FCC RF Test Report

APPLICANT	:	Lenovo (Shanghai) Electronics Technology Co., Ltd.
EQUIPMENT	:	Portable Tablet Computer
BRAND NAME	:	lenovo
MODEL NAME	:	Lenovo B8000-F; 60046; Z0AL
MARKETING NAME	:	YOGA TABLET 10
FCC ID	:	O57B8000F
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter

The product was received on Jul. 26, 2013 and completely tested on Aug. 18, 2013. We, SPORTON INTERNATIONAL (KUNSHAN) 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 (KUNSHAN) INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory
2627

SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR372603-02A	Rev. 01	Initial issue of report	Aug. 27, 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 9.44 dB at 2483.500 MHz
3.9	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 4.55 dB at 0.640 MHz
3.10	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Lenovo (Shanghai) Electronics Technology Co., Ltd.
No. 68 Building, 199 Fenju Road, Wai Gao Qiao FTZ, Shanghai, China

1.2 Manufacturer

Lenovo PC HK Limited
23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Portable Tablet Computer
Brand Name	lenovo
Model Name	Lenovo B8000-F; 60046; Z0AL
Marketing Name	YOGA TABLET 10
FCC ID	O57B8000F
EUT supports Radios application	WLAN 2.4GHz 11b/g/n HT20/HT40 Bluetooth v3.0 + EDR/Bluetooth v4.0
HW Version	Lenovo B8000-F
SW Version	B8000-130906
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two types of EUT sample 1 and sample 2, the differences between two samples is only different supplier for RAM/ Panel/ Touch panel/ camera.

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 v3.0 + BR(1Mbps) : 8.53 dBm (0.00713 W) Bluetooth v3.0 + EDR (2Mbps) : 8.26 dBm (0.00670 W) Bluetooth v3.0 + EDR (3Mbps) : 8.59 dBm (0.00723 W)
99% Occupied Bandwidth	Bluetooth v3.0 + BR (1Mbps) : 0.8840MHz Bluetooth v3.0 + EDR (2Mbps) : 1.1560MHz Bluetooth v3.0 + EDR (3Mbps) : 1.1400MHz
Antenna Type	PIFA Antenna with gain 1.6 dBi
Type of Modulation	Bluetooth v3.0 + EDR : GFSK, π/4-DQPSK, 8-DPSK

1.5 Modification of EUT

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

1.6 Testing Site

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.			
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958			
Test Site No.	Sporton Site No.			FCC/IC Registration No.
	TH01-KS	CO01-KS	03CH01-KS	149928/4086E-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
- IC RSS-210 Issue 8
- IC RSS-Gen Issue 3
- NOTICE 2012-DRS0126

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
3. Per the section 2.2.3 of Notice of 2012-DRS0126, " Receivers Excluded from Industry Canada Requirements", only radiocommunication receivers operating in stand-alone mode within the band 30-960 MHz and scanner receivers are subject to Industry Canada requirements.

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

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

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	8.11 dBm	7.88 dBm	8.22 dBm
Ch39	2441MHz	8.24 dBm	8.02 dBm	8.37 dBm
Ch78	2480MHz	8.53 dBm	8.26 dBm	**8.59 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). For radiated measurement, EUT is rotated on three test planes in Tablet PC configurations and one test plane in Laptop PC configuration to find out the worst emission and recorded in this report.

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

2.2 Test Mode

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

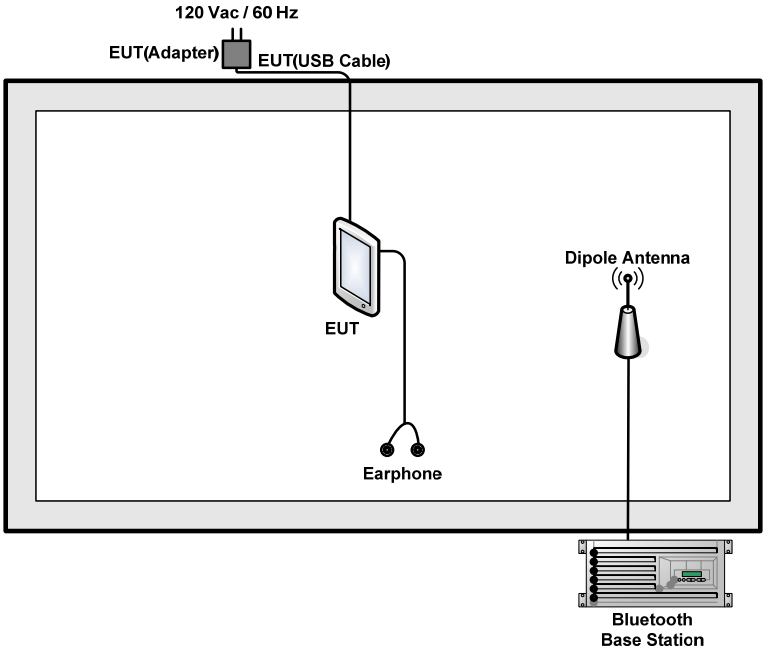
Summary table of Test Cases			
Test Item	**Data Rate / Modulation**		
	Bluetooth BR 1Mbps GFSK	**Bluetooth EDR 2Mbps π/4-DQPSK**	**Bluetooth EDR 3Mbps 8-DPSK**
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480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

Remark:

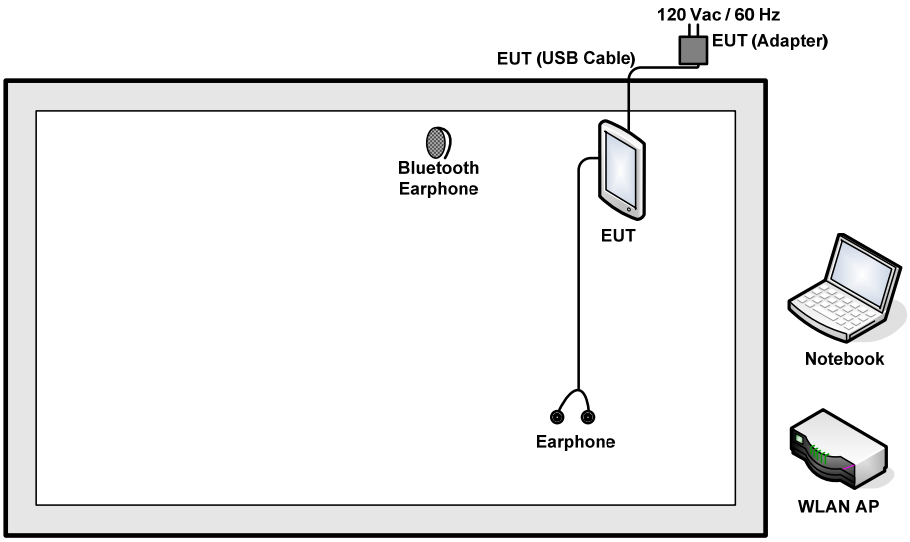
1. For radiated test cases, the worst mode data rate 3Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and no other significantly frequencies found in conducted spurious emission .
2. The worst case of conducted emission is mode 1; only the test data of it was reported.
3. All the radiated test cases were performance with Adapter and Earphone.

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.	Bluetooth Base Station	R&S	CBT	FCC DoC	N/A	Unshielded, 1.8 m
2.	DC Power Supply	GWINSTEK	GPS-3030D	FCC DoC	N/A	Unshielded, 1.8 m
3.	WLAN AP	D-Link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8 m
4.	Notebook	Lenovo	G480	FCC DoC	N/A	AC I/P: Unshielded, 0.9 m DC O/P: Shielded, 1.8 m
5.	Earphone	Lenovo	SH100	FCC DoC	N/A	N/A
6.	Bluetooth Earphone	Lenovo	LBH301	FCC DoC	N/A	N/A

2.5 Description of RF Function Operation Test Setup

For Bluetooth test items, turn on “EnterEngMode” test program was provided and enabled to make EUT contact with Bluetooth base station for continuous transmitting and receiving signals.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

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 5 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 5 + 10 = 15 (dB)

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

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

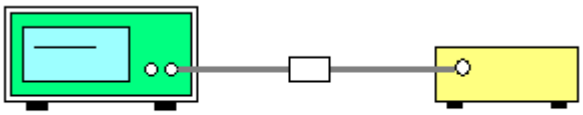
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

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

3.1.4 Test Setup

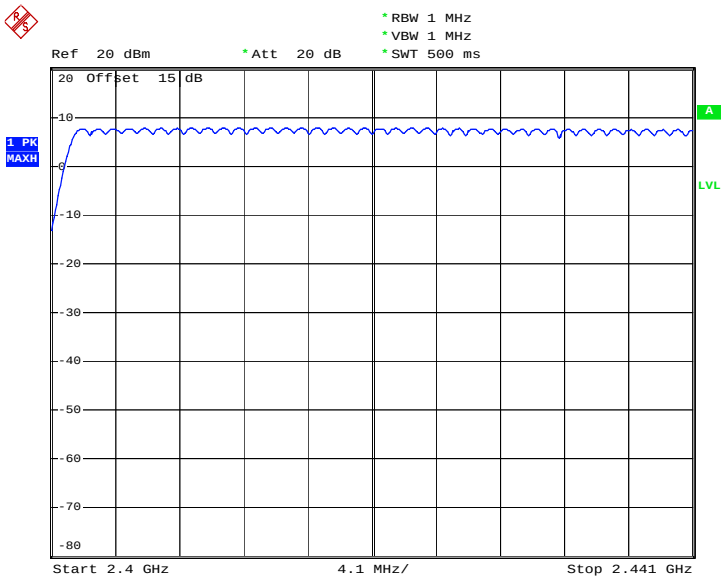


3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	3Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

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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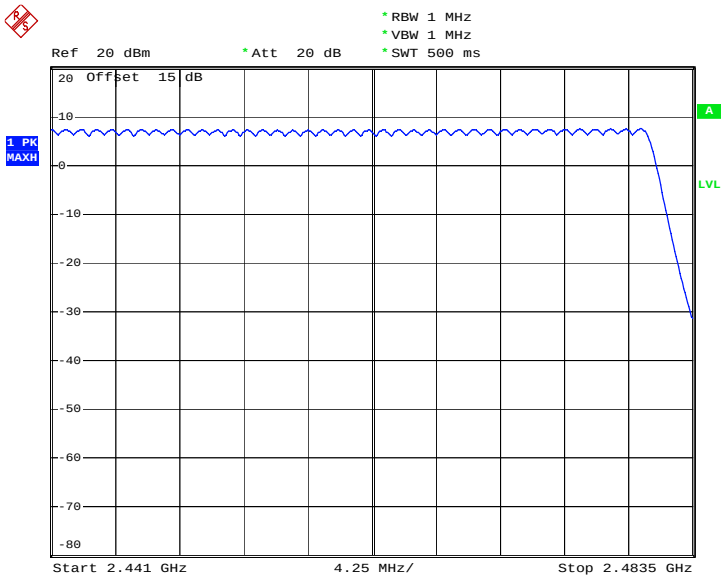

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3.2 Hopping Channel Separation Measurement

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.

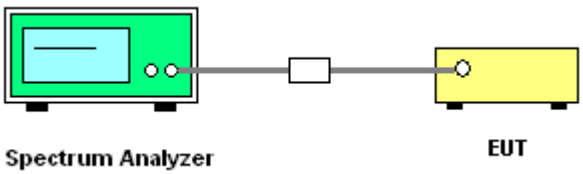
3.2.2 Measuring Instruments

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

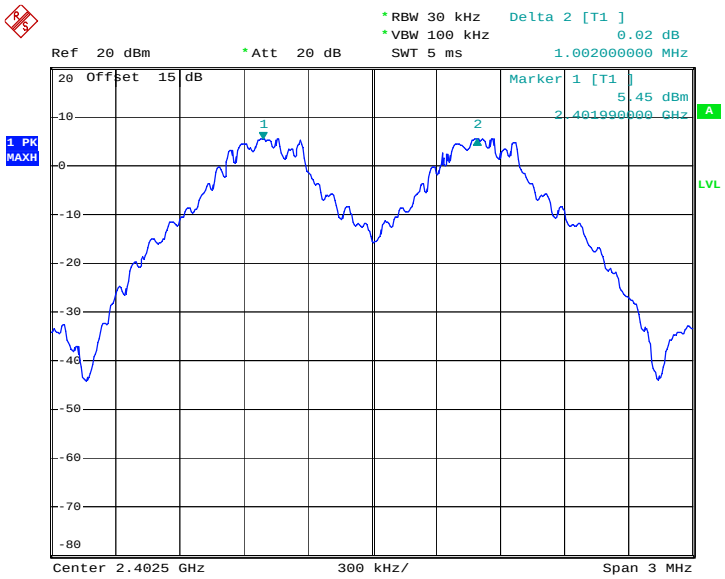


3.2.5 Test Result of Hopping Channel Separation

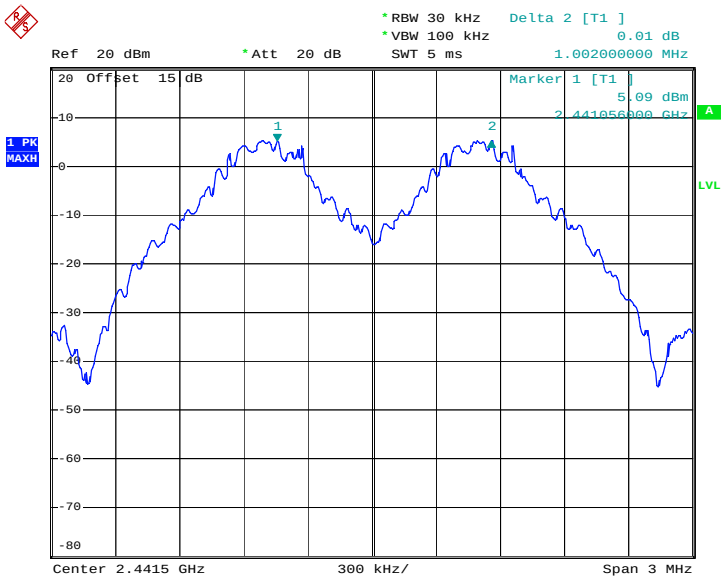
Test Mode :	1Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.6427	Pass
39	2441	1.002	0.6427	Pass
78	2480	1.002	0.6293	Pass

Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



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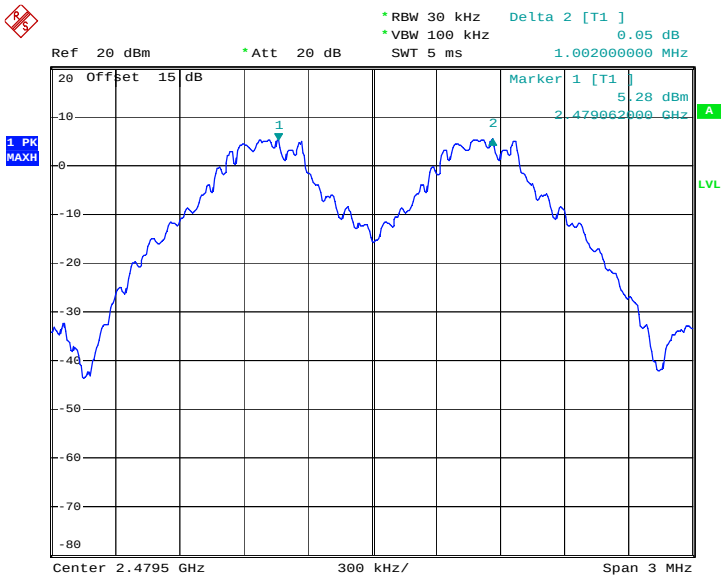
Channel Separation Plot on Channel 77 - 78



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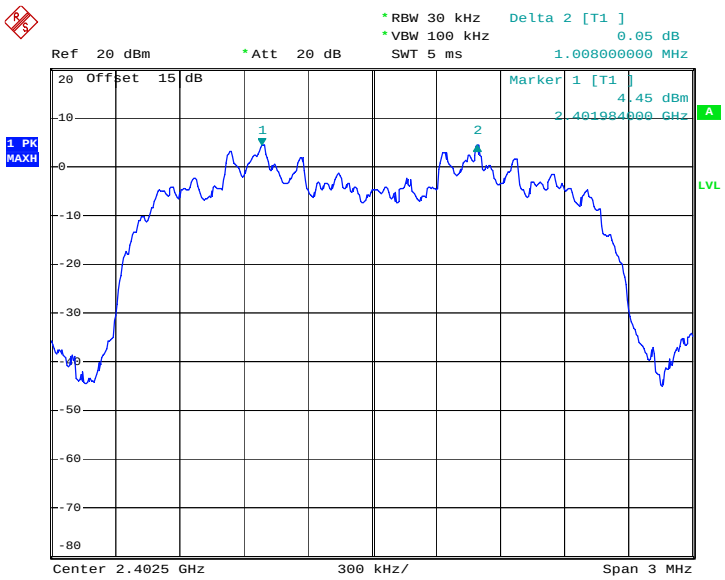
Test Mode :	2Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.008	0.8400	Pass
39	2441	1.002	0.8400	Pass
78	2480	1.002	0.8160	Pass

Channel Separation Plot on Channel 00 - 01



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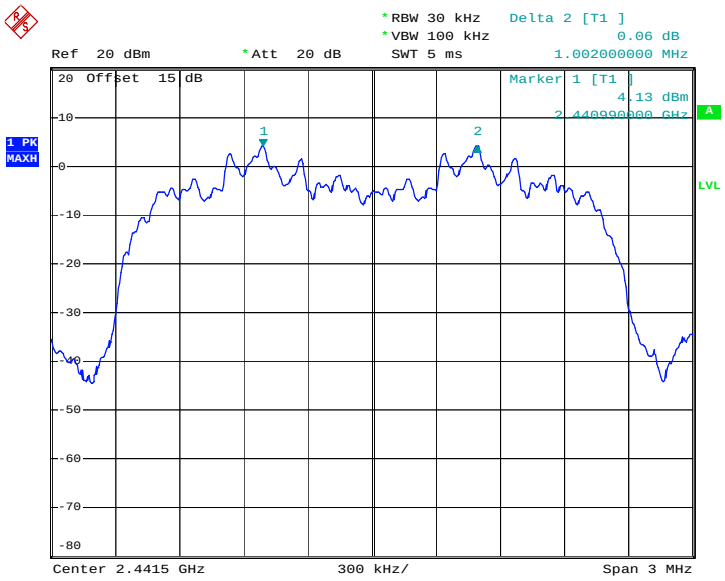
Channel Separation Plot on Channel 39 - 40



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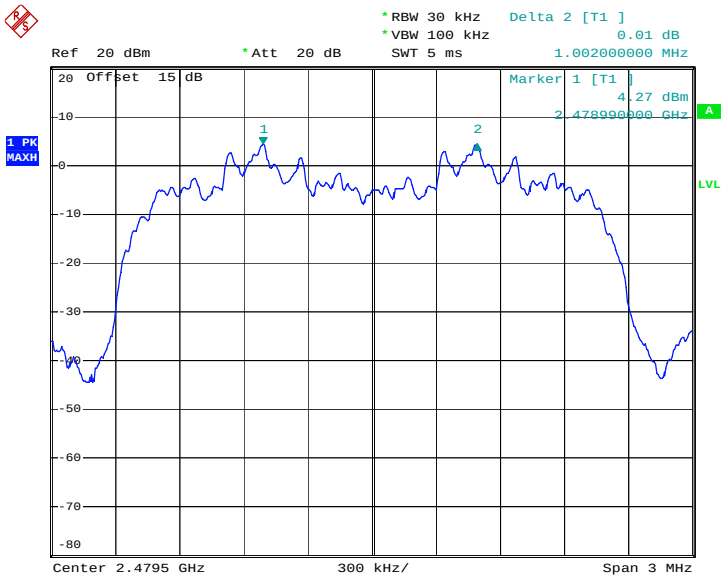
Channel Separation Plot on Channel 77 - 78



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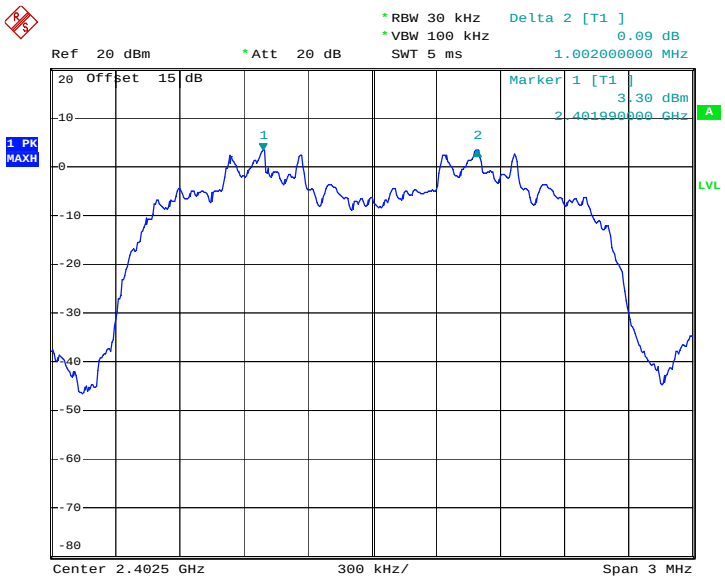
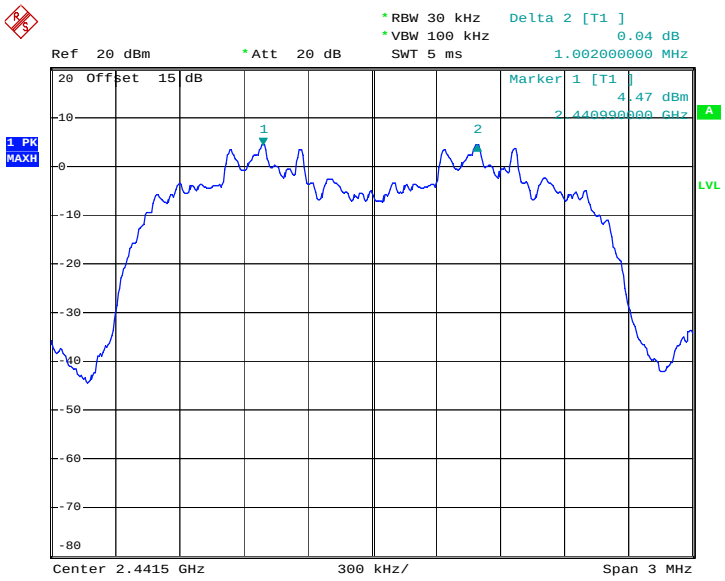
Test Mode :	3Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8560	Pass
39	2441	1.002	0.8600	Pass
78	2480	1.002	0.8400	Pass

Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



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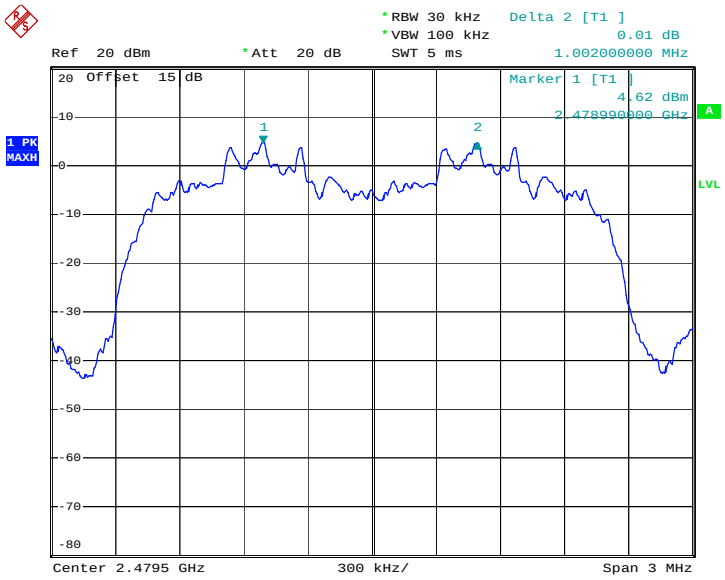
Channel Separation Plot on Channel 77 - 78



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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.

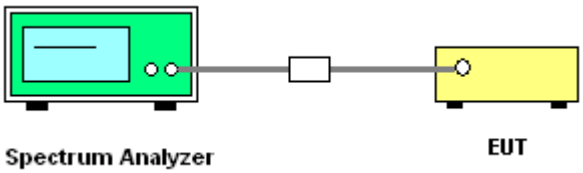
3.3.2 Measuring Instruments

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 :	3DH5	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Mode	Hopping Channel Number	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Normal	79	106.67	2.884	0.31	0.4	Pass
AFH	20	53.33	2.884	0.15	0.4	Pass

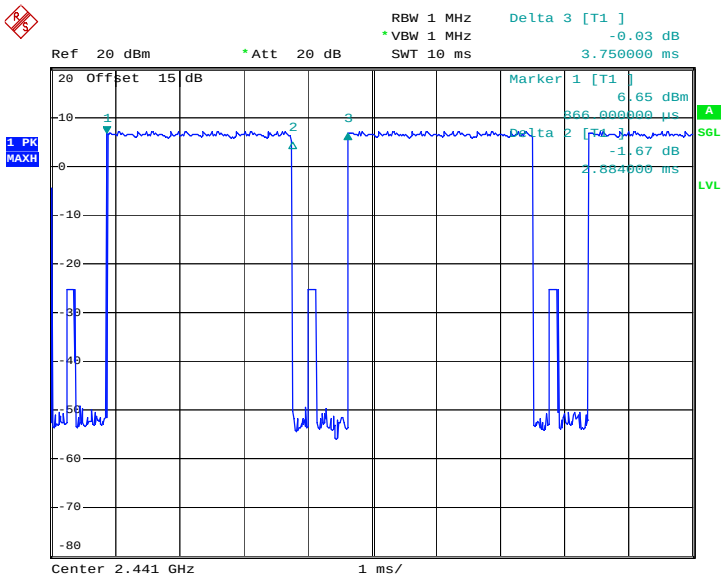
Remark:

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 and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

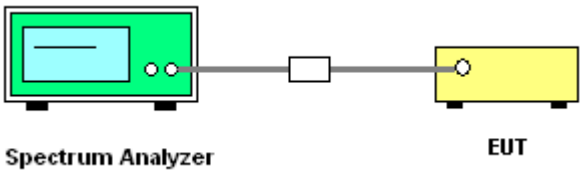
3.4.2 Measuring Instruments

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

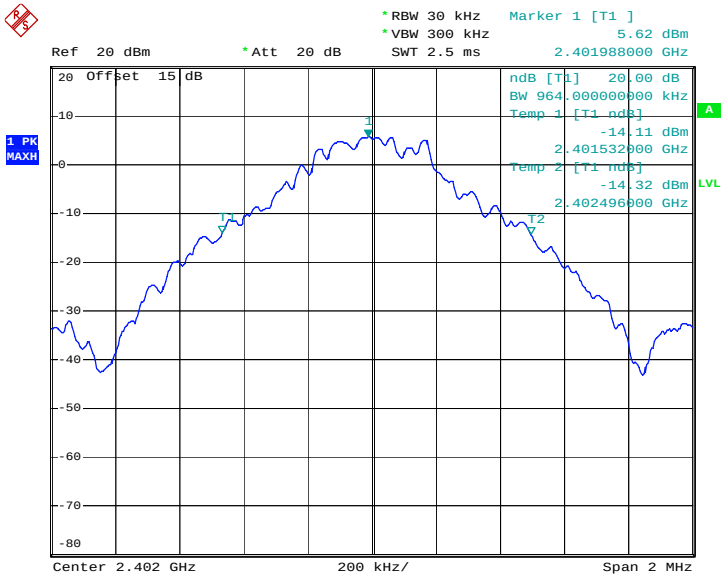


3.4.5 Test Result of 20dB Bandwidth

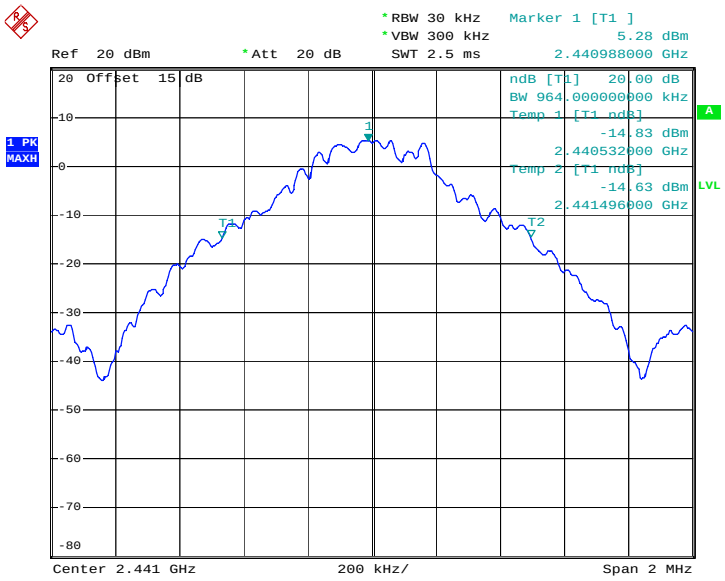
Test Mode :	1Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.964
39	2441	0.964
78	2480	0.944

20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



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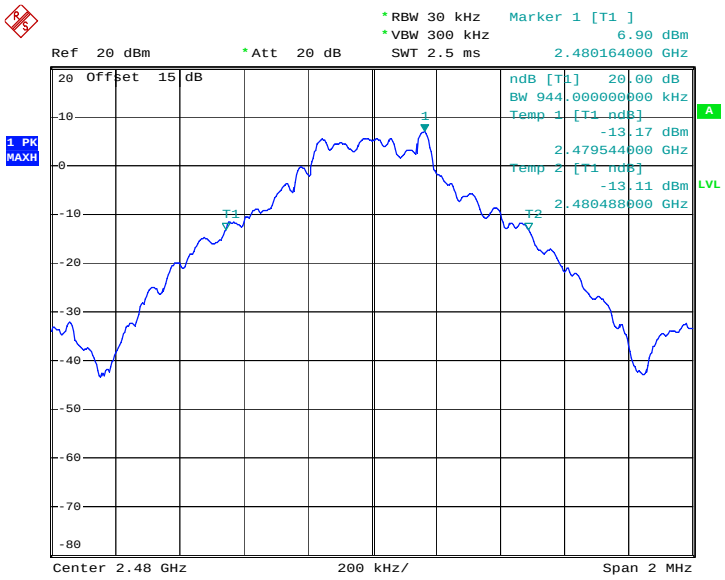
20 dB Bandwidth Plot on Channel 78

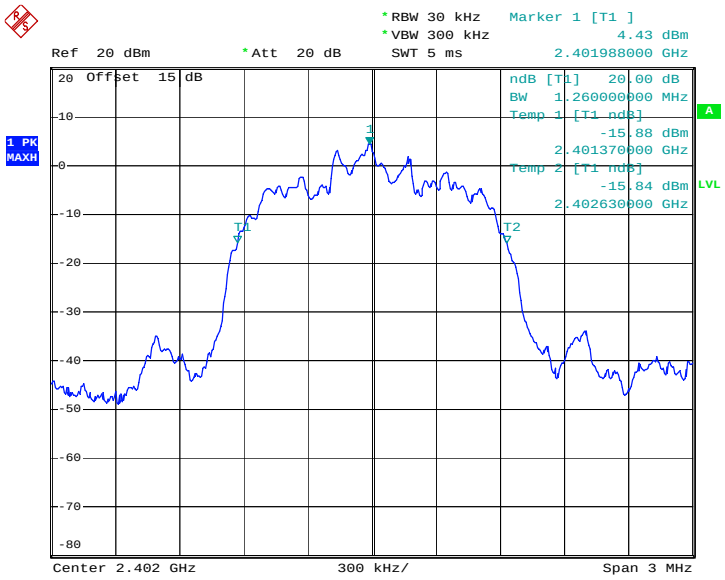


Date: 11.AUG.2013 10:57:38

Test Mode :	2Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

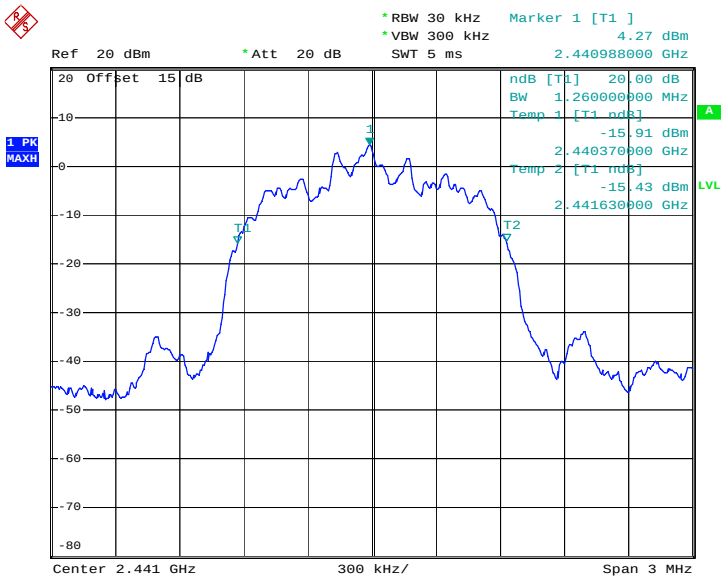
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.260
39	2441	1.260
78	2480	1.224

20 dB Bandwidth Plot on Channel 00



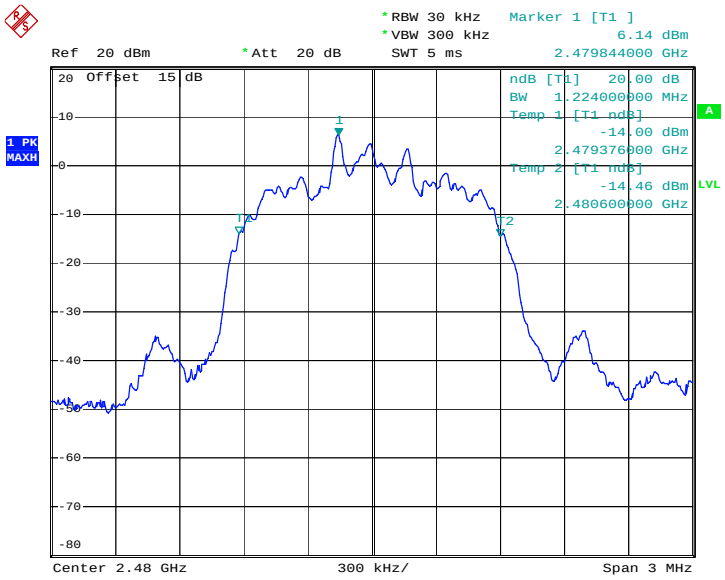
Date: 11.AUG.2013 10:57:53

20 dB Bandwidth Plot on Channel 39



Date: 11.AUG.2013 11:00:24

20 dB Bandwidth Plot on Channel 78

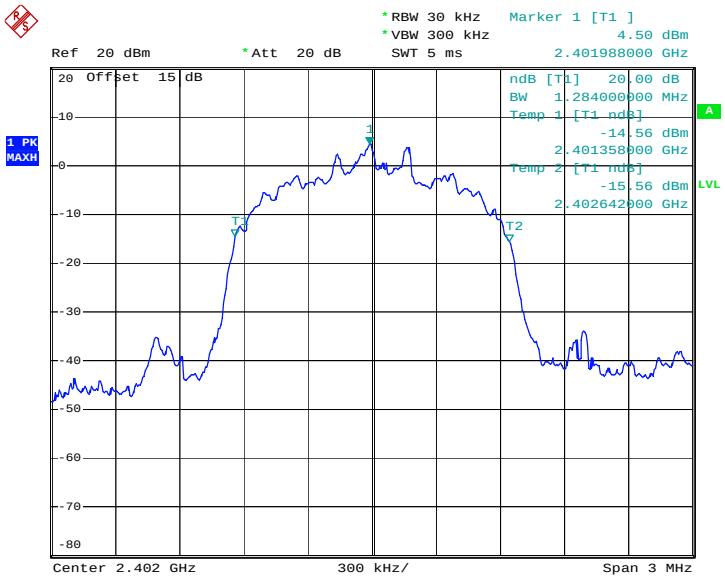


Date: 11.AUG.2013 11:00:56

Test Mode :	3Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

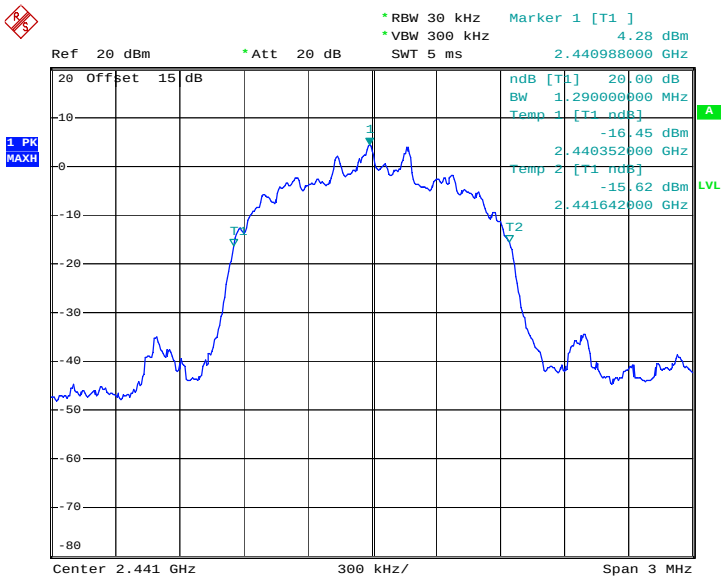
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.284
39	2441	1.290
78	2480	1.260

20 dB Bandwidth Plot on Channel 00



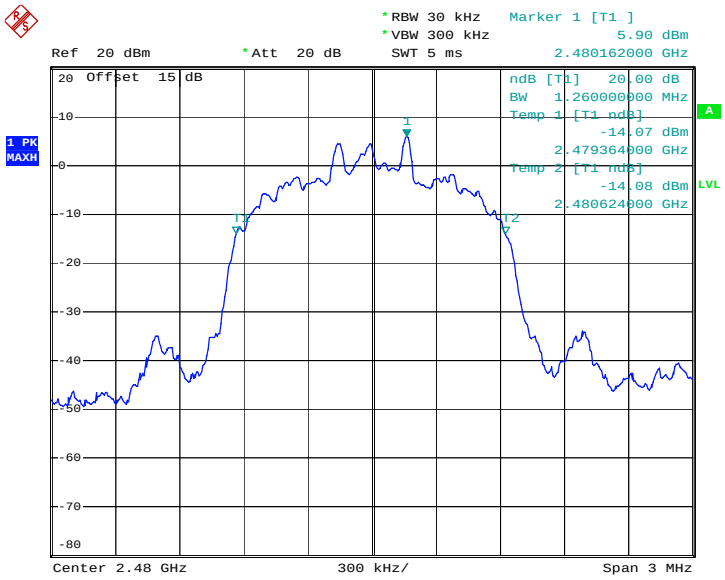
Date: 11.AUG.2013 11:01:14

20 dB Bandwidth Plot on Channel 39



Date: 11.AUG.2013 11:01:31

20 dB Bandwidth Plot on Channel 78



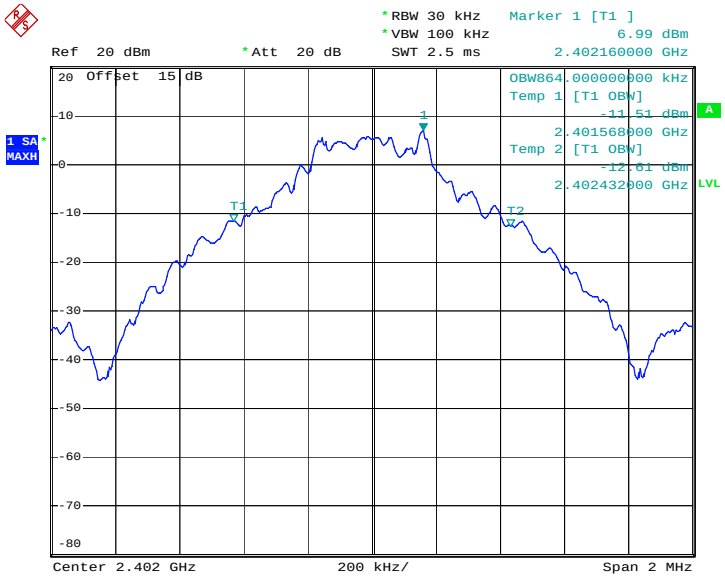
Date: 11.AUG.2013 11:02:22

3.4.6 Test Result of 99% Occupied Bandwidth

Test Mode :	1Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

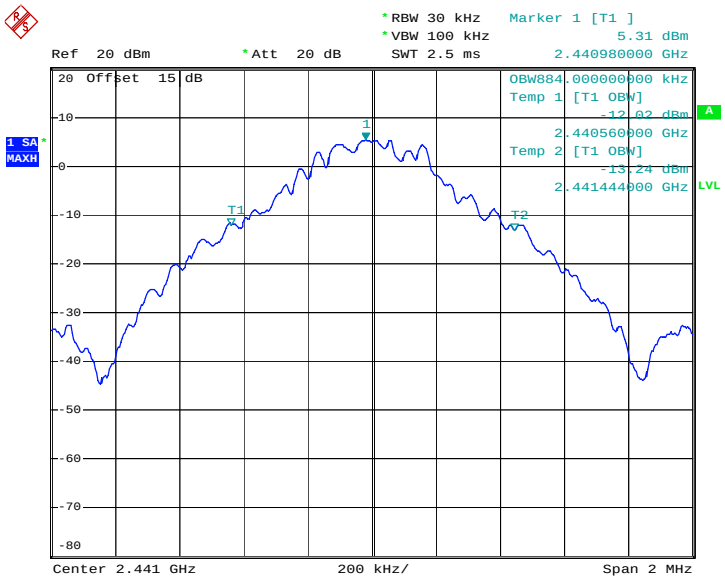
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	0.864
39	2441	0.884
78	2480	0.884

99% Occupied Bandwidth Plot on Channel 00



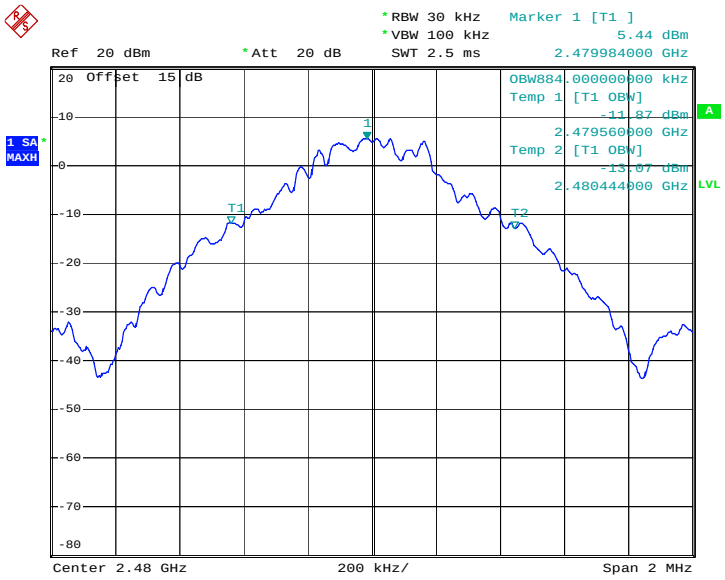
Date: 11.AUG.2013 11:15:01

99% Occupied Bandwidth Plot on Channel 39



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

99% Occupied Bandwidth Plot on Channel 78

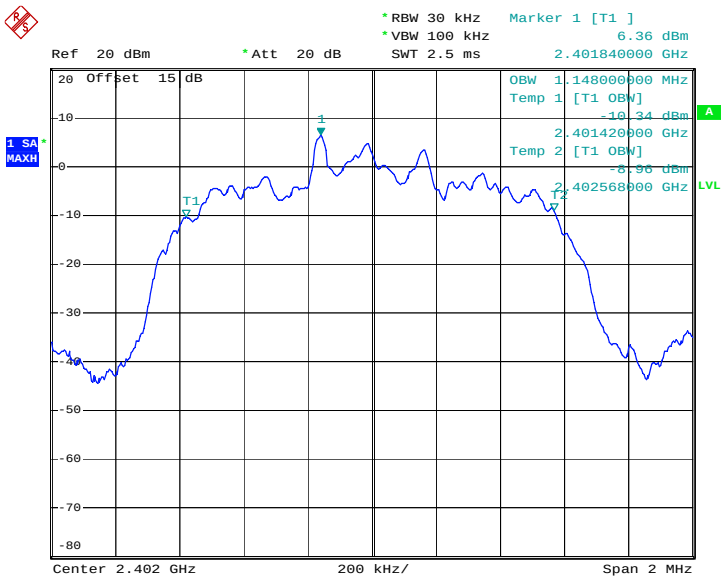


Date: 11.AUG.2013 11:16:13

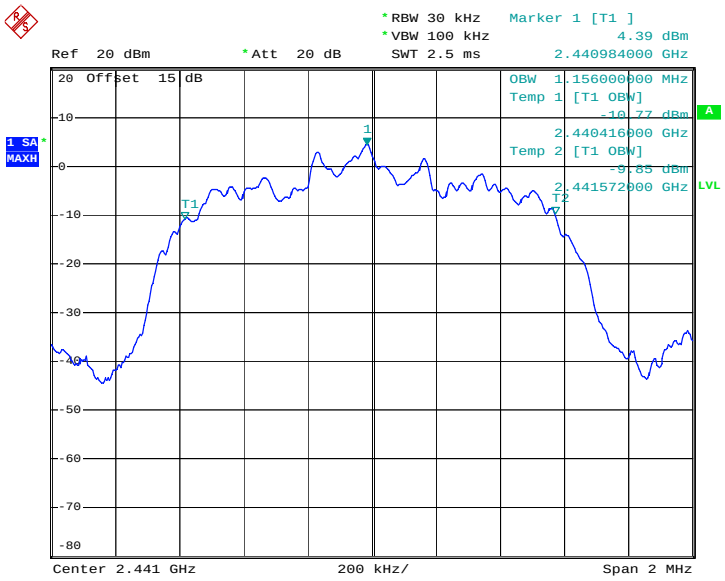
Test Mode :	2Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.148
39	2441	1.156
78	2480	1.156

99% Occupied Bandwidth Plot on Channel 00

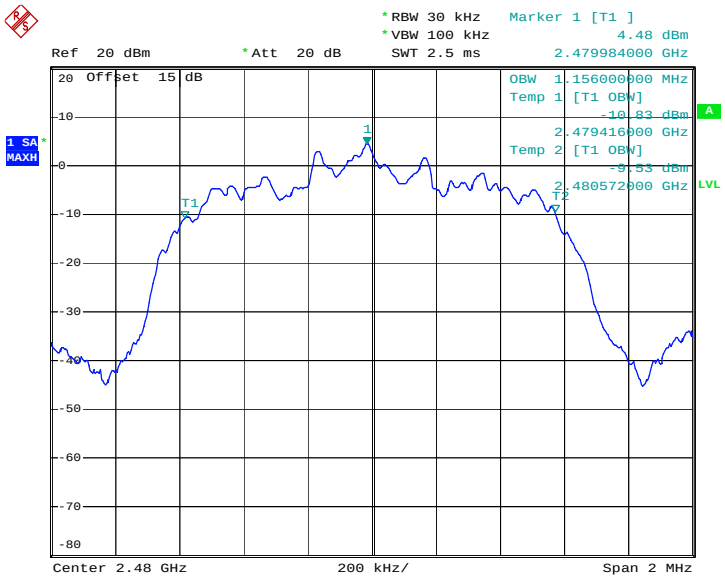


99% Occupied Bandwidth Plot on Channel 39



Date: 11.AUG.2013 11:17:25

99% Occupied Bandwidth Plot on Channel 78

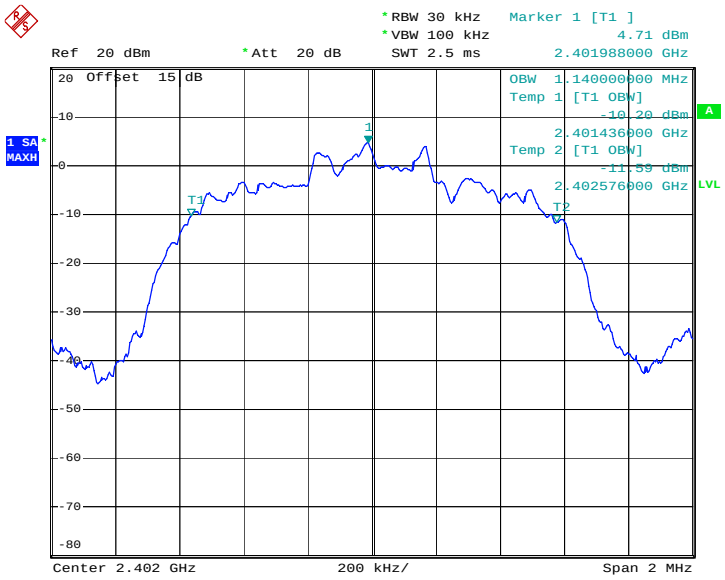


Date: 11.AUG.2013 11:18:01

Test Mode :	3Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

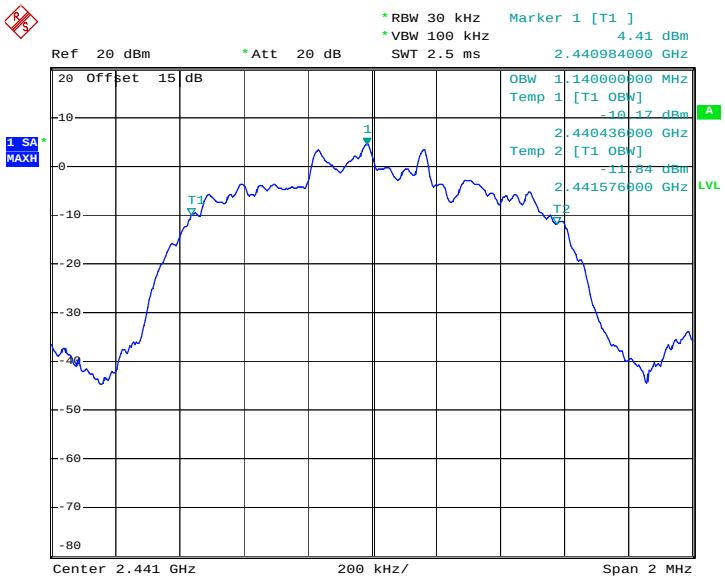
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.140
39	2441	1.140
78	2480	1.140

99% Occupied Bandwidth Plot on Channel 00



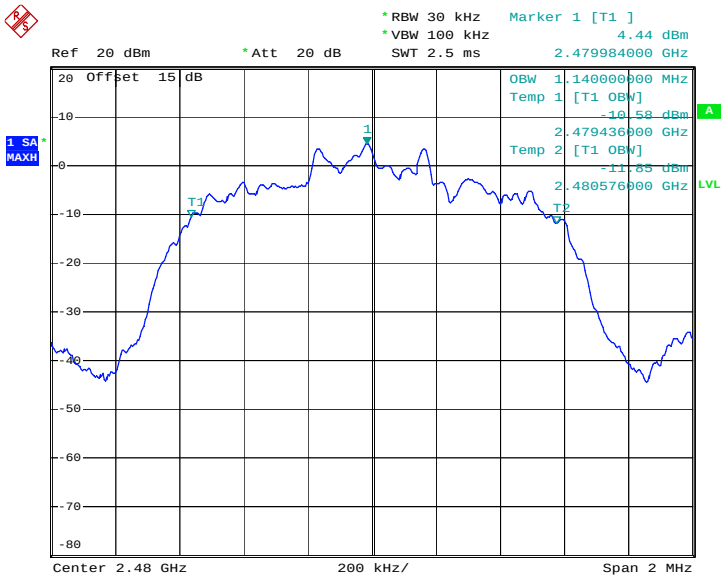
Date: 11.AUG.2013 11:18:37

99% Occupied Bandwidth Plot on Channel 39



Date: 11.AUG.2013 11:19:13

99% Occupied Bandwidth Plot on Channel 78



Date: 11.AUG.2013 11:19:49

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.

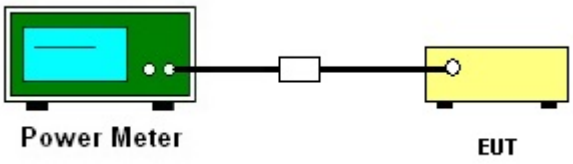
3.5.2 Measuring Instruments

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 :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	8.11	20.97	Pass
39	2441	8.24	20.97	Pass
78	2480	8.53	20.97	Pass

Test Mode :	2Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Channel	Frequency (MHz)	RF Power (dBm)		
		π/4-DQPSK	Max. Limits (dBm)	Pass/Fail
		2 Mbps		
00	2402	7.88	20.97	Pass
39	2441	8.02	20.97	Pass
78	2480	8.26	20.97	Pass

Test Mode :	3Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	8.22	20.97	Pass
39	2441	8.37	20.97	Pass
78	2480	8.59	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

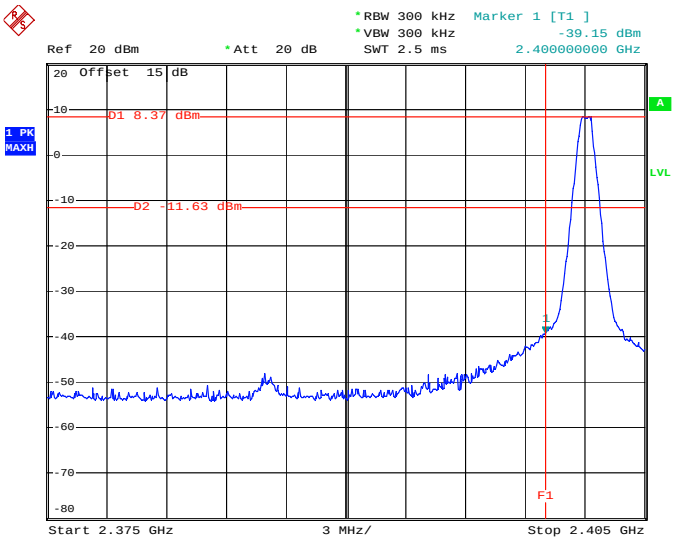
1. The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 300kHz (≥ 1% span=30MHz), VBW = 300kHz (≥ RBW). Band edge emissions 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

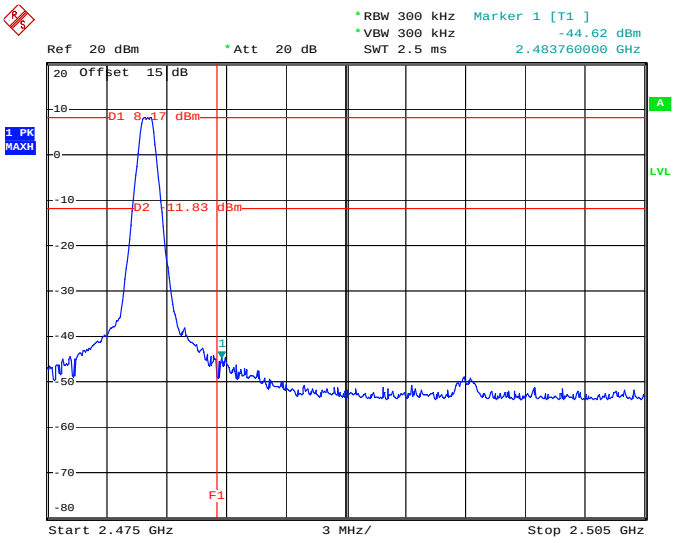
Test Mode :	1Mbps	Temperature :	22~24℃
Test Channel :	00 and 78	Relative Humidity :	47~48%
		Test Engineer :	Adonis Li

Low Band Edge Plot on Channel 00



Date: 11.AUG.2013 11:09:33

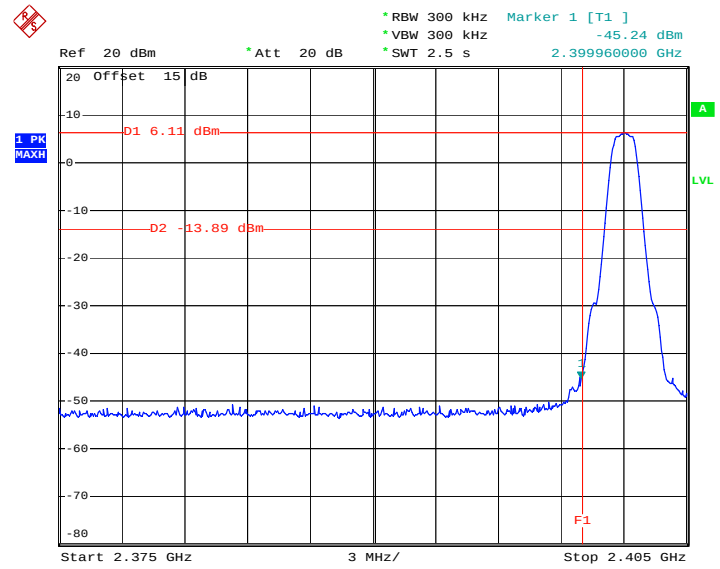
High Band Edge Plot on Channel 78



Date: 11.AUG.2013 11:10:35

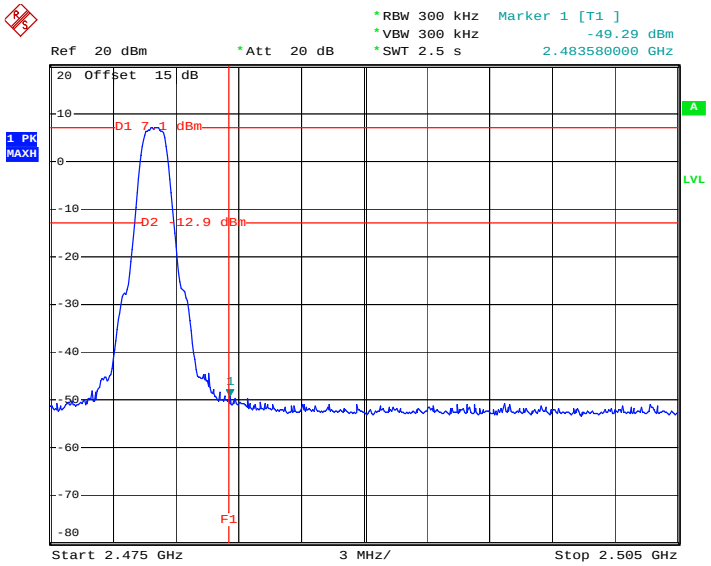
Test Mode :	2Mbps	**Temperature :**	22~24℃
Test Channel :	00 and 78	**Relative Humidity :**	47~48%
		Test Engineer :	Adonis Li

Low Band Edge Plot on Channel 00



Date: 18.AUG.2013 15:59:41

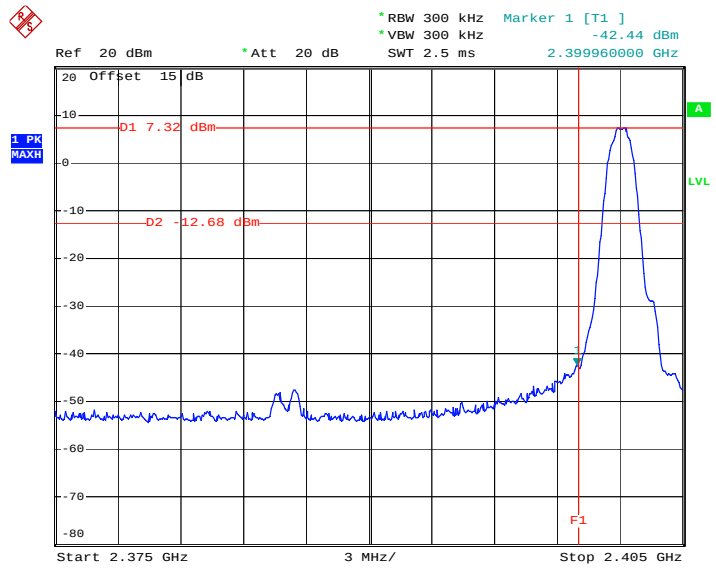
High Band Edge Plot on Channel 78



Date: 18.AUG.2013 15:54:55

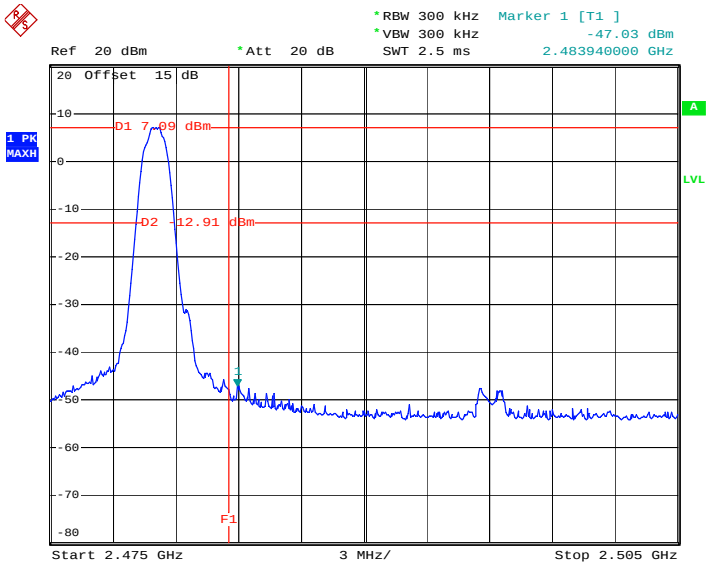
Test Mode :	3Mbps	**Temperature :**	22~24℃
Test Channel :	00 and 78	**Relative Humidity :**	47~48%
		Test Engineer :	Adonis Li

Low Band Edge Plot on Channel 00



Date: 11.AUG.2013 11:13:21

High Band Edge Plot on Channel 78

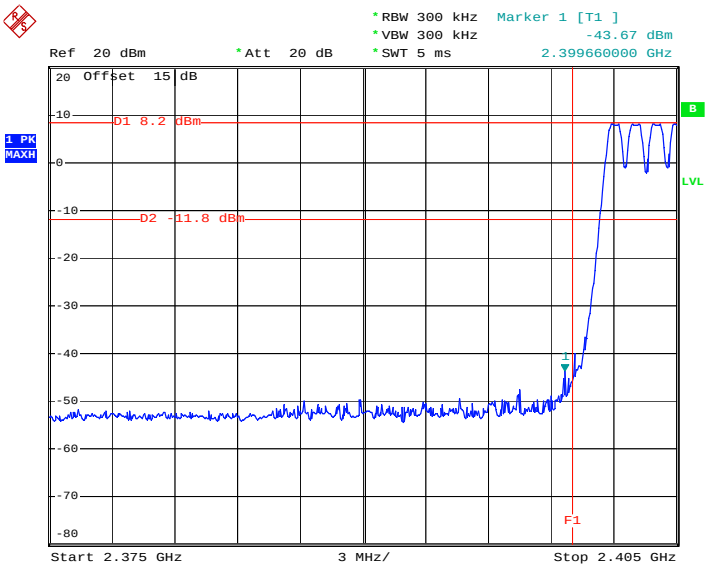


Date: 11.AUG.2013 11:14:24

3.6.7 Test Result of Conducted Hopping Mode Band Edges

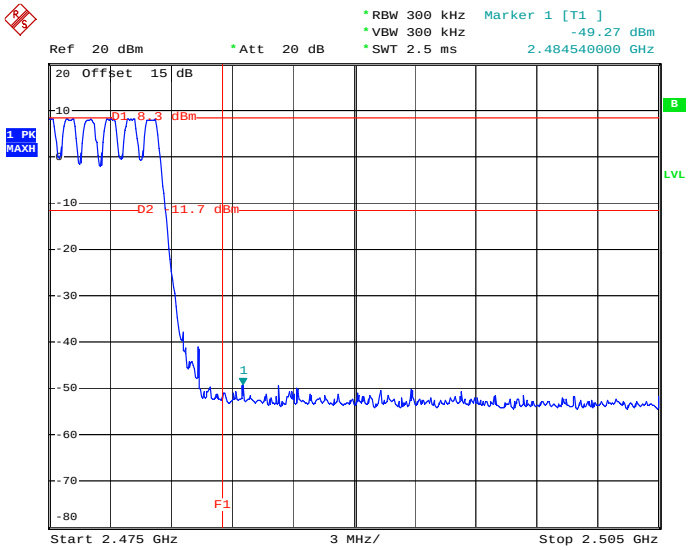
Test Mode :	1Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

1Mbps Hopping Mode Low Band Edge Plot



Date: 11.AUG.2013 11:40:13

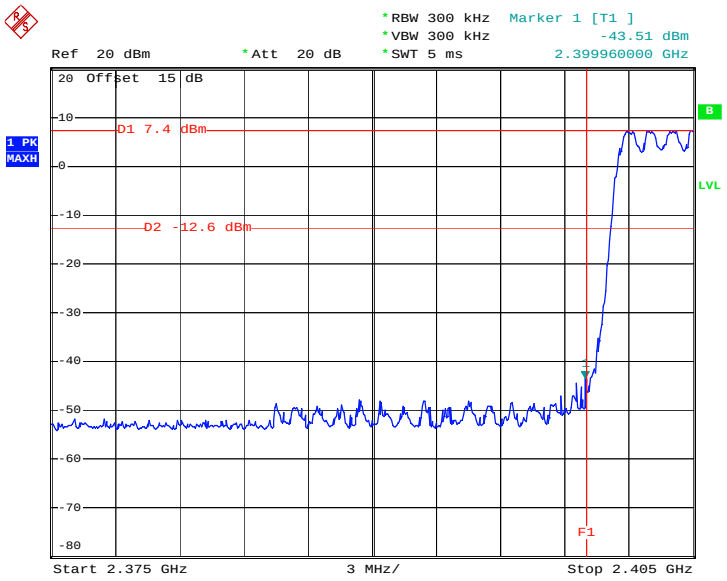
1Mbps Hopping Mode High Band Edge Plot



Date: 11.AUG.2013 11:46:34

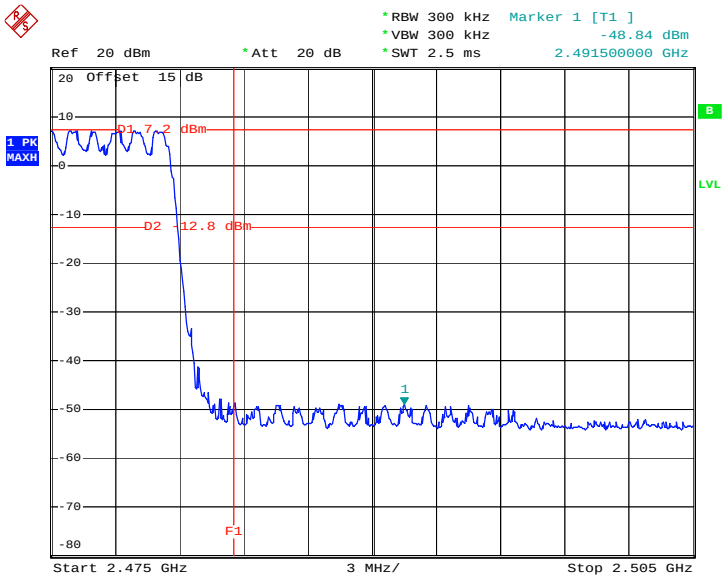
Test Mode :	2Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

2Mbps Hopping Mode Low Band Edge Plot



Date: 11.AUG.2013 11:42:15

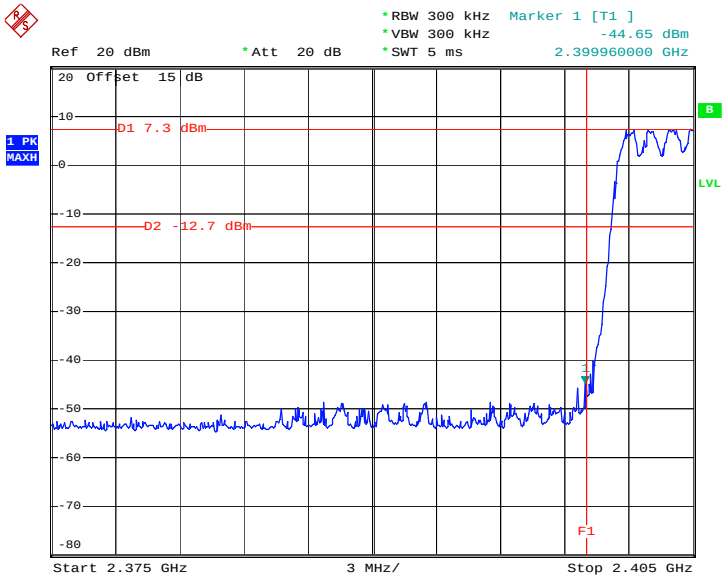
2Mbps Hopping Mode High Band Edge Plot



Date: 11.AUG.2013 11:45:46

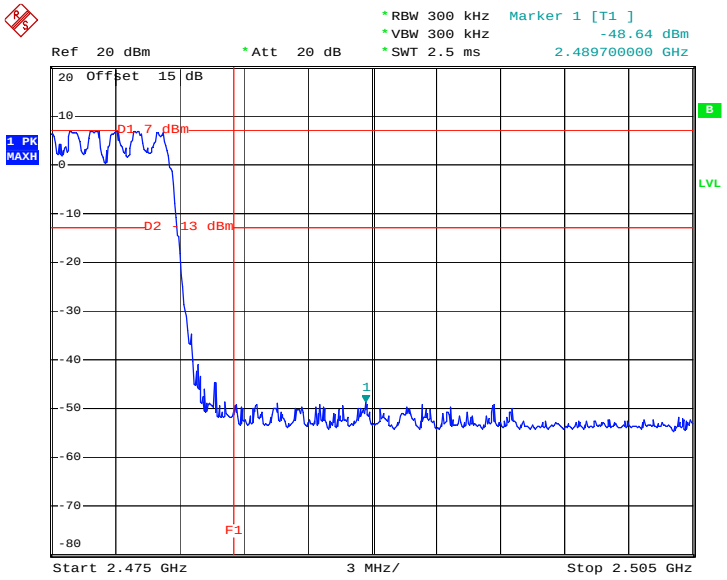
Test Mode :	3Mbps	Temperature :	22~24℃
Test Engineer :	Adonis Li	Relative Humidity :	47~48%

3Mbps Hopping Mode Low Band Edge Plot



Date: 11.AUG.2013 11:43:18

3Mbps Hopping Mode High Band Edge Plot



Date: 11.AUG.2013 11:44:42

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

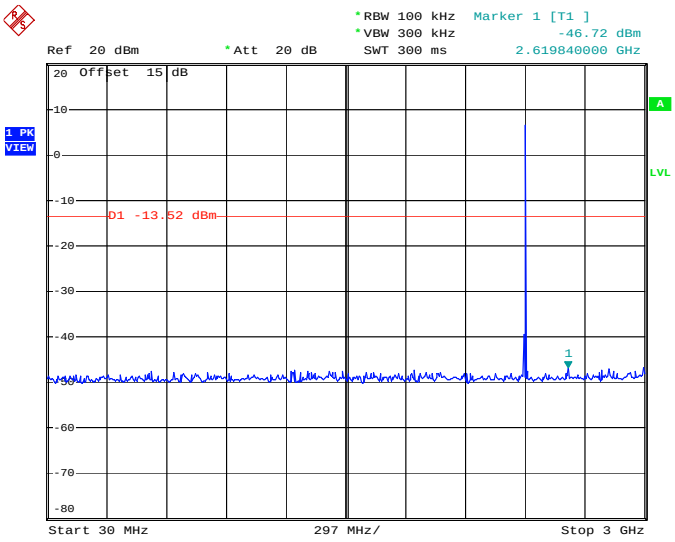
1. The testing follows the guidelines in Spurious RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum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

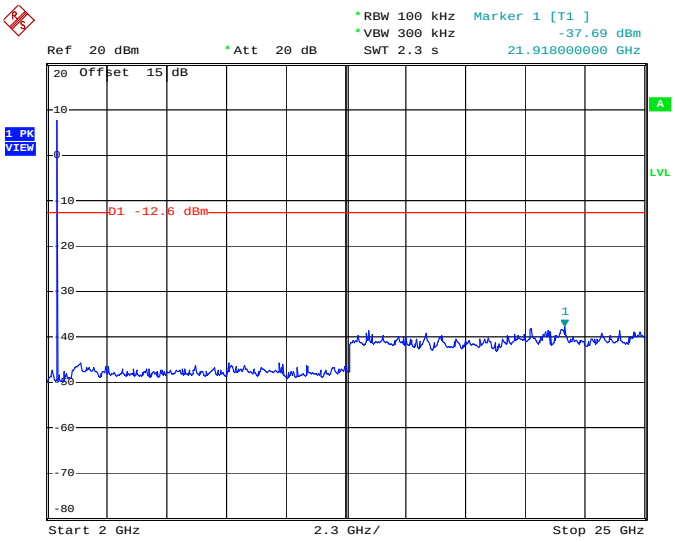
Test Mode :	1Mbps	Temperature :	22~24℃
Test Channel :	00	Relative Humidity :	47~48%
		Test Engineer :	Adonis Li

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



Date: 11.AUG.2013 11:20:44

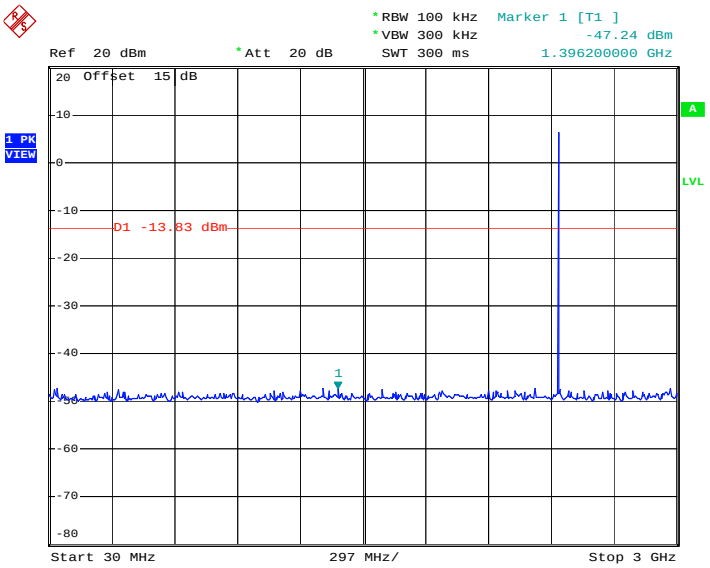
1Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 11.AUG.2013 11:51:15

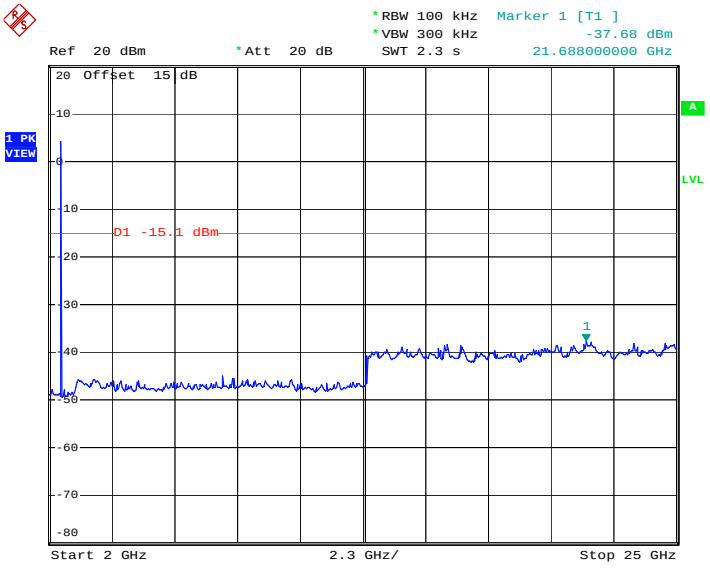
Test Mode :	1Mbps	Temperature :	22~24℃
Test Channel :	39	Relative Humidity :	47~48%
		Test Engineer :	Adonis Li

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



Date: 11.AUG.2013 11:21:48

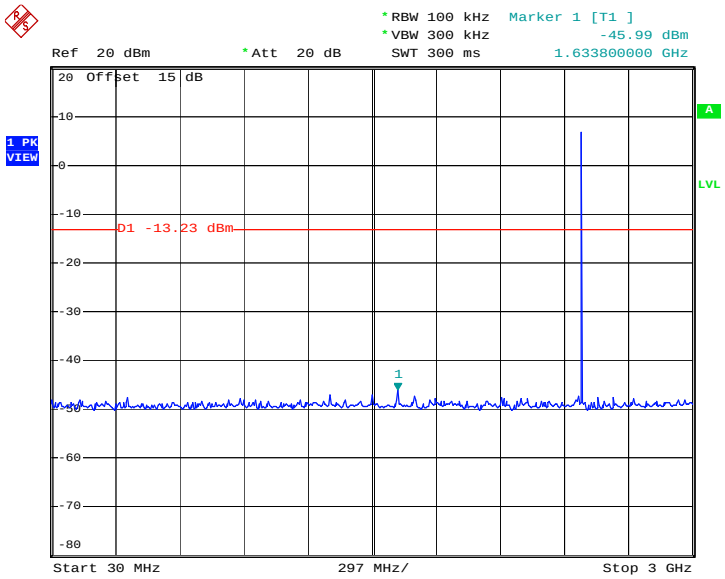
1Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 11.AUG.2013 11:53:40

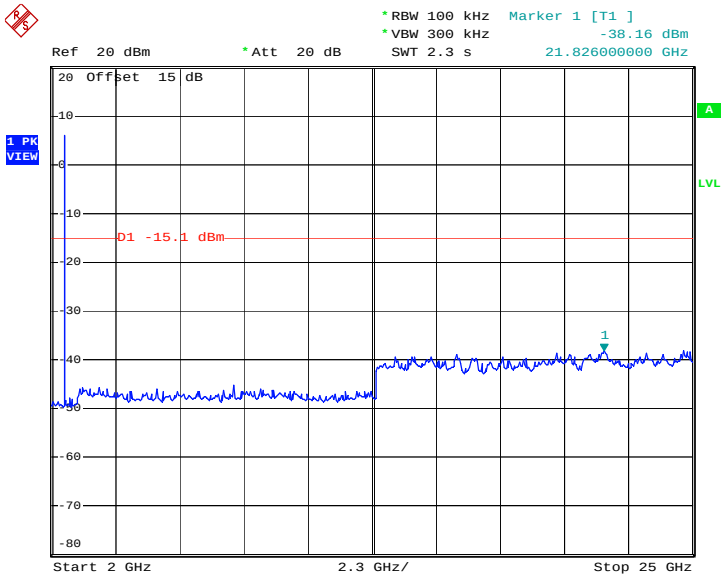
Test Mode :	1Mbps	Temperature :	22~24℃
Test Channel :	78	Relative Humidity :	47~48%
		Test Engineer :	Adonis Li

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



Date: 11.AUG.2013 11:22:52

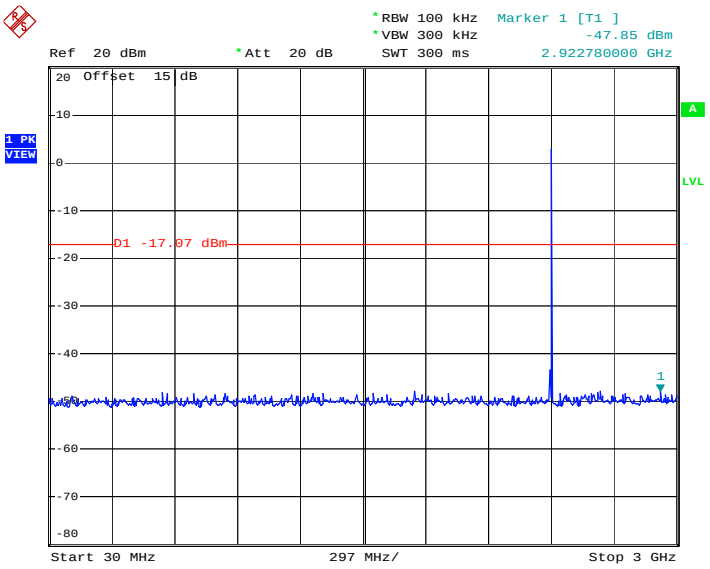
1Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 11.AUG.2013 11:54:35

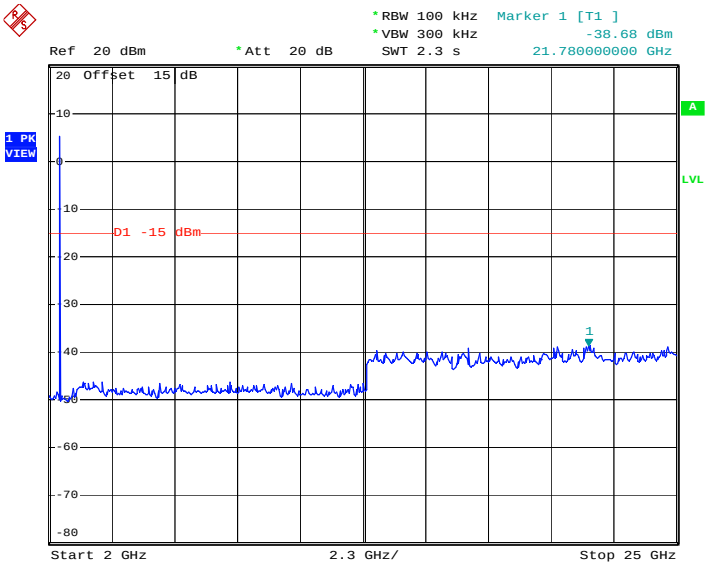
Test Mode :	2Mbps	**Temperature :**	22~24℃
Test Channel :	00	**Relative Humidity :**	47~48%
		Test Engineer :	Adonis Li

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



Date: 11.AUG.2013 13:33:07

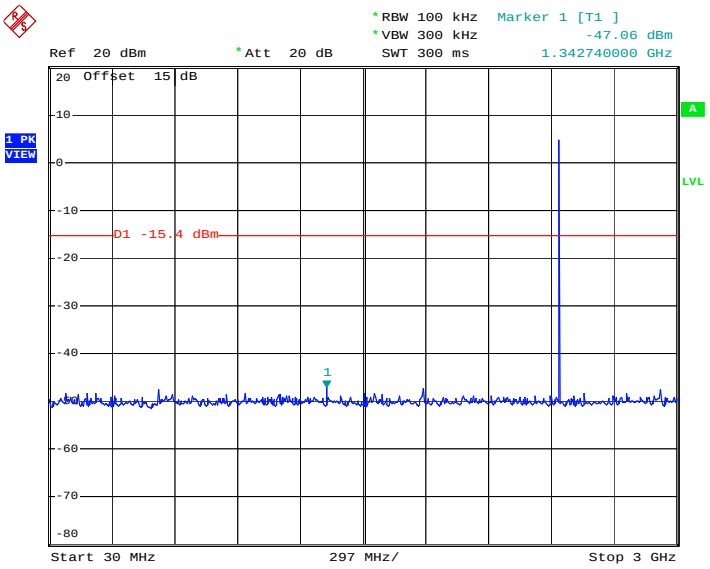
2Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 11.AUG.2013 13:33:43

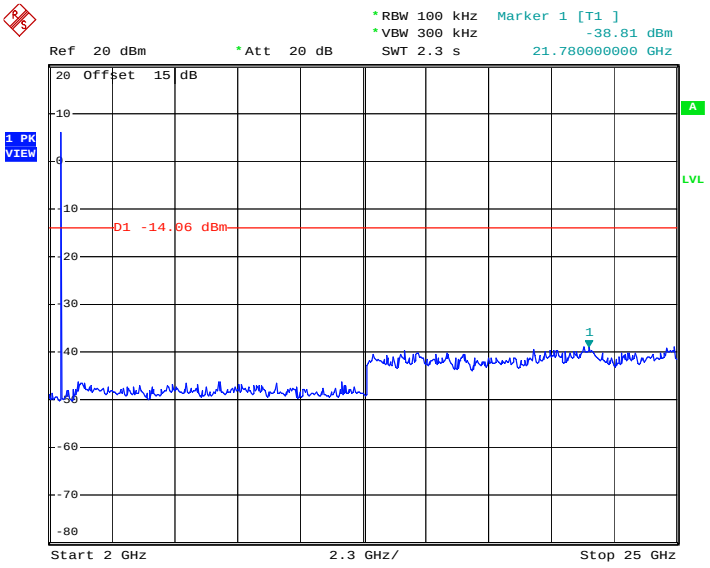
Test Mode :	2Mbps	**Temperature :**	22~24℃
Test Channel :	39	**Relative Humidity :**	47~48%
		Test Engineer :	Adonis Li

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



Date: 11.AUG.2013 13:34:20

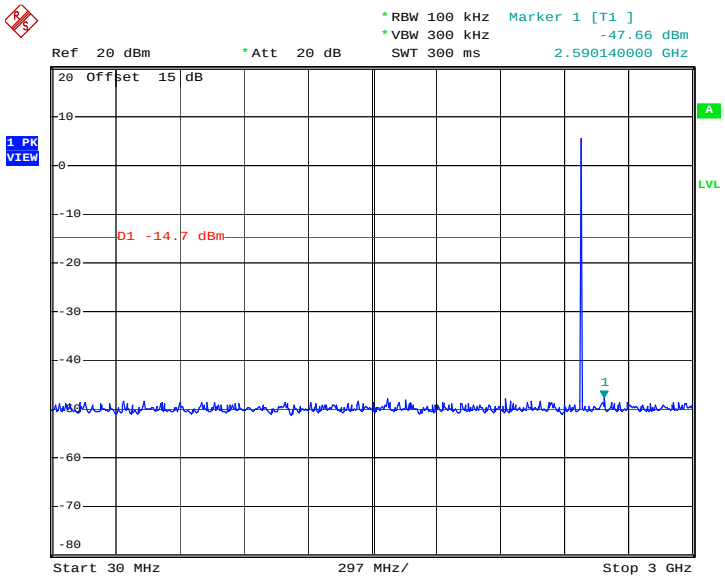
2Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 11.AUG.2013 13:34:48

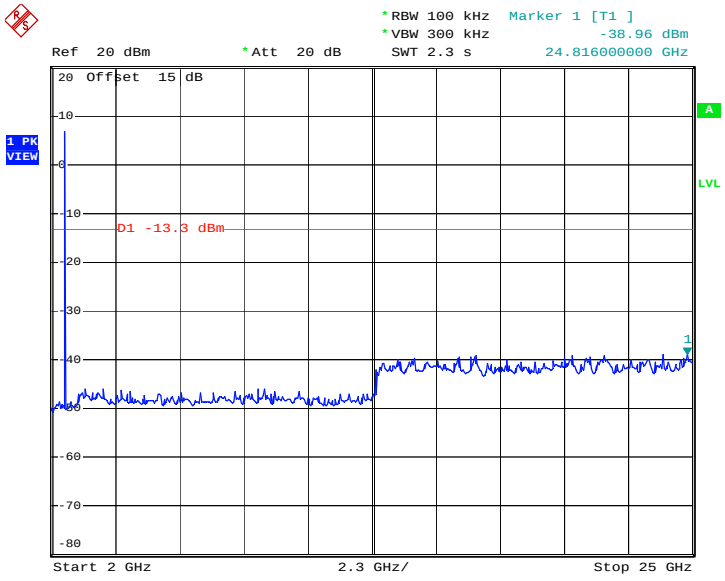
Test Mode :	2Mbps	Temperature :	22~24℃
Test Channel :	78	Relative Humidity :	47~48%
		Test Engineer :	Adonis Li

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



Date: 11.AUG.2013 13:35:32

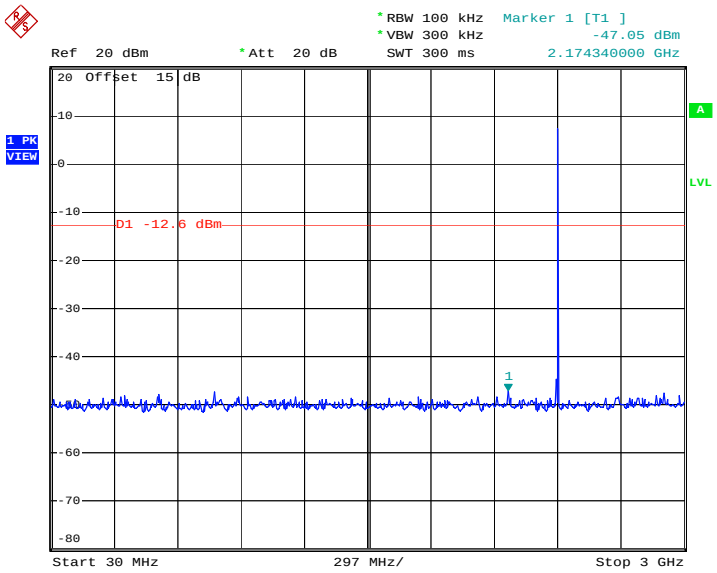
2Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 11.AUG.2013 13:36:13

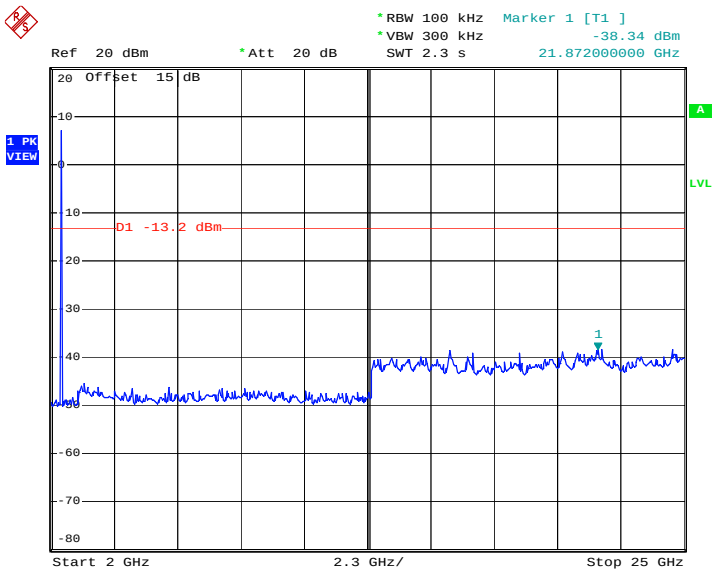
Test Mode :	3Mbps	**Temperature :**	22~24℃
Test Channel :	00	**Relative Humidity :**	47~48%
		Test Engineer :	Adonis Li

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



Date: 11.AUG.2013 13:37:25

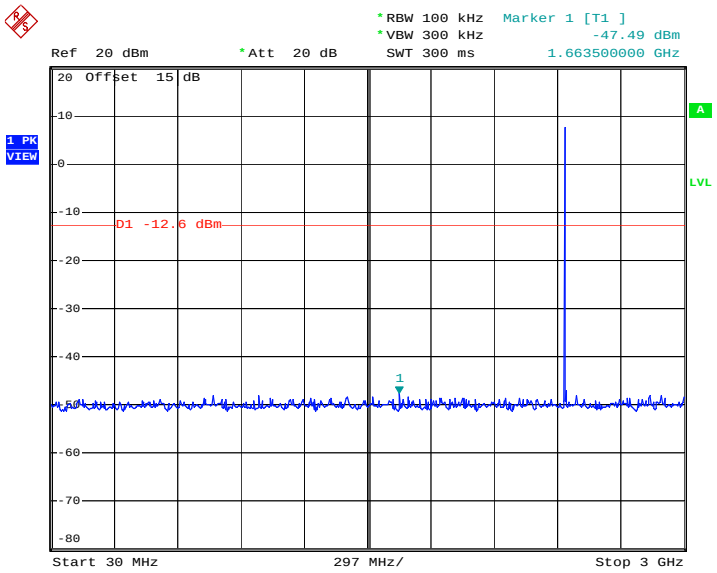
3Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 11.AUG.2013 13:36:53

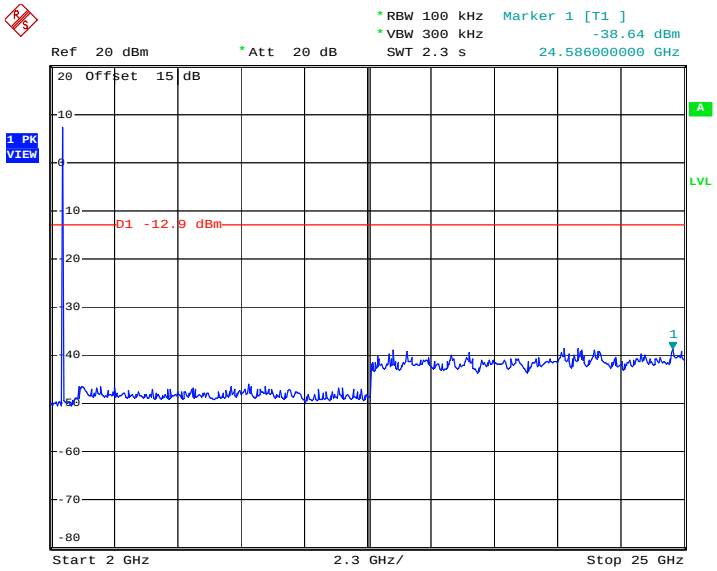
Test Mode :	3Mbps	Temperature :	22~24℃
Test Channel :	39	Relative Humidity :	47~48%
		Test Engineer :	Adonis Li

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



Date: 11.AUG.2013 13:38:08

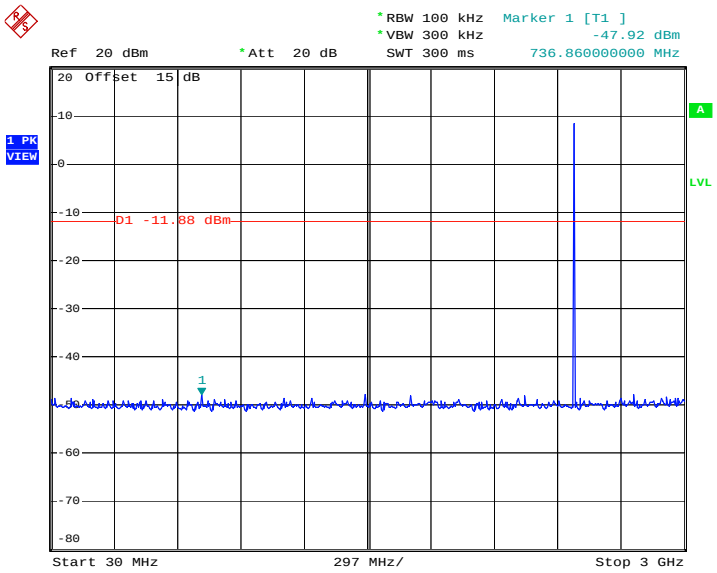
3Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 11.AUG.2013 13:38:41

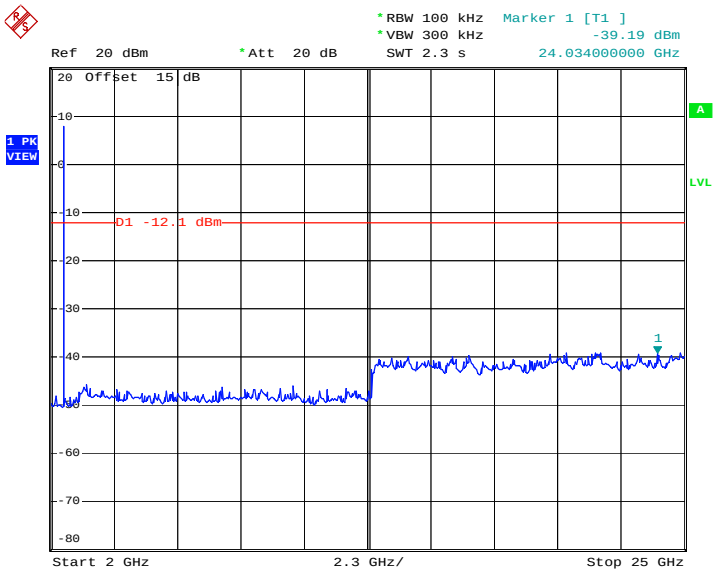
Test Mode :	3Mbps	Temperature :	22~24℃
Test Channel :	78	Relative Humidity :	47~48%
		Test Engineer :	Adonis Li

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



Date: 11.AUG.2013 13:39:19

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



Date: 11.AUG.2013 13:40:05

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

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

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

3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

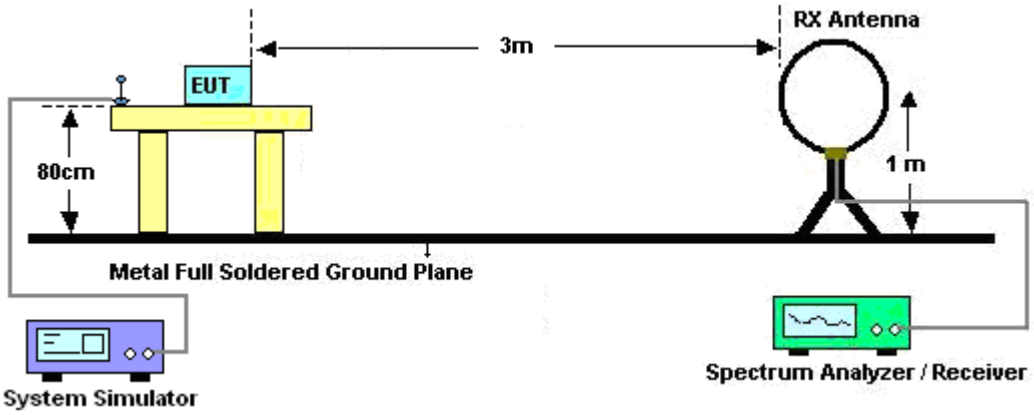
3.8.3 Test Procedures

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. The EUT was placed on a turntable with 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
7. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

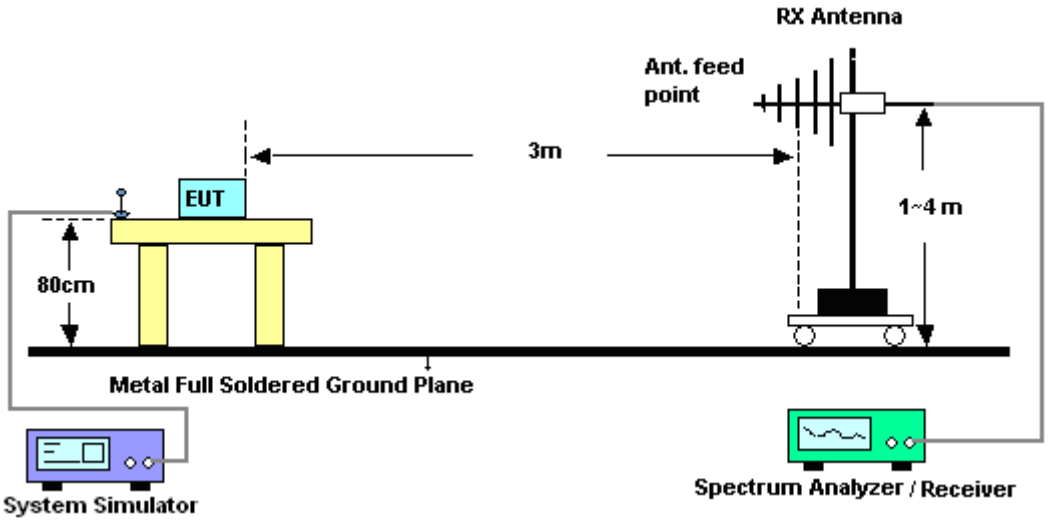
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.76dB) derived from 20log (dwell time/100ms).

3.8.4 Test Setup

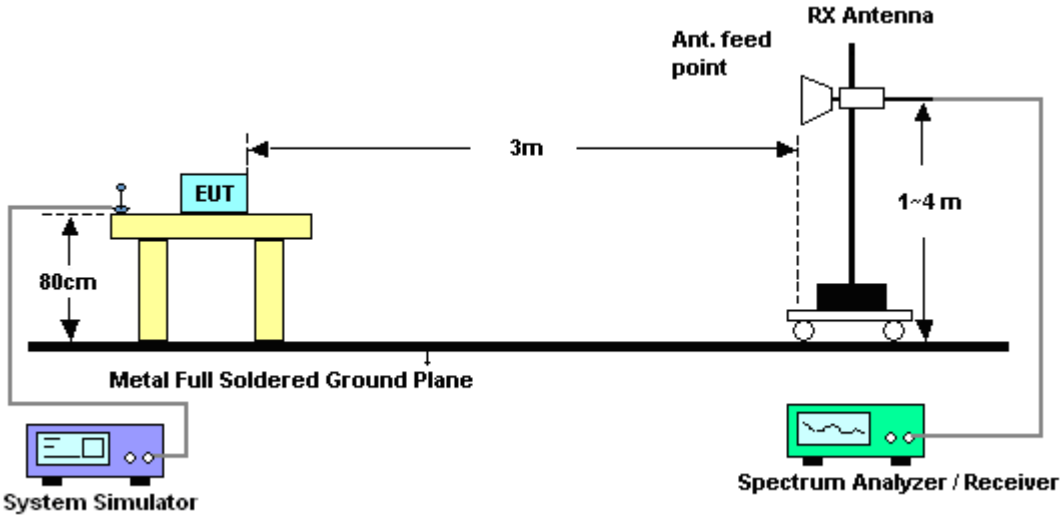
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

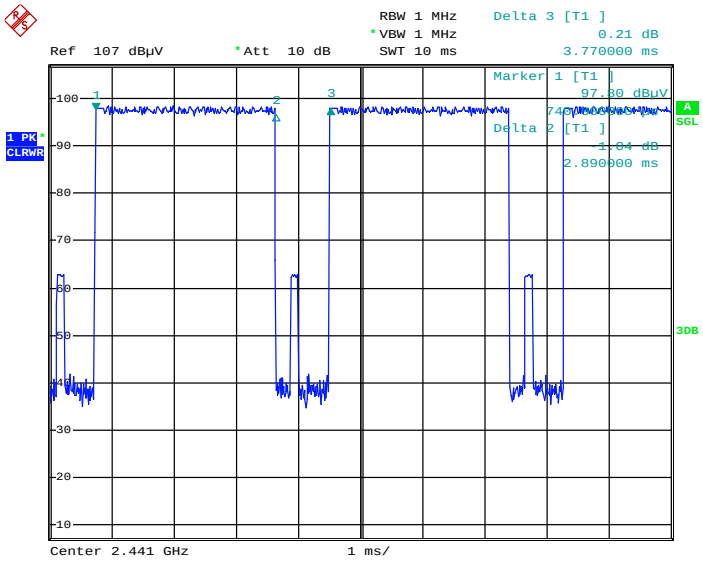


3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

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.

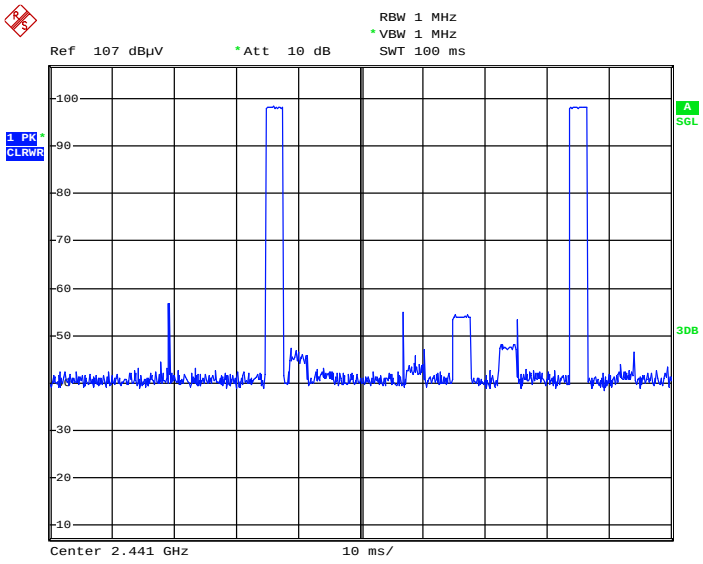
3.8.6 Duty cycle correction factor for average measurement

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



Date: 17.AUG.2013 09:49:44

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



Date: 17.AUG.2013 09:50:18

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.89 / 100 = 5.78 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.76 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

2.89 ms x 20 channels = 57.8 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:

2.89 ms x 2 = 5.78 ms

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

20 x log(5.78 ms/100ms) = -24.76 dB

3.8.7 Test Result of Radiated Spurious at Band Edges

Test Mode :	Mode 1	Temperature :	22~23°C
Test Channel :	00	Relative Humidity :	40~41%
		Test Engineer :	Jun Liu

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
2386.5	53.73	-20.27	74	48.38	32.86	3.17	30.68	126	62	Peak
2386.5	28.97	-25.03	54	-	-	-	-	-	-	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2386.23	51.32	-22.68	74	45.97	32.86	3.17	30.68	105	89	Peak
2386.23	26.56	-27.44	54	-	-	-	-	-	-	Average

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	40~41%
		Test Engineer :	Jun Liu

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	64.56	-9.44	74	58.93	33.01	3.22	30.6	141	64	Peak
2483.5	39.80	-14.20	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	62.07	-11.93	74	56.44	33.01	3.22	30.6	100	87	Peak
2483.5	37.31	-16.69	54	-	-	-	-	-	-	Average

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	40~41%
		Test Engineer :	Jun Liu

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	63.56	-10.44	74	57.93	33.01	3.22	30.6	145	66	Peak
2483.5	38.80	-15.20	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	60.07	-13.93	74	54.44	33.01	3.22	30.6	100	84	Peak
2483.5	35.31	-18.69	54	-	-	-	-	-	-	Average

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

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

Test Mode :	Mode 1	**Temperature :**	22~23°C
Test Channel :	00	**Relative Humidity :**	40~41%
Test Engineer :	Jun Liu	**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, 104.41dBμV/m - 20dB = 84.41dBμV/m. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	104.41	-	-	99.06	32.86	3.17	30.68	123	61	Peak
2402	79.65	-	-	-	-	-	-	123	61	Average
4804	49.37	-24.63	74	38.94	35.17	4.58	29.32	100	162	Peak
4804	24.61	-29.39	54	-	-	-	-	120	0	Average
7206	53.2	-31.21	84.41	41.56	36.16	5.61	30.13	200	130	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 1	Temperature :	22~23°C
Test Channel :	00	Relative Humidity :	40~41%
Test Engineer :	Jun Liu	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. 3. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	102.42	-	-	97.07	32.86	3.17	30.68	105	84	Peak
2402	77.66	-	-	-	-	-	-	105	84	Average
4804	49.18	-24.82	74	38.75	35.17	4.58	29.32	200	0	Peak
4804	24.42	-29.58	54	-	-	-	-	200	0	Average
7206	52.25	-30.17	82.42	40.61	36.16	5.61	30.13	200	100	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 2	Temperature :	22~23°C
Test Channel :	39	Relative Humidity :	40~41%
Test Engineer :	Jun Liu	Polarization :	Horizontal
Remark :	1. 2441 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2441	103.91	-	-	98.39	32.95	3.2	30.63	148	66	Peak
2441	79.15	-	-	-	-	-	-	148	66	Average
4882	50.27	-23.73	74	39.81	35.18	4.6	29.32	100	16	Peak
4882	25.51	-28.49	54	-	-	-	-	100	0	Average
7324	52.2	-21.8	74	40.54	36.21	5.64	30.19	100	0	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 2	Temperature :	22~23°C
Test Channel :	39	Relative Humidity :	40~41%
Test Engineer :	Jun Liu	Polarization :	Vertical
Remark :	1. 2441 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2441	100.27	-	-	94.75	32.95	3.2	30.63	200	97	Peak
2441	75.51	-	-	-	-	-	-	200	97	Average
4882	50.44	-23.56	74	39.98	35.18	4.6	29.32	100	85	Peak
4882	25.68	-28.32	54	-	-	-	-	200	0	Average
7324	51.69	-22.31	74	40.03	36.21	5.64	30.19	120	300	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	40~41%
Test Engineer :	Jun Liu	Polarization :	Horizontal
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

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	19.23	-20.77	40	35.28	18	-0.48	33.57	-	-	Peak
115.36	28.14	-15.36	43.5	48.95	11.8	1	33.61	200	0	Peak
273.47	19.87	-26.13	46	39.27	12.47	1.54	33.41	-	-	Peak
421.88	20.28	-25.72	46	35.56	16.12	1.87	33.27	-	-	Peak
878.75	22.85	-23.15	46	32.25	20.47	2.68	32.55	-	-	Peak
942.77	34.16	-11.84	46	43.09	20.7	2.81	32.44	-	-	Peak
2480	103.66	-	-	98.03	33.01	3.22	30.6	141	64	Peak
2480	78.9	-	-	-	-	-	-	141	64	Average
4960	50.33	-23.67	74	39.82	35.2	4.62	29.31	100	264	Peak
4960	25.57	-28.43	54	-	-	-	-	100	0	Average
7440	52.83	-21.17	74	41.13	36.27	5.67	30.24	200	106	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	40~41%
Test Engineer :	Jun Liu	Polarization :	Vertical
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

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
30.97	25.66	-14.34	40	42.33	17.29	-0.38	33.58	-	-	Peak
48.43	28.26	-11.74	40	53.08	8.12	0.65	33.59	100	0	Peak
62.01	22.84	-17.16	40	50.43	5.27	0.73	33.59	-	-	Peak
115.36	24.76	-18.74	43.5	45.57	11.8	1	33.61	-	-	Peak
866.14	23.12	-22.88	46	32.61	20.49	2.67	32.65	-	-	Peak
942.77	33.42	-12.58	46	42.35	20.7	2.81	32.44	-	-	Peak
2480	101.13	-	-	95.5	33.01	3.22	30.6	100	87	Peak
2480	76.37	-	-	-	-	-	-	100	87	Average
4960	50.69	-23.31	74	40.18	35.2	4.62	29.31	200	136	Peak
7440	53.36	-20.64	74	41.66	36.27	5.67	30.24	100	300	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	40~41%
Test Engineer :	Jun Liu	Polarization :	Horizontal
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

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	103.51	-	-	97.88	33.01	3.22	30.6	145	66	Peak
2480	78.75	-	-	-	-	-	-	145	66	Average
4960	50.08	-23.92	74	39.57	35.2	4.62	29.31	100	94	Peak
4960	25.32	-28.68	54	-	-	-	-	100	16	Average
7440	52.91	-21.09	74	41.21	36.27	5.67	30.24	100	91	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	40~41%
Test Engineer :	Jun Liu	Polarization :	Vertical
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2480	100.33	-	-	94.7	33.01	3.22	30.6	100	84	Peak
2480	75.57	-	-	-	-	-	-	100	84	Average
4960	50.62	-23.38	74	40.11	35.2	4.62	29.31	100	162	Peak
7440	52.47	-21.53	74	40.77	36.27	5.67	30.24	100	91	Peak

Note: Other harmonics are lower than background noise.

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

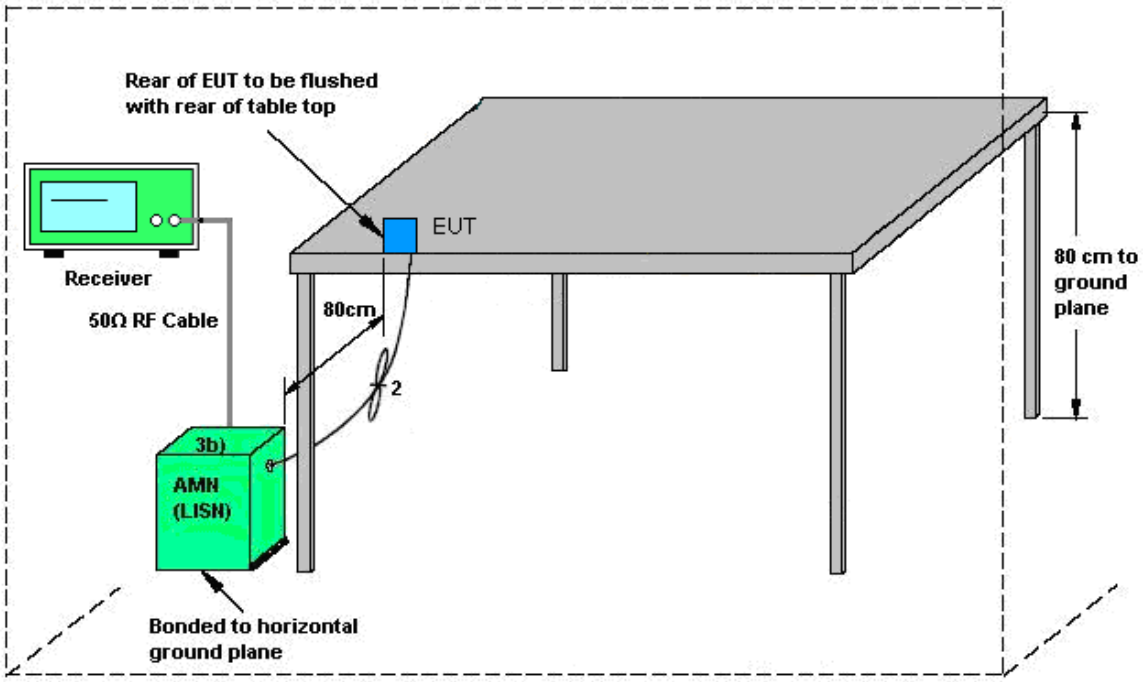
3.9.2 Measuring Instruments

See list of measuring instruments of this test report.

3.9.3 Test Procedures

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

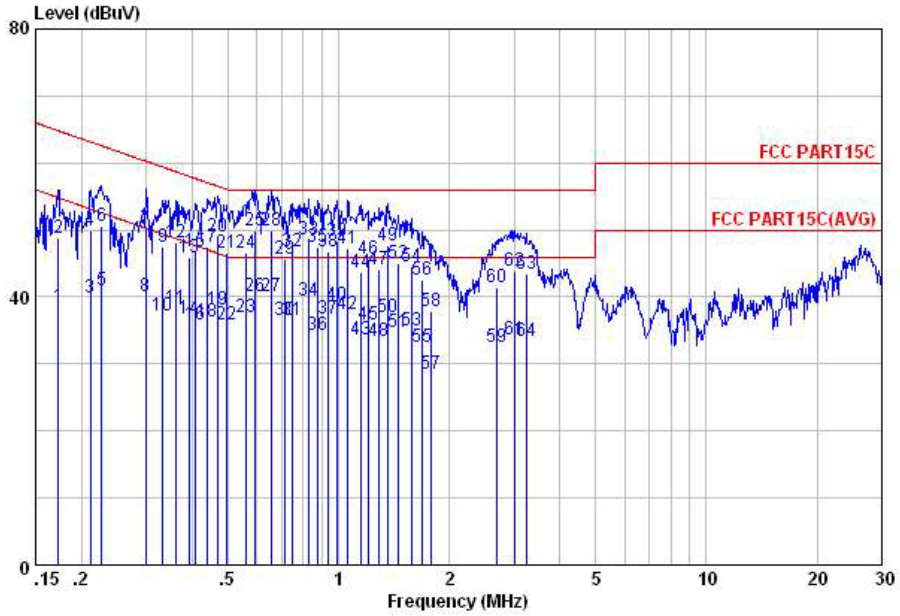
3.9.4 Test Setup



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

3.9.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Henry Chen	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Earphone for Sample 1		

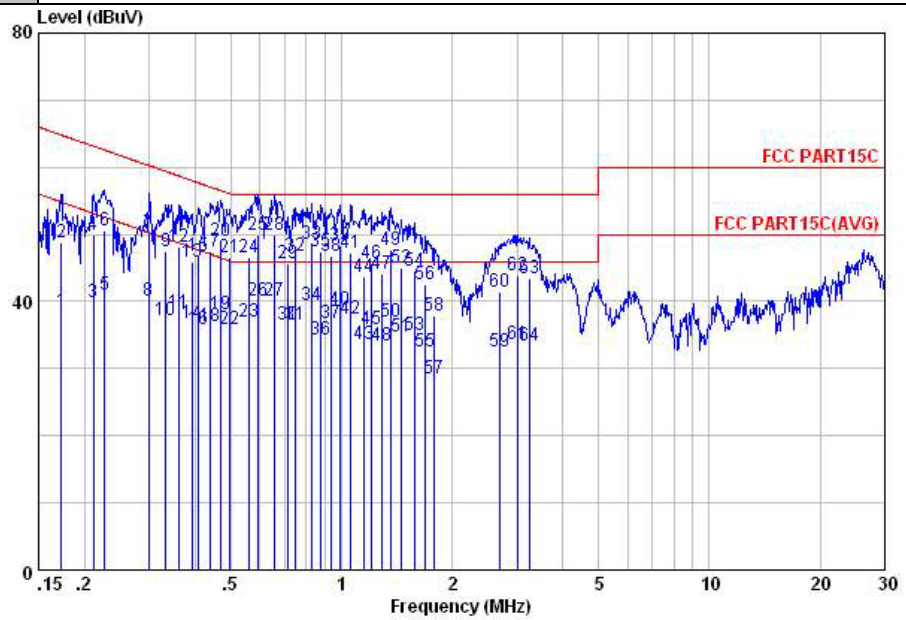


Site : C001-KS
Condition: FCC PART15C LISN-L20130306 LINE

mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.17	38.51	-16.30	54.81	26.39	1.48	10.64	Average
2	0.17	48.81	-16.00	64.81	36.69	1.48	10.64	QP
3	0.21	39.94	-13.20	53.14	28.41	0.97	10.56	Average
4	0.21	49.94	-13.20	63.14	38.41	0.97	10.56	QP
5	0.23	41.08	-11.49	52.57	29.60	0.94	10.54	Average
6	0.23	50.58	-11.99	62.57	39.10	0.94	10.54	QP
7	0.30	50.09	-10.19	60.28	39.00	0.70	10.39	QP
8	0.30	40.19	-10.09	50.28	29.10	0.70	10.39	Average
9	0.33	47.44	-11.96	59.40	36.60	0.50	10.34	QP
10	0.33	37.24	-12.16	49.40	26.40	0.50	10.34	Average
11	0.36	38.31	-10.38	48.69	27.60	0.40	10.31	Average
12	0.36	48.21	-10.48	58.69	37.50	0.40	10.31	QP
13	0.39	45.92	-12.11	58.03	35.30	0.33	10.29	QP
14	0.39	36.72	-11.31	48.03	26.10	0.33	10.29	Average
15	0.41	46.78	-10.90	57.68	36.20	0.30	10.28	QP
16	0.41	35.98	-11.70	47.68	25.40	0.30	10.28	Average
17	0.44	47.43	-9.64	57.07	36.90	0.26	10.27	QP
18	0.44	36.33	-10.74	47.07	25.80	0.26	10.27	Average
19	0.47	38.19	-8.30	46.49	27.69	0.23	10.27	Average
20	0.47	48.99	-7.50	56.49	38.49	0.23	10.27	QP
21	0.50	46.67	-9.38	56.05	36.21	0.20	10.26	QP
22	0.50	35.87	-10.18	46.05	25.41	0.20	10.26	Average
23	0.56	36.95	-9.05	46.00	26.50	0.20	10.25	Average
24	0.56	46.65	-9.35	56.00	36.20	0.20	10.25	QP
25	0.59	49.84	-6.16	56.00	39.40	0.20	10.24	QP
26	0.59	40.14	-5.86	46.00	29.70	0.20	10.24	Average
27	0.66	40.22	-5.78	46.00	29.80	0.20	10.22	Average
28	0.66	50.02	-5.98	56.00	39.60	0.20	10.22	QP

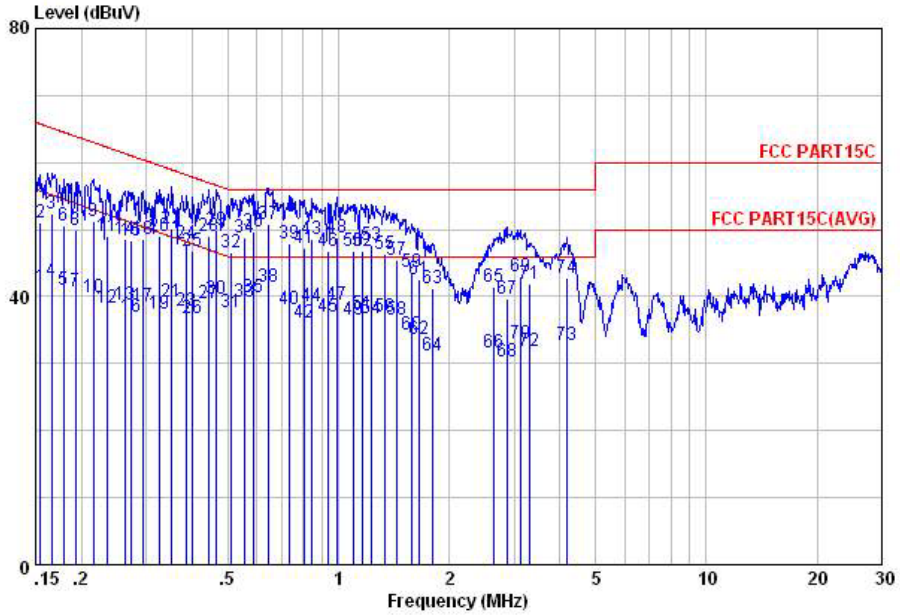
Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Henry Chen	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Earphone for Sample 1		



Site : C001-KS
Condition: FCC PART15C LISN-L20130306 LINE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
29	0.71	45.61	-10.39	56.00	35.20	0.20	10.21	QP
30	0.71	36.51	-9.49	46.00	26.10	0.20	10.21	Average
31	0.75	36.49	-9.51	46.00	26.10	0.19	10.20	Average
32	0.75	46.89	-9.11	56.00	36.50	0.19	10.20	QP
33	0.83	48.55	-7.45	56.00	38.21	0.15	10.19	QP
34	0.83	39.45	-6.55	46.00	29.11	0.15	10.19	Average
35	0.88	47.42	-8.58	56.00	37.10	0.13	10.19	QP
36	0.88	34.42	-11.58	46.00	24.10	0.13	10.19	Average
37	0.93	36.70	-9.30	46.00	26.41	0.11	10.18	Average
38	0.93	46.70	-9.30	56.00	36.41	0.11	10.18	QP
39	0.99	48.38	-7.62	56.00	38.10	0.10	10.18	QP
40	0.99	38.68	-7.32	46.00	28.40	0.10	10.18	Average
41	1.06	47.28	-8.72	56.00	37.00	0.10	10.18	QP
42	1.06	37.38	-8.62	46.00	27.10	0.10	10.18	Average
43	1.15	33.68	-12.32	46.00	23.40	0.10	10.18	Average
44	1.15	43.58	-12.42	56.00	33.30	0.10	10.18	QP
45	1.20	35.88	-10.12	46.00	25.60	0.10	10.18	Average
46	1.20	45.78	-10.22	56.00	35.50	0.10	10.18	QP
47	1.29	44.18	-11.82	56.00	33.90	0.10	10.18	QP
48	1.29	33.38	-12.62	46.00	23.10	0.10	10.18	Average
49	1.37	47.68	-8.32	56.00	37.40	0.10	10.18	QP
50	1.37	37.08	-8.92	46.00	26.80	0.10	10.18	Average
51	1.46	34.79	-11.21	46.00	24.50	0.10	10.19	Average
52	1.46	44.99	-11.01	56.00	34.70	0.10	10.19	QP
53	1.58	34.89	-11.11	46.00	24.60	0.10	10.19	Average
54	1.58	44.49	-11.51	56.00	34.20	0.10	10.19	QP
55	1.69	32.59	-13.41	46.00	22.30	0.10	10.19	Average
56	1.69	42.59	-13.41	56.00	32.30	0.10	10.19	QP
57	1.79	28.49	-17.51	46.00	18.20	0.10	10.19	Average
58	1.79	37.89	-18.11	56.00	27.60	0.10	10.19	QP
59	2.69	32.63	-13.37	46.00	22.30	0.12	10.21	Average
60	2.69	41.43	-14.57	56.00	31.10	0.12	10.21	QP
61	3.01	33.76	-12.24	46.00	23.40	0.14	10.22	Average
62	3.01	43.96	-12.04	56.00	33.60	0.14	10.22	QP
63	3.24	43.38	-12.62	56.00	32.99	0.16	10.23	QP
64	3.24	33.48	-12.52	46.00	23.09	0.16	10.23	Average

Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Henry Chen	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Earphone for Sample 1		

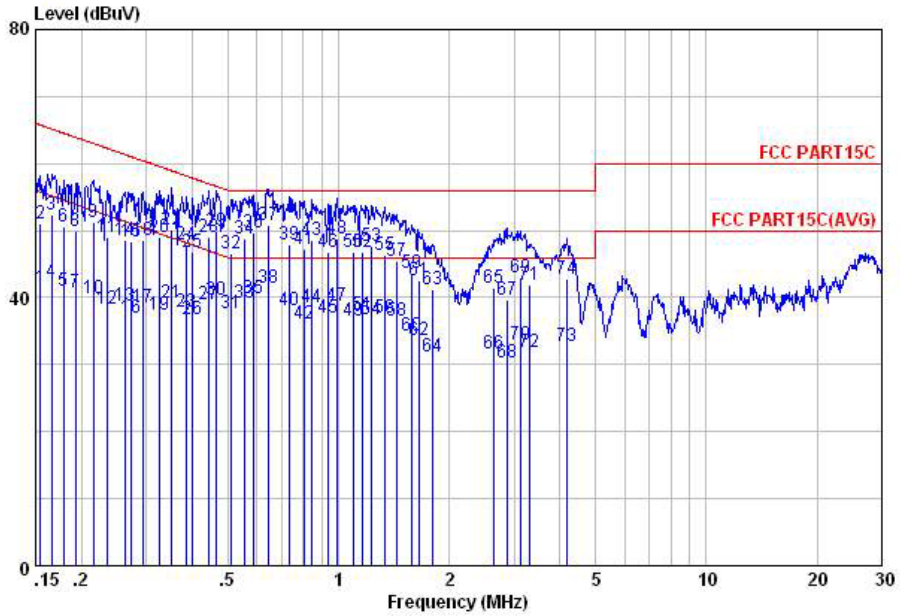


Site : C001-KS
Condition: FCC PART15C LISN-N20130306 NEUTRAL

mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	41.42	-14.32	55.74	28.90	1.83	10.69	Average
2	0.15	51.12	-14.62	65.74	38.60	1.83	10.69	QP
3	0.17	52.28	-12.88	65.16	39.99	1.63	10.66	QP
4	0.17	42.38	-12.78	55.16	30.09	1.63	10.66	Average
5	0.18	41.03	-13.52	54.55	29.10	1.31	10.62	Average
6	0.18	50.53	-14.02	64.55	38.60	1.31	10.62	QP
7	0.19	40.78	-13.15	53.93	29.11	1.08	10.59	Average
8	0.19	49.88	-14.05	63.93	38.21	1.08	10.59	QP
9	0.22	51.33	-11.68	63.01	39.80	0.97	10.56	QP
10	0.22	39.93	-13.08	53.01	28.40	0.97	10.56	Average
11	0.24	48.96	-13.30	62.26	37.50	0.93	10.53	QP
12	0.24	38.26	-14.00	52.26	26.80	0.93	10.53	Average
13	0.26	38.75	-12.63	51.38	27.41	0.86	10.48	Average
14	0.26	48.55	-12.83	61.38	37.21	0.86	10.48	QP
15	0.27	48.28	-12.75	61.03	37.00	0.83	10.45	QP
16	0.27	36.88	-14.15	51.03	25.60	0.83	10.45	Average
17	0.29	38.46	-11.95	50.41	27.30	0.76	10.40	Average
18	0.29	48.66	-11.75	60.41	37.50	0.76	10.40	QP
19	0.33	37.53	-12.00	49.53	26.59	0.59	10.35	Average
20	0.33	48.93	-10.60	59.53	37.99	0.59	10.35	QP
21	0.35	39.22	-9.69	48.91	28.40	0.50	10.32	Average
22	0.35	50.22	-8.69	58.91	39.40	0.50	10.32	QP
23	0.39	37.81	-10.31	48.12	27.10	0.42	10.29	Average
24	0.39	47.91	-10.21	58.12	37.20	0.42	10.29	QP
25	0.40	46.88	-10.93	57.81	36.20	0.40	10.28	QP
26	0.40	36.78	-11.03	47.81	26.10	0.40	10.28	Average
27	0.44	39.02	-8.00	47.02	28.40	0.35	10.27	Average
28	0.44	48.92	-8.10	57.02	38.30	0.35	10.27	QP

Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Henry Chen	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Earphone for Sample 1		

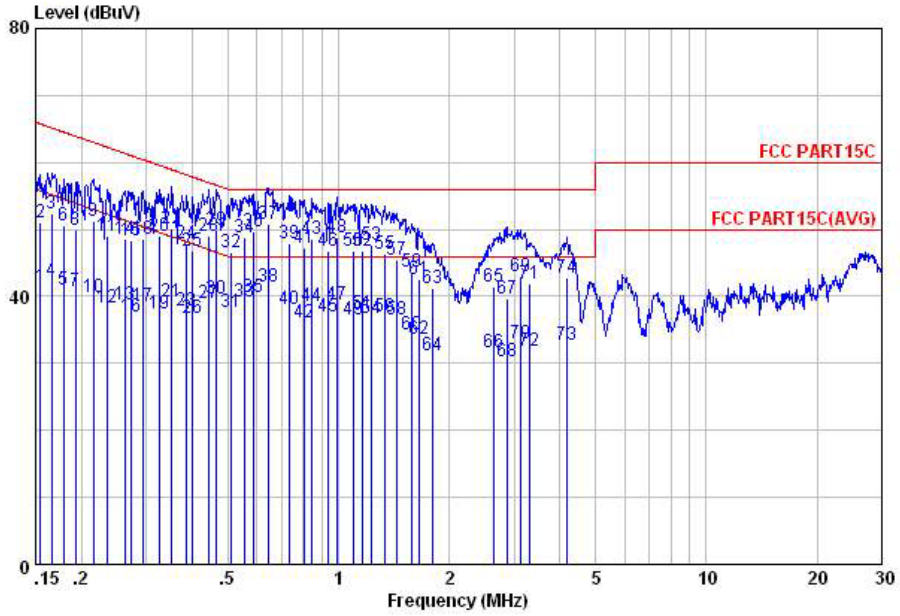


Site : C001-KS
Condition: FCC PART15C LISN-N20130306 NEUTRAL

mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
29	0.46	49.90	-6.73	56.63	39.30	0.33	10.27	QP
30	0.46	39.70	-6.93	46.63	29.10	0.33	10.27	Average
31	0.51	37.76	-8.24	46.00	27.20	0.30	10.26	Average
32	0.51	46.66	-9.34	56.00	36.10	0.30	10.26	QP
33	0.56	39.23	-6.77	46.00	28.71	0.27	10.25	Average
34	0.56	48.83	-7.17	56.00	38.31	0.27	10.25	QP
35	0.59	39.80	-6.20	46.00	29.31	0.25	10.24	Average
36	0.59	49.80	-6.20	56.00	39.31	0.25	10.24	QP
37	0.64	50.75	-5.25	56.00	40.30	0.22	10.23	QP
38	0.64	41.45	-4.55	46.00	31.00	0.22	10.23	Average
39	0.73	48.00	-8.00	56.00	37.60	0.19	10.21	QP
40	0.73	38.20	-7.80	46.00	27.80	0.19	10.21	Average
41	0.81	47.26	-8.74	56.00	36.90	0.16	10.20	QP
42	0.81	36.16	-9.84	46.00	25.80	0.16	10.20	Average
43	0.85	48.63	-7.37	56.00	38.30	0.14	10.19	QP
44	0.85	38.53	-7.47	46.00	28.20	0.14	10.19	Average
45	0.94	37.10	-8.90	46.00	26.81	0.11	10.18	Average
46	0.94	46.90	-9.10	56.00	36.61	0.11	10.18	QP
47	0.99	38.68	-7.32	46.00	28.40	0.10	10.18	Average
48	0.99	48.78	-7.22	56.00	38.50	0.10	10.18	QP
49	1.10	36.58	-9.42	46.00	26.30	0.10	10.18	Average

Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Henry Chen	Relative Humidity :	51~53%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Earphone for Sample 1		



Site : C001-KS
Condition: FCC PART15C LISN-N20130306 NEUTRAL

mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
50	1.10	46.78	-9.22	56.00	36.50	0.10	10.18	QP
51	1.16	37.38	-8.62	46.00	27.10	0.10	10.18	Average
52	1.16	46.88	-9.12	56.00	36.60	0.10	10.18	QP
53	1.23	47.58	-8.42	56.00	37.30	0.10	10.18	QP
54	1.23	36.78	-9.22	46.00	26.50	0.10	10.18	Average
55	1.34	46.28	-9.72	56.00	36.00	0.10	10.18	QP
56	1.34	37.08	-8.92	46.00	26.80	0.10	10.18	Average
57	1.43	45.49	-10.51	56.00	35.20	0.10	10.19	QP
58	1.43	36.59	-9.41	46.00	26.30	0.10	10.19	Average
59	1.59	43.79	-12.21	56.00	33.50	0.10	10.19	QP
60	1.59	34.39	-11.61	46.00	24.10	0.10	10.19	Average
61	1.65	42.59	-13.41	56.00	32.30	0.10	10.19	QP
62	1.65	33.59	-12.41	46.00	23.30	0.10	10.19	Average
63	1.80	41.29	-14.71	56.00	31.00	0.10	10.19	QP
64	1.80	31.29	-14.71	46.00	21.00	0.10	10.19	Average
65	2.65	41.53	-14.47	56.00	31.20	0.12	10.21	QP
66	2.65	31.73	-14.27	46.00	21.40	0.12	10.21	Average
67	2.87	39.65	-16.35	56.00	29.30	0.13	10.22	QP
68	2.87	30.25	-15.75	46.00	19.90	0.13	10.22	Average
69	3.12	42.97	-13.03	56.00	32.59	0.15	10.23	QP
70	3.12	32.87	-13.13	46.00	22.49	0.15	10.23	Average
71	3.31	41.89	-14.11	56.00	31.50	0.16	10.23	QP
72	3.31	31.89	-14.11	46.00	21.50	0.16	10.23	Average
73	4.18	32.83	-13.17	46.00	22.40	0.19	10.24	Average
74	4.18	42.73	-13.27	56.00	32.30	0.19	10.24	QP

3.10 Antenna Requirements

3.10.1 Standard Applicable

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

3.10.2 Antenna Connected Construction

Non-standard connector used.

3.10.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100319	9kHz~40GHz	Dec. 29, 2012	Aug. 01, 2013~ Aug. 18, 2013	Dec. 28, 2013	Conducted (TH01-KS)
Power Meter	Agilent	E4416A	MY45101555	N/A	Aug. 22, 2012	Aug. 01, 2013~ Aug. 18, 2013	Aug. 21, 2013	Conducted (TH01-KS)
Power Sensor	Agilent	E9327A	MY44421198	N/A	Aug. 22, 2012	Aug. 01, 2013~ Aug. 18, 2013	Aug. 21, 2013	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESCI	100534	9kHz~3GHz	Nov. 08, 2012	Aug. 17, 2013	Nov. 07, 2013	Radiation (03CH01-KS)
Spectrum Analyzer	R&S	FSP30	100400	9kHz~30GHz	May 23, 2013	Aug. 17, 2013	May 22, 2014	Radiation (03CH01-KS)
Bilog Antenna	SCHAFFNER	CBL6112D	23182	25MHz~2GHz	Dec. 07, 2012	Aug. 17, 2013	Dec. 06, 2013	Radiation (03CH01-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHZ-30MHZ	Oct. 22, 2012	Aug. 17, 2013	Oct. 21, 2013	Radiation (03CH01-KS)
Double Ridge Horn Antenna	EMCO	3117	00075959	1GHz~18GHz	Jan. 06, 2013	Aug. 17, 2013	Jan. 05, 2014	Radiation (03CH01-KS)
Amplifier	com-power	PA-103A	161069	1MHz~1GHz	May 23, 2013	Aug. 17, 2013	May 22, 2014	Radiation (03CH01-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Dec. 29, 2012	Aug. 17, 2013	Dec. 28, 2013	Radiation (03CH01-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	9170249	15GHz~40GHz	Nov. 23, 2012	Aug. 17, 2013	Nov. 22, 2013	Radiation (03CH01-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	N/A	Aug. 17, 2013	N/A	Radiation (03CH01-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	N/A	Aug. 17, 2013	N/A	Radiation (03CH01-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz	May 23, 2013	Aug. 01, 2013	May 22, 2014	Conduction (CO01-KS)
LISN	MessTec	AN3016	60103	9kHz~30MHz	Dec. 29, 2012	Aug. 01, 2013	Dec. 28, 2013	Conduction (CO01-KS)
LISN (for auxiliary equipment)	MessTec	AN3016	60105	9kHz~30MHz	Dec. 29, 2012	Aug. 01, 2013	Dec. 28, 2013	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	N/A	Nov. 15, 2012	Aug. 01, 2013	Nov. 14, 2013	Conduction (CO01-KS)

5 Uncertainty of Evaluation

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**

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

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