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FCC RADIO TEST REPORT

Applicant's company	**PEGATRON CORPORATION**
Applicant Address	5F., NO. 76, LIGONG ST., BEITOU DISTRICT, TAIPEI CITY 112, Taiwan
FCC ID	**VUI-APS1**
Manufacturer's company	**Maintek Computer (Suzhou) Co., Ltd**
Manufacturer Address	Bldg. 6 NB, 233 Jin Feng Rd, Suzhou District Jiangsu China

Product Name	Advanced power supply with WiFi and MoCA
Brand Name	CISCO
Model No.	APS1, CA010AAB, MWA1221
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Dec. 16, 2014
Final Test Date	Feb. 06, 2015
Submission Type	Original Equipment

Statement

Test result included in this report is for the IEEE 802.11n and IEEE 802.11b/g 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 C63.10-2013**, **47 CFR FCC Part 15 Subpart C**, **KDB 558074 D01 v03r02**, **KDB 662911 D01 v02r01.**

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

Testing Laboratory
1190

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR4D1514AA	Rev. 01	Initial issue of report	Feb. 13, 2015

1. VERIFICATION OF COMPLIANCE

Product Name	:	Advanced power supply with WiFi and MoCA
Brand Name	:	CISCO
Model No.	:	APS1, CA010AAB, MWA1221
Applicant	:	PEGATRON CORPORATION
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 Dec. 16, 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	22.36 dB
4.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	5.84 dB
4.3	15.247(e)	Power Spectral Density	Complies	8.27 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	0.19 dB
4.6	15.247(d)	Band Edge Emissions	Complies	0.09 dB
4.7	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From internal power supply
Modulation	IEEE 802.11b: DSSS IEEE 802.11g: OFDM IEEE 802.11n: see the below table
Data Modulation	IEEE 802.11b: DSSS (BPSK / QPSK / CCK) IEEE 802.11g/n: OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	IEEE 802.11b: DSSS (1/ 2/ 5.5/11) IEEE 802.11g: OFDM (6/9/12/18/24/36/48/54) IEEE 802.11n: see the below table
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11 for 20MHz bandwidth ; 7 for 40MHz bandwidth
Channel Band Width (99%)	IEEE 802.11b: 11.46 MHz IEEE 802.11g: 27.79 MHz IEEE 802.11n MCS0 (HT20): 26.22 MHz IEEE 802.11n MCS0 (HT40): 38.35 MHz
Maximum Conducted Output Power	IEEE 802.11b: 18.41 dBm IEEE 802.11g: 24.16 dBm IEEE 802.11n MCS0 (HT20): 22.83 dBm IEEE 802.11n MCS0 (HT40): 19.01 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	Two (TX)	
Band width Mode	20 MHz	40 MHz
IEEE 802.11b	V	X
IEEE 802.11g	V	X
IEEE 802.11n	V	V

IEEE 11n Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	2	MCS0-15
802.11n (HT40)	2	MCS0-15
Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Note 2: Modulation modes consist of below configuration: HT20/HT40: IEEE 802.11n		

3.2. Accessories

Description
Power cable*1: Non-shielded, 1.5m

3.3. Table for Filed Antenna

Set	Ant.	Brand	Model No.	P/N	Type	Connector	Gain (dBi)	
							2.4GHz	5GHz
1	1	Hong Lin	APS1	290-30233	PCB	I-PEX	1.60	-
	2	Hong Lin	APS1	290-30247	PCB	I-PEX	2.54	-
	3	Hong Lin	APS1	290-30232	PCB	I-PEX	-	4.22
	4	Hong Lin	APS1	290-30248	PCB	I-PEX	-	4.88
2	1	Airgain	N2420S5	-	PCB	I-PEX	1.50	-
	2	Airgain	N2420SLOP	-	PCB	I-PEX	2.20	-
	3	Airgain	N5X20BLO	-	PCB	I-PEX	-	4.10
	4	Airgain	N5X20SC	-	PCB	I-PEX	-	4.60

Note: 1. The EUT has two sets of antenna, and each set contains four antennas.

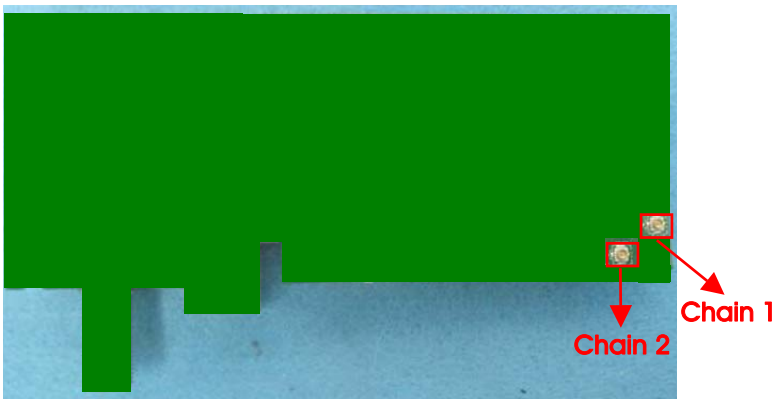
2. Because all antennas are the same type antennas, only the higher gain antennas "set 1" was tested and recorded in the report.

3. Chain 1: Connect to Ant. 1, Chain 2: Connect to Ant. 2, Chain 3: Connect to Ant. 3, Chain 4: Connect to Ant. 4

For 2.4GHz WLAN function (2TX, 2RX):

Chain 1 and Chain 2 could transmit/receive simultaneously.

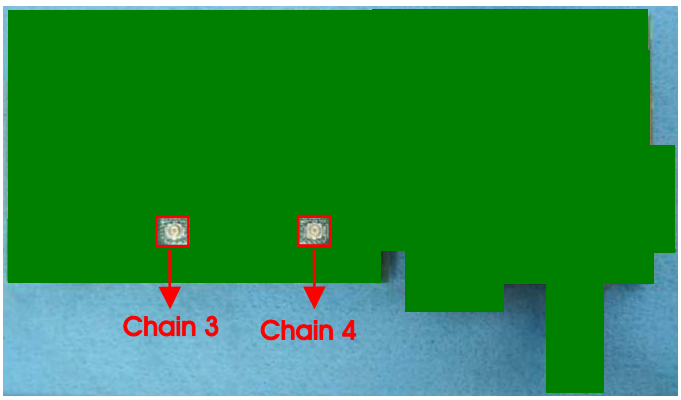
EUT rear view:



For 5GHz WLAN function (2TX, 2RX):

Chain 3 and Chain 4 could transmit/receive simultaneously.

EUT front view:



3.4. Table for Carrier Frequencies

There are two bandwidth systems.

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

For 40MHz bandwidth systems, use Channel 3~Channel 9.

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

3.5. Table for Test Modes

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	-	-	-
Maximum Conducted Output Power	11b/CCK	1 Mbps	1/6/11	1+2
	11g/BPSK	6 Mbps	1/6/11	1+2
	11n HT20	MCS0	1/6/11	1+2
	11n HT40	MCS0	3/6/9	1+2
Power Spectral Density	11b/CCK	1 Mbps	1/6/11	1+2
	11g/BPSK	6 Mbps	1/6/11	1+2
	11n HT20	MCS0	1/6/11	1+2
	11n HT40	MCS0	3/6/9	1+2
6dB Spectrum Bandwidth	11b/CCK	1 Mbps	1/6/11	1+2
	11g/BPSK	6 Mbps	1/6/11	1+2
	11n HT20	MCS0	1/6/11	1+2
	11n HT40	MCS0	3/6/9	1+2
Radiated Emissions Below 1GHz	CTX	-	-	-
Radiated Emissions Above 1GHz	11b/CCK	1 Mbps	1/6/11	1+2
	11g/BPSK	6 Mbps	1/6/11	1+2
	11n HT20	MCS0	1/6/11	1+2
	11n HT40	MCS0	3/6/9	1+2
Band Edge Emissions	11b/CCK	1 Mbps	1/6/11	1+2
	11g/BPSK	6 Mbps	1/6/11	1+2
	11n HT20	MCS0	1/6/11	1+2
	11n HT40	MCS0	3/6/9	1+2

For Co-location MPE and Radiated Emission Co-location test:

The EUT could be applied with 2.4GHz WLAN function and 5GHz WLAN function; therefore Co-location Maximum Permissible Exposure (Please refer to Appendix B) and Radiated Emission Co-location (please refer to Appendix C) tests are added for simultaneously transmit between 2.4GHz WLAN function and 5GHz WLAN function.

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 numbers in the following table are all refer to the identical product.

Model No.	Description
APS1	All the models are identical, the difference model for difference model number as marketing strategy.
CA010AAB	
MWA1221	

From the above models, model: MWA1221 was selected as representative model for the test and its data was recorded in this report.

3.8. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
NB	TOSHIBA	Saellite P50-B	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.

Test Software Version	DOS					
Mode	Test Frequency (MHz)					
	NCB: 20MHz			NCB: 40MHz		
	2412 MHz	2437 MHz	2462 MHz	2422 MHz	2437 MHz	2452 MHz
802.11b	14	14	15.5	-	-	-
802.11g	16	24.5	14.5	-	-	-
802.11n MCS0 HT20	16	22	14	-	-	-
802.11n MCS0 HT40	-	-	-	12	16.5	11.5

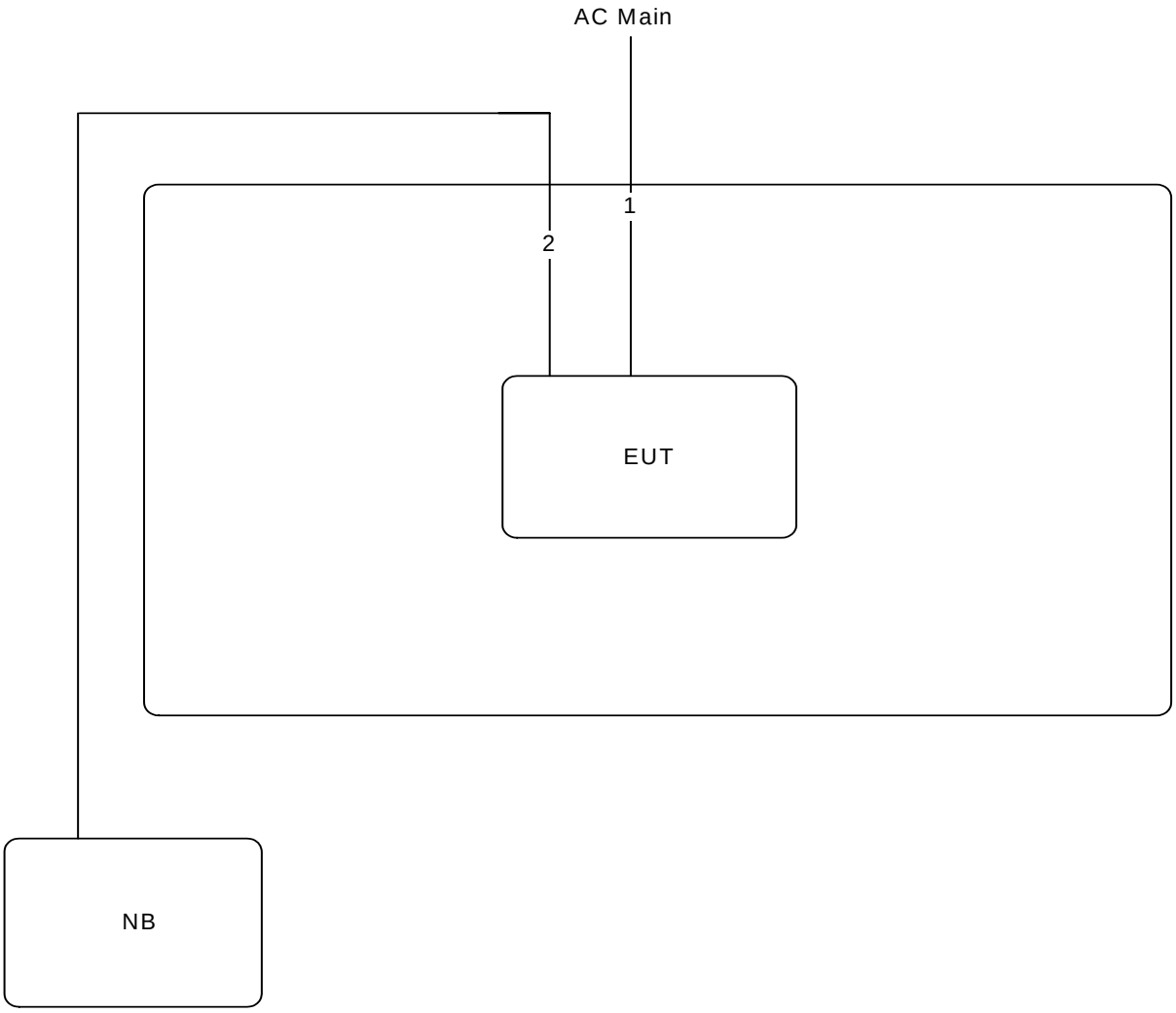
3.10. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.11. Duty Cycle

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11b	1.000	1.000	100.00	0.00	0.01
802.11g	2.011	2.066	97.35	0.12	0.50
802.11n MCS0 HT20	1.870	1.925	97.15	0.13	0.53
802.11n MCS0 HT40	0.896	0.943	94.93	0.23	1.12

3.12. Test Configurations



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	RJ-45 cable	No	10m

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For this product which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

4.1.2. Measuring Instruments and Setting

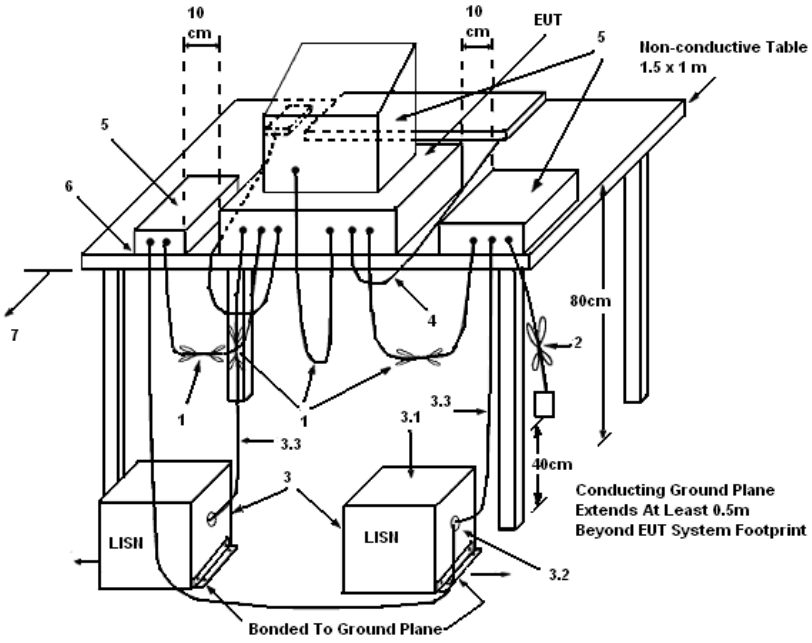
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4. Test Setup Layout



LEGEND:

(1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

(2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.

(3.1) All other equipment powered from additional LISN(s).

(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

(3.3) LISN at least 80 cm from nearest part of EUT chassis.

(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

(5) Non-EUT components of EUT system being tested.

(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

4.1.5. Test Deviation

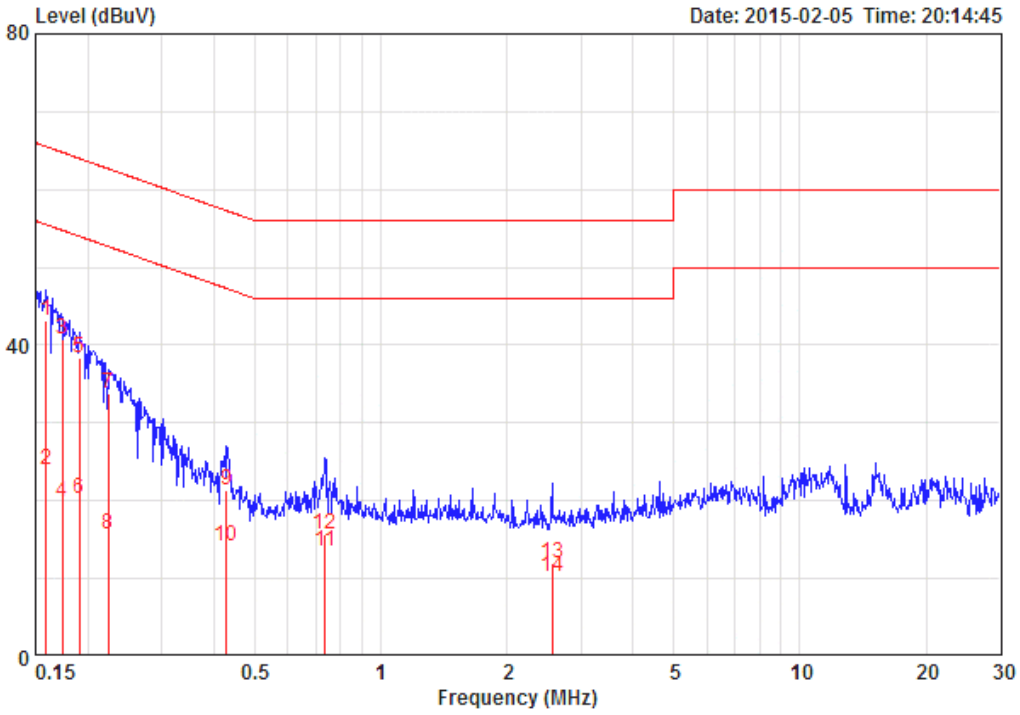
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

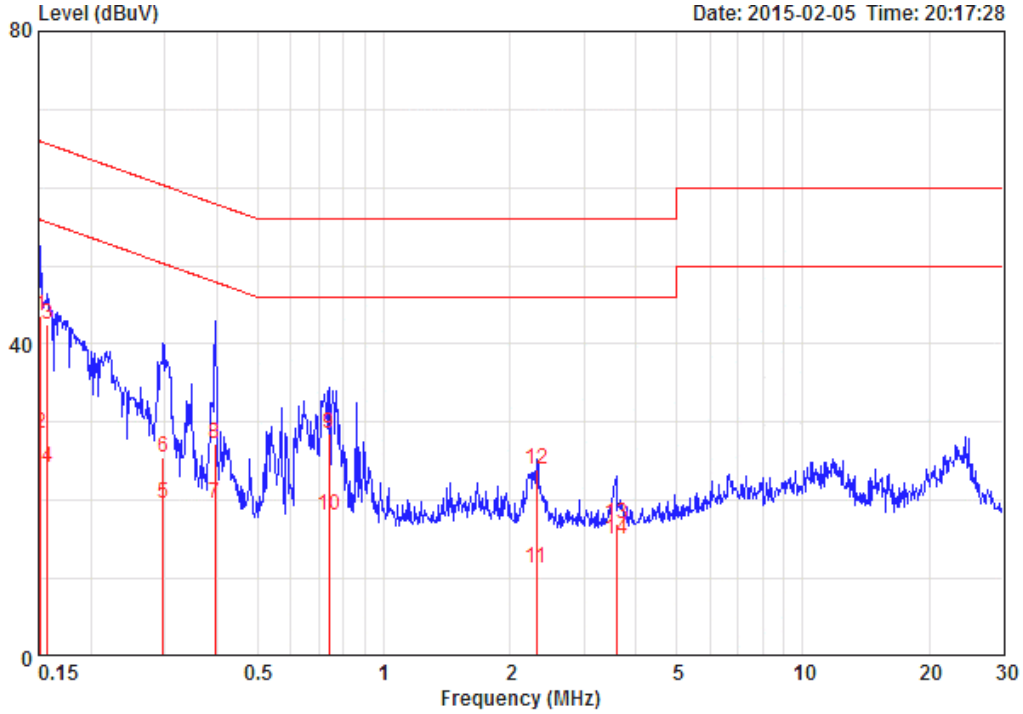
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	25°C	Humidity	52%
Test Engineer	Ryo Fan	Phase	Line
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.15900	43.14	-22.38	65.52	32.95	10.03	0.16	QP	LINE
2	0.15900	24.07	-31.45	55.52	13.88	10.03	0.16	AVERAGE	LINE
3	0.17399	40.82	-23.95	64.77	30.63	10.03	0.16	QP	LINE
4	0.17399	19.76	-35.01	54.77	9.57	10.03	0.16	AVERAGE	LINE
5	0.19039	38.43	-25.59	64.02	28.24	10.03	0.16	QP	LINE
6	0.19039	20.37	-33.65	54.02	10.18	10.03	0.16	AVERAGE	LINE
7	0.22319	33.86	-28.84	62.70	23.66	10.03	0.17	QP	LINE
8	0.22319	15.74	-36.96	52.70	5.54	10.03	0.17	AVERAGE	LINE
9	0.42825	21.34	-35.95	57.29	11.13	10.03	0.18	QP	LINE
10	0.42825	14.07	-33.22	47.29	3.86	10.03	0.18	AVERAGE	LINE
11	0.73519	13.45	-32.55	46.00	3.24	10.02	0.19	AVERAGE	LINE
12	0.73519	15.63	-40.37	56.00	5.42	10.02	0.19	QP	LINE
13	2.567	11.93	-44.07	56.00	1.63	10.03	0.27	QP	LINE
14	2.567	10.27	-35.73	46.00	-0.03	10.03	0.27	AVERAGE	LINE

Temperature	25°C	Humidity	52%
Test Engineer	Ryo Fan	Phase	Neutral
Configuration	CTX		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1 @	0.15160	43.55	-22.36	65.91	33.45	9.94	0.16	QP	NEUTRAL
2	0.15160	28.57	-27.34	55.91	18.47	9.94	0.16	AVERAGE	NEUTRAL
3	0.15733	42.49	-23.12	65.60	32.38	9.95	0.16	QP	NEUTRAL
4	0.15733	24.28	-31.33	55.60	14.17	9.95	0.16	AVERAGE	NEUTRAL
5	0.29712	19.66	-30.67	50.32	9.56	9.92	0.17	AVERAGE	NEUTRAL
6	0.29712	25.41	-34.92	60.32	15.31	9.92	0.17	QP	NEUTRAL
7	0.39553	19.53	-28.41	47.95	9.47	9.88	0.18	AVERAGE	NEUTRAL
8	0.39553	27.35	-30.59	57.95	17.29	9.88	0.18	QP	NEUTRAL
9	0.73910	28.59	-27.41	56.00	18.52	9.88	0.19	QP	NEUTRAL
10	0.73910	18.06	-27.94	46.00	7.99	9.88	0.19	AVERAGE	NEUTRAL
11	2.309	11.33	-34.67	46.00	1.18	9.89	0.26	AVERAGE	NEUTRAL
12	2.309	23.96	-32.04	56.00	13.81	9.89	0.26	QP	NEUTRAL
13	3.584	16.99	-39.01	56.00	6.81	9.89	0.29	QP	NEUTRAL
14	3.584	15.06	-30.94	46.00	4.88	9.89	0.29	AVERAGE	NEUTRAL

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.

4.2.2. Measuring Instruments and Setting

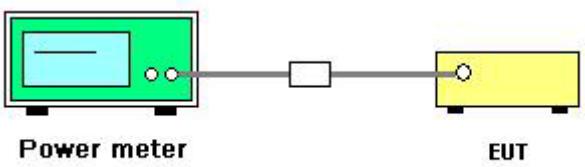
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	Average

4.2.3. Test Procedures

1. Test procedures refer KDB 558074 D01 v03r02 section 9.2.3.2 Measurement using a power meter (PM).
2. Multiple antenna system was performed in accordance with KDB 662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
3. 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	26°C	Humidity	63%
Test Engineer	Kenneth Huang	Test Date	Jan. 07, 2015

Mode	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
802.11b	2412 MHz	14.06	13.11	16.62	30.00	Complies
	2437 MHz	13.85	13.71	16.79	30.00	Complies
	2462 MHz	15.66	15.13	18.41	30.00	Complies
802.11g	2412 MHz	15.89	15.00	18.48	30.00	Complies
	2437 MHz	21.39	20.89	24.16	30.00	Complies
	2462 MHz	14.55	14.25	17.41	30.00	Complies
802.11n MCS0 HT20	2412 MHz	15.77	14.59	18.23	30.00	Complies
	2437 MHz	20.48	19.05	22.83	30.00	Complies
	2462 MHz	13.91	13.71	16.82	30.00	Complies
802.11n MCS0 HT40	2422 MHz	12.35	11.17	14.81	30.00	Complies
	2437 MHz	16.55	15.38	19.01	30.00	Complies
	2452 MHz	11.92	11.25	14.61	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

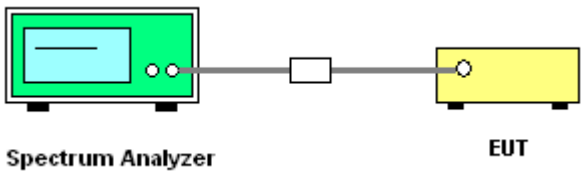
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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 was performed in accordance with KDB 558074 D01 v03r02 for Performing Compliance Measurements on Digital Transmission Systems (DTS) - 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	26°C	Humidity	63%
Test Engineer	Kenneth Huang		

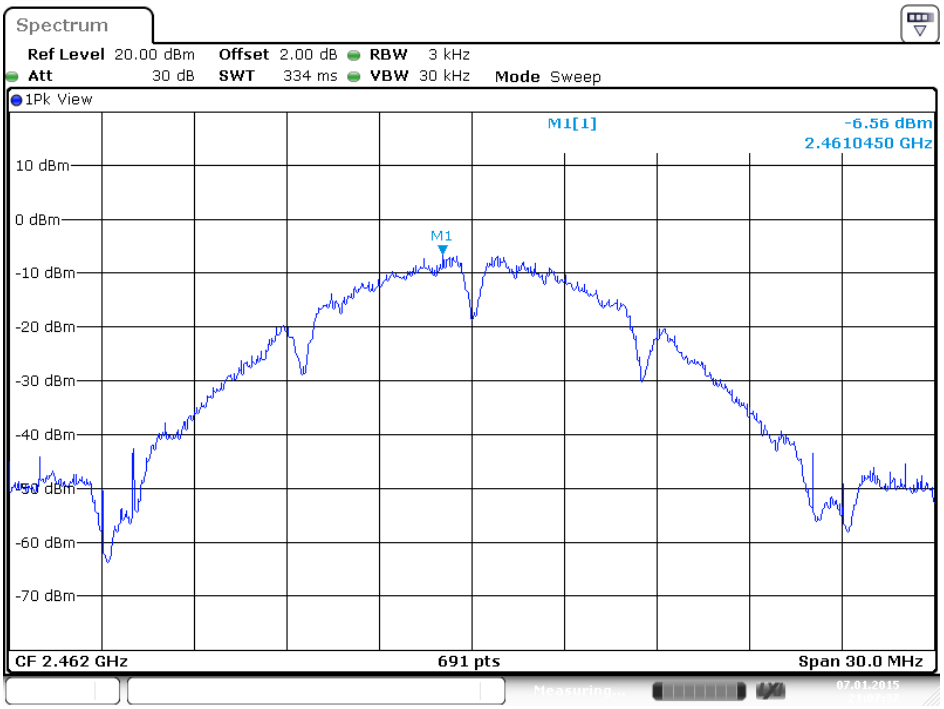
Mode	Frequency	Power Density (dBm/3kHz)			Power Density Limit (dBm/3kHz)	Result
		Chain 1	Chain 2	Total		
802.11b	2412 MHz	-7.22	-6.25	-3.70	8.00	Complies
	2437 MHz	-7.04	-6.49	-3.75	8.00	Complies
	2462 MHz	-6.56	-5.20	-2.82	8.00	Complies
802.11g	2412 MHz	-8.06	-7.23	-4.61	8.00	Complies
	2437 MHz	-3.55	-3.02	-0.27	8.00	Complies
	2462 MHz	-8.31	-7.51	-4.88	8.00	Complies
802.11n MCS0 HT20	2412 MHz	-8.94	-7.23	-4.99	8.00	Complies
	2437 MHz	-3.66	-3.20	-0.41	8.00	Complies
	2462 MHz	-9.62	-7.26	-5.27	8.00	Complies
802.11n MCS0 HT40	2422 MHz	-13.78	-12.10	-9.85	8.00	Complies
	2437 MHz	-10.32	-9.42	-6.84	8.00	Complies
	2452 MHz	-13.76	-11.18	-9.27	8.00	Complies

Note: Directional gain= $10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =5.11dBi<6dBi, so the limit doesn't reduce.

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

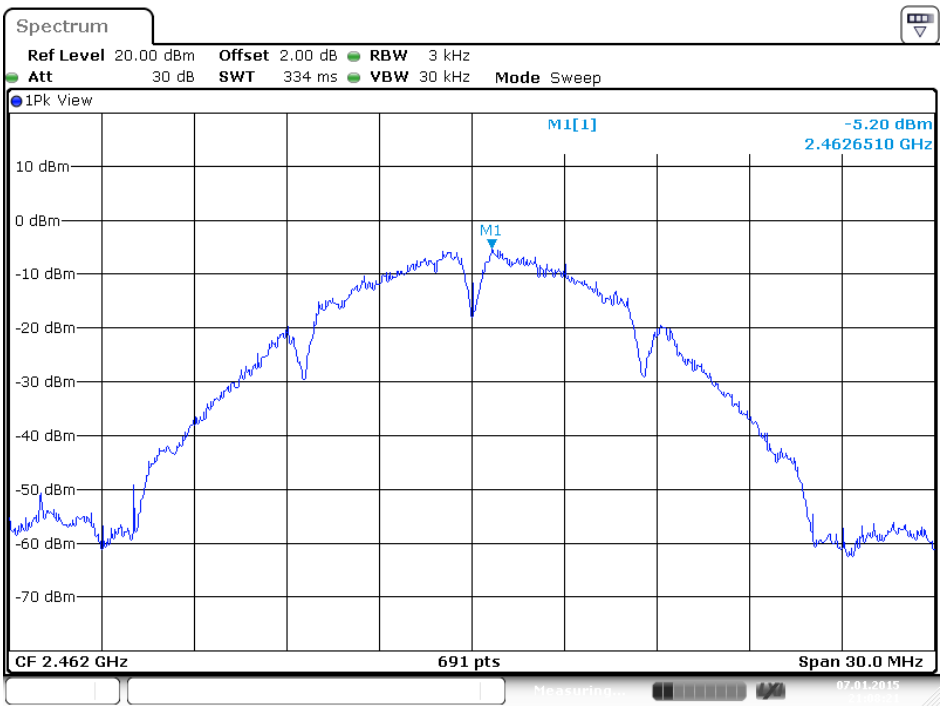
For plots, only the channel with worse result was shown.

Power Density Plot on Configuration IEEE 802.11b / 2462 MHz / Chain 1



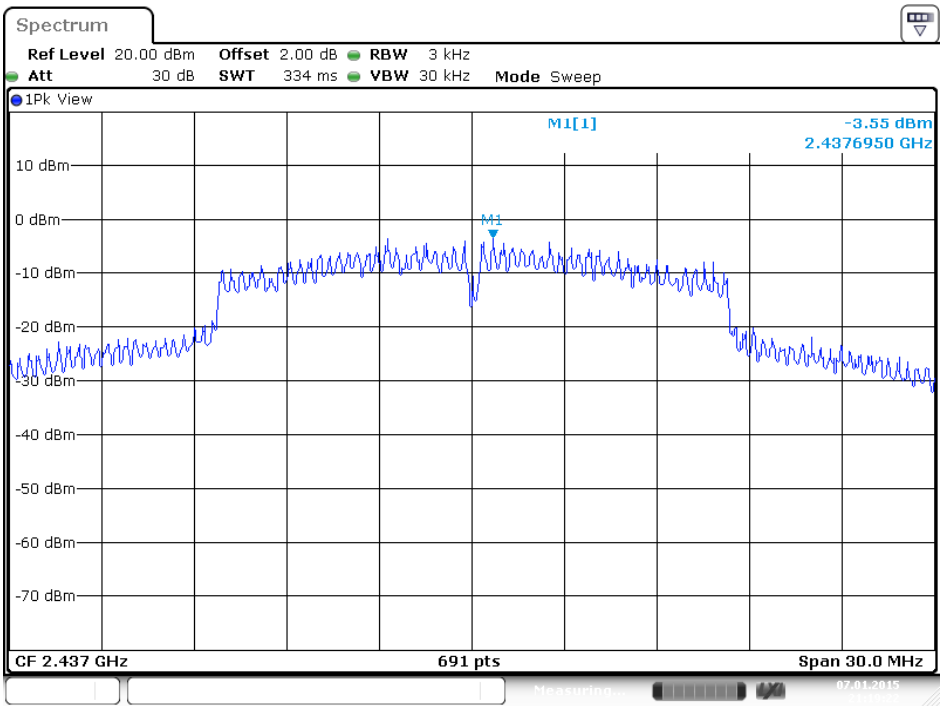
Date: 7.JAN.2015 21:07:37

Power Density Plot on Configuration IEEE 802.11b / 2462 MHz / Chain 2



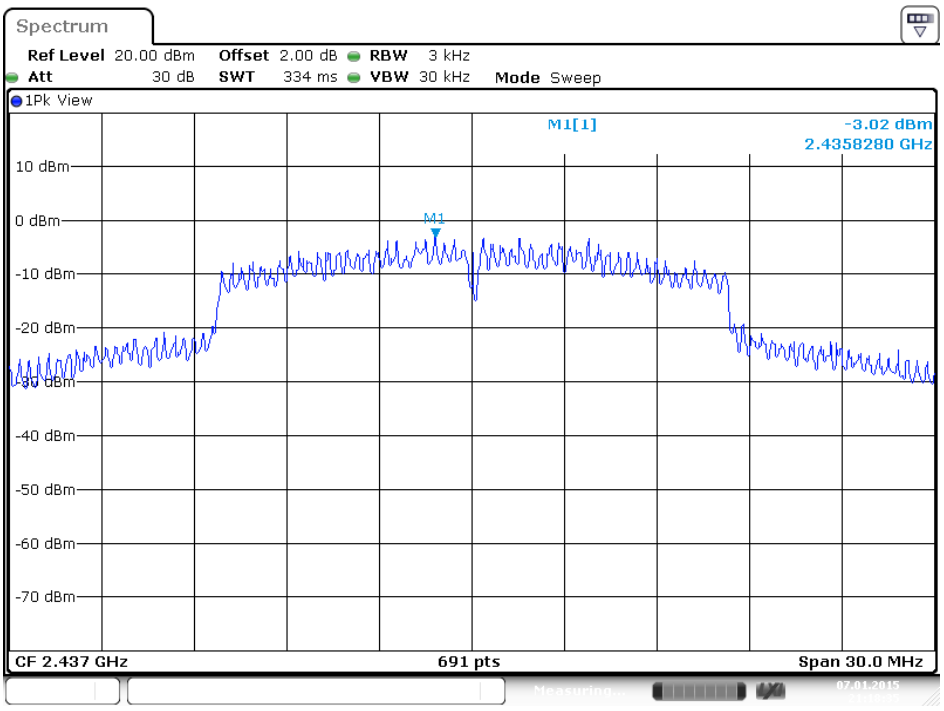
Date: 7.JAN.2015 21:08:21

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



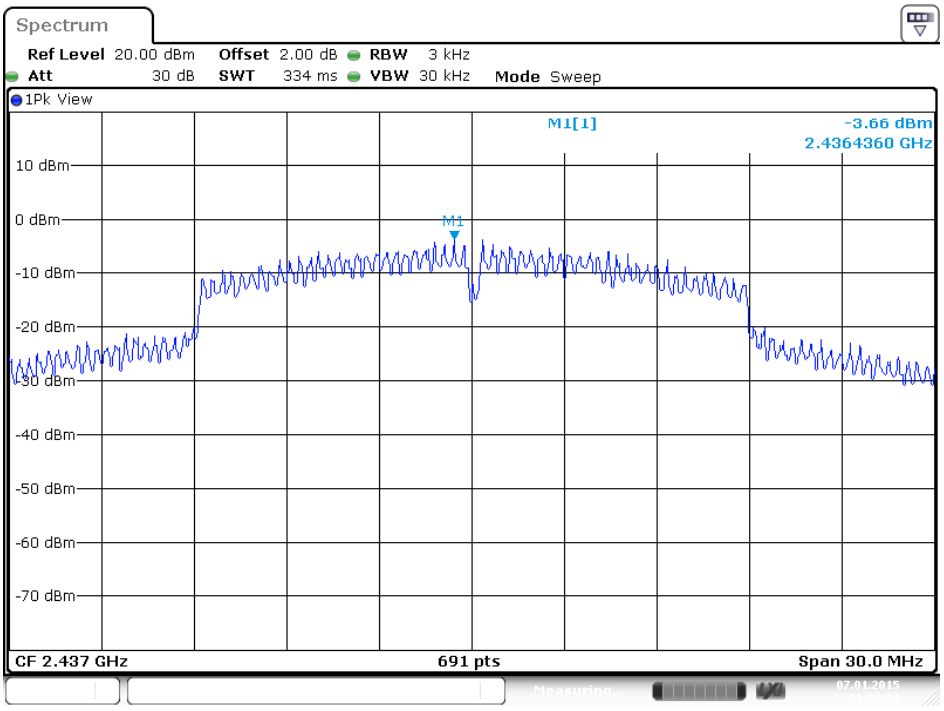
Date: 7.JAN.2015 21:19:22

Power Density Plot on Configuration IEEE 802.11g / 2437 MHz / Chain 2



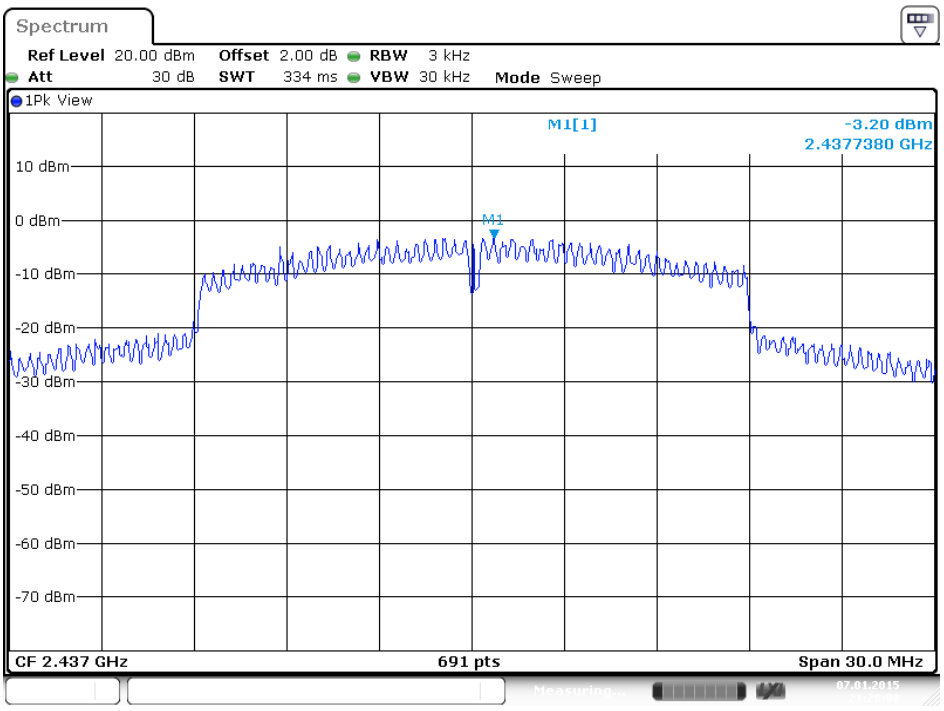
Date: 7.JAN.2015 21:18:35

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



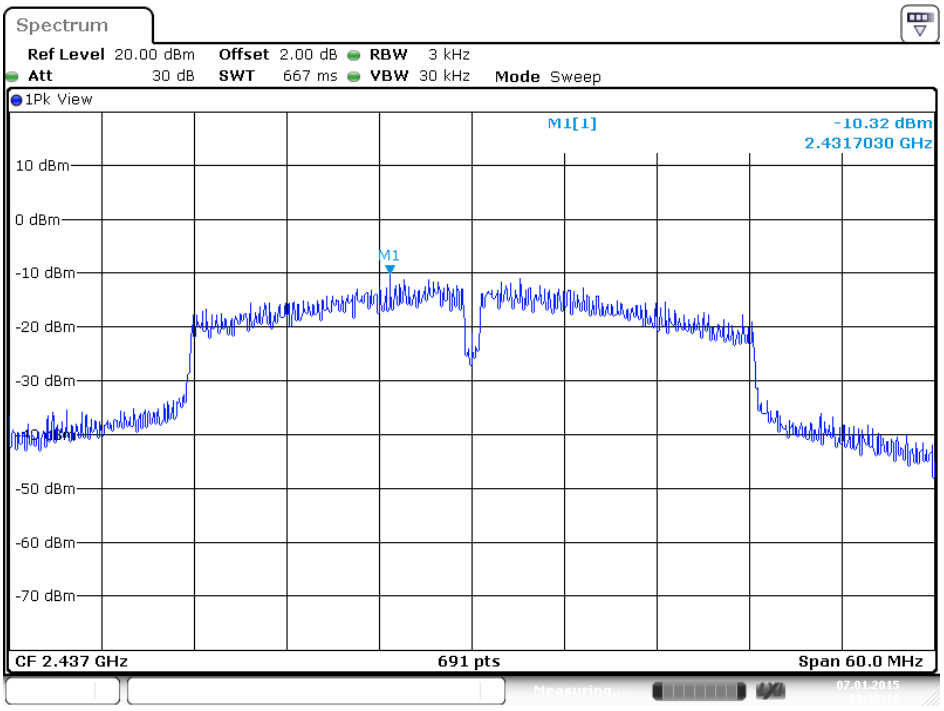
Date: 7.JAN.2015 21:23:34

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



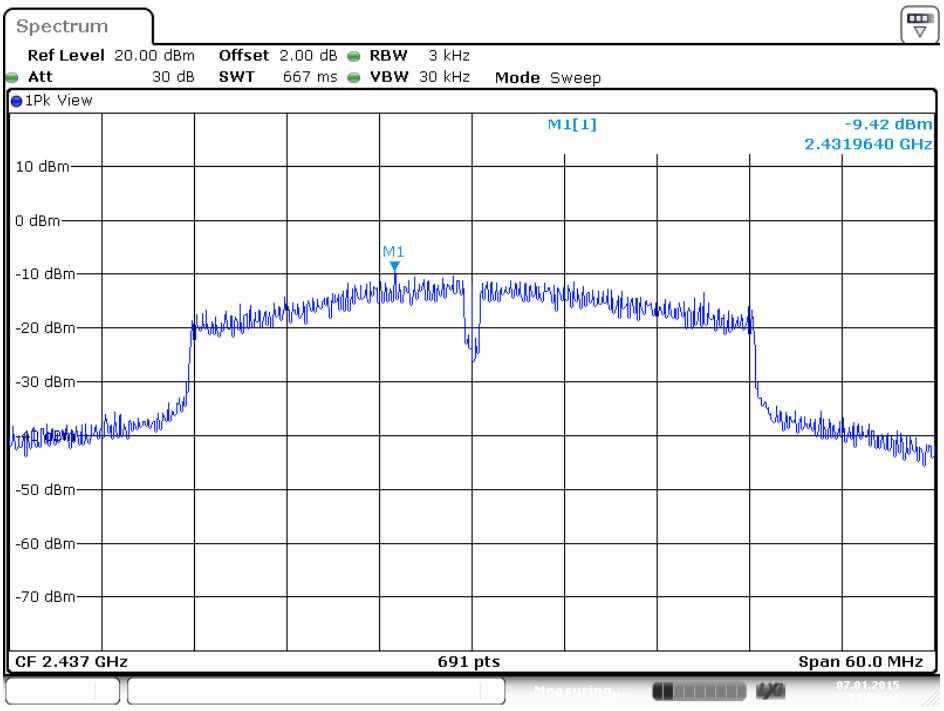
Date: 7.JAN.2015 21:28:08

Power Density Plot on Configuration IEEE 802.11n MCS0 HT40 / 2437 MHz / Chain 1



Date: 7.JAN.2015 21:58:19

Power Density Plot on Configuration IEEE 802.11n MCS0 HT40 / 2437 MHz / Chain 2



Date: 7.JAN.2015 21:57:43

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.

6dB Spectrum Bandwidth	
Spectrum Parameters	**Setting**
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RBW	100kHz
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto
99% Occupied Bandwidth	
Spectrum Parameters	**Setting**
Span	1.5 times to 5.0 times the OBW
RBW	1 % to 5 % of the OBW
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold

4.4.3. Test Procedures

For Radiated 6dB Bandwidth Measurement:

1. The transmitter was radiated to the spectrum analyzer in peak hold mode.
2. Test was performed in accordance with KDB 558074 D01 v03r02 for Performing Compliance Measurements on Digital Transmission Systems (DTS) - section 8.0 DTS bandwidth=> 8.1 Option 1.
3. Multiple antenna system was performed in accordance with KDB 662911 D01 v02r01 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

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

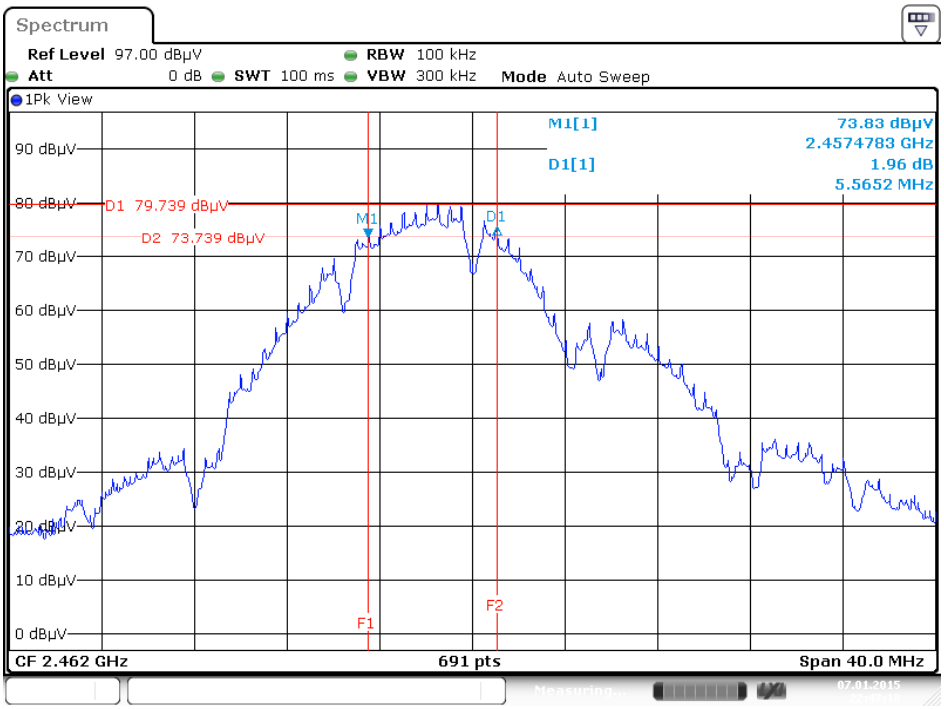
Temperature	26°C	Humidity	63%
Test Engineer	Kenneth Huang		

Mode	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11b	2412 MHz	6.03	10.33	500	Complies
	2437 MHz	6.09	11.46	500	Complies
	2462 MHz	5.57	11.29	500	Complies
802.11g	2412 MHz	11.30	16.58	500	Complies
	2437 MHz	15.01	27.79	500	Complies
	2462 MHz	11.36	16.24	500	Complies
802.11n MCS0 HT20	2412 MHz	15.01	16.93	500	Complies
	2437 MHz	15.01	26.22	500	Complies
	2462 MHz	15.07	16.85	500	Complies
802.11n MCS0 HT40	2422 MHz	26.44	36.32	500	Complies
	2437 MHz	25.16	38.35	500	Complies
	2452 MHz	30.03	36.03	500	Complies

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

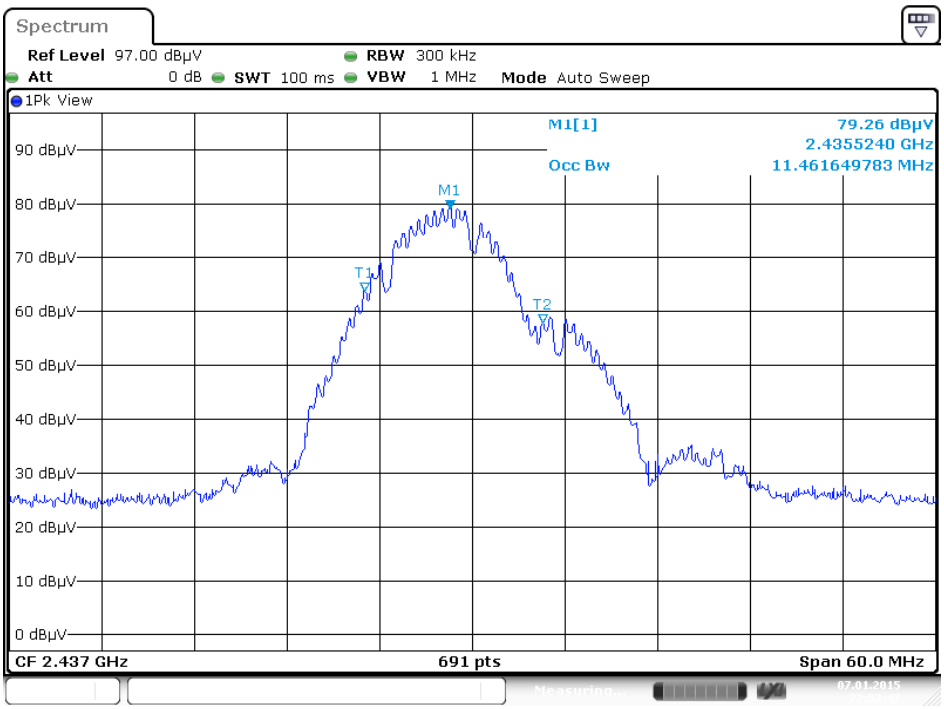
For plots, only the channel with worse result was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11b / 2462 MHz / Chain 1 + Chain 2



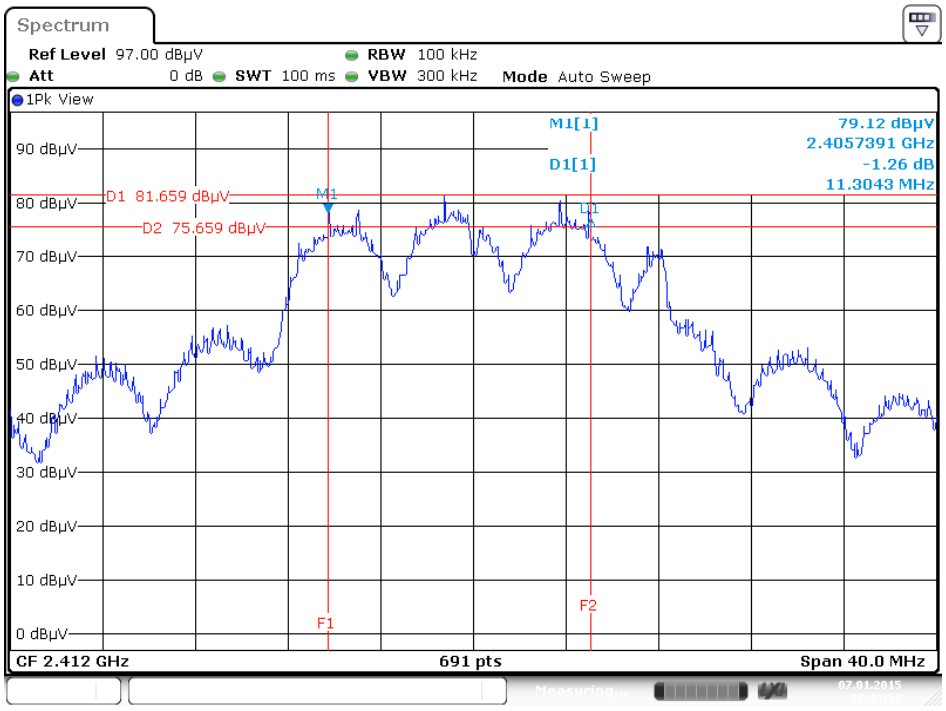
Date: 7.JAN.2015 22:47:18

99% Occupied Bandwidth Plot on Configuration IEEE 802.11b / 2437 MHz / Chain 1 + Chain 2



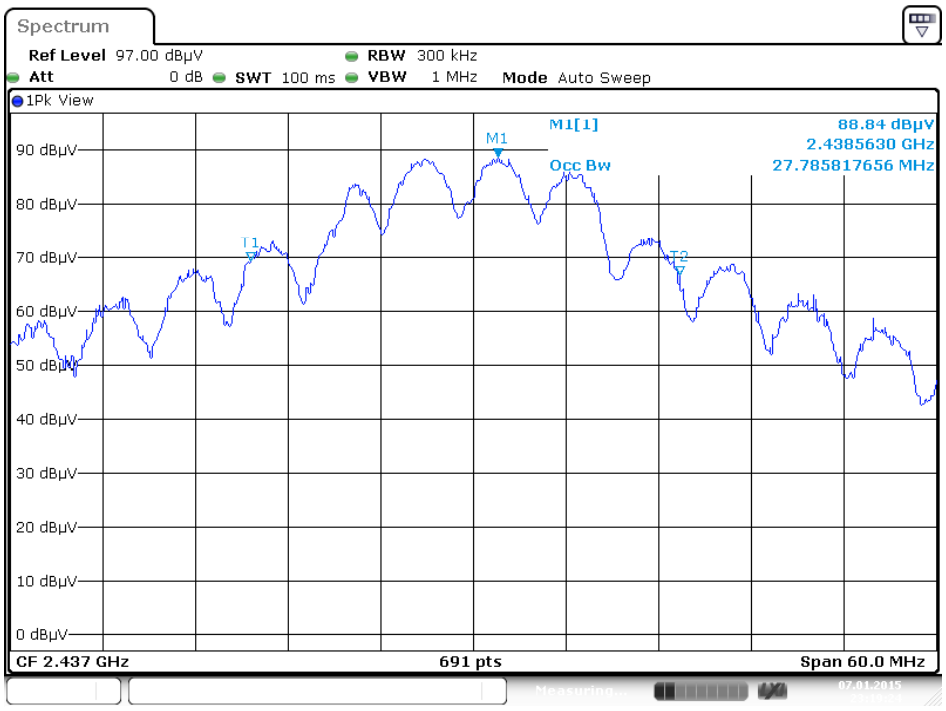
Date: 7.JAN.2015 22:52:47

6 dB Bandwidth Plot on Configuration IEEE 802.11g / 2412 MHz / Chain 1 + Chain 2



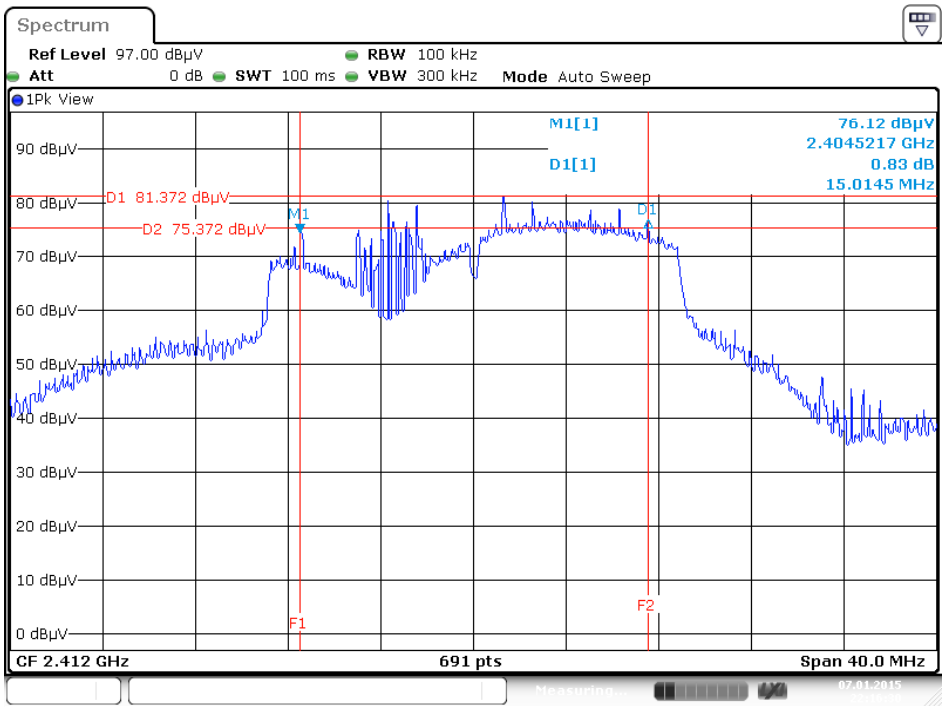
Date: 7.JAN.2015 22:43:59

99% Occupied Bandwidth Plot on Configuration IEEE 802.11g / 2437 MHz / Chain 1 + Chain 2



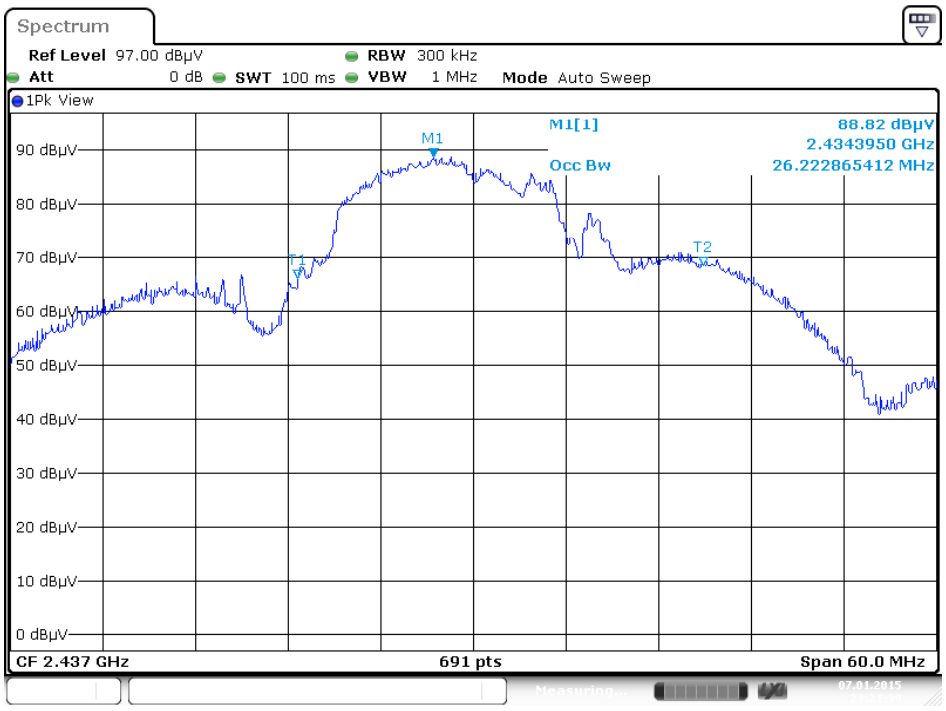
Date: 7.JAN.2015 23:19:25

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 HT20 / 2412 MHz / Chain 1 + Chain 2



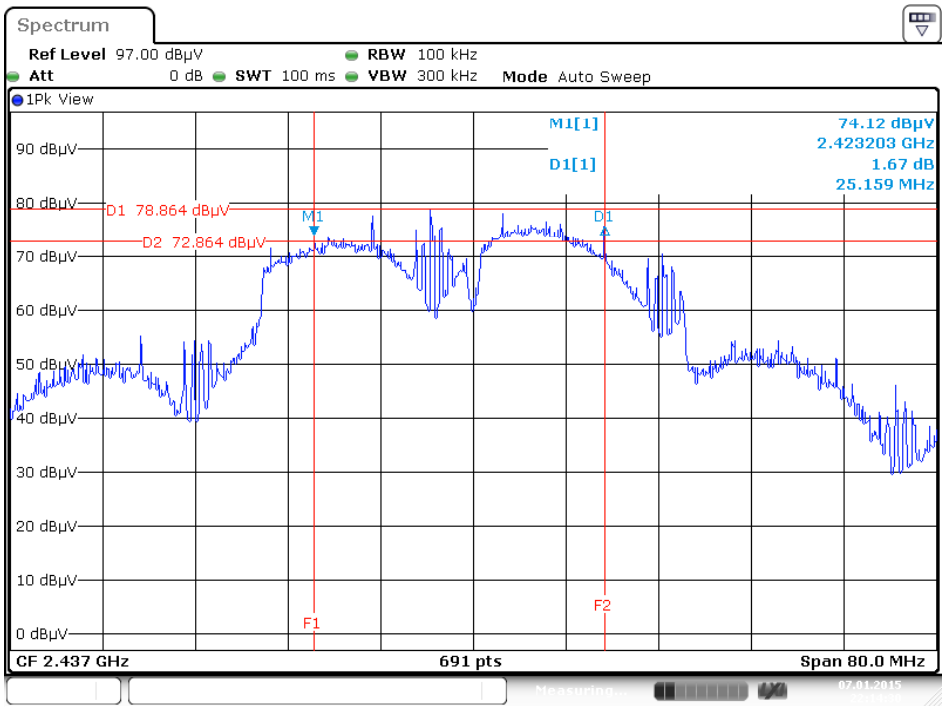
Date: 7.JAN.2015 22:16:30

99% Occupied Bandwidth Plot on Configuration IEEE 802.11n MCS0 HT20 / 2437 MHz / Chain 1 + Chain 2



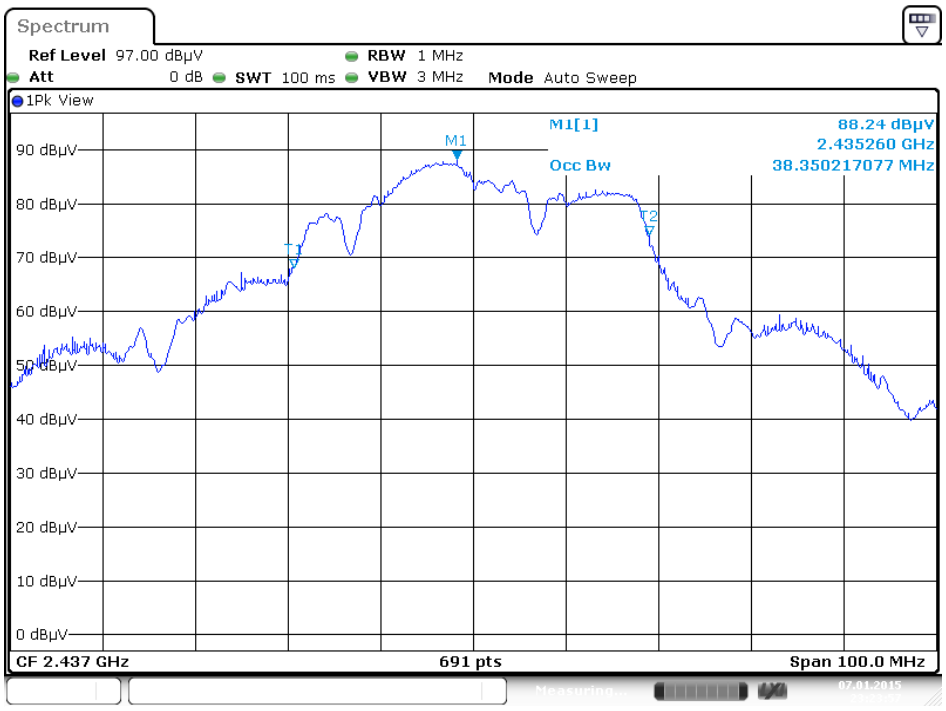
Date: 7.JAN.2015 23:21:40

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 HT40 / 2437 MHz / Chain 1 + Chain 2



Date: 7.JAN.2015 22:14:30

99% Occupied Bandwidth Plot on Configuration IEEE 802.11n MCS0 HT40 / 2437 MHz / Chain 1 + Chain 2



Date: 7.JAN.2015 23:23:58

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 / 1/T for Average
RBW / VBW (Emission in non-restricted band)	100kHz / 300kHz for peak

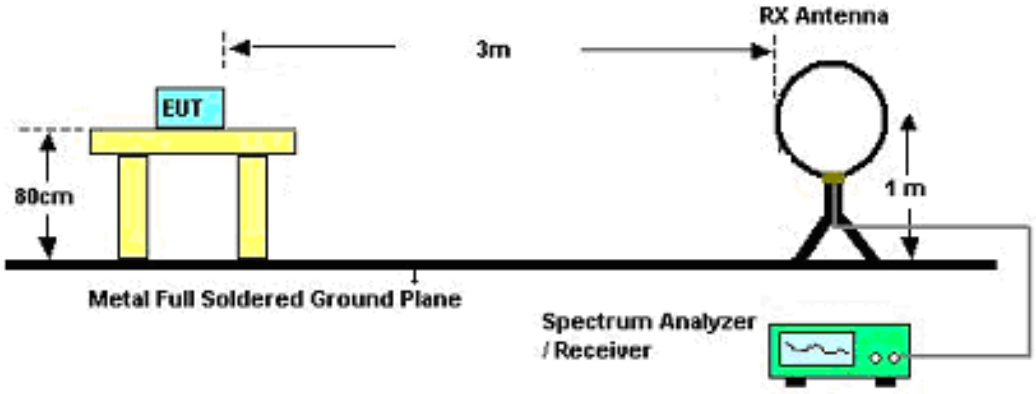
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1GHz / RBW 120kHz for QP

4.5.3. Test Procedures

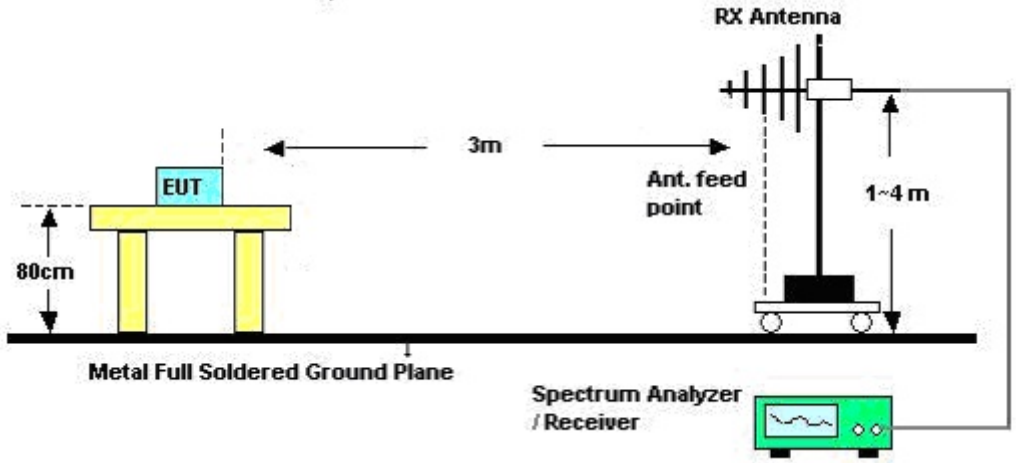
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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 1/T VBW for average reading in spectrum analyzer.
7. 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.
8. 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.
9. 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

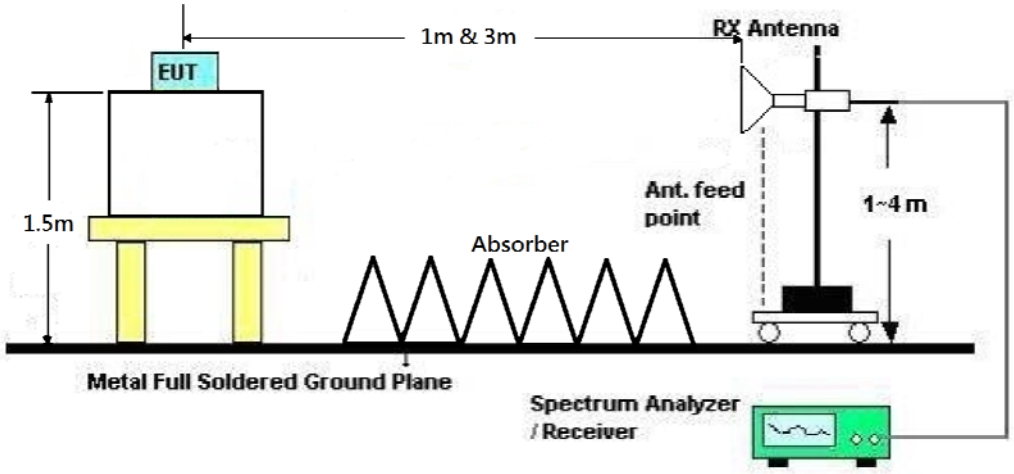
For Radiated Emissions: 9kHz ~30MHz



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	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	CTX
Test Date	Jan. 29, 2015		

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.

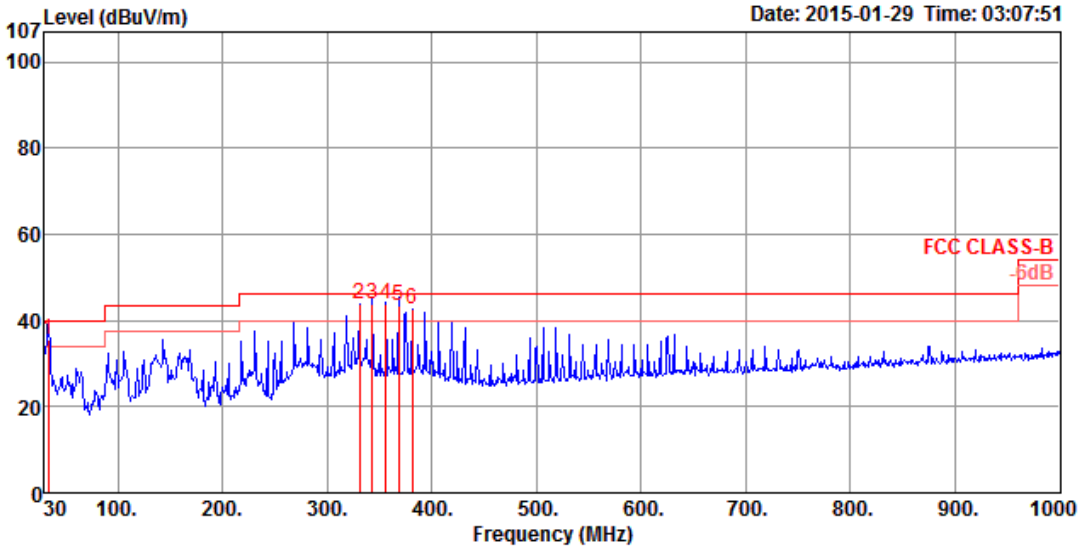
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

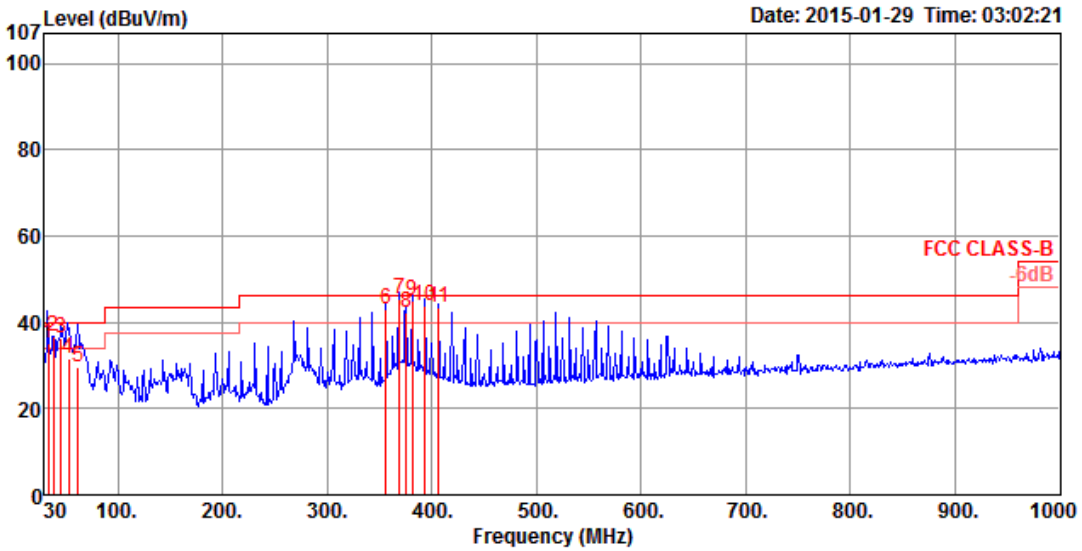
Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	CTX

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Pol/Phase	T/Pos	A/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	33.72	35.45	40.00	-4.55	49.71	0.42	32.41	17.73	HORIZONTAL	31	400	QP
2	330.70	43.84	46.00	-2.16	60.04	1.30	32.28	14.78	HORIZONTAL	236	100	QP
3	343.31	43.69	46.00	-2.31	59.61	1.32	32.36	15.12	HORIZONTAL	226	100	QP
4	355.92	43.90	46.00	-2.10	59.47	1.35	32.37	15.45	HORIZONTAL	252	125	QP
5	368.53	43.48	46.00	-2.52	58.73	1.37	32.38	15.76	HORIZONTAL	247	125	QP
6	381.14	42.77	46.00	-3.23	57.57	1.39	32.26	16.07	HORIZONTAL	209	100	Peak

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Pol/Phase	T/Pos	A/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	33.43	35.33	40.00	-4.67	49.73	0.42	32.42	17.60	VERTICAL	232	100	QP
2	38.73	36.61	40.00	-3.39	53.97	0.44	32.48	14.68	VERTICAL	293	100	Peak
3	45.52	36.51	40.00	-3.49	57.62	0.49	32.43	10.83	VERTICAL	218	100	QP
4	52.75	31.73	40.00	-8.27	55.17	0.51	32.51	8.56	VERTICAL	13	125	QP
5	62.01	29.69	40.00	-10.31	54.83	0.57	32.51	6.80	VERTICAL	44	125	QP
6	355.92	43.05	46.00	-2.95	58.63	1.35	32.37	15.44	VERTICAL	231	125	QP
7	368.74	45.31	46.00	-0.69	60.57	1.37	32.38	15.75	VERTICAL	240	125	QP
8	375.32	42.43	46.00	-3.57	57.46	1.38	32.32	15.91	VERTICAL	243	100	QP
9	381.14	44.84	46.00	-1.16	59.66	1.39	32.26	16.05	VERTICAL	257	150	QP
10	393.75	43.96	46.00	-2.04	58.43	1.41	32.24	16.36	VERTICAL	266	150	QP
11	406.36	43.38	46.00	-2.62	57.67	1.43	32.30	16.58	VERTICAL	190	125	QP

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°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11b CH 1 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4823.99	53.45	54.00	-0.55	49.39	5.87	33.39	35.20	Average	200	46	HORIZONTAL
2	4824.03	56.16	74.00	-17.84	52.10	5.87	33.39	35.20	Peak	200	46	HORIZONTAL
3	12058.70	42.41	54.00	-11.59	28.72	9.36	39.25	34.92	Average	154	161	HORIZONTAL
4	12062.03	56.15	74.00	-17.85	42.48	9.36	39.23	34.92	Peak	154	161	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	4824.00	51.53	54.00	-2.47	47.47	5.87	33.39	35.20	Average	100	121	VERTICAL
2	4824.01	54.93	74.00	-19.07	50.87	5.87	33.39	35.20	Peak	100	121	VERTICAL
3	12062.79	41.64	54.00	-12.36	27.97	9.36	39.23	34.92	Average	161	238	VERTICAL
4	12063.98	55.77	74.00	-18.23	42.10	9.36	39.23	34.92	Peak	161	238	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11b CH 6 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4874.01	53.62	54.00	-0.38	49.42	5.92	33.48	35.20	Average	113	354	HORIZONTAL
2	4874.04	56.71	74.00	-17.29	52.51	5.92	33.48	35.20	Peak	113	354	HORIZONTAL
3	7309.55	50.14	74.00	-23.86	41.93	7.13	36.51	35.43	Peak	167	66	HORIZONTAL
4	7309.61	36.67	54.00	-17.33	28.46	7.13	36.51	35.43	Average	167	66	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	4873.99	51.86	54.00	-2.14	47.66	5.92	33.48	35.20	Average	100	114	VERTICAL
2	4874.07	54.90	74.00	-19.10	50.70	5.92	33.48	35.20	Peak	100	114	VERTICAL
3	7309.76	36.59	54.00	-17.41	28.38	7.13	36.51	35.43	Average	159	299	VERTICAL
4	7312.30	50.43	74.00	-23.57	42.22	7.13	36.51	35.43	Peak	159	299	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11b CH 11/ Chain 1 + Chain 2
Test Date	Dec. 27, 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	4924.03	53.81	54.00	-0.19	49.46	5.97	33.58	35.20	Average	177	350	HORIZONTAL
2	4924.03	56.32	74.00	-17.68	51.97	5.97	33.58	35.20	Peak	177	350	HORIZONTAL
3	7387.71	42.55	54.00	-11.45	34.23	7.17	36.61	35.46	Average	193	184	HORIZONTAL
4	7389.00	52.31	74.00	-21.69	43.99	7.17	36.61	35.46	Peak	193	184	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	4923.93	55.24	74.00	-18.76	50.89	5.97	33.58	35.20	Peak	135	271	VERTICAL
2	4923.99	52.23	54.00	-1.77	47.88	5.97	33.58	35.20	Average	135	271	VERTICAL
3	7387.07	52.45	74.00	-21.55	44.13	7.17	36.61	35.46	Peak	101	308	VERTICAL
4	7387.17	40.71	54.00	-13.29	32.39	7.17	36.61	35.46	Average	101	308	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11g CH 1 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4824.87	43.16	54.00	-10.84	39.10	5.87	33.39	35.20	Average	162	120	HORIZONTAL
2	4824.87	57.40	74.00	-16.60	53.34	5.87	33.39	35.20	Peak	162	120	HORIZONTAL
3	12048.78	55.56	74.00	-18.44	41.90	9.36	39.25	34.95	Peak	129	219	HORIZONTAL
4	12063.40	42.37	54.00	-11.63	28.70	9.36	39.23	34.92	Average	129	219	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	4824.87	57.07	74.00	-16.93	53.01	5.87	33.39	35.20	Peak	100	119	VERTICAL
2	4825.23	43.15	54.00	-10.85	39.09	5.87	33.39	35.20	Average	100	119	VERTICAL
3	12056.17	55.55	74.00	-18.45	41.89	9.36	39.25	34.95	Peak	178	73	VERTICAL
4	12056.53	42.46	54.00	-11.54	28.80	9.36	39.25	34.95	Average	178	73	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11g CH 6 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4875.01	66.35	74.00	-7.65	62.15	5.92	33.48	35.20	Peak	191	144	HORIZONTAL
2	4875.52	53.10	54.00	-0.90	48.90	5.92	33.48	35.20	Average	191	144	HORIZONTAL
3	7308.83	47.36	54.00	-6.64	39.15	7.13	36.51	35.43	Average	197	152	HORIZONTAL
4	7309.92	60.94	74.00	-13.06	52.73	7.13	36.51	35.43	Peak	197	152	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	4878.49	51.17	54.00	-2.83	46.97	5.92	33.48	35.20	Average	100	114	VERTICAL
2	4879.21	64.92	74.00	-9.08	60.72	5.92	33.48	35.20	Peak	100	114	VERTICAL
3	7316.14	56.35	74.00	-17.65	48.13	7.14	36.51	35.43	Peak	109	301	VERTICAL
4	7316.43	42.92	54.00	-11.08	34.70	7.14	36.51	35.43	Average	109	301	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11g CH 11 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4926.17	53.99	74.00	-20.01	49.64	5.97	33.58	35.20	Peak	195	349	HORIZONTAL
2	4926.32	39.88	54.00	-14.12	35.53	5.97	33.58	35.20	Average	195	349	HORIZONTAL
3	7393.74	36.74	54.00	-17.26	28.39	7.17	36.64	35.46	Average	151	104	HORIZONTAL
4	7405.75	50.23	74.00	-23.77	41.87	7.18	36.64	35.46	Peak	151	104	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	4925.81	52.81	74.00	-21.19	48.46	5.97	33.58	35.20	Peak	100	268	VERTICAL
2	4926.82	38.96	54.00	-15.04	34.61	5.97	33.58	35.20	Average	100	268	VERTICAL
3	7389.11	36.69	54.00	-17.31	28.37	7.17	36.61	35.46	Average	183	230	VERTICAL
4	7389.69	50.33	74.00	-23.67	42.01	7.17	36.61	35.46	Peak	183	230	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11n MCS0 HT20 CH 1 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4825.81	42.43	54.00	-11.57	38.37	5.87	33.39	35.20	Average	194	114	HORIZONTAL
2	4825.81	57.59	74.00	-16.41	53.53	5.87	33.39	35.20	Peak	194	114	HORIZONTAL
3	12056.38	55.74	74.00	-18.26	42.08	9.36	39.25	34.95	Peak	173	114	HORIZONTAL
4	12069.26	42.27	54.00	-11.73	28.60	9.36	39.23	34.92	Average	173	114	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	4825.95	42.44	54.00	-11.56	38.38	5.87	33.39	35.20	Average	100	119	VERTICAL
2	4827.91	55.75	74.00	-18.25	51.69	5.87	33.39	35.20	Peak	100	119	VERTICAL
3	12054.79	55.58	74.00	-18.42	41.92	9.36	39.25	34.95	Peak	141	101	VERTICAL
4	12079.75	41.91	54.00	-12.09	28.26	9.36	39.21	34.92	Average	141	101	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11n MCS0 HT20 CH 6 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4876.97	50.64	54.00	-3.36	46.44	5.92	33.48	35.20	Average	111	355	HORIZONTAL
2	4878.12	63.78	74.00	-10.22	59.58	5.92	33.48	35.20	Peak	111	355	HORIZONTAL
3	7315.34	44.95	54.00	-9.05	36.74	7.13	36.51	35.43	Average	197	144	HORIZONTAL
4	7316.64	59.60	74.00	-14.40	51.38	7.14	36.51	35.43	Peak	197	144	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	4877.98	49.80	54.00	-4.20	45.60	5.92	33.48	35.20	Average	121	122	VERTICAL
2	4878.05	63.77	74.00	-10.23	59.57	5.92	33.48	35.20	Peak	121	122	VERTICAL
3	7316.21	56.01	74.00	-17.99	47.79	7.14	36.51	35.43	Peak	119	305	VERTICAL
4	7316.64	42.65	54.00	-11.35	34.43	7.14	36.51	35.43	Average	119	305	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11n MCS0 HT20 CH 11 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4926.46	40.27	54.00	-13.73	35.92	5.97	33.58	35.20	Average	113	103	HORIZONTAL
2	4928.41	54.07	74.00	-19.93	49.72	5.97	33.58	35.20	Peak	113	103	HORIZONTAL
3	7389.62	50.32	74.00	-23.68	42.00	7.17	36.61	35.46	Peak	225	347	HORIZONTAL
4	7393.82	36.45	54.00	-17.55	28.10	7.17	36.64	35.46	Average	225	347	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	4927.04	38.02	54.00	-15.98	33.67	5.97	33.58	35.20	Average	137	266	VERTICAL
2	4928.12	51.86	74.00	-22.14	47.51	5.97	33.58	35.20	Peak	137	266	VERTICAL
3	7387.01	36.60	54.00	-17.40	28.28	7.17	36.61	35.46	Average	174	299	VERTICAL
4	7398.16	50.26	74.00	-23.74	41.91	7.17	36.64	35.46	Peak	174	299	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11n MCS0 HT40 CH 3 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4845.88	35.86	54.00	-18.14	31.76	5.88	33.42	35.20	Average	100	358	HORIZONTAL
2	4848.27	49.29	74.00	-24.71	45.19	5.88	33.42	35.20	Peak	100	358	HORIZONTAL
3	7241.83	36.48	54.00	-17.52	28.39	7.09	36.40	35.40	Average	135	319	HORIZONTAL
4	7284.52	49.90	74.00	-24.10	41.75	7.12	36.45	35.42	Peak	135	319	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	4844.65	50.00	74.00	-24.00	45.90	5.88	33.42	35.20	Peak	134	265	VERTICAL
2	4845.23	36.09	54.00	-17.91	31.99	5.88	33.42	35.20	Average	134	265	VERTICAL
3	7250.52	50.19	74.00	-23.81	42.09	7.10	36.40	35.40	Peak	214	323	VERTICAL
4	7254.93	36.42	54.00	-17.58	28.32	7.10	36.40	35.40	Average	214	323	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11n MCS0 HT40 CH 6 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4874.00	54.35	74.00	-19.65	50.15	5.92	33.48	35.20	Peak	100	118	HORIZONTAL
2	4877.62	42.09	54.00	-11.91	37.89	5.92	33.48	35.20	Average	100	118	HORIZONTAL
3	7265.41	49.74	74.00	-24.26	41.61	7.11	36.43	35.41	Peak	139	336	HORIZONTAL
4	7351.52	36.73	54.00	-17.27	28.45	7.16	36.56	35.44	Average	139	336	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	4876.89	54.81	74.00	-19.19	50.61	5.92	33.48	35.20	Peak	123	122	VERTICAL
2	4879.21	41.78	54.00	-12.22	37.58	5.92	33.48	35.20	Average	123	122	VERTICAL
3	7303.62	49.88	74.00	-24.12	41.69	7.13	36.48	35.42	Peak	156	302	VERTICAL
4	7307.24	37.57	54.00	-16.43	29.39	7.13	36.48	35.43	Average	156	302	VERTICAL

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11n MCS0 HT40 CH 9 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	4894.59	33.11	54.00	-20.89	28.87	5.93	33.51	35.20	Average	129	300	HORIZONTAL
2	4895.61	45.85	74.00	-28.15	41.61	5.93	33.51	35.20	Peak	129	300	HORIZONTAL
3	7342.98	49.88	74.00	-24.12	41.61	7.15	36.56	35.44	Peak	164	318	HORIZONTAL
4	7376.41	37.06	54.00	-16.94	28.74	7.16	36.61	35.45	Average	164	318	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	4905.66	49.29	74.00	-24.71	45.00	5.95	33.54	35.20	Peak	100	120	VERTICAL
2	4907.04	36.20	54.00	-17.80	31.91	5.95	33.54	35.20	Average	100	120	VERTICAL
3	7357.74	37.05	54.00	-16.95	28.77	7.16	36.56	35.44	Average	138	332	VERTICAL
4	7365.62	50.95	74.00	-23.05	42.65	7.16	36.59	35.45	Peak	138	332	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 / 1/T for Average
RBW / VBW (30dBc in any 100 kHz bandwidth emission)	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 v03r02 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

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	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11b CH 1, 6, 11 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	2387.40	60.29	74.00	-13.71	28.15	4.09	28.05	0.00	Peak	210	337	VERTICAL
2	2389.28	45.99	54.00	-8.01	13.85	4.09	28.05	0.00	Average	210	337	VERTICAL
3	2411.28	102.13			69.93	4.11	28.09	0.00	Average	210	337	VERTICAL
4	2411.28	104.82			72.62	4.11	28.09	0.00	Peak	210	337	VERTICAL

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	2374.37	59.32	74.00	-14.68	27.23	4.08	28.01	0.00	Peak	249	274	HORIZONTAL
2	2390.00	45.11	54.00	-8.89	12.97	4.09	28.05	0.00	Average	249	274	HORIZONTAL
3	2436.13	101.60			69.30	4.12	28.18	0.00	Average	249	274	HORIZONTAL
4	2436.42	104.45			72.15	4.12	28.18	0.00	Peak	249	274	HORIZONTAL
5	2483.50	46.45	54.00	-7.55	14.03	4.16	28.26	0.00	Average	249	274	HORIZONTAL
6	2486.10	58.95	74.00	-15.05	26.49	4.16	28.30	0.00	Peak	249	274	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	2462.72	105.08			72.72	4.14	28.22	0.00	Average	248	267	HORIZONTAL
2	2463.01	107.75			75.39	4.14	28.22	0.00	Peak	248	267	HORIZONTAL
3	2483.50	46.75	54.00	-7.25	14.33	4.16	28.26	0.00	Average	248	267	HORIZONTAL
4	2484.95	61.63	74.00	-12.37	29.21	4.16	28.26	0.00	Peak	248	267	HORIZONTAL

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

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11g CH 1, 6, 11 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	2389.86	73.07	74.00	-0.93	40.93	4.09	28.05	0.00	Peak	208	337	VERTICAL
2	2390.00	52.61	54.00	-1.39	20.47	4.09	28.05	0.00	Average	208	337	VERTICAL
3	2410.12	109.93			77.73	4.11	28.09	0.00	Peak	208	337	VERTICAL
4	2410.55	99.00			66.80	4.11	28.09	0.00	Average	208	337	VERTICAL

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	2390.00	53.86	54.00	-0.14	21.72	4.09	28.05	0.00	Average	223	360	VERTICAL
2	2390.00	72.75	74.00	-1.25	40.61	4.09	28.05	0.00	Peak	223	360	VERTICAL
3	2435.55	104.39			72.09	4.12	28.18	0.00	Average	223	360	VERTICAL
4	2435.84	114.63			82.33	4.12	28.18	0.00	Peak	223	360	VERTICAL
5	2485.82	51.29	54.00	-2.71	18.83	4.16	28.30	0.00	Average	223	360	VERTICAL
6	2486.39	67.85	74.00	-6.15	35.39	4.16	28.30	0.00	Peak	223	360	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	2458.96	108.87			76.51	4.14	28.22	0.00	Peak	221	350	VERTICAL
2	2463.01	98.46			66.10	4.14	28.22	0.00	Average	221	350	VERTICAL
3	2483.50	53.67	54.00	-0.33	21.25	4.16	28.26	0.00	Average	221	350	VERTICAL
4	2483.50	70.44	74.00	-3.56	38.02	4.16	28.26	0.00	Peak	221	350	VERTICAL

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

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11n MCS0 HT20 CH 1, 6, 11 / Chain 1 + Chain 2
Test Date	Dec. 27, 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	2389.42	71.97	74.00	-2.03	39.83	4.09	28.05	0.00	Peak	240	268	HORIZONTAL
2	2390.00	53.61	54.00	-0.39	21.47	4.09	28.05	0.00	Average	240	268	HORIZONTAL
3	2413.30	108.90			76.70	4.11	28.09	0.00	Peak	240	268	HORIZONTAL
4	2413.59	98.01			65.81	4.11	28.09	0.00	Average	240	268	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	2389.71	72.94	74.00	-1.06	40.80	4.09	28.05	0.00	Peak	248	320	VERTICAL
2	2390.00	52.54	54.00	-1.46	20.40	4.09	28.05	0.00	Average	248	320	VERTICAL
3	2433.53	103.18			70.93	4.12	28.13	0.00	Average	248	320	VERTICAL
4	2433.82	113.39			81.14	4.12	28.13	0.00	Peak	248	320	VERTICAL
5	2486.10	49.32	54.00	-4.68	16.86	4.16	28.30	0.00	Average	248	320	VERTICAL
6	2487.55	67.33	74.00	-6.67	34.86	4.17	28.30	0.00	Peak	248	320	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	2459.68	107.62			75.26	4.14	28.22	0.00	Peak	216	258	HORIZONTAL
2	2459.97	96.66			64.30	4.14	28.22	0.00	Average	216	258	HORIZONTAL
3	2483.50	53.91	54.00	-0.09	21.49	4.16	28.26	0.00	Average	216	258	HORIZONTAL
4	2483.64	69.55	74.00	-4.45	37.13	4.16	28.26	0.00	Peak	216	258	HORIZONTAL

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

Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weng	Configurations	IEEE 802.11n MCS0 HT40 CH 3, 6, 9 / Chain 1 + Chain 2
Test Date	Dec. 27, 2014		

Channel 3

	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	2389.42	53.69	54.00	-0.31	21.55	4.09	28.05	0.00	Average	218	360	VERTICAL
2	2389.71	68.01	74.00	-5.99	35.87	4.09	28.05	0.00	Peak	218	360	VERTICAL
3	2416.79	92.74			60.54	4.11	28.09	0.00	Average	218	360	VERTICAL
4	2419.68	103.04			70.79	4.12	28.13	0.00	Peak	218	360	VERTICAL

Item 3, 4 are the fundamental frequency at 2422 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	2384.50	67.11	74.00	-6.89	34.98	4.08	28.05	0.00	Peak	240	320	VERTICAL
2	2390.00	53.60	54.00	-0.40	21.46	4.09	28.05	0.00	Average	240	320	VERTICAL
3	2432.95	96.90			64.65	4.12	28.13	0.00	Average	240	320	VERTICAL
4	2433.24	107.07			74.82	4.12	28.13	0.00	Peak	240	320	VERTICAL
5	2486.68	64.63	74.00	-9.37	32.17	4.16	28.30	0.00	Peak	240	320	VERTICAL
6	2488.42	50.03	54.00	-3.97	17.56	4.17	28.30	0.00	Average	240	320	VERTICAL

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

Channel 9

	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	2448.24	92.34			60.03	4.13	28.18	0.00	Average	219	7	VERTICAL
2	2449.68	102.07			69.76	4.13	28.18	0.00	Peak	219	7	VERTICAL
3	2483.50	65.91	74.00	-8.09	33.49	4.16	28.26	0.00	Peak	219	7	VERTICAL
4	2483.79	53.46	54.00	-0.54	21.04	4.16	28.26	0.00	Average	219	7	VERTICAL

Item 1, 2 are the fundamental frequency at 2452 MHz.

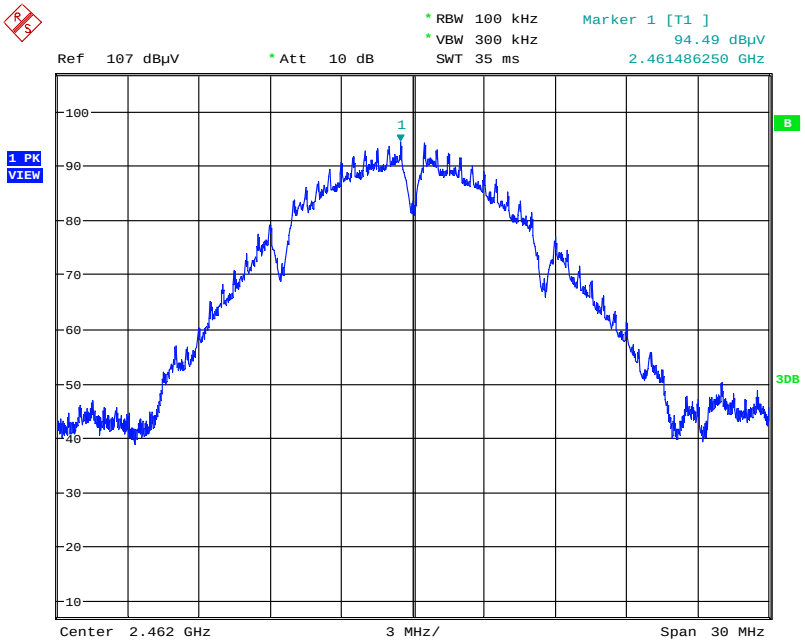
Note:

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

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

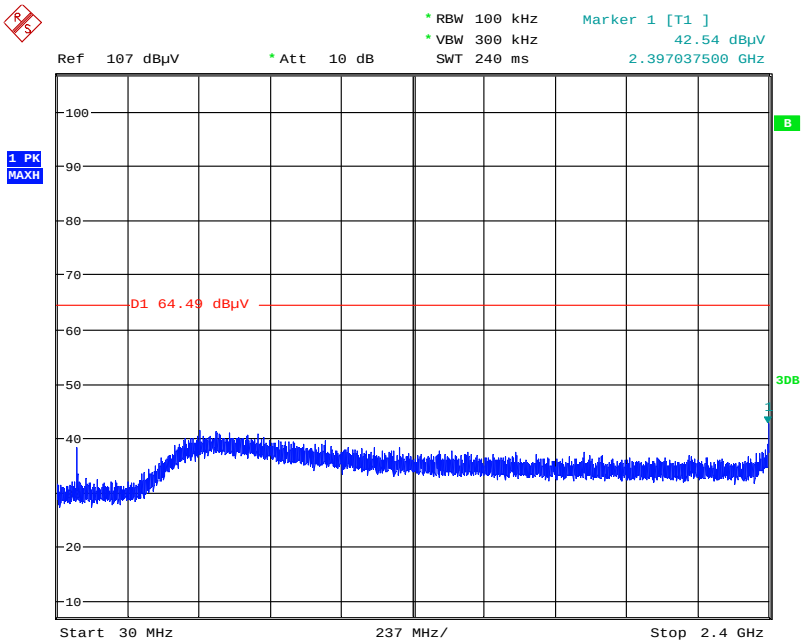
For Emission not in Restricted Band

Plot on Configuration IEEE 802.11b / Reference Level



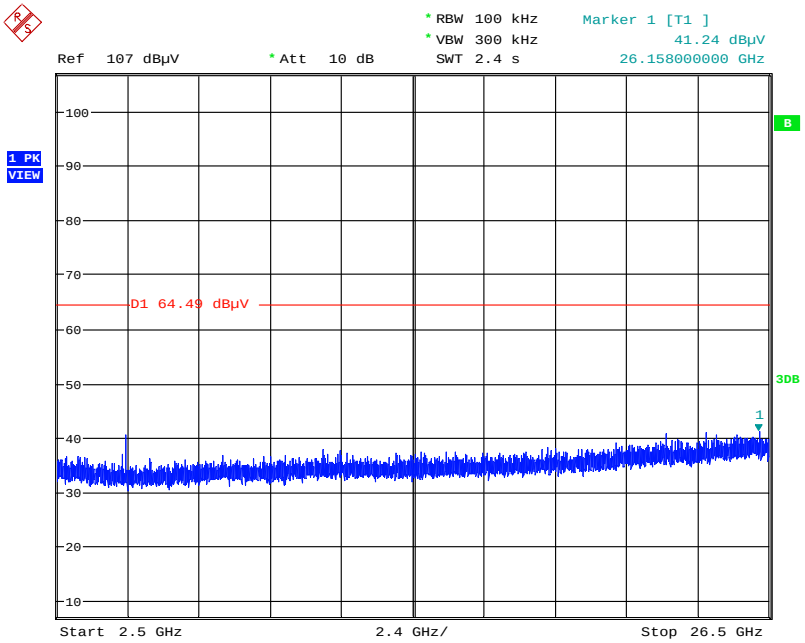
Date: 6.FEB.2015 01:28:03

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



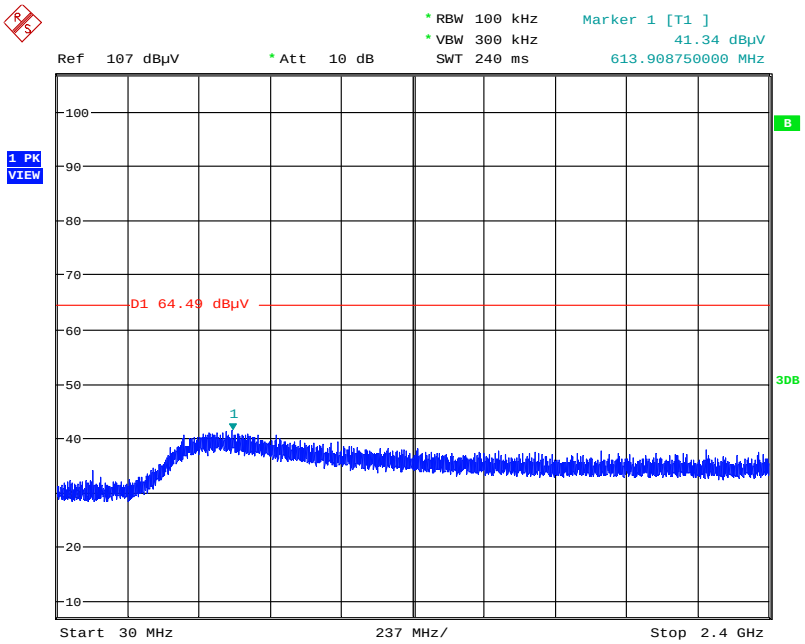
Date: 6.FEB.2015 01:36:38

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



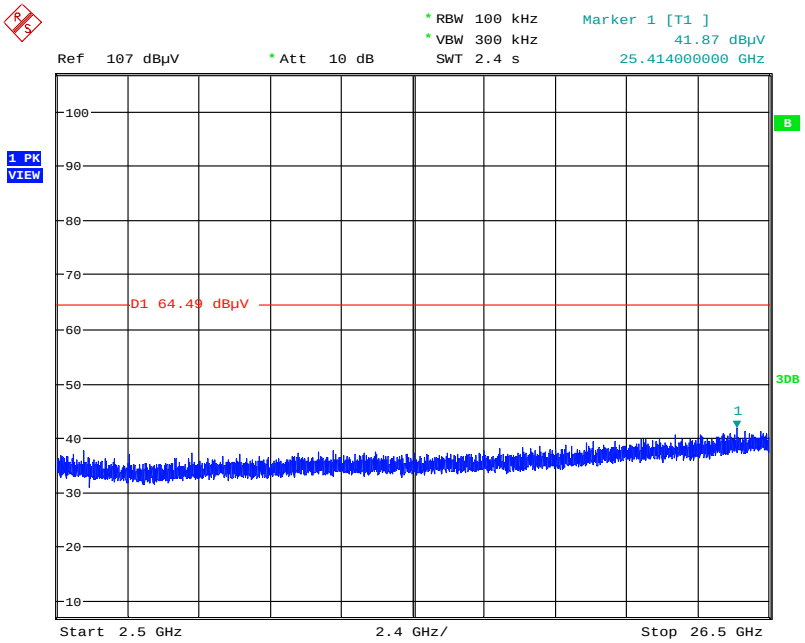
Date: 6.FEB.2015 01:35:39

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



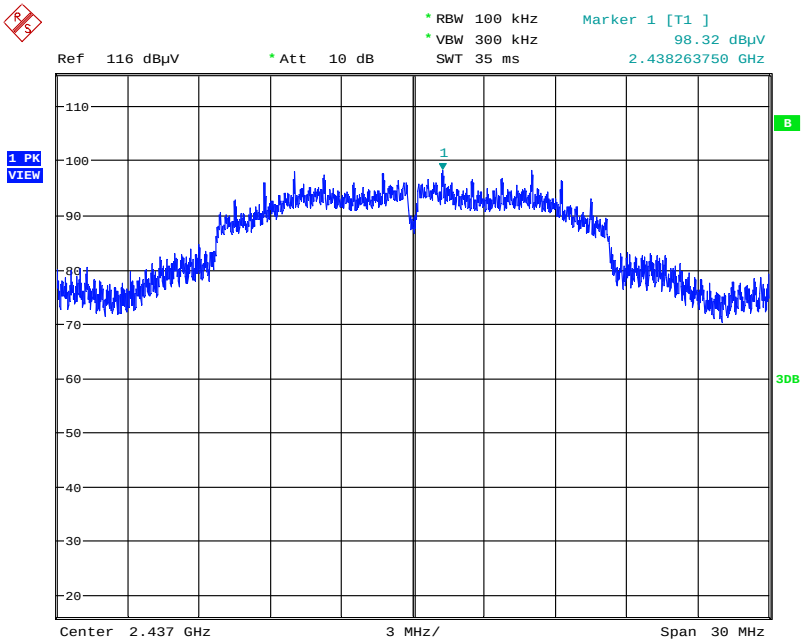
Date: 6.FEB.2015 01:31:30

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



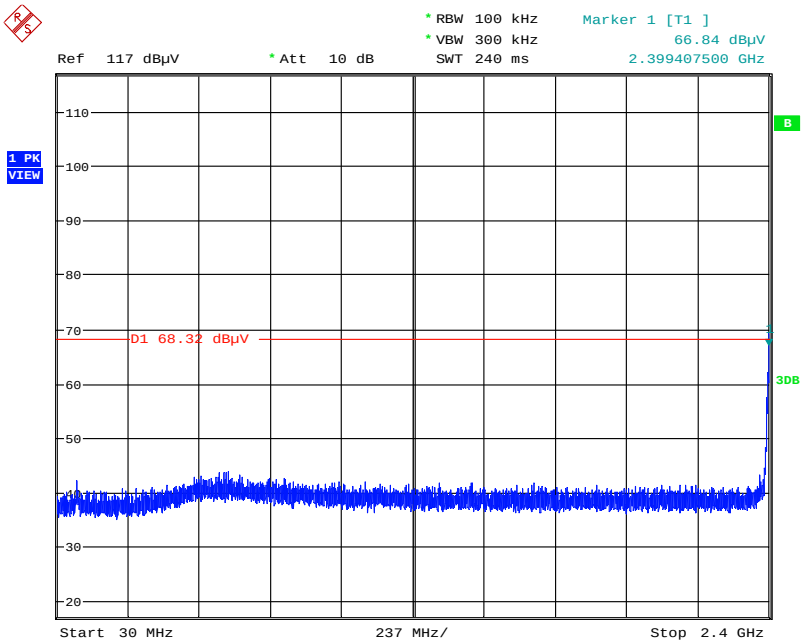
Date: 6.FEB.2015 01:33:11

Plot on Configuration IEEE 802.11g / Reference Level



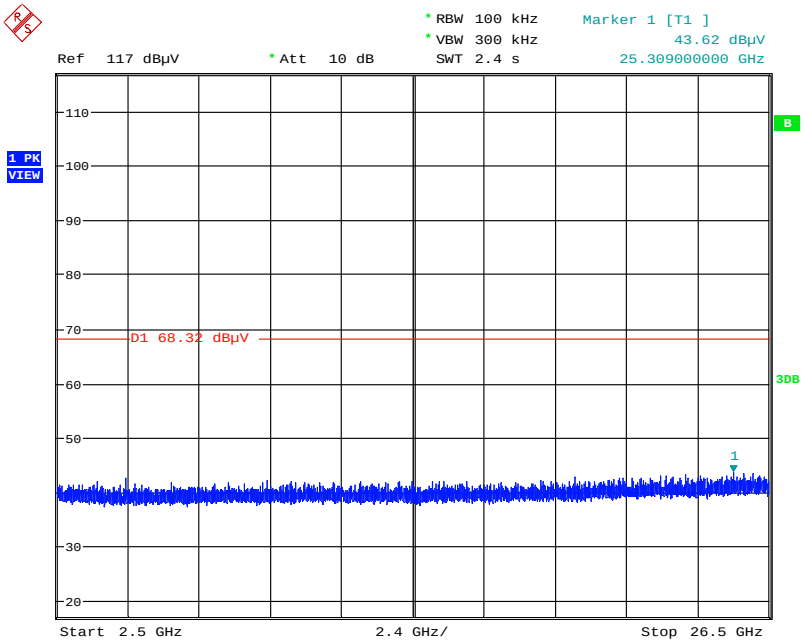
Date: 6.FEB.2015 01:54:39

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



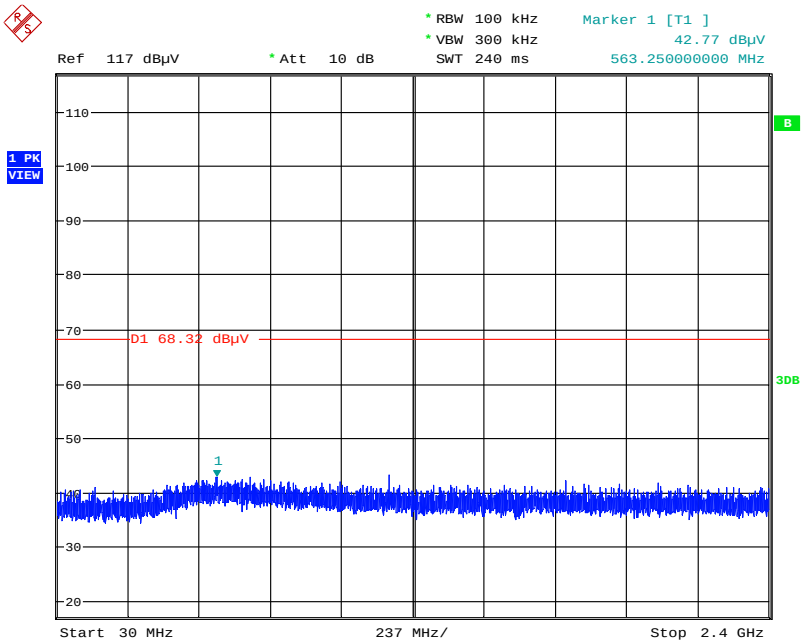
Date: 6.FEB.2015 02:02:24

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



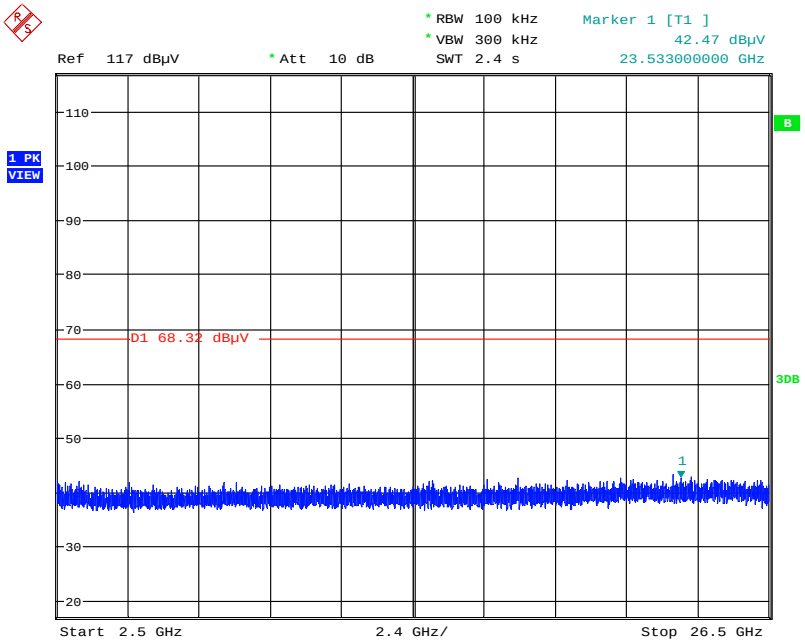
Date: 6.FEB.2015 03:02:25

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



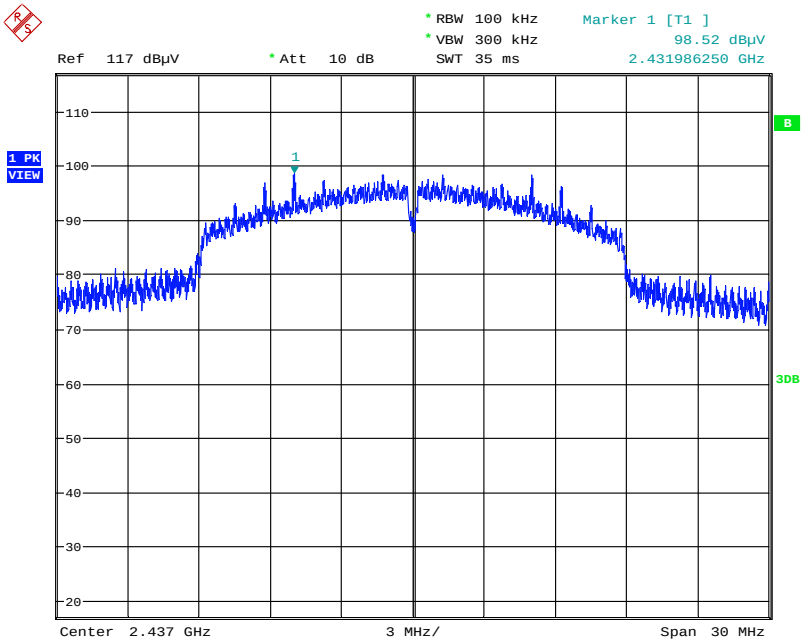
Date: 6.FEB.2015 03:04:15

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



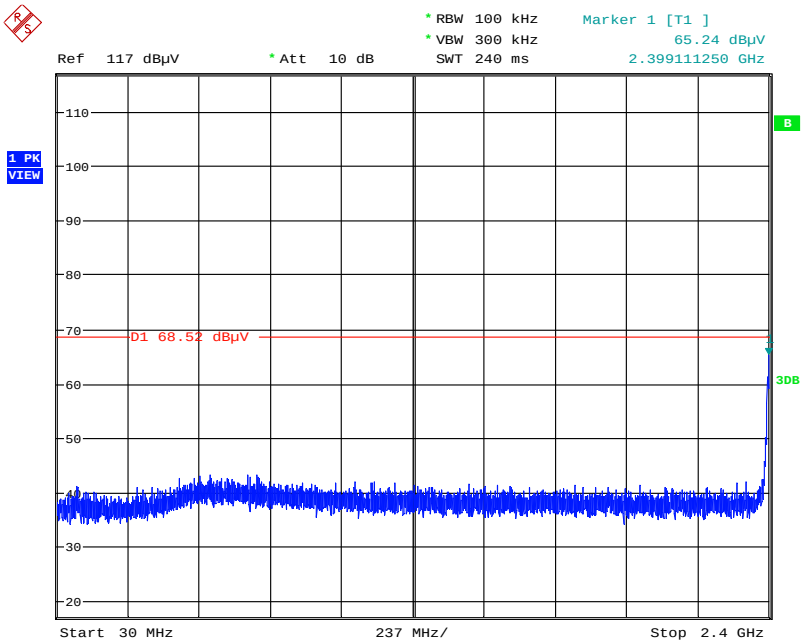
Date: 6.FEB.2015 02:04:44

Plot on Configuration IEEE 802.11n MCS0 HT20 / Reference Level



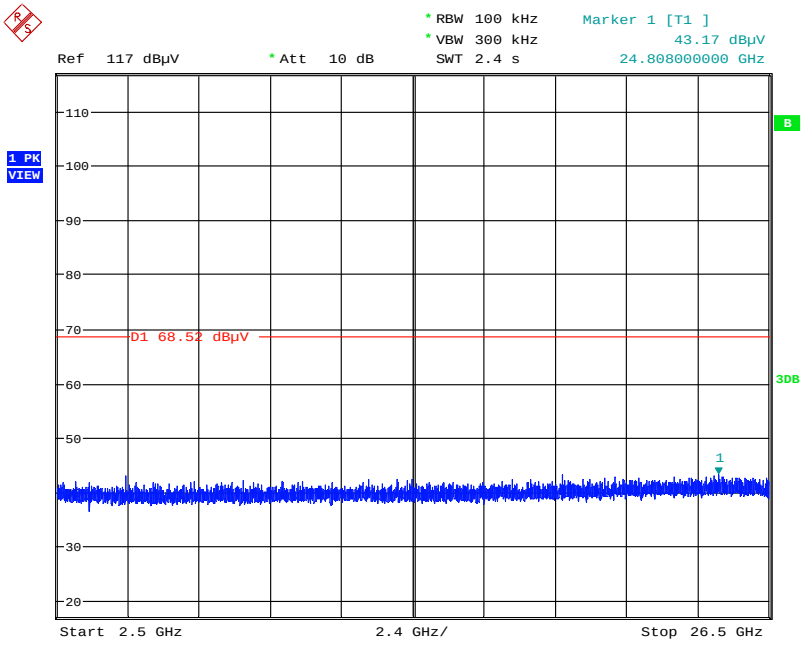
Date: 6.FEB.2015 02:17:23

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



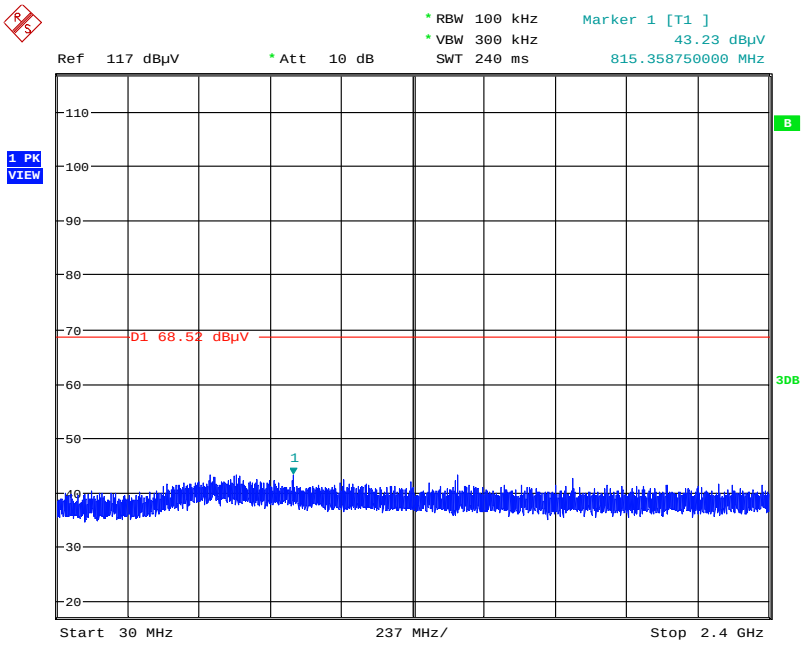
Date: 6.FEB.2015 02:19:41

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



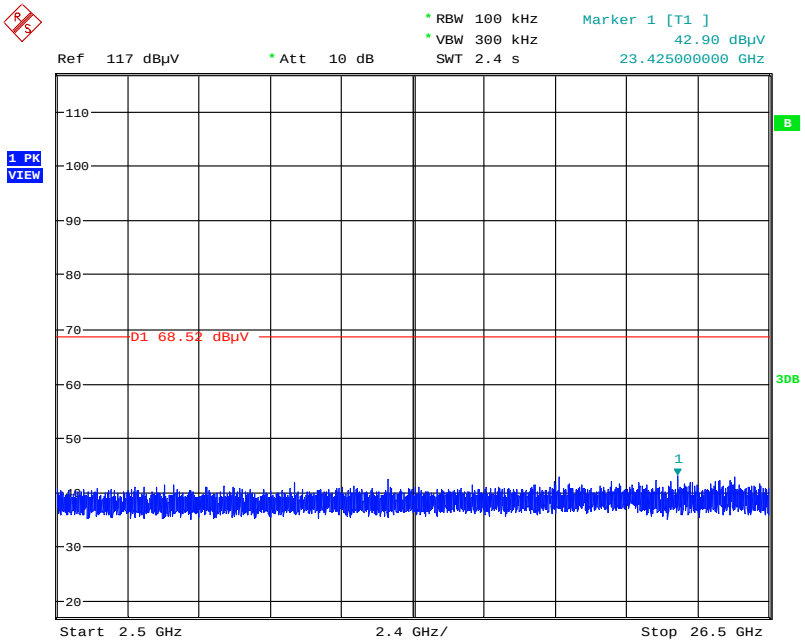
Date: 6.FEB.2015 02:21:05

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



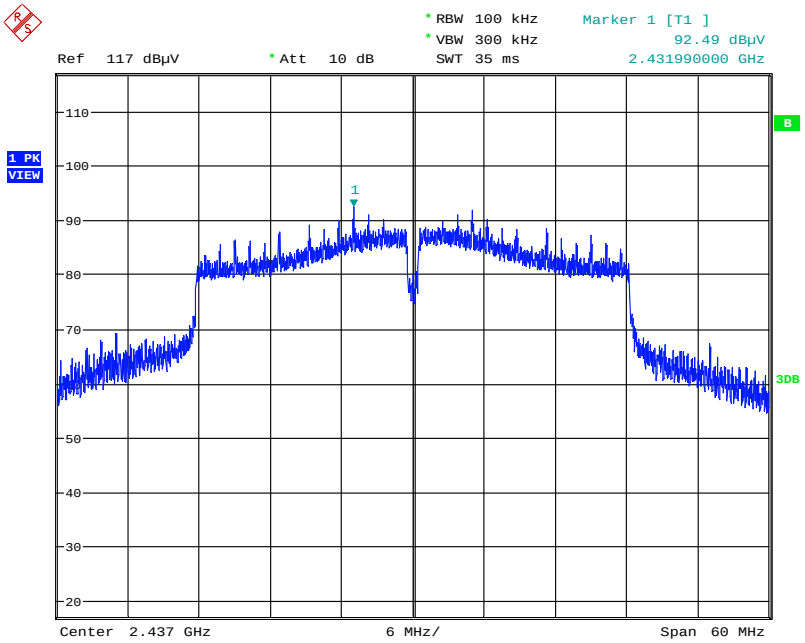
Date: 6.FEB.2015 02:26:04

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



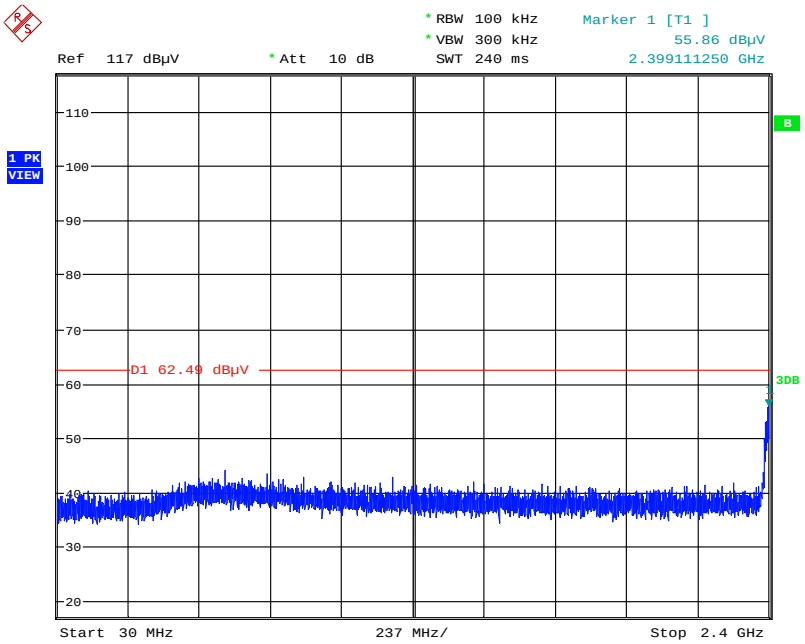
Date: 6.FEB.2015 02:24:09

Plot on Configuration IEEE 802.11n MCS0 HT40 / Reference Level



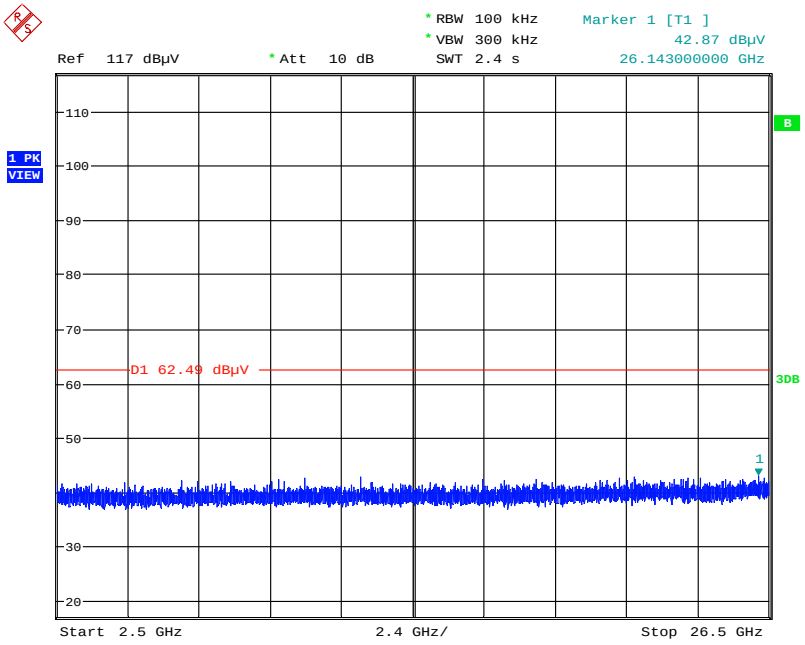
Date: 6.FEB.2015 02:40:25

Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 3 / 30MHz~2400MHz (down 30dBc)



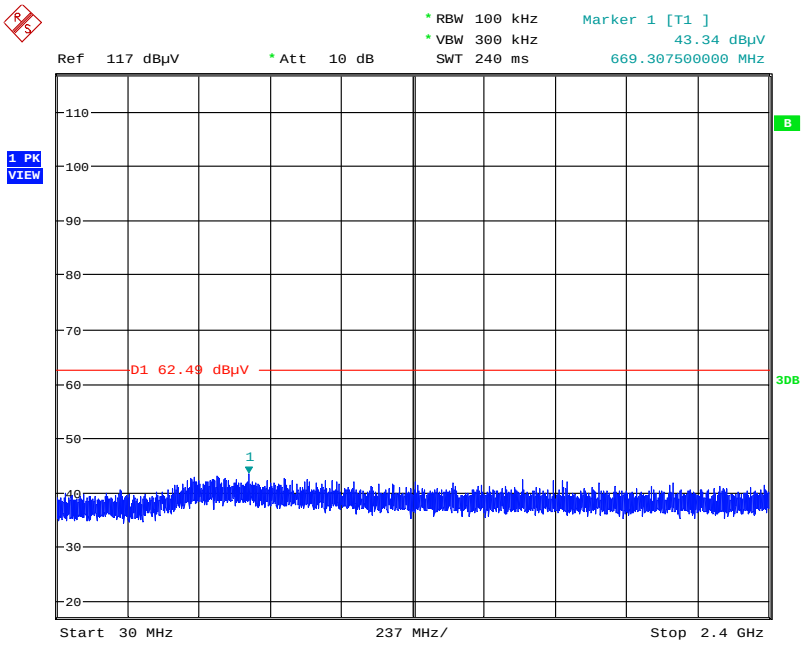
Date: 6.FEB.2015 02:44:29

Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 3 / 2500MHz~26500MHz (down 30dBc)



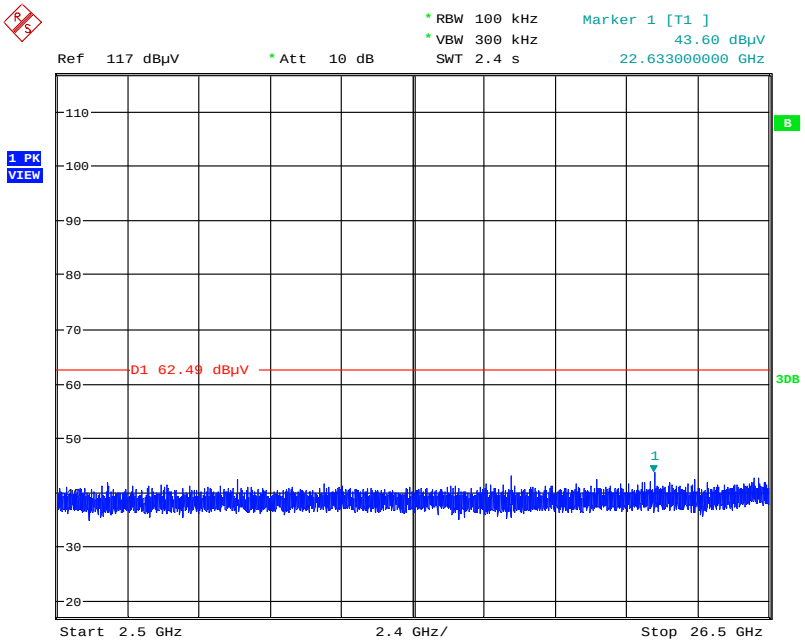
Date: 6.FEB.2015 02:45:49

Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 9 / 30MHz~2400MHz (down 30dBc)



Date: 6.FEB.2015 02:48:35

Plot on Configuration IEEE 802.11n MCS0 HT40 / CH 9 / 2500MHz~26500MHz (down 30dBc)



Date: 6.FEB.2015 02:47:48

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	9kHz ~ 2.75GHz	Apr. 23, 2014	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 02, 2014	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Dec. 02, 2014	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	150kHz ~ 30MHz	Dec. 04, 2014	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-	N.C.R.	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	May 26, 2014	Radiation (03CH01-CB)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Jul. 28, 2014	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Oct. 28, 2014	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 22, 2014	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 15, 2014	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8317A	MY39501305	1GHz ~ 26.5GHz	Jan. 13, 2014	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 12, 2015	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Nov. 25, 2014	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSV40	101026	9kHz ~ 40GHz	Aug. 28, 2014	Radiation (03CH01-CB)
EMI Test Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8GHz	Jan. 21, 2015	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESR26	101289	9kHz~26GHz	Aug. 22, 2014	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R.	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO 2000	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. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Dec.12, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 15, 2014	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	1126203	300MHz~40GHz	Oct. 06, 2014	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1210004	300MHz~40GHz	Oct. 06, 2014	Conducted (TH01-CB)

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

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

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.4 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%
Conducted Emission	1.7 dB	Confidence levels of 95%

Appendix B. Maximum Permissible Exposure

1. Maximum Permissible Exposure

1.1. Applicable Standard

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|², |H|² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|², |H|² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

1.2. MPE Calculation Method

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

Pd = $\frac{30 \times P \times G}{377 \times d^2}$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

1.3. Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

For 5GHz Band:

Antenna Type : PCB Antenna

Conducted Power for IEEE 802.11ac MCS0/Nss1 VHT20: 23.75 dBm

Distance (m)	Antenna Gain (dBi)	Antenna Gain (numeric)	The maximum combined Average Output Power		Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
			(dBm)	(mW)			
0.2	4.88	3.0761	23.7510	237.1940	0.145229	1	Complies

For 2.4GHz Band:

Antenna Type : PCB Antenna

Conducted Power for IEEE 802.11g: 24.16 dBm

Distance (m)	Antenna Gain (dBi)	Antenna Gain (numeric)	The maximum combined Average Output Power		Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Test Result
			(dBm)	(mW)			
0.2	2.54	1.7947	24.1575	260.4649	0.093046	1	Complies

Conclusion:

Both of the WLAN 2.4GHz Band and WLAN 5GHz Band can transmit simultaneously, the formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ...etc. < 1

CPD = Calculation power density

LPD = Limit of power density

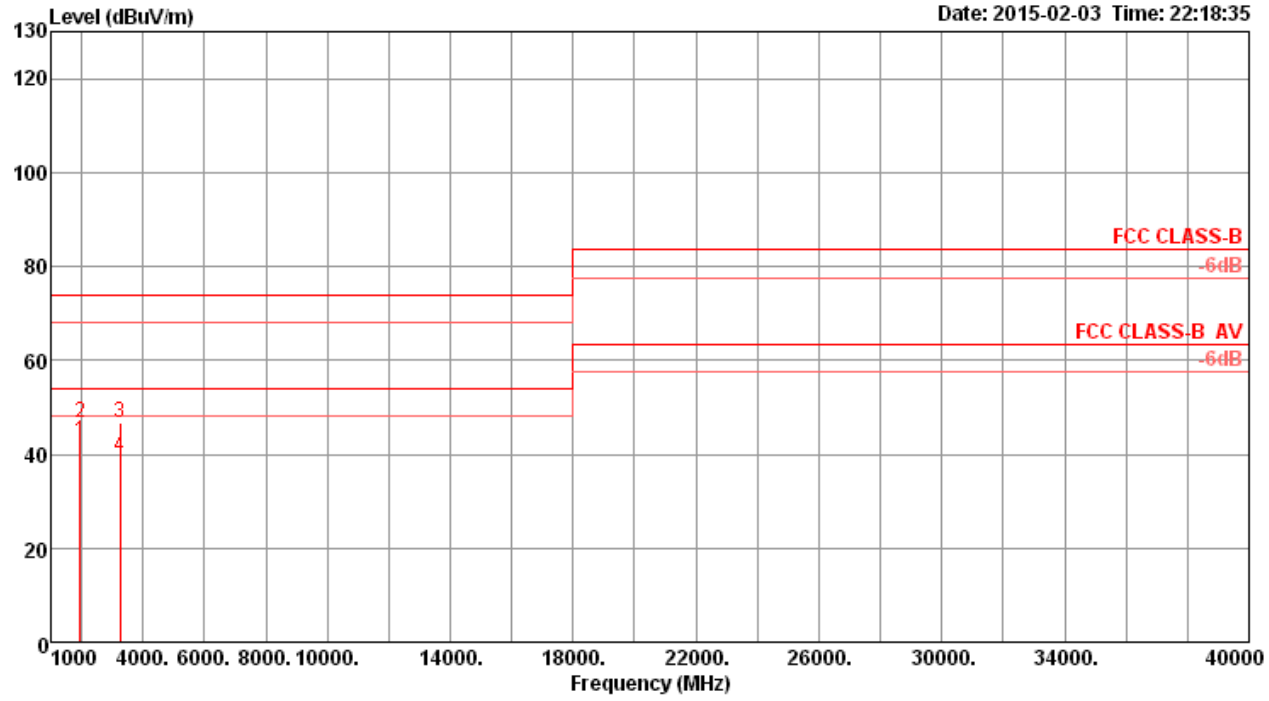
Therefore, the worst-case situation is 0.093046 / 1 + 0.145229 / 1 = 0.238275, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

Appendix C. Radiated Emission Co-location Report

1. Results of Radiated Emissions for Co-located

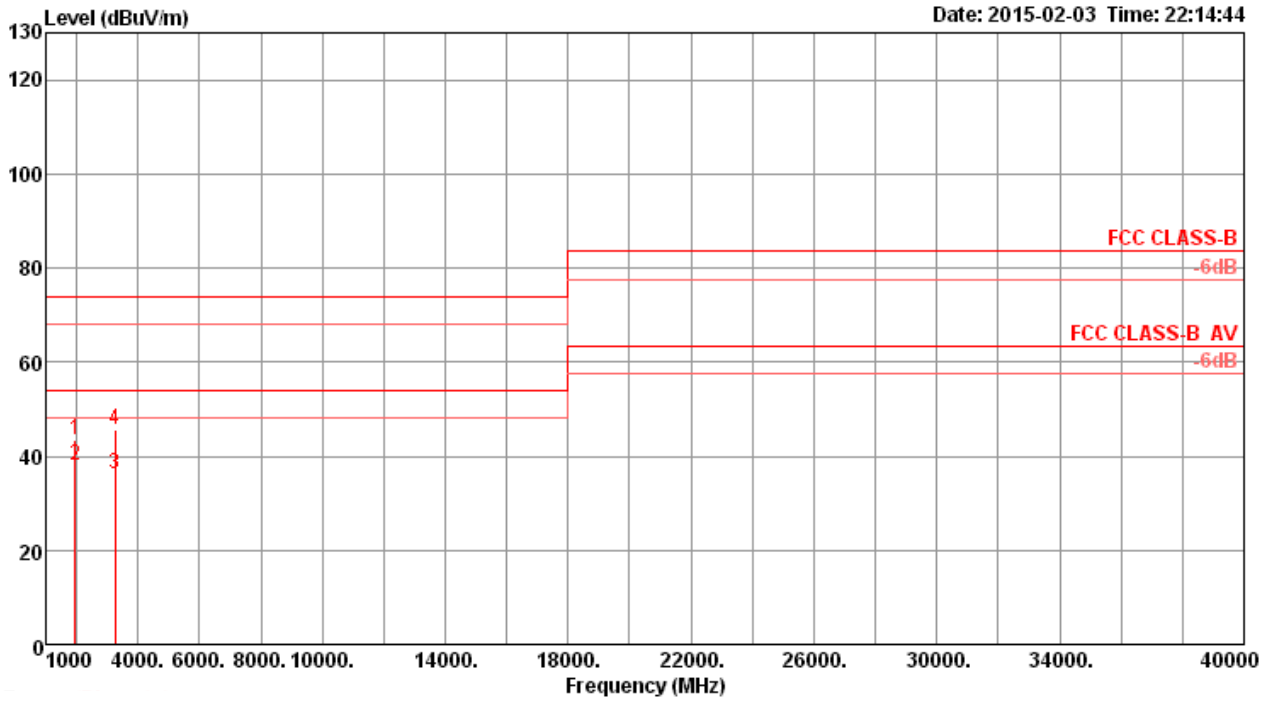
Temperature	25°C	Humidity	40%
Test Engineer	Eddie Weang	Configurations	2.4G + 5G

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	1950.00	42.86	54.00	-11.14	47.08	3.74	26.94	34.90	Average	102	30	HORIZONTAL
2	1950.00	46.80	74.00	-27.20	51.02	3.74	26.94	34.90	Peak	102	30	HORIZONTAL
3	3249.86	46.80	74.00	-27.20	46.75	4.87	30.38	35.20	Peak	100	153	HORIZONTAL
4	3249.96	39.61	54.00	-14.39	39.56	4.87	30.38	35.20	Average	100	153	HORIZONTAL

Vertial



	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	1950.03	43.55	74.00	-30.45	47.77	3.74	26.94	34.90	Peak	100	138	VERTICAL
2	1950.03	37.88	54.00	-16.12	42.10	3.74	26.94	34.90	Average	100	138	VERTICAL
3	3250.03	36.35	54.00	-17.65	36.30	4.87	30.38	35.20	Average	158	196	VERTICAL
4	3250.32	45.64	74.00	-28.36	45.59	4.87	30.38	35.20	Peak	158	196	VERTICAL