FCC RF Test Report

APPLICANT	:	Motorola Solutions, Inc.
EQUIPMENT	:	Touch Computer
BRAND NAME	:	Motorola
MODEL NAME	:	TC55AH
FCC ID	:	UZ7TC55AH
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter

The product was received on Jun. 13, 2013 and completely tested on Jul. 09, 2013. 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.

Louis Wu

Reviewed by: Louis Wu / Manager

Jones Tsai

Approved by: Jones Tsai / Manager

Testing Laboratory 1190

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR322304-07A	Rev. 01	Initial issue of report	Aug. 14, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	RSS-210 A8.4(2)	Number of Channels	≥ 15Chs	Pass	-
3.2	15.247(a)(1)	RSS-210 A8.1(b)	Hopping Channel Separation	≥ 2/3 of 20dB BW	Pass	-
3.3	15.247(a)(1)	RSS-210 A8.1(d)	Dwell Time of Each Channel	≤ 0.4sec in 31.6sec period	Pass	-
3.4	15.247(a)(1)	RSS-210 A8.1(a)	20dB Bandwidth	NA	Pass	-
3.4	-	RSS-Gen 4.6.1	99% Bandwidth	-	Pass	-
3.5	15.247(b)(1)	RSS-210 A8.1(b)	Peak Output Power	≤ 1 W for 1Mbps ≤ 125 mW for 2, 3Mbps	Pass	-
3.6	15.247(d)	RSS-210 A8.5	Conducted Band Edges	≤ 20dBc	Pass	-
3.7	15.247(d)	RSS-210 A8.5	Conducted Spurious Emission	≤ 20dBc	Pass	-
3.8	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 4.60 dB at 30.000 MHz
3.9	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 5.40 dB at 13.558 MHz
3.10	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

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

1.2 Manufacturer

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

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Touch Computer
Brand Name	Motorola
Model Name	TC55AH
FCC ID	UZ7TC55AH
Sample 1	EUT with Scanner
Sample 2	EUT without Scanner
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE WLAN 11abgn / Bluetooth 2.1/3.0/4.0 / NFC
HW Version	DV1
SW Version	Android 4.1.2
FW Version	BSP 1.27
EUT Stage	Identical Prototype

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

1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	Bluetooth BR(1Mbps) : 3.38 dBm (0.0022 W) Bluetooth EDR (2Mbps) : 3.68 dBm (0.0023 W) Bluetooth EDR (3Mbps) : 3.65 dBm (0.0023 W)
99% Occupied Bandwidth	Bluetooth BR(1Mbps) : 0.896MHz Bluetooth EDR (2Mbps) : 1.172MHz Bluetooth EDR (3Mbps) : 1.184MHz
Antenna Type	PIFA Antenna type with gain 0.20 dBi(Battery1) PIFA Antenna type with gain 0.08 dBi(Battery2)
Type of Modulation	Bluetooth 2.1 BR (1Mbps) : GFSK Bluetooth 2.1 EDR (2Mbps) : π/4-DQPSK Bluetooth 2.1 EDR (3Mbps) : 8-DPSK Bluetooth 3.0 BR (1Mbps) : GFSK Bluetooth 3.0 EDR (2Mbps) : π/4-DQPSK Bluetooth 3.0 EDR (3Mbps) : 8-DPSK

The bluetooth antenna is not changed while using battery cover 1 or 2. The antenna gain difference is due to antenna gain measurement result by using different battery covers.

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 C63.10-2009

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		
		GFSK / 1Mbps		
		DH1	DH3	DH5
Ch00	2402MHz	2.93 dBm	2.88 dBm	2.92 dBm
Ch39	2441MHz	3.31 dBm	3.32 dBm	**3.38 dBm**
Ch78	2480MHz	2.80 dBm	2.86 dBm	2.82 dBm

Channel	Frequency	Bluetooth RF Output Power		
		π/4-DQPSK / 2Mbps		
		2DH1	2DH3	2DH5
Ch00	2402MHz	2.83 dBm	3.08 dBm	3.00 dBm
Ch39	2441MHz	3.34 dBm	3.58 dBm	**3.68 dBm**
Ch78	2480MHz	2.67 dBm	2.84 dBm	2.88 dBm

Channel	Frequency	Bluetooth RF Output Power		
		8-DPSK / 3Mbps		
		3DH1	3DH3	3DH5
Ch00	2402MHz	2.94 dBm	3.06 dBm	3.12 dBm
Ch39	2441MHz	3.46 dBm	3.62 dBm	**3.65 dBm**
Ch78	2480MHz	2.88 dBm	2.92 dBm	2.98 dBm

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

a. The EUT has been associated with peripherals pursuant to 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). 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 2Mbps mode, and recorded in this report.

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

2.2 Test Mode

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

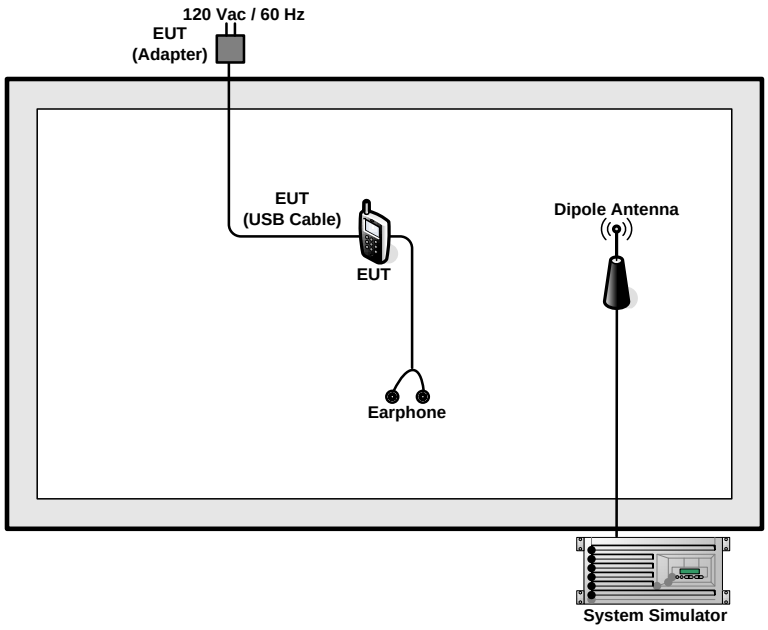
Summary table of Test Cases			
Test Item	**Data Rate / Modulation**		
	Bluetooth BR 1Mbps GFSK	**Bluetooth EDR 2Mbps π/4-DQPSK**	**Bluetooth EDR 3Mbps 8-DPSK**
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated Test Cases	**Bluetooth EDR 2Mbps π/4-DQPSK**		
	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz		
AC Conducted Emission	Mode 1 :GSM850 Idle + Bluetooth Link + WLAN (2.4G) Link + NFC active + Scanner + Battery 2 + USB Cable (USB File transfer) for Sample 1 Mode 2 :WCDMA band V Idle + Bluetooth Link + WLAN (5G) Link + NFC active + Scanner + Battery 1 + USB Cable (USB File transfer) for Sample 1 Mode 3 :LTE Band 5 Idle + Bluetooth Link + WLAN (5G) Link + NFC active + Battery 1 + USB Cable (USB File transfer) for Sample 2		

Remark:

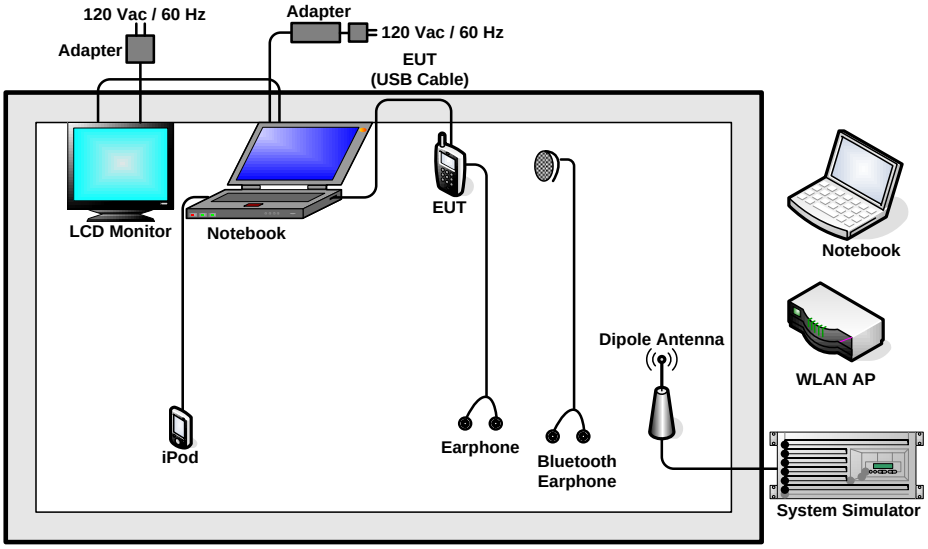
1. For radiated test cases, the data rate 2Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and the conducted spurious emissions and conducted band edge measurement for each data rate are no worse than 2Mbps, and no other significantly frequencies found in conducted spurious emission .
2. For Radiated Test Cases, The tests were performed with Battery 2 and Sample 1.
3. “Bluetooth Link” means EUT linked with Bluetooth headset.
4. “WLAN Link” means EUT associated with AP at 2.4GHz or 5GHz band.
5. “Scanner” means scanning and decoding a barcode by scanner.
6. “USB File transfer” means data application transferred mode between EUT and Notebook through USB port.
7. “NFC active” means turning on NFC function of EUT.

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.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
4.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
5.	Notebook	DELL	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	LCD Monitor	DELL	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
7.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
8.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
9.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
10.	Earphone	Cotron	MAX-300	N/A	Unshielded, 1.2 m	N/A

2.5 Description of RF Function Operation Test Setup

For Bluetooth function, the RF utility, “ADB” was installed in EUT which was programmed in order to make the EUT get into the engineering modes to 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

See list of measuring instruments of this test report.

3.1.3 Test Procedure

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

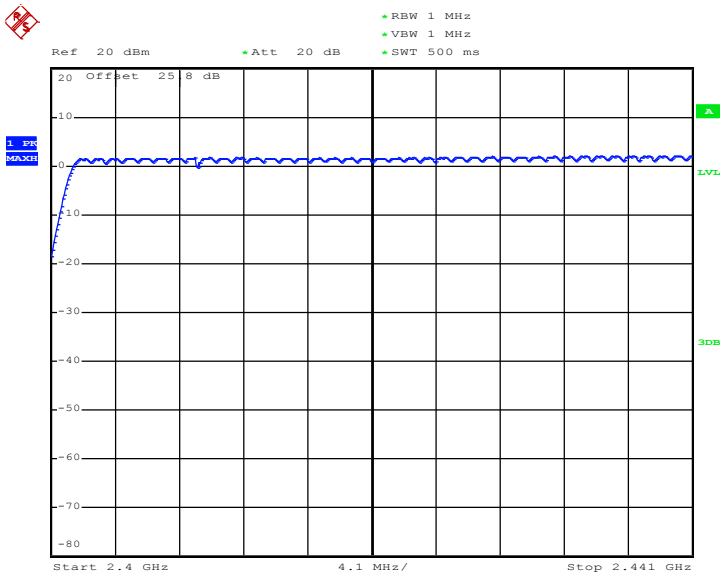
3.1.4 Test Setup

3.1.5 Test Result of Number of Hopping Frequency

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

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

Number of Hopping Channel Plot on Channel 00 - 78



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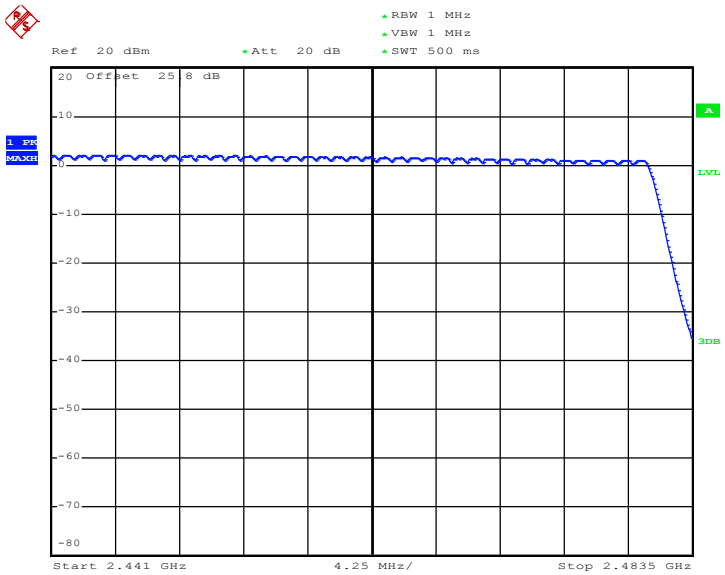

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3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

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

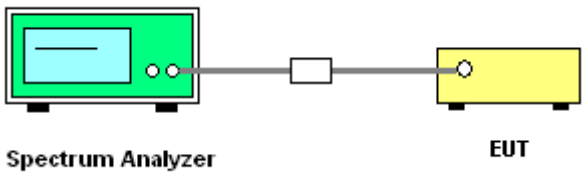
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

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

3.2.4 Test Setup

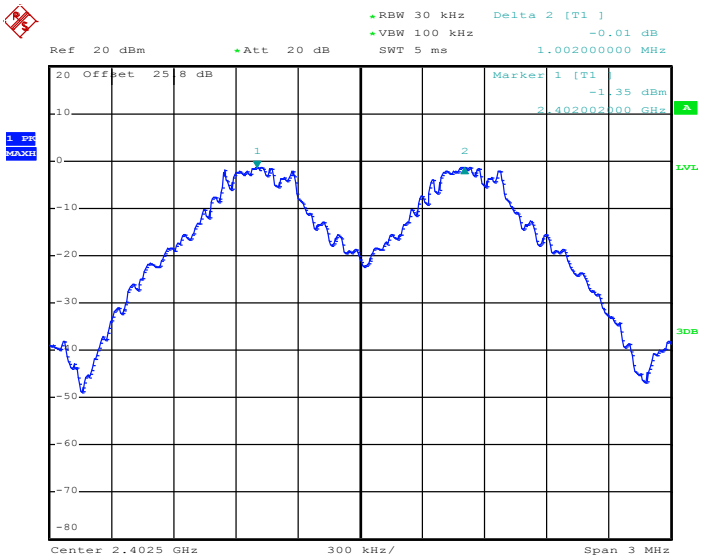


3.2.5 Test Result of Hopping Channel Separation

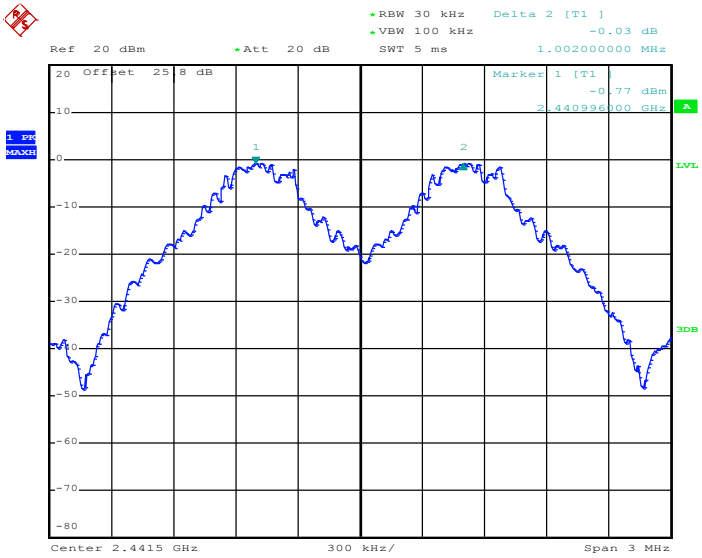
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Coyote Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.643	Pass
39	2441	1.002	0.643	Pass
78	2480	1.002	0.643	Pass

Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



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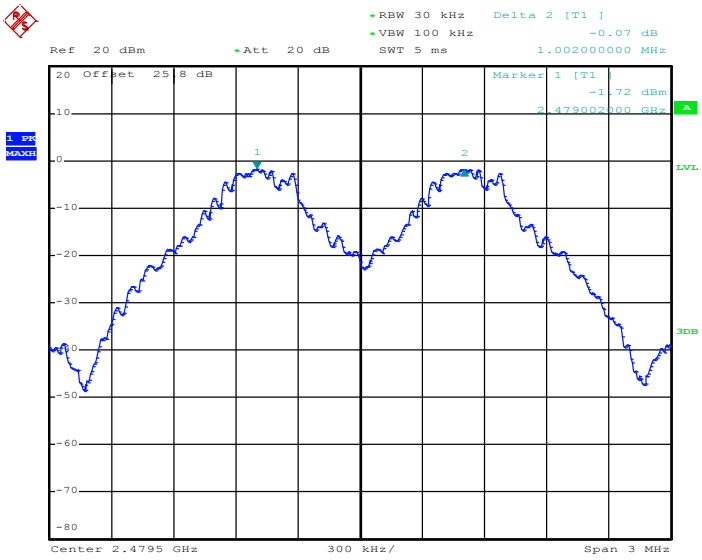
Channel Separation Plot on Channel 77 - 78



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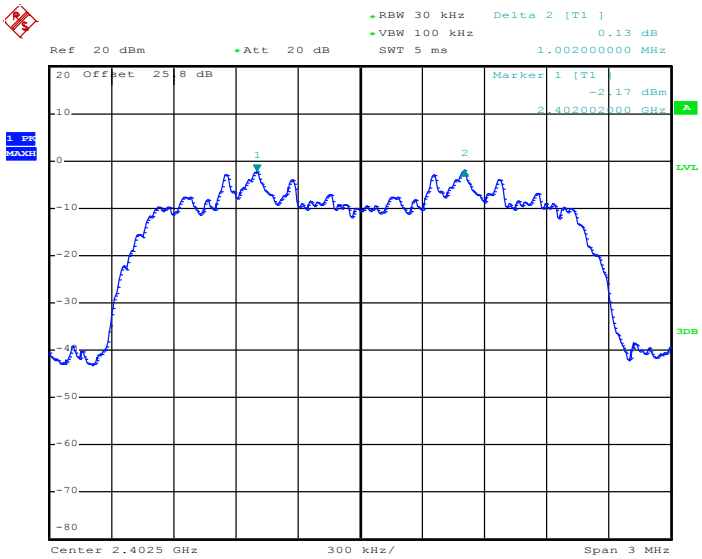
Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Coyote Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.860	Pass
39	2441	1.002	0.860	Pass
78	2480	1.002	0.860	Pass

Channel Separation Plot on Channel 00 - 01



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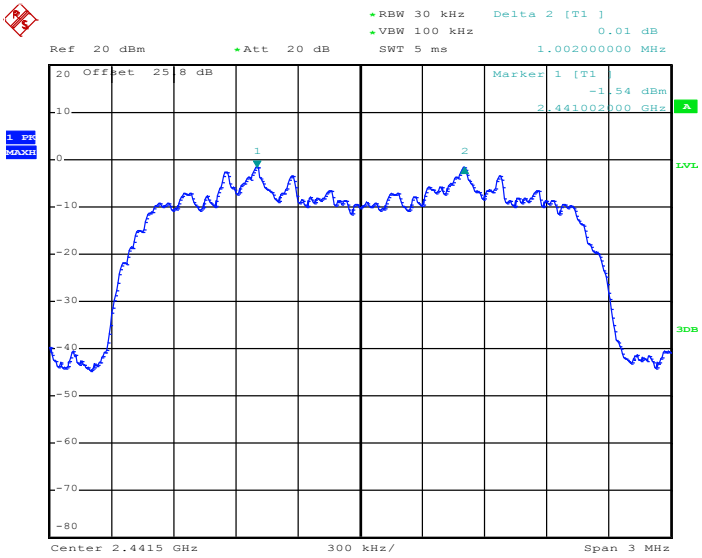
Channel Separation Plot on Channel 39 - 40



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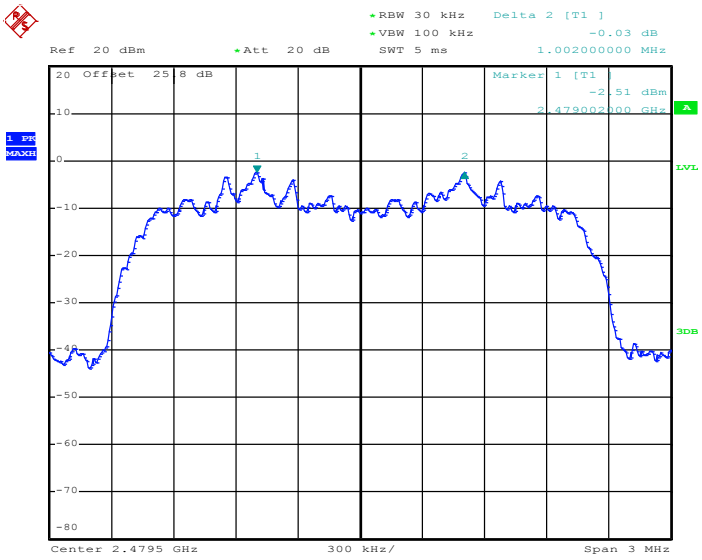
Channel Separation Plot on Channel 77 - 78



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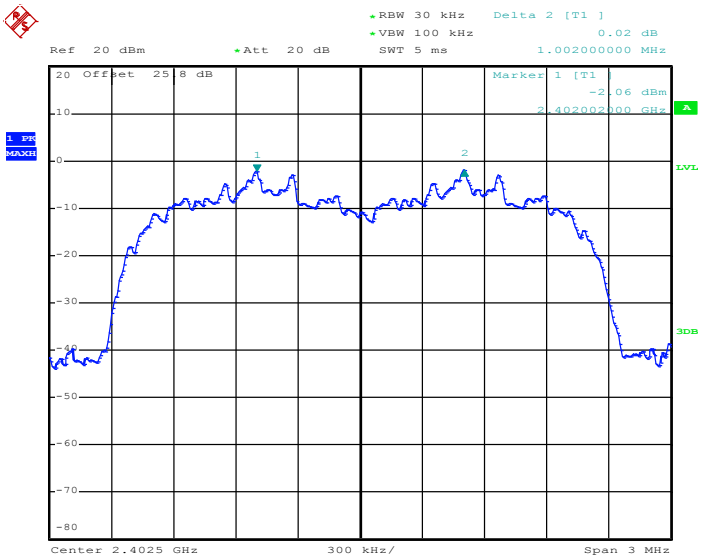
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Coyote Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.872	Pass
39	2441	1.002	0.872	Pass
78	2480	1.002	0.868	Pass

Channel Separation Plot on Channel 00 - 01



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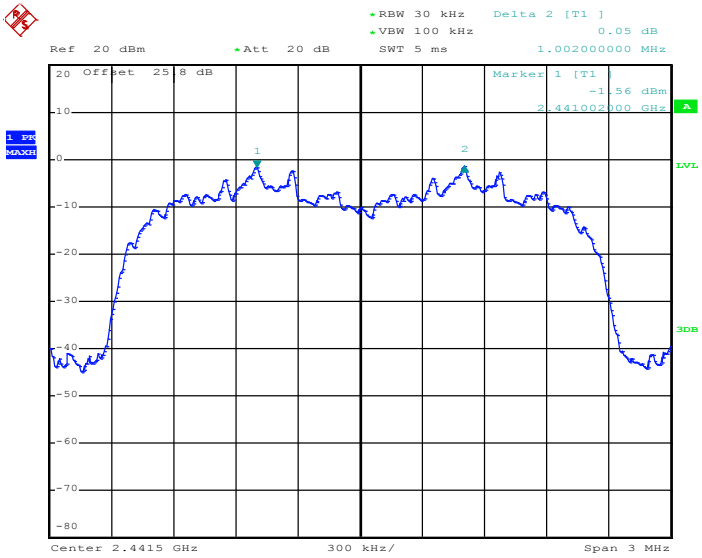
Channel Separation Plot on Channel 39 - 40



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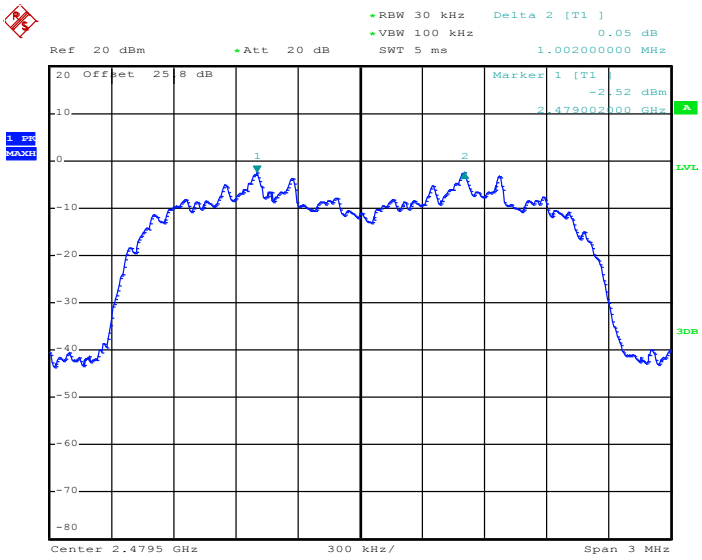
Channel Separation Plot on Channel 77 - 78



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3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

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

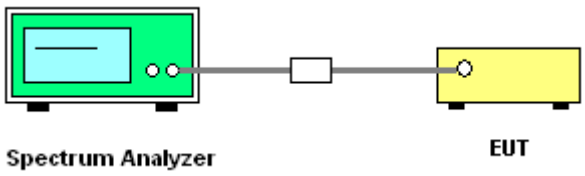
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.3.4 Test Setup



3.3.5 Test Result of Dwell Time

Test Mode :	DH5	Temperature :	24~26℃
Test Engineer :	Coyote 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	2.95	0.31	0.4	Pass
AFH	20	53.33	2.95	0.16	0.4	Pass

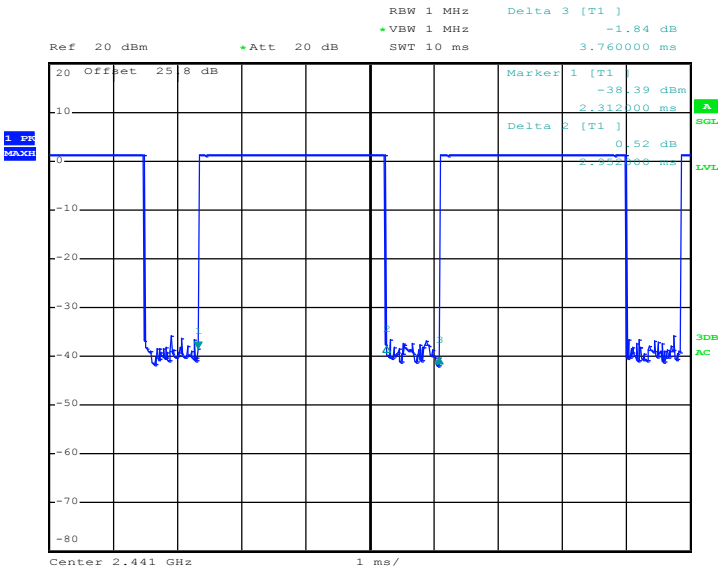
Remark:

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

2. In AFH mode, hopping rate is 800hops/s with 6 slots in 20 hopping channels.
With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s),
Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.33 hops.

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

Package Transfer Time Plot



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3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

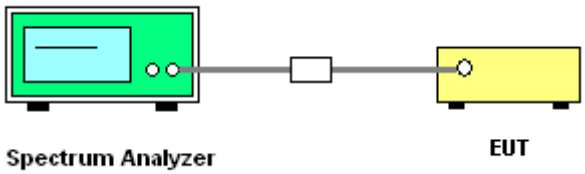
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
   Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel;
   RBW ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
   For 99% Bandwidth measurement, the RBW=30kHz, and VBW = 100kHz. Sweep = auto ;
   Detector function = sample. Trace = max hold.
6. Measure and record the results in the test report.

3.4.4 Test Setup

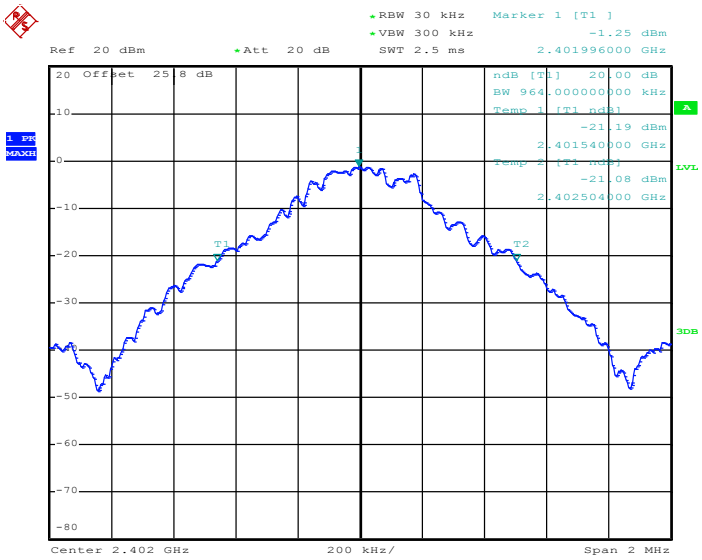


3.4.5 Test Result of 20dB Bandwidth

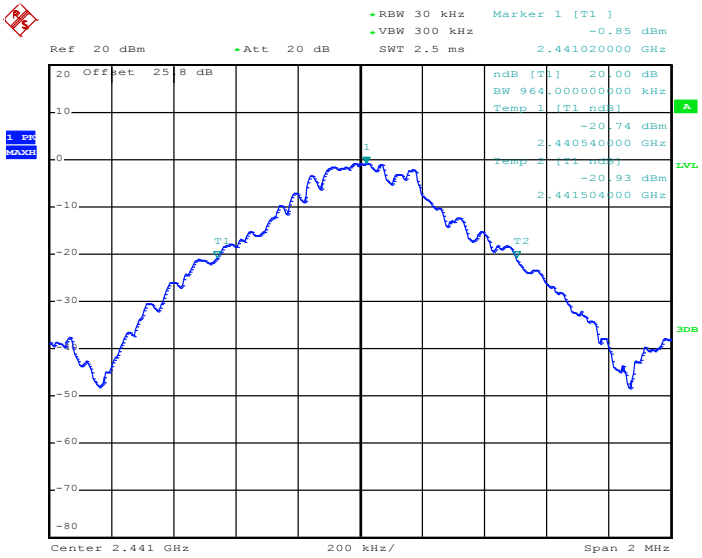
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Coyote Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.964
39	2441	0.964
78	2480	0.964

20 dB Bandwidth Plot on Channel 00

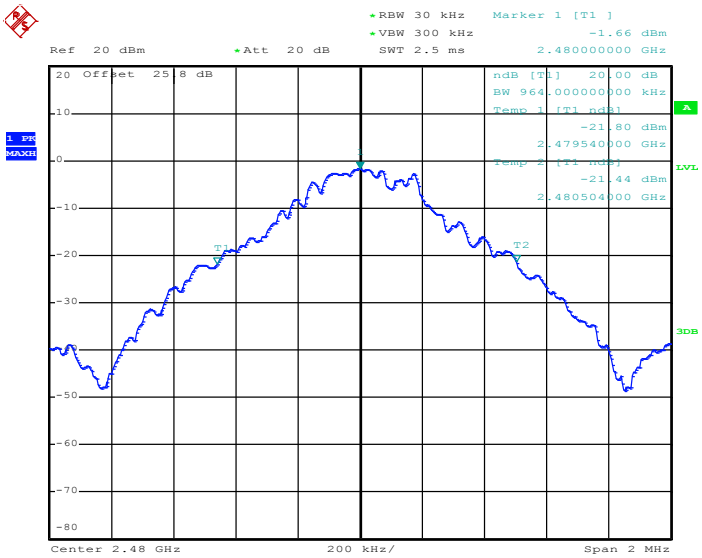


20 dB Bandwidth Plot on Channel 39



Date: 21.JUN.2013 09:20:38

20 dB Bandwidth Plot on Channel 78

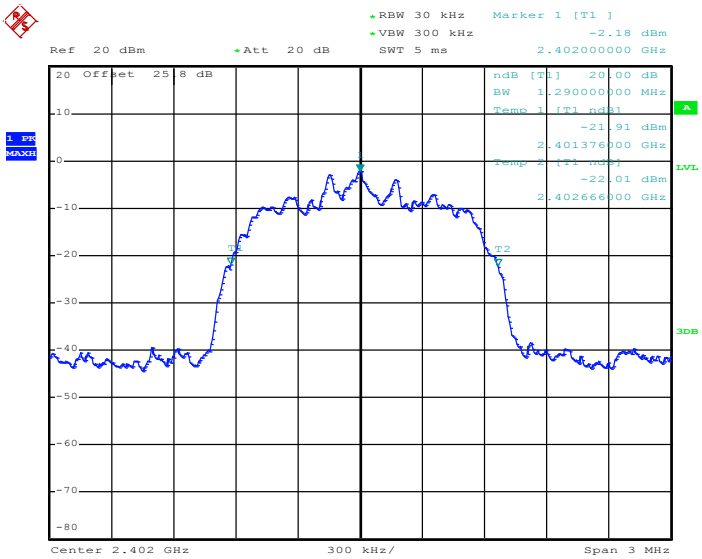


Date: 21.JUN.2013 09:21:13

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

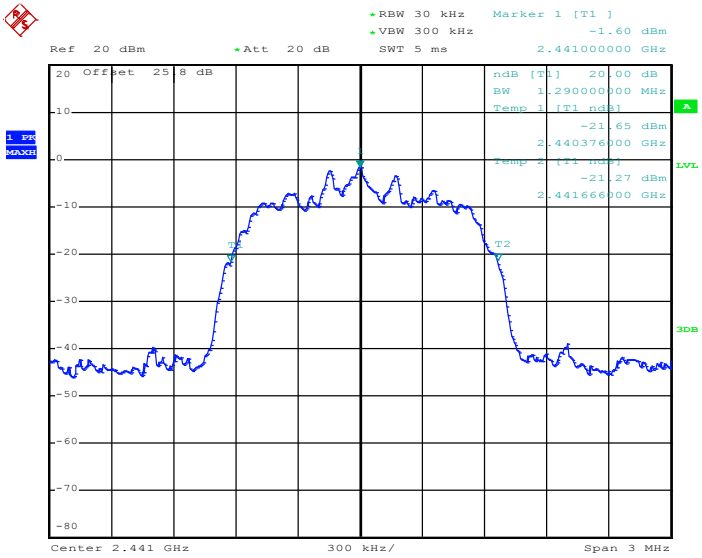
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.290
39	2441	1.290
78	2480	1.290

20 dB Bandwidth Plot on Channel 00



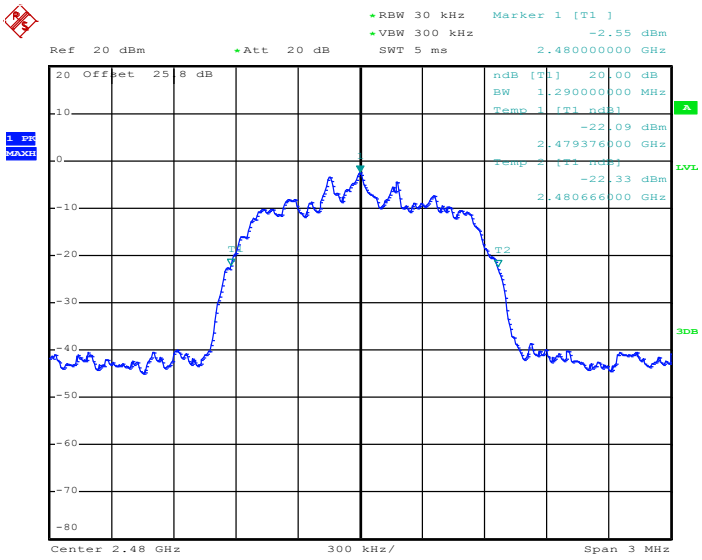
Date: 21.JUN.2013 09:22:04

20 dB Bandwidth Plot on Channel 39



Date: 21.JUN.2013 09:50:14

20 dB Bandwidth Plot on Channel 78

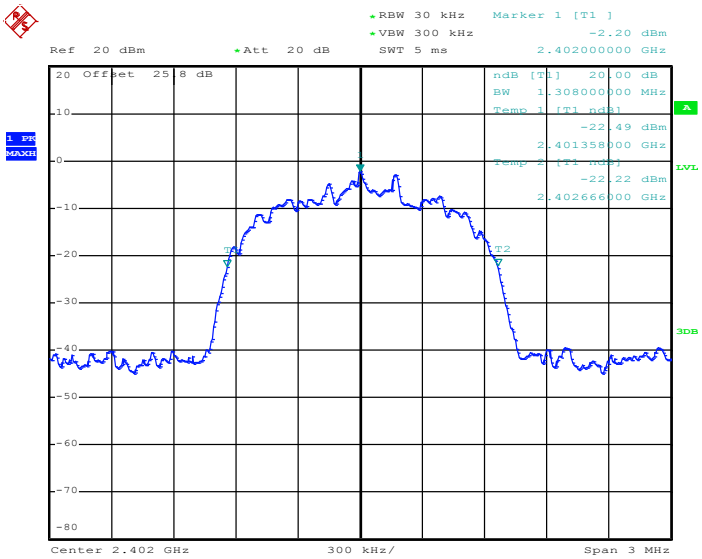


Date: 21.JUN.2013 09:23:22

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

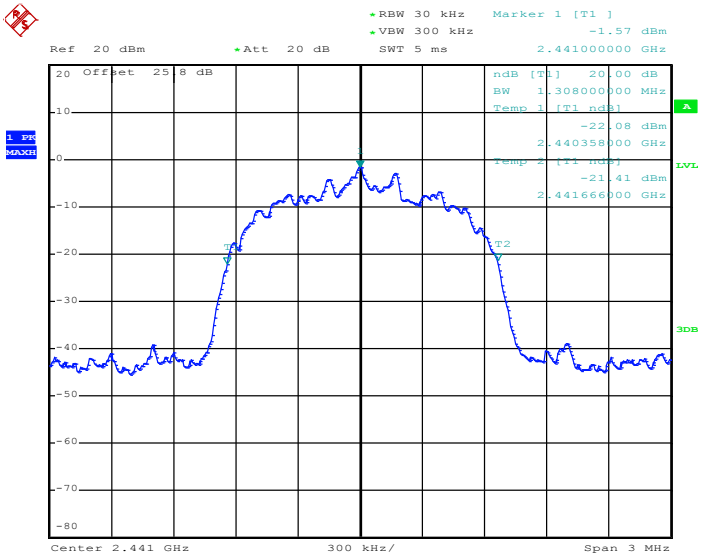
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.308
39	2441	1.308
78	2480	1.302

20 dB Bandwidth Plot on Channel 00



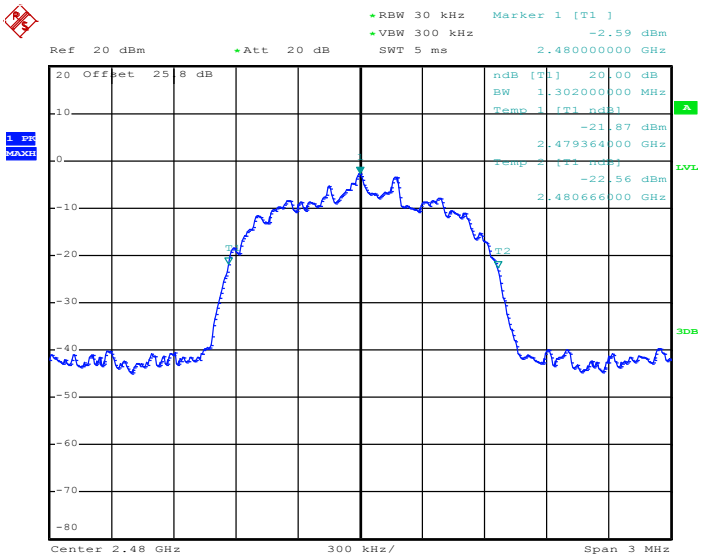
Date: 21.JUN.2013 09:23:52

20 dB Bandwidth Plot on Channel 39



Date: 21.JUN.2013 09:25:26

20 dB Bandwidth Plot on Channel 78



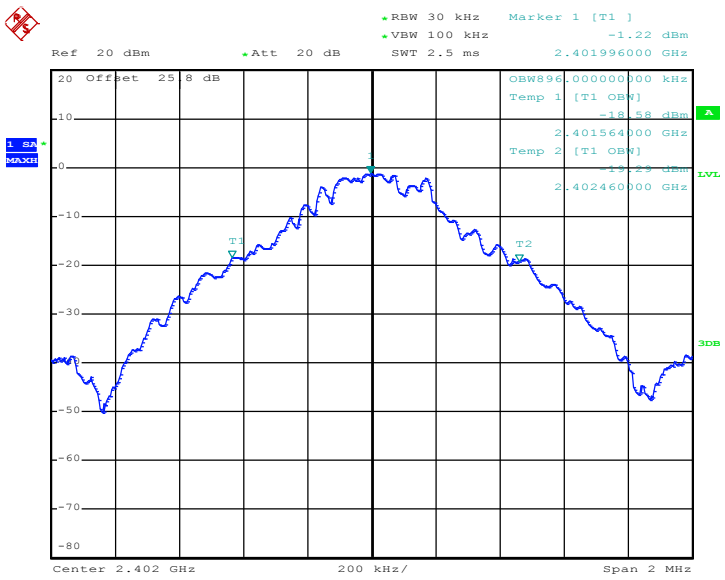
Date: 21.JUN.2013 09:25:54

3.4.6 Test Result of 99% Occupied Bandwidth

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

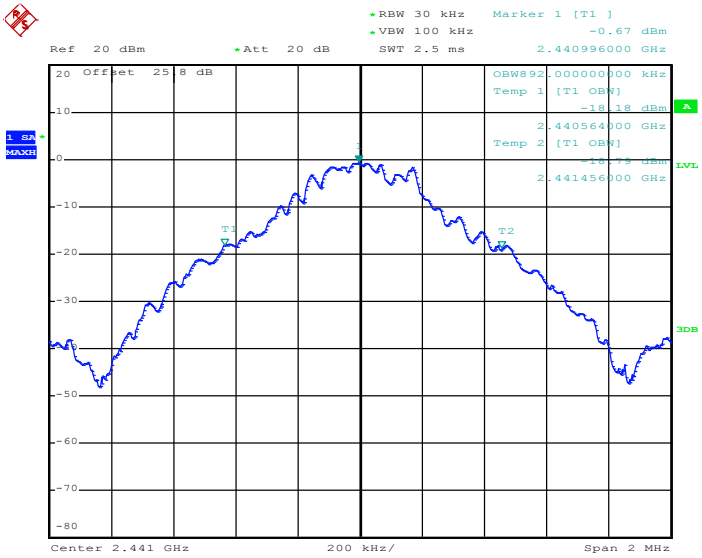
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	0.896
39	2441	0.892
78	2480	0.896

99% Occupied Bandwidth Plot on Channel 00



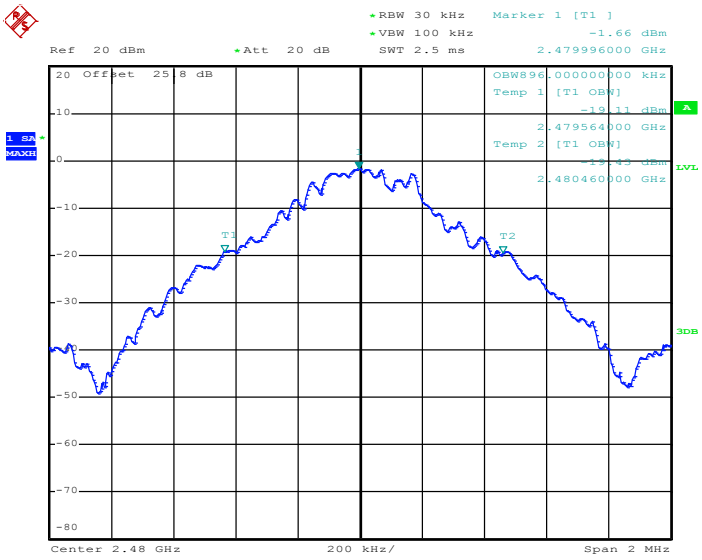
Date: 21.JUN.2013 10:26:58

99% Occupied Bandwidth Plot on Channel 39



Date: 21.JUN.2013 09:32:54

99% Occupied Bandwidth Plot on Channel 78

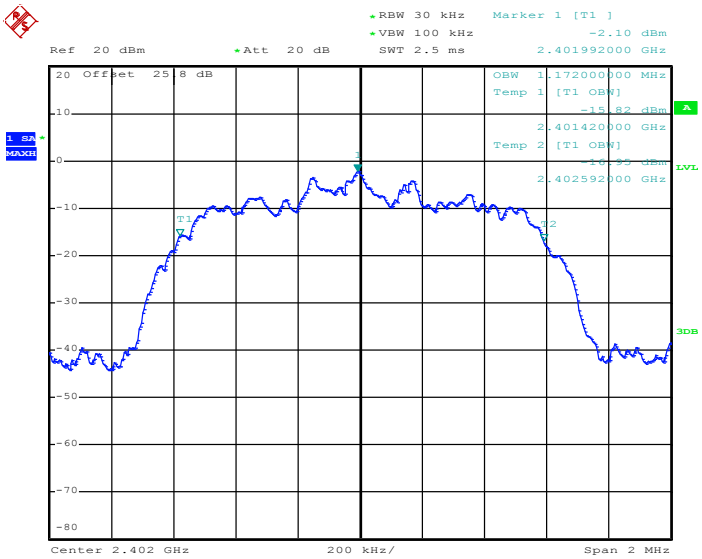


Date: 21.JUN.2013 09:33:30

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

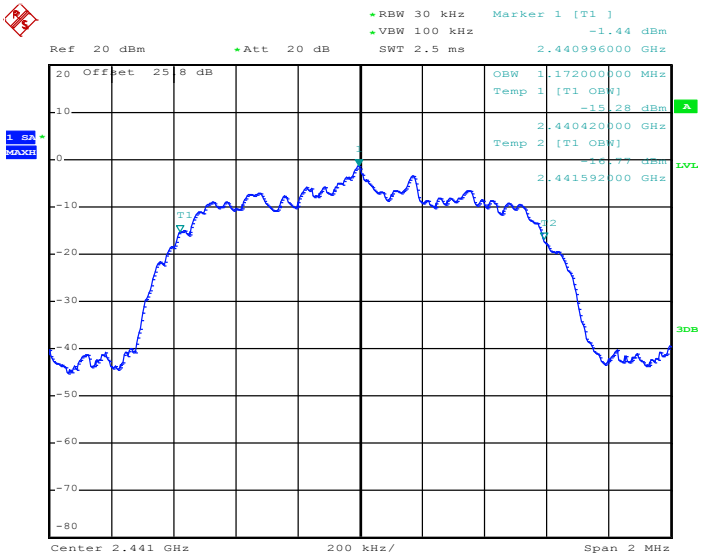
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.172
39	2441	1.172
78	2480	1.172

99% Occupied Bandwidth Plot on Channel 00



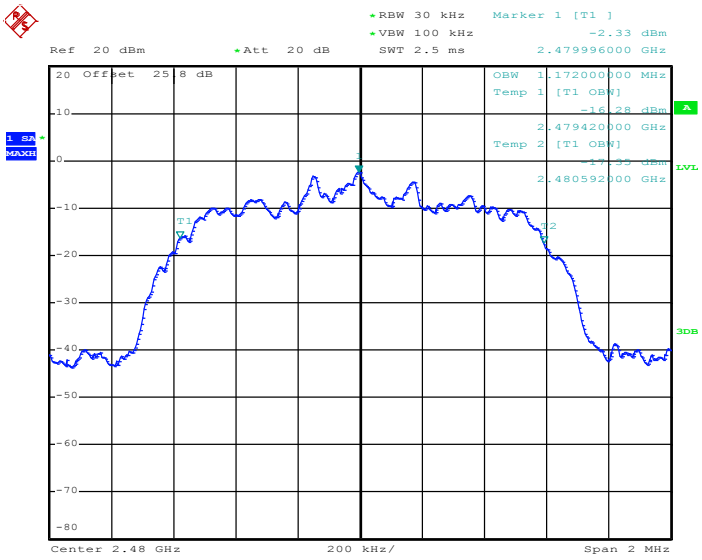
Date: 21.JUN.2013 09:34:06

99% Occupied Bandwidth Plot on Channel 39



Date: 21.JUN.2013 09:34:42

99% Occupied Bandwidth Plot on Channel 78

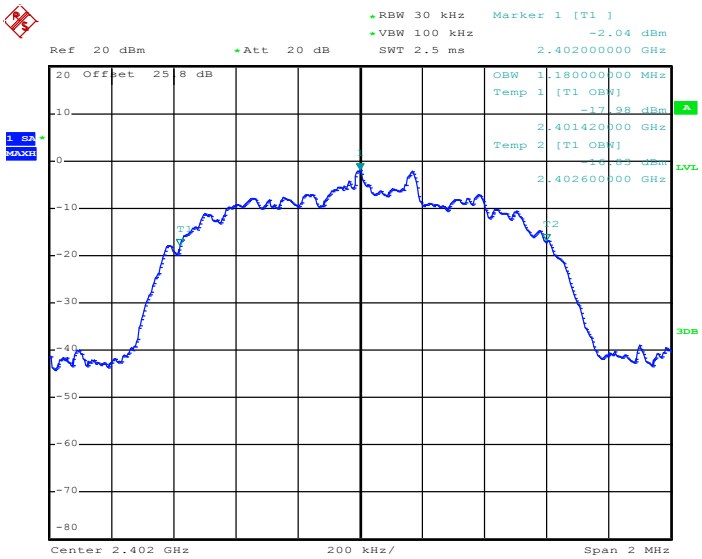


Date: 21.JUN.2013 09:35:18

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

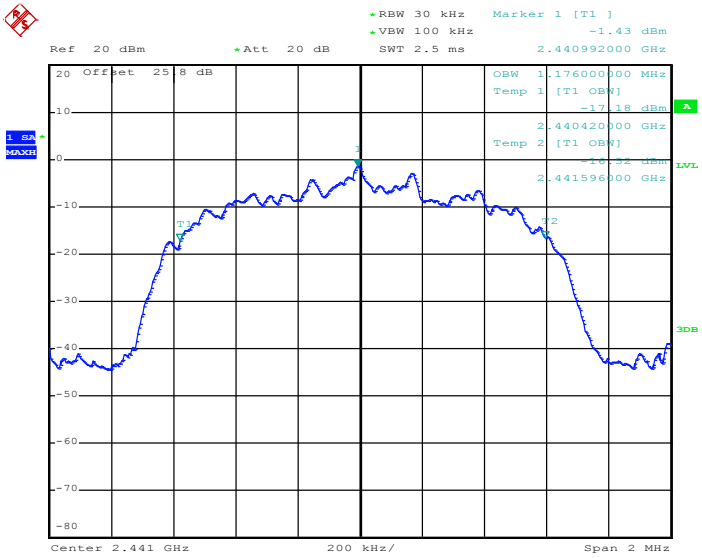
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.180
39	2441	1.176
78	2480	1.184

99% Occupied Bandwidth Plot on Channel 00



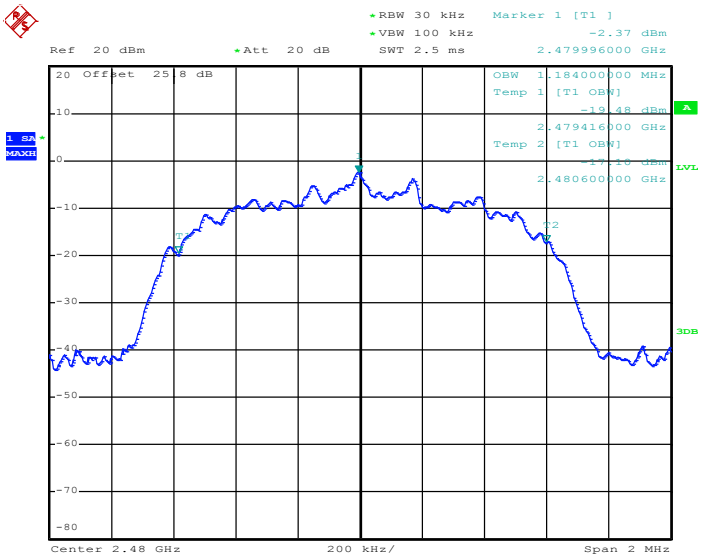
Date: 21.JUN.2013 09:35:54

99% Occupied Bandwidth Plot on Channel 39



Date: 21.JUN.2013 09:36:31

99% Occupied Bandwidth Plot on Channel 78



Date: 21.JUN.2013 09:37:07

3.5 Peak Output Power Measurement

3.5.1 Limit of Peak Output Power

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

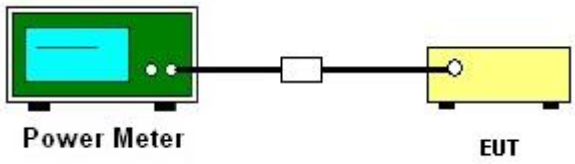
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

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

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	2.92	20.97	Pass
39	2441	3.38	20.97	Pass
78	2480	2.82	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 :	Coyote Lin	Relative Humidity :	50~53%

Channel	Frequency (MHz)	RF Power (dBm)		
		π /4-DQPSK	Max. Limits (dBm)	Pass/Fail
		2 Mbps		
00	2402	3.00	20.97	Pass
39	2441	3.68	20.97	Pass
78	2480	2.88	20.97	Pass

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

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	3.12	20.97	Pass
39	2441	3.65	20.97	Pass
78	2480	2.98	20.97	Pass

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

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

3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

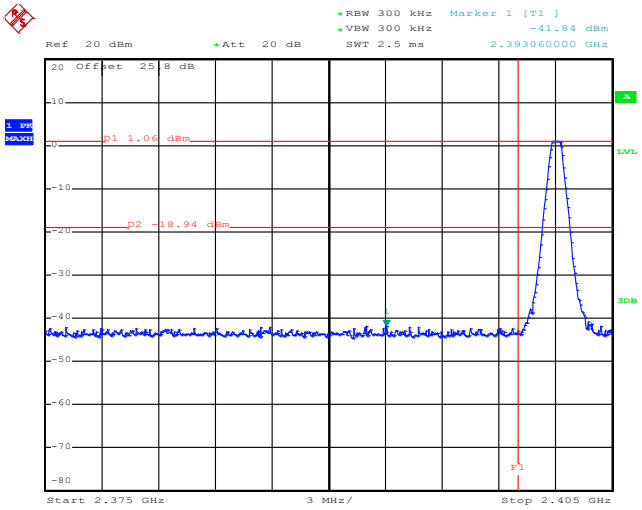
1. The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 300kHz (≥ 1% span=30MHz), VBW = 300kHz (≥ RBW). Band edge emissions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

3.6.4 Test Setup

3.6.6 Test Result of Conducted Band Edges

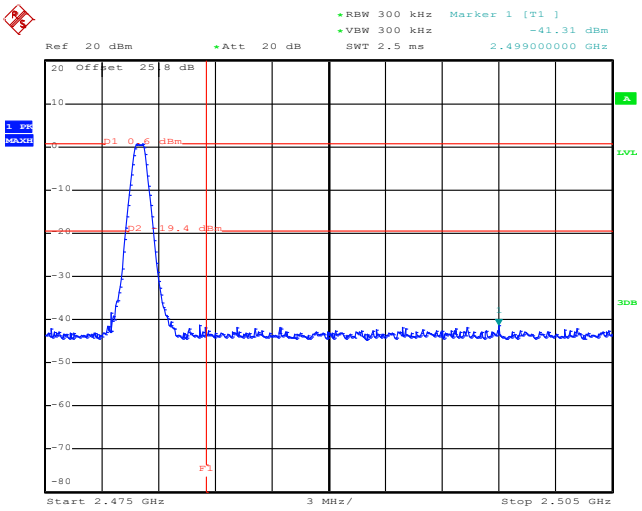
Test Mode :	1Mbps	Temperature :	24~26℃
Test Channel :	00 and 78	Relative Humidity :	50~53%
		Test Engineer :	Coyote Lin

Low Band Edge Plot on Channel 00



Date: 21.JUN.2013 09:26:47

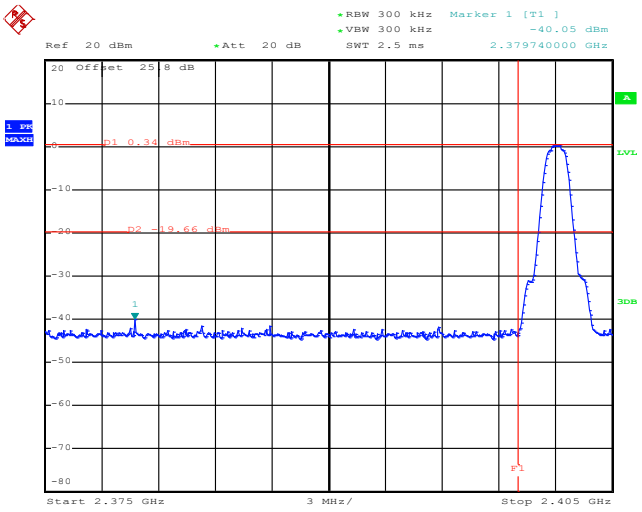
High Band Edge Plot on Channel 78



Date: 21.JUN.2013 09:27:51

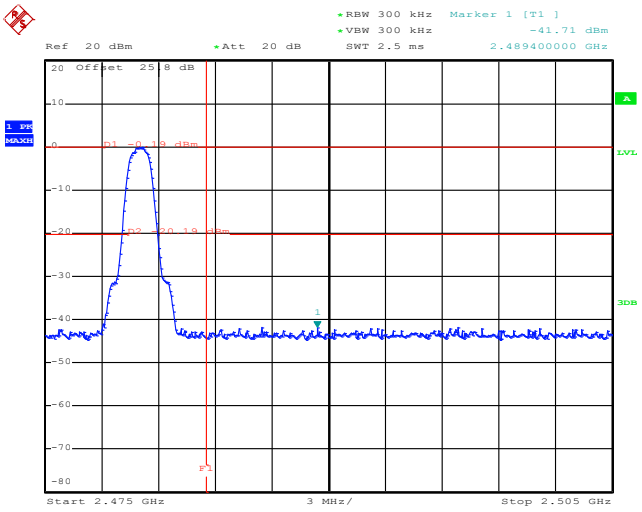
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Coyote Lin

Low Band Edge Plot on Channel 00



Date: 21.JUN.2013 09:28:42

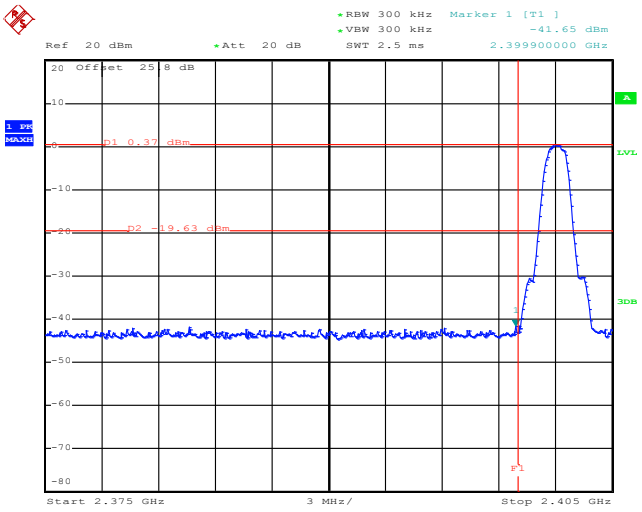
High Band Edge Plot on Channel 78



Date: 21.JUN.2013 09:29:46

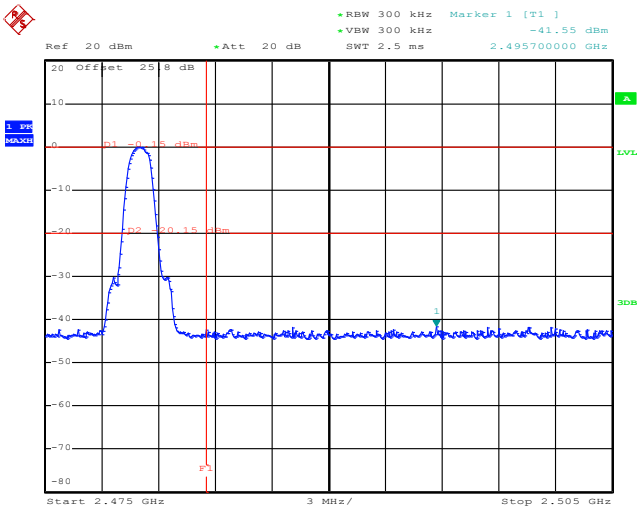
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Coyote Lin

Low Band Edge Plot on Channel 00



Date: 21.JUN.2013 09:30:37

High Band Edge Plot on Channel 78

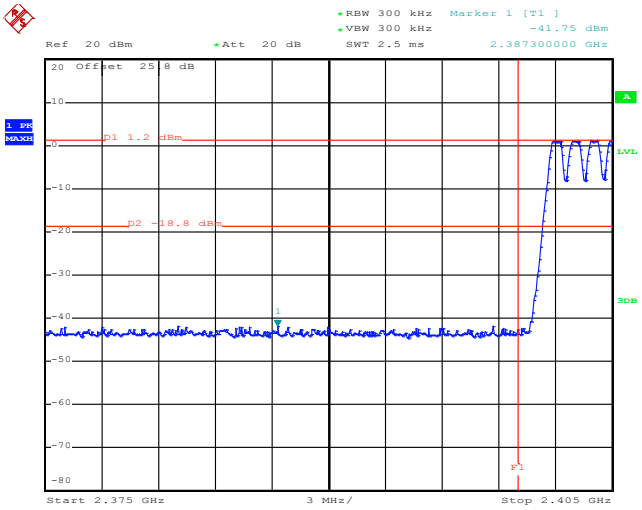


Date: 21.JUN.2013 09:31:40

3.6.7 Test Result of Conducted Hopping Mode Band Edges

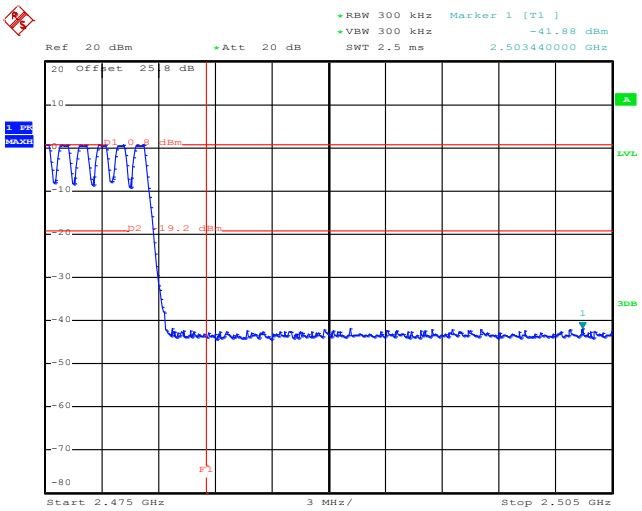
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Coyote Lin	Relative Humidity :	50~53%

1Mbps Hopping Mode Low Band Edge Plot



Date: 21.JUN.2013 10:33:22

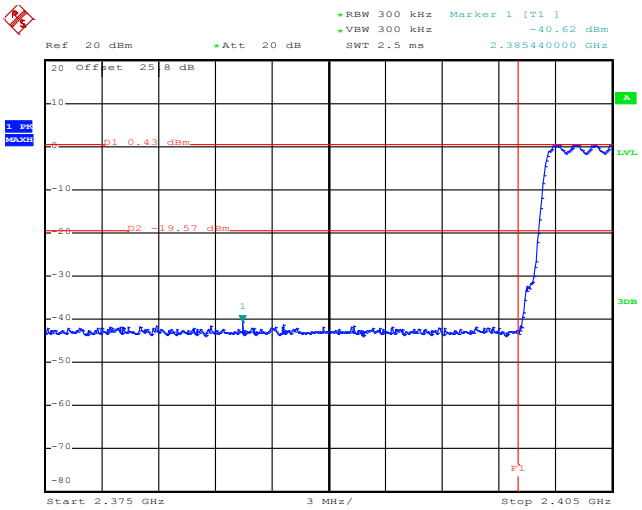
1Mbps Hopping Mode High Band Edge Plot



Date: 21.JUN.2013 10:32:24

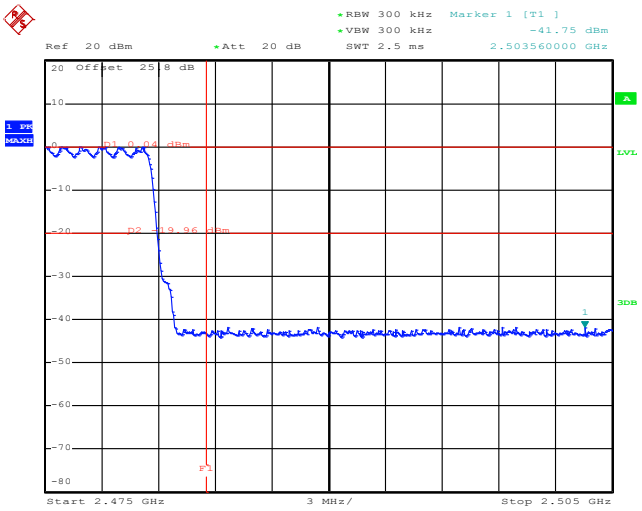
Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Coyote Lin	Relative Humidity :	50~53%

2Mbps Hopping Mode Low Band Edge Plot



Date: 21.JUN.2013 10:25:33

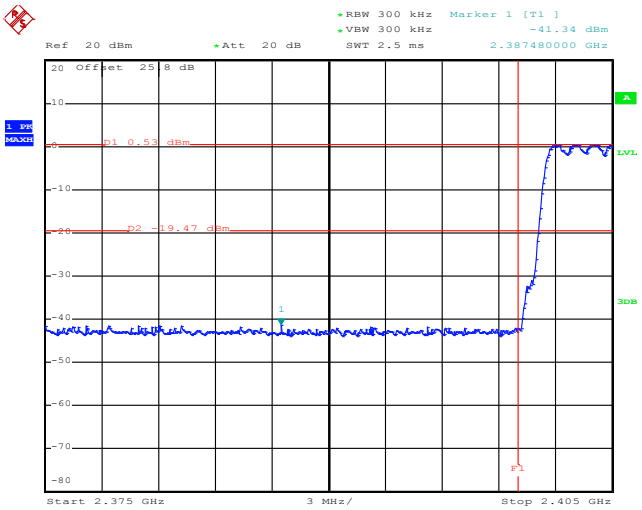
2Mbps Hopping Mode High Band Edge Plot



Date: 21.JUN.2013 10:31:03

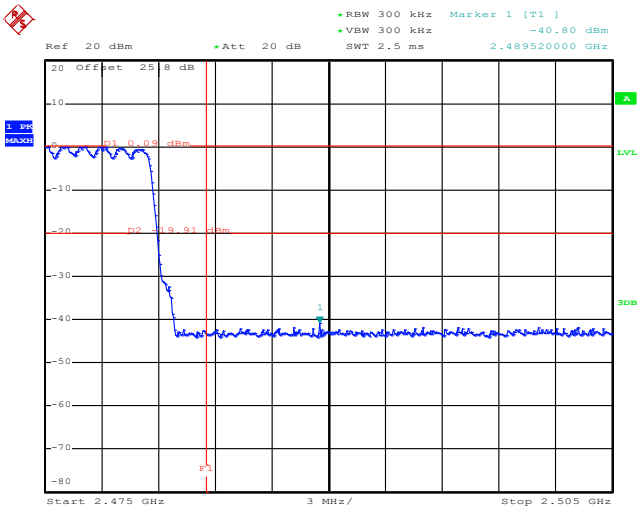
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Coyote Lin	Relative Humidity :	50~53%

3Mbps Hopping Mode Low Band Edge Plot



Date: 21.JUN.2013 10:36:57

3Mbps Hopping Mode High Band Edge Plot



Date: 21.JUN.2013 10:38:55

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

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

3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

3.7.3 Test Procedure

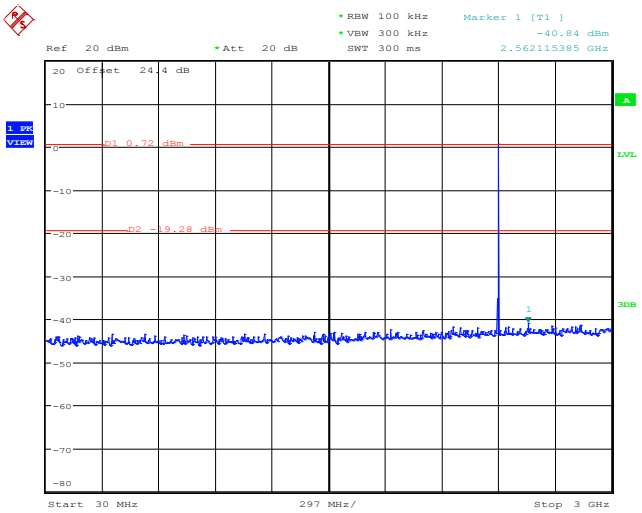
1. The testing follows the guidelines in Spurious RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.7.4 Test Setup

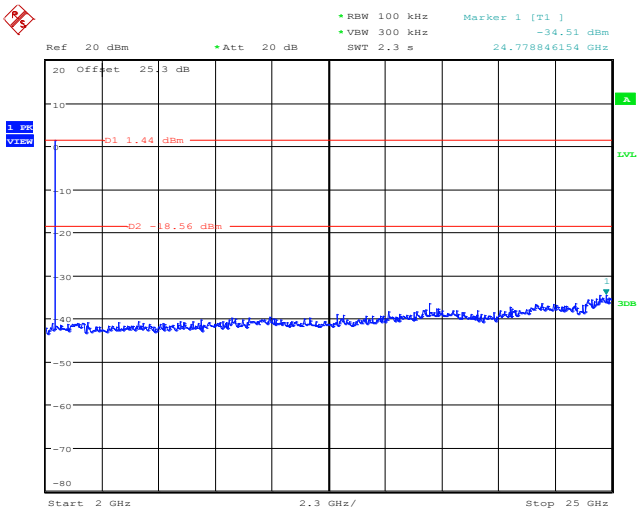
3.7.5 Test Result of Conducted Spurious Emission

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

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

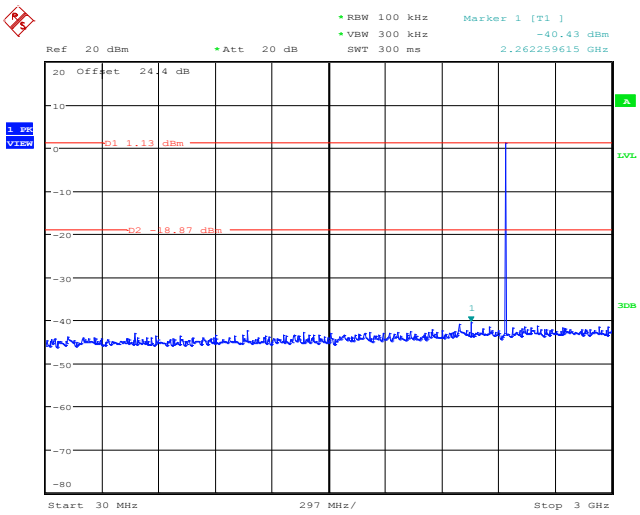


1Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



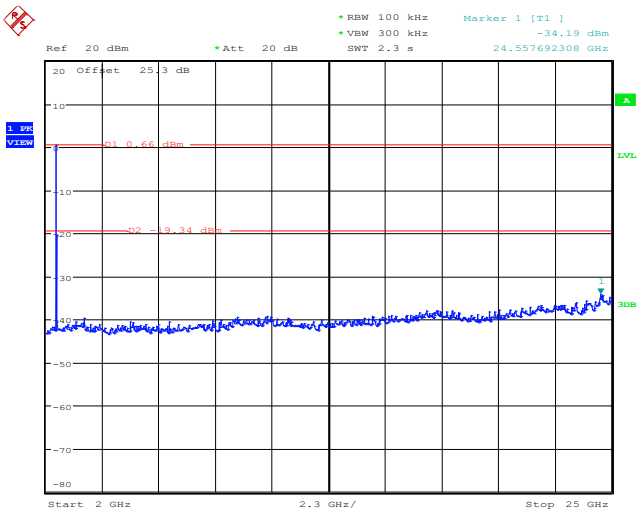
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	39	**Relative Humidity :**	50~53%
		Test Engineer :	Coyote Lin

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



Date: 2.JUL.2013 09:21:11

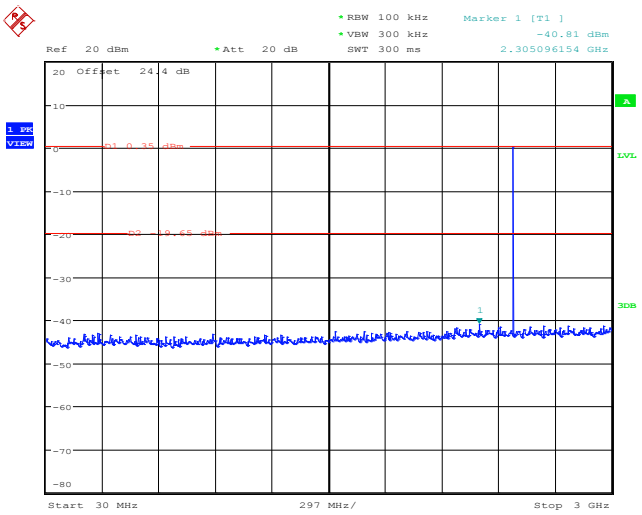
1Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 2.JUL.2013 09:21:32

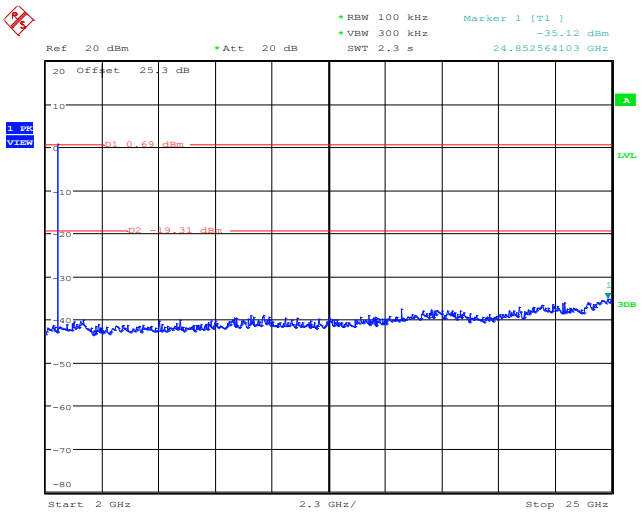
Test Mode :	1Mbps	Temperature :	24~26℃
Test Channel :	78	Relative Humidity :	50~53%
		Test Engineer :	Coyote Lin

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



Date: 2.JUL.2013 09:22:09

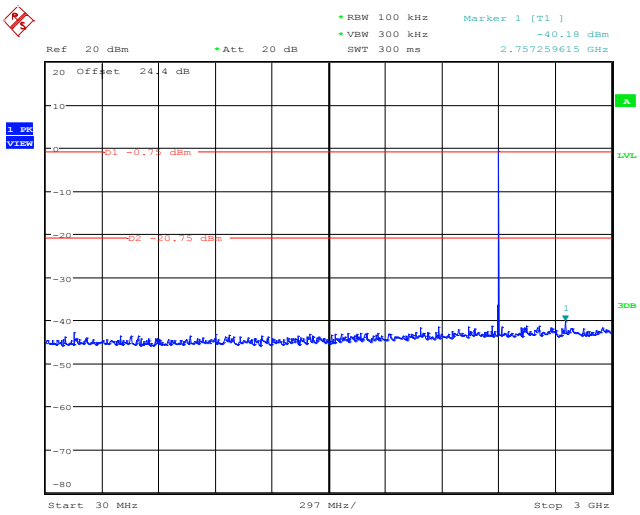
1Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 2.JUL.2013 09:22:30

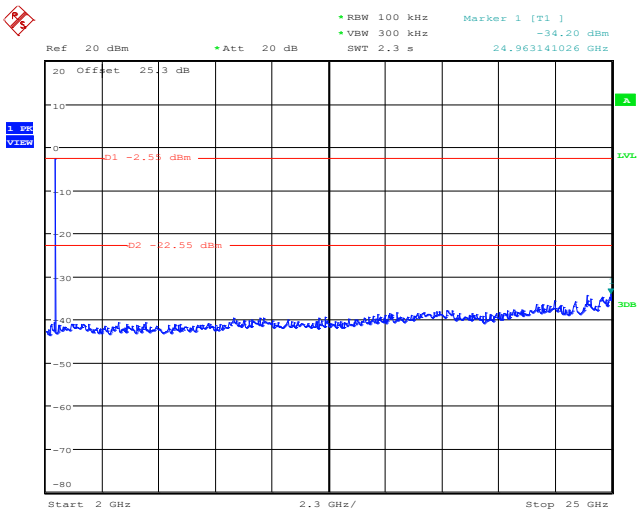
Test Mode :	2Mbps	Temperature :	24~26℃
Test Channel :	00	Relative Humidity :	50~53%
		Test Engineer :	Coyote Lin

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



Date: 2.JUL.2013 09:33:04

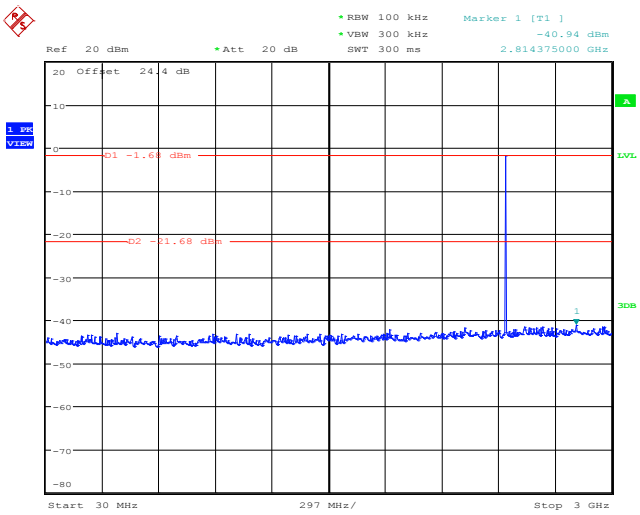
2Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 2.JUL.2013 09:33:26

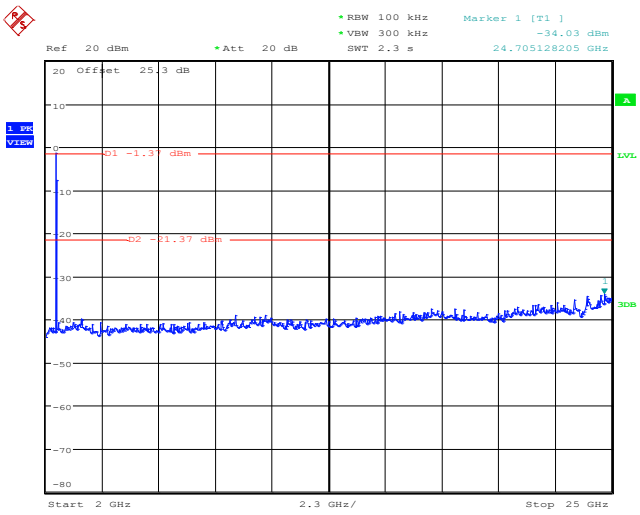
Test Mode :	2Mbps	Temperature :	24~26℃
Test Channel :	39	Relative Humidity :	50~53%
		Test Engineer :	Coyote Lin

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



Date: 2.JUL.2013 09:30:25

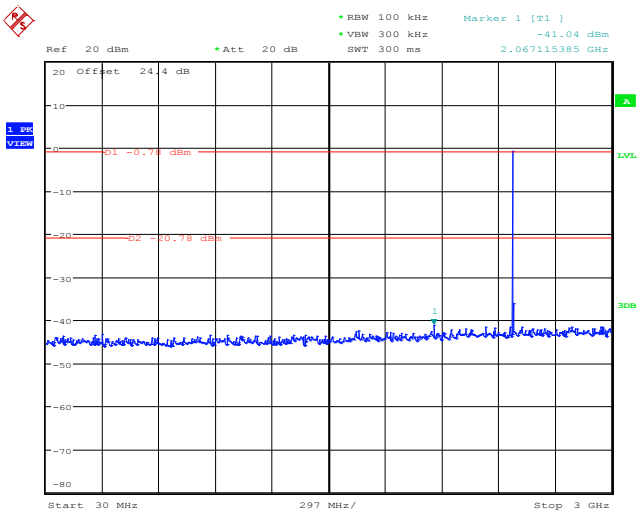
2Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 2.JUL.2013 09:30:46

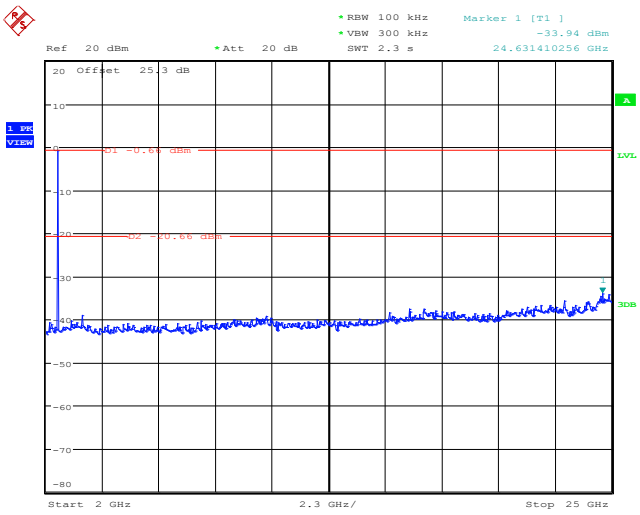
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	78	**Relative Humidity :**	50~53%
		Test Engineer :	Coyote Lin

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



Date: 2.JUL.2013 09:31:15

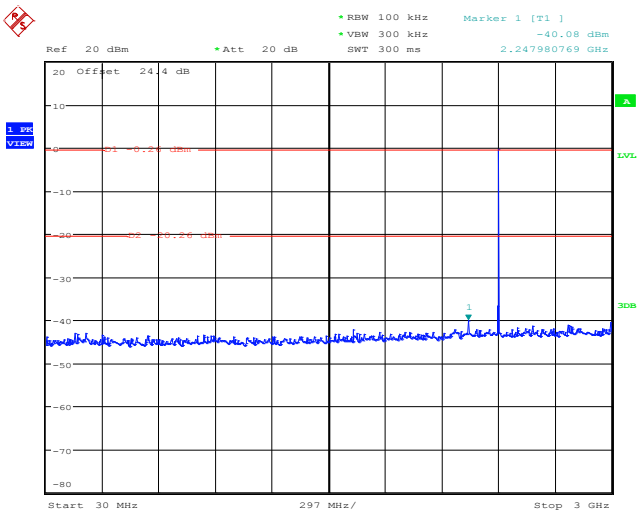
2Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 2.JUL.2013 09:31:37

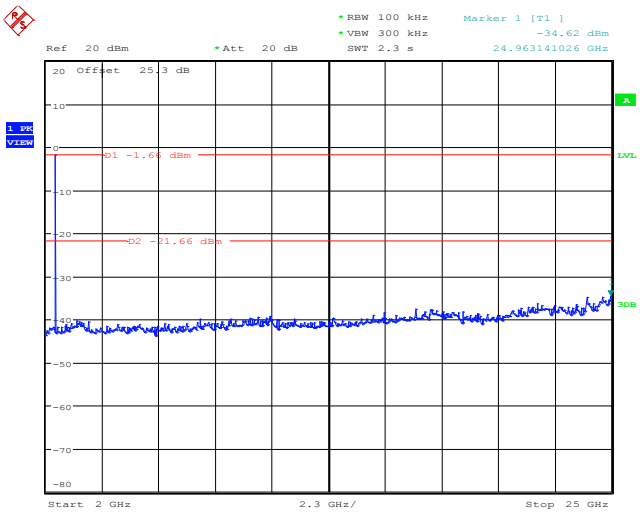
Test Mode :	3Mbps	Temperature :	24~26℃
Test Channel :	00	Relative Humidity :	50~53%
		Test Engineer :	Coyote Lin

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



Date: 2.JUL.2013 09:34:05

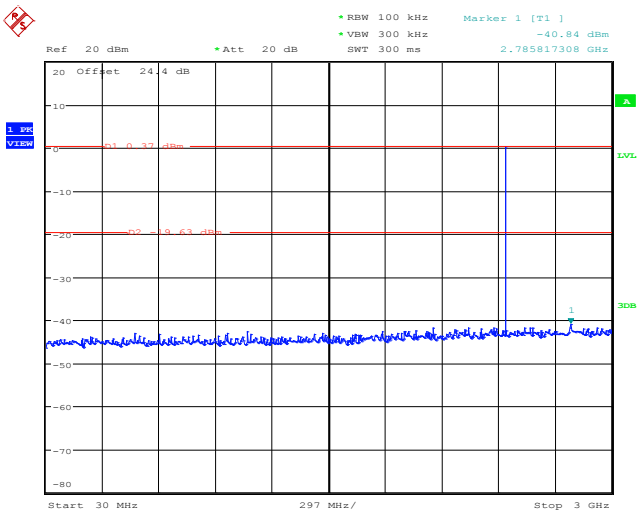
3Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



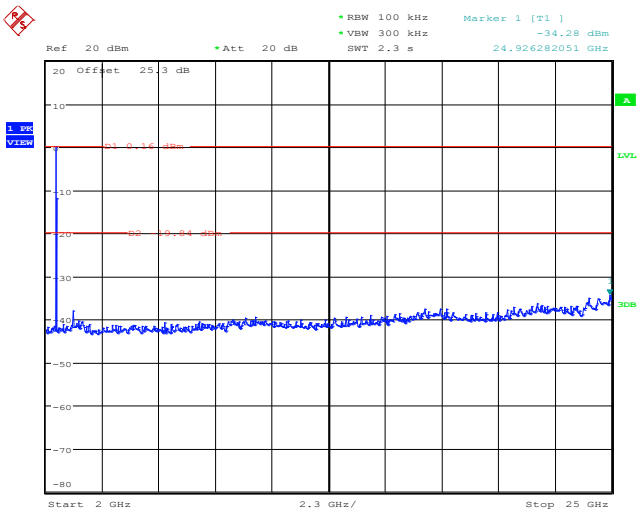
Date: 2.JUL.2013 09:34:26

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

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

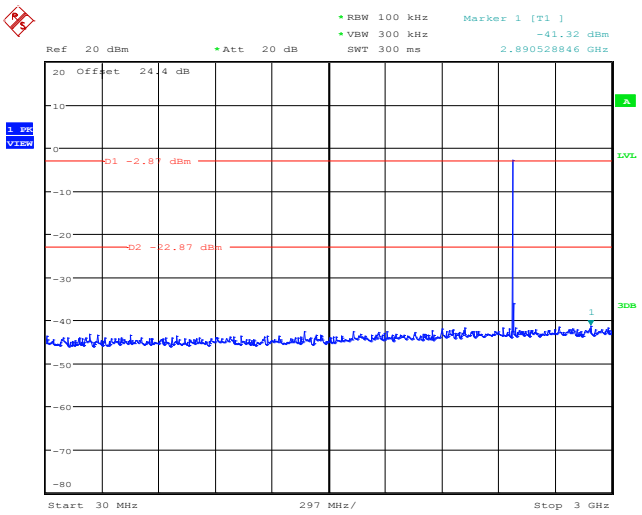


3Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



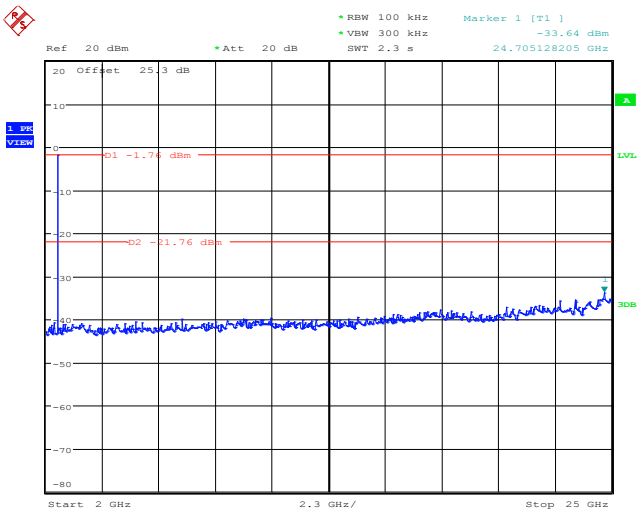
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	78	**Relative Humidity :**	50~53%
		Test Engineer :	Coyote Lin

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



Date: 2.JUL.2013 09:37:31

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



Date: 2.JUL.2013 09:37:52

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

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

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

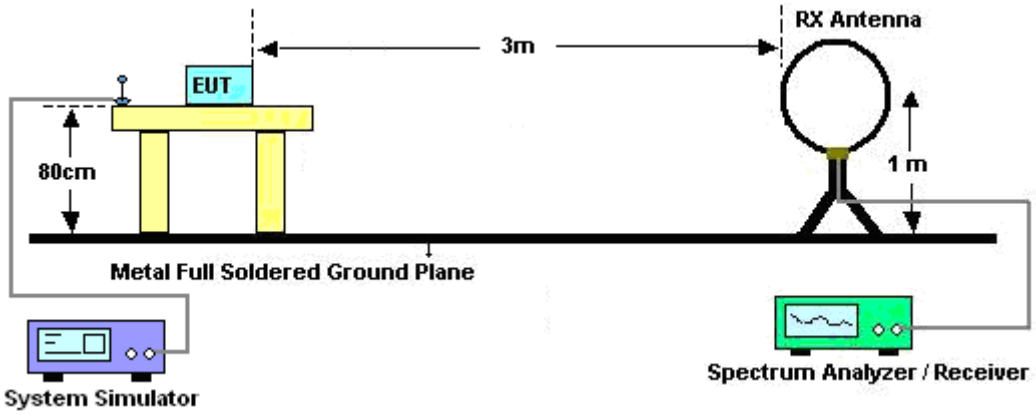
3.8.3 Test Procedures

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines and the guidelines in ANSI C63.10-2009.
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

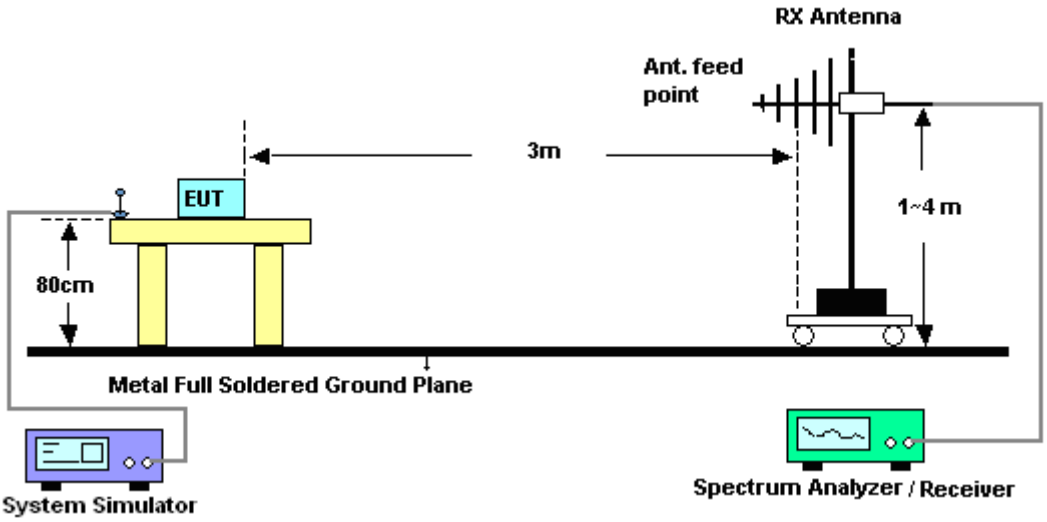
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.79dB) derived from 20log (dwell time/100ms).

3.8.4 Test Setup

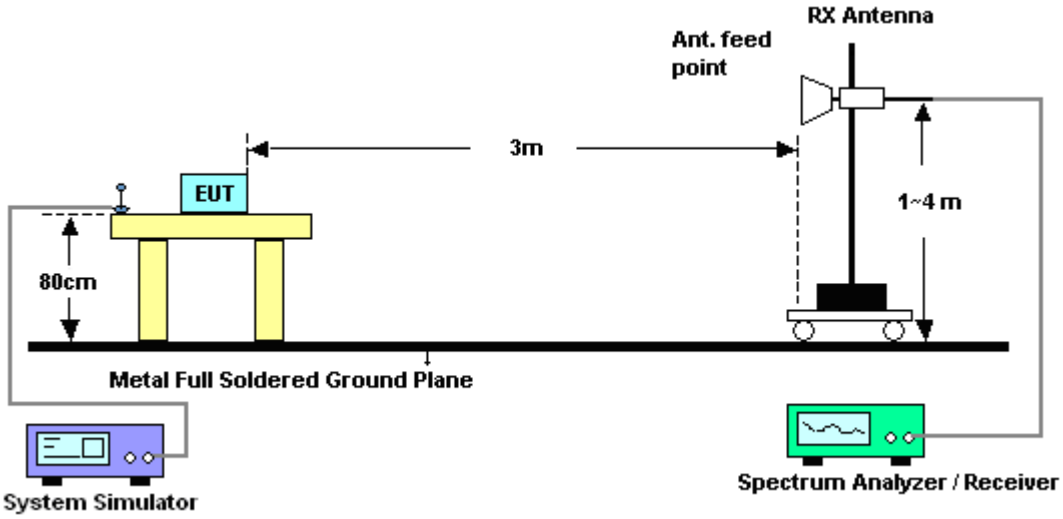
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

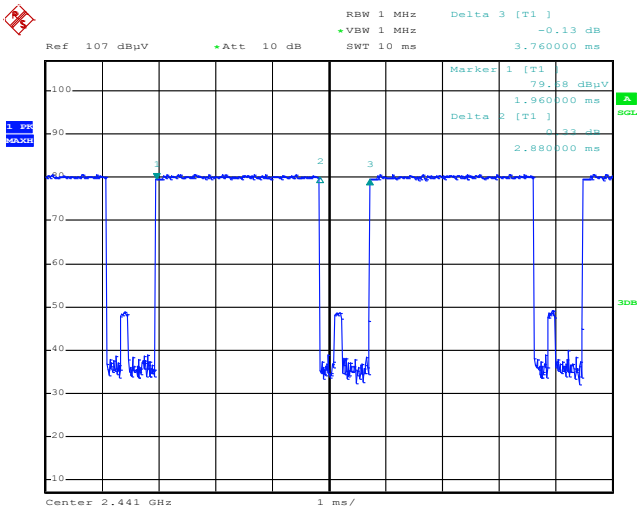


3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

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.

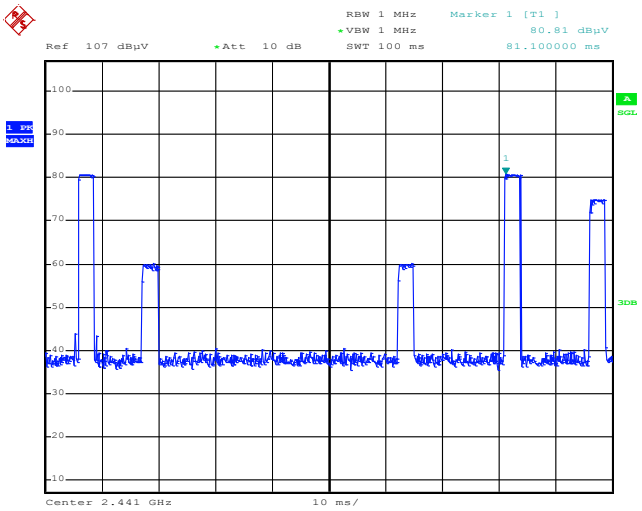
3.8.6 Duty cycle correction factor for average measurement

2DH5 on time (One Pulse) Plot on Channel 39



Date: 9.JUL.2013 19:15:16

2DH5 on time (Count Pulses) Plot on Channel 39



Date: 9.JUL.2013 19:16:40

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. 2DH5 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 :	2Mbps	Temperature :	21~23°C
Test Channel :	00	Relative Humidity :	51~53%
		Test Engineer :	Eric Shih

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
2358.96	46.43	-27.57	74	41.54	32.26	6.88	34.25	101	53	Peak
2358.96	21.64	-32.36	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
2345.19	46.52	-27.48	74	41.69	32.24	6.84	34.25	104	307	Peak
2345.19	21.73	-32.27	54	-	-	-	-	-	-	Average

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 = 46.43dBµV/m – 24.79 (dB) = 21.64dBµV/m.

Test Mode :	2Mbps	Temperature :	21~23°C
Test Channel :	78	Relative Humidity :	51~53%
		Test Engineer :	Eric Shih

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	64.6	-9.4	74	59.59	32.38	7.06	34.43	121	49	Peak
2483.5	39.81	-14.19	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	61.56	-12.44	74	56.55	32.38	7.06	34.43	157	87	Peak
2483.5	36.77	-17.23	54	-	-	-	-	-	-	Average

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

Test Mode :	2Mbps	**Temperature :**	21~23°C
Test Channel :	00	**Relative Humidity :**	51~53%
Test Engineer :	Eric Shih	**Polarization :**	Horizontal
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 7206 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 102.33dBµV/m - 20dB = 82.33dBµV/m.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
47.82	31.28	-8.72	40	52.51	9.3	0.67	31.2	182	66	Peak
149.34	26.53	-16.97	43.5	45.2	11.22	1.21	31.1	-	-	Peak
243.57	22.14	-23.86	46	39.48	12.13	1.53	31	-	-	Peak
541.5	24.21	-21.79	46	33.66	18.79	2.53	30.77	-	-	Peak
721.4	22.14	-23.86	46	28.63	20.92	2.99	30.4	-	-	Peak
892.9	24.83	-21.17	46	28.78	23.03	3.33	30.31	-	-	Peak
2402	102.33	-	-	97.42	32.3	6.91	34.3	101	53	Peak
2402	77.54	-	-	-	-	-	-	-	-	Average
4803	40.72	-33.28	74	56.95	33.98	8.75	58.96	100	0	Peak
4803	15.93	-38.07	54	-	-	-	-	-	-	Average
7206	42.17	-40.16	82.33	53.43	35.56	10.81	57.63	100	0	Peak

Note:

1. Other harmonics are lower than background noise.
2. 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 = 102.33dBµV/m – 24.79 (dB) = 77.54dBµV/m.

Test Mode :	2Mbps	Temperature :	21~23°C
Test Channel :	00	Relative Humidity :	51~53%
Test Engineer :	Eric Shih	Polarization :	Vertical
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 7206 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
49.17	31.71	-8.29	40	53.72	8.5	0.69	31.2	107	336	Peak
140.7	18.81	-24.69	43.5	37.33	11.38	1.2	31.1	-	-	Peak
256.53	16.88	-29.12	46	33.61	12.7	1.57	31	-	-	Peak
509.3	20.23	-25.77	46	30.15	18.25	2.47	30.64	-	-	Peak
689.9	22.1	-23.9	46	29.09	20.51	2.92	30.42	-	-	Peak
867.7	24.55	-21.45	46	28.83	22.78	3.3	30.36	-	-	Peak
2402	93.31	-	-	88.4	32.3	6.91	34.3	104	307	Peak
2402	68.52	-	-	-	-	-	-	-	-	Average
4803	40.34	-33.66	74	56.57	33.98	8.75	58.96	100	0	Peak
4803	15.55	-38.45	54	-	-	-	-	-	-	Average
7206	42	-31.31	73.31	53.26	35.56	10.81	57.63	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	2Mbps	Temperature :	21~23°C
Test Channel :	39	Relative Humidity :	51~53%
Test Engineer :	Eric Shih	Polarization :	Horizontal
Remark :	2442 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30	35.4	-4.6	40	46.37	20	0.53	31.5	133	285	Peak
148.53	27.06	-16.44	43.5	45.71	11.24	1.21	31.1	-	-	Peak
255.72	22.85	-23.15	46	39.6	12.68	1.57	31	-	-	Peak
499.5	21.97	-24.03	46	32.04	18.08	2.45	30.6	-	-	Peak
584.2	22.46	-23.54	46	30.96	19.52	2.64	30.66	-	-	Peak
906.2	25.79	-20.21	46	29.56	23.19	3.35	30.31	-	-	Peak
2442	102.79	-	-	97.84	32.35	6.99	34.39	101	165	Peak
2442	78	-	-	-	-	-	-	-	-	Average
4881	40.24	-33.76	74	56.27	33.95	8.85	58.83	100	0	Peak
4881	15.45	-38.55	54	-	-	-	-	-	-	Average
7323	41.18	-32.82	74	52.48	35.53	10.91	57.74	100	0	Peak
7323	16.39	-37.61	54	-	-	-	-	-	-	Average

Note: Other harmonics are lower than background noise.

Test Mode :	2Mbps	Temperature :	21~23°C
Test Channel :	39	Relative Humidity :	51~53%
Test Engineer :	Eric Shih	Polarization :	Vertical
Remark :	2442 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
47.82	31.55	-8.45	40	52.78	9.3	0.67	31.2	125	228	Peak
146.1	18.51	-24.99	43.5	37.13	11.27	1.21	31.1	-	-	Peak
212.25	20.93	-22.57	43.5	40.66	9.98	1.37	31.08	-	-	Peak
487.6	18.79	-27.21	46	29.27	17.84	2.41	30.73	-	-	Peak
605.2	23.02	-22.98	46	31.07	19.84	2.7	30.59	-	-	Peak
820.8	24.11	-21.89	46	28.96	22.3	3.19	30.34	-	-	Peak
2442	96.19	-	-	91.24	32.35	6.99	34.39	132	305	Peak
2442	71.4	-	-	-	-	-	-	-	-	Average
4881	40.57	-33.43	74	56.6	33.95	8.85	58.83	100	0	Peak
4881	15.78	-38.22	54	-	-	-	-	-	-	Average
7323	41.71	-32.29	74	53.01	35.53	10.91	57.74	100	0	Peak
7323	16.92	-37.08	54	-	-	-	-	-	-	Average

Note: Other harmonics are lower than background noise.

Test Mode :	2Mbps	Temperature :	21~23°C
Test Channel :	78	Relative Humidity :	51~53%
Test Engineer :	Eric Shih	Polarization :	Horizontal
Remark :	2482 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
47.82	33.38	-6.62	40	54.61	9.3	0.67	31.2	138	156	Peak
139.89	25.15	-18.35	43.5	43.65	11.4	1.2	31.1	-	-	Peak
254.64	22.38	-23.62	46	39.15	12.67	1.56	31	-	-	Peak
499.5	21.86	-24.14	46	31.93	18.08	2.45	30.6	-	-	Peak
563.2	22.32	-23.68	46	31.31	19.17	2.59	30.75	-	-	Peak
874	25.03	-20.97	46	29.24	22.84	3.3	30.35	-	-	Peak
2482	102.57	-	-	97.56	32.38	7.06	34.43	121	49	Peak
2482	77.78	-	-	-	-	-	-	-	-	Average
4959	40.06	-33.94	74	55.89	33.91	8.92	58.66	100	0	Peak
4959	15.27	-38.73	54	-	-	-	-	-	-	Average
7440	41.71	-32.29	74	53.01	35.51	11.04	57.85	100	0	Peak
7440	16.92	-37.08	54	-	-	-	-	-	-	Average

Note: Other harmonics are lower than background noise.

Test Mode :	2Mbps	Temperature :	21~23°C
Test Channel :	78	Relative Humidity :	51~53%
Test Engineer :	Eric Shih	Polarization :	Vertical
Remark :	2482 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
47.82	31.17	-8.83	40	52.4	9.3	0.67	31.2	116	261	Peak
139.62	17.94	-25.56	43.5	36.44	11.4	1.2	31.1	-	-	Peak
213.6	21.79	-21.71	43.5	41.44	10.04	1.38	31.07	-	-	Peak
456.8	18.45	-27.55	46	29.73	17.19	2.31	30.78	-	-	Peak
584.2	22.58	-23.42	46	31.08	19.52	2.64	30.66	-	-	Peak
925.1	25.73	-20.27	46	29.2	23.48	3.4	30.35	-	-	Peak
2482	99.66	-	-	94.65	32.38	7.06	34.43	157	87	Peak
2482	74.87	-	-	-	-	-	-	-	-	Average
4959	39.99	-34.01	74	55.82	33.91	8.92	58.66	100	0	Peak
4959	15.2	-38.8	54	-	-	-	-	-	-	Average
7440	40.98	-33.02	74	52.28	35.51	11.04	57.85	100	0	Peak
7440	16.19	-37.81	54	-	-	-	-	-	-	Average

Note: Other harmonics are lower than background noise.

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

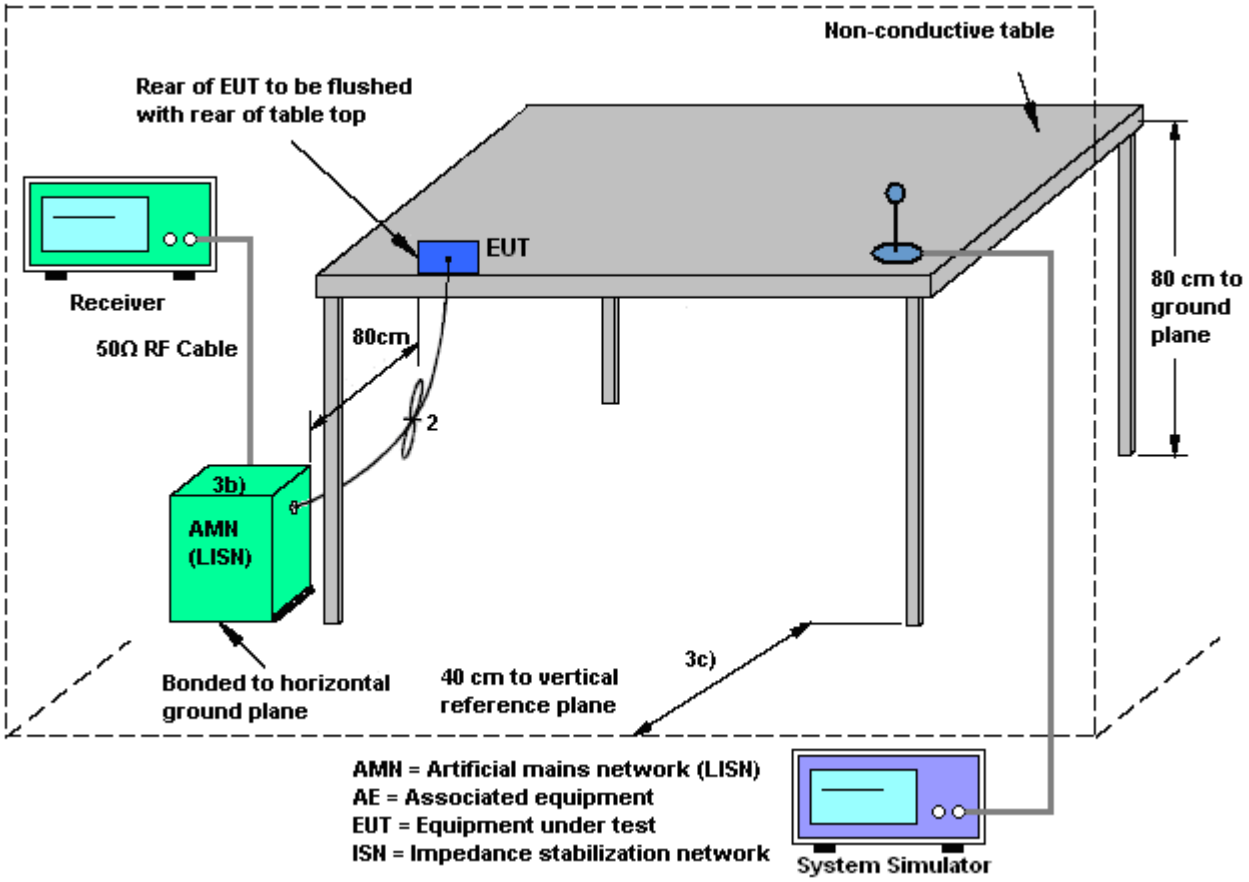
3.9.2 Measuring Instruments

See list of measuring instruments of this test report.

3.9.3 Test Procedures

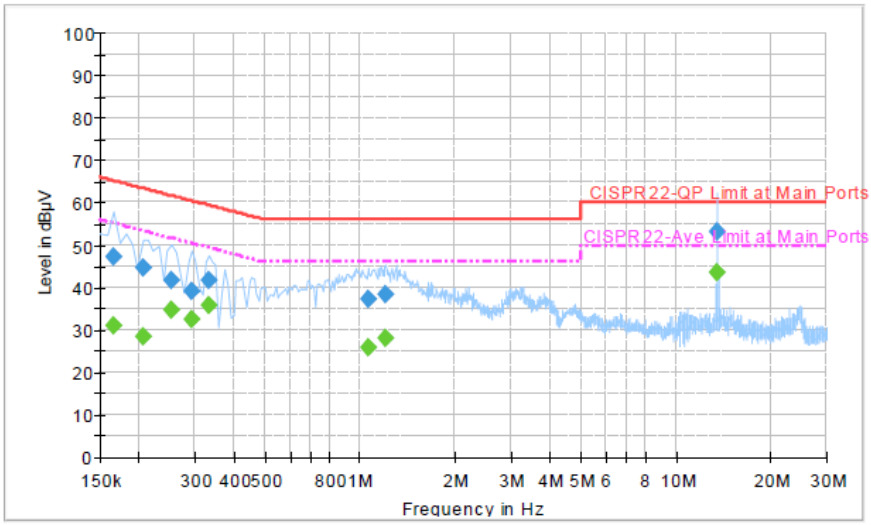
1. The test follows the guidelines in ANSI C63.10-2009 test site requirement.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.9.4 Test Setup



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 :	GSM850 Idle + Bluetooth Link + WLAN (2.4G) Link + NFC active + Scanner + Battery 2 + USB Cable (USB File transfer) for Sample 1		



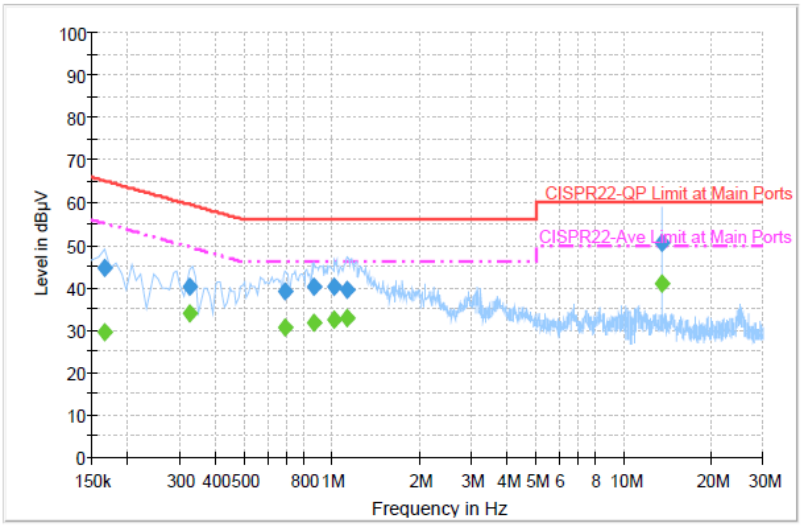
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	47.2	Off	L1	19.4	18.0	65.2
0.206000	44.6	Off	L1	19.4	18.8	63.4
0.254000	41.6	Off	L1	19.5	20.0	61.6
0.294000	39.3	Off	L1	19.4	21.1	60.4
0.334000	41.6	Off	L1	19.4	17.8	59.4
1.062000	37.3	Off	L1	19.4	18.7	56.0
1.206000	38.3	Off	L1	19.5	17.7	56.0
13.558000	53.3	Off	L1	19.8	6.7	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	31.1	Off	L1	19.4	24.1	55.2
0.206000	28.2	Off	L1	19.4	25.2	53.4
0.254000	34.7	Off	L1	19.5	16.9	51.6
0.294000	32.4	Off	L1	19.4	18.0	50.4
0.334000	35.7	Off	L1	19.4	13.7	49.4
1.062000	25.8	Off	L1	19.4	20.2	46.0
1.206000	28.2	Off	L1	19.5	17.8	46.0
13.558000	43.4	Off	L1	19.8	6.6	50.0

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN (2.4G) Link + NFC active + Scanner + Battery 2 + USB Cable (USB File transfer) for Sample 1		



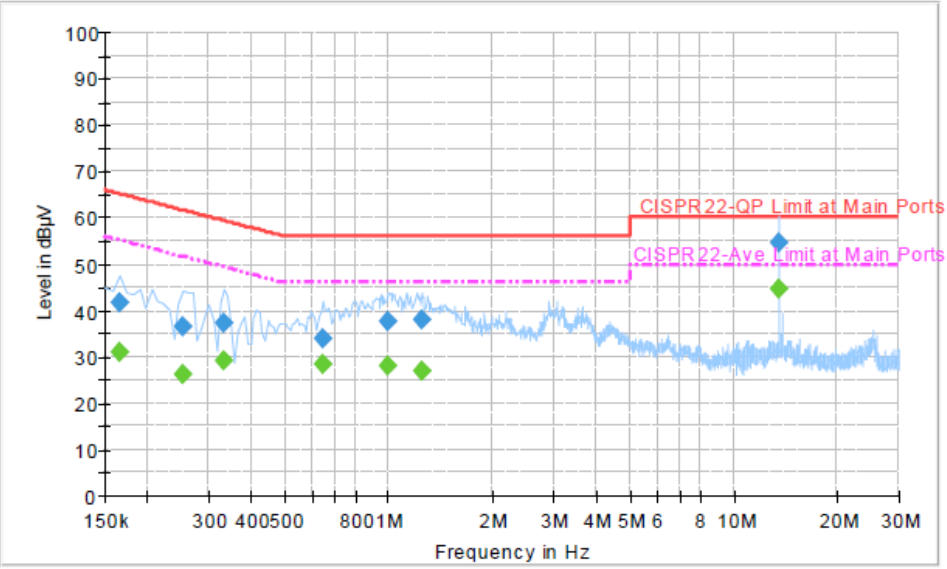
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	44.5	Off	N	19.4	20.7	65.2
0.326000	40.2	Off	N	19.4	19.4	59.6
0.694000	39.3	Off	N	19.5	16.7	56.0
0.870000	40.1	Off	N	19.5	15.9	56.0
1.022000	40.3	Off	N	19.4	15.7	56.0
1.126000	39.5	Off	N	19.5	16.5	56.0
13.558000	50.6	Off	N	19.9	9.4	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	29.5	Off	N	19.4	25.7	55.2
0.326000	34.0	Off	N	19.4	15.6	49.6
0.694000	30.5	Off	N	19.5	15.5	46.0
0.870000	31.9	Off	N	19.5	14.1	46.0
1.022000	32.5	Off	N	19.4	13.5	46.0
1.126000	32.8	Off	N	19.5	13.2	46.0
13.558000	41.1	Off	N	19.9	8.9	50.0

Test Mode :	Mode 2	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WCDMA band V Idle + Bluetooth Link + WLAN (5G) Link + NFC active + Scanner + Battery 1 + USB Cable (USB File transfer) for Sample 1		



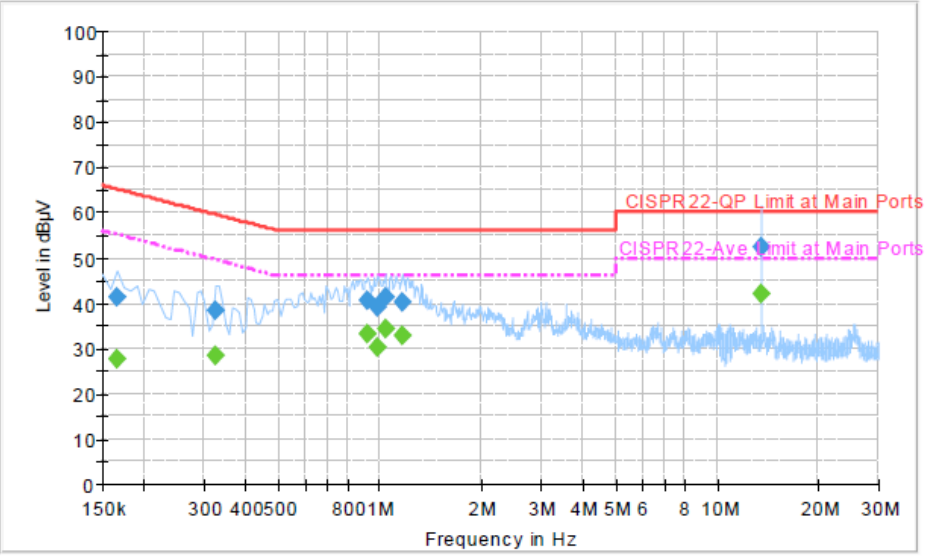
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	41.7	Off	L1	19.4	23.5	65.2
0.254000	36.4	Off	L1	19.5	25.2	61.6
0.334000	37.4	Off	L1	19.4	22.0	59.4
0.646000	34.0	Off	L1	19.4	22.0	56.0
0.998000	37.7	Off	L1	19.4	18.3	56.0
1.246000	38.0	Off	L1	19.5	18.0	56.0
13.558000	54.6	Off	L1	19.8	5.4	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	31.0	Off	L1	19.4	24.2	55.2
0.254000	26.3	Off	L1	19.5	25.3	51.6
0.334000	29.0	Off	L1	19.4	20.4	49.4
0.646000	28.4	Off	L1	19.4	17.6	46.0
0.998000	28.1	Off	L1	19.4	17.9	46.0
1.246000	26.9	Off	L1	19.5	19.1	46.0
13.558000	44.5	Off	L1	19.8	5.5	50.0

Test Mode :	Mode 2	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WCDMA band V Idle + Bluetooth Link + WLAN (5G) Link + NFC active + Scanner + Battery 1 + USB Cable (USB File transfer) for Sample 1		



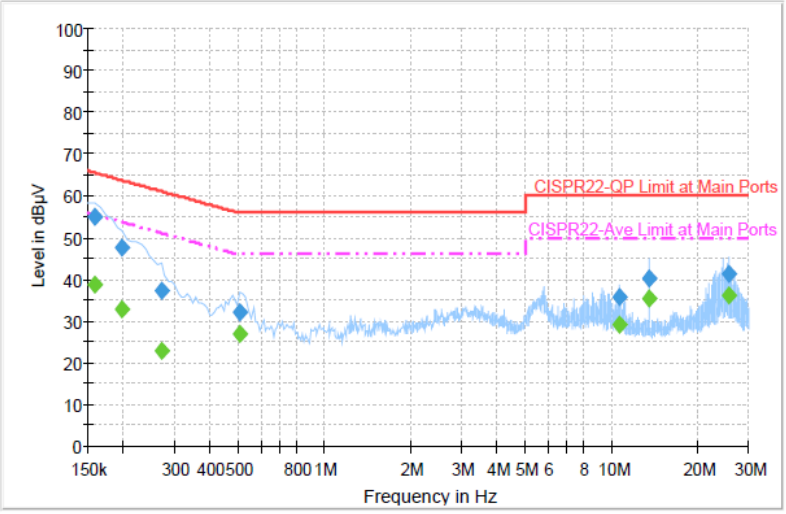
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	41.3	Off	N	19.4	23.9	65.2
0.326000	38.4	Off	N	19.4	21.2	59.6
0.918000	40.7	Off	N	19.4	15.3	56.0
0.982000	39.0	Off	N	19.5	17.0	56.0
1.038000	41.3	Off	N	19.5	14.7	56.0
1.166000	40.3	Off	N	19.5	15.7	56.0
13.558000	52.5	Off	N	19.9	7.5	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	27.8	Off	N	19.4	27.4	55.2
0.326000	28.3	Off	N	19.4	21.3	49.6
0.918000	33.1	Off	N	19.4	12.9	46.0
0.982000	30.2	Off	N	19.5	15.8	46.0
1.038000	34.2	Off	N	19.5	11.8	46.0
1.166000	32.8	Off	N	19.5	13.2	46.0
13.558000	42.2	Off	N	19.9	7.8	50.0

Test Mode :	Mode 3	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	LTE Band 5 Idle + Bluetooth Link + WLAN (5G) Link + NFC active + Battery 1 + USB Cable (USB File transfer) for Sample 2		



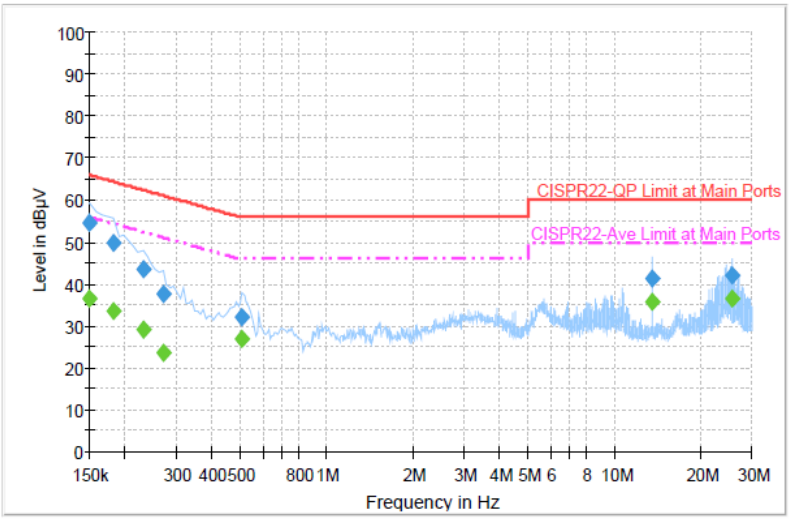
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	54.9	Off	L1	19.3	10.7	65.6
0.198000	47.8	Off	L1	19.3	15.9	63.7
0.270000	37.1	Off	L1	19.3	24.0	61.1
0.510000	32.1	Off	L1	19.4	23.9	56.0
10.638000	35.8	Off	L1	19.7	24.2	60.0
13.558000	40.4	Off	L1	19.8	19.6	60.0
25.574000	41.5	Off	L1	19.9	18.5	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158000	38.9	Off	L1	19.3	26.7	55.6
0.198000	32.7	Off	L1	19.3	21.0	53.7
0.270000	22.9	Off	L1	19.3	28.2	51.1
0.510000	27.0	Off	L1	19.4	19.0	46.0
10.638000	29.2	Off	L1	19.7	20.8	50.0
13.558000	35.5	Off	L1	19.8	14.5	50.0
25.574000	36.2	Off	L1	19.9	13.8	50.0

Test Mode :	Mode 3	Temperature :	20~22℃
Test Engineer :	Slash Huang	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	LTE Band 5 Idle + Bluetooth Link + WLAN (5G) Link + NFC active + Battery 1 + USB Cable (USB File transfer) for Sample 2		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	54.5	Off	N	19.4	11.5	66.0
0.182000	49.9	Off	N	19.4	14.5	64.4
0.230000	43.7	Off	N	19.4	18.7	62.4
0.270000	37.6	Off	N	19.4	23.5	61.1
0.510000	32.2	Off	N	19.4	23.8	56.0
13.558000	41.3	Off	N	19.9	18.7	60.0
25.574000	42.0	Off	N	20.0	18.0	60.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	36.7	Off	N	19.4	19.3	56.0
0.182000	33.5	Off	N	19.4	20.9	54.4
0.230000	29.1	Off	N	19.4	23.3	52.4
0.270000	23.5	Off	N	19.4	27.6	51.1
0.510000	27.0	Off	N	19.4	19.0	46.0
13.558000	35.8	Off	N	19.9	14.2	50.0
25.574000	36.6	Off	N	20.0	13.4	50.0

3.10 Antenna Requirements

3.10.1 Standard Applicable

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

3.10.2 Antenna Connected Construction

Non-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	Jun. 20, 2013~ Jul. 02, 2013	Jun. 06, 2014	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	300MHz~40GHz	Feb. 05, 2013	Jun. 20, 2013~ Jul. 02, 2013	Feb. 04, 2014	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Feb. 05, 2013	Jun. 20, 2013~ Jul. 02, 2013	Feb. 04, 2014	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Nov. 13, 2012	Jun. 13, 2013	Nov. 12, 2013	Conduction (CO05-HY)
Two-LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2012	Jun. 13, 2013	Dec. 11, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 06, 2012	Jun. 13, 2013	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Jun. 13, 2013	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9k~7G	Sep. 03, 2012	Jul. 09, 2013	Sep. 02, 2013	Radiation (03CH07-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101067	9k~30G	Nov. 30, 2012	Jul. 09, 2013	Nov. 29, 2013	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30M~1G	Oct. 06, 2012	Jul. 09, 2013	Oct. 05, 2013	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1G~18G	Aug. 22, 2012	Jul. 09, 2013	Aug. 21, 2013	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18G~40G	Sep. 28, 2012	Jul. 09, 2013	Sep. 27, 2013	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	30M~1G	Feb. 26, 2013	Jul. 09, 2013	Feb. 25, 2014	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1G~26.5G	Dec. 01, 2012	Jul. 09, 2013	Nov. 30, 2013	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	Jul. 09, 2013	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	ChainTek 3000	N/A	N/A	N/A	Jul. 09, 2013	N/A	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	860004/0001	9 kHz~30 MhZ	Jul. 03, 2012	Jul. 09, 2013	Jul. 02, 2014	Radiation (03CH07-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.26**

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

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

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

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