

FCC RF Test Report

APPLICANT : Flaircomm Technologies Inc.
EQUIPMENT : Bluetooth Module
BRAND NAME : Flaircomm
MODEL NAME : FLC-BTM403 Series
FCC ID : TQ6BTM403
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Spread Spectrum (DSS)

The product was received on Apr. 07, 2011 and completely tested on Apr. 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 (KUNSHAN) INC., the test report shall not be reproduced except in full.

Reviewed by:



Jones Tsai / Manager



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



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR140726	Rev. 01	Initial issue of report	May 13, 2011
FR140726	Rev. 02	Update Model name	May 16, 2011
FR140726	Rev. 03	Update Model name	May 17, 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	-
3.3	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 7.2.2	AC Conducted Emission	15.207(a)	Pass	Under limit 10.41 dB at 1.32 MHz
3.9	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.4 dB at 49.17 MHz
3.10	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Flaircomm Technologies Inc.

7F,Guomai Building,Guomai Science and Technology Park,116 East Riverside Road,Fuzhou,Fujian

1.2 Manufacturer

Flaircomm Technologies Inc.

7F,Guomai Building,Guomai Science and Technology Park,116 East Riverside Road,Fuzhou,Fujian

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	Bluetooth Module
Brand Name	Flaircomm
Model Name	FLC-BTM403 Series
FCC ID	TQ6BTM403
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) : 15.06 dBm (0.0321 W) Bluetooth EDR (2Mbps) : 15.1 dBm (0.0324 W) Bluetooth EDR (3Mbps) : 15.14 dBm (0.0327 W)
Antenna Type	Chip Antenna with gain 0.5 dBi
HW Version	1.0
SW Version	1.0
Type of Modulation	Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK
EUT Stage	Identical Prototype

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 (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.	
	TH01-KS	03CH01-KS

1.5 Applied Standards

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

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

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 (Certification), recorded in a separate test report.



1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	PC	DELL	MT320	Fcc DoC	Shielded, 1.2 m	Unshielded, 1.8 m
2.	iPod	Apple	A1199	Fcc DoC	Shielded, 1.2 m	N/A
3.	(USB) Mouse	DELL	MO56UC	Fcc DoC	Shielded, 1.8 m	N/A
4.	(USB) Keyboard	DELL	L100	Fcc DoC	Shielded, 1.8 m	N/A
5.	Printer	HP	Laser Jet 1018	Fcc DoC	Shielded, 1.8 m	Unshielded, 1.8 m
6.	Monitor	DELL	E1910Hc	Fcc DoC	Shielded, 1.2 m	Unshielded, 1.8 m

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		π /4-DQPSK		8-DPSK	
		1Mbps		2Mbps		3Mbps	
Ch00	2402MHz	14.52	dBm	14.84	dBm	15.06	dBm
Ch39	2441MHz	14.76	dBm	14.81	dBm	15.08	dBm
Ch78	2480MHz	15.06	dBm	15.10	dBm	15.14	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).

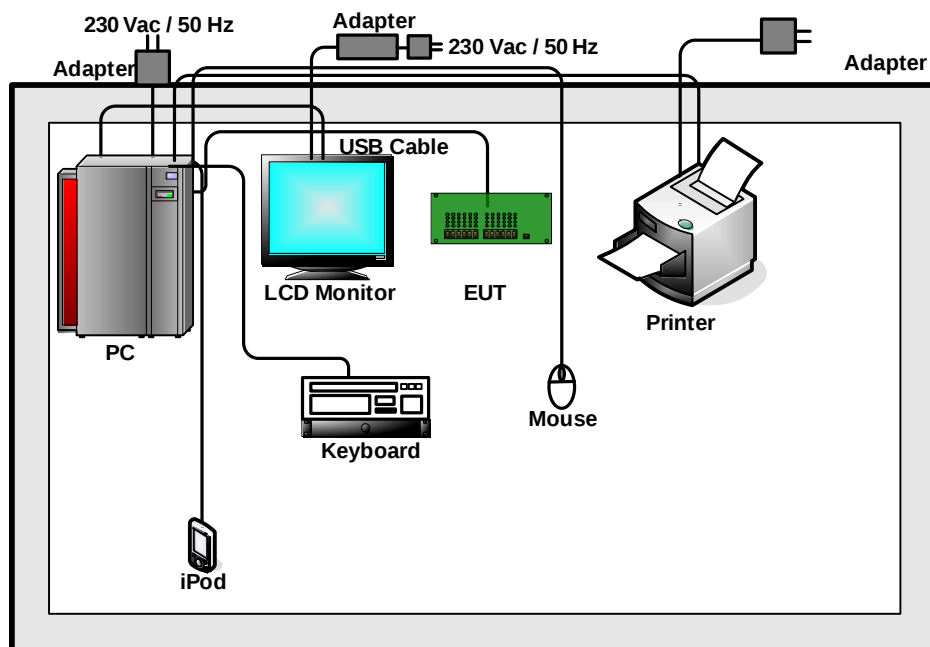
Pre-scanned tests were conducted to determine the final configuration from all possible combinations.

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 Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz
AC Conducted Emission	Mode 1 :Bluetooth Tx		
Remark: 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

<EUT with USB Cable (Link with PC) Mode>



2.4 RF Utility

For Bluetooth function, the RF utility, "Blue Test.exe" was installed in EUT which was programmed in order to make the EUT into the engineering modes 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.

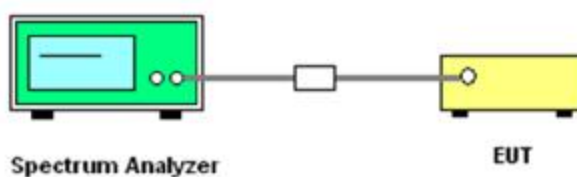
3.1.2 Measuring Instruments

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

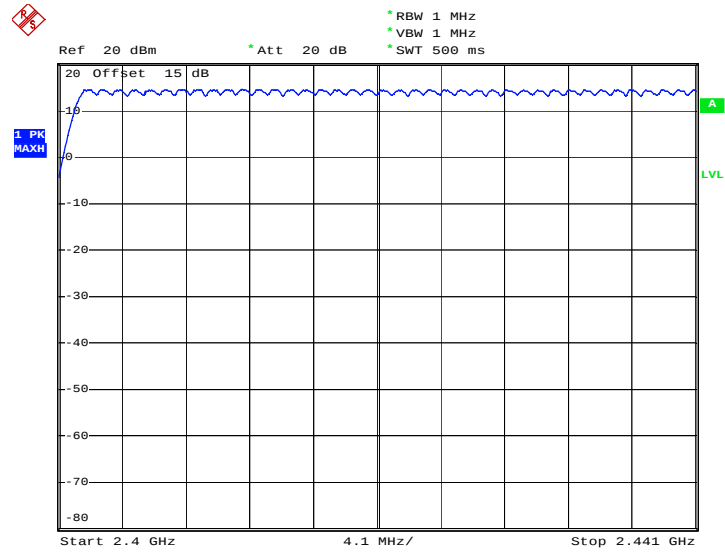


3.1.5 Test Result of Number of Hopping Frequency

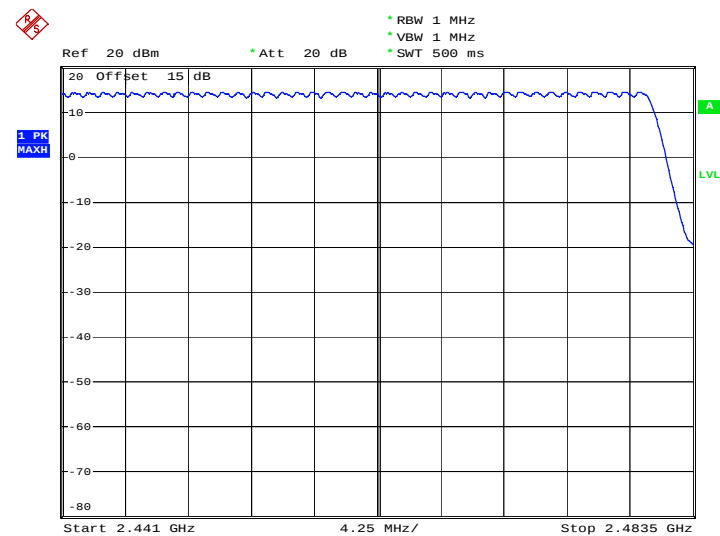
Test Mode :	Mode 1~3	Temperature :	20~21℃
Test Engineer :	Fly Chen	Relative Humidity :	40~41%
Number of Hopping Channels (Channel)		Limits (Channel)	Pass/Fail
79		> 15	Pass



Number of Hopping Channel Plot on Channel 00 - 78



Date: 30.APR.2011 20:01:19



Date: 30.APR.2011 20:03:41

3.2 20dB Bandwidth Measurement

3.2.1 Limit of 20dB Bandwidth

N/A

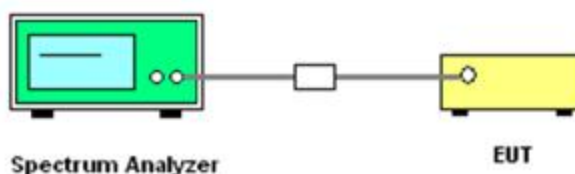
3.2.2 Measuring Instruments

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.

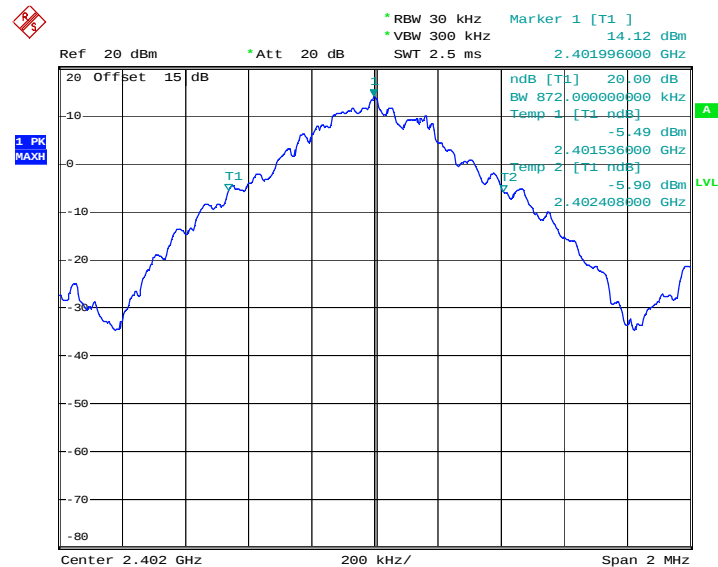
3.2.4 Test Setup



**3.2.5 Test Result of 20dB Bandwidth**

Test Mode :	Mode 1, 2, 3	Temperature :	20~21℃
Test Engineer :	Fly Chen	Relative Humidity :	40~41%

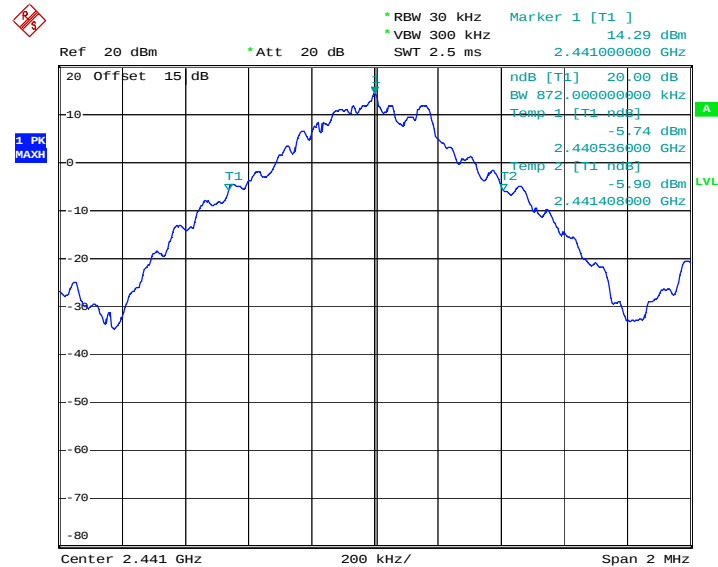
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.872
39	2441	0.872
78	2480	0.872

20 dB Bandwidth Plot on Channel 00

Date: 30.APR.2011 19:50:51

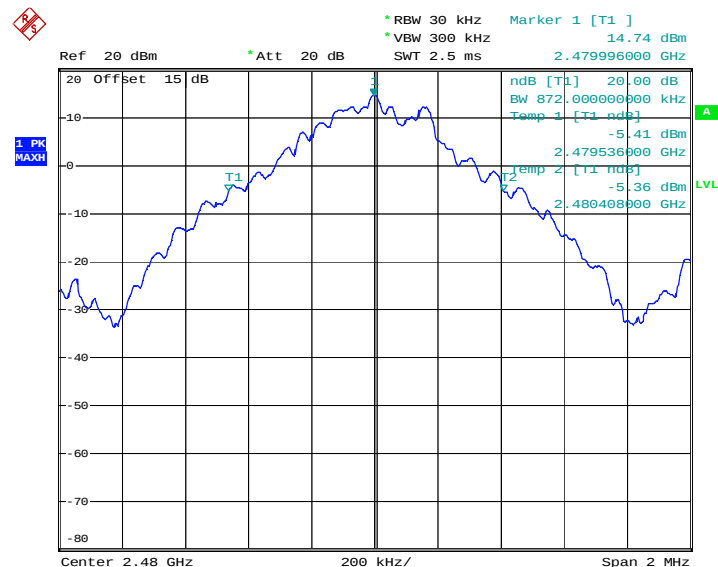


20 dB Bandwidth Plot on Channel 39



Date: 30.APR.2011 19:52:30

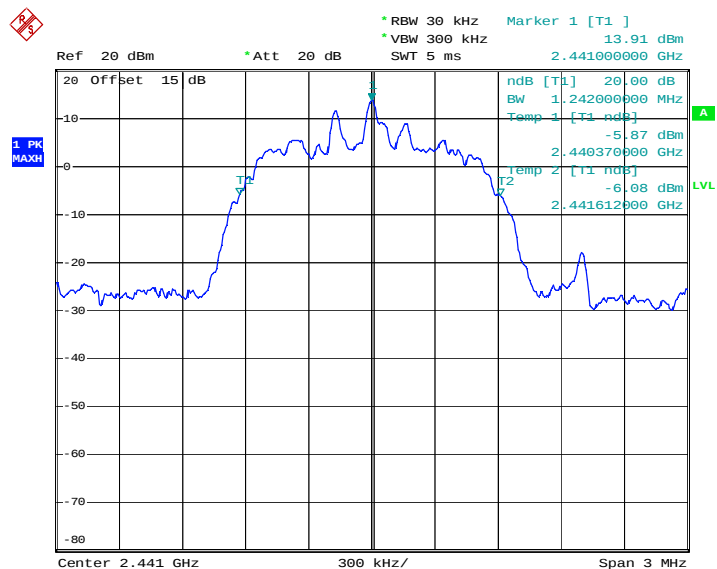
20 dB Bandwidth Plot on Channel 78



Date: 30.APR.2011 19:55:06

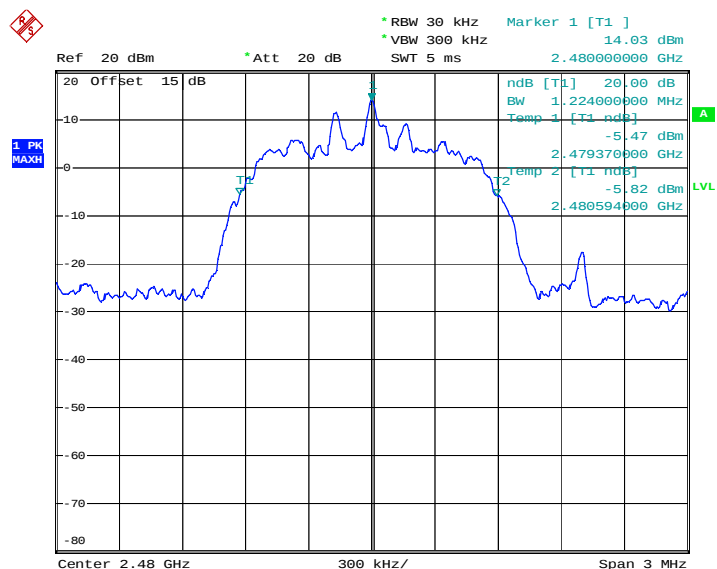


20 dB Bandwidth Plot on Channel 39



Date: 30.APR.2011 19:47:32

20 dB Bandwidth Plot on Channel 78

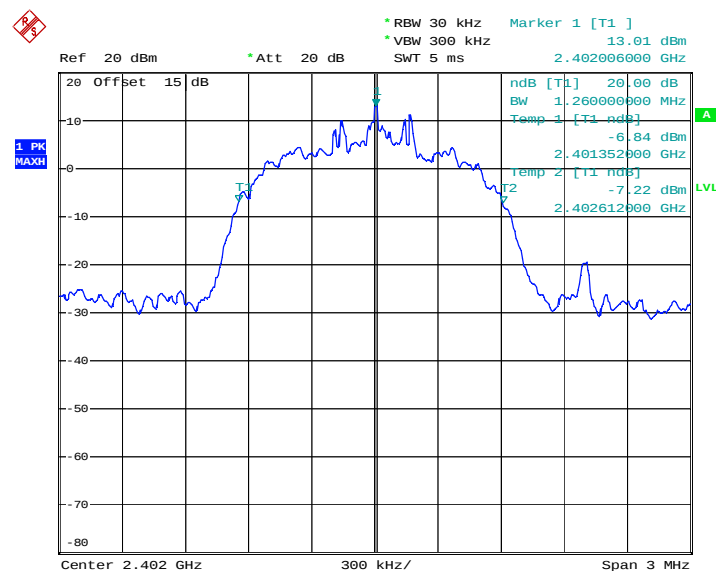


Date: 30.APR.2011 19:45:56



Test Mode :	Mode 7, 8, 9	Temperature :	20~21℃
Test Engineer :	Fly Chen	Relative Humidity :	40~41%

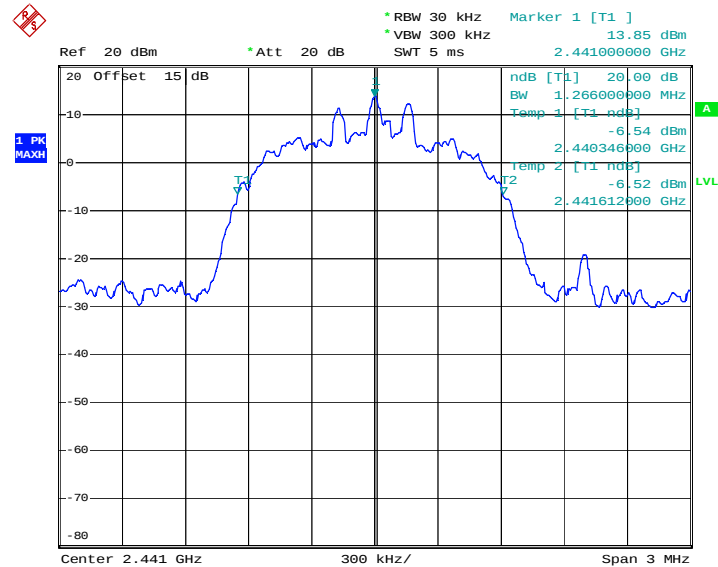
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.260
39	2441	1.266
78	2480	1.260

20 dB Bandwidth Plot on Channel 00

Date: 30.APR.2011 19:04:49

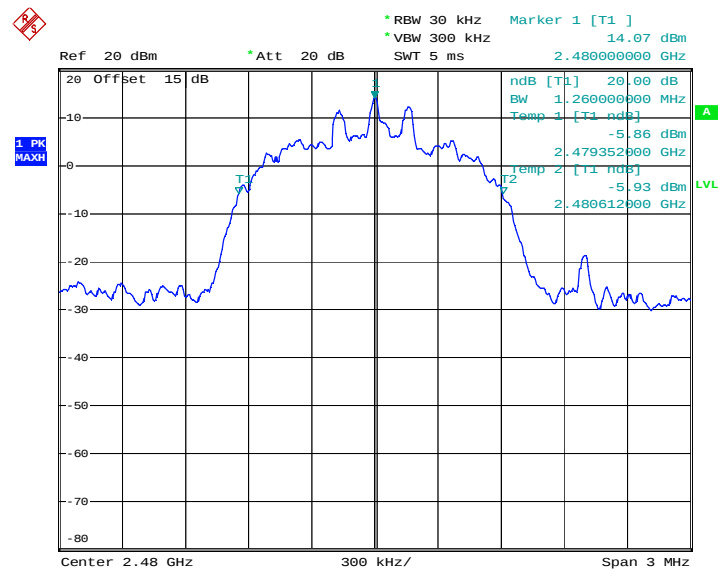


20 dB Bandwidth Plot on Channel 39



Date: 30.APR.2011 19:33:29

20 dB Bandwidth Plot on Channel 78



Date: 30.APR.2011 19:38:59

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.

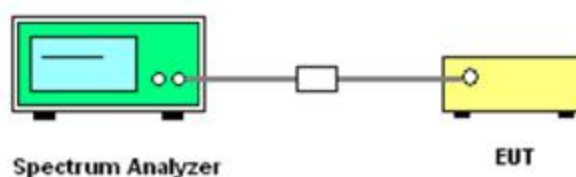
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

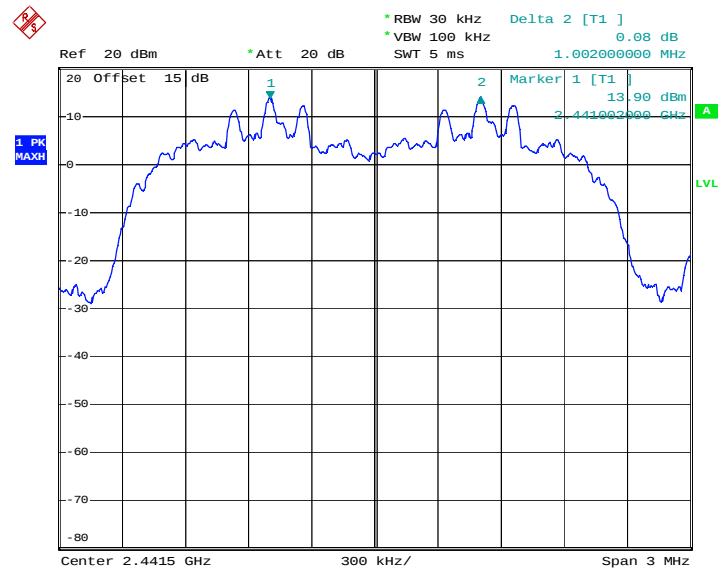
1. Please refer FCC Public Notice DA 00-705 Measurement Guidelines.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. The EUT should be transmitting at its maximum data rate as the worst cases.
4. Use the following spectrum analyzer settings:
Span = wide enough to 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



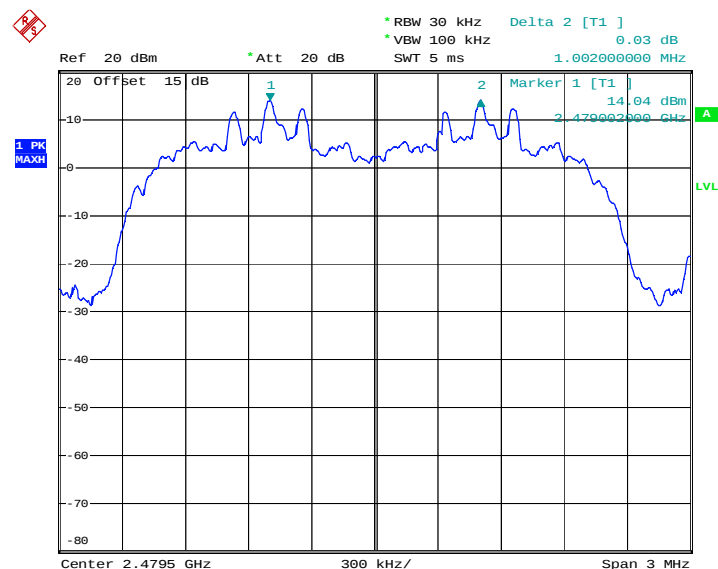


Channel Separation Plot on Channel 39 - 40



Date: 30.APR.2011 19:35:24

Channel Separation Plot on Channel 77 - 78



Date: 30.APR.2011 19:40:33

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.

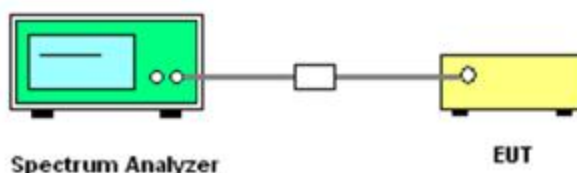
3.4.2 Measuring Instruments

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 :	20~21°C
Test Engineer :	Fly Chen	Relative Humidity :	40~41%

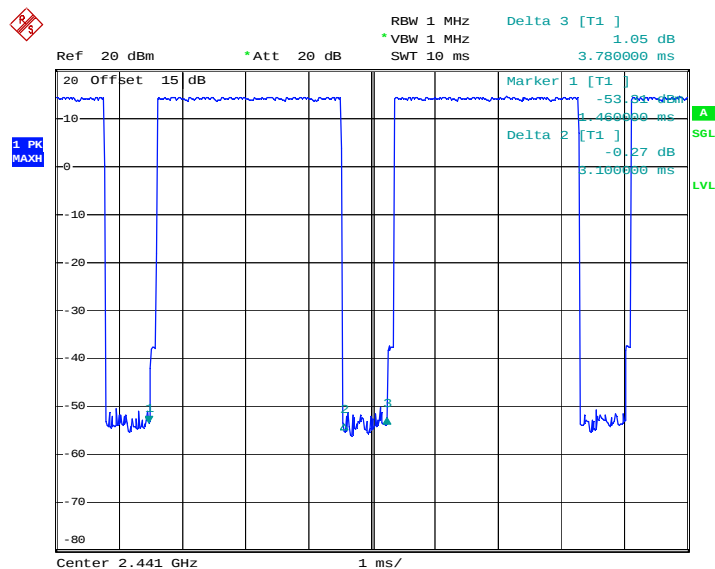
Package Mode	Average Hopping Channel	Package Transfer Time (usec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
3DH5	3.40	3100.00	0.33	0.4	Pass

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)

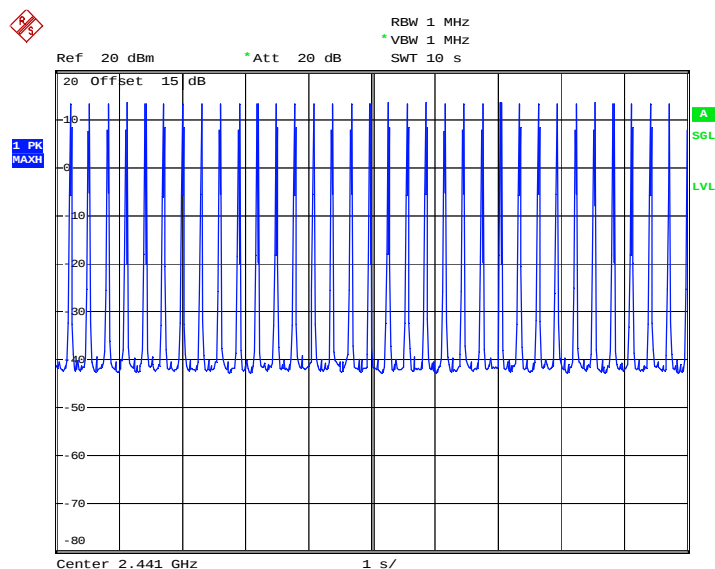


3DH5 Dwell Time (One Pulse) Plot on Channel 39



Date: 28.APR.2011 13:45:36

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



Date: 30.APR.2011 19:02:11

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).

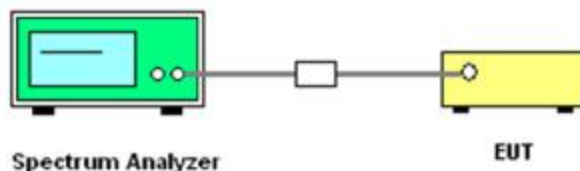
3.5.2 Measuring Instruments

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



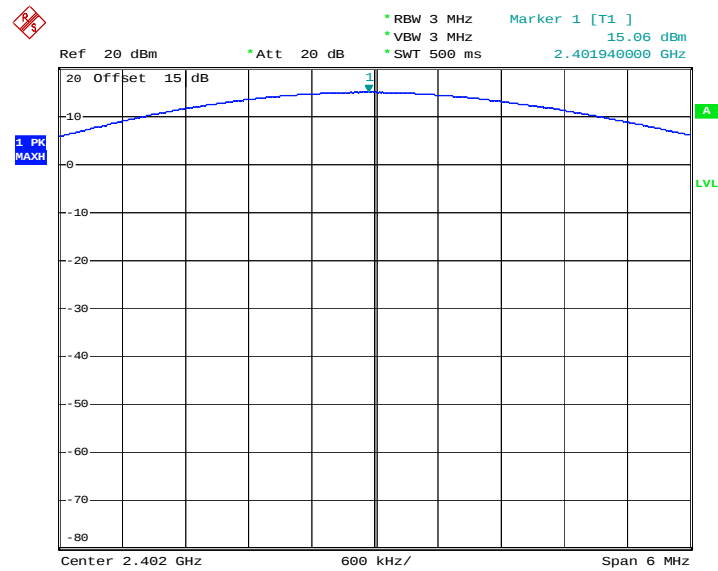
3.5.5 Test Result of Peak Output Power

Test Mode :	Mode 7, 8, 9	Temperature :	20~21℃
Test Engineer :	Fly Chen	Relative Humidity :	40~41%

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	15.06	20.97	Pass
39	2441	15.08	20.97	Pass
78	2480	15.14	20.97	Pass

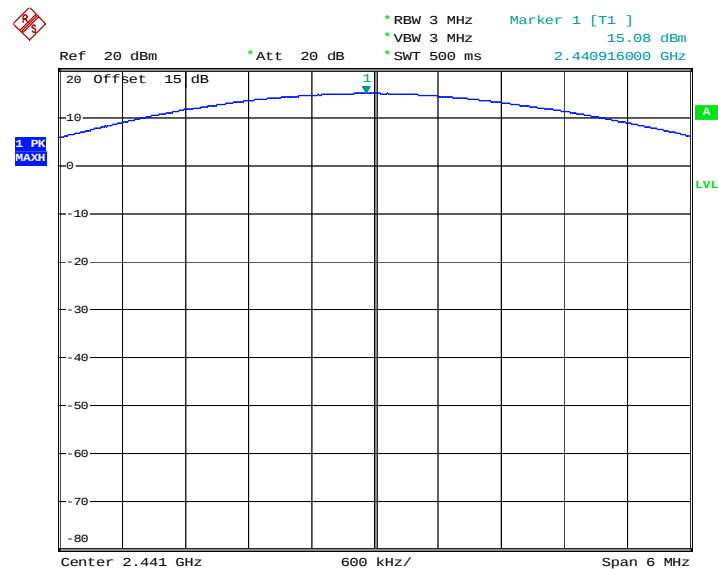


Peak Output Power Plot on Channel 00



Date: 28.APR.2011 13:50:38

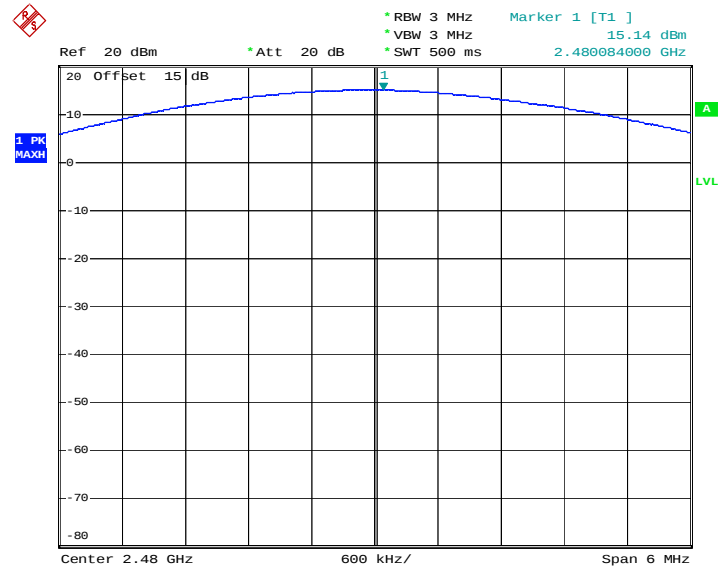
Peak Output Power Plot on Channel 39



Date: 28.APR.2011 13:44:50



Peak Output Power Plot on Channel 78



Date: 28.APR.2011 13:51:01

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

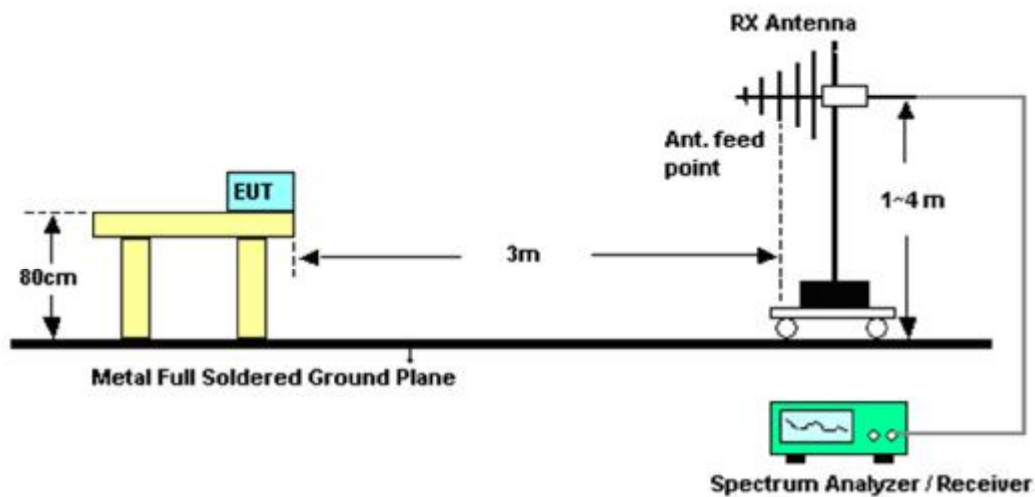
See list of measuring instruments of this test report.

3.6.3 Test Procedures

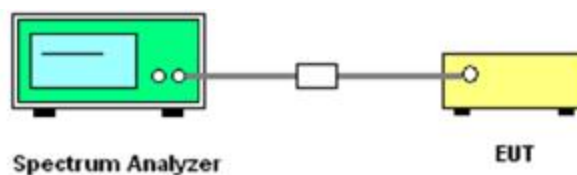
1. The testing follows the guidelines in ANSI C63.4-2003 and FCC Public Notice DA 00-705 Measurement Guidelines.
2. RF antenna conducted test: Set RBW = 300kHz, Video bandwidth (VBW) $\geq$ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band 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 :	20~21°C
Test Channel :	00	Relative Humidity :	40~41%
		Test Engineer :	Jason Jia

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
2386.19	53.33	-20.67	74	51.05	32.86	3.47	34.05	100	0	Peak
2386.19	43.11	-10.89	54	40.83	32.86	3.47	34.05	100	0	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
2385.81	53.3	-20.7	74	51.02	32.86	3.47	34.05	100	0	Peak
2385.81	42.39	-11.61	54	40.11	32.86	3.47	34.05	100	0	Average



Test Mode :	Mode 3	Temperature :	20~21°C
Test Channel :	78	Relative Humidity :	40~41%
		Test Engineer :	Jason Jia

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
2483.5	48.84	-5.16	54	46.35	33.01	3.68	34.2	100	0	Peak
2483.5	65.07	-8.93	74	62.58	33.01	3.68	34.2	100	0	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dB μ V/m)	Delta Result (dB)	Average Result (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
Single Carrier Mode	88.71	39.87	48.84	54	-5.16	Pass
Hopping Mode	88.71	41.39	47.32	54	-6.68	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	59.82	-14.18	74	57.33	33.01	3.68	34.2	100	0	Peak
2483.5	47.33	-6.67	54	44.84	33.01	3.68	34.2	100	0	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dB μ V/m)	Delta Result (dB)	Average Result (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
Single Carrier Mode	88.32	41.73	46.59	54	-7.41	Pass
Hopping Mode	88.32	40.99	47.33	54	-6.67	Pass

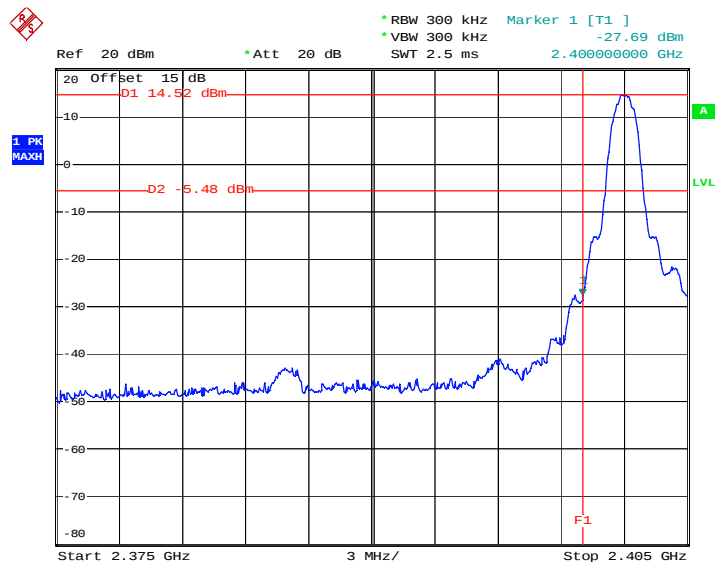
Note : Average result = Maximum field strength – Delta result



3.6.6 Test Result of Conducted Band Edges

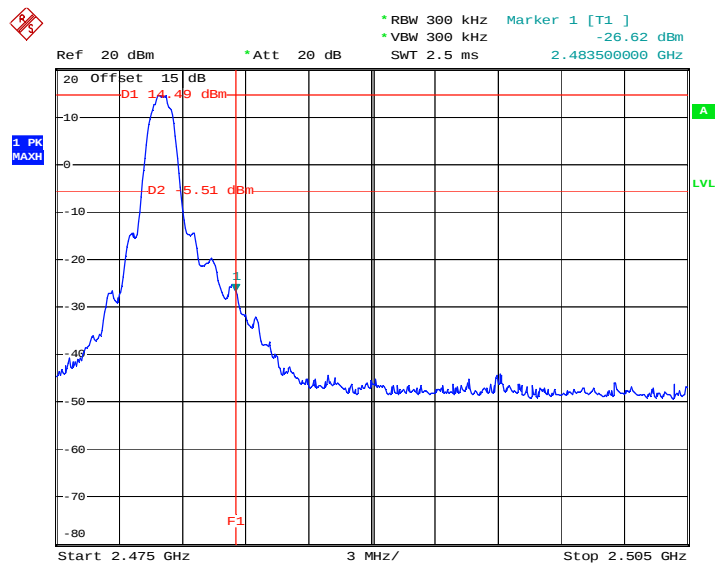
Test Mode :	Mode 1 and 3	Temperature :	20~21℃
Test Channel :	00 and 78	Relative Humidity :	40~41%
		Test Engineer :	Fly Chen

Low Band Edge Plot on Channel 00



Date: 30.APR.2011 20:22:45

High Band Edge Plot on Channel 78



Date: 30.APR.2011 19:41:00

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.

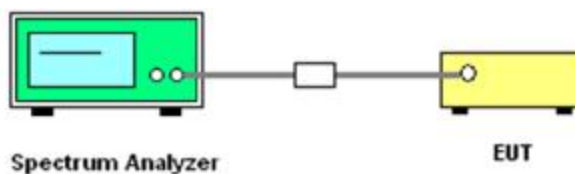
3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

3.7.3 Test Procedure

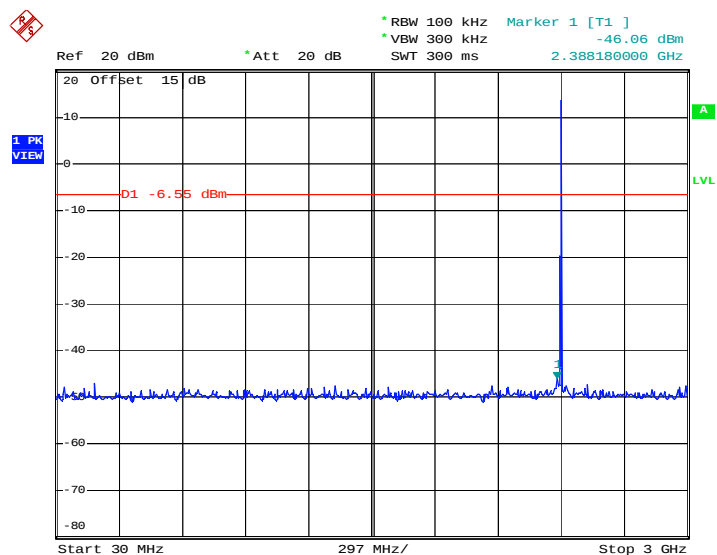
1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set RBW = 100 kHz, Video bandwidth (VBW) $\geq$ RBW, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

3.7.4 Test Setup

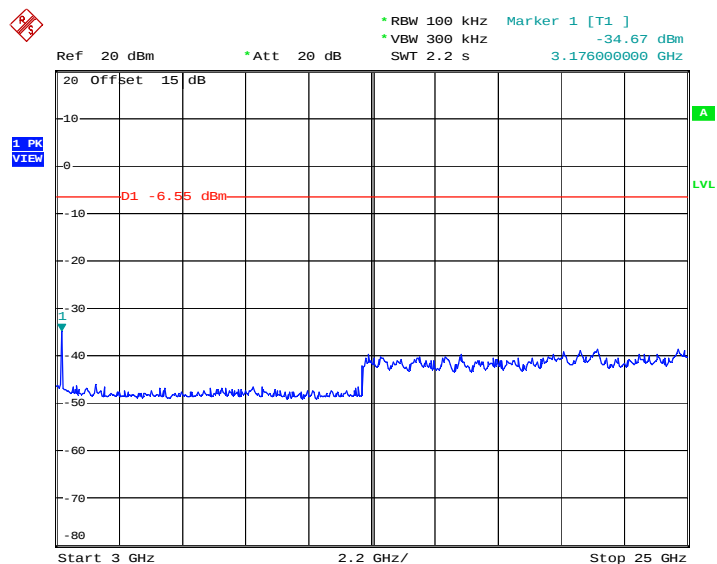


**3.7.5 Test Result**

Test Mode :	Mode 7	Temperature :	20~21℃
Test Channel :	00	Relative Humidity :	40~41%
		Test Engineer :	Fly Chen

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

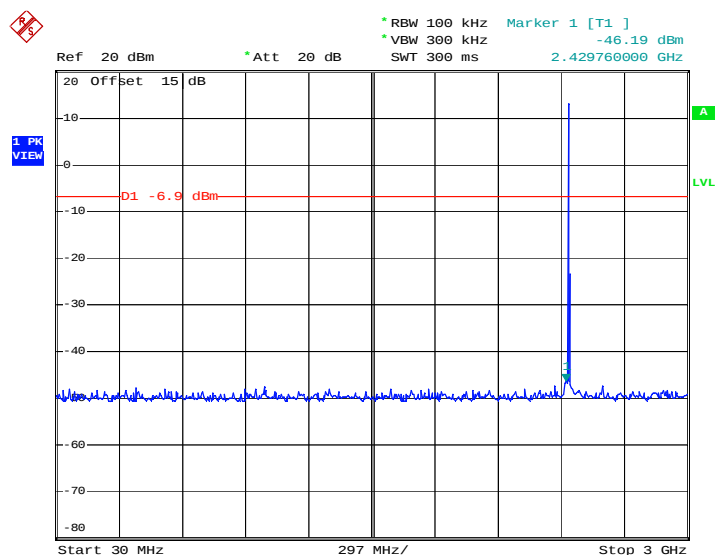
Date: 30.APR.2011 19:31:57

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

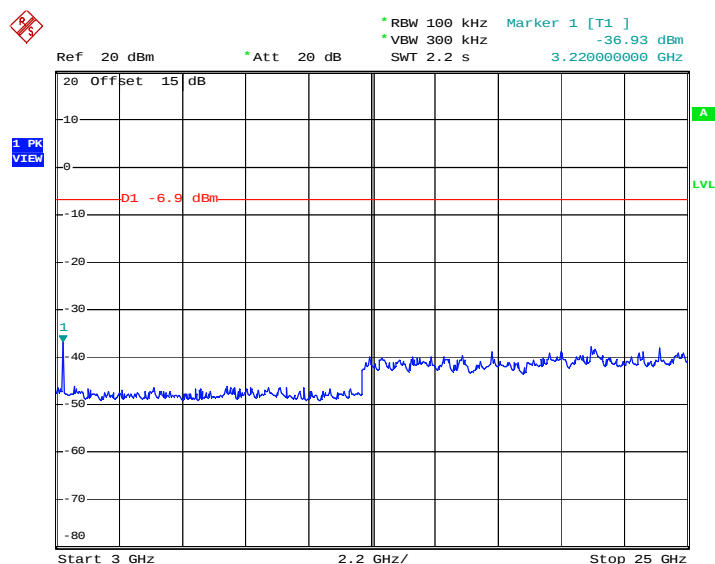
Date: 30.APR.2011 19:32:19



Test Mode :	Mode 8	Temperature :	20~21℃
Test Channel :	39	Relative Humidity :	40~41%
		Test Engineer :	Fly Chen

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

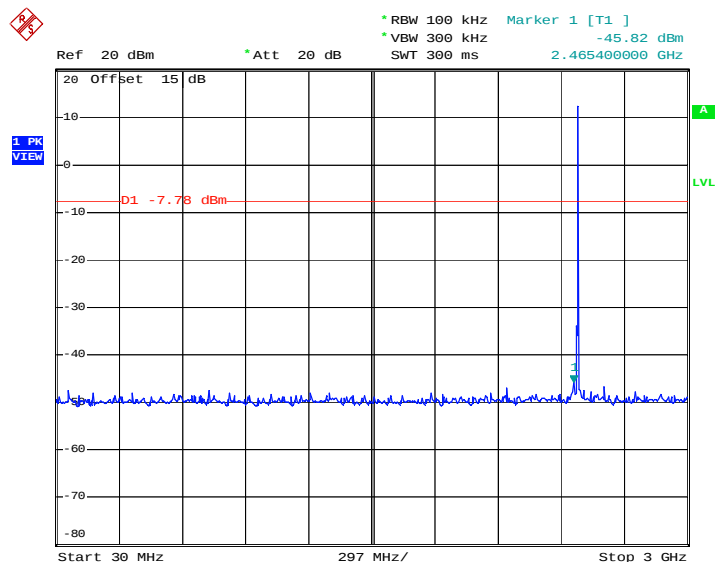
Date: 30.APR.2011 19:37:05

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

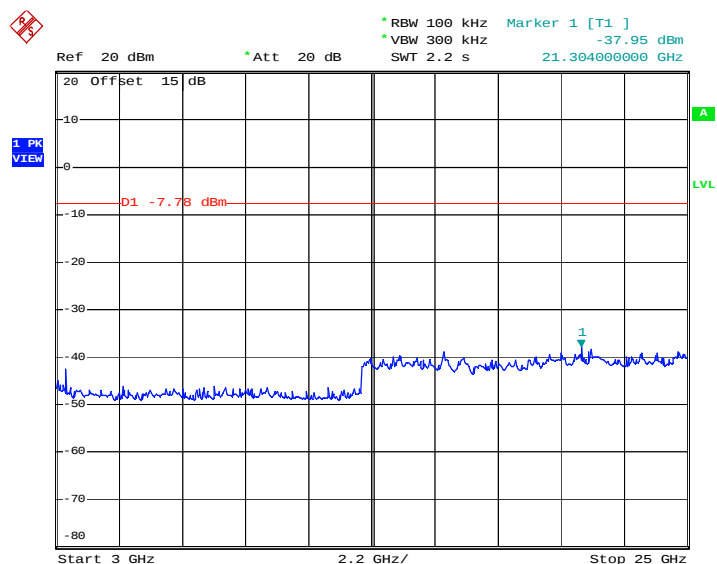
Date: 30.APR.2011 19:37:27



Test Mode :	Mode 9	Temperature :	20~21℃
Test Channel :	78	Relative Humidity :	40~41%
		Test Engineer :	Fly Chen

Conducted Spurious Emission Plot between 30MHz ~ 3 GHz

Date: 30.APR.2011 19:42:37

Conducted Spurious Emission Plot between 3 GHz ~ 25 GHz

Date: 30.APR.2011 19:42:59

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.

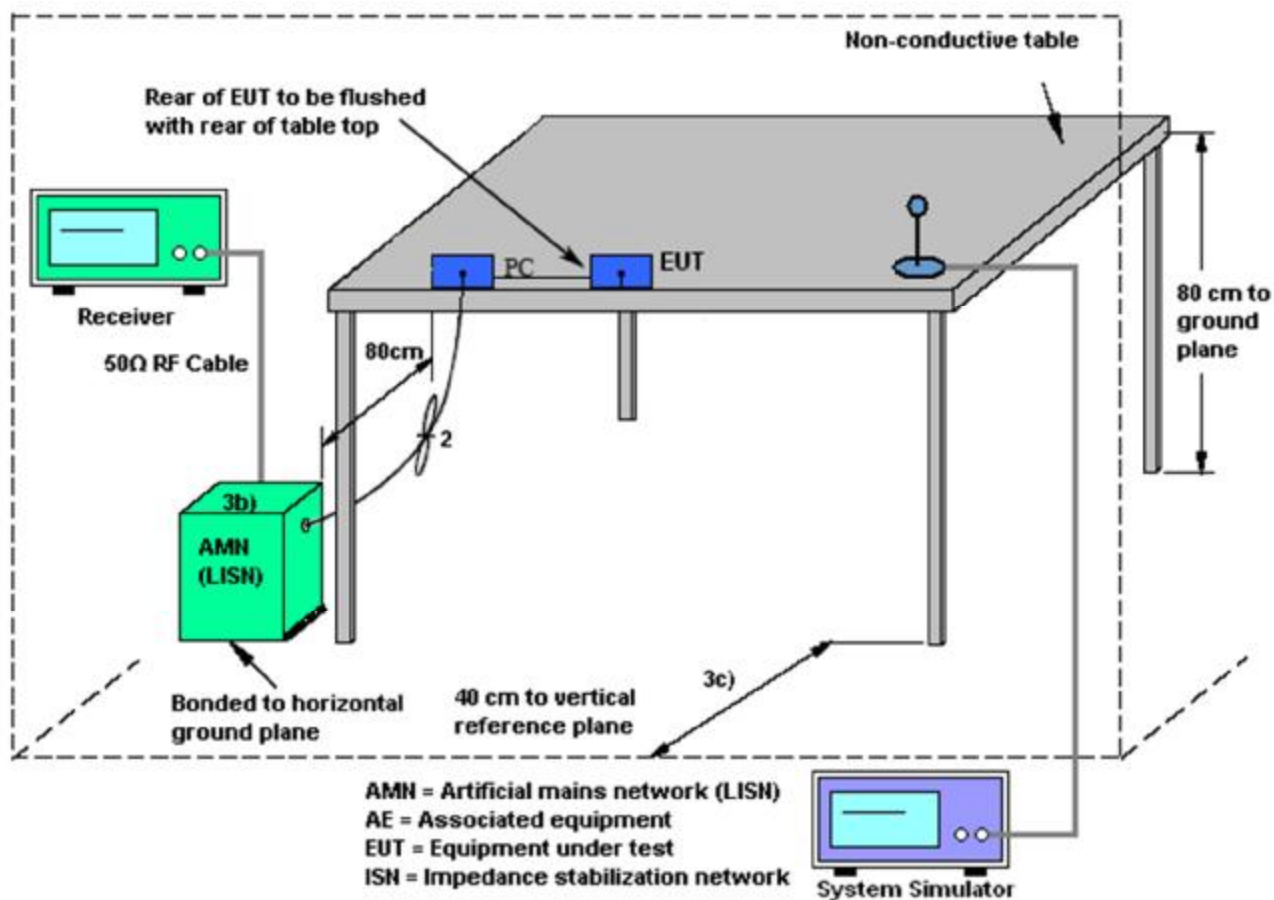
3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

3.8.3 Test Procedures

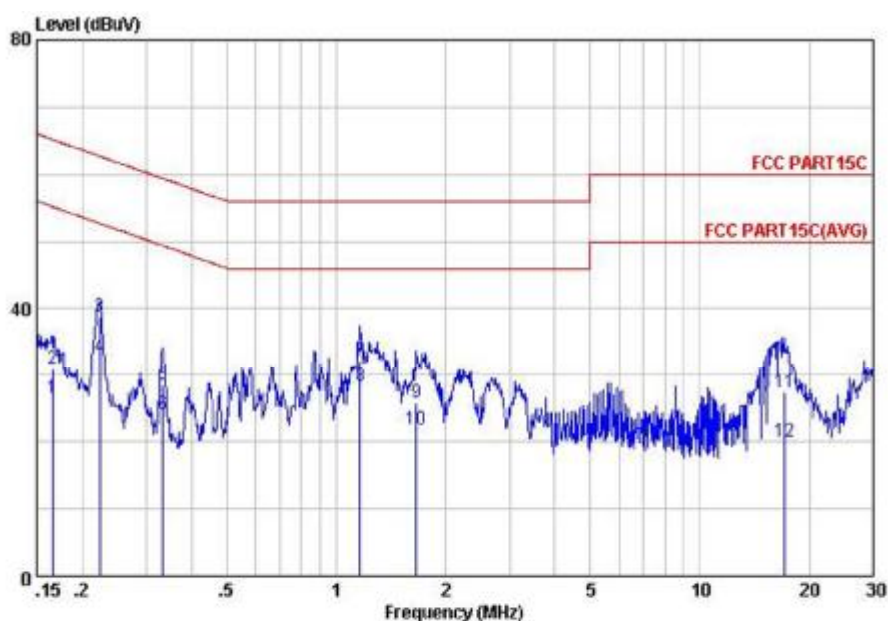
1. Please follow the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. EUT connect PC by fixture and powered by PC, then connect PC to the power mains through a 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 :	20~21℃
Test Engineer :	Jason Jia	Relative Humidity :	42~44%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Tx		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : C001-KS
Condition: FCC PART15C LISN-100807 LINE

Node : Node 1

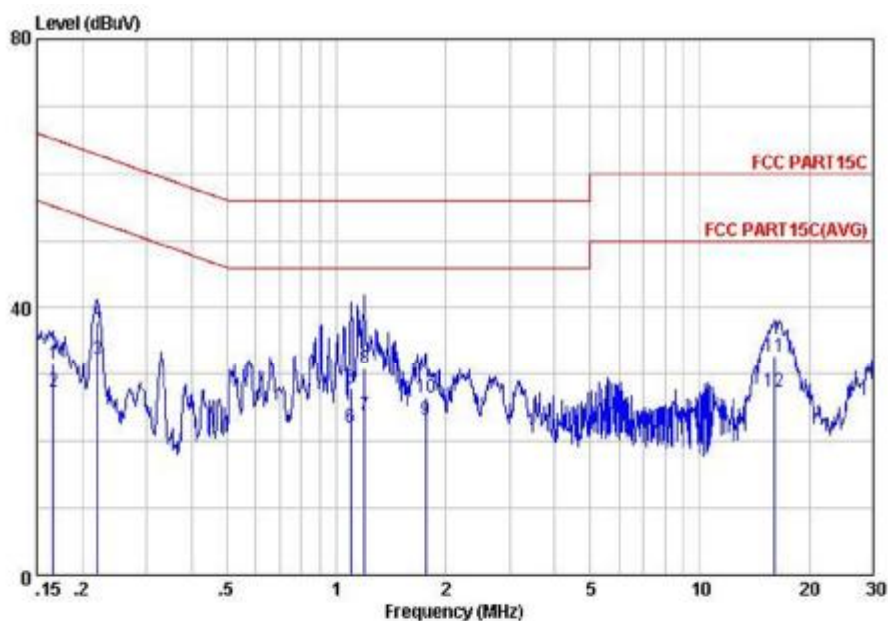
	Freq	Level	Over	Linit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.17	26.57	-28.59	55.16	16.50	-0.07	10.14	Average
2	0.17	30.97	-34.19	65.16	20.90	-0.07	10.14	QP
3	0.22	38.68	-24.02	62.70	28.60	-0.07	10.15	QP
4	0.22	32.68	-20.02	52.70	22.60	-0.07	10.15	Average
5	0.33	28.60	-30.80	59.40	18.50	-0.08	10.18	QP
6	0.33	24.10	-25.30	49.40	14.00	-0.08	10.18	Average
7	1.17	32.17	-23.83	56.00	21.99	-0.10	10.28	QP
8	1.17	28.27	-17.73	46.00	18.09	-0.10	10.28	Average
9	1.66	25.80	-30.20	56.00	15.60	-0.11	10.31	QP
10	1.66	21.80	-24.20	46.00	11.60	-0.11	10.31	Average
11	17.11	27.36	-32.64	60.00	16.81	0.02	10.53	QP
12	17.11	19.96	-30.04	50.00	9.41	0.02	10.53	Average



FCC RF Test Report

Report No. : FR140726

Test Mode :	Mode 1	Temperature :	20~21℃
Test Engineer :	Jason Jia	Relative Humidity :	42~44%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Tx		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : C001-KS
Condition: FCC PART15C LISN-100807 NEUTRAL

Mode : Mode 1

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.17	31.56	-33.56	65.12	21.50	-0.08	10.14	QP
2	0.17	27.36	-27.76	55.12	17.30	-0.08	10.14	Average
3	0.22	32.38	-20.41	52.79	22.30	-0.07	10.15	Average
4	0.22	37.98	-24.81	62.79	27.90	-0.07	10.15	QP
5	1.09	27.88	-28.12	56.00	17.70	-0.09	10.27	QP
6	1.09	22.08	-23.92	46.00	11.90	-0.09	10.27	Average
7	1.20	23.78	-22.22	46.00	13.59	-0.09	10.28	Average
8	1.20	30.98	-25.02	56.00	20.79	-0.09	10.28	QP
9	1.76	23.11	-22.89	46.00	12.90	-0.11	10.32	Average
10	1.76	26.61	-29.39	56.00	16.40	-0.11	10.32	QP
11	16.05	32.71	-27.29	60.00	22.20	-0.02	10.53	QP
12	16.05	27.41	-22.59	50.00	16.90	-0.02	10.53	Average

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

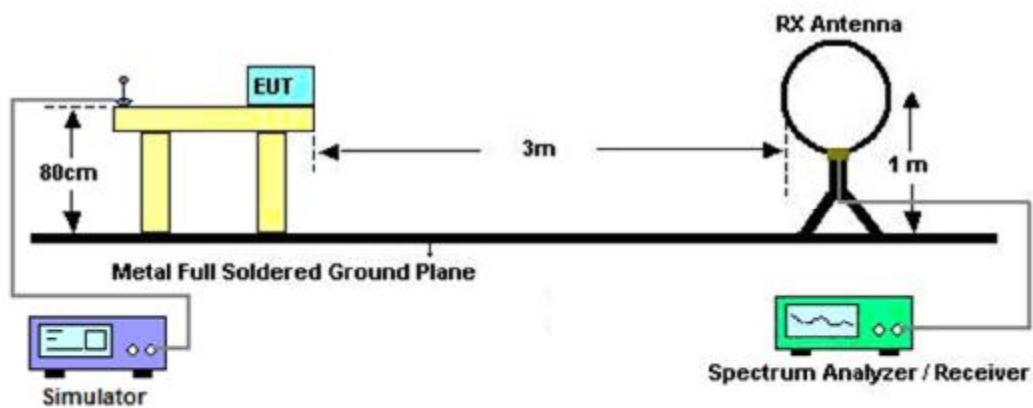
See list of measuring instruments of this test report.

3.9.3 Test Procedures

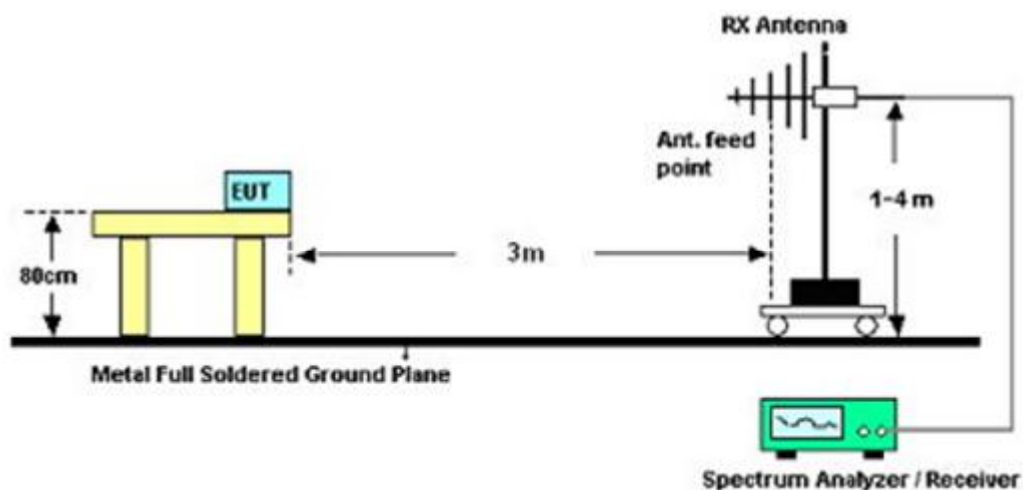
1. The testing follows the guidelines in FCC Public Notice DA 00-705 Measurement Guidelines.
2. Use the following spectrum analyzer settings:
 - (1) Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; 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. 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

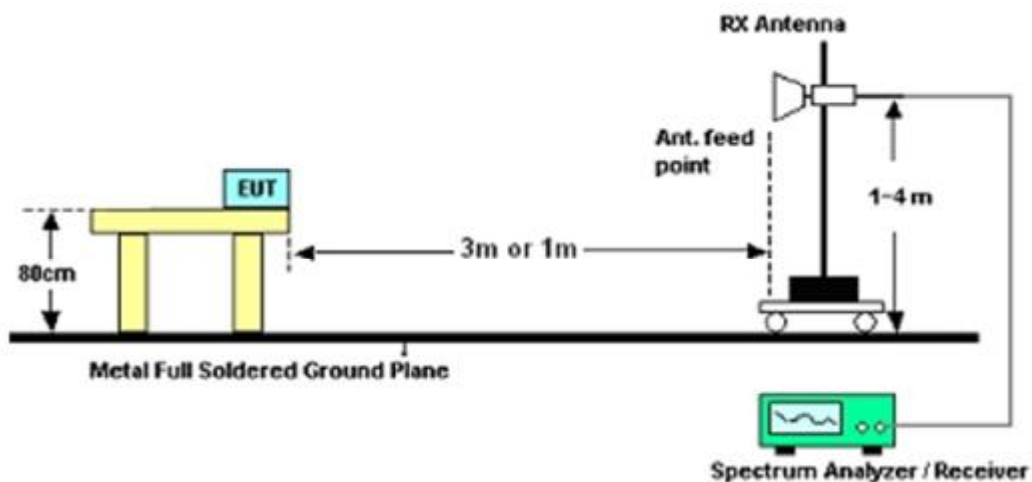
For radiated emissions below 30MHz



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 :	Jason Jia	Temperature :	20~21°C	
		Relative Humidity :	40~41%	

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 :	20~21°C
Test Channel :	00	Relative Humidity :	40~41%
Test Engineer :	Jason Jia	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
50.25	24.88	-15.12	40	47.33	7.4	0.28	30.13			Peak
192	37.4	-6.1	43.5	58.19	8.59	0.58	29.96	100	360	Peak
240.06	33.3	-12.7	46	50.9	11.56	0.66	29.82			Peak
499.5	37.07	-8.93	46	48.65	17.19	0.96	29.73			Peak
633.2	29.4	-16.6	46	39.15	18.81	1.08	29.64			Peak
943.3	35.89	-18.11	54	43.38	20.71	1.33	29.53			Peak
2386.19	53.33	-20.67	74	51.05	32.86	3.47	34.05	100	0	Peak
2386.19	43.11	-10.89	54	40.83	32.86	3.47	34.05	100	0	Average
2402	108.67			106.39	32.86	3.47	34.05	100	0	Peak
2402	90.5			88.22	32.86	3.47	34.05	100	0	Average
2489.55	37.86	-16.14	54	35.32	33.05	3.72	34.23	100	0	Average
2489.55	49.24	-24.76	74	46.7	33.05	3.72	34.23	100	0	Peak



FCC RF Test Report

Report No. : FR140726

Test Mode :	Mode 1	Temperature :	20~21°C
Test Channel :	00	Relative Humidity :	40~41%
Test Engineer :	Jason Jia	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
30.27	32.28	-7.72	40	44.1	18	0.26	30.08			Peak
49.71	35.26	-4.74	40	57.36	7.75	0.28	30.13	100	1	Peak
84.27	32.14	-7.86	40	54.26	7.53	0.37	30.02			Peak
498.1	31.16	-14.84	46	42.75	17.18	0.96	29.73			Peak
699.7	27.98	-18.02	46	37.29	19.29	1.13	29.73			Peak
898.5	34.49	-11.51	46	42.22	20.45	1.3	29.48			Peak
2385.81	53.3	-20.7	74	51.02	32.86	3.47	34.05	100	0	Peak
2385.81	42.39	-11.61	54	40.11	32.86	3.47	34.05	100	0	Average
2402	90.38			88.1	32.86	3.47	34.05	100	0	Average
2402	106.62			104.34	32.86	3.47	34.05	100	0	Peak
2488.6	50.31	-23.69	74	47.77	33.05	3.72	34.23	100	0	Peak
2488.6	38.14	-15.86	54	35.6	33.05	3.72	34.23	100	0	Average

**FCC RF Test Report**

Report No. : FR140726

Test Mode :	Mode 2	Temperature :	20~21°C
Test Channel :	39	Relative Humidity :	40~41%
Test Engineer :	Jason Jia	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
50.25	26.29	-13.71	40	48.74	7.4	0.28	30.13			Peak
192	34.22	-9.28	43.5	55.01	8.59	0.58	29.96			Peak
240.06	32.58	-13.42	46	50.18	11.56	0.66	29.82			Peak
499.5	37.38	-8.62	46	48.96	17.19	0.96	29.73	100	32	Peak
633.2	28.9	-17.1	46	38.65	18.81	1.08	29.64			Peak
902.7	36.02	-9.98	46	43.74	20.46	1.3	29.48			Peak
2341.92	49.53	-24.47	74	47.36	32.78	3.33	33.94	100	360	Peak
2341.92	37.47	-16.53	54	35.3	32.78	3.33	33.94	100	360	Average
2441	108.52			106.12	32.95	3.6	34.15	100	360	Peak
2441	90.72			88.32	32.95	3.6	34.15	100	360	Average
2486.13	49.63	-24.37	74	47.14	33.01	3.68	34.2	100	360	Peak
2486.13	38.09	-15.91	54	35.6	33.01	3.68	34.2	100	360	Average

**FCC RF Test Report**

Report No. : FR140726

Test Mode :	Mode 2	Temperature :	20~21°C
Test Channel :	39	Relative Humidity :	40~41%
Test Engineer :	Jason Jia	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
49.17	36.6	-3.4	40	58.7	7.75	0.28	30.13	100	221	Peak
85.35	30.84	-9.16	40	52.78	7.7	0.37	30.01			Peak
240.06	34.87	-11.13	46	52.47	11.56	0.66	29.82			Peak
498.1	31.39	-14.61	46	42.98	17.18	0.96	29.73			Peak
696.9	28.33	-17.67	46	37.65	19.28	1.13	29.73			Peak
902.7	37.59	-8.41	46	45.31	20.46	1.3	29.48			Peak
2355.03	50.4	-23.6	74	48.19	32.81	3.38	33.98	100	0	Peak
2355.03	37.43	-16.57	54	35.22	32.81	3.38	33.98	100	0	Average
2441	107.32			104.92	32.95	3.6	34.15	100	10	Peak
2441	91.05			88.65	32.95	3.6	34.15	100	10	Average
2489.17	49.67	-24.33	74	47.13	33.05	3.72	34.23	100	0	Peak
2489.17	38.05	-15.95	54	35.51	33.05	3.72	34.23	100	0	Average



FCC RF Test Report

Report No. : FR140726

Test Mode :	Mode 3	Temperature :	20~21°C
Test Channel :	78	Relative Humidity :	40~41%
Test Engineer :	Jason Jia	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
50.52	25.48	-14.52	40	47.93	7.4	0.28	30.13			Peak
192	34.34	-9.16	43.5	55.13	8.59	0.58	29.96			Peak
240.06	33.15	-12.85	46	50.75	11.56	0.66	29.82			Peak
499.5	37.29	-8.71	46	48.87	17.19	0.96	29.73	100	217	Peak
642.3	28.88	-17.12	46	38.58	18.86	1.09	29.65			Peak
902.7	38.32	-7.68	46	46.04	20.46	1.3	29.48			Peak
2345.81	48.33	-25.67	74	46.16	32.78	3.33	33.94	100	0	Peak
2345.81	36.99	-17.01	54	34.82	32.78	3.33	33.94	100	0	Average
2480	105.81			103.32	33.01	3.68	34.2	100	360	Peak
2480	88.71			86.22	33.01	3.68	34.2	100	200	Average
2483.5	48.84	-5.16	54	46.35	33.01	3.68	34.2	100	0	Average
2483.5	65.07	-8.93	74	62.58	33.01	3.68	34.2	100	0	Peak



Test Mode :	Mode 3	Temperature :	20~21°C
Test Channel :	78	Relative Humidity :	40~41%
Test Engineer :	Jason Jia	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
48.36	36.49	-3.51	40	58.22	8.12	0.28	30.13	100	287	Peak
85.89	32.09	-7.91	40	53.84	7.89	0.37	30.01			Peak
240.06	35.42	-10.58	46	53.02	11.56	0.66	29.82			Peak
499.5	31.93	-14.07	46	43.51	17.19	0.96	29.73			Peak
699.7	27.94	-18.06	46	37.25	19.29	1.13	29.73			Peak
936.3	36.7	-9.3	46	44.24	20.67	1.32	29.53			Peak
2371.3	49.18	-24.82	74	46.94	32.83	3.42	34.01	100	0	Peak
2371.3	37.6	-16.4	54	35.36	32.83	3.42	34.01	100	0	Average
2480	104.1			101.61	33.01	3.68	34.2	100	208	Peak
2480	88.32			85.83	33.01	3.68	34.2	100	208	Average
2483.5	59.82	-14.18	74	57.33	33.01	3.68	34.2	100	0	Peak
2483.5	47.33	-6.67	54	44.84	33.01	3.68	34.2	100	0	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 Chip 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	100319	9kHz~40GHz	Jan. 07, 2010	Jan. 06, 2012	Conducted (TH01-KS)
Power Meter	Agilent	E4416A	MY45101555	N/A	Aug. 24, 2010	Aug. 23, 2011	Conducted (TH01-KS)
Power Sensor	Agilent	E9327A	MY44421198	N/A	Aug. 24, 2010	Aug. 23, 2011	Conducted (TH01-KS)
Thermal Chamber	Ten Billion	TTC-B3S	TBN-960502	N/A	Dec. 28, 2010	Dec. 27, 2011	Conduction (TH01-KS)
DC Power Supply	TOPWARD	3306D	N/A	N/A	N/A	N/A	Conduction (TH01-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz	Jun. 22, 2010	Jun. 21, 2011	Conduction (CO01-KS)
LISN	MessTec	AN3016	60103	9kHz~30MHz	Jan. 07, 2011	Jan. 06, 2012	Conduction (CO01-KS)
LISN	MessTec	AN3016	60105	9kHz~30MHz	Jan. 07, 2011	Jan. 06, 2012	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000081 1	N/A	Nov. 10, 2010	Nov. 09, 2011	Conduction (CO01-KS)
System Simulator	R&S	CMU200	837587/066	Full-Band	Jan. 07, 2011	Jan. 06, 2012	Conduction (CO01-KS)
GPS Station	T&E	GS-50	N/A	N/A	N/A	N/A	Conduction (CO01-KS)
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, 2010	Jan. 06, 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	1MHz~18GHz	Jan. 07, 2010	Jan. 06, 2012	Radiation (03CH01-KS)
Amplifier	Wireless	FPA-6592G	060004	30MHz~2GHz	Dec. 09, 2010	Dec. 08, 2011	Radiation (03CH01-KS)
Amplifier	Agilent	8449B	3008A02370	1GHz~26.5GHz	Jan. 07, 2010	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)
Signal Generator	R&S	SMR40	100455	10G-40GHz	Jan. 06, 2010	Jan. 05, 2012	Radiation (03CH01-KS)
SHE-EHF Horn	Schwarzbeck	BBHA9170	BBHA170249	15-40GHz	Oct. 15, 2010	Oct. 14, 2011	Radiation (03CH01-KS)
Loop Antenna	R&S	HFH2-Z2	860004/00	9G-30GHz	Jul. 29, 2010	Jul. 28, 2011	Radiation (03CH01-KS)
Bluetooth Base Station	R&S	CBT	100783	N/A	Aug. 17, 2010	Aug. 16, 2011	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				