SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C.
Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / www.sporton.com.tw

FCC RADIO TEST REPORT

Applicant's company	**Dropcam, Inc.**
Applicant Address	160 Spear Street Suite 1700, San Francisco CA 94105 USA
FCC ID	**ADQ-HD3002**
Manufacturer's company	**Chicony Electronics (Mainland China II) Co., Ltd.**
Manufacturer Address	San Zhong Gong Li Qu, Qingxi, Dongguan, China

Product Name	IP wireless camera
Brand Name	Dropcam
Model Name	DROPCAM3-HD/B
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Sep. 05, 2012
Final Test Date	Sep. 17, 2012
Submission Type	Original Equipment

Statement

Test result included in this report is for the IEEE 802.11n and IEEE 802.11b/g part 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 C63.10-2009** and **47 CFR FCC Part 15 Subpart C** and KDB558074 - 20120118 & KDB662911 D01-20110404.

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

Testing Laboratory
1190

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR290530	Rev. 01	Initial issue of report	Oct. 03, 2012

Certificate No.: CB10109034

1. CERTIFICATE OF COMPLIANCE

Product Name	:	**IP wireless camera**
Brand Name	:	**Dropcam**
Model Name	:	**DROPCAM3-HD/B**
Applicant	:	**Dropcam, Inc.**
Test Rule Part(s)	:	**47 CFR FCC Part 15 Subpart C § 15.247**

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Sep. 05, 2012 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.

Jordan Hsiao

Jordan Hsiao

SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	9.79 dB
4.2	15.247(b)(3)	Peak Output Power	Complies	7.22 dB
4.3	15.247(e)	Power Spectral Density	Complies	15.72 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	3.18 dB
4.6	15.247(d)	Band Edge Emissions	Complies	0.05 dB
4.7	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Peak Output Power	±0.8dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
6dB Spectrum Bandwidth	$\pm 8.5\times10^{-8}$	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.8dB	Confidence levels of 95%
Radiated Emissions (30MHz~1GHz)	±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%

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n

Items	Description
Product Type	WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From Power 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
Channel Band Width (99%)	MCS0 (20MHz): 18.56 MHz
Peak Output Power	MCS0 (20MHz): 22.06 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11b/g

Items	Description
Product Type	802.11b/g: WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From Power Adapter
Modulation	DSSS for IEEE 802.11b ; OFDM for IEEE 802.11g
Data Modulation	DSSS (BPSK / QPSK / CCK) ; OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	DSSS (1/ 2/ 5.5/11) ; OFDM (6/9/12/18/24/36/48/54)
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11
Channel Band Width (99%)	11b: 15.04 MHz ; 11g: 20.80 MHz
Peak Output Power	11b: 19.57 dBm ; 11g: 22.78 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Antenna & Band width

Antenna	Single (TX)
Band width Mode	20 MHz
IEEE 802.11b	V
IEEE 802.11g	V
IEEE 802.11n	V

IEEE 802.11n spec

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Datarate(Mbps)			
									800nsGI		400nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.200	15
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.400	30
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.700	45
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.900	60
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.300	90
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.800	120
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.000	135
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.200	150
8	2	BPSK	1/2	1	104	216	52	108	13.0	27.0	14.444	30
9	2	QPSK	1/2	2	208	432	104	216	26.0	54.0	28.889	60
10	2	QPSK	3/4	2	208	432	156	324	39.0	81.0	43.333	90
11	2	16-QAM	1/2	4	416	864	208	432	52.0	108.0	57.778	120
12	2	16-QAM	3/4	4	416	864	312	648	78.0	162.0	86.667	180
13	2	64-QAM	2/3	6	624	1296	416	864	104.0	216.0	115.556	240
14	2	64-QAM	3/4	6	624	1296	468	972	117.0	243.0	130.000	270
15	2	64-QAM	5/6	6	624	1296	520	1080	130.0	270.0	144.444	300

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

3.2. Accessories

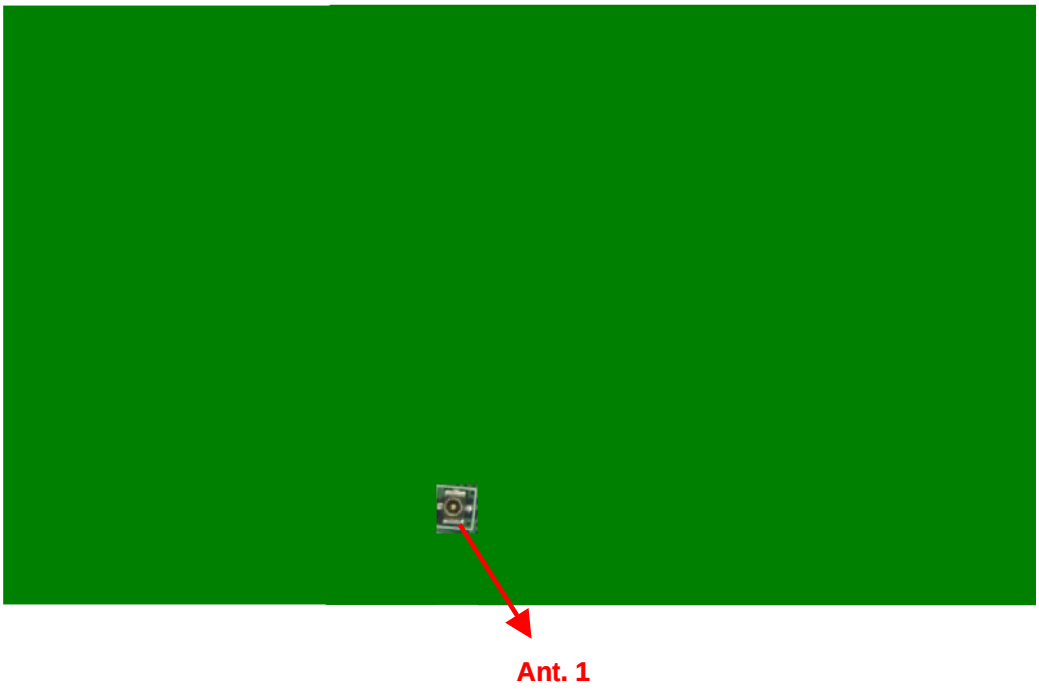
Power	Brand	Model	Rating
Adapter	dropcam	KSAPK0110500200FU	Input: 100-240V~50/60Hz 0.5A Output: 5.0V, 2.0A
Others			
USB Cable, Shielded, 3.0m			
Cardle*1			

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
1	WGT	DC-C646(2.4G)	PCB Antenna	I-PEX	3.81	TX/RX

Note: For IEEE 802.11bgn mode (1TX/1RX)

Ant. 1 can be used as transmitting/receiving antenna.



3.4. Table for Carrier Frequencies

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	-	-

3.5. 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 all the possible configurations 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 Line Conducted Emissions	Normal	-	-	-
Peak Output Power Average Output Power Power Spectral Density	MCS0/20MHz	6.5 Mbps	1/6/11	1
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
6dB Spectrum Bandwidth	MCS0/20MHz	6.5 Mbps	1/6/11	1
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Radiated Emissions 9kHz~1GHz	Normal	-	-	-
Radiated Emissions 1GHz~10th Harmonic	MCS0/20MHz	6.5 Mbps	1/6/11	1
	11b/BPSK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Band Edge Emissions	MCS0/20MHz	6.5 Mbps	1/11	1
	11b/BPSK	1 Mbps	1/11	1
	11g/BPSK	6 Mbps	1/11	1

3.6. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D
CO01-LK	Conduction	Lin Kou	93569	IC 4086C
TH01-CB	OVEN Room	Hsin Chu	-	-

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

Please refer section 6 for Test Site Address.

3.7. Table for Supporting Units

< Conducted Emissions >

Support Unit	Brand	Model	FCC ID
Notebook	DELL	PP32LB	N/A
Wireless AP	D-Link	DIR-600	N/A

< Radiated Emissions>

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6220	N/A
Wireless AP	Planex	GW-AP54SGX	N/A

3.8. 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	Hypertrm		
Frequency	2412 MHz	2437 MHz	2462 MHz
MCS0 20MHz	11	20	11.5

Power Parameters of IEEE 802.11b/g

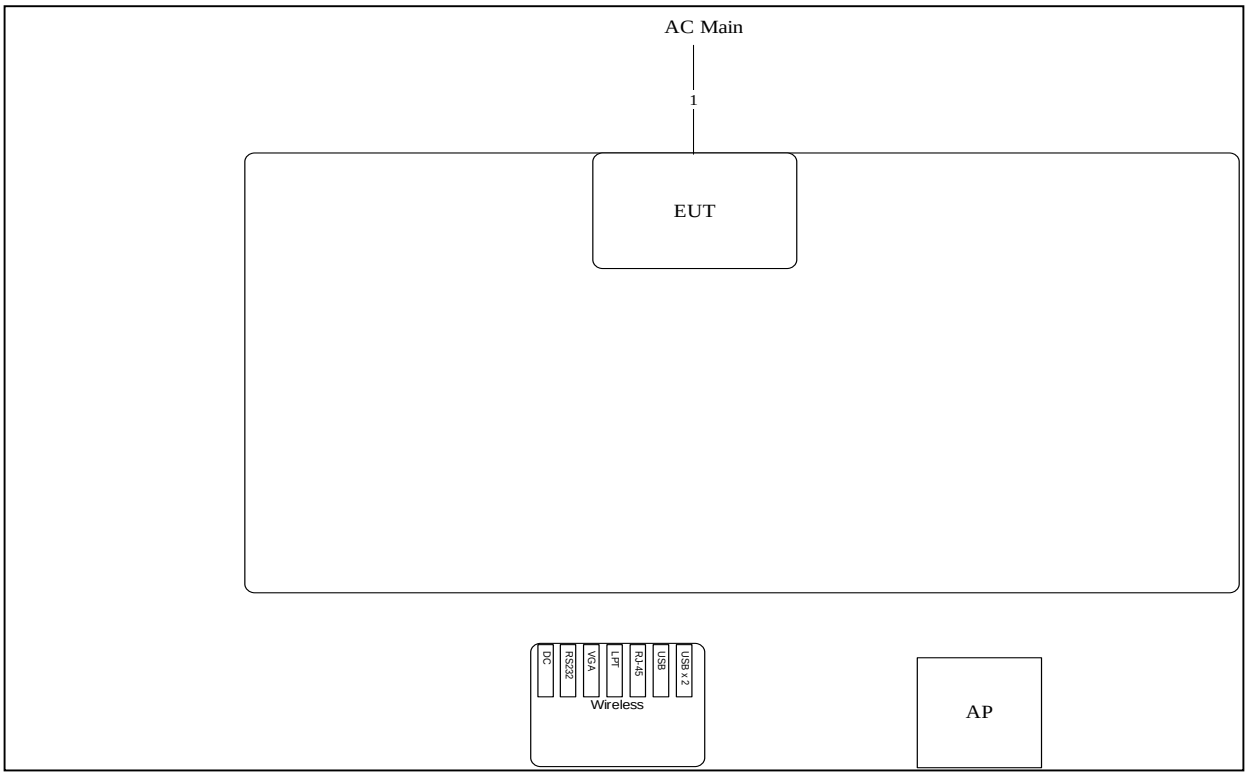
Test Software Version	Hypertrm		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	20	20	20
IEEE 802.11g	13	20	14

During the test, "Hypertrm" under WIN XP was executed the test program to control the EUT continuously transmit RF signal.

3.9. Test Configurations

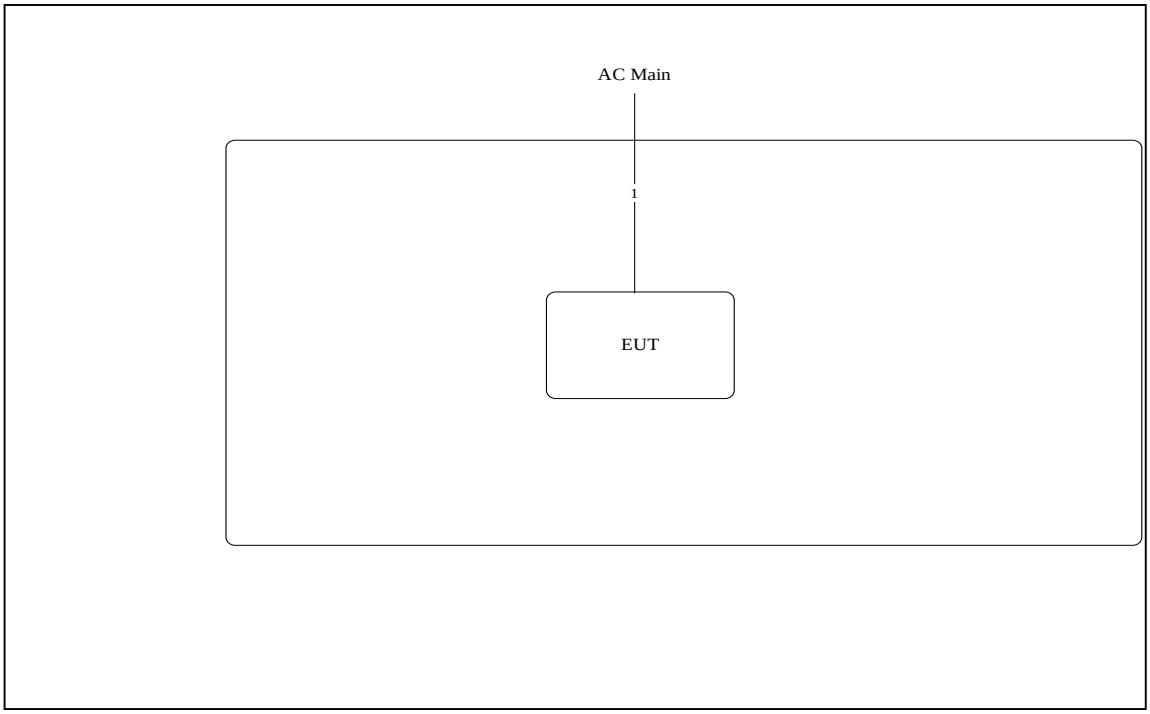
3.9.1. Radiation Emissions Test Configuration

30MHz~1GHz



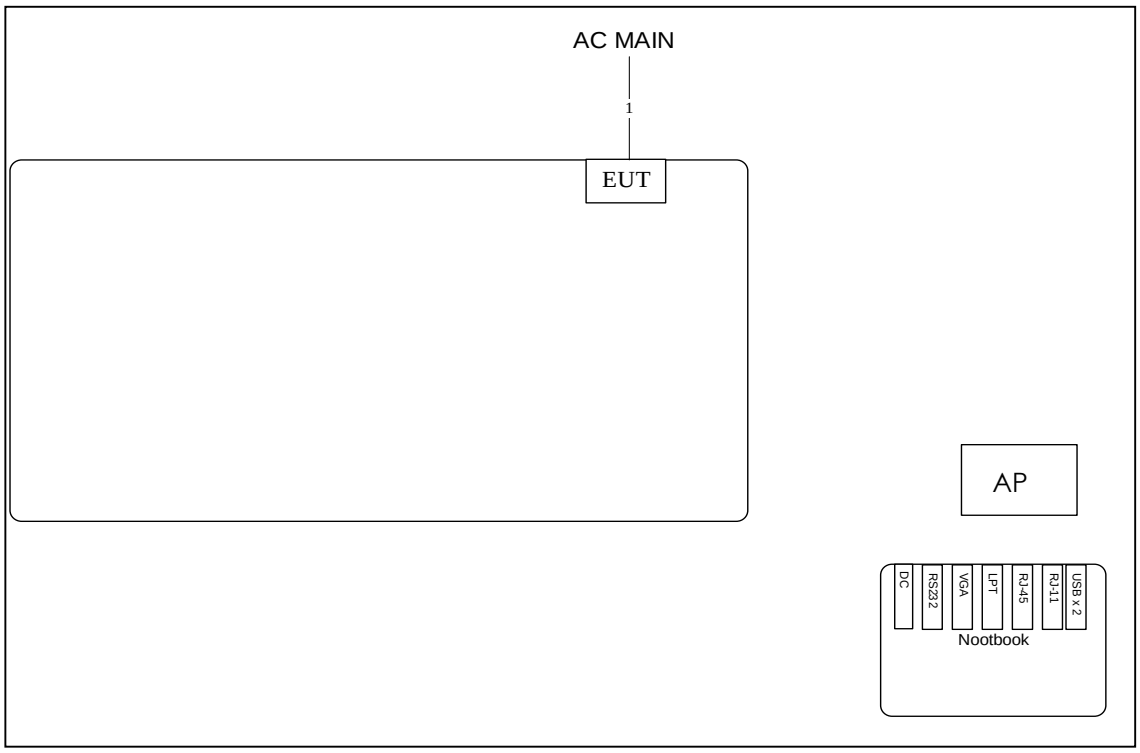
Item	Connection	Shield	Length
1	USB cable	Yes	3.0M

Above 1GHz



Item	Connection	Shield	Length
1	USB cable	Yes	3.0M

3.9.2. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shield	Length
1	USB cable	Yes	3.0M

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. 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.

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

4.1.2. Measuring Instruments and Setting

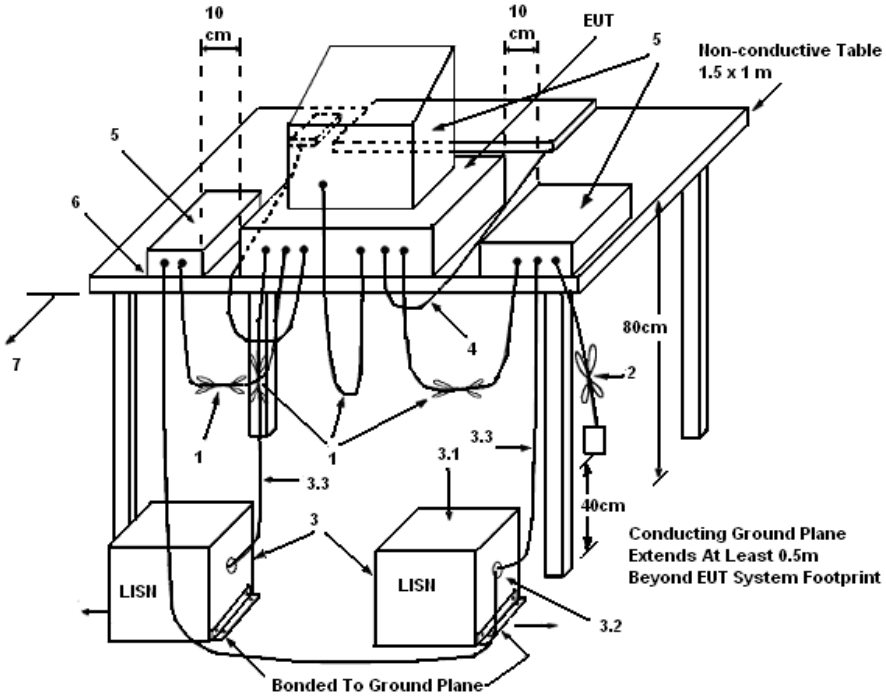
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. 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.

4.1.4. 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.

4.1.5. Test Deviation

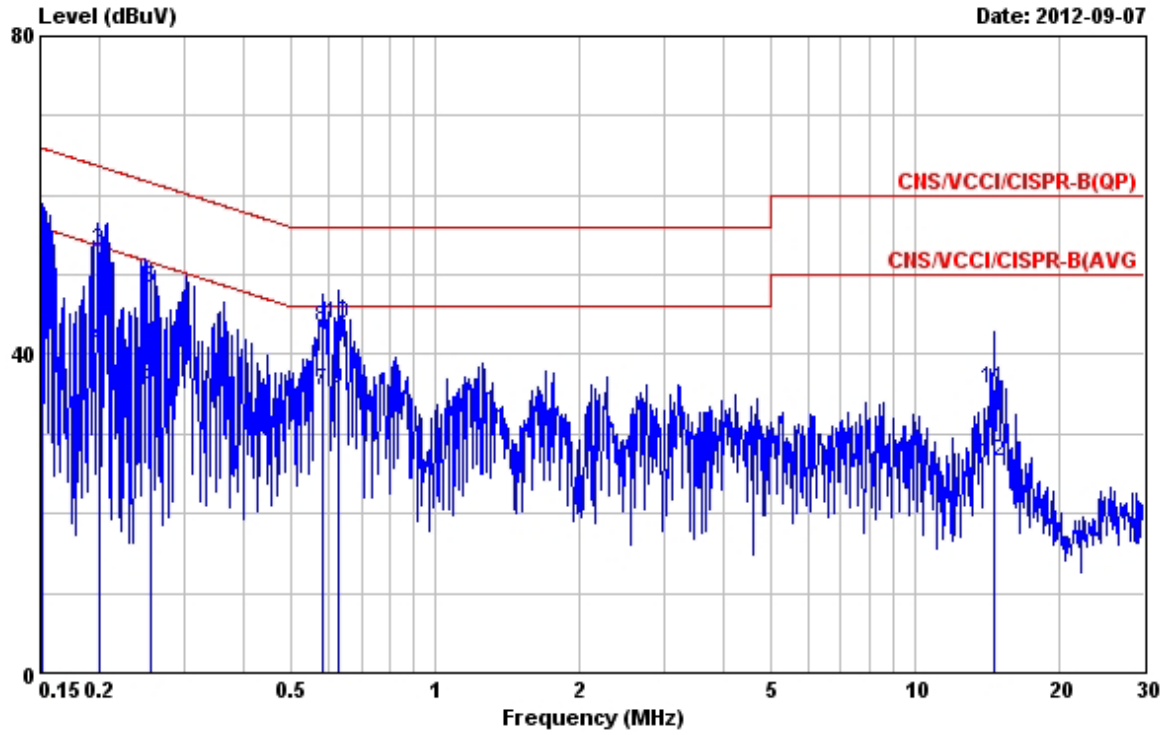
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

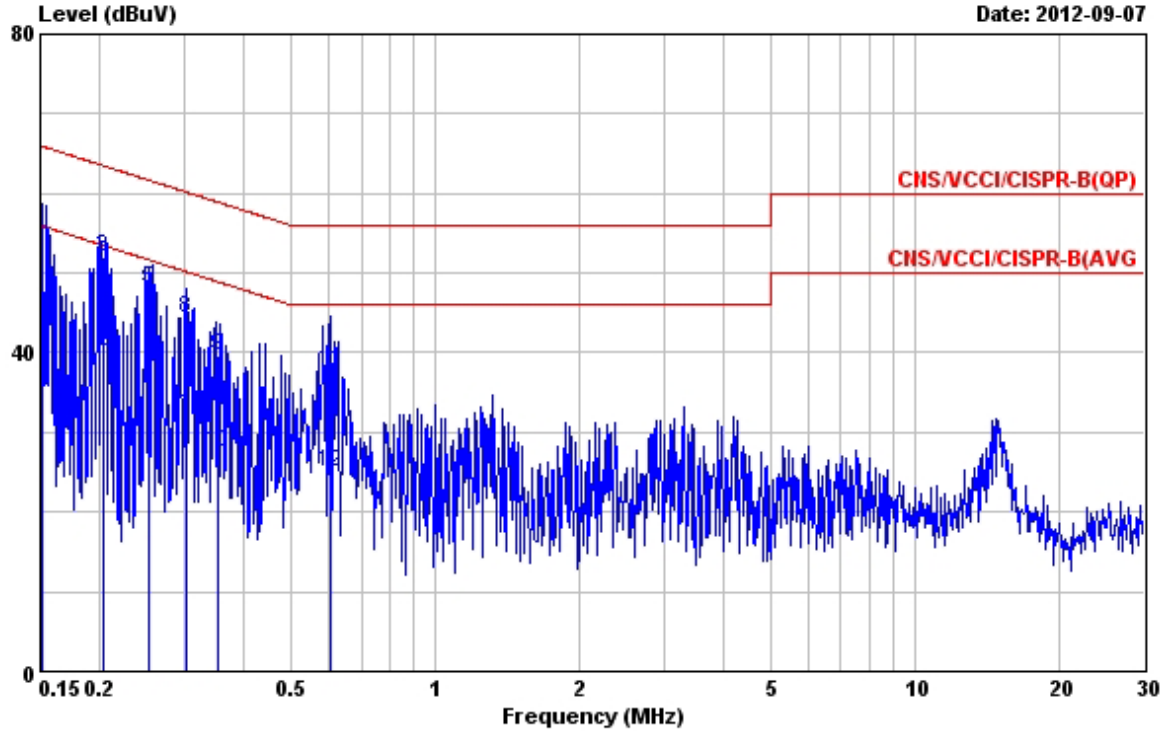
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	29℃	Humidity	48%
Test Engineer	Peter Lin	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 @	0.151	56.15	-9.79	65.94	55.95	0.14	0.06	QP
2	0.151	44.96	-10.98	55.94	44.76	0.14	0.06	Average
3	0.200	53.02	-10.61	63.63	52.82	0.14	0.06	QP
4	0.200	40.94	-12.69	53.63	40.74	0.14	0.06	Average
5	0.256	48.30	-13.26	61.56	48.09	0.14	0.07	QP
6	0.256	36.17	-15.39	51.56	35.96	0.14	0.07	Average
7	0.582	35.37	-10.63	46.00	35.11	0.16	0.10	Average
8	0.582	43.28	-12.72	56.00	43.02	0.16	0.10	QP
9	0.630	35.68	-10.32	46.00	35.41	0.16	0.11	Average
10	0.630	43.88	-12.12	56.00	43.61	0.16	0.11	QP
11	14.590	35.66	-24.34	60.00	34.89	0.39	0.38	QP
12	14.590	26.39	-23.61	50.00	25.62	0.39	0.38	Average

Temperature	23℃	Humidity	54.2%
Test Engineer	Peter Lin	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.152	55.61	-10.28	65.89	55.40	0.15	0.06	QP
2	0.152	44.03	-11.86	55.89	43.82	0.15	0.06	Average
3	0.204	52.04	-11.41	63.45	51.83	0.15	0.06	QP
4	0.204	39.73	-13.72	53.45	39.52	0.15	0.06	Average
5	0.252	47.96	-13.74	61.70	47.74	0.15	0.07	QP
6	0.252	35.53	-16.17	51.70	35.31	0.15	0.07	Average
7	0.303	31.98	-18.18	50.16	31.76	0.15	0.07	Average
8	0.303	44.23	-15.93	60.16	44.01	0.15	0.07	QP
9	0.353	39.62	-19.28	58.90	39.39	0.15	0.08	QP
10	0.353	27.58	-21.32	48.90	27.35	0.15	0.08	Average
11	0.604	37.66	-18.34	56.00	37.39	0.16	0.11	QP
12	0.604	25.03	-20.97	46.00	24.76	0.16	0.11	Average

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. Peak Output Power Measurement

4.2.1. 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.

4.2.2. Measuring Instruments and Setting

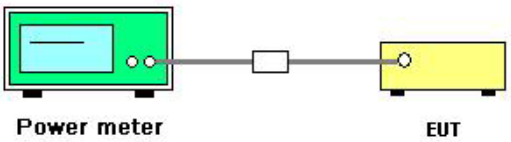
Please refer to section 5 of equipments list in this report. The following table is the setting of the peak power meter.

Power Meter Parameter	Setting
Bandwidth	50MHz bandwidth is greater than the EUT emission bandwidth
Detector	Peak

4.2.3. Test Procedures

Spectrum Parameter	Setting
RF Output Power Method	☒ ANSI C63.10 clause 6.10.2.1 (a) power meter method
RF Output Power Method	☐ ANSI C63.10 clause 6.10.2.1 (b) channel integration method
RF Output Power Method	☐ ANSI C63.10 clause 6.10.3.1 Method 1 - spectral trace averaging
RF Output Power Method	☐ ANSI C63.10 clause 6.10.3.2 Method 2 - zero-span mode with trace averaging

4.2.4. Test Setup Layout



4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of Peak Output Power

Temperature	25℃	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11n
Test Date	Sep. 17, 2012		

Configuration IEEE 802.11n MCS0 20MHz

Channel	Frequency	Conducted Peak Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	20.84	30.00	**Complies**
6	2437 MHz	22.06	30.00	**Complies**
11	2462 MHz	20.67	30.00	**Complies**

Temperature	25℃	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11b/g
Test Date	Sep. 17, 2012		

Configuration IEEE 802.11b

Channel	Frequency	Conducted Peak Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	19.27	30.00	**Complies**
6	2437 MHz	19.57	30.00	**Complies**
11	2462 MHz	19.28	30.00	**Complies**

Configuration IEEE 802.11g

Channel	Frequency	Conducted Peak Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	22.21	30.00	**Complies**
6	2437 MHz	22.78	30.00	**Complies**
11	2462 MHz	21.21	30.00	**Complies**

4.3. Average Output Power Measurement

4.3.1. Measuring Instruments and Setting

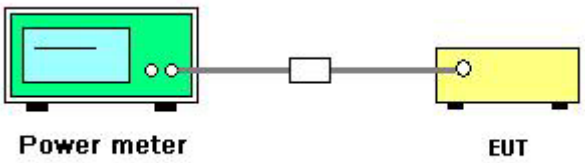
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Bandwidth	50MHz bandwidth is greater than the EUT emission bandwidth
Detector	Average

4.3.2. Test Procedures

Spectrum Parameter	Setting
RF Output Power Method	☒ ANSI C63.10 clause 6.10.2.1 (a) power meter method
RF Output Power Method	☐ ANSI C63.10 clause 6.10.2.1 (b) channel integration method
RF Output Power Method	☐ ANSI C63.10 clause 6.10.3.1 Method 1 - spectral trace averaging
RF Output Power Method	☐ ANSI C63.10 clause 6.10.3.2 Method 2 - zero-span mode with trace averaging

4.3.3. Test Setup Layout



4.3.4. Test Deviation

There is no deviation with the original standard.

4.3.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

Note: Average output power is only for Maximum Permissible Exposure use.

4.3.6. Test Result of Average Output Power

Temperature	25℃	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11n
Test Date	Sep. 17, 2012		

Configuration IEEE 802.11n MCS0 20MHz

Channel	Frequency	Conducted Average Power (dBm)
1	2412 MHz	13.13
6	2437 MHz	15.55
11	2462 MHz	13.25

Temperature	25℃	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11b/g
Test Date	Sep. 17, 2012		

Configuration IEEE 802.11b

Channel	Frequency	Average Conducted Power (dBm)
1	2412 MHz	17.48
6	2437 MHz	17.90
11	2462 MHz	17.65

Configuration IEEE 802.11g

Channel	Frequency	Average Conducted Power (dBm)
1	2412 MHz	14.91
6	2437 MHz	18.50
11	2462 MHz	15.18

4.4. Power Spectral Density Measurement

4.4.1. 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.

4.4.2. Measuring Instruments and Setting

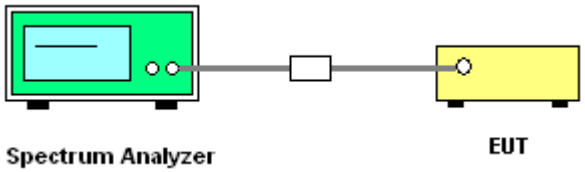
Please refer to section 5 of equipments list in this report. The following table is the setting of Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Set the analyzer span to 5-30% greater than the EBW.
RB	100 kHz
VB	300 kHz
Detector	PEAK
Trace	MAX HOLD
Sweep Time	AUTO

4.4.3. Test Procedures

1. Use this procedure when the maximum conducted output power in the fundamental emission is used to demonstrate compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
2. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW (use of a greater number of measurement points than this minimum requirement is recommended).
3. Use the peak marker function to determine the maximum level in any 100 kHz band segment within the fundamental EBW.
4. Scale the observed power level to an equivalent level in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where: BWCF = 10log (3 kHz/100 kHz = -15.2 dB).
5. The resulting PSD level must be ≤ 8 dBm.
6. When measuring power spectral density with multiple antenna systems, add every result of the values by mathematic formula.

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of Power Spectral Density

Temperature	25℃	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11n

Configuration IEEE 802.11n MCS0 20MHz

Frequency	Power Density (dBm/100kHz)	BWCF factor (100kHz to 3kHz)	Power Density (dBm/3kHz)	Single Port. Limit (dBm/3kHz)	Result
2412 MHz	1.87	-15.23	-13.36	8.00	**Complies**
2437 MHz	4.41	-15.23	-10.82	8.00	**Complies**
2462 MHz	1.80	-15.23	-13.43	8.00	**Complies**

Temperature	25℃	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11b/g

Configuration IEEE 802.11b

Frequency	Power Density (dBm/100kHz)	BWCF factor (100kHz to 3kHz)	Power Density (dBm/3kHz)	Single Port. Limit (dBm/3kHz)	Result
2412 MHz	6.74	-15.23	-8.49	8.00	**Complies**
2437 MHz	7.05	-15.23	-8.18	8.00	**Complies**
2462 MHz	6.70	-15.23	-8.53	8.00	**Complies**

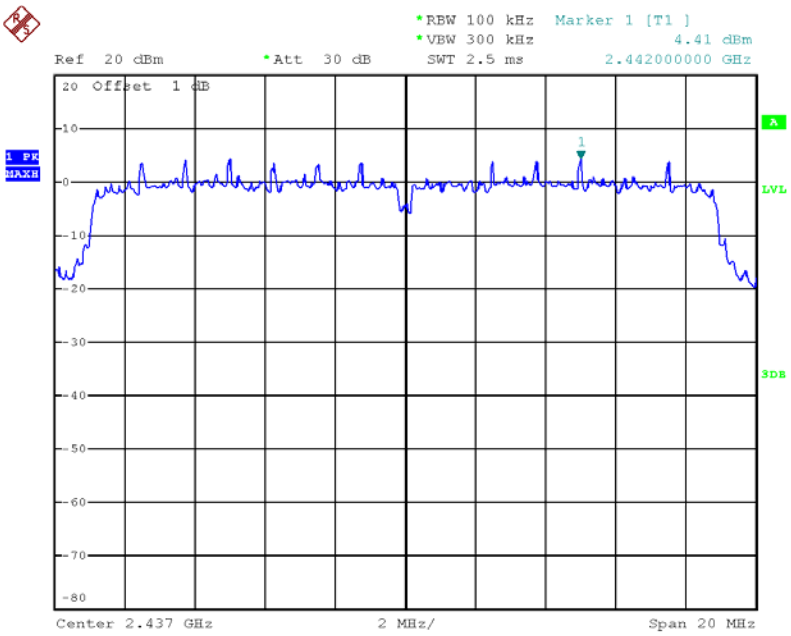
Configuration IEEE 802.11g

Frequency	Power Density (dBm/100kHz)	BWCF factor (100kHz to 3kHz)	Power Density (dBm/3kHz)	Single Port. Limit (dBm/3kHz)	Result
2412 MHz	3.87	-15.23	-11.36	8.00	**Complies**
2437 MHz	7.51	-15.23	-7.72	8.00	**Complies**
2462 MHz	4.00	-15.23	-11.23	8.00	**Complies**

Note: All the test values were listed in the report.

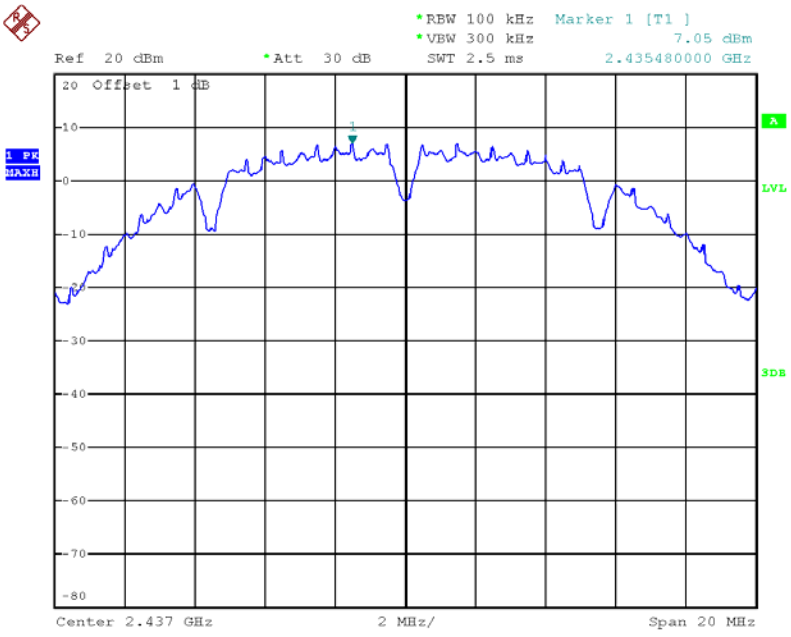
For plots, only the channel with maximum results was shown.

Power Density Plot on Configuration IEEE 802.11n MCS0 20MHz / 2437 MHz



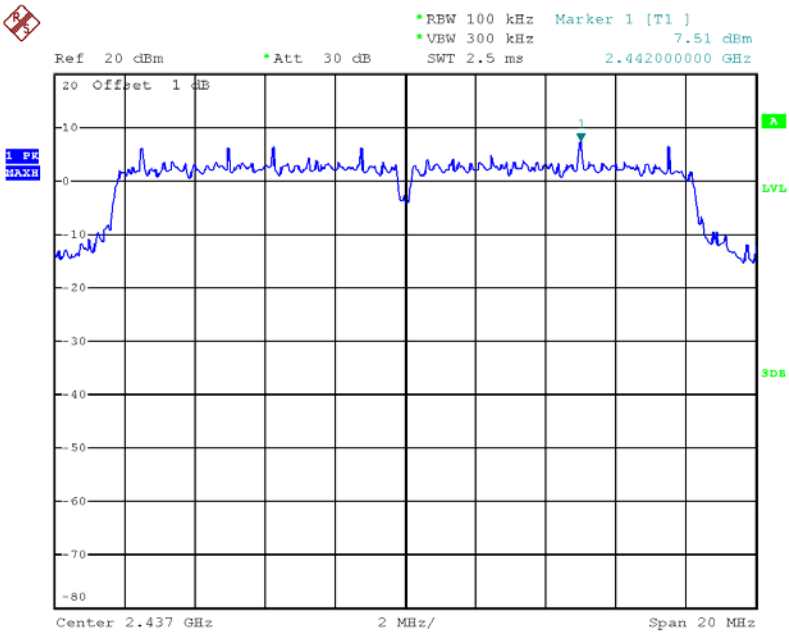
Date: 17.SEP.2012 17:15:22

Power Density Plot on Configuration IEEE 802.11b / 2437 MHz



Date: 17.SEP.2012 17:10:10

Power Density Plot on Configuration IEEE 802.11g / 2437 MHz



4.5. 6dB Spectrum Bandwidth Measurement

4.5.1. Limit

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

4.5.2. Measuring Instruments and Setting

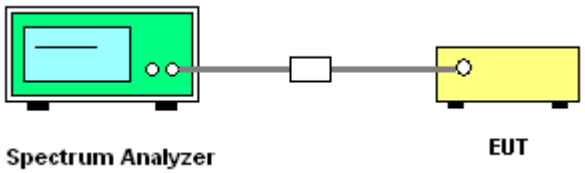
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	1-5 % of the emission bandwidth (EBW)
VB	≥ 3 x RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.5.3. 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.

4.5.4. Test Setup Layout



4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.5.7. Test Result of 6dB Spectrum Bandwidth

Temperature	25℃	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11n

Configuration IEEE 802.11n MCS0 20MHz

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	17.68	18.24	500	**Complies**
6	2437 MHz	17.60	18.56	500	**Complies**
11	2462 MHz	17.68	18.16	500	**Complies**

Temperature	25℃	Humidity	63%
Test Engineer	Benson Peng	Configurations	IEEE 802.11b/g

Configuration IEEE 802.11b

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	10.24	14.80	500	Complies
6	2437 MHz	10.24	15.04	500	Complies
11	2462 MHz	10.24	14.88	500	Complies

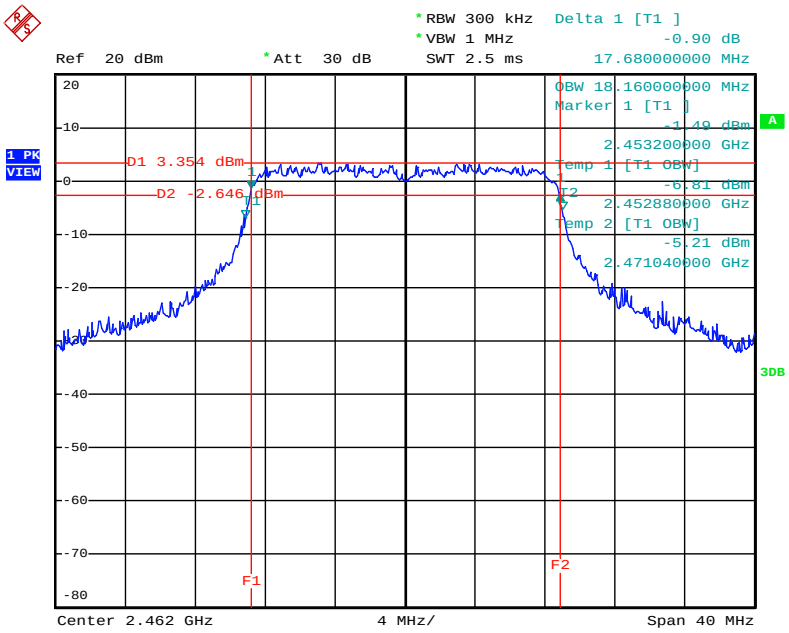
Configuration IEEE 802.11g

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	16.32	17.20	500	Complies
6	2437 MHz	16.40	20.80	500	Complies
11	2462 MHz	16.24	17.28	500	Complies

Note: All the test values were listed in the report.

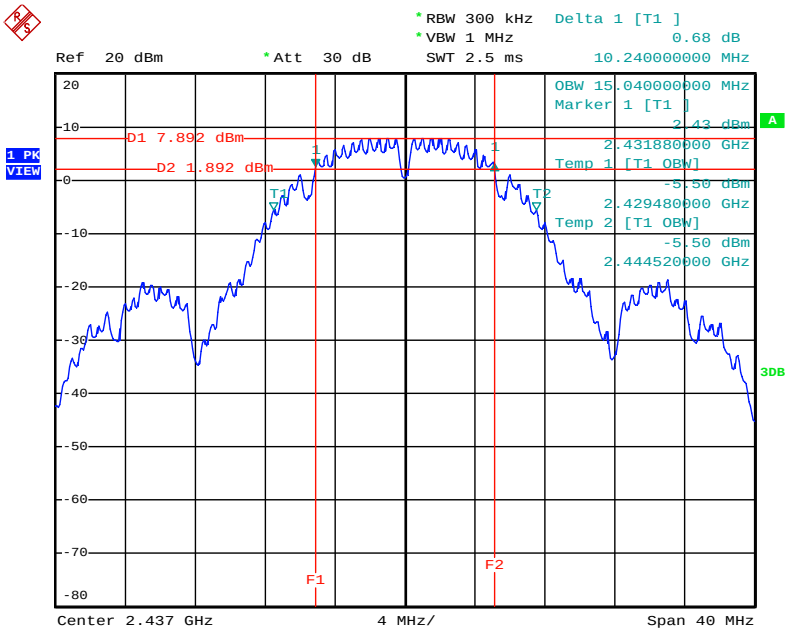
For plots, only the channel with maximum results was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / 2462 MHz



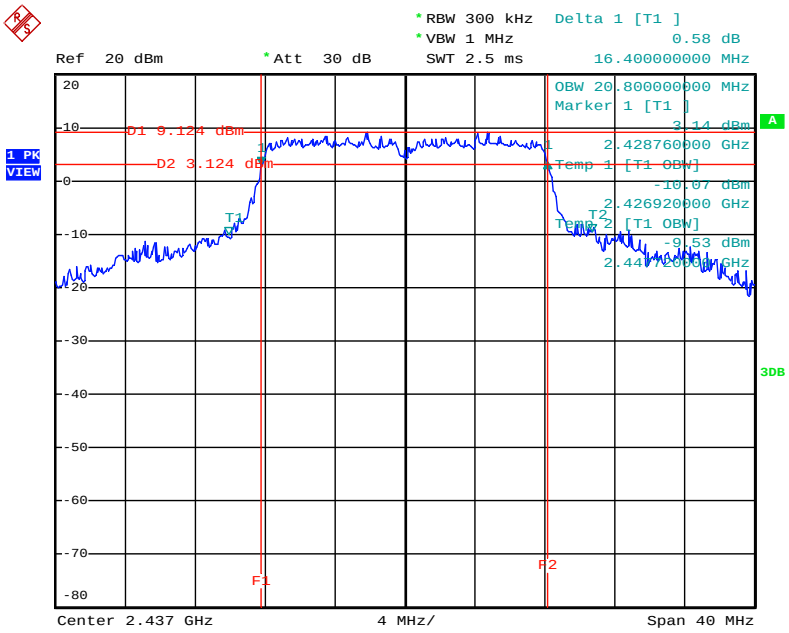
Date: 17.SEP.2012 16:58:06

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2437 MHz



Date: 17.SEP.2012 16:51:39

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2437 MHz



Date: 17.SEP.2012 16:54:43

4.6. Radiated Emissions Measurement

4.6.1. 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.

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

4.6.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1GHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 3MHz for peak

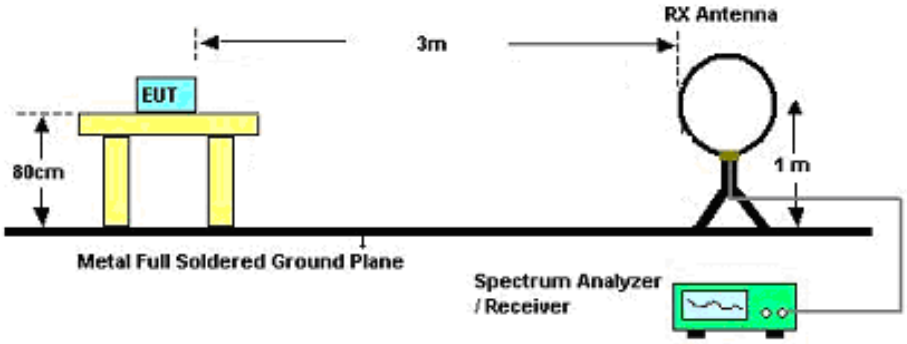
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1GHz / RB 120kHz for QP

4.6.3. Test Procedures

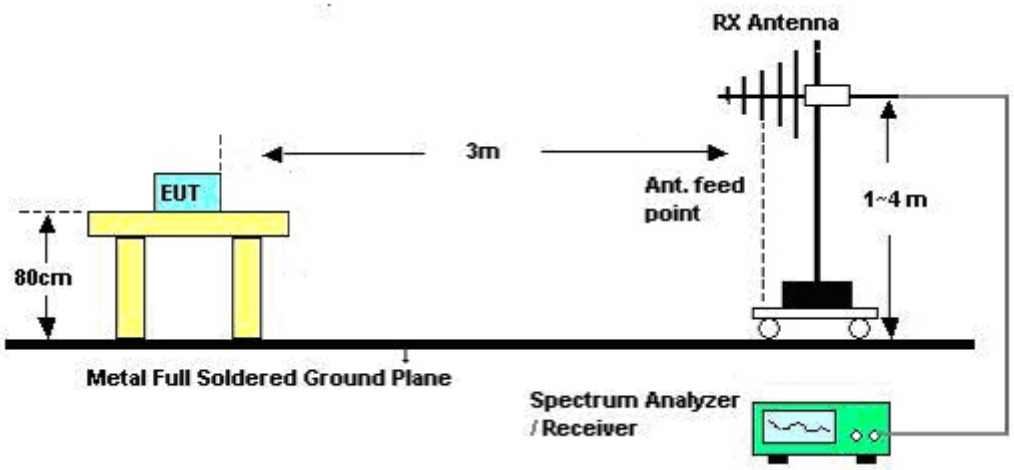
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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 3MHz 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.

4.6.4. Test Setup Layout

For Radiated Emissions below 1GHz



For Radiated Emissions above 1GHz



4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.6.7. Results of Radiated Emissions (9kHz~30MHz)

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	Normal
Test Date	Sep. 14, 2012		

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

Note:

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

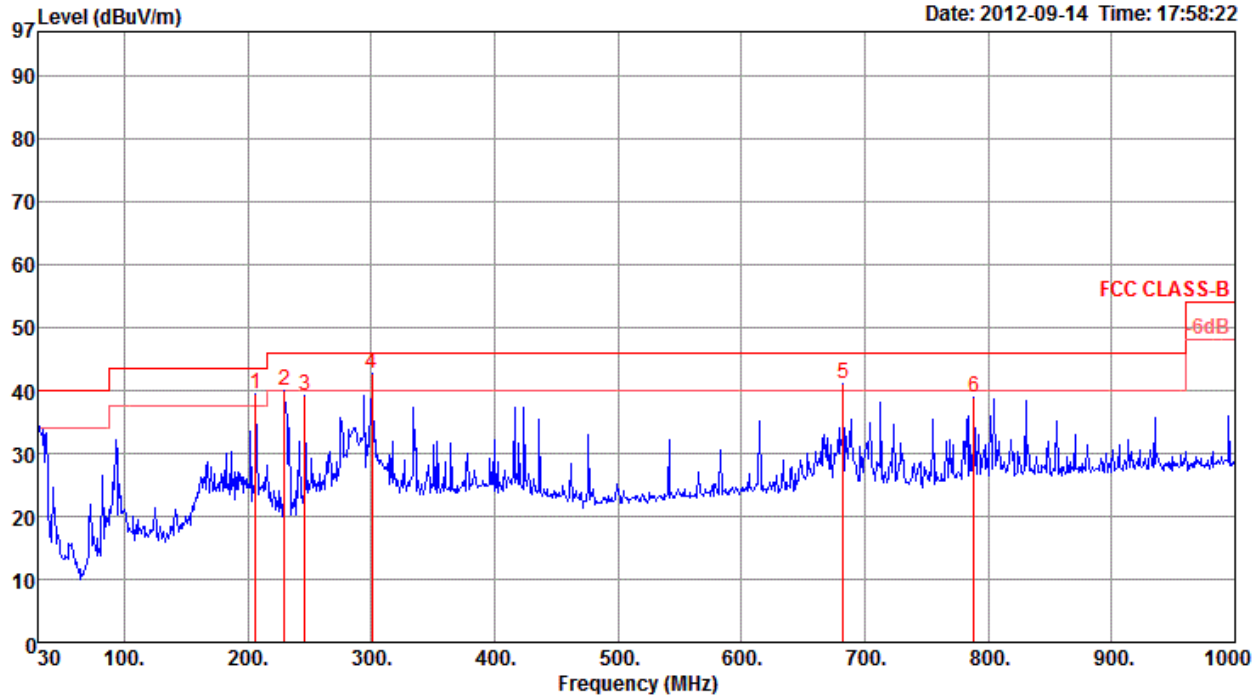
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

4.6.8. Results of Radiated Emissions (30MHz~1GHz)

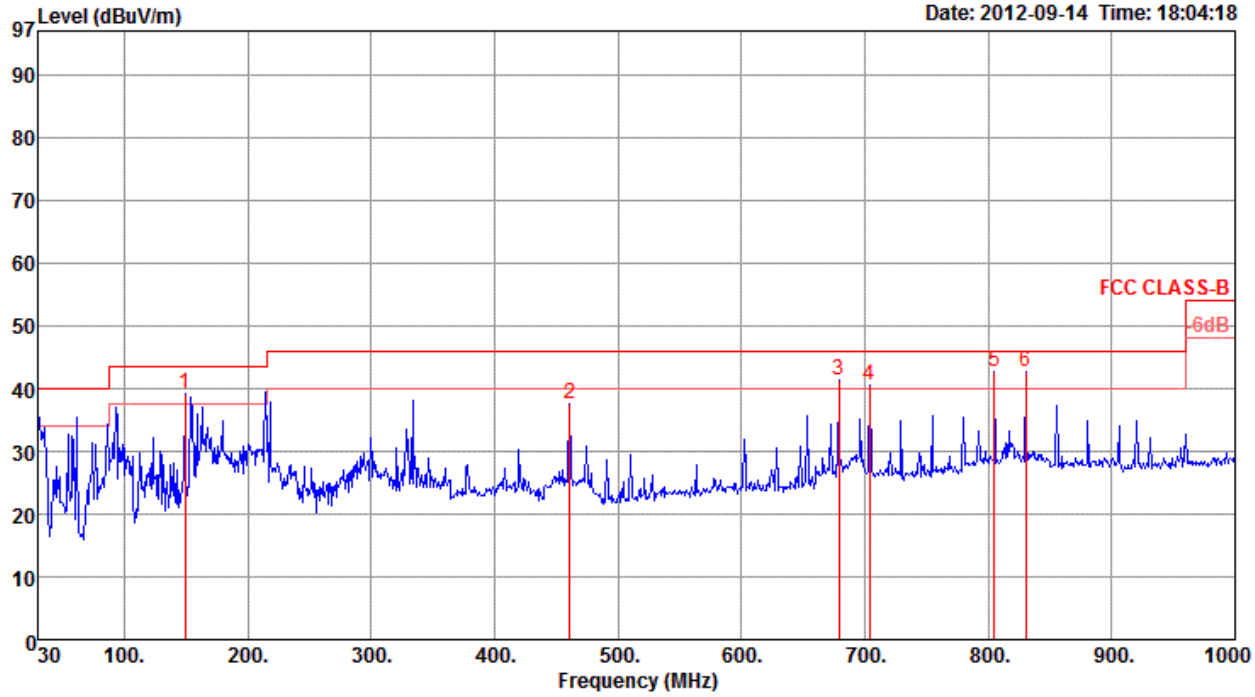
Temperature	27℃	Humidity	50%
Test Engineer	Serway Li	Configurations	Normal

Horizontal



		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	Pol/Phase	T/Pos	A/Pos
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m			deg	cm
1	!	206.54	39.42	43.50	-4.08	53.94	2.15	27.20	10.53	Peak	HORIZONTAL	0	400
2		229.82	39.89	46.00	-6.11	53.34	2.28	27.03	11.30	Peak	HORIZONTAL	0	400
3		246.31	39.10	46.00	-6.90	51.10	2.35	26.96	12.61	Peak	HORIZONTAL	0	400
4	p	300.63	42.57	46.00	-3.43	53.05	2.52	26.83	13.83	Peak	HORIZONTAL	0	400
5	!	682.81	41.18	46.00	-4.82	44.50	4.07	27.25	19.86	Peak	HORIZONTAL	0	400
6		788.54	39.01	46.00	-6.99	40.97	4.32	26.94	20.66	Peak	HORIZONTAL	0	400

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	Pol/Phase	T/Pos	A/Pos
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m			deg	cm
1 !	149.31	39.23	43.50	-4.27	53.67	1.79	27.51	11.28	Peak	VERTICAL	0	100
2	460.68	37.62	46.00	-8.38	45.02	3.27	27.84	17.17	Peak	VERTICAL	0	100
3 !	678.93	41.36	46.00	-4.64	44.76	4.05	27.28	19.83	Peak	VERTICAL	0	100
4 !	704.15	40.43	46.00	-5.57	43.33	4.16	27.08	20.02	Peak	VERTICAL	0	100
5 !	805.03	42.75	46.00	-3.25	44.43	4.37	26.89	20.84	Peak	VERTICAL	0	100
6 p	830.25	42.82	46.00	-3.18	44.28	4.40	26.90	21.04	Peak	VERTICAL	0	100

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB 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.

4.6.9. Results for Radiated Emissions (1GHz~10th Harmonic)

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11n MCS0 20MHz CH 1
Test Date	Sep. 12, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 a	4824.00	30.71	54.00	-23.29	28.63	4.21	34.69	32.56	Average	239	100	HORIZONTAL
2 p	4824.80	43.55	74.00	-30.45	41.34	4.22	34.67	32.66	Peak	239	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 a	4824.00	32.19	54.00	-21.81	30.11	4.21	34.69	32.56	Average	0	100	VERTICAL
2 p	4824.80	43.10	74.00	-30.90	40.95	4.21	34.68	32.62	Peak	0	100	VERTICAL

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11n MCS0 20MHz CH 6
Test Date	Sep. 12, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	4902.20	44.52	74.00	-29.48	42.23	4.22	34.66	32.73	Peak	0	100	HORIZONTAL
2	4921.60	31.70	54.00	-22.30	29.36	4.23	34.65	32.76	Average	0	100	HORIZONTAL
3 a	7324.00	36.83	54.00	-17.17	29.43	5.35	34.94	36.99	Average	0	100	HORIZONTAL
4 p	7324.20	49.64	74.00	-24.36	42.23	5.35	34.95	37.01	Peak	0	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	4874.00	32.62	54.00	-21.38	30.41	4.22	34.67	32.66	Average	360	100	VERTICAL
2	4874.20	44.31	74.00	-29.69	42.10	4.22	34.67	32.66	Peak	360	100	VERTICAL
3 p	7319.00	49.83	74.00	-24.17	42.42	5.35	34.95	37.01	Peak	360	100	VERTICAL
4 a	7319.00	36.57	54.00	-17.43	29.17	5.35	34.94	36.99	Average	360	100	VERTICAL

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11n MCS0 20MHz CH 11
Test Date	Sep. 12, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	4900.80	44.09	74.00	-29.91	41.84	4.22	34.66	32.69	Peak	57	100	HORIZONTAL
2	4923.80	34.08	54.00	-19.92	31.74	4.23	34.65	32.76	Average	57	100	HORIZONTAL
3 a	7385.80	39.22	54.00	-14.78	31.74	5.36	34.96	37.08	Average	57	100	HORIZONTAL
4 p	7386.80	49.27	74.00	-24.73	41.85	5.35	34.96	37.03	Peak	57	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	4923.60	44.64	74.00	-29.36	42.30	4.23	34.65	32.76	Peak	360	100	VERTICAL
2	4924.00	33.84	54.00	-20.16	31.50	4.23	34.65	32.76	Average	360	100	VERTICAL
3 p	7386.20	49.96	74.00	-24.04	42.48	5.36	34.96	37.08	Peak	360	100	VERTICAL
4 a	7386.20	36.69	54.00	-17.31	29.21	5.36	34.96	37.08	Average	360	100	VERTICAL

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB 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.

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11b CH 1
Test Date	Sep. 12, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	4823.90	48.06	74.00	-25.94	45.98	4.21	34.69	32.56	Peak	0	153	HORIZONTAL
2 a	4823.96	42.66	54.00	-11.34	40.58	4.21	34.69	32.56	Average	0	153	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 a	4823.96	41.99	54.00	-12.01	39.91	4.21	34.69	32.56	Average	141	113	VERTICAL
2 p	4823.97	47.82	74.00	-26.18	45.74	4.21	34.69	32.56	Peak	141	113	VERTICAL

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11b CH 6
Test Date	Sep. 12, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 a	4873.97	38.46	54.00	-15.54	36.25	4.22	34.67	32.66	Average	142	100	HORIZONTAL
2	4874.14	46.87	74.00	-27.13	44.66	4.22	34.67	32.66	Peak	142	100	HORIZONTAL
3 p	7310.06	50.00	74.00	-24.00	42.62	5.34	34.93	36.97	Peak	241	100	HORIZONTAL
4	7311.89	36.42	54.00	-17.58	29.05	5.34	34.94	36.97	Average	241	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	4873.88	48.25	74.00	-25.75	46.04	4.22	34.67	32.66	Peak	312	103	VERTICAL
2 a	4873.96	40.86	54.00	-13.14	38.65	4.22	34.67	32.66	Average	312	103	VERTICAL
3 p	7311.52	50.07	74.00	-23.93	42.70	5.34	34.94	36.97	Peak	0	100	VERTICAL
4	7311.84	36.54	54.00	-17.46	29.17	5.34	34.94	36.97	Average	0	100	VERTICAL

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11b CH 11
Test Date	Sep. 12, 2012		

Horizontal

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a	4923.94	38.34	54.00	-15.66	36.00	4.23	34.65	32.76	Average	360	100	HORIZONTAL
2		4924.06	47.28	74.00	-26.72	44.94	4.23	34.65	32.76	Peak	360	100	HORIZONTAL
3	p	7387.68	50.38	74.00	-23.62	42.90	5.36	34.96	37.08	Peak	0	100	HORIZONTAL
4		7390.28	36.28	54.00	-17.72	28.80	5.36	34.96	37.08	Average	0	100	HORIZONTAL

Vertical

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a	4923.96	37.37	54.00	-16.63	35.03	4.23	34.65	32.76	Average	321	100	VERTICAL
2		4924.42	47.20	74.00	-26.80	44.86	4.23	34.65	32.76	Peak	321	100	VERTICAL
3	p	7387.28	49.68	74.00	-24.32	42.20	5.36	34.96	37.08	Peak	0	100	VERTICAL
4		7390.32	36.34	54.00	-17.66	28.86	5.36	34.96	37.08	Average	0	100	VERTICAL

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11g CH 1
Test Date	Sep. 12, 2012		

Horizontal

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a	4824.00	31.77	54.00	-22.23	29.69	4.21	34.69	32.56	Average	301	100	HORIZONTAL
2	p	4824.60	44.20	74.00	-29.80	41.99	4.22	34.67	32.66	Peak	301	100	HORIZONTAL

Vertical

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a	4824.00	32.00	54.00	-22.00	29.92	4.21	34.69	32.56	Average	103	100	VERTICAL
2	p	4824.20	43.45	74.00	-30.55	41.24	4.22	34.67	32.66	Peak	103	100	VERTICAL

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11g CH 6
Test Date	Sep. 12, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	4874.00	33.32	54.00	-20.68	31.11	4.22	34.67	32.66	Average	30	100	HORIZONTAL
2	4874.00	44.43	74.00	-29.57	42.14	4.22	34.66	32.73	Peak	30	100	HORIZONTAL
3 a	7310.80	36.91	54.00	-17.09	29.51	5.35	34.94	36.99	Average	0	100	HORIZONTAL
4 p	7311.80	50.79	74.00	-23.21	43.39	5.35	34.94	36.99	Peak	0	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	4872.00	45.66	74.00	-28.34	43.45	4.22	34.67	32.66	Peak	311	100	VERTICAL
2	4873.80	34.05	54.00	-19.95	31.84	4.22	34.67	32.66	Average	311	100	VERTICAL
3 a	7309.20	37.01	54.00	-16.99	29.61	5.35	34.94	36.99	Average	213	100	VERTICAL
4 p	7309.60	49.97	74.00	-24.03	42.59	5.34	34.93	36.97	Peak	213	100	VERTICAL

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11g CH 11
Test Date	Sep. 12, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	4923.80	44.39	74.00	-29.61	42.05	4.23	34.65	32.76	Peak	0	100	HORIZONTAL
2	4924.00	32.19	54.00	-21.81	29.85	4.23	34.65	32.76	Average	0	100	HORIZONTAL
3 a	7336.20	36.53	54.00	-17.47	29.11	5.35	34.94	37.01	Average	89	100	HORIZONTAL
4 p	7336.60	49.81	74.00	-24.19	42.38	5.35	34.95	37.03	Peak	89	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	4924.00	33.15	54.00	-20.85	30.81	4.23	34.65	32.76	Average	249	100	VERTICAL
2	4933.40	44.29	74.00	-29.71	41.95	4.23	34.65	32.76	Peak	249	100	VERTICAL
3 a	7336.00	36.54	54.00	-17.46	29.12	5.35	34.94	37.01	Average	113	100	VERTICAL
4 p	7339.80	49.89	74.00	-24.11	42.48	5.35	34.95	37.01	Peak	113	100	VERTICAL

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.

4.7. Band Edge Emissions Measurement

4.7.1. 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.

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

4.7.2. Measuring Instruments and Setting

Please refer to section 5 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)	1 MHz / 3 MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	100 kHz /300 kHz for Peak

4.7.3. Test Procedures

1. The test procedure is the same as section 4.5.3, only the freqeuncy 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.

4.7.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.5.4.

4.7.5. Test Deviation

There is no deviation with the original standard.

4.7.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.7.7. Test Result of Band Edge and Fundamental Emissions

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11n MCS0 20MHz CH 1, 6, 11
Test Date	Sep. 12, 2012		

Channel 1

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	!	2390.00	72.35	74.00	-1.65	41.57	2.91	0.00	27.87	Peak	30	100	VERTICAL
2	!	2390.00	53.94	54.00	-0.06	23.16	2.91	0.00	27.87	Average	30	100	VERTICAL
3	a	2415.00				61.14	2.92	0.00	27.84	Average	30	100	VERTICAL
4	p	2415.20				71.17	2.92	0.00	27.84	Peak	30	100	VERTICAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

Channel 6

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1		2390.00	53.23	74.00	-20.77	22.45	2.91	0.00	27.87	Peak	142	100	VERTICAL
2		2390.00	42.49	54.00	-11.51	11.71	2.91	0.00	27.87	Average	142	100	VERTICAL
3	p	2438.80				72.69	2.94	0.00	27.78	Peak	142	100	VERTICAL
4	a	2442.20				62.67	2.94	0.00	27.78	Average	142	100	VERTICAL
5		2483.50	54.06	74.00	-19.94	23.37	2.96	0.00	27.73	Peak	142	100	VERTICAL
6		2483.50	42.65	54.00	-11.35	11.96	2.96	0.00	27.73	Average	142	100	VERTICAL

Item 3, 4 are the fundamental frequency at 2437MHz.

Channel 11

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a	2467.40				60.60	2.95	0.00	27.76	Average	142	100	VERTICAL
2	p	2468.20				70.85	2.95	0.00	27.76	Peak	142	100	VERTICAL
3	!	2483.50	53.09	54.00	-0.91	22.40	2.96	0.00	27.73	Average	142	100	VERTICAL
4	!	2483.90	70.57	74.00	-3.43	39.88	2.96	0.00	27.73	Peak	142	100	VERTICAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11b CH 1, 6, 11
Test Date	Sep. 12, 2012		

Channel 1

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1		2386.20	58.48	74.00	-15.52	27.70	2.91	0.00	27.87	Peak	62	190	HORIZONTAL
2	!	2386.20	49.46	54.00	-4.54	18.68	2.91	0.00	27.87	Average	62	190	HORIZONTAL
3	a	2410.20				70.39	2.92	0.00	27.84	Average	62	190	HORIZONTAL
4	p	2411.00				74.15	2.92	0.00	27.84	Peak	62	190	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

Channel 6

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1		2390.00	53.86	74.00	-20.14	23.08	2.91	0.00	27.87	Peak	31	100	VERTICAL
2		2390.00	42.43	54.00	-11.57	11.65	2.91	0.00	27.87	Average	31	100	VERTICAL
3	p	2438.00				74.31	2.94	0.00	27.78	Peak	31	100	VERTICAL
4	a	2438.80				70.47	2.94	0.00	27.78	Average	31	100	VERTICAL
5		2483.50	54.13	74.00	-19.87	23.44	2.96	0.00	27.73	Peak	31	100	VERTICAL
6		2483.50	42.42	54.00	-11.58	11.73	2.96	0.00	27.73	Average	31	100	VERTICAL

Item 3, 4 are the fundamental frequency at 2437MHz.

Channel 11

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a	2460.20				69.65	2.95	0.00	27.76	Average	34	100	VERTICAL
2	p	2463.00				73.38	2.95	0.00	27.76	Peak	34	100	VERTICAL
3		2483.50	59.06	74.00	-14.94	28.37	2.96	0.00	27.73	Peak	34	100	VERTICAL
4	!	2487.70	50.27	54.00	-3.73	19.60	2.97	0.00	27.70	Average	34	100	VERTICAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

Temperature	24℃	Humidity	60%
Test Engineer	Serway Li	Configurations	IEEE 802.11g CH 1, 6, 11
Test Date	Sep. 12, 2012		

Channel 1

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	!	2390.00	70.22	74.00	-3.78	39.44	2.91	0.00	27.87	Peak	32	100	VERTICAL
2	!	2390.00	53.87	54.00	-0.13	23.09	2.91	0.00	27.87	Average	32	100	VERTICAL
3	p	2405.40				73.34	2.92	0.00	27.84	Peak	32	100	VERTICAL
4	a	2414.40				62.48	2.92	0.00	27.84	Average	32	100	VERTICAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

Channel 6

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1		2389.60	58.31	74.00	-15.69	27.53	2.91	0.00	27.87	Peak	143	100	VERTICAL
2		2390.00	43.65	54.00	-10.35	12.87	2.91	0.00	27.87	Average	143	100	VERTICAL
3	p	2440.20				76.24	2.94	0.00	27.78	Peak	143	100	VERTICAL
4	a	2442.00				65.66	2.94	0.00	27.78	Average	143	100	VERTICAL
5		2483.50	57.34	74.00	-16.66	26.65	2.96	0.00	27.73	Peak	143	100	VERTICAL
6		2483.50	44.02	54.00	-9.98	13.33	2.96	0.00	27.73	Average	143	100	VERTICAL

Item 3, 4 are the fundamental frequency at 2437 MHz.

Channel 11

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	p	2455.60				72.50	2.95	0.00	27.76	Peak	32	100	VERTICAL
2	a	2456.80				62.30	2.95	0.00	27.76	Average	32	100	VERTICAL
3	!	2483.50	70.34	74.00	-3.66	39.65	2.96	0.00	27.73	Peak	32	100	VERTICAL
4	!	2483.50	53.95	54.00	-0.05	23.26	2.96	0.00	27.73	Average	32	100	VERTICAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

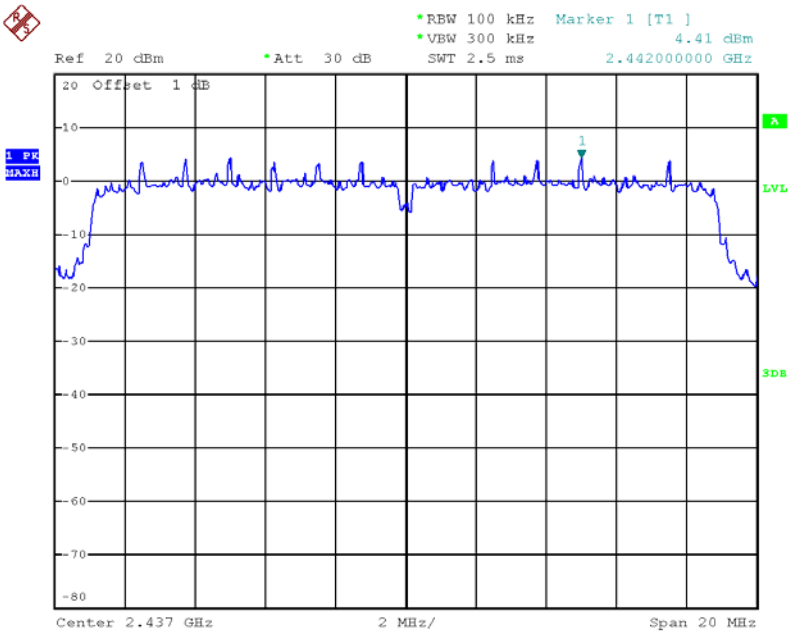
Note:

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

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

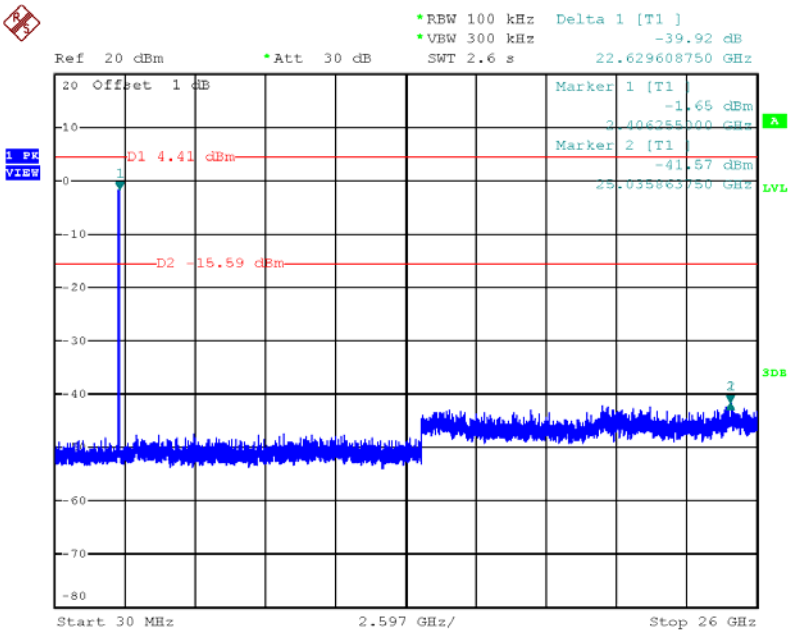
For Emission not in Restricted Band

Plot on Configuration IEEE 802.11n MCS0 20MHz (Reference Level)



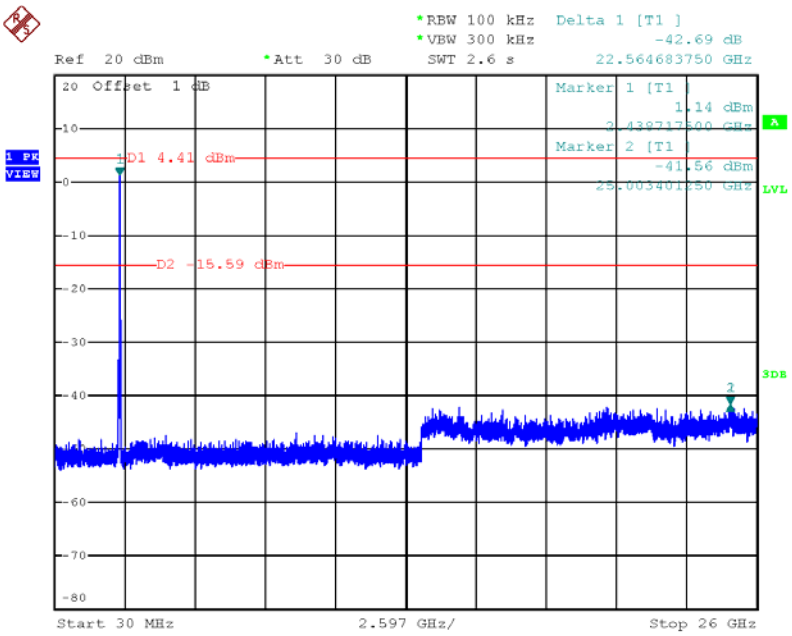
Date: 17.SEP.2012 17:15:22

Plot on Configuration IEEE 802.11n MCS0 20MHz / 2412 MHz (down 20dBc)



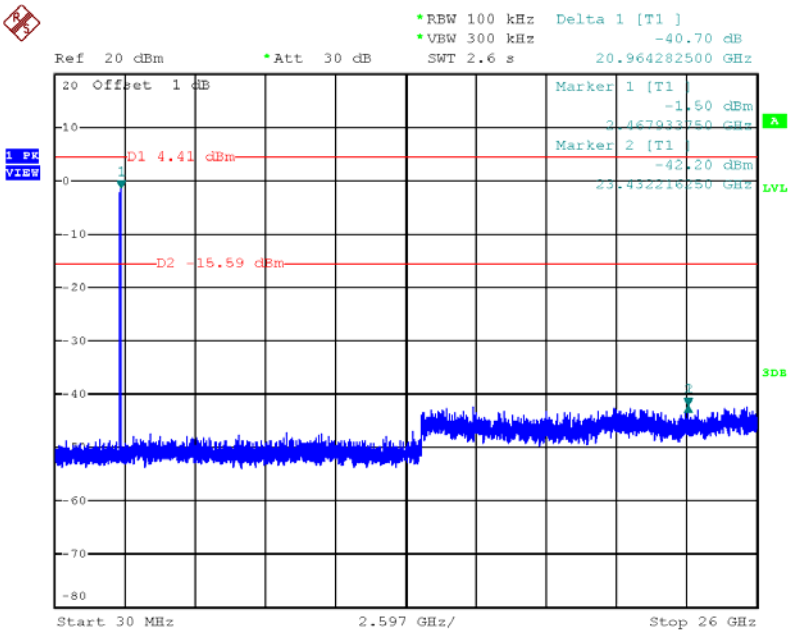
Date: 17.SEP.2012 17:34:12

Plot on Configuration IEEE 802.11n MCS0 20MHz / 2437 MHz (down 20dBc)



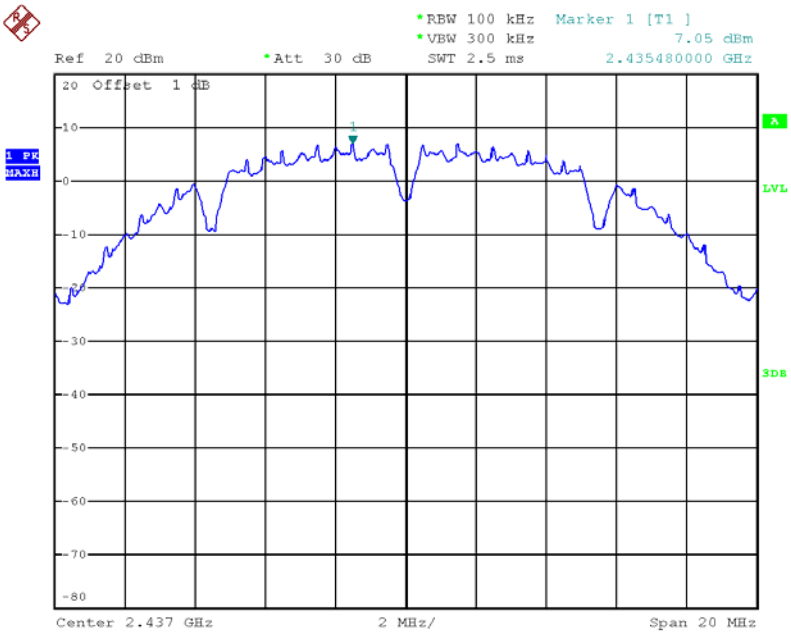
Date: 17.SEP.2012 17:35:08

Plot on Configuration IEEE 802.11n MCS0 20MHz / 2462 MHz (down 20dBc)



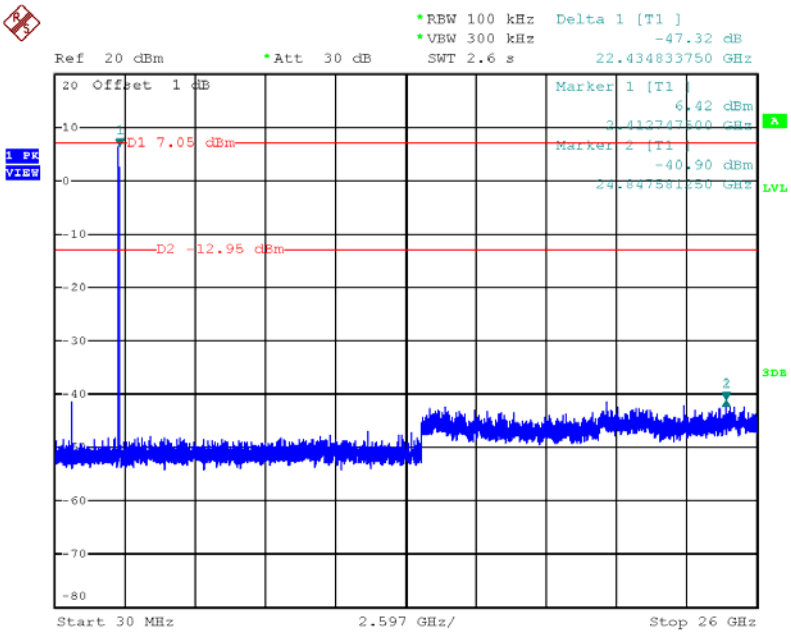
Date: 17.SEP.2012 17:35:46

Plot on Configuration IEEE 802.11b (Reference Level)



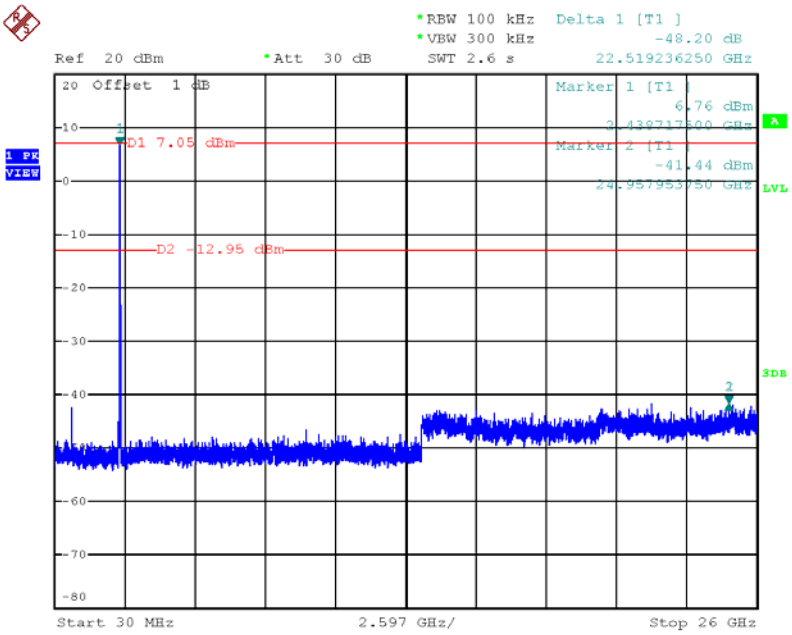
Date: 17.SEP.2012 17:10:10

Plot on Configuration IEEE 802.11b / 2412 MHz (down 20dBc)



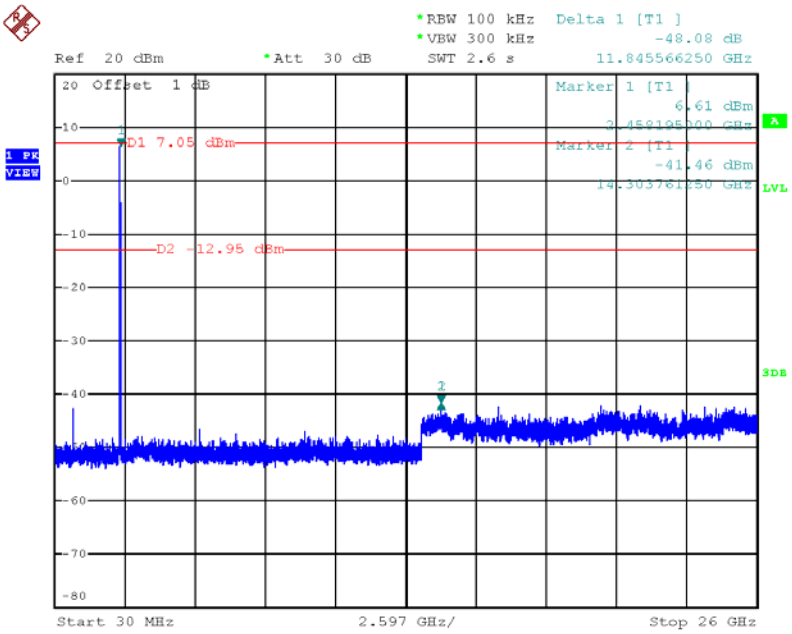
Date: 17.SEP.2012 17:23:09

Plot on Configuration IEEE 802.11b / 2437 MHz (down 20dBc)



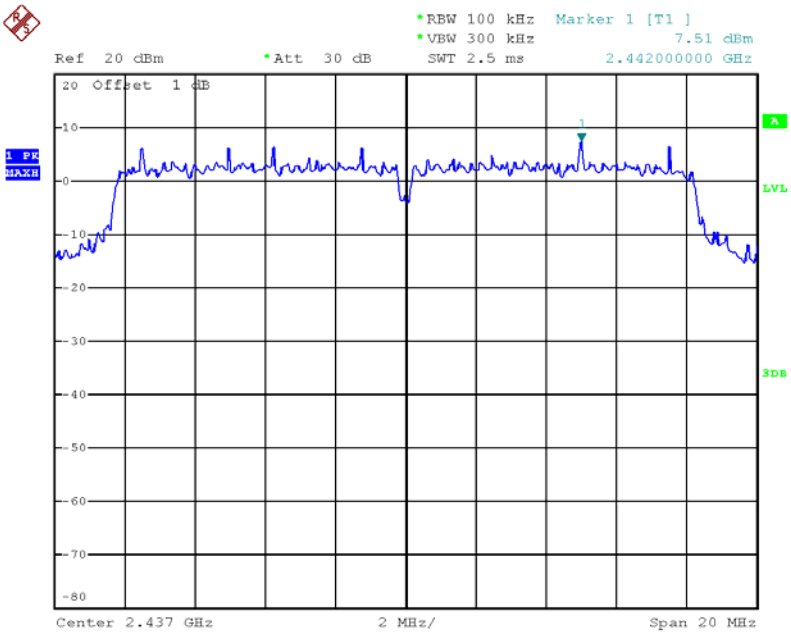
Date: 17.SEP.2012 17:25:42

Plot on Configuration IEEE 802.11b / 2462 MHz (down 20dBc)



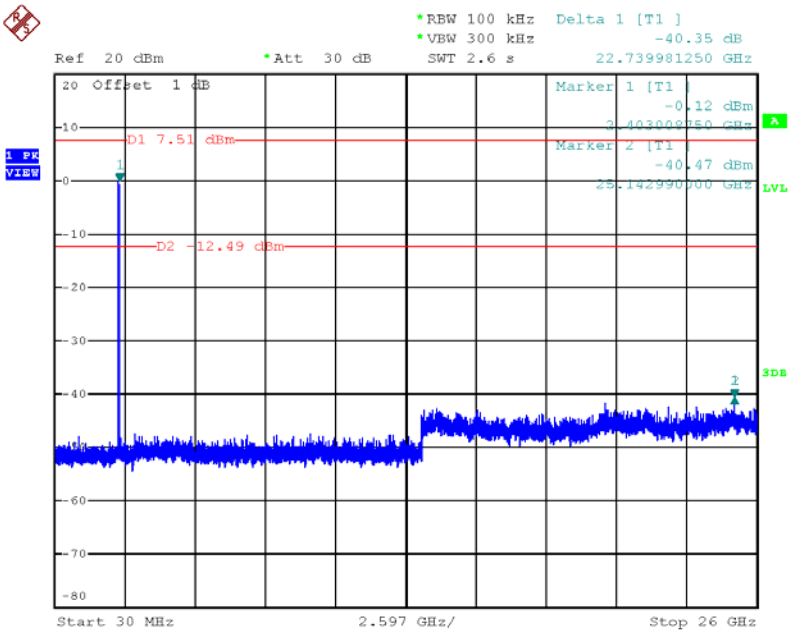
Date: 17.SEP.2012 17:26:27

Plot on Configuration IEEE 802.11g (Reference Level)



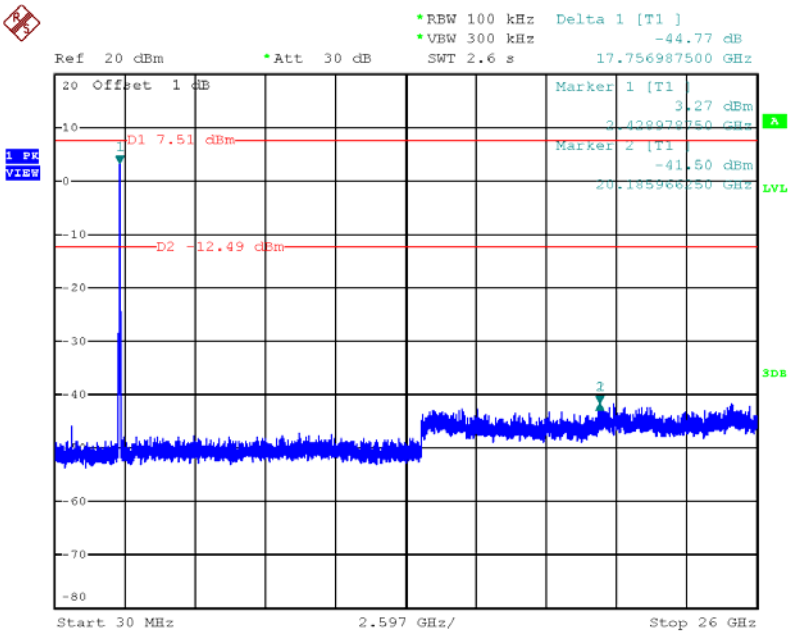
Date: 17.SEP.2012 17:12:19

Plot on Configuration IEEE 802.11g / 2412 MHz (down 20dBc)



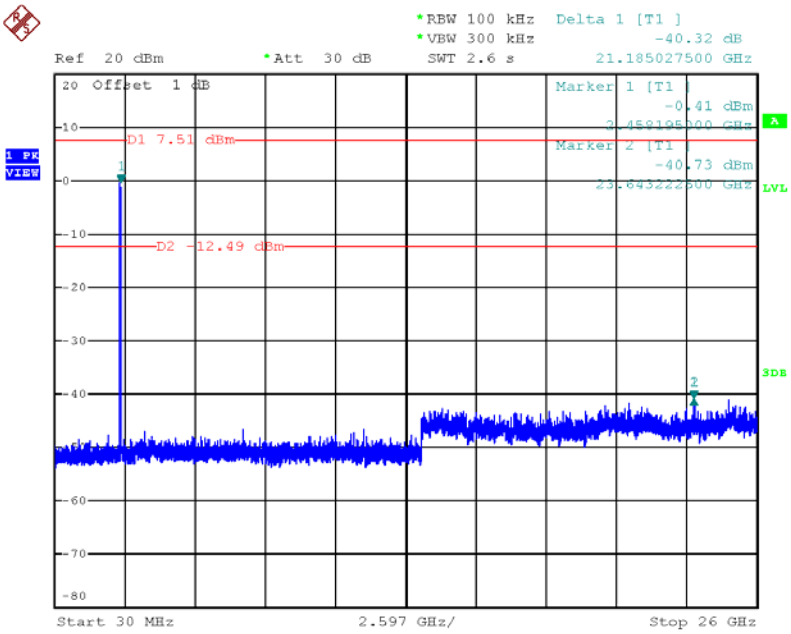
Date: 17.SEP.2012 17:27:57

Plot on Configuration IEEE 802.11g / 2437 MHz (down 20dBc)



Date: 17.SEP.2012 17:29:05

Plot on Configuration IEEE 802.11g / 2462 MHz (down 20dBc)



Date: 17.SEP.2012 17:31:36

4.8. Antenna Requirements

4.8.1. 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.

4.8.2. Antenna Connector Construction

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Test Receiver	R&S	ESCS 30	838251/004	9 kHz ~ 2.75 GHz	Feb. 02, 2012	Conduction (CO01-LK)
LISN	R&S	NNB-2/16Z	99081	9 kHz ~ 30 MHz	Apr. 11, 2012	Conduction (CO01-LK)
RF Cable-CON	Suhner Switzerland	RG223/U	CB017	9 kHz ~ 30 MHz	Nov. 04, 2011	Conduction (CO01-LK)
PULSE LIMTER	R&S	ESH3-Z2	20-6120	9 kHz ~ 30 MHz	May 16. 2012	Conduction (CO01-LK)
Network Testing System	XTRAMUS	NuStreams-600i	OKNS06C00071	10/100/1000Mbps, Auto-Negotiation	N/A	Conduction (CO01-LK)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Jan. 11, 2012	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 25, 2011	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Nov. 22, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 17, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 29, 2011	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Jul. 31, 2012	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100056	9KHz~40GHz	Nov. 03, 2011	Radiation (05CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 20, 2012	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Sep. 09, 2012	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N/A	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N/A	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Sep. 26, 2011	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 05, 2012	Conducted (TH01-CB)
Thermo-Hygro Meter	N/A	HC 520	#1	15~70 degree	Nov. 02, 2011	Conducted (TH01-CB)
Signal Generator	R&S	SMR40	100302	10MHz-40GHz	Nov. 22, 2011	Conducted (TH01-CB)
RF Power Divider	HP	11636A	00306	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Power Splitter	Anaren	44100	1839	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Power Splitter	Anaren	42100	17930	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
Signal generator	R&S	SMU200A	102782	10MHz-40GHz	Jun. 07, 2012	Conducted (TH01-CB)
Horn Antenna	COM-POWER	AH-118	071187	1GHz – 18GHz	May 09, 2012	Conducted (TH01-CB)
Horn Antenna	COM-POWER	AH-118	071042	1GHz – 18GHz	Nov. 01, 2011	Radiation (05CH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-12	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-13	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Nov. 01, 2011	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Nov. 01, 2011	Conducted (TH01-CB)

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

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

6. 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 2nd 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

7. TAF CERTIFICATE OF ACCREDITATION

Certificate No.：L1190-110702

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 Road, 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, 2010 to January 09, 2013
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 Arrangment with Foreign Authorities

Jay-San Chen
President, Taiwan Accreditation Foundation
Date：July 02, 2011

P1, total 22 pages

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