# FCC Test Report (Class II Permissive Change)

Product Name	Access Point
Model No	NanoStationM5
FCC ID	SWX-NSM5D

Applicant	Ubiquiti Networks, Inc.	
Address	12F, No. 105, Song Ren Rd., Sin Yi District,	
	Taipei 110, Taiwan	

Date of Receipt	June 10, 2014
Issued Date	July 03, 2014
Report No.	1460319R-RFUSP42V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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# Test Report

Issued Date: July 03, 2014 Report No.: 1460319R-RFUSP42V00



Product Name	Access Point		
Applicant	Jbiquiti Networks, Inc.		
Address	2F, No. 105, Song Ren Rd., Sin Yi District, Taipei 110, Taiwan		
Manufacturer	Ubiquiti Networks, Inc.		
Model No.	NanoStationM5		
FCC ID.	SWX-NSM5D		
EUT Rated Voltage	DC 24V		
EUT Test Voltage	AC 120V/60Hz		
Trade Name	UBIQUITI		
Applicable Standard	FCC CFR Title 47 Part 15 Subpart E: 2014		
	ANSI C63.10: 2009,		
	KDB 789033 D02 General UNII Test Procedures New Rules v01		
Test Result	Complied		
Documented By	Rita Huang		
	(Senior Adm. Specialist / Rita Huang)		
Tested By	Andy Lin		
	(Engineer / Andy Lin)		
Approved By	Hund		
	( Director / Vincent Lin )		

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- Attachment 1: EUT Test Photographs
- Attachment 2: EUT Detailed Photographs

# 1. GENERAL INFORMATION

# **1.1. EUT Description**

Product Name	Access Point	
Trade Name	UBIQUITI	
FCC ID.	SWX-NSM5D	
Model No.	NanoStationM5	
Frequency Range	802.11a/n-20MHz: 5180-5240MHz	
	802.11n-40MHz: 5190-5230MHz	
Number of Channels	802.11a/n-20MHz: 4, n-40MHz: 2	
Data Rate	802.11a/n: 6-54Mbps, 802.11n: up to 300Mbps	
Channel Control	Auto	
Type of Modulation	802.11a/n:OFDM, BPSK, QPSK, 16QAM, 64QAM	
Antenna type	Integral Antenna	
Antenna Gain	Refer to the table "Antenna List"	
Power Adapter (POE)	MFR: UBIQUITI, M/N: GP-A240-050	
	Input: 100-240V ~ 50/60Hz, MAX 0.3A	
	Output: DC24V, 0.5A	

# Antenna List

No.	Manufacturer	Part No.	Antenna type	Peak Gain
1.	UBIQUITI	N/A	Integral Antenna	16dBi for 5.15~5.25GHz

Note: The antenna of EUT is conform to FCC 15.203

802.11a/n-20MHz Center Working Frequency of Each Channel:

ChannelFrequencyChannelFrequencyChannelFrequencyChannelChannel 36:5180 MHzChannel 40:5200 MHzChannel 44:5220 MHzChannel 48:5240 MHz

802.11n-40MHz Center Working Frequency of Each Channel:

ChannelFrequencyChannelFrequencyChannel 38:5190 MHzChannel 46:5230 MHz

Note:

- 1. This device is a Fixed Point-to-point Access Point with a built-in IEEE 802.11a/n transceiver.
- 2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
- 3. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report. (802.11a is 6Mbps, 802.11n-20BW is 14.4Mbps and 802.11n-40BW are 30Mbps)
- 4. At result of pretests, module supports dual-channel transmission, only the worst case is shown in the report. (802.11a/n is chain A)
- 5. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart E for Unlicensed National Information Infrastructure devices.
- 6. This is requesting a Class II permissive change for FCC ID: SWX-NSM5D. Originally granted on 04/05/2012.

The differences are listed as below:

- Add the frequency band from 5180-5240MHz and 5190 5230MHz by software.
- > All other hardware is identical with original granted.

Test Mode	Mode 1: Transmit (802.11a-6Mbps)	
	Mode 2: Transmit (802.11n-20BW 14.4Mbps)	
	Mode 3: Transmit (802.11n-40BW 30Mbps)	

# **1.2.** Operational Description

The EUT is a Fixed Point-to-point Access Point with a built-in 5GHz transceiver. The device provided of eight kinds of transmitting speed 6, 9, 12, 18, 24, 36, 48 and 54Mbps the device of RF carrier is BPSK, QPSK, 16QAM and 64QAM (IEEE 802.11a/n).

The device provided of eight kinds of transmitting speed 14.4,28.9,43.3,57.8,86.7,115.6,130 and 144.4Mbps in 802.11n(20M-BW) mode and 30,60,90,120,180,240,270 and 300 Mbps(40M-BW) the device of RF carrier is BPSK, QPSK, 16QAM and 64QAM (IEEE 802.11n), the IEEE 802.11n is Multiple In, Multiple Out" (MIMO) technology.

The device adapts direct sequence spread spectrum modulation. The antenna provides diversity function to improve the receiving function and the antennas to support 2(Transmit)  $\times$  2(Receive) MIMO technology.

This device is a proprietary access point, used in Fixed Point-to-point transmission, this is will only work and communicate with our own company product.

# **1.3.** Tested System Datails

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Pro	duct	Manufacturer	Model No.	Serial No.	Power Cord
(1)	Notebook PC	DELL	РРТ	N/A	Non-Shielded, 0.8m

Signal Cable Type		Signal cable Description	
Α	LAN Cable	Non-Shielded, 1.3m	
В	LAN Cable	Non-Shielded, 1.5m	
C	LAN Cable	Non-Shielded, 1.8m	

# **1.4.** Configuration of tested System



# **1.5.** EUT Exercise Software

- (1) Setup the EUT and peripherals as shown in section 1.4.
- (2) Execute "Art V0.9" program on the Notebook PC.
- (3) Configure the test mode, the test channel, and the data rate.
- (4) Start the continuous transmission.
- (5) Verify that the EUT works properly.

# 1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : <u>http://tw.quietek.com/modules/myalbum/</u>

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : <u>http://www.quietek.com/</u>

Site Description: File on Federal Communications Commission FCC Engineering Laboratory 7435 Oakland Mills Road Columbia, MD 21046 Registration Number: 92195

Site Name:	Quietek Corporation
Site Address:	No.5-22, Ruishukeng Linkou Dist., New Taipei City
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	E-Mail : <u>service@quietek.com</u>

FCC Accreditation Number: TW1014

# 2. Conducted Emission

# 2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark					
Х	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2013						
Х	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2014	Peripherals					
Х	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2014	EUT					
	DC LISN	Schwarzbeck	8226 / 176	Mar, 2014	EUT					
Х	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2014						
	No.1 Shielded Room									

Note:

- 1. All equipments are calibrated every one year.
- 2. The test instruments marked by "X" are used to measure the final test results.

# 2.2. Test Setup



# 2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit									
Frequency	Limits								
MHz	QP	AV							
0.15 - 0.50	66-56	56-46							
0.50-5.0	56	46							
5.0 - 30	60	50							

Remarks : In the above table, the tighter limit applies at the band edges.

# 2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2009 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.10, 2009; tested to NII test procedure of FCC KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

# 2.5. Uncertainty

± 2.26 dB

# 2.6. Test Result of Conducted Emission

Product	:	Access Point
Test Item	:	Conducted Emission Test
Power Line	:	Line 1
Test Mode	:	Mode 3: Transmit (802.11n-40BW 30Mbps) (5190MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.185	9.790	39.270	49.060	-15.940	65.000
0.255	9.790	33.200	42.990	-20.010	63.000
0.564	9.790	31.300	41.090	-14.910	56.000
1.005	9.790	25.930	35.720	-20.280	56.000
3.103	9.820	26.180	36.000	-20.000	56.000
9.525	9.973	24.530	34.503	-25.497	60.000
Average					
0.185	9.790	24.350	34.140	-20.860	55.000
0.255	9.790	20.090	29.880	-23.120	53.000
0.564	9.790	16.150	25.940	-20.060	46.000
1.005	9.790	9.700	19.490	-26.510	46.000
3.103	9.820	13.460	23.280	-22.720	46.000
9.525	9.973	14.050	24.023	-25.977	50.000

- 1. All Reading Levels are Quasi-Peak and average value.
- 2. "means the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor

Product	:	Access Point
Test Item	:	Conducted Emission Test
Power Line	:	Line 2
Test Mode	:	Mode 3: Transmit (802.11n-40BW 30Mbps) (5190MHz)

Frequency	Correct	Reading	Reading Measurement		Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.201	9.770	37.300	47.070	-17.473	64.543
0.314	9.770	26.570	36.340	-24.974	61.314
0.525	9.770	32.900	42.670	-13.330	56.000
1.087	9.780	28.740	38.520	-17.480	56.000
1.587	9.790	21.930	31.720	-24.280	56.000
3.728	9.810	26.520	36.330	-19.670	56.000
Average					
0.201	9.770	27.780	37.550	-16.993	54.543
0.314	9.770	12.850	22.620	-28.694	51.314
0.525	9.770	18.050	27.820	-18.180	46.000
1.087	9.780	14.630	24.410	-21.590	46.000
1.587	9.790	7.940	17.730	-28.270	46.000
3.728	9.810	14.090	23.900	-22.100	46.000

- 1. All Reading Levels are Quasi-Peak and average value.
- 2. "means the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor

# 3. Maximun conducted output power

# **3.1.** Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Х	Power Meter	Anritsu	ML2495A/6K00003357	May, 2014
Х	Power Sensor	Anritsu	MA2411B/0738448	Jun, 2014
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2014
Note	2:			

1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

2. The test instruments marked with "X" are used to measure the final test results.

### 3.2. Test Setup

#### 26dBc Occupied Bandwidth



# Conduction Power Measurement (for 802.11an)



#### **Conduction Power Measurement (for 802.11ac)**



# 3.3. 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. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power 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. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power 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-topoint U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power 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. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power 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. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power 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. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point UNII 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.

# 3.4. Test Procedur

As an alternative to FCC KDB-789033, the EUT maximum conducted output power was measured with an average power meter employing a video bandwidth greater than 6dB BW of the emission under test. Maximum conducted output power was read directly from the meter across all data rates, and across three channels within each sub-band. Special care was used to make sure that the EUT was transmitting in continuous mode. This method exceeds the limitations of FCC KDB-789033, and provides more accurate measurements.

802.11an (BW  $\leq$  40MHz) Maximum conducted output power using KDB 789033 section E)3)b) Method PM-G (Measurement using a gated RF average power meter) <u>Note: the power meter have a video bandwidth that is greater than or equal to the measurement</u> <u>bandwidth, (Anritsu/MA2411B video bandwidth: 65MHz)</u>

802.11ac (BW=80MHz) Maximum conducted output power using KDB 789033 section E)2)b) Method SA-1 (trace averaging with the EUT transmitting at full power throughout each sweep).

When transmitted signals consist of two or more non-contiguous spectrum segments (e.g., 80+80 MHz mode) or when a single spectrum segment of a transmission crosses the boundary between two adjacent U-NII bands, KDB 644545 D01 section F) procedure is used for measurements.

# 3.5. Uncertainty

± 1.27 dB

# 3.6. Test Result of Maximum conducted output power

Product	:	Access Point
Test Item	:	Maximum conducted output power
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit (802.11a-6Mbps)

#### CHAIN A

Cable loss=1dB		Maximum conducted output power								
			Data Rate (Mbps)							
Channel No.	Frequency (MHz)	6	9	12	18	24	36	48	54	Required Limit
			Measurement Level (dBm)							
36	5180	13.89								<30dBm
44	5220	12.98	12.89	12.75	12.66	12.57	12.51	12.48	12.43	<30dBm
48	5240	13.72								<30dBm

Note: Maximum conducted output power Value =Reading value on average power meter + cable loss

### CHAIN B

Cable	Maximum conducted output power									
				D	ata Rat	e (Mbps	5)			
Channel No.	Frequency (MHz)	6	9	12	18	24	36	48	54	Required Limit
36	5180	12.98								<30dBm
44	5220	12.88	12.74	12.68	12.57	12.43	12.31	12.25	12.19	<30dBm
48	5240	12.97								<30dBm

Note: Maximum conducted output power Value =Reading value on average power meter + cable loss

#### Maximum conducted output power Measurement:

#### (CHAIN A)

Channel Number	Frequency	Output Power	Output Power Limit	Result
	(MHz)	(dBm)	(dBm)	
36	5180	13.89	30	Pass
44	5220	12.98	30	Pass
48	5240	13.72	30	Pass

Note:

1. Power Output Value =Reading value on average power meter + cable loss.

Product	:	Access Point
Test Item	:	Maximum conducted output power
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit (802.11n-20BW 14.4Mbps)

### CHAIN A

Cable loss=1dB			Maximum conducted output power							
		Data Rate (Mbps)								
Channel No.	Frequency (MHz)	14.4	28.9	43.3	57.8	86.7	115.6	130	144.4	Required Limit
36	5180	16.31								<30dBm
44	5220	16.23	16.14	16.08	16.02	15.85	15.74	15.7	15.62	<30dBm
48	5240	16.18								<30dBm

Note: Maximum conducted output power Value =Reading value on average power meter + cable loss

#### CHAIN B

Cable		Maximum conducted output power								
		Data Rate (Mbps)								
Channel No.	Frequency (MHz)	14.4	28.9	43.3	57.8	86.7	115.6	130	144.4	Required Limit
36	5180	15.48								<30dBm
44	5220	15.26	15.11	14.91	14.85	14.79	14.67	14.55	14.49	<30dBm
48	5240	15.33								<30dBm

Note: Maximum conducted output power Value =Reading value on average power meter + cable loss

#### Maximum conducted output power Measurement:

#### (CHAIN A+ B)

Channel	Frequency	Chain A	Chain B	Output	Output Power	
Number		Power	Power	Power	Limit	Result
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	
36	5180	16.31	15.48	18.93	30	Pass
44	5220	16.23	15.26	18.78	30	Pass
48	5240	16.18	15.33	18.79	30	Pass

Note:

1. Power Output Value =Reading value on average power meter + cable loss

2. Output Power (dBm) = 10LOG (Chain A Power (mW)+ Chain B Power (mW))

Product	:	Access Point
Test Item	:	Maximum conducted output power
Test Site	:	No.3 OATS
Test Mode	:	Mode 3: Transmit (802.11n-40BW 30Mbps)

#### CHAIN A

Cable	Maximum conducted output power									
		Data Rate (Mbps)								
Channel No.	Frequency (MHz)	30	60	90	120	180	240	270	300	Required Limit
		Measurement Level (dBm)								
38	5190	17.73								<30dBm
46	5230	17.57	17.33	17.27	17.17	17.09	16.92	16.84	16.76	<30dBm

Note: Maximum conducted output power Value =Reading value on average power meter + cable loss

#### CHAIN B

Cable	able loss=1dB Maximum conducted output power									
		Data Rate (Mbps)								
Channel No.	Frequency (MHz)	30	60	90	120	180	240	270	300	Required Limit
		Measurement Level (dBm)								
38	5190	17.22								<30dBm
46	5230	17.30	17.25	17.14	17.05	16.99	16.87	16.76	16.69	<30dBm

Note: Maximum conducted output power Value =Reading value on average power meter + cable loss

#### Maximum conducted output power Measurement:

#### (CHAIN A+ B)

Channel Number	Frequency	Chain A Power	Chain B Power	Output Power	Output Power Limit	Result
	(MHz)	(dBm)	(dBm)	(dBm)	(dBm)	
38	5190	17.73	17.22	20.49	30	Pass
46	5230	17.57	17.30	20.45	30	Pass

Note:

1. Power Output Value =Reading value on average power meter + cable loss

2. Output Power (dBm) = 10LOG (Chain A Power (mW)+ Chain B Power (mW))

# 4. Peak Power Spectral Density

### 4.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2014
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2014
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr, 2014

Note:

- 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
- 2. The test instruments marked with "X" are used to measure the final test results.

### 4.2. Test Setup



# 4.3. 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 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, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, 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, 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-topoint 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 point-to-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 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, 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 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, 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 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, 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 UNII 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.

# 4.4. Test Procedure

The EUT was setup to ANSI C63.10, 2009; tested to DTS test procedure of FCC KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

The Peak Power Spectral Density using KDB 789033 section F) procedure, Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer. SA-1 method is selected to run the test.

#### 4.5. Uncertainty

± 1.27 dB

# 4.6. Test Result of Peak Power Spectral Density

Product	:	Access Point
Test Item	:	Peak Power Spectral Density
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit (802.11a-6Mbps)

Channel Number	Frequency (MHz)	Data Rata (Mbps)	Measurement Level (dBm)	Required Limit (dBm)	Result
36	5180	6	0.660	<17	Pass
44	5220	6	0.240	<17	Pass
48	5240	6	0.360	<17	Pass



Agilent Spe	ectrum Analyzer - Swe	pt SA						
KN RL Center	RF 50 Ω Freq 5.18000	AC 0000 GHz	SENSE:INT	#Avg Typ	ALIGNAUTO e: RMS	01:06:51 F	M Jun 24, 2014 E 1 2 3 4 5 6	Frequency
10 dB/div	v Ref 20.00 d	PNO: Fast 🖵 IFGain:Low BM	#Atten: 30 dB		Mkr1	5.186 5 0.	66 dBm	Auto Tune
10.0 —					1			Center Freq 5.180000000 GHz
-10.0			ORE MANAGEMENT AND					<b>Start Freq</b> 5.167500000 GHz
-20.0 -30.0 strait	promiser of the					- <sup>4</sup> 74	M. manhooded	<b>Stop Freq</b> 5.192500000 GHz
-40.0								<b>CF Step</b> 2.500000 MHz <u>Auto</u> Man
-60.0								Freq Offset 0 Hz
Center #Res B	5.18000 GHz W 1.0 MHz	#VBW	3.0 MHz		Sweep	Span 2 1.00 ms (	5.00 MHz (1001 pts)	



Agiler	t Spectrum Analyzer - Swept SA					
Cen	L RF 50 Ω AC ter Freq 5.220000000	GHz PNO: Fast	SENSE:INT	ALIGNAUTO #Avg Type: RMS	01:11:09 PM Jun 24, 2014 TRACE 1 2 3 4 5 6 TYPE A WWWWW	Frequency
10 di	B/div Ref 20.00 dBm	IFGain:Low	#Atten: 30 dB	Mkr1	5.226 750 GHz 0.24 dBm	Auto Tune
10.0				1		Center Freq 5.220000000 GHz
0.00 -10.0						Start Freq 5.207500000 GHz
-20.0	Maduulun and Market and Andrew A				ha had been and have	<b>Stop Freq</b> 5.232500000 GHz
-40.0						CF Step 2.500000 MHz <u>Auto</u> Man
-60.0						Freq Offset 0 Hz
-70.0 Cen	ter 5.22000 GHz				Span 25.00 MHz	
#Re <sup>MSG</sup>	s BW 1.0 MHz	#VBW	3.0 MHz	Sweep Statu	1.00 ms (1001 pts) s	

#### Channel 44:

Channel 48:

Agilen	t Spectru	ım Analyzer - Sv	vept SA								
LXI R	- <b>-</b>	RF 50 S	2 AC		SEM	ISE:INT	#Aug Type		01:26:41 F	M Jun 24, 2014	Frequency
Cen	ter Fr	eq 5.2400	00000	PN0: Fast	Trig: Free	Run	*Avg 1994		TY	PE A WWWWW	
				IFGain:Low	#Atten: 30	dB			D	ET   A N N N N N N	Auto Tuno
								Mkr1	5.246 3	25 GHz	Auto Tune
10 di	3/div	Ref 20.00	dBm						0.	36 dBm	
LUg											Contor From
10.0											5 240000000 CH
								1			5.24000000 GH2
0.00								•			
0.00					and the second second second						Start Freq
-10.0											5.227500000 GHz
-10.0											
-20.0											
20.0		www.							×.	hugen	Stop Freq
-30.0	andura									17mg upphy	5.252500000 GHz
00.0											
-40.0											CF Step
40.0											2.500000 MHz
-50.0											<u>Auto</u> Man
30.0											
-60.0											Freq Offset
50.0											0 Hz
-70.0											
. 0.0											
Cen	ter 5.2	4000 GHz						_	Span 2	5.00 MHz	
#Re	s BW	1.0 MHz		#VBW	3.0 MHz			Sweep	1.00 ms (	1001 pts)	
MSG								STATUS	5		

Product	:	Access Point
Test Item	:	Peak Power Spectral Density
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit (802.11n-20BW 14.4Mbps)

Channel Number	Frequency (MHz)	Chain	PPSD/MHz (dBm)	Total PPSD/MHz (dBm)1	Required Limit (dBm)	Result
26	<b>5100</b>	А	2.640	5.650	<17	Pass
36	5180	В	1.630	4.640	<17	Pass
	5220	А	2.440	5.450	<17	Pass
44	5220	В	1.670	4.680	<17	Pass
40	5240	A		5.360	<17	Pass
48	5240	В	1.540	4.550	<17	Pass

Note

1. The quantity 10\*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

Center Freq 5.18000000 GHz         Frequency           PNO: Fast         Trig: Free Run         #Avg Type: RMS         Trace [12:3:4:5:0]         Auto Tune           10 dB/div         Ref 20.00 dBm         2.64 dBm         Center Freq 5.180000000 GHz         Auto Tune           10 dB/div         Ref 20.00 dBm         2.64 dBm         Center Freq 5.180000000 GHz         Start Freq 5.18000000 GHz         Center Freq 5.18000000 GHz         Center Freq 5.18000000 GHz         Center Freq 5.18000000 GHz         Center Freq 5.18000000 GHz         Start Freq 5.18000000 GHz         Start Freq 5.167500000 GHz         Start Freq 5.167500000 GHz         Start Freq 5.19250000 GHz         Start Freq 5.19250000 GHz         Stop Freq 5.19250000 GHz         Stop Freq 5.19250000 GHz         Stop Freq 5.19250000 GHz         Center 5.19250000 GHz         Center S.1800 GHz         Was         Stop Freq 5.19250000 GHz         Center S.1800 GHz         Was         Stop Stop Stop Stop Stop Stop Stop Stop												
MI         RF         SOQ         AC         ESREENT         ALIGNATO         0.13328 PM An 24, 2014         Frequency           Center Freq 5.18000000 GHz         PNO: Fast         Trig: Free Run         #Avg Type: RMS         Trace [1:3:3:8         March 4, 2014         Auto Tune           10 dBJdiv         Ref 20.00 dBm         Image 1:1:3:3:8         Mkr1 5.186 650 GHz         Center Freq         5.18000000 GHz           10 dBJdiv         Ref 20.00 dBm         Image 1:1:3:3:8         Image 1:1:3:3:8         Image 1:1:3:3:8         Image 1:1:3:3:8         Image 1:1:3:3:8         Auto Tune           10 dBJdiv         Ref 20.00 dBm         Image 1:1:3:3:8         Image 1:1:3:3:3:3:8         Image 1:1:3:3:8	Agilen	t Spectrum A	Inalyzer - Sw	rept SA								
Center Freq 5.18000000 GHz         Trig: Free Run IFGein:Low         #Avg Type: RMS         Trace [12:3:4:56]         Prequency           10 dB/div         Ref 20.00 dBm         Center Freq 2.64 dBm         Mkr1 5.186 650 GHz 2.64 dBm         Auto Tune           10 dB/div         Ref 20.00 dBm         Center Freq 5.18000000 GHz         Start Freq 5.16750000 GHz         Start Freq 5.16750000 GHz           200         Image: Start Freq 5.16750000 GHz         Image: Start Freq 5.16750000 GHz         Start Freq 5.19250000 GHz           300         Image: Start Freq 5.19250000 GHz         Image: Start Freq 5.19250000 GHz         Start Freq 5.19250000 GHz           400         Image: Start Freq 5.19250000 GHz         Image: Start Freq 5.19250000 GHz         Start Freq 5.19250000 GHz           400         Image: Start Freq 5.19250000 GHz         Image: Start Freq 5.19250000 GHz         Image: Start Freq 5.19250000 GHz           400         Image: Start Freq 5.19250000 GHz         Image: Start Freq 5.19250000 GHz         Image: Start Freq 5.19250000 GHz           400         Image: Start Freq 5.19250000 GHz         Image: Start Freq 5.1925000 GHz         Image: Start Freq 5.192500 GHz           400         Image: Start Freq 5.192500 GHz         Image: Start Freq 5.192500 GHz         Image: Start Freq 5.192500 GHz           400         Image: Start Freq 5.192500 GHz         Image: Start Freq 5.192500 GHz         Image: Start	L <b>XI</b> R I	. F	RF 50 Ω	AC AC		SEN	ISE:INT		ALIGN AUTO	01:33:28 F	M Jun 24, 2014	Fraguanay
PN0: Fast         Trg: Free Run #Atten: 30 dB         Mkr1 5.186 650 GHz 2.64 dBm         Auto Tune           10 dB/div         Ref 20.00 dBm         Center Freq 5.18000000 GHz         Center Freq 5.18000000 GHz         Center Freq 5.18000000 GHz           100         1         1         1         1         1         1           100         1         1         1         1         1         1         5.18000000 GHz           100         1         1         1         1         1         1         5.18000000 GHz           2:00         1         1         1         1         1         1         5.167500000 GHz           3:00         1         1         1         1         1         1         5.167500000 GHz           4:00         1 <td>Cen</td> <td>ter Freq</td> <td>5.1800</td> <td>00000</td> <td>GHz</td> <td></td> <td>_</td> <td>#Avg Typ</td> <td>e: RMS</td> <td>TRAC</td> <td>E123456</td> <td>Frequency</td>	Cen	ter Freq	5.1800	00000	GHz		_	#Avg Typ	e: RMS	TRAC	E123456	Frequency
Instruction     Farther: 30 dB     Mkr1 5. 186 650 GHz 2.64 dBm     Auto Tune       100					PNO: Fast 😱	Trig: Free	Run			TYP	TANNNN	
Mkr1 5.186 650 GHz     Auto Tune       10 dB/div     Ref 20.00 dBm     2.64 dBm       10 dB/div     Image: Center Freq       10 dB/div     Image: Center Freq <td></td> <td></td> <td></td> <td></td> <td>IFGain:Low</td> <td>#Atten: 30</td> <td>dB</td> <td></td> <td></td> <td></td> <td></td> <td></td>					IFGain:Low	#Atten: 30	dB					
10g       Ref 20.00 dBm       2.64 dBm         10g       1       1       1         10g       1       1       1       1         10g       1       1       1       1       1         10g       1       1       1       1       1       1         10g       1       1       1       1       1       1       1         10g       1       1       1       1       1       1       1       1       <									Mkr1	5.186 6	50 GHz	Auto Tune
100       2.04 Goldin         100       100         100	40.45		e 20 00	dDm						2	64 dBm	
10.0	Loa		ei 20.00	ubili								
10.0       1       1       1       1       5.18000000 GHz         10.0       1       1       1       1       1       5.18000000 GHz         10.0       1       1       1       1       1       1       1         10.0       1 <td< td=""><td> 3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	3											
10.0												Center Freq
0.00       Image: start freq in the start fr	10.0											5.180000000 GHz
0.00       0.00									. <b>≜'</b>			
000       000       000       000       000       Start Freq         10.0       000       000       000       000       000       000         -20.0       000	0.00		and the second	man		man power and	and a state of the		,	man		
10.0     10.0	0.00									Ϋ́,		Otort From
-10.0 -2			1							X		StartFreq
-200     -200	-10.0									\\		5.167500000 GHz
-20.0       -40.0 <td< td=""><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td>λ</td><td></td><td></td></td<>			1							λ		
-200     -200			¥									
.30.0	-20.0		- 								<sup>3</sup> deq.	Stop Fred
-30.0     -30.0     -5.192500000 GHz       -40.0     -40.0     -40.0       -50.0     -5.18000 GHz       -60.0     -60.0       -70.0     -60.0       -70.0     -70.0       Center 5.18000 GHz       #VBW 3.0 MHz       Sweep 1.00 ms (1001 pts)		unter Mar									WWWWWWWWWWW	otopricq
	20.0	di.									- T	5.192500000 GHz
-40.0 -40.0 -40.0 -40.0 -40.0 -50.0	-30.0											
-40.0 -50.0 -50.0 -60.0 -70.0 Center 5.18000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.00 ms (1001 pts) Status												
-50.0 -50.0 -50.0 -60.0 -70.0 -70.0 Center 5.18000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz #VBW 3.0 MHz Sweep 1.00 ms (1001 pts) MSG	-40.0											CF Step
-50.0 -60.0 -60.0 -7												2.500000 MHz
-50.0 -60.0 -60.0 -7												<u>Auto</u> Man
-60.0 -70.0 -70.0 -70.0 Center 5.18000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.00 ms (1001 pts) MSG	-50.0											
-60.0 -7												
-70.0 -70.0 -70.0 Center 5.18000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.00 ms (1001 pts) MSG	60.0											Freq Offset
-70.0 -70.0 Center 5.18000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.00 ms (1001 pts) Msg	-60.0											0 Hz
-70.0 Center 5.18000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.00 ms (1001 pts)												• • • •
Center 5.18000 GHz Span 25.00 MHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.00 ms (1001 pts)	-70.0											
Center 5.18000 GHz #Res BW 1.0 MHz         Span 25.00 MHz #VBW 3.0 MHz         Span 25.00 MHz Sweep 1.00 ms (1001 pts)												
Center 5.18000 GHz #Res BW 1.0 MHz         Span 25.00 MHz \$Weep 1.00 ms (1001 pts)           Msg         \$Status												
#Res BW 1.0 MHz         #VBW 3.0 MHz         Sweep         1.00 ms (1001 pts)	Con	or 5 190		1				_		Enon 2		
#Res by 1.0 min2         #Vov 3.0 min2         Sweep 1.00 ms (1001 pts)           Msg         status	HD of	DW 4.0			#\/D\//	2.0 840-			Owen	3 opail 2	1001 mm2	
MSG STATUS	#Res	5 044 1.0			#VBVV	3.0 IVIMZ			Sweep	1.00 ms (	roor pts)	
	MSG								STATUS			



								want SA	Analyzor Su	nt Spectrum	Agilo
	M 1 in 24, 2014	01:54:06 5	ALIGN ALITO		NSE-INT	CER		o ac l	RE 50 C	nt opectrum	
Frequency	E 1 2 3 4 5 6 E A WWWWW	TRAC	e: RMS	#Avg Typ	e Run	Trig: Free	GHz PN0: Fast	00000	q 5.2200	nter Fre	Cer
Auto Tune	75 GHz 44 dBm	5.227 2 2.4	Mkr1		0 dB	#Atten: 30	IFGain:Low	dBm	ef 20.00	B/div <b>F</b>	10 d
Center Freq 5.220000000 GHz		1									10.0
<b>Start Freq</b> 5.207500000 GHz		and a second		14-14-14-14-14-14-14-14-14-14-14-14-14-1	and provide resperse	ar an	1120-001 (200-200-000-000-000-000-000-000-000-000				0.00
<b>Stop Freq</b> 5.232500000 GHz	Ulucian Williams	1								WALT WANTIN	-20.0
CF Step 2.500000 MHz <u>Auto</u> Man											-40.0
Freq Offset 0 Hz											-60.0
	5 00 MH-	Enor 3								tor 5 00	-70.0
	1001 pts)	span 2 1.00 ms (	Sweep			3.0 MHz	#VBW		) MHz	es BW 1.	сег #Re

Channel 44 – Chain A

Channel 48 – Chain A

M         RL         RF         50.2         AC         SENSE:INT         ALIGNAUTO         02:030.9PM/Jun24,2014         Frequency           Center Freq 5.240000000 GHz         Trig: Free Run IFGain:Low         Trig: Free Run #Atten: 30 dB         Trig: Stee Run Trype L         Trig: Acc         Frequency         Auto Tune           10 dB/div         Ref 20.00 dBm         Center Freq 5.240000000 GHz         Trig: Stee Run #Atten: 30 dB         Trig: Stee Run Trype L         Trig: Stee Run Trype L         Trig: Stee Run Trype L         Auto Tune           10 dB/div         Ref 20.00 dBm         Center Freq 5.24000000 GHz         Start Freq 5.24000000 GHz         Start Freq 5.227500000 GHz           10.0         Trig: Frequency         Trig: Start Freq 5.227500000 GHz         Start Freq 5.252500000 GHz         Start Freq 5.252500000 GHz
Center Freq 5.240000000 GHz PN0: Fast IFGain:Low         Trig:Free Run #Atten: 30 dB         Trig:Free Run #Atten: 30 dB         Mkr1 5.246 475 GHz 2.35 dBm         Auto Tune           10 dB/div         Ref 20.00 dBm         Center Freq 5.24000000 GHz         Center Freq 5.24000000 GHz         Center Freq 5.24000000 GHz         Start Freq 5.227500000 GHz           10.0
PN0: Fast         Ing. Free fail         Der[A NNNN           IFGain:Low         #Atten: 30 dB         Mkr1 5.246 475 GHz         Auto Tune           10 dB/div         Ref 20.00 dBm         2.35 dBm         Center Freq           10.0         1         1         1         5.24000000 GHz           10.0         1         1         1         5.24000000 GHz           10.0         1         1         1         5.22750000 GHz           20.0         1         1         1         5.22750000 GHz           30.0         1         1         1         1
Mkr1 5.246 475 GHz         Auto Tune           10 dB/div         Ref 20.00 dBm         Center Freq           10.0         1         1           10.0
IO dB/div         Ref 20.00 dBm         2.35 dBm           10         2.35 dBm         Center Freq 5.24000000 GHz           10.0         1         1           0.00         1         1           10.0         1         1
10 dB/div         Ref 20.00 dBm         2.35 dBm           100
Cog         Center Frec           10.0         1           0.00         1           10.0         1     <
10.0         Center Frec           0.00         1         5.24000000 GHz           10.0         5.22750000 GHz           20.0         5.22750000 GHz           30.0         5.25250000 GHz
100         5.24000000 GHz           0.00         1         5.24000000 GHz           100         5.22750000 GHz           200         Stop Freq           300         5.25250000 GHz
0.00 10.0 20.0 -30.0
0.00         Start Freq.           .10.0
Start Free           10.0
-10.0 -10.0 -20.0 -30.0 -30.0 -30.0 -1
-10.0 -20.0 -3
-20.0 -20.0 -30.0
-20.0
-30.0
-30.0 5.252500000 GH2
-30.0
.40.0 CF Step
2.500000 MHz
Auto Man
-50.0
-60.0 Freq Offset
0Hz
II I I I I I I I I I I I I I I I I
-70.0
Center 5.24000 GHz Span 25.00 MHz
#Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.00 ms (1001 pts)
MSG STATUS



Channel 36 – Chain B







					0		• •				
Agiler	nt Spectru	ım Analyzer - Sv	wept SA								
KN R Cer	L nter Fr	RF 50 s	Ω AC   100000 G	Hz	SEN	VSE:INT	#Avg Typ	ALIGN AUTO e: RMS	02:07:54 F	M Jun 24, 2014 E 1 2 3 4 5 6	Frequency
10 di	B/div	Ref 20.00	dBm	PNO: Fast 🕞 Gain:Low	#Atten: 30	) dB		Mkr1	5.232 3 1.3	600 GHz 54 dBm	Auto Tune
10.0			↓1								Center Freq 5.240000000 GHz
0.00 -10.0			angle many in the form of the second	Ang Pays and a strap of a stand	Yanna ang ang ang ang ang ang ang ang ang		10				Start Freq 5.227500000 GHz
-20.0 -30.0	or how and a full	part of the second s							``	Mar Marine Marine	Stop Freq 5.252500000 GHz
-40.0 -50.0											CF Step 2.500000 MH2 <u>Auto</u> Mar
-60.0											Freq Offse 0 H:
-70.0 Cen	ter 5.2	4000 GHz							Span 2	5.00 MHz	
#Re	s BW	1.0 MHz		#VBW	3.0 MHz			Sweep	1.00 ms (	1001 pts)	
MSG								STATU	Б		

#### Channel 48 – Chain B

Product	:	Access Point
Test Item	:	Peak Power Spectral Density
Test Site	:	No.3 OATS
Test Mode	:	Mode 3: Transmit (802.11n-40BW 30Mbps)

Channel Number	Frequency (MHz)	Chain	PPSD/MHz (dBm)	Total PPSD/MHz (dBm)1	Required Limit (dBm)	Result
38	5190	А	1.030	4.040	<17	Pass
		В	0.500	3.510	<17	Pass
46	5220	A		4.110	<17	Pass
	5230	В	0.190	3.200	<17	Pass

Note

1. The quantity 10\*log 2 (two antennas) is added to the spectrum peak value according to document 662911 D01.

Agiter	nt spectrum Analyzer - swept SA							
LXI R	L RF 50Ω AC		SENSE:INT		ALIGN AUTO	02:13:09 P	M Jun 24, 2014	Fragueney
Cen	nter Freg 5.19000000	0 GHz		#Avg Type	e: RMS	TRAC	E123456	Frequency
10 di	B/div Ref 20.00 dBm	PNO: Fast 🖵 Tr IFGain:Low #A	ig: Free Run tten: 30 dB		Mkr	1 5.201 1.0	05 GHz 03 dBm	Auto Tune
Log 10.0					<b>▲</b> <sup>1</sup>			Center Freq 5.190000000 GHz
0.00								<b>Start Freq</b> 5.165000000 GHz
-20.0 -30.0	Contraction of the contraction o						Mill Harrand Martine	<b>Stop Freq</b> 5.215000000 GHz
-40.0 -50.0								CF Step 5.000000 MHz <u>Auto</u> Man
-60.0								Freq Offset 0 Hz
Cen #Re	ter 5.19000 GHz s BW 1.0 MHz	#VBW 3.0	MHz		Sweep	Span 5 1.00 ms (	0.00 MHz 1001 pts)	
MSG					STATUS	5		

#### Channel 38 – Chain A



Agilent Sp	ectrum Analyzer - Swer	ot SA				
Cente	RF 50 Ω r Freq 5.230000	AC DOOD GHz	SENSE:INT	ALIGNAUTO #Avg Type: RMS	02:22:21 PM Jun 24, 2014 TRACE 1 2 3 4 5 6 TYPE A WWWWW	Frequency
10 dB/d	iv Ref 20.00 di	IFGain:Low	#Atten: 30 dB	Mki	1 5.244 70 GHz 1.10 dBm	Auto Tune
10.0					1	Center Freq 5.230000000 GHz
0.00 — -10.0 —						Start Freq 5.20500000 GHz
-20.0					Maran your board	<b>Stop Freq</b> 5.25500000 GHz
-40.0						CF Step 5.000000 MHz <u>Auto</u> Man
-60.0						Freq Offset 0 Hz
-70.0						
Center #Res E	5.23000 GHz W 1.0 MHz	#VBW	3.0 MHz	Sweep	Span 50.00 MHz 1.00 ms (1001 pts) s	

Channel 46 – Chain A

Channel 38 – Chain B



Agilent Spect	rum Analyzer - Swept SA								
LXI RL	RF 50 Ω AC		SENS	SE:INT		ALIGN AUTO	02:26:12 F	M Jun 24, 2014	Frequency
Center F	req 5.23000000	GHz	Tuin: Enc.	<b>D</b>	#Avg Typ	e: RMS	TRAC	E 1 2 3 4 5 6	riequency
		PNO: Fast	#Atton: 30	kun dB			DE	TANNNN	
		IFGam:LUW	HALLEH. OU						
						MK	1 5.226	35 GHz	Auto Tune
10 dB/div	Ref 20.00 dBm						0.	19 dBm	
LUg									Contor From
10.0									CenterFreq
10.0									5.230000000 GHz
			<b>▲</b> <sup>1</sup>						
0.00			and the second second	10000			mony		Otort Eror
			Ý	,					StartFreq
-10.0							+	I	5.205000000 GHz
.20.0	1								
20.0							<u>۱</u>	k.	Stop Freq
	MANIN							"Notice	5.255000000 GHz
-30.0								the state	
-40.0					_				CF Step
									5.000000 MHZ
-50.0									Auto Man
30.0									
									Frea Offset
-60.0									0 11-7
									0112
-70.0								<u> </u>	
Center 5.	2JUUU GHZ	#\/D\//	2.0 840-			Oween	span 5	0.00 WHZ	
#Res BW		#VBW	3.0 IVINZ			oweep	1.00 ms (	iour pis)	
MSG						STATU	S		

#### Channel 46 – Chain B

# 5. Radiated Emission

### 5.1. Test Equipment

The following test equipments are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 3	Х	Loop Antenna	Teseq	HLA6120 / 26739	Jul., 2014
	Х	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2013
	Х	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2013
	Х	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2014
	Х	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2014
	Х	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2013
	Х	Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P/ 925975	Mar, 2014
	Х	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2014
	Х	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2013
	Х	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2014
	Х	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	Х	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

2. The test instruments marked with "X" are used to measure the final test results.

# 5.2. Test Setup

Radiated Emission Below 1GHz



### Radiated Emission Above 1GHz



# 5.3. Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209(a) Limits							
Frequency MHz	Field strength	Measurement distance					
	(microvolts/meter)	(meter)					
0.009-0.490	2400/F(kHz)	300					
0.490-1.705	24000/F(kHz)	30					
1.705-30	30	30					
30-88	100	3					
88-216	150	3					
216-960	200	3					
Above 960	500	3					

Remarks: E field strength  $(dBuV/m) = 20 \log E$  field strength (uV/m)

# 5.4. Test Procedure

The EUT was setup according to ANSI C63.10, 2009 and tested according to FCC KDB-789033 test procedure for compliance to FCC 47CFR 15. 407 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10, 2009 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas. The measurement is divided into the Preliminary Measurement and the Final Measurement. The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna. The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

# 5.5. Uncertainty

- ± 3.8 dB below 1GHz
- ± 3.9 dB above 1GHz

# 5.6. Test Result of Radiated Emission

Product	:	Access Point
Test Item	:	Harmonic Radiated Emission Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit (802.11a-6Mbps) (5180MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
10360.000	12.930	36.150	49.080	-24.920	74.000
15540.000	*	*	*	*	74.000
20720.000	*	*	*	*	74.000
25900.000	*	*	*	*	74.000
31080.000	*	*	*	*	74.000
36260.000	*	*	*	*	74.000
Average					
<b>Detector:</b>					
Vertical					
<b>Peak Detector:</b>					
10360.000	13.724	37.150	50.874	-23.126	74.000
20720.000	*	*	*	*	74.000
25900.000	*	*	*	*	74.000
31080.000	*	*	*	*	74.000
36260.000	*	*	*	*	74.000
Average					

# Detector:

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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Product	: Access Point						
Test Item	: Harmonic Radiated Emission Data						
Test Site	: No.3 OATS						
Test Mode	: Mode 1						
Frequency	Correct	Reading	Measurement	Margin	Limit		
	Factor	Level	Level				
MHz	dB	dBuV	dBuV/m	dB	dBuV/m		
Horizontal							
Peak Detector:							
10440.000	13.322	36.590	49.912	-24.088	74.000		
15600.000	*	*	*	*	74.000		
20800.000	*	*	*	*	74.000		
26000.000	*	*	*	*	74.000		
31200.000	*	*	*	*	74.000		
36400.000	*	*	*	*	74.000		
Average							
<b>Detector:</b>							
Vertical							
Peak Detector:							
10440.000	14.245	37.150	51.395	-22.605	74.000		
20800.000	*	*	*	*	74.000		
26000.000	*	*	*	*	74.000		
31200.000	*	*	*	*	74.000		
36400.000	*	*	*	*	74.000		
Average							

Detector:

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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Product	: Access Point						
Test Item	: Harmonic Radiated Emission Data						
Test Site	: No.3 OATS						
Test Mode	le : Mode 1: Transmit (802.11a-6Mbps) (5240MHz)						
Frequency	Correct	Reading	Measurement	Margin	Limit		
	Factor	Level	Level				
MHz	dB	dBuV	dBuV/m	dB	dBuV/m		
Horizontal							
Peak Detector:							
10480.000	13.693	37.150	50.844	-23.156	74.000		
15720.000	*	*	*	*	74.000		
20960.000	*	*	*	*	74.000		
26200.000	*	*	*	*	74.000		
31440000	*	*	*	*	74.000		
36680.000	*	*	*	*	74.000		
Average							
<b>Detector:</b>							
Vertical							
Peak Detector:							
10480.000	14.620	37.140	51.761	-22.239	74.000		
20960.000	*	*	*	*	74.000		
26200.000	*	*	*	*	74.000		
31440000	*	*	*	*	74.000		
36680.000	*	*	*	*	74.000		
Average							
Dotoctor							

Detector:

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	: Access Point						
Test Item	: Harmonic Radiated Emission Data						
Test Site	: No.3 OAT	S					
Test Mode	: Mode 2: T	ransmit (802.11	n-20BW 14.4Mbps)	(5180MHz)			
Frequency	Correct	Reading	Measurement	Margin	Limit		
	Factor	Level	Level				
MHz	dB	dBuV	dBuV/m	dB	dBuV/m		
Horizontal							
Peak Detector:							
10360.000	12.930	37.120	50.050	-23.950	74.000		
15540.000	*	*	*	*	74.000		
20720.000	*	*	*	*	74.000		
25900.000	*	*	*	*	74.000		
31080.000	*	*	*	*	74.000		
36260.000	*	*	*	*	74.000		
Average							
<b>Detector:</b>							
Vertical							
Peak Detector:							
10360.000	13.724	36.590	50.314	-23.686	74.000		
20720.000	*	*	*	*	74.000		
25900.000	*	*	*	*	74.000		
31080.000	*	*	*	*	74.000		
36260.000	*	*	*	*	74.000		

#### Average

# Detector:

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	: Access Point						
Test Item	: Harmonic Radiated Emission Data						
Test Site	: No.3 OATS						
Test Mode	: Mode 2: Transmit (802.11n-20BW 14.4Mbps) (5220MHz)						
Frequency	Correct	Reading	Measurement	Margin	Limit		
	Factor	Level	Level				
MHz	dB	dBuV	dBuV/m	dB	dBuV/m		
Horizontal							
<b>Peak Detector:</b>							
10440.000	13.322	37.150	50.472	-23.528	74.000		
15660.000	*	*	*	*	74.000		
20880.000	*	*	*	*	74.000		
26100.000	*	*	*	*	74.000		
31320.000	*	*	*	*	74.000		
36540.000	*	*	*	*	74.000		
Average							
<b>Detector:</b>							
Vertical							
<b>Peak Detector:</b>							
10440.000	14.245	37.150	51.395	-22.605	74.000		
20880.000	*	*	*	*	74.000		
26100.000	*	*	*	*	74.000		
31320.000	*	*	*	*	74.000		
36540.000	*	*	*	*	74.000		
Average							
<b>Detector:</b>							

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	: Access Point						
Test Item	: Harmonic Radiated Emission Data						
Test Site	: No.3 OATS						
Test Mode	: Mode 2:	Transmit (802.11	n-20BW 14.4Mbps)	(5240MHz)			
Frequency	Correct	Reading	Measurement	Margin	Limit		
	Factor	Level	Level				
MHz	dB	dBuV	dBuV/m	dB	dBuV/m		
Horizontal							
Peak Detector:							
10480.000	13.693	36.550	50.244	-23.756	74.000		
15720.000	*	*	*	*	74.000		
20960.000	*	*	*	*	74.000		
26200.000	*	*	*	*	74.000		
31440.000	*	*	*	*	74.000		
36680.000	*	*	*	*	74.000		
Average							
Detector:							
Vertical							
Peak Detector:							
10480.000	14.620	37.150	51.771	-22.229	74.000		
20960.000	*	*	*	*	74.000		
26200.000	*	*	*	*	74.000		
31440.000	*	*	*	*	74.000		
36680.000	*	*	*	*	74.000		
Average							

# Detector:

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	: Access Point						
Test Item	: Harmonic Radiated Emission Data						
Test Site	: No.3 OA	: No.3 OATS					
Test Mode	: Mode 3:	Transmit (802.11	n-40BW 30Mbps) (5	190MHz)			
Frequency	Correct	Reading	Measurement	Margin	Limit		
	Factor	Level	Level				
MHz	dB	dBuV	dBuV/m	dB	dBuV/m		
Horizontal							
Peak Detector:							
10380.000	12.939	35.550	48.489	-25.511	74.000		
15570.000	*	*	*	*	74.000		
20760.000	*	*	*	*	74.000		
25950.000	*	*	*	*	74.000		
31140.000	*	*	*	*	74.000		
36330.000	*	*	*	*	74.000		
Average							
Detector:							
Vertical							
Peak Detector:							
10380.000	13.796	36.590	50.386	-23.614	74.000		
20760.000	*	*	*	*	74.000		
25950.000	*	*	*	*	74.000		
31140.000	*	*	*	*	74.000		
36330.000	*	*	*	*	74.000		
Average							

# Detector:

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	: Access Point						
Test Item	: Harmonic Radiated Emission Data						
Test Site	: No.3 OATS						
Test Mode	: Mode 3:	Transmit (802.11	In-40BW 30Mbps) (5	230MHz)			
Frequency	Correct	Reading	Measurement	Margin	Limit		
	Factor	Level	Level				
MHz	dB	dBuV	dBuV/m	dB	dBuV/m		
Horizontal							
<b>Peak Detector:</b>							
10640.000	14.690	36.680	51.370	-22.630	74.000		
15690.000	*	*	*	*	74.000		
20920.000	*	*	*	*	74.000		
26150.000	*	*	*	*	74.000		
31380.000	*	*	*	*	74.000		
36610.000	*	*	*	*	74.000		
Average							
<b>Detector:</b>							
Vertical							
<b>Peak Detector:</b>							
10460.000	14.433	36.550	50.983	-23.017	74.000		
20920.000	*	*	*	*	74.000		
26150.000	*	*	*	*	74.000		
31380.000	*	*	*	*	74.000		
36610.000	*	*	*	*	74.000		
Average							
<b>D</b> - 4 4							

Detector:

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	: Access Point							
Test Item	: General Radiated Emission							
Test Site	: No.3 OA	: No.3 OATS						
Test Mode	: Mode 1:	Transmit (802.11	a-6Mbps) (5220MHz					
Frequency	Correct	Reading	Measurement	Margin	Limit			
	Factor	Level	Level					
MHz	dB	dBuV	dBuV/m	dB	dBuV/m			
Horizontal								
<b>Peak Detector</b>								
101.780	-7.141	42.502	35.361	-8.139	43.500			
152.220	-10.135	40.694	30.559	-12.941	43.500			
369.500	-1.098	35.487	34.389	-11.611	46.000			
468.440	1.195	33.790	34.985	-11.015	46.000			
600.360	3.977	36.226	40.203	-5.797	46.000			
961.200	6.450	42.479	48.929	-5.071	54.000			
Vertical								
<b>Peak Detector</b>								
119.240	-3.541	34.451	30.910	-12.590	43.500			
237.580	-8.970	49.206	40.236	-5.764	46.000			
357.860	-3.734	40.629	36.895	-9.105	46.000			
480.080	-4.359	35.967	31.608	-14.392	46.000			
687.660	2.444	28.304	30.748	-15.252	46.000			
831.220	2.561	33.565	36.126	-9.874	46.000			

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.
- 8. No emission found between lowest internal used/generated frequency to 30MHz.

Product	: Access Point							
Test Item	: General Radiated Emission							
Test Site	: No.3 OATS							
Test Mode	: Mode 2	: Transmit (802.11	n-20BW 14.4Mbps)	(5220MHz)				
Frequency	Correct	Reading	Measurement	Margin	Limit			
	Factor	Level	Level					
MHz	dB	dBuV	dBuV/m	dB	dBuV/m			
Horizontal								
<b>Peak Detector</b>								
49.400	-11.018	44.021	33.003	-6.997	40.000			
225.940	-9.878	45.873	35.994	-10.006	46.000			
398.600	-2.268	36.141	33.873	-12.127	46.000			
600.360	3.977	35.177	39.154	-6.846	46.000			
747.800	3.296	29.772	33.068	-12.932	46.000			
961.200	6.450	42.999	49.449	-4.551	54.000			
Vertical								
<b>Peak Detector</b>								
165.800	-7.719	43.118	35.399	-8.101	43.500			
276.380	-8.653	45.953	37.300	-8.700	46.000			
369.500	-2.868	38.155	35.287	-10.713	46.000			
480.080	-4.359	39.388	35.029	-10.971	46.000			
664.380	-1.918	34.414	32.496	-13.504	46.000			
961.200	7.260	36.736	43.996	-10.004	54.000			

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.
- 8. No emission found between lowest internal used/generated frequency to 30MHz.

Product	: Access Point							
Test Item	: General	Radiated Emissio	n					
Test Site	: No.3 OATS							
Test Mode	: Mode 3: Transmit (802.11n-40BW 30Mbps) (5230MHz)							
Frequency	Correct	Reading	Measurement	Margin	Limit			
	Factor	Level	Level					
MHz	dB	dBuV	dBuV/m	dB	dBuV/m			
Horizontal								
<b>Peak Detector</b>								
175.500	-10.017	46.537	36.519	-6.981	43.500			
396.660	-2.296	35.982	33.686	-12.314	46.000			
476.200	-0.252	39.170	38.918	-7.082	46.000			
600.360	3.977	33.844	37.821	-8.179	46.000			
666.320	2.031	31.468	33.500	-12.500	46.000			
961.200	6.450	43.395	49.845	-4.155	54.000			
Vertical								
Peak Detector								
169.680	-8.728	42.051	33.323	-10.177	43.500			
299.660	-6.855	42.258	35.403	-10.597	46.000			
373.380	-2.373	35.882	33.509	-12.491	46.000			
503.360	-0.852	29.721	28.869	-17.131	46.000			
637.220	-3.649	31.262	27.613	-18.387	46.000			
961.200	7.260	34.913	42.173	-11.827	54.000			

- 1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. Measurement Level = Reading Level + Correct Factor.
- 5. Correct Factor = Antenna factor + Cable loss Amplifier gain.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.
- 8. No emission found between lowest internal used/generated frequency to 30MHz.

# 6. Band Edge

# 6.1. Test Equipment

### **RF Radiated Measurement:**

The following test equipments are used during the band edge tests:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 3		Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2013
	Х	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2013
		Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2013
		Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2014
	Х	Pre-Amplifier	QTK	AP-180C / CHM_0906076	Sep., 2013
		Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P/ 925975	Mar, 2014
	Х	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2014
		Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2013
	Х	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2014
	Х	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	Х	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

Note:

e: 1. All instruments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

# 6.2. Test Setup

#### **RF Radiated Measurement:**



# 6.3. Limits

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

Radiated emissions which fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209:

FCC Part 15 Subpart C Paragraph 15.209 Limits							
Frequency MHz	uV/m @3m	dBuV/m@3m					
30-88	100	40					
88-216	150	43.5					
216-960	200	46					
Above 960	500	54					

Remarks : 1. RF Voltage  $(dBuV) = 20 \log RF$  Voltage (uV)

2. In the Above Table, the tighter limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

# 6.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10:2009 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter is 120 kHz, above 1GHz are 1 MHz. The EUT was setup to ANSI C63.10, 2009; tested to DTS test procedure of FCC KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

# 6.5. Uncertainty

- $\pm$  3.8 dB below 1GHz
- $\pm$  3.9 dB above 1GHz

# 6.6. Test Result of Band Edge

Product	:	Access Point
Test Item	:	Band Edge Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit (802.11a-6Mbps)-Channel 36

#### **RF Radiated Measurement (Horizontal):**

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Average Limit	Docult
Channel No.	(MHz)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dBuV/m)	Result
36 (Peak)	5150.000	35.135	31.802	66.937	74.00	54.00	Pass
36 (Peak)	5183.000	34.950	78.128	113.077			
36 (Average)	5150.000	3.340	45.513	48.853	74.00	54.00	Pass
36 (Average)	5186.600	3.211	98.147	101.358			

**Figure Channel 36:** 

#### Horizontal (Peak)



#### Figure Channel 36:

Horizontal (Average)



Note:1. All readings above 1GHz are performed with peak and/or average measurements as necessary.

- 2. Peak measurements: RBW = 1MHz, VBW = 3MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. "\*", means this data is the worst emission level.
- 5. Measurement Level = Reading Level + Correct Factor.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.



Product	:	Access Point
Test Item	:	Band Edge Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit (802.11a-6Mbps)-Channel 36

#### **RF Radiated Measurement (Vertical):**

Channel Ma	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Average Limit	Docult
Channel No.	(MHz)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dBuV/m)	Result
36 (Peak)	5148.200	5.255	65.727	70.982	74.00	54.00	Pass
36 (Peak)	5150.000	5.260	65.241	70.501	74.00	54.00	Pass
36 (Peak)	5183.000	5.350	109.385	114.735			
36 (Average)	5150.000	5.260	47.077	52.337	74.00	54.00	Pass
36 (Average)	5176.000	5.332	97.714	103.045			

#### Figure Channel 36:

#### Vertical (Peak)





- 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. "\*", means this data is the worst emission level.
- 5. Measurement Level = Reading Level + Correct Factor.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	:	Access Point
Test Item	:	Band Edge Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit (802.11n-20BW 14.4Mbps) -Channel 36

## **RF Radiated Measurement (Horizontal):**

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Average Limit	Docult
	(MHz)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dBuV/m)	Result
36 (Peak)	5150.000	3.340	50.877	54.217	74.00	54.00	Pass
36 (Peak)	5185.600	3.215	95.238	98.452			
36 (Average)	5150.000	3.340	39.013	42.353	74.00	54.00	Pass
36 (Average)	5187.600	3.207	84.368	87.575			

#### Figure Channel 36:

#### Horizontal (Peak)





- 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. "\*", means this data is the worst emission level.
- 5. Measurement Level = Reading Level + Correct Factor.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	:	Access Point
Test Item	:	Band Edge Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 2: Transmit (802.11n-20BW 14.4Mbps) -Channel 36

#### **RF Radiated Measurement (Vertical):**

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Average Limit	Dogult
	(MHz)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dBuV/m)	Result
36 (Peak)	5146.200	5.249	64.095	69.345	74.00	54.00	Pass
36 (Peak)	5150.000	5.260	61.803	67.063	74.00	54.00	Pass
36 (Peak)	5183.600	5.351	99.654	105.005			
36 (Average)	5150.000	5.260	43.939	49.199	74.00	54.00	Pass
36 (Average)	5185.600	5.358	87.765	93.122			

#### Figure Channel 36:

#### Vertical (Peak)





#### Vertical (Average)



- 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. "\*", means this data is the worst emission level.
- 5. Measurement Level = Reading Level + Correct Factor.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	:	Access Point
Test Item	:	Band Edge Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 3: Transmit (802.11n-40BW 30Mbps) -Channel 38

### **RF Radiated Measurement (Horizontal):**

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Average Limit	Docult
	(MHz)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dBuV/m)	Result
38 (Peak)	5150.000	3.340	66.320	69.660	74.00	54.00	Pass
38 (Peak)	5176.800	3.246	86.709	89.955			
38 (Average)	5150.000	3.340	49.424	52.764	74.00	54.00	Pass
38 (Average)	5187.400	3.208	73.394	76.602			

Figure Channel 38:

Horizontal (Peak)









- 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. "\*", means this data is the worst emission level.
- 5. Measurement Level = Reading Level + Correct Factor.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	:	Access Point
Test Item	:	Band Edge Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 3: Transmit (802.11n-40BW 30Mbps) -Channel 38

#### **RF Radiated Measurement (Vertical):**

Channel No.	Frequency	Correct Factor	Reading Level	Emission Level	Peak Limit	Average Limit	Docult
	(MHz)	(dB)	(dBuV)	(dBuV/m)	(dBuV/m)	(dBuV/m)	Result
38 (Peak)	5149.200	5.258	66.087	71.345	74.00	54.00	Pass
38 (Peak)	5150.000	5.260	65.439	70.699	74.00	54.00	Pass
38 (Peak)	5182.800	5.349	85.511	90.860			
38 (Average)	5150.000	5.260	44.764	50.024	74.00	54.00	Pass
38 (Average)	5176.400	5.333	70.390	75.722			

#### Figure Channel 38:

#### Vertical (Peak)





#### Vertical (Average)



- 1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
- 2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- 3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- 4. "\*", means this data is the worst emission level.
- 5. Measurement Level = Reading Level + Correct Factor.
- 6. The average measurement was not performed when the peak measured data under the limit of average detection.

# 7. Frequency Stability

# 7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2014
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2014
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2014

Note:

- 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
- 2. The test instruments marked with "X" are used to measure the final test results.

# 7.2. Test Setup



# 7.3. Limits

Manufactures 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

# 7.4. Test Procedure

The EUT was setup to ANSI C63.10, 2009; tested to DTS test procedure of FCC KDB-789033 for compliance to FCC 47CFR Subpart E requirements.

# 7.5. Uncertainty

± 150 Hz

# 7.6. Test Result of Frequency Stability

Product	:	Access Point
Test Item	:	Frequency Stability
Test Site	:	Temperature Chamber
Test Mode	:	Carrier Wave

#### Chain A

Test Conditions		Channel	Frequency (MHz)	Frequency (MHz)	∆F (MHz)
		36	5180.0000	5180.0064	-0.0064
		38	5190.0000	5190.0089	-0.0089
Tnom (20) °C	Vnom (120)V	44	5220.0000	5220.0095	-0.0095
		46	5230.0000	5230.0085	-0.0085
		48	5240.0000	5240.0099	-0.0099
		36	5180.0000	5180.0058	-0.0058
		38	5190.0000	5190.0099	-0.0099
Tmax (50) °C	Vmax (138)V	44	5220.0000	5220.0095	-0.0095
		46	5230.0000	5230.0084	-0.0084
		48	5240.0000	5240.0094	-0.0094
	Vmin (102)V	36	5180.0000	5180.0058	-0.0058
		38	5190.0000	5190.0099	-0.0099
Tmax (50) °C		44	5220.0000	5220.0095	-0.0095
		46	5230.0000	5230.0084	-0.0084
		48	5240.0000	5240.0094	-0.0094
		36	5180.0000	5180.0098	-0.0098
		38	5190.0000	5190.0097	-0.0097
Tmin (0) °C	Vmax (138)V	44	5220.0000	5220.0089	-0.0089
		46	5230.0000	5230.0096	-0.0096
		48	5240.0000	5240.0096	-0.0096
		36	5180.0000	5180.0098	-0.0098
		38	5190.0000	5190.0097	-0.0097
Tmin (0) °C	Vmin (102)V	44	5220.0000	5220.0089	-0.0089
		46	5230.0000	5230.0096	-0.0096
		48	5240.0000	5240.0096	-0.0096

Test Conditions		Channel	Frequency (MHz)	Frequency (MHz)	△F (MHz)
		36	5180.0000	5180.0065	-0.0065
		38	5190.0000	5190.0091	-0.0091
Tnom (20) °C	Vnom (120)V	44	5220.0000	5220.0093	-0.0093
		46	5230.0000	5230.0084	-0.0084
		48	5240.0000	5240.0097	-0.0097
		36	5180.0000	5180.0053	-0.0053
		38	5190.0000	5190.0097	-0.0097
Tmax (50) °C	Vmax (138)V	44	5220.0000	5220.0093	-0.0093
		46	5230.0000	5230.0085	-0.0085
		48	5240.0000	5240.0092	-0.0092
	Vmin (102)V	36	5180.0000	5180.0053	-0.0053
		38	5190.0000	5190.0097	-0.0097
Tmax (50) °C		44	5220.0000	5220.0093	-0.0093
		46	5230.0000	5230.0085	-0.0085
		48	5240.0000	5240.0092	-0.0092
		36	5180.0000	5180.0097	-0.0097
		38	5190.0000	5190.0096	-0.0096
Tmin (0) °C	Vmax (138)V	44	5220.0000	5220.0090	-0.0090
		46	5230.0000	5230.0095	-0.0095
		48	5240.0000	5240.0095	-0.0095
		36	5180.0000	5180.0097	-0.0097
		38	5190.0000	5190.0096	-0.0096
Tmin (0) °C	Vmin (102)V	44	5220.0000	5220.0090	-0.0090
		46	5230.0000	5230.0095	-0.0095
		48	5240.0000	5240.0095	-0.0095

# 8. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs