

FCC RF Test Report

APPLICANT : Honeywell International Inc
EQUIPMENT : Dolphin 7800
BRAND NAME : Honeywell
MODEL NAME : Dolphin® 7800
FCC ID : HD57800LW
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Spread Spectrum (DSS)

The product was received on Jun. 20, 2011 and completely tested on Oct. 30, 2011. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the compliance with the applicable technical standards.

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

Reviewed by:



Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

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

SPORTON INTERNATIONAL INC.

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FCC ID : HD57800LW

Page Number : 1 of 74

Report Issued Date : Nov. 14, 2011

Report Version : Rev. 01



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR162005-01A	Rev. 01	Initial issue of report	Nov. 14, 2011

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	A8.4(2)	Number of Channels	$\geq 15\text{Chs}$	Pass	-
3.2	15.247(a)(1)	A8.1(a)	20dB Bandwidth	NA	Pass	-
3.2	-	Gen 4.6.1	99% Bandwidth	-	Pass	-
3.3	15.247(a)(1)	A8.1(b)	Channel Separation	$\geq 2/3$ of 20dB BW	Pass	-
3.4	15.247(a)(1)	A8.1(d)	Dwell Time of Each Channel	$\leq 0.4\text{sec}$ in 31.6sec period	Pass	-
3.5	15.247(b)(1)	A8.1(b)	Peak Output Power	$\leq 125\text{ mW}$	Pass	-
3.6	15.247(d)	A8.5	Frequency Band Edges	$\leq 20\text{dBc}$	Pass	-
3.7	15.247(d)	A8.5	Spurious Emission	$< 20\text{ dBc}$	Pass	-
3.8	15.207	Gen 7.2.4	AC Conducted Emission	15.207(a)	Pass	Under limit 13.9 dB at 0.222 MHz
3.9	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 5.91 dB at 4960 MHz
3.10	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Honeywell International Inc
9680 Old Bailes Road, Fort Mill, SC 29707 USA

1.2 Manufacturer

Honeywell International Inc
9680 Old Bailes Road, Fort Mill, SC 29707 USA

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	Dolphin 7800
Brand Name	Honeywell
Model Name	Dolphin® 7800
FCC ID	HD57800LW
Tx/Rx Frequency Range	2400 MHz ~ 2483.5 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Channel Spacing	1 MHz
Maximum Output Power to Antenna	Bluetooth (1Mbps) : 3.60 dBm (0.0023 W) Bluetooth EDR (2Mbps) : -0.52 dBm (0.0009 W) Bluetooth EDR (3Mbps) : 0.13 dBm (0.0010 W)
Antenna Type	PIFA Antenna with gain 2.95 dBi
HW Version	010
SW Version	01
Type of Modulation	Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK
EUT Stage	Production Unit

Remark:

1. For other wireless features of this EUT, test report will be issued separately.
2. This test report recorded only product characteristics and test results of Digital Spread Spectrum (DSS).
3. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Testing Site

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978	
Test Site No.	Sporton Site No.	FCC/IC Registration No.
	CO05-HY	722060/4086B-1

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.	
	03CH01-KS	

1.5 Applied Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC Public Notice DA 00-705
- ♦ ANSI C63.4-2003
- ♦ IC RSS-210 Issue 8
- ♦ IC RSS-Gen Issue 3

Remark:

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

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	GPS Station	T&E	GS-50	N/A	N/A	Unshielded, 1.8 m
3.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Notebook	Dell	P08S	QDS-BRCM1030	N/A	AC I/P: Unshielded, 1.84m DC O/P: Shielded, 0.9m
6.	LCD Monitor	Lenovo	6135-AB1	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
7.	LCD Monitor	Dell	ST2220Lb	Fcc DoC	Shielded, 1.6m	Unshielded, 1.8m
8.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A
9.	iPod	Apple	A1199	FCC DoC	Shielded, 1.0 m	N/A
10.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A

2 Test Configuration of Equipment Under Test

2.1 RF Output Power

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

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	$\pi/4$ -DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	3.10 dBm	-1.14 dBm	-0.49 dBm
Ch39	2441MHz	3.53 dBm	-0.52 dBm	0.13 dBm
Ch78	2480MHz	3.60 dBm	-0.65 dBm	-0.09 dBm

Remark:

1. The data rate was set in 1Mbps for all the test items due to the highest RF output power.
2. The EUT is programmed to transmit signals continuously for all testing.

2.2 Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and 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).

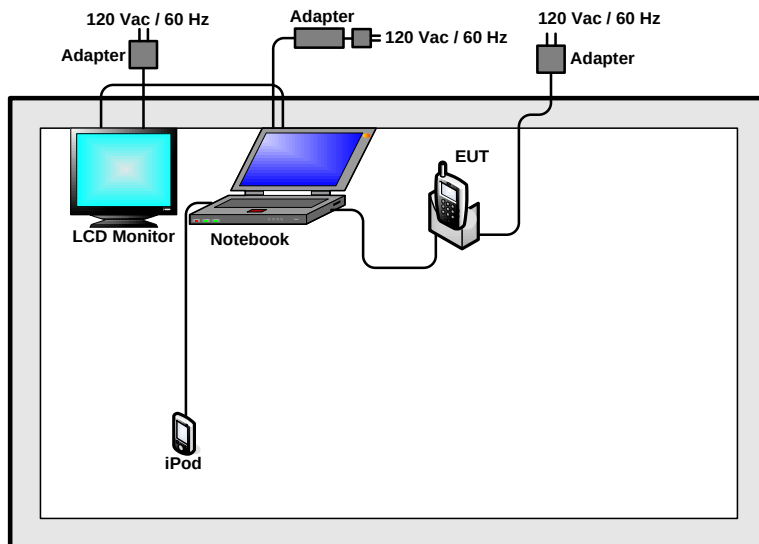
Pre-scanned tests, X, Y, Z in three orthogonal panels, were conducted to determine the final configuration from all possible combinations³.

The following tables are showing the test modes as the worst cases (E2 plane) and recorded in this report.

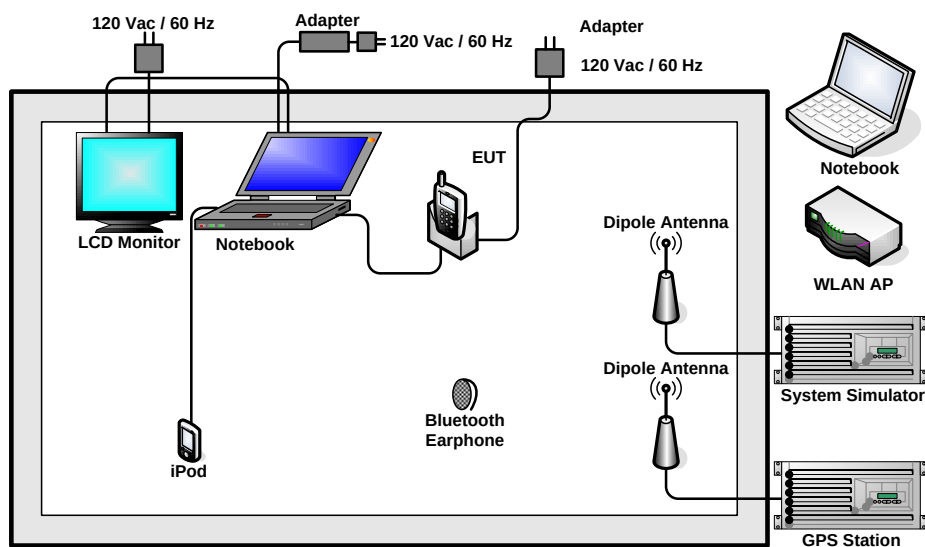
Test Cases			
Test Item	Data Rate / Modulation		
	Bluetooth 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi/4$ -DQPSK	Bluetooth EDR 3Mbps 8-DPSK
Conducted TCs	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated TCs	Mode 1: CH00_2402 MHz for Keypad 1 Mode 2: CH39_2441 MHz for Keypad 1 Mode 3: CH78_2480 MHz for Keypad 1 Mode 4: CH78_2480 MHz for Keypad 2	N/A	N/A
AC Conducted Emission	Mode 1 :GSM850 (GPRS 8) Idle + Bluetooth Link + WLAN Link (2.4G) + GPS Rx + USB Charging Cable with AC Power + USB Cable (Data Link with Notebook) for Keypad 1 Mode 2 :WCDMA Band IV Idle + Bluetooth Link + WLAN Link (5G) + GPS Rx + USB Charging Cable with AC Power + USB Cable (Data Link with Notebook) for Keypad 2		
Remark: 1. For radiated TCs, the data rate was set in 1Mbps due to the highest RF output power; only the data of these modes was reported. 2. For conducted emission, the worst case is mode 2; only the test data of this mode was reported. 3. Link with Notebook means data application transferred mode between DUT and Notebook.			

2.3 Connection Diagram of Test System

<Bluetooth Tx Mode>



<AC Conducted Emission Mode>



2.4 RF Utility

For Bluetooth function, the RF utility, “BT Tester” was installed in EUT which was programmed to contact with Bluetooth base station for transmitting and receiving signals continuously.

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

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

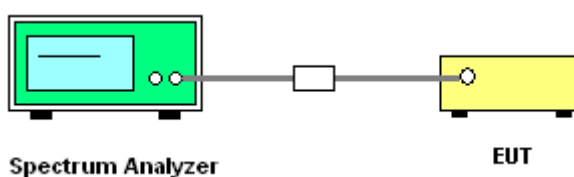
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

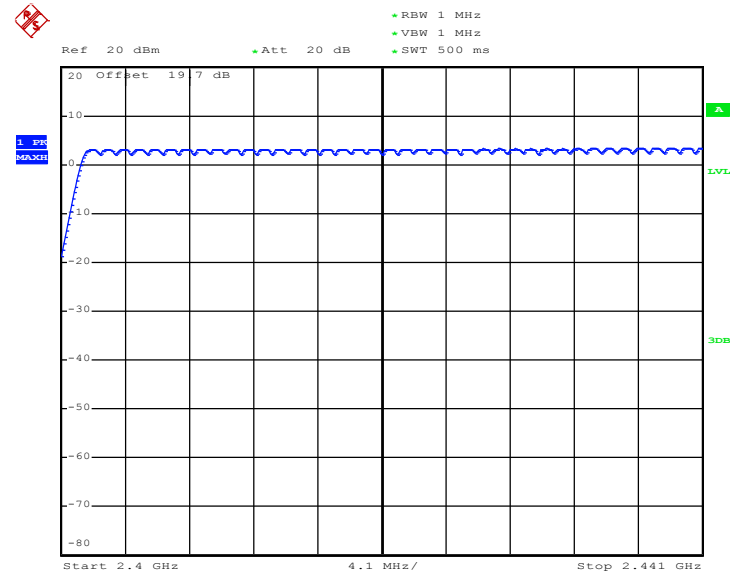
1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. The modulation types of EUT are irrelevant to number of hopping channels deviation.
4. The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = the frequency band of operation; RBW $\geq$ 1% of the span; VBW $\geq$ RBW; Sweep = auto;
Detector function = peak; Trace = max hold.
5. The number of hopping frequency used is defined as the device has the numbers of total channel.

3.1.4 Test Setup

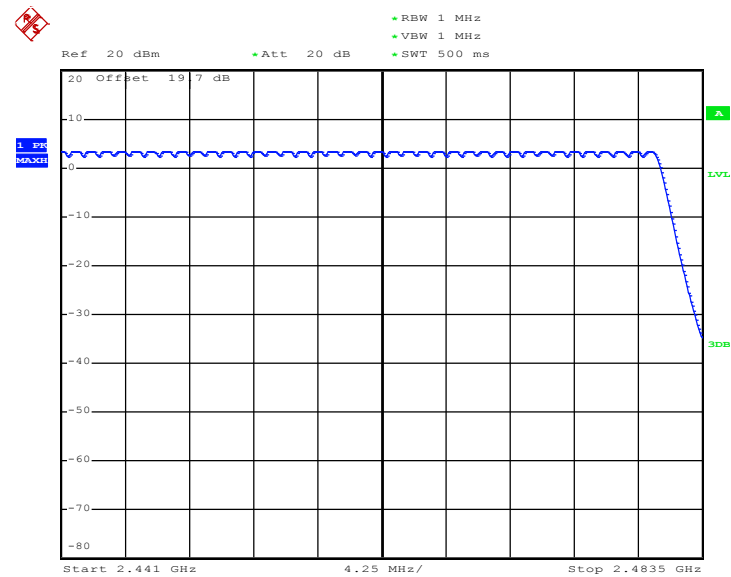


3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	Mode 1~3	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%
Number of Hopping Channels (Channel)		Limits (Channel)	Pass/Fail
79		> 15	Pass

Number of Hopping Channel Plot on Channel 00 - 78


Date: 18.OCT.2011 15:35:27



Date: 18.OCT.2011 15:39:50

3.2 20dB and 99% Bandwidth Measurement

3.2.1 Limit of 20dB Bandwidth

N/A

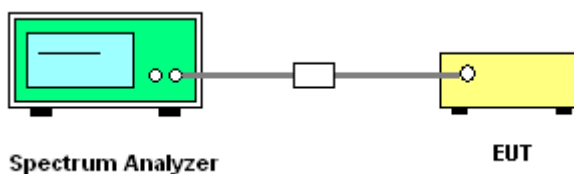
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. The EUT should be transmitting at its maximum data rate as the worst cases.
4. Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel;
RBW $\geq$ 1% of the 20 dB bandwidth; VBW $\geq$ RBW; Sweep = auto; Detector function = peak;
Trace = max hold.
5. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

3.2.4 Test Setup

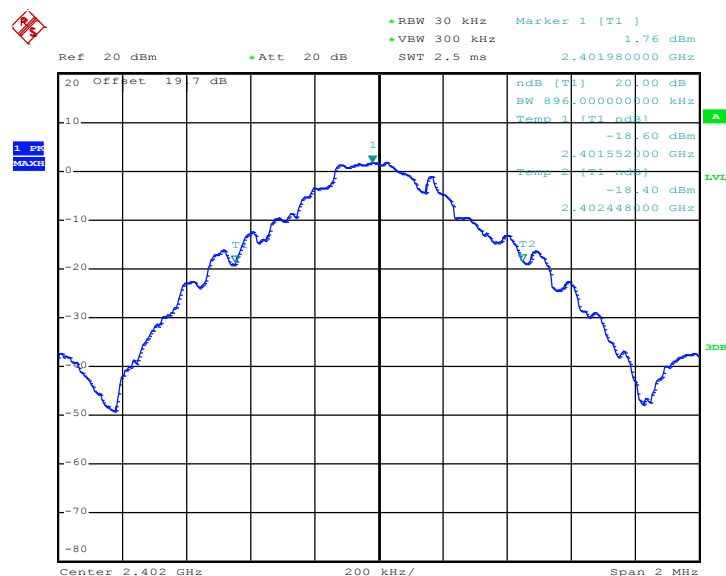


3.2.5 Test Result of 20dB Bandwidth

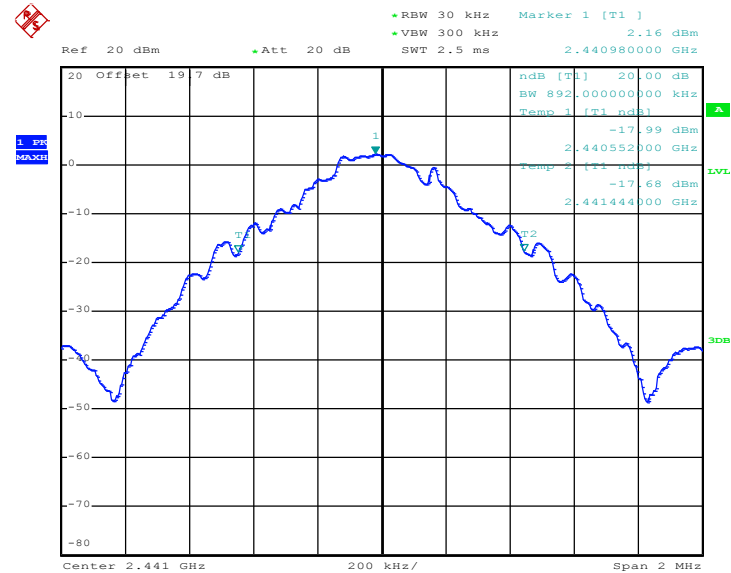
Test Mode :	Mode 1, 2, 3	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.896
39	2441	0.892
78	2480	0.892

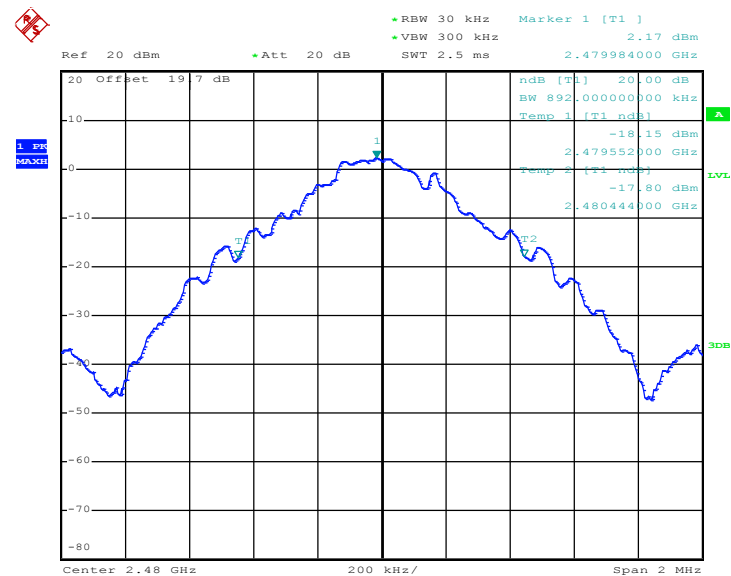
20 dB Bandwidth Plot on Channel 00



Date: 18.OCT.2011 15:27:14

20 dB Bandwidth Plot on Channel 39


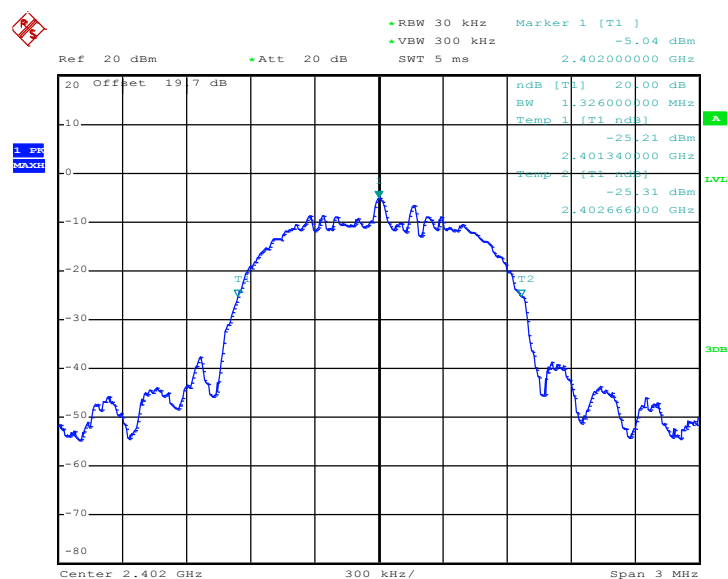
Date: 18.OCT.2011 15:28:20

20 dB Bandwidth Plot on Channel 78


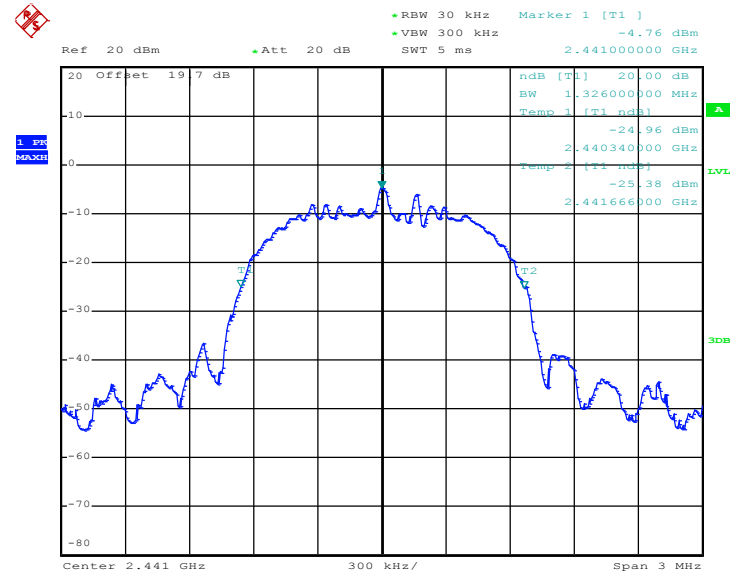
Date: 18.OCT.2011 15:29:16

Test Mode :	Mode 4, 5, 6	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

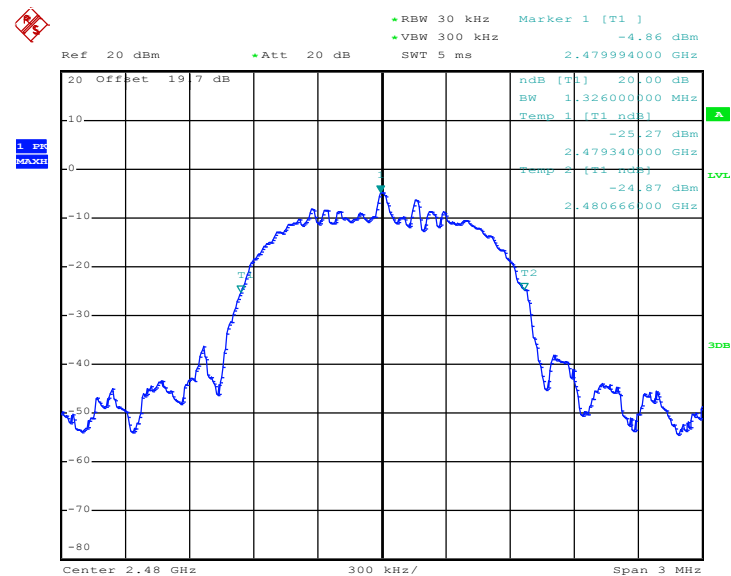
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.326
39	2441	1.326
78	2480	1.326

20 dB Bandwidth Plot on Channel 00


Date: 18.OCT.2011 15:16:57

20 dB Bandwidth Plot on Channel 39


Date: 18.OCT.2011 15:19:10

20 dB Bandwidth Plot on Channel 78


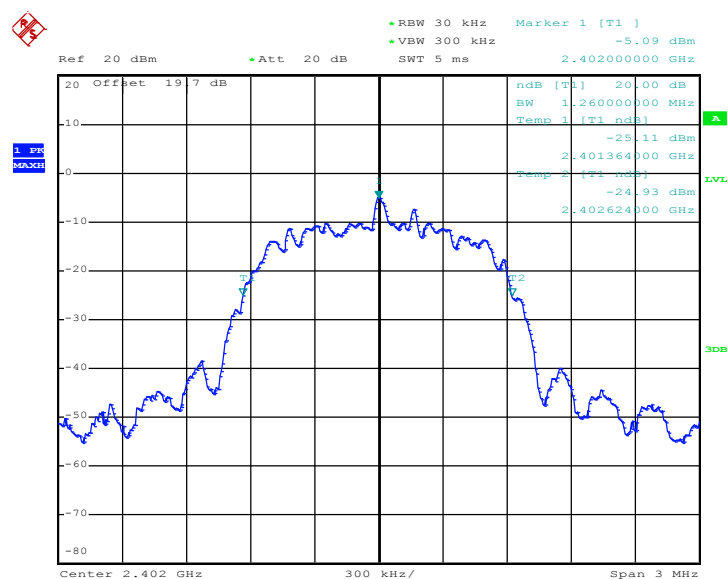
Date: 18.OCT.2011 15:20:44



Test Mode :	Mode 7, 8, 9	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

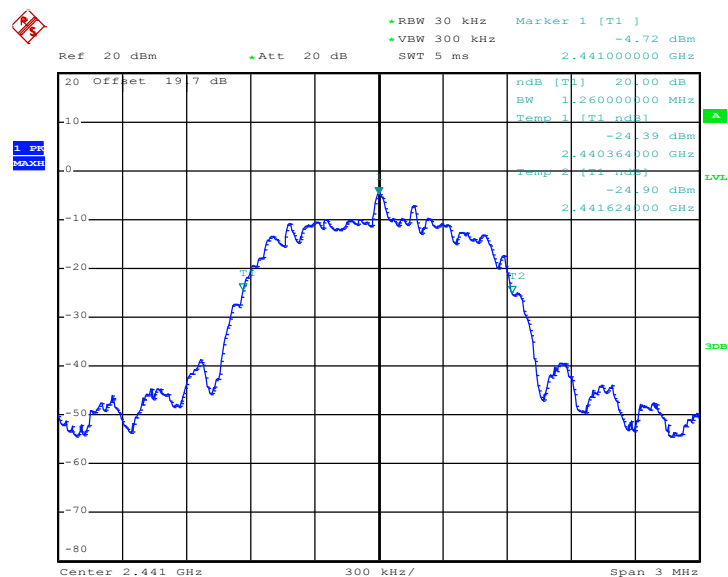
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.260
39	2441	1.260
78	2480	1.260

20 dB Bandwidth Plot on Channel 00



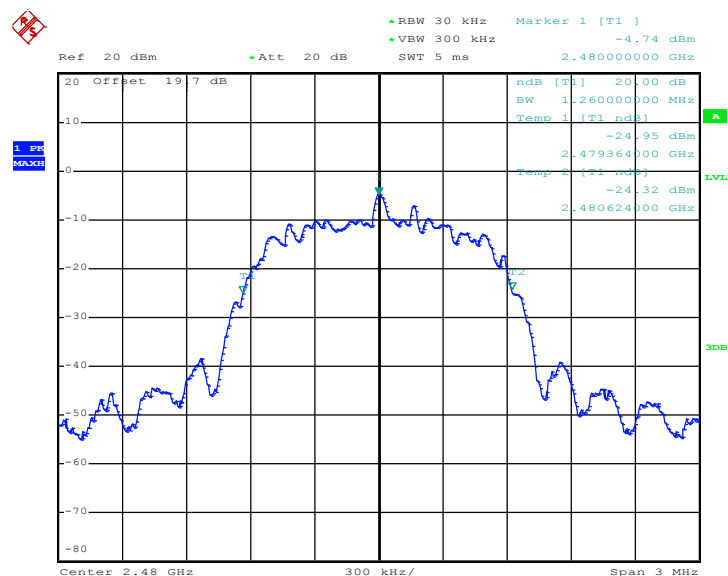
Date: 18.OCT.2011 15:25:37

20 dB Bandwidth Plot on Channel 39



Date: 18.OCT.2011 15:24:03

20 dB Bandwidth Plot on Channel 78



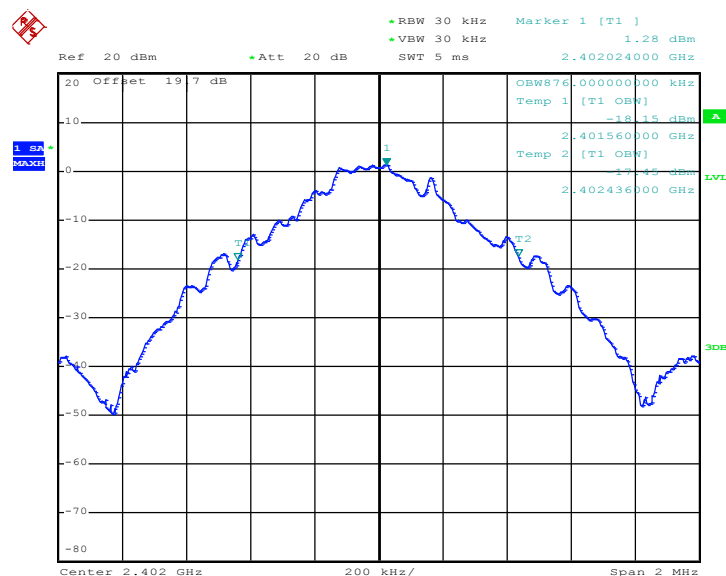
Date: 18.OCT.2011 15:22:23

3.2.6 Test Result of 99% Occupied Bandwidth

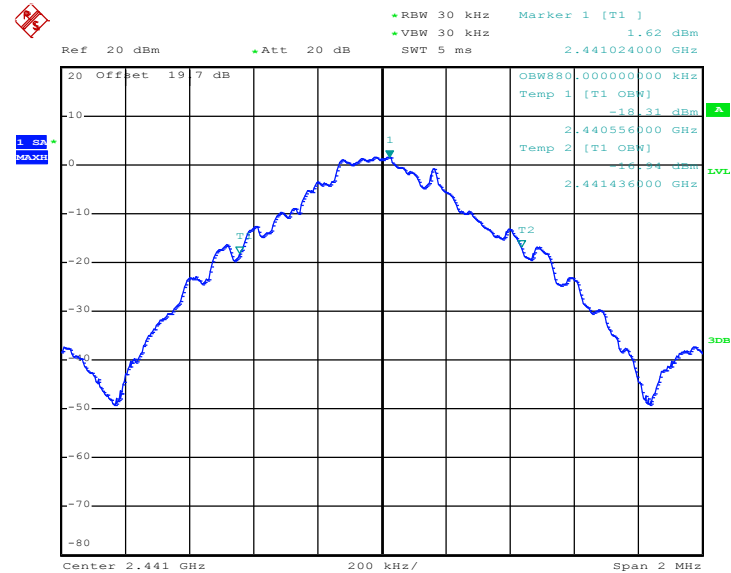
Test Mode :	Mode 1, 2, 3	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	0.876
39	2441	0.880
78	2480	0.880

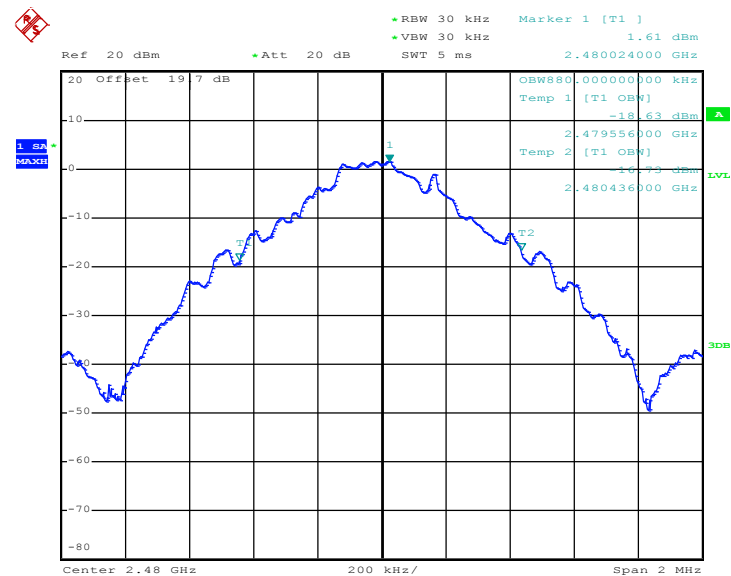
99% Bandwidth Plot on Channel 00



Date: 18.OCT.2011 15:03:49

99% Occupied Bandwidth Plot on Channel 39


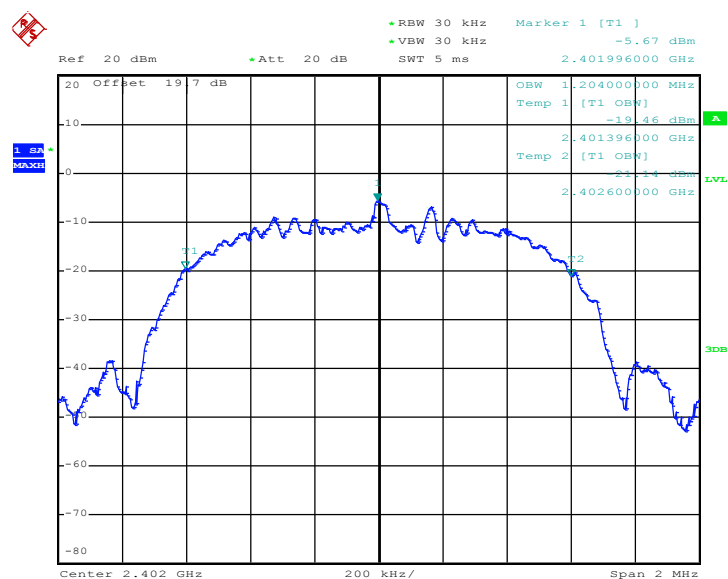
Date: 18.OCT.2011 15:05:20

99% Occupied Bandwidth Plot on Channel 78


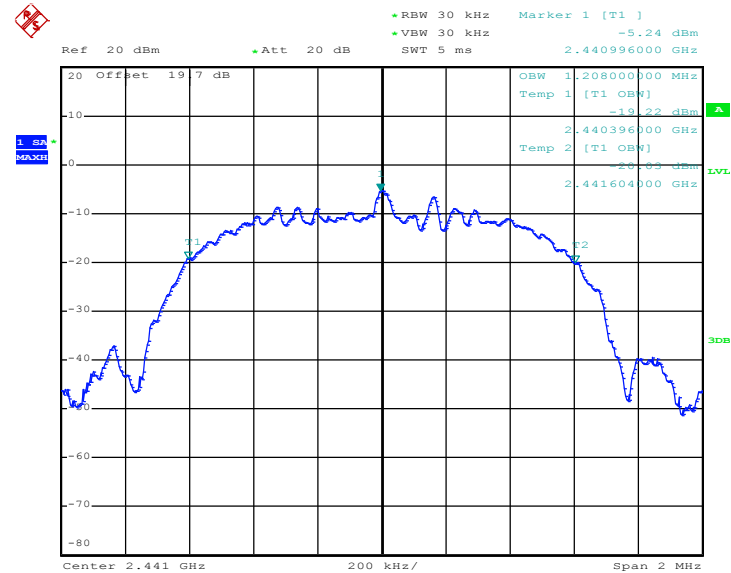
Date: 18.OCT.2011 15:06:45

Test Mode :	Mode 4, 5, 6	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

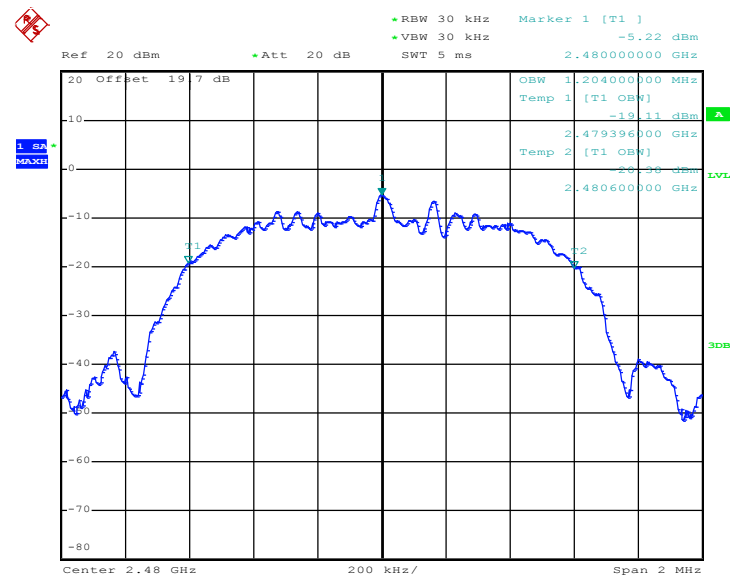
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.204
39	2441	1.208
78	2480	1.204

99% Bandwidth Plot on Channel 00


Date: 18.OCT.2011 15:17:35

99% Occupied Bandwidth Plot on Channel 39


Date: 18.OCT.2011 15:19:47

99% Occupied Bandwidth Plot on Channel 78


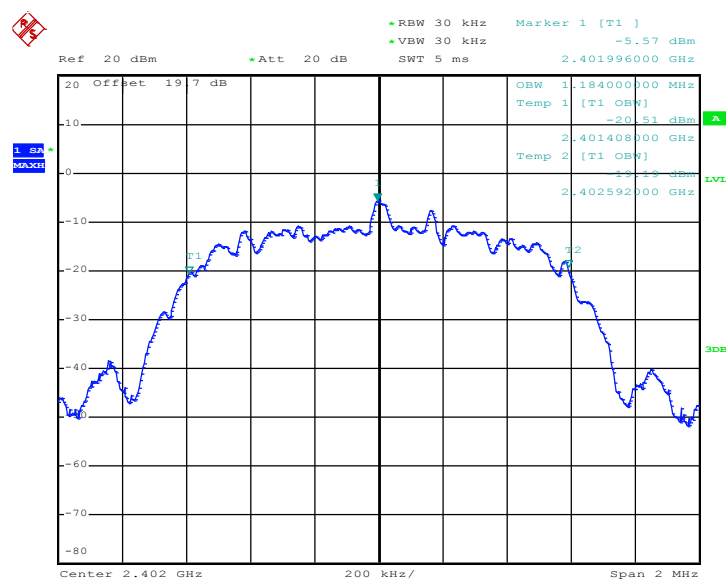
Date: 18.OCT.2011 15:21:30



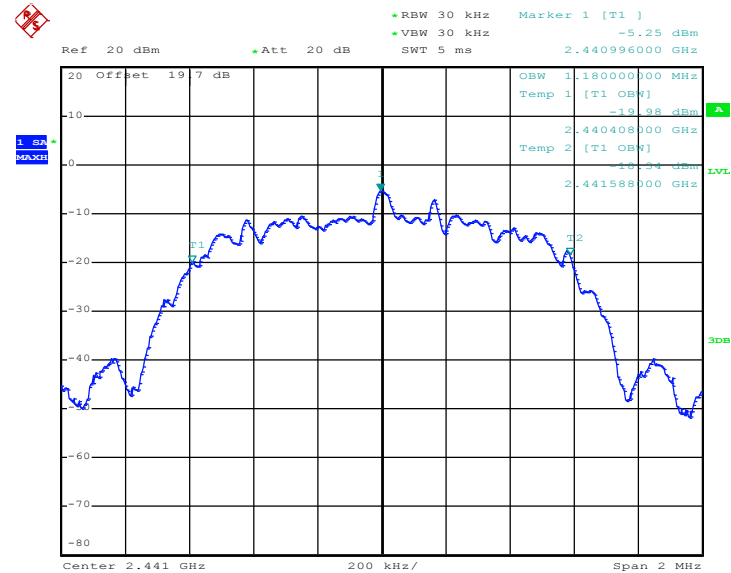
Test Mode :	Mode 7, 8, 9	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

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

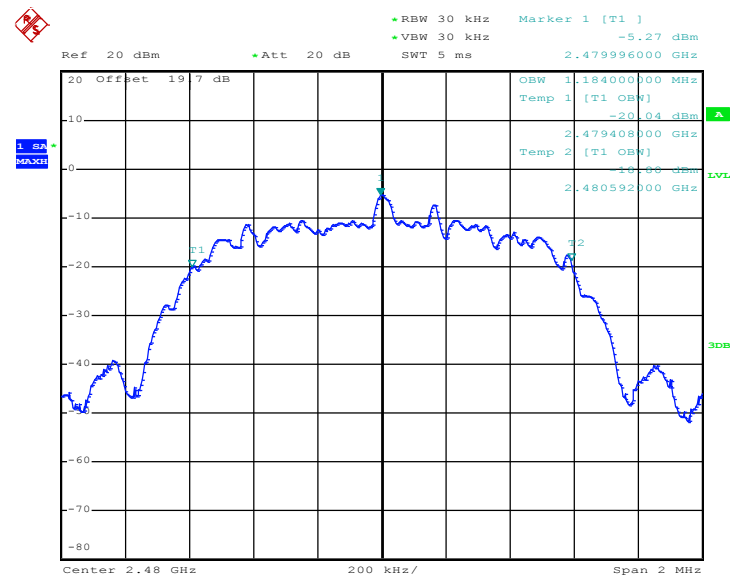
99% Bandwidth Plot on Channel 00



Date: 18.OCT.2011 15:26:13

99% Occupied Bandwidth Plot on Channel 39


Date: 18.OCT.2011 15:24:38

99% Occupied Bandwidth Plot on Channel 78


Date: 18.OCT.2011 15:22:57

3.3 Hopping Channel Separation Measurement

3.3.1 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.

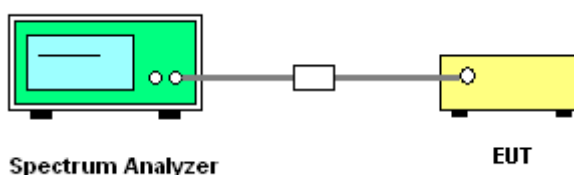
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. Please refer FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. The EUT should be transmitting at its maximum data rate as the worst cases.
4. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels; $RBW \geq 1\%$ of the span;
VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
5. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

3.3.4 Test Setup

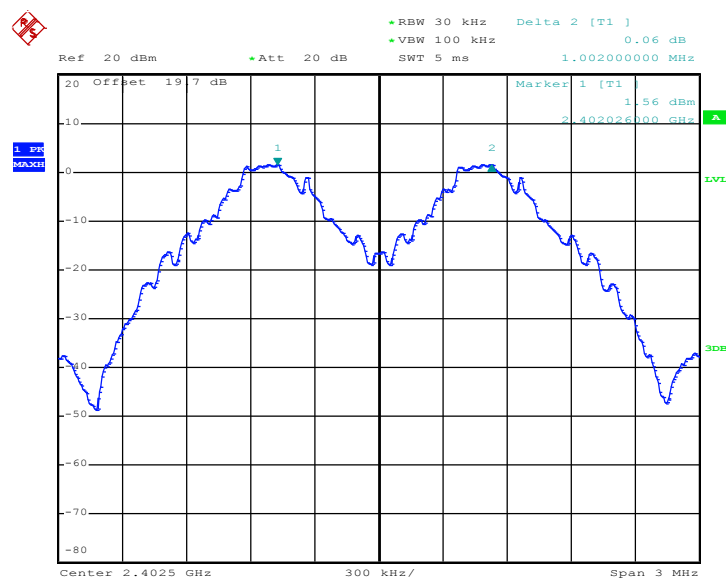


3.3.5 Test Result of Hopping Channel Separation

Test Mode :	Mode 1, 2, 3	Temperature :	24~26℃
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.5973	Pass
39	2441	1.002	0.5947	Pass
78	2480	1.002	0.5947	Pass

Channel Separation Plot on Channel 00 - 01



Date: 18.OCT.2011 13:54:59



Channel Separation Plot on Channel 77 - 78



3.4 Dwell Time Measurement

3.4.1 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.

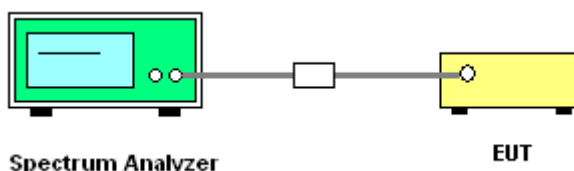
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. The EUT should be transmitting at its maximum data rate as the worst cases.
4. The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW $\geq$ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
5. Use the marker-delta function to calculate the dwell time.

3.4.4 Test Setup



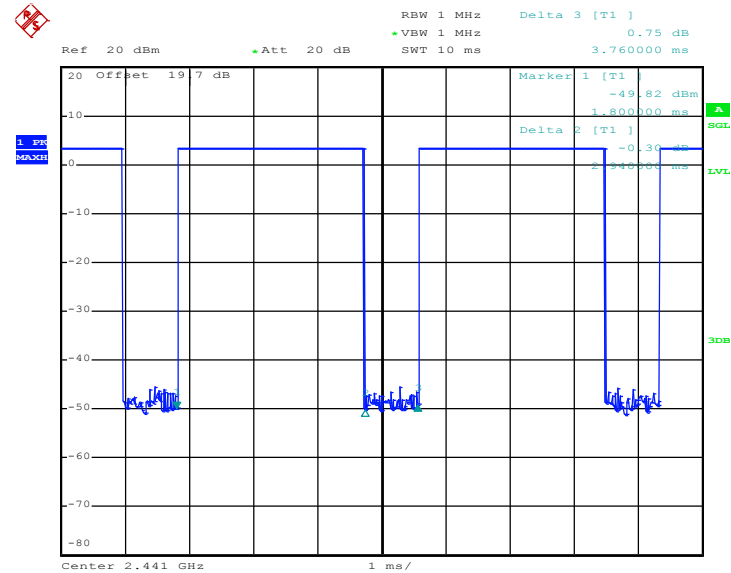
3.4.5 Test Result of Dwell Time

Test Mode :	Mode 2	Temperature :	24~26°C
Test Engineer :	Alan Liu	Relative Humidity :	50~53%

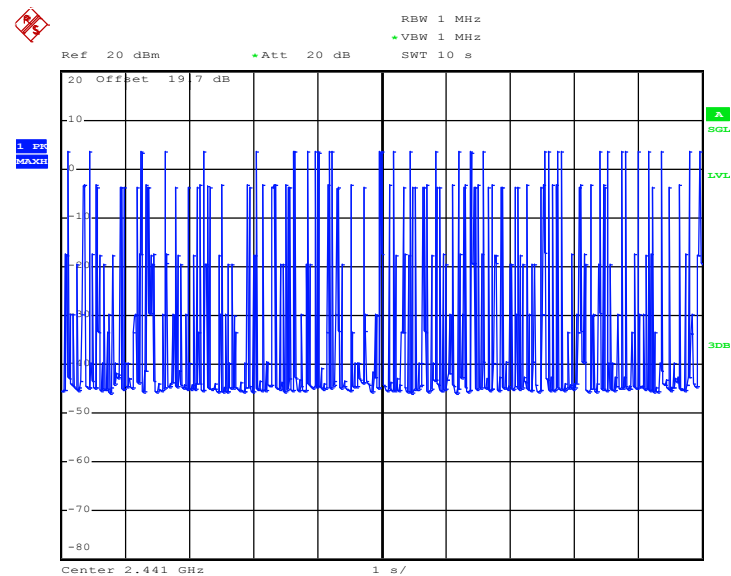
Package Mode	Average Hopping Channel	Package Transfer Time (usec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
DH5	3.20	2940.00	0.30	0.4	Pass

Remark:

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

DH5 Dwell Time (One Pulse) Plot on Channel 39


Date: 13.OCT.2011 15:07:59

DH5 Dwell Time (Count Pulses) Plot on Channel 39


Date: 18.OCT.2011 01:45:19

3.5 Peak Output Power Measurement

3.5.1 Limit of Peak Output Power

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, provided the systems operate with an output power no greater than 125 mW (20.97dBm).

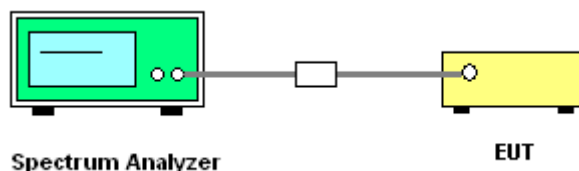
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.

3.5.4 Test Setup

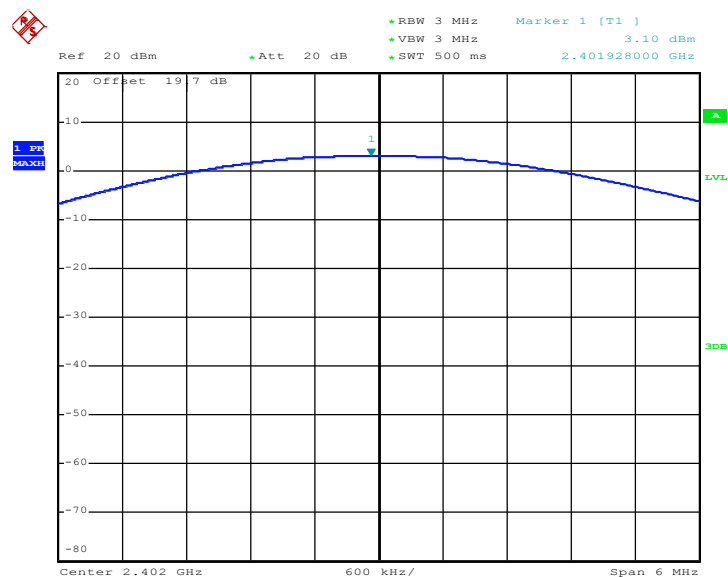


3.5.5 Test Result of Peak Output Power

Test Mode :	Mode 1, 2, 3	Temperature :	24~26℃	
Test Engineer :	Alan Liu	Relative Humidity :	50~53%	

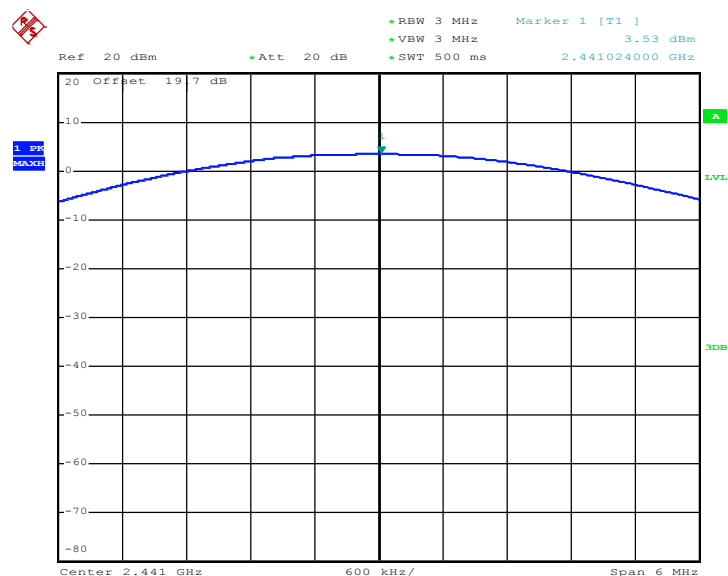
Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	3.10	30	Pass
39	2441	3.53	30	Pass
78	2480	3.60	30	Pass

Peak Output Power Plot on Channel 00



Date: 13.OCT.2011 14:47:20

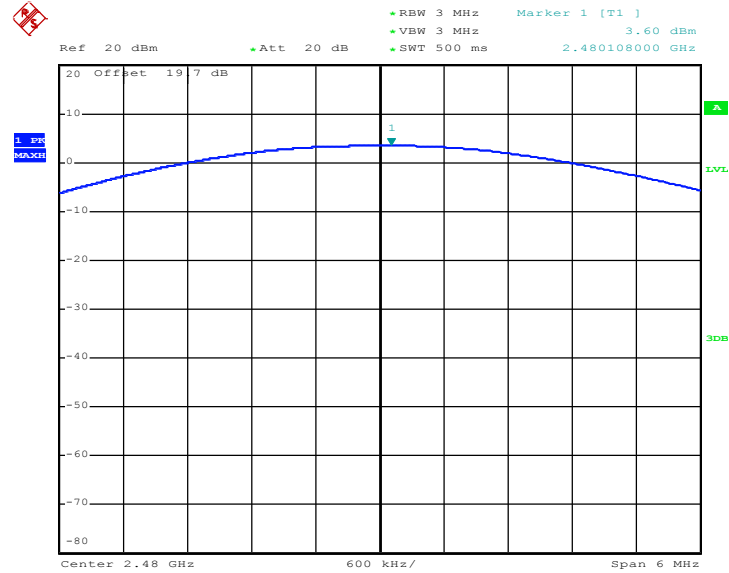
Peak Output Power Plot on Channel 39



Date: 13.OCT.2011 15:02:52



Peak Output Power Plot on Channel 78



Date: 13.OCT.2011 15:29:20

3.6 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

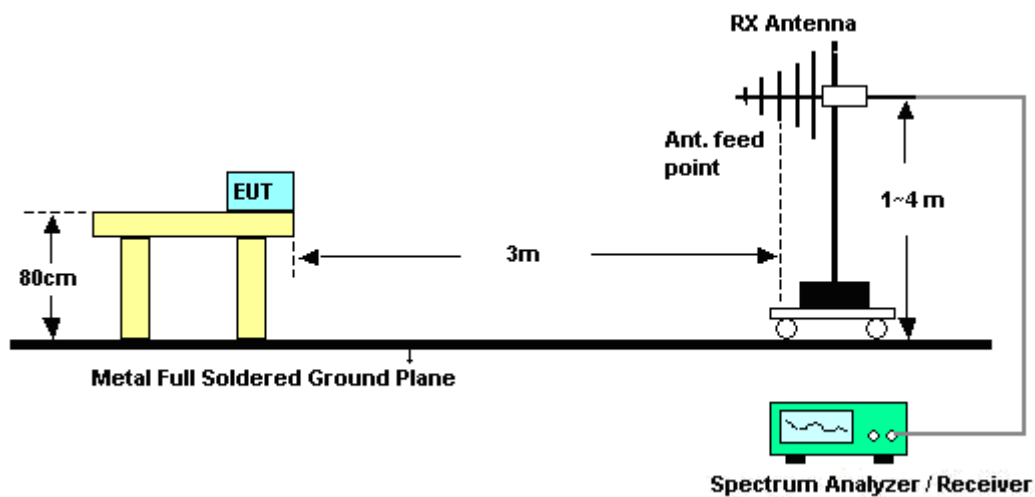
See list of measuring instruments of this test report.

3.6.3 Test Procedures

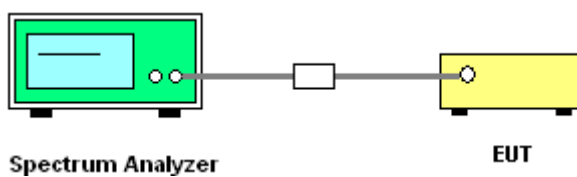
1. The testing follows the guidelines in ANSI C63.4-2003 and FCC Public Notice DA 00-705 Measurement Guidelines.
2. RF antenna conducted test: Set RBW = 300kHz, Video bandwidth (VBW) $\geq$ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 300k Hz RBW. Note: If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB.
3. Radiated emission test: Applies to band edge emissions that fall in the restricted bands listed in FCC Section 15.205. The maximum permitted average field strength is listed in FCC Section 15.209. A pre-amp is necessary for this measurement. For measurements above 1 GHz, set RBW = 1MHz, VBW = 1MHz, Sweep: Auto for Peak; set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto for Average. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation. See FCC Section 15.35(b) and (c).
4. In case the emission is fail due to the used RBW / VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

3.6.4 Test Setup

<Radiated Band Edges>



<Conducted Band Edges>



3.6.5 Test Result of Radiated Band Edges

Test Mode :	Mode 1	Temperature :	22~23°C
Test Channel :	00	Relative Humidity :	46~47%
		Test Engineer :	Chenmy Cheng

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2342.11	49.93	-24.07	74	47.76	32.78	3.33	33.94	118	306	Peak
2342.11	37.04	-16.96	54	34.87	32.78	3.33	33.94	118	306	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2376.88	53	-21	74	50.76	32.83	3.42	34.01	100	122	Peak
2376.88	38.52	-15.48	54	36.28	32.83	3.42	34.01	100	122	Average

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
		Test Engineer :	Chenmy Cheng

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.54	45.78	-28.22	74	43.29	33.01	3.68	34.2	100	117	Peak
2483.54	32.08	-21.92	54	29.59	33.01	3.68	34.2	100	117	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dBμV/m)	Delta Result (dB)	Average Result (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
Single Carrier Mode	84.11	52.03	32.08	54	-21.92	Pass
Hopping Mode	84.11	52.75	31.36	54	-22.64	Pass

Note : Average result = Maximum field strength – Delta result

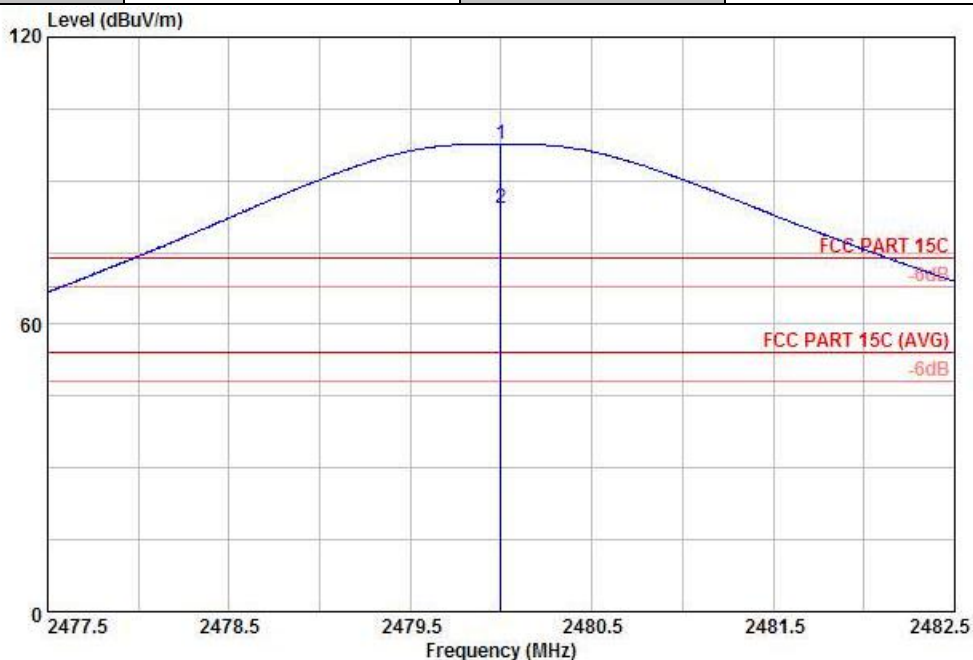
ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.47	48.01	-25.99	74	45.52	33.01	3.68	34.2	100	0	Peak
2484.47	33.49	-20.51	54	31	33.01	3.68	34.2	100	0	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dBμV/m)	Delta Result (dB)	Average Result (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
Single Carrier Mode	87.65	56.72	30.93	54	-23.07	Pass
Hopping Mode	87.65	54.16	33.49	54	-20.51	Pass

Note : Average result = Maximum field strength – Delta result

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Horizontal



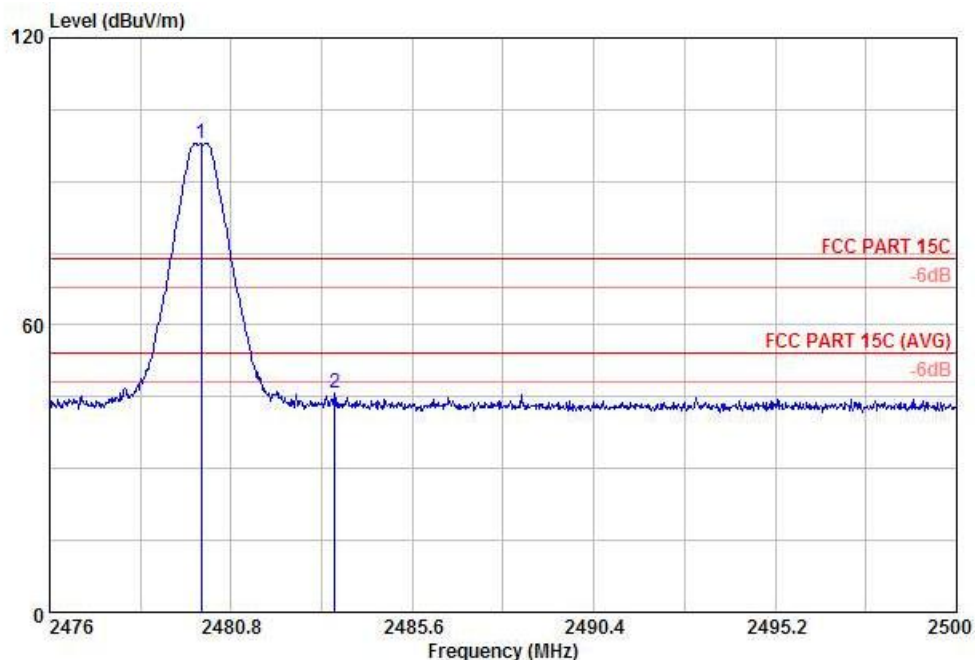
Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 HORIZONTAL

Plane : E2

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 X	2480.00	97.53	23.53	74.00	95.04	33.01	3.68	34.20	100	336 Peak
2 X	2480.00	84.11	30.11	54.00	81.62	33.01	3.68	34.20	100	336 Average

* Maximum field strength of the fundamental emission

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Horizontal



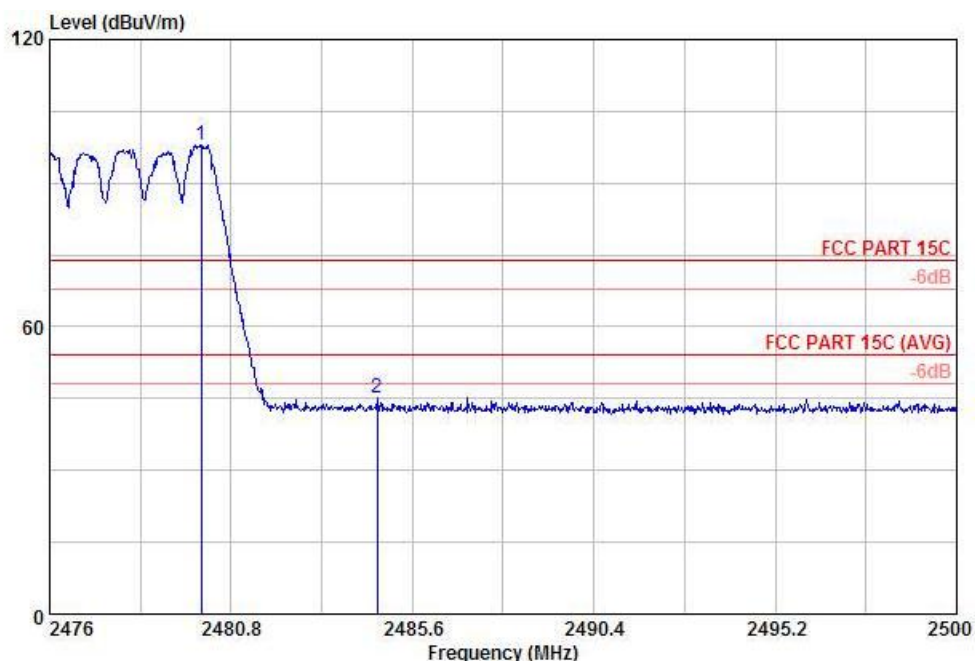
Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 HORIZONTAL

Plane : E2

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	Ant	Table	
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Pos	Pos	Remark
			dB	dBuV/m	dBuV	dB	dB	cm	deg	
1 X	2480.00	97.81	23.81	74.00	95.32	3.68	34.20	100	182	Peak
2	2483.54	45.78	-28.22	74.00	43.29	3.68	34.20	100	117	Peak

* Marker-Delta Method (RBW/VBW=100KHz): 52.03 dB , single carrier Mode

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Horizontal



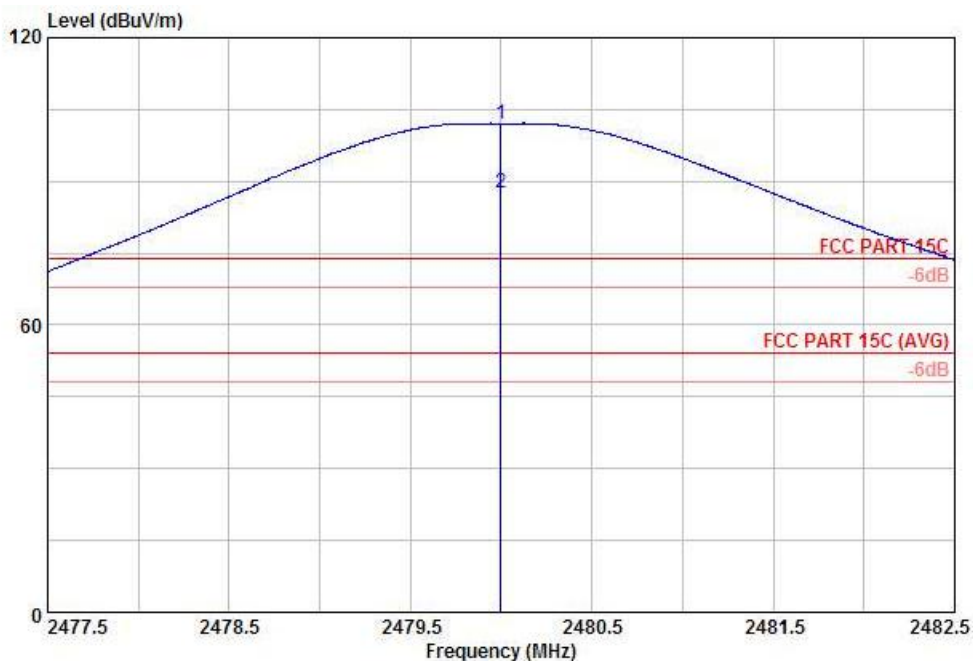
Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 HORIZONTAL

Plane : E2

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	Ant	Table	
	MHz	dBUV/m	Limit	Line	Level Factor	Loss	Factor	Pos	Pos	Remark
			dB	dBUV/m	dBUV	dB/m	dB	dB	cm	deg
1 X	2480.00	97.86	23.86	74.00	95.37	33.01	3.68	34.20	200	106 Peak
2	2484.66	45.11	-28.89	74.00	42.62	33.01	3.68	34.20	200	118 Peak

* Marker-Delta Method (RBW/VBW=100KHz): 52.75 dB , Hopping Mode

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Vertical



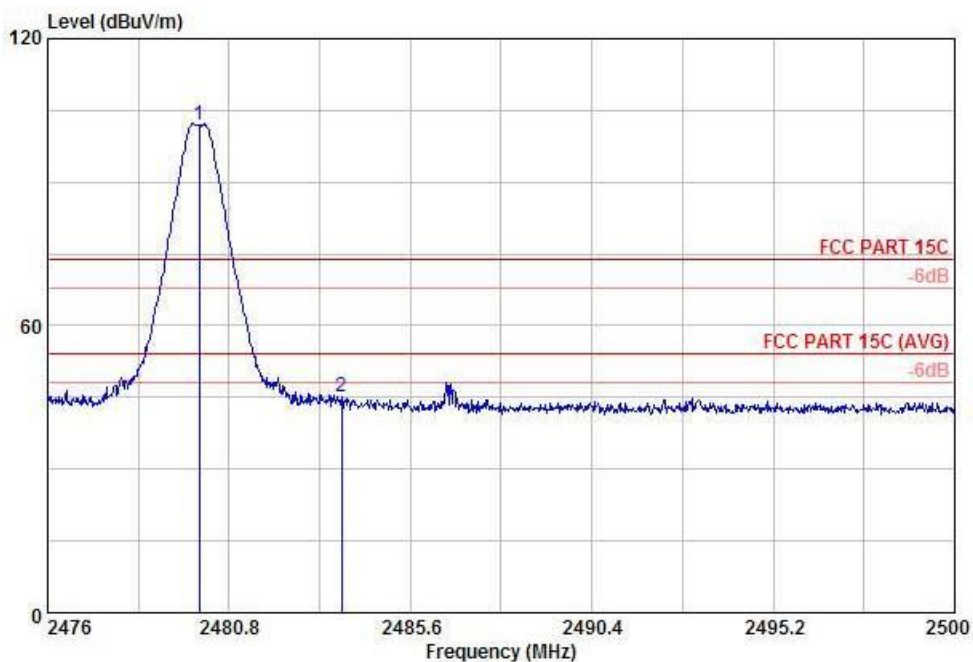
Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 VERTICAL

Plane : E2

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamplifier Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 X	2480.00	102.04	28.04	74.00	99.55	33.01	3.68	34.20	100	120	Peak
2 X	2480.00	87.65	33.65	54.00	85.16	33.01	3.68	34.20	100	120	Average

* Maximum field strength of the fundamental emission

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Vertical



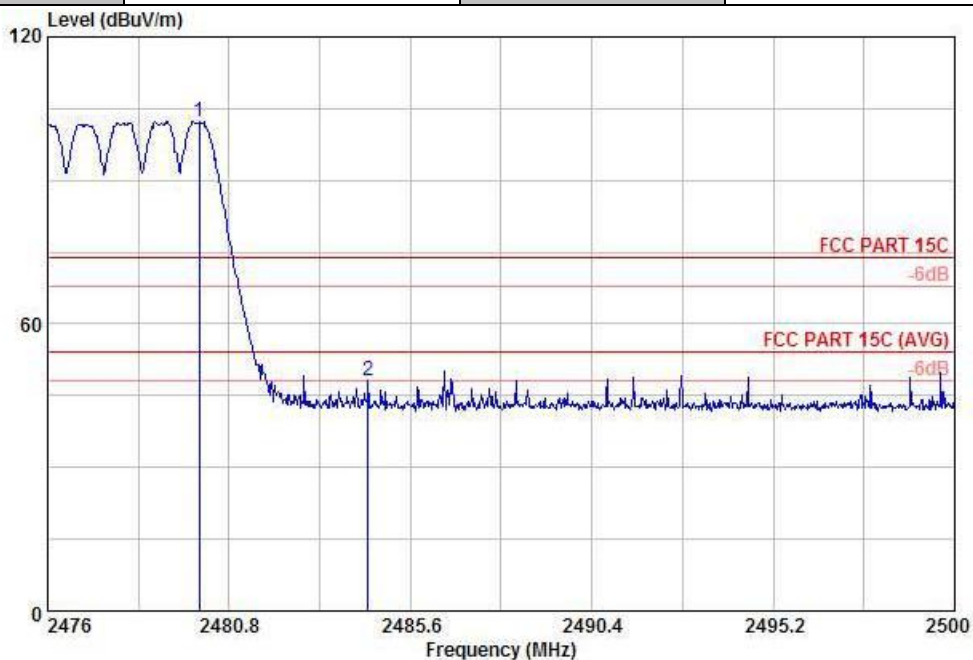
Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 VERTICAL

Plane : E2

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	Ant	Table	
	MHz	dBuV/m	Limit	Line	Level Factor	Loss	Factor	Pos	Pos	Remark
			dB	dBuV/m	dBuV		dB	cm	deg	
1 X	2480.00	101.89	27.89	74.00	99.40	33.01	3.68	34.20	100	0 Peak
2	2483.78	45.17	-28.83	74.00	42.68	33.01	3.68	34.20	100	0 Peak

* Marker-Delta Method (RBW/VBW=100KHz): 56.72 dB , single carrier Mode

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Vertical



Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 VERTICAL

Plane : E2

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level Factor	Cable Loss Factor	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	cm	deg
1 X	2480.00	102.17	28.17	74.00	99.68	33.01	3.68	34.20	100	0 Peak
2	2484.47	48.01	-25.99	74.00	45.52	33.01	3.68	34.20	100	0 Peak

* Marker-Delta Method (RBW/VBW=100KHz): 54.16 dB , Hopping Mode

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
		Test Engineer :	Chenmy Cheng

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2484.04	44.66	-29.34	74	42.17	33.01	3.68	34.2	100	208	Peak
2484.04	32.81	-21.19	54	30.32	33.01	3.68	34.2	100	208	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dBμV/m)	Delta Result (dB)	Average Result (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
Single Carrier Mode	85.67	54.02	31.65	54	-22.35	Pass
Hopping Mode	85.67	52.86	32.81	54	-21.19	Pass

Note : Average result = Maximum field strength – Delta result

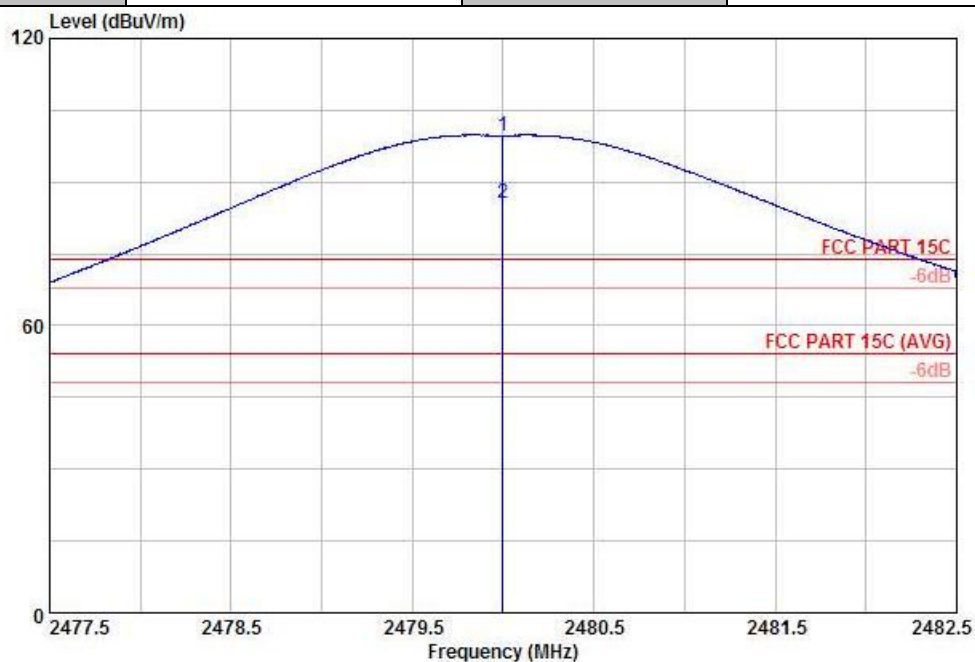
ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	43.05	-30.95	74	40.56	33.01	3.68	34.2	100	331	Peak
2483.5	29.9	-24.1	54	27.41	33.01	3.68	34.2	100	331	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dBμV/m)	Delta Result (dB)	Average Result (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
Single Carrier Mode	88.37	59.54	28.83	54	-25.17	Pass
Hopping Mode	88.37	58.47	29.90	54	-24.10	Pass

Note : Average result = Maximum field strength – Delta result

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Horizontal



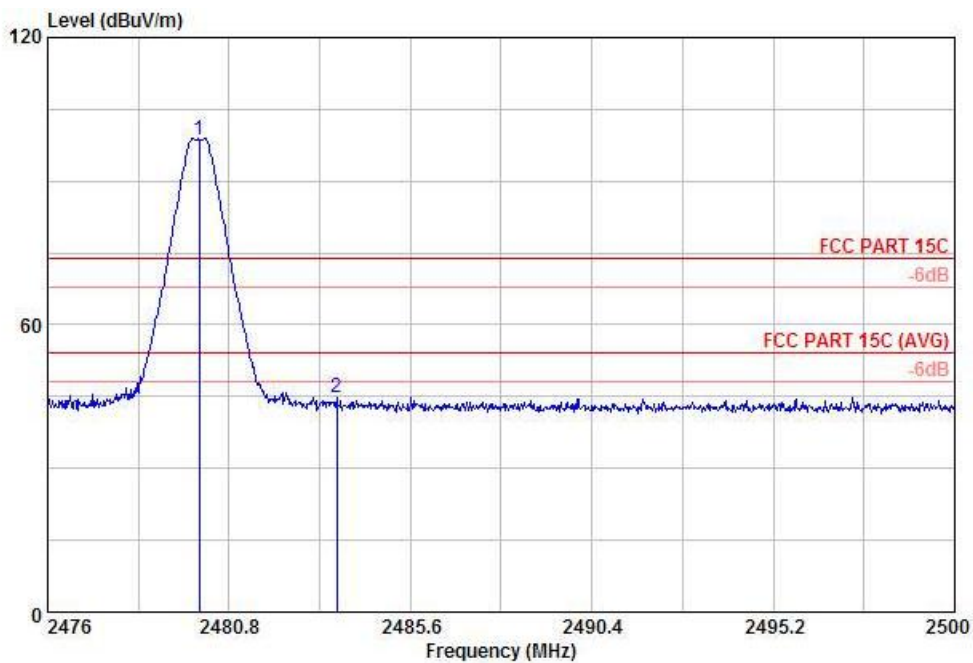
Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 HORIZONTAL

Plane : E2

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 X	2480.00	99.76	25.76	74.00	97.27	33.01	3.68	34.20	100	223 Peak
2 X	2480.00	85.67	31.67	54.00	83.18	33.01	3.68	34.20	100	223 Average

* Maximum field strength of the fundamental emission

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Horizontal



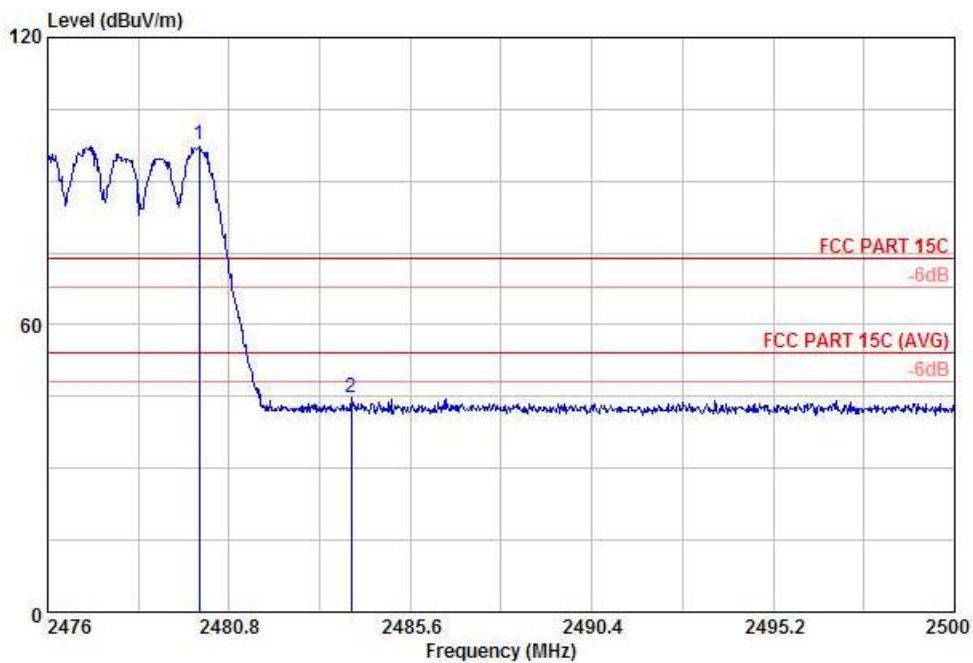
Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 HORIZONTAL

Plane : E2

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level Factor	Cable Loss Factor	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 X	2480.00	98.68	24.68	74.00	96.19	33.01	3.68	34.20	100	118 Peak
2	2483.66	44.66	-29.34	74.00	42.17	33.01	3.68	34.20	100	118 Peak

* Marker-Delta Method (RBW/VBW=100KHz): 54.02 dB , single carrier Mode

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Horizontal



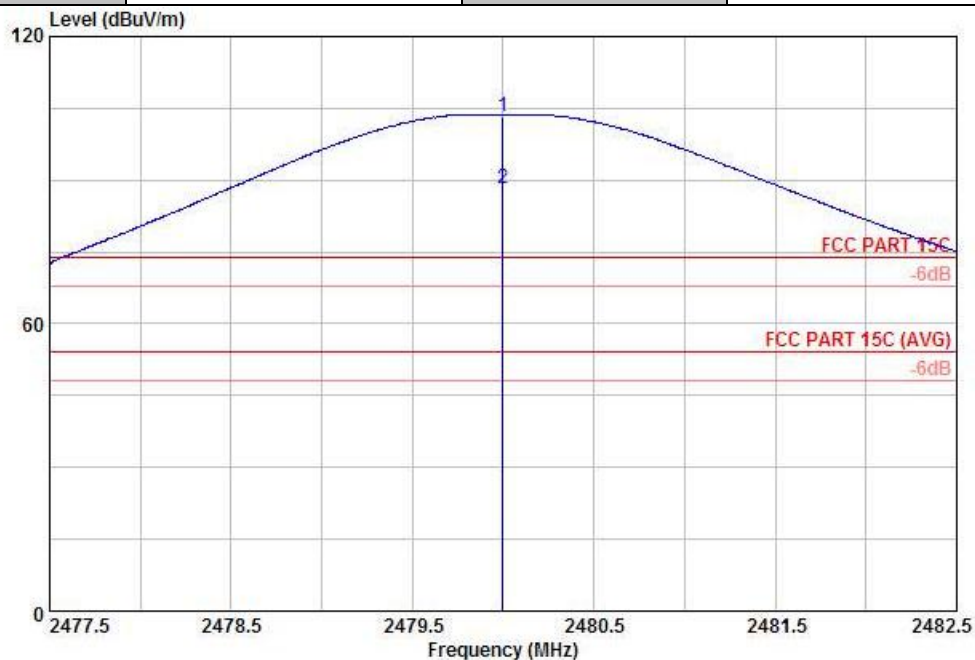
Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 HORIZONTAL

Plane : E2

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 X	2480.00	97.52	23.52	74.00	95.03	33.01	3.68	34.20	100	208 Peak
2	2484.04	44.66	-29.34	74.00	42.17	33.01	3.68	34.20	100	208 Peak

* Marker-Delta Method (RBW/VBW=100KHz): 52.86 dB , Hopping Mode

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Vertical



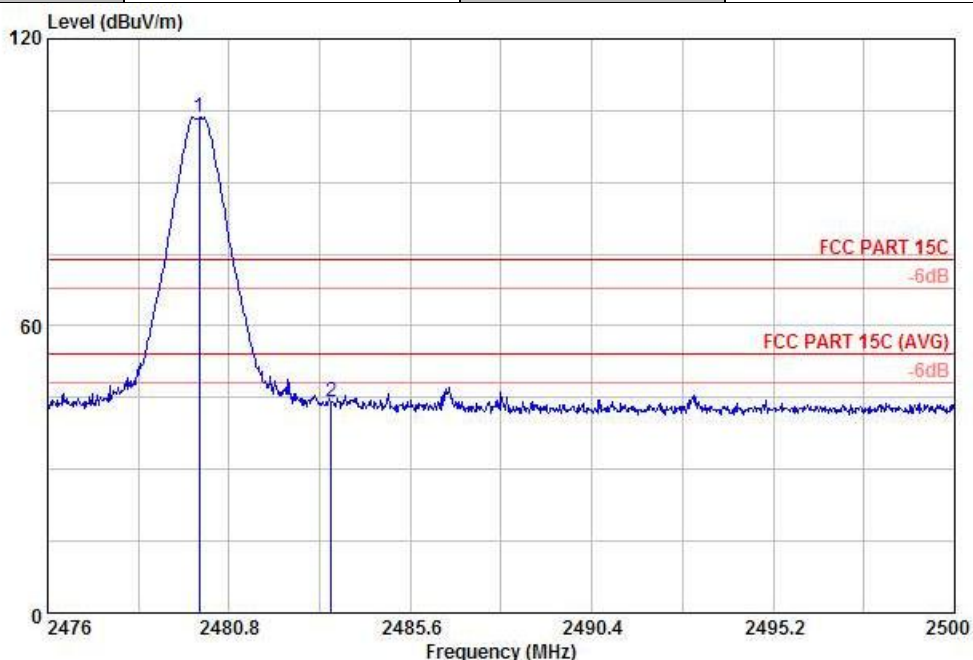
Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 VERTICAL

Plane : E2

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 X	2480.00	103.28	29.28	74.00	100.79	33.01	3.68	34.20	100	174	Peak
2 X	2480.00	88.37	34.37	54.00	85.88	33.01	3.68	34.20	100	174	Average

* Maximum field strength of the fundamental emission

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Vertical



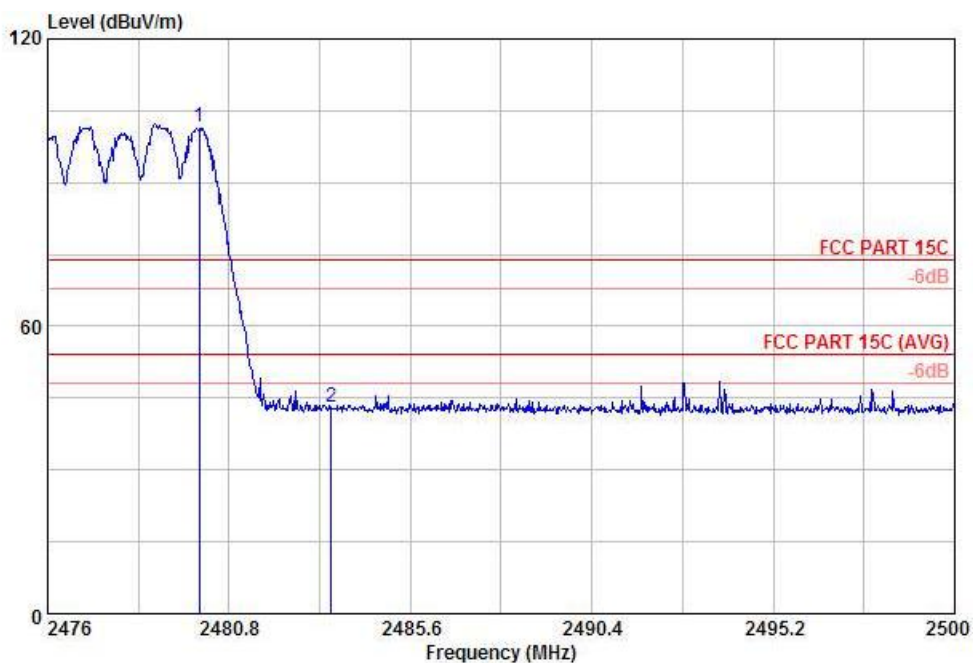
Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 VERTICAL

Plane : E2

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	Ant	Table	
	MHz	dBUV/m	Limit	Line	Level Factor	Loss	Factor	Pos	Pos	Remark
			dB	dBUV/m	dBuV	dB/m	dB	dB	cm	deg
1 X	2480.00	103.66	29.66	74.00	101.17	33.01	3.68	34.20	100	209 Peak
2	2483.50	44.12	-29.88	74.00	41.63	33.01	3.68	34.20	100	209 Peak

* Marker-Delta Method (RBW/VBW=100KHz): 59.54 dB , single carrier Mode

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Vertical



Site : 03CH01-KS
Condition: FCC PART 15C 3m HF ANT-100803 VERTICAL

Plane : E2

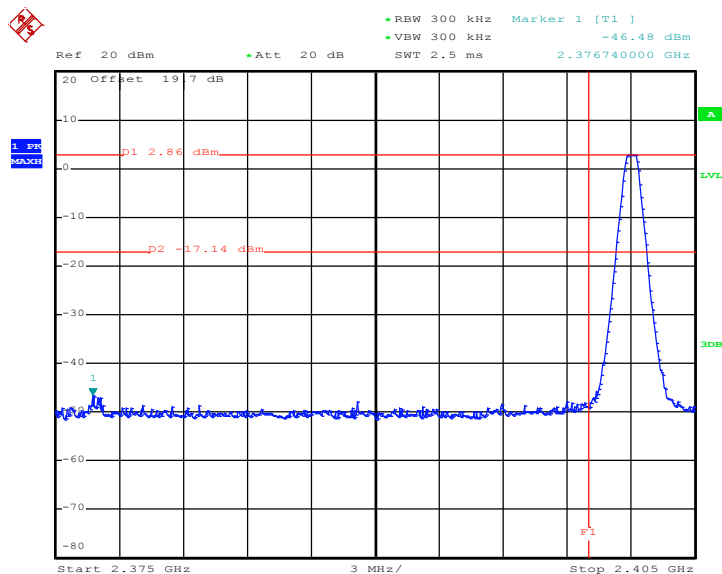
	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	Ant	Table	
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Pos	Pos	Remark
			dB	dBuV/m	dBuV	dB	dB	cm	deg	
1 X	2480.00	101.52	27.52	74.00	99.03	3.68	34.20	100	331	Peak
2	2483.50	43.05	-30.95	74.00	40.56	3.68	34.20	100	331	Peak

* Marker-Delta Method (RBW/VBW=100KHz): 58.47 dB , Hopping Mode

3.6.6 Test Result of Conducted Band Edges

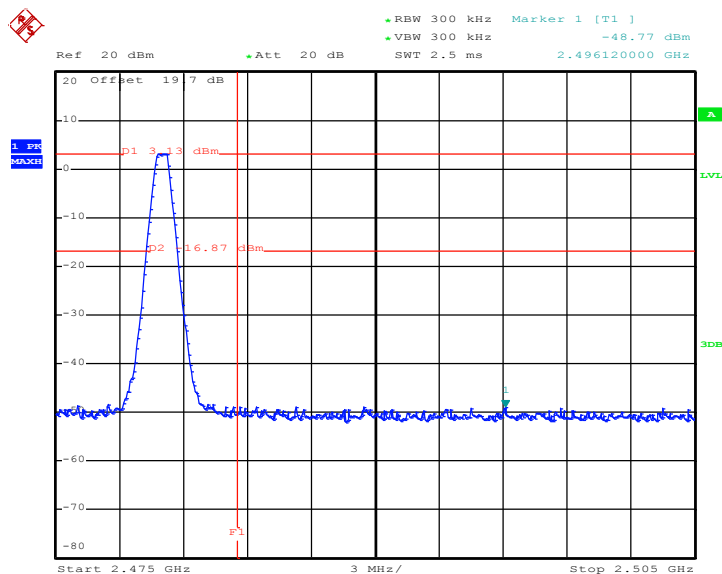
Test Mode :	Mode 1 and 3	Temperature :	24~26℃
Test Channel :	00 and 78	Relative Humidity :	50~53%
		Test Engineer :	Alan Liu

Low Band Edge Plot on Channel 00



Date: 18.OCT.2011 14:42:46

High Band Edge Plot on Channel 78



Date: 18.OCT.2011 14:43:49

3.7 Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

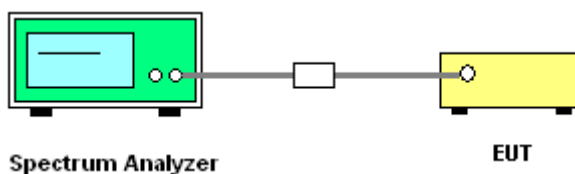
3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

3.7.3 Test Procedure

1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set RBW = 100 kHz, Video bandwidth (VBW) $\geq$ RBW, 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.

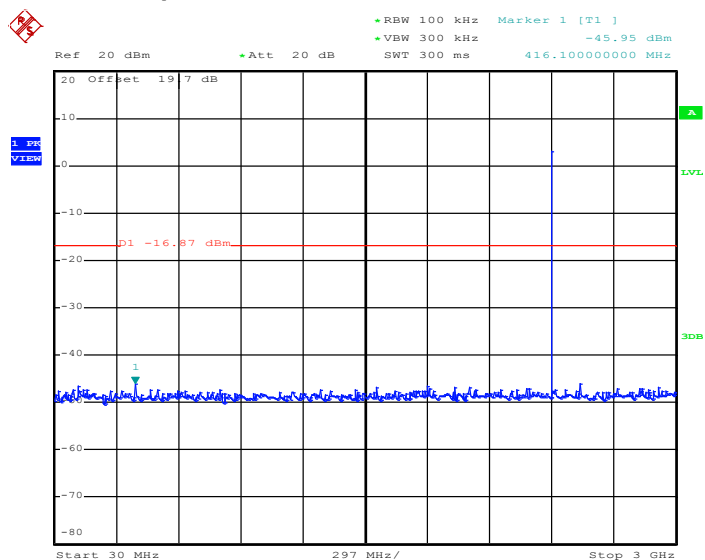
3.7.4 Test Setup



3.7.5 Test Result

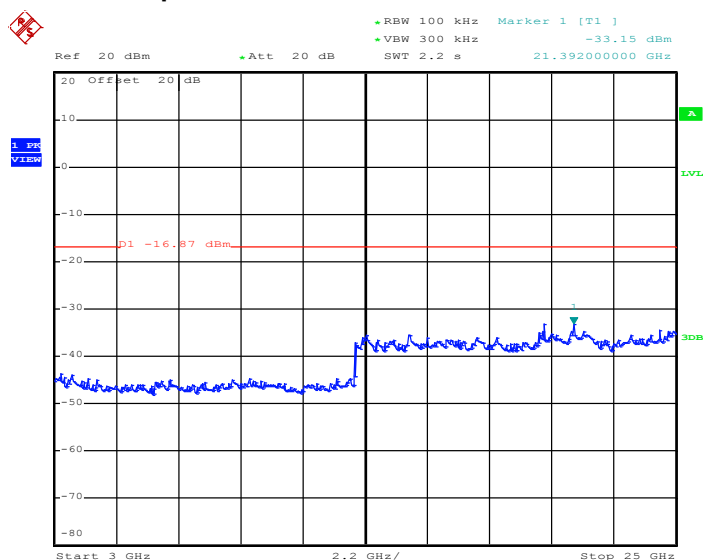
Test Mode :	Mode 1	Temperature :	24~26℃
Test Channel :	00	Relative Humidity :	50~53%
		Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Date: 18.OCT.2011 08:43:24

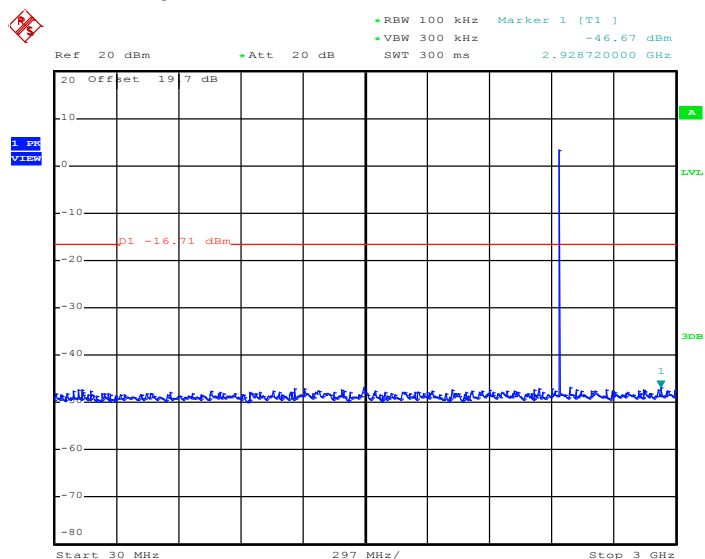
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz



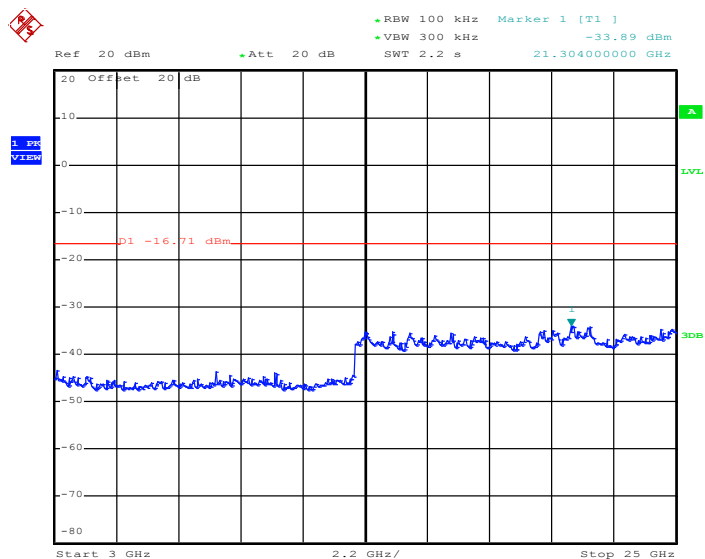
Date: 18.OCT.2011 08:43:46



Test Mode :	Mode 2	Temperature :	24~26°C
Test Channel :	39	Relative Humidity :	50~53%
		Test Engineer :	Alan Liu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

Date: 18.OCT.2011 08:44:40

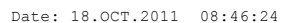
Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

Date: 18.OCT.2011 08:45:02



Report No. : FR162005-01A

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz



3.8 AC Conducted Emission Measurement

3.8.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

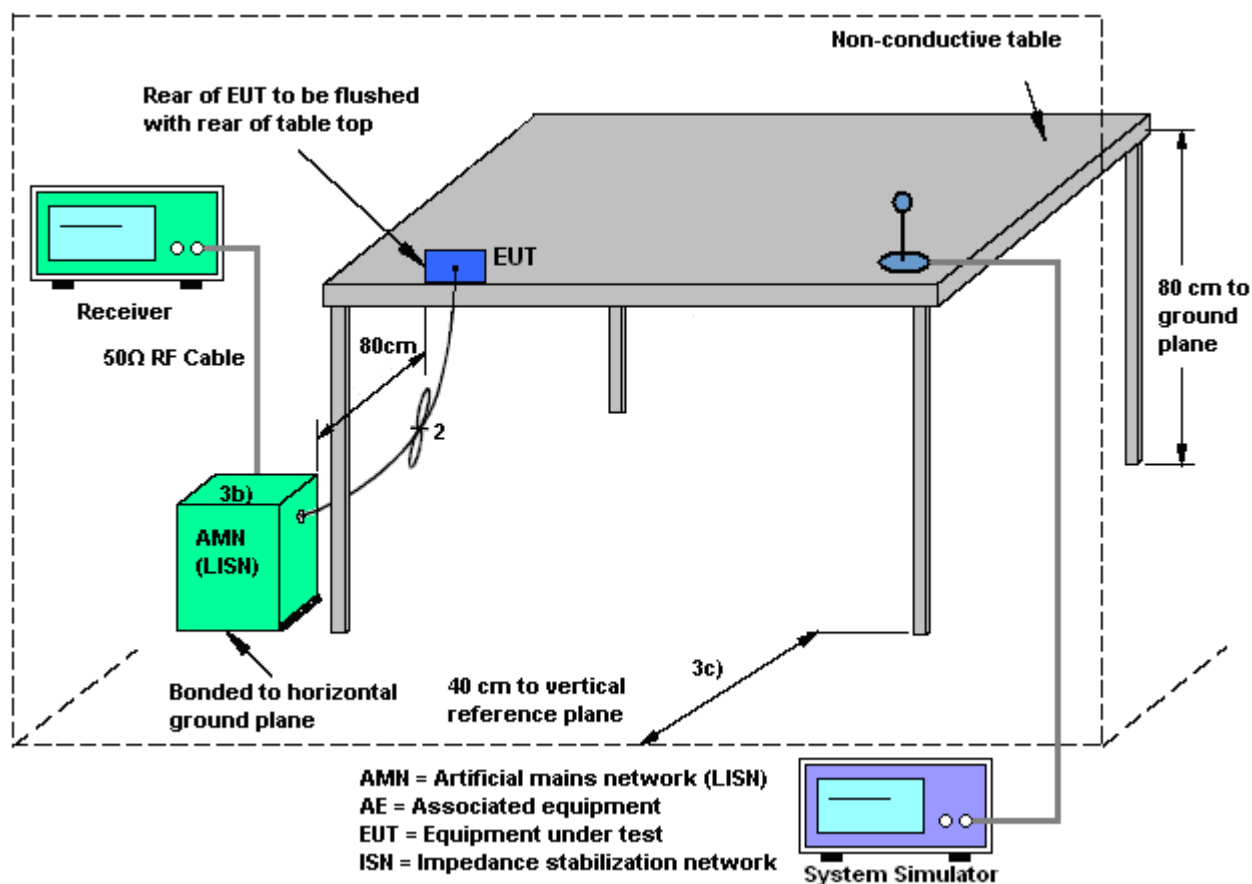
3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

3.8.3 Test Procedures

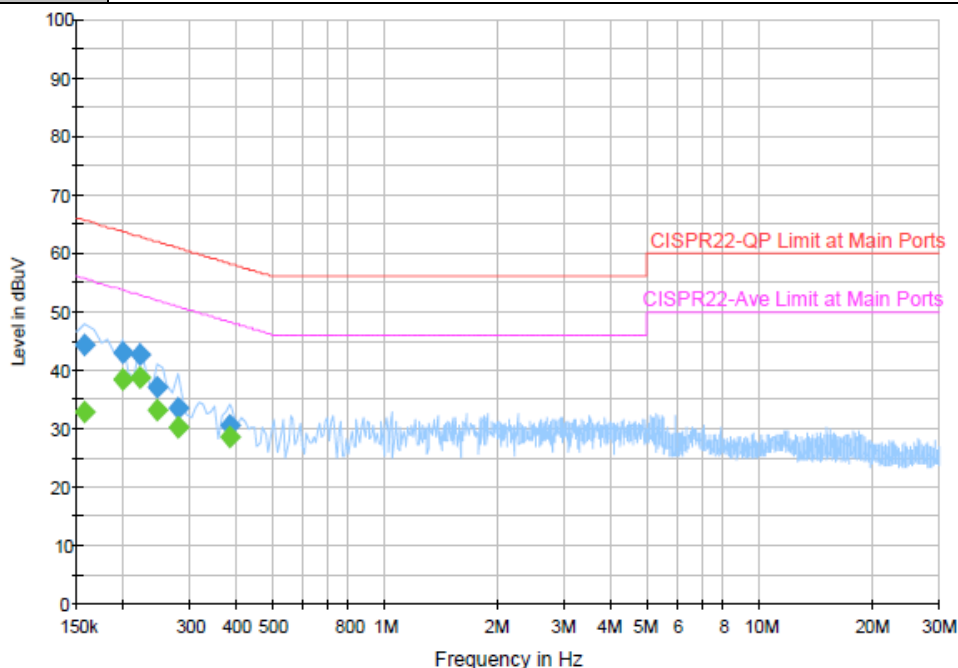
1. Please follow the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.8.4 Test Setup



3.8.5 Test Result of AC Conducted Emission

Test Mode :	Mode 2	Temperature :	21~23°C
Test Engineer :	Kai-Chun Chu	Relative Humidity :	40~42%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WCDMA Band IV Idle + Bluetooth Link + WLAN Link (5G) + GPS Rx + USB Charging Cable with AC Power + USB Cable (Data Link with Notebook) for Keypad 2		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



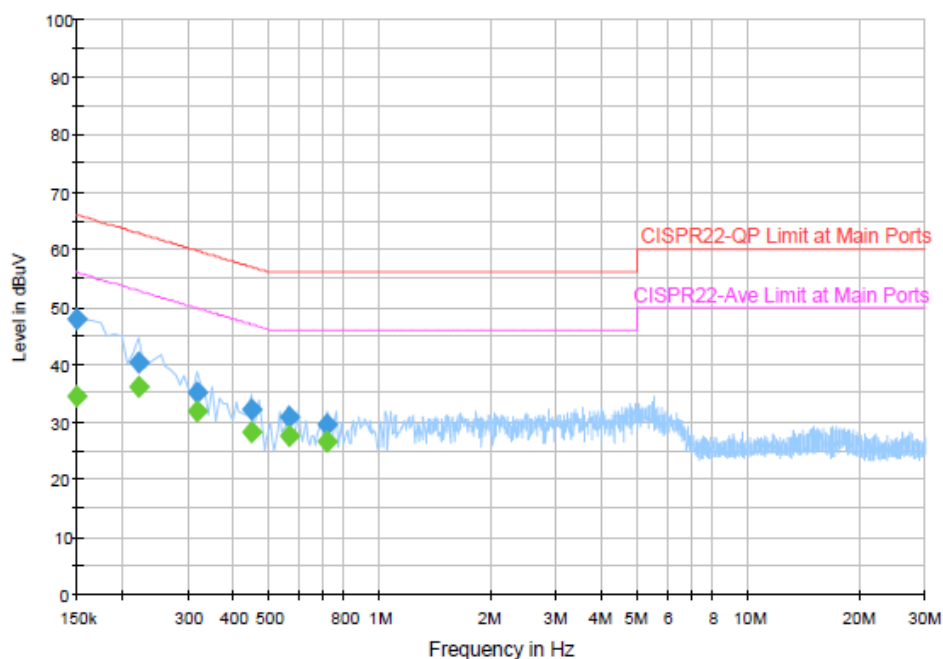
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158000	44.2	Off	L1	19.4	21.4	65.6
0.198000	42.8	Off	L1	19.4	20.9	63.7
0.222000	42.7	Off	L1	19.4	20.0	62.7
0.246000	37.1	Off	L1	19.4	24.8	61.9
0.278000	33.4	Off	L1	19.4	27.5	60.9
0.382000	30.4	Off	L1	19.4	27.8	58.2

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158000	32.7	Off	L1	19.4	22.9	55.6
0.198000	38.4	Off	L1	19.4	15.3	53.7
0.222000	38.8	Off	L1	19.4	13.9	52.7
0.246000	33.1	Off	L1	19.4	18.8	51.9
0.278000	30.1	Off	L1	19.4	20.8	50.9
0.382000	28.6	Off	L1	19.4	19.6	48.2

Test Mode :	Mode 2	Temperature :	21~23°C
Test Engineer :	Kai-Chun Chu	Relative Humidity :	40~42%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WCDMA Band IV Idle + Bluetooth Link + WLAN Link (5G) + GPS Rx + USB Charging Cable with AC Power + USB Cable (Data Link with Notebook) for Keypad 2		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		


Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	47.9	Off	N	19.4	18.1	66.0
0.222000	40.2	Off	N	19.4	22.5	62.7
0.318000	35.0	Off	N	19.4	24.8	59.8
0.446000	32.0	Off	N	19.4	24.9	56.9
0.566000	30.7	Off	N	19.4	25.3	56.0
0.718000	29.6	Off	N	19.5	26.4	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	34.3	Off	N	19.4	21.7	56.0
0.222000	36.0	Off	N	19.4	16.7	52.7
0.318000	31.8	Off	N	19.4	18.0	49.8
0.446000	28.3	Off	N	19.4	18.6	46.9
0.566000	27.5	Off	N	19.4	18.5	46.0
0.718000	26.4	Off	N	19.5	19.6	46.0

3.9 Radiated Emission Measurement

3.9.1 Limit of Radiated Emission

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

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

3.9.2 Measuring Instruments

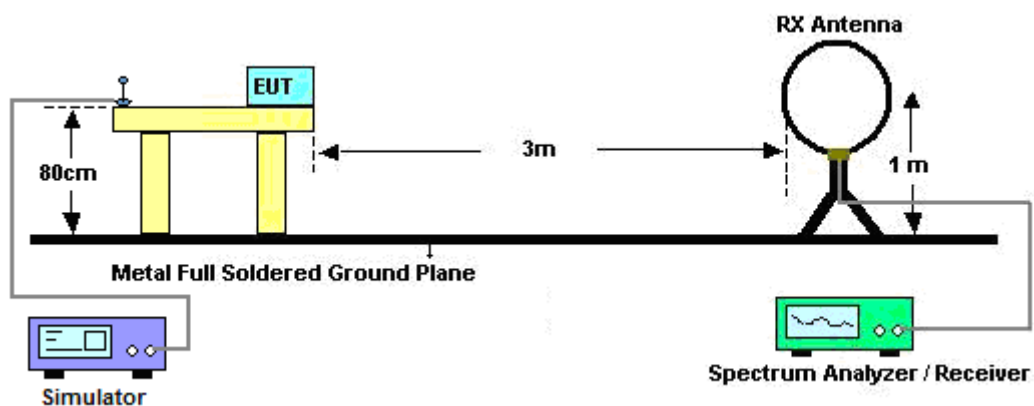
See list of measuring instruments of this test report.

3.9.3 Test Procedures

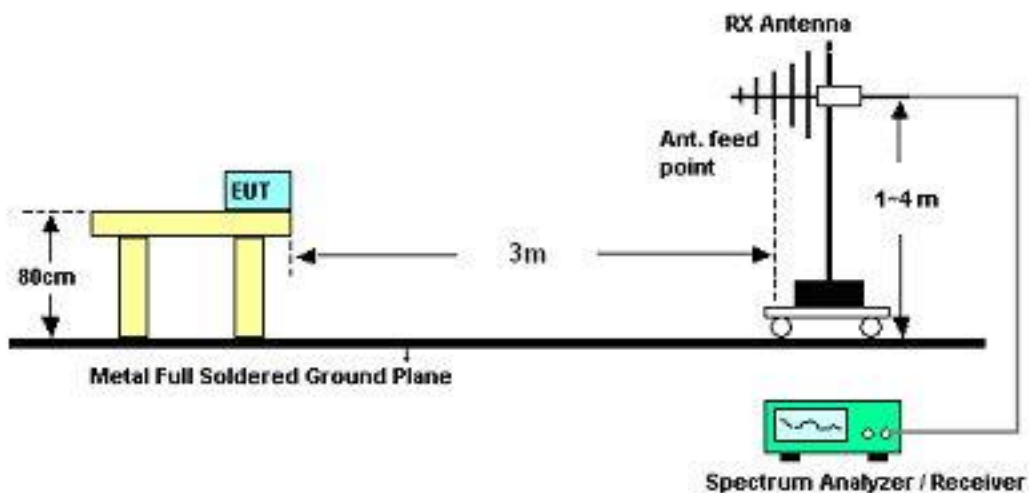
1. The testing follows the guidelines in FCC Public Notice DA 00-705 Measurement Guidelines.
2. Use the following spectrum analyzer settings:
 - (1) Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
 - (2) Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.
Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB)
3. Follow the guidelines in ANSI C63.4-2003 with respect to maximizing the emission by rotating the EUT, measuring the emission for three EUT orthogonal planes, and adjusting the measurement antenna height and polarization. A pre-amp and a high pass filter are used for this test in order to get the good signal level.
4. Measured average value for the peak value is greater than 54 dBuV/m

3.9.4 Test Setup

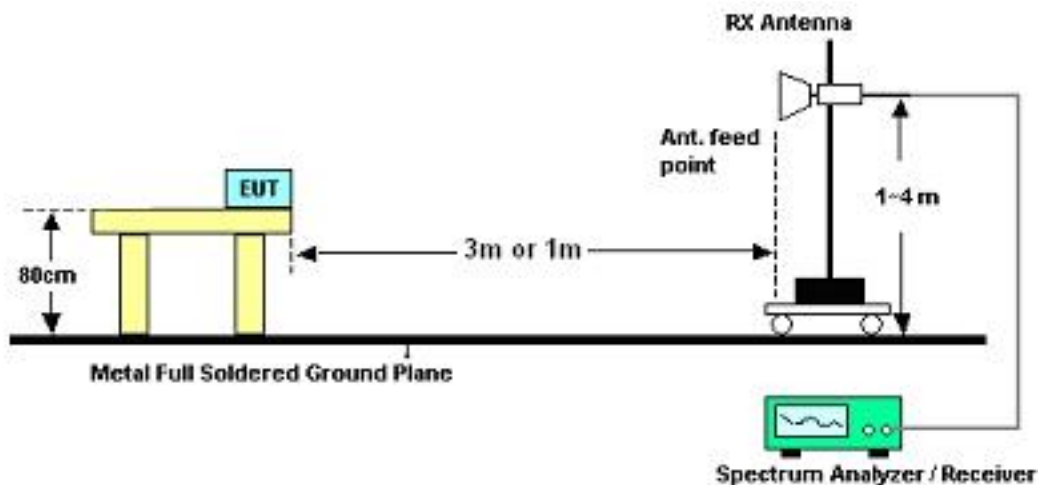
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

Test Engineer :	Chenmy Cheng	Temperature :	22~23°C	
		Relative Humidity :	46~47%	

Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

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

Test Mode :	Mode 1	Temperature :	22~23°C
Test Channel :	00	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Horizontal
Remark :	2402 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30.27	20.53	-19.47	40	32.35	18	0.26	30.08	-	-	Peak
126.12	14.51	-28.99	43.5	32.29	11.74	0.46	29.98	-	-	Peak
234.12	16.95	-29.05	46	34.99	11.17	0.65	29.86	-	-	Peak
360.2	20.22	-25.78	46	34.6	14.72	0.82	29.92	-	-	Peak
872.6	30.41	-15.59	46	38.22	20.48	1.29	29.58	-	-	Peak
936.3	33.98	-12.02	46	41.52	20.67	1.32	29.53	100	0	Peak
2342.11	49.93	-24.07	74	47.76	32.78	3.33	33.94	118	306	Peak
2342.11	37.04	-16.96	54	34.87	32.78	3.33	33.94	118	306	Average
2402	97.8	-	-	95.52	32.86	3.47	34.05	200	12	Peak
2402	82.96	-	-	80.68	32.86	3.47	34.05	200	12	Average
2487.65	49.31	-24.69	74	46.77	33.05	3.72	34.23	100	117	Peak
2487.65	37.17	-16.83	54	34.63	33.05	3.72	34.23	100	117	Average

Test Mode :	Mode 1	Temperature :	22~23°C
Test Channel :	00	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Vertical
Remark :	2402 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
54.03	23.33	-16.67	40	46.68	6.49	0.29	30.13	-	-	Peak
126.12	22.48	-21.02	43.5	40.26	11.74	0.46	29.98	-	-	Peak
162.03	21.86	-21.64	43.5	41.73	9.53	0.53	29.93	-	-	Peak
624.1	25.88	-20.12	46	35.7	18.73	1.08	29.63	-	-	Peak
873.3	32.45	-13.55	46	40.26	20.48	1.29	29.58	122	345	Peak
949.6	35.74	-18.26	54	43.22	20.73	1.33	29.54	-	-	Peak
2376.88	53	-21.00	74	50.76	32.83	3.42	34.01	100	122	Peak
2376.88	38.52	-15.48	54	36.28	32.83	3.42	34.01	100	122	Average
2402	102.16	-	-	99.88	32.86	3.47	34.05	106	122	Peak
2402	87.89	-	-	85.61	32.86	3.47	34.05	106	122	Average
2498.1	49.29	-24.71	74	46.75	33.05	3.72	34.23	200	301	Peak
2498.1	37.09	-16.91	54	34.55	33.05	3.72	34.23	200	301	Average

Test Mode :	Mode 2	Temperature :	22~23°C
Test Channel :	39	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Horizontal
Remark :	2441 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
31.08	19.99	-20.01	40	32.53	17.29	0.25	30.08	-	-	Peak
126.12	19.32	-24.18	43.5	37.1	11.74	0.46	29.98	-	-	Peak
260.04	22.67	-23.33	46	39.7	12.15	0.68	29.86	-	-	Peak
365.1	28.85	-17.15	46	43.08	14.86	0.82	29.91	-	-	Peak
873.3	29.27	-16.73	46	37.08	20.48	1.29	29.58	-	-	Peak
936.3	34.57	-11.43	46	42.11	20.67	1.32	29.53	102	21	Peak
2378.59	49.59	-24.41	74	47.35	32.83	3.42	34.01	100	146	Peak
2378.59	36.82	-17.18	54	34.58	32.83	3.42	34.01	100	146	Average
2441	96.72	-	-	94.32	32.95	3.6	34.15	100	341	Peak
2441	83.46	-	-	81.06	32.95	3.6	34.15	100	341	Average
2484.42	49.19	-24.81	74	46.7	33.01	3.68	34.2	100	119	Peak
2484.42	36.81	-17.19	54	34.32	33.01	3.68	34.2	100	119	Average

Test Mode :	Mode 2	Temperature :	22~23°C
Test Channel :	39	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Vertical
Remark :	2441 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
53.76	23.82	-16.18	40	46.86	6.8	0.29	30.13	-	-	Peak
126.12	22.72	-20.78	43.5	40.5	11.74	0.46	29.98	-	-	Peak
162.03	22.18	-21.32	43.5	42.05	9.53	0.53	29.93	-	-	Peak
356.7	26.48	-19.52	46	40.94	14.65	0.82	29.93	-	-	Peak
624.1	25.09	-20.91	46	34.91	18.73	1.08	29.63	-	-	Peak
936.3	34.83	-11.17	46	42.37	20.67	1.32	29.53	112	109	Peak
2385.43	49.64	-24.36	74	47.4	32.83	3.42	34.01	100	307	Peak
2385.43	37.1	-16.90	54	34.86	32.83	3.42	34.01	100	307	Average
2441	101.25	-	-	98.85	32.95	3.6	34.15	100	122	Peak
2441	86.54	-	-	84.14	32.95	3.6	34.15	100	122	Average
2483.5	48.4	-25.60	74	45.91	33.01	3.68	34.2	100	183	Peak
2483.5	36.91	-17.09	54	34.42	33.01	3.68	34.2	100	183	Average

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Horizontal
Remark :	2480 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30	20.49	-19.51	40	32.31	18	0.26	30.08	-	-	Peak
126.12	19.01	-24.49	43.5	36.79	11.74	0.46	29.98	-	-	Peak
162.03	19.86	-23.64	43.5	39.73	9.53	0.53	29.93	-	-	Peak
354.6	29.3	-16.70	46	43.81	14.6	0.82	29.93	-	-	Peak
872.6	29.35	-16.65	46	37.16	20.48	1.29	29.58	100	0	Peak
950.3	34.16	-19.84	54	41.64	20.73	1.33	29.54	-	-	Peak
2322	48.97	-25.03	74	46.84	32.76	3.27	33.9	100	101	Peak
2322	36.44	-17.56	54	34.31	32.76	3.27	33.9	100	101	Average
2480	97.53	-	-	95.04	33.01	3.68	34.2	100	336	Peak
2480	84.11	-	-	81.62	33.01	3.68	34.2	100	336	Average
2483.54	45.78	-28.22	74	43.29	33.01	3.68	34.2	100	117	Peak
2483.54	32.08	-21.92	54	29.59	33.01	3.68	34.2	100	117	Average
4960	54.14	-19.86	74	46.2	35.2	5	32.26	100	321	Peak
4960	48.09	-5.91	54	40.15	35.2	5	32.26	100	321	Average



Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Vertical
Remark :	2480 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
53.49	24.15	-15.85	40	47.19	6.8	0.29	30.13	133	267	Peak
126.12	22.42	-21.08	43.5	40.2	11.74	0.46	29.98	-	-	Peak
162.03	22.18	-21.32	43.5	42.05	9.53	0.53	29.93	-	-	Peak
624.1	24.97	-21.03	46	34.79	18.73	1.08	29.63	-	-	Peak
872.6	29.54	-16.46	46	37.35	20.48	1.29	29.58	-	-	Peak
950.3	35.23	-18.77	54	42.71	20.73	1.33	29.54	-	-	Peak
2330	48.76	-25.24	74	46.63	32.76	3.27	33.9	100	119	Peak
2330	36.48	-17.52	54	34.35	32.76	3.27	33.9	100	119	Average
2480	102.04	-	-	99.55	33.01	3.68	34.2	100	120	Peak
2480	87.65	-	-	85.16	33.01	3.68	34.2	100	120	Average
2484.47	33.49	-20.51	54	31	33.01	3.68	34.2	100	0	Average
2484.47	48.01	-25.99	74	45.52	33.01	3.68	34.2	100	0	Peak
4960	53.12	-20.88	74	45.18	35.2	5	32.26	100	360	Peak
4960	44.23	-9.77	54	36.29	35.2	5	32.26	100	360	Average

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Horizontal
Remark :	2480 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
32.16	23.65	-16.35	40	36.95	16.55	0.24	30.09	-	-	Peak
240.06	28.21	-17.79	46	45.81	11.56	0.66	29.82	-	-	Peak
260.04	26.89	-19.11	46	43.92	12.15	0.68	29.86	-	-	Peak
675.9	20.77	-25.23	46	30.24	19.11	1.11	29.69	-	-	Peak
876.8	30.03	-15.97	46	37.82	20.48	1.29	29.56	100	25	Peak
943.3	33.35	-20.65	54	40.84	20.71	1.33	29.53	-	-	Peak
2318	48.87	-25.13	74	46.74	32.76	3.27	33.9	100	115	Peak
2318	35.29	-18.71	54	33.16	32.76	3.27	33.9	100	115	Average
2480	99.76	-	-	97.27	33.01	3.68	34.2	100	223	Peak
2480	85.67	-	-	83.18	33.01	3.68	34.2	100	223	Average
2484.04	44.66	-29.34	74	42.17	33.01	3.68	34.2	100	208	Peak
2484.04	32.81	-21.19	54	30.32	33.01	3.68	34.2	100	208	Average
4960	53.82	-20.18	74	45.88	35.2	5	32.26	100	130	Peak
4960	47.5	-6.50	54	39.56	35.2	5	32.26	100	130	Average

Test Mode :	Mode 4	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	46~47%
Test Engineer :	Chenmy Cheng	Polarization :	Vertical
Remark :	2480 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
32.43	24.11	-15.89	40	37.92	16.04	0.24	30.09	-	-	Peak
64.29	23.48	-16.52	40	48.06	5.22	0.32	30.12	-	-	Peak
260.04	22.7	-23.30	46	39.73	12.15	0.68	29.86	-	-	Peak
675.9	24.13	-21.87	46	33.6	19.11	1.11	29.69	-	-	Peak
876.1	30.58	-15.42	46	38.37	20.48	1.29	29.56	100	30	Peak
944	35.21	-18.79	54	42.7	20.71	1.33	29.53	-	-	Peak
2314	49.04	-24.96	74	46.95	32.73	3.22	33.86	100	228	Peak
2314	34.92	-19.08	54	32.83	32.73	3.22	33.86	100	228	Average
2480	103.28	-	-	100.79	33.01	3.68	34.2	100	174	Peak
2480	88.37	-	-	85.88	33.01	3.68	34.2	100	174	Average
2483.5	43.05	-30.95	74	40.56	33.01	3.68	34.2	100	331	Peak
2483.5	29.9	-24.10	54	27.41	33.01	3.68	34.2	100	331	Average
4960	53.26	-20.74	74	45.32	35.2	5	32.26	100	120	Peak
4960	43.2	-10.80	54	35.26	35.2	5	32.26	100	120	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 Connected Construction

The antennas type used in this product is PIFA Antenna without connector and it is considered to meet antenna requirement.

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	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 13, 2011	Jun. 12, 2012	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 18, 2011	Sep. 17, 2012	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	0846202	N/A	Sep. 18, 2011	Sep. 17, 2012	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Feb. 18, 2011	Feb. 17, 2012	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US40441548	N/A	Feb. 18, 2011	Feb. 17, 2012	Conducted (TH02-HY)
EMI Test Receive	R&S	ESCI 7	100724	9kHz~7GHz	Aug. 22, 2011	Aug. 21, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz – 30MHz	Dec. 03, 2010	Dec. 02, 2011	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz – 30MHz	Dec. 01, 2010	Nov. 30, 2011	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
System Simulator	R&S	CMU200	114256	N/A	Feb. 15, 2011	Feb. 14, 2012	Conduction (CO05-HY)
GPS Station	T&E	GS-50	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
EMI Test Receiver	R&S	ESCI	100534	9kHz~3GHz	Nov. 16, 2010	Nov. 15, 2011	Radiation (03CH01-KS)
Spectrum Analyzer	R&S	FSP40	100319	9kHz~40GHz	Jan. 07, 2011	Jan. 06, 2012	Radiation (03CH01-KS)
Spectrum Analyzer	R&S	FSP30	101400	9kHz~30GHz	Jun. 02, 2011	Jun. 01, 2012	Radiation (03CH01-KS)
Bilog Antenna	SCHAFFNER	CBL6112D	23182	25MHz~2GHz	Dec. 07, 2010	Dec. 06, 2011	Radiation (03CH01-KS)
Double Ridge Horn Antenna	EMCO	3117	00075959	1GHz~18GHz	Jan. 07, 2011	Jan. 06, 2012	Radiation (03CH01-KS)
Amplifier	Wireless	FPA-6592G	060029	9KHz~2GHz	Jan. 10, 2011	Jan. 09, 2012	Radiation (03CH01-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Jan. 07, 2011	Jan. 06, 2012	Radiation (03CH01-KS)
Active horn antenna	com-power	AHA-118	701023	1G-18GHz	Nov. 09, 2010	Nov. 08, 2011	Radiation (03CH01-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15-40GHz	Oct. 11, 2011	Oct. 10, 2012	Radiation (03CH01-KS)

5 Uncertainty of Evaluation

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.10	Normal (k=2)	0.05
Cable Loss	0.10	Normal (k=2)	0.05
AMN Insertion Loss	2.50	Rectangular	0.63
Receiver Specification	1.50	Rectangular	0.43
Site Imperfection	1.39	Rectangular	0.80
Mismatch	+0.34 / -0.35	U-Shape	0.24
Combined Standard Uncertainty $U_c(y)$	1.13		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.26		

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
Combined Standard Uncertainty $U_c(y)$	1.27		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.54		

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

Contribution	Uncertainty of X_i		$u(X_i)$	C_i	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	± 0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	± 1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	± 0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	± 2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	± 1.50	Rectangular	0.87	1	0.87
Site Imperfection	± 2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\text{Log}(1-\Gamma_1*\Gamma_2)$	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty $U_c(y)$	2.36				
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.72				



Appendix A. Photographs of EUT

Please refer to Sporton report number EP162005-01 as below.