

COMPLIANCE WORLDWIDE INC. TEST REPORT 267-19

In Accordance with the Requirements of
FCC TITLE 47 CFR Part 15.519, Subpart F
Technical Requirements for Handheld UWB Systems

ISED RSS-220, Issue 1 (March 2009) + Amendment 1 (July 2018)
Devices Using Ultra-Wideband (UWB) Technology

Issued to

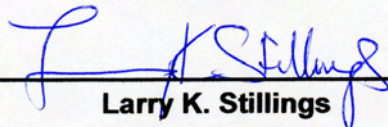
Lemmings, LLC
111 White Magnolia Way
Marietta, SC 29661

For the
Tempo Walk
Model: AV-1

FCC ID: 2ATT2-ROVER1
IC: 25334-ROVER1

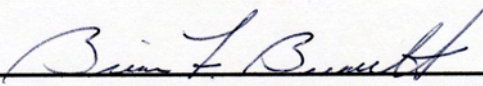
Report Issued on August 21, 2019

Tested By



Larry K. Stillings

Reviewed By



Brian F. Breault

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1. Scope

This test report certifies that the Lemmings Tempo Walk, AV-1 as tested, meets the FCC Part 15, Subpart F and ISSED RSS-220 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:** Lemmings, LLC
- 2.2. **Model Number:** AV-1
- 2.3. **Serial Numbers:** Pre production prototype
- 2.4. **Description:** The Tempo Walk is a remote controlled golf caddy with a wearable anchor.
- 2.5. **Power Source:** Rechargeable Battery 3.7V, 1000 mAh
- 2.6. **Hardware Revision:** Rev12
- 2.7. **Software Revision:** N/A
- 2.8. **Modulation Type:** Pulse Modulation, Frequency Hopping
- 2.9. **Operating Frequencies:** 3.993 GHz (Channel 4) Center Frequency Nominal (900 MHz BW),
6.489 GHz (Channel 5) Center Frequency Nominal (500 MHz BW)
- 2.10. **EMC Modifications:** None

3. Product Configuration

3.1 Operational Characteristics & Software

Hardware Setup:

Using the embedded firmware, the channel is configured for a continuous transmission. The device supports two PRFs 16M & 64M

3.2. EUT Hardware

Manufacturer	Model/Part # / Options	Serial Number	Input Volts	Freq (Hz)	Description/Function
Lemmings	AV-1	Pre production	3.6	DC	Belt worn anchor

3.3. EUT Cables/Transducers

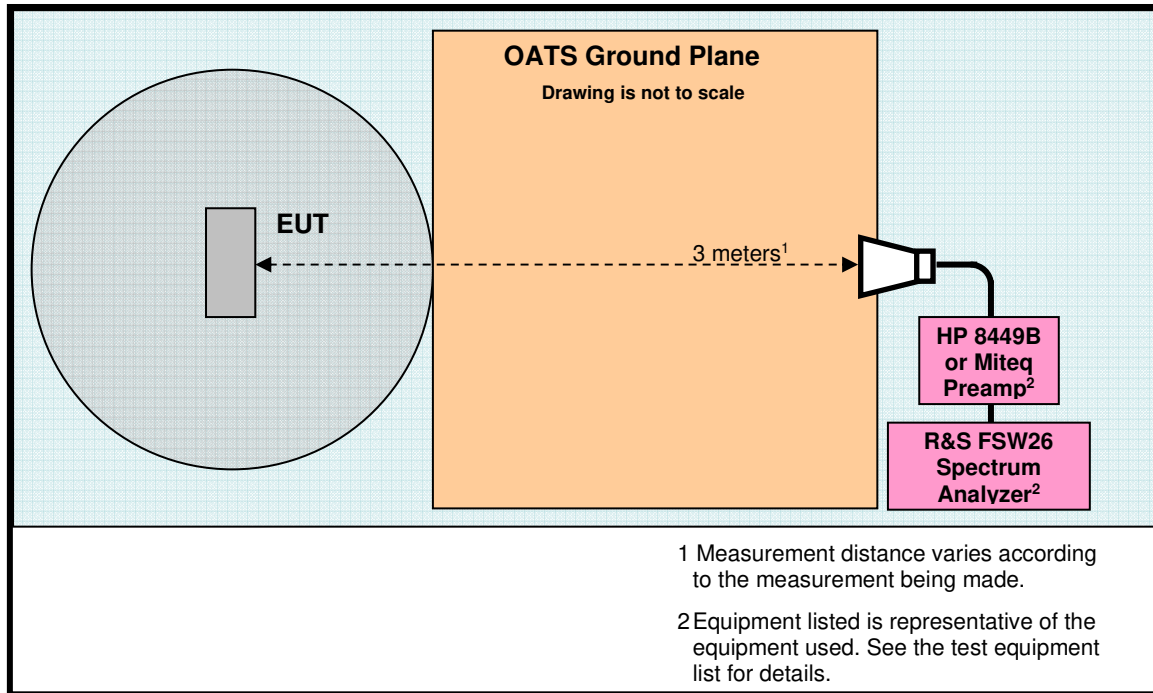
Cable Type	Length	Shield	From	To
None				

3.4. Support Equipment

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
None					

3. Product Configuration (cont.)

3.5. Test Setup Diagram



4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Interval
EMI Receiver 9 kHz to 7 GHz	Rohde & Schwarz	ESR7	101156	9/10/2020	2 Years
Spectrum Analyzer 9 kHz to 40 GHz	Rohde & Schwarz	FSV40	100899	9/10/2020	2 Years
Spectrum Analyzer 10 Hz to 40 GHz	Rohde & Schwarz	FSVR40	100909	5/3/2020	3 Years
Spectrum Analyzer 3 Hz to 26.5 GHz	Rohde & Schwarz	FSW26	102044	9/13/2020	2 Years
Biconilog Antenna 30 MHz to 2 GHz	Sunol Sciences	JB1	A050913	6/5/2021	2 Years
Loop Antenna 9 kHz to 30 MHz	EMCO	6512	9309-1139	10/26/2019	3 Years
Preamplifier 100 MHz to 7 GHz	Miteq	AFS3-00100200-10-15P-4	988773	4/17/2020	2 Years
Preamplifier 100 MHz to 18 GHz	Miteq	AMF-7D-00101800-30-10P	1953081	4/16/2020	2 Years
Preamplifier 2 to 12 GHz	JCA	JCA48-4111B1	7087S	4/17/2020	2 Years
Preamplifier 1 to 26.5 GHz	Hewlett Packard	8449B	3008A01323	9/11/2020	2 Years
Preamplifier 18 to 40 GHz	Miteq	JSD42-21004200-40-5P	649199/649219	11/1/2019	1 Year
Horn Antenna 1 to 18 GHz	ETS-Lindgren	3117	00143292	3/21/2022	3 Years
Horn Antenna 18-40 GHz	Com Power	AH-840	101032	10/9/2020	2 Years
High Pass Filter 8 to 18 GHz	Micro-Tronics	HPM50107	G036	7/20/2020	2 Years
Barometer	Control Company	4195	Cal ID# 236	4/3/2020	2 Years

¹ ESR7 Firmware revision: V3.36, SP2 Date installed: 11/02/2017 Previous V3.36, installed 05/16/2017.
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: V2.80, Date installed: 10/28/2017 Previous V2.61, installed 04/04/2017.

4. Measurements Parameters (continued)

4.2. Measurement & Equipment Setup

Test Dates:	7/1/2019, 7/9/2019, 7/12/2019, 7/17/2019, 8/6/2019, 8/16/2019, 8/21/2019
Test Engineers:	Larry Stillings
Normal Site Temperature (15 – 35°C):	21.6
Relative Humidity (20 -75%RH):	35
Frequency Range:	30 kHz to 40 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	200 Hz – 30 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 Avg Bandwidth:	300 Hz – 30 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, Quasi-Peak & Average

4.3. Measurement Procedure

Test measurements were made in accordance FCC Parts 15.209, 15.519 Subpart F, ISSED RSS-220 requirements.

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

4.4. Measurement Uncertainty

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

RF Frequency (out of band)	$\pm 1 \times 10^{-8}$
Radiated Emission of Transmitter to 100 GHz	± 4.55 dB
Radiated Emission of Receiver	± 4.55 dB
Temperature	$\pm 0.91^{\circ}$ C
Humidity	$\pm 5\%$

5. Measurements Summary

Test Requirement	FCC Rule Requirement	ISED Rule Requirement	Test Report Section	Result	Comment
Antenna Requirement	15.203	RSS-220 5.1 (b)	6.1	Compliant	The antenna is a pcb etch type
Operational Requirements	15.519 (a) (1)	RSS-220	6.2	Compliant	
UWB Bandwidth	15.503 (a) (d) 15.519 (b)	RSS-220 2 RSS-220 5.1	6.3	Compliant	
Radiated Emissions below 960 MHz	15.209	RSS-220 3.4	6.4	Compliant	
Radiated Emissions above 960 MHz	15.519 © 15.521 (d)		6.5	Compliant	
Radiated Emissions in GPS Bands	15.519 (d)	RSS-220 5.3.1 (e)	6.6	Compliant	
RMS Emissions of UWB Transmission in a 1 MHz Bandwidth	15.519 © 15.521 (d)	RSS-220 5.3.1 (d)	6.7	Compliant	
Peak Emissions in a 50 MHz Bandwidth	15.519 (e) 15.521 (g)	RSS-220 5.3.1 (g)	6.8	Compliant	
Conducted Emissions	15.207	RSS-GEN	6.9 6.10	Compliant	Via USB Charger
99% Emission Bandwidth	N/A	RSS-GEN	6.11	Compliant	
Radio Frequency Exposure	1.1307(b)(2), 2.1093 & 1.1310	RSS-102, Issue 5	6.12	Compliant	

6. Measurement Data

6.1. Antenna Requirement (15.203, RSS-220 5.1(b))

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

Result: The antenna utilized by the device under test is a pcb etch type.

6. Measurement Data (continued)

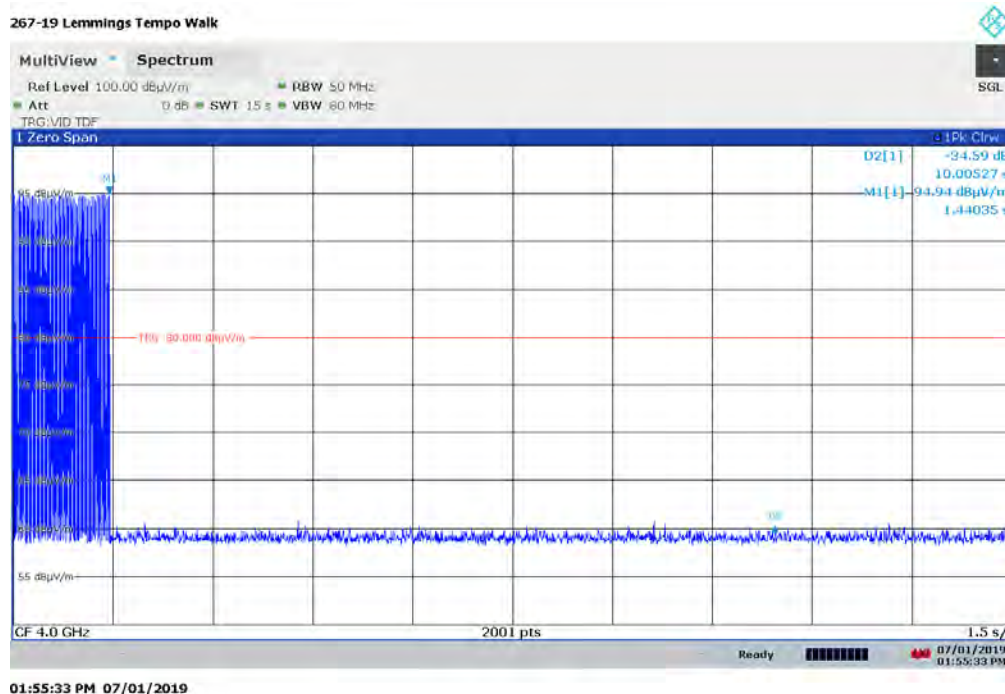
6.2. Operational Requirements of the Device under Test (15.519 (a) (1))

Requirement: UWB device operating under the provisions of this section must be hand held, i.e., they are relatively small device that are primarily hand held while being operated and do not employ a fixed infrastructure. UWB devices operating under the provisions of this section may operate indoors or outdoors.

A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

Result: Compliant

6.2.1 Plot of 10 Second Shutoff



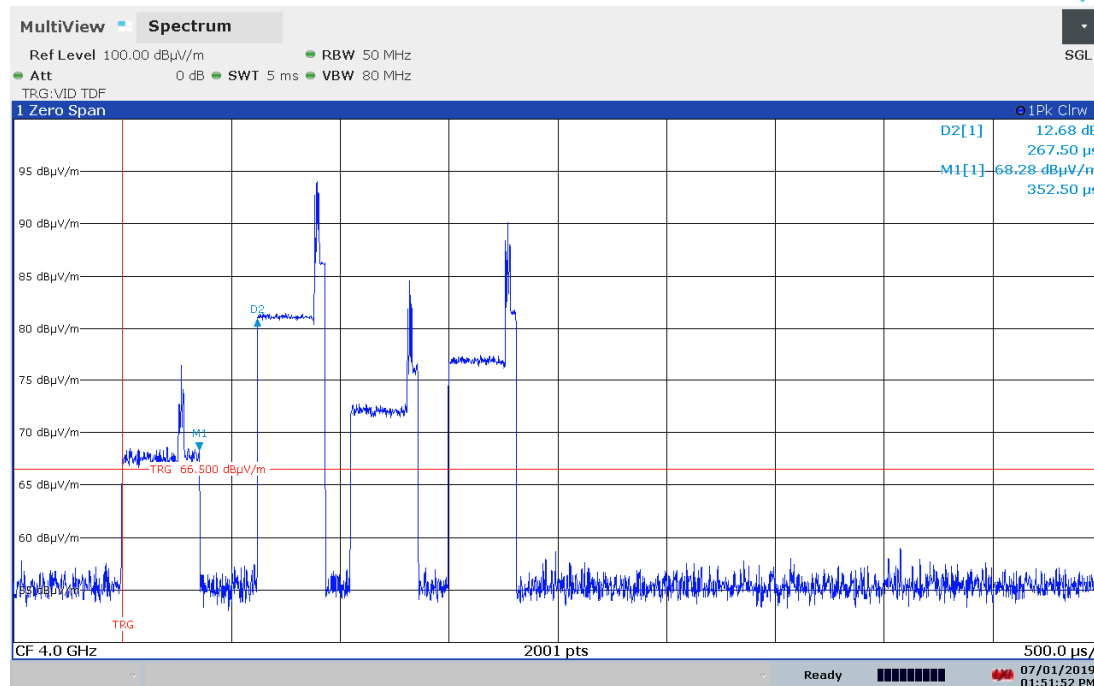
Note: Marker 1 is when the belt unit stops transmitting, Marker D2 shows the EUT shutting off for greater than 10 Seconds.

6. Measurement Data (continued)

6.2. Operational Requirements of the Device under Test (15.519 (a) (1))

6.2.2 Plot of Re-established communications

267-19 Lemmings Tempo Walk



01:51:53 PM 07/01/2019

Note: Marker 1 is with belt unit turned back on to establish communications, Marker D2 shows EUT re-establishing communication after 267.5 microseconds.

6. Measurement Data (continued)

6.3. UWB Bandwidth (15.503 (a) (d), 15.519 (b))

Requirement: The UWB bandwidth of a device operating under the provisions of this section shall be contained between 3,100 MHz and 10,600 MHz and at any point in time, and has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

6.3.1. Measurement Data – Values in GHz

		CH4
f_M	The highest emission peak	4.1969
f_L	10 dB below the highest peak	3.7741
f_H	10 dB above the highest peak	4.4548
f_C	Calculated: $(f_H + f_L) / 2$	4.1145
Bandwidth	Calculated: $(f_H - f_L)$	0.6807
Fractional BW	Calculated: $2 * (f_H - f_L) / (f_H + f_L)$	0.1654

6.3.2. Measurement Plot of 10 dB frequencies (Channel 4, 16M PRF)

330-19 Kronos InTouch HID Prox Upper Band Edge



12:15:45 PM 07/01/2019

6. Measurement Data (continued)

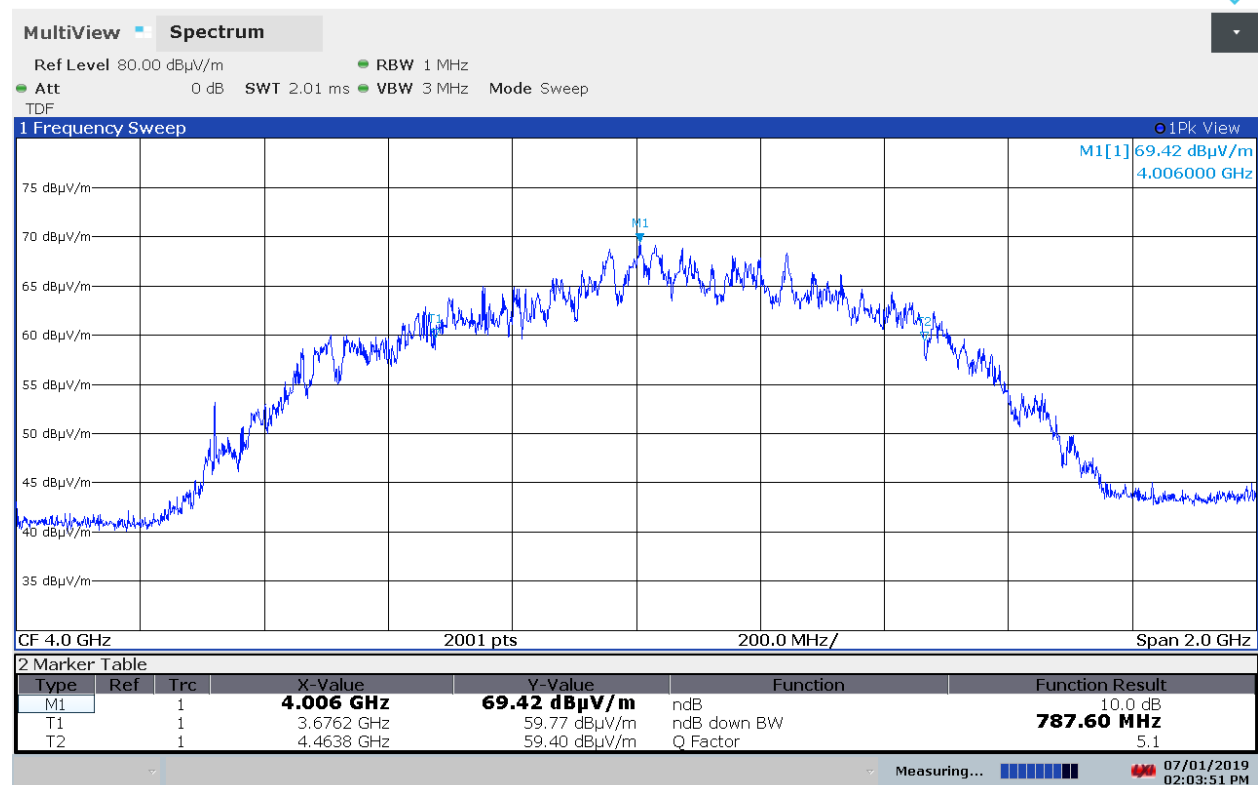
6.3. UWB Bandwidth (15.503 (a) (d), 15.519 (b) continued)

6.3.3. Measurement Data – Values in GHz

		CH4
f_M	The highest emission peak	4.0060
f_L	10 dB below the highest peak	3.6762
f_H	10 dB above the highest peak	4.4638
f_c	Calculated: $(f_H + f_L) / 2$	4.0700
Bandwidth	Calculated: $(f_H - f_L)$	0.7876
Fractional BW	Calculated: $2 * (f_H - f_L) / (f_H + f_L)$	0.1935

6.3.4. Measurement Plot of 10 dB frequencies (Channel 4, 64M PRF)

330-19 Kronos InTouch HID Prox Upper Band Edge



02:03:51 PM 07/01/2019

6. Measurement Data (continued)

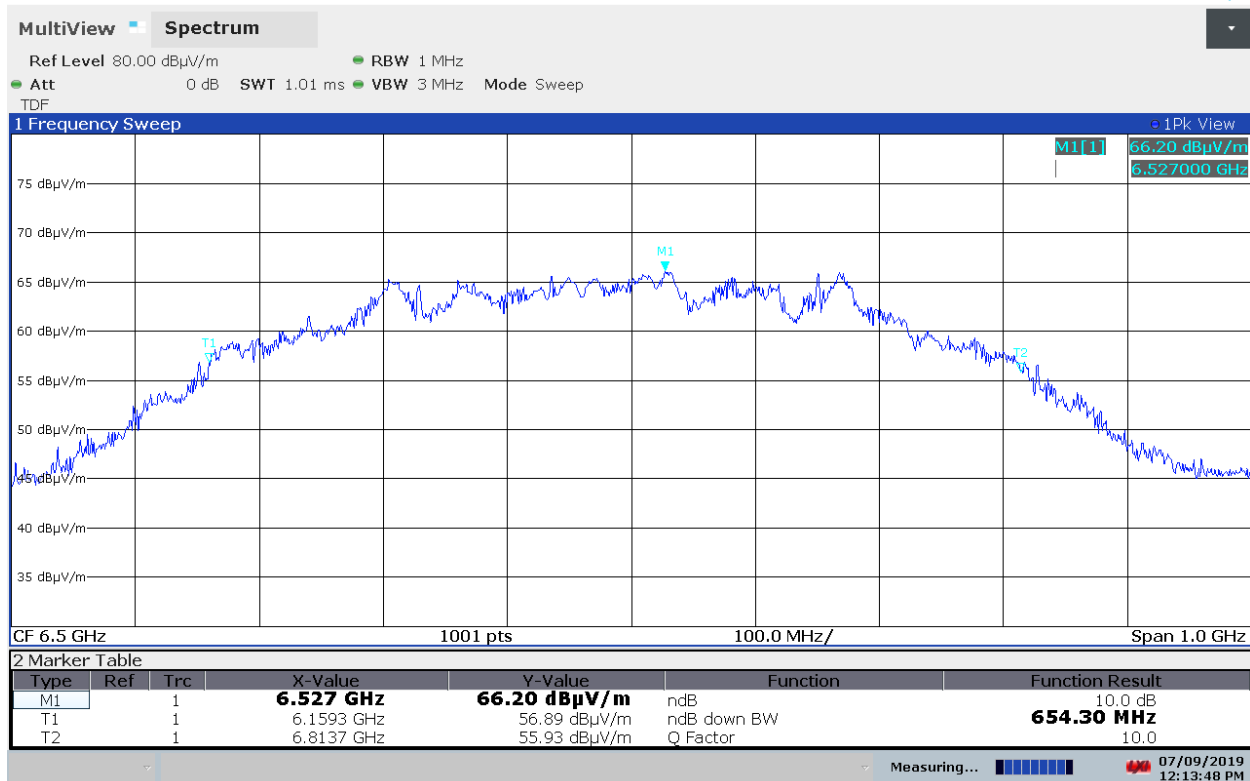
6.3. UWB Bandwidth (15.503 (a) (d), 15.519 (b) continued)

6.3.5. Measurement Data – Values in GHz

		CH5
f_M	The highest emission peak	6.5270
f_L	10 dB below the highest peak	6.1593
f_H	10 dB above the highest peak	6.8137
f_C	Calculated: $(f_H + f_L) / 2$	6.4865
Bandwidth	Calculated: $(f_H - f_L)$	0.6544
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.1009

6.3.6. Measurement Plot of 10 dB frequencies (Channel 5, 16M PRF)

267-19 Lemmings Tempo Walk Belt Unit



12:13:48 PM 07/09/2019

6. Measurement Data (continued)

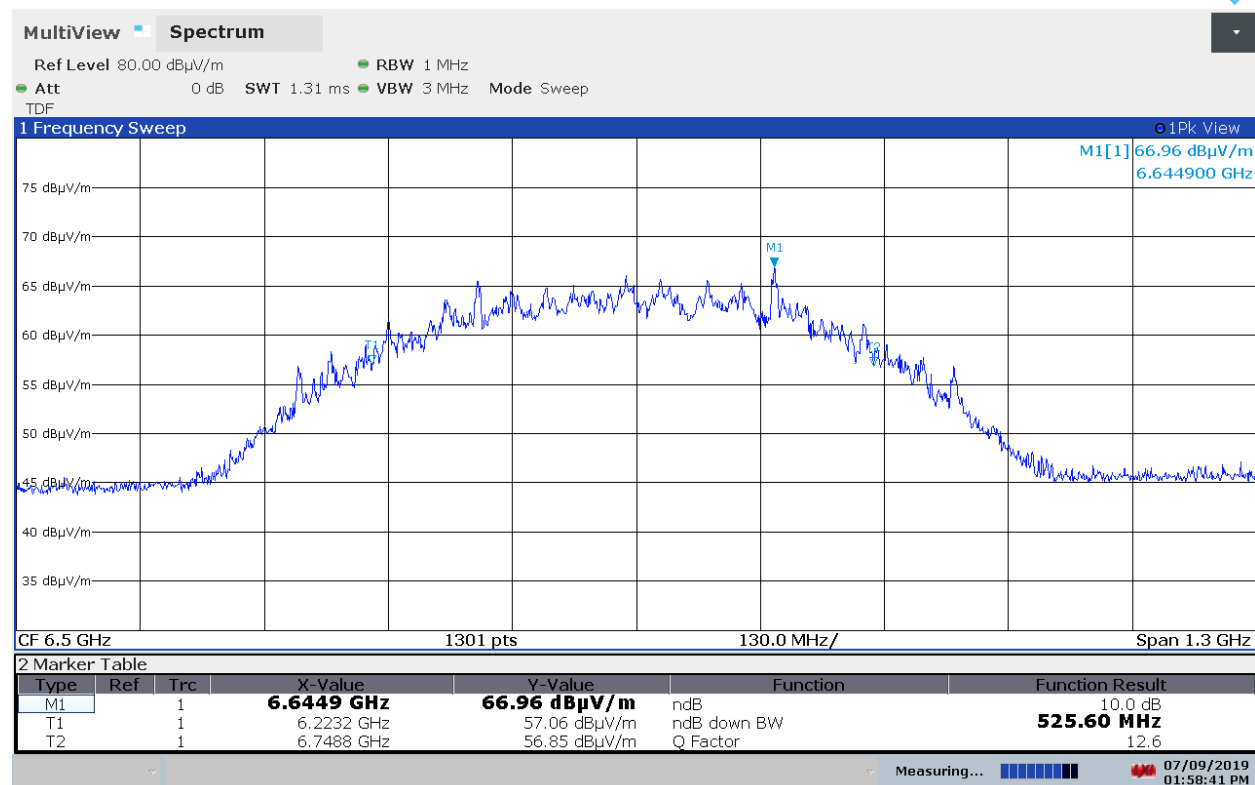
6.3. UWB Bandwidth (15.503 (a) (d), 15.519 (b) continued)

6.3.7. Measurement Data – Values in GHz

		CH5
f_M	The highest emission peak	6.6449
f_L	10 dB below the highest peak	6.2232
f_H	10 dB above the highest peak	6.7488
f_C	Calculated: $(f_H + f_L) / 2$	6.4860
Bandwidth	Calculated: $(f_H - f_L)$	0.5256
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.0810

6.3.8. Measurement Plot of 10 dB frequencies (Channel 5, 64M PRF)

267-19 Lemmings Tempo Walk Belt Unit



01:58:41 PM 07/09/2019

6. Measurement Data (continued)

6.4. Spurious Radiated Emissions below 960 MHz (15.519 (c), 15.209)

Requirement: The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in Section 15.209.

Radiated Emissions Field Strength Limits at 3 Meters (Section 15.209, RSS-220)

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)
0.009 to 0.490	$2,400/F$ (F in kHz)	128.5 to 93.8
0.490 to 1.705	$24,000/F$ (F in kHz)	73.8 to 63
1.705 - 30	30	69.5
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46

Test Notes: Refer to Section 4.1 for the test equipment used.

Frequency Range:	30 kHz to 960 MHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	200 Hz – 30 kHz to 150 kHz 9 kHz – 150 kHz to 30 MHz 120 kHz - 30 MHz to 960 MHz
EMI Receiver Avg Bandwidth (minimum):	300 Hz – 30 kHz to 150 kHz 30 kHz – 150 kHz to 30 MHz 300 kHz - 30 MHz to 960 MHz
Detector Function:	Peak, Quasi-Peak & Average

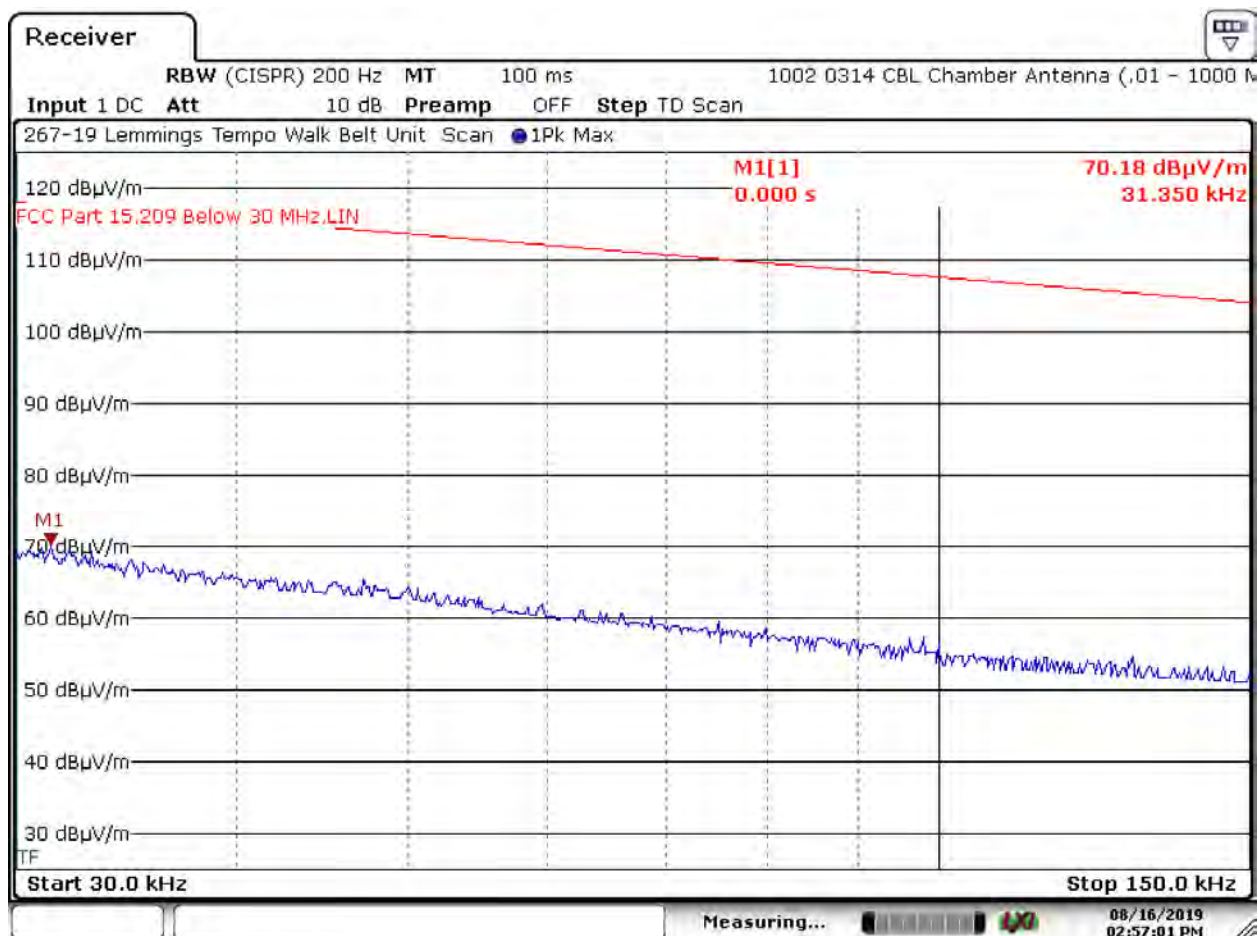
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209, continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.1 Parallel Measurement Antenna – 30 to 150 kHz – Channel 5 16M PRF



Date: 16.AUG.2019 14:57:00

Note: All other channels and PRF were noise floor

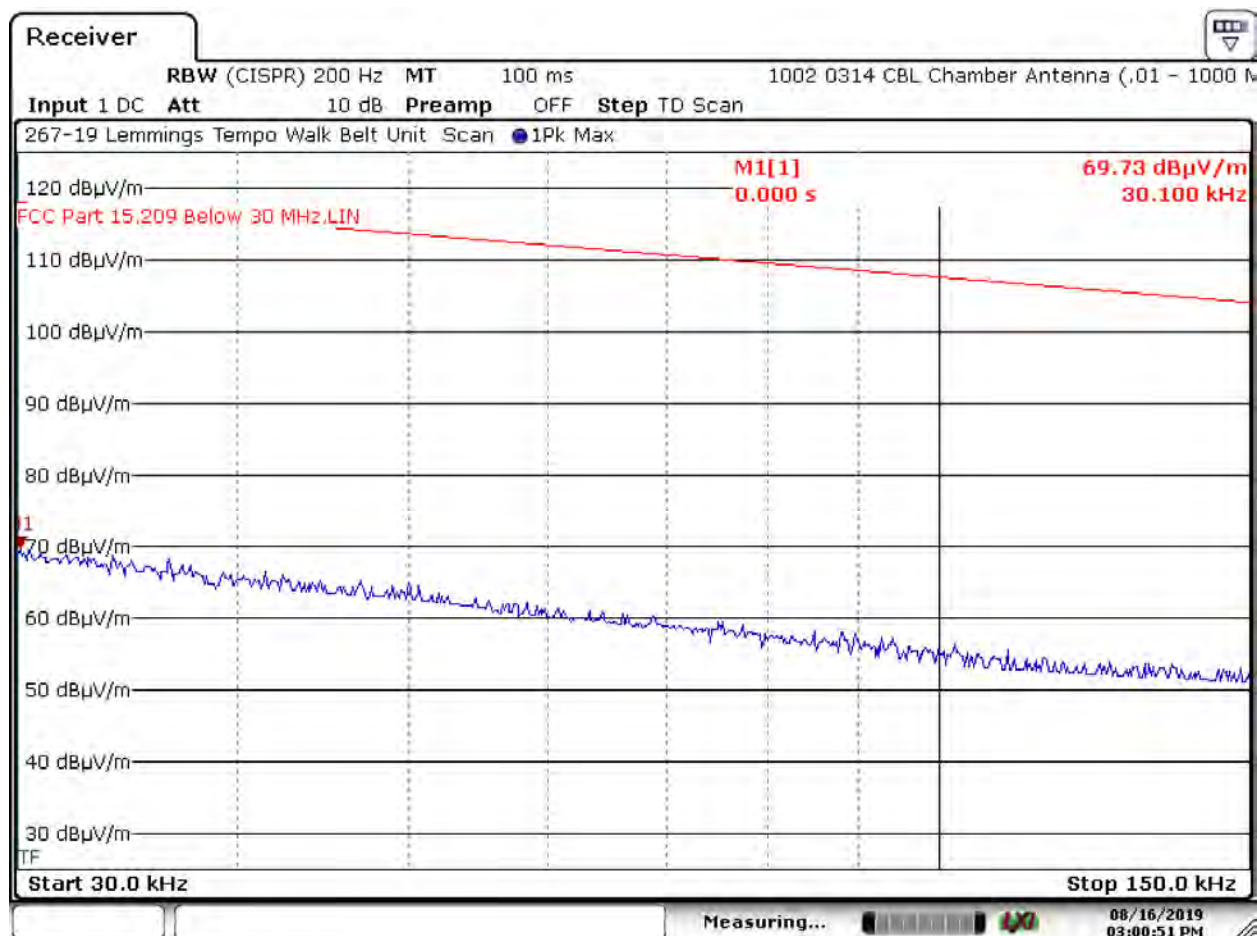
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.2 Perpendicular Measurement Antenna – 30 to 150 kHz – Channel 5 16M



Date: 16.AUG.2019 15:00:50

Note: All other channels and PRF were noise floor

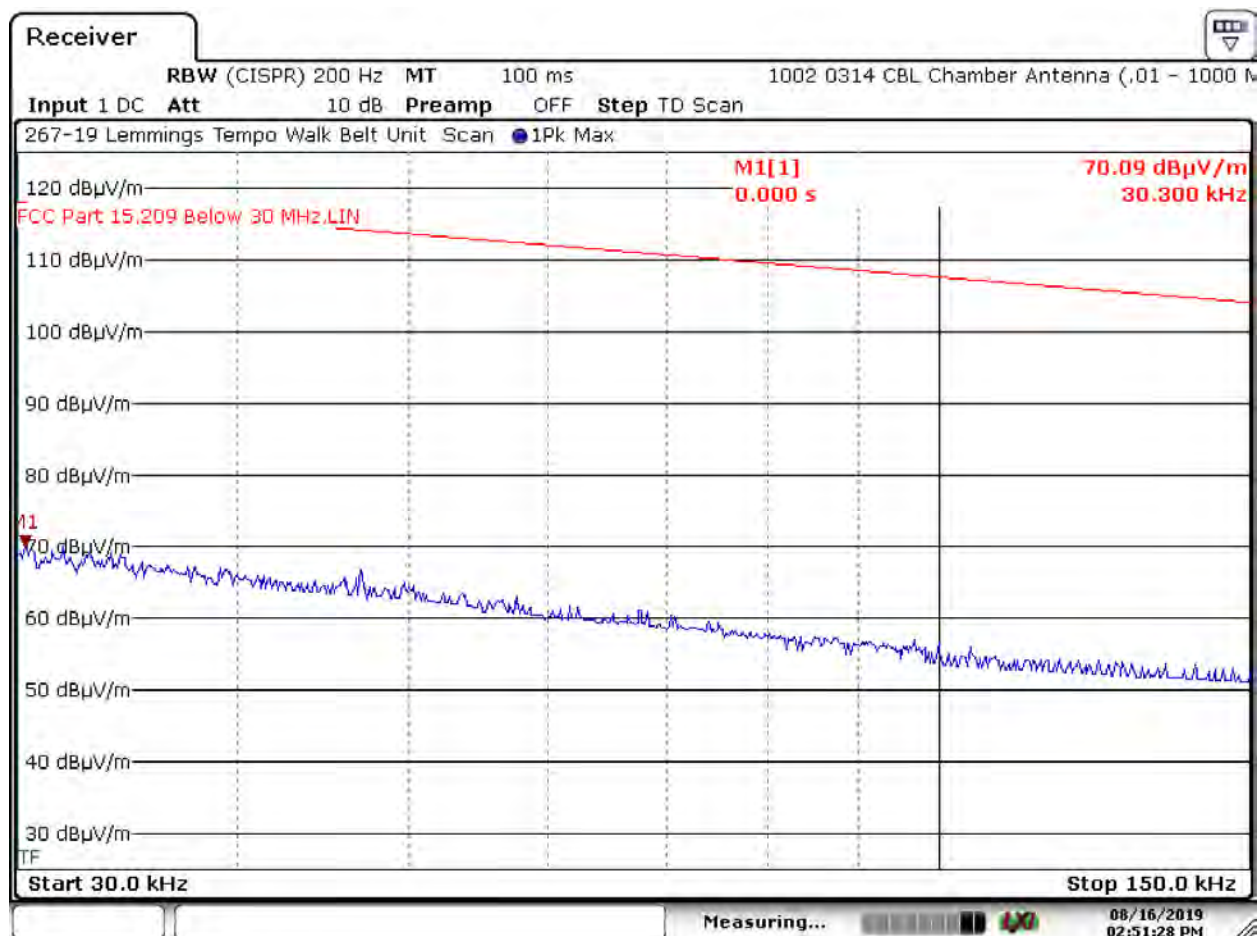
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.3 Ground Parallel Measurement Antenna – 30 to 150 kHz – Channel 5 16M



Date: 16.AUG.2019 14:51:27

Note: All other axes and PRF were noise floor

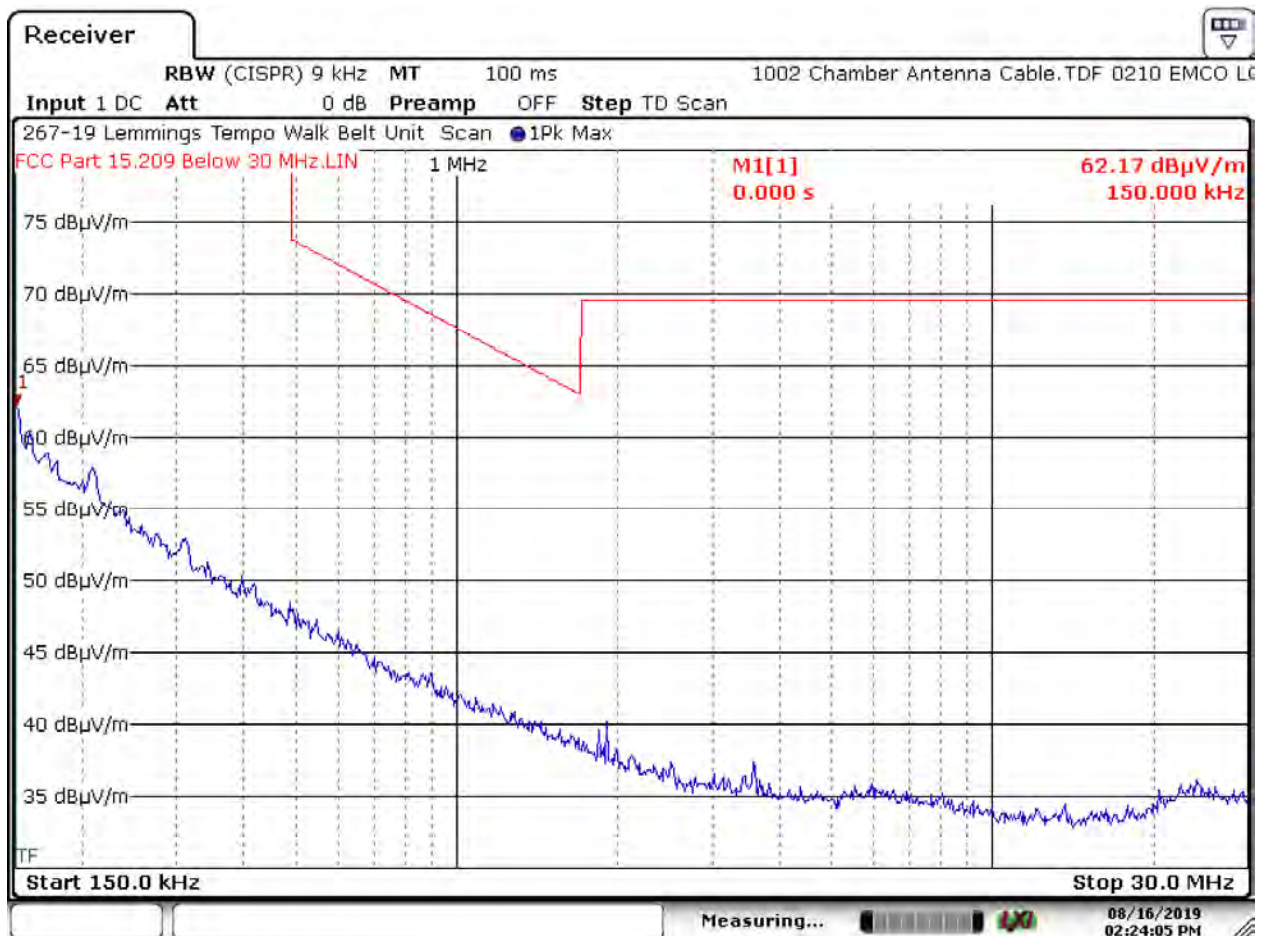
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.4 Parallel Measurement Antenna – 150 kHz to 30 MHz – Channel 5 16M



Date: 16.AUG.2019 14:24:06

Note: All other channels and PRF were noise floor

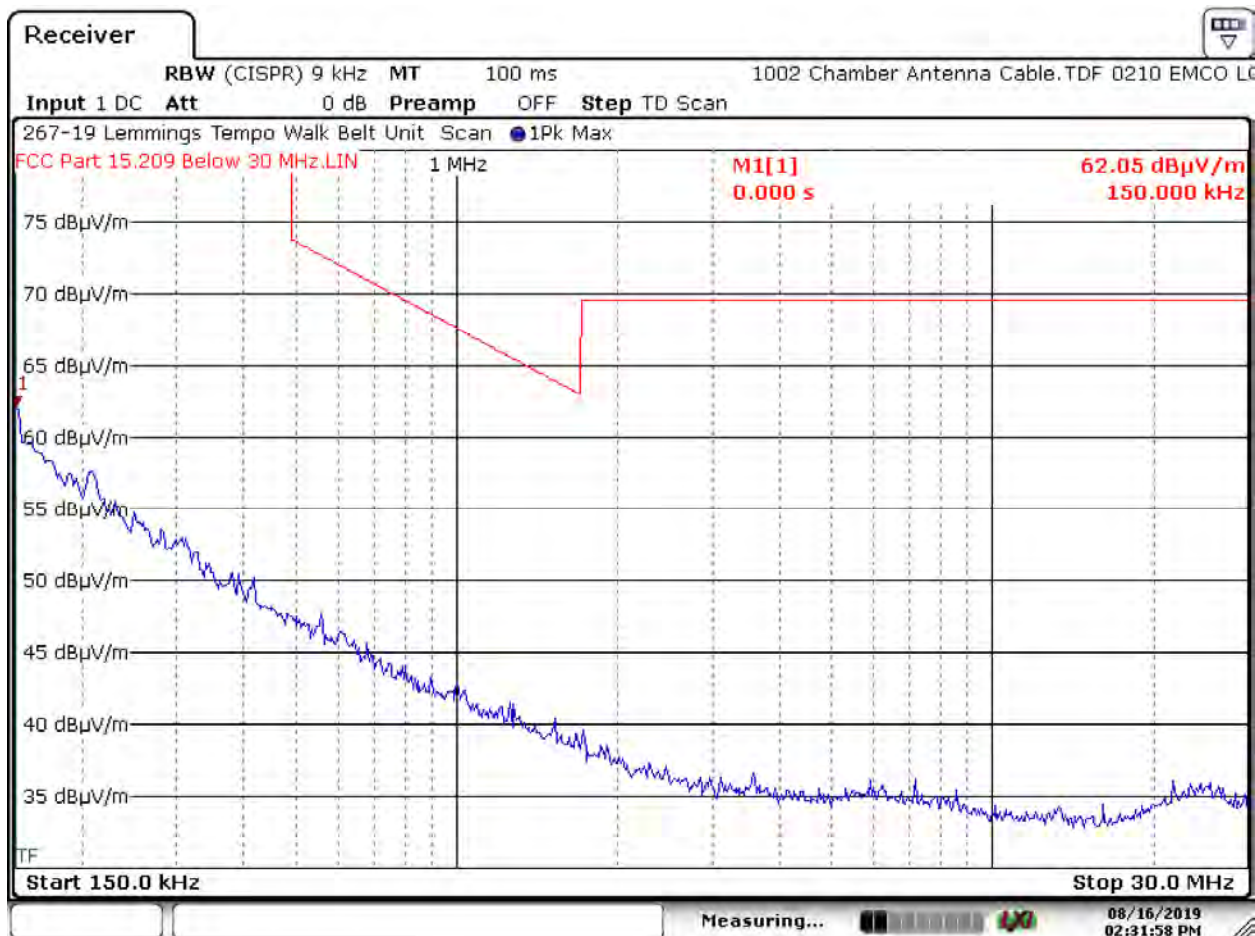
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.5 Perpendicular Measurement Antenna – 150 kHz to 30 MHz – Channel 5



Date: 16.AUG.2019 14:31:56

Note: All other channels and PRF were noise floor

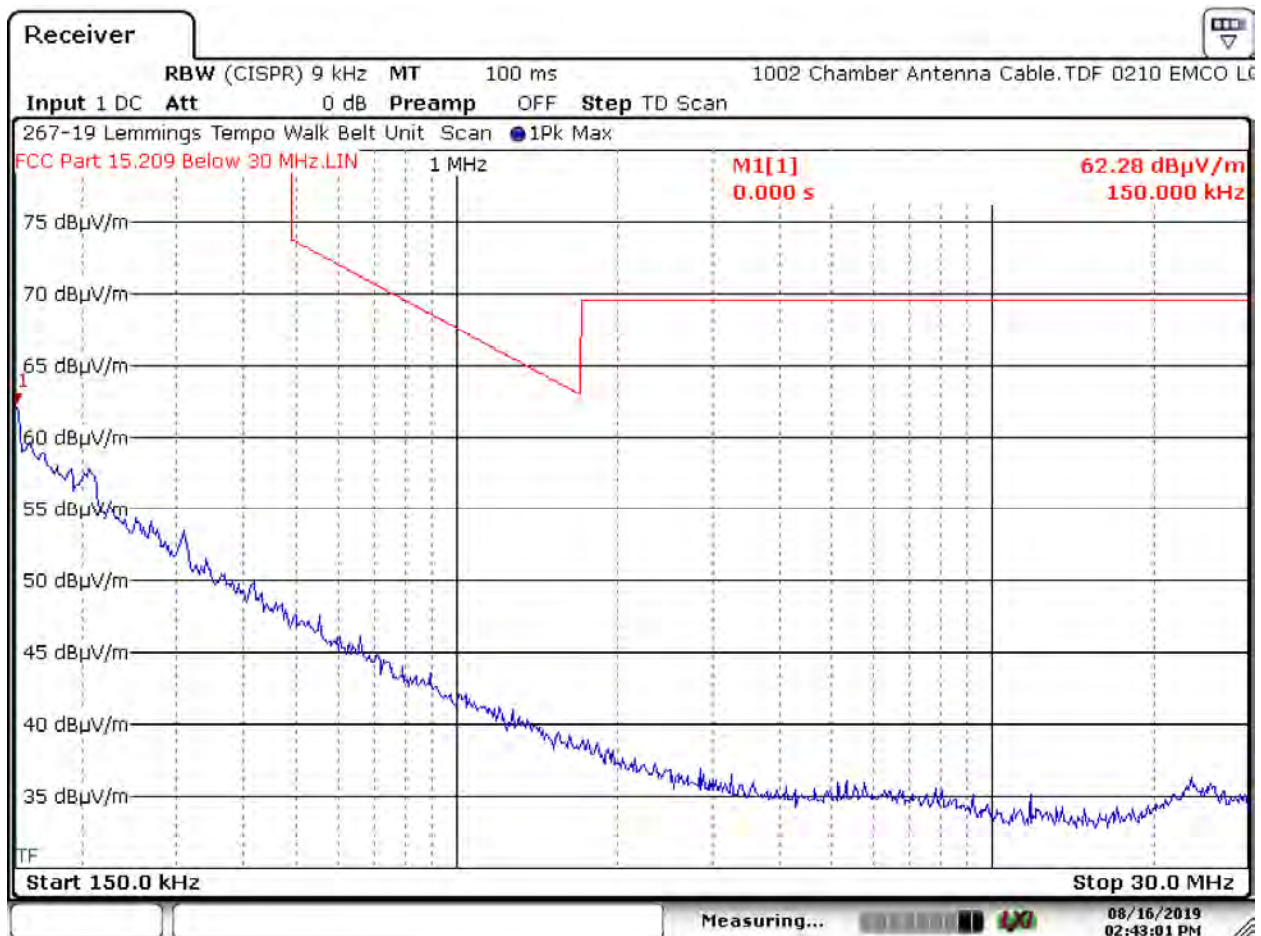
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.6 Ground Parallel Measurement Antenna – 150 kHz to 30 MHz – Channel 5



Date: 16.AUG.2019 14:42:59

Note: All other channels and PRF were noise floor

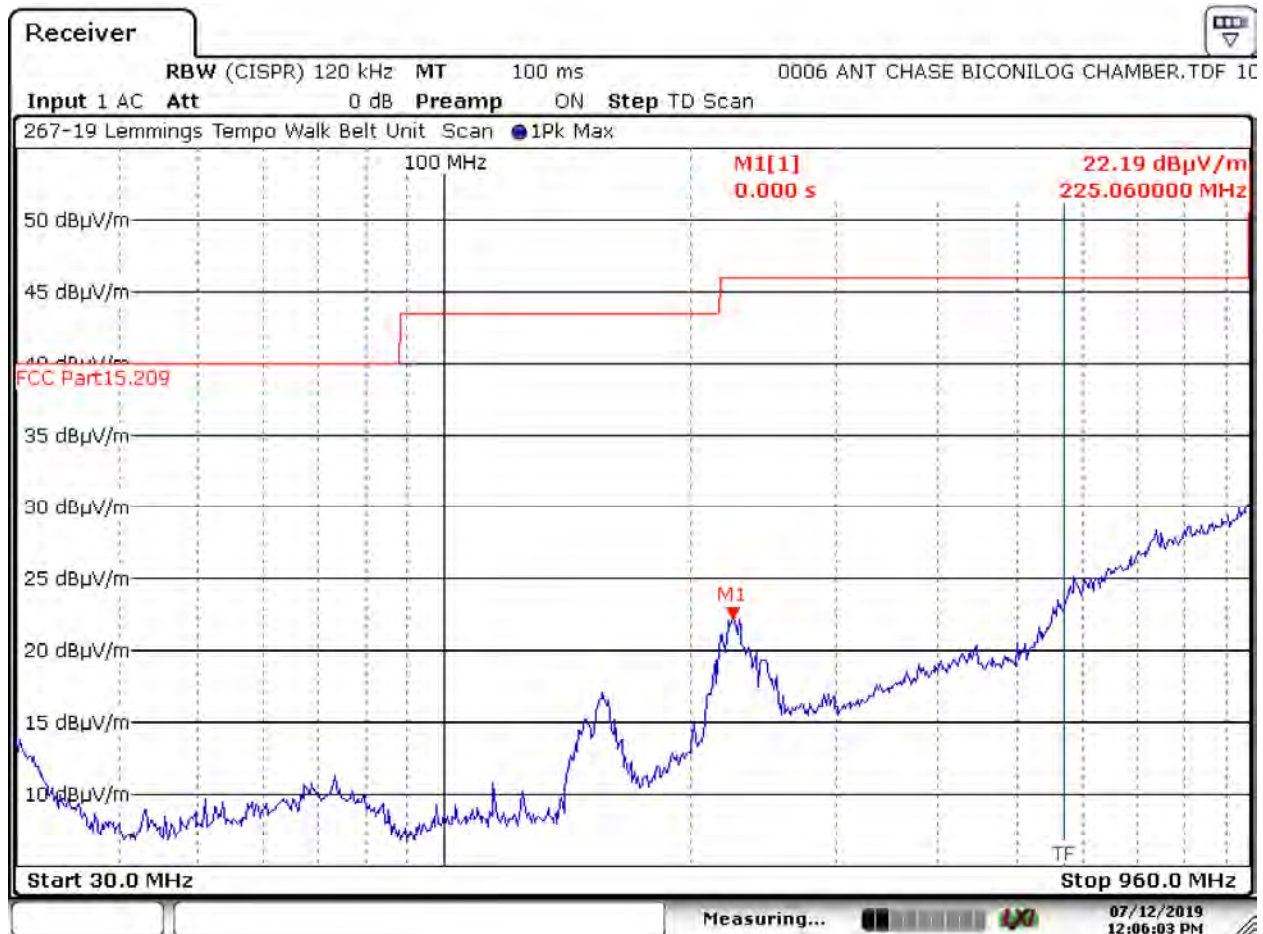
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.7 Horizontal Polarity – 30 to 960 MHz – Channel 4 – 16M PRF



Date: 12.JUL.2019 12:06:02

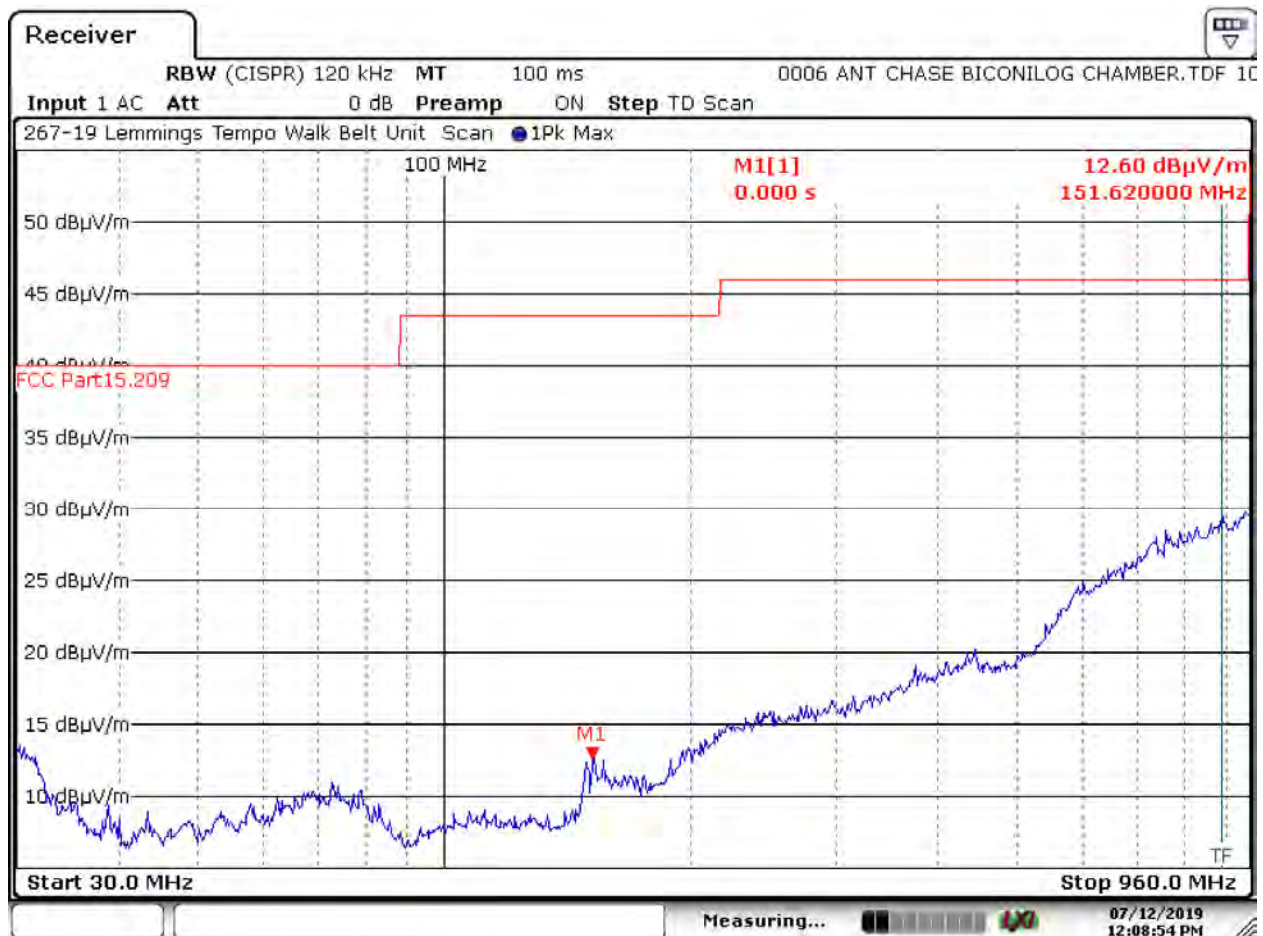
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.8 Vertical Polarity – 30 to 960 MHz – Channel 4 – 16M PRF



Date: 12.JUL.2019 12:08:53

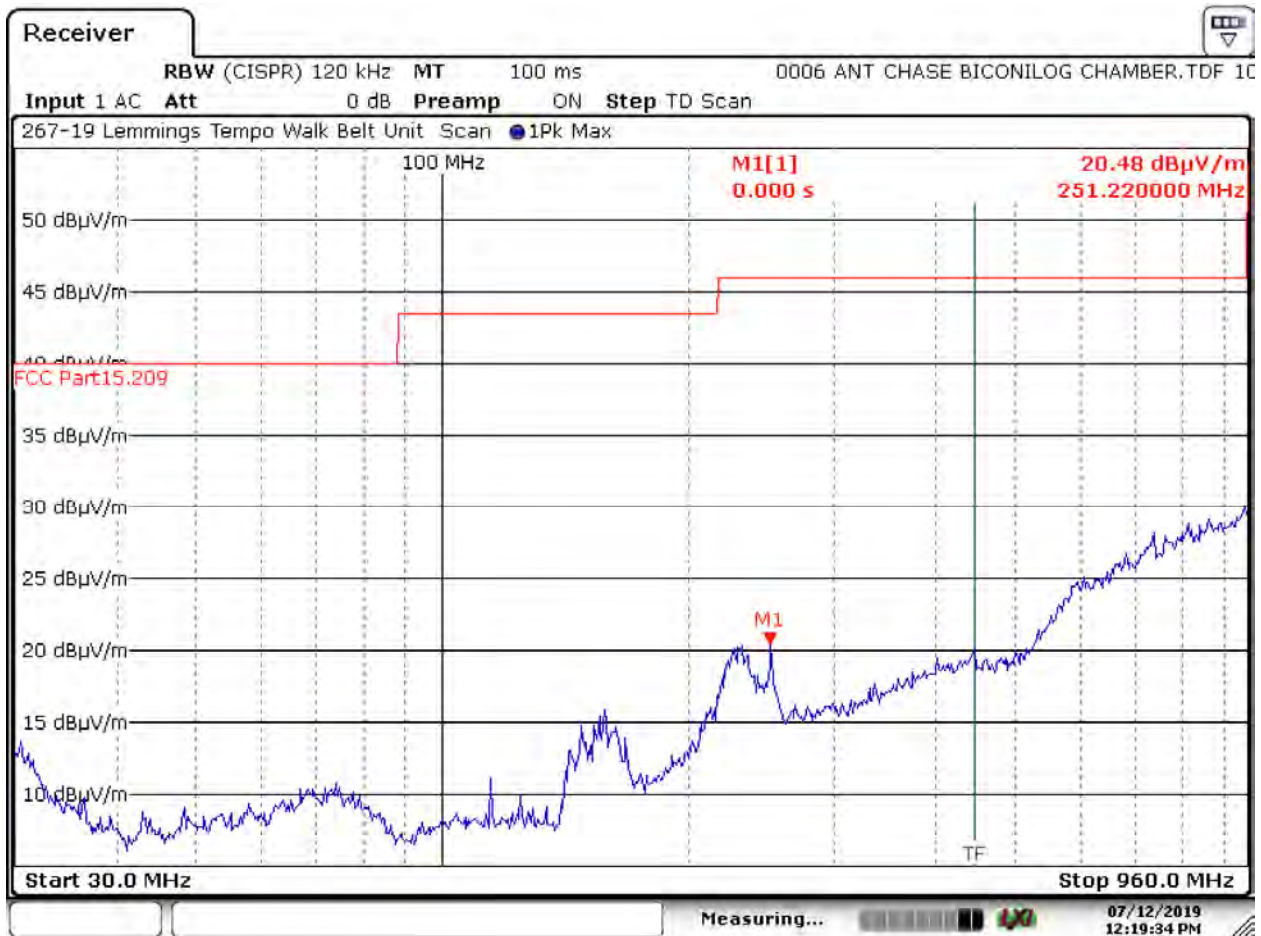
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.9 Horizontal Polarity – 30 to 960 MHz – Channel 4 – 64M PRF



Date: 12.JUL.2019 12:19:33

6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.10 Vertical Polarity – 30 to 960 MHz – Channel 4 - 64M PRF



Date: 12.JUL.2019 12:16:42

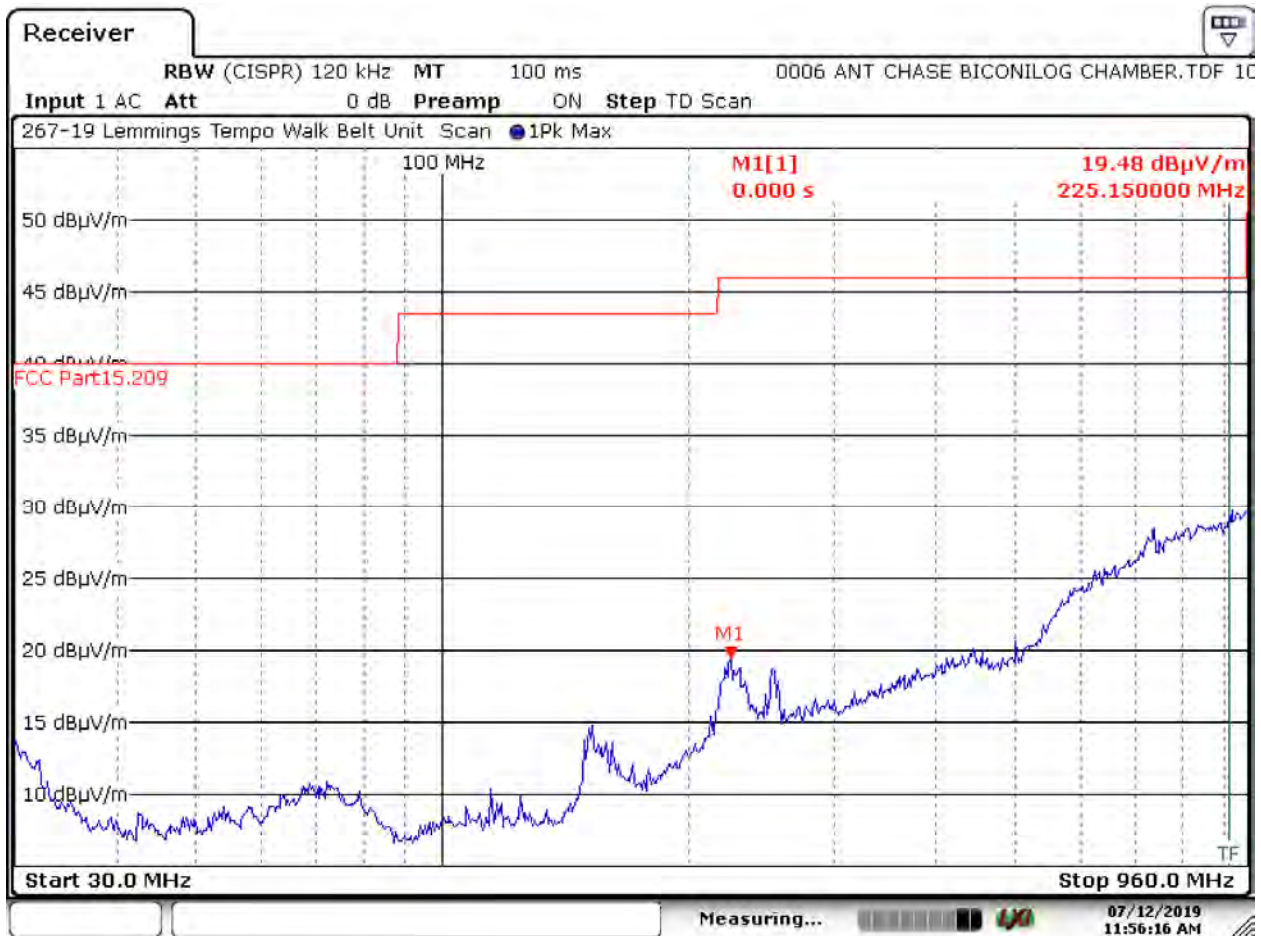
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.11 Horizontal Polarity – 30 to 960 MHz – Channel 5 – 16M PRF



Date: 12.JUL.2019 11:56:14

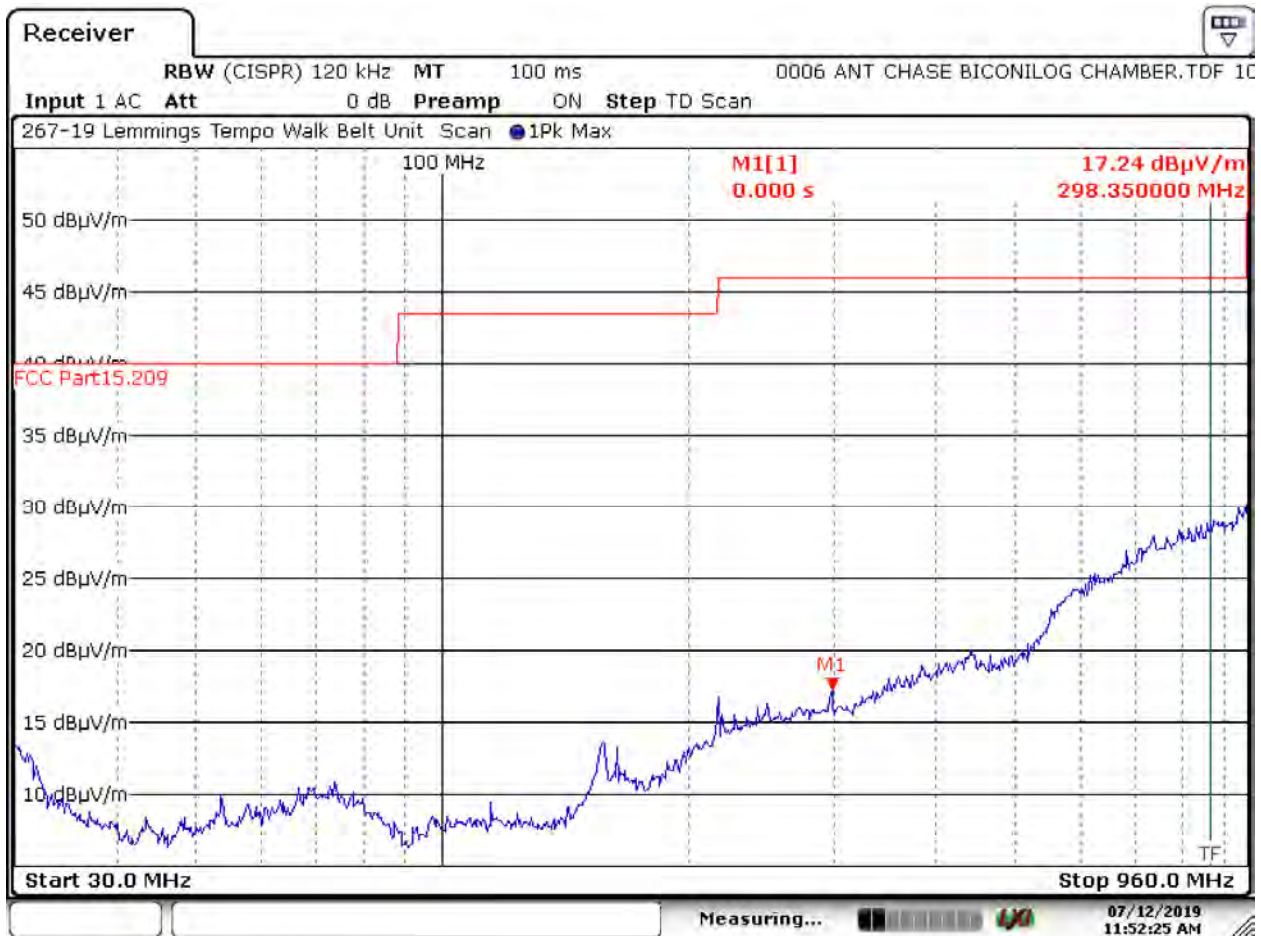
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.12 Vertical Polarity – 30 to 960 MHz – Channel 5 – 16M PRF



Date: 12.JUL.2019 11:52:24

6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.13 Horizontal Polarity – 30 to 960 MHz – Channel 5 – 64M PRF



Date: 12.JUL.2019 11:02:31

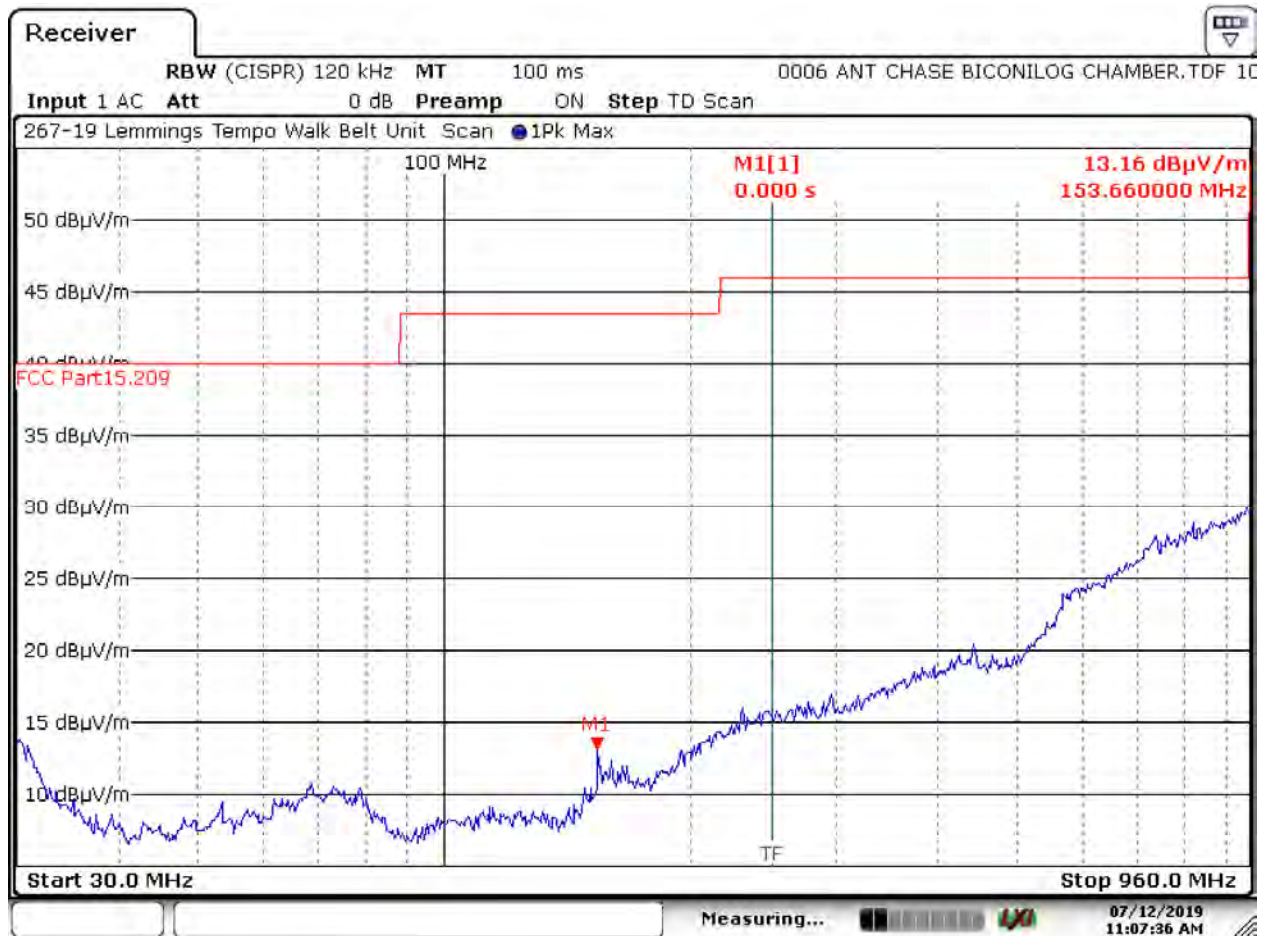
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 10 kHz to 960 MHz, measured at 3 Meters

The device was prescreened in our 3 Meter Semi-Anechoic Chamber. There were no measurable emissions below 960 MHz on our 3 Meter OATS.

6.4.1.14 Vertical Polarity – 30 to 960 MHz – Channel 5 – 64M PRF



Date: 12.JUL.2019 11:07:34

6. Measurement Data (continued)

6.5. Spurious Radiated Emissions above 960 MHz (15.519 (c), 15.521 (d))

Requirement: The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz: The RMS average measurement is based on the use of a spectrum analyzer with a resolution bandwidth of 1 MHz, an RMS detector, and a 1 millisecond or less averaging time.

The EIRP in terms of dBm, can be converted to a field strength, in dB μ V/m at 3 Meters by adding 95.2.

Frequency (MHz)	EIRP (dBm)	EIRP at 3 Meters (dBμV/m)
960 - 1610	-75.3	19.9
1610 - 1990	-63.3	31.9
1990 - 3100	-61.3	33.9
3100 - 10600	-41.3	53.9
Above 10600	-61.3	33.9

Frequency Range:	960 MHz to 40 GHz
Measurement Distance:	1 Meter and 0.3 Meter
EMI Receiver IF Bandwidth:	1 MHz
EMI Receiver Avg Bandwidth	10 MHz
Detector Function:	RMS 1 mS Average as defined in 15.521(d)

Notes: Measurements made from 960 MHz to 18 GHz were made in a semi-anechoic chamber at 1 Meter using a -9.54 dB distance offset was programmed into the spectrum analyzer.

Measurements made from 8 to 18 GHz were done with the aid of a High Pass Filter before the low noise amplifier.

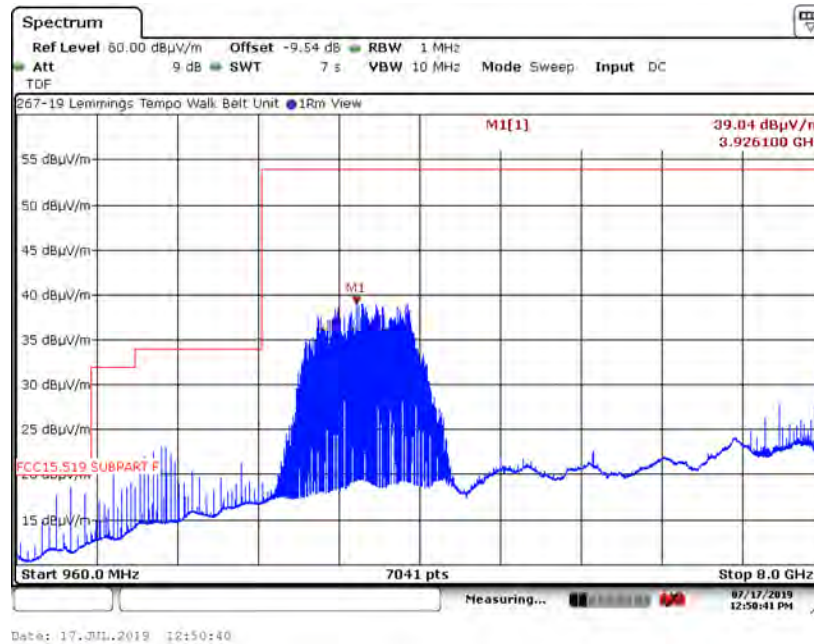
Measurements made from 18 to 40 GHz were done at 0.3 meters and a -20.00 dB distance offset was programmed into the spectrum analyzer.

Plots in 6.5.11 and 6.5.12 shows the range of 960 to 8000 MHz with digital signals with No UWB Transmission.

6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.1. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH4 16M



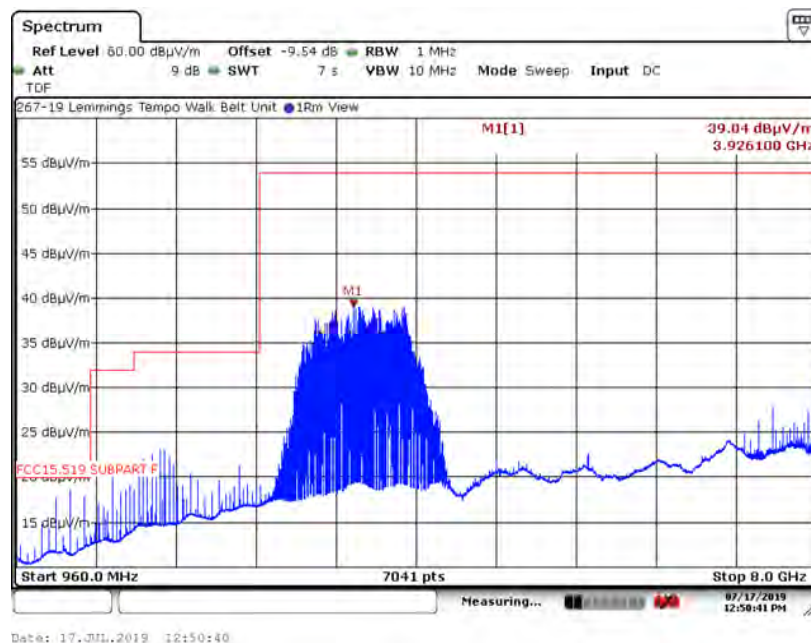
6.5.2. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH4 16M



6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.3. 8 to 18 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH4 16M



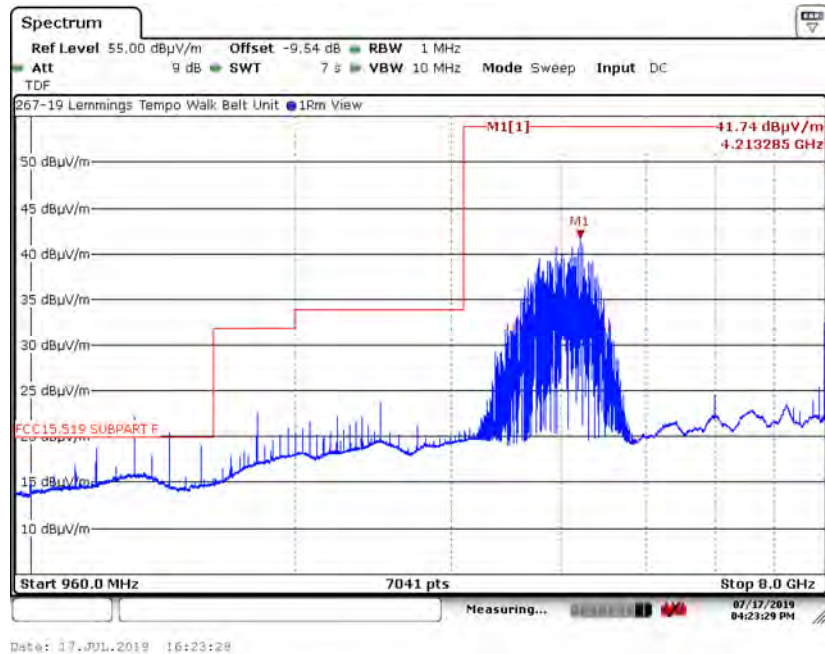
6.5.4. 8 to 18 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH4 16M



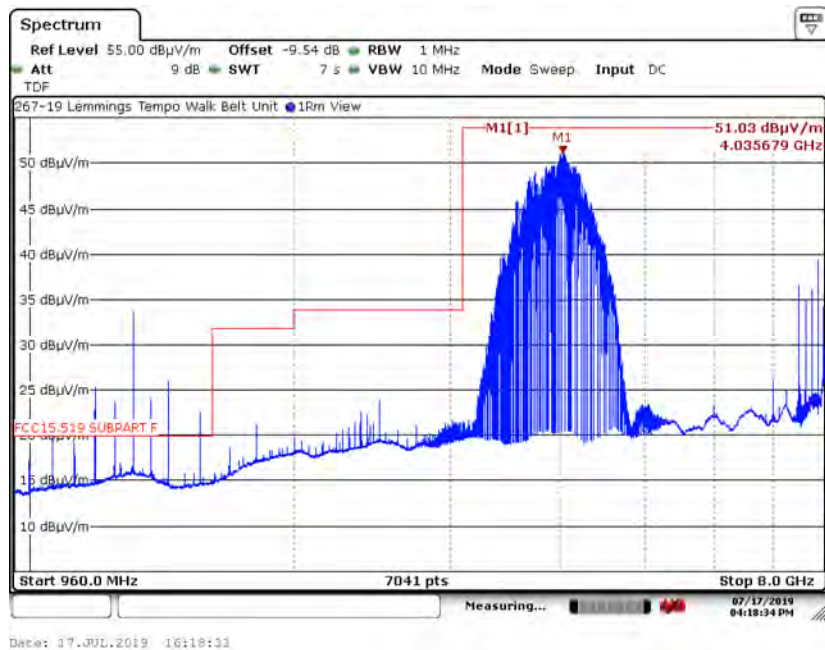
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.5. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH4 64M



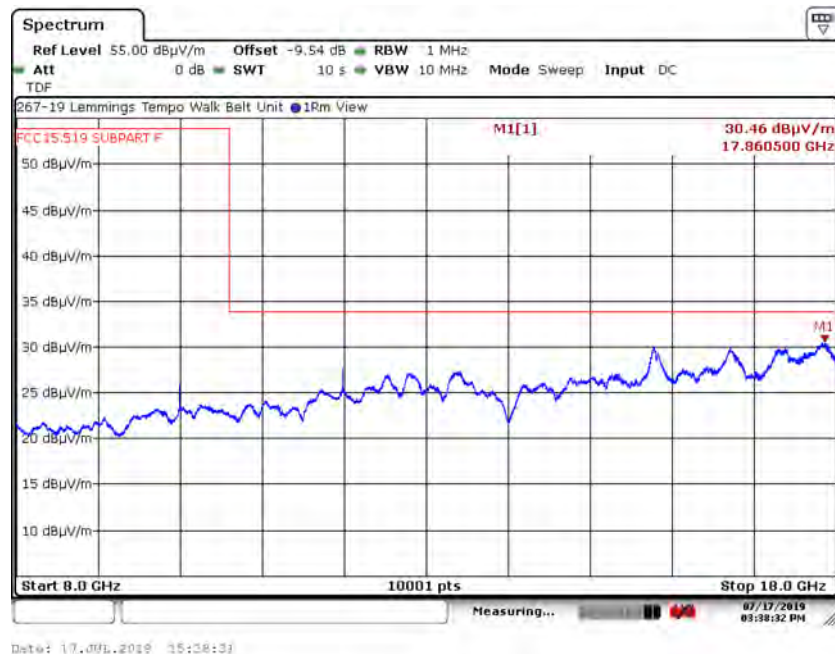
6.5.6. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH4 64M



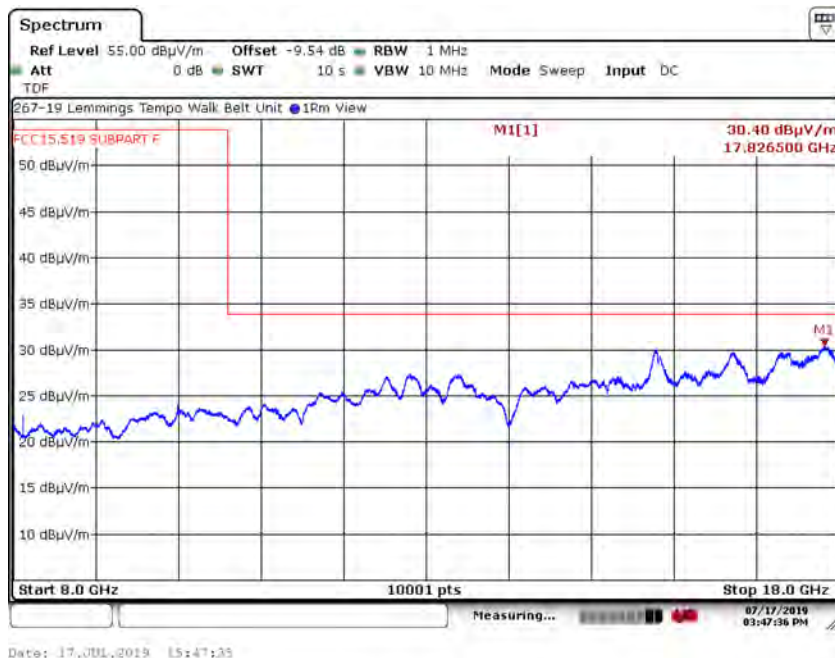
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.7. 8 to 18 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH4 64M



6.5.8. 8 to 18 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH4 64M



6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.9. 18 to 40 GHz Horizontal at 0.3 Meter, -20.00 dB offset in analyzer CH4 64M



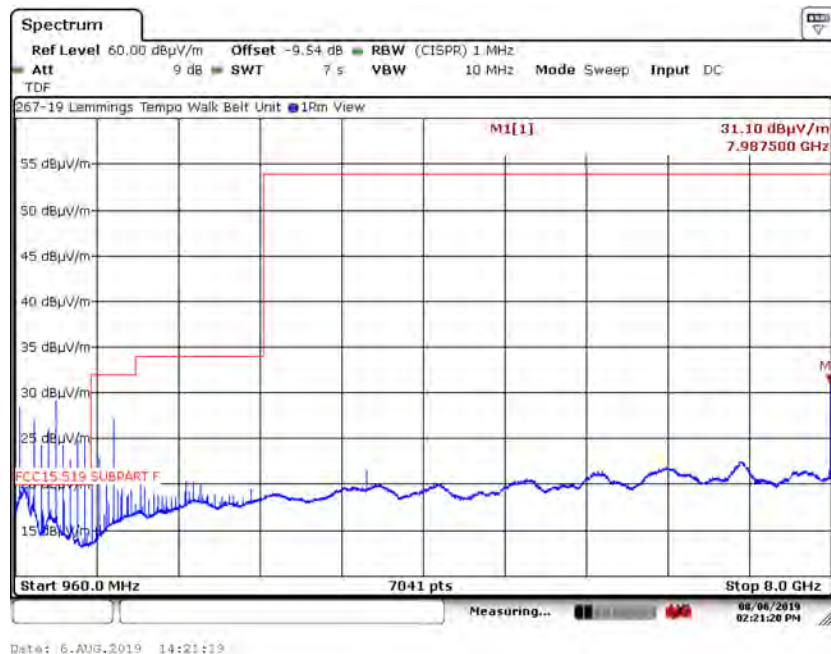
6.5.10. 18 to 40 GHz Vertical at 0.3 Meter, -20.00 dB offset in analyzer CH4 64M



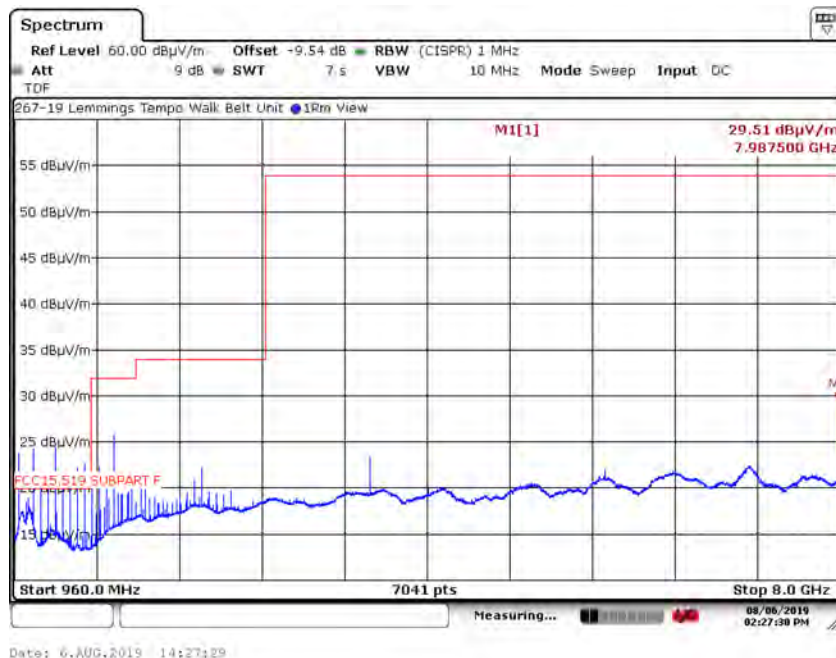
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.11. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer No Tx



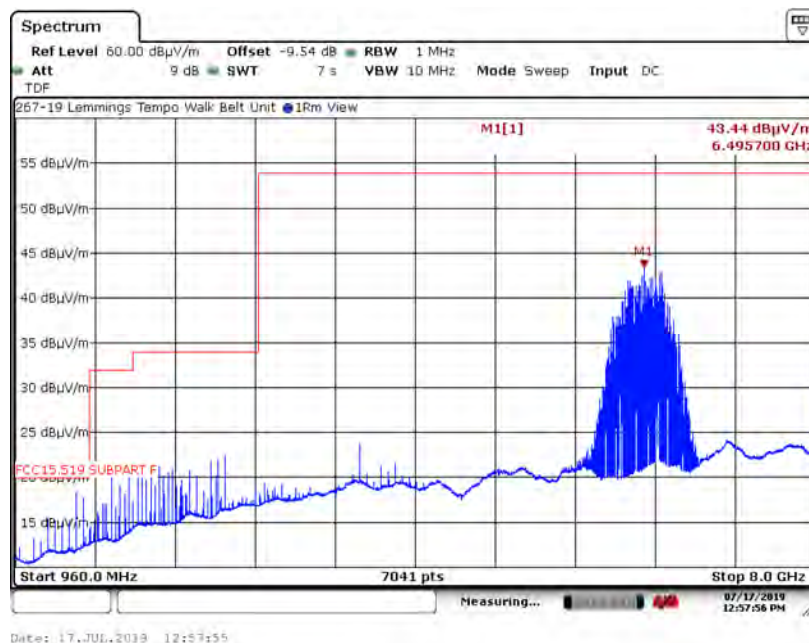
6.5.12. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer No Tx



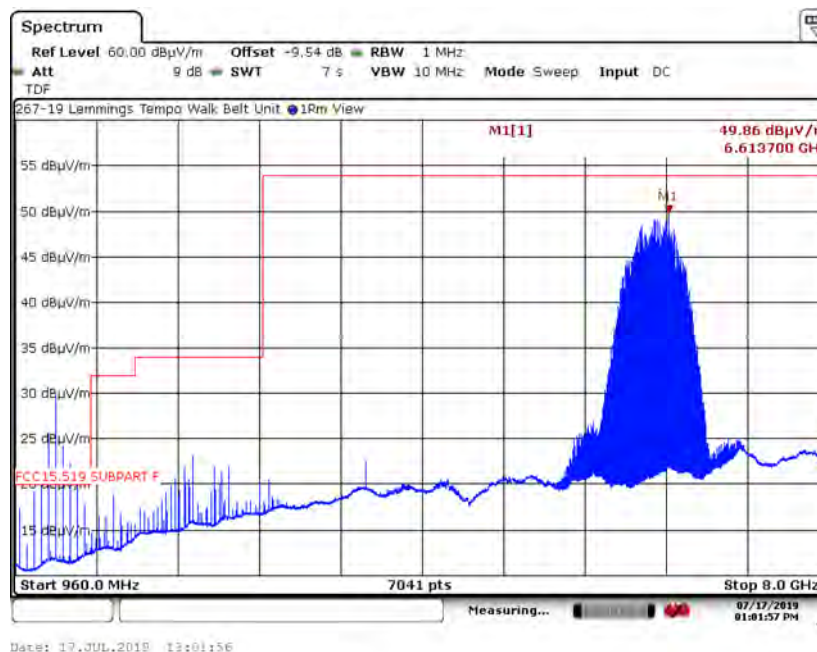
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.13. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH5 16M



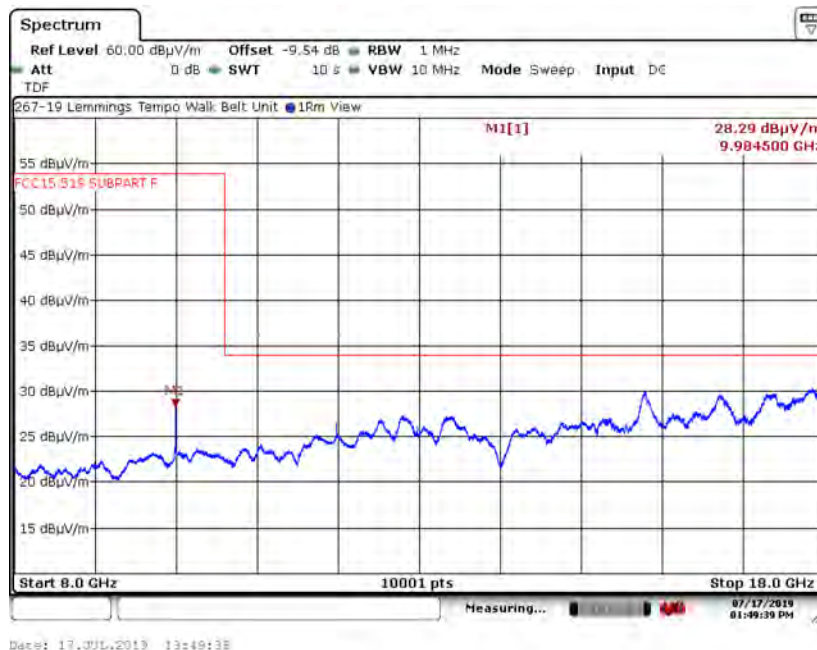
6.5.14. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH5 16M



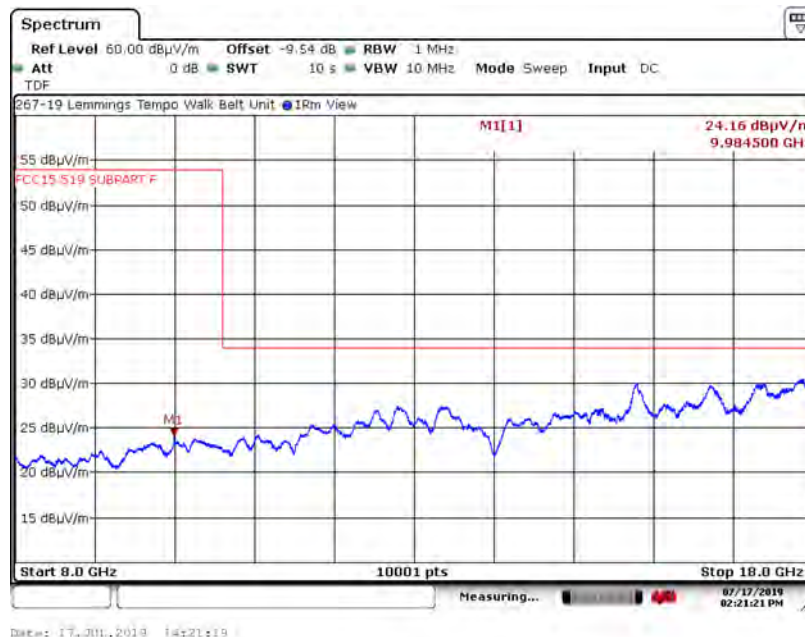
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.15. 8 to 18 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH5 16M



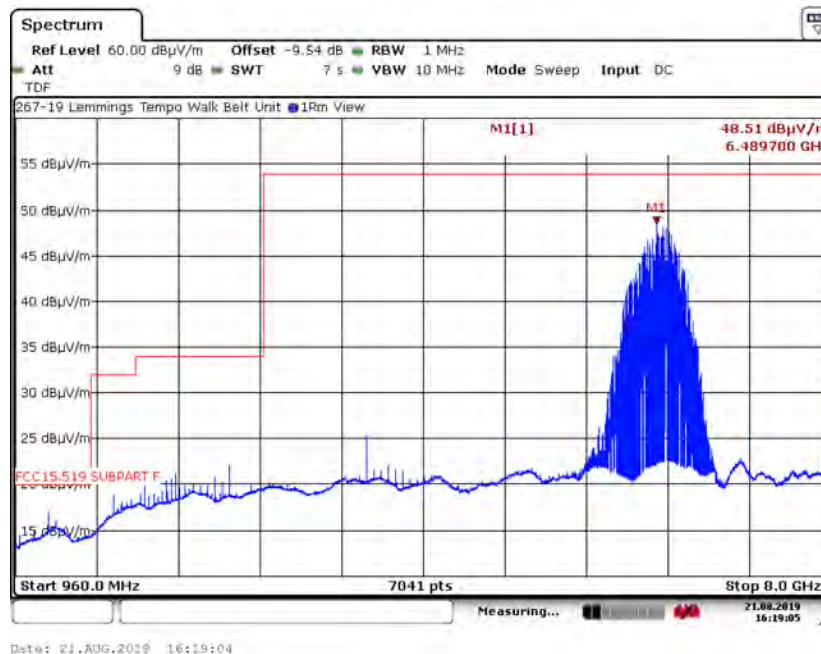
6.5.16. 8 to 18 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH 5 16M



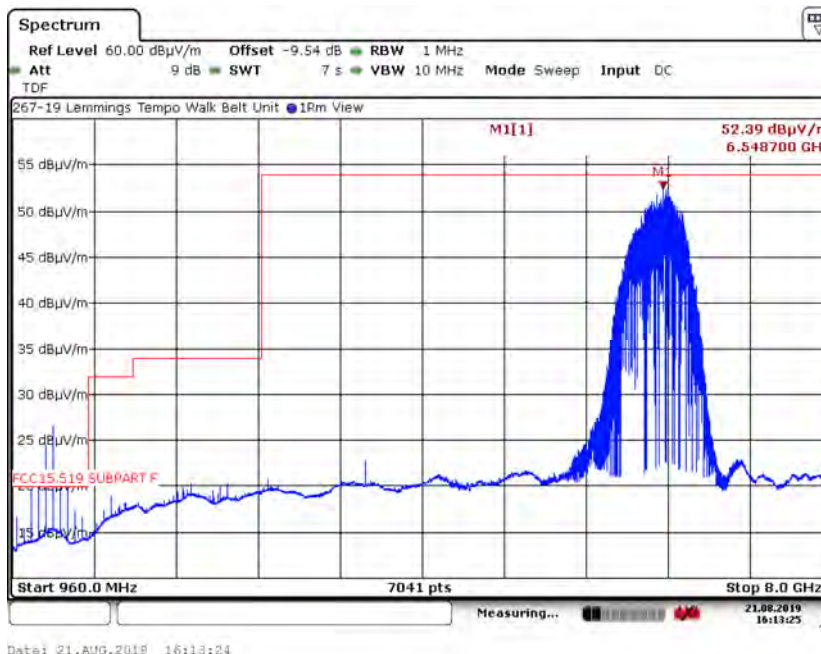
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.17. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH5 64M



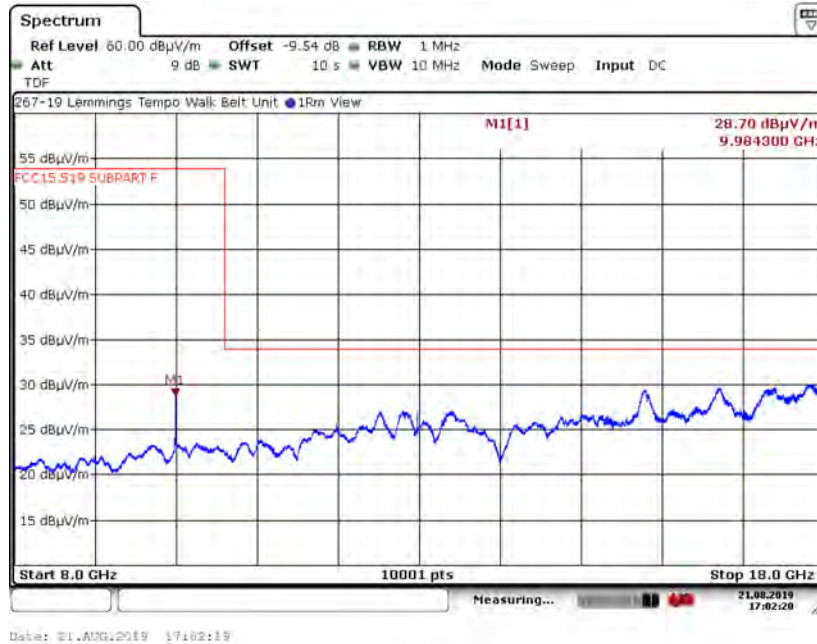
6.5.18. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH5 64M



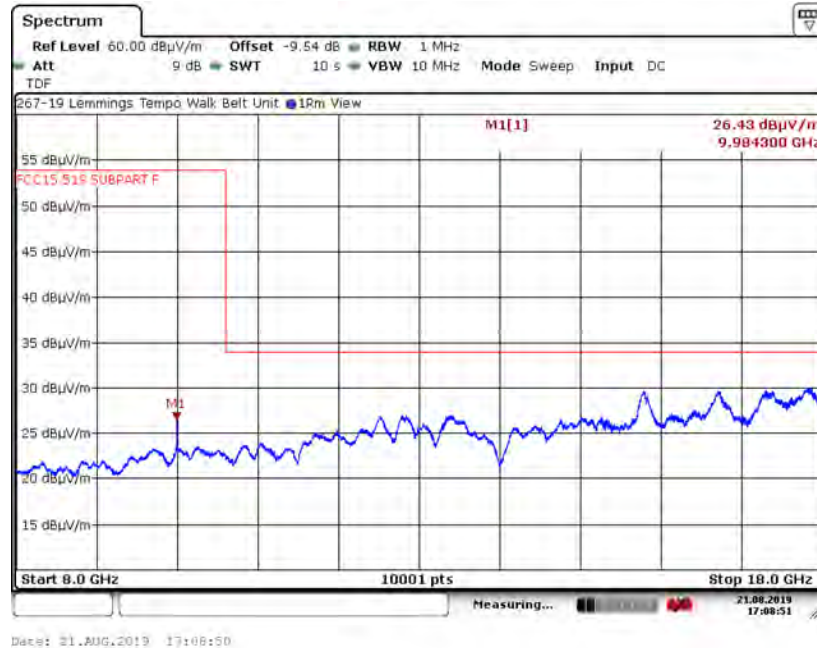
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.19. 8 to 18 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH5 64M



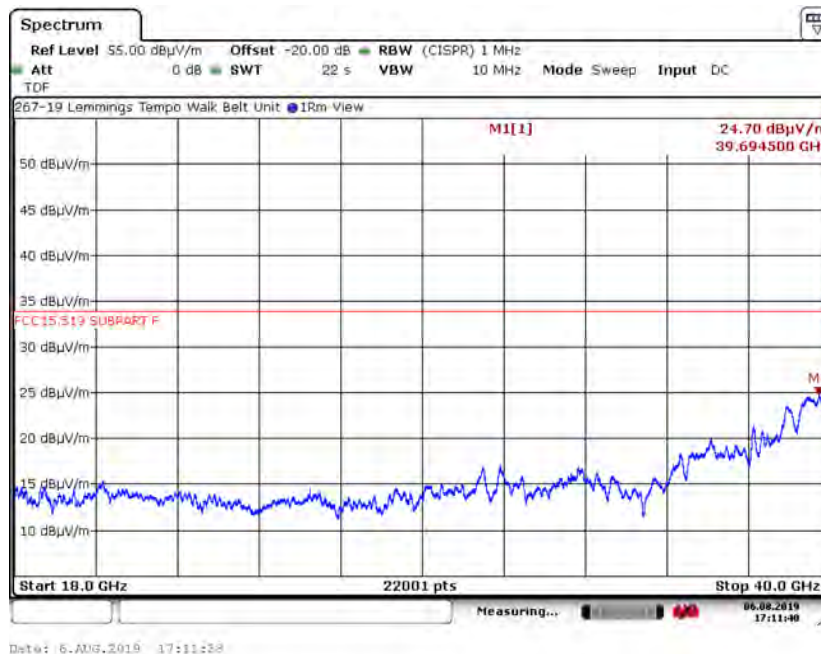
6.5.20. 8 to 18 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH5 64M



6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.21. 18 to 40 GHz Horizontal at 0.3 Meter, -20.00 dB offset in analyzer CH5 64M



6.5.22. 18 to 40 GHz Vertical at 0.3 Meter, -20.00 dB offset in analyzer CH5 64M



6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (RSS-220 5.3.1 (d) continued)

Requirement: The radiated emissions at or below 960 MHz from a device shall not exceed the limits in Section 3.4. The radiated emissions above 960 MHz from a device shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

The RMS average measurement is based on the use of a spectrum analyzer with a resolution bandwidth of 1 MHz, an RMS detector, and a 1 millisecond or less averaging time.

The EIRP in terms of dBm, can be converted to a field strength, in dB μ V/m at 3 Meters by adding 95.2.

Frequency (MHz)	EIRP (dBm)	EIRP at 3 Meters (dBμV/m)
960 - 1610	-75.3	19.9
1610 – 4750	-70.0	25.2
4750 – 10,600	-41.3	53.9
Above 10,600	-61.3	33.9

Frequency Range:	960 MHz to 8 GHz
Measurement Distance:	1 Meter
EMI Receiver IF Bandwidth:	1 MHz
EMI Receiver Avg Bandwidth	10 MHz
Detector Function:	RMS 1 mS Average as defined in Annex Section 4(b)

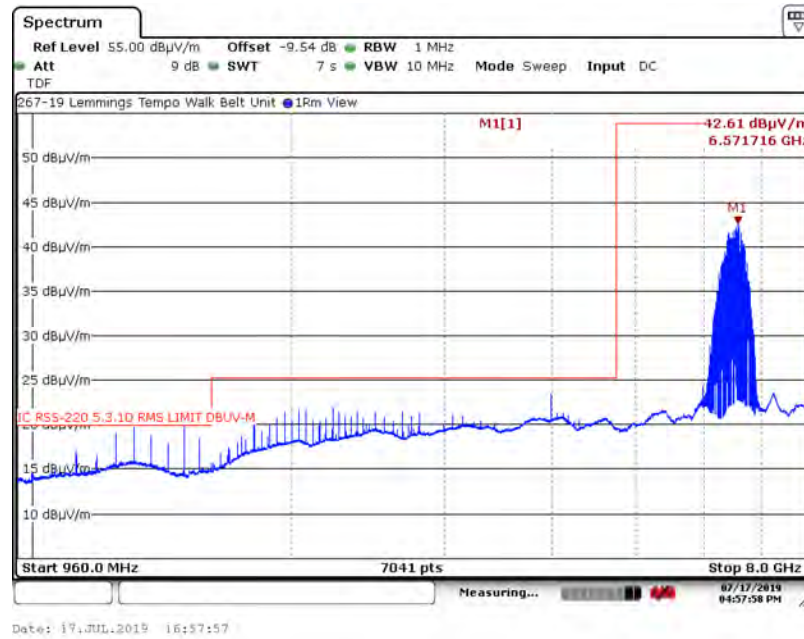
Notes: Measurements made from 960 MHz to 8 GHz were made in a semi-anechoic chamber at 1 Meter using a -9.54 dB distance offset was programmed into the spectrum analyzer.

Measurement data above 8 GHz for Channel 5 is provided in plots 6.5.16 to 6.5.17 & 6.5.19 to 6.5.22 on the previous pages.

6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (RSS-220 5.3.1 (d)) continued)

6.5.23. 960 MHz to 8 GHz Horizontal at 1 Meter, CH5 16M



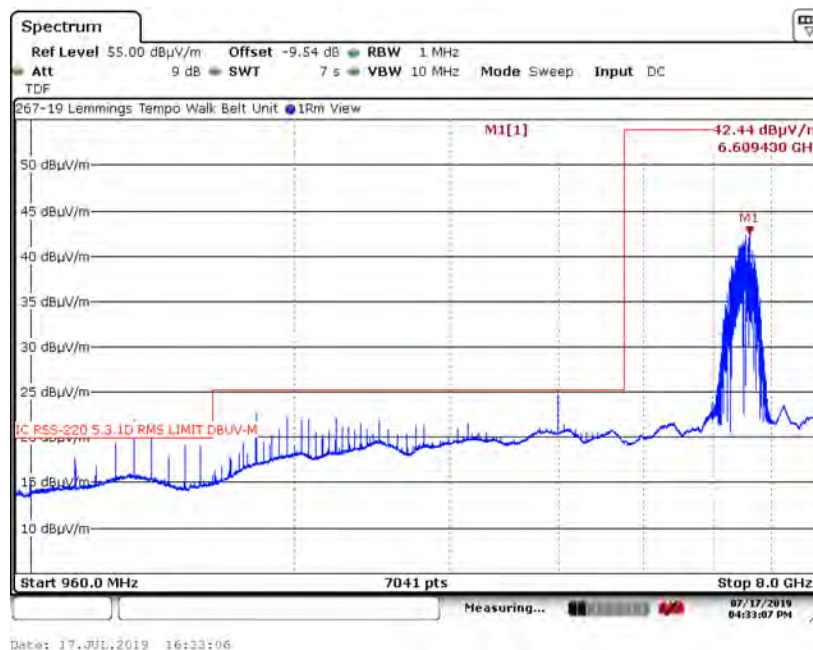
6.5.24. 960 MHz to 8 GHz Vertical at 1 Meter, CH5 16M



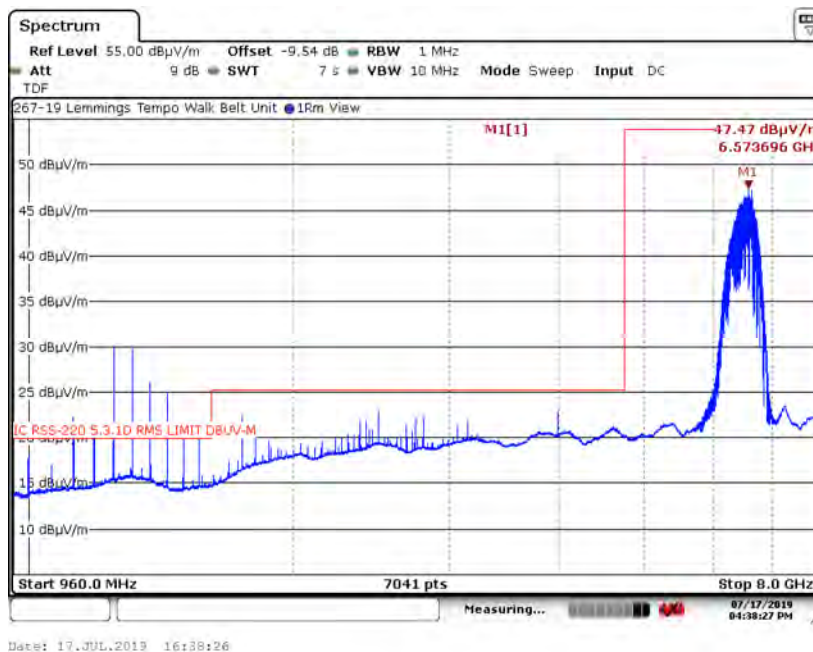
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (RSS-220 5.3.1 (d)) continued)

6.5.25. 960 MHz to 8 GHz Horizontal at 1 Meter, CH5 64M



6.5.26. 960 MHz to 8 GHz Vertical at 1 Meter, CH5 64M



6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.519 (d))

Requirement: In addition to the radiated emission limits specified in the table in paragraph (d) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency (MHz)	EIRP (dBm)	EIRP at 3 Meters (dBμV/m)
1164 - 1240	-85.3	9.9
1559 - 1610	-85.3	9.9

6.6.1. Measurement & Equipment Setup

EMI Receiver IF Bandwidth: 1 kHz
EMI Receiver Avg Bandwidth: 10 kHz
Detector Functions: RMS Average

6.6.2. 1164 to 1240 MHz & 1559 to 1610 MHz

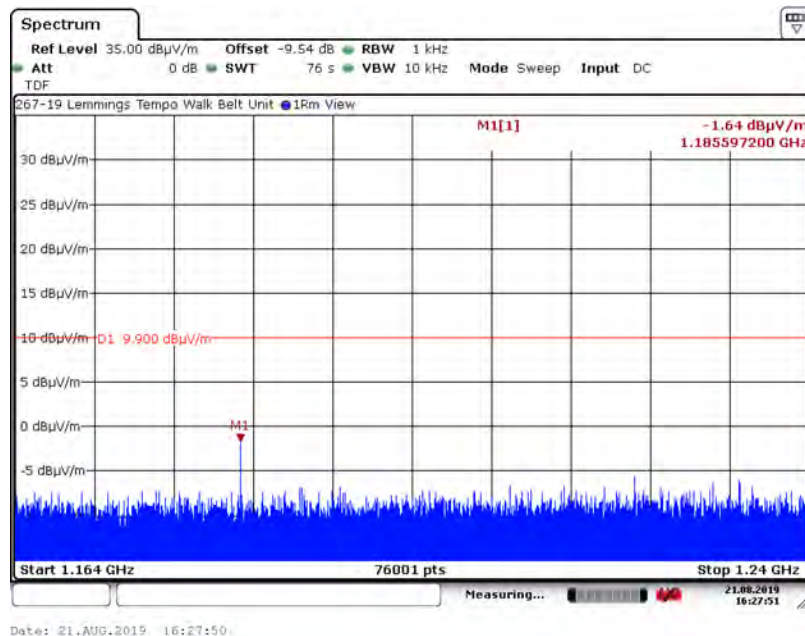
There were no broadband emissions related to the UWB transmitter. Measured signals were narrowband and related to the microprocessor / clocks and do not fall under the requirements of this section. Measurements were made at 1.0 Meter with a -9.54 dB distance correction factor. The -85.3 dBm limit was converted to a field strength limit of 9.9 dBuV/m using a factor of 95.2.

Note: Worst case data of all channels and axis.

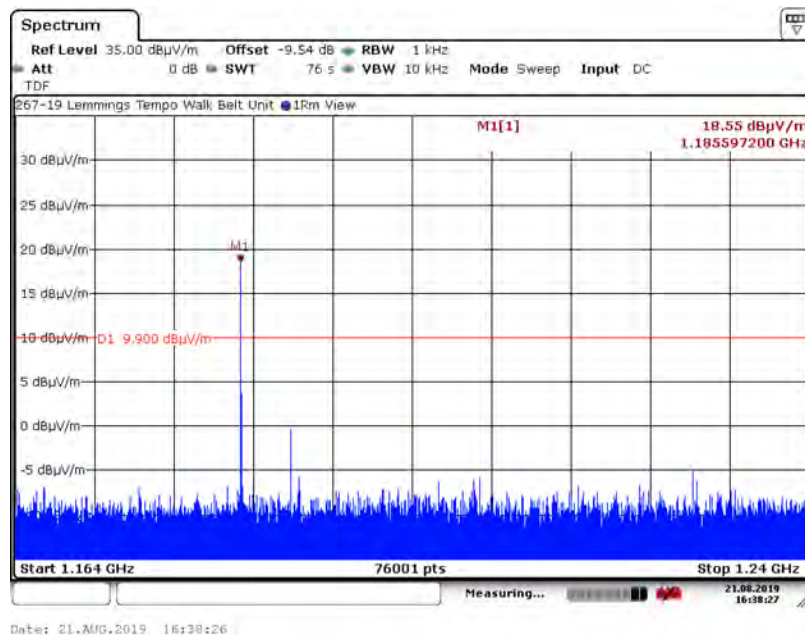
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.519 (d) continued)

6.6.3.1 Horizontal Measurement Polarity 1164 to 1240 MHz, CH5 64M PRF



6.6.3.2 Vertical Measurement Polarity 1164 to 1240 MHz, 16M PRF

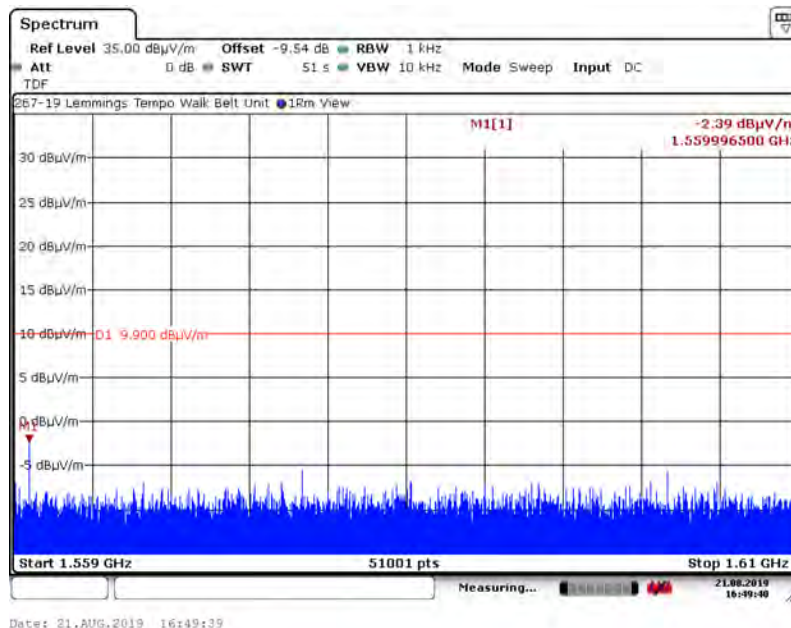


Note: NB Signals are related to digital circuitry as seen in 6.5.11 and 6.5.12

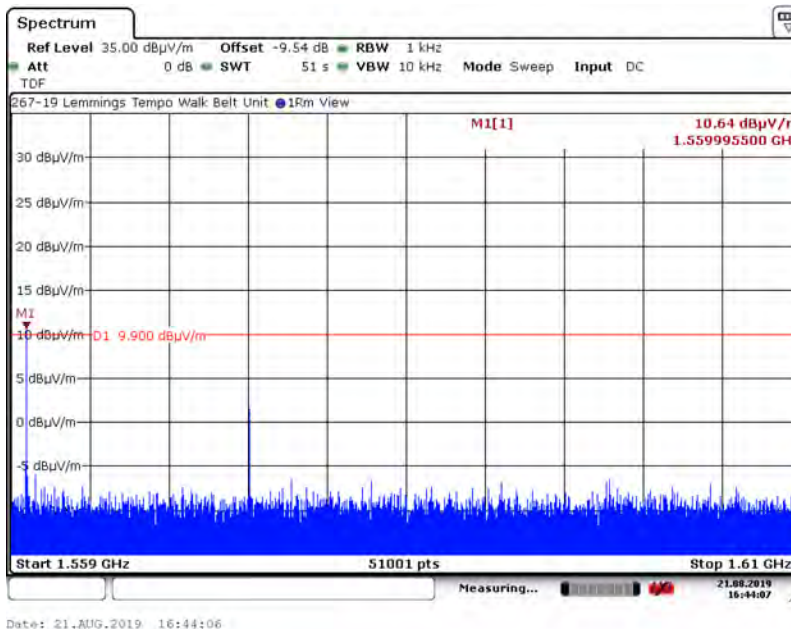
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.519 (d) continued)

6.6.3.3 Horizontal Measurement Polarity 1559 to 1610 MHz, CH5 64M PRF



6.6.3.4 Vertical Measurement Polarity 1559 to 1610 MHz, CH5 64M PRF



Note: NB Signals are related to digital circuitry as seen in 6.5.11 and 6.5.12

6. Measurement Data (continued)

6.7. Radiated Emissions of UWB Transmission (15.519 (c), 15.521 (d))

Requirement: The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

The RMS average measurement is based on the use of a spectrum analyzer with a resolution bandwidth of 1 MHz, an RMS detector, and a 1 millisecond or less averaging time.

The EIRP in terms of dBm, can be converted to a field strength, in dB μ V/m at 3 Meters by adding 95.2.

Frequency (MHz)	EIRP (dBm)	EIRP at 3 Meters (dB μ V/m)
3100 - 10600	-41.3	53.9

Frequency Range:	4 to 5 GHz, 6 to 7 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	1 MHz
EMI Receiver Avg Bandwidth	10 MHz
Detector Function:	RMS 1 mS Average as defined in 15.521(d)

6. Measurement Data (continued)

6.7. Spurious Radiated Emissions (15.519 (c), 15.521(d))

6.7.1. Plot of RMS Power at 3 Meters (Channel 4, 16M PRF)

Frequency (GHz)	Amplitude ¹	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBμV/m)	(dBμV/m)	(dB)	H/V	cm	Deg	
4.1729	53.80	53.90	-0.10	V	199	10	Compliant

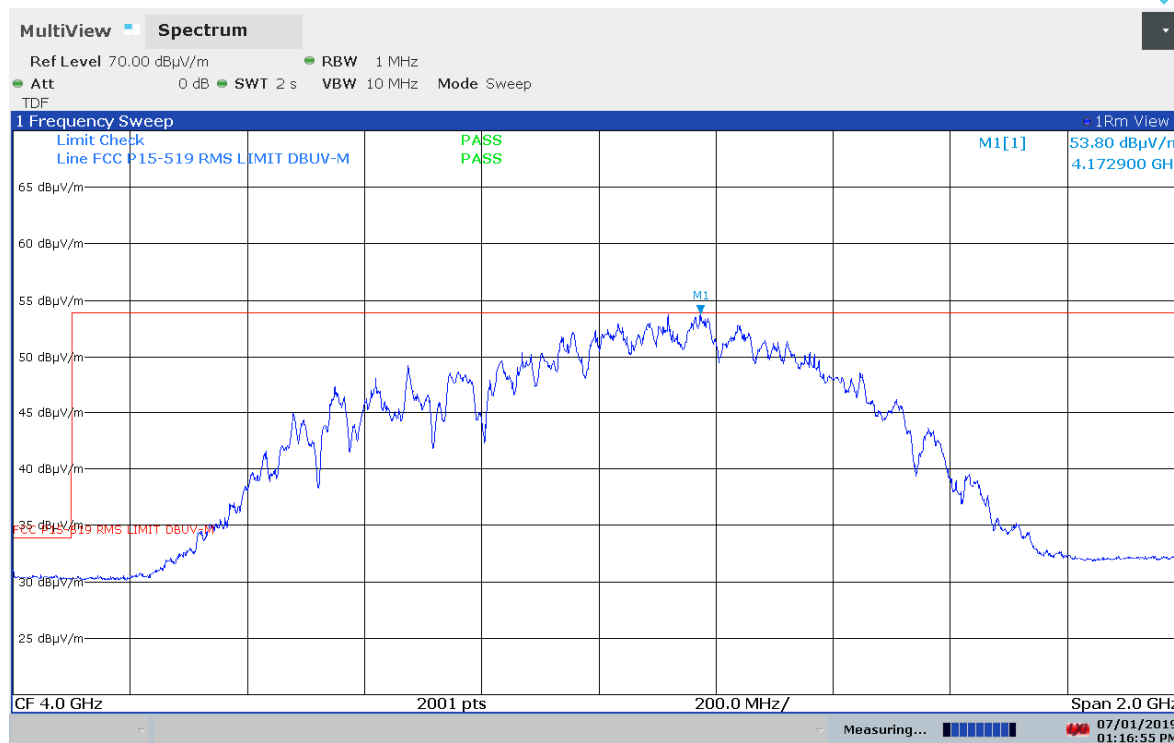
Notes: ¹ Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

Equation (22) from ANSI C63.10-2013, $EIRP = E_{meas} + 20 \log(d_{meas}) - 104.7$; $d_{meas} = 3$

$EIRP (dBm) = E_{meas} (dBμV/m) - 95.2$

Frequency (GHz)	Amplitude ¹ (dBm)	Limit (dBm)	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	EIRP	EIRP	(dB)	H/V	cm	Deg	
4.1729	-41.40	-41.30	-0.10	V	199	10	Compliant

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6. Measurement Data (continued)

6.7. Spurious Radiated Emissions (15.519 (c), 15.521(d)) continued

6.7.2. Plot of RMS Power at 3 Meters (Channel 4, 64M PRF)

Frequency (GHz)	Amplitude ¹	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBμV/m)	(dBμV/m)	(dB)	H/V	cm	Deg	
4.095	53.50	53.90	-0.40	V	199	10	Compliant

Notes: ¹ Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

Equation (22) from ANSI C63.10-2013, $EIRP = E_{meas} + 20 \log(d_{meas}) - 104.7$; $d_{meas} = 3$

$EIRP (dBm) = E_{meas} (dBμV/m) - 95.2$

Frequency (GHz)	Amplitude ¹ (dBm)	Limit (dBm)	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	EIRP	EIRP	(dB)	H/V	cm	Deg	
4.095	-41.70	-41.30	-0.40	V	199	10	Compliant

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6. Measurement Data (continued)

6.7. Spurious Radiated Emissions (15.519 (c), 15.521(d) RSS-220 5.3.1(d))

6.7.3. Plot of RMS Power at 3 Meters (Channel 5, 16M PRF)

Frequency (GHz)	Amplitude ¹	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBμV/m)	(dBμV/m)	(dB)	H/V	cm	Deg	
6.490	53.13	53.90	-0.77	V	222	74	Compliant

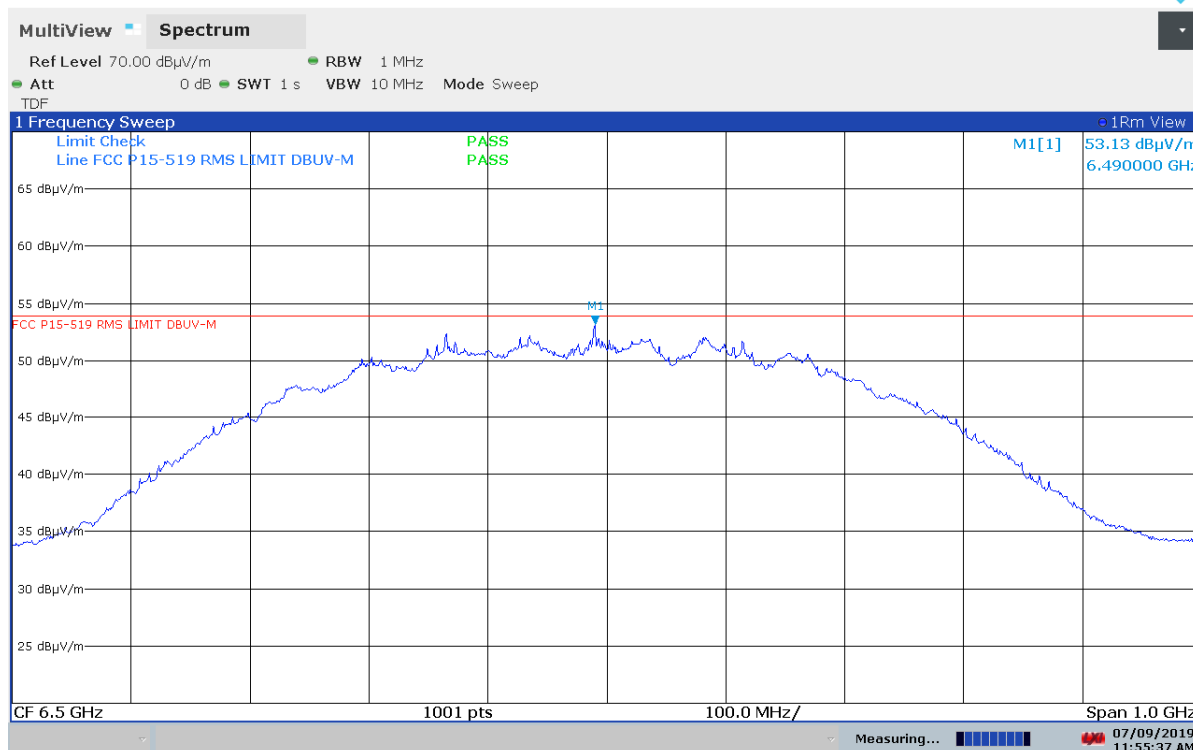
Notes: ¹ Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

Equation (22) from ANSI C63.10-2013, $EIRP = E_{meas} + 20 \log(d_{meas}) - 104.7$; $d_{meas} = 3$

$EIRP (dBm) = E_{meas} (dBμV/m) - 95.2$

Frequency (GHz)	Amplitude ¹ (dBm)	Limit (dBm)	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	EIRP	EIRP	(dB)	H/V	cm	Deg	
6.490	-42.07	-41.30	-0.77	V	222	74	Compliant

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6. Measurement Data (continued)

6.7. Spurious Radiated Emissions (15.519 (c), 15.521(d), RSS-220 5.3.1(d)) continued

6.7.4. Plot of RMS Power at 3 Meters (Channel 5, 64M PRF)

Frequency (GHz)	Amplitude ¹	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBμV/m)	(dBμV/m)	(dB)	H/V	cm	Deg	
6.490	52.22	53.90	-1.68	V	222	74	Compliant

Notes: ¹ Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

Equation (22) from ANSI C63.10-2013, $EIRP = E_{meas} + 20 \log(d_{meas}) - 104.7$; $d_{meas} = 3$

$EIRP (dBm) = E_{meas} (dBμV/m) - 95.2$

Frequency (GHz)	Amplitude ¹ (dBm)	Limit (dBm)	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	EIRP	EIRP	(dB)	H/V	cm	Deg	
6.490	-42.98	-41.30	-1.68	V	222	74	Compliant

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6. Measurement Data (continued)**6.8. Peak Emissions in a 50 MHz Bandwidth (15.519 (e), 15.521 (g))**

Requirement: There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M . That limit is 0 dBm EIRP.

The EIRP in terms of dBm, can be converted to a field strength, in dB μ V/m at 3 Meters by adding 95.2. As used in this subpart, EIRP refers to the highest signal strength measured in any direction and at any frequency from the UWB device.

Frequency (MHz)	EIRP (dBm)	EIRP at 3 Meters (dB μ V/m)
3100 - 10600	0	95.2

Frequency Range:	4 to 5 GHz, 6 to 7 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	50 MHz
EMI Receiver Avg Bandwidth	80 MHz
Detector Function:	Peak, Max Held

6. Measurement Data (continued)

6.8. Peak Emissions in a 50 MHz Bandwidth (15.519 (e), 15.521 (g) continued)

6.8.1 Plot of Peak Power at 3 Meters (Channel 4, 16M PRF)

Frequency (GHz)	Amplitude ¹	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBμV/m)	(dBμV/m)	(dB)	H/V	cm	Deg	
4.2019	95.19	95.20	-0.01	V	199	10	Compliant

Notes: ¹ Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

Equation (22) from ANSI C63.10-2013, $EIRP = E_{meas} + 20 \log(d_{meas}) - 104.7$; $d_{meas} = 3$

$EIRP (dBm) = E_{meas} (dBμV/m) - 95.2$

Frequency (GHz)	Amplitude ¹ (dBm)	Limit (dBm)	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	EIRP	EIRP	(dB)	H/V	cm	Deg	
4.2019	-0.01	0.00	-0.01	V	199	10	Compliant

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6. Measurement Data (continued)

6.8. Peak Emissions in a 50 MHz Bandwidth (15.519 (e), 15.521 (g) continued)

6.8.2 Plot of Peak Power at 3 Meters (Channel 4, 64M PRF)

Frequency (GHz)	Amplitude ¹	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBμV/m)	(dBμV/m)	(dB)	H/V	cm	Deg	
4.2429	91.18	95.20	-4.02	V	199	10	Compliant

Notes: ¹ Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

Equation (22) from ANSI C63.10-2013, $EIRP = E_{meas} + 20 \log(d_{meas}) - 104.7$; $d_{meas} = 3$

$EIRP (dBm) = E_{meas} (dBμV/m) - 95.2$

Frequency (GHz)	Amplitude ¹ (dBm)	Limit (dBm)	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	EIRP	EIRP	(dB)	H/V	cm	Deg	
4.2429	-4.02	0.00	-4.02	V	199	10	Compliant

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6. Measurement Data (continued)

6.8. Peak Emissions in a 50 MHz Bandwidth (15.519 (e), 15.521 (g) RSS-220 cont)

6.8.3 Plot of Peak Power at 3 Meters (Channel 5, 16M PRF)

Frequency (GHz)	Amplitude ¹	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBμV/m)	(dBμV/m)	(dB)	H/V	cm	Deg	
6.501	93.97	95.20	-1.23	V	222	74	Compliant

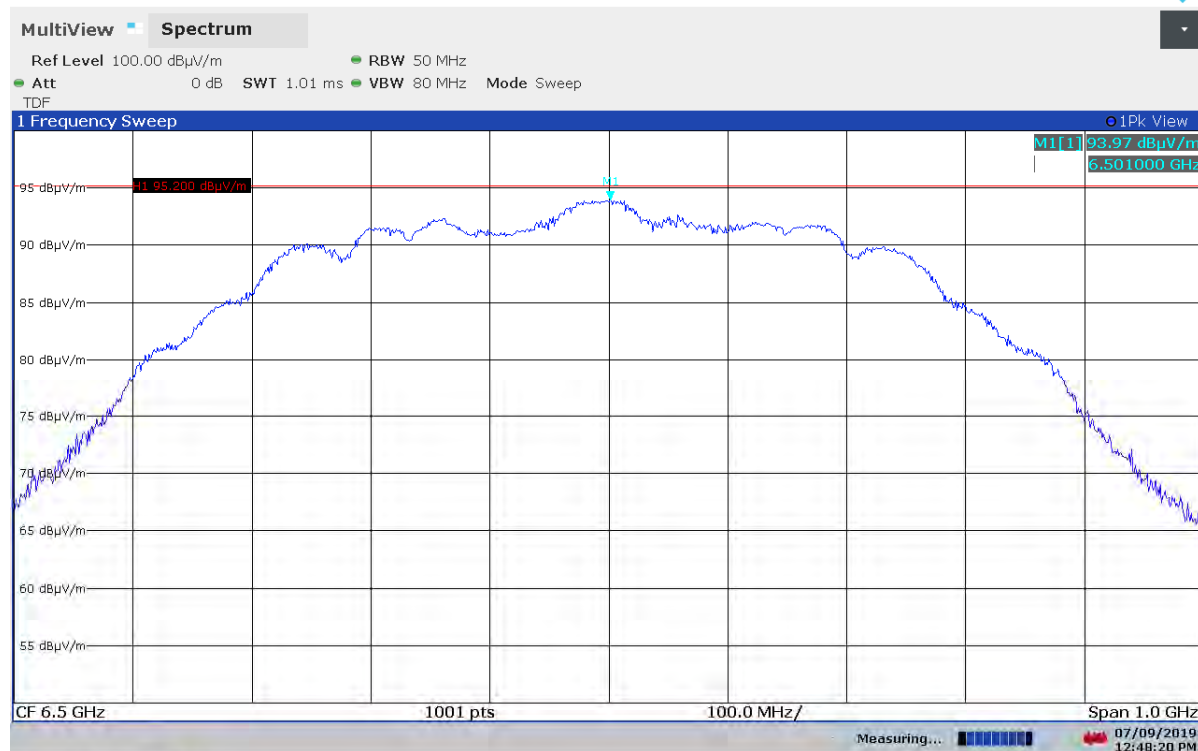
Notes: ¹ Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

Equation (22) from ANSI C63.10-2013, $EIRP = E_{meas} + 20 \log(d_{meas}) - 104.7$; $d_{meas} = 3$

$EIRP \text{ (dBm)} = E_{meas} \text{ (dBμV/m)} - 95.2$

Frequency (GHz)	Amplitude ¹ (dBm)	Limit (dBm)	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	EIRP	EIRP	(dB)	H/V	cm	Deg	
6.501	-1.23	0.00	-1.23	V	222	74	Compliant

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6. Measurement Data (continued)

6.8. Peak Emissions in a 50 MHz Bandwidth (15.519 (e), 15.521 (g). RSS-220 cont)

6.8.4 Plot of Peak Power at 3 Meters (Channel 5, 64M PRF)

Frequency (GHz)	Amplitude ¹	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBμV/m)	(dBμV/m)	(dB)	H/V	cm	Deg	
6.502	89.77	95.20	-5.43	V	222	74	Compliant

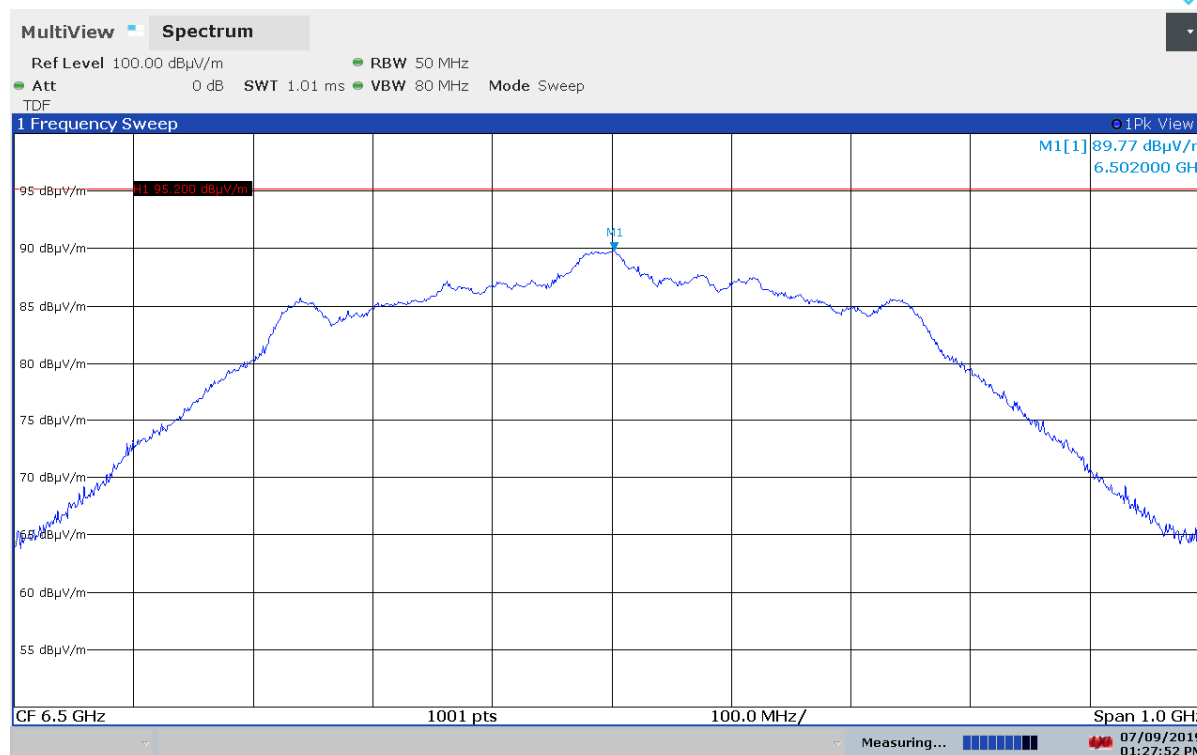
Notes: ¹ Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

Equation (22) from ANSI C63.10-2013, $EIRP = E_{meas} + 20 \log(d_{meas}) - 104.7$; $d_{meas} = 3$

$EIRP \text{ (dBm)} = E_{meas} \text{ (dBμV/m)} - 95.2$

Frequency (GHz)	Amplitude ¹ (dBm)	Limit (dBm)	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	EIRP	EIRP	(dB)	H/V	cm	Deg	
6.502	-5.43	0.00	-5.43	V	222	74	Compliant

267-19 Lemmings Tempo Walk Belt Unit



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6. Measurement Data (continued)

6.9 Conducted Emissions Test Setup

6.9.1. Regulatory Limit: FCC Part 15, Class B, IC RSS-GEN

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.

6.9.2 Measurement Equipment and Software Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due
EMI Receiver	Hewlett Packard	8546A	3330A00115	12/4/2018
RF Filter Section	Hewlett Packard	85460A	3325A00121	12/4/2018
LISN	EMCO	3825/2	9109-1860	11/17/2018
Manufacturer	Software Description		Title/Model #	Rev.
Compliance Worldwide	Test Report Generation Software		Test Report Generator	1.0

6.9.3. Measurement & Equipment Setup

Test Date:	05/16/2018
Test Engineer:	Brian Breault
Site Temperature (°C):	21.4
Relative Humidity (%RH):	31
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

6.9.4. Test Procedure

Test measurements were made in accordance with ANSI C63.4-2014, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

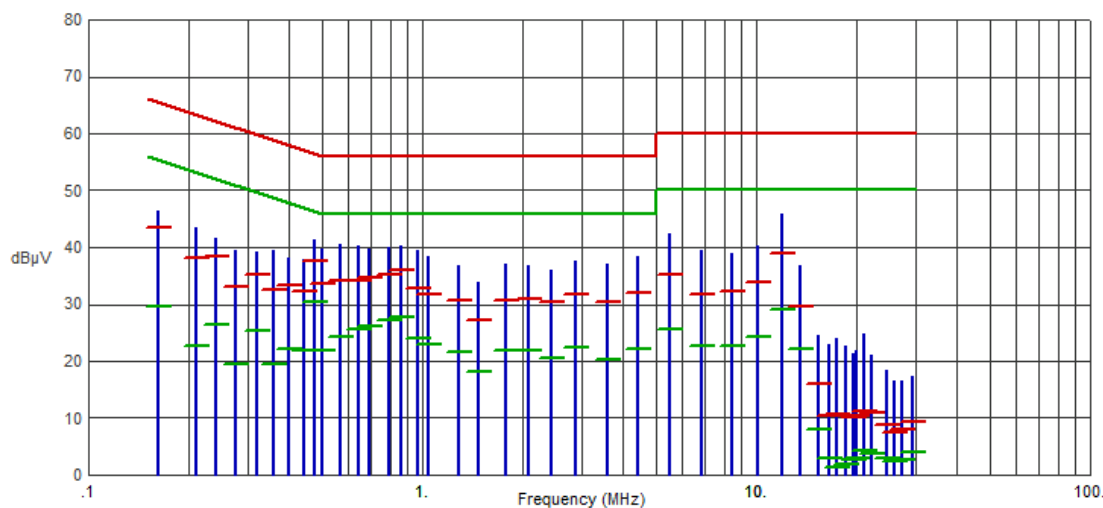
6. Measurement Data (continued)

6.10 Conducted Emissions Test Results

6.10.1. 120 Volts, 60 Hz Phase

Test No.: 267-19, 120 Volts, 60 Hz Phase

FCC, Class B



6. Measurement Data (continued)

6.10 Conducted Emissions Test Results

6.10.1. 120 Volts, 60 Hz Phase continued

Frequency (MHz)	Pk Amp (dBμV)	QP Amp (dBμV)	QP Limit (dBμV)	QP Margin (dB)	Avg Amp (dBμV)	Avg Limit (dBμV)	Avg Margin (dB)	Comments
.1613	46.46	43.39	65.40	-22.01	29.49	55.40	-25.91	
.2108	43.37	38.12	63.17	-25.05	22.55	53.17	-30.62	
.2400	41.72	38.35	62.10	-23.75	26.42	52.10	-25.68	
.2760	39.37	33.09	60.94	-27.85	19.48	50.94	-31.46	
.3188	39.24	35.24	59.74	-24.50	25.38	49.74	-24.36	
.3593	39.34	32.63	58.74	-26.11	19.46	48.74	-29.28	
.3975	38.21	33.42	57.91	-24.49	22.22	47.91	-25.69	
.4403	37.82	32.14	57.06	-24.92	21.80	47.06	-25.26	
.4763	41.25	37.49	56.40	-18.91	30.35	46.40	-16.05	
.4988	39.83	33.65	56.02	-22.37	21.89	46.02	-24.13	
.5708	40.43	34.05	56.00	-21.95	24.39	46.00	-21.61	
.6450	40.36	34.14	56.00	-21.86	25.53	46.00	-20.47	
.6945	39.77	34.71	56.00	-21.29	26.16	46.00	-19.84	
.7913	39.91	35.20	56.00	-20.80	27.20	46.00	-18.80	
.8610	40.33	35.89	56.00	-20.11	27.86	46.00	-18.14	
.9668	39.56	32.92	56.00	-23.08	23.91	46.00	-22.09	
1.0455	38.50	31.74	56.00	-24.26	22.85	46.00	-23.15	
1.2863	36.73	30.74	56.00	-25.26	21.65	46.00	-24.35	
1.4685	33.82	27.31	56.00	-28.69	18.03	46.00	-27.97	
1.7700	37.05	30.73	56.00	-25.27	21.79	46.00	-24.21	
2.0760	36.78	30.90	56.00	-25.10	21.77	46.00	-24.23	
2.4405	35.95	30.46	56.00	-25.54	20.55	46.00	-25.45	
2.8658	37.67	31.69	56.00	-24.31	22.36	46.00	-23.64	
3.5880	37.11	30.37	56.00	-25.63	20.37	46.00	-25.63	
4.4295	38.51	31.96	56.00	-24.04	22.14	46.00	-23.86	
5.5298	42.47	35.30	60.00	-24.70	25.55	50.00	-24.45	
6.8933	39.39	31.77	60.00	-28.23	22.62	50.00	-27.38	
8.4188	38.91	32.31	60.00	-27.69	22.58	50.00	-27.42	
10.0883	40.15	33.80	60.00	-26.20	24.34	50.00	-25.66	
11.8973	45.75	38.85	60.00	-21.15	29.03	50.00	-20.97	
13.4790	36.85	29.62	60.00	-30.38	22.24	50.00	-27.76	
15.3600	24.63	15.92	60.00	-44.08	7.99	50.00	-42.01	
16.5120	22.85	10.50	60.00	-49.50	2.89	50.00	-47.11	
17.4255	24.11	10.56	60.00	-49.44	1.22	50.00	-48.78	
18.6225	22.73	10.46	60.00	-49.54	1.78	50.00	-48.22	
19.4505	21.44	10.07	60.00	-49.93	2.69	50.00	-47.31	
19.8713	21.81	10.33	60.00	-49.67	2.91	50.00	-47.09	
21.1155	24.79	11.15	60.00	-48.85	4.25	50.00	-45.75	
22.2225	21.17	11.01	60.00	-48.99	3.85	50.00	-46.15	
24.5625	18.40	8.86	60.00	-51.14	2.82	50.00	-47.18	
25.8450	16.53	7.53	60.00	-52.47	2.37	50.00	-47.63	
27.4223	16.63	7.95	60.00	-52.05	2.61	50.00	-47.39	
29.4698	17.39	9.29	60.00	-50.71	3.92	50.00	-46.08	

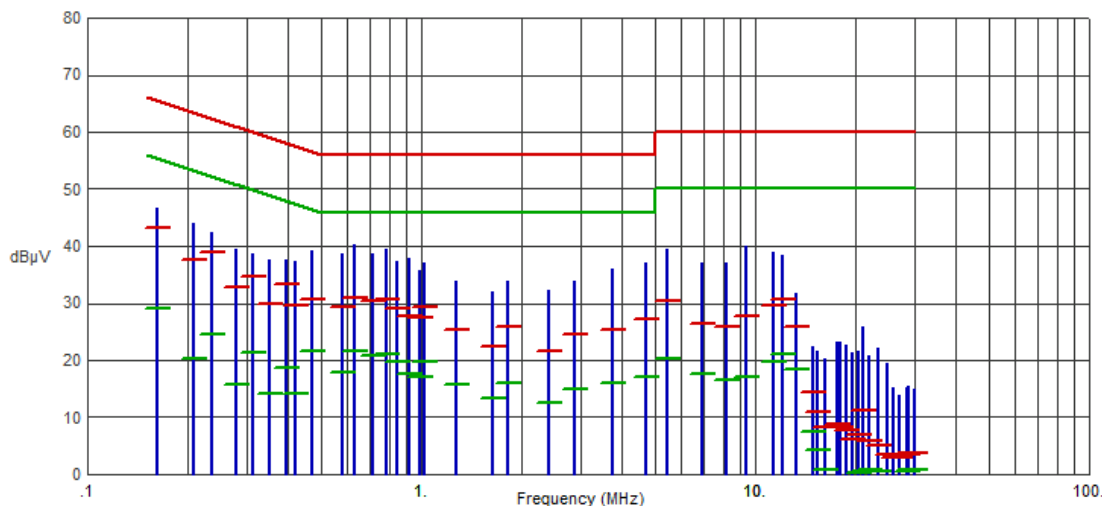
6. Measurement Data (continued)

6.10. Conducted Emissions Test Results (continued)

6.10.2. 120 Volts, 60 Hz Neutral

Test No.: 267-19, 120 Volts, 60 Hz Neutral

FCC, Class B



6. Measurement Data (continued)

6.10. Conducted Emissions Test Results (continued)

6.10.2. 120 Volts, 60 Hz Neutral (continued)

Frequency (MHz)	Pk Amp (dBμV)	QP Amp (dBμV)	QP Limit (dBμV)	QP Margin (dB)	Avg Amp (dBμV)	Avg Limit (dBμV)	Avg Margin (dB)	Comments
.1613	46.72	43.30	65.40	-22.10	29.15	55.40	-26.25	
.2085	43.87	37.55	63.26	-25.71	20.21	53.26	-33.05	
.2355	42.38	38.84	62.25	-23.41	24.46	52.25	-27.79	
.2783	39.58	32.69	60.87	-28.18	15.78	50.87	-35.09	
.3120	38.61	34.63	59.92	-25.29	21.35	49.92	-28.57	
.3503	37.52	29.74	58.96	-29.22	14.12	48.96	-34.84	
.3953	37.52	33.31	57.95	-24.64	18.77	47.95	-29.18	
.4200	37.24	29.65	57.45	-27.80	14.20	47.45	-33.25	
.4695	39.20	30.54	56.52	-25.98	21.72	46.52	-24.80	
.5775	38.70	29.24	56.00	-26.76	17.77	46.00	-28.23	
.6315	40.37	31.05	56.00	-24.95	21.61	46.00	-24.39	
.7125	38.79	30.39	56.00	-25.61	20.88	46.00	-25.12	
.7890	39.43	30.66	56.00	-25.34	21.19	46.00	-24.81	
.8498	37.43	29.13	56.00	-26.87	19.63	46.00	-26.37	
.9195	37.89	27.86	56.00	-28.14	17.67	46.00	-28.33	
.9893	35.78	27.57	56.00	-28.43	17.20	46.00	-28.80	
1.0253	37.01	29.35	56.00	-26.65	19.69	46.00	-26.31	
1.2728	33.81	25.41	56.00	-30.59	15.68	46.00	-30.32	
1.6283	31.92	22.48	56.00	-33.52	13.42	46.00	-32.58	
1.8150	33.98	25.87	56.00	-30.13	16.06	46.00	-29.94	
2.4045	32.22	21.52	56.00	-34.48	12.52	46.00	-33.48	
2.8748	33.84	24.45	56.00	-31.55	14.94	46.00	-31.06	
3.7433	35.92	25.46	56.00	-30.54	15.89	46.00	-30.11	
4.6860	37.09	27.23	56.00	-28.77	17.07	46.00	-28.93	
5.4735	39.59	30.35	60.00	-29.65	20.28	50.00	-29.72	
6.9360	37.12	26.41	60.00	-33.59	17.59	50.00	-32.41	
8.1915	36.98	25.98	60.00	-34.02	16.42	50.00	-33.58	
9.4358	39.87	27.62	60.00	-32.38	17.01	50.00	-32.99	
11.3190	38.90	29.61	60.00	-30.39	19.73	50.00	-30.27	
12.1313	38.47	30.54	60.00	-29.46	20.99	50.00	-29.01	
13.2608	31.78	25.83	60.00	-34.17	18.36	50.00	-31.64	
14.8110	22.32	14.30	60.00	-45.70	7.51	50.00	-42.49	
15.3375	21.61	10.94	60.00	-49.06	4.30	50.00	-45.70	
16.1768	20.27	8.36	60.00	-51.64	.72	50.00	-49.28	
17.5605	23.21	8.90	60.00	-51.10	-.92	50.00	-50.92	
17.9925	23.13	8.34	60.00	-51.66	-.82	50.00	-50.82	
18.7125	22.79	7.85	60.00	-52.15	-.53	50.00	-50.53	
19.5630	21.21	6.03	60.00	-53.97	-.32	50.00	-50.32	
20.4315	21.69	6.90	60.00	-53.10	.27	50.00	-49.73	
20.9603	25.77	11.26	60.00	-48.74	.58	50.00	-49.42	
21.9210	20.76	5.85	60.00	-54.15	.69	50.00	-49.31	
23.2485	22.24	4.98	60.00	-55.02	.62	50.00	-49.38	
24.7718	19.35	3.40	60.00	-56.60	-.12	50.00	-50.12	
25.9935	15.23	2.90	60.00	-57.10	-.31	50.00	-50.31	
27.1410	13.99	2.90	60.00	-57.10	-.27	50.00	-50.27	
28.4708	15.12	3.46	60.00	-56.54	.61	50.00	-49.39	
28.8690	15.48	3.70	60.00	-56.30	.76	50.00	-49.24	
29.9468	14.98	3.84	60.00	-56.16	.92	50.00	-49.08	

6. Measurement Data (continued)

6.11. 99% Emission Bandwidth (RSS-GEN 6.7)

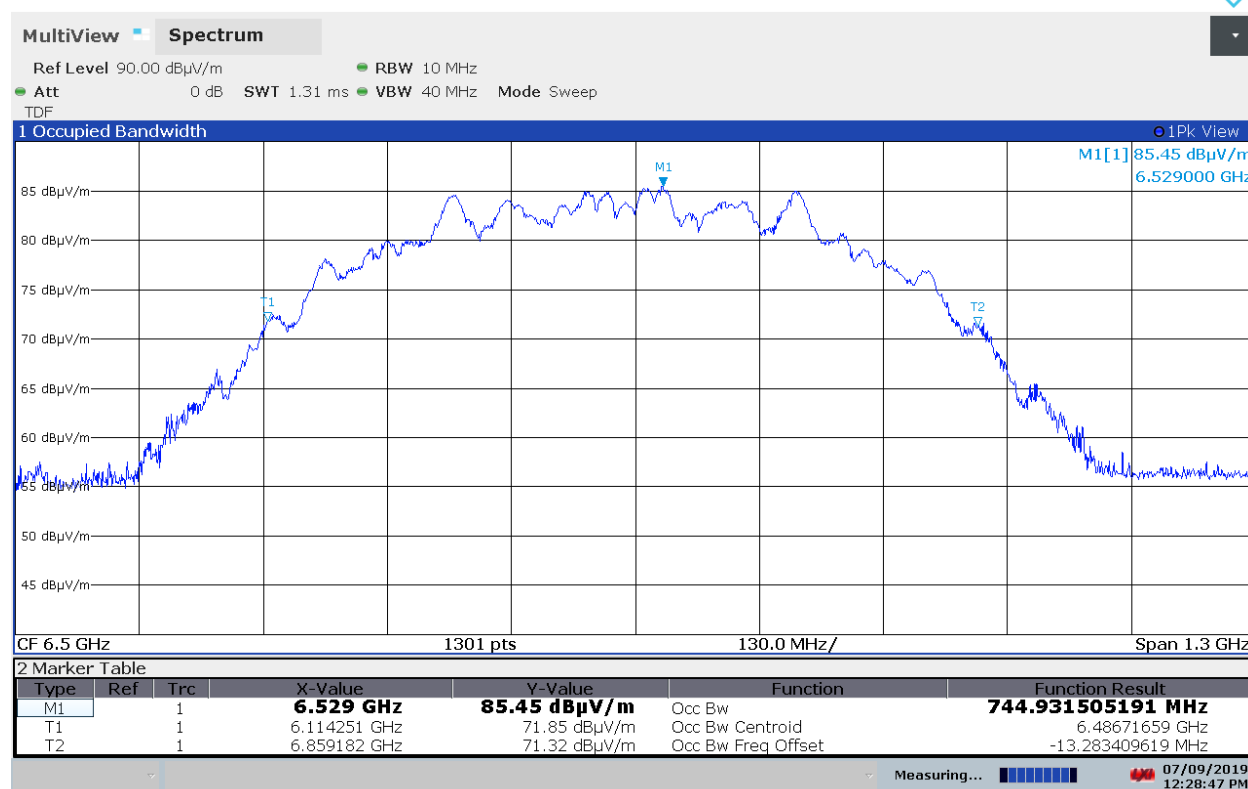
Requirement: The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs RSS-Gen, Section 6.7.

Test Note: The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.

6.11.1 Plot of 99% Emission Bandwidth (Channel 5, 16M PRF)

267-19 Lemmings Tempo Walk Belt Unit



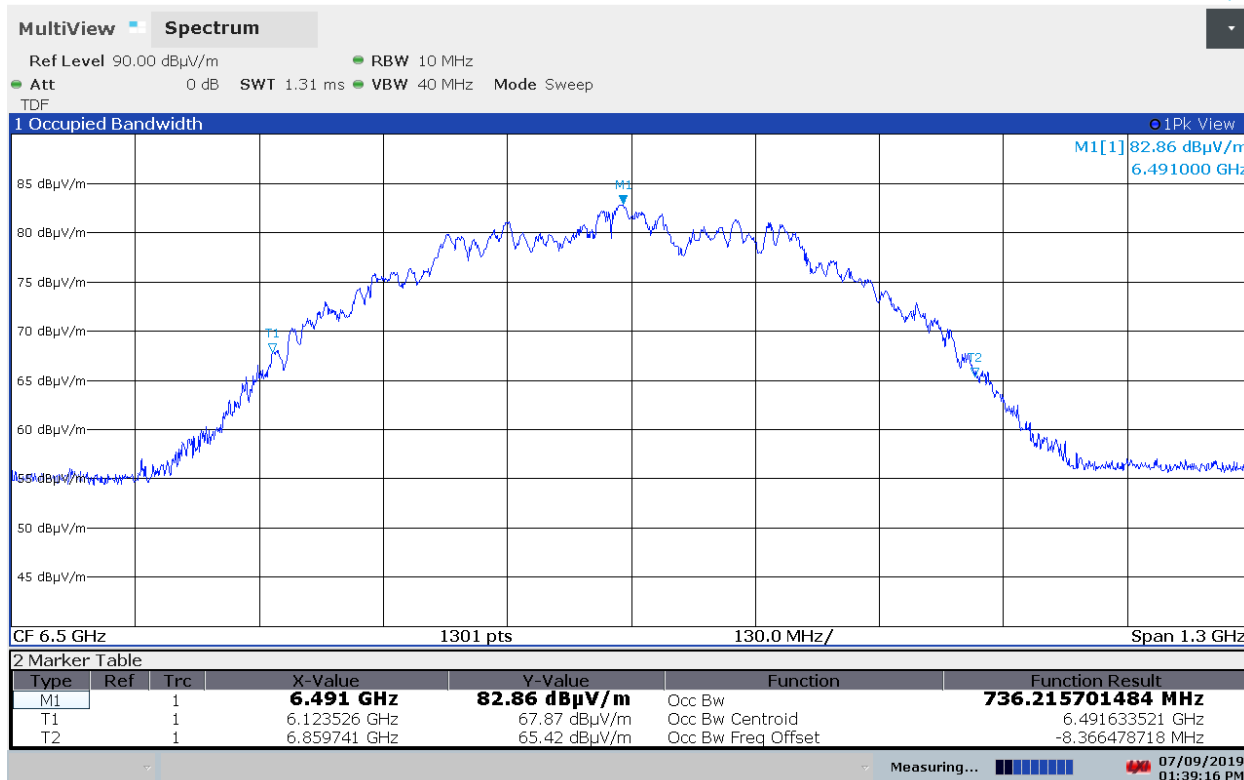
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6. Measurement Data (continued)

6.11. 99% Emission Bandwidth (RSS-GEN 6.7 continued)

6.11.2 Plot of 99% Emission Bandwidth (Channel 5, 64M PRF)

267-19 Lemmings Tempo Walk Belt Unit



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6. Measurement Data (continued)

6.12. Public Exposure to Radio Frequency Energy Levels (1.1307 (b)(2))

6.12.1. SAR Test Exclusion Calculation

Requirement: Portable devices as defined in § 2.1093 of this chapter operating under Part 15 are subject to radio frequency radiation exposure requirements as specified in 1.1307(b)(2) and 2.1093 of this chapter.

For a 1-g SAR, the test exclusion result must be ≤ 3.0 .

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:

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

P_{MAX} mW Maximum power of channel, including tune-up tolerance

d_{MIN} mm Minimum test separation distance, mm (≤ 50 mm)

$f_{(\text{GHz})}$ GHz $f_{(\text{GHz})}$ 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.

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

Channel:		4, 16M	4, 64M	
Input:	P_{MAX}	0.991	0.394	mW
	d_{MIN}	5.000	5.000	mm
	$f_{(\text{GHz})}$	4.097	4.243	GHz
Test Exclusion:		0.401	0.162	
Limit Exemption:		3.000	3.000	

¹ Taken from the peak data in Section 6.5 of this test report (converted to mW).

Notes:

The device does not exceed the test limit exemption and therefore a routine SAR Evaluation is not required.

6. Measurement Data (continued)

6.12.1 RF Exposure for devices that operate above 6 GHz (1.1310)

Requirements: 2.1093(b): A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.

2.1093 (d): Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified 47 CFR 1.1310. Measurements and calculations to demonstrate compliance with MPE Field strength or power density limits for device operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure for devices that operate between 1500 to 100,000 MHz is 1.0 mW/cm² using a 30 minute averaging time.

Center Frequency (GHz)	MPE Distance (cm)	DUT Peak Output Power (dBm)	DUT Antenna Gain (dBi)	DUT Peak Power (mW)	Power Density		FCC Limit (mW/cm ²)
					(mW/cm ²)	(W/m ²)	
	(1)	(2)	(3)		(4)		(5)
6.491	5	-1.23	0.0	0.753	0.0023980	0.0239801	1
6.488	5	-5.43	0.0	0.286	0.0009117	0.0091170	1

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

1. Reference CFR 2.1093(b): For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 5 centimeters of the body of the user.
2. Section 6.7 of this test report. Measured Peak Power at 3 Meters.
3. Antenna Gain included in the measured values of Section 6.7
4. Power density is calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.

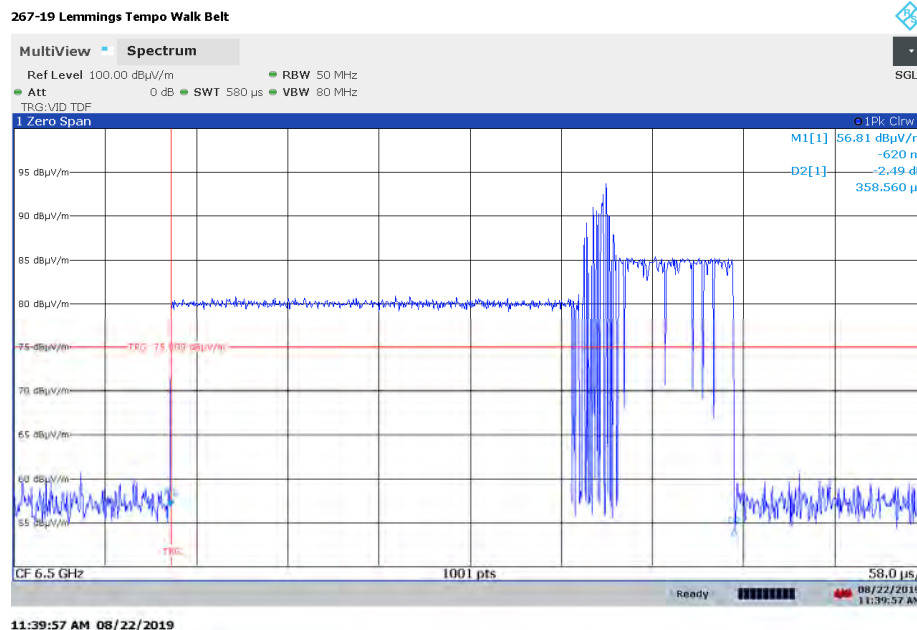
Note: This is the peak power of the device in a 50 MHz bandwidth, the time averaged power is significantly lower. **20 * LOG (0.0358 mS / 22.02 mS) = -35.76 dB**

6. Measurement Data (continued)

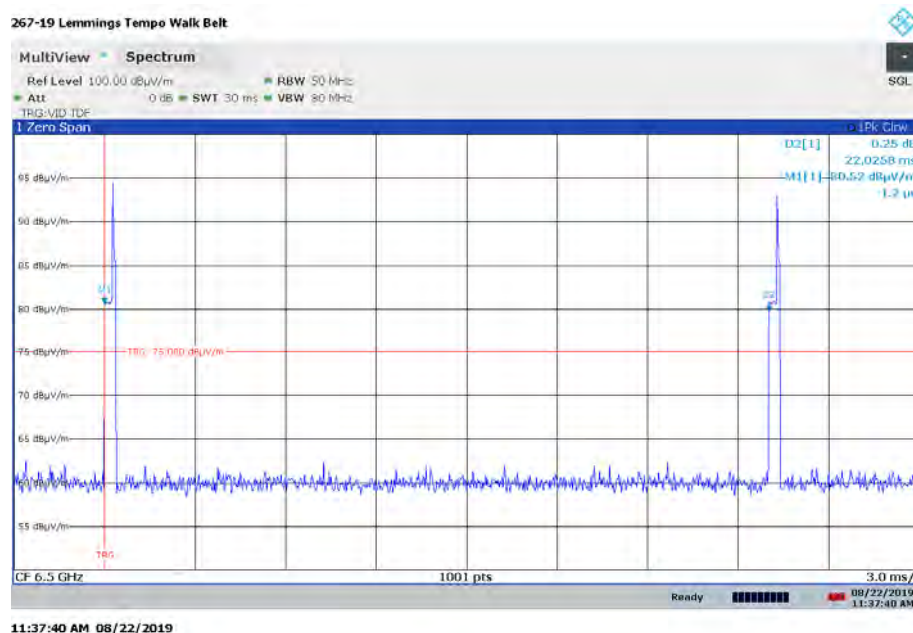
6.12. Public Exposure to Radio Frequency Energy Levels (1.1310, RSS-102)

6.12.1 RF Exposure for devices that operate above 6 GHz (continued)

Worst Case Duty Cycle of the device Burst Length = 0.35856 mS



Repetition Time = 22.02 mS



6. Measurement Data (continued)

6.12. Public Exposure to Radio Frequency Energy Levels (1.1310)

6.12.1 RF Exposure for devices that operate above 6 GHz (continued)

Time averaged power when using the worst case peak power at close distances

A conservative measured distance of the actual end usage of the product results in a distance of at least 1 mm from the body when using the clip shown in the manual maintaining the antenna is on the side away from the body. That results in an exposure level below the 1 mW/cm² limit.

Frequency (GHz)	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	DUT Output Power milliWatts	Power Density		FCC Limit (mW/cm ²)
					(mW/cm ²)	(W/m ²)	
	(1)	(2)	(3)		(4)		(5)
6.497	1	-1.23	0.0	0.753	0.0599501	0.5995013	1

Further reduction is achieved using the time averaged power of the device that is 35.76 dB lower than the peak power. The time averaged power of -37.00 dBm or 0.0002 mW results in a significantly lower RF exposure when 1 cm from the body.

Frequency (GHz)	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	DUT Output Power milliWatts	Power Density		FCC Limit (mW/cm ²)
					(mW/cm ²)	(W/m ²)	
	(1)	(2)	(3)		(4)		(5)
6.497	1	-37.00	0.0	0.000200	0.0000159	0.0001589	1

6. Measurement Data (continued)

6.12. Public Exposure to Radio Frequency Energy Levels (RSS-102)

6.12.1 RF Exposure for devices that operate above 6 GHz (continued)

Requirements: All transmitters are exempt from routine SAR and RF exposure evaluations provided that they comply with the requirements of sections 2.5.1 or 2.5.2.

Section 2.5.1: 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. The limit at 5800 MHz is 1 mW at a distance of ≤ 5 mm.

Section 2.5.2: RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows: at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

Center Frequency (GHz)	DUT Peak Output Power (dBm)	DUT Peak Output Power	ISED 2.5.1 Limit	DUT Peak Output Power	ISED 2.5.2 Limit
		(milliWatts EIRP)	(milliWatts)	(Watts EIRP)	(Watts)
	(1)	(2)	(3)	(4)	(5)
6.496	-1.23	0.753	1	0.000753	5
6.501	-5.43	0.286	1	0.000286	5

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

1. Section 6.8 of this test report. Measured Peak Power at 3 Meters
2. Converted dBm (E.I.R.P) measured in Section 6.8 to milliwatts
3. Reference ISED RSS-102 Section 2.5.1 Limit at 5800 MHz
4. Converted dBm (E.I.R.P) measured in Section 6.8 to Watts
5. Reference ISED RSS-102 Section 2.5.2 Limit above 6 GHz

Note: This is the peak power of the device in a 50 MHz bandwidth the time averaged power of the device is significantly lower. $20 * \text{LOG} (0.0358 \text{ mS} / 22.02 \text{ mS}) = -35.76 \text{ dB}$

6. Measurement Data (continued)

6.12. Public Exposure to Radio Frequency Energy Levels (RSS-102)

6.12.1 RF Exposure for devices that operate above 6 GHz (continued)

Time Averaged Power

Center Frequency (GHz)	DUT Peak Output Power (dBm)	DUT Peak Output Power	ISED 2.5.1 Limit	DUT Peak Output Power	ISED 2.5.2 Limit
		(milliWatts EIRP)	(milliWatts)	(Watts EIRP)	(Watts)
	(1)	(2)	(3)	(4)	(5)
6.496	-37.00	0.0000002	1	0.000200	5
6.501	-41.77	0.0000001	1	0.000067	5

7. 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 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-0274.

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. 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.