

FCC RF Test Report

APPLICANT : Inventec Corporation
EQUIPMENT : PDA Phone
BRAND NAME : Opticon
MODEL NAME : H-19A/H-19B
FCC ID : DGIORCHID1
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Spread Spectrum (DSS)

The product was received on Apr. 10, 2010 and completely tested on May 07, 2010. 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:



Roy Wu / Manager



SPORTON INTERNATIONAL INC.

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FCC ID : DGIORCHID1

Page Number : 1 of 47

Report Issued Date : Jun. 04, 2010

Report Version : Rev. 01



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR041004A	Rev. 01	Initial issue of report	Jun. 04, 2010

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	$\leq 1\text{W}$	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 21.9 dB at 0.422 MHz
3.9	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.38 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

Inventec Corporation

Inventec Building, No. 66, Hou-Kang Street, Shihlin District, Taipei 11170, Taiwan

1.2 Manufacturer

Inventec Corporation

Inventec Building, No. 66, Hou-Kang Street, Shihlin District, Taipei 11170, Taiwan

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	PDA Phone
Brand Name	Opticon
Model Name	H-19A/H-19B
FCC ID	DGIORCHID1
Sample A	H-19A with Scanner 1
Sample B	H-19B with Scanner 2
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	4.07 dBm (2.55 mW)
Antenna Type	PIFA Antenna with gain -5 dBi
HW Version	ORCHID0223_6050A2351001_MB_X01 ORCHID0223_6050A2351501_SUB_X01
SW Version	0.2.8.2
Type of Modulation	GFSK
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	TW1022/4086B-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 7

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.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	GPS Station	T&E	GS-50	N/A	N/A	Unshielded, 1.8 m
3.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
4.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m
5.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A

2 Test Configuration of Equipment Under Test

2.1 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).

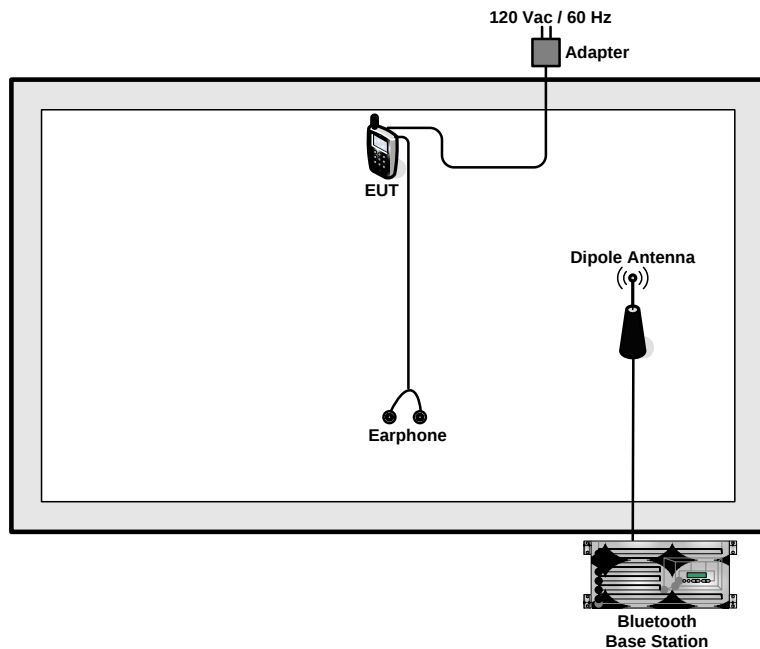
Pre-scanned tests were conducted to determine the final configuration from all possible combinations.

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

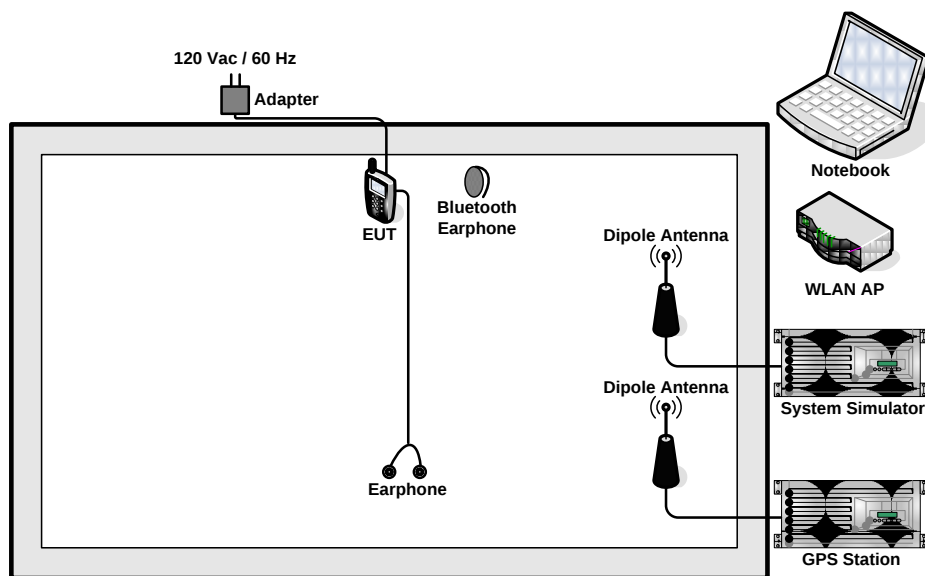
Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth 1Mbps GFSK
Conducted TCs	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz
Radiated TCs	Mode 1: CH00_2402 MHz for Sample B Mode 2: CH39_2441 MHz for Sample B Mode 3: CH78_2480 MHz for Sample B
AC Conducted Emission	Mode 1 : Sample B + GSM850 Idle + Bluetooth Link + WLAN Link + GPS Rx + Earphone + Adapter Mode 2 : Sample A + GSM1900 Idle + Bluetooth Link + WLAN Link + MPEG4 + Earphone + Adapter
Remark: For conducted emission, the worst case is mode 2; only the test data of this mode was reported.	

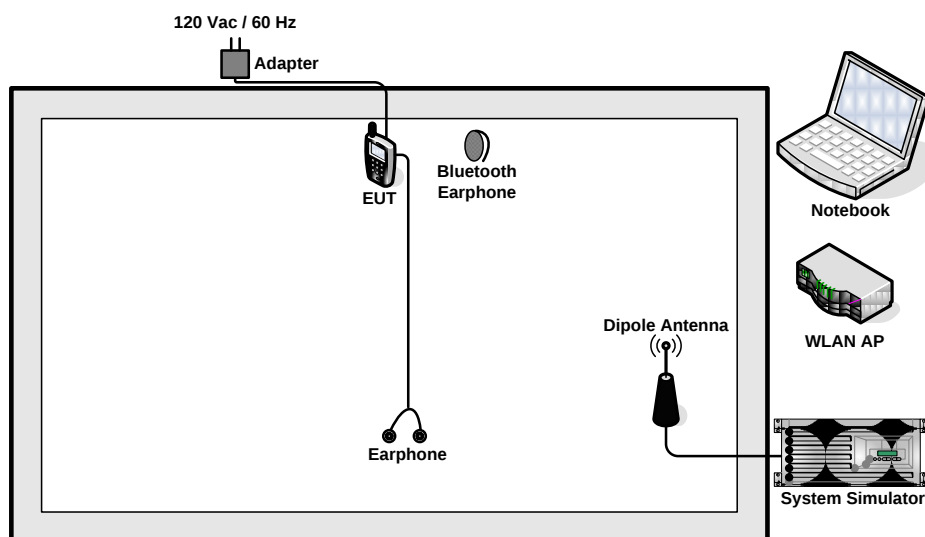
2.2 Connection Diagram of Test System

<Bluetooth Tx Mode>



<EUT with Adapter for GPS Rx Mode>



<EUT with Adapter Mode>


2.3 RF Utility

For Bluetooth function, the RF utility, “BT Test Mode” 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.

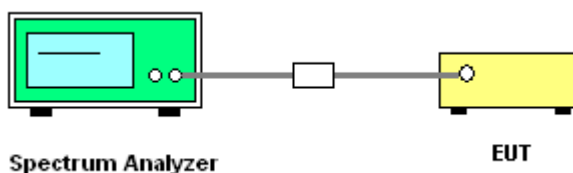
3.1.2 Measuring Instruments

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.

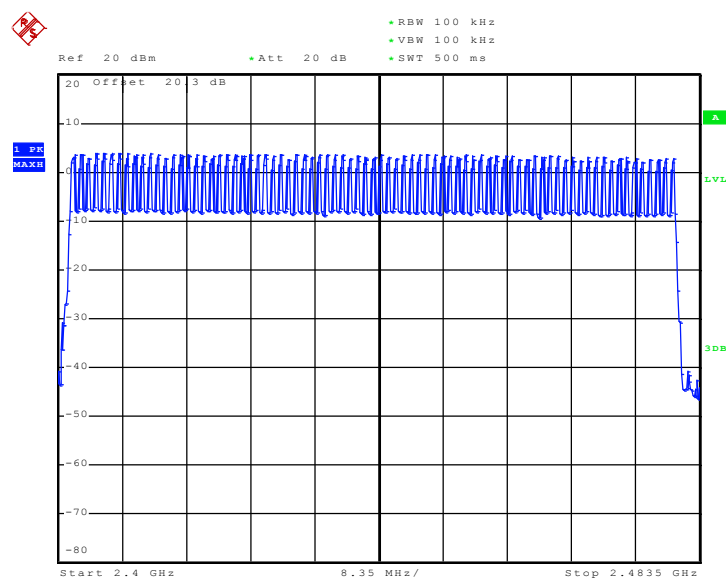
3.1.4 Test Setup



3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	Mode 1~3	Temperature :	25~27℃
Test Engineer :	Lancelot Chen	Relative Humidity :	47~50%
Number of Hopping Channels (Channel)		Limits (Channel)	Pass/Fail
79		> 15	Pass

Number of Hopping Channel Plot on Channel 00 - 78



Date: 20.APR.2010 19:14:22

3.2 20dB Bandwidth Measurement

3.2.1 Limit of 20dB Bandwidth

N/A

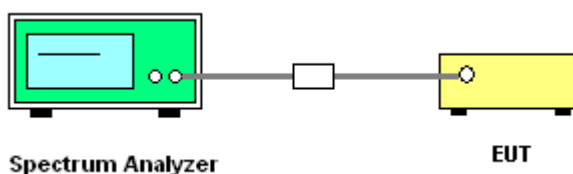
3.2.2 Measuring Instruments

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





Test Mode :	Mode 1, 2, 3	Temperature :	25~27℃
Test Engineer :	Lancelot Chen	Relative Humidity :	47~50%

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.788
39	2441	0.788
78	2480	0.788

• RBW 30 kHz
• VBW 300 kHz
• Att 20 dB
• SWT 500 ms

Marker 1 [T1]
3.69 dBm
2.402000000 GHz

Ref 20 dBm
Offset 20 3 dB

1. PPK
MAX/MIN

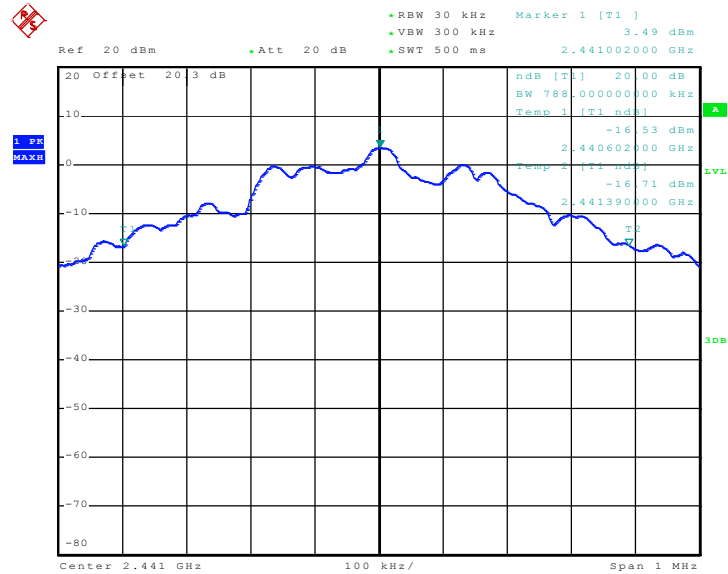
ndB [T1] 20.00 dB
BW 788.00000000 kHz
Temp 1 [T1 ndB] -16.25 dBm
2.401602000 GHz
Temp 2 [T2 ndB] -16.36 dBm
2.402390000 GHz
T2

Center 2.402 GHz
100 kHz/
Span 1 MHz

Date: 20.APR.2010 18:52:21

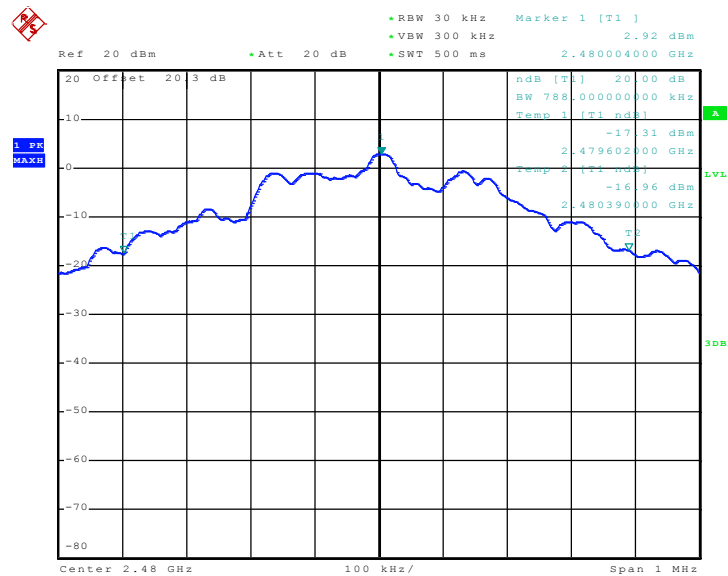


20 dB Bandwidth Plot on Channel 39



Date: 20.APR.2010 18:52:43

20 dB Bandwidth Plot on Channel 78



Date: 20.APR.2010 18:53:05

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.

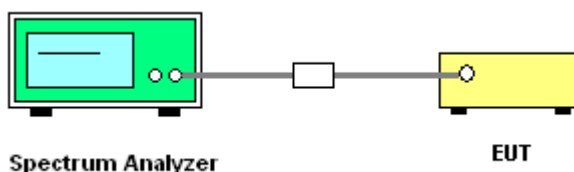
3.3.2 Measuring Instruments

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





Test Mode :	Mode 1, 2, 3	Temperature :	25~27℃	
Test Engineer :	Lancelot Chen	Relative Humidity :	47~50%	

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.004	0.525	Pass
39	2441	1.008	0.525	Pass
78	2480	1.000	0.525	Pass

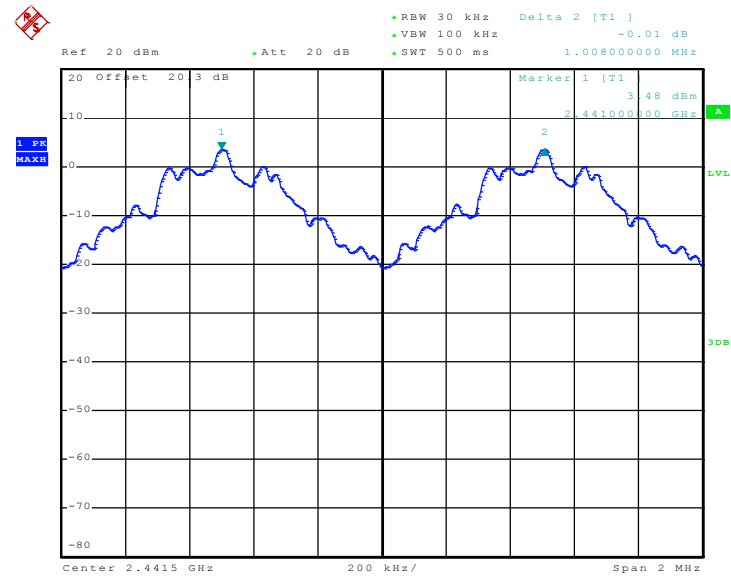
• RBW 30 kHz Delta 2 [T1]
 • VBW 100 kHz 0.02 dB
 • Att 20 dB 1.004000000 MHz
 • SWT 500 ms

Ref 20 dBm
 20 Offset 20 3 dB
 Marker 1 [T1] 3.66 dBm
 2.401996000 GHz
 1. PPK MAXM
 -80
 -70
 -60
 -50
 -40
 -30
 -20
 -10
 0
 10
 20
 Center 2.4025 GHz 200 kHz/ Span 2 MHz

Date: 20.APR.2010 18:54:18

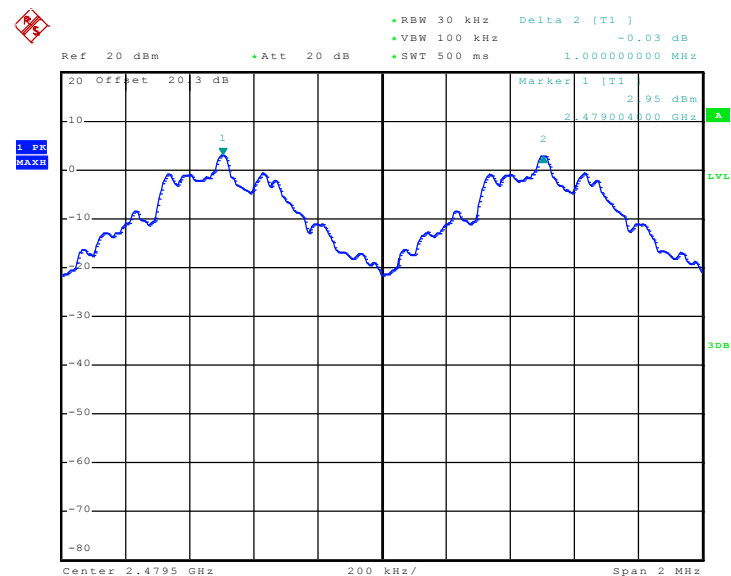


Channel Separation Plot on Channel 39 - 40



Date: 20.APR.2010 18:54:51

Channel Separation Plot on Channel 77 - 78



Date: 20.APR.2010 18:55:28

3.4 Dwell Time Measurement

3.4.1 Limit of Dwell Time

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

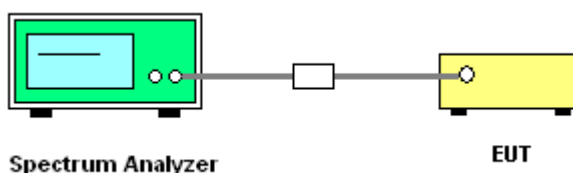
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

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

3.4.4 Test Setup



3.4.5 Test Result of Dwell Time

Test Mode :	Mode 2	Temperature :	25~27°C
Test Engineer :	Lancelot Chen	Relative Humidity :	47~50%

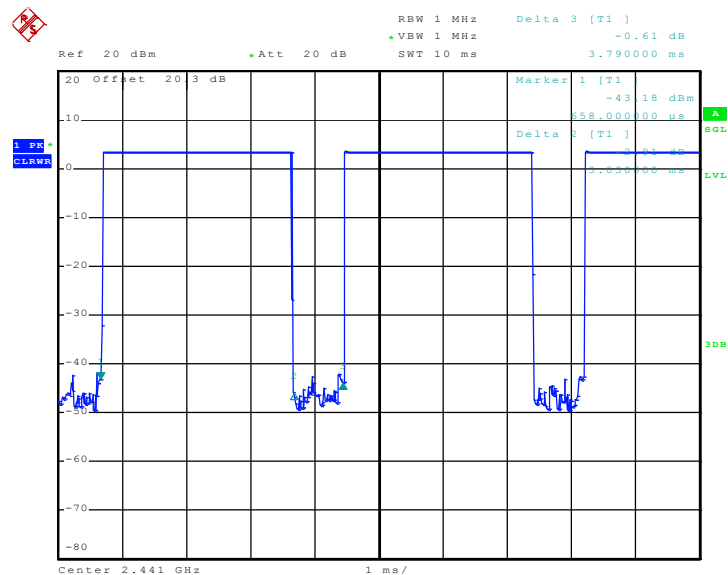
Package Mode	Average Hopping Channel	Package Transfer Time (usec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
DH5	3.30	3030.00	0.32	0.4	Pass

Remark:

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

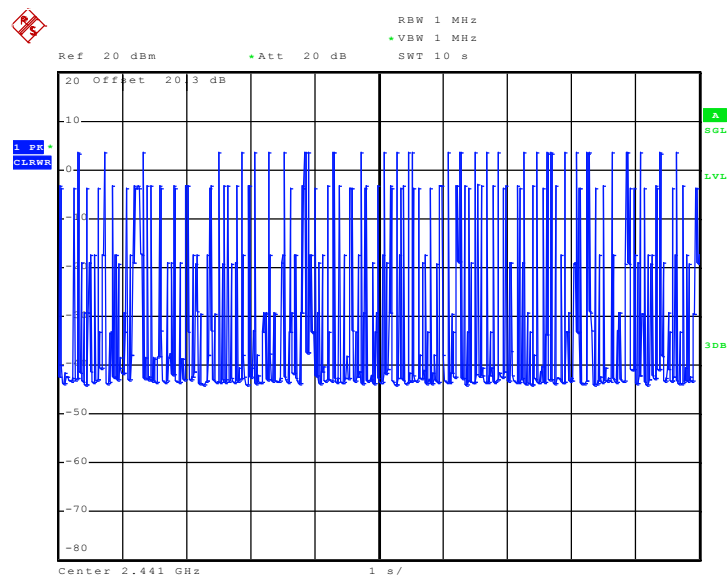


DH5 Dwell Time (One Pulse) Plot on Channel 39



Date: 20.APR.2010 19:04:18

DH5 Dwell Time (Count Pulses) Plot on Channel 39



Date: 20.APR.2010 19:06:04

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 employing at least 75 non-overlapping hopping channels: 1W (30 dBm).

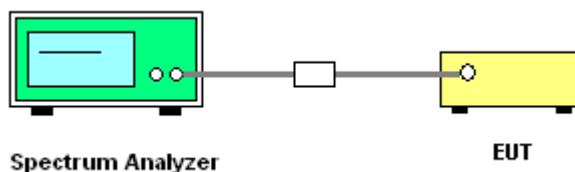
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

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

3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

Test Mode :	Mode 1, 2, 3	Temperature :	25~27°C
Test Engineer :	Lancelot Chen	Relative Humidity :	47~50%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	4.07	30	Pass
39	2441	3.86	30	Pass
78	2480	3.27	30	Pass



1. Pk
MAX

Ref 20 dBm Att 20 dB RBW 3 MHz VBW 3 MHz SWT 500 ms Marker 1 [T1] 4.07 dBm 2.40198000 GHz

Offset 20 dB

Center 2.402 GHz 500 kHz/ Span 5 MHz

Date: 20.APR.2010 18:39:58

Ref 20 dBm Att 20 dB RBW 3 MHz VBW 3 MHz SWT 500 ms

Marker 1 [T1] 3.86 dBm 2.440850000 GHz

Offset 20 dB

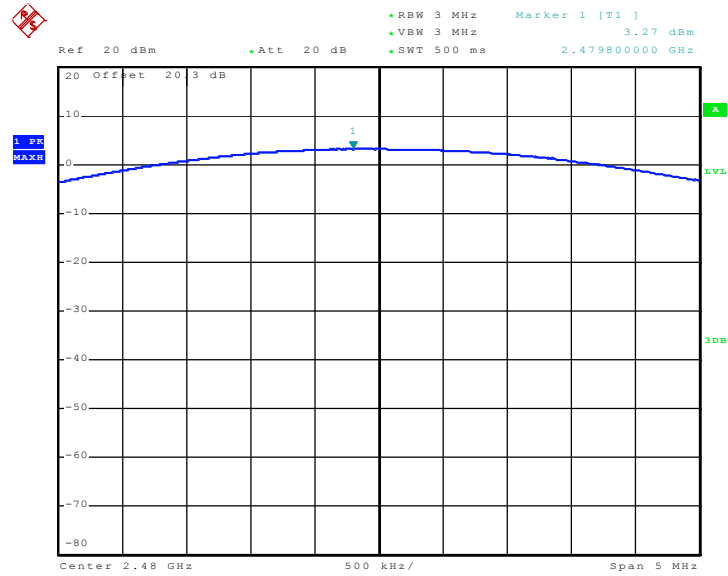
1 3.86 dBm

Center 2.441 GHz Span 5 MHz

Date: 20.APR.2010 18:40:28



Peak Output Power Plot on Channel 78



Date: 20.APR.2010 18:40:48

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

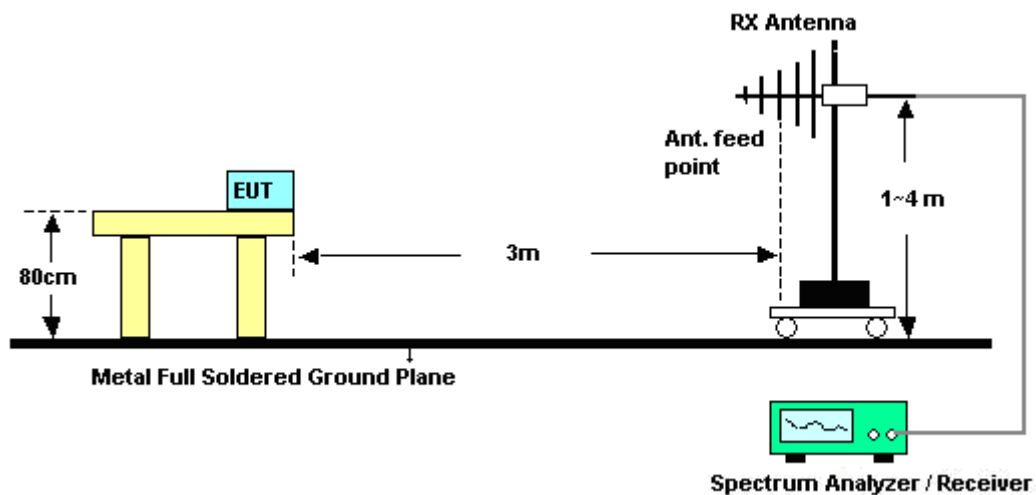
See list of measuring instruments of this test report.

3.6.3 Test Procedures

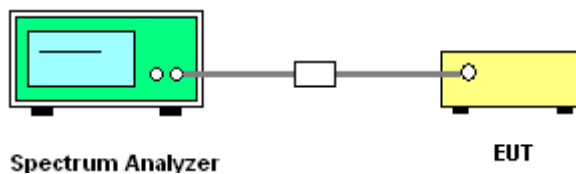
1. The testing follows the guidelines in ANSI C63.4-2003 and FCC Public Notice DA 00-705 Measurement Guidelines.
2. RF antenna conducted test: Set RBW = 300kHz, Video bandwidth (VBW) $\geq$ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band 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 :	22~24°C
Test Channel :	00	Relative Humidity :	48~49%
		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
2385.81	48.39	-25.61	74	44.95	32.13	5.46	34.15	104	2	Peak
2385.81	38	-16	54	34.56	32.13	5.46	34.15	104	2	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	46.35	-27.65	74	42.91	32.13	5.46	34.15	171	321	Peak
2385.81	35.48	-18.52	54	32.04	32.13	5.46	34.15	171	321	Average

Test Mode :	Mode 3	Temperature :	22~24°C
Test Channel :	78	Relative Humidity :	48~49%
		Test Engineer :	Ivan Jiang

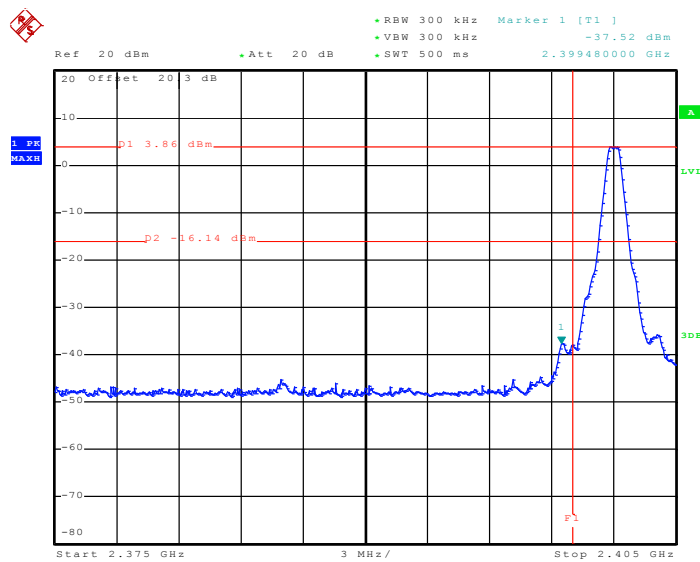
ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	61.92	-12.08	74	58.46	32.27	5.38	34.19	100	360	Peak
2483.5	50.62	-3.38	54	47.16	32.27	5.38	34.19	100	360	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
2483.5	55.49	-18.51	74	52.03	32.27	5.38	34.19	102	239	Peak
2483.5	45.54	-8.46	54	42.08	32.27	5.38	34.19	102	239	Average

3.6.6 Test Result of Conducted Band Edges

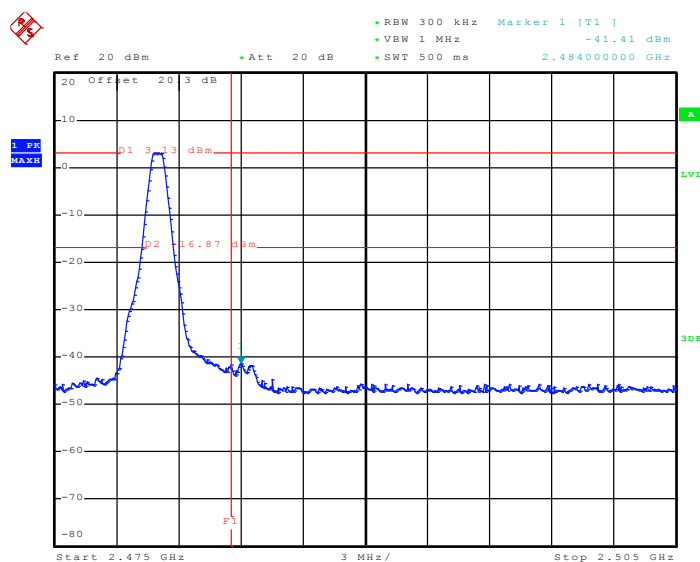
Test Mode :	Mode 1 and 3	Temperature :	25~27°C
Test Channel :	00 and 78	Relative Humidity :	47~50%
		Test Engineer :	Lancelot Chen

Low Band Edge Plot on Channel 00



Date: 20.APR.2010 18:56:51

High Band Edge Plot on Channel 78



Date: 20.APR.2010 19:00:21

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.

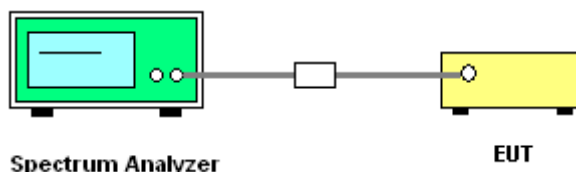
3.7.2 Measuring Instruments

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

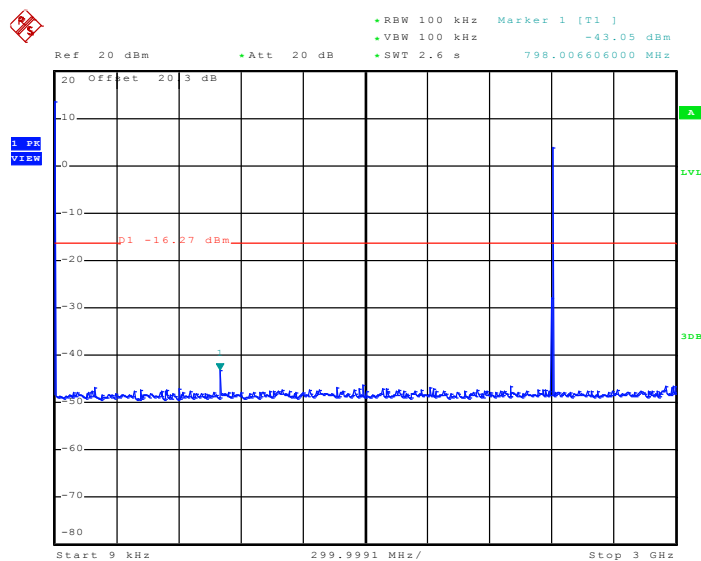




3.7.5 Test Result

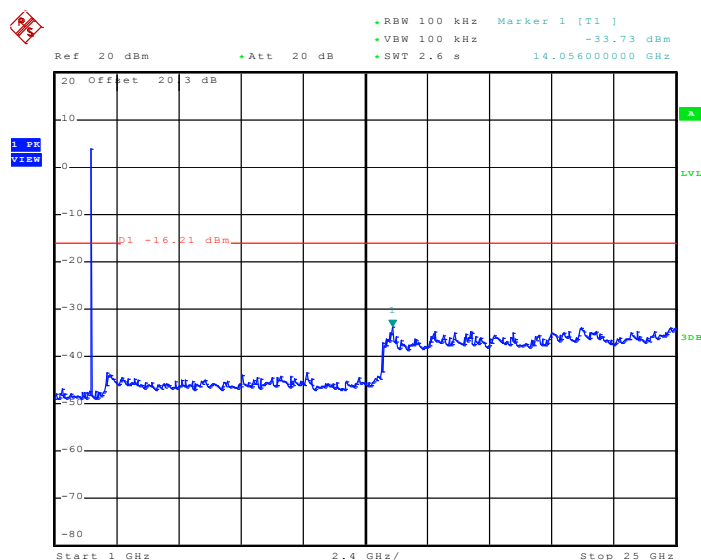
Test Mode :	Mode 1	Temperature :	25~27℃
Test Channel :	00	Relative Humidity :	47~50%
		Test Engineer :	Lancelot Chen

Conducted Spurious Emission Plot between 9 kHz ~ 3 GHz



Date: 20.APR.2010 19:55:17

Conducted Spurious Emission Plot between 1 GHz ~ 25 GHz

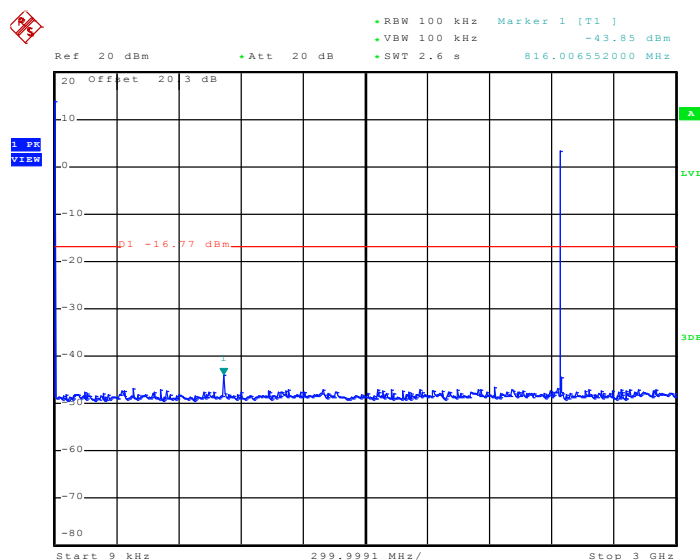


Date: 20.APR.2010 19:23:50



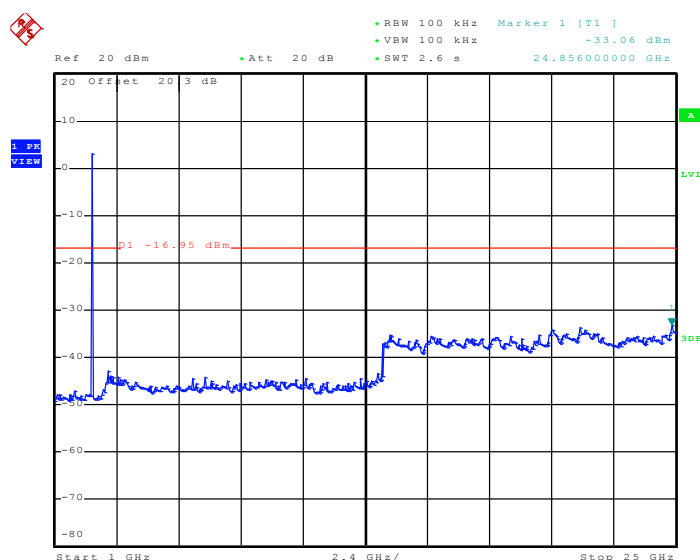
Test Mode :	Mode 2	Temperature :	25~27°C
Test Channel :	39	Relative Humidity :	47~50%
		Test Engineer :	Lancelot Chen

Conducted Spurious Emission Plot between 9 kHz ~ 3 GHz



Date: 20.APR.2010 19:56:59

Conducted Spurious Emission Plot between 1 GHz ~ 25 GHz

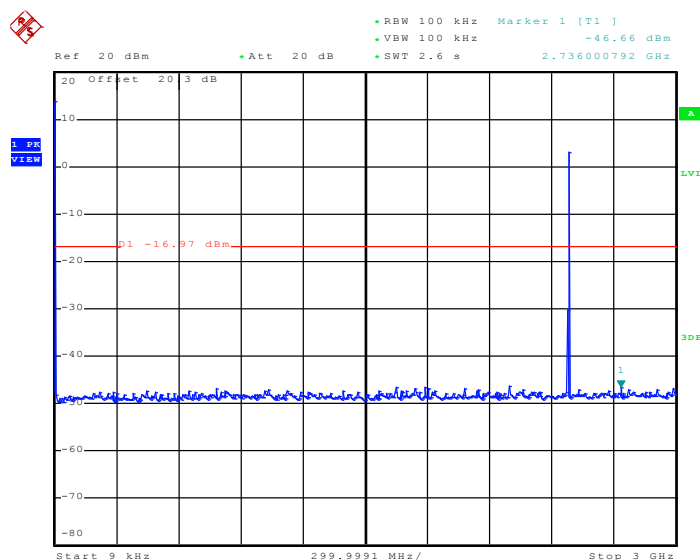


Date: 20.APR.2010 19:25:21



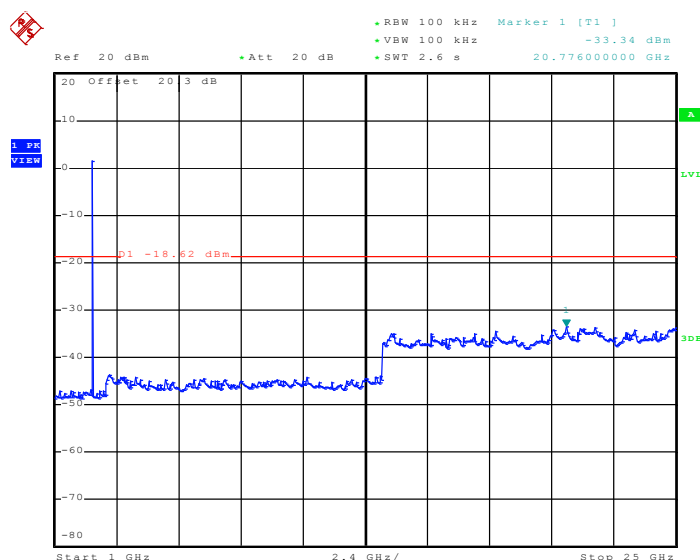
Test Mode :	Mode 3	Temperature :	25~27°C
Test Channel :	78	Relative Humidity :	47~50%
		Test Engineer :	Lancelot Chen

Conducted Spurious Emission Plot between 9 kHz ~ 3 GHz



Date: 20.APR.2010 19:26:18

Conducted Spurious Emission Plot between 1 GHz ~ 25 GHz



Date: 20.APR.2010 19:27:27

3.8 AC Conducted Emission Measurement

3.8.1 Limit of AC Conducted Emission

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

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

*Decreases with the logarithm of the frequency.

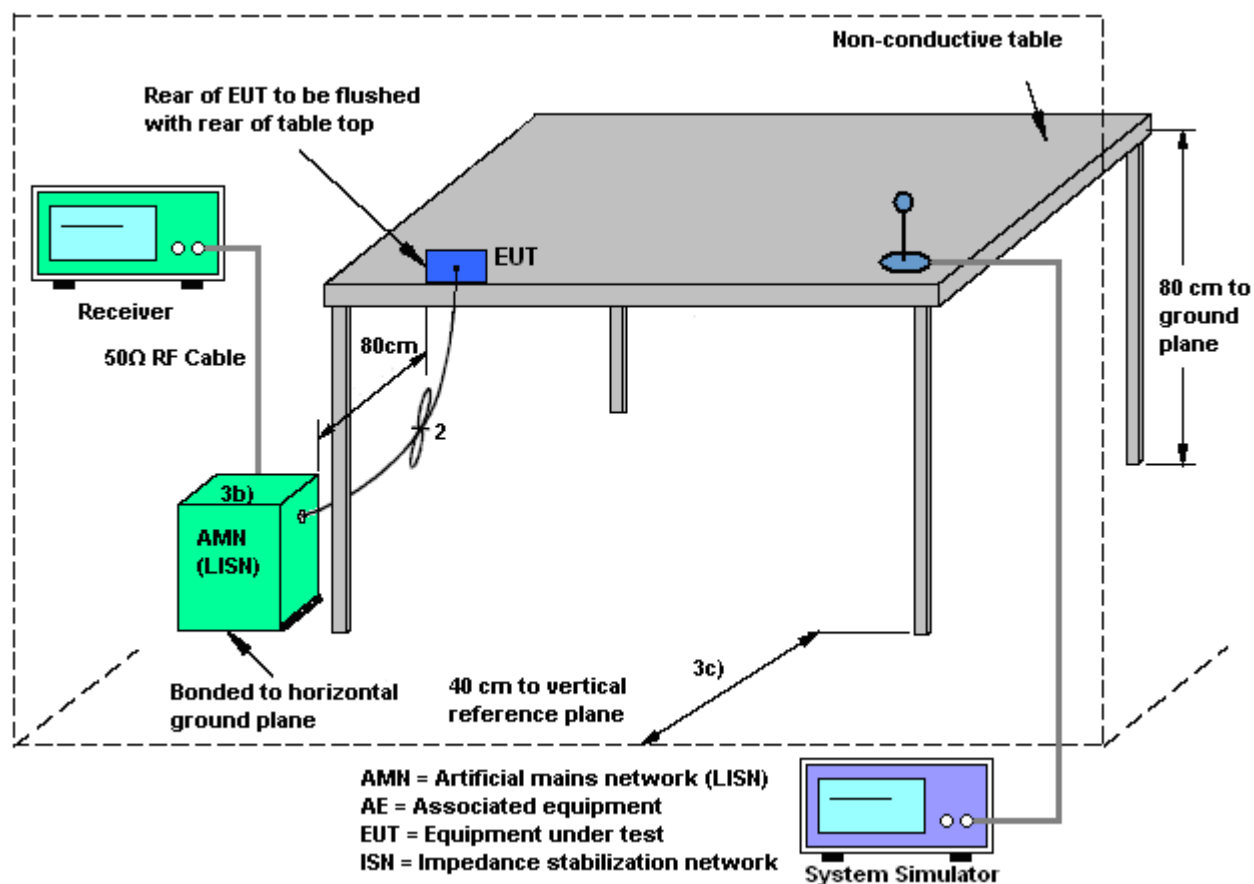
3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

3.8.3 Test Procedures

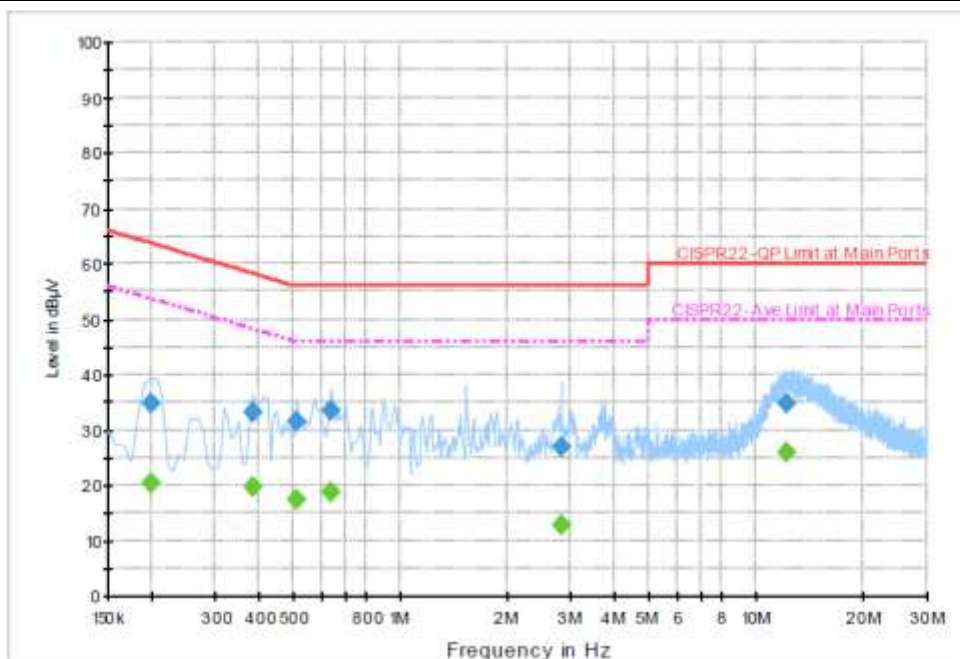
1. Please follow the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All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

3.8.4 Test Setup



3.8.5 Test Result of AC Conducted Emission

Test Mode :	Mode 2	Temperature :	20~22℃
Test Engineer :	Novic Jiang	Relative Humidity :	40~42%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Sample A + GSM1900 Idle + Bluetooth Link + WLAN Link + MPEG4 + Earphone + Adapter		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



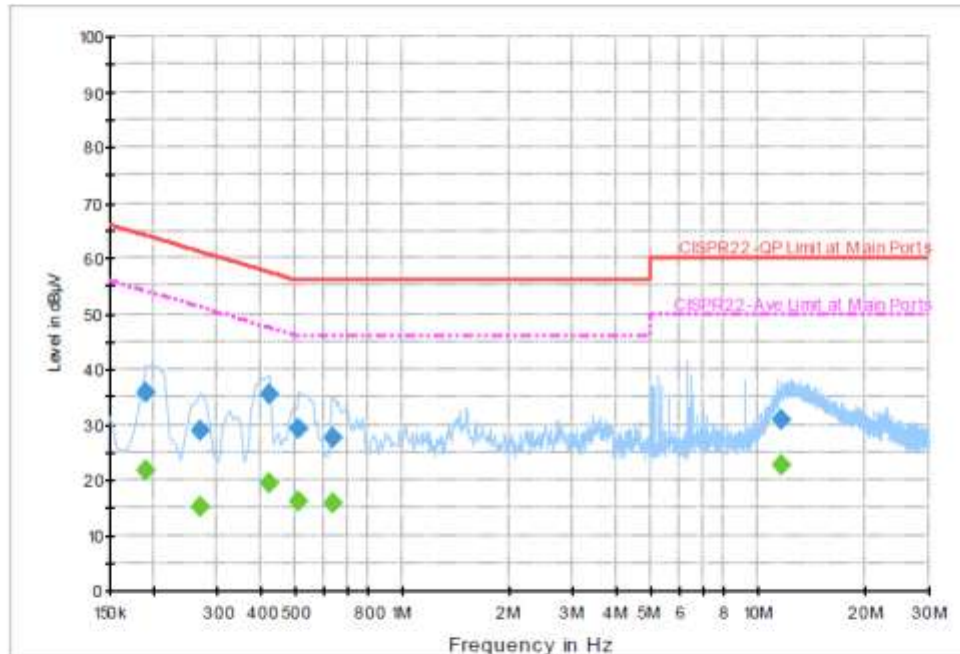
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	34.7	Off	L1	19.6	29.0	63.7
0.382000	33.2	Off	L1	19.5	25.0	58.2
0.510000	31.4	Off	L1	19.4	24.6	56.0
0.638000	33.6	Off	L1	19.5	22.4	56.0
2.822000	26.9	Off	L1	19.5	29.1	56.0
12.126000	34.8	Off	L1	19.6	25.2	60.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	20.4	Off	L1	19.6	33.3	53.7
0.382000	19.8	Off	L1	19.5	28.4	48.2
0.510000	17.3	Off	L1	19.4	28.7	46.0
0.638000	18.8	Off	L1	19.5	27.2	46.0
2.822000	12.6	Off	L1	19.5	33.4	46.0
12.126000	25.8	Off	L1	19.6	24.2	50.0

Test Mode :	Mode 2	Temperature :	20~22°C
Test Engineer :	Novic Jiang	Relative Humidity :	40~42%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Sample A + GSM1900 Idle + Bluetooth Link + WLAN Link + MPEG4 + Earphone + Adapter		
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)
0.190000	35.8	Off	N	19.5	28.2	64.0
0.270000	28.9	Off	N	19.4	32.2	61.1
0.422000	35.5	Off	N	19.4	21.9	57.4
0.510000	29.0	Off	N	19.4	27.0	56.0
0.638000	27.4	Off	N	19.5	28.6	56.0
11.558000	31.0	Off	N	19.6	29.0	60.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	21.7	Off	N	19.5	32.3	54.0
0.270000	15.0	Off	N	19.4	36.1	51.1
0.422000	19.4	Off	N	19.4	28.0	47.4
0.510000	15.9	Off	N	19.4	30.1	46.0
0.638000	15.7	Off	N	19.5	30.3	46.0
11.558000	22.6	Off	N	19.6	27.4	50.0

3.9 Radiated Emission Measurement

3.9.1 Limit of Radiated Emission

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

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

3.9.2 Measuring Instruments

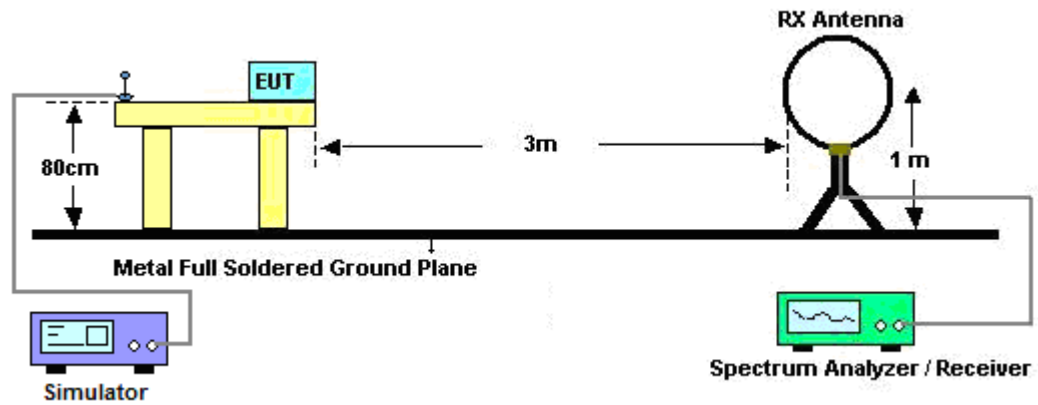
See list of measuring instruments of this test report.

3.9.3 Test Procedures

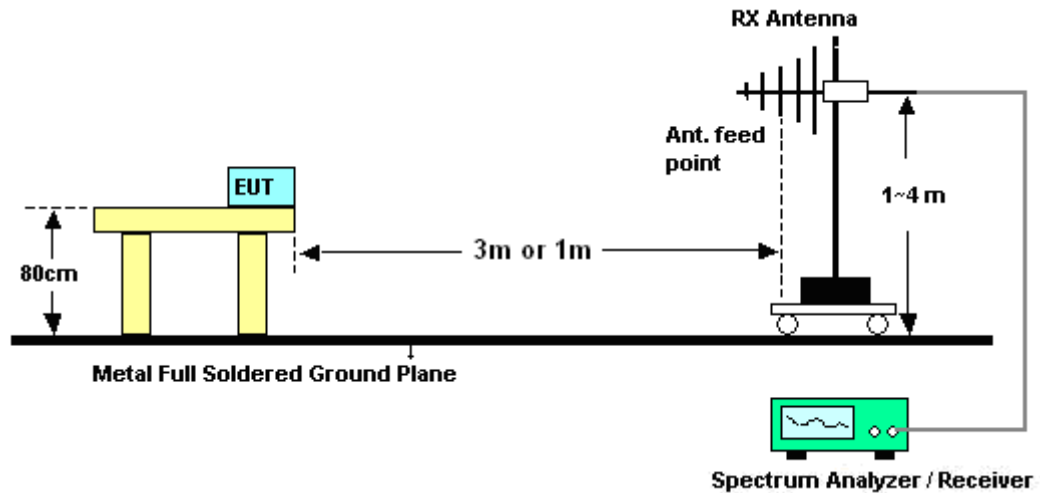
1. The testing follows the guidelines in FCC Public Notice DA 00-705 Measurement Guidelines.
2. Use the following spectrum analyzer settings:
 - (1) Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto;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

3.9.4 Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



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

Test Engineer :	Ivan Jiang	Temperature :	22~24°C	
		Relative Humidity :	48~49%	

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 :	22~24°C
Test Channel :	00	Relative Humidity :	48~49%
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
32.97	22.77	-17.23	40	35.69	17.84	0.71	31.47	-	-	Peak
81.3	20.46	-19.54	40	43.13	7.7	1.16	31.53	-	-	Peak
233.58	20.26	-25.74	46	38.83	10.78	2.08	31.43	-	-	Peak
478.5	25.46	-20.54	46	35.71	17.72	3.09	31.06	-	-	Peak
640.2	30.06	-15.94	46	36.95	20.38	3.61	30.88	-	-	Peak
719.3	33.8	-12.2	46	39.64	21.11	3.82	30.77	100	299	Peak
2385.81	48.39	-25.61	74	44.95	32.13	5.46	34.15	104	2	Peak
2385.81	38	-16	54	34.56	32.13	5.46	34.15	104	2	Average
2402	98.98	-	-	95.54	32.16	5.44	34.16	104	2	Peak
2402	86.38	-	-	82.95	32.13	5.46	34.16	104	2	Average
2500	31.39	-22.61	54	27.92	32.3	5.37	34.2	104	2	Average
2500	44.35	-29.65	74	40.88	32.3	5.37	34.2	104	2	Peak
8418	53.69	-20.31	74	42.67	36	10.12	35.1	100	196	Peak
8418	40.48	-13.52	54	29.46	36	10.12	35.1	100	196	Average



Test Mode :	Mode 1	Temperature :	22~24°C
Test Channel :	00	Relative Humidity :	48~49%
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
30	26.69	-13.31	40	37.96	19.51	0.68	31.46	-	-	Peak
92.37	25.62	-17.88	43.5	46.72	9.17	1.25	31.52	-	-	Peak
195.78	23.34	-20.16	43.5	44.09	8.85	1.89	31.49	-	-	Peak
640.2	39.17	-6.83	46	46.06	20.38	3.61	30.88	110	48	Peak
719.3	38.35	-7.65	46	44.19	21.11	3.82	30.77	-	-	Peak
799.8	34.19	-11.81	46	38.55	22.22	4.1	30.68	-	-	Peak
2385.81	46.35	-27.65	74	42.91	32.13	5.46	34.15	171	321	Peak
2385.81	35.48	-18.52	54	32.04	32.13	5.46	34.15	171	321	Average
2402	93.93	-	-	90.49	32.16	5.44	34.16	171	321	Peak
2402	82.86	-	-	79.43	32.13	5.46	34.16	171	321	Average
2492	31.37	-22.63	54	27.9	32.3	5.37	34.2	171	321	Average
2492	43.93	-30.07	74	40.46	32.3	5.37	34.2	171	321	Peak
8433	53.89	-20.11	74	42.86	36	10.13	35.1	100	88	Peak
8433	40.8	-13.2	54	29.77	36	10.13	35.1	100	88	Average



Test Mode :	Mode 2	Temperature :	22~24°C
Test Channel :	39	Relative Humidity :	48~49%
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
32.7	23.95	-16.05	40	36.87	17.84	0.71	31.47	-	-	Peak
180.66	17.2	-26.3	43.5	37.89	9.04	1.8	31.53	-	-	Peak
209.01	18.76	-24.74	43.5	39.31	8.97	1.95	31.47	-	-	Peak
601.7	29.96	-16.04	46	37.3	20.08	3.5	30.92	-	-	Peak
640.2	30.57	-15.43	46	37.46	20.38	3.61	30.88	-	-	Peak
719.3	33.7	-12.3	46	39.54	21.11	3.82	30.77	100	285	Peak
2380	44.89	-29.11	74	41.46	32.11	5.47	34.15	103	7	Peak
2380	33.22	-20.78	54	29.79	32.11	5.47	34.15	103	7	Average
2441	98.2	-	-	94.74	32.22	5.41	34.17	103	7	Peak
2441	85.93	-	-	82.48	32.22	5.41	34.18	103	7	Average
2486	43.98	-30.02	74	40.52	32.27	5.38	34.19	103	7	Peak
2486	31.66	-22.34	54	28.2	32.27	5.38	34.19	103	7	Average
8262	53.7	-20.3	74	42.78	36	10.02	35.1	100	271	Peak
8262	40.47	-13.53	54	29.55	36	10.02	35.1	100	271	Average



Test Mode :	Mode 2	Temperature :	22~24°C
Test Channel :	39	Relative Humidity :	48~49%
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
31.89	26.17	-13.83	40	38.53	18.4	0.7	31.46	-	-	Peak
92.37	23.3	-20.2	43.5	44.4	9.17	1.25	31.52	-	-	Peak
180.93	21.72	-21.78	43.5	42.41	9.03	1.81	31.53	-	-	Peak
640.2	39.02	-6.98	46	45.91	20.38	3.61	30.88	100	214	Peak
719.3	38.28	-7.72	46	44.12	21.11	3.82	30.77	-	-	Peak
881	35.97	-10.03	46	39.36	22.99	4.33	30.71	-	-	Peak
2390	44.95	-29.05	74	41.52	32.13	5.46	34.16	167	321	Peak
2390	32.65	-21.35	54	29.22	32.13	5.46	34.16	167	321	Average
2441	93.07	-	-	89.61	32.22	5.41	34.17	167	321	Peak
2441	81.76	-	-	78.31	32.22	5.41	34.18	167	321	Average
2486	44.15	-29.85	74	40.69	32.27	5.38	34.19	167	321	Peak
2486	31.38	-22.62	54	27.92	32.27	5.38	34.19	167	321	Average
8418	53.86	-20.14	74	42.84	36	10.12	35.1	100	96	Peak
8418	40.88	-13.12	54	29.86	36	10.12	35.1	100	96	Average



Test Mode :	Mode 3	Temperature :	22~24°C
Test Channel :	78	Relative Humidity :	48~49%
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
32.7	23.15	-16.85	40	36.07	17.84	0.71	31.47	-	-	Peak
53.49	18.36	-21.64	40	41.63	7.36	0.92	31.55	-	-	Peak
233.58	19.69	-26.31	46	38.26	10.78	2.08	31.43	-	-	Peak
576.5	29.14	-16.86	46	37.1	19.61	3.38	30.95	-	-	Peak
640.2	29.93	-16.07	46	36.82	20.38	3.61	30.88	-	-	Peak
719.3	33.87	-12.13	46	39.71	21.11	3.82	30.77	100	17	Peak
2388	45.49	-28.51	74	42.05	32.13	5.46	34.15	100	360	Peak
2388	34.34	-19.66	54	30.9	32.13	5.46	34.15	100	360	Average
2480	84.82	-	-	81.36	32.27	5.38	34.19	100	360	Average
2480	97.75	-	-	94.29	32.27	5.38	34.19	100	360	Peak
2483.5	61.92	-12.08	74	58.46	32.27	5.38	34.19	100	360	Peak
2483.5	50.62	-3.38	54	47.16	32.27	5.38	34.19	100	360	Average
8385	53.9	-20.1	74	42.9	36	10.1	35.1	100	137	Peak
8385	40.88	-13.12	54	29.88	36	10.1	35.1	100	137	Average



Test Mode :	Mode 3	Temperature :	22~24°C
Test Channel :	78	Relative Humidity :	48~49%
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
31.62	26.07	-13.93	40	38.43	18.4	0.7	31.46	-	-	Peak
98.58	24.25	-19.25	43.5	44.31	10.19	1.29	31.54	-	-	Peak
184.17	23.68	-19.82	43.5	44.38	8.99	1.83	31.52	-	-	Peak
601.7	36.39	-9.61	46	43.73	20.08	3.5	30.92	-	-	Peak
640.2	39.27	-6.73	46	46.16	20.38	3.61	30.88	122	141	Peak
719.3	38.03	-7.97	46	43.87	21.11	3.82	30.77	-	-	Peak
2382	45.67	-28.33	74	42.24	32.11	5.47	34.15	102	239	Peak
2382	32.45	-21.55	54	29.02	32.11	5.47	34.15	102	239	Average
2480	92.89	-	-	89.43	32.27	5.38	34.19	102	239	Peak
2480	79.77	-	-	76.31	32.27	5.38	34.19	102	239	Average
2483.5	55.49	-18.51	74	52.03	32.27	5.38	34.19	102	239	Peak
2483.5	45.54	-8.46	54	42.08	32.27	5.38	34.19	102	239	Average
8385	53.91	-20.09	74	42.91	36	10.1	35.1	100	99	Peak
8385	40.66	-13.34	54	29.66	36	10.1	35.1	100	99	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. 23, 2009	Jun. 22, 2010	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 17, 2009	Sep. 16, 2010	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	0846202	N/A	Sep. 10, 2009	Sep. 09, 2010	Conducted (TH02-HY)
EMI Test Receive	R&S	ESCS 30	100356	9KHz ~ 2.75GHz	Aug. 05, 2009	Aug. 04, 2010	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9kHz~30MHz	Nov. 30, 2009	Nov. 29, 2010	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9kHz~30MHz	Nov. 23, 2009	Nov. 22, 2010	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
System Simulator	R&S	CMU200	105934	N/A	Nov. 11, 2008	Nov. 10, 2010	Conduction (CO05-HY)
GPS Station	T&E	GS-50	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz ~ 1GHz	Oct. 31, 2009	Oct. 30, 2010	Radiation (03CH07-HY)
Spectrum Analyzer	R&S	FSP	101067	9KHz ~ 30GHz	Dec. 04, 2009	Dec. 03, 2010	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 20, 2009	Aug. 19, 2010	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz- 40GHz	Oct. 14, 2009	Oct. 13, 2010	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A02362	1GHz~ 26.5GHz	Dec.09,2009	Dec. 08, 2010	Radiation (03CH07-HY)
Pre Amplifier	COM-POWER	PA-103A	161241	10-1000MHz.32 dB.GAIN	Mar. 27, 2010	Mar. 26, 2011	Radiation (03CH07-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 KHz~30 MHz	May 22, 2008	May 21, 2010	Radiation (03CH07-HY)
Bluetooth Base Station	R&S	CBT32	100519	N/A	May 12, 2009	May 11, 2011	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 EP041004 as below.