FCC RADIO TEST REPORT

according to

47 CFR FCC Part 15 Subpart E § 15.407

Equipment	:	**802.11abgn Wireless USB Module**
Model No.	:	**WUBR-507N(M); WUBR-507N(MU)**
Brand Name	:	**SparkLAN**
Applicant	:	**SparkLAN Communications, Inc.** 8F., No.257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan
FCC ID	:	**RYK-WUBR507N**
Manufacturer	:	**SparkLAN Communications, Inc.** 8F., No.257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan
Received Date	:	Oct. 23, 2010
Final Test Date	:	Jan. 30, 2012

Statement

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

Testing Laboratory
1190

SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan, R.O.C.

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APPENDIX B. PHOTOGRAPHS OF EUT

History of This Test Report

Original Issue Date: Nov. 10, 2010

Report No.: FR210523-02AN

□ No additional attachment.

■ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description
FR0O1817AN	Nov. 10, 2010	Original.
FR210523AN	Mar. 27, 2012	Reason for change: Additional printed antenna in this report. Therefore, radiation was performed to verify the new components.
FR210523-02AN	Feb. 23, 2016	Update band 1 Power Limit

CERTIFICATE OF COMPLIANCE

according to

47 CFR FCC Part 15 Subpart E § 15.407

Equipment	:	802.11abgn Wireless USB Module
Model No.	:	WUBR-507N(M); WUBR-507N(MU)
Brand Name	:	SparkLAN
Applicant	:	SparkLAN Communications, Inc. 8F., No.257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Oct. 23, 2010 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.

Kevin Liang / Assistant Manager

SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan, R.O.C.

1 SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart E				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
3.1	15.207	AC Power Line Conducted Emissions	Complies	3.54 dB
3.2	15.407(a)	26dB Spectrum Bandwidth	Complies	-
3.3	15.407(a)	Maximum Conducted Output Power	Complies	1.89 dB
3.4	15.407(a)	Power Spectral Density	Complies	0.11 dB
3.5	15.407(a)	Peak Excursion	Complies	5.05 dB
3.6	15.407(b)	Radiated Emissions	Complies	3.62 dB
3.7	15.407(b)	Band Edge Emissions	Complies	1.25 dB
3.8	15.407(g)	Frequency Stability	Complies	-
3.9	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Conducted Output Power	±0.5dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
Peak Excursion	±0.5dB	Confidence levels of 95%
26dB Spectrum Bandwidth / Frequency Stability	$\pm 8.5\times 10^{-8}$	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 802.11a/n is shown in this report. For more detailed features description, please refer to the manufacturer's specifications or user's manual.

Items	Description
Power Type	Power from host
Modulation Data Rate (Mbps)	See the below table for IEEE 802.11n
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Frequency Range	5150~5350MHz
Channel Band Width (99%)	1TX-802.11a: Band 1: 16.75 MHz 2TX-802.11n MCS 8: (20MHz) Band 1: 17.60 MHz ; (40MHz) Band 1: 36.00 MHz
Conducted Output Power	1TX-802.11a: Band 1: 12.11 dBm 2TX-802.11n MCS 8: (20MHz) Band 1: 11.61 dBm ; (40MHz) Band 1: 11.38 dBm

2.2 Table for Filed Antenna

Antenna & Bandwidth

Antenna Mode	Single Chain		Two Chain	
Bandwidth Mode	20 MHz	40 MHz	20 MHz	40 MHz
802.11a (5150~5250MHz)	V	X	X	X
5G 802.11n (5150~5250MHz)	X	X	V	V

Antenna General Information		
Ant. Cat.	**Ant. Type**	**Gain (dBi)**
		5GHz
External	Dipole	2
Remark: 1. This EUT supports 1TX and Port 1 for emission in modulation mode 11a. 2. This EUT supports 2TX in modulation mode 11n.		

IEEE 802.11n Modulation Scheme

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Data rate(Mbps) 800nsGI	
					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
8	2	BPSK	1/2	1	104	216	52	108	13.0	27.0
9	2	QPSK	1/2	2	208	432	104	216	26.0	54.0
10	2	QPSK	3/4	2	208	432	156	324	39.0	81.0
11	2	16-QAM	1/2	4	416	864	208	432	52.0	108.0
12	2	16-QAM	3/4	4	416	864	312	648	78.0	162.0
13	2	64-QAM	2/3	6	624	1296	416	864	104.0	216.0
14	2	64-QAM	3/4	6	624	1296	468	972	117.0	243.0
15	2	64-QAM	5/6	6	624	1296	520	1080	130.0	270.0

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

Note: EUT belong Mobile device

2.3 Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency (20MHz)	Channel No.	Frequency (40MHz)
5150~5250 MHz Band 1	36	5180 MHz	38	5190 MHz
	40	5200 MHz	46	5230 MHz
	44	5220 MHz	-	-
	48	5240 MHz	-	-

2.4 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.

Test Items	Mode	Data Rate	Channel	Antenna
AC Power Conducted Emission	Normal Mode	Auto	-	-
Max. Conducted Output Power	11a Band 1/BPSK	6Mbps	36/40/48	A
	11n Band 1/BPSK MCS 8 (20MHz)	13Mbps	36/40/48	A/B / A+B
	11n Band 1/BPSK MCS 8 (40MHz)	27Mbps	38/46	
26dB Spectrum Bandwidth 99% Occupied Bandwidth Measurement Power Spectral Density	11a Band 1/BPSK	6Mbps	36/40/48	A
	11n Band 1/BPSK MCS 8 (20MHz)	13Mbps	36/40/48	A+B
	11n Band 1/BPSK MCS 8 (40MHz)	27Mbps	38/46	
Peak Excursion	11n Band 1/BPSK MCS 8 (40MHz)	27Mbps	38	A+B
Radiated Emission Below 1GHz	Normal Mode	Auto	-	-
Radiated Emission Above 1GHz	11a Band 1/BPSK	6Mbps	36/40/48	A
	11n Band 1/BPSK MCS 8 (20MHz)	13Mbps	36/40/48	A+B
	11n Band 1/BPSK MCS 8 (40MHz)	27Mbps	38/46	
Band Edge Emission	11a Band 1/BPSK	6Mbps	36/40/48	A
	11n Band 1/BPSK MCS 8 (20MHz)	13Mbps	36/40/48	A+B
	11n Band 1/BPSK MCS 8 (40MHz)	27Mbps	38/46	

2.5 Table for Testing Locations

Test Site No.	Site Category	Location
CO04-HY	Conduction	Hwa Ya
TH01-HY	OVEN Room	Hwa Ya
03CH03-HY	SAC	Hwa Ya

Semi Anechoic Chamber (SAC).

2.6 Table for Supporting Units

Support Unit	Brand	Model	FCC ID	Remark
Notebook	DELL	PP20L	N/A	Conducted
(USB) Mouse	Microsoft	1004	N/A	
iPod nano	Apple	A1119	N/A	
AP (Remote Workstation)	EDIMAX	BR-6204WG	NDD9562040507	

Support Unit	Brand	Model	FCC ID	Remark
Notebook	DELL	PP20L	N/A	Radiated

2.7 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.

For Single Chain:

Power Parameters of IEEE 802.11a

Test Software Version	RT3x7xQA		
Frequency	5180 MHz	5200 MHz	5240 MHz
IEEE 802.11a	8	8	8

For Two Chain:

Power Parameters of IEEE 802.11n Ant. A+Ant. B (20MHz)

Test Software Version	RT3x7xQA		
Frequency	5180 MHz	5200 MHz	5240 MHz
IEEE 802.11n	04/04	05/05	05/05

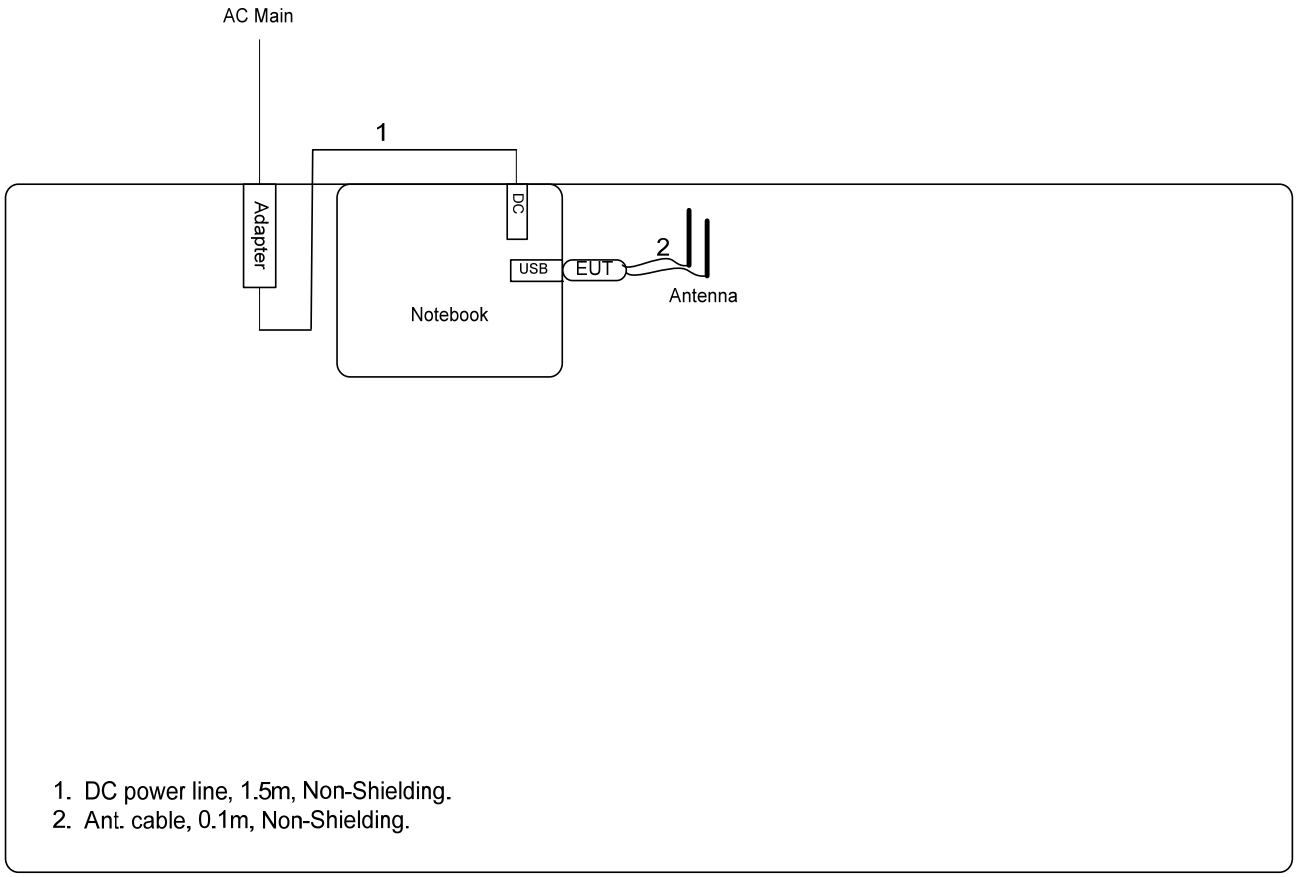
Power Parameters of IEEE 802.11n Ant. A+Ant. B (40MHz)

Test Software Version	RT3x7xQA	
Frequency	5190 MHz	5230 MHz
IEEE 802.11n	06/05	06/06

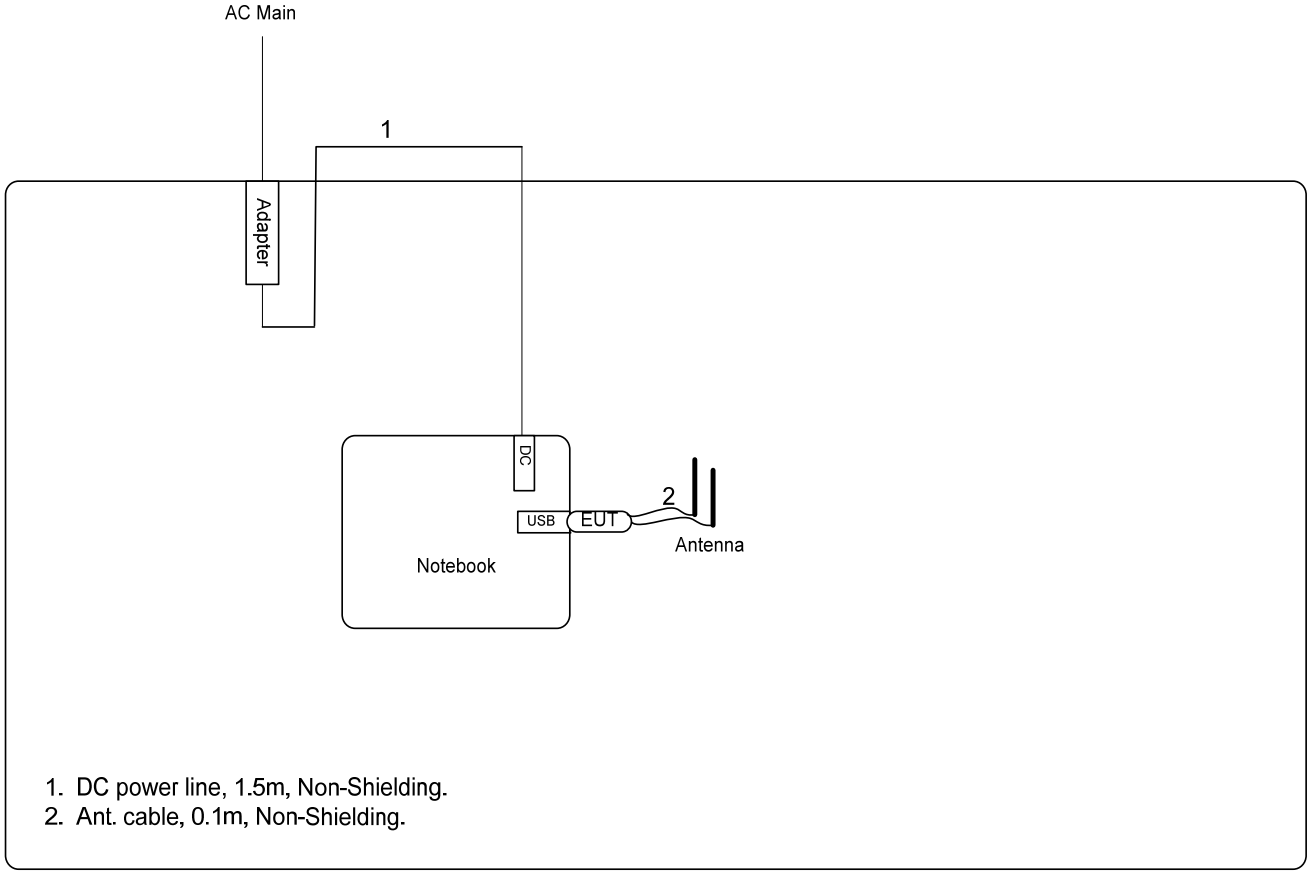
2.8 Test Configuration

2.8.1 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

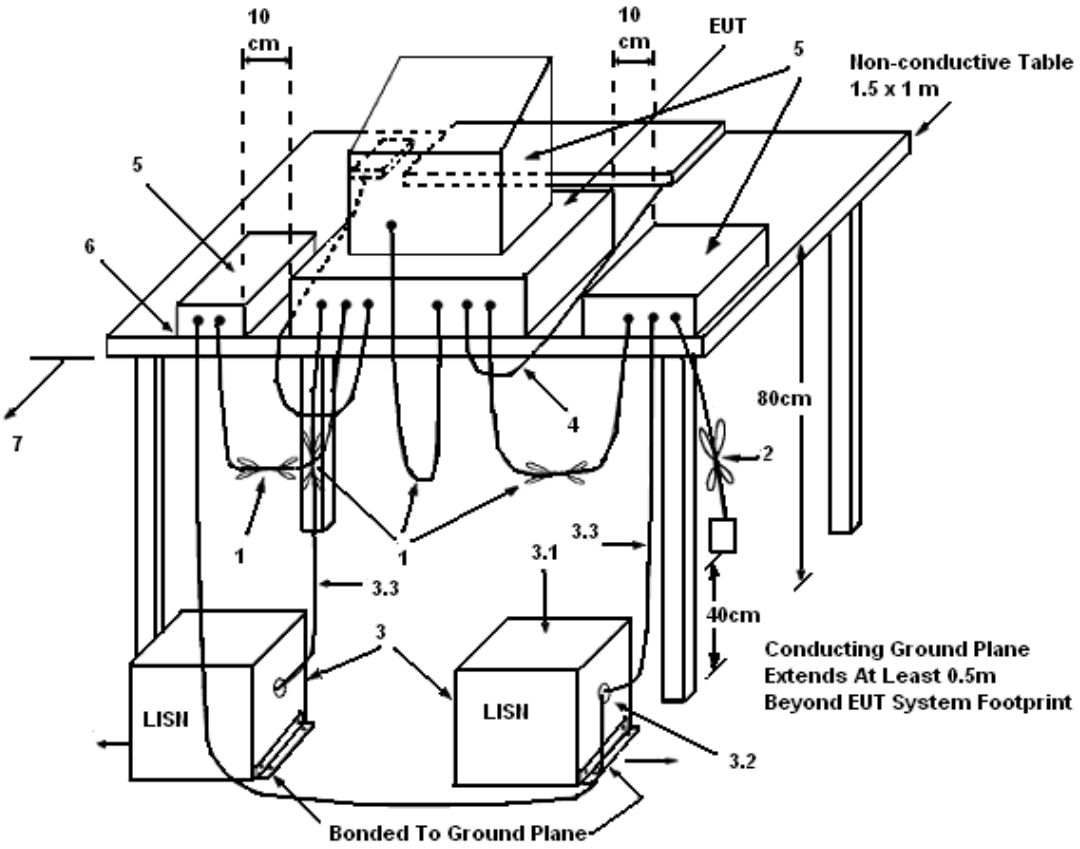
Please refer to section 4 of equipments list in this report. The following table is the setting of the receiver.

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. The EUT warm up about 15 minutes then start test.
2. 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.
3. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
5. The frequency range from 150 KHz to 30 MHz was searched.
6. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
7. 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.

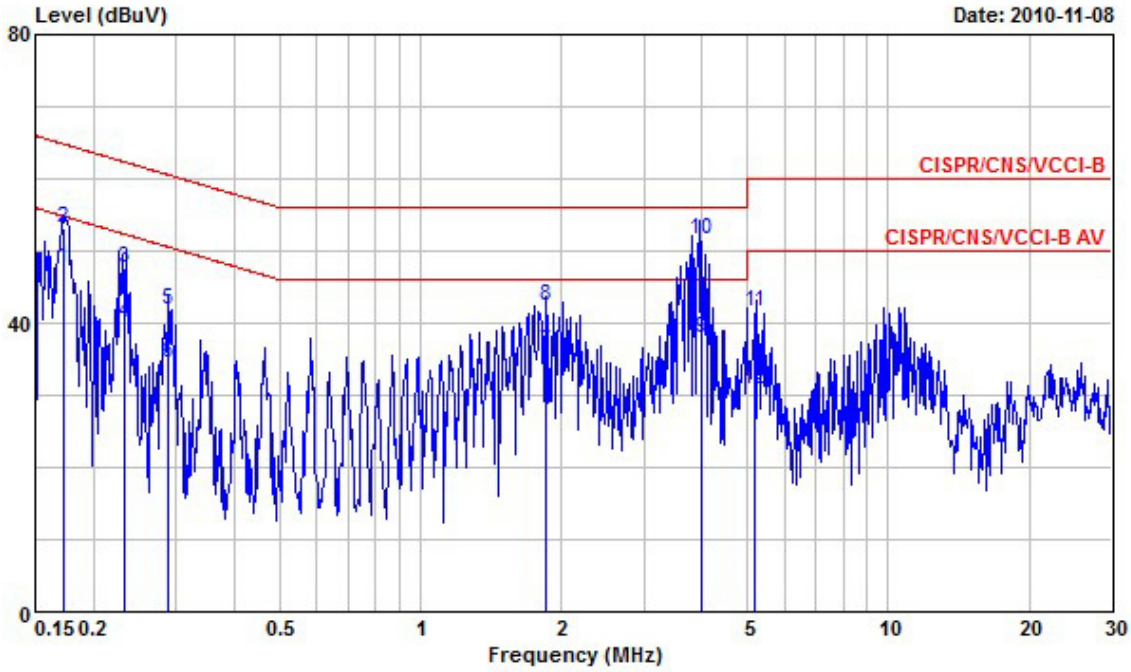
3.1.6 EUT Operation during Test

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

3.1.7 Results of AC Power Line Conducted Emissions Measurement

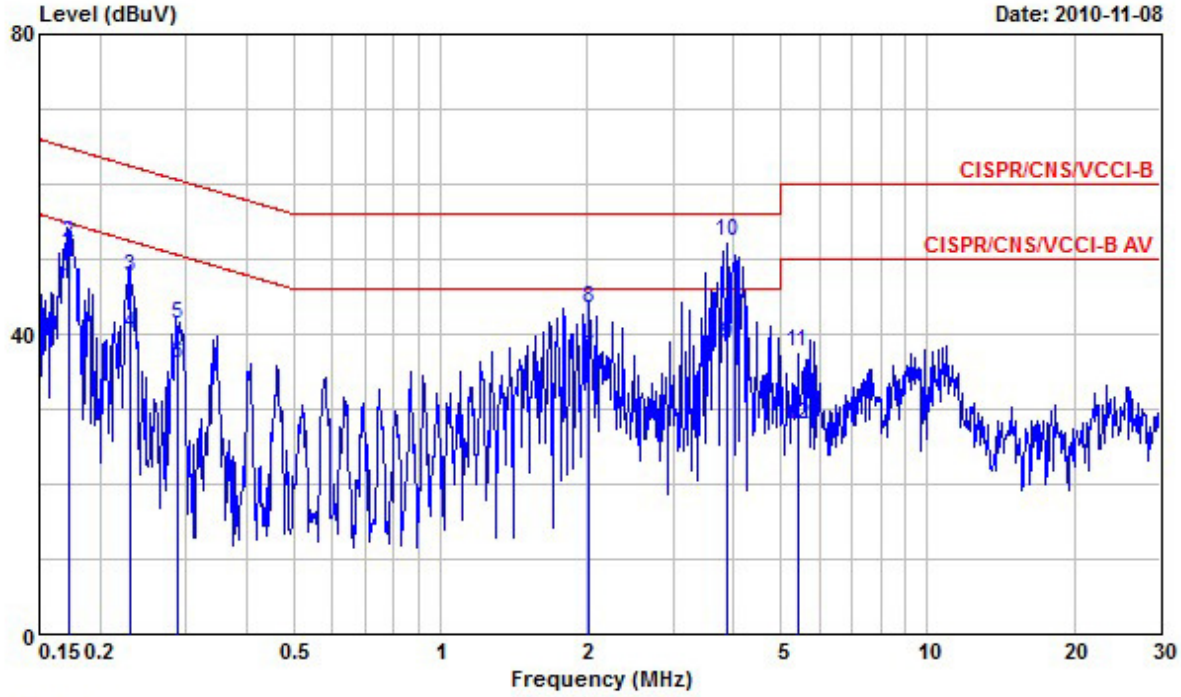
Final Test Date	Nov. 08, 2010	**Test Site No.**	CO04-HY
Temperature	24.9℃	**Humidity**	47.2%
Test Engineer	Jason	**Configuration**	Normal Mode

Line



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1730540	47.68	-7.13	54.81	47.31	0.08	0.29	Average
2	0.1730540	53.18	-11.63	64.81	52.81	0.08	0.29	QP
3	0.2316380	47.76	-14.63	62.39	47.40	0.08	0.28	QP
4	0.2316380	39.96	-12.43	52.39	39.60	0.08	0.28	Average
5	0.2893470	41.89	-18.65	60.54	41.59	0.09	0.21	QP
6	0.2893470	34.39	-16.15	50.54	34.09	0.09	0.21	Average
7	1.850	35.97	-10.03	46.00	35.70	0.13	0.14	Average
8	1.850	42.37	-13.63	56.00	42.10	0.13	0.14	QP
9	4.000	37.78	-8.22	46.00	37.40	0.16	0.22	Average
10	4.000	51.48	-4.52	56.00	51.10	0.16	0.22	QP
11	5.200	41.65	-18.35	60.00	41.21	0.19	0.25	QP
12	5.200	30.75	-19.25	50.00	30.31	0.19	0.25	Average

Neutral



		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.1720450	46.27	-8.59	54.86	45.90	0.08	0.29	Average
2		0.1720450	52.14	-12.72	64.86	51.77	0.08	0.29	QP
3		0.2303960	47.66	-14.78	62.44	47.30	0.08	0.28	QP
4		0.2303960	39.96	-12.48	52.44	39.60	0.08	0.28	Average
5		0.2882840	41.39	-19.18	60.57	41.10	0.08	0.21	QP
6		0.2882840	35.99	-14.58	50.57	35.70	0.08	0.21	Average
7		2.020	36.95	-9.05	46.00	36.70	0.11	0.14	Average
8		2.020	43.55	-12.45	56.00	43.30	0.11	0.14	QP
9		3.870	38.76	-7.24	46.00	38.39	0.15	0.22	Average
10	@	3.870	52.46	-3.54	56.00	52.09	0.15	0.22	QP
11		5.420	37.75	-22.25	60.00	37.30	0.19	0.26	QP
12		5.420	27.95	-22.05	50.00	27.50	0.19	0.26	Average

Note:

Level = Read Level + LISN Factor + Cable Loss.

3.2 99% Occupied Bandwidth Measurement

3.2.1 Limit

No restriction limits. But resolution bandwidth within band edge measurement is 1% of the 99% occupied bandwidth.

3.2.2 Measuring Instruments and Setting

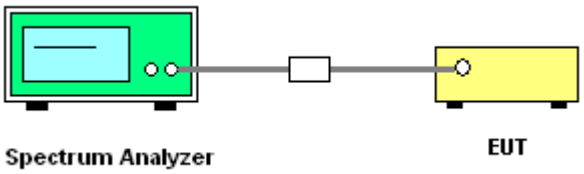
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 26dB Bandwidth
RB	300 kHz
VB	1000 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

3.2.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The resolution bandwidth of 300 kHz and the video bandwidth of 1000 kHz were used.
3. Measured the spectrum width with power higher than 26dB below carrier.
4. Measuring multiple antennas, the connectors are required to link with Spectrum Analyzer through a combiner.

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 99% Occupied Bandwidth

Final Test Date	Nov. 04, 2010	**Test Site No.**	TH01-HY
Temperature	24℃	**Humidity**	63%
Test Engineer	Ian	**Configurations**	802.11a/n

For Single Chain:

Configuration of IEEE 802.11a

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	20.11	16.75
40	5200 MHz	20.11	16.75
48	5240 MHz	20.11	16.67

For Two Chain:

Configuration IEEE 802.11n (20MHz)

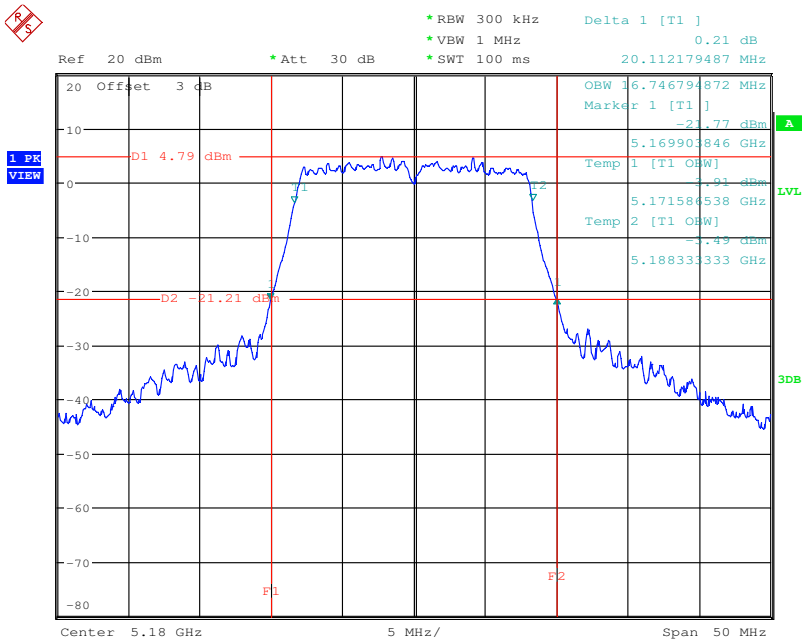
Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	21.10	17.60
40	5200 MHz	20.00	17.60
48	5240 MHz	20.00	17.60

Configuration IEEE 802.11n (40MHz)

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
38	5190 MHz	40.00	36.00
46	5230 MHz	40.00	36.00

For Single Chain:

26 dB Bandwidth Plot on Configuration IEEE 802.11a / 5180 MHz



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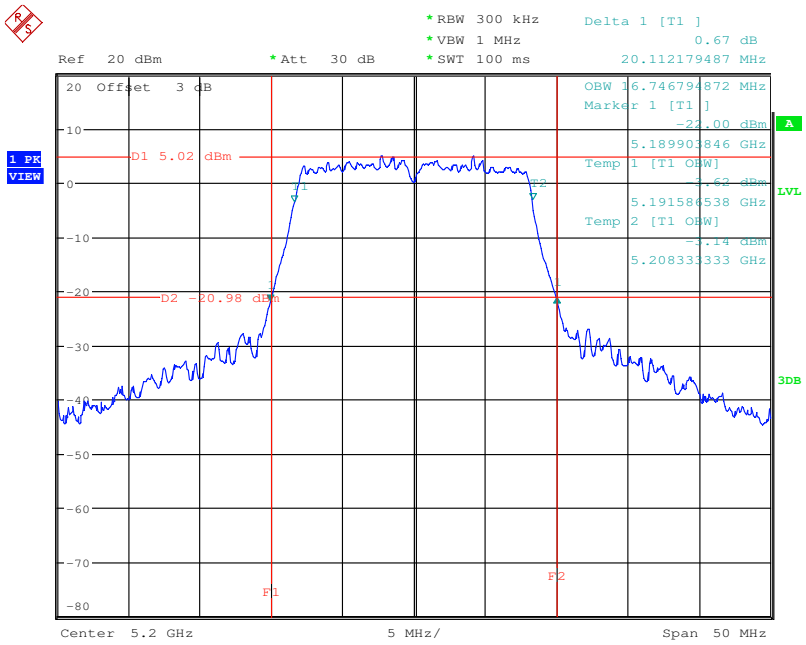
26 dB Bandwidth Plot on Configuration IEEE 802.11a / 5200 MHz



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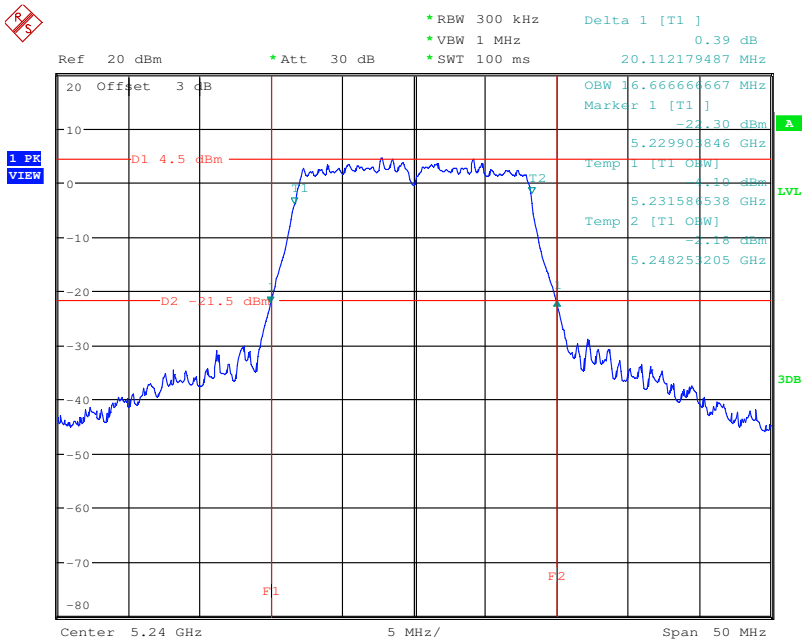
26 dB Bandwidth Plot on Configuration IEEE 802.11a / 5240 MHz



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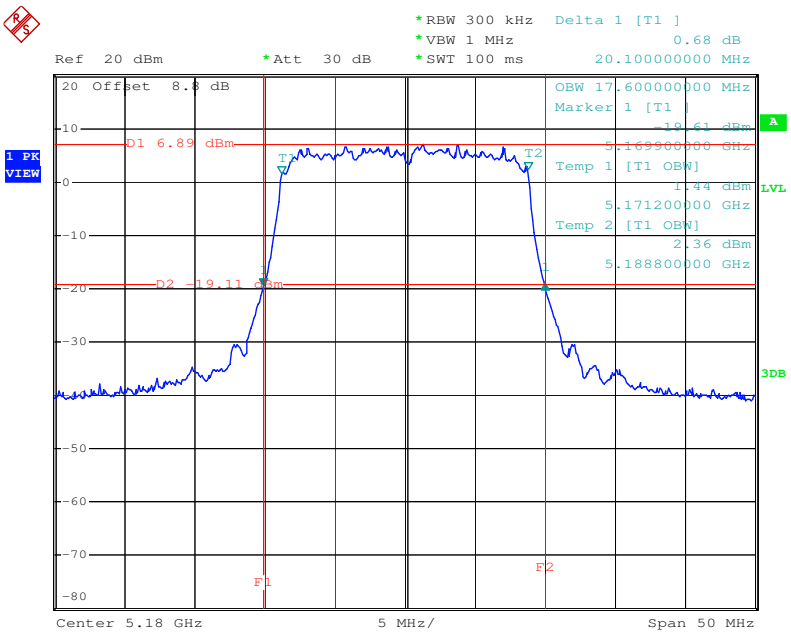
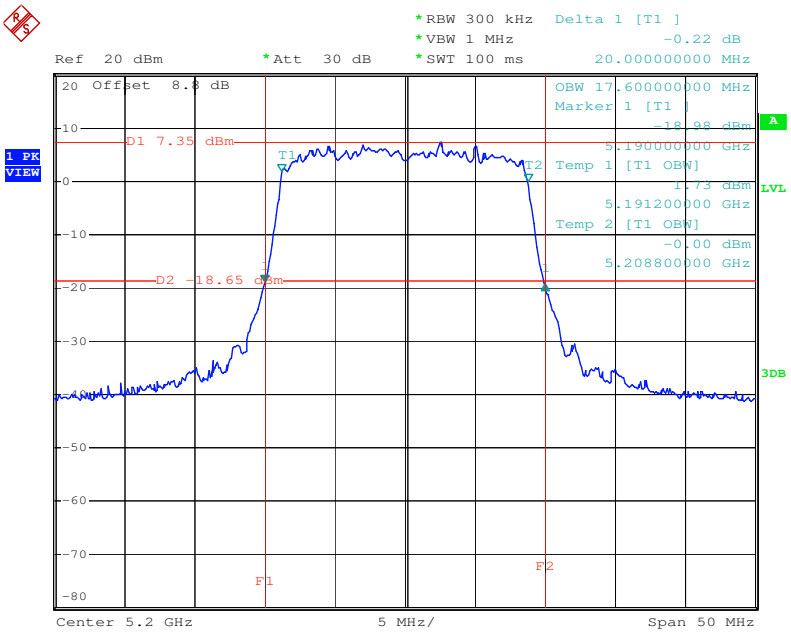
For Two Chain:

26 dB Bandwidth Plot on Configuration IEEE 802.11n Ant. A+Ant. B (20MHz)/ 5180 MHz



Date: 4.NOV.2010 20:45:22

26 dB Bandwidth Plot on Configuration IEEE 802.11n Ant. A+Ant. B (20MHz) / 5200 MHz



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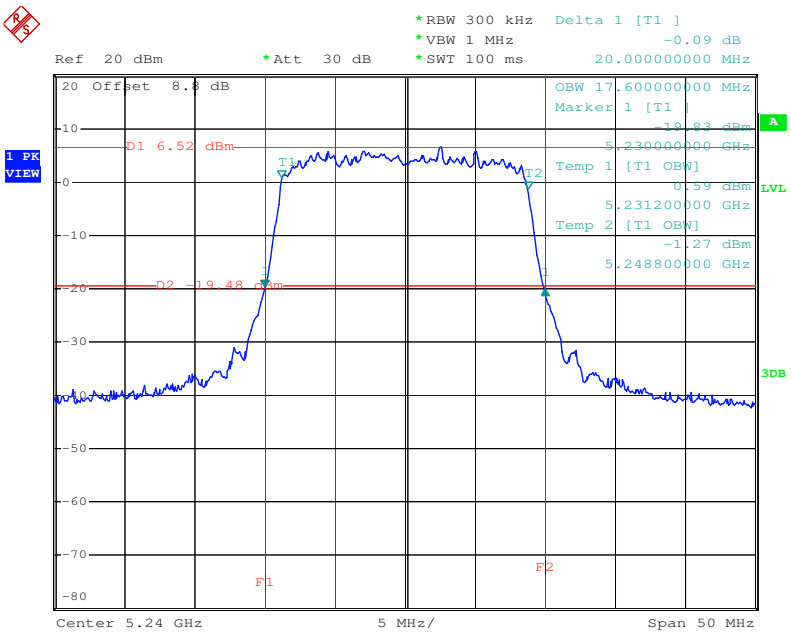
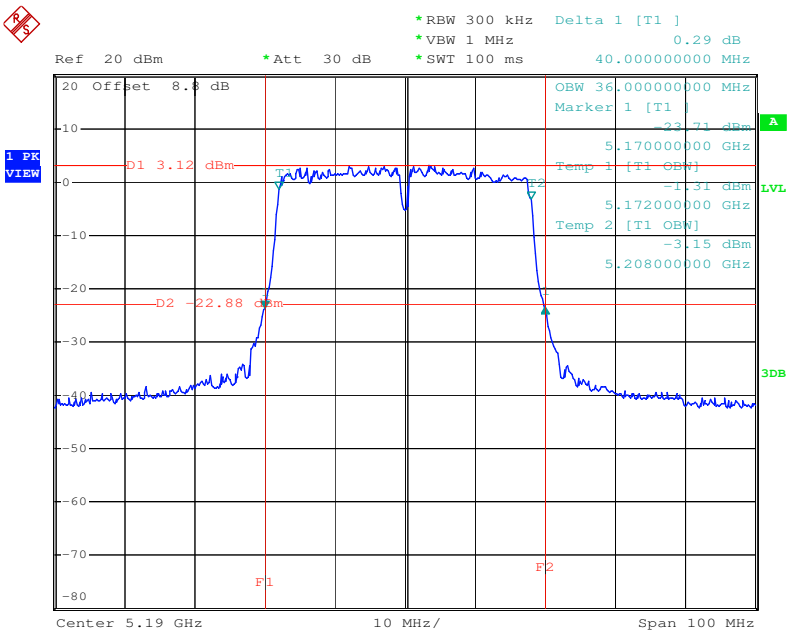
26 dB Bandwidth Plot on Configuration IEEE 802.11n Ant. A+Ant. B (20MHz) / 5240 MHz



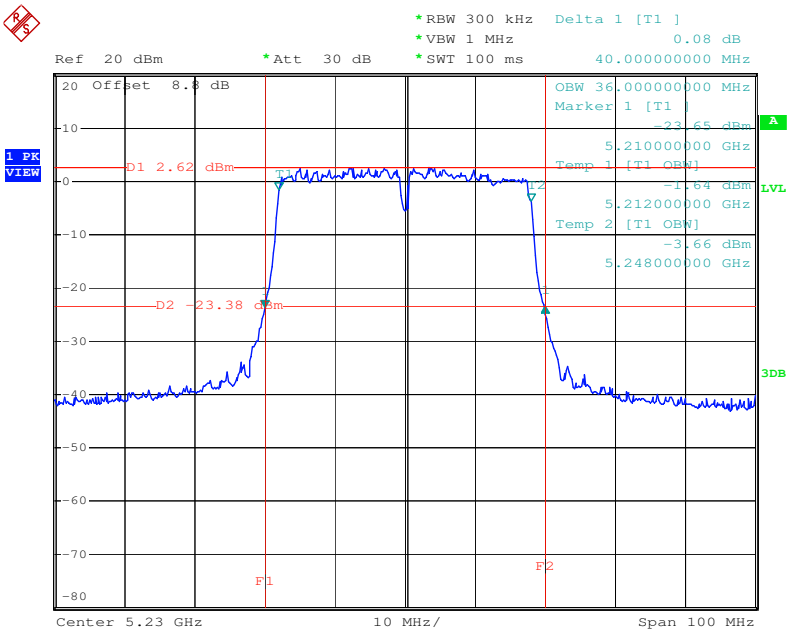
Date: 4.NOV.2010 20:50:40

26 dB Bandwidth Plot on Configuration IEEE 802.11n Ant. A+Ant. B (40MHz) / 5190 MHz



Date: 4.NOV.2010 22:31:12

26 dB Bandwidth Plot on Configuration IEEE 802.11n Ant. A+Ant. B (40MHz) / 5230 MHz



Date: 4.NOV.2010 22:33:32

3.3 Maximum Conducted Output Power Measurement

3.3.1 Limit

For the band 5.15~5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW (17dBm) or 4 dBm + 10log B, where B is the 26 dB emissions bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power and power density from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Maximum Conducted Output Power mean that the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level

3.3.2 Measuring Instruments and Setting

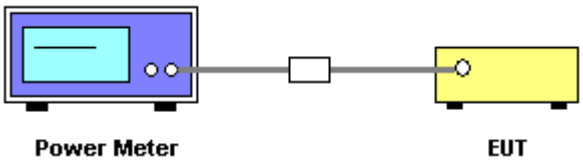
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Power Meter Parameter	Setting
Filter No.	Auto
Measurement time	0.135 s ~ 26 s
Used Sensor	MA2411B

3.3.3 Test Procedures

1. The transmitter output (antenna port) was connected to the wideband power meter.
2. Turn on the EUT and power meter and then record the power value.
3. Repeat above procedures on all channels needed to be tested.
4. When measuring maximum conducted output power within multiple antenna systems, add every result of the values by mathematic formula.

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 Maximum Conducted Output Power

Final Test Date	Nov. 04, 2010	**Test Site No.**	TH01-HY
Temperature	24℃	**Humidity**	63%
Test Engineer	Ian	**Configurations**	802.11a/n

For Single Chain:

Configuration of IEEE 802.11a

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
36	5180 MHz	12.11	24.00	**Complies**
40	5200 MHz	11.78	24.00	**Complies**
48	5240 MHz	11.65	24.00	**Complies**

For Two Chain:

Configuration IEEE 802.11n Ant. A (20MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
36	5180 MHz	7.29	24.00	**Complies**
40	5200 MHz	8.52	24.00	**Complies**
48	5240 MHz	8.09	24.00	**Complies**

Configuration IEEE 802.11n Ant. B (20MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
36	5180 MHz	7.65	24.00	**Complies**
40	5200 MHz	8.67	24.00	**Complies**
48	5240 MHz	8.21	24.00	**Complies**

Configuration IEEE 802.11n Ant. A+Ant. B (20MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
36	5180 MHz	10.48	24.00	**Complies**
40	5200 MHz	11.61	24.00	**Complies**
48	5240 MHz	11.16	24.00	**Complies**

Configuration IEEE 802.11n Ant. A (40MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
38	5190 MHz	8.64	24.00	**Complies**
46	5230 MHz	8.41	24.00	**Complies**

Configuration IEEE 802.11n Ant. B (40MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
38	5190 MHz	8.08	24.00	**Complies**
46	5230 MHz	8.18	24.00	**Complies**

Configuration IEEE 802.11n Ant. A+Ant. B (40MHz)

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
38	5190 MHz	11.38	24.00	**Complies**
46	5230 MHz	11.31	24.00	**Complies**

3.4 Power Spectral Density Measurement

3.4.1 Limit

The power spectral density is defined as the highest level of power in dBm per MHz generated by the transmitter within the power envelope. The following table is power spectral density limits and decrease power density limit rule refer to section 3.3.1.

Frequency Range	Power Spectral Density limit (dBm/MHz)
5.15~5.25 GHz	11

3.4.2 Measuring Instruments and Setting

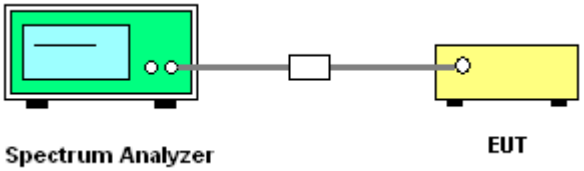
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RB	1000 kHz
VB	3000 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.
2. Set RBW of spectrum analyzer to 1000kHz and VBW to 3000kHz. Set Detector to Peak, Trace to Max Hold. Mark the frequency with maximum peak power as the center of the display of the spectrum.
3. 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 Power Spectral Density

Final Test Date	Nov. 04, 2010	**Test Site No.**	TH01-HY
Temperature	24℃	**Humidity**	63%
Test Engineer	Ian	**Configurations**	802.11a/n

For Single Chain:

Configuration of IEEE 802.11a

Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
5180 MHz	2.23	11.00	**Complies**
5200 MHz	1.24	11.00	**Complies**
5240 MHz	0.74	11.00	**Complies**

For Two Chain:

Configuration IEEE 802.11n (20MHz)

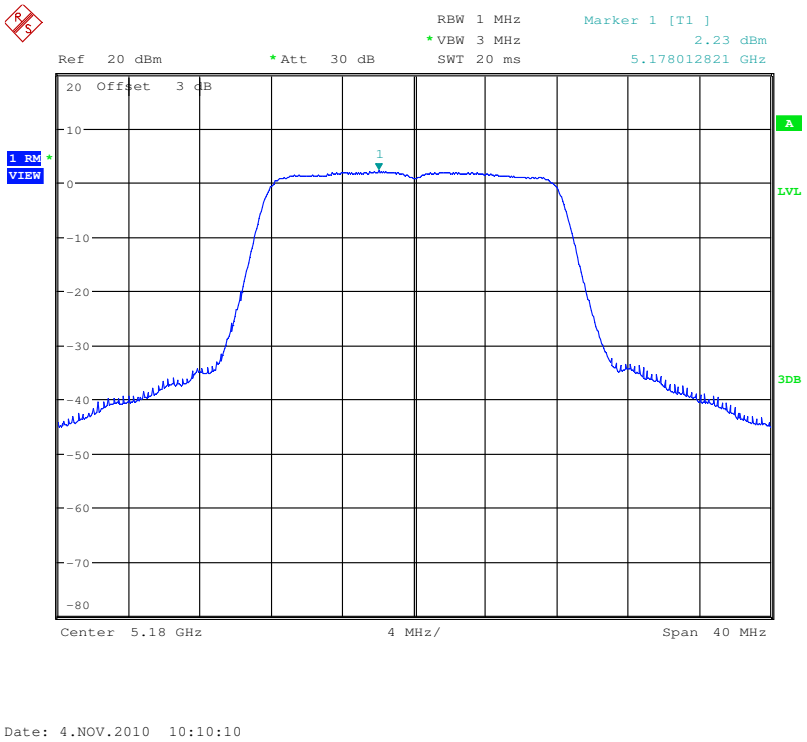
Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
5180 MHz	3.60	11.00	**Complies**
5200 MHz	3.89	11.00	**Complies**
5240 MHz	3.51	11.00	**Complies**

Configuration IEEE 802.11n (40MHz)

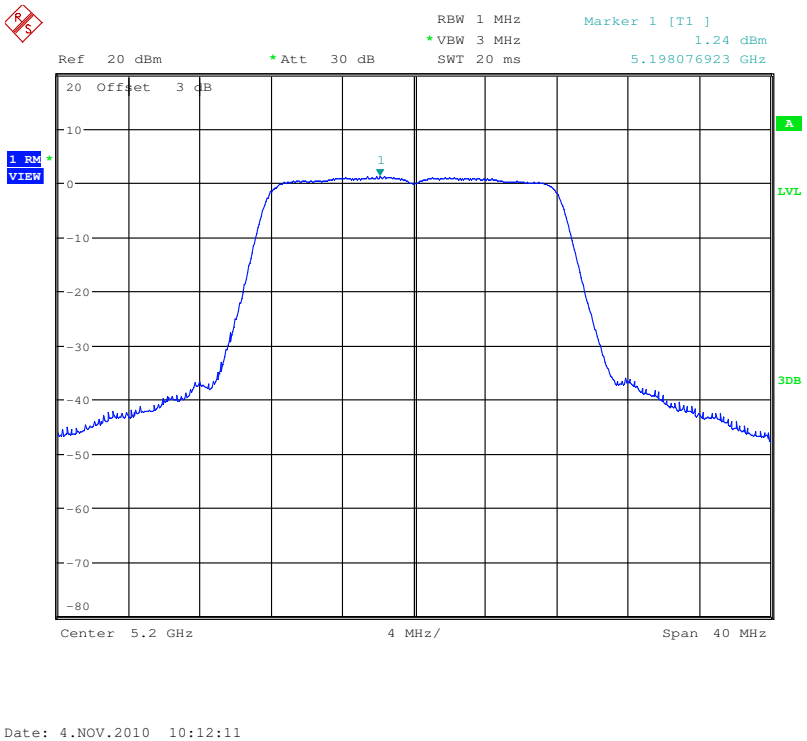
Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
5190 MHz	1.06	11.00	**Complies**
5230 MHz	1.15	11.00	**Complies**

For Single Chain:

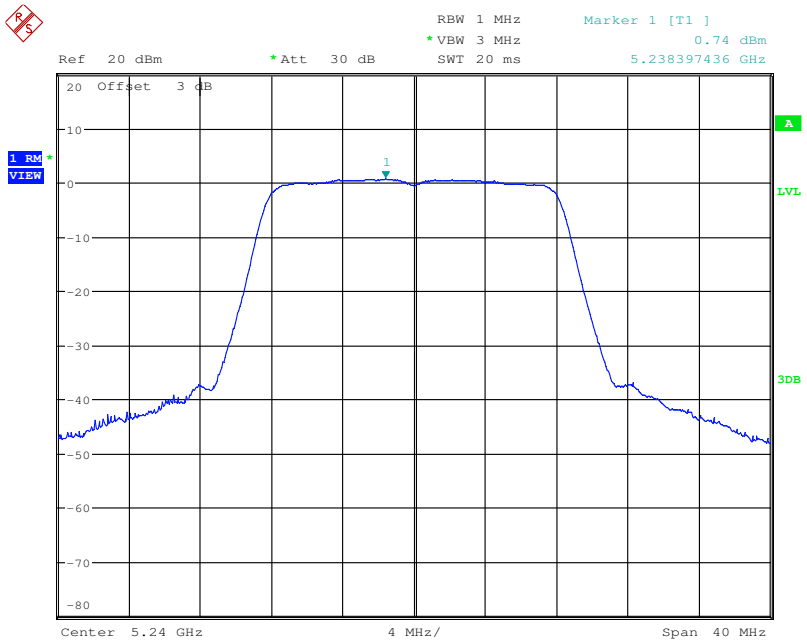
Power Density Plot on Configuration IEEE 802.11a / 5180 MHz



Power Density Plot on Configuration IEEE 802.11a / 5200 MHz

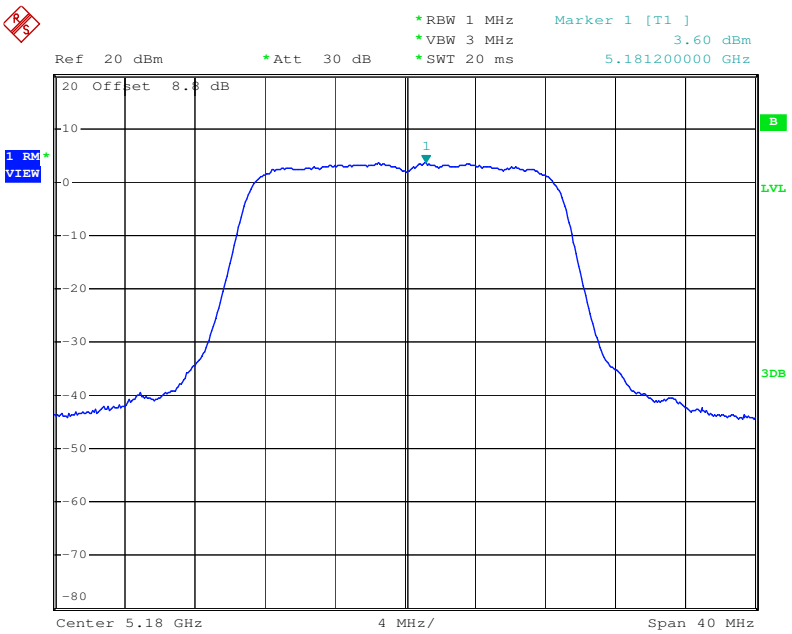


Power Density Plot on Configuration IEEE 802.11a / 5240 MHz



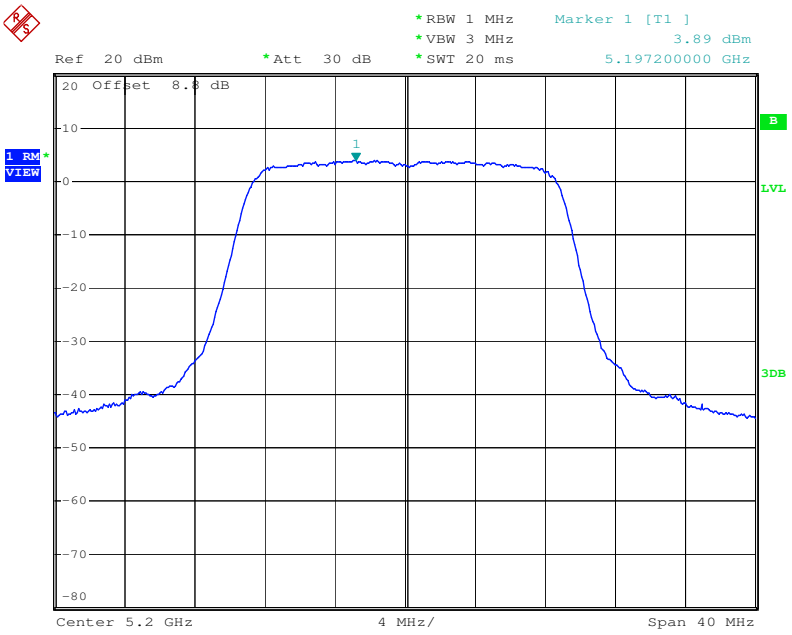
For Two Chain:

Power Density Plot on Configuration IEEE 802.11n Ant. A+Ant. B (20MHz) / 5180 MHz



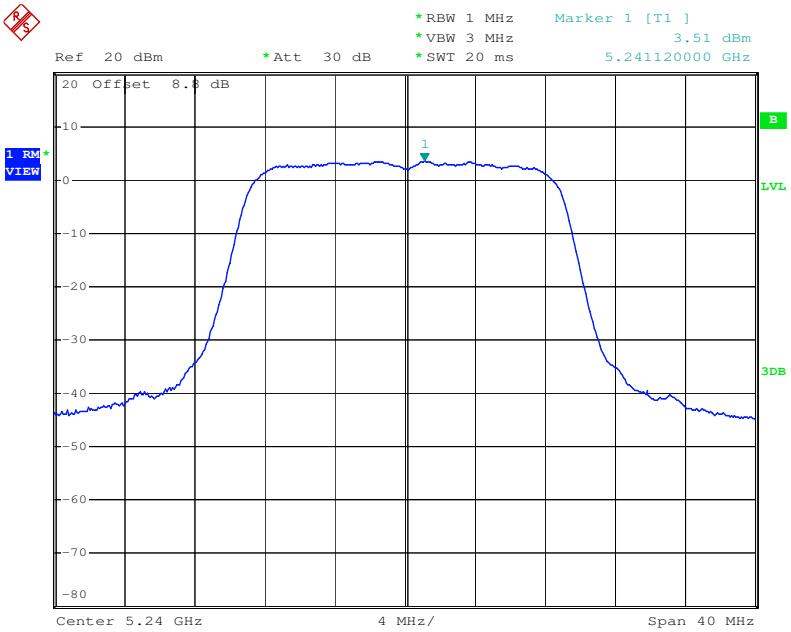
Date: 4.NOV.2010 20:00:33

Power Density Plot on Configuration IEEE 802.11n Ant. A+Ant. B (20MHz) / 5200 MHz



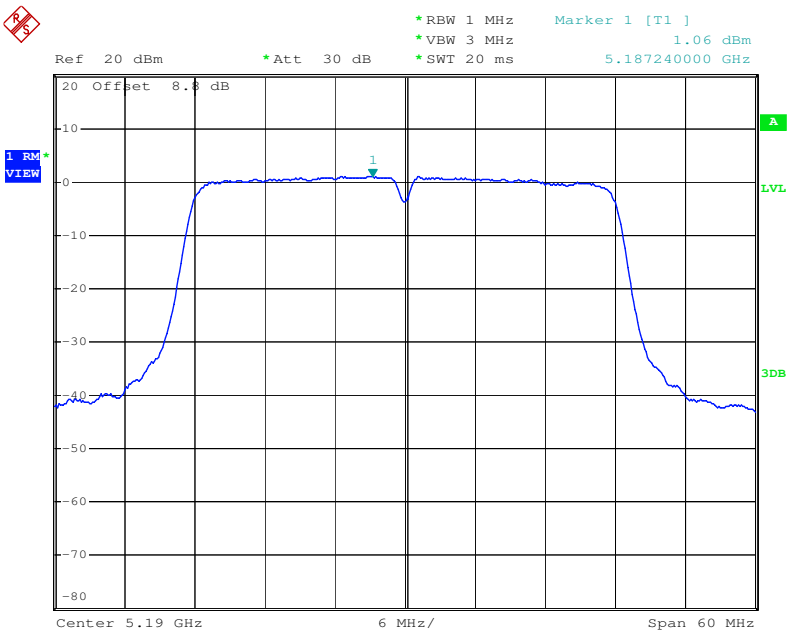
Date: 4.NOV.2010 20:02:00

Power Density Plot on Configuration IEEE 802.11n Ant. A+Ant. B (20MHz) / 5240 MHz



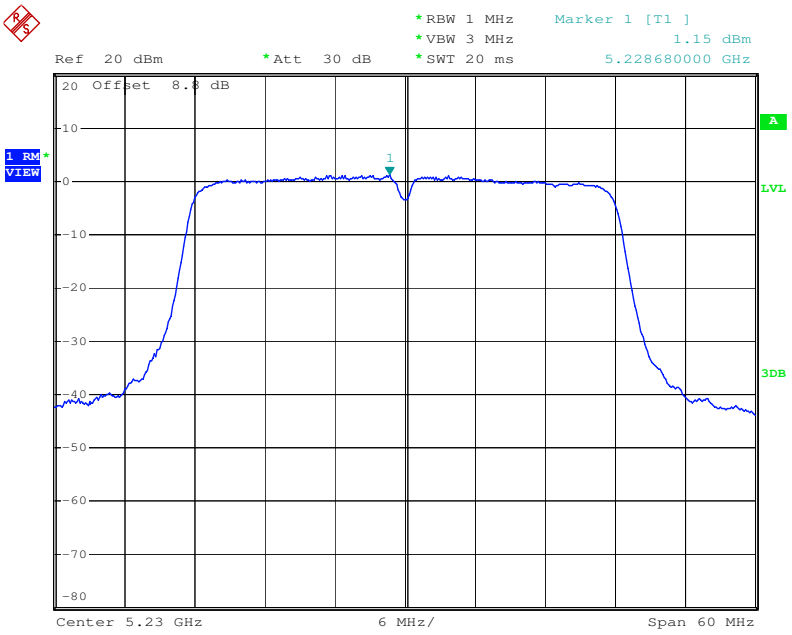
Date: 4.NOV.2010 20:03:10

Power Density Plot on Configuration IEEE 802.11n Ant. A+Ant. B (40MHz) / 5190 MHz



Date: 4.NOV.2010 21:58:07

Power Density Plot on Configuration IEEE 802.11n Ant. A+Ant. B (40MHz) / 5230 MHz



Date: 4.NOV.2010 21:59:12

3.5 Peak Excursion Measurement

3.5.1 Limit

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emissions bandwidth whichever is less.

3.5.2 Measuring Instruments and Setting

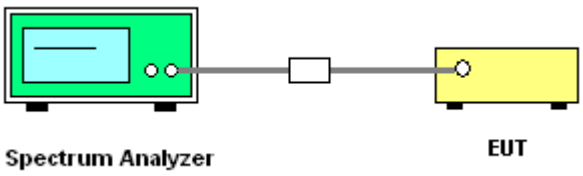
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RB	1000 kHz (Peak Trace) / 1000 kHz (Average Trace)
VB	3000 kHz (Peak Trace) / 300 kHz (Average Trace)
Detector	Peak (Peak Trace) / Sample (Average Trace)
Trace	Max Hold
Sweep Time	60s

3.5.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set the spectrum analyzer span to view the entire emissions bandwidth. The largest difference between the following two traces (Peak Trace and Average Trace) must be ≤ 13 dB for all frequencies across the emissions bandwidth. Submit a plot.
3. Peak Trace: Set RBW = 1 MHz, VBW ≥ 3 MHz with peak detector and max-hold settings.
4. Average Trace: Method #3—video averaging with max hold--and sum power across the band. Set span to encompass the entire emissions bandwidth (EBW) of the signal. Set sweep trigger to “free run”. Set RBW = 1 MHz. Set VBW ≥ 1/T (IEEE 802.11a VBW = 300kHz ≥ 1/4μs). Use sample detector mode if bin width (i.e., span/number of points in spectrum) < 0.5 RBW. Otherwise use peak detector mode. Set max hold. Allow max hold to run for 60 seconds.
5. Measuring multiple antennas, the connectors are required to link with Spectrum Analyzer through a combiner.

3.5.4 Test Setup Layout



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 Test Result of Peak Excursion

Final Test Date	Nov. 04, 2010	**Test Site No.**	TH01-HY
Temperature	24℃	**Humidity**	63%
Test Engineer	Ian	**Configurations**	802.11a/n

For Single Chain:

Configuration of IEEE 802.11a

Frequency	Peak Excursion (dB)	Max. Limit (dB)	Result
5180 MHz	5.63	13	**Complies**
5200 MHz	5.65	13	**Complies**
5240 MHz	5.54	13	**Complies**

For Two Chain:

Configuration IEEE 802.11n Ant. A+Ant. B (20MHz)

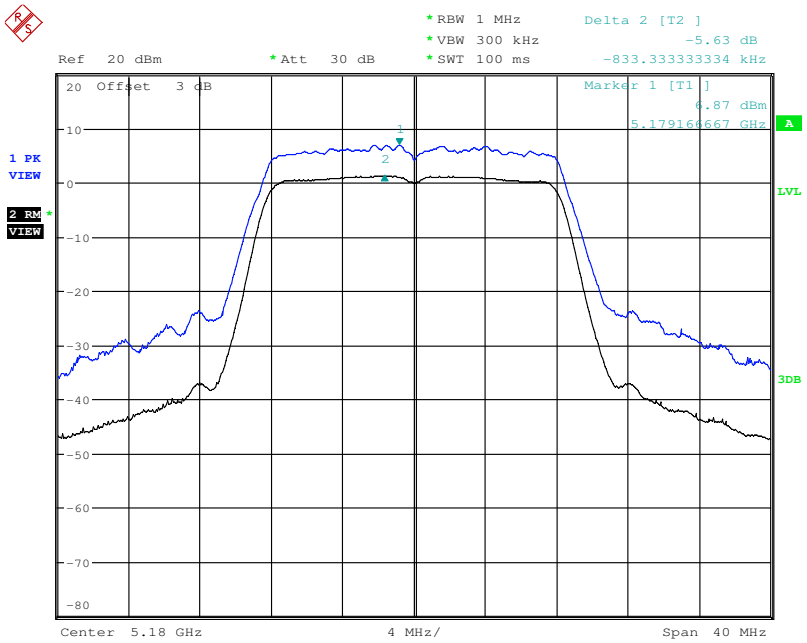
Frequency	Peak Excursion (dB)	Max. Limit (dB)	Result
5180 MHz	6.67	13	**Complies**
5200 MHz	7.02	13	**Complies**
5240 MHz	7.41	13	**Complies**

Configuration IEEE 802.11n Ant. A+Ant. B (40MHz)

Frequency	Peak Excursion (dB)	Max. Limit (dB)	Result
5190 MHz	6.10	13	**Complies**
5230 MHz	7.24	13	**Complies**

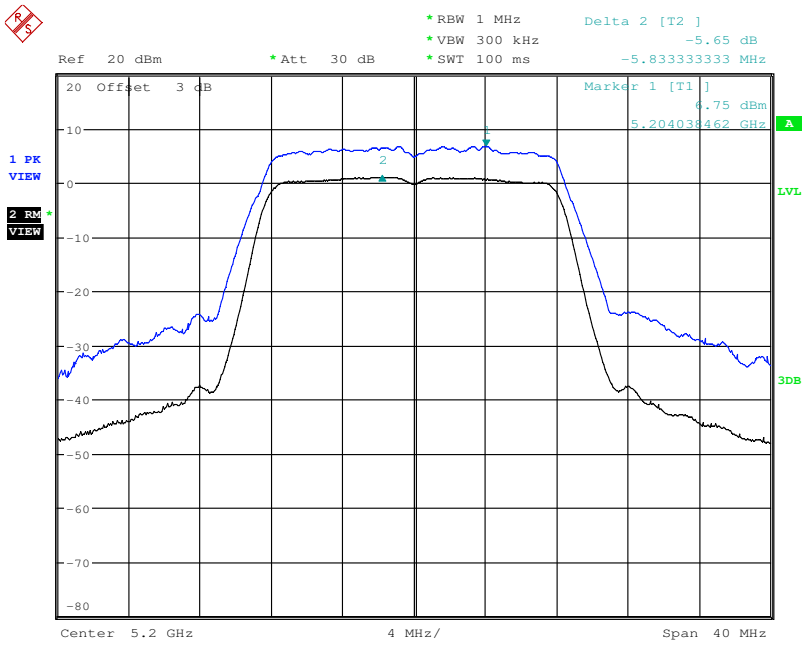
For Single Chain:

Peak Excursion Plot on Configuration IEEE 802.11a / 5180 MHz



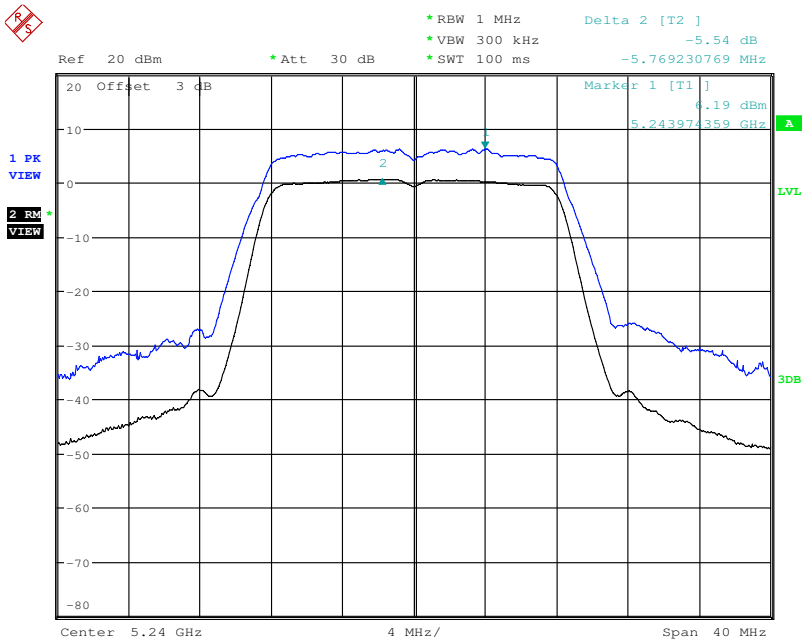
Date: 4.NOV.2010 13:10:59

Peak Excursion Plot on Configuration IEEE 802.11a / 5200 MHz



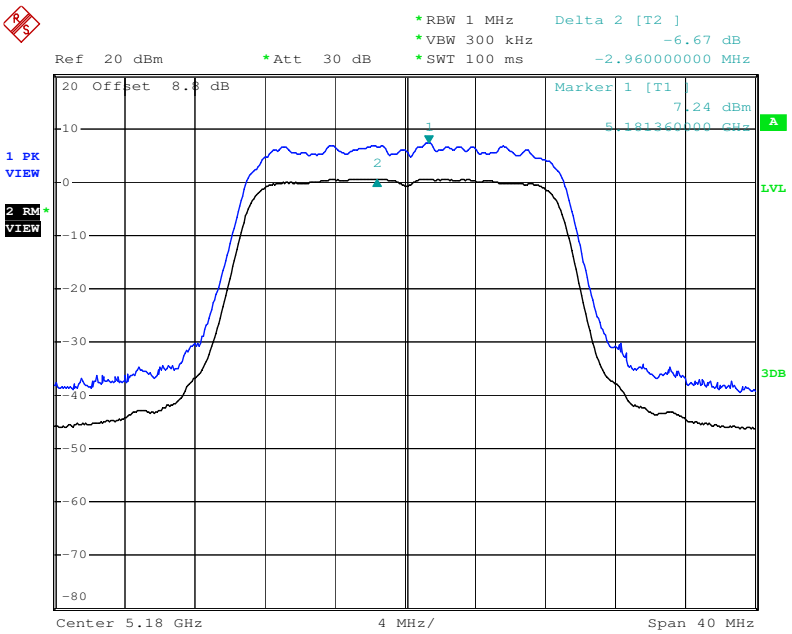
Date: 4.NOV.2010 13:31:50

Peak Excursion Plot on Configuration IEEE 802.11a / 5240 MHz



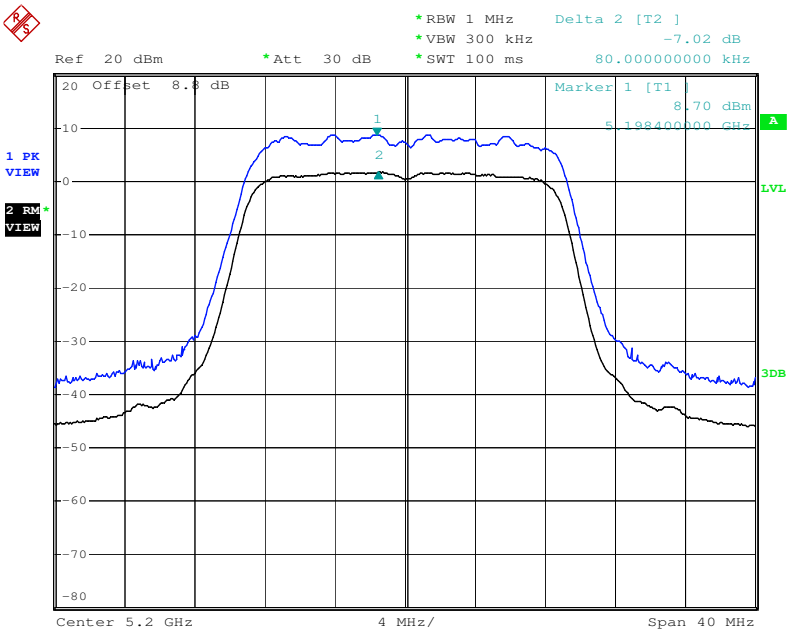
For Two Chain:

Peak Excursion Plot on Configuration IEEE 802.11n Ant. A+Ant. B (20MHz) / 5180 MHz



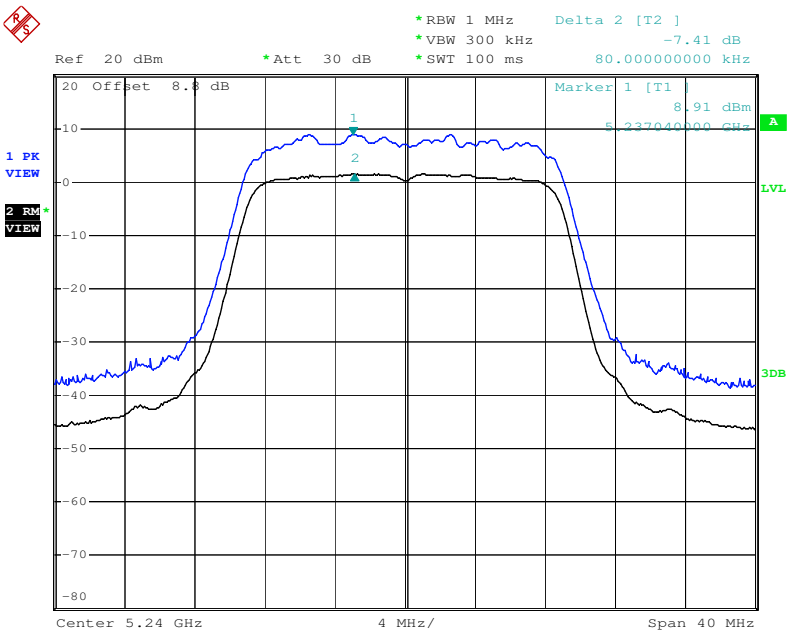
Date: 4.NOV.2010 21:04:44

Peak Excursion Plot on Configuration IEEE 802.11n Ant. A+Ant. B (20MHz) / 5200 MHz



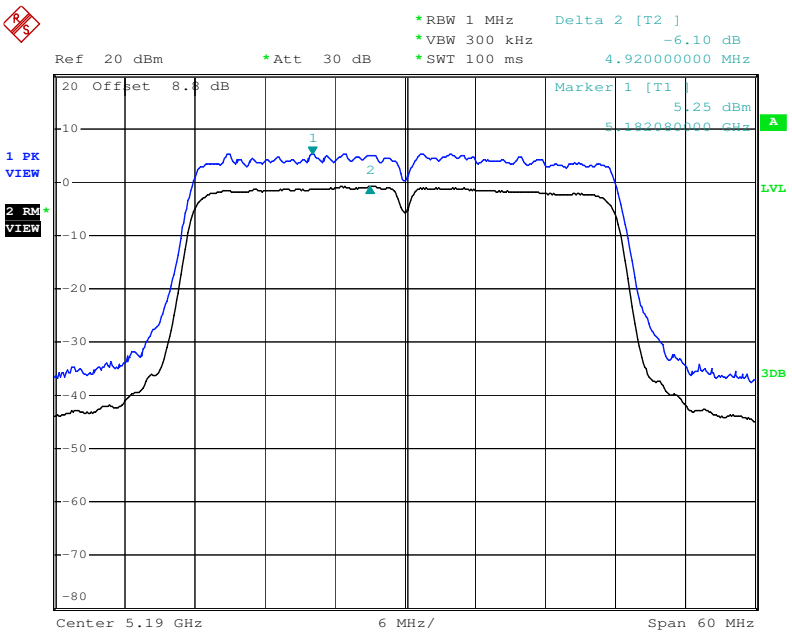
Date: 4.NOV.2010 21:05:48

Peak Excursion Plot on Configuration IEEE 802.11n Ant. A+Ant. B (20MHz) / 5240 MHz



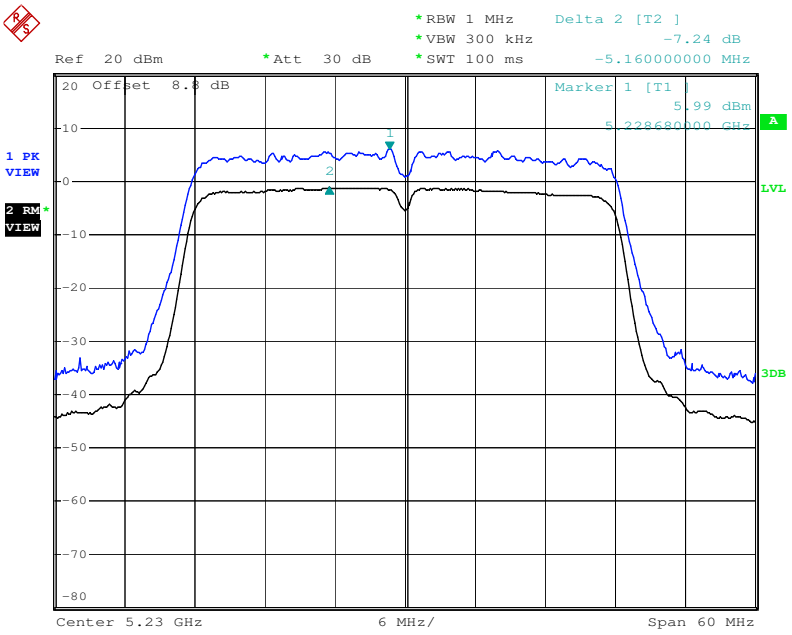
Date: 4.NOV.2010 21:07:32

Peak Excursion Plot on Configuration IEEE 802.11n Ant. A+Ant. B (40MHz) / 5190 MHz



Date: 4.NOV.2010 22:21:47

Peak Excursion Plot on Configuration IEEE 802.11n Ant. A+Ant. B (40MHz) / 5230 MHz



Date: 4.NOV.2010 22:22:56

3.6 Radiated Emissions Measurement

3.6.1 Limit

For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). In addition, 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.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

3.6.2 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.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	40 GHz
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz z for peak

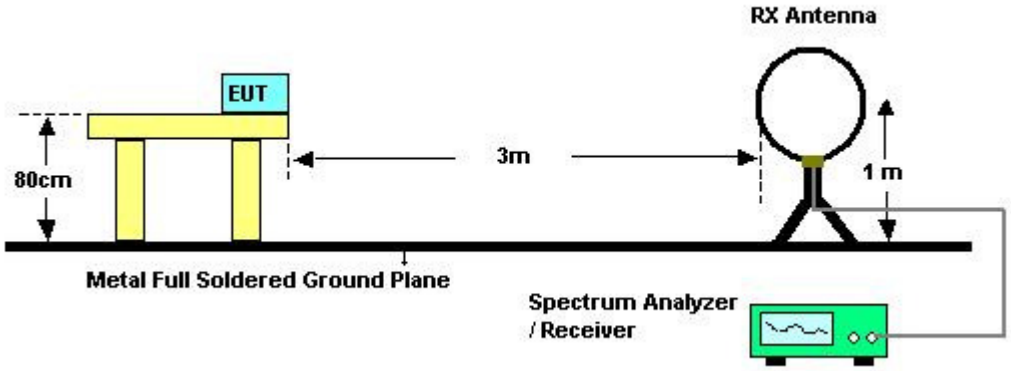
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.6.3 Test Procedures

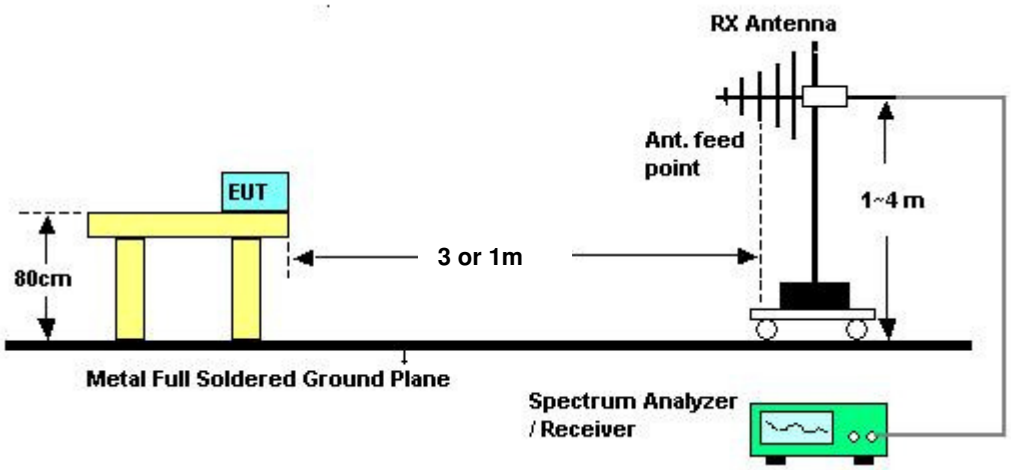
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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.

3.6.4 Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



Above 5GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

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

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 Results of Radiated Emissions (9kHz~30MHz)

Final Test Date	Oct. 26, 2010	**Test Site No.**	03CH03-HY
Temperature	24.9℃	**Humidity**	54%
Test Engineer	Eddie		

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

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

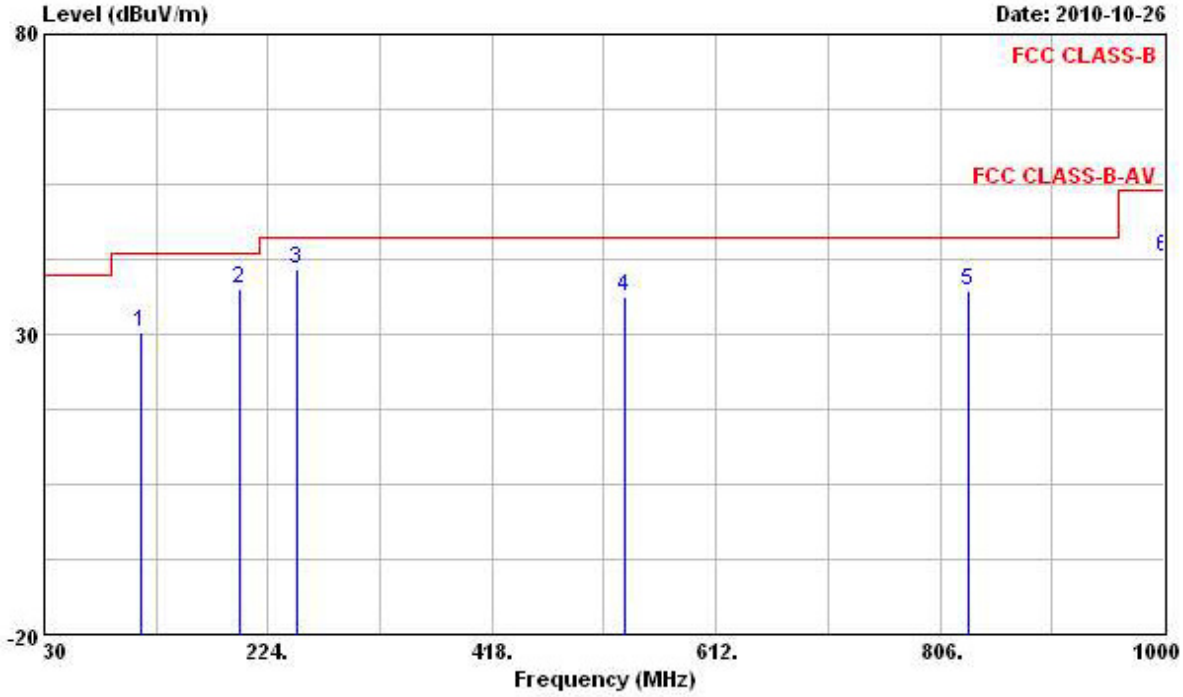
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

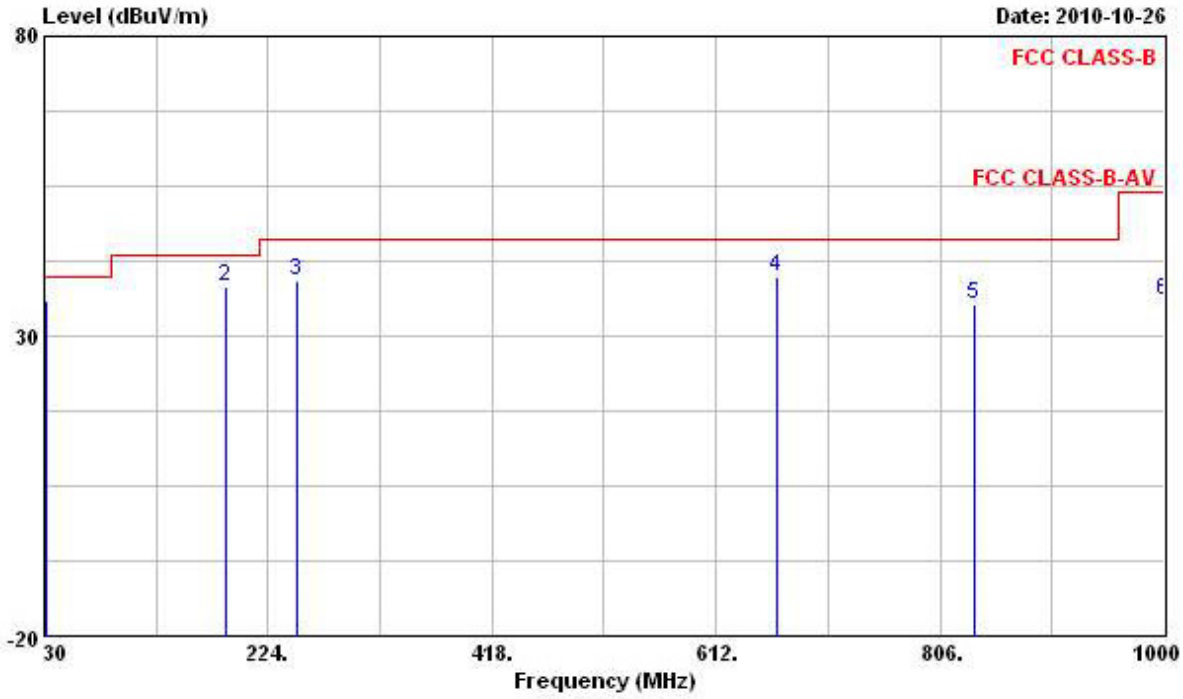
Final Test Date	Oct. 26, 2010	Test Site No.	03CH03-HY
Temperature	24.9℃	Humidity	54%
Test Engineer	Eddie	Configurations	Normal Mode

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	113.420	30.35	-13.15	43.50	43.40	12.80	1.72	27.57	Peak
2	198.780	37.57	-5.93	43.50	51.05	11.28	2.31	27.07	Peak
3	249.220	40.73	-5.27	46.00	51.90	12.97	2.68	26.82	Peak
4	532.460	36.40	-9.60	46.00	42.58	18.21	3.78	28.17	Peak
5	831.220	37.08	-8.92	46.00	39.66	20.19	4.83	27.60	Peak
6	1000.000	42.90	-31.10	74.00	41.97	22.50	5.47	27.04	Peak

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	31.940	35.89	-4.11	40.00	47.49	15.48	0.78	27.86	Peak
2	187.140	38.06	-5.44	43.50	52.60	10.41	2.24	27.19	Peak
3	249.220	39.26	-6.74	46.00	50.43	12.97	2.68	26.82	Peak
4	665.350	39.90	-6.10	46.00	44.36	19.31	4.30	28.07	Peak
5	835.100	35.16	-10.84	46.00	37.71	20.19	4.84	27.58	Peak
6	1000.000	35.89	-38.11	74.00	34.96	22.50	5.47	27.04	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).

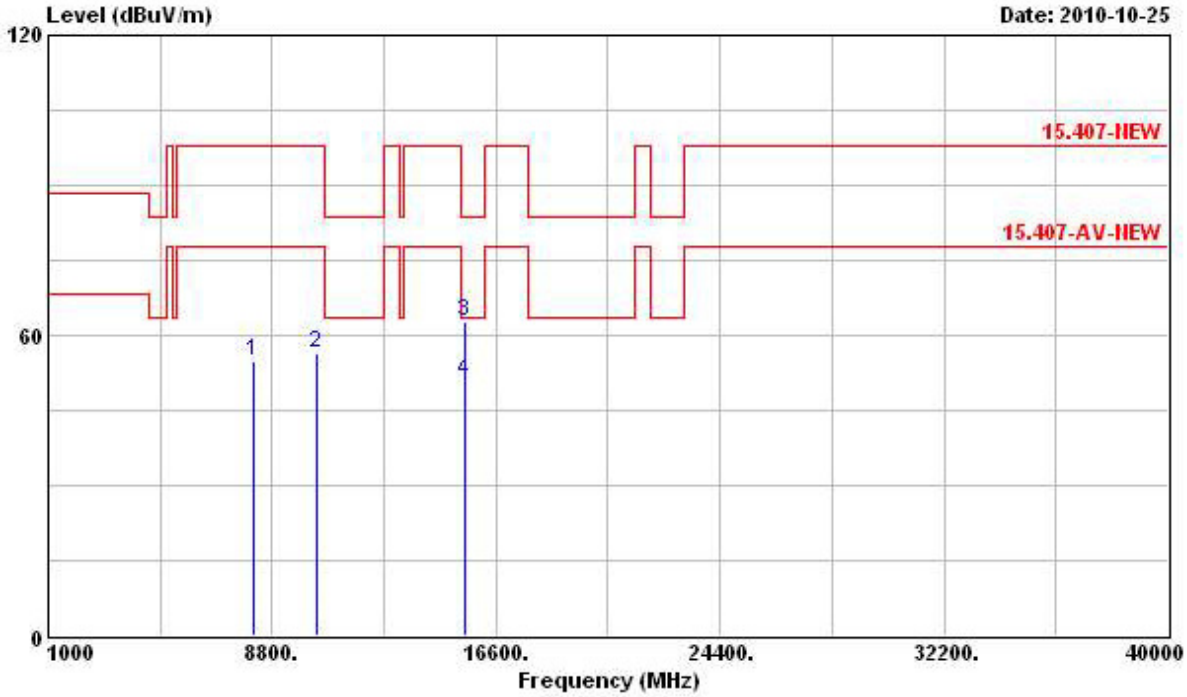
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

3.6.9 Results for Radiated Emissions (1GHz~40GHz)

For Single Chain:

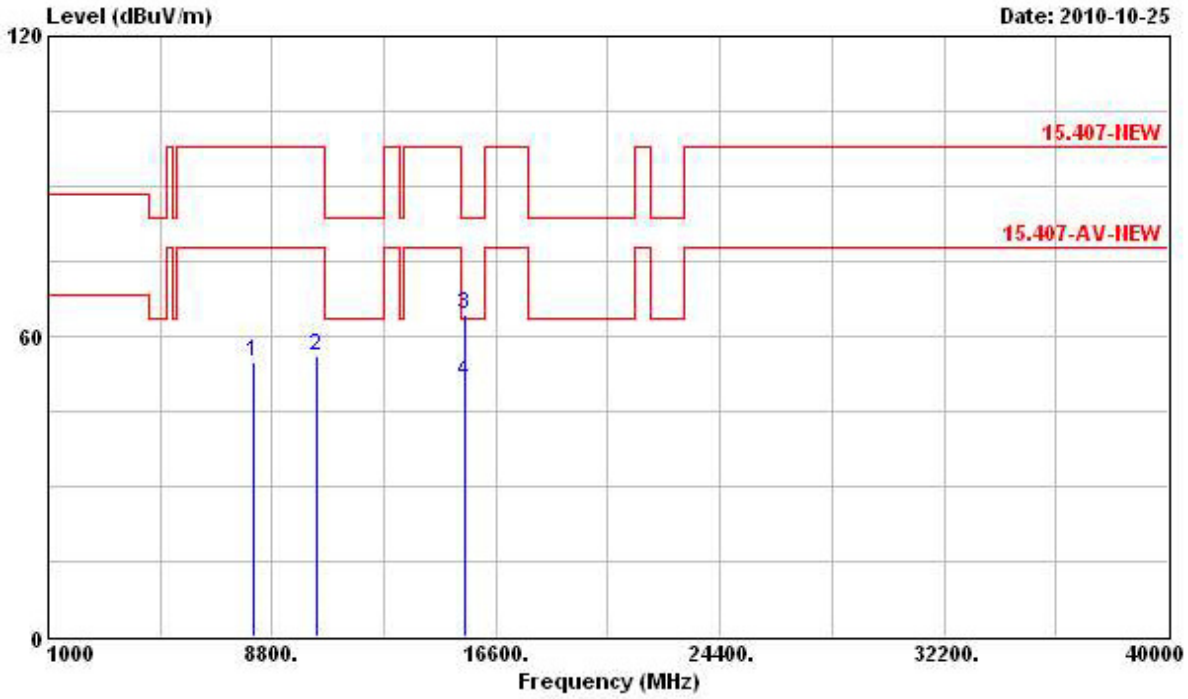
Final Test Date	Oct. 25, 2010	**Test Site No.**	03CH03-HY
Temperature	24.9℃	**Humidity**	54%
Test Engineer	Eddie	**Configuration**	802.11a Ch. 36 (Ant. A)

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8140.000	54.68	-23.16	77.84	44.89	38.28	5.84	34.33	PK
2	10360.000	56.54	-41.30	97.84	43.95	40.02	6.71	34.14	Peak
3	15540.000	62.95	-20.59	83.54	44.53	42.81	8.45	32.84	Peak
4	15540.000	50.91	-12.63	63.54	32.49	42.81	8.45	32.84	Average

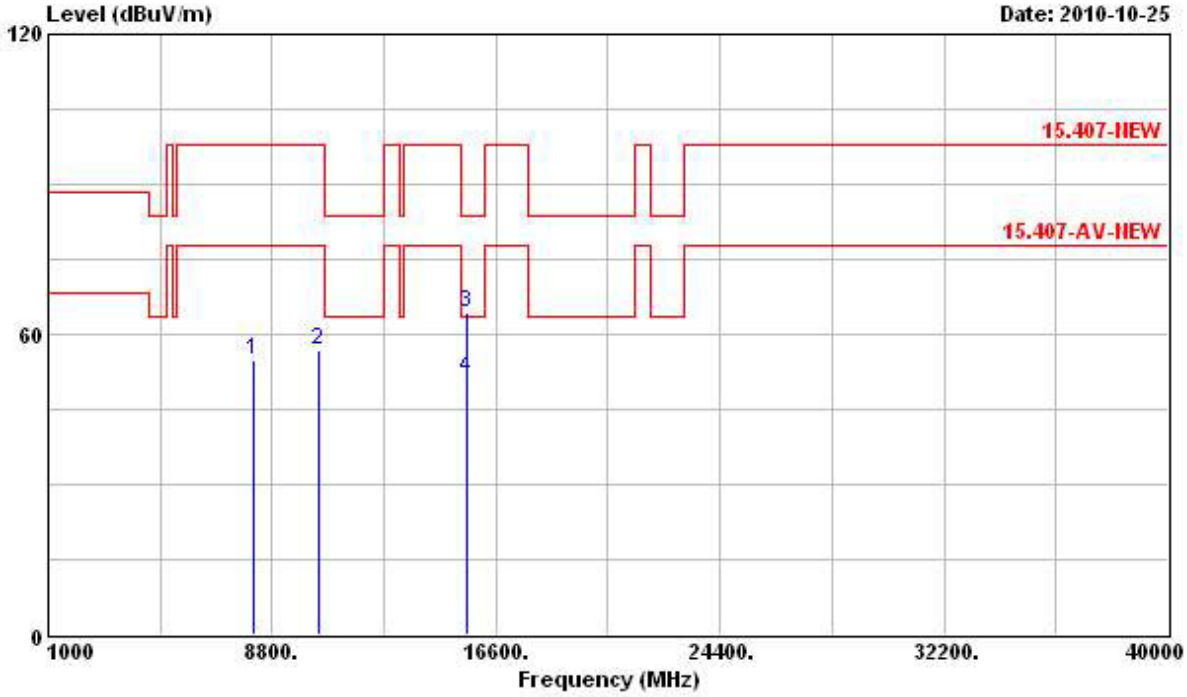
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8168.000	54.75	-43.09	97.84	44.92	38.30	5.85	34.32	Peak
2	10360.000	56.06	-41.78	97.84	43.47	40.02	6.71	34.14	Peak
3	15540.000	64.19	-19.35	83.54	45.77	42.81	8.45	32.84	Peak
4	15540.000	50.96	-12.58	63.54	32.54	42.81	8.45	32.84	Average

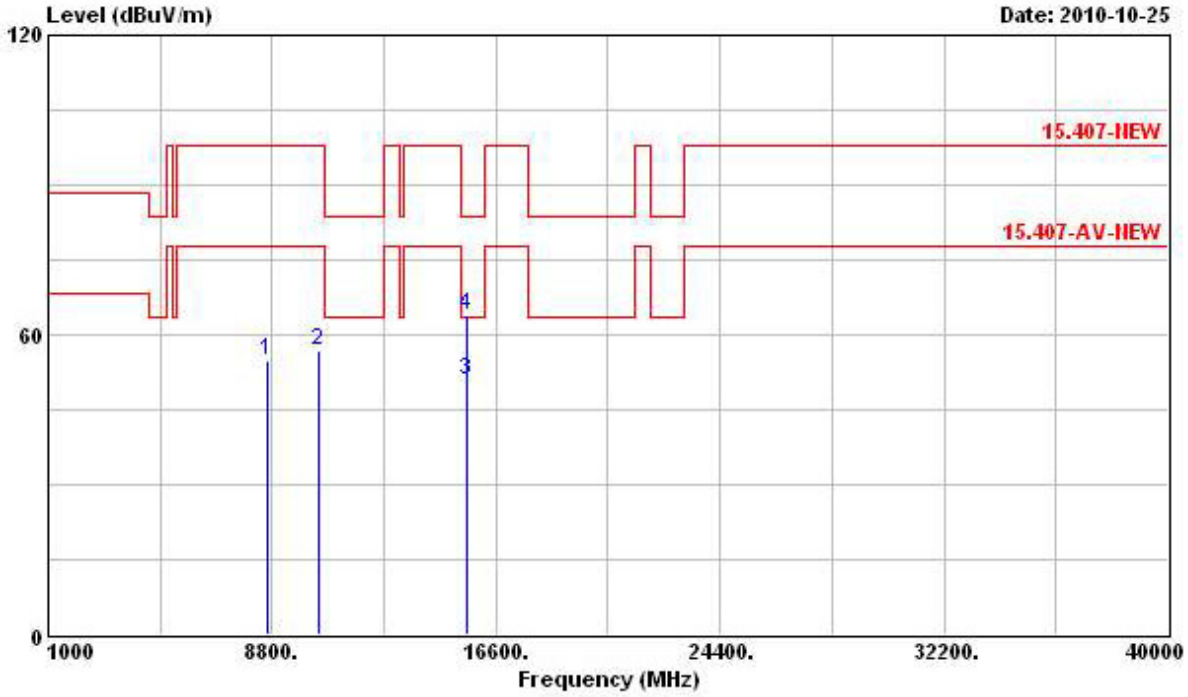
Final Test Date	Oct. 25, 2010	Test Site No.	03CH03-HY
Temperature	24.9℃	Humidity	54%
Test Engineer	Eddie	Configuration	802.11a Ch. 40 (Ant. A)

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8124.000	54.70	-23.14	77.84	44.92	38.27	5.84	34.33	PK
2	10400.000	56.65	-41.19	97.84	43.96	40.04	6.75	34.10	Peak
3	15600.000	64.32	-19.22	83.54	45.97	42.82	8.45	32.92	Peak
4	15600.000	51.14	-12.40	63.54	32.79	42.82	8.45	32.92	Average

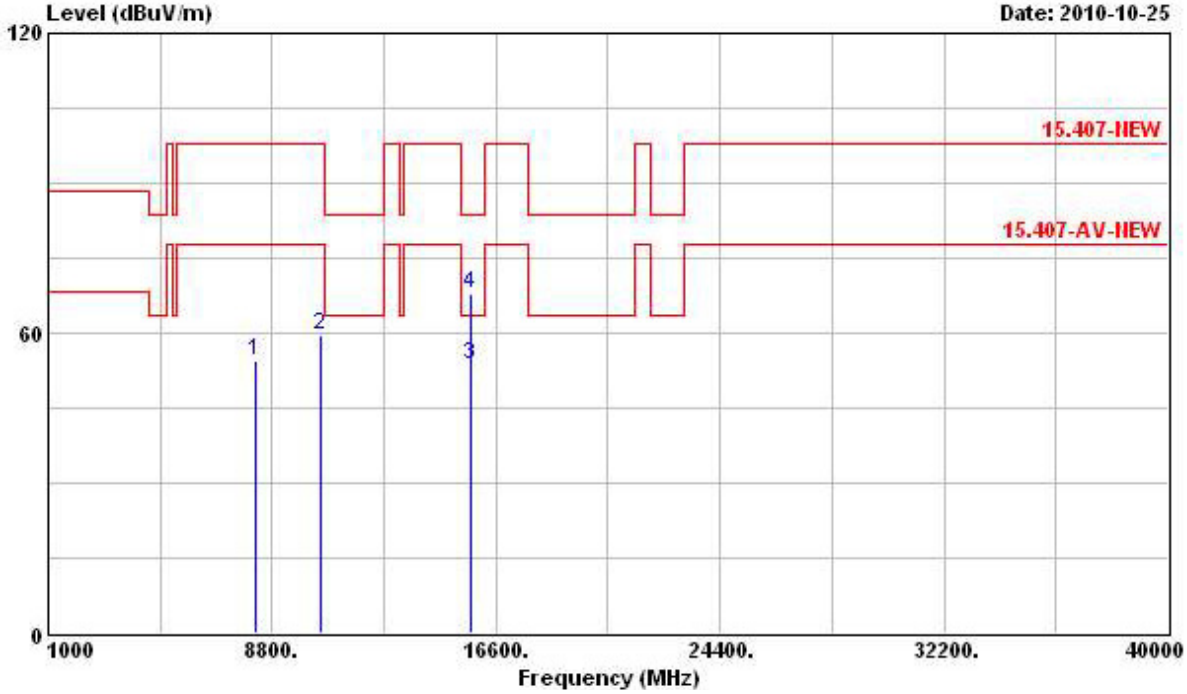
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8668.000	55.00	-42.84	97.84	45.00	38.37	6.02	34.39	Peak
2	10400.000	56.97	-40.87	97.84	44.28	40.04	6.75	34.10	Peak
3	15600.000	50.96	-12.58	63.54	32.61	42.82	8.45	32.92	Average
4	15600.000	63.99	-19.55	83.54	45.64	42.82	8.45	32.92	Peak

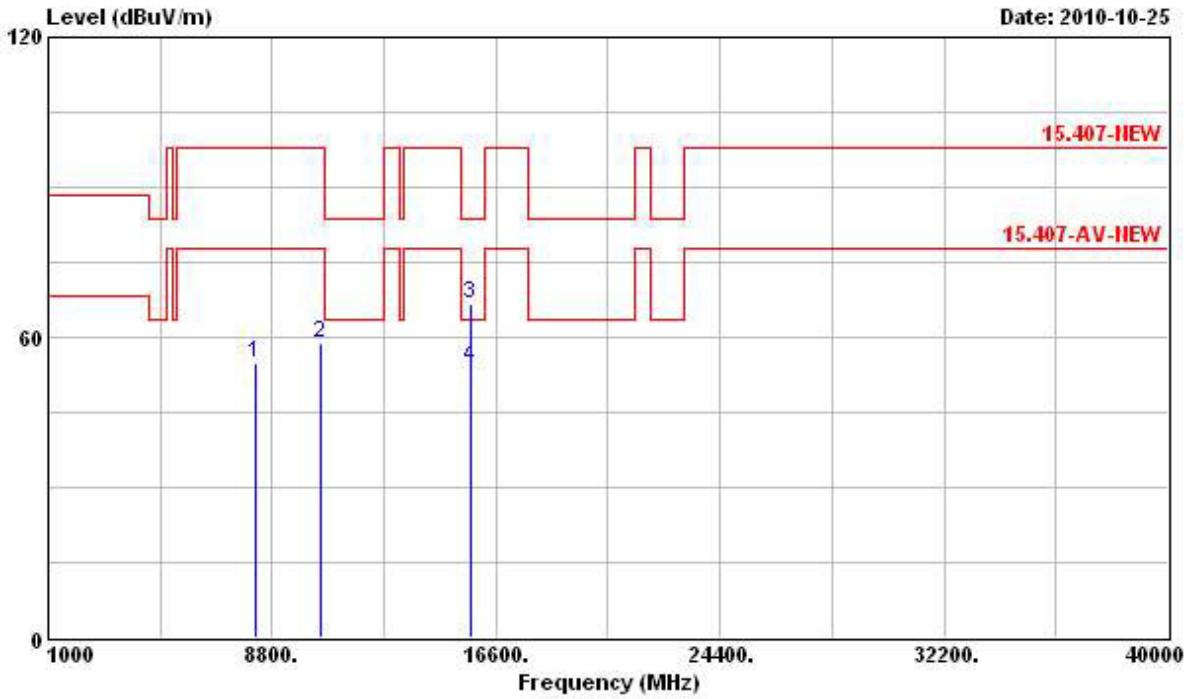
Final Test Date	Oct. 25, 2010	Test Site No.	03CH03-HY
Temperature	24.9℃	Humidity	54%
Test Engineer	Eddie	Configuration	802.11a Ch. 48 (Ant. A)

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8200.000	54.28	-23.56	77.84	44.41	38.32	5.86	34.31	PK
2	10480.000	59.41	-38.43	97.84	46.53	40.09	6.82	34.03	Peak
3	15720.000	53.64	-9.90	63.54	35.37	42.84	8.46	33.03	Average
4	15720.000	67.79	-15.75	83.54	49.52	42.84	8.46	33.03	Peak

Vertical

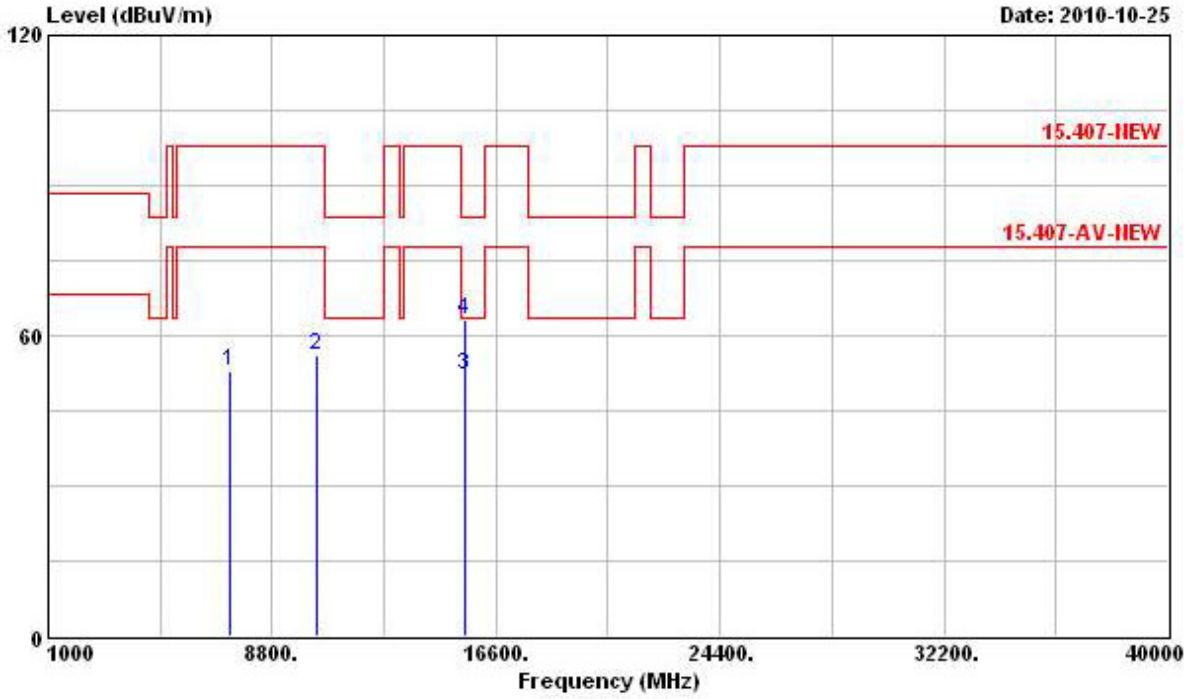


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8192.000	54.85	-22.99	77.84	45.00	38.31	5.85	34.31	PK
2	10480.000	58.90	-38.94	97.84	46.02	40.09	6.82	34.03	Peak
3	15720.000	66.87	-16.67	83.54	48.60	42.84	8.46	33.03	Peak
4	15720.000	53.91	-9.63	63.54	35.64	42.84	8.46	33.03	Average

For Two Chain:

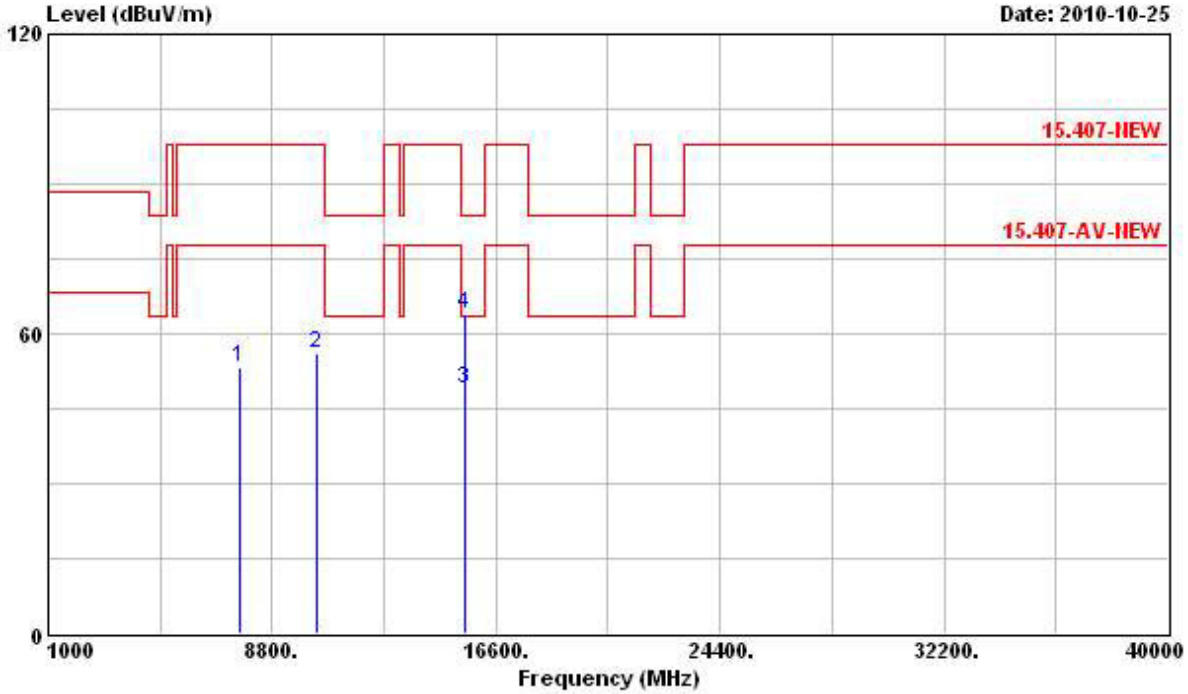
Final Test Date	Oct. 25, 2010	**Test Site No.**	03CH03-HY
Temperature	24.9℃	**Humidity**	54%
Test Engineer	Eddie	**Configuration**	802.11n Ch. 36 (20MHz) / (Ant. A+Ant. B)

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7352.000	52.89	-24.95	77.84	43.67	37.87	5.64	34.29	PK
2	10360.000	56.10	-41.74	97.84	43.51	40.02	6.71	34.14	Peak
3	15540.000	52.07	-11.47	63.54	33.65	42.81	8.45	32.84	Average
4	15540.000	63.25	-20.29	83.54	44.83	42.81	8.45	32.84	Peak

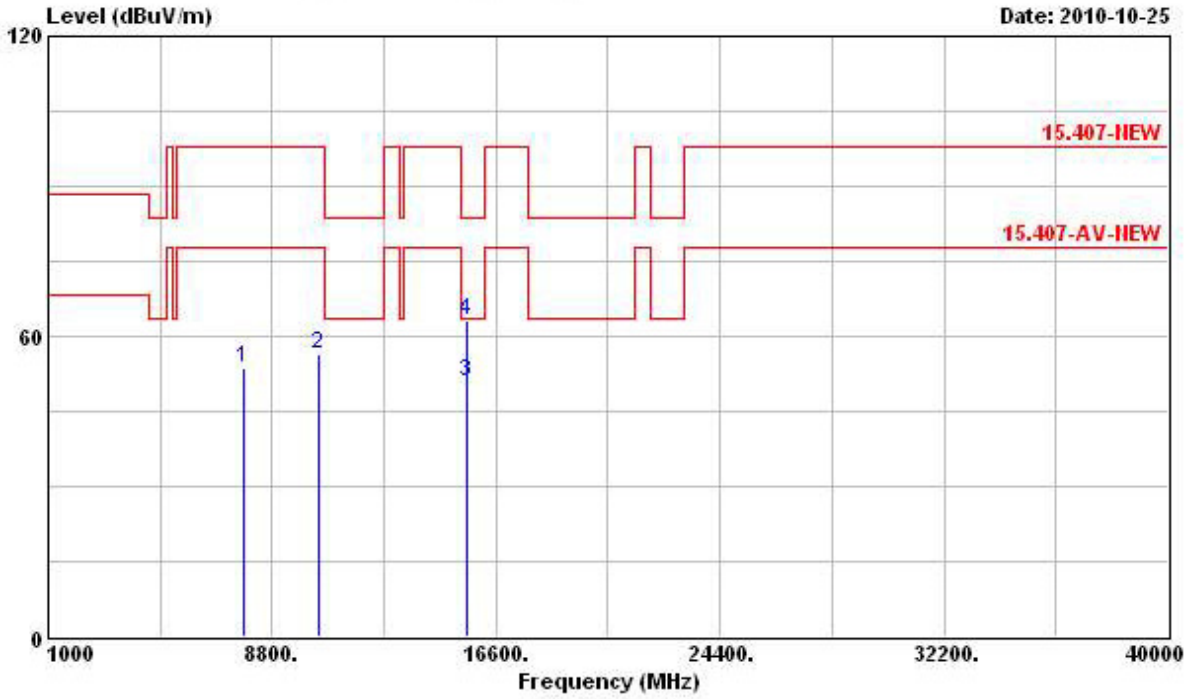
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7648.000	53.39	-24.45	77.84	44.03	37.99	5.69	34.32	PK
2	10360.000	55.99	-41.85	97.84	43.40	40.02	6.71	34.14	Peak
3	15540.000	48.98	-14.56	63.54	30.56	42.81	8.45	32.84	Average
4	15540.000	64.08	-19.46	83.54	45.66	42.81	8.45	32.84	Peak

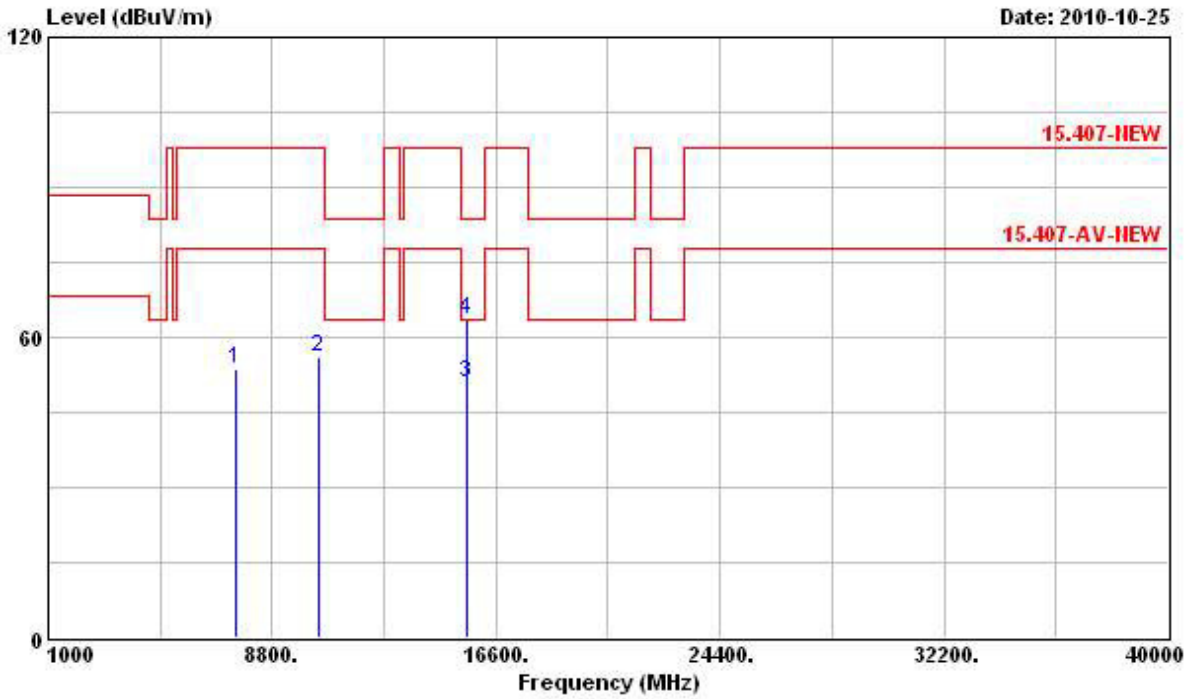
Final Test Date	Oct. 25, 2010	Test Site No.	03CH03-HY
Temperature	24.9℃	Humidity	54%
Test Engineer	Eddie	Configuration	802.11n Ch. 40 (20MHz) / (Ant. A+Ant. B)

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7808.000	53.62	-44.22	97.84	44.13	38.08	5.75	34.34	Peak
2	10400.000	56.64	-41.20	97.84	43.95	40.04	6.75	34.10	Peak
3	15600.000	50.79	-12.75	63.54	32.44	42.82	8.45	32.92	Average
4	15600.000	63.33	-20.21	83.54	44.98	42.82	8.45	32.92	Peak

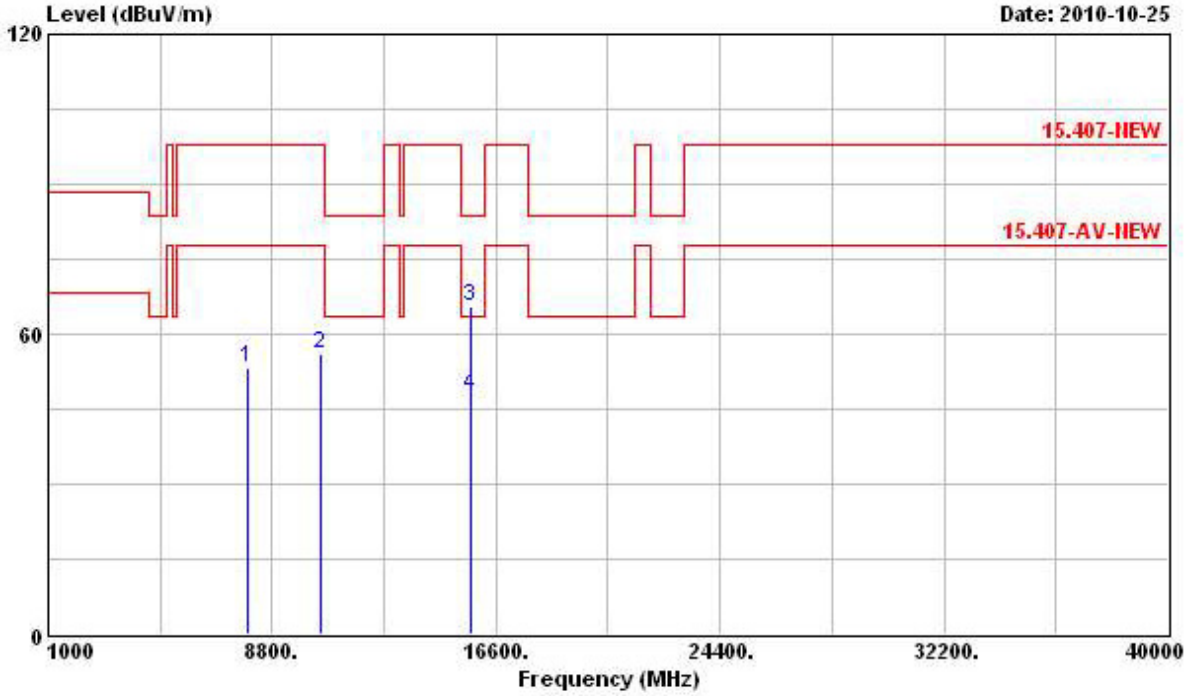
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7566.000	53.68	-24.16	77.84	44.37	37.94	5.67	34.30	PK
2	10400.000	56.16	-41.68	97.84	43.47	40.04	6.75	34.10	Peak
3	15600.000	51.03	-12.51	63.54	32.68	42.82	8.45	32.92	Average
4	15600.000	63.52	-20.02	83.54	45.17	42.82	8.45	32.92	Peak

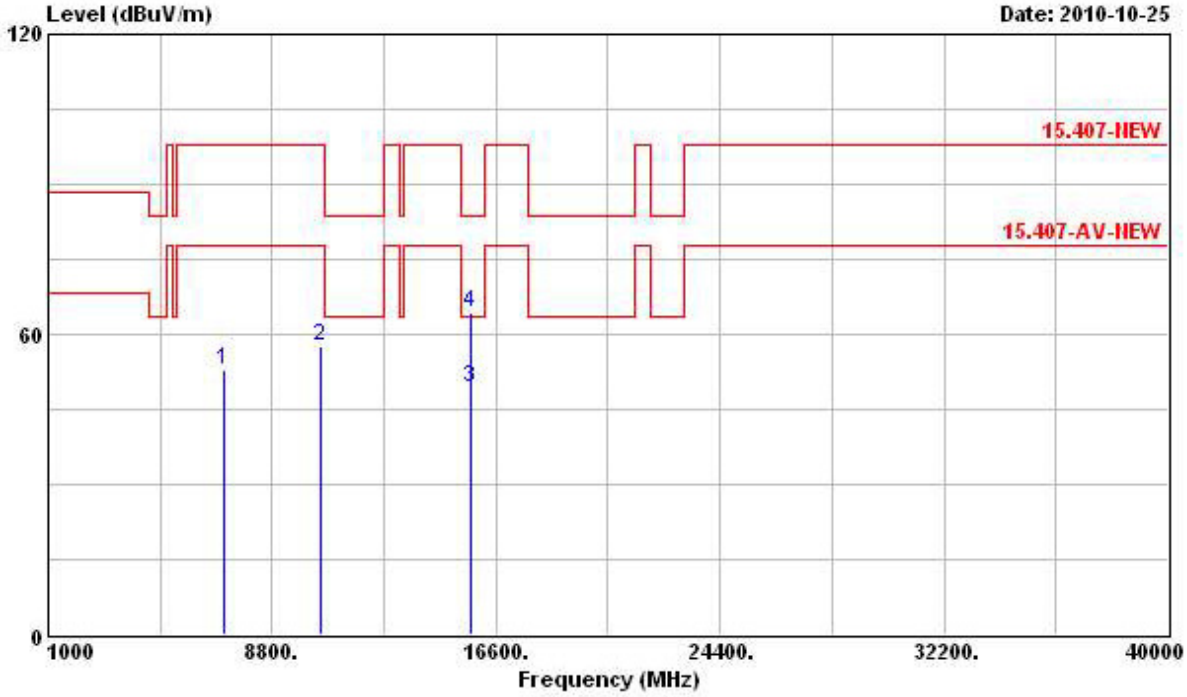
Final Test Date	Oct. 25, 2010	Test Site No.	03CH03-HY
Temperature	24.9℃	Humidity	54%
Test Engineer	Eddie	Configuration	802.11n Ch. 48 (20MHz) / (Ant. A+Ant. B)

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7916.000	53.48	-44.36	97.84	43.90	38.15	5.78	34.35	Peak
2	10480.000	55.87	-41.97	97.84	42.99	40.09	6.82	34.03	Peak
3	15720.000	65.35	-18.19	83.54	47.08	42.84	8.46	33.03	Peak
4	15720.000	47.93	-15.61	63.54	29.66	42.84	8.46	33.03	Average

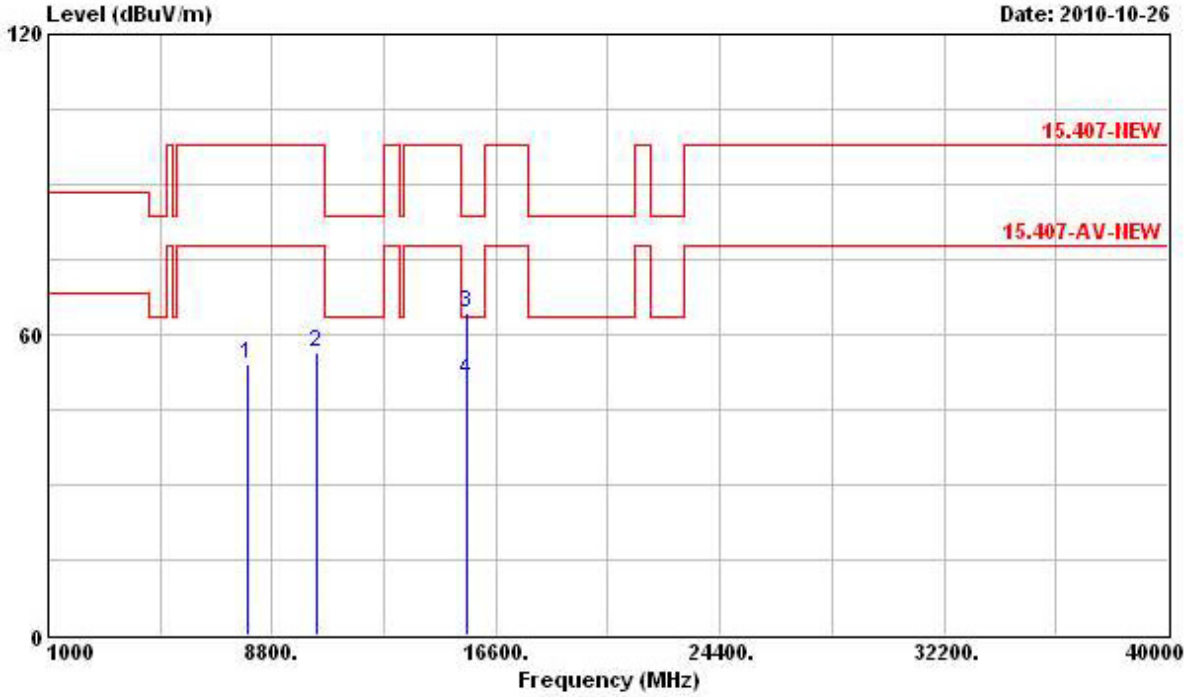
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7132.000	52.97	-44.87	97.84	43.81	37.83	5.61	34.28	Peak
2	10480.000	57.45	-40.39	97.84	44.57	40.09	6.82	34.03	Peak
3	15720.000	49.17	-14.37	63.54	30.90	42.84	8.46	33.03	Average
4	15720.000	64.19	-19.35	83.54	45.92	42.84	8.46	33.03	Peak

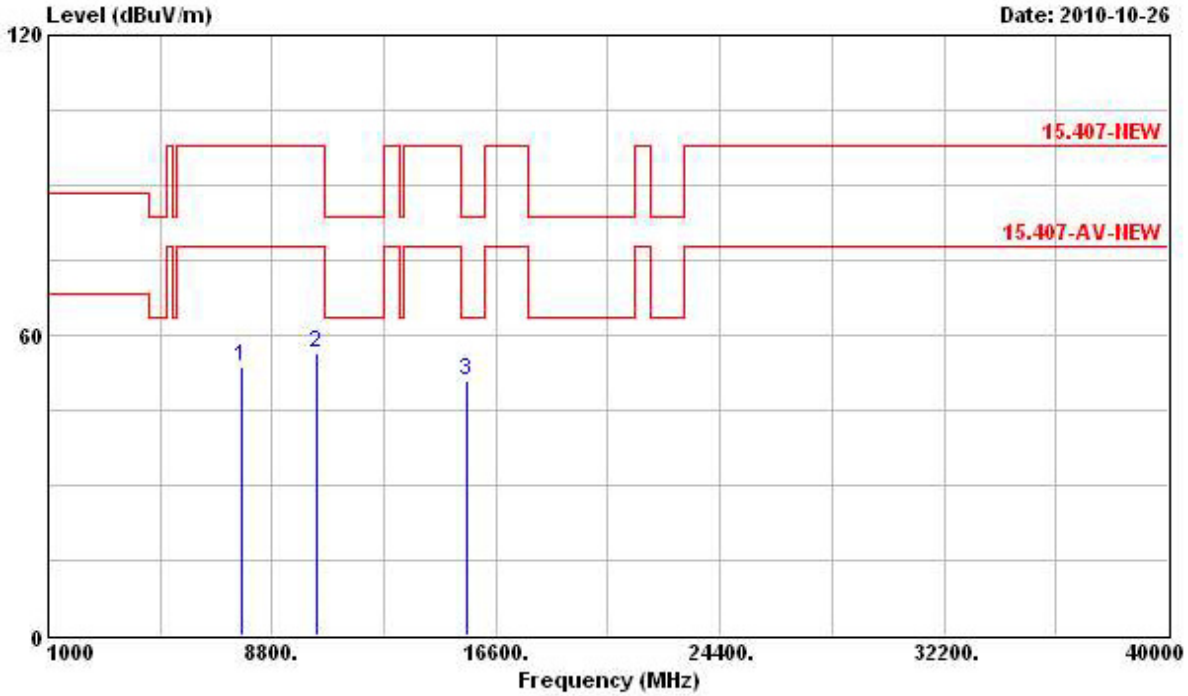
Final Test Date	Oct. 26, 2010	Test Site No.	03CH03-HY
Temperature	24.9℃	Humidity	54%
Test Engineer	Eddie	Configuration	802.11n Ch. 38 (40MHz) / (Ant. A + Ant. B)

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7952.000	54.09	-43.75	97.84	44.49	38.17	5.79	34.36	Peak
2	10380.000	56.62	-41.22	97.84	43.96	40.03	6.75	34.12	Peak
3	15570.000	64.22	-19.32	83.54	45.83	42.81	8.45	32.87	Peak
4	15570.000	50.93	-12.61	63.54	32.54	42.81	8.45	32.87	Average

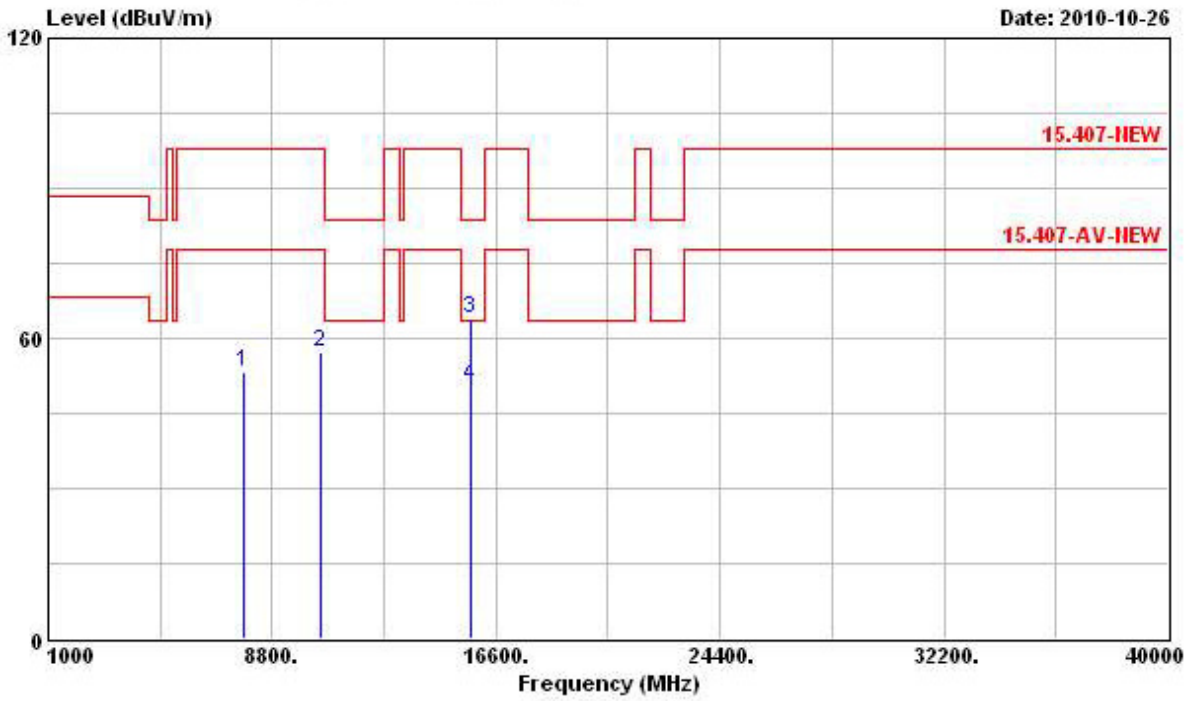
Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7760.000	53.55	-44.29	97.84	44.09	38.06	5.73	34.33	Peak
2	10380.000	56.43	-41.41	97.84	43.77	40.03	6.75	34.12	Peak
3	15570.000	50.91	-12.63	63.54	32.52	42.81	8.45	32.87	Average

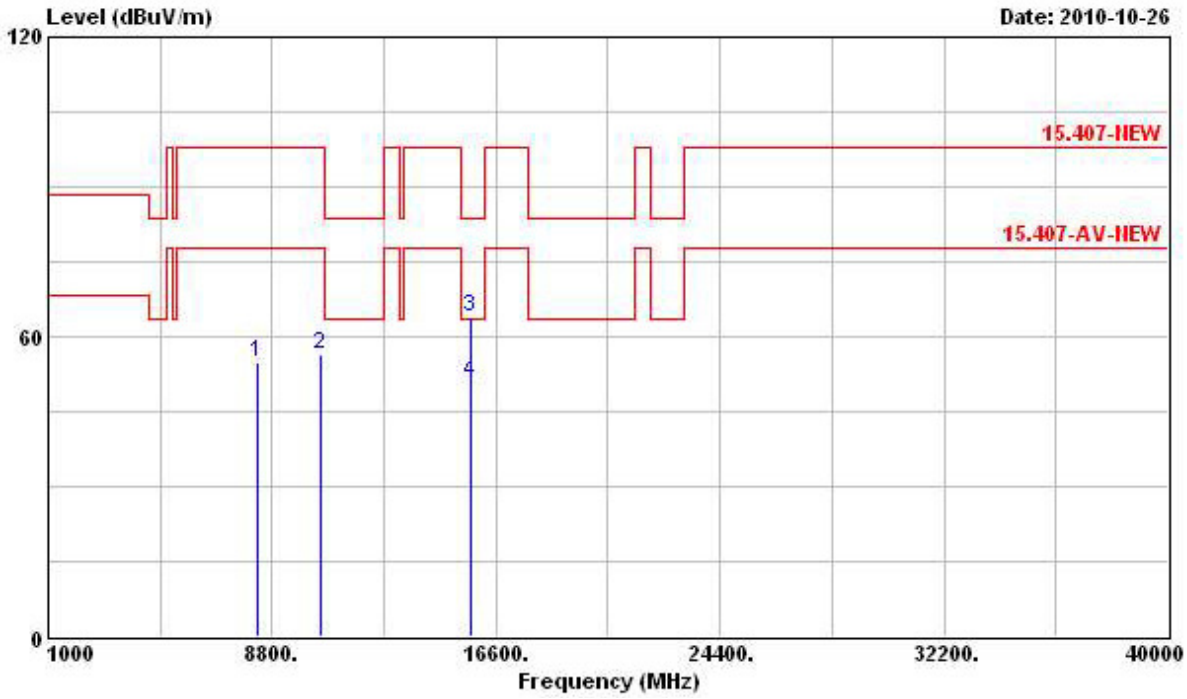
Final Test Date	Oct. 26, 2010	Test Site No.	03CH03-HY
Temperature	24.9℃	Humidity	54%
Test Engineer	Eddie	Configuration	802.11n Ch. 46 (40MHz) / (Ant. A + Ant. B)

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7788.000	53.38	-44.46	97.84	43.91	38.07	5.74	34.34	Peak
2	10460.000	57.14	-40.70	97.84	44.30	40.07	6.82	34.05	Peak
3	15690.000	64.11	-19.43	83.54	45.81	42.84	8.46	33.00	Peak
4	15690.000	50.42	-13.12	63.54	32.12	42.84	8.46	33.00	Average

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	8282.000	54.91	-22.93	77.84	44.92	38.37	5.89	34.27	PK
2	10460.000	56.36	-41.48	97.84	43.52	40.07	6.82	34.05	Peak
3	15690.000	64.14	-19.40	83.54	45.84	42.84	8.46	33.00	Peak
4	15690.000	51.04	-12.50	63.54	32.74	42.84	8.46	33.00	Average

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.

The limits above 5GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

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

3.7 Band Edge and Fundamental Emissions Measurement

3.7.1 Limit

For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). 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.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

3.7.2 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	100 MHz
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1 MHz /1 MHz for Peak

3.7.3 Test Procedures

1. The test procedure is the same as section 3.6.3, only the frequency range investigated is limited to 100MHz around band edges.
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.

3.7.4 Test Setup Layout

This test setup layout is the same as that shown in section 3.6.4.

3.7.5 Test Deviation

There is no deviation with the original standard.

3.7.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.7.7 Test Result of Band Edge and Fundamental Emissions

For Single Chain:

Final Test Date	Oct. 23, 2010	**Test Site No.**	03CH03-HY
Temperature	24.9℃	**Humidity**	54%
Test Engineer	Eddie	**Configuration**	802.11a Ch. 36, 40, 48 (Ant. A)

Channel 36

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5127.100	61.81	-1.73	63.54	20.84	36.19	4.78	0.00	Average
2 @	5180.600	106.16			65.10	36.26	4.80	0.00	Average
1	5134.200	74.63	-8.91	83.54	33.66	36.19	4.78	0.00	Peak
2 @	5178.700	116.33			75.27	36.26	4.80	0.00	Peak

The item 2 is fundamental emissions.

Channel 40

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5147.400	62.13	-1.41	63.54	21.14	36.21	4.78	0.00	Average
2 @	5198.100	108.61			67.52	36.28	4.81	0.00	Average
3 @	5394.600	60.01	-3.53	63.54	18.57	36.56	4.88	0.00	Average
1	5147.700	74.19	-9.35	83.54	33.20	36.21	4.78	0.00	Peak
2 @	5198.100	118.42			77.33	36.28	4.81	0.00	Peak
3	5381.700	72.94	-10.60	83.54	31.53	36.54	4.87	0.00	Peak

The item 2 is fundamental emissions.

Channel 48

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5114.100	60.94	-2.60	63.54	20.01	36.16	4.77	0.00	Average
2 @	5238.600	113.55			72.40	36.33	4.82	0.00	Average
3 @	5357.700	60.51	-3.03	63.54	19.15	36.49	4.87	0.00	Average
1	5117.400	74.12	-9.42	83.54	33.18	36.16	4.78	0.00	Peak
2 @	5237.400	123.52			82.37	36.33	4.82	0.00	Peak
3	5365.800	73.77	-9.77	83.54	32.39	36.51	4.87	0.00	Peak

The item 2 is fundamental emissions.

For Two Chain:

Final Test Date	Oct. 23, 2010	**Test Site No.**	03CH03-HY
Temperature	24.9℃	**Humidity**	54%
Test Engineer	Eddie	**Configuration**	802.11n Ch. 36, 40, 48 (20MHz) / (Ant. A + Ant. B)

Channel 36

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5127.800	61.90	-1.64	63.54	20.93	36.19	4.78	0.00	Average
2 @	5181.400	106.48			65.42	36.26	4.80	0.00	Average
1	5122.300	74.44	-9.10	83.54	33.50	36.16	4.78	0.00	Peak
2 @	5181.900	118.23			77.17	36.26	4.80	0.00	Peak

The item 2 is fundamental emissions.

Channel 40

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5147.700	62.16	-1.38	63.54	21.17	36.21	4.78	0.00	Average
2 @	5197.800	107.37			66.28	36.28	4.81	0.00	Average
3 @	5365.800	60.46	-3.08	63.54	19.08	36.51	4.87	0.00	Average
1	5146.500	73.95	-9.59	83.54	32.96	36.21	4.78	0.00	Peak
2 @	5196.600	118.85			77.76	36.28	4.81	0.00	Peak
3	5388.900	73.12	-10.42	83.54	31.70	36.54	4.88	0.00	Peak

The item 2 is fundamental emissions.

Channel 48

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5125.800	61.22	-2.32	63.54	20.25	36.19	4.78	0.00	Average
2 @	5237.700	112.44			71.29	36.33	4.82	0.00	Average
3 @	5352.900	61.05	-2.49	63.54	19.69	36.49	4.87	0.00	Average
1	5133.300	73.93	-9.61	83.54	32.96	36.19	4.78	0.00	Peak
2 @	5238.600	123.95			82.80	36.33	4.82	0.00	Peak
3	5374.500	73.75	-9.79	83.54	32.37	36.51	4.87	0.00	Peak

The item 2 is fundamental emissions.

Final Test Date	Oct. 25, 2010	Test Site No.	03CH03-HY
Temperature	24.9℃	Humidity	54%
Test Engineer	Eddie	Configuration	802.11n Ch. 38, 46 (40MHz) / (Ant. A + Ant. B)

Channel 38

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1 @	5149.940	62.17	-1.37	63.54	21.18	36.21	4.78	0.00	Average
2 @	5194.490	96.01			54.92	36.28	4.81	0.00	Average
1	5148.290	75.05	-8.49	83.54	34.06	36.21	4.78	0.00	Peak
2 @	5193.610	106.53			65.44	36.28	4.81	0.00	Peak

The item 2 is fundamental emissions.

Channel 46

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	5148.750	59.42	-4.12	63.54	18.43	36.21	4.78	0.00	Average
2 @	5222.750	96.64			55.53	36.30	4.81	0.00	Average
3	5350.500	59.36	-4.18	63.54	18.00	36.49	4.87	0.00	Average
1	5131.750	72.97	-10.57	83.54	32.00	36.19	4.78	0.00	Peak
2 @	5233.500	107.06			65.91	36.33	4.82	0.00	Peak
3	5366.500	73.18	-10.36	83.54	31.80	36.51	4.87	0.00	Peak

The item 2 is fundamental emissions.

3.8 Frequency Stability Measurement

3.8.1 Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emissions is maintained within the band of operation under all conditions of normal operation as specified in the user's manual or ±20ppm (IEEE 802.11a specification).

3.8.2 Measuring Instruments and Setting

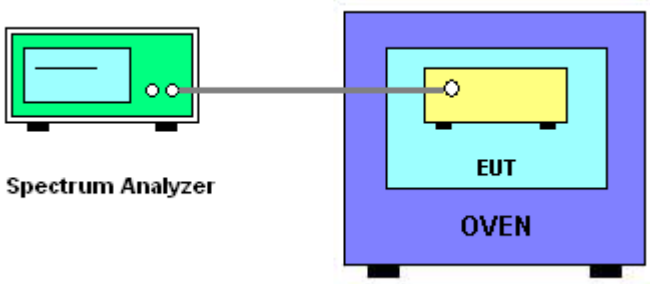
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Entire absence of modulation emissions bandwidth
RB	10 kHz
VB	10 kHz
Sweep Time	Auto

3.8.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±20ppm (IEEE 802.11a specification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature rule is -30°C~50°C.
8. Measuring multiple antennas, the connectors are required to link with Spectrum Analyzer through a combiner.

3.8.4 Test Setup Layout



3.8.5 Test Deviation

There is no deviation with the original standard.

3.8.6 EUT Operation during Test

The EUT was programmed to be in continuously un-modulation transmitting mode.

3.8.7 Test Result of Frequency Stability

Voltage vs. Frequency Stability

For Two Chain

Voltage	Measurement Frequency (MHz)
(V)	IEEE 802.11 n (40MHz) 5190 MHz
126.5	5189.999819
110.00	5189.999996
93.5	5189.999832
Max. Deviation (MHz)	0.000181
Max. Deviation (ppm)	0.03

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)
(℃)	IEEE 802.11 n (40MHz) 5190 MHz
-25	5189.999269
-20	5189.999413
-10	5189.999157
0	5189.999543
10	5189.999313
20	5189.999996
30	5189.999370
40	5189.998744
50	5189.998159
Max. Deviation (MHz)	0.001841
Max. Deviation (ppm)	0.35

3.9 Antenna Requirements

3.9.1 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.

3.9.2 Antenna Connector Construction

Please refer FCC 15.407 section 15.203. The antenna specification is not subject to the requirement of FCC 15.407 section 2.2.

4 LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Apr. 06, 2010	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	99041	9kHz – 30MHz	Mar. 23, 2010	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz – 30MHz	Apr. 29, 2010	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2010	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.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSU26.5	100015	20Hz ~ 26.5GHz	Nov. 19, 2009	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Apr. 16, 2010	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-S	MAB0103-001	N/A	Aug. 05, 2010	Conducted (TH01-HY)
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Dec. 02, 2009	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Dec. 02, 2009	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Mar. 30, 2010	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	0917017	300MHz~40GHz	Dec. 03, 2009	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	0949003	300MHz~40GHz	Dec. 03, 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. 26, 2010*	Conducted (TH01-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 18, 2010	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	COA9231A	18667	9 kHz - 2 GHz	Jan. 24, 2010	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1 GHz - 26.5 GHz	Aug. 02, 2010	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP40	100305/040	9 kHz - 40GHz	Feb. 02, 2010	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30 MHz – 1 GHz	Oct. 16, 2010	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	May 20, 2010	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15 GHz - 40 GHz	Jan.11, 2010	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30 MHz - 1 GHz	Jan. 05, 2010	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1 GHz - 40 GHz	Jan. 05, 2010	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 – 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-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. 29, 2010*	Radiation (03CH03-HY)

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