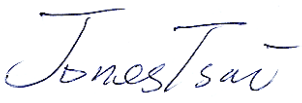
FCC RF Test Report

APPLICANT	:	Sony Mobile Communications AB
EQUIPMENT	:	Smart phone
BRAND NAME	:	Sony
MODEL NAME	:	C2304
TYPE NAME	:	PM-0710-BV
FCC ID	:	PY7PM-0710
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter

The product was received on Aug. 06, 2013 and testing was completed on Sep. 21, 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
FR380631A	Rev. 01	Initial issue of report	Oct. 14, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	Number of Channels	≥ 15Chs	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	≥ 2/3 of 20dB BW	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	≤ 0.4sec in 31.6sec period	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	NA	Pass	-
3.5	15.247(b)(1)	Peak Output Power	≤ 125 mW	Pass	-
3.6	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	≤ 20dBc	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 7.73 dB at 2483.500 MHz
3.9	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 12.60 dB at 2.374 MHz
3.10	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Sony Mobile Communications AB
Nya Vattentornet, 22188 Lund, Sweden

1.2 Manufacturer

Arima Communications Corp.
6F., No. 866, Jhongjheng Rd., Jhonghe Dist., New Taipei City 23586, Taiwan

1.3 Feature of Equipment Under Test

The Equipment Under Test (hereafter called: EUT) is smart phone supporting, GSM / WCDMA / Wi-Fi 2.4GHz 802.11b/g/n, Bluetooth with FM Receiver, and GPS features, and below is details of information.

General Information of Equipment Under Test	
Equipment	Smart phone
Brand Name	Sony
Model Name	C2304
Type Name	PM-0710-BV
FCC ID	PY7PM-0710
GSM Operating Band(s)	GSM 850/900/1800/1900MHz
WCDMA Operating Band(s)	FDD Band I / II / V
WCDMA Rel. Version	Rel. 8
GPRS / EGPRS Multi Slot Class	GPRS Class 12 , EGPRS Class 12
Wi-Fi Specification	802.11b/g/n (HT20 / HT40)
Bluetooth Version	v3.0+EDR / v4.0-LE
Power Supply	Battery / AC Adapter / Car Charger

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

1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	Bluetooth BR(1Mbps) : 8.01 dBm (0.0063 W) Bluetooth EDR (2Mbps) : 7.73 dBm (0.0059 W) Bluetooth EDR (3Mbps) : 8.07 dBm (0.0064 W)
Antenna Type	PIFA Antenna type with gain -1.53 dBi
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π /4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK
EUT #1	IMEI : 00440214-695721-6 S/N : WUJ5875001
EUT #11	IMEI : 00440214-695741-4 S/N : WUJ5875011
EUT #12	IMEI : 00440214-695743-0 S/N : WUJ5875012
H/W	AP
S/W	16.0.B.1.3
EUT Stage	Production Unit

Accessory List	
AC Adapter 2	Model No. : EP800
	Type No. : AC-0300-CN
AC Adapter 3	Model No. : EP800
	Type No. : AC-0300-CN
Battery	Model No. : N/A
Earphone 2	Model No. : MH410c
	Type No. : AG-1100
Earphone 12	Model No. : MH410c
	Type No. : AG-1100
USB Cable 4	Model No. : EC450
	Part No. : 1242-6715.1 11W36
USB Cable 9	Model No. : EC450
	Part No. : 1242-6715.2 12W22

Note:

1. Above EUT list and accessory list used are electrically identical per declared by manufacturer.
2. Above the accessories list are used to exercise the EUT during test, and the serial number of each type of accessories is listed in each section of this report.
3. For other wireless features of this EUT, test report will be issued separately.

1.5 Modification of EUT

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

1.6 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.

1.7 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

Remark:

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

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

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	7.28 dBm	7.01 dBm	7.28 dBm
Ch39	2441MHz	7.26 dBm	6.98 dBm	7.23 dBm
Ch78	2480MHz	8.01 dBm	7.73 dBm	**8.07** 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 3Mbps for all the test items due to the highest RF output power.

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 (Y 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.

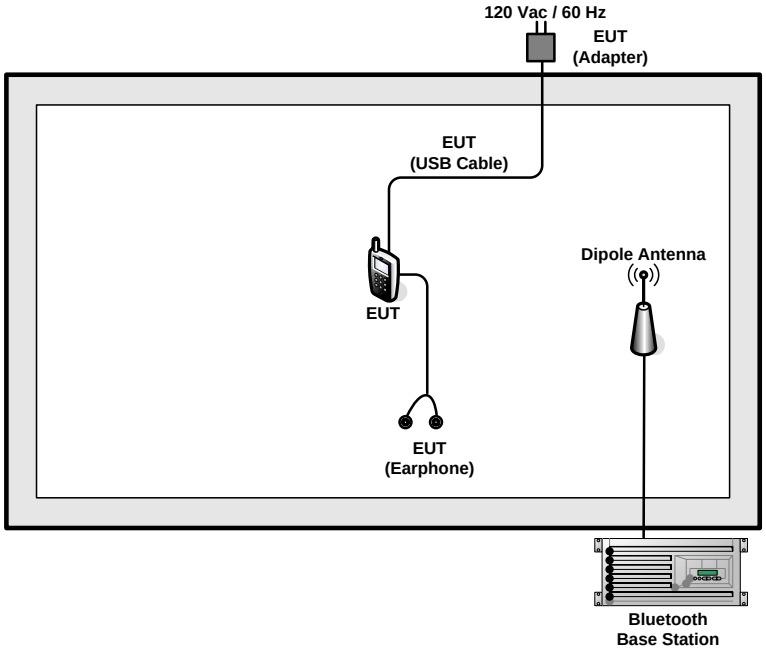
Summary table of Test Cases			
Test Item	**Data Rate / Modulation**		
	Bluetooth BR 1Mbps GFSK	**Bluetooth EDR 2Mbps π /4-DQPSK**	**Bluetooth EDR 3Mbps 8-DPSK**
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated Test Cases	**Bluetooth BR 1Mbps GFSK**	**Bluetooth EDR 2Mbps π /4-DQPSK**	**Bluetooth EDR 3Mbps 8-DPSK**
	CH00_2402 MHz(*) CH39_2441 MHz(*) CH78_2480 MHz(*)	CH00_2402 MHz(*) CH39_2441 MHz(*) CH78_2480 MHz(*)	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz
AC Conducted Emission	Mode 1 :GSM1900 Idle + Bluetooth Link + WLAN Idle + MP3 + Earphone + Battery + USB Cable (Charging from Adapter) + SIM 1 Mode 2 :GSM1900 Idle + Bluetooth Idle + WLAN Link + MP3 + Earphone + Battery + USB Cable (Charging from Adapter) + SIM 2		

Remark:

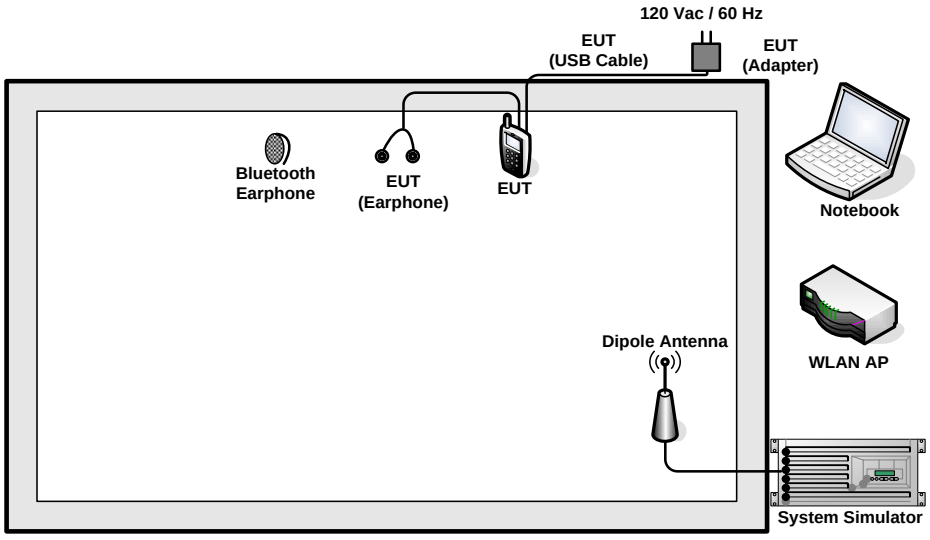
1. For radiated test cases, the worst mode data rate 3Mbps was reported only, because its has the highest RF output power at preliminary tests, and the conducted spurious emissions (*) for each data rates has no significantly wosre than the 3Mbps data rate, and other frequencies found.
2. The band edge for different data rates is fully performed by conducted measurement, and is compliance with the limie line, and thus the data rate 3Mbps is used for radiated spurious emissions measurement due to maximum output power, and no non-compliance found during Conducted band edge measurement. .
3. For Radiated TCs, The tests were performance with Adapter 2, Earphone 2, and USB Cable 9.
4. For Conduction TCs, The tests were performance with Adapter 3, Earphone 12, and USB Cable 4.

2.3 Connection Diagram of Test System

<Bluetooth Tx Mode>



<AC Conducted Emission Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m
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.	Bluetooth Earphone	Sony Ericsson	MH755	N/A	N/A	N/A
6.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 EUT Operation Test Setup

For Bluetooth RF test items, an engineering test program (SW16.0.B.1.3) was provided and enabled to make EUT contact with Bluetooth base station for continuous transmitting and receiving signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

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

Example:
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.
Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

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

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

3.1.3 Test Procedure

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW ≥ 1% of the span; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

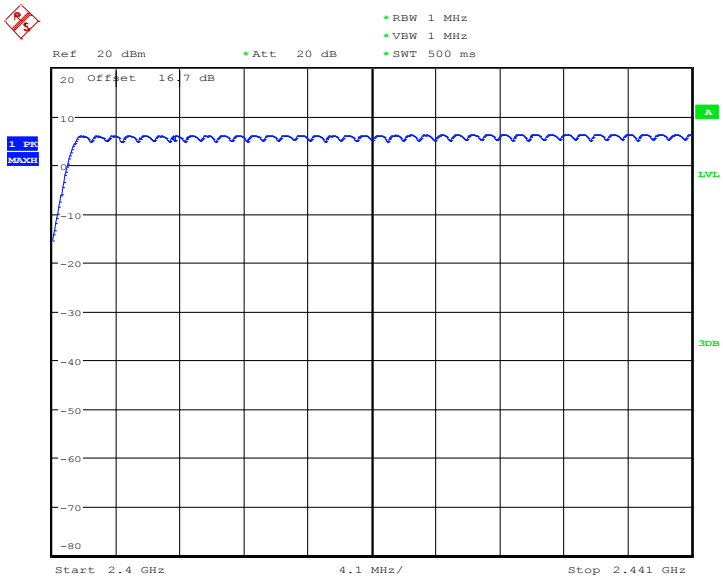
3.1.4 Test Setup

3.1.5 Test Result of Number of Hopping Frequency

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

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

Number of Hopping Channel Plot on Channel 00 - 78



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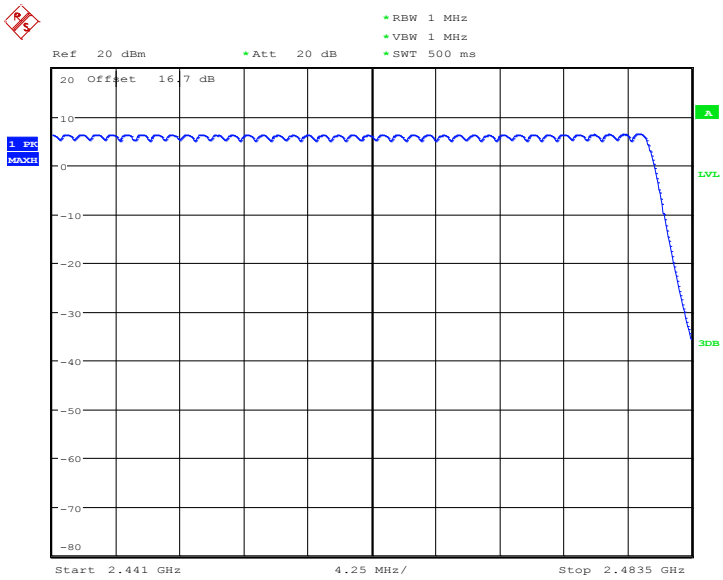

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Note: The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.

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.

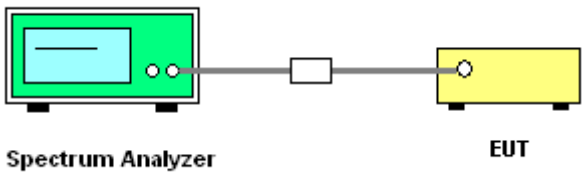
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels; RBW ≥ 1% of the span; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.2.4 Test Setup

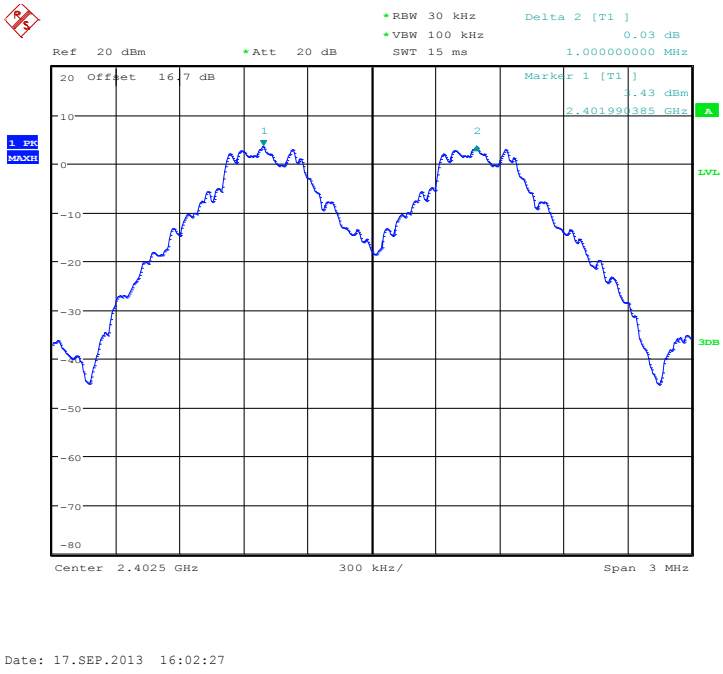


3.2.5 Test Result of Hopping Channel Separation

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

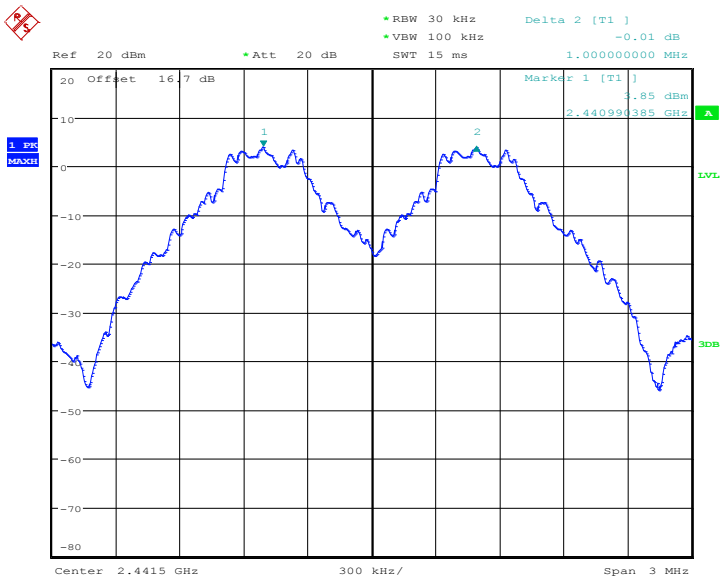
Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.000	0.6282	Pass
39	2441	1.000	0.6303	Pass
78	2480	1.005	0.5342	Pass

Channel Separation Plot on Channel 00 - 01



Note: The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.

Channel Separation Plot on Channel 39 - 40



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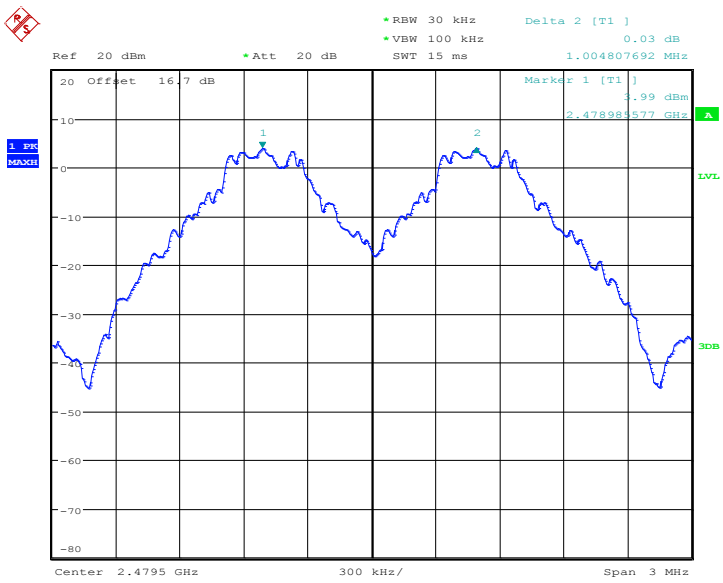
Channel Separation Plot on Channel 77 - 78



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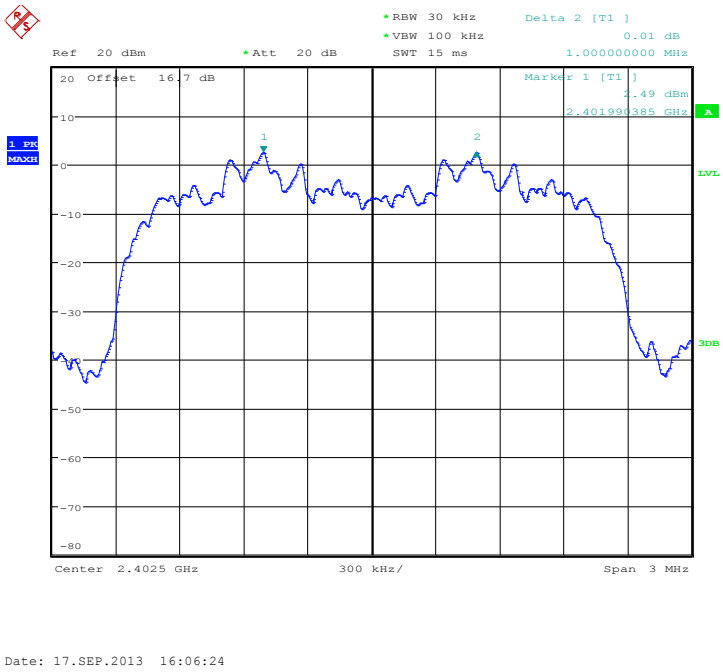
Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

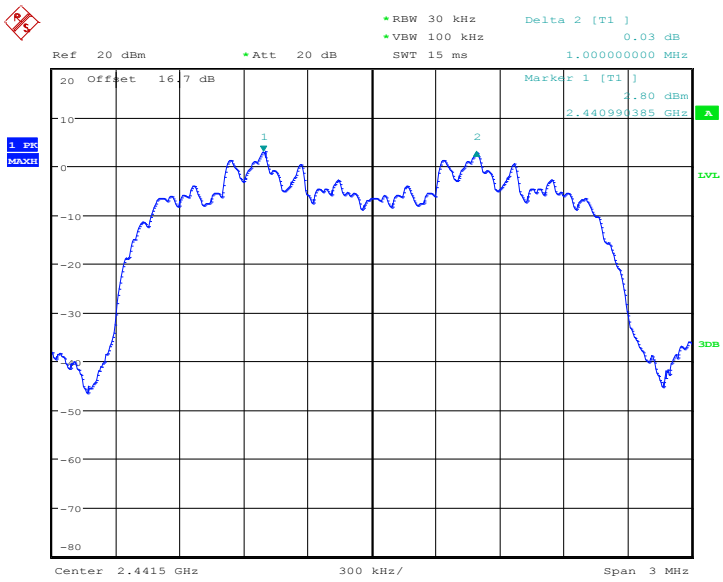
Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.000	0.8429	Pass
39	2441	1.000	0.8429	Pass
78	2480	1.005	0.8077	Pass

Channel Separation Plot on Channel 00 - 01



Note: The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.

Channel Separation Plot on Channel 39 - 40



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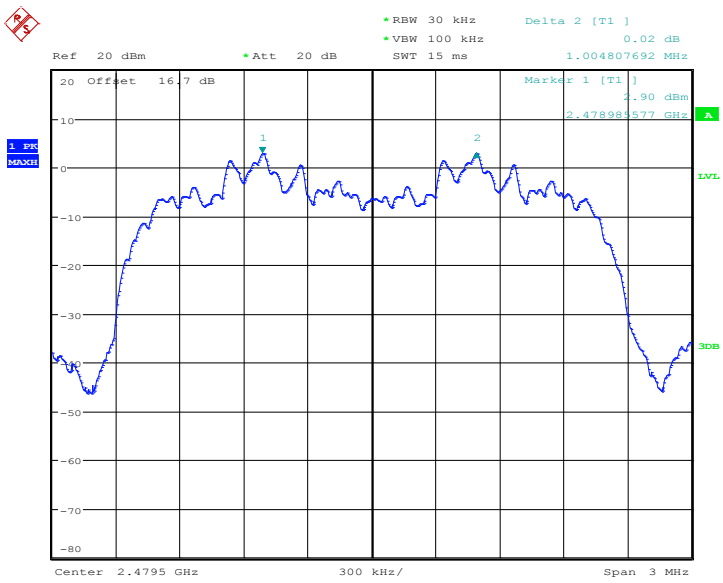
Channel Separation Plot on Channel 77 - 78



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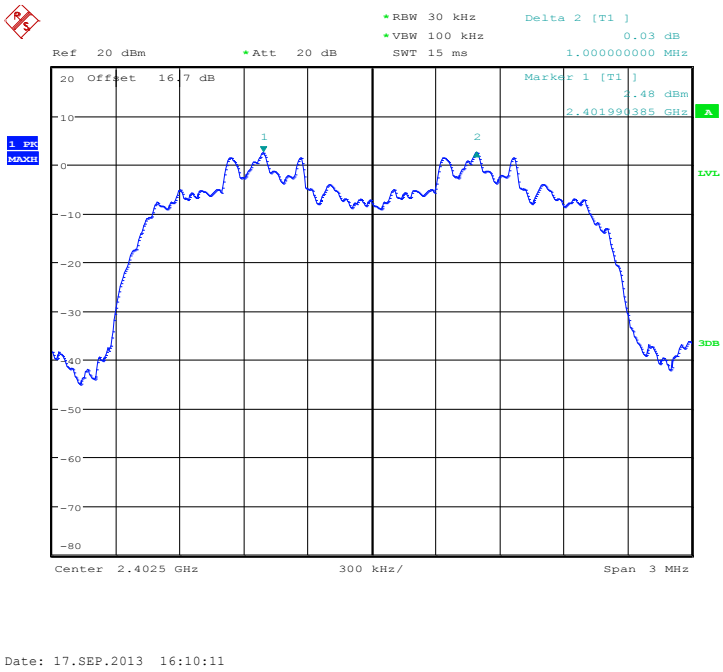
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

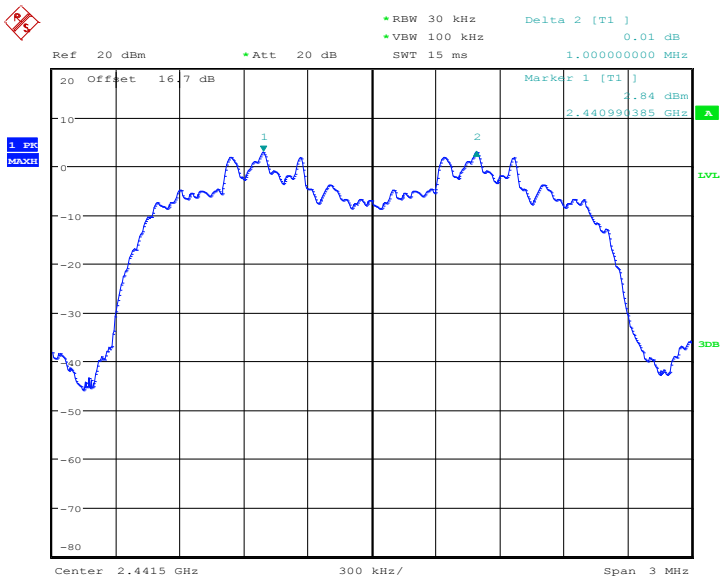
Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.000	0.8301	Pass
39	2441	1.000	0.8333	Pass
78	2480	1.000	0.8333	Pass

Channel Separation Plot on Channel 00 - 01



Note: The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.

Channel Separation Plot on Channel 39 - 40



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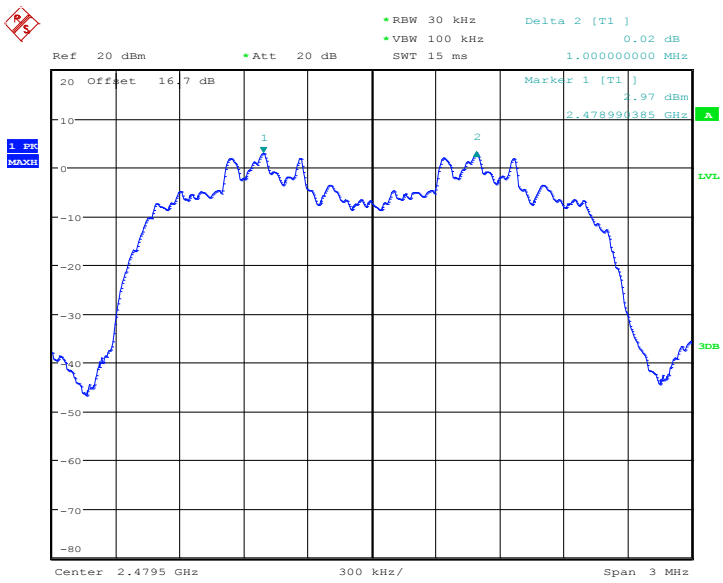
Channel Separation Plot on Channel 77 - 78



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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

The measuring equipment is listed in the section 4 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 :	Book Lin	Relative Humidity :	50~53%

Mode	Hopping Channel Number	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Normal	79	106.67	2.89	0.31	0.4	Pass
AFH	20	53.33	2.89	0.15	0.4	Pass

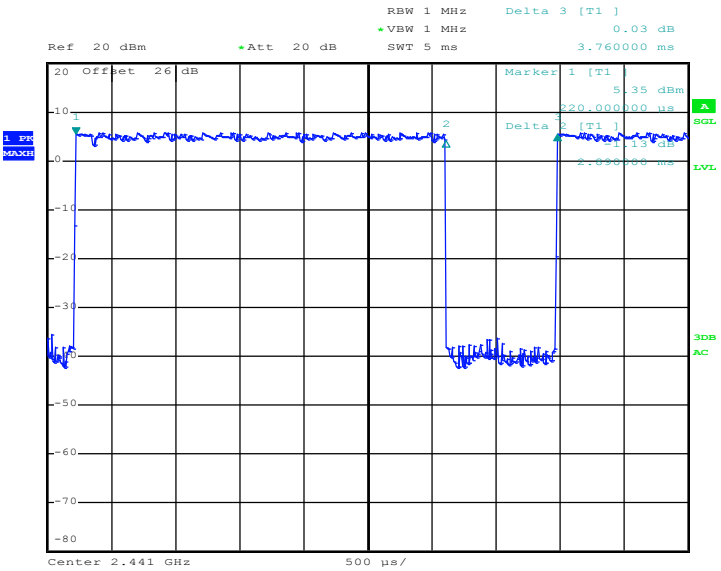
Remark:

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 Bandwidth Measurement

3.4.1 Limit of 20dB Bandwidth

Reporting only

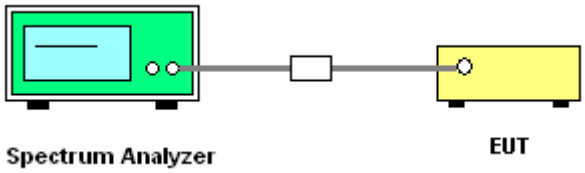
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 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. Measure and record the results in the test report.

3.4.4 Test Setup

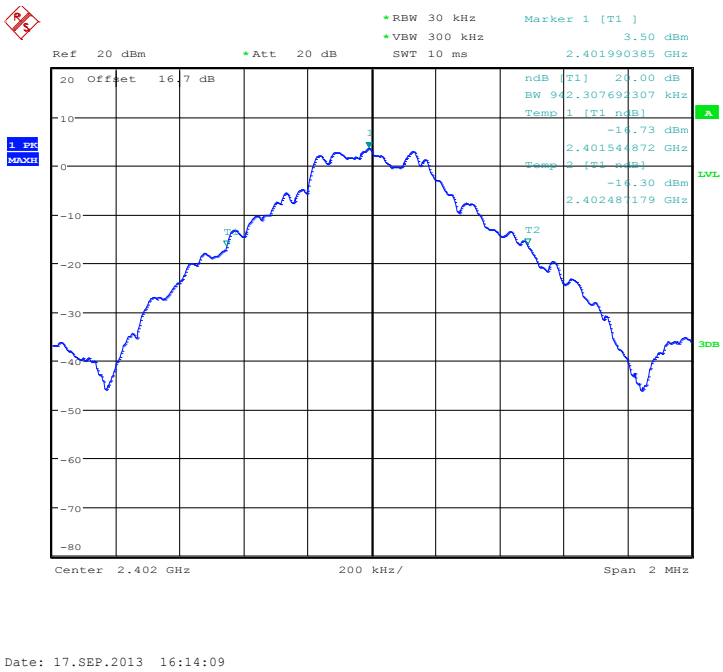


3.4.5 Test Result of 20dB Bandwidth

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

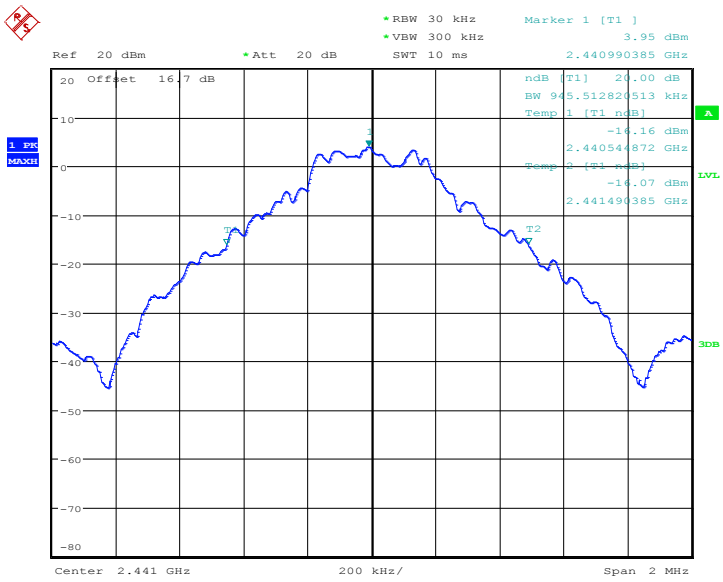
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.942
39	2441	0.946
78	2480	0.801

20 dB Bandwidth Plot on Channel 00



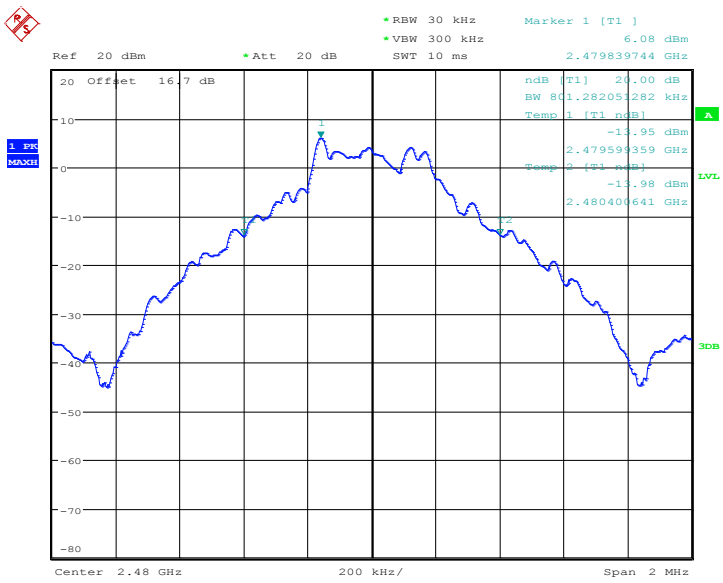
Note: The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.

20 dB Bandwidth Plot on Channel 39



Date: 17.SEP.2013 16:14:31

20 dB Bandwidth Plot on Channel 78

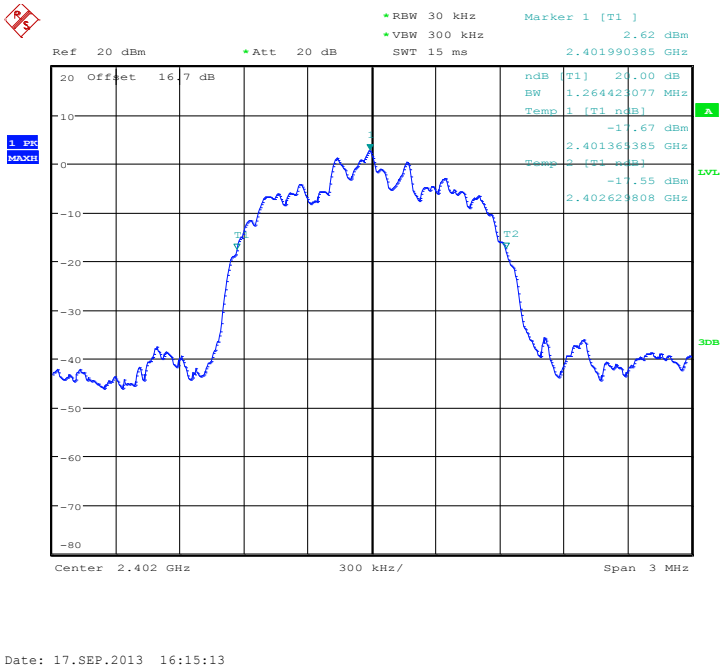


Date: 17.SEP.2013 16:14:52

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

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.264
39	2441	1.264
78	2480	1.212

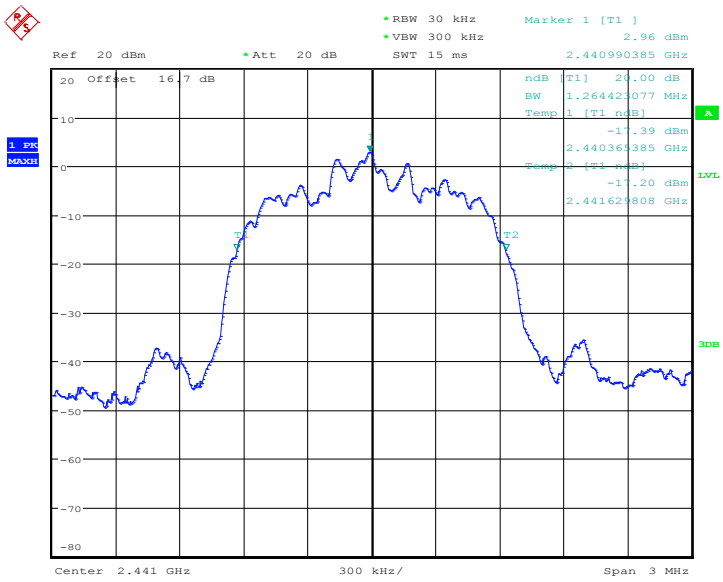
20 dB Bandwidth Plot on Channel 00



Date: 17.SEP.2013 16:15:13

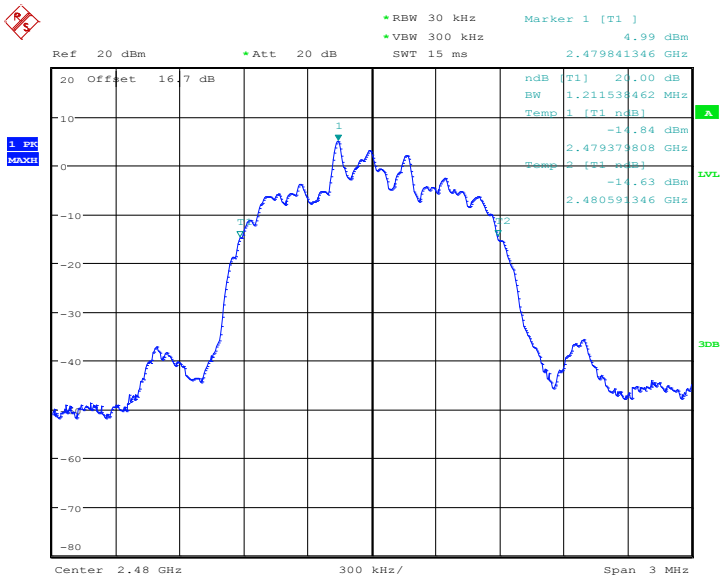
Note: The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.

20 dB Bandwidth Plot on Channel 39



Date: 17.SEP.2013 16:15:40

20 dB Bandwidth Plot on Channel 78

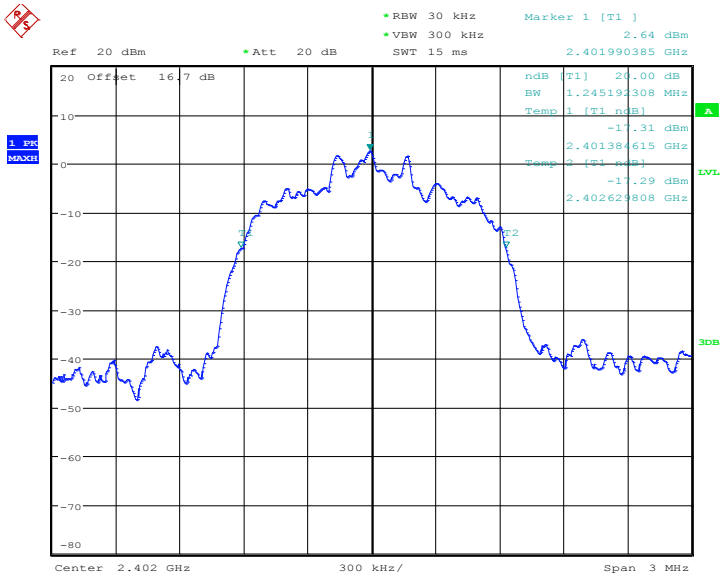


Date: 17.SEP.2013 16:16:07

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

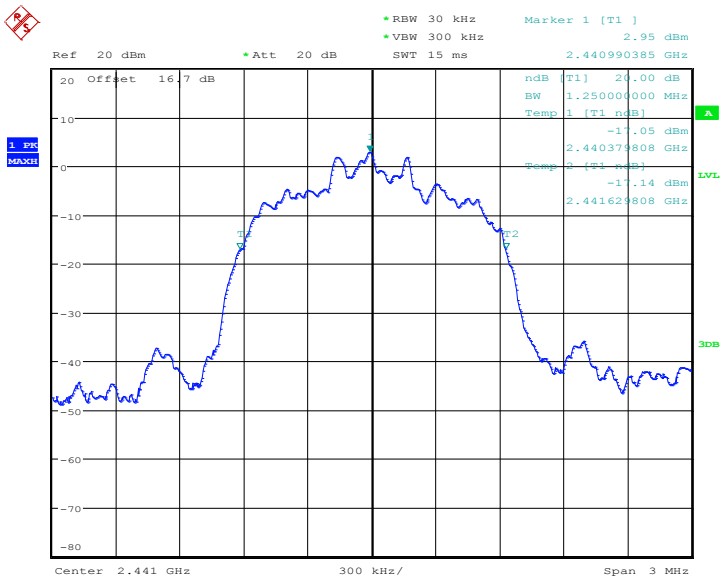
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.245
39	2441	1.250
78	2480	1.250

20 dB Bandwidth Plot on Channel 00



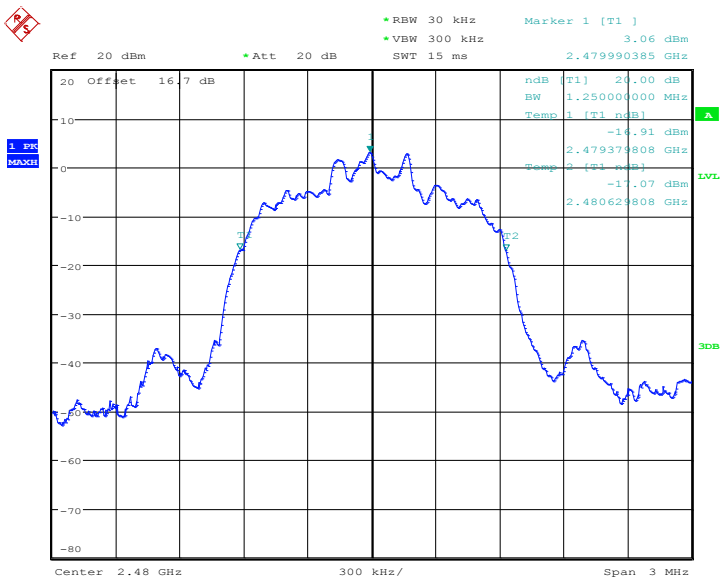
Note: The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.

20 dB Bandwidth Plot on Channel 39



Date: 17.SEP.2013 16:16:59

20 dB Bandwidth Plot on Channel 78



Date: 17.SEP.2013 16:17:37

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.

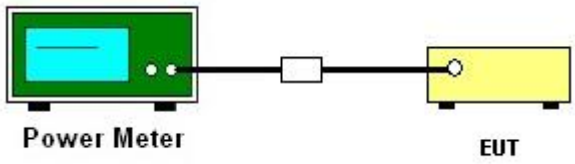
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 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 :	Book Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	7.28	20.97	Pass
39	2441	7.26	20.97	Pass
78	2480	8.01	20.97	Pass

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

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

Channel	Frequency (MHz)	RF Power (dBm)		
		π /4-DQPSK	Max. Limits (dBm)	Pass/Fail
		2 Mbps		
00	2402	7.01	20.97	Pass
39	2441	6.98	20.97	Pass
78	2480	7.73	20.97	Pass

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

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	7.28	20.97	Pass
39	2441	7.23	20.97	Pass
78	2480	8.07	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

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

3.6.3 Test Procedures

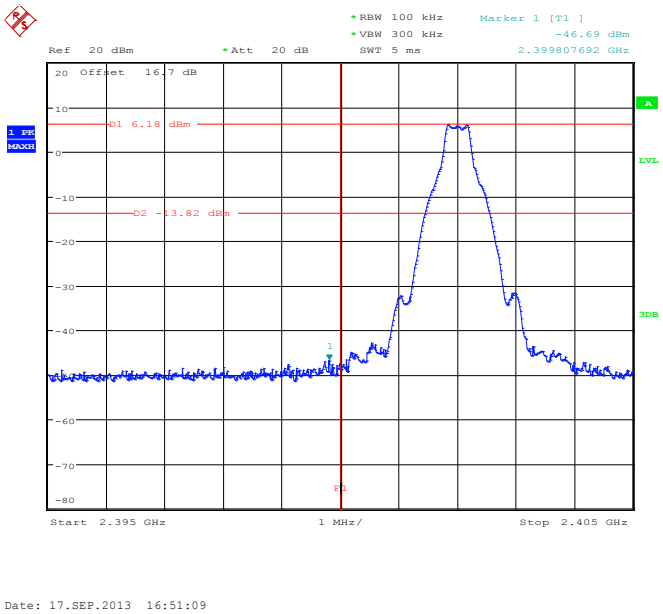
1. The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100kHz (≥ 1% span=10MHz), VBW = 300kHz (≥ RBW). Band edge emissions 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

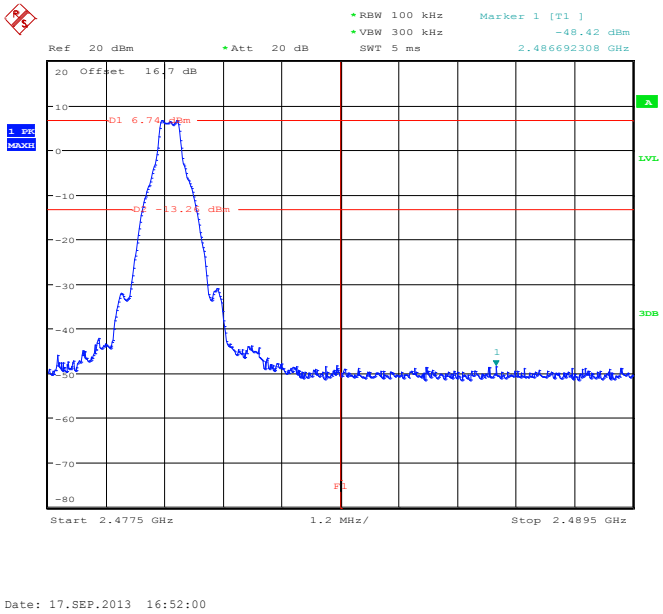
3.6.6 Test Result of Conducted Band Edges

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

Low Band Edge Plot on Channel 00



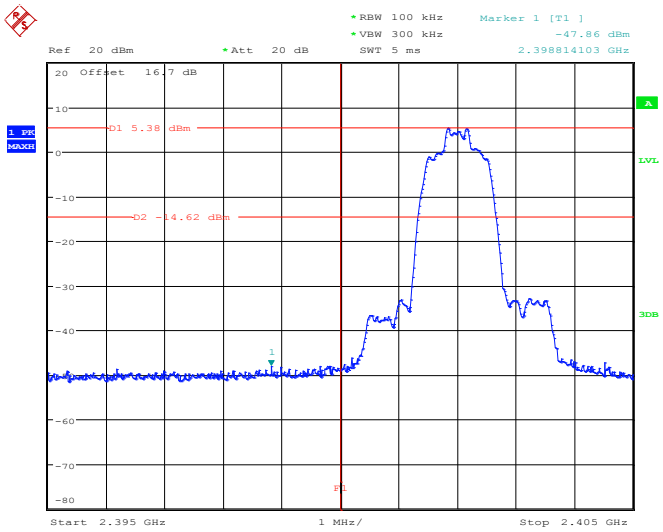
High Band Edge Plot on Channel 78



Note: The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.

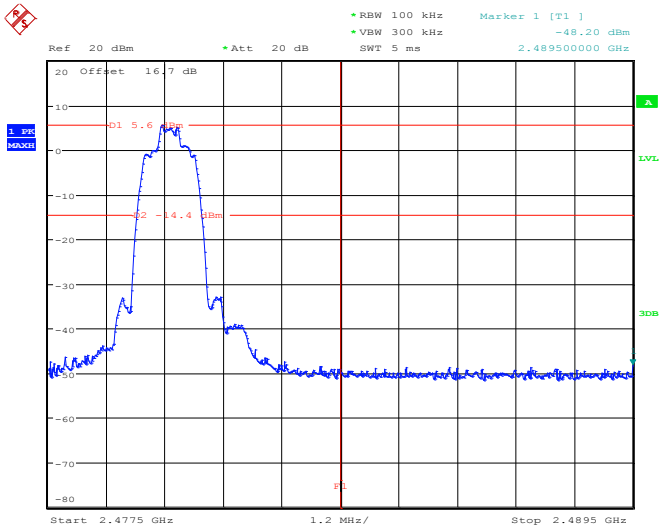
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
Test Engineer :	Book Lin		

Low Band Edge Plot on Channel 00



Date: 17.SEP.2013 16:52:52

High Band Edge Plot on Channel 78

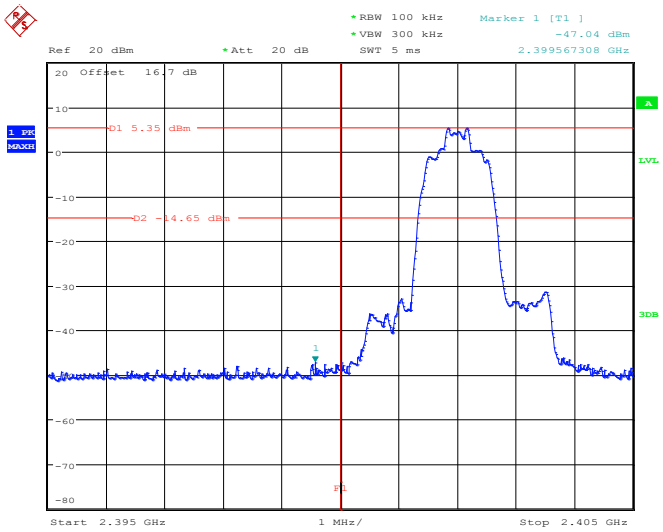


Date: 17.SEP.2013 16:53:43

Note: The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.

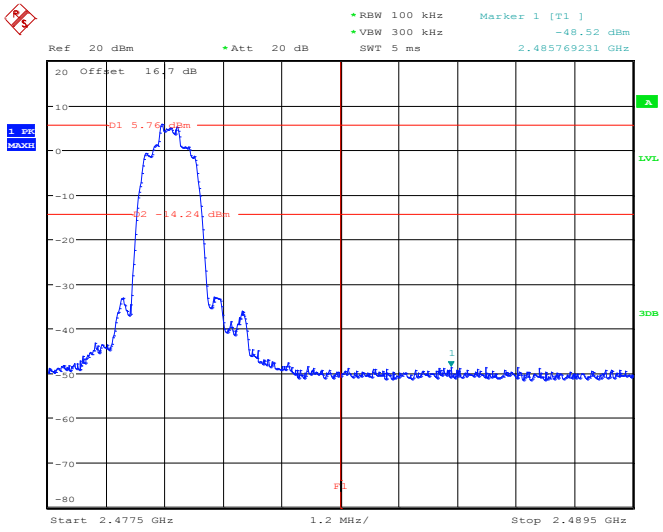
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
Test Engineer :	Book Lin		

Low Band Edge Plot on Channel 00



Date: 17.SEP.2013 16:54:34

High Band Edge Plot on Channel 78



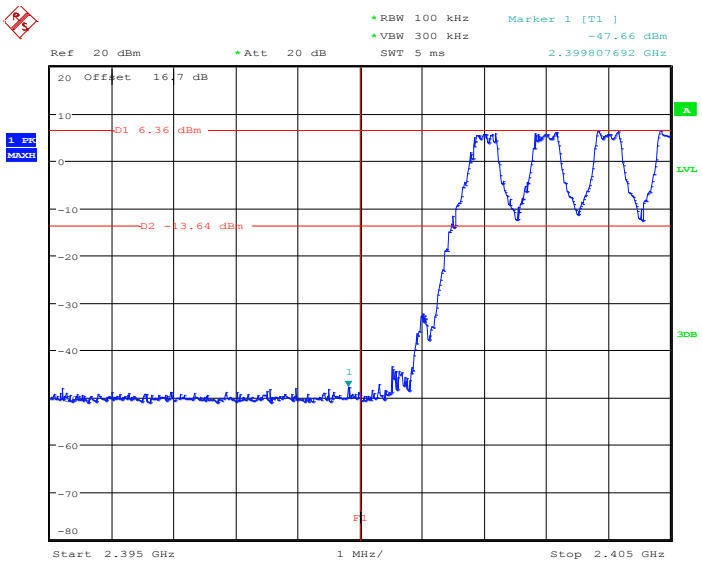
Date: 17.SEP.2013 16:55:26

Note: The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.

3.6.7 Test Result of Conducted Hopping Mode Band Edges

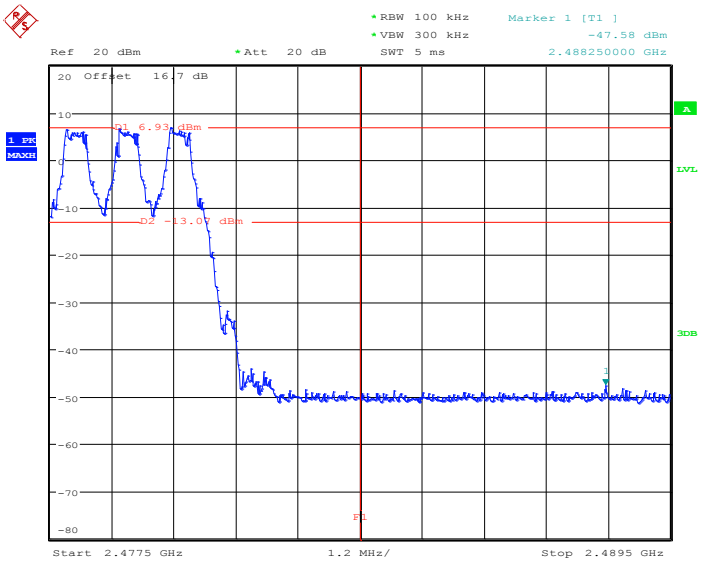
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

1Mbps Hopping Mode Low Band Edge Plot



Date: 17.SEP.2013 16:49:35

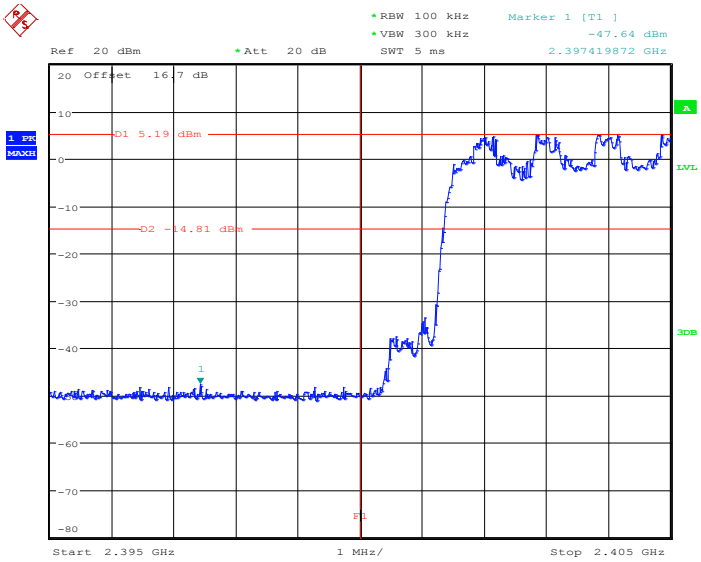
1Mbps Hopping Mode High Band Edge Plot



Date: 17.SEP.2013 16:47:45

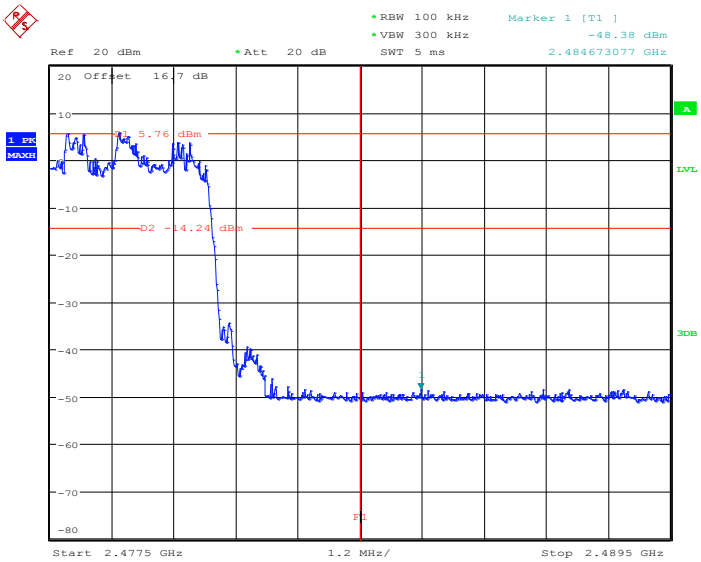
Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

2Mbps Hopping Mode Low Band Edge Plot



Date: 17.SEP.2013 16:43:49

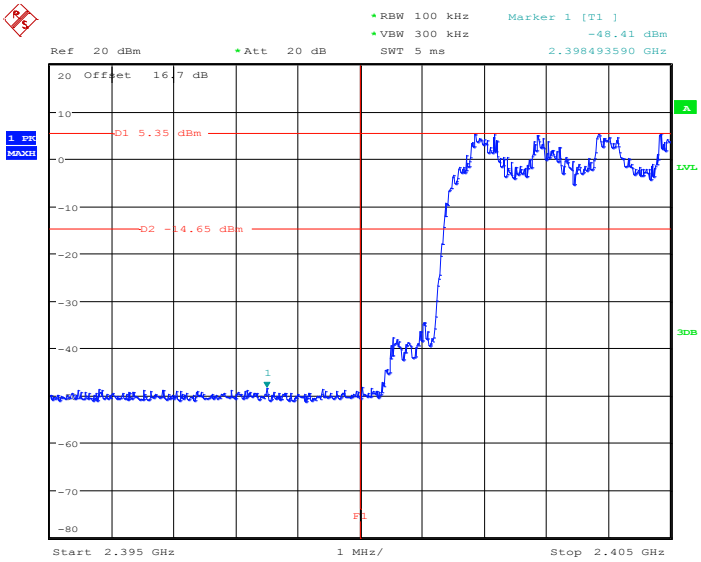
2Mbps Hopping Mode High Band Edge Plot



Date: 17.SEP.2013 16:45:47

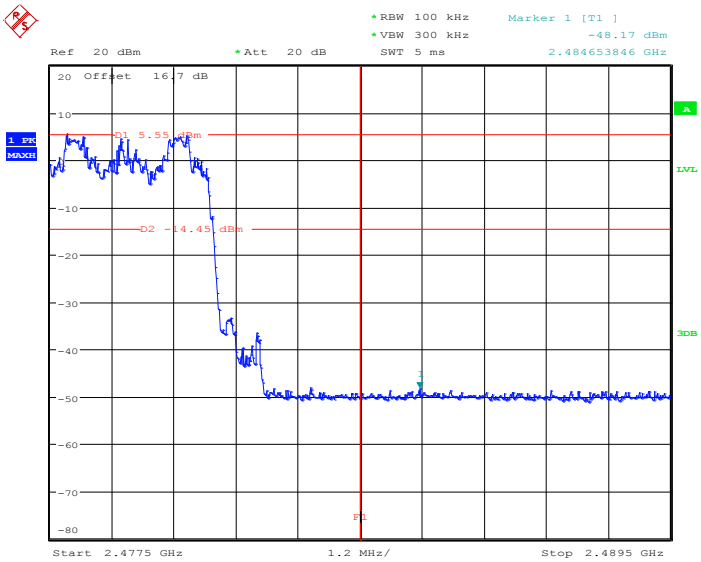
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Book Lin	Relative Humidity :	50~53%

3Mbps Hopping Mode Low Band Edge Plot



Date: 17.SEP.2013 16:41:53

3Mbps Hopping Mode High Band Edge Plot



Date: 17.SEP.2013 16:40:22

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

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

3.7.3 Test Procedure

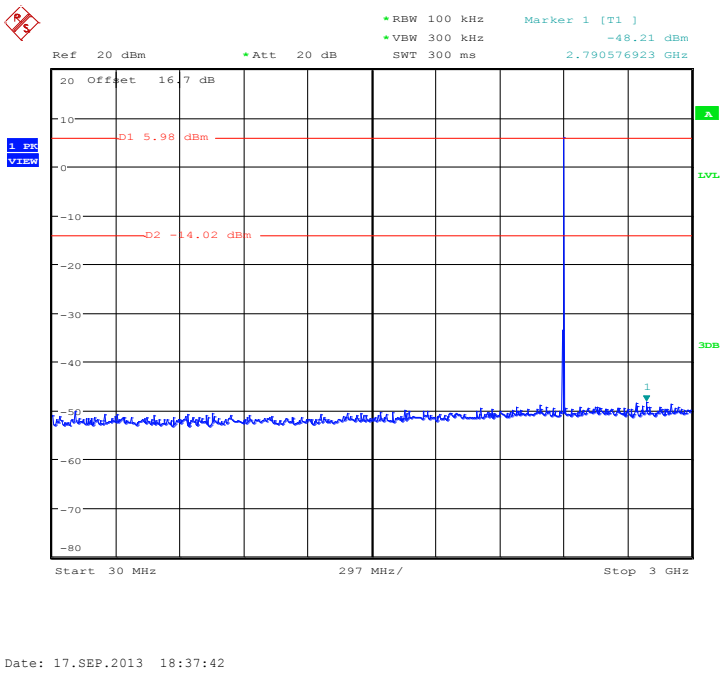
1. The testing follows the guidelines in Spurious RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum 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 :	50~53%
Test Engineer :	Book Lin		

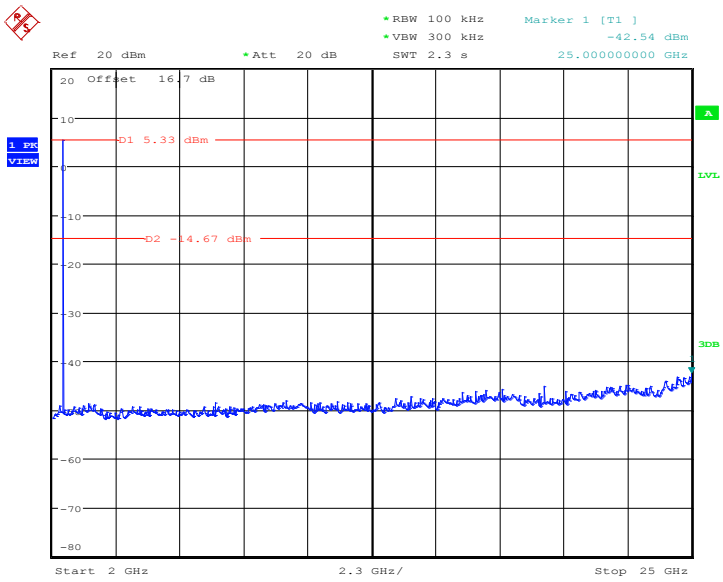
1Mbps CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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



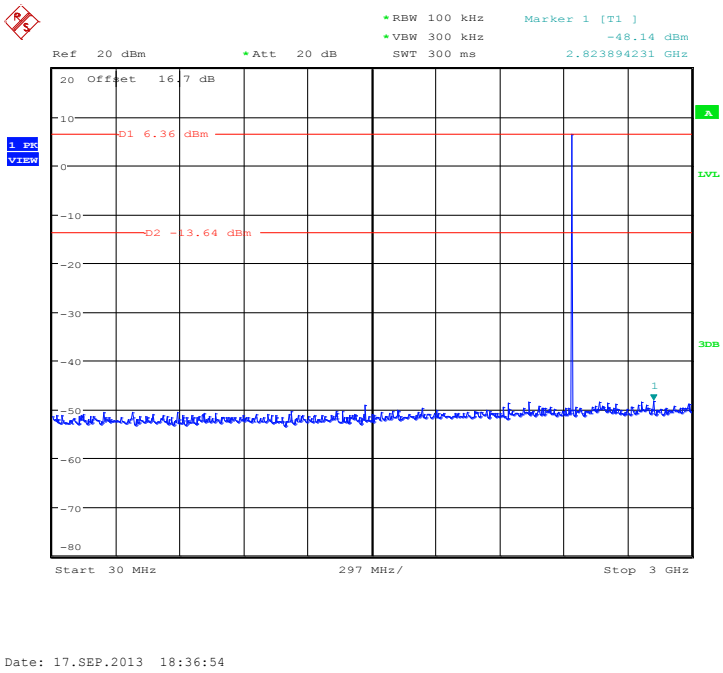
Date: 17.SEP.2013 18:38:03

Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

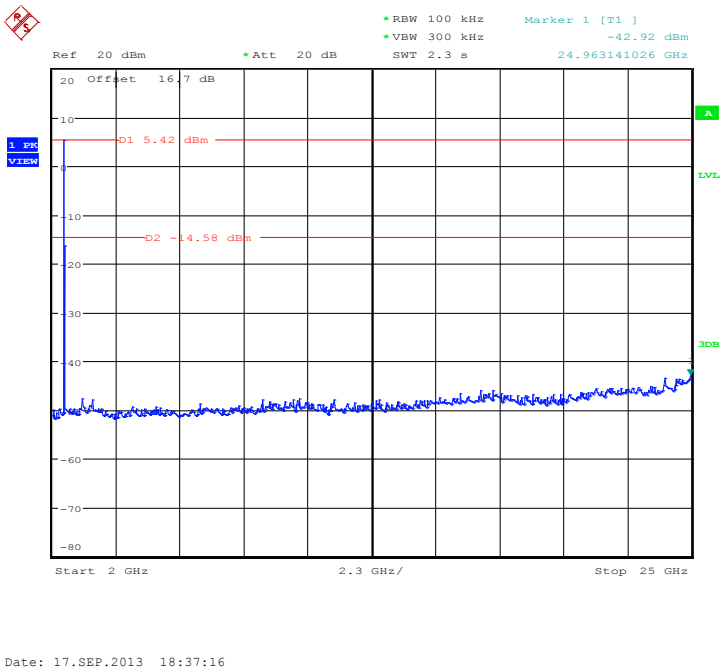
1Mbps CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

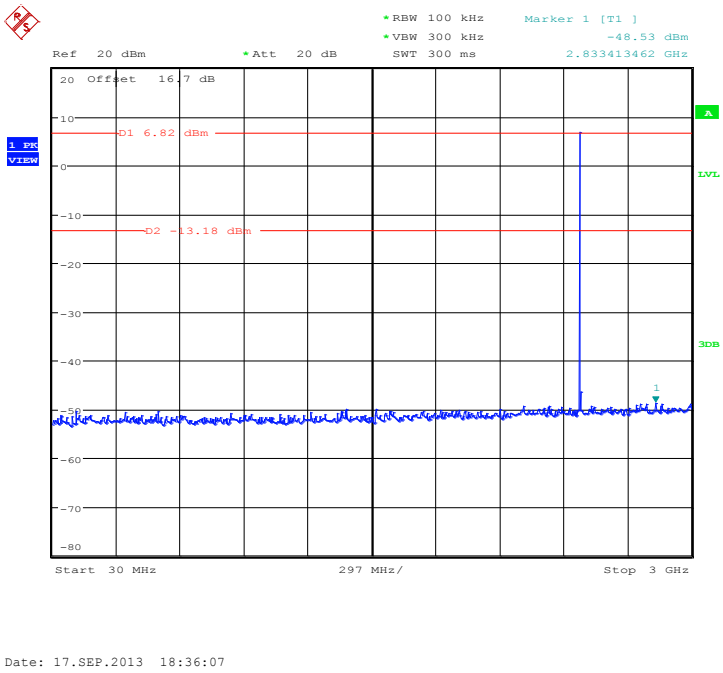


Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

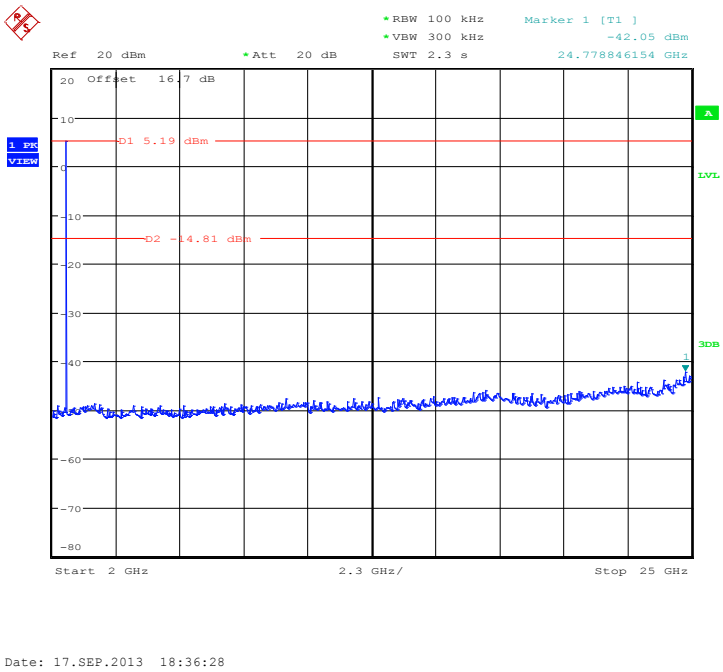
1Mbps CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

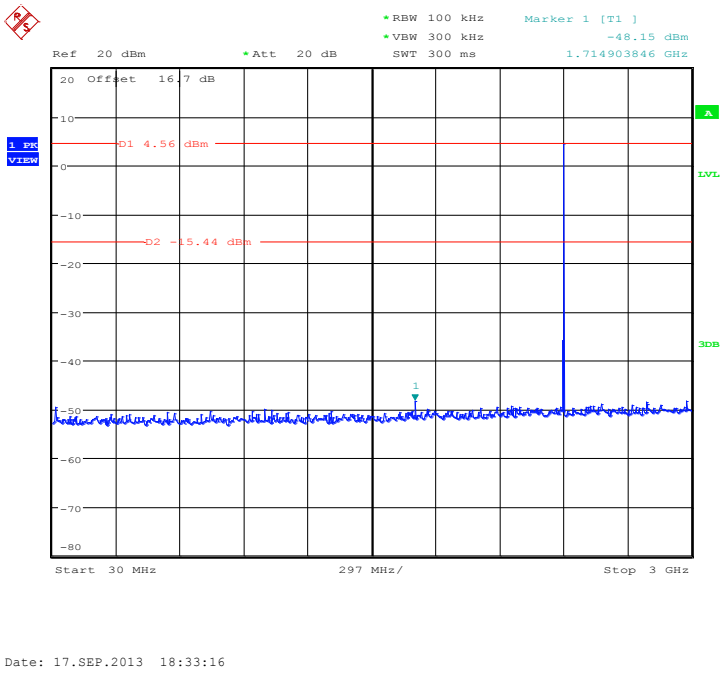


Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

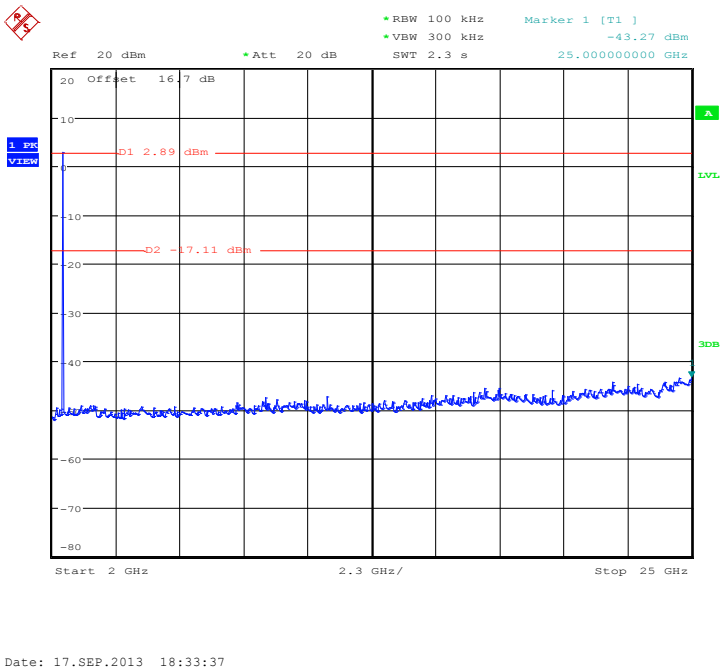
2Mbps CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

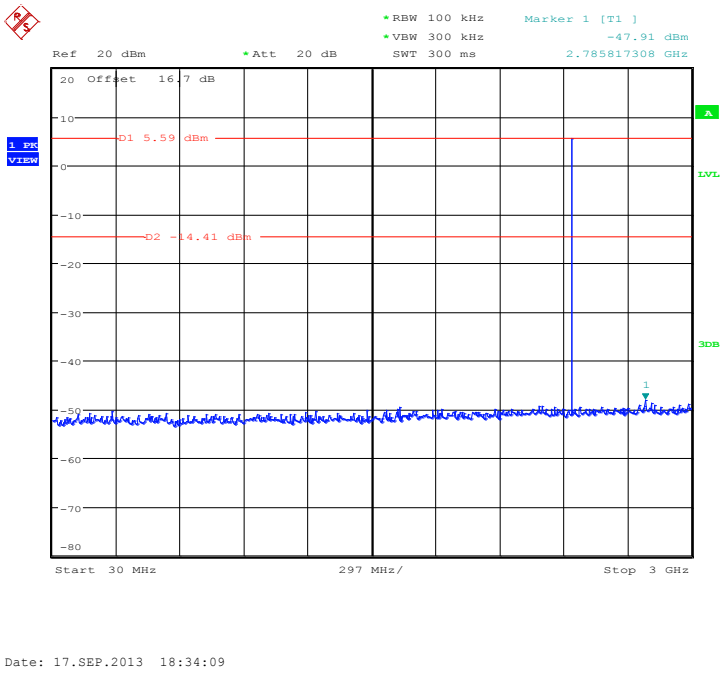


Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

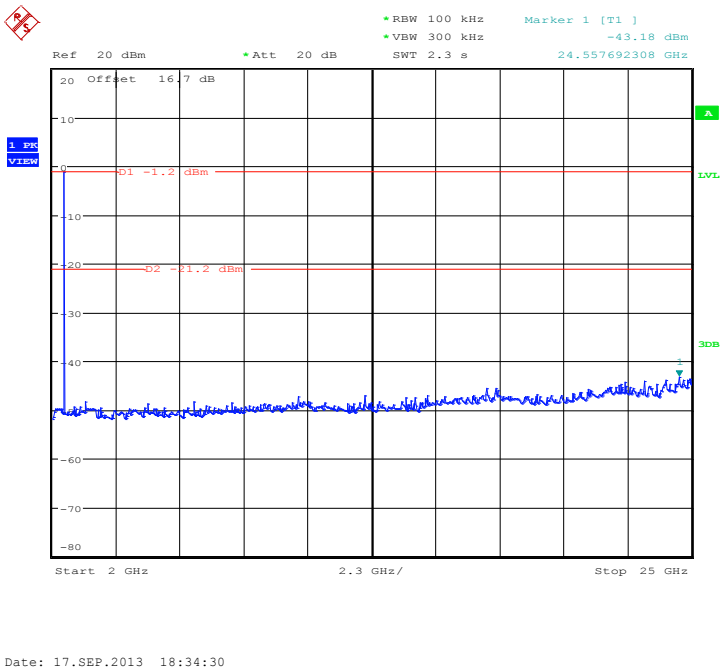
2Mbps CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

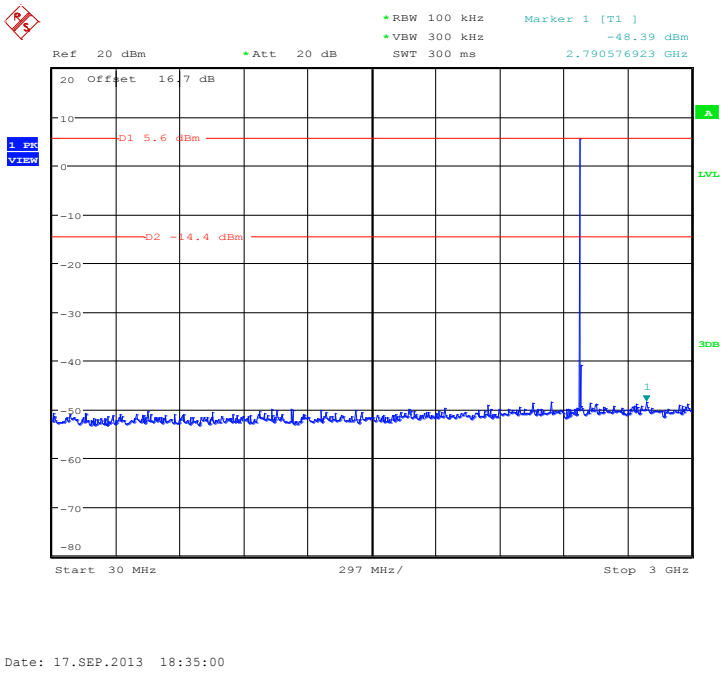


Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

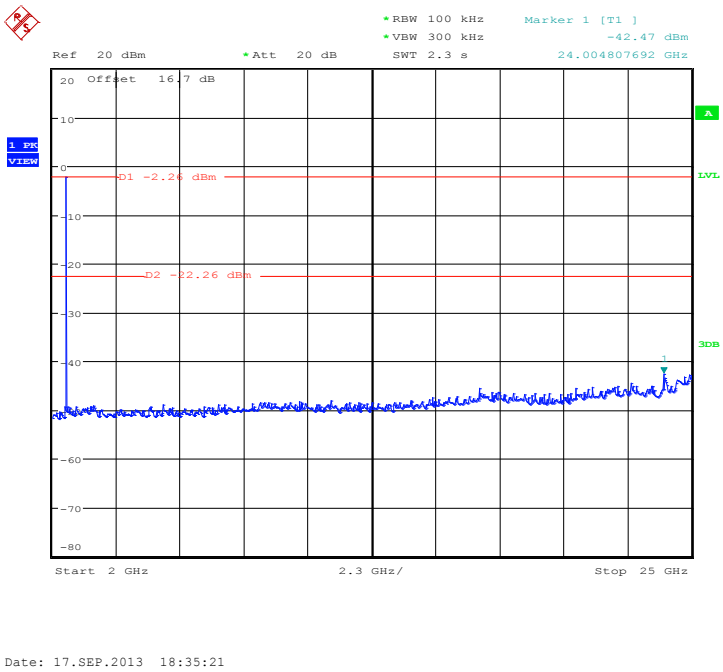
2Mbps CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

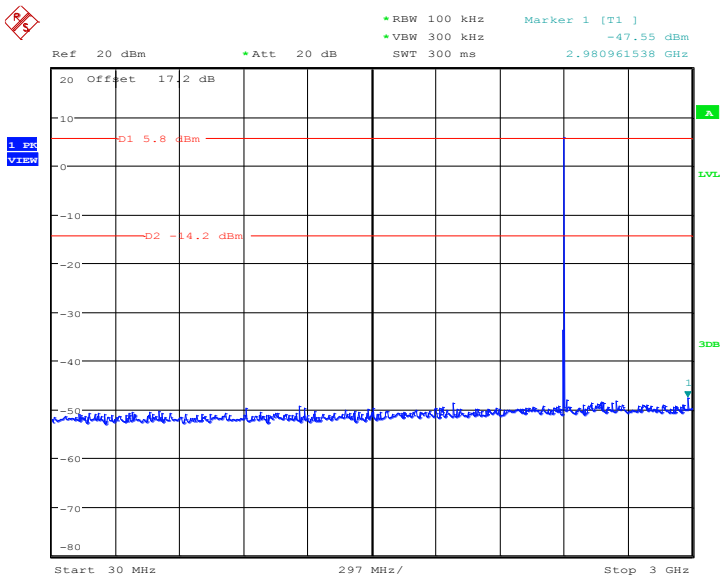


Note:

1. The total loss is 16.7 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

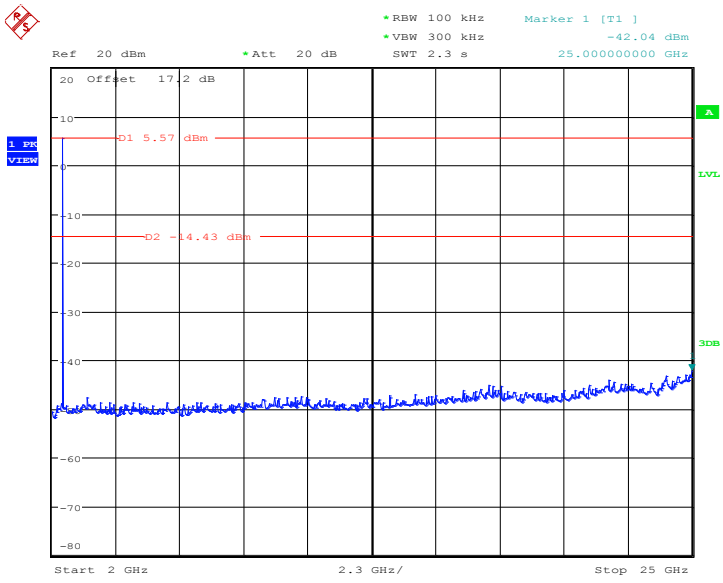
3Mbps CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Note:

1. The total loss is 17.2 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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



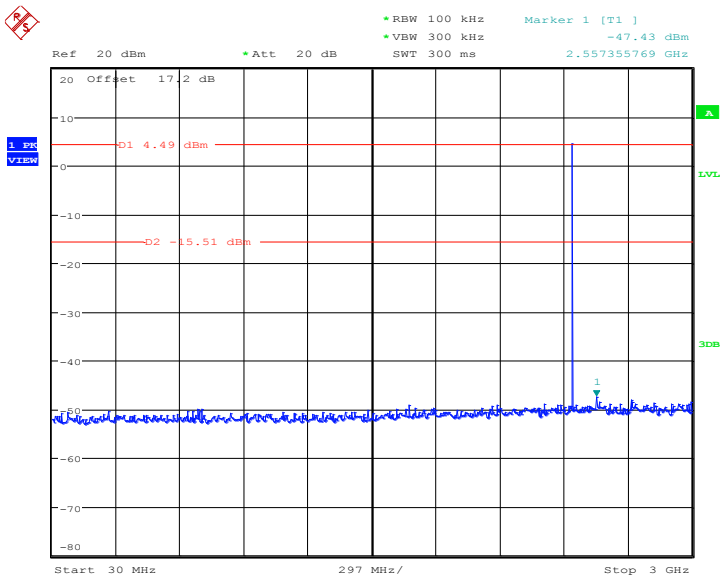
Date: 7.OCT.2013 15:38:37

Note:

1. The total loss is 17.2 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

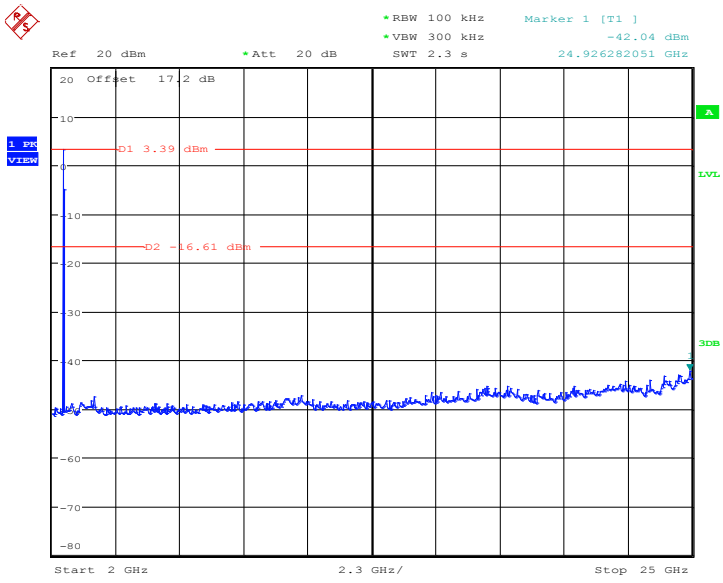
3Mbps CSE Plot on Ch 39 between 30MHz ~ 3 GHz



Note:

1. The total loss is 17.2 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

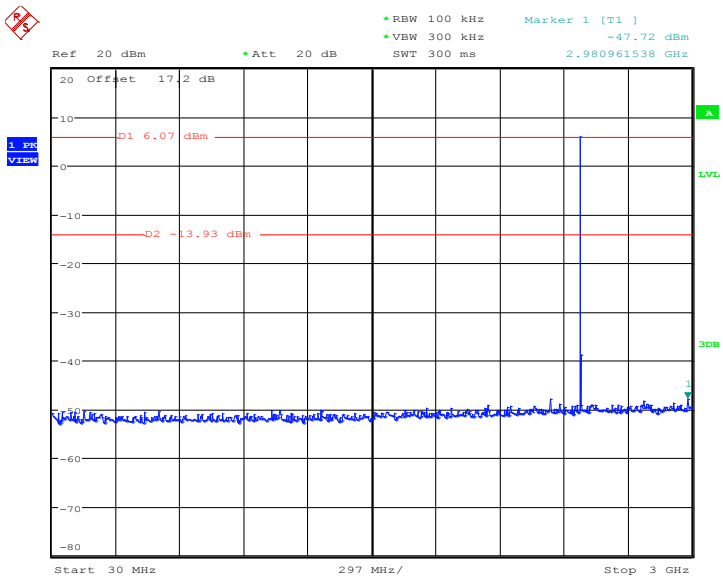


Note:

1. The total loss is 17.2 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

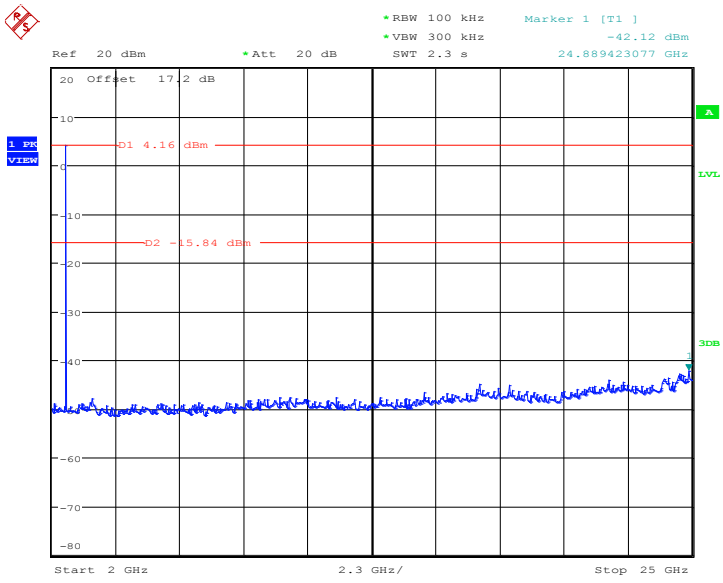
3Mbps CSE Plot on Ch 78 between 30MHz ~ 3 GHz



Note:

1. The total loss is 17.2 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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



Date: 7.OCT.2013 15:43:06

Note:

1. The total loss is 17.2 dB of the RF cable and attenuator, and has been compensated to the spectrum analyzer offset.
2. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

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

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

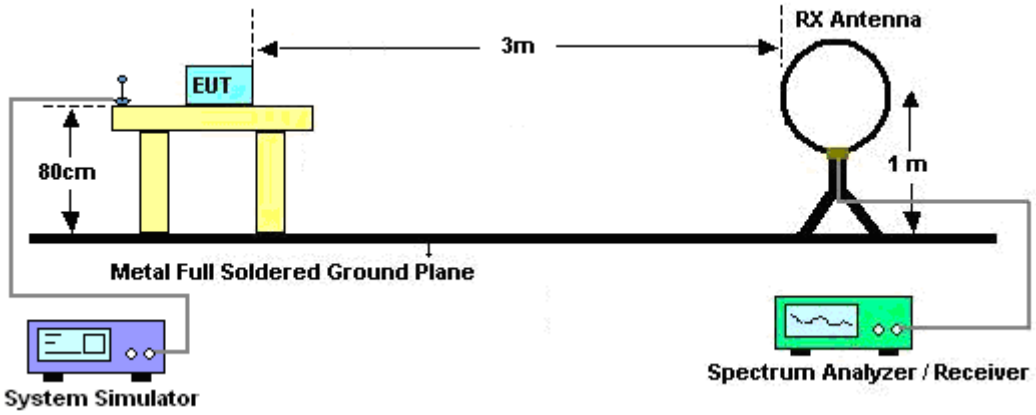
3.8.3 Test Procedures

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

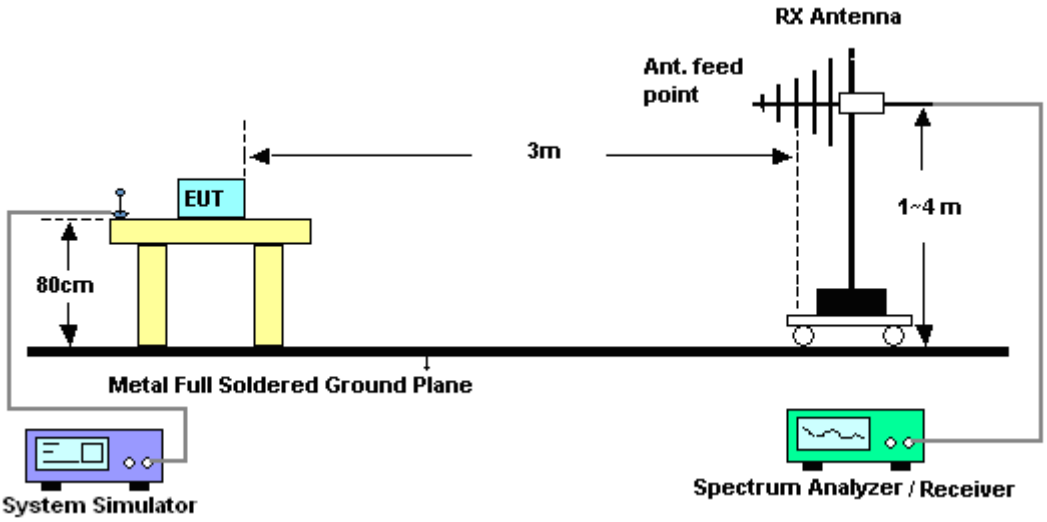
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.79dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

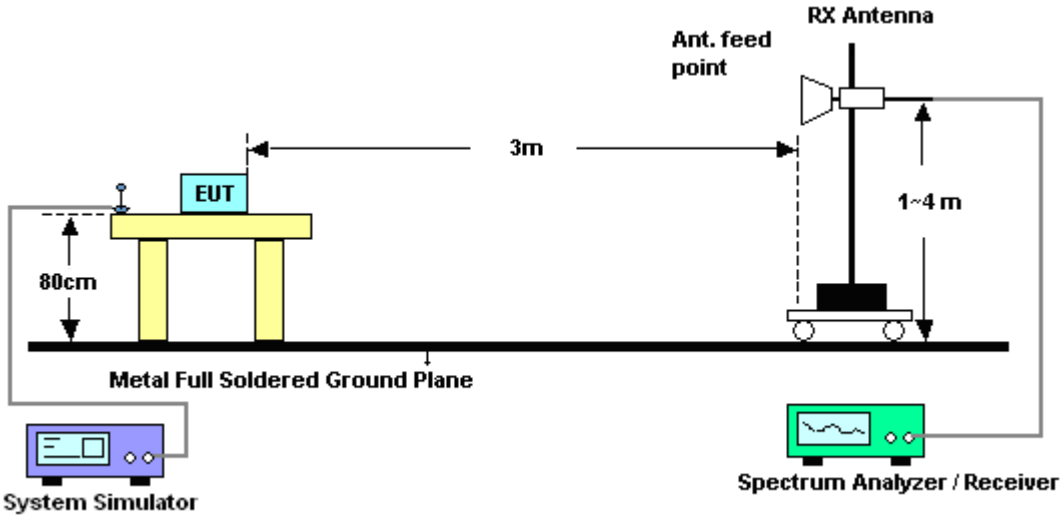
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

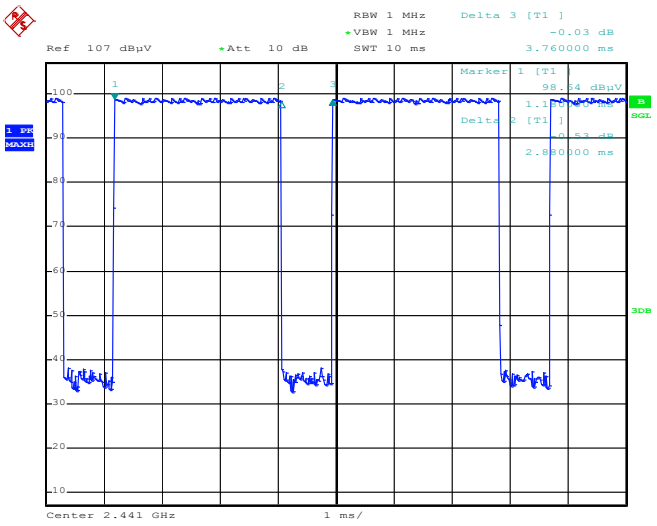


3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

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.

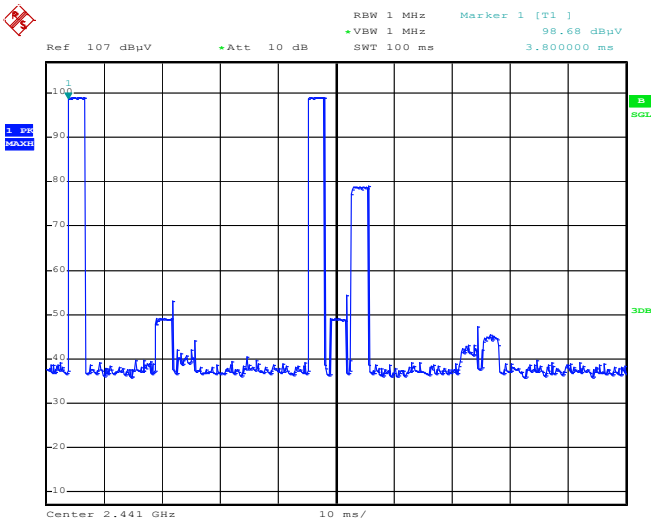
3.8.6 Duty cycle correction factor for average measurement

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



Date: 21.SEP.2013 04:47:27

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



Date: 21.SEP.2013 04:49:39

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.88 / 100 = 5.76 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.79 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

2.88 ms x 20 channels = 57.6 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:

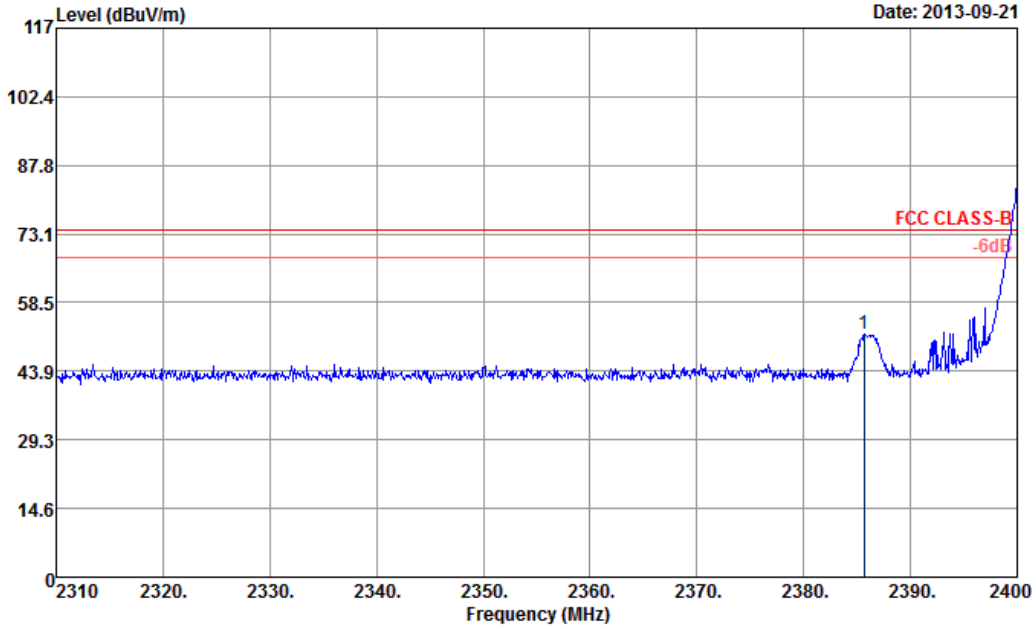
2.88 ms x 2 = 5.76 ms

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

20 x log(5.76 ms/100ms) = -24.79 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 :	Eric Shih		



Site : 03CH07-HY
Condition : FCC CLASS-B 3m HF-ANT_120823 HORIZONTAL
: RBW:1000.000KHz VBW:1000.000KHz SWT:Auto

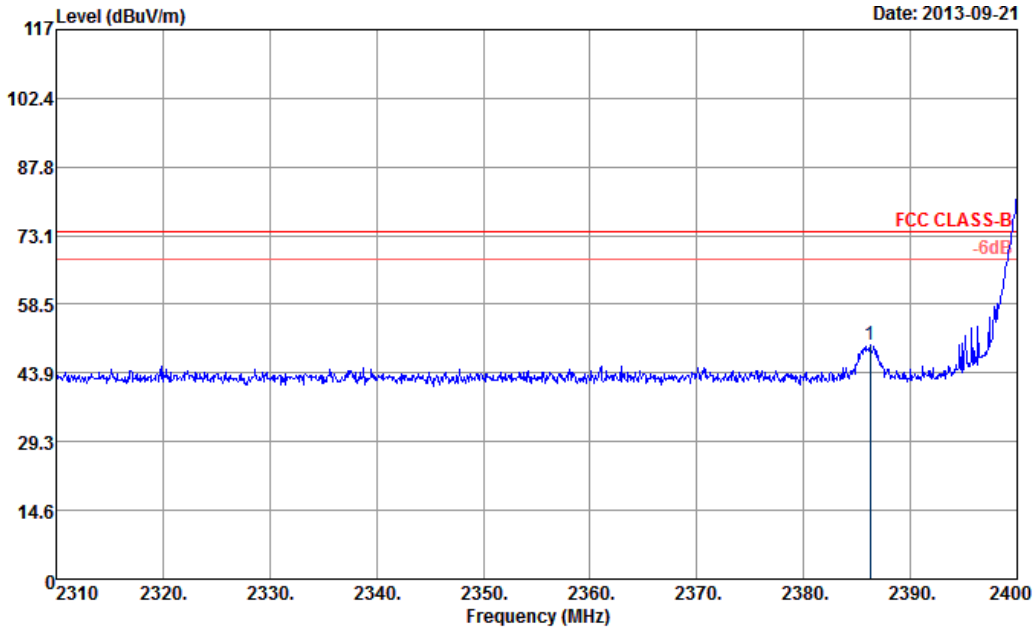
ANTENNA POLARITY : HORIZONTAL

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
2385.69	51.91	-22.09	74	46.97	32.3	6.91	34.27	100	64	Peak
2385.69	27.12	-26.88	54	-	-	-	-	-	-	Average

Note:

1. The average levels were calculated from the peak level corrected with duty cycle correction factor (24.79dB) derived from 20log (dwell time/100ms).
   For example: Average level = 51.91dBuV/m – 24.79 (dB) = 27.12dBuV/m.
2. Worst case measurement on 2385.69 MHz is compliance with 74/54 dBuV/m (peak/average) limit and Edge Measurement in the restricted band 2310-2390MHz. And, 2390-2400 MHz is non-restricted band which limit line is 20dB below the fundamental frequency emission level which is tested by conducted spurious emission. Both the test results are compliance with the FCC limit line.

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	00	Relative Humidity :	51~53%
Test Engineer :	Eric Shih		



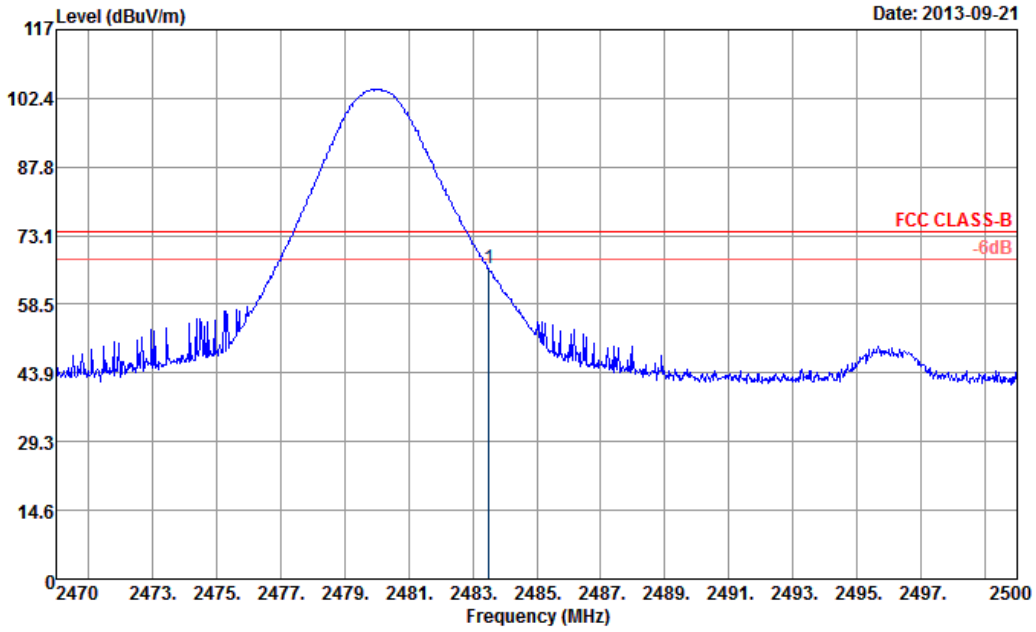
Site : 03CH07-HY
Condition : FCC CLASS-B 3m HF-ANT_120823 VERTICAL
: RBW:1000.000KHz VBW:1000.000KHz SWT:Auto

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	49.74	-24.26	74	44.8	32.3	6.91	34.27	111	110	Peak
2386.23	24.95	-29.05	54	-	-	-	-	-	-	Average

Note: Worst case measurement on 2386.23 MHz is compliance with 74/54 dBuV/m (peak/average) limit and Edge Measurement in the restricted band 2310-2390MHz. And, 2390-2400 MHz is non-restricted band which limit line is 20dB below the fundamental frequency emission level which is tested by conducted spurious emission. Both the test results are compliance with the FCC limit line.

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	78	Relative Humidity :	51~53%
Test Engineer :	Eric Shih		



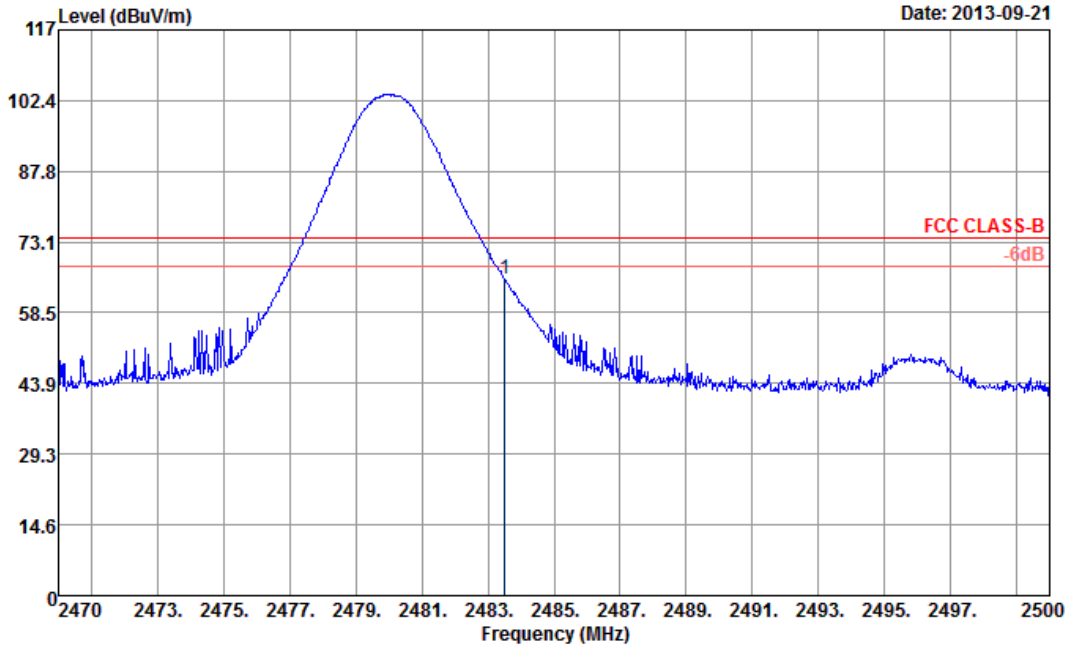
Site : 03CH07-HY
Condition : FCC CLASS-B 3m HF-ANT_120823 HORIZONTAL
: RBW:1000.000KHz VBW:1000.000KHz SWT:Auto

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	66.27	-7.73	74	61.26	32.38	7.06	34.43	121	63	Peak
2483.5	41.48	-12.52	54	-	-	-	-			Average

Note: Worst case measurement on 2483.5 MHz is compliance with 74/54 dBuV/m (peak/average) limit and Edge Measurement in the restricted band 2483.5-2500MHz. And, 2480-2483.5MHz is within the operating band and not within the restricted band. The test result is compliance with the FCC limit line.

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	78	Relative Humidity :	51~53%
Test Engineer :	Eric Shih		



Site : 03CH07-HY
Condition : FCC CLASS-B 3m HF-ANT_120823 VERTICAL
: RBW:1000.000KHz VBW:1000.000KHz SWT:Auto

ANTENNA POLARITY : VERTICAL

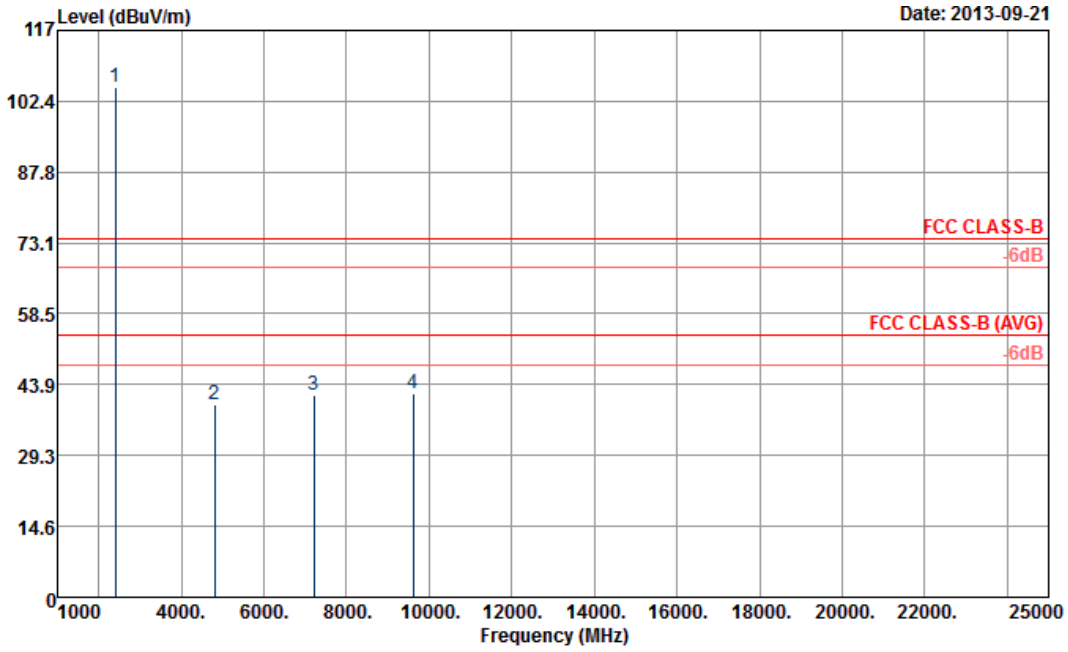
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limity Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	65.57	-8.43	74	60.56	32.38	7.06	34.43	102	109	Peak
2483.5	40.78	-13.22	54	-	-	-	-			Average

Note:

1. Worst case measurement on 2483.5 MHz is compliance with 74/54 dBuV/m (peak/average) limit and Edge Measurement in the restricted band 2483.5-2500MHz. And, 2480-2483.5MHz is within the operating band and not within the restricted band. The test result is complinance with the FCC limit line.
2. The band edge for different data rates is fully performed by conducted measurement, and is compliance with the limie line, and thus the data rate 3Mbps is used for radiated spurious emissions measurement due to maximum output power, and no non-compliance found during Conducted band edge measurement.

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

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	00	Relative Humidity :	51~53%
Test Engineer :	Eric Shih		
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 7206 MHz and 9609 MHz are not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 105.29dBμV/m - 20dB = 85.29dBμV/m. 3. The harmonic (5th, 6th, 7th,…etc.) and other spurious are not reported, because those levels are lower than average limit line and background noise.		



Site : 03CH07-HY
Condition : FCC CLASS-B 3m SHF-EHF HORIZONTAL

ANTENNA POLARITY : HORIZONTAL

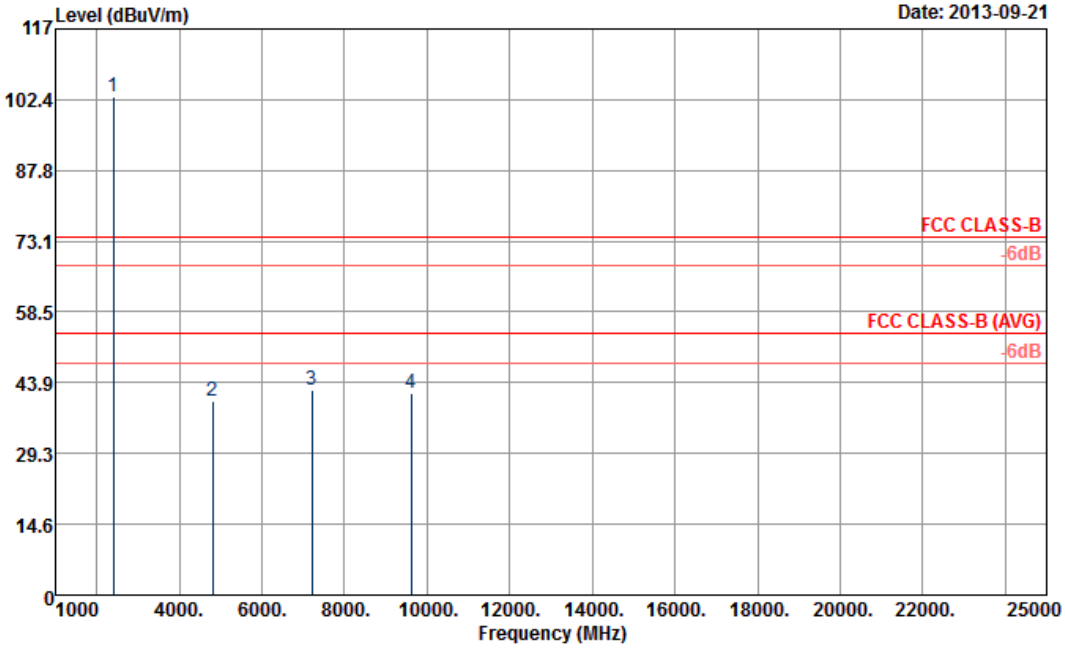
Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	105.29	-	-	100.38	32.3	6.91	34.3	100	64	Peak
2402	80.5	-	-	-	-	-	-	-	-	Average
4803	39.86	-34.14	74	56.09	33.98	8.75	58.96	100	0	Peak
4803	15.07	-38.93	54	-	-	-	-	-	-	Average
7206	41.86	-43.43	85.29	53.12	35.56	10.81	57.63	100	0	Peak
9609	42.05	-43.24	85.29	50.59	36.44	13.7	58.68	100	0	Peak

Other harmonics are lower than background noise

Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.79dB) derived from 20log (dwell time/100ms).

For example: Average level = 105.29dBuV/m – 24.79 (dB) = 80.50dBuV/m.

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	00	Relative Humidity :	51~53%
Test Engineer :	Eric Shih		
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 7206 MHz and 9609 MHz are not within a restricted band, and its limit line is 20dB below the highest emission level. 3. The harmonic (5th, 6th, 7th,…etc.) and other spurious are not reported, because those levels are lower than average limit line and background noise.		



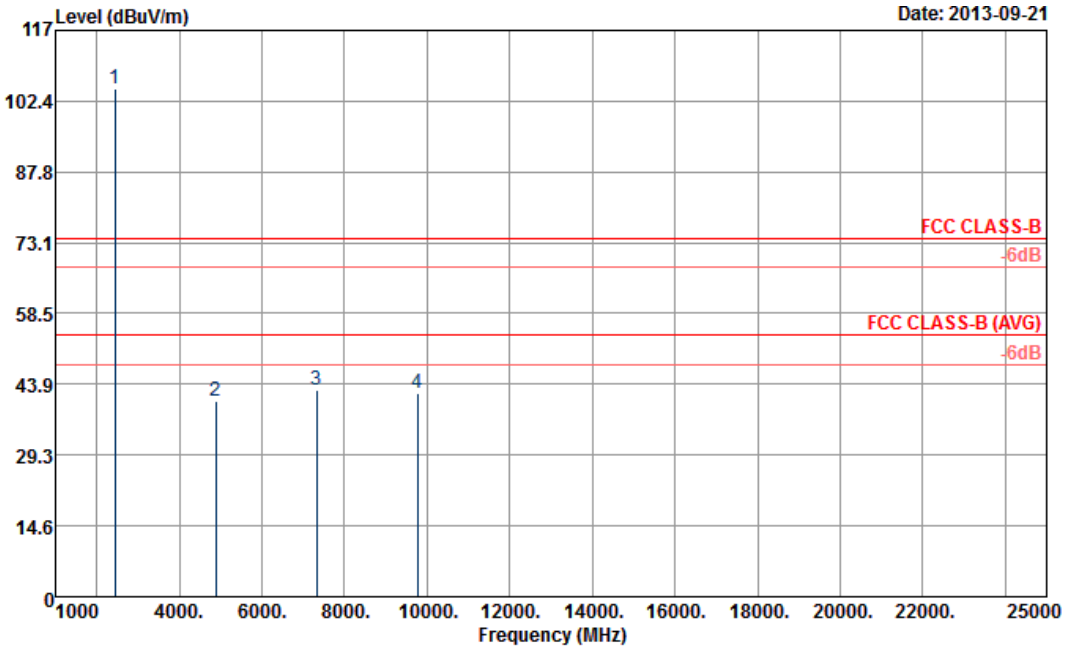
Site : 03CH07-HY
Condition : FCC CLASS-B 3m SHF-EHF VERTICAL

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
2402	103.14	-	-	98.23	32.3	6.91	34.3	111	110	Peak
2402	78.35	-	-	-	-	-	-	-	-	Average
4803	40.11	-33.89	74	56.34	33.98	8.75	58.96	100	0	Peak
4803	15.32	-38.68	54	-	-	-	-	-	-	Average
7206	42.39	-40.75	83.14	53.65	35.56	10.81	57.63	100	0	Peak
9609	41.84	-41.3	83.14	50.38	36.44	13.7	58.68	100	0	Peak

Other harmonics are lower than background noise

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	39	Relative Humidity :	51~53%
Test Engineer :	Eric Shih		
Remark :	1. 2442 MHz is fundamental signal which can be ignored. 2. 9765 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. The harmonic (5th, 6th, 7th,…etc.) and other spurious are not reported, because those levels are lower than average limit line and background noise.		



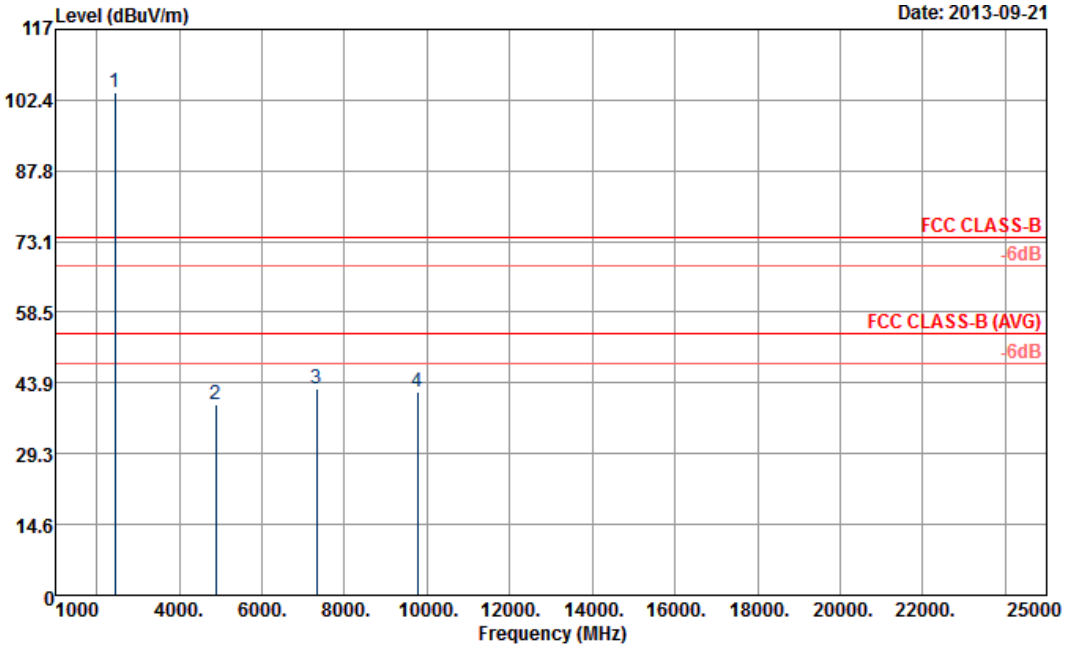
Site : 03CH07-HY
Condition : FCC CLASS-B 3m SHF-EHF HORIZONTAL

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
2442	104.82	-	-	99.87	32.35	6.99	34.39	100	63	Peak
2442	80.03	-	-	-	-	-	-	-	-	Average
4881	40.31	-33.69	74	56.34	33.95	8.85	58.83	100	0	Peak
4881	15.52	-38.48	54	-	-	-	-	-	-	Average
7323	42.8	-31.2	74	54.1	35.53	10.91	57.74	100	0	Peak
7323	18.01	-35.99	54	-	-	-	-	-	-	Average
9765	42.03	-42.79	84.82	50.38	36.69	13.69	58.73	100	0	Peak

Other harmonics are lower than background noise

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	39	Relative Humidity :	51~53%
Test Engineer :	Eric Shih		
Remark :	1. 2442 MHz is fundamental signal which can be ignored. 2. 9765 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. The harmonic (5th, 6th, 7th,…etc.) and other spurious are not reported, because those levels are lower than average limit line and background noise.		



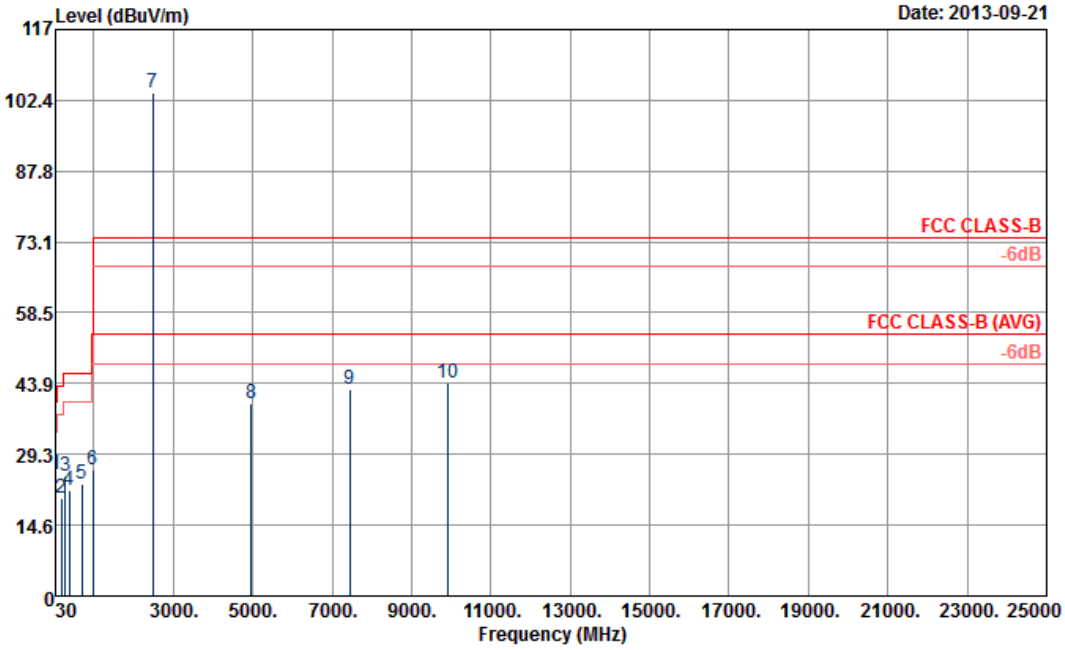
Site : 03CH07-HY
Condition : FCC CLASS-B 3m SHF-EHF VERTICAL

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
2442	103.86	-	-	98.91	32.35	6.99	34.39	106	108	Peak
2442	79.07	-	-	-	-	-	-	-	-	Average
4881	39.54	-34.46	74	55.57	33.95	8.85	58.83	100	0	Peak
4881	14.75	-39.25	54	-	-	-	-	-	-	Average
7323	42.72	-31.28	74	54.02	35.53	10.91	57.74	100	0	Peak
7323	17.93	-36.07	54	-	-	-	-	-	-	Average
9765	41.91	-41.95	83.86	50.26	36.69	13.69	58.73	100	0	Peak

Other harmonics are lower than background noise

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	78	Relative Humidity :	51~53%
Test Engineer :	Eric Shih		
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. 9921 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. The harmonic (5th, 6th, 7th,…etc.) and other spurious are not reported, because those levels are lower than average limit line and background noise.		



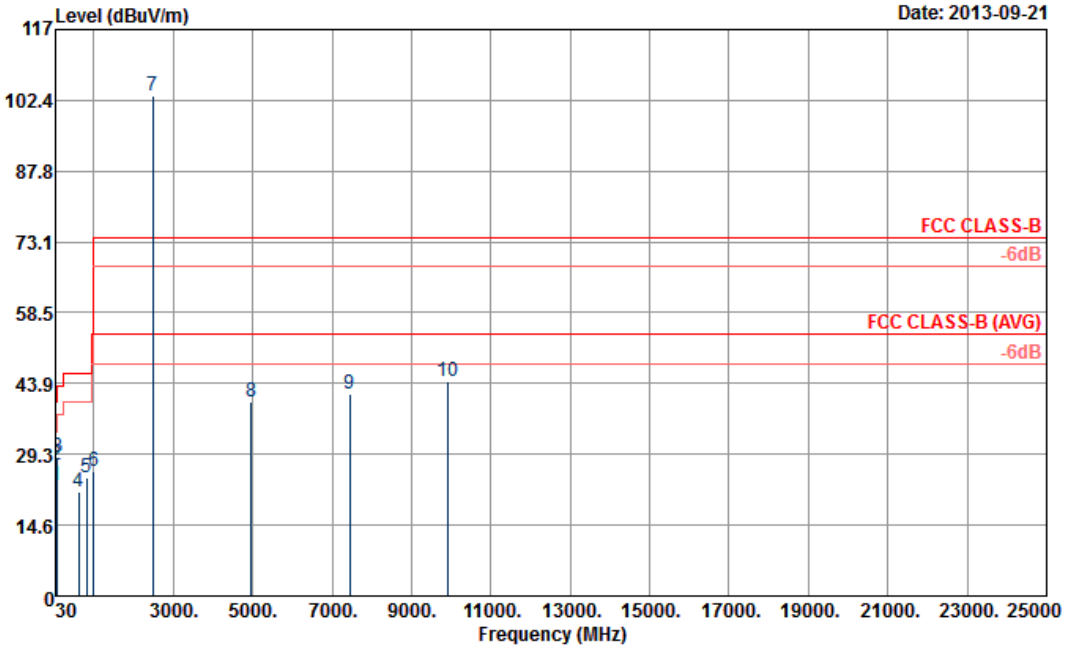
Site : 03CH07-HY
Condition : FCC CLASS-B 3m SHF-EHF HORIZONTAL

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
31.35	24.97	-15.03	40	36.57	19.28	0.54	31.42	136	37	Peak
182.28	20.11	-23.39	43.5	40.87	8.92	1.26	30.94	-	-	Peak
278.13	24.68	-21.32	46	40.96	13	1.64	30.92	-	-	Peak
370.7	21.96	-24.04	46	35.72	15.21	2.08	31.05	-	-	Peak
688.5	22.99	-23.01	46	29.98	20.51	2.92	30.42	-	-	Peak
965	26.1	-27.9	54	28.88	24.08	3.48	30.34	-	-	Peak

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
2480	103.94	-	-	98.93	32.38	7.06	34.43	121	63	Peak
2480	79.15	-	-	-	-	-	-	-	-	Average
4959	39.71	-34.29	74	55.54	33.91	8.92	58.66	100	0	Peak
4959	14.92	-39.08	54	-	-	-	-	-	-	Average
7440	42.6	-31.4	74	53.9	35.51	11.04	57.85	100	0	Peak
7440	17.81	-36.19	54	-	-	-	-	-	-	Average
9921	44.16	-39.78	83.94	52.36	36.9	13.68	58.78	100	0	Peak
Other harmonics are lower than background noise										

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	78	Relative Humidity :	51~53%
Test Engineer :	Eric Shih		
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. 9921 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. 3. The harmonic (5th, 6th, 7th,…etc.) and other spurious are not reported, because those levels are lower than average limit line and background noise.		



Site : 03CH07-HY
Condition : FCC CLASS-B 3m SHF-EHF VERTICAL

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
31.62	22.87	-17.13	40	35.18	18.56	0.55	31.42	-	-	Peak
50.52	26.95	-13.05	40	49.35	8.1	0.7	31.2	-	-	Peak
80.22	28.8	-11.2	40	51.4	7.7	0.88	31.18	159	77	Peak
615.7	21.39	-24.61	46	29.3	19.92	2.74	30.57	-	-	Peak
818	24.41	-21.59	46	29.29	22.27	3.19	30.34	-	-	Peak
986.7	25.89	-28.11	54	28.24	24.4	3.5	30.25	-	-	Peak

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
2480	103.43	-	-	98.42	32.38	7.06	34.43	102	109	Peak
2480	78.64	-	-	-	-	-	-	-	-	Average
4959	40.12	-33.88	74	55.95	33.91	8.92	58.66	100	0	Peak
4959	15.33	-38.67	54	-	-	-	-	-	-	Average
7440	41.76	-32.24	74	53.06	35.51	11.04	57.85	100	0	Peak
7440	16.97	-37.03	54	-	-	-	-	-	-	Average
9921	44.4	-39.03	83.43	52.6	36.9	13.68	58.78	100	0	Peak
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.

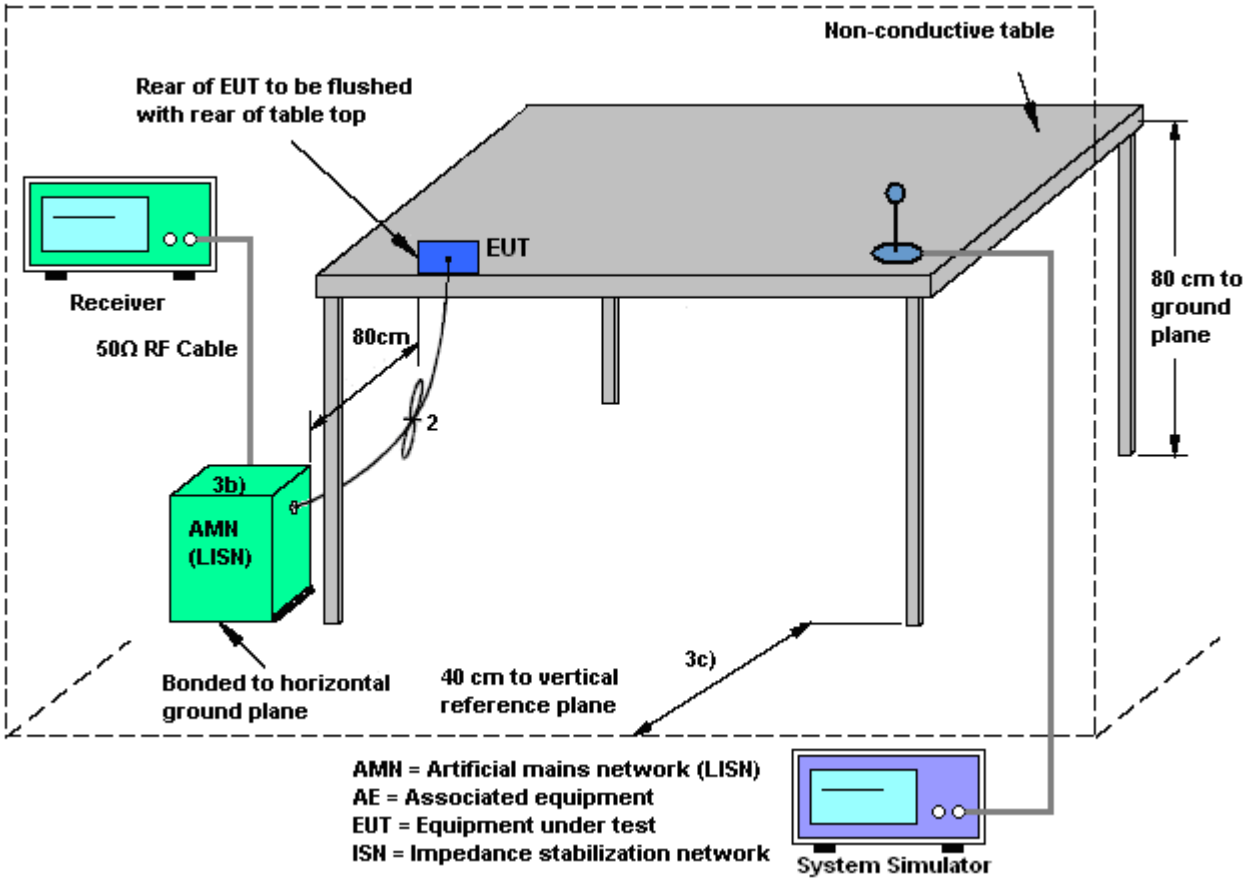
3.9.2 Measuring Instruments

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

3.9.3 Test Procedures

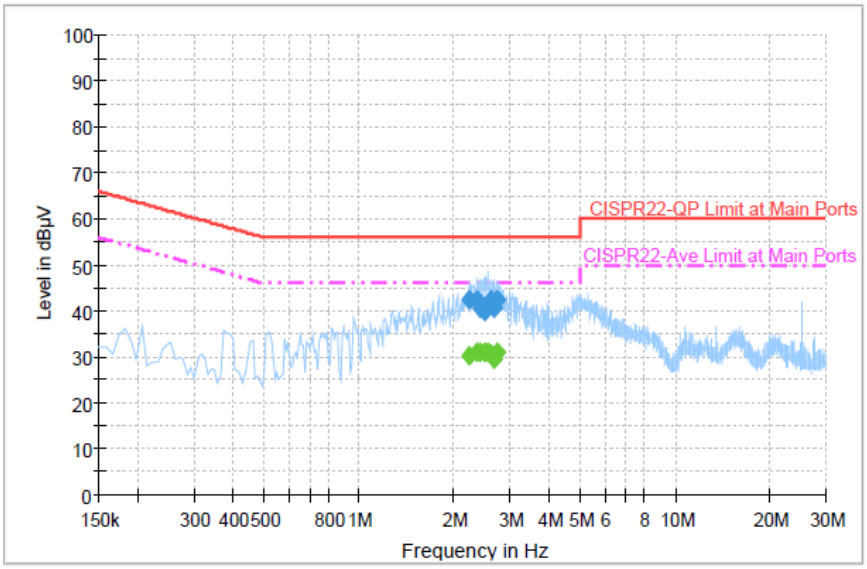
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.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



3.9.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM1900 Idle + Bluetooth Link + WLAN Idle + MP3 + Earphone + Battery + USB Cable (Charging from Adapter) + SIM 1		



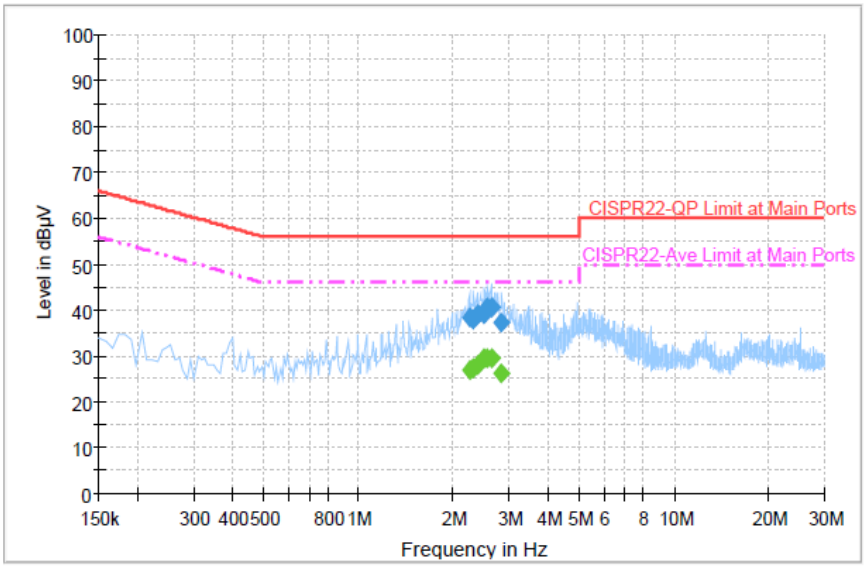
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.230000	42.3	Off	L1	19.5	13.7	56.0
2.366000	42.6	Off	L1	19.6	13.4	56.0
2.430000	40.5	Off	L1	19.7	15.5	56.0
2.494000	40.0	Off	L1	19.6	16.0	56.0
2.558000	41.3	Off	L1	19.6	14.7	56.0
2.606000	42.3	Off	L1	19.6	13.7	56.0
2.686000	40.6	Off	L1	19.6	15.4	56.0
2.734000	42.5	Off	L1	19.6	13.5	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.230000	30.2	Off	L1	19.5	15.8	46.0
2.366000	31.1	Off	L1	19.6	14.9	46.0
2.430000	31.1	Off	L1	19.7	14.9	46.0
2.494000	31.0	Off	L1	19.6	15.0	46.0
2.558000	30.9	Off	L1	19.6	15.1	46.0
2.606000	30.8	Off	L1	19.6	15.2	46.0
2.686000	29.4	Off	L1	19.6	16.6	46.0
2.734000	31.1	Off	L1	19.6	14.9	46.0

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM1900 Idle + Bluetooth Link + WLAN Idle + MP3 + Earphone + Battery + USB Cable (Charging from Adapter) + SIM 1		



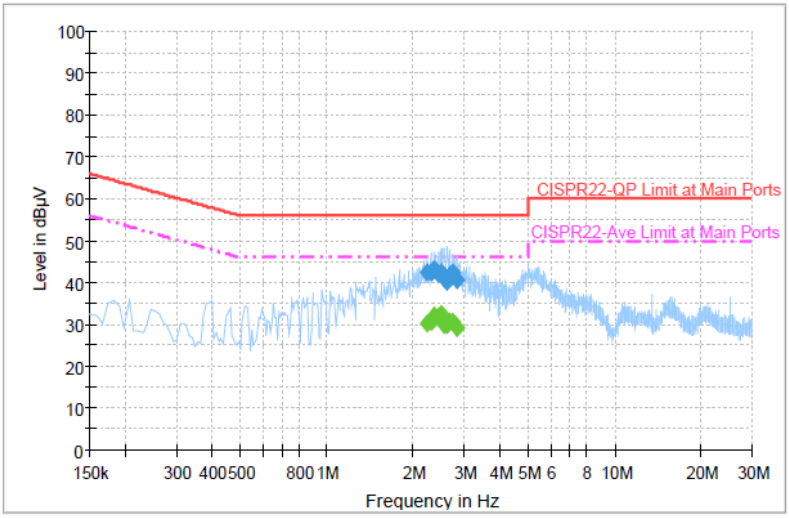
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.246000	38.5	Off	N	19.6	17.5	56.0
2.310000	37.9	Off	N	19.6	18.1	56.0
2.382000	39.2	Off	N	19.7	16.8	56.0
2.502000	39.1	Off	N	19.6	16.9	56.0
2.574000	40.5	Off	N	19.6	15.5	56.0
2.638000	40.4	Off	N	19.6	15.6	56.0
2.846000	37.4	Off	N	19.6	18.6	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.246000	26.8	Off	N	19.6	19.2	46.0
2.310000	27.2	Off	N	19.6	18.8	46.0
2.382000	28.2	Off	N	19.7	17.8	46.0
2.502000	29.5	Off	N	19.6	16.5	46.0
2.574000	29.5	Off	N	19.6	16.5	46.0
2.638000	29.4	Off	N	19.6	16.6	46.0
2.846000	26.1	Off	N	19.6	19.9	46.0

Test Mode :	Mode 2	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM1900 Idle + Bluetooth Idle + WLAN Link + MP3 + Earphone + Battery + USB Cable (Charging from Adapter) + SIM 2		



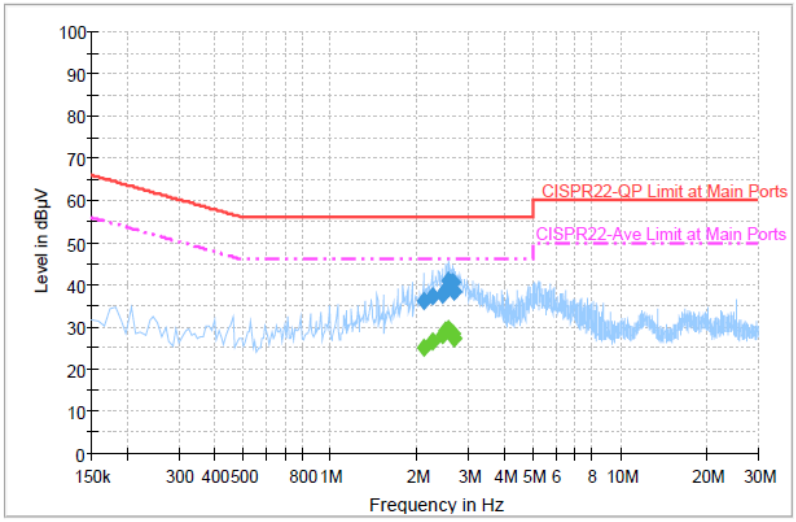
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.230000	42.5	Off	L1	19.5	13.5	56.0
2.302000	42.4	Off	L1	19.6	13.6	56.0
2.374000	43.4	Off	L1	19.6	12.6	56.0
2.446000	42.2	Off	L1	19.6	13.8	56.0
2.510000	42.6	Off	L1	19.6	13.4	56.0
2.558000	40.8	Off	L1	19.6	15.2	56.0
2.630000	40.3	Off	L1	19.6	15.7	56.0
2.686000	41.8	Off	L1	19.6	14.2	56.0
2.750000	42.4	Off	L1	19.6	13.6	56.0
2.822000	40.5	Off	L1	19.6	15.5	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.230000	30.4	Off	L1	19.5	15.6	46.0
2.302000	30.6	Off	L1	19.6	15.4	46.0
2.374000	32.2	Off	L1	19.6	13.8	46.0
2.446000	31.8	Off	L1	19.6	14.2	46.0
2.510000	32.6	Off	L1	19.6	13.4	46.0
2.558000	30.1	Off	L1	19.6	15.9	46.0
2.630000	30.0	Off	L1	19.6	16.0	46.0
2.686000	30.5	Off	L1	19.6	15.5	46.0
2.750000	30.5	Off	L1	19.6	15.5	46.0
2.822000	29.1	Off	L1	19.6	16.9	46.0

Test Mode :	Mode 2	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM1900 Idle + Bluetooth Idle + WLAN Link + MP3 + Earphone + Battery + USB Cable (Charging from Adapter) + SIM 2		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.110000	36.3	Off	N	19.6	19.7	56.0
2.246000	37.4	Off	N	19.6	18.6	56.0
2.446000	37.6	Off	N	19.7	18.4	56.0
2.502000	38.7	Off	N	19.6	17.3	56.0
2.574000	40.8	Off	N	19.6	15.2	56.0
2.646000	40.5	Off	N	19.6	15.5	56.0
2.678000	38.5	Off	N	19.6	17.5	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.110000	25.1	Off	N	19.6	20.9	46.0
2.246000	26.6	Off	N	19.6	19.4	46.0
2.446000	28.2	Off	N	19.7	17.8	46.0
2.502000	29.3	Off	N	19.6	16.7	46.0
2.574000	29.6	Off	N	19.6	16.4	46.0
2.646000	28.5	Off	N	19.6	17.5	46.0
2.678000	27.4	Off	N	19.6	18.6	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 Anti-Replacement Construction

Non-standard connector used.

3.10.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz ~ 40GHz	Jun. 07, 2013	Sep. 14, 2013 ~ Oct. 07, 2013	Jun. 06, 2014	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	300MHz ~ 40GHz	Feb. 05, 2013	Sep. 14, 2013 ~ Oct. 07, 2013	Feb. 04, 2014	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz ~ 40GHz	Feb. 05, 2013	Sep. 14, 2013 ~ Oct. 07, 2013	Feb. 04, 2014	Conducted (TH02-HY)
Thermometer	Wisewind	410	N/A	N/A	Nov. 20, 2012	Sep. 14, 2013 ~ Oct. 07, 2013	Nov. 19, 2013	Conducted (TH02-HY)
RF cable	HONOVA	MF86	N/A	N/A	Nov. 26, 2012	Sep. 14, 2013 ~ Oct. 07, 2013	Nov. 25, 2013	Conducted (TH02-HY)
RF cable	HONOVA	MF86	N/A	N/A	Nov. 26, 2012	Sep. 14, 2013 ~ Oct. 07, 2013	Nov. 25, 2013	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz ~ 7GHz	Sep. 06, 2013	Sep. 21, 2013	Sep. 05, 2014	Radiation (03CH07-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101067	9kHz ~ 30GHz	Nov. 30, 2012	Sep. 21, 2013	Nov. 29, 2013	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	860004/0001	9kHz ~ 30MhZ	Jul. 03, 2012	Sep. 21, 2013	Jul. 03, 2014	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30MHz ~ 1GHz	Oct. 06, 2012	Sep. 21, 2013	Oct. 05, 2013	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 22, 2013	Sep. 21, 2013	Aug. 21, 2014	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz ~ 40GHz	Sep. 28, 2012	Sep. 21, 2013	Sep. 27, 2013	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	30MHz ~ 1GHz	Feb. 26, 2013	Sep. 21, 2013	Feb. 25, 2014	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz ~ 26.5GHz	Dec. 01, 2012	Sep. 21, 2013	Nov. 30, 2013	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	159088	DC~18GHz High Gain	Feb. 27, 2013	Sep. 21, 2013	Feb. 26, 2014	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	Sep. 21, 2013	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	ChainTek 3000	N/A	N/A	N/A	Sep. 21, 2013	N/A	Radiation (03CH07-HY)
High Pass Filter	Microwave	H03G18G3	N/A	3GHz HPF	Nov. 26, 2012	Sep. 21, 2013	Nov. 25, 2013	Radiation (03CH07-HY)
High Pass Filter	Microwave	H07G18G3	282388	7GHz HPF	Nov. 29, 2012	Sep. 21, 2013	Nov. 28, 2013	Radiation (03CH07-HY)
Low Pass Filter	Wainwright	WLKS1200-8SS	SN3	Pass Filter	Nov. 29, 2012	Sep. 21, 2013	Nov. 28, 2013	Radiation (03CH07-HY)
HF RF Cable	HUBER SUHNER	SUCOFLEX 104	38411/6	1GHz ~ 18GHz	Dec.04 , 2012	Sep. 21, 2013	Dec.03,2013	Radiation (03CH07-HY)
LF RF Cable	Warison+HUBER SUHNER	WCBA-WC04NM.NM2	N/A	30MHz ~ 1GHz	Dec.04 , 2012	Sep. 21, 2013	Dec.03,2013	Radiation (03CH07-HY)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Test Software	Audix	E3	Version 6.2009-08-24	N/A	N/A	Sep. 21, 2013	N/A	Radiation (03CH07-HY)
Hygrometer	Testo	608-H1	34897197	N/A	Nov. 20, 2012	Sep. 21, 2013	Nov. 19, 2013	Radiation (03CH07-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Nov. 13, 2012	Sep. 11, 2013	Nov. 12, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2012	Sep. 11, 2013	Dec. 11, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 06, 2012	Sep. 11, 2013	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	APC	APC-1000 W	N/A	N/A	N/A	Sep. 11, 2013	N/A	Conduction (CO05-HY)
Test Software	N/A	EMC32	8.40.0	N/A	N/A	Sep. 11, 2013	N/A	Conduction (CO05-HY)
Thermometer	Testo	608-H1	34913912	N/A	Apr. 25, 2013,	Sep. 11, 2013	Apr. 24, 2014	Conduction (CO05-HY)
LF Cable	Shuner	RG-402	N/A	N/A	Aug. 18, 2013	Sep. 11, 2013	Sep. 17, 2013	Conduction (CO05-HY)

Note: Test equipment calibration is traceable to the procedure of ISO17025.

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**