SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
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FCC RADIO TEST REPORT

Applicant's company	**Roku, Inc.**
Applicant Address	12980 Saratoga Avenue Suite #D Saratoga California United States 95070
FCC ID	**TC2-N1002**
Manufacturer's company	**1. Dong Guan G-Com Computer Co. Ltd.** **2. LITE-ON TECHNOLOGY (Changzhou) CO., LTD**
Manufacturer Address	1. 1ST ROW YIN SHAN RD., YIN HWU INDUSTRIAL, GUANGDONG, China 2. A9 Building,No.88 Yanghu Road, Wujin Hi-Tech Industrial Development Zone ,Changzhou City, Jiangsu Province 213100 China

Product Name	2 x 2 Wi-Fi Module
Brand Name	Roku
Model No.	WM03, WM04
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz / 5725 ~ 5850MHz
Received Date	Jan. 20, 2014
Final Test Date	Feb. 19, 2014
Submission Type	Original Equipment

Statement

Test result included is only for the IEEE 802.11n, IEEE 802.11b/g part and IEEE 802.11a (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 v03r01** and **KDB 662911 D01 v02r01**.

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

Testing Laboratory
1190

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR412906AA	Rev. 01	Initial issue of report	Mar. 11, 2014

Certificate No.: CB10302091

1. CERTIFICATE OF COMPLIANCE

Product Name	:	2 x 2 Wi-Fi Module
Brand Name	:	Roku
Model No.	:	WM03, WM04
Applicant	:	Roku, 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. 20, 2014 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	11.58 dB
4.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	6.65 dB
4.3	15.247(e)	Power Spectral Density	Complies	8.87 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	0.10 dB
4.6	15.247(d)	Band Edge Emissions	Complies	0.27 dB
4.7	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n

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
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n
Frequency Range	2400 ~ 2483.5MHz / 5725 ~ 5850MHz
Channel Number	For 2.4GHz Band: 11 for 20MHz bandwidth For 5GHz Band: 5 for 20MHz bandwidth
Channel Band Width (99%)	For 2.4GHz Band: MCS0 (HT20): 17.60 MHz For 5GHz Band: MCS0 (HT20): 17.68 MHz
Maximum Conducted Output Power	For 2.4GHz Band: MCS0 (HT20): 23.35 dBm For 5GHz Band: MCS0 (HT20): 21.34 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11a/b/g

Items	Description
Product Type	802.11a/b/g: WLAN (1TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From host system
Modulation	DSSS for IEEE 802.11b ; OFDM for IEEE 802.11a/g
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 / 5725 ~ 5850MHz
Channel Number	11b/g: 11 ; 11a: 5
Channel Band Width (99%)	11b: 10.16 MHz ; 11g: 16.64 MHz ; 11a: 16.56 MHz
Maximum Conducted Output Power	11b: 18.84 dBm ; 11g: 20.18 dBm ; 11a: 19.84 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Items	Description	
Beamforming Function	☐ With beamforming	☒ Without beamforming

Antenna and Band width

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

IEEE 11n Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	2	MCS 0-15
Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20. Note 2: Modulation modes consist of below configuration: HT20: IEEE 802.11n		

3.2. Accessories

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
					2.4GHz	5GHz
1	LiteOn	3010000502XD	PIFA Antenna	I-PEX	3.53	3.43
2	LiteOn	301000005046D	PIFA Antenna	N/A	3.29	4.26

Note: The EUT has two antennas.

For 2.4G:

For IEEE 802.11b/g mode (1TX/2RX)

Only Chain 1 can be used as transmitting antenna.

Chain 1 and Chain 2 could receive simultaneously.

For IEEE 802.11n mode (2TX/2RX)

Chain 1 and Chain 2 could transmit/receive simultaneously.

For 5G:

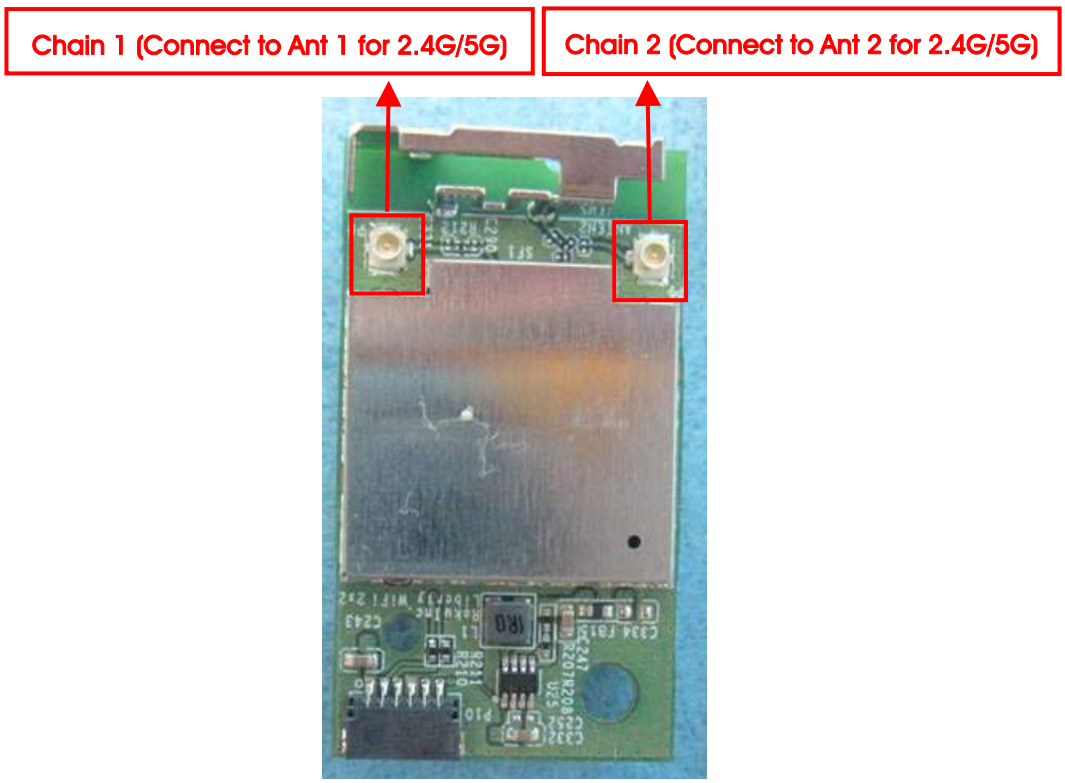
For IEEE 802.11a mode (1TX/2RX)

Only Chain 1 can be used as transmitting antenna.

Chain 1 and Chain 2 could receive simultaneously.

For IEEE 802.11n mode (2TX/2RX)

Chain 1 and Chain 2 could transmit/receive simultaneously.



3.4. Table for Carrier Frequencies

For 2.4GHz Band:

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

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	-	-

For 5GHz Band:

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

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5725~5850 MHz Band 4	149	5745 MHz	159	5795 MHz
	151	5755 MHz	161	5805 MHz
	153	5765 MHz	165	5825 MHz
	157	5785 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.

For 2.4GHz Band

Test Items	Mode	Data Rate	Channel	Chain
AC Power Line Conducted Emissions	Normal Link	-	-	-
Maximum Conducted Output Power	11n HT20	MCS0	1/6/11	1+2
	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Power Spectral Density	11n HT20	MCS0	1/6/11	1+2
	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
6dB Spectrum Bandwidth	11n HT20	MCS0	1/6/11	1+2
	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Radiated Emissions Below 1GHz	Normal Link	-	-	-
Radiated Emissions Above 1GHz	11n HT20	MCS0	1/6/11	1+2
	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
Band Edge Emissions	11n HT20	MCS0	1/6/11	1+2
	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1

For 5GHz Band

Test Items	Mode	Data Rate	Channel	Chain
AC Power Line Conducted Emissions	Normal Link	-	-	-
Maximum Conducted Output Power	11n HT20	MCS0	149/157/165	1+2
	11a/BPSK	6 Mbps	149/157/165	1
Power Spectral Density	11n HT20	MCS0	149/157/165	1+2
	11a/BPSK	6 Mbps	149/157/165	1
6dB Spectrum Bandwidth	11n HT20	MCS0	149/157/165	1+2
	11a/BPSK	6 Mbps	149/157/165	1
Radiated Emissions Below 1GHz	Normal Link	-	-	-
Radiated Emissions Above 1GHz	11n HT20	MCS0	149/157/165	1+2
	11a/BPSK	6 Mbps	149/157/165	1
Band Edge Emissions	11n HT20	MCS0	149/157/165	1+2
	11a/BPSK	6 Mbps	149/157/165	1

The following test modes were performed for all tests:

For Conducted Emission test:

Mode 1. Normal Link- 2.4G

Mode 2. Normal Link- 5G

Mode 1 is the worst case, so it was selected to record in this test report.

For Radiated Emission Below 1GHz test:

Antennas can be used in X-axis or Z-axis.

Mode 1. Normal Link- Antennas placed in X-axis- 2.4G

Mode 2. Normal Link- Antennas placed in Z-axis- 2.4G

Mode 1 has been evaluated to be the worst case among Mode 1~2, thus measurement for Mode 3 will follow this same test mode.

Mode 3. Normal Link- Antennas placed in X-axis- 5G

Mode 3 is the worst case, so it was selected to record in this test report.

For Radiated Emission Above 1GHz test:

The EUT was performed at Antennas placed in X-axis and Antennas placed in Z- axis and the worst-case was found at Antennas placed in X-axis. So the measurement will follow this same test configuration.

Mode 1. CTX- Antennas placed in X-axis- 2.4G

Mode 2. CTX- Antenna placed in X-axis- 5G

3.6. Table for Testing Locations

Test Site Location				
Address:	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			
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).

3.7. Table for Multiple Listing

The model names in the following table are all refer to the identical product.

Brand Name	Model Name	Metal Ring	Photo
Roku	WM03	V	
	WM04	X	

Note:

From the above models, model: WM03 was selected as representative model for the test and its data was recorded in this report.

3.8. Table for Supporting Units

For Test Site No: 03CH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E6220	DoC
Mouse	Logitech	M-U0026	DoC
Earphone	E-BOOKI	E-EPC040	N/A
AP Router	Planex	GW-AP54SGX	KA220030603014-1
Fixture	Liteon	TB006_USB_3.3V	N/A

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E6220	DoC
Mouse	Logitech	M-U0026	DoC
Earphone	e-Power	S90W	N/A
AP Router	Planex	GW-AP54SGX	KA220030603014-1
Fixture	Liteon	TB006_USB_3.3V	N/A

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC
Fixture	Liteon	TB006_USB_3.3V	N/A

3.9. Table for Parameters of Test Software Setting

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

For 2.4GHz Band

Power Parameters of IEEE 802.11n MCS0 HT20

Test Software Version	Manual Tool version 2.0.0.3		
Frequency	2412 MHz	2437 MHz	2462 MHz
MCS0 HT20	56	80	58

Power Parameters of IEEE 802.11b/g

Test Software Version	Manual Tool version 2.0.0.3		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	71	66	62
IEEE 802.11g	62	80	64

For 5GHz Band

Power Parameters of IEEE 802.11n MCS0 HT20

Test Software Version	Manual Tool version 2.0.0.3		
Frequency	5745 MHz	5785 MHz	5825 MHz
MCS0 HT20	70	70	70

Power Parameters of IEEE 802.11a

Test Software Version	Manual Tool version 2.0.0.3		
Frequency	5745 MHz	5785 MHz	5825 MHz
IEEE 802.11a	74	74	74

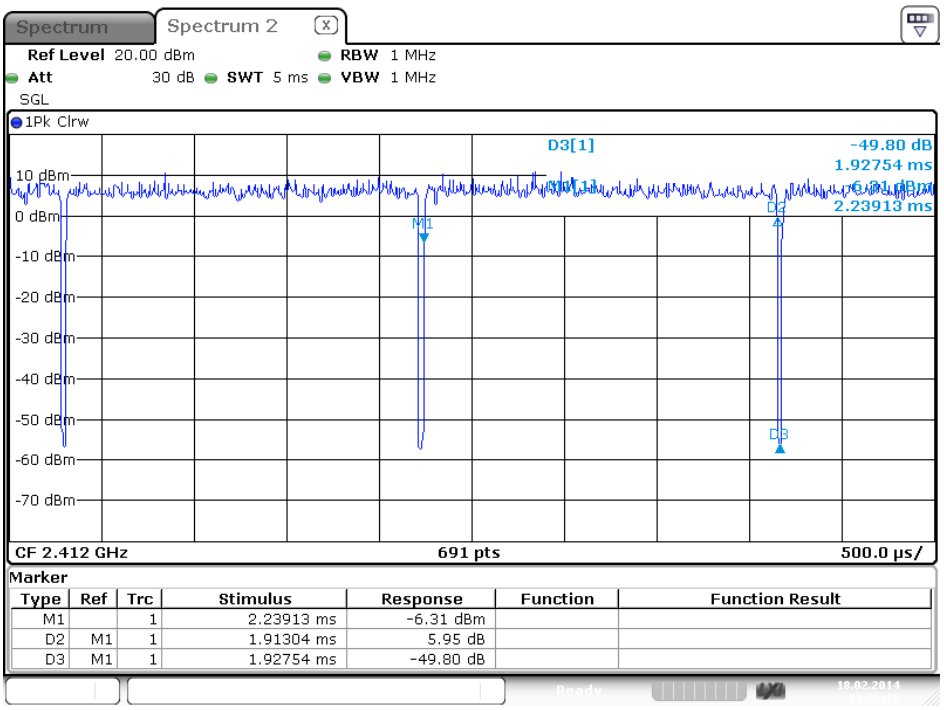
3.10. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.11. Duty Cycle

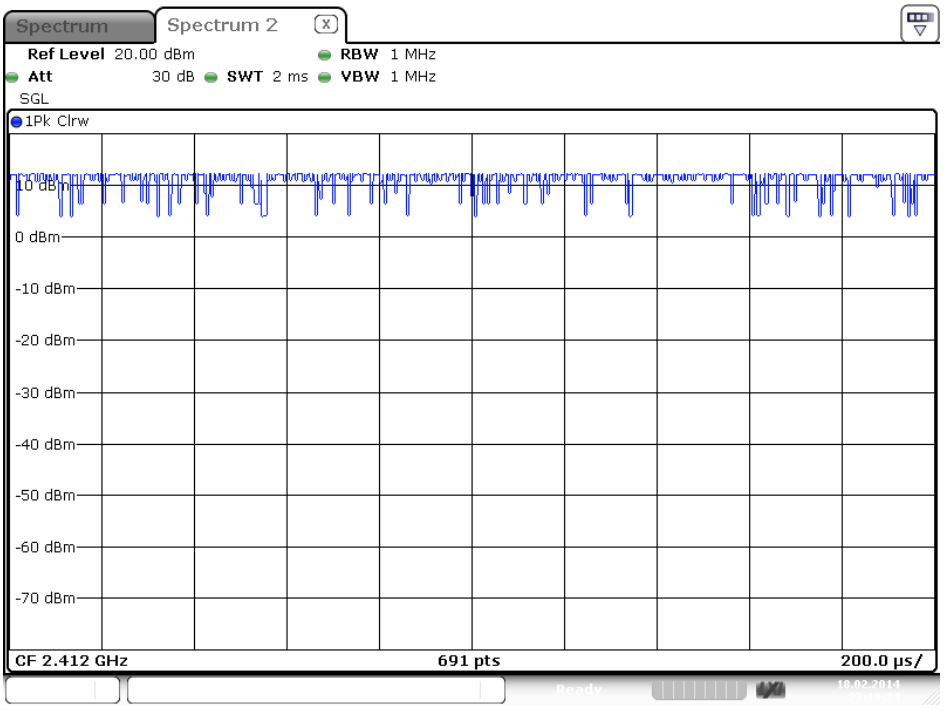
For 2.4GHz Band:

IEEE 802.11n MCS0 HT20



Date: 18.FEB.2014 23:26:15

IEEE 802.11b



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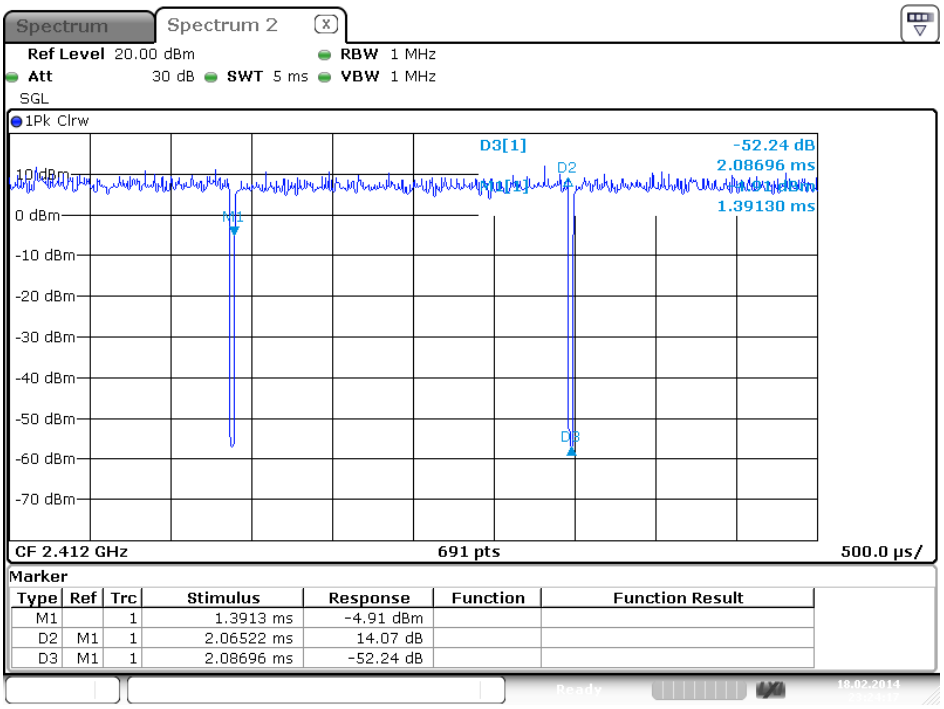
IEEE 802.11g



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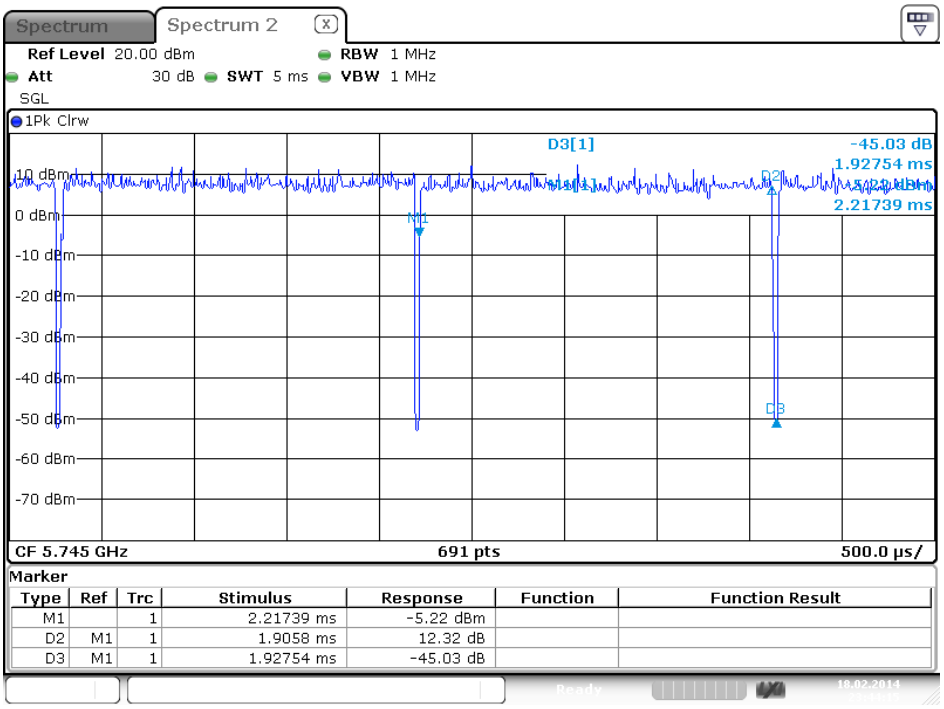
For 5GHz Band:

IEEE 802.11n MCS0 HT20



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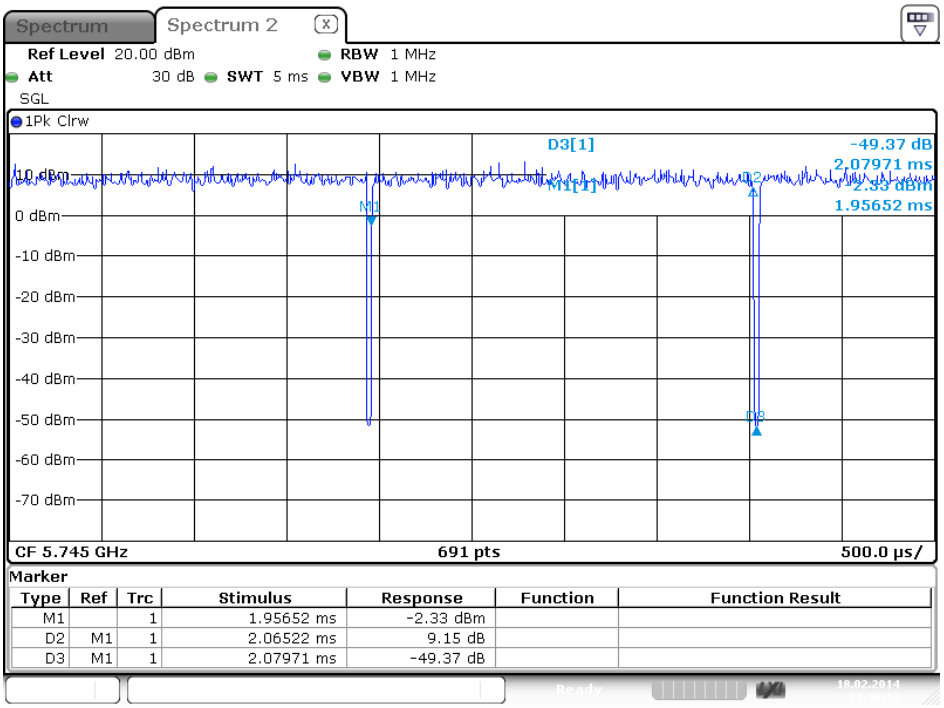
IEEE 802.11a



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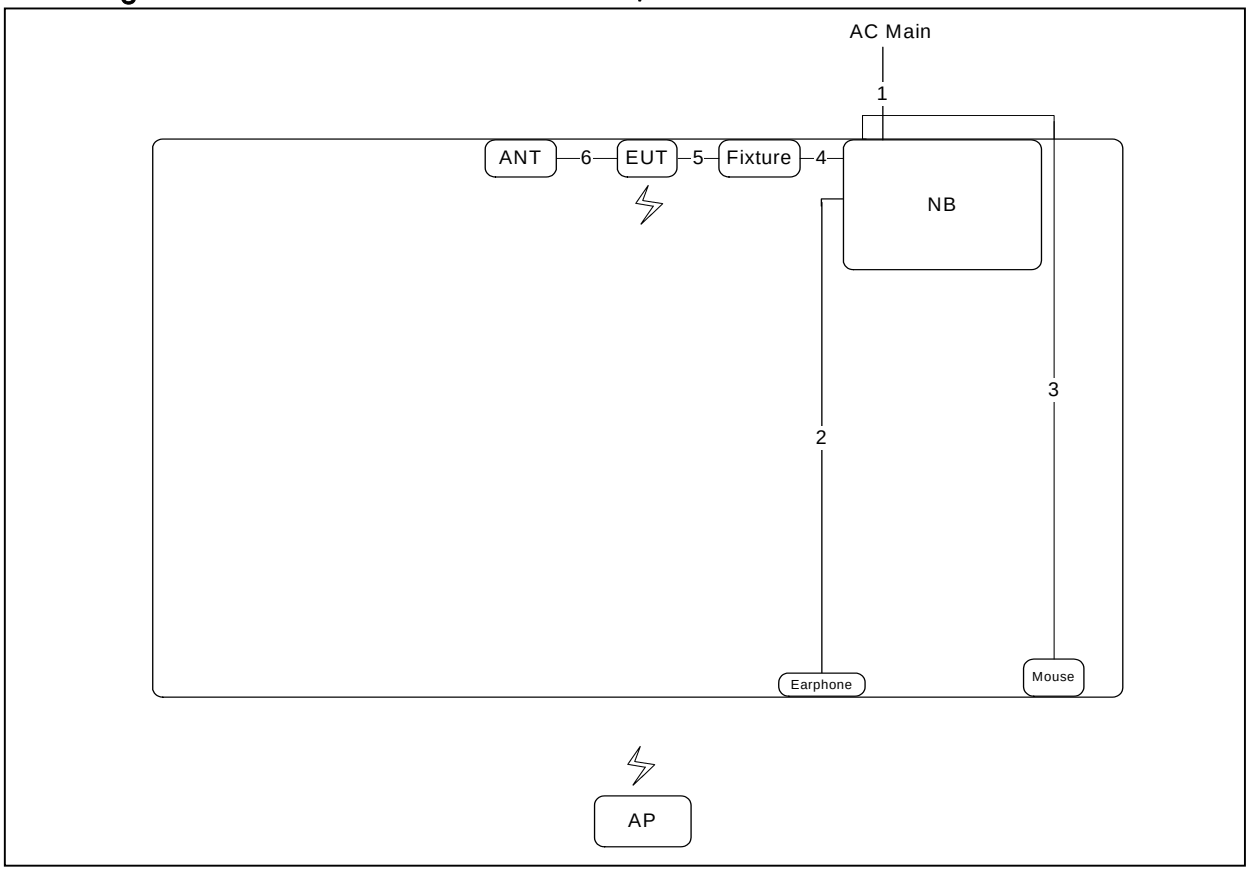
3.12. Test Configurations

3.12.1. AC Power Line Conduction and Radiated Emission Below 1GHz Emissions Test Configuration

Test Configuration: Conduction Emissions / Test Mode: Mode 1

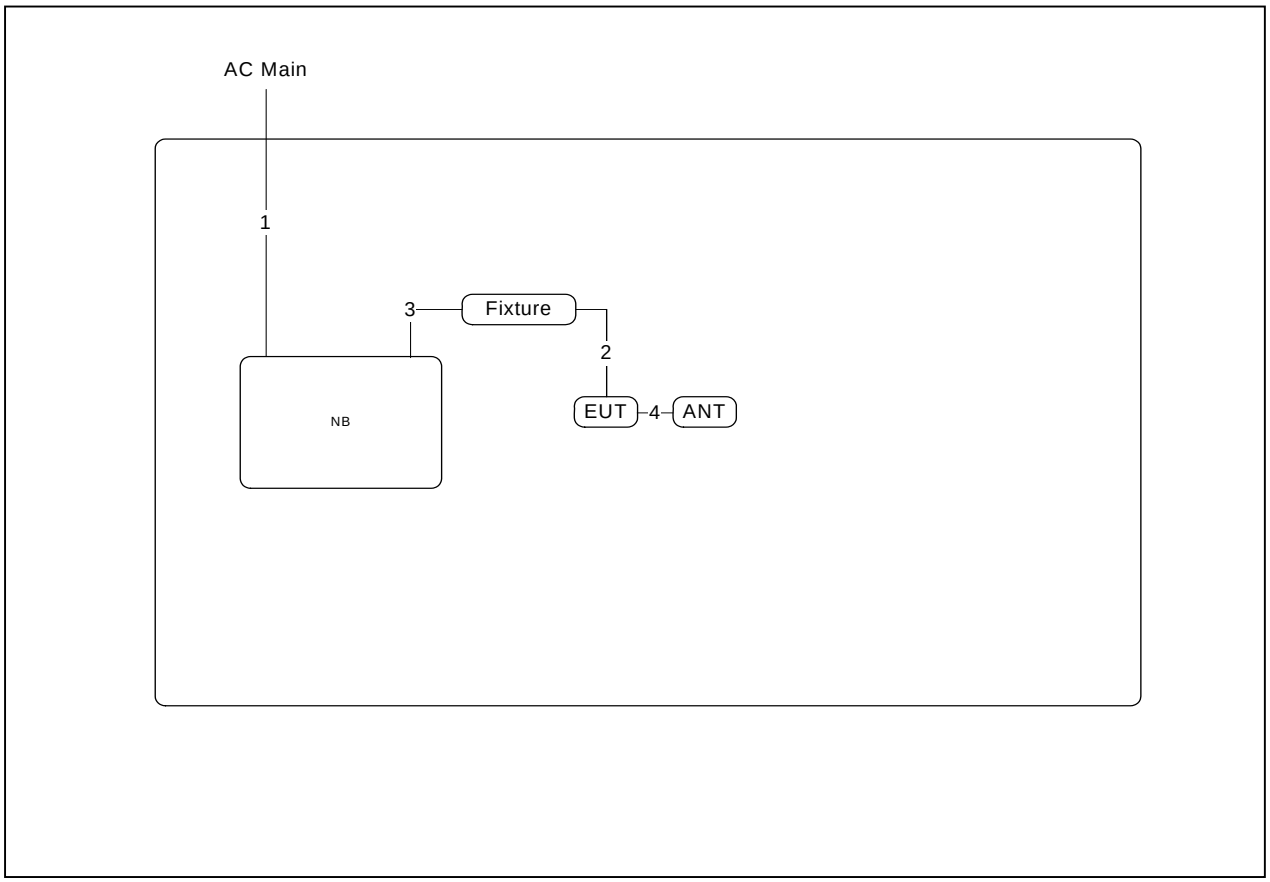
Test Configuration: Radiated Emission 30MHz~1GHz / Test Mode: Mode 3



Item	Connection	Shielded	Length(m)
1	AC Power cable	No	2.6m
2	Audio cable	No	1.1m
3	USB cable	No	1.8m
4	USB cable	Yes	0.2m
5	4Pin cable	No	0.13m
6	ANT cable	Yes	0.3m

3.12.2. Radiated Emission Above 1GHz

Test Configuration: above 1GHz / Test Mode: Mode 1 ~ Mode 2



Item	Connection	Shielded	Length(m)
1	AC Power cable	No	2.6m
2	USB cable	Yes	0.2m
3	4Pin cable	No	0.13m
4	ANT cable	Yes	0.3m

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

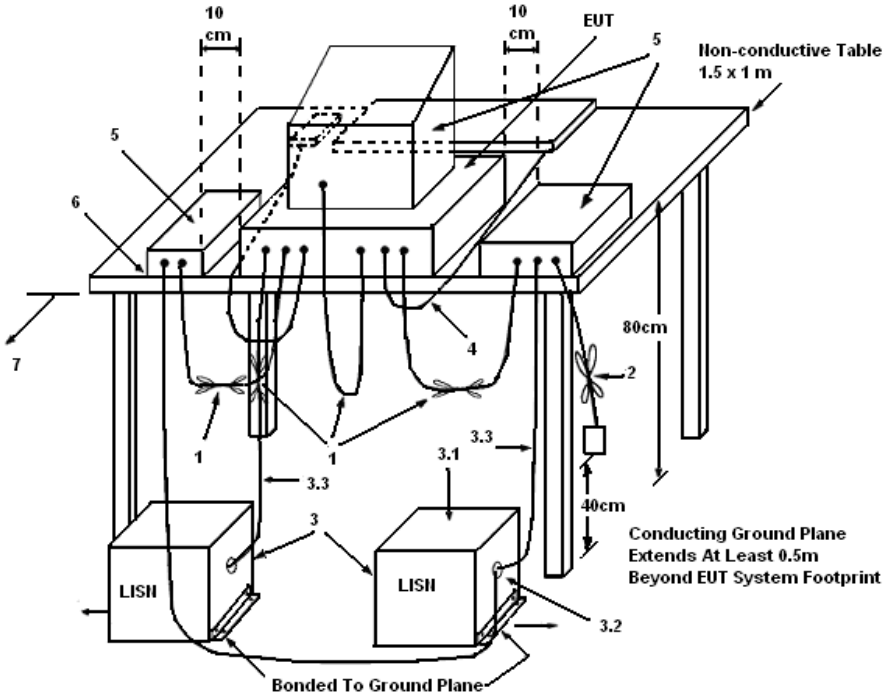
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

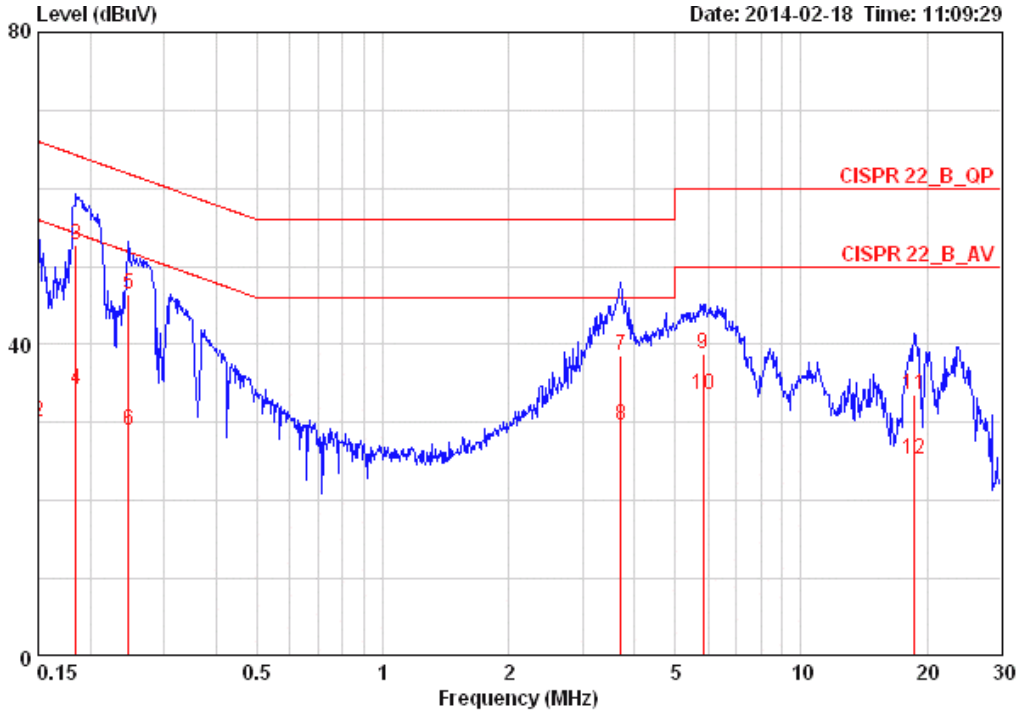
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

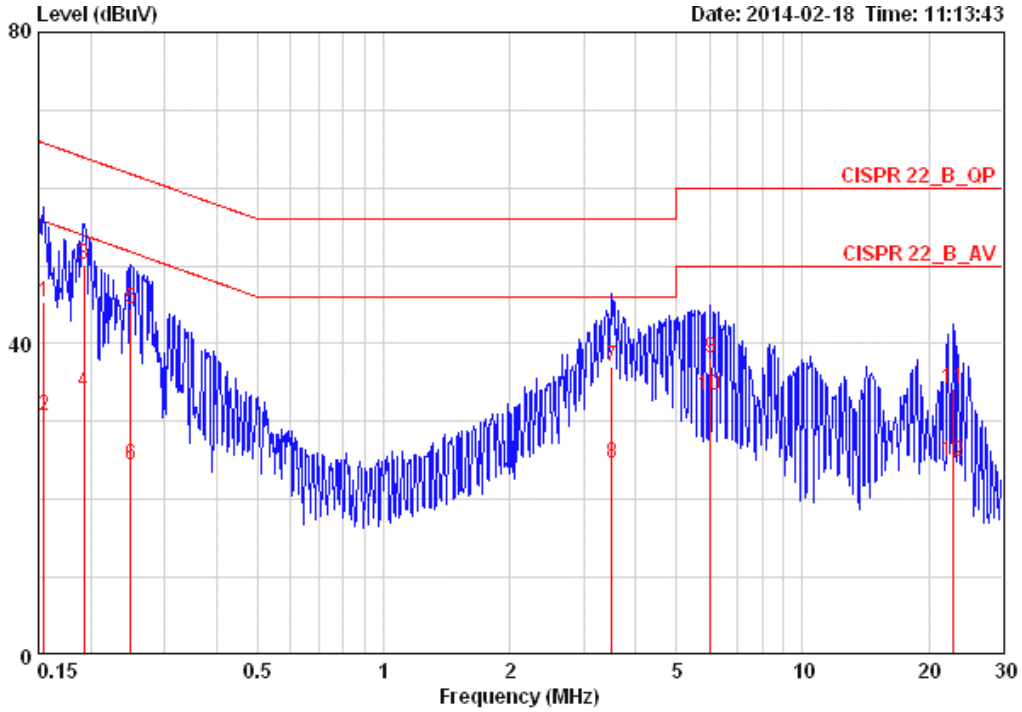
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	23℃	Humidity	51%
Test Engineer	Justin Chiu	Phase	Line
Configuration	Normal Link	Test Mode	Mode 1



	Freq	Level	Over Limit	Limit Line	LISN Factor	Read Level	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dB	dBuV	dB		
1	0.15000	47.29	-18.71	66.00	0.15	46.98	0.16	LINE	QP
2	0.15000	29.99	-26.01	56.00	0.15	29.68	0.16	LINE	AVERAGE
3 @	0.18443	52.70	-11.58	64.28	0.15	52.39	0.16	LINE	QP
4	0.18443	34.32	-19.96	54.28	0.15	34.01	0.16	LINE	AVERAGE
5	0.24682	46.51	-15.35	61.86	0.15	46.19	0.17	LINE	QP
6	0.24682	29.10	-22.76	51.86	0.15	28.78	0.17	LINE	AVERAGE
7	3.700	38.67	-17.33	56.00	0.27	38.11	0.29	LINE	QP
8	3.700	29.65	-16.35	46.00	0.27	29.09	0.29	LINE	AVERAGE
9	5.836	38.79	-21.21	60.00	0.31	38.15	0.33	LINE	QP
10	5.836	33.50	-16.50	50.00	0.31	32.86	0.33	LINE	AVERAGE
11	18.622	33.46	-26.54	60.00	0.57	32.40	0.49	LINE	QP
12	18.622	25.26	-24.74	50.00	0.57	24.20	0.49	LINE	AVERAGE

Temperature	23°C	Humidity	51%
Test Engineer	Justin Chiu	Phase	Neutral
Configuration	Normal Link	Test Mode	Mode 1



	Freq	Level	Over Limit	Limit Line	LISN Factor	Read Level	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dB	dBuV	dB		
1	0.15485	45.24	-20.50	65.74	0.07	45.01	0.16	NEUTRAL	QP
2	0.15485	30.71	-25.03	55.74	0.07	30.48	0.16	NEUTRAL	AVERAGE
3 @	0.19242	50.18	-13.75	63.93	0.07	49.95	0.16	NEUTRAL	QP
4	0.19242	33.84	-20.09	53.93	0.07	33.61	0.16	NEUTRAL	AVERAGE
5	0.24945	44.42	-17.36	61.78	0.07	44.18	0.17	NEUTRAL	QP
6	0.24945	24.39	-27.39	51.78	0.07	24.15	0.17	NEUTRAL	AVERAGE
7	3.509	37.04	-18.96	56.00	0.13	36.62	0.29	NEUTRAL	QP
8	3.509	24.63	-21.37	46.00	0.13	24.21	0.29	NEUTRAL	AVERAGE
9	6.024	38.22	-21.78	60.00	0.18	37.71	0.34	NEUTRAL	QP
10	6.024	33.40	-16.60	50.00	0.18	32.89	0.34	NEUTRAL	AVERAGE
11	22.896	34.29	-25.71	60.00	0.57	33.17	0.55	NEUTRAL	QP
12	22.896	24.82	-25.18	50.00	0.57	23.70	0.55	NEUTRAL	AVERAGE

Note:

Level = Read Level + LISN Factor + Cable Loss

4.2. Maximum Conducted Output Power Measurement

4.2.1. Limit

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

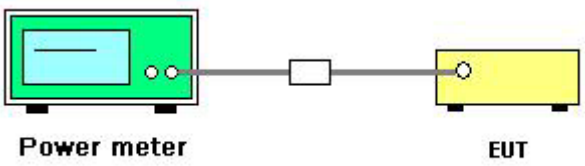
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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

4.2.3. Test Procedures

1. Test procedures refer KDB 558074 D01 v03r01 section 9.2.2 Measurement using a power meter (PM).
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	23°C	Humidity	58%
Test Engineer	David Tseng	Configurations	IEEE 802.11n
Test Date	Feb. 17, 2014		

For 2.4GHz Band

Configuration IEEE 802.11n MCS0 HT20 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
1	2412 MHz	15.15	14.51	17.85	30.00	Complies
6	2437 MHz	20.55	20.11	23.35	30.00	Complies
11	2462 MHz	15.15	15.09	18.13	30.00	Complies

For 5GHz Band

Configuration IEEE 802.11n MCS0 HT20 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
149	5745 MHz	18.22	18.42	21.33	30.00	Complies
157	5785 MHz	18.12	18.53	21.34	30.00	Complies
165	5825 MHz	18.15	18.08	21.13	30.00	Complies

Temperature	23°C	Humidity	58%
Test Engineer	David Tseng	Configurations	IEEE 802.11a/b/g
Test Date	Feb. 17, 2014		

Configuration IEEE 802.11b / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	18.84	30.00	Complies
6	2437 MHz	17.78	30.00	Complies
11	2462 MHz	16.94	30.00	Complies

Configuration IEEE 802.11g / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	16.33	30.00	Complies
6	2437 MHz	20.18	30.00	Complies
11	2462 MHz	16.54	30.00	Complies

Configuration IEEE 802.11a / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	19.84	30.00	Complies
157	5785 MHz	19.82	30.00	Complies
165	5825 MHz	19.76	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

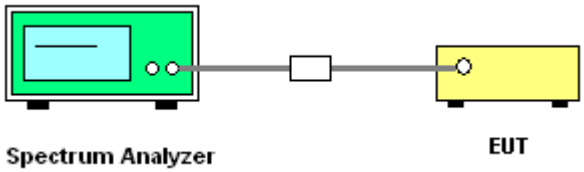
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Set the span to 1.5 times the DTS channel bandwidth.
RBW	3 kHz ≤ RBW ≤ 100kHz
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto couple

4.3.3. Test Procedures

1. Test procedures refer KDB 558074 D01 v03r01 section 10.2 Method PKPSD (peak PSD) and KDB 662911 D01 v02r01 section In-Band Power Spectral Density (PSD) Measurements option (b) Measure and sum spectral maximal across the outputs.
2. 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.
3. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW (use of a greater number of measurement points than this minimum requirement is recommended).
4. Use the peak marker function to determine the maximum level in any 3 kHz band segment within the fundamental EBW.
5. The resulting PSD level must be ≤ 8 dBm.

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	23°C	Humidity	58%
Test Engineer	David Tseng	Configurations	IEEE 802.11n

For 2.4GHz Band

Configuration IEEE 802.11n MCS0 HT20 / Chain 1 + Chain 2

Channel	Frequency	Power Density (dBm/3kHz)			Power Density Limit (dBm/3kHz)	Result
		Chain 1	Chain 2	Total		
1	2412 MHz	-10.21	-9.13	-6.63	8.00	Complies
6	2437 MHz	-3.14	-4.77	-0.87	8.00	Complies
11	2462 MHz	-9.77	-8.96	-6.34	8.00	Complies

For 5GHz Band

Configuration IEEE 802.11n MCS0 HT20 / Chain 1 + Chain 2

Channel	Frequency	Power Density (dBm/3kHz)			Power Density Limit (dBm/3kHz)	Result
		Chain 1	Chain 2	Total		
149	5745 MHz	-7.91	-6.93	-4.38	8.00	Complies
157	5785 MHz	-7.59	-8.25	-4.90	8.00	Complies
165	5825 MHz	-7.10	-7.25	-4.16	8.00	Complies

Temperature	23°C	Humidity	58%
Test Engineer	David Tseng	Configurations	IEEE 802.11a/b/g

Configuration IEEE 802.11b / Chain 1

Channel	Frequency	Power Density (dBm/3kHz)	Power Density Limit (dBm/3kHz)	Result
1	2412 MHz	-3.50	8.00	Complies
6	2437 MHz	-5.47	8.00	Complies
11	2462 MHz	-4.89	8.00	Complies

Configuration IEEE 802.11g / Chain 1

Channel	Frequency	Power Density (dBm/3kHz)	Power Density Limit (dBm/3kHz)	Result
1	2412 MHz	-8.89	8.00	Complies
6	2437 MHz	-4.63	8.00	Complies
11	2462 MHz	-7.53	8.00	Complies

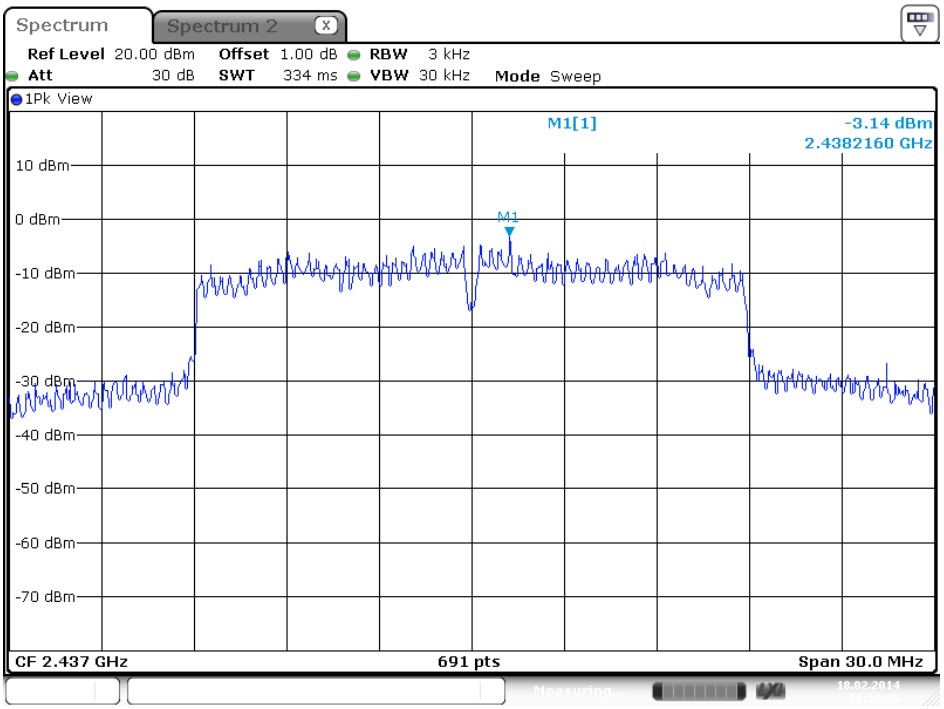
Configuration IEEE 802.11a / Chain 1

Channel	Frequency	Power Density (dBm/3kHz)	Power Density Limit (dBm/3kHz)	Result
149	5745 MHz	-6.75	8.00	Complies
157	5785 MHz	-7.02	8.00	Complies
165	5825 MHz	-5.41	8.00	Complies

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

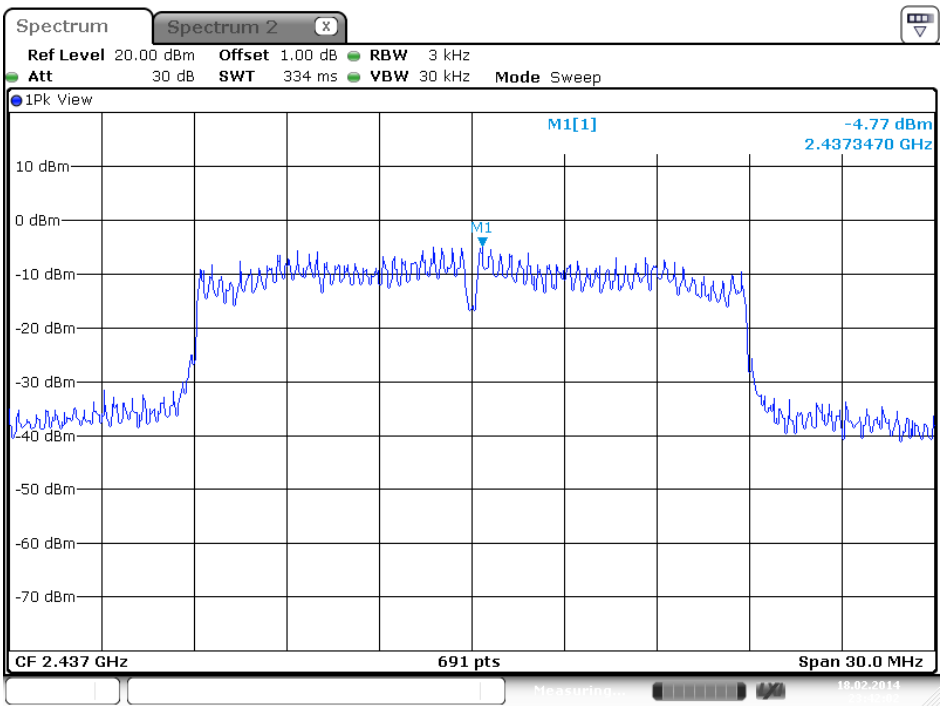
For plots, only the channel with worse result was shown.

Power Density Plot on Configuration IEEE 802.11n MCS0 HT20 / 2437 MHz / Chain 1



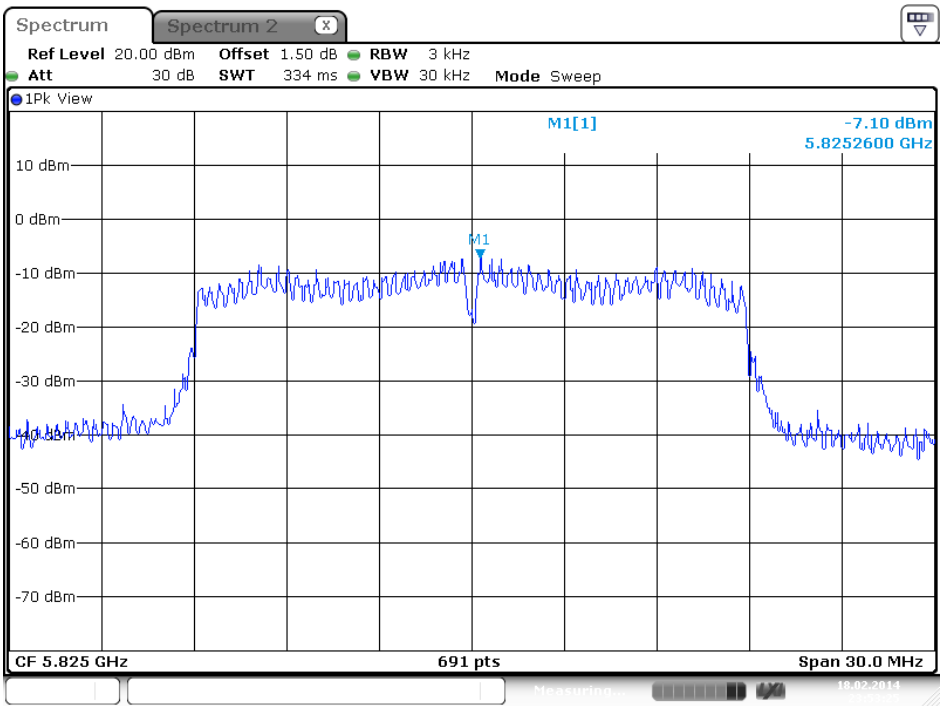
Date: 18.FEB.2014 23:37:36

Power Density Plot on Configuration IEEE 802.11n MCS0 HT20 / 2437 MHz / Chain 2



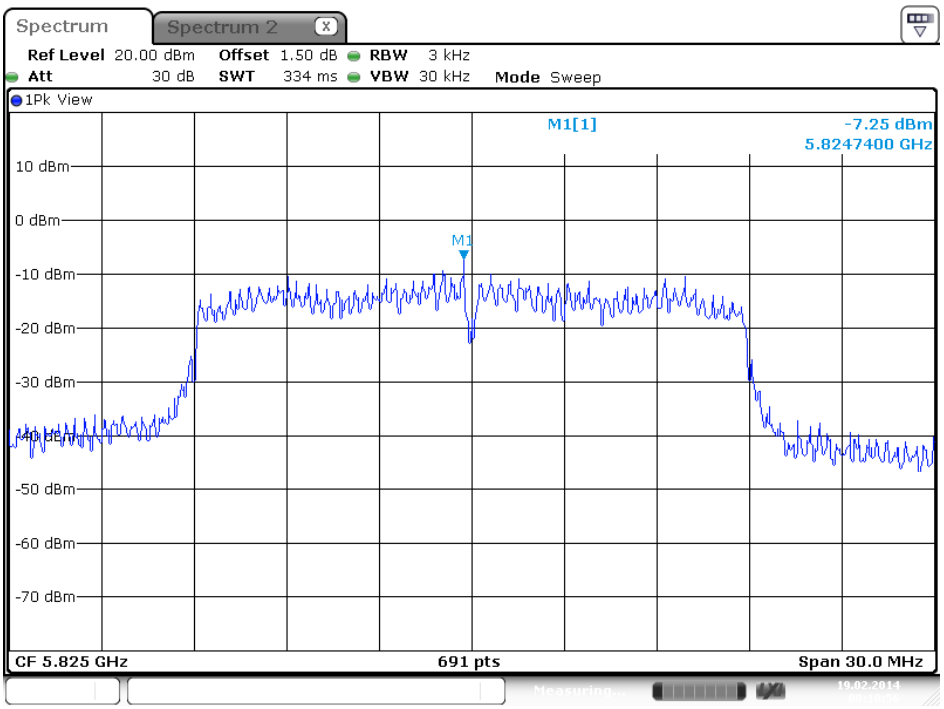
Date: 18.FEB.2014 23:42:01

Power Density Plot on Configuration IEEE 802.11n MCS0 HT20 / 5825 MHz / Chain 1



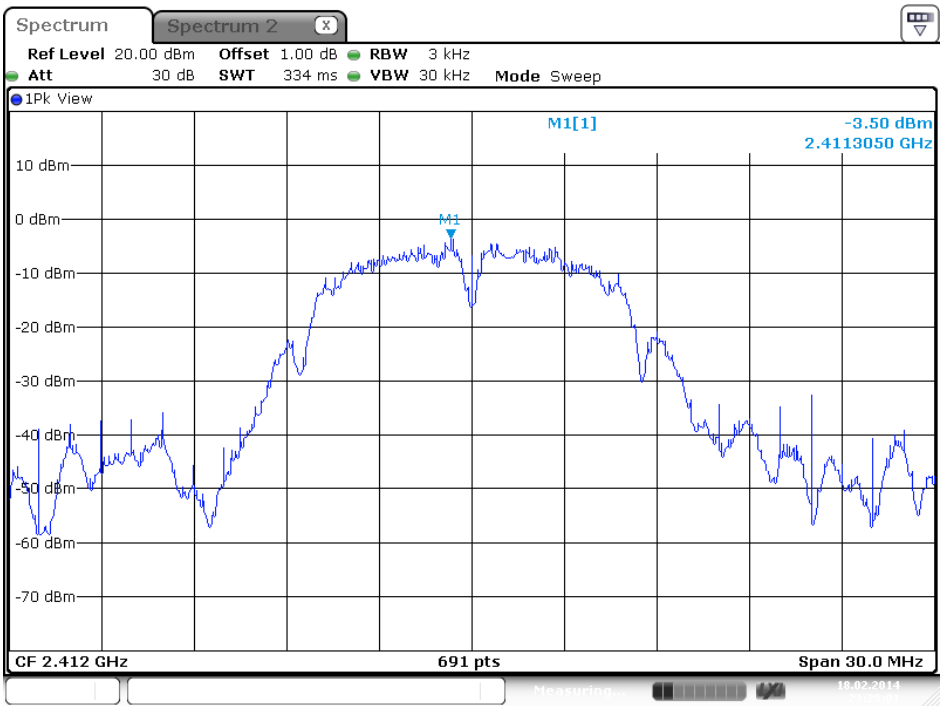
Date: 18.FEB.2014 23:53:25

Power Density Plot on Configuration IEEE 802.11n MCS0 HT20 / 5825 MHz / Chain 2



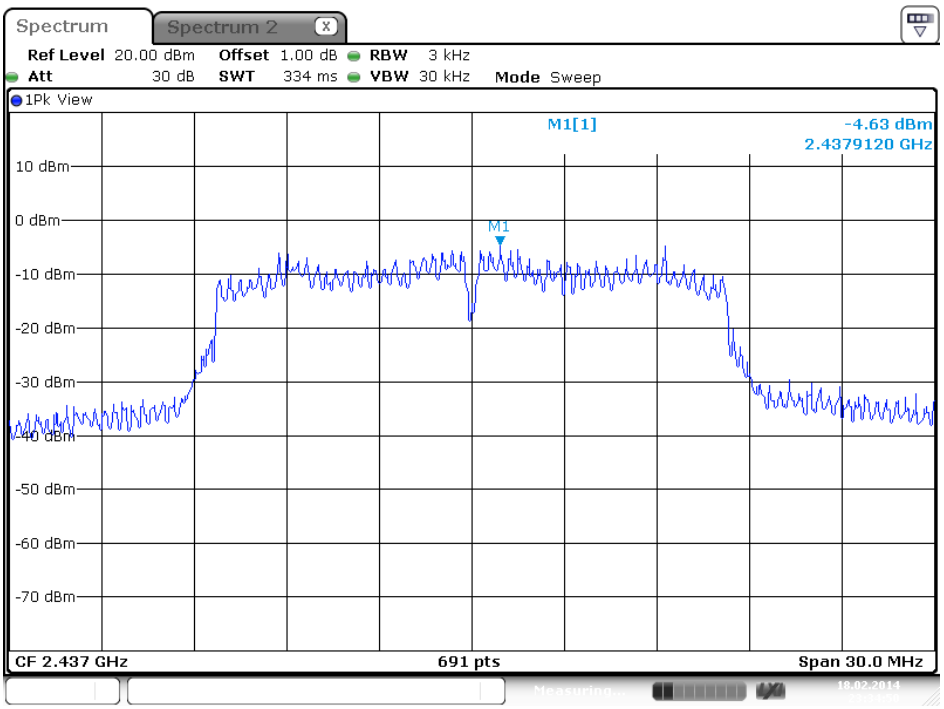
Date: 19.FEB.2014 00:10:56

Power Density Plot on Configuration IEEE 802.11b / 2412 MHz / Chain 1



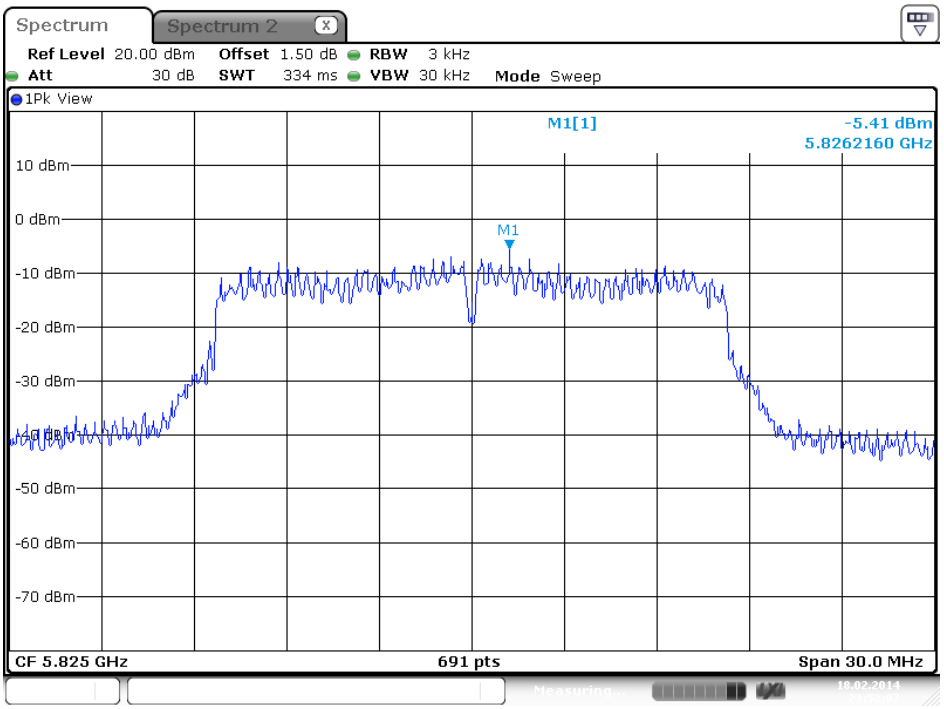
Date: 18.FEB.2014 23:28:01

Power Density Plot on Configuration IEEE 802.11g / 2437 MHz / Chain 1



Date: 18.FEB.2014 23:34:50

Power Density Plot on Configuration IEEE 802.11a / 5825 MHz / Chain 1



Date: 18.FEB.2014 23:52:06

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 the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RBW	100kHz
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.4.3. Test Procedures

For Radiated 6dB Bandwidth Measurement:

7. The transmitter was radiated to the spectrum analyzer in peak hold mode.
8. Test was performed in accordance with KDB 558074 D01 v03r01 for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8.0 DTS 6-dB signal bandwidth option 1.
9. Multiple antenna system was performed in accordance with KDB 662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
10. Measured the spectrum width with power higher than 6dB below carrier.

4.4.4. Test Setup Layout

For Radiated 6dB Bandwidth Measurement:

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

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	23°C	Humidity	58%
Test Engineer	David Tseng	Configurations	IEEE 802.11n

For 2.4GHz Band

Configuration IEEE 802.11n MCS0 HT20 / Chain 1 + Chain 2

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	17.60	17.60	500	Complies
6	2437 MHz	15.76	17.28	500	Complies
11	2462 MHz	16.96	17.52	500	Complies

For 5GHz Band

Configuration IEEE 802.11n MCS0 HT20 / Chain 1 + Chain 2

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	15.52	17.60	500	Complies
157	5785 MHz	15.68	17.60	500	Complies
165	5825 MHz	16.16	17.68	500	Complies

Temperature	23℃	Humidity	58%
Test Engineer	David Tseng	Configurations	IEEE 802.11a/b/g

Configuration IEEE 802.11b / Chain 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	8.08	10.16	500	Complies
6	2437 MHz	8.08	10.08	500	Complies
11	2462 MHz	7.52	10.08	500	Complies

Configuration IEEE 802.11g / Chain 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	14.40	16.40	500	Complies
6	2437 MHz	13.44	16.64	500	Complies
11	2462 MHz	14.80	16.32	500	Complies

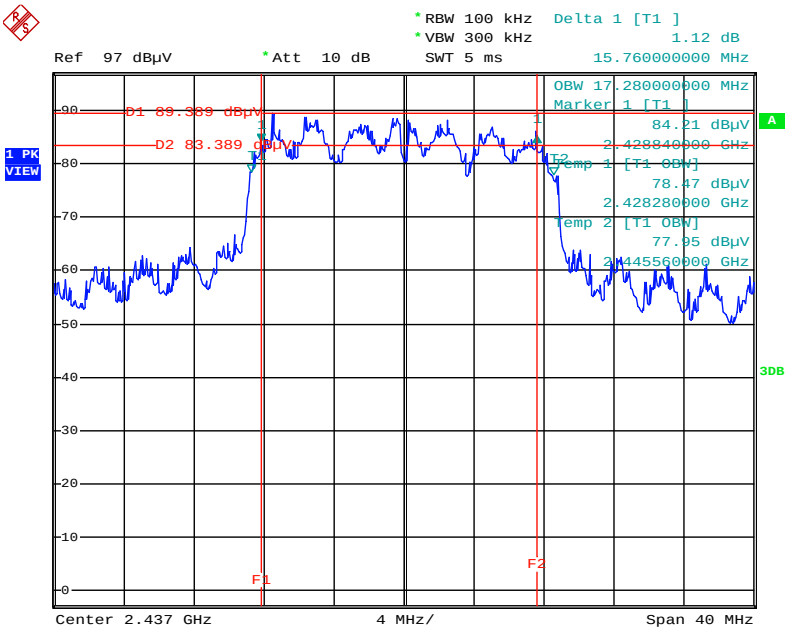
Configuration IEEE 802.11a / Chain 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	15.52	16.56	500	Complies
157	5785 MHz	15.12	16.40	500	Complies
165	5825 MHz	15.04	16.56	500	Complies

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

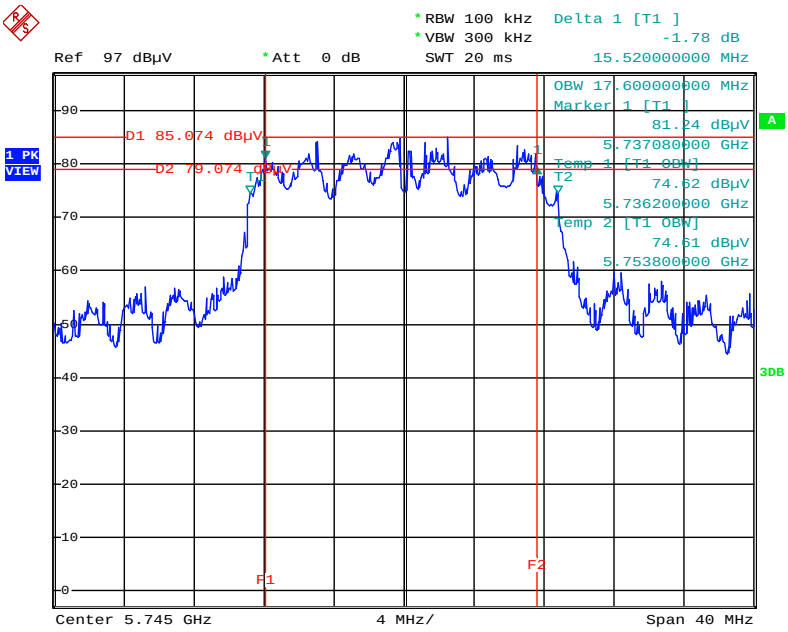
For plots, only the channel with worse result was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 HT20 / 2437 MHz / Chain 1 + Chain 2



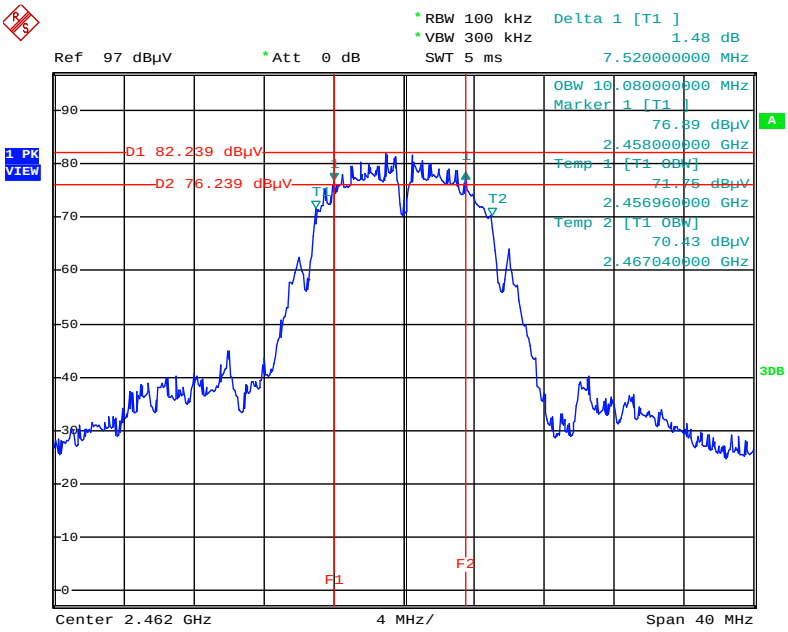
Date: 18.FEB.2014 00:01:21

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 HT20 / 5745 MHz / Chain 1 + Chain 2



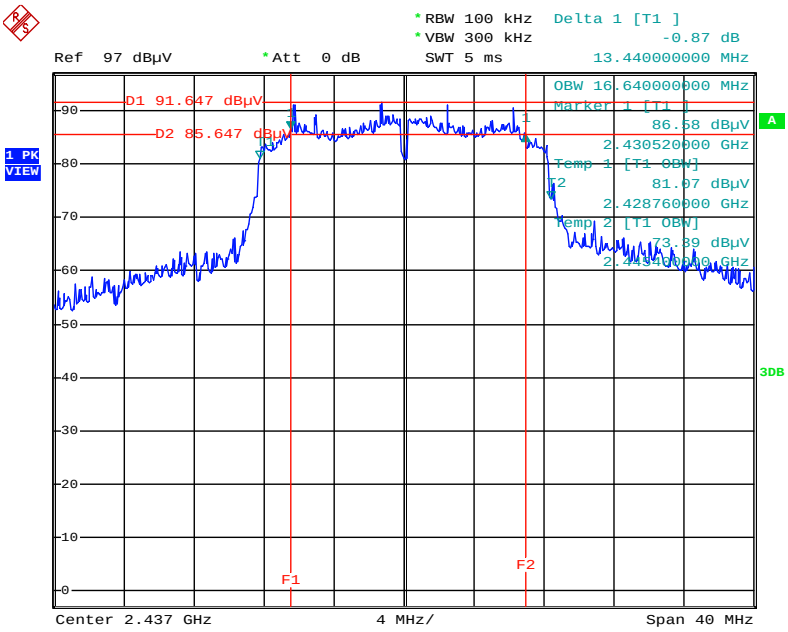
Date: 18.FEB.2014 00:15:55

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2462 MHz / Chain 1



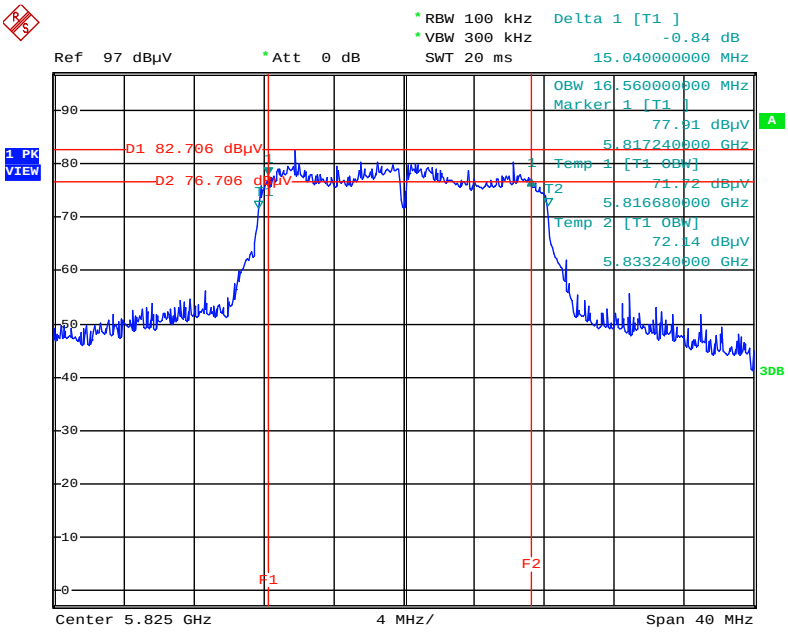
Date: 17.FEB.2014 23:50:16

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2437 MHz / Chain 1



Date: 17.FEB.2014 23:54:29

6 dB Bandwidth Plot on Configuration IEEE 802.11a / 5825 MHz / Chain 1



Date: 18.FEB.2014 00:12:49

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	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 10Hz for Average
RBW / VBW (Emission in non-restricted band)	100kHz / 300kHz for peak

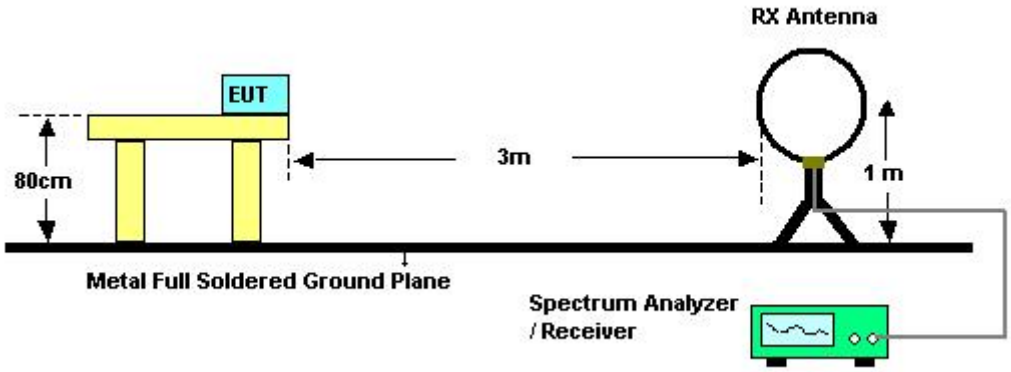
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.5.3. Test Procedures

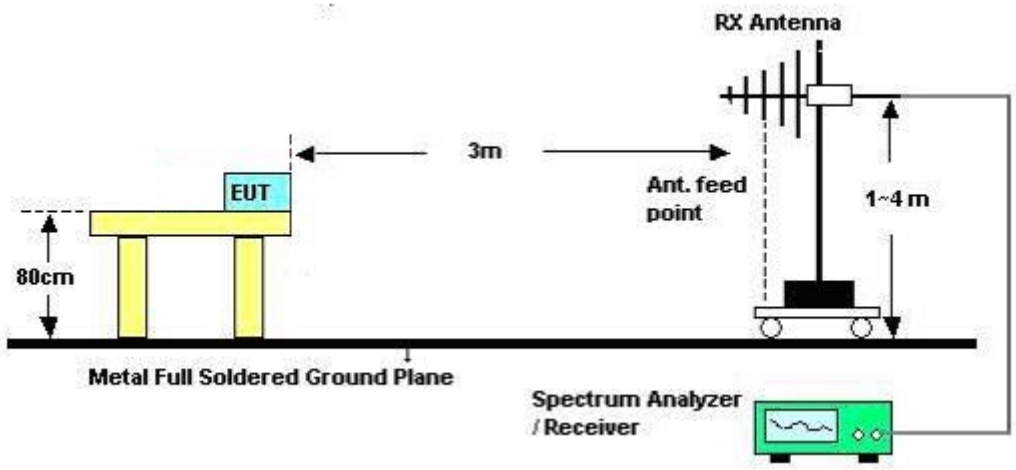
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

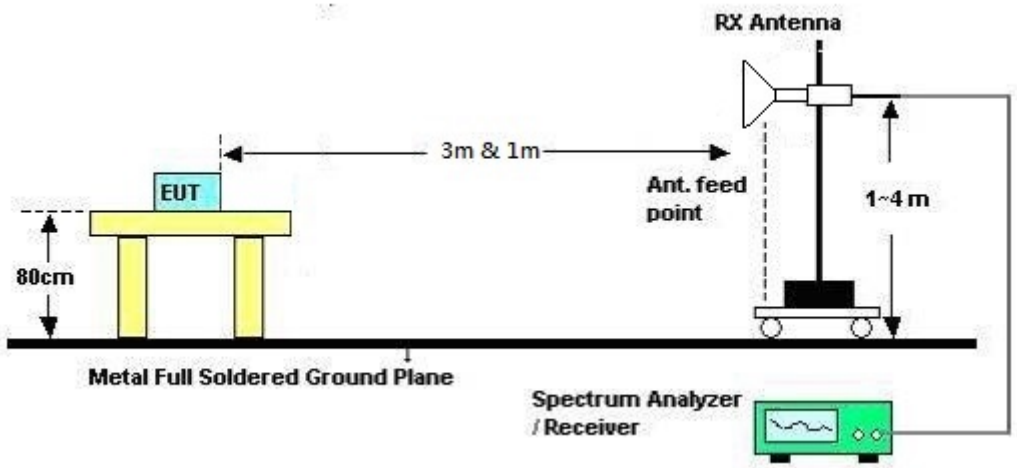
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~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	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	Normal Link
Test Date	Feb. 15, 2014	Test Mode	Mode 3

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.

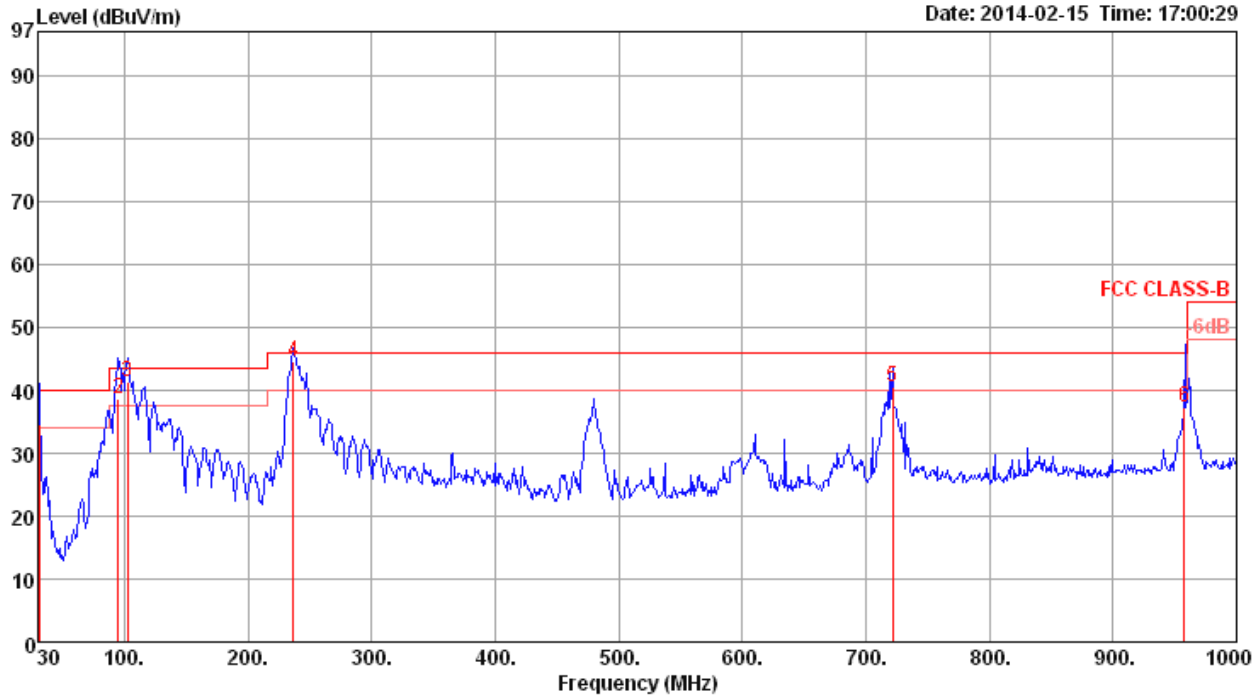
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

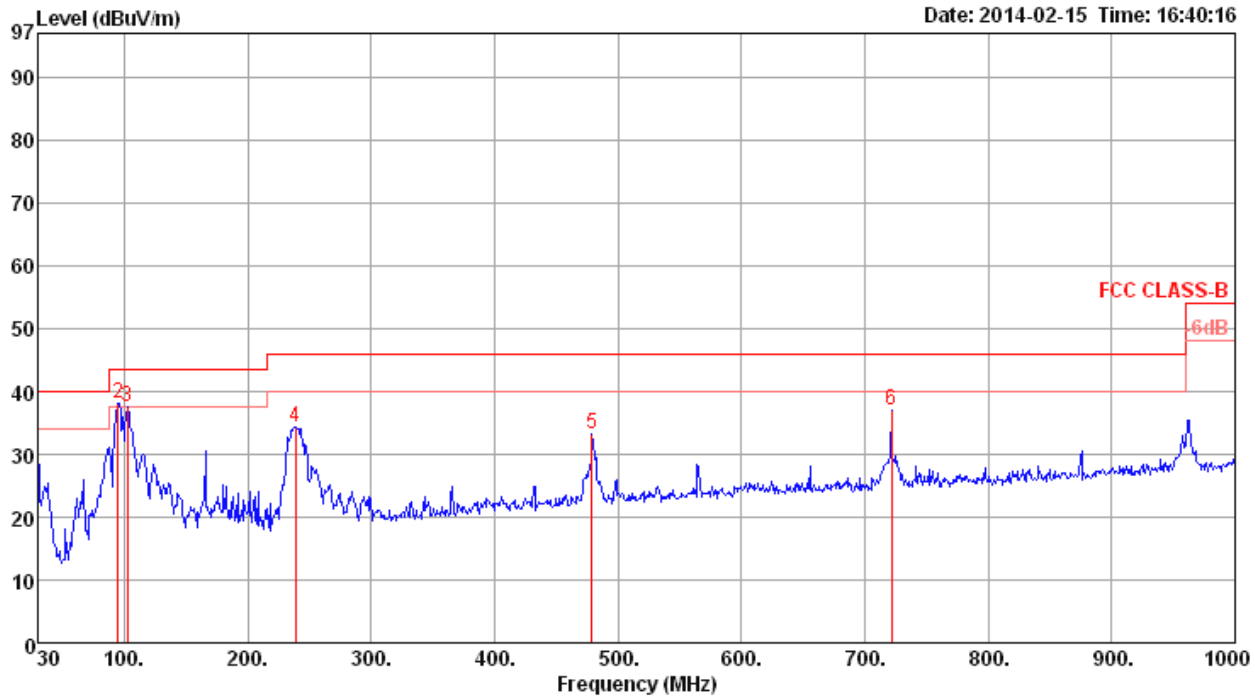
Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	Normal Link
Test Mode	Mode 3		

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	31.00	34.55	40.00	-5.45	43.50	0.63	18.22	27.80	QP	294	222	HORIZONTAL
2	95.00	38.64	43.50	-4.86	55.09	1.19	9.98	27.62	QP	221	161	HORIZONTAL
3	102.75	41.47	43.50	-2.03	56.66	1.19	11.21	27.59	QP	221	156	HORIZONTAL
4	236.73	44.49	46.00	-1.51	58.00	1.75	11.77	27.03	QP	168	169	HORIZONTAL
5	721.61	40.46	46.00	-5.54	45.99	3.14	19.24	27.91	QP	132	156	HORIZONTAL
6	958.00	37.36	46.00	-8.64	40.01	3.55	20.97	27.17	QP	128	32	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	30.00	30.82	40.00	-9.18	39.25	0.61	18.76	27.80	Peak	400	0	VERTICAL
2	94.99	38.19	43.50	-5.31	54.64	1.19	9.98	27.62	Peak	400	0	VERTICAL
3	102.75	37.51	43.50	-5.99	52.70	1.19	11.21	27.59	Peak	400	0	VERTICAL
4	238.55	34.42	46.00	-11.58	47.78	1.75	11.91	27.02	Peak	400	0	VERTICAL
5	479.11	33.13	46.00	-12.87	41.23	2.59	17.30	27.99	Peak	400	0	VERTICAL
6	721.61	37.12	46.00	-8.88	42.65	3.14	19.24	27.91	Peak	400	0	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.

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

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 HT20 CH 1 / Chain 1 + Chain 2
Test Date	Jan. 20, 2014		

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	4823.17	30.31	54.00	-23.69	28.97	3.31	33.06	35.03	Average	100	306	HORIZONTAL
2	4824.10	42.18	74.00	-31.82	40.84	3.31	33.06	35.03	Peak	100	306	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	4821.84	30.37	54.00	-23.63	29.03	3.31	33.06	35.03	Average	100	13	VERTICAL
2	4824.56	42.64	74.00	-31.36	41.30	3.31	33.06	35.03	Peak	100	13	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 HT20 CH 6 / Chain 1 + Chain 2
Test Date	Jan. 20, 2014		

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	4874.58	50.45	74.00	-23.55	48.99	3.33	33.16	35.03	Peak	190	12	HORIZONTAL
2	4874.80	38.28	54.00	-15.72	36.82	3.33	33.16	35.03	Average	190	12	HORIZONTAL
3	7309.83	66.48	74.00	-7.52	61.86	4.06	35.96	35.40	Peak	177	222	HORIZONTAL
4	7309.96	52.96	54.00	-1.04	48.34	4.06	35.96	35.40	Average	177	222	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	4872.29	55.51	74.00	-18.49	54.05	3.33	33.16	35.03	Peak	104	355	VERTICAL
2	4872.48	42.69	54.00	-11.31	41.23	3.33	33.16	35.03	Average	104	355	VERTICAL
3	7309.99	46.21	54.00	-7.79	41.59	4.06	35.96	35.40	Average	100	95	VERTICAL
4	7310.17	59.51	74.00	-14.49	54.89	4.06	35.96	35.40	Peak	100	95	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 HT20 CH 11 / Chain 1 + Chain 2
Test Date	Jan. 20, 2014		

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	4923.69	44.71	74.00	-29.29	43.11	3.35	33.26	35.01	Peak	135	93	HORIZONTAL
2	4925.84	31.60	54.00	-22.40	30.00	3.35	33.26	35.01	Average	135	93	HORIZONTAL
3	7386.21	43.38	54.00	-10.62	38.63	4.06	36.09	35.40	Average	170	222	HORIZONTAL
4	7388.41	58.27	74.00	-15.73	53.52	4.06	36.09	35.40	Peak	170	222	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	4924.06	31.04	54.00	-22.96	29.44	3.35	33.26	35.01	Average	100	315	VERTICAL
2	4926.44	42.53	74.00	-31.47	40.93	3.35	33.26	35.01	Peak	100	315	VERTICAL
3	7385.92	52.03	74.00	-21.97	47.28	4.06	36.09	35.40	Peak	100	149	VERTICAL
4	7386.15	38.65	54.00	-15.35	33.90	4.06	36.09	35.40	Average	100	149	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 HT20 CH 149 / Chain 1 + Chain 2
Test Date	Jan. 20, 2014		

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	11489.04	58.58	74.00	-15.42	49.97	5.11	38.78	35.28	Peak	117	298	HORIZONTAL
2	11491.96	43.83	54.00	-10.17	35.22	5.11	38.78	35.28	Average	117	298	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	11489.42	45.06	54.00	-8.94	36.45	5.11	38.78	35.28	Average	118	323	VERTICAL
2	11494.13	58.29	74.00	-15.71	49.67	5.12	38.78	35.28	Peak	118	323	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 HT20 CH 157 / Chain 1 + Chain 2
Test Date	Jan. 20, 2014		

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	11569.07	44.46	54.00	-9.54	35.80	5.13	38.83	35.30	Average	132	296	HORIZONTAL
2	11569.07	60.21	74.00	-13.79	51.55	5.13	38.83	35.30	Peak	132	296	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	11568.97	46.10	54.00	-7.90	37.44	5.13	38.83	35.30	Average	129	342	VERTICAL
2	11571.86	59.80	74.00	-14.20	51.13	5.14	38.83	35.30	Peak	129	342	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 HT20 CH 165 / Chain 1 + Chain 2
Test Date	Jan. 20, 2014		

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	11646.28	57.32	74.00	-16.68	48.60	5.16	38.86	35.30	Peak	134	260	HORIZONTAL
2	11651.12	43.53	54.00	-10.47	34.81	5.16	38.86	35.30	Average	134	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	11648.65	46.21	54.00	-7.79	37.49	5.16	38.86	35.30	Average	129	340	VERTICAL
2	11650.93	59.51	74.00	-14.49	50.79	5.16	38.86	35.30	Peak	129	340	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11b CH 1 / Chain 1
Test Date	Jan. 20, 2014		

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	4823.91	55.67	74.00	-18.33	54.33	3.31	33.06	35.03	Peak	200	39	HORIZONTAL
2	4823.97	53.40	54.00	-0.60	52.06	3.31	33.06	35.03	Average	200	39	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	4823.98	44.78	54.00	-9.22	43.44	3.31	33.06	35.03	Average	101	82	VERTICAL
2	4823.98	49.38	74.00	-24.62	48.04	3.31	33.06	35.03	Peak	101	82	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11b CH 6 / Chain 1
Test Date	Jan. 20, 2014		

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	4873.97	56.13	74.00	-17.87	54.67	3.33	33.16	35.03	Peak	191	43	HORIZONTAL
2	4873.97	53.90	54.00	-0.10	52.44	3.33	33.16	35.03	Average	191	43	HORIZONTAL
3	7311.69	48.31	54.00	-5.69	43.69	4.06	35.96	35.40	Average	174	221	HORIZONTAL
4	7311.75	53.71	74.00	-20.29	49.09	4.06	35.96	35.40	Peak	174	221	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	4873.97	48.96	74.00	-25.04	47.50	3.33	33.16	35.03	Peak	100	89	VERTICAL
2	4873.98	44.48	54.00	-9.52	43.02	3.33	33.16	35.03	Average	100	89	VERTICAL
3	7310.02	51.54	74.00	-22.46	46.92	4.06	35.96	35.40	Peak	102	340	VERTICAL
4	7311.69	45.23	54.00	-8.77	40.61	4.06	35.96	35.40	Average	102	340	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11b CH 11 / Chain 1
Test Date	Jan. 20, 2014		

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	4923.90	56.02	74.00	-17.98	54.42	3.35	33.26	35.01	Peak	186	49	HORIZONTAL
2	4923.96	53.88	54.00	-0.12	52.28	3.35	33.26	35.01	Average	186	49	HORIZONTAL
3	7385.28	47.16	54.00	-6.84	42.41	4.06	36.09	35.40	Average	173	224	HORIZONTAL
4	7386.94	53.07	74.00	-20.93	48.32	4.06	36.09	35.40	Peak	173	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	4923.92	51.67	74.00	-22.33	50.07	3.35	33.26	35.01	Peak	103	349	VERTICAL
2	4923.98	48.61	54.00	-5.39	47.01	3.35	33.26	35.01	Average	103	349	VERTICAL
3	7385.26	45.08	54.00	-8.92	40.33	4.06	36.09	35.40	Average	100	333	VERTICAL
4	7386.66	51.37	74.00	-22.63	46.62	4.06	36.09	35.40	Peak	100	333	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11g CH 1 / Chain 1
Test Date	Jan. 20, 2014		

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	4823.33	45.18	74.00	-28.82	43.84	3.31	33.06	35.03	Peak	100	178	HORIZONTAL
2	4825.23	31.84	54.00	-22.16	30.50	3.31	33.06	35.03	Average	100	178	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	4823.57	30.51	54.00	-23.49	29.17	3.31	33.06	35.03	Average	100	328	VERTICAL
2	4825.15	42.24	74.00	-31.76	40.90	3.31	33.06	35.03	Peak	100	328	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11g CH 6 / Chain 1
Test Date	Jan. 20, 2014		

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	4874.16	56.59	74.00	-17.41	55.13	3.33	33.16	35.03	Peak	191	48	HORIZONTAL
2	4874.29	43.17	54.00	-10.83	41.71	3.33	33.16	35.03	Average	191	48	HORIZONTAL
3	7308.28	47.33	54.00	-6.67	42.71	4.06	35.96	35.40	Average	175	227	HORIZONTAL
4	7308.31	61.04	74.00	-12.96	56.42	4.06	35.96	35.40	Peak	175	227	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	4872.27	34.88	54.00	-19.12	33.42	3.33	33.16	35.03	Average	100	89	VERTICAL
2	4872.73	48.15	74.00	-25.85	46.69	3.33	33.16	35.03	Peak	100	89	VERTICAL
3	7311.96	44.19	54.00	-9.81	39.57	4.06	35.96	35.40	Average	121	338	VERTICAL
4	7315.10	57.69	74.00	-16.31	53.07	4.06	35.96	35.40	Peak	121	338	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11g CH 11 / Chain 1
Test Date	Jan. 20, 2014		

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	4924.19	37.00	54.00	-17.00	35.40	3.35	33.26	35.01	Average	197	20	HORIZONTAL
2	4925.54	50.31	74.00	-23.69	48.71	3.35	33.26	35.01	Peak	197	20	HORIZONTAL
3	7385.58	54.33	74.00	-19.67	49.58	4.06	36.09	35.40	Peak	184	203	HORIZONTAL
4	7388.24	40.23	54.00	-13.77	35.48	4.06	36.09	35.40	Average	184	203	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	4923.46	34.66	54.00	-19.34	33.06	3.35	33.26	35.01	Average	100	3	VERTICAL
2	4923.98	45.53	74.00	-28.47	43.93	3.35	33.26	35.01	Peak	100	3	VERTICAL
3	7384.30	39.11	54.00	-14.89	34.36	4.06	36.09	35.40	Average	101	322	VERTICAL
4	7385.17	54.38	74.00	-19.62	49.63	4.06	36.09	35.40	Peak	101	322	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11a CH 149 / Chain 1
Test Date	Jan. 20, 2014		

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	11490.06	62.07	74.00	-11.93	53.46	5.11	38.78	35.28	Peak	140	298	HORIZONTAL
2	11490.13	47.37	54.00	-6.63	38.76	5.11	38.78	35.28	Average	140	298	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	11488.75	46.52	54.00	-7.48	37.91	5.11	38.78	35.28	Average	100	324	VERTICAL
2	11489.84	60.54	74.00	-13.46	51.93	5.11	38.78	35.28	Peak	100	324	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11a CH 157 / Chain 1
Test Date	Jan. 20, 2014		

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	11569.04	62.33	74.00	-11.67	53.67	5.13	38.83	35.30	Peak	123	322	HORIZONTAL
2	11569.62	46.66	54.00	-7.34	38.00	5.13	38.83	35.30	Average	123	322	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	11570.80	49.13	54.00	-4.87	40.46	5.14	38.83	35.30	Average	123	341	VERTICAL
2	11575.87	63.15	74.00	-10.85	54.48	5.14	38.83	35.30	Peak	123	341	VERTICAL

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11a CH 165 / Chain 1
Test Date	Jan. 20, 2014		

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	11649.39	63.65	74.00	-10.35	54.93	5.16	38.86	35.30	Peak	137	29	HORIZONTAL
2	11649.84	48.87	54.00	-5.13	40.15	5.16	38.86	35.30	Average	137	29	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	11649.71	51.80	54.00	-2.20	43.08	5.16	38.86	35.30	Average	121	337	VERTICAL
2	11652.40	65.41	74.00	-8.59	56.69	5.16	38.86	35.30	Peak	121	337	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. 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
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 10Hz for Average
RBW / VBW (Emission in non-restricted band)	100 kHz / 300 kHz for Peak

4.6.3. Test Procedures

For Radiated band edges Measurement:

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

For Radiated Out of Band Emission Measurement:

1. Test was performed in accordance with KDB 558074 D01 v03r01 for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10.1 Unwanted Emissions into Non-Restricted Frequency Bands Measurement Procedure
2. The radiated emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.
   Only worst data of each operating mode is presented.

4.6.4. Test Setup Layout

For Radiated band edges Measurement:

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

For Radiated Out of Band Emission Measurement:

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.

4.6.7. Test Result of Band Edge and Fundamental Emissions

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11n MCS0 HT20 CH 1, 6, 11 / Chain 1 + Chain 2
Test date	Jan. 20, 2014		

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	2386.47	73.56	74.00	-0.44	43.18	2.21	28.17	0.00	Peak	100	27	HORIZONTAL
2	2389.04	53.53	54.00	-0.47	23.15	2.21	28.17	0.00	Average	100	27	HORIZONTAL
3	2411.68	98.70			68.27	2.22	28.21	0.00	Average	100	27	HORIZONTAL
4	2411.68	107.74			77.31	2.22	28.21	0.00	Peak	100	27	HORIZONTAL

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

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	2387.76	67.84	74.00	-6.16	37.46	2.21	28.17	0.00	Peak	109	16	VERTICAL
2	2389.68	53.15	54.00	-0.85	22.77	2.21	28.17	0.00	Average	109	16	VERTICAL
3	2431.55	114.65			84.17	2.23	28.25	0.00	Peak	109	16	VERTICAL
4	2436.68	103.85			73.33	2.23	28.29	0.00	Average	109	16	VERTICAL
5	2483.82	53.47	54.00	-0.53	22.84	2.26	28.37	0.00	Average	109	16	VERTICAL
6	2488.95	71.82	74.00	-2.18	41.15	2.26	28.41	0.00	Peak	109	16	VERTICAL

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

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	2456.23	109.80			79.23	2.24	28.33	0.00	Peak	100	30	HORIZONTAL
2	2461.36	100.00			69.43	2.24	28.33	0.00	Average	100	30	HORIZONTAL
3	2483.50	53.12	54.00	-0.88	22.48	2.26	28.38	0.00	Average	100	30	HORIZONTAL
4	2484.14	67.72	74.00	-6.28	37.08	2.26	28.38	0.00	Peak	100	30	HORIZONTAL

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

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11b CH 1, 6, 11 / Chain 1
Test Date	Jan. 20, 2014		

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	2387.44	46.91	54.00	-7.09	16.53	2.21	28.17	0.00	Average	100	36	HORIZONTAL
2	2387.76	58.72	74.00	-15.28	28.34	2.21	28.17	0.00	Peak	100	36	HORIZONTAL
3	2411.04	109.24			78.81	2.22	28.21	0.00	Peak	100	36	HORIZONTAL
4	2411.20	105.57			75.14	2.22	28.21	0.00	Average	100	36	HORIZONTAL

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

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	2386.47	57.79	74.00	-16.21	27.41	2.21	28.17	0.00	Peak	100	45	HORIZONTAL
2	2390.00	44.34	54.00	-9.66	13.95	2.22	28.17	0.00	Average	100	45	HORIZONTAL
3	2436.36	102.82			72.30	2.23	28.29	0.00	Average	100	45	HORIZONTAL
4	2437.96	106.65			76.13	2.23	28.29	0.00	Peak	100	45	HORIZONTAL
5	2483.50	45.38	54.00	-8.62	14.74	2.26	28.38	0.00	Average	100	45	HORIZONTAL
6	2484.78	57.82	74.00	-16.18	27.18	2.26	28.38	0.00	Peak	100	45	HORIZONTAL

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

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	2461.20	104.18			73.61	2.24	28.33	0.00	Average	100	35	HORIZONTAL
2	2462.96	108.00			77.43	2.24	28.33	0.00	Peak	100	35	HORIZONTAL
3	2483.50	46.38	54.00	-7.62	15.74	2.26	28.38	0.00	Average	100	35	HORIZONTAL
4	2487.99	58.15	74.00	-15.85	27.47	2.26	28.42	0.00	Peak	100	35	HORIZONTAL

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

Temperature	19°C	Humidity	63%
Test Engineer	Satoshi Yang	Configurations	IEEE 802.11g CH 1, 6, 11 / Chain 1
Test Date	Jan. 20, 2014		

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	2389.84	73.53	74.00	-0.47	43.14	2.22	28.17	0.00	Peak	100	28	HORIZONTAL
2	2390.00	51.24	54.00	-2.76	20.85	2.22	28.17	0.00	Average	100	28	HORIZONTAL
3	2411.36	97.96			67.53	2.22	28.21	0.00	Average	100	28	HORIZONTAL
4	2411.68	109.27			78.84	2.22	28.21	0.00	Peak	100	28	HORIZONTAL

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

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	2389.68	63.36	74.00	-10.64	32.98	2.21	28.17	0.00	Peak	100	36	HORIZONTAL
2	2390.00	48.18	54.00	-5.82	17.79	2.22	28.17	0.00	Average	100	36	HORIZONTAL
3	2430.91	111.47			80.99	2.23	28.25	0.00	Peak	100	36	HORIZONTAL
4	2443.09	101.29			70.76	2.24	28.29	0.00	Average	100	36	HORIZONTAL
5	2483.50	50.79	54.00	-3.21	20.15	2.26	28.38	0.00	Average	100	36	HORIZONTAL
6	2484.14	70.99	74.00	-3.01	40.35	2.26	28.38	0.00	Peak	100	36	HORIZONTAL

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

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	2461.04	99.27			68.70	2.24	28.33	0.00	Average	100	30	HORIZONTAL
2	2462.16	110.12			79.55	2.24	28.33	0.00	Peak	100	30	HORIZONTAL
3	2483.50	53.73	54.00	-0.27	23.09	2.26	28.38	0.00	Average	100	30	HORIZONTAL
4	2484.14	71.55	74.00	-2.45	40.91	2.26	28.38	0.00	Peak	100	30	HORIZONTAL

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

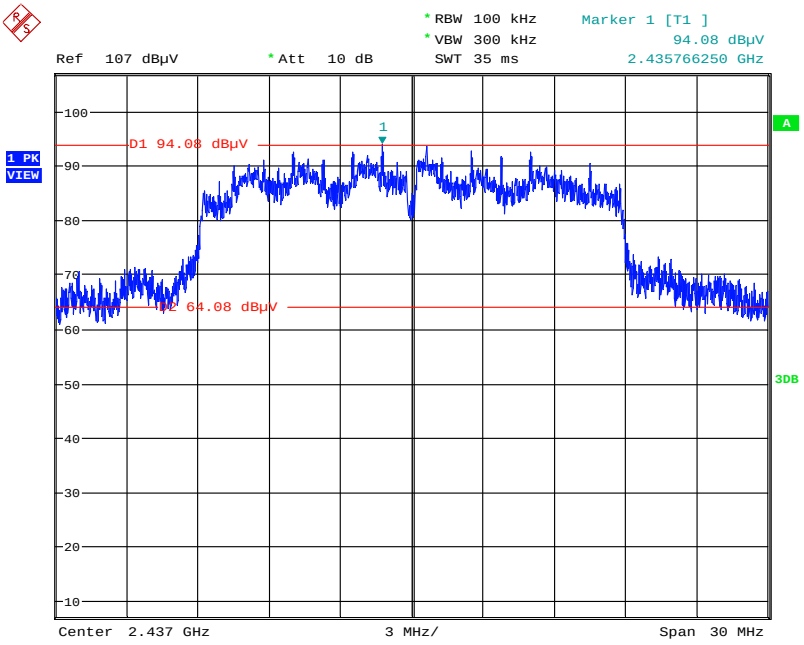
Note:

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

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

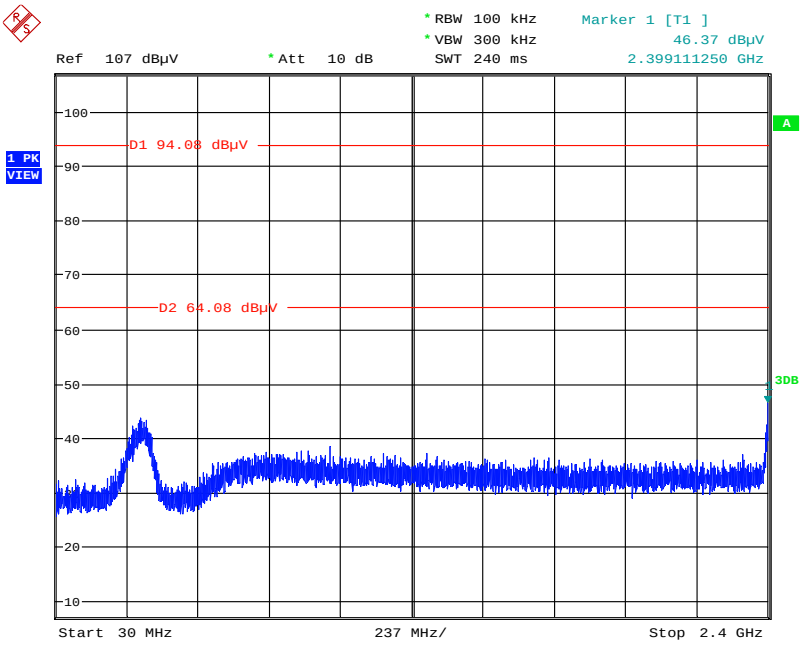
For Emission not in Restricted Band

Plot on Configuration IEEE 802.11n MCS0 HT20 / Reference Level



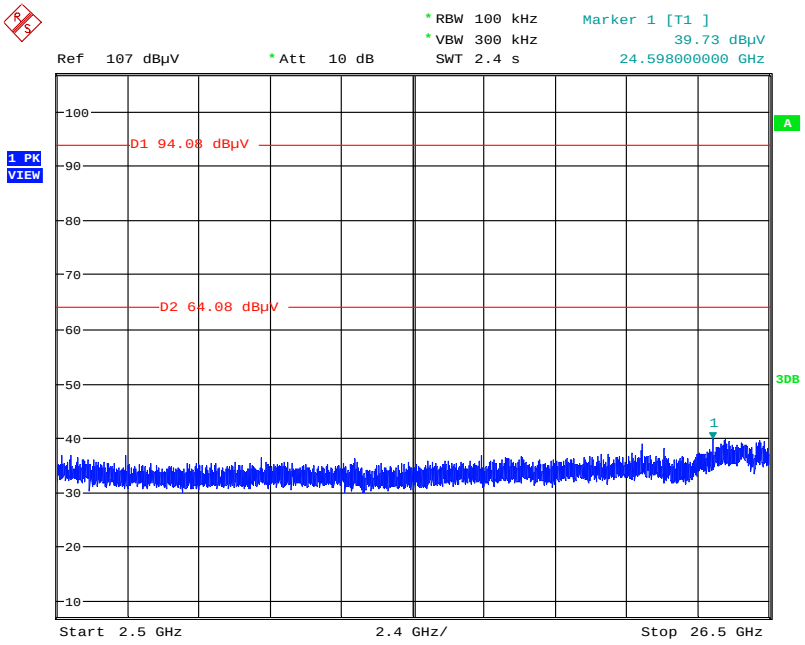
Date: 11.FEB.2014 21:29:15

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 1 / 30MHz~2400MHz (down 30dBc)



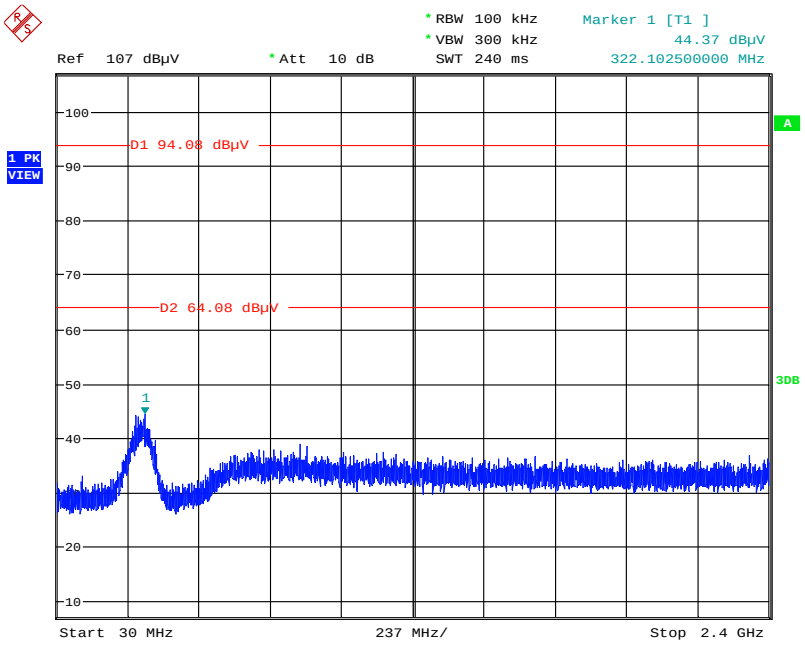
Date: 11.FEB.2014 21:29:54

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 1 / 2500MHz~26500MHz (down 30dBc)



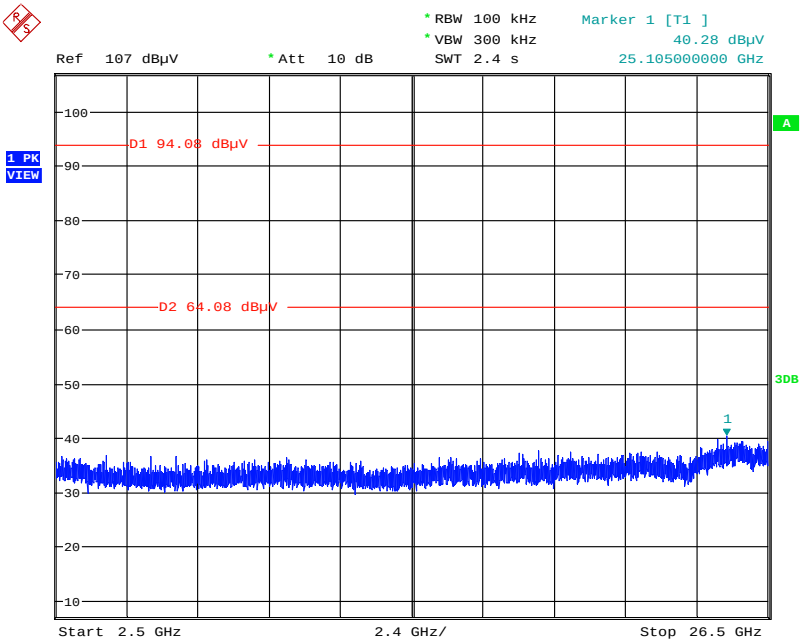
Date: 11.FEB.2014 21:30:16

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 11 / 30MHz~2400MHz (down 30dBc)



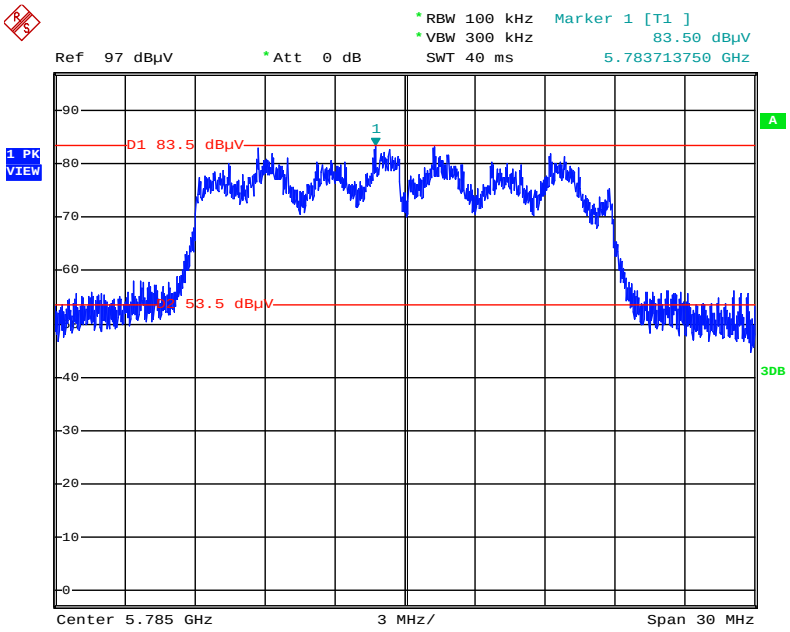
Date: 11.FEB.2014 21:30:54

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 11 / 2500MHz~26500MHz (down 30dBc)



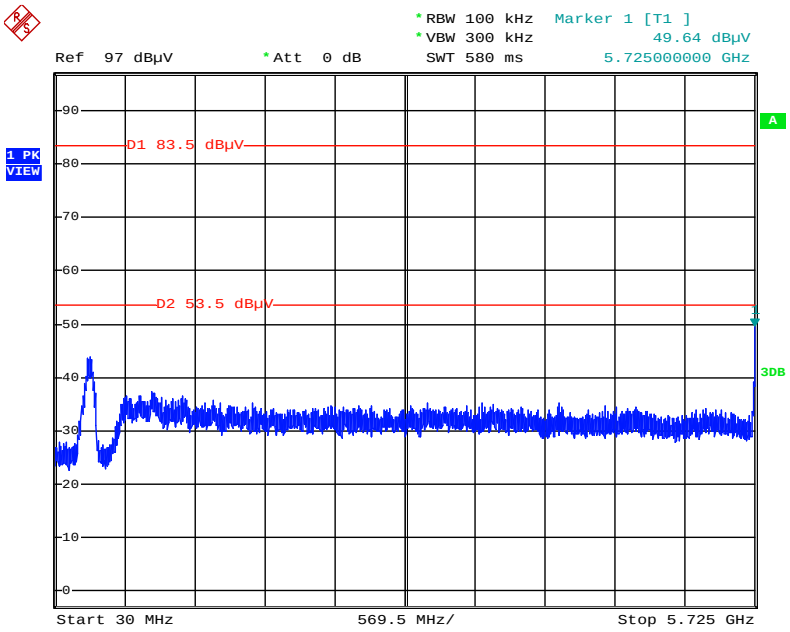
Date: 11.FEB.2014 21:30:38

Plot on Configuration IEEE 802.11n MCS0 HT20 / Reference Level



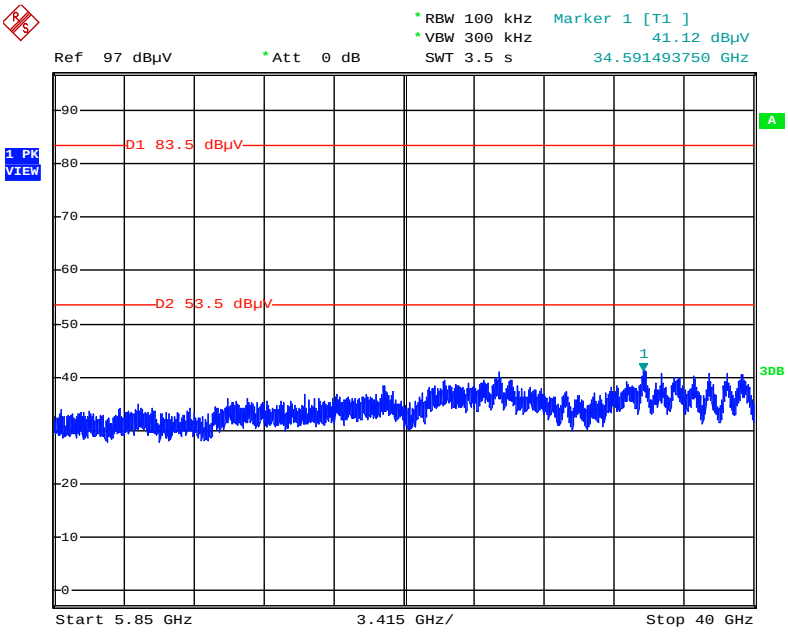
Date: 12.FEB.2014 01:55:02

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 149 / 30MHz~5725MHz (down 30dBc)



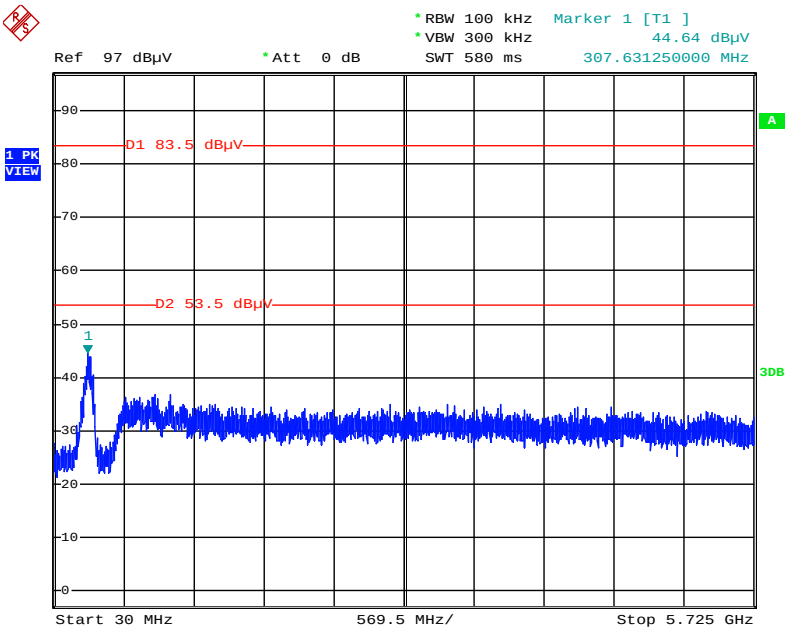
Date: 12.FEB.2014 01:57:17

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 149 / 5850MHz~40000MHz (down 30dBc)



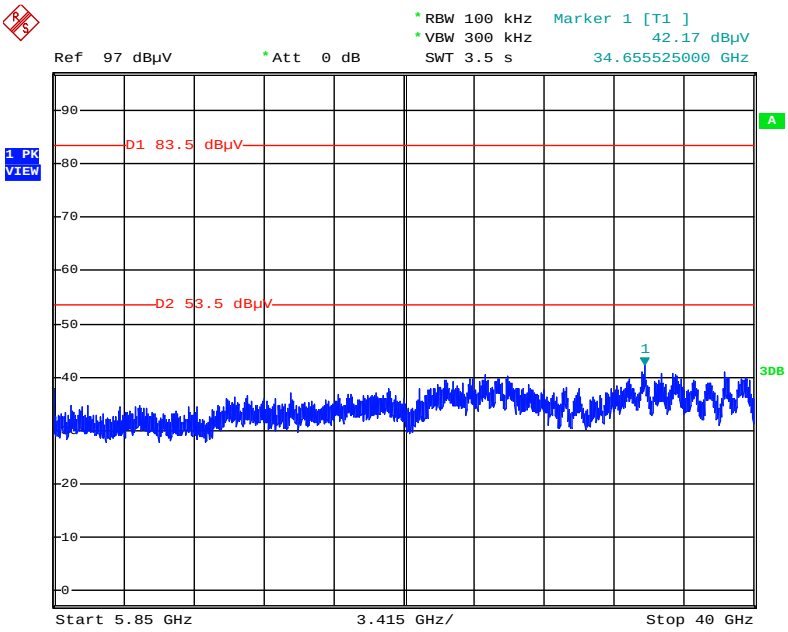
Date: 12.FEB.2014 01:57:50

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 165 / 30MHz~5725MHz (down 30dBc)



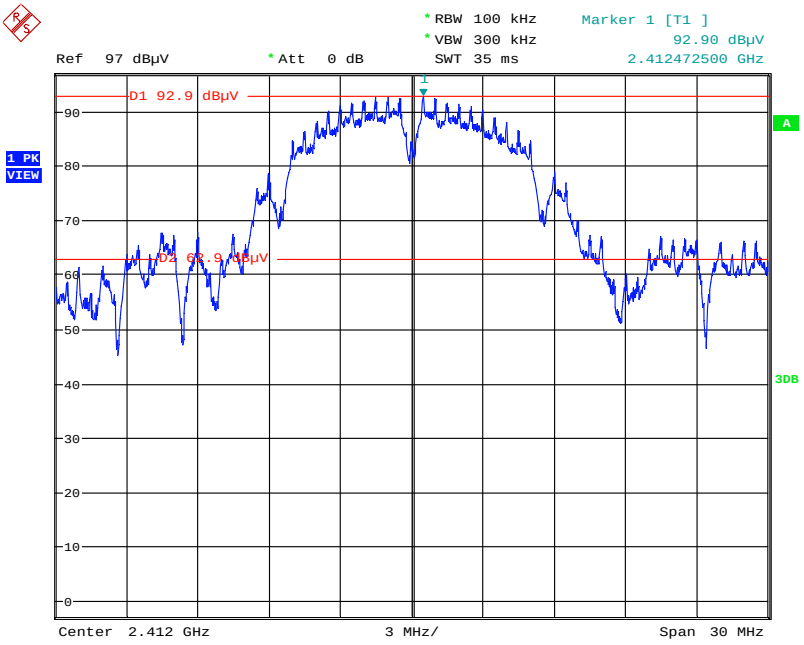
Date: 12.FEB.2014 01:58:47

Plot on Configuration IEEE 802.11n MCS0 HT20 / CH 165 / 5850MHz~40000MHz (down 30dBc)



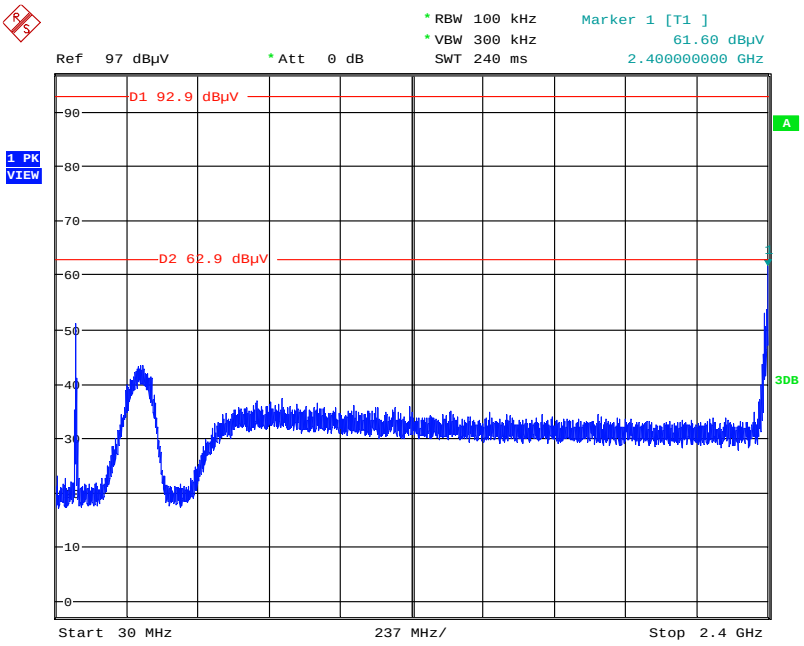
Date: 12.FEB.2014 01:58:23

Plot on Configuration IEEE 802.11b / Reference Level



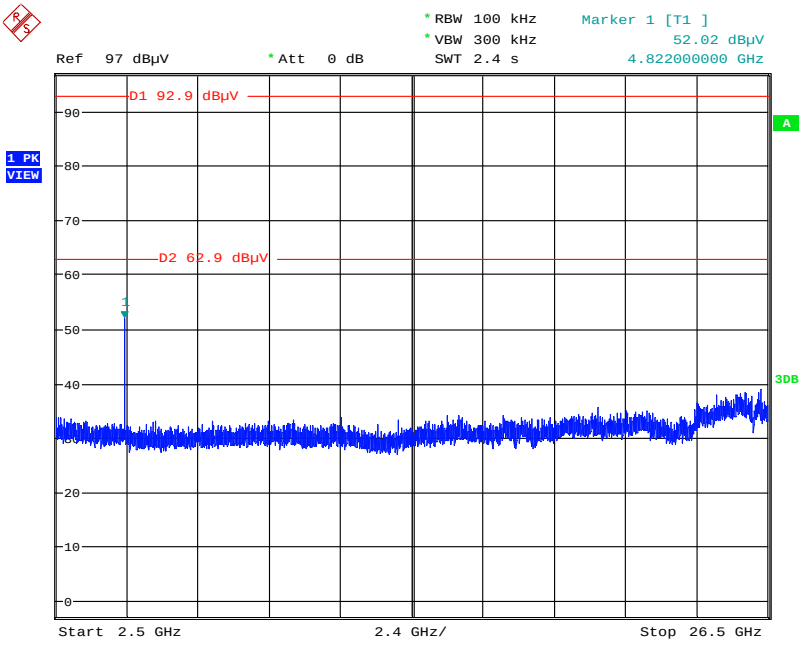
Date: 11.FEB.2014 21:18:22

Plot on Configuration IEEE 802.11b / CH 1 / 30MHz~2400MHz (down 30dBc)



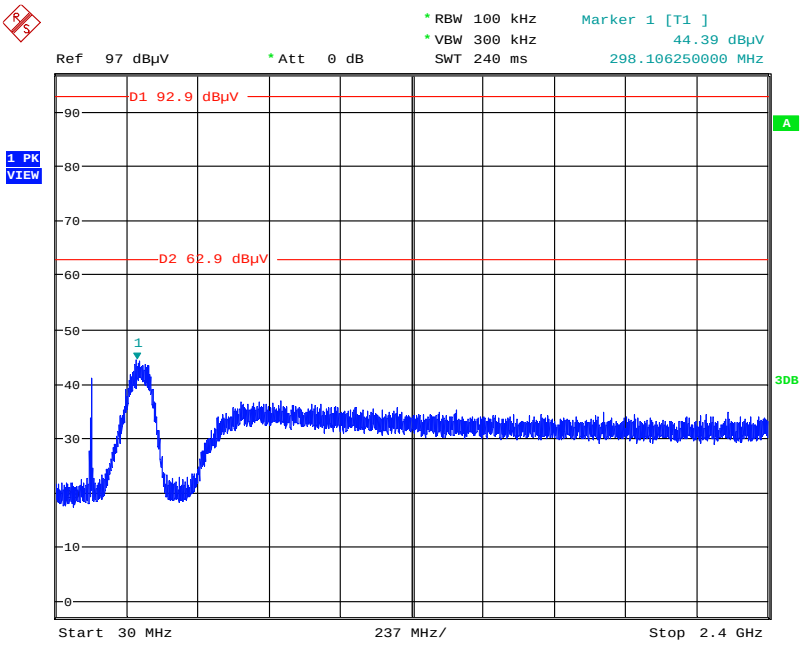
Date: 11.FEB.2014 21:18:44

Plot on Configuration IEEE 802.11b / CH 1 / 2500MHz~26500MHz (down 30dBc)



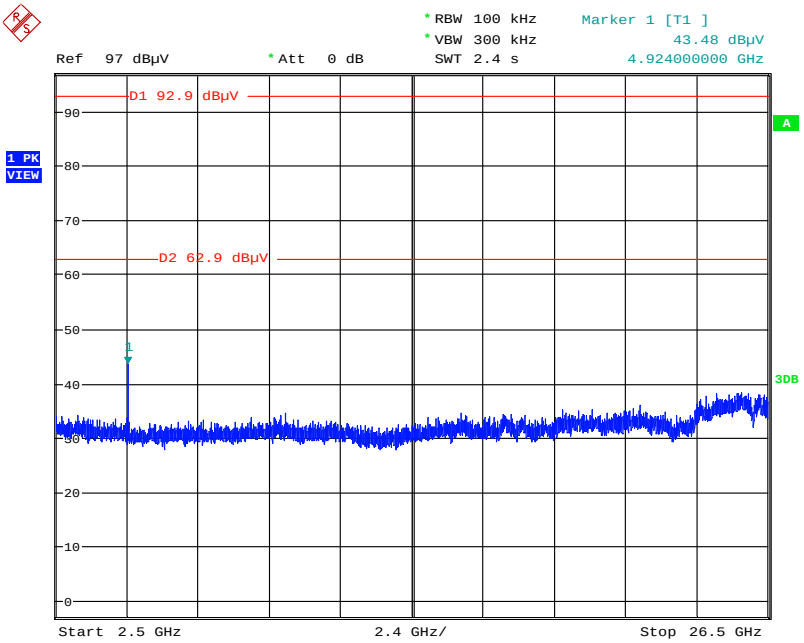
Date: 11.FEB.2014 21:19:05

Plot on Configuration IEEE 802.11b / CH 11 / 30MHz~2400MHz (down 30dBc)



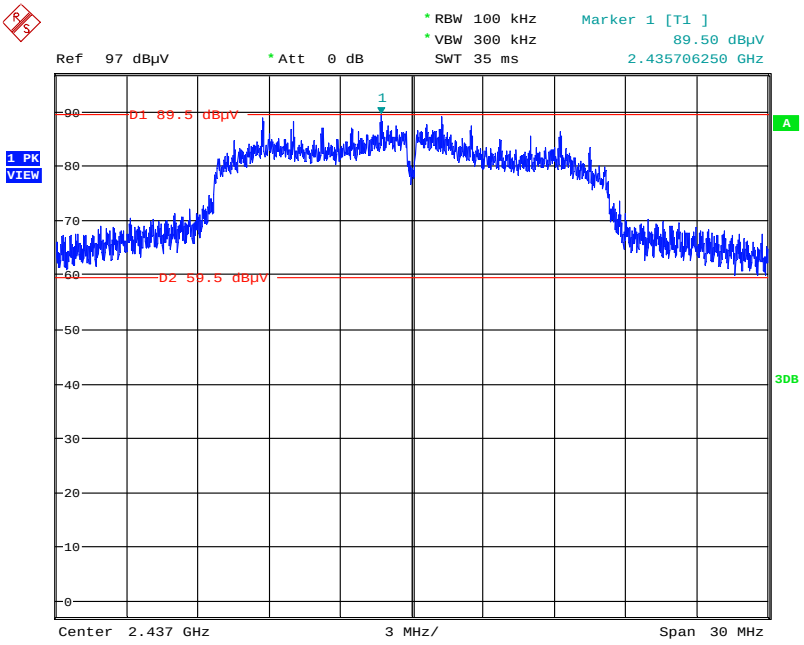
Date: 11.FEB.2014 21:20:14

Plot on Configuration IEEE 802.11b / CH 11 / 2500MHz~26500MHz (down 30dBc)



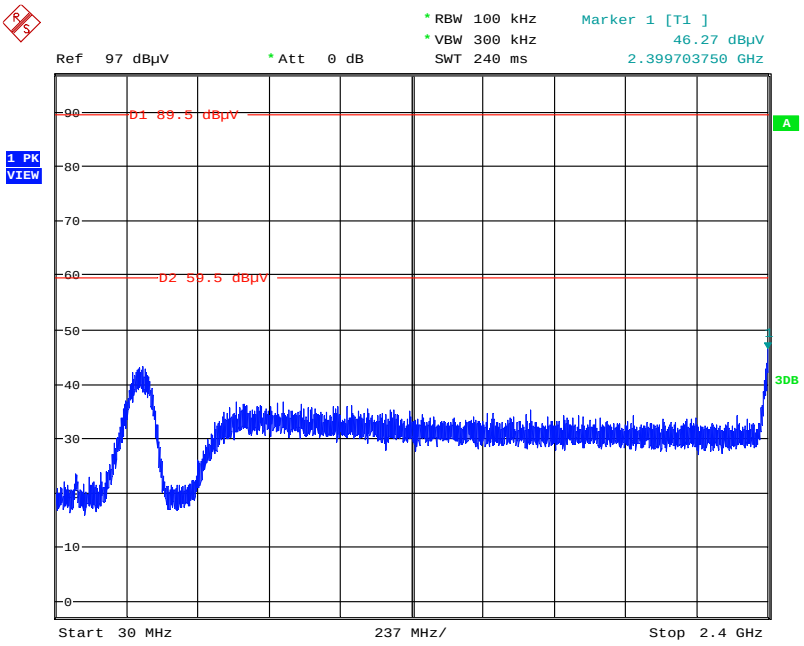
Date: 11.FEB.2014 21:19:51

Plot on Configuration IEEE 802.11g / Reference Level



Date: 11.FEB.2014 21:24:28

Plot on Configuration IEEE 802.11g / CH 1 / 30MHz~2400MHz (down 30dBc)



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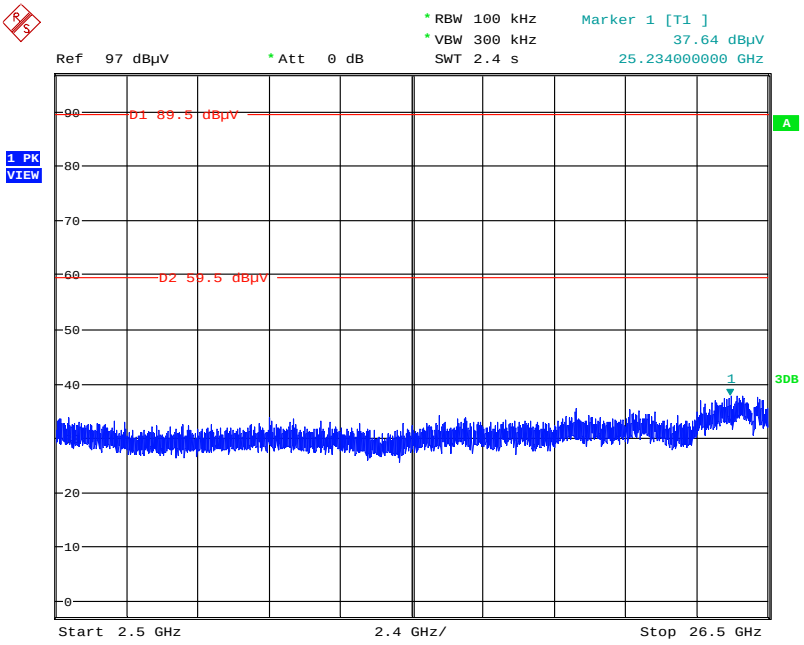
Plot on Configuration IEEE 802.11g / CH 1 / 2500MHz~26500MHz (down 30dBc)



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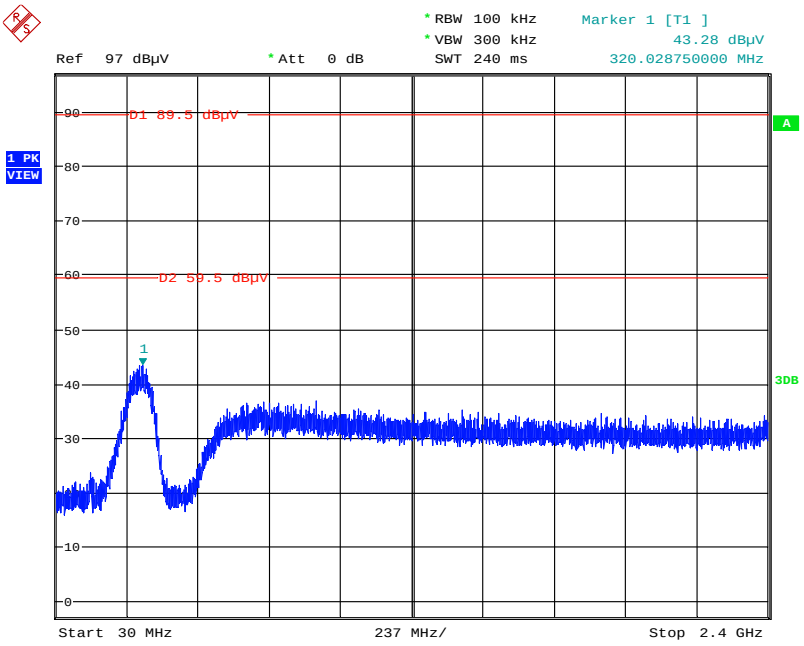
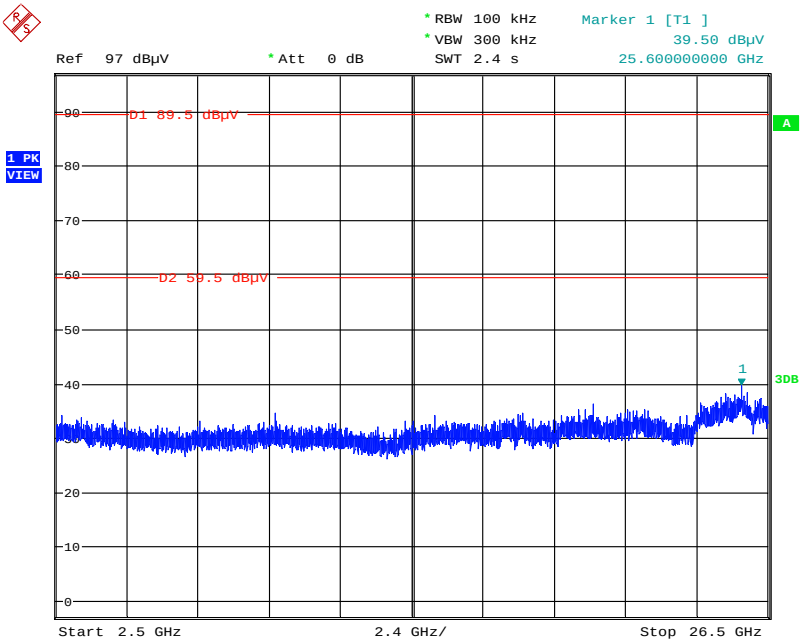


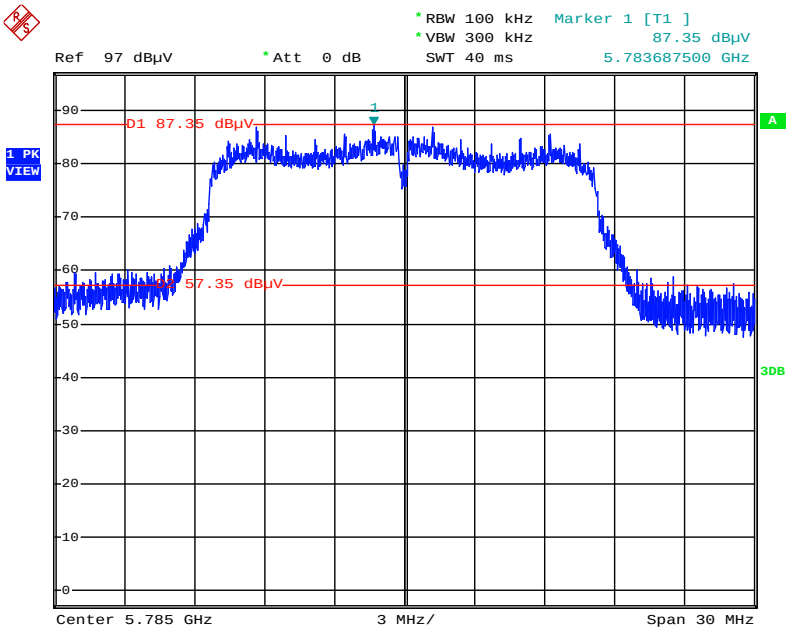
Date: 11.FEB.2014 21:25:42

Plot on Configuration IEEE 802.11g / CH 11 / 2500MHz~26500MHz (down 30dBc)



Date: 11.FEB.2014 21:25:30

Plot on Configuration IEEE 802.11a / Reference Level



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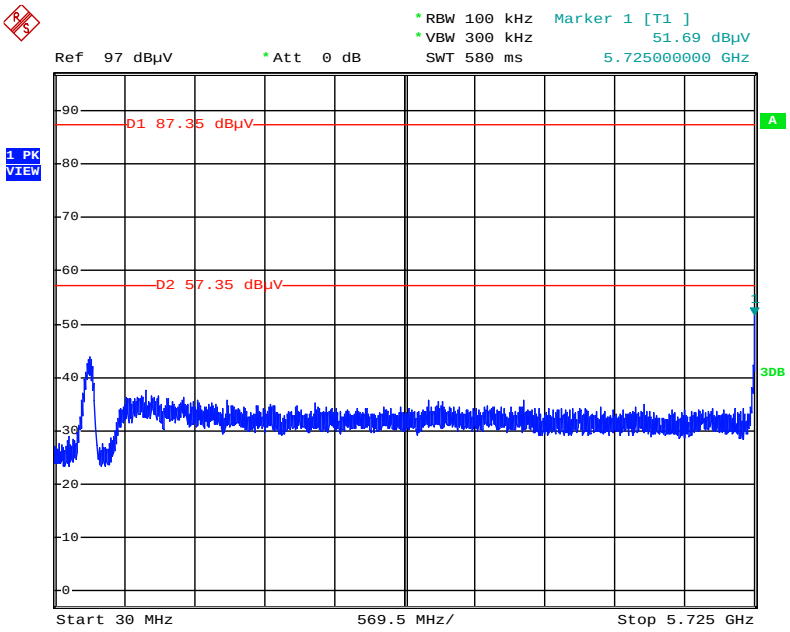
Plot on Configuration IEEE 802.11a / CH 149 / 30MHz~5725MHz (down 30dBc)



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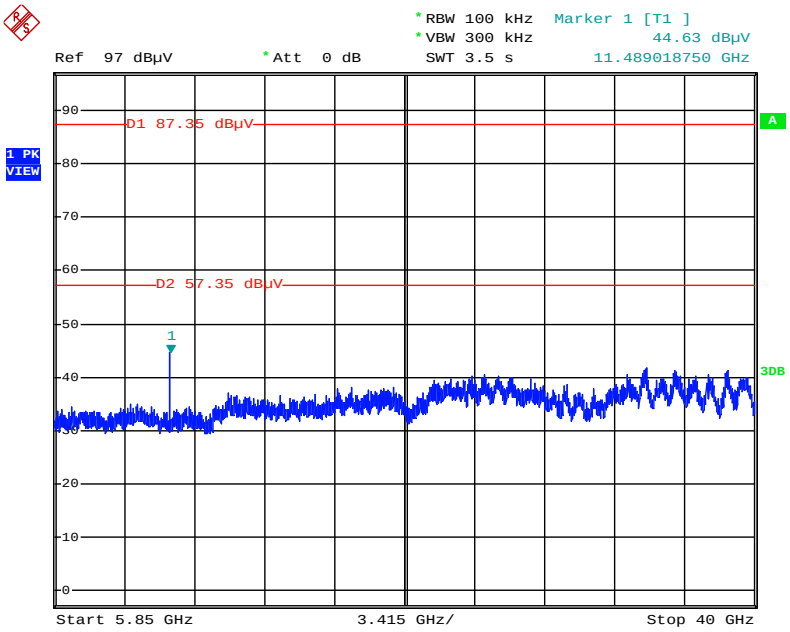
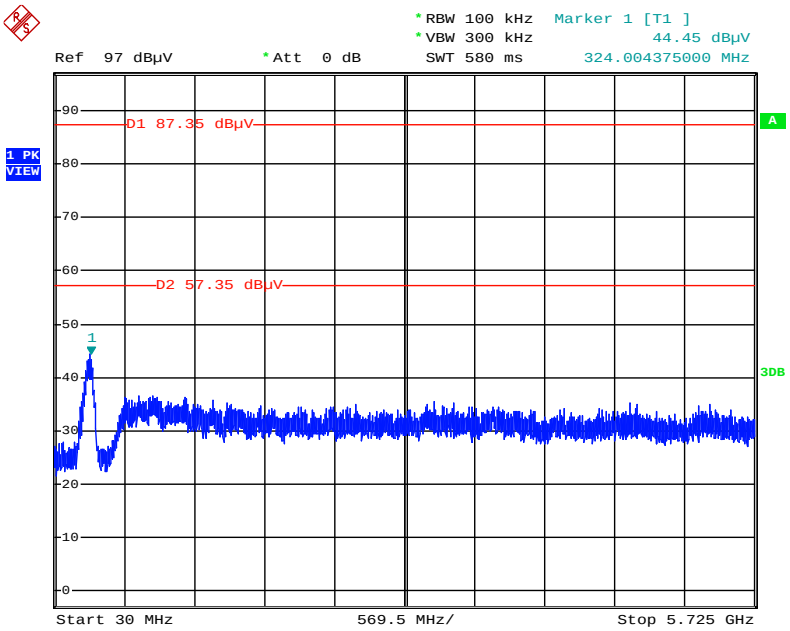
Plot on Configuration IEEE 802.11a / CH 149 / 5850MHz~40000MHz (down 30dBc)



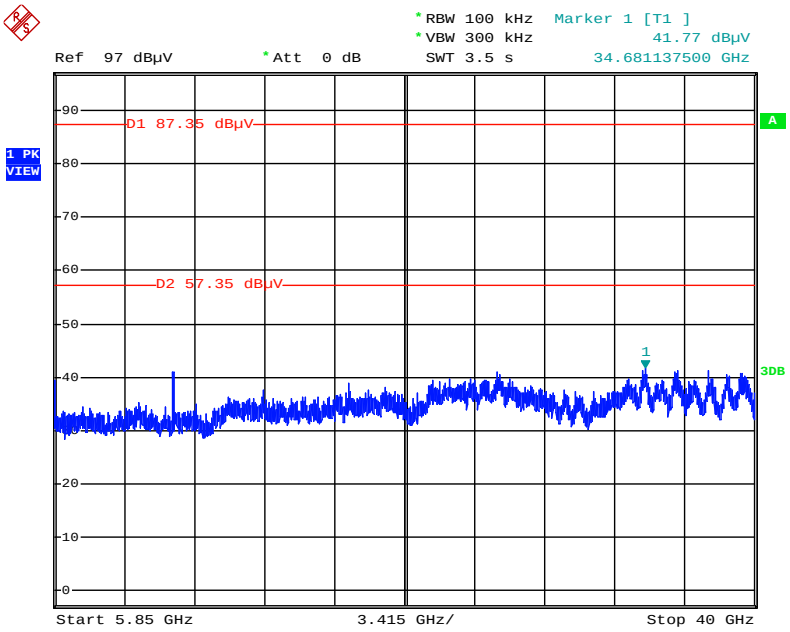
Date: 12.FEB.2014 01:50:33

Plot on Configuration IEEE 802.11a / CH 165 / 30MHz~5725MHz (down 30dBc)



Date: 12.FEB.2014 01:51:46

Plot on Configuration IEEE 802.11a / CH 165 / 5850MHz~40000MHz (down 30dBc)



Date: 12.FEB.2014 01:51:20

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	100355	9 kHz ~ 2.75 GHz	Apr. 12, 2013	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150 kHz ~ 100 MHz	Nov. 23, 2013	Conduction (CO01-CB)
Arifical Mains Network	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Nov. 23, 2013	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150 kHz ~ 30 MHz	Dec. 04, 2013	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-	-	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Apr. 16, 2013	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Nov. 05, 2012*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 01, 2013	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Dec. 17, 2013	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 12, 2013	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Dec. 16, 2013	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Oct. 23, 2013	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100019	9kHz~40GHz	Dec. 02, 2013	Radiation (03CH01-CB)
EMI Test Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8GHz	Dec. 12, 2013	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. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Nov. 29, 2013	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 04, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Sep. 18, 2013	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Sep. 18, 2013	Conducted (TH01-CB)

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

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

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

6. MEASUREMENT UNCERTAINTY

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	0.026	dB	normal(k=2)	0.013
Cable loss	0.002	dB	normal(k=2)	0.001
AMN/LISN specification	1.200	dB	normal(k=2)	0.600
Mismatch Receiver VSWR 1= AMN/LISN VSWR 2=	-0.080	dB	U-shaped	0.060
Combined standard uncertainty Uc(y)				1.2
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				2.4

Uncertainty of Radiated Emission Measurement (30MHz ~ 1,000MHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	±0.173	dB	K=1	0.086
Cable loss	±0.174	dB	K=2	0.087
Antenna gain	±0.169	dB	K=2	0.084
Site imperfection	±0.433	dB	Triangular	0.214
Pre-amplifier gain	±0.366	dB	K=2	0.183
Transmitter antenna	±1.200	dB	Rectangular	0.600
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				1.778
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				3.555

Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	±0.191	dB	K=1	0.095
Cable loss	±0.169	dB	K=2	0.084
Antenna gain	±0.191	dB	K=2	0.096
Site imperfection	±0.582	dB	Triangular	0.291
Pre-amplifier gain	±0.304	dB	K=2	0.152
Transmitter antenna	±1.200	dB	Rectangular	0.600
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				1.839
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				3.678

Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	±0.186	dB	K=1	0.093
Cable loss	±0.167	dB	K=2	0.083
Antenna gain	±0.190	dB	K=2	0.095
Site imperfection	±0.488	dB	Triangular	0.244
Pre-amplifier gain	±0.269	dB	K=2	0.134
Transmitter antenna	±1.200	dB	Rectangular	0.600
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				1.771
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				3.541

Uncertainty of Conducted Emission Measurement

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Cable loss	±0.038	dB	K=2	0.019
Attenuator	±0.047	dB	K=2	0.024
Power Meter specification	±0.300	dB	Triangular	0.150
Power Sensor specification	±0.300	dB	Rectangular	0.150
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				0.863
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				1.726