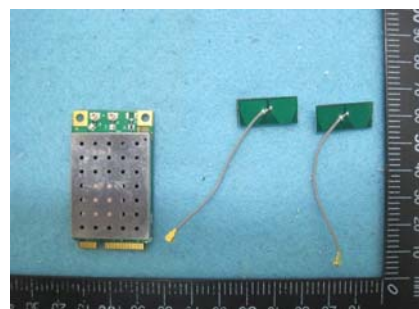


FCC RADIO TEST REPORT

Applicant's company	Alpha Networks Inc.
Applicant Address	No.8 Li-shing 7th Rd., Science-based Industrial Park, Hsinchu, Taiwan, R.O.C.
FCC ID	RRK-2012070022
Manufacturer's company	Alpha Networks Inc.
Manufacturer Address	No.8 Li-shing 7th Rd., Science-based Industrial Park, Hsinchu, Taiwan, R.O.C.
Manufacturer's company	Alpha Networks (Dongguan) Co., Ltd.
Manufacturer Address	Xin An District, Chang An Town, DongGuan City, GuangDong Province, China

Product Name	WIRELESS AC MODULE
Brand Name	ALPHA
Model Name	WMC-AC02
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	5725 ~ 5850MHz
Received Date	Jan. 04, 2013
Final Test Date	Jan. 17, 2013
Submission Type	Original Equipment



Statement

Test result included is only for the IEEE 802.11n part and IEEE 802.11a/ac (5725 ~ 5850MHz) 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**,

47 CFR FCC Part 15 Subpart C, KDB 558074 D01 v02 and KDB 662911 D01 v01r02.

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

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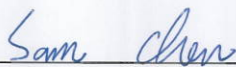
History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR310926AA	Rev. 01	Initial issue of report	Jan. 30, 2013

1. CERTIFICATE OF COMPLIANCE

Product Name : WIRELESS AC MODULE
Brand Name : ALPHA
Model Name : WMC-AC02
Applicant : Alpha Networks 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 Jan. 04, 2013 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.



Sam 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	10.70 dB
4.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	4.41 dB
4.3	15.247(e)	Power Spectral Density	Complies	8.13 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	3.24 dB
4.6	15.247(d)	Band Edge Emissions	Complies	-
4.7	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Conducted Output Power	±0.8dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
6dB Spectrum Bandwidth	±8.5×10 ⁻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°C	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/ac

Items	Description
Product Type	WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From Host System
Modulation	see the below table for IEEE 802.11n/ac
Data Modulation	For 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM) For 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n
Frequency Range	5725 ~ 5850MHz
Channel Number	5 for 20MHz bandwidth ; 2 for 40MHz bandwidth ; 1 for 80MHz bandwidth
Channel Band Width (99%)	MCS0 (20MHz): 20.48 MHz ; MCS0 (40MHz): 41.92 MHz ; MCS0 (80MHz): 76.80 MHz
Maximum Conducted Output Power	11n: MCS0 (20MHz): 25.57 dBm ; MCS0 (40MHz): 25.56 dBm 11ac: MCS0 (20MHz): 25.59 dBm ; MCS0 (40MHz): 25.51 dBm ; MCS0 (80MHz): 24.96 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

802.11a

Items	Description
Product Type	WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From Host System
Modulation	OFDM for IEEE 802.11a
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	OFDM (6/9/12/18/24/36/48/54)
Frequency Range	5725 ~ 5850MHz
Channel Number	5
Channel Band Width (99%)	20.40 MHz
Maximum Conducted Output Power	25.56 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Antenna & Band width

Antenna	Two (TX)		
Band width Mode	20 MHz	40 MHz	80 MHz
IEEE 802.11a	V	X	X
IEEE 802.11n	V	V	X
IEEE 802.11ac	V	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

IEEE 802. 11a, 11n and 11ac Spec.

Worst Modulation Used for Conformance Testing				
Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS	Worst Data Rate / MCS	Worst Modulation Mode
802.11a	2	6-54 Mbps	6Mbps	11A5.8G-20M
802.11n 20MHz	2	MCS 0-15	MCS 0	11N5.8G-20M
802.11n 40MHz	2	MCS 0-15	MCS 0	11N5.8G-40M
802.11ac 20MHz	2	MCS 0-9	MCS 0-Nss1	11AC5.8G-20M
802.11ac 40MHz	2	MCS 0-9	MCS 0-Nss1	11AC5.8G-40M
802.11ac 80MHz	2	MCS 0-9	MCS 0-Nss1	11AC5.8G-80M
Note 1: IEEE 802.11 modulation consists of IEEE 802.11a.				
Note 2: IEEE 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Worst modulation mode of Guard Interval (GI) is 400ns.				
Note 3: IEEE 802.11ac modulation consists of VHT20, VHT40, VHT80 and VHT160. Then EUT support VHT20, VHT40, VHT80. (VHT: Very High Throughput).				
Note 4: Modulation modes consist of 11A5.8G-20M, 11N5.8G-20M, 11N5.8G-40M, 11AC5.8G-20M, 11AC5.8G-40M, 11AC5.8G-80M.				
Note 5: 11A: IEEE 802.11a, 11N: IEEE 802.11n, 11AC: IEEE 802.11ac. 5.8G: 5.725-5.850GHz band				
Note 6: 20M/40M/80M: Channel Bandwidth 20MHz/40MHz/80MHz				

3.2. Accessories

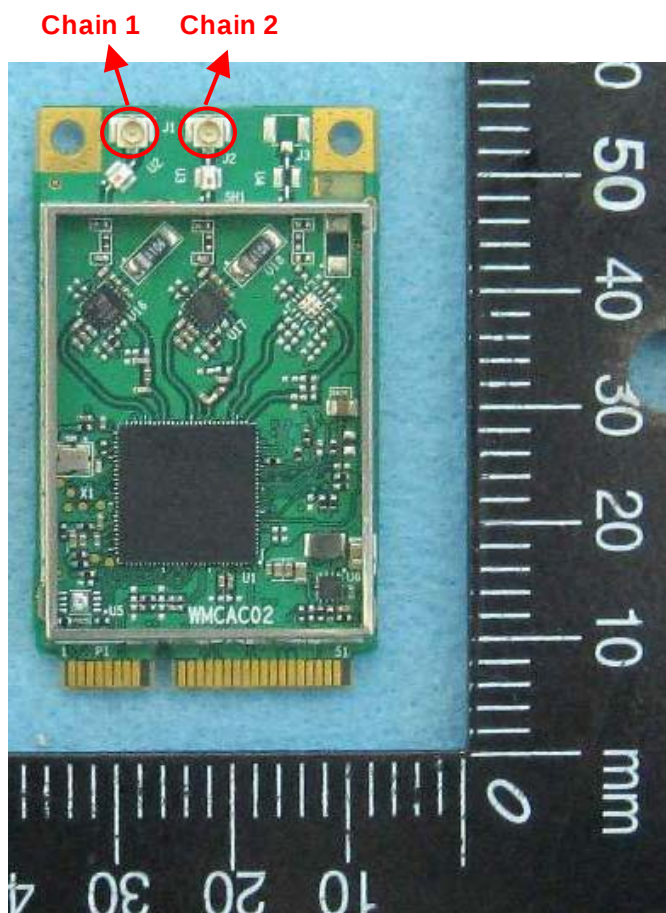
N/A

3.3. Table for Filed Antenna

Chain	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Loss of External Cable (dB)	True Gain (dBi)	Remark
1	WHA YU	SSR-30247	PCB Antenna	I-PEX	4	0.18	3.82	TX / RX
2	WHA YU	SSR-30247	PCB Antenna	I-PEX	4	0.18	3.82	TX / RX

Note: The EUT has two Chains.

Chain 1 and Chain 2 could transmit/receive simultaneously.



3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 149, 153, 157, 161, 165.

For 40MHz bandwidth systems, use Channel 151, 159.

For 80MHz bandwidth systems, use Channel 155.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5725~5850 MHz Band 4	149	5745 MHz	157	5785 MHz
	151	5755 MHz	159	5795 MHz
	153	5765 MHz	161	5805 MHz
	155	5775 MHz	165	5825 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	Chain
AC Power Line Conducted Emissions	CTX/11a	6Mbps	-	1+2
Maximum Conducted Output Power	MCS0/20MHz	7.2 Mbps	149/157/165	1+2
	MCS0/40MHz	14.4 Mbps	151/159	1+2
	MCS0/80MHz	Nss1	155	1+2
	11a/BPSK	6 Mbps	149/157/165	1+2
Power Spectral Density	MCS0/20MHz	7.2 Mbps	149/157/165	1+2
	MCS0/40MHz	14.4 Mbps	151/159	1+2
	MCS0/80MHz	Nss1	155	1+2
	11a/BPSK	6 Mbps	149/157/165	1+2
6dB Spectrum Bandwidth	MCS0/20MHz	7.2 Mbps	149/157/165	1+2
	MCS0/40MHz	14.4 Mbps	151/159	1+2
	MCS0/80MHz	Nss1	155	1+2
	11a/BPSK	6 Mbps	149/157/165	1+2
Radiated Emissions Below 1GHz	CTX/11a	6Mbps	-	1+2
Radiated Emissions Above 1GHz	MCS0/20MHz	7.2 Mbps	149/157/165	1+2
	MCS0/40MHz	14.4 Mbps	151/159	1+2
	MCS0/80MHz	Nss1	155	1+2
	11a/BPSK	6 Mbps	149/157/165	1+2
Band Edge Emissions	MCS0/20MHz	7.2 Mbps	149/157/165	1+2
	MCS0/40MHz	14.4 Mbps	151/159	1+2
	MCS0/80MHz	Nss1	155	1+2
	11a/BPSK	6 Mbps	149/157/165	1+2

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-CB	Conduction	Hsin Chu	262045	IC 4086D
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

<For Radiated Emissions, Band Edge Emissions and AC Power Line Conducted Emissions test:>

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	E2K4965AGNM

<For Maximum Conducted Output Power, Power Spectral Density and 6dB Spectrum Bandwidth test:>

Support Unit	Brand	Model	FCC ID
Notebook	DELL	M1330	E2KWM3945ABG

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 MCS0 20MHz / Chain 1 + Chain 2 (2TX)

Test Software Version	Manual Tool Version:1.0.0.10		
Frequency	5745 MHz	5785 MHz	5825 MHz
MCS0 20MHz	90	90	90

Power Parameters of IEEE 802.11n MCS0 40MHz / Chain 1 + Chain 2 (2TX)

Test Software Version	Manual Tool Version:1.0.0.10	
Frequency	5755 MHz	5795 MHz
MCS0 40MHz	90	90

Power Parameters of IEEE 802.11ac MCS0 20MHz / Chain 1 + Chain 2 (2TX)

Test Software Version	Manual Tool Version:1.0.0.10		
Frequency	5745 MHz	5785 MHz	5825 MHz
MCS0 20MHz	90	90	90

Power Parameters of IEEE 802.11ac MCS0 40MHz / Chain 1 + Chain 2 (2TX)

Test Software Version	Manual Tool Version:1.0.0.10	
Frequency	5755 MHz	5795 MHz
MCS0 40MHz	90	90

Power Parameters of IEEE 802.11ac MCS0 80MHz / Chain 1 + Chain 2 (2TX)

Test Software Version	Manual Tool Version:1.0.0.10	
Frequency	5775 MHz	
MCS0 80MHz	90	

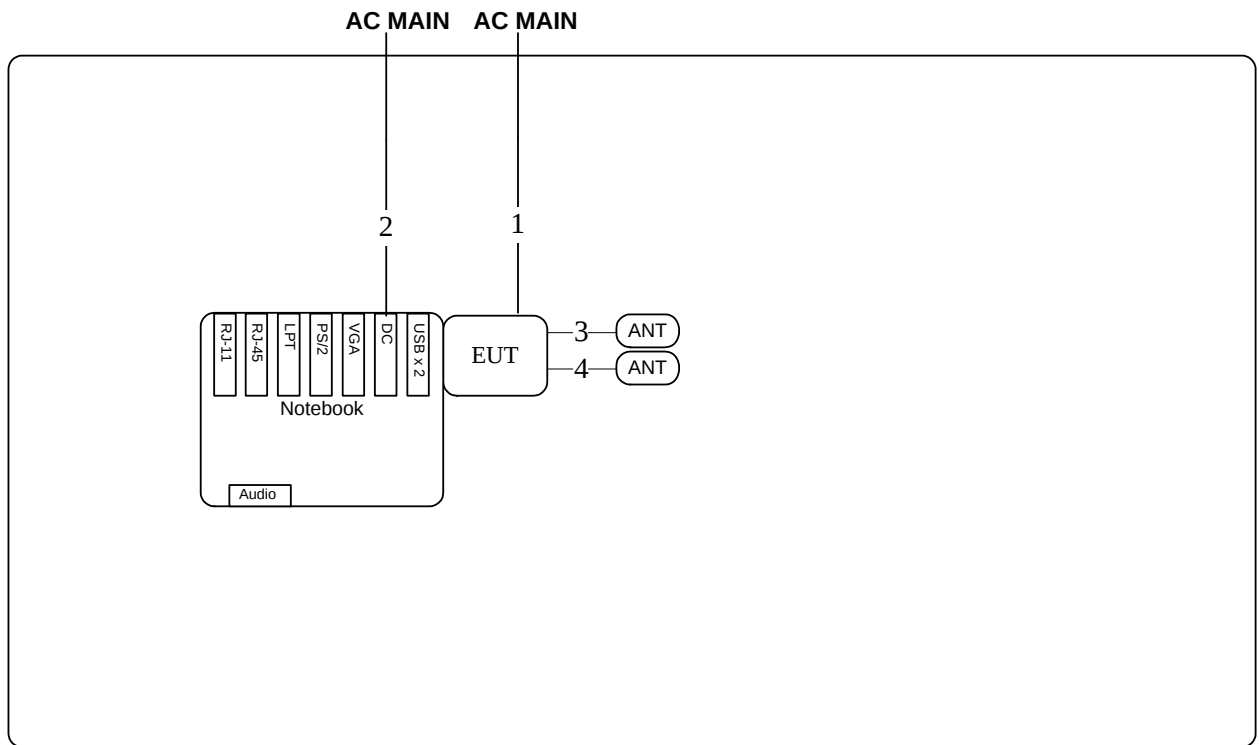
Power Parameters of IEEE 802.11a / Chain 1 + Chain 2 (2TX)

Test Software Version	Manual Tool Version:1.0.0.10		
Frequency	5745 MHz	5785 MHz	5825 MHz
IEEE 802.11a	90	90	90

During the test, "Manual Tool Version:1.0.0.10" under WIN XP was executed the test program to control the EUT continuously transmit RF signal.

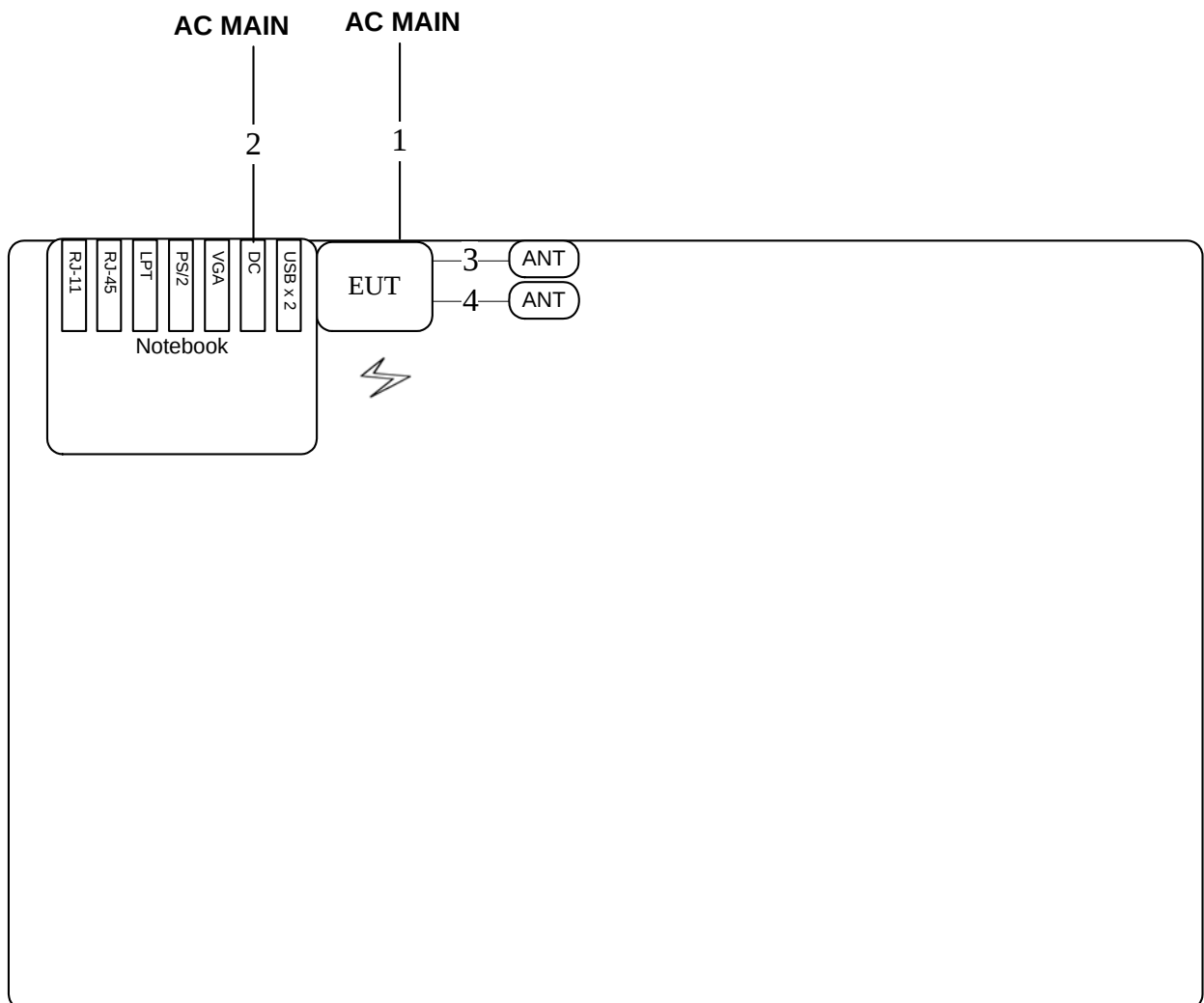
3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration



Item	Connection	Shield	Length
1	Power cable	No	1.5m
2	Power cable	No	2.6m
3	Antenna cable	No	0.09m
4	Antenna cable	No	0.13m

3.9.2. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shield	Length
1	Power cable	No	1.5m
2	Power cable	No	2.6m
3	Antenna cable	No	0.09m
4	Antenna cable	No	0.13m

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

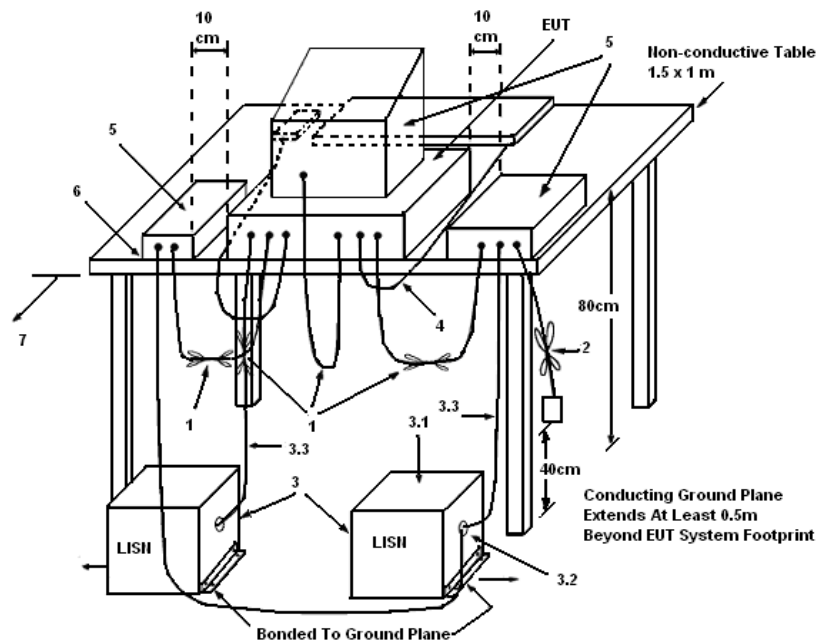
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

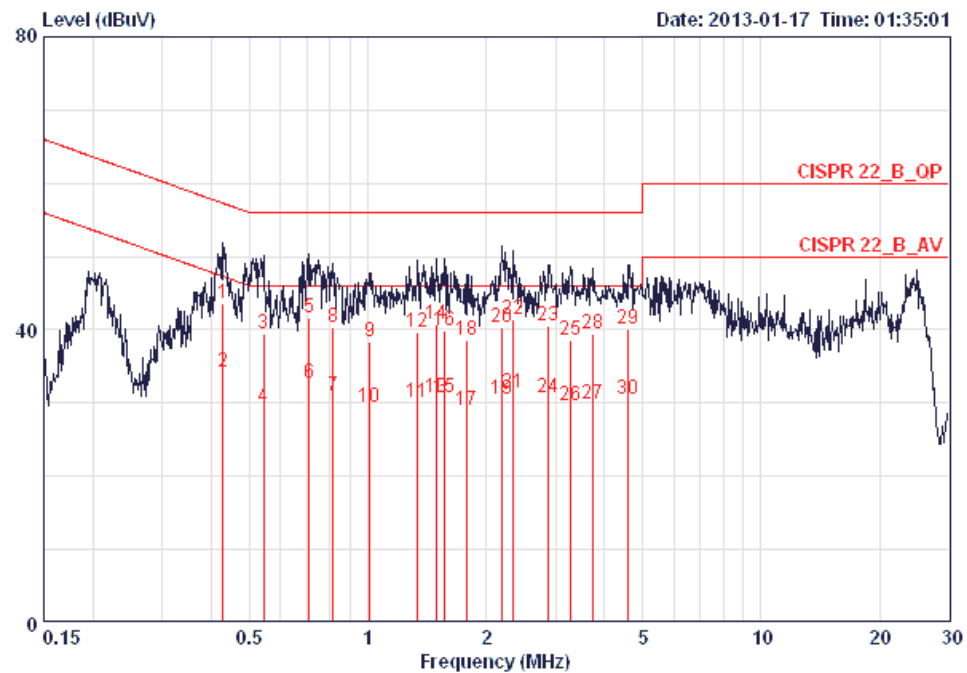
There is no deviation with the original standard.

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

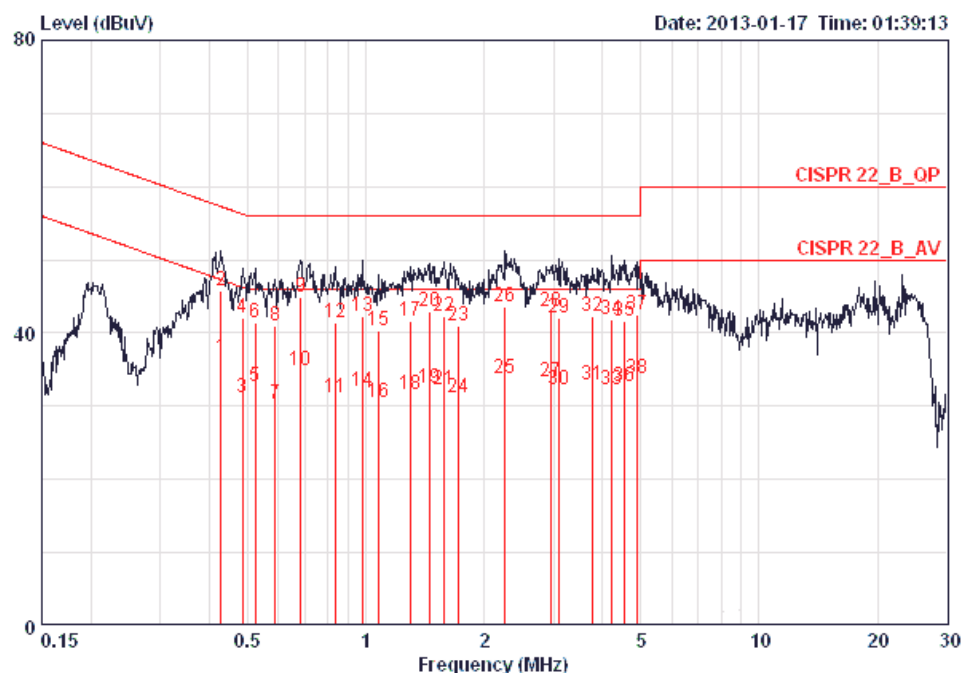
Temperature	24°C	Humidity	60%
Test Engineer	Simon Yang	Phase	Line
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.42825	43.66	-13.63	57.29	43.38	0.08	0.20	QP
2	0.42825	34.32	-12.97	47.29	34.04	0.08	0.20	AVERAGE
3	0.54355	39.41	-16.59	56.00	39.13	0.08	0.20	QP
4	0.54355	29.42	-16.58	46.00	29.14	0.08	0.20	AVERAGE
5	0.70842	41.64	-14.37	56.00	41.35	0.09	0.20	QP
6	0.70842	32.63	-13.38	46.00	32.34	0.09	0.20	AVERAGE
7	0.81737	30.95	-15.05	46.00	30.66	0.09	0.20	AVERAGE
8	0.81737	40.41	-15.59	56.00	40.12	0.09	0.20	QP
9	1.010	38.26	-17.74	56.00	37.97	0.09	0.20	QP
10	1.010	29.49	-16.51	46.00	29.20	0.09	0.20	AVERAGE
11	1.338	30.08	-15.92	46.00	29.77	0.10	0.21	AVERAGE
12	1.338	39.70	-16.30	56.00	39.39	0.10	0.21	QP
13	1.487	30.75	-15.25	46.00	30.43	0.10	0.22	AVERAGE
14	1.487	40.71	-15.29	56.00	40.39	0.10	0.22	QP
15	1.568	30.70	-15.30	46.00	30.38	0.10	0.22	AVERAGE
16	1.568	39.97	-16.03	56.00	39.65	0.10	0.22	QP
17	1.781	28.96	-17.04	46.00	28.63	0.11	0.23	AVERAGE
18	1.781	38.56	-17.44	56.00	38.23	0.11	0.23	QP
19	2.190	30.44	-15.56	46.00	30.09	0.11	0.23	AVERAGE
20	2.190	40.30	-15.70	56.00	39.95	0.11	0.23	QP
21	2.346	31.40	-14.60	46.00	31.05	0.11	0.24	AVERAGE
22	2.346	41.44	-14.56	56.00	41.09	0.11	0.24	QP
23	2.884	40.51	-15.49	56.00	40.14	0.12	0.25	QP
24	2.884	30.65	-15.35	46.00	30.28	0.12	0.25	AVERAGE
25	3.276	38.66	-17.34	56.00	38.27	0.12	0.27	QP

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
26	3.276	29.59	-16.41	46.00	29.20	0.12	0.27	AVERAGE
27	3.740	29.76	-16.24	46.00	29.34	0.13	0.29	AVERAGE
28	3.740	39.42	-16.58	56.00	39.00	0.13	0.29	QP
29	4.598	40.12	-15.88	56.00	39.67	0.14	0.31	QP
30	4.598	30.62	-15.38	46.00	30.17	0.14	0.31	AVERAGE

Temperature	24°C	Humidity	60%
Test Engineer	Simon Yang	Phase	Neutral
Configuration	CTX		



	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.42825	36.59	-10.70	47.29	36.24	0.15	0.20	AVERAGE
2	0.42825	45.80	-11.49	57.29	45.45	0.15	0.20	QP
3	0.48632	31.14	-15.09	46.23	30.79	0.15	0.20	AVERAGE
4	0.48632	42.14	-14.09	56.23	41.79	0.15	0.20	QP
5	0.52376	32.62	-13.38	46.00	32.27	0.15	0.20	AVERAGE
6	0.52376	41.46	-14.54	56.00	41.11	0.15	0.20	QP
7	0.58851	30.29	-15.71	46.00	29.93	0.16	0.20	AVERAGE
8	0.58851	40.96	-15.04	56.00	40.60	0.16	0.20	QP
9	0.68263	44.86	-11.14	56.00	44.50	0.16	0.20	QP
10	0.68263	34.80	-11.20	46.00	34.44	0.16	0.20	AVERAGE
11	0.83488	31.16	-14.85	46.00	30.79	0.17	0.20	AVERAGE
12	0.83488	41.33	-14.68	56.00	40.96	0.17	0.20	QP
13	0.97871	42.21	-13.79	56.00	41.88	0.17	0.16	QP
14	0.97871	32.13	-13.87	46.00	31.80	0.17	0.16	AVERAGE
15	1.077	40.34	-15.66	56.00	39.96	0.17	0.20	QP
16	1.077	30.53	-15.47	46.00	30.15	0.17	0.20	AVERAGE
17	1.296	41.53	-14.47	56.00	41.14	0.18	0.21	QP
18	1.296	31.52	-14.48	46.00	31.13	0.18	0.21	AVERAGE
19	1.449	32.59	-13.41	46.00	32.19	0.18	0.22	AVERAGE
20	1.449	42.93	-13.07	56.00	42.53	0.18	0.22	QP
21	1.585	32.33	-13.67	46.00	31.93	0.18	0.22	AVERAGE
22	1.585	42.24	-13.76	56.00	41.84	0.18	0.22	QP
23	1.716	41.02	-14.98	56.00	40.61	0.18	0.22	QP
24	1.716	31.26	-14.74	46.00	30.85	0.18	0.22	AVERAGE
25	2.261	33.69	-12.31	46.00	33.26	0.19	0.24	AVERAGE

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
26	2.261	43.50	-12.50	56.00	43.07	0.19	0.24	QP
27	2.946	33.32	-12.68	46.00	32.87	0.20	0.25	AVERAGE
28	2.946	42.84	-13.16	56.00	42.39	0.20	0.25	QP
29	3.090	42.07	-13.93	56.00	41.61	0.21	0.25	QP
30	3.090	32.25	-13.75	46.00	31.79	0.21	0.25	AVERAGE
31	3.759	33.02	-12.98	46.00	32.51	0.22	0.29	AVERAGE
32	3.759	42.31	-13.69	56.00	41.80	0.22	0.29	QP
33	4.224	32.34	-13.66	46.00	31.81	0.22	0.30	AVERAGE
34	4.224	41.81	-14.19	56.00	41.28	0.22	0.30	QP
35	4.525	41.58	-14.42	56.00	41.04	0.23	0.31	QP
36	4.525	32.70	-13.30	46.00	32.16	0.23	0.31	AVERAGE
37	4.900	42.46	-13.54	56.00	41.90	0.24	0.32	QP
38	4.900	33.70	-12.30	46.00	33.14	0.24	0.32	AVERAGE

Note:

Level = Read Level + LISN Factor + Cable Loss

4.2. Maximum Conducted Output Power Measurement

4.2.1. Limit

Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter output power.

4.2.2. Measuring Instruments and Setting

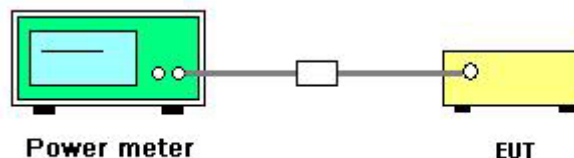
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	Average

4.2.3. Test Procedures

1. Test procedures refer KDB558074 v01 r02 section 8.2.3 option 3.
2. This procedure provides an alternative for determining the RMS output power using a broadband RF average power meter with a thermocouple detector.

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 Maximum Conducted Output Power

Temperature	25°C	Humidity	56%
Test Engineer	Magic Lai	Configurations	IEEE 802.11n/ac
Test Date	Jan. 16, 2013		

Configuration IEEE 802.11n MCS0 20MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Chain 1	Chain 2			
149	5745 MHz	22.80	22.31	25.57	30.00	Complies
157	5785 MHz	22.75	22.33	25.56	30.00	Complies
165	5825 MHz	22.67	22.36	25.53	30.00	Complies

Configuration IEEE 802.11n MCS0 40MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Chain 1	Chain 2			
151	5755 MHz	22.50	22.60	25.56	30.00	Complies
159	5795 MHz	22.35	22.58	25.48	30.00	Complies

Configuration IEEE 802.11ac MCS0 20MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Chain 1	Chain 2			
149	5745 MHz	22.78	22.36	25.59	30.00	Complies
157	5785 MHz	22.72	22.34	25.54	30.00	Complies
165	5825 MHz	22.67	22.44	25.57	30.00	Complies

Configuration IEEE 802.11ac MCS0 40MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Chain 1	Chain 2			
151	5755 MHz	22.40	22.59	25.51	30.00	Complies
159	5795 MHz	22.28	22.57	25.44	30.00	Complies

Configuration IEEE 802.11ac MCS0 80MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Chain 1	Chain 2			
155	5775 MHz	21.99	21.90	24.96	30.00	Complies

Temperature	25°C	Humidity	56%
Test Engineer	Magic Lai	Configurations	IEEE 802.11a
Test Date	Jan. 16, 2013		

Configuration IEEE 802.11a / Chain 1 + Chain 2 (2TX)

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Chain 1	Chain 2			
149	5745 MHz	22.80	22.27	25.55	30.00	Complies
157	5785 MHz	22.72	22.38	25.56	30.00	Complies
165	5825 MHz	22.63	22.40	25.53	30.00	Complies

4.3. Power Spectral Density Measurement

4.3.1. Limit

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

4.3.2. Measuring Instruments and Setting

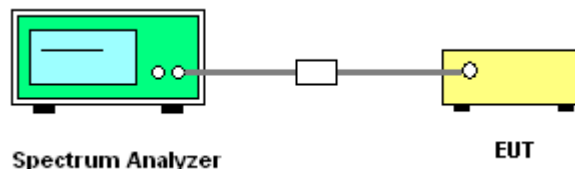
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Set the span to 1.5 times the DTS channel bandwidth.
RB	100 kHz
VB	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto couple

4.3.3. Test Procedures

1. Test procedures refer KDB558074 v01 r02 section 9.1 option 1
2. Spectrum analyzer must be capable of utilizing a number of measurement points in each sweep that is greater than or equal to twice the span/RBW in order to ensure bin-to-bin spacing of $\leq RBW/2$ so that narrowband signals are not lost between frequency bins.
3. 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.
4. Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$ (use of a greater number of measurement points than this minimum requirement is recommended).
5. Use the peak marker function to determine the maximum level in any 100 kHz band segment within the fundamental EBW.
6. 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: $BWCF = 10\log (3 \text{ kHz}/100 \text{ kHz} = -15.2 \text{ dB})$.
7. The resulting PSD level must be $\leq 8 \text{ dBm}$.
8. When measuring power spectral density with multiple antenna systems, add every result of the values by mathematic formula.

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 Power Spectral Density

Temperature	25°C	Humidity	56%
Test Engineer	Magic Lai	Configurations	IEEE 802.11n/ac

Configuration IEEE 802.11n MCS0 20MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port Limit (dBm/3kHz)	Result
		Chain 1	Chain 2		Chain 1	Chain 2		
149	5745 MHz	11.98	12.03	-15.23	-3.25	-3.20	4.99	Complies
157	5785 MHz	11.91	11.98	-15.23	-3.32	-3.25	4.99	Complies
165	5825 MHz	12.09	11.91	-15.23	-3.14	-3.32	4.99	Complies

Note: PSD Limit = (8dBm/MHz - (10log(2))) = 4.99dBm/MHz

Configuration IEEE 802.11n MCS0 40MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port Limit (dBm/3kHz)	Result
		Chain 1	Chain 2		Chain 1	Chain 2		
151	5755 MHz	9.44	9.41	-15.23	-5.79	-5.82	4.99	Complies
159	5795 MHz	9.13	9.21	-15.23	-6.10	-6.02	4.99	Complies

Note: PSD Limit = (8dBm/MHz - (10log(2))) = 4.99dBm/MHz

Configuration IEEE 802.11ac MCS0 80MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port Limit (dBm/3kHz)	Result
		Chain 1	Chain 2		Chain 1	Chain 2		
155	5775 MHz	4.52	5.01	-15.23	-10.71	-10.22	4.99	Complies

Note: PSD Limit = (8dBm/MHz - (10log(2))) = 4.99dBm/MHz

Temperature	25°C	Humidity	56%
Test Engineer	Magic Lai	Configurations	IEEE 802.11a

Configuration IEEE 802.11a / Chain 1 + Chain 2 (2TX)

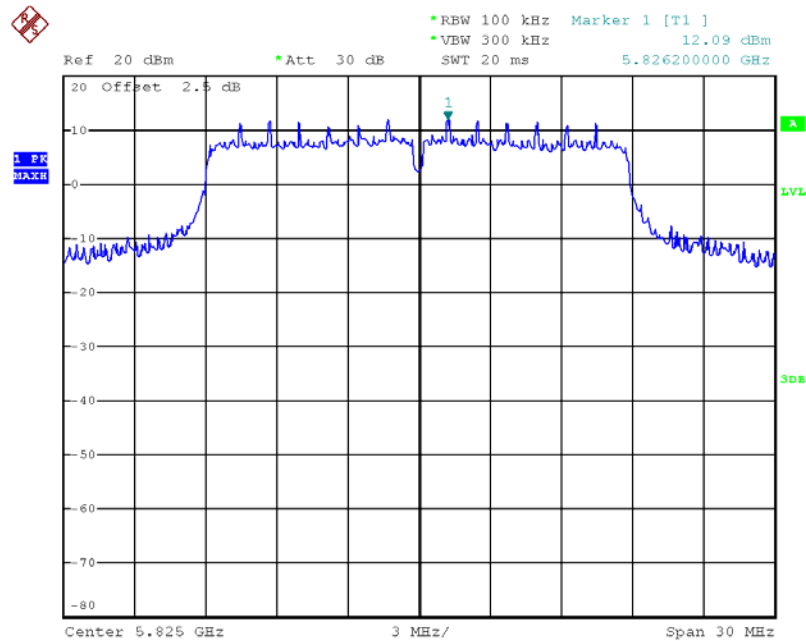
Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port Limit (dBm/3kHz)	Result
		Chain 1	Chain 2		Chain 1	Chain 2		
149	5745 MHz	10.54	11.36	-15.23	-4.69	-3.87	4.99	Complies
157	5785 MHz	10.84	10.69	-15.23	-4.39	-4.54	4.99	Complies
165	5825 MHz	10.31	11.02	-15.23	-4.92	-4.21	4.99	Complies

Note: PSD Limit = (8dBm/MHz - (10log(2))) = 4.99dBm/MHz

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

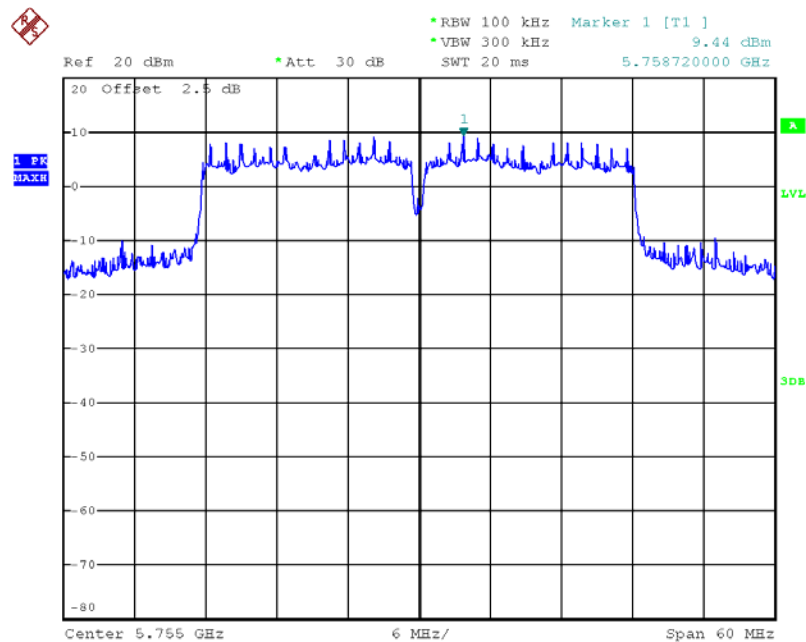
For plots, only the channel with maximum results was shown.

Power Density Plot on Configuration IEEE 802.11n MCS0 20MHz / 5825 MHz / Chain 1 (2TX)

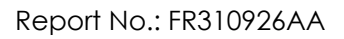


Date: 17.JAN.2013 00:14:29

Power Density Plot on Configuration IEEE 802.11n MCS0 40MHz / 5755 MHz / Chain 1 (2TX)



Date: 17.JAN.2013 00:23:22



Ref 20 dBm *Att 30 dB RBW 100 kHz VBW 300 kHz SWT 20 ms Marker 1 [T1] 5.01 dBm 5.769960000 GHz

20 Offset 2.5 dB

10

0

-10

-30

-40

-50

-60

-70

-80

Center 5.775 GHz 12 MHz/ Span 120 MHz

Ref 20 dBm *Att 30 dB *RBW 100 kHz Marker 1 [T1] 11.36 dBm
 *VBW 300 kHz SWT 20 ms 5.743680000 GHz

20 Offset 2.5 dB

1. PK MAXH

Center 5.745 GHz 3 MHz/ Span 30 MHz

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Issued Date : Jan. 30, 2013

4.4. 6dB Spectrum Bandwidth Measurement

4.4.1. Limit

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

4.4.2. Measuring Instruments and Setting

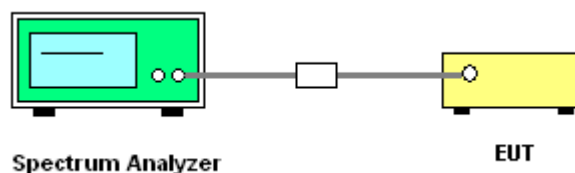
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	1-5 % or DTS BW, not exceed 100KHz
VB	$\geq 3 \times \text{RBW}$
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. Test was performed in accordance with KDB 558074 Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 5.1.1 EBW Measurement Procedure
3. Multiple antenna system was performed in accordance with KDB 662911 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
4. Measured the spectrum width with power higher than 6dB below carrier.

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 6dB Spectrum Bandwidth

Temperature	25°C	Humidity	56%
Test Engineer	Magic Lai	Configurations	IEEE 802.11n/ac

Configuration IEEE 802.11n MCS0 20MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	15.76	19.92	500	Complies
157	5785 MHz	16.72	20.48	500	Complies
165	5825 MHz	16.08	19.92	500	Complies

Configuration IEEE 802.11n MCS0 40MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
151	5755 MHz	35.36	41.92	500	Complies
159	5795 MHz	35.36	38.88	500	Complies

Configuration IEEE 802.11ac MCS0 80MHz / Chain 1 + Chain 2 (2TX)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
155	5775 MHz	69.12	76.80	500	Complies

Temperature	25°C	Humidity	56%
Test Engineer	Magic Lai	Configurations	IEEE 802.11a

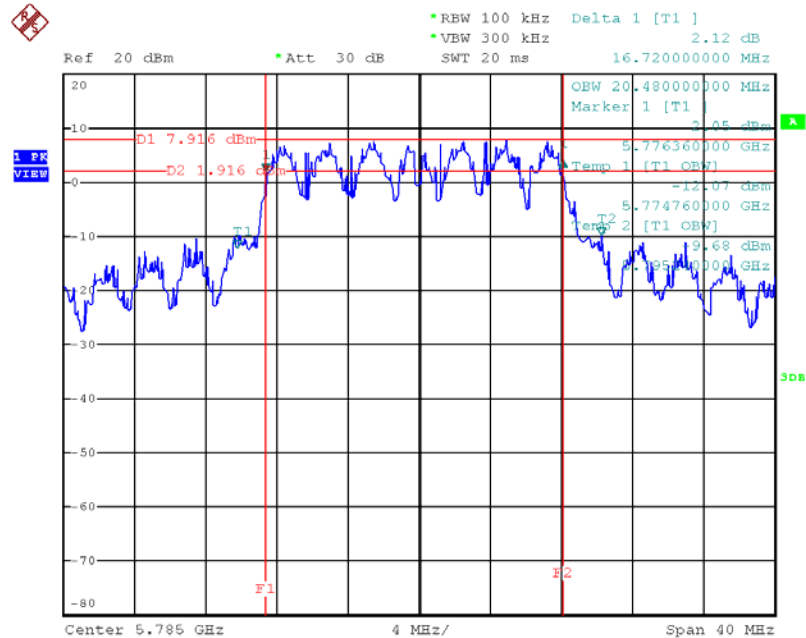
Configuration IEEE 802.11a / Chain 1 + Chain 2 (2TX)

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	12.72	19.68	500	Complies
157	5785 MHz	12.72	20.40	500	Complies
165	5825 MHz	12.64	20.32	500	Complies

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

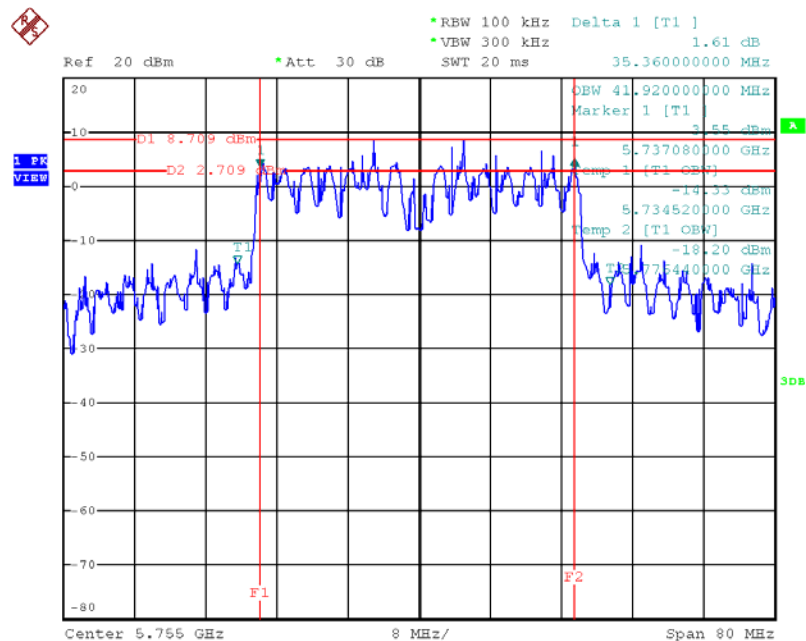
For plots, only the channel with maximum results was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / 5785 MHz / Chain 1 + Chain 2 (2TX)



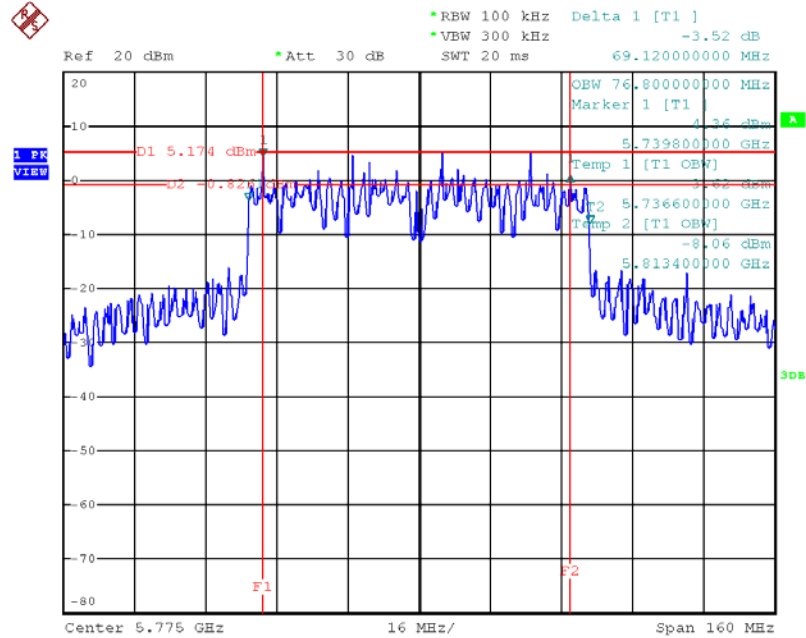
Date: 16.JAN.2013 23:23:10

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / 5755 MHz / Chain 1 + Chain 2 (2TX)



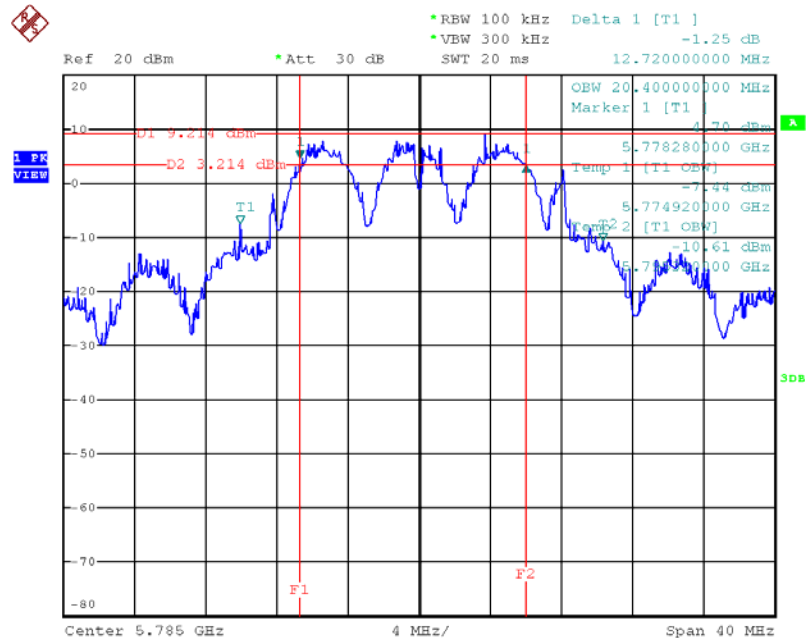
Date: 16.JAN.2013 23:25:26

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0 80MHz / 5775 MHz / Chain 1 + Chain 2 (2TX)



Date: 16.JAN.2013 23:27:31

6 dB Bandwidth Plot on Configuration IEEE 802.11a / 5785 MHz / Chain 1 + Chain 2 (2TX)



Date: 16.JAN.2013 23:19:59

4.5. Radiated Emissions Measurement

4.5.1. Limit

30dBc 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

4.5.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer 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)	100kHz / 300kHz for peak

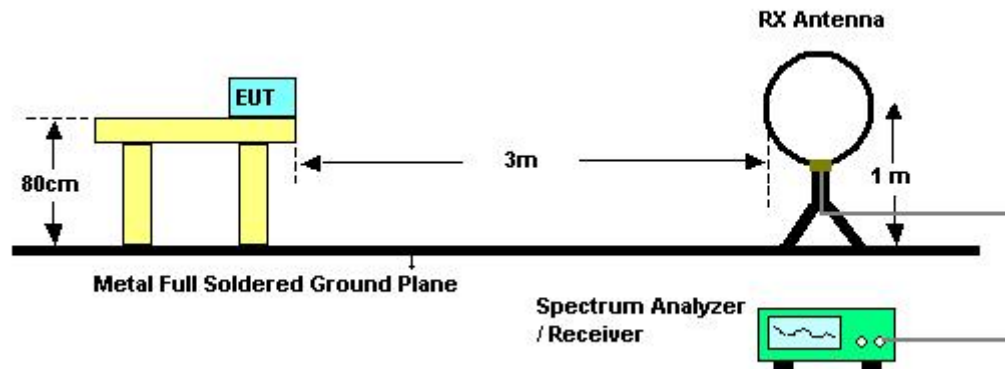
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1GHz / RB 120kHz for QP

4.5.3. Test Procedures

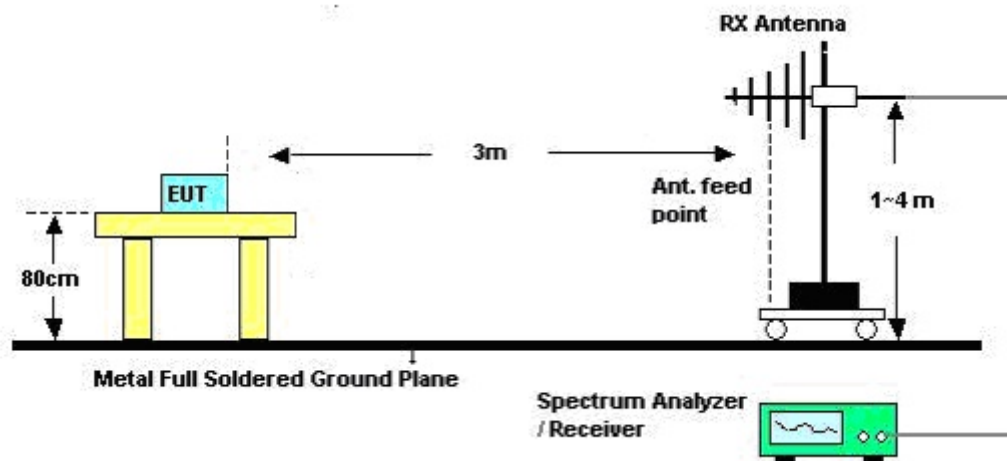
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

4.5.4. Test Setup Layout

For radiated emissions below 1GHz



For radiated emissions above 1GHz



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

Temperature	24.5°C	Humidity	60%
Test Engineer	Serway Li	Configurations	CTX
Test Date	Jan. 17, 2013		

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

Note:

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

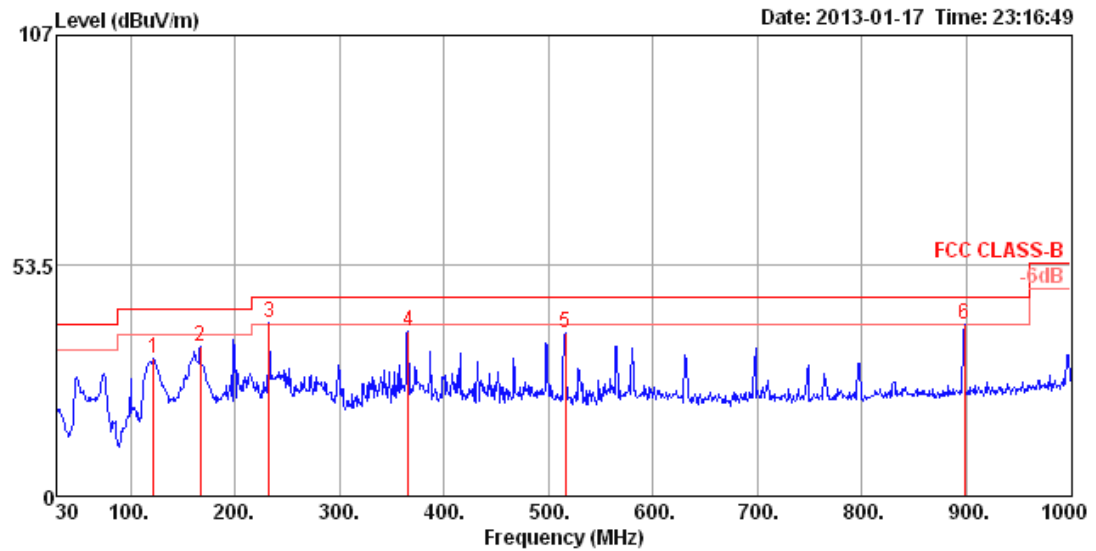
Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

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

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

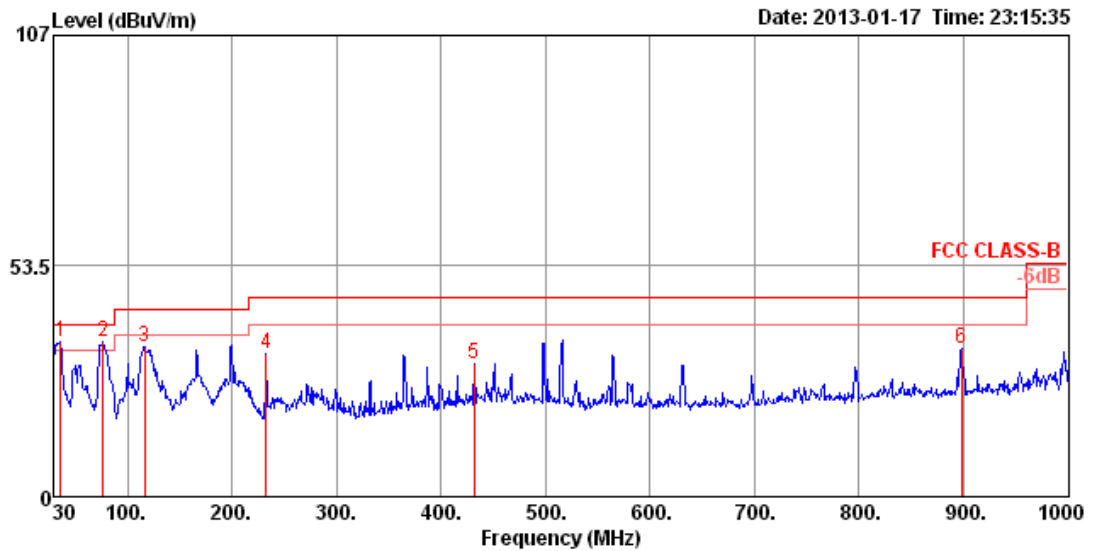
Temperature	24.5°C	Humidity	60%
Test Engineer	Serway Li	Configurations	CTX

Horizontal



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	122.15	31.81	43.50	-11.69	50.41	1.31	11.65	31.56	150	339	HORIZONTAL Peak
2	166.77	34.90	43.50	-8.60	55.55	1.57	9.32	31.54	200	296	HORIZONTAL Peak
3 pp	232.73	40.20	46.00	-5.80	59.79	1.84	10.02	31.45	150	117	HORIZONTAL Peak
4	365.62	38.43	46.00	-7.57	52.66	2.39	14.75	31.37	100	156	HORIZONTAL Peak
5	515.97	37.76	46.00	-8.24	49.00	2.86	17.31	31.41	150	142	HORIZONTAL Peak
6	898.15	39.97	46.00	-6.03	46.57	3.97	20.63	31.20	100	264	HORIZONTAL Peak

Vertical



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1 pp	35.82	35.87	40.00	-4.13	52.43	0.70	14.62	31.88	100	1 VERTICAL	Peak
2 !	76.56	35.84	40.00	-4.16	60.18	1.03	6.32	31.69	150	318 VERTICAL	Peak
3	116.33	34.84	43.50	-8.66	53.60	1.28	11.51	31.55	125	330 VERTICAL	Peak
4	232.73	33.16	46.00	-12.84	52.75	1.84	10.02	31.45	200	146 VERTICAL	Peak
5	431.58	30.96	46.00	-15.04	43.32	2.59	16.21	31.16	125	265 VERTICAL	Peak
6	898.15	34.29	46.00	-11.71	40.89	3.97	20.63	31.20	100	129 VERTICAL	Peak

Note:

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

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

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

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

Temperature	25.6°C	Humidity	56%
Test Engineer	David Tseng	Configurations	IEEE 802.11n MCS0 20MHz CH 149 / Chain 1 + Chain 2 (2TX)
Test Date	Jan. 12, 2013		

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	11489.29	57.79	74.00	-16.21	49.18	5.11	38.78	35.28	Peak	151	294	HORIZONTAL
2	11500.00	42.75	54.00	-11.25	34.12	5.12	38.79	35.28	Average	151	294	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	11486.89	57.88	74.00	-16.12	49.27	5.11	38.78	35.28	Peak	141	282	VERTICAL
2	11489.26	44.17	54.00	-9.83	35.56	5.11	38.78	35.28	Average	141	282	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	David Tseng	Configurations	IEEE 802.11n MCS0 20MHz CH 157 / Chain 1 + Chain 2 (2TX)
Test Date	Jan. 12, 2013		

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	11569.17	42.14	54.00	-11.86	33.48	5.13	38.83	35.30	Average	146	317	HORIZONTAL
2	11569.33	54.25	74.00	-19.75	45.59	5.13	38.83	35.30	Peak	146	317	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	11569.87	59.02	74.00	-14.98	50.35	5.14	38.83	35.30	Peak	128	225	VERTICAL
2	11570.29	45.06	54.00	-8.94	36.39	5.14	38.83	35.30	Average	128	225	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	David Tseng	Configurations	IEEE 802.11n MCS0 20MHz CH 165 / Chain 1 + Chain 2 (2TX)
Test Date	Jan. 12, 2013		

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	11650.04	44.26	54.00	-9.74	35.54	5.16	38.86	35.30	Average	100	304	HORIZONTAL
2	11650.04	50.96	74.00	-23.04	42.24	5.16	38.86	35.30	Peak	100	304	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	11649.96	37.14	54.00	-16.86	28.42	5.16	38.86	35.30	Average	100	72	VERTICAL
2	11649.96	51.05	74.00	-22.95	42.33	5.16	38.86	35.30	Peak	100	72	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	David Tseng	Configurations	IEEE 802.11n MCS0 40MHz CH 151 / Chain 1 + Chain 2 (2TX)
Test Date	Jan. 12, 2013		

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	11510.32	40.18	54.00	-13.82	31.55	5.12	38.79	35.28	Average	146	260	HORIZONTAL
2	11514.97	52.85	74.00	-21.15	44.23	5.12	38.79	35.29	Peak	146	260	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	11505.48	41.47	54.00	-12.53	32.84	5.12	38.79	35.28	Average	136	227	VERTICAL
2	11511.22	56.77	74.00	-17.23	48.14	5.12	38.79	35.28	Peak	136	227	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	David Tseng	Configurations	IEEE 802.11n MCS0 40MHz CH 159 / Chain 1 + Chain 2 (2TX)
Test Date	Jan. 12, 2013		

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	11590.08	44.71	54.00	-9.29	36.04	5.14	38.83	35.30	Average	100	256	HORIZONTAL
2	11590.08	55.37	74.00	-18.63	46.70	5.14	38.83	35.30	Peak	100	256	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	11589.36	53.08	74.00	-20.92	44.41	5.14	38.83	35.30	Peak	100	298	VERTICAL
2	11589.44	41.95	54.00	-12.05	33.28	5.14	38.83	35.30	Average	100	298	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	David Tseng	Configurations	IEEE 802.11ac MCS0 80MHz CH 155 / Chain 1 + Chain 2 (2TX)
Test Date	Jan. 12, 2013		

Horizontal

	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp		A/Pos	T/Pos	
	MHz	dBuV/m	dBuV/m	dB	dBuV	Loss	Factor	Factor	Remark	cm	deg	Pol/Phase
1	5133.29	50.76	54.00	-3.24	48.72	3.43	33.64	35.03	Average	148	273	HORIZONTAL
2	5133.31	56.09	74.00	-17.91	54.05	3.43	33.64	35.03	Peak	148	273	HORIZONTAL
3	11550.16	42.32	54.00	-11.68	33.68	5.13	38.81	35.30	Average	100	277	HORIZONTAL
4	11550.16	53.16	74.00	-20.84	44.52	5.13	38.81	35.30	Peak	100	277	HORIZONTAL

Vertical

	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp		A/Pos	T/Pos	
	MHz	dBuV/m	dBuV/m	dB	dBuV	Loss	Factor	Factor	Remark	cm	deg	Pol/Phase
1	5133.31	47.78	54.00	-6.22	45.74	3.43	33.64	35.03	Average	103	102	VERTICAL
2	5133.31	55.18	74.00	-18.82	53.14	3.43	33.64	35.03	Peak	103	102	VERTICAL
3	11550.16	43.13	54.00	-10.87	34.49	5.13	38.81	35.30	Average	100	307	VERTICAL
4	11550.16	54.82	74.00	-19.18	46.18	5.13	38.81	35.30	Peak	100	307	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	David Tseng	Configurations	IEEE 802.11a CH 149 / Chain 1 + Chain 2 (2TX)
Test Date	Jan. 12, 2013		

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	11489.87	43.48	54.00	-10.52	34.87	5.11	38.78	35.28	Average	138	10	HORIZONTAL
2	11492.69	52.95	74.00	-21.05	44.34	5.11	38.78	35.28	Peak	138	10	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	11490.13	43.86	54.00	-10.14	35.25	5.11	38.78	35.28	Average	101	261	VERTICAL
2	11495.64	55.56	74.00	-18.44	46.94	5.12	38.78	35.28	Peak	101	261	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	David Tseng	Configurations	IEEE 802.11a CH 157 / Chain 1 + Chain 2 (2TX)
Test Date	Jan. 12, 2013		

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	11569.17	45.76	54.00	-8.24	37.10	5.13	38.83	35.30	Average	130	277	HORIZONTAL
2	11569.23	59.32	74.00	-14.68	50.66	5.13	38.83	35.30	Peak	130	277	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	11568.88	57.64	74.00	-16.36	48.98	5.13	38.83	35.30	Peak	140	12	VERTICAL
2	11570.10	44.66	54.00	-9.34	35.99	5.14	38.83	35.30	Average	140	12	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	David Tseng	Configurations	IEEE 802.11a CH 165 / Chain 1 + Chain 2 (2TX)
Test Date	Jan. 12, 2013		

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	11652.36	43.44	54.00	-10.56	34.72	5.16	38.86	35.30	Average	100	244	HORIZONTAL
2	11652.36	51.40	74.00	-22.60	42.68	5.16	38.86	35.30	Peak	100	244	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	11652.36	49.73	74.00	-24.27	41.01	5.16	38.86	35.30	Peak	100	279	VERTICAL
2	11652.40	40.53	54.00	-13.47	31.81	5.16	38.86	35.30	Average	100	279	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.

4.6. Band Edge Emissions Measurement

4.6.1. Limit

30dBc 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 the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	100 KHz / 300 KHz for Peak

4.6.3. Test Procedures

- The test procedure is the same as section 4.5.3, only the frequency range investigated is limited to 100MHz around bandedges.

4.6.4. Test Setup Layout

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

4.6.5. Test Deviation

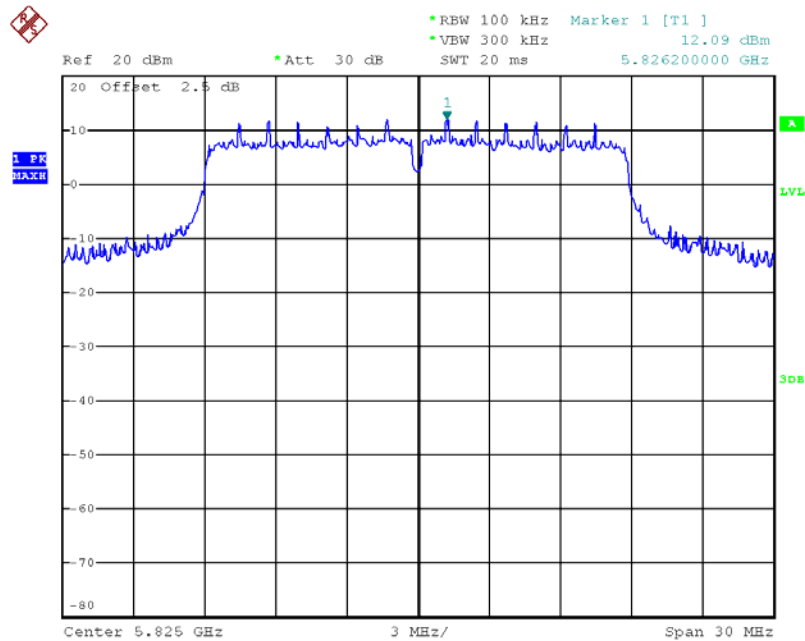
There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

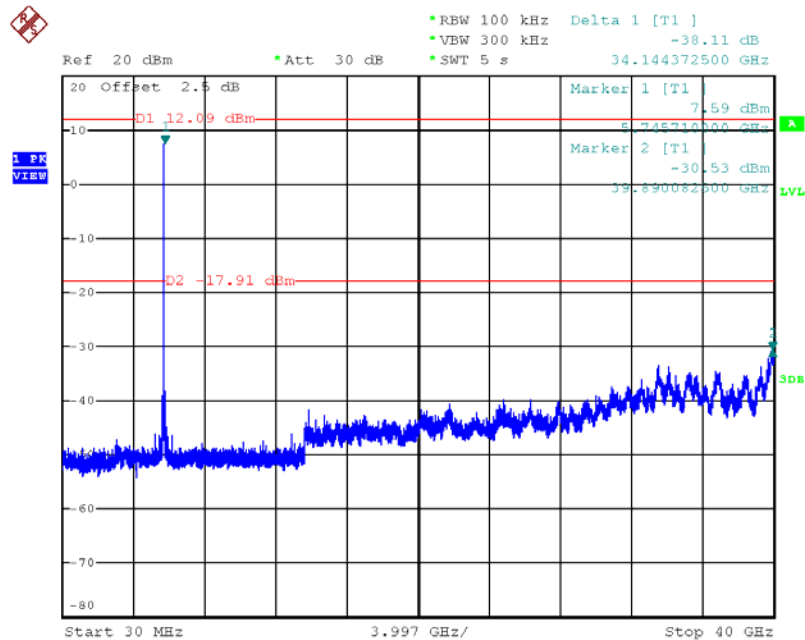
For Emission not in Restricted Band

Plot on Configuration IEEE 802.11n MCS0 20MHz / Reference Level



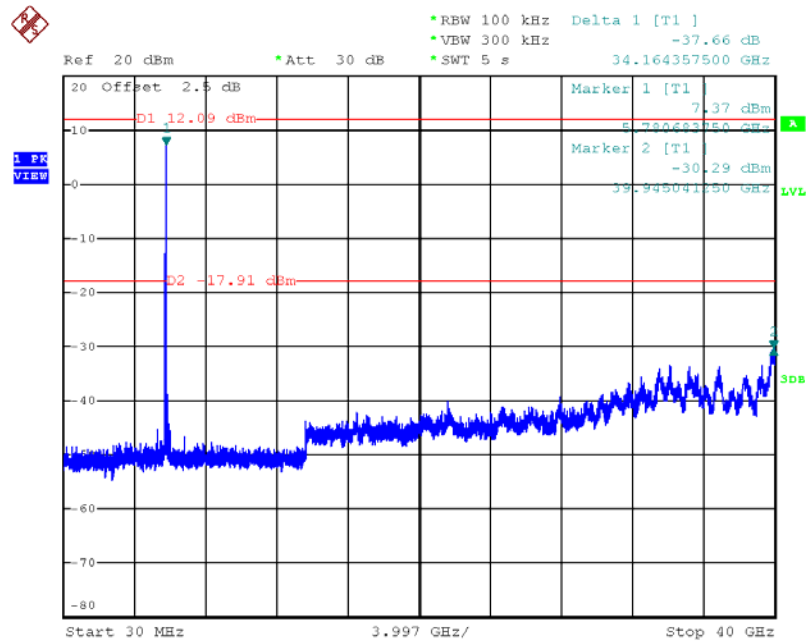
Date: 17.JAN.2013 00:14:29

Plot on Configuration IEEE 802.11n MCS0 20MHz / CH 149 (down 30dBc)



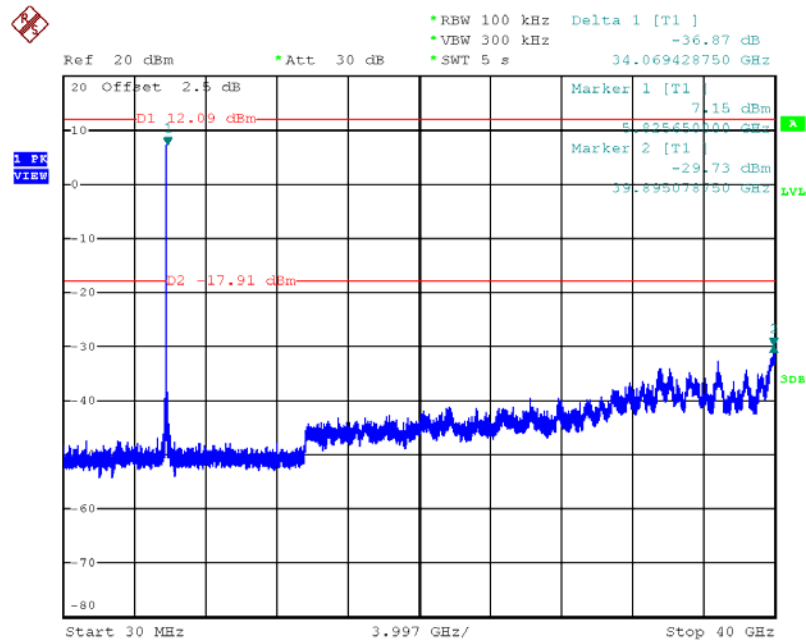
Date: 17.JAN.2013 01:31:27

Plot on Configuration IEEE 802.11n MCS0 20MHz / CH 157 (down 30dBc)



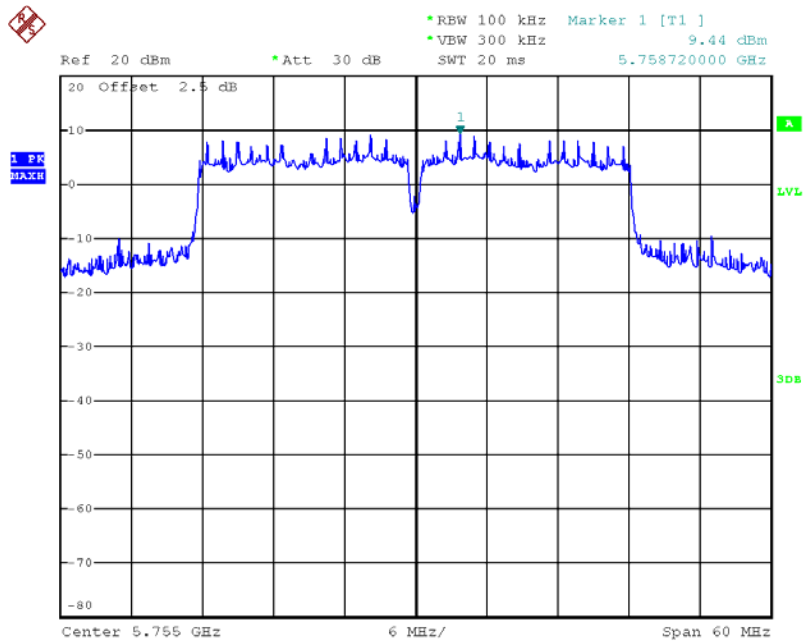
Date: 17.JAN.2013 01:30:45

Plot on Configuration IEEE 802.11n MCS0 20MHz / CH 165 (down 30dBc)



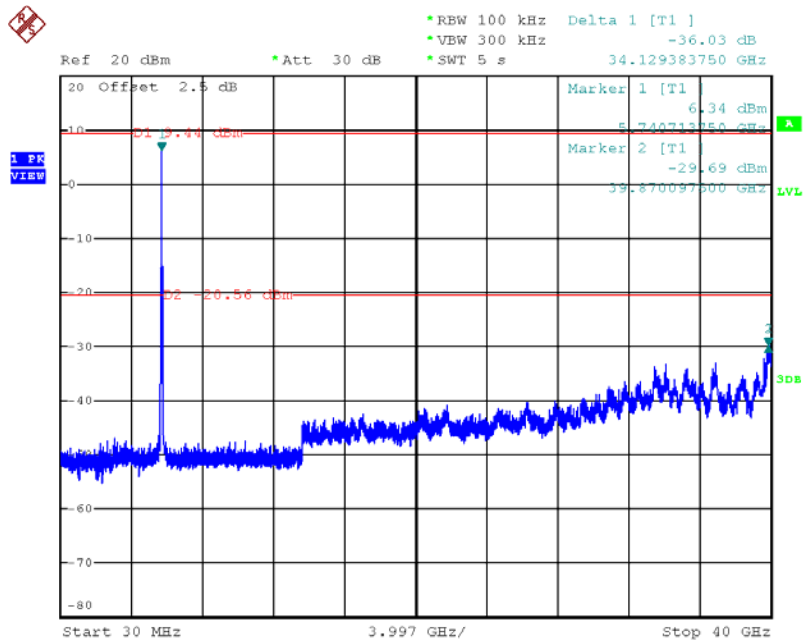
Date: 17.JAN.2013 01:30:10

Plot on Configuration IEEE 802.11n MCS0 40MHz / Reference Level



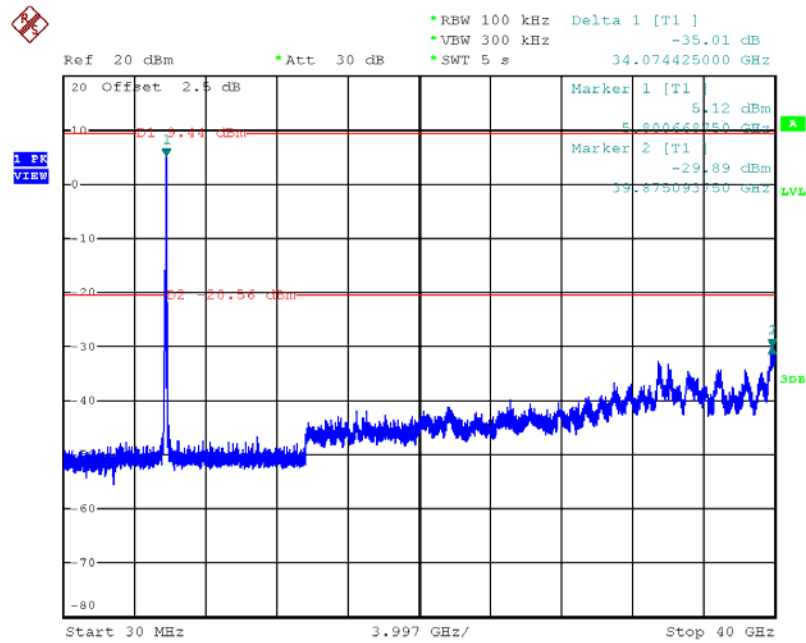
Date: 17.JAN.2013 00:23:22

Plot on Configuration IEEE 802.11n MCS0 40MHz / CH 151 (down 30dBc)



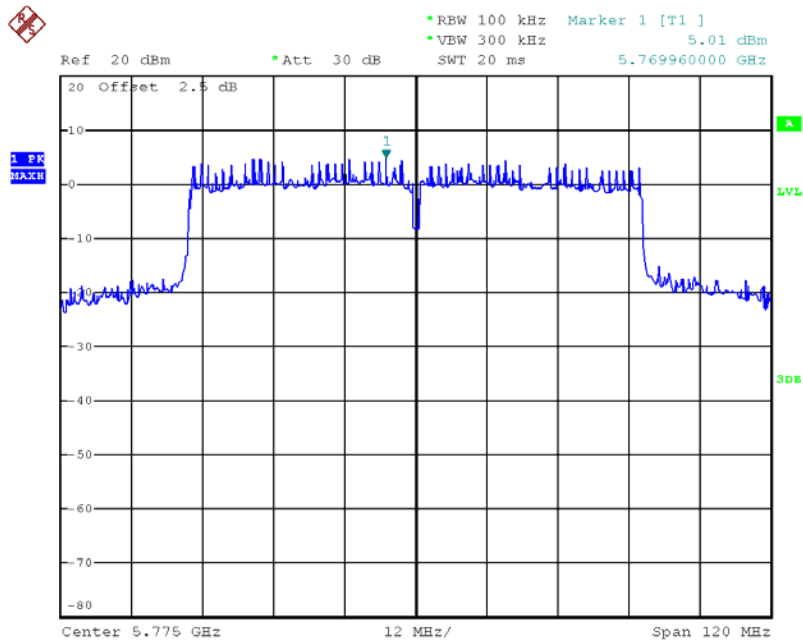
Date: 17.JAN.2013 01:32:43

Plot on Configuration IEEE 802.11n MCS0 40MHz / CH 159 (down 30dBc)



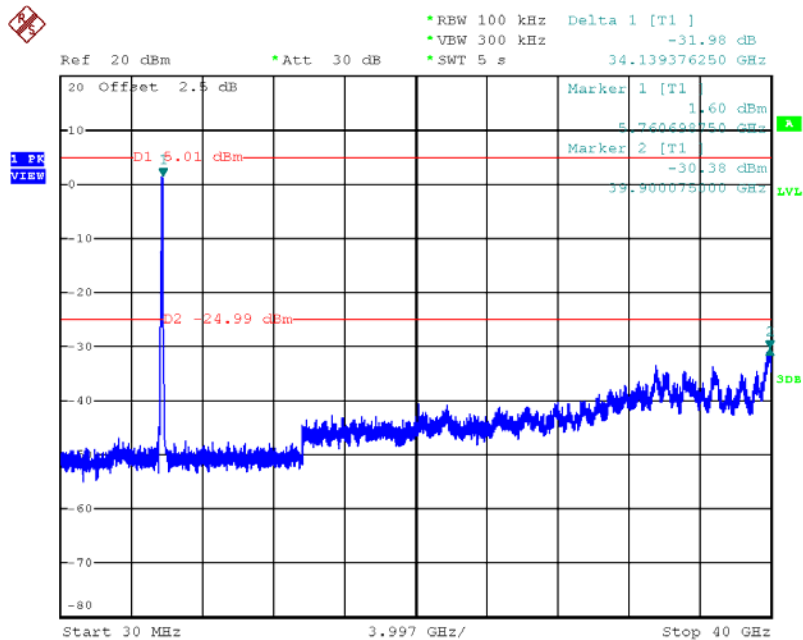
Date: 17.JAN.2013 01:33:20

Plot on Configuration IEEE 802.11ac MCS0 80MHz / Reference Level



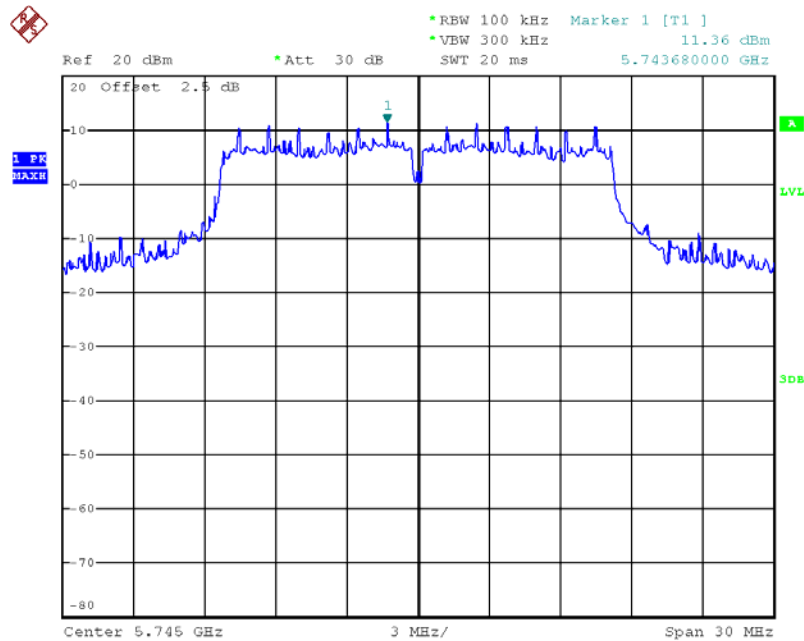
Date: 16.JAN.2013 23:35:30

Plot on Configuration IEEE 802.11ac MCS0 80MHz / CH 155 (down 30dBc)



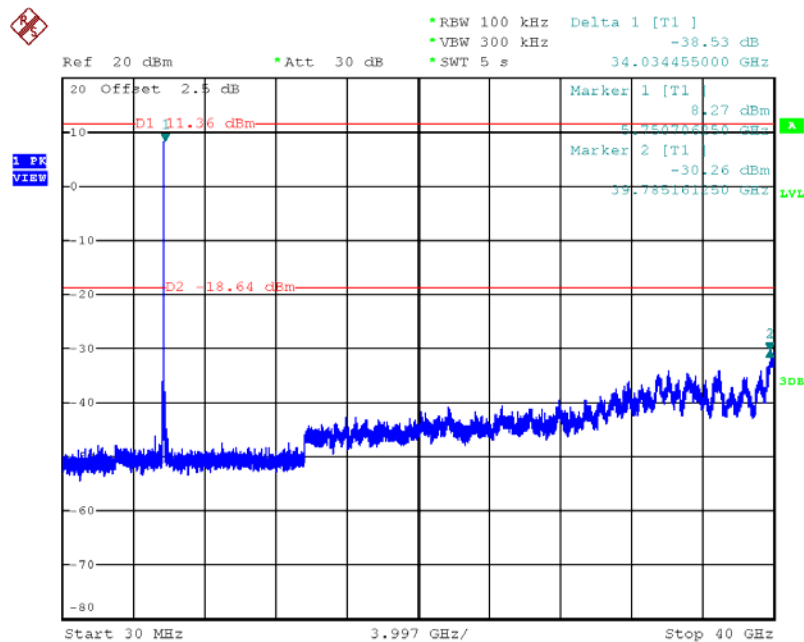
Date: 17.JAN.2013 01:34:59

Plot on Configuration IEEE 802.11a / Reference Level



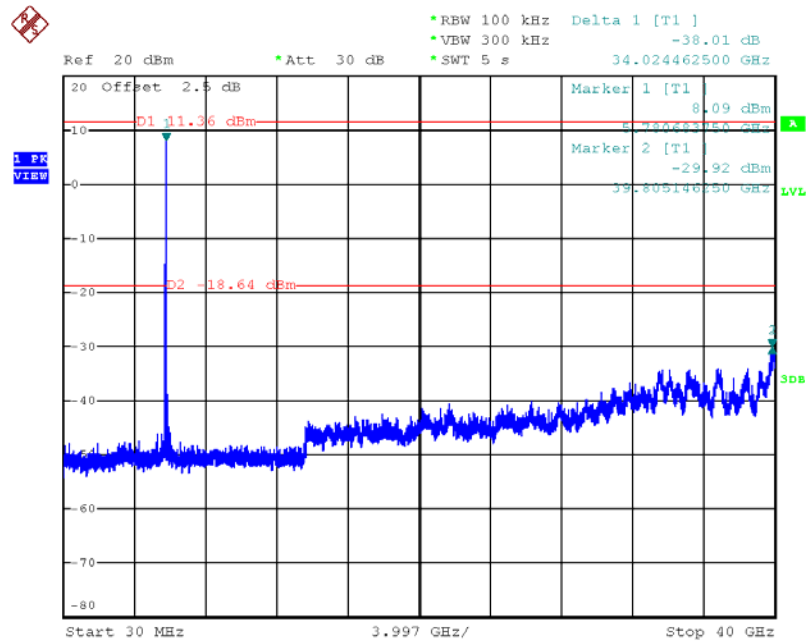
Date: 16.JAN.2013 23:37:11

Plot on Configuration IEEE 802.11a / CH 149 (down 30dBc)



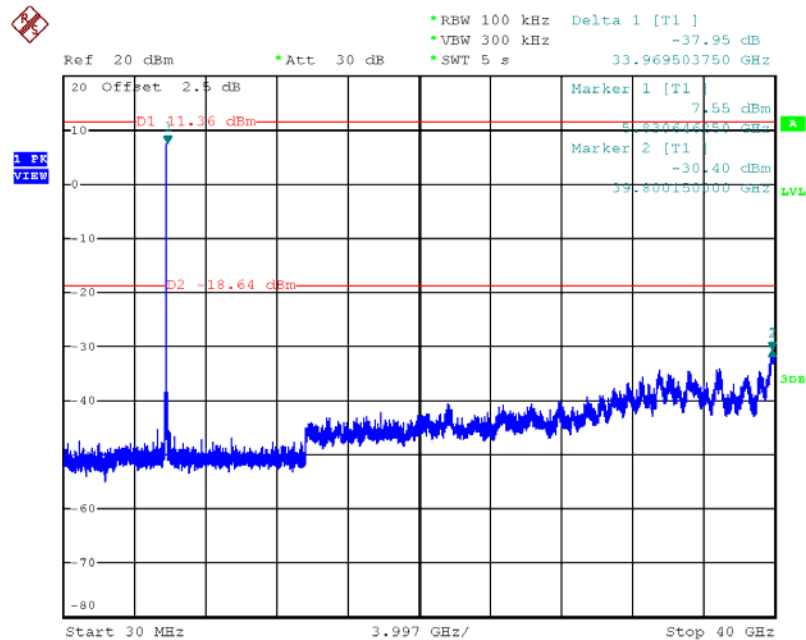
Date: 17.JAN.2013 01:26:54

Plot on Configuration IEEE 802.11a / CH 157 (down 30dBc)



Date: 17.JAN.2013 01:27:53

Plot on Configuration IEEE 802.11a / CH 165 (down 30dBc)



Date: 17.JAN.2013 01:28:33

4.7. Antenna Requirements

4.7.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.7.2. 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	Oct. 23, 2012	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Nov.26, 2012	Conduction (CO01-CB)
V- LISN	Schwarzbeck	NSLK 8127	8127-478	9kHz ~ 30MHz	Jun. 22, 2012	Conduction (CO01-CB)
Coupling and Decoupling Network	TESEQ	ISN PLC 25-25	26476	0.15MHz~30MHz	Feb. 09, 2012	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	0.15MHz~30MHz	Dec. 4, 2012	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-----	-----	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, 2012	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, 2012	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, 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, 2012	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, 2012	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, 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)
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 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, 2012	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, 2012	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)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Nov. 27, 2012	Conducted (TH01-CB)

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

N.C.R. means Non-Calibration required.

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., Neihsu Chiu, Taipei, Taiwan 114, R.O.C. TEL : 886-2-2631-4739 FAX : 886-2-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. TEL : 886-2-8227-2020 FAX : 886-2-8227-2626
NEIHU	ADD : 4Fl., No. 339, Hsin Hu 2 nd 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