TEST REPORT

of

FCC PART 15 SUBPART E

☐ New Application; ☐ Class I PC; ☒ Class II PC

Product :	**802.11n 2x2 MIMO BaseStation**
Brand:	**N/A**
Model:	**RocketM5**
Model Difference:	**N/A**
FCC ID:	**SWX-RM5**
FCC Rule Part:	**§15.407, Cat:NII**
Applicant:	**Ubiquiti Networks, Inc.**
Address:	**12F, No105, Song Ren Rd., SinYi District, Taipei, Taiwan**

Test Performed by:

International Standards Laboratory
<Lung-Tan LAB>
*Site Registration No.
BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;
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Report No.: **ISL-14LR162FE**

Issue Date : **2014/08/06**

Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

This report MUST not be used to claim product endorsement by TAF, NVLAP or any agency of the Government.

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VERIFICATION OF COMPLIANCE

Applicant:	Ubiquiti Networks, Inc.
Product Description:	802.11n 2x2 MIMO BaseStation
Brand Name:	N/A
Model No.:	RocketM5
Model Difference:	N/A
FCC ID:	SWX-RM5
FCC Rule Part:	§15.407, Cat: NII
Date of test:	2014/07/15 ~ 2014/08/06
Date of EUT Received:	2014/07/15

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

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	Dion Chang / Engineer		
Prepared By:	Eva Kao	***Date:***	2014/08/06
	Eva Kao / Technical Supervisor		
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Version

Version No.	Date	Description
00	2014/08/06	Initial creation of document

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1. GENERAL INFORMATION

1.1. Product Description

General:

Product Name	802.11n 2x2 MIMO BaseStation	
Brand Name	N/A	
Model Name	RocketM5	
Model Difference	N/A	
Point to Point Mode	Yes.	
DFS Mode	N/A for band 5150-5250MHz	
TPC	No	
Operation Environment	Fixed Point to Point, Outdoor used	
Gigabit LAN	one provided	
Power Supply	24Vdc from AC/DC adapter	
	Adapter:	Model: GP-B240-100

WLAN: 2X2 SM-MIMO

Wi-Fi	Frequency Range (MHz)	Channels	Peak / Average Rated Power	Modulation Technology
802.11a	5180 – 5240(NII)	4	11.19dBm (AV)	OFDM
802.11an	HT20, 5180 – 5240(NII)	4	10.73dBm (AV)	
	HT40, 5190 – 5230(NII)	3	5.64dBm (AV)	
Antenna Designation		Revised SMA type, Sector Antenna / 20dBi According to KDB662911 D01 SM-MIMO signals could be considered uncorrelated for purposes of directional gain computation. Directional gain = G_{ANT}		

This report applies for Wifi frequency band 5150 MHz– 5250 MHz

Remark: The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: SWX-RM5** filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.

1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2009). Radiated testing was performed at an antenna to EUT distance 3 meters.

KDB Document: 789033 D02 General UNII Test Procedures New Rules v01

FCC 14-30 Revision UNII

594280 D02 U-NII Device Security v01

1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of International Standards Laboratory <Lung-Tan LAB> No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd., Lung-Tan Hsiang, Tao Yuan County 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number is: TW1036, Canada Registration Number: 4067B-3.

1.5. Special Accessories

Not available for this EUT intended for grant.

1.6. Equipment Modifications

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4-2009.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” Is still within the 3Db illumination BW of the measurement antenna. According to the requirements in Section 8 and 13 and Subclause 8.3.1.2 of ANSI C63.4-2009.

2.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

Table 1-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	NoteBook	HP	440 G1	2CE40911GZ	N/A	No- Shielding

3. SUMMARY OF TEST RESULT

FCC Rules	Description Of Test	Result
§15.207	AC Power Line Conducted Emission	Compliant
§15.407(a)	26dB/99% Emission Bandwidth	Compliant
§15.407(e)	6dB Emission Bandwidth	N/A
§15.407(a)(1)(iii)	Average Output Power/ Spectral Density Measurement	Compliant
§15.407(b)	Undesirable Emission – Conducted Measurement	N/A
§15.407(b)	Undesirable Emission – Radiated Measurement	Compliant
§15.407(c)	Transmission in case of Absence of Information	Compliant
§15.407(g)	Frequency Stability	Compliant
§15.407 (a)(1)(iii)	Antenna Requirement	Compliant
§15.407(d)	TPC and DFS Measurement	N/A
§15.407(i)	Device Security	Compliant

4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.
Test program used to control the EUT for staying in continuous transmitting mode is programmed.

5150MHz-5250MHz:
a mode: Channel lowest (5180MHz)、Mid (5200MHz) and Highest (5240MHz) with 6Mbps data rate are chosen for full testing.

HT 20 mode: Channel lowest (5180MHz)、Mid (5200MHz) and Highest (5240MHz) with 6.5Mbps data rate are chosen for full testing

HT 40 mode: Channel lowest (5190MHz) 、Mid (5210MHz)and Highest (5230MHz) with 13.5Mbps data rate are chosen for full testing

The worst case 802.11 n HT20 (5GHz) was reported for Radiated Emission.

5. AC POWER LINE CONDUCTED EMISSION TEST

5.1. Standard Applicable

According to §15.207, frequency range within 150 KHz to 30 MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

5.2. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Conduction 04-1 Cable	WOKEN	CFD 300-NL	Conduction 04 -1	09/24/2013	09/23/2014
EMI Receiver 16	Rohde & Schwarz	ESCI	101221	05/08/2014	05/07/2015
LISN 18	ROHDE & SCHWARZ	ENV216	101424	03/13/2014	03/12/2015
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/13/2014	03/12/2015

5.3. EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2009.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

5.4. Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

5.5. Measurement Result:

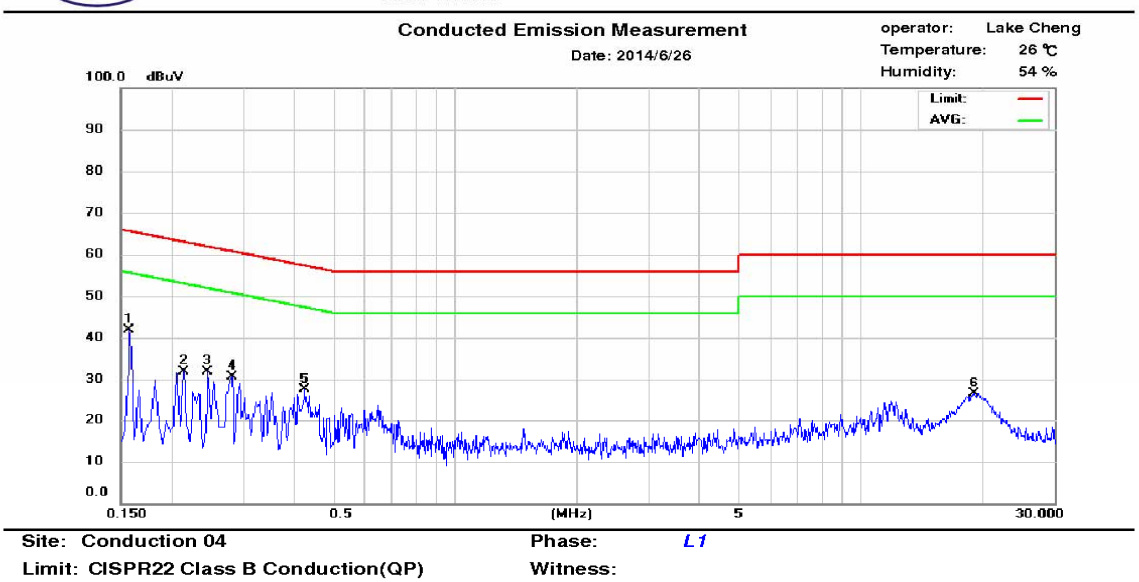
The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Note: Refer to next page for measurement data and plots.

AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode	Test Date:	2014/08/04
Test By:	Dino		

Address:No.120,Lane 180,San Ho Tsuen,Hsin Ho Road,Lung-Tan Hsiang,
Tao Yuan Conty,Taiwan R.O.C.
Tel:03-4071718

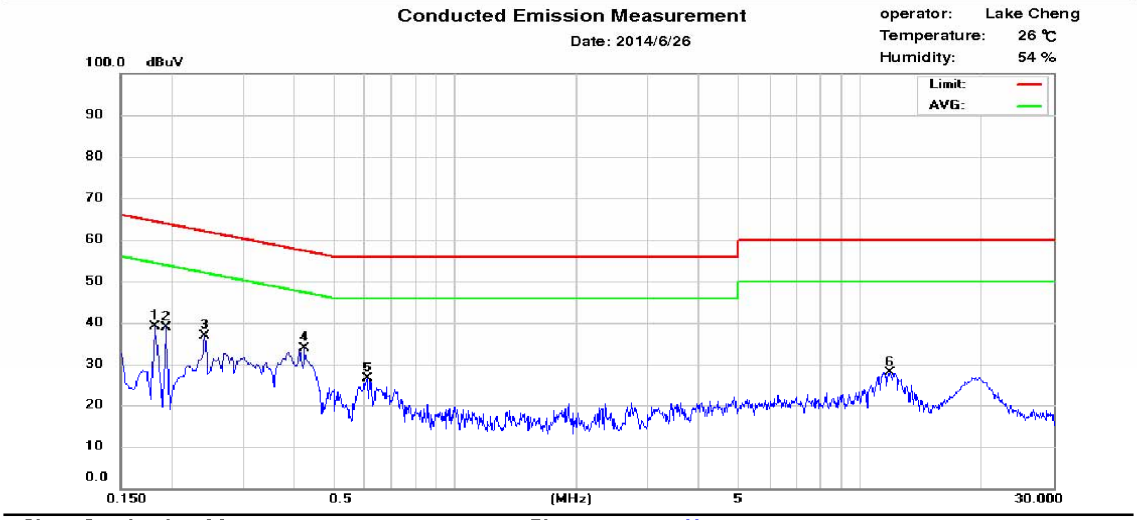


Site: Conduction 04 Phase: L1

Limit: CISPR22 Class B Conduction(QP) Witness:

No.	Frequency (MHz)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)	Note
1	0.158	9.61	30.96	65.57	-34.61	10.39	55.57	-45.18	
2	0.214	9.58	25.27	63.05	-37.78	8.80	53.05	-44.25	
3	0.246	9.58	26.46	61.89	-35.43	9.49	51.89	-42.40	
4	0.282	9.58	23.50	60.76	-37.26	8.79	50.76	-41.97	
5	0.426	9.59	22.42	57.33	-34.91	9.06	47.33	-38.27	
6	19.066	9.93	22.19	60.00	-37.81	17.47	50.00	-32.53	

Address:No.120,Lane 180,San Ho Tsuen,Hsin Ho Road,Lung-Tan Hsiang,
Tao Yuan Conty,Taiwan R.O.C.
Tel:03-4071718



Site: Conduction 04 Phase: N

Limit: CISPR22 Class B Conduction(QP) Witness:

No.	Frequency (MHz)	Correct Factor (dB)	QP Emission (dBuV)	QP Limit (dBuV)	QP Margin (dB)	AVG Emission (dBuV)	AVG Limit (dBuV)	AVG Margin (dB)	Note
1	0.182	9.60	27.24	64.39	-37.15	9.05	54.39	-45.34	
2	0.194	9.60	26.29	63.86	-37.57	8.89	53.86	-44.97	
3	0.242	9.60	27.54	62.03	-34.49	10.22	52.03	-41.81	
4	0.426	9.60	27.78	57.33	-29.55	11.77	47.33	-35.56	
5	0.610	9.60	20.63	56.00	-35.37	7.87	46.00	-38.13	
6	11.910	9.81	21.87	60.00	-38.13	9.44	50.00	-40.56	

6. AVERAGE OUTPUT POWER / SPECTRAL DENSITY MEASUREMENT

6.1 Standard Applicable

According to §15.407(a) Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15 – 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15 – 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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.

(iii) For fixed point-to-point access points operating in the band 5.15 – 5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed pointto-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. 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.

(iv) For mobile and portable client devices in the 5.15 – 5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. 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.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBiare 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.
(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. 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.

NOTE TO PARAGRAPH (a)(3): The Commission strongly recommends that parties employing U-NII devices to provide critical communications services should determine if there are any nearby Government radar systems that could affect their operation.

6.2 Measurement Procedure

For Average Power

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

For Peak Power Spectral Density

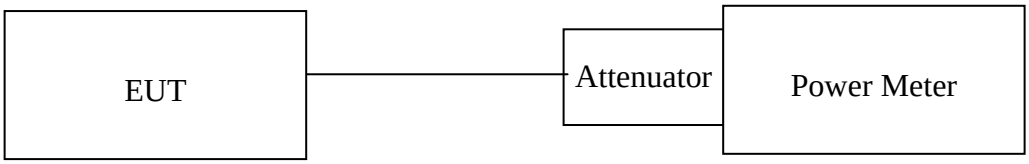
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
3. Set RBW=1MHz,VBW=3MHz, Span=50MHz (Base Mode), Sweep time = Auto, traces 100 sweeps of video averaging for 5150-5725MHz;
4. Set RBW=500KHz,VBW=1.5MHz, Span=60MHz (Base Mode), Sweep time = Auto, traces 100 sweeps of video averaging for 5725-5850MHz;
5. Record the max. reading.
6. Repeat above procedures until all frequency measured were complete.

Refer to section E3 of KDB Document: KDB 789033 D02 General UNII Test Procedures New Rules v01

6.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Power Meter 05	Anritsu	ML2495A	1116010	04/19/2014	04/18/2015
Power Sensor 05	Anritsu	MA2411B	34NKF50	04/19/2014	04/18/2015
Power Sensor 06	DARE	RPR3006W	13I00030SNO33	10/18/2013	10/17/2014
Power Sensor 07	DARE	RPR3006W	13I00030SNO34	10/18/2013	10/17/2014
Temperature Chamber	KSON	THS-B4H100	2287	03/17/2014	03/16/2015
DC Power supply	ABM	51850	N/A	08/16/2013	08/15/2014
AC Power supply	EXTECH	CFC105W	NA	12/19/2013	12/18/2014
Attenuator	Woken	Watt-65m3502	11051601	NA	NA
Splitter	MCLI	PS4-199	12465	12/27/2013	12/26/2014
Spectrum analyzer	Agilent	N9030A	MY51360021	03/29/2014	03/28/2015

6.4 Measurement Equipment Used:



6.5 Measurement Result

Band: 5150-5250 MHz

Average Power Measurement:

2*2

Mode	Freq (MHz)	channel	Output Chain (dBm)		Combine Output Power (dBm)	Limit (dBm)	Result
			Chain 0	chain 1			
802.11a	5180	36	6.09	9.25	10.96	30	Pass
	5200	40	6.6	9.33	11.19	30	Pass
	5240	48	7.12	8.88	11.10	30	Pass

Mode	Freq(MHz)	channel	Output Chain (dBm)		Combine Output Power (dBm)	Limit (dBm)	Result
			Chain 0	chain 1			
802.11n HT20	5180	36	6.6	8.5	10.66	30	Pass
	5200	40	6.83	8.4	10.70	30	Pass
	5240	48	7.02	8.33	10.73	30	Pass

Mode	Freq(MHz)	channel	Output Chain (dBm)		Combine Output Power (dBm)	Limit (dBm)	Result
			Chain 0	chain 1			
802.11n HT40	5190	38	3.5	1.54	5.64	30	Pass
	5210	42	3.64	1.26	5.62	30	Pass
	5230	50	3.71	2.55	6.18	30	Pass

Peak Power Spectral Density Measurement:

802.11a Mode

Frequency MHz	Chain 0 RF Power Density Reading (dBm)	Chain 1 RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level (dBm/MHz)	Maximum Limit (dBm/MHz)
5180	-5.21	-2.98	0.00	-0.94	17
5200	-5.00	-2.61	0.00	-0.64	17
5240	-4.50	-3.63	0.00	-1.03	17

802.11n HT20 Mode

Frequency MHz	Chain 0 RF Power Density Reading (dBm)	Chain 1 RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level (dBm/MHz)	Maximum Limit (dBm/MHz)
5180	-5.82	-3.34	0.00	-1.40	17
5200	-6.14	-3.24	0.00	-1.44	17
5240	-6.15	-5.71	0.00	-2.91	17

802.11HT40 Mode

Frequency MHz	Chain 0 RF Power Density Reading (dBm)	Chain 1 RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level (dBm/MHz)	Maximum Limit (dBm/MHz)
5190	-16.84	-12.47	0.00	-11.12	17
5210	-16.63	-13.24	0.00	-11.60	17
5230	-16.69	-12.66	0.00	-11.21	17

802.11a (Chain 0)

Peak Power Spectral Density Data Plot (CH Low)

Peak Power Spectral Density Data Plot (CH Mid)

Peak Power Spectral Density Data Plot (CH High)

802.11a (Chain 1)

Peak Power Spectral Density Data Plot (CH Low)

Peak Power Spectral Density Data Plot (CH Mid)

Peak Power Spectral Density Data Plot (CH High)

802.11n HT20 (Chain 0)

Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11n HT20 (Chain 1)

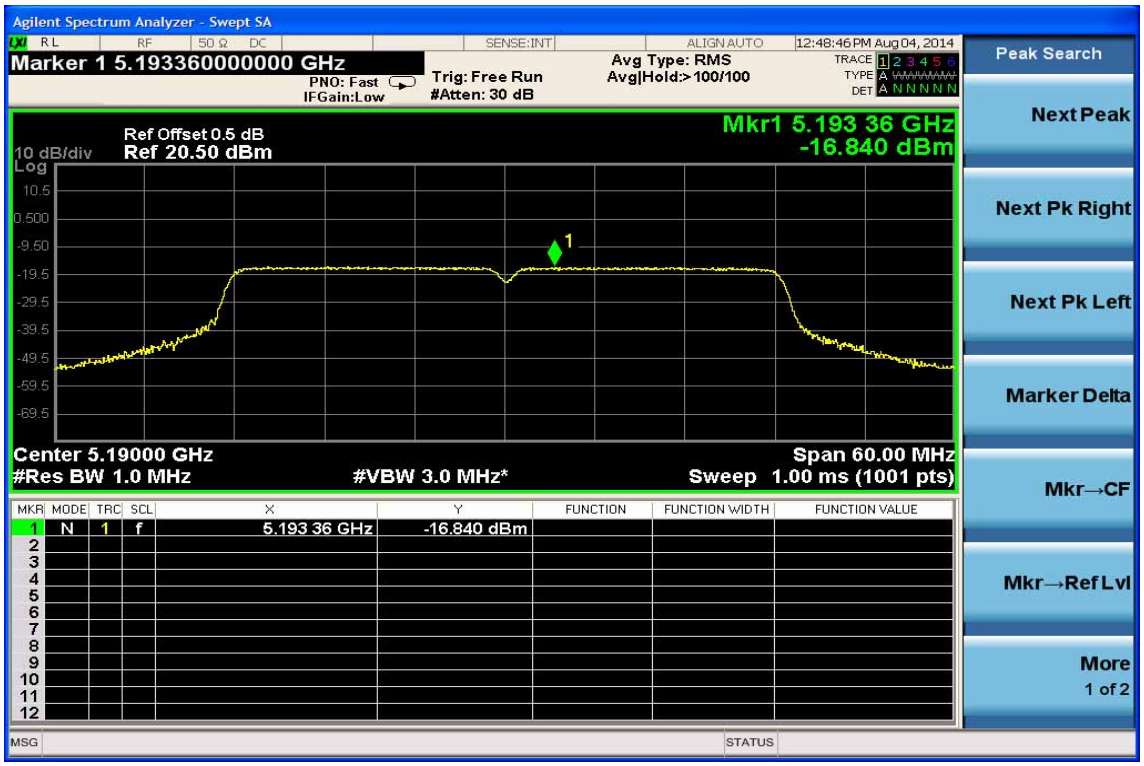
Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

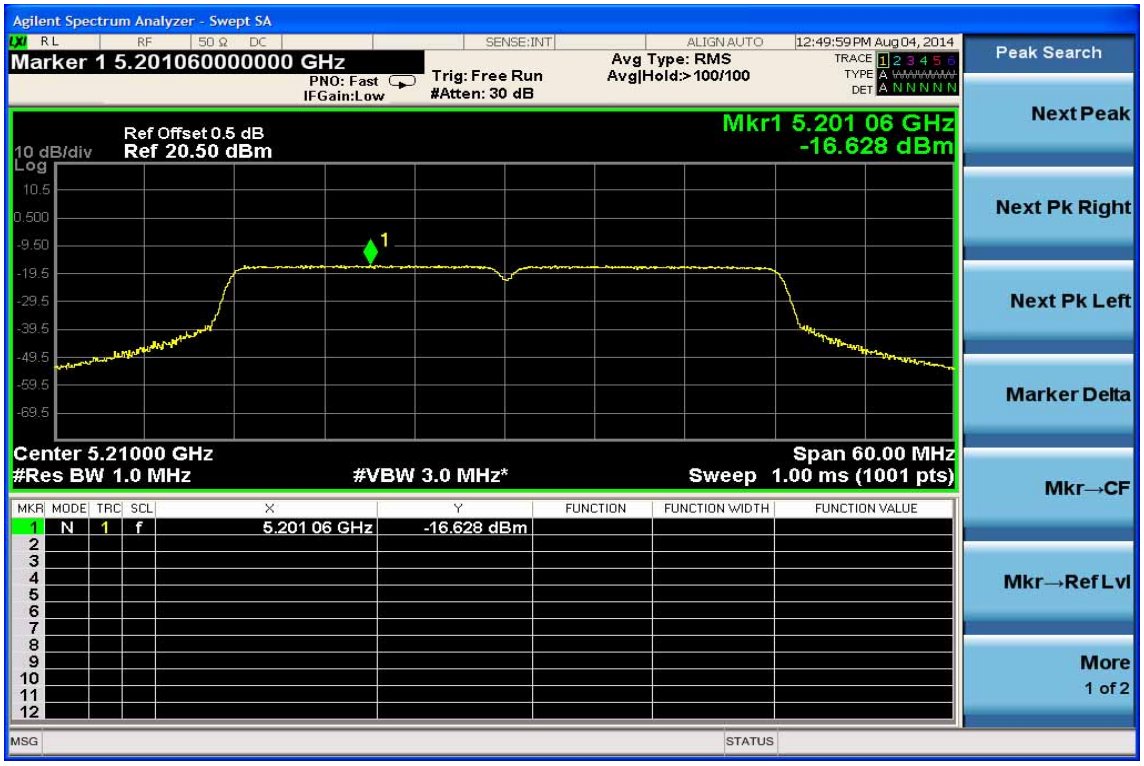
Power Spectral Density Test Plot (CH-High)

802.11n HT40 (Chain 0)

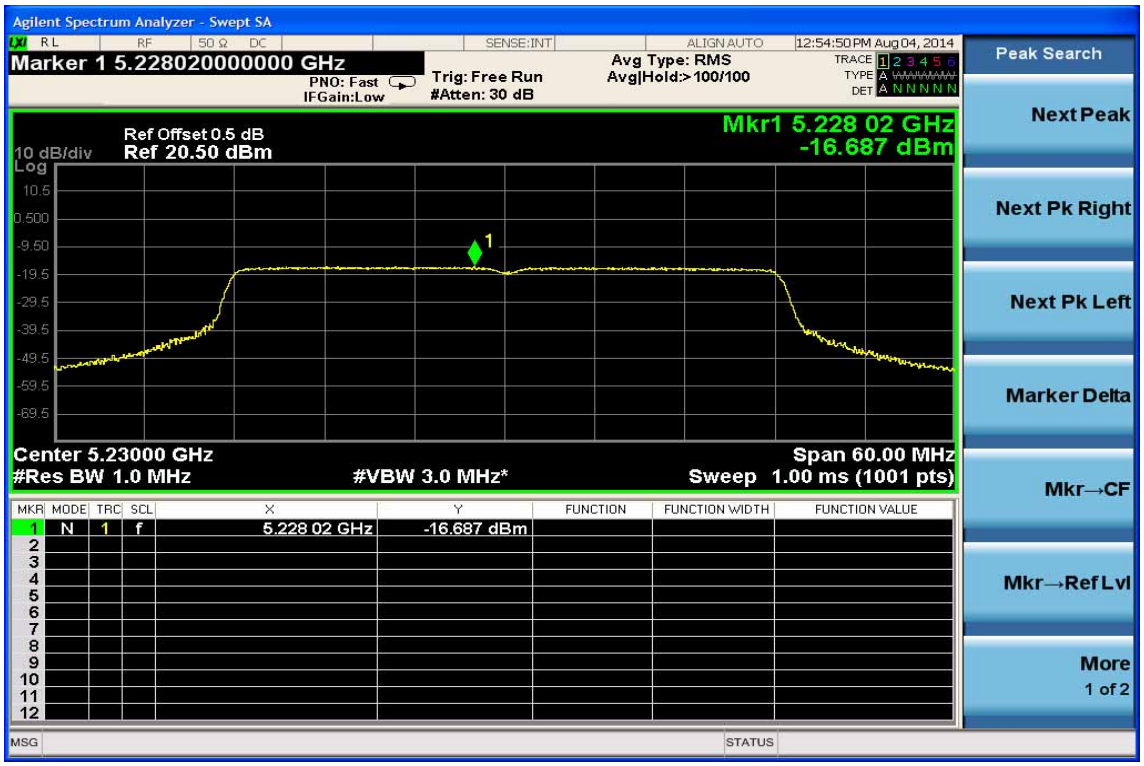
Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)

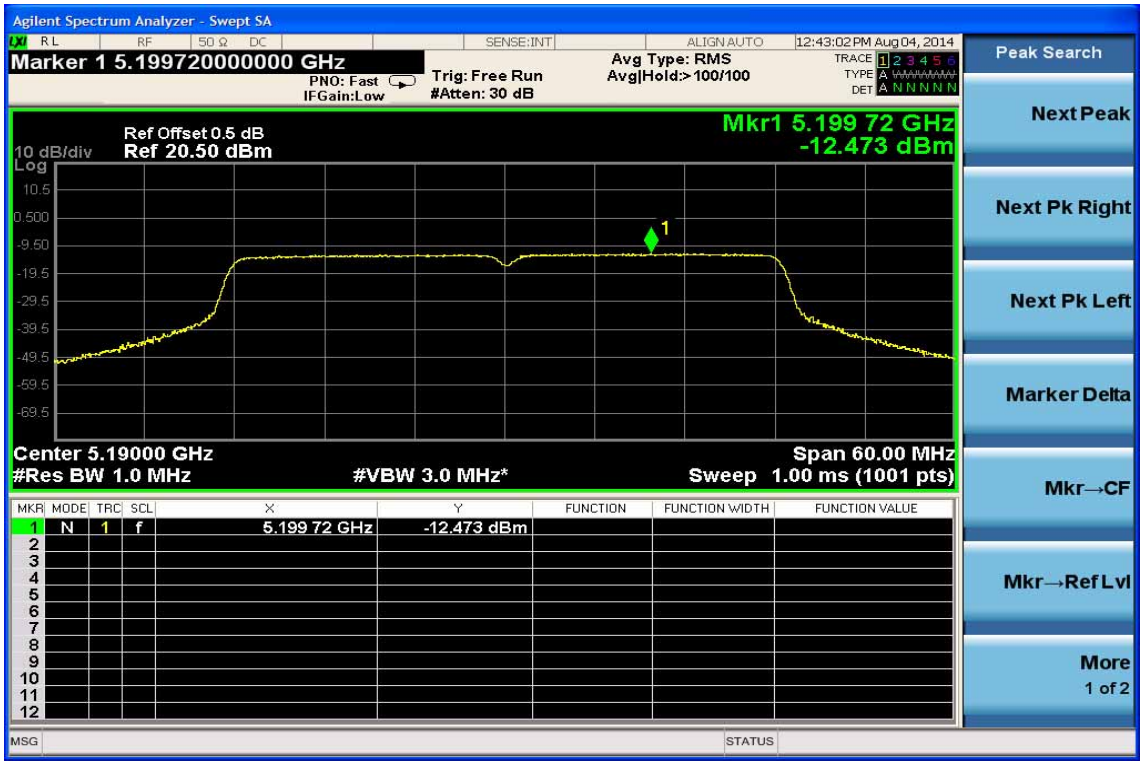


Power Spectral Density Test Plot (CH-High)



802.11n HT40 (Chain 1)

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

7. 26dB /99% EMISSION BANDWIDTH MEASUREMENT

7.1 Standard Applicable

According to §15.407(a). No Limit required.

7.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=300KHz, VBW =1MHz, Span= 30/60MHz,, Sweep=auto
4. Mark the peak frequency and –26dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

Refer to section D of KDB Document: KDB 789033 D02 General UNII Test Procedures New Rules v01

7.3 Measurement Equipment Used:

Refer to section 6.3 for details.

7.4 Test Set-up:

Refer to section 6.4 for details.

7.5 Measurement Result

802.11a Mode

Frequency (MHz)	26dB Bandwidth (MHz)
5180	23.450
5200	23.650
5240	22.850

802.11n HT20 Mode

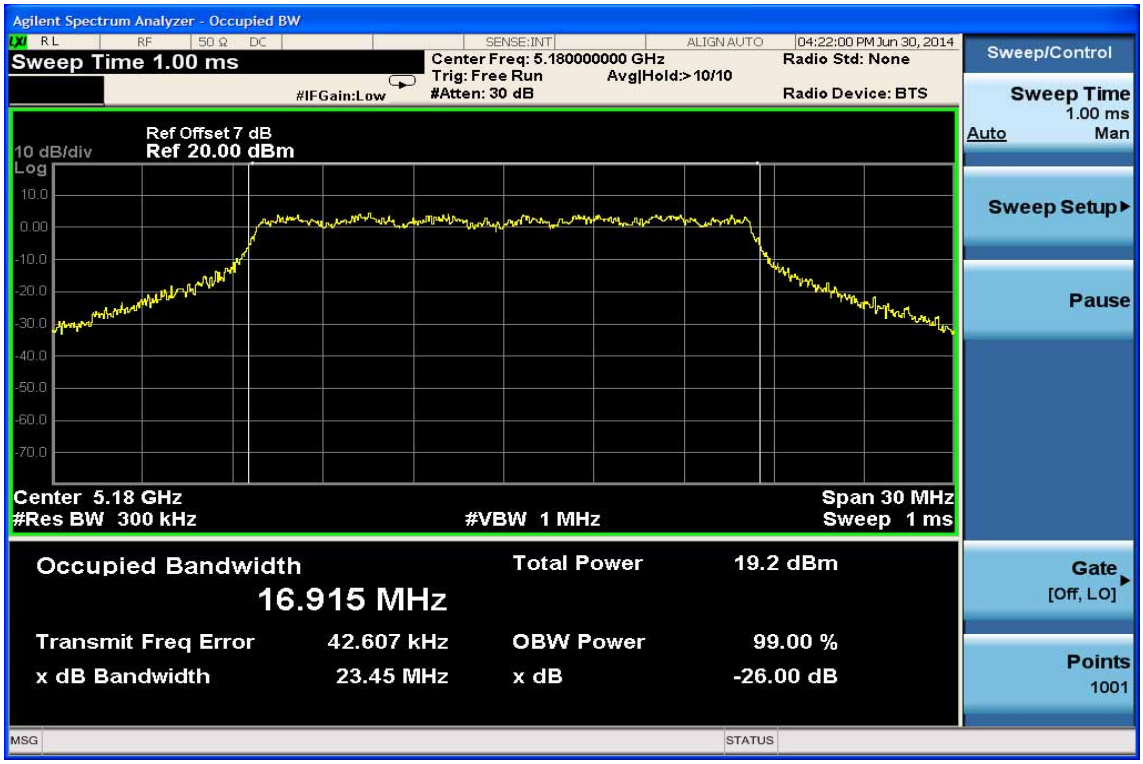
Frequency (MHz)	26dB Bandwidth (MHz)
5180	25.570
5200	24.570
5240	24.680

802.11n HT40 Mode

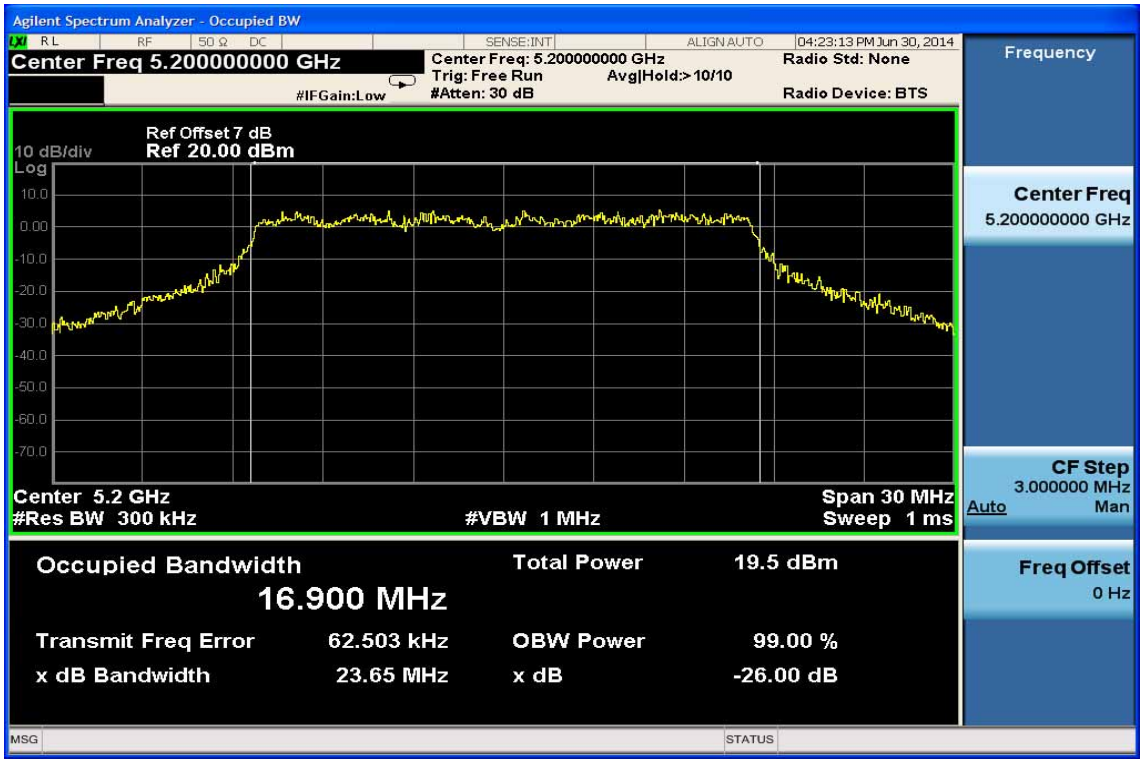
Frequency (MHz)	26dB Bandwidth (MHz)
5190	45.050
5210	43.630
5230	44.710

802.11a

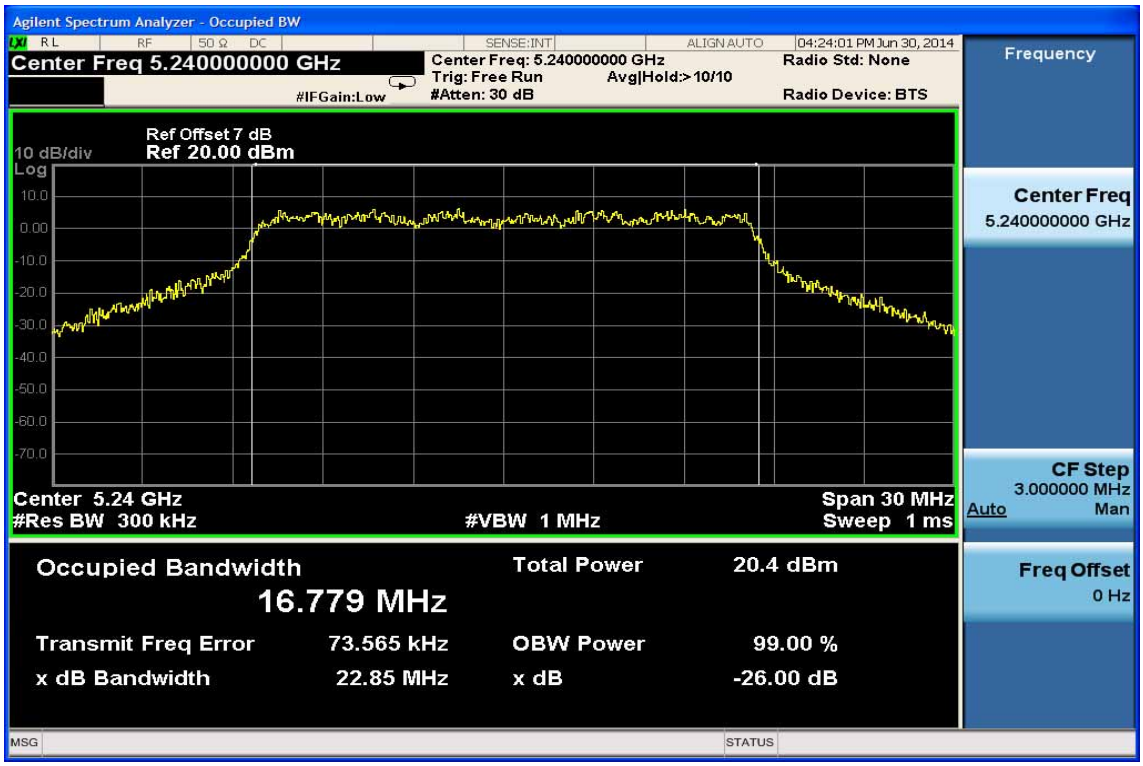
26dB Band Width Test Data CH-Low



26dB Band Width Test Data CH-Mid

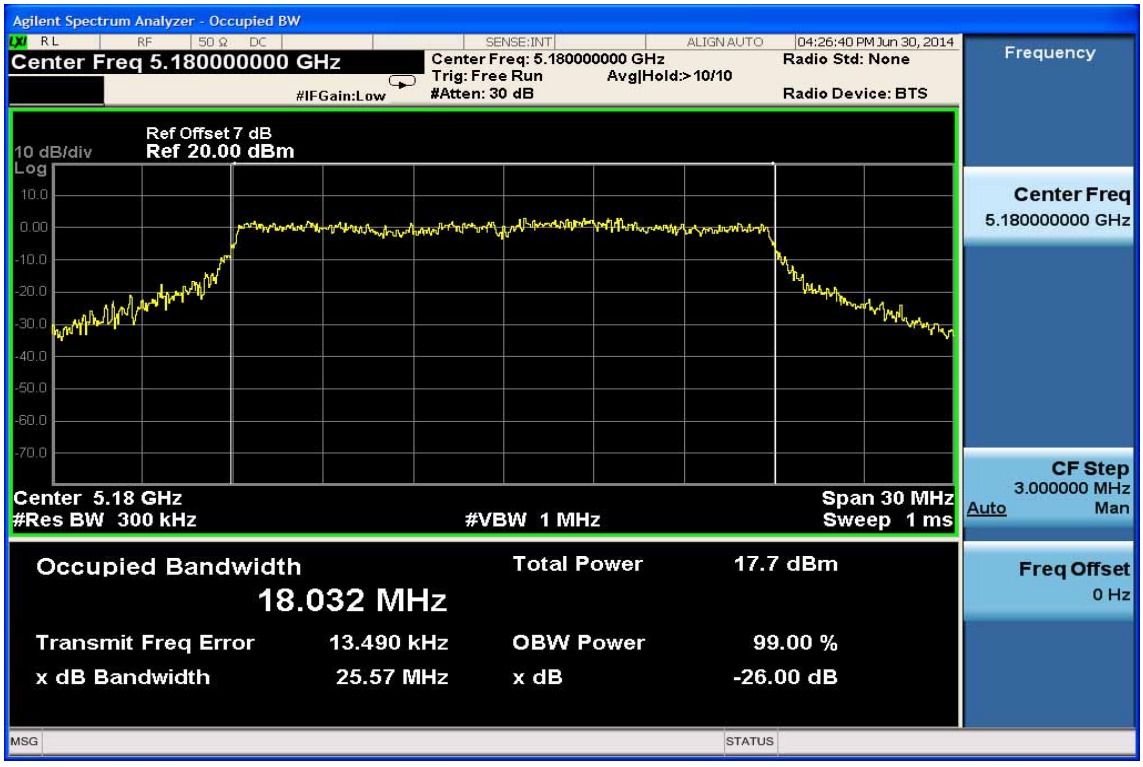


26dB Band Width Test Data CH-High

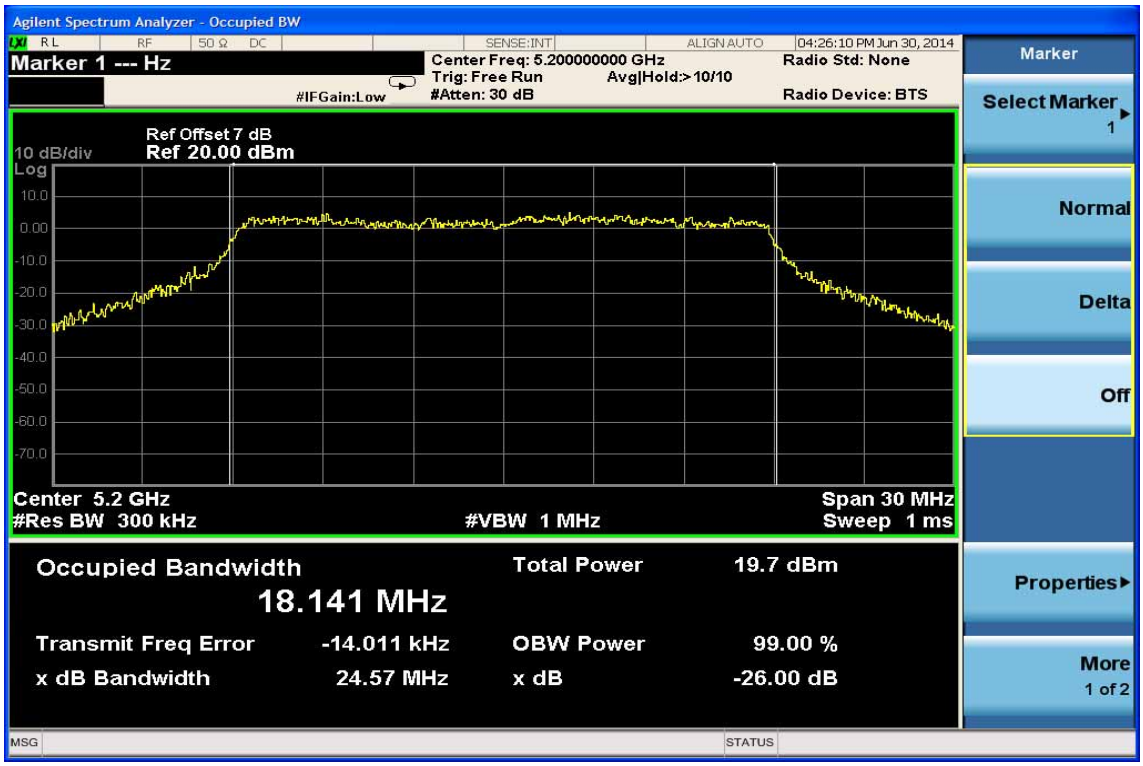


802.11n HT20

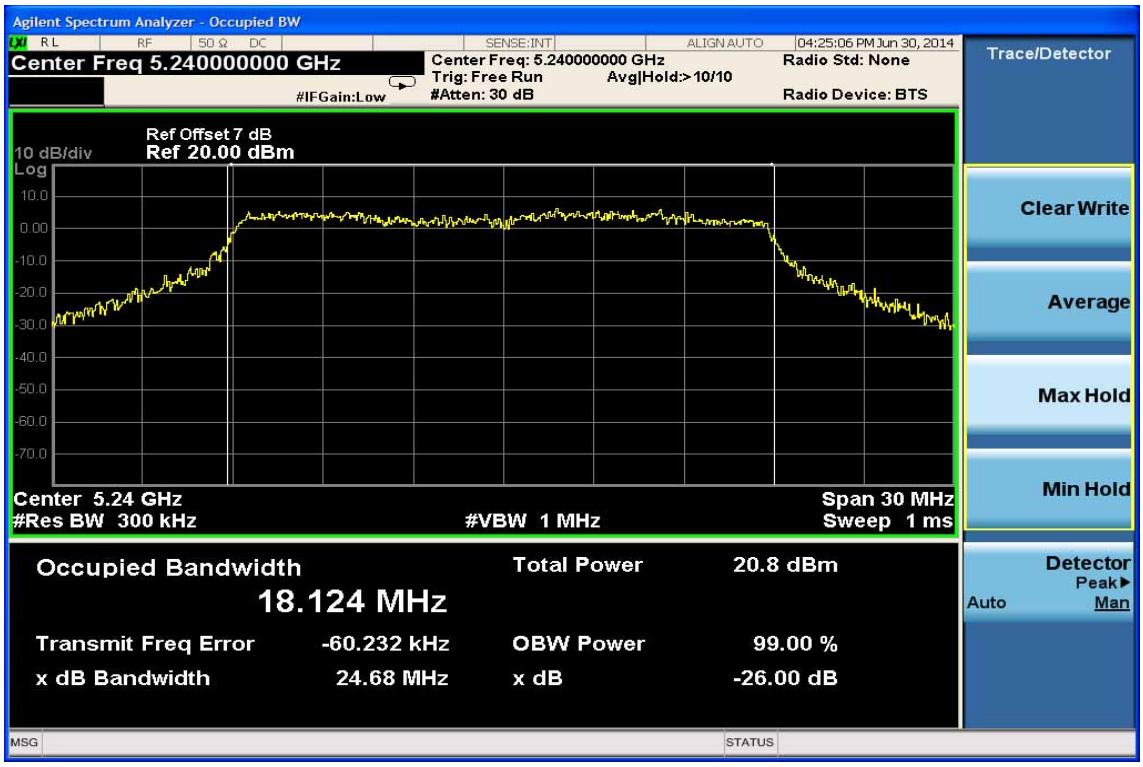
26dB Band Width Test Data CH-Low



26dB Band Width Test Data CH-Mid

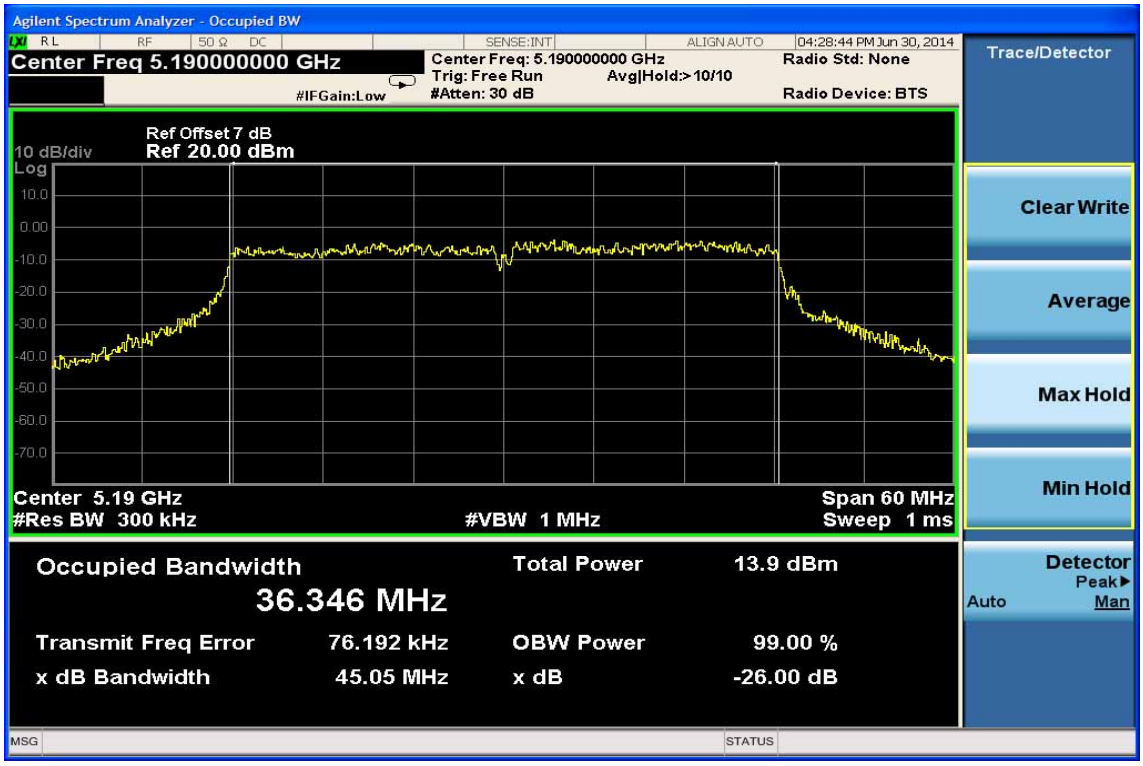


26dB Band Width Test Data CH-High

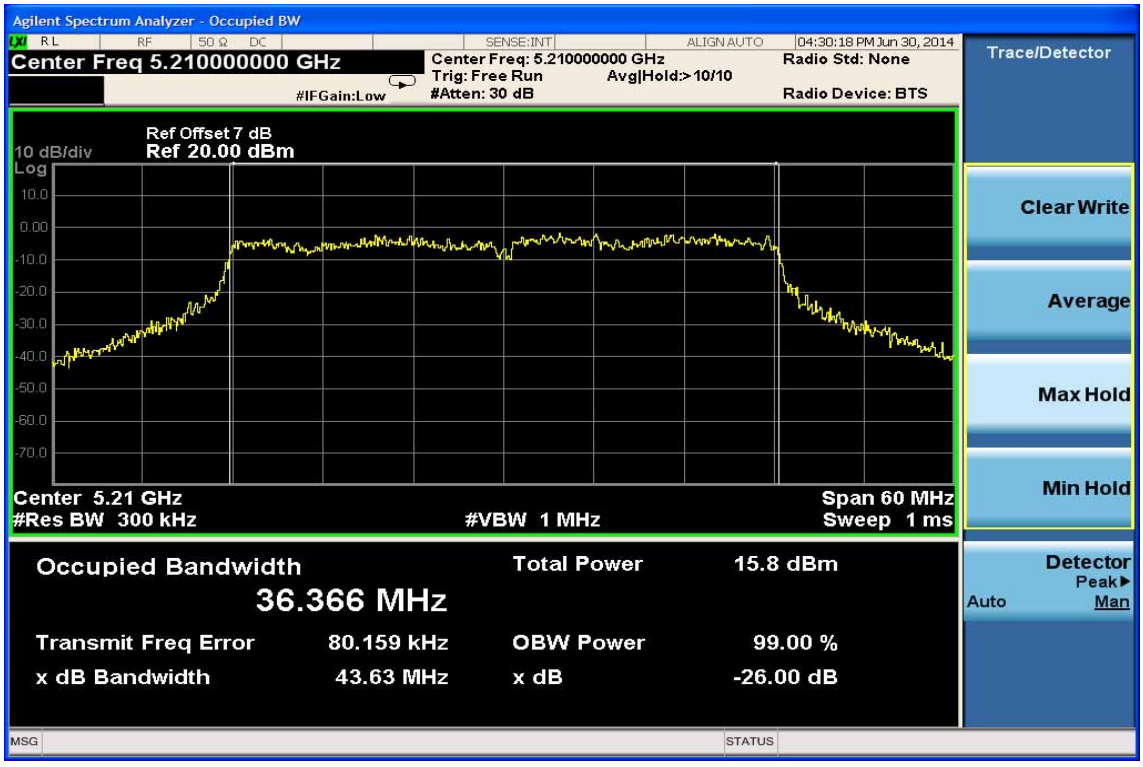


802.11n HT40

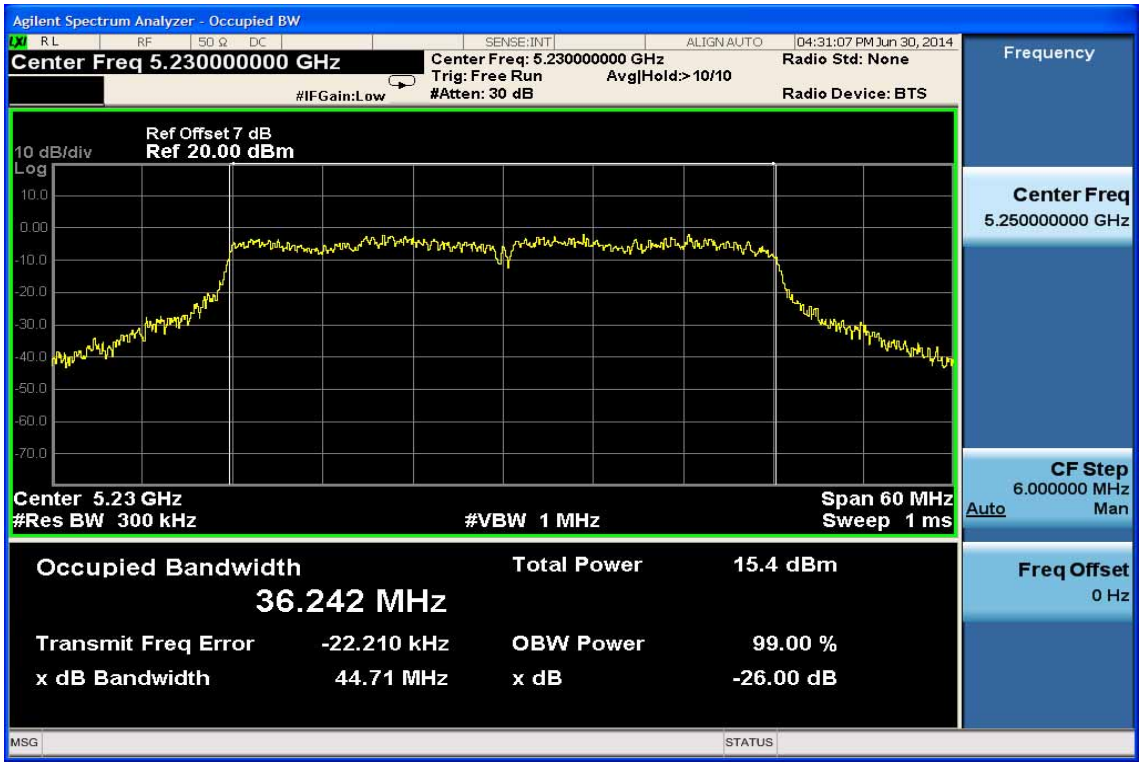
26dB Band Width Test Data CH-Low



26dB Band Width Test Data CH-Mid



26dB Band Width Test Data CH-High



8. 6dB EMISSION BANDWIDTH MEASUREMENT

8.1 Standard Applicable

According to §15.407 (e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

8.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the.antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=100KHz, VBW =300MHz, Span= 50MHz, Sweep=auto
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

Refer to section D of KDB Document: KDB 789033 D02 General UNII Test Procedures New Rules v01

8.3 Measurement Equipment Used:

Refer to section 6.3 for details.

8.4 Test Set-up:

Refer to section 6.4 for details.

8.5 Measurement Result

N/A

9. UNDESIRABLE EMISSION - CONDUCTED MEASUREMENT

9.1 Standard Applicable

According to §15.407(b), Undesirable Emission Limits: Except as shown in Paragraph (b)(7) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) 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.

(2) For transmitters operating in the 5.25-5.35 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.

(3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) 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 -17dBm/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.

(5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.

(7) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
3. Set Spectrum RBW=1MHz, VBW = 1MHz for peak measurement and 10Hz for average measurement.
4. Set Spectrum at lower/upper band edge and the restricted band adjacent to the lower/upper edge of the authorized band, with the transmitter set to the lowest/highest channel.
5. Set Spectrum over the 30MHz to 40GHz range with the transmitter set to the lowest, middle, and highest channels.

Refer to section G of KDB Document: KDB 789033 D02 General UNII Test Procedures New Rules v01

Conducted RF measurements of the transmitter output were made at the band edges and the adjacent restricted bands.

Also, conducted RF measurements of the transmitter output over the 30 MHz to 40 GHz band were made in order to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

9.3 Measurement Equipment Used:

Refer to section 6.3 for details.

9.4 Measurement Result

N/A.

Refer to section G of KDB Document: KDB 789033 D02 General UNII Test Procedures New Rules v01

10. UNDESIRABLE EMISSION - RADICTED MEASUREMENT

10.1 Standard Applicable

According to §15.407(b), Undesirable Emission Limits: Except as shown in Paragraph (b)(7) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) 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.

(2) For transmitters operating in the 5.25-5.35 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.

(3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) 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 -17dBm/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.

(5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.

(7) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

§15.205- RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209- RADIATED EMISSION LIMITS: GENERAL REQUIREMENTS

FCC PART 15.209

MEASURING DISTANCE OF 3 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

10.2 EUT Setup

1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4-2009.
2. The EUT was put in the front of the test table. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the monitor, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when necessary.
6. The host PC system was connected with 120Vac/60Hz power source.

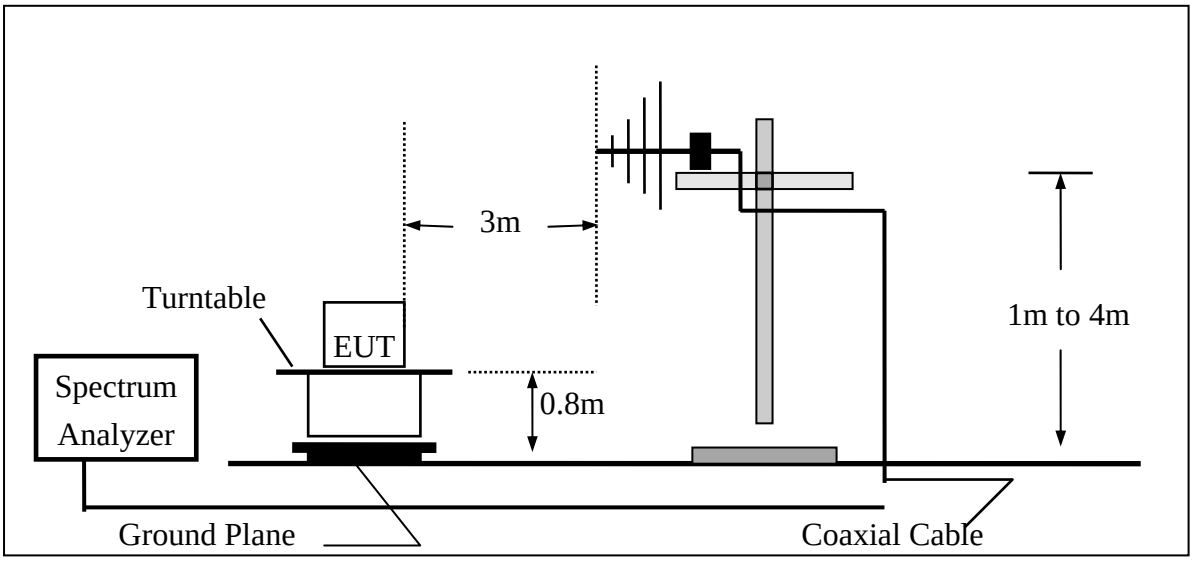
10.3 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until all frequency measured were complete.
7.

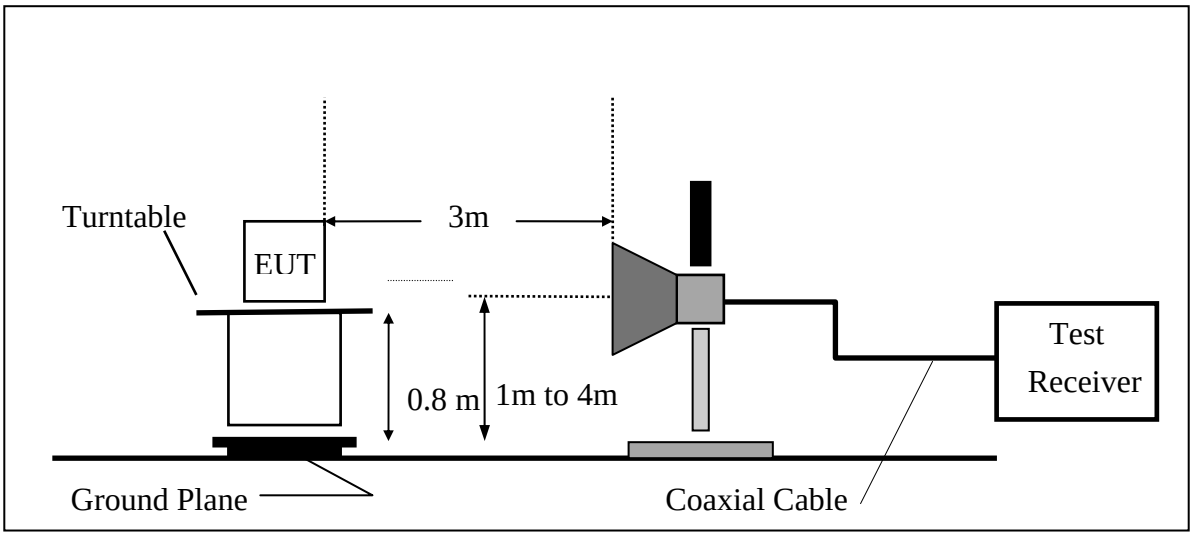
Refer to section G of KDB Document: KDB 789033 D02 General UNII Test Procedures New Rules v01

10.4 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



10.5 Measurement Equipment Used:

Chamber 14(966)					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/18/2013	07/17/2014
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/26/2014	05/25/2015
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	05/07/2014	05/06/2015
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	03/07/2013	03/06/2015
Bilog Antenna30-1G	Schaffner	CBL 6112B	2756	01/08/2014	01/07/2015
Horn antenna1-18G(06)	EMCO	3117	0006665	11/04/2013	11/03/2014
Horn antenna26-40G(05)	Com-power	AH-640	100A	01/09/2013	01/08/2015
Horn antenna18-26G(04)	Com-power	AH-826	081001	05/15/2013	05/14/2015
Preamplifier9-1000M	HP	8447D	NA	02/20/2014	02/19/2015
Preamplifier1-18G	MITEQ	AFS44-00101800-25-10P-44	1329256	07/18/2013	07/17/2014
Preamplifier1-26G	EM	EM01M26G	NA	02/20/2014	02/19/2015
Preamplifier26-40G	MITEQ	JS-26004000-27-5A	818471	05/08/2013	05/07/2015
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	02/17/2014	02/16/2015
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/14/2013	10/13/2014
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	10/03/2013	10/02/2015
2.4G Filter	Micro-Tronics	Brm50702	76	12/27/2013	12/26/2014
5G Filter	Micro-Tronics	Brm50716	005	12/27/2013	12/26/2014

10.6 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

10.7 Measurement Result

Refer to attach tabular data sheets.

NOTE:

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 100kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.

Radiated Spurious Emission Measurement Result (below 1GHz) (worst case)

Operation Mode	802.11n HT20 TX CH Low	Test Date	2014/08/04
Fundamental Frequency	5180MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	65 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	375.32	52.18	-9.74	42.44	46.00	-3.56	Peak	VERTICAL
2	424.79	49.29	-8.75	40.54	46.00	-5.46	Peak	VERTICAL
3	500.45	49.96	-7.66	42.30	46.00	-3.70	Peak	VERTICAL
4	624.61	48.31	-5.36	42.95	46.00	-3.05	Peak	VERTICAL
5	749.74	45.09	-2.95	42.14	46.00	-3.86	Peak	VERTICAL
6	874.87	44.00	-1.30	42.70	46.00	-3.30	Peak	VERTICAL
1	74.62	51.31	-15.79	35.52	40.00	-4.48	Peak	HORIZONTAL
2	144.46	47.65	-12.25	35.40	43.50	-8.10	Peak	HORIZONTAL
3	174.53	52.05	-13.07	38.98	43.50	-4.52	Peak	HORIZONTAL
4	381.14	52.47	-9.62	42.85	46.00	-3.15	Peak	HORIZONTAL
5	500.45	50.30	-7.66	42.64	46.00	-3.36	Peak	HORIZONTAL
6	624.61	47.80	-5.36	42.44	46.00	-3.56	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	802.11n HT20 TX CH Mid	Test Date	2014/08/04
Fundamental Frequency	5200MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	65 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	74.62	51.65	-15.79	35.86	40.00	-4.14	Peak	VERTICAL
2	375.32	52.55	-9.74	42.81	46.00	-3.19	Peak	VERTICAL
3	390.84	51.54	-9.43	42.11	46.00	-3.89	Peak	VERTICAL
4	500.45	50.14	-7.66	42.48	46.00	-3.52	Peak	VERTICAL
5	624.61	47.54	-5.36	42.18	46.00	-3.82	Peak	VERTICAL
6	749.74	44.66	-2.95	41.71	46.00	-4.29	Peak	VERTICAL
1	174.53	50.26	-13.07	37.19	43.50	-6.31	Peak	HORIZONTAL
2	275.41	49.18	-11.78	37.40	46.00	-8.60	Peak	HORIZONTAL
3	391.81	52.87	-9.41	43.46	46.00	-2.54	Peak	HORIZONTAL
4	499.48	50.20	-7.68	42.52	46.00	-3.48	Peak	HORIZONTAL
5	624.61	47.19	-5.36	41.83	46.00	-4.17	Peak	HORIZONTAL
6	749.74	40.56	-2.95	37.61	46.00	-8.39	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	802.11n HT20 TX CH High	Test Date	2014/08/04
Fundamental Frequency	5240MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	65 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	125.06	49.13	-14.08	35.05	43.50	-8.45	Peak	VERTICAL
2	375.32	51.53	-9.74	41.79	46.00	-4.21	Peak	VERTICAL
3	500.45	50.70	-7.66	43.04	46.00	-2.96	Peak	VERTICAL
4	624.61	47.79	-5.36	42.43	46.00	-3.57	Peak	VERTICAL
5	749.74	44.82	-2.95	41.87	46.00	-4.13	Peak	VERTICAL
6	874.87	42.97	-1.30	41.67	46.00	-4.33	Peak	VERTICAL
1	74.62	52.48	-15.79	36.69	40.00	-3.31	Peak	HORIZONTAL
2	174.53	49.84	-13.07	36.77	43.50	-6.73	Peak	HORIZONTAL
3	381.14	53.28	-9.62	43.66	46.00	-2.34	Peak	HORIZONTAL
4	499.48	50.15	-7.68	42.47	46.00	-3.53	Peak	HORIZONTAL
5	624.61	47.11	-5.36	41.75	46.00	-4.25	Peak	HORIZONTAL
6	749.74	39.82	-2.95	36.87	46.00	-9.13	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11n HT20 TX CH Low	Test Date	2014/08/04
Fundamental Frequency	5180MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1252.00	62.66	-15.95	46.71	74.00	-27.29	Peak	VERTICAL
2	1497.00	66.89	-15.30	51.59	74.00	-22.41	Peak	VERTICAL
3	10360.00	34.63	7.99	42.62	74.00	-31.38	Peak	VERTICAL
1	1497.00	65.57	-15.30	50.27	74.00	-23.73	Peak	HORIZONTAL
2	2001.00	57.56	-12.05	45.51	74.00	-28.49	Peak	HORIZONTAL
3	10360.00	35.77	7.99	43.76	74.00	-30.24	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11n HT20 TX CH Mid	Test Date	2014/08/04
Fundamental Frequency	5200MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1210.00	62.72	-16.06	46.66	74.00	-27.34	Peak	VERTICAL
2	1497.00	66.64	-15.30	51.34	74.00	-22.66	Peak	VERTICAL
3	10400.00	34.11	8.04	42.15	74.00	-31.85	Peak	VERTICAL
1	1497.00	66.70	-15.30	51.40	74.00	-22.60	Peak	HORIZONTAL
2	2001.00	58.29	-12.05	46.24	74.00	-27.76	Peak	HORIZONTAL
3	10400.00	35.73	8.04	43.77	74.00	-30.23	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11n HT20 TX CH High	Test Date	2014/08/04
Fundamental Frequency	5240MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1252.00	65.62	-15.95	49.67	74.00	-24.33	Peak	VERTICAL
2	1497.00	65.34	-15.30	50.04	74.00	-23.96	Peak	VERTICAL
3	10480.00	35.21	8.17	43.38	74.00	-30.62	Peak	VERTICAL
1	1497.00	64.51	-15.30	49.21	74.00	-24.79	Peak	HORIZONTAL
2	2001.00	54.85	-12.05	42.80	74.00	-31.20	Peak	HORIZONTAL
3	10480.00	34.97	8.17	43.14	74.00	-30.86	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Emission(Band Edge): 802.11a mode

Operation Mode	TX CH Low	Test Date	2014/08/04
Fundamental Frequency	5180 MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5150.00	52.31	-0.74	51.57	54.00	-2.43	Average	VERTICAL
2	5150.00	71.99	-0.74	71.25	74.00	-2.75	Peak	VERTICAL
1	5148.90	44.90	-0.75	44.15	54.00	-9.85	Average	HORIZONTAL
2	5148.90	61.77	-0.75	61.02	74.00	-12.98	Peak	HORIZONTAL
3	5150.00	45.63	-0.74	44.89	54.00	-9.11	Average	HORIZONTAL
4	5150.00	60.06	-0.74	59.32	74.00	-14.68	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2014/08/04
Fundamental Frequency	5240MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5350.00	45.74	-0.21	45.53	54.00	-8.47	Average	VERTICAL
2	5350.00	53.33	-0.21	53.12	74.00	-20.88	Peak	VERTICAL
3	5459.28	45.84	0.09	45.93	54.00	-8.07	Average	VERTICAL
4	5459.28	57.15	0.09	57.24	74.00	-16.76	Peak	VERTICAL
1	5350.00	45.37	-0.21	45.16	54.00	-8.84	Average	HORIZONTAL
2	5350.00	50.46	-0.21	50.25	74.00	-23.75	Peak	HORIZONTAL
3	5411.04	45.48	-0.04	45.44	54.00	-8.56	Average	HORIZONTAL
4	5411.04	55.31	-0.04	55.27	74.00	-18.73	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Emission(Band Edge): 802.11n HT20 mode, Combine

Operation Mode	TX CH Low	Test Date	2014/08/04
Fundamental Frequency	5180 MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5150.00	52.43	-0.74	51.69	54.00	-2.31	Average	VERTICAL
2	5150.00	72.52	-0.74	71.78	74.00	-2.22	Peak	VERTICAL
1	5150.00	45.11	-0.74	44.37	54.00	-9.63	Average	HORIZONTAL
2	5150.00	57.98	-0.74	57.24	74.00	-16.76	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2014/08/04
Fundamental Frequency	5240MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5350.00	45.37	-0.21	45.16	54.00	-8.84	Average	VERTICAL
2	5350.00	54.96	-0.21	54.75	74.00	-19.25	Peak	VERTICAL
3	5446.56	44.97	0.06	45.03	54.00	-8.97	Average	VERTICAL
4	5446.56	57.69	0.06	57.75	74.00	-16.25	Peak	VERTICAL
1	5350.00	45.18	-0.21	44.97	54.00	-9.03	Average	HORIZONTAL
2	5350.00	52.74	-0.21	52.53	74.00	-21.47	Peak	HORIZONTAL
3	5414.64	45.36	-0.03	45.33	54.00	-8.67	Average	HORIZONTAL
4	5414.64	55.25	-0.03	55.22	74.00	-18.78	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Emission(Band Edge): 802.11n HT40 mode, Combine

Operation Mode	TX CH Low	Test Date	2014/08/04
Fundamental Frequency	5190 MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5150.00	52.42	-0.74	51.68	54.00	-2.32	Average	VERTICAL
2	5150.00	68.04	-0.74	67.30	74.00	-6.70	Peak	VERTICAL
1	5032.08	45.32	-1.07	44.25	54.00	-9.75	Average	HORIZONTAL
2	5032.08	56.12	-1.07	55.05	74.00	-18.95	Peak	HORIZONTAL
3	5150.00	45.86	-0.74	45.12	54.00	-8.88	Average	HORIZONTAL
4	5150.00	53.15	-0.74	52.41	74.00	-21.59	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2014/08/04
Fundamental Frequency	5230MHz	Test By	Dino
Temperature	25 ℃	Humidity	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	5350.00	45.27	-0.21	45.06	54.00	-8.94	Average	VERTICAL
2	5350.00	53.76	-0.21	53.55	74.00	-20.45	Peak	VERTICAL
3	5446.56	45.31	0.06	45.37	54.00	-8.63	Average	VERTICAL
4	5446.56	57.97	0.06	58.03	74.00	-15.97	Peak	VERTICAL
1	5350.00	45.85	-0.21	45.64	54.00	-8.36	Average	HORIZONTAL
2	5350.00	51.43	-0.21	51.22	74.00	-22.78	Peak	HORIZONTAL
3	5409.36	45.26	-0.04	45.22	54.00	-8.78	Average	HORIZONTAL
4	5409.36	55.52	-0.04	55.48	74.00	-18.52	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

11. TRANSMISSION IN THE ABSENCE OF DATA

11.1 Standard Applicable

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

11.2Result:

No non-compliance noted:

Refer to the theory of operation.

12. FREQUENCY STABILITY

12.1 Standard Applicable

According to §15.407 (g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

12.2 Result:

No non-compliance noted:

±20ppm ppm was defined in product specification.

13. ANTENNA REQUIREMENT

13.1 Standard Applicable

According to §15.203, Antenna requirement.

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 a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

13.2 Antenna Connected Construction

The directional gins of antenna used for transmitting is 20dBi, and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

According to KDB662911 D01 SM-MIMO signals could be considered uncorrelated for purposes of directional gain computation.

Directional gain = G_{ANT}