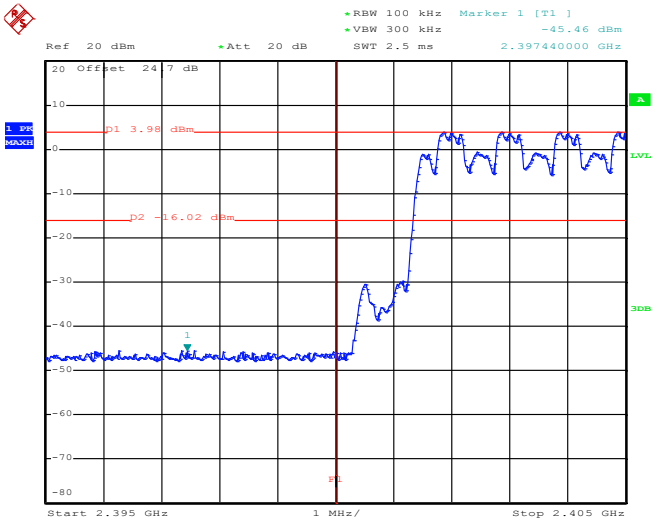
1Mbps Hopping Mode High Band Edge Plot



Date: 3.SEP.2013 15:28:52

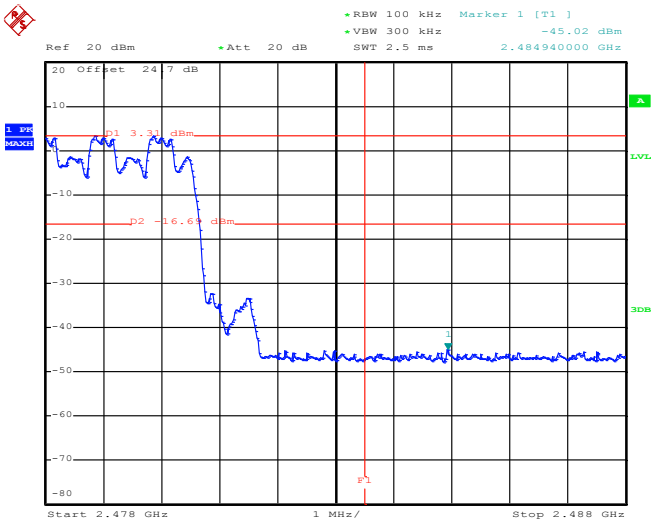
Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Reece Lee	Relative Humidity :	48~51%

2Mbps Hopping Mode Low Band Edge Plot



Date: 3.SEP.2013 15:43:45

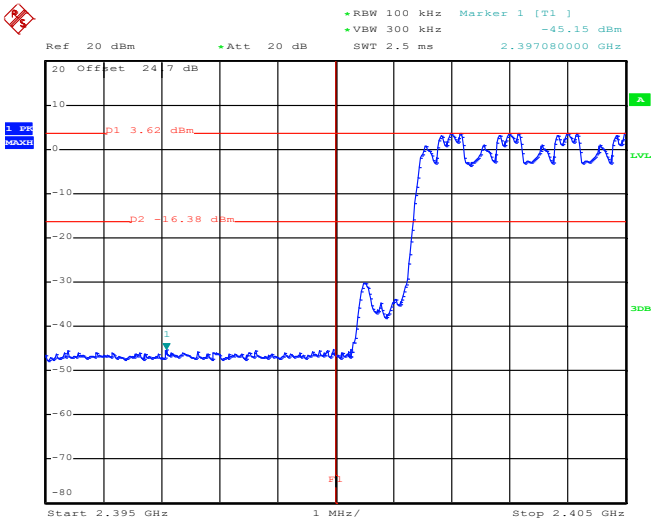
2Mbps Hopping Mode High Band Edge Plot



Date: 3.SEP.2013 15:35:37

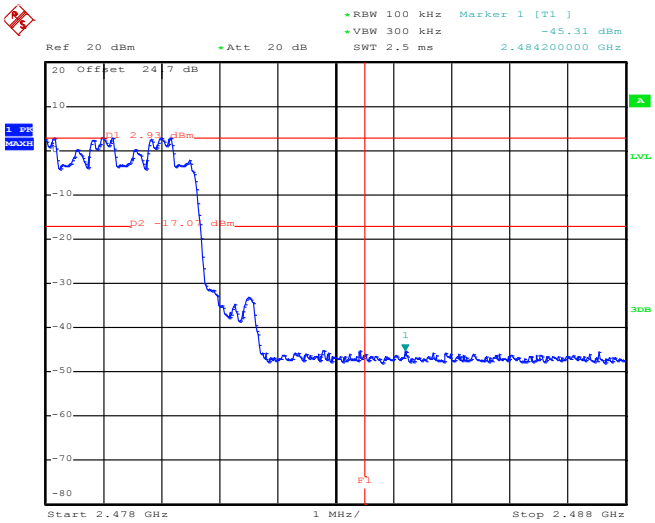
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Reece Lee	Relative Humidity :	48~51%

3Mbps Hopping Mode Low Band Edge Plot



Date: 3.SEP.2013 15:51:33

3Mbps Hopping Mode High Band Edge Plot



Date: 3.SEP.2013 15:38:41

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.

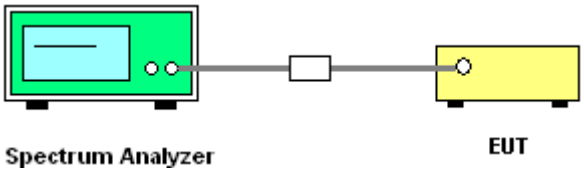
3.7.2 Measuring Instruments

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.

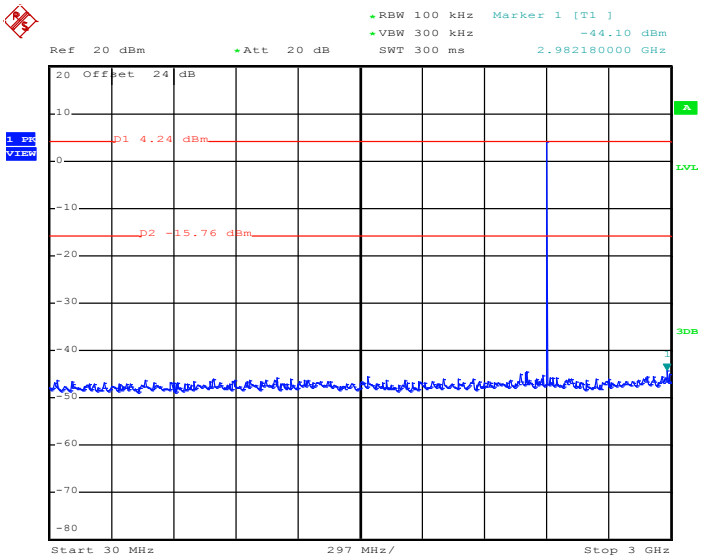
3.7.4 Test Setup



3.7.5 Test Result of Conducted Spurious Emission

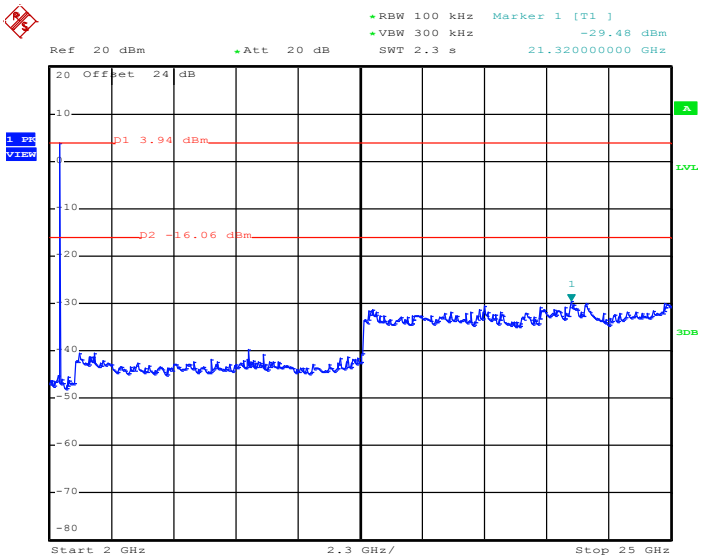
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	00	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

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



Date: 9.AUG.2013 20:42:54

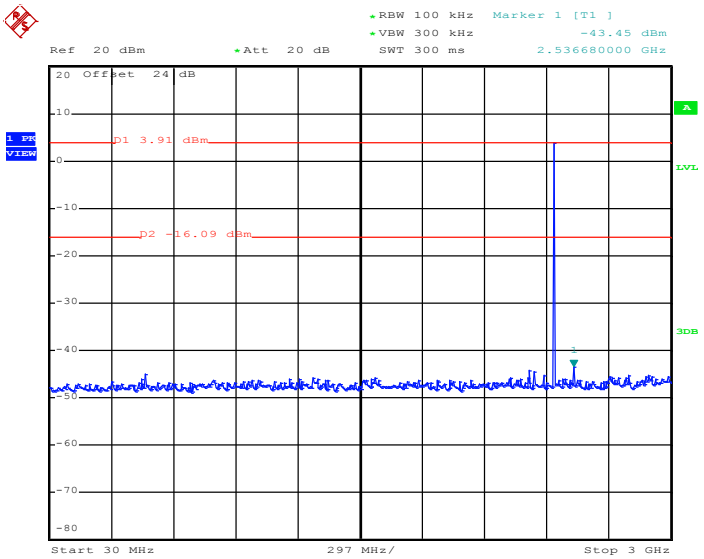
1Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 9.AUG.2013 20:43:16

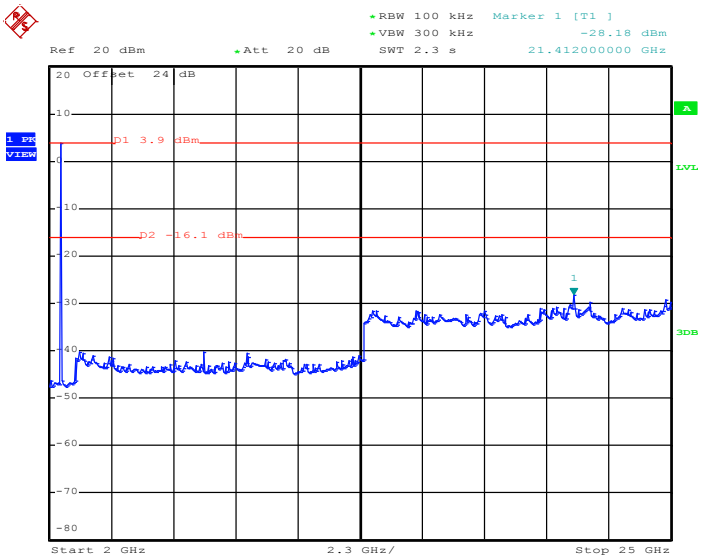
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	39	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

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



Date: 9.AUG.2013 20:49:56

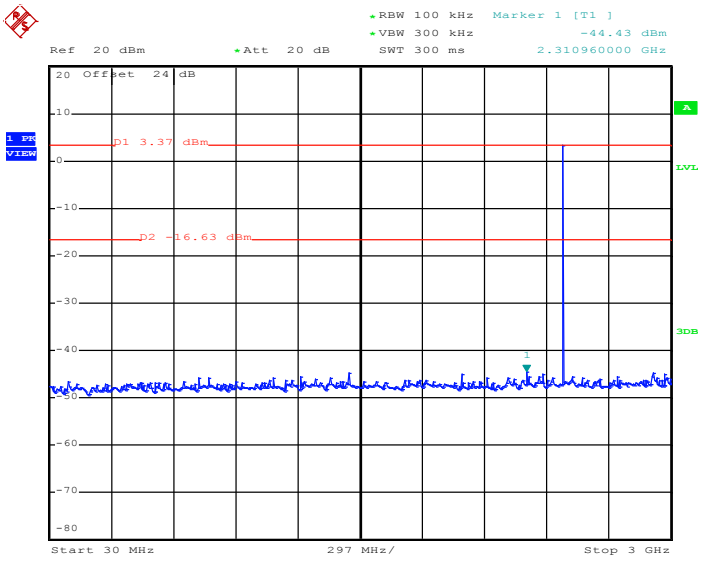
1Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 9.AUG.2013 20:50:17

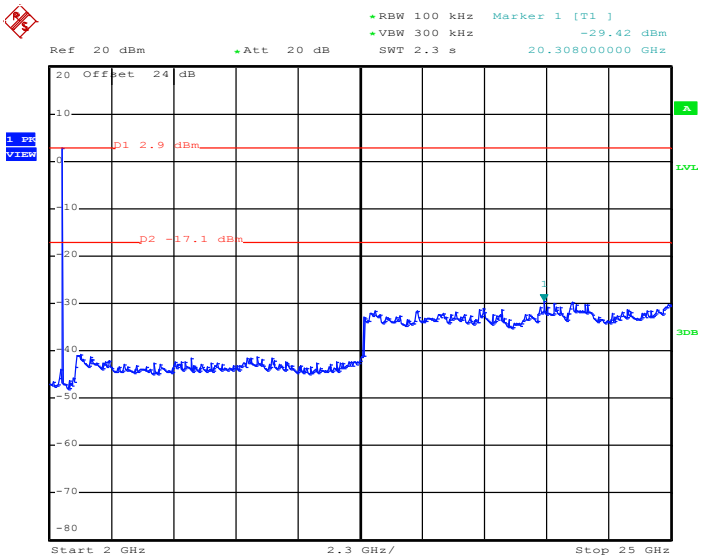
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	78	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

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



Date: 9.AUG.2013 21:19:06

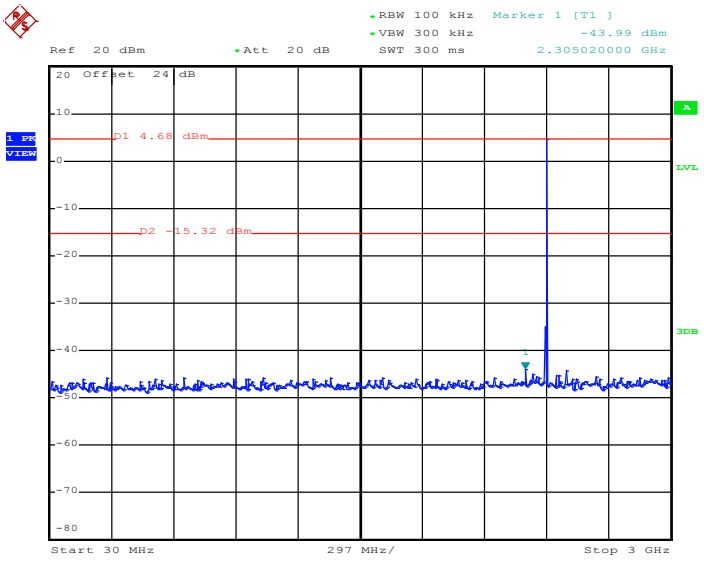
1Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 9.AUG.2013 21:19:28

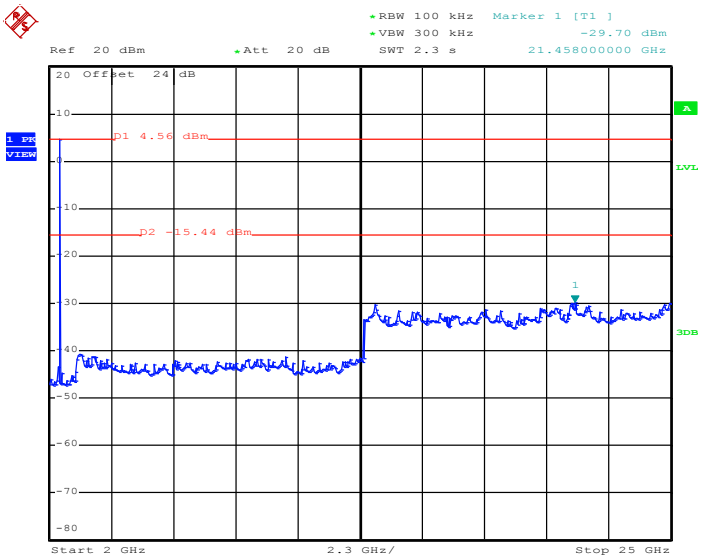
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	00	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

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



Date: 9.AUG.2013 20:25:42

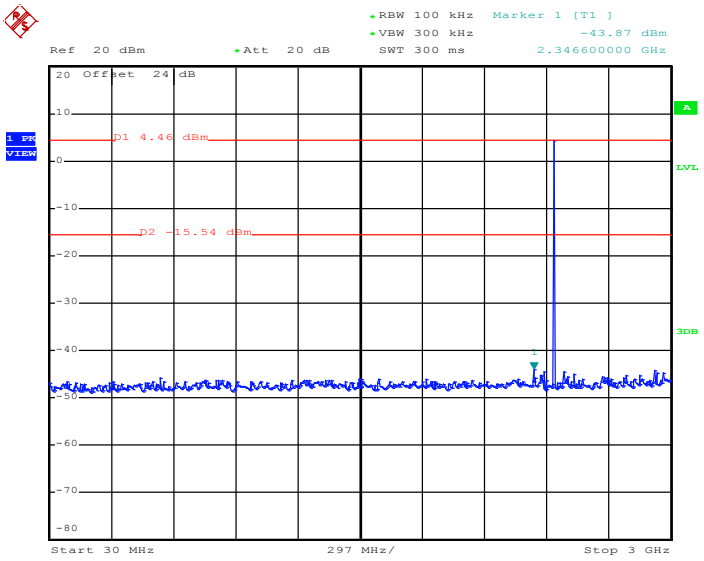
2Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 9.AUG.2013 20:26:04

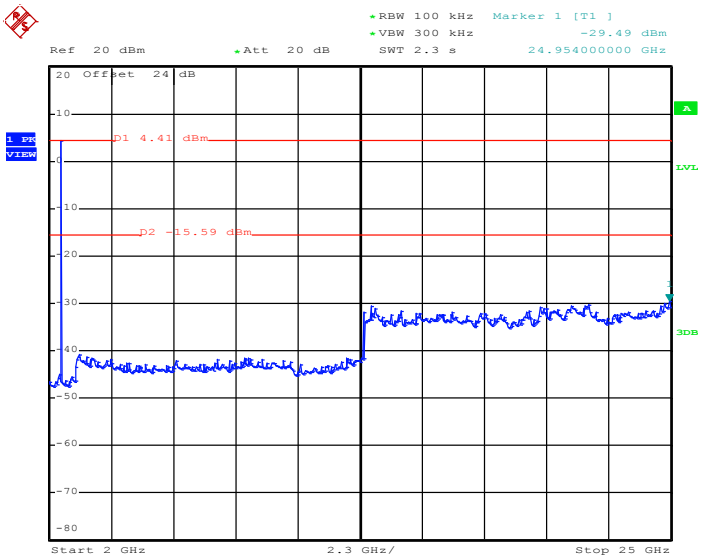
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	39	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

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



Date: 9.AUG.2013 20:19:42

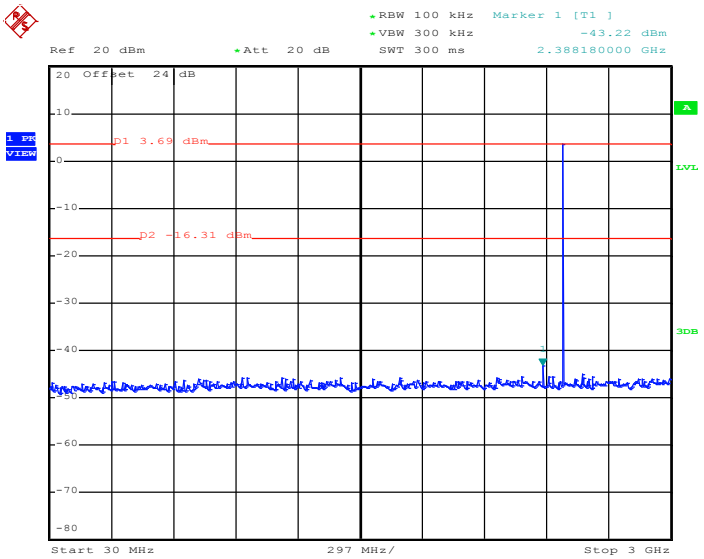
2Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 9.AUG.2013 20:20:04

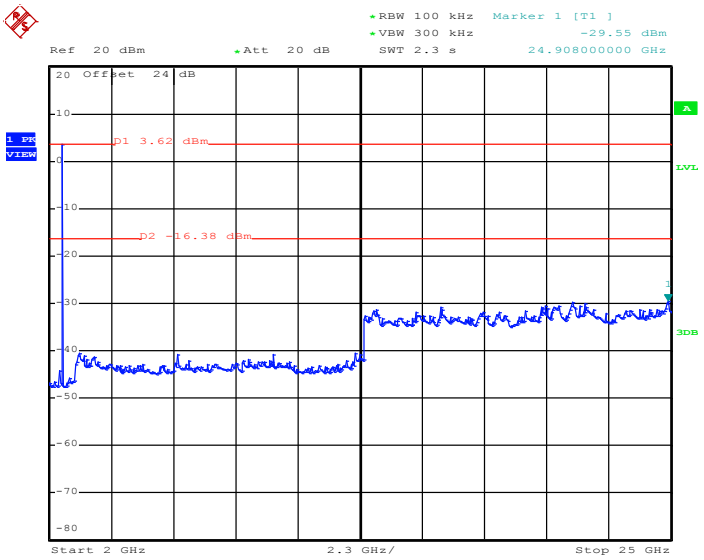
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	78	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

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



Date: 9.AUG.2013 20:09:08

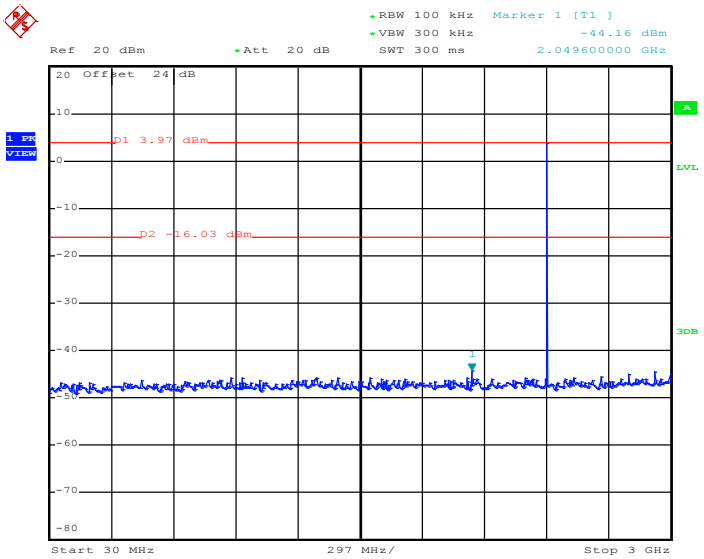
2Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 9.AUG.2013 20:09:29

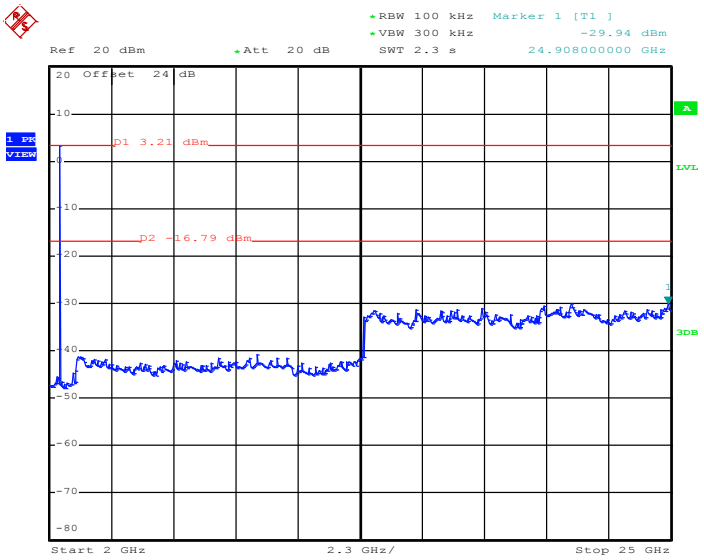
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	00	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

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



Date: 9.AUG.2013 21:30:23

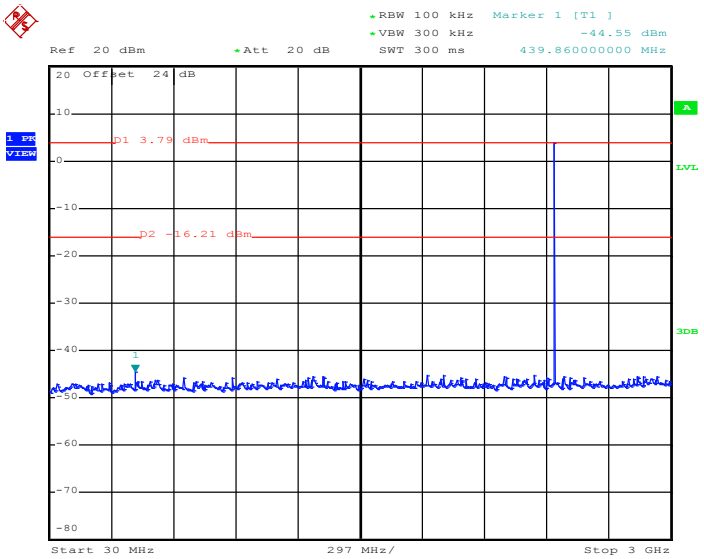
3Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 9.AUG.2013 21:30:45

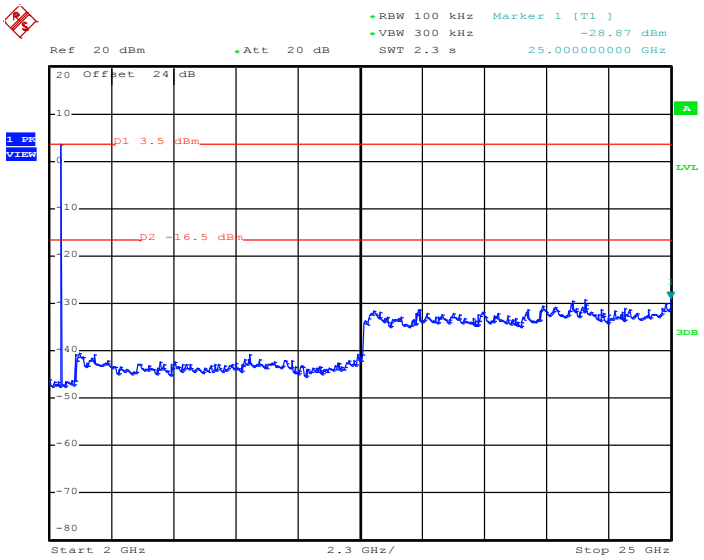
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	39	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

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



Date: 9.AUG.2013 21:28:30

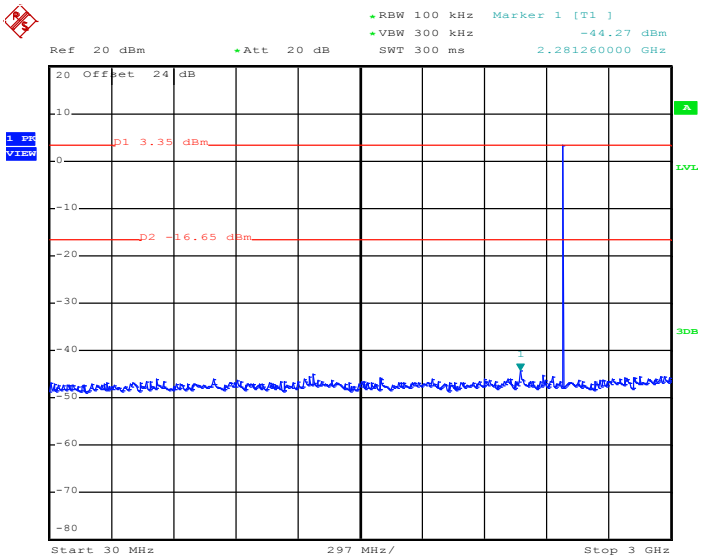
3Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 9.AUG.2013 21:28:52

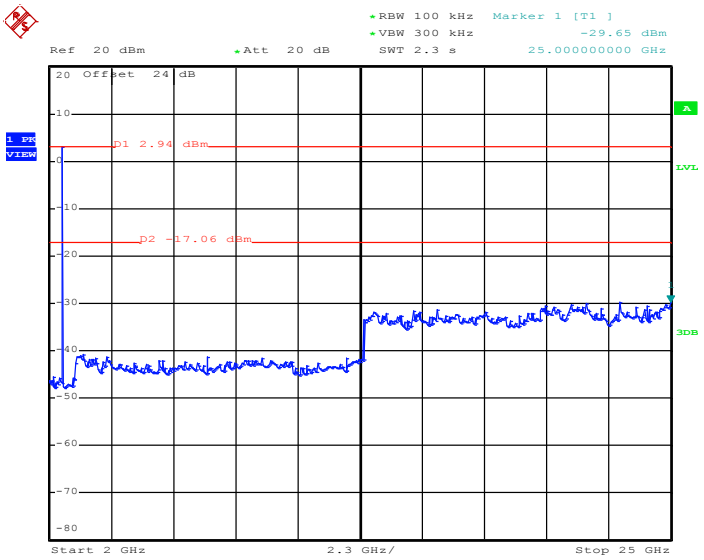
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	78	**Relative Humidity :**	48~51%
		Test Engineer :	Reece Lee

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



Date: 9.AUG.2013 21:22:53

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



Date: 9.AUG.2013 21:23:15

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.

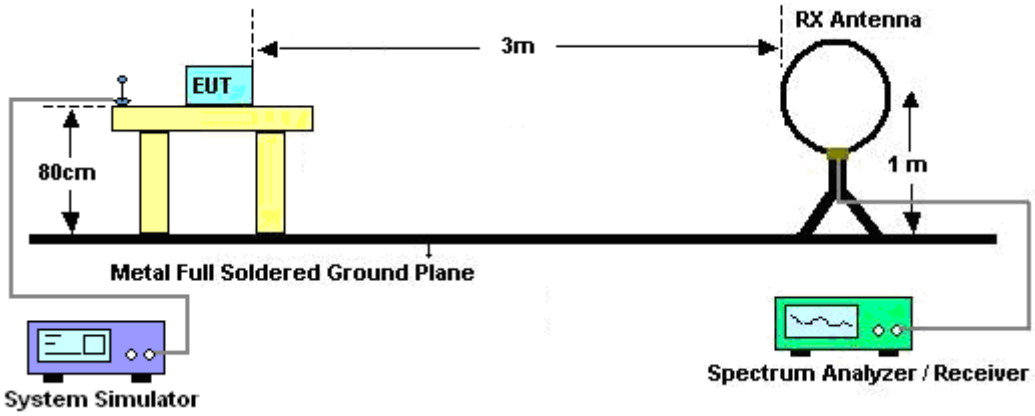
3.8.3 Test Procedures

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
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

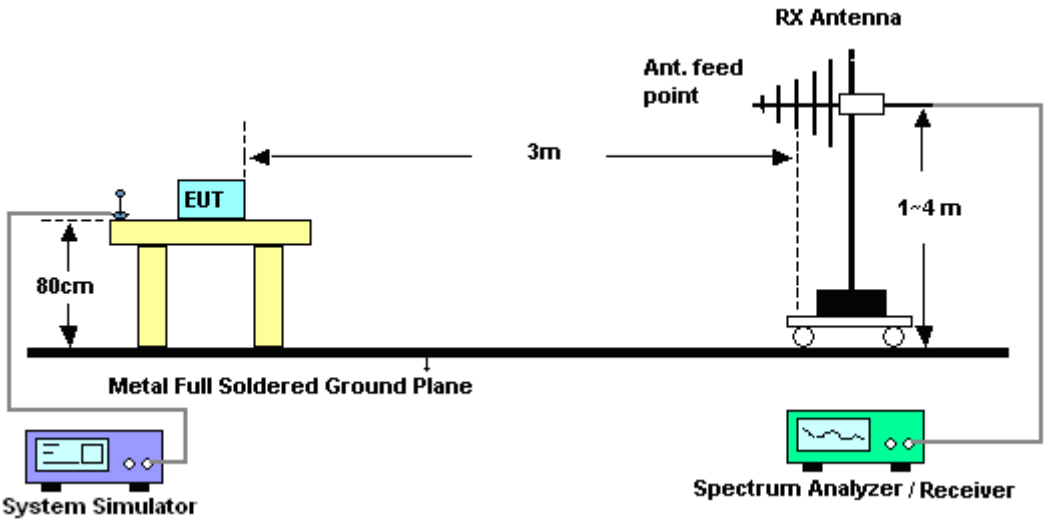
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.73dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as bandedge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction

3.8.4 Test Setup

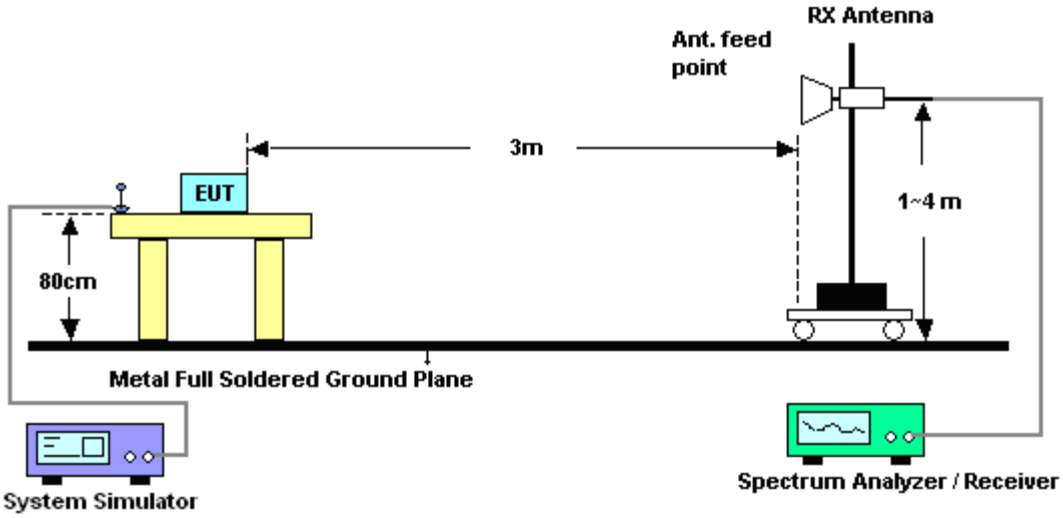
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

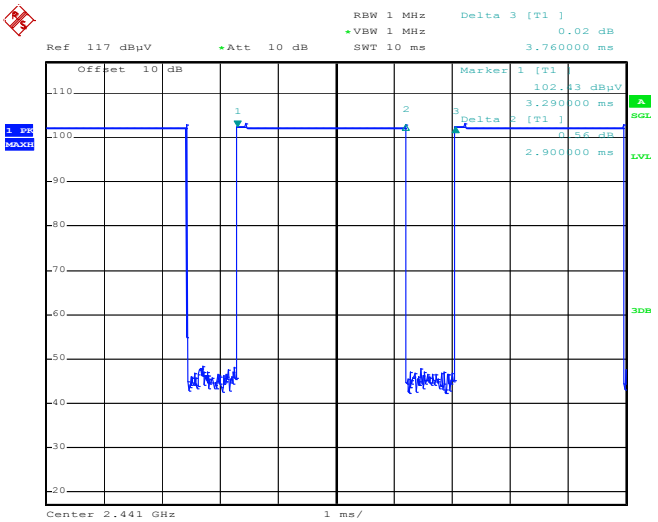


3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

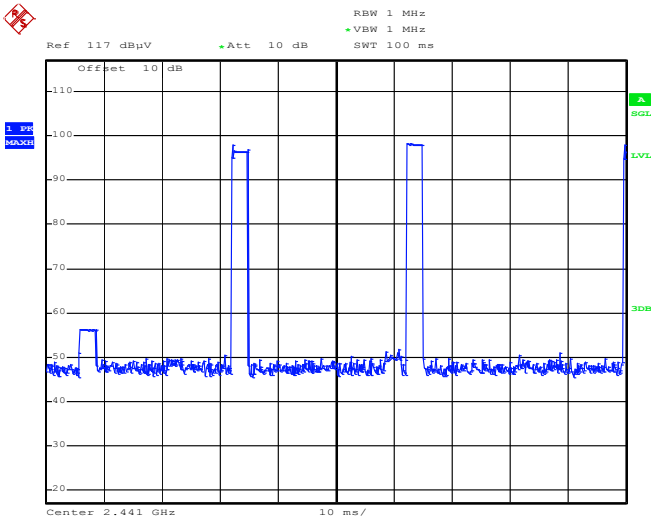
3.8.6 Duty cycle correction factor for average measurement

3DH5 on time (One Pulse) Plot on Channel 39



Date: 2.AUG.2013 11:37:15

3DH5 on time (Count Pulses) Plot on Channel 39



Date: 2.AUG.2013 11:40:52

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.90 / 100 = 5.80 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.73 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

2.90 ms x 20 channels = 58.0 ms

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:

2.90 ms x 2 = 5.80 ms

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

20 x log(5.80 ms/100ms) = -24.73 dB

3.8.7 Test Result of Radiated Spurious at Band Edges

Test Mode :	3Mbps	**Temperature :**	21~24°C
Test Channel :	00	**Relative Humidity :**	51~53%
		Test Engineer :	Kyle Jhuang

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
2353.65	53.36	-20.64	74	48.51	32.26	6.84	34.25	140	240	Peak
2353.65	28.63	-25.37	54	-	-	-	-	-	-	Average
2497.6	50.25	-23.75	74	45.27	32.4	7.06	34.48	140	240	Peak
2497.6	25.52	-28.48	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
2353.74	51.84	-22.16	74	46.99	32.26	6.84	34.25	101	284	Peak
2353.74	27.11	-26.89	54	-	-	-	-	-	-	Average
2497.93	50.14	-23.86	74	45.16	32.4	7.06	34.48	101	284	Peak
2497.93	25.41	-28.59	54	-	-	-	-	-	-	Average

Test Mode :	3Mbps	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	51~53%
		Test Engineer :	Kyle Jhuang

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
2383.71	48.12	-25.88	74	43.2	32.28	6.91	34.27	126	37	Peak
2383.71	23.39	-30.61	54	-	-	-	-	-	-	Average
2483.5	59.04	-14.96	74	54.03	32.38	7.06	34.43	126	37	Peak
2483.5	34.31	-19.69	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
2383.62	50.8	-23.2	74	45.88	32.28	6.91	34.27	117	282	Peak
2383.62	26.07	-27.93	54	-	-	-	-	-	-	Average
2483.5	61.71	-12.29	74	56.7	32.38	7.06	34.43	117	282	Peak
2483.5	36.98	-17.02	54	-	-	-	-	-	-	Average

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

Note: Pre-scanned all test modes and only choose the worst case mode recorded in the test report for radiated spurious emission below 1GHz.

Test Mode :	3Mbps	**Temperature :**	21~24°C
Test Channel :	00	**Relative Humidity :**	51~53%
Test Engineer :	Kyle Jhuang	**Polarization :**	Horizontal
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 7206 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 108.37dBμV/m - 20dB = 88.37dBμV/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
2402	108.37	-	-	103.46	32.3	6.91	34.3	140	240	Peak
2402	83.64	-	-	-	-	-	-	-	-	Average
4803	40.56	-33.44	74	56.79	33.98	8.75	58.96	100	0	Peak
4803	15.83	-38.17	54	-	-	-	-	-	-	Average
7206	42.11	-46.26	88.37	53.37	35.56	10.81	57.63	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	**Temperature :**	21~24°C
Test Channel :	00	**Relative Humidity :**	51~53%
Test Engineer :	Kyle Jhuang	**Polarization :**	Vertical
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 7206 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
2402	104.32	-	-	99.41	32.3	6.91	34.3	101	284	Peak
2402	79.59	-	-	-	-	-	-	-	-	Average
4803	39.85	-34.15	74	56.08	33.98	8.75	58.96	100	0	Peak
4803	15.12	-38.88	54	-	-	-	-	-	-	Average
7206	42.42	-41.9	84.32	53.68	35.56	10.81	57.63	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	**Temperature :**	21~24°C
Test Channel :	39	**Relative Humidity :**	51~53%
Test Engineer :	Kyle Jhuang	**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
2441	103.98	-	-	99.03	32.35	6.99	34.39	166	308	Peak
2441	79.25	-	-	-	-	-	-	-	-	Average
4881	39.84	-34.16	74	55.87	33.95	8.85	58.83	100	0	Peak
4881	15.11	-38.89	54	-	-	-	-	-	-	Average
7323	40.94	-33.06	74	52.24	35.53	10.91	57.74	100	0	Peak
7323	16.21	-37.79	54	-	-	-	-	-	-	Average

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	**Temperature :**	21~24°C
Test Channel :	39	**Relative Humidity :**	51~53%
Test Engineer :	Kyle Jhuang	**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
2441	103.64	-	-	98.69	32.35	6.99	34.39	122	286	Peak
2441	78.91	-	-	-	-	-	-	-	-	Average
4881	39.91	-34.09	74	55.94	33.95	8.85	58.83	100	0	Peak
4881	15.18	-38.82	54	-	-	-	-	-	-	Average
7323	41.92	-32.08	74	53.22	35.53	10.91	57.74	100	0	Peak
7323	17.19	-36.81	54	-	-	-	-	-	-	Average

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	51~53%
Test Engineer :	Kyle Jhuang	**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
50.25	29.99	-10.01	40	52.39	8.1	0.7	31.2	100	25	Peak
130.71	23.17	-20.33	43.5	41.54	11.58	1.15	31.1	-	-	Peak
270.84	24.01	-21.99	46	40.47	12.89	1.64	30.99	-	-	Peak
323.1	21.17	-24.83	46	36.42	13.93	1.82	31	-	-	Peak
629.7	22.14	-23.86	46	29.87	20.03	2.78	30.54	-	-	Peak
908.3	25.87	-20.13	46	29.61	23.22	3.36	30.32	-	-	Peak
2480	98.66	-	-	93.65	32.38	7.06	34.43	126	37	Peak
2480	73.93	-	-	-	-	-	-	-	-	Average
4959	40.46	-33.54	74	56.29	33.91	8.92	58.66	100	0	Peak
4959	15.73	-38.27	54	-	-	-	-	-	-	Average
7440	41.78	-32.22	74	53.08	35.51	11.04	57.85	100	0	Peak
7440	17.05	-36.95	54	-	-	-	-	-	-	Average

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	51~53%
Test Engineer :	Kyle Jhuang	**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
51.33	30.46	-9.54	40	53.05	7.9	0.71	31.2	100	47	Peak
129.36	25.55	-17.95	43.5	43.89	11.62	1.14	31.1	-	-	Peak
226.56	22.04	-23.96	46	40.6	10.98	1.46	31	-	-	Peak
329.4	23.69	-22.31	46	38.73	14.11	1.85	31	-	-	Peak
482	21.27	-24.73	46	31.94	17.72	2.39	30.78	-	-	Peak
801.2	24.97	-21.03	46	30.02	22.11	3.14	30.3	-	-	Peak
2480	101.15	-	-	96.14	32.38	7.06	34.43	117	282	Peak
2480	76.42	-	-	-	-	-	-	-	-	Average
4959	39.89	-34.11	74	55.72	33.91	8.92	58.66	100	0	Peak
4959	15.16	-38.84	54	-	-	-	-	-	-	Average
7440	40.78	-33.22	74	52.08	35.51	11.04	57.85	100	0	Peak
7440	16.05	-37.95	54	-	-	-	-	-	-	Average

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.

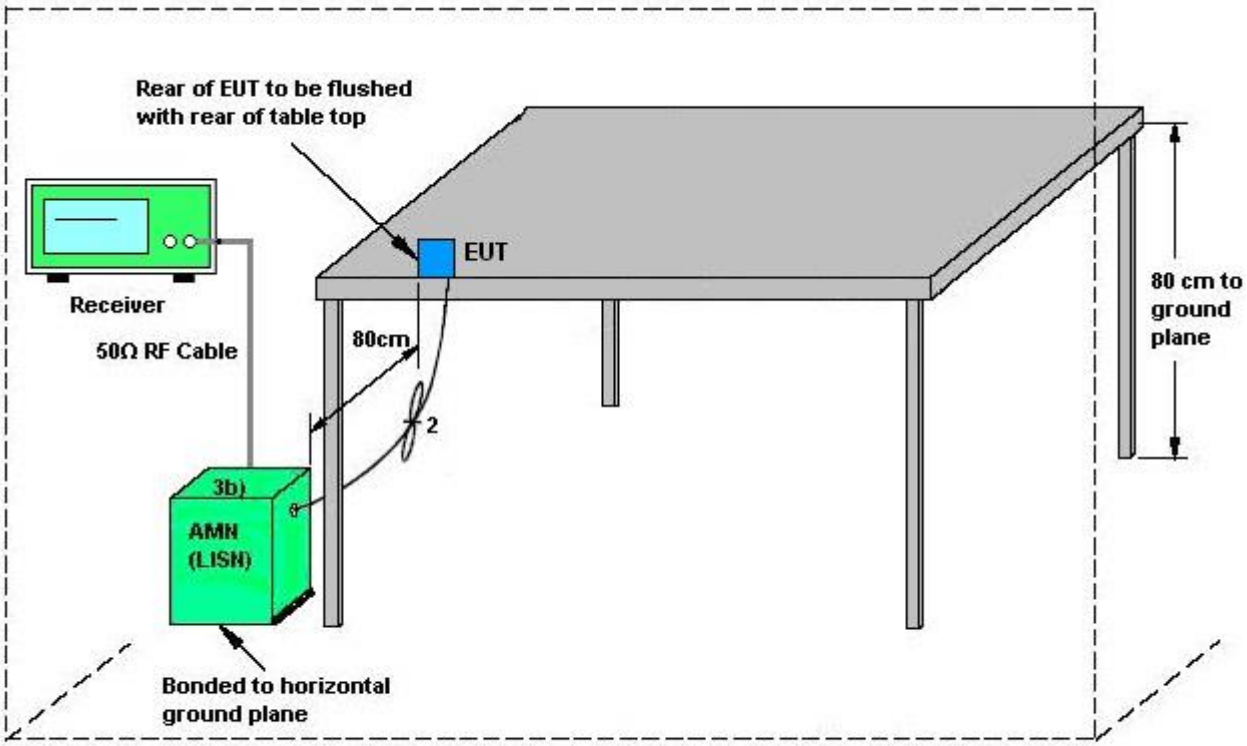
3.9.2 Measuring Instruments

See list of measuring instruments of this test report.

3.9.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

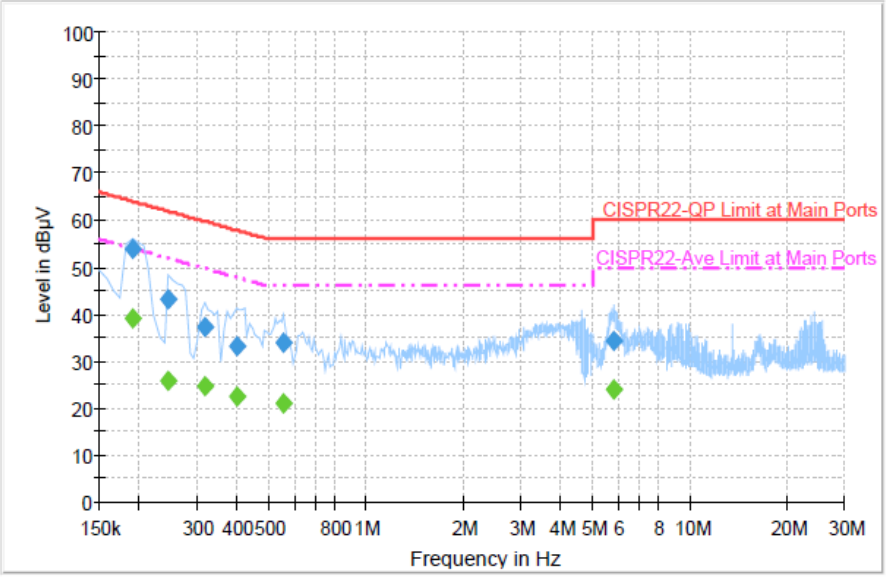
3.9.4 Test Setup



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 :	Kai-Chun Chu	**Relative Humidity :**	45~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	WLAN (2.4GHz, 11b, Ch06, 1Mbps) Link + Bluetooth Link + Earphone + USB Cable (Data Link with Notebook) + Camera		



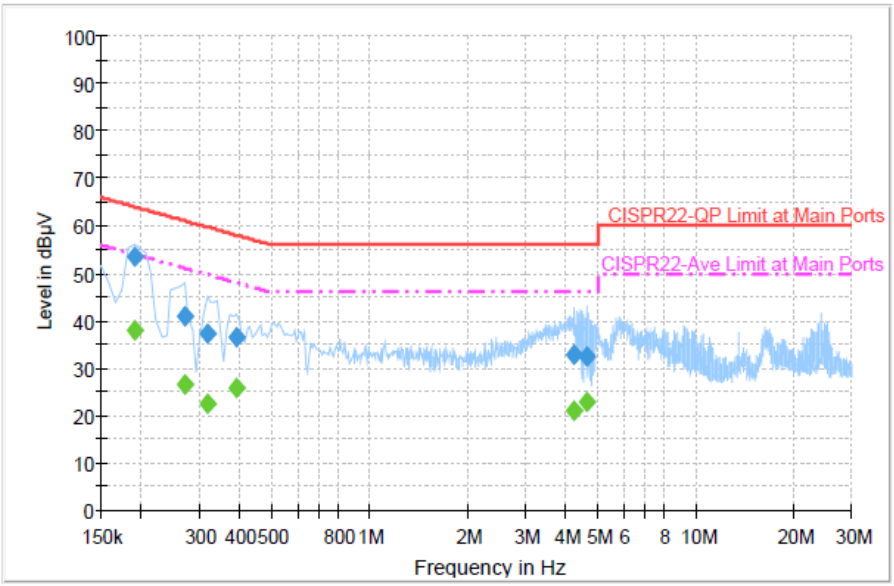
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	53.8	Off	L1	19.4	10.2	64.0
0.246000	43.1	Off	L1	19.4	18.8	61.9
0.318000	37.2	Off	L1	19.4	22.6	59.8
0.398000	33.2	Off	L1	19.5	24.7	57.9
0.558000	34.0	Off	L1	19.4	22.0	56.0
5.790000	34.5	Off	L1	19.6	25.5	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	39.0	Off	L1	19.4	15.0	54.0
0.246000	26.0	Off	L1	19.4	25.9	51.9
0.318000	24.8	Off	L1	19.4	25.0	49.8
0.398000	22.4	Off	L1	19.5	25.5	47.9
0.558000	21.2	Off	L1	19.4	24.8	46.0
5.790000	24.1	Off	L1	19.6	25.9	50.0

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Kai-Chun Chu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN (2.4GHz, 11b, Ch06, 1Mbps) Link + Bluetooth Link + Earphone + USB Cable (Data Link with Notebook) + Camera		



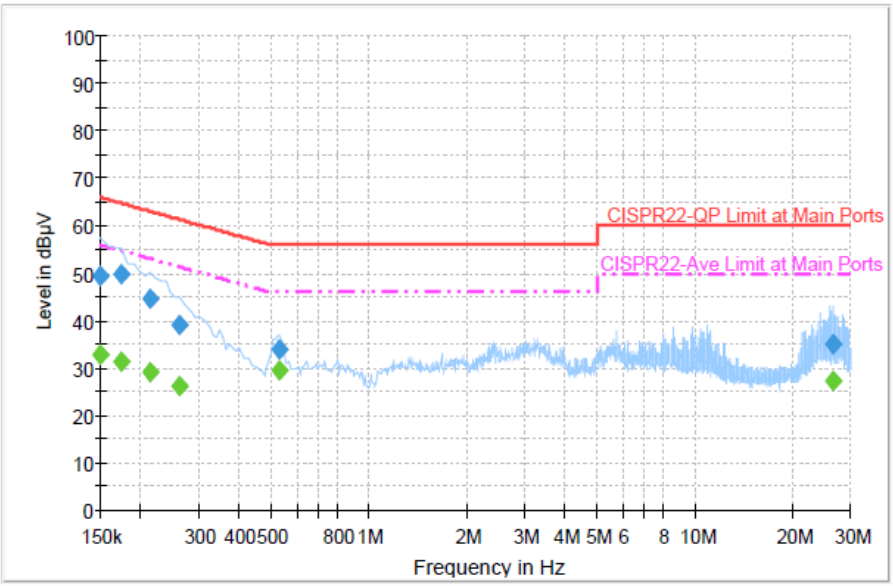
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	53.6	Off	N	19.4	10.4	64.0
0.270000	41.1	Off	N	19.4	20.0	61.1
0.318000	37.4	Off	N	19.4	22.4	59.8
0.390000	36.5	Off	N	19.4	21.6	58.1
4.246000	32.8	Off	N	19.6	23.2	56.0
4.622000	32.5	Off	N	19.7	23.5	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190000	38.1	Off	N	19.4	15.9	54.0
0.270000	26.6	Off	N	19.4	24.5	51.1
0.318000	22.7	Off	N	19.4	27.1	49.8
0.390000	25.9	Off	N	19.4	22.2	48.1
4.246000	20.9	Off	N	19.6	25.1	46.0
4.622000	23.1	Off	N	19.7	22.9	46.0

Test Mode :	Mode 2	**Temperature :**	20~22℃
Test Engineer :	Kai-Chun Chu	**Relative Humidity :**	45~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	WLAN (5GHz, 11a, Ch157, 6Mbps) Link + Bluetooth Link + Earphone + USB Cable (Data Link with Notebook) + Camera		



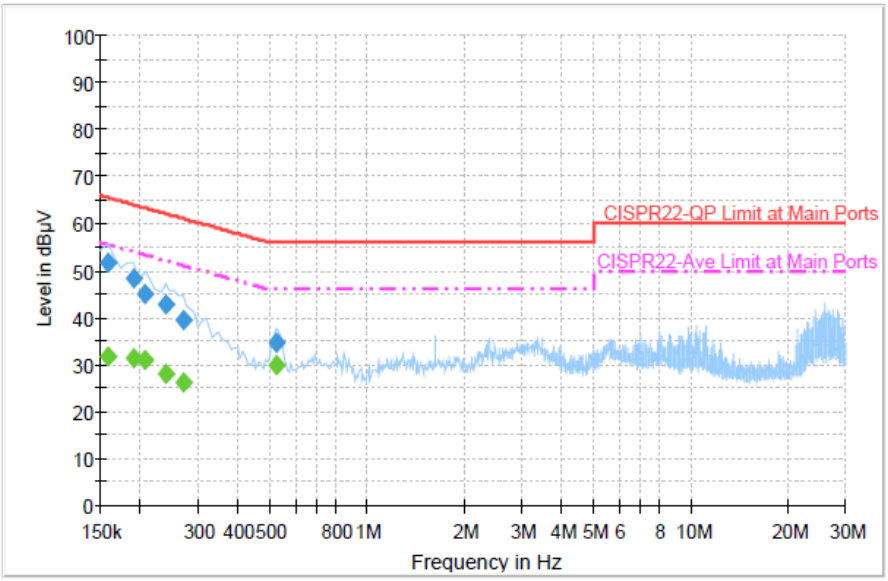
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	49.3	Off	L1	19.4	16.7	66.0
0.174000	49.7	Off	L1	19.4	15.1	64.8
0.214000	44.6	Off	L1	19.4	18.4	63.0
0.262000	39.1	Off	L1	19.4	22.3	61.4
0.534000	34.0	Off	L1	19.4	22.0	56.0
26.382000	35.2	Off	L1	20.0	24.8	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	32.9	Off	L1	19.4	23.1	56.0
0.174000	31.3	Off	L1	19.4	23.5	54.8
0.214000	29.1	Off	L1	19.4	23.9	53.0
0.262000	26.2	Off	L1	19.4	25.2	51.4
0.534000	29.7	Off	L1	19.4	16.3	46.0
26.382000	27.5	Off	L1	20.0	22.5	50.0

Test Mode :	Mode 2	**Temperature :**	20~22℃
Test Engineer :	Kai-Chun Chu	**Relative Humidity :**	45~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	WLAN (5GHz, 11a, Ch157, 6Mbps) Link + Bluetooth Link + Earphone + USB Cable (Data Link with Notebook) + Camera		



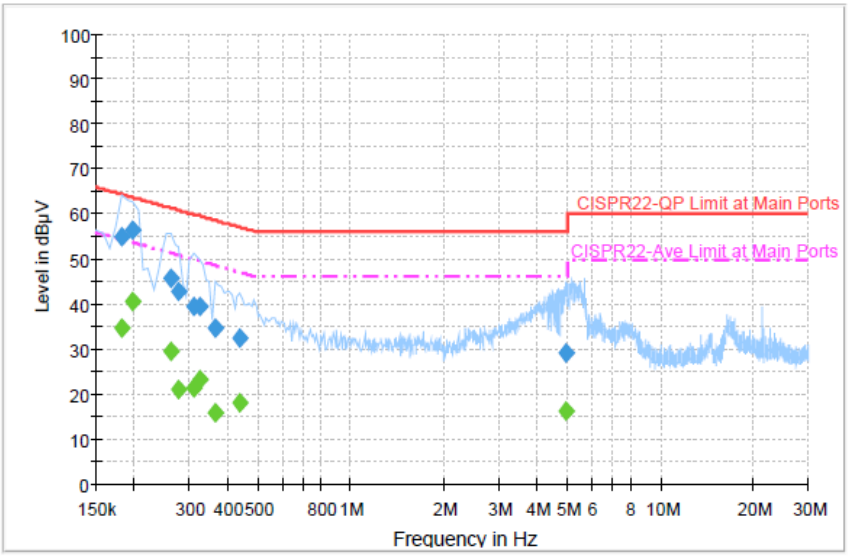
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	51.7	Off	N	19.3	13.9	65.6
0.190000	48.4	Off	N	19.4	15.6	64.0
0.206000	45.0	Off	N	19.4	18.4	63.4
0.238000	42.9	Off	N	19.5	19.3	62.2
0.270000	39.5	Off	N	19.4	21.6	61.1
0.526000	34.6	Off	N	19.4	21.4	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	31.8	Off	N	19.3	23.8	55.6
0.190000	31.5	Off	N	19.4	22.5	54.0
0.206000	31.1	Off	N	19.4	22.3	53.4
0.238000	28.2	Off	N	19.5	24.0	52.2
0.270000	26.1	Off	N	19.4	25.0	51.1
0.526000	30.0	Off	N	19.4	16.0	46.0

Test Mode :	Mode 3	**Temperature :**	20~22℃
Test Engineer :	Kai-Chun Chu	**Relative Humidity :**	45~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	WLAN (2.4GHz, 11b, Ch06, 1Mbps) MIMO Tx + Earphone + USB Cable (Data Link with Notebook) + Camera		



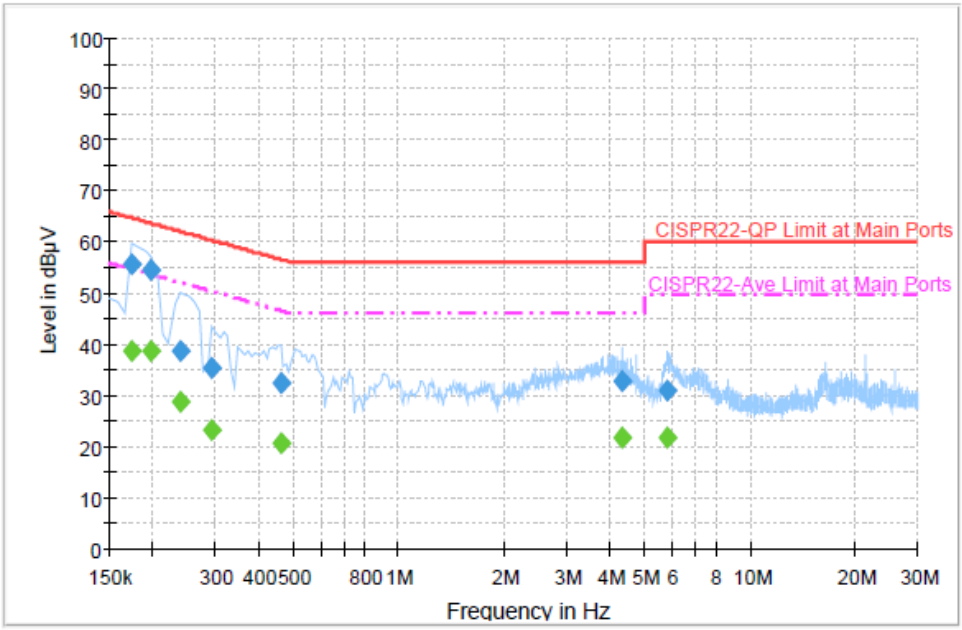
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	54.9	Off	L1	19.4	9.5	64.4
0.198000	56.3	Off	L1	19.3	7.4	63.7
0.262000	45.9	Off	L1	19.4	15.5	61.4
0.278000	42.7	Off	L1	19.3	18.2	60.9
0.310000	39.6	Off	L1	19.4	20.4	60.0
0.326000	39.6	Off	L1	19.4	20.0	59.6
0.366000	34.8	Off	L1	19.4	23.8	58.6
0.438000	32.3	Off	L1	19.4	24.8	57.1
4.934000	29.0	Off	L1	19.7	27.0	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.182000	34.5	Off	L1	19.4	19.9	54.4
0.198000	40.6	Off	L1	19.3	13.1	53.7
0.262000	29.5	Off	L1	19.4	21.9	51.4
0.278000	21.0	Off	L1	19.3	29.9	50.9
0.310000	21.3	Off	L1	19.4	28.7	50.0
0.326000	23.2	Off	L1	19.4	26.4	49.6
0.366000	16.0	Off	L1	19.4	32.6	48.6
0.438000	18.0	Off	L1	19.4	29.1	47.1
4.934000	16.2	Off	L1	19.7	29.8	46.0

Test Mode :	Mode 3	**Temperature :**	20~22℃
Test Engineer :	Kai-Chun Chu	**Relative Humidity :**	45~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	WLAN (2.4GHz, 11b, Ch06, 1Mbps) MIMO Tx + Earphone + USB Cable (Data Link with Notebook) + Camera		



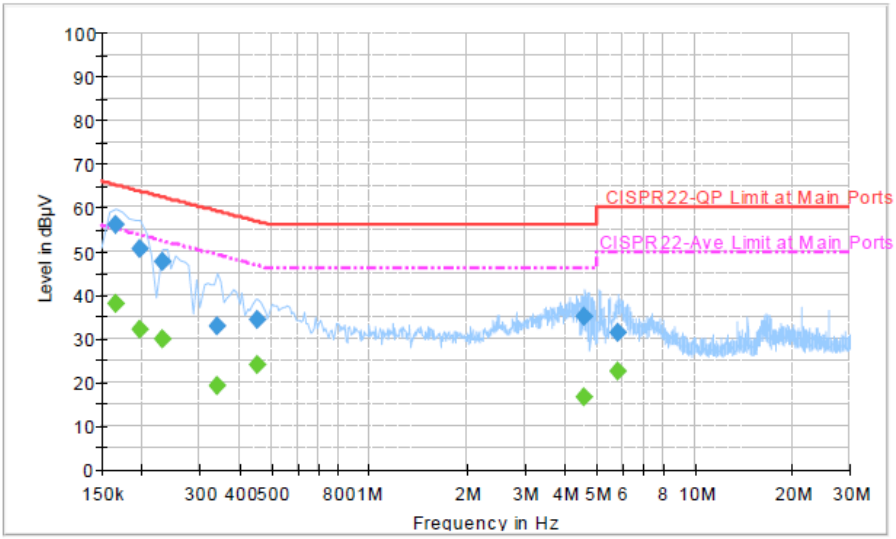
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.174000	55.7	Off	N	19.4	9.1	64.8
0.198000	54.5	Off	N	19.3	9.2	63.7
0.238000	38.7	Off	N	19.5	23.5	62.2
0.294000	35.6	Off	N	19.4	24.8	60.4
0.462000	32.3	Off	N	19.3	24.4	56.7
4.326000	32.9	Off	N	19.6	23.1	56.0
5.806000	30.9	Off	N	19.7	29.1	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.174000	38.9	Off	N	19.4	15.9	54.8
0.198000	38.7	Off	N	19.3	15.0	53.7
0.238000	28.8	Off	N	19.5	23.4	52.2
0.294000	23.4	Off	N	19.4	27.0	50.4
0.462000	20.6	Off	N	19.3	26.1	46.7
4.326000	21.6	Off	N	19.6	24.4	46.0
5.806000	21.7	Off	N	19.7	28.3	50.0

Test Mode :	Mode 4	Temperature :	20~22℃
Test Engineer :	Kai-Chun Chu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN (5GHz, 11a, Ch157, 6Mbps) MIMO Tx + Earphone + USB Cable (Data Link with Notebook) + Camera		



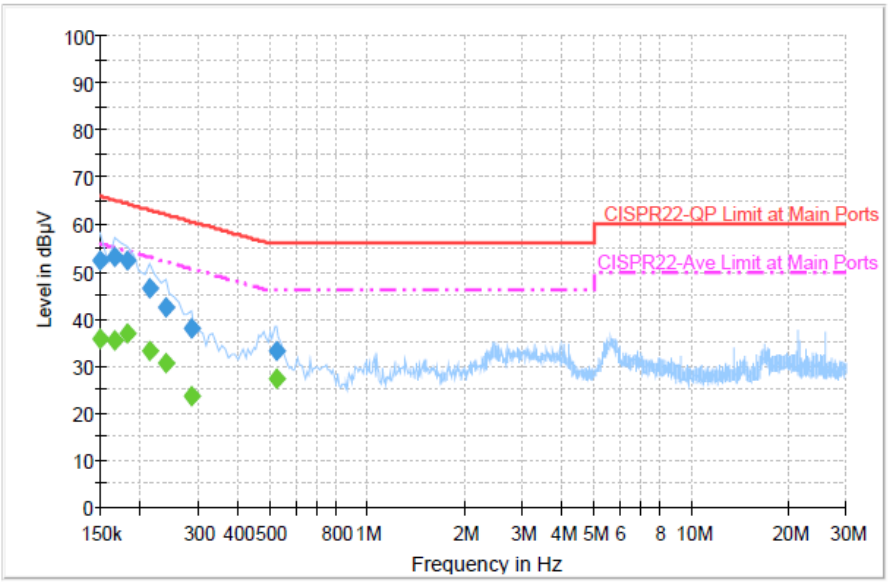
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	56.1	Off	L1	19.4	9.1	65.2
0.198000	50.4	Off	L1	19.3	13.3	63.7
0.230000	47.7	Off	L1	19.4	14.7	62.4
0.342000	32.9	Off	L1	19.4	26.3	59.2
0.454000	34.2	Off	L1	19.3	22.6	56.8
4.598000	34.9	Off	L1	19.7	21.1	56.0
5.822000	31.3	Off	L1	19.6	28.7	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	38.1	Off	L1	19.4	17.1	55.2
0.198000	32.1	Off	L1	19.3	21.6	53.7
0.230000	29.9	Off	L1	19.4	22.5	52.4
0.342000	19.2	Off	L1	19.4	30.0	49.2
0.454000	24.0	Off	L1	19.3	22.8	46.8
4.598000	16.7	Off	L1	19.7	29.3	46.0
5.822000	22.4	Off	L1	19.6	27.6	50.0

Test Mode :	Mode 4	**Temperature :**	20~22℃
Test Engineer :	Kai-Chun Chu	**Relative Humidity :**	45~47%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	WLAN (5GHz, 11a, Ch157, 6Mbps) MIMO Tx + Earphone + USB Cable (Data Link with Notebook) + Camera		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	52.3	Off	N	19.4	13.7	66.0
0.166000	53.3	Off	N	19.4	11.9	65.2
0.182000	52.3	Off	N	19.4	12.1	64.4
0.214000	46.5	Off	N	19.4	16.5	63.0
0.238000	42.5	Off	N	19.5	19.7	62.2
0.286000	38.2	Off	N	19.4	22.4	60.6
0.526000	33.1	Off	N	19.4	22.9	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	35.9	Off	N	19.4	20.1	56.0
0.166000	35.6	Off	N	19.4	19.6	55.2
0.182000	36.8	Off	N	19.4	17.6	54.4
0.214000	33.3	Off	N	19.4	19.7	53.0
0.238000	30.6	Off	N	19.5	21.6	52.2
0.286000	23.7	Off	N	19.4	26.9	50.6
0.526000	27.2	Off	N	19.4	18.8	46.0

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-detachable antenna is 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	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 07, 2013	Jul. 23, 2013 ~ Sep. 05, 2013	Jun. 06, 2014	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	300MHz~40GHz	Feb. 05, 2013	Jul. 23, 2013 ~ Sep. 05, 2013	Feb. 04, 2014	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Feb. 05, 2013	Jul. 23, 2013 ~ Sep. 05, 2013	Feb. 04, 2014	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Nov. 13, 2012	Jul. 12, 2013 ~ Sep. 04, 2013	Nov. 12, 2013	Conduction (CO05-HY)
Two-LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2012	Jul. 12, 2013 ~ Sep. 04, 2013	Dec. 11, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 06, 2012	Jul. 12, 2013 ~ Sep. 04, 2013	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Jul. 12, 2013 ~ Sep. 04, 2013	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Sep. 03, 2012	Aug. 02, 2013	Sep. 02, 2013	Radiation (03CH07-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101067	9kHz~30GHz	Nov. 30, 2012	Aug. 02, 2013	Nov. 29, 2013	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	860004/0001	9 kHz~30 MhZ	Jul. 03, 2012	Aug. 02, 2013	Jul. 03, 2014	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30MHz~1GHz	Oct. 06, 2012	Aug. 02, 2013	Oct. 05, 2013	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1GHz~18GHz	Aug. 22, 2012	Aug. 02, 2013	Aug. 21, 2013	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Sep. 28, 2012	Aug. 02, 2013	Sep. 27, 2013	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	30MHz~1GHz	Feb. 26, 2013	Aug. 02, 2013	Feb. 25, 2014	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Dec. 01, 2012	Aug. 02, 2013	Nov. 30, 2013	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	Aug. 02, 2013	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	ChainTek 3000	N/A	N/A	N/A	Aug. 02, 2013	N/A	Radiation (03CH07-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**