TEST REPORT ADDENDUM - RADIATED

FROM

Test of: Actiontec Electronics Inc T3200M
to

To: FCC CFR 47 Part 15 Subpart E 15.407& IC RSS-247 (DFS Bands)

Test Report Serial No.: ATEC14-U13_Radiated Rev A

Note: this report is one of a set of five reports that together address the requirements of the standards noted above for certification purposes.

Master Document Number	Addendum Reports
ATEC14-U13_Master	ATEC14-U13_Conducted
	ATEC14-U13_Radiated
	ATEC14-U13_DFS
	ATEC14-U2 (FCC Part 15B & ICES_003)

This report supersedes: NONE

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

Product Function: Wireless 802.11ac Bonded VDSL2 Modem Gateway with MoCA 2.0

Issue Date: 1st April 2016

This Test Report is Issued Under the Authority of:

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TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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1. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	1st April 2016	Initial release.
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In the above table the latest report revision will replace all earlier versions.

2. 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)

3. TEST SUMMARY

List of Measurements

Test Header	Result	Data Link
(b)(2) Radiated	Complies	-
i).. Restricted Band Emissions	Complies	-
Galtronics Custom PCB SMT	Complies	View Data
ii).. Restricted Band-Edge Emissions	Complies	-
Galtronics Custom PCB SMT	Complies	View Data

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4. TEST RESULTS

4.1. Radiated Emissions

Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions			
Standard:	FCC CFR 47:15.407	**Ambient Temp. (ºC):**	20.0 - 24.5
Test Heading:	Radiated Spurious and Band-Edge Emissions	**Rel. Humidity (%):**	32 - 45
Standard Section(s):	15.407 (b), 15.205, 15.209	**Pressure (mBars):**	999 - 1001
Reference Document(s):	See Normative References		

Test Procedure for Radiated Spurious and Band-Edge Emissions
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 Undesirable Measurement were per the Radiated Test Set-up specified in this document.

15.407 (b) Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

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

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

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

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

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

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

Limits for Restricted Bands (15.205, 15.209)
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:
The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength (dBµV/m);

$$E = {1000000 \times \sqrt{30P}}/{3} \ \mu V/m$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz equates to 68.23 dBuV/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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4.1.1. Restricted Band Emissions

4.1.1.1. Galtronics Custom PCB SMT

Equipment Configuration for Radiated Spurious - Restricted Band Emissions			
Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11a
Antenna Gain (dBi):	4.46	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.14	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5260.00	**Data Rate:**	6.00 MBit/s
Power Setting:	17	**Tested By:**	JMH

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	5266.18	83.07	3.68	-11.26	75.49	Fundamental	Vertical	151	0	--	--	
#2	7013.18	55.48	4.18	-7.42	52.24	Peak (NRB)	Horizontal	151	0	--	--	Pass
#3	7013.18	55.48	4.18	-7.42	52.24	Peak (NRB)	Horizontal	151	0	--	--	Pass
#4	10519.60	50.31	5.43	-4.21	51.53	Peak (NRB)	Vertical	151	77	--	--	Pass
Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber												

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Equipment Configuration for Radiated Spurious - Restricted Band Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11a
Antenna Gain (dBi):	4.46	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.14	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5300.00	**Data Rate:**	6.00 MBit/s
Power Setting:	17	**Tested By:**	JMH

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	5298.24	79.25	3.81	-11.10	71.96	Fundamental	Horizontal	101	31	--	--	
#2	7066.71	52.48	4.18	-7.34	49.32	Peak (NRB)	Horizontal	101	31	--	--	Pass
#3	10601.96	39.16	5.57	-3.93	40.80	Max Avg	Vertical	194	32	54.0	-13.2	Pass
#4	10601.96	53.33	5.57	-3.93	54.97	Max Peak	Vertical	194	32	74.0	-19.0	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

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Equipment Configuration for Radiated Spurious - Restricted Band Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11a
Antenna Gain (dBi):	4.46	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.14	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5320.00	**Data Rate:**	6.00 MBit/s
Power Setting:	17	**Tested By:**	JMH

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	5326.13	77.16	3.73	-11.06	69.83	Fundamental	Vertical	149	0	--	--	
#2	5326.13	77.09	3.73	-11.06	69.76	Peak (NRB)	Vertical	149	0	--	--	Pass
#3	7093.16	54.68	4.23	-7.33	51.58	Peak (NRB)	Horizontal	149	0	--	--	Pass
#4	10637.55	41.19	5.43	-3.89	42.73	Max Avg	Vertical	158	275	54.0	-11.3	Pass
#5	10637.55	53.90	5.43	-3.89	55.44	Max Peak	Vertical	158	275	74.0	-18.6	Pass
Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber												

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Equipment Configuration for Radiated Spurious - Restricted Band Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11a
Antenna Gain (dBi):	4.40	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.4	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5500.00	**Data Rate:**	6.00 MBit/s
Power Setting:	16	**Tested By:**	JMH

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	1170.34	58.81	2.13	-17.03	43.91	Peak (Scan)	Vertical	151	0	54.0	-10.1	Pass
#2	1374.75	56.49	2.27	-15.37	43.39	Peak (Scan)	Horizontal	151	0	54.0	-10.6	Pass
#3	1612.23	57.09	2.35	-16.19	43.25	Peak (Scan)	Horizontal	151	0	54.0	-10.8	Pass
#4	2396.79	53.29	2.69	-12.86	43.12	Peak (Scan)	Horizontal	151	0	54.0	-10.9	Pass
#5	5506.01	68.35	3.75	-11.18	60.92	Fundamental	Vertical	151	0	--	--	

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

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Equipment Configuration for Radiated Spurious - Restricted Band Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11a
Antenna Gain (dBi):	4.40	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.4	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5580.00	**Data Rate:**	6.00 MBit/s
Power Setting:	16	**Tested By:**	JMH

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	5587.01	74.50	3.78	-11.19	67.09	Fundamental	Vertical	101	0	--	--	
#2	7440.03	54.07	4.30	-7.13	51.24	Max Avg	Vertical	131	301	54.0	-2.8	Pass
#3	7440.03	57.96	4.30	-7.13	55.13	Max Peak	Vertical	131	301	74.0	-18.9	Pass
#4	11153.74	38.07	5.91	-4.06	39.92	Max Avg	Horizontal	147	217	54.0	-14.1	Pass
#5	11153.74	51.24	5.91	-4.06	53.09	Max Peak	Horizontal	147	217	74.0	-20.9	Pass
Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber												

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Equipment Configuration for Radiated Spurious - Restricted Band Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11a
Antenna Gain (dBi):	4.40	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.4	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5720.00	**Data Rate:**	6.00 MBit/s
Power Setting:	16	**Tested By:**	JMH

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	1169.70	38.76	2.13	-16.52	24.37	Max Avg	Vertical	183	93	54.0	-29.6	Pass
#2	1169.70	50.77	2.13	-16.52	36.38	Max Peak	Vertical	183	93	74.0	-37.6	Pass
#3	5726.41	57.64	3.79	-10.72	50.71	Fundamental	Horizontal	150	1	--	--	
#4	7626.57	55.27	4.38	-6.97	52.68	Max Avg	Horizontal	184	314	54.0	-1.3	Pass
#5	7626.57	61.51	4.38	-6.97	58.92	Max Peak	Horizontal	184	314	74.0	-15.1	Pass
#6	11439.96	43.97	5.35	-4.93	44.39	Max Avg	Vertical	162	280	54.0	-9.6	Pass
#7	11439.96	54.80	5.35	-4.93	55.22	Max Peak	Vertical	162	280	74.0	-18.8	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

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4.1.2. Restricted Band-Edge Emissions

4.1.2.2. Galtronics Custom PCB SMT

RESULTS SUMMARY FOR RADIATED BAND-EDGE EMISSIONS

Galtronics Custom PCB SMT		Band-Edge Freq	Limit 74.0dBµV/m	Limit 54.0dBµV/m	Power Setting
Operational Mode	Operating Frequency (MHz)	MHz	dBµV/m	dBµV/m	
802.11a	5320.00	5350.00	63.87	50.30	17
802.11ac-80	5290.00	5350.00	70.87	53.48	17
802.11n HT-20	5320.00	5350.00	63.84	50.44	17
802.11n HT-40	5310.00	5350.00	67.54	47.85	17

Galtronics Custom PCB SMT		Band-Edge Freq	Limit 74.0dBµV/m	Limit 54.0dBµV/m	Power Setting
Operational Mode	Operating Frequency (MHz)	MHz	dBµV/m	dBµV/m	
802.11a	5500.00	5460.00	61.19	48.31	16
802.11ac-80	5530.00	5460.00	67.07	52.68	16
802.11n HT-20	5500.00	5460.00	61.39	49.15	17
802.11n HT-40	5510.00	5460.00	63.69	48.99	16

Click on the links to view the data.

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Equipment Configuration for Restricted Upper Band-Edge Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11a
Antenna Gain (dBi):	4.46	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.14	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5320.00	**Data Rate:**	6.00 MBit/s
Power Setting:	17	**Tested By:**	JMH

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	5351.98	12.08	3.71	34.51	50.30	Max Avg	Horizontal	165	85	54.0	-3.7	Pass
#2	5352.20	25.65	3.71	34.51	63.87	Max Peak	Horizontal	165	85	74.0	-10.1	Pass
Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber												

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Equipment Configuration for Restricted Upper Band-Edge Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11ac-80
Antenna Gain (dBi):	4.46	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.14	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5290.00	**Data Rate:**	29.30 MBit/s
Power Setting:	17	**Tested By:**	JMH

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	5350.44	32.66	3.70	34.51	70.87	Max Peak	Horizontal	165	85	74.0	-3.1	Pass
#2	5350.88	15.26	3.71	34.51	53.48	Max Avg	Horizontal	165	85	54.0	-0.5	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

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Equipment Configuration for Restricted Upper Band-Edge Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11n HT-20
Antenna Gain (dBi):	4.46	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.14	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5320.00	**Data Rate:**	6.50 MBit/s
Power Setting:	17	**Tested By:**	JMH

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	5350.00	12.23	3.70	34.51	50.44	Max Avg	Horizontal	165	85	54.0	-3.6	Pass
#2	5350.66	25.62	3.71	34.51	63.84	Max Peak	Horizontal	165	85	74.0	-10.2	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

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Equipment Configuration for Restricted Upper Band-Edge Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11n HT-40
Antenna Gain (dBi):	4.46	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.14	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5310.00	**Data Rate:**	13.50 MBit/s
Power Setting:	17	**Tested By:**	JMH

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	5350.00	9.64	3.70	34.51	47.85	Max Avg	Horizontal	165	85	54.0	-6.2	Pass
#2	5353.53	29.33	3.71	34.50	67.54	Max Peak	Horizontal	165	85	74.0	-6.5	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

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Equipment Configuration for Restricted Lower Band-Edge Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11a
Antenna Gain (dBi):	4.40	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.4	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5500.00	**Data Rate:**	6.00 MBit/s
Power Setting:	16	**Tested By:**	JMH

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	5460.00	10.21	3.79	34.31	48.31	Max Avg	Horizontal	170	90	54.0	-5.7	Pass
#2	5460.00	23.09	3.79	34.31	61.19	Max Peak	Horizontal	170	90	74.0	-12.8	Pass
Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber												

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

Equipment Configuration for Restricted Lower Band-Edge Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11ac-80
Antenna Gain (dBi):	4.40	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.4	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5530.00	**Data Rate:**	29.30 MBit/s
Power Setting:	16	**Tested By:**	JMH

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	5459.34	28.97	3.79	34.31	67.07	Max Peak	Horizontal	170	90	74.0	-6.9	Pass
#2	5459.56	14.58	3.79	34.31	52.68	Max Avg	Horizontal	170	90	54.0	-1.3	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

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Equipment Configuration for Restricted Lower Band-Edge Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11n HT-20
Antenna Gain (dBi):	4.40	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.4	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5500.00	**Data Rate:**	6.50 MBit/s
Power Setting:	17	**Tested By:**	JMH

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	5459.56	23.29	3.79	34.31	61.39	Max Peak	Horizontal	170	90	74.0	-12.6	Pass
#2	5460.00	11.05	3.79	34.31	49.15	Max Avg	Horizontal	170	90	54.0	-4.9	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

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Equipment Configuration for Restricted Lower Band-Edge Emissions

Antenna:	Galtronics Custom PCB SMT	**Variant:**	802.11n HT-40
Antenna Gain (dBi):	4.40	**Modulation:**	OFDM
Beam Forming Gain (Y):	1.4	**Duty Cycle (%):**	100
Channel Frequency (MHz):	5510.00	**Data Rate:**	13.50 MBit/s
Power Setting:	16	**Tested By:**	JMH

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	5459.78	25.59	3.79	34.31	63.69	Max Peak	Horizontal	170	90	74.0	-10.3	Pass
#2	5460.00	10.89	3.79	34.31	48.99	Max Avg	Horizontal	170	90	54.0	-5.0	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

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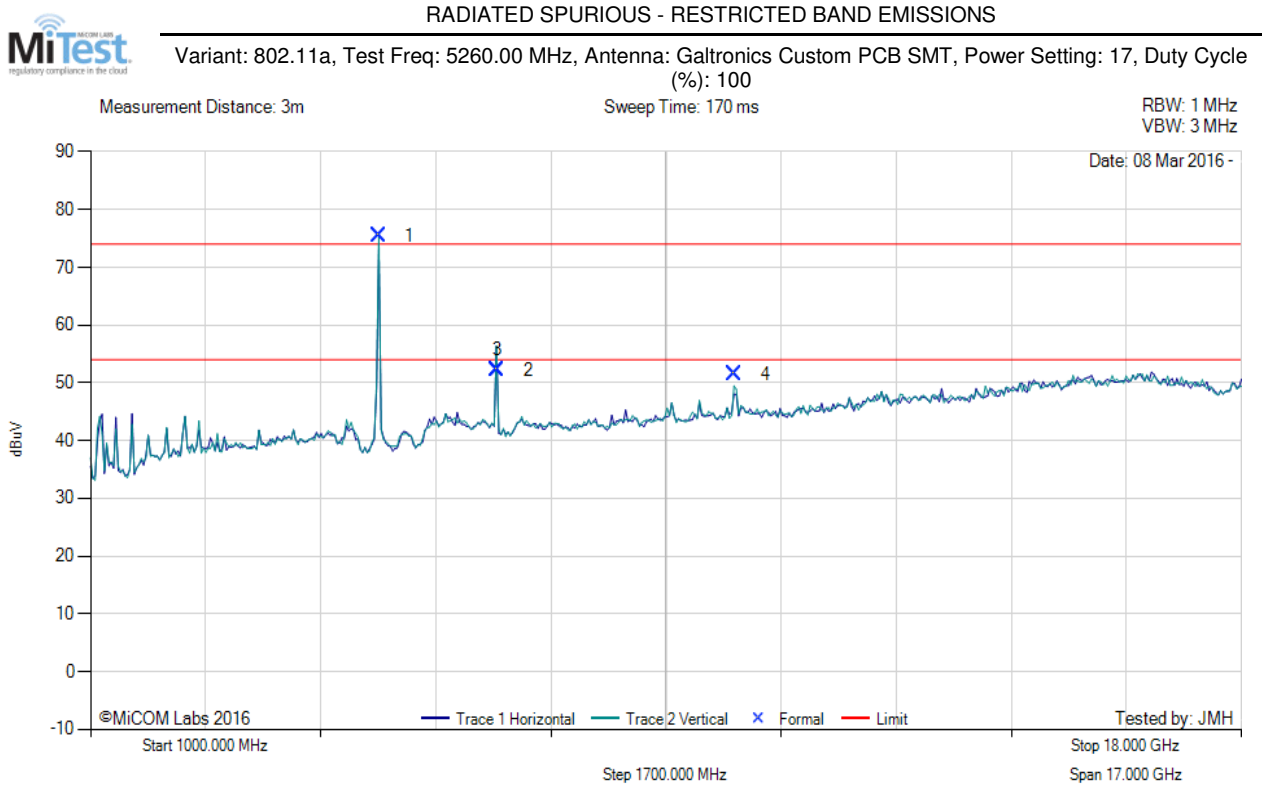
A. APPENDIX - GRAPHICAL IMAGES

This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report.

A.1. Radiated

A.1.1. Restricted Band Emissions

A.1.1.1. Galtronics Custom PCB SMT



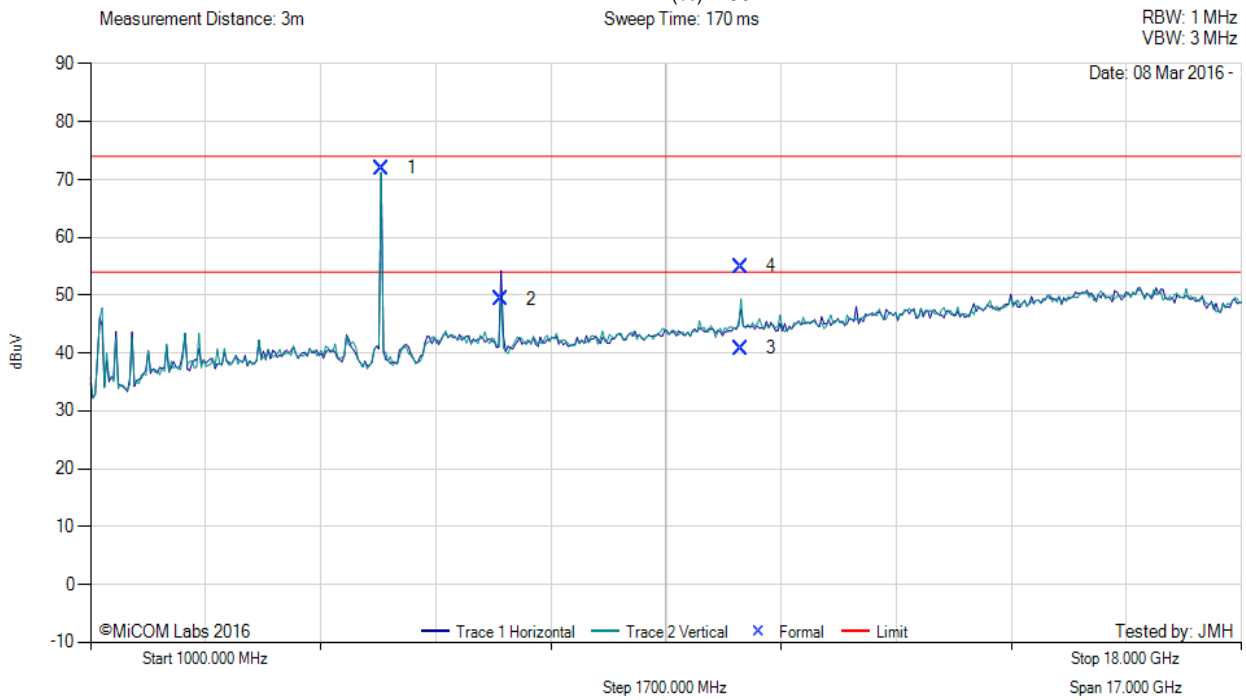
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5266.18	83.07	3.68	-11.26	75.49	Fundamental	Vertical	151	0	--	--	
2	7013.18	55.48	4.18	-7.42	52.24	Peak (NRB)	Horizontal	151	0	--	--	Pass
3	7013.18	55.48	4.18	-7.42	52.24	Peak (NRB)	Horizontal	151	0	--	--	Pass
4	10519.60	50.31	5.43	-4.21	51.53	Peak (NRB)	Vertical	151	77	--	--	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5300.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 17, Duty Cycle (%): 100



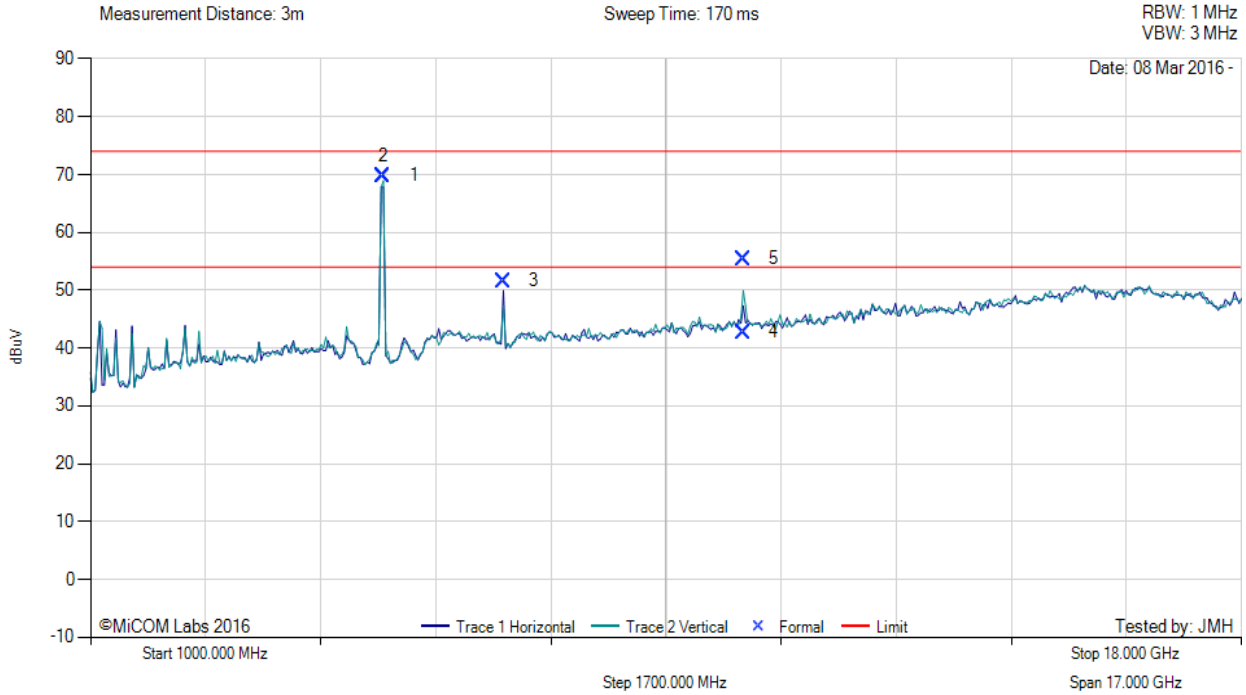
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5298.24	79.25	3.81	-11.10	71.96	Fundamental	Horizontal	101	31	--	--	
2	7066.71	52.48	4.18	-7.34	49.32	Peak (NRB)	Horizontal	101	31	--	--	Pass
3	10601.96	39.16	5.57	-3.93	40.80	Max Avg	Vertical	194	32	54.0	-13.2	Pass
4	10601.96	53.33	5.57	-3.93	54.97	Max Peak	Vertical	194	32	74.0	-19.0	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5320.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 17, Duty Cycle (%): 100



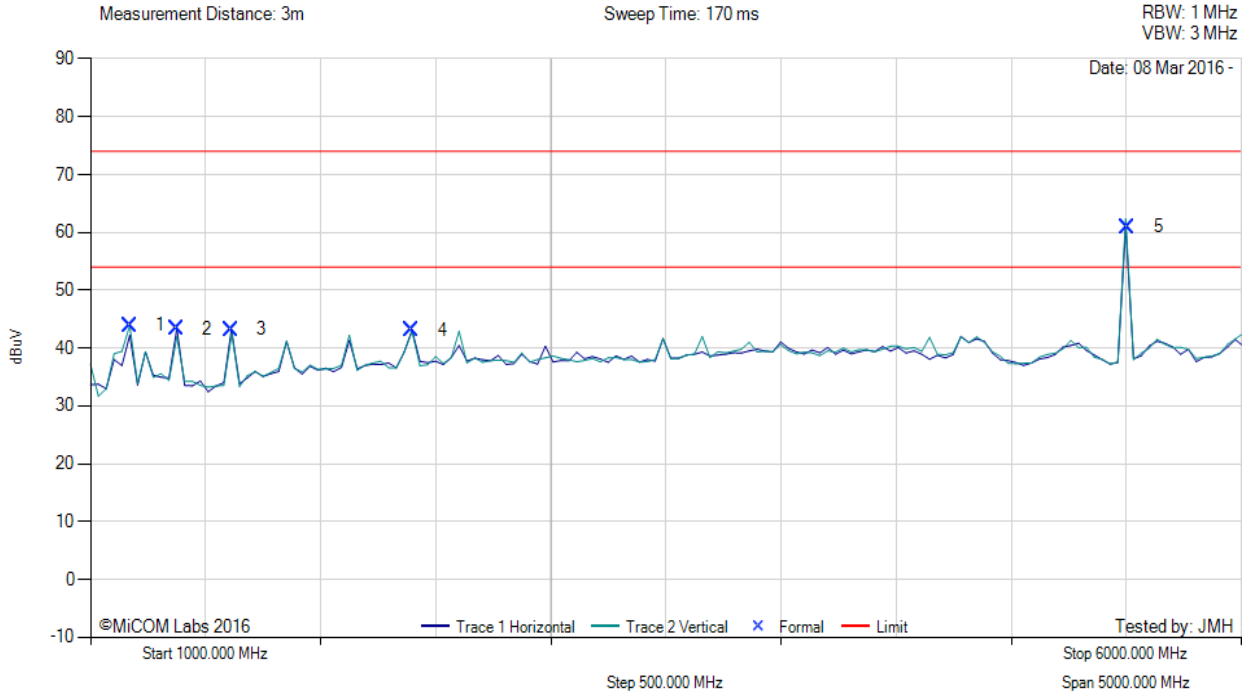
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5326.13	77.16	3.73	-11.06	69.83	Fundamental	Vertical	149	0	--	--	
2	5326.13	77.09	3.73	-11.06	69.76	Peak (NRB)	Vertical	149	0	--	--	Pass
3	7093.16	54.68	4.23	-7.33	51.58	Peak (NRB)	Horizontal	149	0	--	--	Pass
4	10637.55	41.19	5.43	-3.89	42.73	Max Avg	Vertical	158	275	54.0	-11.3	Pass
5	10637.55	53.90	5.43	-3.89	55.44	Max Peak	Vertical	158	275	74.0	-18.6	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5500.0MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 16, Duty Cycle (%): 100



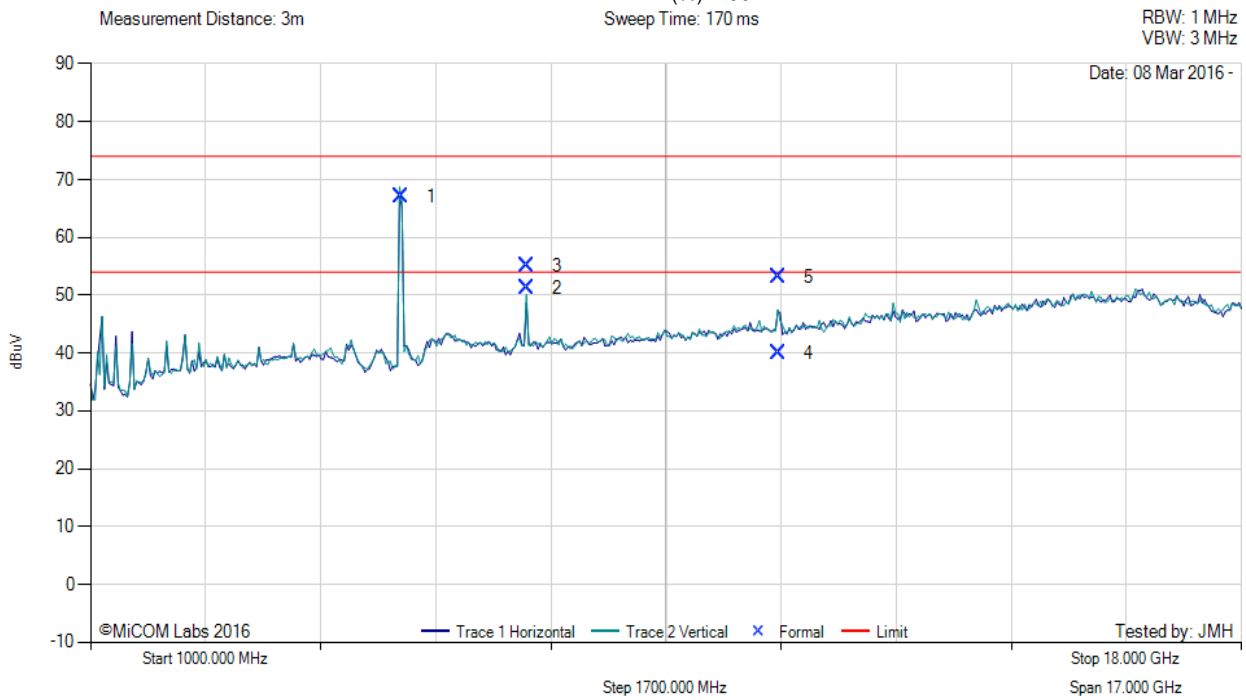
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	1170.34	58.81	2.13	-17.03	43.91	Peak (Scan)	Vertical	151	0	54.0	-10.1	Pass
2	1374.75	56.49	2.27	-15.37	43.39	Peak (Scan)	Horizontal	151	0	54.0	-10.6	Pass
3	1612.23	57.09	2.35	-16.19	43.25	Peak (Scan)	Horizontal	151	0	54.0	-10.8	Pass
4	2396.79	53.29	2.69	-12.86	43.12	Peak (Scan)	Horizontal	151	0	54.0	-10.9	Pass
5	5506.01	68.35	3.75	-11.18	60.92	Fundamental	Vertical	151	0	--	--	

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5580.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 16, Duty Cycle (%): 100



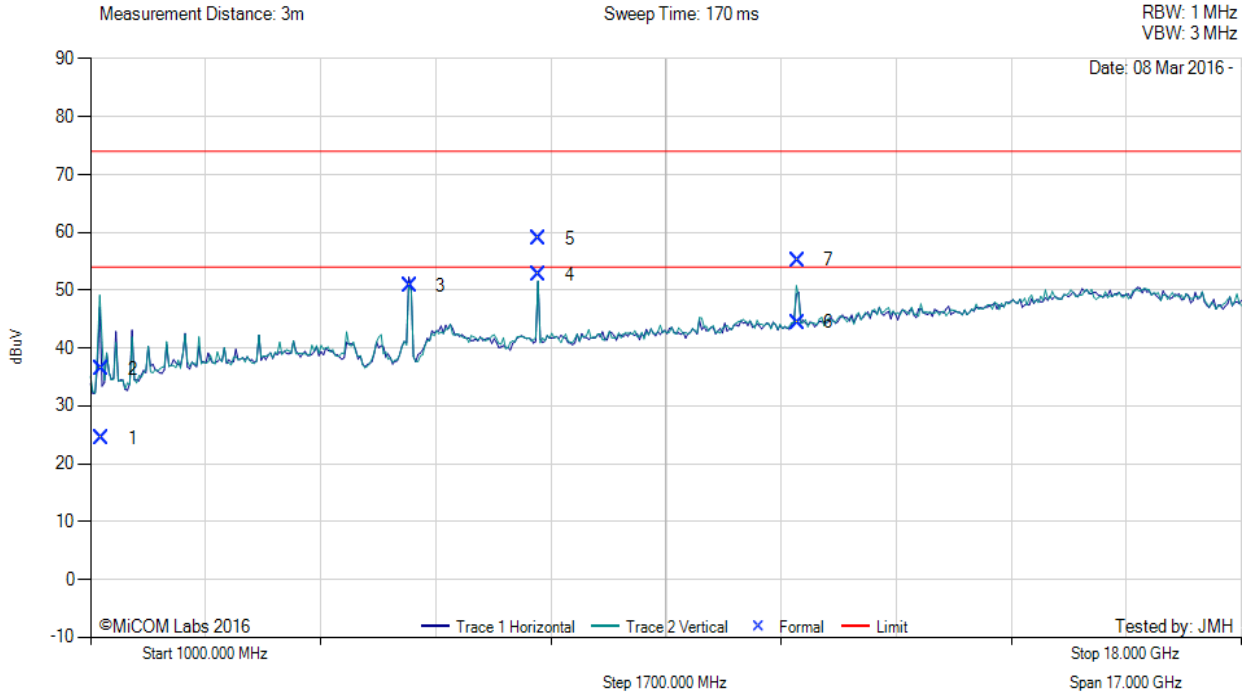
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5587.01	74.50	3.78	-11.19	67.09	Fundamental	Vertical	101	0	--	--	
2	7440.03	54.07	4.30	-7.13	51.24	Max Avg	Vertical	131	301	54.0	-2.8	Pass
3	7440.03	57.96	4.30	-7.13	55.13	Max Peak	Vertical	131	301	74.0	-18.9	Pass
4	11153.74	38.07	5.91	-4.06	39.92	Max Avg	Horizontal	147	217	54.0	-14.1	Pass
5	11153.74	51.24	5.91	-4.06	53.09	Max Peak	Horizontal	147	217	74.0	-20.9	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RADIATED SPURIOUS - RESTRICTED BAND EMISSIONS

Variant: 802.11a, Test Freq: 5720.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 16, Duty Cycle (%): 100



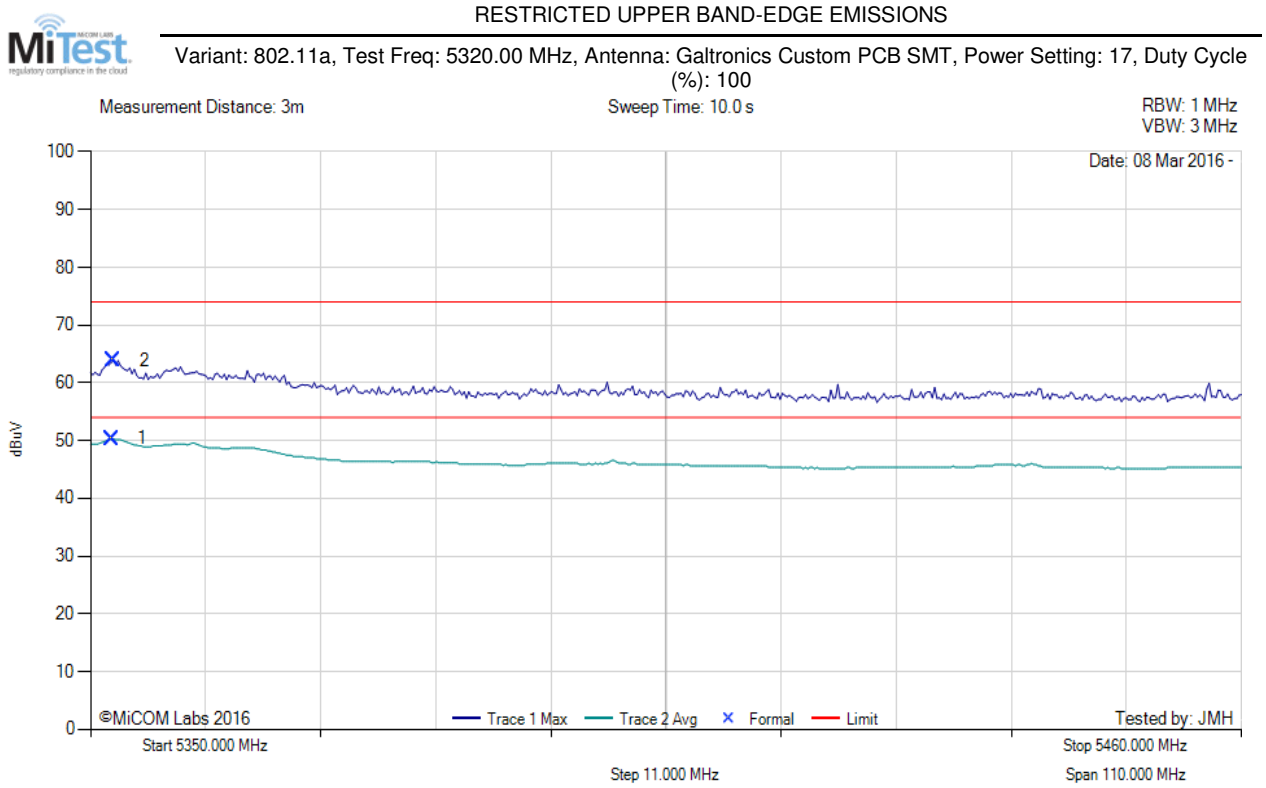
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	1169.70	38.76	2.13	-16.52	24.37	Max Avg	Vertical	183	93	54.0	-29.6	Pass
2	1169.70	50.77	2.13	-16.52	36.38	Max Peak	Vertical	183	93	74.0	-37.6	Pass
3	5726.41	57.64	3.79	-10.72	50.71	Fundamental	Horizontal	150	1	--	--	
4	7626.57	55.27	4.38	-6.97	52.68	Max Avg	Horizontal	184	314	54.0	-1.3	Pass
5	7626.57	61.51	4.38	-6.97	58.92	Max Peak	Horizontal	184	314	74.0	-15.1	Pass
6	11439.96	43.97	5.35	-4.93	44.39	Max Avg	Vertical	162	280	54.0	-9.6	Pass
7	11439.96	54.80	5.35	-4.93	55.22	Max Peak	Vertical	162	280	74.0	-18.8	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

A.1.2. Restricted Band-Edge Emissions

A.1.2.2. Galtronics Custom PCB SMT



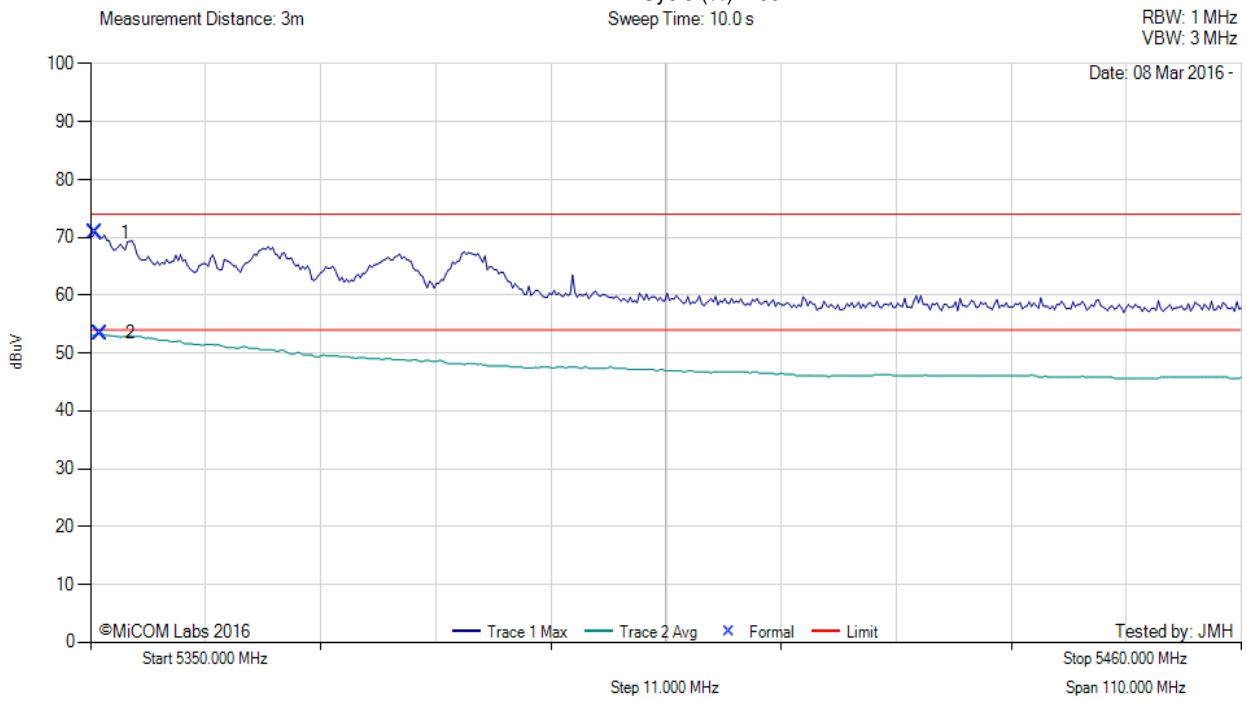
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5351.98	12.08	3.71	34.51	50.30	Max Avg	Horizontal	165	85	54.0	-3.7	Pass
2	5352.20	25.65	3.71	34.51	63.87	Max Peak	Horizontal	165	85	74.0	-10.1	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RESTRICTED UPPER BAND-EDGE EMISSIONS

Variant: 802.11ac-80, Test Freq: 5290.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 17, Duty Cycle (%): 100



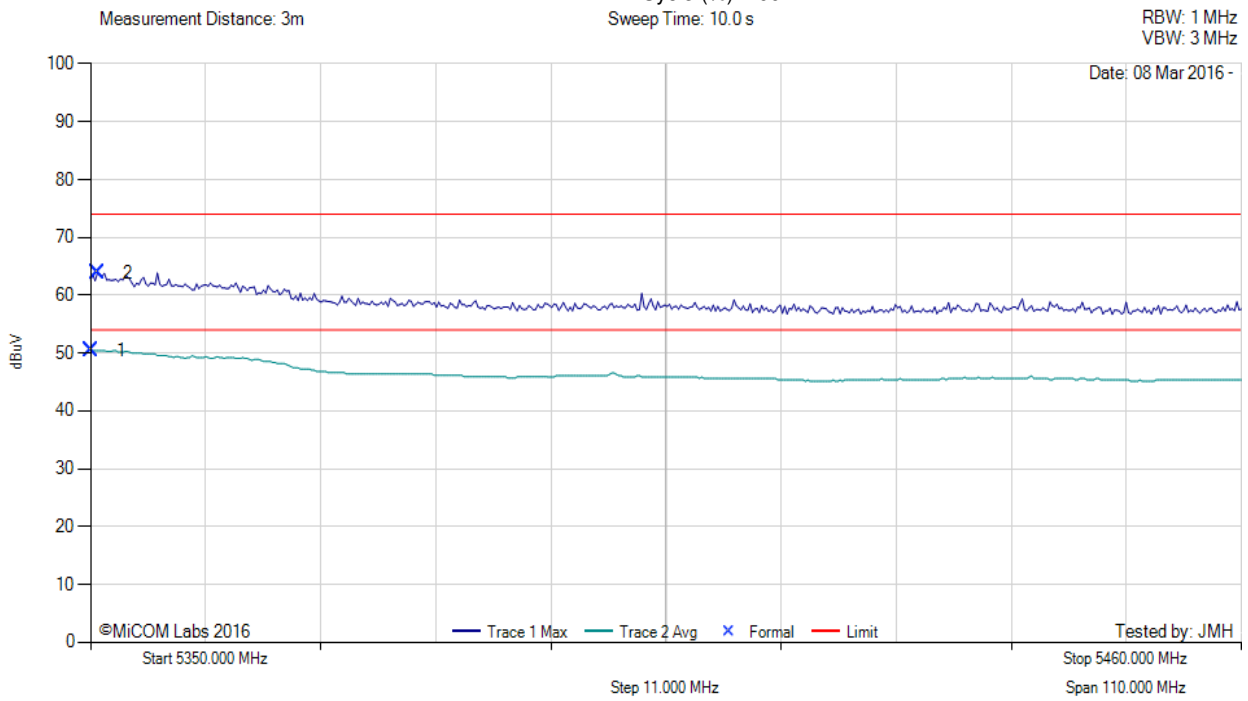
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5350.44	32.66	3.70	34.51	70.87	Max Peak	Horizontal	165	85	74.0	-3.1	Pass
2	5350.88	15.26	3.71	34.51	53.48	Max Avg	Horizontal	165	85	54.0	-0.5	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RESTRICTED UPPER BAND-EDGE EMISSIONS

Variant: 802.11n HT-20, Test Freq: 5320.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 17, Duty Cycle (%): 100



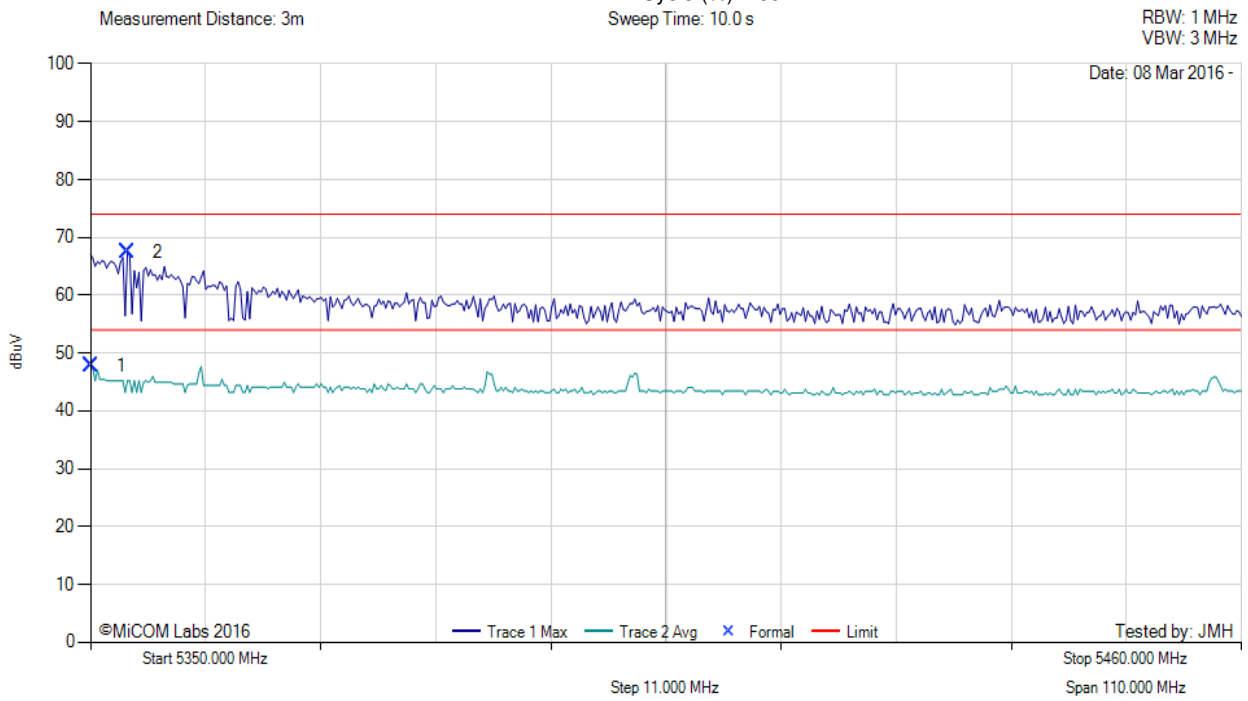
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5350.00	12.23	3.70	34.51	50.44	Max Avg	Horizontal	165	85	54.0	-3.6	Pass
2	5350.66	25.62	3.71	34.51	63.84	Max Peak	Horizontal	165	85	74.0	-10.2	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RESTRICTED UPPER BAND-EDGE EMISSIONS

Variant: 802.11n HT-40, Test Freq: 5310.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 17, Duty Cycle (%): 100



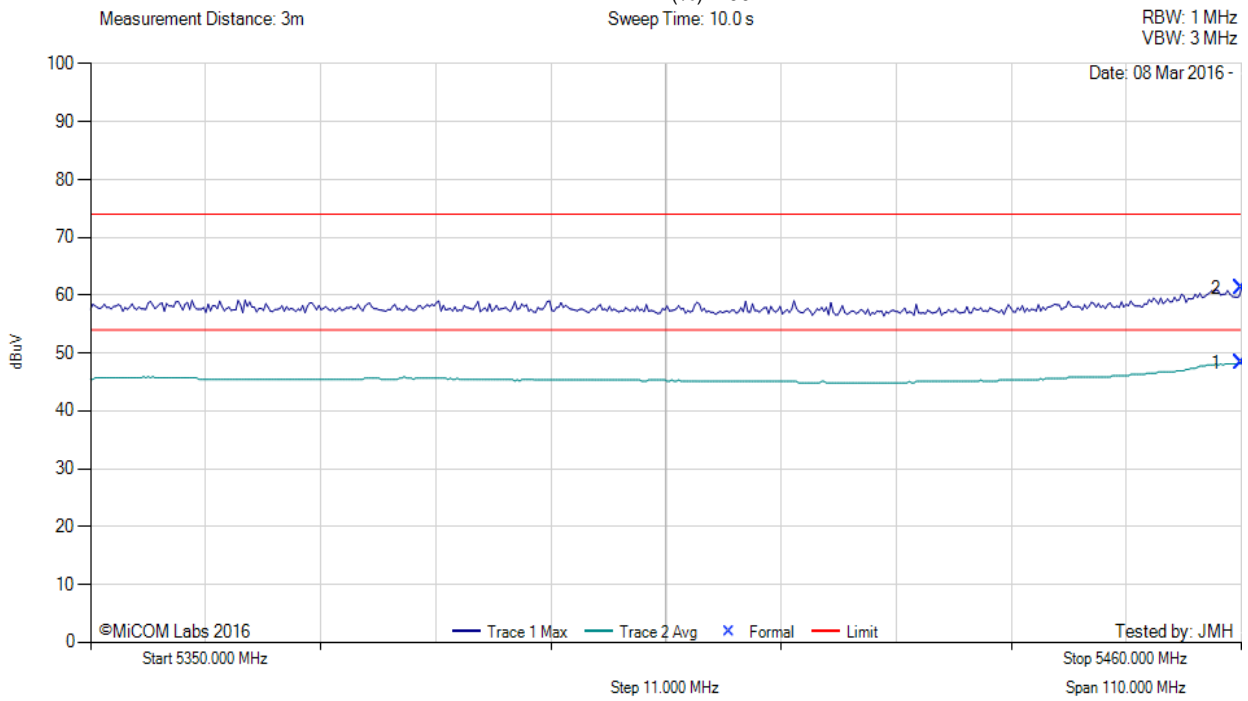
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5350.00	9.64	3.70	34.51	47.85	Max Avg	Horizontal	165	85	54.0	-6.2	Pass
2	5353.53	29.33	3.71	34.50	67.54	Max Peak	Horizontal	165	85	74.0	-6.5	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RESTRICTED LOWER BAND-EDGE EMISSIONS

Variant: 802.11a, Test Freq: 5500.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 16, Duty Cycle (%): 100



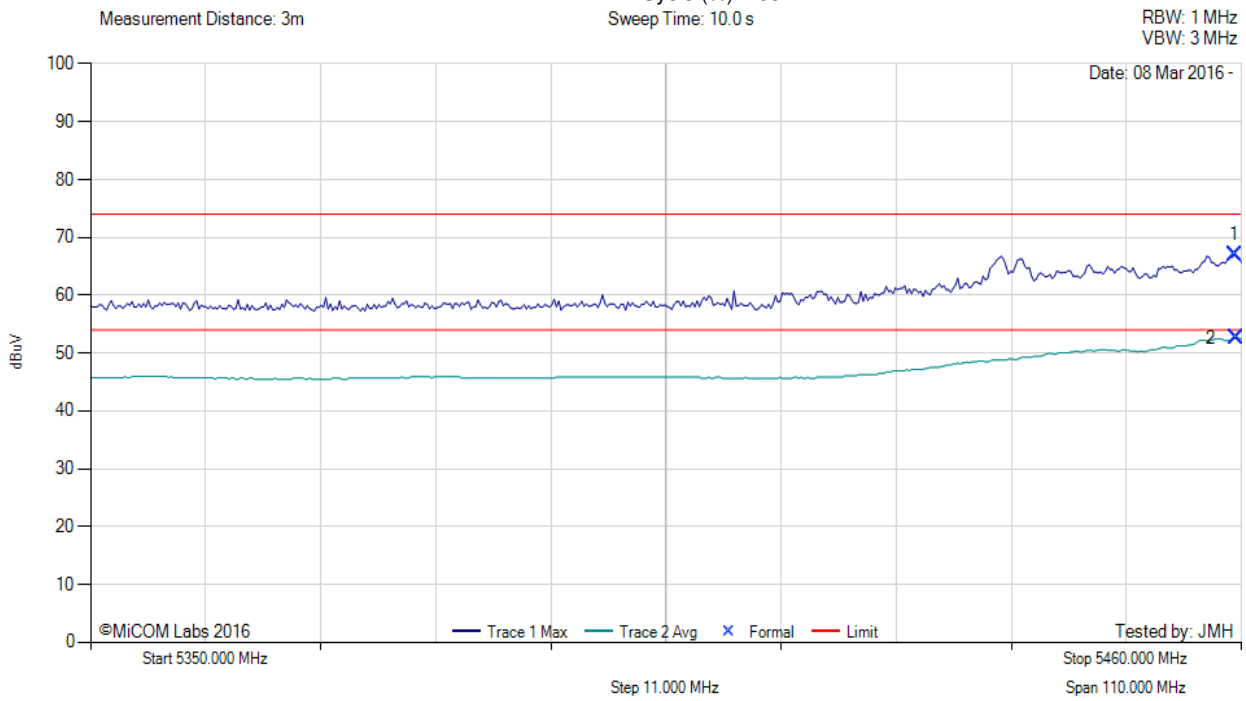
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5460.00	10.21	3.79	34.31	48.31	Max Avg	Horizontal	170	90	54.0	-5.7	Pass
2	5460.00	23.09	3.79	34.31	61.19	Max Peak	Horizontal	170	90	74.0	-12.8	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RESTRICTED LOWER BAND-EDGE EMISSIONS

Variant: 802.11ac-80, Test Freq: 5530.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 16, Duty Cycle (%): 100



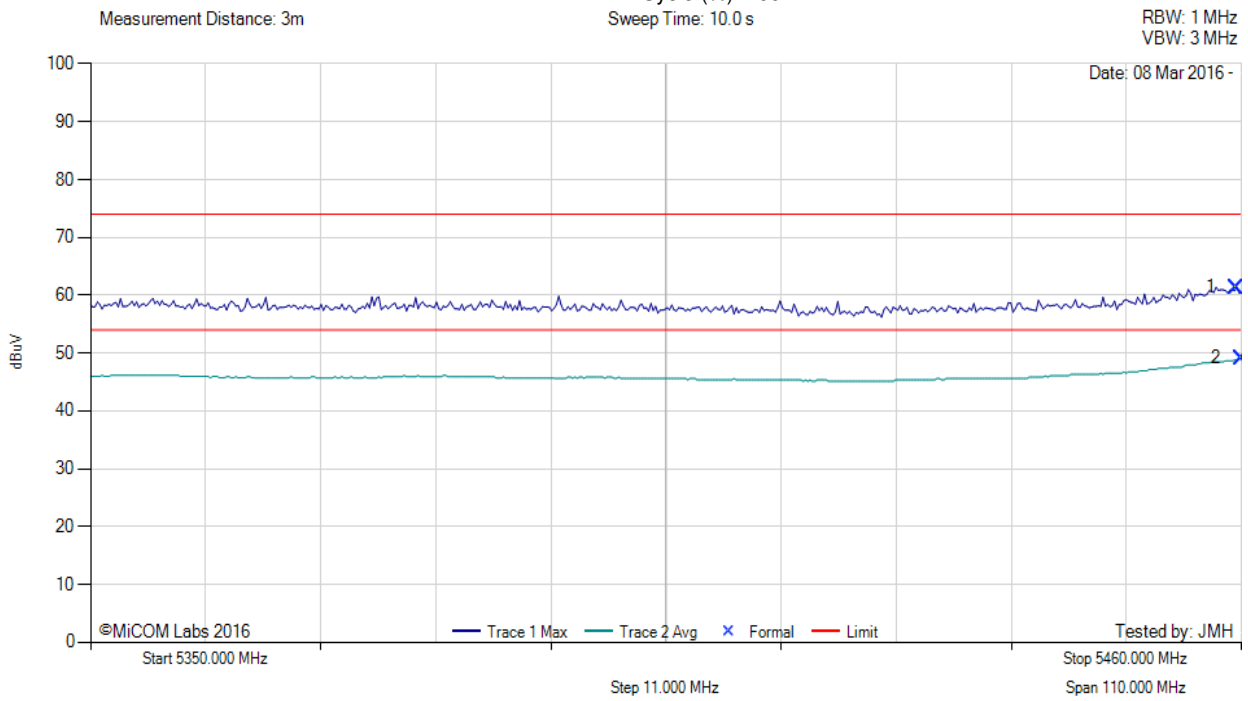
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5459.34	28.97	3.79	34.31	67.07	Max Peak	Horizontal	170	90	74.0	-6.9	Pass
2	5459.56	14.58	3.79	34.31	52.68	Max Avg	Horizontal	170	90	54.0	-1.3	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RESTRICTED LOWER BAND-EDGE EMISSIONS

Variant: 802.11n HT-20, Test Freq: 5500.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 17, Duty Cycle (%): 100



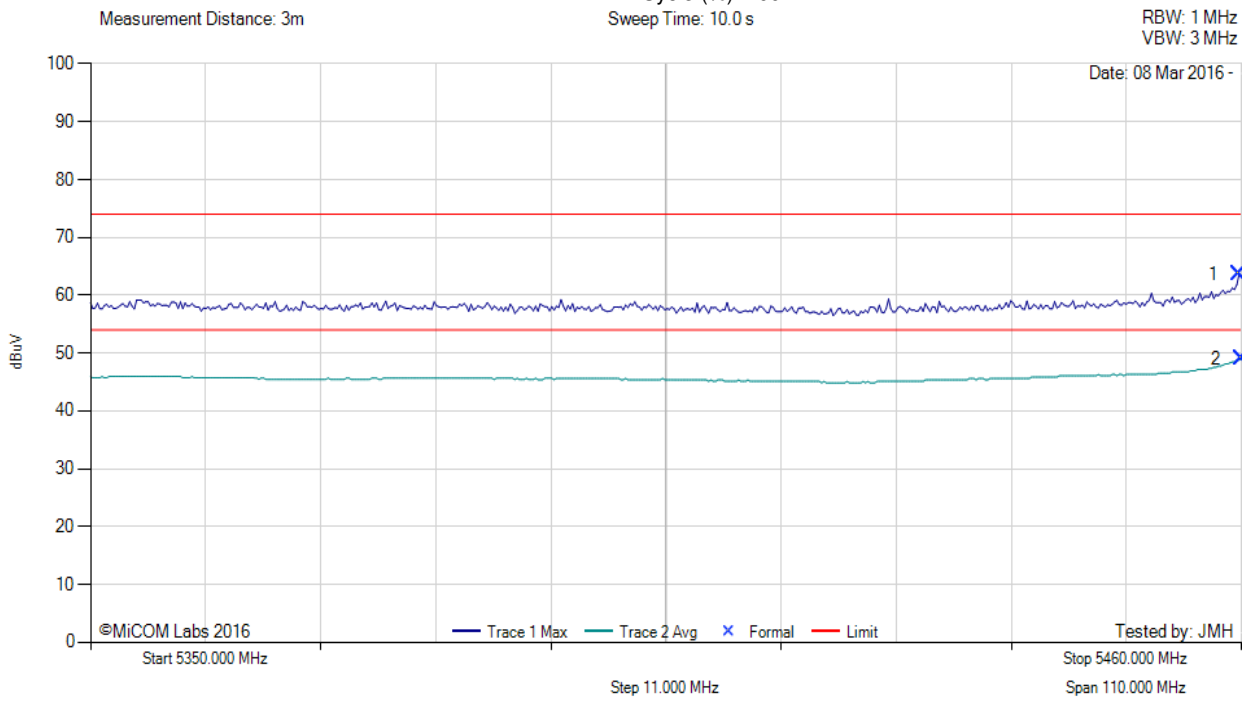
Num	Frequency MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	5459.56	23.29	3.79	34.31	61.39	Max Peak	Horizontal	170	90	74.0	-12.6	Pass
2	5460.00	11.05	3.79	34.31	49.15	Max Avg	Horizontal	170	90	54.0	-4.9	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

RESTRICTED LOWER BAND-EDGE EMISSIONS

Variant: 802.11n HT-40, Test Freq: 5510.00 MHz, Antenna: Galtronics Custom PCB SMT, Power Setting: 16, Duty Cycle (%): 100



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	5459.78	25.59	3.79	34.31	63.69	Max Peak	Horizontal	170	90	74.0	-10.3	Pass
2	5460.00	10.89	3.79	34.31	48.99	Max Avg	Horizontal	170	90	54.0	-5.0	Pass

Test Notes: EUT on 150cm table powered by AC/DC PS. ENET connected to laptop outside chamber

back to matrix

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