COMPLIANCE WORLDWIDE INC.
TEST REPORT 276-17

In Accordance with the Requirements of

Federal Communications Commission CFR Title 47 Part 15.249, Subpart C

Innovation, Science and Economic Development Canada RSS 210, Issue 9

Low Power License-Exempt Radio Communication Devices Intentional Radiators

Issued to

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062-3426

for the

Garmin
Model Number AA3095
ANT+ Transmitter

FCC ID: IPH-A3095
IC: 1792A- A3095

Report Issued on August 4, 2017

Tested by

Brian F. Breault

Reviewed by

Larry K. Stillings

Table of Contents

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(603) 887 3903 Fax (603) 887 6445
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1. Scope

This test report certifies that the Garmin Model AA3095, as tested, meets the FCC Part 15, Subpart C and Innovation, Science and Economic Development Canada RSS 210, Issue 9 requirements. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

2. Product Details

2.1. Manufacturer:	Garmin International, Inc.
2.2. Model Number:	AA3095
2.3. Serial Number:	Radiated Mode Measurements - 3949088924 Conducted Mode Measurements - 3949088937
2.4. Description:	The Garmin AA3095 is a dive watch with ANT+, BLE, and Wi-Fi communication capabilities
2.5. Power Source:	DC 3.7 Volts lithium rechargeable battery, not user accessible
2.6. Hardware Revision:	V06
2.7. Software Version:	2.0
2.8. Modulation Type:	GFSK
2.9. Operating Frequency:	2.4 GHz to 2.4835 Nominal
2.10. EMC Modifications:	None

3. Product Configuration

3.1. Operational Characteristics & Software

Operating Instructions for Test

Start the unit in test mode by pressing and holding the **DOWN** button (bottom left) while pressing and releasing the **PWR/LIGHT** button (top left). Release the **DOWN** button once the main test mode screen is displayed immediately after the Garmin logo screen.

Scroll through the test mode pages by pressing the **BACK/LAP** (bottom right) button.

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3. Product Configuration (continued)

3.1. Operational Characteristics & Software (continued)

Operating Instructions for Test (continued)

The first RF test page is the ANT Test Mode page, which will take seven button presses of the **BACK/LAP** button to get to.

- Use the **MENU/UP** (middle left) button to change the frequency (high/low/mid).
- Use the **PWR/LIGHT** (top left) button to change from Carrier to Beacon.
- Use the **START/STOP** (top right) button to turn the test ON or OFF.
- When the test is complete **STOP** the test, then press the **BACK/LAP** (bottom right) to scroll to the next test page.

The next RF test page will be the BLE test page which will take four button presses of the **BACK/LAP** button.

- Use the **MENU/UP** (middle left) button to change the Channel.
- Use the **PWR/LIGHT** (top left) button to change from the TX mode to the RX mode.
- Hold the **MENU/UP** (middle left) button to change between Carrier Wave and data types.
- Use the **DOWN** (bottom left) button to change the TX LEN within data types.
- Use the **START/STOP** (top right) button to turn the test ON or OFF.

When the test is complete use the **START/STOP** (top right) button to STOP the test, then use the **BACK/LAP** button to scroll to the next test page. The next RF test page will be the WIFI test page.

- Use the **DOWN** (bottom left) button to change CHANNEL for test.
- Use the **PWR/LIGHT** (top left) button to change the Data Rate (CW, B-1 MHz, G-6 MHz, N-MCS 0, etc).
- Use the **START/STOP** (top right) button to turn test ON or OFF

When all testing has been completed, press and hold the **PWR/LIGHT** (top left) to power off the unit.

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3. Product Configuration (continued)

3.1. Operational Characteristics & Software (continued)

During all radiated emissions measurement testing, the product was mounted on a polystyrene form to facilitate rotating the device through three orthogonal axes, as required by ANSI C63.10, section 5.10.1, for a hand held or body worn device. The three axes were defined as follows:

X-Axis Horizontal on the left edge with the Garmin logo on the face of the AA3095 pointing to the left. The front of the device was facing the antenna at 0º turntable azimuth.

Y-Axis Vertical with Garmin logo on the face of the AA3095 pointing up. The front of the device was facing the antenna at 0º turntable azimuth.

Z-Axis The front of the AA3095 was facing up. The bottom edge of the device was facing the antenna at 0º turntable azimuth. The Garmin logo on the face of the AA3095 is pointing away from the antenna at 0° azimuth.

X-Axis

Y-Axis

Z-Axis

3.2. EUT Hardware

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
Garmin International, Inc.	AA3095	3949088924[1] 3949088937[2]	3.7	DC	Dive Watch

[1] Unit used for radiated test measurements.
[2] Unit used for conducted test measurements.

3.3. EUT Cables/Transducers

Cable Type	Length	Shield	From	To
See 3.6				

3.4. Miscellaneous EUT Items

Manufacturer	Model/Part #	Qty	Description / Function
None			

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3. Product Configuration (continued)

3.5. Support Equipment

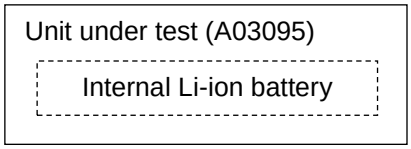
Device	Manufacturer	Model	Serial No.	Comment
AC Adapter	Garmin	ADP-5BW PN 362-00087-00	054W56B018B	5 volts at 1 amp

3.6. Support Equipment Cables

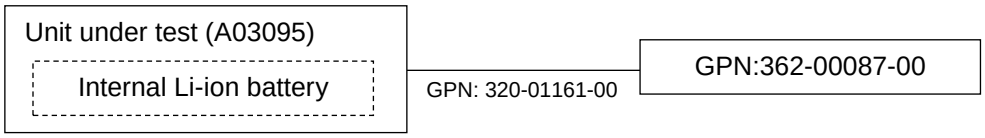
Part #	Shielded Y or N	Length	Description / Function
320-01161-00	Y	1 Meter	Charger cable. USB Type A male to device specific connector.

3.7. Block Diagram

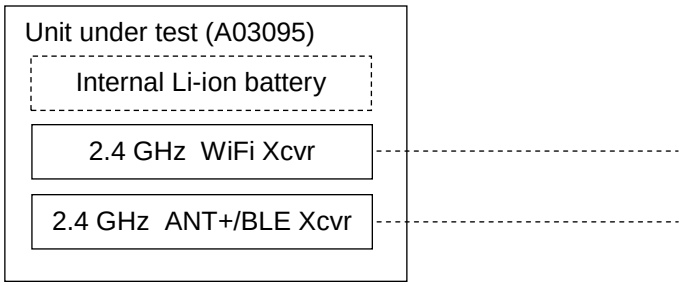
Unit operating off internal battery.



Battery charged via USB cable connected to AC adapter (Part 15.207)



Unit powered by internal battery transmitting ANT+/BLE/Wi-Fi wireless data @ 2.4 GHz



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4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Interval
EMI Test Receiver, 9kHz - 7GHz [1]	Rohde & Schwarz	ESR7	101156	7/23/2018	3 Years
Spectrum Analyzer 20 Hz – 40 GHz [2]	Rohde & Schwarz	FSV40	100899	7/23/2018	3 Years
Spectrum Analyzer, 9 kHz - 40 GHz [3]	Rohde & Schwarz	FSVR40	100909	5/3/2019	2 Years
Spectrum Analyzer, 2 Hz - 26 GHz [4]	Rohde & Schwarz	FSW26	102057	12/7/2018	2 Years
EMI Receiver	Hewlett Packard	8546A	3650A00360	12/6/2018	3 Years
Passive Loop Antenna, 9 kHz to 30 MHz	EMCO	6512	9309-1139	10/26/2018	2 Years
Biconilog Antenna, 30 MHz to 2 GHz	Sunol Sciences	JB1	A050913	6/3/2019	2 Years
Horn Antenna, 960 MHz to 18 GHz	Electro-Metrics	EM-6961	6337	5/2/2018	1 Year
Horn Antenna, 18 GHz to 40 GHz	Com-Power	AH-840	101032	2/24/2018	2 Years
Preamplifier, 1 GHz to 26.5 GHz	Hewlett Packard	8449B	3008A00329	7/22/18	3 Years
LISN 50 ohm 50 µH, 9 kHz to 30 MHz	EMCO	3825/2	9109-1860	11/17/2017	1 Year
2.4 GHz Band Reject Filter	Micro-Tronics	BRM50702	150	6/12/2018	1 Year
EMI Receiver, 9 kHz to 6.5 GHz	Hewlett Packard	8546A	3330A00115	12/4/2018	2 Years
Digital Barometer	Control Company	4195	ID236	10/8/2017	2 Years
Digital Multi-meter	Fluke	187	83030167	11/21/2017	1 Year
Temperature Chamber	Associated Research	E-0029	N/A	NR	---

[1] ESR7 Firmware revision: V3.36, Date installed: 05/16/2017 Previous V2.26 SP2, installed 11/15/2016.
[2] FSV40 Firmware revision: V2.30 SP4, Date installed: 05/04/2016 Previous V2.30 SP1, installed 10/22/2014.
[3] FSVR40 Firmware revision: V2.23 SP1, Date installed: 08/19/2016 Previous V2.23, installed 10/20/2014.
[4] FSW26 Firmware revision: V2.61 SP1, Date installed: 04/04/2017 Previous V2.40, installed 05/04/2016.

4.2. Measurement Software

Manufacturer	Software Description	Title or Model #	Rev.	Report Sections
Compliance Worldwide	Test Report Generation Software	Test Report Generator	1.0	7.9. Conducted Emissions

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4. Measurements Parameters

4.3. Measurement & Equipment Setup

Test Dates:	7/14/2017 – 8/10/2017
Test Engineer:	Brian Breault
Normal Site Temperature (15 - 35°C):	21.2
Relative Humidity (20 -75%RH):	35
Frequency Range:	25 MHz to 25 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	200 Hz - 10 kHz to 150 kHz 9 kHz - 150 kHz to 30 MHz 120 kHz - 30 MHz to 1 GHz 1 MHz - Above 1 GHz
EMI Receiver Average Bandwidth:	1 kHz - 10 kHz to 150 kHz 30 kHz - 150 kHz to 30 MHz 300 kHz - 30 MHz to 1 GHz 3 MHz - Above 1 GHz
Detector Function:	Peak, QP - 10 kHz to 1 GHz Peak, Avg - Above 1 GHz Unless otherwise specified.

4.4. Measurement Procedure

Test measurements were made in accordance FCC Part 15.249, ISED Canada RSS-210 B.10: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

The test methods used to generate the data in this test report are in accordance with ANSI C63.10: 2013, American National Standard for Testing Unlicensed Wireless Devices.

4.5. Measurement Uncertainty

The following uncertainties are expressed for an expansion/coverage factor of K=2.

RF Frequency	$\pm$ 1x10^{-8}
Radiated Emission of Transmitter	$\pm$ 4.55 dB
Radiated Emission of Receiver	$\pm$ 4.55 dB
Temperature	$\pm$ 0.91^{o} C
Humidity	$\pm$ 5%

5. Choice of Equipment for Test Suits

5.1 Choice of Model

This test report is based on the test sample supplied by the manufacturer. This unit is reported by the manufacturer to be equivalent to the production units.

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5. Choice of Equipment for Test Suits (continued)

5.2 Presentation

The test samples were tested complete with all required ancillary equipment. Refer to Section 3 of this report for product equipment configuration.

5.3 Choice of Operating Frequencies

The AA3095, as tested, operates in the 2.4 GHz ISM band.

In accordance with ANSI C63.10-2013, section 5.6, and FCC Part 15.31 (m), the choice of operating frequencies selected for the testing detailed in this report are as follows:

Low Channel	2	2402 MHz
Middle Channel	41	2441 MHz
High Channel	80	2480 MHz

5.4 Mode of Operation

Modulation type : GFSK
Payload pattern : PRB29
Payload Length : 37 bytes

6. Measurement Summary

Test Requirement	FCC Requirement	IC Requirement	Test Section	Result	Comment
Antenna Requirement	15.203	RSS-GEN 6.7	6.1	Compliant	
Radiated Field Strength of Fundamental	15.249 (a),(c)	RSS-210 B.10	6.2	Compliant	
Radiated Field Strength of Harmonics	15.249 (a),(c)	RSS-210 B.10	6.3	Compliant	
Fixed, Point-to-Point Operation	15.249 (b)	N/A	---	Not Required	
Band Edge Measurements	15.249 (d) 15.209	N/A	6.4	Compliant	
Spurious Radiated Emissions	15.249 (d), 15.209	RSS-210 B.10	6.5	Compliant	
Occupied Bandwidth 26 dB	ANSI C63.4 § 13.1.7	N/A	6.6	Compliant	
99% Bandwidth	N/A	RSS-GEN 6.6	6.7	Compliant	
AC Power Line Conducted Emissions	15.207	RSS-GEN 8.8	6.8	Compliant	
RF Safety	95.1125 2.1093 1.1307 (b)(1))	RSS-102 Issue 5	6.9	Compliant	

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7. Measurement Data

7.1. Antenna Requirement (Section 15.203, RSS-GEN, Issue 4)

Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

Results: The Garmin AA3095 utilizes an etch antenna which is not user accessible.

7.2. Radiated Field Strength of Fundamental (15.249, Section (a), (c)), IC RSS-210 B.10

Requirement: The 3 meter field strength of the fundamental emissions from intentional radiators operating within the 2400 – 2483.5 MHz frequency band shall comply with the following requirement: 50 millivolts/meter (94 dBµV/m) average mode measurement and 500 millivolts/meter (114 dBµV/m) peak mode measurement.

Test Results: Compliant

Frequency (MHz)	Amplitude[1] (dBµV/m) at 3 Meters		Limit (dBµV/m) at 3 Meters		Margin (dBµV/m) at 3 Meters		Ant Polarity	Ant Height	Turntable Azimuth	Result
	Peak	Average[2]	Peak	Average	Peak	Average	H/V	cm	Deg	
2402	93.28	59.59	114.00	94.00	-20.72	-34.41	H	357	195	Compliant
2441	92.88	59.16	114.00	94.00	-21.12	-34.84	H	185	201	Compliant
2480	92.35	58.69	114.00	94.00	-21.65	-35.31	H	323	193	Compliant

[1] All correction factors are included in measurement values.

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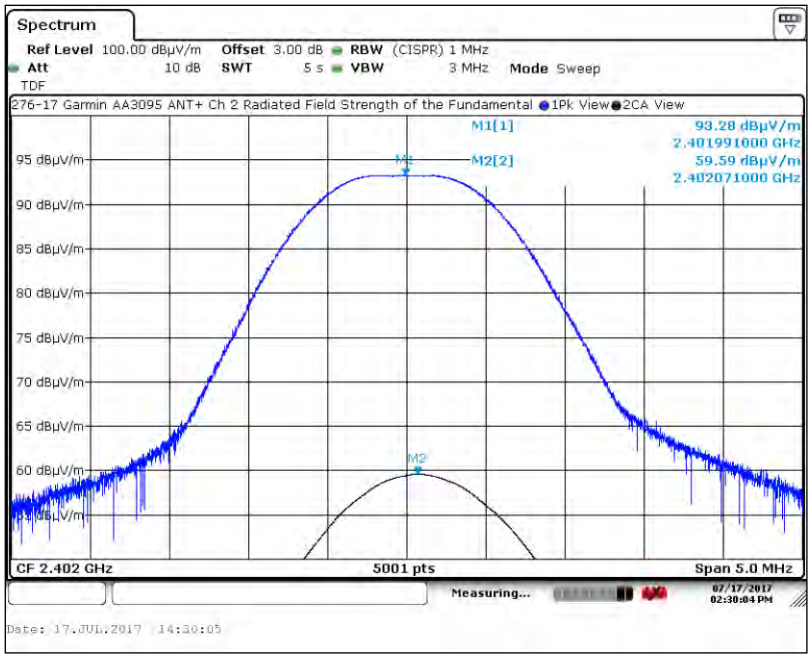
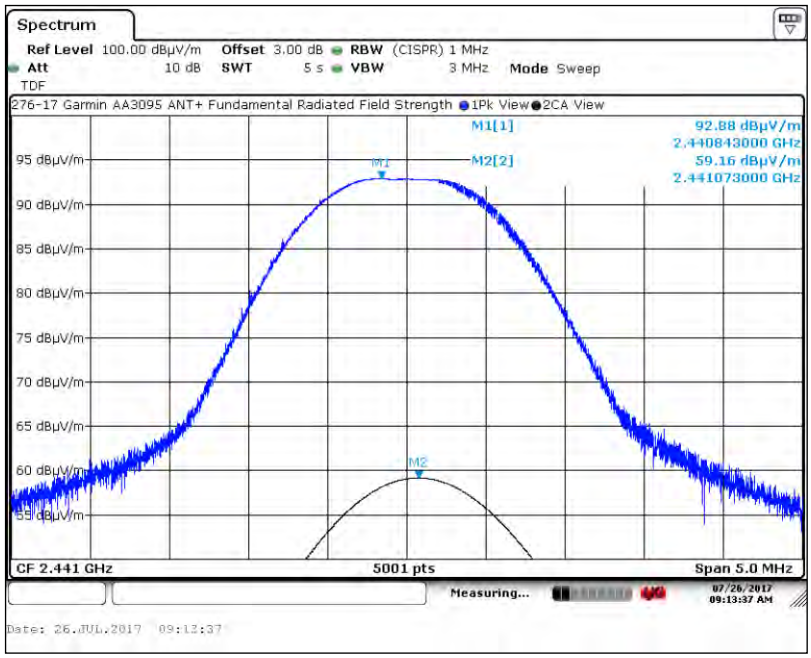
7. Measurement Data (continued)

7.2. Radiated Field Strength of Fundamental (15.249, Section (a), (c)), IC RSS-210 B.10

7.2.1. Radiated Field Strength of Fundamental – Channel 2



7.2.2. Radiated Field Strength of Fundamental – Channel 41



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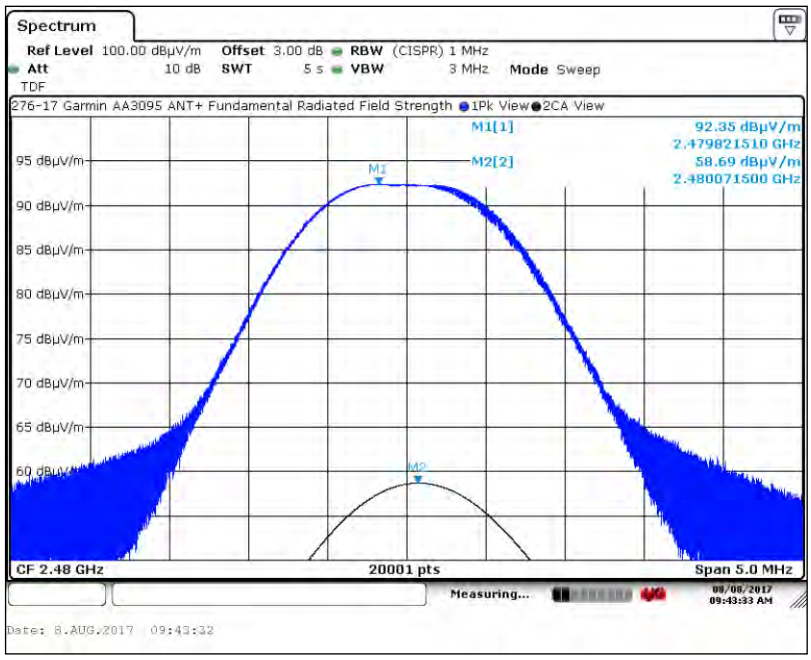
7. Measurement Data (continued)

7.2. Radiated Field Strength of Fundamental (15.249, Section (a), (c)), IC RSS-210 B.10

7.2.3. Radiated Field Strength of Fundamental – Channel 80



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7. Measurement Data (continued)

7.3. Radiated Field Strength of Harmonics (15.249, Section (a)), IC RSS-210 B.10

Requirement: The 3 meter field strength of the harmonic emissions from intentional radiators operated within the 2400 to 2483.5 MHz frequency bands shall comply with the following: 500 microvolts/meter (54 dBµV/m), average mode measurement. Peak field strength may not be greater than 20 dB above the average limit (74 dBµV/m).

Test Results : Compliant

Notes: All correction factors are included in the field strength values. The tabled values represent the worst case antenna polarity and orthogonal position of the DUT.

Freq. (MHz)	Field Strength (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		Antenna Polarity (H/V)	Result
	Peak	Average	Peak	Average	Peak	Average		
4804	48.41	35.02	74.00	54.00	-25.59	-18.98	H	Compliant
4882	51.22	35.43	74.00	54.00	-22.78	-18.57	H	Compliant
4960	48.95	35.56	74.00	54.00	-25.05	-18.44	V	Compliant
7206	52.77	39.18	74.00	54.00	-21.23	-14.82	V	Compliant
7323	53.61	39.77	74.00	54.00	-20.39	-14.23	H	Compliant
7440	52.81	39.20	74.00	54.00	-21.19	-14.80	H	Compliant
9608	56.49	42.08	74.00	54.00	-17.51	-11.92	V	Compliant
9764	56.07	42.75	74.00	54.00	-17.93	-11.25	H	Compliant
9920	55.86	41.74	74.00	54.00	-18.14	-12.26	H	Compliant
12010	58.77	46.50	74.00	54.00	-15.23	-7.50	V	Compliant
12205	60.55	46.48	74.00	54.00	-13.45	-7.52	H	Compliant
12400	59.77	46.71	74.00	54.00	-14.23	-7.29	H	Compliant
14412	61.82	47.43	74.00	54.00	-12.18	-6.57	V	Compliant
14646	62.36	48.98	74.00	54.00	-11.64	-5.02	H	Compliant
14880	62.10	48.64	74.00	54.00	-11.90	-5.36	H	Compliant
16814	62.03	48.26	74.00	54.00	-11.97	-5.74	V	Compliant
17087	61.61	48.41	74.00	54.00	-12.39	-5.59	H	Compliant
17360	56.09	42.61	74.00	54.00	-17.91	-11.39	H	Compliant
19216	63.14	48.66	74.00	54.00	-10.86	-5.34	H	Compliant
19528	61.91	48.08	74.00	54.00	-12.09	-5.92	H	Compliant
19840	61.28	47.54	74.00	54.00	-12.72	-6.46	H	Compliant
21618	63.07	48.90	74.00	54.00	-10.93	-5.10	H	Compliant
21969	63.37	49.48	74.00	54.00	-10.63	-4.52	H	Compliant
22320	64.93	50.57	74.00	54.00	-9.07	-3.43	H	Compliant
24020	61.93	48.66	74.00	54.00	-12.07	-5.34	H	Compliant
24410	62.74	48.78	74.00	54.00	-11.26	-5.22	H	Compliant
24800	63.31	48.84	74.00	54.00	-10.69	-5.16	H	Compliant

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7. Measurement Data (continued)

7.4. Band Edge Measurements

Requirement: Emissions radiated outside of the specified frequency band of 2400 to 2483.5 MHz, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Test Results : Compliant

Band Edge Measurements - Lower and Upper Band Edge

Modulated

Frequency (MHz)	Band Edge (dBµV/m)				Part 15.209 Limit (dBµV/m)		Margin (dBµV/m)		Result
		Freq MHz	Peak	Average	Peak	Average	Peak[1]	Average	
2402	Lower	2400	2400	58.58	35.26	74	54	-15.42	Compliant
2480	Upper	2483.5	47.82	35.67	74	54	-26.18	-18.33	Compliant

Unmodulated

Frequency (MHz)	Band Edge (dBµV/m)				Part 15.209 Limit (dBµV/m)		Margin (dBµV/m)		Result
		Freq MHz	Peak	Average	Peak	Average	Peak[1]	Average	
2402	Lower	2400	52.63	41.4	74	54	-21.37	-12.60	Compliant
2480	Upper	2483.5	47.15	36.93	74	54	-26.85	-17.07	Compliant

Lower Restricted Band

Frequency (MHz)	Field Strength (dBµV/m)		Part 15.209 Limit (dBµV/m)		Margin (dB)		Result
	Peak	Average	Peak	Average	Peak	Average	
2322.0540	49.84	38.55	74.00	54.00	-24.16	-15.45	Compliant

Upper Restricted Band

Frequency (MHz)	Field Strength (dBµV/m)		Part 15.209 Limit (dBµV/m)		Margin (dB)		Result
	Peak	Average	Peak	Average	Peak	Average	
2483.7854	51.23	35.33	74.00	54.00	-22.77	-18.67	Compliant

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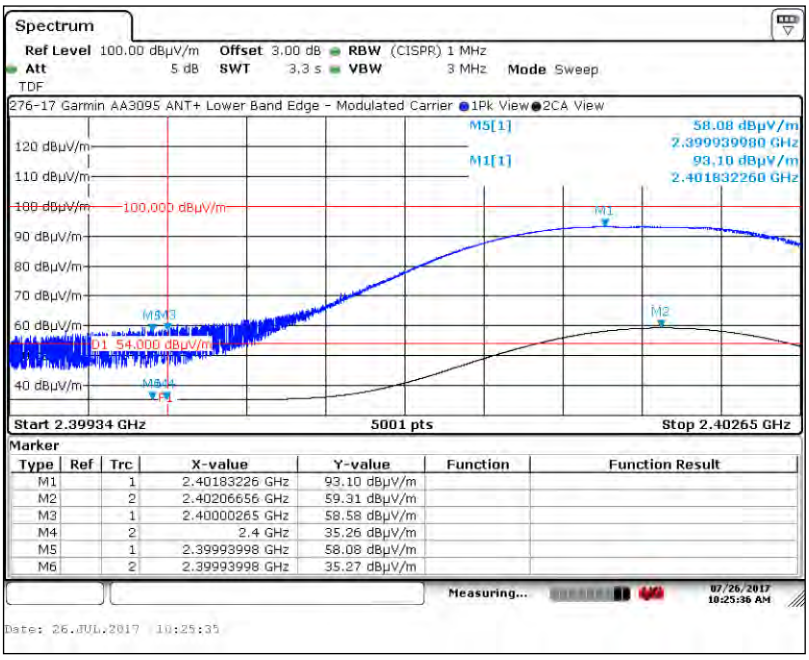
7. Measurement Data (continued)

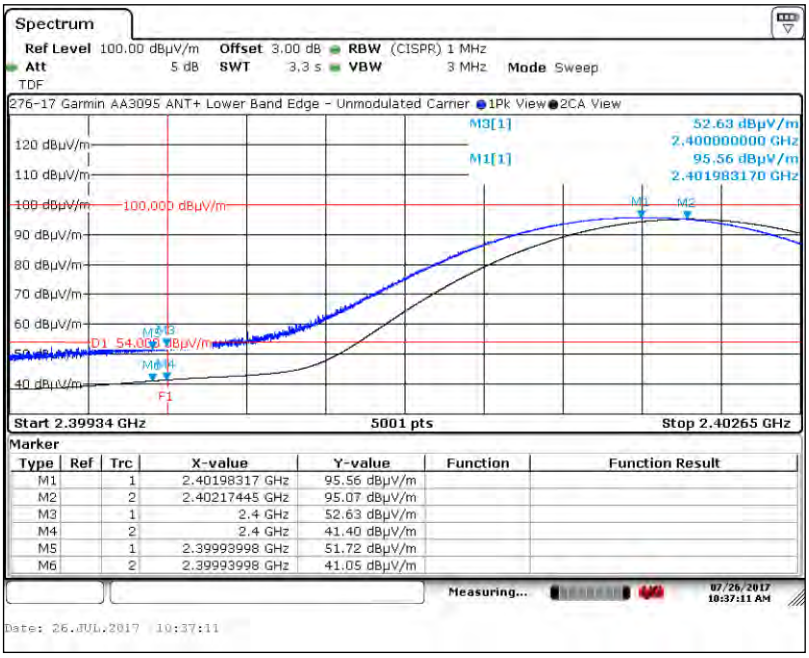
7.4. Band Edge Measurements (continued)

7.4.1. Band Edge Measurements - Lower Band Edge

7.4.1.1. Modulated



7.4.1.2. Unmodulated



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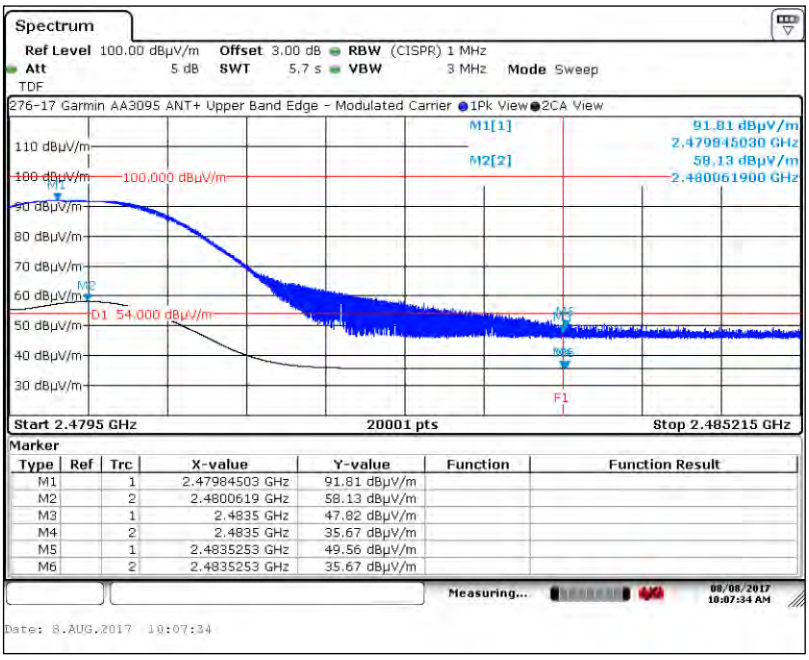
7. Measurement Data (continued)

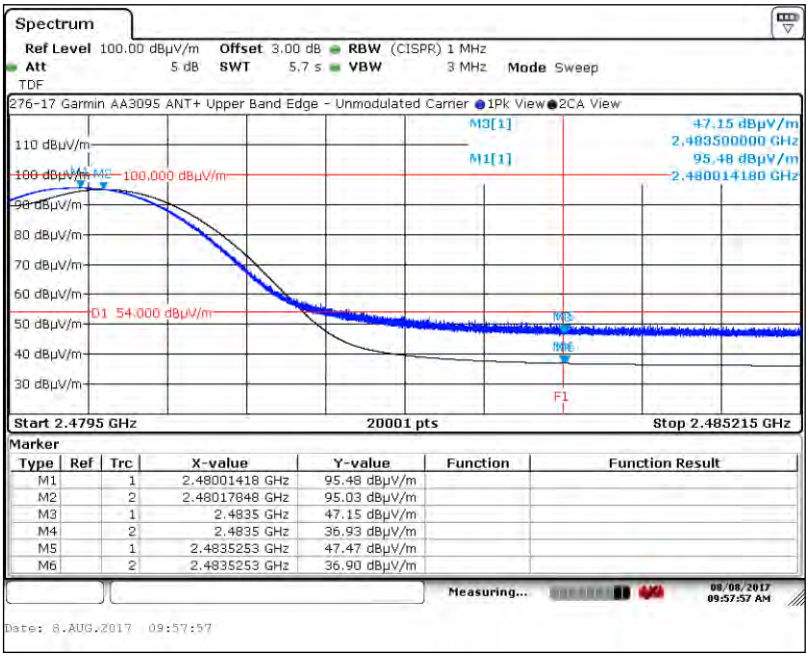
7.4. Band Edge Measurements (continued)

7.4.2. Band Edge Measurements - Upper Band Edge

7.4.2.1. Modulated



7.4.2.2. Unmodulated



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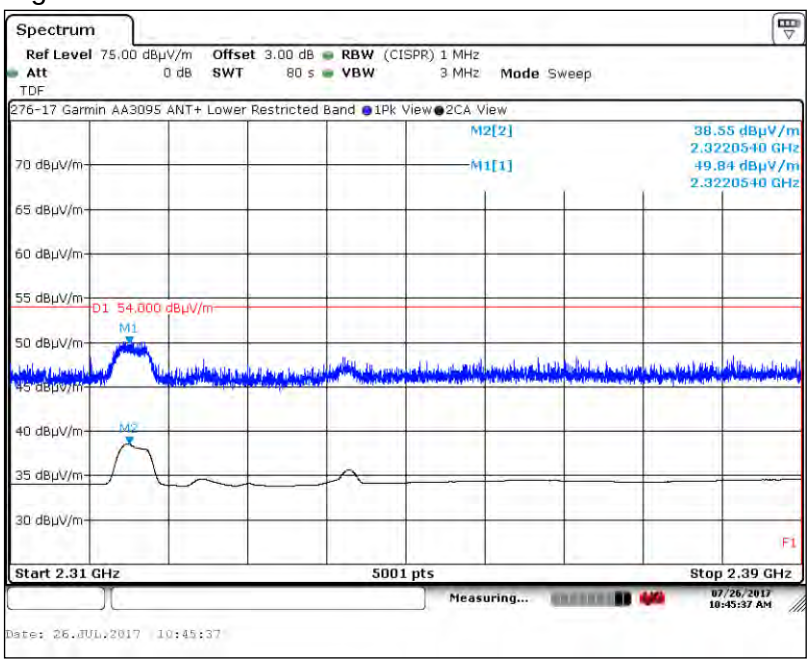
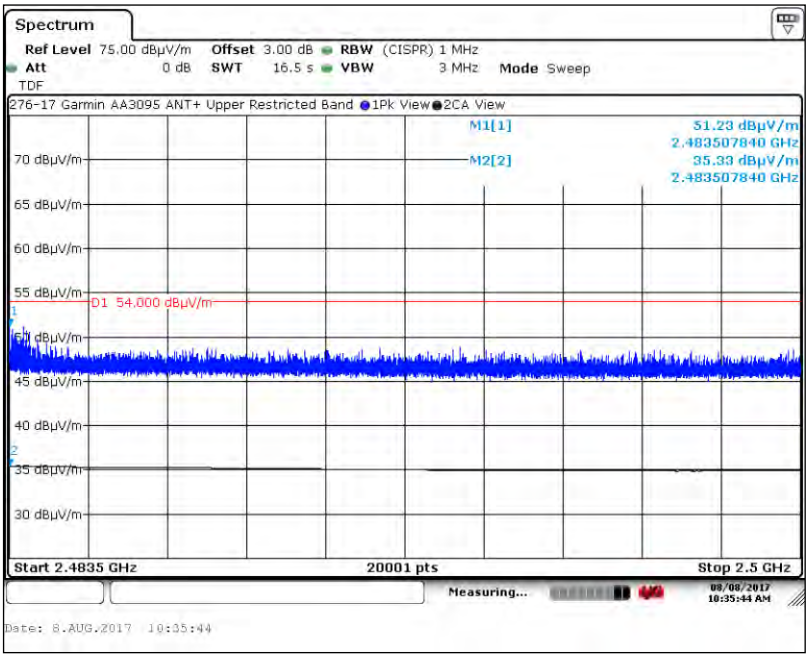
7. Measurement Data (continued)

7.4. Band Edge Measurements (continued)

7.4.3. Band Edge Measurements – Lower Restricted Band



7.4.4. Band Edge Measurements – Upper Restricted Band



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7. Measurement Data (continued)

7.5. Spurious Radiated Emissions, 32 kHz to EUT 10th Harmonic (15.249, Section (d)), IC RSS-GEN, Issue 4

Requirement: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Test Notes: Detailed plots of the spurious emissions measurements can be found in Appendix A.

The lowest frequency generated by the device under test is 32.768 kHz.

7.5.1. Regulatory Limit: FCC Part 209, Quasi-Peak & Average

Frequency Range (MHz)	Distance (Meters)	Limit (dBµV/m)
0.009 to 0.490	3	128.5 to 93.8
0.490 to 1.705	3	73.8 to 63
1.705 to 30	3	69.5
30 to 88	3	40.0
88 to 216	3	43.5
216 to 960	3	46.0
Above 960	3	54.0

7.5.2. Spurious Radiated Emissions Measurement Summary

Notes: Each of the tabled entries represent the worst case receive antenna polarity and DUT orthogonal position for the given frequency range.

All measurements are peak mode measurements.

Frequency Range	Worst-Case Measured Frequency	Field Strength	FCC Part 15.209 Limit	Margin	Appendix A Reference	Receive Antenna Polarity
	(MHz)	(dBµV/m)	(dBµV/m)	(dB)		(H/V)
10 kHz - 150 kHz	0.01021	104.41	127.18	-22.77	A1.2.3.	Parallel
.150 kHz - 30 MHz	0.80977	60.22	69.45	-9.23	A2.2.1.	Parallel
30 MHz - 1000 MHz	957.54740	38.82	46.00	-7.18	A3.3.4.	V
1000 MHz - 10000 MHz	9619.40000	47.95	54.00	-6.05	A4.2.1.	H
10000 MHz - 18000 MHz	16697.10000	47.41	54.00	-6.59	A5.2.1.	H
18000 MHz - 25000 MHz	24170.70000	47.39	54.00	-6.61	A6.1.4.	V

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7. Measurement Data (continued)

7.6 Occupied Bandwidth (ANSI C63.10, Section 6.9.1 & IC RSS-GEN, Issue 4)

Requirement: The occupied bandwidth measurements on an intentional radiator shall be made in accordance with the requirements outlined in ANSI C63.10-2013, Section 6.9.1. If no bandwidth requirement is specified by the procuring or regulatory agency, the bandwidth will be measured at –20 dB with respect to the reference level.

Test Notes: The span range for the SA display shall be between two times and five times the OBW. The nominal IF filter bandwidth (3 dB RBW) should be approximately 1% to 5% of the OBW, unless otherwise specified, depending on the applicable requirement. The dynamic range of the SA at the selected RBW shall be more than 10 dB below the target "dB down" (attenuation) requirement, i.e., if the requirement calls for measuring the –20 dB OBW, the SA noise floor at the selected RBW shall be at least 30 dB below the largest measured value on the display.

Test Results : Compliant

Frequency (MHz)	-20 dB Bandwidth (kHz)
2402	689.06
2441	694.660
2480	699.860

7.6.1. Occupied (-20 dB) Bandwidth, Channel 2

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7. Measurement Data (continued)

7.6 Occupied Bandwidth (ANSI C63.4, Section 13.1.7 & IC RSS-GEN, Issue 4) (continued)

7.6.2. Occupied (-20 dB) Bandwidth, Channel 41

7.6.3. Occupied (-20 dB) Bandwidth, Channel 80

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7. Measurement Data (continued)

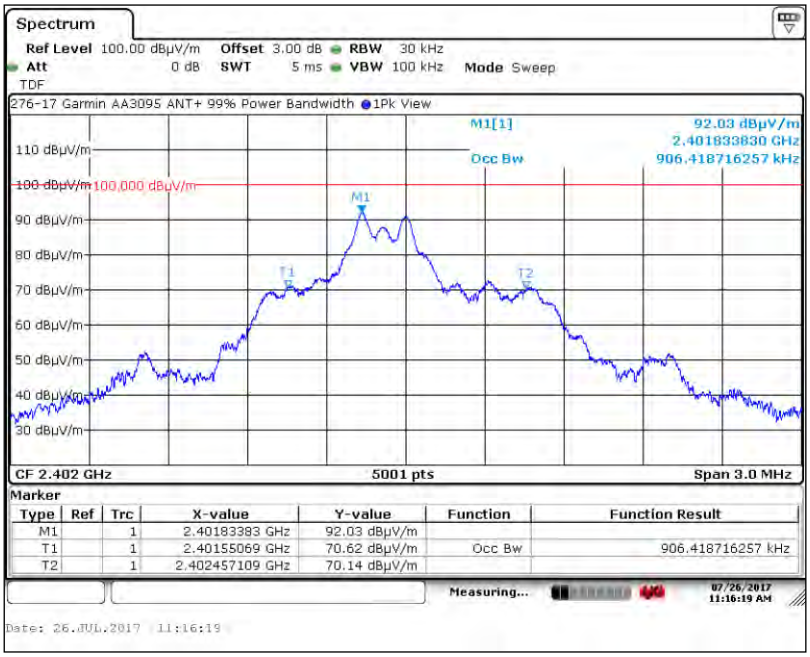
7.7. 99% Emission Bandwidth (IC RSS-GEN, Issue 4, Section 4.6.1)

Requirement: When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

Test Notes: The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

Frequency (MHz)	Emission Bandwidth (kHz)
2402	906.419
2441	914.817
2480	922.016

7.7.1. 99% Emission Bandwidth, Channel 0



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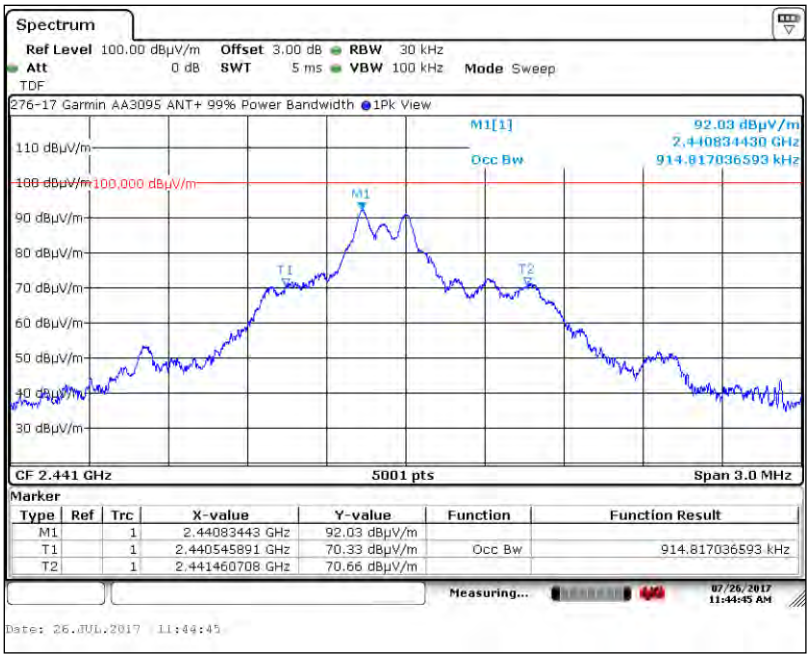
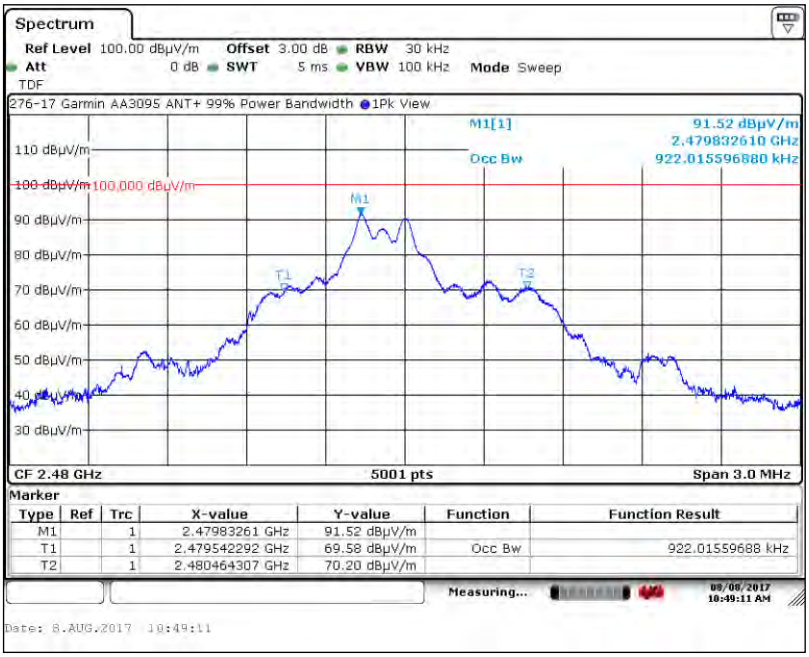
7. Measurement Data (continued)

7.7. 99% Emission Bandwidth (IC RSS-GEN, Issue 4, Section 4.6.1) (continued)

7.7.2. 99% Emission Bandwidth, Channel 41



7.7.3. 99% Emission Bandwidth, Channel 80



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7. Measurement Data (continued)

7.8. Conducted Emissions (FCC Part 15.207)

Requirement: 15.207 With certain exceptions, 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 µH/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5.0	56	46
5.0 to 30.0	60	50
* Decreases with the logarithm of the frequency.		

Procedure: This test was performed in accordance with the procedure detailed in ANSI C63.10-2013, Section 6.2: Standard test method for ac power-line conducted emissions from unlicensed wireless devices.

Test Notes: The portable device was fully discharged and then plugged into the supplied charger.

Results: The device under test meets the FCC Part 15.207 test requirements.

Measurement & Equipment Setup

Test Date:	6/27/2017
Test Engineer:	Brian Breault
Site Temperature (°C):	21
Relative Humidity (%RH):	37
Frequency Range:	0.15 MHz to 30 MHz
EMI Receiver IF Bandwidth:	9 kHz
EMI Receiver Avg Bandwidth:	30 kHz
Detector Functions:	Peak, Quasi-Peak & Average

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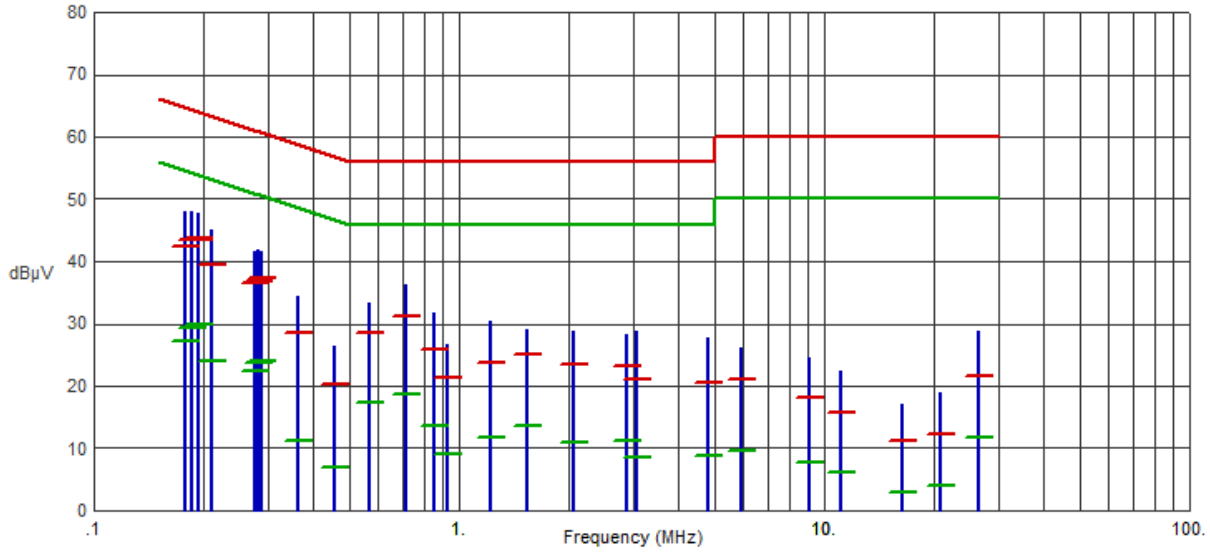
7. Measurement Data (continued)

7.8. Conducted Emissions (FCC Part 15.207) (continued)

7.8.1. 120 Volts, 60 Hz Phase

Test No.: 276-17, 120 Volts, 60 Hz Phase FCC Part 15.207



Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
.1769	48.00	42.46	64.63	-22.17	27.20	54.63	-27.43	
.1861	47.94	43.43	64.21	-20.78	29.22	54.21	-24.99	
.1925	47.70	43.71	63.93	-20.22	29.96	53.93	-23.97	
.1930	47.53	43.52	63.91	-20.39	29.84	53.91	-24.07	
.2105	45.12	39.35	63.19	-23.84	24.01	53.19	-29.18	
.2771	41.72	36.58	60.90	-24.32	22.44	50.90	-28.46	
.2811	41.96	36.77	60.78	-24.01	23.67	50.78	-27.11	
.2880	41.63	37.27	60.58	-23.31	23.97	50.58	-26.61	
.3625	34.42	28.58	58.67	-30.09	11.17	48.67	-37.50	
.4580	26.42	20.40	56.73	-36.33	6.85	46.73	-39.88	
.5704	33.24	28.59	56.00	-27.41	17.42	46.00	-28.58	
.7144	36.31	31.13	56.00	-24.87	18.75	46.00	-27.25	
.8530	31.75	25.95	56.00	-30.05	13.47	46.00	-32.53	
.9255	26.74	21.39	56.00	-34.61	8.97	46.00	-37.03	
1.2162	30.29	23.61	56.00	-32.39	11.60	46.00	-34.40	
1.5302	29.01	24.96	56.00	-31.04	13.56	46.00	-32.44	
2.0682	28.74	23.35	56.00	-32.65	10.83	46.00	-35.17	
2.8793	28.36	23.14	56.00	-32.86	11.17	46.00	-34.83	
3.0775	28.81	21.09	56.00	-34.91	8.46	46.00	-37.54	
4.8278	27.83	20.52	56.00	-35.48	8.87	46.00	-37.13	
5.9457	26.01	20.97	60.00	-39.03	9.73	50.00	-40.27	
9.0879	24.42	18.15	60.00	-41.85	7.86	50.00	-42.14	
11.0568	22.34	15.75	60.00	-44.25	6.16	50.00	-43.84	
16.2994	17.08	11.32	60.00	-48.68	2.92	50.00	-47.08	
20.8074	18.87	12.19	60.00	-47.81	3.92	50.00	-46.08	
26.3606	28.70	21.60	60.00	-38.40	11.65	50.00	-38.35	

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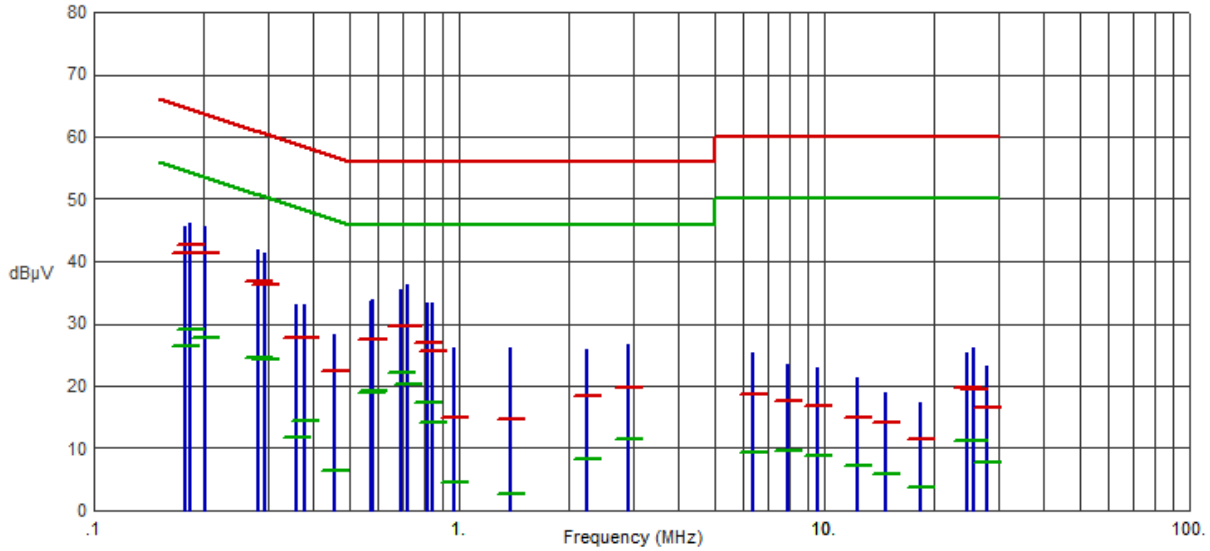
7. Measurement Data (continued)

7.8. Conducted Emissions (FCC Part 15.207) (continued)

7.8.2. 120 Volts, 60 Hz Neutral

Test No.: 276-17, 120 Volts, 60 Hz Neutral FCC Part 15.207



Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
.1781	45.48	41.32	64.57	-23.25	26.45	54.57	-28.12	
.1835	46.15	42.58	64.33	-21.75	29.09	54.33	-25.24	
.2014	45.71	41.23	63.55	-22.32	27.68	53.55	-25.87	
.2823	41.86	36.69	60.75	-24.06	24.62	50.75	-26.13	
.2928	41.30	36.30	60.44	-24.14	24.26	50.44	-26.18	
.3578	33.09	27.78	58.78	-31.00	11.84	48.78	-36.94	
.3788	32.99	27.79	58.31	-30.52	14.49	48.31	-33.82	
.4574	28.40	22.47	56.74	-34.27	6.30	46.74	-40.44	
.5724	33.69	27.47	56.00	-28.53	18.95	46.00	-27.05	
.5815	33.76	27.55	56.00	-28.45	19.13	46.00	-26.87	
.6899	35.55	29.71	56.00	-26.29	22.07	46.00	-23.93	
.7260	36.26	29.47	56.00	-26.53	20.26	46.00	-25.74	
.8235	33.35	26.93	56.00	-29.07	17.33	46.00	-28.67	
.8458	33.31	25.53	56.00	-30.47	14.14	46.00	-31.86	
.9663	26.19	14.81	56.00	-41.19	4.50	46.00	-41.50	
1.3819	26.10	14.71	56.00	-41.29	2.69	46.00	-43.31	
2.2342	25.99	18.33	56.00	-37.67	8.31	46.00	-37.69	
2.9139	26.66	19.67	56.00	-36.33	11.38	46.00	-34.62	
6.3616	25.21	18.58	60.00	-41.42	9.41	50.00	-40.59	
7.9233	23.53	17.55	60.00	-42.45	9.68	50.00	-40.32	
9.5540	22.98	16.77	60.00	-43.23	8.73	50.00	-41.27	
12.2987	21.31	14.85	60.00	-45.15	7.20	50.00	-42.80	
14.7607	18.90	14.24	60.00	-45.76	5.97	50.00	-44.03	
18.3520	17.33	11.37	60.00	-48.63	3.64	50.00	-46.36	
24.5718	25.44	19.71	60.00	-40.29	11.13	50.00	-38.87	
25.5532	26.04	19.54	60.00	-40.46	11.12	50.00	-38.88	
27.8537	23.29	16.49	60.00	-43.51	7.84	50.00	-42.16	

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7. Measurement Data (continued)

7.9. Public Exposure to Radio Frequency Energy Levels ((1.1307 (b)(1)) RSS-GEN, ISSUE 4, RSS 102)

7.9.1. FCC Requirements

Requirement: Portable devices are subject to radio frequency radiation exposure requirements.

For a 10-g extremity SAR, the test exclusion result must be ≤ 7.5.

Test Notes: The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by the following formula:

$$\text{SAR Test Exclusion} = \frac{P_{MAX}}{d_{MIN}} \times \sqrt{f_{(GHz)}} \quad (1)$$

P_{MAX}	mW	Maximum power of channel, including tune-up tolerance
d_{MIN}	mm	Minimum test separation distance, mm (≤ 50 mm)
$f_{(GHz)}$	GHz	$f_{(GHz)}$ is the RF channel transmit frequency in GHz (>100 MHz and <6 GHz)

(1) FCC OET 447498 - Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

Conclusion: The device under test meets the exclusion requirement detailed in FCC OET 447498.

Input:	P_{MAX}[1]	(mW)	0.94432	0.86123	0.76229
	d_{MIN}	(mm)	5.00	5.00	5.00
	$f_{(GHz)}$		2.402	2.441	2.480
Test Exclusion:			**0.29271**	**0.26911**	**0.24009**
Limit Exemption:			**7.50**	**7.50**	**7.50**

[1] Taken from column 5 of the table in Section 7.4 of this test report.

[2] When the minimum test separation distance is < 5 mm, a distance of 5 mm according to KDB 447498, 4.1 f) is applied to determine SAR test exclusion.

7.10.2. RSS-102 Issue 5 Requirements

Requirement: SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1. Portable devices are subject to radio frequency radiation exposure requirements.

Test Notes: The limit was taken from Table 1 of RSS-102 Issue 5.

Frequency (MHz)	Separation Distance (mm)	Maximum Power (mW)	RSS-102 Limit (mW)	Result
2402.00	≤5	0.94	7.00	Compliant
2441.00	≤5	0.86	6.19	Compliant
2480.00	≤5	0.76	5.91	Compliant

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8. Test Setup Photographs

8.1 Radiated Field Strength, Harmonics and Spurious Emissions >1 GHz, Front View

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8. Test Setup Photographs

8.2. Radiated Field Strength, Harmonics and Spurious Emissions >1 GHz, Rear View (1 GHz to 18 GHz)

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8. Test Setup Photographs

8.3. Radiated Field Strength, Harmonics and Spurious Emissions >1 GHz, Rear View (above 18 GHz)

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8. Test Setup Photographs

8.4. Spurious Emissions <1 GHz, Front View

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8. Test Setup Photographs

8.5. Spurious Emissions, Rear View (10 kHz to 30 MHz)

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8. Test Setup Photographs

8.6. Spurious Emissions, Rear View (30 MHz to 1 GHz)

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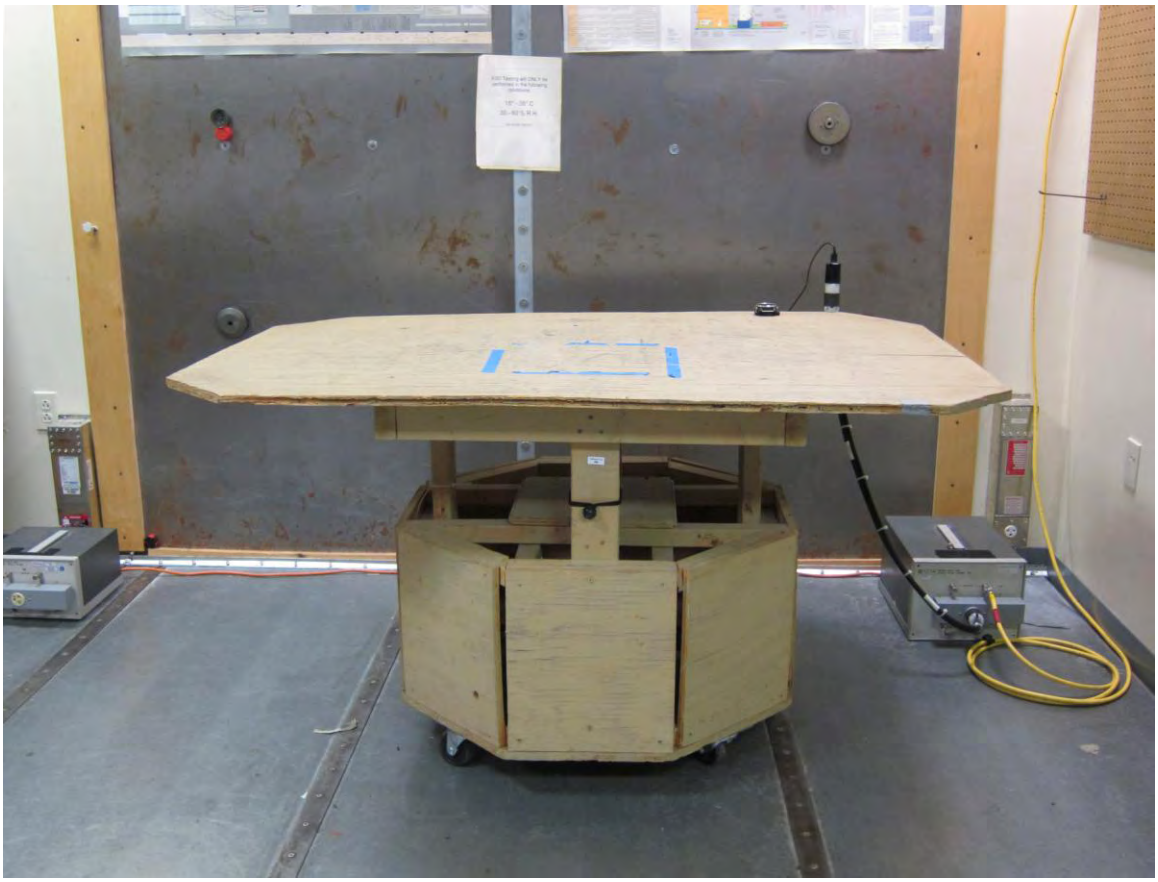
8. Test Setup Photographs

8.7. Conducted Emissions, Front View



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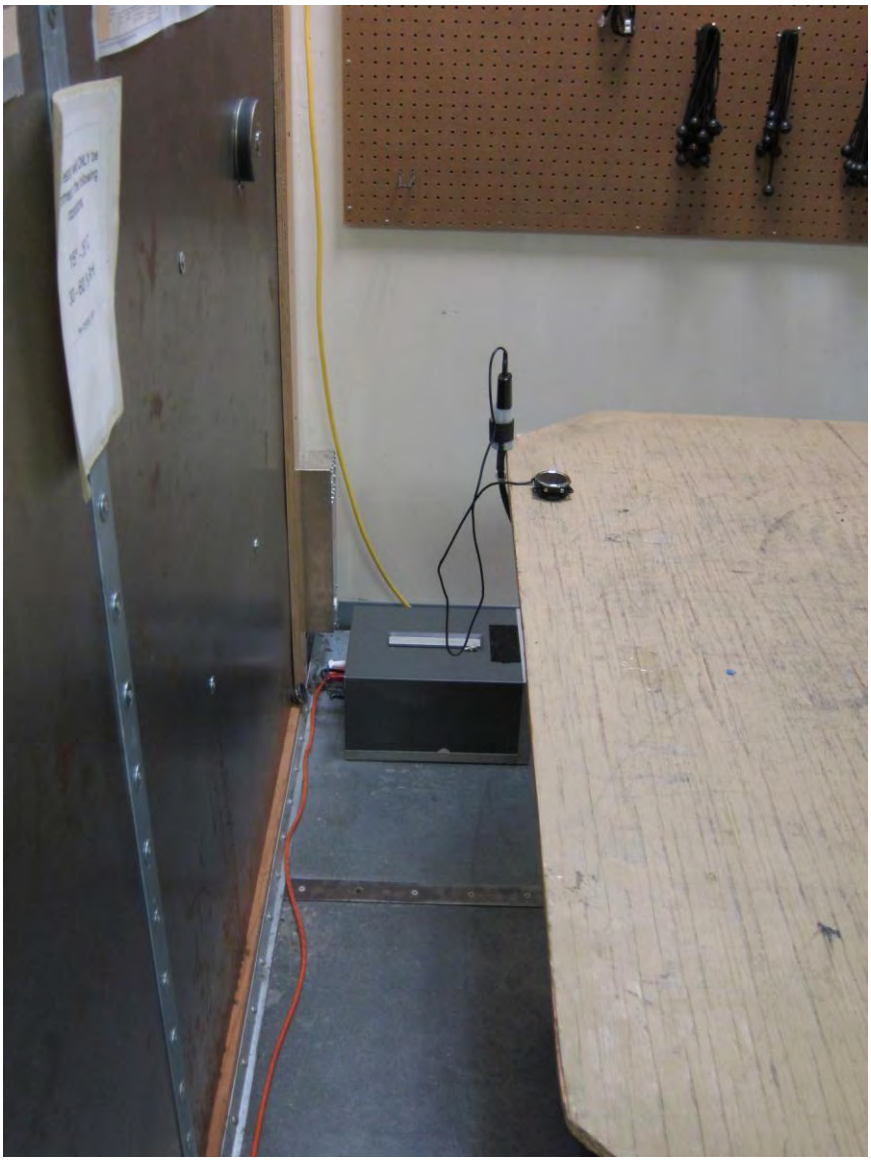
8. Test Setup Photographs

8.8. Conducted Emissions, Rear View



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9. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with the Federal Communications Commission (FCC) and Industry Canada standards. Through our American Association for Laboratory Accreditation (A2LA) ISO Guide 17025:2005 Accreditation our test sites are designated with the FCC (designation number **US1091**), Industry Canada (file number **IC 3023A-1)** and VCCI (Member number 3168) under registration number A-0208.

Compliance Worldwide is also designated as a Phase 1 CAB under APEC-MRA (US0132) for Australia/New Zealand AS/NZS CISPR 22, Chinese-Taipei (Taiwan) BSMI CNS 13438 and Korea (RRA) KN 11, KN 13, KN 14-1, KN 22, KN 32, KN 61000-6-3, KN 61000-6-4.

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022. A second conducted emissions site is also located in the basement of the OATS site with a 2.3 x 2.5 meter ground plane and a 2.4 x 2.4 meter vertical wall.

Both sites are designed to test products or systems 1.5 meters W x 1.5 meters L x 2.0 meters H, floor standing or table top.

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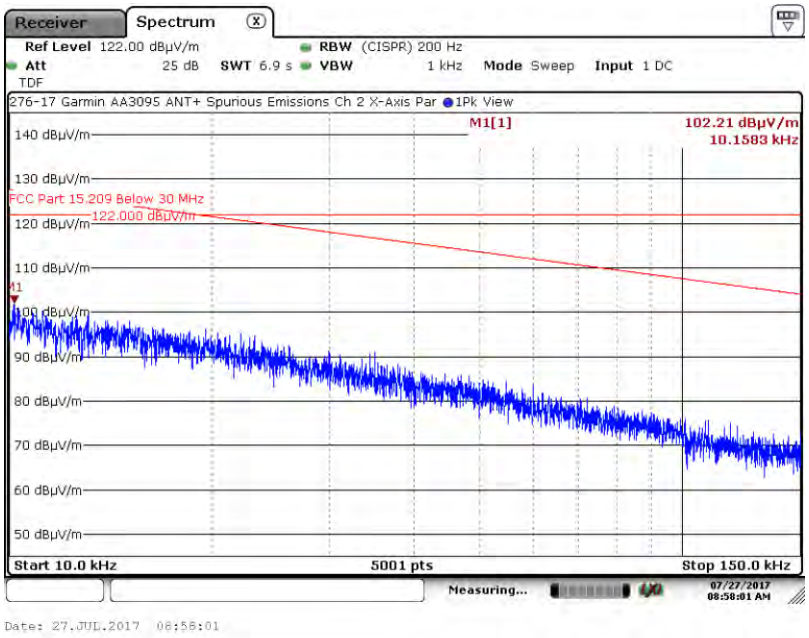
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

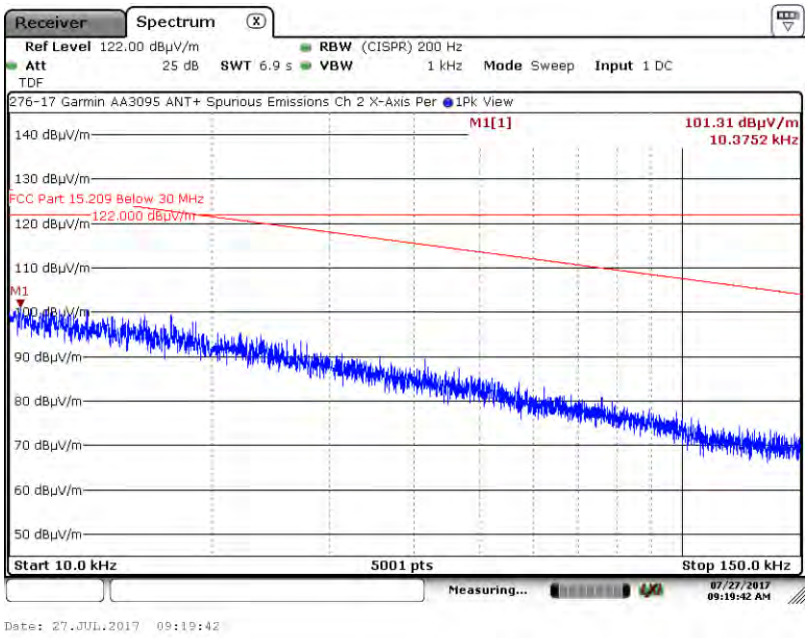
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.1. Channel 2, 2402 MHz

A1.1.1. Measurement Results: X-Axis, Parallel Antenna



A1.1.2. Measurement Results: X-Axis, Perpendicular Antenna



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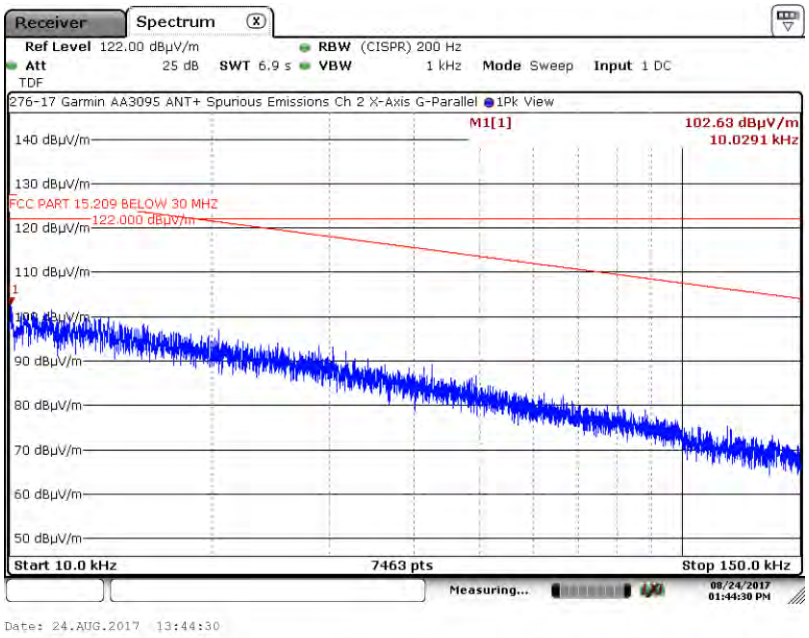
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

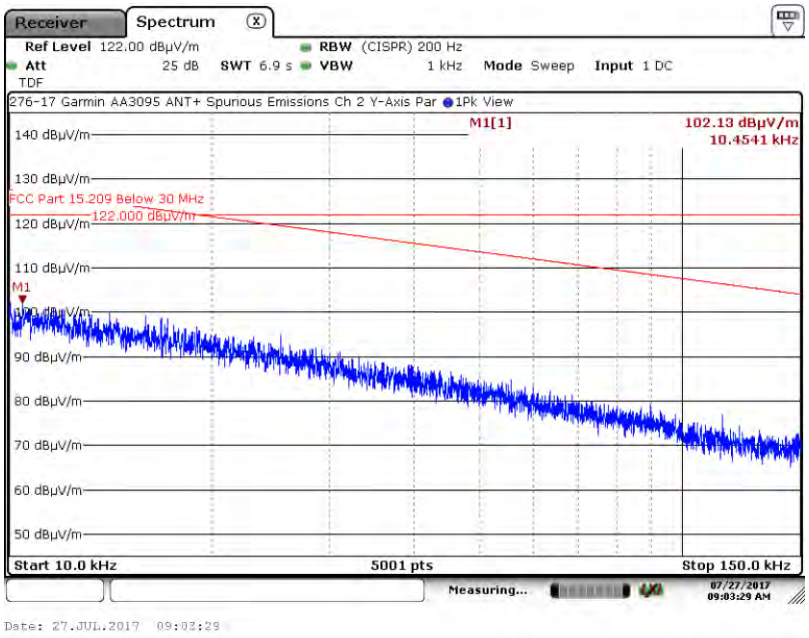
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.1. Channel 2, 2402 MHz

A1.1.3. Measurement Results: X-Axis, Ground-Parallel Antenna



A1.1.4. Measurement Results: Y-Axis, Parallel Antenna



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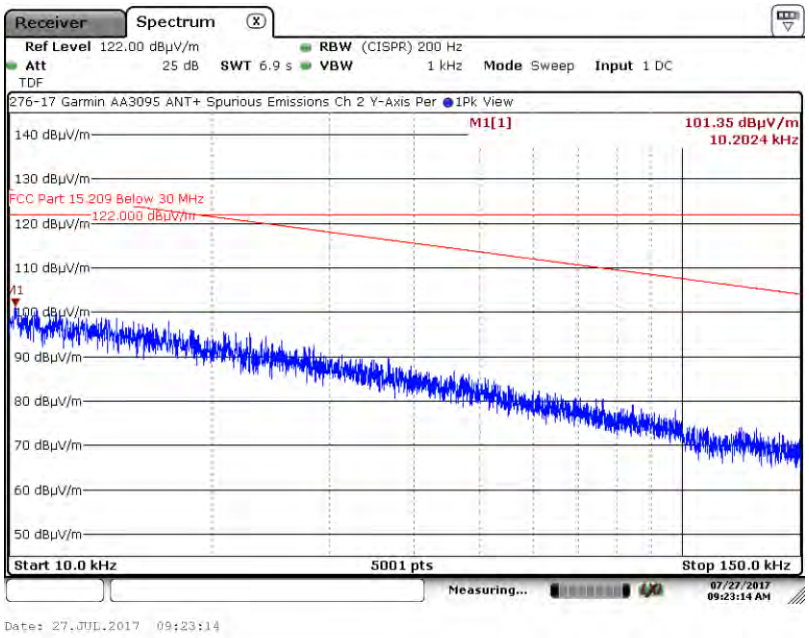
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

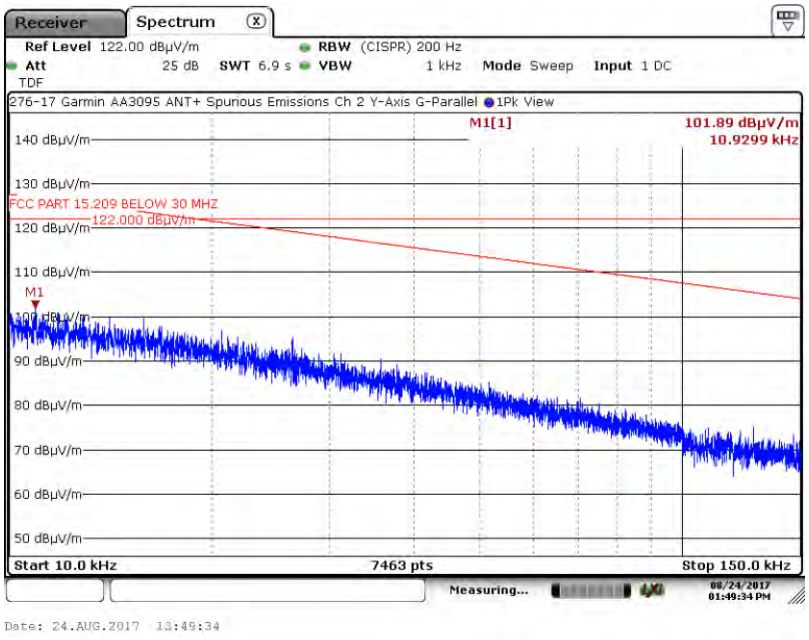
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.1. Channel 2, 2402 MHz

A1.1.5. Measurement Results: Y-Axis, Perpendicular Antenna



A1.1.6. Measurement Results: Y-Axis, Ground-Parallel Antenna



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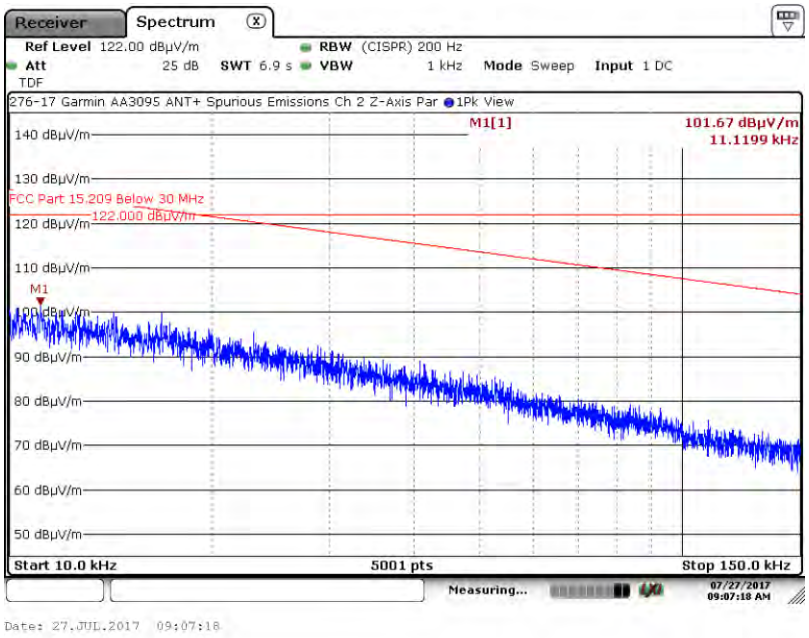
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

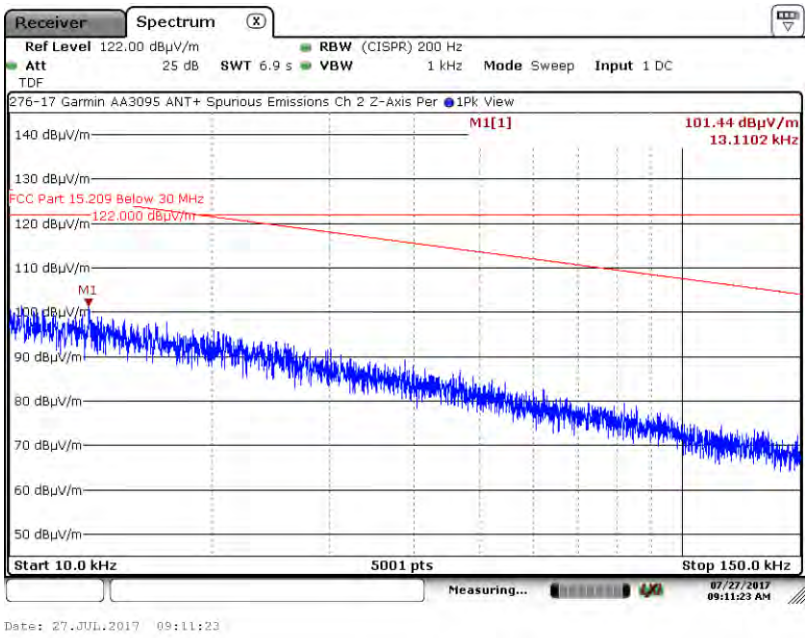
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.1. Channel 2, 2402 MHz

A1.1.7. Measurement Results: Z-Axis, Parallel Antenna



A1.1.8. Measurement Results: Z-Axis, Perpendicular Antenna



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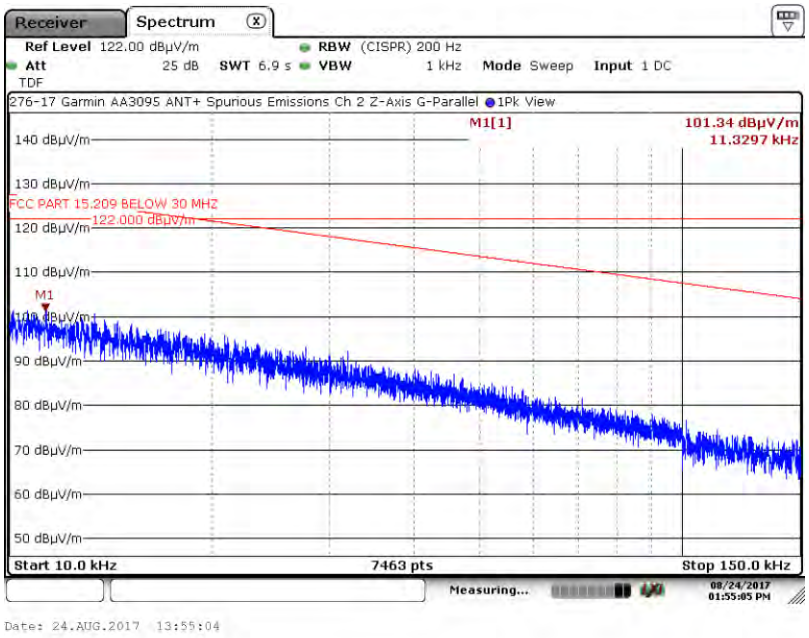
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.1. Channel 2, 2402 MHz

A1.1.9. Measurement Results: Z-Axis, Ground-Parallel Antenna



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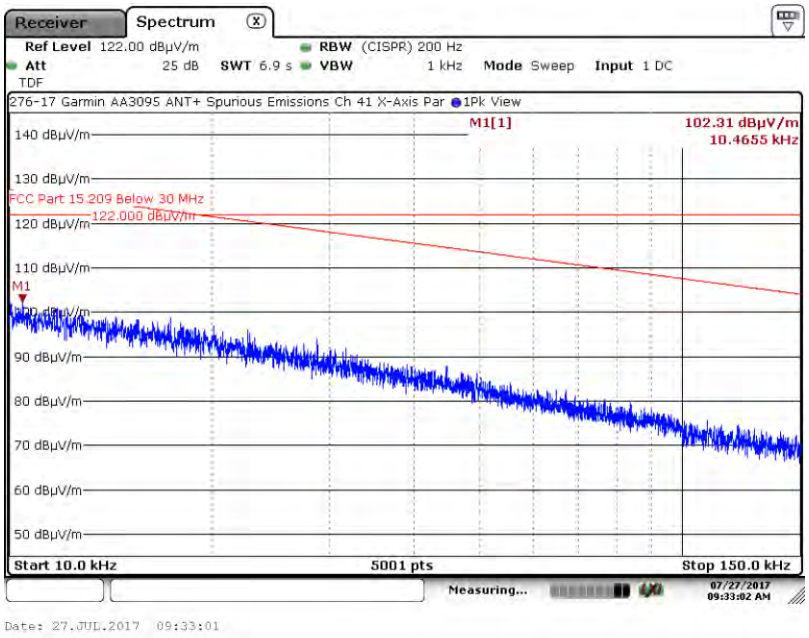
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

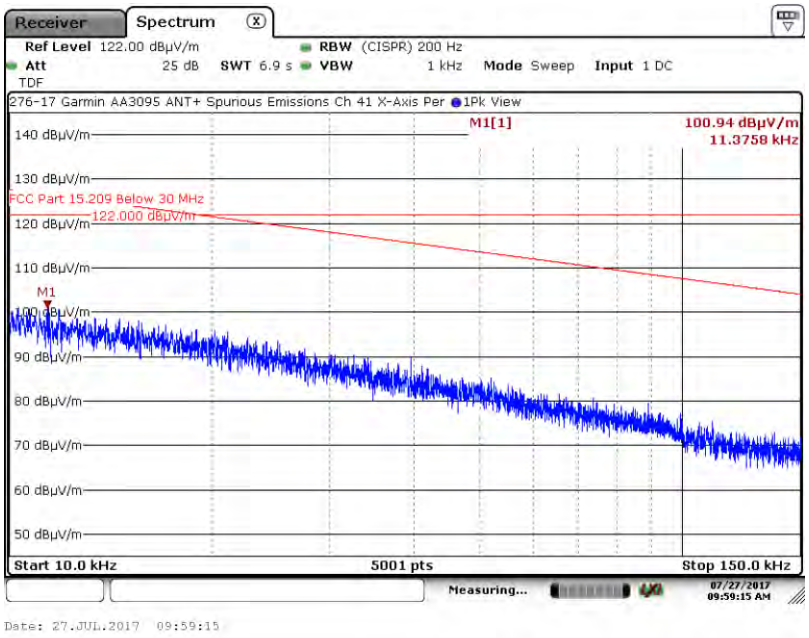
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.2. Channel 41, 2440 MHz

A1.2.1. Measurement Results: X-Axis, Parallel Antenna



A1.2.2. Measurement Results: X-Axis, Perpendicular Antenna



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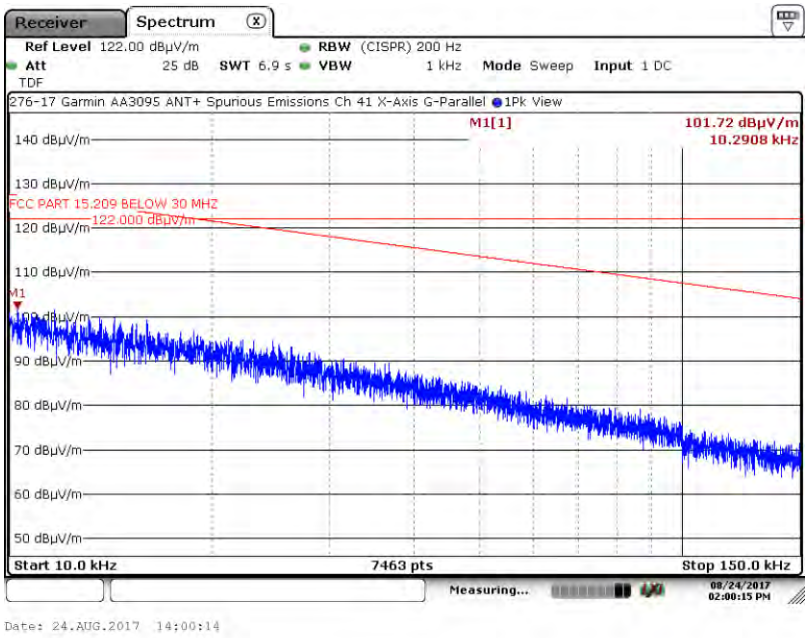
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

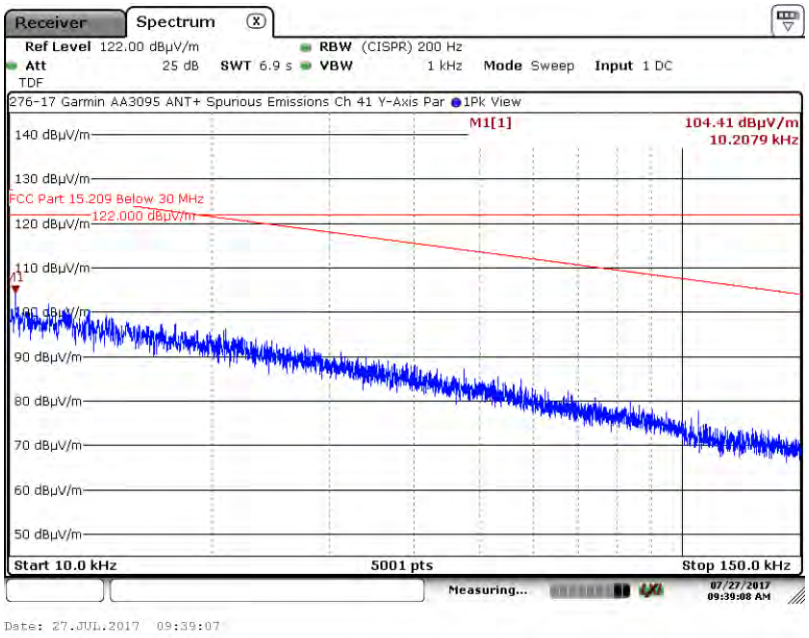
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.2. Channel 41, 2440 MHz

A1.2.3. Measurement Results: X-Axis, Ground-Parallel Antenna



A1.2.4. Measurement Results: Y-Axis, Parallel Antenna



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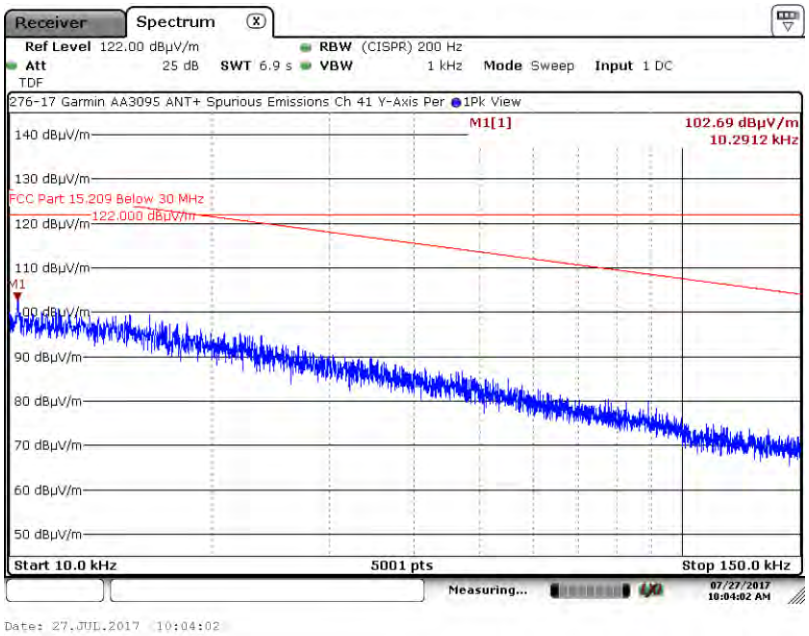
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

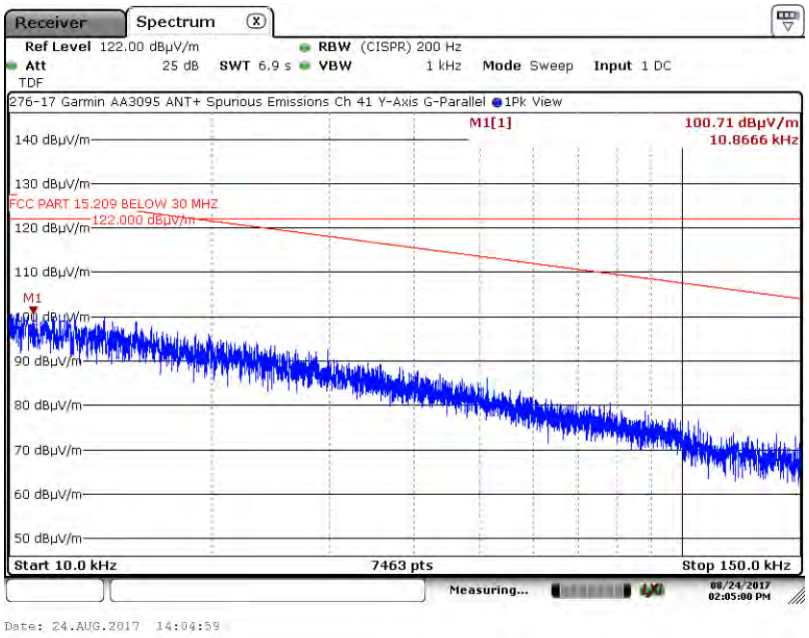
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.2. Channel 41, 2440 MHz

A1.2.5. Measurement Results: Y-Axis, Perpendicular Antenna



A1.2.6. Measurement Results: Y-Axis, Ground-Parallel Antenna



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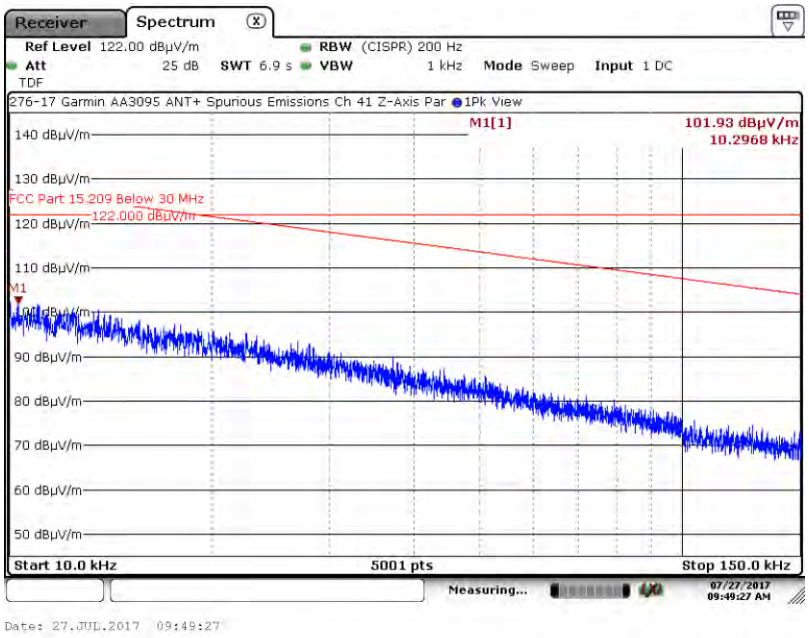
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

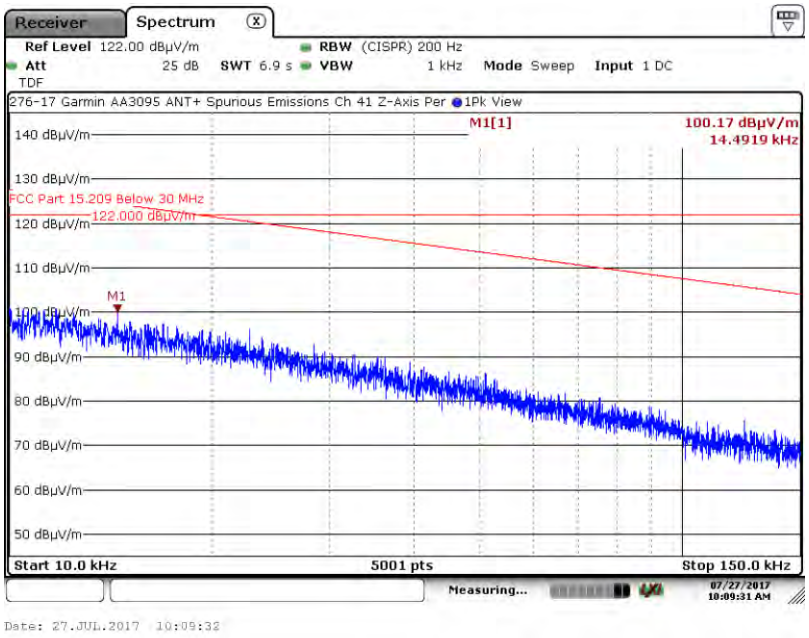
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.2. Channel 41, 2440 MHz

A1.2.7. Measurement Results: Z-Axis, Parallel Antenna



A1.2.8. Measurement Results: Z-Axis, Perpendicular Antenna



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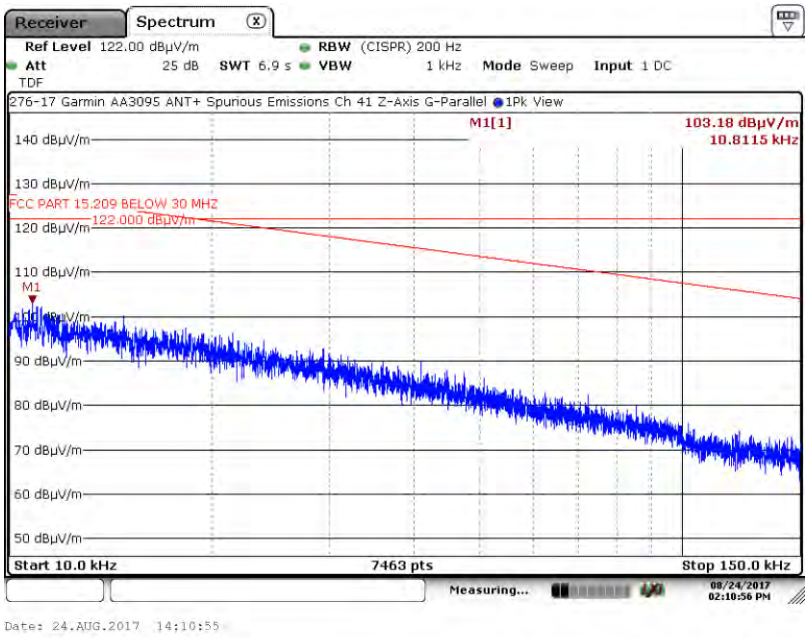
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.2. Channel 41, 2440 MHz

A1.2.9. Measurement Results: Z-Axis, Ground-Parallel Antenna



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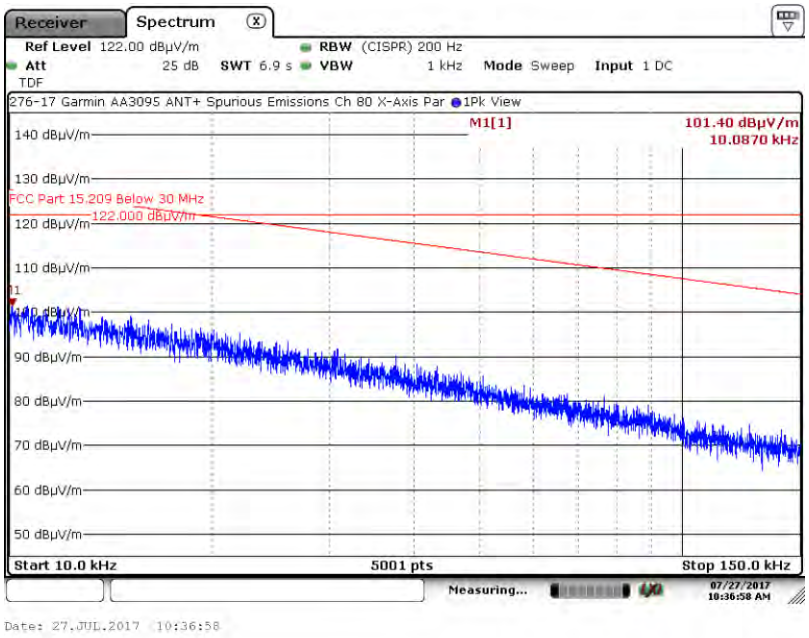
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

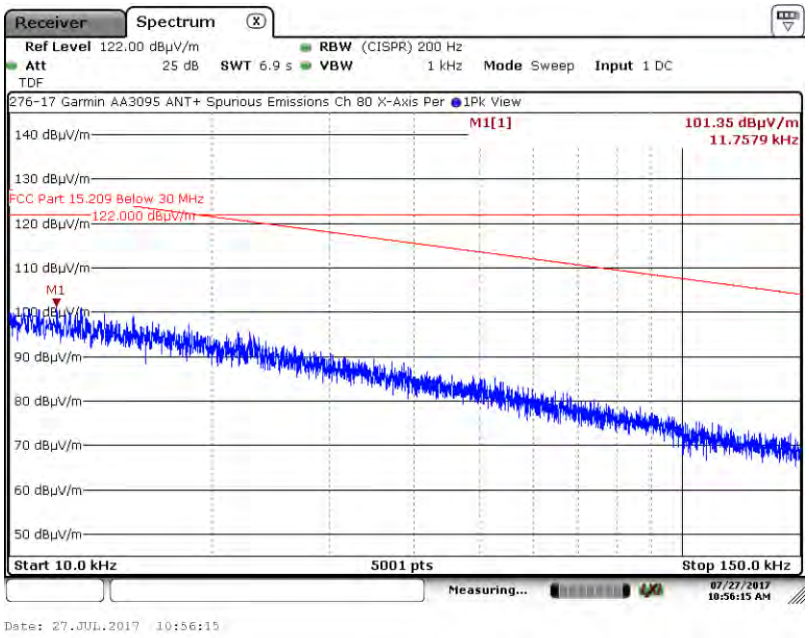
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.3. Channel 80, 2480 MHz

A1.3.1. Measurement Results: X-Axis, Parallel Antenna



A1.3.2. Measurement Results: X-Axis, Perpendicular Antenna



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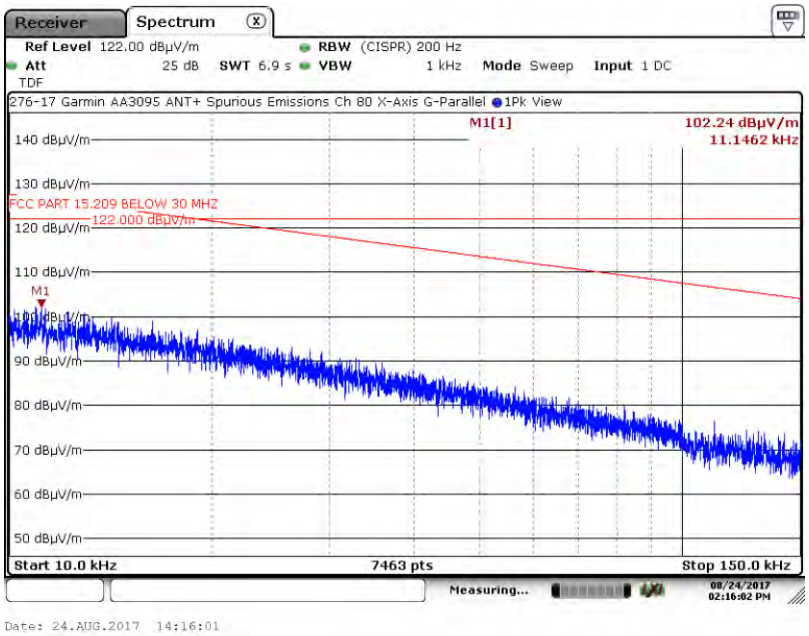
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

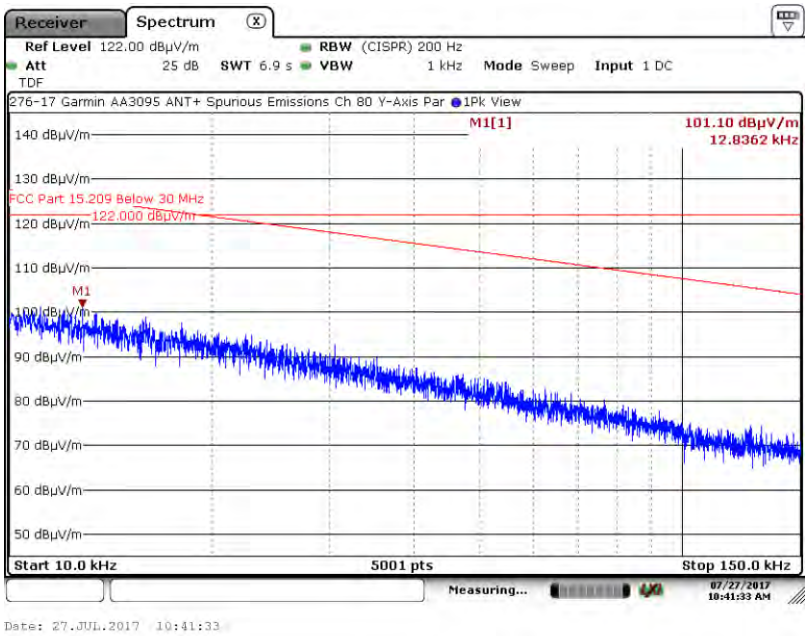
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.3. Channel 80, 2480 MHz

A1.3.3. Measurement Results: X-Axis, Ground-Parallel Antenna



A1.3.4. Measurement Results: Y-Axis, Parallel Antenna



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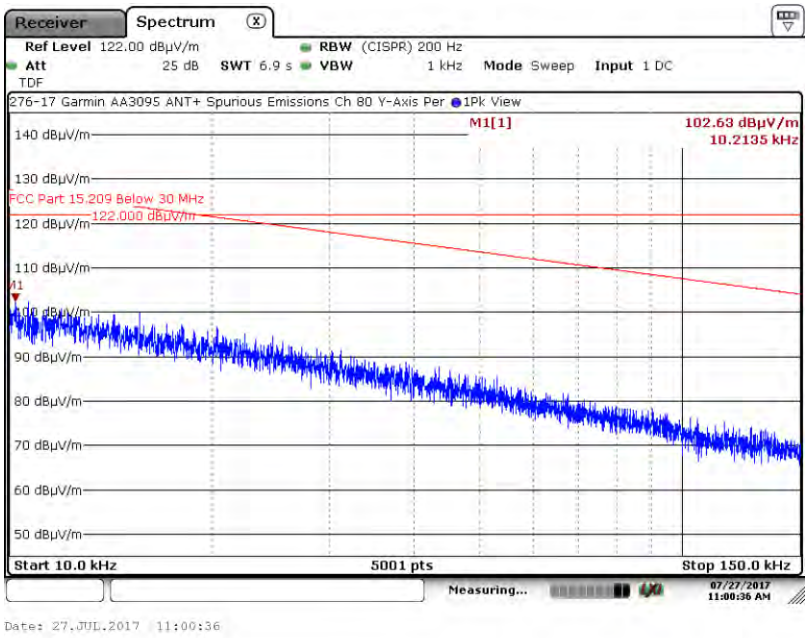
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

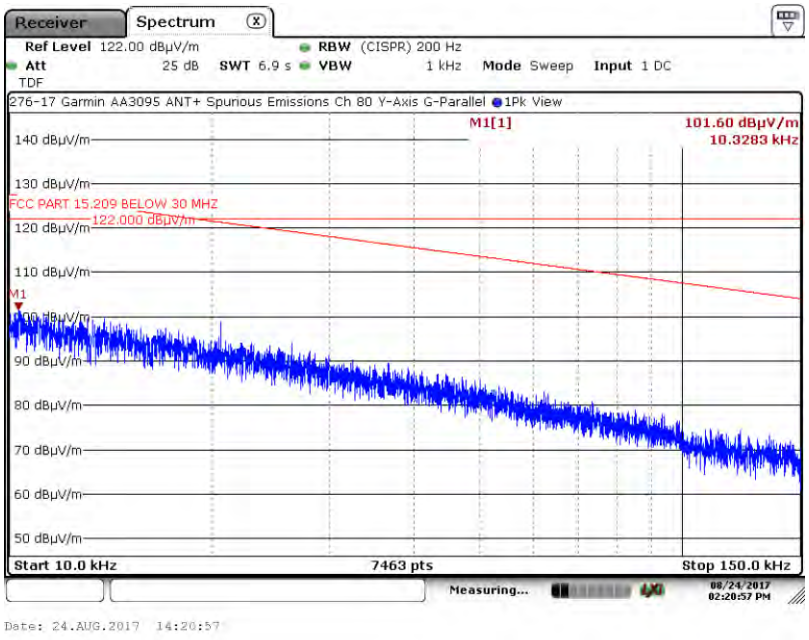
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.3. Channel 80, 2480 MHz

A1.3.5. Measurement Results: Y-Axis, Perpendicular Antenna



A1.3.6. Measurement Results: Y-Axis, Ground-Parallel Antenna



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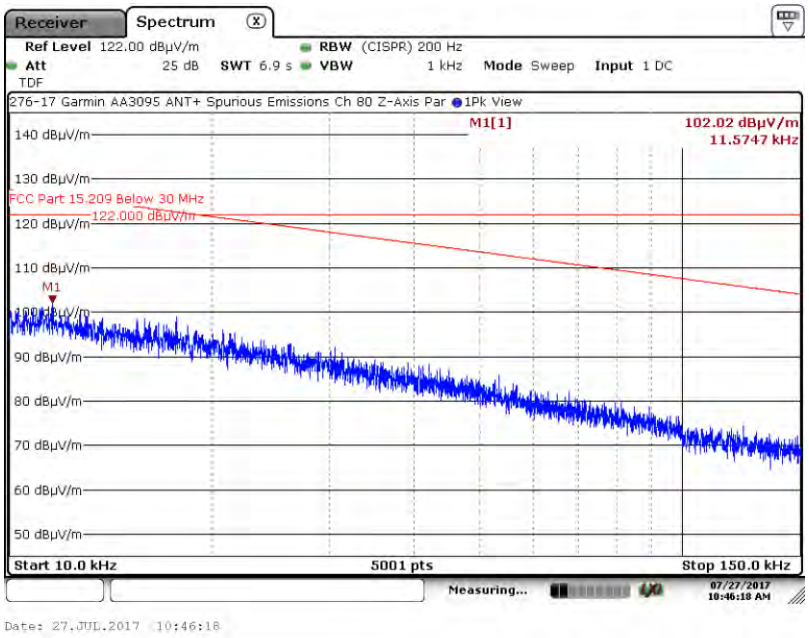
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

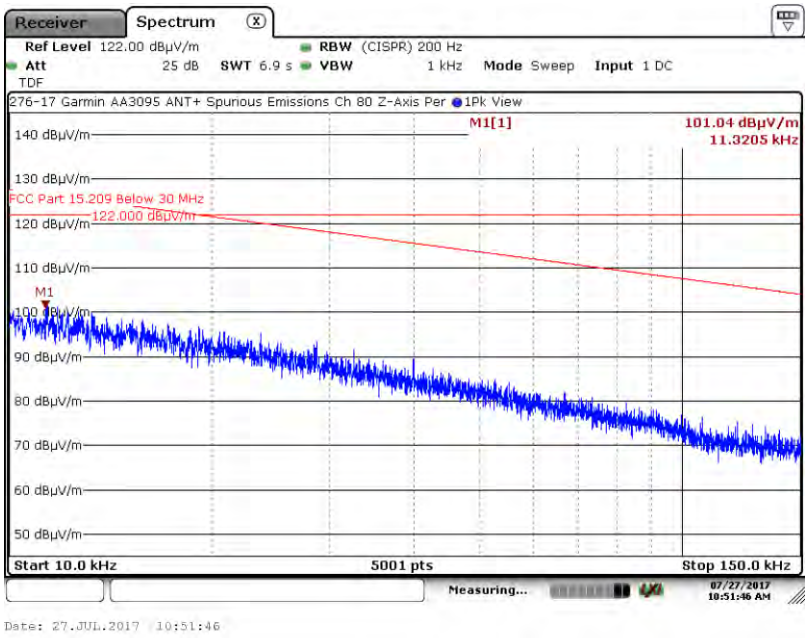
A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.3. Channel 80, 2480 MHz

A1.3.7. Measurement Results: Z-Axis, Parallel Antenna



A1.3.8. Measurement Results: Z-Axis, Perpendicular Antenna



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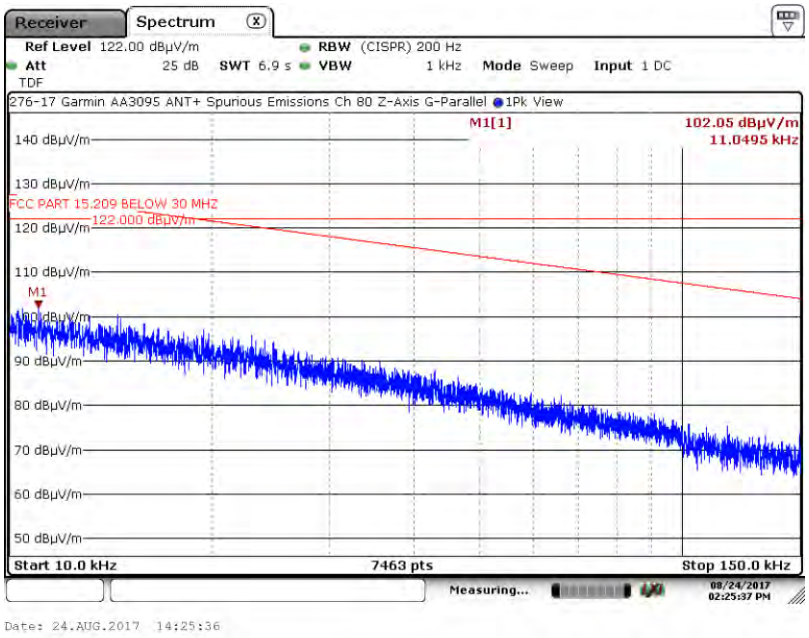
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

A1. Spurious Radiated Emissions (10 kHz – 150 kHz) Test Results

A1.3. Channel 80, 2480 MHz

A1.3.9. Measurement Results: Z-Axis, Ground-Parallel Antenna



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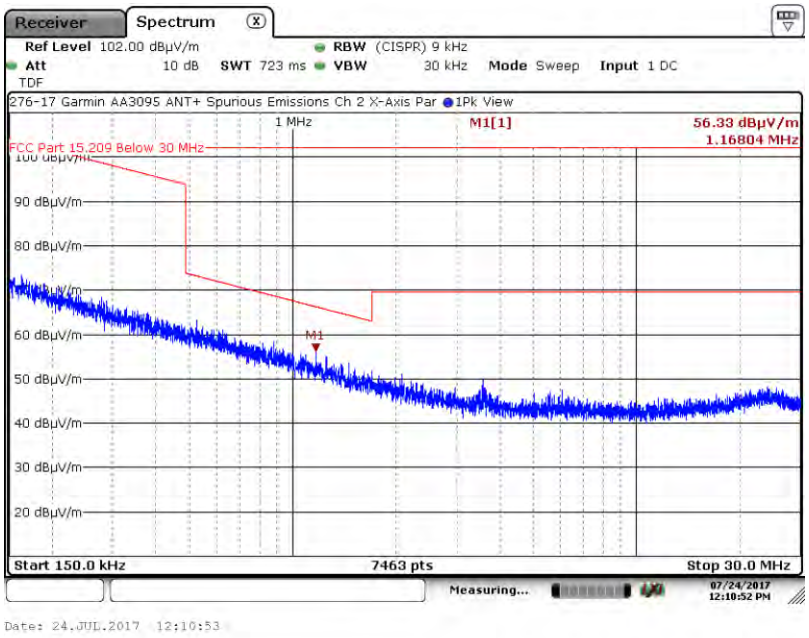
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

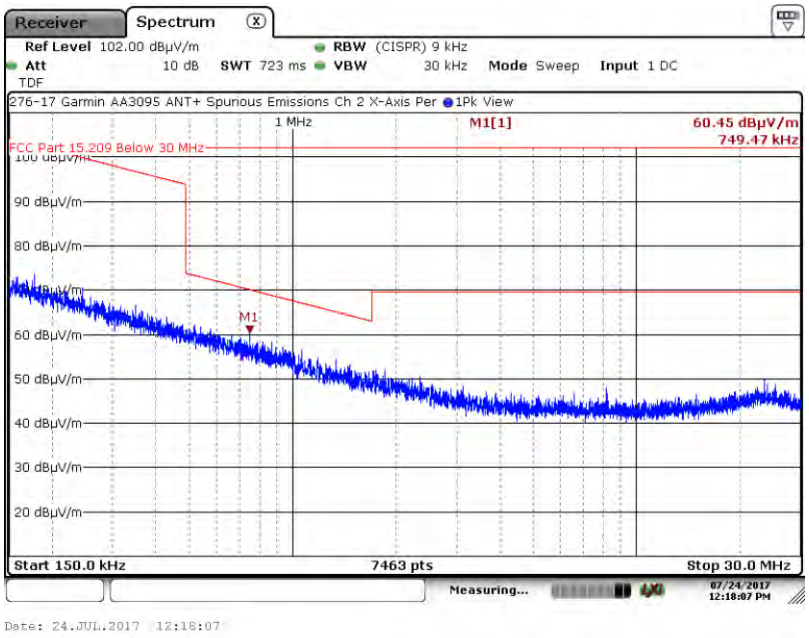
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.1. Channel 2, 2402 MHz

A2.1.1. Measurement Results: X-Axis, Parallel Antenna



A2.1.2. Measurement Results: X-Axis, Perpendicular Antenna



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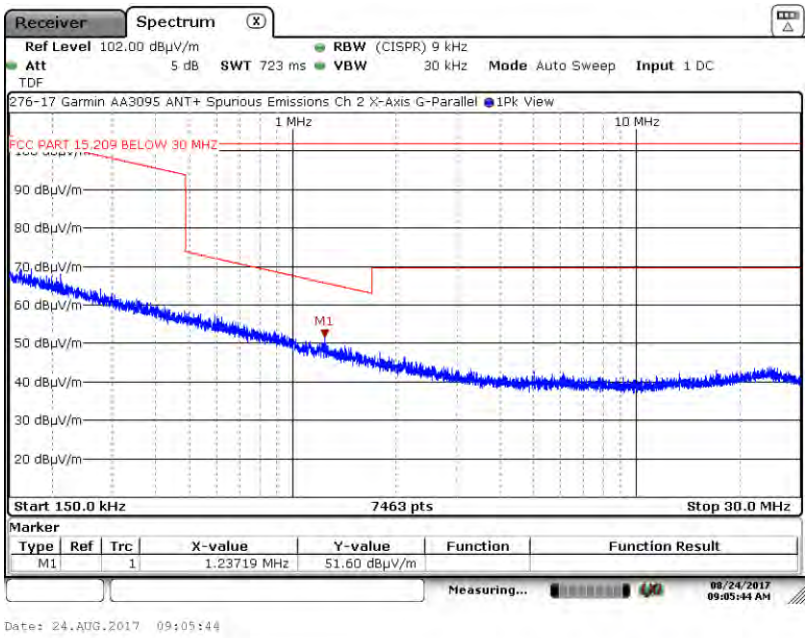
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

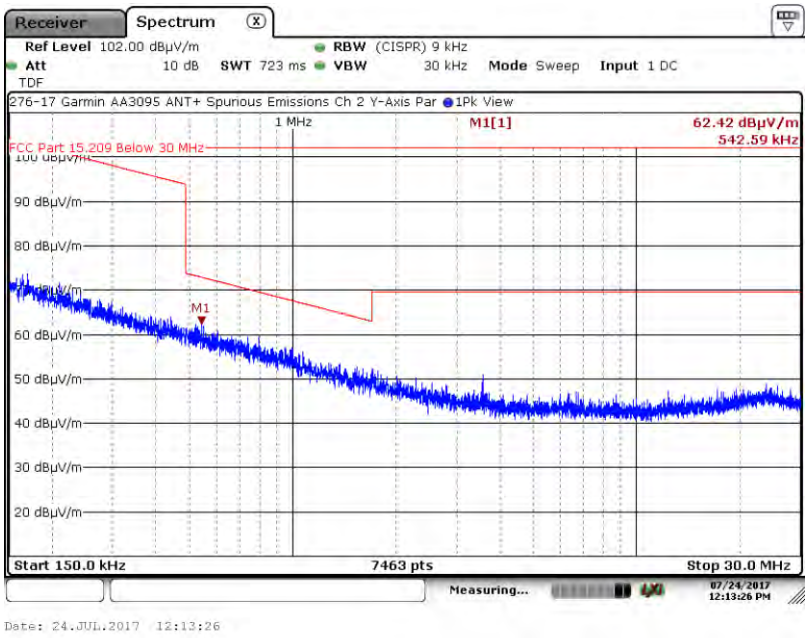
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.1. Channel 2, 2402 MHz

A2.1.3. Measurement Results: X-Axis, Ground-Parallel Antenna



A2.1.4. Measurement Results: Y-Axis, Parallel Antenna



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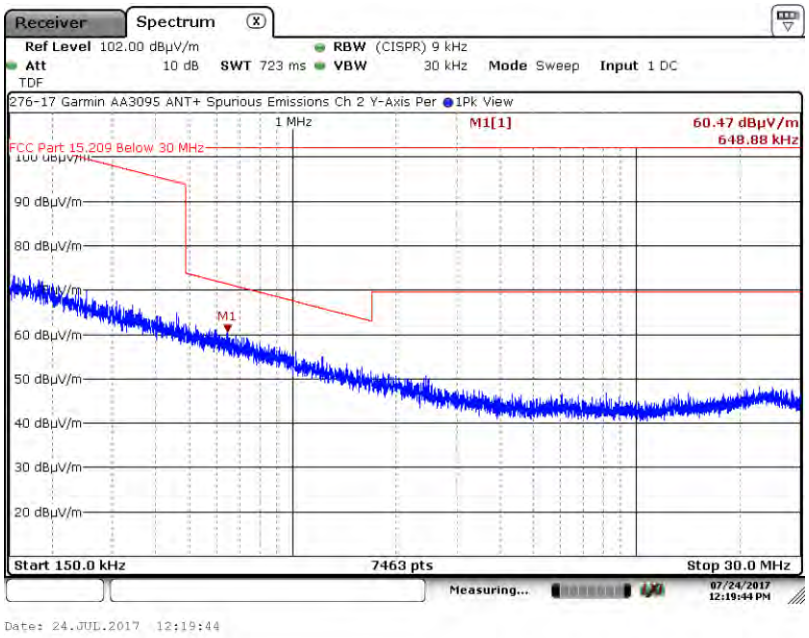
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

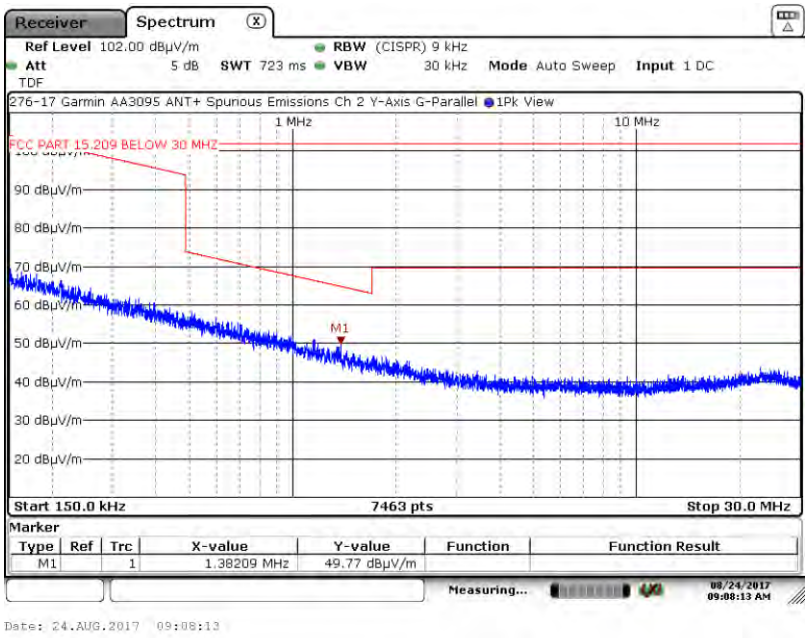
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.1. Channel 2, 2402 MHz

A2.1.5. Measurement Results: Y-Axis, Perpendicular Antenna



A2.1.6. Measurement Results: Y-Axis, Ground-Parallel Antenna



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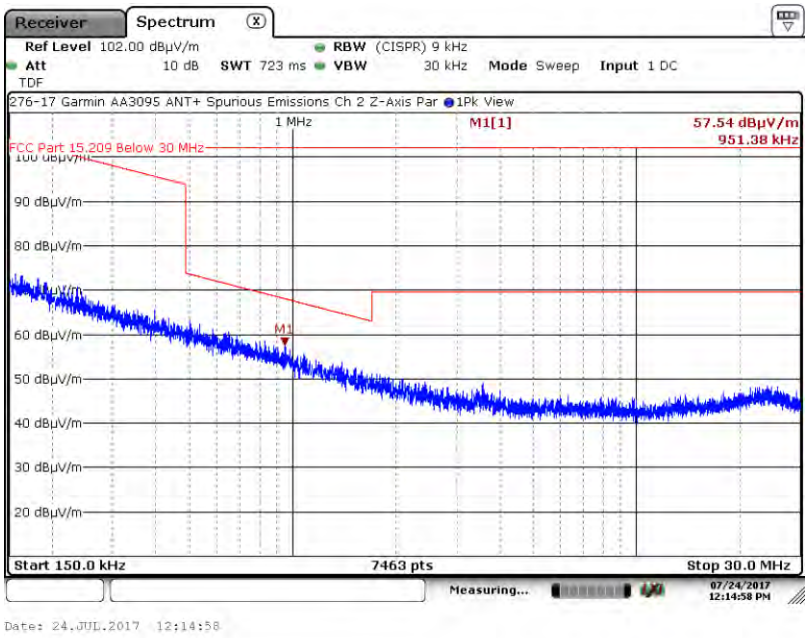
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

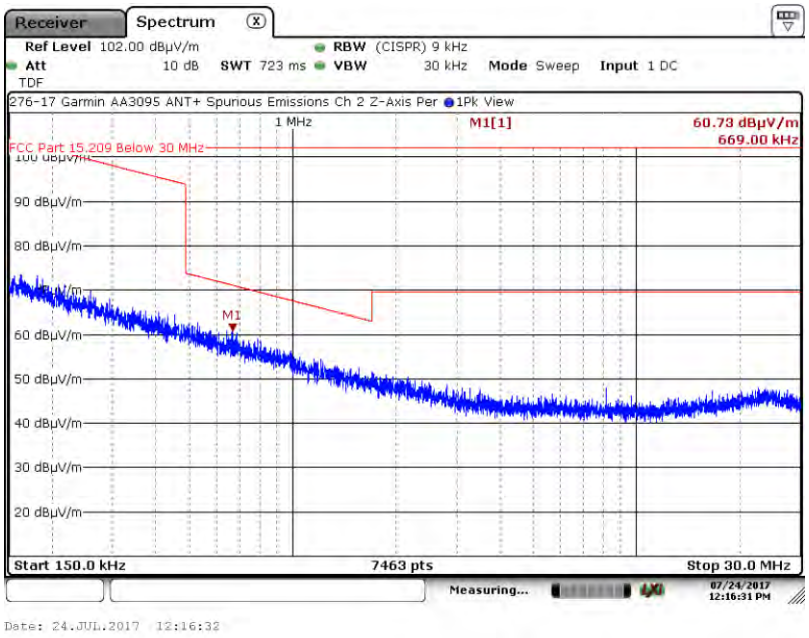
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.1. Channel 2, 2402 MHz

A2.1.7. Measurement Results: Z-Axis, Parallel Antenna



A2.1.8. Measurement Results: Z-Axis, Perpendicular Antenna



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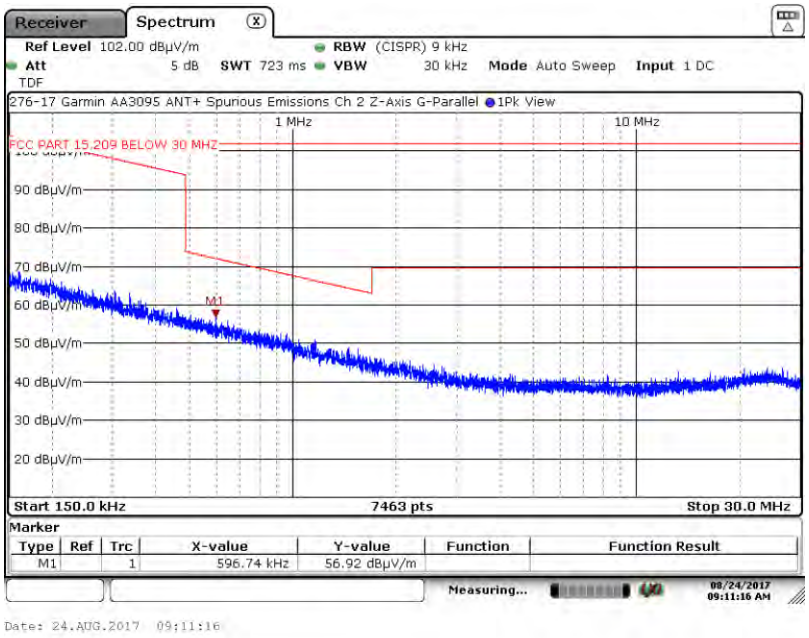
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.2. Channel 41, 2440 MHz

A2.1.9. Measurement Results: Z-Axis, Ground-Parallel Antenna



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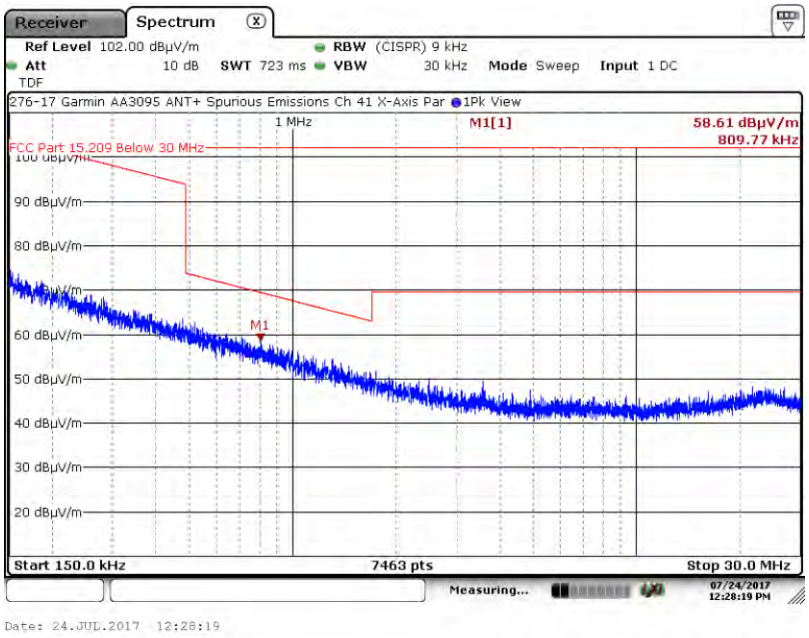
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

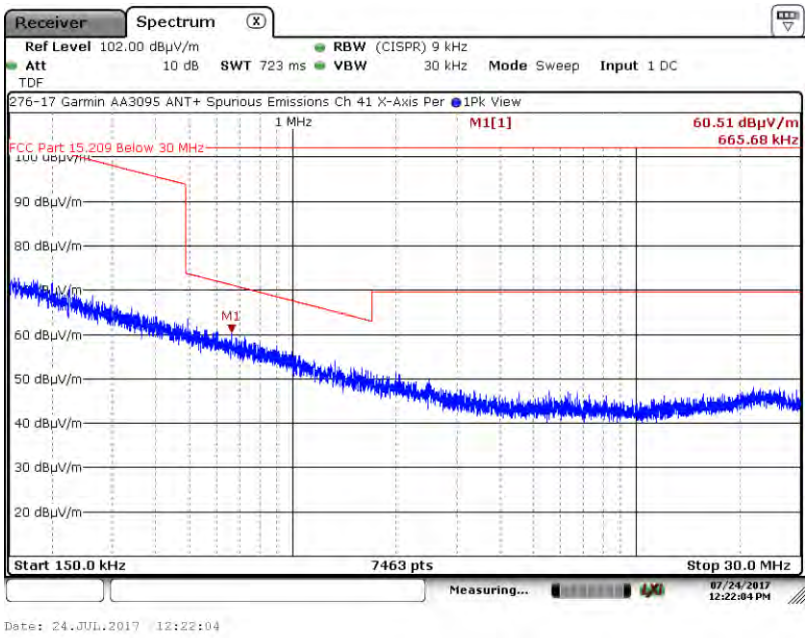
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.2. Channel 41, 2440 MHz

A2.2.1. Measurement Results: X-Axis, Parallel Antenna



A2.2.2. Measurement Results: X-Axis, Perpendicular Antenna



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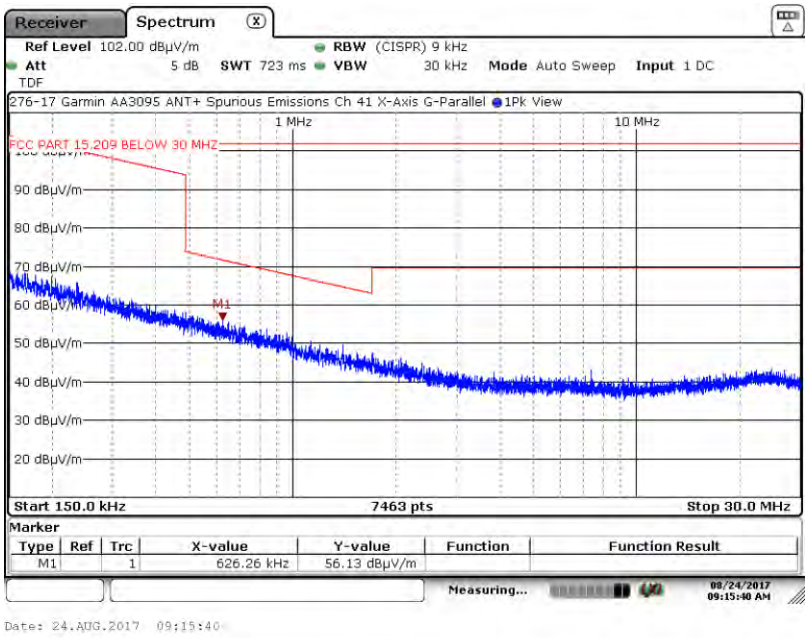
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

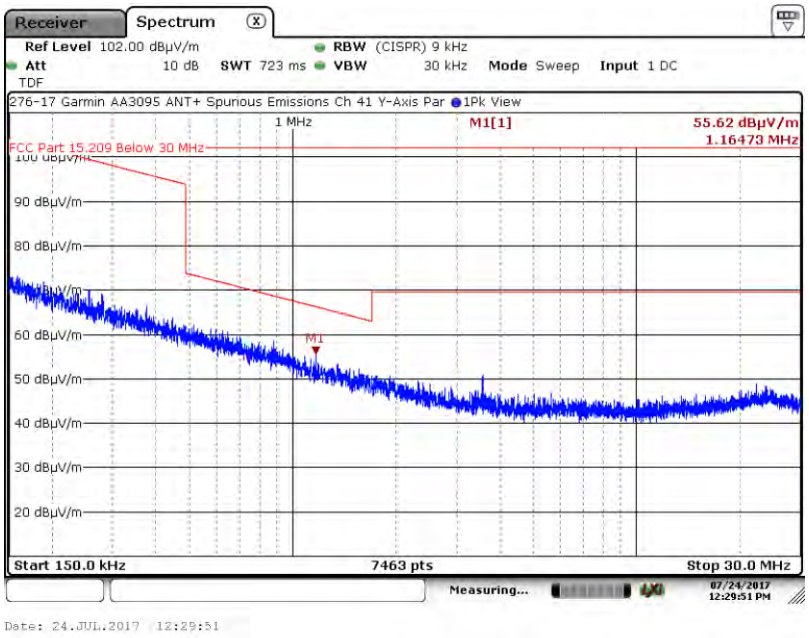
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.2. Channel 41, 2440 MHz

A2.2.3. Measurement Results: X-Axis, Ground-Parallel Antenna



A2.2.4. Measurement Results: Y-Axis, Parallel Antenna



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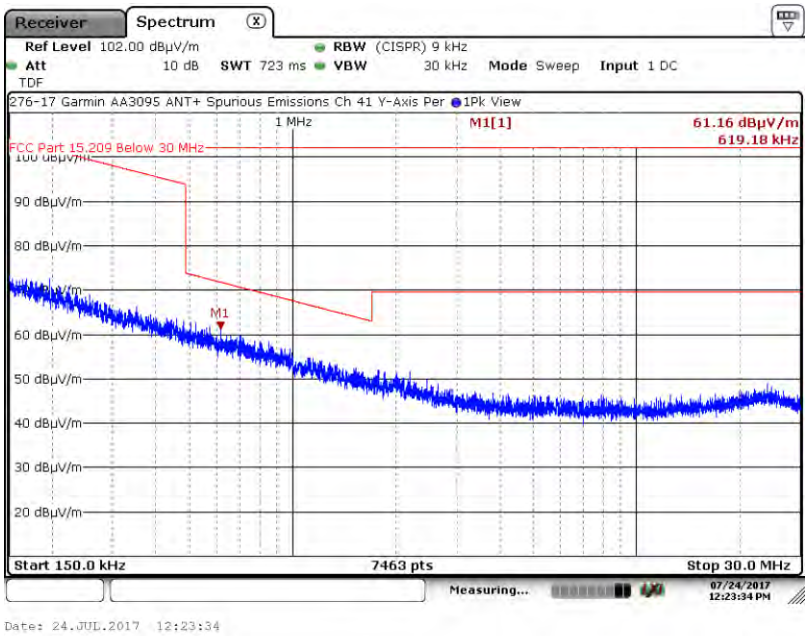
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

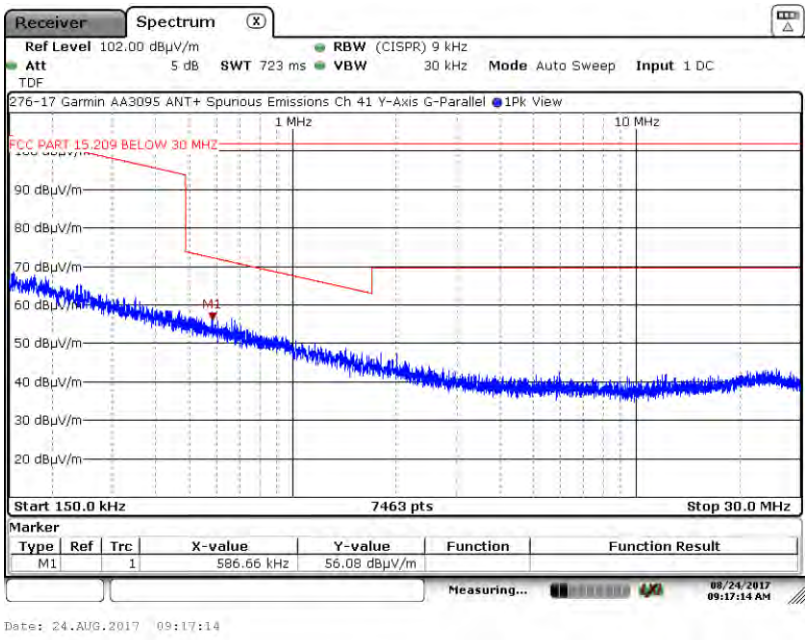
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.2. Channel 41, 2440 MHz

A2.2.5. Measurement Results: Y-Axis, Perpendicular Antenna



A2.2.6. Measurement Results: Y-Axis, Ground-Parallel Antenna



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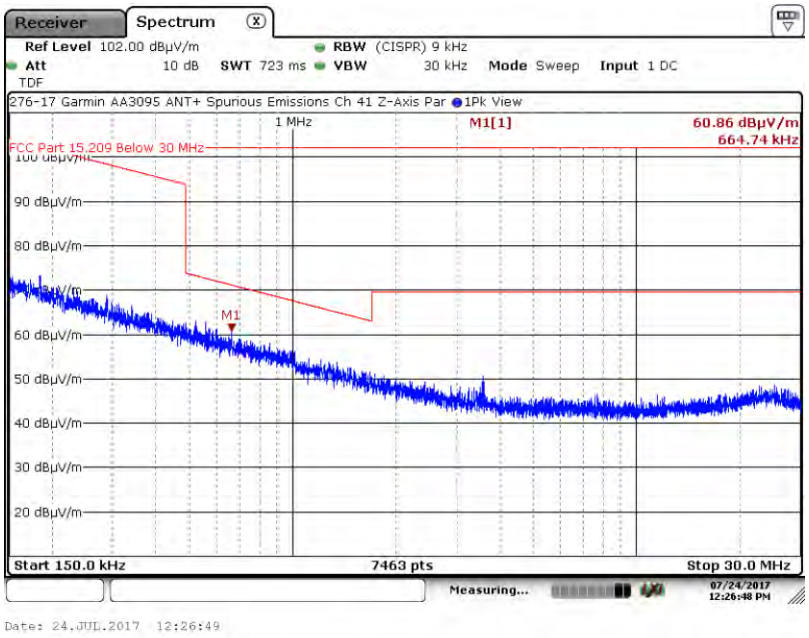
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

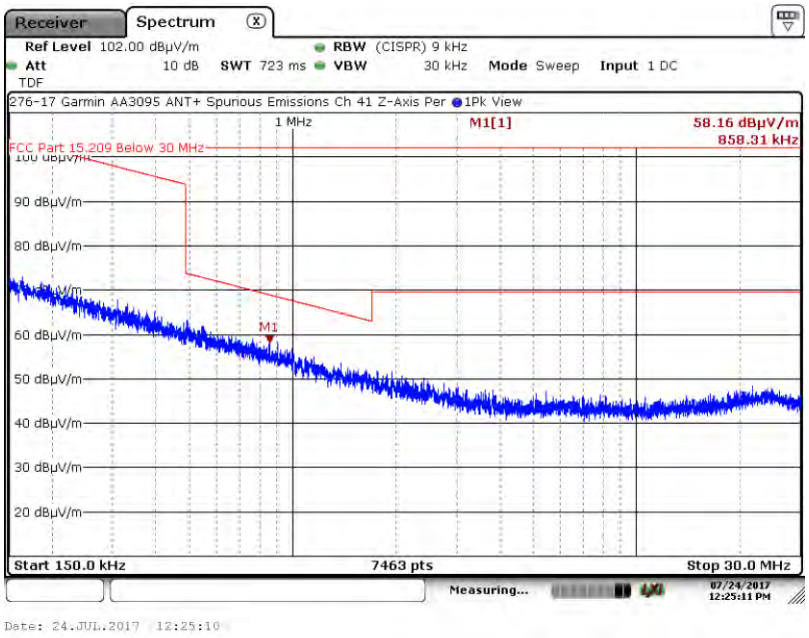
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.2. Channel 41, 2440 MHz

A2.2.7. Measurement Results: Z-Axis, Parallel Antenna



A2.2.8. Measurement Results: Z-Axis, Perpendicular Antenna



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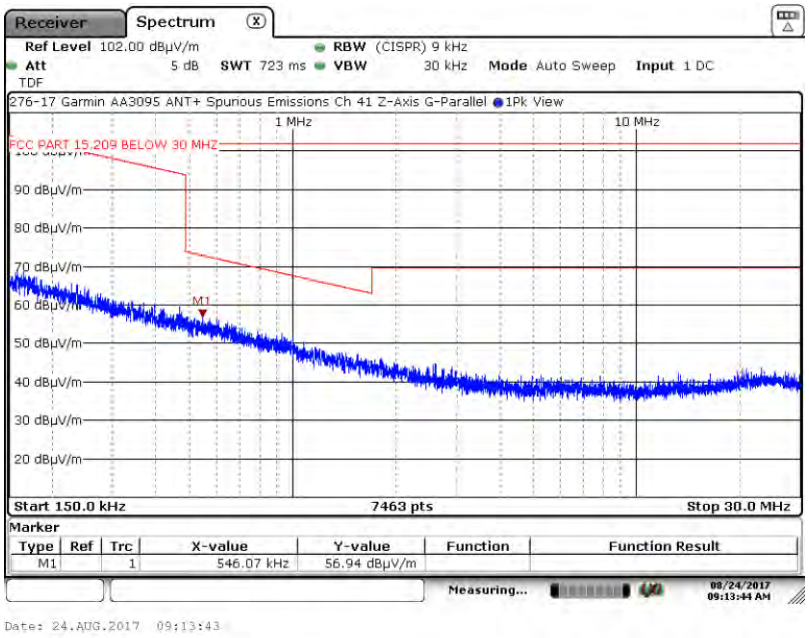
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.2. Channel 41, 2440 MHz

A2.2.9. Measurement Results: Z-Axis, Ground-Parallel Antenna



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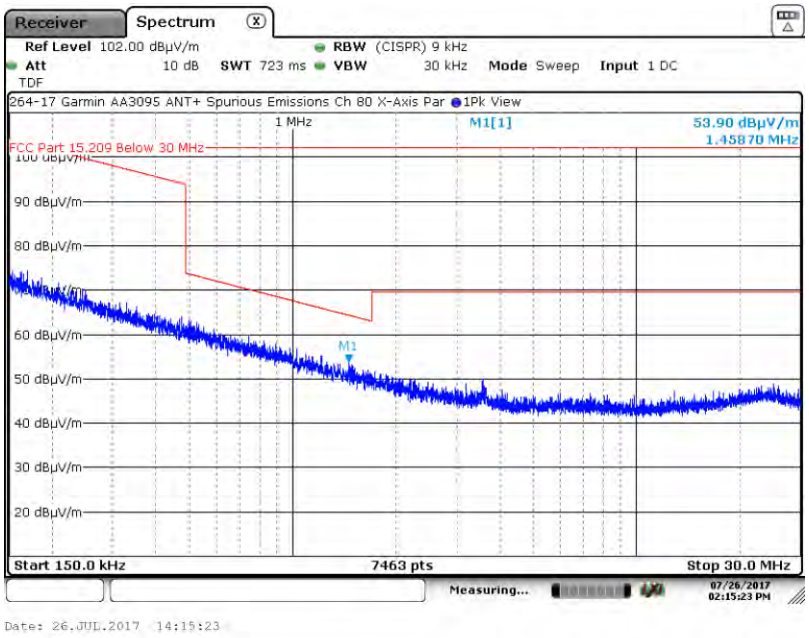
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

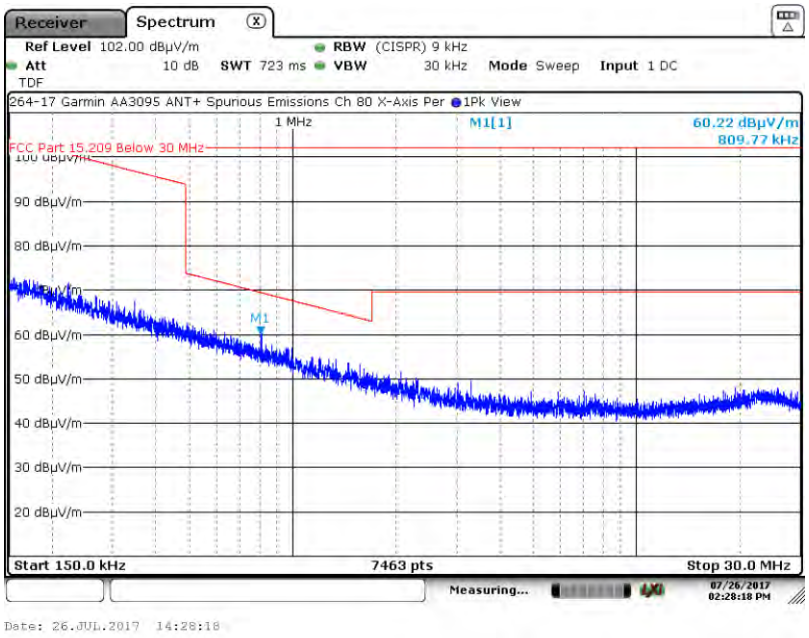
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.3. Channel 80, 2480 MHz

A2.3.1. Measurement Results: X-Axis, Parallel Antenna



A2.3.2. Measurement Results: X-Axis, Perpendicular Antenna



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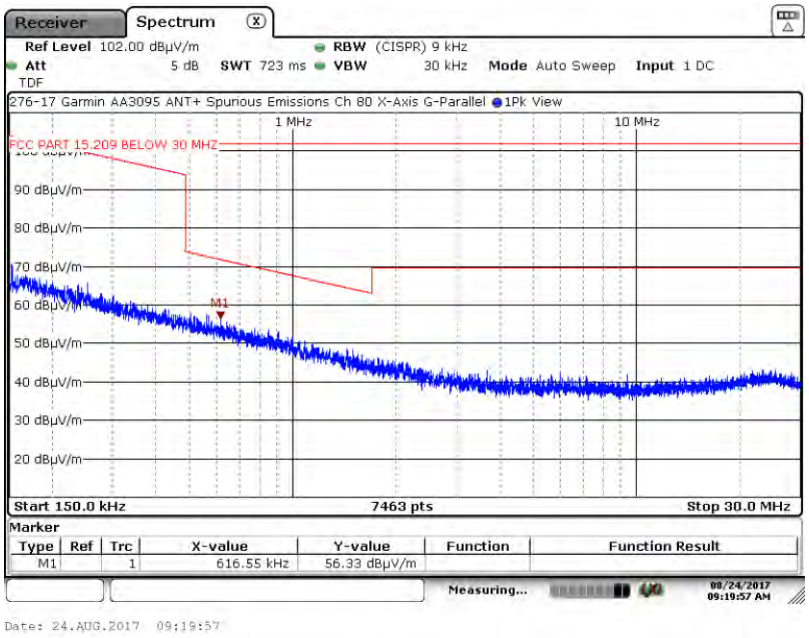
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

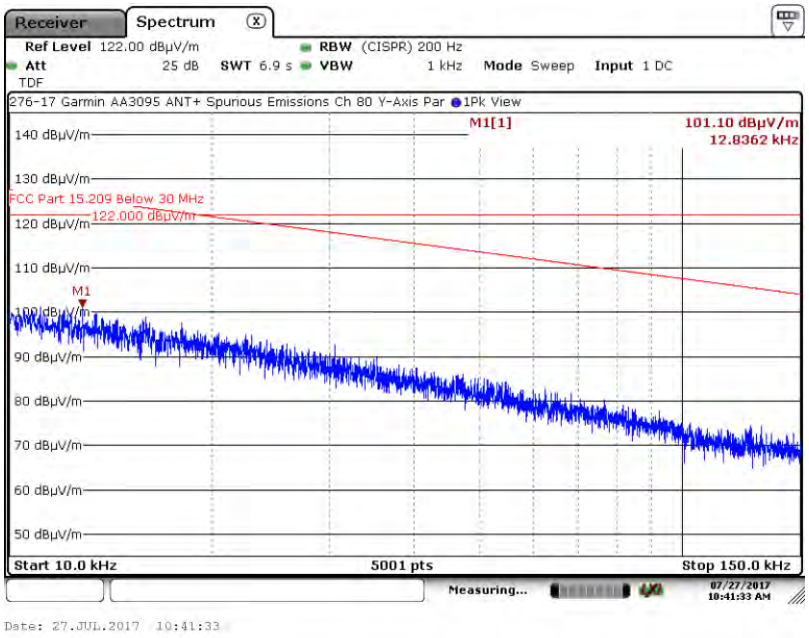
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.3. Channel 80, 2480 MHz

A2.3.3. Measurement Results: X-Axis, Ground-Parallel Antenna



A2.3.4. Measurement Results: Y-Axis, Parallel Antenna



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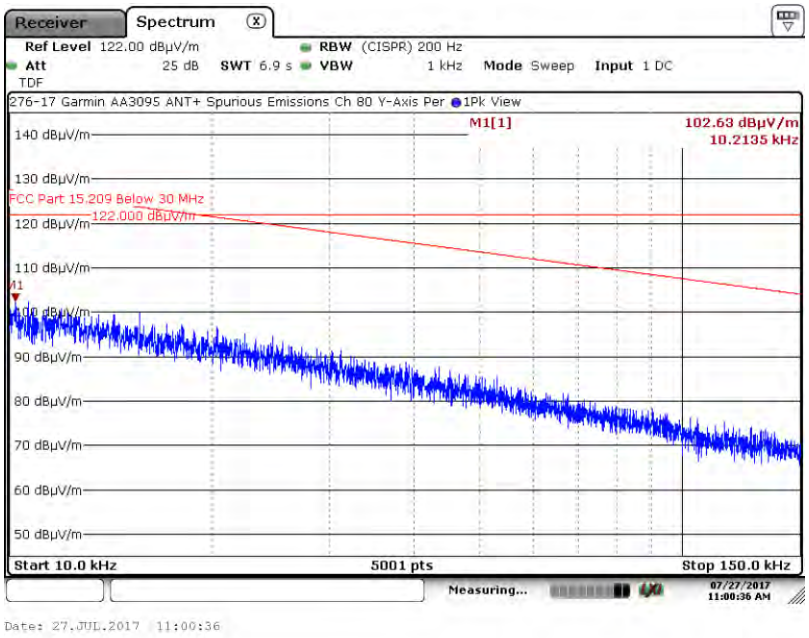
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

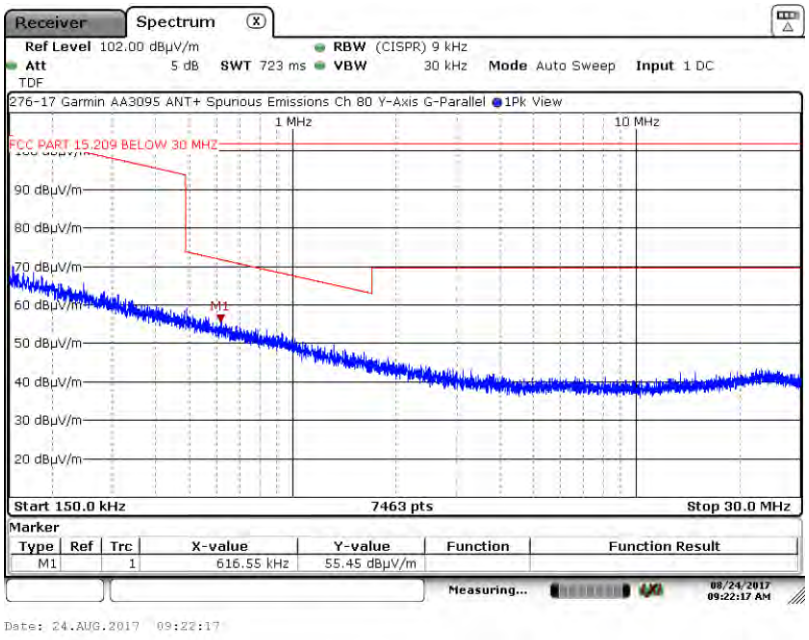
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.3. Channel 80, 2480 MHz

A2.3.5. Measurement Results: Y-Axis, Perpendicular Antenna



A2.3.6. Measurement Results: Y-Axis, Ground-Parallel Antenna



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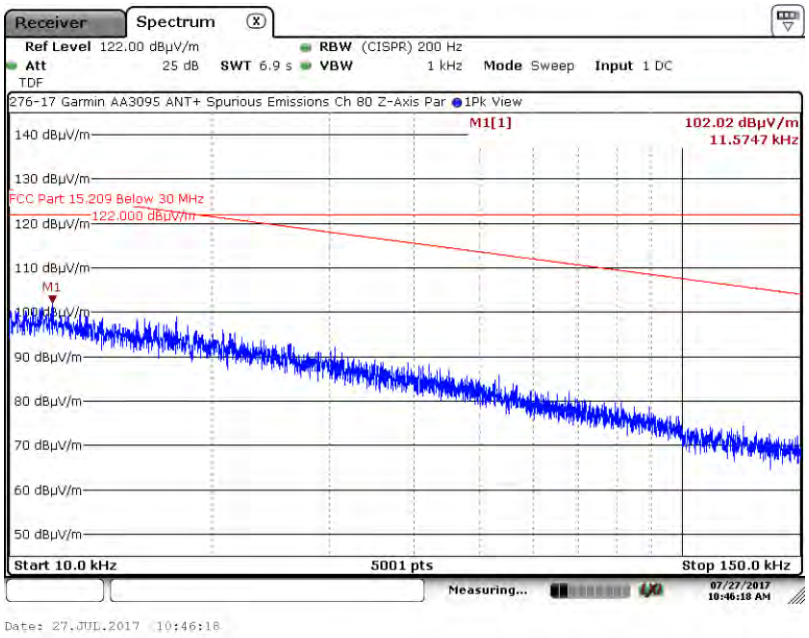
Appendix A - Transmitter Spurious Radiated Emissions (10 kHz to 25 GHz)

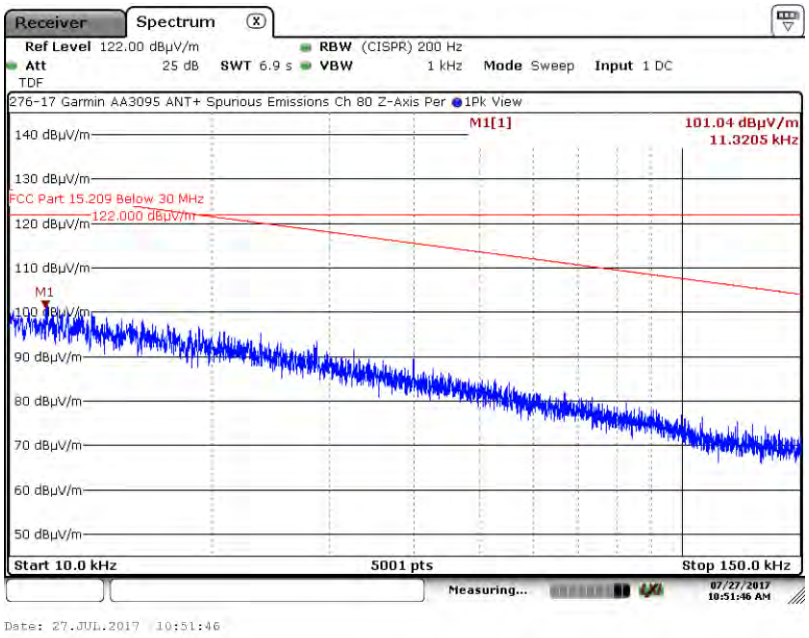
A2. Spurious Radiated Emissions (150 kHz – 30 MHz) Test Results

A2.3. Channel 80, 2480 MHz

A2.3.7. Measurement Results: Z-Axis, Parallel Antenna



A2.3.8. Measurement Results: Z-Axis, Perpendicular Antenna



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