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FCC RADIO TEST REPORT

Applicant's company	**LOGITECH FAR EAST LTD.**
Applicant Address	#2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C.
FCC ID	**JNZOR0004**
Manufacturer's company	**LOGITECH FAR EAST LTD.**
Manufacturer Address	#2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C.

Product Name	RF Transceiver
Brand Name	Logitech
Model Name	O-R0004
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.249
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Jul. 13, 2012
Final Test Date	Dec. 14, 2012
Submission Type	Original Equipment

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 C63.10-2009** and **47 CFR FCC Part 15 Subpart C**.

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

Testing Laboratory
1190

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR271312AA	Rev. 01	Initial issue of report	Jan. 04, 2013
FR271312AA	Rev. 02	Modified the product name to "RF Transceiver" from "Harmony Hub".	Feb. 26, 2013

Certificate No.: CB10112096

1. CERTIFICATE OF COMPLIANCE

Product Name	:	RF Transceiver
Brand Name	:	Logitech
Model Name	:	O-R0004
Applicant	:	LOGITECH FAR EAST LTD.
Test Rule Part(s)	:	**47 CFR FCC Part 15 Subpart C § 15.249**

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Jul. 13, 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.

Reviewed By:
Sam Chen
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	9.70 dB
4.2	15.249(a)	Field Strength of Fundamental Emissions	Complies	4.95 dB
4.3	15.215(c)	20dB Spectrum Bandwidth	Complies	-
4.4	15.249(a)/(d)	Radiated Emissions	Complies	1.79 dB
4.5	15.249(d)	Band Edge Emissions	Complies	0.04 dB
4.6	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Field Strength of Fundamental Emissions	±0.8dB	Confidence levels of 95%
20dB Spectrum Bandwidth	$\pm 8.5\times10^{-8}$	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%

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n

Items	Description
Product Type	WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	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 ; 7 for 40MHz bandwidth
Channel Band Width (99%)	MCS0 (20MHz): 18.08 MHz ; MCS0 (40MHz): 36.48 MHz
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11b/g

Items	Description
Product Type	WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	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: 14.08 MHz ; 11g: 17.04 MHz
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	40 MHz
802.11b	V	X
802.11g	V	X
802.11n	V	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

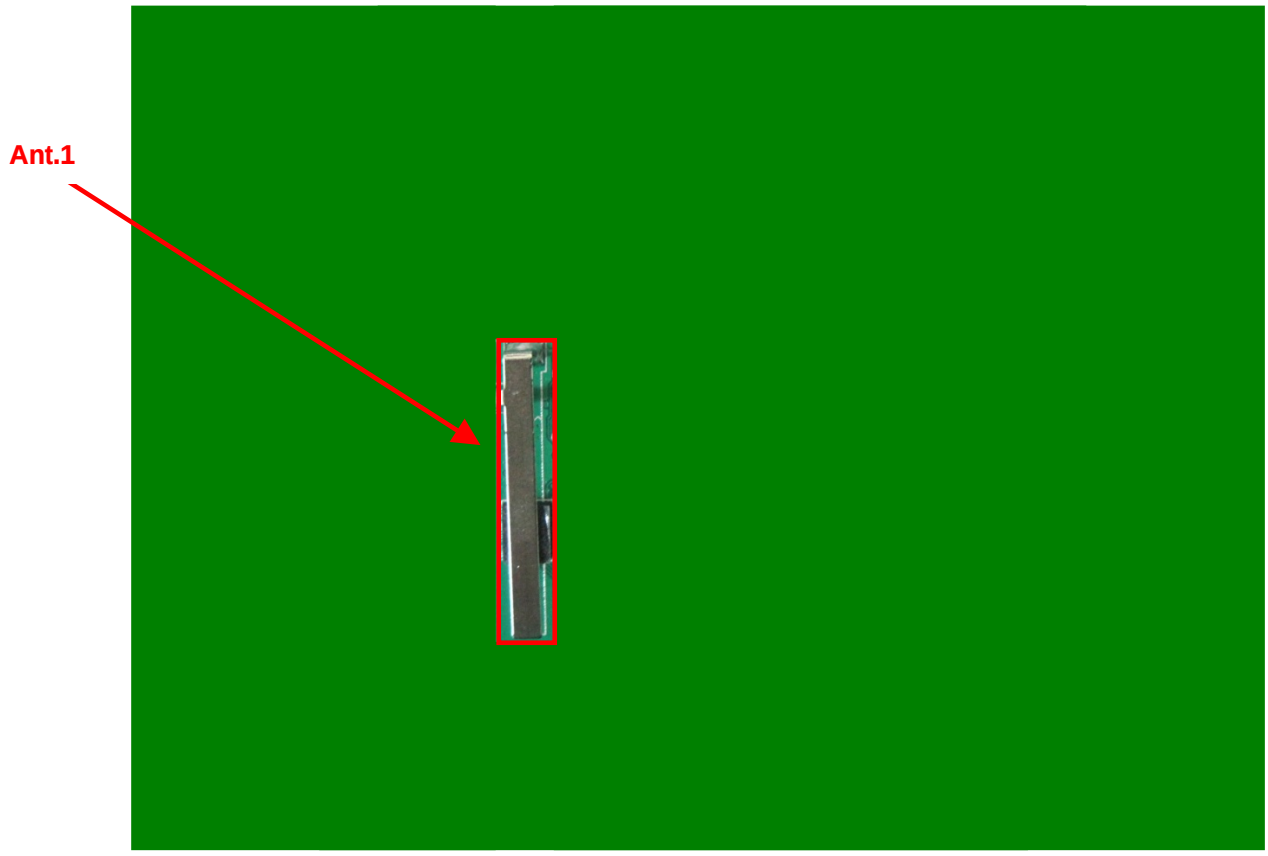
Power	Brand Holder	Model	Rating
Adapter 1	Logitech	AD631MC	I/P: 100-240V~50/60Hz 0.13A O/P: 5.15V, 1A
Adapter 2	Logitech	KSAS0060510100D5D	I/P: 100-240V~50/60Hz 0.18A O/P: 5.1V,1.0A
Others			
USB Cable: Shielded, 0.65m			
IR Cable*2: Non-shielded, 2.6m			

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
1	--	--	PIFA	N/A	5.82	TX / RX Ant.

Note: The EUT has one antennas.

Ant. 1 could transmit/receive simultaneously.



3.4. Table for Carrier Frequencies

For IEEE 802.11b/g, use Channel 1~Channel 11.
There are two bandwidth systems for IEEE 802.11n.
For both 20MHz bandwidth systems, use Channel 1~Channel 11.
For both 40MHz bandwidth systems, use Channel 3~Channel 9.

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

3.5. Table for Test Modes

Test Items	Mode	Channel	Antenna
AC Power Line Conducted Emissions	CTX	-	-
Field Strength of Fundamental Emissions 20dB Spectrum Bandwidth	20MHz	1/6/11	1
	40MHz	3/6/9	1
	11b	1/6/11	1
	11g	1/6/11	1
Radiated Emissions 30MHz ~ 1GHz	CTX	-	-
Radiated Emissions 1GHz~10th Harmonic	20MHz	1/6/11	1
	40MHz	3/6/9	1
	11b	1/6/11	1
	11g	1/6/11	1
Band Edge Emissions	20MHz	1/6/11	1
	40MHz	3/6/9	1
	11b	1/6/11	1
	11g	1/6/11	1

Note: CTX=continuously transmitting

The following test modes were performed for all tests:

For Conducted Emission test:

Mode 1: EUT+ Adapter 1

Mode 2: EUT+ Adapter 2

Due to Mode 2 generated the worst test result, so it was recorded in this report.

For Radiated Emission test:

Mode 1: EUT+ Adapter 1

Mode 2: EUT+ Adapter 2

Due to Mode 2 generated the worst test result, so it was recorded in this report.

3.6. Table for Testing Locations

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

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

Please refer section 6 for Test Site Address.

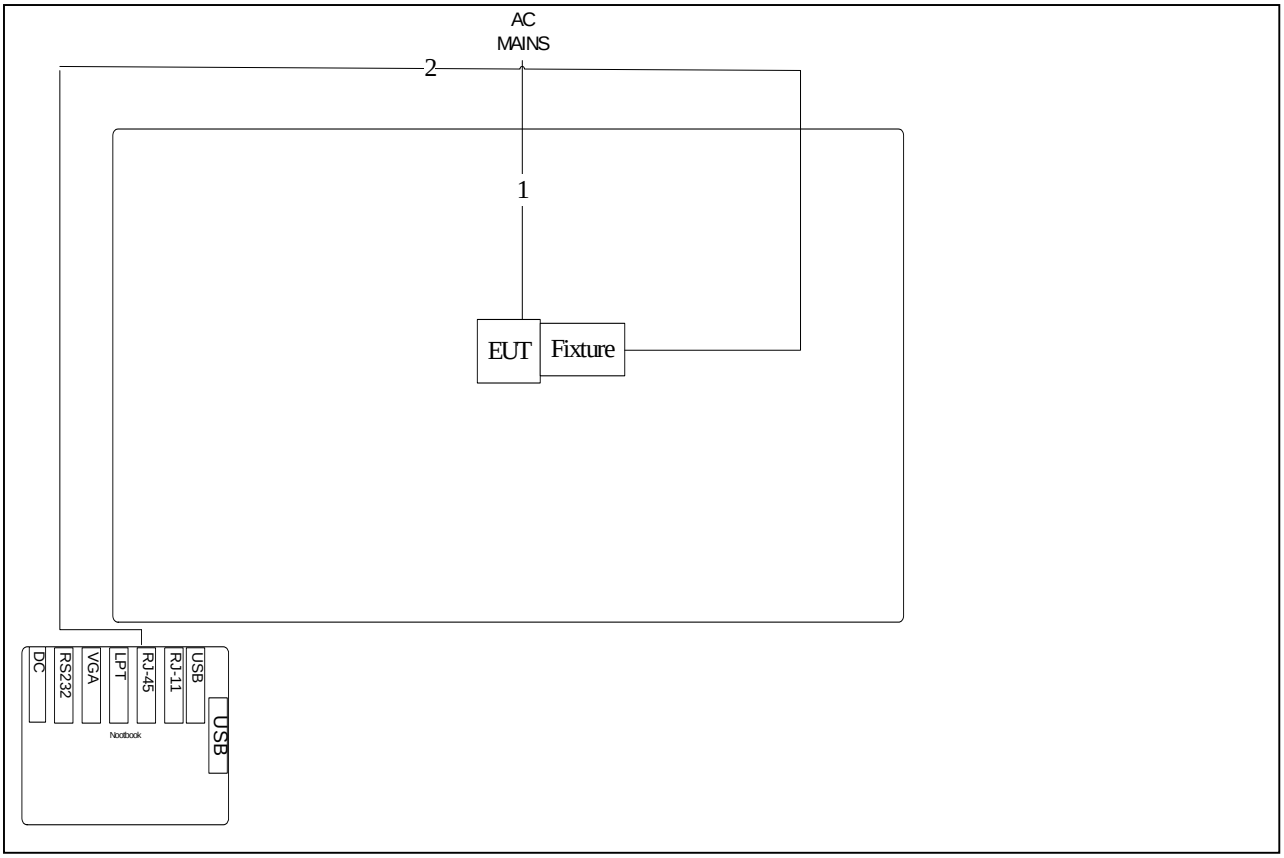
3.7. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6220	E2KWM3945ABG

3.8. Test Configurations

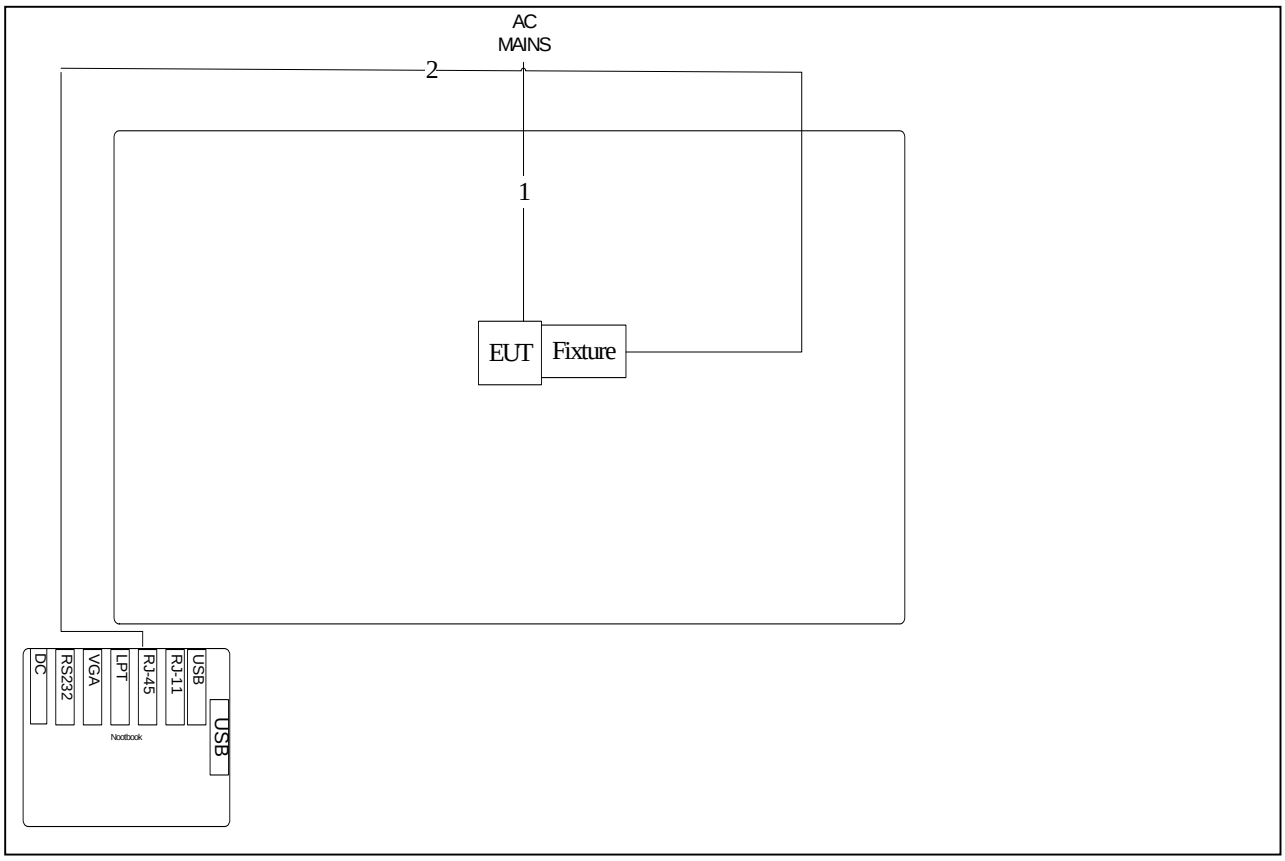
3.8.1. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz



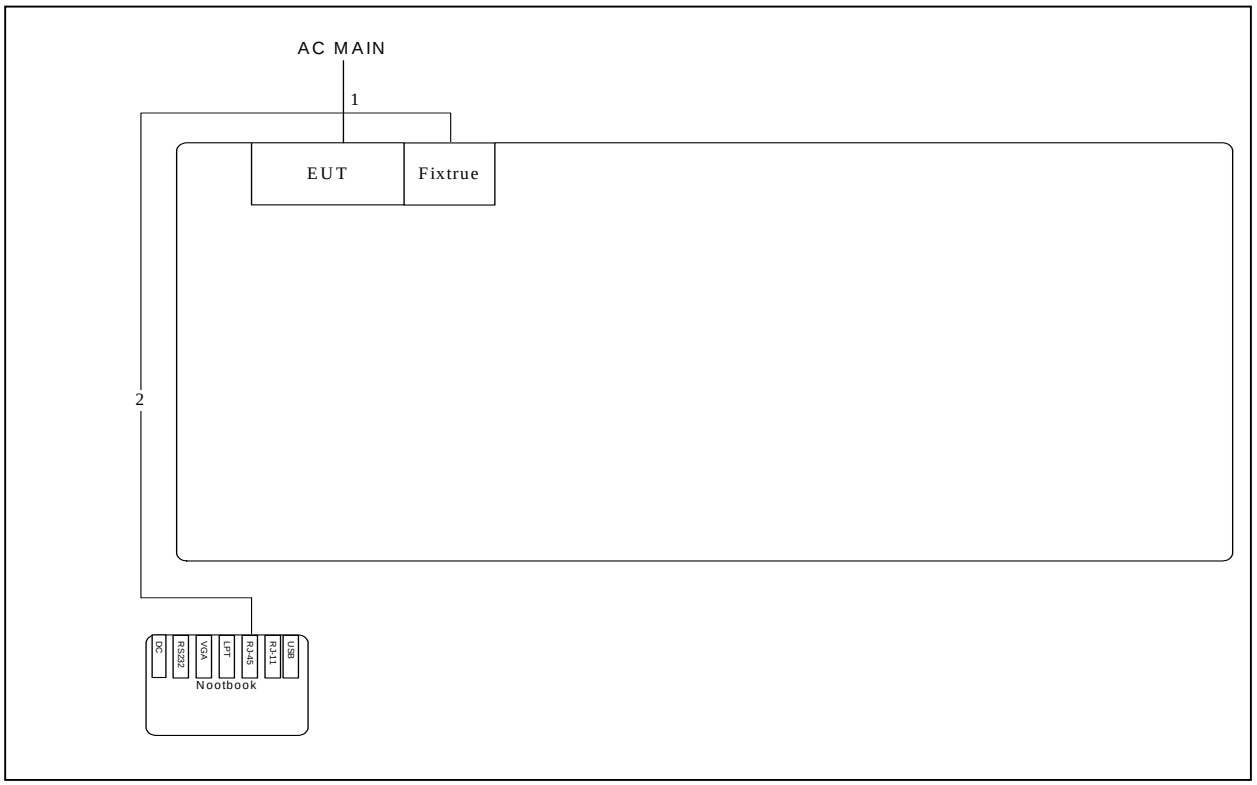
Item	Connection	Shield	Length
1	Power cable	No	1.8m
2	RJ-45 cable	No	10m

Test Configuration: Above 1GHz



Item	Connection	Shield	Length
1	Power cable	No	1.8m
2	RJ-45 cable	No	10m

3.8.2. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shield	Length
1	Power cable	No	1.8m
2	RJ-45 cable	No	10m

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

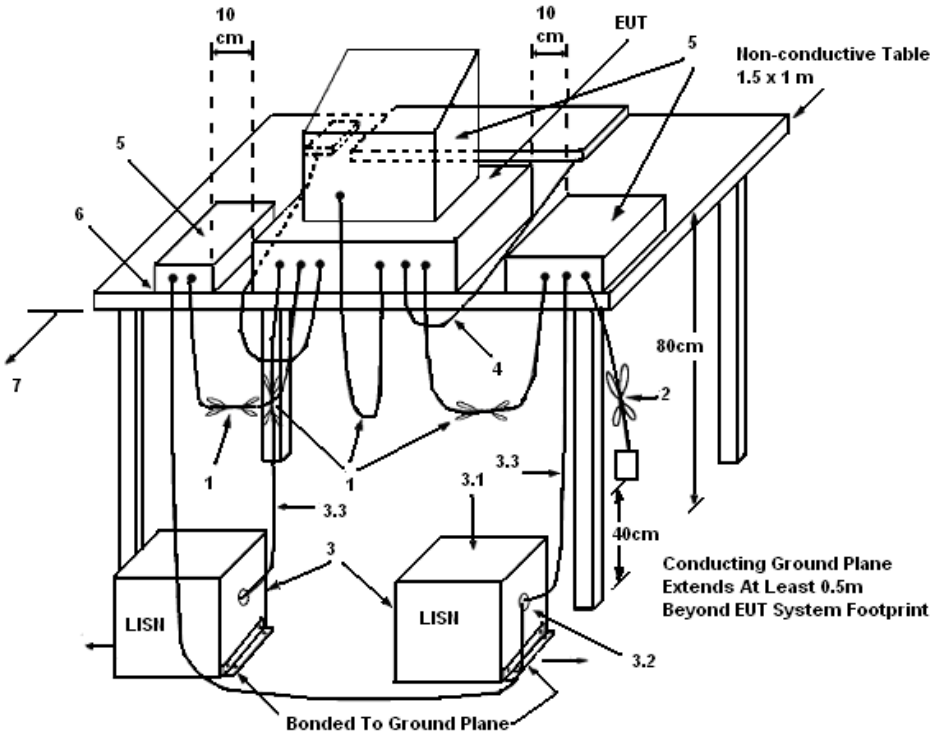
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

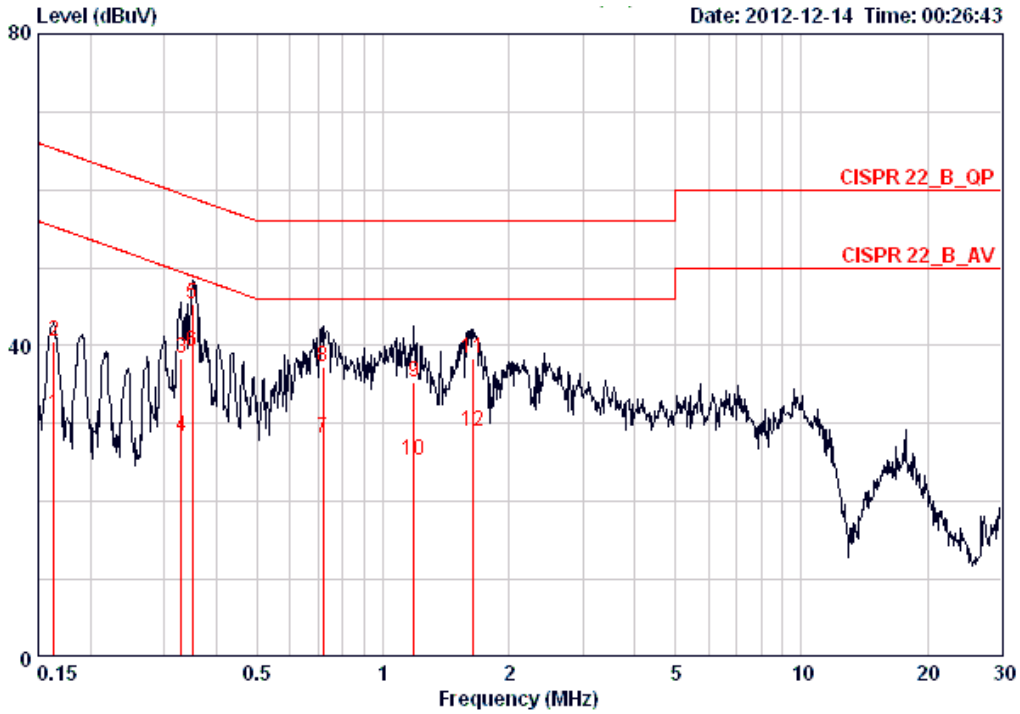
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

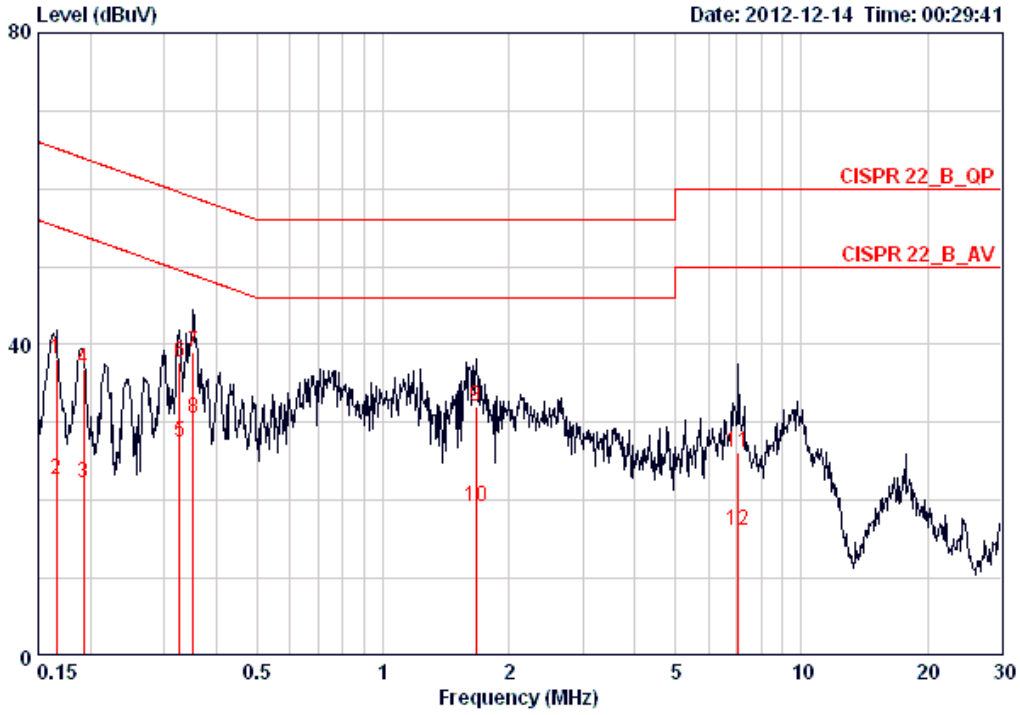
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	20℃	Humidity	70%
Test Engineer	Simon Yang	Phase	Line
Configuration	CTX / Mode 2		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.16327	31.18	-24.12	55.30	31.18	0.00	0.00	LINE	AVERAGE
2	0.16327	40.62	-24.68	65.30	40.62	0.00	0.00	LINE	QP
3	0.33033	38.38	-21.06	59.44	38.38	0.00	0.00	LINE	QP
4	0.33033	28.40	-21.04	49.44	28.40	0.00	0.00	LINE	AVERAGE
5	0.35015	45.37	-13.59	58.96	45.37	0.00	0.00	LINE	QP
6 @	0.35015	39.26	-9.70	48.96	39.26	0.00	0.00	LINE	AVERAGE
7	0.71977	28.11	-17.89	46.00	28.11	0.00	0.00	LINE	AVERAGE
8	0.71977	37.33	-18.67	56.00	37.33	0.00	0.00	LINE	QP
9	1.184	35.33	-20.67	56.00	35.33	0.00	0.00	LINE	QP
10	1.184	25.26	-20.74	46.00	25.26	0.00	0.00	LINE	AVERAGE
11	1.636	38.41	-17.59	56.00	38.41	0.00	0.00	LINE	QP
12	1.636	29.00	-17.00	46.00	29.00	0.00	0.00	LINE	AVERAGE

Temperature	20℃	Humidity	70%
Test Engineer	Simon Yang	Phase	Neutral
Configuration	CTX / Mode 2		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.16589	38.10	-27.06	65.16	38.10	0.00	0.00	NEUTRAL	QP
2	0.16589	22.76	-32.40	55.16	22.76	0.00	0.00	NEUTRAL	AVERAGE
3	0.19242	22.24	-31.69	53.93	22.24	0.00	0.00	NEUTRAL	AVERAGE
4	0.19242	36.82	-27.11	63.93	36.82	0.00	0.00	NEUTRAL	QP
5	0.32685	27.45	-22.08	49.53	27.45	0.00	0.00	NEUTRAL	AVERAGE
6	0.32685	37.61	-21.92	59.53	37.61	0.00	0.00	NEUTRAL	QP
7	0.35201	39.10	-19.81	58.91	39.10	0.00	0.00	NEUTRAL	QP
8	0.35201	30.56	-18.35	48.91	30.56	0.00	0.00	NEUTRAL	AVERAGE
9	1.671	32.05	-23.95	56.00	32.05	0.00	0.00	NEUTRAL	QP
10	1.671	19.24	-26.76	46.00	19.24	0.00	0.00	NEUTRAL	AVERAGE
11	7.062	26.16	-33.84	60.00	26.16	0.00	0.00	NEUTRAL	QP
12	7.062	16.10	-33.90	50.00	16.10	0.00	0.00	NEUTRAL	AVERAGE

Note:

Level = Read Level + LISN Factor + Cable Loss

4.2. Field Strength of Fundamental Emissions Measurement

4.2.1. Limit

The field strength of fundamental emissions within these bands specified at a distance of 3 meters (measurement instrumentation employing an average detector) shall comply with the following table.

Frequency Band (MHz)	Fundamental Emissions Limit (dBuV/m) at 3m
2400-2483.5	94 (Average)
	114 (Peak)

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 spectrum analyzer.

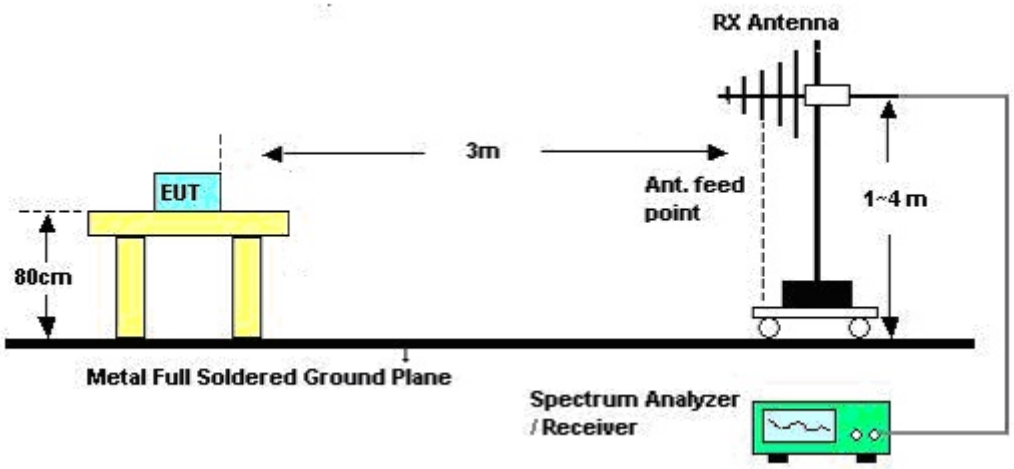
Power Meter Parameter	Setting
RB	1 MHz Peak / 3MHz Peak
VB	1 MHz Peak / 10Hz Average
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.2.3. 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. For Fundamental emissions, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
6. 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.

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 Field Strength of Fundamental Emissions

Temperature	20℃	Humidity	70%
Test Engineer	Benson Peng	Configurations	Configuration IEEE 802.11n MCS0 20MHz / Channel 1, 6, 11
Test Date	Nov, 15, 2012		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2407.64	86.32	94.00	-7.68	55.89	2.22	28.21	0.00	Average	100	133	VERTICAL
2	2407.64	104.53	114.00	-9.47	74.10	2.22	28.21	0.00	Peak	100	133	VERTICAL

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 p	2433.06	107.26	114.00	-6.74	76.52	2.93	0.00	27.81	Peak	210	103	VERTICAL
2 a	2433.06	89.05	94.00	-4.95	58.31	2.93	0.00	27.81	Average	210	103	VERTICAL

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2465.52	86.22	94.00	-7.78	55.65	2.24	28.33	0.00	Average	100	143	VERTICAL
2	2465.52	104.43	114.00	-9.57	73.86	2.24	28.33	0.00	Peak	100	143	VERTICAL

Note:

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

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

Temperature	20℃	Humidity	70%
Test Engineer	Benson Peng	Configurations	Configuration IEEE 802.11n MCS0 40MHz / Channel 3, 6, 9
Test Date	Nov, 15, 2012		

Channel 3

	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	2414.07	101.44	114.00	-12.56	70.68	2.92	0.00	27.84	Peak	34	100	VERTICAL
2 a	2414.07	83.23	94.00	-10.77	52.47	2.92	0.00	27.84	Average	34	100	VERTICAL

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 p	2453.44	104.29	114.00	-9.71	73.57	2.94	0.00	27.78	Peak	209	100	VERTICAL
2 a	2453.44	86.08	94.00	-7.92	55.36	2.94	0.00	27.78	Average	209	100	VERTICAL

Channel 9

	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	2456.48	101.64	114.00	-12.36	70.93	2.95	0.00	27.76	Peak	210	100	VERTICAL
2 a	2456.48	83.43	94.00	-10.57	52.72	2.95	0.00	27.76	Average	210	100	VERTICAL

Note:

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

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

Temperature	20℃	Humidity	70%
Test Engineer	Benson Peng	Configurations	Configuration IEEE 802.11b / Channel 1, 6, 11
Test Date	Nov, 15, 2012		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2410.85	84.09	94.00	-9.91	53.66	2.22	28.21	0.00	Average	100	252	VERTICAL
2	2410.85	102.30	114.00	-11.70	71.87	2.22	28.21	0.00	Peak	100	252	VERTICAL

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2435.85	86.30	94.00	-7.70	55.78	2.23	28.29	0.00	Average	100	208	VERTICAL
2	2435.85	104.51	114.00	-9.49	73.99	2.23	28.29	0.00	Peak	100	208	VERTICAL

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2464.37	86.13	94.00	-7.87	55.56	2.24	28.33	0.00	Average	100	161	HORIZONTAL
2	2464.37	104.34	114.00	-9.66	73.77	2.24	28.33	0.00	Peak	100	161	HORIZONTAL

Note:

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

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

Temperature	20℃	Humidity	70%
Test Engineer	Benson Peng	Configurations	Configuration IEEE 802.11g / Channel 1, 6, 11
Test Date	Nov, 15, 2012		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2405.56	88.43	94.00	-5.57	58.00	2.22	28.21	0.00	Average	100	135	VERTICAL
2	2405.56	106.64	114.00	-7.36	76.21	2.22	28.21	0.00	Peak	100	135	VERTICAL

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2435.08	87.78	94.00	-6.22	57.26	2.23	28.29	0.00	Average	100	190	VERTICAL
2	2435.08	105.99	114.00	-8.01	75.47	2.23	28.29	0.00	Peak	100	190	VERTICAL

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2464.56	86.97	94.00	-7.03	56.40	2.24	28.33	0.00	Average	100	145	VERTICAL
2	2464.56	105.18	114.00	-8.82	74.61	2.24	28.33	0.00	Peak	100	145	VERTICAL

Note:

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

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

4.3. 20dB Spectrum Bandwidth Measurement

4.3.1. Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (2400 ~ 2483.5MHz).

4.3.2. Measuring Instruments and Setting

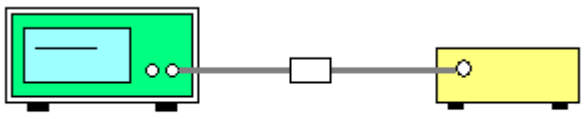
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser 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.

4.3.4. Test Setup Layout



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of 20dB Spectrum Bandwidth

Temperature	20℃	Humidity	70%
Test Engineer	Benson Peng	Configurations	Configuration IEEE 802.11n MCS0 20MHz / Channel 1, 6, 11

Frequency	20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) f_L > 2400MHz	Frequency range (MHz) f_H < 2483.5MHz	Test Result
2412 MHz	19.12	17.76	2403.1200	-	Complies
2437 MHz	19.28	18.08	-	-	Complies
2462 MHz	19.28	17.84	-	2470.8800	Complies

Temperature	20℃	Humidity	70%
Test Engineer	Benson Peng	Configurations	Configuration IEEE 802.11n MCS0 40MHz / Channel 3, 6, 9

Frequency	20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) f_L > 2400MHz	Frequency range (MHz) f_H < 2483.5MHz	Test Result
2422 MHz	38.24	36.48	2403.7600	-	Complies
2437 MHz	37.92	36.48	-	-	Complies
2452 MHz	38.08	36.48	-	2470.2400	Complies

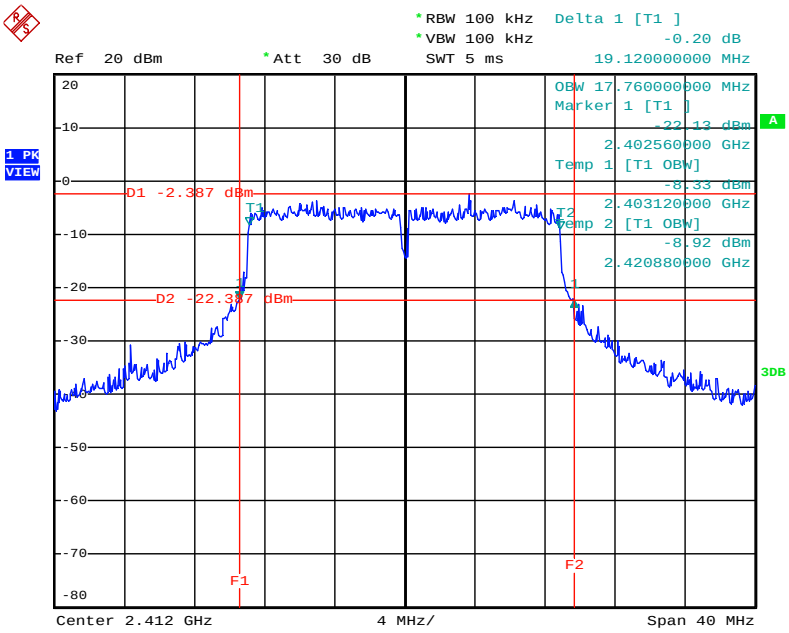
Temperature	20℃	Humidity	70%
Test Engineer	Benson Peng	Configurations	Configuration IEEE 802.11b / Channel 1, 6, 11

Frequency	20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) f_L > 2400MHz	Frequency range (MHz) f_H < 2483.5MHz	Test Result
2412 MHz	16.00	14.08	2404.9600	-	Complies
2437 MHz	16.16	14.08	-	-	Complies
2462 MHz	16.08	14.08	-	2469.0400	Complies

Temperature	20℃	Humidity	70%
Test Engineer	Benson Peng	Configurations	Configuration IEEE 802.11g / Channel 1, 6, 11

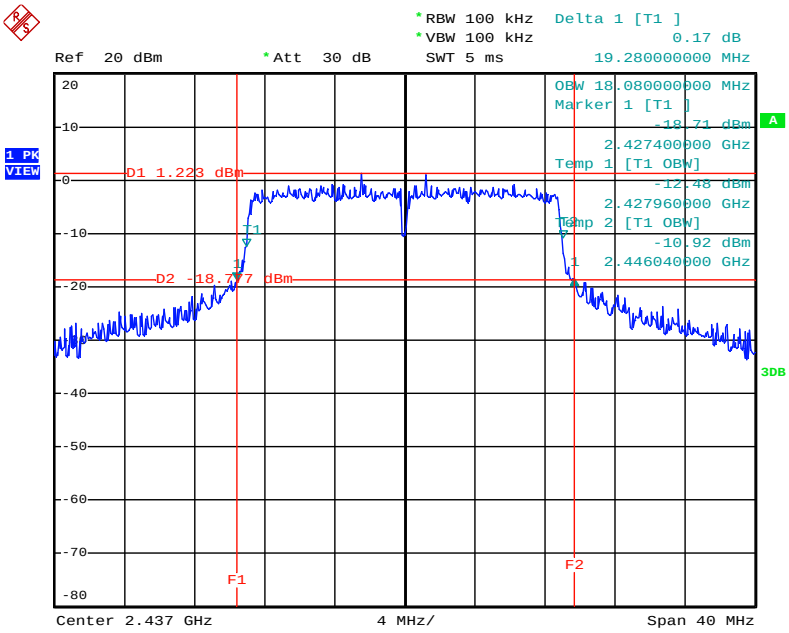
Frequency	20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) f_L > 2400MHz	Frequency range (MHz) f_H < 2483.5MHz	Test Result
2412 MHz	18.16	16.64	2403.6800	-	Complies
2437 MHz	18.88	17.04	-	-	Complies
2462 MHz	18.88	16.64	-	2470.3200	Complies

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / 2412 MHz



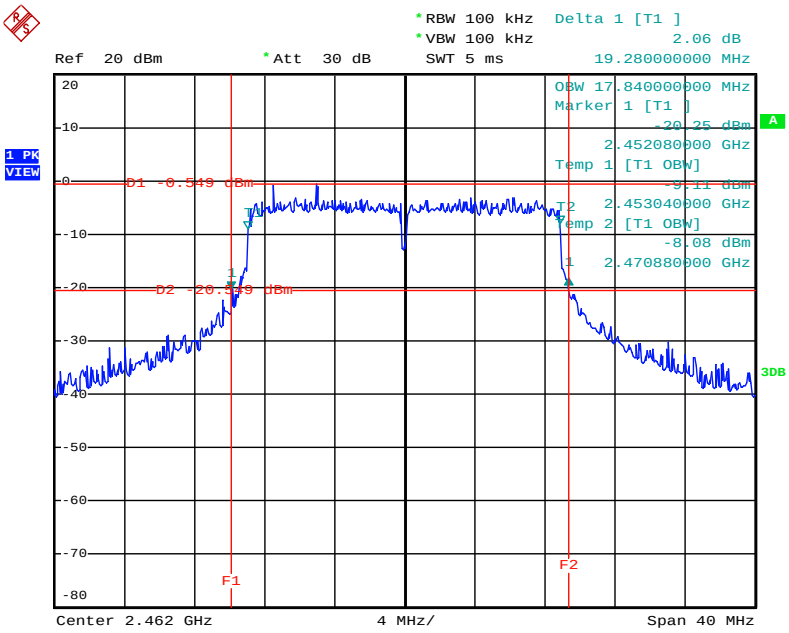
Date: 10.DEC.2012 19:10:12

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / 2437 MHz



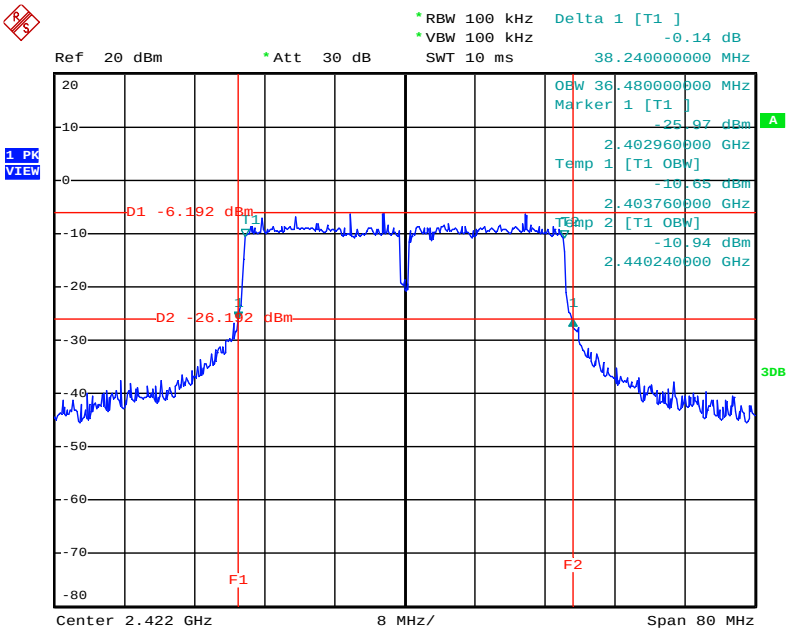
Date: 10.DEC.2012 19:10:42

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / 2462 MHz



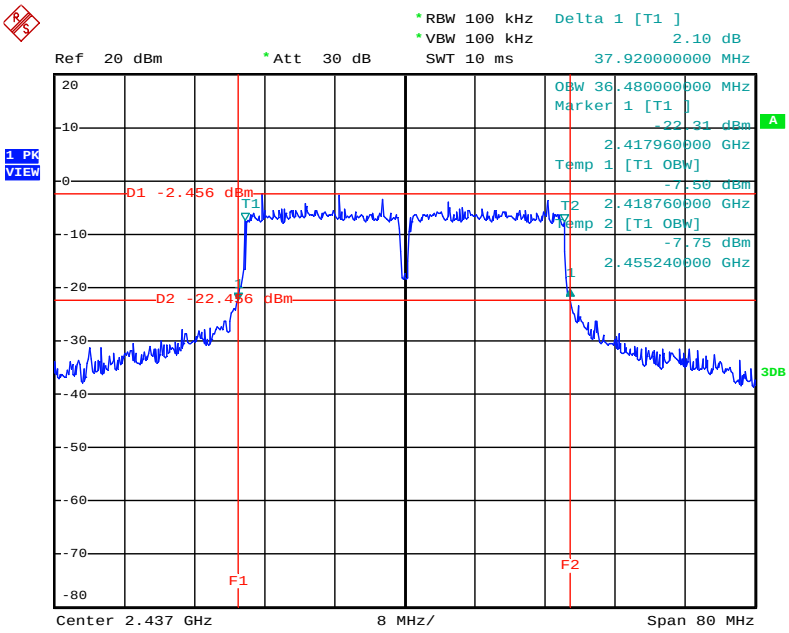
Date: 10.DEC.2012 19:11:13

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / 2422 MHz



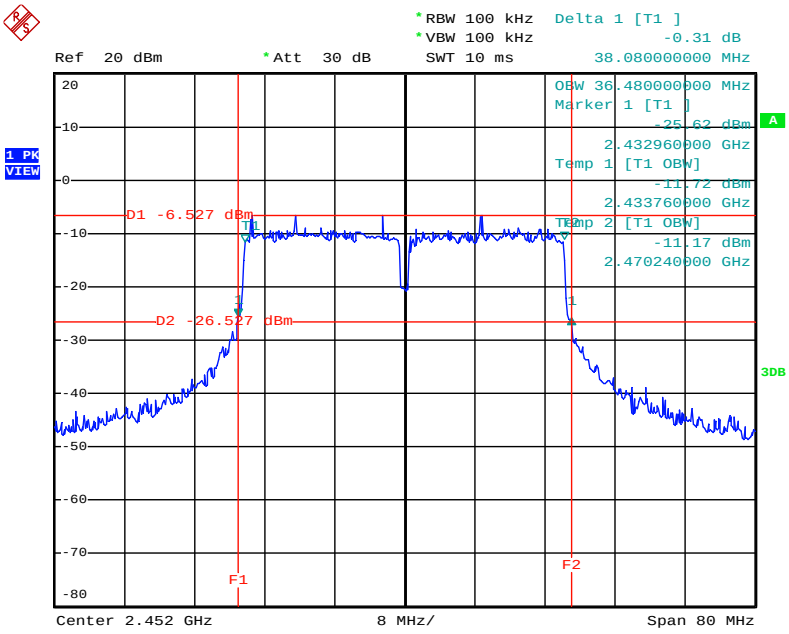
Date: 10.DEC.2012 19:12:10

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / 2437 MHz



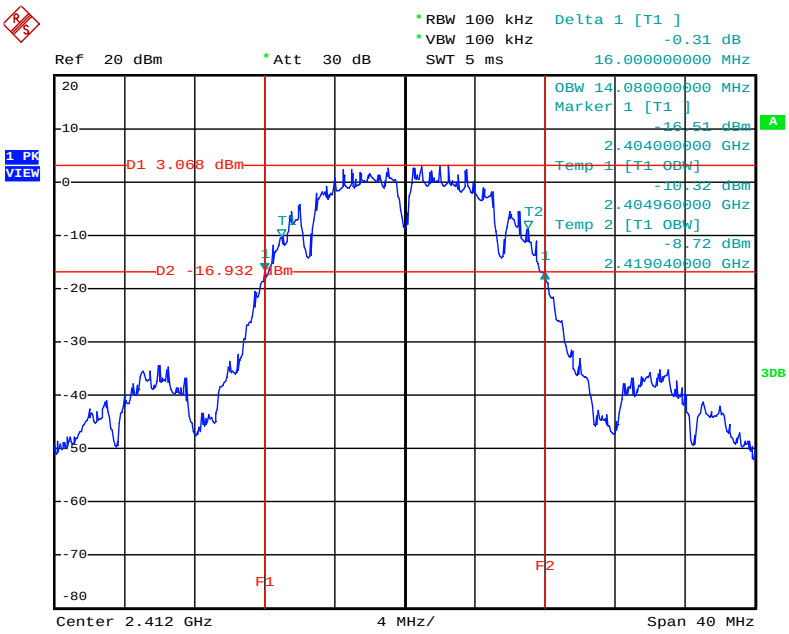
Date: 10.DEC.2012 19:13:10

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / 2452 MHz



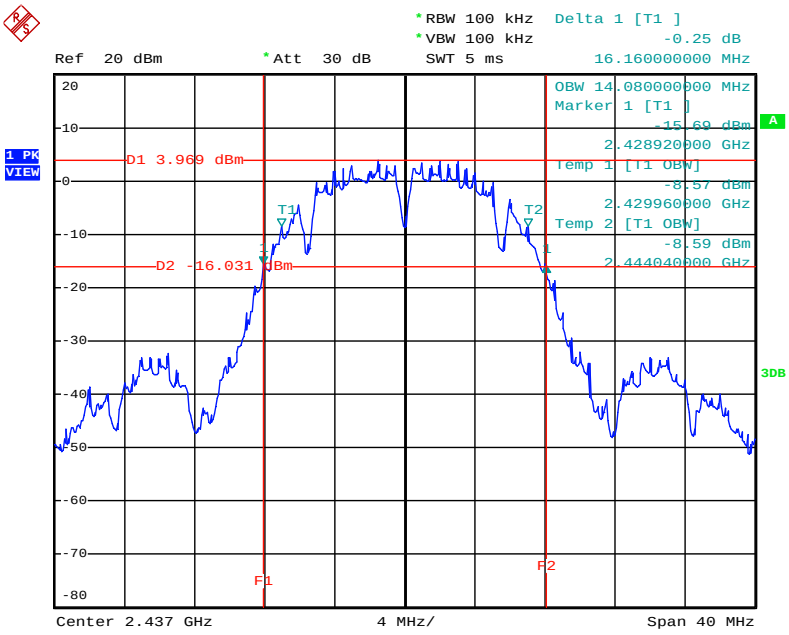
Date: 10.DEC.2012 19:13:59

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11b / 2412 MHz



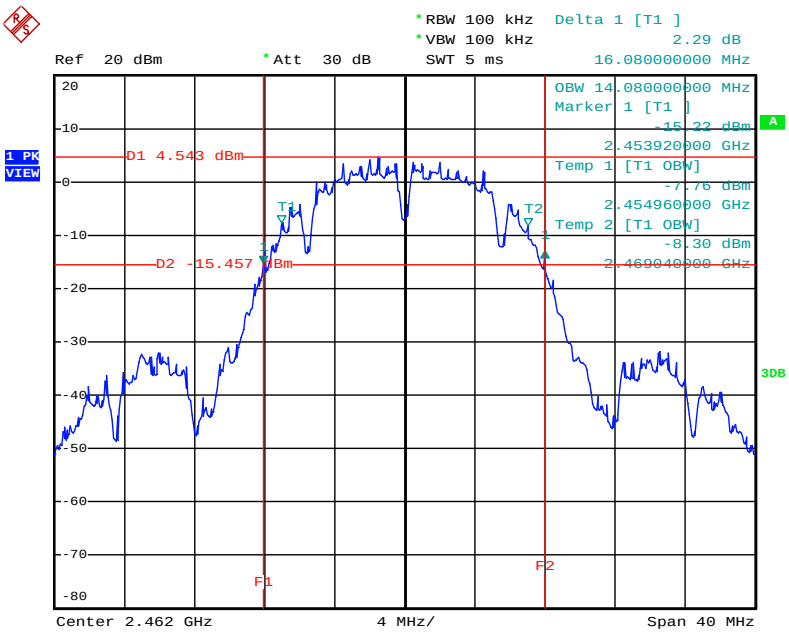
Date: 10.DEC.2012 19:06:40

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11b / 2437 MHz



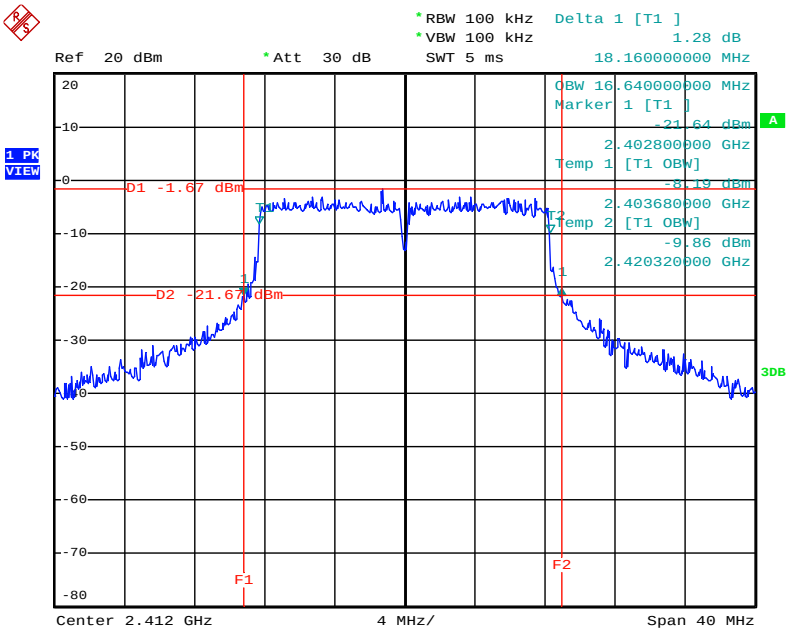
Date: 10.DEC.2012 19:07:26

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11b / 2462 MHz



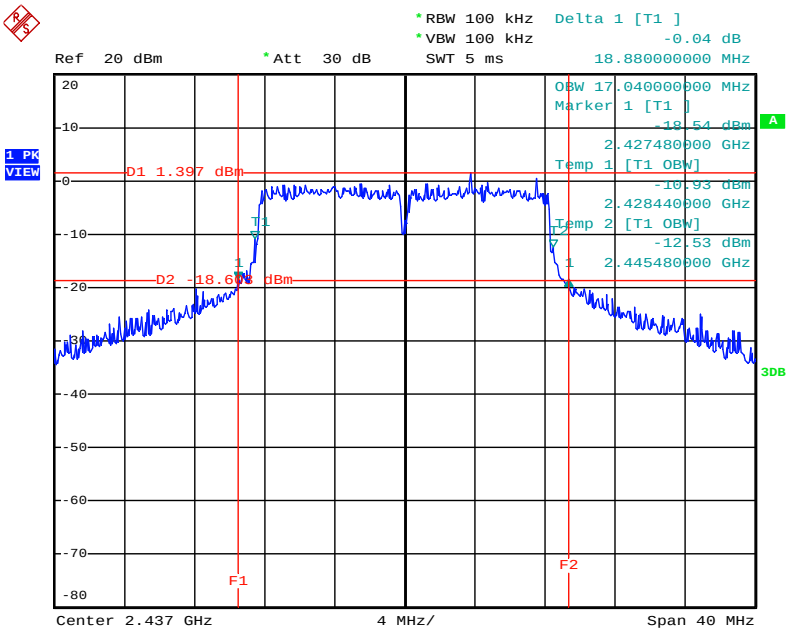
Date: 10.DEC.2012 19:07:59

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11g / 2412 MHz



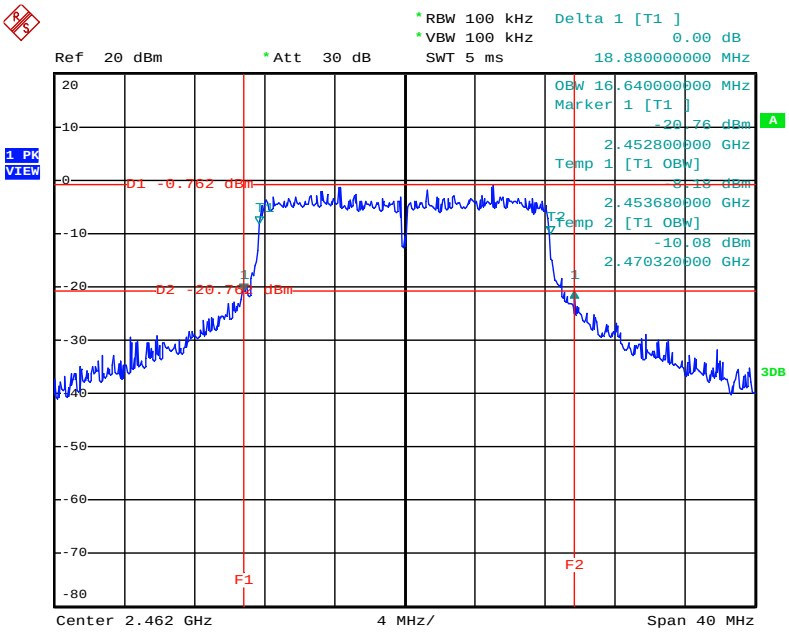
Date: 10.DEC.2012 19:09:36

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11g / 2437 MHz



Date: 10.DEC.2012 19:09:06

20 dB/99% Bandwidth Plot on Configuration IEEE 802.11g / 2462 MHz



Date: 10.DEC.2012 19:08:34

4.4. Radiated Emissions Measurement

4.4.1. Limit

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 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

4.4.2. 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 and receiver.

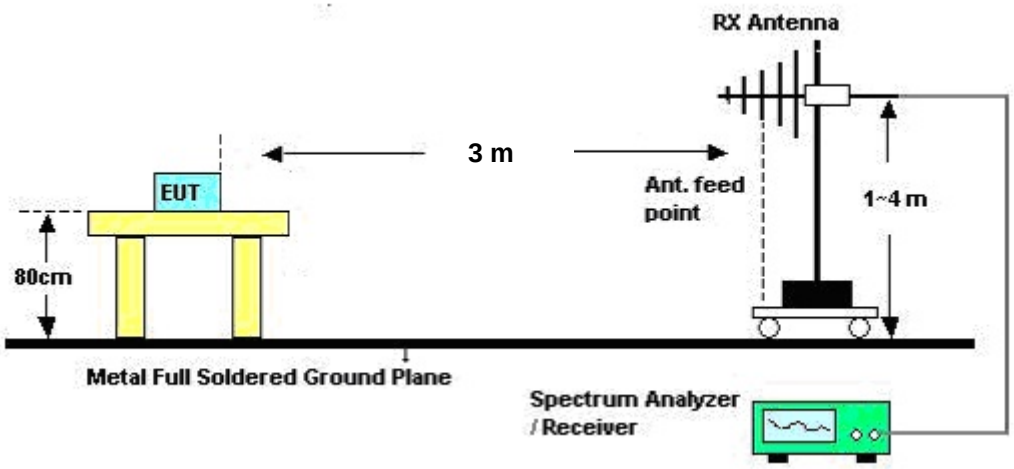
Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average

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

4.4.3. 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.

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

Temperature	20℃	Humidity	70%
Test Engineer	Satoshi Yang	Configurations	CTX / Mode 2

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 20dB below the permissible value has no need to be reported.

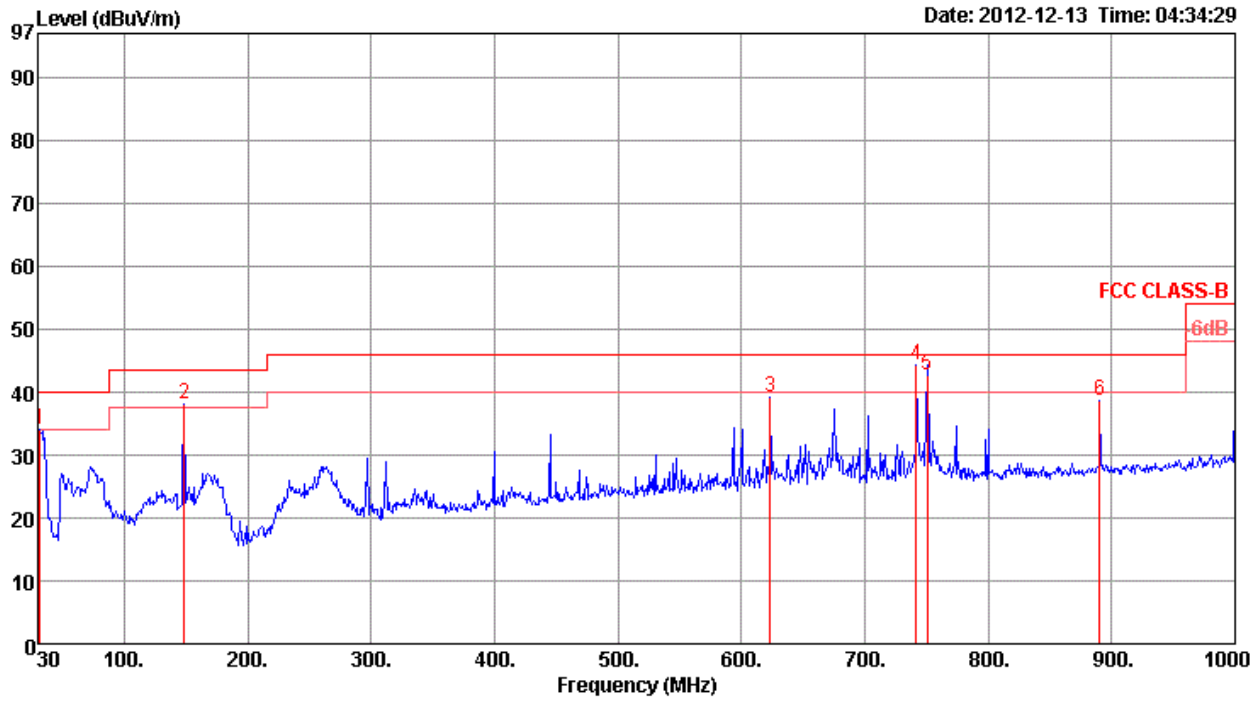
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

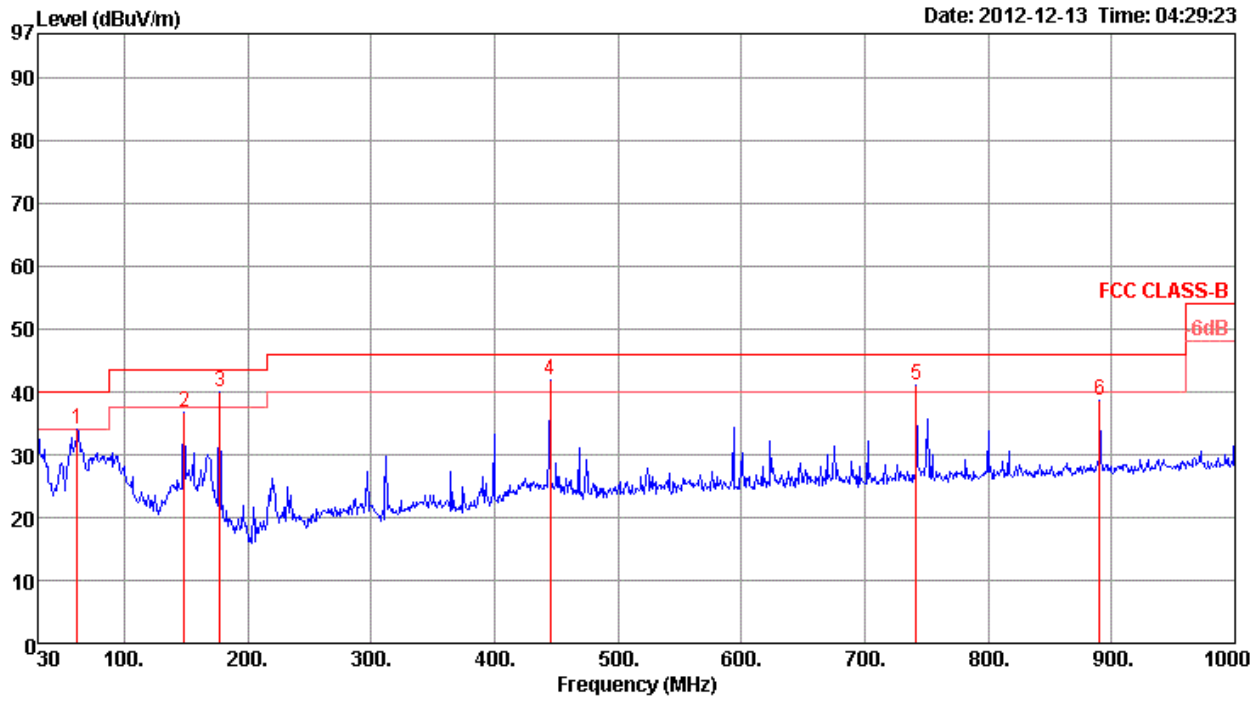
Temperature	20℃	Humidity	70%
Test Engineer	Satoshi Yang	Configurations	CTX / Mode 2

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	31.94	34.15	40.00	-5.85	43.76	0.50	17.69	27.80	Peak	101	0	HORIZONTAL
2	148.34	38.23	43.50	-5.27	52.20	1.45	11.94	27.36	Peak	101	0	HORIZONTAL
3	623.64	39.08	46.00	-6.92	45.28	3.04	18.84	28.08	Peak	101	0	HORIZONTAL
4	741.98	44.21	46.00	-1.79	49.20	3.47	19.37	27.83	QP	100	87	HORIZONTAL
5	750.71	42.63	46.00	-3.37	47.50	3.50	19.43	27.80	QP	131	299	HORIZONTAL
6	890.39	38.65	46.00	-7.35	42.05	3.56	20.46	27.42	Peak	101	0	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	62.01	34.07	40.00	-5.93	54.24	0.84	6.74	27.75	Peak	400	0	VERTICAL
2	148.34	36.74	43.50	-6.76	50.71	1.45	11.94	27.36	Peak	400	0	VERTICAL
3	177.44	40.08	43.50	-3.42	52.57	1.59	13.13	27.21	Peak	400	0	VERTICAL
4	445.16	41.80	46.00	-4.20	50.29	2.57	16.77	27.83	Peak	400	0	VERTICAL
5	741.98	41.16	46.00	-4.84	46.15	3.47	19.37	27.83	Peak	400	0	VERTICAL
6	890.39	38.53	46.00	-7.47	41.93	3.56	20.46	27.42	Peak	400	0	VERTICAL

Note:

The amplitude of spurious emissions which 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.

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

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 20MHz Ch 1
Test Date	Dec. 07, 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	4821.51	59.60	74.00	-14.40	57.52	4.21	34.69	32.56	Peak	43	188	HORIZONTAL
2 a	4821.51	41.39	54.00	-12.61	39.31	4.21	34.69	32.56	Average	43	188	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 p	4824.46	59.41	74.00	-14.59	57.33	4.21	34.69	32.56	Peak	324	100	VERTICAL
2 a	4824.46	41.20	54.00	-12.80	39.12	4.21	34.69	32.56	Average	324	100	VERTICAL

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 20MHz Ch 6
Test Date	Dec. 07, 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	4872.48	64.03	74.00	-9.97	61.82	4.22	34.67	32.66	Peak	122	179	HORIZONTAL
2	a	4872.48	45.82	54.00	-8.18	43.61	4.22	34.67	32.66	Average	122	179	HORIZONTAL
3		7313.94	49.09	74.00	-24.91	41.72	5.34	34.94	36.97	Peak	283	100	HORIZONTAL
4		7313.94	30.88	54.00	-23.12	23.51	5.34	34.94	36.97	Average	283	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	p	4873.88	64.94	74.00	-9.06	62.73	4.22	34.67	32.66	Peak	251	100	VERTICAL
2	a	4873.88	46.73	54.00	-7.27	44.52	4.22	34.67	32.66	Average	251	100	VERTICAL
3		7309.10	49.20	74.00	-24.80	41.82	5.34	34.93	36.97	Peak	320	100	VERTICAL
4		7309.10	30.99	54.00	-23.01	23.61	5.34	34.93	36.97	Average	320	100	VERTICAL

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 20MHz Ch11
Test Date	Dec. 07, 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	4923.93	56.84	74.00	-17.16	54.50	4.23	34.65	32.76	Peak	109	181	HORIZONTAL
2 a	4923.93	38.63	54.00	-15.37	36.29	4.23	34.65	32.76	Average	109	181	HORIZONTAL
3	7382.45	48.85	74.00	-25.15	41.39	5.36	34.96	37.06	Peak	73	181	HORIZONTAL
4	7382.45	30.64	54.00	-23.36	23.18	5.36	34.96	37.06	Average	73	181	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 p	4928.53	59.10	74.00	-14.90	56.76	4.23	34.65	32.76	Peak	250	100	VERTICAL
2 a	4928.53	40.89	54.00	-13.11	38.55	4.23	34.65	32.76	Average	250	100	VERTICAL
3	7383.92	36.84	74.00	-37.16	29.36	5.36	34.96	37.08	Peak	72	100	VERTICAL
4	7383.92	18.63	54.00	-35.37	11.15	5.36	34.96	37.08	Average	72	100	VERTICAL

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 40MHz Ch 3
Test Date	Dec. 07, 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		4843.02	47.01	74.00	-26.99	44.89	4.21	34.68	32.59	Peak	318	100	HORIZONTAL
2		4843.02	28.80	54.00	-25.20	26.68	4.21	34.68	32.59	Average	318	100	HORIZONTAL
3	p	7267.93	49.75	74.00	-24.25	42.41	5.34	34.93	36.93	Peak	142	100	HORIZONTAL
4	a	7267.93	31.54	54.00	-22.46	24.20	5.34	34.93	36.93	Average	142	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	p	4844.19	52.80	74.00	-21.20	50.68	4.21	34.68	32.59	Peak	250	100	VERTICAL
2	a	4844.19	34.59	54.00	-19.41	32.47	4.21	34.68	32.59	Average	250	100	VERTICAL
3		7267.43	49.29	74.00	-24.71	41.95	5.34	34.93	36.93	Peak	318	100	VERTICAL
4		7267.43	31.08	54.00	-22.92	23.74	5.34	34.93	36.93	Average	318	100	VERTICAL

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 40MHz Ch 6
Test Date	Dec. 07, 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	4871.97	58.92	74.00	-15.08	56.71	4.22	34.67	32.66	Peak	122	172	HORIZONTAL
2	a	4871.97	41.71	54.00	-12.29	39.50	4.22	34.67	32.66	Average	122	172	HORIZONTAL
3		7309.61	49.88	74.00	-24.12	42.50	5.34	34.93	36.97	Peak	298	100	HORIZONTAL
4		7309.61	31.67	54.00	-22.33	24.29	5.34	34.93	36.97	Average	298	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	p	4871.97	58.83	74.00	-15.17	56.62	4.22	34.67	32.66	Peak	251	100	VERTICAL
2	a	4871.97	40.62	54.00	-13.38	38.41	4.22	34.67	32.66	Average	251	100	VERTICAL
3		7309.50	49.36	74.00	-24.64	41.98	5.34	34.93	36.97	Peak	137	100	VERTICAL
4		7309.50	31.15	54.00	-22.85	23.77	5.34	34.93	36.97	Average	137	100	VERTICAL

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 40MHz Ch 9
Test Date	Dec. 07, 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	4901.34	43.83	74.00	-30.17	41.58	4.22	34.66	32.69	Peak	161	100	HORIZONTAL
2	4901.34	25.62	54.00	-28.38	23.37	4.22	34.66	32.69	Average	161	100	HORIZONTAL
3 p	7358.04	49.10	74.00	-24.90	41.67	5.35	34.95	37.03	Peak	264	100	HORIZONTAL
4 a	7358.04	30.89	54.00	-23.11	23.46	5.35	34.95	37.03	Average	264	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	4907.13	43.39	74.00	-30.61	41.10	4.22	34.66	32.73	Peak	94	100	VERTICAL
2	4907.13	25.18	54.00	-28.82	22.89	4.22	34.66	32.73	Average	94	100	VERTICAL
3 p	7351.17	49.61	74.00	-24.39	42.18	5.35	34.95	37.03	Peak	164	100	VERTICAL
4 a	7351.17	31.40	54.00	-22.60	23.97	5.35	34.95	37.03	Average	164	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	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11b CH 1
Test Date	Dec. 07, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2325.67	45.40	54.00	-8.60	50.30	2.18	28.02	35.10	Average	126	288	HORIZONTAL
2	2325.67	63.61	74.00	-10.39	68.51	2.18	28.02	35.10	Peak	126	288	HORIZONTAL
3	4823.53	49.12	54.00	-4.88	47.78	3.31	33.06	35.03	Average	165	224	HORIZONTAL
4	4823.53	67.33	74.00	-6.67	65.99	3.31	33.06	35.03	Peak	165	224	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2327.21	46.52	54.00	-7.48	51.42	2.18	28.02	35.10	Average	100	150	VERTICAL
2	2327.21	64.73	74.00	-9.27	69.63	2.18	28.02	35.10	Peak	100	150	VERTICAL
3	4823.59	43.49	54.00	-10.51	42.15	3.31	33.06	35.03	Average	100	349	VERTICAL
4	4823.59	61.70	74.00	-12.30	60.36	3.31	33.06	35.03	Peak	100	349	VERTICAL

Temperature	20℃	Humidity	62%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11b CH 6
Test Date	Dec. 07, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2327.87	43.24	54.00	-10.76	48.14	2.18	28.02	35.10	Average	129	287	HORIZONTAL
2	2327.87	61.45	74.00	-12.55	66.35	2.18	28.02	35.10	Peak	129	287	HORIZONTAL
3	4873.64	42.98	54.00	-11.02	41.52	3.33	33.16	35.03	Average	193	215	HORIZONTAL
4	4873.64	61.19	74.00	-12.81	59.73	3.33	33.16	35.03	Peak	193	215	HORIZONTAL
5	7308.14	27.62	54.00	-26.38	23.00	4.06	35.96	35.40	Average	100	12	HORIZONTAL
6	7308.14	45.83	74.00	-28.17	41.21	4.06	35.96	35.40	Peak	100	12	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2328.03	45.53	54.00	-8.47	50.43	2.18	28.02	35.10	Average	104	147	VERTICAL
2	2328.03	63.74	74.00	-10.26	68.64	2.18	28.02	35.10	Peak	104	147	VERTICAL
3	4873.62	41.92	54.00	-12.08	40.46	3.33	33.16	35.03	Average	104	309	VERTICAL
4	4873.62	60.13	74.00	-13.87	58.67	3.33	33.16	35.03	Peak	104	309	VERTICAL
5	7311.19	30.53	54.00	-23.47	25.91	4.06	35.96	35.40	Average	112	325	VERTICAL
6	7311.19	48.80	74.00	-25.20	44.18	4.06	35.96	35.40	Peak	112	325	VERTICAL

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11b CH 11
Test Date	Dec. 07, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2324.82	41.36	54.00	-12.64	46.26	2.18	28.02	35.10	Average	100	285	HORIZONTAL
2	2324.82	59.57	74.00	-14.43	64.47	2.18	28.02	35.10	Peak	100	285	HORIZONTAL
3	4923.56	44.33	54.00	-9.67	42.73	3.35	33.26	35.01	Average	162	214	HORIZONTAL
4	4923.56	62.54	74.00	-11.46	60.94	3.35	33.26	35.01	Peak	162	214	HORIZONTAL
5	7387.41	29.01	54.00	-24.99	24.26	4.06	36.09	35.40	Average	100	127	HORIZONTAL
6	7387.41	47.22	74.00	-26.78	42.47	4.06	36.09	35.40	Peak	100	127	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2327.71	45.45	54.00	-8.55	50.35	2.18	28.02	35.10	Average	100	148	VERTICAL
2	2327.71	63.66	74.00	-10.34	68.56	2.18	28.02	35.10	Peak	100	148	VERTICAL
3	4923.61	43.91	54.00	-10.09	42.31	3.35	33.26	35.01	Average	100	305	VERTICAL
4	4923.61	62.12	74.00	-11.88	60.52	3.35	33.26	35.01	Peak	100	305	VERTICAL
5	7387.44	34.58	54.00	-19.42	29.83	4.06	36.09	35.40	Average	100	341	VERTICAL
6	7387.44	52.79	74.00	-21.21	48.04	4.06	36.09	35.40	Peak	100	341	VERTICAL

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11g CH 1
Test Date	Dec. 07, 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	4824.75	65.07	74.00	-8.93	62.99	4.21	34.69	32.56	Peak	102	177	HORIZONTAL
2 a	4824.75	46.86	54.00	-7.14	44.78	4.21	34.69	32.56	Average	102	177	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 p	4825.03	61.61	74.00	-12.39	59.53	4.21	34.69	32.56	Peak	324	100	VERTICAL
2 a	4825.03	43.40	54.00	-10.60	41.32	4.21	34.69	32.56	Average	324	100	VERTICAL

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11g CH 6
Test Date	Dec. 07, 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	4872.96	63.86	74.00	-10.14	61.65	4.22	34.67	32.66	Peak	109	147	HORIZONTAL
2	a	4872.96	45.65	54.00	-8.35	43.44	4.22	34.67	32.66	Average	109	147	HORIZONTAL
3		7314.05	50.35	74.00	-23.65	42.98	5.34	34.94	36.97	Peak	21	100	HORIZONTAL
4		7314.05	32.14	54.00	-21.86	24.77	5.34	34.94	36.97	Average	21	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	p	4875.07	65.65	74.00	-8.35	63.44	4.22	34.67	32.66	Peak	251	100	VERTICAL
2	a	4875.07	47.44	54.00	-6.56	45.23	4.22	34.67	32.66	Average	251	100	VERTICAL
3		7311.70	53.25	74.00	-20.75	45.88	5.34	34.94	36.97	Peak	97	100	VERTICAL
4		7311.70	35.04	54.00	-18.96	27.67	5.34	34.94	36.97	Average	97	100	VERTICAL

Temperature	20℃	Humidity	62%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11g CH 11
Test Date	Dec. 07, 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	4923.41	56.68	74.00	-17.32	54.34	4.23	34.65	32.76	Peak	108	183	HORIZONTAL
2 a	4923.41	38.47	54.00	-15.53	36.13	4.23	34.65	32.76	Average	108	183	HORIZONTAL
3	7388.62	48.49	74.00	-25.51	41.01	5.36	34.96	37.08	Peak	280	100	HORIZONTAL
4	7388.62	30.28	54.00	-23.72	22.80	5.36	34.96	37.08	Average	280	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 p	4925.13	60.58	74.00	-13.42	58.24	4.23	34.65	32.76	Peak	251	100	VERTICAL
2 a	4925.13	42.37	54.00	-11.63	40.03	4.23	34.65	32.76	Average	251	100	VERTICAL
3	7385.36	48.87	74.00	-25.13	41.39	5.36	34.96	37.08	Peak	314	100	VERTICAL
4	7385.36	30.66	54.00	-23.34	23.18	5.36	34.96	37.08	Average	314	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.

4.5. Band Edge Emissions Measurement

4.5.1. Limit

Band edge emissions radiated outside of the specified frequency bands shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 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

4.5.2. 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	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average

4.5.3. Test Procedures

1. The test procedure is the same as section 4.2.3, only the frequency range investigated is limited to 2MHz 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.

4.5.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.2.4.

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 Band Edge and Fundamental Emissions

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 20MHz Ch 1, 6, 11
Test Date	Dec. 07, 2012		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2388.60	53.68	54.00	-0.32	23.30	2.21	28.17	0.00	Average	100	133	VERTICAL
2	2388.60	71.89	74.00	-2.11	41.51	2.21	28.17	0.00	Peak	100	133	VERTICAL

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		2389.86	58.64	74.00	-15.36	27.86	2.91	0.00	27.87	Peak	210	103	VERTICAL
2		2389.86	40.43	54.00	-13.57	9.65	2.91	0.00	27.87	Average	210	103	VERTICAL
3	p	2483.64	59.85	74.00	-14.15	29.16	2.96	0.00	27.73	Peak	210	103	VERTICAL
4	a	2483.64	41.64	54.00	-12.36	10.95	2.96	0.00	27.73	Average	210	103	VERTICAL

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2483.50	53.15	54.00	-0.85	22.52	2.26	28.37	0.00	Average	100	143	VERTICAL
2	2483.50	71.36	74.00	-2.64	40.73	2.26	28.37	0.00	Peak	100	143	VERTICAL

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 40MHz Ch 3, 6, 9
Test Date	Dec. 07, 2012		

Channel 3

		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	2388.60	71.56	74.00	-2.44	40.78	2.91	0.00	27.87	Peak	34	100	VERTICAL
2	a	2388.60	53.35	54.00	-0.65	22.57	2.91	0.00	27.87	Average	34	100	VERTICAL

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	p	2389.80	72.06	74.00	-1.94	41.28	2.91	0.00	27.87	Peak	281	104	HORIZONTAL
2	a	2389.80	53.85	54.00	-0.15	23.07	2.91	0.00	27.87	Average	281	104	HORIZONTAL
3	!	2484.20	72.03	74.00	-1.97	41.34	2.96	0.00	27.73	Peak	281	104	HORIZONTAL
4	!	2484.20	53.82	54.00	-0.18	23.13	2.96	0.00	27.73	Average	281	104	HORIZONTAL

Channel 9

		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	2495.20	71.92	74.00	-2.08	41.25	2.97	0.00	27.70	Peak	210	100	VERTICAL
2	a	2495.20	53.71	54.00	-0.29	23.04	2.97	0.00	27.70	Average	210	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.

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11b CH 1, 6, 11
Test Date	Dec. 07, 2012		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2384.87	39.64	54.00	-14.36	9.26	2.21	28.17	0.00	Average	100	209	HORIZONTAL
2	2384.87	57.82	74.00	-16.18	27.44	2.21	28.17	0.00	Peak	100	209	HORIZONTAL

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2389.04	39.83	54.00	-14.17	9.45	2.21	28.17	0.00	Average	100	208	VERTICAL
2	2389.04	58.04	74.00	-15.96	27.66	2.21	28.17	0.00	Peak	100	208	VERTICAL
3	2486.55	40.86	54.00	-13.14	10.19	2.26	28.41	0.00	Average	100	208	VERTICAL
4	2486.55	59.07	74.00	-14.93	28.40	2.26	28.41	0.00	Peak	100	208	VERTICAL

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2487.35	44.84	54.00	-9.16	14.16	2.26	28.42	0.00	Average	100	161	HORIZONTAL
2	2487.35	63.05	74.00	-10.95	32.37	2.26	28.42	0.00	Peak	100	161	HORIZONTAL

Temperature	20℃	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11g CH 1, 6, 11
Test Date	Dec. 07, 2012		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2389.20	53.32	54.00	-0.68	22.94	2.21	28.17	0.00	Average	100	135	VERTICAL
2	2389.20	71.53	74.00	-2.47	41.15	2.21	28.17	0.00	Peak	100	135	VERTICAL

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2388.80	38.78	54.00	-15.22	8.40	2.21	28.17	0.00	Average	100	190	VERTICAL
2	2388.80	56.99	74.00	-17.01	26.61	2.21	28.17	0.00	Peak	100	190	VERTICAL
3	2483.30	37.12	54.00	-16.88	6.49	2.26	28.37	0.00	Average	100	190	VERTICAL
4	2483.30	55.33	74.00	-18.67	24.70	2.26	28.37	0.00	Peak	100	190	VERTICAL

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2483.90	53.96	54.00	-0.04	23.33	2.26	28.37	0.00	Average	100	145	VERTICAL
2	2483.90	72.17	74.00	-1.83	41.54	2.26	28.37	0.00	Peak	100	145	VERTICAL

Note:

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

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

4.6. Antenna Requirements

4.6.1. 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,

4.6.2. 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
EMI Test Receiver	R&S	ESCS 30	100377	9kHz ~ 2.75GHz	Sep. 14, 2012	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	4083	150kHz ~ 100MHz	Nov. 14, 2012	Conduction (CO01-CB)
V- LISN	Schwarzbeck	NSLK 8127	8127-478	9K ~ 30MHz	Jun. 22, 2012	Conduction (CO01-CB)
PULSE LIMITER	R&S	ESH3-Z2	100430	9K~30MHz	Feb. 03, 2012	Conduction (CO01-CB)
COND Cable	Woken	Cable	1	0.15MHz~30MHz	Dec. 04, 2011	Conduction (CO01-CB)
COND Cable	Woken	Cable	1	0.15MHz~30MHz	Dec. 04, 2012	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Jan. 11, 2012	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 27, 2011	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 27, 2012	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Nov. 23, 2011	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Nov. 23, 2012	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 27, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 27, 2012	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 23, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 23, 2012	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. 16, 2011	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100056	9KHz~40GHz	Nov. 16, 2012	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 20, 2012	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N.C.R	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 18, 2011	Radiation (03CH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 18, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 18, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 18, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 18, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Nov. 05, 2012*	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9KHz~40GHz	Oct. 08, 2012	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 05, 2012	Conducted (TH01-CB)
Signal Generator	R&S	SMR40	100302	10MHz-40GHz	Nov. 27, 2012	Conducted (TH01-CB)
RF Power Divider	Woken	2 Way	0120A02056002D	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)
RF Power Divider	Woken	3 Way	MDC2366	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)
RF Power Divider	Woken	4 Way	0120A04056002D	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)
Signal generator	R&S	SMU200A	102782	10MHz-40GHz	Sep. 26, 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	Dec. 06, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 19, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 19, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 19, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 19, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 19, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Nov. 28, 2012	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Nov. 27, 2012	Conducted (TH01-CB)
Mixer	OML	M19HW/A	U91113-1	40 ~ 60 GHz	Mar. 23, 2011*	Radiation (TH01-CB)
Mixer	OML	M15HW/A	V91113-1	50 ~ 75 GHz	Mar. 23, 2011*	Radiation (TH01-CB)
Diplexer	OML	DPL313B	N/A	40~200GHz	N.C.R	Radiation (TH01-CB)
Mixer	OML	M12HW/A	E91113-1	60 ~ 90 GHz	Mar. 23, 2011*	Radiation (TH01-CB)
Mixer	OML	M08HW/A	F91113-1	90 ~ 140 GHz	Mar. 23, 2011*	Radiation (TH01-CB)
Mixer	OML	M05HW/A	G91113-1	140 ~ 220 GHz	N.C.R	Radiation (TH01-CB)
Standard Horn Antenna	Custom Microwave	HO19R	U91113-A	40 ~ 60 GHz	N.C.R	Radiation (TH01-CB)
Standard Horn Antenna	Custom Microwave	HO15R	V91113-A	50 ~ 75 GHz	N.C.R	Radiation (TH01-CB)
Standard Horn Antenna	Custom Microwave	HO12R	E91113-A	60 ~ 90 GHz	N.C.R	Radiation (TH01-CB)
Standard Horn Antenna	Custom Microwave	HO08R	F91113-A	90 ~ 140 GHz	N.C.R	Radiation (TH01-CB)
Standard Horn Antenna	Custom Microwave	HO05R	G91113-A	140 ~ 220 GHz	N.C.R	Radiation (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