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FCC RADIO TEST REPORT

Applicant's company	**Aerohive Networks Inc.**
Applicant Address	330 Gibraltar Drive, Sunnyvale, CA 94089, USA
FCC ID	**WBV-AP130**
Manufacturer's company	**Wistron NeWeb Corporation**
Manufacturer Address	20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan, R.O.C.

Product Name	Access Point
Brand Name	Aerohive
Model No.	AP130
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Dec. 02, 2014
Final Test Date	Jan. 27, 2015
Submission Type	Original Equipment

Statement

Test result included is only for the IEEE 802.11b/g and IEEE 802.11n/ac 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**, **KDB644545 D01 v01r02.**

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
FR4D0481AA	Rev. 01	Initial issue of report	Feb. 06, 2015

1. VERIFICATION OF COMPLIANCE

Product Name	:	Access Point
Brand Name	:	Aerohive
Model No.	:	AP130
Applicant	:	Aerohive Networks Inc.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart C § 15.247

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Dec. 02, 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	4.52 dB
4.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	6.51 dB
4.3	15.247(e)	Power Spectral Density	Complies	0.27 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	4.02 dB
4.6	15.247(d)	Band Edge Emissions	Complies	0.01 dB
4.7	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Product Type	IEEE 802.11b/g: WLAN (1TX, 1RX) IEEE 802.11n/ac: WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From PoE
Modulation	IEEE 802.11b: DSSS IEEE 802.11g: OFDM IEEE 802.11n/ac: see the below table
Data Modulation	IEEE 802.11b: DSSS (BPSK / QPSK / CCK) IEEE 802.11g/n: OFDM (BPSK / QPSK / 16QAM / 64QAM) IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
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/ac: see the below table
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11
Channel Band Width (99%)	**For Non-Beamforming Mode:** IEEE 802.11b: 12.07 MHz IEEE 802.11g: 17.45 MHz IEEE 802.11ac MCS0/Nss1 (VHT20): 17.80 MHz **For Beamforming Mode:** IEEE 802.11ac MCS0/Nss1 (VHT20): 18.41 MHz
Maximum Conducted Output Power	**For Non-Beamforming Mode:** IEEE 802.11b: 20.93 dBm IEEE 802.11g: 19.75 dBm IEEE 802.11ac MCS0/Nss1 (VHT20): 22.62 dBm **For Beamforming Mode:** IEEE 802.11ac MCS0/Nss1 (VHT20): 22.62 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Items	Description	
Beamforming Function	☒ With beamforming	☐ Without beamforming

Note: The product has beamforming function for 802.11n HT20, 802.11ac VHT20 in 2.4GHz band and 802.11n HT20/40, 802.11ac VHT20/40/80 in 5GHz band.

Antenna and Band width

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

IEEE 802.11n/ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	2	MCS0-15
802.11ac (VHT20)	2	MCS0-15

Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20.

Note 2: IEEE Std. 802.11ac modulation consists of VHT20, VHT40, VHT80 and VHT160 (VHT: Very High Throughput). Then EUT support VHT20.

Note 3: Modulation modes consist of below configuration:
HT20: IEEE 802.11n, VHT20: IEEE 802.11ac

3.2. Accessories

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
					2.4GHz	5GHz
1	-	95EAAH15.GDA	PIFA Antenna	I-PEX	3.86	-
2	-	95EAAH15.GC9	PIFA Antenna	I-PEX	3.86	-
3	-	95EAAH15.GDC	PIFA Antenna	I-PEX	-	5.29
4	-	95EAAH15.GDB	PIFA Antenna	I-PEX	-	5.29

Note: The EUT has four antennas.

Ant. 1 and Ant. 2 are used in 2.4GHz band only, and Ant. 3 and Ant. 4 are used in 5GHz band only.

For 2.4GHz band:

For 802.11b/g mode:

Only Chain 1 is used as the transmitting and receiving antenna.

For 802.11n/ac mode:

Both Chain 1 and Chain 2 can be used as transmitting antennas.

Chain 1 and Chain 2 can transmit and receive signal simultaneously.

For 5GHz band:

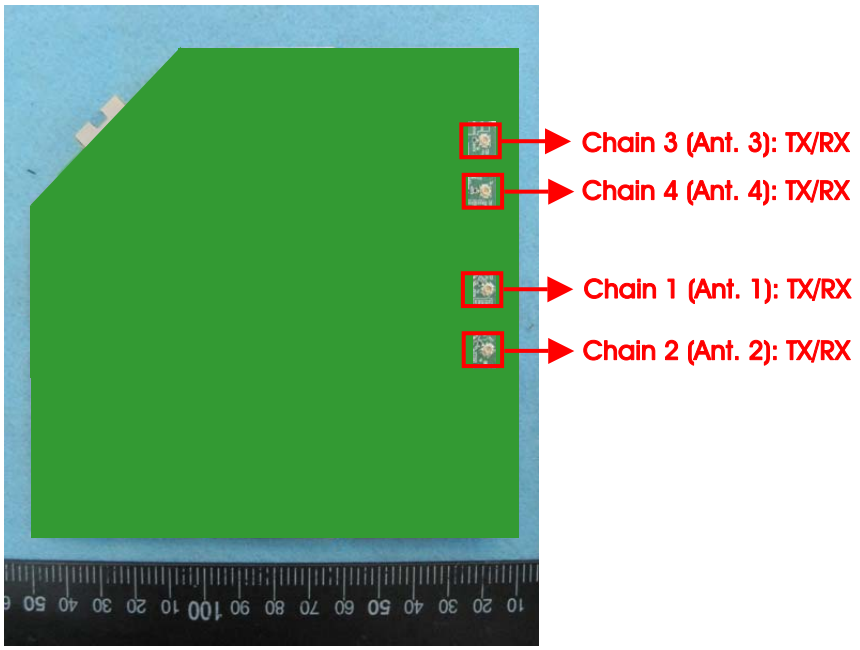
For 802.11a mode:

Only Chain 3 is used as the transmitting and receiving antenna.

For 802.11n/ac mode:

Both Chain 3 and Chain 4 can be used as transmitting antennas.

Chain 3 and Chain 4 can transmit and receive signal simultaneously.



3.4. Table for Carrier Frequencies

There is one bandwidth system.

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	-	-

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	Normal Link	-	-	-
Maximum Conducted Output Power	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11ac VHT20	MCS0/Nss1	1/6/11	1+2
Power Spectral Density	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11ac VHT20	MCS0/Nss1	1/6/11	1+2
6dB Spectrum Bandwidth	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11ac VHT20	MCS0/Nss1	1/6/11	1+2
Radiated Emissions Below 1GHz	Normal Link	-	-	-
Radiated Emissions Above 1GHz	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11ac VHT20	MCS0/Nss1	1/6/11	1+2
Band Edge Emissions	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11ac VHT20	MCS0/Nss1	1/6/11	1+2

Note 1: VHT20 covers HT20, due to same modulation.

Note 2: There are two modes of EUT in 802.11n/ac, one is beamforming mode, and the other is non-beamforming mode, Beamforming mode and non-beamforming mode have been test and

record in this test report.

The following test modes were performed for all tests:

For Conducted Emission test:

Mode 1. Normal Link

For Radiated Emission test below 1GHz:

Mode 1. Place EUT in X axis

Mode 2. Place EUT in Y axis

Mode 2 performed as worst case, it was recorded in this report.

For Radiated Emission test above 1GHz:

Mode 2 generated the worst test result for Radiated emission below 1GHz test, thus the measurement for Radiated emission above 1GHz test will follow this same test configuration.

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 Supporting Units

For Test Site No: CO01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
NB	DELL	E6430	DoC
PoE	Power Dsine	PD-3501G/AC	N/A

For Test Site No: 03CH01-CB (Radiated Emission below 1GHz test)

Support Unit	Brand	Model	FCC ID
NB	DELL	M1330	DoC
NB	DELL	M1340	DoC
NB	DELL	E6430	DoC
PoE	Power Dsine	PD-3501G/AC	N/A

For Test Site No: 03CH01-CB (Radiated Emission above 1GHz test)

For Non-Beamforming Mode:

Support Unit	Brand	Model	FCC ID
NB	DELL	M1330	DoC
PoE	Power Dsine	PD-3501G/AC	N/A

For Beamforming Mode:

Support Unit	Brand	Model	FCC ID
NB	DELL	M1340	DoC
NB	DELL	E6430	DoC
PoE	Power Dsine	PD-3501G/AC	N/A
WLAN ac Dongle	Netgear	A6200	PY312200200

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
NB	DELL	D420	E2KWM3945ABG
PoE	Power Dsine	PD-3501G/AC	N/A

3.8. 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 Non-Beamforming Mode:

Test Software Version	PUTTY suite V0.62.0.0		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	2412 MHz	2437 MHz	2462 MHz
802.11b	80	78	80
802.11g	71	76	73
802.11ac MCS0/Nss1 VHT20	66	75	63

For Beamforming Mode:

Test Software Version	PUTTY suite V0.62.0.0		
Mode	Test Frequency (MHz)		
	NCB: 20MHz		
	2412 MHz	2437 MHz	2462 MHz
802.11ac MCS0/Nss1 VHT20	65	75	61

3.9. EUT Operation during Test

For Non-Beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For Beamforming mode:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

During the test, the following programs under WIN XP were executed.

The program was executed as follows:

1. During the test, the EUT operation to normal function.
2. Executed command fixed test channel under PUTTY suite V0.62.0.0.
3. Executed "Lantest.exe " to link with the remote workstation to receive and transmit packet by WLAN ac Dongle and transmit duty cycle no less 98%

3.10. Duty Cycle

For Non-Beamforming mode:

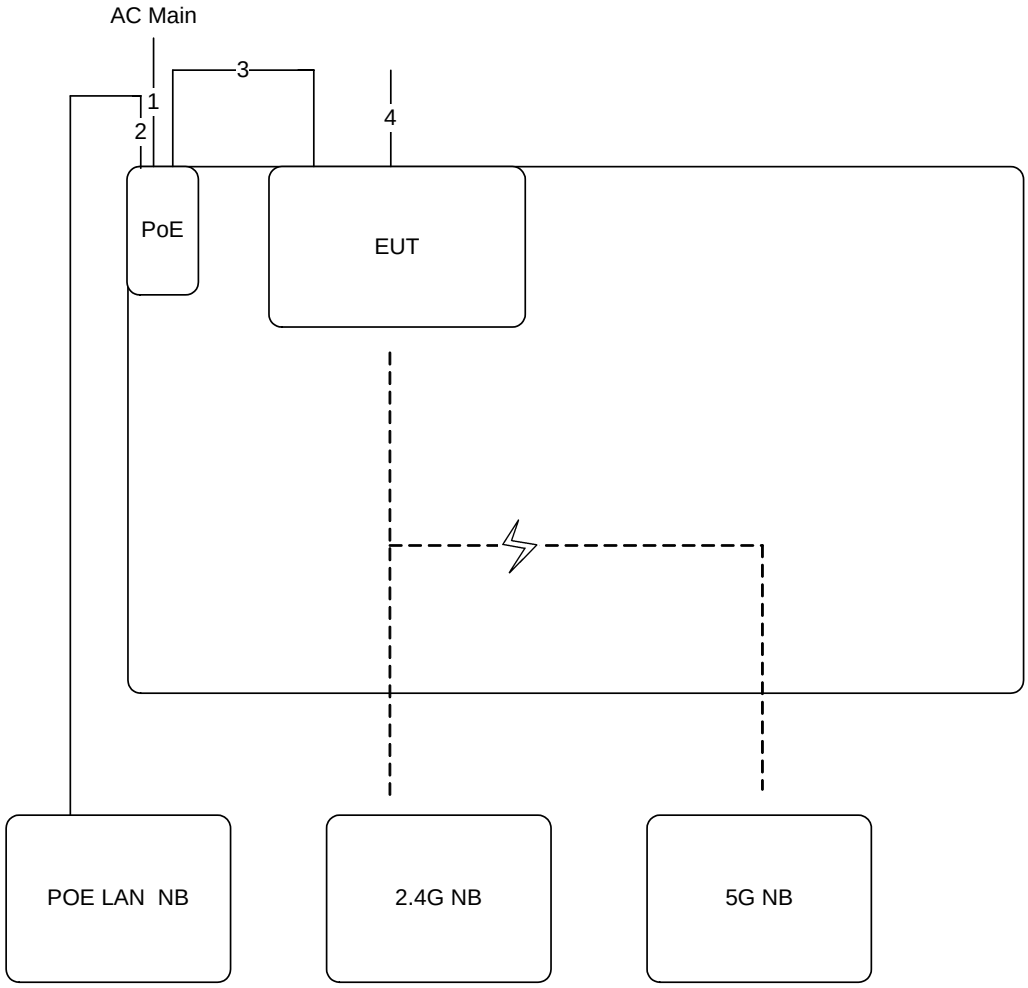
Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11b	1.000	1.000	100.00%	0.00	0.01
802.11g	2.060	2.079	99.06%	0.04	0.01
802.11ac MCS0/Nss1 VHT20	1.912	1.947	98.21%	0.08	0.01

For Beamforming mode:

Mode	On Time (ms)	On+Off Time (ms)	Duty Cycle (%)	Duty Factor (dB)	1/T Minimum VBW (kHz)
802.11ac MCS0/Nss1 VHT20	4.035	4.263	94.64%	0.24	0.25

3.11. Test Configurations

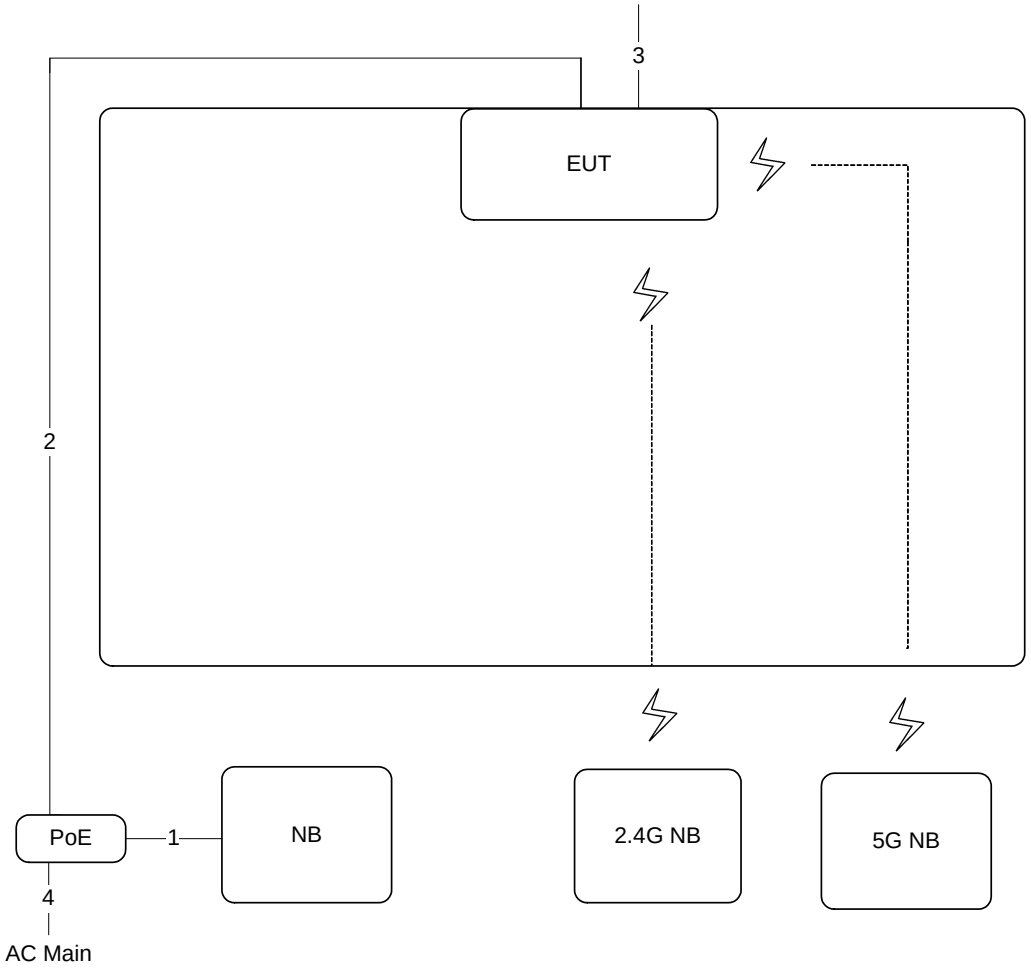
3.11.1. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length (m)	Remark
1	Power cable	No	1.8m	-
2	RJ-45 cable	No	10m	-
3	RJ-45 cable	No	1m	-
4	Console cable	No	1.8m	Load

3.11.2. Radiation Emissions Test Configuration

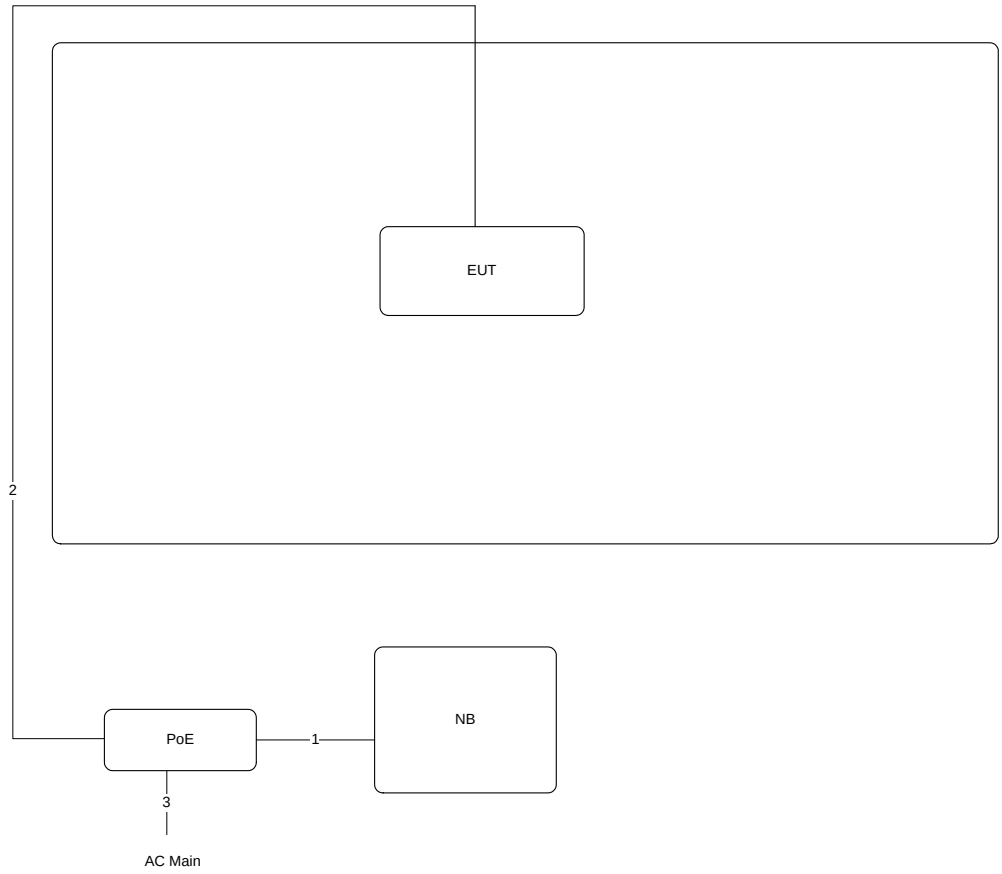
Test Configuration: 30MHz ~1GHz



Item	Connection	Shielded	Length (m)	Remark
1	RJ-45 cable	No	1m	-
2	RJ-45 cable	No	10m	-
3	Console cable	No	1.5m	Load
4	Power cable	No	1.8m	-

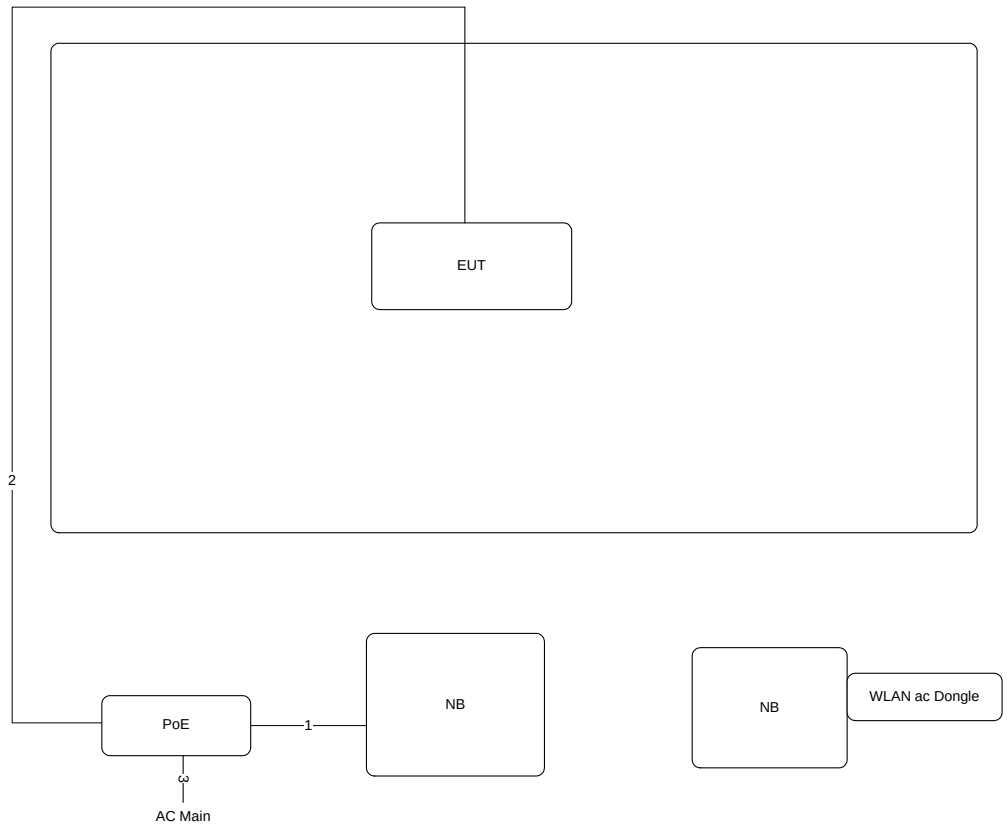
Test Configuration: above 1GHz

For Non-Beamforming Mode:



Item	Connection	Shielded	Length (m)
1	RJ-45 cable	No	1m
2	RJ-45 cable	No	10m
3	Power cable	No	1.8m

For Beamforming Mode:



Item	Connection	Shielded	Length (m)
1	RJ-45 cable	No	1m
2	RJ-45 cable	No	10m
3	Power cable	No	1.8m

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

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

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

4.1.2. Measuring Instruments and Setting

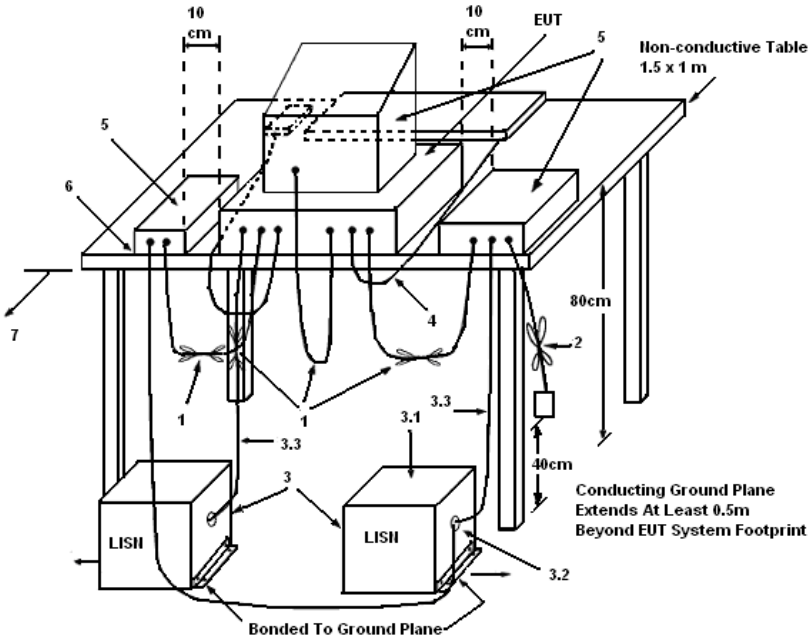
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

4.1.3. Test Procedures

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

4.1.4. Test Setup Layout



LEGEND:

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

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

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

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

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

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

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

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

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

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

4.1.5. Test Deviation

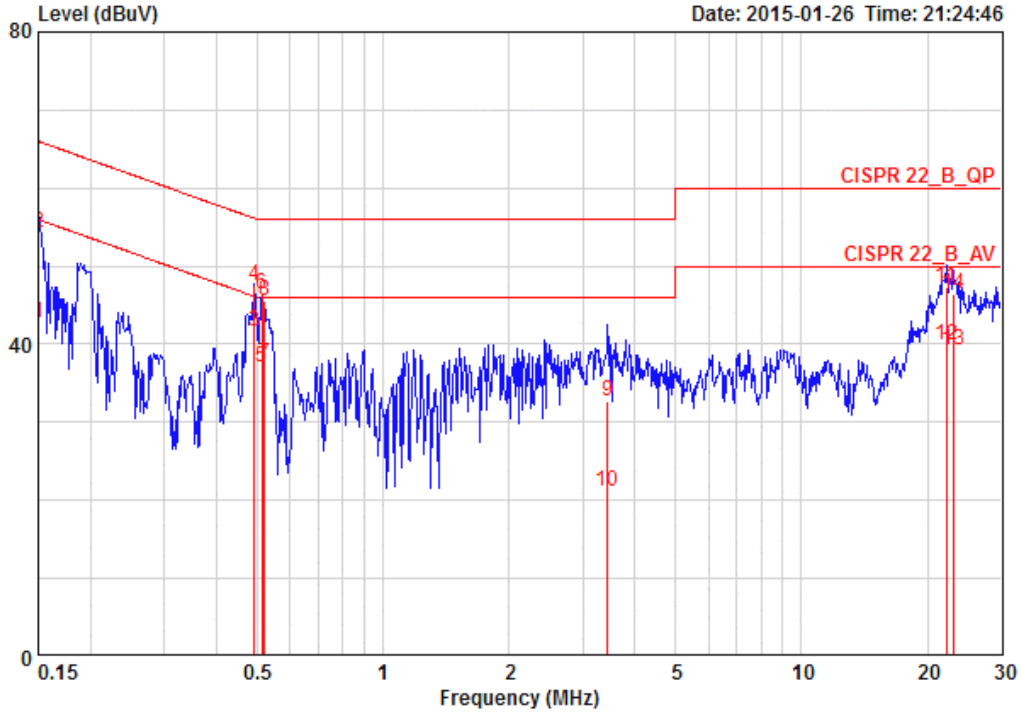
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

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

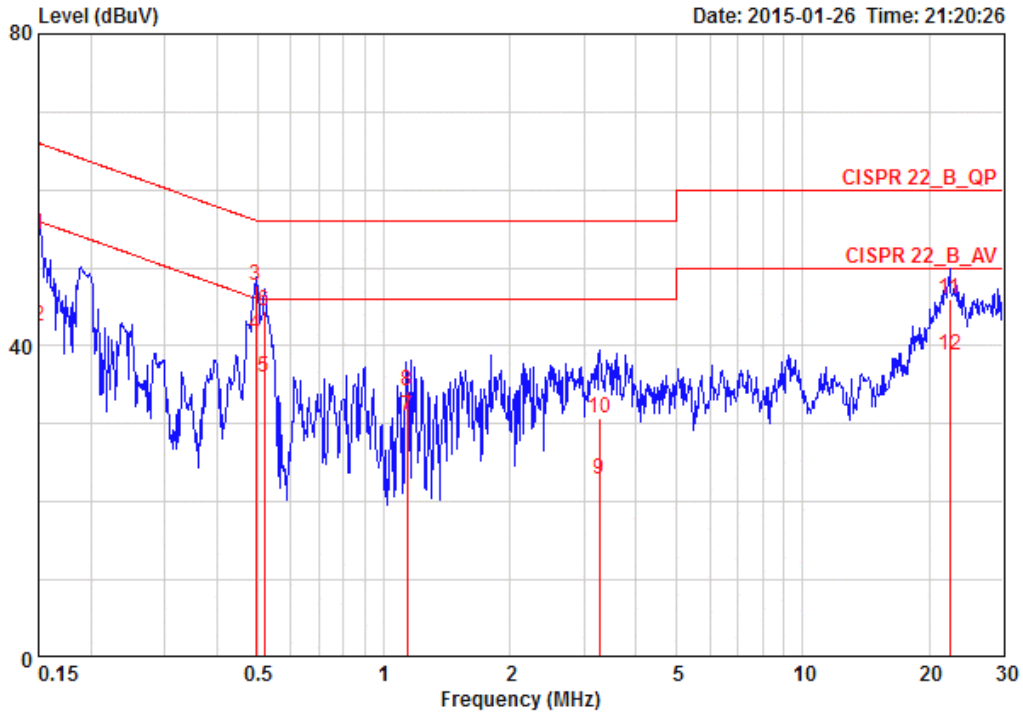
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	24°C	Humidity	54%
Test Engineer	Sollo Luo	Phase	Line
Configuration	Normal Link	Test Mode	Mode 1



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.15000	42.77	-13.23	56.00	32.65	9.96	0.16	AVERAGE	LINE
2	0.15000	54.31	-11.69	66.00	44.19	9.96	0.16	QP	LINE
3 @	0.49150	41.63	-4.52	46.14	31.48	9.96	0.18	AVERAGE	LINE
4 @	0.49150	47.48	-8.67	56.14	37.33	9.96	0.18	QP	LINE
5 @	0.51278	37.09	-8.91	46.00	26.94	9.96	0.19	AVERAGE	LINE
6 @	0.51278	46.42	-9.58	56.00	36.27	9.96	0.19	QP	LINE
7 @	0.52100	37.44	-8.56	46.00	27.29	9.96	0.19	AVERAGE	LINE
8 @	0.52100	45.64	-10.36	56.00	35.49	9.96	0.19	QP	LINE
9	3.436	32.78	-23.22	56.00	22.43	10.06	0.29	QP	LINE
10	3.436	21.21	-24.79	46.00	10.86	10.06	0.29	AVERAGE	LINE
11	22.180	47.23	-12.77	60.00	36.25	10.44	0.54	QP	LINE
12 @	22.180	39.98	-10.02	50.00	29.00	10.44	0.54	AVERAGE	LINE
13	23.018	39.24	-10.76	50.00	28.25	10.44	0.55	AVERAGE	LINE
14	23.018	46.36	-13.64	60.00	35.37	10.44	0.55	QP	LINE

Temperature	24°C	Humidity	54%
Test Engineer	Sollo Luo	Phase	Neutral
Configuration	Normal Link	Test Mode	Mode 1



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark	Pol/Phase
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.15000	54.32	-11.68	66.00	44.21	9.95	0.16	QP	NEUTRAL
2	0.15000	42.50	-13.50	56.00	32.39	9.95	0.16	AVERAGE	NEUTRAL
3 @	0.49411	47.75	-8.35	56.10	37.61	9.95	0.18	QP	NEUTRAL
4 @	0.49411	41.37	-4.73	46.10	31.23	9.95	0.18	AVERAGE	NEUTRAL
5 @	0.51824	36.01	-9.99	46.00	25.87	9.95	0.19	AVERAGE	NEUTRAL
6	0.51824	44.51	-11.49	56.00	34.37	9.95	0.19	QP	NEUTRAL
7	1.138	31.02	-14.98	46.00	20.82	9.99	0.21	AVERAGE	NEUTRAL
8	1.138	34.31	-21.69	56.00	24.11	9.99	0.21	QP	NEUTRAL
9	3.276	22.86	-23.14	46.00	12.54	10.04	0.29	AVERAGE	NEUTRAL
10	3.276	30.77	-25.23	56.00	20.45	10.04	0.29	QP	NEUTRAL
11	22.416	45.91	-14.09	60.00	34.95	10.41	0.54	QP	NEUTRAL
12	22.416	38.86	-11.14	50.00	27.90	10.41	0.54	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

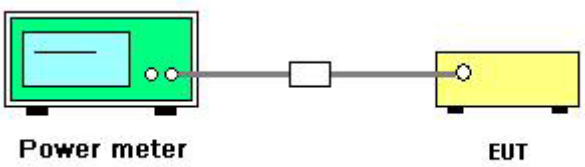
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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

For Non-Beamforming Mode:

Temperature	26°C	Humidity	63%
Test Engineer	Serway Li	Test Date	Jan. 26, 2015

Mode	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
802.11b	2412 MHz	20.88	-	20.88	30.00	Complies
	2437 MHz	20.72	-	20.72	30.00	Complies
	2462 MHz	20.93	-	20.93	30.00	Complies
802.11g	2412 MHz	18.99	-	18.99	30.00	Complies
	2437 MHz	19.75	-	19.75	30.00	Complies
	2462 MHz	18.67	-	18.67	30.00	Complies
802.11ac MCS0/Nss1 VHT20	2412 MHz	17.21	17.61	20.42	30.00	Complies
	2437 MHz	19.35	19.86	22.62	30.00	Complies
	2462 MHz	16.12	16.91	19.54	30.00	Complies

For Beamforming Mode:

Temperature	26°C	Humidity	63%
Test Engineer	Serway Li	Test Date	Jan. 26, 2015

Mode	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
802.11ac MCS0/Nss1 VHT20	2412 MHz	16.91	17.36	20.15	29.13	Complies
	2437 MHz	19.35	19.86	22.62	29.13	Complies
	2462 MHz	15.62	16.41	19.04	29.13	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =6.87>6dBi, so the limit=30-(6.87-6)=29.13dBm

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

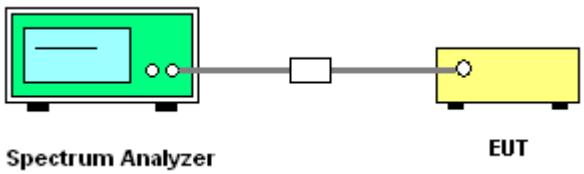
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

For Non-Beamforming Mode:

Temperature	26°C	Humidity	63%
Test Engineer	Serway Li		

Mode	Frequency	Power Density (dBm/3kHz)			Power Density Limit (dBm/3kHz)	Result
		Chain 1	Chain 2	Total		
802.11b	2412 MHz	7.67	-	7.67	8.00	Complies
	2437 MHz	7.45	-	7.45	8.00	Complies
	2462 MHz	7.53	-	7.53	8.00	Complies
802.11g	2412 MHz	6.22	-	6.22	8.00	Complies
	2437 MHz	7.19	-	7.19	8.00	Complies
	2462 MHz	6.57	-	6.57	8.00	Complies
802.11ac MCS0/Nss1 VHT20	2412 MHz	4.80	-1.01	5.81	7.13	Complies
	2437 MHz	5.85	0.02	6.86	7.13	Complies
	2462 MHz	3.98	-3.61	4.68	7.13	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$=6.87>6dBi, so the limit of 11ac VHT20=8-(6.87-6)=7.13dBm/3kHz.

For Beamforming Mode:

Temperature	26°C	Humidity	63%
Test Engineer	Serway Li		

Mode	Frequency	Power Density (dBm/3kHz)			Power Density Limit (dBm/3kHz)	Result
		Chain 1	Chain 2	Total		
802.11ac MCS0/Nss1 VHT20	2412 MHz	1.91	-0.84	3.76	7.13	Complies
	2437 MHz	3.49	0.98	5.42	7.13	Complies
	2462 MHz	1.57	-2.34	3.05	7.13	Complies

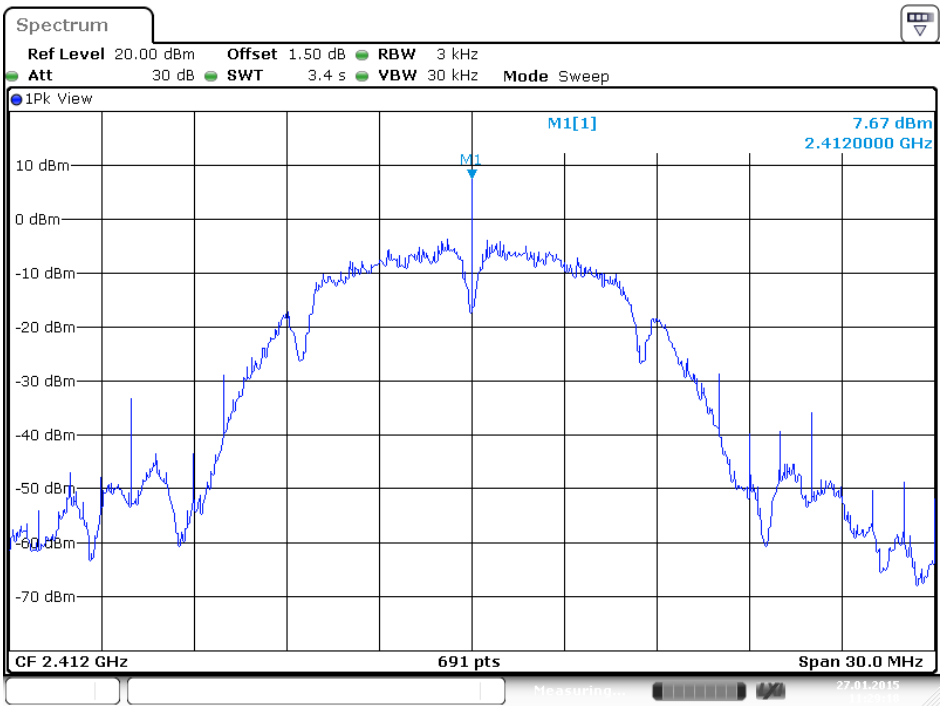
Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$=6.87>6dBi, so the limit of 11ac VHT20=8-(6.87-6)=7.13dBm/3kHz.

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

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

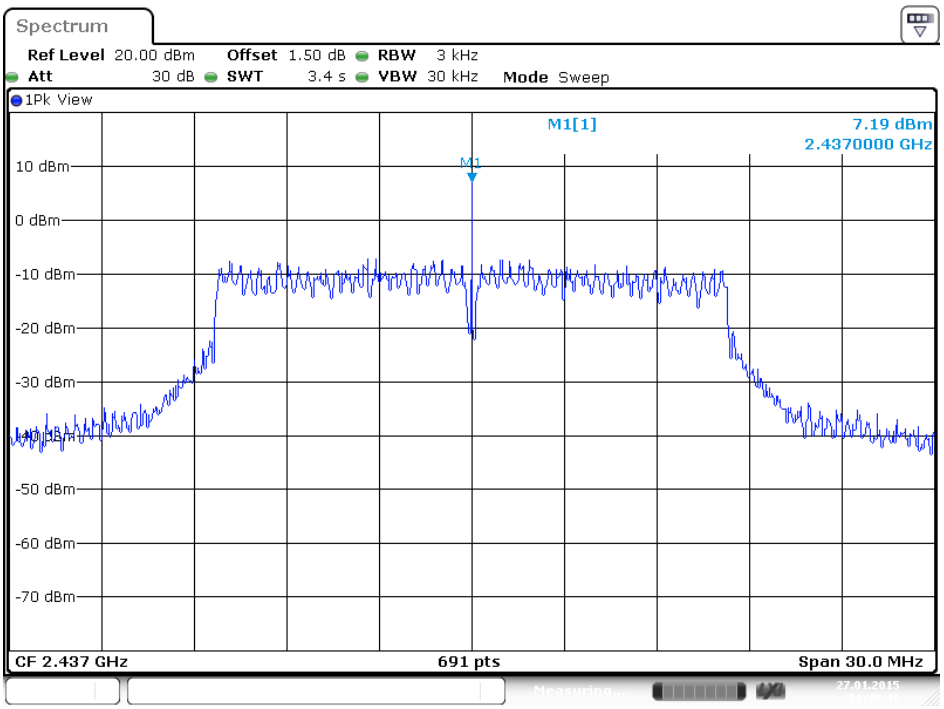
For Non-Beamforming Mode:

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



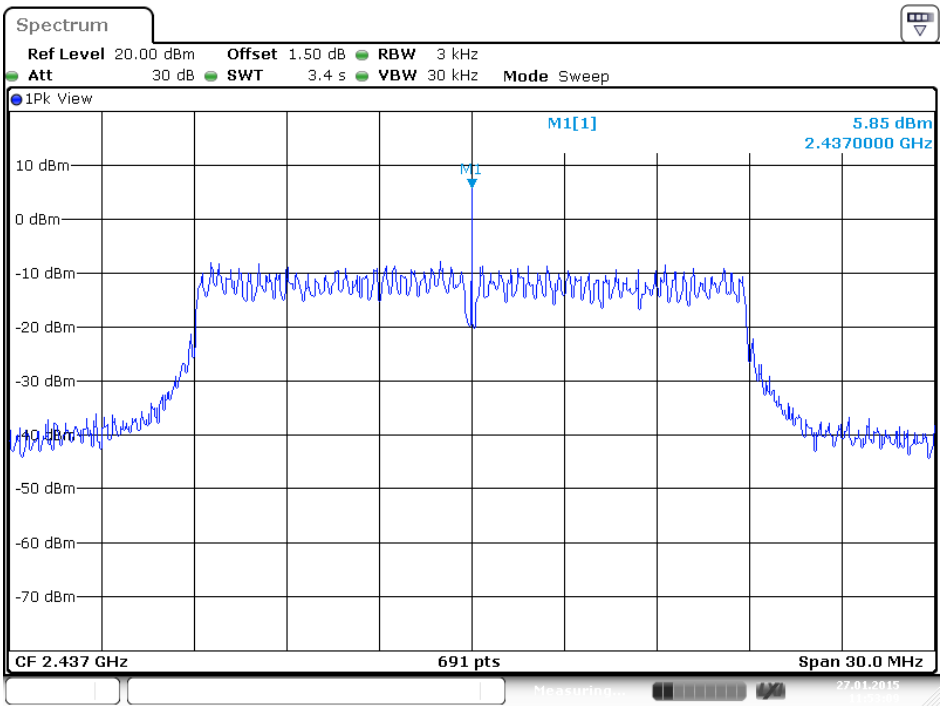
Date: 27.JAN.2015 11:29:18

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



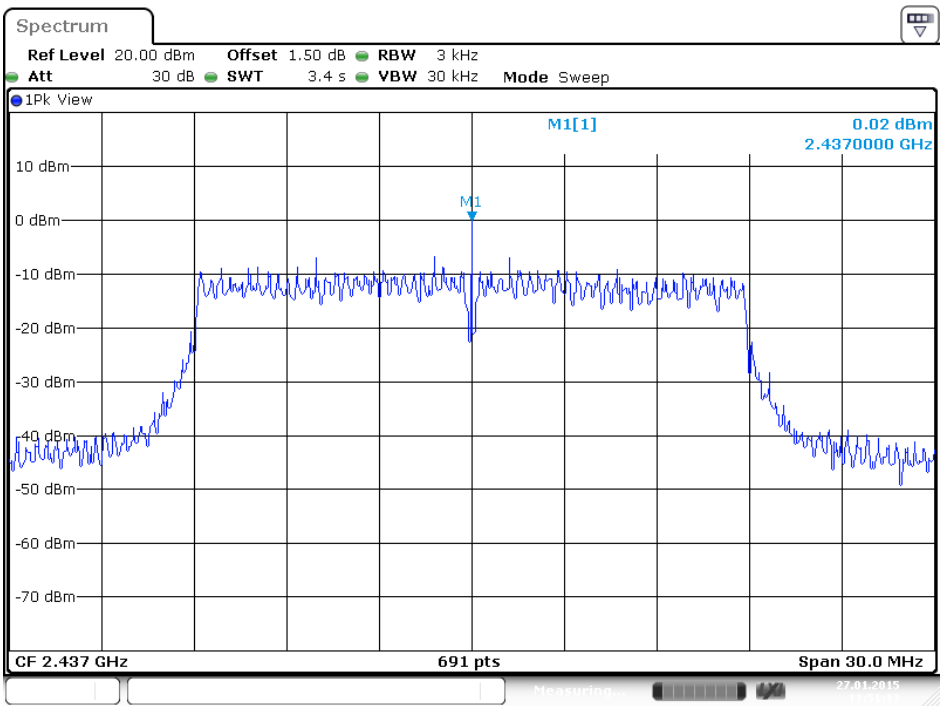
Date: 27.JAN.2015 11:40:49

Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / 2437 MHz / Chain 1



Date: 27.JAN.2015 11:53:10

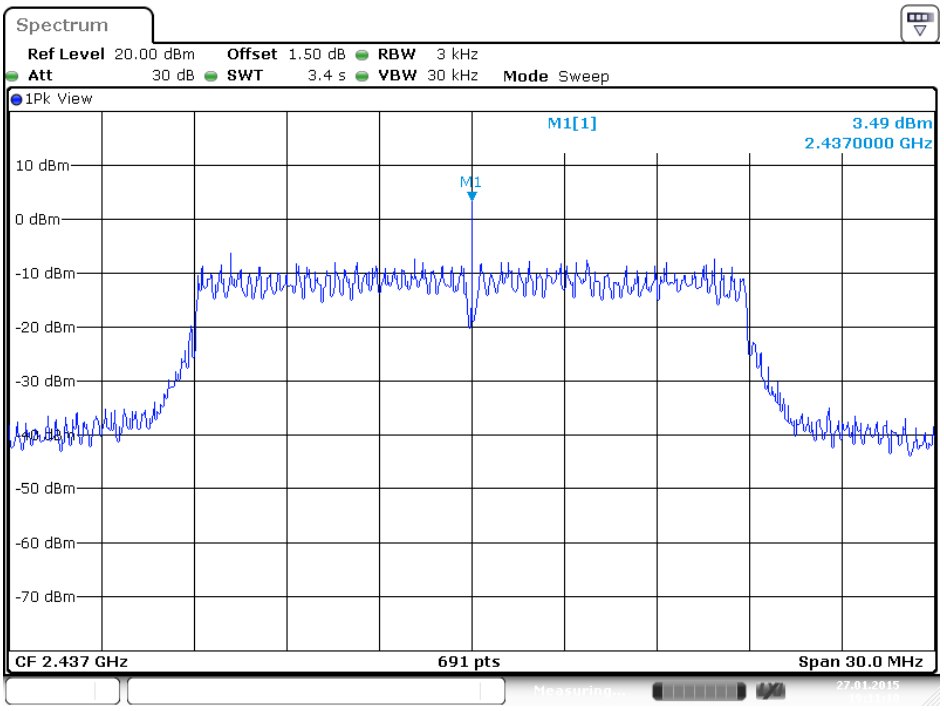
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / 2437 MHz / Chain 2



Date: 27.JAN.2015 11:51:13

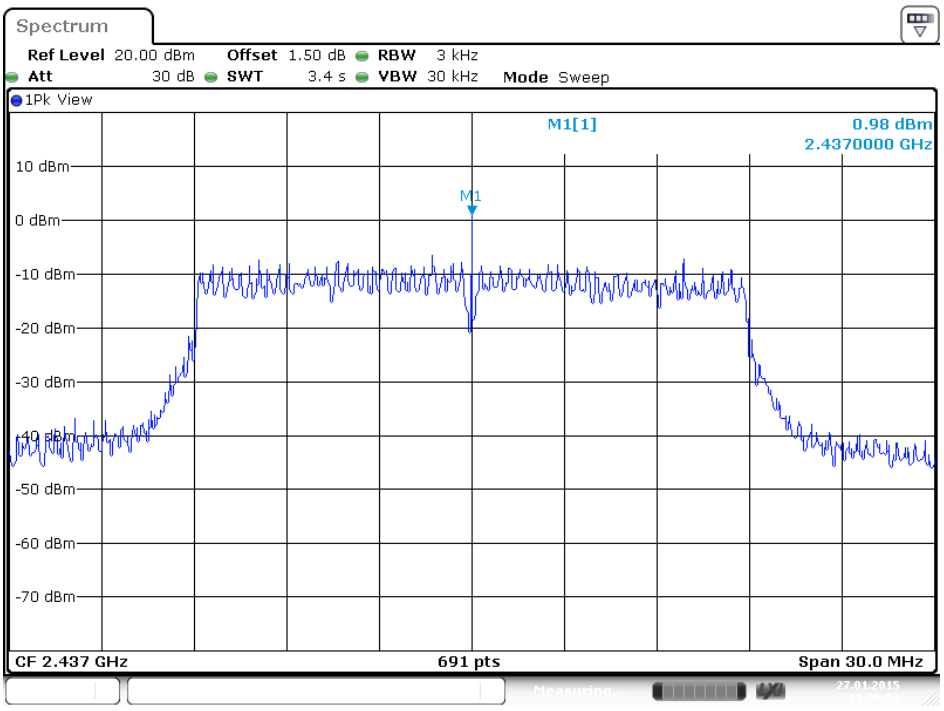
For Beamforming Mode:

Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / 2437 MHz / Chain 1



Date: 27.JAN.2015 19:11:10

Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / 2437 MHz / Chain 2



Date: 27.JAN.2015 19:09:53

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

For Non-Beamforming Mode:

Temperature	26℃	Humidity	63%
Test Engineer	Serway Li		

Mode	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11b	2412 MHz	9.04	12.07	500	Complies
	2437 MHz	8.52	11.90	500	Complies
	2462 MHz	9.04	12.07	500	Complies
802.11g	2412 MHz	16.29	17.19	500	Complies
	2437 MHz	16.29	17.45	500	Complies
	2462 MHz	16.29	17.19	500	Complies
802.11ac MCS0/Nss1 VHT20	2412 MHz	16.06	17.45	500	Complies
	2437 MHz	16.06	17.80	500	Complies
	2462 MHz	16.29	17.45	500	Complies

For Beamforming Mode:

Temperature	26℃	Humidity	63%
Test Engineer	Serway Li		

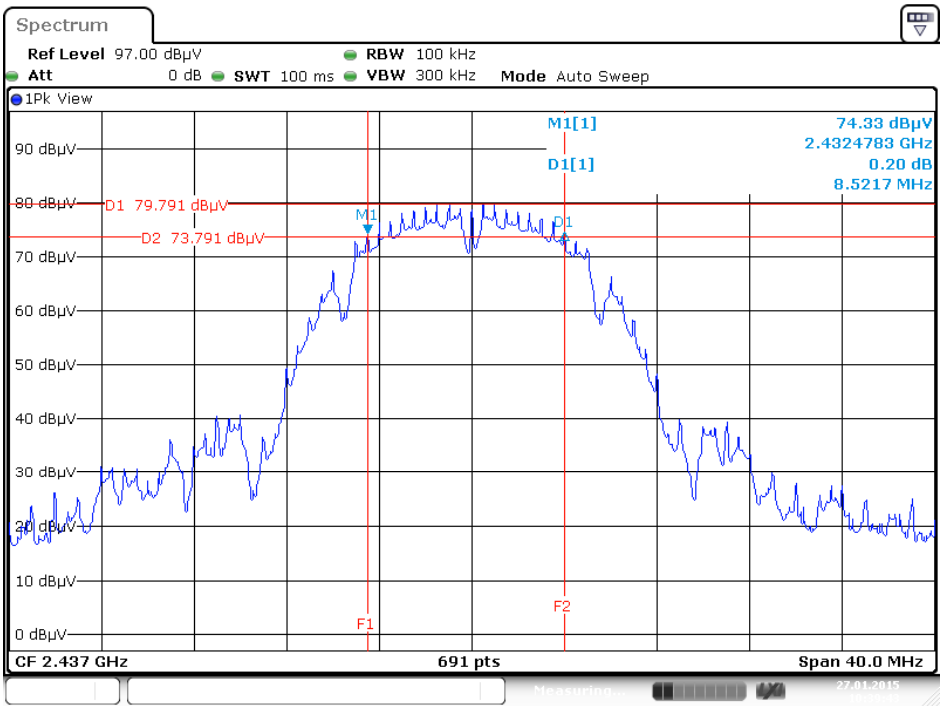
Mode	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
802.11ac MCS0/Nss1 VHT20	2412 MHz	17.57	18.15	500	Complies
	2437 MHz	17.51	18.41	500	Complies
	2462 MHz	17.51	18.06	500	Complies

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

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

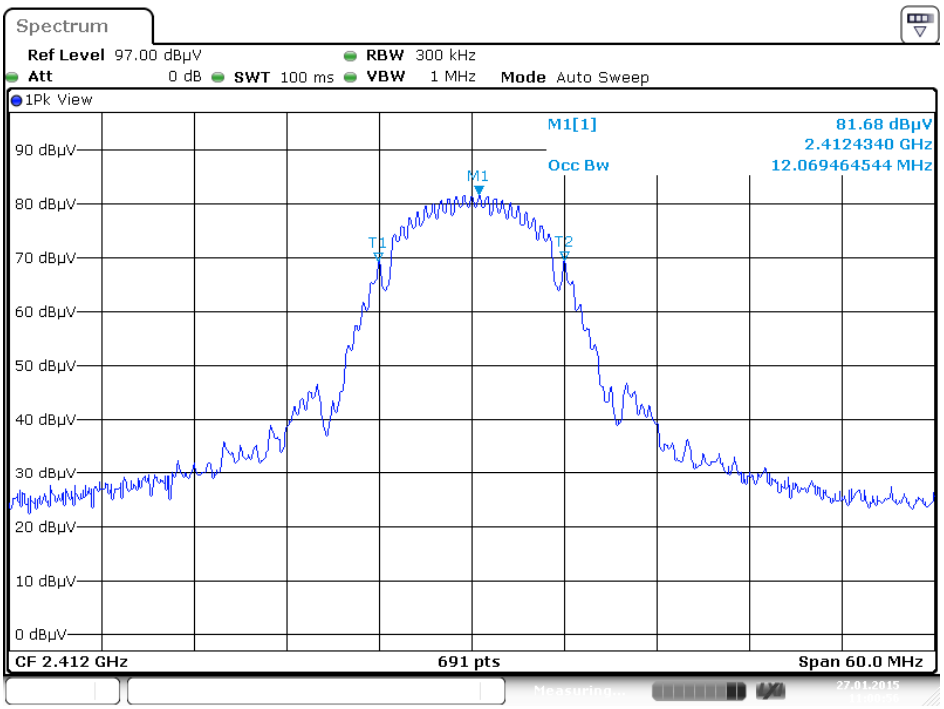
For Non-Beamforming Mode:

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



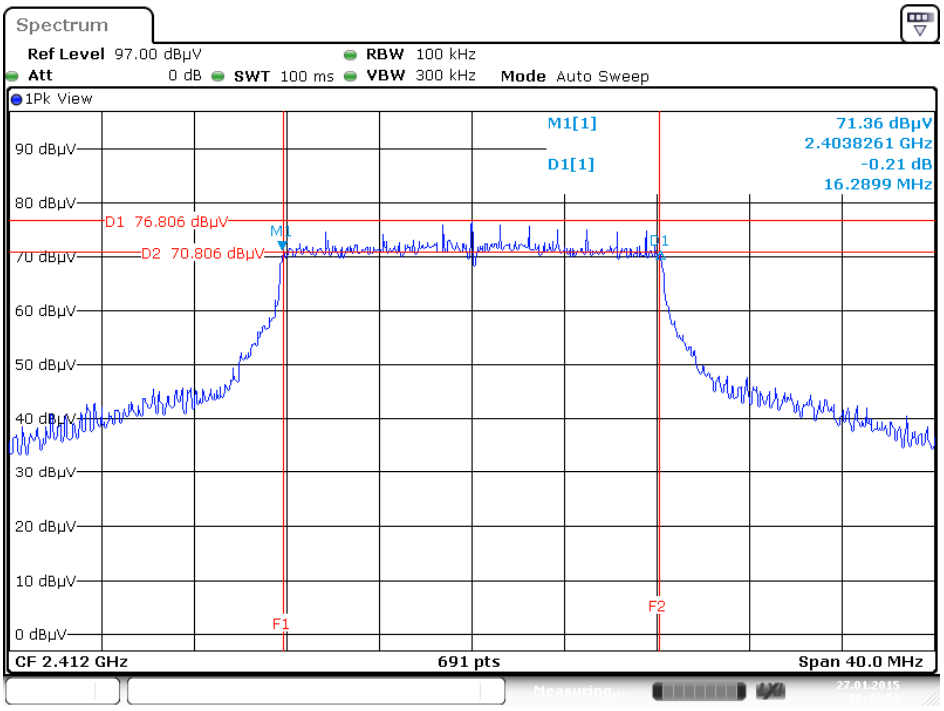
Date: 27.JAN.2015 10:39:43

99% Occupied Bandwidth Plot on Configuration IEEE 802.11b / 2412 MHz / Chain 1



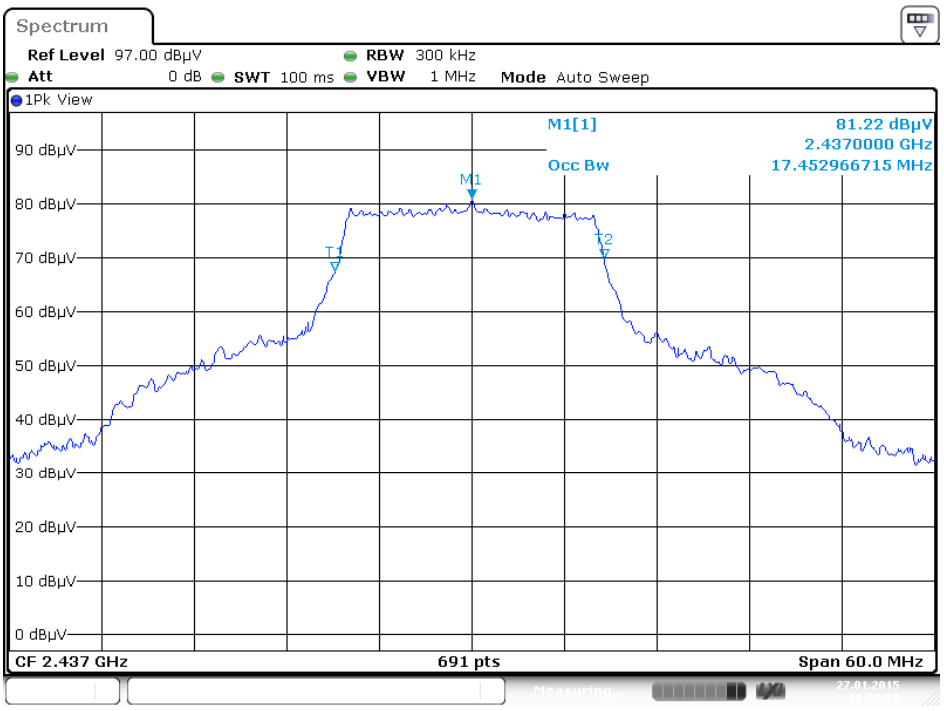
Date: 27.JAN.2015 11:00:56

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



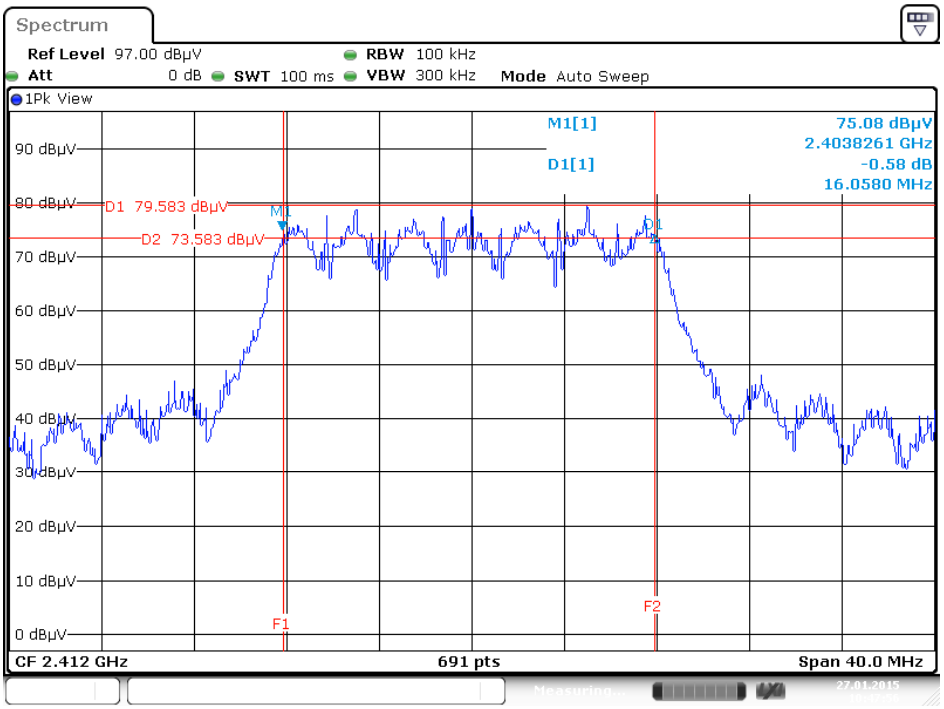
Date: 27.JAN.2015 10:42:53

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



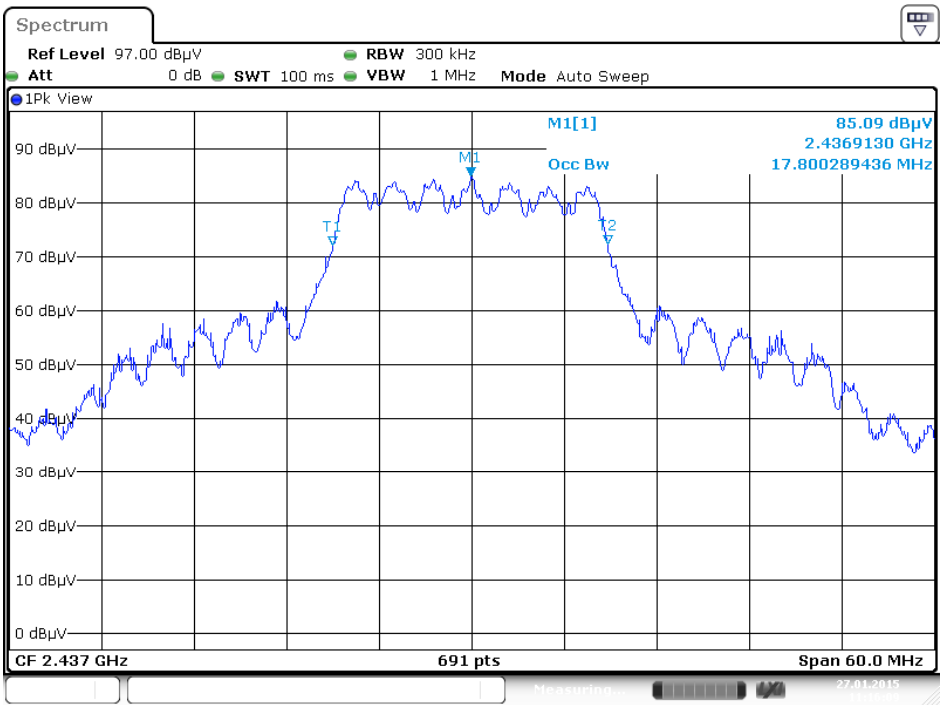
Date: 27.JAN.2015 11:09:30

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / 2412 MHz / Chain 1 + Chain 2



Date: 27.JAN.2015 10:47:56

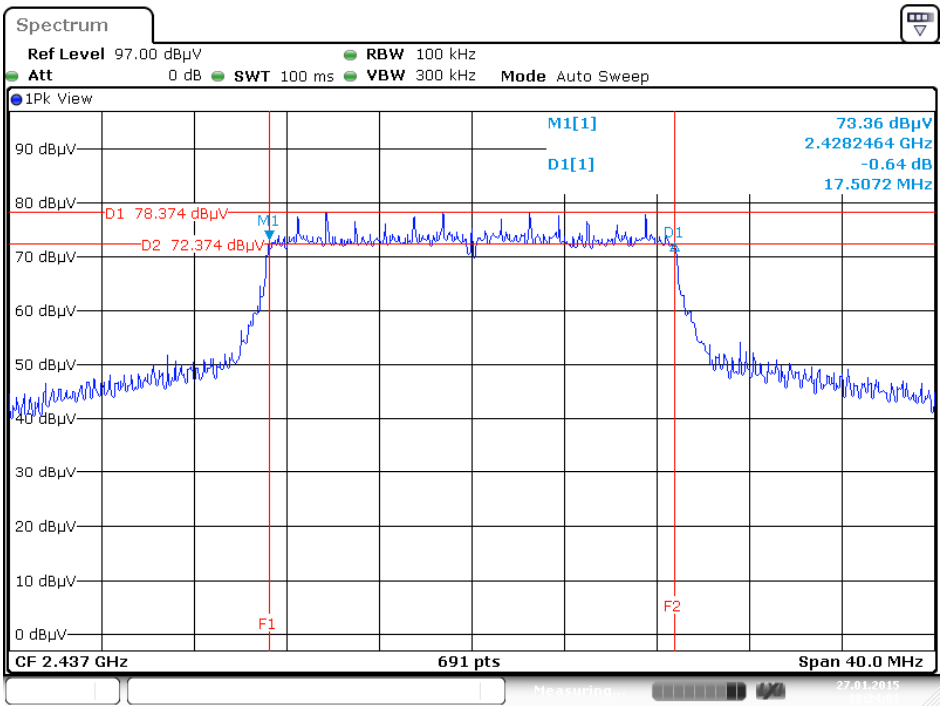
99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / 2437MHz / Chain 1 + Chain 2



Date: 27.JAN.2015 11:16:09

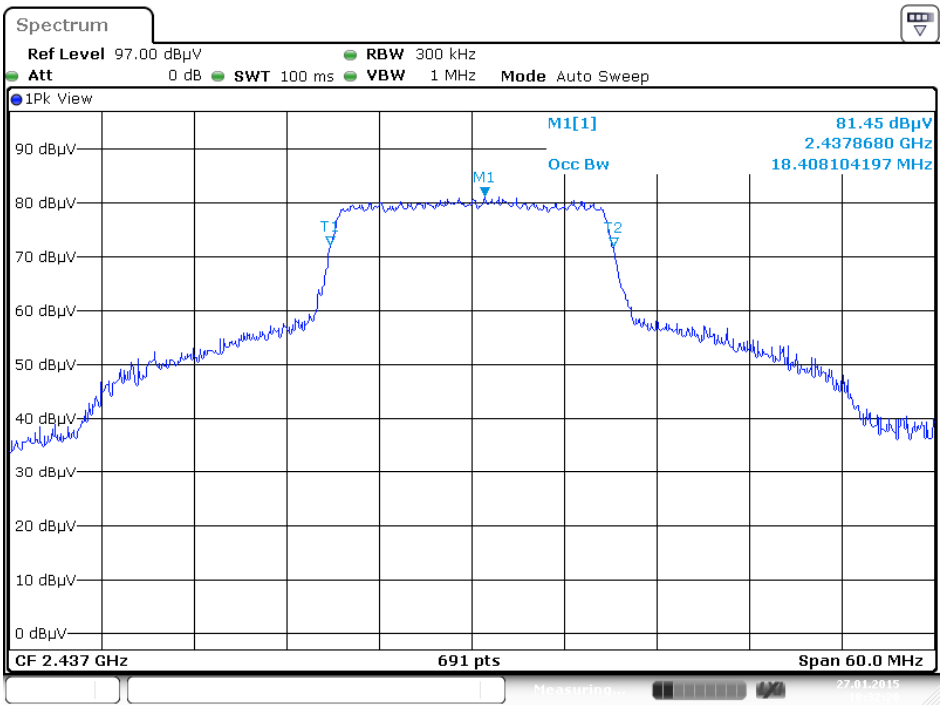
For Beamforming Mode:

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / 2437 MHz / Chain 1 + Chain 2



Date: 27.JAN.2015 18:24:02

99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / 2437 MHz / Chain 1 + Chain 2



Date: 27.JAN.2015 18:32:21

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

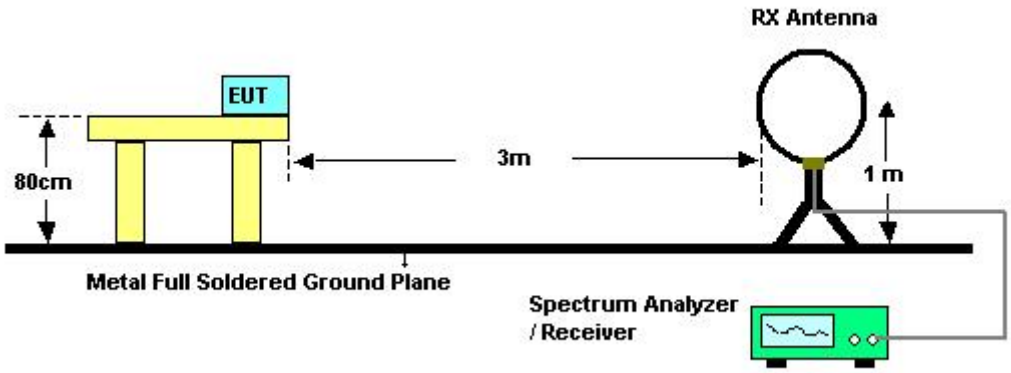
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1GHz / RBW 120kHz for QP

4.5.3. Test Procedures

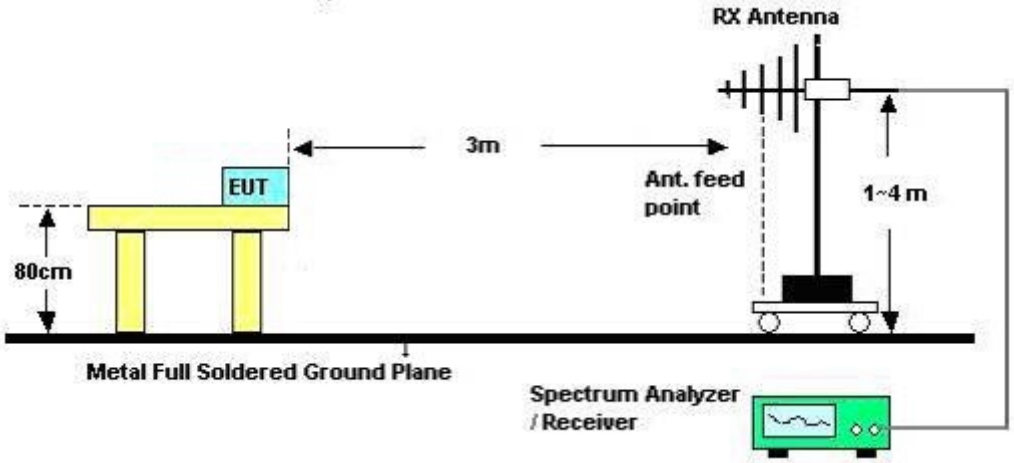
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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

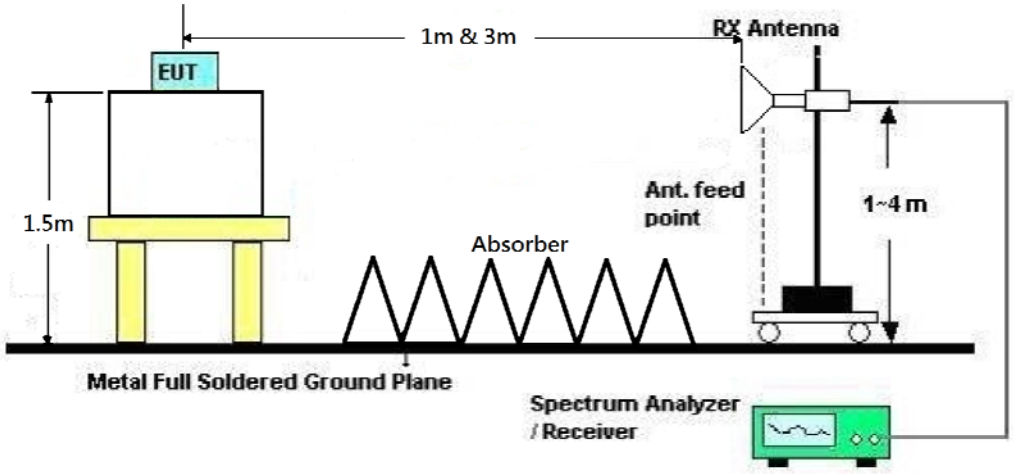
For Radiated Emissions: 9kHz ~30MHz



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

For non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

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

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	Normal Link
Test Date	Jan. 24, 2015	Test Mode	Mode 2

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.

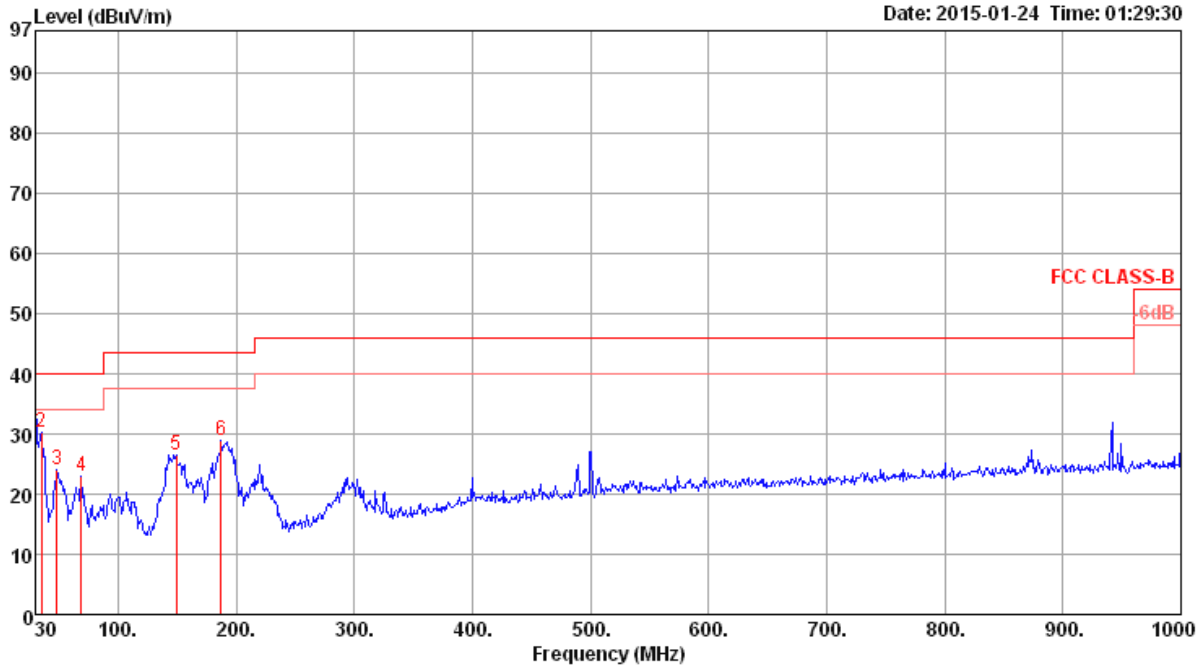
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

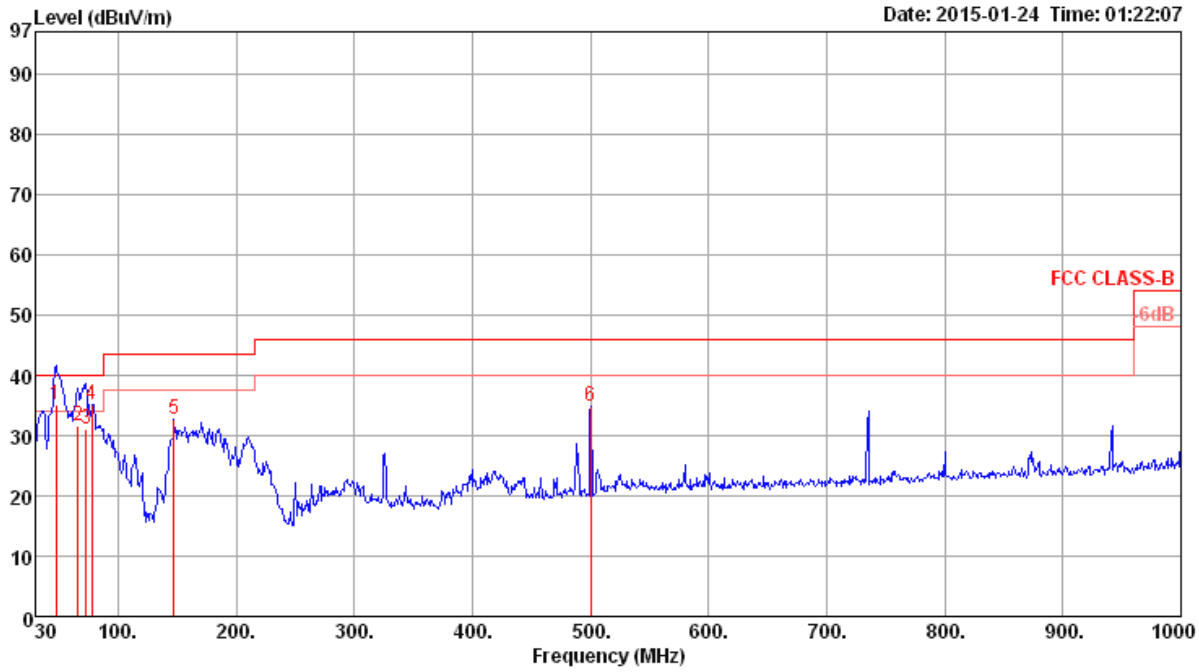
Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	Normal Link
Test Mode	Mode 2		

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	30.00	32.71	40.00	-7.29	41.14	0.61	18.76	27.80	Peak	100	0	HORIZONTAL
2	34.85	30.36	40.00	-9.64	41.38	0.70	16.08	27.80	Peak	100	0	HORIZONTAL
3	48.43	24.07	40.00	-15.93	41.92	0.82	9.13	27.80	Peak	100	0	HORIZONTAL
4	68.80	22.98	40.00	-17.02	43.08	0.98	6.65	27.73	Peak	100	0	HORIZONTAL
5	149.31	26.55	43.50	-16.95	40.59	1.42	11.90	27.36	Peak	100	0	HORIZONTAL
6	187.14	28.87	43.50	-14.63	42.72	1.60	11.71	27.16	Peak	100	0	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	47.46	35.17	40.00	-4.83	52.75	0.80	9.42	27.80	QP	109	174	VERTICAL
2	65.89	31.68	40.00	-8.32	51.78	0.95	6.69	27.74	QP	139	335	VERTICAL
3	72.68	31.21	40.00	-8.79	51.19	0.95	6.78	27.71	QP	135	157	VERTICAL
4	77.53	35.14	40.00	-4.86	54.85	0.95	7.03	27.69	Peak	400	0	VERTICAL
5	147.37	32.56	43.50	-10.94	46.51	1.42	11.99	27.36	Peak	400	0	VERTICAL
6	500.45	34.85	46.00	-11.15	42.65	2.67	17.63	28.10	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)

For Non-Beamforming Mode:

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11b CH 1 / Chain 1
Test Date	Dec. 08, 2014		

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	4823.97	46.86	54.00	-7.14	39.78	9.62	35.30	32.76	HORIZONTAL	333	100	Average
2	4824.03	52.47	74.00	-21.53	45.39	9.62	35.30	32.76	HORIZONTAL	333	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	4823.99	49.98	54.00	-4.02	42.90	9.62	35.30	32.76	VERTICAL	333	150	Average
2	4824.09	54.54	74.00	-19.46	47.46	9.62	35.30	32.76	VERTICAL	333	150	Peak

Temperature	26℃	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11b CH 6 / Chain 1
Test Date	Dec. 09, 2014		

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	4873.99	42.80	54.00	-11.20	35.62	9.69	35.31	32.80	HORIZONTAL	327	100	Average
2	4874.07	50.18	74.00	-23.82	43.00	9.69	35.31	32.80	HORIZONTAL	327	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	4873.83	50.91	74.00	-23.09	43.73	9.69	35.31	32.80	VERTICAL	334	201	Peak
2	4874.00	44.23	54.00	-9.77	37.05	9.69	35.31	32.80	VERTICAL	334	201	Average

Temperature	26℃	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11b CH 11 / Chain 1
Test Date	Dec. 09, 2014		

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	4923.95	49.60	74.00	-24.40	42.33	9.76	35.33	32.84	HORIZONTAL	359	102	Peak
2	4924.03	39.92	54.00	-14.08	32.65	9.76	35.33	32.84	HORIZONTAL	359	102	Average

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	4924.01	41.78	54.00	-12.22	34.51	9.76	35.33	32.84	VERTICAL	37	100	Average
2	4924.01	41.78	74.00	-32.22	34.51	9.76	35.33	32.84	VERTICAL	37	100	Peak

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11g CH 1 / Chain 1
Test Date	Dec. 08, 2014		

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	4820.41	47.00	74.00	-27.00	39.93	9.61	35.30	32.76	HORIZONTAL	234	100	Peak
2	4828.89	34.03	54.00	-19.97	26.93	9.63	35.30	32.77	HORIZONTAL	234	100	Average

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	4814.56	48.31	74.00	-25.69	41.23	9.61	35.29	32.76	VERTICAL	338	100	Peak
2	4832.22	34.18	54.00	-19.82	27.08	9.63	35.30	32.77	VERTICAL	338	100	Average

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11g CH 6 / Chain 1
Test Date	Dec. 08, 2014		

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	4873.97	47.58	74.00	-26.42	40.40	9.69	35.31	32.80	HORIZONTAL	212	153	Peak
2	4883.96	34.65	54.00	-19.35	27.45	9.71	35.32	32.81	HORIZONTAL	212	153	Average
3	7301.74	54.66	74.00	-19.34	41.77	11.13	35.36	37.12	HORIZONTAL	126	129	Peak
4	7310.10	41.24	54.00	-12.76	28.35	11.13	35.36	37.12	HORIZONTAL	126	129	Average

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	4875.13	35.63	54.00	-18.37	28.46	9.69	35.32	32.80	VERTICAL	110	222	Average
2	4882.22	47.73	74.00	-26.27	40.54	9.70	35.32	32.81	VERTICAL	110	222	Peak
3	7311.29	41.30	54.00	-12.70	28.41	11.13	35.36	37.12	VERTICAL	239	147	Average
4	7318.18	54.28	74.00	-19.72	41.37	11.14	35.36	37.13	VERTICAL	239	147	Peak

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11g CH 11 / Chain 1
Test Date	Dec. 08, 2014		

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	4921.05	48.60	74.00	-25.40	41.34	9.76	35.33	32.83	HORIZONTAL	61	166	Peak
2	4921.28	35.15	54.00	-18.85	27.89	9.76	35.33	32.83	HORIZONTAL	61	166	Average
3	7376.01	55.18	74.00	-18.82	42.16	11.19	35.32	37.15	HORIZONTAL	248	140	Peak
4	7394.34	41.83	54.00	-12.17	28.77	11.21	35.31	37.16	HORIZONTAL	248	140	Average

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	4926.23	35.50	54.00	-18.50	28.22	9.77	35.33	32.84	VERTICAL	194	143	Average
2	4930.86	48.72	74.00	-25.28	41.45	9.77	35.34	32.84	VERTICAL	194	143	Peak
3	7388.40	54.84	74.00	-19.16	41.78	11.21	35.31	37.16	VERTICAL	262	191	Peak
4	7388.95	41.63	54.00	-12.37	28.57	11.21	35.31	37.16	VERTICAL	262	191	Average

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 1 / Chain 1 + Chain 2
Test Date	Jan. 16, 2015		

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	4820.00	44.79	74.00	-29.21	41.66	5.74	33.70	31.09	HORIZONTAL	163	161	Peak
2	4832.04	31.59	54.00	-22.41	28.44	5.74	33.70	31.11	HORIZONTAL	163	161	Average
3	7335.88	37.34	54.00	-16.66	28.02	7.22	34.02	36.12	HORIZONTAL	360	125	Average
4	7337.08	50.19	74.00	-23.81	40.87	7.22	34.02	36.12	HORIZONTAL	360	125	Peak
5	12059.80	42.88	54.00	-11.12	29.80	9.27	35.03	38.84	HORIZONTAL	112	103	Average
6	12065.16	55.72	74.00	-18.28	42.65	9.27	35.03	38.83	HORIZONTAL	112	103	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	4818.84	31.33	54.00	-22.67	28.21	5.74	33.70	31.08	VERTICAL	186	141	Average
2	4831.44	43.99	54.00	-10.01	40.84	5.74	33.70	31.11	VERTICAL	186	141	Average
3	7331.58	37.08	54.00	-16.92	27.78	7.22	34.02	36.10	VERTICAL	259	121	Average
4	7339.16	50.56	74.00	-23.44	41.22	7.22	34.03	36.15	VERTICAL	259	121	Peak
5	12059.84	42.77	74.00	-31.23	29.67	9.27	35.03	38.86	VERTICAL	170	144	Peak
6	12068.08	56.27	74.00	-17.73	43.15	9.32	35.03	38.83	VERTICAL	170	144	Peak

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 6 / Chain 1 + Chain 2
Test Date	Jan. 16, 2015		

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	4876.40	44.40	74.00	-29.60	41.12	5.77	33.68	31.19	HORIZONTAL	163	139	Peak
2	4878.98	31.50	54.00	-22.50	28.22	5.77	33.68	31.19	HORIZONTAL	163	139	Average
3	7312.46	49.63	74.00	-24.37	40.38	7.19	34.00	36.06	HORIZONTAL	184	140	Peak
4	7313.00	37.15	54.00	-16.85	27.90	7.19	34.00	36.06	HORIZONTAL	184	140	Average
5	12185.48	55.57	74.00	-18.43	42.49	9.36	34.99	38.71	HORIZONTAL	171	123	Peak
6	12187.12	42.43	54.00	-11.57	29.35	9.36	34.99	38.71	HORIZONTAL	171	123	Average

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	4876.50	31.23	54.00	-22.77	27.96	5.77	33.68	31.18	VERTICAL	86	130	Average
2	4876.64	44.51	74.00	-29.49	41.24	5.77	33.68	31.18	VERTICAL	86	130	Peak
3	7310.96	49.99	74.00	-24.01	40.75	7.19	34.00	36.05	VERTICAL	263	130	Peak
4	7315.96	36.88	54.00	-17.12	27.59	7.19	34.00	36.10	VERTICAL	263	130	Average
5	12180.16	42.38	54.00	-11.62	29.29	9.36	34.99	38.72	VERTICAL	130	145	Average
6	12182.24	55.24	74.00	-18.76	42.15	9.36	34.99	38.72	VERTICAL	130	145	Peak

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 11 / Chain 1 + Chain 2
Test Date	Jan. 16, 2015		

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	4922.84	45.12	74.00	-28.88	41.73	5.79	33.67	31.27	HORIZONTAL	299	155	Peak
2	4923.02	31.96	54.00	-22.04	28.57	5.79	33.67	31.27	HORIZONTAL	299	155	Average
3	7383.26	49.98	74.00	-24.02	40.57	7.25	34.07	36.23	HORIZONTAL	118	139	Peak
4	7389.66	37.00	54.00	-17.00	27.58	7.25	34.07	36.24	HORIZONTAL	118	139	Average
5	12310.74	42.16	54.00	-11.84	29.06	9.46	34.95	38.59	HORIZONTAL	343	165	Average
6	12313.06	55.60	74.00	-18.40	42.51	9.46	34.95	38.58	HORIZONTAL	343	165	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	4923.04	31.88	54.00	-22.12	28.51	5.79	33.67	31.25	VERTICAL	152	129	Average
2	4923.06	44.42	74.00	-29.58	41.05	5.79	33.67	31.25	VERTICAL	152	129	Peak
3	7388.26	50.17	74.00	-23.83	40.74	7.25	34.07	36.25	VERTICAL	291	166	Peak
4	7391.00	36.87	54.00	-17.13	27.44	7.25	34.07	36.25	VERTICAL	291	166	Average
5	12306.26	55.41	74.00	-18.59	42.30	9.46	34.96	38.61	VERTICAL	109	149	Peak
6	12308.32	42.15	54.00	-11.85	29.03	9.46	34.95	38.61	VERTICAL	109	149	Average

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.

For Beamforming Mode:

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 1 / Chain 1 + Chain 2
Test Date	Jan. 13, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	4823.35	43.82	74.00	-30.18	41.74	4.10	32.56	34.58	Peak	61	100	HORIZONTAL
2	4826.50	30.07	54.00	-23.93	27.99	4.10	32.56	34.58	Average	61	100	HORIZONTAL
3	12059.62	51.77	74.00	-22.23	41.41	6.63	38.53	34.80	Peak	13	109	HORIZONTAL
4	12059.62	40.04	54.00	-13.96	29.68	6.63	38.53	34.80	Average	13	109	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	4726.24	43.75	74.00	-30.25	41.96	4.05	32.35	34.61	Peak	273	131	VERTICAL
2	4726.76	31.22	54.00	-22.78	29.43	4.05	32.35	34.61	Average	273	131	VERTICAL
3	12059.62	53.63	74.00	-20.37	43.27	6.63	38.53	34.80	Peak	146	118	VERTICAL
4	12062.50	40.02	54.00	-13.98	29.66	6.63	38.53	34.80	Average	146	118	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 6 / Chain 1 + Chain 2
Test Date	Jan. 13, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	4871.29	30.99	54.00	-23.01	28.77	4.13	32.66	34.57	Average	187	111	HORIZONTAL
2	4872.93	43.88	74.00	-30.12	41.66	4.13	32.66	34.57	Peak	187	111	HORIZONTAL
3	7310.44	49.49	74.00	-24.51	42.15	5.09	37.07	34.82	Peak	260	112	HORIZONTAL
4	7316.00	35.77	54.00	-18.23	28.41	5.10	37.09	34.83	Average	260	112	HORIZONTAL
5	12188.61	39.95	54.00	-14.05	29.46	6.65	38.58	34.74	Average	347	104	HORIZONTAL
6	12189.20	53.57	74.00	-20.43	43.08	6.65	38.58	34.74	Peak	347	104	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	4874.05	43.78	74.00	-30.22	41.56	4.13	32.66	34.57	Peak	309	100	VERTICAL
2	4874.05	31.21	54.00	-22.79	28.99	4.13	32.66	34.57	Average	309	100	VERTICAL
3	7306.00	35.47	54.00	-18.53	28.13	5.09	37.07	34.82	Average	124	100	VERTICAL
4	7306.43	49.61	74.00	-24.39	42.27	5.09	37.07	34.82	Peak	124	100	VERTICAL
5	12180.00	39.79	54.00	-14.21	29.32	6.65	38.58	34.76	Average	209	104	VERTICAL
6	12188.61	53.70	74.00	-20.30	43.21	6.65	38.58	34.74	Peak	209	104	VERTICAL

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 11 / Chain 1 + Chain 2
Test Date	Jan. 13, 2015		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	4920.75	43.99	74.00	-30.01	41.63	4.15	32.76	34.55	Peak	124	100	HORIZONTAL
2	4929.00	30.83	54.00	-23.17	28.47	4.15	32.76	34.55	Average	124	100	HORIZONTAL
3	7383.71	36.47	54.00	-17.53	29.01	5.12	37.18	34.84	Average	154	106	HORIZONTAL
4	7388.95	49.44	74.00	-24.56	41.98	5.12	37.18	34.84	Peak	154	106	HORIZONTAL
5	12308.37	40.17	54.00	-13.83	29.58	6.67	38.62	34.70	Average	246	102	HORIZONTAL
6	12308.69	53.57	74.00	-20.43	42.98	6.67	38.62	34.70	Peak	246	102	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	4919.00	42.62	74.00	-31.38	40.26	4.15	32.76	34.55	Peak	350	132	VERTICAL
2	4919.00	30.62	54.00	-23.38	28.26	4.15	32.76	34.55	Average	350	136	VERTICAL
3	7381.00	35.95	54.00	-18.05	28.52	5.11	37.16	34.84	Average	244	100	VERTICAL
4	7387.51	49.85	74.00	-24.15	42.39	5.12	37.18	34.84	Peak	244	100	VERTICAL
5	12305.00	40.29	54.00	-13.71	29.70	6.67	38.62	34.70	Average	266	106	VERTICAL
6	12308.37	54.00	74.00	-20.00	43.41	6.67	38.62	34.70	Peak	266	106	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

For non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

For Non-Beamforming Mode:

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11b CH 1, 6, 11 / Chain 1
Test Date	Dec. 09, 2014		

Channel 1

	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	2390.00	51.66	54.00	-2.34	17.63	6.13	0.00	27.90	HORIZONTAL	303	136	Average
2	2390.00	62.73	74.00	-11.27	28.70	6.13	0.00	27.90	HORIZONTAL	303	136	Peak
3	2411.13	109.68			75.61	6.17	0.00	27.90	HORIZONTAL	303	136	Peak
4	2411.28	106.85			72.78	6.17	0.00	27.90	HORIZONTAL	303	136	Average

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

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Pol/Phase	T/Pos	A/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	2387.40	60.91	74.00	-13.09	26.88	6.13	0.00	27.90	HORIZONTAL	284	240	Peak
2	2390.00	46.67	54.00	-7.33	12.64	6.13	0.00	27.90	HORIZONTAL	284	240	Average
3	2436.13	106.82			72.71	6.21	0.00	27.90	HORIZONTAL	284	240	Average
4	2436.71	109.72			75.60	6.22	0.00	27.90	HORIZONTAL	284	240	Peak
5	2484.37	48.08	54.00	-5.92	13.88	6.30	0.00	27.90	HORIZONTAL	284	240	Average
6	2490.45	61.66	74.00	-12.34	27.45	6.31	0.00	27.90	HORIZONTAL	284	240	Peak

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

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Pol/Phase	T/Pos	A/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	2462.72	105.04			70.88	6.26	0.00	27.90	HORIZONTAL	64	100	Average
2	2463.01	107.79			73.63	6.26	0.00	27.90	HORIZONTAL	64	100	Peak
3	2483.50	51.75	54.00	-2.25	17.55	6.30	0.00	27.90	HORIZONTAL	64	100	Average
4	2489.14	62.21	74.00	-11.79	28.00	6.31	0.00	27.90	HORIZONTAL	64	100	Peak

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

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11g CH 1, 6, 11 / Chain 1
Test Date	Dec. 03, 2014 ~ Dec. 08, 2014		

Channel 1

	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	2389.57	70.74	74.00	-3.26	36.71	6.13	0.00	27.90	HORIZONTAL	63	166	Peak
2	2390.00	53.99	54.00	-0.01	19.96	6.13	0.00	27.90	HORIZONTAL	63	166	Average
3	2410.26	109.60			75.53	6.17	0.00	27.90	HORIZONTAL	63	166	Peak
4	2413.30	98.67			64.59	6.18	0.00	27.90	HORIZONTAL	63	166	Average

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	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	2389.71	61.02	74.00	-12.98	30.24	2.86	27.92	0.00	Peak	288	175	HORIZONTAL
2	2390.00	45.13	54.00	-8.87	14.35	2.86	27.92	0.00	Average	288	175	HORIZONTAL
3	2434.11	100.84			70.08	2.88	27.88	0.00	Average	288	175	HORIZONTAL
4	2435.26	111.99			81.23	2.88	27.88	0.00	Peak	288	175	HORIZONTAL
5	2483.50	45.62	54.00	-8.38	14.89	2.91	27.82	0.00	Average	288	175	HORIZONTAL
6	2484.08	59.60	74.00	-14.40	28.87	2.91	27.82	0.00	Peak	288	175	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	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	2462.14	109.47			78.73	2.90	27.84	0.00	Peak	354	127	VERTICAL
2	2463.16	98.91			68.17	2.90	27.84	0.00	Average	354	127	VERTICAL
3	2483.50	53.07	54.00	-0.93	22.34	2.91	27.82	0.00	Average	354	127	VERTICAL
4	2483.64	73.06	74.00	-0.94	42.33	2.91	27.82	0.00	Peak	354	127	VERTICAL

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

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 1, 6, 11 / Chain 1
Test date	Jan. 16, 2015		

Channel 1

	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	2389.60	71.61	74.00	-2.39	40.58	3.99	0.00	27.04	HORIZONTAL	312	102	Peak
2	2390.00	53.78	54.00	-0.22	22.75	3.99	0.00	27.04	HORIZONTAL	312	102	Average
3	2409.60	102.28			71.18	4.01	0.00	27.09	HORIZONTAL	312	102	Average
4	2410.00	112.77			81.67	4.01	0.00	27.09	HORIZONTAL	312	102	Peak
5	2487.50	50.14	54.00	-3.86	18.79	4.08	0.00	27.27	HORIZONTAL	312	102	Average
6	2487.50	58.82	74.00	-15.18	27.47	4.08	0.00	27.27	HORIZONTAL	312	102	Peak

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

Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Pol/Phase	T/Pos	A/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	2389.20	66.16	74.00	-7.84	35.13	3.99	0.00	27.04	HORIZONTAL	314	101	Peak
2	2390.00	47.39	54.00	-6.61	16.36	3.99	0.00	27.04	HORIZONTAL	314	101	Average
3	2429.40	105.58			74.42	4.03	0.00	27.13	HORIZONTAL	314	101	Average
4	2431.80	115.99			84.82	4.03	0.00	27.14	HORIZONTAL	314	101	Peak
5	2484.30	67.00	74.00	-7.00	35.67	4.07	0.00	27.26	HORIZONTAL	314	101	Peak
6	2484.70	49.23	54.00	-4.77	17.90	4.07	0.00	27.26	HORIZONTAL	314	101	Average

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

Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	cm	deg		
1	5148.26	65.64	74.00	-8.36	58.17	33.02	9.86	35.41	173	295	Peak	HORIZONTAL
2	5150.00	50.40	54.00	-3.60	42.93	33.02	9.86	35.41	173	295	Average	HORIZONTAL
3	5178.26	111.80			104.33	33.04	9.85	35.42	173	295	Peak	HORIZONTAL
4	5180.29	101.50			94.03	33.04	9.85	35.42	173	295	Average	HORIZONTAL

Item 3, 4 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 Beamforming Mode:

Temperature	26°C	Humidity	68%
Test Engineer	Peter Wu	Configurations	IEEE 802.11ac MCS0/Nss1 VHT20 CH 1, 6, 11 / Chain 1
Test date	Jan. 13, 2015		

Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	2388.72	73.79	74.00	-0.21	43.01	2.86	27.92	0.00	Peak	355	211	VERTICAL
2	2390.00	53.42	54.00	-0.58	22.64	2.86	27.92	0.00	Average	355	211	VERTICAL
3	2410.88	110.05			79.28	2.87	27.90	0.00	Peak	355	211	VERTICAL
4	2411.36	100.22			69.45	2.87	27.90	0.00	Average	355	211	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	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	2389.68	61.67	74.00	-12.33	30.89	2.86	27.92	0.00	Peak	44	112	HORIZONTAL
2	2390.00	49.65	54.00	-4.35	18.87	2.86	27.92	0.00	Average	44	112	HORIZONTAL
3	2431.55	103.82			73.06	2.88	27.88	0.00	Average	44	112	HORIZONTAL
4	2431.87	113.45			82.69	2.88	27.88	0.00	Peak	44	112	HORIZONTAL
5	2483.50	48.64	54.00	-5.36	17.91	2.91	27.82	0.00	Average	44	112	HORIZONTAL
6	2484.14	61.12	74.00	-12.88	30.39	2.91	27.82	0.00	Peak	44	112	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	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		deg	cm	
1	2460.88	111.61			80.87	2.90	27.84	0.00	Peak	360	250	VERTICAL
2	2462.00	104.25			73.51	2.90	27.84	0.00	Average	360	250	VERTICAL
3	2483.50	73.35	74.00	-0.65	42.62	2.91	27.82	0.00	Peak	360	250	VERTICAL
4	2483.50	52.81	54.00	-1.19	22.08	2.91	27.82	0.00	Average	360	250	VERTICAL

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

Note:

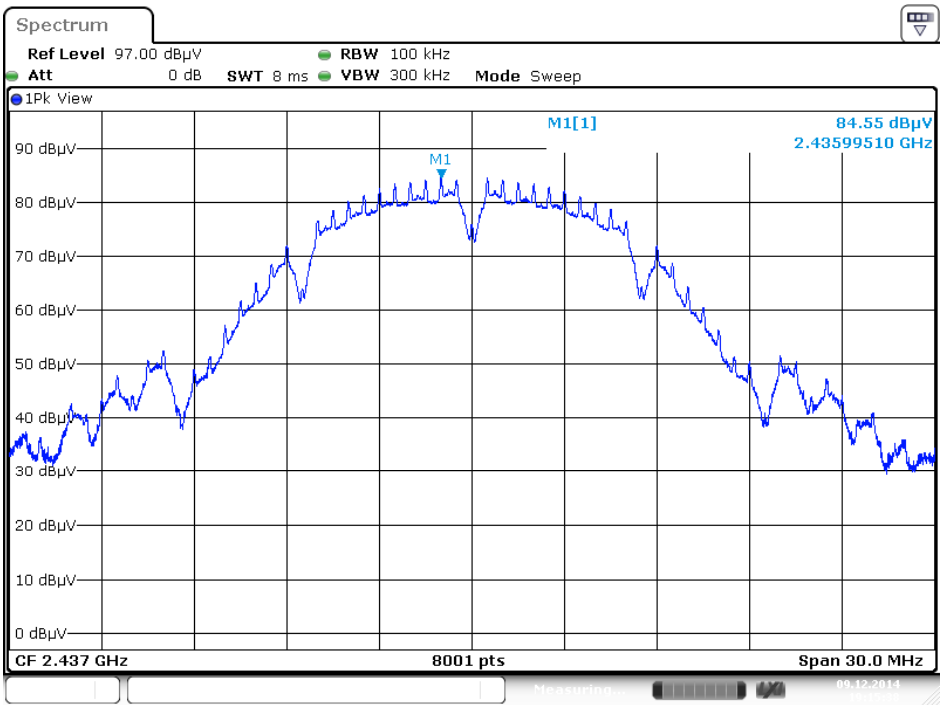
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

For Emission not in Restricted Band

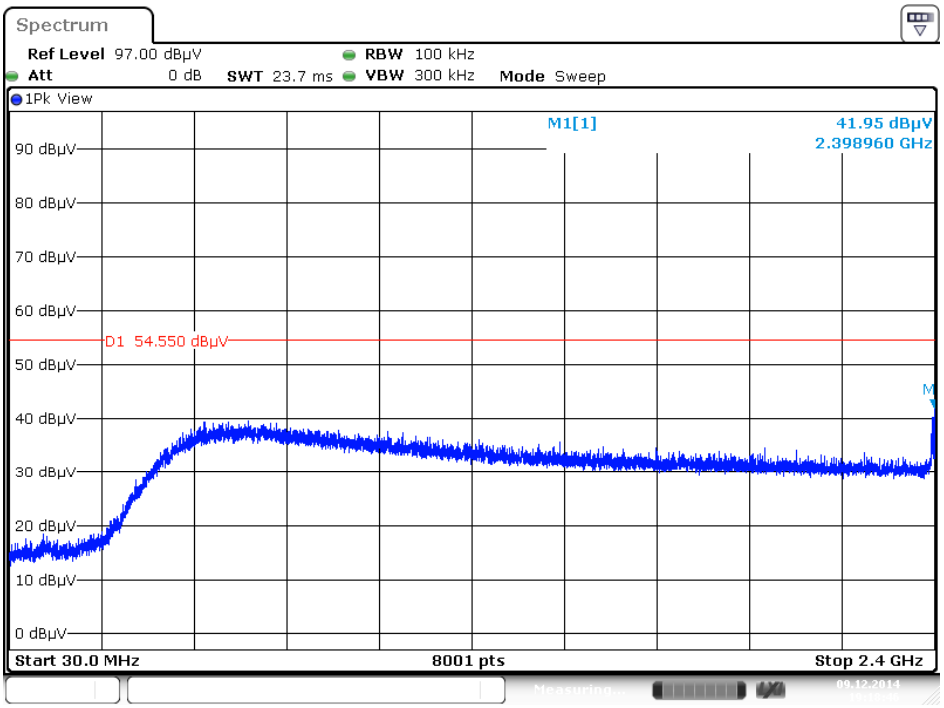
For Non-Beamforming Mode:

Plot on Configuration IEEE 802.11b / Reference Level



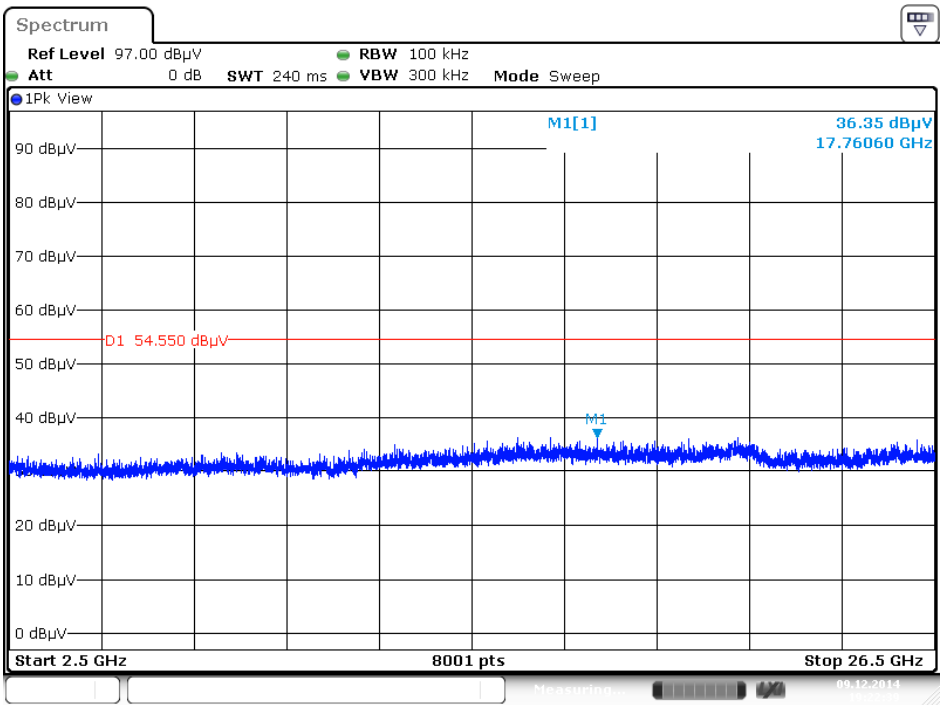
Date: 9.DEC.2014 19:15:39

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



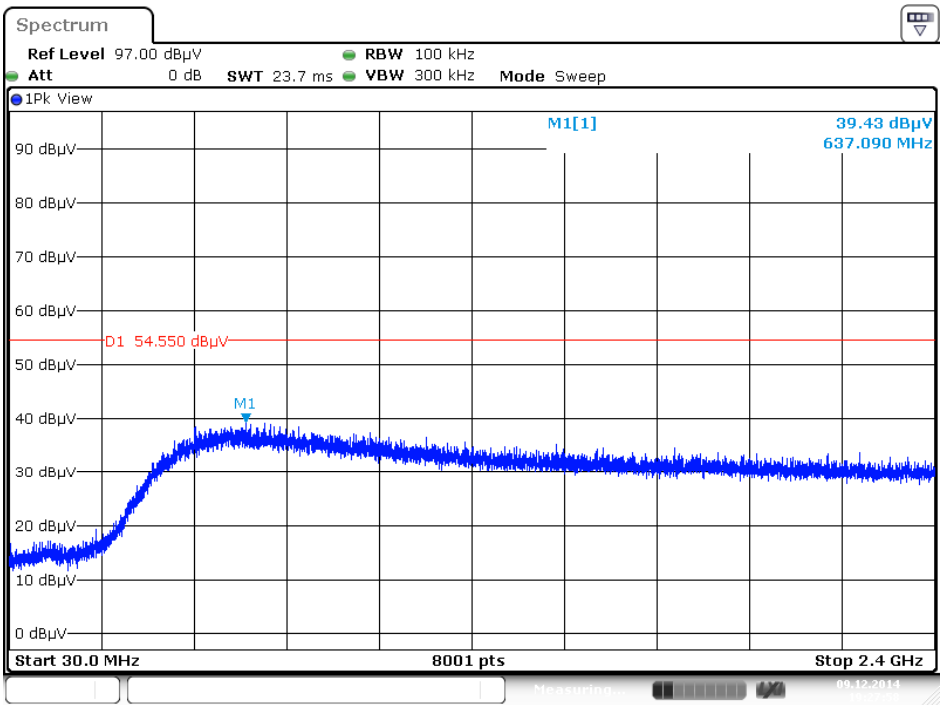
Date: 9.DEC.2014 19:18:47

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



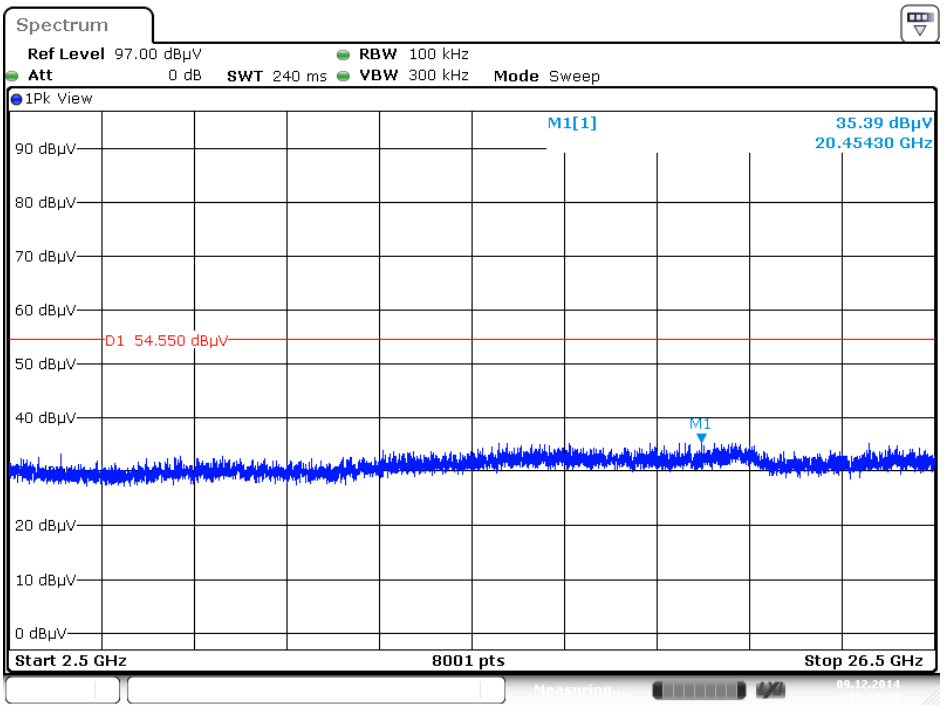
Date: 9.DEC.2014 19:22:38

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



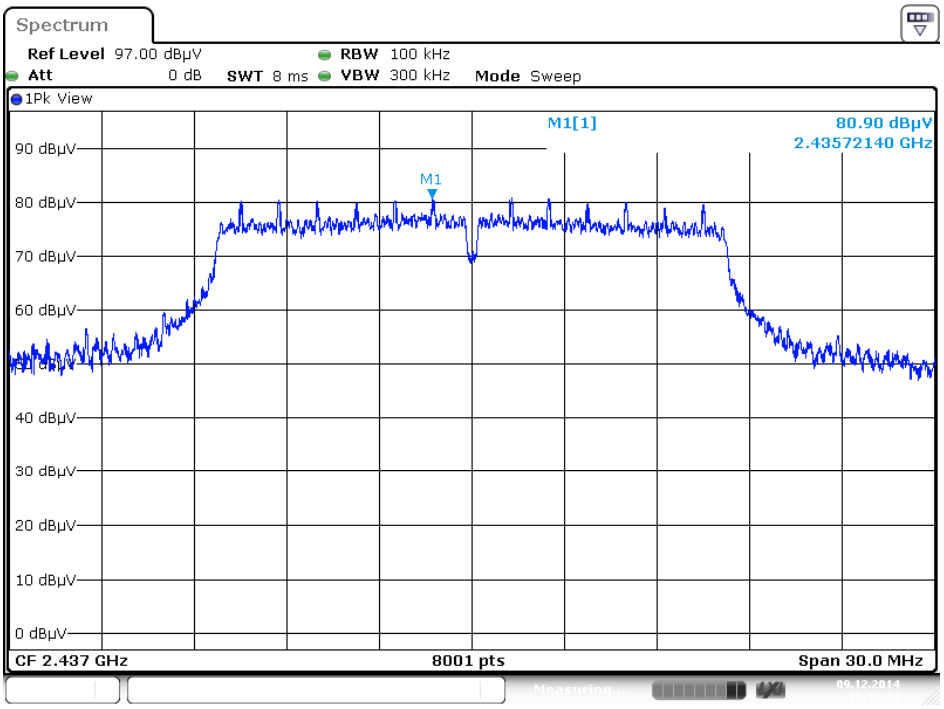
Date: 9.DEC.2014 19:27:58

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



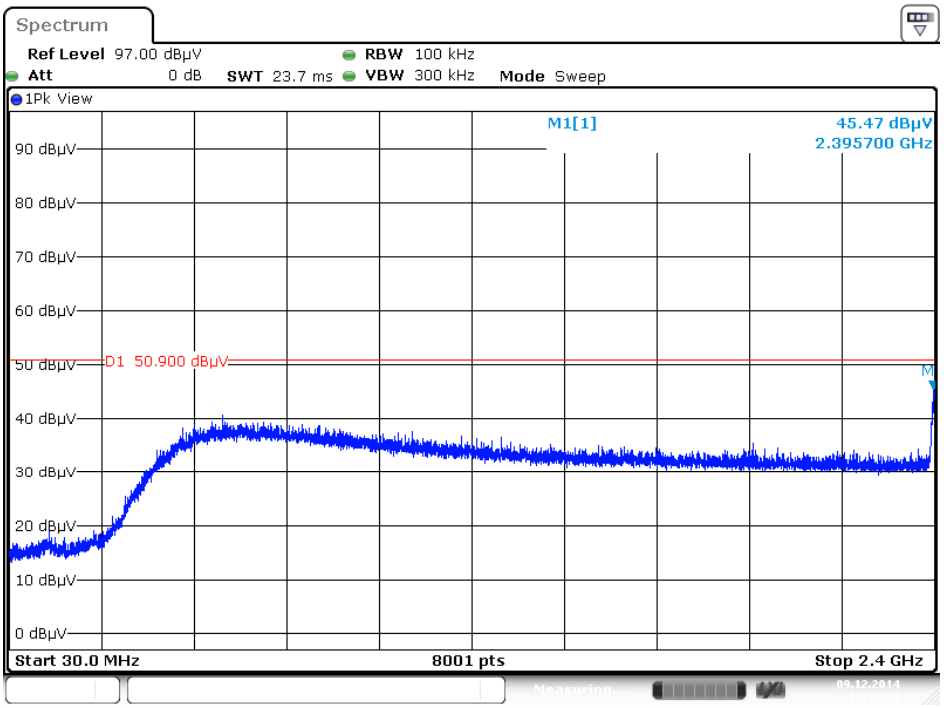
Date: 9.DEC.2014 19:28:29

Plot on Configuration IEEE 802.11g / Reference Level



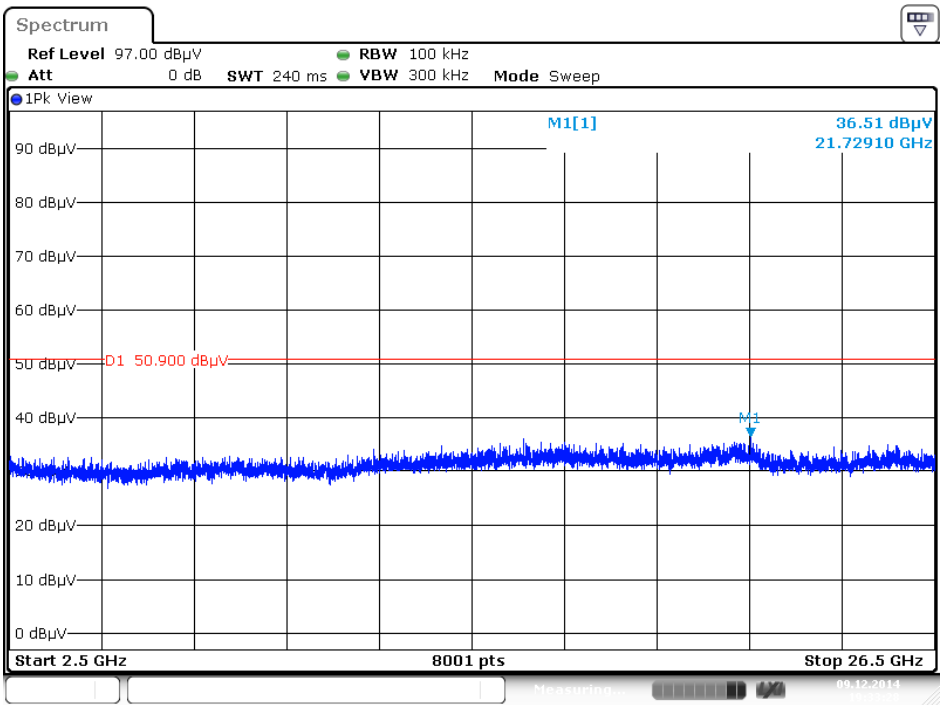
Date: 9.DEC.2014 19:30:14

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



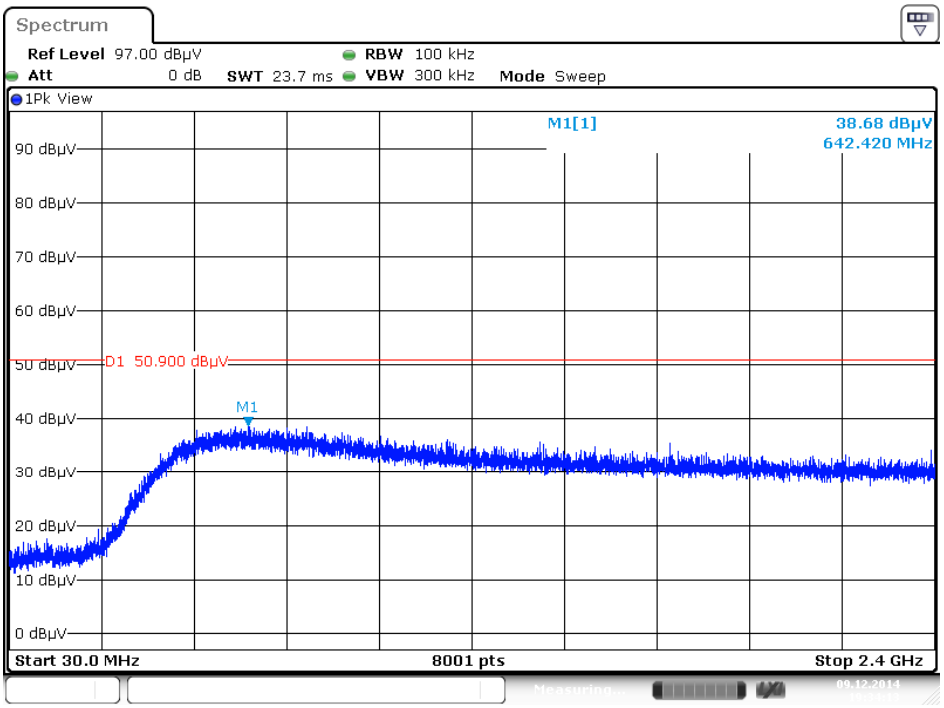
Date: 9.DEC.2014 19:32:39

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



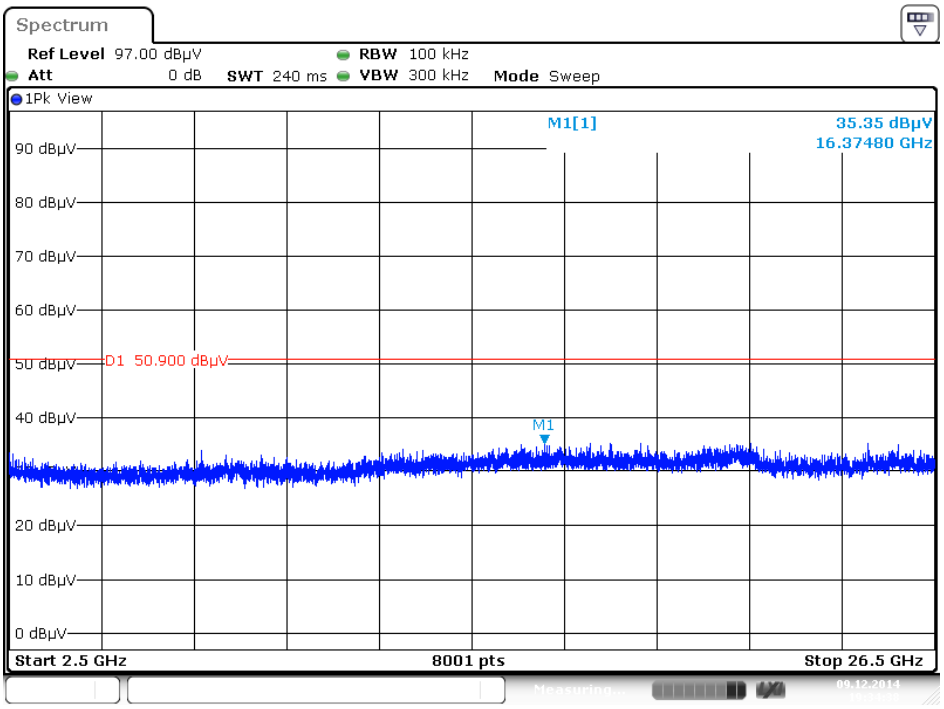
Date: 9.DEC.2014 19:33:28

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



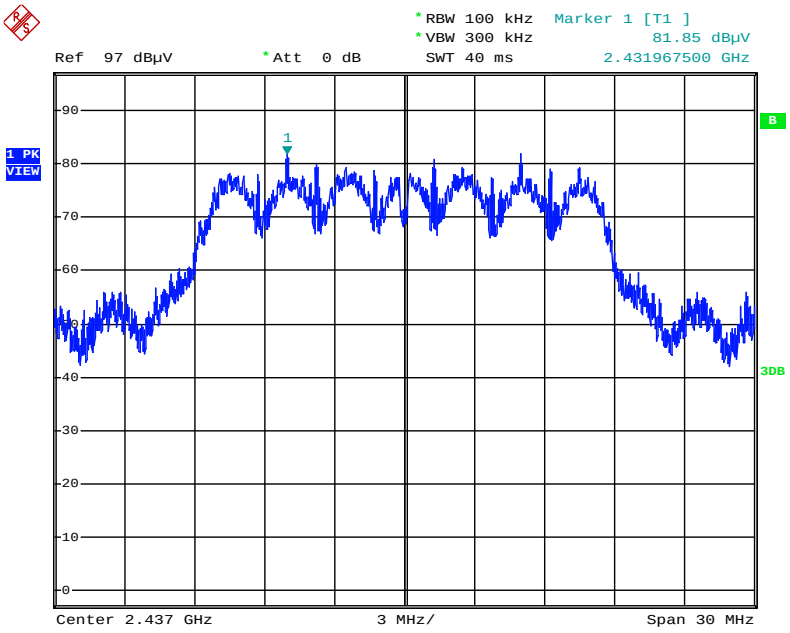
Date: 9.DEC.2014 19:34:13

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



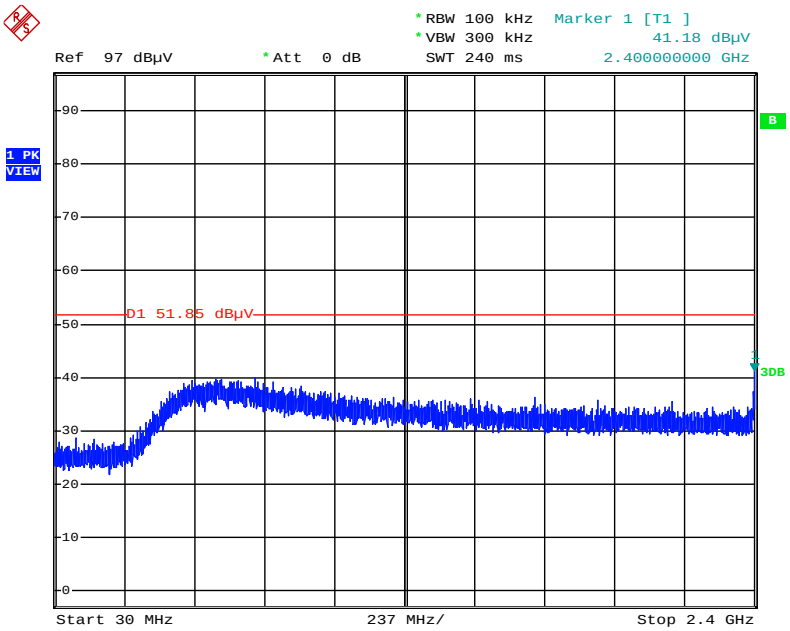
Date: 9.DEC.2014 19:34:37

Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Reference Level



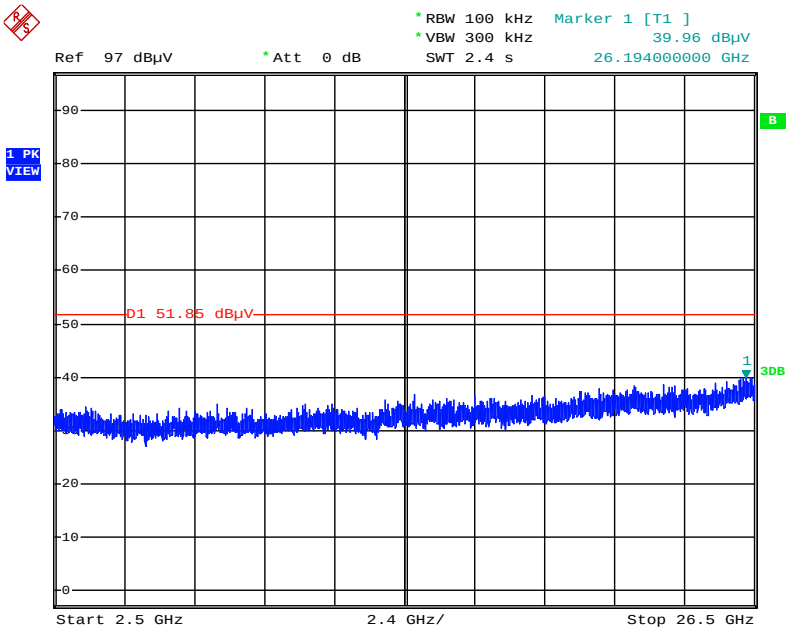
Date: 16.JAN.2015 23:11:33

Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / CH 1 / 30MHz~2400MHz (down 30dBc)



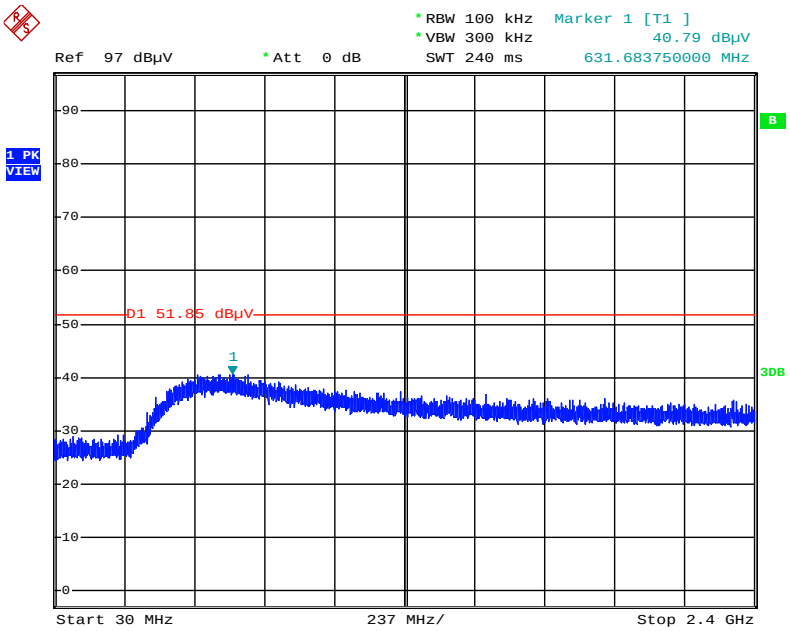
Date: 16.JAN.2015 23:27:13

Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / CH 1 / 2500MHz~26500MHz (down 30dBc)



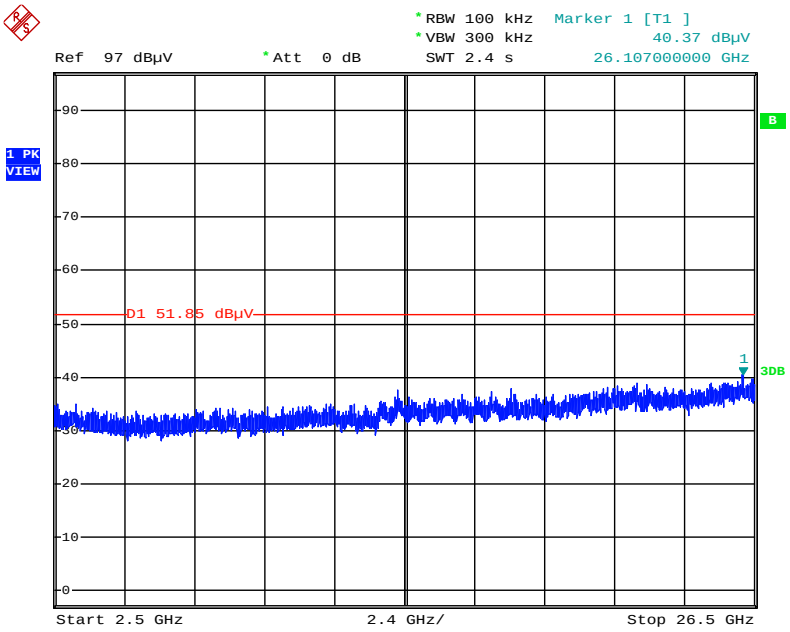
Date: 16.JAN.2015 23:29:30

Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / CH 11 / 30MHz~2400MHz (down 30dBc)



Date: 16.JAN.2015 23:34:10

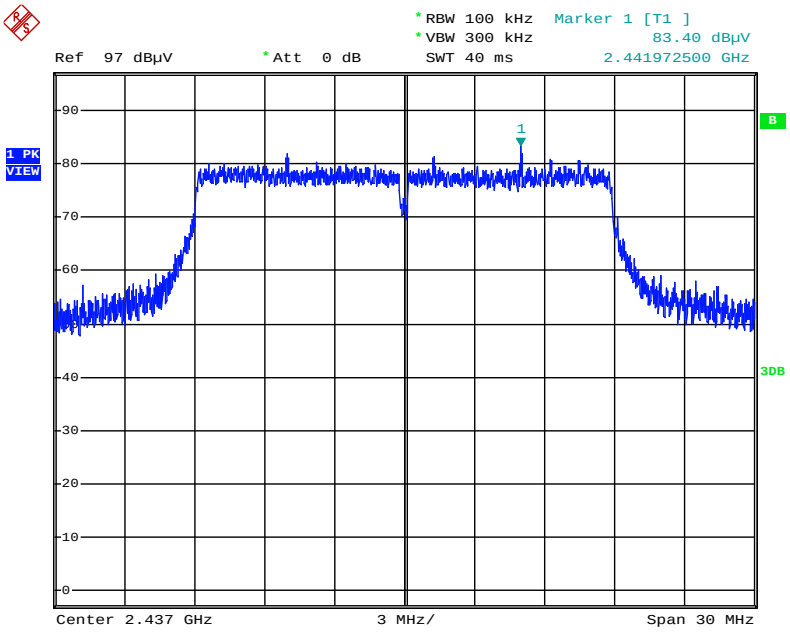
Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / CH 11 / 2500MHz~26500MHz (down 30dBc)



Date: 16.JAN.2015 23:32:26

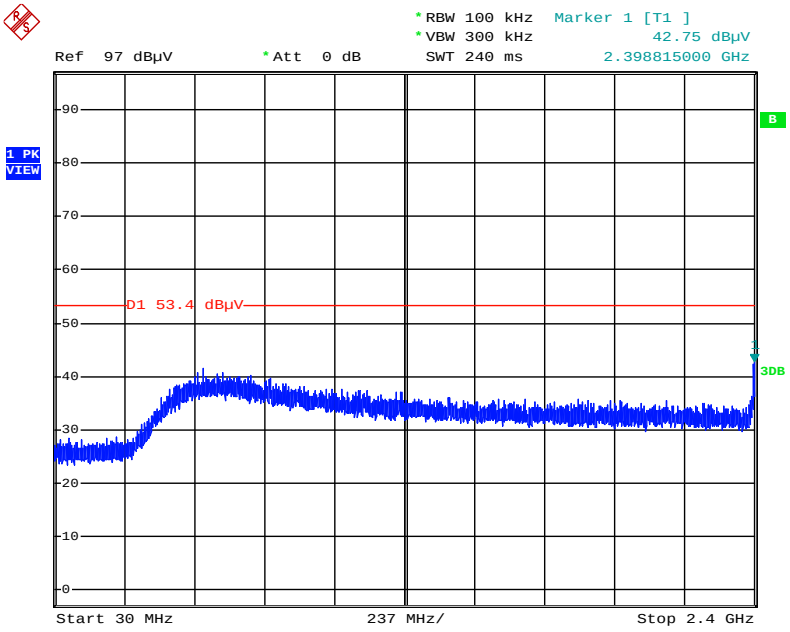
For Beamforming Mode:

Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Reference Level



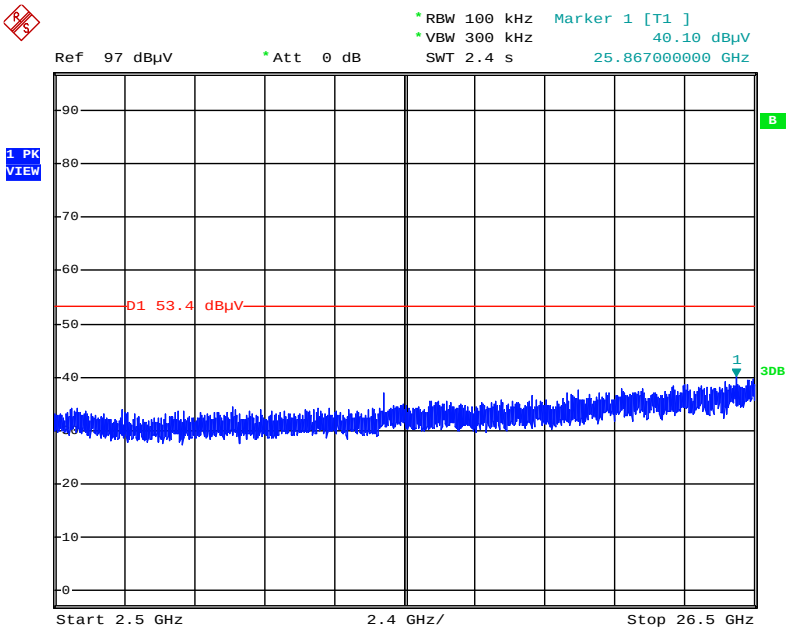
Date: 17.JAN.2015 01:09:07

Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / CH 1 / 30MHz~2400MHz (down 30dBc)



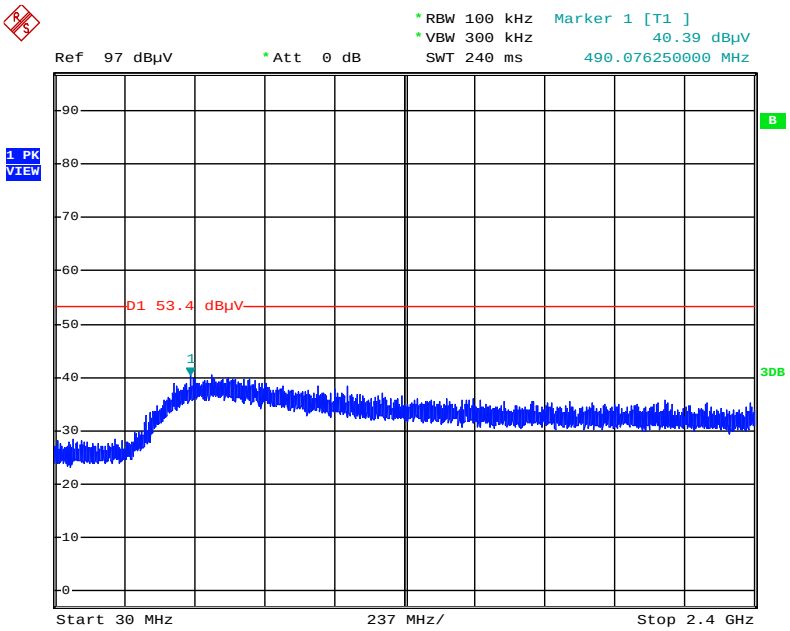
Date: 17.JAN.2015 01:24:58

Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / CH 1 / 2500MHz~26500MHz (down 30dBc)



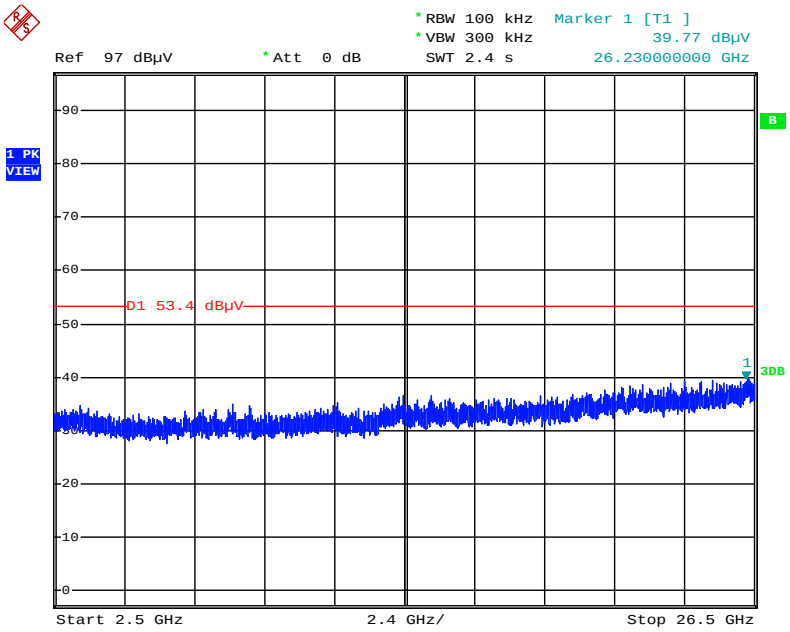
Date: 17.JAN.2015 01:19:56

Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / CH 11 / 30MHz~2400MHz (down 30dBc)



Date: 17.JAN.2015 01:23:43

Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / CH 11 / 2500MHz~26500MHz (down 30dBc)



Date: 17.JAN.2015 01:22:35

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	8449B	3008A02009	1GHz ~ 26.5GHz	Dec. 17, 2014	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Nov. 25, 2014	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100080	9kHz ~ 40GHz	Oct. 15, 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 Power Divider	Woken	2 Way	0120A02056002D	2GHz ~ 18GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Power Divider	Woken	3 Way	MDC2366	2GHz ~ 18GHz	Nov. 15, 2014	Conducted (TH01-CB)
RF Power Divider	Woken	4 Way	0120A04056002D	2GHz ~ 18GHz	Nov. 15, 2014	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
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.

NCR 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%