FCC RF Test Report

APPLICANT	:	Acer Incorporated
EQUIPMENT	:	Smart HandHeld
BRAND NAME	:	Acer
MODEL NAME	:	Z500
FCC ID	:	HLZDMZ500
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter

The product was received on Aug. 04, 2014 and testing was completed on Aug. 14, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

TABLE OF CONTENTS

REVISION HISTORY **3**

SUMMARY OF TEST RESULT **4**

1 GENERAL DESCRIPTION **5**

1.1 Applicant 5
1.2 Manufacturer 5
1.3 Product Feature of Equipment Under Test 5
1.4 Product Specification subjective to this standard 6
1.5 Modification of EUT 7
1.6 Testing Location 7
1.7 Applicable Standards 8

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST **9**

2.1 Descriptions of Test Mode 9
2.2 Test Mode 10
2.3 Connection Diagram of Test System 11
2.4 Support Unit used in test configuration and system 12
2.5 EUT Operation Test Setup 12
2.6 Measurement Results Explanation Example 12

3 TEST RESULT **13**

3.1 Number of Channel Measurement 13
3.2 Hopping Channel Separation Measurement 15
3.3 Dwell Time Measurement 22
3.4 20dB and 99% Bandwidth Measurement 25
3.5 Peak Output Power Measurement 38
3.6 Conducted Band Edges Measurement 40
3.7 Conducted Spurious Emission Measurement 47
3.8 Radiated Band Edges and Spurious Emission Measurement 57
3.9 AC Conducted Emission Measurement 68
3.10 Antenna Requirements 72

4 LIST OF MEASURING EQUIPMENT **73**

5 UNCERTAINTY OF EVALUATION **74**

APPENDIX A. SETUP PHOTOGRAPHS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR480441A	Rev. 01	Initial issue of report	Aug. 21, 2014

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	Number of Channels	≥ 15Chs	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	≥ 2/3 of 20dB BW	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	≤ 0.4sec in 31.6sec period	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	NA	Pass	-
3.4	-	99% Bandwidth	-	Pass	-
3.5	15.247(b)(1)	Peak Output Power	≤ 125 mW	Pass	-
3.6	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	≤ 20dBc	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 7.59 dB at 75.630 MHz
3.9	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 6.34 dB at 0.180 MHz
3.10	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Acer Incorporated
8F., No. 88, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 22181, Taiwan (R.O.C.)

1.2 Manufacturer

Compal Communications (Nanjing) Co., Ltd.
No. 68-2, Suyuan Road, Nanjing Export Processing Zone(South Area), China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smart HandHeld
Brand Name	Acer
Model Name	Z500
FCC ID	HLZDMZ500
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/HSPA+(Downlink Only) WLAN2.4GHz 802.11b/g/n HT20/HT40 Bluetooth v3.0+EDR Bluetooth v4.0 LE
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 subjective to this standard

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) : 5.97 dBm (0.0040 W) Bluetooth EDR (2Mbps) : 5.64 dBm (0.0037 W) Bluetooth EDR (3Mbps) : 5.85 dBm (0.0038 W)
99% Occupied Bandwidth	Bluetooth BR(1Mbps) : 0.864MHz Bluetooth EDR (2Mbps) : 1.164MHz Bluetooth EDR (3Mbps) : 1.148MHz
Antenna Type	Chip Antenna with gain 0.04 dBi
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π/4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK

1.5 Modification of EUT

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

1.6 Testing Location

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 Registration No.**
	TH02-HY	03CH05-HY	TW1022

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 Registration No.**
	CO01-KS	149928

1.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC Public Notice DA 00-705
- ANSI C63.4-2003

Remark:

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

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

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

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π /4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	5.78 dBm	5.24 dBm	5.50 dBm
Ch39	2441MHz	5.92 dBm	5.50 dBm	5.55 dBm
Ch78	2480MHz	**5.97** dBm	5.64 dBm	5.85 dBm

Remark:

1. All the test data for each data rate were verified, but only the worst case was reported.
2. The data rate was set in 1Mbps for all the test items due to the highest RF output power.

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels, and different data rates were conducted to determine the final configuration (Z plane as worst plane) from all possible combinations, and the worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.

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

2.2 Test Mode

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

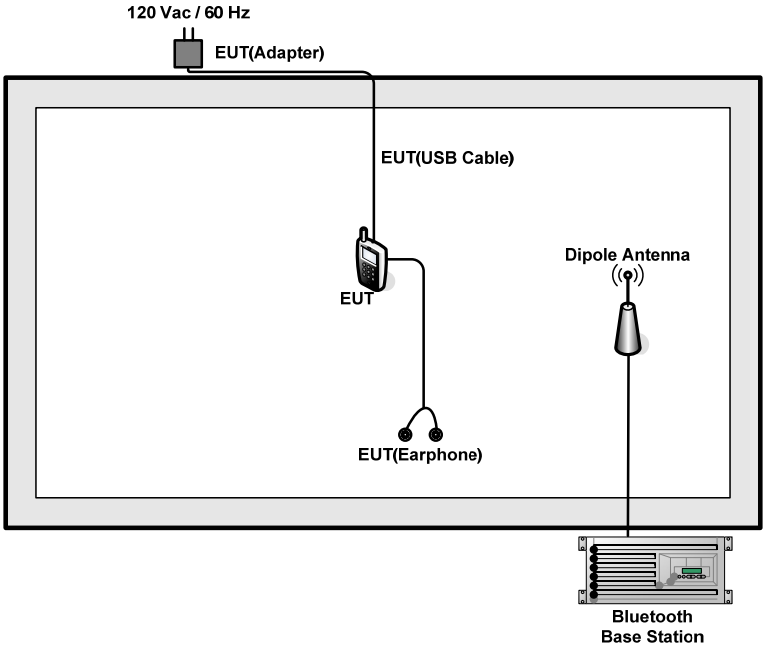
Summary table of Test Cases			
Test Item	**Data Rate / Modulation**		
	Bluetooth BR 1Mbps GFSK	**Bluetooth EDR 2Mbps π/4-DQPSK**	**Bluetooth EDR 3Mbps 8-DPSK**
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated Test Cases	**Bluetooth BR 1Mbps GFSK**		
	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 Link + Earphone + USB Cable (Charging from Adapter 1) for Sample 1 Mode 2 : GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter 2) for Sample 1		

Remark:

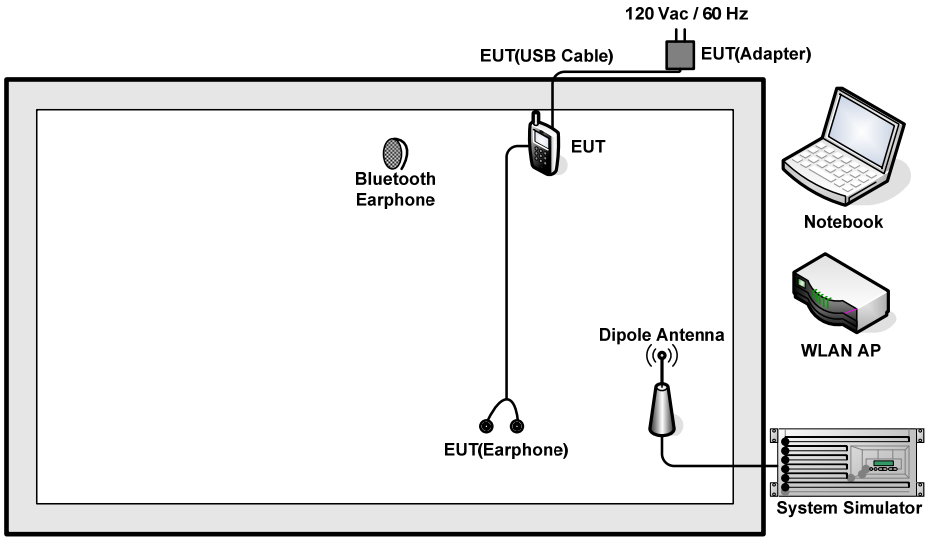
1. For radiated test cases, the worst mode data rate 1Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and no other significantly frequencies found in conducted spurious emission.
2. The worst case of conducted emission is mode 2; only the test data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

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.	BT Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m
3.	WLAN AP	D-Link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8 m
4.	Notebook	Lenovo	G480	N/A	N/A	AC I/P: Unshielded, 0.9 m DC O/P: Shielded, 1.8 m
5.	Bluetooth Earphone	Lenovo	LBH505	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For Bluetooth function, the engineering test program was provided and enabled to make EUT connect with Bluetooth base station to continuous transmit/receive.

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 5.4 dB and 20dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 5.4 + 20 = 25.4 (dB)

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

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

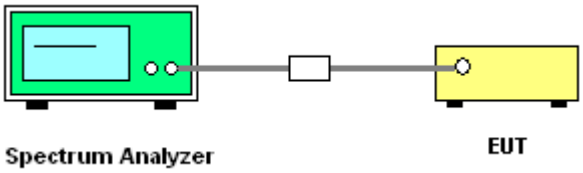
3.1.2 Measuring Instruments

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

3.1.3 Test Procedure

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

3.1.4 Test Setup

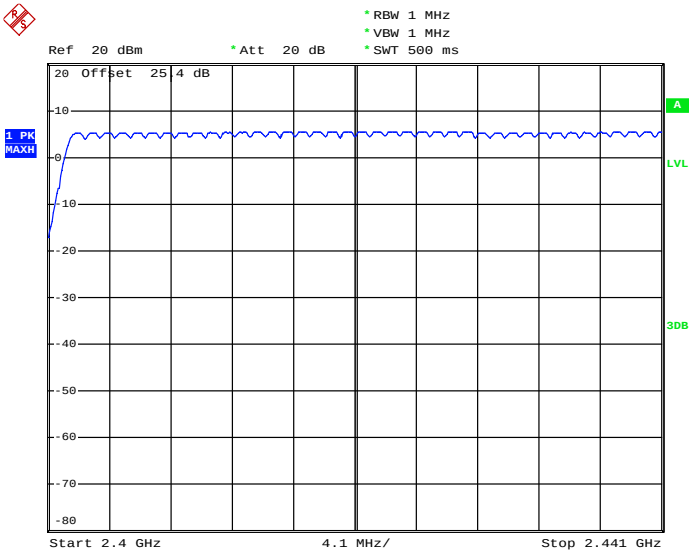


3.1.5 Test Result of Number of Hopping Frequency

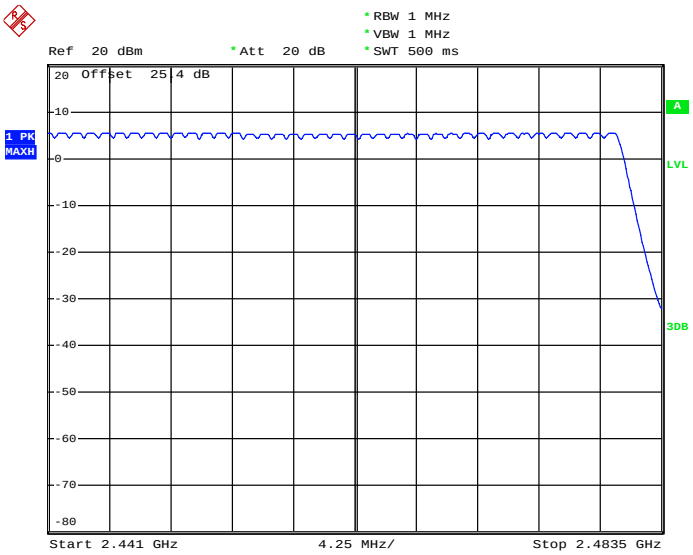
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Engineer :	Osolemio Chang	**Relative Humidity :**	50~53%

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



Date: 13.AUG.2014 00:15:28



Date: 13.AUG.2014 00:11:10

3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

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

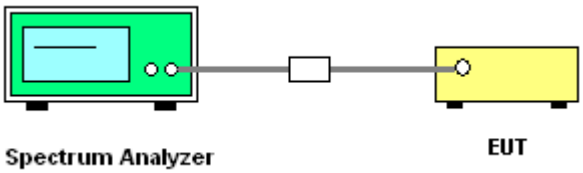
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

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

3.2.4 Test Setup

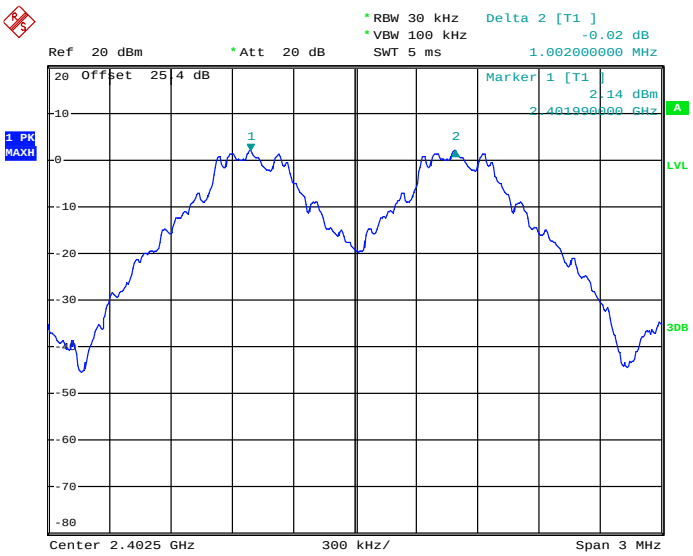


3.2.5 Test Result of Hopping Channel Separation

Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Engineer :	Osolemio Chang	**Relative Humidity :**	50~53%

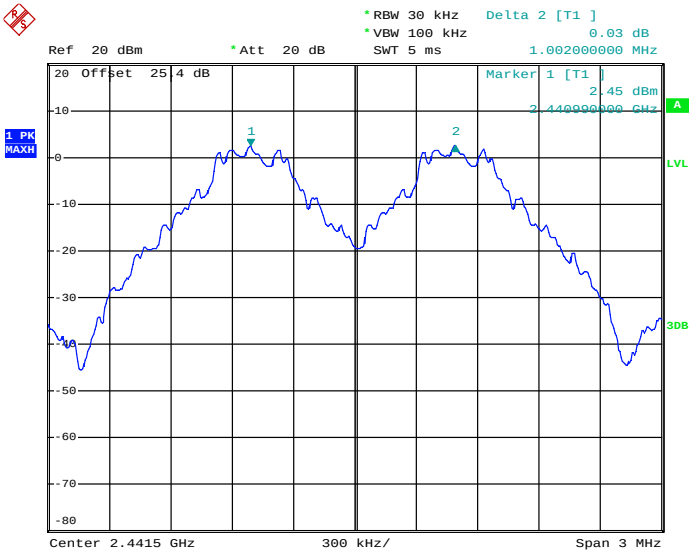
Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.6240	Pass
39	2441	1.002	0.6240	Pass
78	2480	1.002	0.6240	Pass

Channel Separation Plot on Channel 00 - 01



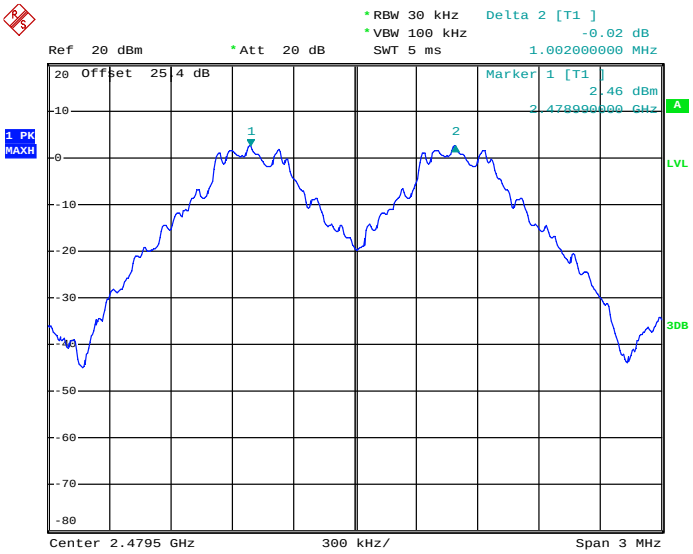
Date: 12.AUG.2014 23:19:30

Channel Separation Plot on Channel 39 - 40



Date: 12.AUG.2014 23:18:32

Channel Separation Plot on Channel 77 - 78

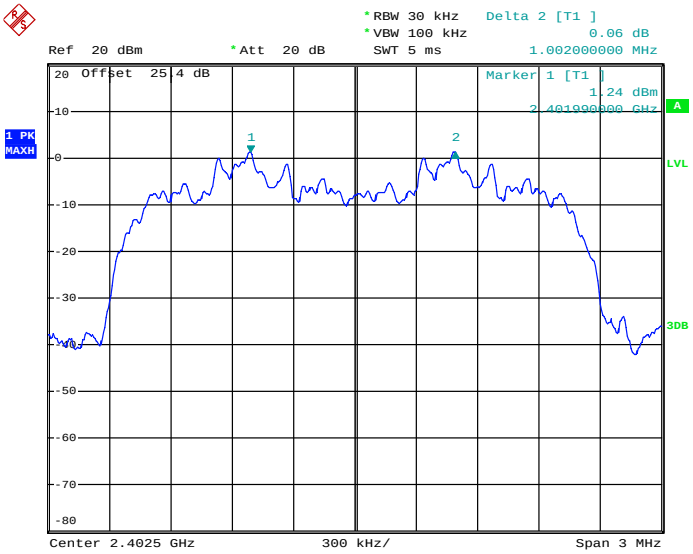


Date: 12.AUG.2014 23:20:58

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

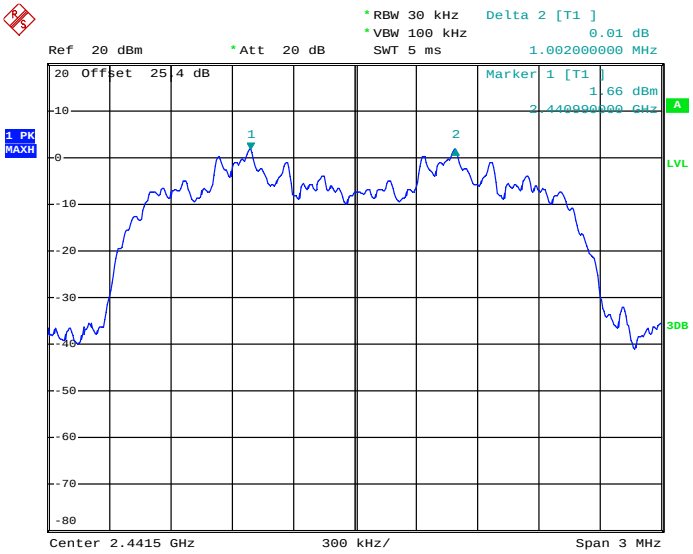
Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8440	Pass
39	2441	1.002	0.8440	Pass
78	2480	1.002	0.8440	Pass

Channel Separation Plot on Channel 00 - 01



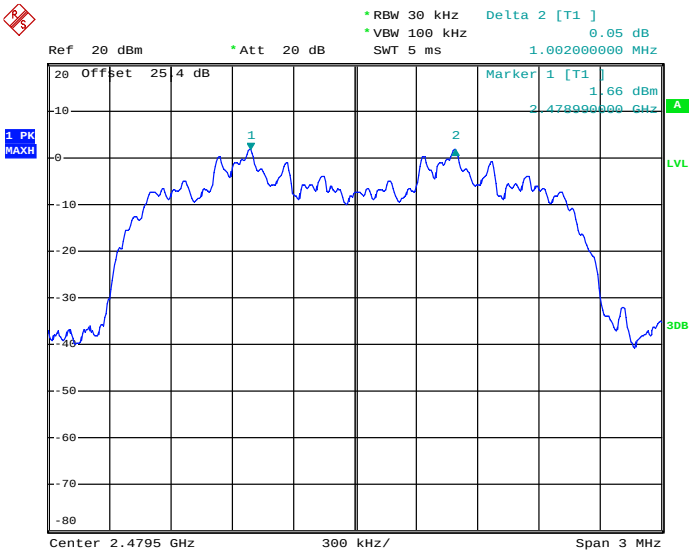
Date: 12.AUG.2014 23:23:41

Channel Separation Plot on Channel 39 - 40



Date: 12.AUG.2014 23:24:46

Channel Separation Plot on Channel 77 - 78

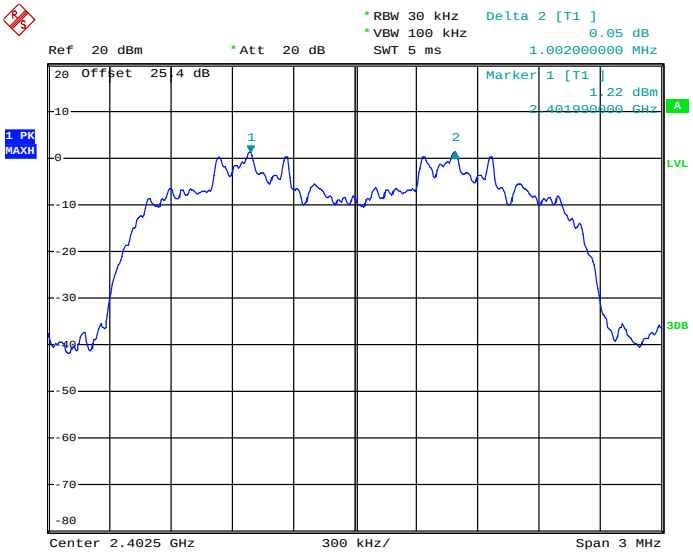


Date: 12.AUG.2014 23:26:00

Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Engineer :	Osolemio Chang	**Relative Humidity :**	50~53%

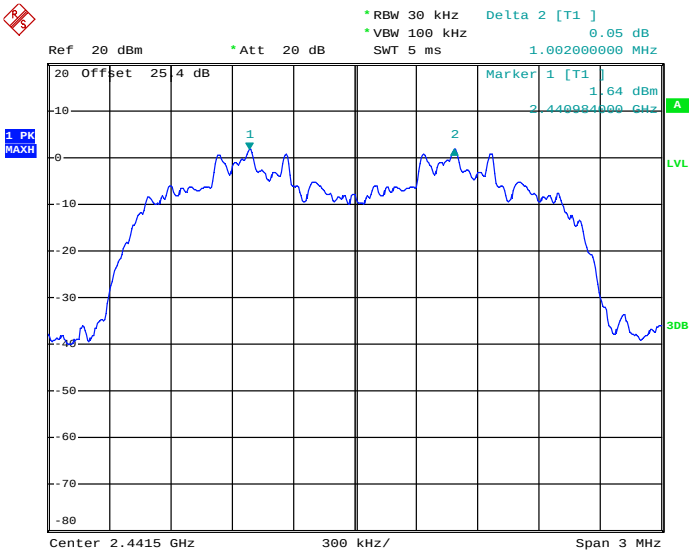
Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8320	Pass
39	2441	1.002	0.8240	Pass
78	2480	1.002	0.8320	Pass

Channel Separation Plot on Channel 00 - 01



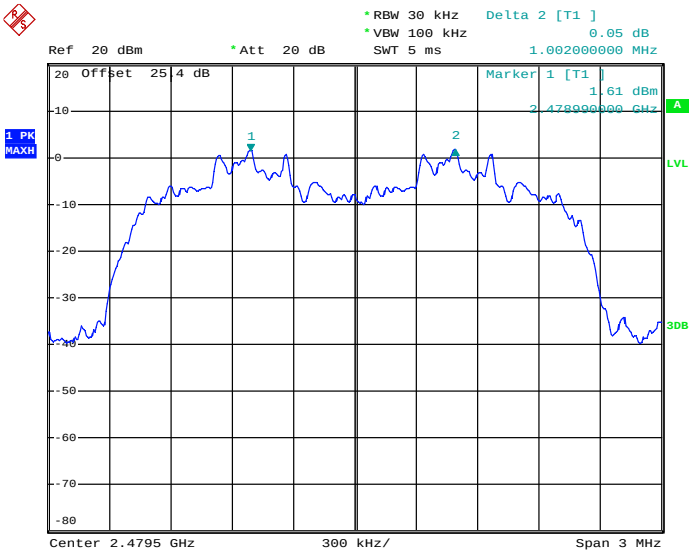
Date: 12.AUG.2014 23:29:49

Channel Separation Plot on Channel 39 - 40



Date: 12.AUG.2014 23:27:14

Channel Separation Plot on Channel 77 - 78



Date: 12.AUG.2014 23:30:45

3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

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

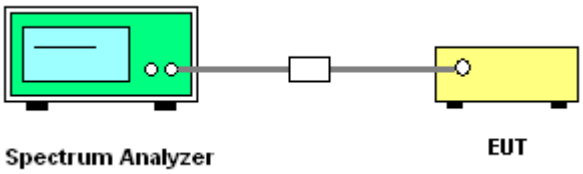
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

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

3.3.4 Test Setup



3.3.5 Test Result of Dwell Time

Test Mode :	DH5	**Temperature :**	24~26℃
Test Engineer :	Osolemio Chang	**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	2.88	0.31	0.4	Pass
AFH	20	53.33	2.88	0.15	0.4	Pass

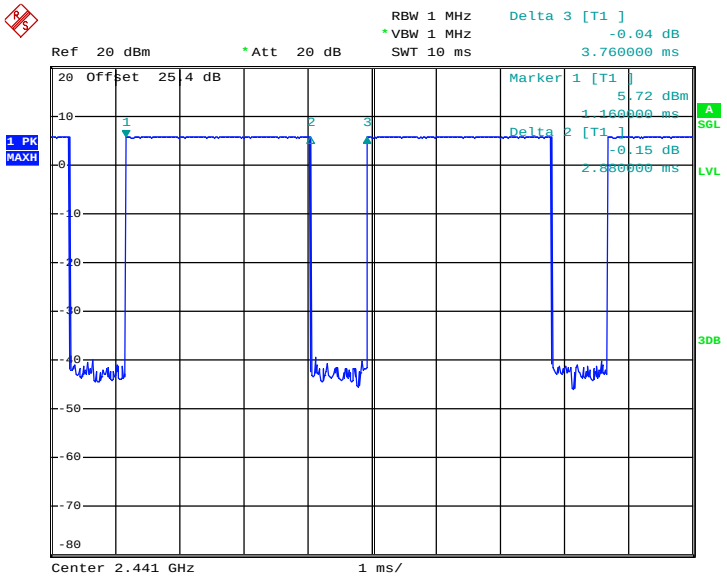
Remark:

1. In normal mode, hopping rate is 1600 hops/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 800 hops/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



Date: 9.AUG.2014 11:35:45

3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

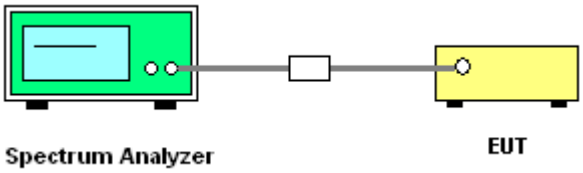
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

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

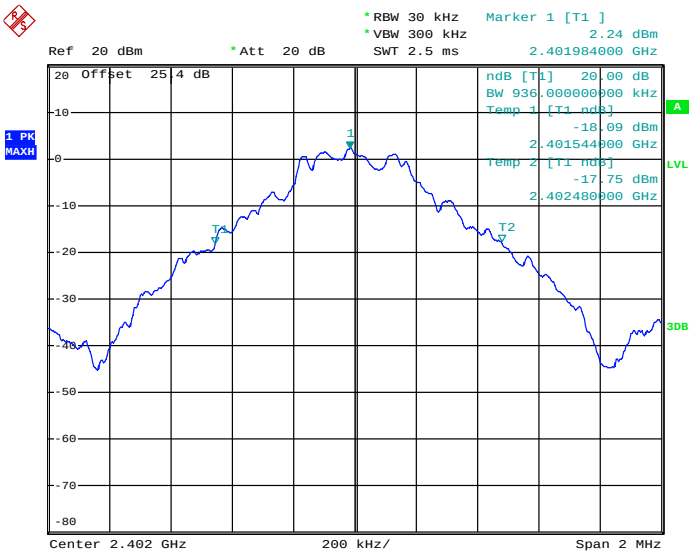


3.4.5 Test Result of 20dB Bandwidth

Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Engineer :	Osolemio Chang	**Relative Humidity :**	50~53%

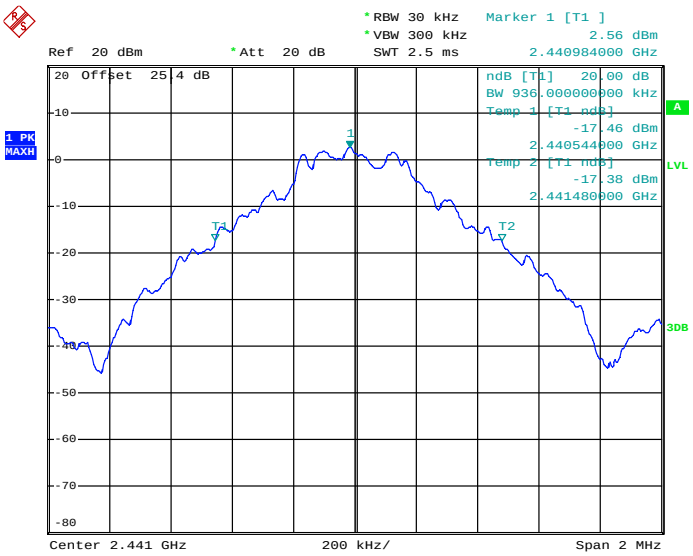
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.936
39	2441	0.936
78	2480	0.936

20 dB Bandwidth Plot on Channel 00



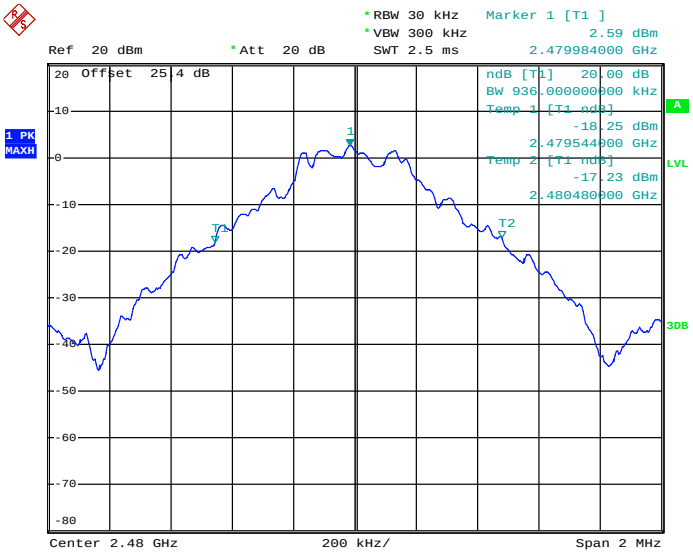
Date: 12.AUG.2014 23:32:28

20 dB Bandwidth Plot on Channel 39



Date: 12.AUG.2014 23:31:56

20 dB Bandwidth Plot on Channel 78

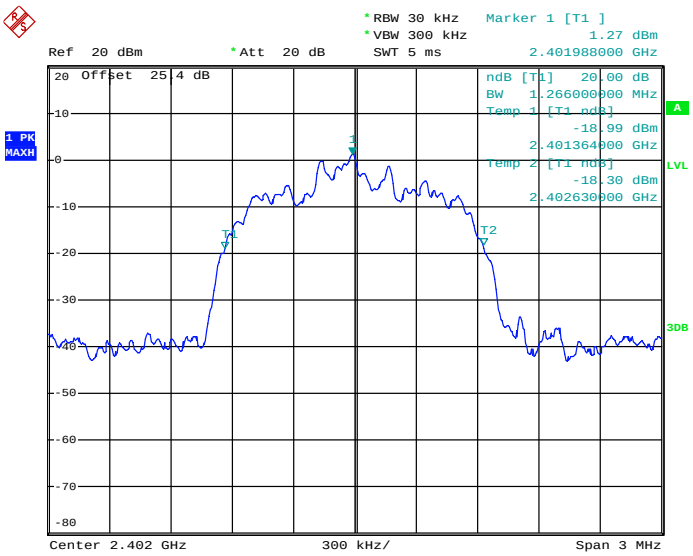


Date: 12.AUG.2014 23:33:21

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

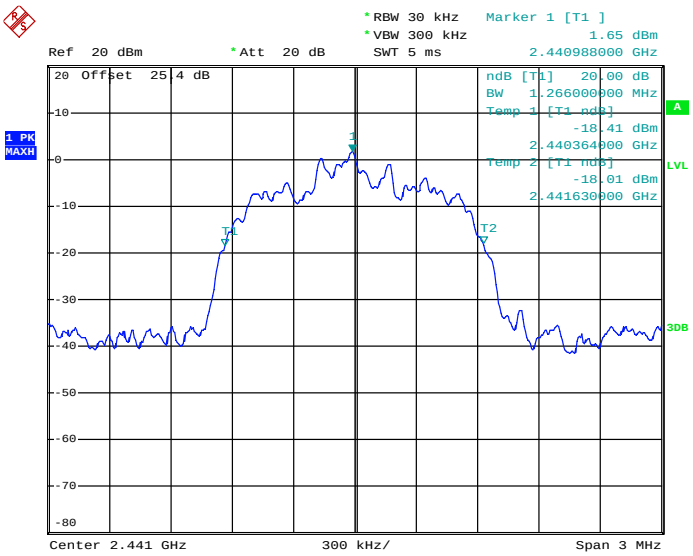
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.266
39	2441	1.266
78	2480	1.266

20 dB Bandwidth Plot on Channel 00



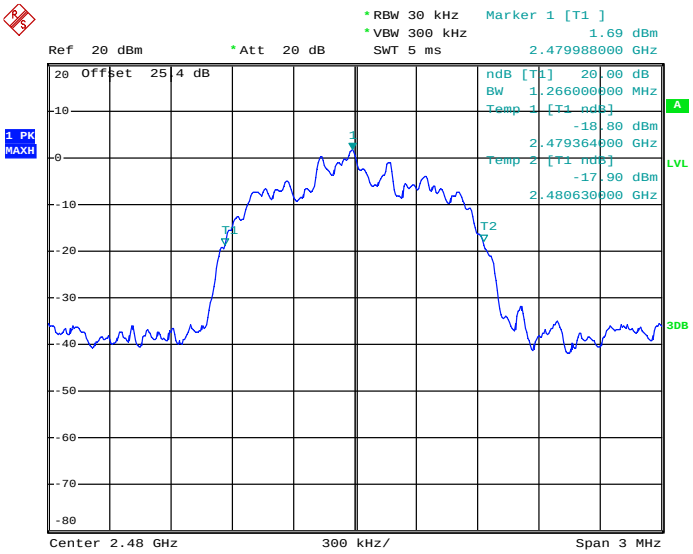
Date: 12.AUG.2014 23:35:09

20 dB Bandwidth Plot on Channel 39



Date: 12.AUG.2014 23:35:59

20 dB Bandwidth Plot on Channel 78

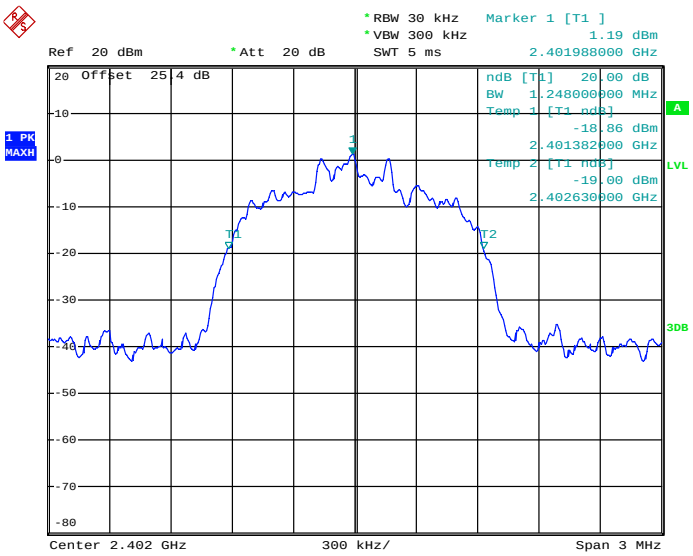


Date: 12.AUG.2014 23:38:03

Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Engineer :	Osolemio Chang	**Relative Humidity :**	50~53%

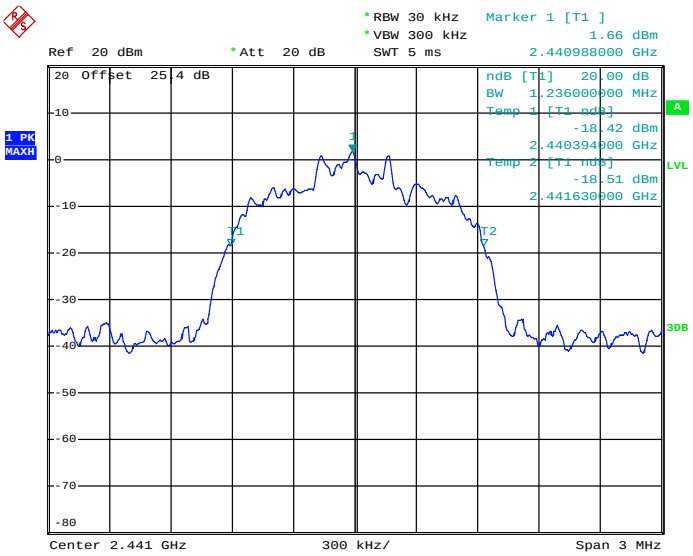
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.248
39	2441	1.236
78	2480	1.248

20 dB Bandwidth Plot on Channel 00



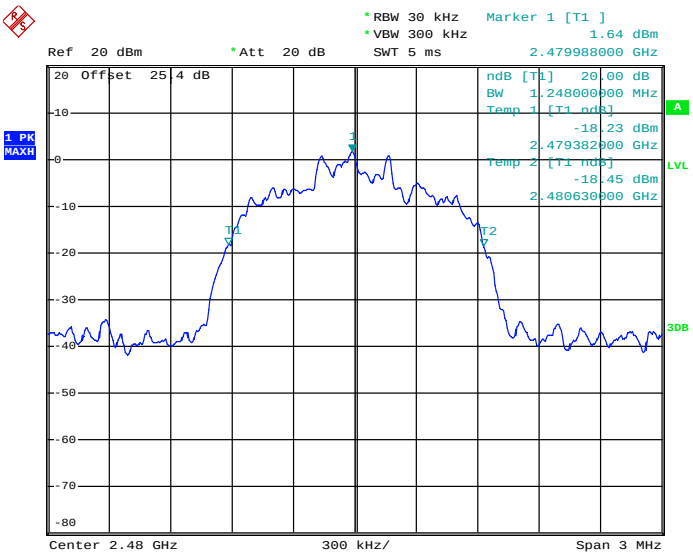
Date: 12.AUG.2014 23:39:48

20 dB Bandwidth Plot on Channel 39



Date: 12.AUG.2014 23:38:40

20 dB Bandwidth Plot on Channel 78



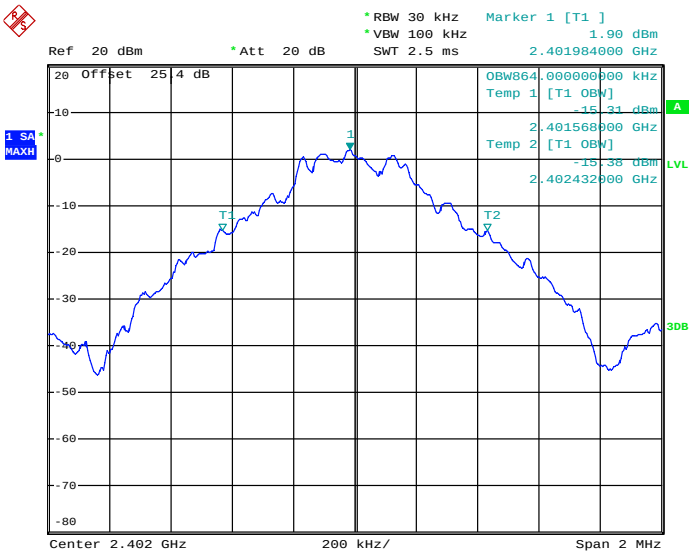
Date: 12.AUG.2014 23:40:26

3.4.6 Test Result of 99% Occupied Bandwidth

Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Engineer :	Osolemio Chang	**Relative Humidity :**	50~53%

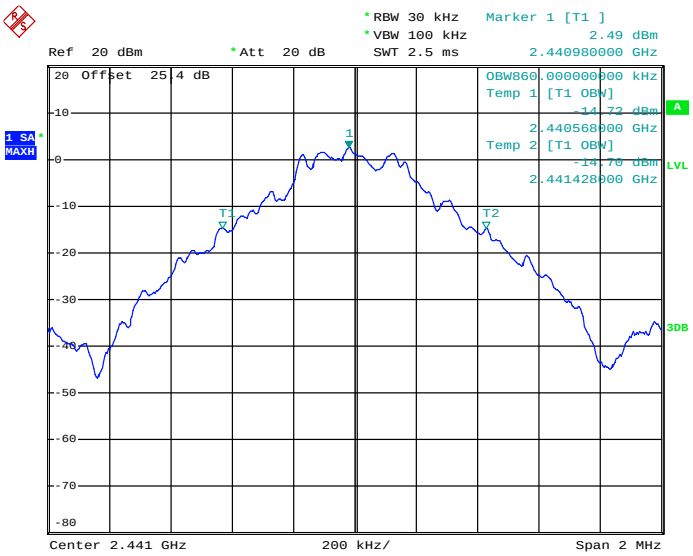
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	0.864
39	2441	0.860
78	2480	0.864

99% Occupied Bandwidth Plot on Channel 00



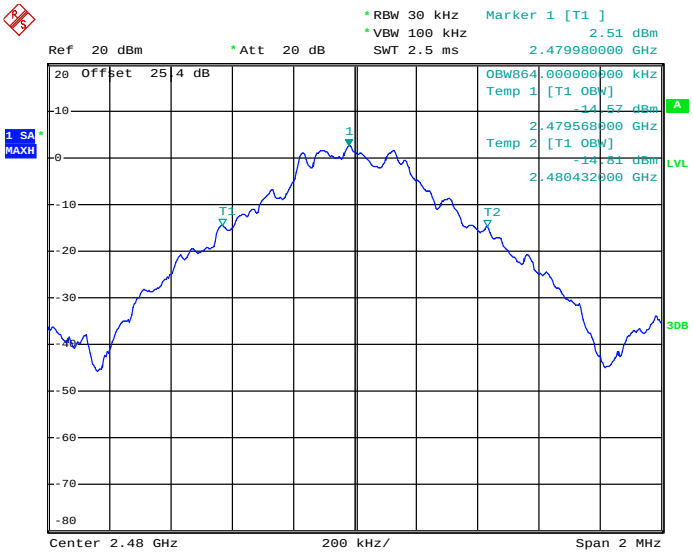
Date: 14.AUG.2014 01:21:02

99% Occupied Bandwidth Plot on Channel 39



Date: 14.AUG.2014 01:20:21

99% Occupied Bandwidth Plot on Channel 78

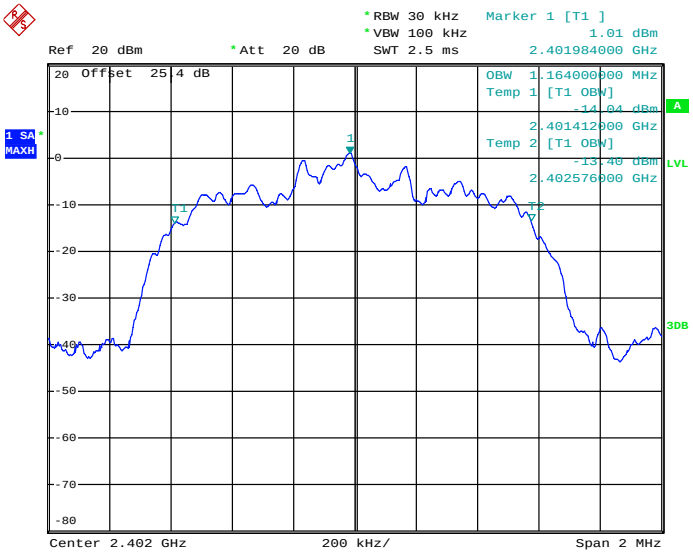


Date: 14.AUG.2014 01:21:42

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

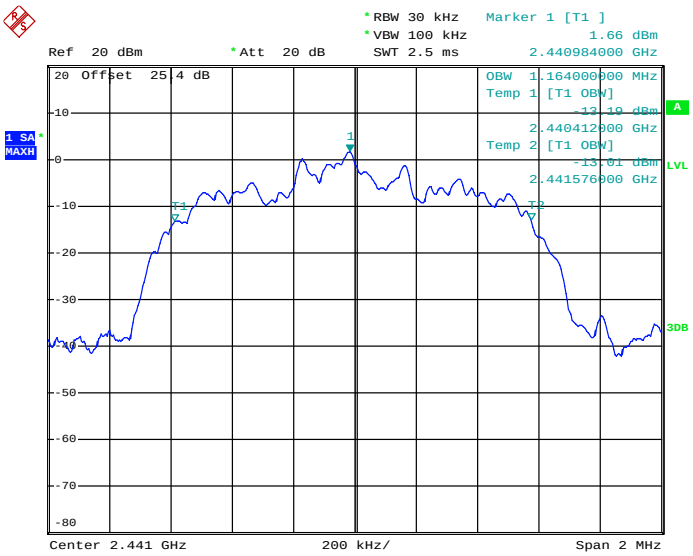
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.164
39	2441	1.164
78	2480	1.164

99% Occupied Bandwidth Plot on Channel 00



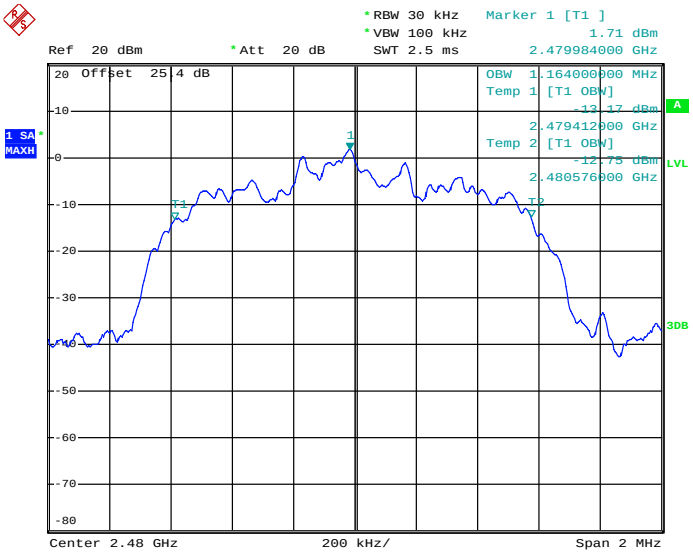
Date: 14.AUG.2014 01:23:13

99% Occupied Bandwidth Plot on Channel 39



Date: 14.AUG.2014 01:23:53

99% Occupied Bandwidth Plot on Channel 78

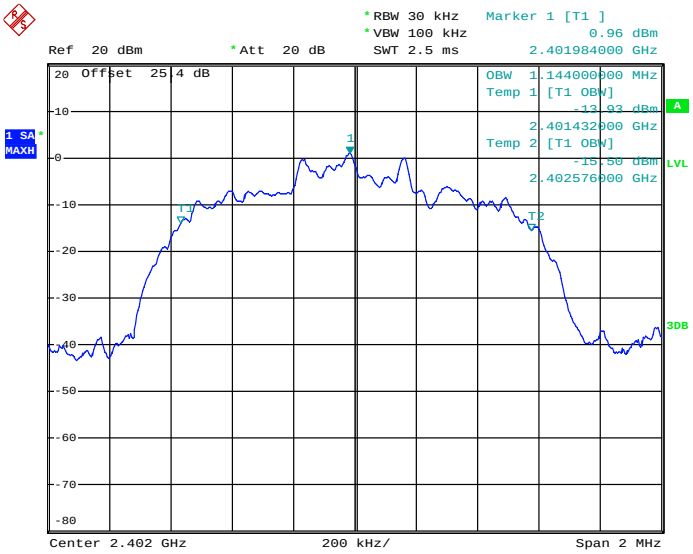


Date: 14.AUG.2014 01:24:37

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

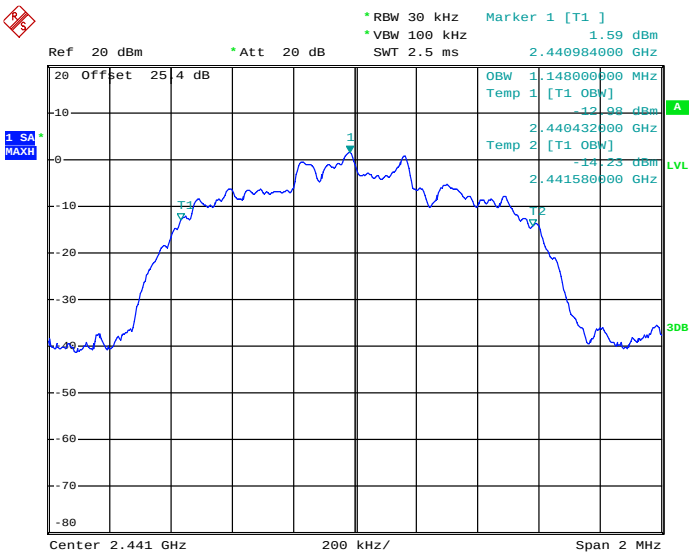
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.144
39	2441	1.148
78	2480	1.148

99% Occupied Bandwidth Plot on Channel 00



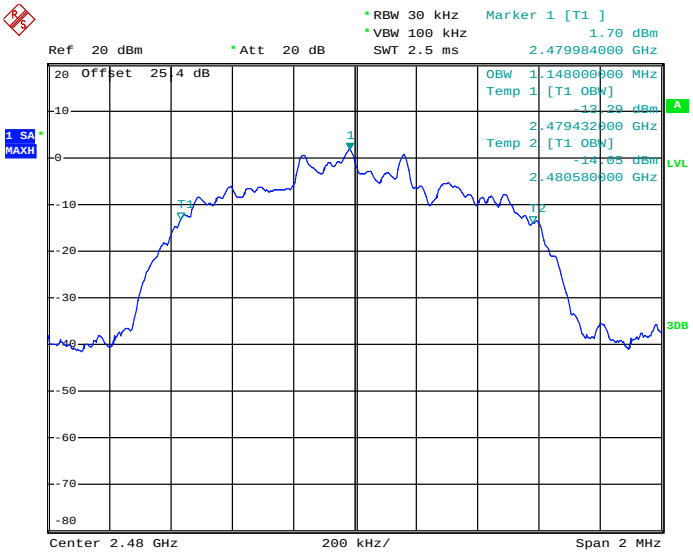
Date: 14.AUG.2014 01:26:06

99% Occupied Bandwidth Plot on Channel 39



Date: 14.AUG.2014 01:25:25

99% Occupied Bandwidth Plot on Channel 78



Date: 14.AUG.2014 01:26:47

Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

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.

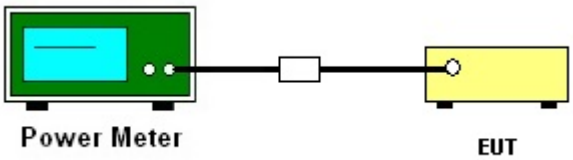
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

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

3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Engineer :	Osolemio Chang	**Relative Humidity :**	50~53%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	5.78	20.97	Pass
39	2441	5.92	20.97	Pass
78	2480	5.97	20.97	Pass

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

Channel	Frequency (MHz)	RF Power (dBm)		
		π/4-DQPSK	Max. Limits (dBm)	Pass/Fail
		2 Mbps		
00	2402	5.24	20.97	Pass
39	2441	5.50	20.97	Pass
78	2480	5.64	20.97	Pass

Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Engineer :	Osolemio Chang	**Relative Humidity :**	50~53%

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	5.50	20.97	Pass
39	2441	5.55	20.97	Pass
78	2480	5.85	20.97	Pass

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

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

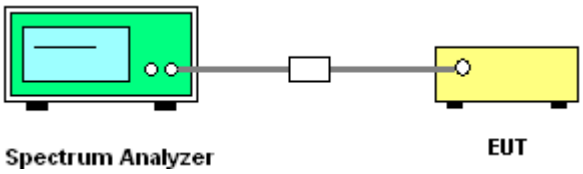
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

1. The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100kHz (≥ 1% span=10MHz), VBW = 300kHz (≥ RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2. and 3.
5. Measure and record the results in the test report.

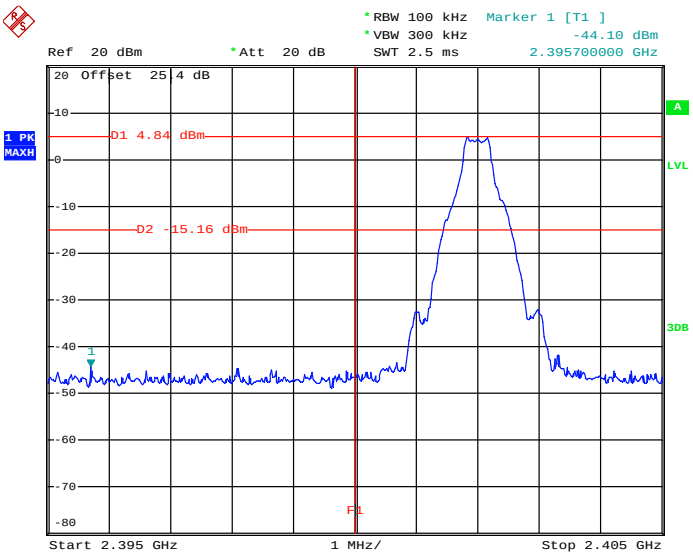
3.6.4 Test Setup



3.6.5 Test Result of Conducted Band Edges

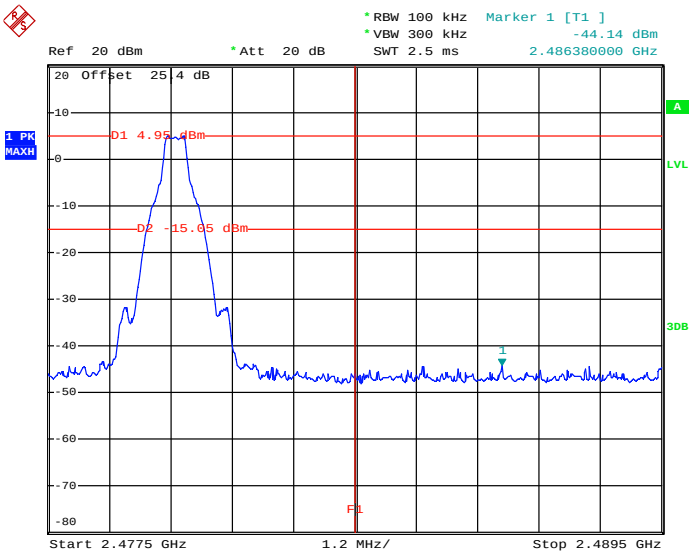
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

Low Band Edge Plot on Channel 00



Date: 13.AUG.2014 00:21:09

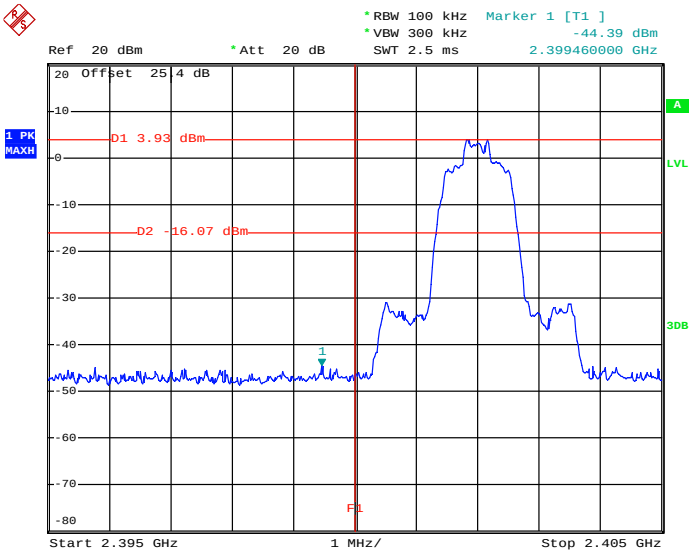
High Band Edge Plot on Channel 78



Date: 13.AUG.2014 00:21:39

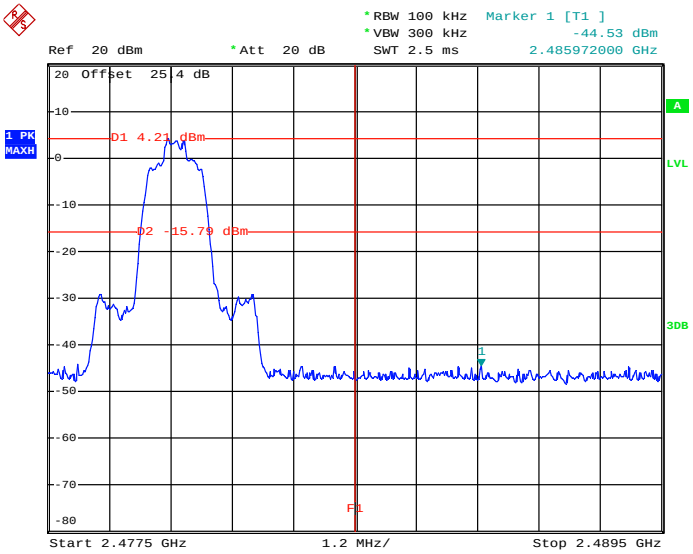
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

Low Band Edge Plot on Channel 00



Date: 13.AUG.2014 00:22:48

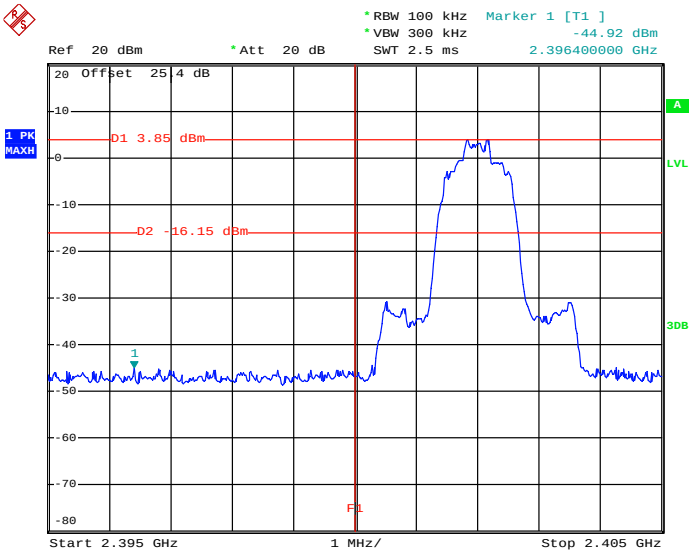
High Band Edge Plot on Channel 78



Date: 13.AUG.2014 00:23:26

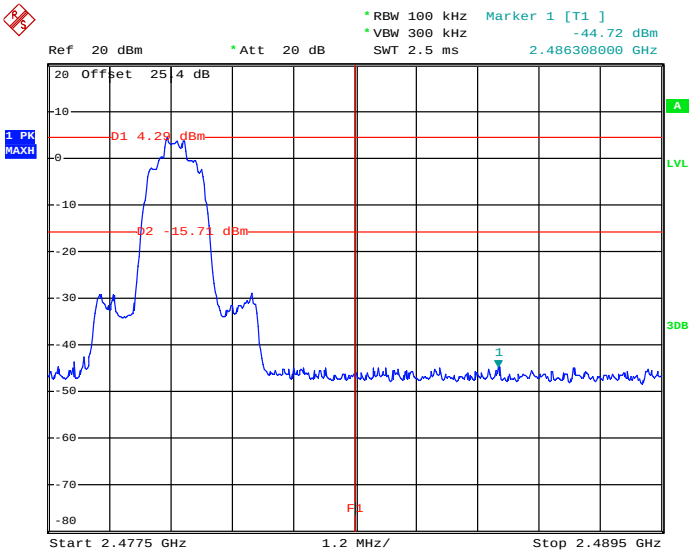
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	00 and 78	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

Low Band Edge Plot on Channel 00



Date: 13.AUG.2014 00:25:56

High Band Edge Plot on Channel 78

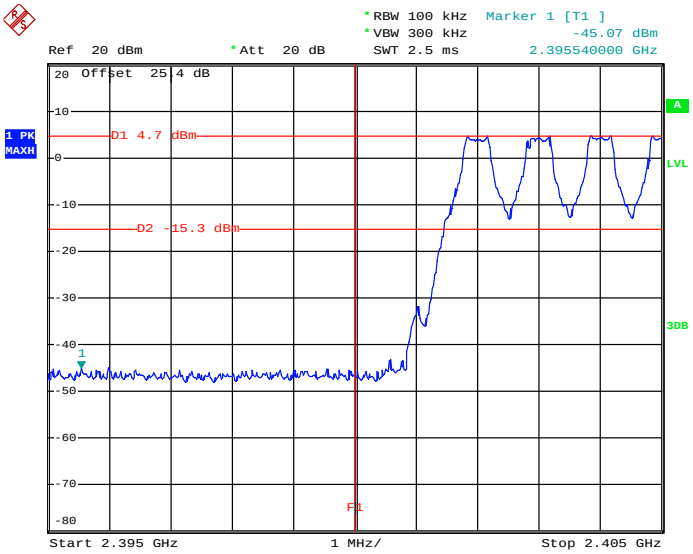


Date: 13.AUG.2014 00:26:36

3.6.6 Test Result of Conducted Hopping Mode Band Edges

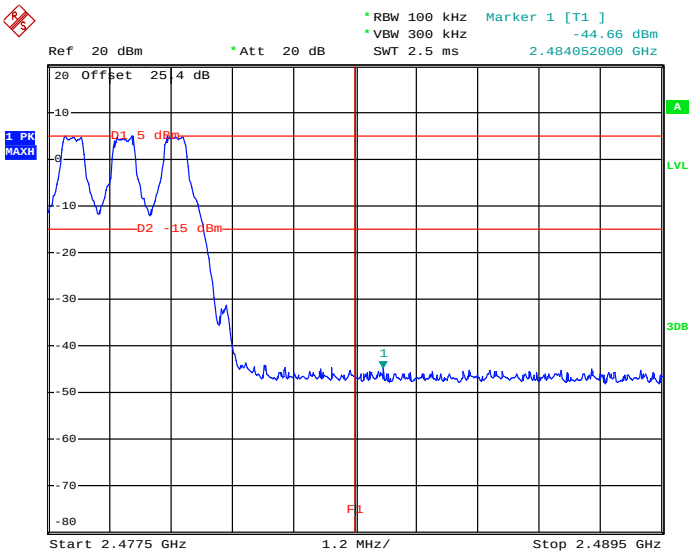
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Engineer :	Osolemio Chang	**Relative Humidity :**	50~53%

1Mbps Hopping Mode Low Band Edge Plot



Date: 13.AUG.2014 00:16:47

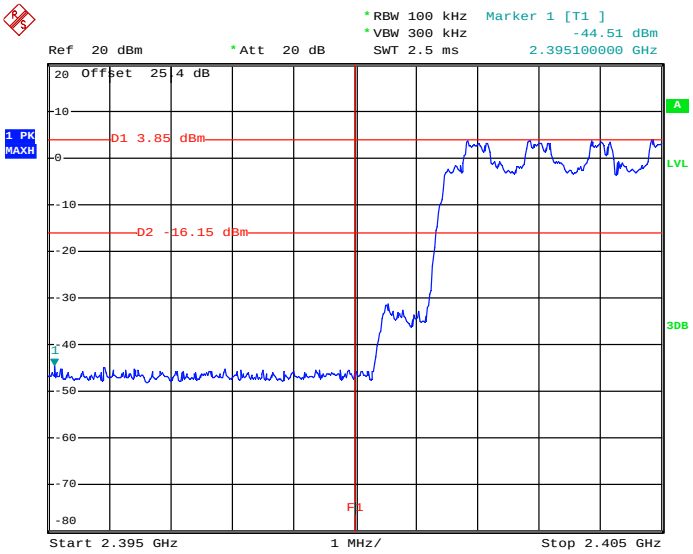
1Mbps Hopping Mode High Band Edge Plot



Date: 13.AUG.2014 00:17:14

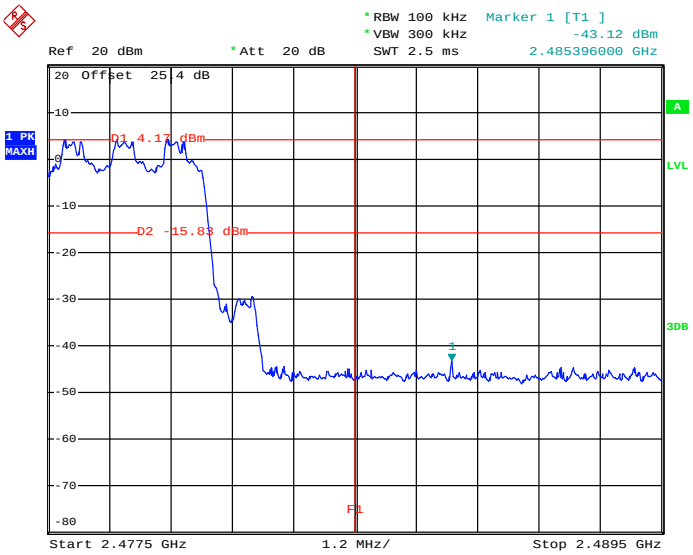
Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Osolemio Chang	Relative Humidity :	50~53%

2Mbps Hopping Mode Low Band Edge Plot



Date: 13.AUG.2014 00:18:04

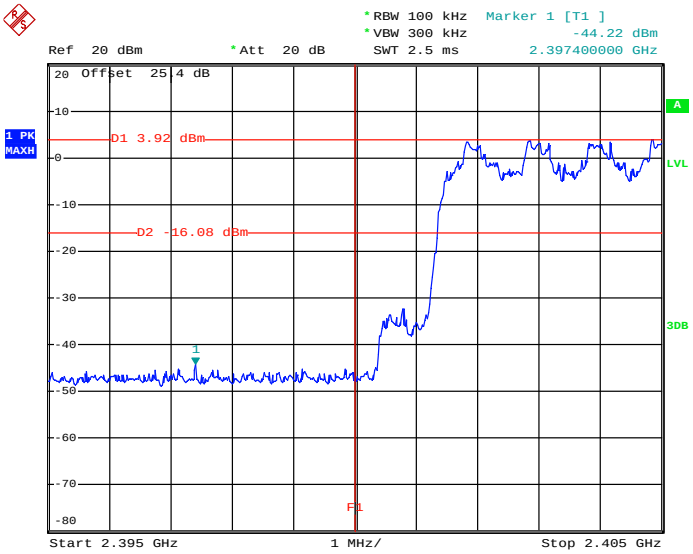
2Mbps Hopping Mode High Band Edge Plot



Date: 13.AUG.2014 00:18:35

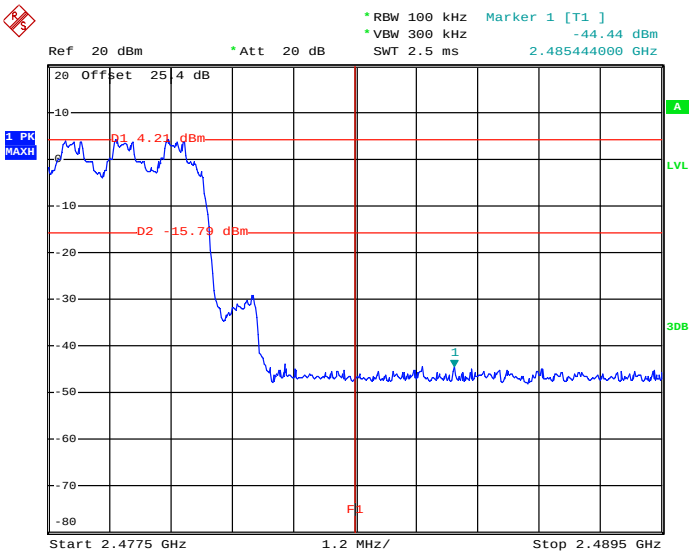
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Osolemio Chang	Relative Humidity :	50~53%

3Mbps Hopping Mode Low Band Edge Plot



Date: 13.AUG.2014 00:19:52

3Mbps Hopping Mode High Band Edge Plot



Date: 13.AUG.2014 00:20:20

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

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

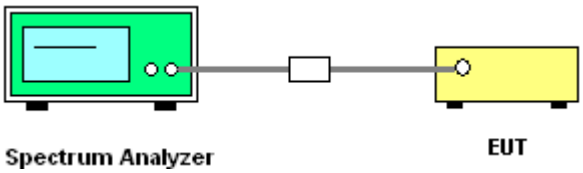
3.7.2 Measuring Instruments

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

3.7.3 Test Procedure

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

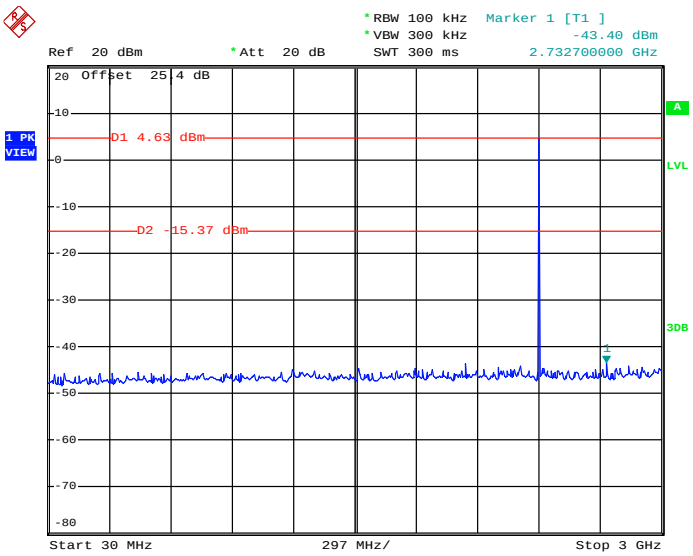
3.7.4 Test Setup



3.7.5 Test Result of Conducted Spurious Emission

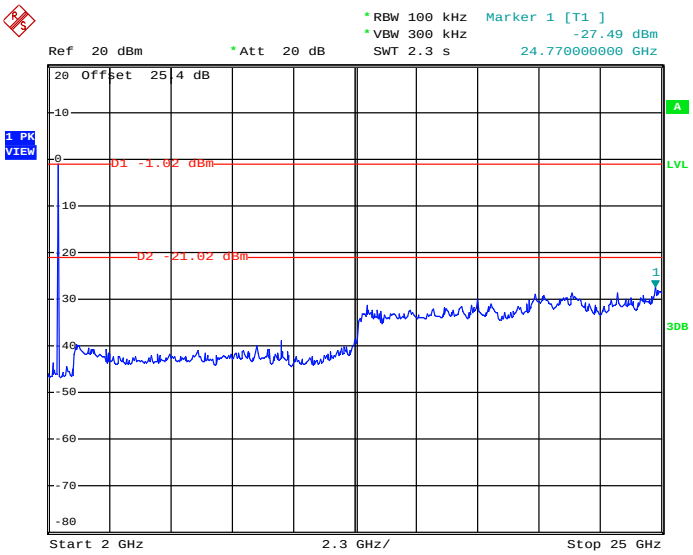
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	00	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

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



Date: 12.AUG.2014 23:42:26

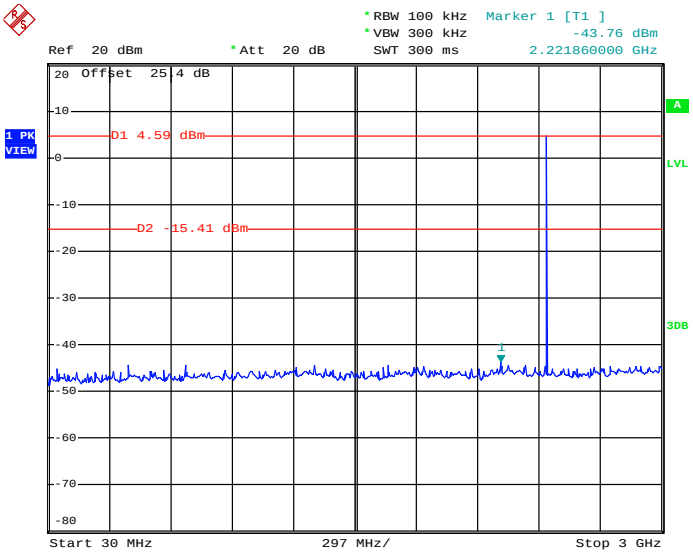
1Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 12.AUG.2014 23:42:48

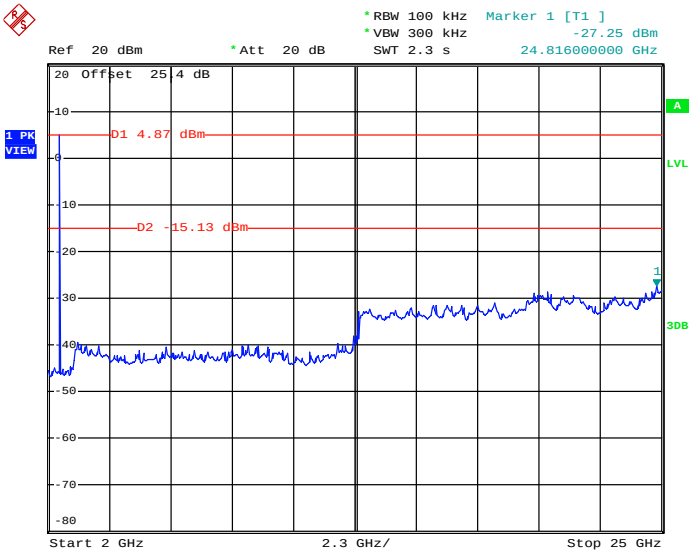
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	39	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

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



Date: 12.AUG.2014 23:44:03

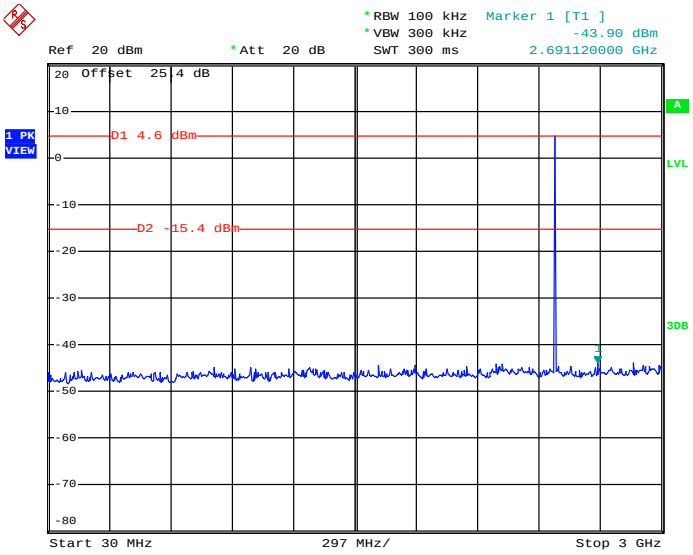
1Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 12.AUG.2014 23:44:24

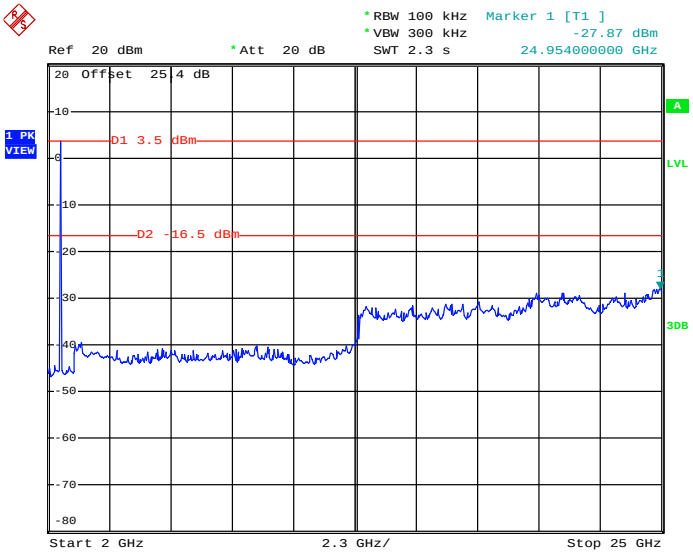
Test Mode :	1Mbps	**Temperature :**	24~26℃
Test Channel :	78	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

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



Date: 12.AUG.2014 23:46:10

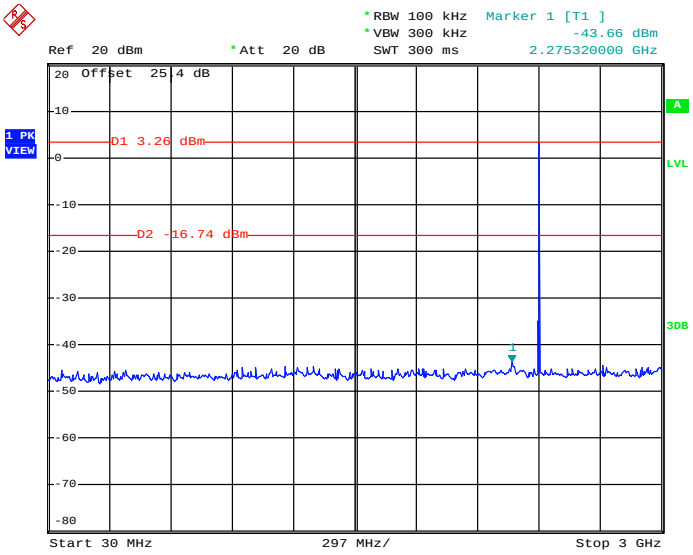
1Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 12.AUG.2014 23:46:32

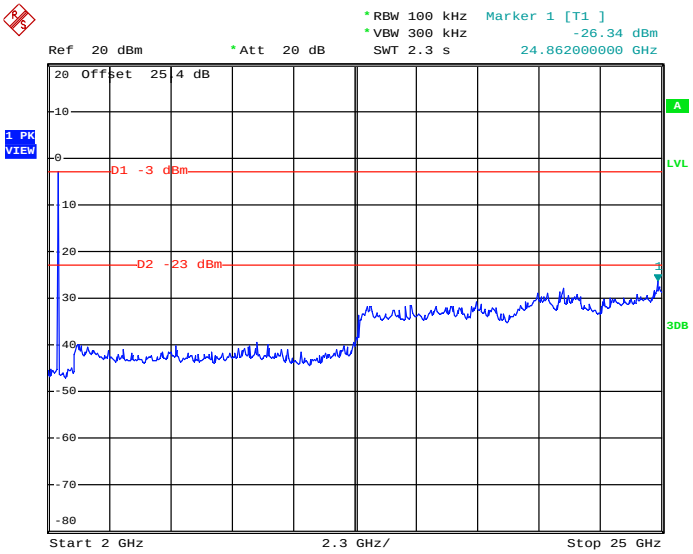
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	00	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

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



Date: 12.AUG.2014 23:49:14

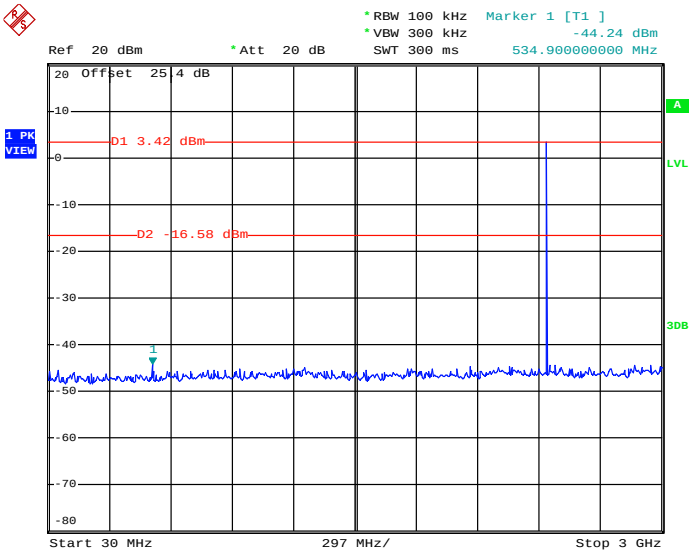
2Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 12.AUG.2014 23:49:35

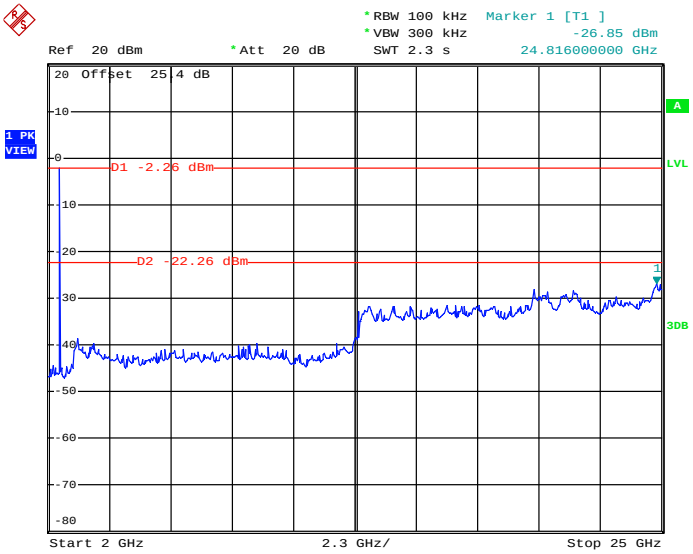
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	39	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

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



Date: 12.AUG.2014 23:50:52

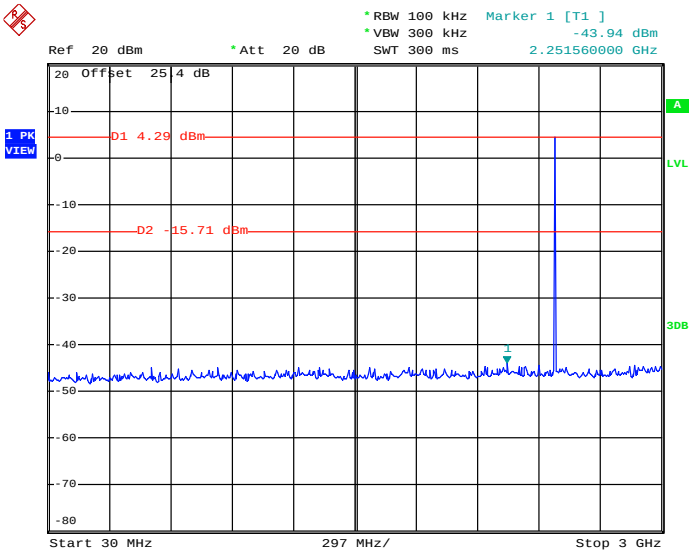
2Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 12.AUG.2014 23:51:14

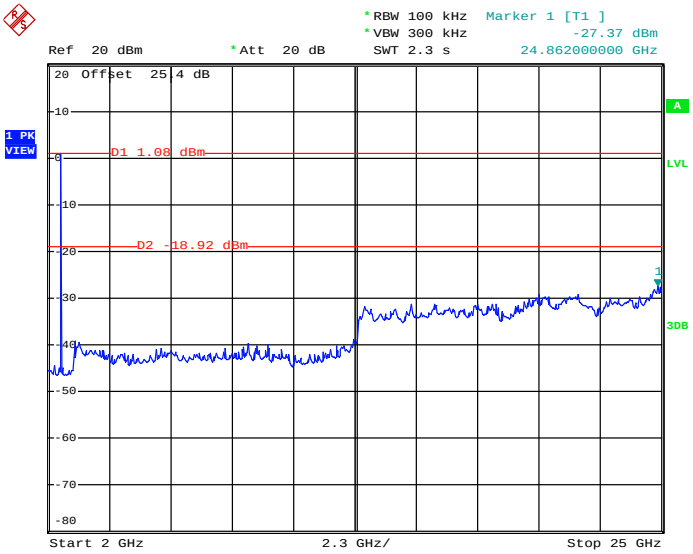
Test Mode :	2Mbps	**Temperature :**	24~26℃
Test Channel :	78	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

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



Date: 12.AUG.2014 23:52:54

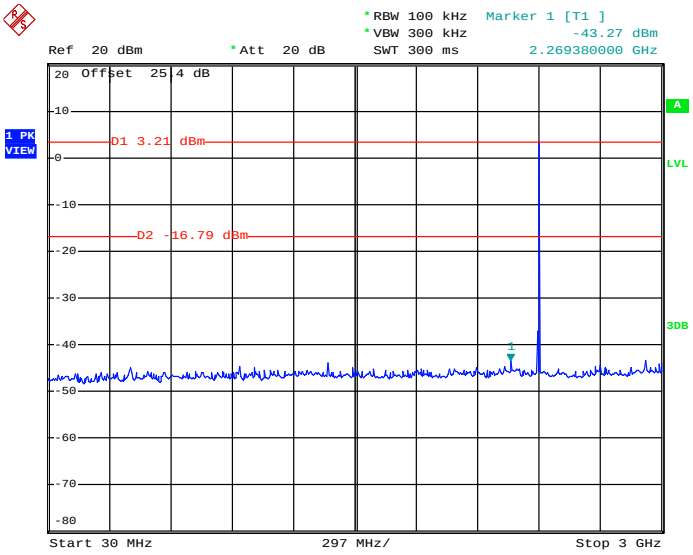
2Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz



Date: 12.AUG.2014 23:53:15

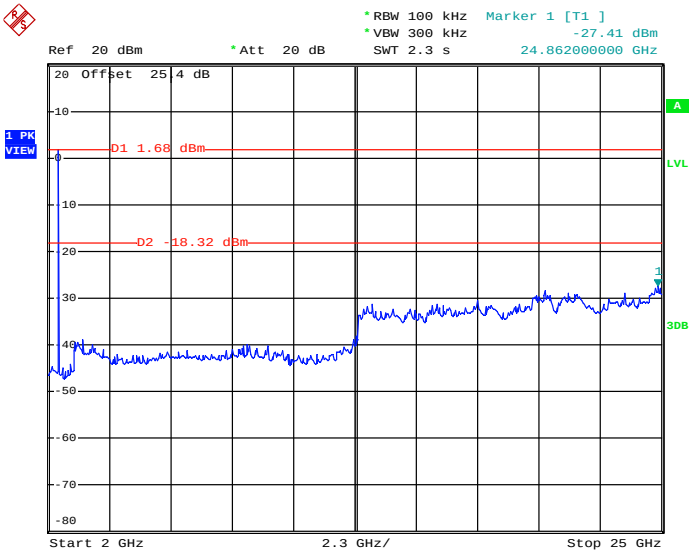
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	00	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

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



Date: 12.AUG.2014 23:58:37

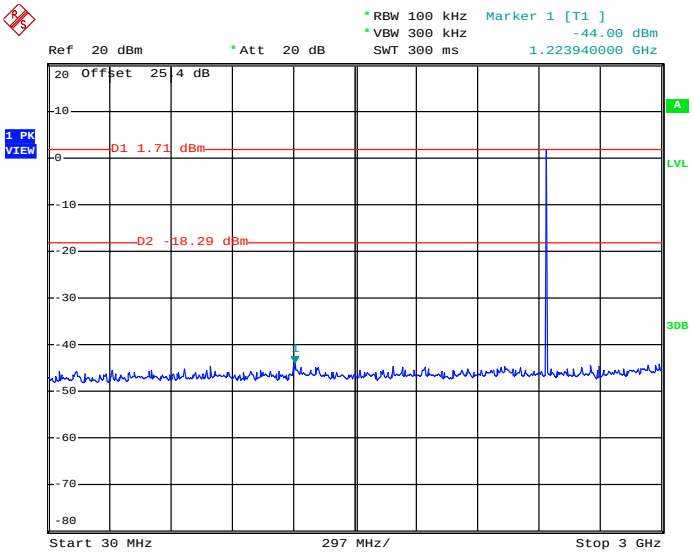
3Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz



Date: 12.AUG.2014 23:58:58

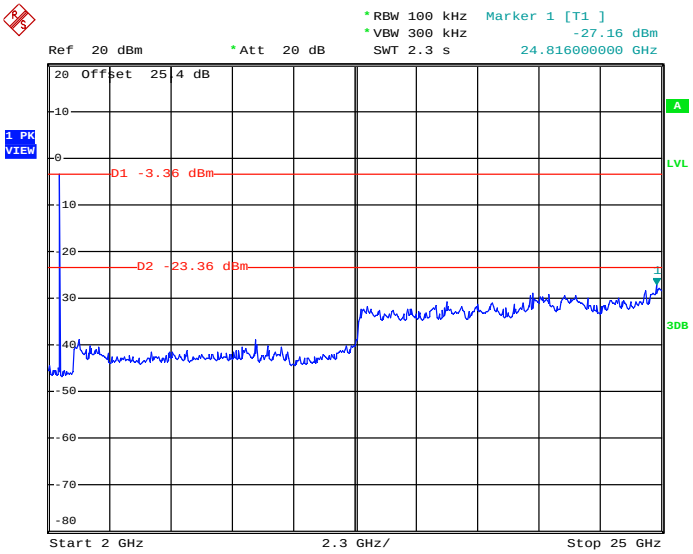
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	39	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

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



Date: 12.AUG.2014 23:56:07

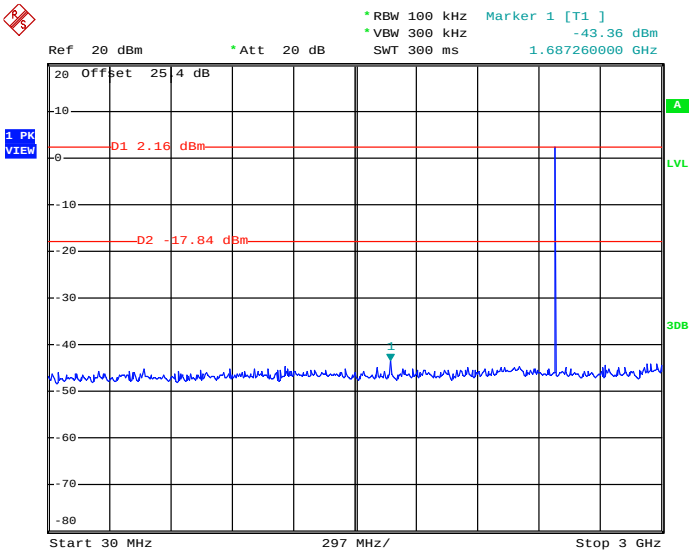
3Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz



Date: 12.AUG.2014 23:56:29

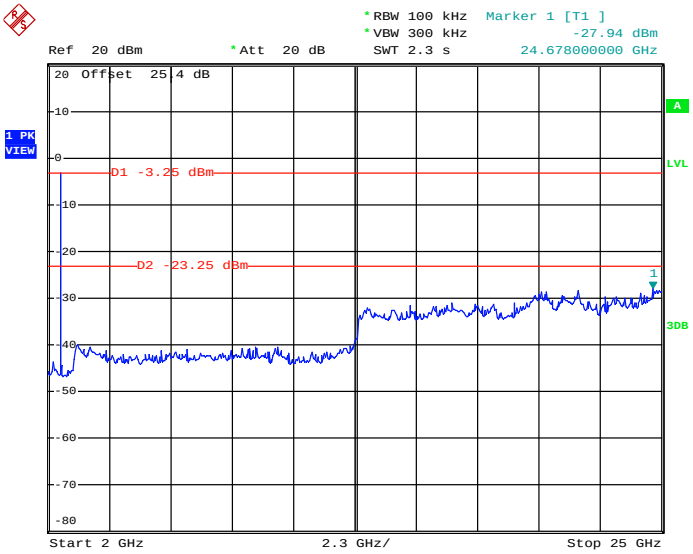
Test Mode :	3Mbps	**Temperature :**	24~26℃
Test Channel :	78	**Relative Humidity :**	50~53%
		Test Engineer :	Osolemio Chang

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



Date: 13.AUG.2014 00:00:26

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



Date: 13.AUG.2014 00:00:48

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

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

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

3.8.2 Measuring Instruments

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

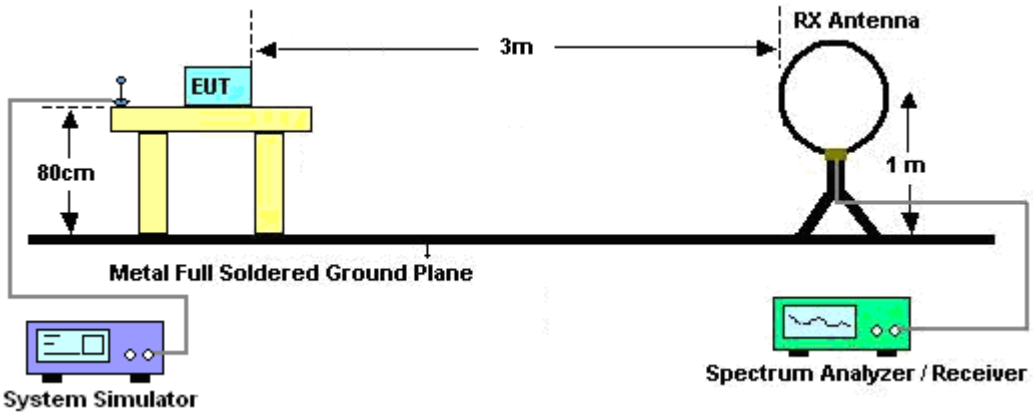
3.8.3 Test Procedures

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

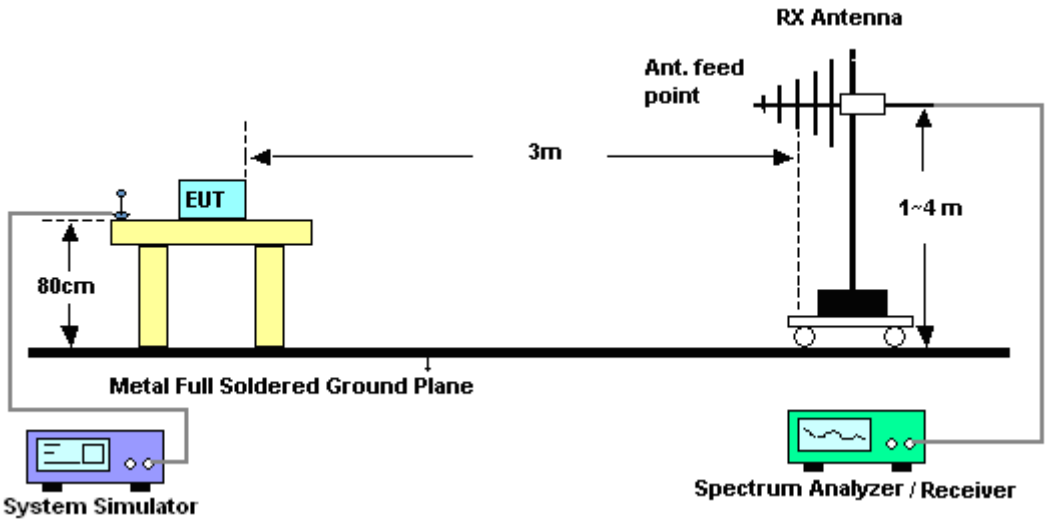
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.82dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

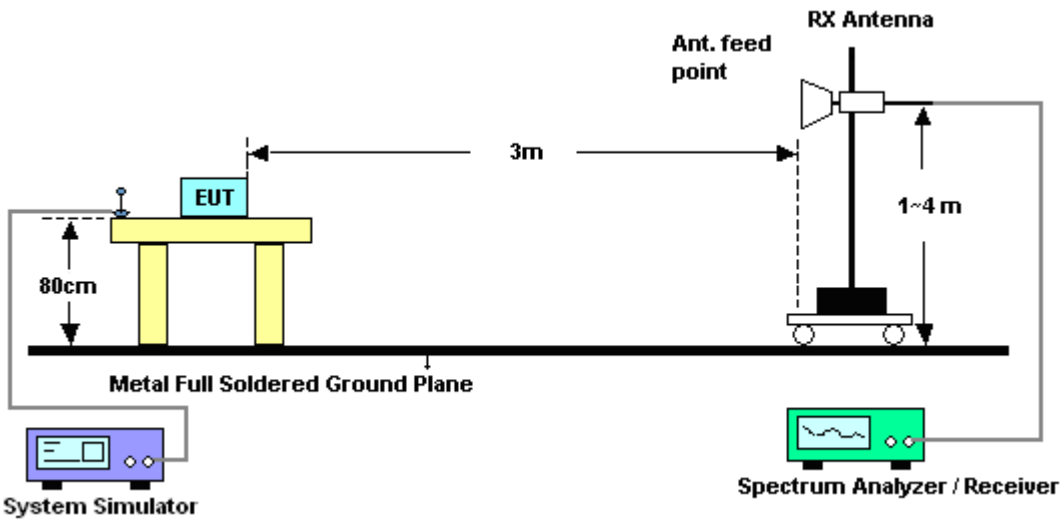
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

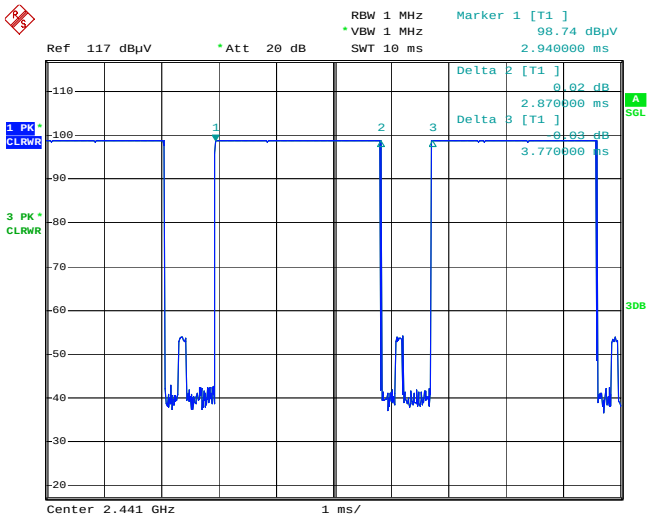


3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

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

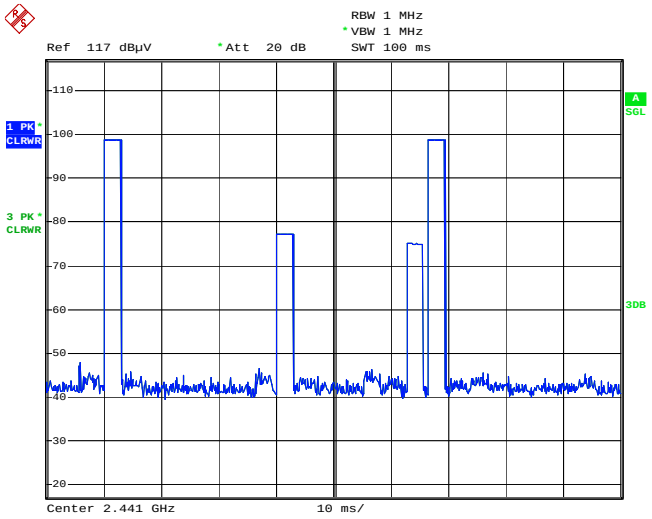
3.8.6 Duty cycle correction factor for average measurement

DH5 on time (One Pulse) Plot on Channel 39



Date: 13.AUG.2014 13:11:15

DH5 on time (Count Pulses) Plot on Channel 39



Date: 13.AUG.2014 13:15:57

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.87 / 100 = 5.74 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.82 dB
3. DH5 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

2.87 ms x 20 channels = 57.4 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:

2.87 ms x 2 = 5.74 ms

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

20 x log(5.74 ms/100ms) = -24.82 dB

3.8.7 Test Result of Radiated Spurious at Band Edges

Test Mode :	1Mbps	**Temperature :**	25~26°C
Test Channel :	00	**Relative Humidity :**	50~51%
		Test Engineer :	Jet Lui

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
2389.92	40.79	-33.21	74	42.93	26.93	4.58	33.65	107	77	Peak
2389.92	15.97	-38.03	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
2388.48	40.68	-33.32	74	42.82	26.93	4.58	33.65	100	62	Peak
2388.48	15.86	-38.14	54	-	-	-	-	-	-	Average

Test Mode :	1Mbps	**Temperature :**	25~26°C
Test Channel :	78	**Relative Humidity :**	50~51%
		Test Engineer :	Jet Lui

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	60.24	-13.76	74	62.01	27.16	4.64	33.57	104	70	Peak
2483.5	35.42	-18.58	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	59.55	-14.45	74	61.32	27.16	4.64	33.57	120	87	Peak
2483.5	34.73	-19.27	54	-	-	-	-	-	-	Average

Note: Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.82dB)

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 :	1Mbps	**Temperature :**	25~26°C
Test Channel :	00	**Relative Humidity :**	50~51%
Test Engineer :	Jet Lui	**Polarization :**	Horizontal
Remark :	2402 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	99.43	-	-	101.53	26.93	4.62	33.65	107	77	Peak
2402	74.61	-	-	-	-	-	-	107	77	Average
4803	37.08	-36.92	74	58.33	31.2	6.52	58.97	100	0	Peak
4803	12.26	-41.74	54	-	-	-	-	100	0	Average

Note: 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.82)

Test Mode :	1Mbps	**Temperature :**	25~26°C
Test Channel :	00	**Relative Humidity :**	50~51%
Test Engineer :	Jet Lui	**Polarization :**	Vertical
Remark :	2403 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2402	98.19	-	-	100.22	26.98	4.62	33.63	100	62	Peak
2402	73.37	-	-	-	-	-	-	100	62	Average
4803	36.04	-37.96	74	29.52	0	6.52	0	100	0	Peak
4803	11.22	-42.78	54	-	-	-	-	100	0	Average

Note: 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.82)

Test Mode :	1Mbps	**Temperature :**	25~26°C
Test Channel :	39	**Relative Humidity :**	50~51%
Test Engineer :	Jet Lui	**Polarization :**	Horizontal
Remark :	2441 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2441	100.44	-	-	102.29	27.07	4.68	33.6	140	44	Peak
2441	75.62	-	-	-	-	-	-	140	44	Average
4881	35.56	-38.44	74	56.54	31.31	6.58	58.87	100	0	Peak
4881	10.74	-43.26	54	-	-	-	-	100	0	Average
7323	40.57	-33.43	74	54.63	36.19	8.24	58.49	100	0	Peak
7323	15.75	-38.25	54	-	-	-	-	100	0	Average

Note: 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.82)

Test Mode :	1Mbps	**Temperature :**	25~26°C
Test Channel :	39	**Relative Humidity :**	50~51%
Test Engineer :	Jet Lui	**Polarization :**	Vertical
Remark :	2441 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2441	97.57	-	-	99.42	27.07	4.68	33.6	101	57	Peak
2441	72.75	-	-	-	-	-	-	101	57	Average
4881	35.33	-38.67	74	56.31	31.31	6.58	58.87	100	0	Peak
4881	10.51	-43.49	54	-	-	-	-	100	0	Average
7323	41.91	-32.09	74	55.97	36.19	8.24	58.49	100	0	Peak
7323	17.09	-36.91	54	-	-	-	-	100	0	Average

Note: 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.82)

Test Mode :	1Mbps	**Temperature :**	25~26°C
Test Channel :	78	**Relative Humidity :**	50~51%
Test Engineer :	Jet Lui	**Polarization :**	Horizontal
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
57	30.52	-9.48	40	55.27	6.2	0.85	31.8	113	96	Peak
99.93	20.28	-23.22	43.5	40.56	10.4	1.1	31.78	-	-	Peak
211.98	26.44	-17.06	43.5	47.48	9.22	1.52	31.78	-	-	Peak
495.3	27.09	-18.91	46	38.81	17.95	2.22	31.89	-	-	Peak
622	33.09	-12.91	46	42.38	20.25	2.5	32.04	-	-	Peak
900.6	32.5	-13.50	46	37.51	23.41	3	31.42	-	-	Peak
2480	99.7	-	-	101.38	27.16	4.73	33.57	104	70	Peak
2480	74.88	-	-	-	-	-	-	104	70	Average
4959	36.47	-37.53	74	29.86	0	6.61	0	100	0	Peak
4959	11.65	-42.35	54	-	-	-	-	100	0	Average
7440	40.89	-33.11	74	54.76	36.48	8.36	58.71	100	0	Peak
7440	16.07	-37.93	54	-	-	-	-	100	0	Average

Note: 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.82)

Test Mode :	1Mbps	**Temperature :**	25~26°C
Test Channel :	78	**Relative Humidity :**	50~51%
Test Engineer :	Jet Lui	**Polarization :**	Vertical
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
75.63	32.41	-7.59	40	56.4	6.85	0.95	31.79	103	350	Peak
172.02	32.15	-11.35	43.5	53.02	9.54	1.37	31.78	-	-	Peak
268.14	25.78	-20.22	46	42.85	13	1.7	31.77	-	-	Peak
559.7	31.65	-14.35	46	41.19	20.1	2.34	31.98	-	-	Peak
808.2	35.98	-10.02	46	42.77	22.24	2.85	31.88	-	-	Peak
900.6	34.04	-11.96	46	39.05	23.41	3	31.42	-	-	Peak
2480	98.92	-	-	100.6	27.16	4.73	33.57	120	87	Peak
2480	74.1	-	-	-	-	-	-	120	87	Average
4959	36.35	-37.65	74	29.74	0	6.61	0	100	0	Peak
4959	11.53	-42.47	54	-	-	-	-	100	0	Average
7440	41.78	-32.22	74	55.65	36.48	8.36	58.71	100	0	Peak
7440	16.96	-37.04	54	-	-	-	-	100	0	Average

Note: 1. Other harmonics are lower than background noise.

2. Average Emission Level = Peak Emission Level + duty cycle correction factor(-24.82)

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

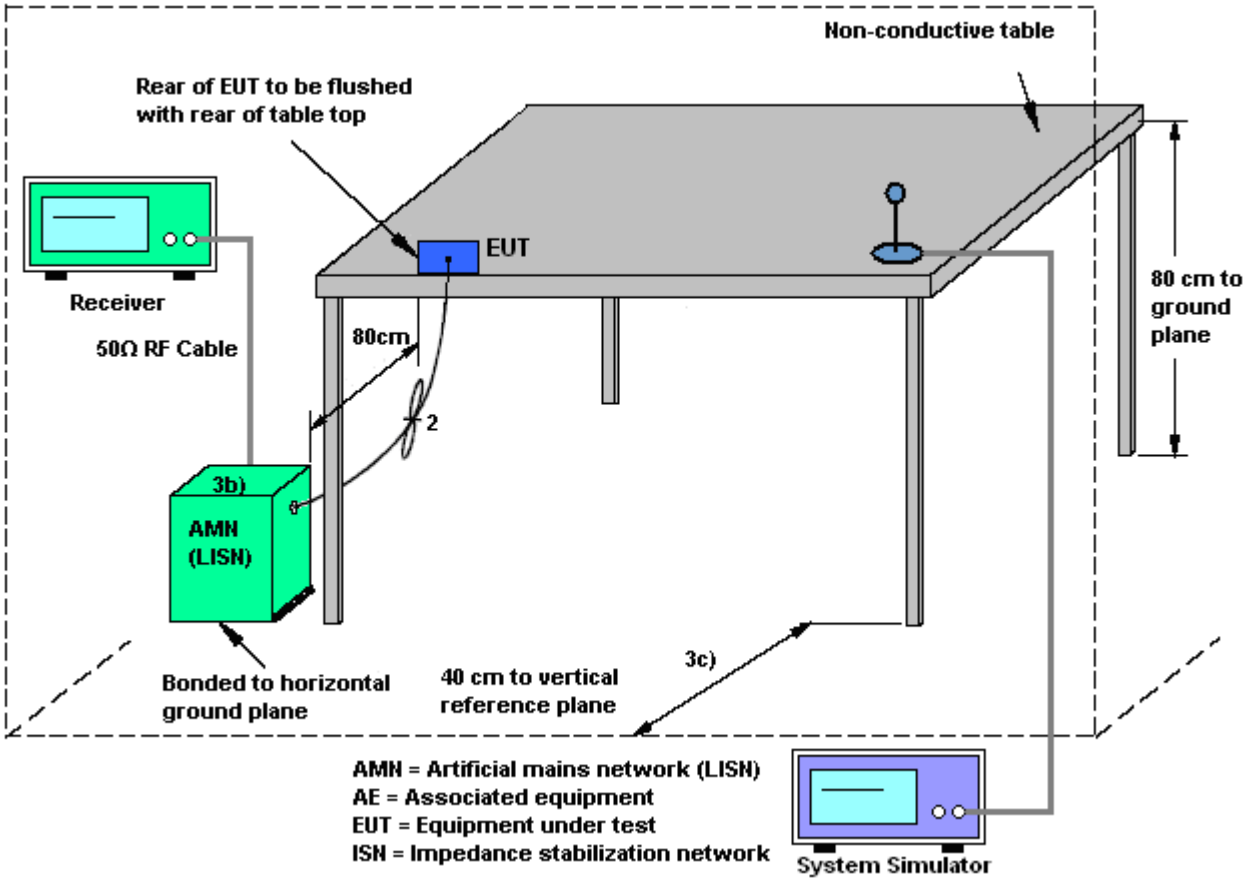
3.9.2 Measuring Instruments

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

3.9.3 Test Procedures

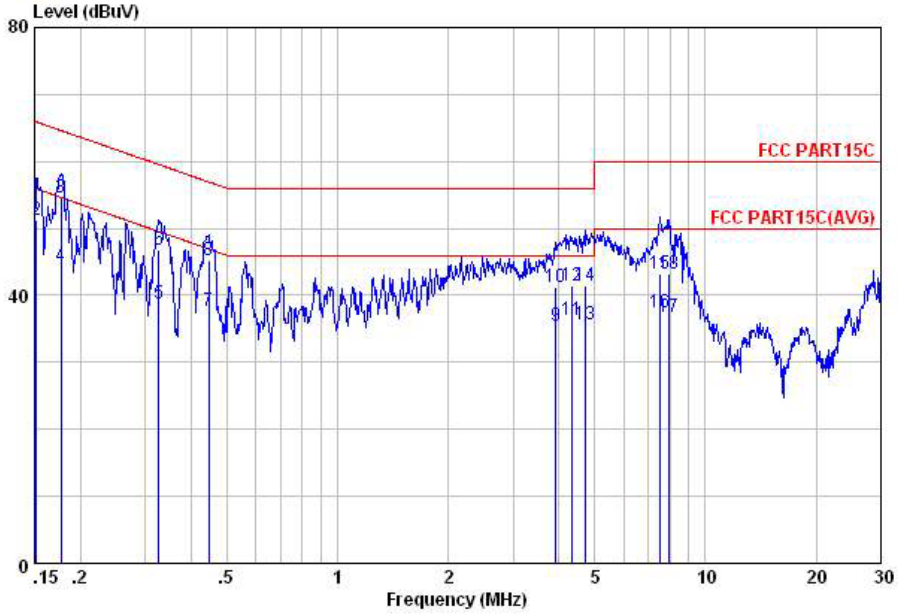
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.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

3.9.4 Test Setup



3.9.5 Test Result of AC Conducted Emission

Test Mode :	Mode 2	**Temperature :**	22~24℃
Test Engineer :	Eligah Wang	**Relative Humidity :**	37~39%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter 2) for Sample 1		

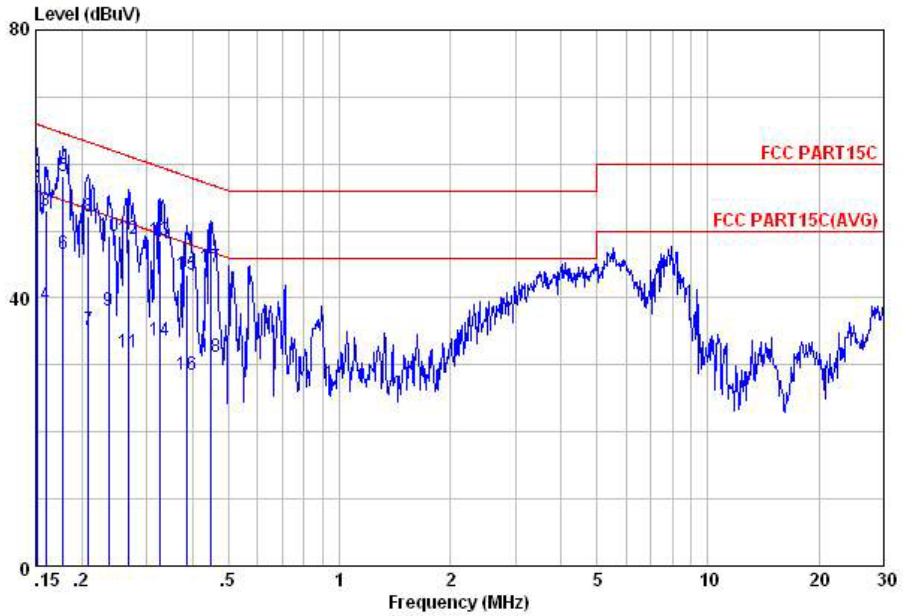


Site : C001-KS
Condition: FCC PART15C LISN-L20130306 LINE

mode : Mode 2

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	39.24	-16.67	55.91	26.60	1.93	10.71	Average
2	0.15	51.24	-14.67	65.91	38.60	1.93	10.71	QP
3	0.18	54.60	-10.04	64.64	42.60	1.37	10.63	QP
4	0.18	44.30	-10.34	54.64	32.30	1.37	10.63	Average
5	0.33	38.77	-10.76	49.53	27.89	0.53	10.35	Average
6	0.33	46.77	-12.76	59.53	35.89	0.53	10.35	QP
7	0.45	37.63	-9.30	46.93	27.11	0.25	10.27	Average
8	0.45	45.33	-11.60	56.93	34.81	0.25	10.27	QP
9	3.92	35.32	-10.68	46.00	24.90	0.18	10.24	Average
10	3.92	41.32	-14.68	56.00	30.90	0.18	10.24	QP
11	4.34	36.34	-9.66	46.00	25.90	0.19	10.25	Average
12	4.34	41.34	-14.66	56.00	30.90	0.19	10.25	QP
13	4.72	35.55	-10.45	46.00	25.10	0.20	10.25	Average
14	4.72	41.55	-14.45	56.00	31.10	0.20	10.25	QP
15	7.53	43.13	-16.87	60.00	32.60	0.20	10.33	QP
16	7.53	37.33	-12.67	50.00	26.80	0.20	10.33	Average
17	7.98	36.84	-13.16	50.00	26.30	0.20	10.34	Average
18	7.98	43.34	-16.66	60.00	32.80	0.20	10.34	QP

Test Mode :	Mode 2	**Temperature :**	22~24℃
Test Engineer :	Eligah Wang	**Relative Humidity :**	37~39%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter 2) for Sample 1		



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

mode : Mode 2

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	41.50	-14.46	55.96	28.89	1.89	10.72	Average
2	0.15	57.20	-8.76	65.96	44.59	1.89	10.72	QP
3	0.16	53.02	-12.45	65.47	40.61	1.74	10.67	QP
4	0.16	39.02	-16.45	55.47	26.61	1.74	10.67	Average
5	0.18	58.25	-6.34	64.59	46.30	1.33	10.62	QP
6	0.18	46.55	-8.04	54.59	34.60	1.33	10.62	Average
7	0.21	35.15	-18.12	53.27	23.60	0.98	10.57	Average
8	0.21	52.15	-11.12	63.27	40.60	0.98	10.57	QP
9	0.24	38.05	-14.17	52.22	26.60	0.92	10.53	Average
10	0.24	49.35	-12.87	62.22	37.90	0.92	10.53	QP
11	0.27	31.91	-19.25	51.16	20.61	0.84	10.46	Average
12	0.27	48.91	-12.25	61.16	37.61	0.84	10.46	QP
13	0.33	48.54	-11.03	59.57	37.59	0.60	10.35	QP
14	0.33	33.54	-16.03	49.57	22.59	0.60	10.35	Average
15	0.39	43.51	-14.61	58.12	32.80	0.42	10.29	QP
16	0.39	28.61	-19.51	48.12	17.90	0.42	10.29	Average
17	0.45	44.52	-12.37	56.89	33.91	0.34	10.27	QP
18	0.45	31.22	-15.67	46.89	20.61	0.34	10.27	Average

3.10 Antenna Requirements

3.10.1 Standard Applicable

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

3.10.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.10.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 09, 2014	Aug. 09, 2014~ Aug. 14, 2014	Jun. 08, 2015	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	300MHz~40GHz	Jan. 28, 2014	Aug. 09, 2014~ Aug. 14, 2014	Jan. 27, 2015	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	300MHz~40GHz	Jan. 28, 2014	Aug. 09, 2014~ Aug. 14, 2014	Jan. 27, 2015	Conducted (TH02-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 09, 2014	Aug. 12, 2014~ Aug. 13, 2014	Jun. 08, 2015	Radiation (03CH05-HY)
EMI Test Receiver	R&S	ESVS10	834468/0003	20MHz ~ 1000MHz	May 06, 2014	Aug. 12, 2014~ Aug. 13, 2014	May 05, 2015	Radiation (03CH05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100330	9K~30M	Nov. 15, 2012	Aug. 12, 2014~ Aug. 13, 2014	Nov. 14, 2014	Radiation (03CH05-HY)
Bilog Antenna	Schaffner	CBL6111C	2725	30MHz~1GHz	Oct. 10, 2013	Aug. 12, 2014~ Aug. 13, 2014	Oct. 09, 2014	Radiation (03CH05-HY)
Double Ridged Guide Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz~18GHz	Apr. 16, 2014	Aug. 12, 2014~ Aug. 13, 2014	Apr. 15, 2015	Radiation (03CH05-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	18GHz~40GHz	Oct. 03, 2013	Aug. 12, 2014~ Aug. 13, 2014	Oct. 02, 2014	Radiation (03CH05-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	1590074	100kHz~18GHz	Jul. 07, 2014	Aug. 12, 2014~ Aug. 13, 2014	Jul. 06, 2015	Radiation (03CH05-HY)
Preamplifier	COM-POWER	PA-103	161075	9kHz~30MHz	Apr. 15, 2014	Aug. 12, 2014~ Aug. 13, 2014	Apr. 14, 2015	Radiation (03CH05-HY)
Preamplifier	Miteq	TTA0204	1872107	18GHz~40GHz	May 23, 2014	Aug. 12, 2014~ Aug. 13, 2014	May 22, 2015	Radiation (03CH05-HY)
Turn Table	HD	HD100	420/611	0 - 360 degree	N/A	Aug. 12, 2014~ Aug. 13, 2014	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	HD100	240/666	1 m - 4 m	N/A	Aug. 12, 2014~ Aug. 13, 2014	N/A	Radiation (03CH05-HY)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 04, 2014	Aug. 08, 2014	May 03, 2015	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Dec. 10, 2013	Aug. 08, 2014	Dec. 09, 2014	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Dec. 10, 2013	Aug. 08, 2014	Dec. 09, 2014	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Nov. 12, 2013	Aug. 08, 2014	Nov. 11, 2014	Conduction (CO01-KS)

※ Calibration Interval of Loop Antenna is two years.

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))	2.3

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.5