COMPLIANCE WORLDWIDE INC.
TEST REPORT 171-17

In Accordance with the Requirements of

Federal Communications Commission 47 CFR Part 15.519, Subpart F
Technical Requirements for Hand Held UWB Systems

Issued to

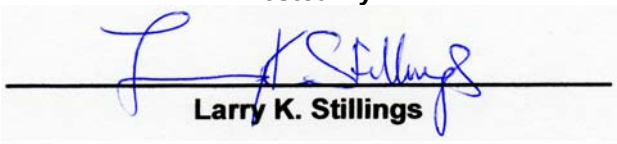
Wiser Systems, Inc.
1017 Main Campus Drive, Suite 2300
Raleigh, NC 27606 USA
919-833-8253

For the
Handheld Tag
Model: TAGV1.0

FCC ID: 2AGZM-B01017

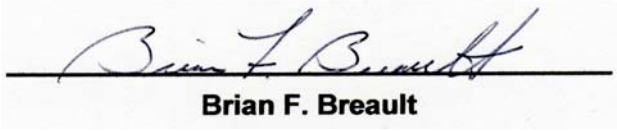
Report Issued on May 31, 2017

Tested By



Larry K. Stillings

Reviewed By



Brian F. Breault

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1. Scope

This test report certifies that the Wiser Systems Handheld Tag as tested, meets the FCC Part 15, Subpart F 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:	Wiser Systems, Inc.
2.2. Model Number:	TAGV1.0
2.3. Serial Number:	Pre production
2.4. Description:	RRLT Locator System leverages new advances in Ultra-Wideband technology to deliver low cost/high accuracy, real-time localization.
2.5. Power Source:	3.0 VDC (CR2032 Lithium)
2.6. Hardware Revision:	N/A
2.7. Software Revision:	N/A
2.8. Modulation Type:	Pulse Modulation, Frequency Hopping
2.9. Operating Frequencies:	3.993 GHz Center Frequency Nominal (Channel 2 – 500 MHz BW, Channel 4 – 900 MHz BW) 6489.5 GHz Center Frequency Nominal (Channel 5 – 500 MHz BW)
2.10. EMC Modifications:	None

3. Product Configuration

3.1 Operational Characteristics & Software

Hardware Setup:

Connect the Wiser USB Dongle to a laptop computer via USB. Place a battery into the handheld tag.

Using the software tool configure the USB dongle to transmit on Channel 2 (16M or 64M PRF), Channel 4 (16M or 64M PRF) or Channel 5 (16M or 64M PRF) using data rates of 110 kbps or 6.8 Mbps.

3.2. EUT Hardware

Manufacturer	Model/Part # / Options	Serial Number	Input Volts	Freq (Hz)	Description/Function
Wiser Systems	TAGV1.0	Pre production	3.0	DC	Handheld Tag

3.3. Support Equipment

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
Wiser Systems	USB Dongle	n/a	5.0	DC	For setting up the DUT operation.
Dell	Laptop		120	60	For controlling the USB Dongle

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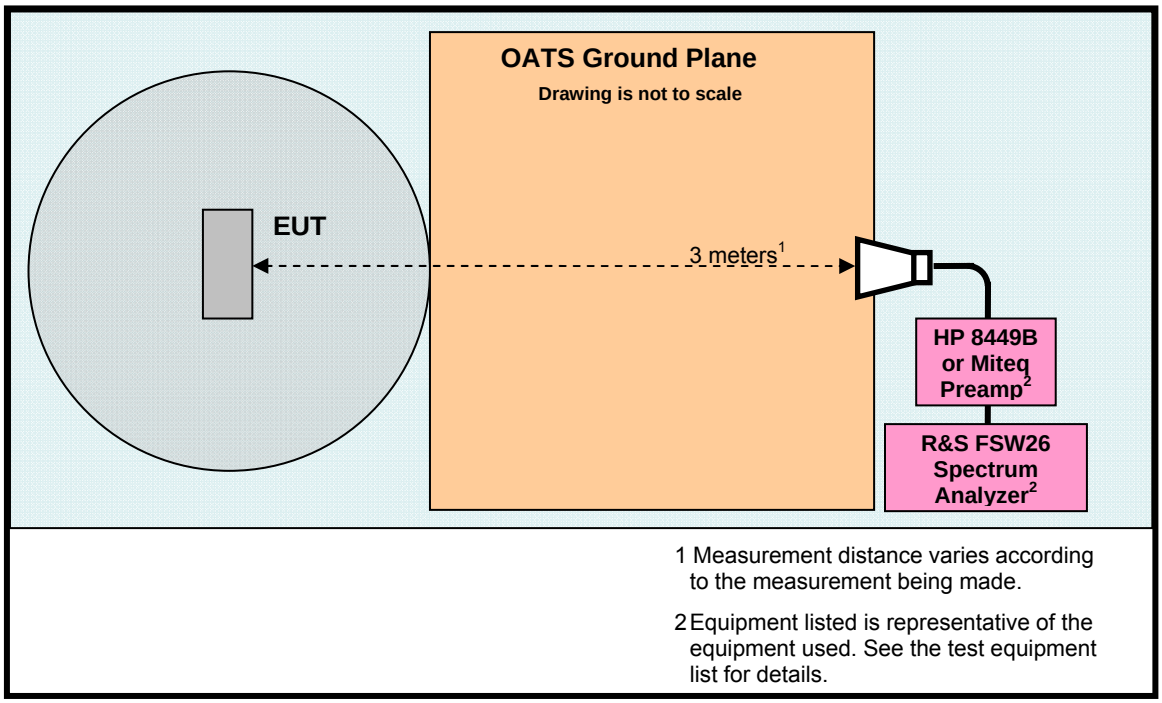
3. Product Configuration (cont.)

3.4. Test Setup Diagram



3.5. EUT Orientation Diagram

In addition, the measurements were performed with the device in three orthogonal positions in accordance with ANSI C63.10-2013, sections 5.10.1, 6.4.6 and Annex H. The three orthogonal axes were defined as follows:

X-Axis		Y-Axis	Z-Axis
X Axis	Flat on Table	Clip of unit is facing the antenna at 0º	
Y Axis	On Edge on Table	Top/Face of unit is facing the antenna at 0º	
Z Axis	Sideways on Edge	Top/Face of the unit is facing the antenna at 0º	

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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 Receiver 9 kHz to 7 GHz	Rohde & Schwarz	ESR7	101156	7/23/2017	2 Years
Spectrum Analyzer 9 kHz to 40 GHz	Rohde & Schwarz	FSV40	100899	7/23/2017	2 Years
Spectrum Analyzer 10 Hz to 40 GHz	Rohde & Schwarz	FSVR40	100909	7/23/2017	2 Years
Spectrum Analyzer 3 Hz to 26.5 GHz	Rohde & Schwarz	FSW26	102044	12/7/2018	2 Years
Biconilog Antenna 30 MHz to 2 GHz	Sunol Sciences	JB1	A050913	6/3/2019	3 Years
Loop Antenna 9 kHz to 30 MHz	EMCO	6512	9309-1139	10/26/2018	2 Years
Preamplifier 100 MHz to 7 GHz	Miteq	AFS3-00100200-10-15P-4	988773	6/2/2017	1 Year
Preamplifier 100 MHz to 18 GHz	Miteq	AMF-7D-00101800-30-10P	1953081	6/1/2017	1 Year
Preamplifier 2 to 12 GHz	JCA	JCA48-4111B1	7087S	6/2/2017	1 Year
Preamplifier 1 to 26.5 GHz	Hewlett Packard	8449B	3008A01323	7/22/2017	2 Years
Preamplifier 18 to 40 GHz	Avantek	AWT-40039	FM22038832	6/2/2017	1 Year
Horn Antenna 960 MHz to 18 GHz	ETS-Lindgren	3117	00143292	2/22/2019	3 Years
Horn Antenna 18 to 40 GHz	Com Power	AH-840	101032	2/24/2018	2 Years
High Pass Filter 8 to 18 GHz	Micro-Tronics	HPM50107	G036	6/1/2017	1 Year
Barometer	Control Company	4195	Cal ID# 236	10/8/2017	2 Years

[1] ESR7 Firmware revision: V2.28,SP1 Date installed: 9/2/2016 Previous V2.26, installed 8/15/2014.
[2] FSV40 Firmware revision: V2.30 SP4, Date installed: 5/4/2016 Previous V2.30 SP1, installed 10/22/2014.
[3] FSVR40 Firmware revision: V2.23, Date installed: 10/20/2014 Previous V1.63 SP1, installed 8/28/2013.
[4] FSW26 Firmware revision: V2.50, Date installed: 9/12/2016 Previous V2.40, installed 5/4/2016.

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4. Measurements Parameters (continued)

4.2. Measurement & Equipment Setup

Test Dates:	3/28/2017, 3/29/2017, 4/14/2017, 4/17/2017, 4/18/2017, 4/24/2017, 4/25/2017, 4/26/2017, 4/27/2017, 5/12/2017, 5/15/2017, 5/16/2017, 5/17/2017, 5/18/2017, 5/19/2017
Test Engineers:	Brian Breault, Larry Stillings
Normal Site Temperature (15 - 35°C):	21.6
Relative Humidity (20 -75%RH):	35
Frequency Range:	10 kHz to 40 GHz
Measurement Distance:	3 Meters, 1 Meter, 0.3 Meter
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 Avg Bandwidth:	300 Hz – 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, Quasi-Peak & Average

4.3. Measurement Procedure

Test measurements were made in accordance FCC Parts 15.209, 15.519 Subpart F.

The test methods used to generate the data is 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)	$\pm 1x10^{-8}$
Radiated Emission of Transmitter to 100 GHz	± 4.55 dB
Radiated Emission of Receiver	± 4.55 dB
Temperature	$\pm 0.91^{o}$ C
Humidity	± 5%

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5. Measurements Summary

Test Requirement	FCC Rule Requirement	Test Report Section	Result	Comment
Antenna Requirement	15.203	6.1	Compliant	The antenna is a pcb surface mount
Operational Requirements	15.519 (a) (1)	6.2	Compliant	
UWB Bandwidth	15.503 (a) (d) 15.519 (b)	6.3	Compliant	
Radiated Emissions below 960 MHz	15.519 (c) 15.209	6.4	Compliant	
Radiated Emissions above 960 MHz	15.519 (c) 15.521 (d)	6.5	Compliant	
Radiated Emissions in GPS Bands	15.519 (d)	6.6	Compliant	
RMS Power of UWB in a 1 MHz Bandwidth	15.519 (c) 15.521 (d)	6.7	Complaint	
Peak Emissions in a 50 MHz Bandwidth	15.519 (e) 15.521 (g)	6.8	Compliant	
Conducted Emissions	15.207	6.9	Compliant	The EUT is battery powered
Radio Frequency Exposure	FCC OET Bulletin 65	6.10	Compliant	

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6. Measurement Data

6.1. Antenna Requirement (15.203)

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 surface mount type.

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6. Measurement Data (continued)

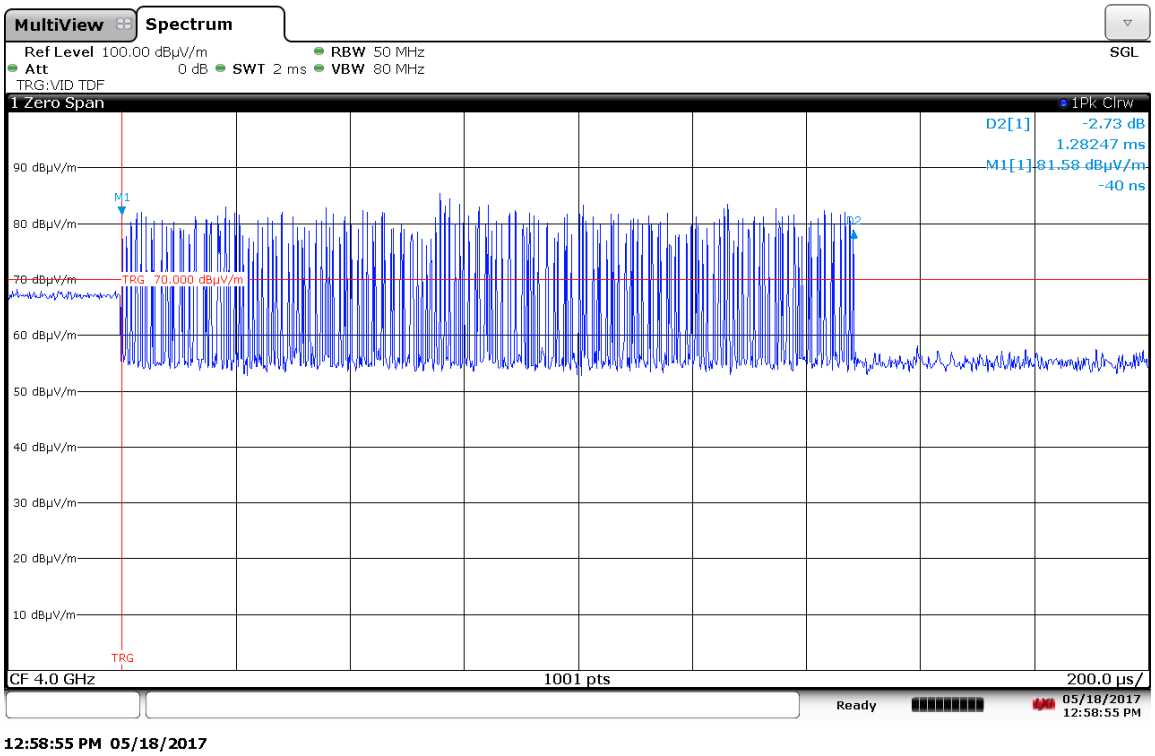
6.2. Operational Requirements of the Device under Test (15.519 (a) (a)(1))

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, the EUT transmits a 1.28 mS burst of location information every 11.865 seconds to an associated receiver.

6.2.1 Plot of Transmission



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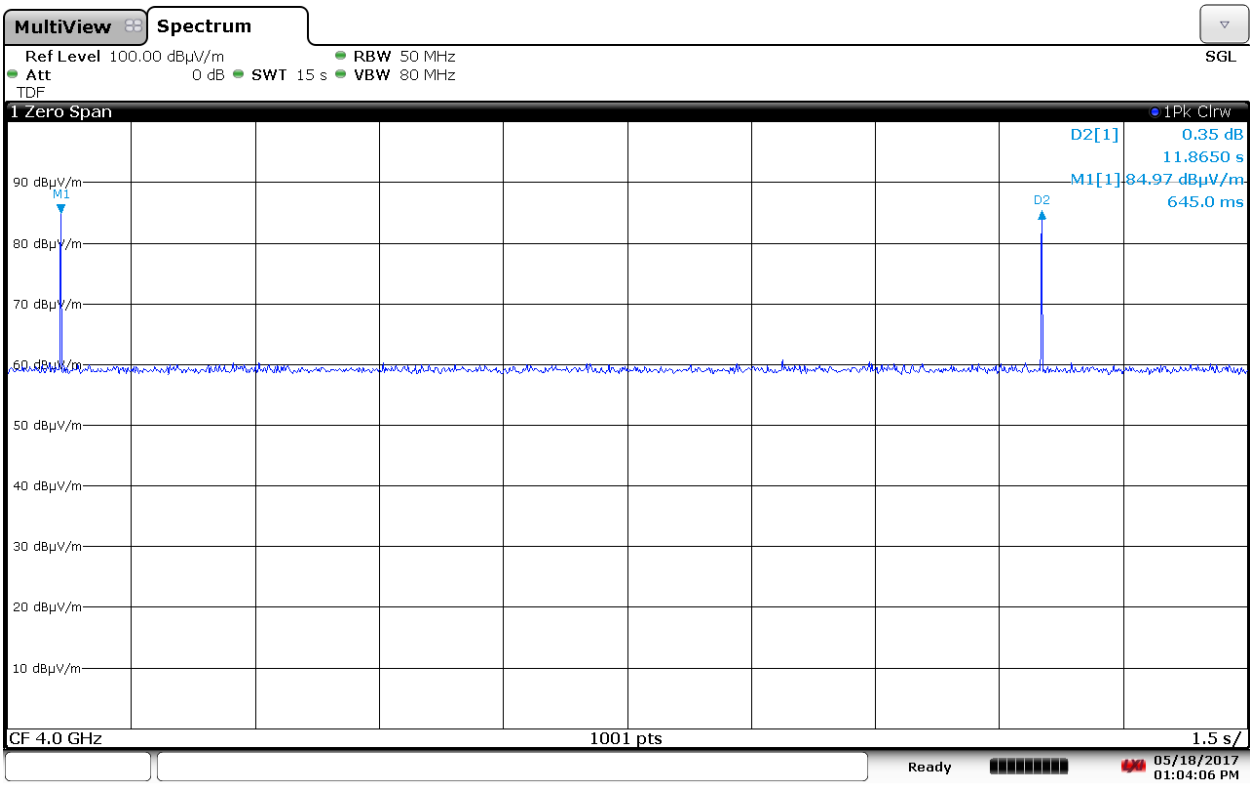
6. Measurement Data (continued)

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

6.2.2 Plot of Transmission Period



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6. Measurement Data (continued)

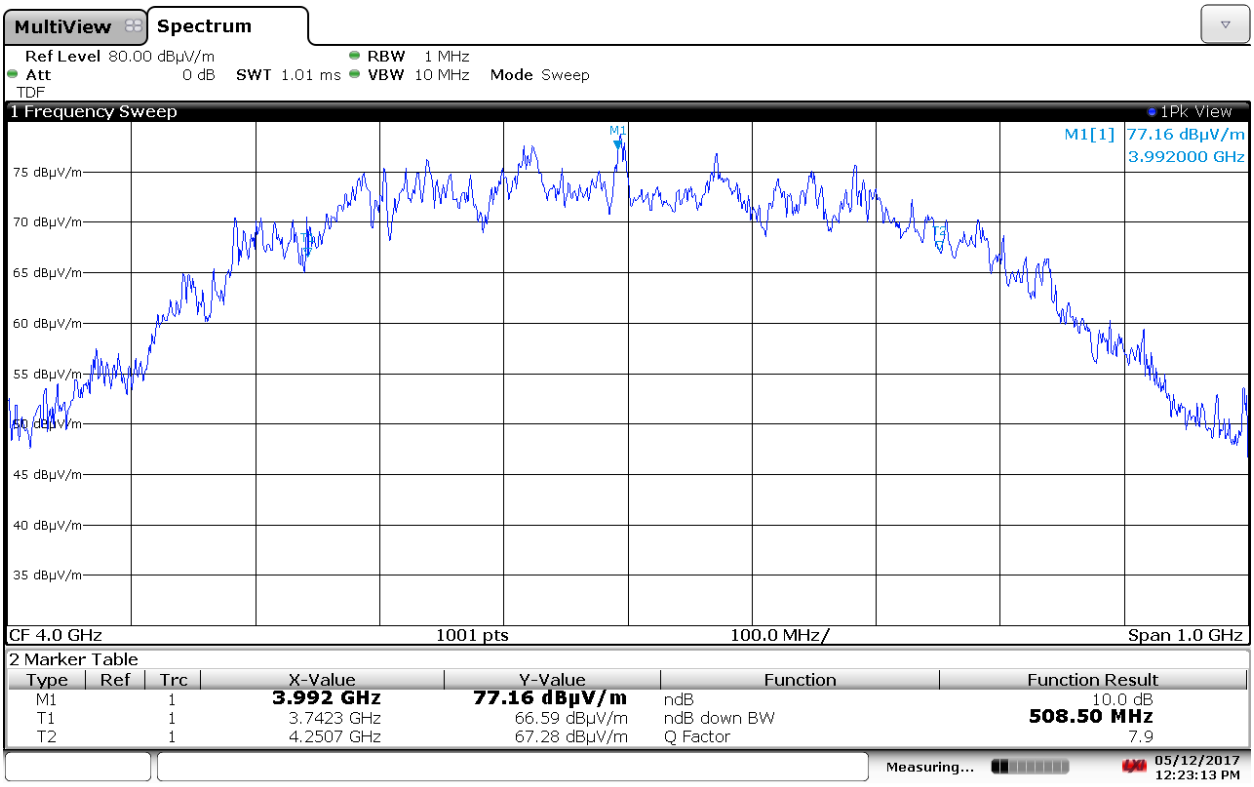
6.3. UWB Bandwidth (15.503 (a) (d), 15.519 (b))

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

f_M	The highest emission peak	3.9920
f_L	10 dB below the highest peak	3.7423
f_H	10 dB above the highest peak	4.2507
f_C	Calculated: $(f_H + f_L) / 2$	3.9965
Bandwidth	Calculated: $(f_H - f_L)$	0.5085
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.1272

6.3.2. Measurement Plot of 10 dB frequencies (Channel 2, 110 kbps, 16M PRF)



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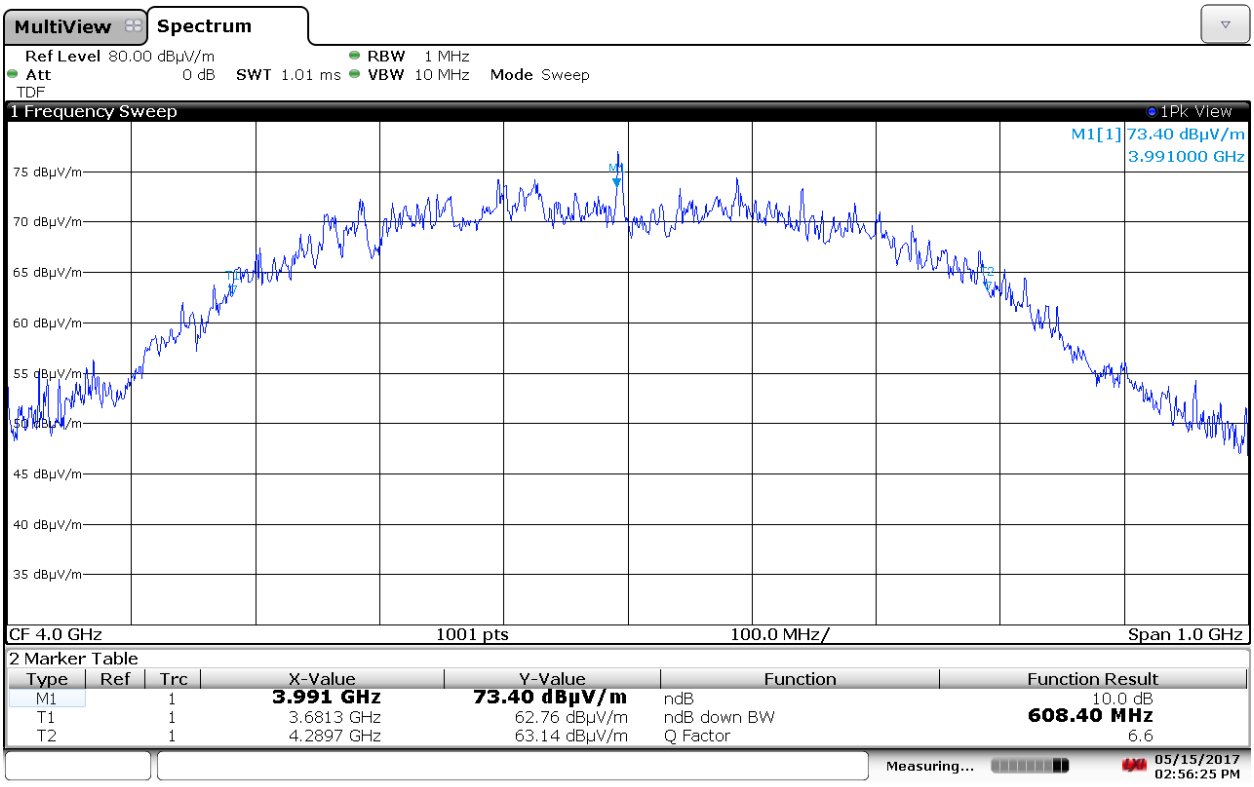
6. Measurement Data (continued)

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

6.3.3. Measurement Data – Values in GHz

f_M	The highest emission peak	3.9910
f_L	10 dB below the highest peak	3.6813
f_H	10 dB above the highest peak	4.2897
f_C	Calculated: $(f_H + f_L) / 2$	3.9855
Bandwidth	Calculated: $(f_H - f_L)$	0.6084
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.1527

6.3.4. Measurement Plot of 10 dB frequencies (Channel 2, 110 kbps, 64M PRF)



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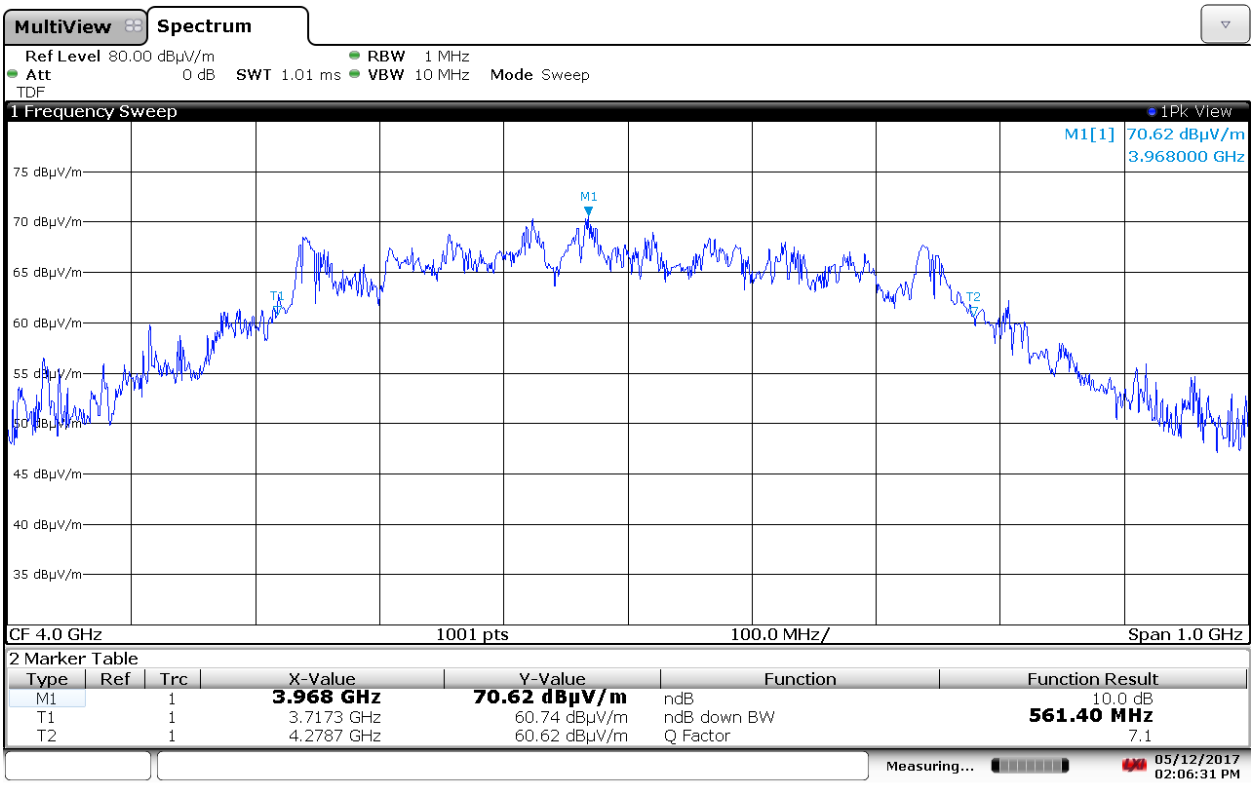
6. Measurement Data (continued)

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

6.3.5. Measurement Data – Values in GHz

f_M	The highest emission peak	3.9680
f_L	10 dB below the highest peak	3.7173
f_H	10 dB above the highest peak	4.2787
f_C	Calculated: $(f_H + f_L) / 2$	3.9980
Bandwidth	Calculated: $(f_H - f_L)$	0.5614
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.1404

6.3.6. Measurement Plot of 10 dB frequencies (Channel 2, 6.8 Mbps, 16M PRF)



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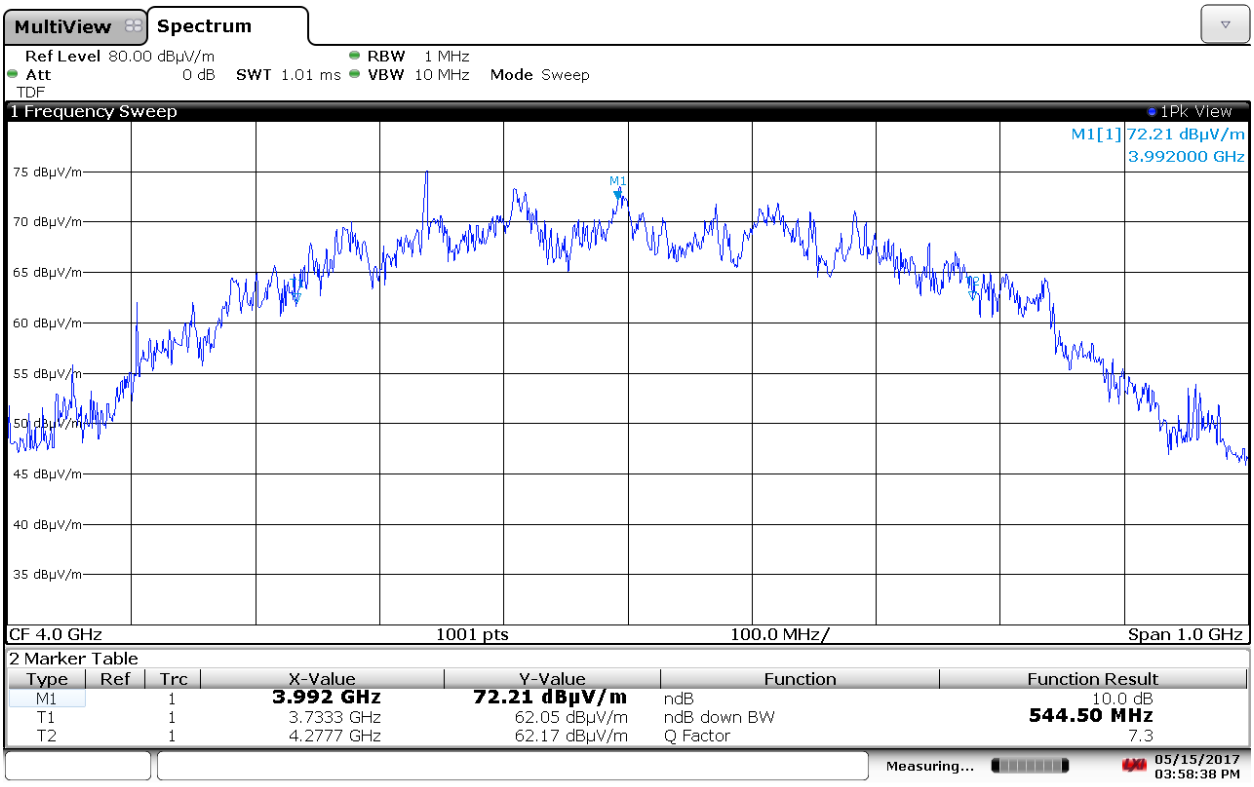
6. Measurement Data (continued)

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

6.3.7. Measurement Data – Values in GHz

f_M	The highest emission peak	3.9920
f_L	10 dB below the highest peak	3.7333
f_H	10 dB above the highest peak	4.2777
f_C	Calculated: $(f_H + f_L) / 2$	4.0055
Bandwidth	Calculated: $(f_H - f_L)$	0.5444
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.1359

6.3.8. Measurement Plot of 10 dB frequencies (Channel 2, 6.8 Mbps, 64M PRF)



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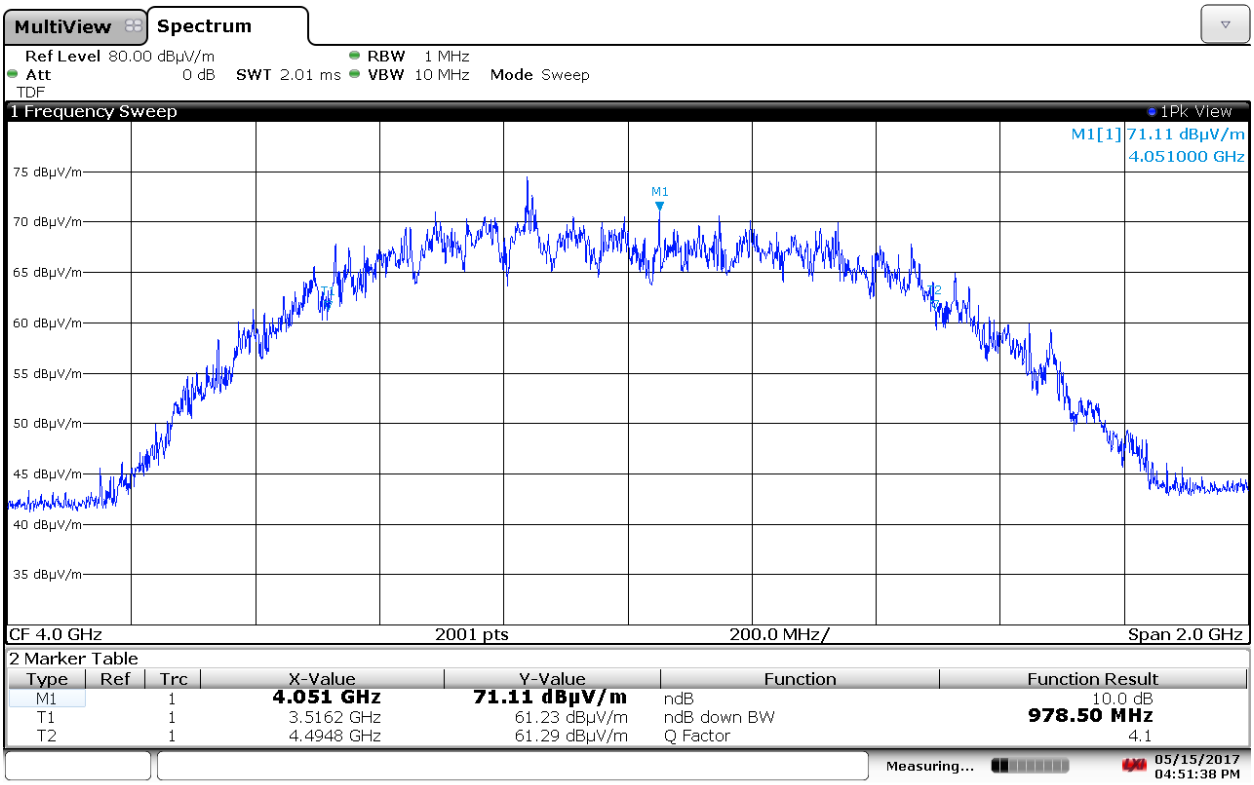
6. Measurement Data (continued)

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

6.3.9. Measurement Data – Values in GHz

f_M	The highest emission peak	4.0510
f_L	10 dB below the highest peak	3.5162
f_H	10 dB above the highest peak	4.4948
f_C	Calculated: $(f_H + f_L) / 2$	4.0055
Bandwidth	Calculated: $(f_H - f_L)$	0.9785
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.2443

6.3.10. Measurement Plot of 10 dB frequencies (Channel 4, 110 kbps, 16M PRF)



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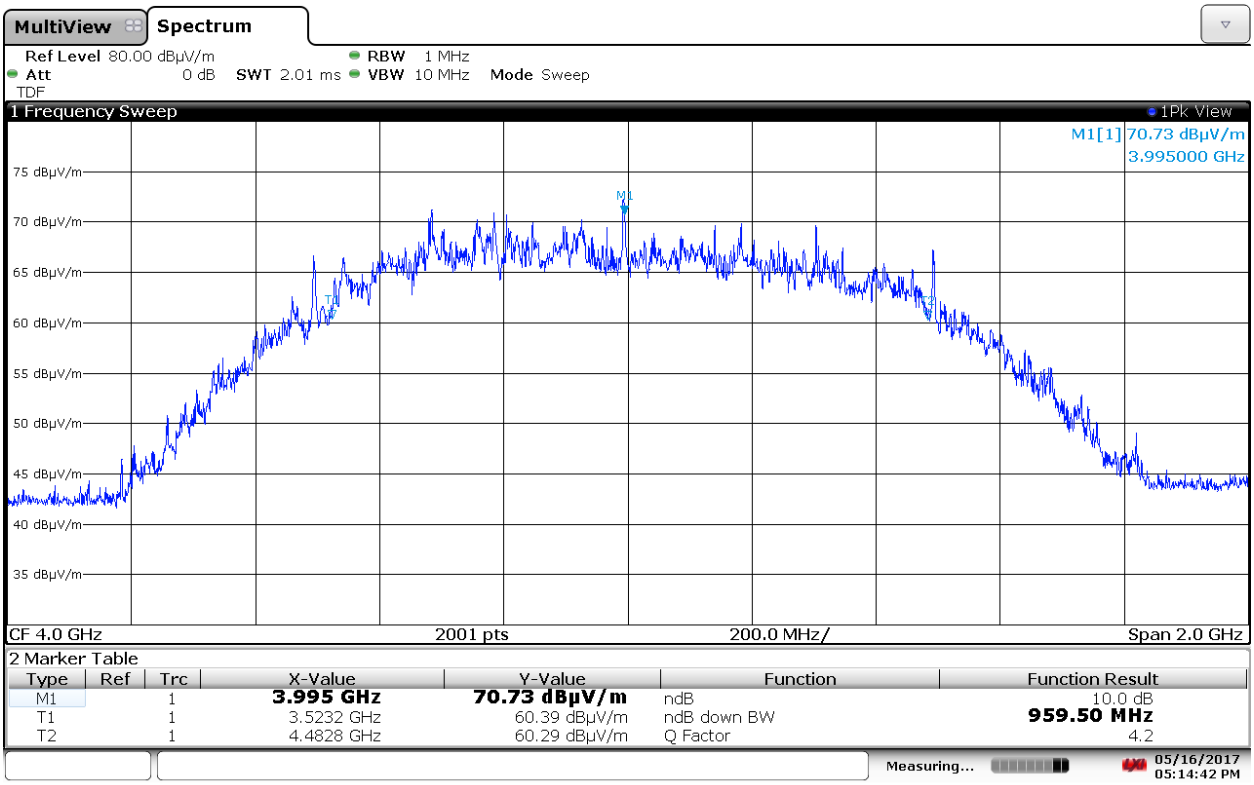
6. Measurement Data (continued)

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

6.3.11. Measurement Data – Values in GHz

f_M	The highest emission peak	3.9950
f_L	10 dB below the highest peak	3.5232
f_H	10 dB above the highest peak	4.4828
f_C	Calculated: $(f_H + f_L) / 2$	4.0030
Bandwidth	Calculated: $(f_H - f_L)$	0.9595
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.2397

6.3.12. Measurement Plot of 10 dB frequencies (Channel 4, 110 kbps, 64M PRF)



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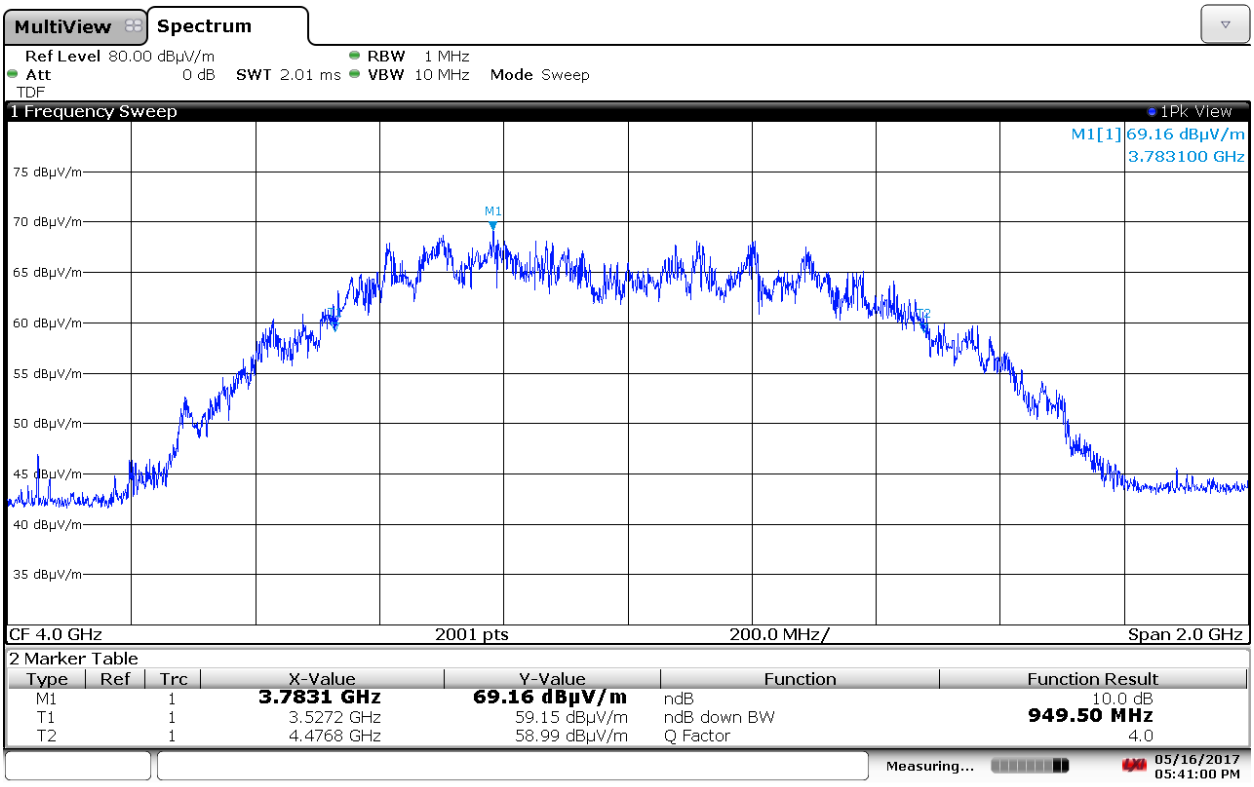
6. Measurement Data (continued)

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

6.3.13. Measurement Data – Values in GHz

f_M	The highest emission peak	3.7831
f_L	10 dB below the highest peak	3.5272
f_H	10 dB above the highest peak	4.4768
f_C	Calculated: $(f_H + f_L) / 2$	4.0020
Bandwidth	Calculated: $(f_H - f_L)$	0.9495
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.2373

6.3.14. Measurement Plot of 10 dB frequencies (Channel 4, 6.8 Mbps, 16M PRF)



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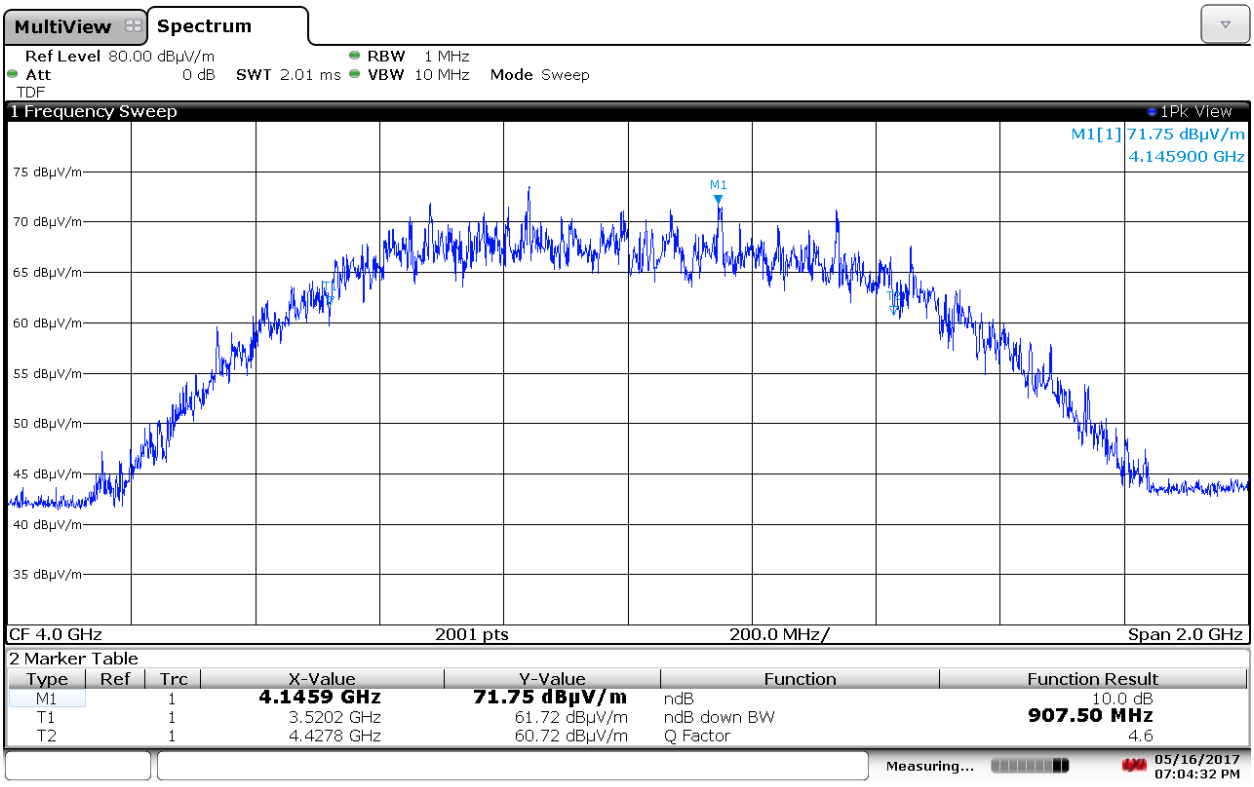
6. Measurement Data (continued)

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

6.3.15. Measurement Data – Values in GHz

f_M	The highest emission peak	4.1459
f_L	10 dB below the highest peak	3.5202
f_H	10 dB above the highest peak	4.4278
f_C	Calculated: $(f_H + f_L) / 2$	3.9740
Bandwidth	Calculated: $(f_H - f_L)$	0.9076
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.2284

6.3.16. Measurement Plot of 10 dB frequencies (Channel 4, 6.8 Mbps, 64M PRF)



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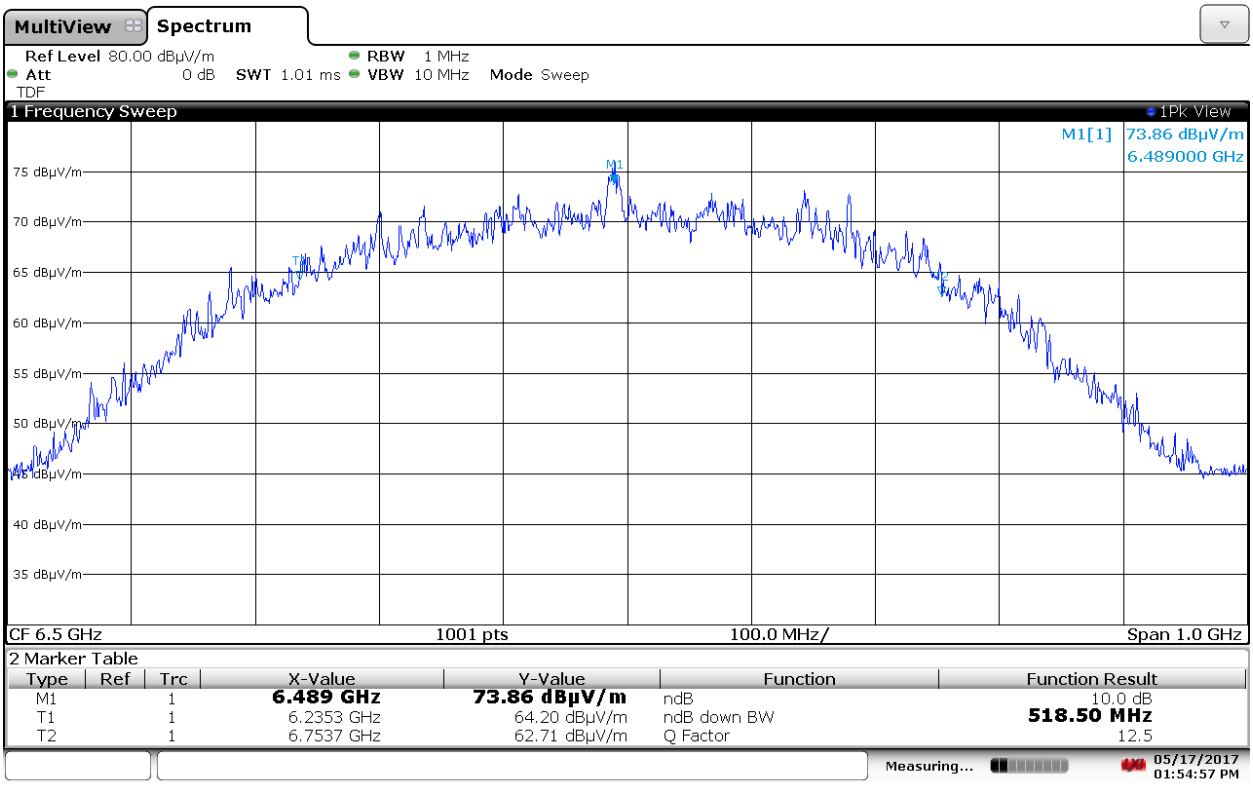
6. Measurement Data (continued)

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

6.3.17. Measurement Data – Values in GHz

f_M	The highest emission peak	6.4890
f_L	10 dB below the highest peak	6.2353
f_H	10 dB above the highest peak	6.7537
f_C	Calculated: $(f_H + f_L) / 2$	6.4945
Bandwidth	Calculated: $(f_H - f_L)$	0.5185
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.0798

6.3.18. Measurement Plot of 10 dB frequencies (Channel 5, 110 kbps, 16M PRF)



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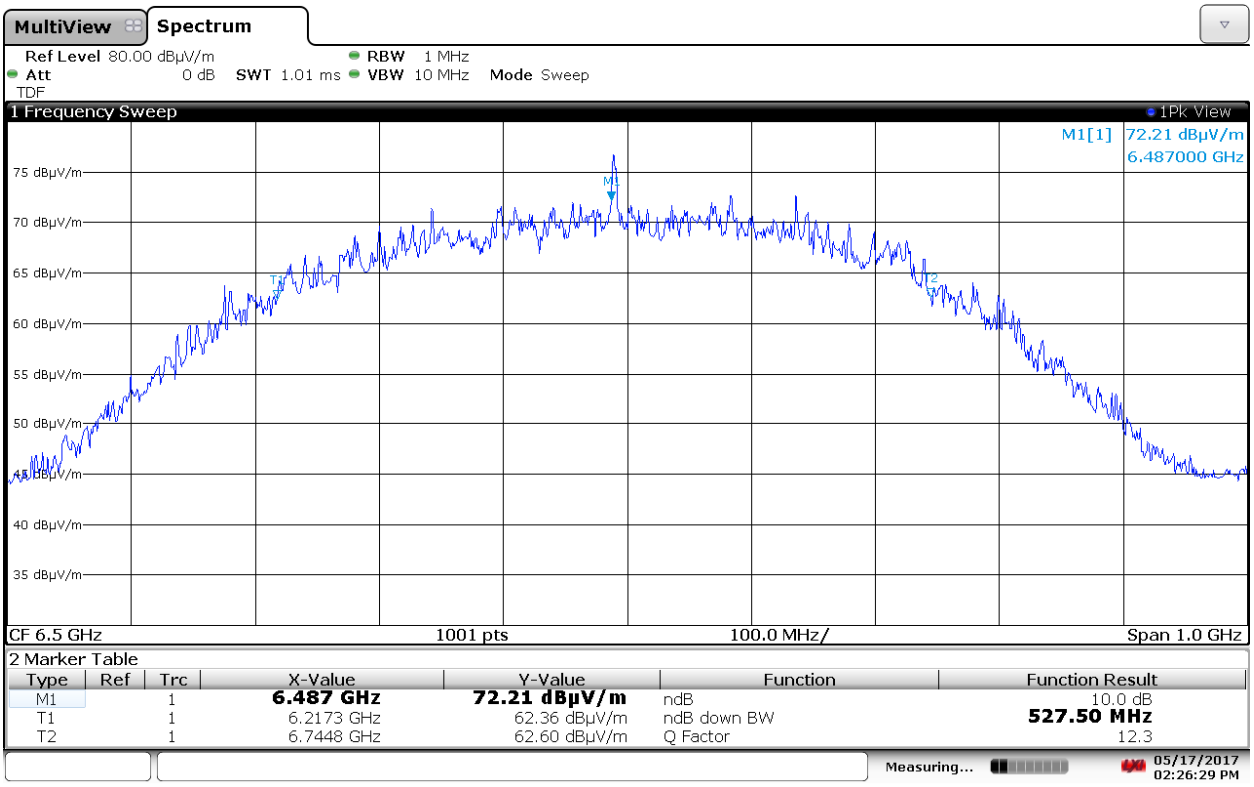
6. Measurement Data (continued)

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

6.3.19. Measurement Data – Values in GHz

f_M	The highest emission peak	6.4870
f_L	10 dB below the highest peak	6.2173
f_H	10 dB above the highest peak	6.7448
f_C	Calculated: $(f_H + f_L) / 2$	6.4811
Bandwidth	Calculated: $(f_H - f_L)$	0.5275
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.0814

6.3.20. Measurement Plot of 10 dB frequencies (Channel 5, 110 kbps, 64M PRF)



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6. Measurement Data (continued)

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

6.3.21. Measurement Data – Values in GHz

f_M	The highest emission peak	6.4640
f_L	10 dB below the highest peak	6.2173
f_H	10 dB above the highest peak	6.7488
f_C	Calculated: $(f_H + f_L) / 2$	6.4831
Bandwidth	Calculated: $(f_H - f_L)$	0.5315
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.0820

6.3.22. Measurement Plot of 10 dB frequencies (Channel 5, 6.8 Mbps, 16M PRF)

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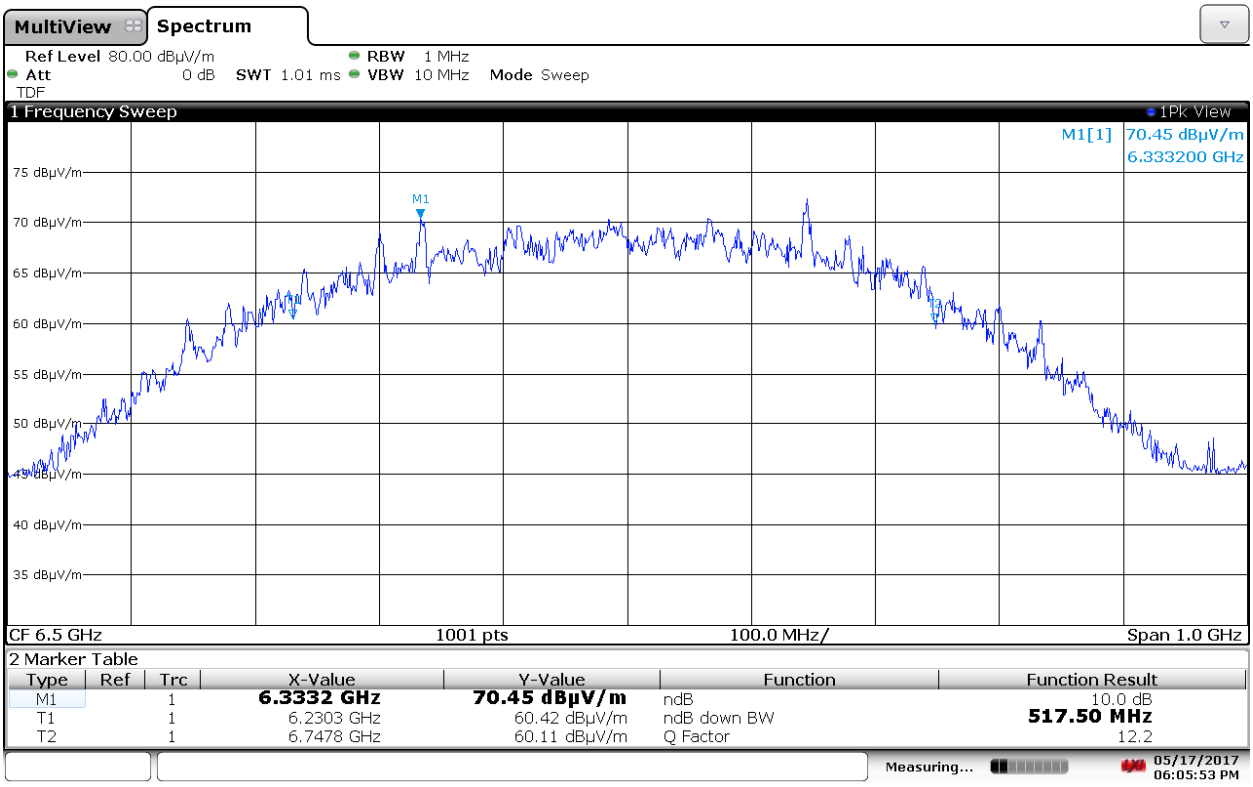
6. Measurement Data (continued)

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

6.3.23. Measurement Data – Values in GHz

f_M	The highest emission peak	6.3332
f_L	10 dB below the highest peak	6.2303
f_H	10 dB above the highest peak	6.7478
f_C	Calculated: $(f_H + f_L) / 2$	6.4891
Bandwidth	Calculated: $(f_H - f_L)$	0.5175
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.0797

6.3.24. Measurement Plot of 10 dB frequencies (Channel 5, 6.8 Mbps, 64M PRF)



06:05:54 PM 05/17/2017

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6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (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)

Frequency (MHz)	Field Strength (dBµV/m)
0.009 to 0.490	128.5 to 93.8
0.490 to 1.705	73.8 to 63
1.705 - 30	69.5
30 - 88	40
88 - 216	43.5
216 - 960	46
960 - 40,000	54

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

Frequency Range:	10 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 (minimum):	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

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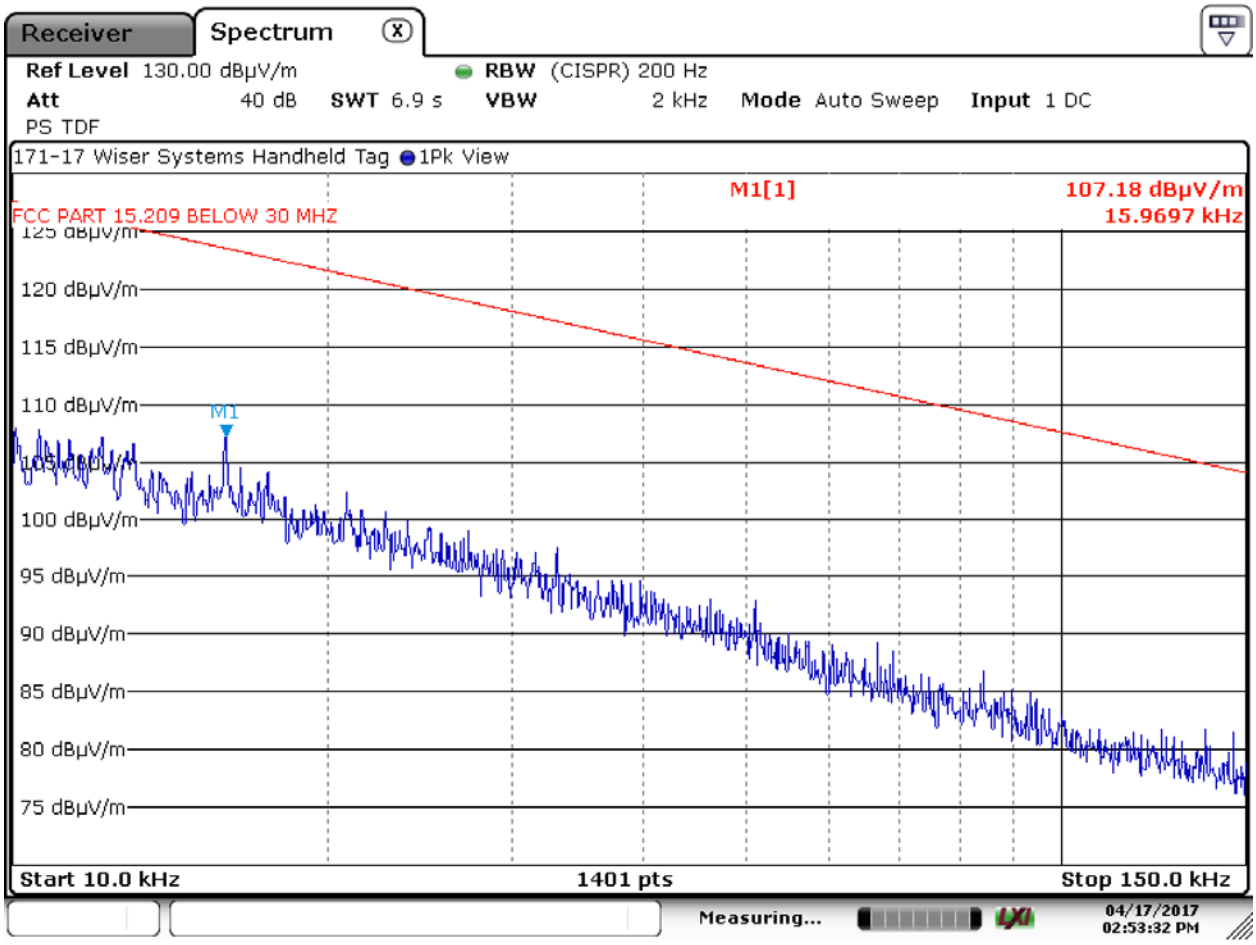
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209)

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 – 10 to 150 kHz



Date: 17.APR.2017 14:53:32

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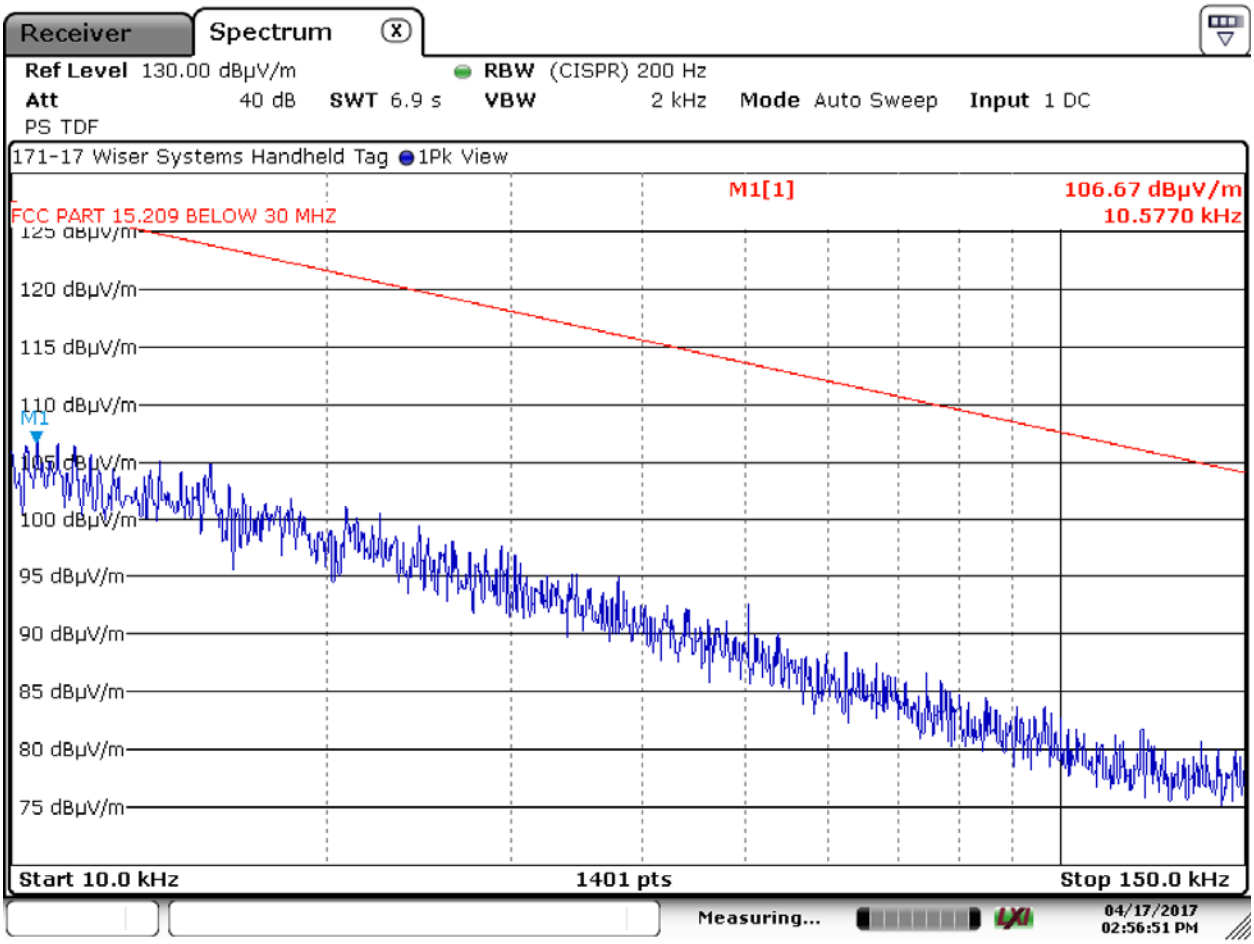
6. Measurement Data (continued)

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 – 10 to 150 kHz



Date: 17.APR.2017 14:56:50

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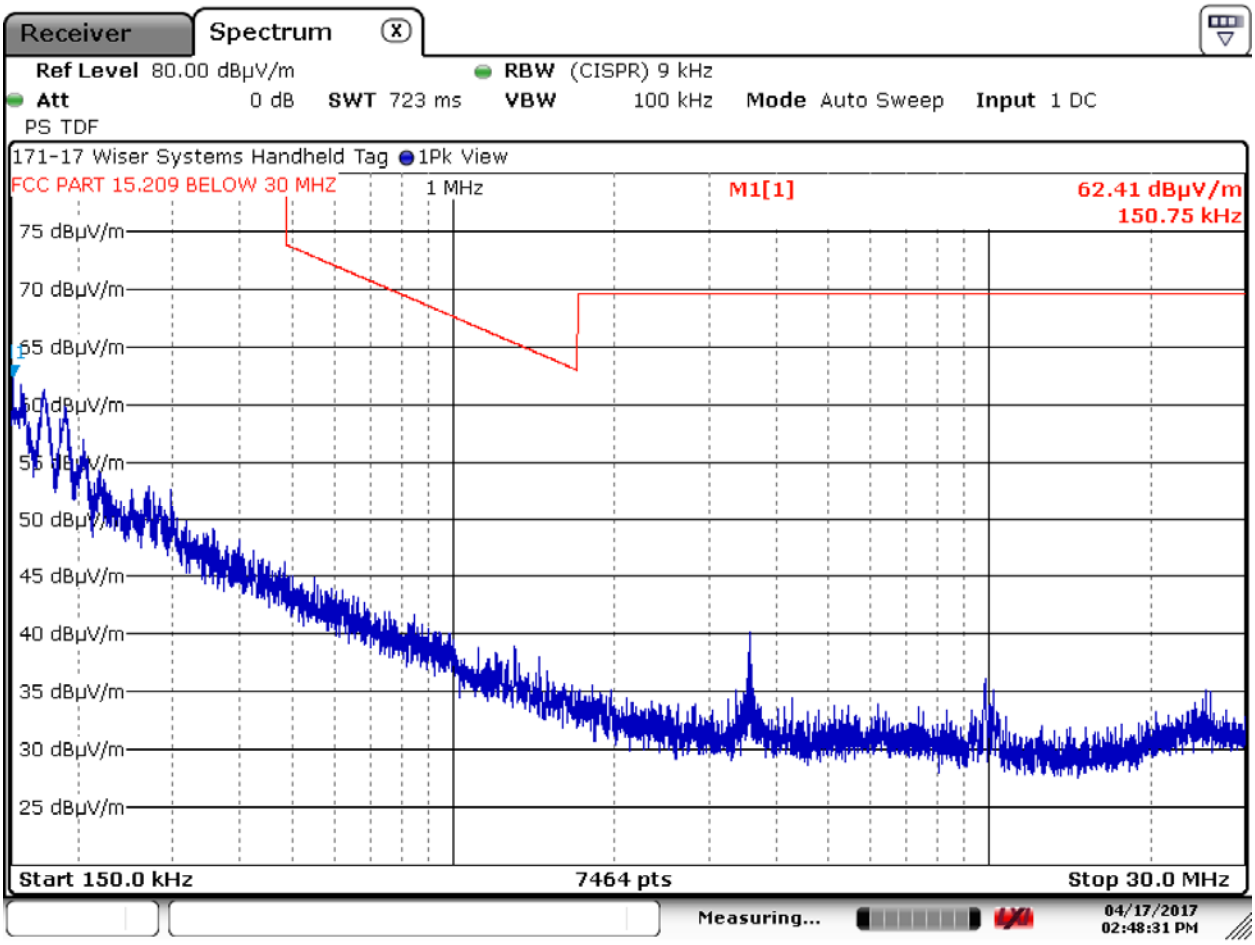
6. Measurement Data (continued)

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 Parallel Measurement Antenna – 150 kHz to 30 MHz



Date: 17.APR.2017 14:48:30

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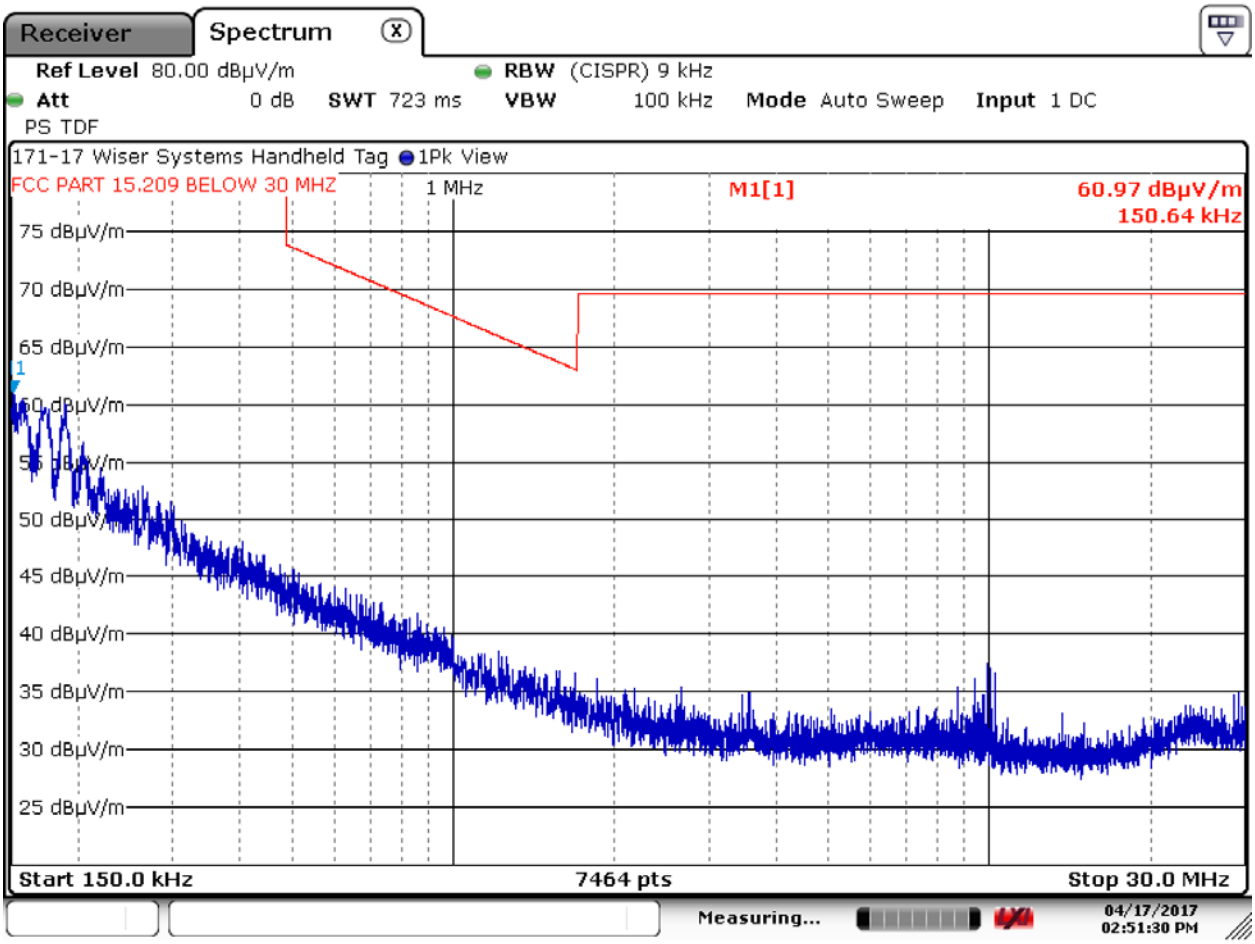
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 32 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 Perpendicular Measurement Antenna – 150 kHz to 30 MHz



Date: 17.APR.2017 14:51:29

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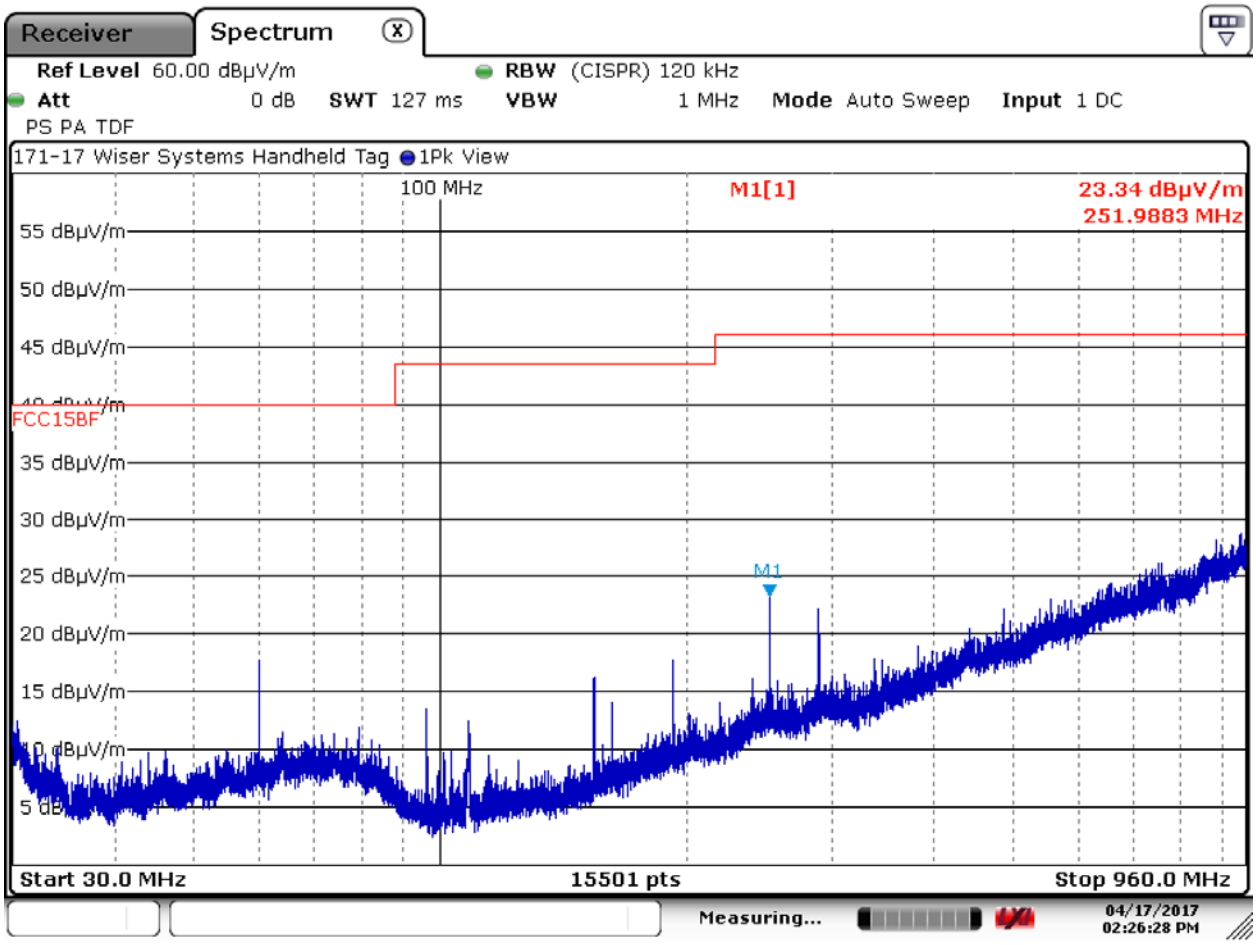
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 32 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 Horizontal Polarity – 30 to 960 MHz



Date: 17.APR.2017 14:26:28

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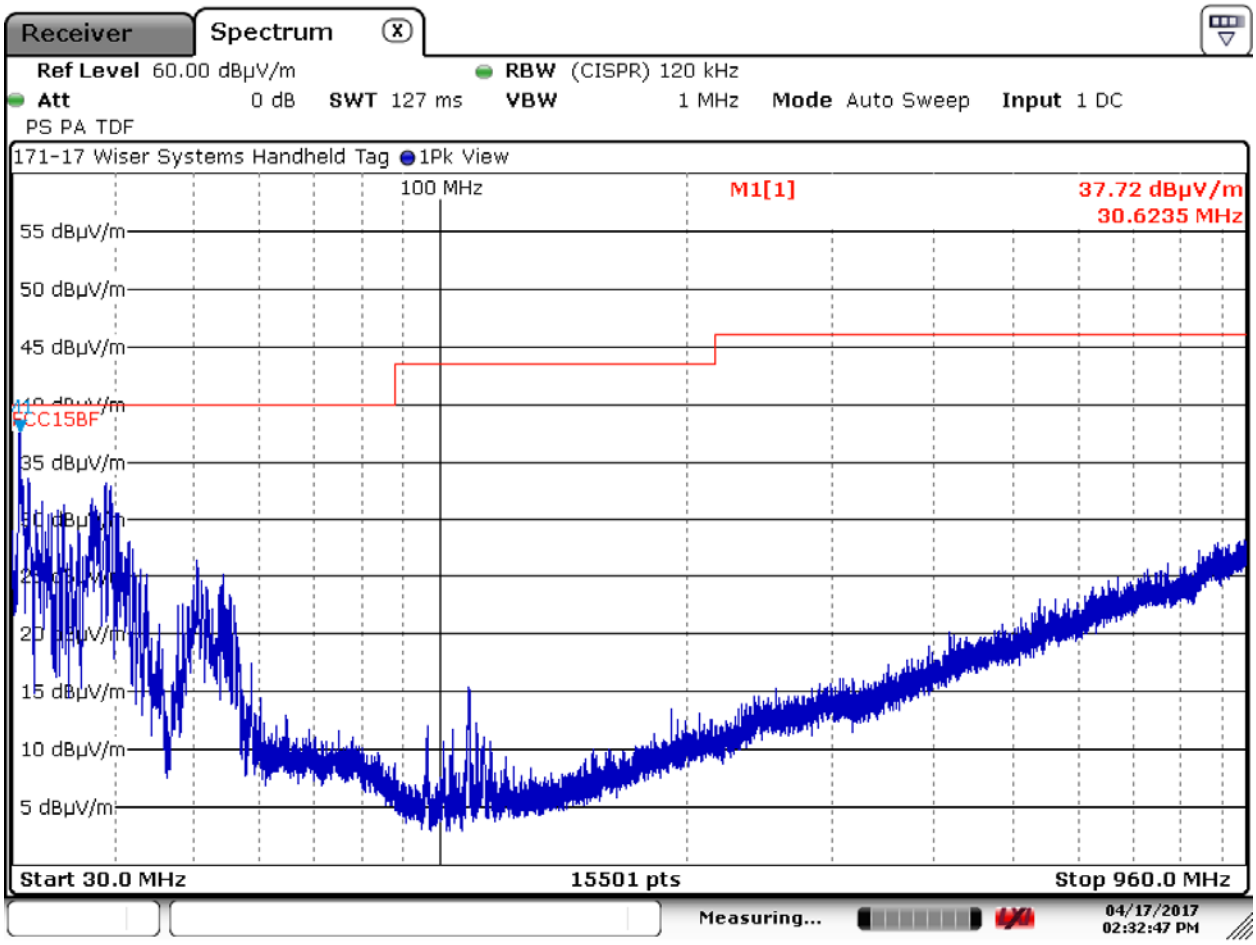
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 32 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 Vertical Polarity – 30 to 960 MHz



Date: 17.APR.2017 14:32:46

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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.

Frequency (MHz)	EIRP (dBm)	EIRP at 3 Meters (dBµV/m)
960 - 1610	-75.3	19.9
1610 - 1990	-53.3	41.9
1990 - 3100	-51.3	43.9
3100 - 10600	-41.3	53.9
Above 10600	-51.3	43.9

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

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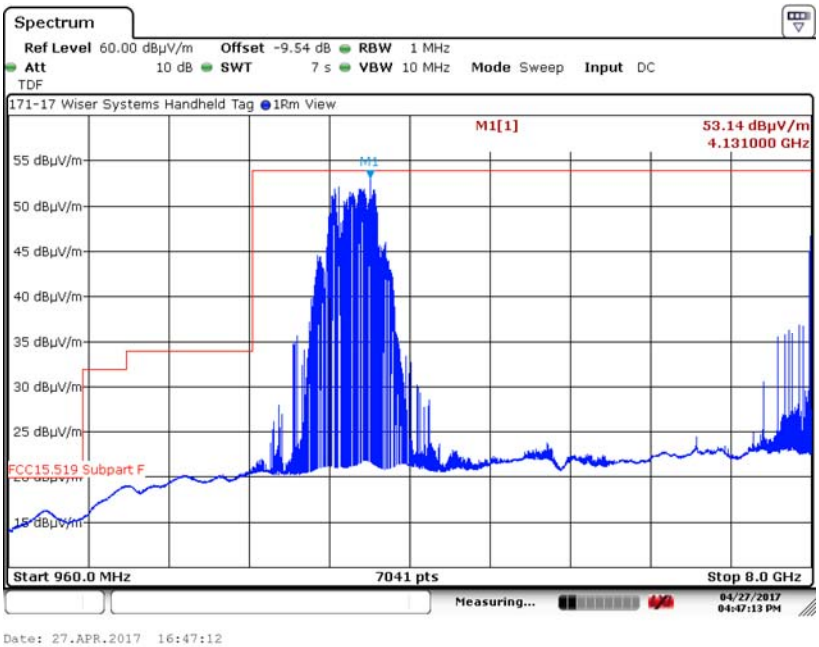
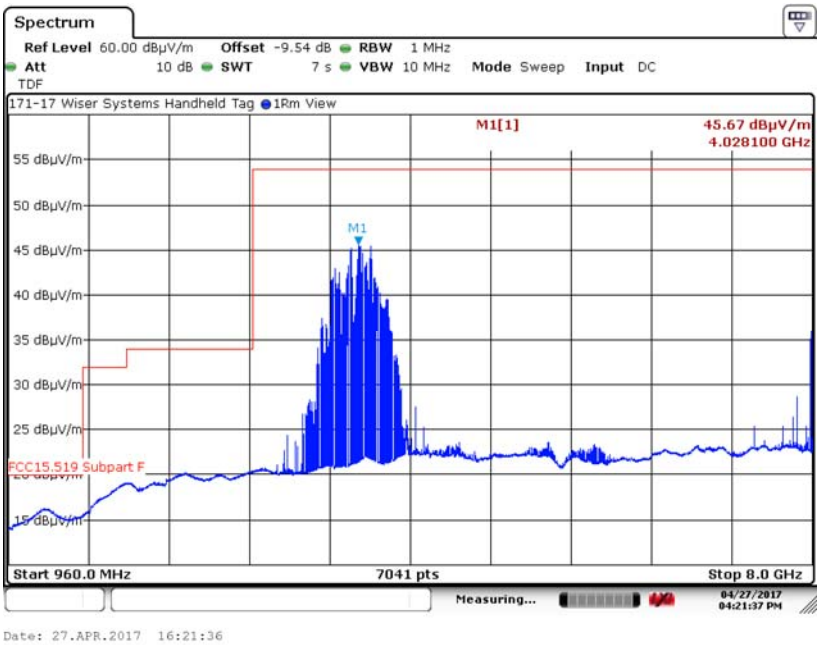
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.1. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 2, 110 kbps, 16M PRF)



6.5.2. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 2, 110 kbps, 16M PRF)



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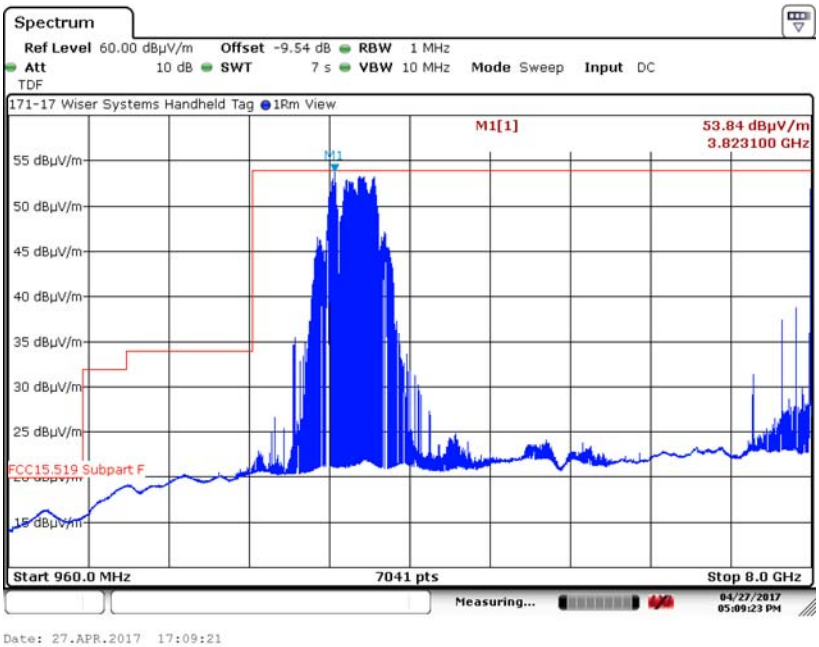
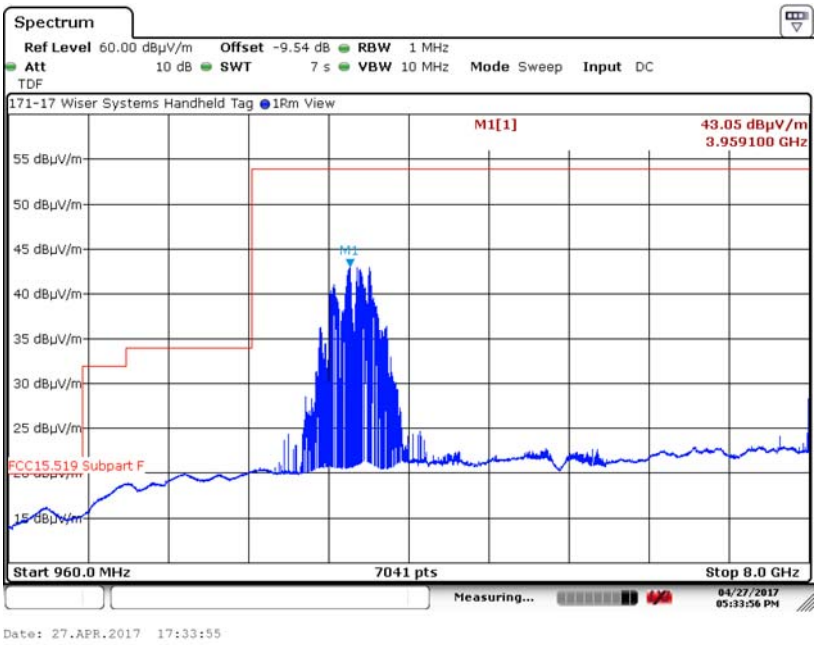
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.3. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 2, 110 kbps, 64M PRF)



6.5.4. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 2, 110 kbps, 64M PRF)



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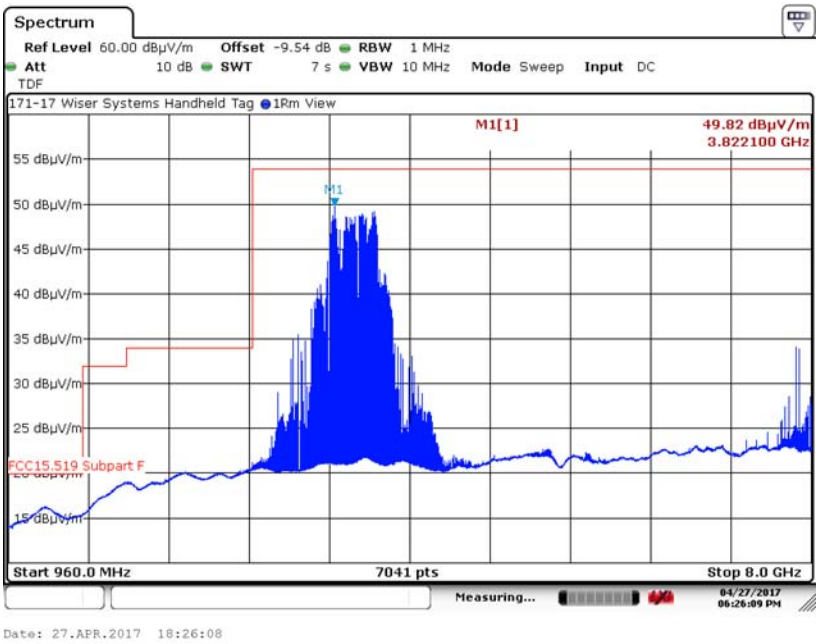
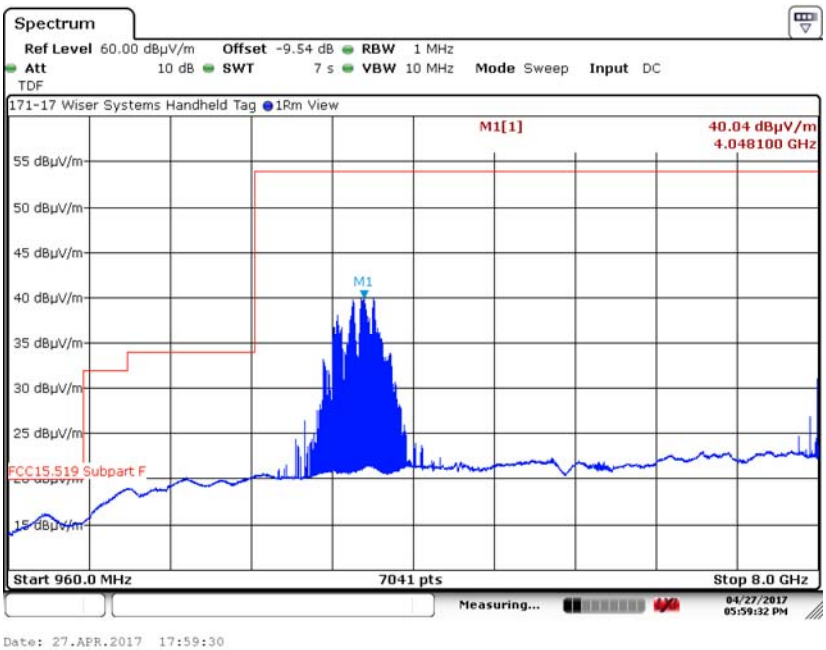
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.5. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 2, 6.8 Mbps, 16M PRF)



6.5.6. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 2, 6.8 Mbps, 16M PRF)



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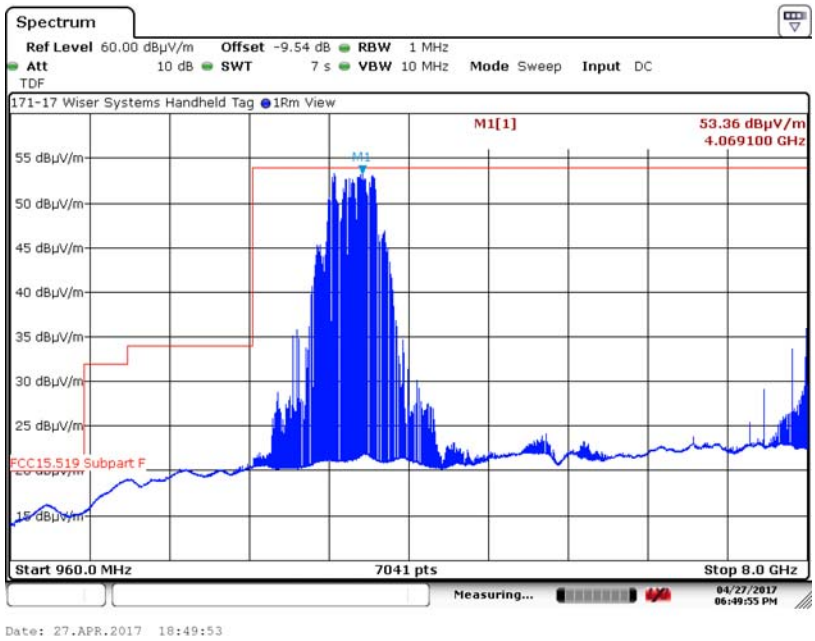
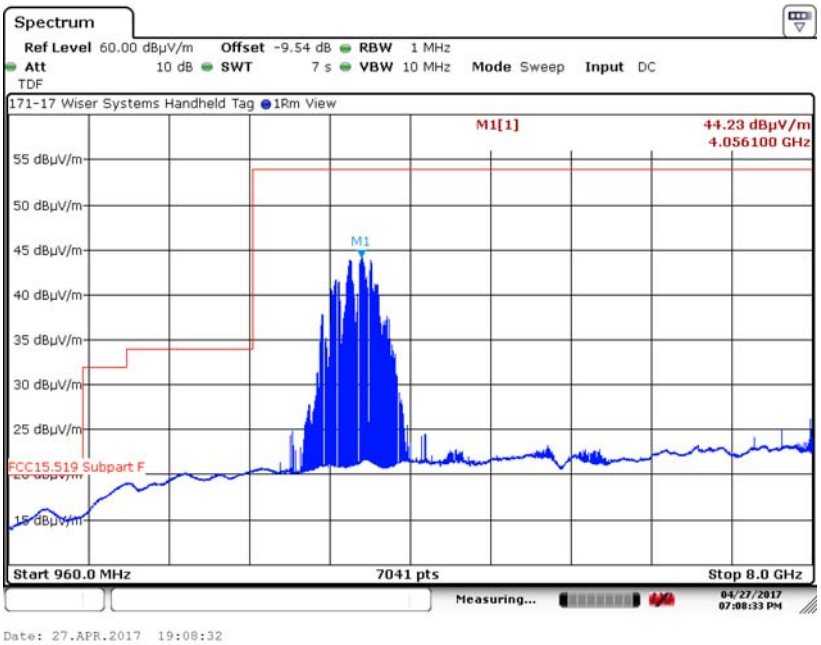
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.7. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 2, 6.8 Mbps, 64M PRF)



6.5.8. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 2, 6.8 Mbps, 64M PRF)



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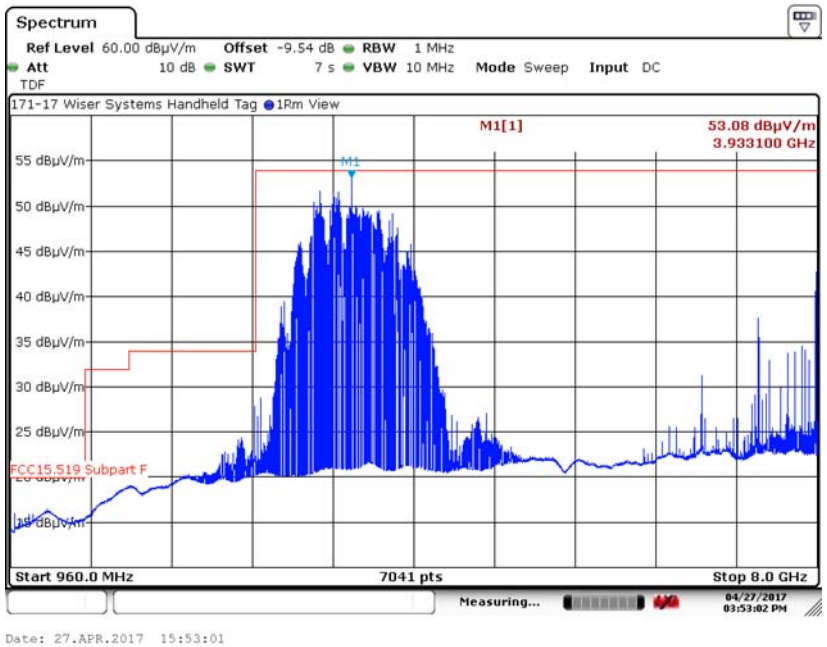
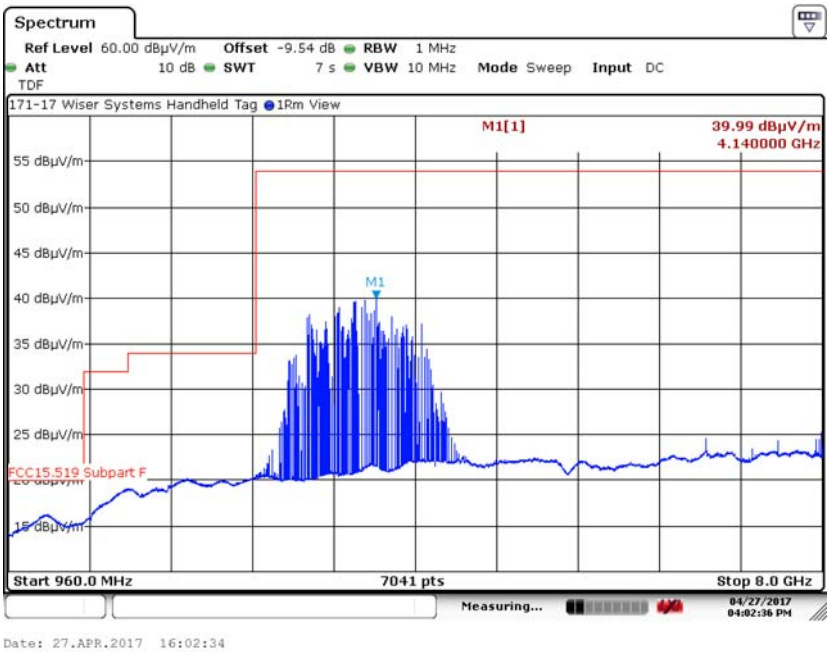
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.9. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 4, 110 kbps, 16M PRF)



6.5.10. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 4, 110 kbps, 16M PRF)



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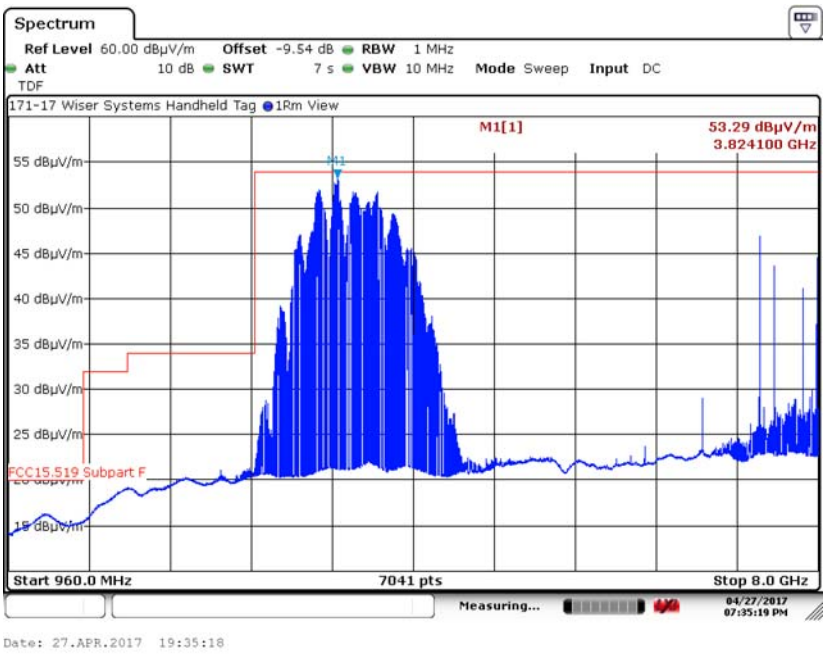
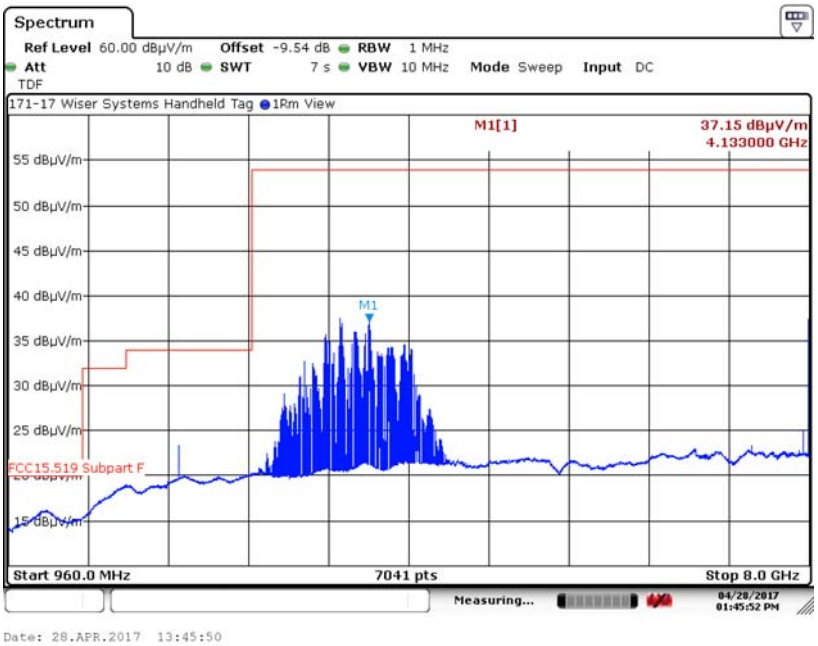
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.11. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 4, 110 kbps, 64M PRF)



6.5.12. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 4, 110 kbps, 64M PRF)



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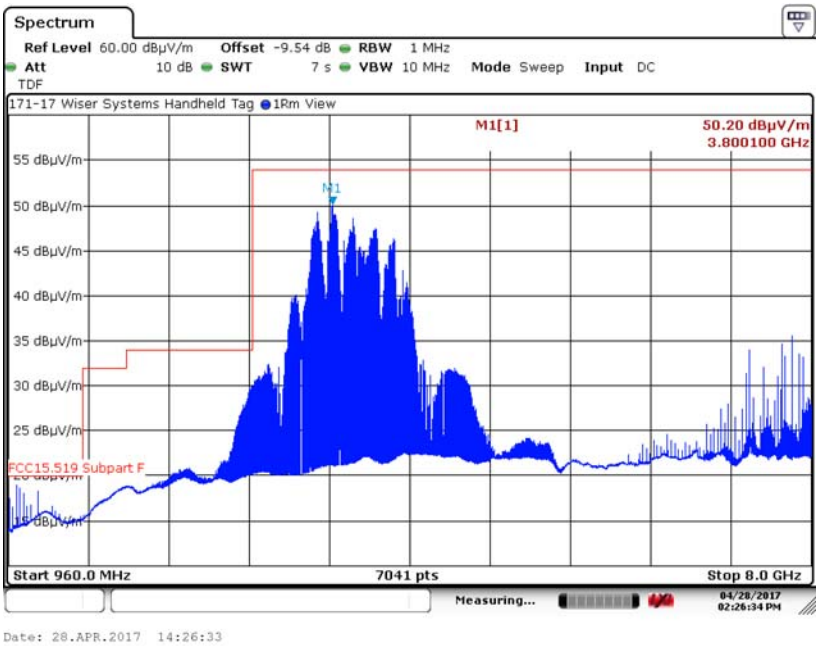
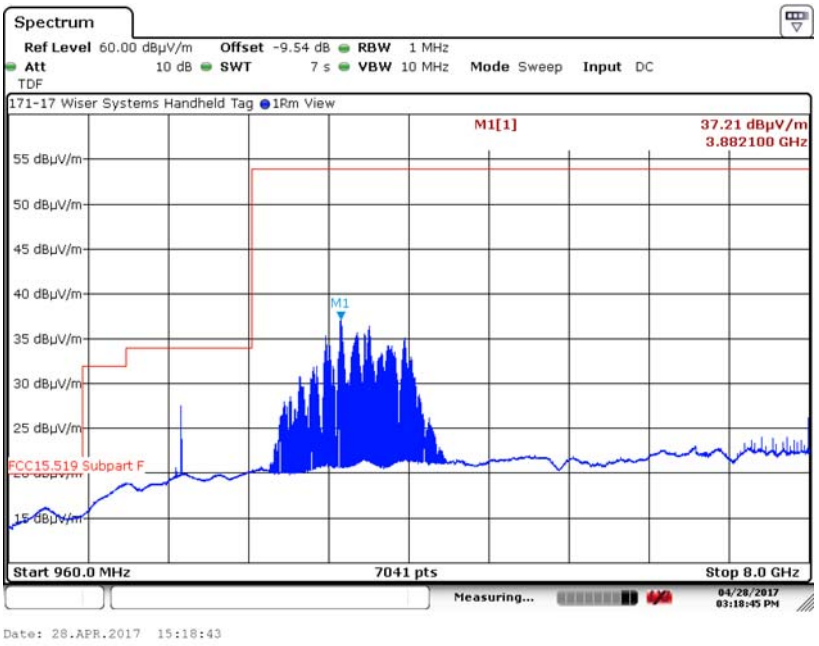
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.13. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 4, 6.8 Mbps, 16M PRF)



6.5.14. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 4, 6.8 Mbps, 16M PRF)



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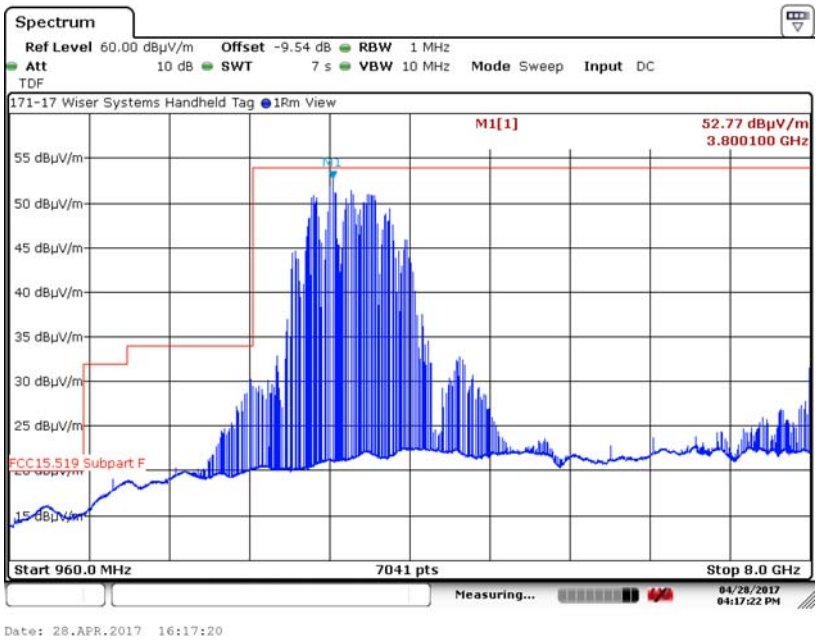
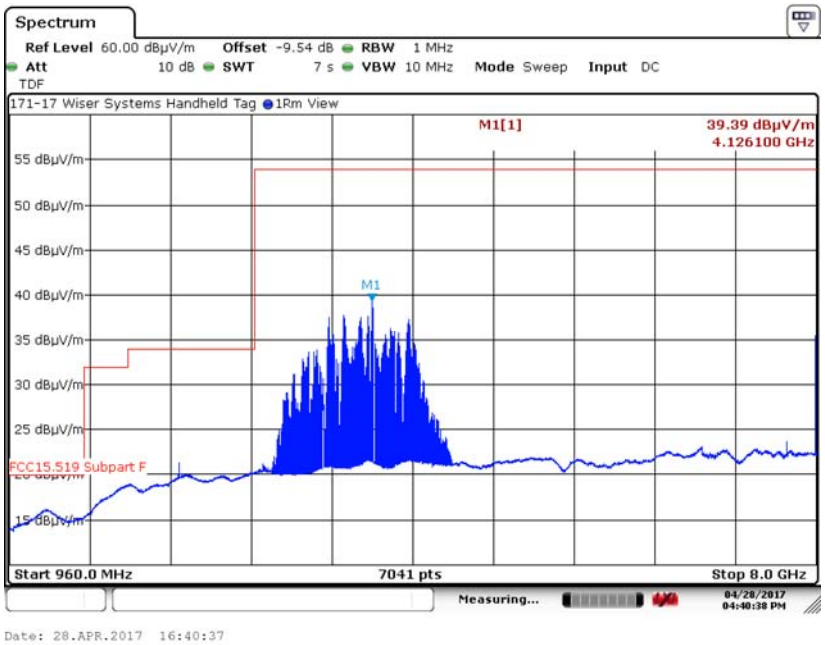
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.15. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 4, 6.8 Mbps, 64M PRF)



6.5.16. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 4, 6.8 Mbps, 64M PRF)



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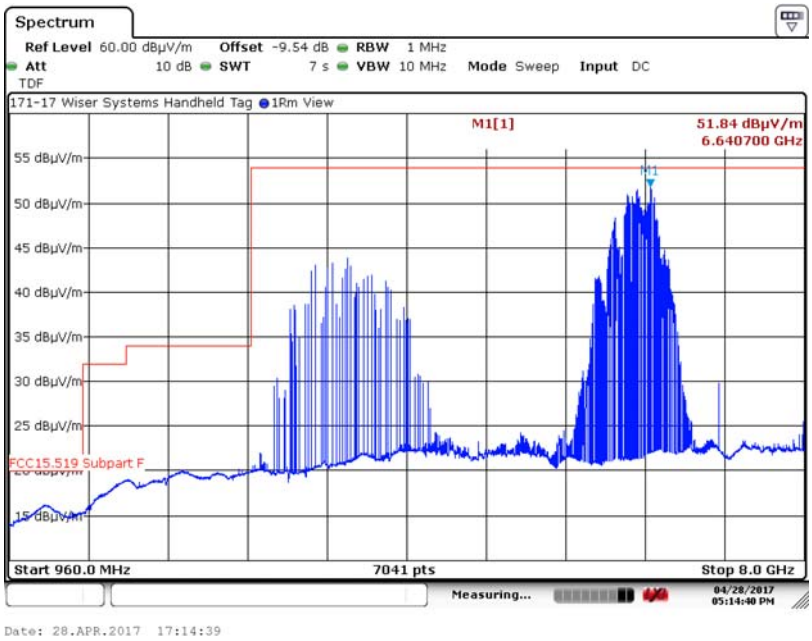
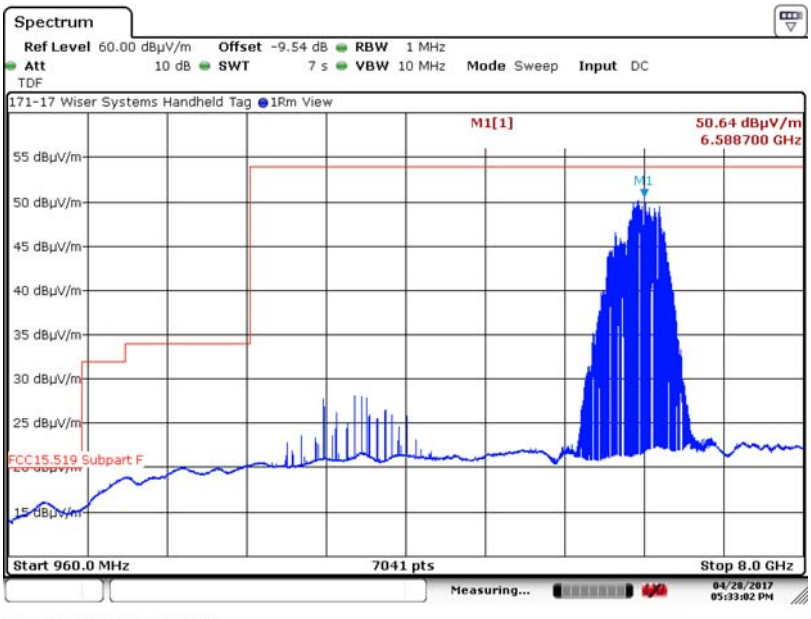
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.17. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 5, 110 kbps, 16M PRF)



6.5.18. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 5, 110 kbps, 16M PRF)



Note: Signal at 4 GHz is from the support equipment

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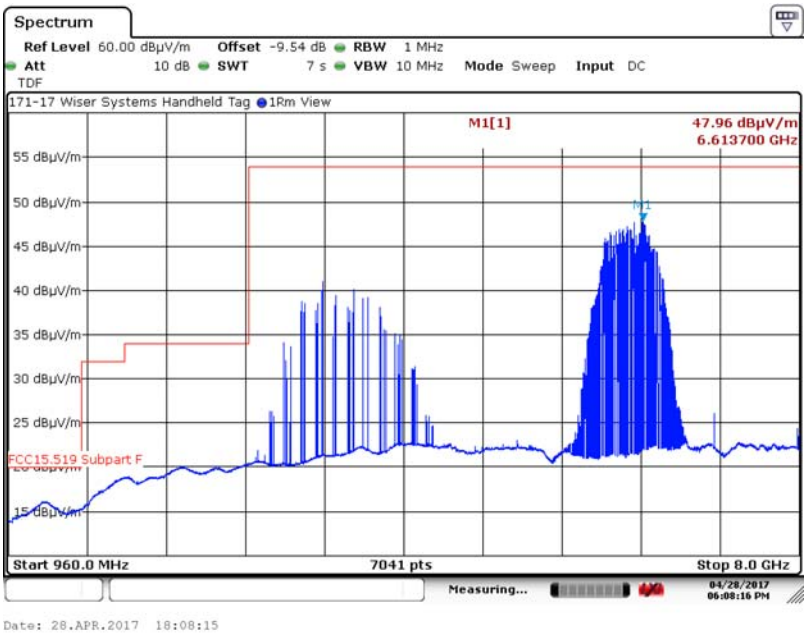
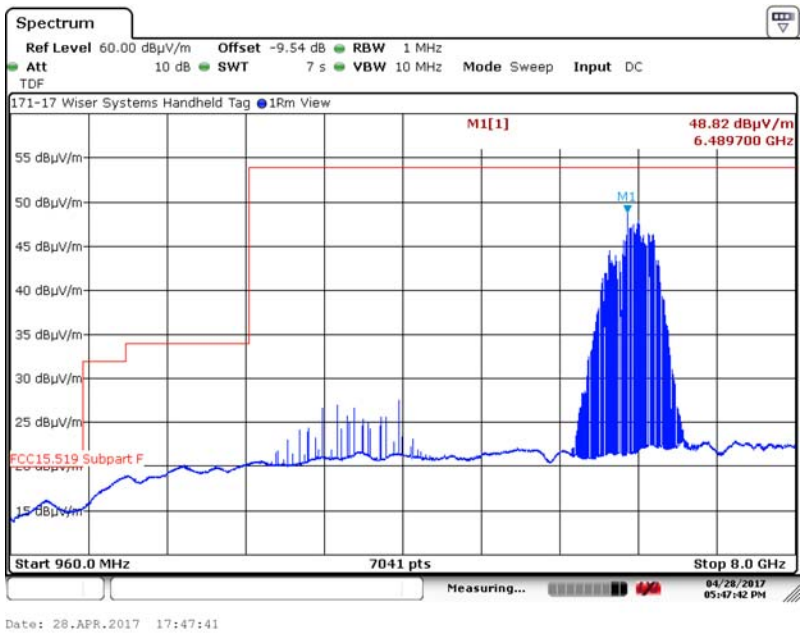
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.19. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 5, 110 kbps, 64M PRF)



6.5.20. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 5, 110 kbps, 64M PRF)



Note: Signal at 4 GHz is from the support equipment

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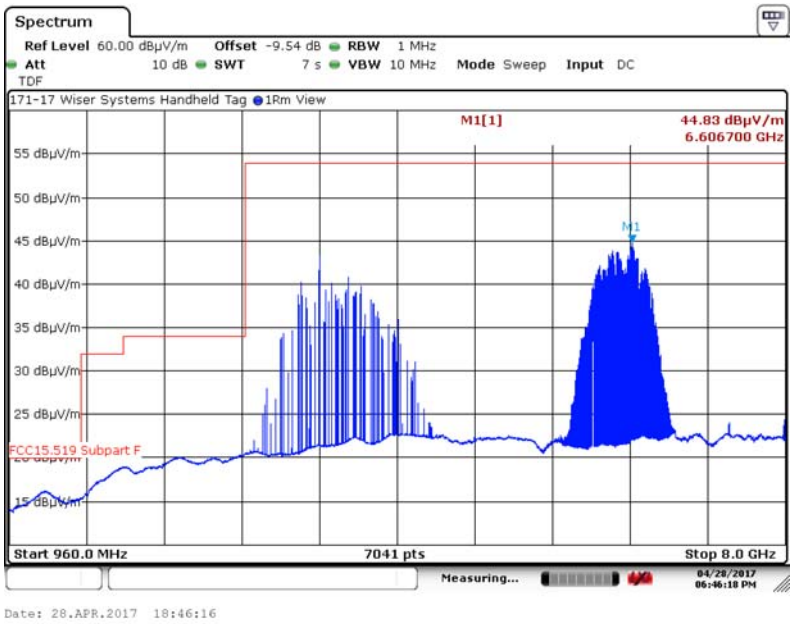
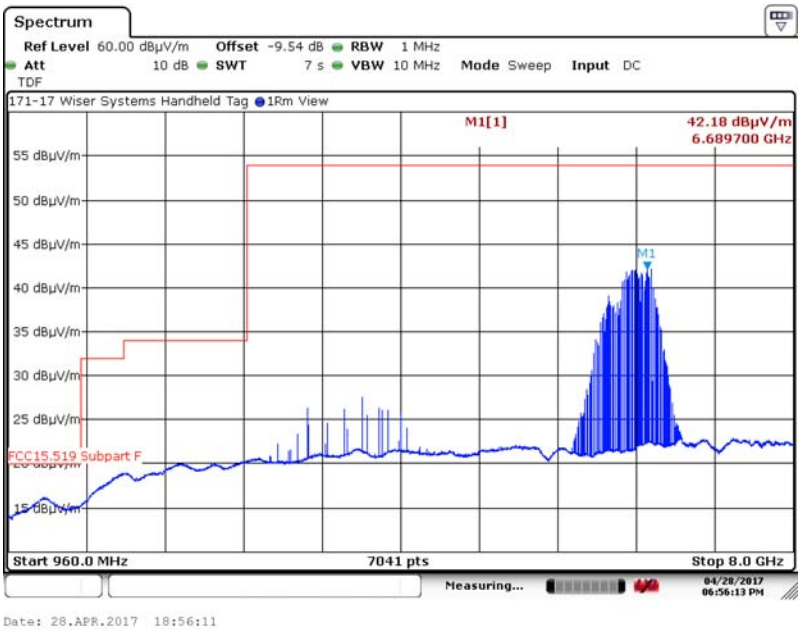
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.21. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 5, 6.8 Mbps, 16M PRF)



6.5.22. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 5, 6.8 Mbps, 16M PRF)



Note: Signal at 4 GHz is from the support equipment

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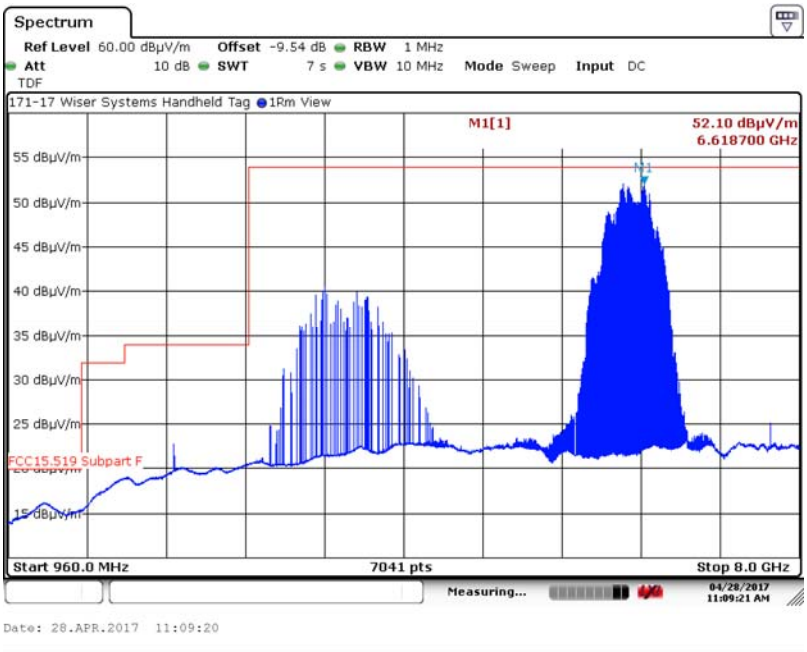
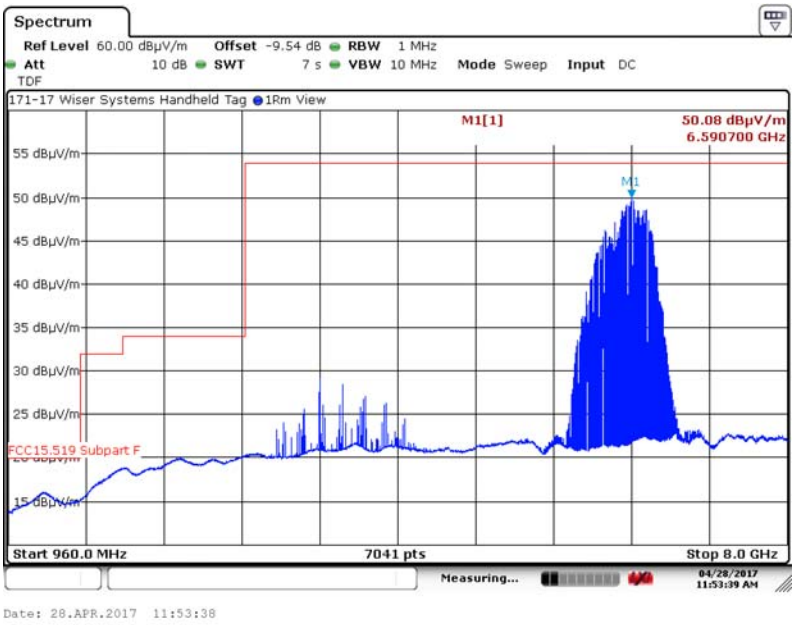
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.519 (c))

6.5.23. 960 MHz to 8 GHz Horizontal at 1 Meter (Channel 5, 6.8 Mbps, 64M PRF)



6.5.24. 960 MHz to 8 GHz Vertical at 1 Meter (Channel 5, 6.8 Mbps, 64M PRF)



Note: Signal at 4 GHz is from the support equipment

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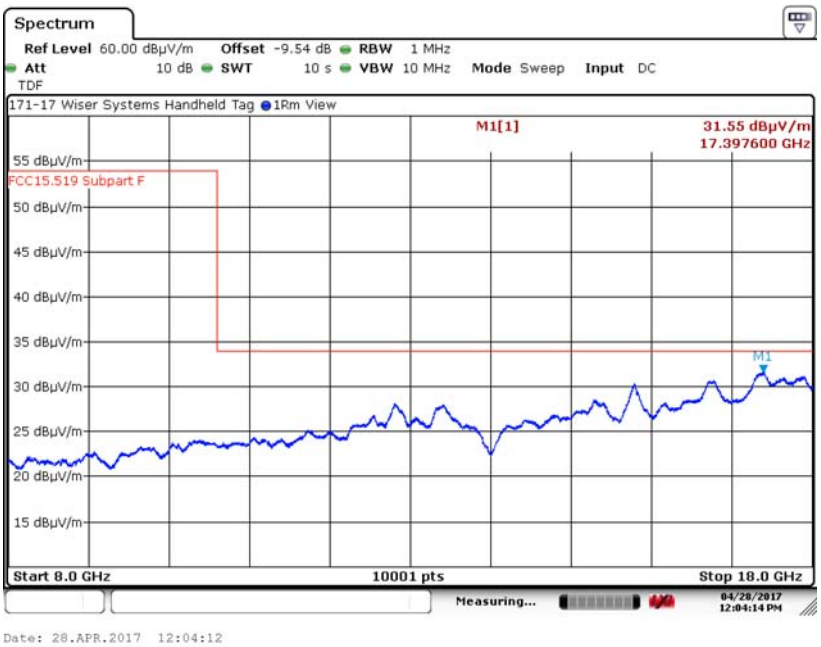
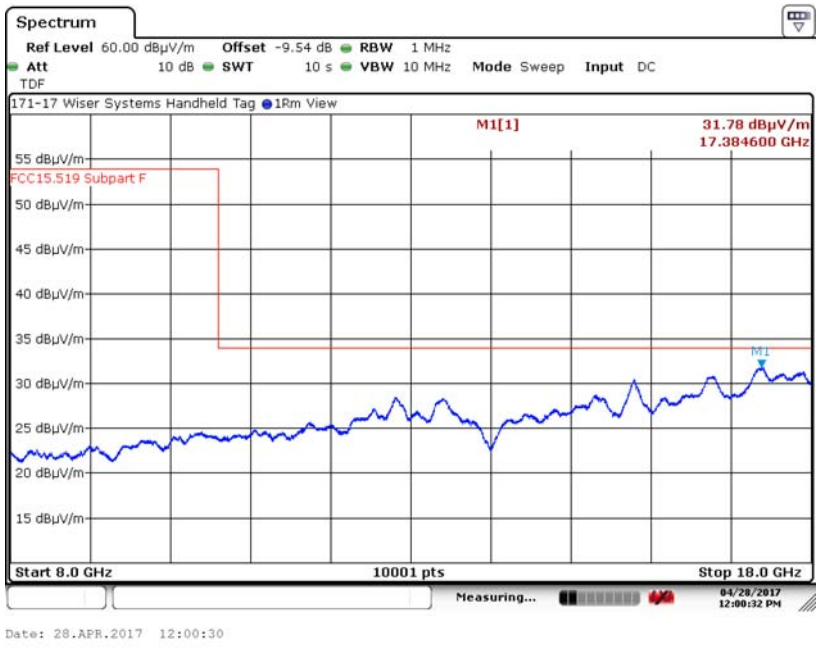
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.519 (c))

6.5.25. 8 to 18 GHz Horizontal at 1 Meter (all modes of operation)



6.5.26. 8 to 18 GHz Vertical at 1 Meter (all modes of operation)



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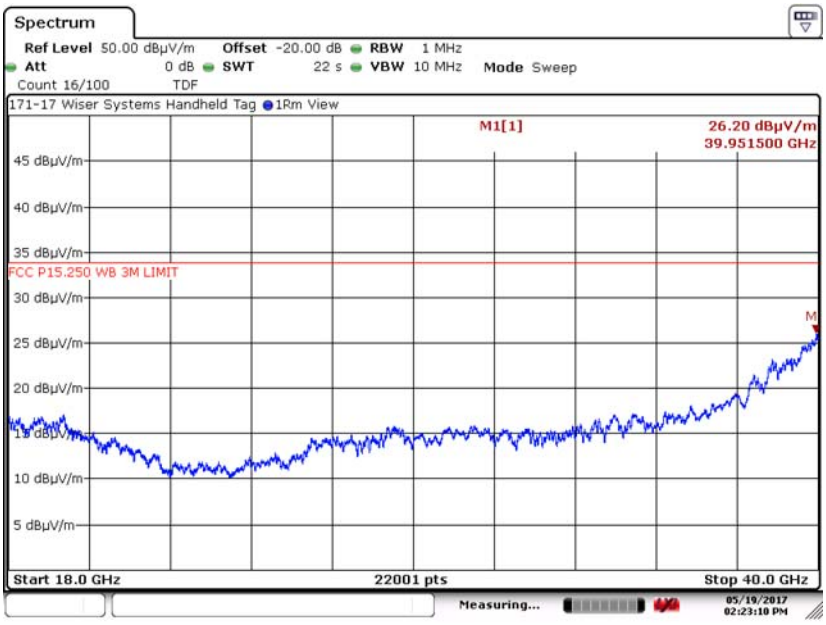
6. Measurement Data (continued)

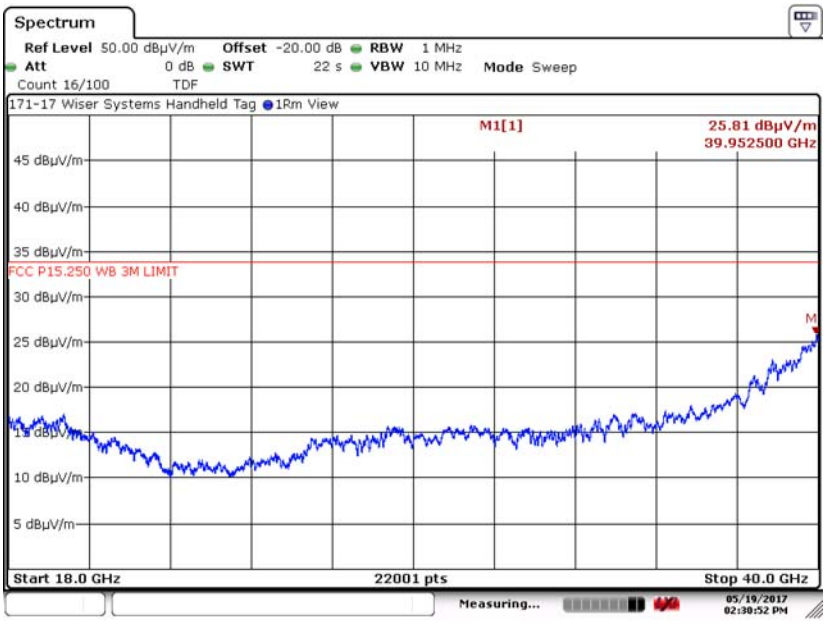
6.5. Spurious Radiated Emissions (15.519 (c))

6.5.27. 18 to 40 GHz Horizontal at 0.3 Meter (all modes of operation)



Date: 19.MAY.2017 14:23:11

6.5.28. 18 to 40 GHz Vertical at 0.3 Meter (all modes of operation)



Date: 19.MAY.2017 14:30:52

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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 Function: RMS

6.6.2. 1164 to 1240 MHz & 1559 to 1610 MHz

There were no broadband emissions related to the UWB transmitter. Any measured signals that are narrowband and related to the microprocessor / clocks within the device do not fall under the requirements of this section.

Measurements were made at 3 Meters and the -85.3 dBm limit was converted to a field strength limit of 9.9 dBuV/m using a factor of 95.2

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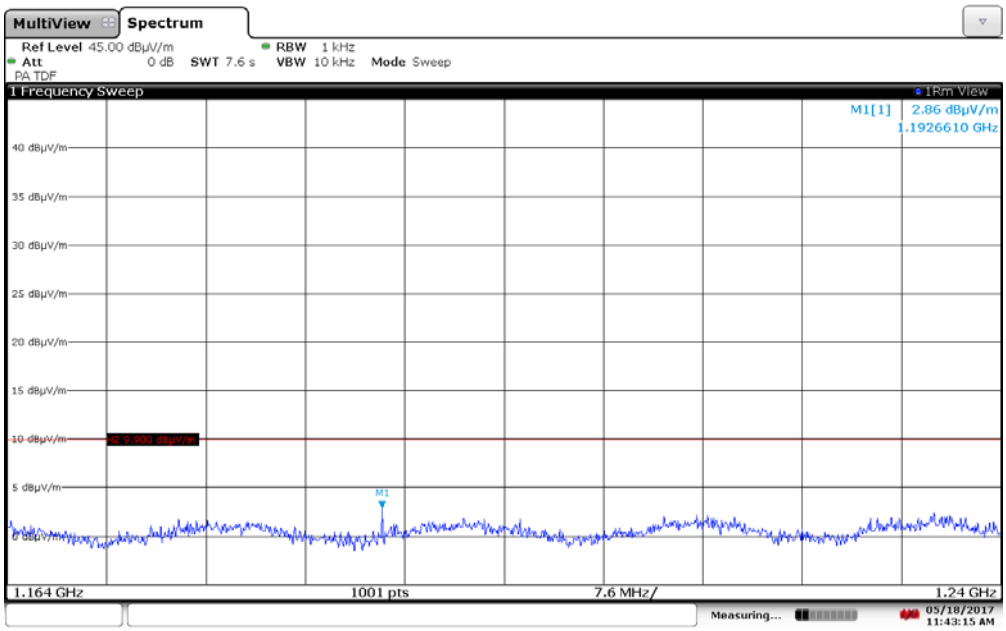
6. Measurement Data (continued)

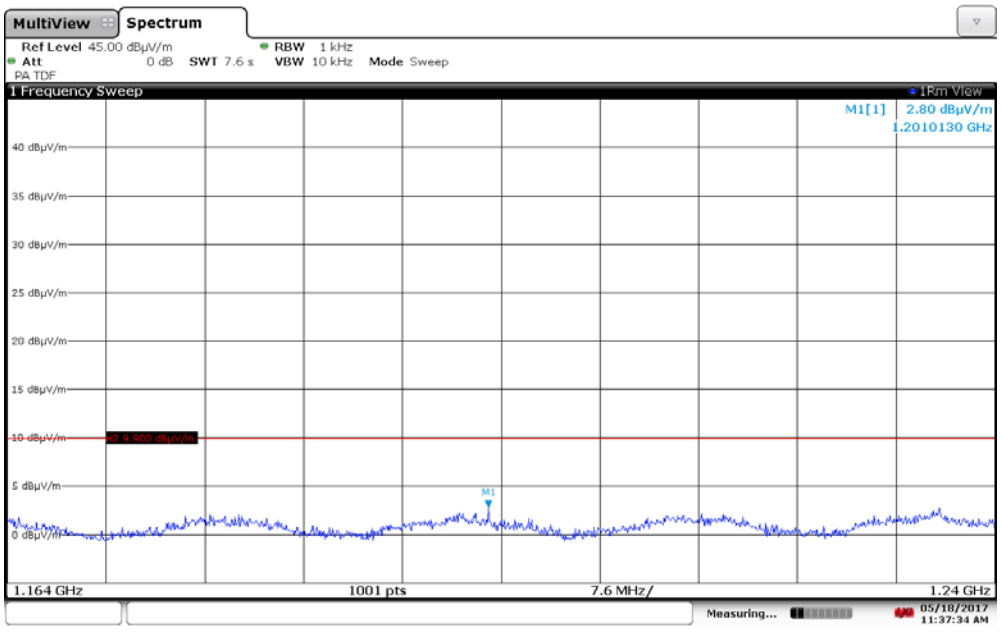
6.6. Spurious Radiated Emissions in GPS Bands (15.519 (d))

6.6.3.1 Horizontal Measurement Polarity 1164 to 1240 MHz



11:43:16 AM 05/18/2017

6.6.3.2 Vertical Measurement Polarity 1164 to 1240 MHz



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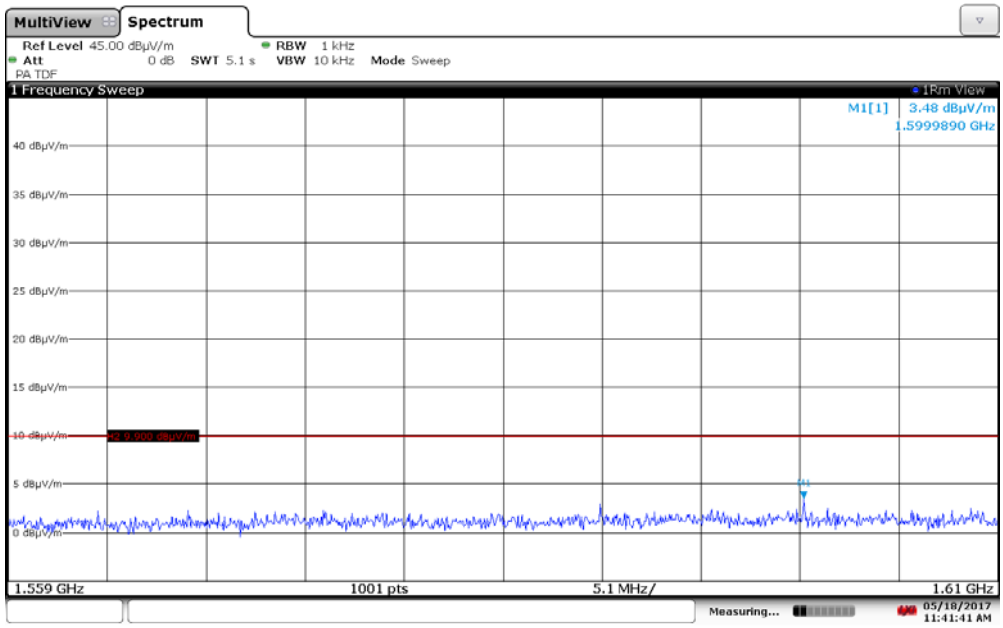
6. Measurement Data (continued)

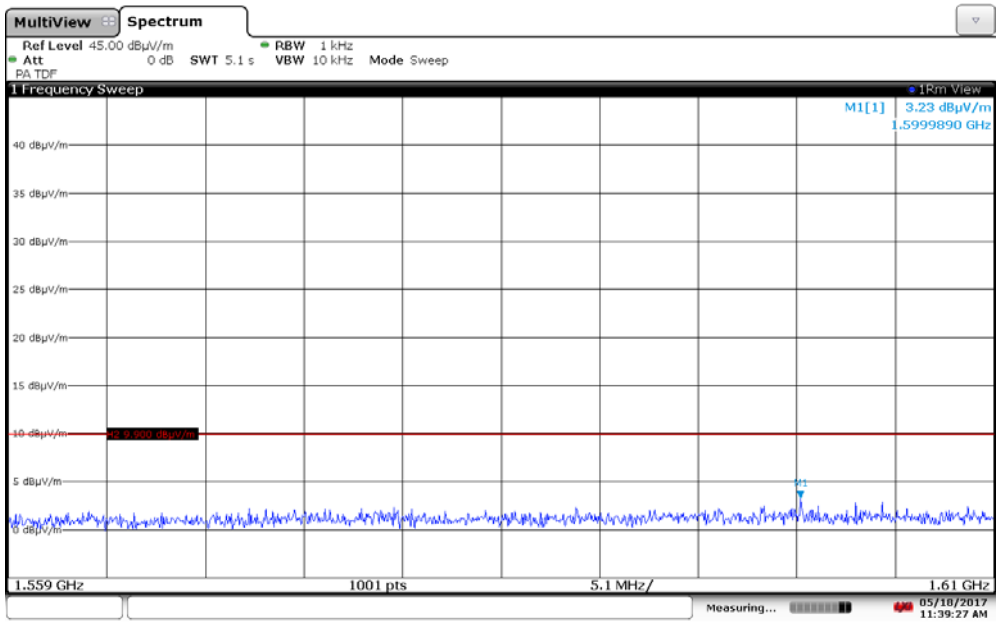
6.6. Spurious Radiated Emissions in GPS Bands (15.519 (d) continued)

6.6.3.3 Horizontal Measurement Polarity 1559 to 1610 MHz



11:41:41 AM 05/18/2017

6.6.3.4 Vertical Measurement Polarity 1559 to 1610 MHz



11:39:28 AM 05/18/2017

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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.

Measurements were made at 3 Meters and the -85.3 dBm limit was converted to a field strength limit of 9.9 dBuV/m using a factor of 95.2

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

Frequency Range:	3.5 to 4.5 GHz, 3.0 to 5.0 GHz & 6.0 to 7.0 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)

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6. Measurement Data (continued)

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

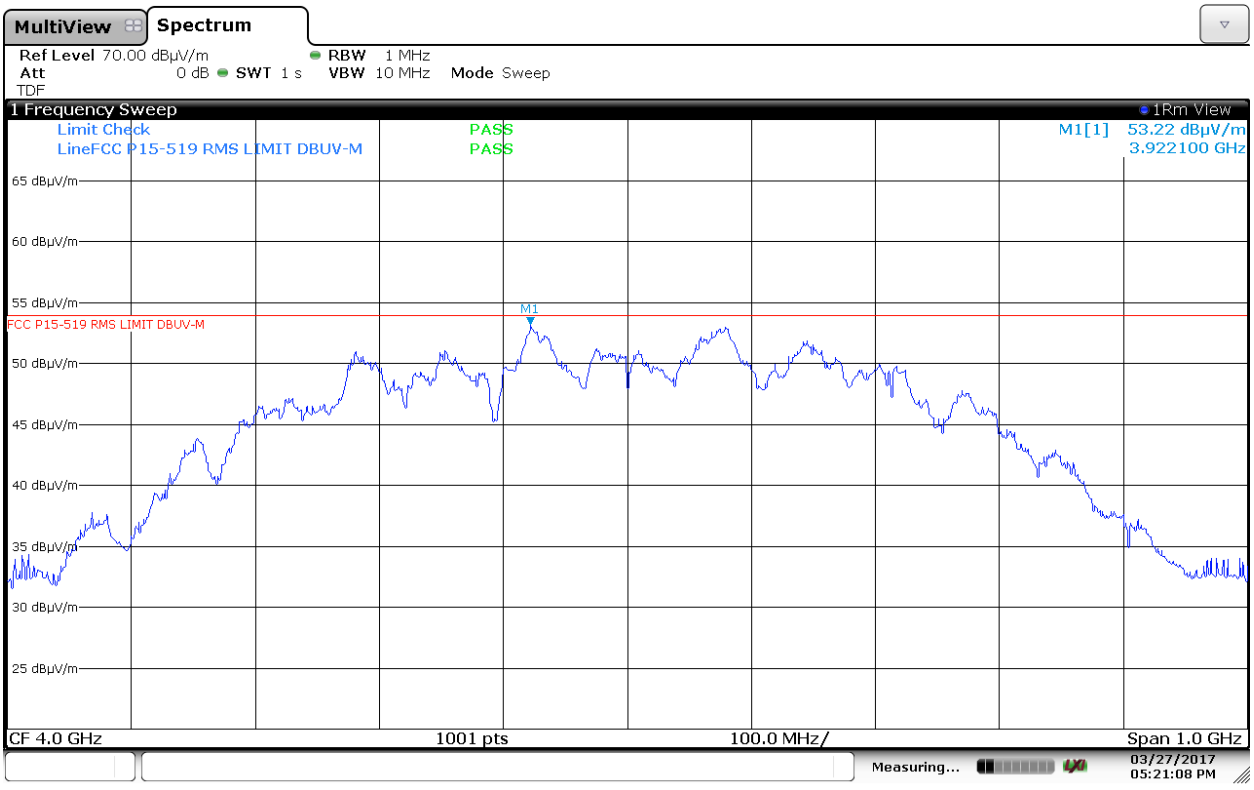
6.7.1. Plot of RMS Power at 3 Meters (Channel 2, 110 kbps, 16M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.9221	53.22	53.90	-0.68	H	100	299	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	
3.9221	-41.98	-41.30	-0.68	H	100	299	Compliant



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6. Measurement Data (continued)

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

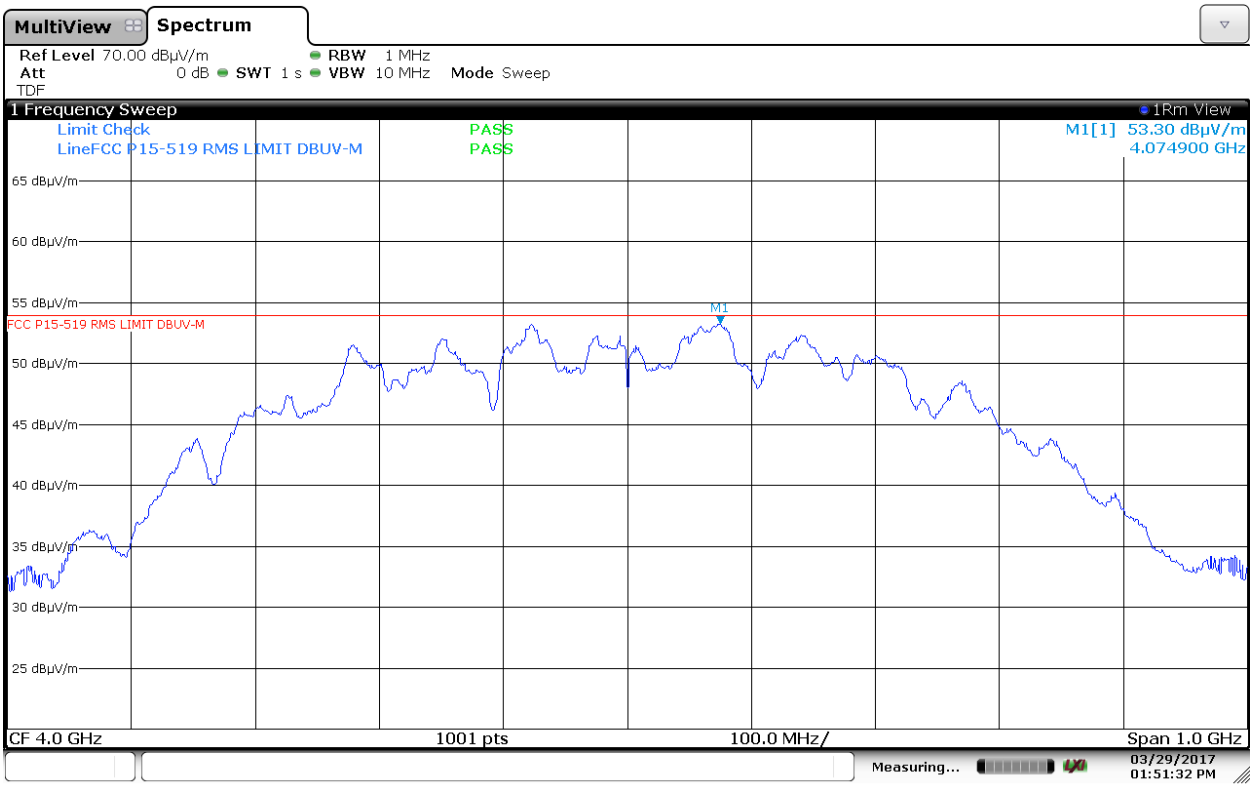
6.7.2. Plot of RMS Power at 3 Meters (Channel 2, 110 kbps, 64M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
4.0749	53.30	53.90	-0.60	H	100	299	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	
4.0749	-41.90	-41.30	-0.60	H	100	299	Compliant



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6. Measurement Data (continued)

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

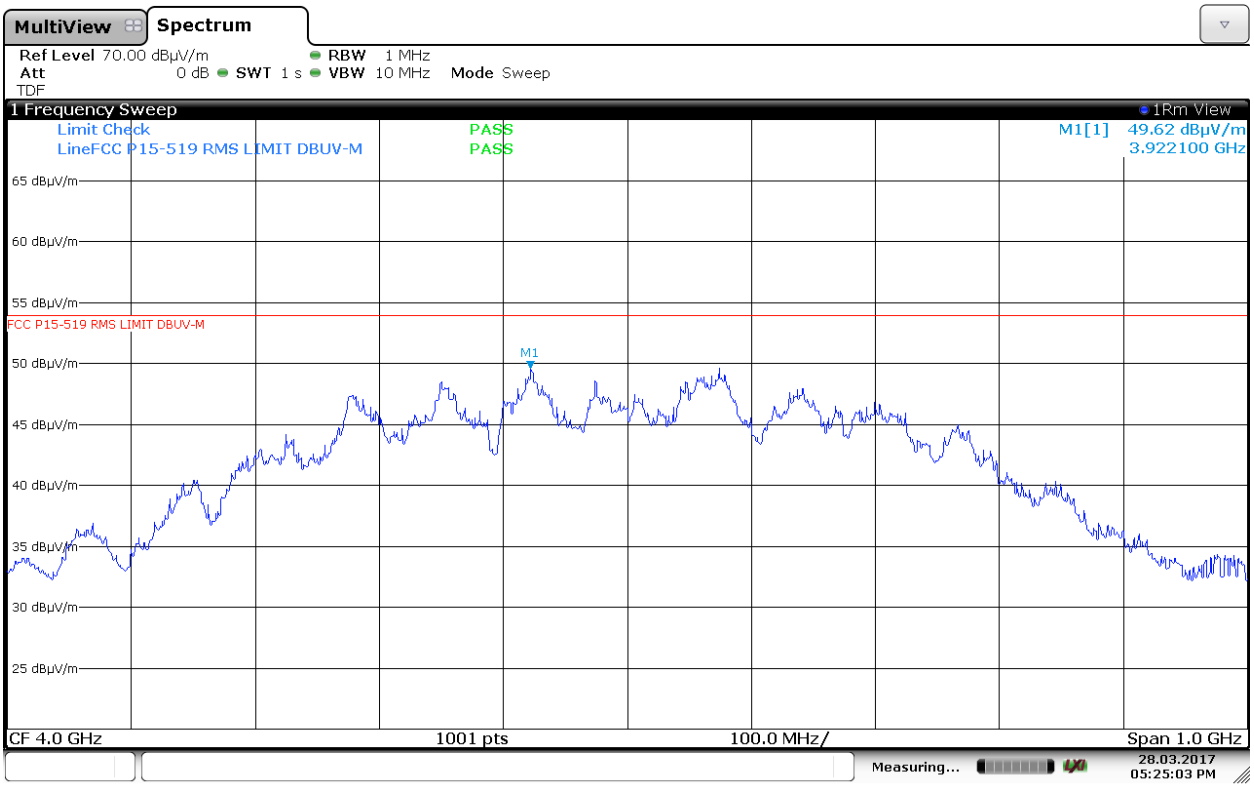
6.7.3. Plot of RMS Power at 3 Meters (Channel 2, 6.8 Mbps, 16M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.9221	49.62	53.90	-4.28	H	100	299	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	
3.9221	-44.58	-41.30	-4.28	H	100	299	Compliant



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6. Measurement Data (continued)

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

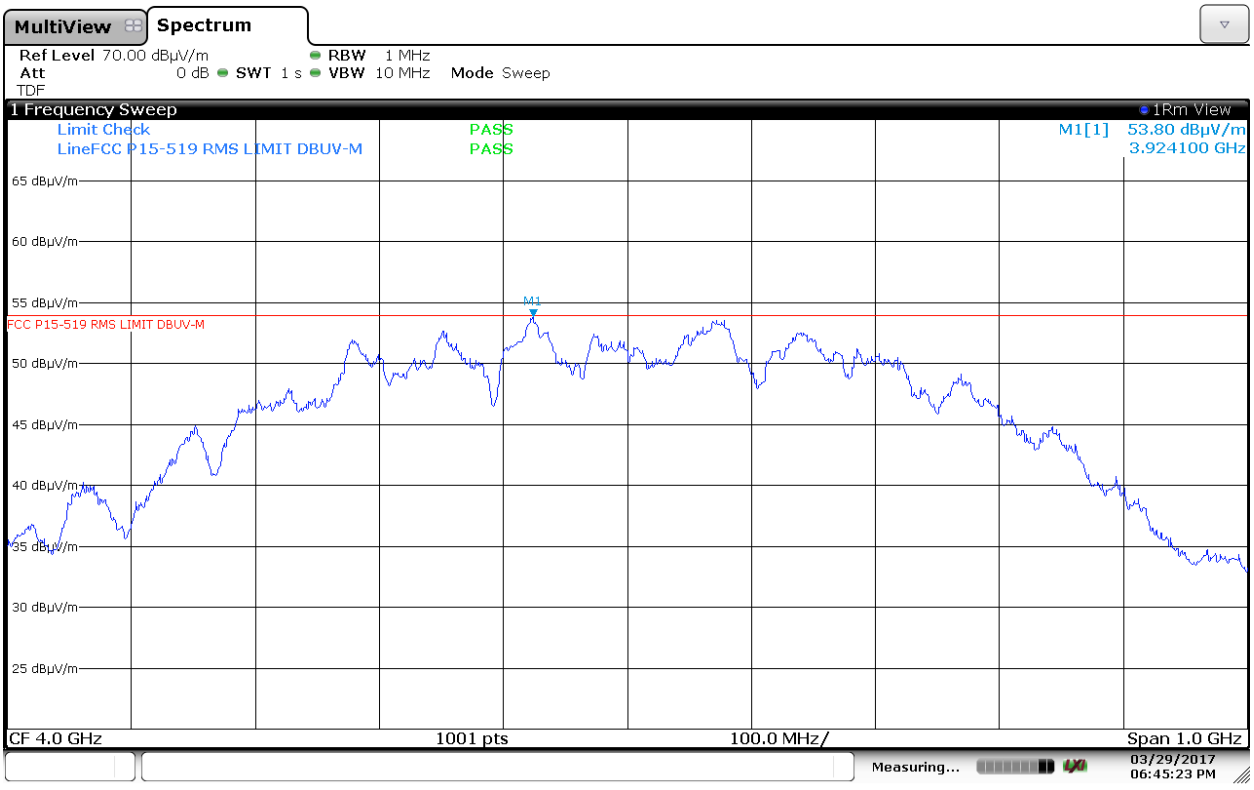
6.7.4. Plot of RMS Power at 3 Meters (Channel 2, 6.8 Mbps, 64M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.9241	53.80	53.90	-0.10	H	100	299	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	
3.9241	-41.40	-41.30	-0.10	H	100	299	Compliant



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6. Measurement Data (continued)

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

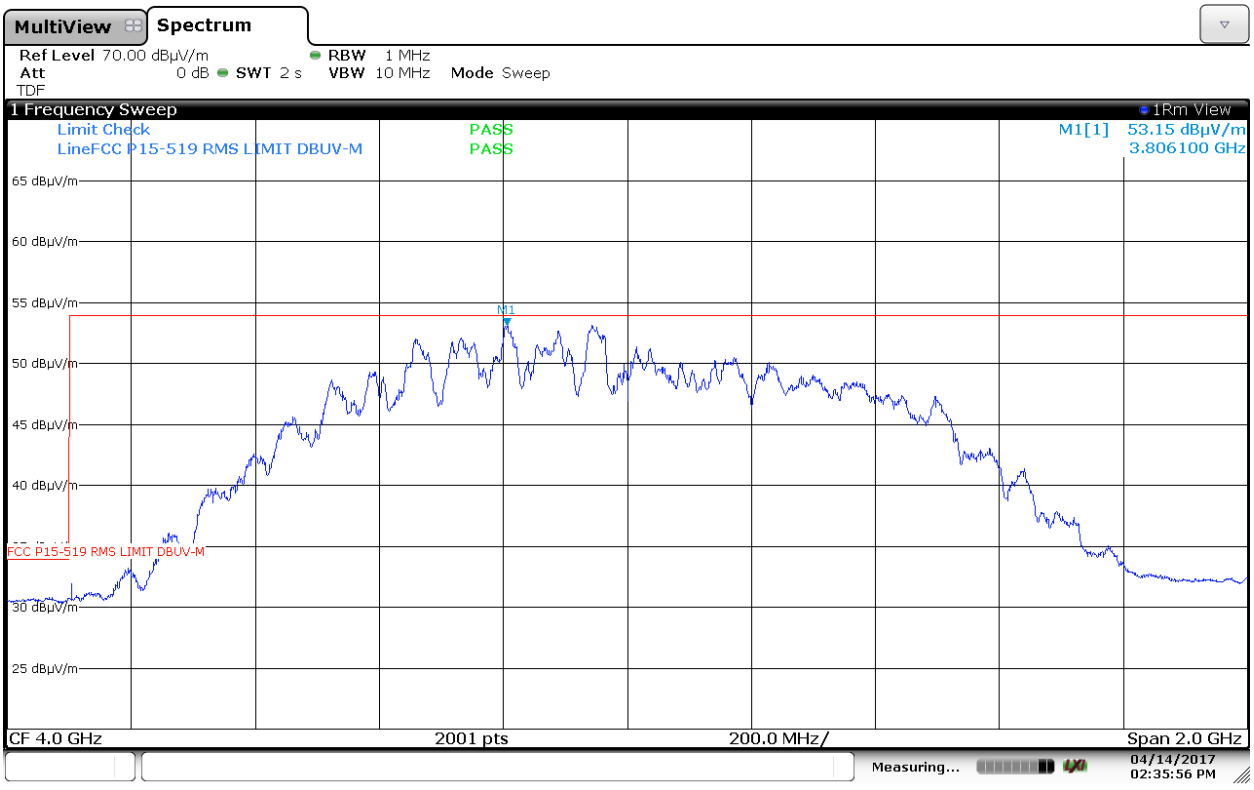
6.7.5. Plot of RMS Power at 3 Meters (Channel 4, 110 kbps, 16M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.8061	53.15	53.90	-0.75	H	100	299	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	
3.8061	-42.05	-41.30	-0.75	H	100	299	Compliant



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6. Measurement Data (continued)

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

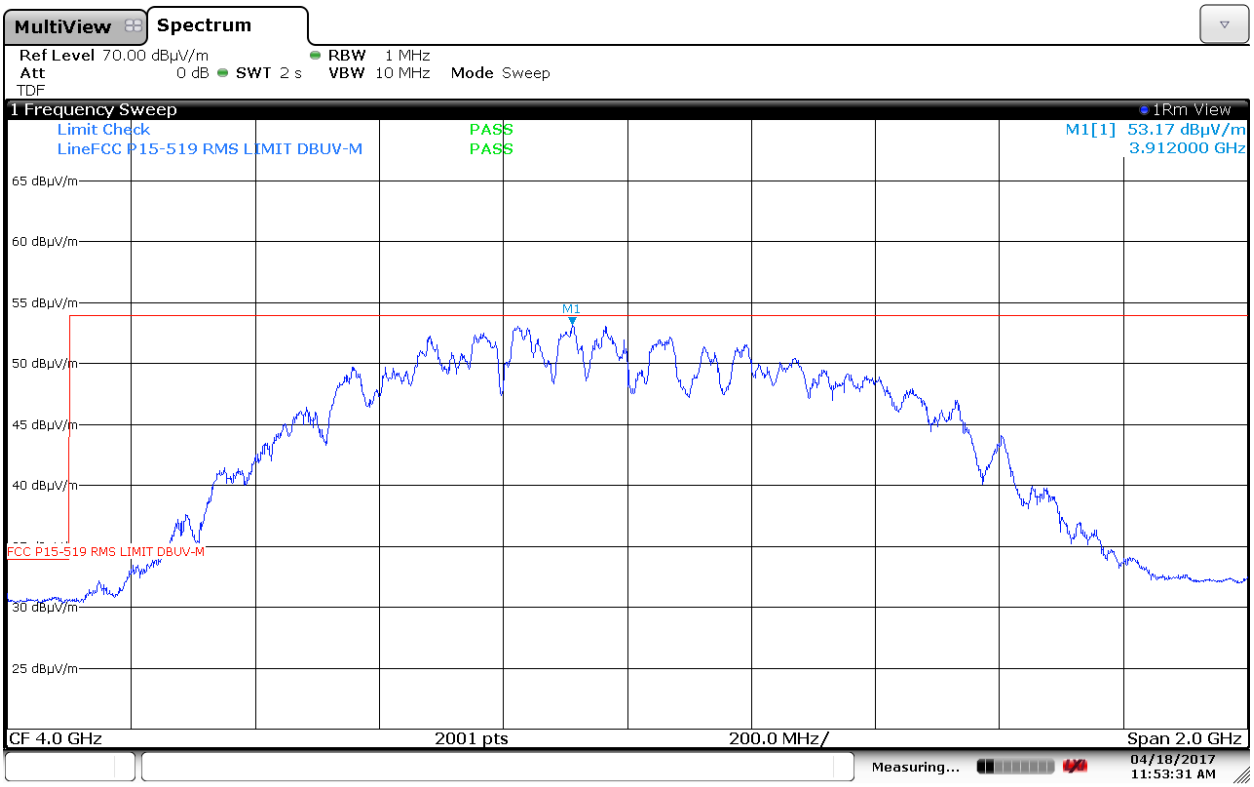
6.7.6. Plot of RMS Power at 3 Meters (Channel 4, 110 kbps, 64M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.9120	53.17	53.90	-0.73	H	100	299	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	
3.9120	-42.03	-41.30	-0.73	H	100	299	Compliant



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6. Measurement Data (continued)

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

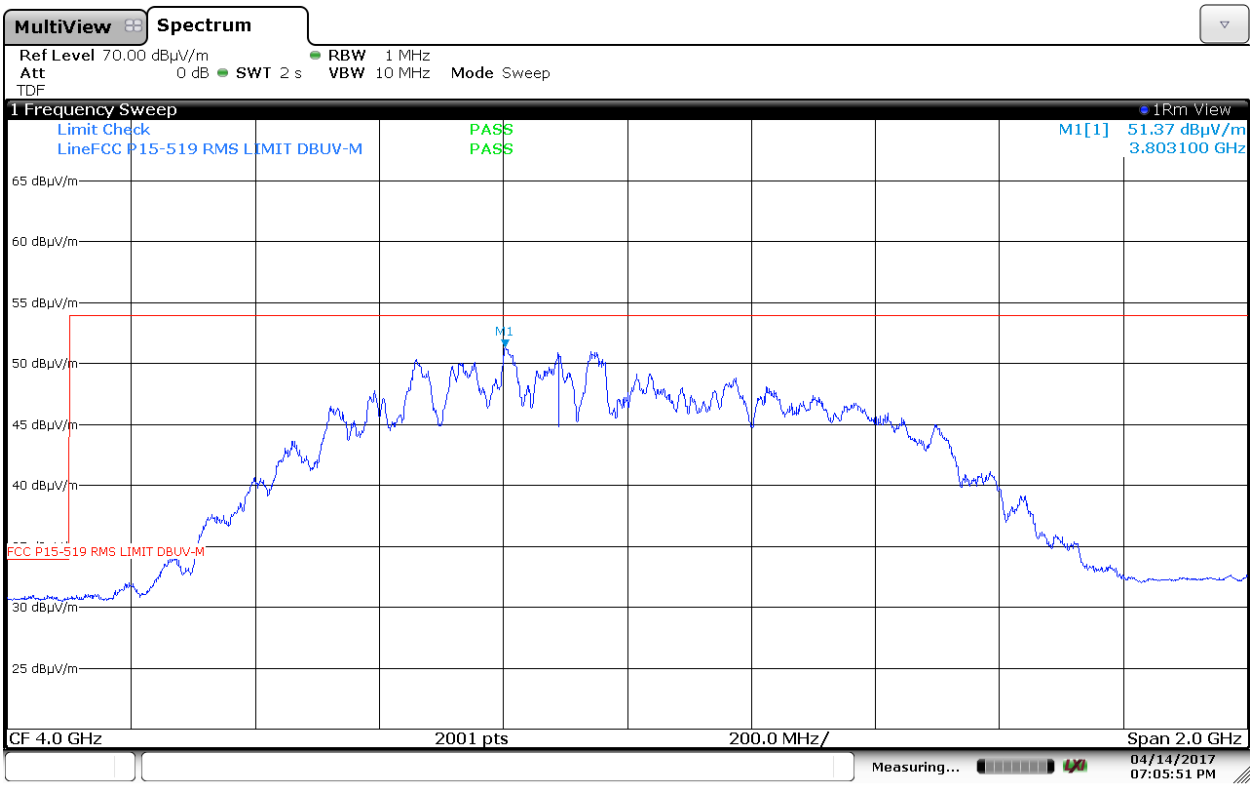
6.7.7. Plot of RMS Power at 3 Meters (Channel 4, 6.8 Mbps, 16M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.8031	51.37	53.90	-2.53	H	100	299	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	
3.8031	-43.83	-41.30	-2.53	H	100	299	Compliant



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6. Measurement Data (continued)

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

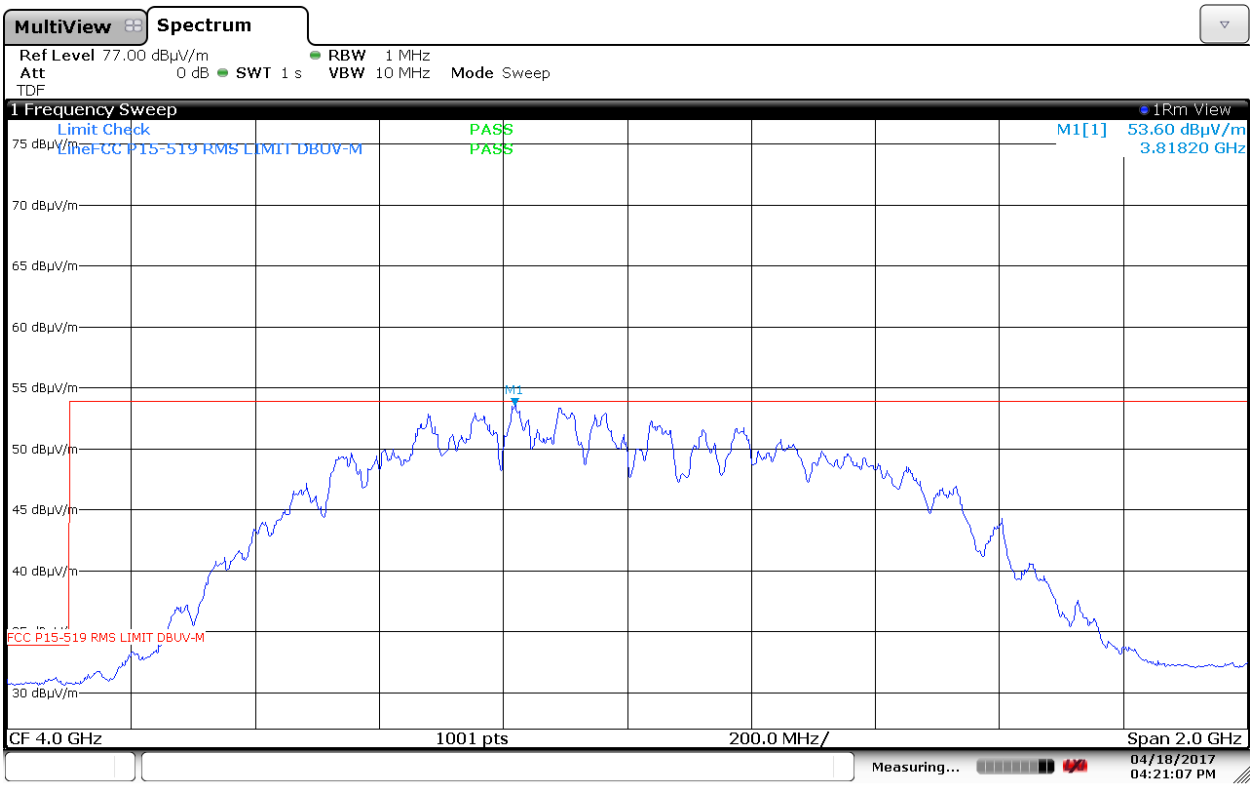
6.7.8. Plot of RMS Power at 3 Meters (Channel 4, 6.8 Mbps, 64M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.8182	53.60	53.90	-0.30	H	100	299	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	
3.8182	-41.60	-41.30	-0.30	H	100	299	Compliant



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6. Measurement Data (continued)

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

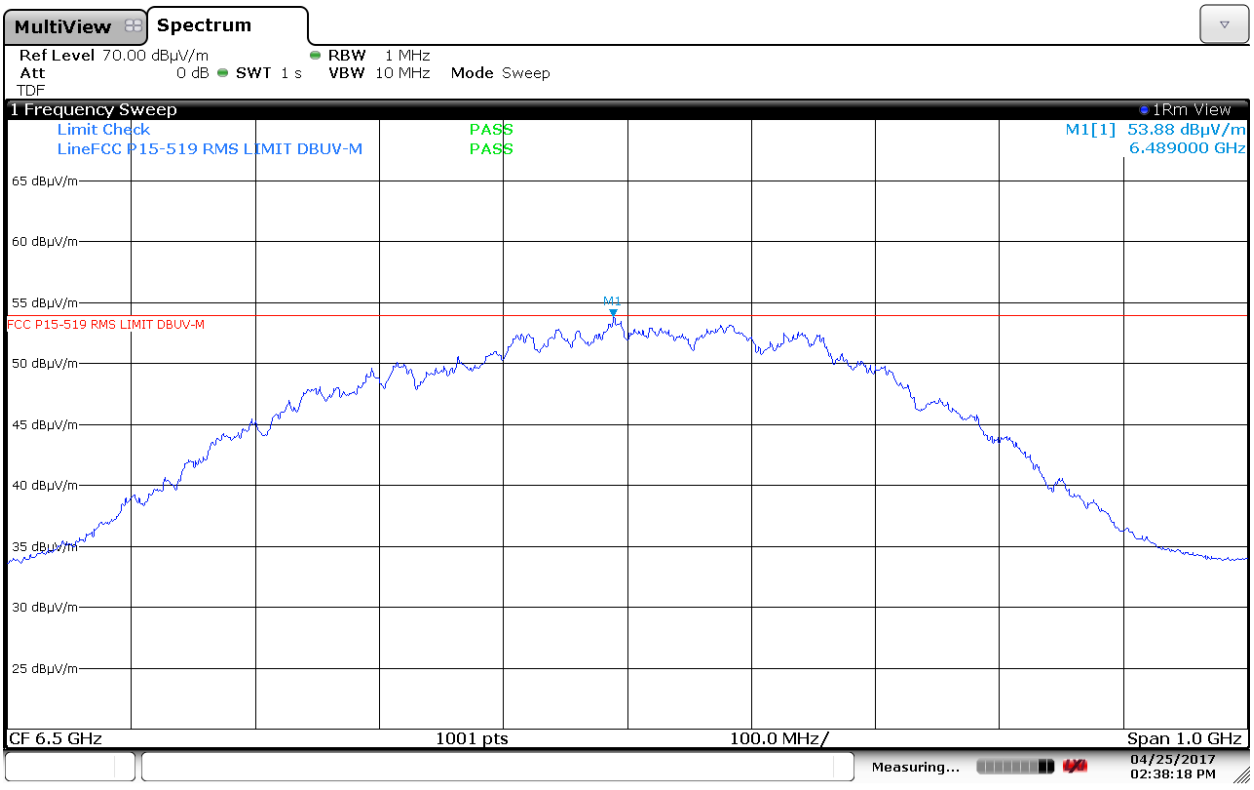
6.7.9. Plot of RMS Power at 3 Meters (Channel 5, 110 kbps, 16M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.4890	53.88	53.90	-0.02	H	133	315	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	
6.4890	-41.32	-41.30	-0.02	H	133	315	Compliant



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6. Measurement Data (continued)

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

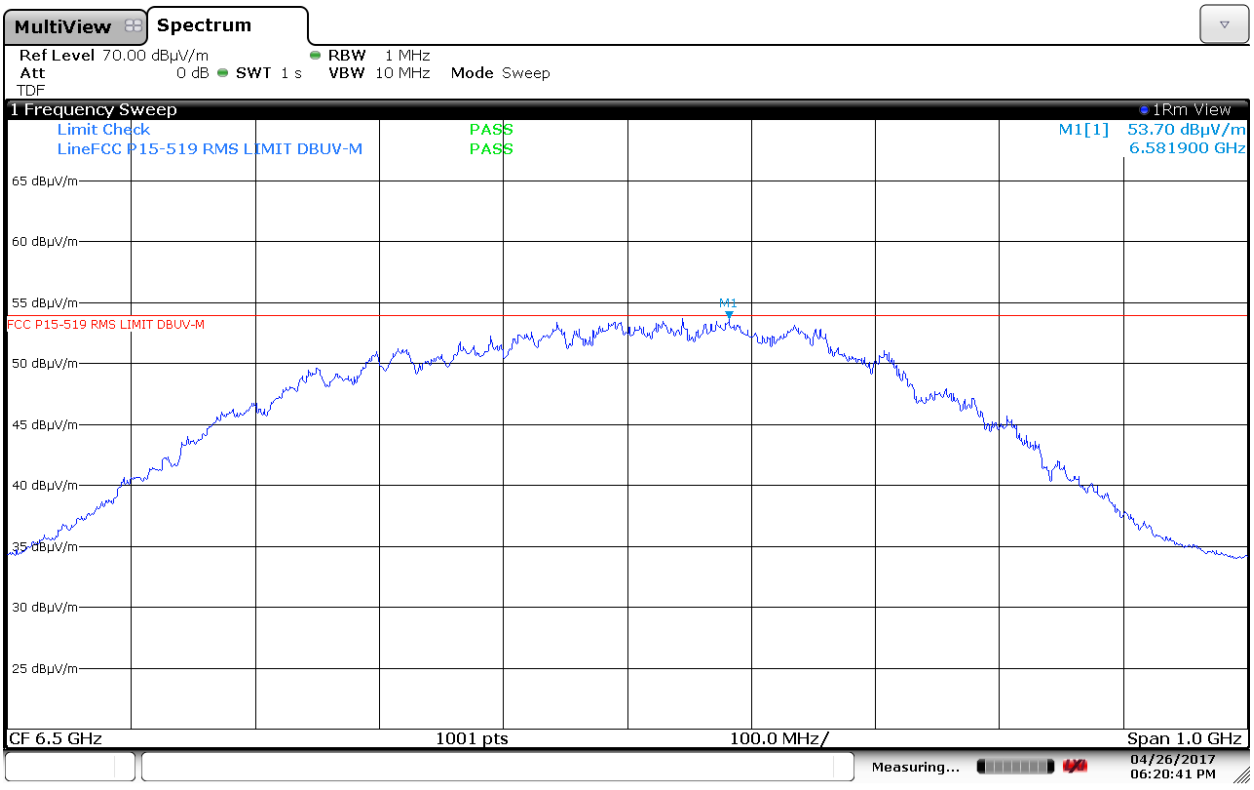
6.7.10. Plot of RMS Power at 3 Meters (Channel 5, 110 kbps, 64M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.5819	53.70	53.90	-0.20	H	133	315	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	
6.5819	-41.50	-41.30	-0.20	H	133	315	Compliant



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6. Measurement Data (continued)

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

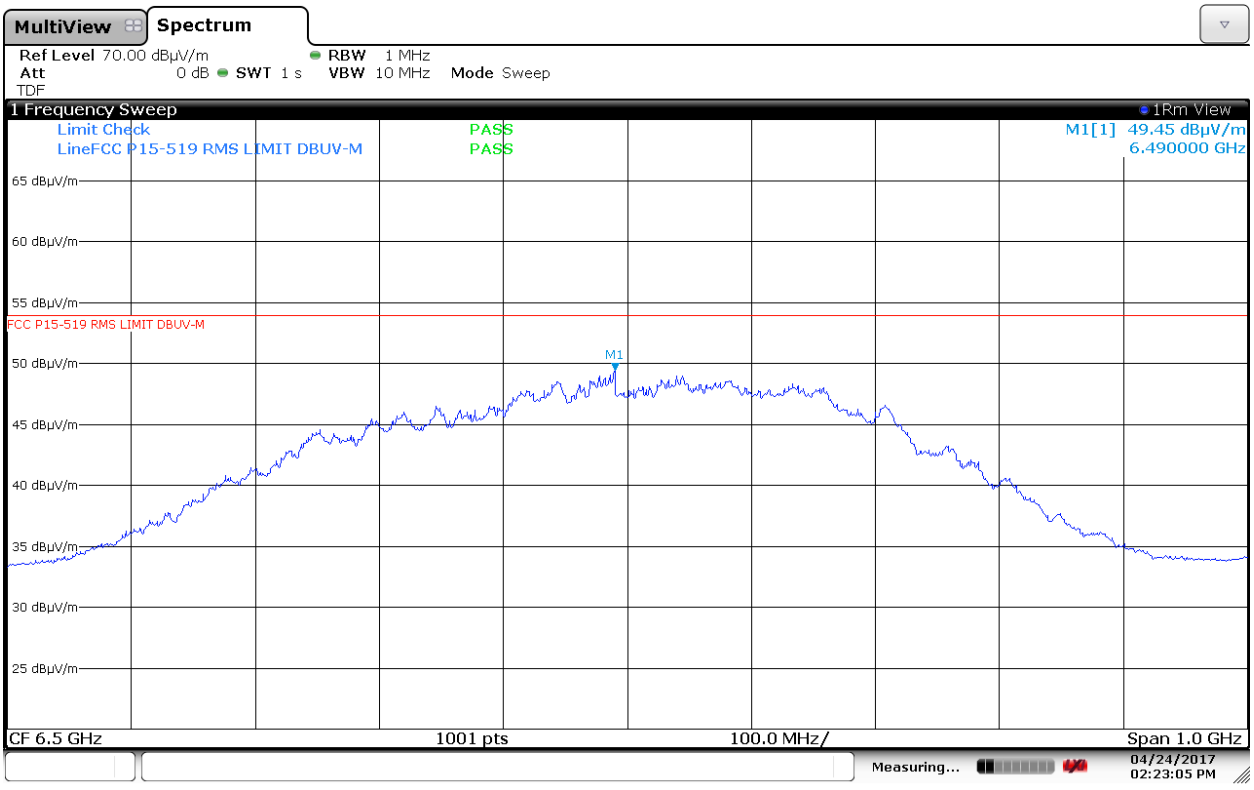
6.7.11. Plot of RMS Power at 3 Meters (Channel 5, 6.8 Mbps, 16M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.4900	49.45	53.90	-4.45	H	133	315	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	
6.4900	-44.75	-41.30	-4.45	H	133	315	Compliant



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6. Measurement Data (continued)

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

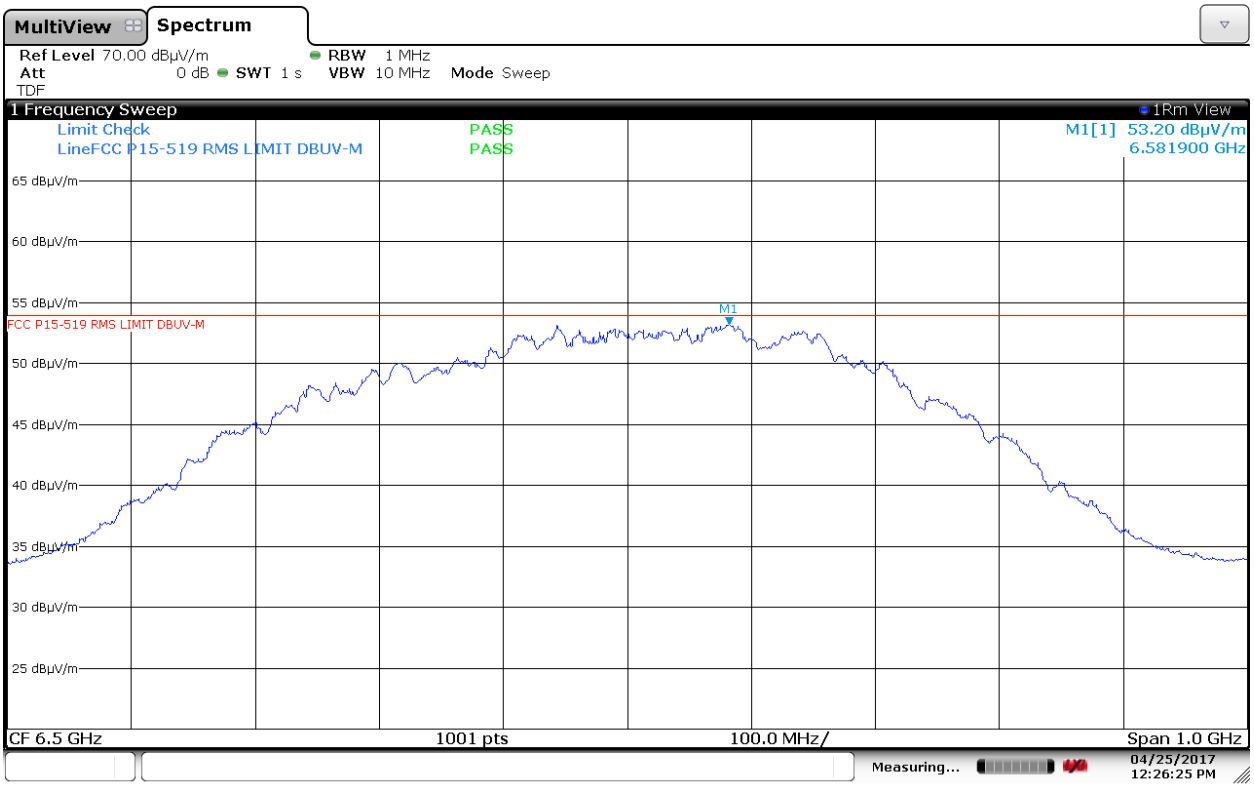
6.7.12. Plot of RMS Power at 3 Meters (Channel 5, 6.8 Mbps, 16M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.5819	53.20	53.90	-0.70	H	133	315	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	
6.5819	-42.00	-41.30	-0.70	H	133	315	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 dBµV/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 (dBµV/m)
3100 - 10600	0	95.2

Frequency Range:	3.5 to 4.5 GHz, 3.0 to 5.0 GHz & 6.0 to 7.0 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	50 MHz
EMI Receiver Avg Bandwidth	80 MHz
Detector Function:	Peak, Max Held

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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.989	91.54	95.20	-3.66	H	100	299	Compliant

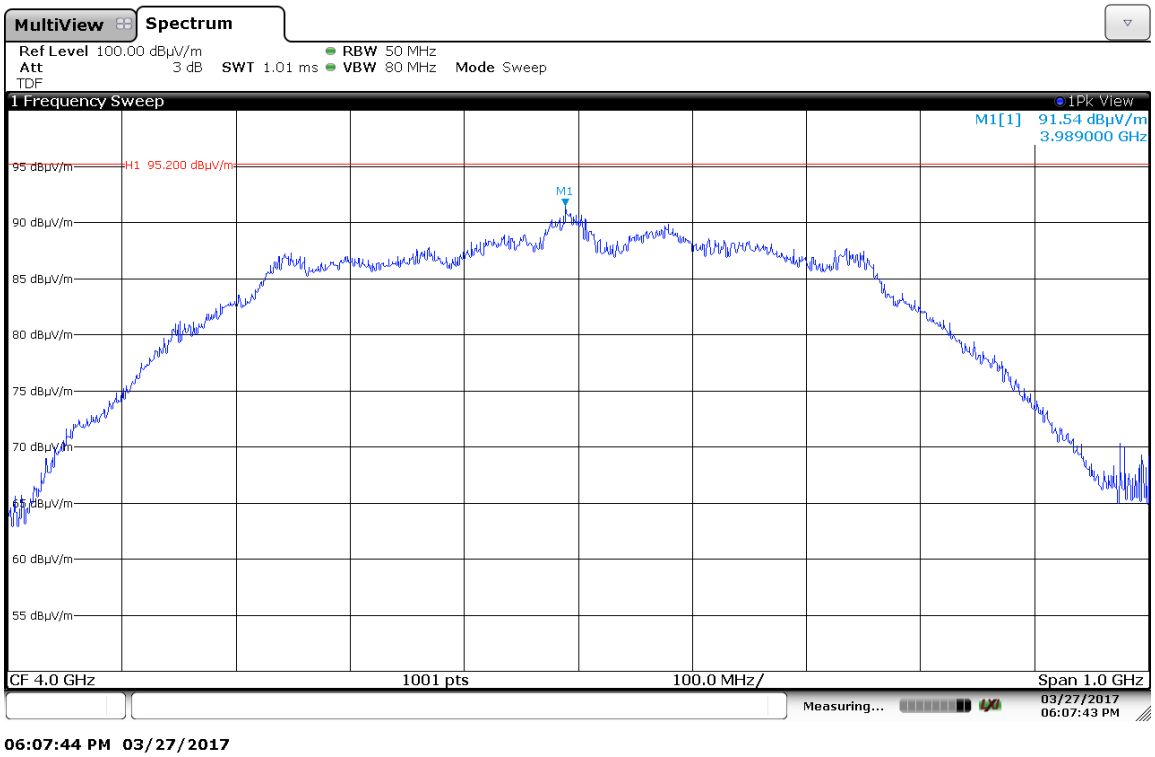
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
3.989	-3.66	0.00	-3.66	H	100	299	Compliant

6.8.1 Plot of Peak Power at 3 Meters (Channel 2, 110 kbps, 16M PRF)



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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.994	86.75	95.20	-8.45	H	100	299	Compliant

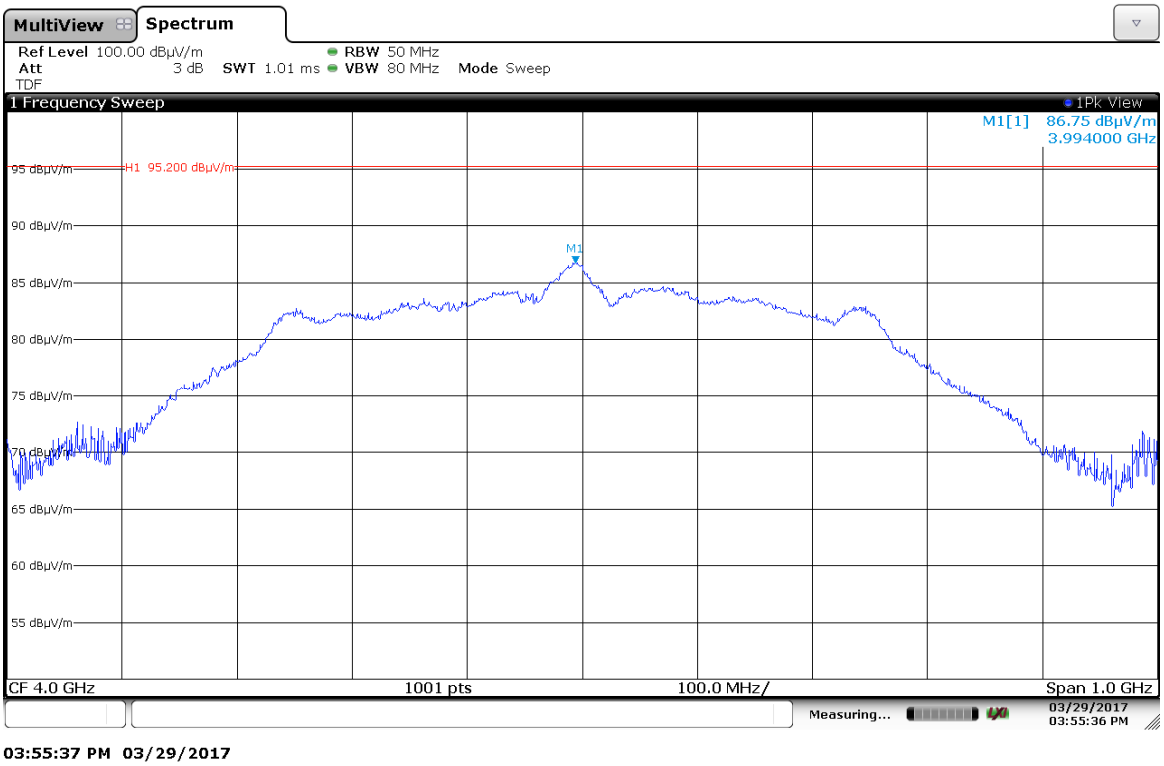
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
3.994	-8.45	0.00	-8.45	H	100	299	Compliant

6.8.2 Plot of Peak Power at 3 Meters (Channel 2, 110 kbps, 64M PRF)



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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
4.0509	94.81	95.20	-0.39	H	100	299	Compliant

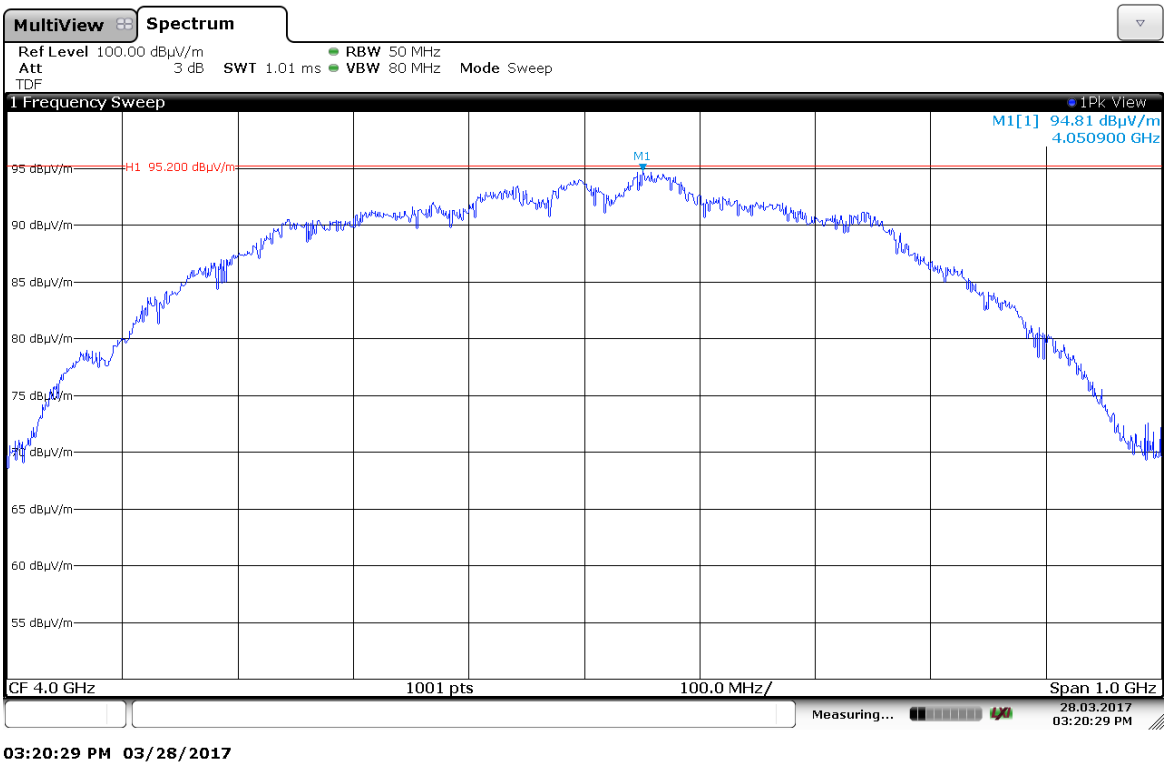
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
4.0509	-0.39	0.00	-0.39	H	100	299	Compliant

6.8.3 Plot of Peak Power at 3 Meters (Channel 2, 6.8 Mbps, 16M PRF)



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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.992	94.94	95.20	-0.26	H	100	299	Compliant

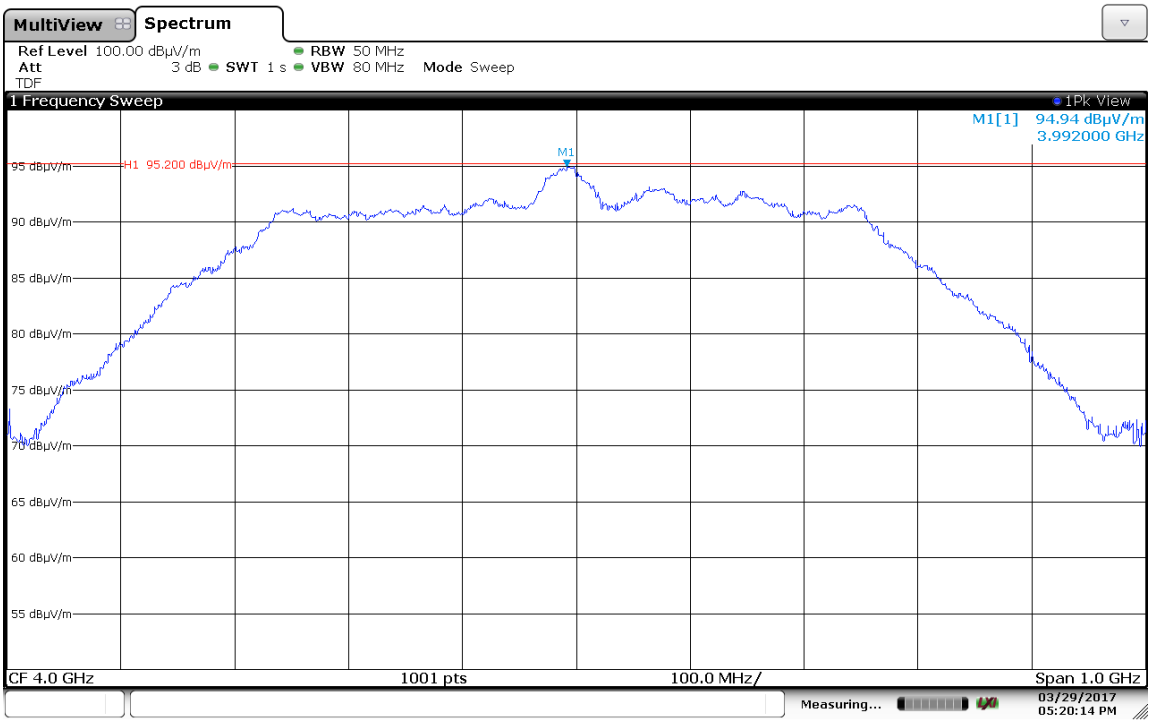
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
3.992	-0.26	0.00	-0.26	H	100	299	Compliant

6.8.4 Plot of Peak Power at 3 Meters (Channel 2, 6.8 Mbps, 64M PRF)



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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.7431	92.33	95.20	-2.87	H	100	299	Compliant

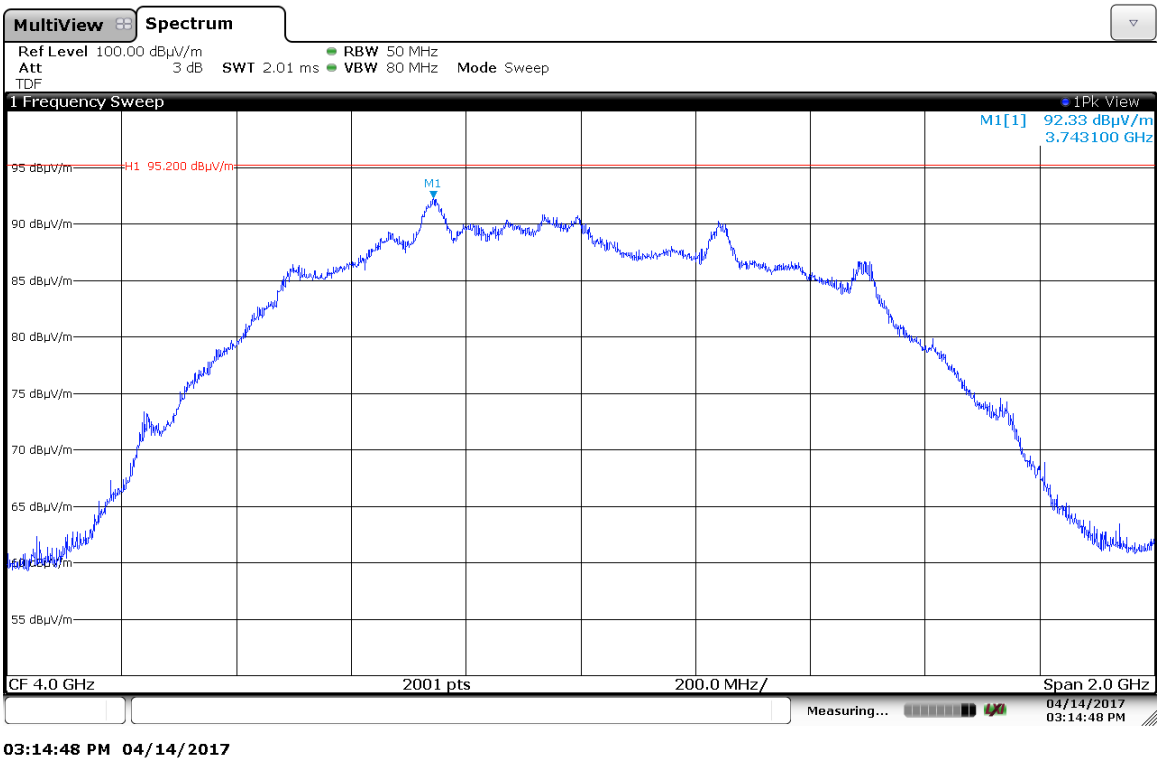
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
3.7431	-2.87	0.00	-2.87	H	100	299	Compliant

6.8.5 Plot of Peak Power at 3 Meters (Channel 4, 110 kbps, 16M PRF)



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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.7441	86.95	95.20	-8.25	H	100	299	Compliant

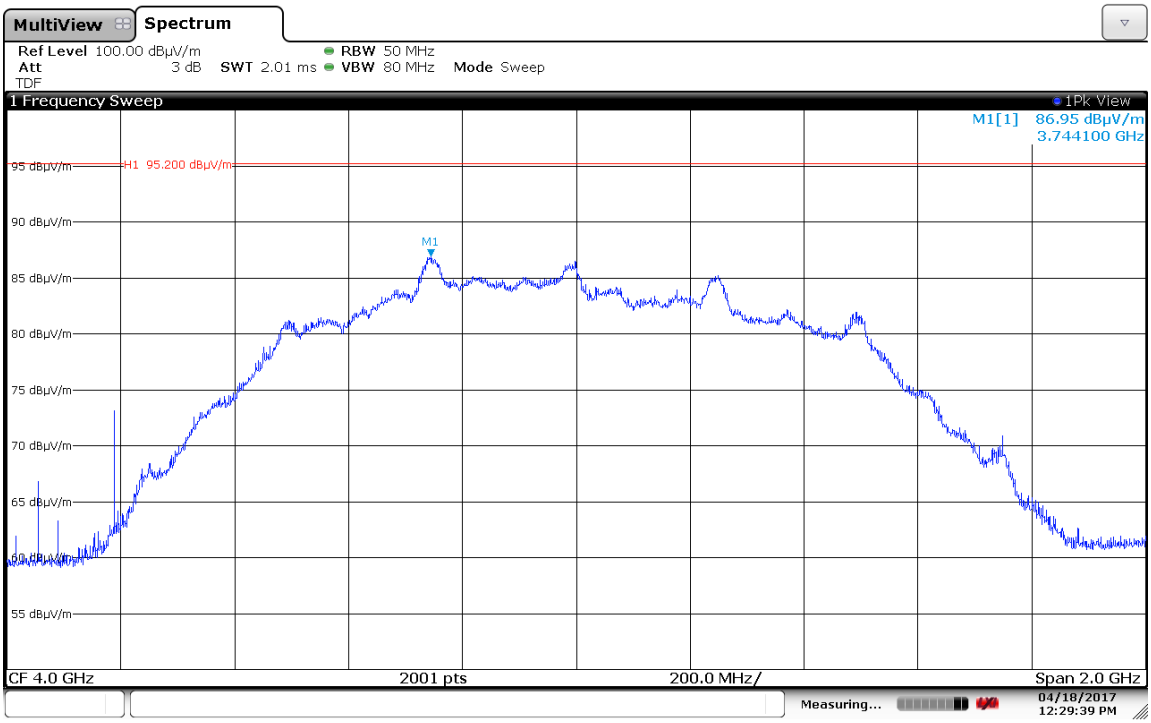
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
3.7441	-8.25	0.00	-8.25	H	100	299	Compliant

6.8.6 Plot of Peak Power at 3 Meters (Channel 4, 110 kbps, 64M PRF)



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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.8001	95.09	95.20	-0.11	H	100	299	Compliant

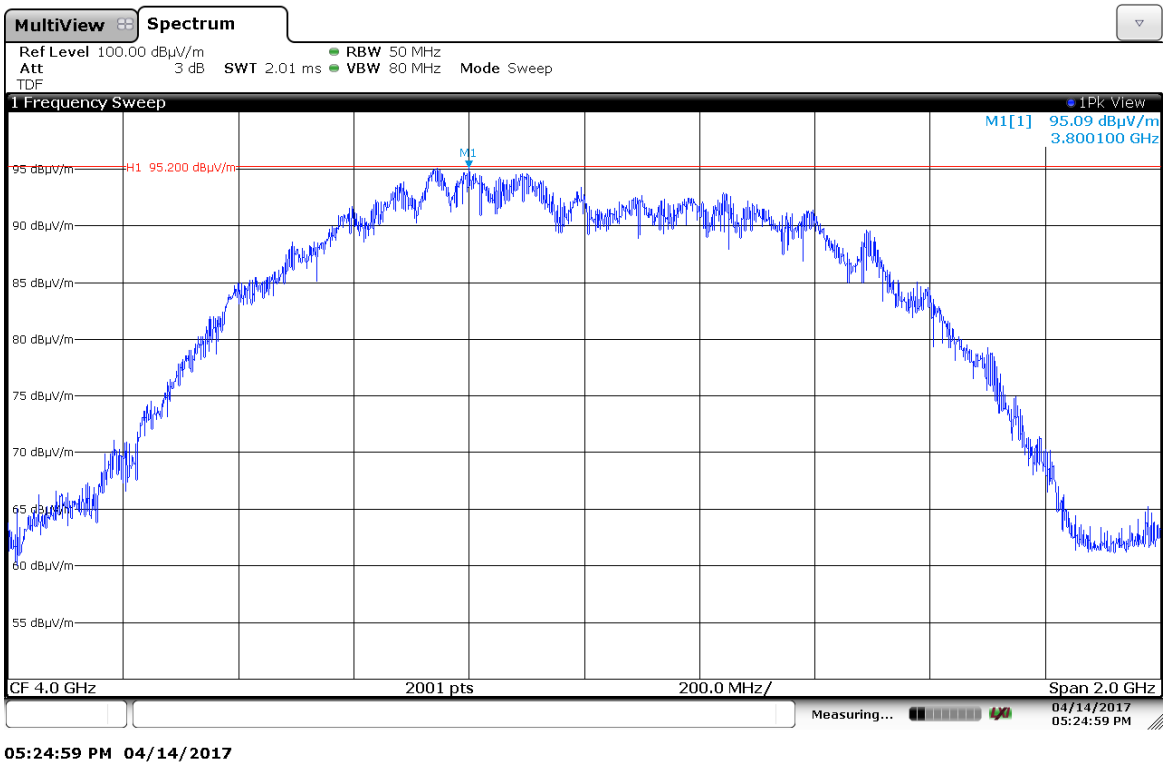
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
3.8001	-0.11	0.00	-0.11	H	100	299	Compliant

6.8.7 Plot of Peak Power at 3 Meters (Channel 4, 6.8 Mbps, 16M PRF)



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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
3.7443	94.48	95.20	-0.72	H	100	299	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	
3.7443	-0.72	0.00	-0.72	H	100	299	Compliant

6.8.8 Plot of Peak Power at 3 Meters (Channel 4, 6.8 Mbps, 64M PRF)

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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.488	94.33	95.20	-0.87	H	133	315	Compliant

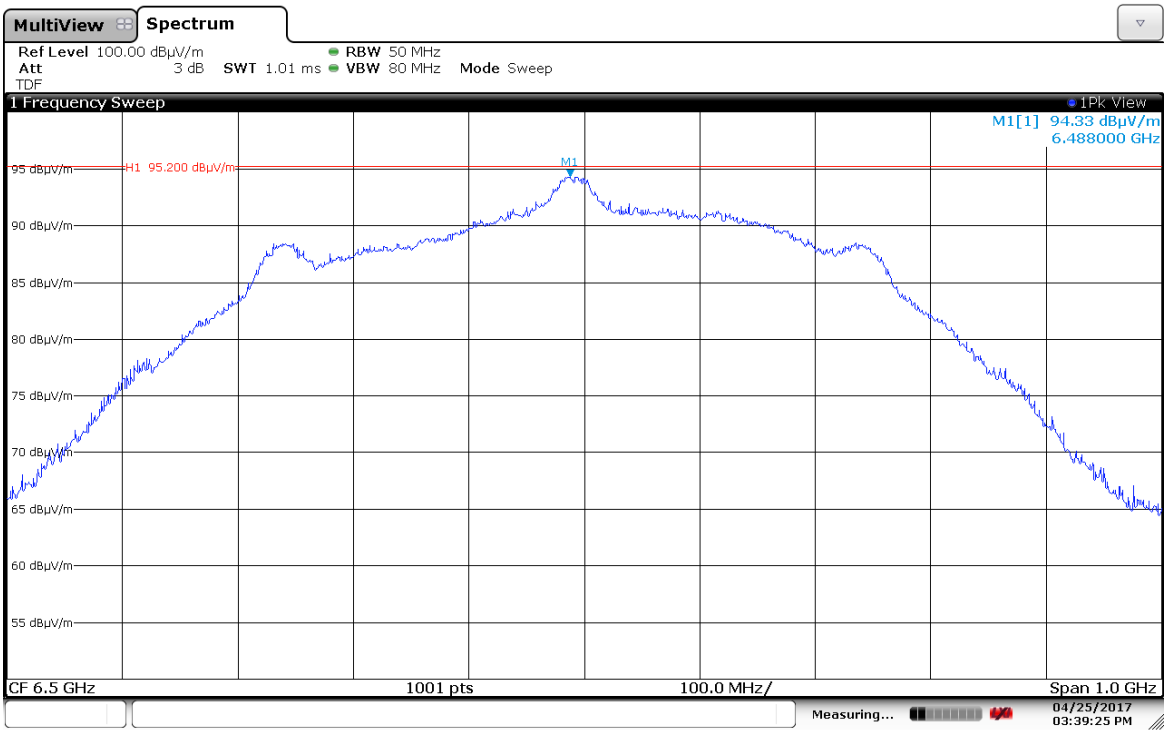
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
6.488	-0.87	0.00	-0.87	H	133	315	Compliant

6.8.9 Plot of Peak Power at 3 Meters (Channel 5, 110 kbps, 16M PRF)



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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.494	88.18	95.20	-7.02	H	133	315	Compliant

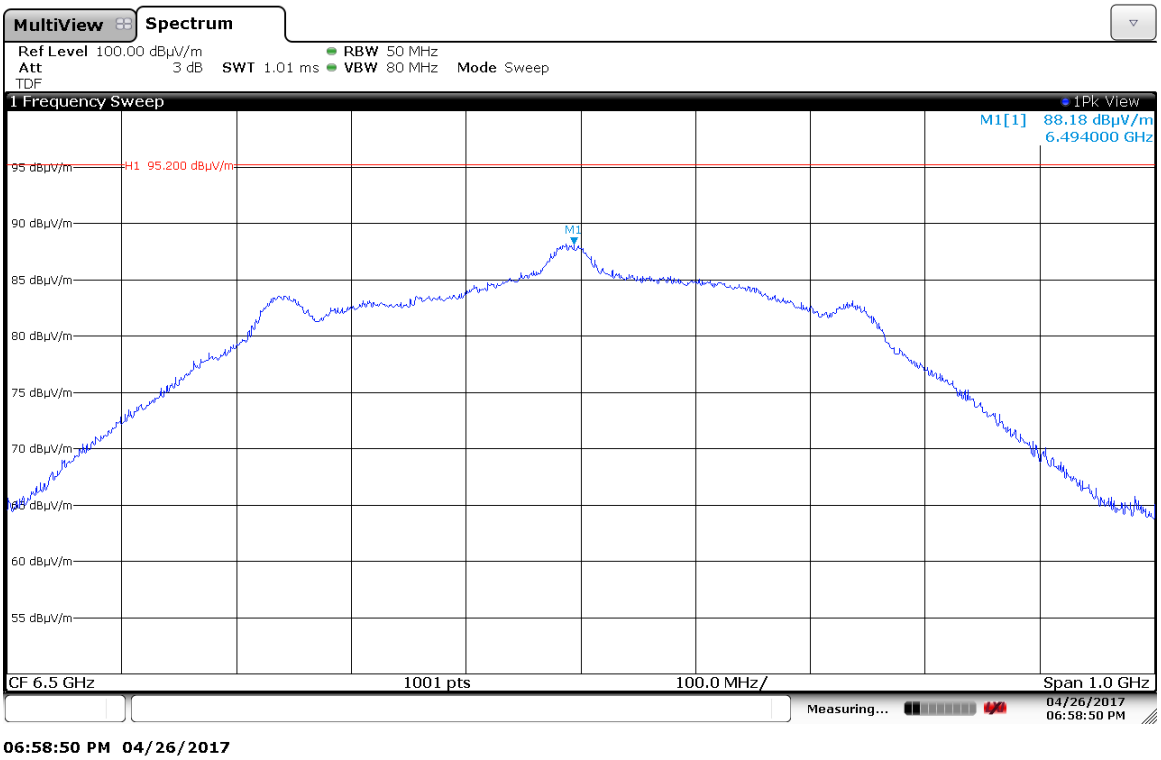
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
6.494	-7.02	0.00	-7.02	H	133	315	Compliant

6.8.10 Plot of Peak Power at 3 Meters (Channel 5, 110 kbps, 64M PRF)



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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.487	94.70	95.20	-0.50	H	133	315	Compliant

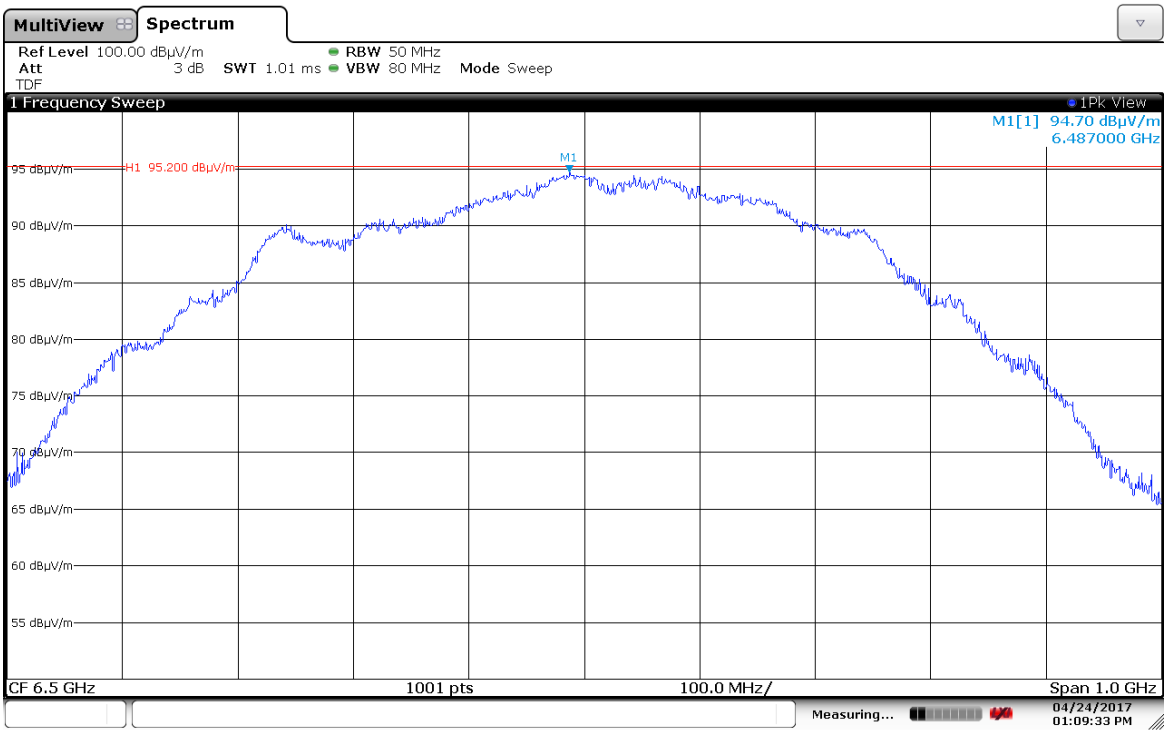
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
6.487	-0.50	0.00	-0.50	H	133	315	Compliant

6.8.11 Plot of Peak Power at 3 Meters (Channel 5, 6.8 Mbps, 16M PRF)



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6. Measurement Data (continued)

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

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.

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.487	94.79	95.20	-0.41	H	133	315	Compliant

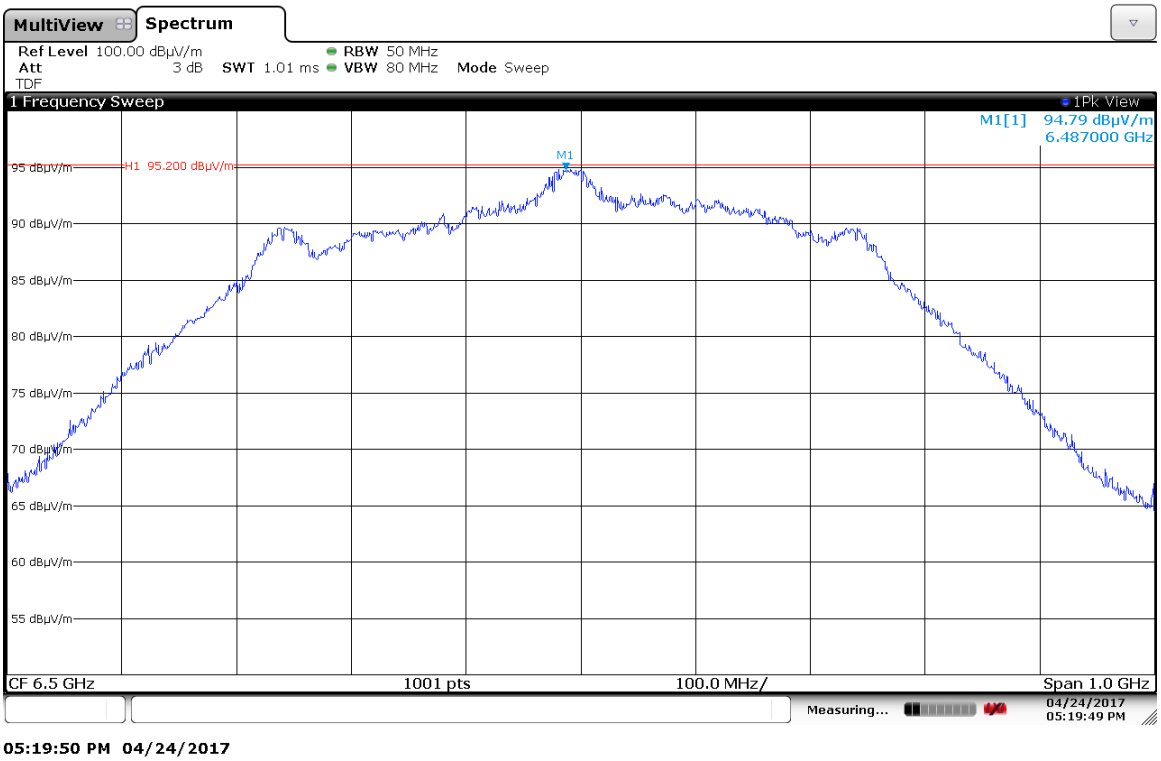
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
6.487	-0.41	0.00	-0.41	H	133	315	Compliant

6.8.12 Plot of Peak Power at 3 Meters (Channel 5, 6.8 Mbps, 64M PRF)



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6. Measurement Data (continued)

6.9 Conducted Emissions Test Setup

6.9.1. Regulatory Limit: FCC Part 15.207

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	11/17/2017
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:	N/A
Test Engineer:	N/A
Site Temperature (°C):	22
Relative Humidity (%RH):	35
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.

6.9.5. Notice: Conducted Emissions

There were no measurements as this is a battery operated unit.

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6. Measurement Data (continued)

6.10. Public Exposure to Radio Frequency Energy Levels (1.1307 (b)(1))

6.10.1. 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) 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:

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

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.

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

		Channel 2	Channel 4	
Input:	P_{MAX}	0.9357	0.9685	mW
	d_{MIN}	5.000	5.000	mm
	$f_{(GHz)}$	3.992	3.800	GHz
Test Exclusion:		**0.374**	**0.378**	
Limit Exemption:		**3.000**	**3.000**	

Note: Taken from the worse case peak data for each channel in Section 6.8 of this test report (converted to mW).

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

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6. Measurement Data (continued)

6.10. Public Exposure to Radio Frequency Energy Levels (1.1307 (b)(1))

6.10.2 RF Exposure for devices that operate above 6 GHz

Center Frequency (GHz)	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		FCC Limit (mW/cm^2)
				(mW/cm^2)	(W/m^2)	
	(1)	(2)	(3)	(4)		(5)
6.488	5	-0.87	0.0	0.0026053	0.0260525	1
6.494	5	-7.02	0.0	0.0006322	0.0063219	1
6.487	5	-0.50	0.0	0.0028369	0.0283694	1
6.487	5	-0.41	0.0	0.0028963	0.0289634	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.
3. Data supplied by the client.
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.
6. Reference IC RSS-102 Section 4 Table 4 RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

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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 17025:2005 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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