Company: Actiontec Electronics Inc

Test of: WCB6240Q
To: FCC CFR 47 Part 15 Subpart E 15.407 +
Industry Canada RSS-247 Issue 1

Report No.: ATEC09-U11a Conducted (DFS Bands) Rev A

CONDUCTED TEST REPORT

CONDUCTED TEST REPORT

FROM

MiCOM Labs
opening wireless markets

Test of: Actiontec Electronics Inc WCB6240Q
to

To: FCC CFR 47 Part 15 Subpart E 15.407 +
Industry Canada RSS-247 Issue 1

Test Report Serial No.: ATEC09-U11a Conducted (DFS Bands) Rev A

This report supersedes: NONE

Note: this report is one of a set of three reports that together address the requirements for certification purposes

Report Number	Test Report Type
ATEC09-U5a, b	2.4 GHz Conducted & Radiated Test Reports
ATEC09-U8a, b	5 GHz (non-DFS) Conducted, Radiated Test Reports
ATEC09-U11a, b, c	5 GHz (DFS) Conducted, Radiated, DFS Test Reports
ATEC09-U2	FCC Part 15B / ICES-003 Test Report

Applicant: Actiontec Electronics Inc
760 N Mary Avenue
Sunnyvale California 94085
USA

Product Function: Wireless Access Point and Ethernet Router

Issue Date: 27th October 2015

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
575 Boulder Court
Pleasanton California 94566
USA
Phone: +1 (925) 462-0304
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A2LA ACCREDITED
TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2005. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 28th day of February 2014.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2015

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

1.2. RECOGNITION

MiCOM Labs, Inc has widely recognized wireless testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA countries. MiCOM Labs test reports are accepted globally.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2 4143A-3
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	RCB 210
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

EU MRA – European Union Mutual Recognition Agreement.
NB – Notified Body
APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement. Recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing
Phase II – recognition for both product testing and certification

1.3. PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

United States of America – Telecommunication Certification Body (TCB)
Industry Canada – Certification Body, CAB Identifier – US0159
Europe – Notified Body (NB), NB Identifier - 2280
Japan – Recognized Certification Body (RCB), RCB Identifier - 210

2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	13th October 2015	
Draft #2	19th October 2015	
Rev A	27th October 2015	Initial Release
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In the above table the latest report revision will replace all earlier versions.

3. TEST RESULT CERTIFICATE

Manufacturer:	Actiontec Electronics Inc 760 N Mary Avenue Sunnyvale California 94085 USA	**Tested By:**	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model:	WCB6240Q	**Telephone:**	+1 925 462 0304
		Fax:	+1 925 462 0306
Type Of Equipment:	802.11a/b/g/n/ac Wireless Router		
S/N's:	GWXA5360700016		
Test Date(s):	25th September – 6th October 2015	**Website:**	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart E 15.407 **Industry Canada RSS-247 Issue 1** (DFS Bands Only)	**EQUIPMENT COMPLIES**

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.

2. Details of test methods used have been recorded and kept on file by the laboratory.

3. Test results apply only to the item(s) tested.

A2LA ACCREDITED
TESTING CERT #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
I	KDB 662911	Oct 31 2013	Guidance for measurement of output emission of devices that employ single transmitter with multiple outputs or systems with multiple transmitters operating simultaneously in the same frequency band
II	KDB 905462 D07 v01	10th June 2015	Test guidance to demonstrate compliance for U-NII devices subject to DFS requirements.
III	KDB 926956 DO1 v01r02	17th October 2014	U-NII Device Transition Plan
IV	KDB 789033 D02 v01	6th June 2014	General UNII Test Procedures New Rules V01
V	A2LA	June 2015	R105 - Requirement's When Making Reference to A2LA Accreditation Status
VI	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
VII	ANSI C63.4	2009	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
VIII	CISPR 22	2008	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
IX	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
X	FCC 06-96	Jun 3 2006	Memorandum Opinion and Order
XI	FCC 47 CFR Part 15.407	2014	Radio Frequency Devices; Subpart E –Unlicensed National Information Infrastructure Devices
XII	ICES-003	Issue 5 2012	Spectrum Management and Telecommunications; Interference-Causing Equipment Standard. Information Technology Equipment (ITE) – Limits and methods of measurement.
XIII	M 3003	Edition 3 Nov. 2012	Expression of Uncertainty and Confidence in Measurements
XIV	RSS-247 Issue 1	May 2015	Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices
XV	RSS-Gen Issue 4	November 2014	General Requirements and Information for the Certification of Radiocommunication Equipment
XVI	KDB 644545 D03 v01	August 14th 2014	Guidance for IEEE 802.11ac New Rules
XVII	FCC 47 CFR Part 2.1033	2014	FCC requirements and rules regarding photographs and test setup diagrams.

4.2. Test and Uncertainty Procedure

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Actiontec Electronics Inc WCB6240Q to FCC CFR 47 Part 15 Subpart E 15.407 and Industry Canada RSS-247 Issue 1
Applicant:	Actiontec Electronics Inc 760 N Mary Avenue Sunnyvale California 94085 USA
Manufacturer:	As Applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	ATEC09-U11a Conducted (DFS Bands)
Date EUT received:	15th September 2015
Standard(s) applied:	FCC CFR 47 Part 15 Subpart E 15.407 Industry Canada RSS-247 Issue 1
Dates of test (from - to):	25th September – 6th October 2015
No of Units Tested:	2
Type of Equipment:	802.11a/b/g/n/ac Wireless Router
Product Family Name:	802.11ac Wireless 4-Port Ethernet Bridge with Optional MoCA
Model(s):	Tested Device: WCB6240Q + WEB6040Q
Location for use:	Indoor
Declared Frequency Range(s):	5250 - 5350; 5470 - 5725 MHz;
Primary function of equipment:	Wireless Access Point and Ethernet Router
Secondary function of equipment:	Optional Cable MoCA Bridge
Type of Modulation:	OFDM
EUT Modes of Operation:	802.11a; 802.11n HT-20/40; 802.11ac-24/40/80
Declared Nominal Output Power (Ave):	+24 dBm
Beam-Forming:	This device has beam-forming capability
Transmit/Receive Operation:	Transceiver - Half Duplex
Rated Input Voltage and Current:	AC/ DC adaptor (adaptor sold with unit) 12Vdc, 2A
Operating Temperature Range:	Declared Range 0°C to 40°C
ITU Emission Designator:	802.11a: 16M4D1D 802.11ac-80: 75M9D1D 802.11n HT-20: 17M7D1D 802.11n HT-40: 36M2D1D
Equipment Dimensions:	9 x 1.5 x 5.75 inches
Weight:	1.1 lbs
Hardware Rev:	AM3
Software Rev:	1.1.01.19yfa

5.2. Scope Of Test Program

Actiontec Electronics Inc WCB6240Q

The scope of the test program was to test the Actiontec Electronics Inc WCB6240Q configurations in the frequency ranges 5250 - 5350 MHz; 5470 - 5725 MHz; for compliance against the following specifications:

FCC CFR 47 Part 15 Subpart E 15.407
Radio Frequency Devices; Subpart E –Unlicensed National Information Infrastructure Devices

Industry Canada RSS-247 Issue 1
Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices

Manufacturers Declaration of Similarity
Re: FCC ID: LNQWXB6X40Q
IC ID: 2496A-WXB6X40Q
Actiontec Models: WxB6x40Q

Product Similarities;
Actiontec Models: WCB6240Q and WEB6040Q To whom it may concern: We, Actiontec Electronics, Inc., hereby to declare the mentioned two models have electrically identical Wireless circuitry with the same electromagnetic emissions and electromagnetic compatibility characteristics. Descriptions of the differences between these two models are as follows;

WCB6240Q – 802.11ac Wireless 4-Port Ethernet Bridge with Bonded MoCA
WEB6040Q – 802.11ac Wireless 4-Port Ethernet Bridge without MoCA.

Actiontec Electronics Inc WCB6240Q

Actiontec Electronics Inc WCB6240Q

5.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	Wireless Router	Actiontec	WCB6240Q	GWXA5360700016
EUT	Power Adapter 100 - 240Vac 50/60Hz 0.7A 12 Vdc 2.0 A	Actiontec	WA-24Q12FU	DJ87714D14043198400
Support	Laptop PC	IBM	Thinkpad	None

5.4. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
integral	Galtronics	Custom PCB SMT	Dipole	4.5	2.5	360	Y	5250 - 5350
integral	Galtronics	Custom Internal Cabled	Dipole	4.5	1.8	360	Y	5470 – 5725

BF Gain - Beamforming Gain
Dir BW - Directional BeamWidth
X-Pol - Cross Polarization

5.5. Cabling and I/O Ports

Port Type	Max Cable Length	# Of Ports	Screened	Conn Type	Data Type
Ethernet GbE LAN	100m	4	N	RJ45	Packet Data
MoCA	unknown	1	Y	F-Type	RF

5.6. Test Configurations

Results for the following configurations are provided in this report:

Operational Mode(s) (802.11a/b/g/n/ac)	Data Rate with Highest Power MBit/s	Channel Frequency (MHz)		
		Low	Mid	High
5250 - 5350 MHz				
802.11a	6	5,260.00	5,300.00	5,320.00
802.11ac-80	29.3	--	--	5,290.00
802.11n HT-20	6.5	5,260.00	5,300.00	5,320.00
802.11n HT-40	13.5	5,270.00	--	5,310.00
5470 - 5725 MHz				
802.11a	6	5,500.00	5,580.00	5,720.00
802.11ac-80	29.3	5,530.00	5,610.00	5,690.00
802.11n HT-20	6.5	5,500.00	5,580.00	5,720.00
802.11n HT-40	13.5	5,510.00	5,550.00	5,710.00

5.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:
1. NONE

5.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:
1. NONE

6. TEST SUMMARY

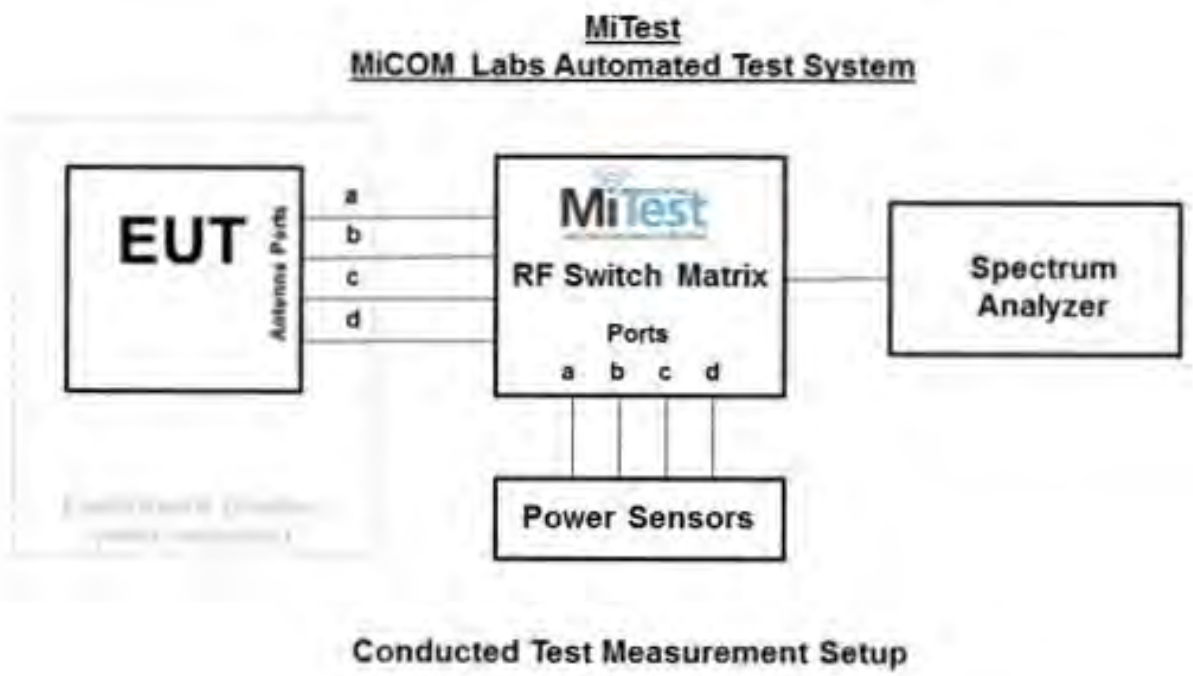
List of Measurements

Test Header	Result	Data Link
(a) Peak Transmit Power	Complies	View Data
(a) 26 dB & 99% Bandwidth	Complies	View Data
(a)(5) Power Spectral Density	Complies	View Data

7. TEST EQUIPMENT CONFIGURATION(S)

7.1. Conducted

Conducted RF Emission Test Set-up(s)
The following tests were performed using the conducted test set-up shown in the diagram below.
1. Peak Transmit Power
2. 26 dB and 99% Bandwidth
3. Power Spectral Density



Conducted Test Measurement Setup

A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
158	Barometer/Thermometer	Control Company	4196	E2846	04 Dec 2015
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	27 Aug 2016
361	Desktop for RF#1, Labview Software installed	Dell	Vostro 220	WS RF#1	Not Required
380	4x4 RF Switch Box	MiCOM Labs	MiTest RF Switch Box	MIC001	20 Dec 2015
390	USB Power Head 50MHz - 24GHz -60 to +20dBm	Agilent	U2002A	MY50000103	17 Oct 2015
398	Test Software	MiCOM	MiTest ATS	Version 3.0.0.16	Not Required
408	USB to GPIB interface	National Instruments	GPIB-USB HS	14C0DE9	Not Required
435	USB Wideband Power Sensor	Boonton	55006	8730	31 Jul 2016
440	USB Wideband Power Sensor	Boonton	55006	9178	25 Sep 2016
441	USB Wideband Power Sensor	Boonton	55006	9179	25 Sep 2016
442	USB Wideband Power Sensor	Boonton	55006	9181	25 Sep 2016
RF#1 GPIB#1	GPIB cable to Power Supply	HP	GPIB	None	Not Required
RF#1 SMA#1	EUT to Mitest box port 1	Flexco	SMA Cable port1	None	20 Dec 2015
RF#1 SMA#2	EUT to Mitest box port 2	Flexco	SMA Cable port2	None	20 Dec 2015
RF#1 SMA#3	EUT to Mitest box port 3	Flexco	SMA Cable port3	None	20 Dec 2015
RF#1 SMA#4	EUT to Mitest box port 4	Flexco	SMA Cable port4	None	20 Dec 2015
RF#1 USB#1	USB Cable to Mitest Box	Dynex	USB Cable	None	Not Required

8. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by MiTest. MiTest is an automated test system developed by MiCOM Labs. MiTest is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.

The MiCOM Labs "MiTest" Automated Test System" (Patent Pending)

9. TEST RESULTS

9.1. Peak Transmit Power

Conducted Test Conditions for Maximum Conducted Output Power			
Standard:	FCC CFR 47:15.407	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Maximum Conducted Output Power	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.407 (a)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Maximum Conducted Output Power Measurement
Method PM (Measurement using an RF average power meter). KDB 789033 defines a methodology using an average wideband power meter. Measurements were made while the EUT was operating in a continuous transmission mode (100% duty cycle) at the appropriate center frequency. All operational modes and frequency bands were measured independently and the resultant calculated. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured and reported separately. A summation (Σ) of each antenna port output power is provided which includes any offset due to Duty Cycle Correction Factor (DCCF). Testing was performed under ambient conditions at nominal voltage.

Test configuration and setup used for the measurement was per the Conducted Test Set-up section specified in this document.
Supporting Information
Calculated Power = A + G + Y+ 10 log (1/x) dBm

A = Total Power [10*Log10 ($10^{a/10}$ + $10^{b/10}$ + $10^{c/10}$ + $10^{d/10}$)]
G = Antenna Gain
Y = Beamforming Gain
x = Duty Cycle (average power measurements only)

Limits Maximum Conducted Output Power

Operating Frequency Band 5150-5250 MHz
15. 407 (a)(1)
(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. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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 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 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.

Operating Frequency Band 5250-5350 and 5470 – 5725 MHz

15. 407 (a)(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 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.

Operating Frequency Band 5725 – 5850 MHz

15. 407 (a)(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.

Maximum Conducted Power Limit(s)

Operating Frequency Band 5250 - 5350 and 5470 – 5725 MHz
15. 407 (a)(2)

Mode	Frequency Range (MHz)	Maximum 26 dB Bandwidth (MHz)	11 + 10 Log (B) (dBm)	Maximum Power Limit (dBm)
a	5250 – 5350	22.745	24.569	+24.0
HT-20		23.948	24.793	+24.0
HT-40		43.086	27.343	+24.0
ac-80		83.768	30.231	+24.0
a	5470 – 5725	22.846	24.588	+24.0
HT-20		23.948	24.793	+24.0
HT-40		42.886	27.323	+24.0
ac-80		83.768	30.231	+24.0

Maximum Conducted Power Limit 5250 – 5350 and 5470 – 5725 MHz: +24 dBm (+30 dBm/EIRP, 6 dBi antenna)

EUT: Indoor wireless router
Antenna Gain (both frequency bands): 4.50 dBi

Beamforming Gain (5250 – 5350 MHz): 2.50 dB
Beamforming Gain (5470 – 5725 MHz): 1.80 dB

Total Gain (5250 – 5350 MHz): Antenna Gain + Beamforming Gain = 4.50 + 2.50 = 7.00 dBi
Maximum conducted power (5250 – 5350, 5470 - 5725 MHz) = +24.0 – (7.0 – 6.0) = +23.0 dBm

Total Gain (5470 – 5725 MHz): Antenna Gain + Beamforming Gain = 4.50 + 1.80 = 6.30 dBi
Maximum conducted power (5250 – 5350, 5470 - 5725 MHz) = +24.0 – (6.3 – 6.0) = +23.7 dBm

Equipment Configuration for Peak Transmit Power			
Variant:	802.11a	**Duty Cycle (%):**	98.0
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power + DCCF (+0.09 dB)	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dB	
5260.0	15.99	14.68	14.51	15.42	21.30	21.643	23.00	-1.70	
5300.0	14.80	14.50	13.77	14.82	20.60	21.643	23.00	-2.40	
5320.0	15.44	14.52	14.40	15.17	21.01	21.743	23.00	-1.99	

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Variant:	802.11ac-80	**Duty Cycle (%):**	96.0
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power + DCCF (+0.18 dB)	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dB	
5290.0	13.43	12.26	11.36	12.29	18.66	82.966	23.00	-10.34	

Traceability to Industry Recognized Test Methodologies

Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	

DCCF - Duty Cycle Correction Factor

Equipment Configuration for Peak Transmit Power			
Variant:	802.11n HT-20	**Duty Cycle (%):**	98.0
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power + DCCF (+0.09 dB)	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dB	
5260.0	15.67	14.42	14.11	15.00	20.95	23.046	23.00	-2.05	
5300.0	15.40	14.39	13.64	14.59	20.66	23.046	23.00	-2.34	
5320.0	15.25	14.33	14.19	15.00	20.82	23.246	23.00	-2.18	

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Equipment Configuration for Peak Transmit Power			
Variant:	802.11n HT-40	**Duty Cycle (%):**	97.0
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power + DCCF (+0.13 dB)	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dB	
5270.0	17.00	15.88	14.82	15.87	22.11	42.685	23.00	-0.89	
5310.0	16.70	15.56	14.65	16.05	21.96	42.685	23.00	-1.04	

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Equipment Configuration for Peak Transmit Power			
Variant:	802.11a	**Duty Cycle (%):**	98.0
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power + DCCF (+0.09 dB)	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dB	
5500.0	16.31	15.79	16.01	16.35	22.23	21.743	23.70	-1.47	
5580.0	15.94	15.14	15.55	15.32	21.61	21.543	23.70	-2.09	
5720.0	15.10	14.52	14.60	15.05	20.93	22.144	23.70	-2.77	

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Equipment Configuration for Peak Transmit Power			
Variant:	802.11ac-80	**Duty Cycle (%):**	96.0
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power + DCCF (+0.18 dB)	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dB	
5530.0	16.44	16.50	15.96	16.57	22.57	82.966	23.70	-1.13	
5610.0	17.20	17.26	16.89	17.18	23.33	82.966	23.70	-0.37	
5690.0	17.03	16.93	16.43	16.43	22.91	82.565	23.70	-0.79	

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Equipment Configuration for Peak Transmit Power			
Variant:	802.11n HT-20	**Duty Cycle (%):**	98.0
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power + DCCF (+0.09 dB)	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dB	
5500.0	15.94	16.14	15.60	16.05	22.05	23.146	23.70	-1.65	
5580.0	15.49	15.43	15.32	15.43	21.53	23.246	23.70	-2.17	
5720.0	15.84	15.56	15.69	16.17	21.93	23.046	23.70	-1.77	

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Equipment Configuration for Peak Transmit Power			
Variant:	802.11n HT-40	**Duty Cycle (%):**	97.0
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power + DCCF (+0.13 dB)	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dB	
5510.0	16.29	16.25	15.97	16.09	22.28	42.485	23.70	-1.42	
5550.0	16.93	16.63	16.17	16.43	22.70	42.685	23.70	-1.00	
5710.0	16.43	15.64	15.65	16.22	22.15	42.485	23.70	-1.55	

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

9.2. 26 dB & 99% Bandwidth

Conducted Test Conditions for 26 dB and 99% Bandwidth			
Standard:	FCC CFR 47:15.407	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	26 dB and 99 % Bandwidth	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.407 (a)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for 26 dB and 99% Bandwidth Measurement
The bandwidth at 26 dB and 99 % is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency. The Resolution Bandwidth was set to approximately 1% of the emission bandwidth.
Testing was performed under ambient conditions at nominal voltage. Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured and reported.

Test configuration and setup used for the measurement was per the Conducted Test Set-up section specified in this document.

Equipment Configuration for 26 dB & 99% Occupied Bandwidth			
Variant:	802.11a	**Duty Cycle (%):**	98.0
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 26 dB Bandwidth (MHz) Port(s)				26 dB Bandwidth (MHz)			
MHz	a	b	c	d	Highest	Lowest		
5260.0	22.345	21.643	21.844	22.645	22.645	21.643		
5300.0	22.745	21.643	21.944	22.345	22.745	21.643		
5320.0	22.144	21.743	21.944	22.545	22.545	21.743		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	a	b	c	d	Highest	Lowest		
5260.0	16.733	16.633	16.733	16.834	16.834	16.633		
5300.0	16.834	16.733	16.733	16.834	16.834	16.733		
5320.0	16.834	16.733	16.733	16.834	16.834	16.733		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for 26 dB & 99% Occupied Bandwidth			
Variant:	802.11ac-80	**Duty Cycle (%):**	96.0
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 26 dB Bandwidth (MHz) Port(s)				26 dB Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5290.0	83.768	83.367	82.966	82.966	83.768	82.966		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5290.0	75.752	75.752	75.752	75.752	75.752	75.752		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for 26 dB & 99% Occupied Bandwidth			
Variant:	802.11n HT-20	**Duty Cycle (%):**	98.0
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 26 dB Bandwidth (MHz) Port(s)				26 dB Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5260.0	23.547	23.046	23.547	23.447	23.547	23.046		
5300.0	23.948	23.046	23.848	23.547	23.948	23.046		
5320.0	23.547	23.246	23.747	23.647	23.747	23.246		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5260.0	18.036	18.036	18.036	18.036	18.036	18.036		
5300.0	18.036	18.136	18.136	18.036	18.136	18.036		
5320.0	18.036	18.036	18.036	18.036	18.036	18.036		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for 26 dB & 99% Occupied Bandwidth			
Variant:	802.11n HT-40	**Duty Cycle (%):**	97.0
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 26 dB Bandwidth (MHz) Port(s)				26 dB Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5270.0	42.886	43.086	42.685	42.685	43.086	42.685		
5310.0	42.685	42.886	42.685	42.886	42.886	42.685		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5270.0	36.673	36.673	36.673	36.673	36.673	36.673		
5310.0	36.673	36.874	36.673	36.673	36.874	36.673		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for 26 dB & 99% Occupied Bandwidth			
Variant:	802.11a	**Duty Cycle (%):**	98.0
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 26 dB Bandwidth (MHz) Port(s)				26 dB Bandwidth (MHz)			
MHz	a	b	c	d	Highest	Lowest		
5500.0	22.445	21.944	21.743	22.645	22.645	21.743		
5580.0	22.144	22.244	21.543	22.545	22.545	21.543		
5720.0	22.545	22.345	22.144	22.846	22.846	22.144		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	a	b	c	d	Highest	Lowest		
5500.0	16.733	16.834	16.733	16.834	16.834	16.733		
5580.0	16.834	16.733	16.733	16.733	16.834	16.733		
5720.0	16.834	16.834	16.733	16.934	16.934	16.733		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for 26 dB & 99% Occupied Bandwidth			
Variant:	802.11ac-80	**Duty Cycle (%):**	96.0
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 26 dB Bandwidth (MHz) Port(s)				26 dB Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5530.0	82.966	83.367	83.367	83.367	83.367	82.966		
5610.0	83.367	82.966	83.367	83.367	83.367	82.966		
5690.0	82.966	82.565	83.768	83.367	83.768	82.565		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5530.0	75.752	75.752	75.752	75.752	75.752	75.752		
5610.0	75.752	75.752	75.752	75.752	75.752	75.752		
5690.0	75.752	75.752	75.752	76.152	76.152	75.752		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for 26 dB & 99% Occupied Bandwidth			
Variant:	802.11n HT-20	**Duty Cycle (%):**	98.0
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 26 dB Bandwidth (MHz) Port(s)				26 dB Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5500.0	23.146	23.547	23.547	23.447	23.547	23.146		
5580.0	23.246	23.246	23.447	23.647	23.647	23.246		
5720.0	23.046	23.447	23.848	23.948	23.948	23.046		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5500.0	18.036	18.036	18.036	18.036	18.036	18.036		
5580.0	18.036	18.036	18.036	18.036	18.036	18.036		
5720.0	17.936	18.036	18.036	18.136	18.136	17.936		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for 26 dB & 99% Occupied Bandwidth			
Variant:	802.11n HT-40	**Duty Cycle (%):**	97.0
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured 26 dB Bandwidth (MHz) Port(s)				26 dB Bandwidth (MHz)			
MHz	a	b	c	d	Highest	Lowest		
5510.0	42.886	42.485	42.485	42.685	42.886	42.485		
5550.0	42.886	42.886	42.685	42.886	42.886	42.685		
5710.0	42.485	42.685	42.685	42.886	42.886	42.485		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	a	b	c	d	Highest	Lowest		
5510.0	36.673	36.673	36.673	36.673	36.673	36.673		
5550.0	36.673	36.673	36.673	36.673	36.673	36.673		
5710.0	36.673	36.673	36.673	36.673	36.673	36.673		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the links in the above matrix to view the graphical image (plot).

9.3. Power Spectral Density

Conducted Test Conditions for Power Spectral Density			
Standard:	FCC CFR 47:15.407	**Ambient Temp. (ºC):**	24.0 - 27.5
Test Heading:	Power Spectral Density	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.407 (a)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Power Spectral Density
The in-band power spectral density was measured using the test technique specified in KDB 789033. A 1 MHz measurement bandwidth was implemented for the analyzer sweep. Once the sweep is complete the analyzer trace data is downloaded and used for post processing purposes.
Where the device operated with multiple antenna ports i.e. MIMO device, each port was measured separately. The Peak Power Spectral Density is the highest level found across the emission bandwidth. With multiple antenna port measurements the numerical analyzer data from each port is summed (å) and a link to this additional graphic is provided.

Test configuration and setup used for the measurement was per the Conducted Test Set-up section specified in this document.

Measure and sum the spectra across the outputs. With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The individual spectra are then summed mathematically in linear power units. Unlike in-band power measurements, in which the sum involves a single measured value (output power) from each output, measurements for compliance with PSD limits involve summing entire spectra across corresponding frequency bins on the various outputs. Consistency is maintained for any device with multiple transmitter outputs to be certain the individual outputs are all aligned with the same span and same number of points. In this instance, the linear power spectrum value within the first spectral bin of output 0 is summed with that in the first spectral bin of output 1, and the first spectral bin of output 2, and so on up to the Nth output to obtain the true value for the first frequency bin of the summed spectrum. The summed spectrum value for each frequency bin is computed in this fashion. These summed spectral values were post processed and the resulting numerical and graphical data presented.

NOTE: It may be observed that spectrum in some plots break the limit line however this in itself does NOT constitute a failure. In all cases a spectrum summation plot is provided in order to prove compliance. A failure occurs only after the summation of all spectrum plots have been summed and are found to be greater than the limit line.

Supporting Information
Calculated Power = A + 10 log (1/x) dBm
A = Total Power Spectral Density [10*Log10 ($10^{a/10}$ + $10^{b/10}$ + $10^{c/10}$ + $10^{d/10}$)]
x = Duty Cycle

Limits Power Spectral Density

Operating Frequency Band 5150-5250 MHz

15. 407 (a)(1)
(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. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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 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 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.

Operating Frequency Band 5250-5350 and 5470 – 5725 MHz

15. 407 (a)(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 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.

Operating Frequency Band 5725 – 5850 MHz

15. 407 (a)(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.

Horizontal and Vertical Antenna Polarization

The WCB6200Q antennas are dual polarized i.e. 3 antennas operate horizontal the other 1 vertical polarization. For this reason the Power Spectral Density test does not compare all 4 antenna's to the limit but it measures the 3 horizontal and 1 vertical antennas separately.

As a result two separate sets of tests were performed;

1).. Horizontal 3 antenna chains

2).. Vertical single antenna chain

NOTE: Antenna chain power cannot be set on an individual basis

Equipment Configuration for Power Spectral Density			
Variant:	802.11a	**Duty Cycle (%):**	98.0
Data Rate:	6 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.09 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5260.0	4.717	4.449	4.776	--	9.194	10.0	-0.8
5300.0	4.409	3.679	4.656	--	8.781	10.0	-1.2
5320.0	4.663	3.904	4.671	--	9.142	10.0	-0.8

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Equipment Configuration for Power Spectral Density			
Variant:	802.11a	**Duty Cycle (%):**	98.0
Data Rate:	6 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.09 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5260.0	--	--	--	5.126	5.214	10.0	-4.8
5300.0	--	--	--	4.750	4.838	10.0	-5.2
5320.0	--	--	--	4.919	5.007	10.0	-5.0

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for Power Spectral Density			
Variant:	802.11ac-80	**Duty Cycle (%):**	98.0
Data Rate:	29.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.09 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5290.0	0.099	-1.032	-0.061	--	3.939	10.0	-6.0

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Equipment Configuration for Power Spectral Density			
Variant:	802.11ac-80	**Duty Cycle (%):**	96.0
Data Rate:	29.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.18 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5290.0	--	--	--	-0.014	0.163	10.0	-9.8

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for Power Spectral Density			
Variant:	802.11n HT-20	**Duty Cycle (%):**	98.0
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.09 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5260.0	4.498	3.209	4.089	--	8.658	10.0	-1.3
5300.0	4.086	2.748	4.101	--	8.358	10.0	-1.6
5320.0	3.879	2.886	4.394	--	8.464	10.0	-1.5

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Equipment Configuration for Power Spectral Density			
Variant:	802.11n HT-20	**Duty Cycle (%):**	98.0
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.09 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5260.0	--	--	--	4.736	4.824	10.0	-5.2
5300.0	--	--	--	3.911	3.999	10.0	-6.0
5320.0	--	--	--	3.993	4.081	10.0	-5.9

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for Power Spectral Density			
Variant:	802.11n HT-40	**Duty Cycle (%):**	97.0
Data Rate:	13.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.13 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5270.0	3.497	2.473	3.037	--	7.511	10.0	-2.5
5310.0	3.052	2.339	3.153	--	7.526	10.0	-2.4

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Equipment Configuration for Power Spectral Density			
Variant:	802.11n HT-40	**Duty Cycle (%):**	97.0
Data Rate:	13.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	2.50
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.13 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5270.0	--	--	--	2.448	2.580	10.0	-7.4
5310.0	--	--	--	2.500	2.632	10.0	-7.4

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for Power Spectral Density			
Variant:	802.11a	**Duty Cycle (%):**	98.0
Data Rate:	6 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.09 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5500.0	4.904	5.038	7.545	--	10.674	10.7	-0.0
5580.0	4.600	4.628	7.373	--	10.468	10.7	-0.2
5720.0	3.807	3.141	5.903	--	9.097	10.7	-1.6

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Equipment Configuration for Power Spectral Density			
Variant:	802.11a	**Duty Cycle (%):**	98.0
Data Rate:	6 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.09 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5500.0	--	--	--	5.490	5.578	10.7	-5.1
5580.0	--	--	--	4.843	4.931	10.7	-5.8
5720.0	--	--	--	4.586	4.674	10.7	-6.0

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for Power Spectral Density			
Variant:	802.11ac-80	**Duty Cycle (%):**	96.0
Data Rate:	29.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.18 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5530.0	0.477	0.351	2.326	--	5.210	10.7	-5.5
5610.0	-0.466	0.550	2.560	--	5.582	10.7	-5.1
5690.0	-0.796	0.098	1.538	--	4.821	10.7	-5.8

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Equipment Configuration for Power Spectral Density			
Variant:	802.11ac-80	**Duty Cycle (%):**	96.0
Data Rate:	29.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.18 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5530.0	--	--	--	0.932	1.109	10.7	-9.6
5610.0	--	--	--	-0.285	-0.108	10.7	-10.8
5690.0	--	--	--	-0.212	-0.035	10.7	-10.7

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for Power Spectral Density			
Variant:	802.11n HT-20	**Duty Cycle (%):**	96.0
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.18 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5500.0	4.012	4.241	7.003	--	10.052	10.7	-0.6
5580.0	3.730	3.985	6.787	--	9.961	10.7	-0.7
5720.0	3.246	2.814	5.510	--	8.860	10.7	-1.8

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Equipment Configuration for Power Spectral Density			
Variant:	802.11n HT-20	**Duty Cycle (%):**	98.0
Data Rate:	6.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.09 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5500.0	--	--	--	5.222	5.310	10.7	-5.4
5580.0	--	--	--	4.515	4.603	10.7	-6.1
5720.0	--	--	--	4.587	4.675	10.7	-6.0

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Note: click the links in the above matrix to view the graphical image (plot).

Equipment Configuration for Power Spectral Density			
Variant:	802.11n HT-40	**Duty Cycle (%):**	96.0
Data Rate:	13.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.18 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5510.0	1.583	1.846	4.316	--	7.497	10.7	-3.2
5550.0	1.260	0.940	3.799	--	6.772	10.7	-3.9
5710.0	0.852	0.275	3.068	--	6.364	10.7	-4.3

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Equipment Configuration for Power Spectral Density			
Variant:	802.11n HT-40	**Duty Cycle (%):**	96.0
Data Rate:	13.5 MBit/s	**Antenna Gain (dBi):**	4.50
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	1.80
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Power Spectral Density Port(s) (dBm/MHz)				Amplitude Summation + DCCF (+0.18 dB)	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**dBm/MHz**	**dBm/MHz**	**dB**
5510.0	--	--	--	2.693	2.870	10.7	-7.8
5550.0	--	--	--	1.965	2.097	10.7	-8.6
5710.0	--	--	--	1.662	1.794	10.7	-8.9

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

DCCF - Duty Cycle Correction Factor

Note: click the links in the above matrix to view the graphical image (plot).