SPORTON International Inc.
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FCC RADIO TEST REPORT

Applicant's company	**Atop Technologies, Inc**
Applicant Address	1TH FL 30 R&D RD II,SCIENCE-BASED INDUSTRIAL PARK,HSINCHU 300 TAIWAN
FCC ID	**RPV-AW-SW5502**
Manufacturer's company	**Atop Technologies, Inc**
Manufacturer Address	1TH FL 30 R&D RD II,SCIENCE-BASED INDUSTRIAL PARK,HSINCHU 300 TAIWAN

Product Name	Industrial Wireless Device
Brand Name	ATOP
Model No.	SW5501,SW5501-TB,SW5501-Sis,SW5502,SW5502-TB,SW5502-Sis,AW5500,AW5501,AW5501-TB,AW5501-Sis,AW5502,AW5502-TB,AW5502-Sis,MW5501,MW5501-TB,MW5501-Sis,MW5502,MW5502-TB,MW5502-Sis,SW1501T,SW1501,SW1502T,SW1502,AW1500,AW5500C,AW5501C,AW5502C,AW5502C-TB,SW5501C,SW5502C,SW5502C-TB,SW1501S,SW1501S1,MW5501C,MW5502C,MW5502C-TB,MW1501S,MW1501S1,GW91W-Maxi-CA,GW91W-SDK-CA,SW5501C-T1,SW5501C-Wn,SW5501C-Wn-T1,SW5502C-T1,SW5502C-Wn,SW5502C-Wn-T1,SW5502C-TB-T1,SW5502C-TB-Wn,SW5502C-TB-Wn-T1,AW5500C-T1,AW5500C-Wn,AW5500C-Wn-T1,AW5501C-T1,AW5501C-Wn,AW5501C-Wn-T1,AW5502C-T1,AW5502C-Wn,AW5502C-Wn-T1,AW5502C-TB-T1,AW5502C-TB-Wn,AW5502C-TB-Wn-T1.
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Received Date	Nov. 03, 2011
Final Test Date	Jul. 28, 2014
Submission Type	Class II Change
Operating Mode	Master and Client (without radar detection function)

Statement

Test result included is for the IEEE 802.11n and IEEE 802.11a of the product.
The test result in this report refers exclusively to the presented test model / sample.
Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.
The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2009**, **47 CFR FCC Part 15 Subpart E, KDB789033 D02 v01, KDB662911 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
FR1N0918-05AB	Rev. 01	Initial issue of report	Jul. 30, 2014

Certificate No.: CB10307090

1. CERTIFICATE OF COMPLIANCE

Product Name	:	Industrial Wireless Device
Brand Name	:	ATOP
Model No.	:	SW5501,SW5501-TB,SW5501-Sis,SW5502,SW5502-TB,SW5502-Sis,AW5500,AW5501,AW5501-TB,AW5501-Sis,AW5502,AW5502-TB,AW5502-Sis,MW5501,MW5501-TB,MW5501-Sis,MW5502,MW5502-TB,MW5502-Sis,SW1501T,SW1501,SW1502T,SW1502,AW1500,AW5500C,AW5501C,AW5502C,AW5502C-TB,SW5501C,SW5502C,SW5502C-TB,SW1501S,SW1501S1,MW5501C,MW5502C,MW5502C-TB,MW1501S,MW1501S1,GW91W-Maxi-CA,GW91W-SDK-CA,SW5501C-T1,SW5501C-Wn,SW5501C-Wn-T1,SW5502C-T1,SW5502C-Wn,SW5502C-Wn-T1,SW5502C-TB-T1,SW5502C-TB-Wn,SW5502C-TB-Wn-T1,AW5500C-T1,AW5500C-Wn,AW5500C-Wn-T1,AW5501C-T1,AW5501C-Wn,AW5501C-Wn-T1,AW5502C-T1,AW5502C-Wn,AW5502C-Wn-T1,AW5502C-TB-T1,AW5502C-TB-Wn,AW5502C-TB-Wn-T1.
Applicant	:	Atop Technologies, Inc
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Nov. 03, 2011 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 E				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.407(a)	26dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies	-
4.2	15.407(e)	6dB Spectrum Bandwidth and 99% Occupied Bandwidth	Complies	-
4.3	15.407(a)	Maximum Conducted Output Power	Complies	0.47 dB
4.4	15.407(a)	Power Spectral Density	Complies	0.68 dB
4.5	15.407(b)	Radiated Emissions	Complies	0.66 dB
4.6	15.407(b)	Band Edge Emissions	Complies	0.12 dB
4.7	15.407(g)	Frequency Stability	Complies	-
4.8	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n

Items	Description
Product Type	WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	see the below table for IEEE 802.11n
Data Modulation	For 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n
Frequency Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Channel Number	9 for 20MHz bandwidth ; 4 for 40MHz bandwidth
Channel Band Width (99%)	Band 1: 802.11n MCS8 (HT20): 36.80 MHz ; 802.11n MCS8 (HT40): 46.72 MHz Band 4: 802.11n MCS8 (HT20): 25.52 MHz ; 802.11n MCS8 (HT40): 36.96 MHz
Maximum Conducted Output Power	Band 1: For Master mode 802.11n MCS8 (HT20): 26.19 dBm ; 802.11n MCS8 (HT40): 21.84 dBm For Client mode (without radar detection function) 802.11n MCS8 (HT20): 23.53 dBm ; 802.11n MCS8 (HT40): 21.84 dBm Band 4: For Master and Client (without radar detection function) 802.11n MCS8 (HT20): 23.14 dBm ; 802.11n MCS8 (HT40): 16.97 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11a

Items	Description
Product Type	WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From power adapter
Modulation	OFDM for IEEE 802.11a
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	OFDM (6/9/12/18/24/36/48/54)
Frequency Range	5150 ~ 5250 MHz / 5725 ~ 5850 MHz
Channel Number	9
Channel Band Width (99%)	Band 1: 802.11a: 36.16 MHz Band 4: 802.11a: 28.96 MHz
Maximum Conducted Output Power	Band 1: For Master mode 802.11a: 23.23 dBm For Client mode (without radar detection function) 802.11a: 23.23 dBm Band 4: For Master and Client (without radar detection function): 802.11a: 21.62 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Items	Description	
Communication Mode	☒ IP Based (Load Based)	☐ Frame Based
Beamforming Function	☐ With beamforming	☒ Without beamforming

Antenna and Band width

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

IEEE 11n Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	2	MCS 8-15
802.11n (HT40)	2	MCS 8-15
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

Power	Brand Holder	Model	Rating
Adapter	SOLYTECH ENTERPRISE CORPORATION	AD1724C	INPUT: 100-240V~0.5A, 50-60Hz OUTPUT: 24V, 0.63A, Max. 15W
Other			
OMNI Antenna*2			

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)		Cable loss	True Gain (dBi)
1	JOYMAX	TWX-614XRSXX-999	OMNI Antenna	Reversed-SMA	2.4GHz	3	1	2
					5GHz	5	2	3
2	JOYMAX	TWX-614XRSXX-999	OMNI Antenna	Reversed-SMA	2.4GHz	3	1	2
					5GHz	5	2	3

Note: The EUT has two antennas.

For 2.4GHz function:

For IEEE 802.11bg mode (1TX/1RX):

Only Chain 1 can be used as transmitting antenna and receiving antenna.

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

Chain 1 and Chain 2 could transmit/receive simultaneously.

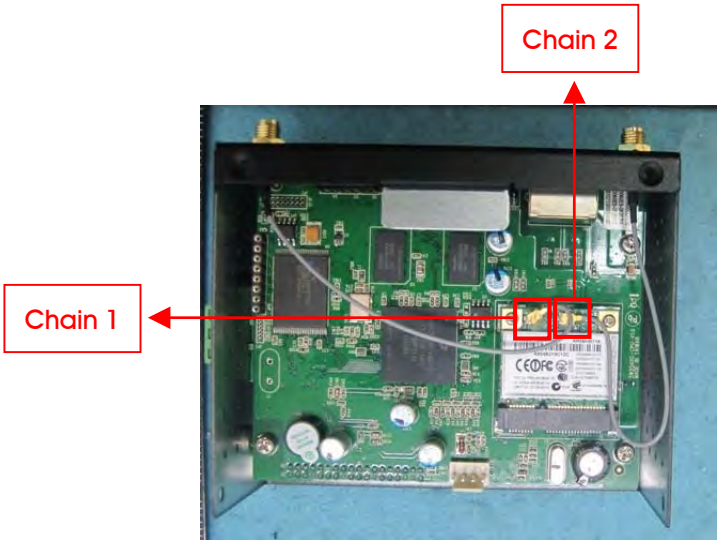
For 5GHz function:

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

Only Chain 1 can be used as transmitting antenna and receiving antenna.

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

Chain 1 and Chain 2 could transmit/receive simultaneously.



3.4. Table for Carrier Frequencies

There are two bandwidth systems.

For 20MHz bandwidth systems, use Channel 36, 40, 44, 48, 149, 153, 157, 161, 165.

For 40MHz bandwidth systems, use Channel 38, 46, 151, 159.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5150~5250 MHz Band 1	36	5180 MHz	44	5220 MHz
	38	5190 MHz	46	5230 MHz
	40	5200 MHz	48	5240 MHz
5725~5850 MHz Band 4	149	5745 MHz	159	5795 MHz
	151	5755 MHz	161	5805 MHz
	153	5765 MHz	165	5825 MHz
	157	5785 MHz	-	-

3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

For Master mode

Test Items	Mode		Data Rate	Channel	Chain
Max. Conducted Output Power	11n HT20	Band 1&4	MCS8	36/40/48/157/165	1+2
	11n HT40	Band 1&4	MCS8	38/46	1+2
	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
Power Spectral Density	11n HT20	Band 1&4	MCS8	36/40/48/149/157/165	1+2
	11n HT40	Band 1&4	MCS8	38/46	1+2
	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
26dB&6dB Spectrum Bandwidth 99% Occupied Bandwidth Measurement	11n HT20	Band 1&4	MCS8	36/40/48/149/157/165	1+2
	11n HT40	Band 1&4	MCS8	38/46/151/159	1+2
	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
Radiated Emission Above 1GHz	11n HT20	Band 1&4	MCS8	36/40/48/149/157/165	1+2
	11n HT40	Band 1&4	MCS8	38/46/151/159	1+2
	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
Band Edge Emission	11n HT20	Band 1&4	MCS8	36/40/48/149/157/165	1+2
	11n HT40	Band 1&4	MCS8	38/46/151/159	1+2
	11a/BPSK	Band 1&4	6Mbps	36/40/48/149/157/165	1
Frequency Stability	Un-modulation		-	40	1

The following test modes were performed for all tests:

For Radiated Emission above 1GHz test:

Test Mode : EUT 1 (Model: AW5502-TB)

For Co-location MPE 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).

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.**	**VCCI Reg. No**
03CH01-CB	SAC	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 and Class II Change

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

Wireless Mode: Client

Software: Serial Device Server

Model Name	Top Board	Bottom Board	Serial DB9 Type	Serial TB5 Type	Antenna	Band
SW5501 SW1501	Same	Same (One Serial)	Yes	No	2	2.4G+5G
SW5501-TB	Same	Same (One Serial)	No	Yes	2	2.4G+5G
SW5501-Sis	Same	Same (One Serial, isolation function)	No	Yes	2	2.4G+5G
SW5502 SW1502	Same	Same (Two Serial)	Yes	No	2	2.4G+5G
SW5502-TB	Same	Same (Two Serial)	No	Yes	2	2.4G+5G
SW5502-Sis	Same	Slight Different (Two Serial, isolation function)	No	Yes	2	2.4G+5G
SW1501T	Reverse male and female connector of top and bottom					
SW1502T	Reverse male and female connector of top and bottom					
SW5501C	With UART Minus one led	One serial	Yes	No	2	2.4G+5G
SW5501C-T1	With UART Minus one led	One serial	Yes	No	1	2.4G+5G
SW5501C-Wn	With UART Minus one led	One serial	Yes	No	2	2.4G
SW5501C-Wn-T1	With UART Minus one led	One serial	Yes	No	1	2.4G
SW5502C	With UART	Two serial-DB9	Yes	No	2	2.4G+5G

SW5502C-T1	With UART	Two serial-DB9	Yes	No	1	2.4G+5G
SW5502C-Wn	With UART	Two serial-DB9	Yes	No	2	2.4G
SW5502C-Wn-T1	With UART	Two serial-DB9	Yes	No	1	2.4G
SW5502C-TB	With UART	Two serial-TB5	No	Yes	2	2.4G+5G
SW5502C-TB-T1	With UART	Two serial-TB5	No	Yes	1	2.4G+5G
SW5502C-TB-Wn	With UART	Two serial-TB5	No	Yes	2	2.4G
SW5502C-TB-Wn-T1	With UART	Two serial-TB5	No	Yes	1	2.4G
SW1501S	Mini Size	Mini size with one serial	Yes	No	1	2.4G+5G
SW1501S1 GW91W-Maxi-CA GW91W-SDK-CA		Mini size with one serial& unique connector	No	NO	1	2.4G+5G

Wireless Mode: Master

Software: Access Point

Model Name	Top Board	Bottom Board	Serial DB9 Type	Serial TB5 Type	Antenna	Band
AW5500 AW1500	Same	Same (No Serial)	No	No	2	2.4G+5G
AW5501	Same	Same (One Serial)	Yes	No	2	2.4G+5G
AW5501-TB	Same	Same (One Serial)	No	Yes	2	2.4G+5G
AW5501-Sis	Same	Same (One Serial, isolation function)	No	Yes	2	2.4G+5G
AW5502	Same	Same (Two Serial)	Yes	No	2	2.4G+5G
AW5502-TB	Same	Same (Two Serial)	No	Yes	2	2.4G+5G
AW5502-Sis	Same	Slight Different (Two Serial, isolation function)	No	Yes	2	2.4G+5G
AW5500C	Without UART	No serial	No	No	2	2.4G+5G
AW5500C-T1	Without UART	No serial	No	No	1	2.4G+5G
AW5500C-Wn	Without UART	No serial	No	No	2	2.4G
AW5500C-Wn-T1	Without UART	No serial	No	No	1	2.4G
AW5501C	With UART Minus one led	One serial	Yes	Yes	2	2.4G+5G
AW5501C-T1	With UART Minus one led	One serial	Yes	Yes	1	2.4G+5G

AW5501C-Wn	With UART Minus one led	One serial	Yes	Yes	2	2.4G
AW5501C-Wn-T1	With UART Minus one led	One serial	Yes	Yes	1	2.4G
AW5502C	With UART	Two serial-DB9	Yes	No	2	2.4G+5G
AW5502C-T1	With UART	Two serial-DB9	Yes	No	1	2.4G+5G
AW5502C-Wn	With UART	Two serial-DB9	Yes	No	2	2.4G
AW5502C-Wn-T1	With UART	Two serial-DB9	Yes	No	1	2.4G
AW5502C-TB	With UART	Two serial-TB5	No	Yes	2	2.4G+5G
AW5502C-TB-T1	With UART	Two serial-TB5	No	Yes	1	2.4G+5G
AW5502C-TB-Wn	With UART	Two serial-TB5	No	Yes	2	2.4G
AW5502C-TB-Wn-T1	With UART	Two serial-TB5	No	Yes	1	2.4G

Wireless Mode: Client

Software: Modbus Gateway

Model Name	Top Board	Bottom Board	Serial DB9 Type	Serial TB5 Type	Antenna	Band
MW5501	Same	Same (One Serial)	Yes	Yes	2	2.4G+5G
MW5501-TB	Same	Same (One Serial)	No	Yes	2	2.4G+5G
MW5501-Sis	Same	Same (One Serial, isolation function)	No	Yes	2	2.4G+5G
MW5502	Same	Same (Two Serial)	Yes	No	2	2.4G+5G
MW5502-TB	Same	Same (Two Serial)	No	Yes	2	2.4G+5G
MW5502-Sis	Same	Slight Different (Two Serial, isolation function)	No	Yes	2	2.4G+5G
MW5501C	With UART	One Serial	Yes	Yes	2	2.4G+5G
MW5502C	With UART	Two Serial-DB9	Yes	No	2	2.4G+5G
MW5502C-TB	With UART	Two Serial-TB5	No	Yes	2	2.4G+5G
MW1501S	Mini Size	Mini size with one Serial	Yes	No	2	2.4G+5G
MW1501S1	Mini Size	Mini size with one Serial and unique connector	No	No	2	2.4G+5G

From the above models, model Name: AW5502-TB was selected as representative model for the test and its data was recorded in this report.

This product is an extension of original one reported under Sporton project number: 1N0918 and 1N0918-01.

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Changing 5GHz Band 1 and Band 4 to "New Rules" from "Old Rules". 2. There is no change in hardware or in existing RF relevant portion.	1. 26dB Spectrum Bandwidth and 99% Occupied Bandwidth 2. 6dB Spectrum Bandwidth and 99% Occupied Bandwidth 3. Maximum Conducted Output Power 4. Power Spectral Density 5. Radiated Emissions 6. Band Edge Emissions 7. Frequency Stability

3.8. Table for Supporting Units

For Test Site No: 03CH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	M1330	E2KWM3945ABG

For Test Site No: TH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC

3.9. Table for Parameters of Test Software Setting

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

For Master mode

Power Parameters of IEEE 802.11n MCS8 HT20

Test Software Version	DOS		
Frequency	5180 MHz	5200 MHz	5240 MHz
MCS8 HT20	16	21	26

Power Parameters of IEEE 802.11n MCS8 HT40

Test Software Version	DOS	
Frequency	5190 MHz	5230 MHz
MCS8 HT40	12	20

Power Parameters of IEEE 802.11a

Test Software Version	DOS		
Frequency	5180 MHz	5200 MHz	5240 MHz
802.11a	18	23	27

For Client mode (without radar detection function)

Power Parameters of IEEE 802.11n MCS8 HT20

Test Software Version	DOS		
Frequency	5180 MHz	5200 MHz	5240 MHz
MCS8 HT20	16	21	21

Power Parameters of IEEE 802.11n MCS8 HT40

Test Software Version	DOS	
Frequency	5190 MHz	5230 MHz
MCS8 HT40	12	20

Power Parameters of IEEE 802.11a

Test Software Version	DOS		
Frequency	5180 MHz	5200 MHz	5240 MHz
802.11a	18	23	27

For Master and Client (without radar detection function)

Power Parameters of IEEE 802.11n MCS8 HT20

Test Software Version	DOS		
Frequency	5745 MHz	5785 MHz	5825 MHz
MCS8 HT20	10	23	17

Power Parameters of IEEE 802.11n MCS8 HT40

Test Software Version	DOS	
Frequency	5755 MHz	5795 MHz
MCS8 HT40	8	16

Power Parameters of IEEE 802.11a

Test Software Version	DOS		
Frequency	5745 MHz	5785 MHz	5825 MHz
802.11a	13	25	17

3.10. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

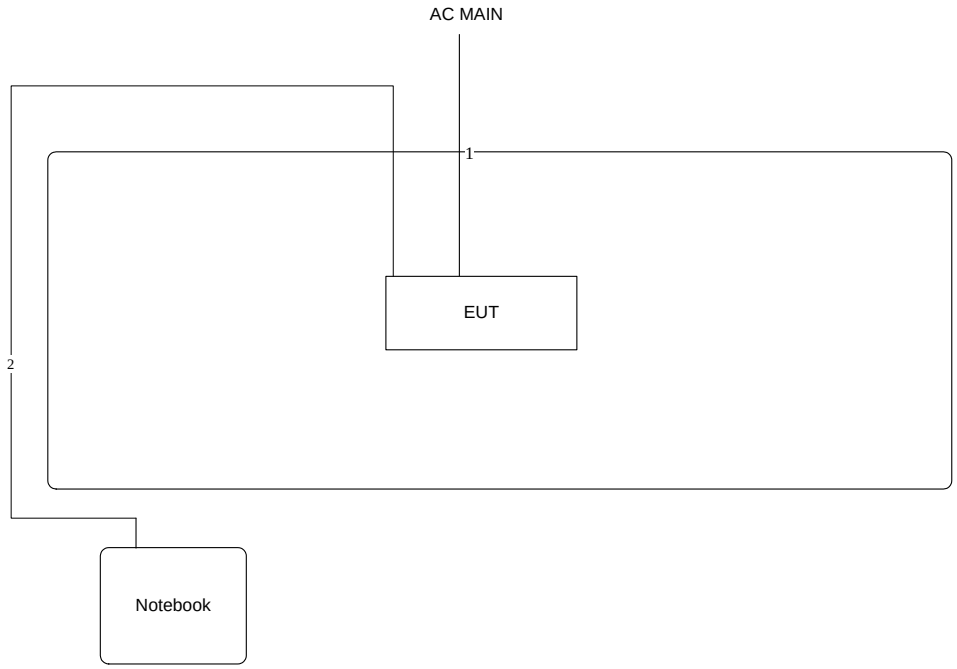
3.11. Duty Cycle

Mode	On Time(ms)	On+Off Time(ms)	Duty Cycle(%)	1/T Minimum VBW (kHz)
802.11n MCS8 HT20	1.970	1.980	99.49	0.01
802.11n MCS8 HT40	0.505	0.525	96.19	1.98
802.11a	2.120	2.130	99.53	0.01

3.12. Test Configurations

3.12.1. Radiation Emissions Test Configuration

Test Configuration: above 1GHz



Item	Connection	Shielded	Length(m)
1	Power cable	No	1.75m
2	RJ-45 cable	No	10m

4. TEST RESULT

4.1. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

4.1.1. Limit

No restriction limits.

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 spectrum analyzer.

26dB Bandwidth	
Spectrum Parameters	**Setting**
Attenuation	Auto
Span Frequency	> 26dB Bandwidth
RBW	Approximately 1% of the emission bandwidth
VBW	VBW > 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

4.1.3. Test Procedures

For Radiated 26dB Bandwidth and 99% Occupied Bandwidth Measurement:

1. The transmitter was radiated to the spectrum analyzer in peak hold mode.
2. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

4.1.4. Test Setup Layout

For Radiated 26dB Bandwidth and 99% Occupied Bandwidth Measurement:

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

4.1.5. Test Deviation

There is no deviation with the original standard.

4.1.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.1.7. Test Result of 26dB Bandwidth and 99% Occupied Bandwidth

Temperature	26°C	Humidity	63%
Test Engineer	Kenneth Huang	Configurations	IEEE 802.11n

Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	25.12	18.56
40	5200 MHz	31.52	22.40
48	5240 MHz	48.00	36.80

Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2

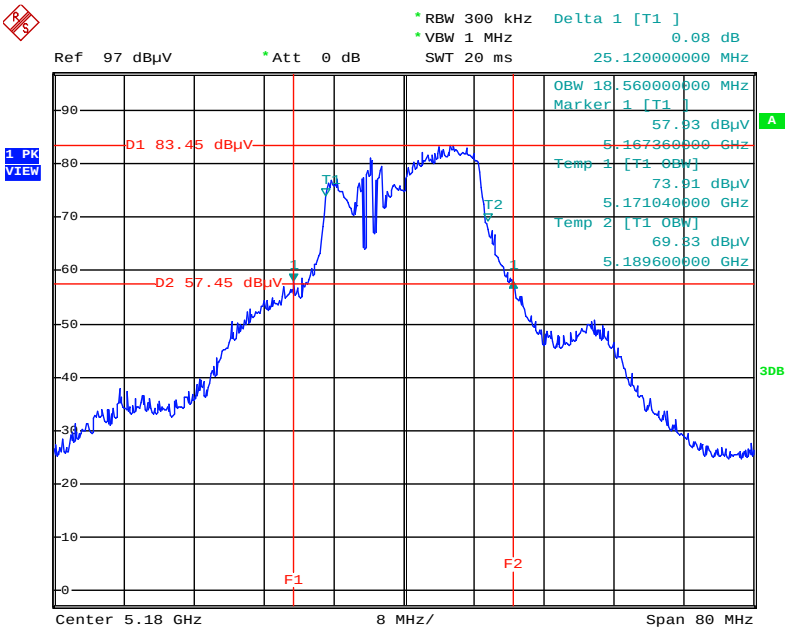
Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
38	5190 MHz	46.08	36.80
46	5230 MHz	81.60	46.72

Temperature	26°C	Humidity	63%
Test Engineer	Kenneth Huang	Configurations	IEEE 802.11a

Configuration IEEE 802.11a / Chain 1

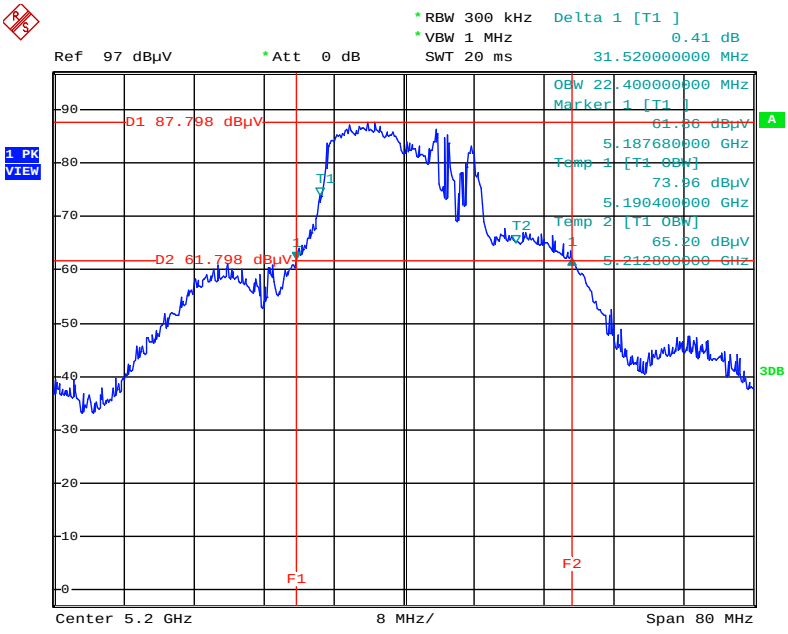
Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	29.60	17.92
40	5200 MHz	42.56	27.20
48	5240 MHz	50.24	36.16

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2 / 5180 MHz



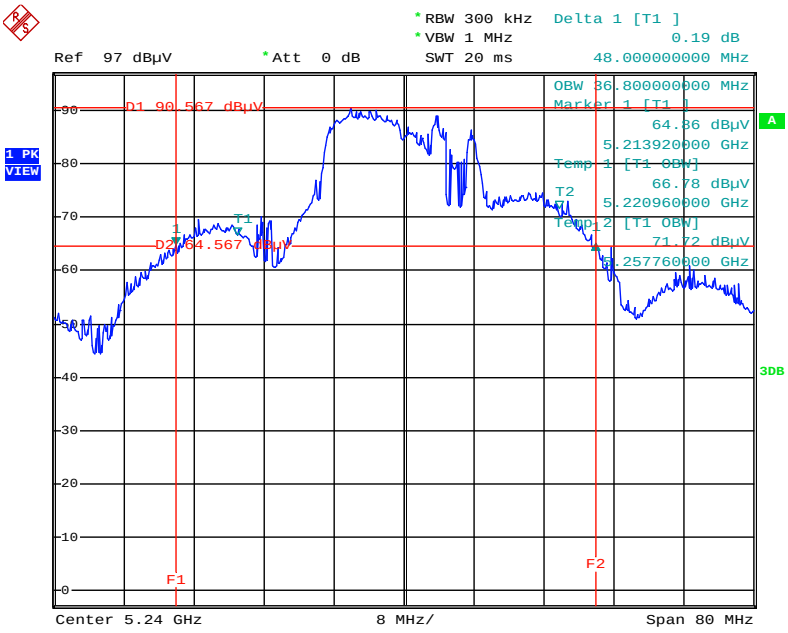
Date: 2.JUL.2014 21:47:25

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2 / 5200 MHz



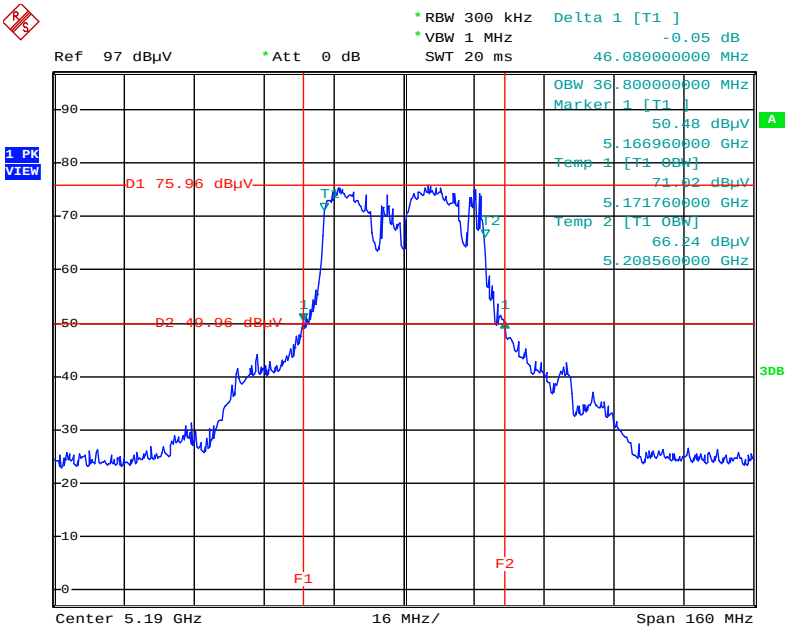
Date: 2.JUL.2014 21:48:07

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2 / 5240 MHz



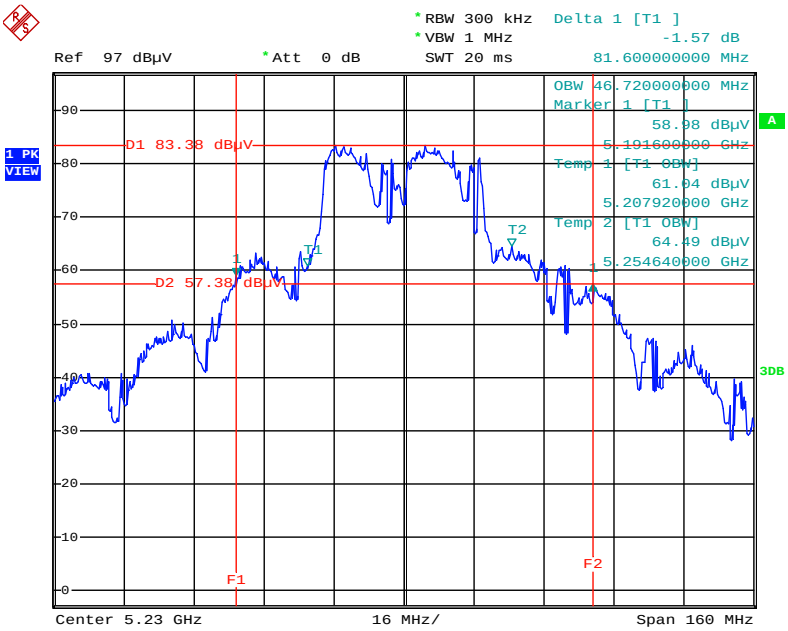
Date: 2.JUL.2014 21:48:47

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2 / 5190 MHz



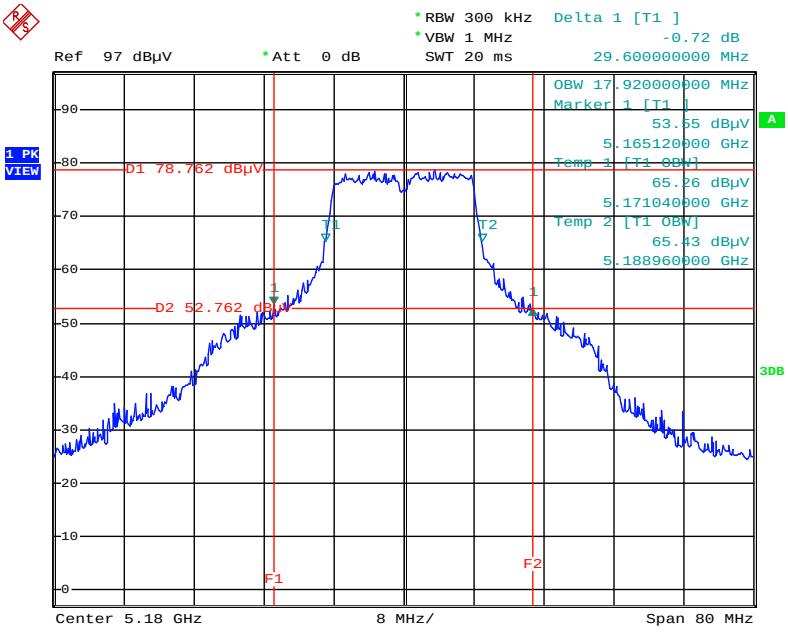
Date: 2.JUL.2014 21:52:13

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2 / 5230 MHz



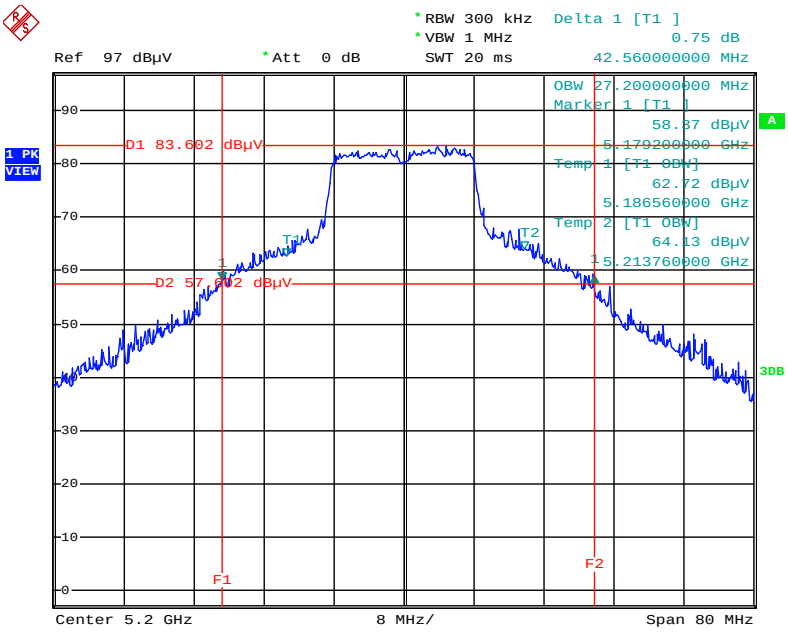
Date: 2.JUL.2014 21:52:46

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5180 MHz



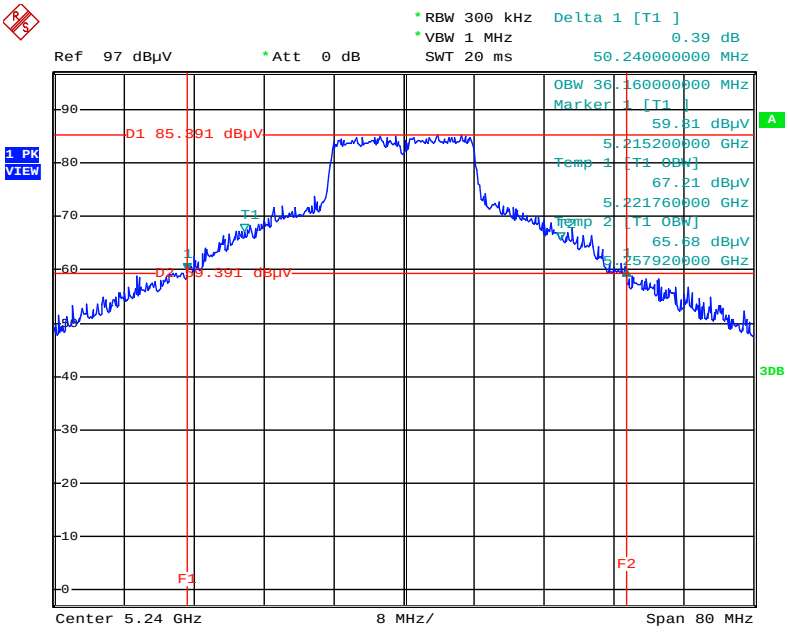
Date: 2.JUL.2014 21:39:17

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5200 MHz



Date: 2.JUL.2014 21:40:34

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5240 MHz



Date: 2.JUL.2014 21:42:39

4.2. 6dB Spectrum Bandwidth and 99% Occupied Bandwidth Measurement

4.2.1. Limit

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

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 spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RBW	approximately 1% of the emission bandwidth
VBW	VBW > RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.2.3. 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 KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (C) Emission Bandwidth.
3. Multiple antenna system was performed in accordance with KDB662911 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.

4.2.4. Test Setup Layout

For Radiated 6dB Bandwidth Measurement:

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

4.2.5. 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 6dB Spectrum Bandwidth and 99% Occupied Bandwidth

Temperature	26°C	Humidity	63%
Test Engineer	Kenneth Huang	Configurations	IEEE 802.11n

Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	12.56	16.88	500	Complies
157	5785 MHz	16.96	25.52	500	Complies
165	5825 MHz	11.68	16.96	500	Complies

Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
151	5755 MHz	35.68	36.48	500	Complies
159	5795 MHz	35.68	36.96	500	Complies

Temperature	26°C	Humidity	63%
Test Engineer	Kenneth Huang	Configurations	IEEE 802.11a

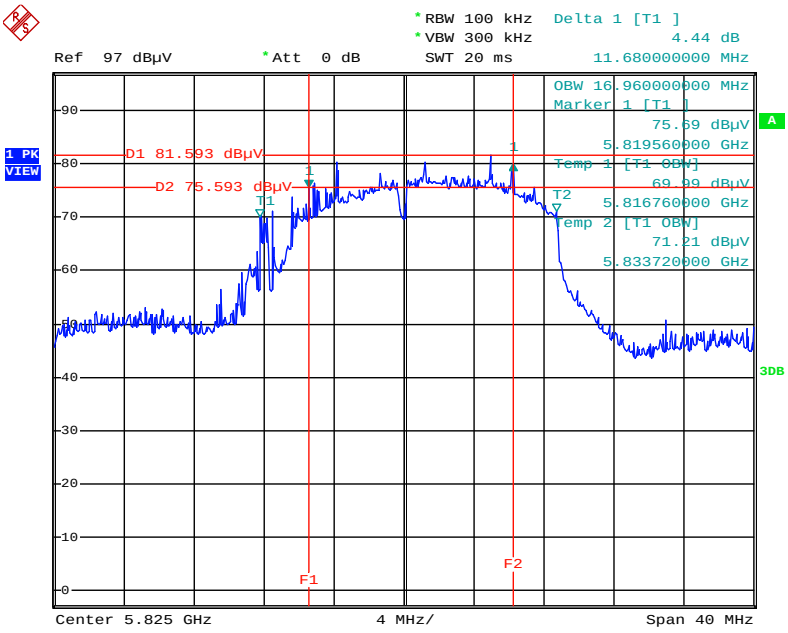
Configuration IEEE 802.11a / Chain 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	16.32	16.64	500	Complies
157	5785 MHz	16.32	28.96	500	Complies
165	5825 MHz	16.32	17.12	500	Complies

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

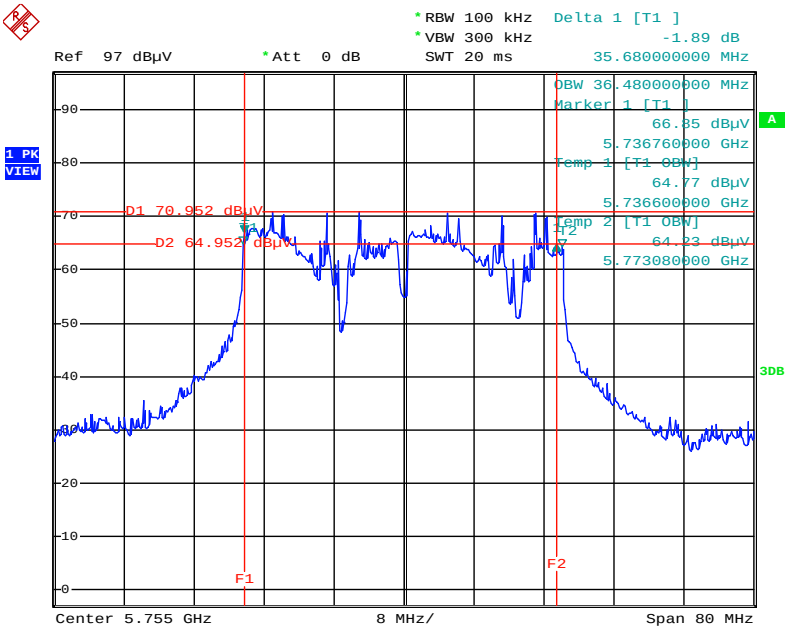
For plots, only the channel with worse result was shown.

6 dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2 / 5825 MHz



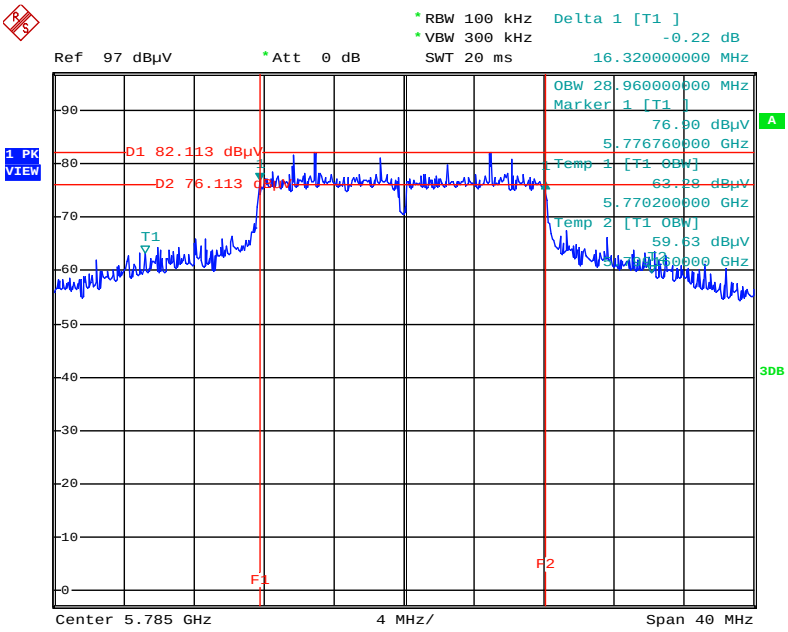
Date: 2.JUL.2014 21:50:59

6 dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2 / 5755MHz



Date: 2.JUL.2014 21:53:41

6 dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 / 5785 MHz



Date: 2.JUL.2014 21:44:54

4.3. Maximum Conducted Output Power Measurement

4.3.1. Limit

For the band 5.15~5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) (master limit) or 250 mW (24dBm) (client limit) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725~5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

4.3.2. Measuring Instruments and Setting

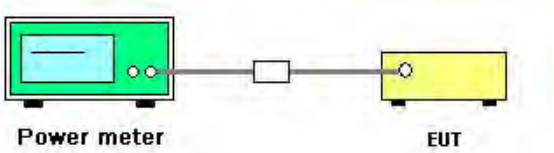
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	AVERAGE

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (E) Maximum conducted output power =>3. Measurement using a Power Meter (PM) =>b) Method PM-G (Measurement using a gated RF average power meter).
3. Multiple antenna systems was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
4. When measuring maximum conducted output power with multiple antenna systems, add every result of the values by mathematic formula.

4.3.4. Test Setup Layout



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Maximum Conducted Output Power

Temperature	26°C	Humidity	63%
Test Engineer	Kenneth Huang	Configurations	IEEE 802.11n
Test Date	Jul. 03, 2014 ~ Jul. 28, 2014		

For Master mode

Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
36	5180 MHz	14.75	15.18	17.98	30.00	Complies
40	5200 MHz	19.81	19.98	22.91	30.00	Complies
48	5240 MHz	23.12	23.24	26.19	30.00	Complies

Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
38	5190 MHz	10.01	10.75	13.41	30.00	Complies
46	5230 MHz	18.42	19.21	21.84	30.00	Complies

For Client mode (without radar detection function)

Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
36	5180 MHz	14.75	15.18	17.98	24.00	Complies
40	5200 MHz	19.81	19.98	22.91	24.00	Complies
48	5240 MHz	20.29	20.73	23.53	24.00	Complies

Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
38	5190 MHz	10.01	10.75	13.41	24.00	Complies
46	5230 MHz	18.42	19.21	21.84	24.00	Complies

For Master and Client (without radar detection function)

Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
149	5745 MHz	11.18	11.32	14.26	30.00	Complies
157	5785 MHz	20.10	20.16	23.14	30.00	Complies
165	5825 MHz	15.44	15.62	18.54	30.00	Complies

Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2

Channel	Frequency	Conducted Power (dBm)			Max. Limit (dBm)	Result
		Chain 1	Chain 2	Total		
151	5755 MHz	7.65	8.20	10.94	30.00	Complies
159	5795 MHz	13.92	13.99	16.97	30.00	Complies

Temperature	26°C	Humidity	63%
Test Engineer	Kenneth Huang	Configurations	IEEE 802.11a
Test Date	Jul. 03, 2014 ~ Jul. 28, 2014		

For Master mode

Configuration IEEE 802.11a / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
36	5180 MHz	16.91	30.00	Complies
40	5200 MHz	21.14	30.00	Complies
48	5240 MHz	23.23	30.00	Complies

For Client mode (without radar detection function)

Configuration IEEE 802.11a / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
36	5180 MHz	16.91	24.00	Complies
40	5200 MHz	21.14	24.00	Complies
48	5240 MHz	23.23	24.00	Complies

For Master and Client (without radar detection function)

Configuration IEEE 802.11a / Chain 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	13.81	30.00	Complies
157	5785 MHz	21.62	30.00	Complies
165	5825 MHz	16.23	30.00	Complies

4.4. Power Spectral Density Measurement

4.4.1. Limit

The power spectral density is defined as the highest level of power in dBm per MHz generated by the transmitter within the power envelope. The following table is power spectral density limits and decrease power density limit rule refer to section 4.3.1.

Frequency Range	Power Spectral Density limit
5.15~5.25 GHz	17 dBm/MHz for master limit 11 dBm/MHz for client limit
5.725~5.85 GHz	30 dBm/500kHz

4.4.2. Measuring Instruments and Setting

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

For 5.15~5.25 GHz

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	1000 kHz
VBW	3000 kHz
Detector	RMS
Trace	AVERAGE
Sweep Time	Auto
Trace Average	100 times

For 5.725~5.85 GHz

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Set the span to 1.5 times the DTS channel bandwidth.
RBW	RBW ≥ 1/T
VBW	VBW ≥ 3 RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto couple
Note: If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.	

4.4.3. Test Procedures

For 5.15~5.25 GHz

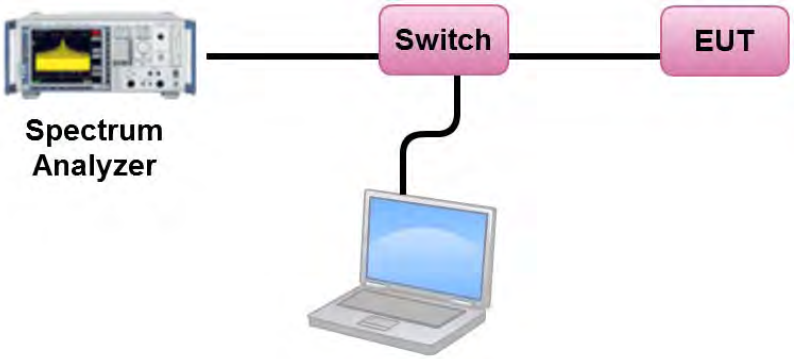
1. The transmitter output (antenna port) was connected RF switch to the spectrum analyzer.
2. Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (F) Maximum Power Spectral Density (PSD).
3. Multiple antenna systems was performed in accordance KDB662911 D01 v02r01 in-Band Power Spectral Density (PSD) Measurements (a) Measure and sum the spectra across the outputs.
4. When measuring first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3 and so on up to the Nth output to obtain the value for the first frequency bin of the summed spectrum. The summed spectrum value for each of the other frequency bins is computed in the same way.

For 5.725~5.85 GHz

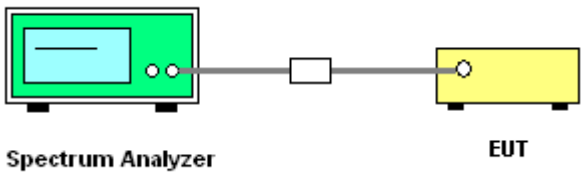
1. Test procedures refer KDB662911 D01 v02r01 section In-Band Power Spectral Density (PSD) Measurements option (b) Measure and sum spectral maximal across the outputs.
2. Use this procedure when the maximum conducted output power in the fundamental emission is used to demonstrate compliance. The EUT 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 measured result of PSD level must add 10log(500kHz/RBW) and the final result should ≤ 30 dBm.

4.4.4. Test Setup Layout

For 5.15~5.25 GHz



For 5.725~5.85 GHz



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 Power Spectral Density

Temperature	26°C	Humidity	63%
Test Engineer	Kenneth Huang	Configurations	IEEE 802.11n
Test Date	Jul. 02, 2014 ~ Jul. 28, 2014		

For Master mode

Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	4.67	17.00	Complies
40	5200 MHz	9.22	17.00	Complies
48	5240 MHz	12.76	17.00	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =3dBi <6dBi, so the limit doesn't reduce.

Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	-2.13	17.00	Complies
46	5230 MHz	5.71	17.00	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =3dBi <6dBi, so the limit doesn't reduce.

For Client mode (without radar detection function)

Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	4.67	11.00	Complies
40	5200 MHz	9.22	11.00	Complies
48	5240 MHz	10.32	11.00	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =3dBi <6dBi, so the limit doesn't reduce.

Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	-2.13	11.00	Complies
46	5230 MHz	5.71	11.00	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =3dBi <6dBi, so the limit doesn't reduce.

For Master and Client (without radar detection function)

Channel	Frequency	Power Density (dBm/3kHz)			BWCF factor	Total Power Density	Power Density Limit	Result
		Chain 1	Chain 2	Total	3kHz to 500kHz	dBm/500kHz		
149	5745 MHz	-12.31	-14.13	-10.12	22.22	12.10	30.00	Complies
157	5785 MHz	-6.35	-5.43	-2.86	22.22	19.36	30.00	Complies
165	5825 MHz	-10.31	-10.20	-7.24	22.22	14.98	30.00	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =3dBi <6dBi, so the limit doesn't reduce.

Channel	Frequency	Power Density (dBm/3kHz)			BWCF factor	Total Power Density	Power Density Limit	Result
		Chain 1	Chain 2	Total	3kHz to 500kHz	dBm/500kHz		
151	5755 MHz	-20.93	-20.16	-17.52	22.22	4.70	30.00	Complies
159	5795 MHz	-14.01	-13.36	-10.66	22.22	11.56	30.00	Complies

Note: $DirectionalGain = 10 \cdot \log\left[\frac{\sum_{j=1}^{N_{SS}}\left\{\sum_{k=1}^{N_{ANT}} g_{j,k}\right\}^2}{N_{ANT}}\right]$ =3dBi <6dBi, so the limit doesn't reduce.

Temperature	26°C	Humidity	63%
Test Engineer	Kenneth Huang	Configurations	IEEE 802.11a
Test Date	Jul. 02, 2014 ~ Jul. 28, 2014		

For Master mode

Configuration IEEE 802.11a / Chain 1

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	3.33	17.00	Complies
40	5200 MHz	7.27	17.00	Complies
48	5240 MHz	9.60	17.00	Complies

For Client mode (without radar detection function)

Configuration IEEE 802.11a / Chain 1

Channel	Frequency	Total Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	3.33	11.00	Complies
40	5200 MHz	7.27	11.00	Complies
48	5240 MHz	9.60	11.00	Complies

For Master and Client (without radar detection function)

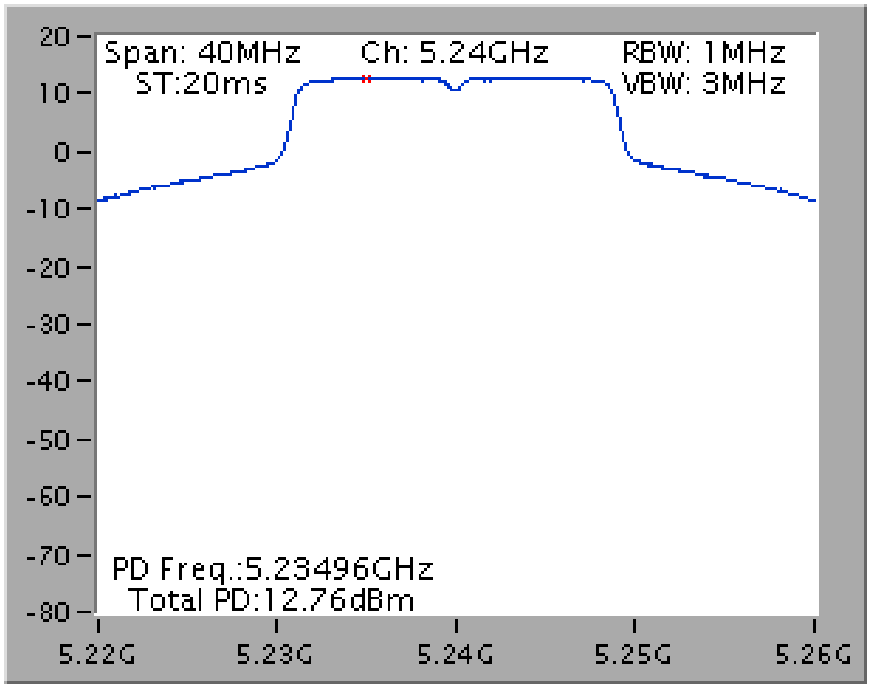
Channel	Frequency	Power Density (dBm/3kHz)	BWCF factor	Total Power Density	Power Density Limit	Result
			3kHz to 500kHz	dBm/500kHz		
149	5745 MHz	-11.13	22.22	11.09	30.00	Complies
157	5785 MHz	-5.44	22.22	16.78	30.00	Complies
165	5825 MHz	-8.97	22.22	13.25	30.00	Complies

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

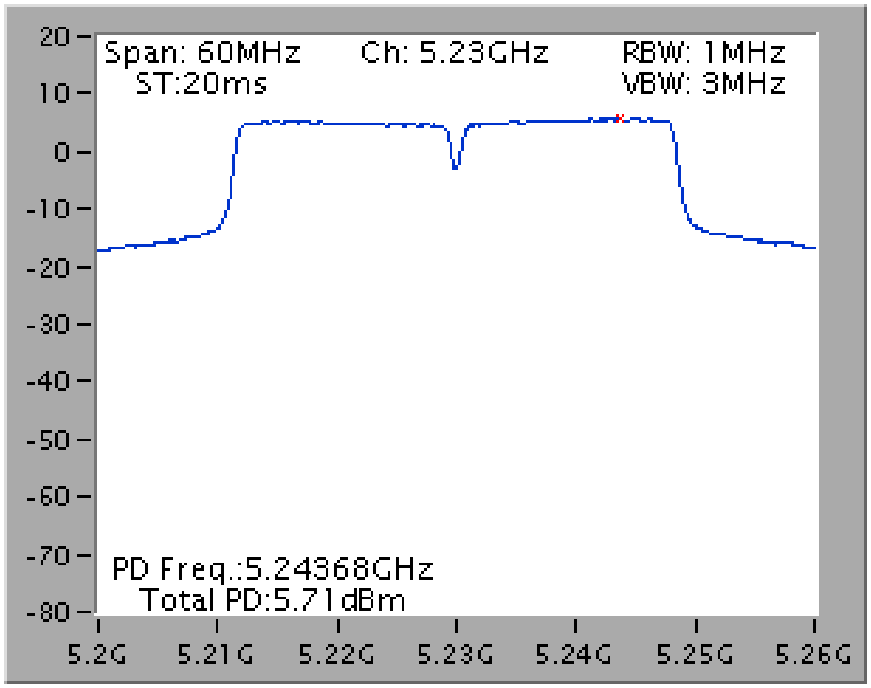
For plots, only the channel with worse result was shown.

For Master mode

Power Density Plot on Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2 / 5240 MHz

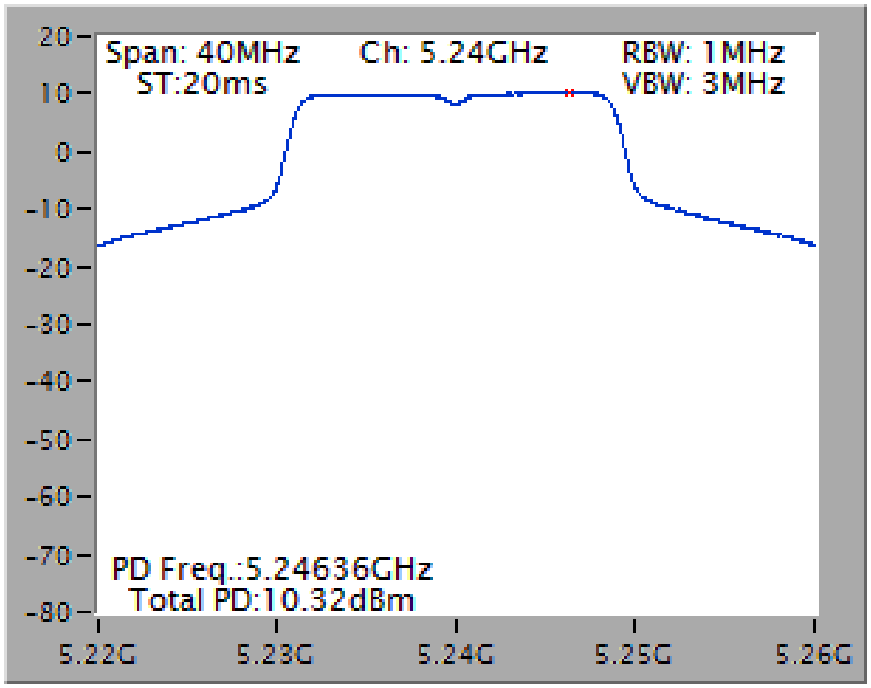


Power Density Plot on Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2 / 5230 MHz

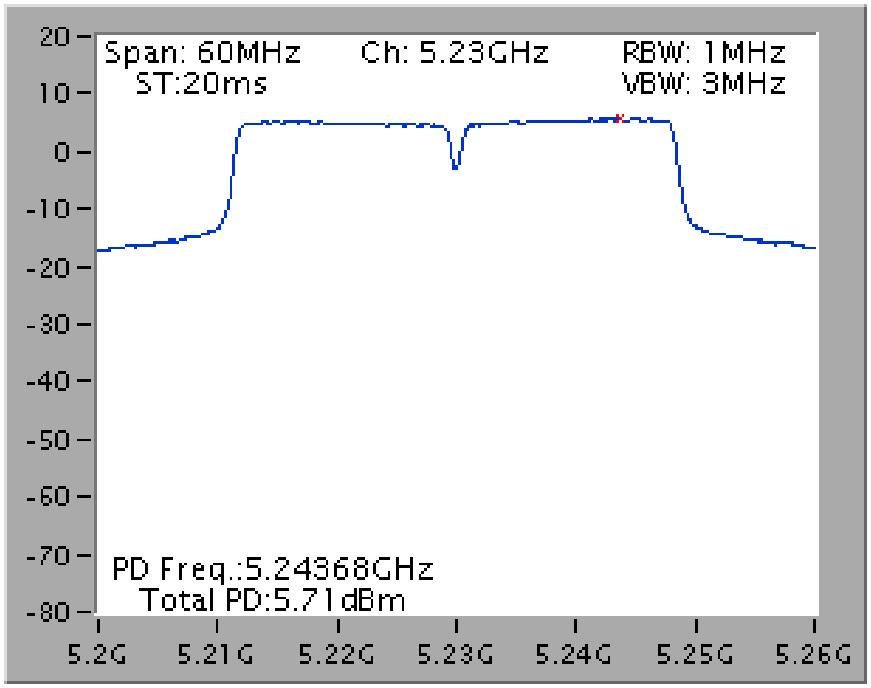


For Client mode (without radar detection function)

Power Density Plot on Configuration IEEE 802.11n MCS8 HT20 / Chain 1 + Chain 2 / 5240 MHz

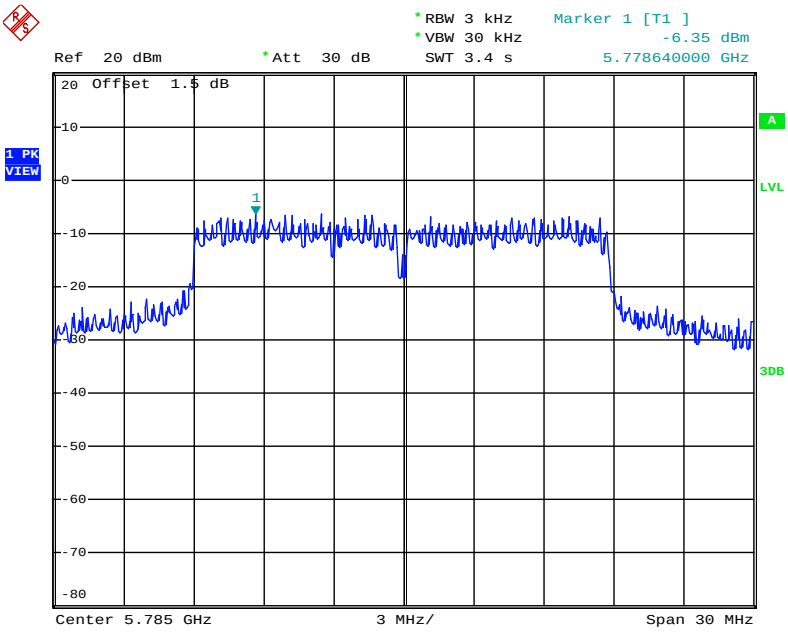


Power Density Plot on Configuration IEEE 802.11n MCS8 HT40 / Chain 1 + Chain 2 / 5230 MHz



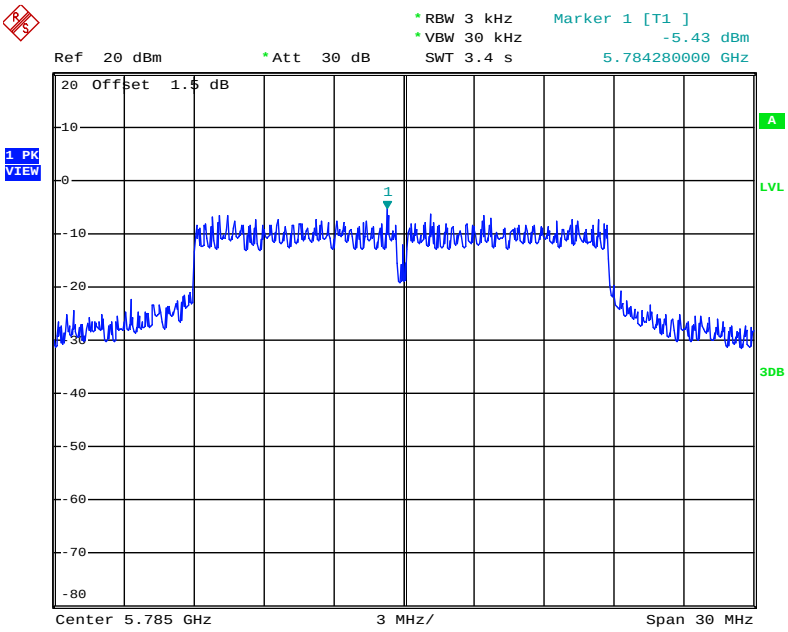
For Master and Client (without radar detection function)

Power Density Plot on Configuration IEEE 802.11n MCS8 HT20 / Chain 1 / 5785 MHz



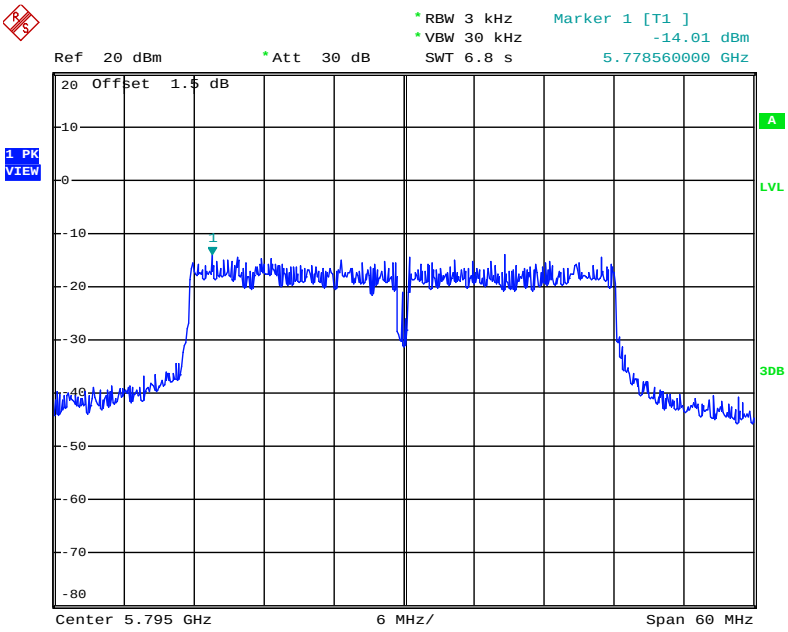
Date: 2.JUL.2014 22:07:24

Power Density Plot on Configuration IEEE 802.11n MCS8 HT20 / Chain 2 / 5785 MHz



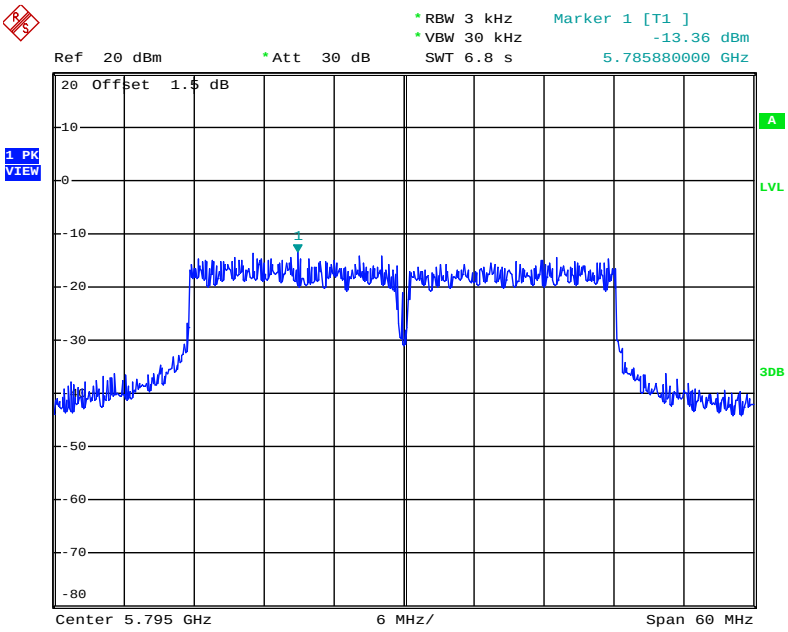
Date: 2.JUL.2014 22:06:51

Power Density Plot on Configuration IEEE 802.11n MCS8 HT40 / Chain 1 / 5795 MHz



Date: 2.JUL.2014 22:11:06

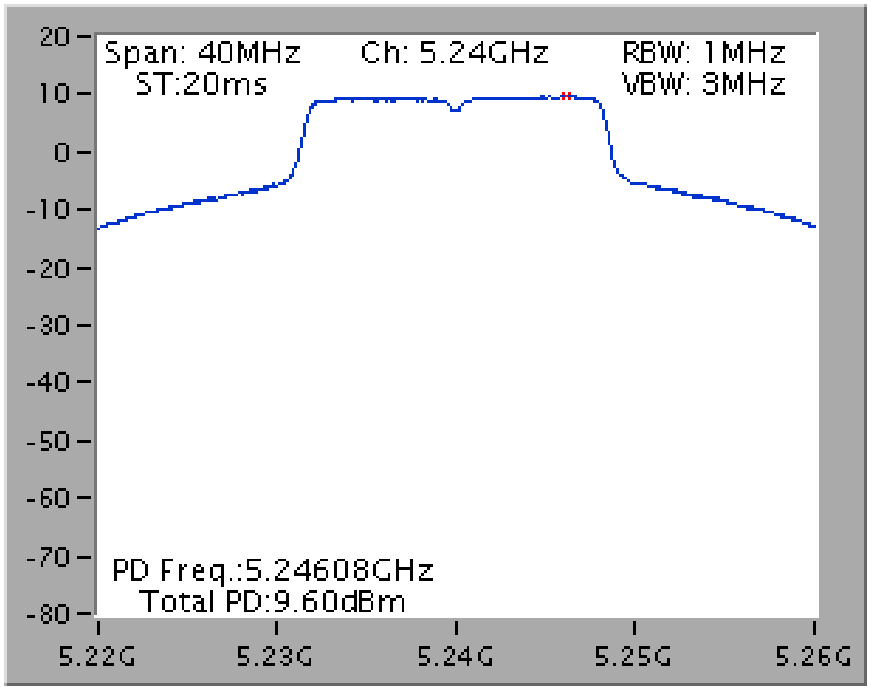
Power Density Plot on Configuration IEEE 802.11n MCS8 HT40 / Chain 2 / 5795 MHz



Date: 2.JUL.2014 22:11:37

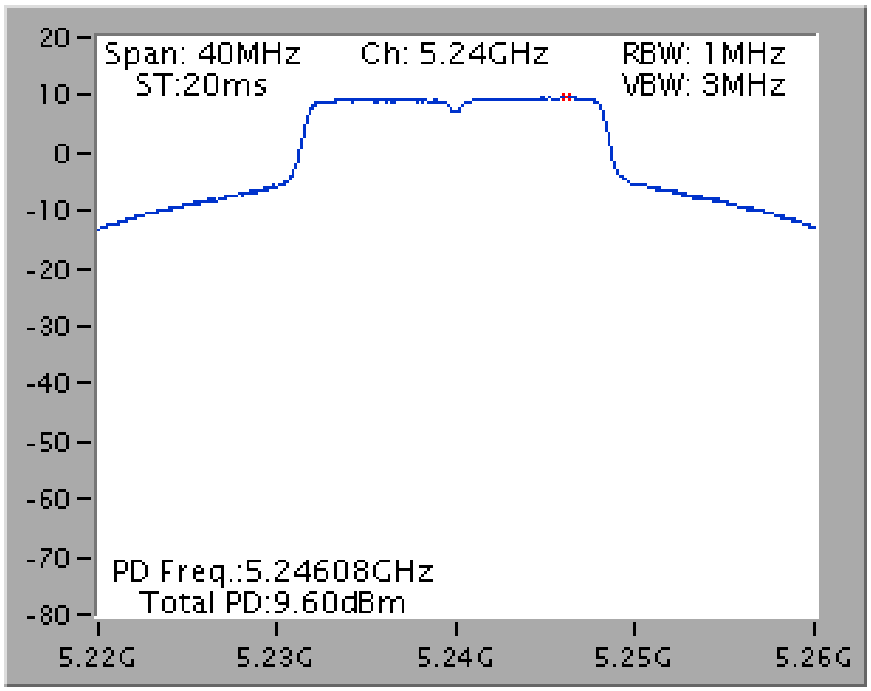
For Master mode

Power Density Plot on Configuration IEEE 802.11a / Chain 1 / 5240 MHz



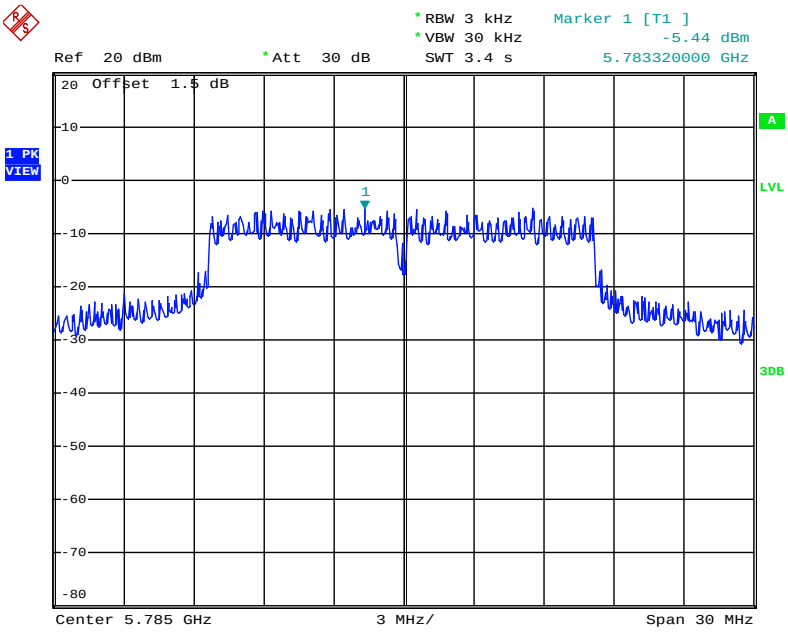
For Client mode (without radar detection function)

Power Density Plot on Configuration IEEE 802.11a / Chain 1 / 5240 MHz



For Master and Client (without radar detection function)

Power Density Plot on Configuration IEEE 802.11a / Chain 1 / 5785 MHz



Date: 2.JUL.2014 22:13:41

4.5. Radiated Emissions Measurement

4.5.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

In addition, 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	40 GHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, Please refer to section 3.11 for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for peak

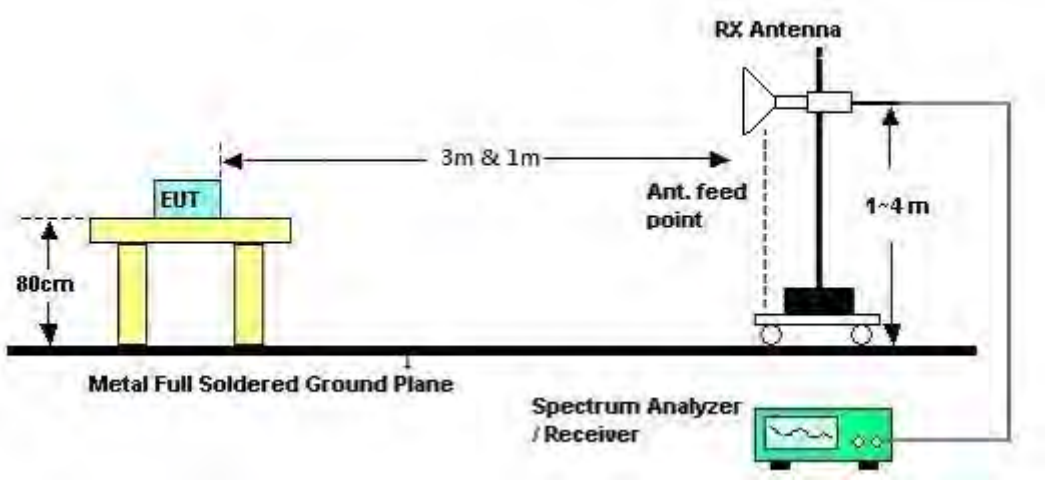
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.5.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz 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: 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 for Radiated Emissions (1GHz~40GHz)

Temperature	22°C	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT20 CH 36 / Chain 1 + Chain 2
Test Date	Jun. 23, 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	15531.60	53.68	74.00	-20.32	44.27	6.13	38.45	35.17	Peak	100	124	HORIZONTAL
2	15535.08	40.99	54.00	-13.01	31.58	6.13	38.45	35.17	Average	100	124	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	15537.88	40.96	54.00	-13.04	31.55	6.13	38.45	35.17	Average	100	201	VERTICAL
2	15549.56	55.03	74.00	-18.97	45.64	6.13	38.43	35.17	Peak	100	201	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT20 CH 40 / Chain 1 + Chain 2
Test Date	Jun. 23, 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	15595.92	53.58	74.00	-20.42	44.27	6.13	38.36	35.18	Peak	100	195	HORIZONTAL
2	15601.56	40.45	54.00	-13.55	31.15	6.13	38.36	35.19	Average	100	195	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	15596.16	40.69	54.00	-13.31	31.38	6.13	38.36	35.18	Average	100	305	VERTICAL
2	15601.84	52.91	74.00	-21.09	43.61	6.13	38.36	35.19	Peak	100	305	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT20 CH 48 / Chain 1 + Chain 2
Test Date	Jun. 23, 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	15718.60	43.03	54.00	-10.97	33.91	6.14	38.19	35.21	Average	112	137	HORIZONTAL
2	15723.56	55.61	74.00	-18.39	46.49	6.14	38.19	35.21	Peak	112	137	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	15716.08	40.27	54.00	-13.73	31.15	6.14	38.19	35.21	Average	100	65	VERTICAL
2	15724.32	53.56	74.00	-20.44	44.44	6.14	38.19	35.21	Peak	100	65	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT20 CH 149 / Chain 1 + Chain 2
Test Date	Jun. 24, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11489.84	50.83	74.00	-23.17	41.38	5.11	39.39	35.05	Peak	100	193	HORIZONTAL
2	11491.48	38.24	54.00	-15.76	28.79	5.11	39.39	35.05	Average	100	193	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11486.66	51.46	74.00	-22.54	42.01	5.11	39.39	35.05	Peak	100	152	VERTICAL
2	11487.30	38.39	54.00	-15.61	28.94	5.11	39.39	35.05	Average	100	152	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT20 CH 157 / Chain 1 + Chain 2
Test Date	Jun. 24, 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	11571.16	61.62	74.00	-12.38	52.10	5.14	39.44	35.06	Peak	142	150	HORIZONTAL
2	11572.58	49.53	54.00	-4.47	40.01	5.14	39.44	35.06	Average	142	150	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	11571.68	53.34	54.00	-0.66	43.82	5.14	39.44	35.06	Average	100	221	VERTICAL
2	11571.84	66.39	74.00	-7.61	56.87	5.14	39.44	35.06	Peak	100	221	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT20 CH 165 / Chain 1 + Chain 2
Test Date	Jun. 24, 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	11645.62	51.70	74.00	-22.30	42.13	5.16	39.48	35.07	Peak	100	164	HORIZONTAL
2	11649.02	39.12	54.00	-14.88	29.56	5.16	39.48	35.08	Average	100	164	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	11651.38	44.48	54.00	-9.52	34.91	5.16	39.49	35.08	Average	100	222	VERTICAL
2	11652.02	57.68	74.00	-16.32	48.11	5.16	39.49	35.08	Peak	100	222	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT40 CH 38 / Chain 1 + Chain 2
Test Date	Jun. 23, 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	15562.20	40.75	54.00	-13.25	31.39	6.13	38.40	35.17	Average	100	238	HORIZONTAL
2	15568.00	53.13	74.00	-20.87	43.77	6.13	38.40	35.17	Peak	100	238	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	15561.56	40.48	54.00	-13.52	31.12	6.13	38.40	35.17	Average	100	12	VERTICAL
2	15573.68	53.47	74.00	-20.53	44.12	6.13	38.40	35.18	Peak	100	12	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT40 CH 46 / Chain 1 + Chain 2
Test Date	Jun. 23, 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	15686.68	40.15	54.00	-13.85	30.99	6.14	38.23	35.21	Average	100	53	HORIZONTAL
2	15692.16	53.00	74.00	-21.00	43.84	6.14	38.23	35.21	Peak	100	53	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	15682.40	40.38	54.00	-13.62	31.22	6.14	38.23	35.21	Average	100	184	VERTICAL
2	15690.20	52.49	74.00	-21.51	43.33	6.14	38.23	35.21	Peak	100	184	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT40 CH 151 / Chain 1 + Chain 2
Test Date	Jun. 24, 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	11509.56	38.08	54.00	-15.92	28.61	5.12	39.40	35.05	Average	100	241	HORIZONTAL
2	11512.64	50.66	74.00	-23.34	41.19	5.12	39.40	35.05	Peak	100	241	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11505.22	50.69	74.00	-23.31	41.22	5.12	39.40	35.05	Peak	100	185	VERTICAL
2	11507.86	38.23	54.00	-15.77	28.76	5.12	39.40	35.05	Average	100	185	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT40 CH 159 / Chain 1 + Chain 2
Test Date	Jun. 24, 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	11591.06	51.86	74.00	-22.14	42.33	5.14	39.45	35.06	Peak	100	156	HORIZONTAL
2	11592.28	38.92	54.00	-15.08	29.39	5.14	39.45	35.06	Average	100	156	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	11587.06	51.45	74.00	-22.55	41.92	5.14	39.45	35.06	Peak	102	310	VERTICAL
2	11594.80	40.85	54.00	-13.15	31.32	5.14	39.45	35.06	Average	102	310	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11a CH 36 / Chain 1
Test Date	Jun. 23, 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	15534.76	52.71	74.00	-21.29	43.30	6.13	38.45	35.17	Peak	100	91	HORIZONTAL
2	15542.52	40.89	54.00	-13.11	31.48	6.13	38.45	35.17	Average	100	91	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	15539.36	40.68	54.00	-13.32	31.27	6.13	38.45	35.17	Average	100	158	VERTICAL
2	15543.80	53.45	74.00	-20.55	44.06	6.13	38.43	35.17	Peak	100	158	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11a CH 40 / Chain 1
Test Date	Jun. 23, 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	15598.32	54.04	74.00	-19.96	44.73	6.13	38.36	35.18	Peak	100	161	HORIZONTAL
2	15599.12	41.70	54.00	-12.30	32.40	6.13	38.36	35.19	Average	100	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	15601.72	41.65	54.00	-12.35	32.35	6.13	38.36	35.19	Average	100	193	VERTICAL
2	15604.52	54.00	74.00	-20.00	44.70	6.13	38.36	35.19	Peak	100	193	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11a CH 48 / Chain 1
Test Date	Jun. 23, 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	15714.12	41.02	54.00	-12.98	31.90	6.14	38.19	35.21	Average	100	125	HORIZONTAL
2	15716.48	53.02	74.00	-20.98	43.90	6.14	38.19	35.21	Peak	100	125	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	15719.16	41.98	54.00	-12.02	32.86	6.14	38.19	35.21	Average	100	190	VERTICAL
2	15719.92	54.23	74.00	-19.77	45.11	6.14	38.19	35.21	Peak	100	190	VERTICAL

Temperature	22°C	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11a CH 149 / Chain 1
Test Date	Jun. 24, 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	11486.88	51.48	74.00	-22.52	42.03	5.11	39.39	35.05	Peak	100	133	HORIZONTAL
2	11488.92	38.79	54.00	-15.21	29.34	5.11	39.39	35.05	Average	100	133	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11490.92	40.30	54.00	-13.70	30.85	5.11	39.39	35.05	Average	100	222	VERTICAL
2	11493.38	53.16	74.00	-20.84	43.70	5.12	39.39	35.05	Peak	100	222	VERTICAL

Temperature	22°C	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11a CH 157 / Chain 1
Test Date	Jun. 24, 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	11570.14	59.13	74.00	-14.87	49.61	5.14	39.44	35.06	Peak	152	242	HORIZONTAL
2	11571.10	45.73	54.00	-8.27	36.21	5.14	39.44	35.06	Average	152	242	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	11565.66	66.69	74.00	-7.31	57.18	5.13	39.44	35.06	Peak	100	222	VERTICAL
2	11570.54	51.81	54.00	-2.19	42.29	5.14	39.44	35.06	Average	100	222	VERTICAL

Temperature	22℃	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11a CH 165 / Chain 1
Test Date	Jun. 24, 2014		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11646.10	39.85	54.00	-14.15	30.28	5.16	39.48	35.07	Average	100	249	HORIZONTAL
2	11652.32	52.45	74.00	-21.55	42.88	5.16	39.49	35.08	Peak	100	249	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	11650.06	54.71	74.00	-19.29	45.15	5.16	39.48	35.08	Peak	125	287	VERTICAL
2	11651.34	41.36	54.00	-12.64	31.79	5.16	39.49	35.08	Average	125	287	VERTICAL

Note:

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

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

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

4.6. Band Edge Emissions Measurement

4.6.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

In addition, 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, Please refer to section 3.11 for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for Peak

4.6.3. Test Procedures

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

4.6.4. Test Setup Layout

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

4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

Temperature	22°C	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT20 CH 36, 40, 48 / Chain 1 + Chain 2
Test Date	Jun. 23, 2014		

Channel 36

	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	5149.60	69.53	74.00	-4.47	66.90	3.43	34.11	34.91	Peak	106	104	VERTICAL
2	5150.00	52.56	54.00	-1.44	49.93	3.43	34.11	34.91	Average	106	104	VERTICAL
3	5174.80	105.20			102.51	3.44	34.16	34.91	Average	106	104	VERTICAL
4	5176.40	116.43			113.74	3.44	34.16	34.91	Peak	106	104	VERTICAL

Item 3, 4 are the fundamental frequency at 5180 MHz.

Channel 40

	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	5147.60	73.31	74.00	-0.69	70.68	3.43	34.11	34.91	Peak	100	307	VERTICAL
2	5150.00	51.01	54.00	-2.99	48.38	3.43	34.11	34.91	Average	100	307	VERTICAL
3	5206.40	109.91			107.19	3.45	34.18	34.91	Average	100	307	VERTICAL
4	5207.20	121.60			118.88	3.45	34.18	34.91	Peak	100	307	VERTICAL

Item 3, 4 are the fundamental frequency at 5200 MHz.

Channel 48

	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	5147.60	73.37	74.00	-0.63	70.74	3.43	34.11	34.91	Peak	111	307	VERTICAL
2	5150.00	51.18	54.00	-2.82	48.55	3.43	34.11	34.91	Average	111	307	VERTICAL
3	5246.00	111.22			108.42	3.46	34.25	34.91	Average	111	307	VERTICAL
4	5247.80	123.52			120.72	3.46	34.25	34.91	Peak	111	307	VERTICAL

Item 3, 4 are the fundamental frequency at 5240 MHz.

Temperature	22°C	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT20 CH 149, 157, 165 / Chain 1 + Chain 2
Test Date	Jun. 24, 2014		

Channel 149

	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	5714.80	60.40	68.20	-7.80	57.06	3.60	34.68	34.94	Peak	100	258	VERTICAL
2	5724.60	78.02	78.20	-0.18	74.67	3.60	34.69	34.94	Peak	100	258	VERTICAL
3	5740.20	99.64			96.27	3.61	34.70	34.94	Average	100	258	VERTICAL
4	5740.60	112.33			108.96	3.61	34.70	34.94	Peak	100	258	VERTICAL

Item 3, 4 are the fundamental frequency at 5745 MHz.

Channel 157

	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	5713.40	67.70	68.20	-0.50	64.36	3.60	34.68	34.94	Peak	100	280	VERTICAL
2	5725.00	68.56	78.20	-9.64	65.21	3.60	34.69	34.94	Peak	100	280	VERTICAL
3	5791.40	119.45			116.04	3.63	34.72	34.94	Peak	100	280	VERTICAL
4	5791.80	106.74			103.33	3.63	34.72	34.94	Average	100	280	VERTICAL
5	5850.40	72.54	78.20	-5.66	69.11	3.64	34.74	34.95	Peak	100	280	VERTICAL
6	5870.40	65.09	68.20	-3.11	61.65	3.65	34.74	34.95	Peak	100	280	VERTICAL

Item 3, 4 are the fundamental frequency at 5785 MHz.

Channel 165

	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	5819.80	103.03			99.62	3.63	34.73	34.95	Average	100	318	VERTICAL
2	5826.60	115.98			112.57	3.63	34.73	34.95	Peak	100	318	VERTICAL
3	5850.00	76.10	78.20	-2.10	72.67	3.64	34.74	34.95	Peak	100	318	VERTICAL
4	5860.40	67.94	68.20	-0.26	64.50	3.65	34.74	34.95	Peak	100	318	VERTICAL

Item 1, 2 are the fundamental frequency at 5825 MHz.

Temperature	22°C	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT40 CH 38, 46 / Chain 1 + Chain 2
Test Date	Jun. 23, 2014		

Channel 38

	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	5142.80	68.81	74.00	-5.19	66.18	3.43	34.11	34.91	Peak	100	284	VERTICAL
2	5150.00	52.52	54.00	-1.48	49.89	3.43	34.11	34.91	Average	100	284	VERTICAL
3	5174.40	93.77			91.08	3.44	34.16	34.91	Average	100	284	VERTICAL
4	5174.80	105.79			103.10	3.44	34.16	34.91	Peak	100	284	VERTICAL

Item 3, 4 are the fundamental frequency at 5190 MHz.

Channel 46

	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	5145.80	70.10	74.00	-3.90	67.47	3.43	34.11	34.91	Peak	114	319	VERTICAL
2	5150.00	52.55	54.00	-1.45	49.92	3.43	34.11	34.91	Average	114	319	VERTICAL
3	5243.80	114.99			112.19	3.46	34.25	34.91	Peak	114	319	VERTICAL
4	5245.00	103.69			100.89	3.46	34.25	34.91	Average	114	319	VERTICAL

Item 3, 4 are the fundamental frequency at 5230 MHz.

Temperature	22°C	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11n MCS8 HT40 CH 151, 159 / Chain 1 + Chain 2
Test Date	Jun. 24, 2014		

Channel 151

	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	5712.20	67.72	68.20	-0.48	64.38	3.60	34.68	34.94	Peak	100	225	VERTICAL
2	5725.00	74.83	78.20	-3.37	71.48	3.60	34.69	34.94	Peak	100	225	VERTICAL
3	5769.00	93.93			90.54	3.62	34.71	34.94	Average	100	225	VERTICAL
4	5770.20	106.77			103.38	3.62	34.71	34.94	Peak	100	225	VERTICAL

Item 3, 4 are the fundamental frequency at 5755 MHz.

Channel 159

	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	5708.20	60.41	68.20	-7.79	57.07	3.60	34.68	34.94	Peak	102	80	VERTICAL
2	5724.20	67.22	78.20	-10.98	63.87	3.60	34.69	34.94	Peak	102	80	VERTICAL
3	5787.00	112.63			109.22	3.63	34.72	34.94	Peak	102	80	VERTICAL
4	5787.40	99.67			96.26	3.63	34.72	34.94	Average	102	80	VERTICAL
5	5851.20	71.31	78.20	-6.89	67.88	3.64	34.74	34.95	Peak	102	80	VERTICAL
6	5865.20	67.07	68.20	-1.13	63.63	3.65	34.74	34.95	Peak	102	80	VERTICAL

Item 3, 4 are the fundamental frequency at 5795 MHz.

Temperature	22°C	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11a CH 36, 40, 48 / Chain 1
Test Date	Jun. 23, 2014		

Channel 36

	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	5149.60	73.77	74.00	-0.23	71.14	3.43	34.11	34.91	Peak	100	283	VERTICAL
2	5150.00	53.11	54.00	-0.89	50.48	3.43	34.11	34.91	Average	100	283	VERTICAL
3	5186.00	103.77			101.08	3.44	34.16	34.91	Average	100	283	VERTICAL
4	5186.80	114.11			111.42	3.44	34.16	34.91	Peak	100	283	VERTICAL

Item 3, 4 are the fundamental frequency at 5180 MHz.

Channel 40

	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	5150.00	50.35	54.00	-3.65	47.72	3.43	34.11	34.91	Average	100	308	VERTICAL
2	5150.00	73.19	74.00	-0.81	70.56	3.43	34.11	34.91	Peak	100	308	VERTICAL
3	5202.00	118.71			115.99	3.45	34.18	34.91	Peak	100	308	VERTICAL
4	5206.40	106.93			104.21	3.45	34.18	34.91	Average	100	308	VERTICAL

Item 3, 4 are the fundamental frequency at 5200 MHz.

Channel 48

	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	5147.60	73.46	74.00	-0.54	70.83	3.43	34.11	34.91	Peak	100	284	VERTICAL
2	5150.00	49.24	54.00	-4.76	46.61	3.43	34.11	34.91	Average	100	284	VERTICAL
3	5237.00	109.74			106.96	3.46	34.23	34.91	Average	100	284	VERTICAL
4	5237.00	121.25			118.47	3.46	34.23	34.91	Peak	100	284	VERTICAL
5	5351.20	64.72	74.00	-9.28	61.75	3.49	34.39	34.91	Peak	100	284	VERTICAL
6	5352.40	46.86	54.00	-7.14	43.89	3.49	34.39	34.91	Average	100	284	VERTICAL

Item 3, 4 are the fundamental frequency at 5240 MHz.

Temperature	22°C	Humidity	61%
Test Engineer	Nick Peng	Configurations	IEEE 802.11a CH 149, 157, 165 / Chain 1
Test Date	Jun. 24, 2014		

Channel 149

	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	5713.60	64.03	68.20	-4.17	60.69	3.60	34.68	34.94	Peak	100	255	VERTICAL
2	5724.40	77.58	78.20	-0.62	74.23	3.60	34.69	34.94	Peak	100	255	VERTICAL
3	5749.00	110.87			107.50	3.61	34.70	34.94	Peak	100	255	VERTICAL
4	5752.00	99.00			95.63	3.61	34.70	34.94	Average	100	255	VERTICAL

Item 3, 4 are the fundamental frequency at 5745 MHz.

Channel 157

	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	5703.40	67.36	68.20	-0.84	64.03	3.59	34.68	34.94	Peak	100	263	VERTICAL
2	5721.40	71.58	78.20	-6.62	68.23	3.60	34.69	34.94	Peak	100	263	VERTICAL
3	5787.80	117.87			114.46	3.63	34.72	34.94	Peak	100	263	VERTICAL
4	5789.00	105.91			102.50	3.63	34.72	34.94	Average	100	263	VERTICAL
5	5854.40	72.77	78.20	-5.43	69.34	3.64	34.74	34.95	Peak	100	263	VERTICAL
6	5864.40	68.12	68.20	-0.08	64.68	3.65	34.74	34.95	Peak	100	263	VERTICAL

Item 3, 4 are the fundamental frequency at 5785 MHz.

Channel 165

	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	5818.20	102.03			98.63	3.63	34.72	34.95	Average	108	256	VERTICAL
2	5819.20	113.56			110.16	3.63	34.72	34.95	Peak	108	256	VERTICAL
3	5860.00	68.08	68.20	-0.12	64.64	3.65	34.74	34.95	Peak	108	256	VERTICAL

Item 1, 2 are the fundamental frequency at 5825 MHz.

Note:

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

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

4.7. Frequency Stability Measurement

4.7.1. Limit

In-band emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band (IEEE 802.11n specification).

4.7.2. Measuring Instruments and Setting

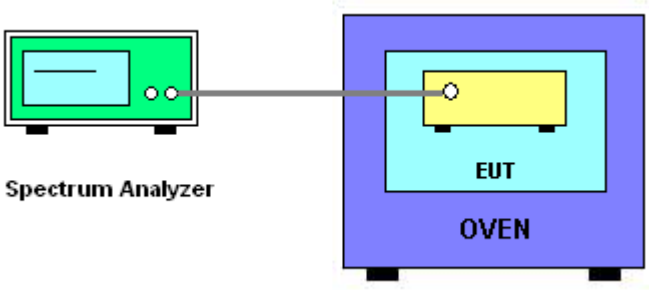
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Entire absence of modulation emissions bandwidth
RBW	10 kHz
VBW	10 kHz
Sweep Time	Auto

4.7.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature is -10°C~60°C.

4.7.4. Test Setup Layout



4.7.5. Test Deviation

There is no deviation with the original standard.

4.7.6. EUT Operation during Test

The EUT was programmed to be in continuously un-modulation transmitting mode.

4.7.7. Test Result of Frequency Stability

Temperature	26°C	Humidity	63%
Test Engineer	Kenneth Huang	Test Date	Jul. 03, 2014

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	5200 MHz
126.50	5200.0100
110.00	5200.0000
93.50	5199.9800
Max. Deviation (MHz)	**0.020000**
Max. Deviation (ppm)	**3.85**

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)
(°C)	5200 MHz
-10	5199.9500
0	5199.9700
10	5200.0000
20	5200.0000
30	5200.0200
40	5200.0700
50	5200.0800
60	5200.0870
Max. Deviation (MHz)	**0.087000**
Max. Deviation (ppm)	**16.73**

4.8. Antenna Requirements

4.8.1. 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.

4.8.2. 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
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 01, 2013	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Dec. 17, 2013	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Dec. 16, 2013	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Oct. 23, 2013	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100019	9kHz~40GHz	Dec. 02, 2013	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R.	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N.C.R.	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Nov. 29, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2013	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Sep. 18, 2013	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Sep. 18, 2013	Conducted (TH01-CB)

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

NCR means Non-Calibration required.

6. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	Remark
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%