

Avantronics Limited

Bluetooth Headset

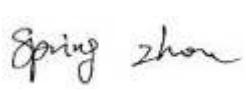
Model: 4G

3 June, 2011
Report No.: 11021393
(This report supersedes NONE)



Modifications made to the product : None

This Test Report is Issued Under the Authority of:

	
Peter Cai Compliance Engineer	Spring Zhou Technical Manager

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Test result presented in this test report is applicable to the representative sample only.



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Title: RF Test Report for Bluetooth Headset
Model: 4G
To: FCC 15.247:2010, RSS-210 Issue 8 December 2010

Serial#: 11021393
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Laboratory Introduction

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Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC , RF/Wireless , Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless , Telecom
Taiwan	BSMI , NCC , NIST	EMC, RF, Telecom , Safety
Hong Kong	OFTA , NIST	RF/Wireless , Telecom
Australia	NATA, NIST	EMC, RF, Telecom , Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF , Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC , RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom , Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC , RF , Telecom
Canada	IC FCB , NIST	EMC , RF , Telecom
Singapore	iDA, NIST	EMC , RF , Telecom
EU	NB	EMC & R&TTE Directive



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1 Executive Summary & EUT information

The purpose of this test programme was to demonstrate compliance of the Avantronics Limited, Bluetooth Headset, and model: 4G against the current Stipulated Standards. The Bluetooth Headset has demonstrated compliance with the FCC 15.247:2010, RSS-210 Issue 8 December 2010.

EUT Information

EUT Description	: The Avantalk 4G is a new Bluetooth mono headset from the Avantalk family. It delivers clear voice transmission and high quality sound and with Multipoint Technology, your headset seamlessly transforms into a powerful communication solution for up to two Bluetooth devices. The Avantalk 4G is stylish and lightweight for all-day use and comfort in wearing.
Model No	: 4G (Note)
Serial No	: N/A
Input Power	: DC5.0V 300 ~ 500mA
Classification	
Per Stipulated Test Standard	: Spread Spectrum System/Device

Note:

The other model is AH381, circuit and PCB LAYOUT exactly the same only the appearance of different colors and models.



2 TECHNICAL DETAILS

Purpose	Compliance testing of Bluetooth Headset with stipulated standard
Applicant / Client	Avantronics Limited Unit 1903,Shenhua Commercial Building, No.2018 Jiabin Road,Luohu District,Shenzhen,China.
Manufacturer	Avantronics Limited Unit 1903,Shenhua Commercial Building, No.2018 Jiabin Road,Luohu District,Shenzhen,China.
Laboratory performing the tests	SIEMIC Nanjing (China) Laboratories NO.2-1,Longcang Dadao, Yuhua Economic Development Zone, Nanjing, China Tel:+86(25)86730128/86730129 Fax:+86(25)86730127 Email:info@siemic.com
Test report reference number	11021393
Date EUT received	30 May, 2011
Standard applied	FCC 15.247:2010, RSS-210 Issue 8 December 2010
Dates of test (from – to)	31 May to 3 June, 2011
No of Units :	#1
Equipment Category :	Spread Spectrum System/Device
Trade Name :	Avantalk
Model :	4G
RF Operating Frequency (ies)	2402MHz-2480MHz
Number of Channels :	79
Modulation :	GFSK, $\pi/4$ DPSK, 8DPSK
FCC ID :	WJ5-4GAH381
IC ID :	8475A-4G



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3 MODIFICATION

NONE

4 TEST SUMMARY

The product was tested in accordance with the following specifications.
 All testing has been performed according to below product classification:

Spread Spectrum System/Device

Test Results Summary

Test Standard		Description	Pass / Fail
47 CFR Part 15.247:2010	RSS-210 Issue 8 December 2010		
15.203		Antenna Requirement	Pass
15.205	RSS210(A8.5)	Restricted Band of Operation	Pass
15.207(a)	RSSGen(7.2.2)	Conducted Emissions Voltage	Pass
15.247(a)(1)	RSS210(A8.1)	Channel Separation	Pass
15.247(a)(1)	RSS210(A8.1)	Occupied Bandwidth	Pass
15.247(a)(2)	RSS210(A8.1)	Bandwidth	Pass
15.247(a)(1)(i)	RSS210(A8.1)	Number of Hopping Channels	Pass
15.247(a)(1)(i)	RSS210(A8.1)	Time of Occupancy	Pass
15.247(b)(2)	RSS210(A8.4)	Output Power	Pass
15.247(c)	RSS210(A8.4)	Antenna Gain > 6 dBi	N/A
15.247(d)	RSS210(A8.5)	Conducted Spurious Emissions	Pass
15.209,15.247(d)	RSS210(A8.5)	Radiated Spurious Emissions	Pass
15.247(e)	RSS210(A8.3)	Power Spectral Density	N/A
15.247(f)	RSS210(A8.3)	Hybrid System Requirement	N/A
15.247(g)	RSS210(A8.1)	Hopping Capability	Pass
15.247(h)	RSS210(A8.1)	Hopping Coordination Requirement	Pass
15.247(i)	RSSGen(A5.5)	RF Exposure requirement	Pass
15.247(d)		100KHz Bandwidth of Frequency Band Edge	Pass
	RSSGen(A4.8)	Receiver Spurious Emissions	Pass

ANSI C63.4: 2009/RSS-Gen Issue 2:2007

PS: All measurement uncertainties are not taken into consideration for all presented test result.



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5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 Antenna Requirement

Requirement(s): 47 CFR §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

- a) Antenna must be permanently attached to the device.
- b) Antenna must use a unique type of connector to attach to the device.
- c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

The antenna is integral antenna, antenna gain is 2dBi.



5.2 Conducted Emissions Voltage

Requirement:

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	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.

Procedures:

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±3.5dB.
4.

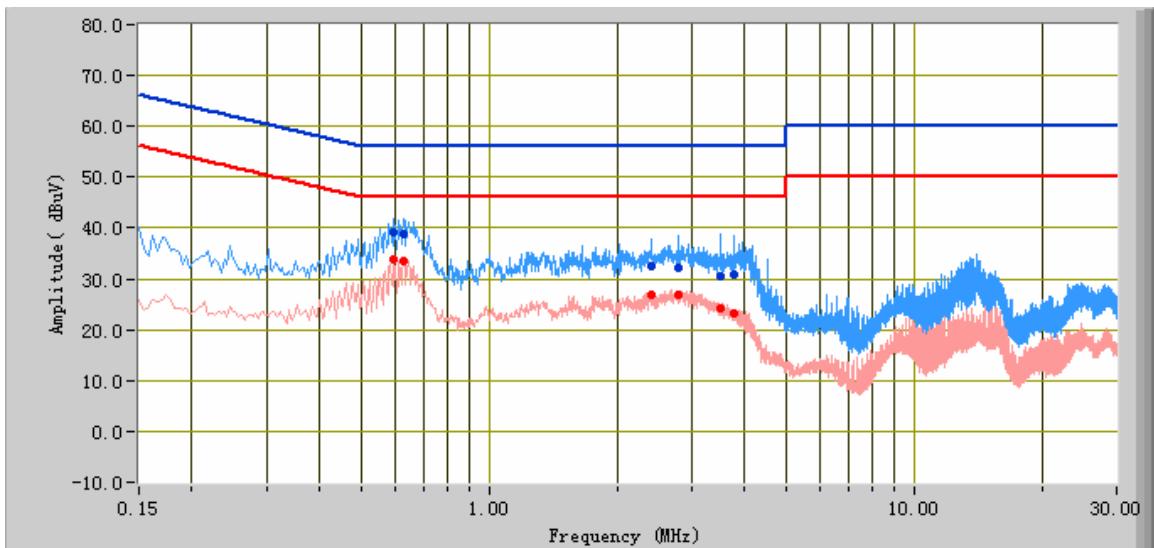
Environmental Conditions	Temperature	23°C
	Relative Humidity	50%
	Atmospheric Pressure	1019mbar
5. Test date : 3 June, 2011
Tested By : Peter Cai

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Peak Detector**Quasi Peak Limit****Average Detector****Average Limit**

Test Data

LINE

Frequency (MHz)	Quasi Peak (dBuV)	Limit (dBuV)	Margin (dB)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Factors (dB)
0.63	38.88	56.00	-17.12	33.67	46.00	-12.33	10.14
0.60	39.18	56.00	-16.82	33.75	46.00	-12.25	10.15
3.52	30.42	56.00	-25.58	24.23	46.00	-21.77	10.36
2.79	32.30	56.00	-23.70	26.70	46.00	-19.30	10.20
3.77	30.78	56.00	-25.22	23.26	46.00	-22.74	10.44
2.41	32.42	56.00	-23.58	26.82	46.00	-19.18	10.20

Peak Detector



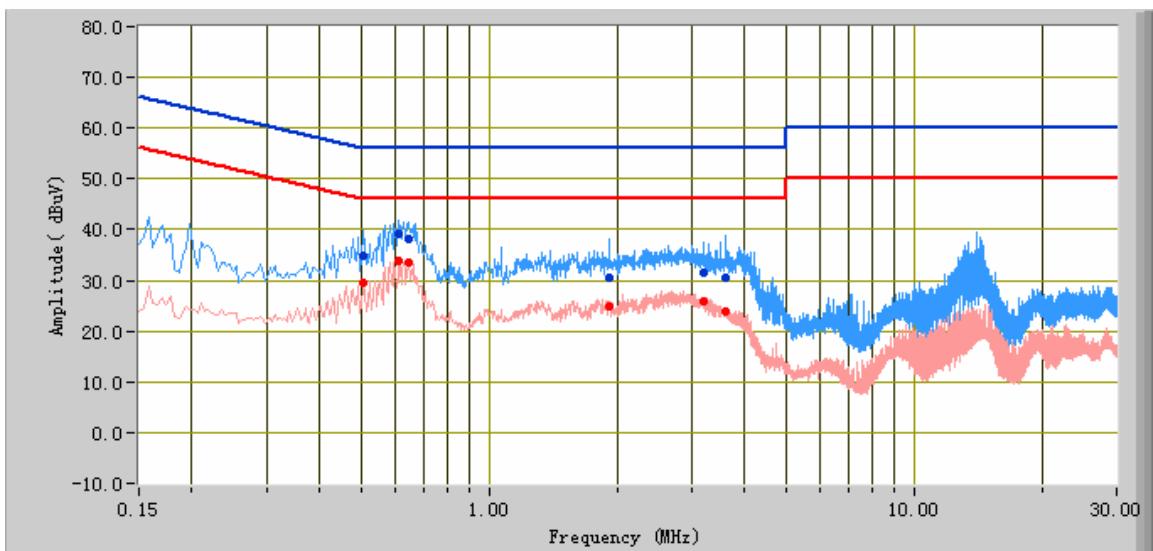
Quasi Peak Limit



Average Detector



Average Limit



Test Data

NEUTRAL

Frequency (MHz)	Quasi Peak (dBuV)	Limit (dBuV)	Margin (dB)	Average (dBuV)	Limit (dBuV)	Margin (dB)	Factors (dB)
0.61	39.04	56.00	-16.96	33.76	46.00	-12.24	10.14
0.65	38.31	56.00	-17.69	33.63	46.00	-12.37	10.13
0.51	34.71	56.00	-21.29	29.59	46.00	-16.41	10.17
3.62	30.55	56.00	-25.45	23.86	46.00	-22.14	10.39
1.92	30.40	56.00	-25.60	24.79	46.00	-21.21	10.20
3.21	31.36	56.00	-24.64	25.88	46.00	-20.12	10.27

5.3 Channel Separation

1. Conducted Measurement

EUT was set for low, mid, high channel with modulated mode and highest RF output power. The spectrum analyzer was connected to the antenna terminal.

2.	Environmental Conditions	Temperature	22°C
		Relative Humidity	50%
		Atmospheric Pressure	1019mbar

3. Conducted Emissions Measurement Uncertainty

All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ± 1.5 dB.

4. Test date : 1 June, 2011

Tested By : Peter Cai

Requirement(s): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Procedures: The Channel Separation was measured conducted using a spectrum analyzer at low, mid, and hi channels.

Configuration: Bluetooth Mode, Basic Rate

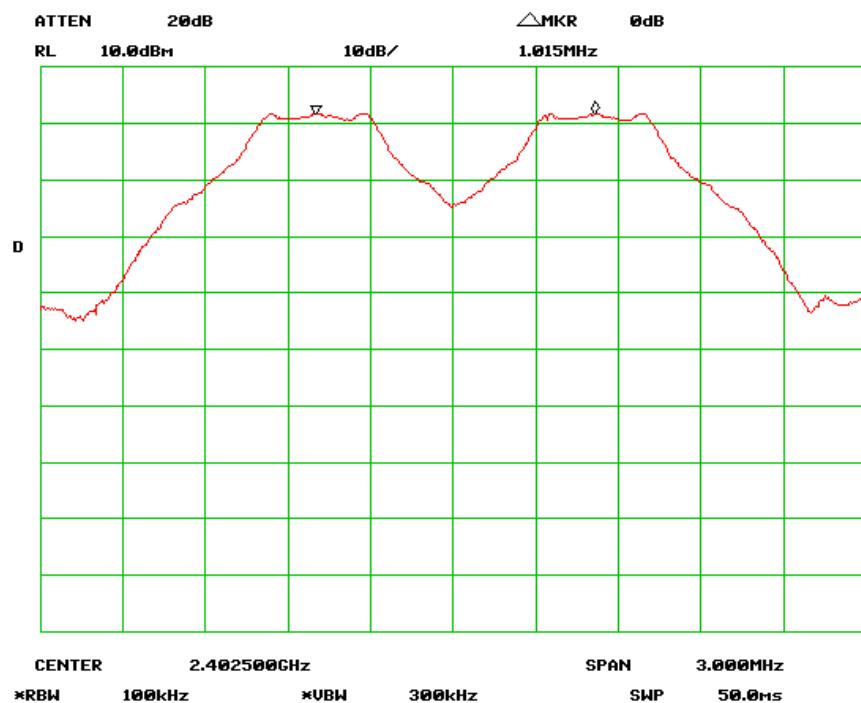
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	2/3 20dB Bandwidth (MHz)
Low	2402	1.015	0.590
Mid	2441	1.015	0.597
High	2480	1.015	0.590

Configuration: Bluetooth Mode, EDR 3Mbps

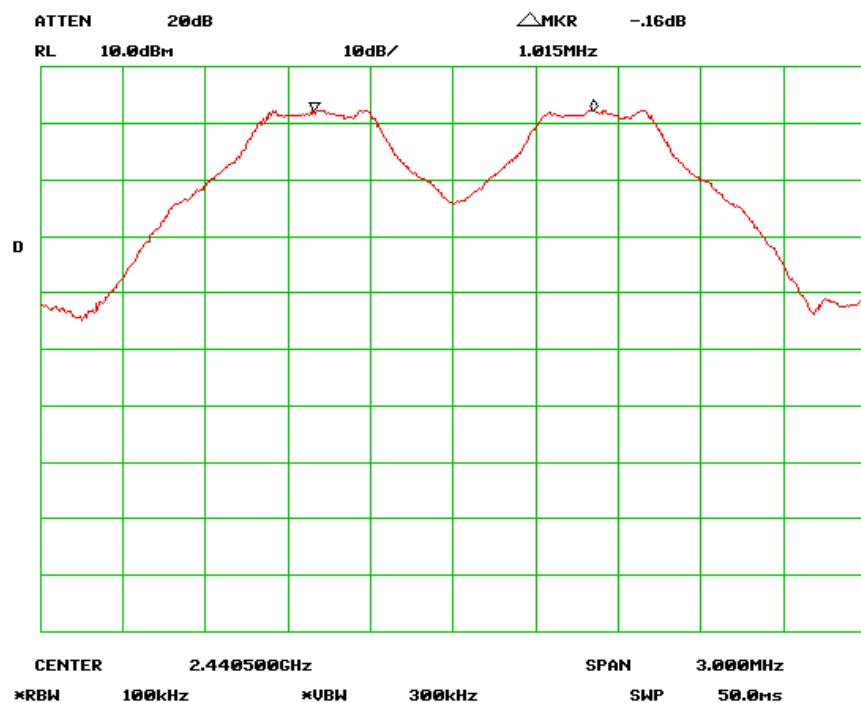
Channel	Channel Frequency (MHz)	Channel Separation (MHz)	2/3 20dB Bandwidth (MHz)
Low	2402	1.008	0.863
Mid	2441	1.017	0.870
High	2480	1.017	0.867

Refer to the attached plots.

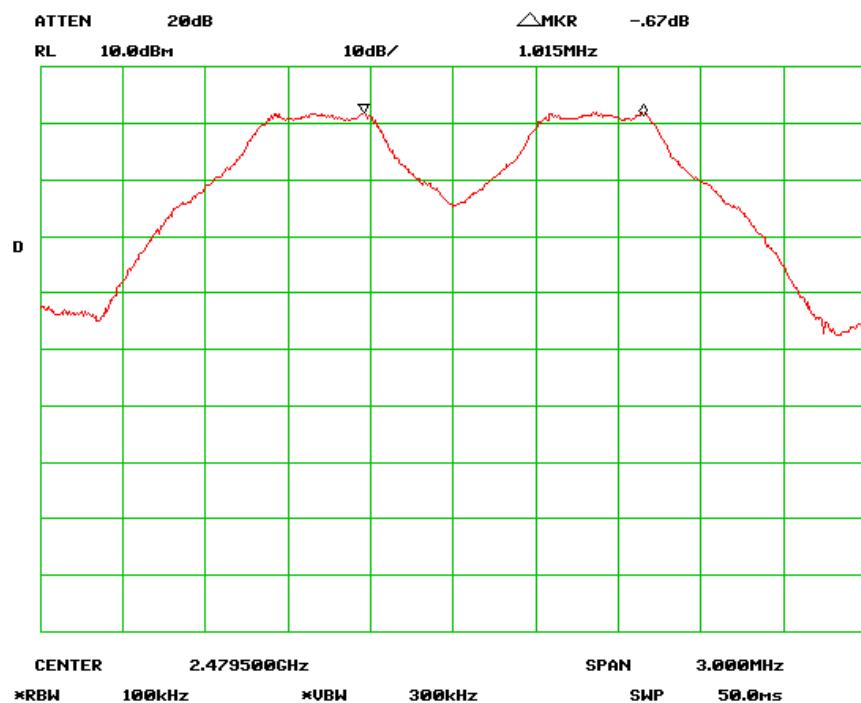
Channel Separation - Low Channel (Basic Rate)



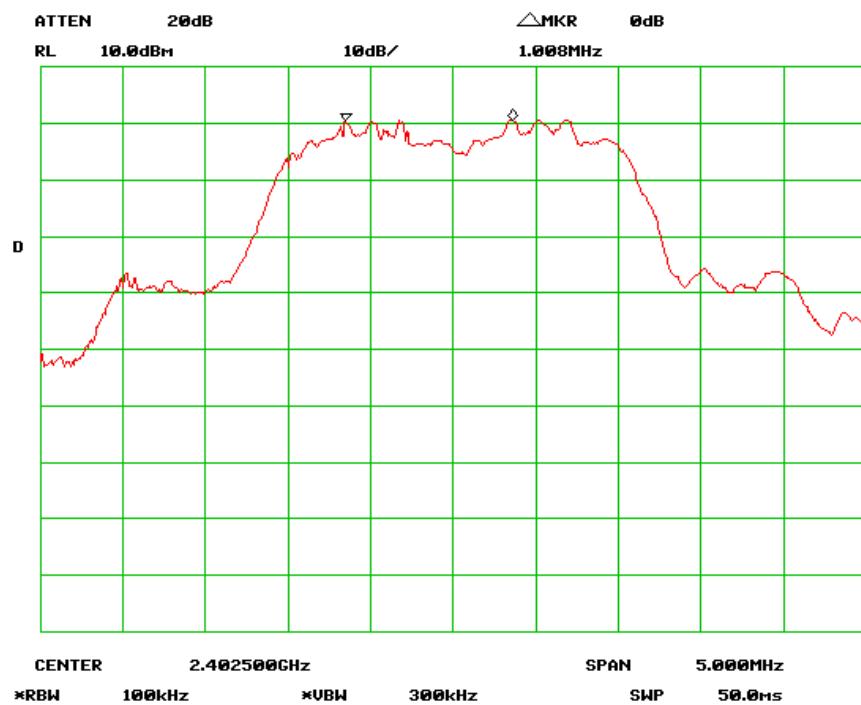
Channel Separation – Mid Channel (Basic Rate)



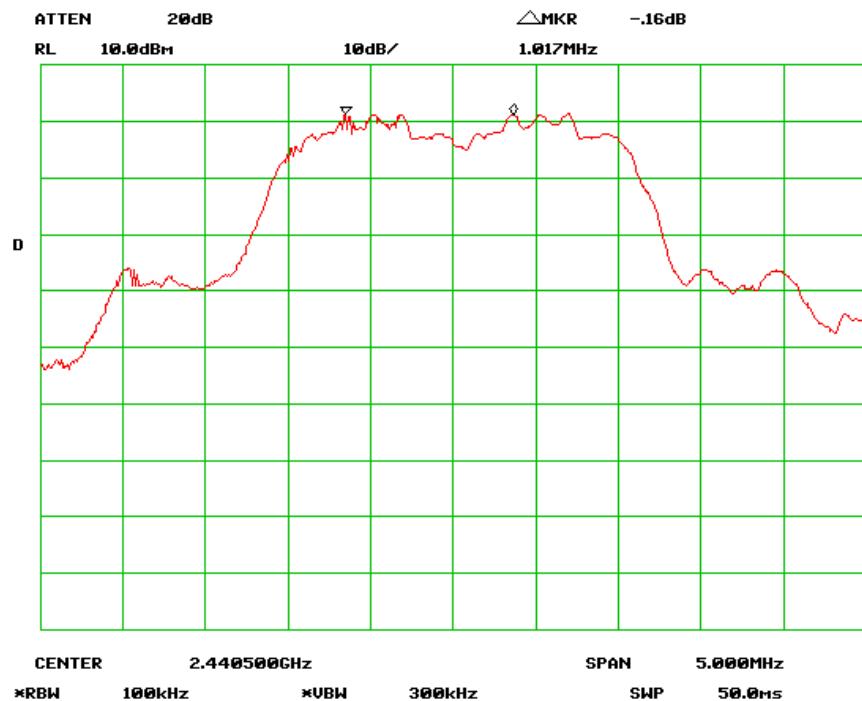
Channel Separation – High Channel (Basic Rate)



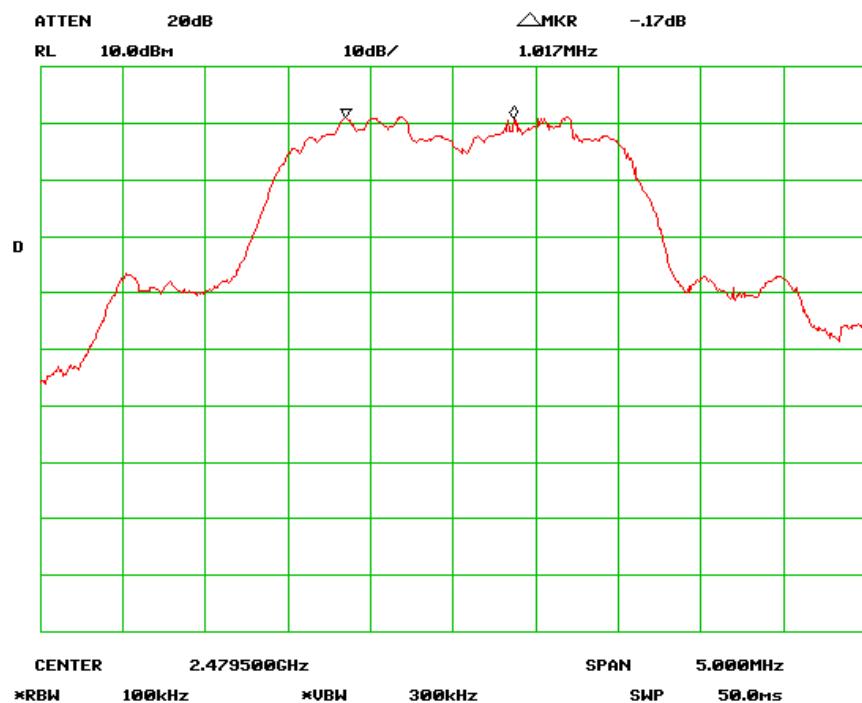
Channel Separation - Low Channel (EDR 3Mbps)



Channel Separation – Mid Channel (EDR 3Mbps)



Channel Separation – High Channel (EDR 3Mbps)



5.4 20dB & 99% Occupied Bandwidth

1. Conducted Measurement

EUT was set for low, mid, high channel with modulated mode and highest RF output power. The spectrum analyzer was connected to the antenna terminal.

2.	Environmental Conditions	Temperature	22°C
		Relative Humidity	50%
		Atmospheric Pressure	1019mbar

3. Conducted Emissions Measurement Uncertainty

All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is $\pm 1.5\text{dB}$.

4. Test date : 1 June, 2011

Tested By : Peter Cai

Requirement(s): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Procedures: The 20dB bandwidths were measured conducted using a spectrum analyzer at low, mid, and hi channels.

Configuration: Bluetooth Mode, Basic Rate

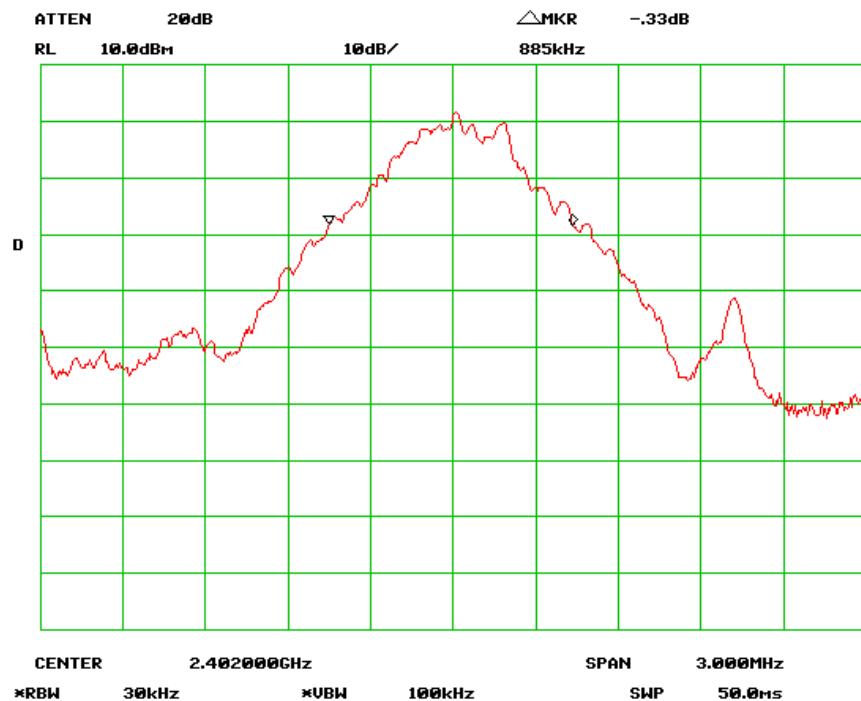
Channel	Channel Frequency (MHz)	20 dB Channel Bandwidth (KHz)	99% Channel Bandwidth (KHz)
Low	2402	885	865
Mid	2441	895	865
High	2480	885	870

Configuration: Bluetooth Mode, EDR 3Mbps

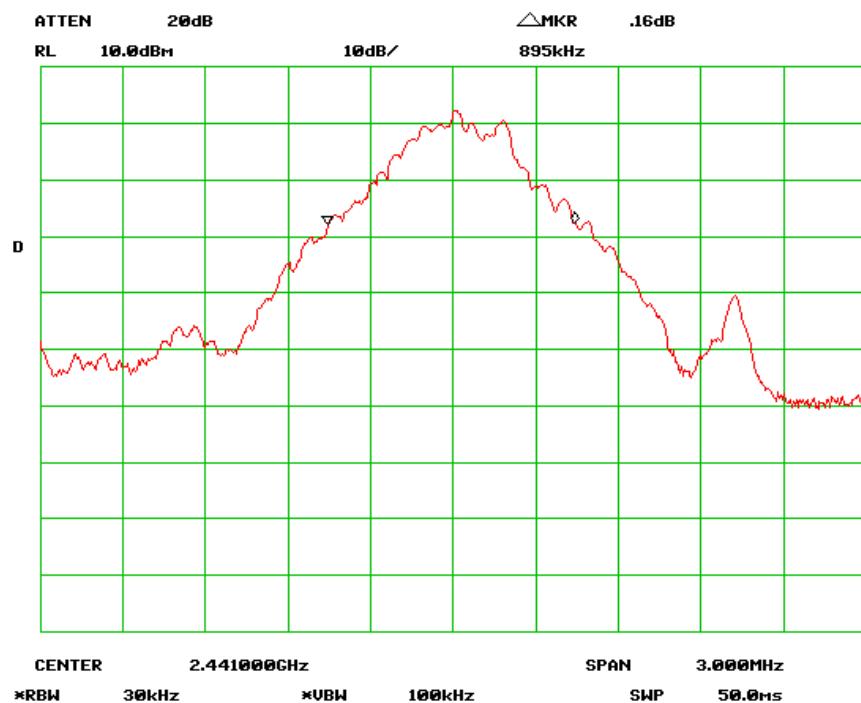
Channel	Channel Frequency (MHz)	20 dB Channel Bandwidth (KHz)	99% Channel Bandwidth (KHz)
Low	2402	1295	1230
Mid	2441	1305	1225
High	2480	1300	1215

Refer to the attached plots.

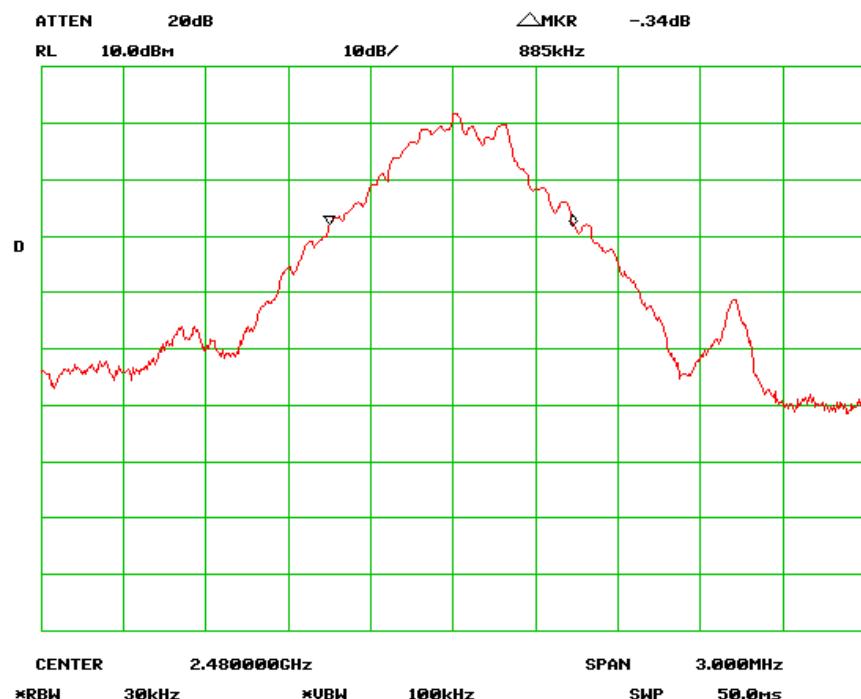
20 dB Bandwidth - Low Channel (Basic Rate)



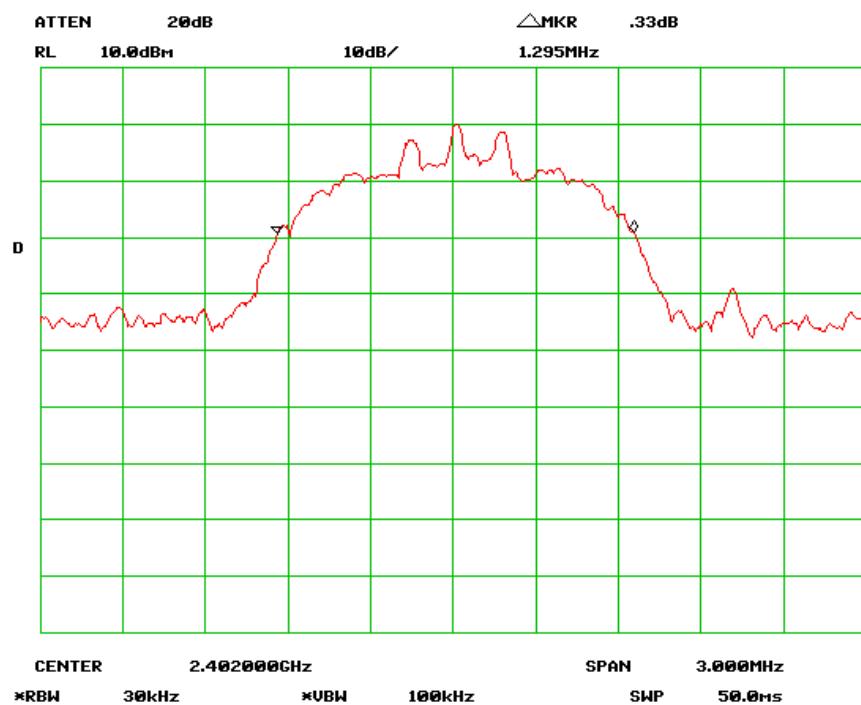
20 dB Bandwidth - Mid Channel (Basic Rate)



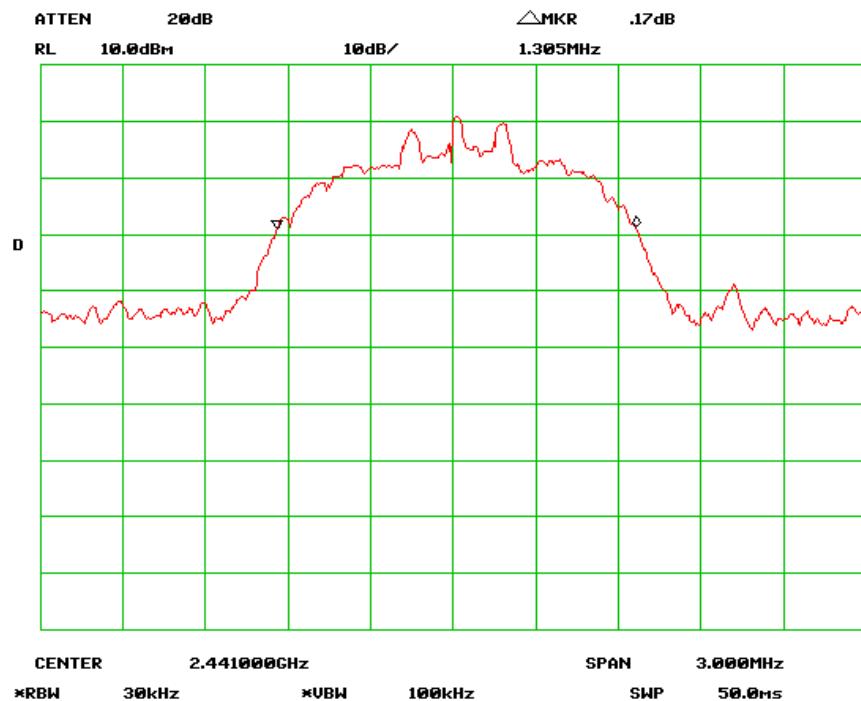
20 dB Bandwidth - High Channel (Basic Rate)



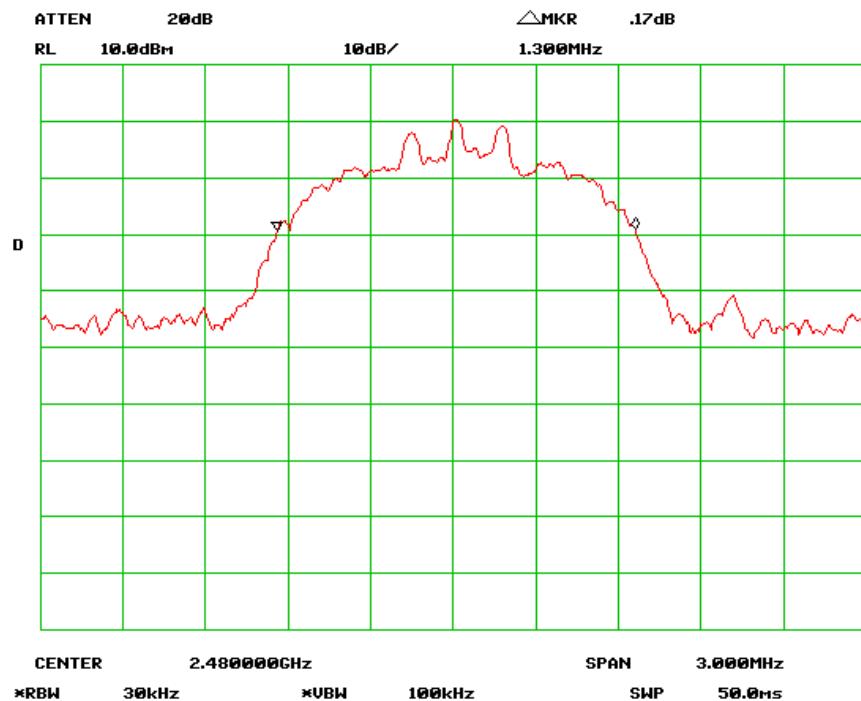
20 dB Bandwidth - Low Channel (EDR 3Mbps)



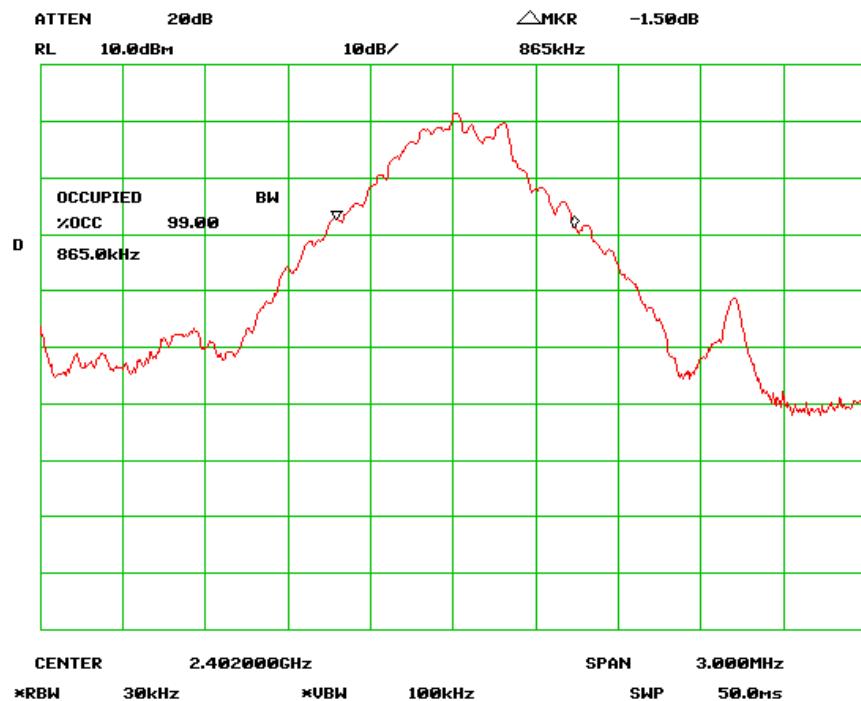
20 dB Bandwidth - Mid Channel (EDR 3Mbps)



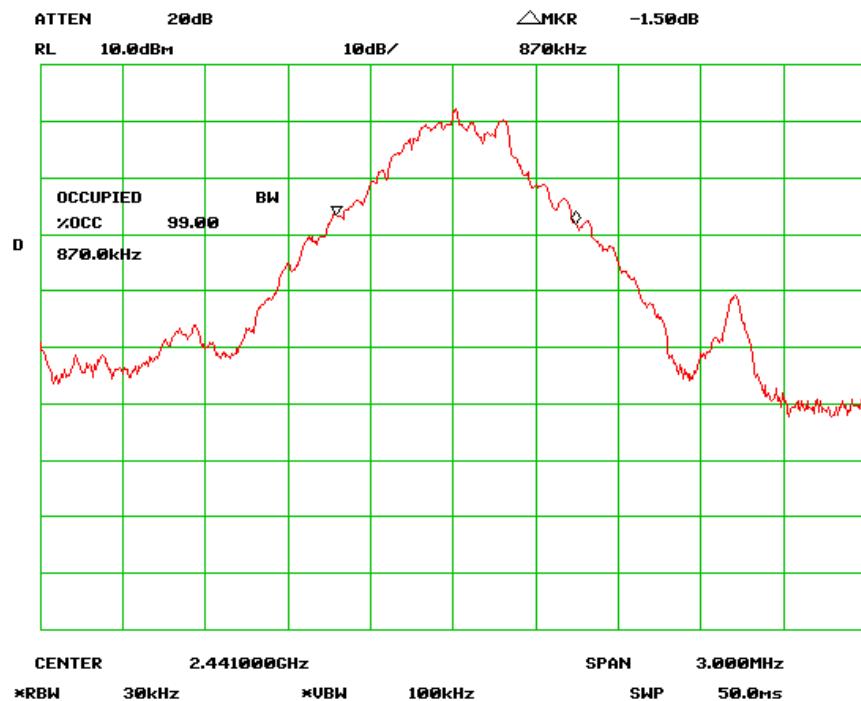
20 dB Bandwidth - High Channel (EDR 3Mbps)



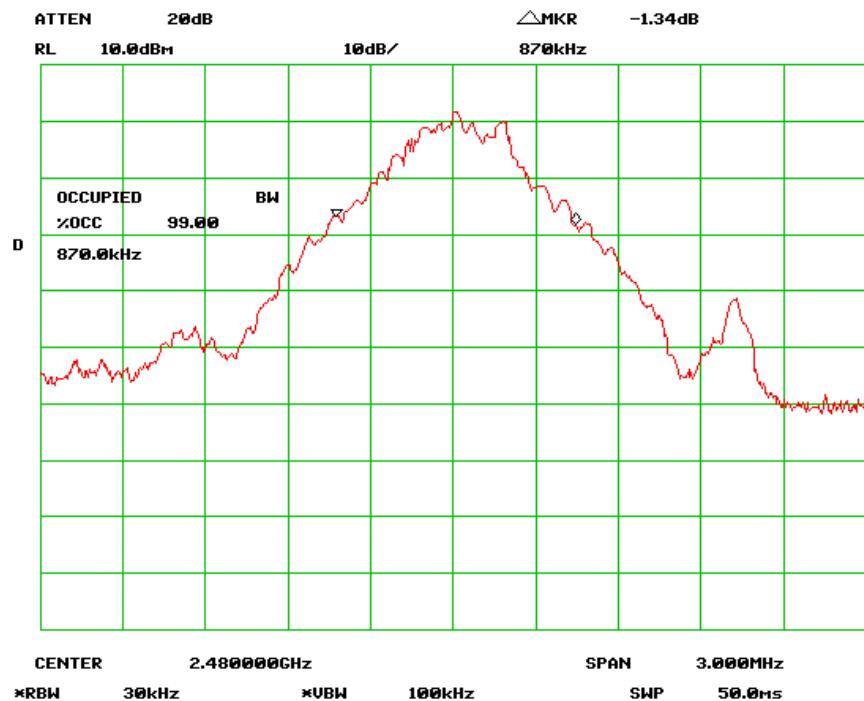
99% Occupied Bandwidth - Low Channel (Basic Rate)



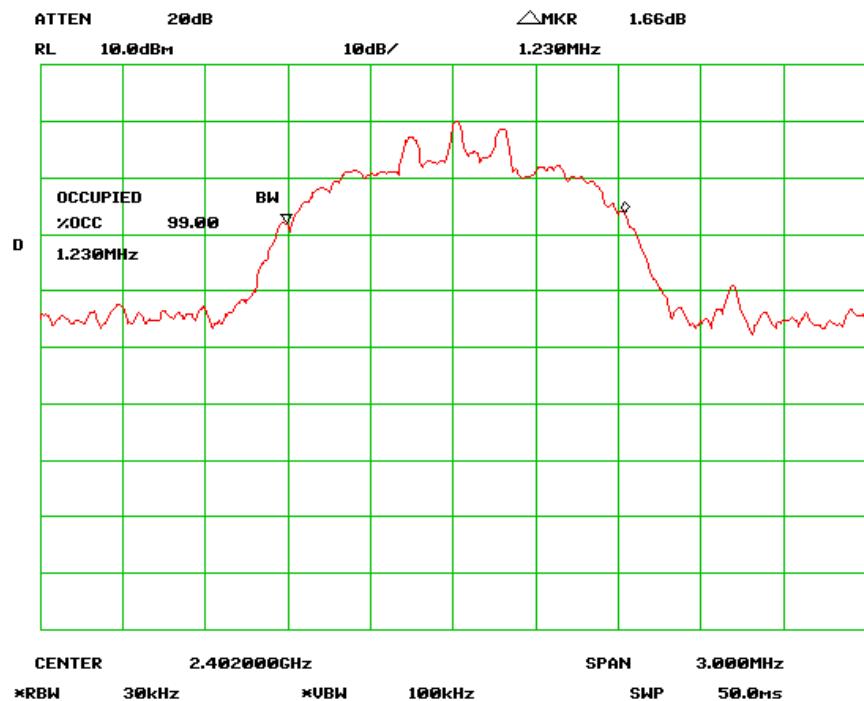
99% Occupied Bandwidth - Mid Channel (Basic Rate)



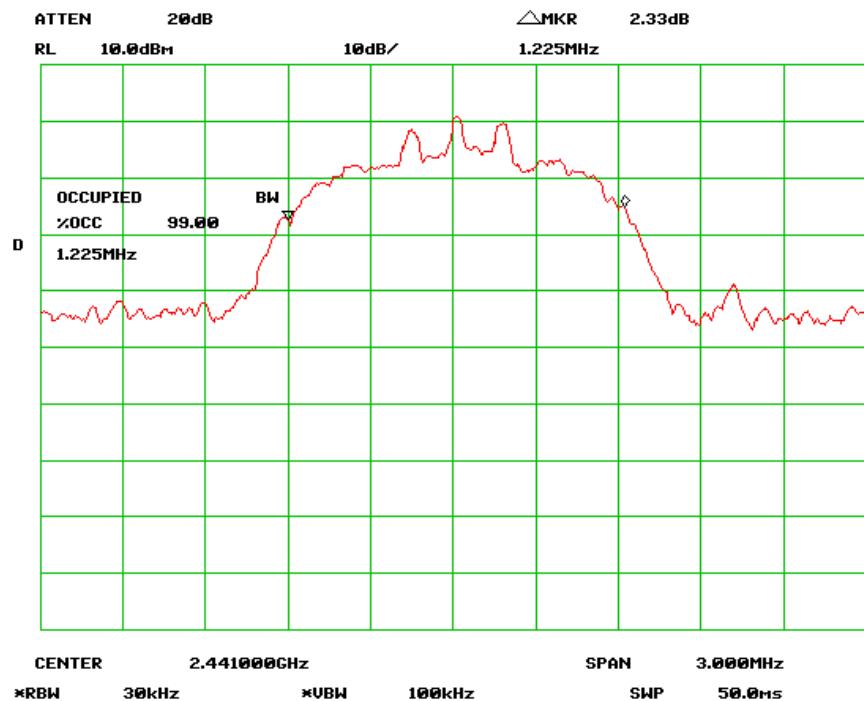
99% Occupied Bandwidth - High Channel (Basic Rate)



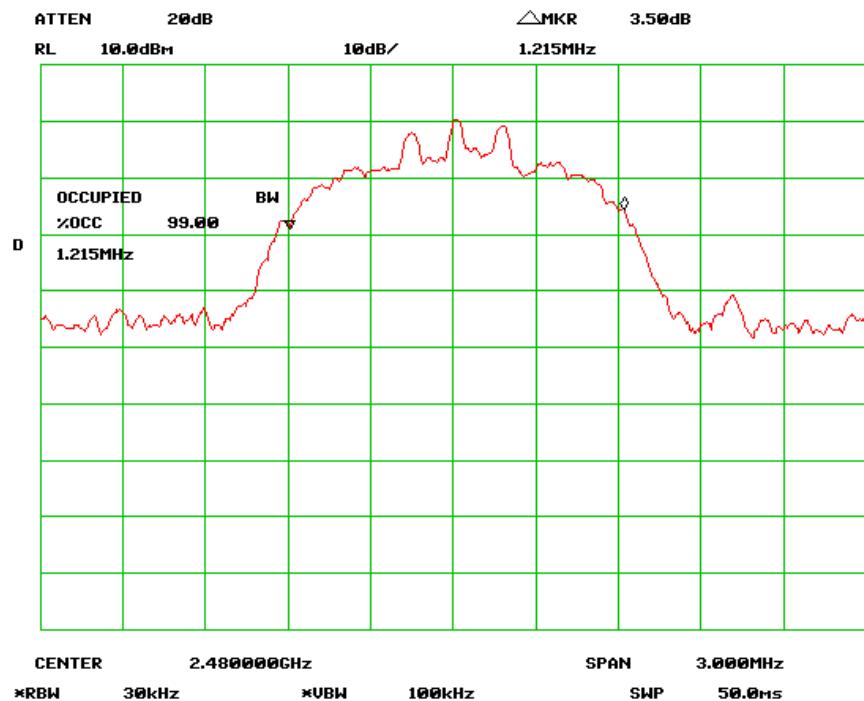
99% Occupied Bandwidth - Low Channel (EDR 3Mbps)



99% Occupied Bandwidth - Mid Channel (EDR 3Mbps)



99% Occupied Bandwidth - High Channel (EDR 3Mbps)



5.5 Number of Hopping Channel

1. Conducted Measurement
EUT was set for low, mid, high channel with modulated mode and highest RF output power. The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is $\pm 1.5\text{dB}$.
3. Environmental Conditions
Temperature 22°C
Relative Humidity 50%
Atmospheric Pressure 1019mbar
4. Test date : 1 June, 2011
Tested By : Peter Cai

Standard Requirement:

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

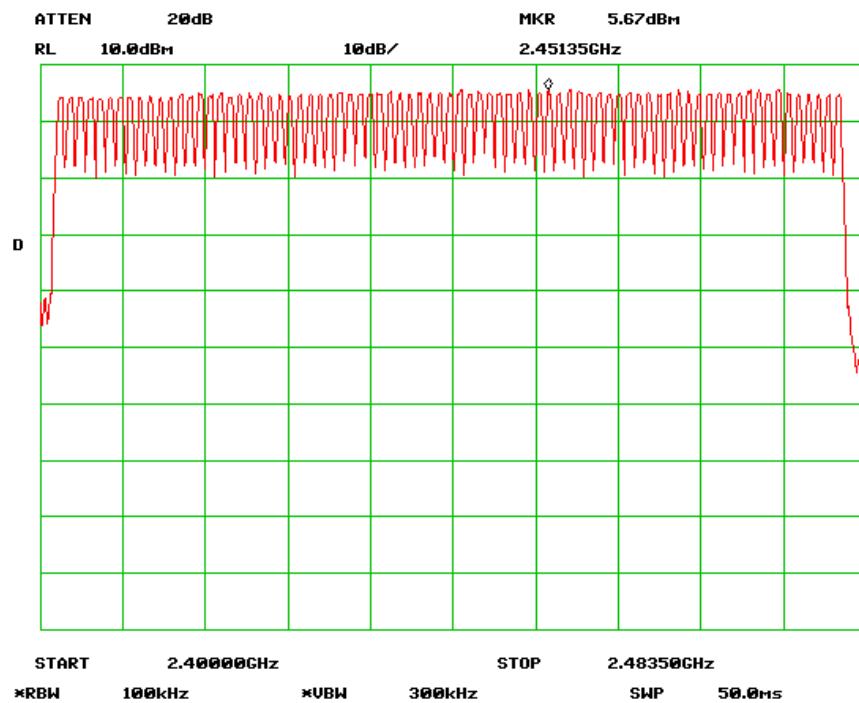
Procedures: The Number of Hopping Channel measurement was taken conducted using a spectrum analyzer.

RBW=100 KHz, VBW > RBW

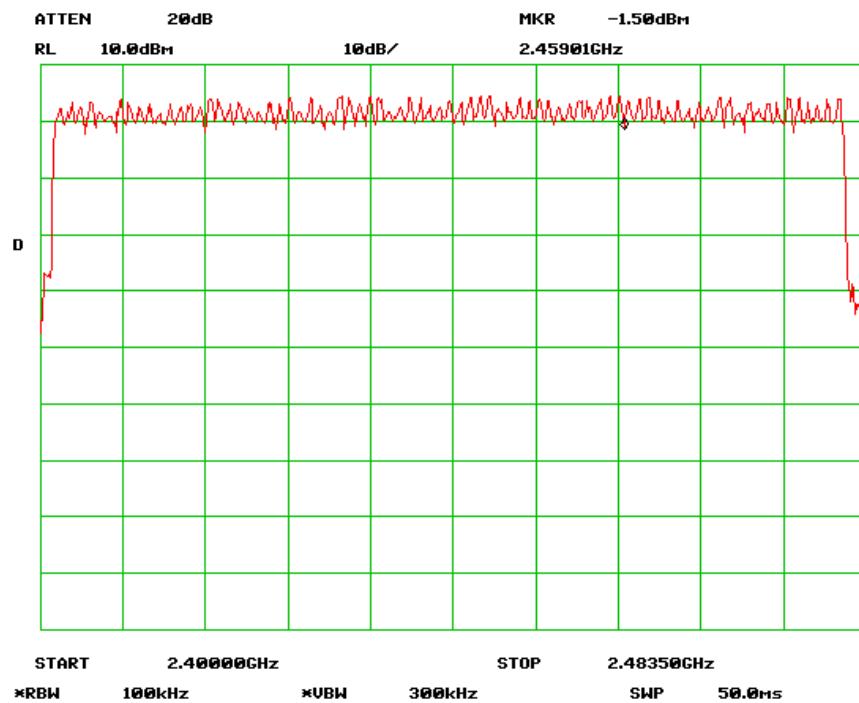
Test Result:

Total Channel: 79 Channels

Number of Hopping Channel (Bluetooth Mode Basic Rate)



Number of Hopping Channel (Bluetooth Mode EDR 3Mbps)



5.6 Time of Occupancy

1. Conducted Measurement
 EUT was set for low, mid, high channel with modulated mode and highest RF output power.
 The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
 All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is ± 1.5 dB.
3. Environmental Conditions

Temperature	22°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar
4. Test date : 1 June, 2011
 Tested By : Peter Cai

Standard Requirement:

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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used

Procedures: The Time of Occupancy measurement was taken conducted using a spectrum analyzer.

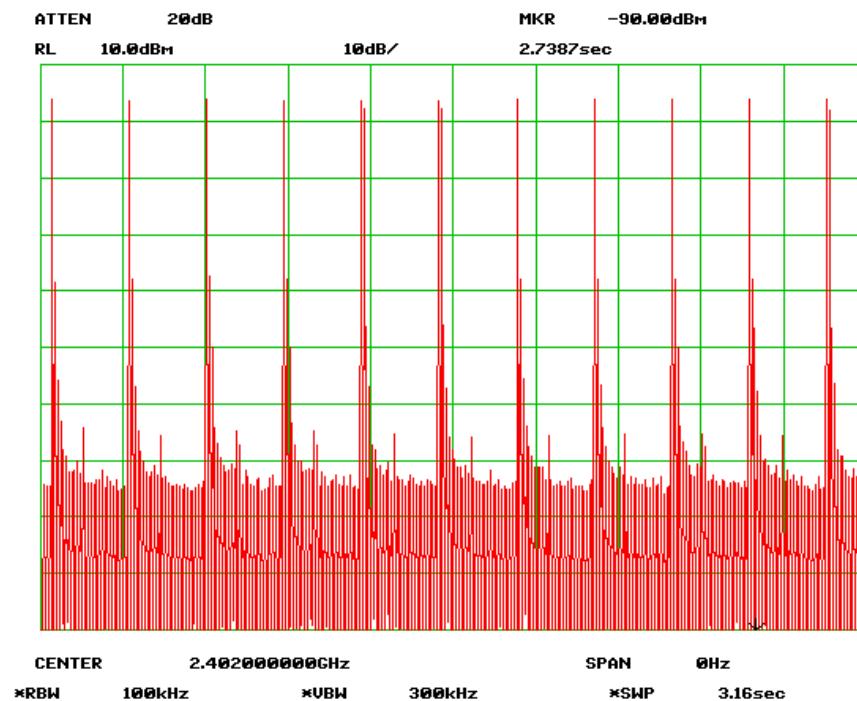
Test Result: Pass

Configuration: Bluetooth Mode EDR 3Mbps

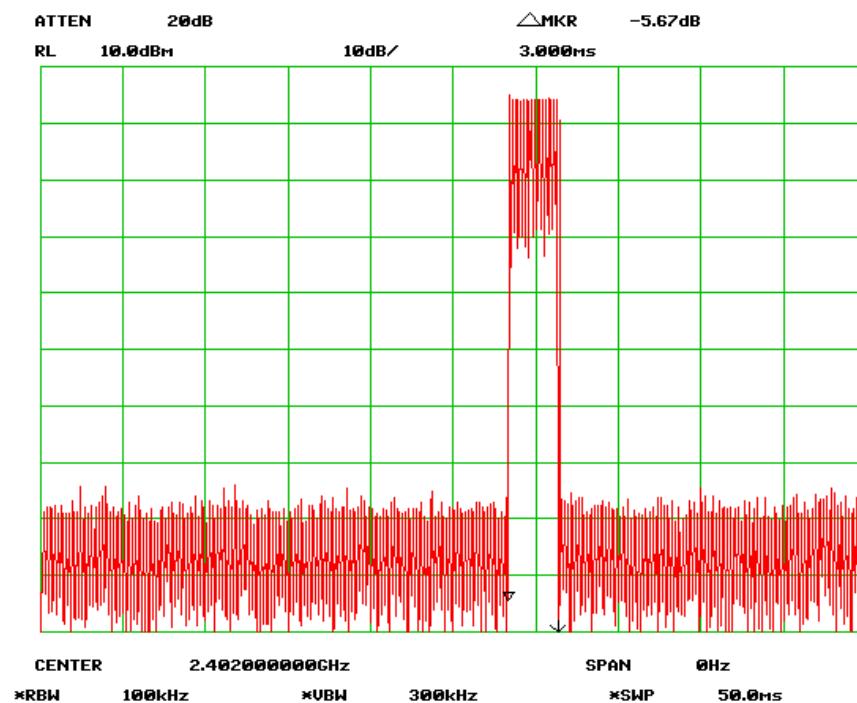
Channel	Channel Frequency (MHz)	Dwell Time (sec)	Limit (sec)
Low	2402	0.33	0.4
Mid	2441	0.33	0.4
High	2480	0.33	0.4

Note: *Dwell Time* = On-time * number of times the specific channel on during 31.6sec sweep.

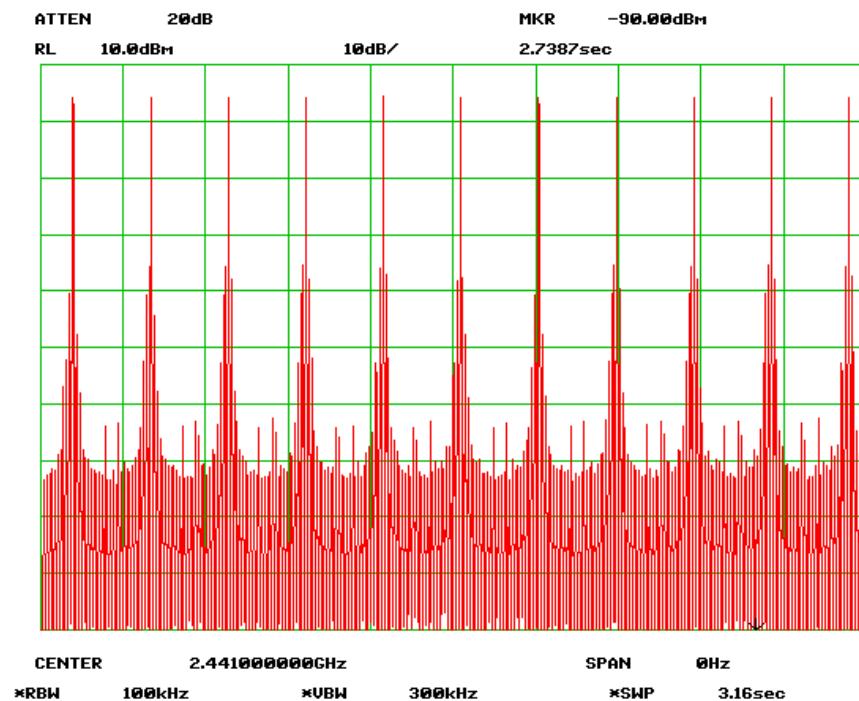
Low Channel (Sweep in 3.16sec)



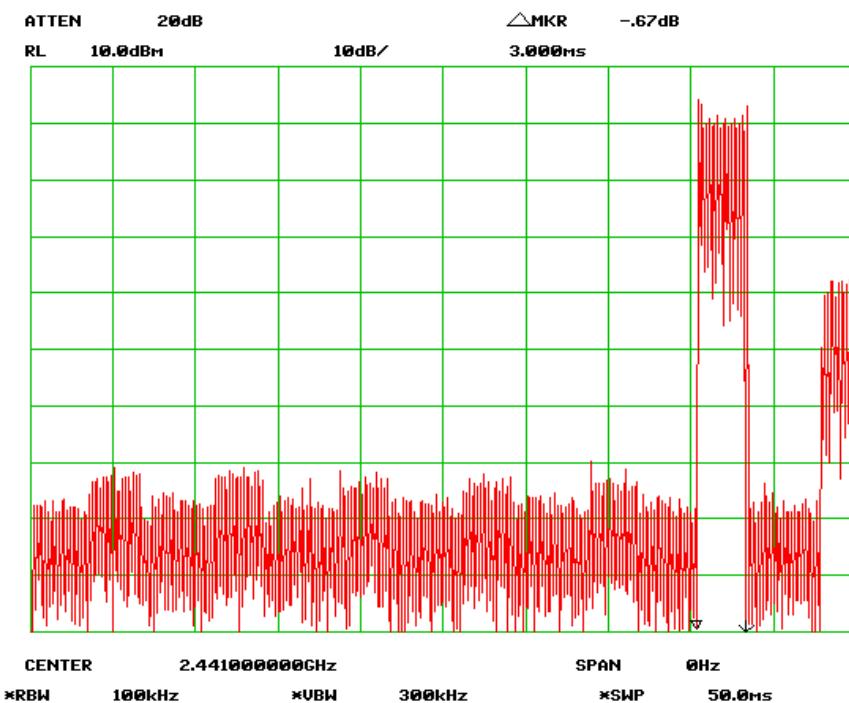
Low Channel (Sweep in 50msec)



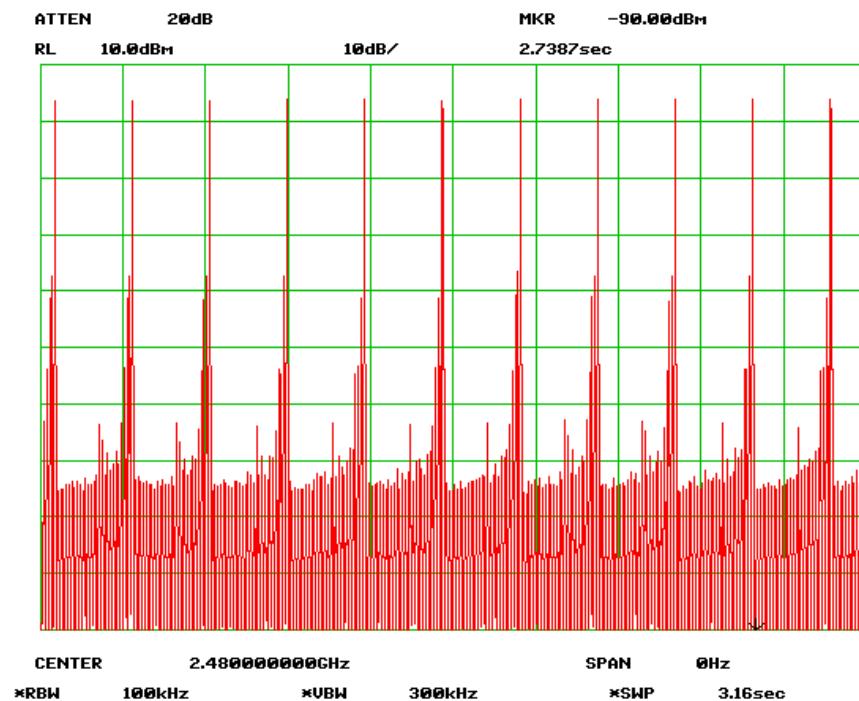
Mid Channel (Sweep in 3.16sec)



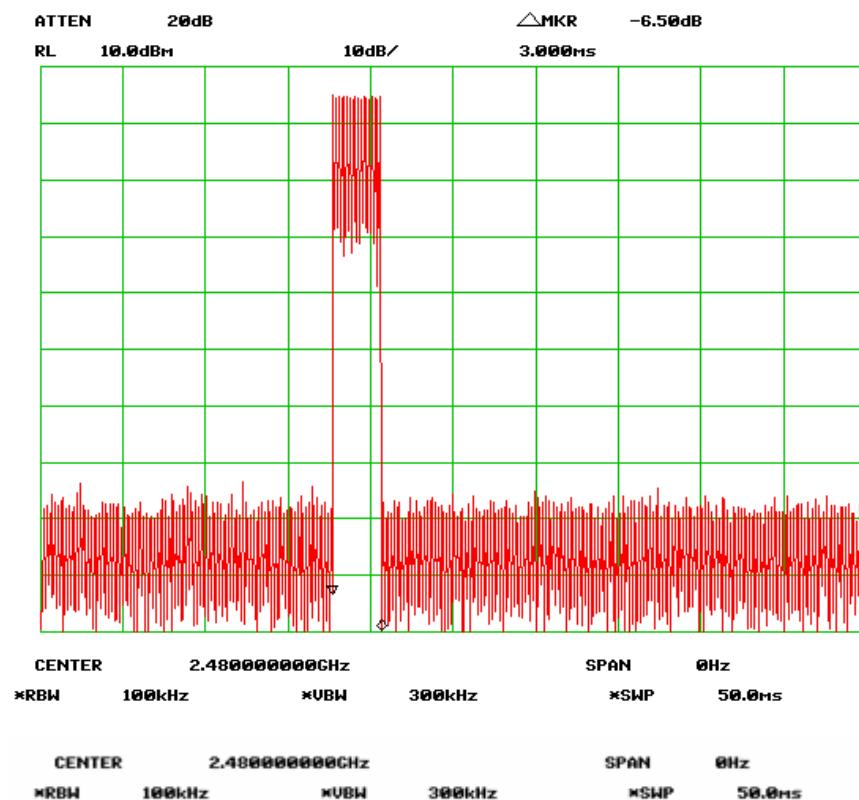
Mid Channel (Sweep in 50msec)



High Channel (Sweep in 3.16sec)



High Channel (Sweep in 50msec)



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5.7 Peak Output Power

1. Conducted Measurement
EUT was set for low, mid, high channel with modulated mode and highest RF output power.
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is $\pm 1.5\text{dB}$.
3. Environmental Conditions
Temperature 22°C
Relative Humidity 50%
Atmospheric Pressure 1019mbar
4. Test date : 1 June, 2011
Tested By : Peter Cai

Standard Requirement:

For frequency hopping systems in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5MHz band: 0.125 watts.

Procedures: The peak output power was measured conducted using a spectrum analyzer at low, mid, and hi channels. Peak detector was set to measure the power output. The power is converted from watt to dBm, therefore, 0.125 watt = 20.97 dBm.

Note: For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5MHz band: 0.125 watts.

Test Result: Pass

Configuration: Bluetooth Mode Basic Rate

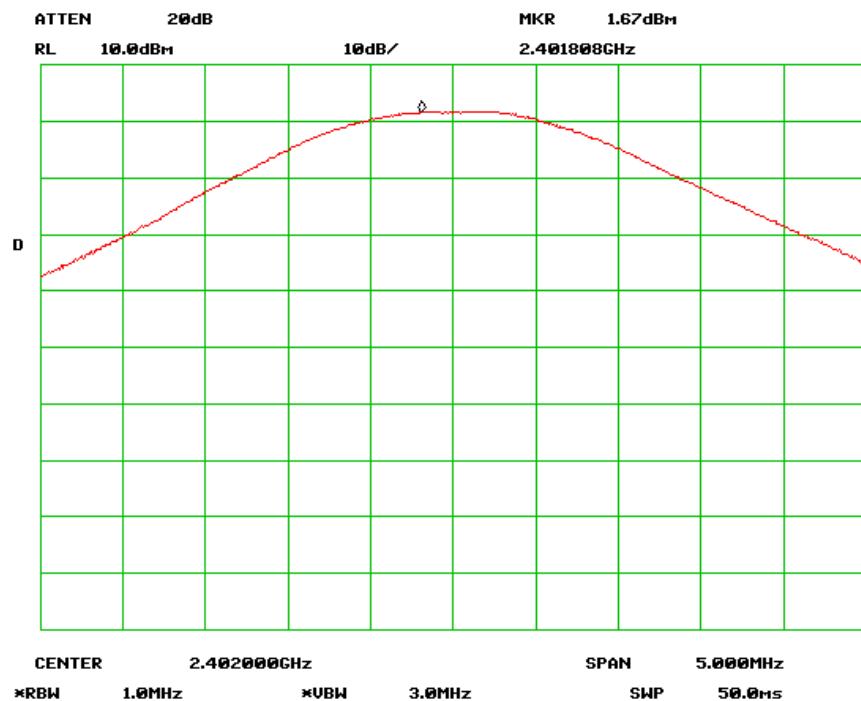
Channel	Channel Frequency (MHz)	Measured Output Power (dBm)	Peak Output Power Limit (dBm)
Low	2402	1.67	20.97
Mid	2441	2.50	20.97
High	2480	2.17	20.97

Configuration: Bluetooth Mode EDR 3Mbps

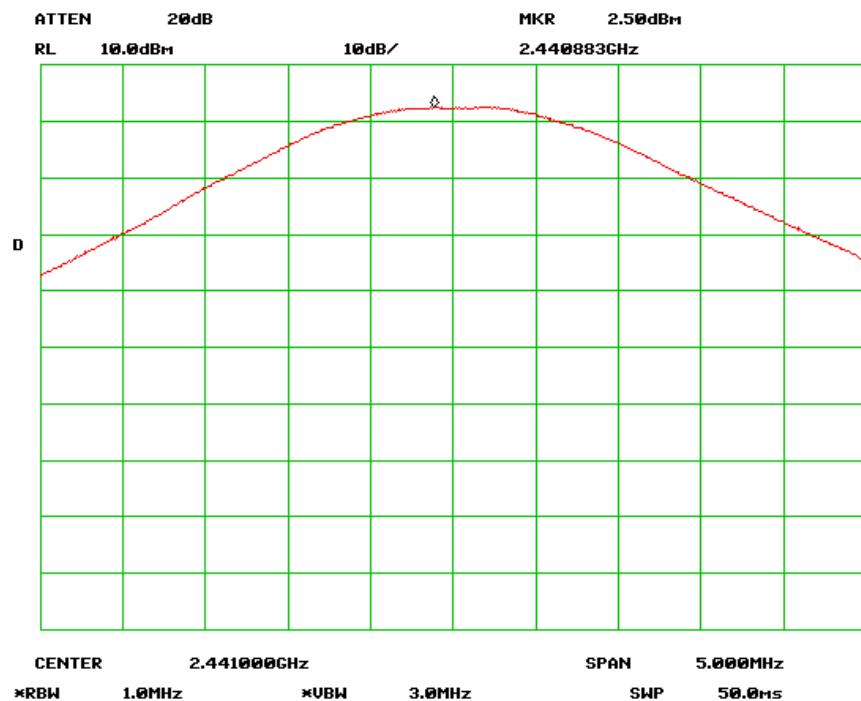
Channel	Channel Frequency (MHz)	Measured Output Power (dBm)	Peak Output Power Limit (dBm)
Low	2402	1.33	20.97
Mid	2441	2.17	20.97
High	2480	1.67	20.97

Refer to the attached plots.

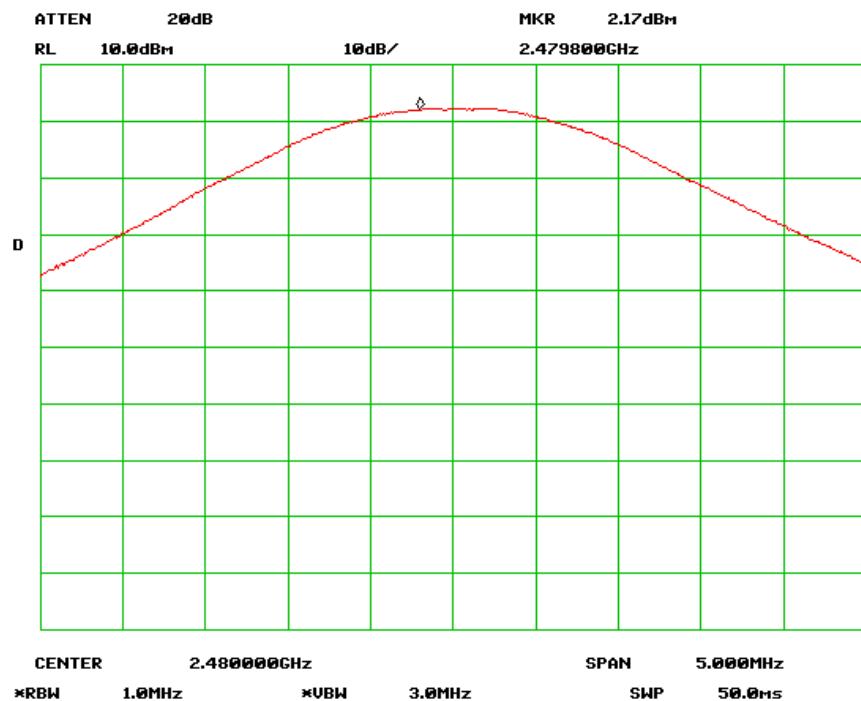
Output Power Low Channel (Basic Rate)



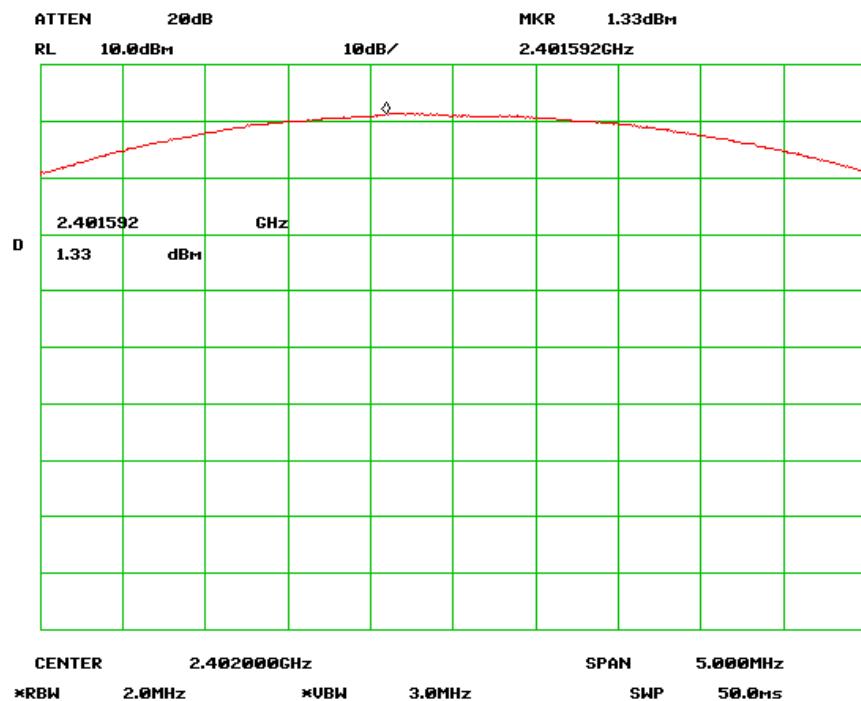
Output Power Mid Channel (Basic Rate)



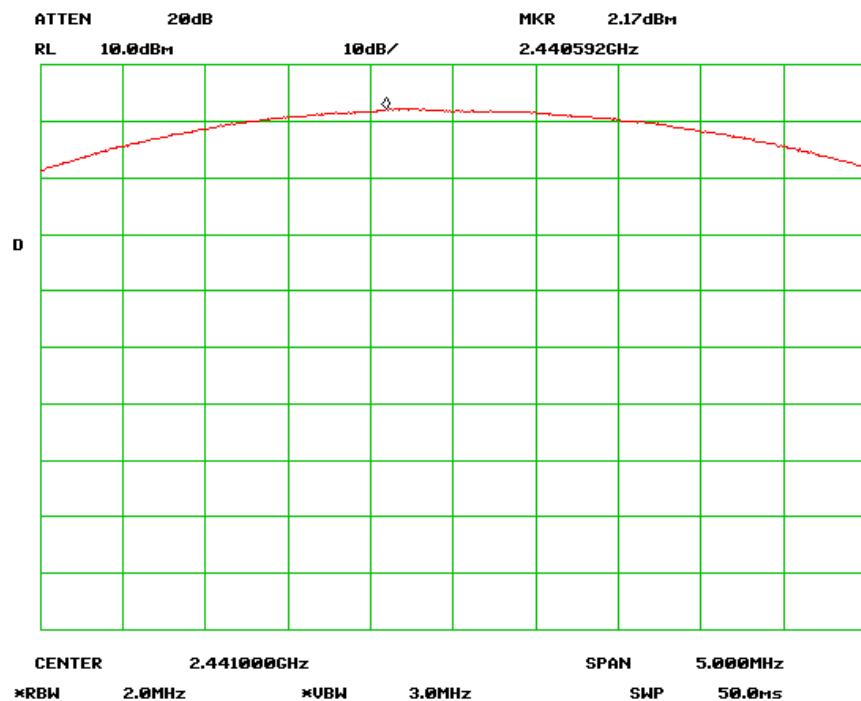
Output Power High Channel (Basic Rate)



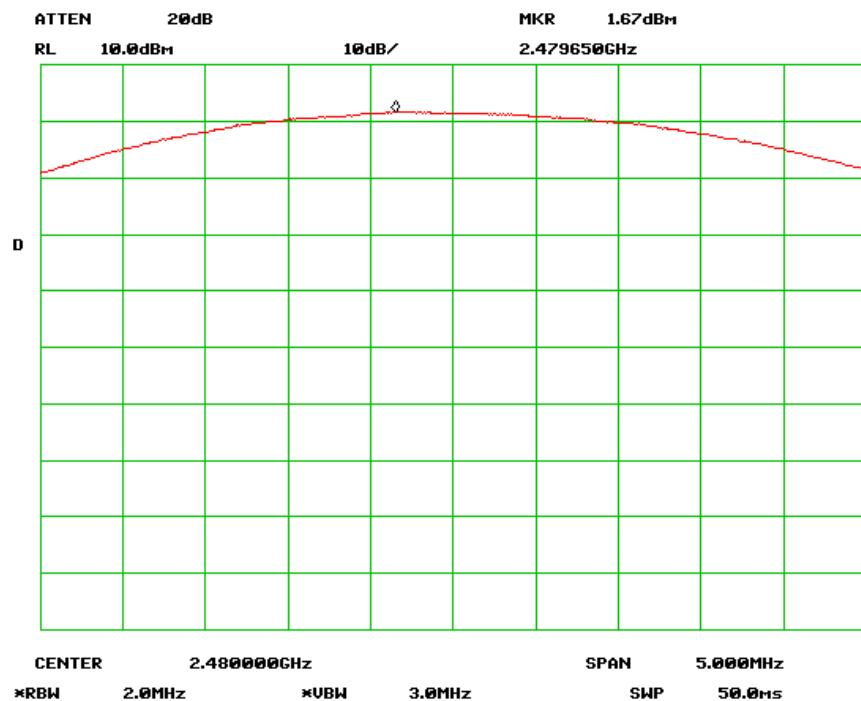
Output Power Low Channel (EDR 3Mbps)



Output Power Mid Channel (EDR 3Mbps)



Output Power High Channel (EDR 3Mbps)



5.8 Antenna Port Emission

1. Conducted Measurement
EUT was set for low, mid, high channel with modulated mode and highest RF output power.
The spectrum analyzer was connected to the antenna terminal.
2. Conducted Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 40GHz is $\pm 1.5\text{dB}$.
3.

Environmental Conditions	Temperature	22°C
	Relative Humidity	50%
	Atmospheric Pressure	1019mbar
4. Test date : 1 June, 2011
Tested By : Peter Cai

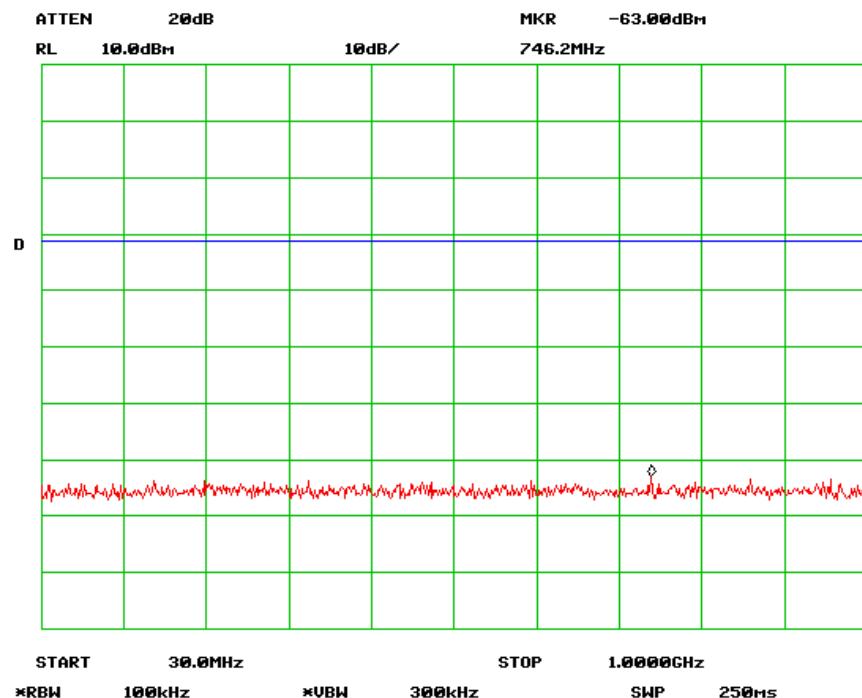
Standard Requirement: Radiated emission limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

Procedures: The conducted spurious emissions were measured using a spectrum analyzer at low, mid, and hi channels. The limit was determined by attenuating 20 dB of the RF peak power output

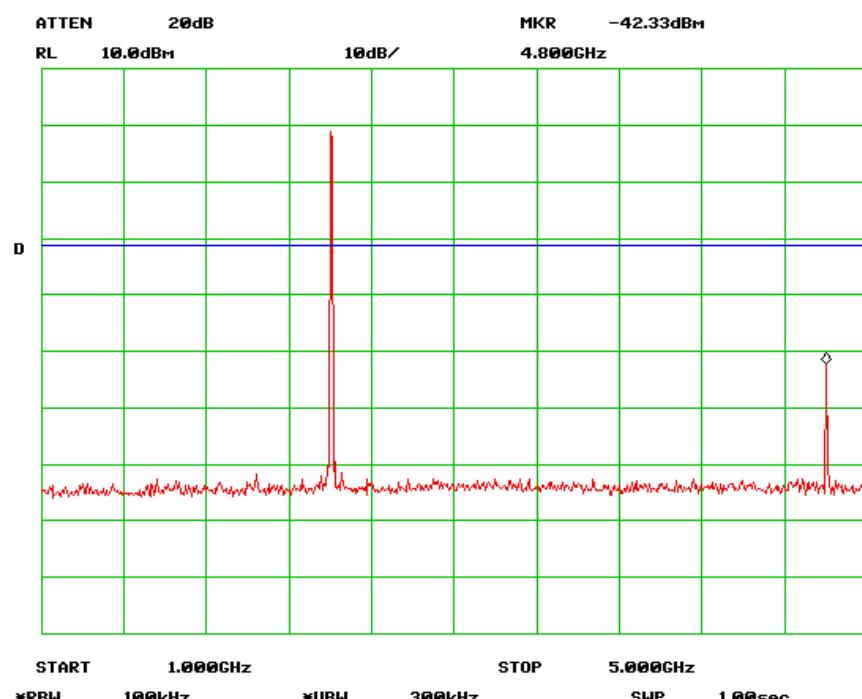
Test Result: Pass

Refer to the attached plots.

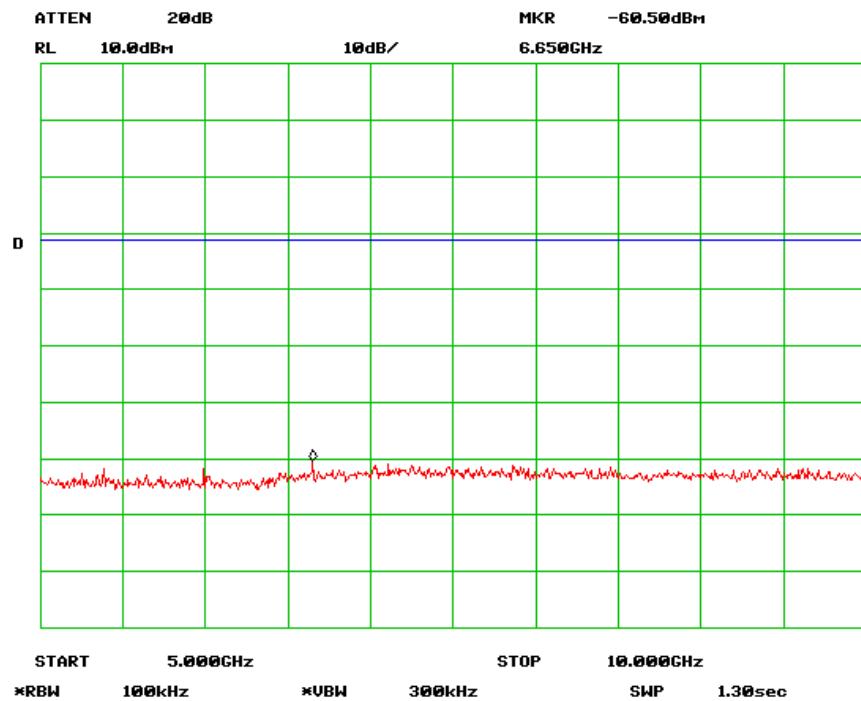
Bluetooth Mode EDR 3Mbps



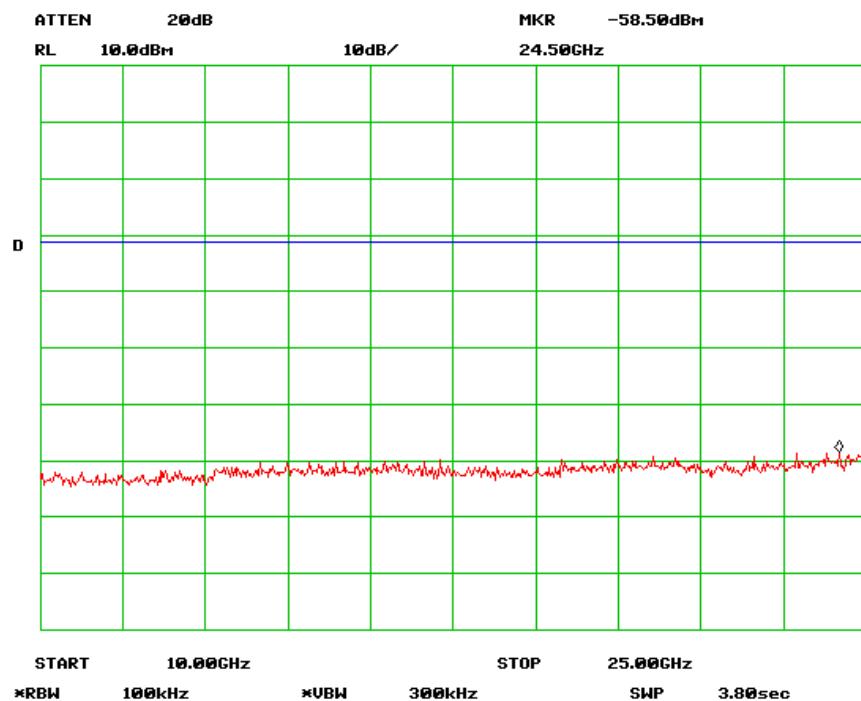
Antenna Port Emission Low-1



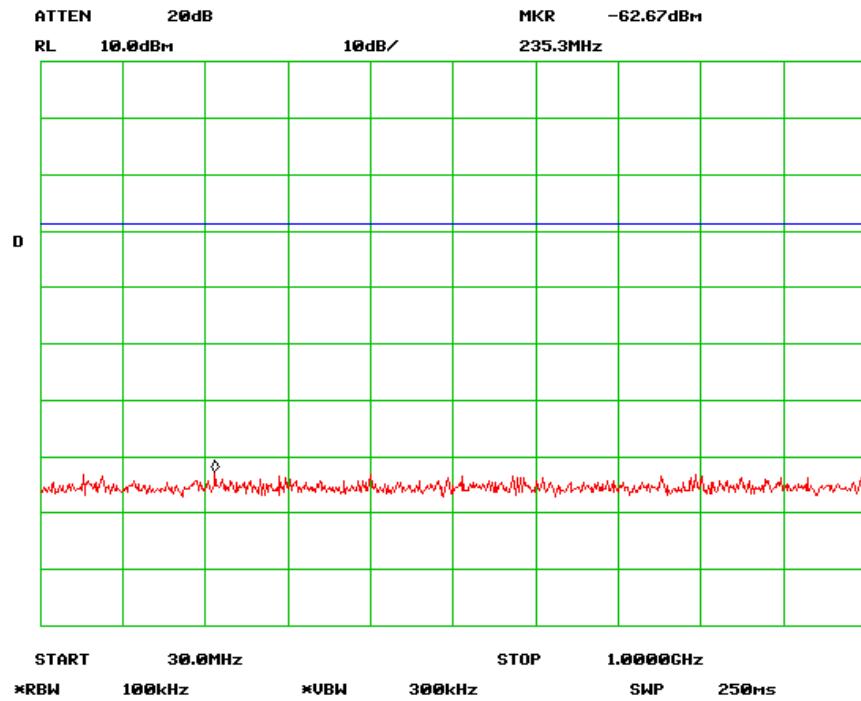
Antenna Port Emission Low-2



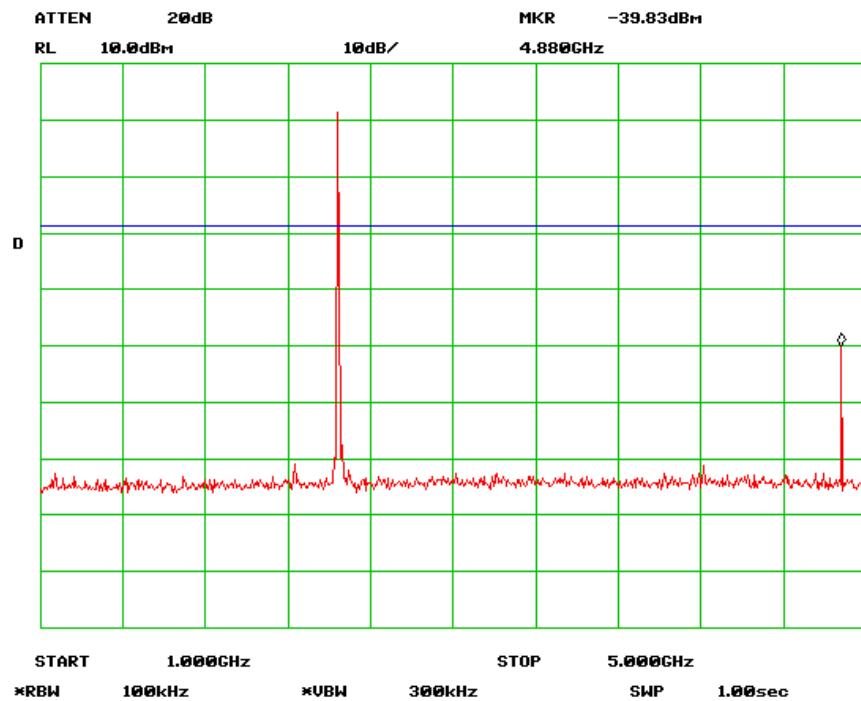
Antenna Port Emission Low-3



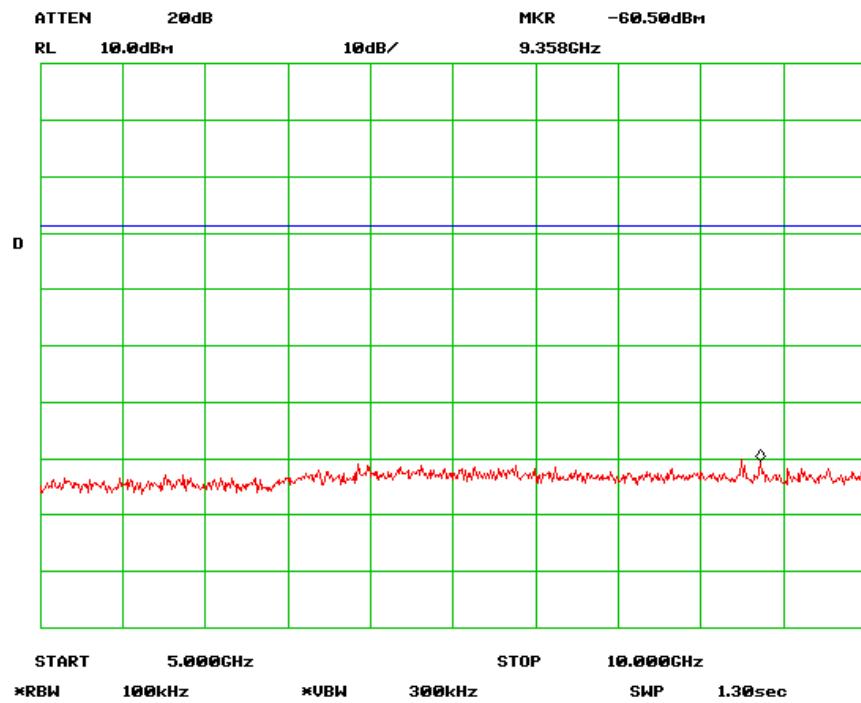
Antenna Port Emission Low-4



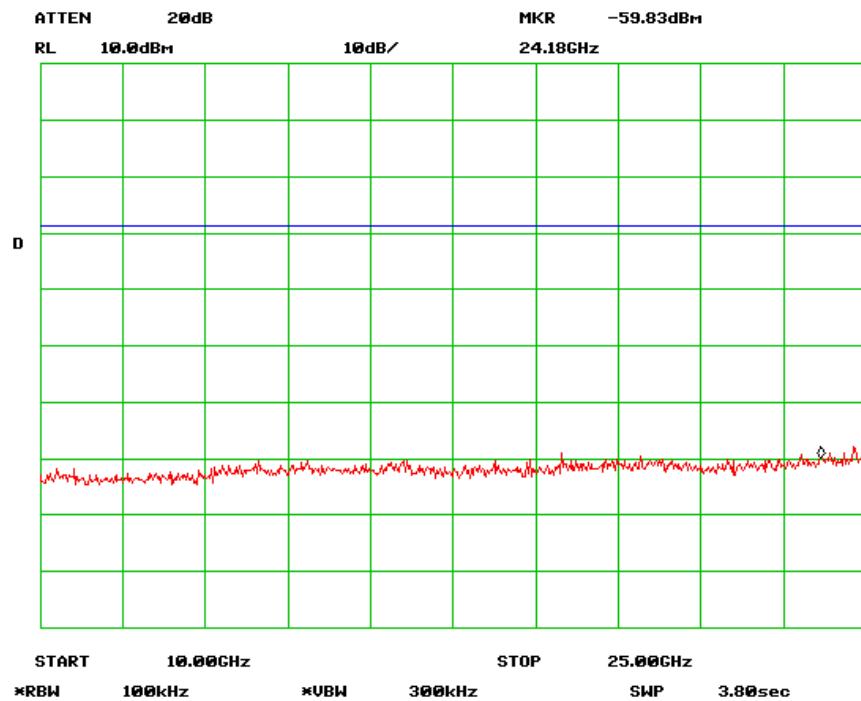
Antenna Port Emission Mid-1



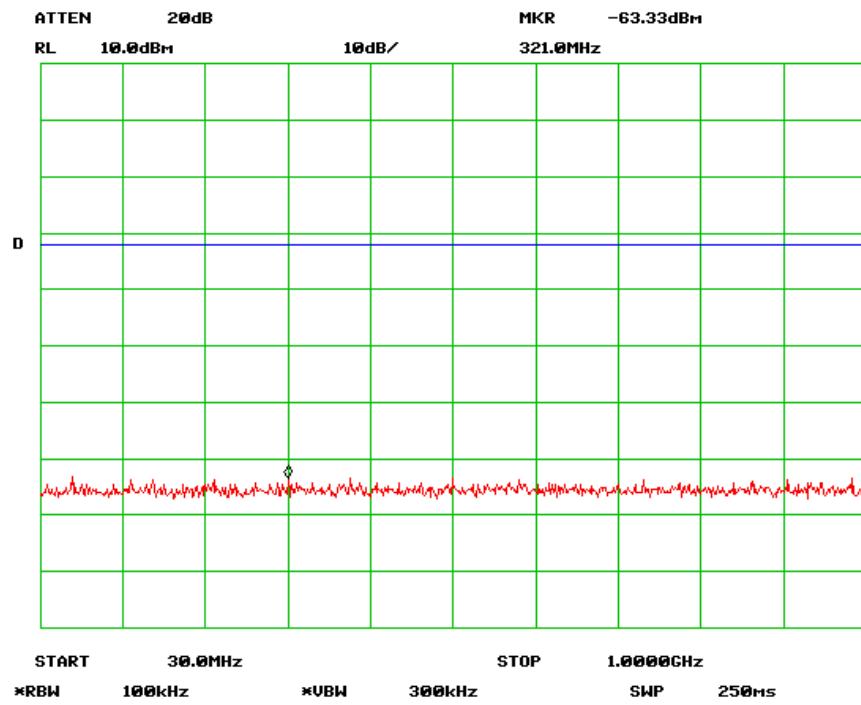
Antenna Port Emission Mid-2



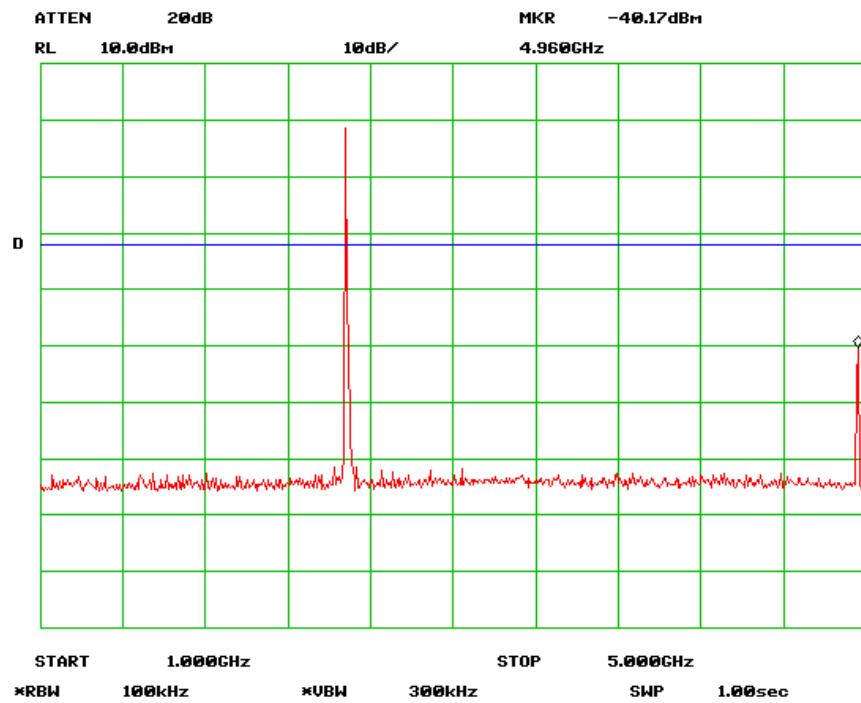
Antenna Port Emission Mid-3



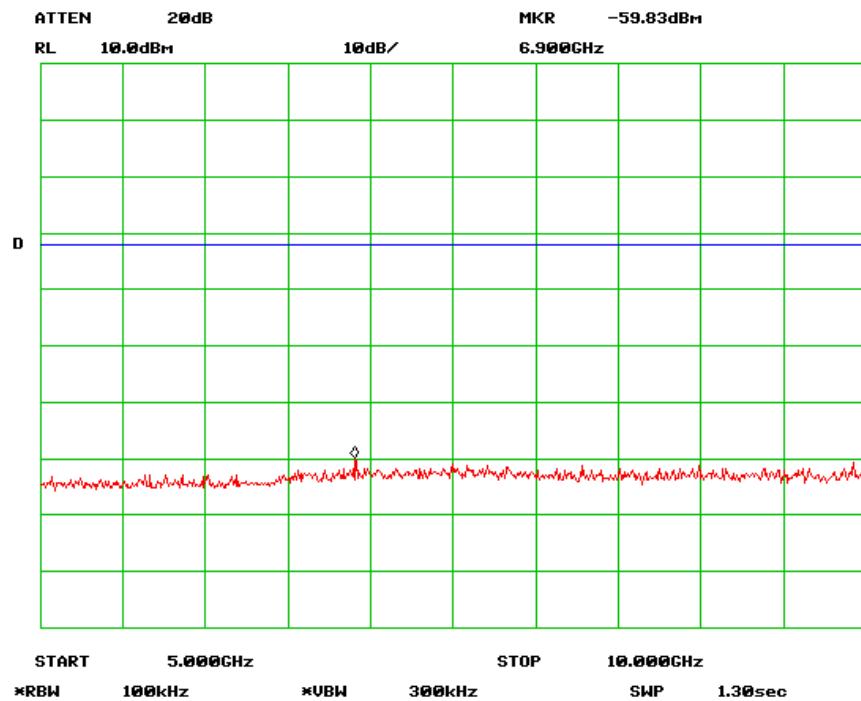
Antenna Port Emission Mid-4



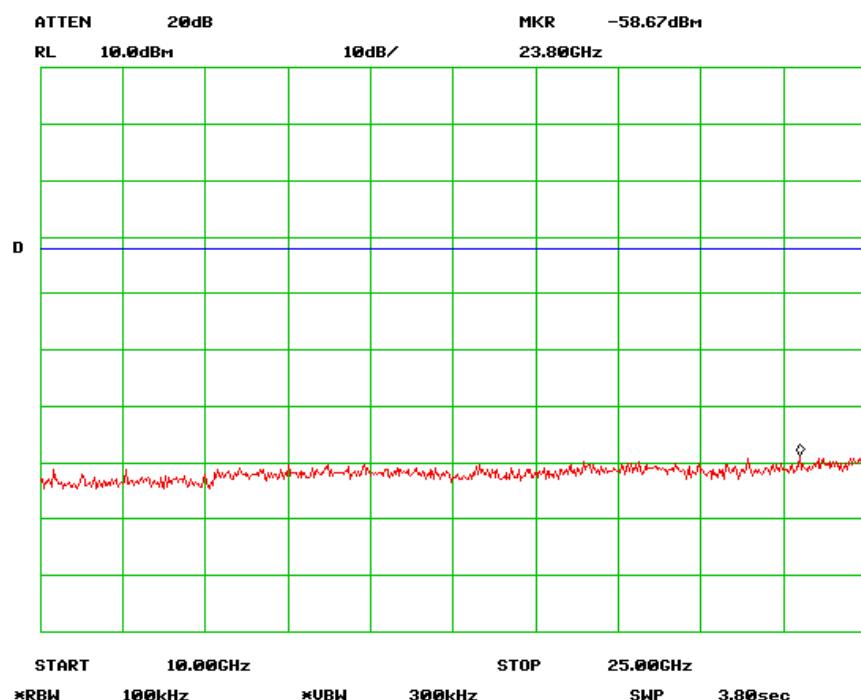
Antenna Port Emission High-1



Antenna Port Emission High-2



Antenna Port Emission High-3



Antenna Port Emission High-4



5.9 Radiated Spurious Emission < 1GHz

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz & 1GHz above (3m & 10m) is +5.6/-4.5dB.
4.

Environmental Conditions	Temperature	23°C
	Relative Humidity	50%
	Atmospheric Pressure	1019mbar
5. Test date : 3 June, 2011
Tested By : Peter Cai

Standard Requirement: The emissions from the Low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

Test Result: Pass

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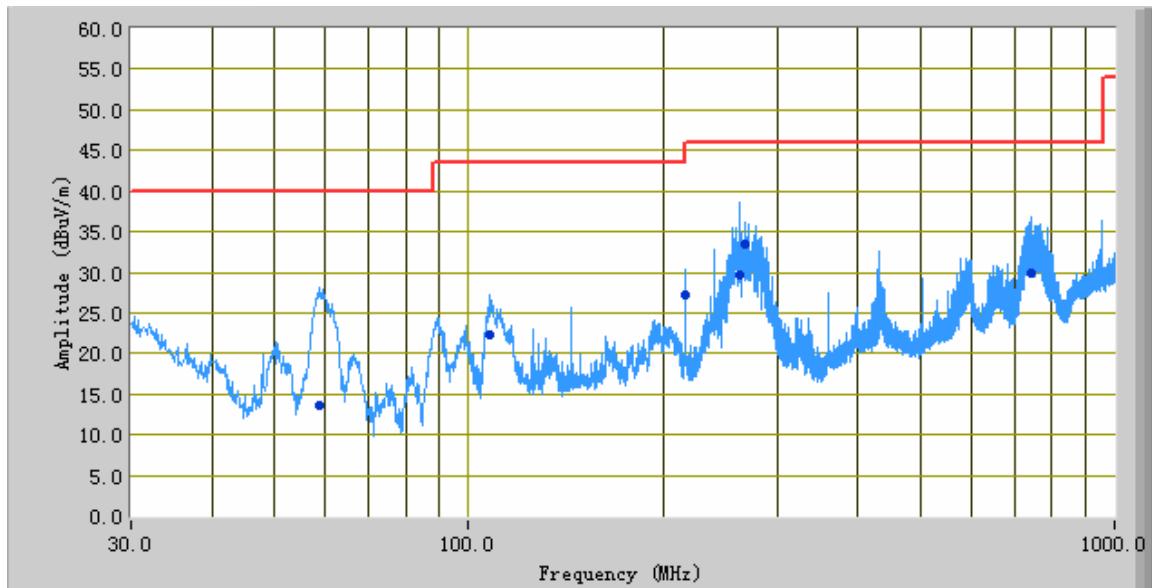
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Transmit Mode

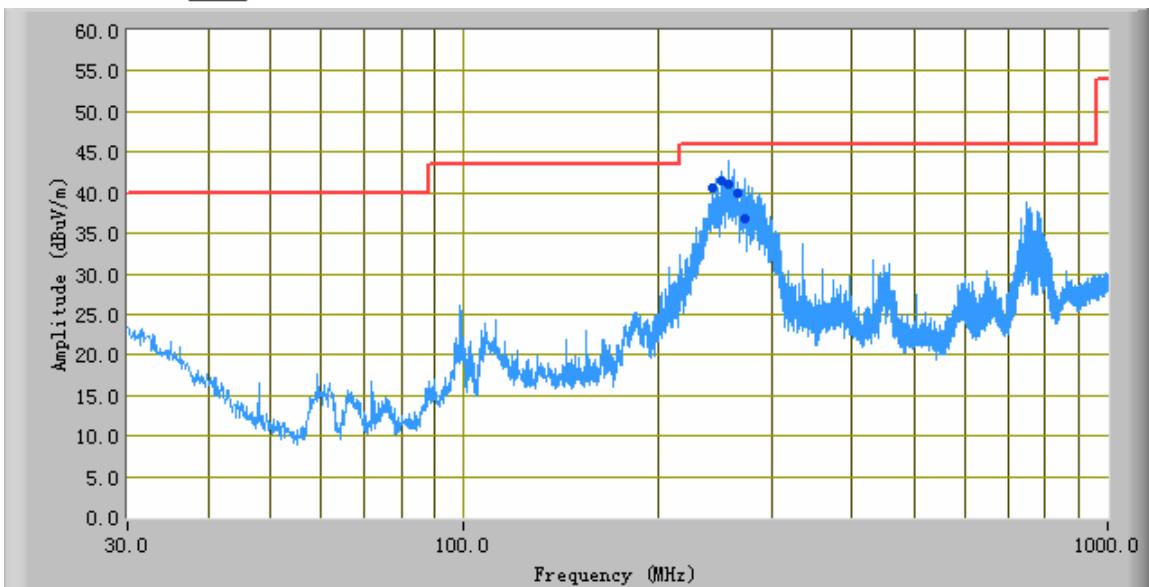
Peak Detector

Quasi Peak Limit



Test Data

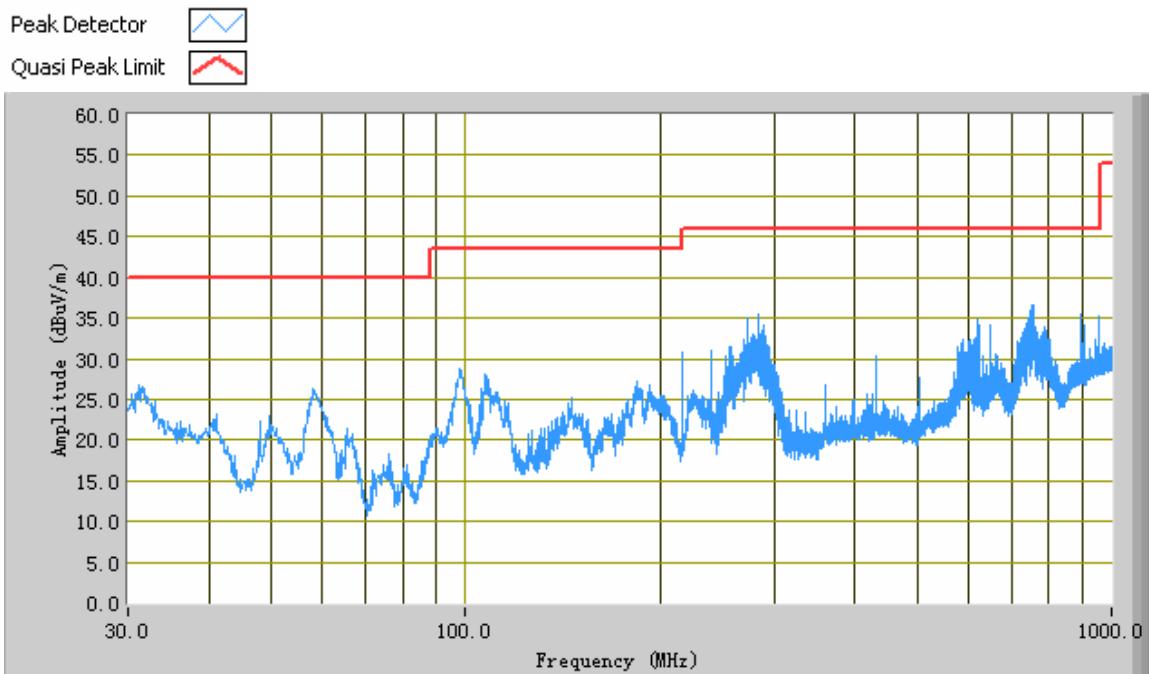
Frequency (MHz)	QP (dBuV/m)	Azimuth	Polarity(H/V)	Height (cm)	Factors (dB)	Limit (dBuV/m)	Margin (dB)
262.25	29.64	168.00	V	112.00	-28.59	46.00	-16.36
744.84	29.88	171.00	V	100.00	-20.63	46.00	-16.12
58.94	13.68	50.00	V	100.00	-37.36	40.00	-26.32
267.81	33.51	160.00	V	102.00	-29.55	46.00	-12.49
107.66	22.37	28.00	V	118.00	-32.47	43.50	-21.13
216.42	27.30	240.00	V	270.00	-32.95	46.00	-18.70

Peak Detector Quasi Peak Limit 

Test Data

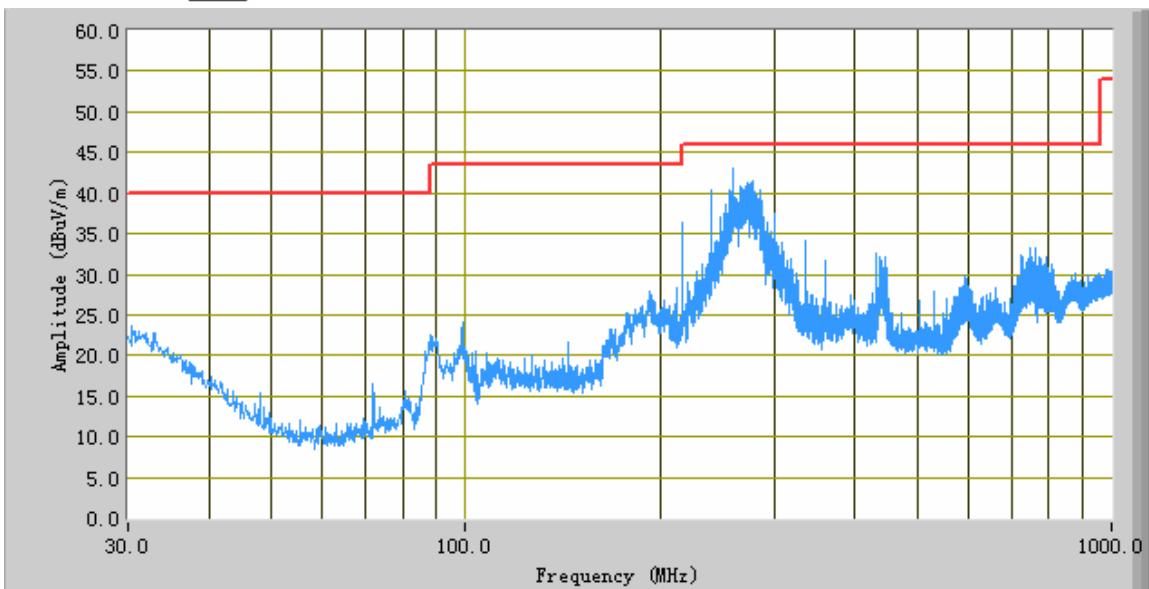
Frequency (MHz)	QP (dBuV/m)	Azimuth	Polarity(H /V)	Height (cm)	Factors (dB)	Limit (dBuV/m)	Margin (dB)
258.41	41.12	171.00	H	132.00	-28.57	46.00	-4.88
251.37	41.52	26.00	H	114.00	-29.90	46.00	-4.48
272.63	36.82	27.00	H	108.00	-27.73	46.00	-9.18
266.65	39.84	46.00	H	104.00	-27.92	46.00	-6.16
242.63	40.83	50.00	H	133.00	-30.57	46.00	-5.17
288.26	39.90	38.80	H	102.00	-27.09	46.00	-6.10

Receive Mode



Test Data

Frequency (MHz)	Peak (dBuV/m)	Azimuth	Polarity(H /V)	Height (cm)	Factors (dB)	Limit (dBuV/m)	Margin (dB)
752.53	36.69	315.60	V	100.00	-20.56	46.00	-9.31
758.71	36.61	315.60	V	100.00	-20.47	46.00	-9.39
283.29	35.51	7.00	V	200.00	-29.74	46.00	-10.49
898.88	35.48	185.90	V	100.00	-17.76	46.00	-10.52
953.44	35.33	286.00	V	200.00	-17.34	46.00	-10.67
273.71	35.04	352.20	V	200.00	-29.93	46.00	-10.96

Peak Detector Quasi Peak Limit 

Test Data

Frequency (MHz)	Peak (dBuV/m)	Azimuth	Polarity(H /V)	Height (cm)	Factors (dB)	Limit (dBuV/m)	Margin (dB)
259.28	42.99	21.80	H	100.00	-28.41	46.00	-3.01
278.93	41.56	23.50	H	100.00	-27.72	46.00	-4.44
266.32	40.81	23.50	H	100.00	-27.94	46.00	-5.19
285.84	40.34	23.50	H	100.00	-27.28	46.00	-5.66
240.00	40.26	177.50	H	100.00	-30.72	46.00	-5.74
250.55	37.54	51.60	H	100.00	-30.04	46.00	-8.46

5.10 Radiated Spurious Emissions > 1GHz & Band Edge

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz & 1GHz above (3m & 10m) is +5.6/-4.5dB.
4. Environmental Conditions Temperature 23°C
 Relative Humidity 50%
 Atmospheric Pressure 1019mbar
5. Test date : 3 June, 2011
Tested By : Peter Cai

Standard Requirement: The emissions from the Low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges.

Test Result: Pass

Note: Other Bluetooth modes were verified, only the result of worst case basic rate mode was presented.

Transmit Mode

@ 2402MHz @ 3 Meter

Frequency	Direction	Height	Polar	Cable loss	Amplifier	Corrected Reading	15.247/15.209	15.247/15.209	
GHz	Degree	Meter	H / V	(dB)	(dB)	(dBuV/m)	Limit (dBuV/m)	Margin	Comments
4.804	2	1.02	v	5.15	55.00	58.0	74.00	-16.0	Peak
4.804	10	1.10	h	5.15	55.00	52.0	74.00	-22.0	Peak
4.804	16	1.02	v	5.15	55.00	48.0	54.00	-6.0	Ave
4.804	21	1.10	h	5.15	55.00	43.0	54.00	-11.0	Ave

Emission was scanned up to 25GHz.

@ 2441MHz @ 3 Meter

Frequency	Direction	Height	Polar	Cable loss	Amplifier	Corrected Reading	15.247/15.209	15.247/15.209	
GHz	Degree	Meter	H / V	(dB)	(dB)	(dBuV/m)	Limit (dBuV/m)	Margin	Comments
4.882	5	1.10	v	5.16	55.00	60.0	74.00	-14.0	Peak
4.882	30	1.24	h	5.16	55.00	59.0	74.00	-15.0	Peak
4.882	5	1.10	v	5.16	55.00	50.0	54.00	-4.0	Ave
4.882	30	1.24	h	5.16	55.00	47.0	54.00	-7.0	Ave

Emission was scanned up to 25GHz.

@ 2480MHz @ 3 Meter

Frequency	Direction	Height	Polar	Cable loss	Amplifier	Corrected Reading	15.247/15.209	15.247/15.209	
GHz	Degree	Meter	H / V	(dB)	(dB)	(dBuV/m)	Limit (dBuV/m)	Margin	Comments
4.960	26	1.11	v	5.17	55.00	56.0	74.00	-18.0	Peak
4.960	7	1.42	h	5.17	55.00	52.0	74.00	-22.0	Peak
4.960	26	1.11	v	5.17	55.00	47.0	54.00	-7.0	Ave
4.960	7	1.42	h	5.17	55.00	44.0	54.00	-10.0	Ave

Emission was scanned up to 25GHz.

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No emissions were found when EUT was under receiver mode above 1GHz.

Band Edge

Channel	Polarity	Detector	Frequency	Result	Limit	Margin
Low Channel	V	Peak	2400	36.77	74	-37.23
Low Channel	H	Peak	2400	32.12	74	-41.88
Low Channel	V	Avg	2400	26.44	54	-27.56
Low Channel	H	Avg	2400	24.59	54	-29.41

Channel	Polarity	Detector	Frequency	Result	Limit	Margin
High Channel	V	Peak	2483.5	33.23	74	-40.77
High Channel	H	Peak	2483.5	35.67	74	-38.33
High Channel	V	Avg	2483.5	24.33	54	-29.67
High Channel	H	Avg	2483.5	26.75	54	-27.25



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Annex A. TEST INSTRUMENT & METHOD

Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES

Instrument	Manufacturer	Model	CAL Due Date
Spectrum Analyzer	HP	8563 E	2012.01.10
EMI Receiver	Rohde & Schwarz	ESPI 3	2012.05.25
Antenna (30MHz~2GHz)	Sunol Sciences	JB1	2011.10.04
Horn Antenna (1~18GHz)	A-INFOMW	JXTXLB-10180	2011.10.04
Horn Antenna (1~18GHz)	N/A	N/A	2011.10.04
Pre-Amplifier(0.01 ~ 1.3GHz)	HP	8447F	2012.05.25
Pre-Amplifier(0.1 ~ 18GHz)	MITEQ	AMF-7D-00101800-30- 10P	2012.05.25
Horn Antenna (18~40GHz)	Com Power	AH-840	2012.05.25
Microwave Pre-Amp (18~40GHz)	Com Power	PA-840	2012.05.25



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Annex A.ii. CONDUCTED EMISSIONS TEST DESCRIPTION

Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B.
2. The power supply for the EUT was fed through a $50\Omega/50\mu\text{H}$ EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipments were powered separately from another main supply.

Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 KHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line (for AC mains) or DC line (for DC power).

Sample Calculation Example

At 20 MHz

limit = $250 \mu\text{V} = 47.96 \text{ dB}\mu\text{V}$

Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.20 dB

Q-P reading obtained directly from EMI Receiver = $40.00 \text{ dB}\mu\text{V}$
(Calibrated for system losses)

Therefore, Q-P margin = $47.96 - 40.00 = 7.96$

i.e. **7.96 dB below limit**

Annex A. iii. RADIATED EMISSIONS TEST DESCRIPTION

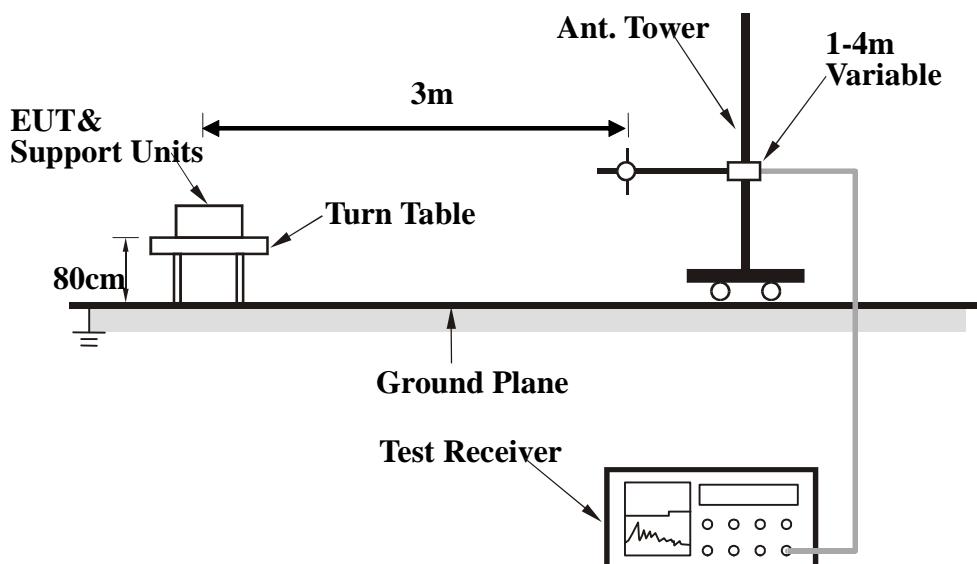
EUT Characterisation

EUT characterisation, over the frequency range from 30MHz to 10th Harmonic, was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred, clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS).

Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.





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Test Method

The following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

Final Radiated Emission Measurement

1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	100 kHz	100 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Sample Calculation Example

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

$$\text{Peak} = \text{Reading} + \text{Corrected Factor}$$

where

$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain (if any)}$$

And the average value is

$$\text{Average} = \text{Peak Value} + \text{Duty Factor}$$

$$\text{Set RBW} = 1\text{MHz}, \text{VBW} = 10\text{Hz}.$$

Note:

If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.



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Annex B. EUT AND TEST SETUP PHOTOGRAPHS

Please see attachment

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Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

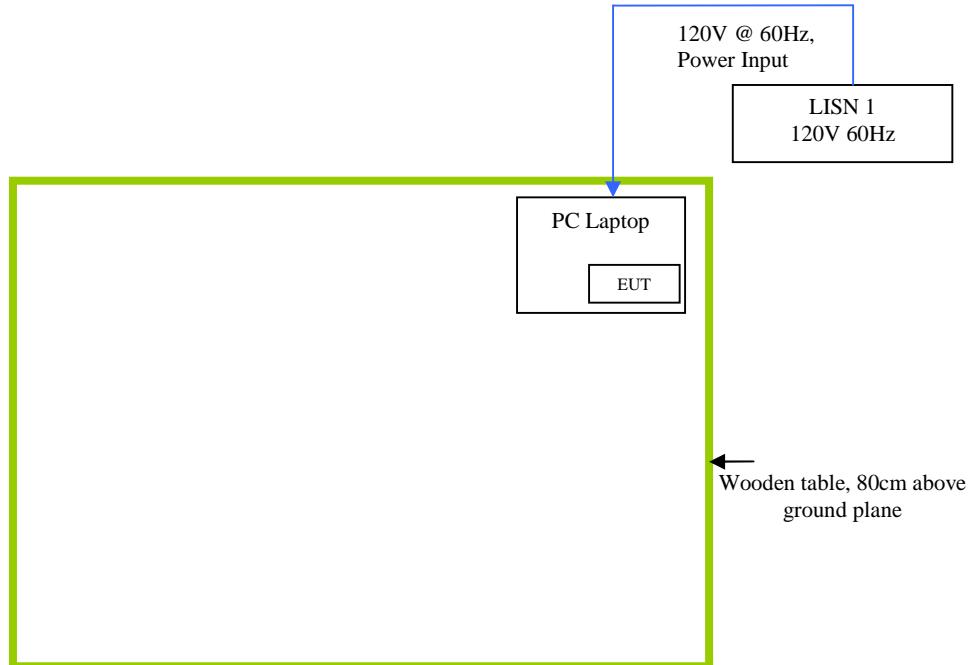
EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

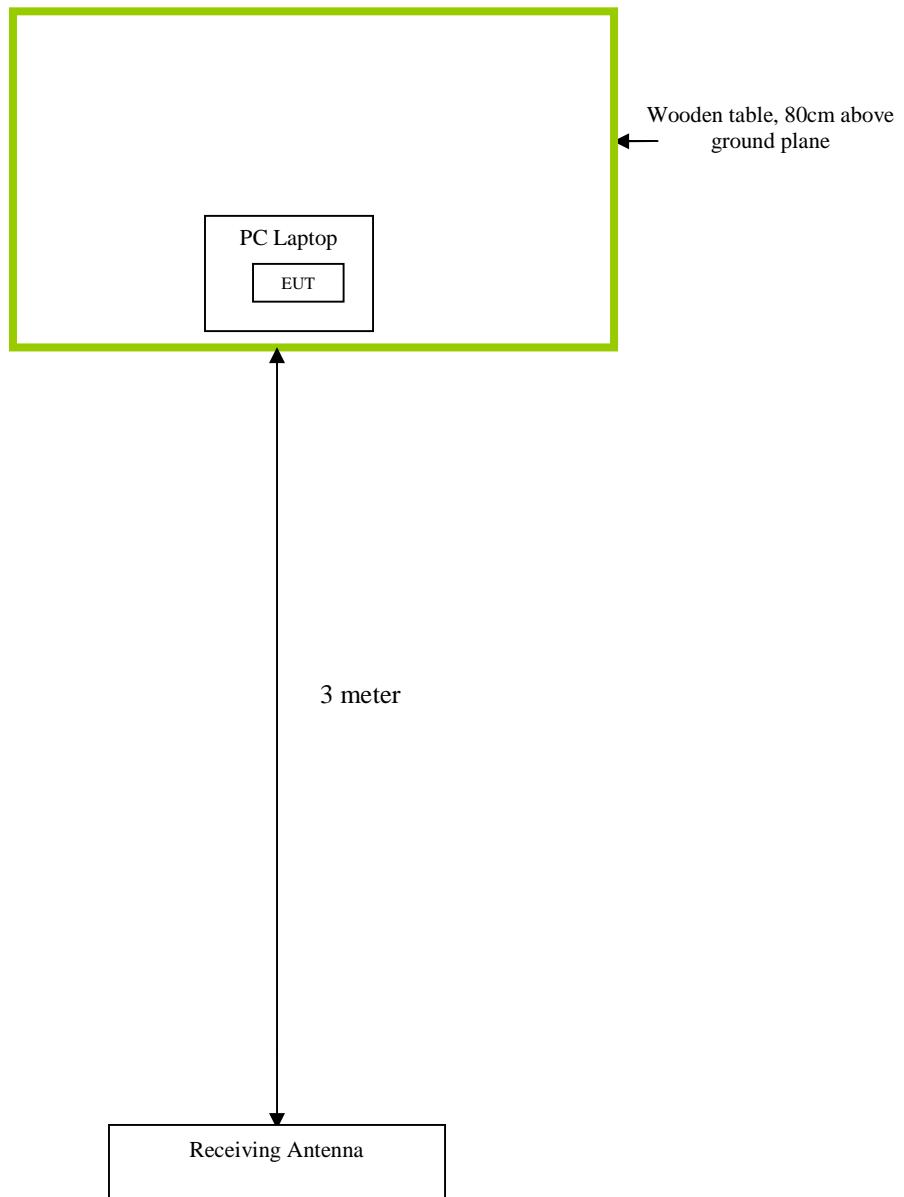
The following is a description of supporting equipment and details of cables used with the EUT.

Equipment Description (Including Brand Name)	Model & Serial Number	Cable Description (List Length, Type & Purpose)
Gateway Laptop	MS2288 & LXWHF02013951C3CA92200	N/A

Block Configuration Diagram for Conducted Emissions



Block Configuration Diagram for Radiated Emissions





SIEMIC, INC.

Accessing global markets

Title: RF Test Report for Bluetooth Headset
Model: 4G
To: FCC 15.247:2010, RSS-210 Issue 8 December 2010

Serial#: 11021393
Issue Date: 3 June, 2011
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Annex C.ii. EUT OPERATING CONDITIONS

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
Emissions Testing	The EUT was continuously transmitting to stimulate the worst case.



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Annex D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST

Please see attachment