

FCC RF Test Report

APPLICANT : Acer Incorporated
EQUIPMENT : Dual band WiFi LGA Module
BRAND NAME : Acer
MODEL NAME : T77H389
FCC ID : HLZ-T77H389
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DSS) Spread Spectrum Transmitter

The product was received on Jul. 10, 2012 and completely tested on Sep. 11, 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 / Manager



SPORTON INTERNATIONAL INC.

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FCC ID : HLZ-T77H389

Page Number : 1 of 74

Report Issued Date : Sep. 26, 2012

Report Version : Rev. 02



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR271030A	Rev. 01	Initial issue of report	Sep. 18, 2012
FR271030A	Rev. 02	Update report for adding Loop Antenna in the list of measuring equipment	Sep. 26, 2012

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	A8.4(2)	Number of Channels	$\geq 15\text{Chs}$	Pass	-
3.2	15.247(a)(1)	A8.1(b)	Hopping Channel Separation	$\geq 2/3$ of 20dB BW	Pass	-
3.3	15.247(a)(1)	A8.1(d)	Dwell Time of Each Channel	$\leq 0.4\text{sec}$ in 31.6sec period	Pass	-
3.4	15.247(a)(1)	A8.1(a)	20dB Bandwidth	NA	Pass	-
3.4	-	Gen 4.6.1	99% Bandwidth	-	Pass	-
3.5	15.247(b)(1)	A8.1(b)	Peak Output Power	$\leq 1\text{ w}$ for 1Mbps $\leq 125\text{ Mw}$ for 2, 3Mbps	Pass	-
3.6	15.247(d)	A8.5	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
3.7	15.247(d)	A8.5	Conducted Spurious Emission	$\leq 20\text{dBc}$	Pass	-
3.8	15.247(d)	A8.5	Radiated Band Edges	15.209(a) & 15.247(d)	Pass	-
3.9	15.247(d)	A8.5	Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 6.31 dB at 99.930 MHz
3.10	15.207	Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 18.40 dB at 2.574 MHz
3.11	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Acer Incorporated

8F., No. 88, Sec. 1, Xintai 5th Rd., New Taipei City 22181, Taiwan, R.O.C.

1.2 Manufacturer

1. AMBIT MICROSYSTEMS (SHANGHAI) LTD.

No. 1925, Nanle Road, Songjiang Export Process Zone, Shanghai, China

2. Hon Fu Jin Precision Industry (Shenzhen) Co., Ltd.

Communication Network Solution Business Group; No. 2, 2nd Donghuan Road, 10th Yousong Industrial District, Longhua Town, Baoan District, Shenzhen, Guangdong 518109 China

3. Hong Fu Jin Precision Electronics (YanTai) Co., Ltd.

CNSBG-CPE1; A11 Building, Export Processing Zone, Economic & Technologic, Development Area, YanTai, Shandong, 264006, China

4. Hong Fu Jin Precision Electronics (Chongqing) Co.,Ltd.

Building D02, No. 1, East Zone 1st Road , Shapingba District, Chongqing, 401332, China

5. Foxconn CMMSG Industrial Electronics Ltd.

N800, Marginal Rodovia dos Bandeirantes avenue, Engordadouro district, Jundiai City, Sao Paulo, Brazil, ZIP Code: 13213-008

6. Fenix Industrial Electronics Ltd.

N236, Jose de Palma Renno street, Centro district, Santa Rita do Sapucaí City , Minas Gerais, Brazil , ZIP Code: 37540-000

7. Foxconn MOEBG Industria De Eletronicos Ltda.

No. 1580a Acai Street, Industrial district, Manaus Amazonas, Brazil, ZIP Code: 69075-020

8. Nanning Fu Tai Hong Precision Electronic Co., Ltd.

HWV Product Division No. 13, Road, Keyuan East; High Technical Industrial, Development Zone, Nanning, Guangxi, 530007, China

9. Nanning Fu Tai Hong Precision Electronics Co., Ltd.

The Forth Building, China-ASEAN Advanced Business Part Phase Three, No. 18, Zongbu Road, High Technical Industrial Development Zone, Nanning, Guangxi, 530007, China

10. Nanning Fu Gui Precision Electronics Co., Ltd.

China-ASEAN Advanced Business Park Phase Three, No. 18, Zongbu Road, High Technical Industrial Development Zone, Nanning , Guangxi , 530007, China

11. FUNING Precision Component (Bac Ninh) Co., Ltd.

Que Vo industrial park, Van Duong commune, Bac Ninh city, BacNinh province, Vietnam

12. Fuhong Precision Component (Bac Giang) Limited

Dinh Tram Industrial Park, Viet Yen District Bac Giang Province 236100, Vietnam

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Dual band WiFi LGA Module
Brand Name	Acer
Model Name	T77H389
FCC ID	HLZ-T77H389
EUT supports Radios application	WLAN 11abgn / Bluetooth
HW Version	035
SW Version	045
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.

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) : 9.33 dBm (0.0086 W) Bluetooth EDR (2Mbps) : 9.01 dBm (0.0080 W) Bluetooth EDR (3Mbps) : 8.98 dBm (0.0079 W)
99% Occupied Bandwidth	Bluetooth (1Mbps) : 0.876MHz Bluetooth EDR (2Mbps) : 1.204MHz Bluetooth EDR (3Mbps) : 1.220MHz
Antenna Type	Antenna 1: PIFA Antenna type with gain -0.15 dBi Antenna 2: Chip Antenna type with gain 2.50 dBi
Type of Modulation	Bluetooth (1Mbps) : GFSK Bluetooth 2.1 EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth 2.1 EDR (3Mbps) : 8-DPSK Bluetooth 3.0 EDR : GFSK, $\pi/4$ -DQPSK, 8-DPSK

1.4 Testing Site

Test Site	SPORTON INTERNATIONAL INC.			
Test Site Location	No. 52, Hwa Ya 1 st 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	03CH05-HY	722060/4086B-1

1.5 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

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	E6500	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	LCD Monitor	Lenovo	6135-AB1	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
4.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A

2 Test Configuration of Equipment Under Test

2.1 RF Output Power

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

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	$\pi/4$ -DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	8.62 dBm	8.26 dBm	8.16 dBm
Ch39	2441MHz	9.33 dBm	9.01 dBm	8.98 dBm
Ch78	2480MHz	9.30 dBm	9.00 dBm	8.95 dBm

Remark:

1. All the test data for each data rate were verified, but only the worst case was reported.
2. The data rate was set in 1Mbps for all the test items due to the highest RF output power.
3. The EUT is programmed to transmit signals continuously for all testing.

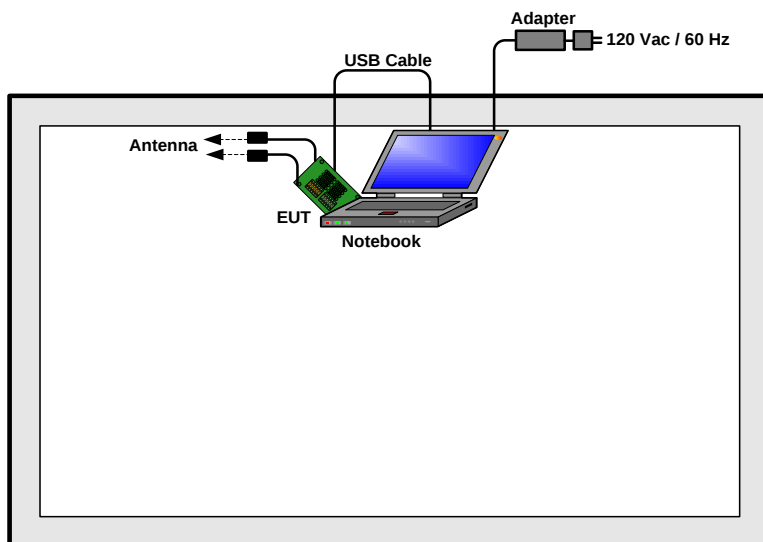
2.2 Test Mode

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).

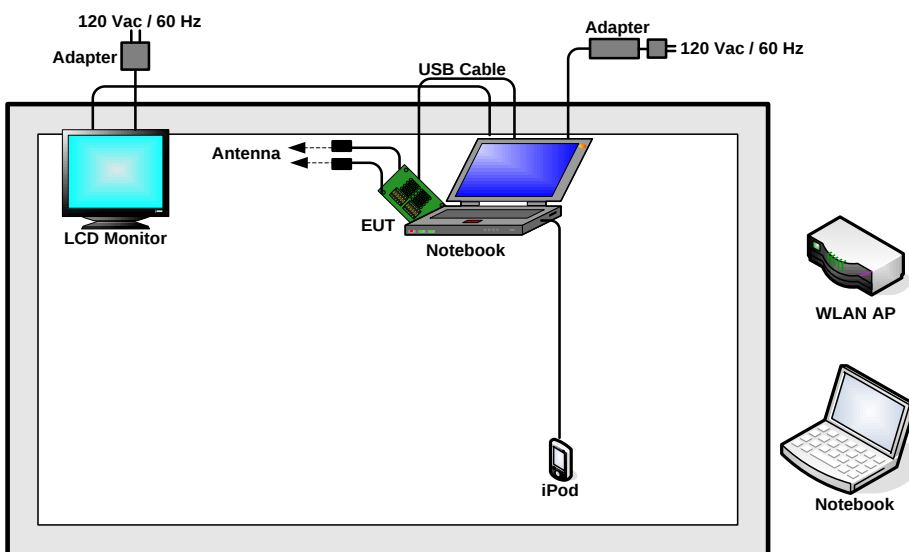
Test Cases			
Test Item	Data Rate / Modulation		
	Bluetooth 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi/4$ -DQPSK	Bluetooth EDR 3Mbps 8-DPSK
Conducted TCs	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated TCs	<Antenna 1> Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz <Antenna 2> Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Pretest	Pretest
AC Conducted Emission	Mode 1 :Bluetooth Link + WLAN (2.4G) Link Mode 2 :Bluetooth Link + WLAN (5G) Link		
Remark:			
1. For radiated TCs, the data rate was set in 1Mbps due to the highest RF output power; only the data of these modes was reported.			
2. For conducted emission, the worst case is mode 1; only the test data of this mode was reported.			
3. For radiated TCs, all the tests were performance with chain 0.			
4. For conducted emission, all the tests were performance with Main Antenna: Chip Antenna and Aux. Antenna: PIFA Antenna			

2.3 Connection Diagram of Test System

<Bluetooth Tx Mode>



<AC Conducted Emission Mode>



2.4 RF Utility

For Bluetooth function, programmed RF utility, "Blue tool" installed in the notebook make the EUT provides functions like channel selection and power level for continuous transmitting and receiving signals.

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

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

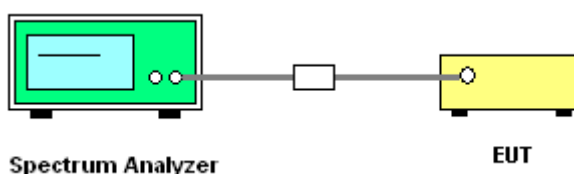
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

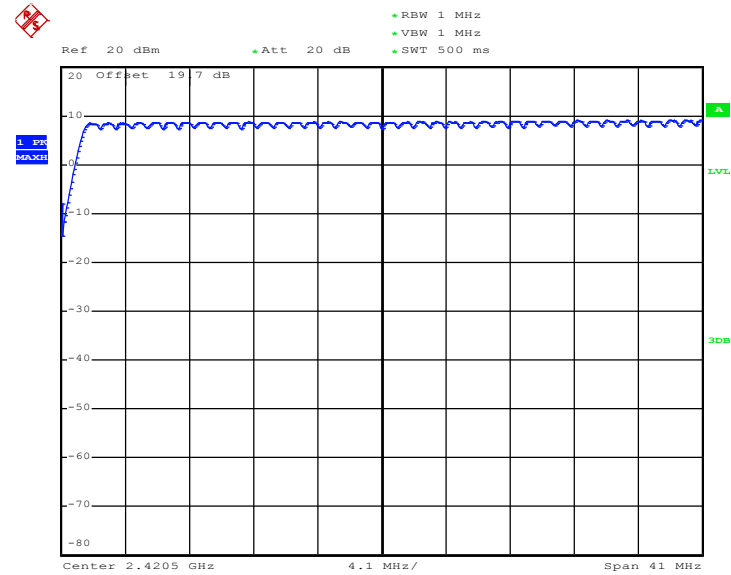
1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW $\geq$ 1% of the span; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.

3.1.4 Test Setup

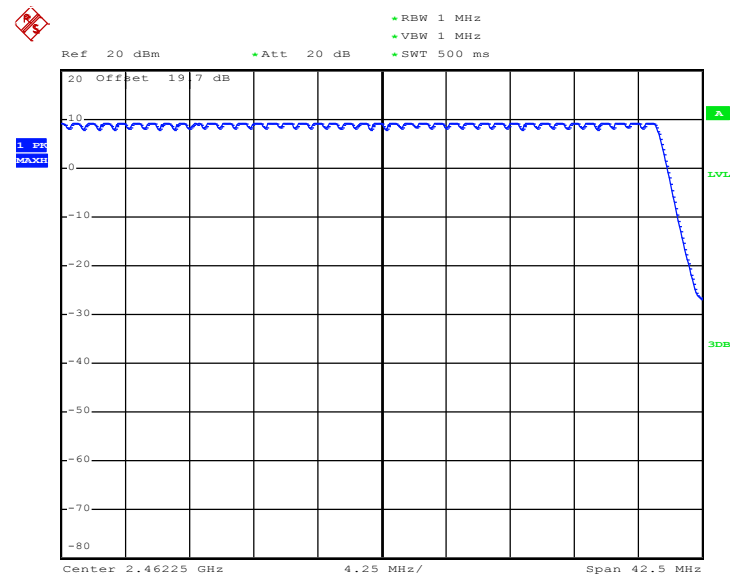


3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	1Mbps	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%
Number of Hopping Channels (Channel)		Limits (Channel)	Pass/Fail
79		> 15	Pass

Number of Hopping Channel Plot on Channel 00 - 78


Date: 19.AUG.2012 16:39:11



Date: 19.AUG.2012 16:48:36

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.

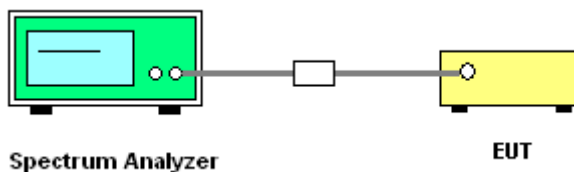
3.2.2 Measuring Instruments

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 a low loss cable.
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; $RBW \geq 1\%$ of the span;
 $VBW \geq RBW$; Sweep = auto; Detector function = peak; Trace = max hold.

3.2.4 Test Setup

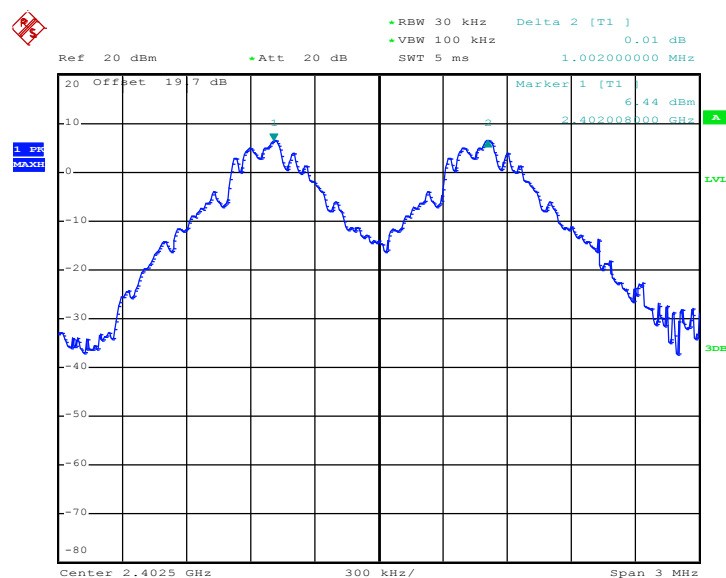


3.2.5 Test Result of Hopping Channel Separation

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

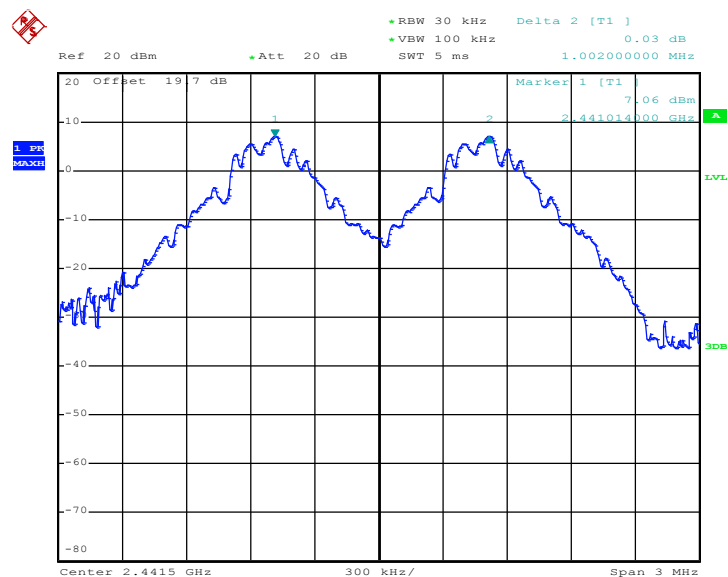
Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.5813	Pass
39	2441	1.002	0.5840	Pass
78	2480	1.002	0.5840	Pass

Channel Separation Plot on Channel 00 - 01



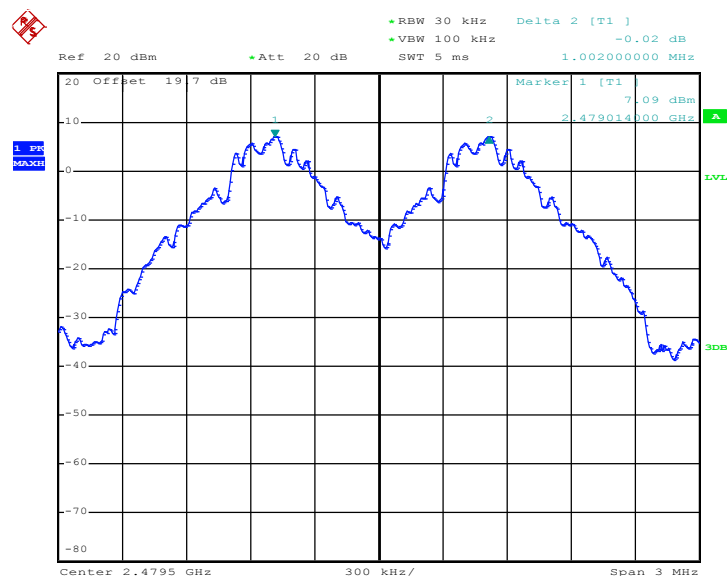
Date: 19.AUG.2012 15:20:28

Channel Separation Plot on Channel 39 - 40



Date: 19.AUG.2012 14:55:54

Channel Separation Plot on Channel 77 - 78



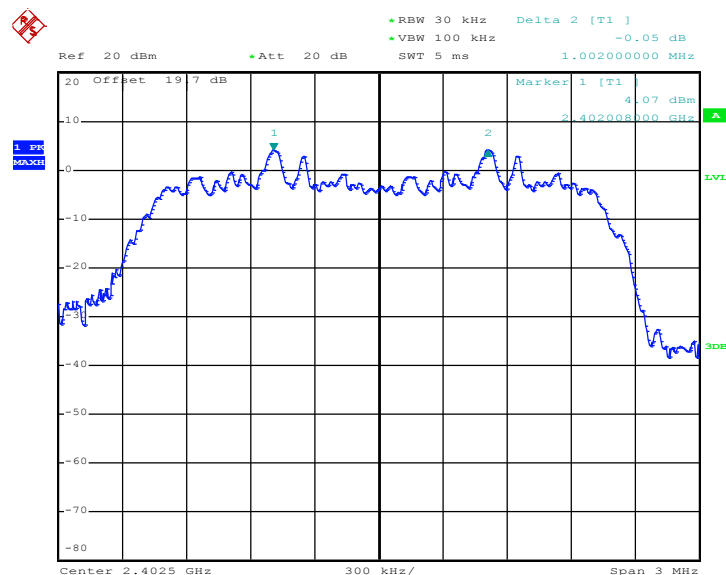
Date: 19.AUG.2012 15:21:31



Test Mode :	2Mbps	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

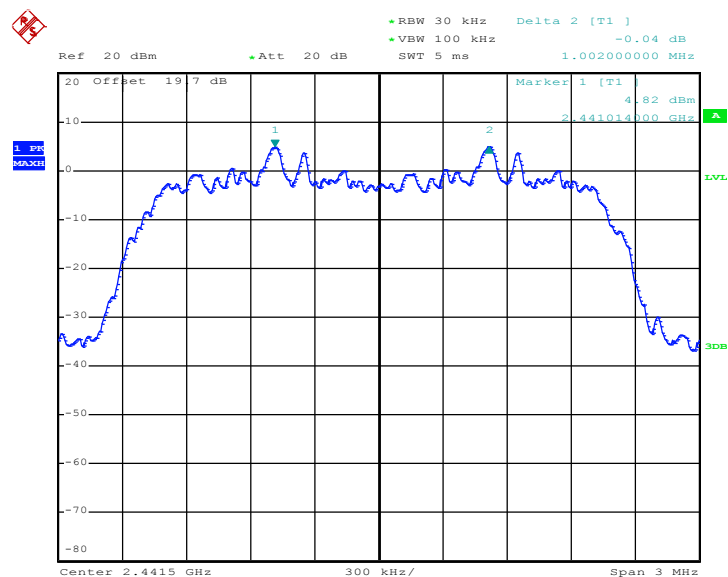
Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8880	Pass
39	2441	1.002	0.8920	Pass
78	2480	1.002	0.8920	Pass

Channel Separation Plot on Channel 00 - 01



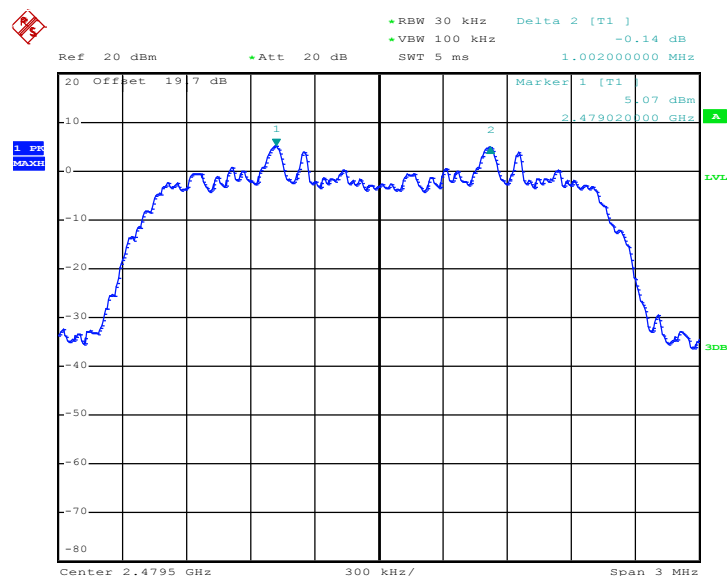
Date: 19.AUG.2012 15:41:08

Channel Separation Plot on Channel 39 - 40



Date: 19.AUG.2012 15:42:47

Channel Separation Plot on Channel 77 - 78

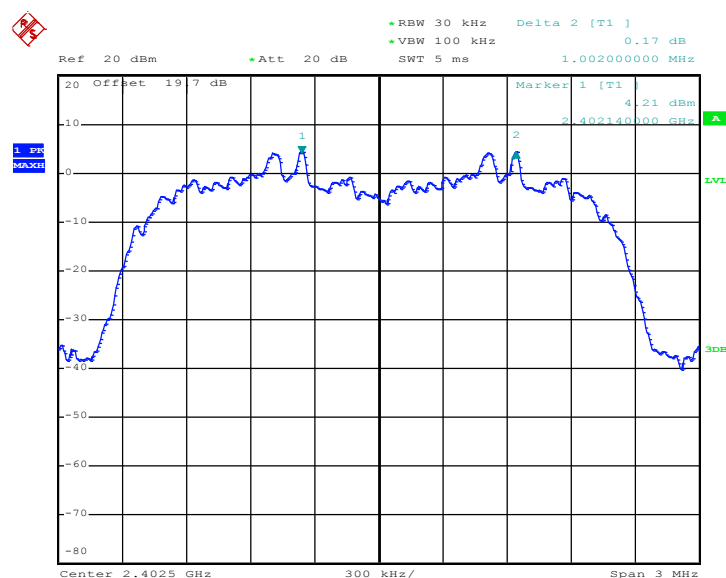


Date: 19.AUG.2012 15:49:08

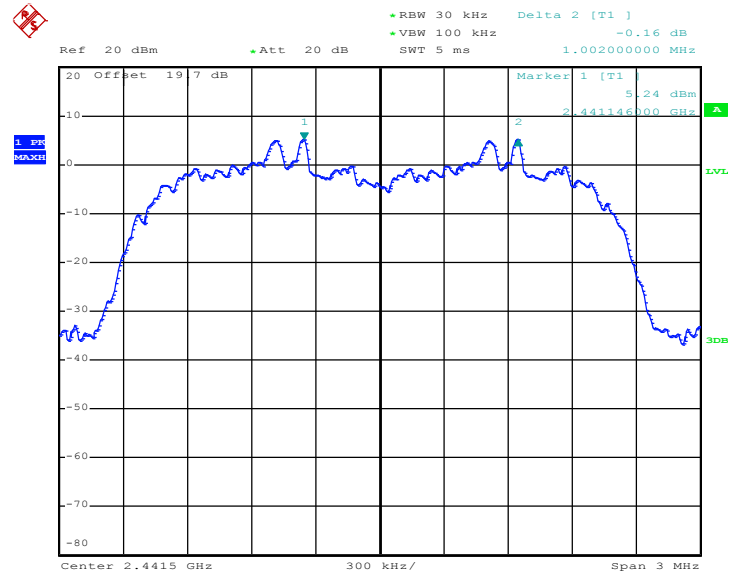
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8800	Pass
39	2441	1.002	0.8800	Pass
78	2480	1.002	0.8760	Pass

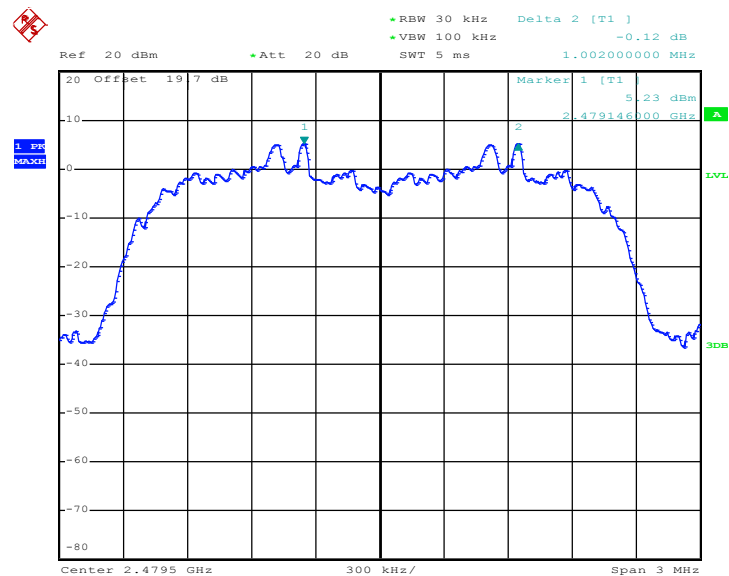
Channel Separation Plot on Channel 00 - 01



Date: 19.AUG.2012 16:06:52

Channel Separation Plot on Channel 39 - 40


Date: 19.AUG.2012 15:58:21

Channel Separation Plot on Channel 77 - 78


Date: 19.AUG.2012 15:56:28

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.

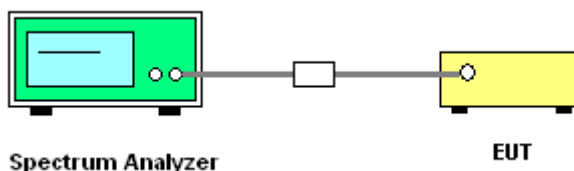
3.3.2 Measuring Instruments

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 connector was connected to the spectrum analyzer through a low loss cable.
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 $\geq$ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.

3.3.4 Test Setup



3.3.5 Test Result of Dwell Time

Test Mode :	DH5	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

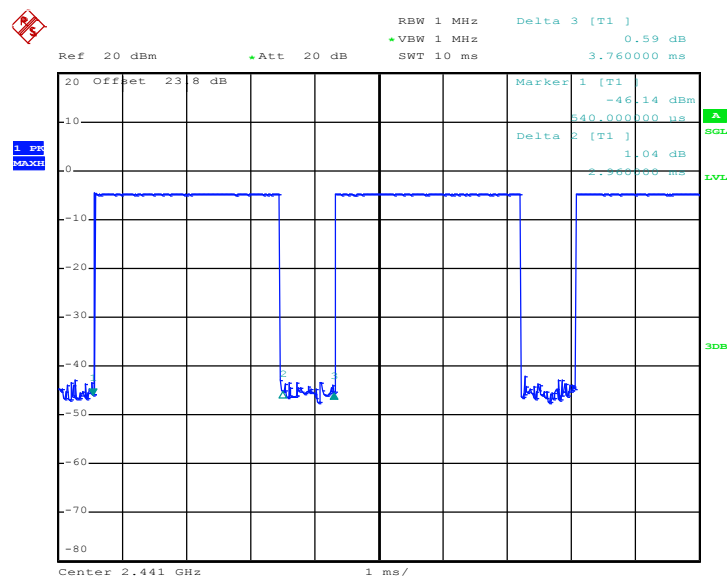
Package Mode	Average Hopping Channel	Package Transfer Time (usec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
DH5	2.90	2960.00	0.27	0.4	Pass

Remark:

1. Dwell Time=79(channels) x 0.4(s) x average hopping channel x package transfer time
2. 79 channels come from the Hopping Channel number.
3. Average Hopping Channel = hops/sweep time
4. T: Package Transfer Time(us)

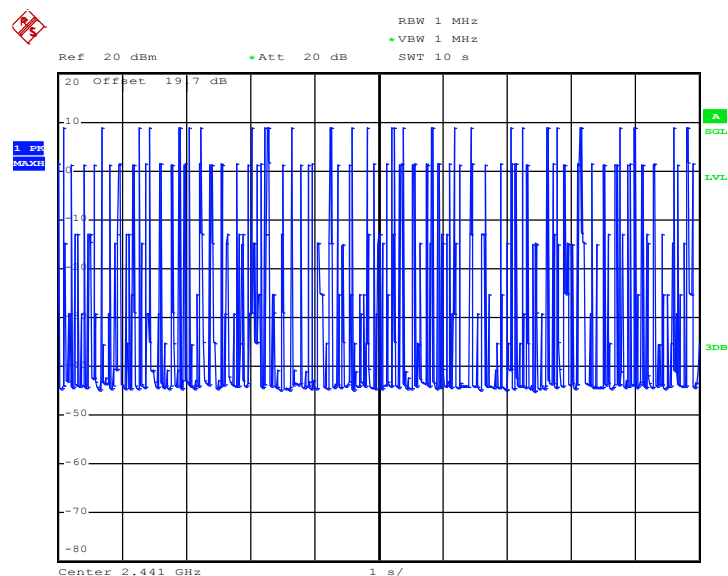


DH5 Dwell Time (One Pulse) Plot on Channel 39



Date: 31.JUL.2012 00:25:45

DH5 Dwell Time (Count Pulses) Plot on Channel 39



Date: 19.AUG.2012 16:14:40

3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB Bandwidth

Reporting only

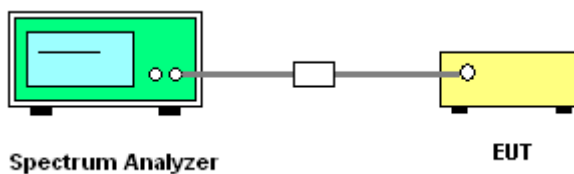
3.4.2 Measuring Instruments

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 a low loss cable.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel;
RBW $\geq$ 1% of the 20 dB bandwidth; VBW $\geq$ RBW; Sweep = auto; Detector function = peak;
Trace = max hold.

3.4.4 Test Setup

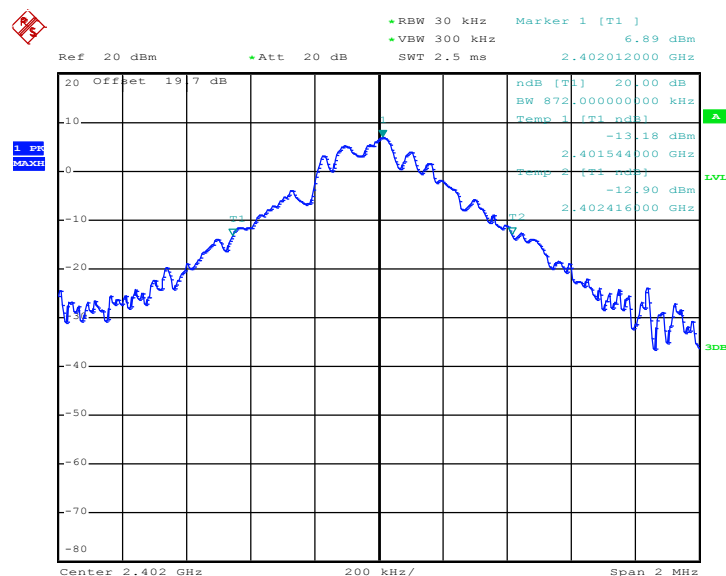


3.4.5 Test Result of 20dB Bandwidth

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

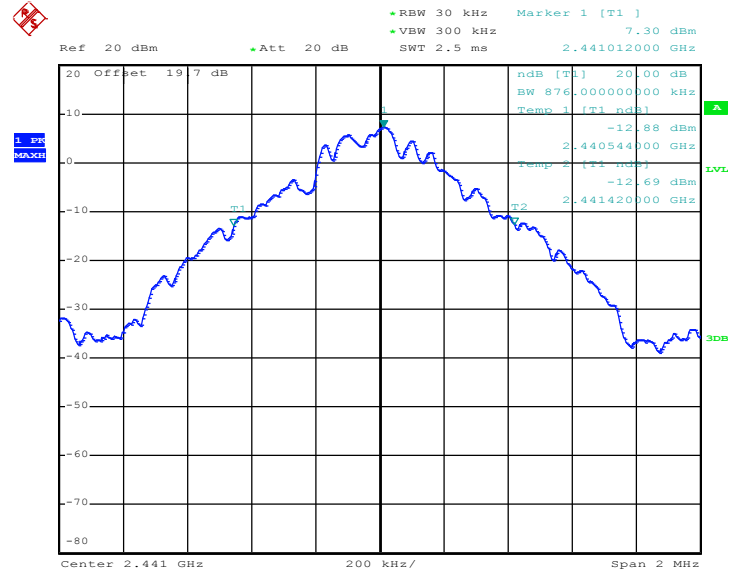
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.872
39	2441	0.876
78	2480	0.876

20 dB Bandwidth Plot on Channel 00



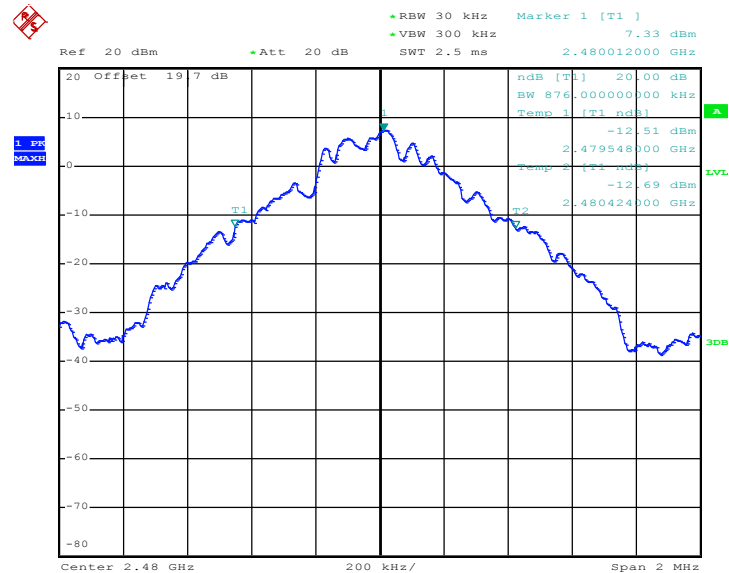
Date: 19.AUG.2012 14:56:41

20 dB Bandwidth Plot on Channel 39



Date: 19.AUG.2012 14:57:23

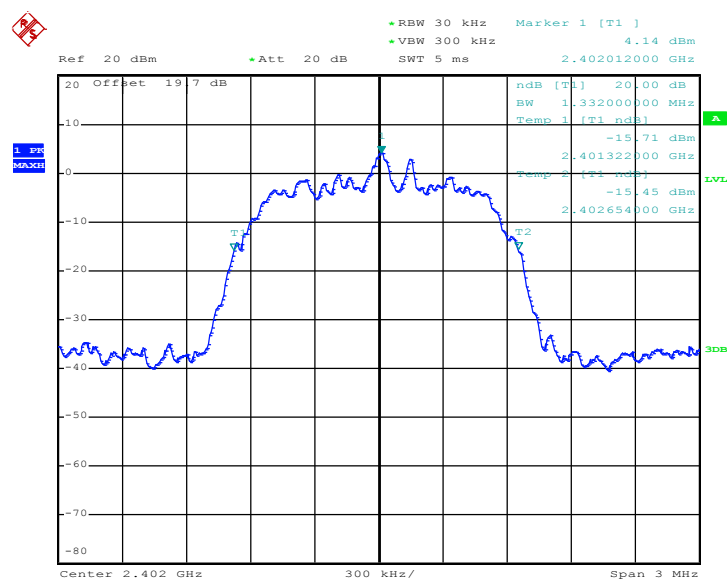
20 dB Bandwidth Plot on Channel 78



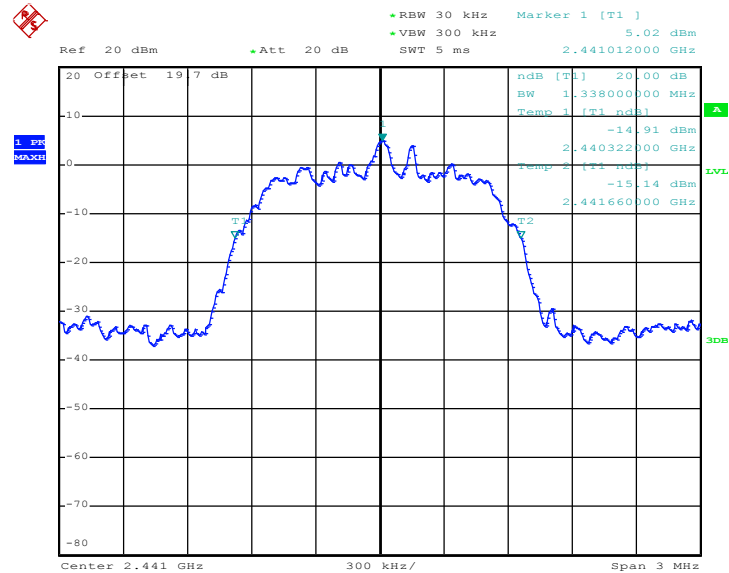
Date: 19.AUG.2012 15:22:02

Test Mode :	2Mbps	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

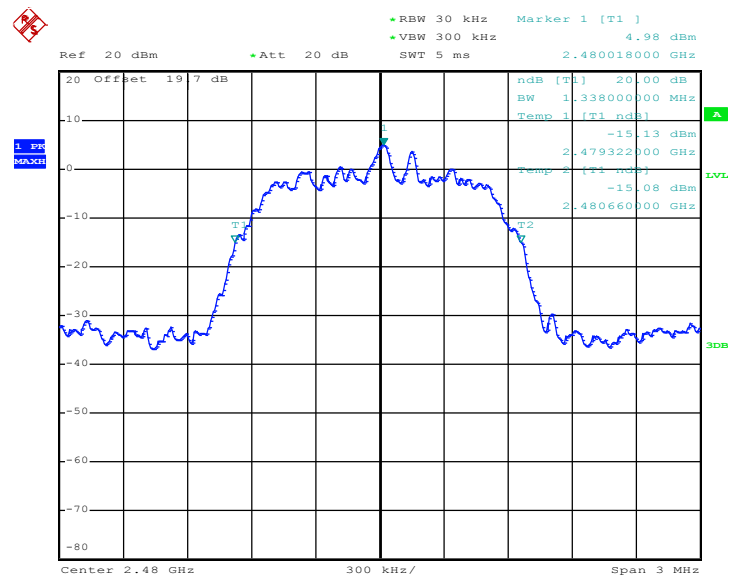
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.332
39	2441	1.338
78	2480	1.338

20 dB Bandwidth Plot on Channel 00


Date: 19.AUG.2012 15:36:30

20 dB Bandwidth Plot on Channel 39


Date: 19.AUG.2012 15:43:21

20 dB Bandwidth Plot on Channel 78


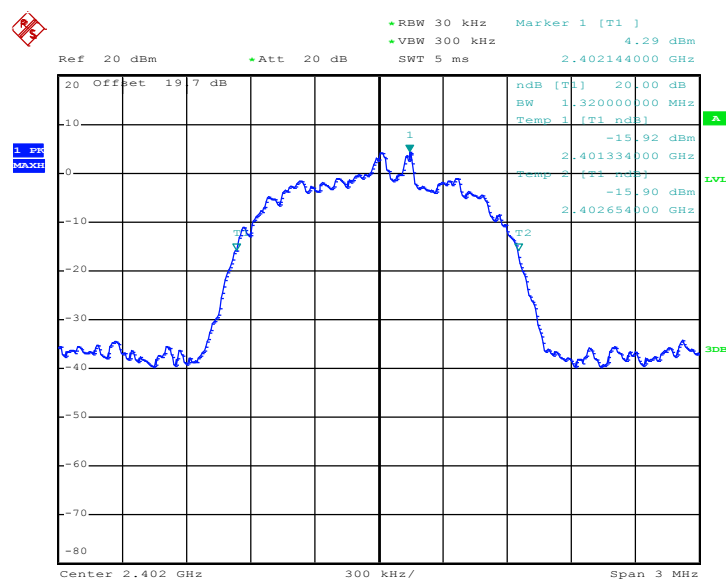
Date: 19.AUG.2012 15:49:45



Test Mode :	3Mbps	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

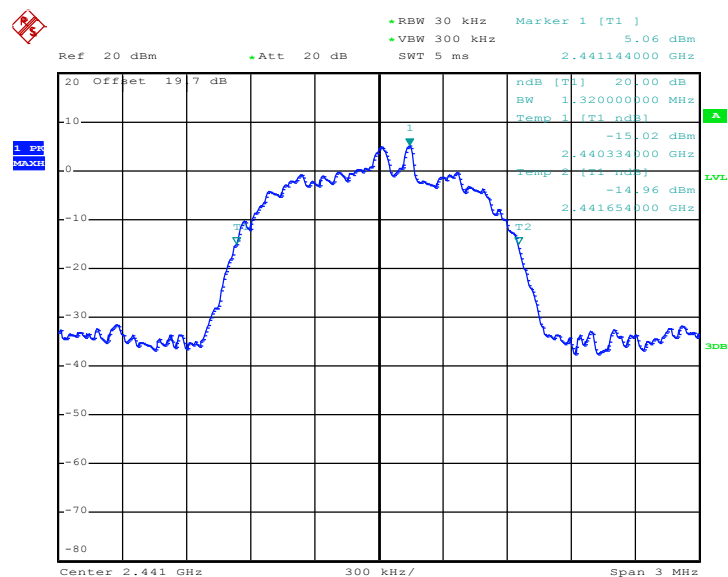
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.320
39	2441	1.320
78	2480	1.314

20 dB Bandwidth Plot on Channel 00



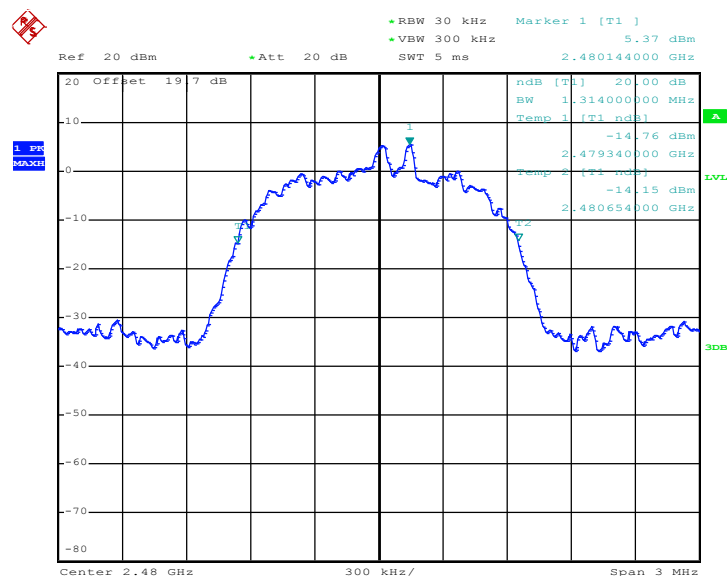
Date: 19.AUG.2012 16:03:21

20 dB Bandwidth Plot on Channel 39



Date: 19.AUG.2012 15:58:56

20 dB Bandwidth Plot on Channel 78



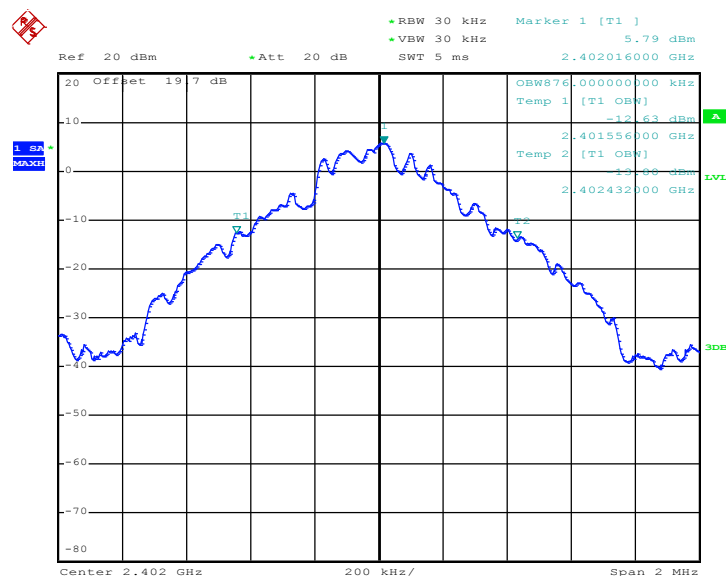
Date: 19.AUG.2012 15:56:57

3.4.6 Test Result of 99% Occupied Bandwidth

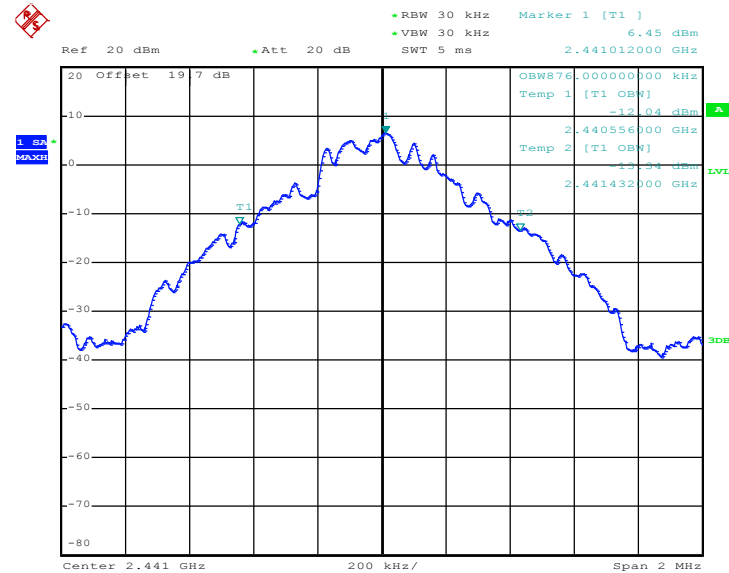
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	0.876
39	2441	0.876
78	2480	0.876

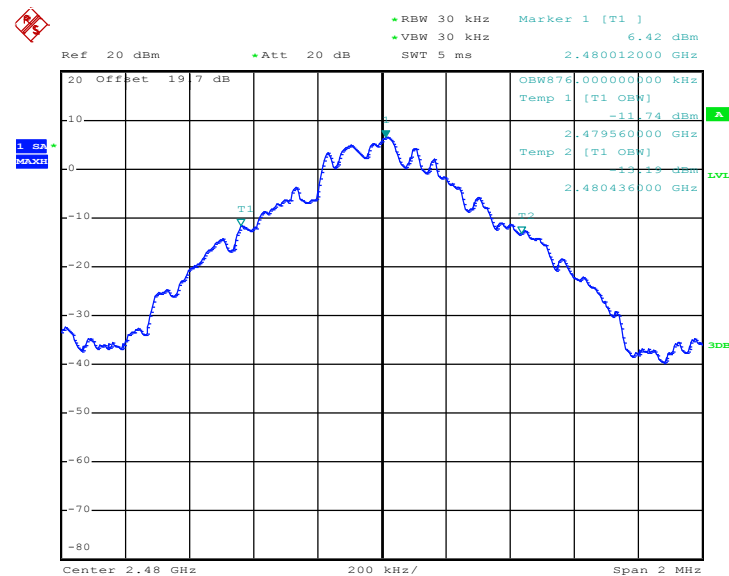
99% Bandwidth Plot on Channel 00



Date: 19.AUG.2012 15:09:01

99% Occupied Bandwidth Plot on Channel 39


Date: 19.AUG.2012 16:51:48

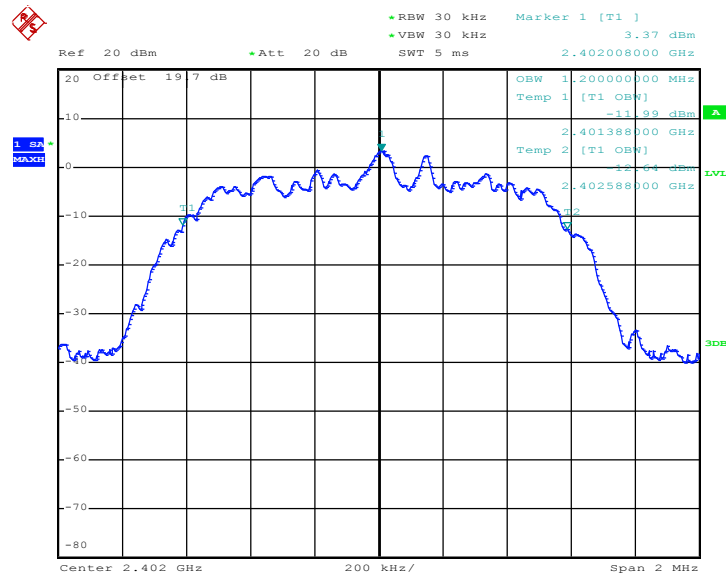
99% Occupied Bandwidth Plot on Channel 78


Date: 19.AUG.2012 15:22:37

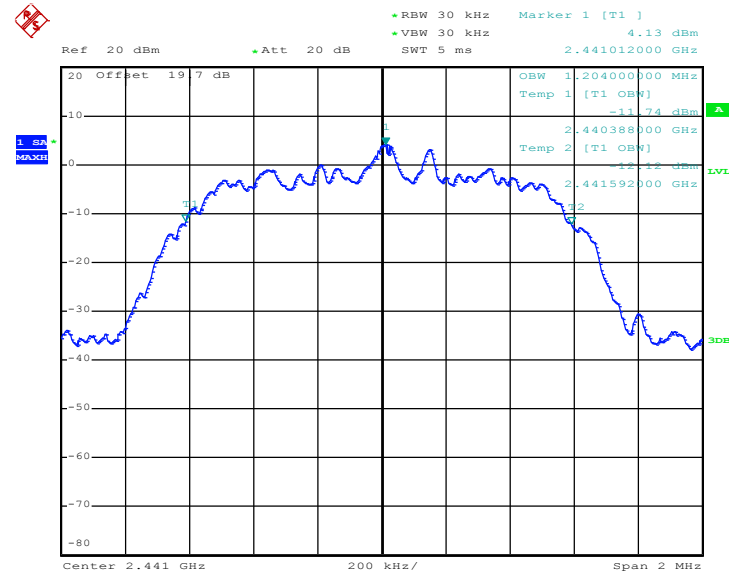


Test Mode :	2Mbps	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

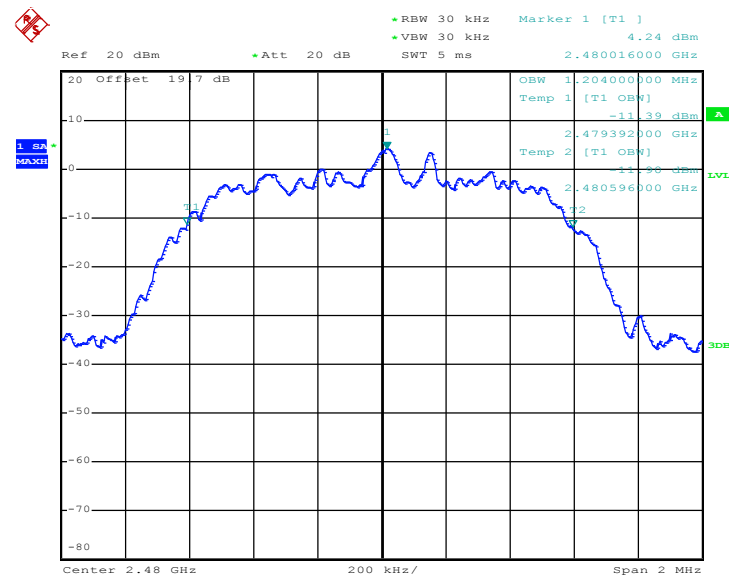
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.200
39	2441	1.204
78	2480	1.204

99% Bandwidth Plot on Channel 00

Date: 19.AUG.2012 15:38:11

99% Occupied Bandwidth Plot on Channel 39


Date: 19.AUG.2012 15:44:31

99% Occupied Bandwidth Plot on Channel 78


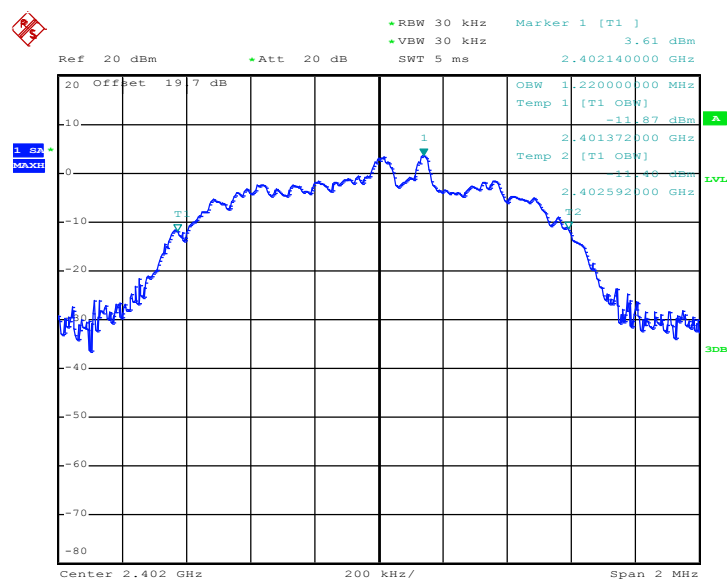
Date: 19.AUG.2012 15:50:43



Test Mode :	3Mbps	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

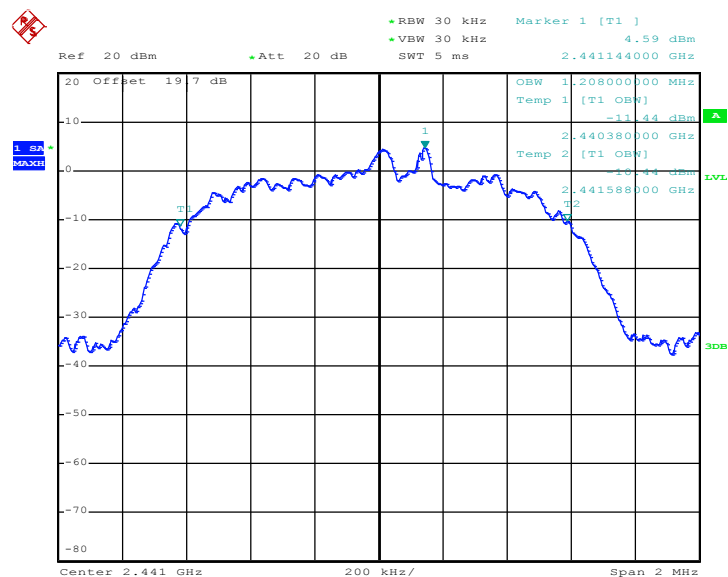
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.220
39	2441	1.208
78	2480	1.220

99% Bandwidth Plot on Channel 00



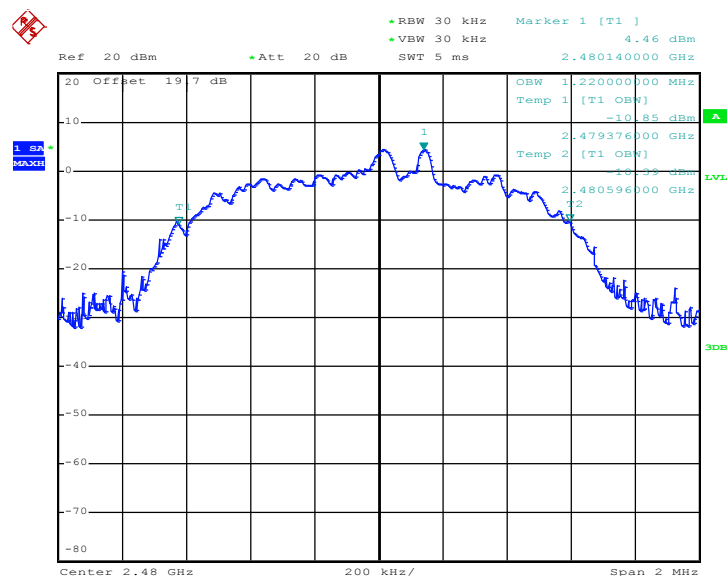
Date: 19.AUG.2012 16:03:56

99% Occupied Bandwidth Plot on Channel 39



Date: 19.AUG.2012 15:59:29

99% Occupied Bandwidth Plot on Channel 78



Date: 19.AUG.2012 15:54:27

3.5 Peak Output Power Measurement

3.5.1 Limit of Peak Output Power

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

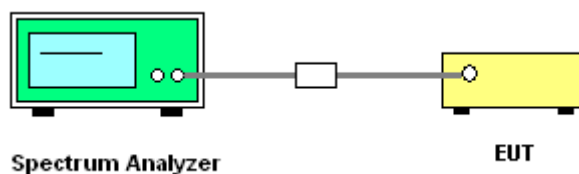
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.5.4 Test Setup

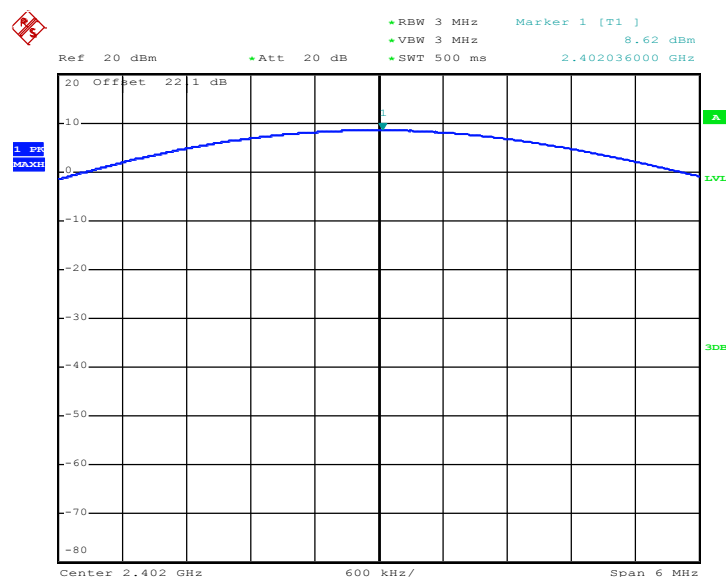


3.5.5 Test Result of Peak Output Power

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

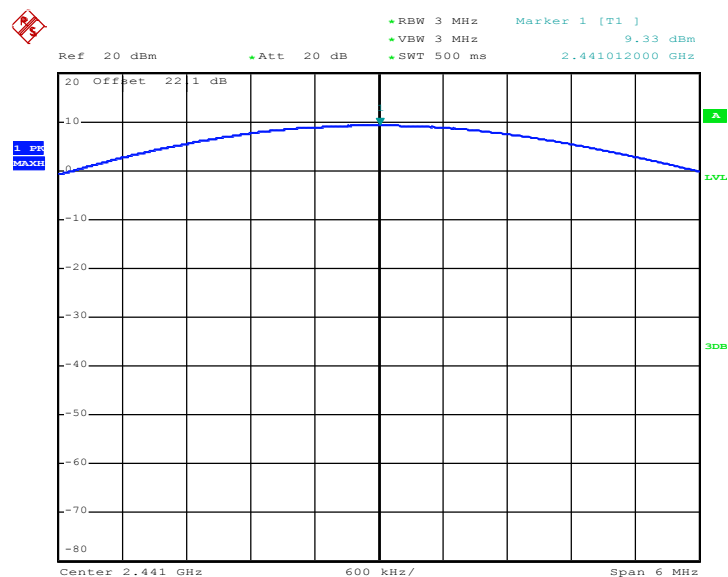
Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	8.62	30.00	Pass
39	2441	9.33	30.00	Pass
78	2480	9.30	30.00	Pass

Peak Output Power Plot on Channel 00



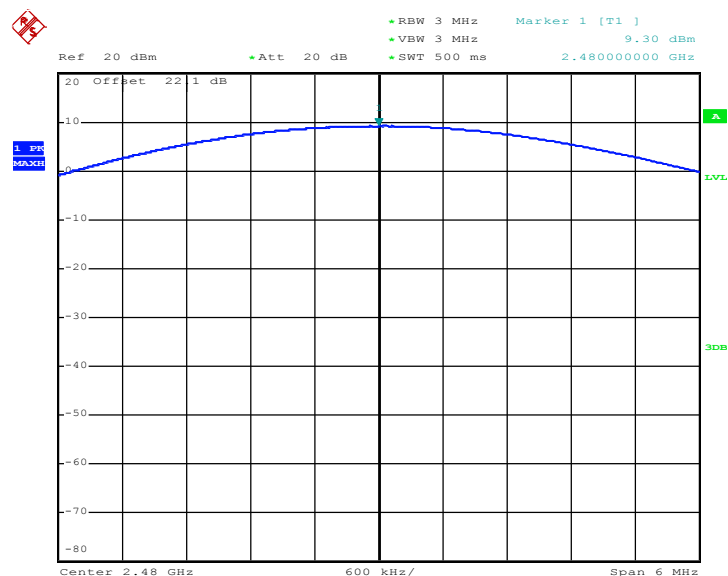
Date: 10.AUG.2012 23:13:06

Peak Output Power Plot on Channel 39



Date: 10.AUG.2012 23:17:06

Peak Output Power Plot on Channel 78



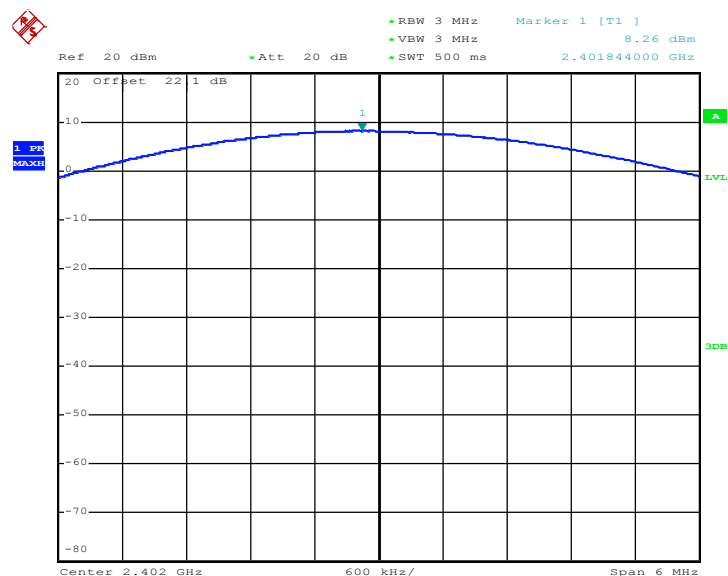
Date: 10.AUG.2012 23:32:24



Test Mode :	2Mbps	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

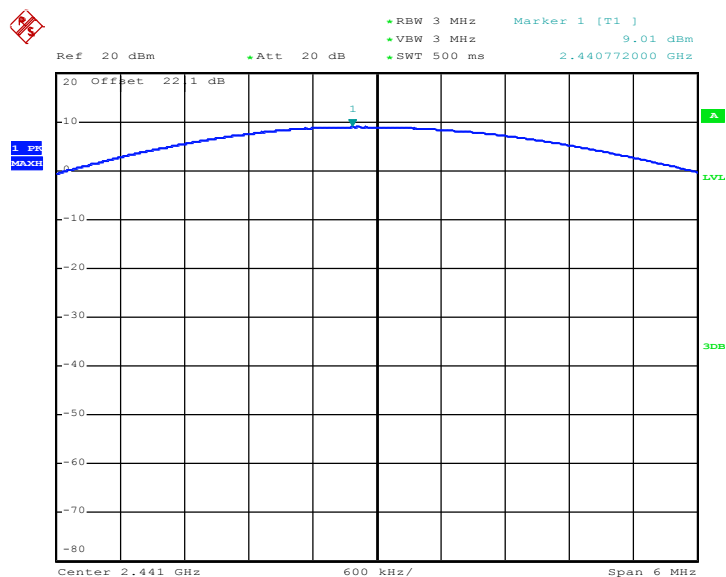
Channel	Frequency (MHz)	RF Power (dBm)		
		$\pi/4$ -DQPSK	Max. Limits (dBm)	Pass/Fail
		2 Mbps		
00	2402	8.26	20.97	Pass
39	2441	9.01	20.97	Pass
78	2480	9.00	20.97	Pass

Peak Output Power Plot on Channel 00



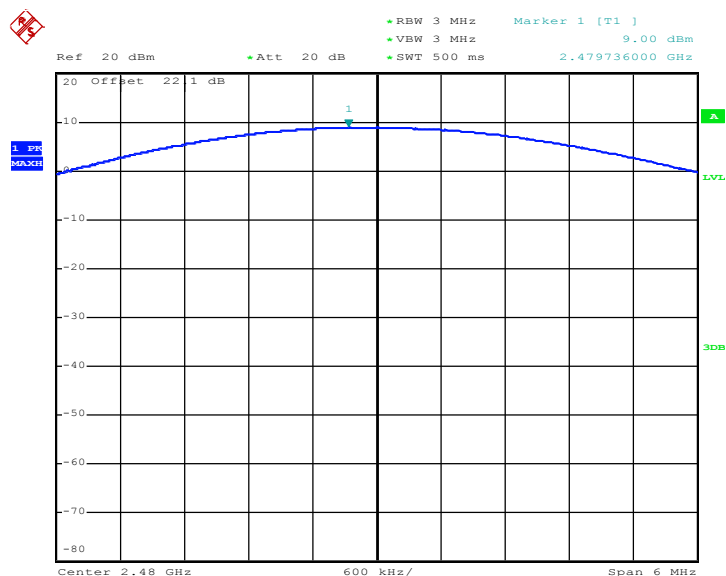
Date: 10.AUG.2012 23:15:45

Peak Output Power Plot on Channel 39



Date: 10.AUG.2012 23:29:57

Peak Output Power Plot on Channel 78



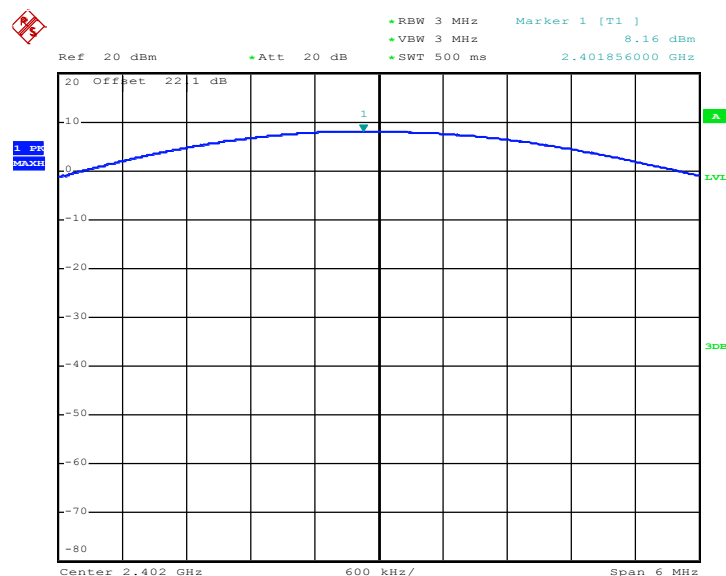
Date: 10.AUG.2012 23:33:53



Test Mode :	3Mbps	Temperature :	24~26°C
Test Engineer :	Reece Li	Relative Humidity :	50~53%

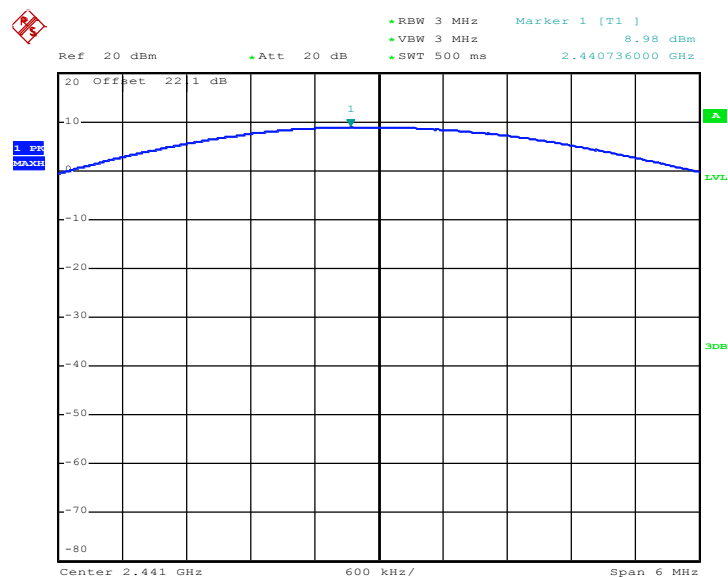
Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	8.16	20.97	Pass
39	2441	8.98	20.97	Pass
78	2480	8.95	20.97	Pass

Peak Output Power Plot on Channel 00



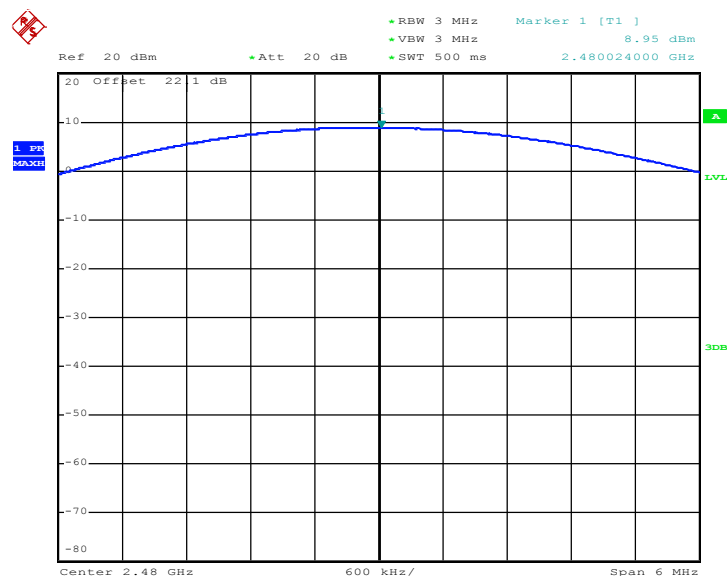
Date: 10.AUG.2012 23:47:05

Peak Output Power Plot on Channel 39



Date: 10.AUG.2012 23:31:46

Peak Output Power Plot on Channel 78



Date: 10.AUG.2012 23:39:00

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.

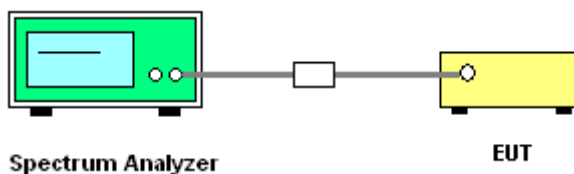
3.6.2 Measuring Instruments

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 ($\geq 1\%$ span=30MHz), VBW = 300KHz ($\geq$ 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. Record the results in the test report.

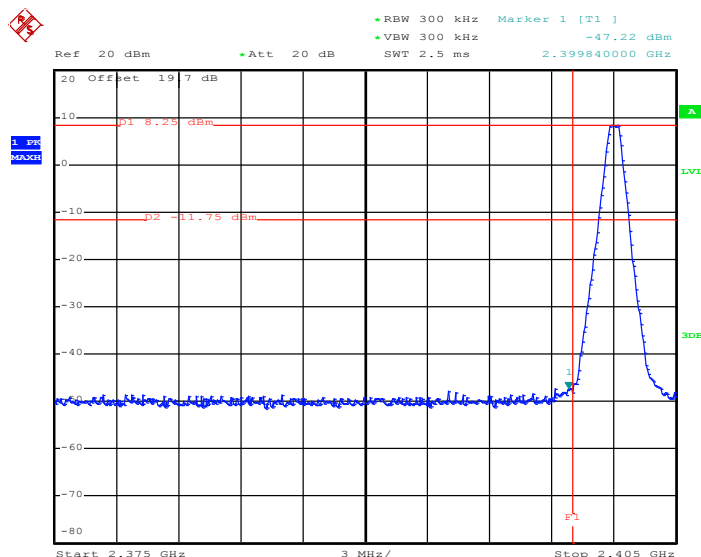
3.6.4 Test Setup



4.6.5 Test Result of Conducted Band Edges

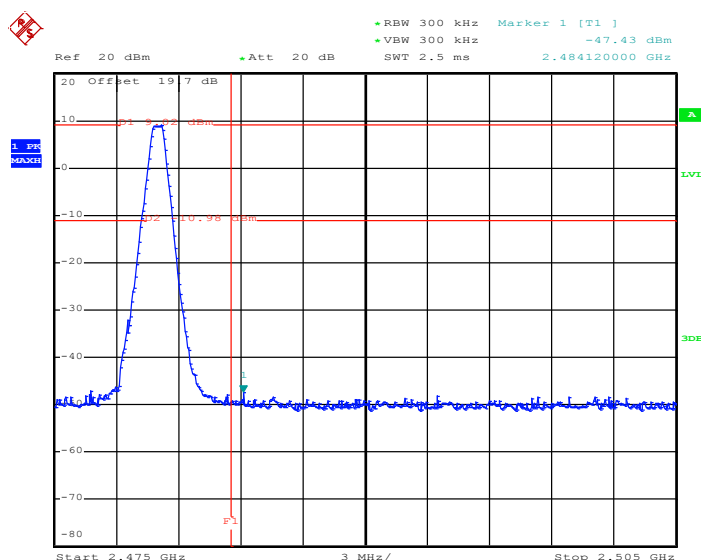
Test Mode :	1Mbps	Temperature :	24~26℃
Test Channel :	00 and 78	Relative Humidity :	50~53%
		Test Engineer :	Reece Li

Low Band Edge Plot on Channel 00



Date: 19.AUG.2012 15:33:20

High Band Edge Plot on Channel 78

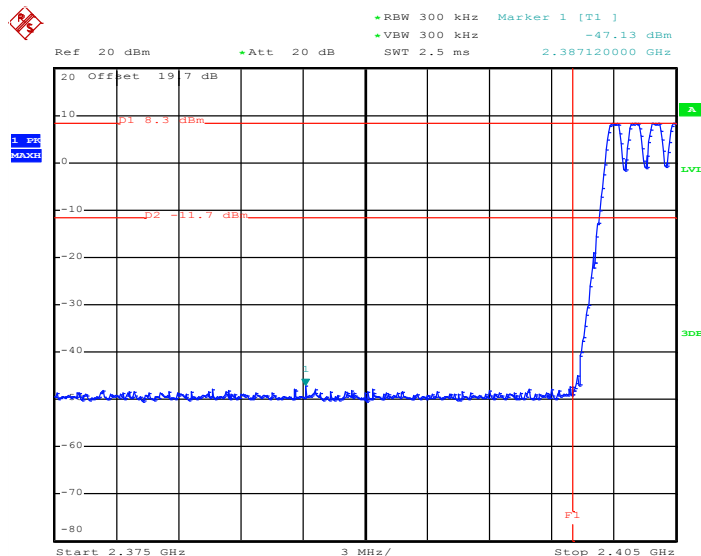


Date: 19.AUG.2012 15:23:44

4.6.6 Test Result of Conducted Hopping Mode Band Edges

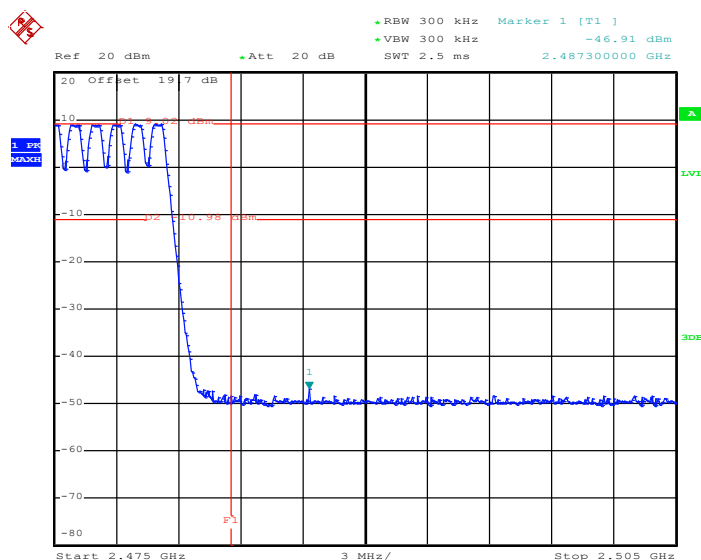
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Reece Li	Relative Humidity :	50~53%

Hopping Mode Low Band Edge Plot



Date: 19.AUG.2012 17:25:28

Hopping Mode High Band Edge Plot



Date: 19.AUG.2012 17:29:31

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.

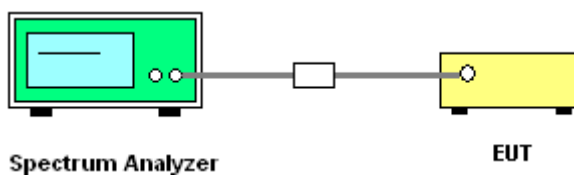
3.7.2 Measuring Instruments

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 transmitter output was connected to the spectrum analyzer via a low lose cable.
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. Record the results in the test report.

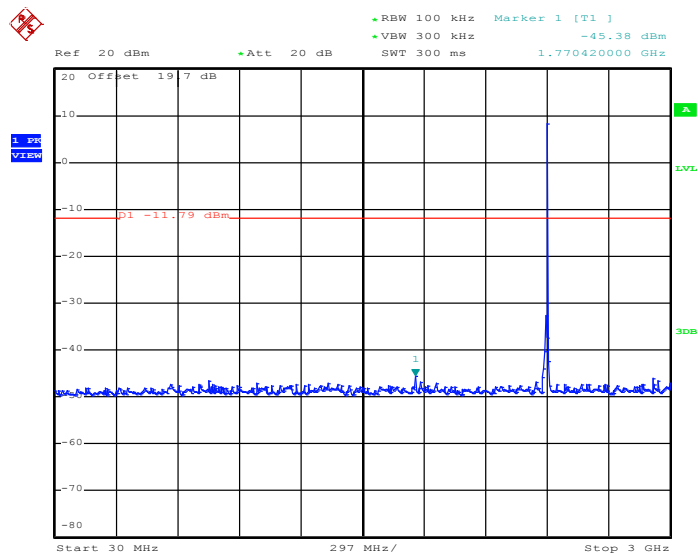
3.7.4 Test Setup



3.7.5 Test Result

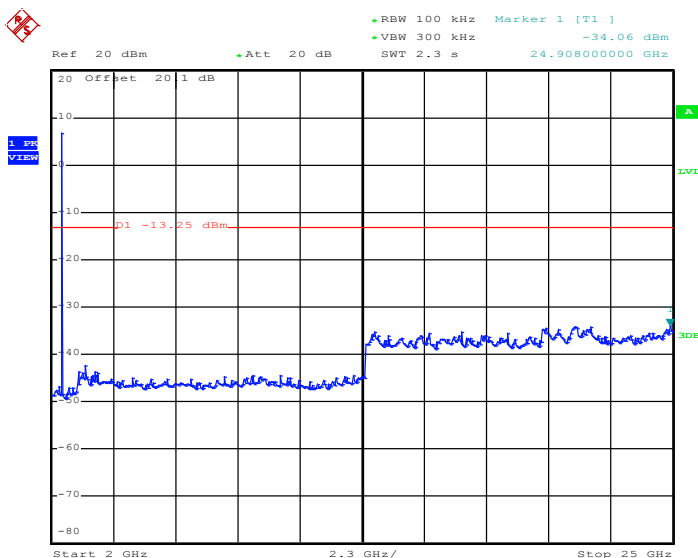
Test Mode :	1Mbps	Temperature :	24~26°C
Test Channel :	00	Relative Humidity :	50~53%
		Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Date: 19.AUG.2012 15:09:27

Conducted Spurious Emission Plot between 2 GHz ~ 25 GHz

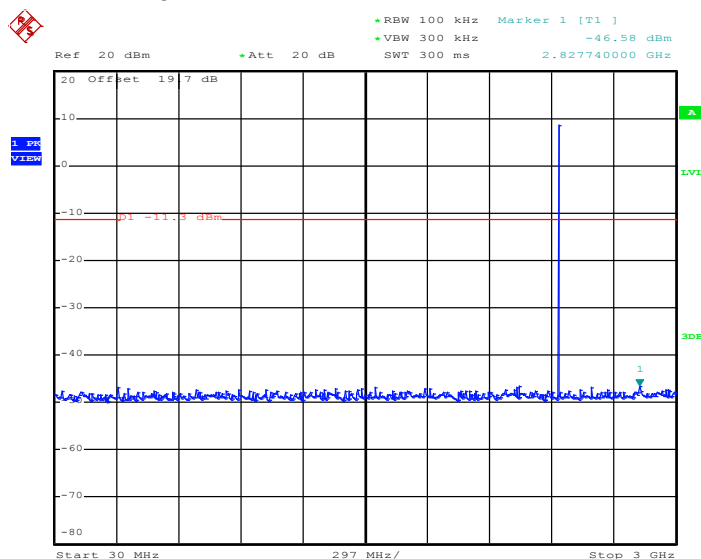


Date: 19.AUG.2012 15:09:49



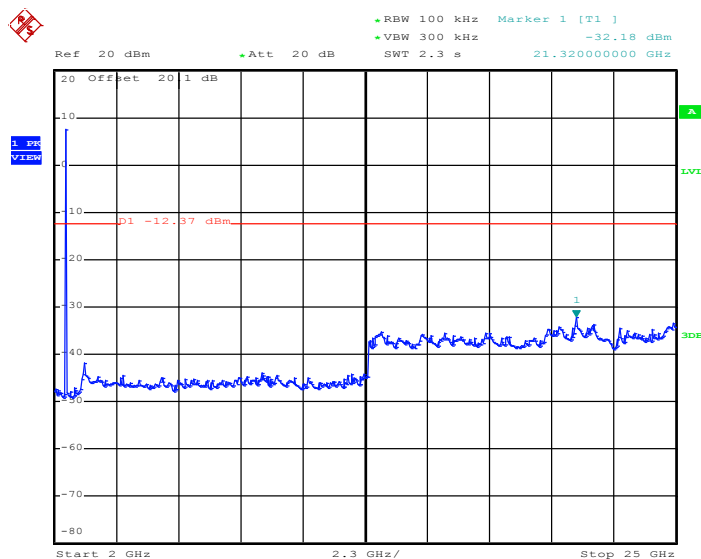
Test Mode :	1Mbps	Temperature :	24~26°C
Test Channel :	39	Relative Humidity :	50~53%
		Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Date: 19.AUG.2012 14:58:32

Conducted Spurious Emission Plot between 2 GHz ~ 25 GHz

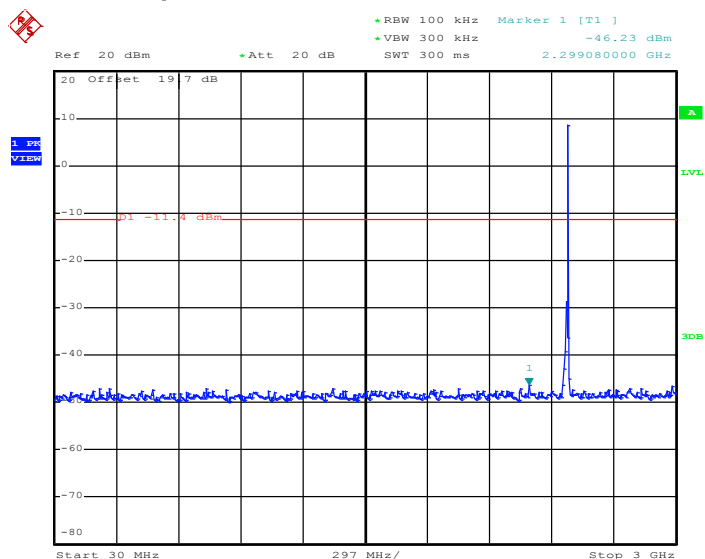


Date: 19.AUG.2012 14:58:54



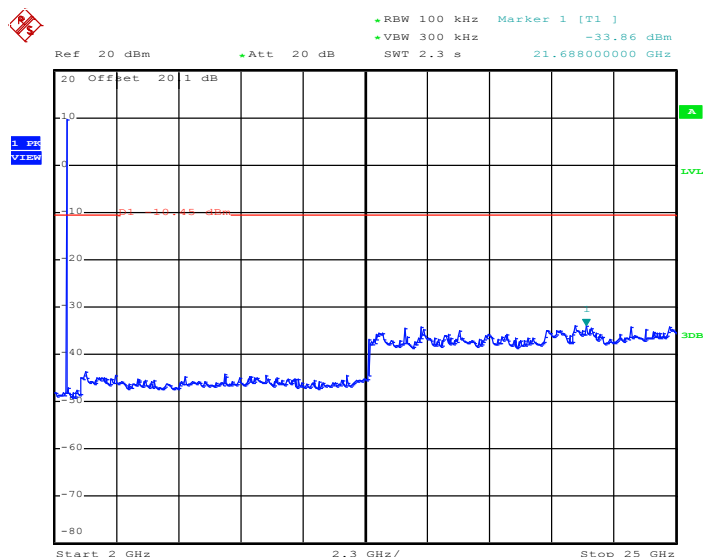
Test Mode :	1Mbps	Temperature :	24~26°C
Test Channel :	78	Relative Humidity :	50~53%
		Test Engineer :	Reece Li

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Date: 19.AUG.2012 15:23:01

Conducted Spurious Emission Plot between 2 GHz ~ 25 GHz



Date: 19.AUG.2012 15:23:23

3.8 Radiated Band Edges Measurement

3.8.1 Limit of Radiated Band Edges

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.

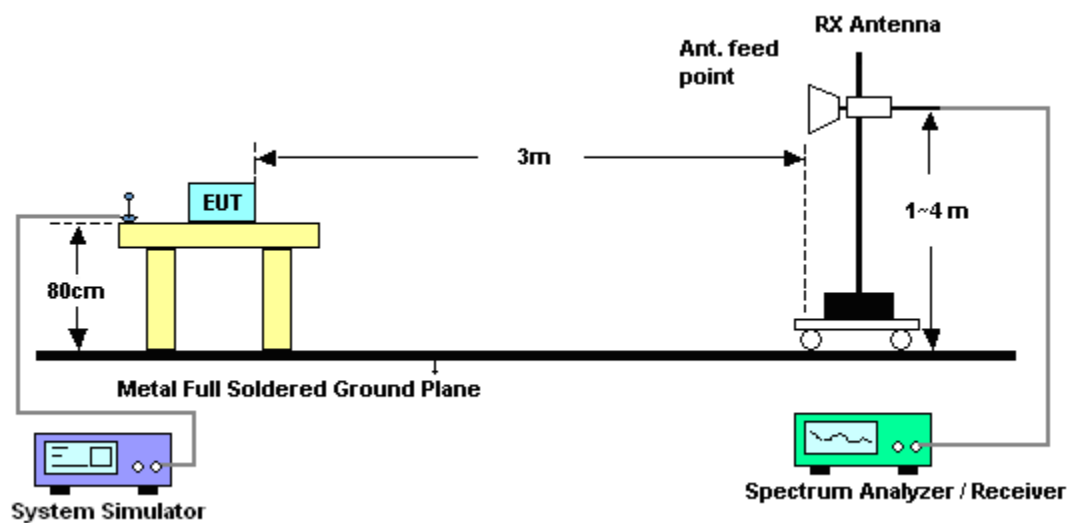
3.8.3 Test Procedures

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 $f < 1 \text{ GHz}$, RBW=1MHz for $f > 1 \text{ GHz}$; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
 - (3) For average measurement: use duty cycle correction factor method.
Duty cycle = On time/100 milliseconds
On time = $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$
Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
Average Level = Peak Level + $20 * \log(\text{Duty cycle})$
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 (24.5dB) derived from $20 \log (\text{dwell time}/100\text{ms})$.

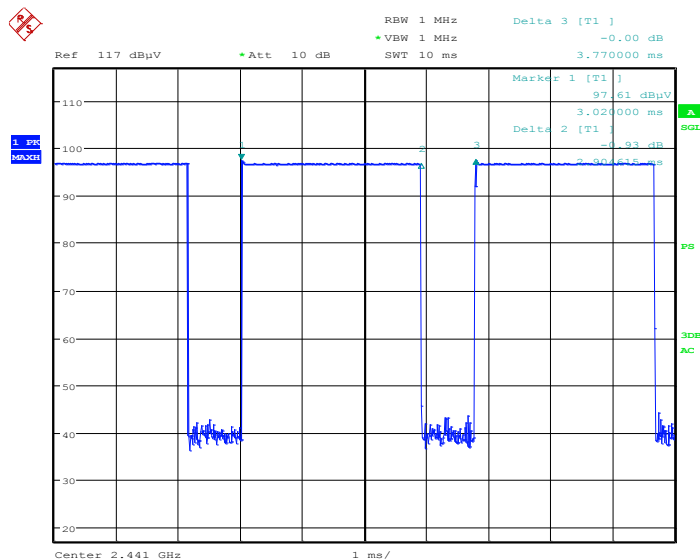
For example: Average level = $45.61 \text{ dBuV/m} - 24.5 \text{ (dB)} = 21.11 \text{ dBuV/m}$.

3.8.4 Test Setup



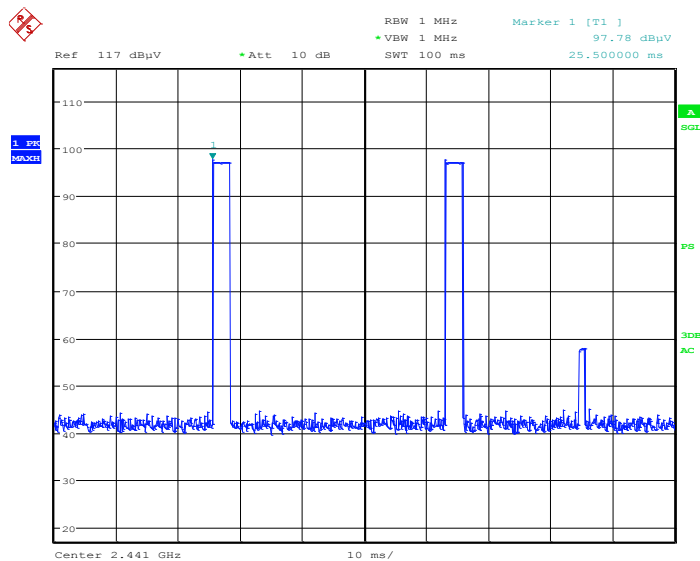
3.8.5 Duty cycle correction factor for average measurement

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



Date: 8.SEP.2012 08:32:31

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



Date: 8.SEP.2012 08:34:34

Note:

1. Duty cycle = on time/100 milliseconds = $2 * 2.904 / 100 = 5.81 \%$
2. Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.72 \text{ dB}$
3. DH5 has the highest duty cycle and is reported.

3.8.6 Test Result of Radiated Band Edges

<Antenna 1>

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	00	Relative Humidity :	40~42%
		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
2368.86	46.16	-27.84	74	45.31	32.16	4.57	35.88	118	19	Peak
2368.86	21.44	-32.56	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
2389.65	46.71	-27.29	74	45.83	32.18	4.58	35.88	179	276	Peak
2389.65	21.99	-32.01	54	-	-	-	-	-	-	Average

Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.72dB) derived from $20\log(\text{dwell time}/100\text{ms})$.

For example: Average level = 46.16dBuV/m – 24.72 (dB) = 21.44dBuV/m.

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	78	Relative Humidity :	40~42%
		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
2483.5	59.92	-14.08	74	58.81	32.28	4.64	35.81	112	121	Peak
2483.5	35.2	-18.8	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
2483.5	51.1	-22.9	74	49.99	32.28	4.64	35.81	137	305	Peak
2483.5	26.38	-27.62	54	-	-	-	-	-	-	Average

<Antenna 2>

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	00	Relative Humidity :	40~42%
		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
2364.63	46.51	-27.49	74	45.69	32.13	4.57	35.88	179	333	Peak
2364.63	21.79	-32.21	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
2386.23	46.22	-27.78	74	45.34	32.18	4.58	35.88	115	233	Peak
2386.23	21.5	-32.5	54	-	-	-	-	-	-	Average

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	78	Relative Humidity :	40~42%
		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
2483.5	63.96	-10.04	74	62.85	32.28	4.64	35.81	114	328	Peak
2483.5	39.24	-14.76	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
2483.5	55.86	-18.14	74	54.75	32.28	4.64	35.81	200	256	Peak
2483.5	31.14	-22.86	54	-	-	-	-	-	-	Average

3.9 Radiated Spurious Emission Measurement

3.9.1 Limit of Radiated Emission

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

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
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

3.9.2 Measuring Instruments

See list of measuring instruments of this test report.

3.9.3 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 $f > 1$ GHz ; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
 - (3) For average measurement: use duty cycle correction factor method.
Duty cycle = On time/100 milliseconds
$$\text{On time} = N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$$

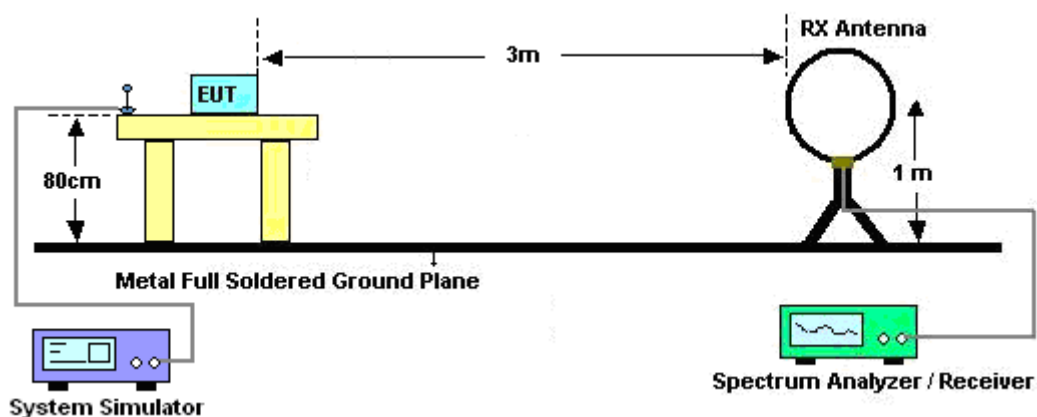
Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
$$\text{Average Level} = \text{Peak Level} + 20 * \log(\text{Duty cycle})$$
7. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
8. For measurement below 1GHz, if the emission level of the EUT measured by the peak detector is more than 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement by using the quasi-peak detector will be reported.

Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.5dB) derived from $20 \log(\text{dwell time}/100\text{ms})$.

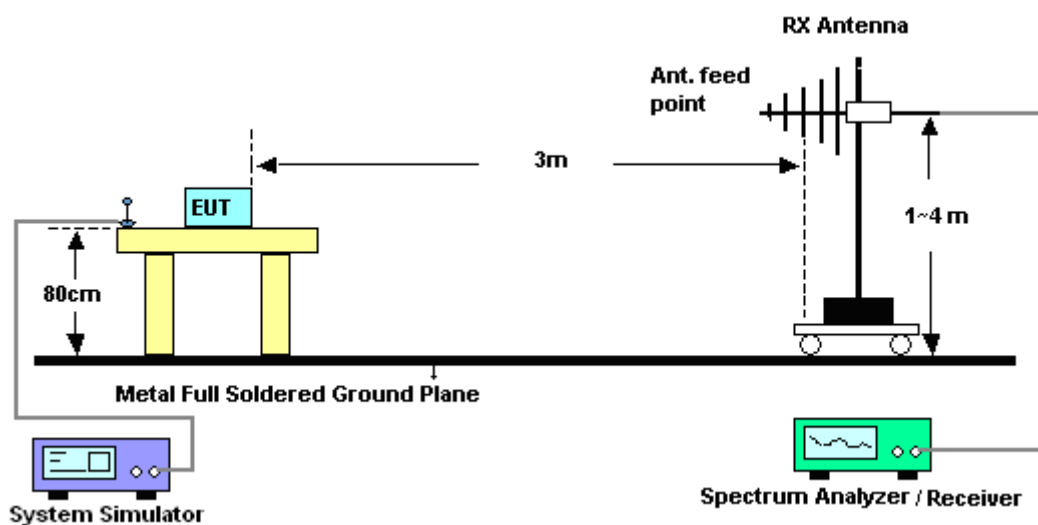
For example: Average level = 45.61dBuV/m – 24.5 (dB) = 21.11dBuV/m.

3.9.4 Test Setup

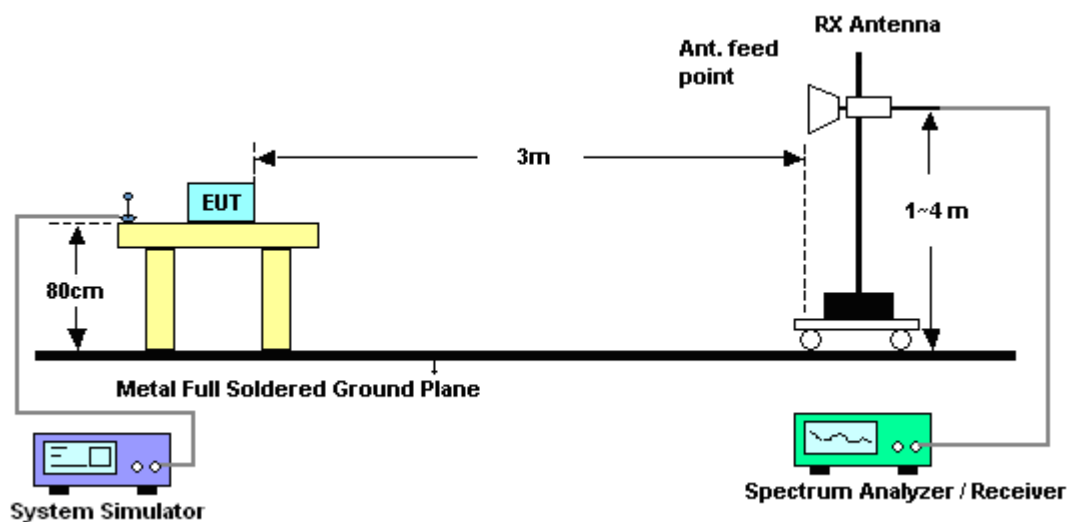
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

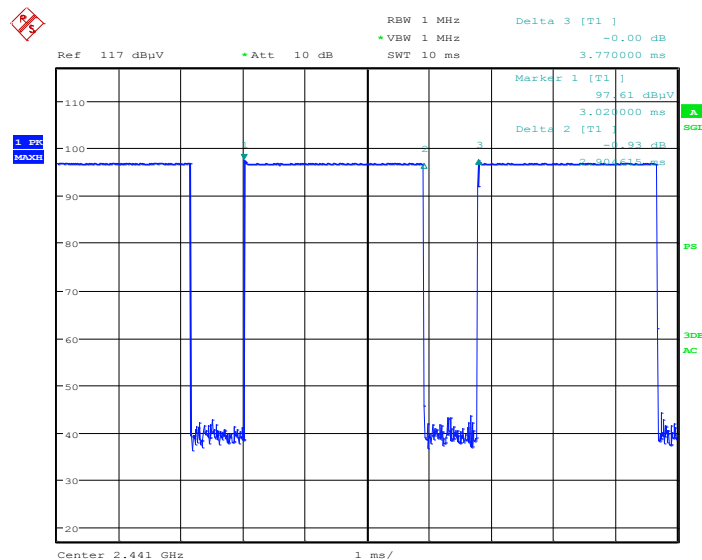


3.9.5 Test Results of Radiated Emissions (9 KHz ~ 30 MHz)

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.

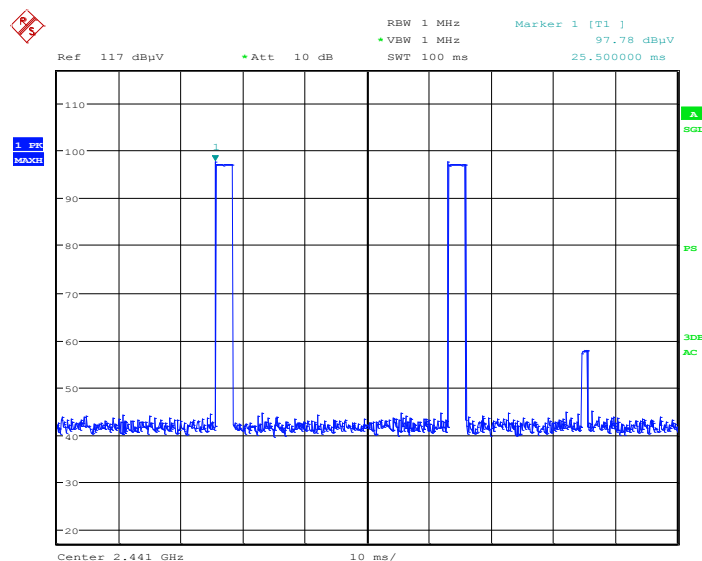
3.9.6 Duty cycle correction factor for average measurement

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



Date: 8.SEP.2012 08:32:31

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



Date: 8.SEP.2012 08:34:34

Note:

1. Duty cycle = on time/100 milliseconds = $2 * 2.904 / 100 = 5.81 \%$
2. Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.72 \text{ dB}$
3. DH5 has the highest duty cycle and is reported.

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

<Antenna 1>

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	00	Relative Humidity :	40~42%
Test Engineer :	David Ke	Polarization :	Horizontal
Remark :	2402 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	102.56	-	-	101.66	32.18	4.58	35.86	118	19	Peak
2402	77.84	-	-	-	-	-	-	-	-	Average
4806	42.58	-31.42	74	60.87	34.26	6.51	59.06	100	0	Peak
4806	17.86	-36.14	54	-	-	-	-	-	-	Average

Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.72dB) derived from $20\log(\text{dwell time}/100\text{ms})$.

For example: Average level = 102.56dBuV/m – 24.72 (dB) = 77.84dBuV/m.

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	00	Relative Humidity :	40~42%
Test Engineer :	David Ke	Polarization :	Vertical
Remark :	2402 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	93	-	-	92.1	32.18	4.58	35.86	179	276	Peak
2402	68.28	-	-	-	-	-	-	-	-	Average
4803	41.24	-32.76	74	59.54	34.26	6.5	59.06	100	0	Peak
4803	16.52	-37.48	54	-	-	-	-	-	-	Average

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	39	Relative Humidity :	40~42%
Test Engineer :	David Ke	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	103.69	-	-	102.67	32.24	4.61	35.83	117	25	Peak
2441	78.97	-	-	-	-	-	-	-	-	Average
4881	43.41	-30.59	74	61.47	34.28	6.54	58.88	100	0	Peak
4881	18.69	-35.31	54	-	-	-	-	-	-	Average

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	39	Relative Humidity :	40~42%
Test Engineer :	David Ke	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	94.99	-	-	93.97	32.24	4.61	35.83	174	277	Peak
2441	70.27	-	-	-	-	-	-	-	-	Average
4881	42.53	-31.47	74	60.59	34.28	6.54	58.88	100	0	Peak
4881	17.81	-36.19	54	-	-	-	-	-	-	Average



Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	78	Relative Humidity :	40~42%
Test Engineer :	David Ke	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
42.42	33.14	-6.86	40	52.38	11.56	0.76	31.56	-	-	Peak
99.93	37.19	-6.31	43.5	57.64	9.9	1.09	31.44	100	186	Peak
143.94	35.92	-7.58	43.5	54.74	11.17	1.27	31.26	-	-	Peak
348.3	39.66	-6.34	46	54.45	14.42	1.9	31.11	-	-	Peak
382.6	37.58	-8.42	46	51.35	15.29	1.97	31.03	-	-	Peak
563.9	31.73	-14.27	46	40.1	20.15	2.35	30.87	-	-	Peak
2480	104.34	-	-	103.23	32.28	4.64	35.81	112	121	Peak
2480	79.62	-	-	-	-	-	-	-	-	Average
4959	45.64	-28.36	74	63.43	34.29	6.57	58.65	100	0	Peak
4959	20.92	-33.08	54	-	-	-	-	-	-	Average



Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	78	Relative Humidity :	40~42%
Test Engineer :	David Ke	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
66.45	29.42	-10.58	40	54	6.06	0.89	31.53	100	45	Peak
133.14	31.11	-12.39	43.5	49.78	11.4	1.24	31.31	-	-	Peak
156.09	29.36	-14.14	43.5	48.45	10.82	1.32	31.23	-	-	Peak
365.1	31.03	-14.97	46	45.41	14.74	1.93	31.05	-	-	Peak
468	31.06	-14.94	46	42.22	17.56	2.17	30.89	-	-	Peak
645.1	28.62	-17.38	46	35.74	20.45	2.57	30.14	-	-	Peak
2480	95.78	-	-	94.67	32.28	4.64	35.81	137	305	Peak
2480	71.06	-	-	-	-	-	-	-	-	Average
4962	44.26	-29.74	74	62.05	34.29	6.57	58.65	100	0	Peak
4962	19.54	-34.46	54	-	-	-	-	-	-	Average

<Antenna 2>

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	00	Relative Humidity :	40~42%
Test Engineer :	David Ke	Polarization :	Horizontal
Remark :	2402 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	108.32	-	-	107.58	32.02	4.58	35.86	179	333	Peak
2402	83.6	-	-	-	-	-	-	-	-	Average
4804	44.36	-29.64	74	62.66	34.26	6.5	59.06	100	0	Peak
4804	19.64	-34.36	54	-	-	-	-	-	-	Average

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	00	Relative Humidity :	40~42%
Test Engineer :	David Ke	Polarization :	Vertical
Remark :	2402 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	99.04	-	-	98.3	32.02	4.58	35.86	115	233	Peak
2402	74.32	-	-	-	-	-	-	-	-	Average
4806	45.71	-28.29	74	64	34.26	6.51	59.06	100	0	Peak
4806	20.99	-33.01	54	-	-	-	-	-	-	Average

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	39	Relative Humidity :	40~42%
Test Engineer :	David Ke	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	108.22	-	-	107.38	32.06	4.61	35.83	115	331	Peak
2441	83.5	-	-	-	-	-	-	-	-	Average
4884	43.52	-30.48	74	61.58	34.28	6.54	58.88	100	0	Peak
4884	18.8	-35.2	54	-	-	-	-	-	-	Average

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	39	Relative Humidity :	40~42%
Test Engineer :	David Ke	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	98.13	-	-	97.29	32.06	4.61	35.83	145	214	Peak
2441	73.41	-	-	-	-	-	-	-	-	Average
4882	45.32	-28.68	74	63.38	34.28	6.54	58.88	100	0	Peak
4882	20.6	-33.4	54	-	-	-	-	-	-	Average

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	78	Relative Humidity :	40~42%
Test Engineer :	David Ke	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
97.5	29.74	-13.76	43.5	50.46	9.62	1.09	31.43	-	-	Peak
132.6	36.59	-6.91	43.5	55.26	11.4	1.24	31.31	122	251	Peak
220.89	36.22	-9.78	46	56.24	9.39	1.54	30.95	-	-	Peak
366.5	36.99	-9.01	46	51.3	14.79	1.94	31.04	-	-	Peak
468	34.14	-11.86	46	45.3	17.56	2.17	30.89	-	-	Peak
527.5	36.45	-9.55	46	46.63	18.38	2.28	30.84	-	-	Peak
2480	108.47	-	-	107.36	32.28	4.64	35.81	114	328	Peak
2480	83.75	-	-	-	-	-	-	-	-	Average
4962	45.37	-28.63	74	63.16	34.29	6.57	58.65	100	0	Peak
4962	20.65	-33.35	54	-	-	-	-	-	-	Average

Test Mode :	1Mbps	Temperature :	20~22°C
Test Channel :	78	Relative Humidity :	40~42%
Test Engineer :	David Ke	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
86.43	27.74	-12.26	40	49.85	8.22	1.05	31.38	100	255	Peak
132.6	29.06	-14.44	43.5	47.73	11.4	1.24	31.31	-	-	Peak
220.89	30.01	-15.99	46	50.03	9.39	1.54	30.95	-	-	Peak
349.7	31.96	-14.04	46	46.66	14.5	1.9	31.1	-	-	Peak
407.8	30.67	-15.33	46	43.57	16.22	2.03	31.15	-	-	Peak
456.1	30.72	-15.28	46	42.24	17.32	2.15	30.99	-	-	Peak
2480	99.6	-	-	98.49	32.28	4.64	35.81	200	256	Peak
2480	74.88	-	-	-	-	-	-	-	-	Average
4962	46.42	-27.58	74	64.21	34.29	6.57	58.65	100	0	Peak
4962	21.7	-32.3	54	-	-	-	-	-	-	Average

3.10 AC Conducted Emission Measurement

3.10.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 KHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

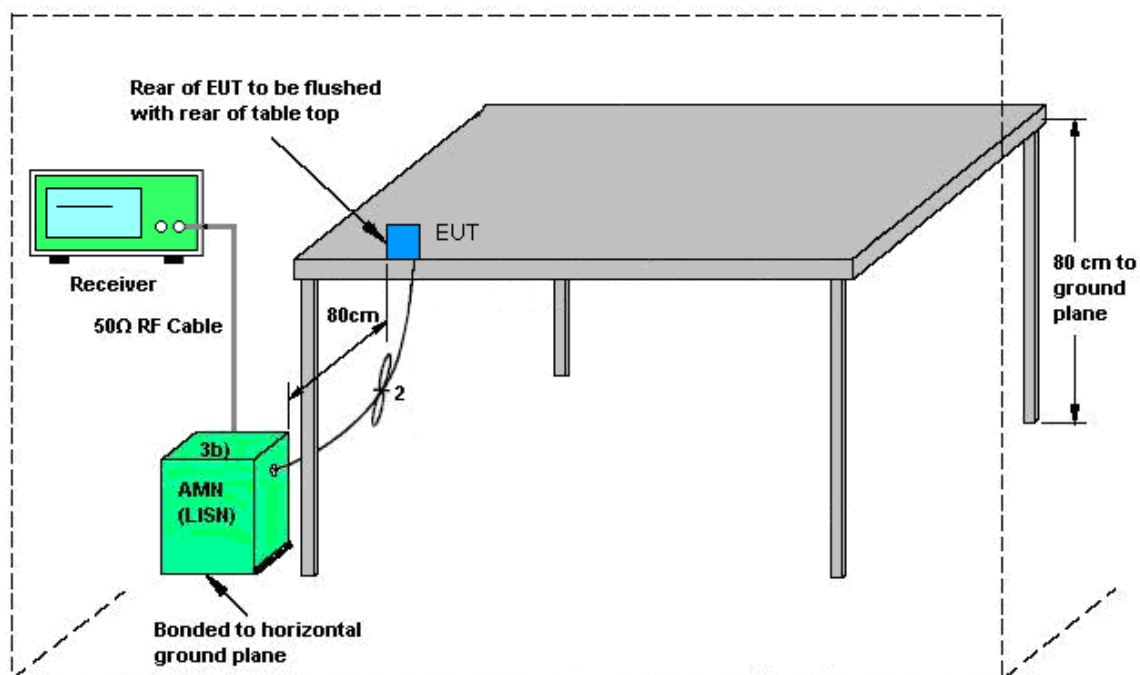
3.10.2 Measuring Instruments

See list of measuring instruments of this test report.

3.10.3 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.

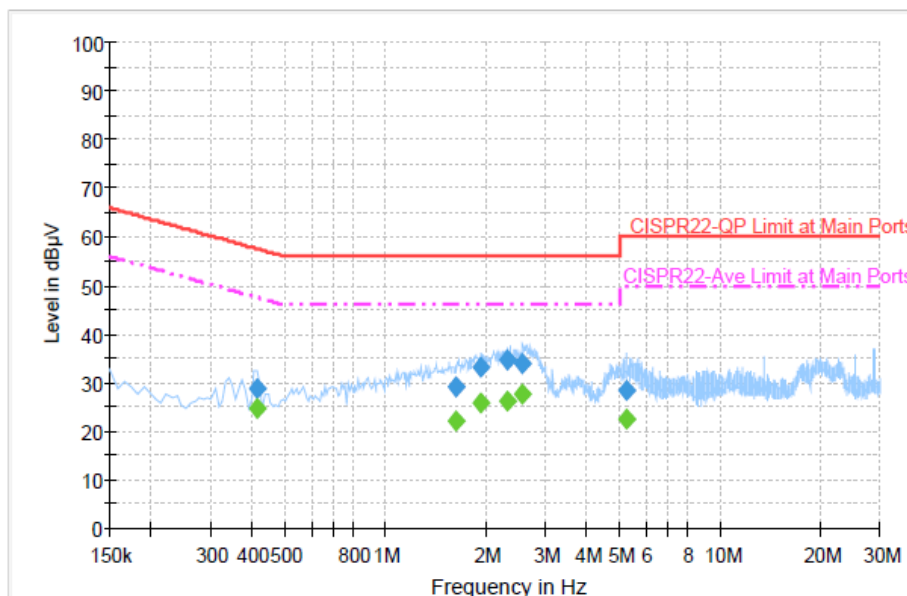
3.10.4 Test Setup



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

3.10.5 Test Result of AC Conducted Emission

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



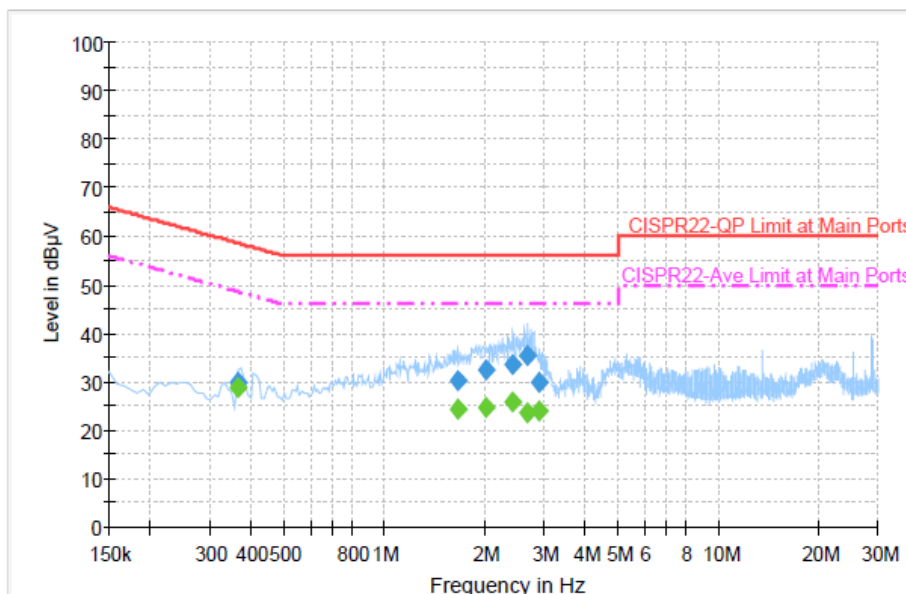
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.414000	28.7	Off	L1	19.4	28.9	57.6
1.622000	29.2	Off	L1	19.4	26.8	56.0
1.926000	33.4	Off	L1	19.5	22.6	56.0
2.302000	34.6	Off	L1	19.5	21.4	56.0
2.574000	34.0	Off	L1	19.6	22.0	56.0
5.262000	28.4	Off	L1	19.6	31.6	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.414000	24.6	Off	L1	19.4	23.0	47.6
1.622000	22.0	Off	L1	19.4	24.0	46.0
1.926000	25.8	Off	L1	19.5	20.2	46.0
2.302000	26.4	Off	L1	19.5	19.6	46.0
2.574000	27.6	Off	L1	19.6	18.4	46.0
5.262000	22.7	Off	L1	19.6	27.3	50.0

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


Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.366000	29.8	Off	N	19.4	28.8	58.6
1.662000	30.3	Off	N	19.5	25.7	56.0
2.014000	32.5	Off	N	19.5	23.5	56.0
2.430000	33.4	Off	N	19.6	22.6	56.0
2.694000	35.5	Off	N	19.6	20.5	56.0
2.910000	30.0	Off	N	19.7	26.0	56.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.366000	28.6	Off	N	19.4	20.0	48.6
1.662000	24.3	Off	N	19.5	21.7	46.0
2.014000	24.7	Off	N	19.5	21.3	46.0
2.430000	25.8	Off	N	19.6	20.2	46.0
2.694000	23.7	Off	N	19.6	22.3	46.0
2.910000	24.1	Off	N	19.7	21.9	46.0



3.11 Antenna Requirements

3.11.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.11.2 Antenna Connected Construction

Non-standard connector used.

3.11.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 06, 2012	Jul. 31, 2012~ Aug. 19, 2012	Jun. 05, 2013	Conducted (TH02-HY)
Spectrum Analyzer	R&S	ESU26	100390	20Hz ~ 26.5GHz	Dec. 22, 2011	Jul. 27, 2012~ Sep. 11, 2012	Dec. 21, 2012	Radiation (03CH05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2725	30MHz ~ 2GHz	Oct. 22, 2011	Jul. 27, 2012~ Sep. 11, 2012	Oct. 21, 2012	Radiation (03CH05-HY)
Turn Table	HD	Deis HD 2000	420/611	0 ~ 360 degree	N/A	Jul. 27, 2012~ Sep. 11, 2012	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	MA 240	240/666	1 m ~ 4 m	N/A	Jul. 27, 2012~ Sep. 11, 2012	N/A	Radiation (03CH05-HY)
Horn Antenna	ESCO	3117	66584	1GHz ~ 18GHz	Aug. 04, 2011	Jul. 27, 2012~ Aug. 03, 2012	Aug. 03, 2012	Radiation (03CH05-HY)
Horn Antenna	ESCO	3117	66584	1GHz~18GHz	Aug. 10, 2012	Aug. 10, 2012~ Sep. 11, 2012	Aug. 09, 2013	Radiation (03CH05-HY)
Pre Amplifier	COM-POWER	PA-103A	161075	10Hz ~ 1000MHz Gain:32dB	Feb. 27, 2012	Jul. 27, 2012~ Sep. 11, 2012	Feb. 26, 2013	Radiation (03CH05-HY)
Pre Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	159087	1GHz~18GHz	Feb. 27, 2012	Jul. 27, 2012~ Sep. 11, 2012	Feb. 26, 2013	Radiation (03CH05-HY)
Pre Amplifier	Agilent	8449B	3008A019 17	1GHz~26.5GHz	Aug. 30, 2011	Jul. 27, 2012~ Sep. 11, 2012	Aug. 29, 2012	Radiation (03CH05-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 251	15GHz ~ 40GHz	Oct. 21, 2011	Jul. 27, 2012~ Sep. 11, 2012	Oct. 20, 2012	Radiation (03CH05-HY)
Loop Antenna	R&S	HFH2-Z2	100315	9KHz ~ 30MHz	May 14, 2012	Jul. 27, 2012~ Sep. 11, 2012	May 13, 2013	Radiation (03CH05-HY)
EMI Test Receiver	R&S	ESCS 30	100356	9KHz ~ 2.75GHz	Oct. 27, 2011	Aug. 20, 2012	Oct. 26, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz ~ 30MHz	Dec. 09, 2011	Aug. 20, 2012	Dec. 08, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz ~ 30MHz	Dec. 06, 2011	Aug. 20, 2012	Dec. 05, 2012	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Aug. 20, 2012	N/A	Conduction (CO05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.26
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.54
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.72
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Appendix A. Photographs of EUT

Please refer to Sporton report number EP271030A as below.