

# FCC RADIO TEST REPORT

according to

47 CFR FCC Part 15 Subpart C § 15.247

**Equipment** : **Wireless Ethernet Adapter**  
**Model No.** : **EchoLife WS311**  
**Brand Name** : **Huawei**  
**Filing Type** : **New Application**  
**Applicant** : **Huawei Technologies Co., Ltd.**  
Administration Building, Huawei Base, Bantian, Longgang  
District, Shenzhen 518129 P.R.C. 518129

**FCC ID** : **QISWS311**  
**Manufacturer** : **ASKEY TECHNOLOGY (JINGSU) LTD.**  
No. 1388, Jiao Tong Road, WuJiang  
Economic-Technological Development Area, Jiangsu  
Province, P.R.C.

**Received Date** : Jul. 02, 2009  
**Final Test Date** : Jul. 31, 2009

## Statement

**Test result included is only for the 802.11n of the product.**

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.

The test equipment used to perform the test is calibrated and traceable to NML/ROC.



***SPORTON International Inc.***

*6F, No. 106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.*

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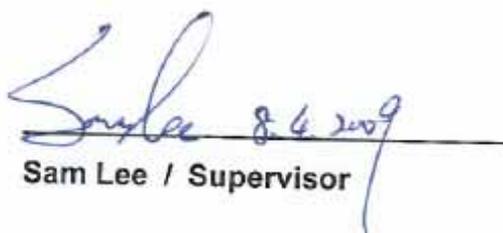
# CERTIFICATE OF COMPLIANCE

according to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment : Wireless Ethernet Adapter  
Model No. : EchoLife WS311  
Brand Name : Huawei  
Applicant : Huawei Technologies Co., Ltd.  
Administration Building, Huawei Base,  
Bantian, Longgang District, Shenzhen 518129  
P.R.C. 518129

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Jul. 02, 2009 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.



Sam Lee / Supervisor

**SPORTON International Inc.**

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

**1 SUMMARY OF THE TEST RESULT**

<b>Applied Standard: 47 CFR FCC Part 15 Subpart C</b>				
<b>Part</b>	<b>Rule Section</b>	<b>Description of Test</b>	<b>Result</b>	<b>Under Limit</b>
3.1	15.207	AC Power Line Conducted Emissions	Complies	11.20 dB
3.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	12.82 dB
3.3	15.247(e)	Power Spectral Density	Complies	20.42 dB
3.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
3.5	15.247(d)	Radiated Emissions	Complies	3.08 dB
3.6	15.247(d)	Band Edge Emissions	Complies	1.17 dB
3.7	15.203	Antenna Requirements	Complies	-

<b>Test Items</b>	<b>Uncertainty</b>	<b>Remark</b>
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Peak Conducted Output Power	±0.8dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
6dB Spectrum Bandwidth	±8.5×10 <sup>-8</sup>	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.8dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±1.9dB	Confidence levels of 95%
Radiated / Band Edge Emissions (1GHz~18GHz)	±1.9dB	Confidence levels of 95%
Radiated Emissions (18GHz~40GHz)	±1.9dB	Confidence levels of 95%
Temperature	±0.7	Confidence levels of 95%
Humidity	±3.2%	Confidence levels of 95%
DC / AC Power Source	±1.4%	Confidence levels of 95%

## 2 GENERAL INFORMATION

### 2.1 Product Details

Only the radio detail of IEEE 802.11n is shown in the table below. For more detailed features description, please refer to the manufacturer's specifications or user's manual.

Items	Description
Power Type	+5V from adapter
Modulation	See the below table for IEEE 802.11n
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	See the below table for IEEE 802.11n
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11 for 20MHz bandwidth ; 7 for 40MHz bandwidth
Channel Band Width (99%)	MCS0 (20MHz) : 17.50 MHz ; MCS0 (40MHz) : 35.90 MHz
Conducted Output Power	MCS0 (20MHz) : 17.18 dBm ; MCS0 (40MHz) : 11.71 dBm

### 2.2 Accessories

#### Adapter 1

Power	Brand	Model	Rating
Switching power supply	Dongguan Shilong Fuhua	UE05L1-050100SPAU	INPUT : 100-240V~50/60Hz 0.2A MAX OUTPUT : +5V 1.0A

#### Adapter 2

Power	Brand	Model	Rating
Switching power supply	Shenzhen Frecom	FM050010-US	INPUT : 100-240V~50/60Hz 0.3A OUTPUT : +5V 1.0A

### 2.3 Table for Filed Antenna

#### Antenna & Bandwidth

Antenna	Single (TX)	
Bandwidth Mode	20 MHz	40 MHz
802.11b	V	X
802.11g	V	X
802.11n (2.4GHz)	V	V

Ant.	Antenna Type	Connector	Gain (dBi)	Remark
A	Printed Antenna	N/A	1.5	TX / RX

(1T1R Spatial Multiplexing MIMO configuration. 1 antenna is for signal transmitting and receiving).

IEEE 802.11n Modulation Scheme

MCS Index	Nss	Modulation	R	NBPS	NCBPS		NDBPS		Data rate(Mbps)			
					800nsGI		20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
					20MHz	40MHz						
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5		
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0		
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5		
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0		
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0		
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0		
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5		
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0		

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPS	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	guard interval

2.4 Table for Carrier Frequencies

There are two bandwidth systems for IEEE 802.11n.

For 20MHz bandwidth systems, use Channel 1~Channel 11.

For 40MHz bandwidth systems, use Channel 3~Channel 9.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400~2483.5MHz	1	2412 MHz	7	2442 MHz
	2	2417 MHz	8	2447 MHz
	3	2422 MHz	9	2452 MHz
	4	2427 MHz	10	2457 MHz
	5	2432 MHz	11	2462 MHz
	6	2437 MHz	-	-

**2.5 Table for Test Modes**

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on the entire possible configuration for searching the worst cases. The following table is a list of the test modes shown in this test report.

<b>Test Items</b>	<b>Mode</b>	<b>Data Rate</b>	<b>Channel</b>
AC Power Line Conducted Emissions	See the Note	Auto	-
Maximum Conducted Output Power	MCS0 (20MHz)	6.5 Mbps	1/6/11
Power Spectral Density 6dB Spectrum Bandwidth Radiated Emissions 1GHz~10 <sup>th</sup> Harmonic Band Edge Emissions	MCS0 (40MHz)	13.5 Mbps	3/6/9
Radiated Emissions 9kHz~1GHz	See the Note	Auto	-

Note:

The following test modes were pretested for conducted and radiated below 1GHz test:

Mode 1. EUT + Adapter 1

Mode 2. EUT + Adapter 2

Mode 3. EUT + USB

The worse case of conducted and radiated below 1GHz test is mode 1 and mode 2.

In the Radiated Emissions (1GHz~12.75GHz): Because the EUT RF module is same, so use the Mode 1 is tested in this report.

**2.6 Table for Testing Locations**

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH02-HY	SAC	Hwa Ya	643075	IC 4086B-1	-
CO04-HY	Conduction	Hwa Ya	643075	IC 4086B-1	-
TH01-HY	OVEN Room	Hwa Ya	-	-	-

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC); Fully Anechoic Chamber (FAC).

**2.7 Table for Supporting Units**

Support Unit	Brand	Model	FCC ID
Notebook PC	DELL	D400	DoC
Modem	ACEEX	DM1414	IFAXDM1414
USB Mouse	Microsoft	1004	N/A
Notebook PC (Remote Workstation)	DELL	D400	DoC

**2.8 Table for Parameters of Test Software Setting**

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

**Power Parameters of IEEE 802.11n**

Test Software Version	REALTEK 11n Single Chip USB WLAN NIC Massproduction Kit		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11n(20MHz)	14	14	10
Frequency	2422 MHz	2437 MHz	2452 MHz
IEEE 802.11n(40MHz)	2	2	0

**2.9 EUT Operation during Test**

An executive program, EMCTEST.EXE under WIN XP, which generates a complete line of continuously repeating “H” pattern was used as the test software.

The NB sends “H” messages to the panel, and the panel displays “H” patterns on the screen.

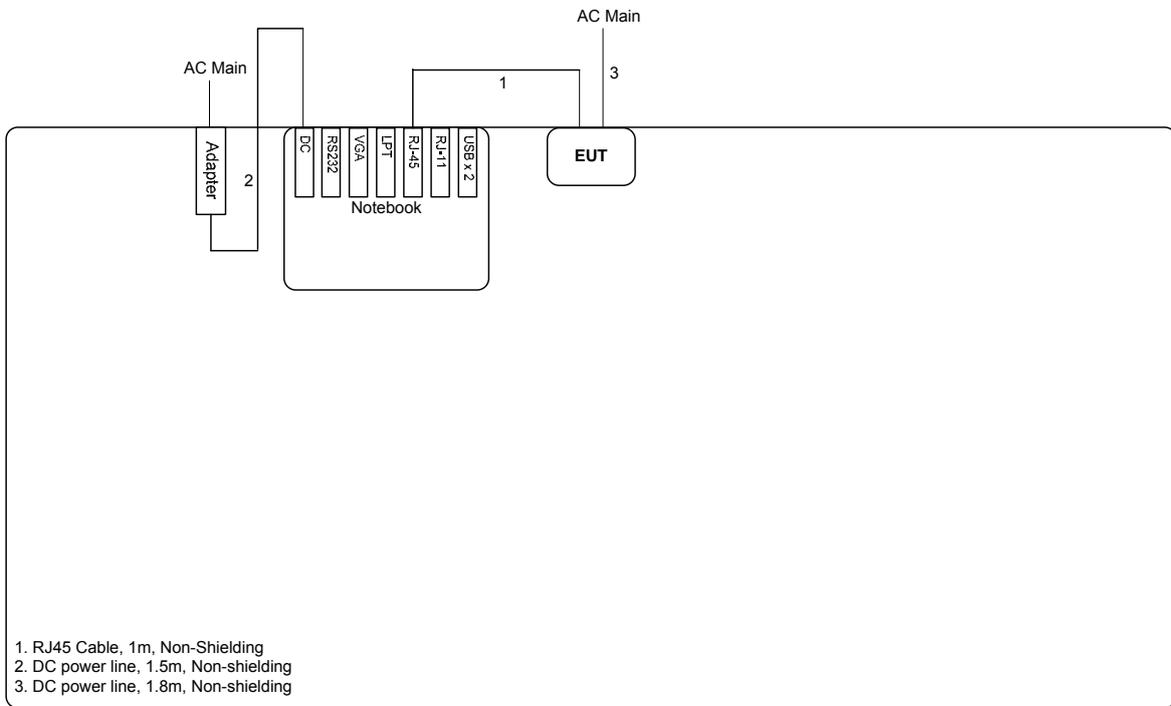
Executed "ping.exe" to link with the remote workstation to receive and transmit data by LAN and WLAN.

Executed “REALTEK 11n Single Chip USB WLAN NIC Massproduction Kit” to keep transmitting signals at fixed frequency.

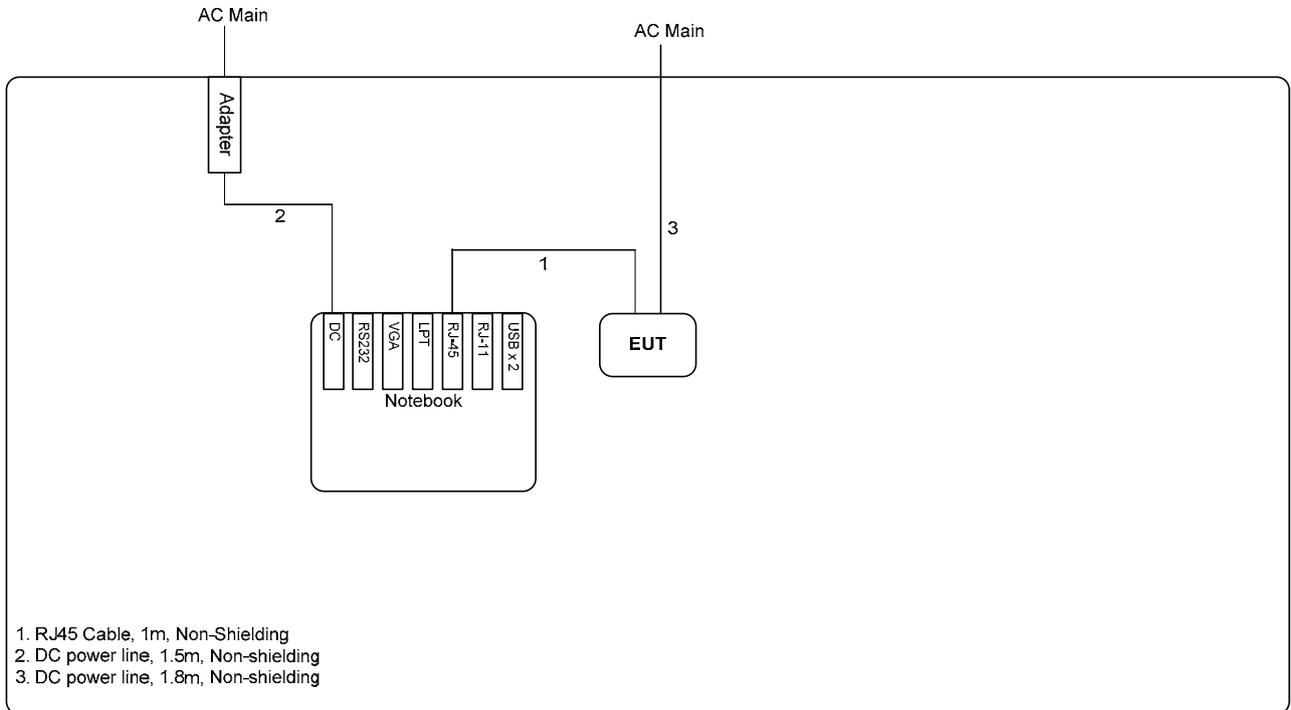
**2.10 Test Configuration**

**2.10.1 Radiation Emissions Test Configuration**

**For radiated emissions 9kHz~1GHz**



**For radiated emissions above 1GHz**



### 3 TEST RESULT

#### 3.1 AC Power Line Conducted Emissions Measurement

##### 3.1.1 Limit

For this product which is designed to be connected to the 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 below limits table.

Class B

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

##### 3.1.2 Measuring Instruments and Setting

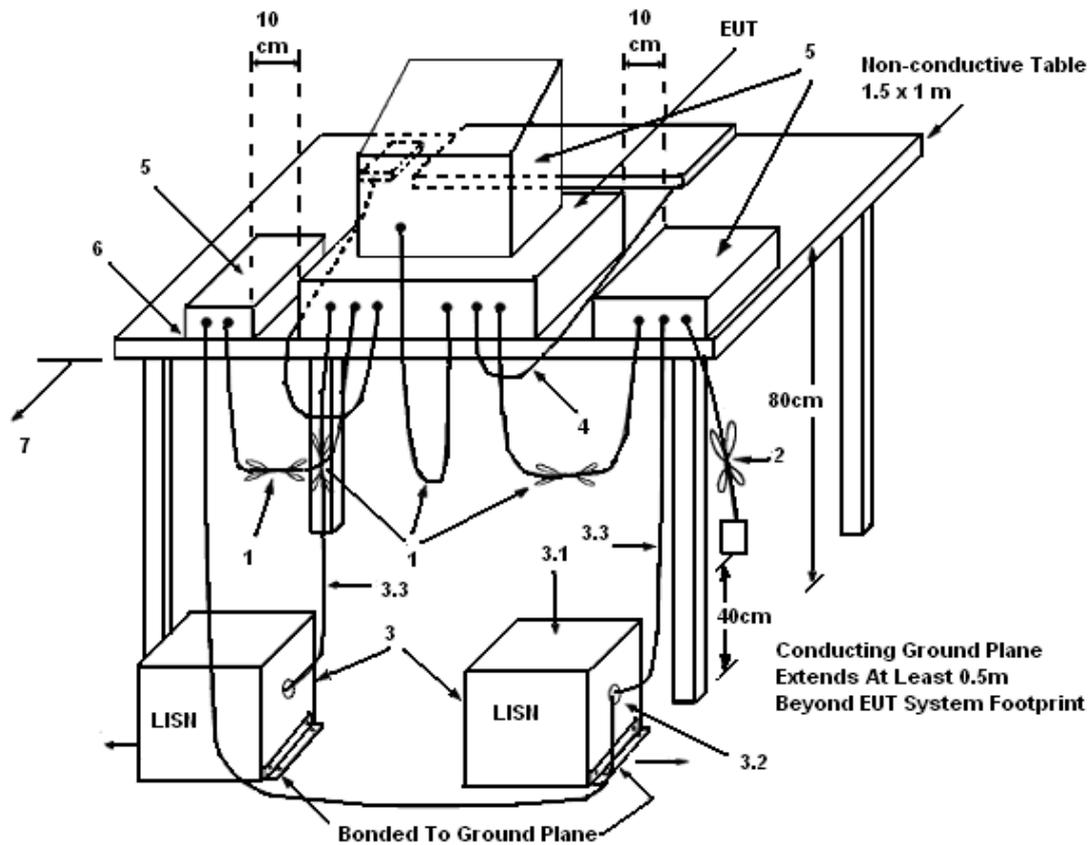
Please refer to section 4 of equipments list in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

##### 3.1.3 Test Procedures

1. Configure the EUT according to ANSI C63.4. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 KHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

**3.1.4 Test Setup Layout**



**LEGEND:**

- (1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- (2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- (3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.
  - (3.1) All other equipment powered from additional LISN(s).
  - (3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
  - (3.3) LISN at least 80 cm from nearest part of EUT chassis.
- (4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
- (5) Non-EUT components of EUT system being tested.
- (6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- (7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

**3.1.5 Test Deviation**

There is no deviation with the original standard.

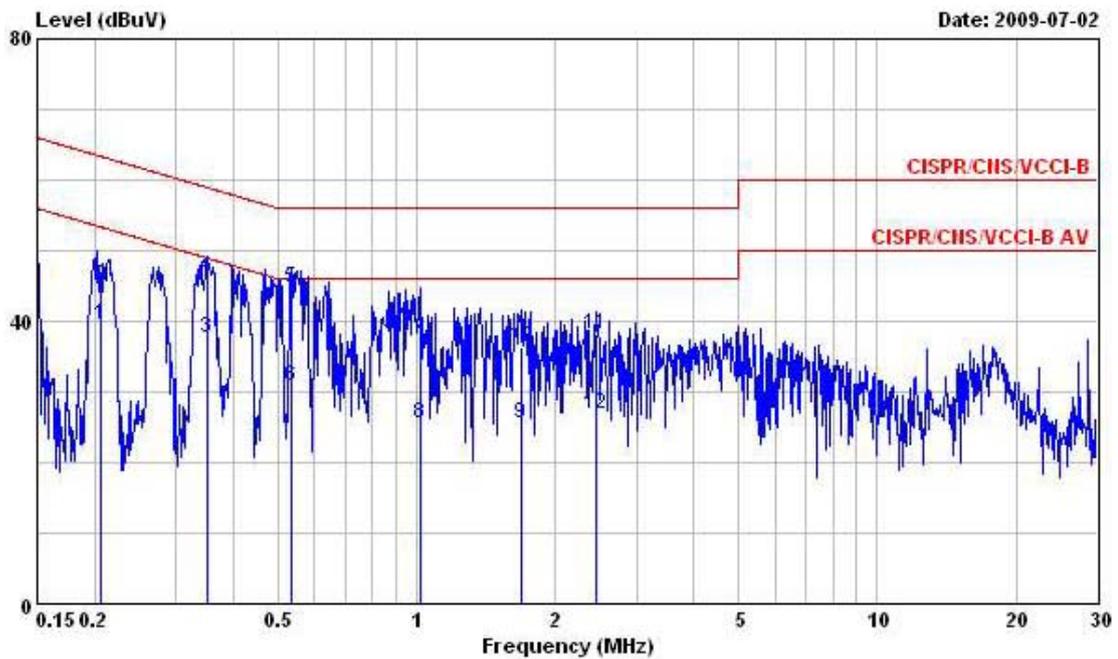
**3.1.6 EUT Operation during Test**

The EUT was placed on the test table and programmed in normal function.

**3.1.7 Results of AC Power Line Conducted Emissions Measurement**

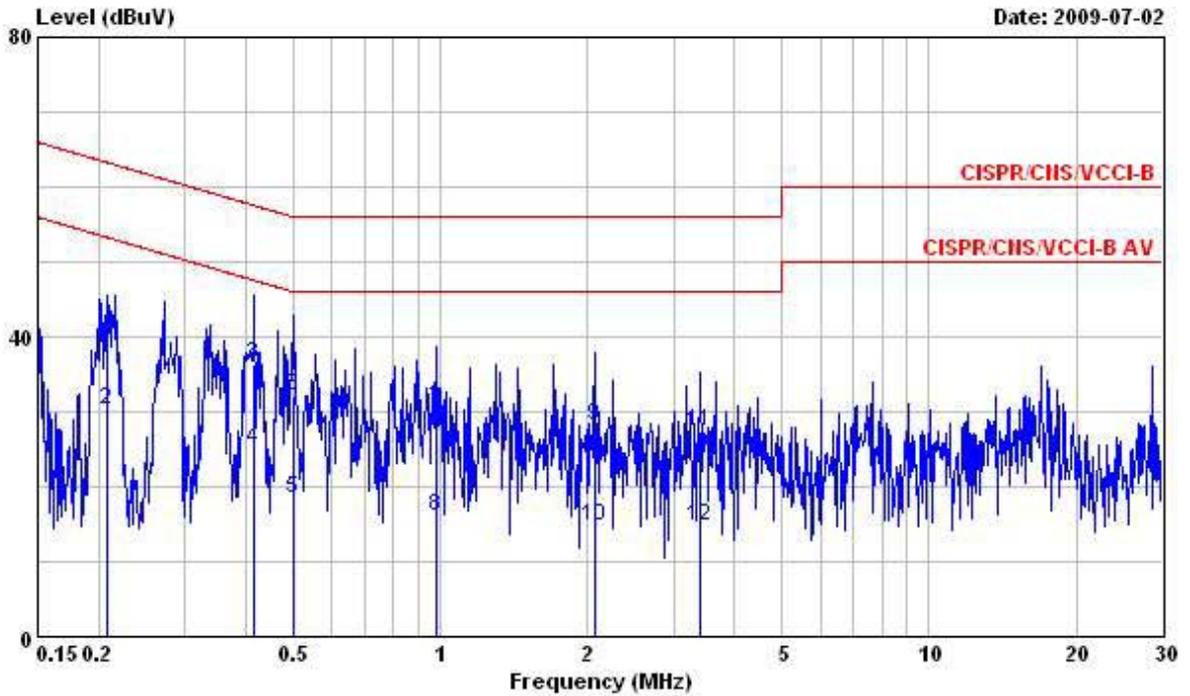
<b>Final Test date</b>	Jul. 02, 2009	<b>Test Site No.</b>	CO04-HY
<b>Temperature</b>	25	<b>Humidity</b>	55%
<b>Test Engineer</b>	Chris	<b>Configuration</b>	Mode 1

*Line*



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.2059650	39.40	-13.97	53.37	39.26	0.08	0.06	Average
2	0.2059650	45.09	-18.28	63.37	44.95	0.08	0.06	QP
3	@0.3520120	37.50	-11.41	48.91	37.33	0.09	0.08	Average
4	@0.3520120	46.34	-12.57	58.91	46.17	0.09	0.08	QP
5	@0.5321540	44.80	-11.20	56.00	44.60	0.10	0.10	QP
6	0.5321540	30.83	-15.17	46.00	30.63	0.10	0.10	Average
7	1.020	37.37	-18.63	56.00	37.12	0.11	0.14	QP
8	1.020	25.61	-20.39	46.00	25.36	0.11	0.14	Average
9	1.680	25.40	-20.60	46.00	25.11	0.12	0.17	Average
10	1.680	36.29	-19.71	56.00	36.00	0.12	0.17	QP
11	2.460	38.29	-17.71	56.00	37.95	0.14	0.20	QP
12	2.460	26.88	-19.12	46.00	26.54	0.14	0.20	Average

Neutral



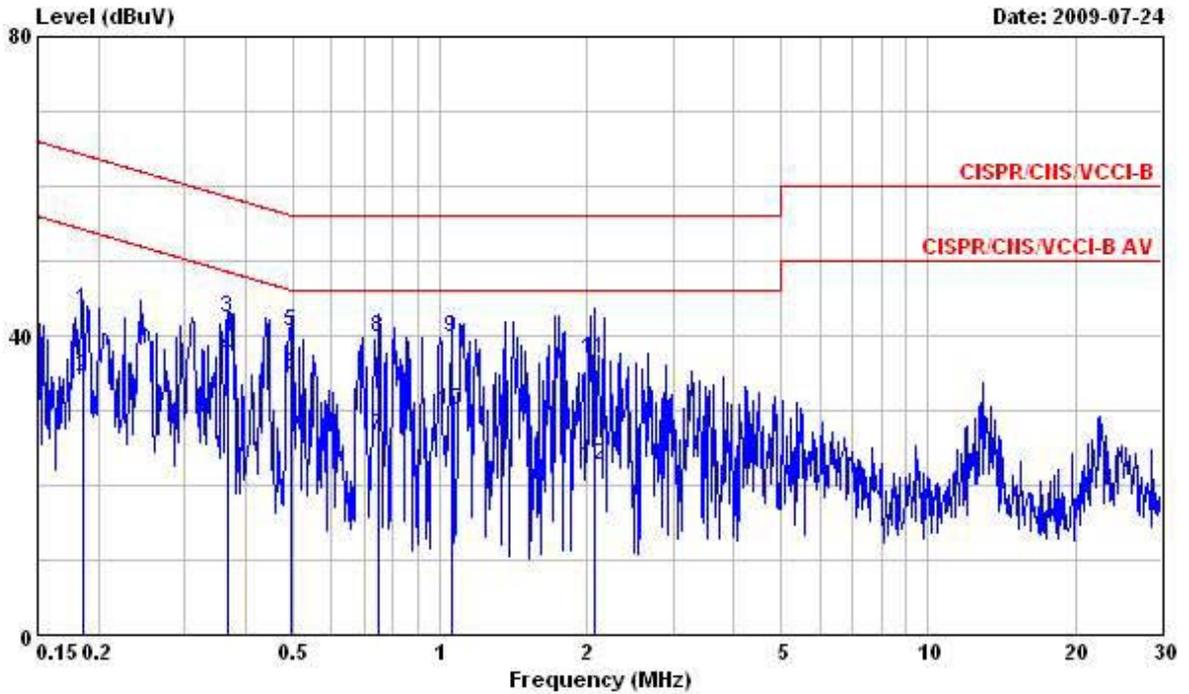
	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.2084930	38.94	-24.33	63.27	38.80	0.08	0.06	QP
2	0.2084930	30.36	-22.91	53.27	30.22	0.08	0.06	Average
3	0.4170520	36.42	-21.09	57.51	36.26	0.08	0.08	QP
4	0.4170520	25.12	-22.39	47.51	24.96	0.08	0.08	Average
5	0.5020260	18.46	-27.54	46.00	18.29	0.08	0.09	Average
6	0.5020260	32.08	-23.92	56.00	31.91	0.08	0.09	QP
7	0.9787140	30.27	-25.73	56.00	30.03	0.10	0.14	QP
8	0.9787140	16.00	-30.00	46.00	15.76	0.10	0.14	Average
9	2.070	28.20	-27.80	56.00	27.91	0.11	0.18	QP
10	2.070	14.83	-31.17	46.00	14.54	0.11	0.18	Average
11	3.400	27.45	-28.55	56.00	27.08	0.14	0.23	QP
12	3.400	14.64	-31.36	46.00	14.27	0.14	0.23	Average

Note:

Level = Read Level + LISN Factor + Cable Loss.

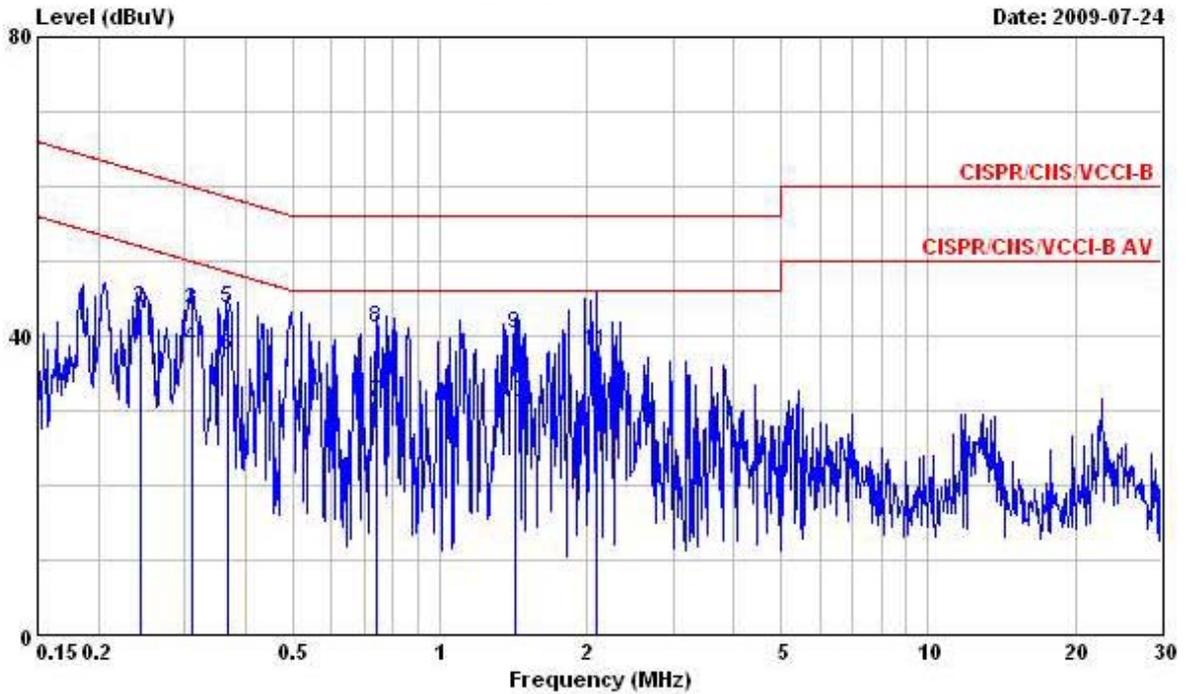
Final Test date	Jul. 24, 2009	Test Site No.	CO04-HY
Temperature	25	Humidity	55%
Test Engineer	Chris	Configuration	Mode 2

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1854100	43.48	-20.76	64.24	43.32	0.08	0.08	QP
2	0.1854100	34.36	-19.88	54.24	34.20	0.08	0.08	Average
3	0.3692040	42.41	-16.11	58.52	42.24	0.09	0.08	QP
4	0.3692040	37.01	-11.51	48.52	36.84	0.09	0.08	Average
5	0.4941090	40.54	-15.56	56.10	40.36	0.09	0.09	QP
6	0.4941090	34.73	-11.37	46.10	34.55	0.09	0.09	Average
7	0.7509390	26.67	-19.33	46.00	26.45	0.10	0.12	Average
8	0.7509390	39.62	-16.38	56.00	39.40	0.10	0.12	QP
9	1.060	39.75	-16.25	56.00	39.50	0.11	0.14	QP
10	1.060	30.01	-15.99	46.00	29.76	0.11	0.14	Average
11	2.064	36.90	-19.10	56.00	36.59	0.13	0.18	QP
12	2.064	22.53	-23.47	46.00	22.22	0.13	0.18	Average

Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.2429320	39.13	-12.87	52.00	38.98	0.08	0.07	Average
2	0.2429320	43.80	-18.20	62.00	43.65	0.08	0.07	QP
3	0.3099790	43.46	-16.51	59.97	43.31	0.08	0.07	QP
4	0.3099790	38.38	-11.59	49.97	38.23	0.08	0.07	Average
5	0.3692040	43.79	-14.73	58.52	43.63	0.08	0.08	QP
6	0.3692040	37.26	-11.26	48.52	37.10	0.08	0.08	Average
7	0.7430230	31.09	-14.91	46.00	30.88	0.09	0.12	Average
8	0.7430230	41.06	-14.94	56.00	40.85	0.09	0.12	QP
9	1.430	40.37	-15.63	56.00	40.10	0.11	0.16	QP
10	1.430	30.95	-15.05	46.00	30.68	0.11	0.16	Average
11	2.100	38.02	-17.98	56.00	37.73	0.11	0.18	QP
12	2.100	27.11	-18.89	46.00	26.82	0.11	0.18	Average

Note:

Level = Read Level + LISN Factor + Cable Loss.

**3.2 Maximum Conducted Output Power Measurement**

**3.2.1 Limit**

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceed 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

**3.2.2 Measuring Instruments and Setting**

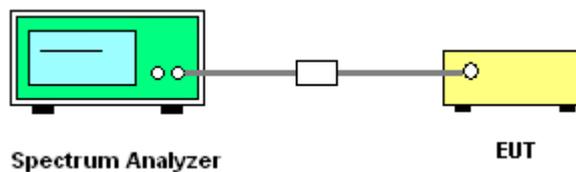
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

<b>Power Meter Parameter</b>	<b>Setting</b>
Attenuation	Auto
Span Frequency	0.135 s ~ 26 s
RB	1000 kHz
VB	3000 kHz
Detector	rms
Trace	Max Hold
Sweep Time	Auto

**3.2.3 Test Procedures**

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Test was performed in accordance with Measurement of Digital Transmission Systems Operating under Section 15.247.
3. When measuring maximum conducted output power within multiple antenna systems, add every result of the values by mathematic formula.

**3.2.4 Test Setup Layout**



**3.2.5 Test Deviation**

There is no deviation with the original standard.

**3.2.6 EUT Operation during Test**

The EUT was programmed to be in continuously transmitting mode.

**3.2.7 Test Result of Maximum Conducted Output Power**

<b>Final Test date</b>	Jul. 31, 2009	<b>Test Site No.</b>	TH01-HY
<b>Temperature</b>	25	<b>Humidity</b>	54%
<b>Test Engineer</b>	Duncan	<b>Configuration</b>	802.11n

**Configuration of IEEE 802.11n (20MHz)**

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	17.18	30.00	<b>Complies</b>
6	2437 MHz	17.17	30.00	<b>Complies</b>
11	2462 MHz	15.69	30.00	<b>Complies</b>

**Configuration of IEEE 802.11n (20MHz)**

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	11.71	30.00	<b>Complies</b>
6	2437 MHz	10.76	30.00	<b>Complies</b>
9	2452 MHz	10.82	30.00	<b>Complies</b>

**3.3 Power Spectral Density Measurement**

**3.3.1 Limit**

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

**3.3.2 Measuring Instruments and Setting**

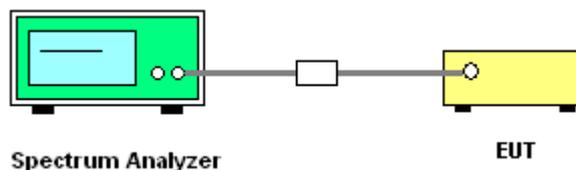
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	1.5MHz
RB	3 kHz
VB	30 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	500s

**3.3.3 Test Procedures**

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set RBW of spectrum analyzer to 3kHz and VBW to 30kHz. Set Detector to Peak, Trace to Max Hold.
3. Mark the frequency with maximum peak power as the center of the display of the spectrum.
4. Set the span to 1.5MHz and the sweep time to 500s and record the maximum peak value.
5. Measuring multiple antennas, the connectors are required to link with Spectrum Analyzer through a combiner.

**3.3.4 Test Setup Layout**



**3.3.5 Test Deviation**

There is no deviation with the original standard.

**3.3.6 EUT Operation during Test**

The EUT was programmed to be in continuously transmitting mode.

**3.3.7 Test Result of Power Spectral Density**

<b>Final Test date</b>	Jul. 31, 2009	<b>Test Site No.</b>	TH01-HY
<b>Temperature</b>	25	<b>Humidity</b>	54%
<b>Test Engineer</b>	Duncan	<b>Configuration</b>	802.11n

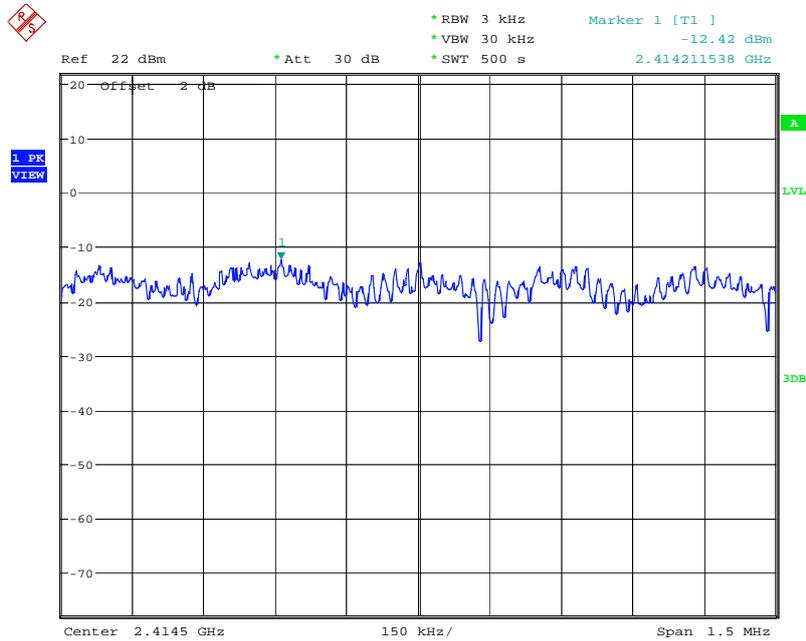
**Configuration of IEEE 802.11n (20MHz)**

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	-12.42	8.00	<b>Complies</b>
6	2437 MHz	-13.94	8.00	<b>Complies</b>
11	2462 MHz	-14.42	8.00	<b>Complies</b>

**Configuration of IEEE 802.11n (40MHz)**

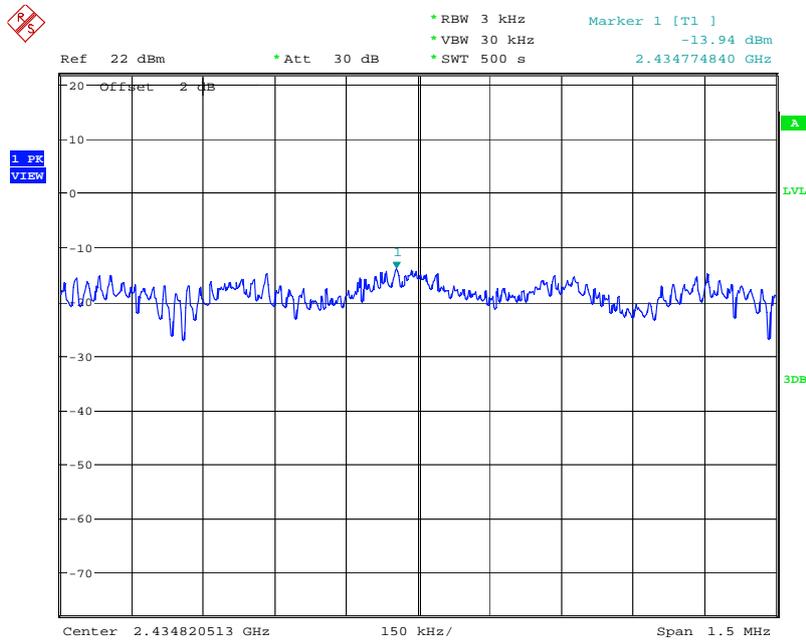
Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
3	2422 MHz	-20.15	8.00	<b>Complies</b>
6	2437 MHz	-19.89	8.00	<b>Complies</b>
9	2452 MHz	-21.07	8.00	<b>Complies</b>

Power Density Plot on Configuration of IEEE 802.11n (20MHz) / 2412 MHz



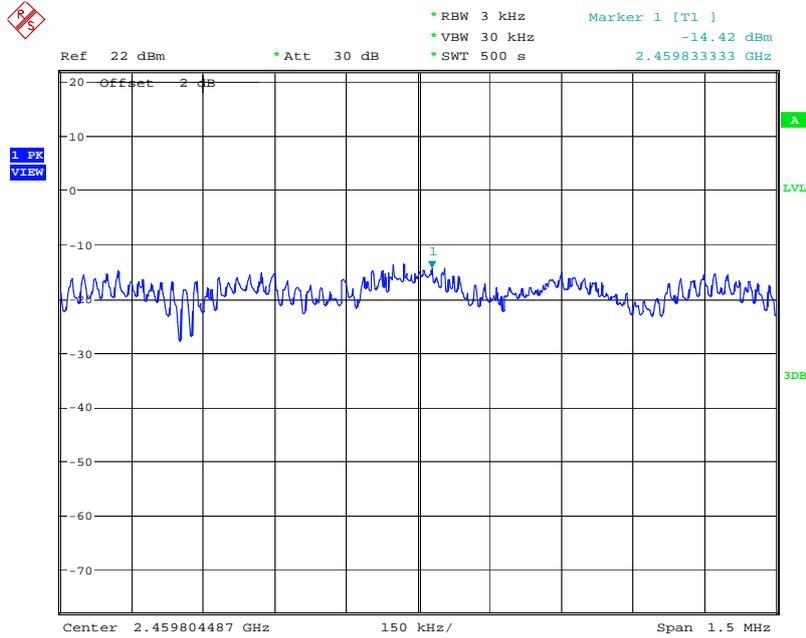
Date: 31.JUL.2009 22:44:19

Power Density Plot on Configuration of IEEE 802.11n (20MHz) / 2437 MHz



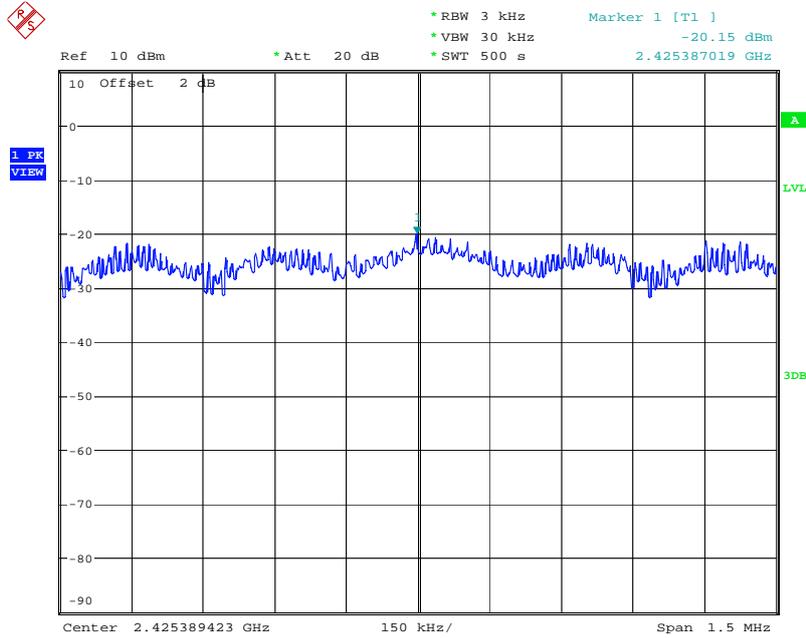
Date: 31.JUL.2009 22:49:37

Power Density Plot on Configuration of IEEE 802.11n (20MHz) / 2462 MHz



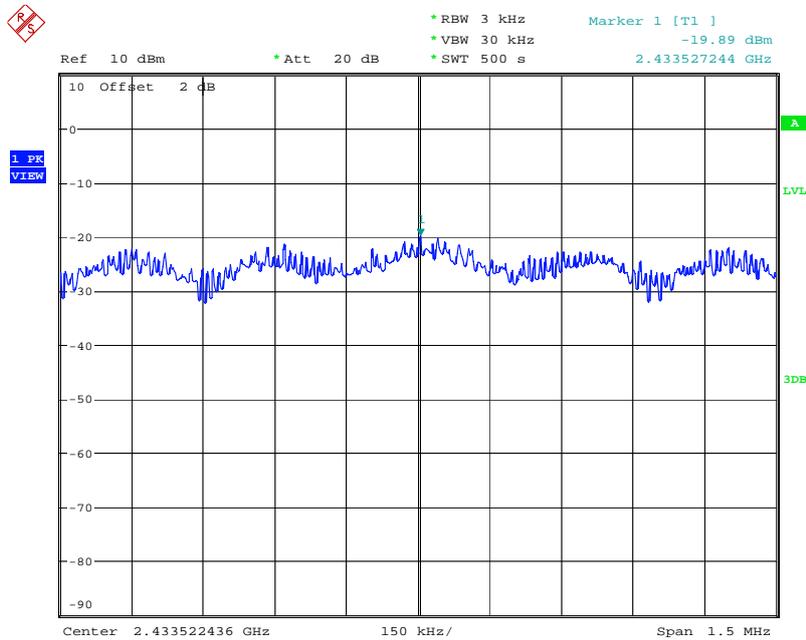
Date: 31.JUL.2009 22:48:36

Power Density Plot on Configuration of IEEE 802.11n (40MHz) / 2422 MHz



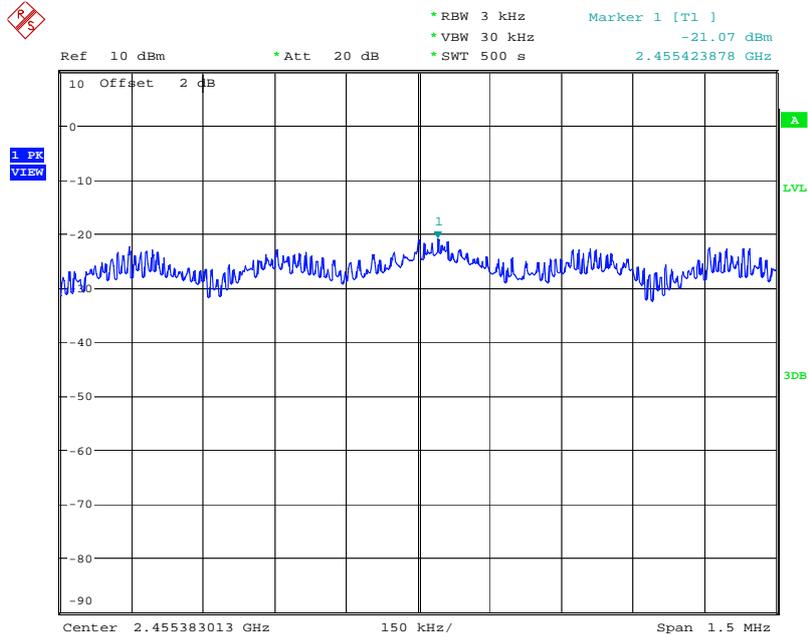
Date: 31.JUL.2009 22:59:34

Power Density Plot on Configuration of IEEE 802.11n (40MHz) / 2437 MHz



Date: 31.JUL.2009 23:01:21

Power Density Plot on Configuration of IEEE 802.11n (40MHz) / 2452 MHz



Date: 31.JUL.2009 23:05:42

**3.4 6dB Spectrum Bandwidth Measurement**

**3.4.1 Limit**

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

**3.4.2 Measuring Instruments and Setting**

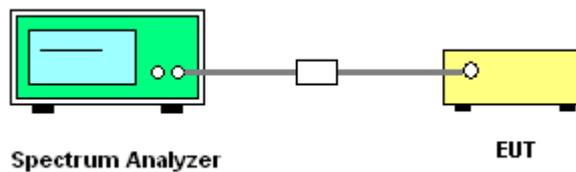
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

**3.4.3 Test Procedures**

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 6dB below carrier.
4. Measuring multiple antennas, the connectors are required to link with Spectrum Analyzer through a combiner.

**3.4.4 Test Setup Layout**



**3.4.5 Test Deviation**

There is no deviation with the original standard.

**3.4.6 EUT Operation during Test**

The EUT was programmed to be in continuously transmitting mode.

**3.4.7 Test Result of 6dB Spectrum Bandwidth**

<b>Final Test date</b>	Jul. 31, 2009	<b>Test Site No.</b>	TH01-HY
<b>Temperature</b>	25	<b>Humidity</b>	54%
<b>Test Engineer</b>	Duncan	<b>Configuration</b>	802.11n

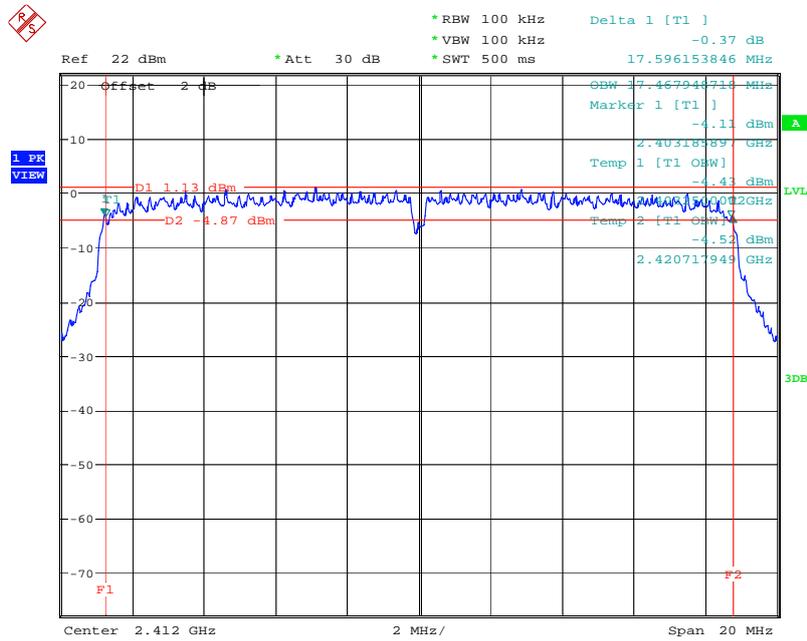
**Configuration of IEEE 802.11n (20MHz)**

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	17.596	17.467	500	<b>Complies</b>
6	2437 MHz	17.596	17.500	500	<b>Complies</b>
11	2462 MHz	17.628	17.500	500	<b>Complies</b>

**Configuration of IEEE 802.11n (40MHz)**

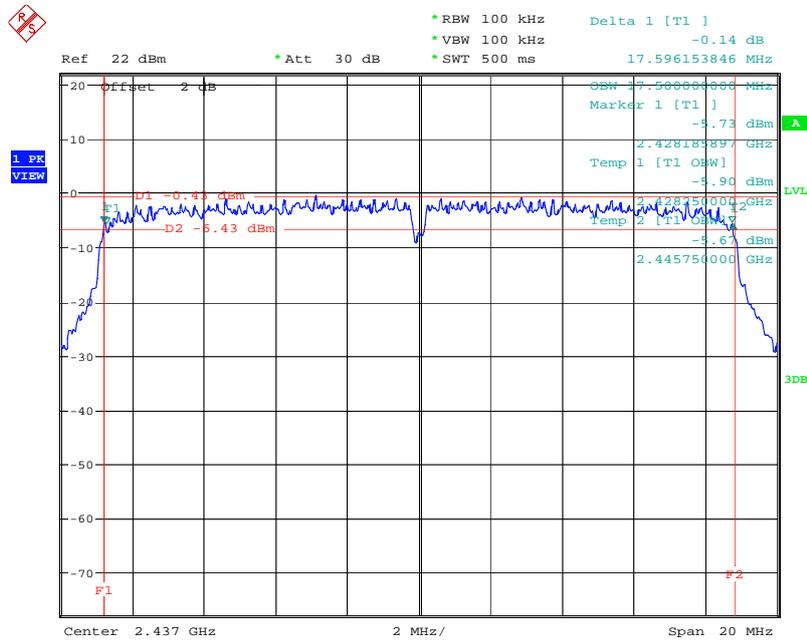
Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
3	2422 MHz	36.410	35.897	500	<b>Complies</b>
6	2437 MHz	36.410	35.897	500	<b>Complies</b>
9	2452 MHz	36.410	35.897	500	<b>Complies</b>

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) / 2412 MHz



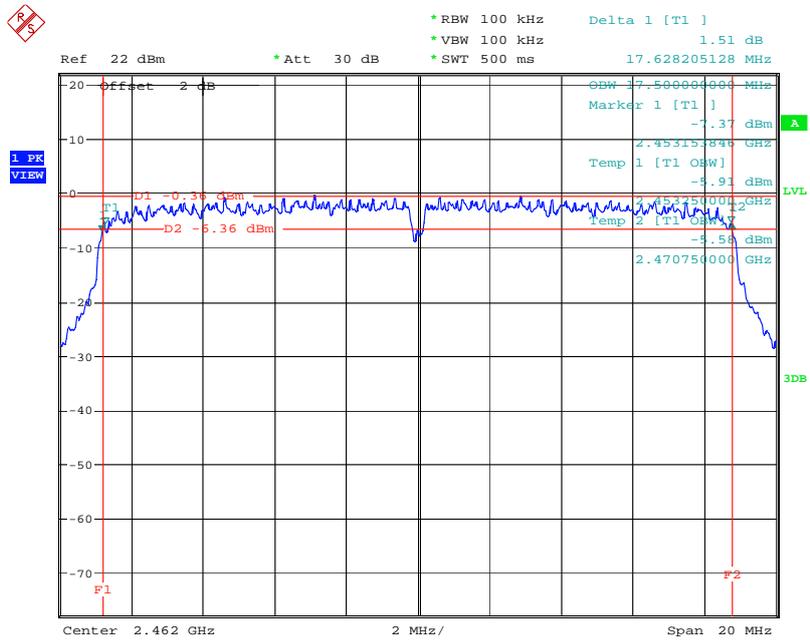
Date: 31.JUL.2009 22:43:32

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) / 2437 MHz



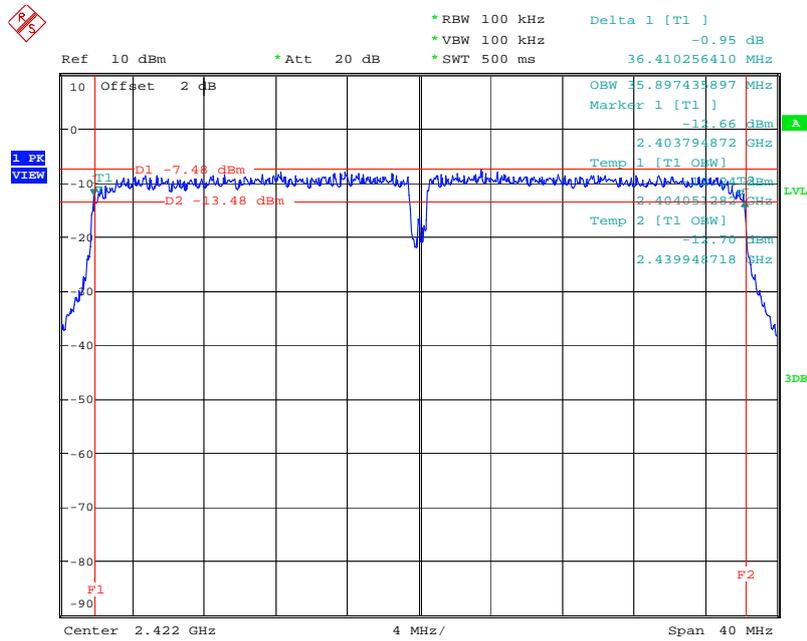
Date: 31.JUL.2009 22:50:34

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) / 2462 MHz



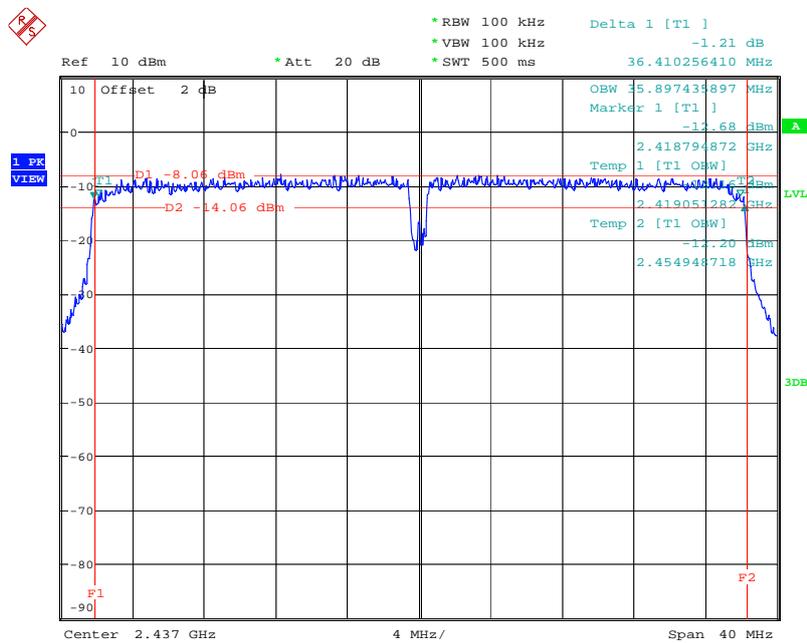
Date: 31.JUL.2009 22:47:48

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) / 2422 MHz



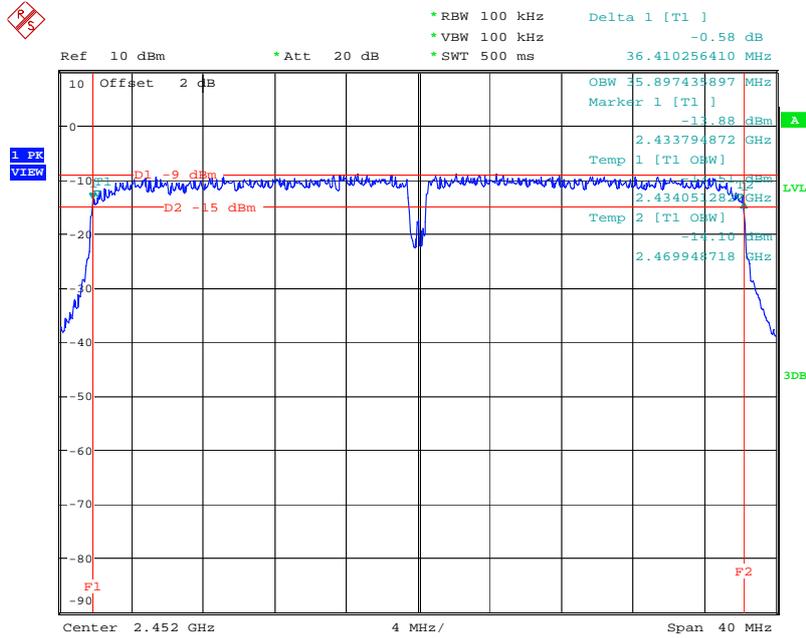
Date: 31.JUL.2009 22:57:26

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) / 2437 MHz



Date: 31.JUL.2009 23:02:43

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) / 2452 MHz



Date: 31.JUL.2009 23:03:51

**3.5 Radiated Emissions Measurement**

**3.5.1 Limit**

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

<b>Frequencies (MHz)</b>	<b>Field Strength (microvolt/meter)</b>	<b>Measurement Distance (meters)</b>
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

**3.5.2 Measuring Instruments and Setting**

Please refer to section 4 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

<b>Spectrum Parameter</b>	<b>Setting</b>
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	100KHz / 100KHz for peak

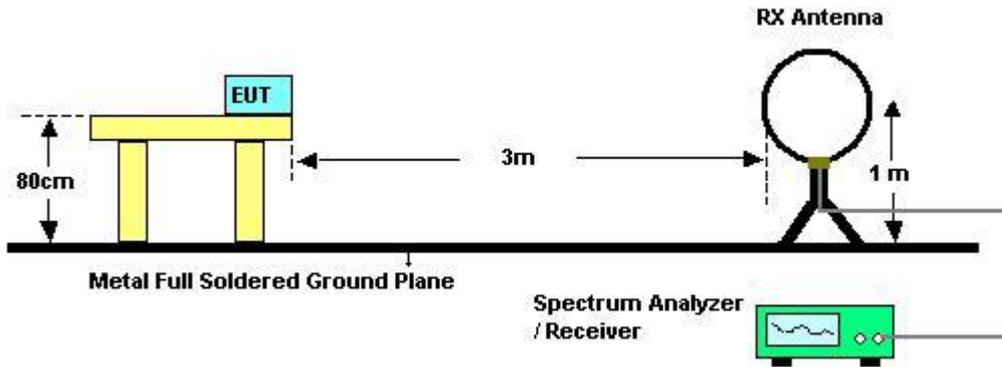
<b>Receiver Parameter</b>	<b>Setting</b>
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

**3.5.3 Test Procedures**

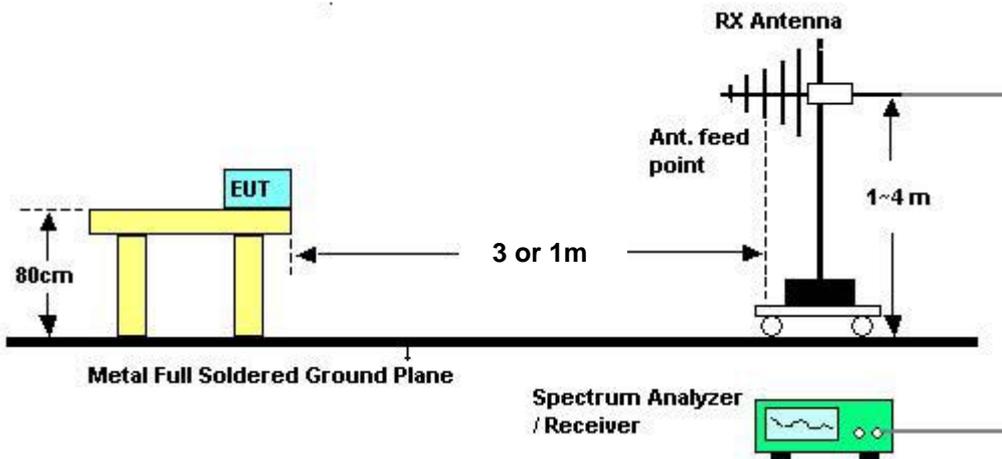
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

### 3.5.4 Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



Above 10 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);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

### 3.5.5 Test Deviation

There is no deviation with the original standard.

### 3.5.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

**3.5.7 Results of Radiated Emissions (9kHz~30MHz)**

<b>Final Test date</b>	Jul. 31, 2009	<b>Test Site No.</b>	03CH02-HY
<b>Temperature</b>	22	<b>Humidity</b>	55%
<b>Test Engineer</b>	Kobe		

<b>Freq. (MHz)</b>	<b>Level (dBuV)</b>	<b>Over Limit (dB)</b>	<b>Limit Line (dBuV)</b>	<b>Remark</b>
-	-	-	-	See Note

Note:

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

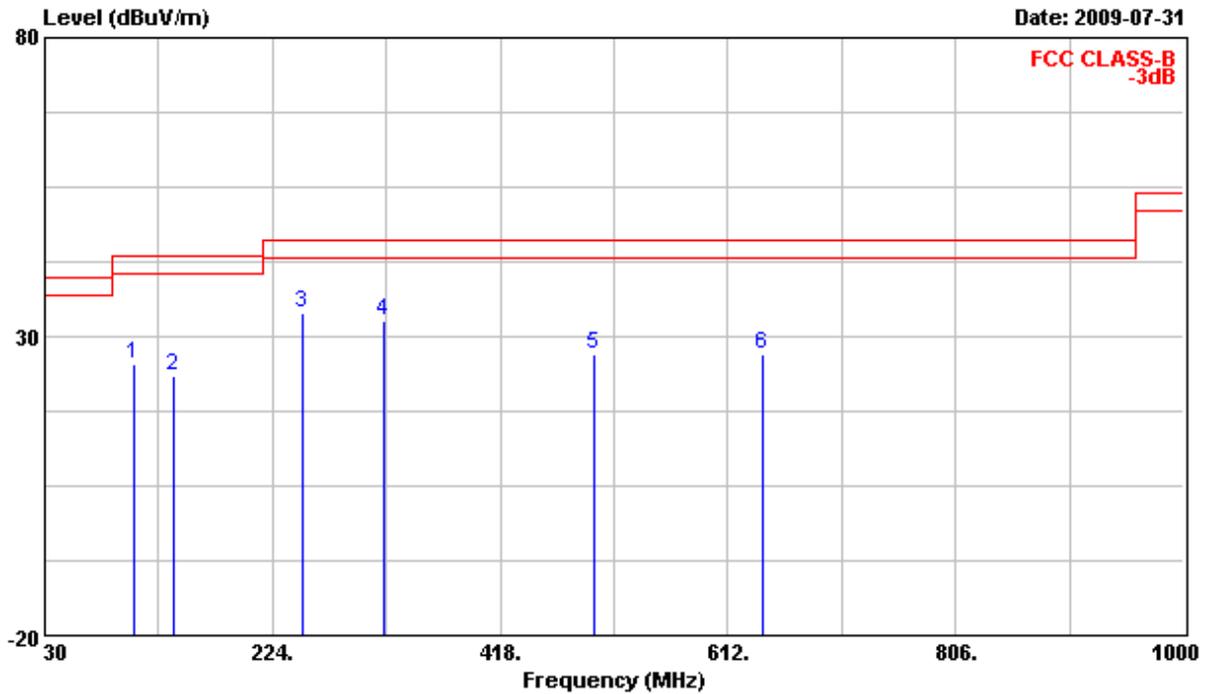
Distance extrapolation factor =  $40 \log(\text{specific distance} / \text{test distance})$  (dB);

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

3.5.8 Results of Radiated Emissions (30MHz~1GHz)

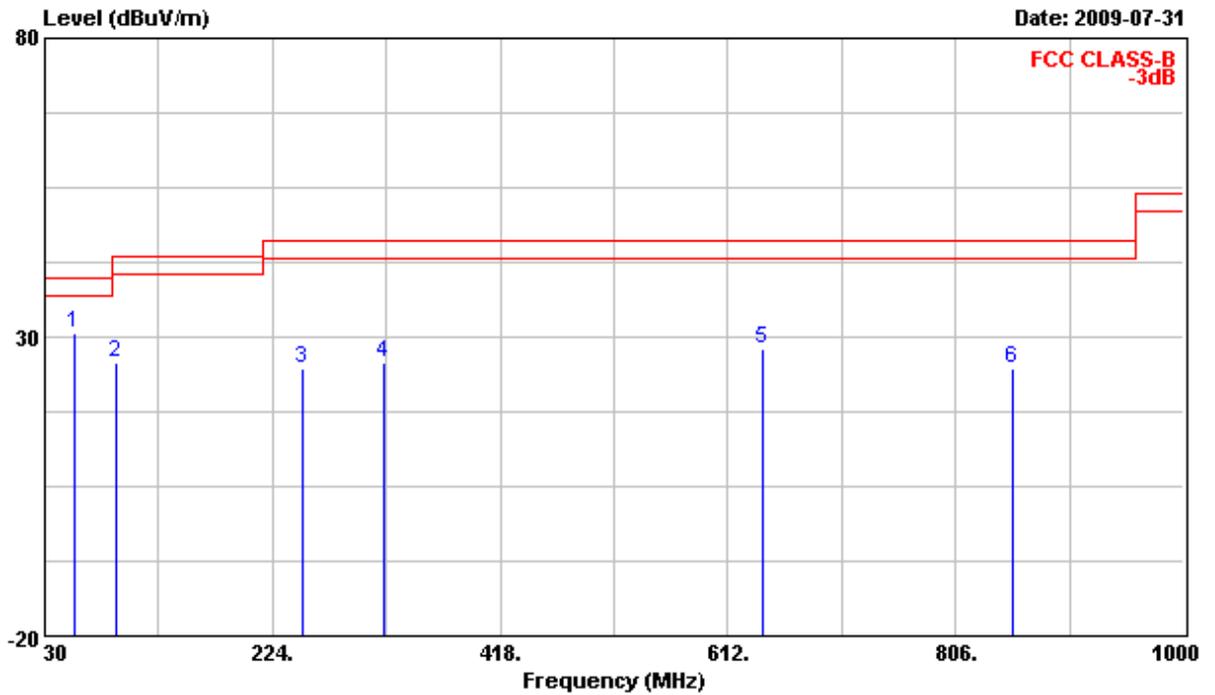
Final Test date	Jul. 31, 2009	Test Site No.	03CH02-HY
Temperature	22	Humidity	55%
Test Engineer	Kobe	Configuration	Mode 1

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	105.660	25.38	-18.12	43.50	42.21	11.88	2.09	30.79	---	---	Peak
2	140.580	23.42	-20.08	43.50	39.85	11.90	2.38	30.72	---	---	Peak
3	249.220	34.09	-11.91	46.00	48.53	12.97	3.10	30.50	---	---	Peak
4	319.060	32.61	-13.39	46.00	45.56	14.00	3.40	30.36	---	---	Peak
5	498.510	27.08	-18.92	46.00	35.46	17.26	4.26	29.90	---	---	Peak
6	641.100	26.92	-19.08	46.00	31.63	19.63	5.10	29.44	---	---	Peak

Vertical



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	cm	deg	
1	56.190	30.68	-9.32	40.00	51.89	8.05	1.54	30.80	---	---	Peak
2	90.140	25.87	-17.63	43.50	45.24	9.50	1.93	30.80	---	---	Peak
3	249.220	24.84	-21.16	46.00	39.28	12.97	3.10	30.50	---	---	Peak
4	319.060	25.87	-20.13	46.00	38.82	14.00	3.40	30.36	---	---	Peak
5	641.100	27.93	-18.07	46.00	32.64	19.63	5.10	29.44	---	---	Peak
6	854.500	24.84	-21.16	46.00	27.97	20.14	5.56	28.84	---	---	Peak

Note:

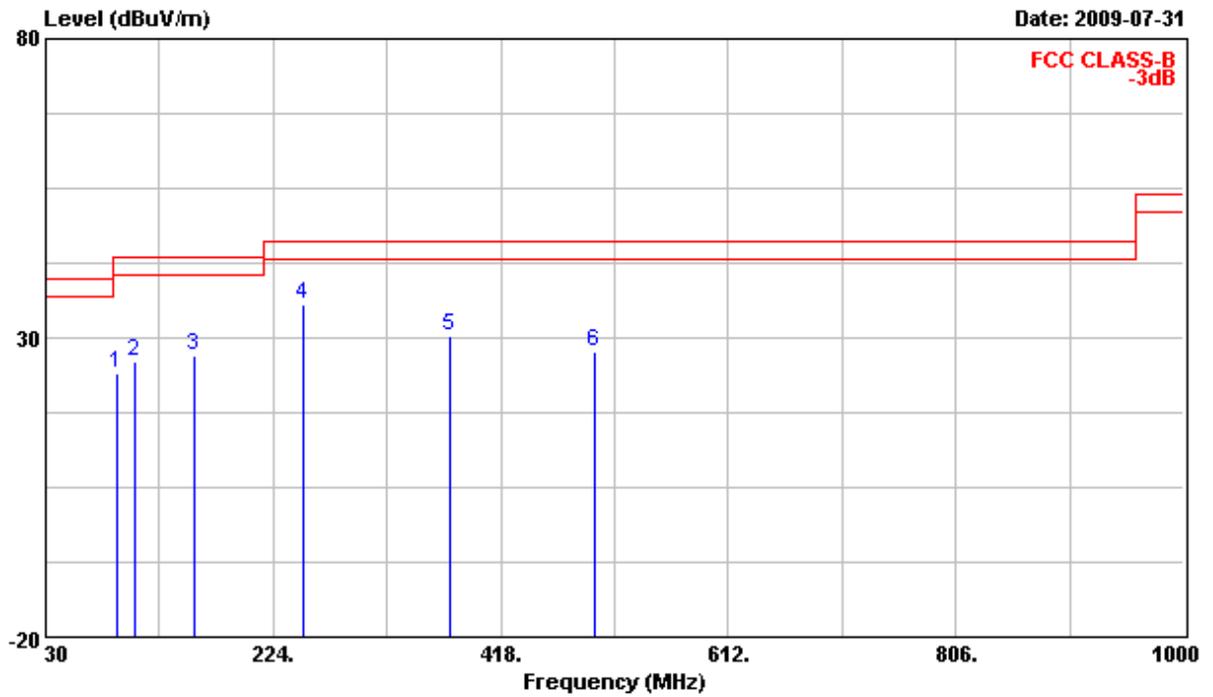
The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBUV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

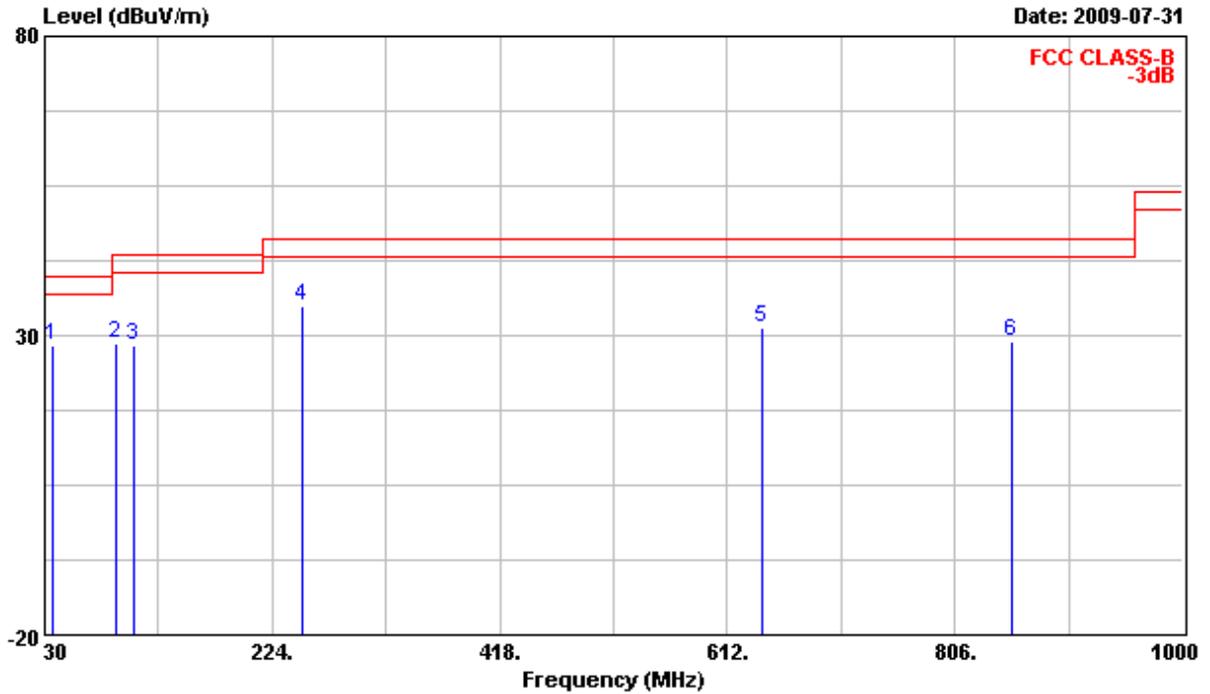
Final Test date	Jul. 31, 2009	Test Site No.	03CH02-HY
Temperature	22	Humidity	55%
Test Engineer	Kobe	Configuration	Mode 2

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	90.140	24.16	-19.34	43.50	43.53	9.50	1.93	30.80	---	---	Peak
2	105.660	25.98	-17.52	43.50	42.81	11.88	2.09	30.79	---	---	Peak
3	156.100	26.91	-16.59	43.50	44.44	10.64	2.52	30.69	---	---	Peak
4	249.220	35.54	-10.46	46.00	49.98	12.97	3.10	30.50	---	---	Peak
5	374.350	30.42	-15.58	46.00	42.06	14.86	3.76	30.25	---	---	Peak
6	498.510	27.58	-18.42	46.00	35.96	17.26	4.26	29.90	---	---	Peak

Vertical



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	36.790	28.38	-11.62	40.00	43.94	13.92	1.37	30.85	---	---	Peak
2	90.140	28.79	-14.71	43.50	48.16	9.50	1.93	30.80	---	---	Peak
3	105.660	28.44	-15.06	43.50	45.27	11.88	2.09	30.79	---	---	Peak
4	249.220	35.00	-11.00	46.00	49.44	12.97	3.10	30.50	---	---	Peak
5	641.100	31.42	-14.58	46.00	36.13	19.63	5.10	29.44	---	---	Peak
6	854.500	28.91	-17.09	46.00	32.04	20.14	5.56	28.84	---	---	Peak

Note:

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

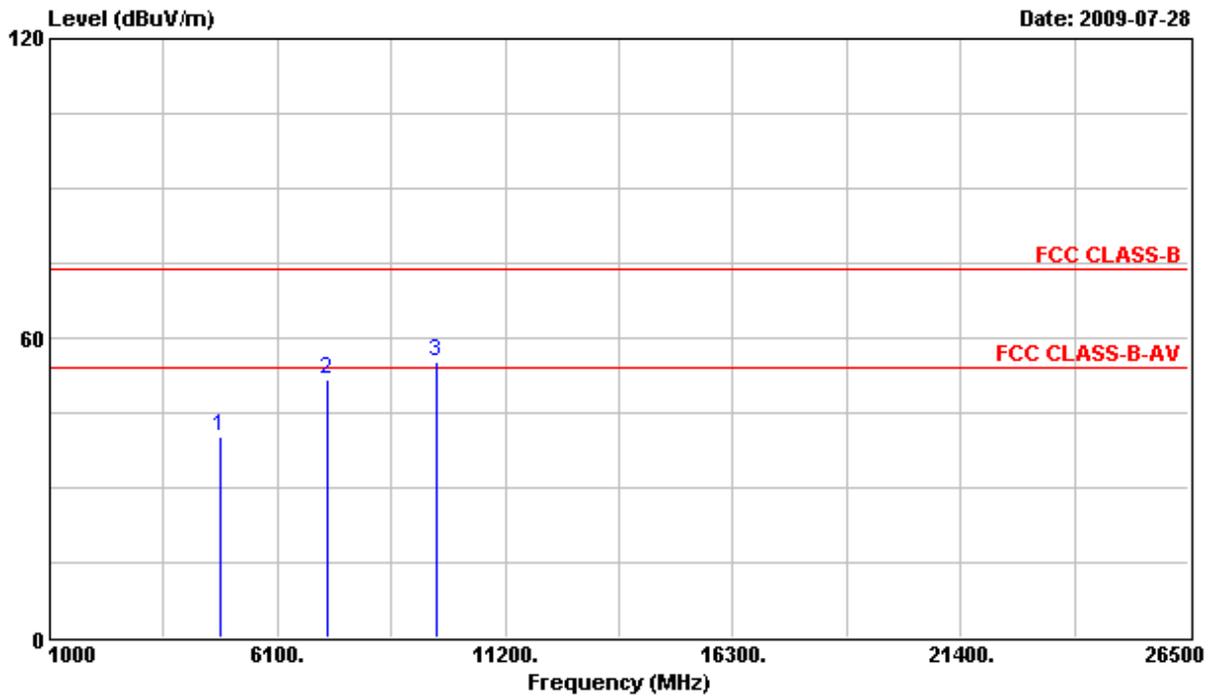
Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

3.5.9 Results for Radiated Emissions (1GHz~10<sup>th</sup> Harmonic)

Final Test date	Jul. 28, 2009	Test Site No.	03CH02-HY
Temperature	22	Humidity	55%
Test Engineer	Kobe	Configuration	802.11n CH 1 (20MHz)

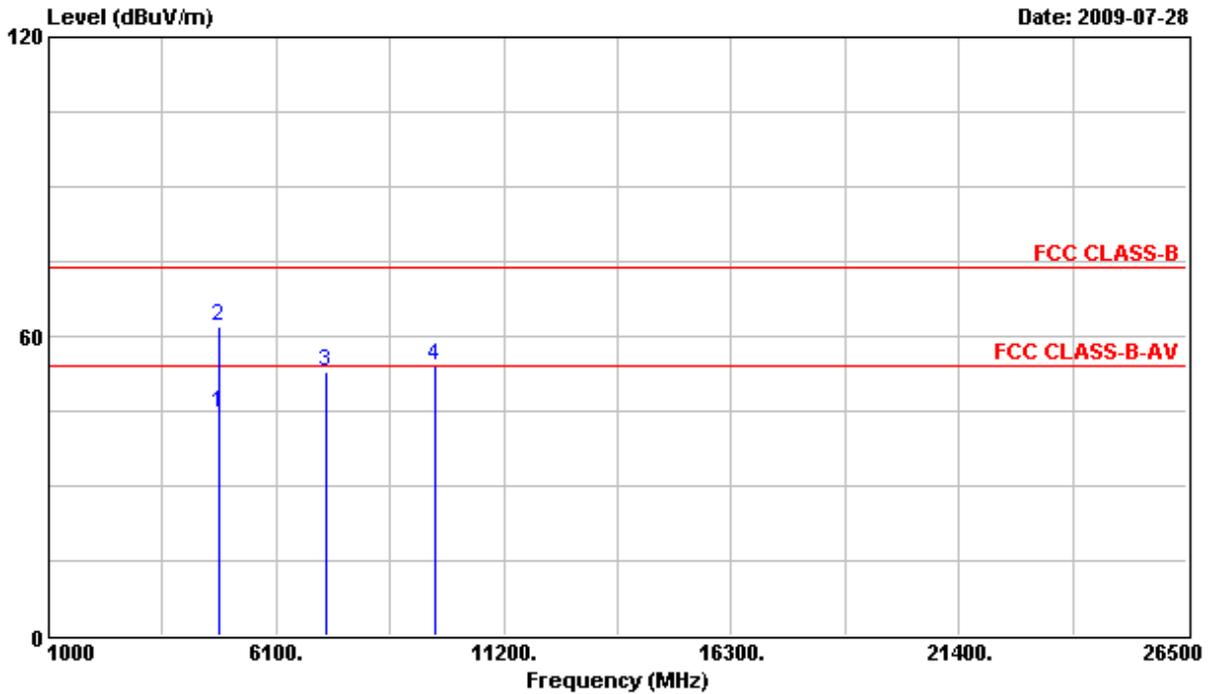
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	cm	deg	
1	4823.600	40.36	-13.64	54.00	34.54	35.76	4.58	34.51	---	---	PK
2	7236.000	51.89			42.70	37.85	5.63	34.29	---	---	PEAK
3	9648.000	55.45			44.34	39.39	6.34	34.63	---	---	PEAK

Note: An item 2 and 3 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

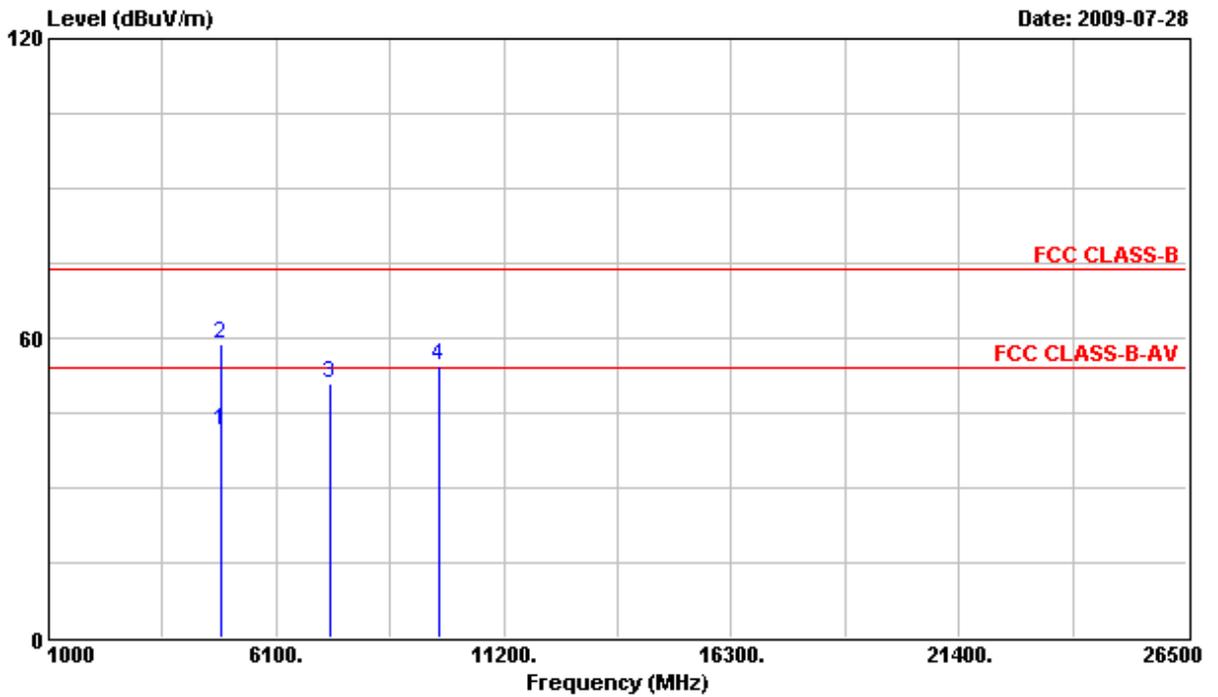


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 @	4823.400	44.65	-9.35	54.00	39.46	35.13	4.58	34.51	---	---	Average
2	4823.400	61.97	-12.03	74.00	56.78	35.13	4.58	34.51	---	---	Peak
3	7236.000	53.00			44.76	36.90	5.63	34.29	---	---	PEAK
4	9648.000	53.95			43.64	38.59	6.34	34.63	---	---	PEAK

Note: An item 3 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test date	Jul. 28, 2009	Test Site No.	03CH02-HY
Temperature	22	Humidity	55%
Test Engineer	Kobe	Configuration	802.11n CH 6 (20MHz)

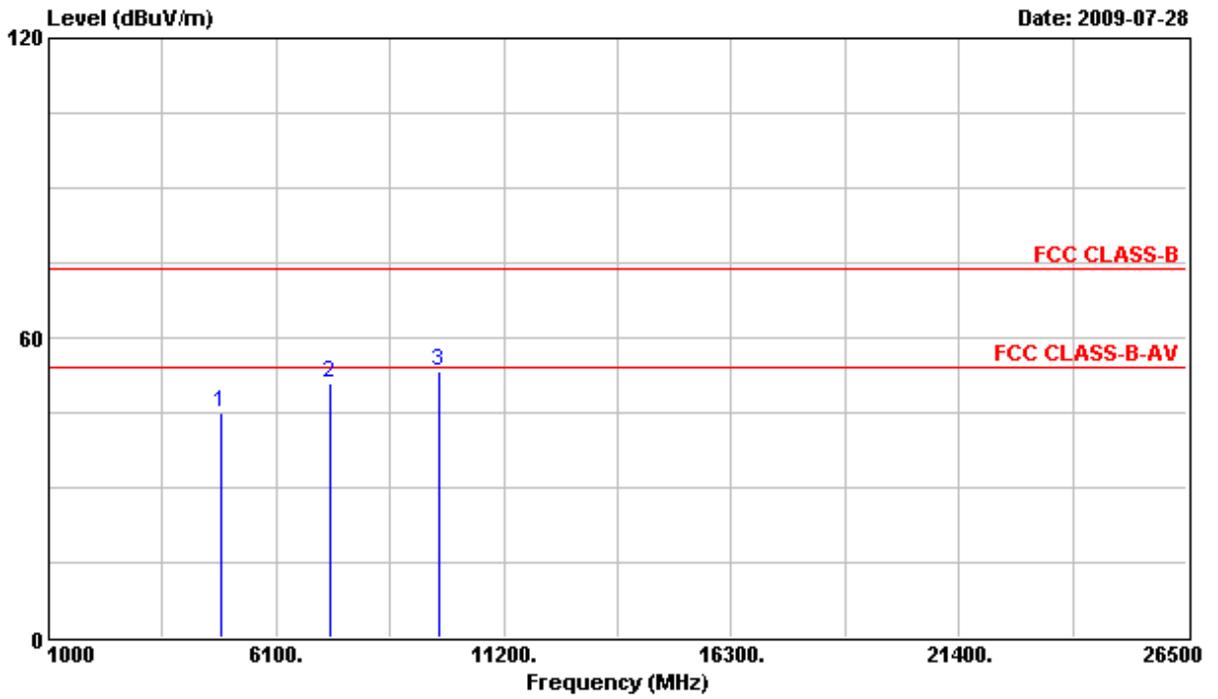
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	4873.800	41.57	-12.43	54.00	35.58	35.83	4.61	34.45	---	---	Average
2	4873.800	58.97	-15.03	74.00	52.98	35.83	4.61	34.45	---	---	Peak
3 @	7311.000	50.86	-3.14	54.00	41.65	37.86	5.64	34.29	---	---	PK
4	9748.000	54.39			43.10	39.51	6.36	34.58	---	---	PEAK

Note: An item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

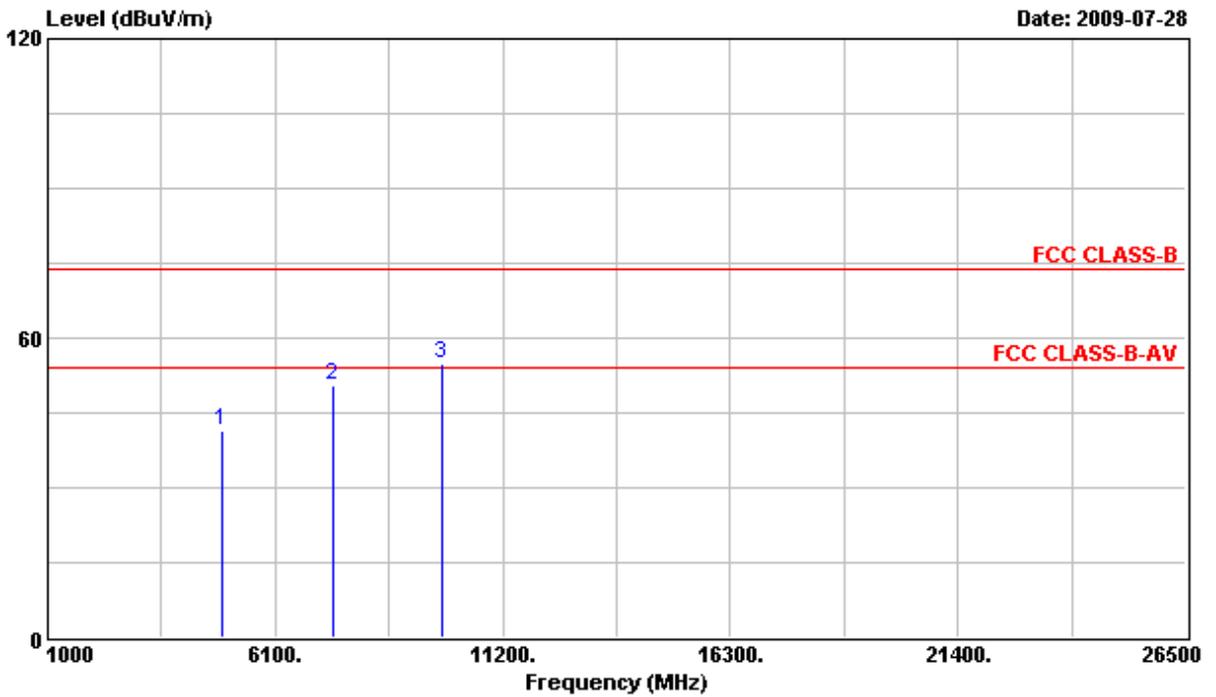


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	4874.000	44.81	-9.19	54.00	39.47	35.18	4.61	34.45	---	---	PK
2	7311.000	50.77	-3.23	54.00	42.50	36.92	5.64	34.29	---	---	PK
3	9748.000	53.42			42.94	38.71	6.36	34.58	---	---	PEAK

Note: An item 3 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test date	Jul. 28, 2009	Test Site No.	03CH02-HY
Temperature	22	Humidity	55%
Test Engineer	Kobe	Configuration	802.11n CH 11 (20MHz)

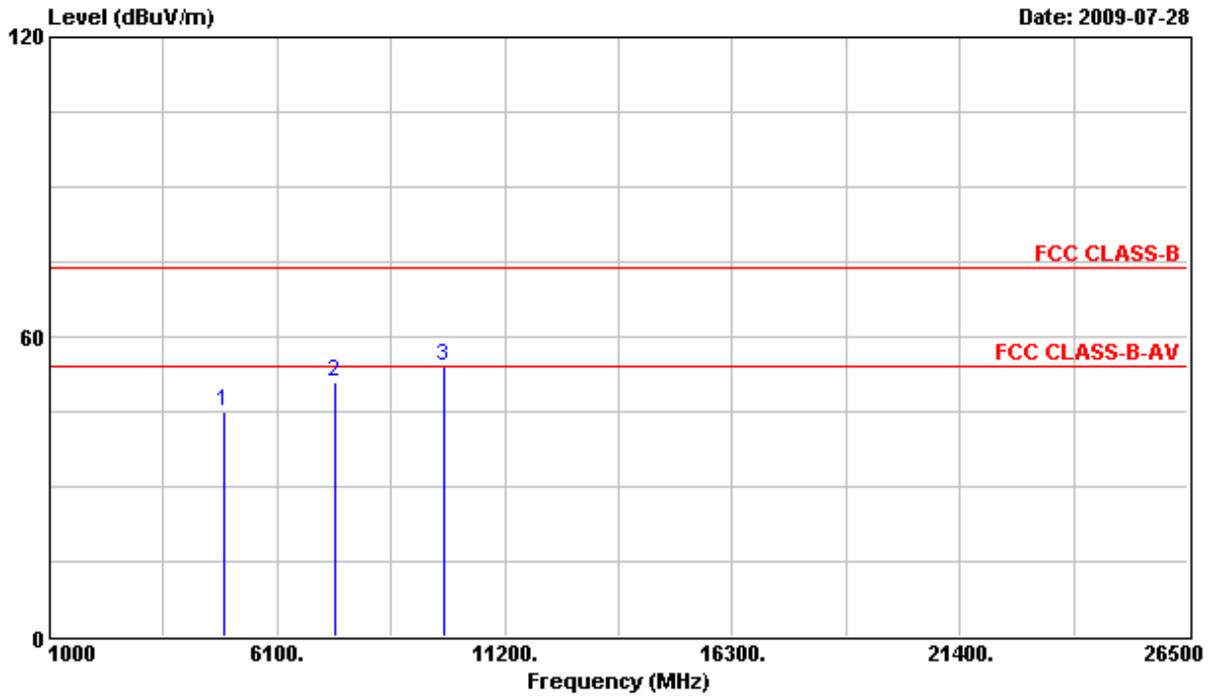
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	4924.000	41.48	-12.52	54.00	35.28	35.90	4.68	34.38	---	---	PK
2 @	7386.000	50.46	-3.54	54.00	41.23	37.88	5.65	34.29	---	---	PK
3	9848.000	54.67			43.23	39.61	6.38	34.54	---	---	PEAK

Note: An item 3 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

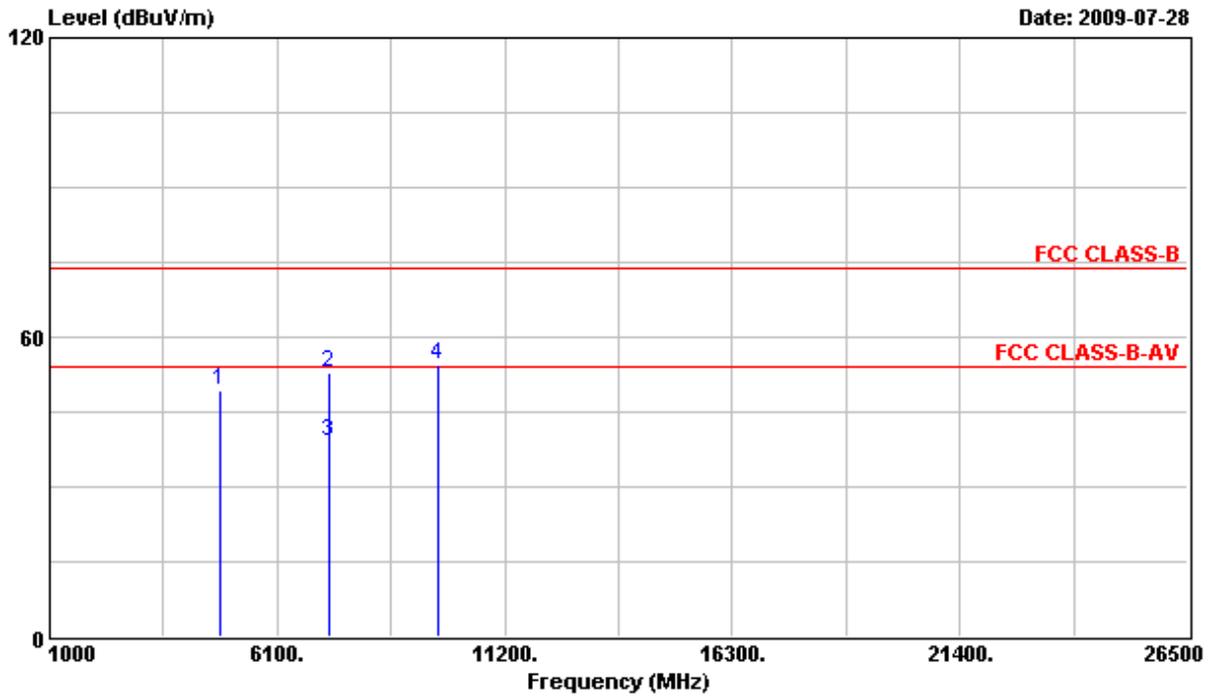


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB	cm	deg	
1	4926.200	44.92	-9.08	54.00	39.40	35.23	4.68	34.38	---	---	PK
2	7386.000	50.92	-3.08	54.00	42.61	36.96	5.65	34.29	---	---	PK
3	9848.000	54.22			43.58	38.81	6.38	34.54	---	---	PEAK

Note: An item 3 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test date	Jul. 28, 2009	Test Site No.	03CH02-HY
Temperature	22	Humidity	55%
Test Engineer	Kobe	Configuration	802.11n CH 3 (40MHz)

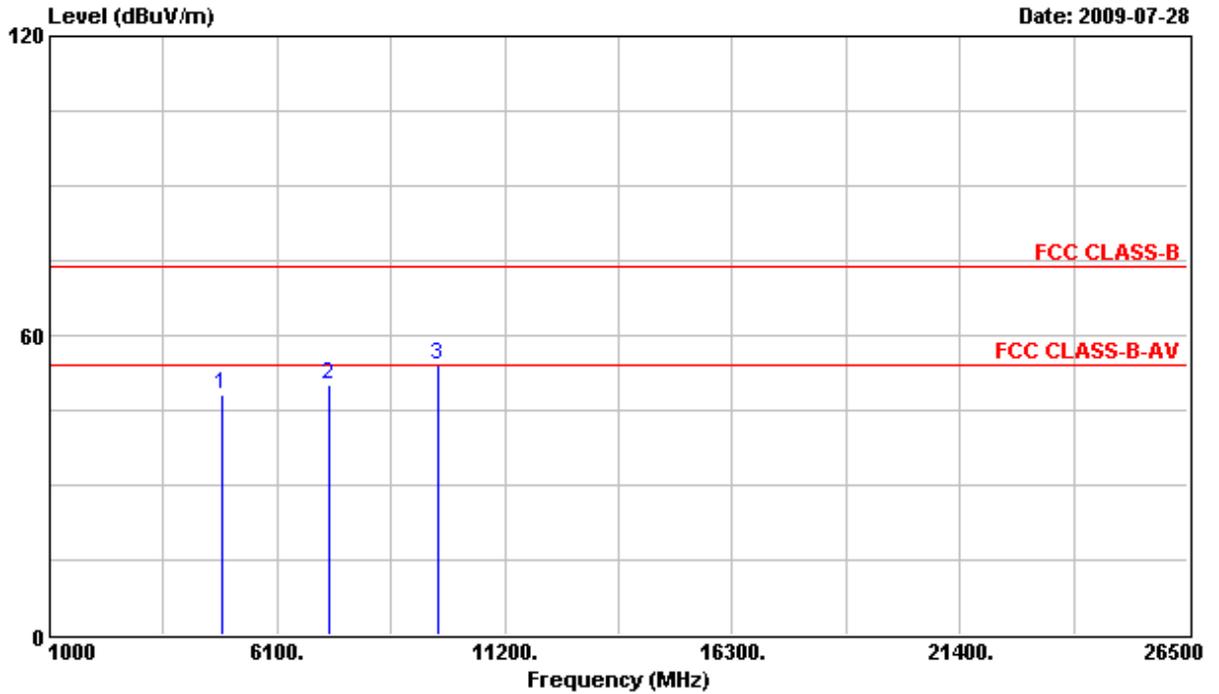
Horizontal



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Remark
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	4840.000	49.45	-4.55	54.00	43.57	35.78	4.58	34.48	---	---	Average
2	7262.000	52.77	-21.23	74.00	43.57	37.85	5.63	34.29	---	---	PEAK
3	7262.000	39.22	-14.78	54.00	30.02	37.85	5.63	34.29	---	---	Average
4	9688.000	54.62			43.45	39.43	6.35	34.60	---	---	PEAK

Note: An item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

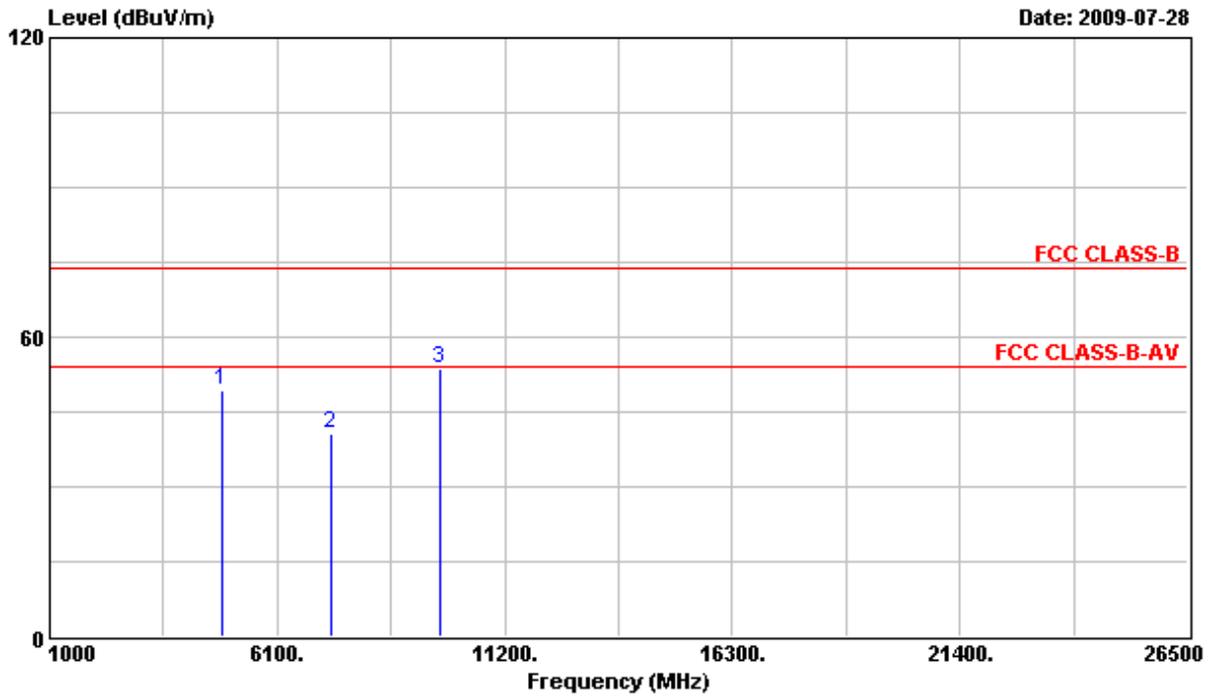


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 @	4844.000	48.13	-5.87	54.00	42.86	35.14	4.61	34.48	---	---	PK
2 @	7266.000	50.11	-3.89	54.00	41.86	36.91	5.63	34.29	---	---	PK
3	9688.000	54.11			43.74	38.63	6.35	34.60	---	---	Peak

Note: An item 3 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test date	Jul. 28, 2009	Test Site No.	03CH02-HY
Temperature	22	Humidity	55%
Test Engineer	Kobe	Configuration	802.11n CH 6 (40MHz)

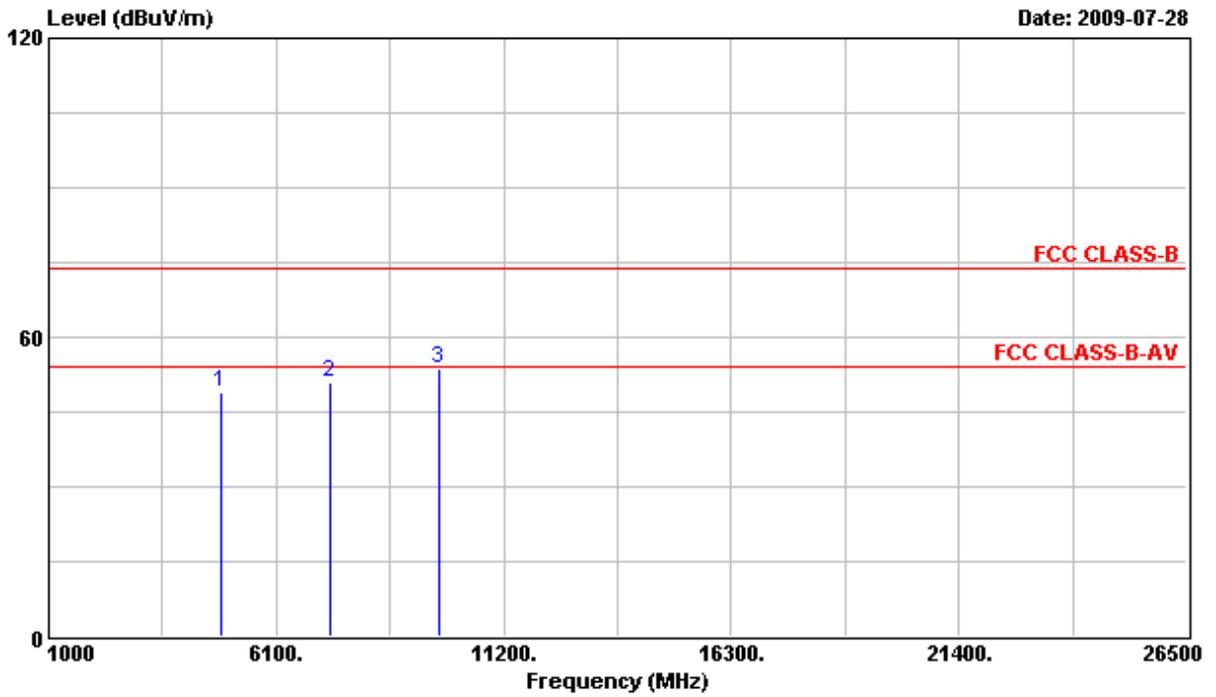
Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	4872.000	49.54	-4.46	54.00	43.54	35.83	4.61	34.45	---	---	PK
2	7316.000	40.46	-13.54	54.00	31.25	37.87	5.64	34.29	---	---	PK
3	9748.000	53.85			42.57	39.51	6.36	34.58	---	---	Peak

Note: An item 3 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

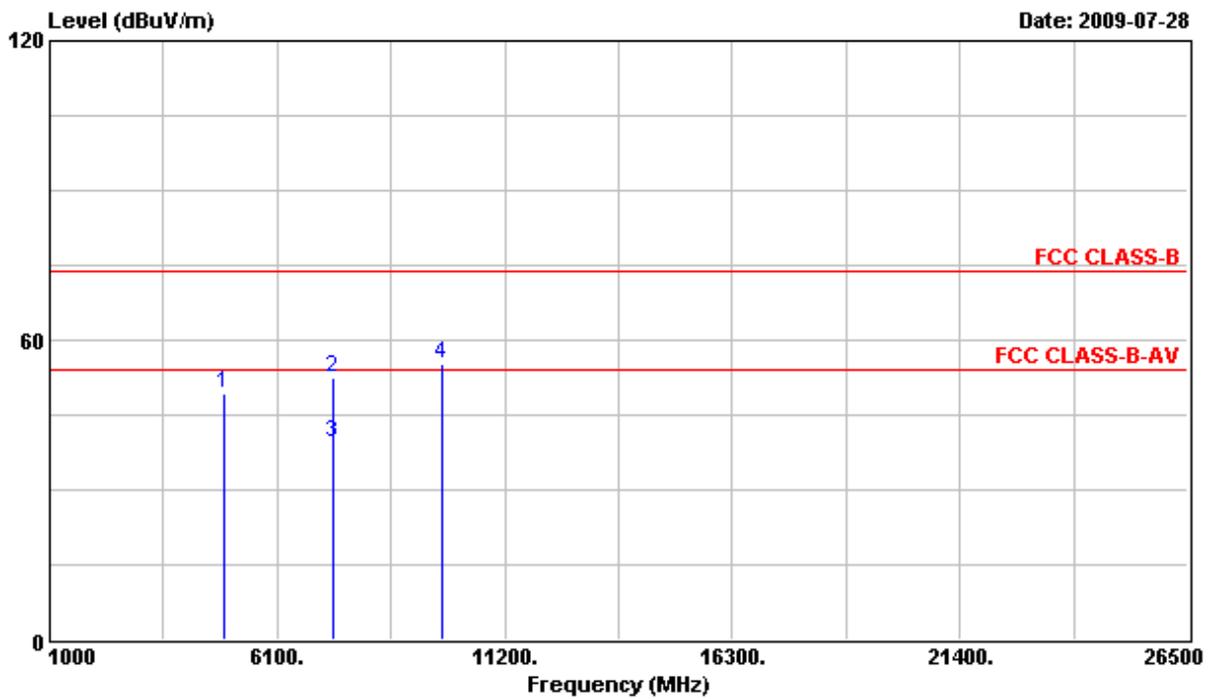


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	4874.000	48.98	-5.02	54.00	43.64	35.18	4.61	34.45	---	---	PK
2	7311.000	50.81	-3.19	54.00	42.54	36.92	5.64	34.29	---	---	PK
3	9752.000	53.82			43.34	38.71	6.36	34.58	---	---	Peak

Note: An item 3 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test date	Jul. 28, 2009	Test Site No.	03CH02-HY
Temperature	22	Humidity	55%
Test Engineer	Kobe	Configuration	802.11n CH 9 (40MHz)

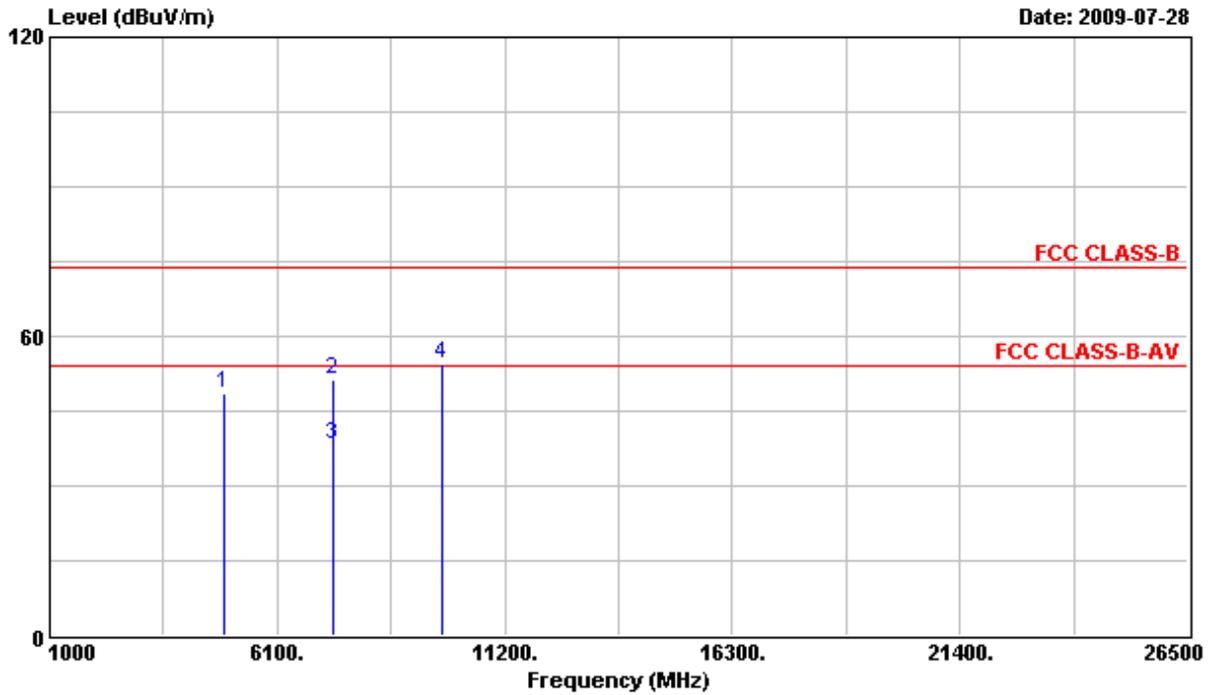
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 @	4904.000	49.43	-4.57	54.00	43.32	35.88	4.64	34.42	---	---	PK
2	7356.000	52.58	-21.42	74.00	43.36	37.87	5.64	34.29	---	---	PEAK
3	7356.000	39.32	-14.68	54.00	30.10	37.87	5.64	34.29	---	---	Average
4	9804.000	55.43			44.05	39.57	6.37	34.56	---	---	PEAK

Note: An item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	4908.000	48.39	-5.61	54.00	42.95	35.21	4.64	34.42	---	---	Average
2	7356.000	51.31	-22.69	74.00	43.02	36.94	5.64	34.29	---	---	PEAK
3	7356.000	38.49	-15.51	54.00	30.19	36.94	5.64	34.29	---	---	Average
4	9808.000	54.32			43.74	38.77	6.37	34.56	---	---	PEAK

Note: An item 4 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Emission level (dBUV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

**3.6 Band Edge and Fundamental Emissions Measurement**

**3.6.1 Limit**

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

<b>Frequencies (MHz)</b>	<b>Field Strength (micorvolts/meter)</b>	<b>Measurement Distance (meters)</b>
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

**3.6.2 Measuring Instruments and Setting**

Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

<b>Spectrum Parameter</b>	<b>Setting</b>
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	100 KHz /100 KHz for Peak

**3.6.3 Test Procedures**

1. The test procedure is the same as section 3.5.3; only the frequency range investigated is limited to 100MHz around bandedges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

**3.6.4 Test Setup Layout**

This test setup layout is the same as that shown in section 3.5.4.

**3.6.5 Test Deviation**

There is no deviation with the original standard.

**3.6.6 EUT Operation during Test**

The EUT was programmed to be in continuously transmitting mode.

**3.6.7 Test Result of Band Edge and Fundamental Emissions**

<b>Final Test date</b>	Jul. 28, 2009	<b>Test Site No.</b>	03CH02-HY
<b>Temperature</b>	22	<b>Humidity</b>	55%
<b>Test Engineer</b>	Kobe	<b>Configuration</b>	802.11n CH 1, 6, 11 (20MHz)

**Channel 1**

Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 @	2390.000	72.83	-1.17	74.00	38.02	31.79	3.02	0.00	---	---	Peak
2 @	2415.260	113.76			78.88	31.86	3.02	0.00	---	---	Peak
1 @	2390.000	52.71	-1.29	54.00	17.90	31.79	3.02	0.00	---	---	Average
2 @	2414.500	102.98			68.10	31.86	3.02	0.00	---	---	Average

An item 2 is Fundamental Emissions.

**Channel 6**

Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 @	2440.340	113.86			78.82	31.99	3.05	0.00	---	---	Peak
1 @	2440.340	102.99			67.95	31.99	3.05	0.00	---	---	Average

An item 1 is Fundamental Emissions.

**Channel 11**

Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg		
1 @	2458.770	111.28			76.17	32.06	3.05	0.00	---	---	Peak
2 @	2483.500	70.13	-3.87	74.00	34.92	32.13	3.08	0.00	---	---	Peak
1 @	2458.770	100.37			65.26	32.06	3.05	0.00	---	---	Average
2 @	2483.500	52.19	-1.81	54.00	16.98	32.13	3.08	0.00	---	---	Average

An item 1 is Fundamental Emissions.

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

<b>Final Test date</b>	Jul. 28, 2009	<b>Test Site No.</b>	03CH02-HY
<b>Temperature</b>	22	<b>Humidity</b>	55%
<b>Test Engineer</b>	Kobe	<b>Configuration</b>	802.11n CH 3, 6, 9 (40MHz)

**Channel 3**

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 @	2385.620	66.72	-7.28	74.00	31.91	31.79	3.02	0.00	---	---	Peak
2 @	2415.450	106.11			71.23	31.86	3.02	0.00	---	---	Peak
1 @	2390.000	52.57	-1.43	54.00	17.76	31.79	3.02	0.00	---	---	Average
2 @	2415.450	94.40			59.52	31.86	3.02	0.00	---	---	Average

An item 2 is Fundamental Emissions.

**Channel 6**

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 @	2440.340	104.96			69.92	31.99	3.05	0.00	---	---	Peak
1 @	2444.710	93.63			58.59	31.99	3.05	0.00	---	---	Average

An item 1 is Fundamental Emissions.

**Channel 9**

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 @	2449.650	104.03			68.99	31.99	3.05	0.00	---	---	Peak
2 @	2483.500	66.28	-7.72	74.00	31.07	32.13	3.08	0.00	---	---	Peak
1 @	2448.700	93.38			58.34	31.99	3.05	0.00	---	---	Average
2 @	2483.500	52.23	-1.77	54.00	17.02	32.13	3.08	0.00	---	---	Average

An item 1 is Fundamental Emissions.

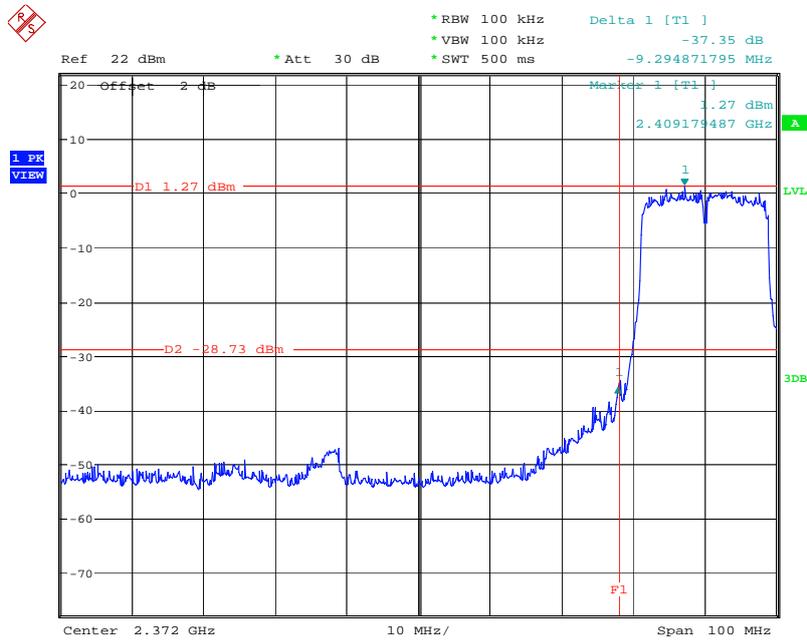
Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

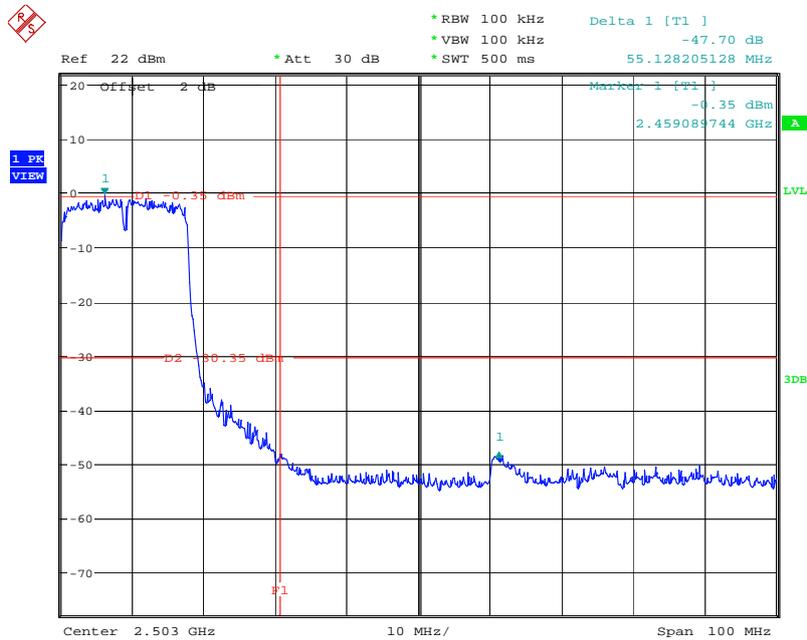
For Emission not in Restricted Band

Low Band Edge Plot on Configuration of IEEE 802.11n (20MHz) / 2412 MHz



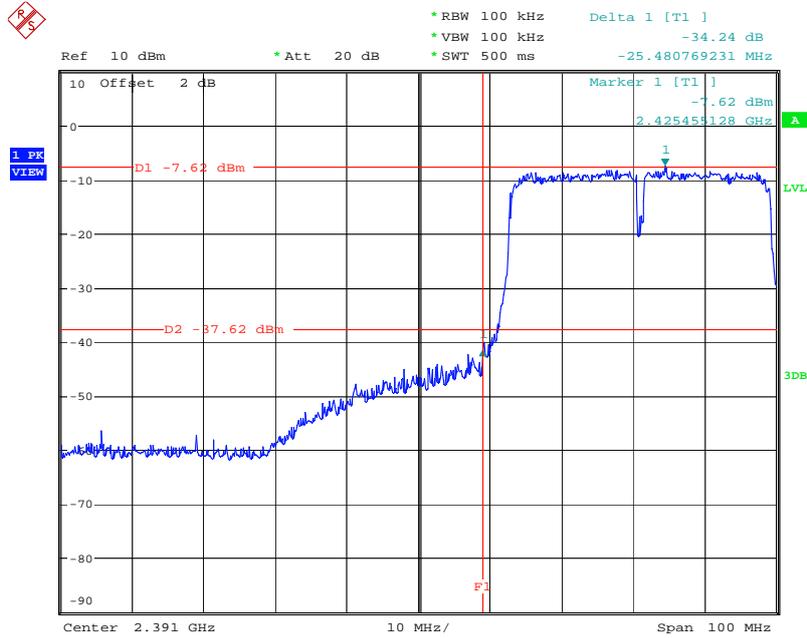
Date: 31.JUL.2009 22:42:35

High Band Edge Plot on Configuration of IEEE 802.11n (20MHz) / 2462 MHz



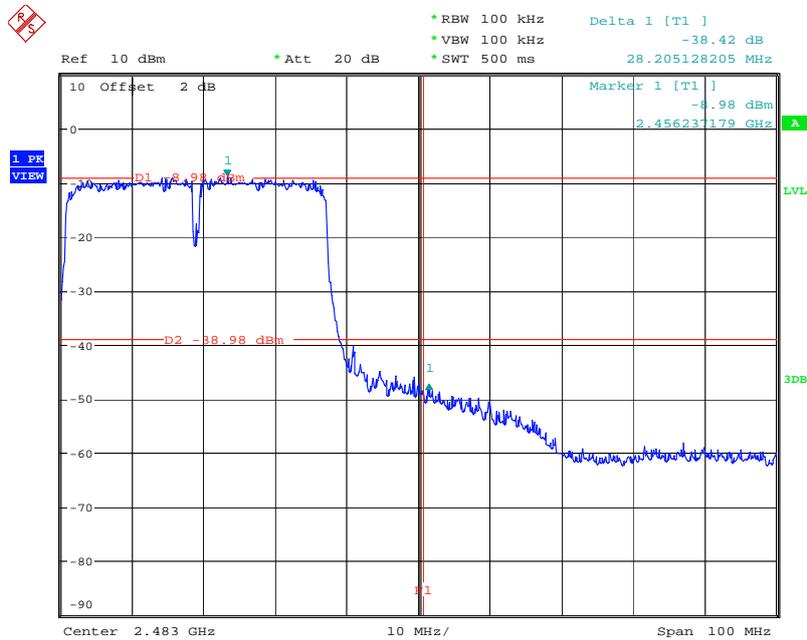
Date: 31.JUL.2009 22:46:41

Low Band Edge Plot on Configuration of IEEE 802.11n (40MHz) / 2422 MHz



Date: 31.JUL.2009 22:58:26

High Band Edge Plot on Configuration of IEEE 802.11n (40MHz) / 2452 MHz



Date: 31.JUL.2009 23:04:37

### **3.7 Antenna Requirements**

#### **3.7.1 Limit**

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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. 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 provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

#### **3.7.2 Antenna Connector Construction**

Please refer to section 2.3 in this test report; antenna connector complied with the requirements.

**4 LIST OF MEASURING EQUIPMENTS**

**Conducted Emissions**

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Apr. 15, 2009	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	99079	9kHz – 30MHz	Mar. 23, 2009	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz – 30MHz	Mar. 22, 2009	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2009	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)

Note: Calibration Interval of instruments listed above is one year.

**Radiated Emissions below 1GHz**

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30 MHz - 1 GHz 3m	May 11, 2009	Radiation (03CH02-HY)
Amplifier	Agilent	8447D	2944A11146	100 kHz – 1.3 GHz	Jul. 07, 2009	Radiation (03CH02-HY)
Spectrum Analyzer	R&S	FSP40	100305/040	9 kHz - 40GHz	Feb. 04, 2009	Radiation (03CH02-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2723	30 MHz - 2 GHz	Nov. 30, 2008	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0 - 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 m - 4 m	N/A	Radiation (03CH02-HY)
RF Cable-R03m	Jye Bao	RG142	CB020	30 MHz - 1 GHz	Dec. 17, 2008	Radiation (03CH02-HY)

Note: Calibration Interval of instruments listed above is one year.

**Radiated Emissions above 1GHz and Band Edge and Fundamental Emissions**

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30 MHz - 1 GHz 3m	May 11, 2009	Radiation (03CH02-HY)
Spectrum Analyzer	R&S	FSP40	100305/040	9 kHz - 40GHz	Feb. 04, 2009	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0 - 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 m - 4 m	N/A	Radiation (03CH02-HY)
Amplifier	Agilent	8449B	3008A02373	1GHz – 26.5 GHz	Jul. 16, 2009	Radiation (03CH02-HY)
Horn Antenna	ETS-LINDGREN	3117	00091920	1GHz~18GHz	Oct. 22, 2008	Radiation (03CH02-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX106	03CH02-HY	1GHz~40GHz	Dec. 17, 2008	Radiation (03CH02-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	Jul 28, 2008*	Radiation (03CH02-HY)

Note: Calibration Interval of instruments listed above is two years.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSU26.5	100015	20Hz ~ 26.5GHz	Oct. 28, 2008	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Mar. 13, 2009	Conducted (TH01-HY)
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Dec. 01, 2008	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Dec. 01, 2008	Conducted (TH01-HY)
Vector Signal Generator	R&S	SMU200A	102098	100kHz ~ 6GHz	Feb. 13, 2009	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Mar. 25, 2009	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	Jul. 12, 2009*	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is two years.

## 5 TEST LOCATION

SHIJR	ADD : 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C. TEL : 886-2-2696-2468 FAX : 886-2-2696-2255
HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-318-0055
LINKOU	ADD : No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C TEL : 886-2-2601-1640 FAX : 886-2-2601-1695
DUNGHU	ADD : No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C. TEL : 886-2-2631-4739 FAX : 886-2-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. TEL : 886-2-8227-2020 FAX : 886-2-8227-2626
NEIHU	ADD : 4Fl., No. 339, Hsin Hu 2 <sup>nd</sup> Rd., Taipei 114, Taiwan, R.O.C. TEL : 886-2-2794-8886 FAX : 886-2-2794-9777
JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085

6 TAF CERTIFICATE OF ACCREDITATION



Certificate No. : L1190-090318

財團法人全國認證基金會  
Taiwan Accreditation Foundation

Certificate of Accreditation

This is to certify that

**Sporton International Inc.**

**EMC & Wireless Communications Laboratory**

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

**is accredited in respect of laboratory**

- Accreditation Criteria** : ISO/IEC 17025:2005
- Accreditation Number** : 1190
- Originally Accredited** : December 15, 2003
- Effective Period** : January 10, 2007 to January 09, 2010
- Accredited Scope** : Testing Field, see described in the Appendix
- Specific Accreditation Program** : Accreditation Program for Designated Testing Laboratory for Commodities Inspection  
Accreditation Program for Telecommunication Equipment Testing Laboratory  
Accreditation Program for BSMI Mutual Recognition Arrangement with Foreign Authorities

Jay-San Chen  
President, Taiwan Accreditation Foundation  
Date : March 18, 2009

PI, total 19 pages

The Appendix forms an integral part of this Certificate, which shall be invalid when use without the Appendix