

FCC RF Test Report

APPLICANT : Honeywell International Inc
EQUIPMENT : 99EX Mobile computer
BRAND NAME : Honeywell
MODEL NAME : 99EX
FCC ID : HD599EXL00
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Spread Spectrum (DSS)

The product was received on Sep. 28, 2011 and completely tested on Oct. 13, 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:



Anderson Chiu / Deputy Manager



SPORTON INTERNATIONAL INC.

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FCC ID : HD599EXL00

Page Number : 1 of 65

Report Issued Date : Oct. 25, 2011

Report Version : Rev. 01



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR0D0904-17B	Rev. 01	Initial issue of report	Oct. 25, 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 19.9 dB at 0.478 MHz
3.9	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 7.18 dB at 2483.50 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	99EX Mobile computer
Brand Name	Honeywell
Model Name	99EX
FCC ID	HD599EXL00
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) : 2.60 dBm (0.0018 W) Bluetooth EDR (2Mbps) : 2.99 dBm (0.0020 W) Bluetooth EDR (3Mbps) : 3.64 dBm (0.0023 W)
Antenna Type	PIFA Antenna with gain 2.5 dBi
HW Version	5
SW Version	26.02
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	03CH07-HY	722060/4086B-1

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 (DoC), recorded in a separate test report.

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	GPS Station	T&E	GS-50	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
3.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A
4.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	LCD Monitor	Lenovo	6135-AB1	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
6.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
7.	Cradle	Honeywell	99EX-HB	N/A	N/A	N/A
8.	Adapter	ENG	3A-902DB12	N/A	N/A	N/A
9.	USB Cable	N/A	N/A	N/A	N/A	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	2.40 dBm	2.67 dBm	3.38 dBm
Ch39	2441MHz	2.60 dBm	2.99 dBm	3.64 dBm
Ch78	2480MHz	2.09 dBm	2.51 dBm	3.23 dBm

Remark:

1. The data rate was set in 3Mbps 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).

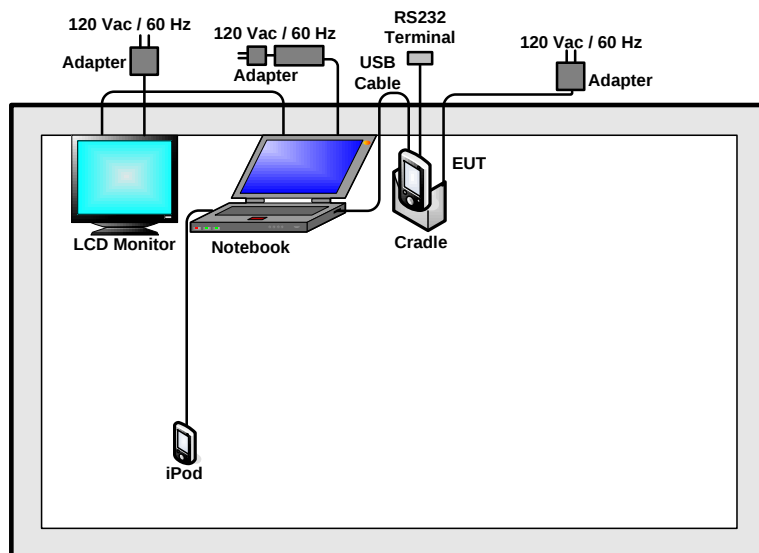
Pre-scanned tests were conducted to determine the final configuration from all possible combinations.

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

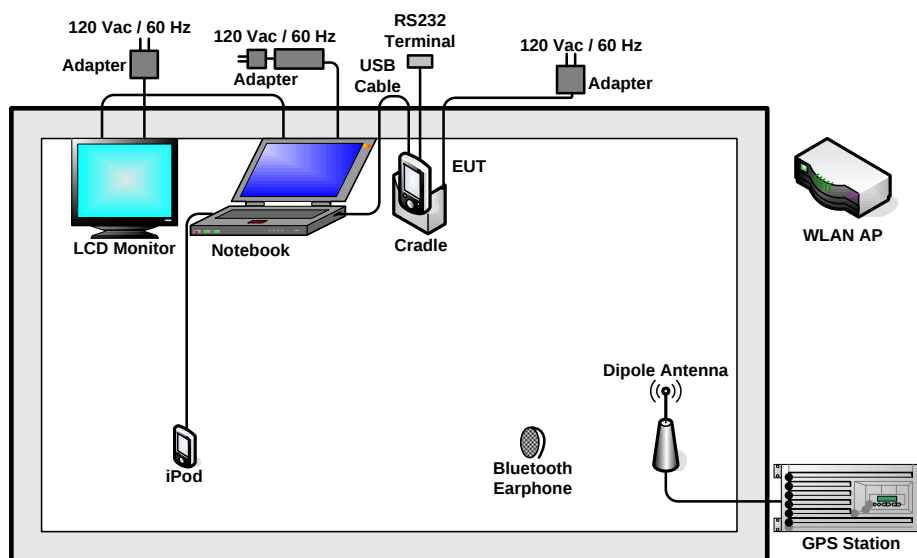
Test Cases			
Test Item	Data Rate / Modulation		
	Bluetooth 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi/4$ -DQPSK	Bluetooth EDR 3Mbps 8-DPSK
Conducted TCs	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated TCs	N/A	N/A	Mode 1: CH00_2402 MHz + TC Mode 2: CH39_2441 MHz + TC Mode 3: CH78_2480 MHz + TC
AC Conducted Emission	Mode 1 :Bluetooth Link + WLAN (2.4G) Link + GPS Rx + Scanner + Cradle + Adapter + RS232 Terminal + USB Cable (Link with Notebook)		
Remark:			
1. TC stands for Test Configuration, and consists of USB cable, RS232 terminal, cradle, and adapter.			
2. For radiated TCs, the data rate was set in 3Mbps due to the highest RF output power; only the data of these modes was reported.			

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 can send transmitting signal for all testing.

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.

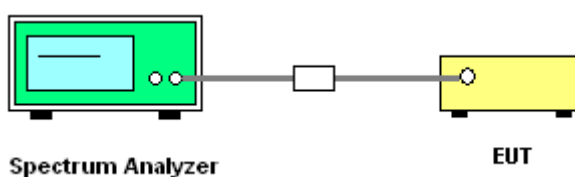
3.1.2 Measuring Instruments

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.

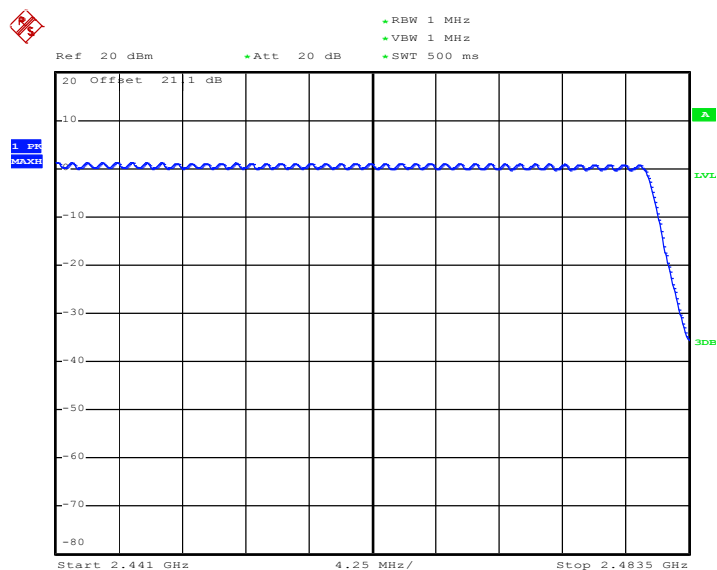
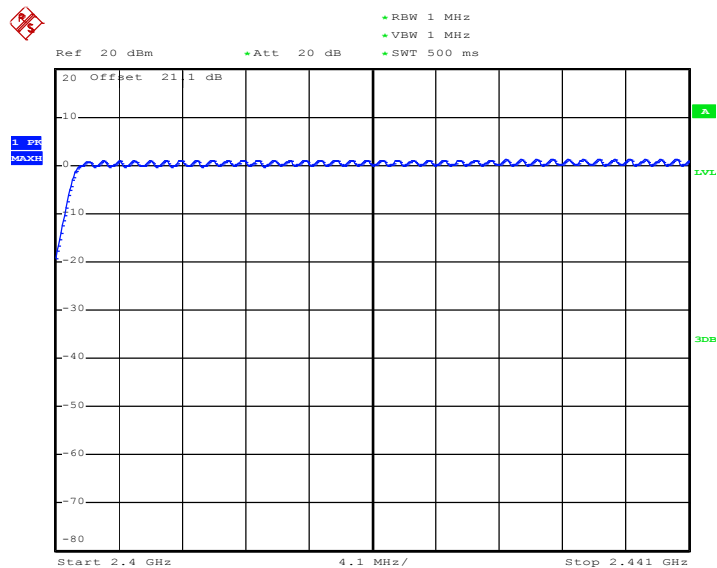
3.1.4 Test Setup



3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	Mode 7~9	Temperature :	22~24°C
Test Engineer :	Hank Yu	Relative Humidity :	40~43%
Number of Hopping Channels (Channel)		Limits (Channel)	Pass/Fail
79		> 15	Pass

Number of Hopping Channel Plot on Channel 00 - 78



3.2 20dB and 99% Bandwidth Measurement

3.2.1 Limit of 20dB Bandwidth

N/A

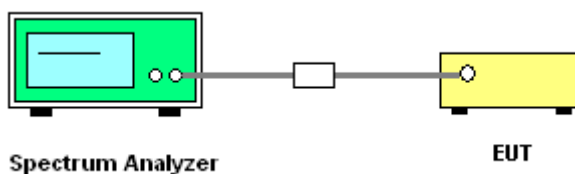
3.2.2 Measuring Instruments

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

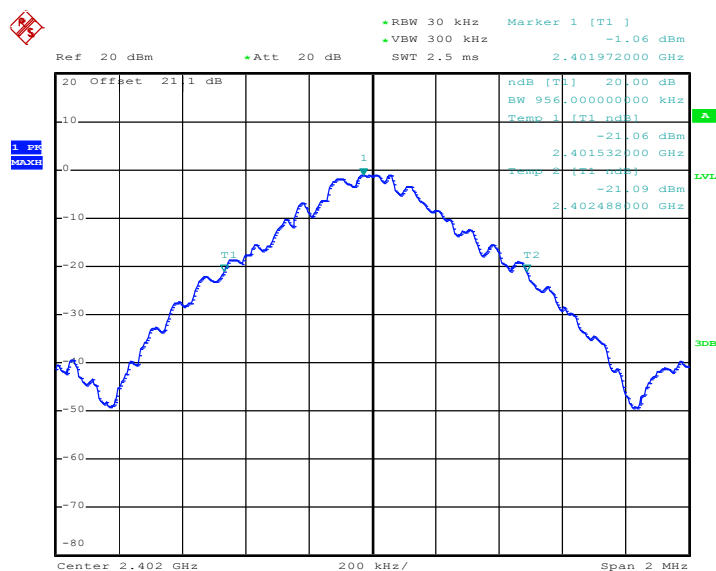


3.2.5 Test Result of 20dB Bandwidth

Test Mode :	Mode 1~3	Temperature :	22~24℃
Test Engineer :	Hank Yu	Relative Humidity :	40~43%

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.956
39	2441	0.956
78	2480	0.956

20 dB Bandwidth Plot on Channel 00





1. RF WASH

Ref 20 dBm • Att 20 dB SWT 2.5 ms 2.440968000 GHz

• RBW 30 kHz Marker 1 [T1] -0.68 dBm
 • VBW 300 kHz

20 Offset 21 1 dB

ndB [T1] 20.00 dB
 BW 956.0000000 kHz
 Temp 1 [T1 ndB] -20.67 dBm
 2.440532000 GHz
 Temp 2 [T2 ndB] -21.04 dBm
 2.441488000 GHz

Center 2.441 GHz 200 kHz/ Span 2 MHz

1. Vpk
PASCAL

Ref 20 dBm Att 20 dB RBW 30 kHz VBW 300 kHz SWT 2.5 ms

Marker 1 [T1] -1.03 dBm 2.479968000 GHz

ndB [T1] 20.00 dB
BW 956.00000000 kHz
Temp 1 [T1 ndB] -21.17 dBm
2.479532000 GHz
Temp 2 [T1 ndB] -21.21 dBm
2.480488000 GHz

20 Offset 21.1 dB

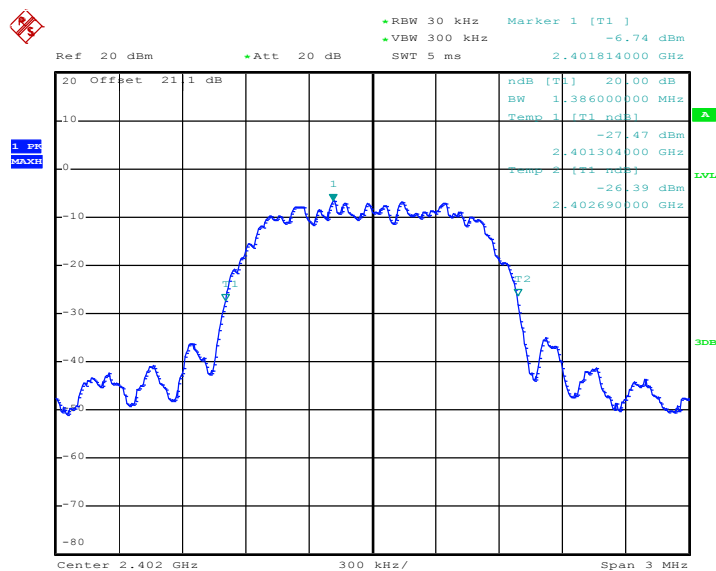
1

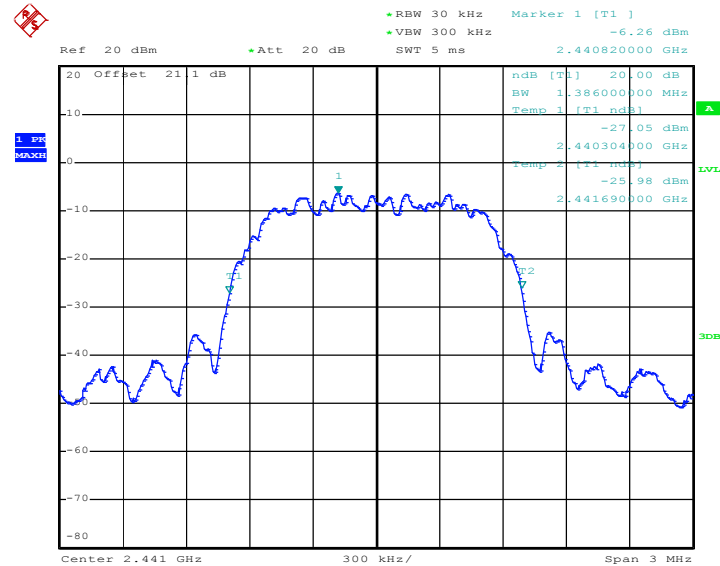
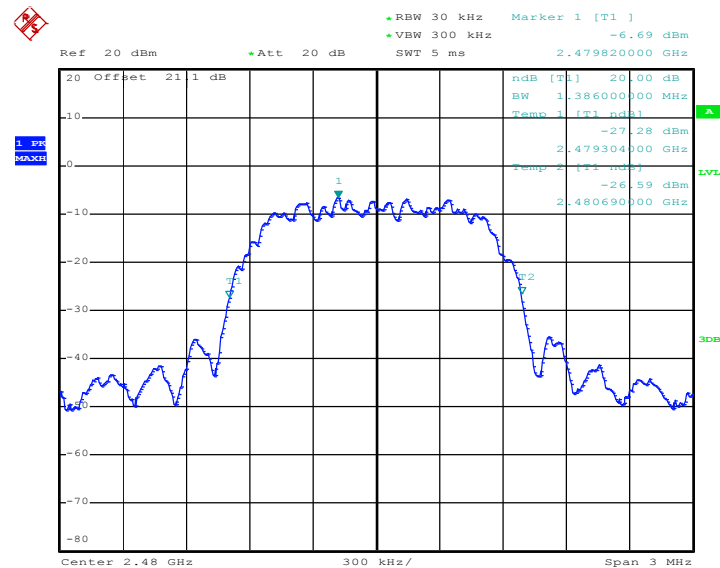
T1 T2

Center 2.48 GHz 200 kHz/ Span 2 MHz

Test Mode :	Mode 4~6	Temperature :	22~24°C
Test Engineer :	Hank Yu	Relative Humidity :	40~43%

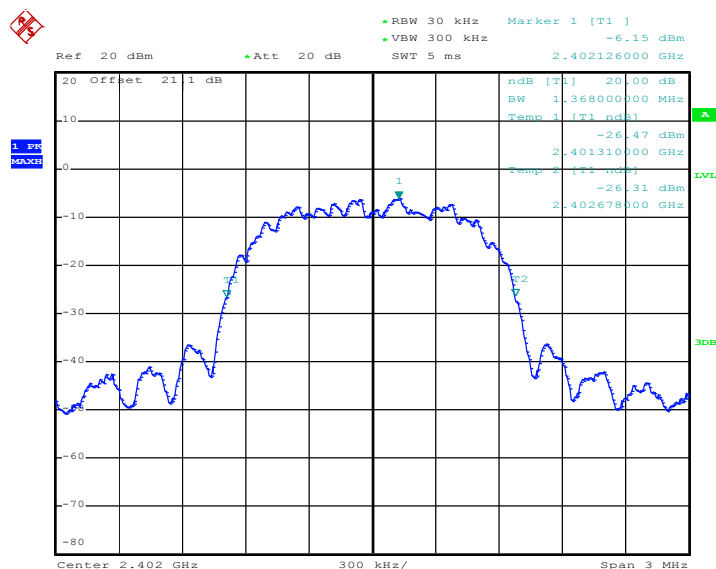
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.386
39	2441	1.386
78	2480	1.386

20 dB Bandwidth Plot on Channel 00


20 dB Bandwidth Plot on Channel 39

20 dB Bandwidth Plot on Channel 78


Test Mode :	Mode 7~9	Temperature :	22~24°C
Test Engineer :	Hank Yu	Relative Humidity :	40~43%

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.368
39	2441	1.368
78	2480	1.362

20 dB Bandwidth Plot on Channel 00




1. 500 MHz

1. 500 MHz

Ref 20 dBm

Att 20 dB

RBW 30 kHz

VBW 300 kHz

SWT 5 ms

Marker 1 [T1]

-5.74 dBm

2.441126000 GHz

20 Offset 21 1 dB

10

0

-10

-20

-30

-40

-50

-60

-70

-80

1

2.440310000 GHz

2.441678000 GHz

2.441126000 GHz

Center 2.441 GHz

300 kHz/

Span 3 MHz

1. 598
MAX

Ref 20 dBm Att 20 dB RBW 30 kHz VBW 300 kHz SWT 5 ms

Marker 1 [T1] -6.26 dBm 2.480126000 GHz

dBm [T1]	20.00 dB
BW	1.362000000 MHz
Temp 1 [T1 dBm]	-25.85 dBm
	2.479316000 GHz
Temp 2 [T2 dBm]	-25.89 dBm
	2.480678000 GHz

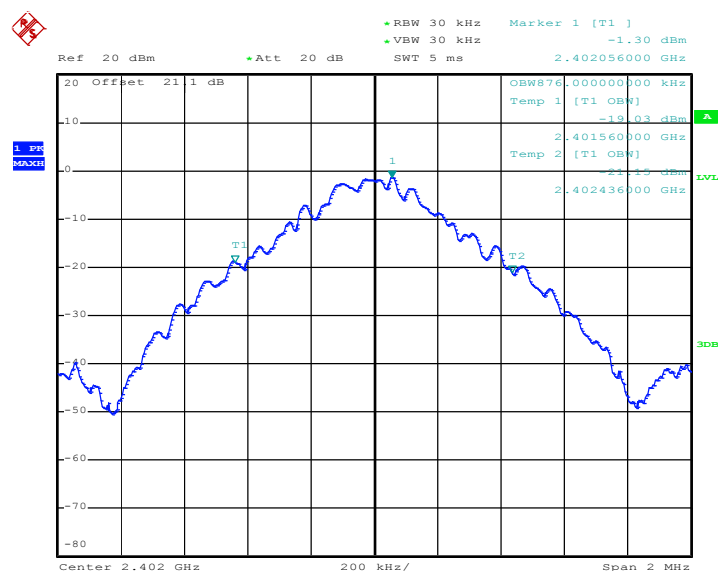
Center 2.48 GHz Span 3 MHz 300 kHz/

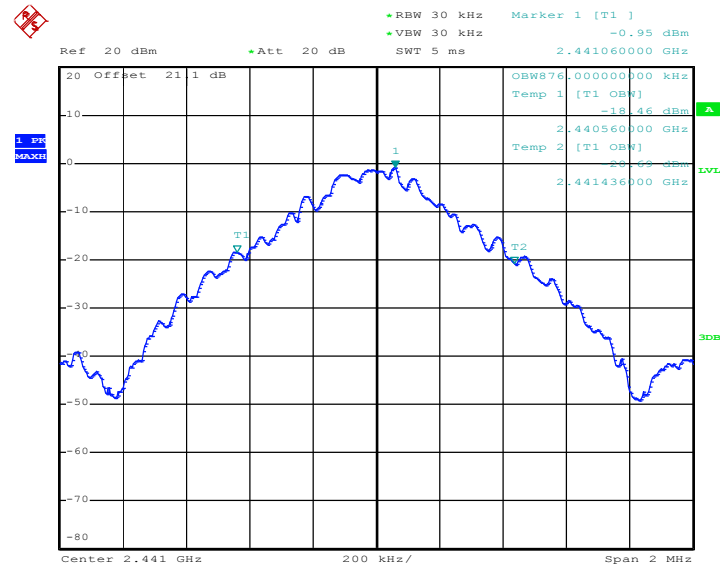
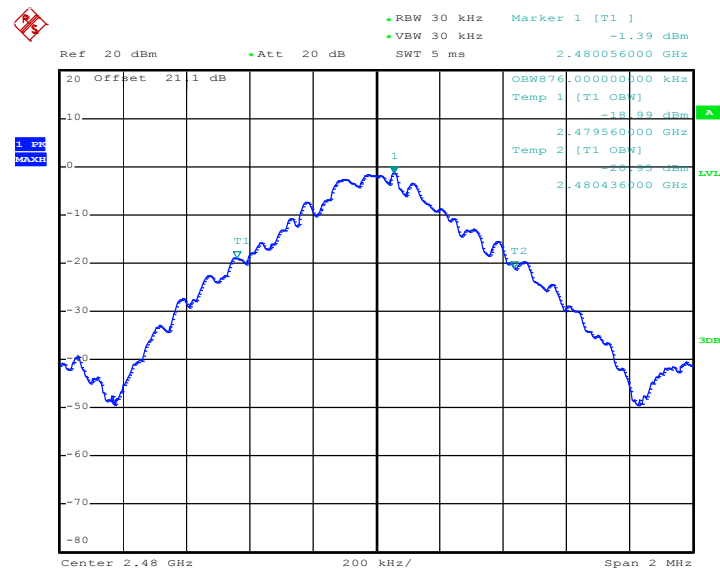
3.2.6 Test Result of 99% Occupied Bandwidth

Test Mode :	Mode 1~3	Temperature :	22~24℃
Test Engineer :	Hank Yu	Relative Humidity :	40~43%

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

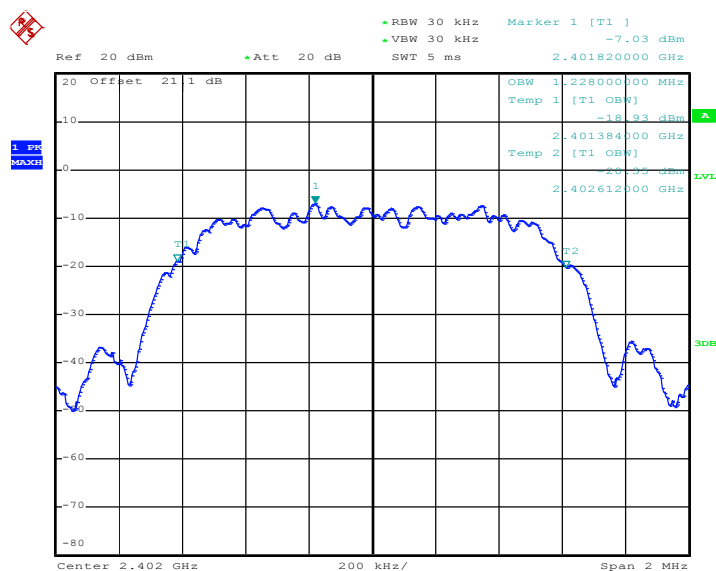
99% Bandwidth Plot on Channel 00



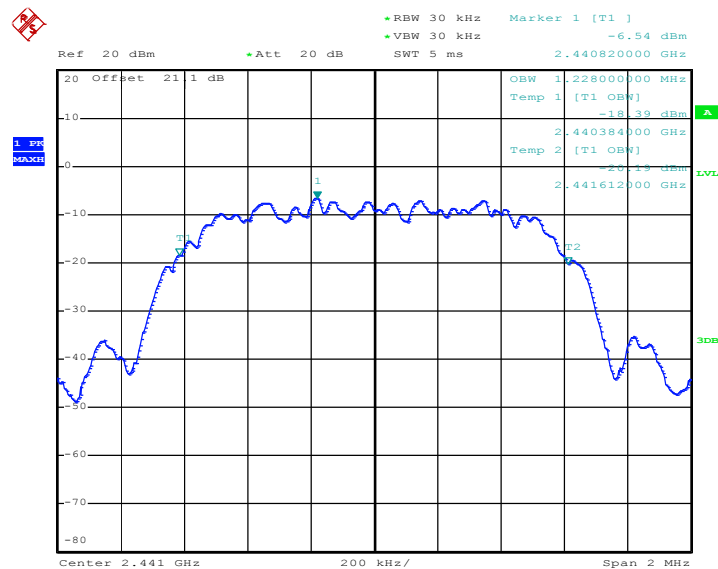
99% Occupied Bandwidth Plot on Channel 39

99% Occupied Bandwidth Plot on Channel 78


Test Mode :	Mode 4~6	Temperature :	22~24°C
Test Engineer :	Hank Yu	Relative Humidity :	40~43%

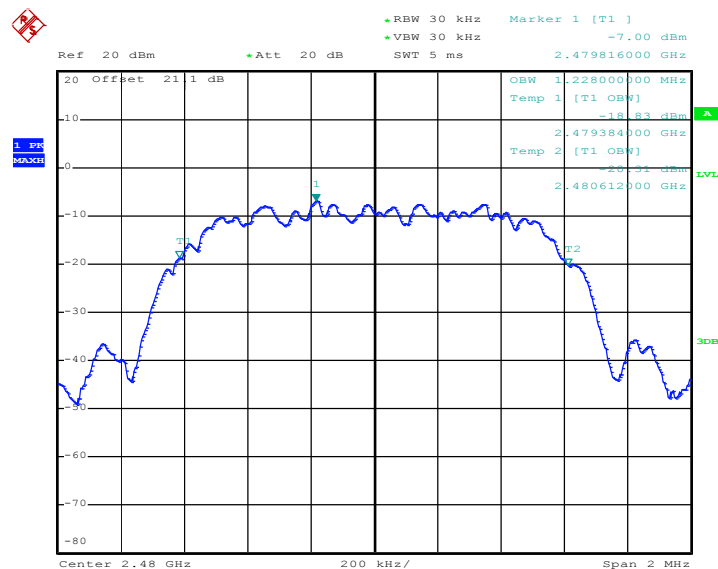
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.228
39	2441	1.228
78	2480	1.228

99% Bandwidth Plot on Channel 00


99% Occupied Bandwidth Plot on Channel 39

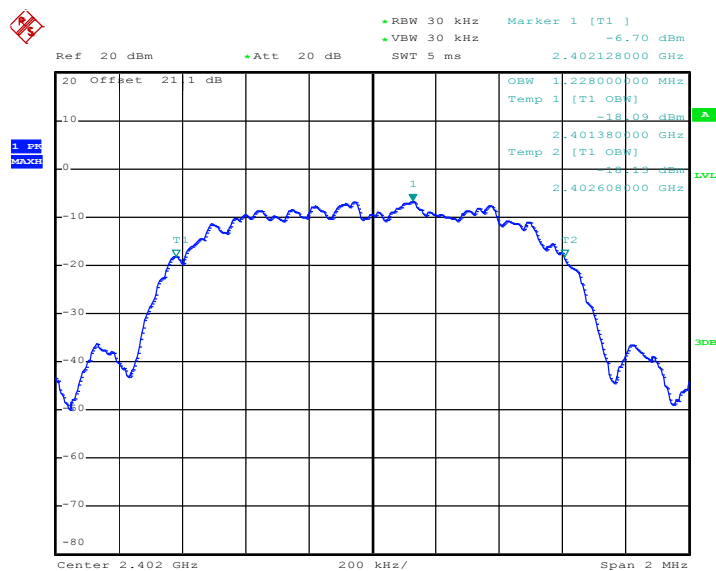


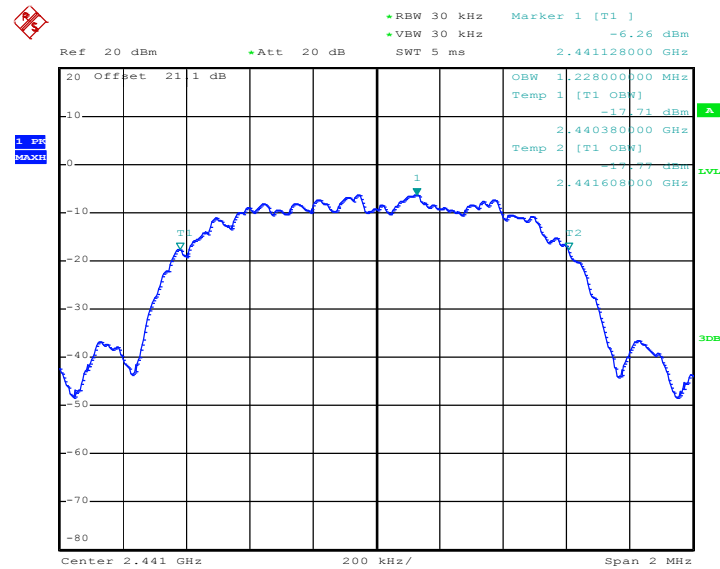
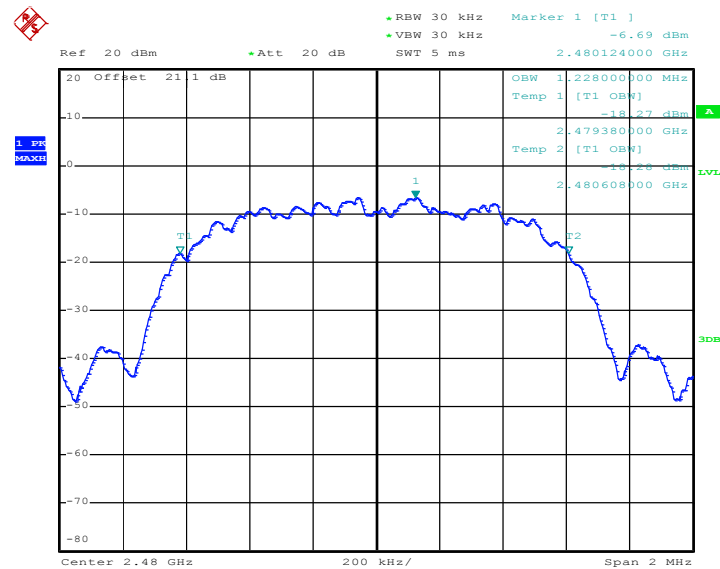
99% Occupied Bandwidth Plot on Channel 78



Test Mode :	Mode 7~9	Temperature :	22~24°C
Test Engineer :	Hank Yu	Relative Humidity :	40~43%

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)
00	2402	1.228
39	2441	1.228
78	2480	1.228

99% Bandwidth Plot on Channel 00


99% Occupied Bandwidth Plot on Channel 39

99% Occupied Bandwidth Plot on Channel 78


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.

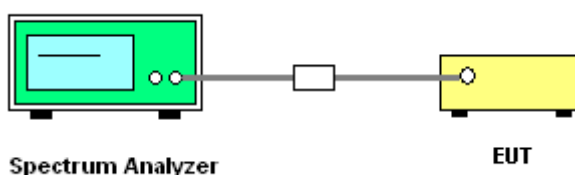
3.3.2 Measuring Instruments

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

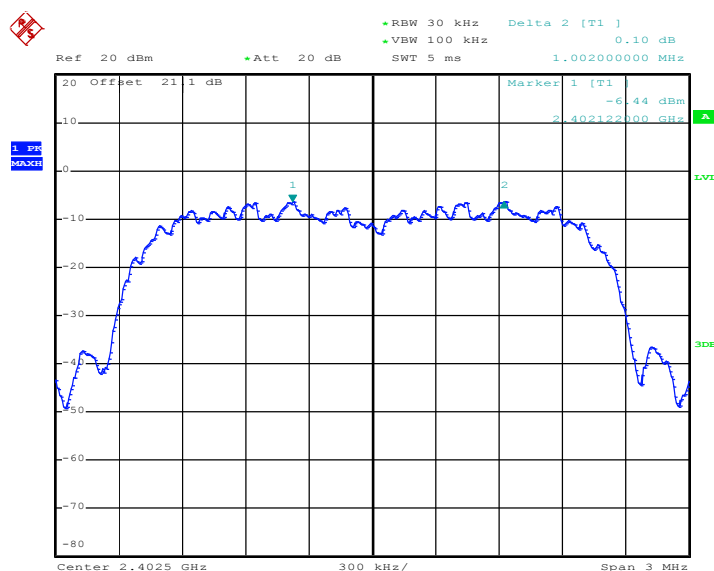


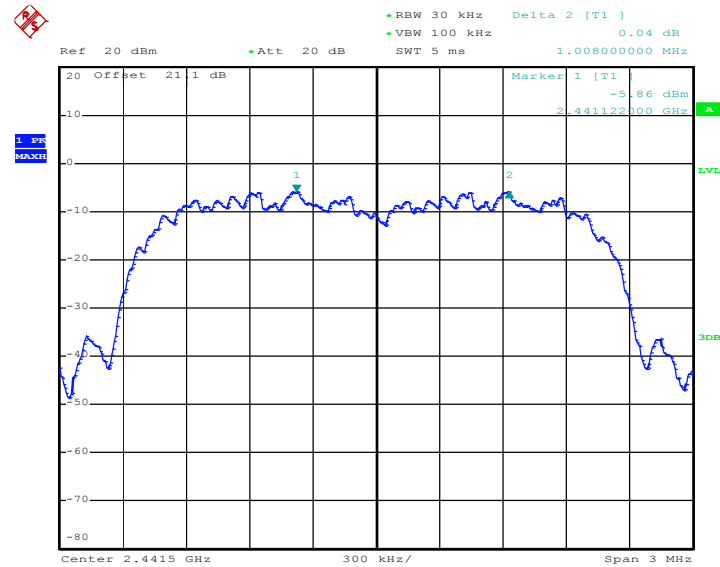
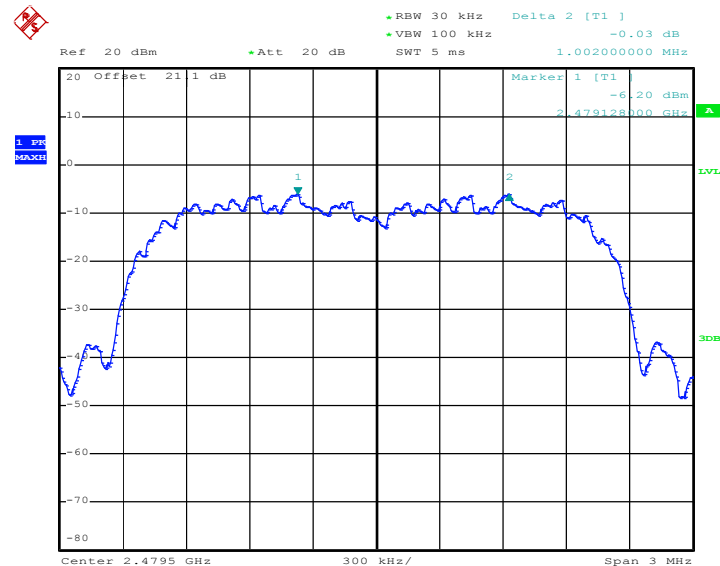
3.3.5 Test Result of Hopping Channel Separation

Test Mode :	Mode 7~9	Temperature :	22~24℃
Test Engineer :	Hank Yu	Relative Humidity :	40~43%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.912	Pass
39	2441	1.008	0.912	Pass
78	2480	1.002	0.908	Pass

Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40

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.

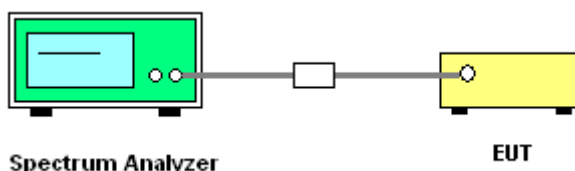
3.4.2 Measuring Instruments

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



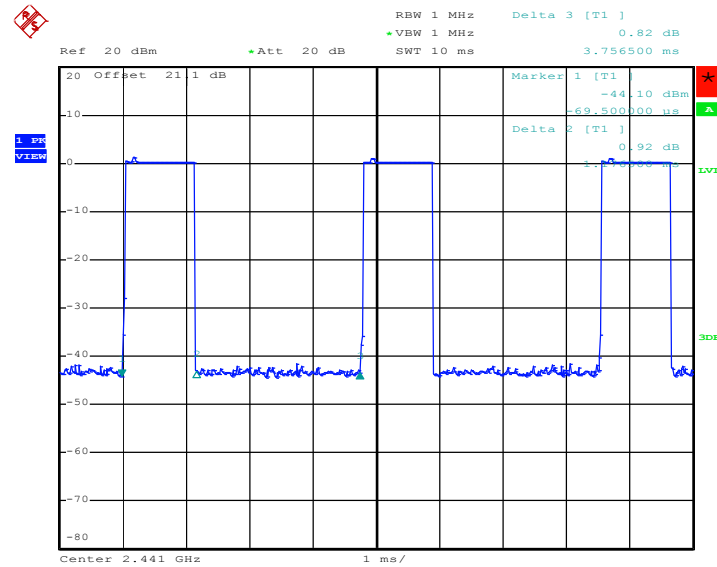
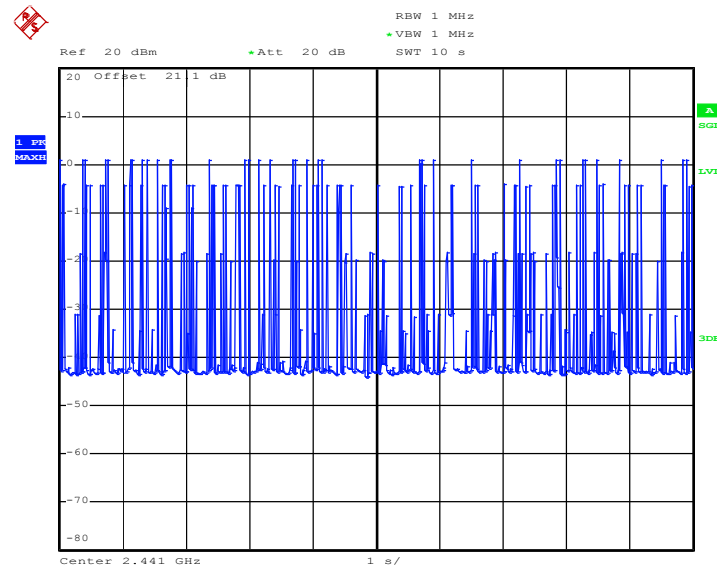
3.4.5 Test Result of Dwell Time

Test Mode :	Mode 8	Temperature :	22~24°C
Test Engineer :	Hank Yu	Relative Humidity :	40~43%

Package Mode	Average Hopping Channel	Package Transfer Time (usec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
3DH5	3.30	1176.50	0.12	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)

3DH5 Dwell Time (One Pulse) Plot on Channel 39

3DH5 Dwell Time (Count Pulses) Plot on Channel 39


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).

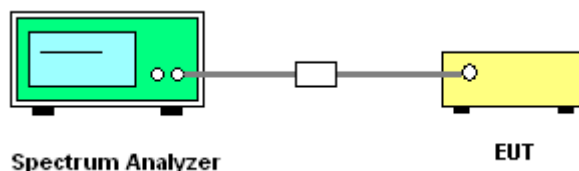
3.5.2 Measuring Instruments

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.

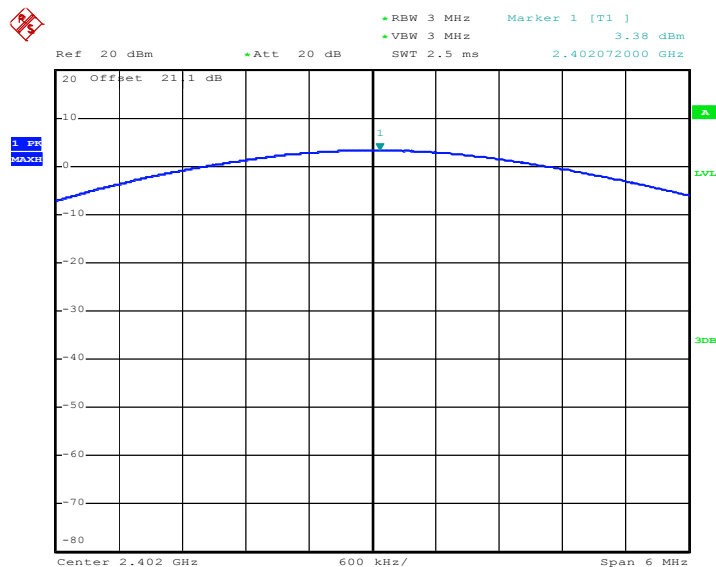
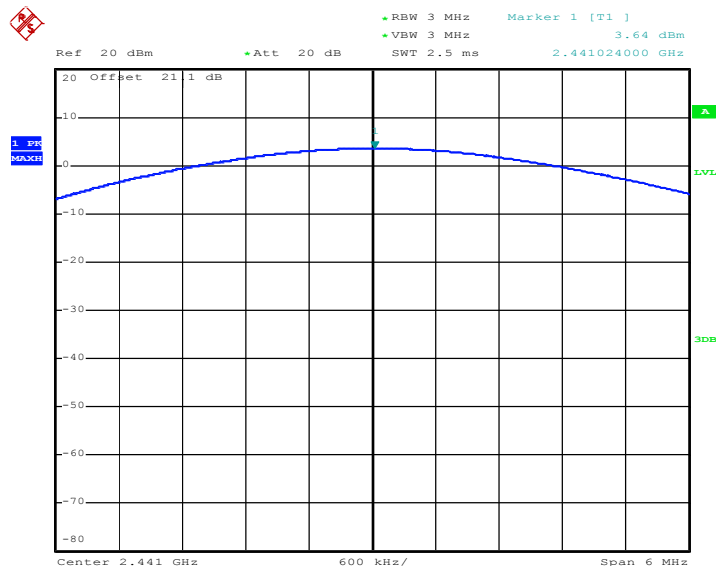
3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

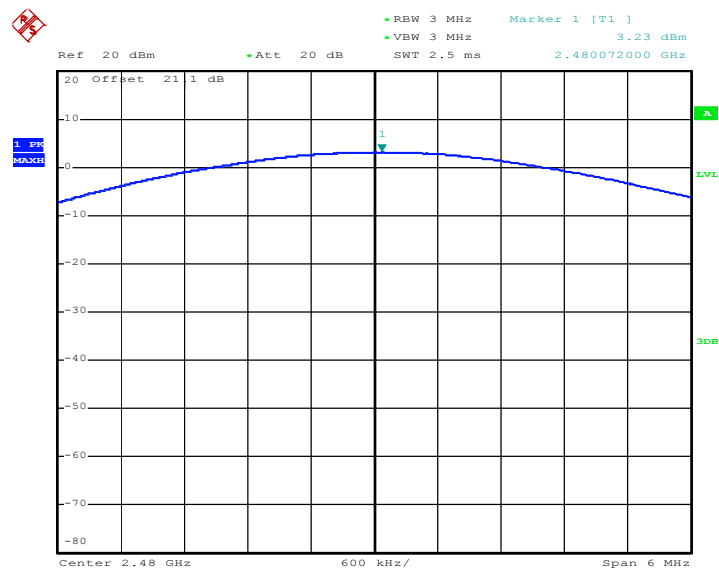
Test Mode :	Mode 7~9	Temperature :	22~24℃
Test Engineer :	Hank Yu	Relative Humidity :	40~43%

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	3.38	20.97	Pass
39	2441	3.64	20.97	Pass
78	2480	3.23	20.97	Pass

Peak Output Power Plot on Channel 00

Peak Output Power Plot on Channel 39




Peak Output Power Plot on Channel 78



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

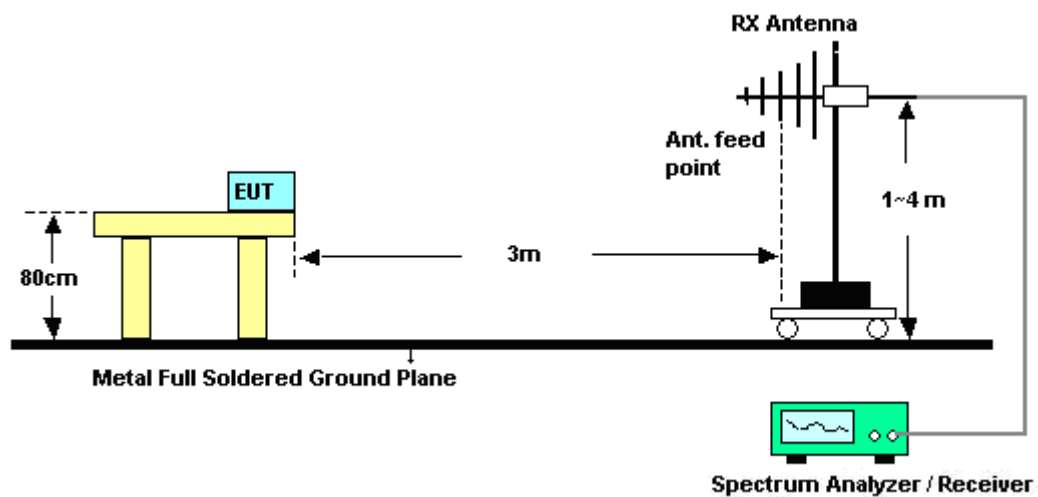
See list of measuring instruments of this test report.

3.6.3 Test Procedures

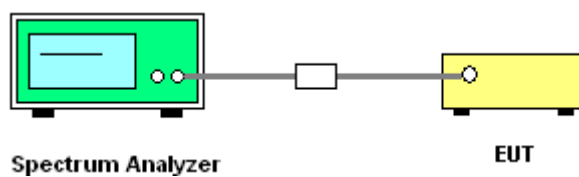
1. The testing follows the guidelines in ANSI C63.4-2003 and FCC Public Notice DA 00-705 Measurement Guidelines.
2. RF antenna conducted test: Set RBW = 300kHz, Video bandwidth (VBW) $\geq$ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band 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 :	49~50%
		Test Engineer :	Ivan Jiang

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
2367.57	47.33	-26.67	74.00	43.05	32.13	5.99	33.84	100	300	Peak
2367.57	32.88	-21.12	54.00	28.60	32.13	5.99	33.84	100	300	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
2338.69	45.72	-28.28	74.00	41.49	32.11	5.95	33.83	100	357	Peak
2338.69	33.27	-20.73	54.00	29.04	32.11	5.95	33.83	100	357	Average

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	49~50%
		Test Engineer :	Ivan Jiang

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
2483.50	65.06	-8.94	74.00	60.50	32.28	6.18	33.90	100	320	Peak
2483.50	46.82	-7.18	54.00	42.26	32.28	6.18	33.90	100	320	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	96.73	49.91	46.82	54.00	-7.18	Pass
Hopping Mode	96.73	51.58	45.15	54.00	-8.85	Pass

Note : Average result = Maximum field strength – Delta result

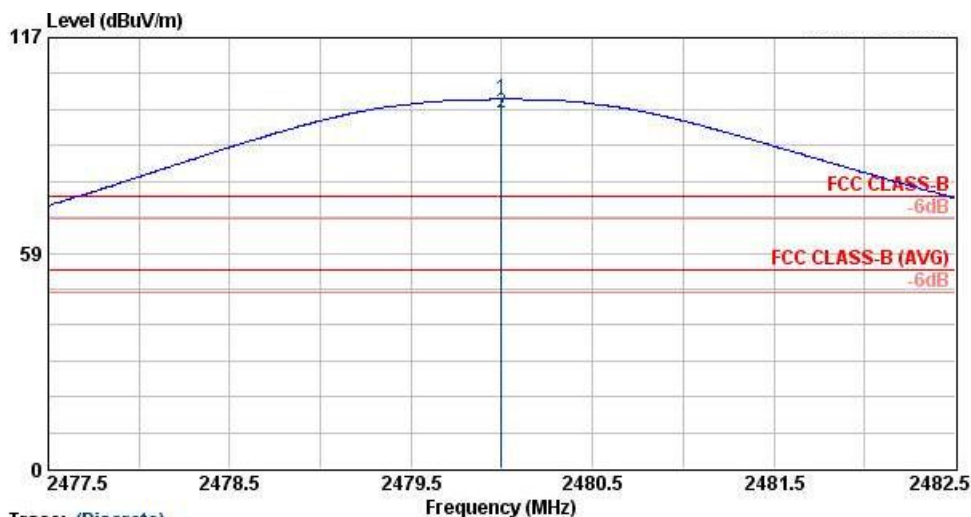
ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.50	58.65	-15.35	74.00	54.09	32.28	6.18	33.90	100	6	Peak
2483.50	42.59	-11.41	54.00	38.03	32.28	6.18	33.90	100	6	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	90.11	47.52	42.59	54.00	-11.41	Pass
Hopping Mode	90.11	50.34	39.77	54.00	-14.23	Pass

Note : Average result = Maximum field strength – Delta result

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	Polarization :	Horizontal

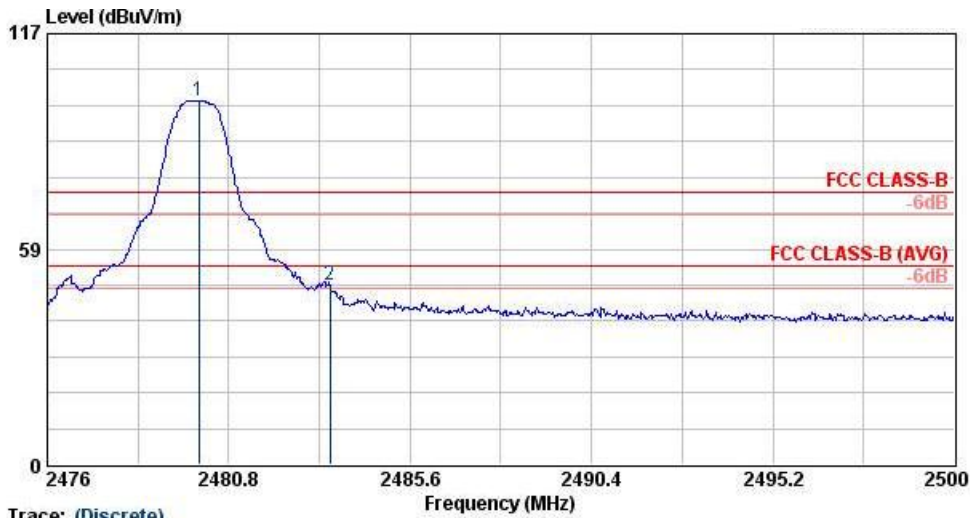


Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC CLASS-B HF_ANT_100824 HORIZONTAL
 Project : FR 0D0904-02
 Mode : Mode 3

	Freq	Level	Over	Limit	Read	Antenna	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 @	2480.00	100.34	26.34	74.00	95.78	32.28	6.18	33.90	100	320	Peak
2 @	2480.00	96.73	42.73	54.00	92.17	32.28	6.18	33.90	100	320	Average

* Maximum field strength of the fundamental emission

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	Polarization :	Horizontal



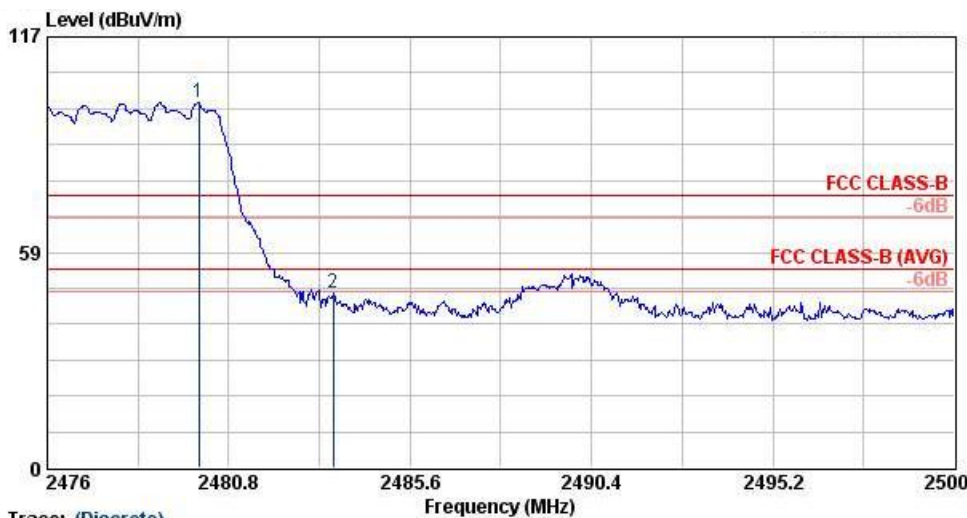
Trace: (Discrete)

Site : 03CH07-HY
Condition : FCC CLASS-B HF_ANT_100824 HORIZONTAL
Project : FR 0D0904-02
Mode : Mode 3

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	Remark
1 @	2480.00	98.73	24.73	74.00	94.17	32.28	6.18	33.90	100	320	Peak
2	2483.49	48.82	-25.18	74.00	44.26	32.28	6.18	33.90	100	320	Peak

* Marker-Delta Method (RBW/VBW=100KHz): 49.91 dB , single carrier Mode

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	Polarization :	Horizontal



Level (dBuV/m)

Frequency (MHz)

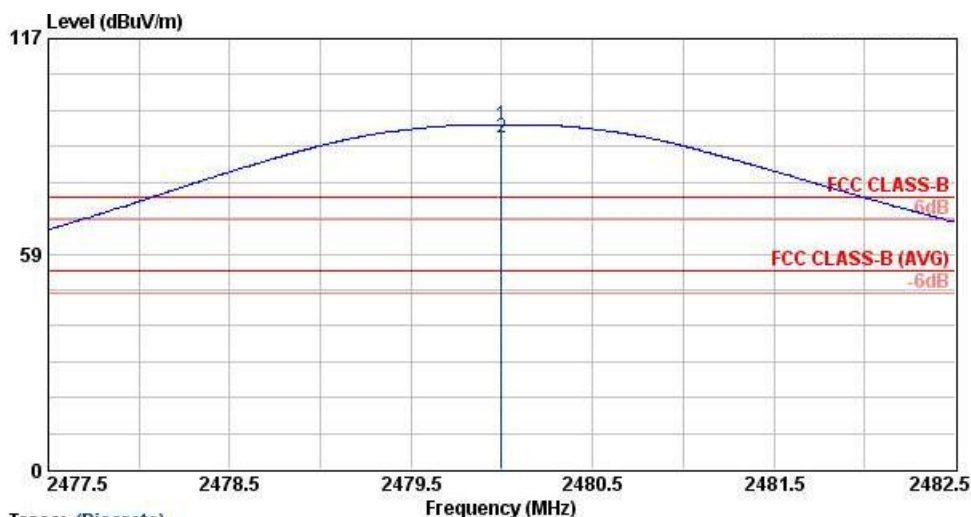
Trace: (Discrete)

Site : 03CH07-HY
Condition : FCC CLASS-B HF_ANT_100824 HORIZONTAL
Project : FR 0D0904-02
Mode : Mode 3

	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 @	2480.00	99.02	25.02	74.00	94.46	32.28	6.18	33.90	100	320 Peak
2	2483.56	47.44	-26.56	74.00	42.88	32.28	6.18	33.90	100	320 Peak

* Marker-Delta Method (RBW/VBW=100KHz): 51.58 dB , Hopping Mode

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	Polarization :	Vertical

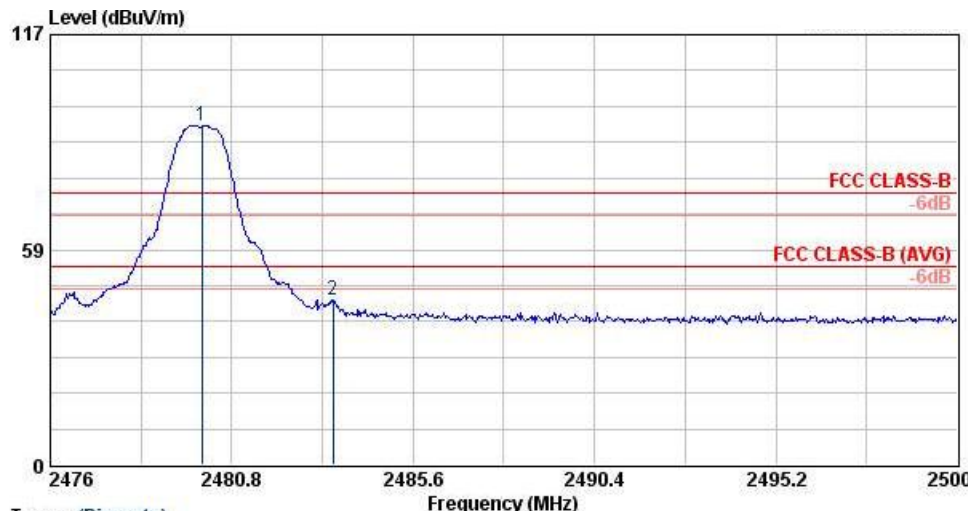


Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC CLASS-B HF_ANT_100824 VERTICAL
 Project : FR 0D0904-02
 Mode : Mode 3

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Remark
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 @	2480.00	93.73	19.73	74.00	89.17	32.28	6.18	33.90	100	6	Peak
2 @	2480.00	90.11	36.11	54.00	85.55	32.28	6.18	33.90	100	6	Average

* Maximum field strength of the fundamental emission

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	Polarization :	Vertical



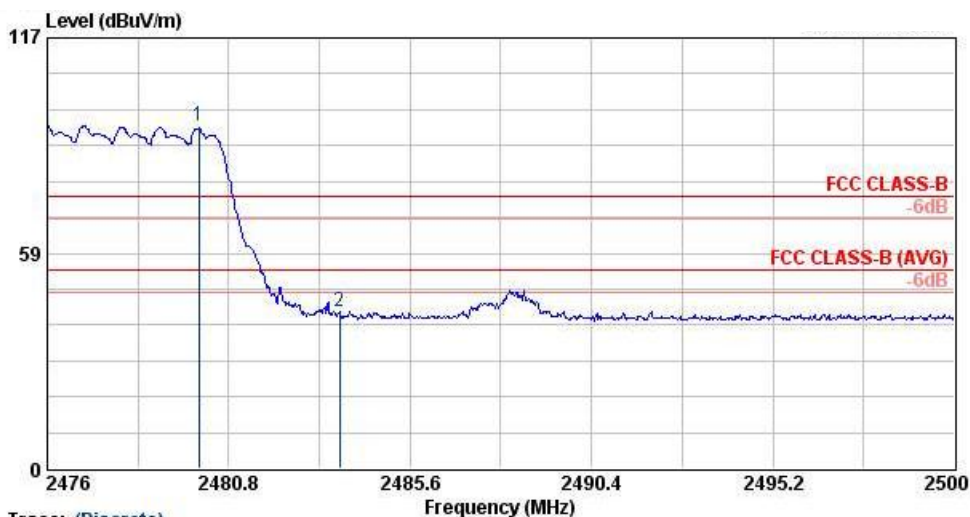
Trace: (Discrete)

Site : 03CH07-HY
Condition : FCC CLASS-B HF_ANT_100824 VERTICAL
Project : FR 0D0904-02
Mode : Mode 3

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	Ant	Table	Remark	
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Pos	Pos		
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	X	2480.00	92.11	18.11	74.00	87.55	32.28	6.18	33.90	100	6 Peak
2		2483.49	44.59	-29.41	74.00	40.03	32.28	6.18	33.90	100	6 Peak

* Marker-Delta Method (RBW/VBW=100KHz): 47.52 dB , single carrier Mode

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	Polarization :	Vertical



Trace: (Discrete)

Site : 03CH07-HY
Condition : FCC CLASS-B HF_ANT_100824 VERTICAL
Project : FR 0D0904-02
Mode : Mode 3

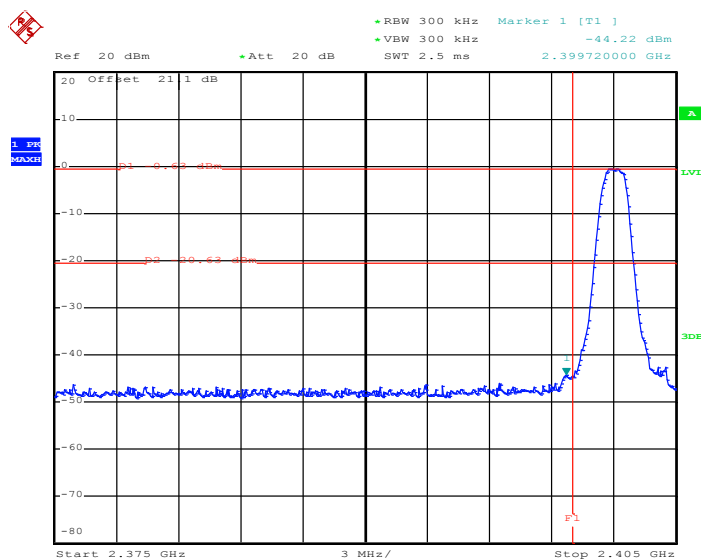
	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	
	MHz	dBuV/m	dB	dBuV/m	Level	Factor	Loss	Factor	Pos	Pos	Remark
					dBuV	dB/m	dB	dB	cm	deg	
1 @	2480.00	93.16	19.16	74.00	88.60	32.28	6.18	33.90	100	6	Peak
2	2483.73	42.82	-31.18	74.00	38.26	32.28	6.18	33.90	100	6	Peak

* Marker-Delta Method (RBW/VBW=100KHz): 50.34 dB , Hopping Mode

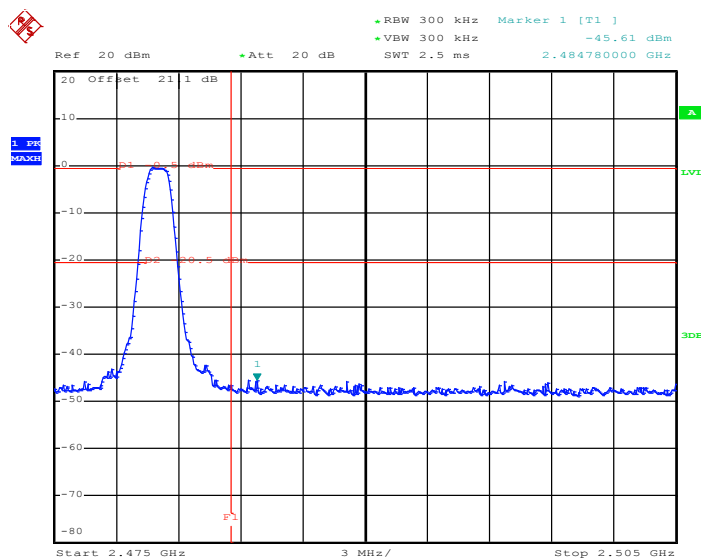
3.6.6 Test Result of Conducted Band Edges

Test Mode :	Mode 7 and 9	Temperature :	22~24℃
Test Channel :	00 and 78	Relative Humidity :	40~43%
		Test Engineer :	Hank Yu

Low Band Edge Plot on Channel 00



High Band Edge Plot on Channel 78



3.7 Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

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

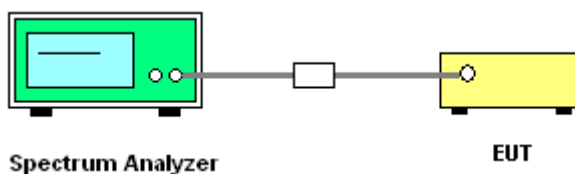
3.7.2 Measuring Instruments

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.

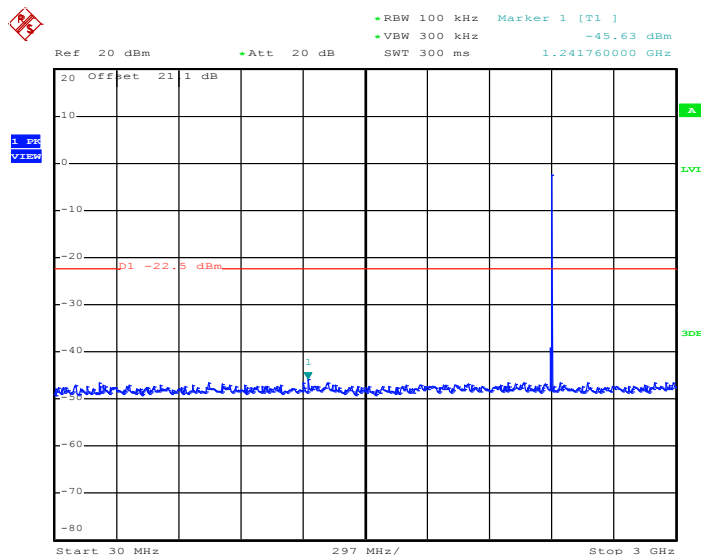
3.7.4 Test Setup



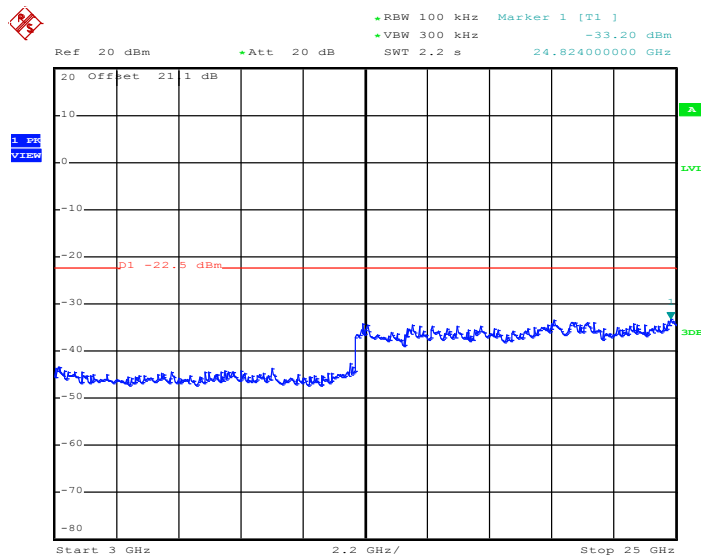
3.7.5 Test Result

Test Mode :	Mode 7	Temperature :	22~24℃
Test Channel :	00	Relative Humidity :	40~43%
		Test Engineer :	Hank Yu

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

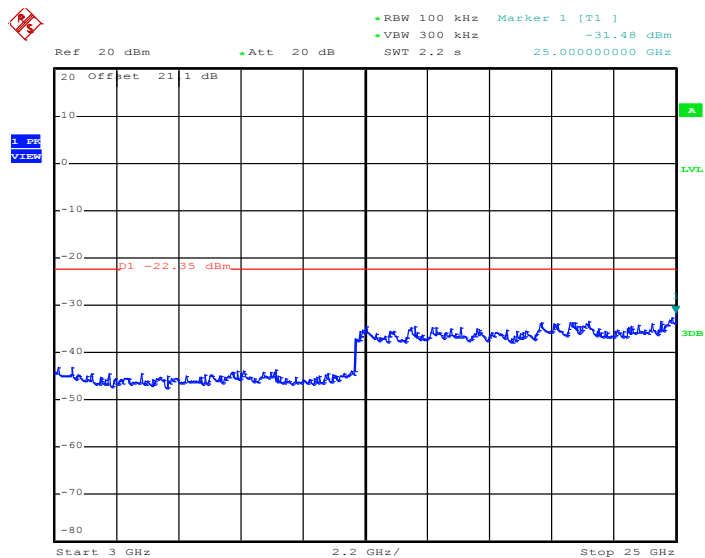


Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

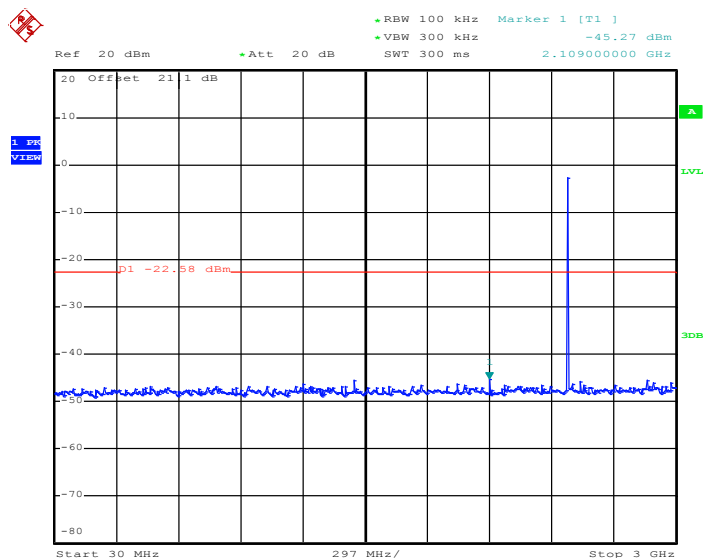
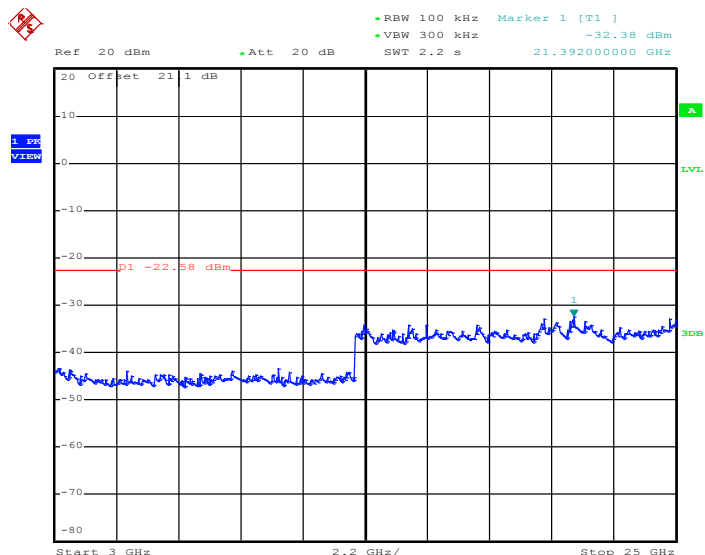




Conducted Spurious Emission Plot between 30MHz ~ 3 GHz



Test Mode :	Mode 9	Temperature :	22~24°C
Test Channel :	78	Relative Humidity :	40~43%
		Test Engineer :	Hank Yu

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.

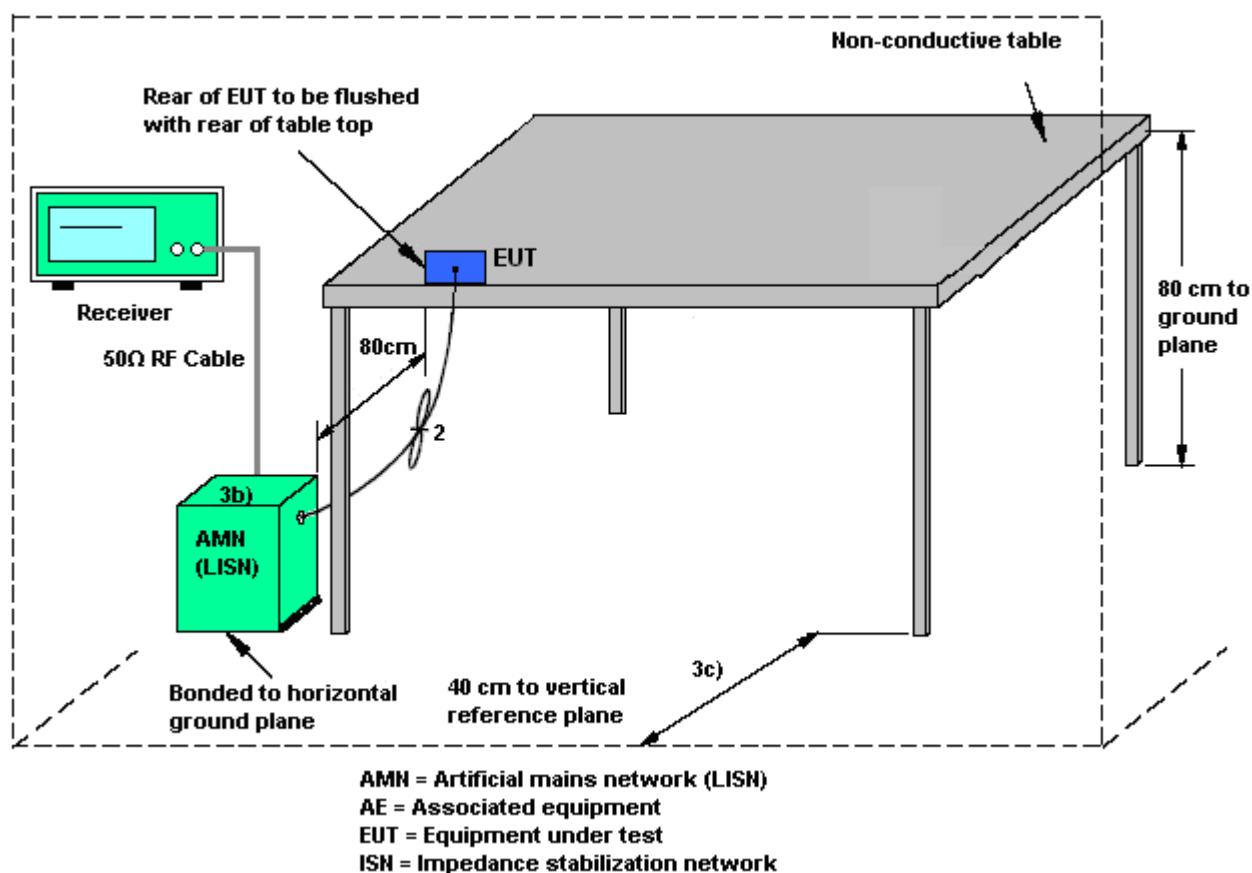
3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

3.8.3 Test Procedures

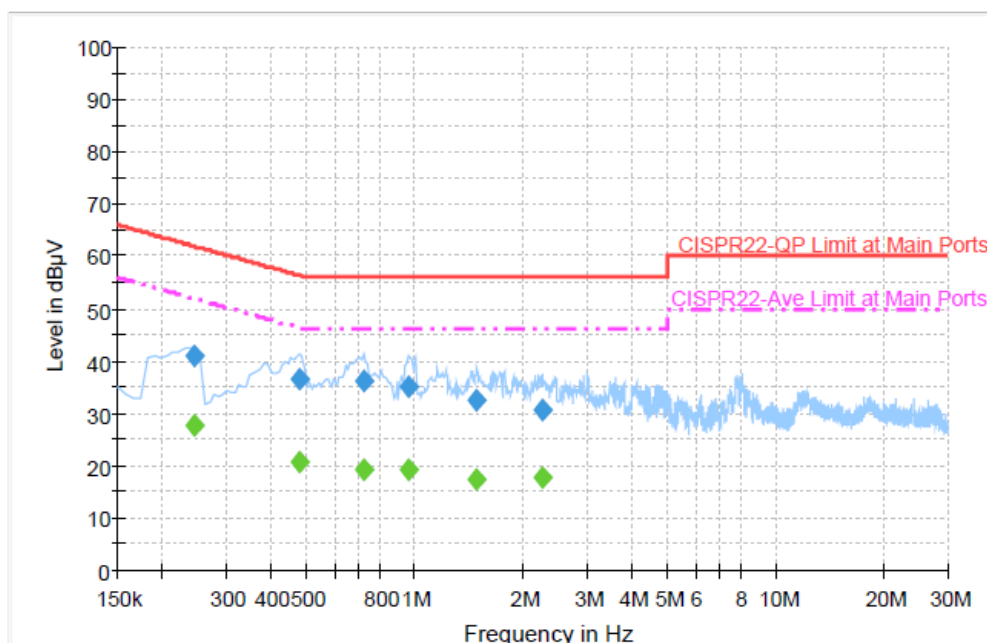
1. Please follow the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All 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 1	Temperature :	20~22°C
Test Engineer :	Cona Huang	Relative Humidity :	30~32%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Link + WLAN (2.4G) Link + GPS Rx + Scanner + Cradle + Adapter + RS232 Terminal + USB Cable (Link with Notebook)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



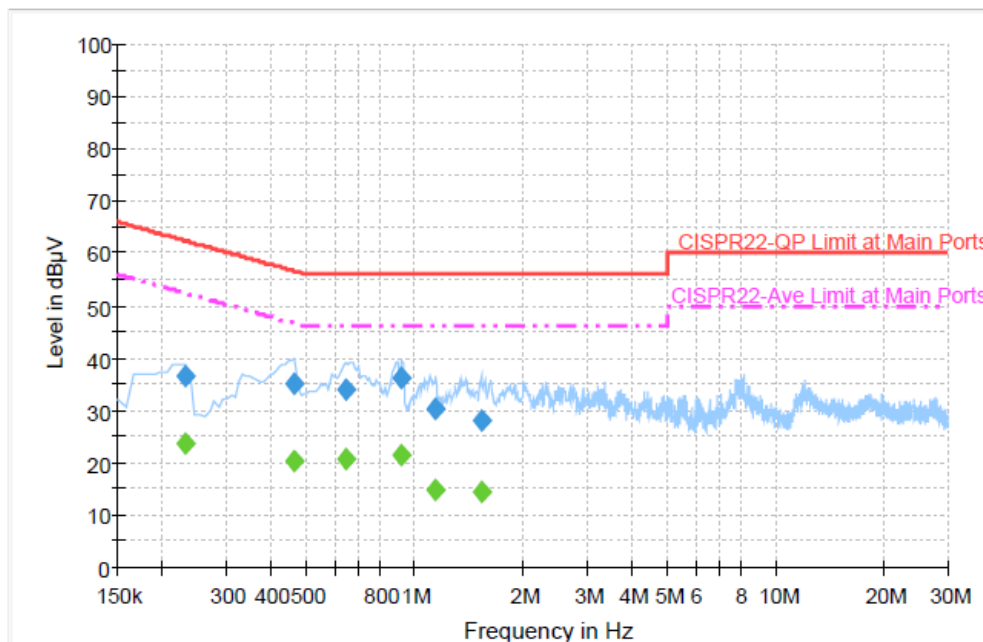
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.246000	40.9	Off	L1	19.4	21.0	61.9
0.478000	36.5	Off	L1	19.4	19.9	56.4
0.726000	36.1	Off	L1	19.4	19.9	56.0
0.966000	34.9	Off	L1	19.4	21.1	56.0
1.486000	32.4	Off	L1	19.4	23.6	56.0
2.246000	30.5	Off	L1	19.5	25.5	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.246000	27.7	Off	L1	19.4	24.2	51.9
0.478000	20.6	Off	L1	19.4	25.8	46.4
0.726000	19.0	Off	L1	19.4	27.0	46.0
0.966000	19.1	Off	L1	19.4	26.9	46.0
1.486000	17.5	Off	L1	19.4	28.5	46.0
2.246000	17.5	Off	L1	19.5	28.5	46.0

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Cona Huang	Relative Humidity :	30~32%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN (2.4G) Link + GPS Rx + Scanner + Cradle + Adapter + RS232 Terminal + USB Cable (Link with Notebook)		
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)
0.230000	36.6	Off	N	19.4	25.8	62.4
0.462000	35.2	Off	N	19.3	21.5	56.7
0.646000	34.1	Off	N	19.3	21.9	56.0
0.918000	36.1	Off	N	19.4	19.9	56.0
1.142000	30.1	Off	N	19.4	25.9	56.0
1.526000	28.1	Off	N	19.4	27.9	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.230000	23.8	Off	N	19.4	28.6	52.4
0.462000	20.4	Off	N	19.3	26.3	46.7
0.646000	20.6	Off	N	19.3	25.4	46.0
0.918000	21.4	Off	N	19.4	24.6	46.0
1.142000	14.8	Off	N	19.4	31.2	46.0
1.526000	14.4	Off	N	19.4	31.6	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

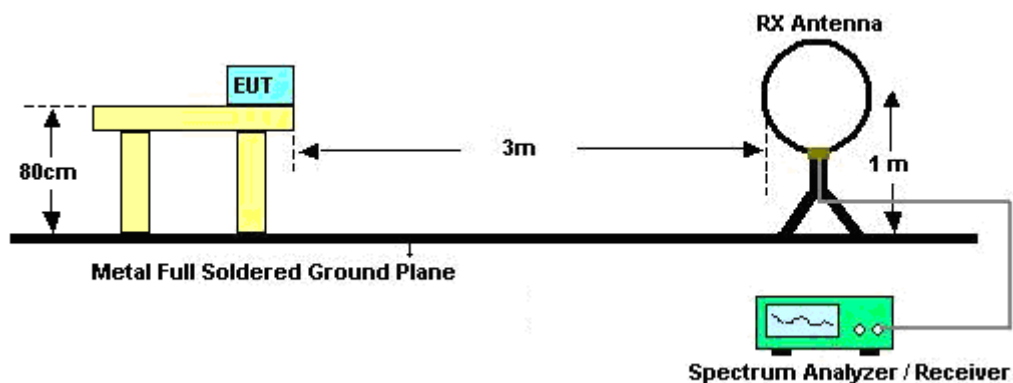
See list of measuring instruments of this test report.

3.9.3 Test Procedures

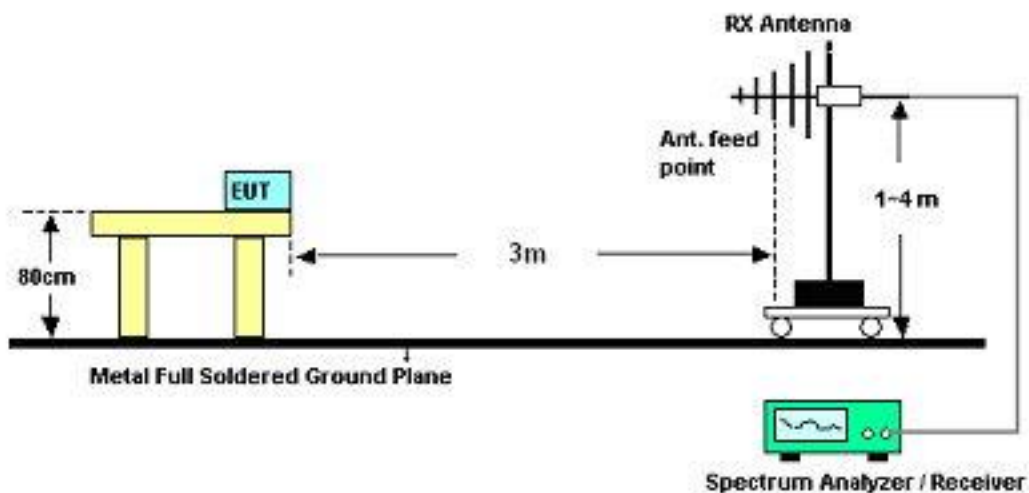
- The testing follows the guidelines in FCC Public Notice DA 00-705 Measurement Guidelines.
- Use the following spectrum analyzer settings:
 - Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
 - 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)
- 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.
- Measured average value for the peak value is greater than 54 dBuV/m

3.9.4 Test Setup

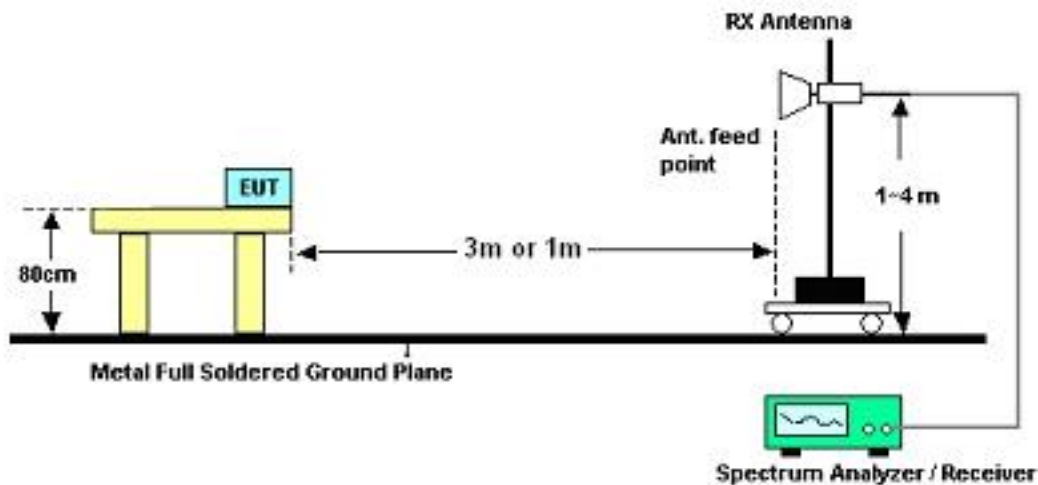
For radiated emissions below 30MHz



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 :	Ivan Jiang	Temperature :	22~23°C	
		Relative Humidity :	49~50%	

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 :	49~50%
Test Engineer :	Ivan Jiang	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
118.02	31.26	-12.24	43.50	50.37	11.36	1.09	31.56	106	231	Peak
135.30	27.15	-16.35	43.50	45.94	11.59	1.18	31.56	-	-	Peak
226.29	28.76	-17.24	46.00	47.80	10.95	1.46	31.45	-	-	Peak
766.90	23.58	-22.42	46.00	29.23	21.95	3.09	30.69	-	-	Peak
897.10	25.68	-20.32	46.00	29.44	23.60	3.34	30.70	-	-	Peak
995.80	26.91	-27.09	54.00	29.14	24.84	3.51	30.58	-	-	Peak
2367.57	47.33	-26.67	74.00	43.05	32.13	5.99	33.84	100	300	Peak
2367.57	32.88	-21.12	54.00	28.60	32.13	5.99	33.84	100	300	Average
2402.00	99.98	-	-	95.62	32.18	6.03	33.85	100	300	Peak
2402.00	96.77	-	-	92.41	32.18	6.03	33.85	100	300	Average
2492.00	33.17	-20.83	54.00	28.59	32.30	6.18	33.90	100	300	Average
2492.00	45.07	-28.93	74.00	40.49	32.30	6.18	33.90	100	300	Peak



Test Mode :	Mode 1	Temperature :	22~23°C
Test Channel :	00	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	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
98.58	29.39	-14.11	43.50	50.26	9.68	0.99	31.54	-	-	Peak
118.83	31.83	-11.67	43.50	50.84	11.45	1.10	31.56	159	185	Peak
223.05	22.97	-23.03	46.00	42.23	10.75	1.44	31.45	-	-	Peak
589.80	24.94	-21.06	46.00	33.60	19.61	2.66	30.93	-	-	Peak
794.90	24.41	-21.59	46.00	29.57	22.39	3.13	30.68	-	-	Peak
995.80	26.94	-27.06	54.00	29.17	24.84	3.51	30.58	-	-	Peak
2338.69	45.72	-28.28	74.00	41.49	32.11	5.95	33.83	100	357	Peak
2338.69	33.27	-20.73	54.00	29.04	32.11	5.95	33.83	100	357	Average
2402.00	92.01	-	-	87.65	32.18	6.03	33.85	100	357	Peak
2402.00	88.80	-	-	84.44	32.18	6.03	33.85	100	357	Average
2492.00	33.17	-20.83	54.00	28.59	32.30	6.18	33.90	100	357	Average
2492.00	45.53	-28.47	74.00	40.95	32.30	6.18	33.90	100	357	Peak



Test Mode :	Mode 2	Temperature :	22~23°C
Test Channel :	39	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	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
118.29	31.66	-11.84	43.50	50.77	11.36	1.09	31.56	103	229	Peak
135.30	27.44	-16.06	43.50	46.23	11.59	1.18	31.56	-	-	Peak
222.78	27.99	-18.01	46.00	47.25	10.75	1.44	31.45	-	-	Peak
760.60	24.58	-21.42	46.00	30.36	21.84	3.08	30.70	-	-	Peak
909.70	26.29	-19.71	46.00	29.85	23.75	3.36	30.67	-	-	Peak
987.40	26.95	-27.05	54.00	29.30	24.73	3.50	30.58	-	-	Peak
2350.00	44.97	-29.03	74.00	40.74	32.11	5.95	33.83	100	357	Peak
2350.00	32.85	-21.15	54.00	28.62	32.11	5.95	33.83	100	357	Average
2441.00	101.32	-	-	96.85	32.24	6.11	33.88	100	357	Peak
2441.00	97.80	-	-	93.33	32.24	6.11	33.88	100	357	Average
2486.00	44.66	-29.34	74.00	40.10	32.28	6.18	33.90	100	357	Peak
2486.00	33.30	-20.70	54.00	28.74	32.28	6.18	33.90	100	357	Average



Test Mode :	Mode 2	Temperature :	22~23°C
Test Channel :	39	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	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
99.66	32.12	-11.38	43.50	52.88	9.79	0.99	31.54	135	78	Peak
118.29	27.23	-16.27	43.50	46.34	11.36	1.09	31.56	-	-	Peak
225.21	23.86	-22.14	46.00	42.97	10.89	1.45	31.45	-	-	Peak
724.90	23.14	-22.86	46.00	29.63	21.27	3.00	30.76	-	-	Peak
878.20	25.49	-20.51	46.00	29.52	23.37	3.31	30.71	-	-	Peak
998.60	26.82	-27.18	54.00	29.01	24.88	3.51	30.58	-	-	Peak
2358.00	45.68	-28.32	74.00	41.40	32.13	5.99	33.84	125	11	Peak
2358.00	33.05	-20.95	54.00	28.77	32.13	5.99	33.84	125	11	Average
2441.00	94.82	-	-	90.35	32.24	6.11	33.88	125	11	Peak
2441.00	91.23	-	-	86.76	32.24	6.11	33.88	125	11	Average
2494.00	44.78	-29.22	74.00	40.20	32.30	6.18	33.90	125	11	Peak
2494.00	33.13	-20.87	54.00	28.55	32.30	6.18	33.90	125	11	Average

Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	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
117.21	31.58	-11.92	43.50	50.77	11.28	1.09	31.56	150	37	Peak
134.49	28.02	-15.48	43.50	46.82	11.59	1.17	31.56	-	-	Peak
225.21	27.33	-18.67	46.00	46.44	10.89	1.45	31.45	-	-	Peak
716.50	22.93	-23.07	46.00	29.58	21.15	2.98	30.78	-	-	Peak
861.40	25.16	-20.84	46.00	29.41	23.18	3.29	30.72	-	-	Peak
976.90	27.68	-26.32	54.00	30.17	24.60	3.49	30.58	-	-	Peak
2332.00	45.18	-28.82	74.00	40.97	32.09	5.95	33.83	100	320	Peak
2332.00	33.17	-20.83	54.00	28.96	32.09	5.95	33.83	100	320	Average
2480.00	96.72	-	-	92.16	32.28	6.18	33.90	100	320	Average
2480.00	100.36	-	-	95.80	32.28	6.18	33.90	100	320	Peak
2483.50	65.06	-8.94	74.00	60.50	32.28	6.18	33.90	100	320	Peak
2483.50	46.82	-7.18	54.00	42.26	32.28	6.18	33.90	100	320	Average



Test Mode :	Mode 3	Temperature :	22~23°C
Test Channel :	78	Relative Humidity :	49~50%
Test Engineer :	Ivan Jiang	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
103.17	29.94	-13.56	43.50	50.43	10.04	1.01	31.54	133	276	Peak
118.29	27.92	-15.58	43.50	47.03	11.36	1.09	31.56	-	-	Peak
226.29	23.59	-22.41	46.00	42.63	10.95	1.46	31.45	-	-	Peak
696.90	22.61	-23.39	46.00	29.64	20.86	2.93	30.82	-	-	Peak
830.60	26.10	-19.90	46.00	30.77	22.82	3.22	30.71	-	-	Peak
973.40	26.97	-27.03	54.00	29.50	24.56	3.48	30.57	-	-	Peak
2332.00	45.25	-28.75	74.00	41.04	32.09	5.95	33.83	100	6	Peak
2332.00	33.13	-20.87	54.00	28.92	32.09	5.95	33.83	100	6	Average
2480.00	90.29	-	-	85.73	32.28	6.18	33.90	100	6	Average
2480.00	93.73	-	-	89.17	32.28	6.18	33.90	100	6	Peak
2483.50	58.65	-15.35	74.00	54.09	32.28	6.18	33.90	100	6	Peak
2483.50	42.59	-11.41	54.00	38.03	32.28	6.18	33.90	100	6	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)
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)
GPS Station	Pendulum	GSG-54	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz ~ 1GHz	Oct. 30, 2010	Oct. 29, 2011	Radiation (03CH07-HY)
Spectrum Analyzer	R&S	FSP30	101067	9KHz ~ 30GHz	Dec. 03, 2010	Dec. 02, 2011	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 10, 2011	Aug. 09, 2012	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A02362	1GHz~ 26.5GHz	Dec. 06, 2010	Dec. 05, 2011	Radiation (03CH07-HY)
Pre Amplifier	COM-POWER	PA-103A	161241	10-1000MHz.32 dB.GAIN	Mar. 29, 2011	Mar. 28, 2012	Radiation (03CH07-HY)
EMI TEST RECEIVER	R&S	ESCI 7	100724	9kHz~7GHz	Aug. 22, 2011	Aug. 21, 2012	Radiation (03CH07-HY)
Pre Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	159088	1GHz ~ 18GHz	Feb. 21, 2011	Feb. 20, 2012	Radiation (03CH07-HY)

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 EP0D0904-17 as below.