Company: Actiontec Electronics Inc.

Test of: M6240V
To: FCC CFR 47 Part 15 Subpart C 15.247 (DTS)

Report No.: ATEC06-U5b Rev A

RADIATED TEST REPORT

MiCOM Labs
opening wireless markets

RADIATED TEST REPORT

FROM

Test of: Actiontec Electronics Inc. M6240V
to

To: FCC CFR 47 Part 15 Subpart C 15.247 (DTS)

Test Report Serial No.: ATEC06-U5b Rev A

Note: this report is one of a set of two reports that together address the requirements for FCC 15.247

Report Number	Test Report Type
ATEC06-U5a	Conducted Test Report
ATEC06-U5b	Radiated Test Report

This report supersedes: NONE

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

Product Function: Gigabit Wireless Router

Issue Date: 28th July 2015

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
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Pleasanton California 94566
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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

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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

American Association for Laboratory Accreditation

Accredited Product Certification Body

A2LA has accredited

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Pleasanton, CA

for technical competence as a

Product Certification Body

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 - *Requirements for bodies certifying products, processes and services*. This accreditation demonstrates technical competence for a defined scope and the operation of a quality management system.

Presented this 28th day of February 2014.

President & CEO
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2015

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation

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		
Rev A	28th July 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 94085 USA	**Tested By:**	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model:	M6240V	**Telephone:** **Fax:**	+1 925 462 0304 +1 925 462 0306
Type Of Equipment:	Gigabit Wireless Router		
S/N's:	SB32522060009		
Test Date(s):	19 - 19 June 2015	**Website:**	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart C 15.247 (DTS) Radiated RF Emission Requirements	**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.

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.

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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 558074 D01 V03r03	June 9,2015	DTS Meas Guidance v03r02 Guidance for performing compliance measurements on Digital Transmission Systems (DTS) operating under section 15.247.
III	A2LA	June 2015	Reference to A2LA Accreditation Status – A2LA Advertising Policy
IV	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
V	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
VI	CISPR 22	2008	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
VII	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
VIII	FCC 47 CFR Part 15.247	2014	Radio Frequency Devices; Subpart C – Intentional Radiators
IX	ICES-003	Issue 5 2012	Spectrum Management and Telecommunications; Interference-Causing Equipment Standard. Information Technology Equipment (ITE) – Limits and methods of measurement.
X	M 3003	Edition 3 Nov. 2012	Expression of Uncertainty and Confidence in Measurements
XI	KDB 644545 D03 v01	August 14th 2014	Guidance for IEEE 802.11ac New Rules v01
XII	FCC 47 CFR Part 2.1033	2014	FCC requirements and rules regarding photographs and test setup diagrams.

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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.

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5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Actiontec Electronics Inc.M6420V to FCC CFR 47 Part 15 Subpart C 15.247 (DTS). Radio Frequency Devices; Subpart C – Intentional Radiators
Applicant:	Actiontec Electronics Inc. 760 N Mary Avenue Sunnyvale 94085 USA
Manufacturer:	As Applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Test report reference number:	ATEC06-U5b Rev A
Date EUT received:	15th June 2015
Standard(s) applied:	FCC CFR 47 Part 15 Subpart C 15.247 (DTS)
Dates of test (from - to):	19th June 2015
No of Units Tested:	2
Type of Equipment:	Gigabit Wireless Router
Product Family Name:	GbE 11ac Fiber Gateway
Model(s):	M6240V (Device tested) M6240 M6240L
Location for use:	Indoor
Declared Frequency Range(s):	2400 - 2483.5 MHz;
Primary function of equipment:	Gigabit Wireless Router
Secondary function of equipment:	Residential Gateway
Type of Modulation:	OFDM
EUT Modes of Operation:	2400 - 2483.5 MHz: 802.11b; 802.11g; 802.11n HT-20; 802.11n HT-40;
Declared Nominal Output Power (Ave):	2400 - 2483.5 MHz: 802.11b: -; 802.11g: -; 802.11n HT-20: -; 802.11n HT-40:
Transmit/Receive Operation:	Transceiver - Half Duplex
Rated Input Voltage and Current:	AC/ DC adaptor (adaptor sold with unit) 12 V DC/3.5A
Operating Temperature Range:	Declared Range 0°C to 40°C
ITU Emission Designator:	802.11b 12M1G1D 802.11g 16M5D1D 802.11n HT-20 17M7D1D 802.11n HT-40 36M4D1D
Equipment Dimensions:	11.0 x 1.5 x 7 inches
Weight:	1.6 lbs
Hardware Rev:	AM3
Software Rev:	62.0.10

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5.2. Scope Of Test Program

Actiontec Electronics Inc. M6240V

The scope of the test program was to test the Actiontec Electronics Inc. M6240V configurations in the frequency ranges 2400 - 2483.5 MHz; for compliance against the following specification:

FCC CFR 47 Part 15 Subpart C 15.247 (DTS)
Radio Frequency Devices; Subpart C – Intentional Radiators

Manufacturers Declaration of Similarity

Re: FCC ID: LNQM6240V
Actiontec Models: M6240V, M6240, M6240L

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

The differences among these 3 models are as follows –

M6240V – GbE 11ac Fiber Gateway with MoCA LAN/WAN and VoIP
M6240 – GbE 11ac Fiber Gateway with MoCA LAN, without MoCA WAN/VoIP
M6240L – GbE 11ac Fiber Gateway with MoCA LAN/VoIP, without MoCA WAN

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Actiontec Electronics Inc. M6240V

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	M6240V	5190700005
EUT	Power Adapter 100 - 240Vac 50/60Hz 1.0A 12 Vdc 3.5 A	Actiontec	NBS40C120350VU	1512
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	Dipole	3.0	2.0	360	-	5725 - 5850
integral	Galtronics	Custom PCB	Dipole	4.0	-	360	-	2400 - 2483.5

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	4	N	RJ45	Packet Data
Ethernet	100m	1	N	RJ45	Packet Data
USB	15m	2	N	USB 3.0	Digital
Optical	SFP	1	N		Digital

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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
2400 - 2483.5 MHz				
802.11b	1	2,412.00	2,437.00	2,462.00
802.11g	6	2,412.00	--	2,462.00
802.11n HT-20	6.5	2,412.00	--	2,462.00
802.11n HT-40	13.5	2,422.00	--	2,452.00

Antenna Test Configurations for Radiated Emissions

Results for the following configurations are provided in this report.

Radiated emissions testing was performed for all possible configurations on the integral antenna, the table below identifies all radiated testing completed on the device.

15.247	
802.11b,g, 802.11n HT-20	SE 2412
	SE 2437
	SE 2462
	BE 2390
	BE 2483.5
802.11n HT-40	SE 2422
	SE 2437
	SE 2452
	BE 2390
	BE 2483.5

KEY;-

SE – Spurious Emission BE – Band-Edge

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

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6. TEST SUMMARY

List of Measurements

Test Header	Result	Data Link
15.247(d) Emissions	-	-
(2) Radiated Emissions	-	-
(i) 15.205 Restricted Band Emissions	Complies	View Data
(ii) 15.205 Restricted Band-Edge Emissions	Complies	View Data
(3) 15.209 Digital Emissions (0.03 - 1 GHz)	Complies	-

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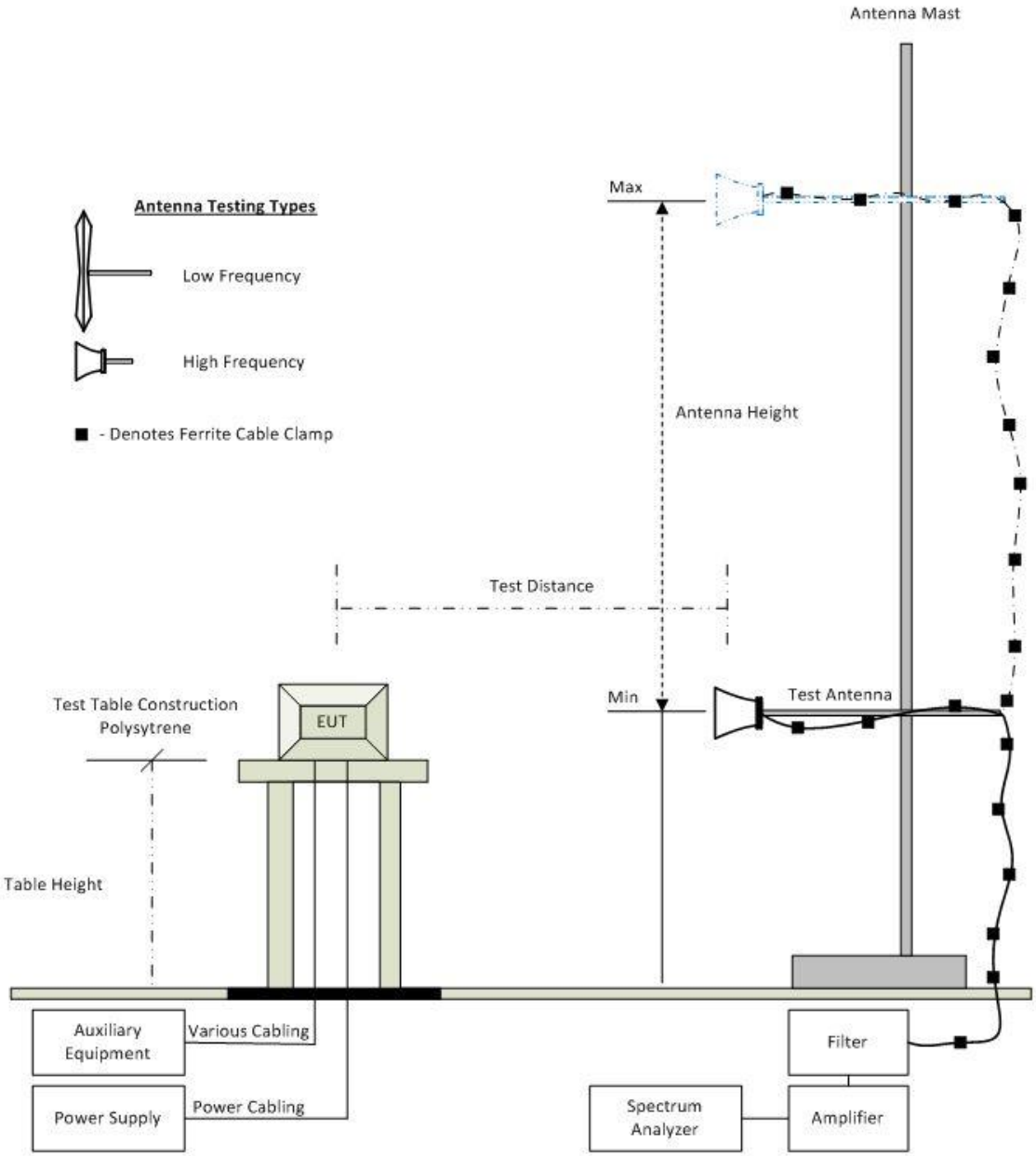
7. TEST EQUIPMENT CONFIGURATION(S)

Radiated Emissions testing was performed using the set-up shown in the diagram below.



Radiated Emission Test 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
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CY101	04R08507	Not Required
193	Receiver 20 Hz to 7 GHz	Rhode & Schwarz	ESI 7	838496/007	14 Jan 2016
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
330	Variac 0-280 Vac	Staco Energy Co	3PN1020B	0546	Cal when used
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	14 Aug 2015
341	900MHz Notch Filter	EWT	EWT-14-0199	H1	08 Oct 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
346	1.6 TO 10GHz High Pass Filter	EWT	EWT-57-0112	H1	07 Oct 2015
377	Band Rejection Filter 5150 to 5880MHz	Microtronics	BRM50716	034	08 Oct 2015
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	17 Jul 2015
393	DC - 1050 MHz Low Pass Filter	Microcircuits	VLFX-1050	N/A	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	28 May 2016
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required

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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
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	25 Aug 2015
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	25 Aug 2015
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	25 Aug 2015
465	Low Pass Filter DC-1000 MHz	Mini-Circuits	NLP-1200+	VUU01901402	25 Aug 2015
466	Low Pass Filter DC-1500 MHz	Mini-Circuits	NLP-1750+	VUU10401438	25 Aug 2015
467	2495 to 2650 MHz notch filter	MicroTronics	BRM50709	011	05 Sep 2015
468	Low pass filter	Mini Circuits	SLP-550	None	30 Sep 2015
469	Low pass filter	Mini Circuit	SLP-1000	None	30 Sep 2015
470	High Pass filter	Mini Circuits	SHP-700	None	30 Sep 2015
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
CC05	Confidence Check	MiCOM	CC05	None	01 Aug 2015
VLF-1700	Low pass filter DC-1700 MHz	Mini Circuits	VLF-1700	None	30 Sep 2015

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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. Emissions

9.1.1. Radiated Emissions

9.1.1.1. Restricted Band Emissions

Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions (Restricted Bands)			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Radiated Spurious and Band-Edge Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.205, 15.209	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Spurious and Band-Edge Emissions (Restricted Bands)
Radiated emissions for restricted bands 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. Measurements on any restricted band frequency or frequencies above 1 GHz are based on the use of measurement instrumentation employing peak and average detectors. All measurements were performed using a resolution bandwidth of 1 MHz.

Test configuration and setup for Radiated Spurious and Band-Edge Measurement were per the Radiated Test Set-up specified in this document.

Limits for Restricted Bands
Peak emission: 74 dBuV/m
Average emission: 54 dBuV/m

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

Example:
Given receiver input reading of 51.5 dBmV; 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 (FS) of the measured emission is:

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

Conversion between dBmV/m (or dBmV) and mV/m (or mV) are as follows:
Level (dBmV/m) = 20 * Log (level (mV/m))

40 dBmV/m = 100 mV/m
48 dBmV/m = 250 mV/m

Restricted Bands of Operation (15.205)
(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Frequency Band			
MHz	**MHz**	**MHz**	**GHz**
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

(b) Except as provided 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 §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.

(d) The following devices are exempt from the requirements of this section:

(1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a) of this section, the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a) of this section, and the fundamental emission is outside of the bands listed in paragraph (a) of this section more than 99% of the time the device is actively transmitting, without compensation for duty cycle.

(2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.

(3) Cable locating equipment operated pursuant to §15.213.

(4) Any equipment operated under the provisions of §15.253, 15.255, and 15.256 in the frequency band 75-85 GHz, or §15.257 of this part.

(5) Biomedical telemetry devices operating under the provisions of §15.242 of this part are not subject to the restricted band 608-614 MHz but are subject to compliance within the other restricted bands.

(6) Transmitters operating under the provisions of subparts D or F of this part.

(7) Devices operated pursuant to §15.225 are exempt from complying with this section for the 13.36-13.41 MHz band only.

(8) Devices operated in the 24.075-24.175 GHz band under §15.245 are exempt from complying with the requirements of this section for the 48.15-48.35 GHz and 72.225-72.525 GHz bands only, and shall not exceed the limits specified in §15.245(b).

(9) Devices operated in the 24.0-24.25 GHz band under §15.249 are exempt from complying with the requirements of this section for the 48.0-48.5 GHz and 72.0-72.75 GHz bands only, and shall not exceed the limits specified in §15.249(a).

(e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of §15.245 shall not exceed the limits specified in §15.245(b).

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Equipment Configuration for Radiated Spurious - Restricted Band Emissions

Variant:	802.11b	**Duty Cycle (%):**	99
Data Rate:	1 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	CCK	**Beam Forming Gain (Y):**	Not Applicable
Channel Frequency (MHz):	2412 MHz	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	1124.90	45.42	2.74	-16.90	31.26	Peak (Scan)	Vertical	100	0	0.0	--	
#2	1124.90	36.74	2.74	-16.90	22.58	Max Avg	Vertical	100	121	54.0	-31.4	Pass
#3	1124.90	45.52	2.74	-16.90	31.36	Max Peak	Vertical	100	121	68.2	-36.9	Pass
#4	4824.14	42.77	5.83	-11.15	37.45	Max Avg	Horizontal	100	95	54.0	-16.6	Pass
#5	4824.14	48.98	5.83	-11.15	43.66	Max Peak	Horizontal	100	95	68.2	-24.6	Pass
#6	4824.14	46.22	5.83	-11.15	40.90	Peak (Scan)	Horizontal	100	0	0.0	--	
#7	9647.90	41.52	8.71	-6.08	44.15	Peak (Scan)	Horizontal	100	0	0.0	--	
#8	9647.90	27.11	8.71	-6.08	29.74	Max Avg	Horizontal	128	62	54.0	-24.3	Pass
#9	9647.90	39.16	8.71	-6.08	41.79	Max Peak	Horizontal	128	62	68.2	-26.4	Pass

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Equipment Configuration for Radiated Spurious - Restricted Band Emissions

Variant:	802.11b	**Duty Cycle (%):**	99
Data Rate:	1 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	CCK	**Beam Forming Gain (Y):**	Not Applicable
Channel Frequency (MHz):	2437 MHz	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	1125.16	44.91	2.74	-16.90	30.75	Peak (Scan)	Vertical	100	0	0.0	--	
2	1125.16	33.00	2.74	-16.90	18.84	Max Avg	Vertical	100	128	54.0	-35.2	Pass
3	1125.16	43.81	2.74	-16.90	29.65	Max Peak	Vertical	100	128	68.2	-38.6	Pass
4	4884.01	55.39	5.87	-11.27	49.99	Max Avg	Horizontal	119	97	54.0	-4.0	Pass
5	4884.01	56.71	5.87	-11.27	51.31	Max Peak	Horizontal	119	97	68.2	-16.9	Pass
6	4884.01	51.96	5.87	-11.27	46.56	Peak (Scan)	Horizontal	100	0	0.0	--	
7	7390.32	26.31	7.43	-7.17	26.57	Max Avg	Vertical	110	3	54.0	-27.4	Pass
8	7390.32	38.03	7.43	-7.17	38.29	Max Peak	Vertical	110	3	68.2	-29.9	Pass
9	7390.32	41.87	7.43	-7.17	42.13	Peak (Scan)	Vertical	100	0	0.0	--	
10	9768.02	46.63	8.64	-6.20	49.07	Peak (Scan)	Horizontal	100	0	0.0	--	
11	9768.02	49.22	8.64	-6.20	51.66	Max Avg	Horizontal	103	162	54.0	-2.3	Pass
12	9768.02	52.71	8.64	-6.20	55.15	Max Peak	Horizontal	103	162	68.2	-13.1	Pass

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Equipment Configuration for Radiated Spurious - Restricted Band Emissions

Variant:	802.11b	**Duty Cycle (%):**	99
Data Rate:	1 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	CCK	**Beam Forming Gain (Y):**	Not Applicable
Channel Frequency (MHz):	2462 MHz	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	1125.18	45.08	2.74	-16.90	30.92	Peak (Scan)	Horizontal	100	0	0.0	--	
2	1125.18	31.54	2.74	-16.90	17.38	Max Avg	Horizontal	118	246	54.0	-36.6	Pass
3	1125.18	43.61	2.74	-16.90	29.45	Max Peak	Horizontal	118	246	68.2	-38.8	Pass
4	1375.09	47.09	3.00	-15.38	34.71	Peak (Scan)	Horizontal	100	0	0.0	--	
5	1375.09	42.25	3.00	-15.38	29.87	Max Avg	Horizontal	100	279	54.0	-24.1	Pass
6	1375.09	48.76	3.00	-15.38	36.38	Max Peak	Horizontal	100	279	68.2	-31.9	Pass
7	2155.05	28.08	3.79	-12.52	19.35	Max Avg	Vertical	134	0	54.0	-34.7	Pass
8	2155.05	40.52	3.79	-12.52	31.79	Max Peak	Vertical	134	0	68.2	-36.4	Pass
9	2155.05	43.83	3.79	-12.52	35.10	Peak (Scan)	Vertical	100	0	0.0	--	

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9.1.1.2. Restricted Band-Edge Emissions

Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions (Restricted Bands)			
Standard:	FCC CFR 47:15.247	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Radiated Spurious and Band-Edge Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.205, 15.209	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Spurious and Band-Edge Emissions (Restricted Bands)
Radiated emissions for restricted bands 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. Measurements on any restricted band frequency or frequencies above 1 GHz are based on the use of measurement instrumentation employing peak and average detectors. All measurements were performed using a resolution bandwidth of 1 MHz.

Test configuration and setup for Radiated Spurious and Band-Edge Measurement were per the Radiated Test Set-up specified in this document.

Limits for Restricted Bands
Peak emission: 74 dBuV/m
Average emission: 54 dBuV/m

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

Example:
Given receiver input reading of 51.5 dBmV; 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 (FS) of the measured emission is:

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

Conversion between dBmV/m (or dBmV) and mV/m (or mV) are as follows:
Level (dBmV/m) = 20 * Log (level (mV/m))

40 dBmV/m = 100 mV/m
48 dBmV/m = 250 mV/m
Restricted Bands of Operation (15.205)
(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Frequency Band			
MHz	**MHz**	**MHz**	**GHz**
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

(b) Except as provided 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 §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.

(d) The following devices are exempt from the requirements of this section:

(1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a) of this section, the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a) of this section, and the fundamental emission is outside of the bands listed in paragraph (a) of this section more than 99% of the time the device is actively transmitting, without compensation for duty cycle.

(2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.

(3) Cable locating equipment operated pursuant to §15.213.

(4) Any equipment operated under the provisions of §15.253, 15.255, and 15.256 in the frequency band 75-85 GHz, or §15.257 of this part.

(5) Biomedical telemetry devices operating under the provisions of §15.242 of this part are not subject to the restricted band 608-614 MHz but are subject to compliance within the other restricted bands.

(6) Transmitters operating under the provisions of subparts D or F of this part.

(7) Devices operated pursuant to §15.225 are exempt from complying with this section for the 13.36-13.41 MHz band only.

(8) Devices operated in the 24.075-24.175 GHz band under §15.245 are exempt from complying with the requirements of this section for the 48.15-48.35 GHz and 72.225-72.525 GHz bands only, and shall not exceed the limits specified in §15.245(b).

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(9) Devices operated in the 24.0-24.25 GHz band under §15.249 are exempt from complying with the requirements of this section for the 48.0-48.5 GHz and 72.0-72.75 GHz bands only, and shall not exceed the limits specified in §15.249(a).

(e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of §15.245 shall not exceed the limits specified in §15.245(b).

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Summary of Power Setting used for Band Edge Measurements

Peak Limit 74 dBµV, Average Limit 54.0 dBµV

Galtronics Custom PCB		BandEdge Freq	Peak	Average	Power Setting
Operational Mode	Operating Frequency (MHz)	MHz	dBµV	dBµV	
802.11b	2412	2390.00	43.72	34.63	25
802.11g	2412	2390.00	72.82	51.74	21
802.11n HT-20	2412	2390.00	73.69	53.44	21
802.11n HT-40	2412	2390.00	66.44	51.85	22
802.11b	2462	2383.50	61.92	52.74	25
802.11g	2462	2383.50	70.93	51.74	21
802.11n HT-20	2462	2383.50	69.88	52.58	22
802.11n HT-40	2452	2383.50	65.39	50.08	18

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Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions

Variant:	802.11b	**Duty Cycle (%):**	99
Data Rate:	1 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	CCK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	2375.03	51.73	4.04	-12.05	43.72	Max Peak	Horizontal	126	99	74.0	-30.3	Pass
#2	2375.21	42.64	4.04	-12.05	34.63	Max Avg	Horizontal	126	99	54.0	-19.4	Pass

Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions

Variant:	802.11g	**Duty Cycle (%):**	99
Data Rate:	6 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	OFDM	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	2390.00	59.62	4.04	-11.92	51.74	Max Avg	Horizontal	126	-4	54.0	-2.3	Pass
#2	2390.00	80.70	4.04	-11.92	72.82	Max Peak	Horizontal	126	-4	74.0	-1.2	Pass

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Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions

Variant:	802.11n HT-20	**Duty Cycle (%):**	99
Data Rate:	6.5 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	OFDM	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	2388.92	61.32	4.04	-11.92	53.44	Max Avg	Horizontal	126	-4	54.0	-0.6	Pass
#2	2388.92	81.57	4.04	-11.92	73.69	Max Peak	Horizontal	126	-4	74.0	-0.3	Pass

Equipment Configuration for Radiated - Lower Restricted Band-Edge Emissions

Variant:	802.11n HT-40	**Duty Cycle (%):**	99
Data Rate:	13.5 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	OFDM	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	2388.56	59.73	4.04	-11.92	51.85	Max Avg	Horizontal	126	-4	54.0	-2.2	Pass
#2	2388.92	74.32	4.04	-11.92	66.44	Max Peak	Horizontal	126	-4	74.0	-7.6	Pass

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Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions

Variant:	802.11b	**Duty Cycle (%):**	99
Data Rate:	1 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	CCK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	2483.50	60.28	4.10	-11.64	52.74	Max Avg	Vertical	126	293	54.0	-1.3	Pass
#2	2483.50	69.46	4.10	-11.64	61.92	Max Peak	Vertical	126	293	74.0	-12.1	Pass

Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions

Variant:	802.11g	**Duty Cycle (%):**	99
Data Rate:	6 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	OFDM	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	2483.50	78.47	4.10	-11.64	70.93	Max Peak	Horizaontal	126	-4	74.0	-3.1	Pass
#2	2483.63	59.28	4.10	-11.64	51.74	Max Avg	Horizaontal	126	-4	54.0	-2.3	Pass

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Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions

Variant:	802.11n HT-20	**Duty Cycle (%):**	99
Data Rate:	6.5 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	OFDM	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	2484.57	60.12	4.10	-11.64	52.58	Max Avg	Horizaontal	126	-4	54.0	-1.4	Pass
#2	2484.97	77.42	4.10	-11.64	69.88	Max Peak	Horizaontal	126	-4	74.0	-4.1	Pass

Equipment Configuration for Radiated - Upper Restricted Band-Edge Emissions

Variant:	802.11n HT-40	**Duty Cycle (%):**	99
Data Rate:	6.5 Mbit/s	**Antenna Gain (dBi):**	4.00
Modulation:	OFDM	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	SB
Engineering Test Notes:			

Test Measurement Results

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	2485.23	57.62	4.10	-11.64	50.08	Max Avg	Horizaontal	126	-4	54.0	-3.9	Pass
#2	2485.37	72.93	4.10	-11.64	65.39	Max Peak	Horizaontal	126	-4	74.0	-8.6	Pass

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9.1.2. Digital Emissions (0.03 - 1 GHz)

FCC, Part 15 Subpart C §15.205/ §15.209

Test Procedure
Testing 30M-1 GHz was performed in a 3-meter anechoic chamber using a CISPR compliant receiver. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. To further maximize emissions the receive antenna was varied between 1 and 4 meters. The emissions are recorded with receiver in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed. The anechoic chamber test set-up is identified in Section 6 Test Set-Up Photographs.

Field Strength Calculation
The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

$$FS = R + AF + CORR$$

where:

FS = Field Strength
R = Measured Receiver Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain

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

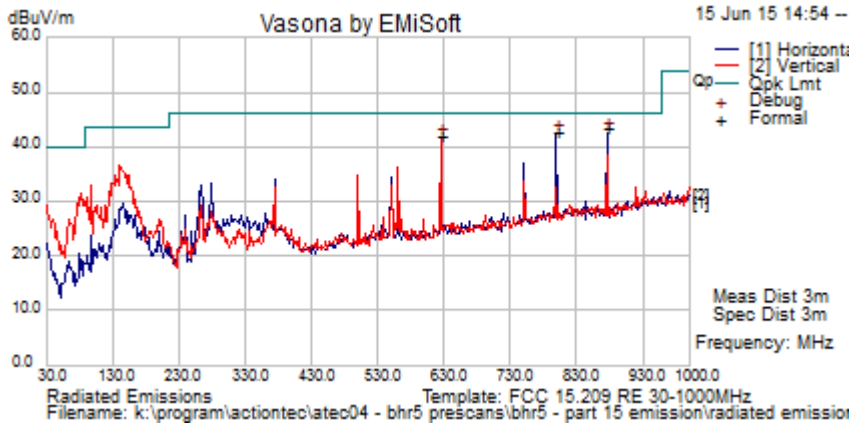
$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3 dB\mu V/m$$

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

$$Level\ (dB\mu V/m) = 20 * Log\ (level\ (\mu V/m))$$

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

Test Freq.	2.4/5GHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	19.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	49
Power Setting	idle	**Press. (mBars)**	998
Antenna	Integral		
Test Notes 1	S/N:GBEA5190700001:Model:M6240V; Part 15B;		
Test Notes 2	F/W:		



Formally measured emission peaks

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	Comments
874.995	45.1	6.3	-8.0	43.3	Quasi Max	H	99	266	46	-2.7	Pass	
799.204	45.5	6.1	-8.8	42.8	Quasi Max	H	99	320	46	-3.2	Pass	
624.995	47.3	5.7	-10.9	42.0	Quasi Max	V	100	280	46	-4.0	Pass	

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

A. APPENDIX - GRAPHICAL IMAGES

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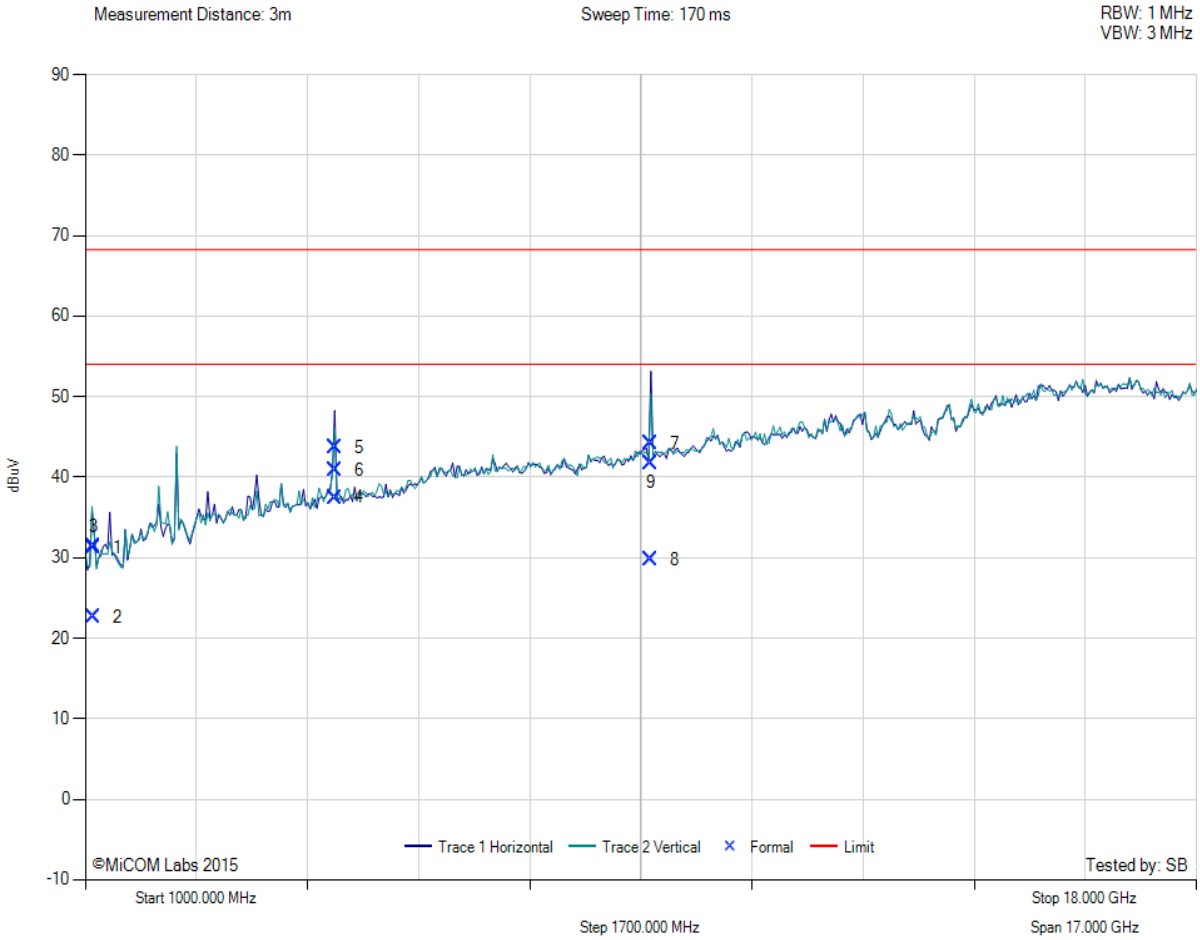
A.1. Emissions

A.1.1. Radiated Emissions

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11b, Test Freq: 2412.00 MHz, Antenna: Galtronics Custom PCB, Power Setting: 25

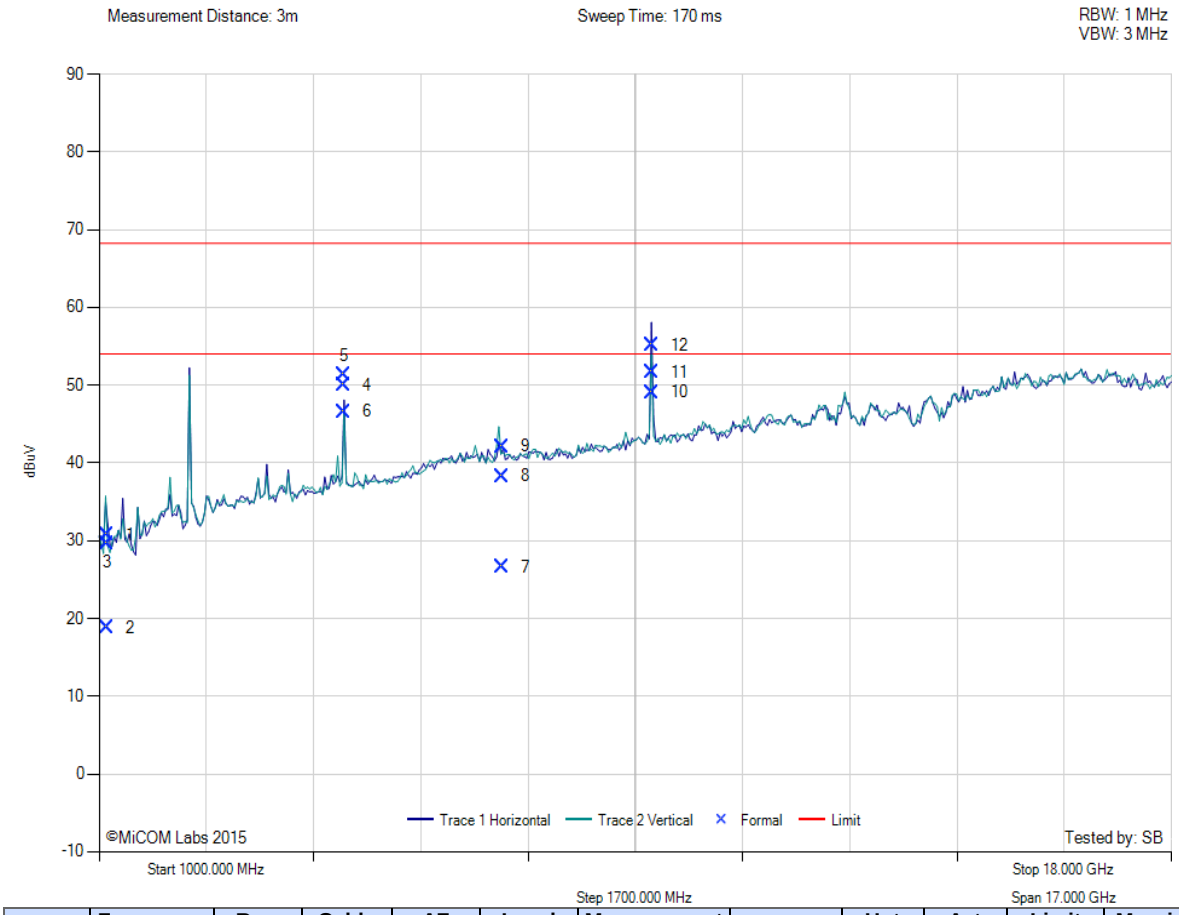


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	1124.90	45.42	2.74	-16.90	31.26	Peak (Scan)	Vertical	100	0	0.0	--	
2	1124.90	36.74	2.74	-16.90	22.58	Max Avg	Vertical	100	121	54.0	-31.4	Pass
3	1124.90	45.52	2.74	-16.90	31.36	Max Peak	Vertical	100	121	68.2	-36.9	Pass
4	4824.14	42.77	5.83	-11.15	37.45	Max Avg	Horizontal	100	95	54.0	-16.6	Pass
5	4824.14	48.98	5.83	-11.15	43.66	Max Peak	Horizontal	100	95	68.2	-24.6	Pass
6	4824.14	46.22	5.83	-11.15	40.90	Peak (Scan)	Horizontal	100	0	0.0	--	
7	9647.90	41.52	8.71	-6.08	44.15	Peak (Scan)	Horizontal	100	0	0.0	--	
8	9647.90	27.11	8.71	-6.08	29.74	Max Avg	Horizontal	128	62	54.0	-24.3	Pass
9	9647.90	39.16	8.71	-6.08	41.79	Max Peak	Horizontal	128	62	68.2	-26.4	Pass

back to matrix

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11b, Test Freq: 2437.00 MHz, Antenna: Galtronics Custom PCB, Power Setting: 25



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	1125.16	44.91	2.74	-16.90	30.75	Peak (Scan)	Vertical	100	0	0.0	--	
2	1125.16	33.00	2.74	-16.90	18.84	Max Avg	Vertical	100	128	54.0	-35.2	Pass
3	1125.16	43.81	2.74	-16.90	29.65	Max Peak	Vertical	100	128	68.2	-38.6	Pass
4	4884.01	55.39	5.87	-11.27	49.99	Max Avg	Horizontal	119	97	54.0	-4.0	Pass
5	4884.01	56.71	5.87	-11.27	51.31	Max Peak	Horizontal	119	97	68.2	-16.9	Pass
6	4884.01	51.96	5.87	-11.27	46.56	Peak (Scan)	Horizontal	100	0	0.0	--	
7	7390.32	26.31	7.43	-7.17	26.57	Max Avg	Vertical	110	3	54.0	-27.4	Pass
8	7390.32	38.03	7.43	-7.17	38.29	Max Peak	Vertical	110	3	68.2	-29.9	Pass
9	7390.32	41.87	7.43	-7.17	42.13	Peak (Scan)	Vertical	100	0	0.0	--	
10	9768.02	46.63	8.64	-6.20	49.07	Peak (Scan)	Horizontal	100	0	0.0	--	
11	9768.02	49.22	8.64	-6.20	51.66	Max Avg	Horizontal	103	162	54.0	-2.3	Pass
12	9768.02	52.71	8.64	-6.20	55.15	Max Peak	Horizontal	103	162	68.2	-13.1	Pass

back to matrix

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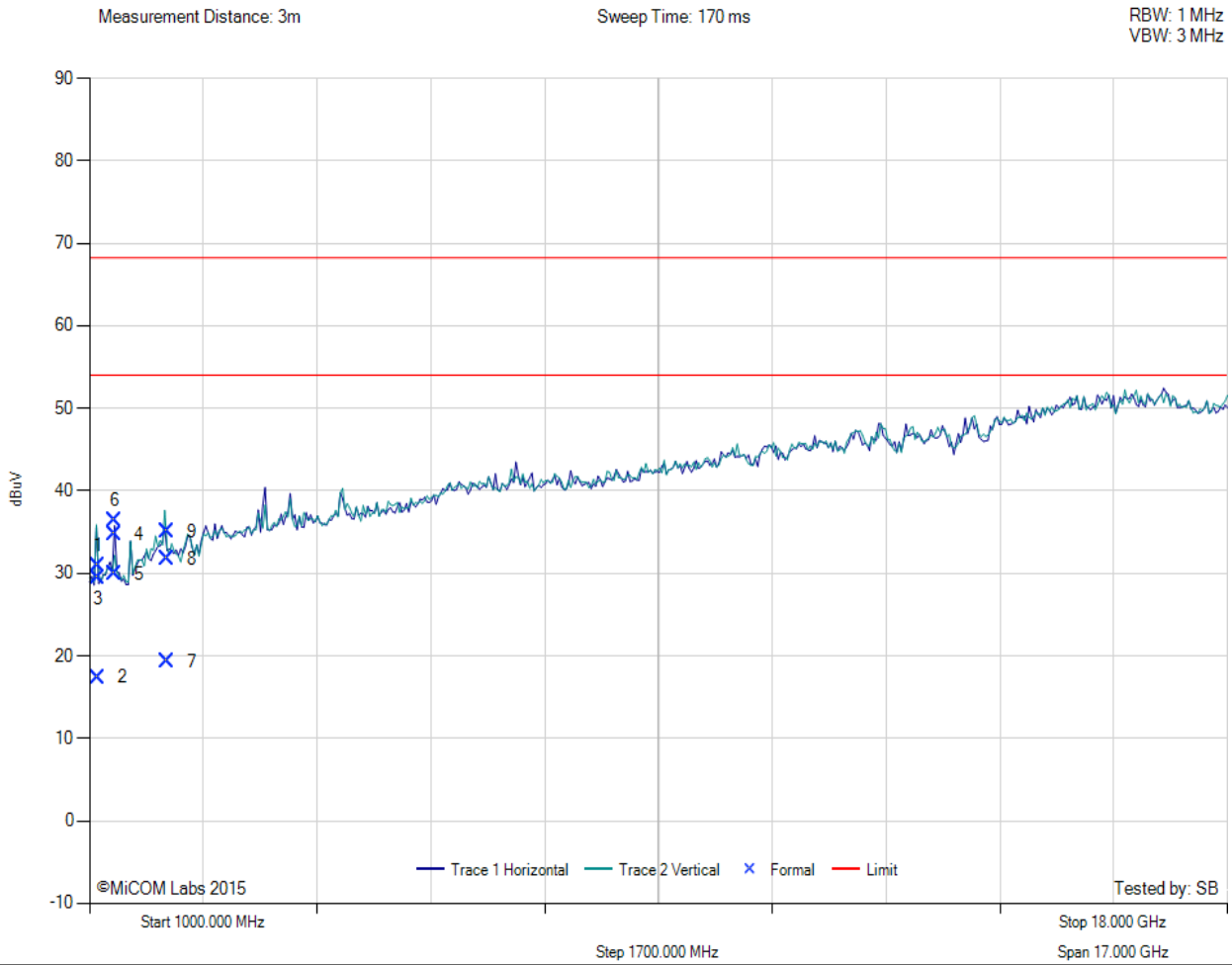
RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11b, Test Freq: 2462.00 MHz, Antenna: Galtronics Custom PCB, Power Setting: 25



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	1125.18	45.08	2.74	-16.90	30.92	Peak (Scan)	Horizontal	100	0	0.0	--	
2	1125.18	31.54	2.74	-16.90	17.38	Max Avg	Horizontal	118	246	54.0	-36.6	Pass
3	1125.18	43.61	2.74	-16.90	29.45	Max Peak	Horizontal	118	246	68.2	-38.8	Pass
4	1375.09	47.09	3.00	-15.38	34.71	Peak (Scan)	Horizontal	100	0	0.0	--	
5	1375.09	42.25	3.00	-15.38	29.87	Max Avg	Horizontal	100	279	54.0	-24.1	Pass
6	1375.09	48.76	3.00	-15.38	36.38	Max Peak	Horizontal	100	279	68.2	-31.9	Pass
7	2155.05	28.08	3.79	-12.52	19.35	Max Avg	Vertical	134	0	54.0	-34.7	Pass
8	2155.05	40.52	3.79	-12.52	31.79	Max Peak	Vertical	134	0	68.2	-36.4	Pass
9	2155.05	43.83	3.79	-12.52	35.10	Peak (Scan)	Vertical	100	0	0.0	--	

back to matrix

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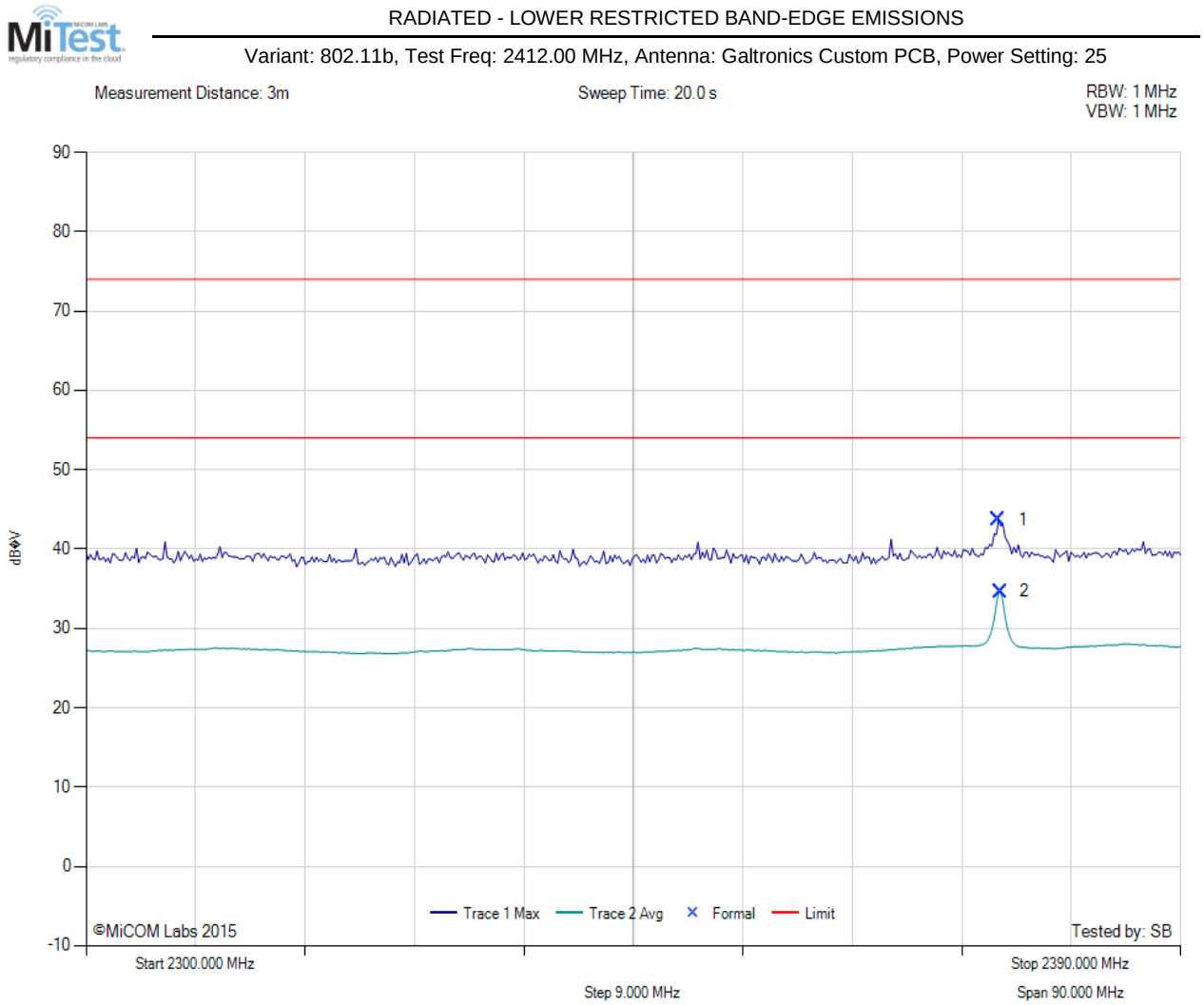
A.1.2. Restricted Band-Edge Emissions

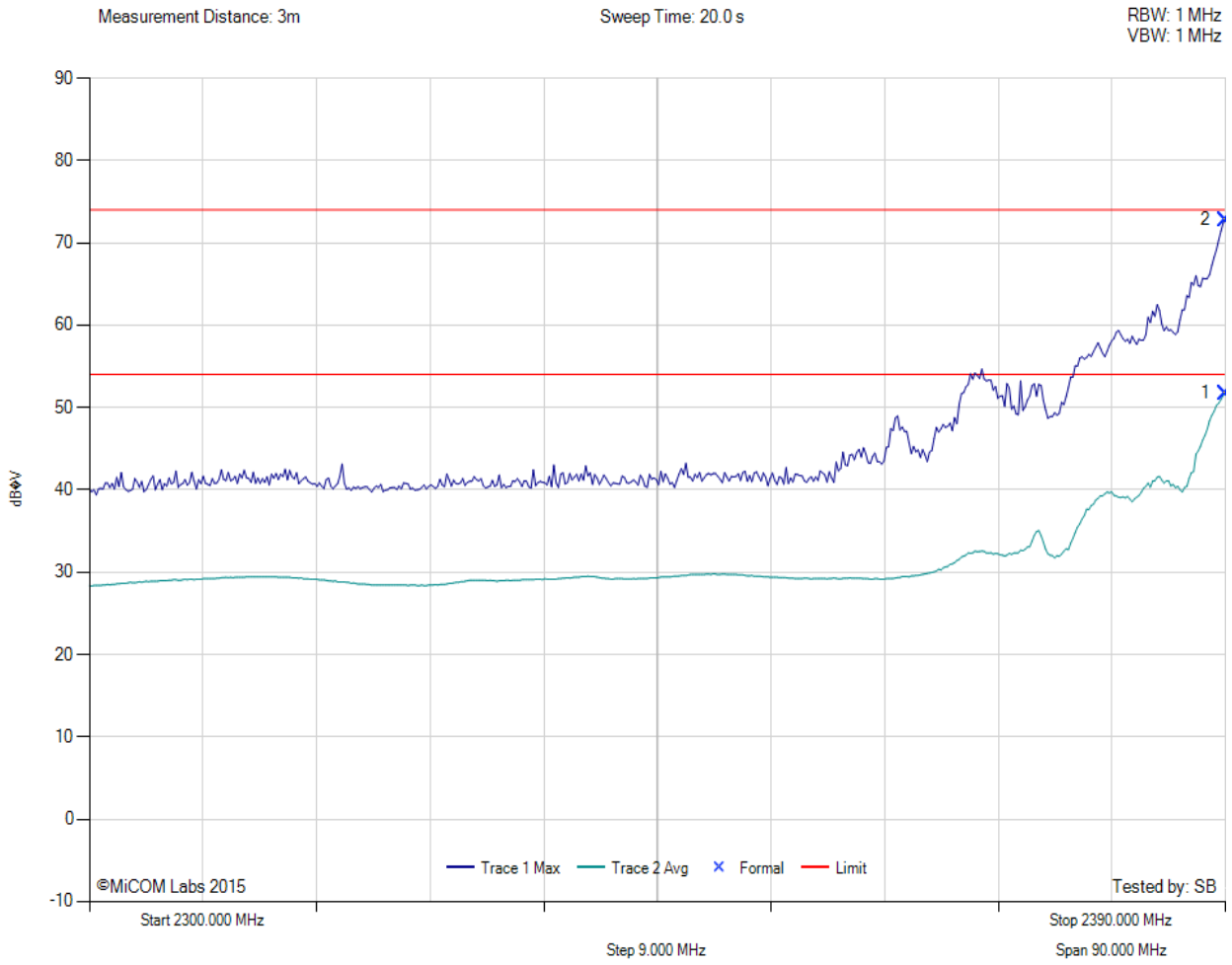


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2375.03	51.73	4.04	-12.05	43.72	Max Peak	Horizaontal	126	99	74.0	-30.3	Pass
2	2375.21	42.64	4.04	-12.05	34.63	Max Avg	Horizaontal	126	99	54.0	-19.4	Pass

back to matrix

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: 802.11g, Test Freq: 2412.00 MHz, Antenna: Galtronics Custom PCB, Power Setting: 21

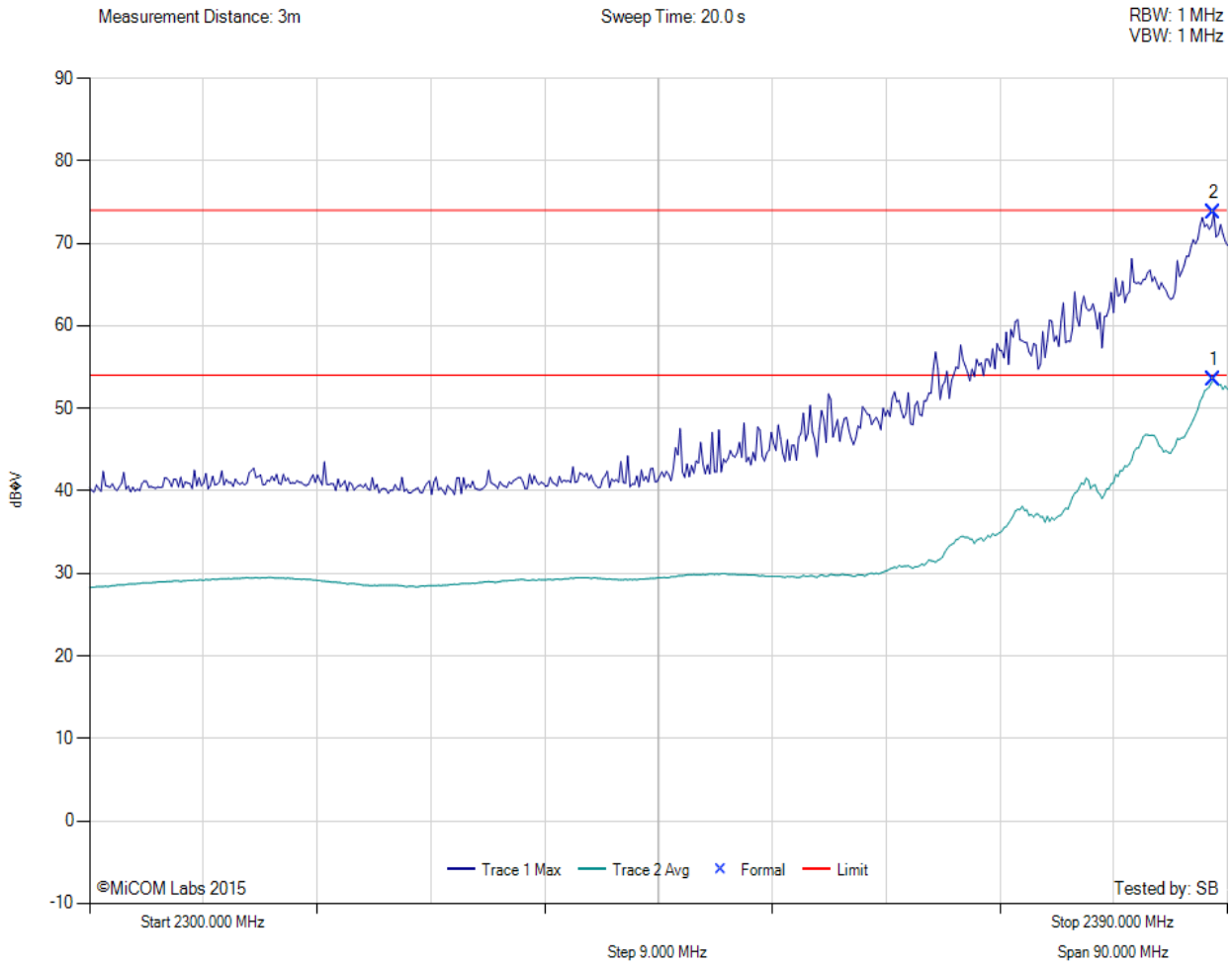


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2390.00	59.62	4.04	-11.92	51.74	Max Avg	Horizaontal	126	-4	54.0	-2.3	Pass
2	2390.00	80.70	4.04	-11.92	72.82	Max Peak	Horizaontal	126	-4	74.0	-1.2	Pass

back to matrix

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: 802.11n HT-20, Test Freq: 2412.00 MHz, Antenna: Galtronics Custom PCB, Power Setting: 21

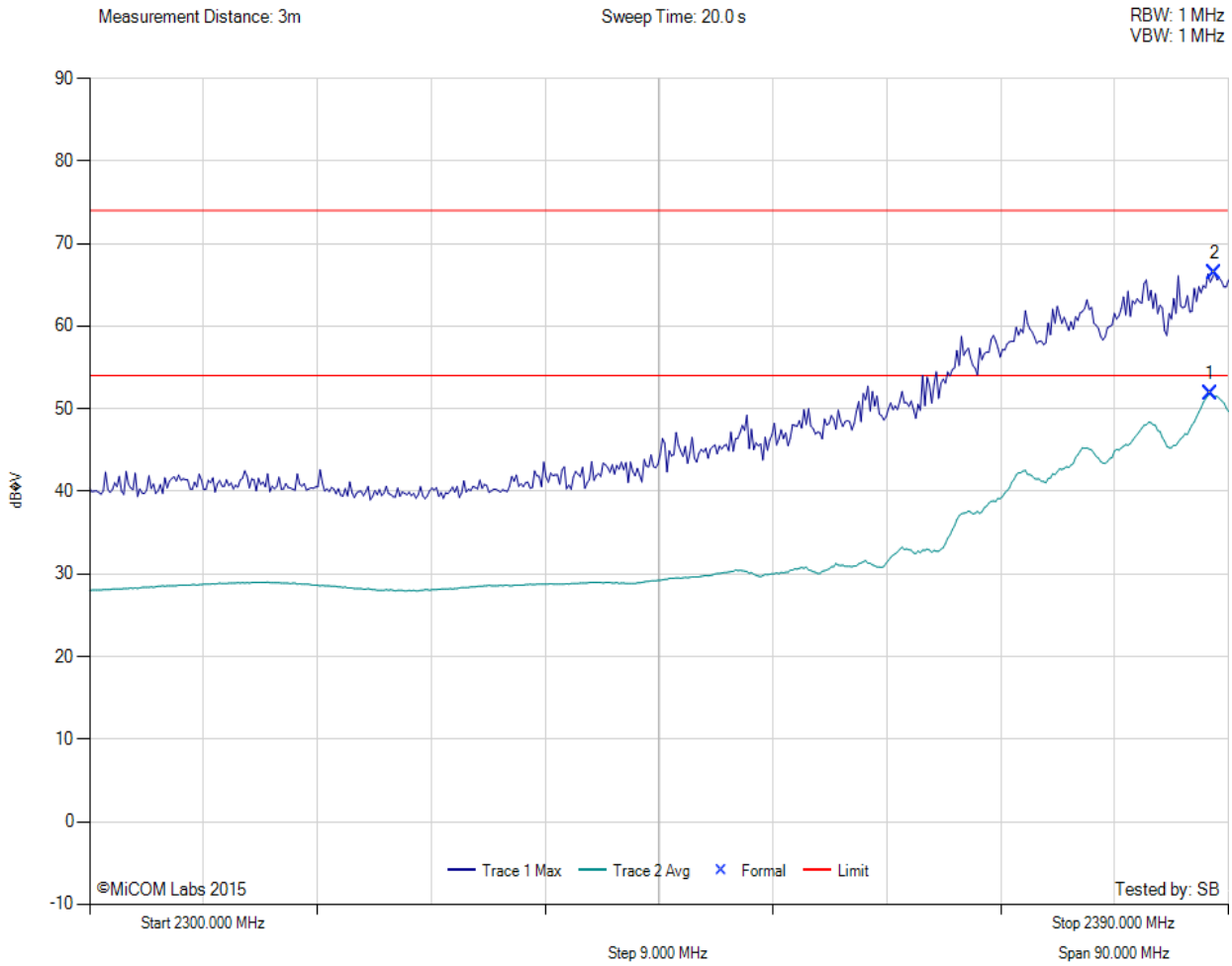


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2388.92	61.32	4.04	-11.92	53.44	Max Avg	Horizaontal	126	-4	54.0	-0.6	Pass
2	2388.92	81.57	4.04	-11.92	73.69	Max Peak	Horizaontal	126	-4	74.0	-0.3	Pass

back to matrix

RADIATED - LOWER RESTRICTED BAND-EDGE EMISSIONS

Variant: 802.11n HT-40, Test Freq: 2422.00 MHz, Antenna: Galtronics Custom PCB, Power Setting: 22

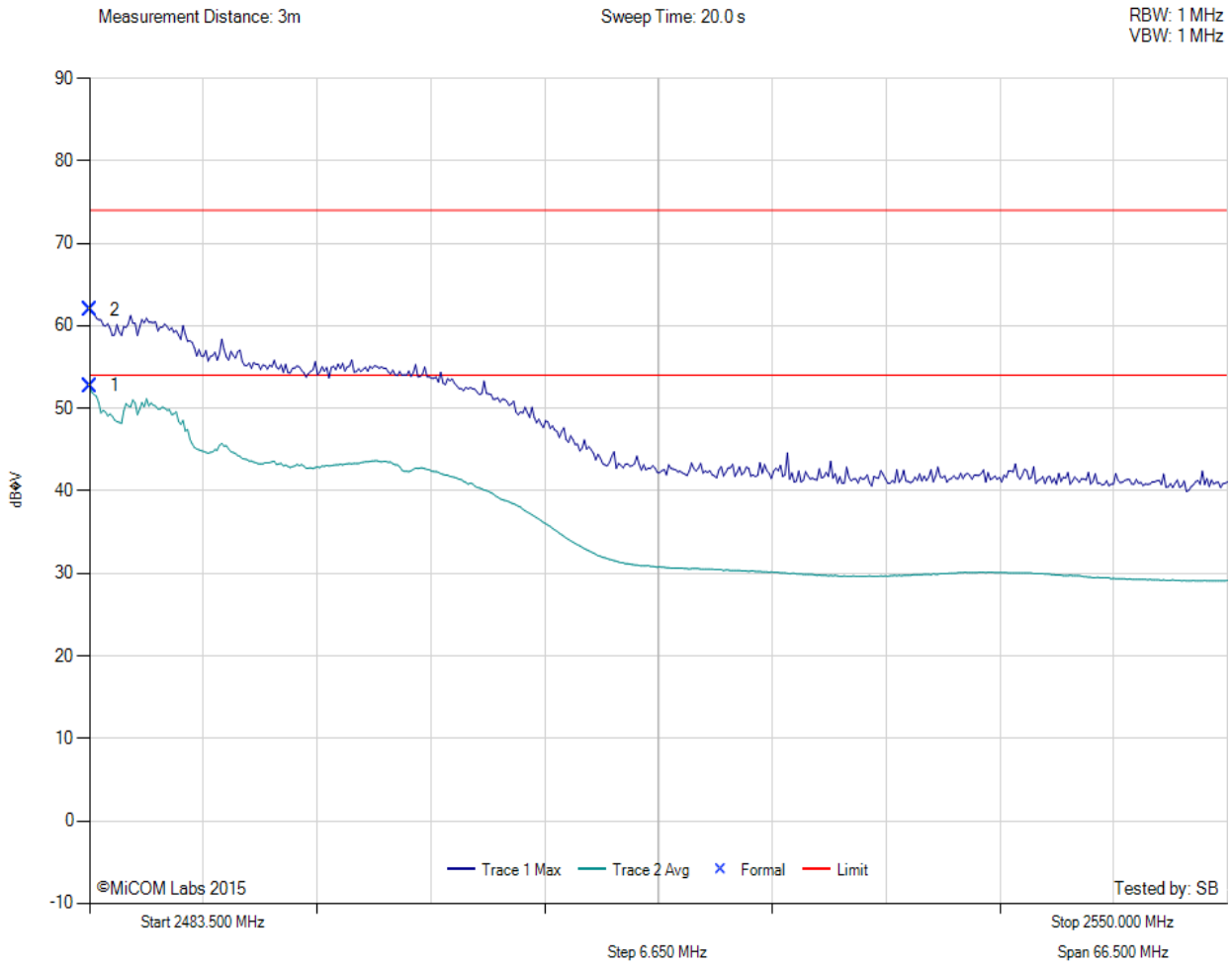


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2388.56	59.73	4.04	-11.92	51.85	Max Avg	Horizaontal	126	-4	54.0	-2.2	Pass
2	2388.92	74.32	4.04	-11.92	66.44	Max Peak	Horizaontal	126	-4	74.0	-7.6	Pass

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: 802.11b, Test Freq: 2462.00 MHz, Antenna: Galtronics Custom PCB, Power Setting: 25

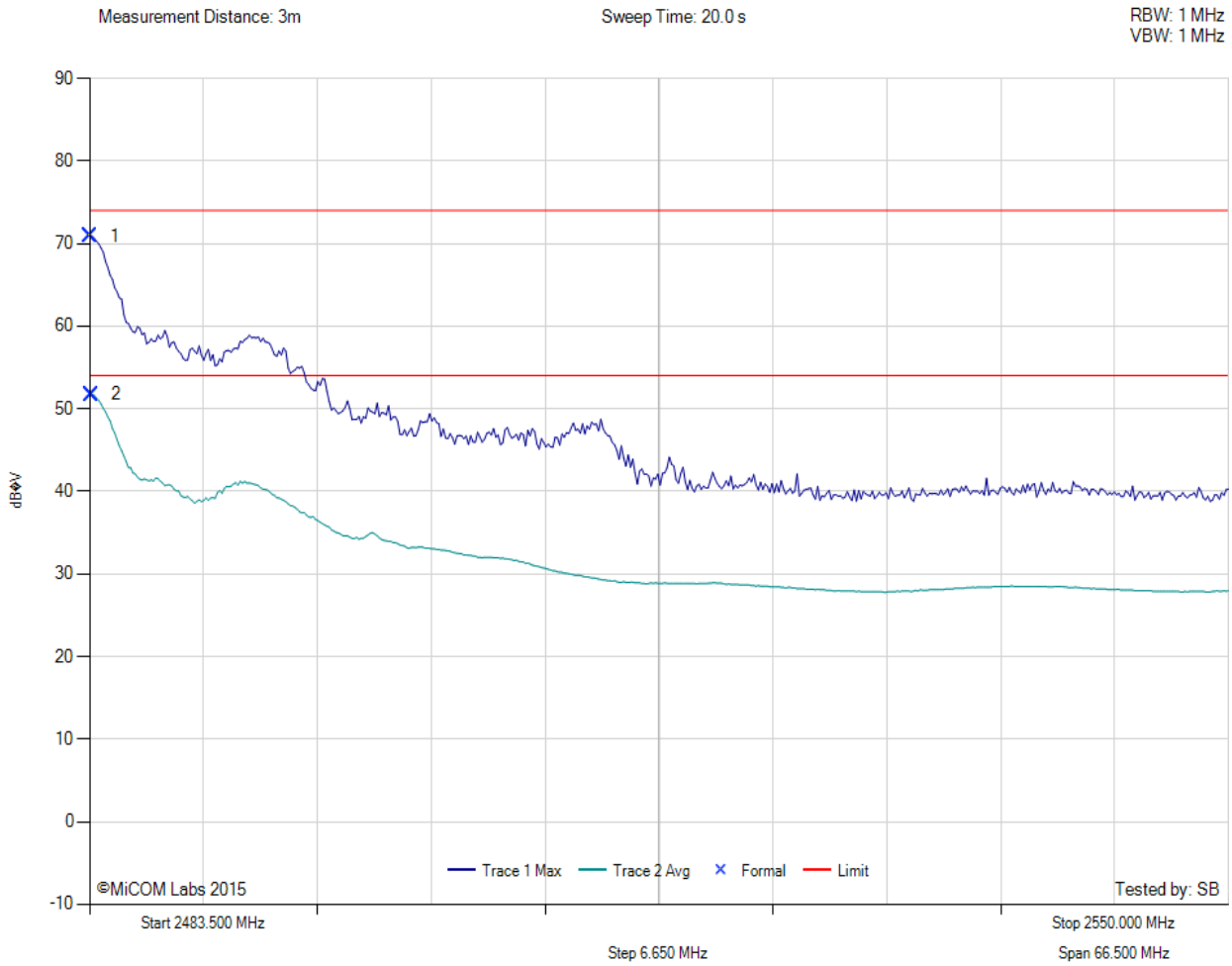


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2483.50	60.28	4.10	-11.64	52.74	Max Avg	Vertical	126	293	54.0	-1.3	Pass
2	2483.50	69.46	4.10	-11.64	61.92	Max Peak	Vertical	126	293	74.0	-12.1	Pass

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: 802.11g, Test Freq: 2462.00 MHz, Antenna: Galtronics Custom PCB, Power Setting: 21

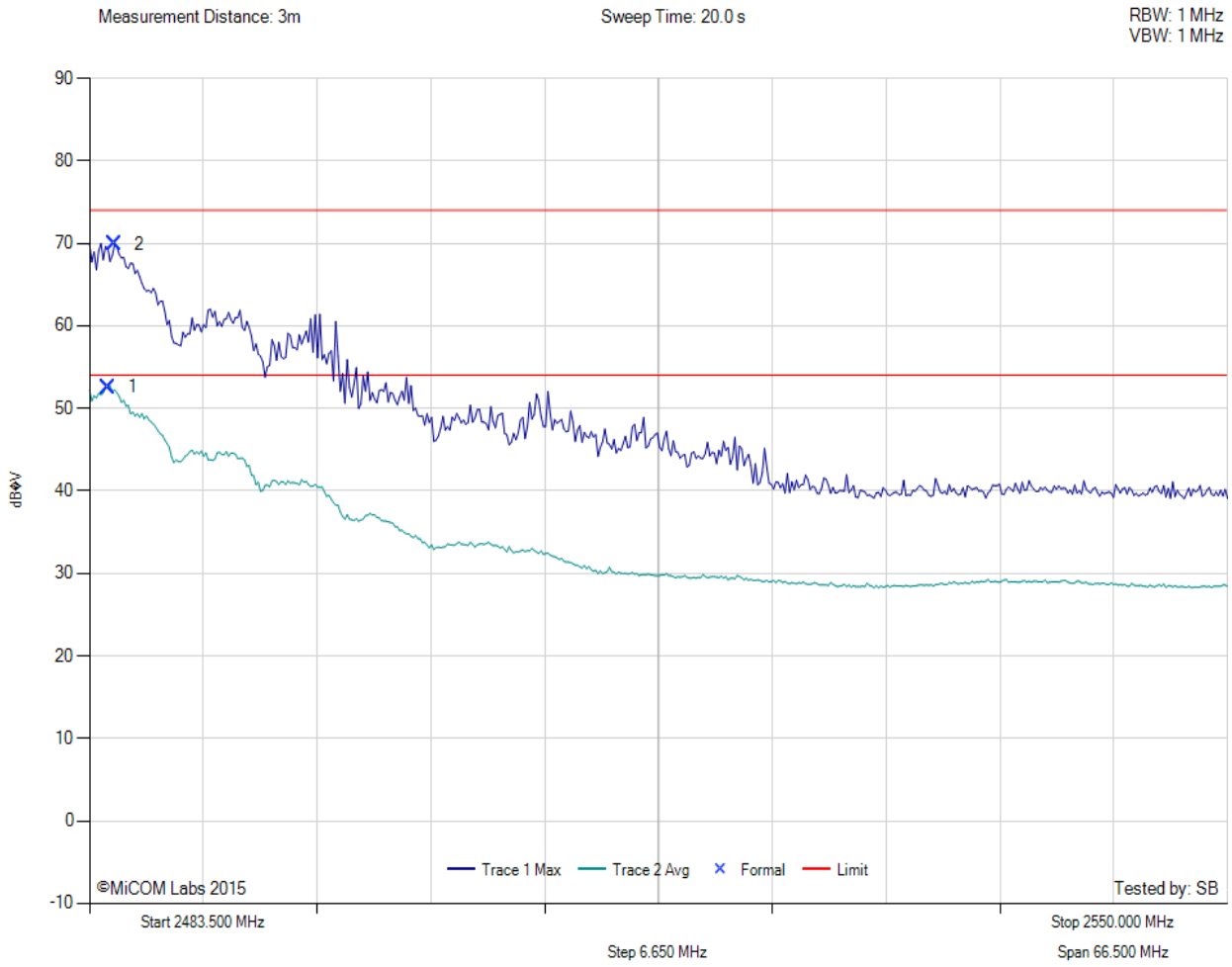


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2483.50	78.47	4.10	-11.64	70.93	Max Peak	Horizaontal	126	-4	74.0	-3.1	Pass
2	2483.63	59.28	4.10	-11.64	51.74	Max Avg	Horizaontal	126	-4	54.0	-2.3	Pass

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: 802.11n HT-20, Test Freq: 2462.00 MHz, Antenna: Galtronics Custom PCB, Power Setting: 22

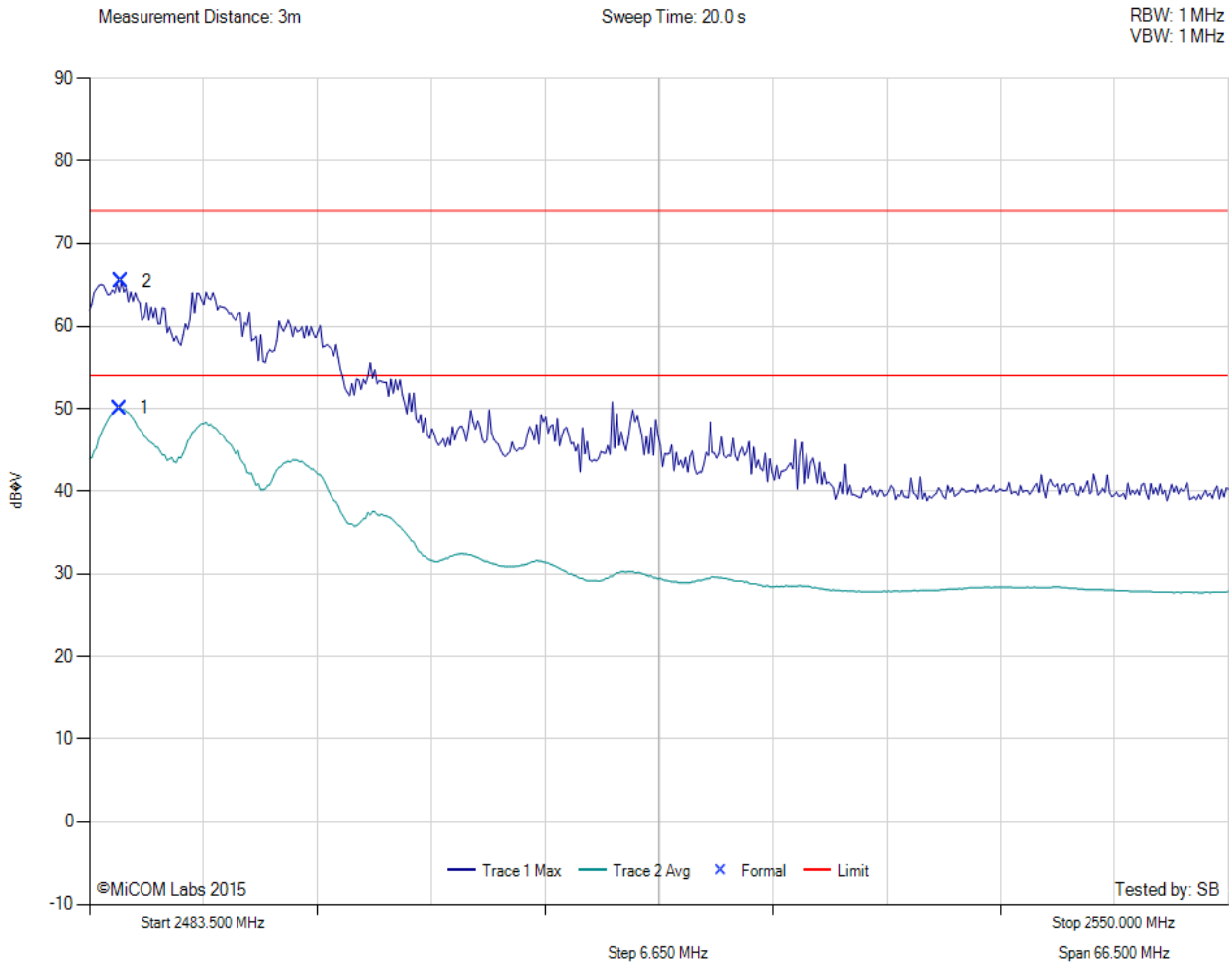


Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2484.57	60.12	4.10	-11.64	52.58	Max Avg	Horizaontal	126	-4	54.0	-1.4	Pass
2	2484.97	77.42	4.10	-11.64	69.88	Max Peak	Horizaontal	126	-4	74.0	-4.1	Pass

back to matrix

RADIATED - UPPER RESTRICTED BAND-EDGE EMISSIONS

Variant: 802.11n HT-40, Test Freq: 2452.00 MHz, Antenna: Galtronics Custom PCB, Power Setting: 18



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	2485.23	57.62	4.10	-11.64	50.08	Max Avg	Horizaontal	126	-4	54.0	-3.9	Pass
2	2485.37	72.93	4.10	-11.64	65.39	Max Peak	Horizaontal	126	-4	74.0	-8.6	Pass

back to matrix

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