COMPLIANCE WORLDWIDE INC.
TEST REPORT 178-20

In Accordance with the Requirements of

FCC TITLE 47 CFR Part 15.519, Subpart F
Technical Requirements for Handheld UWB Systems
Class II Permissive Change

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

Issued to

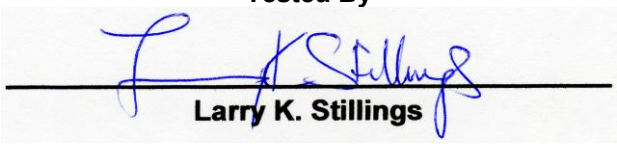
Wiser Systems, Inc.
1017 Main Campus Drive, Suite 2300
Raleigh, NC 27606 USA
919-833-8253

For the
USB Dongle
Models: USB5V1.0

FCC ID: 2AGZM-C00420
IC: 25948-C00420

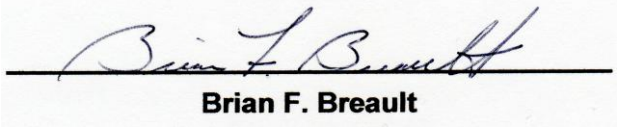
Report Issued on April 30, 2020

Tested By



Larry K. Stillings

Reviewed By



Brian F. Breault

Table of Contents

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1. Scope

This test report certifies that the Wiser Systems USB Dongle USB5V1.0 as tested, meets the FCC Part 15, Subpart F and ISED 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:	Wiser Systems, Inc.
2.2. Model Numbers:	USB5V1.0
2.3. Serial Numbers:	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:	5 VDC via USB, External Battery or USB to AC Adapter
2.6. Hardware Revision:	N/A
2.7. Software Revision:	N/A
2.8. Modulation Type:	Pulse Modulation, Frequency Hopping
2.9. Operating Frequencies:	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 remotely located laptop computer via USB.

Using the software tool configure the USB dongle to transmit on Channel 5 (16M or 64M PRF) using the appropriate data rate (110 kbps or 6.8 Mbps).

3.2. EUT Hardware

Manufacturer	Model/Part # / Options	Serial Number	Input Volts	Freq (Hz)	Description/Function
Wiser Systems	USB5V1.0	Pre-production	5.0	DC	USB Dongle Anchor

3.3. EUT Cables/Transducers

Cable Type	Length	Shield	From	To
USB	1M	Yes	EUT	Laptop for Control / Battery Power

3.4. Support Equipment

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
Dell	Laptop		120	60	For controlling the USB Dongle

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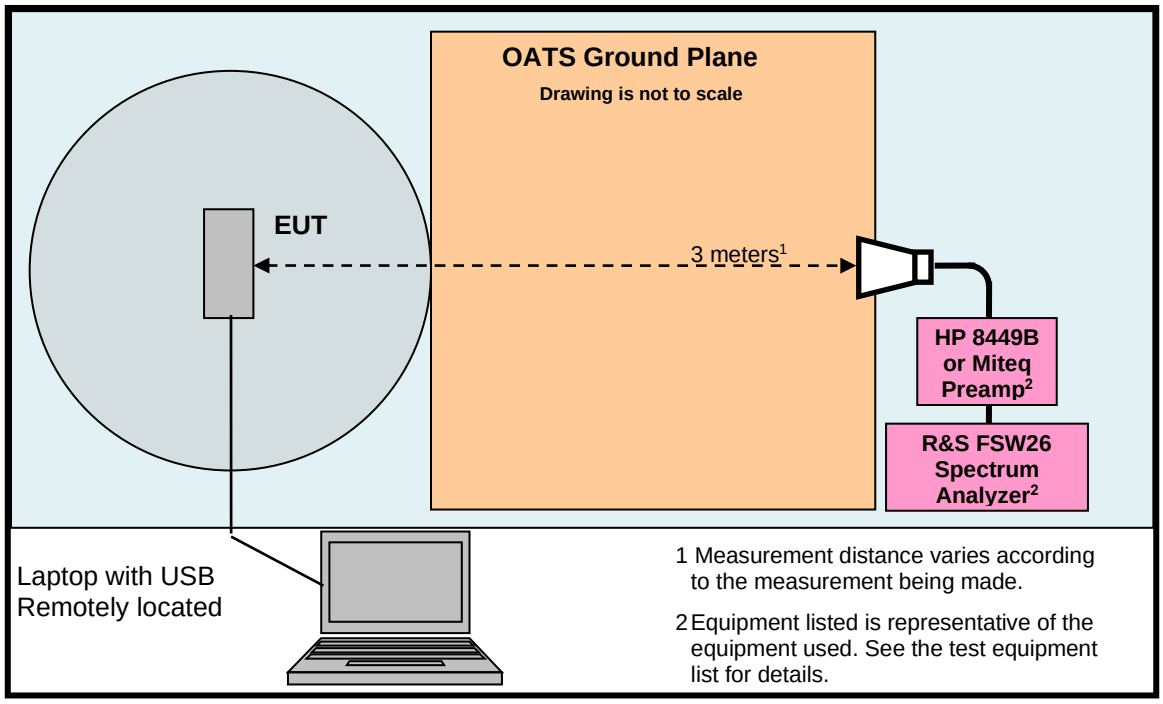
3. Product Configuration (cont.)

3.5. Test Setup Diagram



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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	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	1/28/2022	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	1/6/2021	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.

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4. Measurements Parameters (continued)

4.2. Measurement & Equipment Setup

Test Dates:	3/30/2020, 3/31/2020, 4/1/2020, 4/29/2020
Test Engineers:	Sean Defelice, 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:	>= 3 * RBW
Detector Function:	Peak, Quasi-Peak & Average

4.3. Measurement Procedure

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

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	$\pm$ 4.55 dB
Radiated Emission of Receiver	$\pm$ 4.55 dB
Temperature	$\pm$ 0.91^{o} C
Humidity	$\pm$ 5%

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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	
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 (c) 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 (c) 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	
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	

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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 custom soldered type.

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6. Measurement Data (continued)

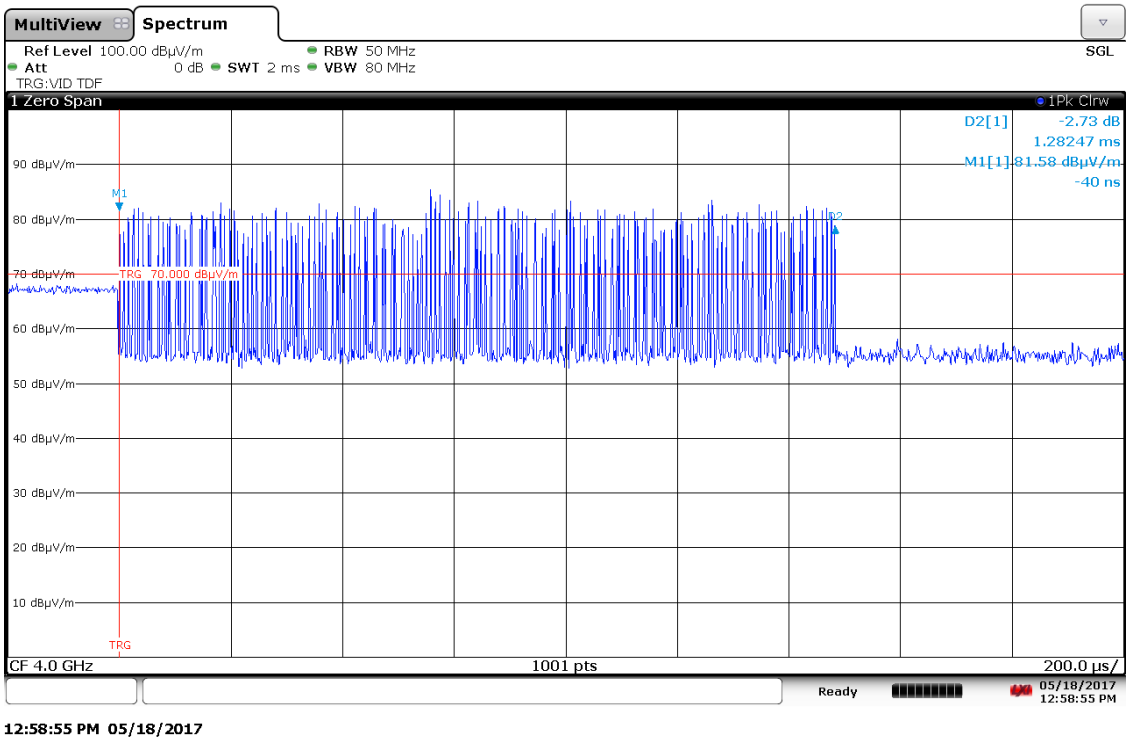
6.2. Operational Requirements of the Device under Test (15.519 (a) (1))

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, 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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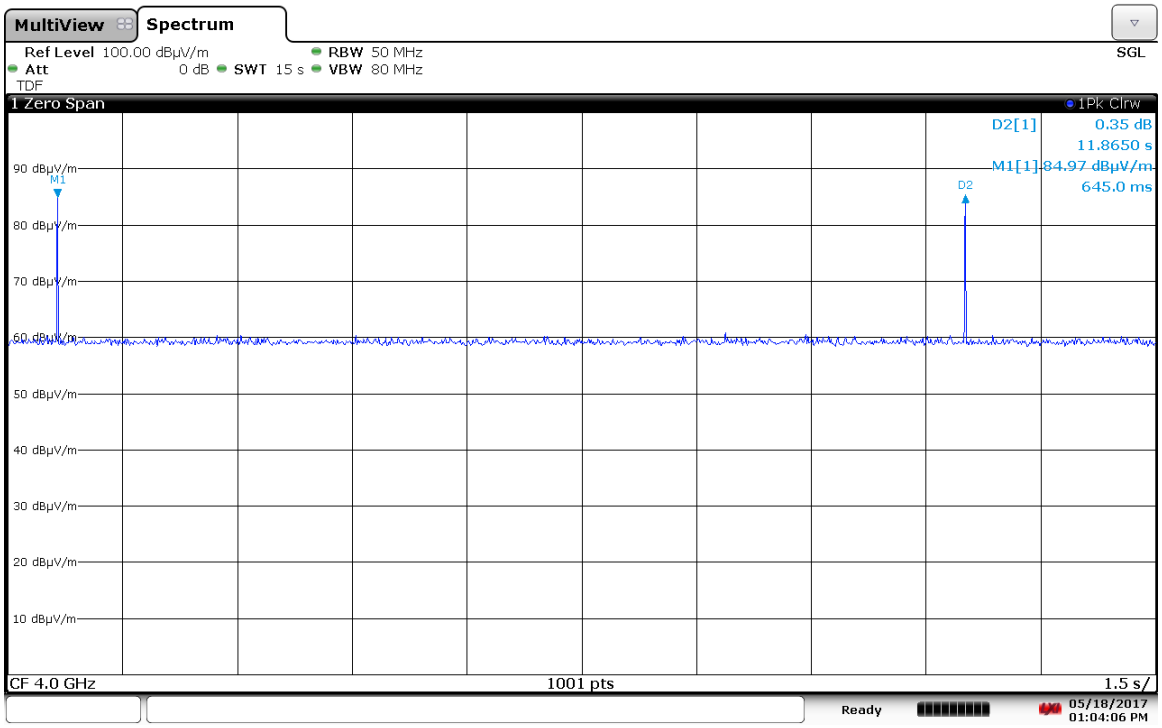
6. Measurement Data (continued)

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

6.2.2 Plot of Transmission Period



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6. Measurement Data (continued)

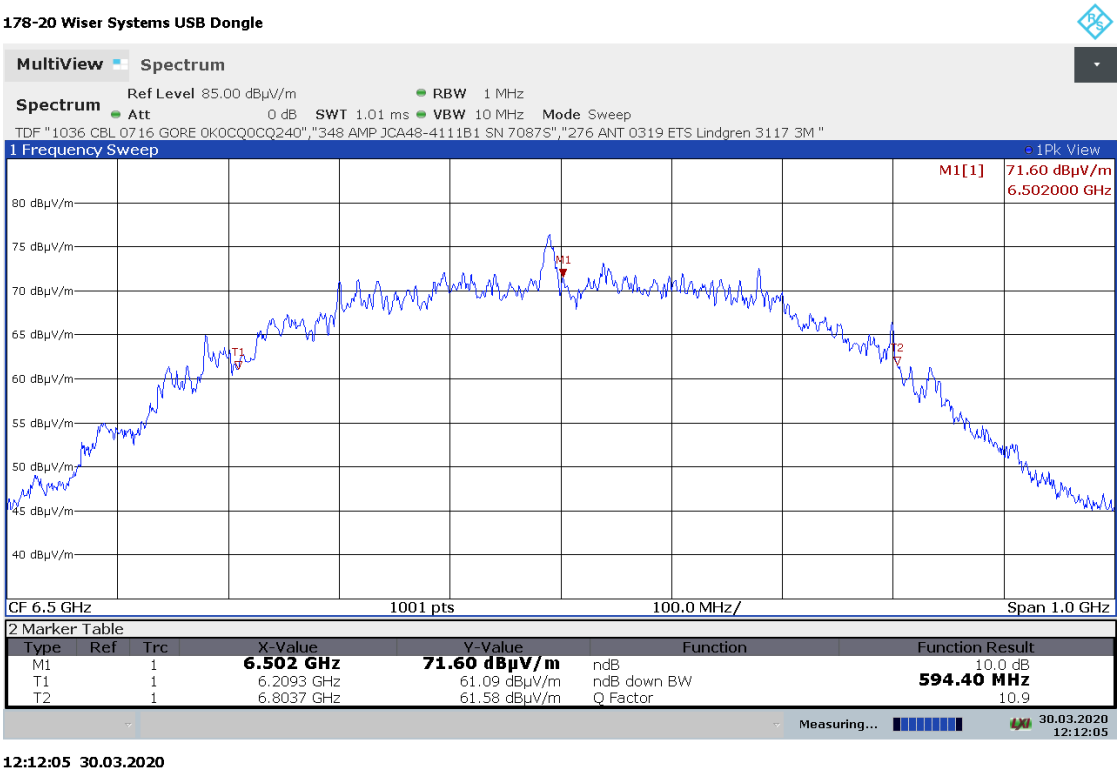
6.3. UWB Bandwidth (15.503 (a) (d), 15.519 (b))

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

		CH5
f_M	The highest emission peak	6.5020
f_L	10 dB below the highest peak	6.2093
f_H	10 dB above the highest peak	6.8037
f_C	Calculated: (f_H + f_L) / 2	6.5065
Bandwidth	Calculated: (f_H - f_L)	0.5944
Fractional BW	Calculated: 2*(f_H - f_L) / (f_H + f_L)	0.0914

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



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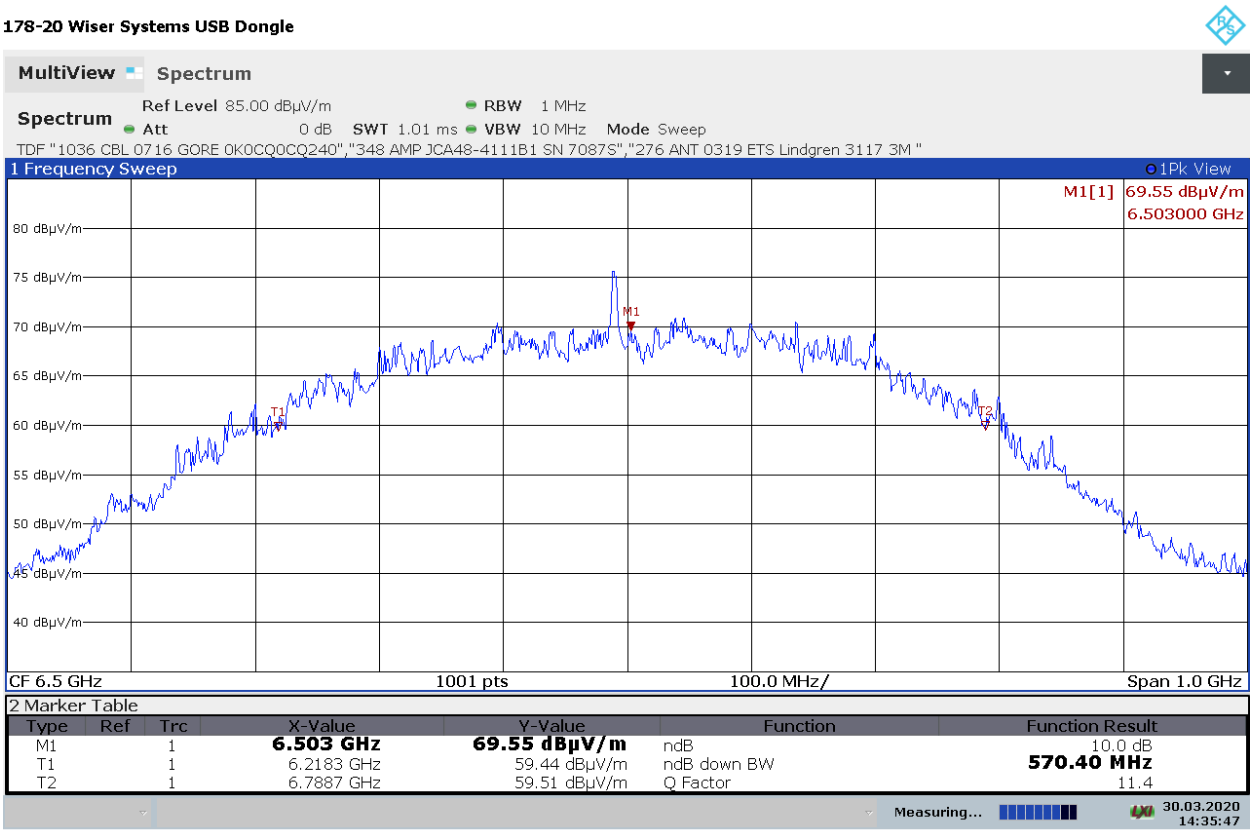
6. Measurement Data (continued)

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

6.3.3. Measurement Data – Values in GHz

		CH5
f_M	The highest emission peak	6.5030
f_L	10 dB below the highest peak	6.2183
f_H	10 dB above the highest peak	6.7887
f_C	Calculated: $(f_H + f_L) / 2$	6.5035
Bandwidth	Calculated: $(f_H - f_L)$	0.5704
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.0877

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



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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

		CH5
f_M	The highest emission peak	6.5020
f_L	10 dB below the highest peak	6.2023
f_H	10 dB above the highest peak	6.8027
f_C	Calculated: $(f_H + f_L) / 2$	6.5025
Bandwidth	Calculated: $(f_H - f_L)$	0.6004
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.0923

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

15:37:33 30.03.2020

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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

		CH5
f_M	The highest emission peak	6.5020
f_L	10 dB below the highest peak	6.2093
f_H	10 dB above the highest peak	6.8047
f_C	Calculated: $(f_H + f_L) / 2$	6.5070
Bandwidth	Calculated: $(f_H - f_L)$	0.5954
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.0915

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

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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 (µV/m)	Field Strength (dBµV/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

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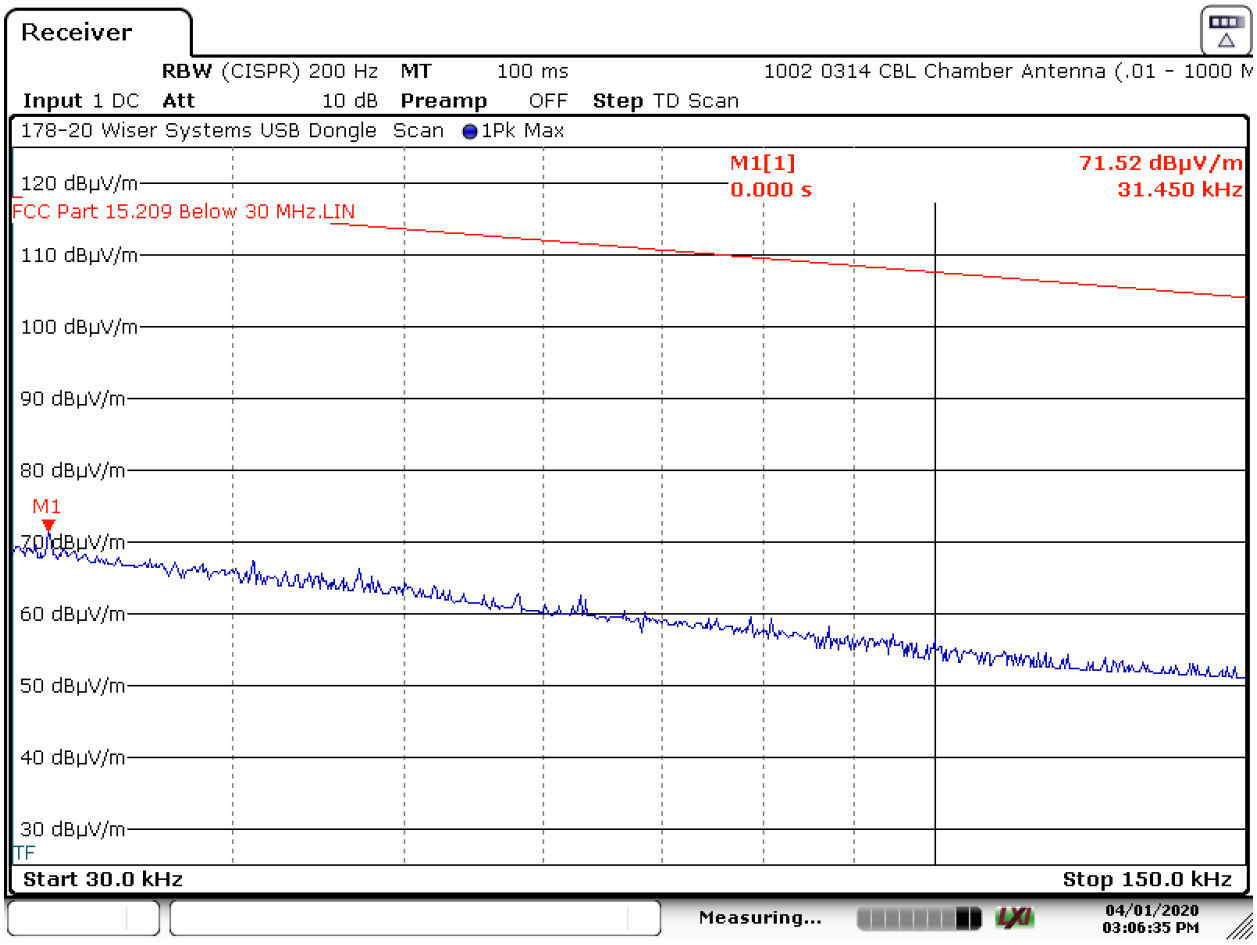
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209, continued)

6.4.1. 30 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 – 6.8 Mbps 16M PRF



Date: 1.APR.2020 15:06:35

Note: The other data rate / PRFs were also noise floor

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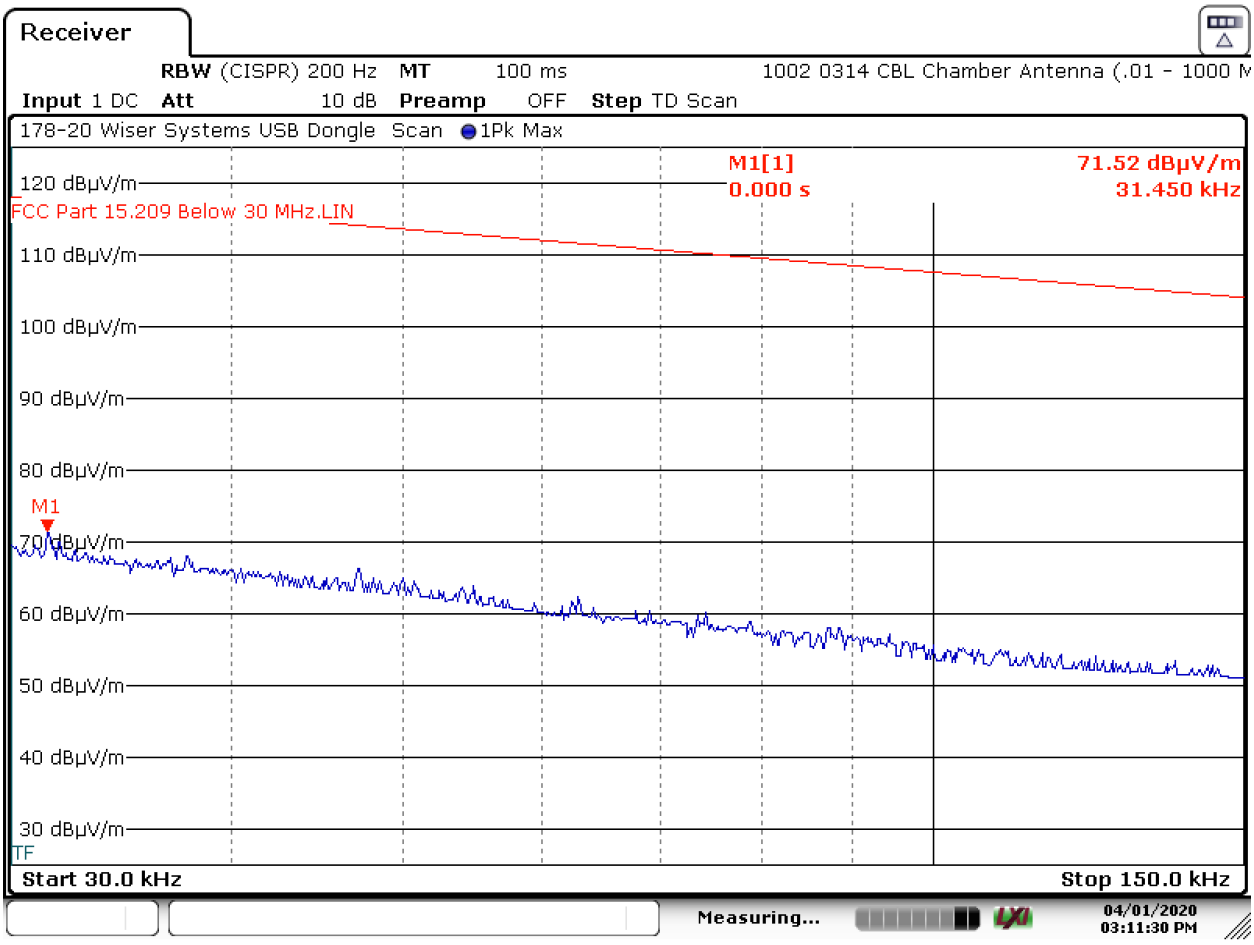
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 30 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 – 6.8 Mbps 16M



Date: 1.APR.2020 15:11:30

Note: The other data rate / PRFs were also noise floor

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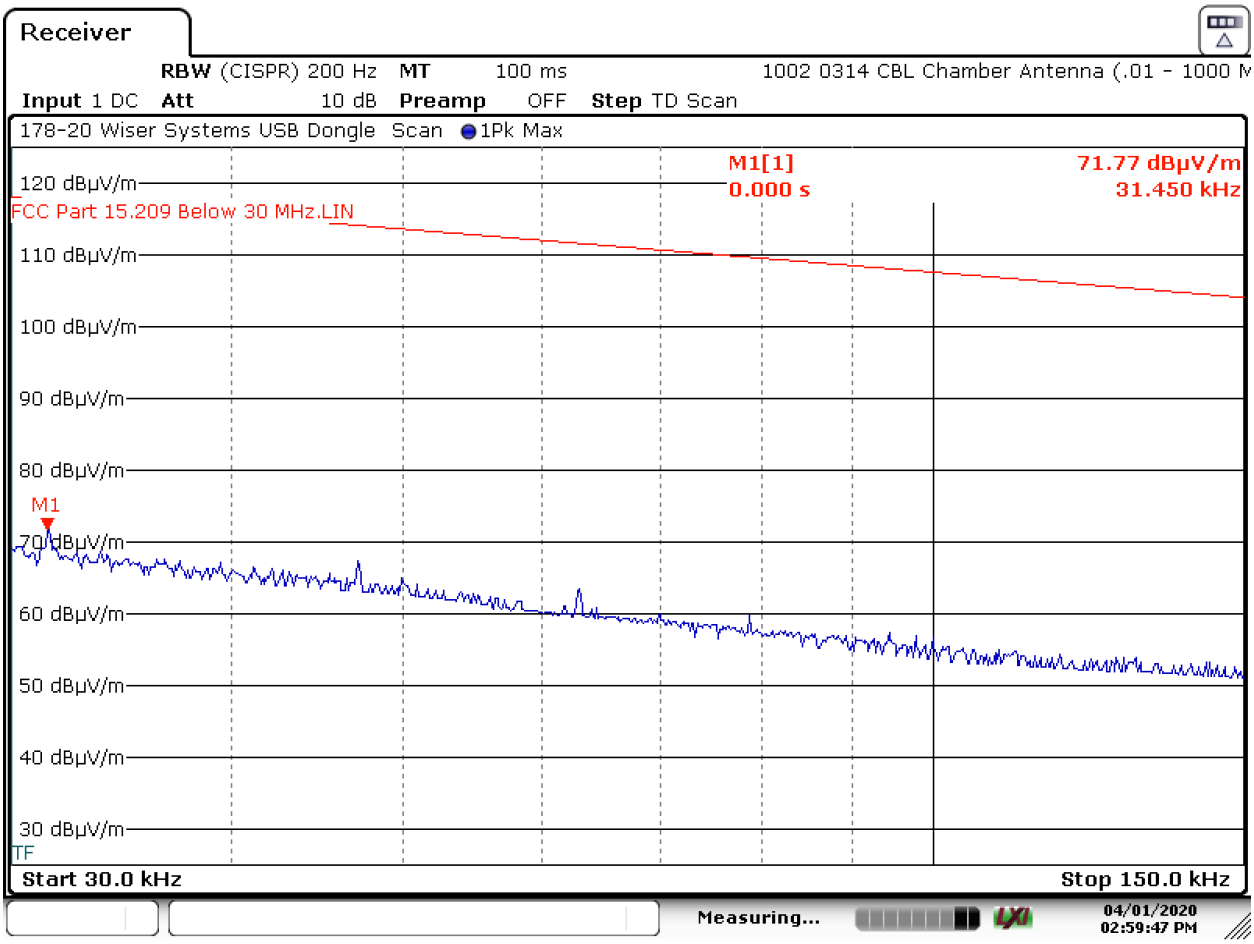
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 30 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 – 6.8 Mbps 16M



Date: 1.APR.2020 14:59:47

Note: The other data rate / PRFs were also noise floor

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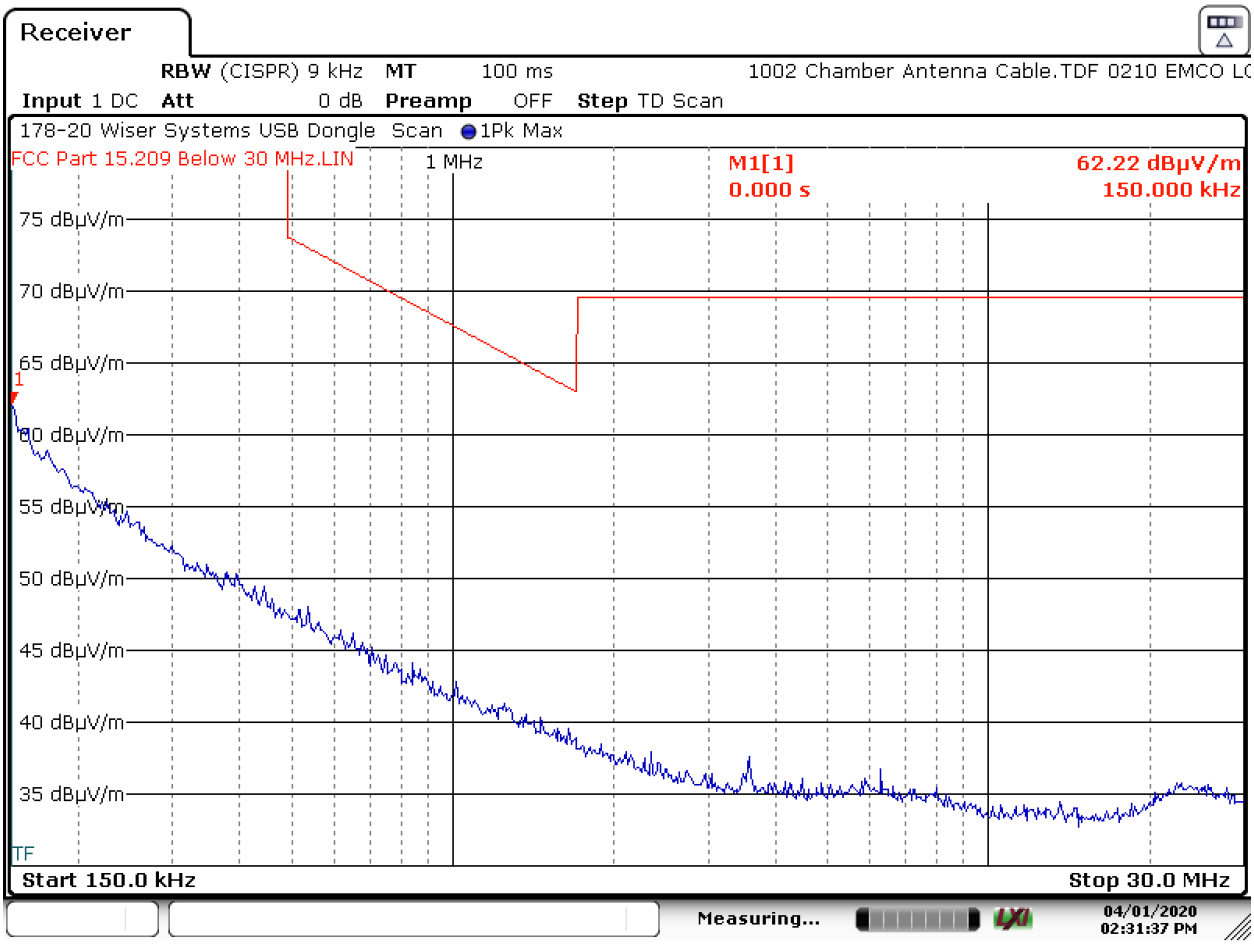
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 30 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 – 6.8 Mbps 16M



Date: 1.APR.2020 14:31:37

Note: The other data rate / PRFs were also noise floor

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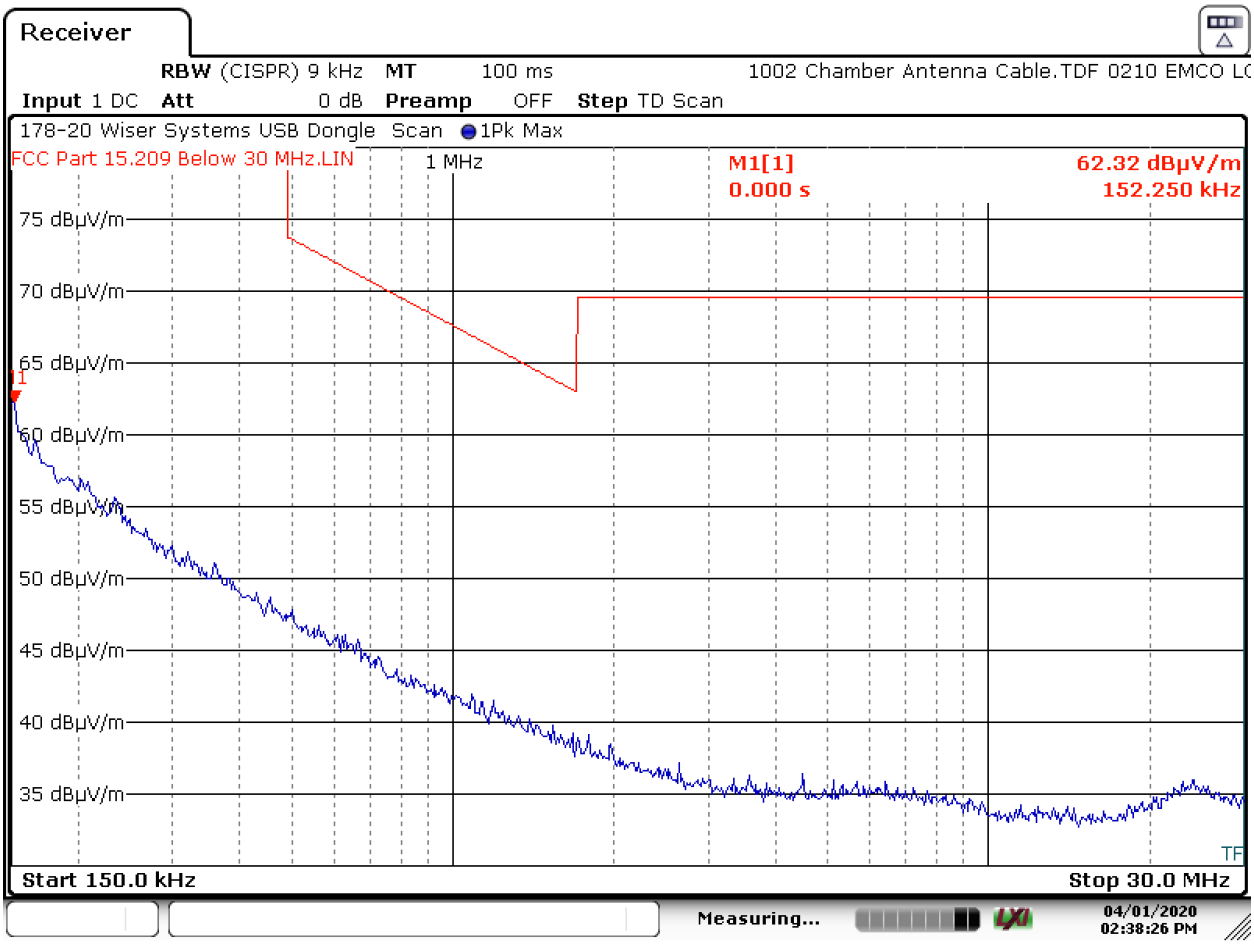
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 30 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 – 6.8 Mbps 16M



Date: 1.APR.2020 14:38:26

Note: The other data rate / PRFs were also noise floor

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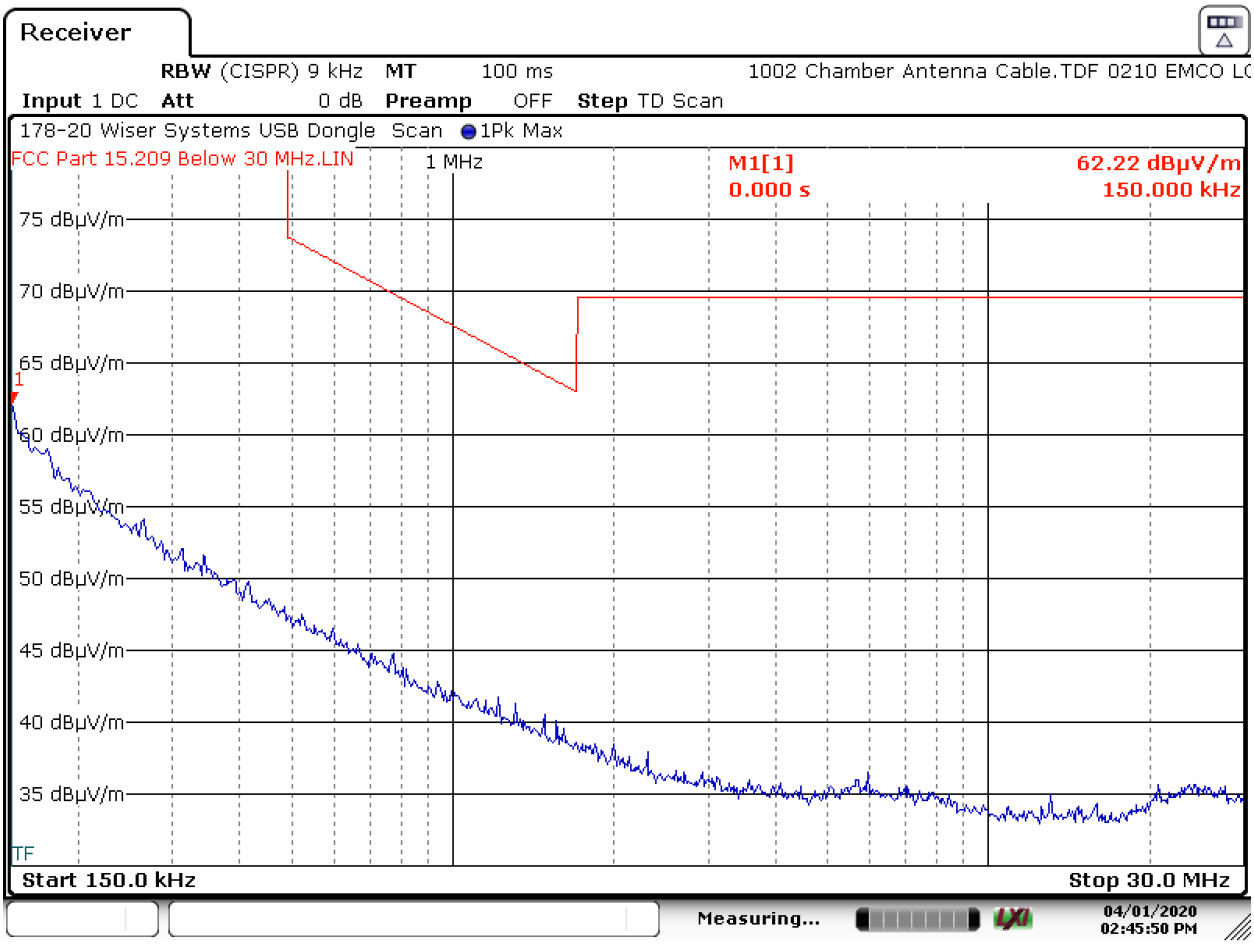
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 30 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 – 6.8 Mbps 16M



Date: 1.APR.2020 14:45:50

Note: The other data rate / PRFs were also noise floor

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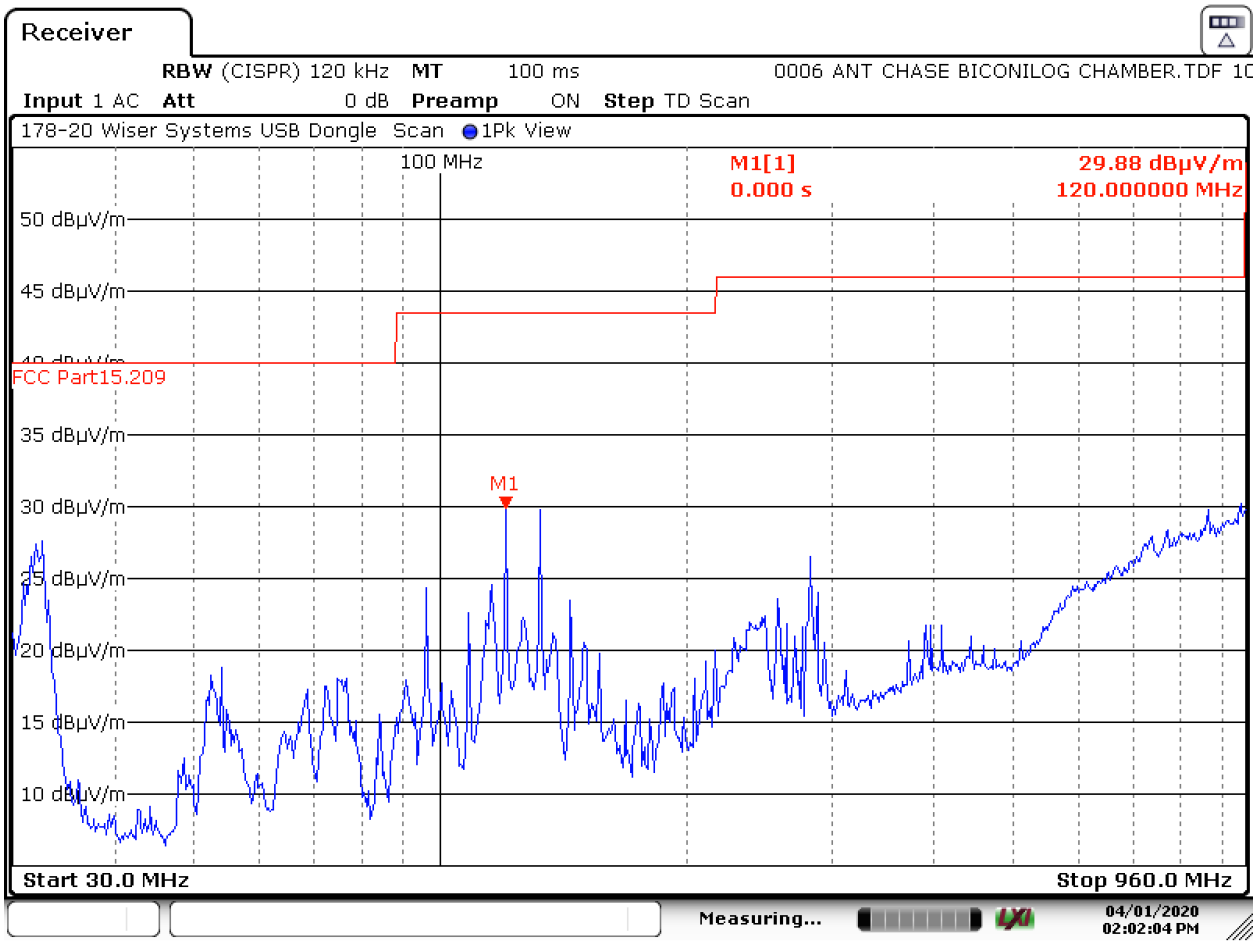
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 30 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 – 6.8 Mbps – 16M PRF



Date: 1.APR.2020 14:02:04

Note: The other data rate / PRFs were also significantly below the limits.

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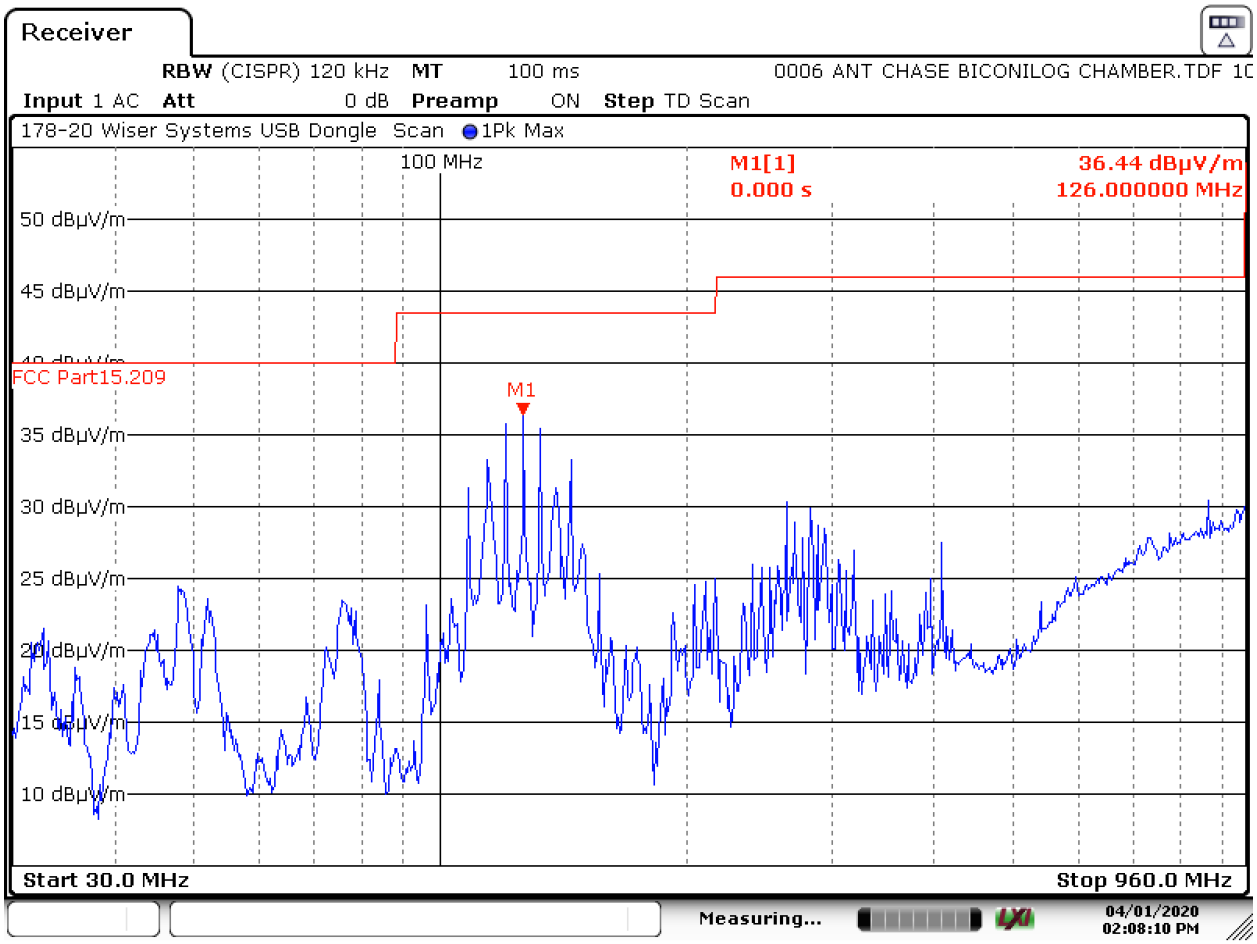
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

6.4.1. 30 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 – 6.8 Mbps – 16M PRF



Date: 1.APR.2020 14:08:10

Note: The other data rate / PRFs were also significantly below the limits.

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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.

The EIRP in terms of dBm, can be converted to a field strength, in dBµV/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.

Narrowband emission at 1.1525 GHz is related to clock noise and is subject to the spurious limit in section 15.209.

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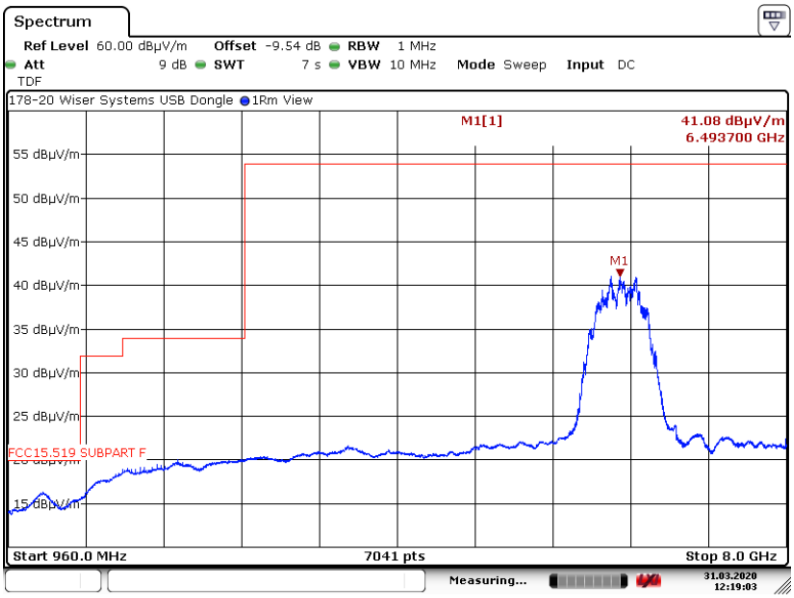
6. Measurement Data (continued)

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

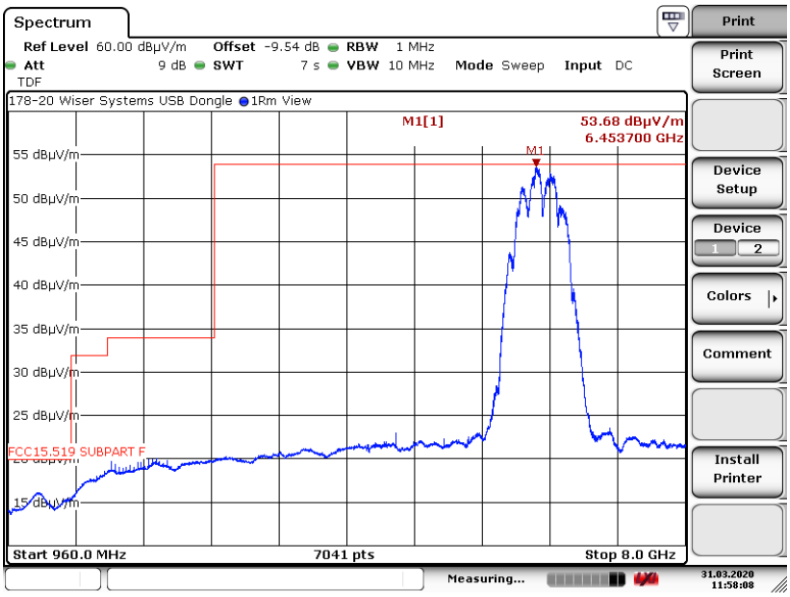
6.5.1. 960 MHz to 8 GHz Horizontal at 1 Meter, 110kbps - 16M



Horizontal

Date: 31.MAR.2020 12:19:03

6.5.2. 960 MHz to 8 GHz Vertical at 1 Meter, 110kbps - 16M



Horizontal

Date: 31.MAR.2020 11:58:07

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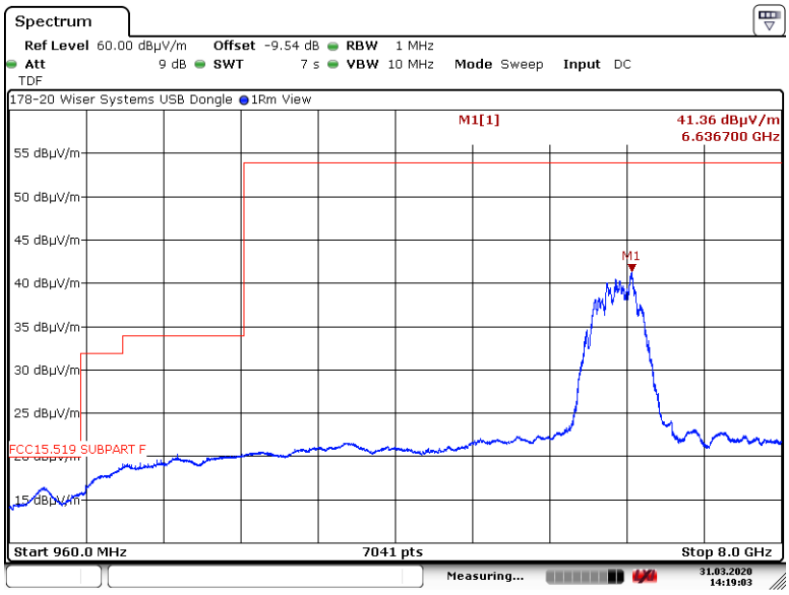
6. Measurement Data (continued)

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

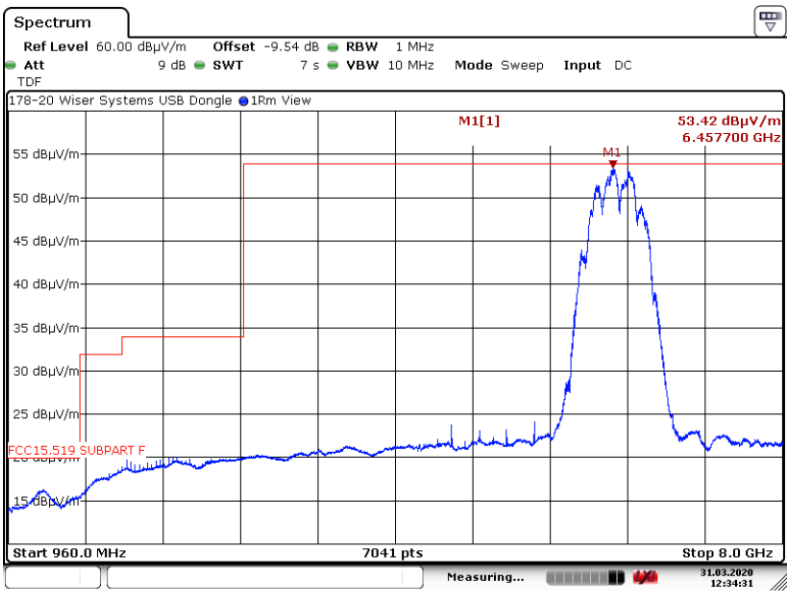
6.5.3. 960 MHz to 8 GHz Horizontal at 1 Meter, 110kbps - 64M



Horizontal

Date: 31.MAR.2020 14:19:03

6.5.4. 960 MHz to 8 GHz Vertical at 1 Meter, 110kbps - 64M



Horizontal

Date: 31.MAR.2020 12:34:31

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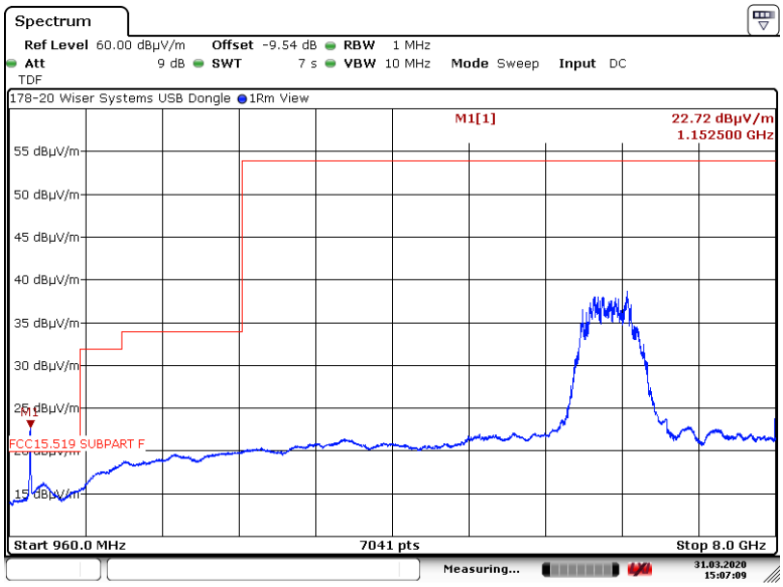
6. Measurement Data (continued)

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

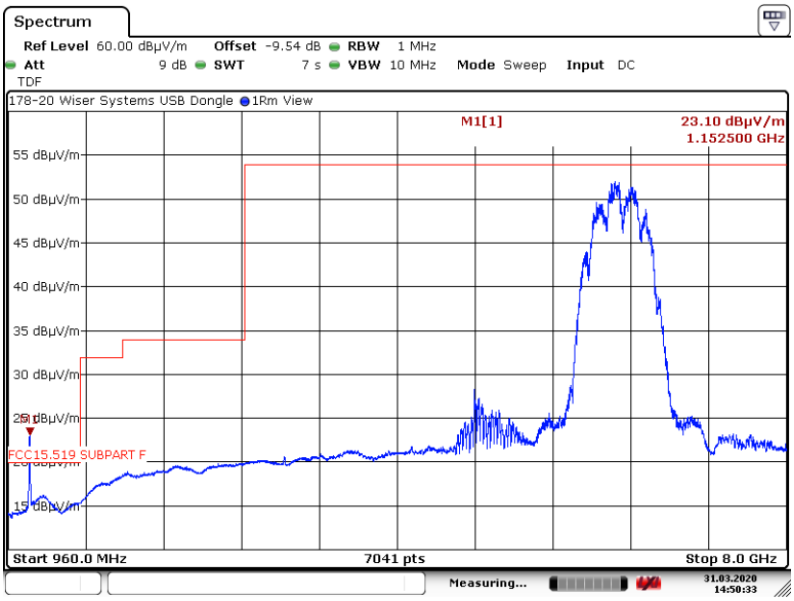
6.5.5. 960 MHz to 8 GHz Horizontal at 1 Meter, 6.8 Mbps - 16M



Horizontal

Date: 31.MAR.2020 15:07:10

6.5.6. 960 MHz to 8 GHz Vertical at 1 Meter, 6.8 Mbps - 16M



Horizontal

Date: 31.MAR.2020 14:50:33

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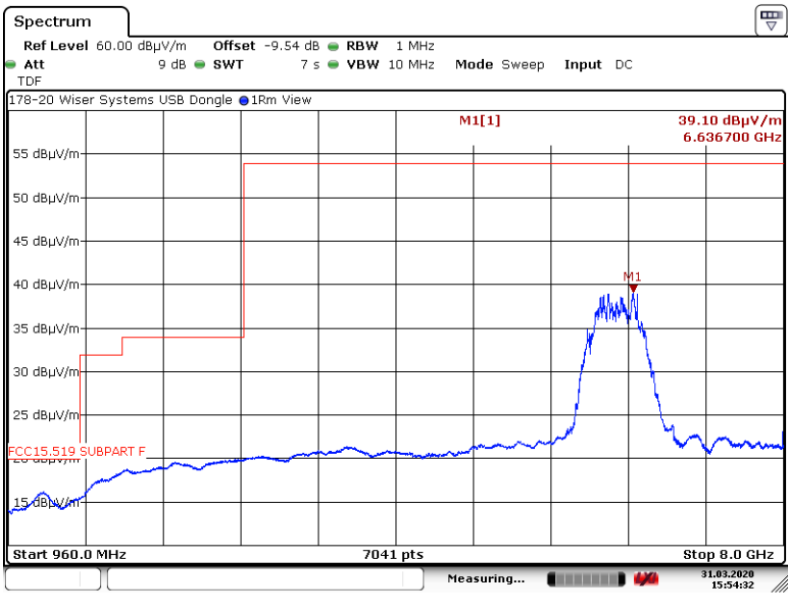
6. Measurement Data (continued)

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

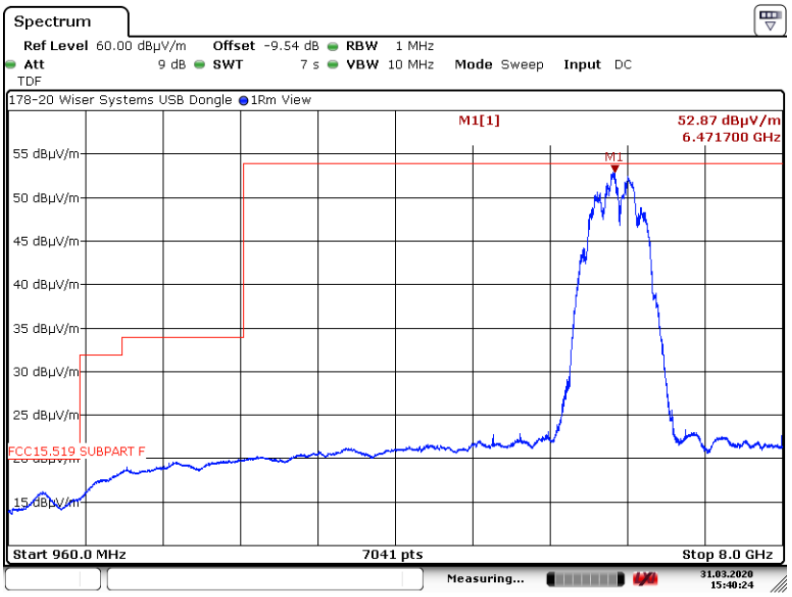
6.5.7. 960 MHz to 8 GHz Horizontal at 1 Meter, 6.8 Mbps - 64M



Horizontal

Date: 31.MAR.2020 15:54:32

6.5.8. 960 MHz to 8 GHz Vertical at 1 Meter, 6.8 Mbps - 64M



Horizontal

Date: 31.MAR.2020 15:40:24

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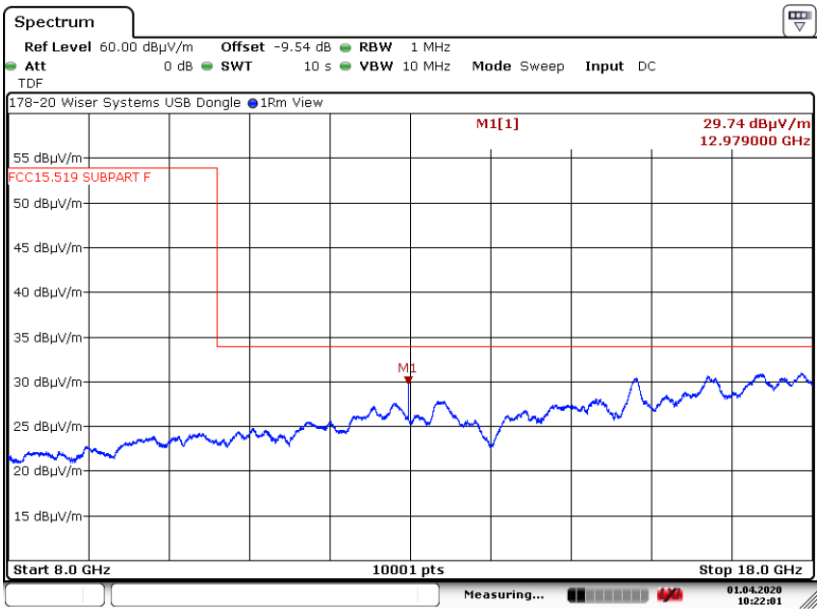
6. Measurement Data (continued)

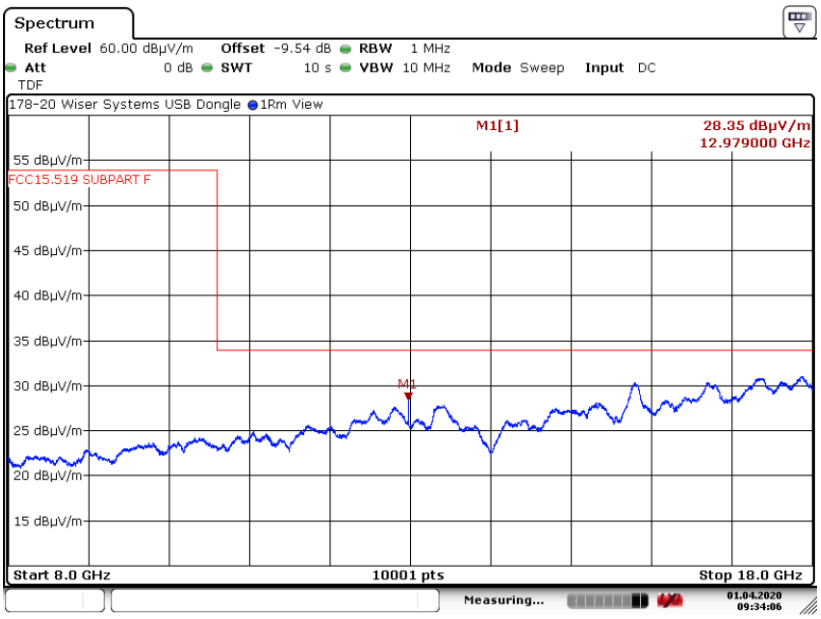
6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.9. 8 to 18 GHz Horizontal at 1 Meter, 110 kbps - 16M



Date: 1.APR.2020 10:22:01

6.5.10. 8 to 18 GHz Vertical at 1 Meter, 110 kbps - 16M



Date: 1.APR.2020 09:34:06

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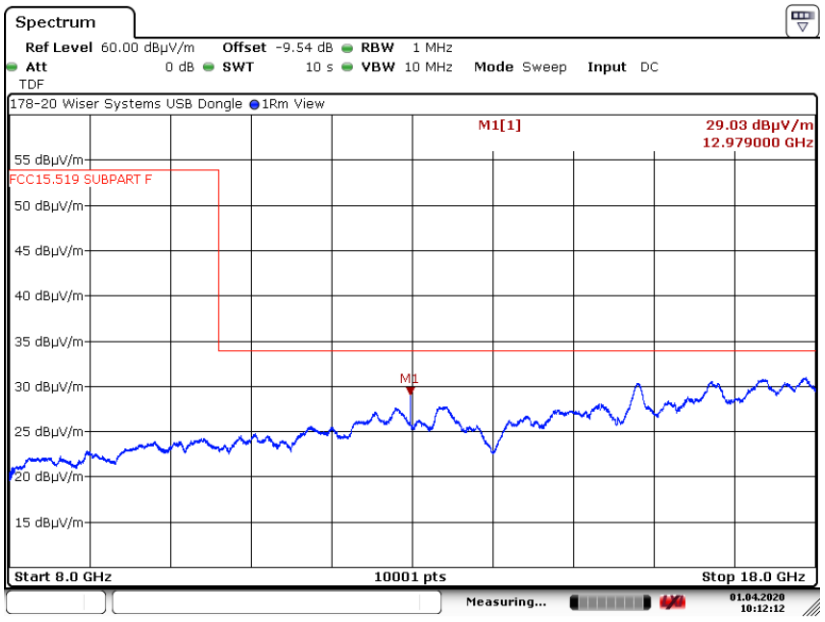
6. Measurement Data (continued)

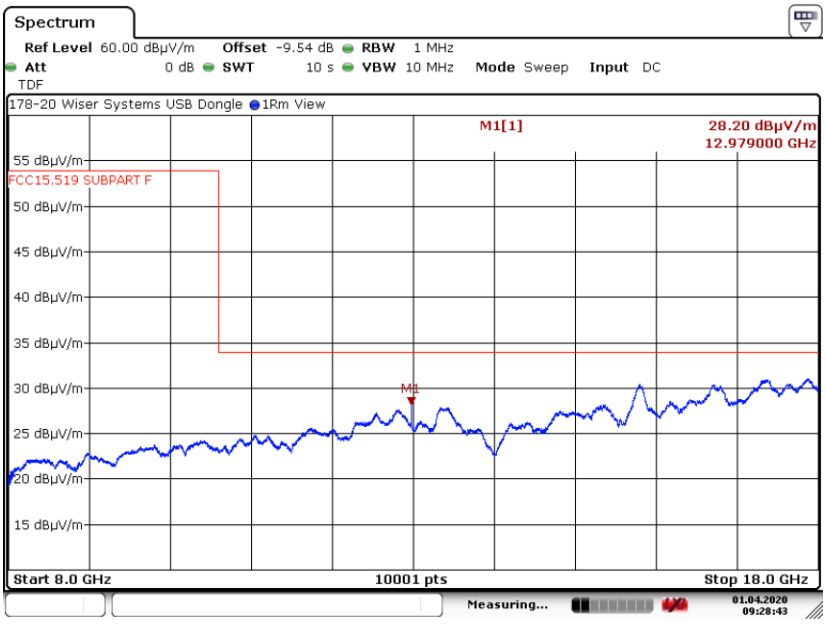
6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.11. 8 to 18 GHz Horizontal at 1 Meter, 110 kbps - 64M



Date: 1.APR.2020 10:12:12

6.5.12. 8 to 18 GHz Vertical at 1 Meter, 110 kbps - 64M



Date: 1.APR.2020 09:28:44

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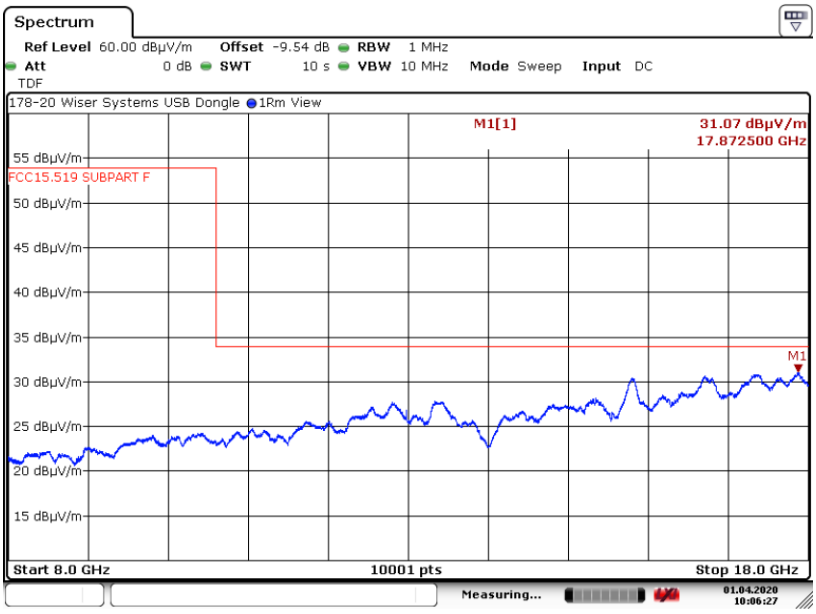
6. Measurement Data (continued)

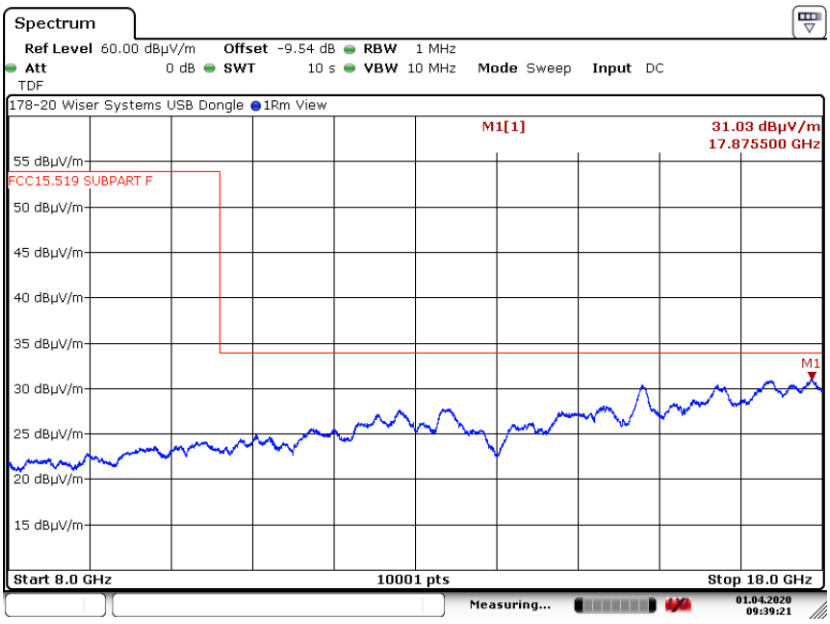
6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.13. 8 to 18 GHz Horizontal at 1 Meter, 6.8 Mbps - 16M



Date: 1.APR.2020 10:06:27

6.5.14. 8 to 18 GHz Vertical at 1 Meter, 6.8 Mbps - 16M



Date: 1.APR.2020 09:39:21

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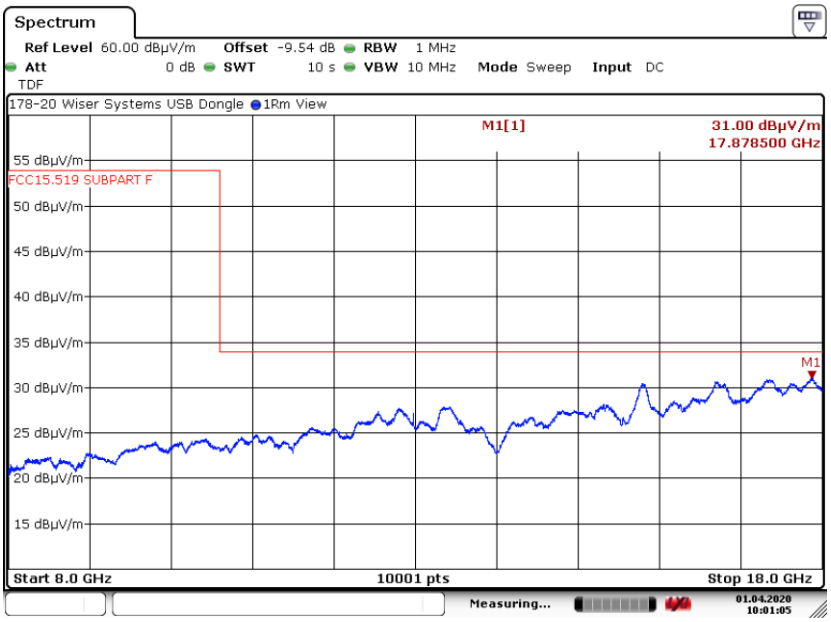
6. Measurement Data (continued)

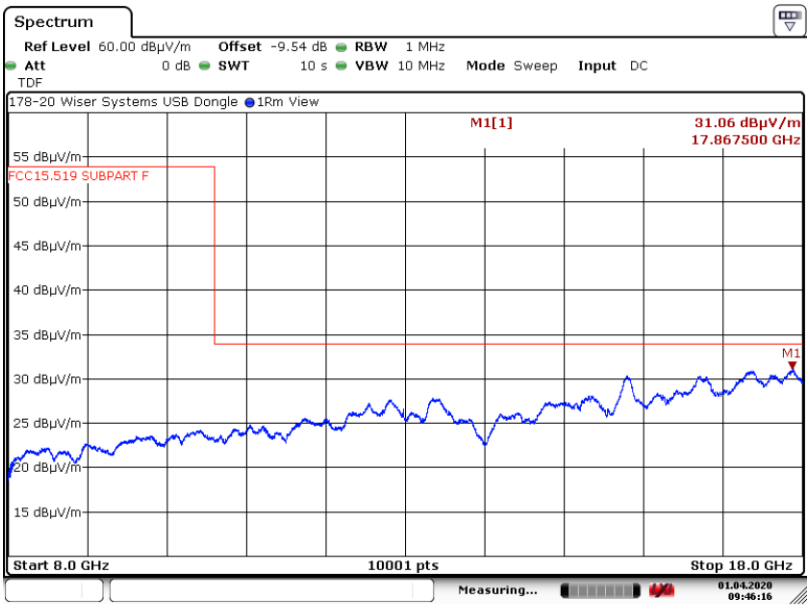
6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.15. 8 to 18 GHz Horizontal at 1 Meter, 6.8 Mbps - 64M



Date: 1.APR.2020 10:01:05

6.5.16. 8 to 18 GHz Vertical at 1 Meter, 110 kbps - 64M



Date: 1.APR.2020 09:46:17

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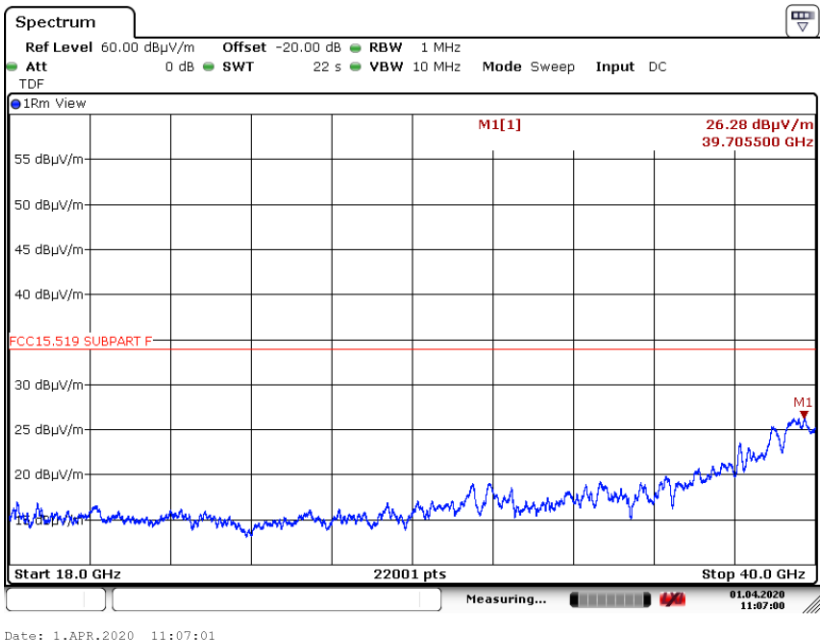
6. Measurement Data (continued)

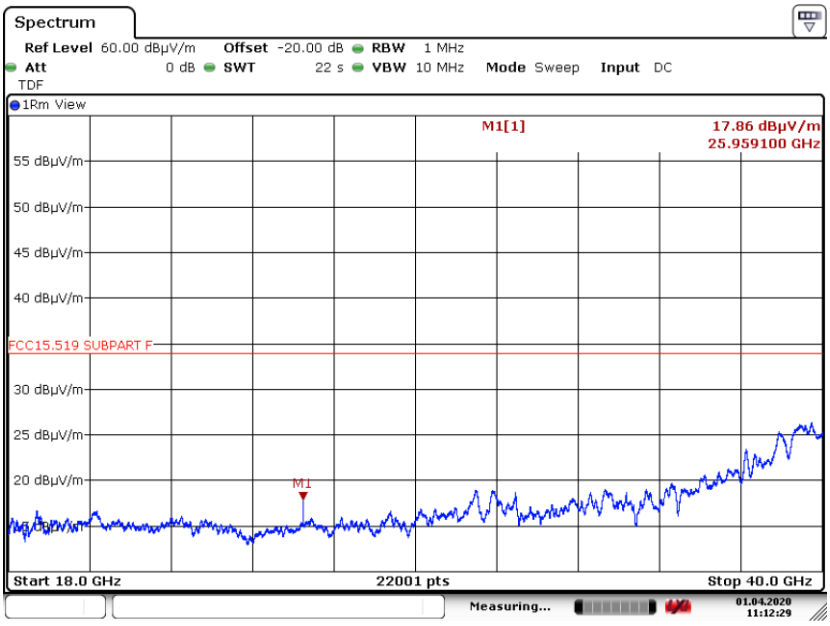
6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.17. 18 to 40 GHz Horizontal at 0.3 Meter, 110 kbps - 16M



Date: 1.APR.2020 11:07:01

6.5.18. 18 to 40 GHz Vertical at 0.3 Meter, 110 kbps - 16M



Date: 1.APR.2020 11:12:29

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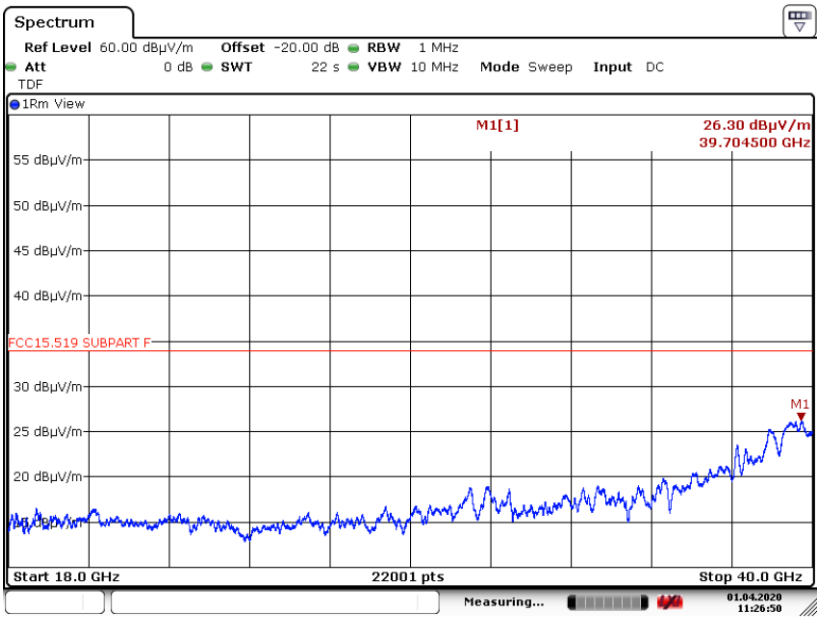
6. Measurement Data (continued)

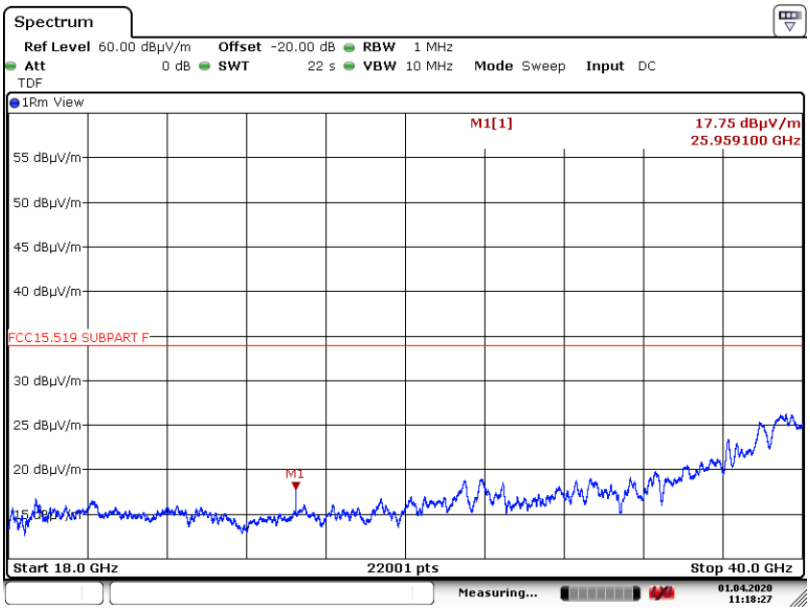
6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.19. 18 to 40 GHz Horizontal at 0.3 Meter, 110 kbps - 64M



Date: 1.APR.2020 11:26:50

6.5.20. 18 to 40 GHz Vertical at 0.3 Meter, 110 kbps - 64M



Date: 1.APR.2020 11:18:28

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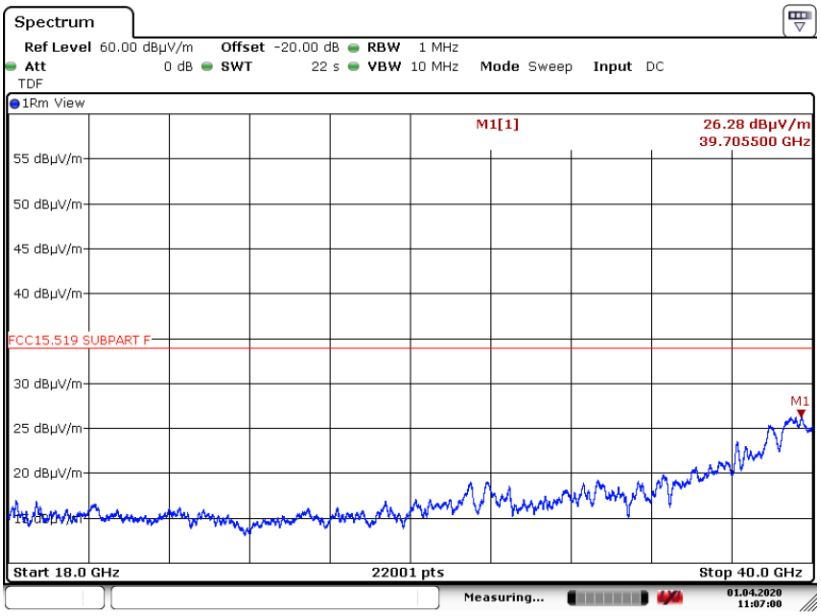
6. Measurement Data (continued)

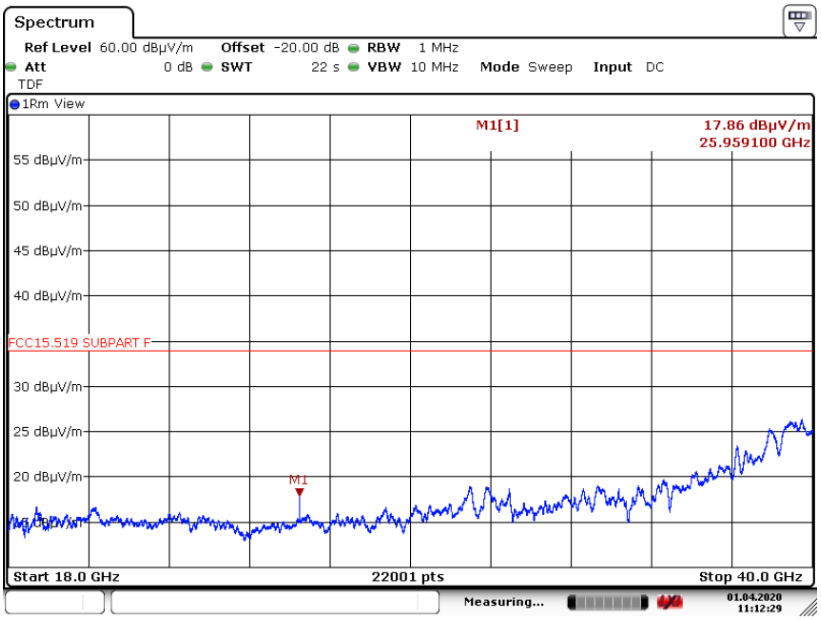
6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.17. 18 to 40 GHz Horizontal at 0.3 Meter, 110 kbps - 16M



Date: 1.APR.2020 11:07:01

6.5.18. 18 to 40 GHz Vertical at 0.3 Meter, 110 kbps - 16M



Date: 1.APR.2020 11:12:29

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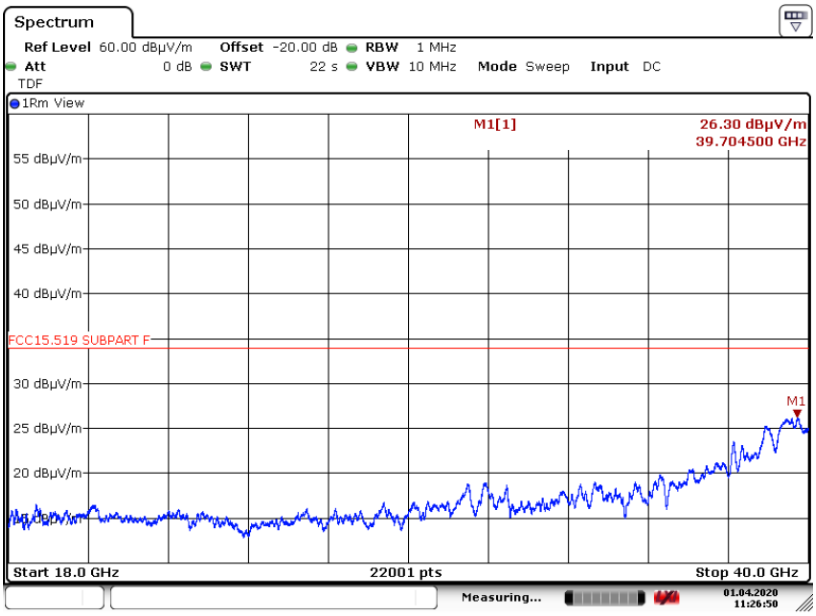
6. Measurement Data (continued)

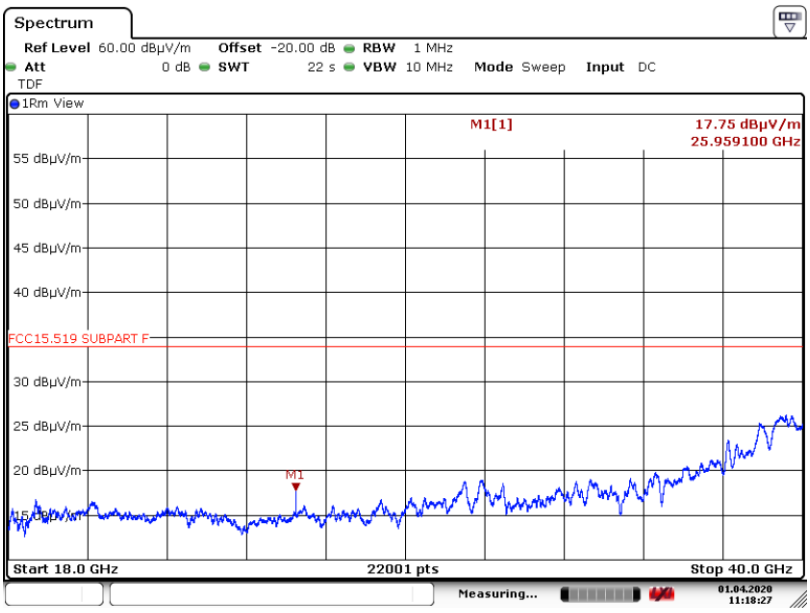
6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.19. 18 to 40 GHz Horizontal at 0.3 Meter, 110 kbps - 64M



Date: 1.APR.2020 11:26:50

6.5.20. 18 to 40 GHz Vertical at 0.3 Meter, 110 kbps - 64M



Date: 1.APR.2020 11:18:28

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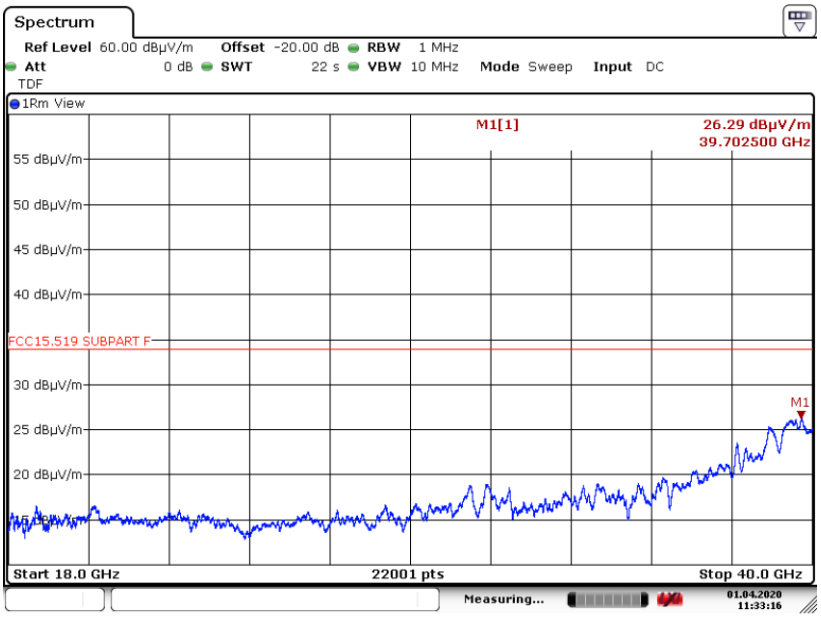
6. Measurement Data (continued)

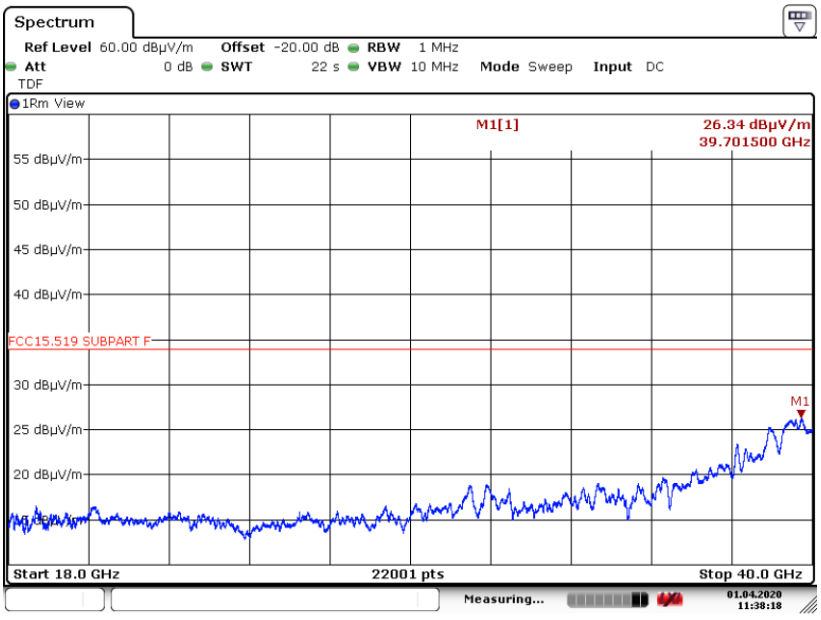
6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.21. 18 to 40 GHz Horizontal at 0.3 Meter, 6.8 Mbps - 16M



Date: 1.APR.2020 11:33:16

6.5.22. 18 to 40 GHz Vertical at 0.3 Meter, 6.8 Mbps - 16M



Date: 1.APR.2020 11:38:19

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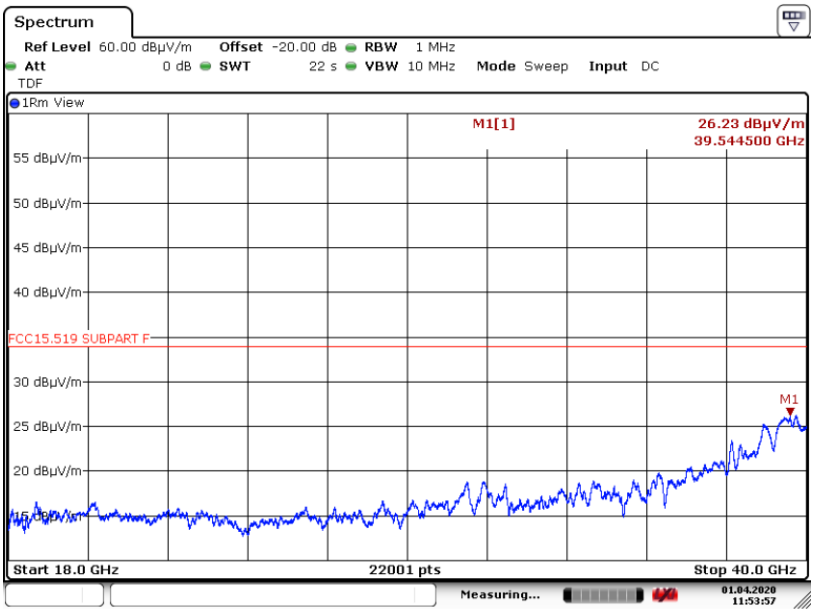
6. Measurement Data (continued)

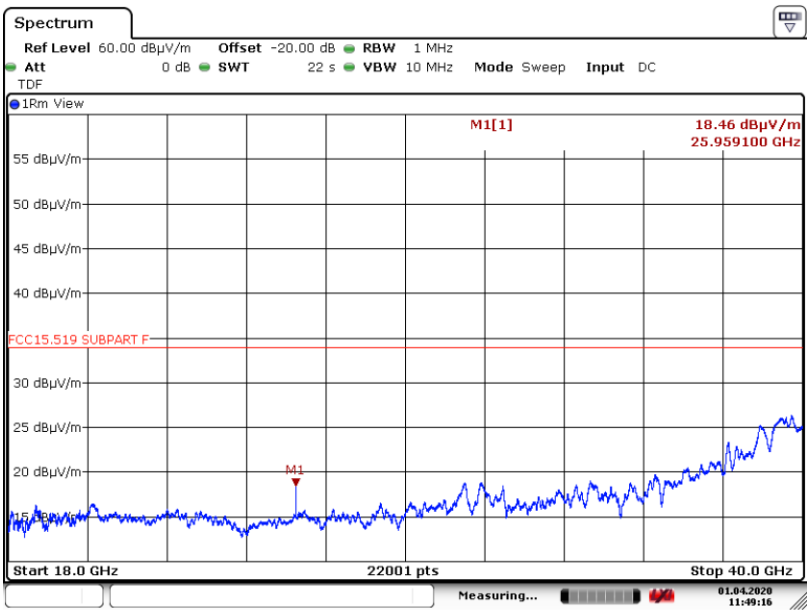
6.5. Spurious Radiated Emissions (15.519 (c) continued)

6.5.23. 18 to 40 GHz Horizontal at 0.3 Meter, 6.8 Mbps - 64M



Date: 1.APR.2020 11:53:57

6.5.24. 18 to 40 GHz Vertical at 0.3 Meter, 6.8 Mbps - 64M



Date: 1.APR.2020 11:49:16

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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 dBµV/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 6.5.9 to 6.5.12 on the previous pages.

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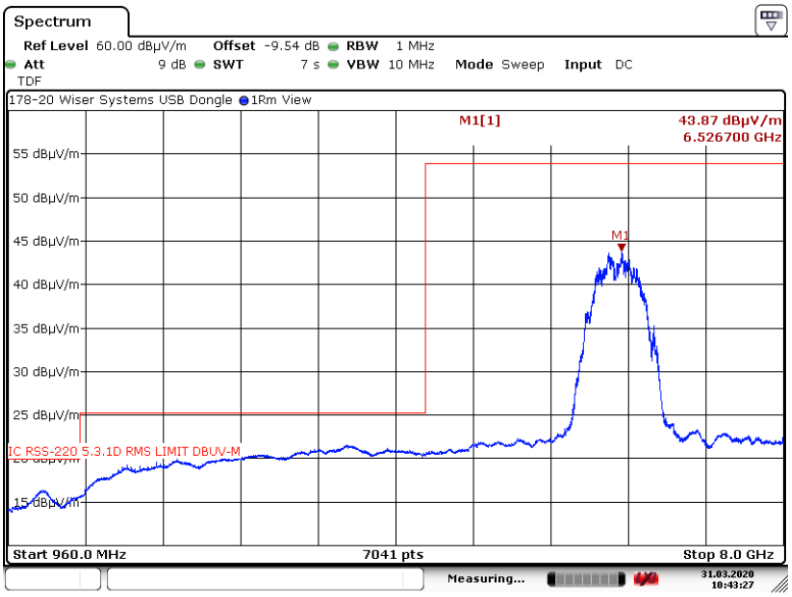
6. Measurement Data (continued)

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

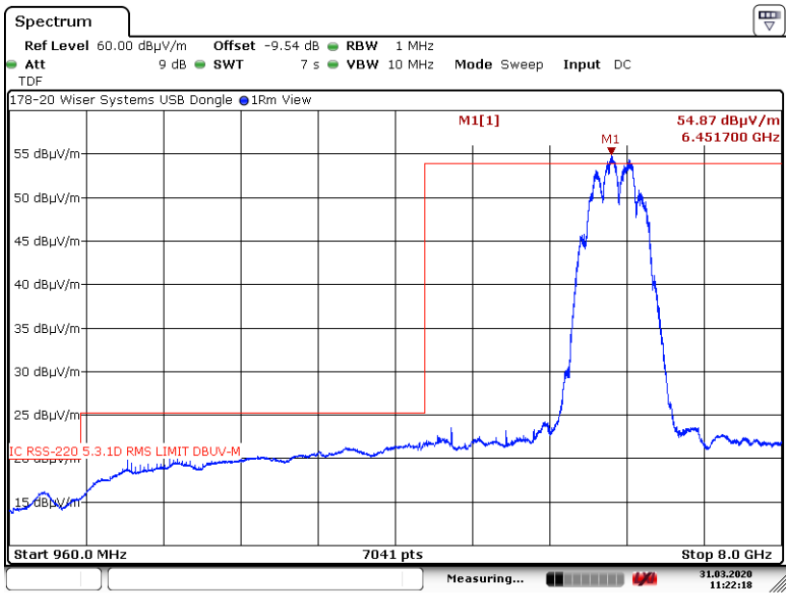
6.5.25. 960 MHz to 8 GHz Horizontal at 1 Meter, 110 kbps - 16M



Horizontal

Date: 31.MAR.2020 10:43:27

6.5.26. 960 MHz to 8 GHz Vertical at 1 Meter, 110 kbps - 16M



Horizontal

Date: 31.MAR.2020 11:22:18

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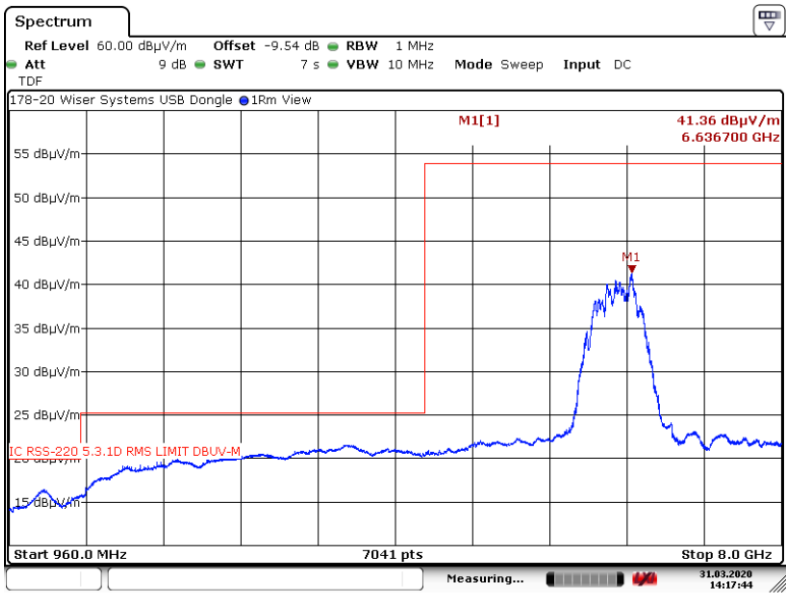
6. Measurement Data (continued)

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

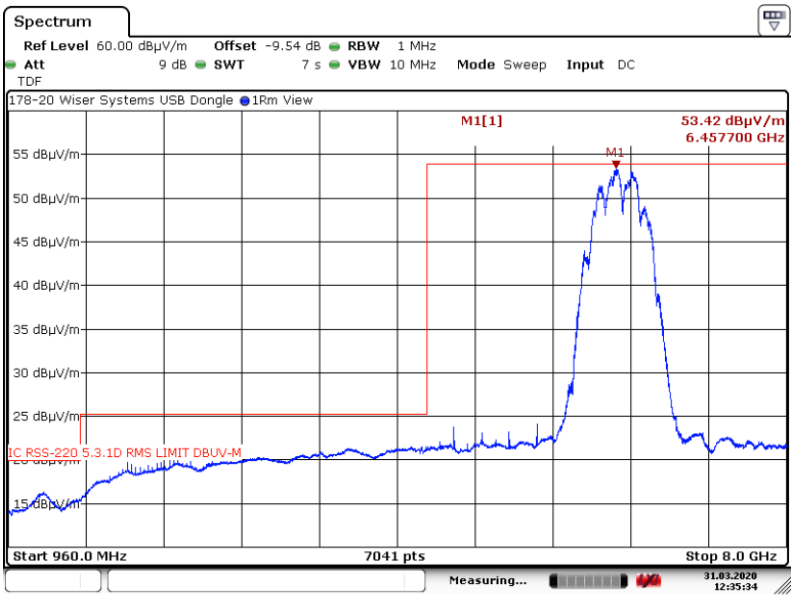
6.5.27. 960 MHz to 8 GHz Horizontal at 1 Meter, 110 kbps - 64M



Horizontal

Date: 31.MAR.2020 14:17:44

6.5.28. 960 MHz to 8 GHz Vertical at 1 Meter, 110 kbps - 64M



Horizontal

Date: 31.MAR.2020 12:35:34

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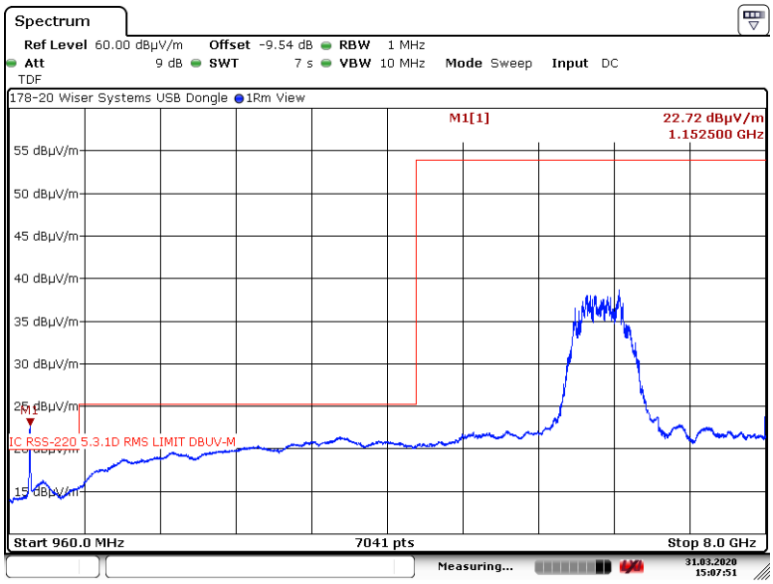
6. Measurement Data (continued)

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

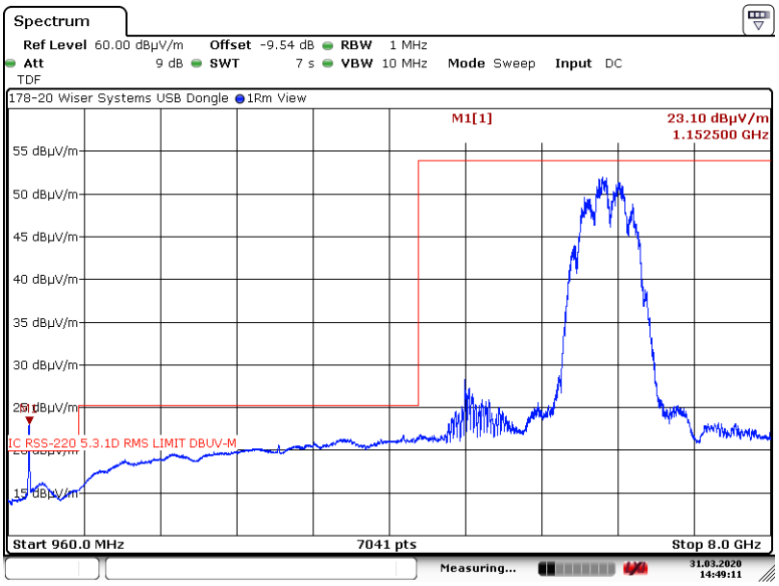
6.5.29. 960 MHz to 8 GHz Horizontal at 1 Meter, 6.8 Mbps - 16M



Horizontal

Date: 31.MAR.2020 15:07:51

6.5.30. 960 MHz to 8 GHz Vertical at 1 Meter, 6.8 Mbps - 16M



Horizontal

Date: 31.MAR.2020 14:49:11

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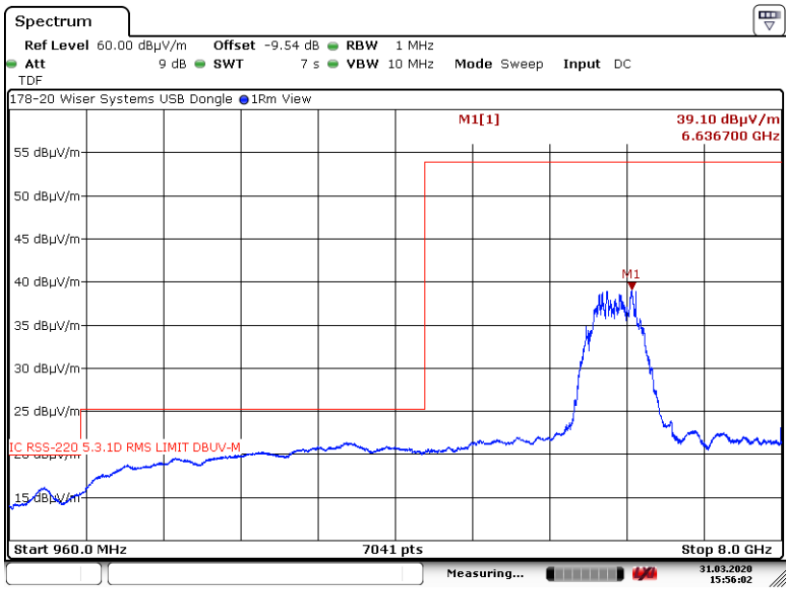
6. Measurement Data (continued)

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

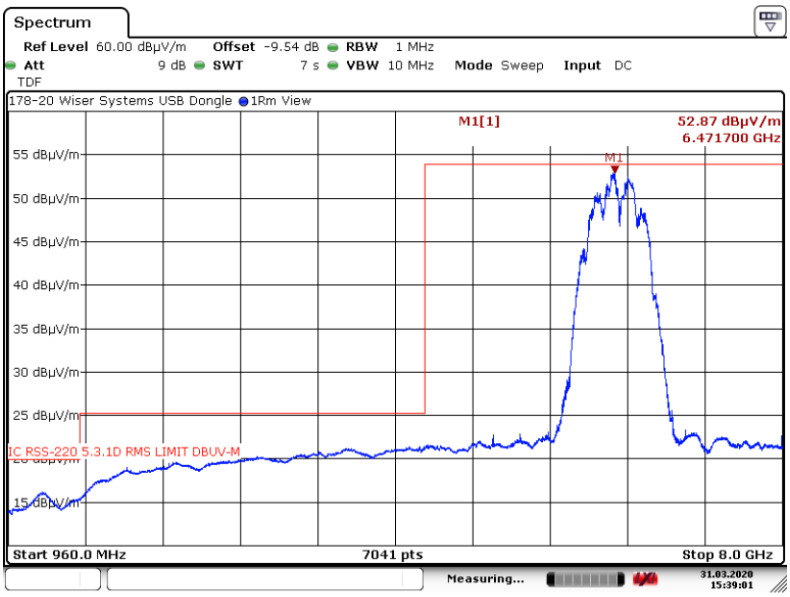
6.5.31. 960 MHz to 8 GHz Horizontal at 1 Meter, 6.8 Mbps - 64M



Horizontal

Date: 31.MAR.2020 15:56:02

6.5.32. 960 MHz to 8 GHz Vertical at 1 Meter, 6.8 Mbps - 64M



Horizontal

Date: 31.MAR.2020 15:39:01

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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 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.

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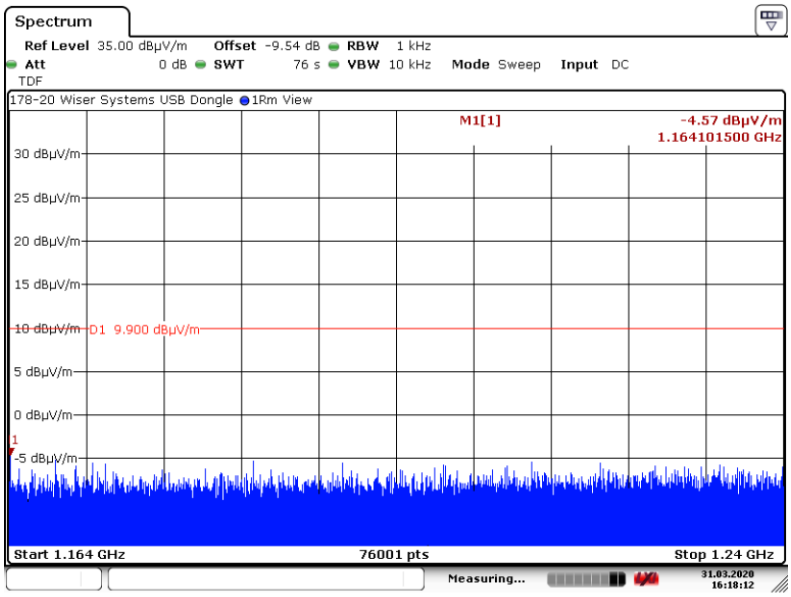
6. Measurement Data (continued)

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

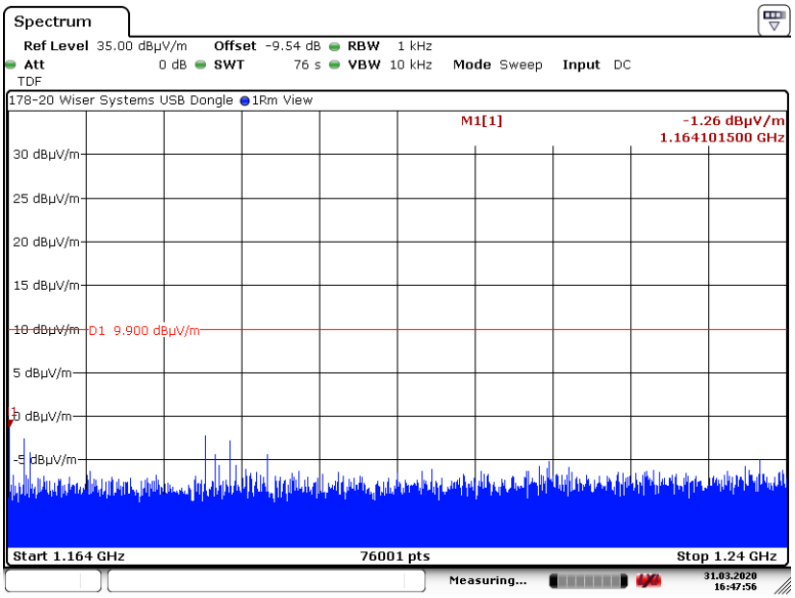
6.6.3.1 Horizontal Measurement Polarity 1164 to 1240 MHz



Horizontal

Date: 31.MAR.2020 16:18:13

6.6.3.2 Vertical Measurement Polarity 1164 to 1240 MHz



Horizontal

Date: 31.MAR.2020 16:47:56

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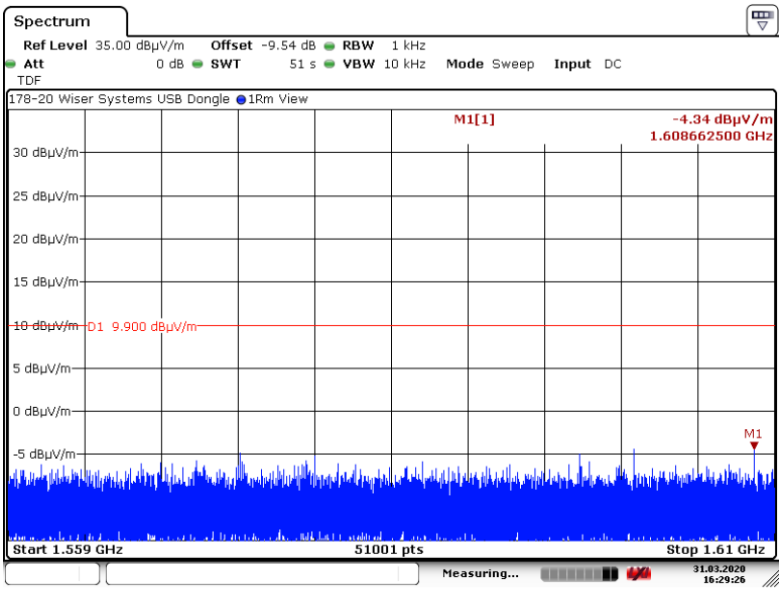
6. Measurement Data (continued)

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

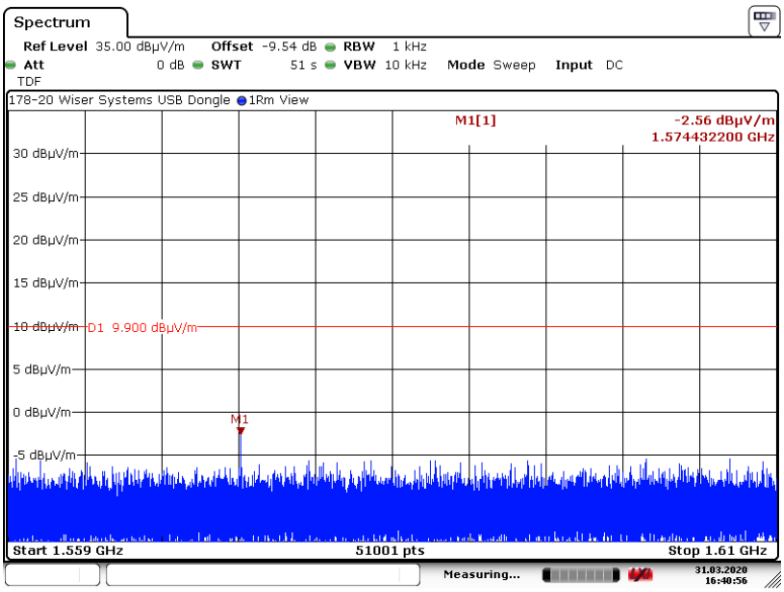
6.6.3.3 Horizontal Measurement Polarity 1559 to 1610 MHz



Horizontal

Date: 31.MAR.2020 16:29:25

6.6.3.4 Vertical Measurement Polarity 1559 to 1610 MHz



Horizontal

Date: 31.MAR.2020 16:40:56

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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.

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

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

Frequency Range:	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)

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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 (110 kbps - 16M PRF)

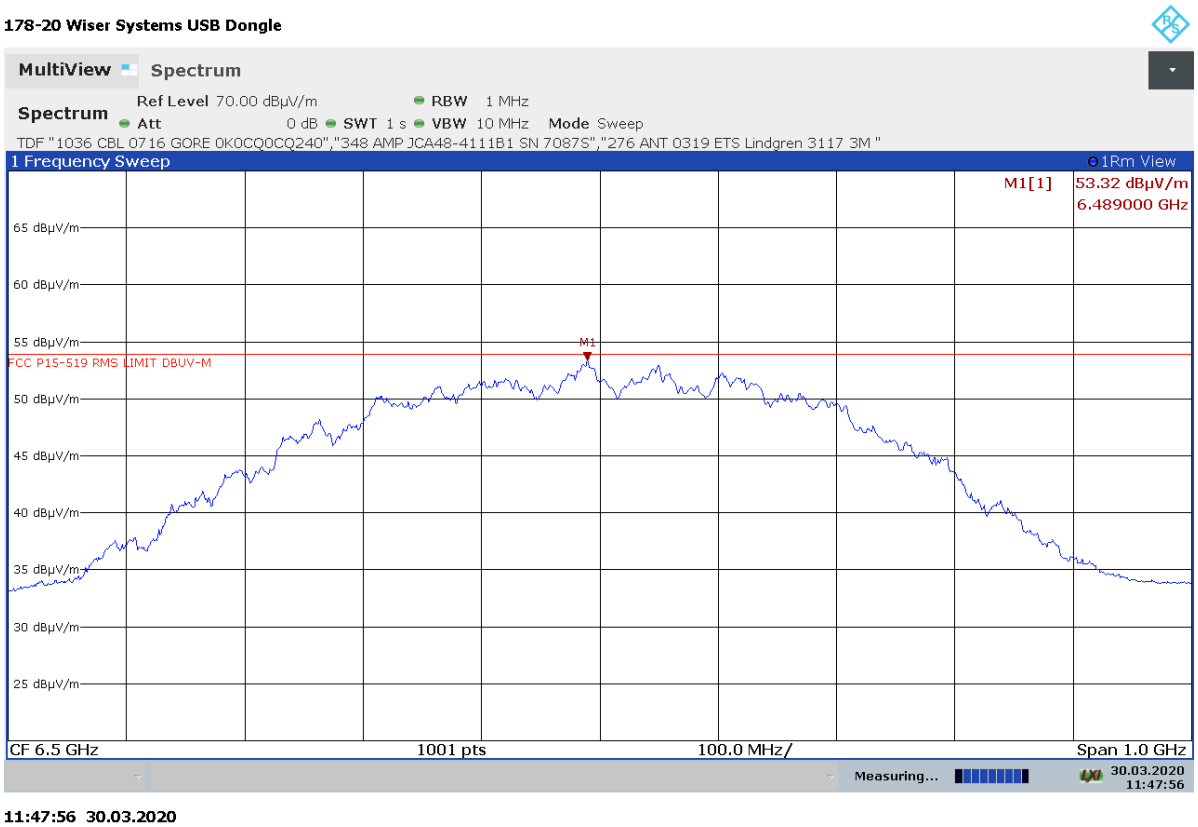
Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.489	53.32	53.90	-0.58	V	100	65	Compliant

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	
6.489	-41.88	-41.30	-0.58	V	100	65	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 (110 kbps - 64M PRF)

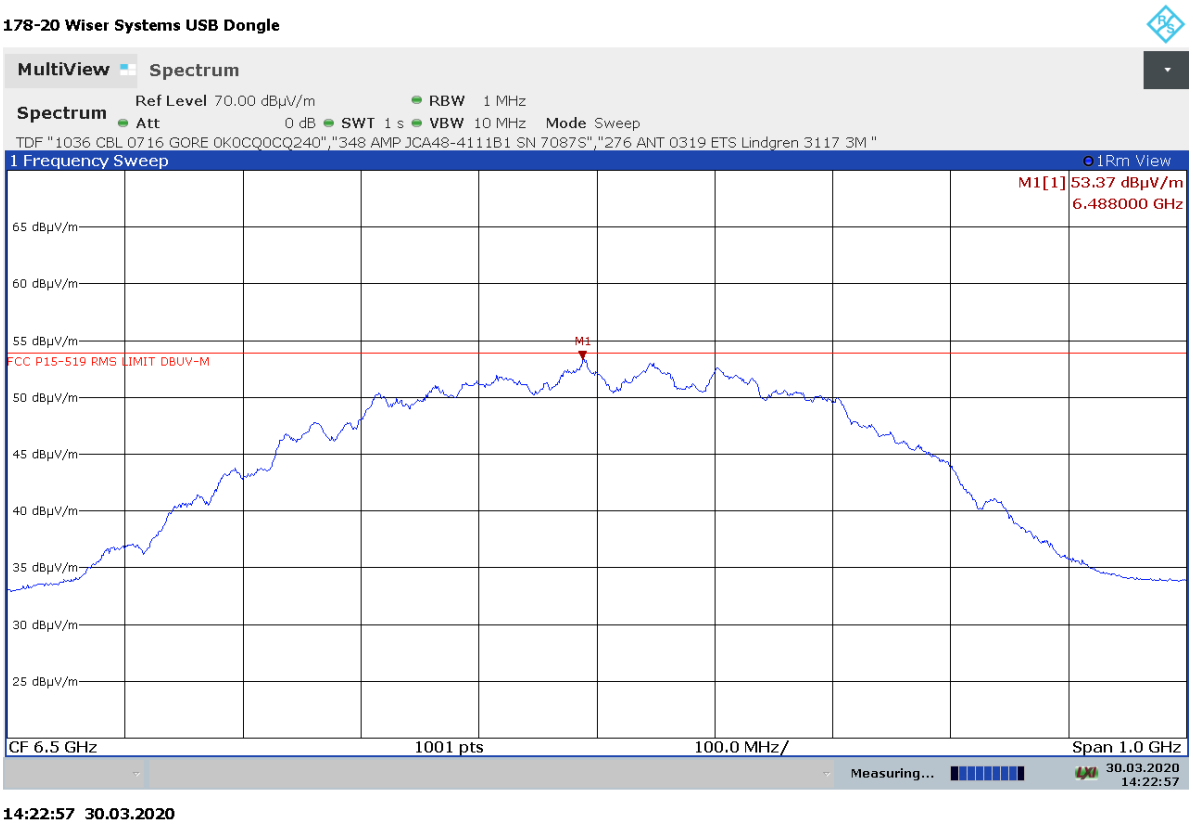
Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.488	53.37	53.90	-0.53	V	100	65	Compliant

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	-41.83	-41.30	-0.53	V	100	65	Compliant



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6. Measurement Data (continued)

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

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

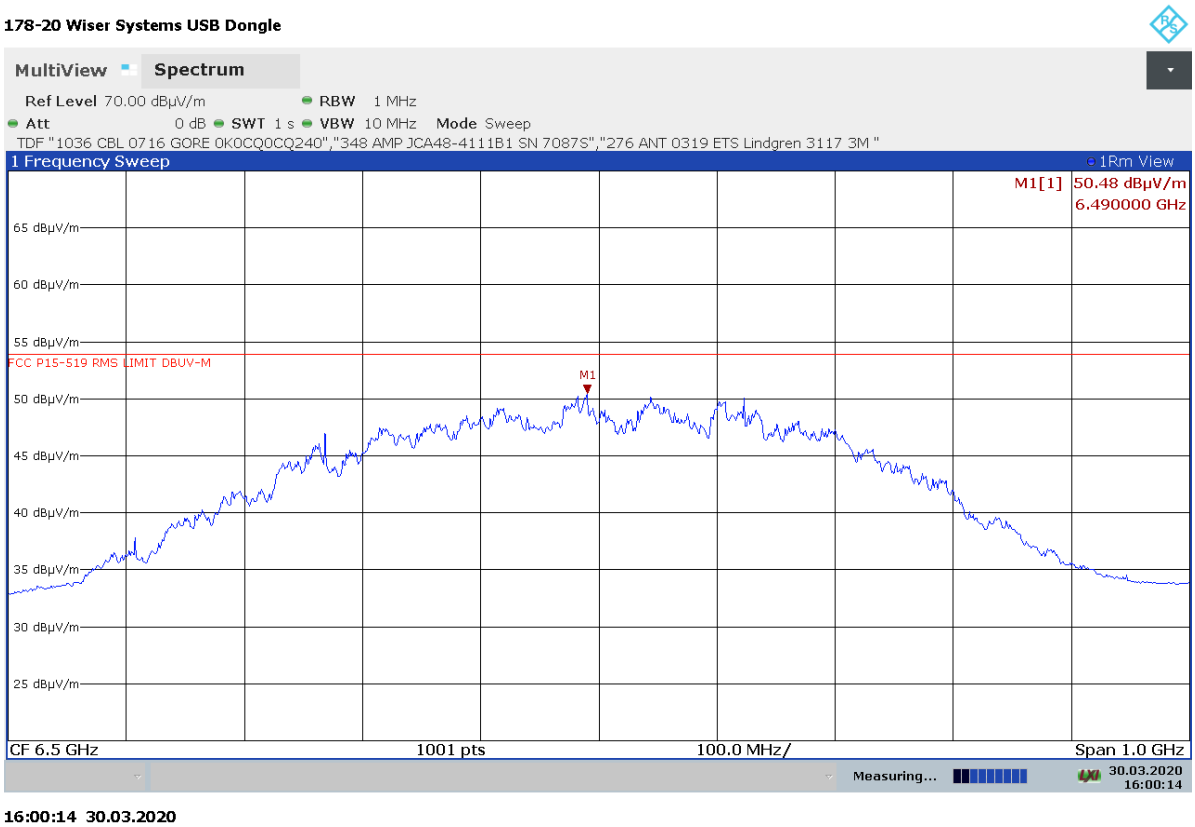
Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.490	50.48	53.90	-3.42	V	100	65	Compliant

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	-44.72	-41.30	-3.42	V	100	65	Compliant



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6. Measurement Data (continued)

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

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

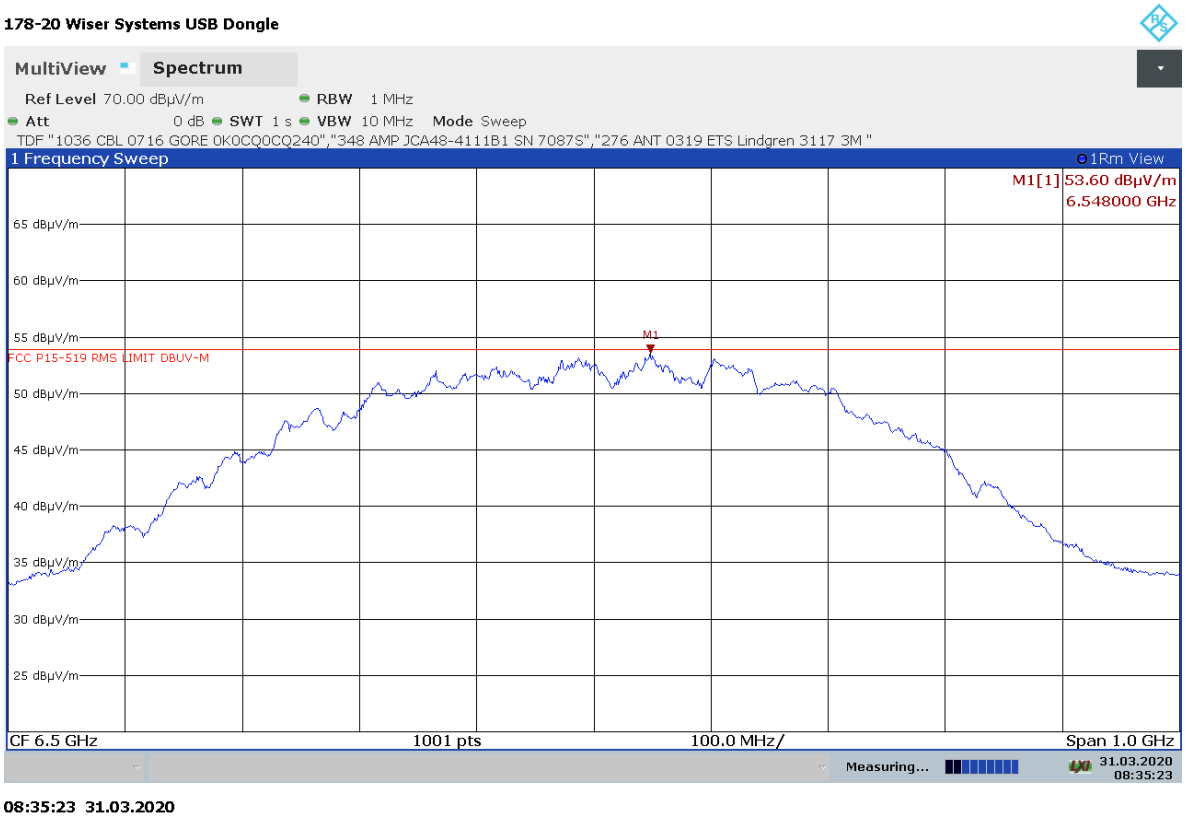
Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.548	53.60	53.90	-0.30	V	100	65	Compliant

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	
6.548	-41.60	-41.30	-0.30	V	100	65	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:	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

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6. Measurement Data (continued)

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

6.8.1 Plot of Peak Power at 3 Meters (110 kbps - 16M PRF)

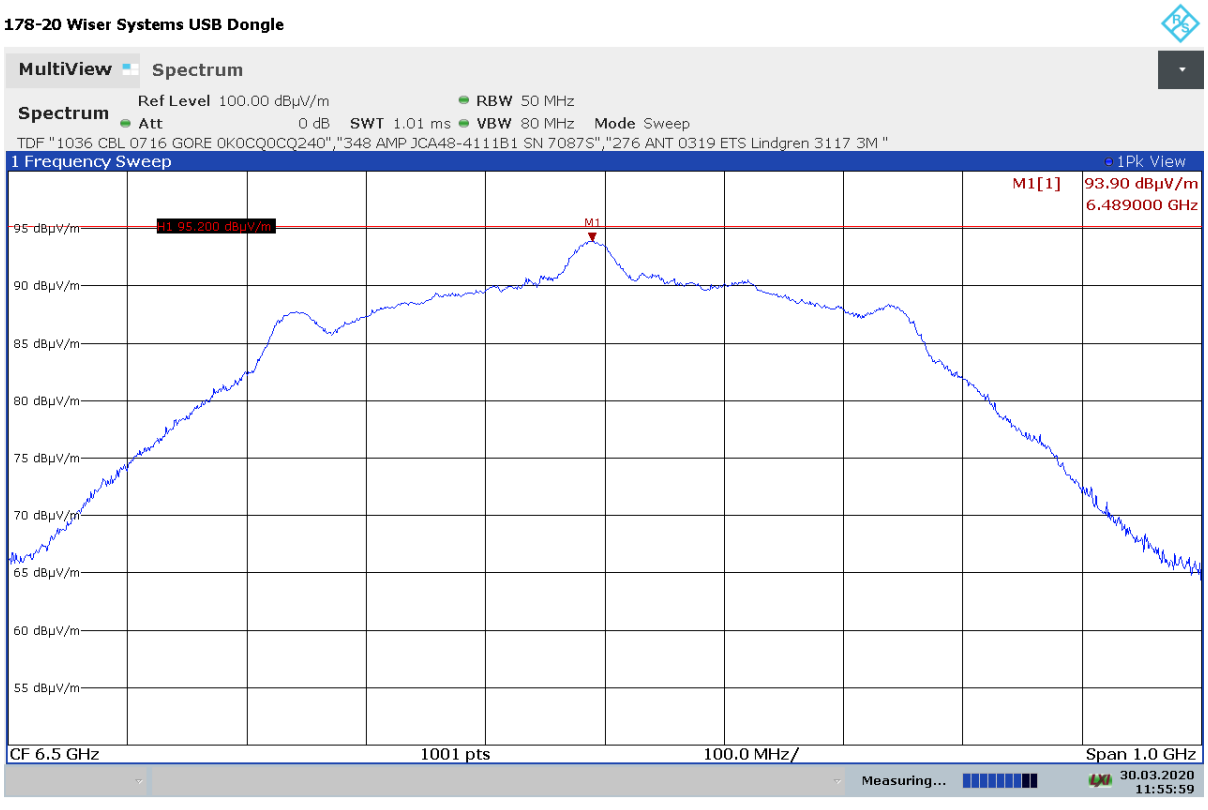
Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.489	93.90	95.20	-1.30	V	100	65	Compliant

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	
6.489	-1.30	0.00	-1.30	V	100	65	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 (110 kbps - 64M PRF)

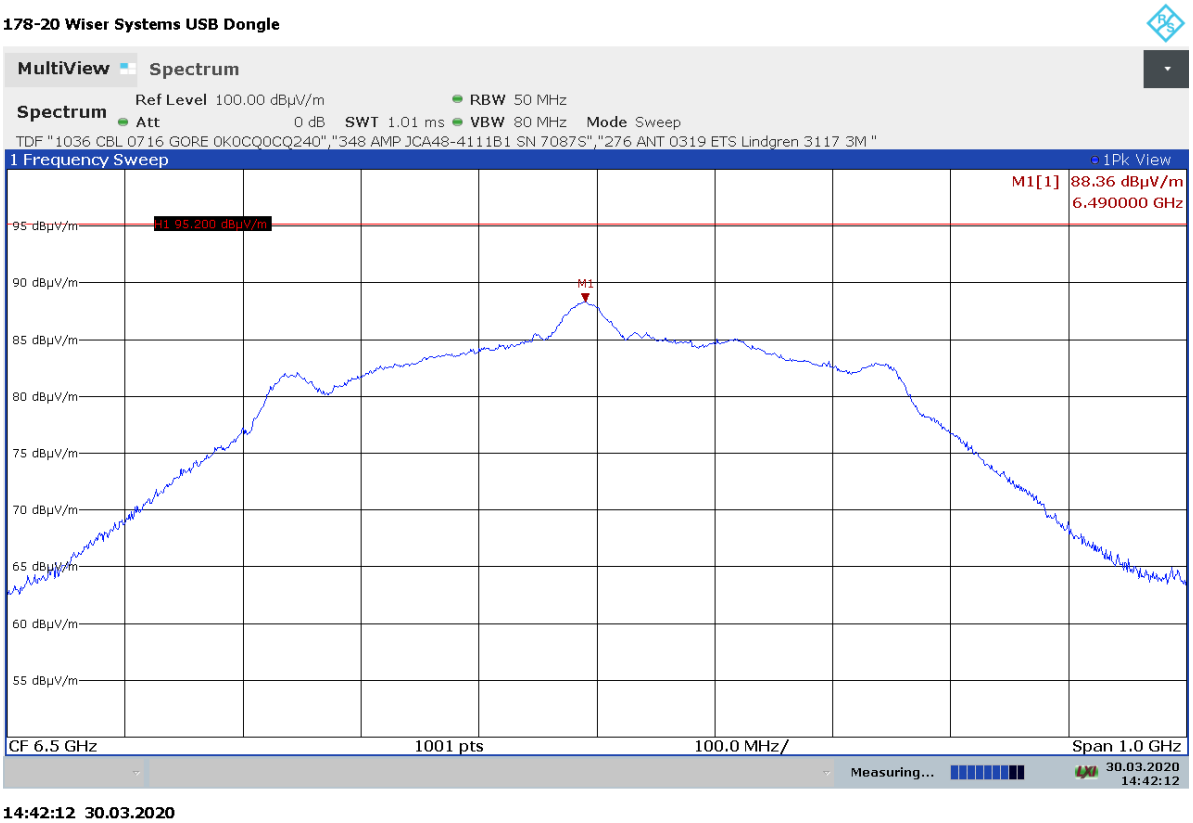
Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.490	88.36	95.20	-6.84	V	100	65	Compliant

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	-6.84	0.00	-6.84	V	100	65	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)

6.8.3 Plot of Peak Power at 3 Meters (6.8 Mbps - 16M PRF)

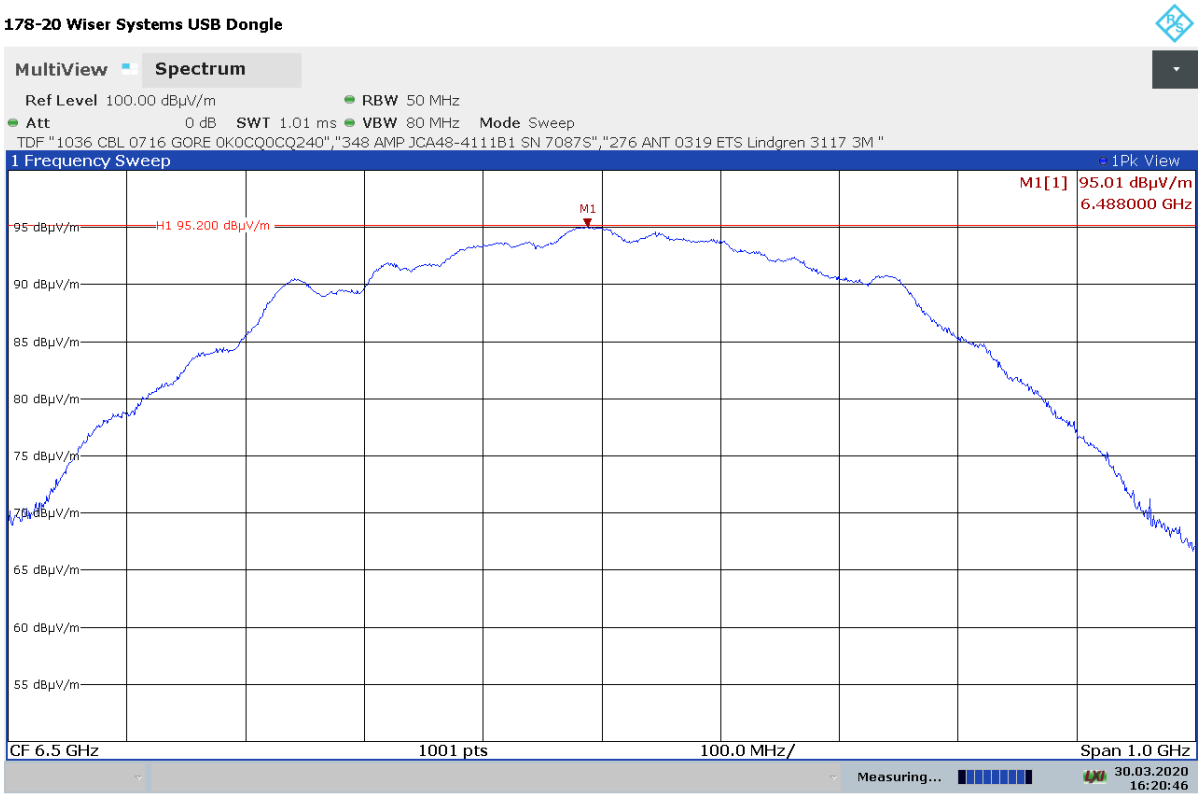
Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.488	95.01	95.20	-0.19	V	100	65	Compliant

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	-0.19	0.00	-0.19	V	100	65	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)

6.8.4 Plot of Peak Power at 3 Meters (6.8 Mbps - 64M PRF)

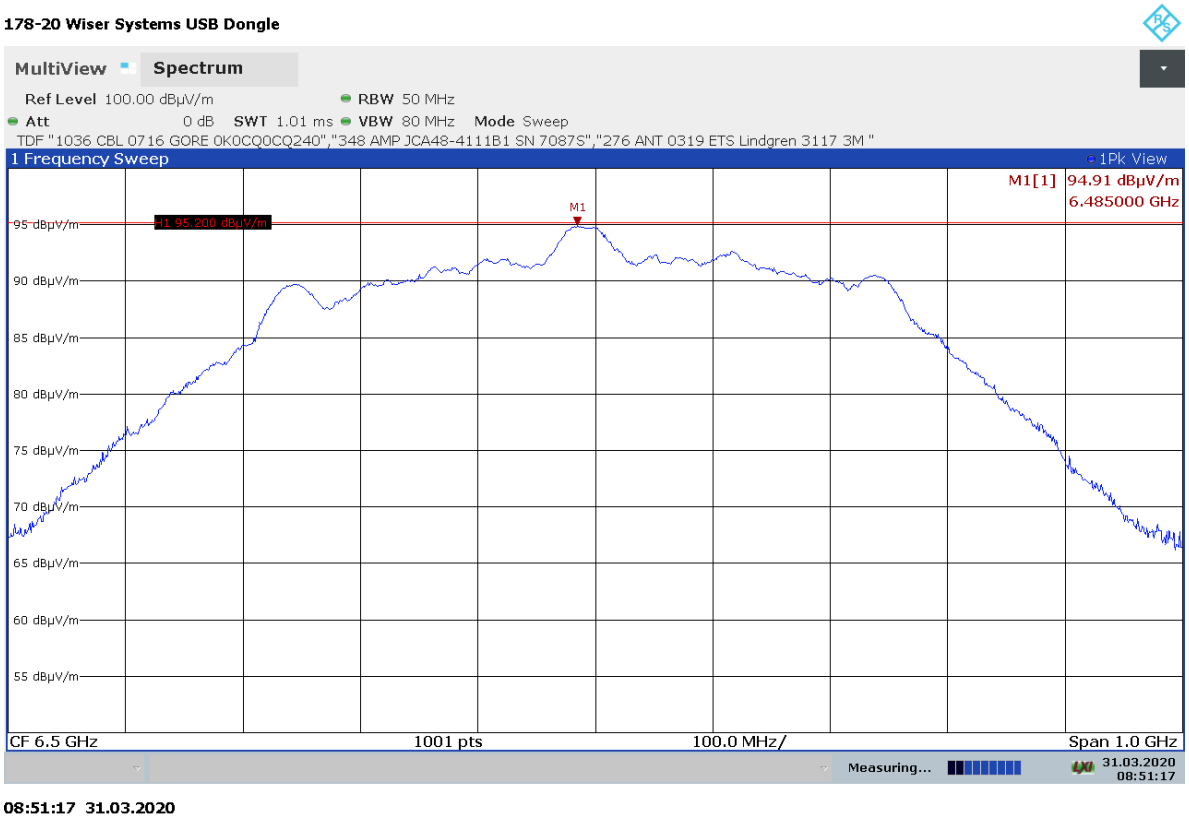
Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.485	94.91	95.20	-0.29	V	100	65	Compliant

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	
6.485	-0.29	0.00	-0.29	V	100	65	Compliant



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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
LISN	EMCO	3825/2	9109-1860	9/10/2020
EMI Receiver	Rohde & Schwarz	ESR7	101156	9/10/2020
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):	N/A
Relative Humidity (%RH):	N/A
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.

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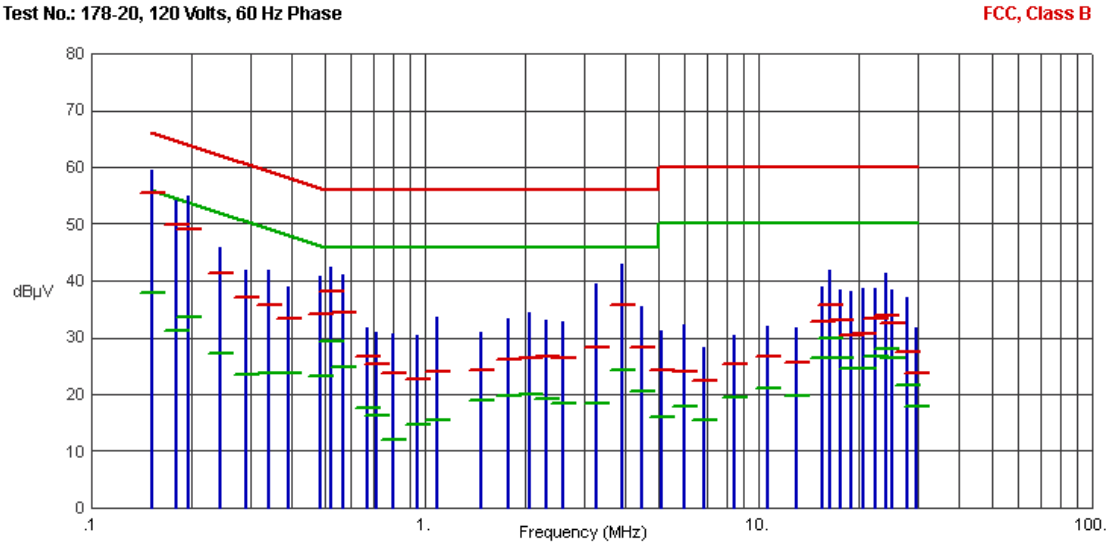
6. Measurement Data (continued)

6.10 Conducted Emissions Test Results

6.10.1. 120 Volts, 60 Hz Phase



Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
.1523	59.44	55.55	65.87	-10.32	37.90	55.87	-17.97	
.1793	54.20	49.74	64.52	-14.78	31.14	54.52	-23.38	
.1950	54.85	49.16	63.82	-14.66	33.59	53.82	-20.23	
.2423	45.92	41.24	62.02	-20.78	27.16	52.02	-24.86	
.2918	41.92	37.19	60.47	-23.28	23.41	50.47	-27.06	
.3413	41.93	35.61	59.17	-23.56	23.86	49.17	-25.31	
.3885	38.94	33.36	58.10	-24.74	23.68	48.10	-24.42	
.4853	40.81	34.22	56.25	-22.03	23.19	46.25	-23.06	
.5235	42.50	38.17	56.00	-17.83	29.29	46.00	-16.71	
.5685	41.01	34.39	56.00	-21.61	24.73	46.00	-21.27	
.6720	31.66	26.67	56.00	-29.33	17.47	46.00	-28.53	
.7148	31.05	25.40	56.00	-30.60	16.37	46.00	-29.63	
.8048	30.66	23.66	56.00	-32.34	12.02	46.00	-33.98	
.9465	30.33	22.60	56.00	-33.40	14.61	46.00	-31.39	
1.0905	33.54	24.09	56.00	-31.91	15.59	46.00	-30.41	
1.4753	30.86	24.34	56.00	-31.66	18.85	46.00	-27.15	
1.7790	33.25	26.02	56.00	-29.98	19.75	46.00	-26.25	
2.0535	34.34	26.29	56.00	-29.71	19.97	46.00	-26.03	
2.3213	32.99	26.78	56.00	-29.22	19.16	46.00	-26.84	
2.5845	32.73	26.43	56.00	-29.57	18.40	46.00	-27.60	
3.2775	39.35	28.32	56.00	-27.68	18.36	46.00	-27.64	
3.8985	42.96	35.78	56.00	-20.22	24.16	46.00	-21.84	
4.4588	35.37	28.23	56.00	-27.77	20.51	46.00	-25.49	
5.1315	31.07	24.20	60.00	-35.80	15.95	50.00	-34.05	
6.0068	32.34	23.96	60.00	-36.04	17.75	50.00	-32.25	
6.8280	28.33	22.42	60.00	-37.58	15.36	50.00	-34.64	
8.4863	30.30	25.46	60.00	-34.54	19.35	50.00	-30.65	
10.6553	32.00	26.65	60.00	-33.35	21.05	50.00	-28.95	
13.0515	31.65	25.47	60.00	-34.53	19.63	50.00	-30.37	

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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
15.5963	39.03	32.84	60.00	-27.16	26.53	50.00	-23.47	
16.3928	41.78	35.79	60.00	-24.21	29.75	50.00	-20.25	
17.6258	38.47	33.10	60.00	-26.90	26.44	50.00	-23.56	
18.9578	38.07	30.46	60.00	-29.54	24.44	50.00	-25.56	
20.5575	38.72	30.67	60.00	-29.33	24.44	50.00	-25.56	
22.3575	38.61	33.25	60.00	-26.75	26.66	50.00	-23.34	
24.0000	41.27	33.99	60.00	-26.01	27.93	50.00	-22.07	
25.1610	38.34	32.63	60.00	-27.37	26.50	50.00	-23.50	
27.7530	37.00	27.54	60.00	-32.46	21.70	50.00	-28.30	
29.6003	31.74	23.81	60.00	-36.19	17.85	50.00	-32.15	

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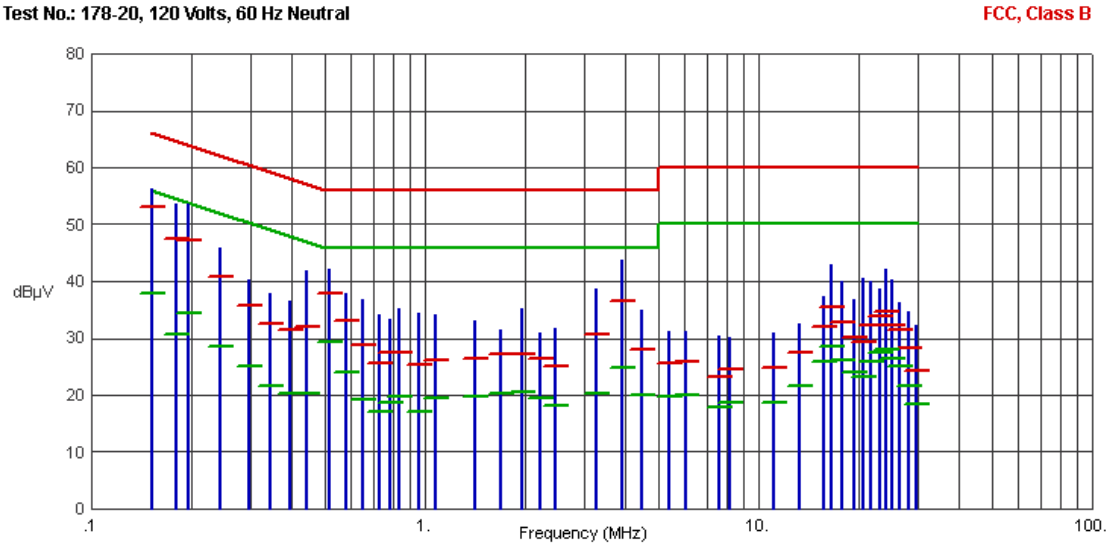
6. Measurement Data (continued)

6.10 Conducted Emissions Test Results (continued)

6.10.2. 120 Volts, 60 Hz Neutral



Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
.1523	56.23	53.11	65.87	-12.76	37.90	55.87	-17.97	
.1793	53.48	47.60	64.52	-16.92	30.60	54.52	-23.92	
.1950	53.68	47.20	63.82	-16.62	34.45	53.82	-19.37	
.2445	45.79	40.91	61.94	-21.03	28.55	51.94	-23.39	
.2963	40.21	35.61	60.35	-24.74	24.95	50.35	-25.40	
.3435	37.93	32.64	59.12	-26.48	21.61	49.12	-27.51	
.3953	36.58	31.35	57.95	-26.60	20.39	47.95	-27.56	
.4425	41.74	31.88	57.01	-25.13	20.26	47.01	-26.75	
.5145	42.08	37.87	56.00	-18.13	29.25	46.00	-16.75	
.5820	37.75	32.99	56.00	-23.01	23.99	46.00	-22.01	
.6495	36.91	28.76	56.00	-27.24	19.14	46.00	-26.86	
.7328	34.08	25.59	56.00	-30.41	17.18	46.00	-28.82	
.7845	33.45	27.52	56.00	-28.48	18.75	46.00	-27.25	
.8340	35.12	27.47	56.00	-28.53	19.82	46.00	-26.18	
.9600	34.35	25.38	56.00	-30.62	17.08	46.00	-28.92	
1.0770	34.12	26.13	56.00	-29.87	19.40	46.00	-26.60	
1.4168	33.07	26.31	56.00	-29.69	19.84	46.00	-26.16	
1.6868	31.59	27.22	56.00	-28.78	20.17	46.00	-25.83	
1.9590	35.30	27.32	56.00	-28.68	20.51	46.00	-25.49	
2.2065	30.85	26.36	56.00	-29.64	19.38	46.00	-26.62	
2.4698	31.62	24.97	56.00	-31.03	18.08	46.00	-27.92	
3.2798	38.71	30.77	56.00	-25.23	20.20	46.00	-25.80	
3.8783	43.78	36.64	56.00	-19.36	24.82	46.00	-21.18	
4.4723	34.88	28.10	56.00	-27.90	19.89	46.00	-26.11	
5.4150	31.30	25.66	60.00	-34.34	19.63	50.00	-30.37	
6.0248	31.11	25.83	60.00	-34.17	19.97	50.00	-30.03	
7.6200	30.46	23.33	60.00	-36.67	17.83	50.00	-32.17	
8.1825	30.07	24.58	60.00	-35.42	18.79	50.00	-31.21	
11.0603	30.85	24.89	60.00	-35.11	18.74	50.00	-31.26	

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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
13.3328	32.62	27.36	60.00	-32.64	21.48	50.00	-28.52	
15.6525	37.33	32.08	60.00	-27.92	25.95	50.00	-24.05	
16.4940	42.90	35.42	60.00	-24.58	28.63	50.00	-21.37	
17.7653	39.90	32.83	60.00	-27.17	26.20	50.00	-23.80	
19.2390	36.91	30.19	60.00	-29.81	24.06	50.00	-25.94	
20.5260	40.63	29.30	60.00	-30.70	23.19	50.00	-26.81	
21.6623	39.98	32.22	60.00	-27.78	25.80	50.00	-24.20	
23.1293	38.76	33.83	60.00	-26.17	27.52	50.00	-22.48	
24.0000	42.09	34.75	60.00	-25.25	28.11	50.00	-21.89	
25.1588	40.30	32.35	60.00	-27.65	26.40	50.00	-23.60	
26.4863	36.27	31.36	60.00	-28.64	24.98	50.00	-25.02	
28.2593	34.59	28.23	60.00	-31.77	21.51	50.00	-28.49	
29.7218	32.18	24.36	60.00	-35.64	18.52	50.00	-31.48	

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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.

Data rate / PRF	Frequency (GHz)	99% Power Bandwidth (MHz)
110 kbps, 16M	6.489	694.98
110 kbps, 64M	6.490	709.68
6.8 Mbps, 16M	6.559	731.75
6.8 Mbps, 64M	6.487	702.44

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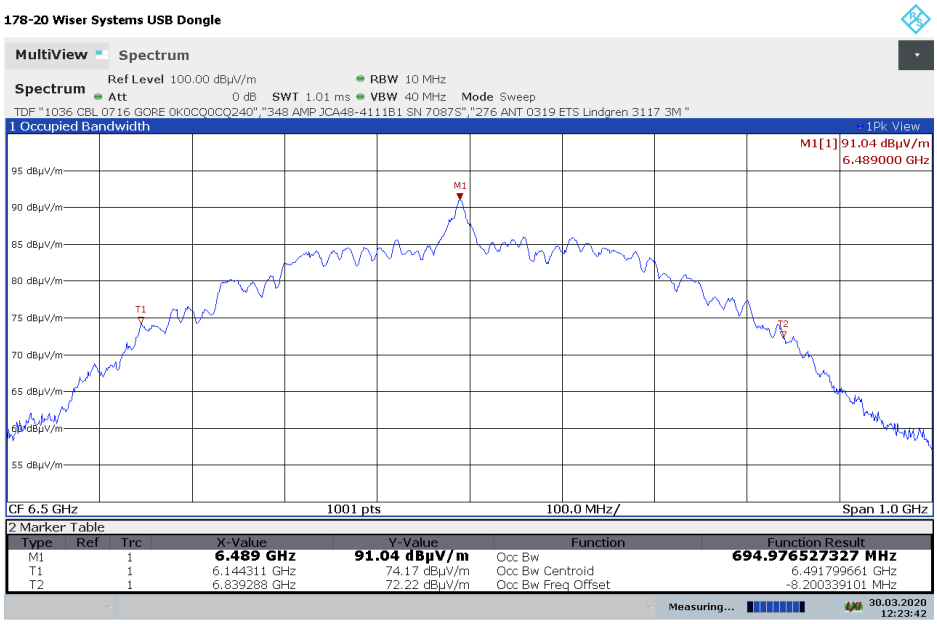
6. Measurement Data (continued)

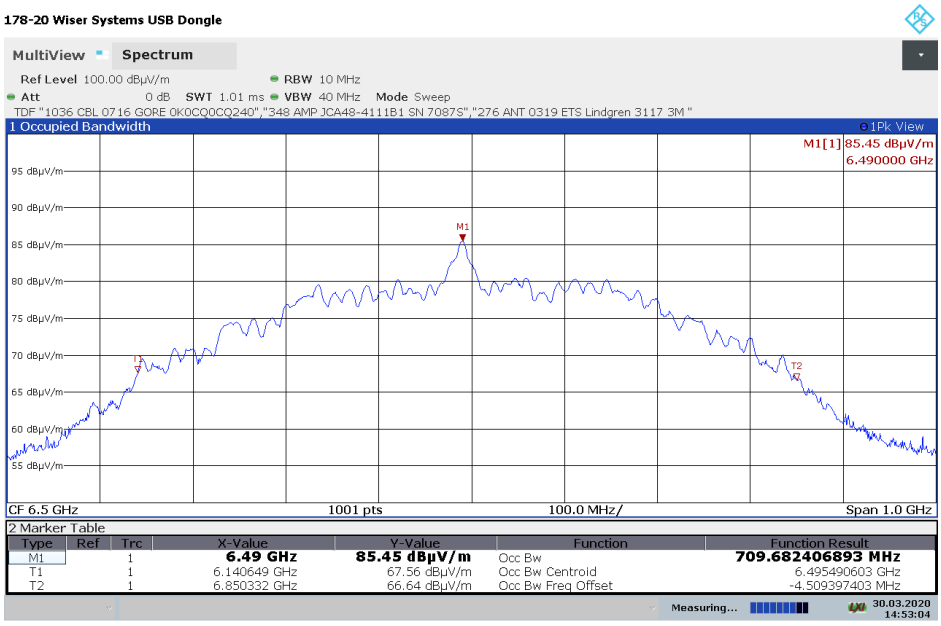
6.11. 99% Emission Bandwidth (RSS-GEN 6.7)

6.11.1 Plot of 99% Emission Bandwidth (110 kbps - 16M PRF)



12:23:42 30.03.2020

6.11.2 Plot of 99% Emission Bandwidth (110 kbps - 64M PRF)



14:53:04 30.03.2020

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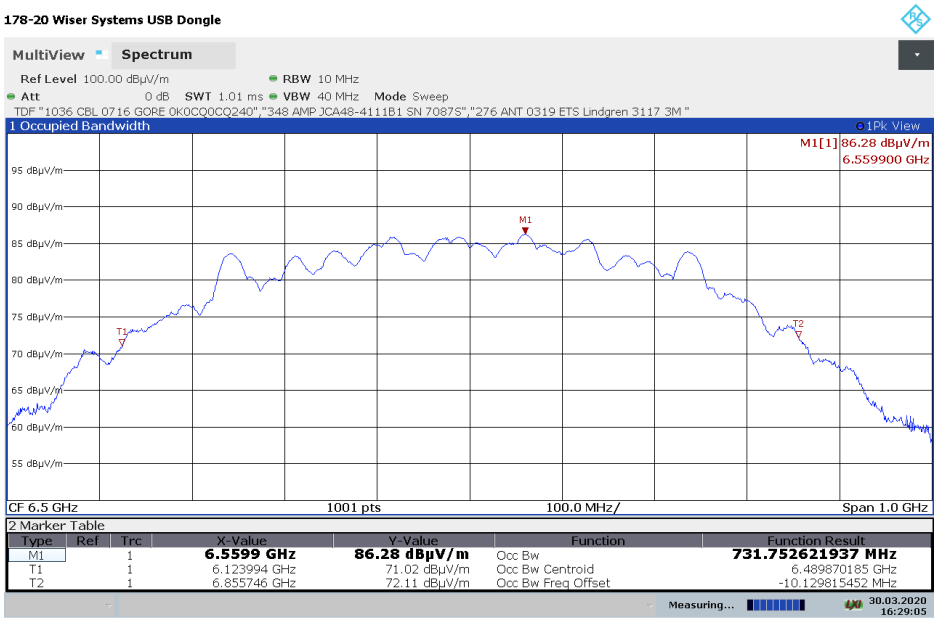
6. Measurement Data (continued)

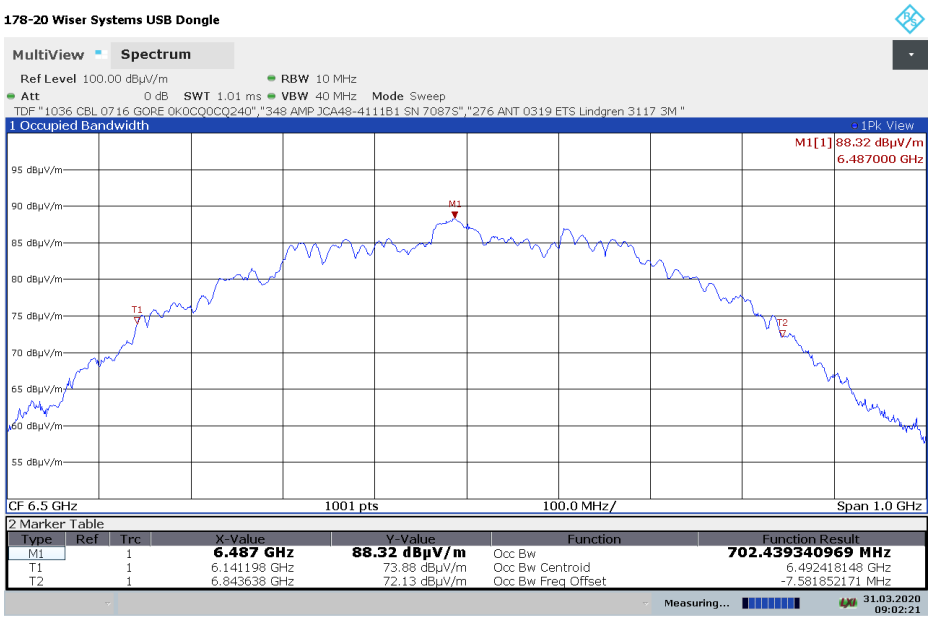
6.11. 99% Emission Bandwidth (RSS-GEN 6.7)

6.11.3 Plot of 99% Emission Bandwidth (6.8 Mbps - 16M PRF)



16:29:05 30.03.2020

6.11.4 Plot of 99% Emission Bandwidth (6.8 Mbps - 64M PRF)



09:02:21 31.03.2020

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6. Measurement Data (continued)

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

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

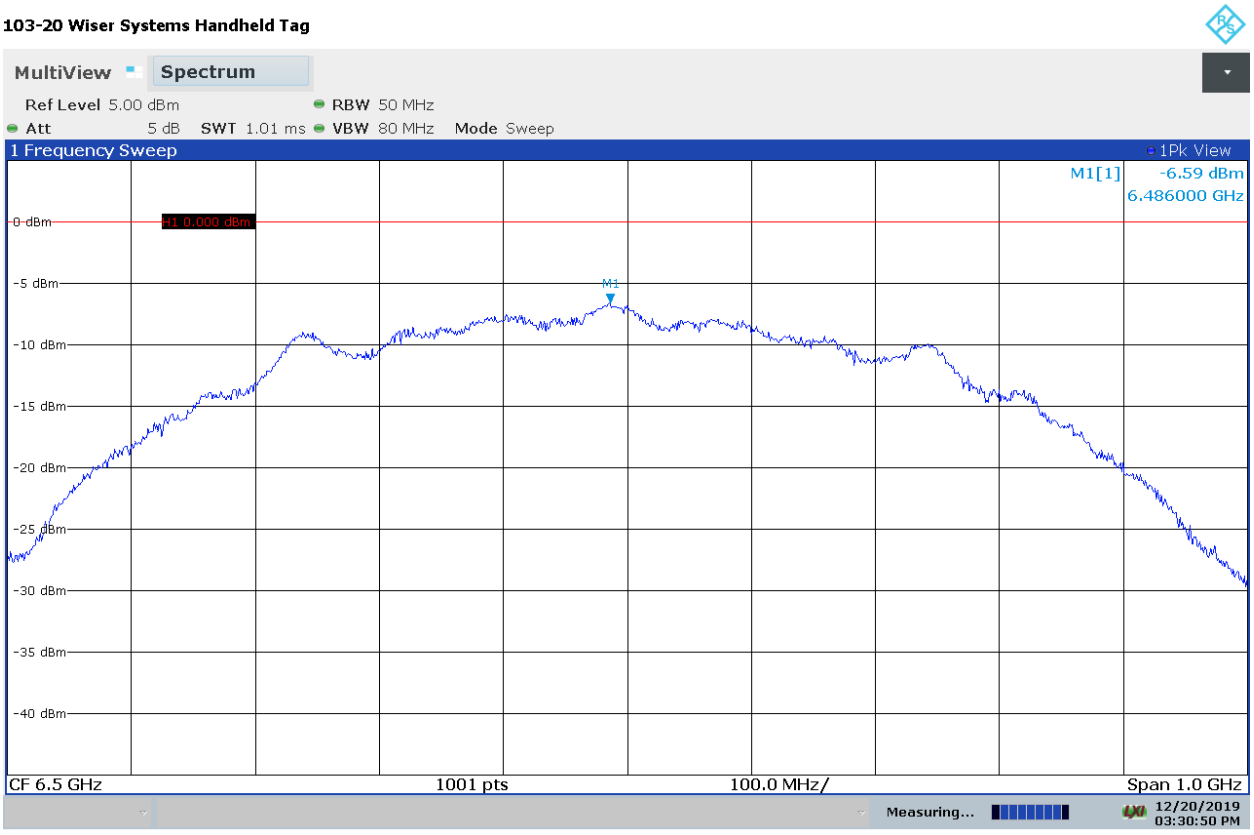
Requirement: TCB Workshop November 2019 RF Exposure Policy Updates dated November 13, 2019, specifically slide 11.

Test exclusion based on 1 mW may be used now with the portable device f > 6GHz FCC MPE power density limits. Maximum time-averaged conducted power irrespective of distance from the body.

Worst Case conducted peak power = **-6.59 dBm or 0.219 mW**

Result: Device is compliant with the Test Exclusion requirement of 1 mW.

103-20 Wiser Systems Handheld Tag



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6. Measurement Data (continued)

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

6.12.2 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 ≤ 5mm.

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)
6.489	-1.30	0.741	1	0.000741	5
6.490	-6.84	0.207	1	0.000207	5
6.488	-0.19	0.957	1	0.000957	5
6.488	-0.64	0.863	1	0.000863	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

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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 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 32, 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.

The radiated emissions test site for measurements above 1GHz is a 3 Meter open area test site (OATS) with a 3.6 by 3.6 meter anechoic absorber floor patch to achieve a quasi-free space measurement environment per ANSI C63.4/C63.10 and CISPR 16-1-4 standards.

The 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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8. Test Images

8.1. Spurious and Harmonic Emissions – 30 kHz to 1 GHz Front

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8. Test Images

8.2. Spurious and Harmonic Emissions – 30 kHz to 30 MHz Rear

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8. Test Images

8.3. Spurious and Harmonic Emissions – 30 MHz to 1 GHz Rear

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8. Test Images

8.4. Spurious and Harmonic Emissions – 1 to 18 GHz Front

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8. Test Images

8.5. Spurious and Harmonic Emissions – 1 to 18 GHz Rear

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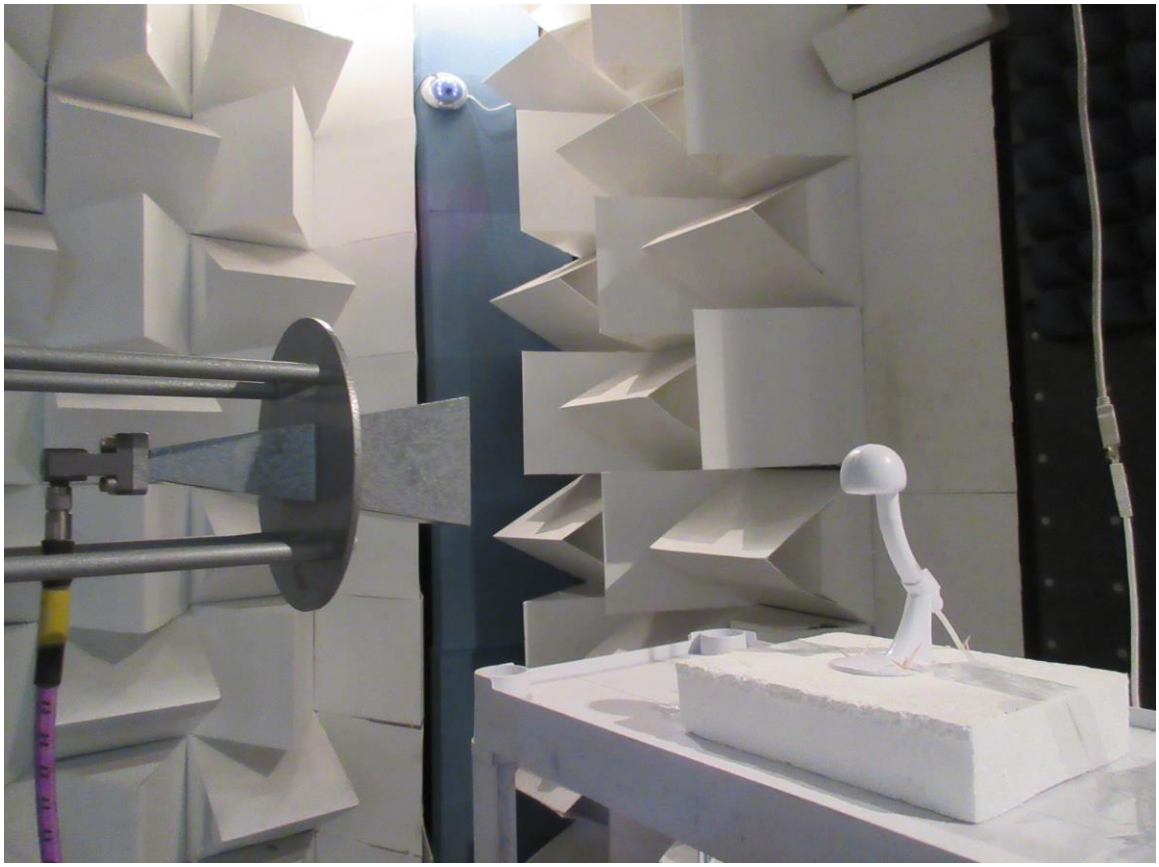
8. Test Images

8.6. Spurious and Harmonic Emissions – 18 to 40 GHz Side View



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