Company: Actiontec Electronics, Inc.

Test of: WxB6x00Q (802.11a/b/g/n/ac Wireless Router)

To: FCC CFR 47 Subpart E, 15.407 & RSS-210 Annex 9

Report No.: ATEC03–U3a Rev A

CONDUCTED, RADIATED TEST REPORT

CONDUCTED & RADIATED TEST REPORT

FROM

Test of: Actiontec Electronics, Inc. WxB6x00Q

to

To: FCC CFR 47 Subpart E, 15.407 & RSS-210 Annex 9

Test Report Serial No.: ATEC03–U3a Rev A

This report supersedes: NONE

Applicant:	Actiontec 760 N Mary Avenue Sunnyvale, California 94085 USA
Product Function:	Wireless, Ethernet and MoCA Bridge
Issue Date:	20th April 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
Fax: +1 (925) 462-0306
www.micomlabs.com

TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

Contents

1. ACCREDITATION, LISTINGS & RECOGNITION....4
1.1. TESTING ACCREDITATION....4
1.2. RECOGNITION....5
1.3. PRODUCT CERTIFICATION....6
2. DOCUMENT HISTORY....7
3. TEST RESULT CERTIFICATE....8
4. REFERENCES AND MEASUREMENT UNCERTAINTY....9
4.1. Normative References....9
4.2. Test and Uncertainty Procedure....10
5. PRODUCT DETAILS AND TEST CONFIGURATIONS....11
5.1. Technical Details....11
5.2. Scope Of Test Program....12
5.3. Equipment Model(s) and Serial Number(s)....15
5.4. Antenna Details....15
5.5. Cabling and I/O Ports....15
5.6. Test Configurations....16
5.7. Equipment Modifications....16
5.8. Deviations from the Test Standard....16
6. TEST EQUIPMENT CONFIGURATION(S)....17
6.1. Conducted....17
6.2. Radiated Spurious Emission Test Set-up > 1 GHz....19
6.3. Digital Emissions Test Set-up (0.03 – 1 GHz)....20
6.4. ac Wireline Emission Test Set-up....22
7. MEASUREMENT AND PRESENTATION OF TEST DATA....23
8. TEST RESULTS....24
8.1. Conducted Testing....24
8.1.1. Peak Transmit Power....24
8.1.2. Transmit Power Control (TPC)....35
8.1.3. 26 dB & 99% Bandwidth....36
8.1.4. Power Spectral Density....45
8.1.5. Frequency Stability....56
8.2. Radiated Testing....57
8.2.1. Radiated Testing....57
8.2.2. ac Wireline Testing....76
APPENDIX A – Graphical Images (Plots)....78
A.1. 26 dB & 99% Bandwidth....79
A.2. Power Spectral Density....163

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	9th Mar 2015	
Rev A	20th April 2015	Initial Release
.		
.		
.		
.		
.		

In the above table the latest report revision will replace all earlier versions.

3. TEST RESULT CERTIFICATE

Manufacturer:	Actiontec 760 N Mary Avenue Sunnyvale, California 94085 USA
Model:	WCB6200Q
Type Of Equipment:	802.11a/b/g/n/ac Wireless Router
S/N's:	Conducted – GWXA4480300016 Radiated – GWXA4480300015
Test Date(s):	04 - 05 March 2015

Tested By:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Telephone:	+1 925 462 0304
Fax:	+1 925 462 0306
Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart E 15.407	**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:

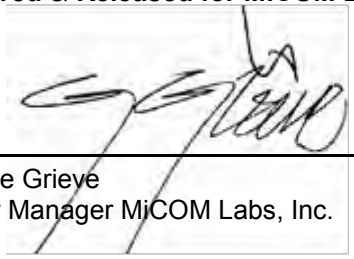
1. This document reports conditions under which testing was conducted and the results of testing performed.

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	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	905462	Jun 3 2014	Test guidance to demonstrate compliance for U-NII devices subject to DFS requirements.
III	926956	June 3,2014	U-NII Device Transition Plan
IV	443999 V01r3	Sept 23rd 2014	Approval of DFS UNII The current interim procedures to approve UNII devices operating in the 5470 - 5725 MHz band with radar detection and DFS capabilities
V	789033 D02	Jun 8 2014	General UNII Test Procedures New Rules V01
VI	A2LA	April 2014	Reference to A2LA Accreditation Status – A2LA Advertising Policy
VII	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
VIII	ANSI C63.4	2014	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
IX	CISPR 22	2008	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
X	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
XI	FCC 06-96	Jun 3 2006	Memorandum Opinion and Order
XII	FCC 47 CFR Part 15.407	2014	CFR Title 47 Part 15.407 – Radio Frequency Devices; Subpart E –Unlicensed National Information Infrastructure Devices
XIII	ICES-003	Issue 5 2012	Spectrum Management and Telecommunications; Interference-Causing Equipment Standard. Information Technology Equipment (ITE) – Limits and methods of measurement.
XIV	M 3003	Edition 3 Nov. 2012	Expression of Uncertainty and Confidence in Measurements
XV	RSS-210 Annex 9	2010	Radio Standards Specification 210; Low Power License-Exempt Radiocommunication Devices (All Frequency Bands): Category 1 Equipment
XVI	RSS-Gen	2010	General Requirements and Information for the Certification of Radiocommunication Equipment
XVII	KDB 644545 D03	August 14th 2014	Guidance for IEEE 802.11ac New Rules v01
XVIII	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. WxB6x00Q to FCC CFR 47 Part 15 Subpart E 15.407 & RSS-210 Annex 9
Applicant:	Actiontec 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:	ATEC03–U3b
Date EUT received:	20th March 2015
Standard(s) applied:	FCC CFR 47 Part 15 Subpart E 15.407 & RSS-210 Annex 9
Dates of test (from - to):	10th – 23rd March 2015
No of Units Tested:	1
Type of Equipment:	802.11a/b/g/n/ac Wireless Router
Product Family Name:	802.11ac Wireless Ethernet Bridge with Optional MoCA
Model(s):	WCB6200Q (device tested) WCB6000Q WEB6000Q
Location for use:	Indoor
Declared Frequency Range(s):	5250 - 5350 MHz; 5470 - 5725 MHz
Primary function of equipment:	Wireless Access Point and Ethernet Router
Secondary function of equipment:	Optional Cable MoCA Bridge
Type of Modulation:	CCK, OFDM
EUT Modes of Operation:	5250 - 5350 and 5470 – 5725 MHz: 802.11a; 802.11n HT-20; 802.11n HT-40; 802.11ac-80;
Declared Nominal Output Power (Ave):	5250 - 5350 MHz: +20 dBm 5470 - 5725 MHz: +20 dBm
Transmit/Receive Operation:	Transceiver - Simplex
System Beam Forming:	This device has beam-forming capability
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 16M6D1D 802.11n HT-20 17M9D1D 802.11n HT-40 36M6D1D 802.11ac 80 76M6D1D
Equipment Dimensions:	WCB6200Q: 228mm x 38mm x 146mm / 9.0" x 1.5" x 5.7" (W x D x H)
Weight:	WCB6200Q: 0.50 kg
Hardware Rev:	WCB6200Q: wcb6200 AM3
Software Rev:	WCB6200Q: 1.1.01.19k.d2b

5.2. Scope Of Test Program

Actiontec WxB6x00Q

The scope of the test program was to test the Actiontec WCB6200Q, 802.11a/b/g/n/ac Wireless Router configurations in the DFS frequency bands 5250 - 5350 MHz; 5470 - 5725 MHz for compliance against the following DFS specification:

FCC CFR 47 Part 15 Subpart E 15.407 (Limited to DFS Testing)

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

Manufacturers Declaration of Product Similarity

Re: FCC ID: LNQWXB6X00Q

Actiontec Models: WCB6200Q, WCB6000Q, WEB6000Q

To whom it may concern:
We, Actiontec Electronics, Inc., hereby to declare the above mentioned 3 models have electrically identical Wireless circuitry with the same electromagnetic emissions and electromagnetic compatibility characteristics.

Descriptions of the differences among these 3 models are declared as follow –
WCB6200Q – 802.11ac Wireless Ethernet Bridge with Bonded LAN MoCA
WCB6000Q – 802.11ac Wireless Ethernet Bridge with LAN MoCA
WEB6000Q – 802.11ac Wireless Ethernet Bridge without MoCA

Actiontec WCB6200Q

Side 2 View

FCC OET KDB Implementation
This test program implements the following FCC KDB – 662911 31st October 2013;
Emissions Testing of Transmitters with Multiple Outputs in the Same Band

The KDB document provides guidance for measurements of conducted output emissions of devices that employ a single transmitter with multiple outputs in the same band, with the outputs occupying the same or overlapping frequency ranges. It applies to EMC compliance measurements on devices that transmit on multiple antennas simultaneously in the same or overlapping frequency ranges through a coordinated process. Examples include, but are not limited to, devices employing beam forming or multiple-input and multiple-output (MIMO.) This guidance applies to both licensed and unlicensed devices wherever the FCC rules call for conducted output measurements. Guidance is provided for in-band, out-of-band and spurious emission measurements.

This guidance does not apply to the multiple transmitters included in a composite device, such as a device that combines an 802.11 modem with a cell phone in one enclosure with each driving its own antenna.

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

Type	Description	Manufacturer	Model	Serial no.	Delivery Data
EUT	Conducted Unit	Actiontec Electronics, Inc.	WCB6200Q	GWXA4480300016	26 Feb 2015
EUT	Radiated Unit	Actiontec Electronics, Inc.	WCB6200Q	GWXA4480300015	26 Feb 2015

5.4. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
External	Galtronics	Custom PCB SMT	Dipole	3.0	3.92	360	-	5250 - 5350
External	Galtronics	Custom PCB SMT	Dipole	3.0	4.39	360	-	5470 - 5725
External	Galtronics	Custom Internal Cabled	Dipole	3.0	3.92	360	-	5250 - 5350
External	Galtronics	Custom Internal Cabled	Dipole	3.0	4.39	360	-	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	100m	2	N	RJ-45	Packet Data

5.6. Test Configurations

Testing was performed to determine the highest power level versus bit rate. The variant with the highest power was used to exercise the product.

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
802.11n 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
802.11ac-80	29.3	5,290.00	-	-
5470 - 5725 MHz				
802.11a	6	5,500.00	5,580.00	5,720.00
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
802.11ac-80	29.3	5,530.00	5,610.00	5,690.00

Legacy – data rates for 802.11abg products

Results for the above configurations are provided in this report

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

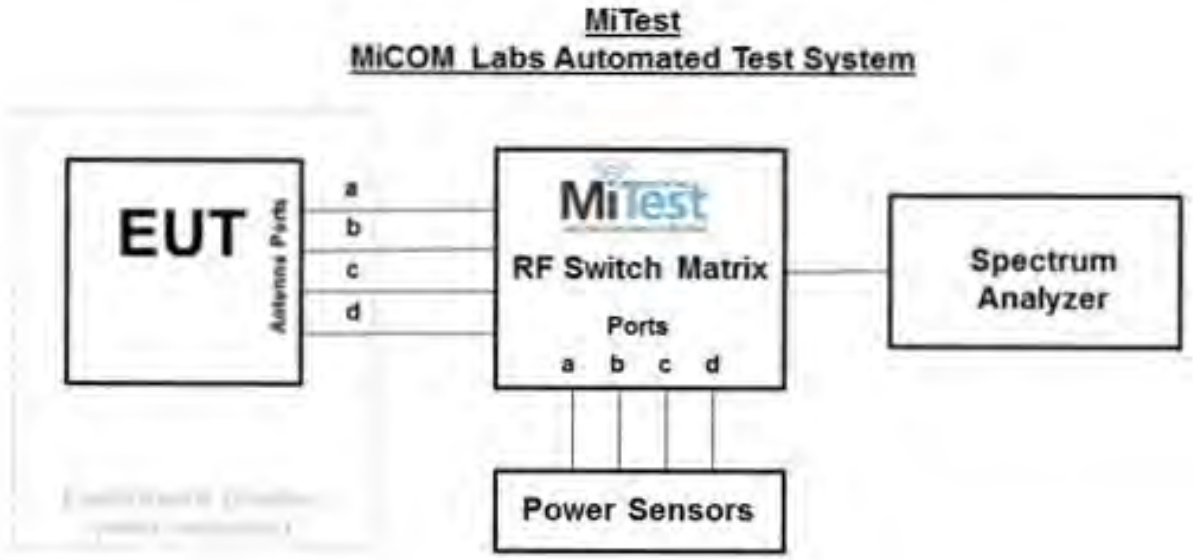
6. TEST EQUIPMENT CONFIGURATION(S)

6.1. Conducted

Conducted RF Emission Test Set-up(s) with Environmental Chamber.
The following tests were performed using the conducted test set-up shown in the diagram below.

1. Peak Transmit Power
2. Transmit Power Control (TPC)
3. 26 dB and 99% Occupied Bandwidth
4. Power Spectral Density

*environmental chamber utilized



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.

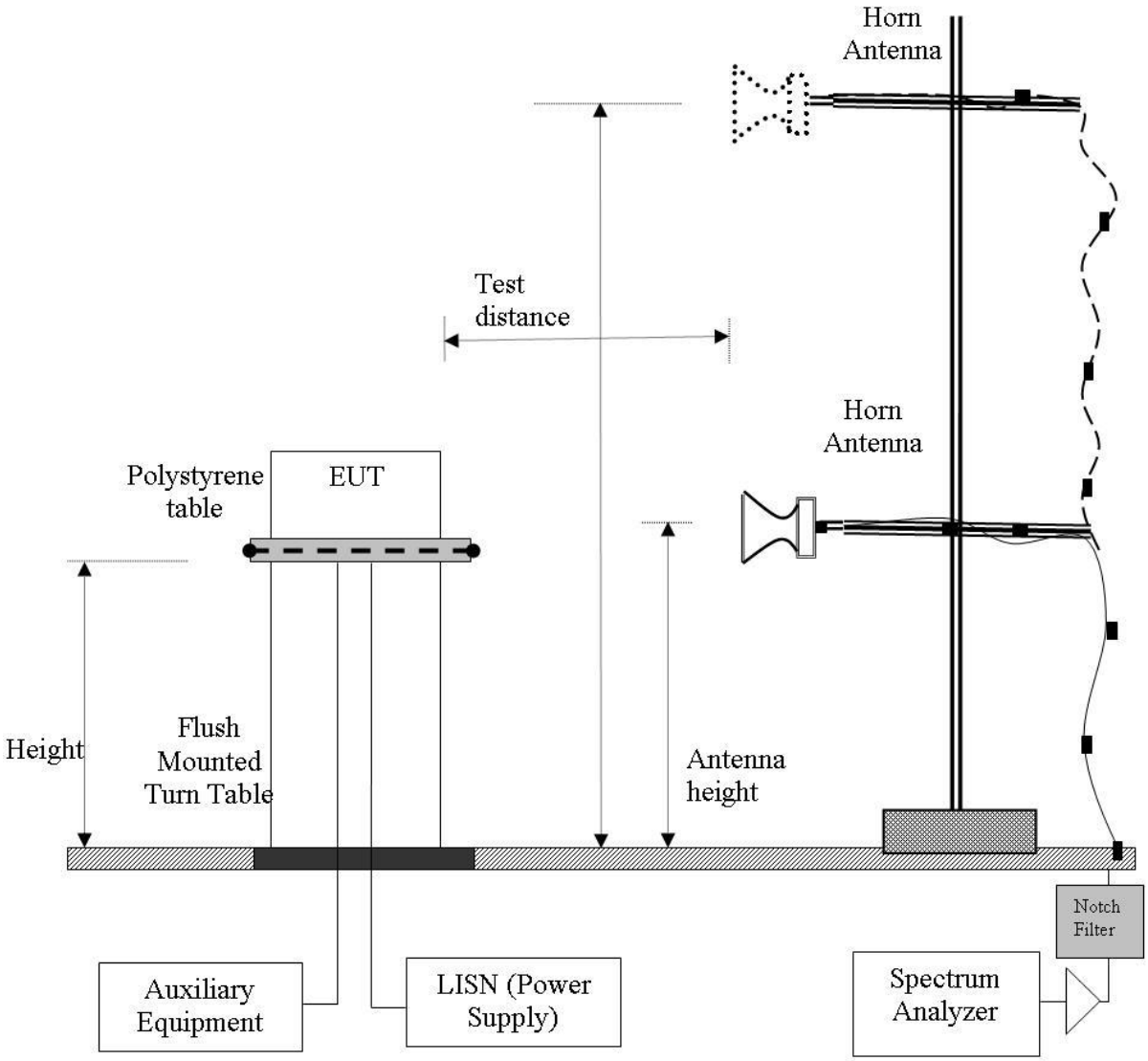
Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
127	Power Supply	HP	6674A	US36370530	Cal when used
158	Barometer/Thermometer	Control Company	4196	E2846	04 Dec 2015
193	Receiver 20 Hz to 7 GHz	Rhode & Schwarz	ESI 7	838496/007	14 Jan 2016

248	Resistance Thermometer	Thermotronics	GR2105-02	9340 #1	30 Oct 2015
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	31 Jul 2015
376	USB 10MHz - 18GHz Average Power Sensor	Agilent	U2000A	MY51440005	28 Oct 2015
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	17 Jul 2015
381	4x4 RF Switch Box	MiCOM Labs	MiTest RF Switch Box	MIC002	30 Jun 2015
419	Laptop with Labview Software	Lenova	W520	TS02	Not Required
420	USB to GPIB Interface	National Instruments	GPIB-USB HS	1346738	Not Required
435	USB Wideband Power Sensor	Boonton	55006	8730	31 Jul 2015
436	USB Wideband Power Sensor	Boonton	55006	8731	31 Jul 2015
437	USB Wideband Power Sensor	Boonton	55006	8759	31 Jul 2015
445	PoE Injector	D-Link	DPE-101GL	QTAH1E2000625	Not Required
460	Dell Computer with installation of MiTest executable.	Dell	Optiplex330	BC944G1	Not Required
74	Environmental Chamber Chamber 3	Tenney	TTC	12808-1	30 Sep 2015
RF#2 GPIB#1	GPIB cable to Power Supply	HP	GPIB	None	Not Required
RF#2 SMA#1	EUT to Mitest box port 1	Flexco	SMA Cable port1	None	30 Jun 2015
RF#2 SMA#2	EUT to Mitest box port 2	Flexco	SMA Cable port2	None	30 Jun 2015
RF#2 SMA#3	EUT to Mitest box port 3	Flexco	SMA Cable port3	None	30 Jun 2015
RF#2 SMA#4	EUT to Mitest box port 3	Flexco	SMA Cable port4	None	30 Jun 2015
RF#2 SMA#SA	Mitest box to SA	Flexco	SMA Cable SA	None	30 Jun 2015
RF#2 USB#1	USB Cable to Mitest Box	Dynex	USB Cable	None	Not Required

6.2. Radiated Spurious Emission Test Set-up > 1 GHz

The following tests were performed using the conducted test set-up shown in the diagram below.

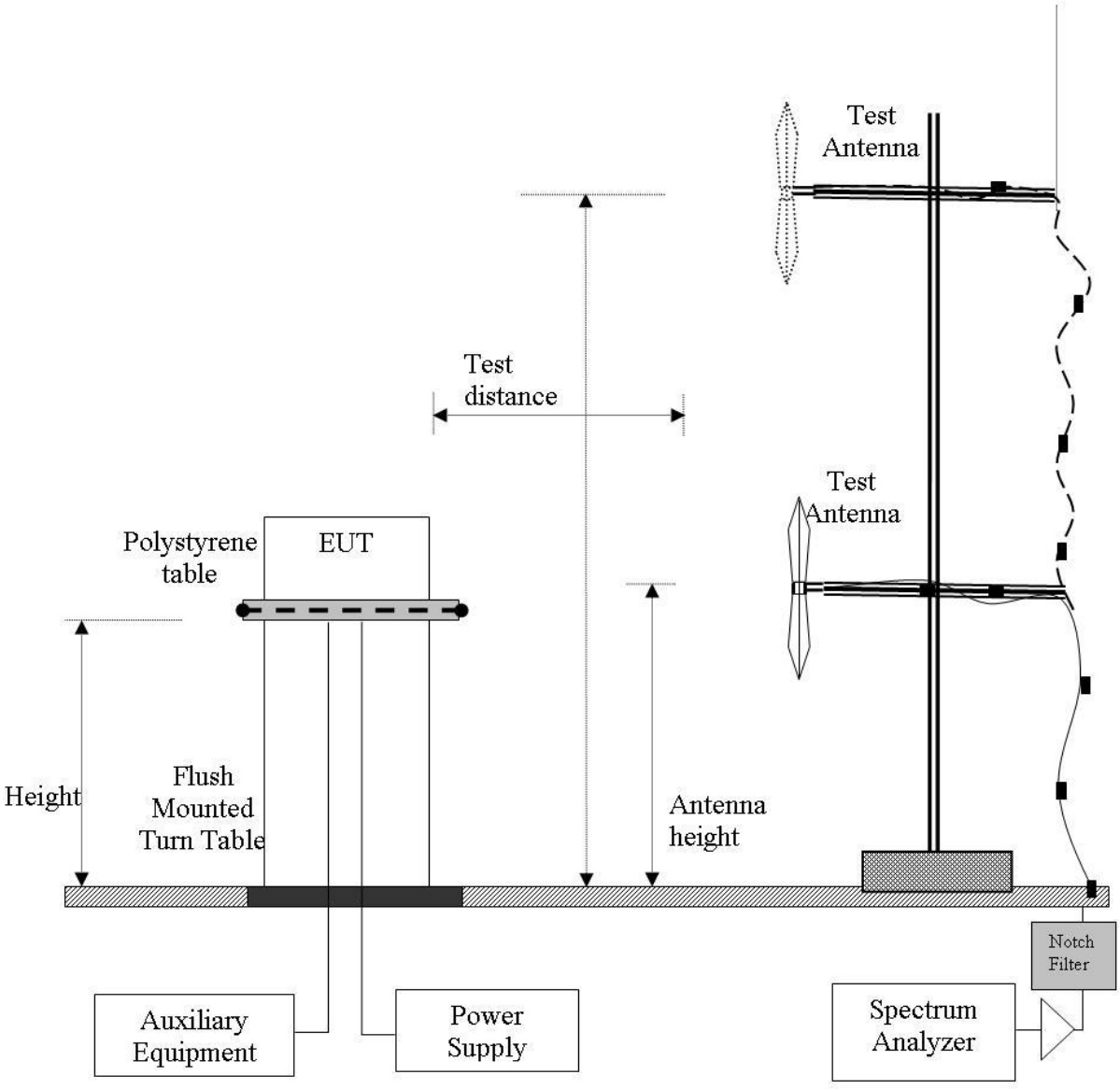
Radiated Emission Measurement Setup – Above 1 GHz



6.3. Digital Emissions Test Set-up (0.03 – 1 GHz)

The following tests were performed using the conducted test set-up shown in the diagram below.

Digital Emission Measurement Setup – Below 1 GHz



Traceability of Test Equipment Utilized for Radiated Emission Testing

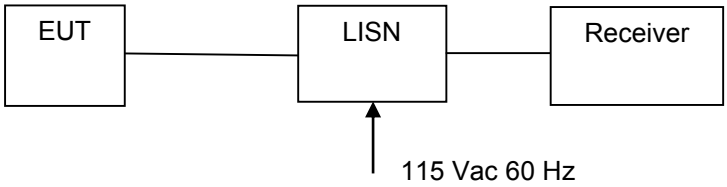
Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
158	Barometer/Thermometer	Control Company	4196	E2846	04 Dec 2015
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CY101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	31 Jul 2015
301	5470 to 5725 MHz Notch Filter	Microtronics	RBC50704	001	08 Oct 2015
302	5150 to 5350 MHz Notch Filter	Microtronics	BRC50703	002	08 Oct 2015
303	5725 to 5875 MHz Notch filter	Microtronics	BRC50705	003	08 Oct 2015
310	SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001	30 Oct 2015
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	14 Aug 2015
342	2.4 GHz Notch Filter	EWT	EWT-14-0203	H1	08 Oct 2015
343	5.15 GHz Notch Filter	EWT	EWT-14-0200	H1	08 Oct 2015
344	5.35 GHz Notch Filter	EWT	EWT-14-0201	H1	08 Oct 2015
345	5.46 GHz Notch Filter	EWT	EWT-14-0202	H1	08 Oct 2015
377	Band Rejection Filter 5150 to 5880MHz	Microtronics	BRM50716	034	08 Oct 2015
396	2.4 GHz Notch Filter	Microtronics	BRM50701	001	07 Oct 2015
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	23 Oct 2015
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	10 Oct 2015
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	30 May 2015
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
416	Gigabit ethernet filter	ETS-Lingren	Gigafoil 260366	None	Not Required
502	Test Software for Radiated Emissions	EMISoft	Vasona	Version 5 Build 59	Not Required
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used

6.4. ac Wireline Emission Test Set-up

The following tests were performed using the conducted test set-up shown in the diagram below.

1. Section 5.1.3 ac Wireline Conducted Emissions

Test Measurement Set up



Measurement set up for AC Wireline Conducted Emissions Test

Traceability of Test Equipment Utilized for ac Wireline Emission Testing

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
158	Barometer/Thermometer	Control Company	4196	E2846	04 Dec 2015
184	Pulse Limiter	Rhode & Schwarz	ESH3Z2	357.8810.52	Cal when used
190	LISN (two-line V-network)	Rhode & Schwarz	ESH3Z5	836679/006	12 Sep 2015
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	31 Jul 2015
316	Dell desktop computer workstation with Vasona	Dell	Desktop	WS04	Not Required

7. 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)

8. TEST RESULTS

8.1. Conducted Testing

8.1.1. 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.

Operating Frequency Band 5250 - 5350 and 5470 – 5725 MHz

15. 407 (a)(2)

Maximum Conducted Power

Mode	Frequency Range (MHz)	Maximum 26 dB Bandwidth (MHz)	11 + 10 Log (B) (dBm)	Maximum Power Limit (dBm)
a	5250 – 5350	23.046	24.63	+24.0
HT-20		23.848	24.77	+24.0
HT-40		43.086	27.34	+24.0
ac-80		84.168	30.25	+24.0
a	5470 – 5725	22.946	24.61	+24.0
HT-20		23.848	24.77	+24.0
HT-40		42.886	27.32	+24.0
ac-80		84.168	30.25	+24.0

Maximum Transmit (Conducted) Power Limits

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

EUT: Indoor wireless router
Antenna gain for both frequency bands: 3.00 dBi

Beamforming Gain
5250 – 5350 MHz: 3.92 dB
5470 – 5725 MHz: 4.39 dB

Maximum conducted power (5250 – 5350 MHz) = +24 – (3.0 + 3.92 – 6) = +23.08 dBm

Maximum conducted power (5470 – 5725 MHz) = +24 – (3.0 + 4.39 – 6) = +22.61 dBm

Equipment Configuration for Peak Transmit Power			
Variant:	802.11a	**Duty Cycle (%):**	99
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm)				Calculated Total Power	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
	Port(s)								
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dBm	
5260.0	17.18	16.15	14.02	16.61	22.21	23.547	23.08	-0.87	18.00
5300.0	17.54	16.56	13.96	16.51	22.39	23.848	23.08	-0.69	18.00
5320.0	17.54	15.88	13.83	16.60	22.23	23.547	23.08	-0.85	18.00

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 (%):**	99
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dBm	
5290.0	15.57	14.61	12.00	15.16	20.60	83.768	23.08	-2.48	16.00

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 (%):**	99
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dBm	
5260.0	17.23	16.26	14.07	16.79	22.31	23.948	23.08	-0.77	18.00
5300.0	17.36	16.17	13.80	16.72	22.27	23.547	23.08	-0.81	18.00
5320.0	17.43	16.25	13.56	16.69	22.27	24.048	23.08	-0.81	18.00

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 (%):**	99
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dBm	
5270.0	16.42	15.71	13.10	16.31	21.64	42.886	23.08	-1.44	17.00
5310.0	16.82	15.75	13.20	16.33	21.79	42.685	23.08	-1.29	17.00

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 (%):**	99
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dBm	
5500.0	15.91	14.50	13.62	15.00	20.90	23.547	22.61	-1.71	16.00
5580.0	16.07	14.73	13.87	15.04	21.06	23.747	22.61	-1.55	16.00
5720.0	15.70	14.95	14.25	14.96	21.06	23.547	22.61	-1.55	16.00

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 (%):**	99
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dBm	
5530.0	16.99	15.51	14.63	15.89	21.90	83.768	22.61	-0.71	17.00
5610.0	16.84	15.79	14.49	15.94	21.91	83.367	22.61	-0.70	17.00
5690.0	16.64	15.59	14.48	15.50	21.68	83.768	22.61	-0.93	17.00

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 (%):**	99
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dBm	
5500.0	16.76	15.51	14.41	15.66	21.73	23.848	22.61	-0.88	17.00
5580.0	16.96	15.76	14.83	15.86	21.98	23.547	22.61	-0.63	17.00
5720.0	16.64	15.69	15.14	16.15	22.00	24.148	22.61	-0.61	17.00

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 (%):**	99
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

Test Frequency	Measured Conducted Output Power (dBm) Port(s)				Calculated Total Power	Minimum 26 dB Bandwidth	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	Σ Port(s) dBm	MHz	dBm	dBm	
5510.0	16.98	15.64	14.62	15.75	21.89	42.685	22.61	-0.72	17.00
5550.0	16.90	15.48	14.45	15.68	21.78	42.886	22.61	-0.83	17.00
5710.0	16.73	16.05	15.31	16.05	22.13	42.685	22.61	-0.48	17.00

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

DCCF - Duty Cycle Correction Factor

8.1.2. Transmit Power Control (TPC)

Conducted Test Conditions for Transmit Power Control (TPC)			
Standard:	FCC CFR 47:15.407	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Transmit Power Control (TPC)	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.247 (h)	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Section "Normative References" KDB 789033 - D01 DTS General UNII Test Procedures KDB 662911 - Measurement of Transmitters with Multiple Output, MIMO, Smart Antenna		

Test Procedure for Transmit Power Control
Transmit power control (TPC). U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

Transmit Power Control measurement test setup diagram is provided in Section "Test Equipment Measurement Setup \ Conducted RF Emissions".

From the Peak Transmit Power section in this document it was found that the device EIRP was greater than 500 mW therefore Transmit Power Control implementation is required. Testing was performed and the unit TPC function was greater than 6 dB.

In order to verify the TPC function the manufacturers GUI was used for test purposes.

8.1.3. 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 (%):**	99.0
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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	24.148	23.848	23.547	24.248	24.248	23.547		
5300.0	23.848	24.248	23.848	24.449	24.449	23.848		
5320.0	23.547	23.547	24.048	23.948	24.048	23.547		

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

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 (%):**	99.0
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	
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**		
					0.000	0.000		
5290.0	83.768	83.768	84.168	83.768	84.168	83.768		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
					0.000	0.000		
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 (%):**	99.0
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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	24.649	23.948	24.349	24.148	24.649	23.948		
5300.0	23.848	23.848	23.547	24.148	24.148	23.547		
5320.0	24.248	24.148	24.048	24.048	24.248	24.048		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5260.0	18.136	18.136	18.136	18.136	18.136	18.136		
5300.0	18.236	18.136	18.136	18.136	18.236	18.136		
5320.0	18.136	18.136	18.136	18.136	18.136	18.136		

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 (%):**	99.0
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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	42.886	43.086	42.886	43.086	42.886		
5310.0	42.886	43.287	42.685	42.685	43.287	42.685		

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

Equipment Configuration for 26 dB & 99% Occupied Bandwidth			
Variant:	802.11a	**Duty Cycle (%):**	99.0
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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	23.547	23.948	23.848	24.048	24.048	23.547		
5580.0	23.747	23.747	23.848	24.048	24.048	23.747		
5720.0	23.547	23.948	23.848	24.449	24.449	23.547		

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

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 (%):**	99.0
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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	83.768	83.768	83.768	84.168	84.168	83.768		
5610.0	83.768	83.768	83.768	83.367	83.768	83.367		
5690.0	84.168	83.768	84.168	84.168	84.168	83.768		

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	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 (%):**	99.0
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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	24.148	24.248	23.848	23.848	24.248	23.848		
5580.0	24.549	23.547	24.248	24.148	24.549	23.547		
5720.0	24.649	24.148	24.248	24.148	24.649	24.148		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5500.0	18.136	18.136	18.136	18.136	18.136	18.136		
5580.0	18.136	18.136	18.136	18.136	18.136	18.136		
5720.0	18.236	18.136	18.136	18.236	18.236	18.136		

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 (%):**	99.0
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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	43.086	43.086	43.086	42.685	43.086	42.685		
5550.0	42.886	42.886	43.086	42.886	43.086	42.886		
5710.0	43.086	42.685	42.685	42.886	43.086	42.685		

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				99% Bandwidth (MHz)			
MHz	**a**	**b**	**c**	**d**	**Highest**	**Lowest**		
5510.0	36.874	36.673	36.673	36.673	36.874	36.673		
5550.0	36.874	36.874	36.673	36.673	36.874	36.673		
5710.0	36.874	36.673	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).

8.1.4. 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.

NOTE: for the WCB6200Q device the antennas are dual polarized i.e. 2 antennas operate horizontal the other 2 vertical polarization. For this reason the Power Spectral Density test does not compare all 4 antenna's to the limit but it measures the 2 horizontal and 2 vertical antennas separately.

Maximum Power Spectral Density Limits

Maximum Limit 5250 – 5350 and 5470 – 5725 MHz: +11 dBm/MHz (6 dBi antenna)

Antenna Gain
Antenna gain for both frequency bands: 3.00 dBi

Beamforming Gain
5250 – 5350 MHz: 3.92 dB
5470 – 5725 MHz: 4.39 dB

Maximum Power Spectral Density (5250 – 5350 MHz) = +11 – (3.0 + 3.92 – 6) = +10.08 dBm/MHz

Maximum Power Spectral Density (5470 – 5725 MHz) = +11 – (3.0 + 4.39 – 6) = +9.61 dBm/MHz

Equipment Configuration for Power Spectral Density			
Variant:	802.11a	**Duty Cycle (%):**	99.0
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5260.0	7.455	6.422	--	--	9.860	10.1	-0.3
5300.0	7.586	6.323	--	--	10.018	10.1	-0.1
5320.0	7.407	6.241	--	--	9.854	10.1	-0.3

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:	802.11a	**Duty Cycle (%):**	99.0
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5260.0	--	--	4.496	6.734	8.797	10.1	-1.3
5300.0	--	--	4.249	7.081	8.909	10.1	-1.2
5320.0	--	--	4.028	7.470	9.130	10.1	-1.0

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 (%):**	99.0
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5290.0	-1.070	-2.348	--	--	1.232	10.1	-8.9

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 (%):**	99.0
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5290.0	--	--	-4.160	-1.282	0.550	10.1	-9.6

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 (%):**	99.0
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5260.0	5.443	4.618	--	--	8.070	10.1	-2.0
5300.0	5.588	4.697	--	--	8.154	10.1	-2.0
5320.0	5.842	4.592	--	--	8.271	10.1	-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 (%):**	99.0
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5260.0	--	--	2.364	5.300	7.115	10.1	-3.0
5300.0	--	--	2.151	5.338	7.067	10.1	-3.0
5320.0	--	--	2.047	5.379	7.062	10.1	-3.0

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 (%):**	99.0
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5270.0	2.566	1.818	--	--	5.191	10.1	-4.9
5310.0	2.897	1.875	--	--	5.438	10.1	-4.7

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 (%):**	99.0
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	3.92
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5270.0	--	--	-0.524	2.698	4.383	10.1	-5.7
5310.0	--	--	-0.582	2.433	4.153	10.1	-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:	802.11a	**Duty Cycle (%):**	99.0
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5500.0	5.319	3.809	--	--	7.632	9.6	-2.0
5580.0	5.347	4.024	--	--	7.731	9.6	-1.9
5720.0	4.316	3.782	--	--	7.089	9.6	-2.5

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:	802.11a	**Duty Cycle (%):**	99.0
Data Rate:	6.00 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5500.0	--	--	3.139	4.605	6.895	9.6	-2.7
5580.0	--	--	3.278	4.467	6.930	9.6	-2.7
5720.0	--	--	3.047	3.838	6.499	9.6	-3.1

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 (%):**	99.0
Data Rate:	29 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5530.0	0.762	-0.639	--	--	3.079	9.6	-6.5
5610.0	-0.055	-0.813	--	--	2.262	9.6	-7.3
5690.0	-0.818	-1.606	--	--	1.795	9.6	-7.8

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 (%):**	99.0
Data Rate:	29.30 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5530.0	--	--	-2.237	0.461	2.363	9.6	-7.2
5610.0	--	--	-2.677	-0.696	1.342	9.6	-8.3
5690.0	--	--	-2.635	-1.098	1.254	9.6	-8.4

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:	802.11n HT-20	**Duty Cycle (%):**	99.0
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5500.0	6.012	4.616	--	--	8.370	9.6	-1.2
5580.0	6.038	4.744	--	--	8.383	9.6	-1.2
5720.0	5.147	4.308	--	--	7.769	9.6	-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 (%):**	99.0
Data Rate:	6.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5500.0	--	--	3.782	5.102	7.500	9.6	-2.1
5580.0	--	--	4.022	5.062	7.607	9.6	-2.0
5720.0	--	--	3.865	4.852	7.421	9.6	-2.2

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 (%):**	99.0
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5510.0	1.680	1.000	--	--	4.315	9.6	-5.3
5550.0	2.871	1.485	--	--	5.186	9.6	-4.4
5710.0	2.014	1.555	--	--	4.819	9.6	-4.8

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-40	**Duty Cycle (%):**	99.0
Data Rate:	13.50 MBit/s	**Antenna Gain (dBi):**	3.00
Modulation:	OFDM	**Beam Forming Gain (Y)(dB):**	4.39
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 (+0.04 dB)	Limit	Margin
MHz	a	b	c	d	dBm/MHz	dBm/MHz	dB
5510.0	--	--	-0.114	2.343	4.215	9.6	-5.4
5550.0	--	--	0.569	1.973	4.350	9.6	-5.3
5710.0	--	--	0.811	1.622	4.239	9.6	-5.4

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).

8.1.5. Frequency Stability

FCC, Part 15 Subpart C §15.407(g)

Test Procedure

The manufacturer of the equipment is responsible for ensuring that the frequency stability is such that emissions are always maintained within the band of operation under all conditions.

Manufacturer Declaration

The frequency stability of the reference oscillator sets the frequency stability of the RF transceiver signals. Therefore all of the RF signals should have ±20ppm stability.

This stability accounts for room temp tolerance of the crystal oscillator circuit, frequency variation across temperature, and crystal ageing.

±20ppm at 5.250 GHz translates to a maximum frequency shift of ±105 KHz. As the edge of the channels is at least one MHz from either of the band edges, ±105 KHz is more than sufficient to guarantee that the intentional emission will remain in the band over the entire operating range of the EUT.

Specification

Limits

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

8.2. Radiated Testing

8.2.1. Radiated Testing

Transmitter Radiated Spurious Emissions (above 1 GHz); Peak Field Strength Measurements; and Radiated Band Edge Measurements – Restricted Bands

FCC, Part 15 Subpart C §15.247(d) 15.205; 15.209
Industry Canada RSS-210 §A8.5, §2.2, §2.6
Industry Canada RSS-Gen §4.7

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Operational Modes

Operational mode(s) tested for spurious emissions were the modes which delivered maximum spectral density

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

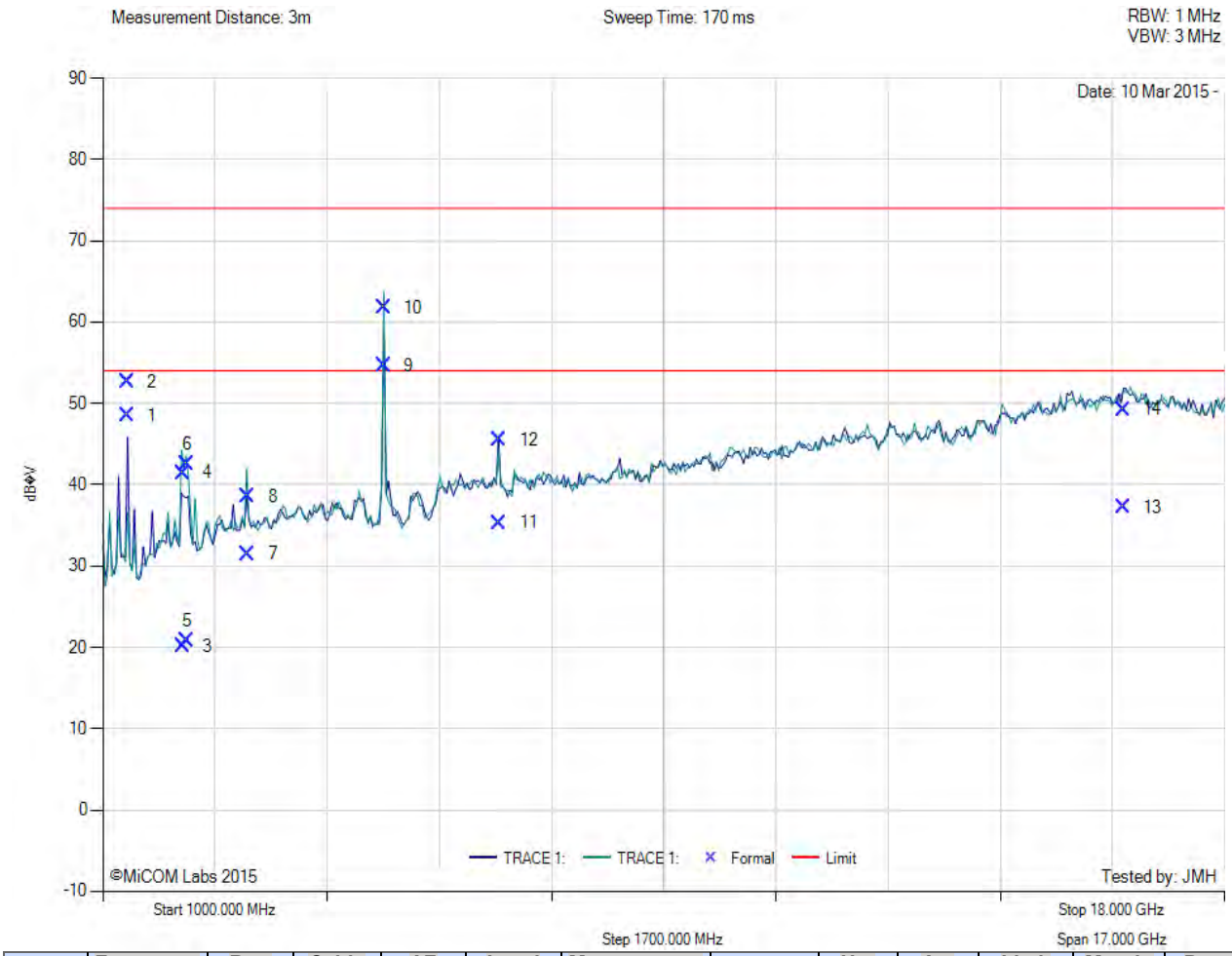
40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

NOTE: KDB 662911 was implemented for Out-of-Band measurements. Where necessary Option (2) Measure and add 10 log (N) dB was implemented

Radiated Spurious

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5260.00 MHz, Antenna: Galtronics, Power Setting: 13

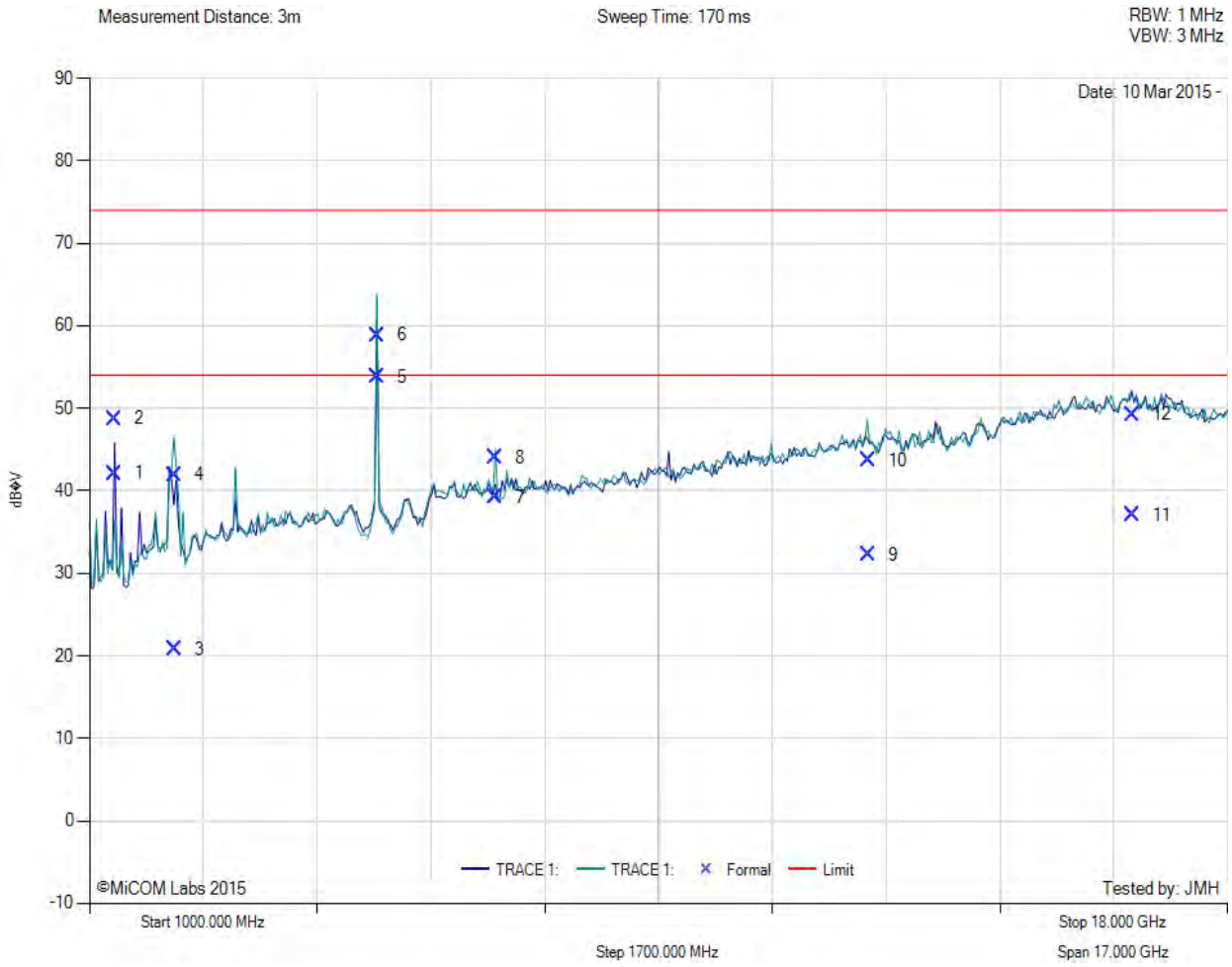


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	1374.99	60.92	3.00	-15.38	48.54	MAvg	Horizontal	100	73	54.0	-25.5	Pass
2	1374.99	64.97	3.00	-15.38	52.59	MPeak	Horizontal	100	73	74.0	-21.4	Pass
3	2206.54	28.83	3.85	-12.52	20.16	MAvg	Vertical	100	327	54.0	-53.8	Pass
4	2206.54	50.10	3.85	-12.52	41.43	MPeak	Vertical	100	327	74.0	-32.6	Pass
5	2274.64	29.04	3.90	-12.15	20.79	MAvg	Vertical	100	354	54.0	-53.2	Pass
6	2274.64	50.80	3.90	-12.15	42.55	MPeak	Vertical	100	354	74.0	-31.5	Pass
8	3200.11	45.19	4.68	-11.29	38.58	MPeak	Vertical					NRB
10	5258.08	66.90	6.13	-11.30	61.73	MPeak	Vertical					FUND
12	7013.37	45.69	7.21	-7.42	45.48	MPeak	Horizontal					NRB
14	16465.61	35.28	12.26	1.72	49.26	MPeak	Horizontal					NRB

Test Notes: Unit is beaconing in the 2.4G band, added 2.4G filter: FUND – Fundamental Frequency, NRB – Non-Restricted Band

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5300.00 MHz, Antenna: Galtronics, Power Setting: 13

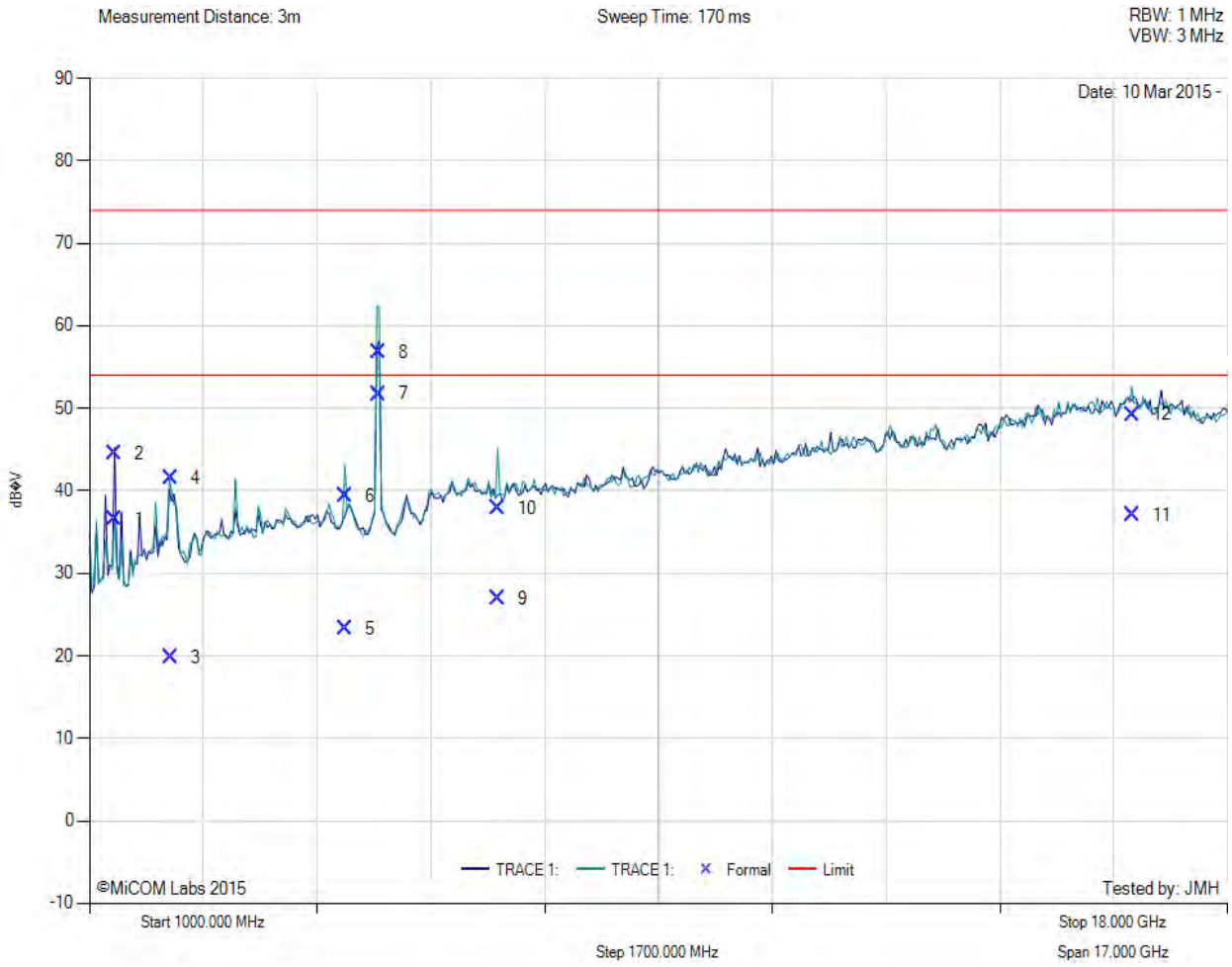


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	1375.07	54.51	3.00	-15.38	42.13	MAvg	Horizontal	103	73	54.0	-31.9	Pass
2	1375.07	61.15	3.00	-15.38	48.77	MPeak	Horizontal	103	73	74.0	-25.2	Pass
3	2275.63	29.04	3.90	-12.15	20.79	MAvg	Vertical	100	53	54.0	-53.2	Pass
4	2275.63	50.19	3.90	-12.15	41.94	MPeak	Vertical	100	53	74.0	-32.1	Pass
6	5298.16	63.78	6.17	-11.10	58.85	MPeak	Vertical					FUND
8	7066.72	44.10	7.22	-7.34	43.98	MPeak	Vertical					NRB
9	12628.69	28.53	10.06	-6.40	32.19	MAvg	Horizontal	160	276	54.0	-41.8	Pass
10	12628.69	40.07	10.06	-6.40	43.73	MPeak	Horizontal	160	276	74.0	-30.3	Pass
12	16575.99	35.57	12.08	1.58	49.23	MPeak	Horizontal					NRB

Test Notes: Unit is beaconing in the 2.4G band, added 2.4G filter: FUND – Fundamental Frequency, NRB – Non-Restricted Band

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5320.00 MHz, Antenna: Galtronics, Power Setting: 13

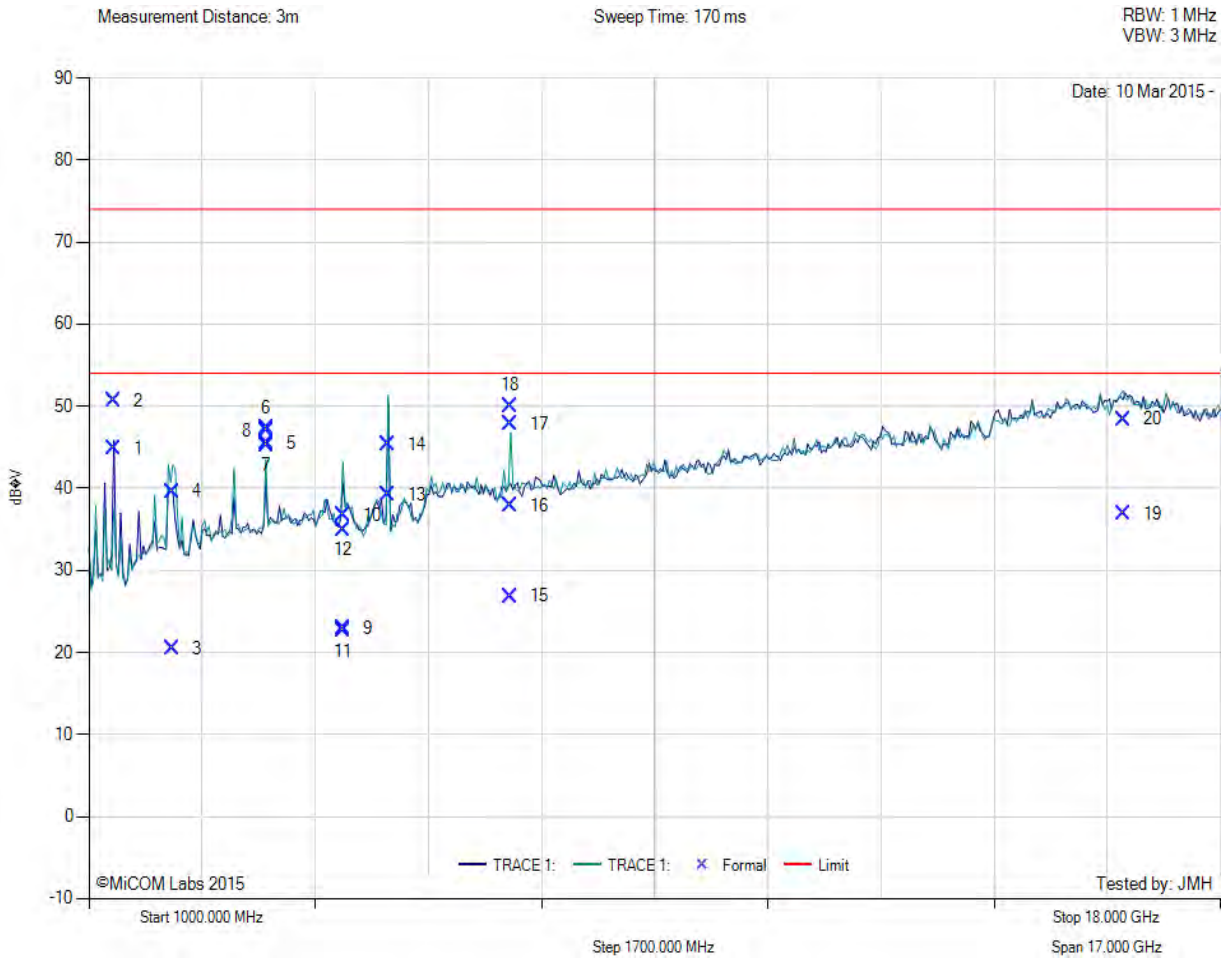


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	1375.10	48.98	3.00	-15.38	36.60	MAvg	Horizontal	100	75	54.0	-37.4	Pass
2	1375.10	56.88	3.00	-15.38	44.50	MPeak	Horizontal	100	75	74.0	-29.5	Pass
3	2208.12	28.47	3.86	-12.51	19.82	MAvg	Vertical	103	2	54.0	-54.2	Pass
4	2208.12	50.17	3.86	-12.51	41.52	MPeak	Vertical	103	2	74.0	-32.5	Pass
5	4824.05	28.61	5.83	-11.15	23.29	MAvg	Vertical	158	217	54.0	-50.7	Pass
6	4824.05	44.64	5.83	-11.15	39.32	MPeak	Vertical	158	217	74.0	-34.7	Pass
8	5318.16	61.65	6.19	-11.07	56.77	MPeak	Vertical					FUND
10	7093.11	37.99	7.23	-7.33	37.89	MPeak	Vertical					NRB
12	16573.18	35.62	12.04	1.58	49.24	MPeak	Vertical					NRB

Test Notes: EUT beaconing in 2.4G band, added 2.4G filter: FUND – Fundamental Frequency, NRB – Non-Restricted Band

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5500.00 MHz, Antenna: Galtronics, Power Setting: 13

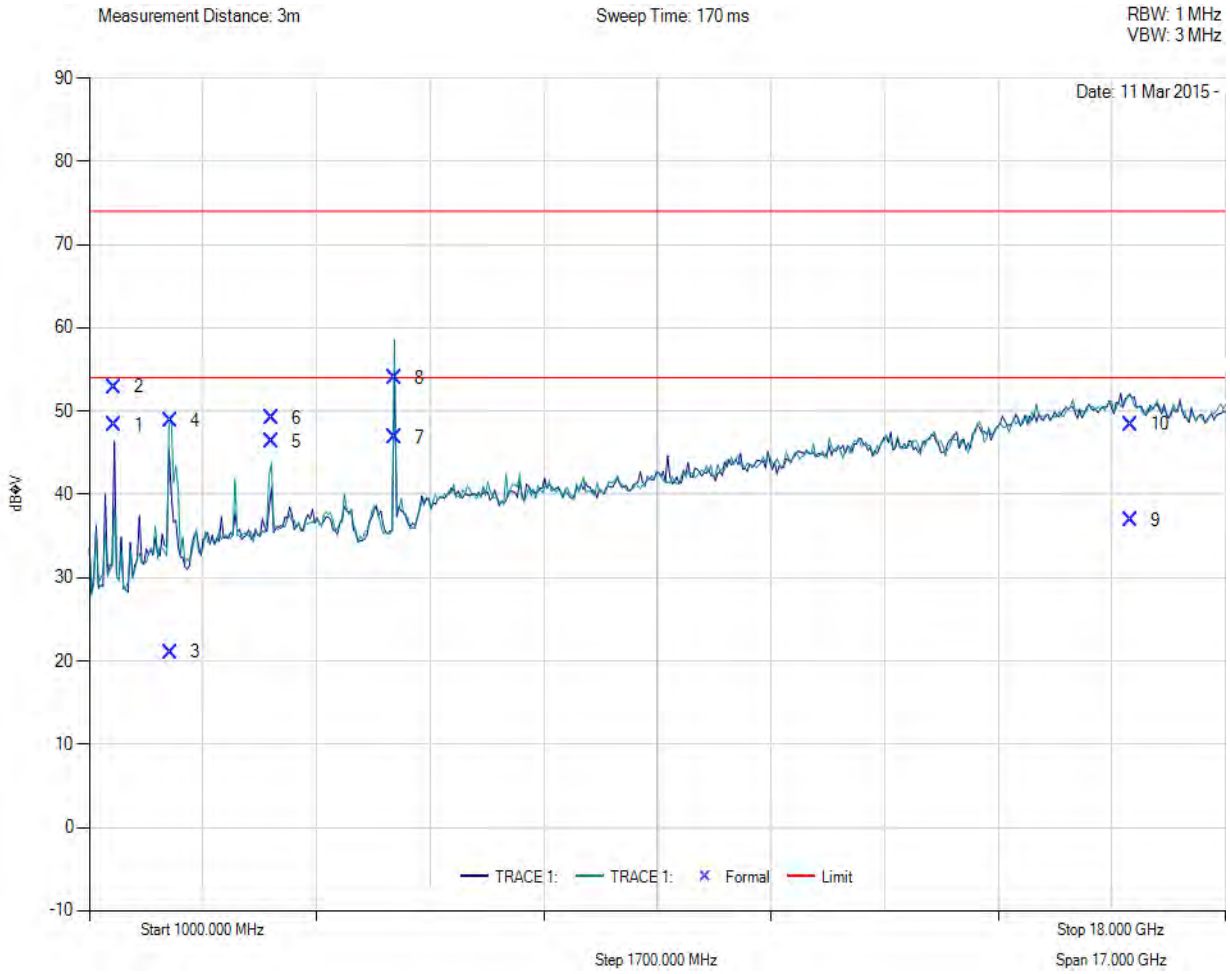


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	1375.05	57.24	3.00	-15.38	44.86	MAvg	Horizontal	101	83	54.0	-29.1	Pass
2	1375.05	63.02	3.00	-15.38	50.64	MPeak	Horizontal	101	83	74.0	-23.4	Pass
3	2250.26	28.70	3.89	-12.10	20.49	MAvg	Vertical	100	37	54.0	-53.5	Pass
4	2250.26	47.82	3.89	-12.10	39.61	MPeak	Vertical	100	37	74.0	-34.4	Pass
5	3666.60	51.50	5.05	-11.02	45.53	MAvg	Horizontal	106	246	54.0	-28.5	Pass
6	3666.60	53.28	5.05	-11.02	47.31	MPeak	Horizontal	106	246	74.0	-26.7	Pass
9	4823.89	28.22	5.83	-11.15	22.90	MAvg	Vertical	100	219	54.0	-51.1	Pass
10	4823.89	41.99	5.83	-11.15	36.67	MPeak	Vertical	100	219	74.0	-37.3	Pass
14	5495.67	50.30	6.26	-11.17	45.39	MPeak	Vertical					FUND
17	7333.34	47.68	7.38	-7.24	47.82	MAvg	Vertical	150	264	54.0	-26.2	Pass
18	7333.34	49.92	7.38	-7.24	50.06	MPeak	Vertical	150	264	74.0	-23.9	Pass
20	16535.59	34.72	12.07	1.60	48.39	MPeak	Vertical					NRB

Test Notes: EUT beaconing in 2.4G band, added 2.4G filter: FUND – Fundamental Frequency, NRB – Non-Restricted Band

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5580.00 MHz, Antenna: Galtronics, Power Setting: 13

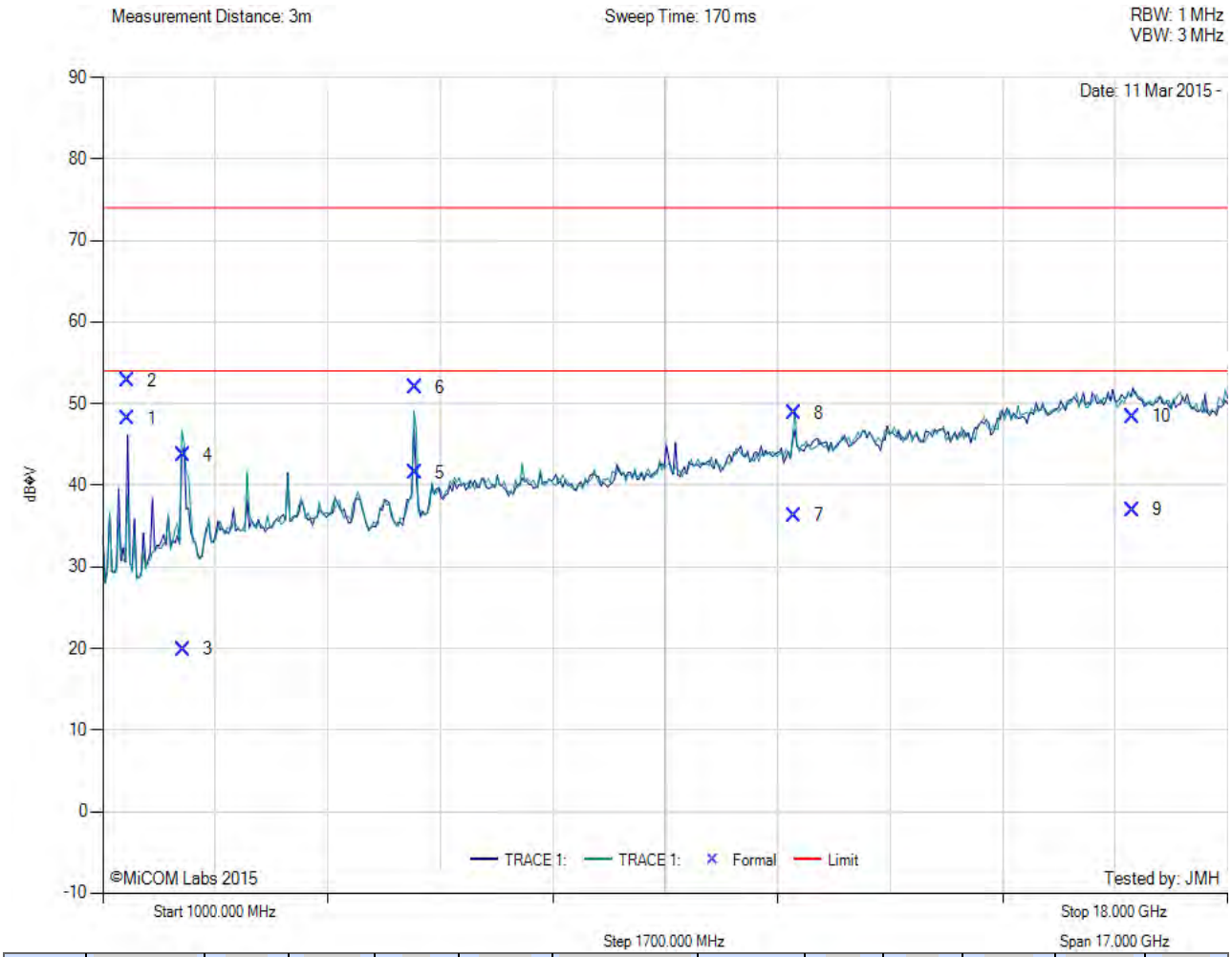


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	1375.01	60.75	3.00	-15.38	48.37	Max Avg	Horizontal	100	62	54.0	-5.6	Pass
2	1375.01	65.27	3.00	-15.38	52.89	Max Peak	Horizontal	100	62	74.0	-21.1	Pass
3	2222.20	29.53	3.87	-12.37	21.03	Max Avg	Vertical	100	64	54.0	-33.0	Pass
4	2222.20	57.35	3.87	-12.37	48.85	Max Peak	Vertical	100	64	74.0	-25.2	Pass
5	3720.01	52.21	5.07	-10.90	46.38	Max Avg	Vertical	114	249	54.0	-7.6	Pass
6	3720.01	54.97	5.07	-10.90	49.14	Max Peak	Vertical	114	249	74.0	-24.9	Pass
8	5574.23	58.83	6.32	-11.21	53.94	Max Peak	Vertical					FUND
10	16579.46	34.72	12.11	1.58	48.41	Max Peak	Vertical					NRB

Test Notes: EUT beaconing in 2.4G band, added 2.4G filter: FUND – Fundamental Frequency, NRB – Non-Restricted Band

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5720.00 MHz, Antenna: Galtronics, Power Setting: 13



Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	1375.01	60.59	3.00	-15.38	48.21	Max Avg	Horizontal	100	59	54.0	-5.8	Pass
2	1375.01	65.16	3.00	-15.38	52.78	Max Peak	Horizontal	100	59	74.0	-21.2	Pass
3	2221.29	28.40	3.87	-12.38	19.89	Max Avg	Vertical	100	351	54.0	-34.1	Pass
4	2221.29	52.18	3.87	-12.38	43.67	Max Peak	Vertical	100	351	74.0	-30.3	Pass
6	5712.46	56.35	6.40	-10.77	51.98	Max Peak	Vertical					FUND
7	11441.81	31.74	9.47	-4.92	36.29	Max Avg	Vertical	158	254	54.0	-17.7	Pass
8	11441.81	44.27	9.47	-4.92	48.82	Max Peak	Vertical	158	254	74.0	-25.2	Pass
10	16565.81	34.87	11.96	1.59	48.42	Max Peak	Horizontal					NRB

Test Notes: EUT beaconing in 2.4G band, added 2.4G filter: FUND – Fundamental Frequency, NRB – Non-Restricted Band

Restricted Band-Edge Spurious

Integral Antenna - Radiated Band-Edge

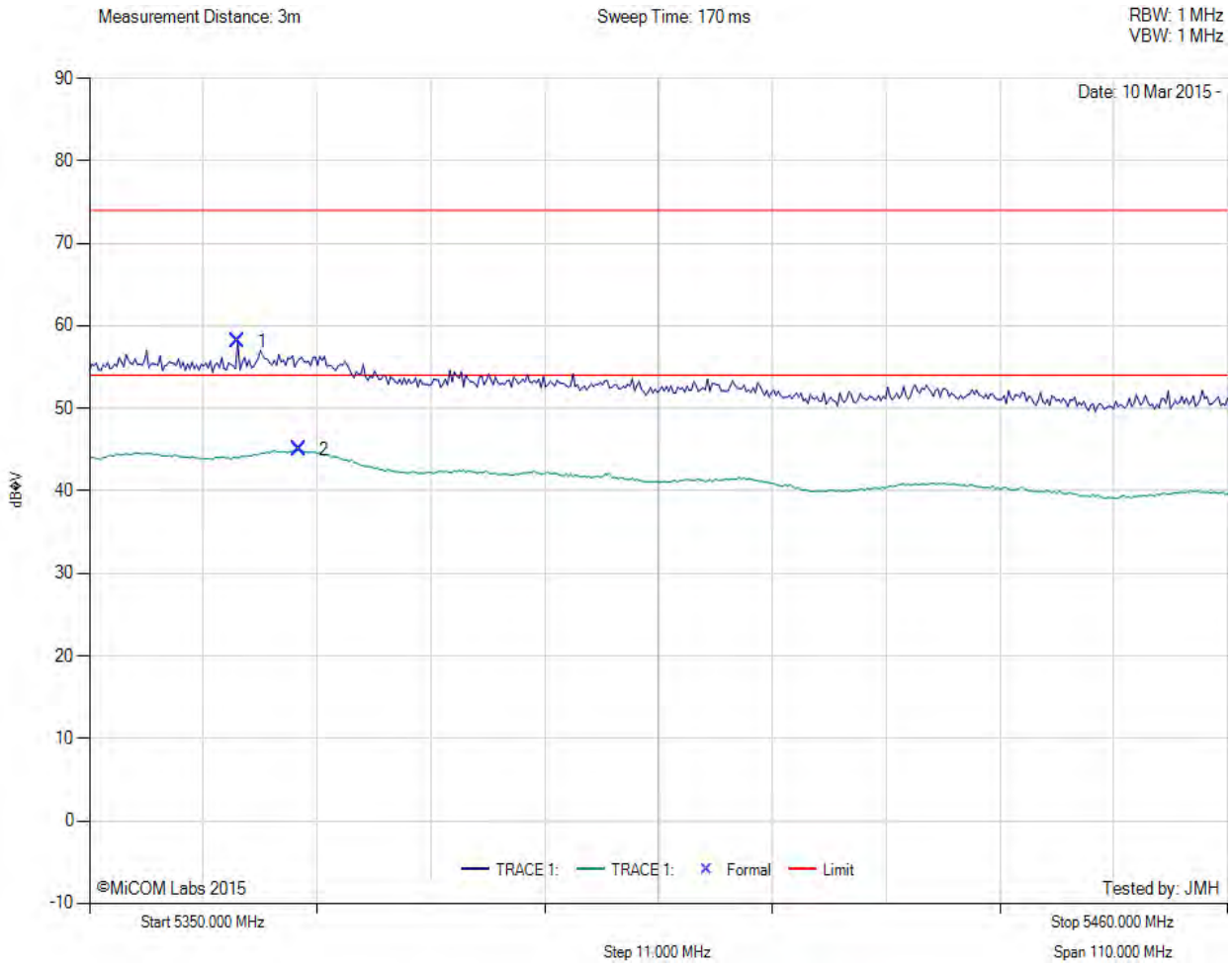
Peak Limit 74.0 dBµV, Average Limit 54.0 dBµV

		5350 MHz		
		dBµV		Power Setting
Operational Mode	Operating Frequency (MHz)	Peak	Average	
a	5320.0	58.08	45.01	13
n HT-20	5320.0	56.83	43.83	13
n HT-40	5310.0	61.21	47.36	14
ac-80	5290.0	67.95	52.41	11

		5470 MHz		
		dBµV		Power Setting
Operational Mode	Operating Frequency	Peak	Average	
a	5500.0	55.71	43.07	13
n HT-20	5500.0	55.95	43.38	13
n HT-40	5510.0	55.54	43.33	14
ac-80	5530.0	66.16	49.99	14

RESTRICTED UPPER BAND-EDGE EMISSIONS

Variant: 802.11a, Test Freq: 5320.00 MHz, Antenna: Galtronics, Power Setting: 13

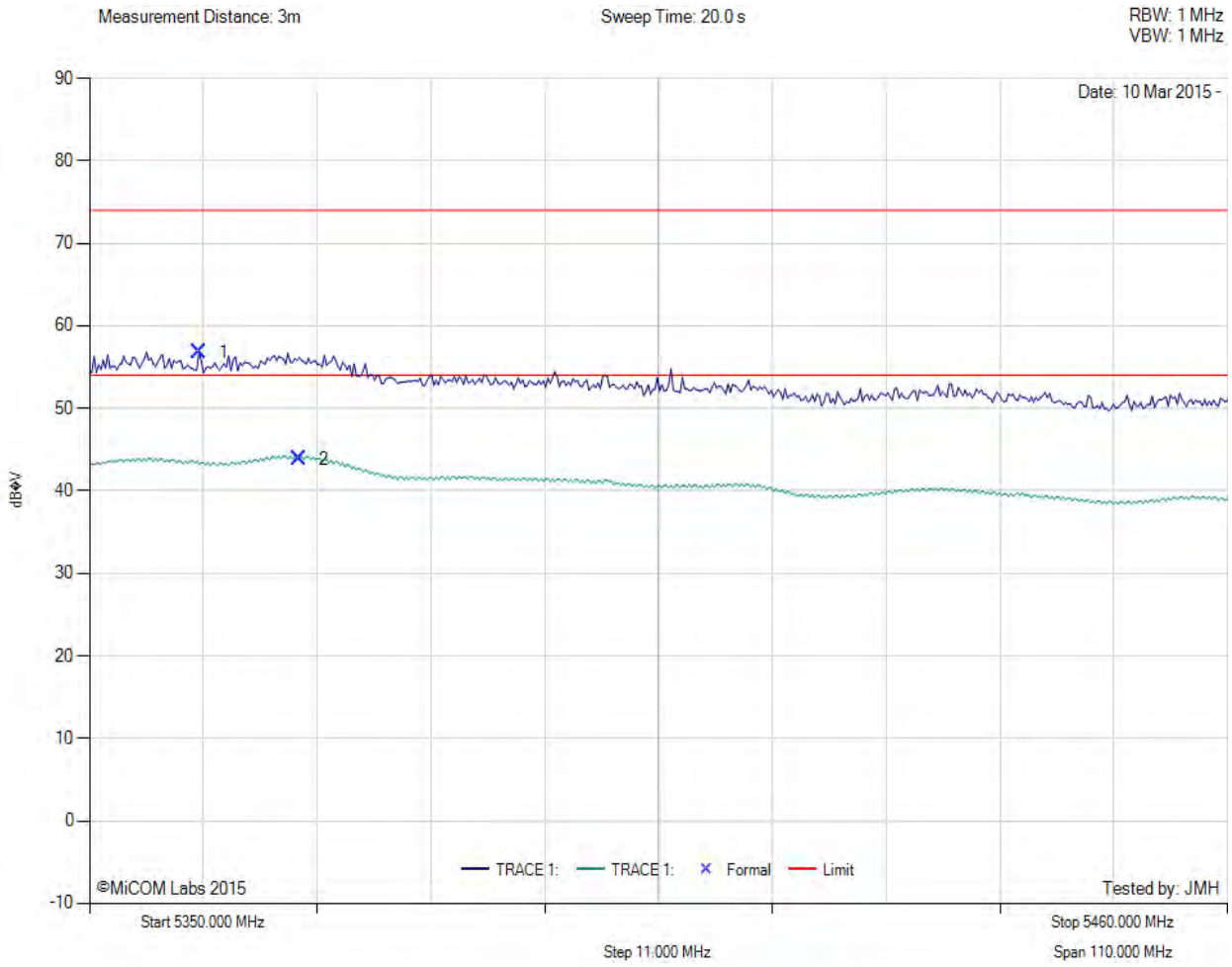


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	5364.33	62.96	6.17	-11.05	58.08	Max Peak	Vertical	101	287	74.0	-15.9	Pass
2	5370.28	49.90	6.18	-11.07	45.01	Max Avg	Vertical	101	287	54.0	-9.0	Pass

Test Notes: PS 13 for 802.11a

RESTRICTED UPPER BAND-EDGE EMISSIONS

Variant: 802.11n HT-20, Test Freq: 5320.00 MHz, Antenna: Galtronics, Power Setting: 13

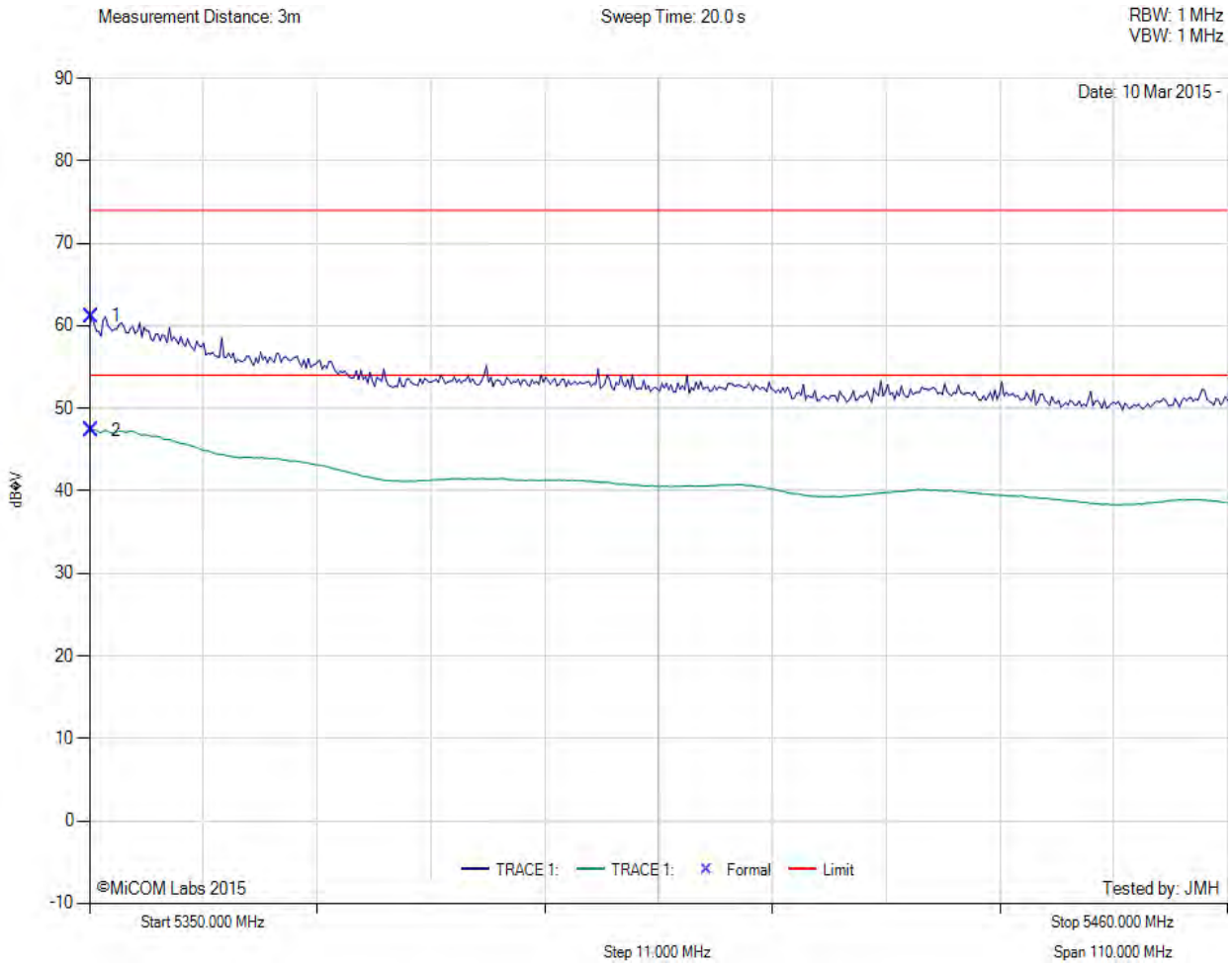


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	5360.58	61.72	6.17	-11.06	56.83	Max Peak	Vertical	101	287	74.0	-17.2	Pass
2	5370.28	48.72	6.18	-11.07	43.83	Max Avg	Vertical	101	287	54.0	-10.2	Pass

Test Notes: PS 13 for HT20

RESTRICTED UPPER BAND-EDGE EMISSIONS

Variant: 802.11n HT-40, Test Freq: 5310.00 MHz, Antenna: Galtronics, Power Setting: 14

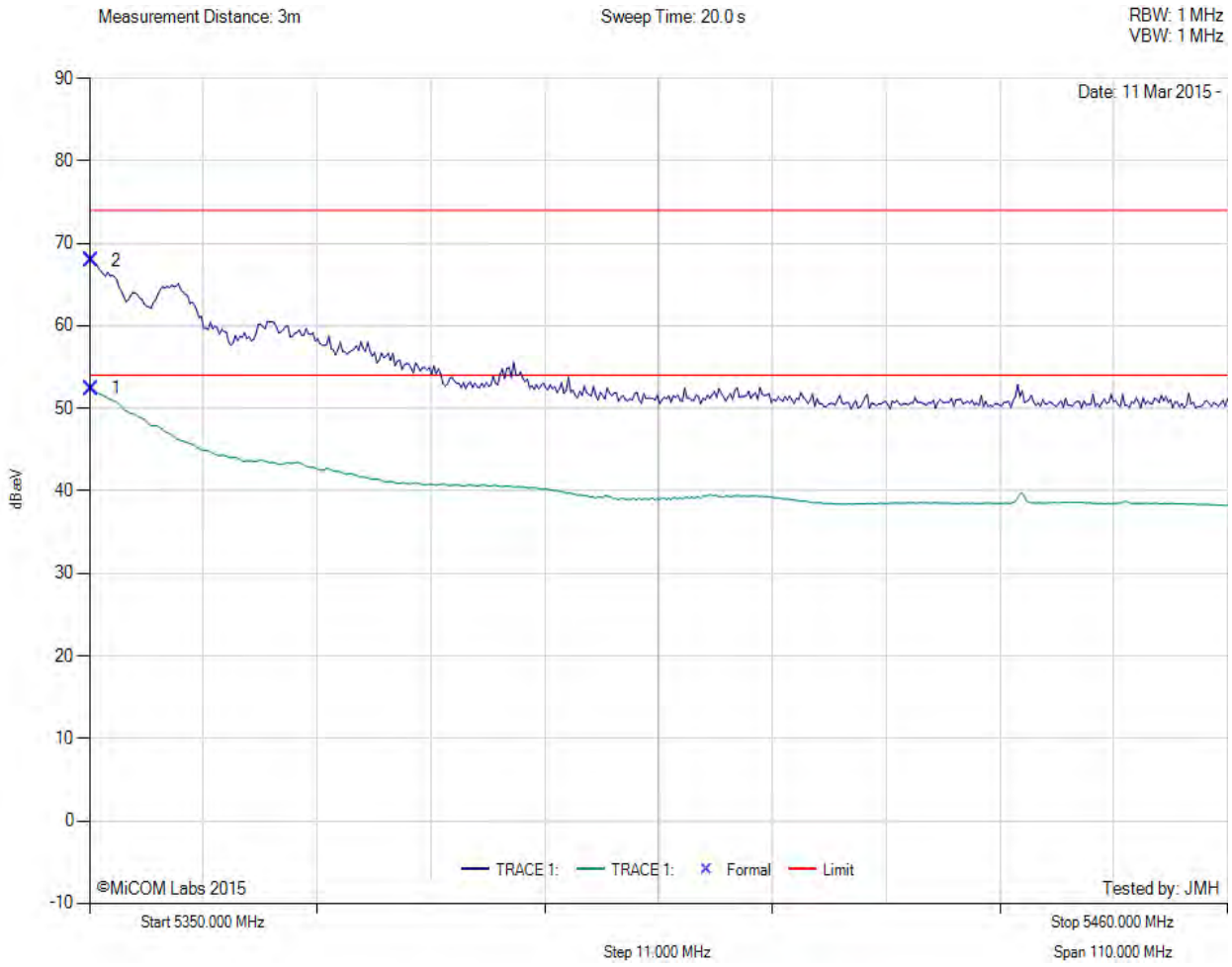


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	5350.22	66.07	6.16	-11.02	61.21	Max Peak	Vertical	101	288	74.0	-12.8	Pass
2	5350.22	52.22	6.16	-11.02	47.36	Max Avg	Vertical	101	288	54.0	-6.6	Pass

Test Notes: PS 14 for HT40

RESTRICTED UPPER BAND-EDGE EMISSIONS

Variant: 802.11ac-80, Test Freq: 5290.00 MHz, Antenna: Galtronics, Power Setting: 11

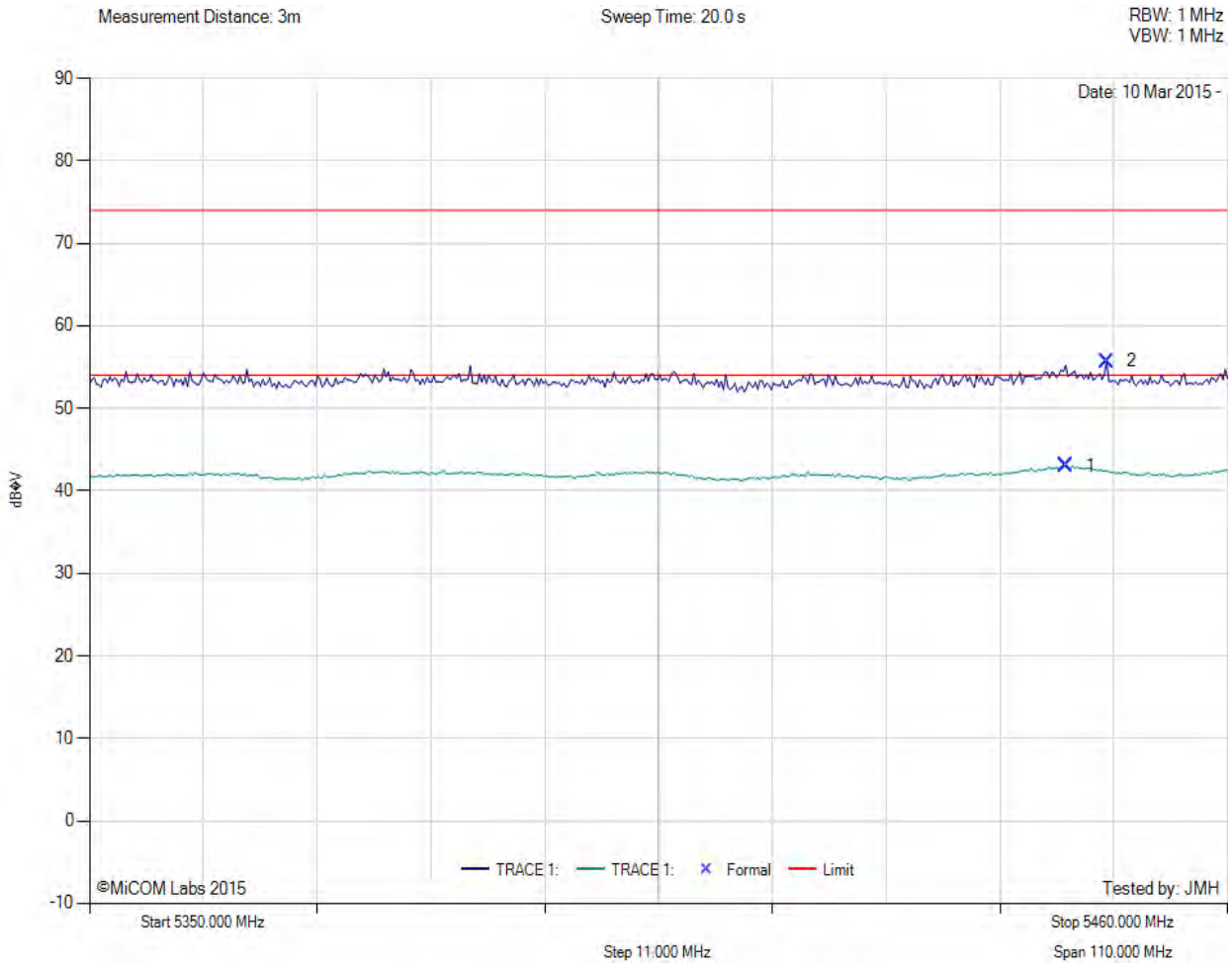


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	5350.22	57.27	6.16	-11.02	52.41	Avg Peak	Vertical	103	288	54.0	-1.6	Pass
2	5350.22	72.81	6.16	-11.02	67.95	Max Peak	Vertical	103	288	74.0	-6.1	Pass

Test Notes: Reduced power to comply with Band Edge requirements

RESTRICTED LOWER BAND-EDGE EMISSIONS

Variant: 802.11a, Test Freq: 5500.00 MHz, Antenna: Galtronics, Power Setting: 13

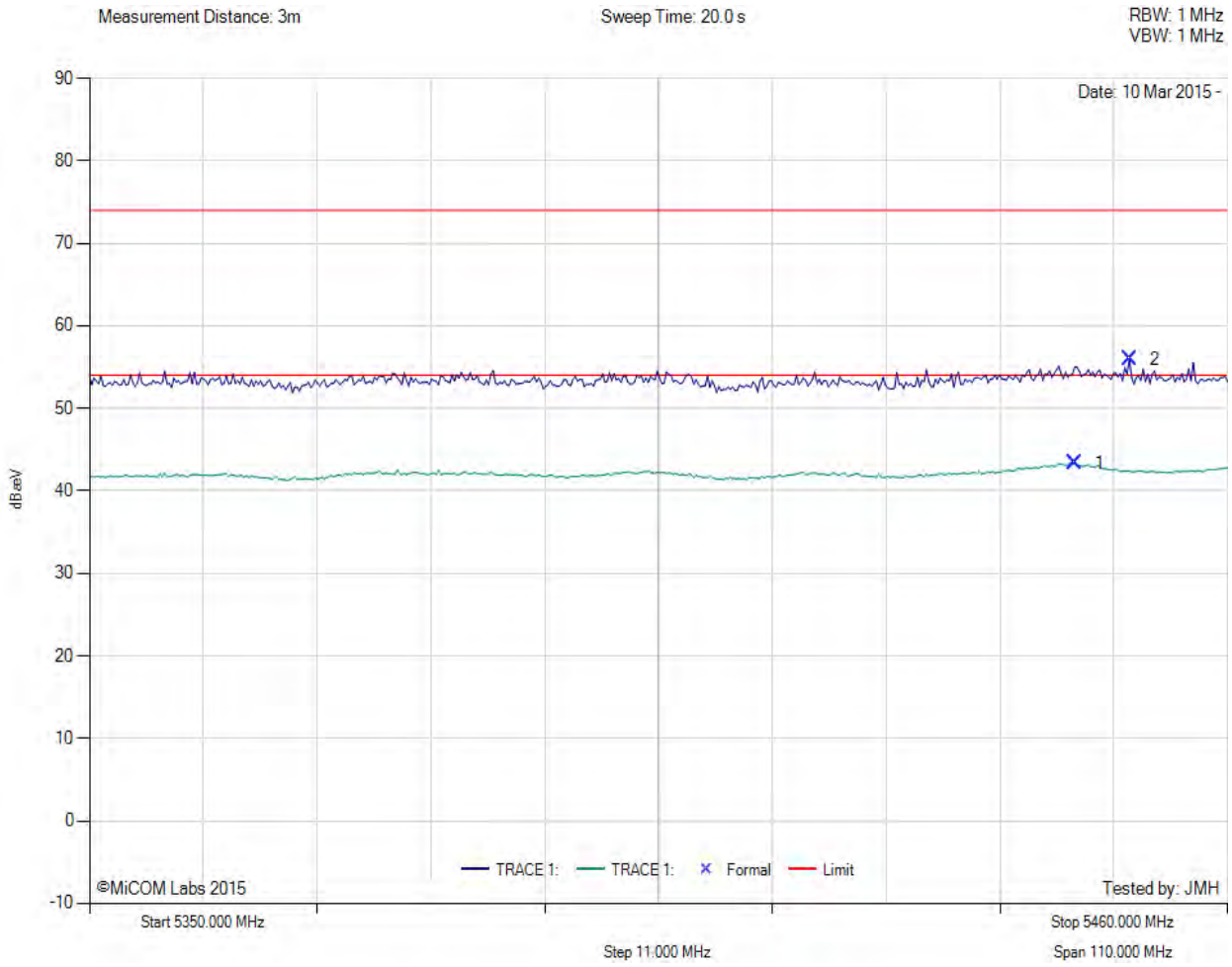


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	5444.35	48.05	6.24	-11.22	43.07	Max Avg	Vertical	107	288	54.0	-10.9	Pass
2	5448.32	60.70	6.24	-11.23	55.71	Max Peak	Vertical	107	288	74.0	-18.3	Pass

Test Notes: PS 13 for 802.11a

RESTRICTED LOWER BAND-EDGE EMISSIONS

Variant: 802.11n HT-20, Test Freq: 5500.00 MHz, Antenna: Galtronics, Power Setting: 13

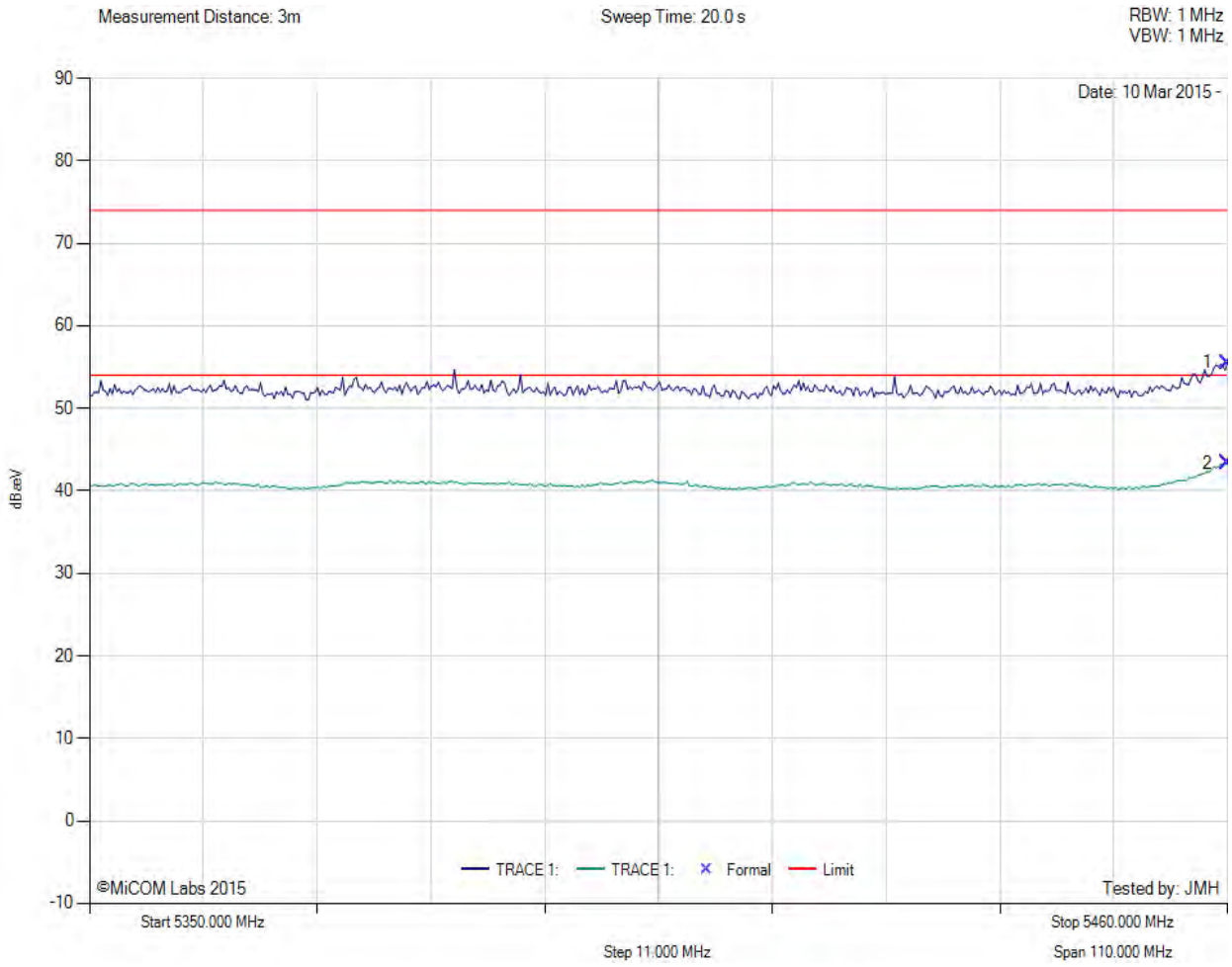


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	5445.23	48.37	6.24	-11.23	43.38	Max Avg	Vertical	107	288	54.0	-10.6	Pass
2	5450.52	60.93	6.25	-11.23	55.95	Max Peak	Vertical	107	288	74.0	-18.1	Pass

Test Notes: PS 13 for HT20

RESTRICTED LOWER BAND-EDGE EMISSIONS

Variant: 802.11n HT-40, Test Freq: 5510.00 MHz, Antenna: Galtronics, Power Setting: 14

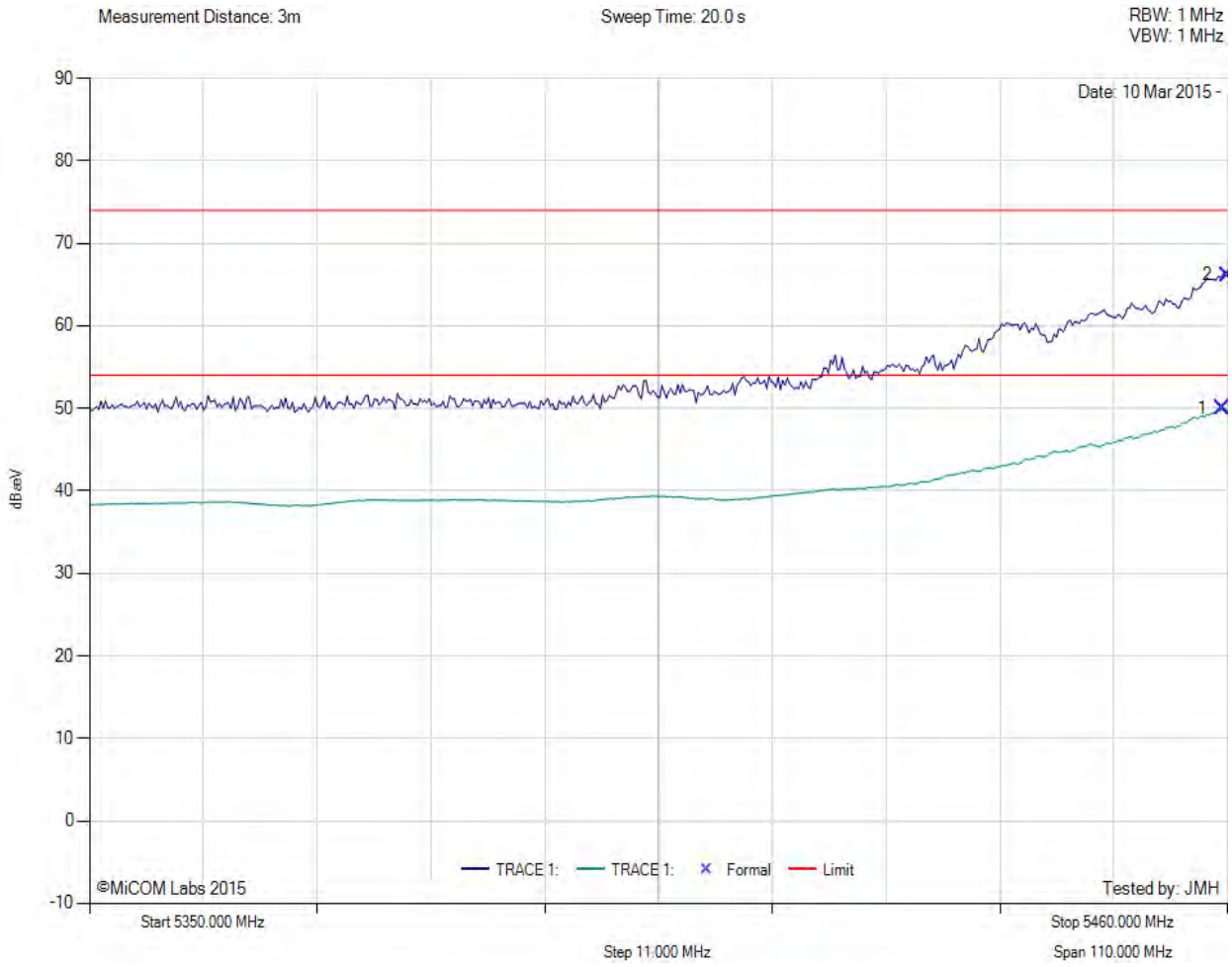


Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	5460.00	60.50	6.26	-11.22	55.54	Max Peak	Vertical	107	288	74.0	-18.5	Pass
2	5460.00	48.29	6.26	-11.22	43.33	Max Avg	Vertical	107	288	54.0	-10.7	Pass

Test Notes: PS 14 for HT40

RESTRICTED LOWER BAND-EDGE EMISSIONS

Variant: 802.11ac-80, Test Freq: 5530.00 MHz, Antenna: Galtronics, Power Setting: 14



Num	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1	5459.56	54.95	6.26	-11.22	49.99	Max Avg	Vertical	107	288	54.0	-4.0	Pass
2	5460.00	71.12	6.26	-11.22	66.16	Max Peak	Vertical	107	288	74.0	-7.8	Pass

Test Notes: PS 14 for AC80

Digital Emissions (0.03 – 1 GHz)

Client submitted a test report in lieu of performing Digital Emission testing.

Cerpass Technology Corp.
Report No.: SEFD1501015
Date: 9th January 2015

Specification

Limits

§15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

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

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

§15.209 (a) Limit Matrix

Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

8.2.2. ac Wireline Testing

FCC, Part 15 Subpart C §15.207
Industry Canada RSS-Gen §7.2.2

Test Procedure
The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

Measurement Results for ac Wireline Conducted Emissions (150 kHz – 30 MHz)

Client submitted a test report in lieu of performing ac Wireline Emission testing.

Cerpass Technology Corp.
Report No.: SEFD1501015
Date: 9th January 2015

Specification

Limits

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

§15.207 (a) Limit Matrix
The lower limit applies at the boundary between frequency ranges

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

Laboratory Measurement Uncertainty for Conducted Emissions

Measurement uncertainty	±2.64 dB