

**COMPLIANCE WORLDWIDE INC.
TEST REPORT 152-24**

**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**

Issued to

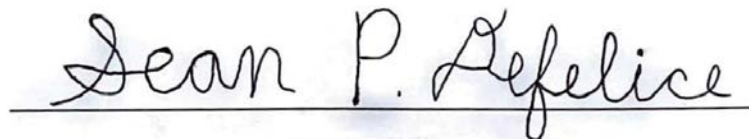
**Wiser Systems, Inc.
811 W. Hargett Street
Raleigh, NC 27603
(919) 551-5566**

**For the
USB Dongle Antenna
Models: USB3V2.0**

FCC ID: 2AGZM-A01116

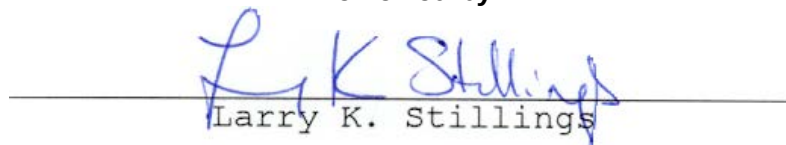
Report Issued on April 30, 2024

Tested by



Sean P. Defelice

Reviewed by



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1. Scope

This test report certifies that the Wiser Systems USB Dongle USB3V2.0 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. Measurement Uncertainty will not be applied to any of the measurement / testing results in this test report to determine pass/fail criteria per the Decision Rule as defined in ISO/IEC Guide 17025-2017 Clause 3.7.

2. Product Details

- 2.1. Manufacturer: Wiser Systems, Inc.
- 2.2. Model Numbers: USB3V2.0
- 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: Rev 1
- 2.7. Software Revision: N/A
- 2.8. Modulation Type: Pulse Modulation, Frequency Hopping
- 2.9. Operating Frequencies: 4.5 GHz Center Frequency Nominal (Channel 3 – 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 3.

3.2. EUT Hardware

Manufacturer	Model/Part # / Options	Serial Number	Input Volts	Freq (Hz)	Description/Function
Wiser Systems	USB3V2.0	Pre-production	5.0	DC	USB Dongle Anchor

3.3. EUT Cables/Transducers

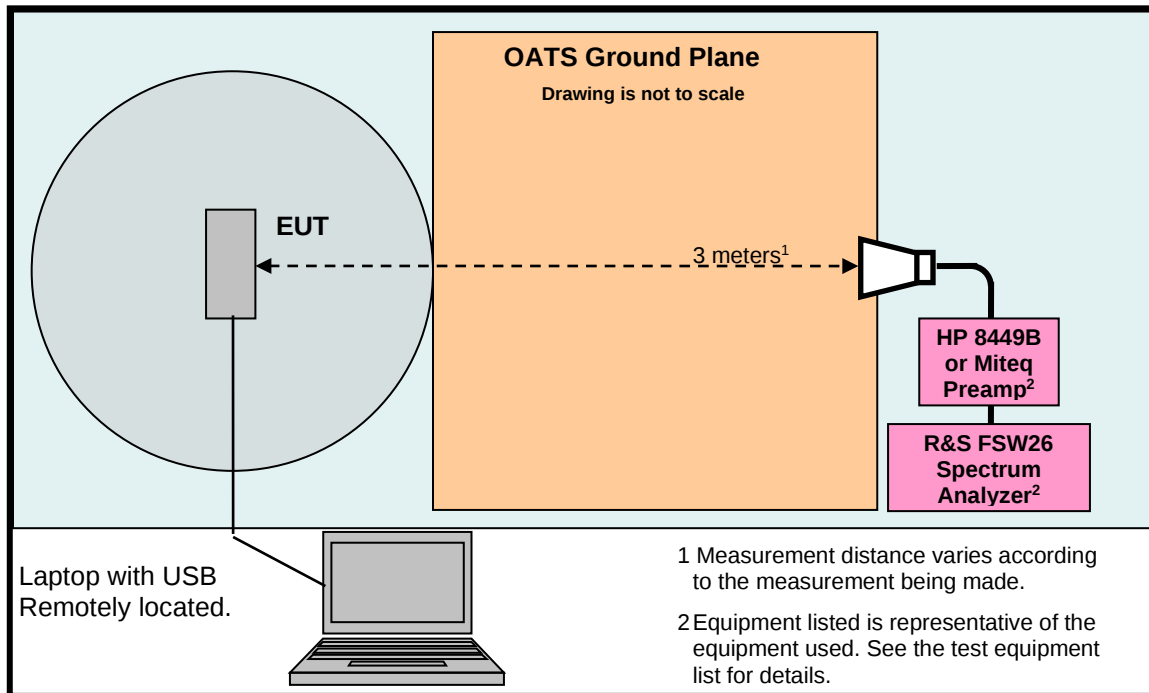
Cable Type	Length	Shield	From	To
USB	1M	Yes	EUT	Laptop for Control / Battery Power

3.4. Support Equipment

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
Lenovo	ThinkPad T440P	PB-031DX9	120	60	For controlling the USB Dongle

3. Product Configuration (cont.)

3.5. Test Setup Diagram



4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Interval
EMI Test Receiver, 9 kHz – 7 GHz ¹	Rohde & Schwarz	ESR7	101156	10/25/2024	3 Years
EMI Test Receiver, 10 Hz – 7 GHz ¹	Rohde & Schwarz	ESR7	101770	7/23/2024	3 Years
EMI Test Receiver, 9 kHz – 26.5 GHz ¹	Rohde & Schwarz	ESR26	101693	6/26/2024	1 Year
Spectrum Analyzer, 2 Hz to 26.5 GHz ²	Rohde & Schwarz	FSW26	102057	6/24/2024	3 Years
Spectrum Analyzer, 9 kHz to 40 GHz ³	Rohde & Schwarz	FSV40	100899	8/12/2024	4 Years
Spectrum Analyzer 10 Hz – 40 GHz ⁴	Rohde & Schwarz	FSVR40	100909	9/18/2024	4 Years
Loop Antenna 9 kHz - 30 MHz	EMCO	6512	9309-1139	4/14/2025	3 Years
Biconilog Antenna, 30 MHz - 2 GHz	Sunol Sciences	JB1	A050913	7/1/2024	3 Years
Dbl Ridged Guide Antenna 1 - 18 GHz	ETS-Lindgren	3117	00143292	5/11/2025	3 Years
Dbl Ridged Guide Antenna 1 - 18 GHz	ETS-Lindgren	3117	00227631	4/21/2025	3 Years
Preamplifier 100 MHz to 7 GHz	Miteq	AFS3-00100200-10-15P-4	988773	9/28/2024	1 Year
Preamplifier 100 MHz to 18 GHz	Miteq	AMF-7D-00101800-30-10P	1953081	9/27/2024	1 Year
Preamplifier 2 to 12 GHz	JCA	JCA48-4111B1	7087S	9/28/2024	1 Year
Preamplifier 18 to 40 GHz	Miteq	JSD42-21004200-40-5P	649199/649219	9/27/2024	1 Year
Horn Antenna 18 to 40 GHz	Com Power	AH-840	101032	1/25/2025	3 Years
High Pass Filter 6.4 to 18 GHz	Micro-Tronics	HPM50112	014	2/27/2025	1 Year
Barometric Pressure/Humidity & Temp Datalogger	Extech Instruments	SD700	Q590483	4/4/2025	1 Year

¹ ESRxx Firmware revision: V3.48 SP3, Date installed: 09/30/2020

² FSW26 Firmware revision: V4.71 SP1, Date installed: 11/16/2020

³ FSV40 Firmware revision: V2.30 SP4, Date installed: 05/04/2016

⁴ FSVR40 Firmware revision: V2.23 SP1, Date installed: 08/19/2016

Previous V3.48 SP2, installed 07/23/2020.

Previous V4.61, installed 08/11/2020.

Previous V2.30 SP1, installed 10/22/2014.

Previous V2.23, installed 10/22/2014.

4. Measurements Parameters (continued)

4.2. Measurement & Equipment Setup

Test Dates:	4/16/2024, 4/17/2024, 4/27/2024
Test Engineers:	Sean Defelice
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:	$\geq 3 * RBW$
Detector Function:	Peak, Quasi-Peak & Average
Antenna Height:	1 to 4 meters
Measurement Uncertainty 30 to 200 MHz:	± 4.76 dB (H), ± 4.88 dB (V)
Measurement Uncertainty 200 to 1 GHz:	± 5.01 dB (H), ± 5.00 dB (V)
Measurement Uncertainty 1 to 6 GHz:	± 5.17 dB
Measurement Uncertainty 6 to 18 GHz:	± 5.48 dB
Measurement Uncertainty 18 to 40 GHz:	± 5.49 dB

4.3. Measurement Procedure

Test measurements were made in accordance with FCC Parts 15.209 and 15.519 Subpart F requirements.

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

4.4. Measurement Uncertainty

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

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

5. Measurements Summary

Test Requirement	FCC Rule Requirement	Test Report Section	Result	Comment
Antenna Requirement	15.203	6.1	Compliant	
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	15.209	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 Emissions of UWB Transmission in a 1 MHz Bandwidth	15.519 (c) 15.521 (d)	6.7	Compliant	
Peak Emissions in a 50 MHz Bandwidth	15.519 (e) 15.521 (g)	6.8	Compliant	
Conducted Emissions	15.207	6.9 6.10	Compliant	

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 custom soldered type.

6. Measurement Data (continued)

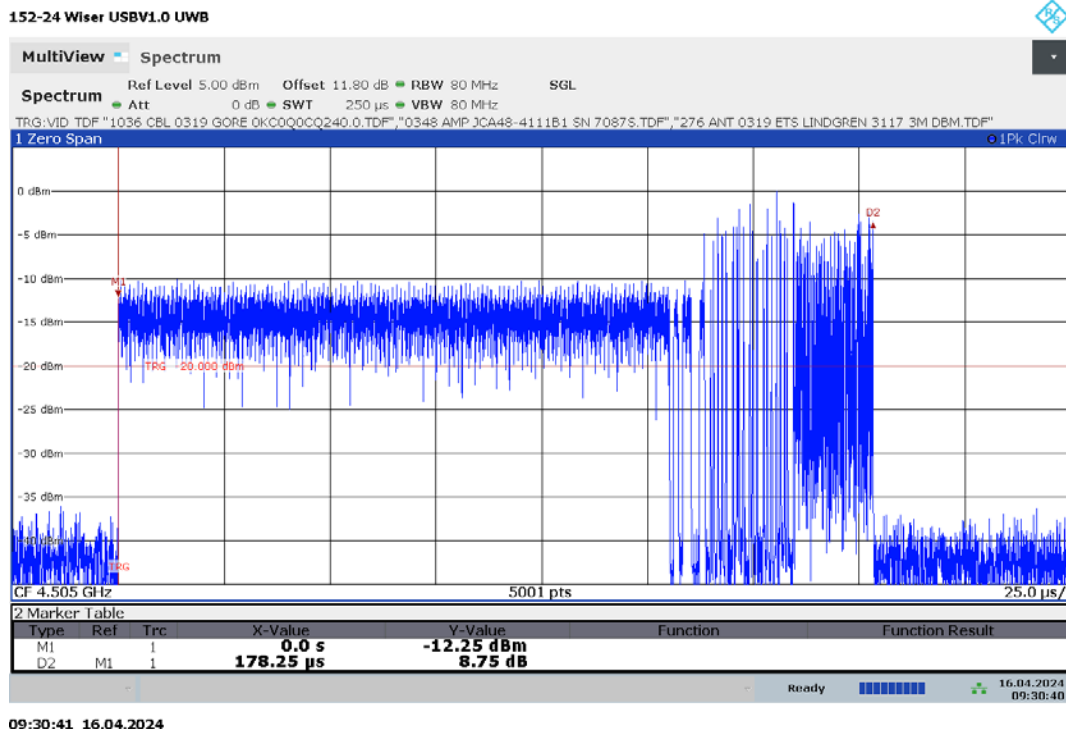
6.2. Operational Requirements of the Device under Test (15.519 (a) (1))

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

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

Result: Compliant, the EUT transmits a 178.25 μ S burst of location information every 10.074 seconds to an associated receiver.

6.2.1 Plot of Transmission

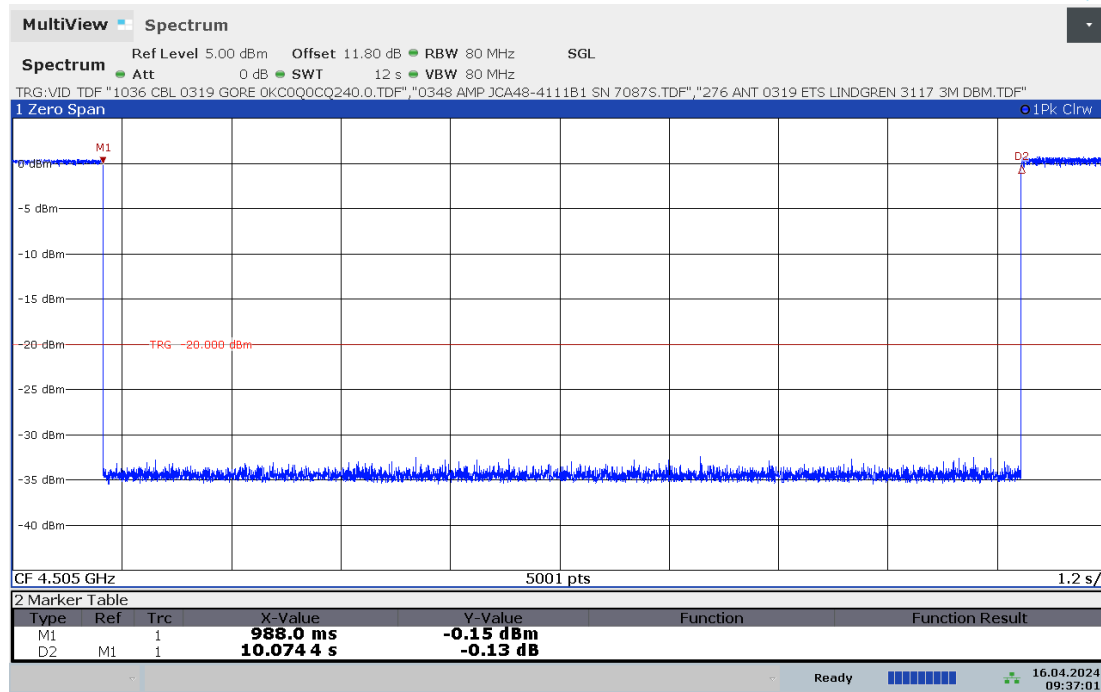


6. Measurement Data (continued)

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

6.2.2 Plot of Transmission Period

152-24 Wiser USBV1.0 UWB



09:37:01 16.04.2024

6. Measurement Data (continued)

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

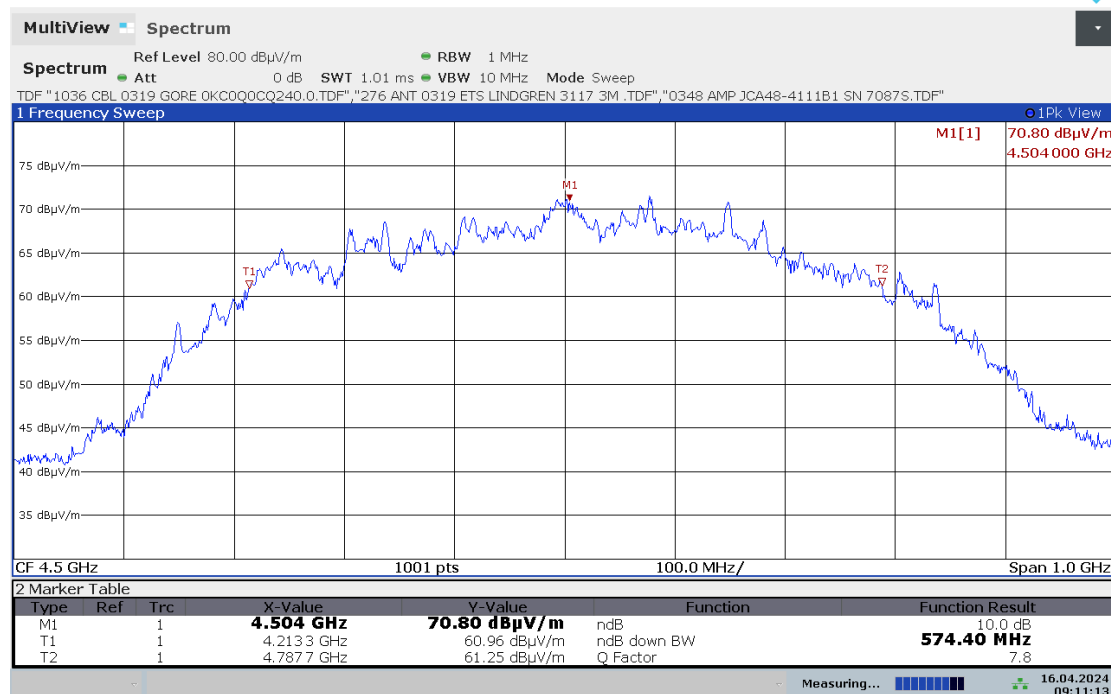
Requirement: The UWB bandwidth of a device operating under the provisions of this section shall be contained between 3,100 MHz and 10,600 MHz and at any point in time and has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the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

6.3.1. Measurement Data – Values in GHz

		CH3
f_M	The highest emission peak	4.5040
f_L	10 dB below the highest peak	4.2133
f_H	10 dB above the highest peak	4.7877
f_c	Calculated: $(f_H + f_L) / 2$	4.5005
Bandwidth	Calculated: $(f_H - f_L)$	0.5744
Fractional BW	Calculated: $2 \cdot (f_H - f_L) / (f_H + f_L)$	0.1276

6.3.2. Measurement Plot of 10 dB frequencies (Channel 3)

152-24 Wiser USBV1.0 UWB



09:11:14 16.04.2024

6. Measurement Data (continued)

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

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

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

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

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

Frequency Range:	30 kHz to 960 MHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	200 Hz – 30 kHz to 150 kHz 9 kHz – 150 kHz to 30 MHz 120 kHz - 30 MHz to 960 MHz
EMI Receiver Avg Bandwidth:	$\geq 3 * \text{RBW or IF(BW)}$
Detector Function:	Peak, Quasi-Peak & Average

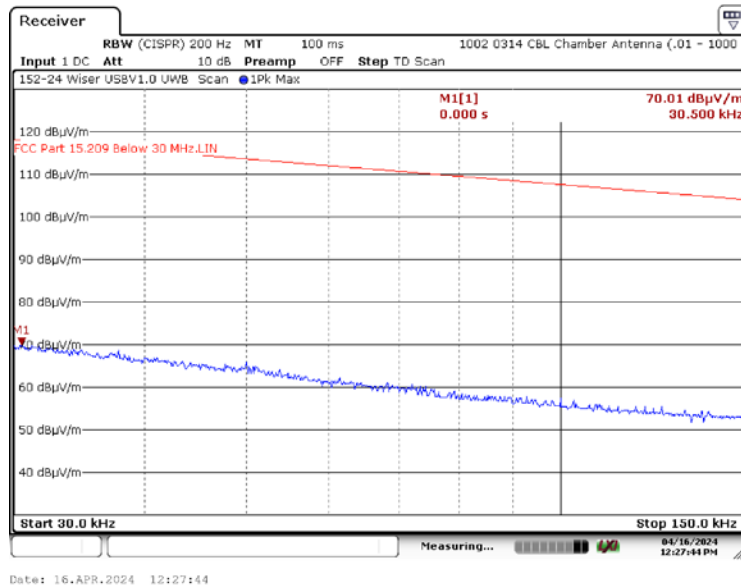
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209, continued)

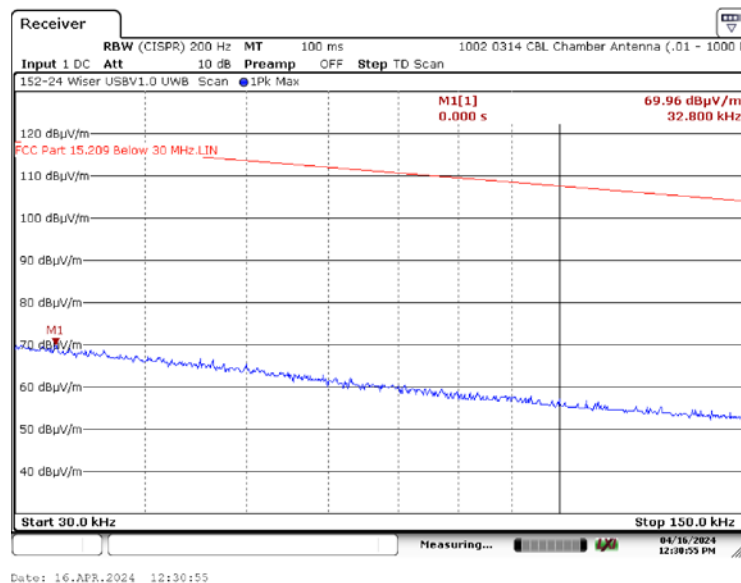
6.4.1. 30 kHz to 960 MHz, measured at 3 Meters

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 – CH3



6.4.1.2 Perpendicular Measurement Antenna – 30 to 150 kHz – CH3



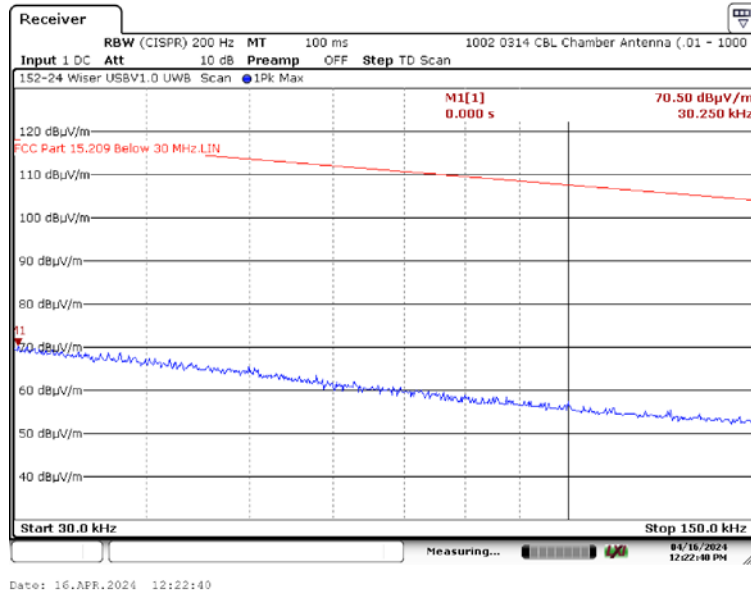
6. Measurement Data (continued)

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 – CH3



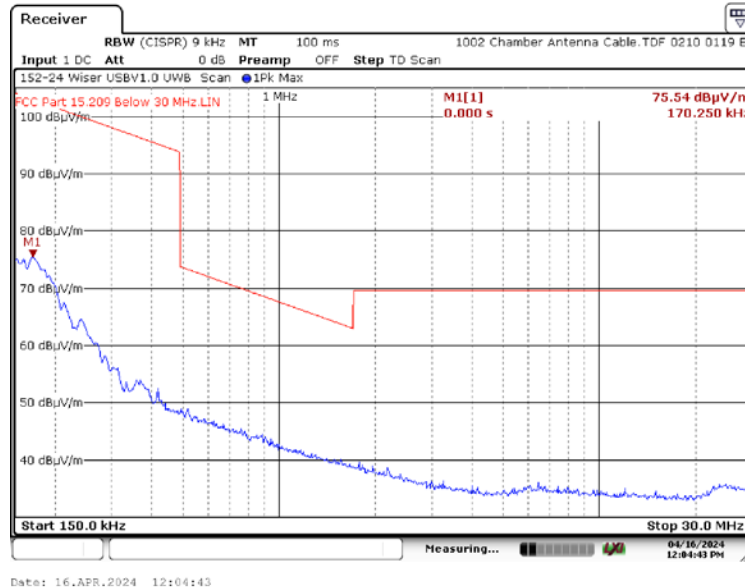
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

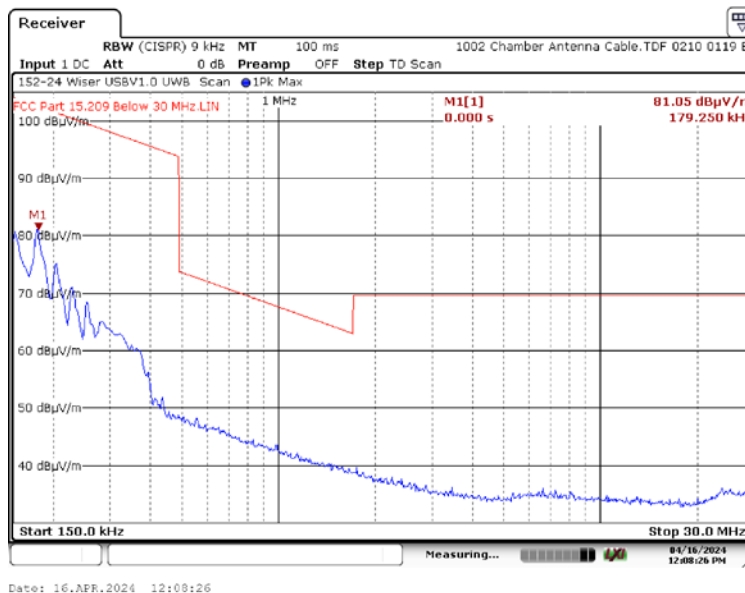
6.4.1. 30 kHz to 960 MHz, measured at 3 Meters

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 – CH3



6.4.1.5 Perpendicular Measurement Antenna – 150 kHz to 30 MHz – CH3



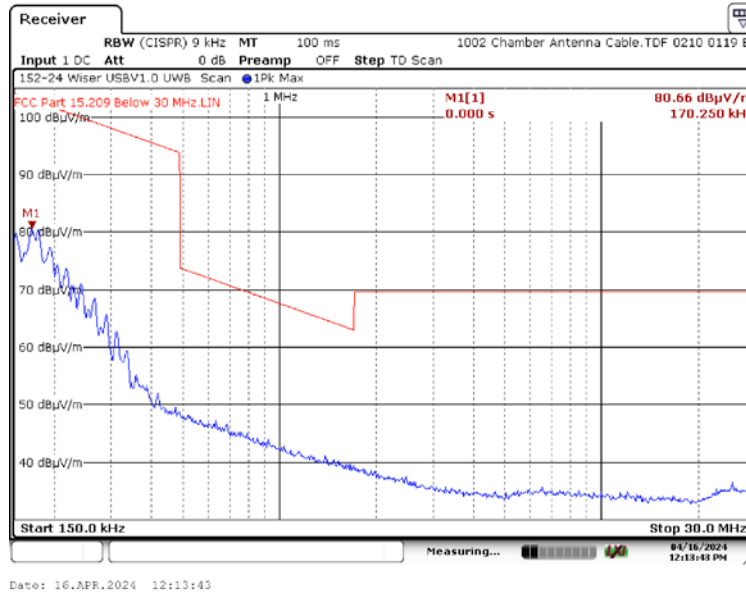
6. Measurement Data (continued)

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 – CH3



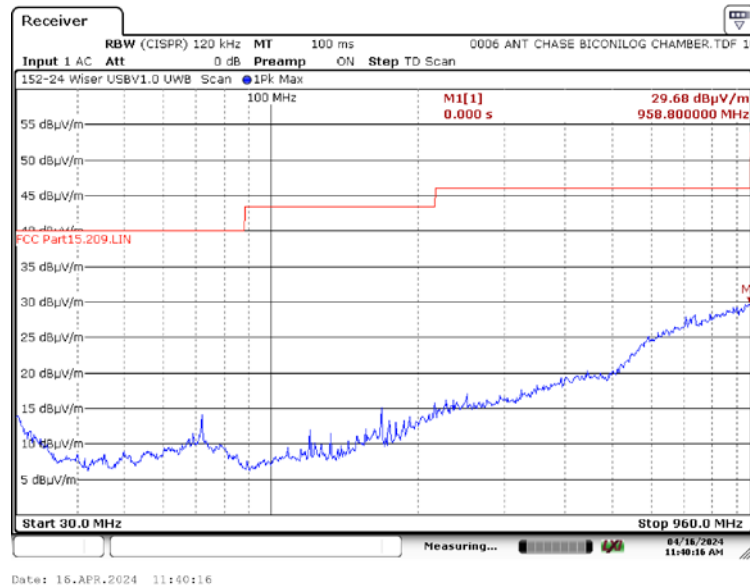
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.209 continued)

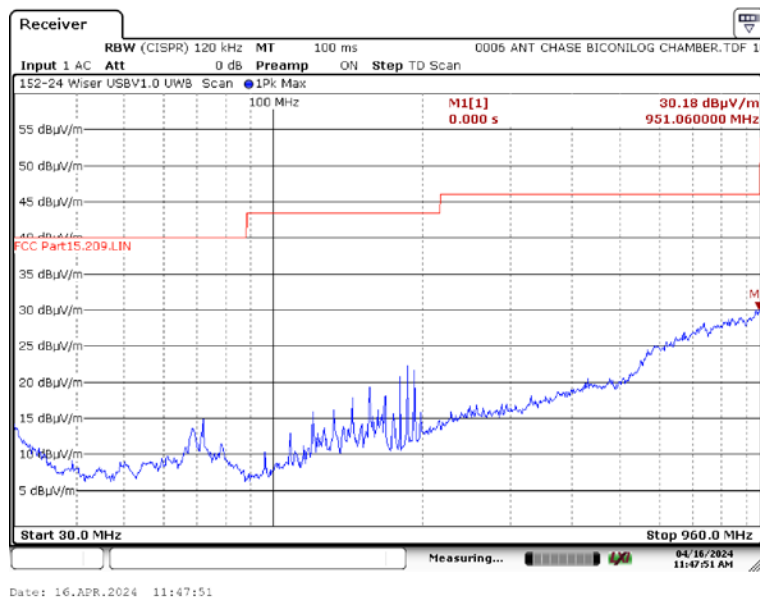
6.4.1. 30 kHz to 960 MHz, measured at 3 Meters

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 – CH3



6.4.1.8 Vertical Polarity – 30 to 960 MHz – CH3



6. Measurement Data (continued)

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

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

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

Frequency (MHz)	EIRP (dBm)	EIRP at 3 Meters (dB μ V/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.

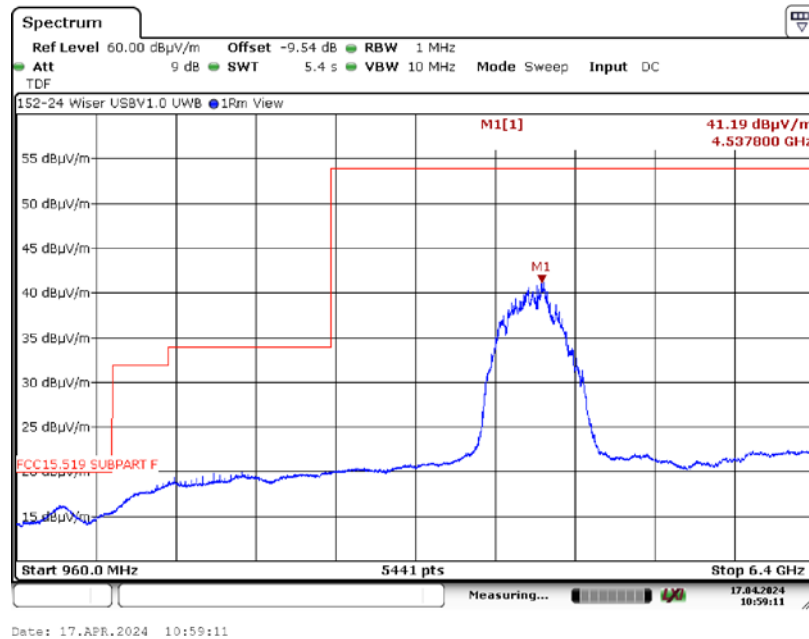
Measurements made from 6.4 to 18 GHz were done with the aid of a High Pass Filter before the low noise amplifier.

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.

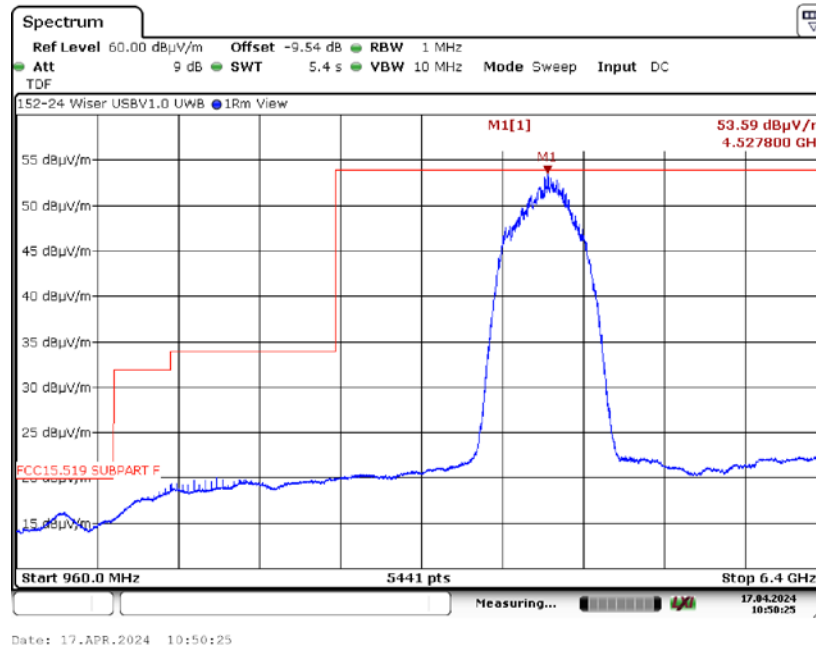
6. Measurement Data (continued)

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

6.5.1. 960 MHz to 6.4 GHz Horizontal at 1 Meter, CH3



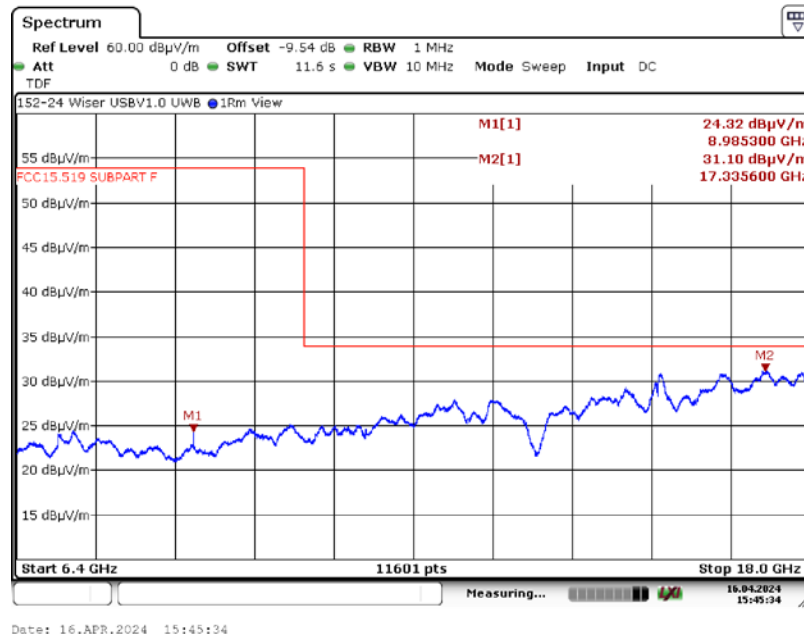
6.5.2. 960 MHz to 6.4 GHz Vertical at 1 Meter, CH3



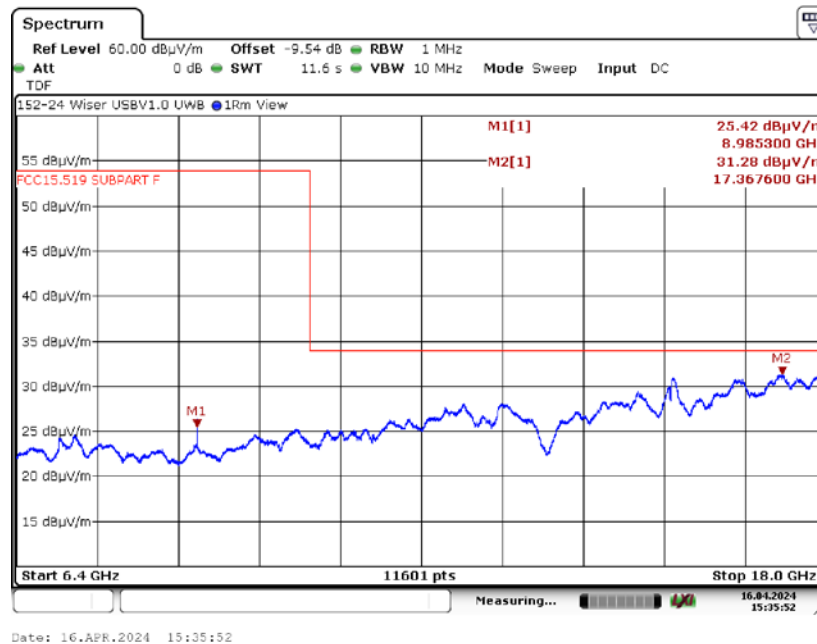
6. Measurement Data (continued)

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

6.5.3. 6.4 to 18 GHz Horizontal at 1 Meter, CH3



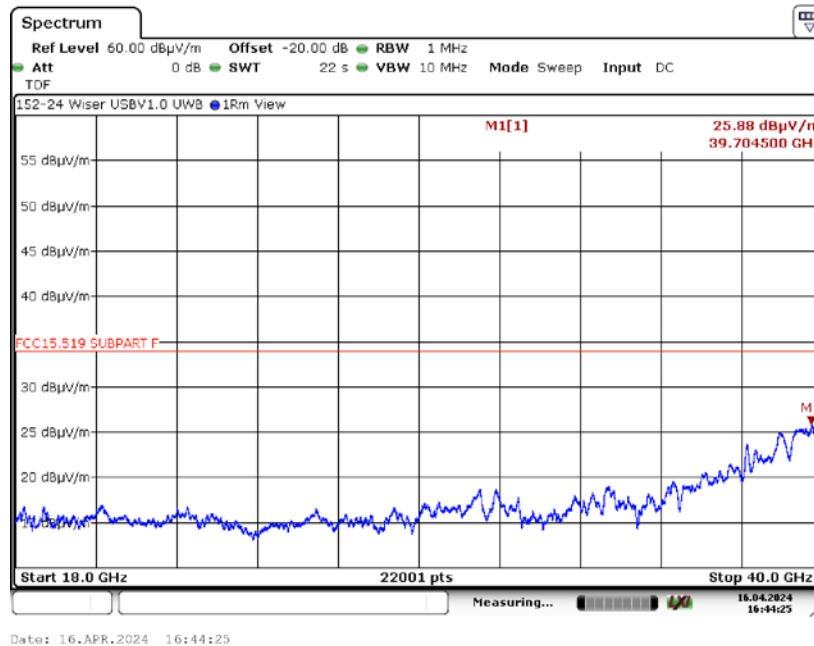
6.5.4. 6.4 to 18 GHz Vertical at 1 Meter, CH3



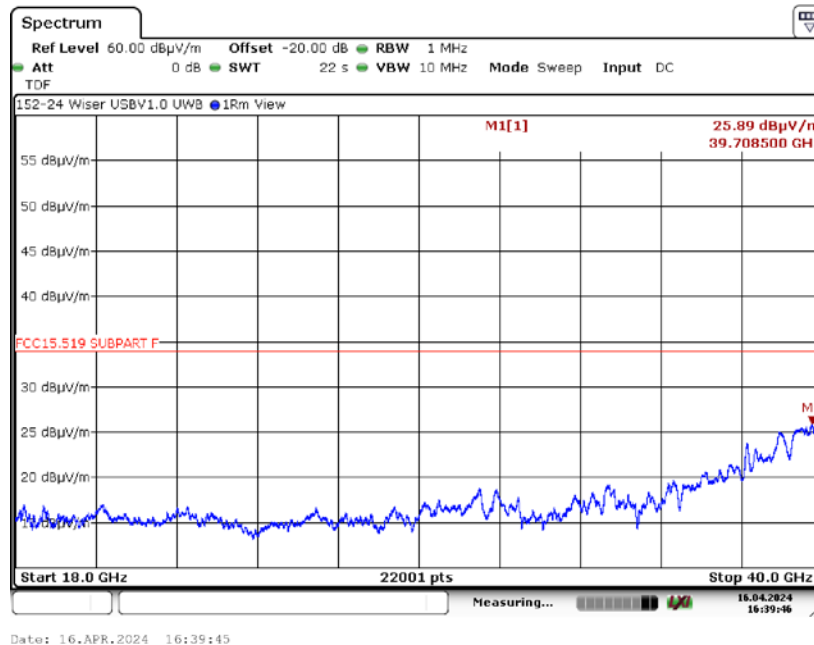
6. Measurement Data (continued)

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

6.5.5. 18 to 40 GHz Horizontal at 0.3 Meter, CH3



6.5.6. 18 to 40 GHz Vertical at 0.3 Meter, CH3



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

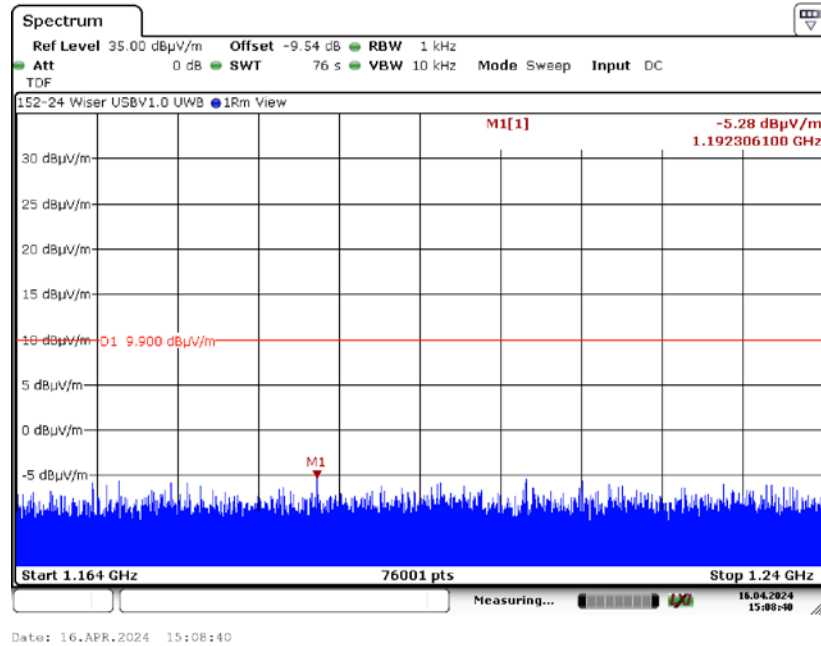
6.6.2. 1164 to 1240 MHz & 1559 to 1610 MHz

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.

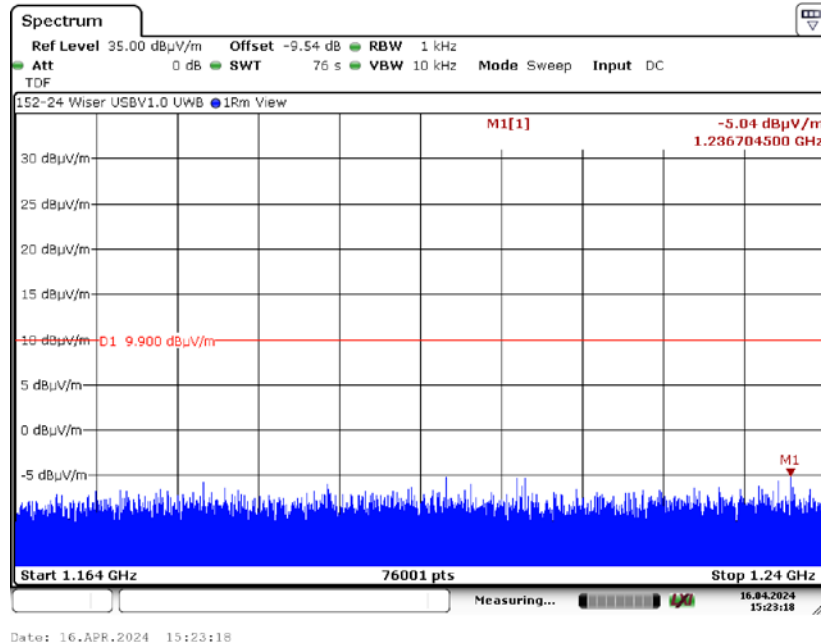
6. Measurement Data (continued)

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

6.6.3.1 Horizontal Measurement Polarity 1164 to 1240 MHz, CH3



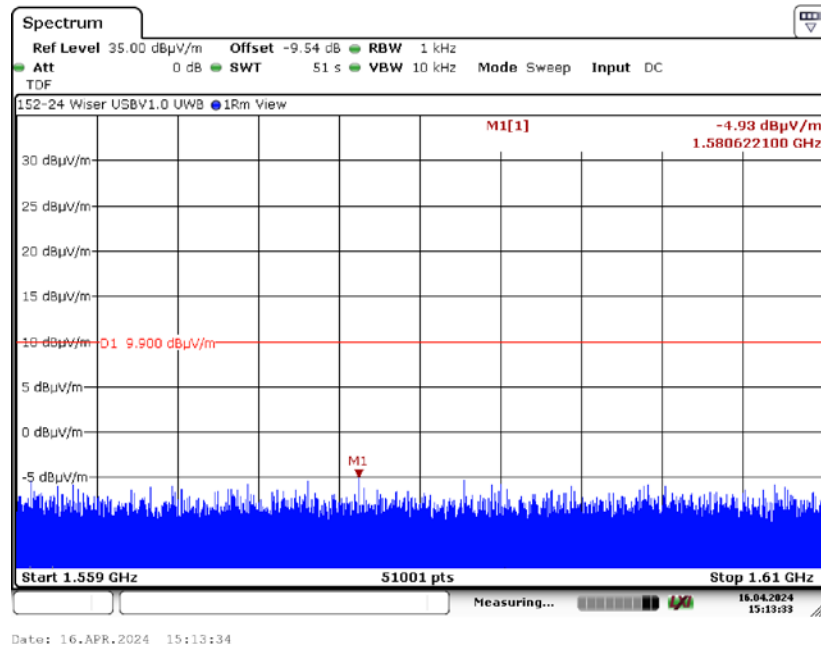
6.6.3.2 Vertical Measurement Polarity 1164 to 1240 MHz, CH3



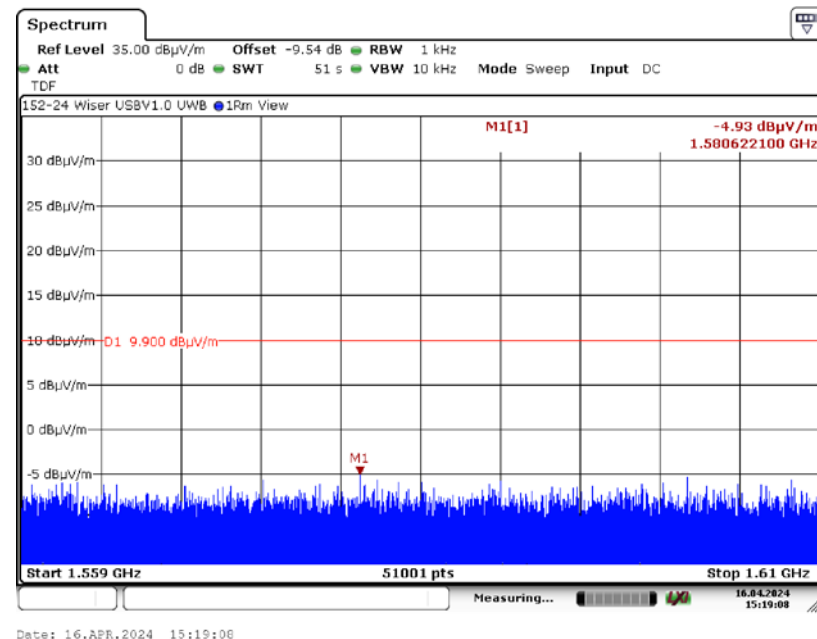
6. Measurement Data (continued)

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

6.6.3.3 Horizontal Measurement Polarity 1559 to 1610 MHz, CH3



6.6.3.4 Vertical Measurement Polarity 1559 to 1610 MHz, CH3



6. Measurement Data (continued)

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

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

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

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

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

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

6. Measurement Data (continued)

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

6.7.1. Plot of RMS Power at 3 Meters (Channel 3)

Frequency (GHz)	Amplitude ¹	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBμV/m)	(dBμV/m)	(dB)	H/V	cm	Deg	
4.505	53.85	53.90	-0.05	V	118	272	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	
4.505	-41.35	-41.30	-0.05	V	118	272	Compliant

152-24 Wiser USBV1.0 UWB



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6. Measurement Data (continued)

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

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

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

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

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

6. Measurement Data (continued)

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

6.8.1 Plot of Peak Power at 3 Meters (Channel 3)

Frequency (GHz)	Amplitude ¹	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBμV/m)	(dBμV/m)	(dB)	H/V	cm	Deg	
4.498	94.93	95.20	-0.27	V	118	272	Compliant

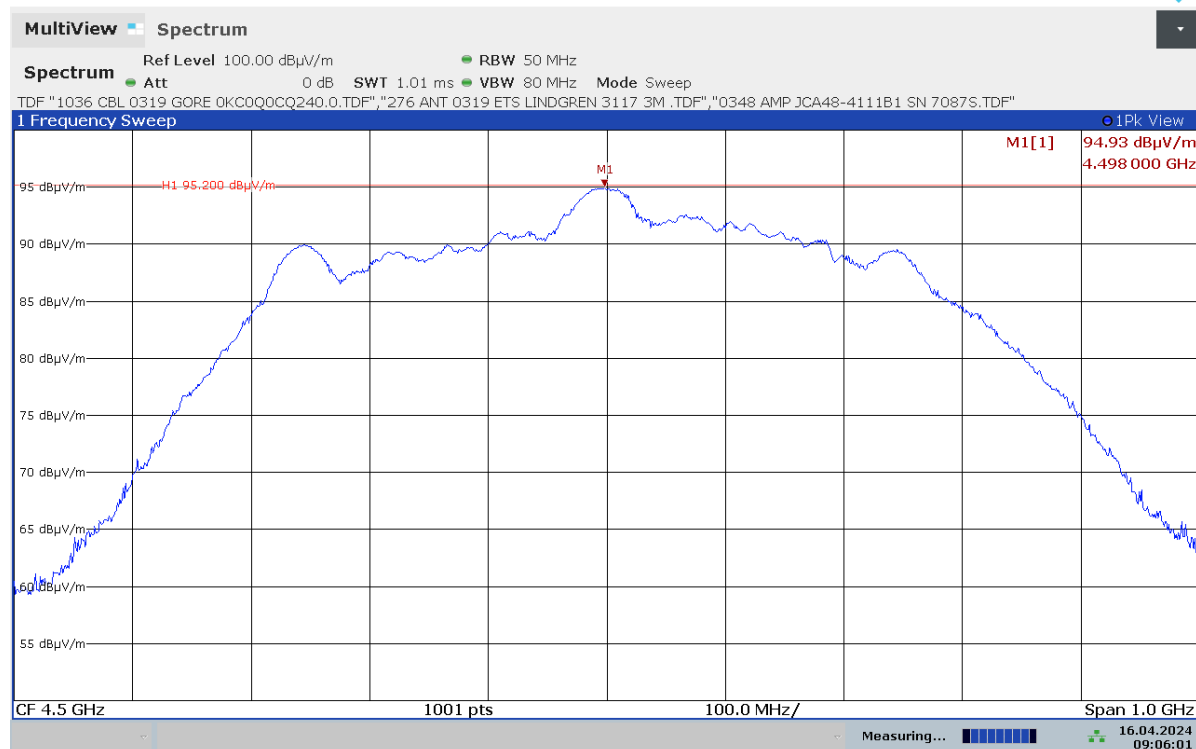
Notes: ¹ Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
4.498	-0.27	0.00	-0.27	V	118	272	Compliant

152-24 Wiser USBV1.0 UWB



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6. Measurement Data (continued)

6.9 Conducted Emissions Test Setup

6.9.1. Regulatory Limit: FCC Part 15, Class B

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	Rohde & Schwarz	ESR7	101156	10/25/2024
LISN	EMCO	3825/2	11967C	3/28/2025
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:	4/27/2024
Test Engineer:	Sean Defelice
Site Temperature (°C):	21
Relative Humidity (%RH):	35
Frequency Range:	0.15 MHz to 30 MHz
EMI Receiver IF Bandwidth:	9 kHz
EMI Receiver Avg Bandwidth:	≥ 3 * RBW or IF(BW)
Detector Functions:	Peak, Quasi-Peak. & Average
Measurement Uncertainty	± 3.56 dB

6.9.4. Test Procedure

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

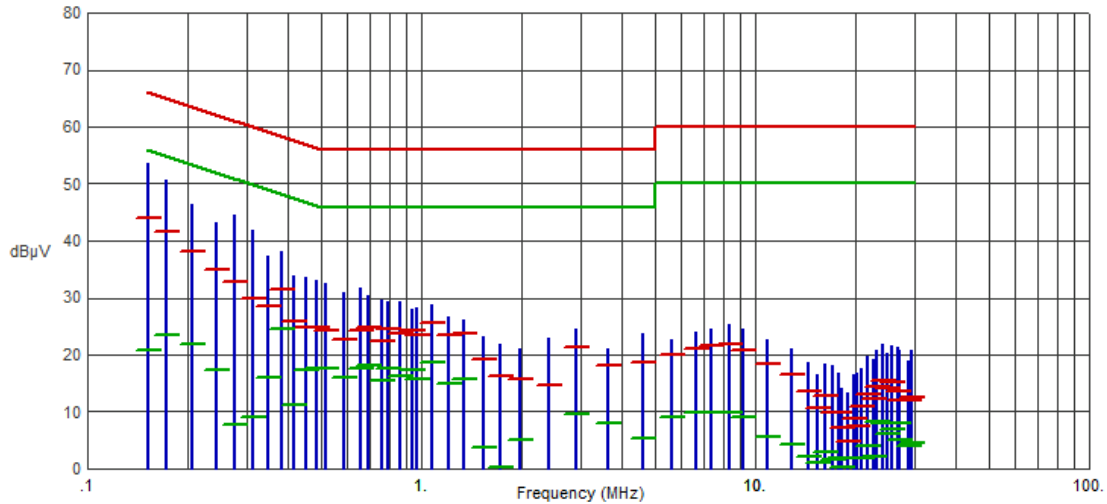
6. Measurement Data (continued)

6.10 Conducted Emissions Test Results

6.10.1. 120 Volts, 60 Hz Phase

Test No.: 159-24, 120 Volts, 60 Hz Phase

EN55032, Class B



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	53.55	43.88	65.87	-21.99	20.85	55.87	-35.02	
.1725	50.66	41.71	64.84	-23.13	23.44	54.84	-31.40	
.2063	46.35	38.26	63.35	-25.09	21.89	53.35	-31.46	
.2423	43.22	34.94	62.02	-27.08	17.40	52.02	-34.62	
.2760	44.53	32.84	60.94	-28.10	7.63	50.94	-43.31	
.3120	41.94	29.96	59.92	-29.96	9.17	49.92	-40.75	
.3458	37.20	28.51	59.06	-30.55	16.03	49.06	-33.03	
.3818	38.20	31.59	58.24	-26.65	24.50	48.24	-23.74	
.4155	33.96	25.75	57.54	-31.79	11.28	47.54	-36.26	
.4493	33.56	24.87	56.89	-32.02	17.44	46.89	-29.45	
.4853	33.10	24.82	56.25	-31.43	17.70	46.25	-28.55	
.5190	32.65	24.38	56.00	-31.62	17.47	46.00	-28.53	
.5888	30.80	22.78	56.00	-33.22	16.05	46.00	-29.95	
.6585	31.65	24.23	56.00	-31.77	17.50	46.00	-28.50	
.6923	30.51	24.71	56.00	-31.29	18.15	46.00	-27.85	
.7620	29.64	22.27	56.00	-33.73	15.57	46.00	-30.43	
.7958	29.31	24.40	56.00	-31.60	17.48	46.00	-28.52	
.8678	29.44	23.85	56.00	-32.15	16.32	46.00	-29.68	
.9353	27.97	24.16	56.00	-31.84	17.28	46.00	-28.72	
.9713	28.21	23.50	56.00	-32.50	15.82	46.00	-30.18	
1.0748	28.88	25.68	56.00	-30.32	18.58	46.00	-27.42	
1.2075	26.75	23.39	56.00	-32.61	14.96	46.00	-31.04	
1.3470	26.05	23.78	56.00	-32.22	15.76	46.00	-30.24	
1.5338	23.21	19.23	56.00	-36.77	3.78	46.00	-42.22	
1.7183	21.89	16.33	56.00	-39.67	0.31	46.00	-45.69	
1.9680	21.09	15.78	56.00	-40.22	4.98	46.00	-41.02	
2.4090	23.01	14.66	56.00	-41.34	-2.19	46.00	-48.19	
2.9108	24.60	21.44	56.00	-34.56	9.73	46.00	-36.27	

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
3.6330	21.15	18.18	56.00	-37.82	7.98	46.00	-38.02	
4.5983	23.80	18.69	56.00	-37.31	5.43	46.00	-40.57	
5.6063	22.76	19.94	60.00	-40.06	9.10	50.00	-40.90	
6.6525	23.93	20.99	60.00	-39.01	9.81	50.00	-40.19	
7.3748	24.62	21.71	60.00	-38.29	9.87	50.00	-40.13	
8.3760	25.24	21.79	60.00	-38.21	9.80	50.00	-40.20	
9.1725	24.61	20.80	60.00	-39.20	8.99	50.00	-41.01	
10.8578	22.73	18.45	60.00	-41.55	5.63	50.00	-44.37	
12.9098	21.11	16.54	60.00	-43.46	4.37	50.00	-45.63	
14.4375	18.63	13.56	60.00	-46.44	2.22	50.00	-47.78	
15.3060	16.48	10.75	60.00	-49.25	0.94	50.00	-49.06	
16.2263	18.31	12.78	60.00	-47.22	2.96	50.00	-47.04	
17.0835	18.11	9.85	60.00	-50.15	1.50	50.00	-48.50	
17.6933	16.67	9.78	60.00	-50.22	1.87	50.00	-48.13	
18.2445	14.20	7.12	60.00	-52.88	0.26	50.00	-49.74	
18.9105	13.45	4.89	60.00	-55.11	-2.80	50.00	-52.80	
19.7093	16.41	8.68	60.00	-51.32	-0.11	50.00	-50.11	
20.2538	16.73	7.44	60.00	-52.56	-1.74	50.00	-51.74	
20.8703	17.55	10.86	60.00	-49.14	1.83	50.00	-48.17	
21.6645	19.82	13.12	60.00	-46.88	4.06	50.00	-45.94	
22.5690	19.22	12.40	60.00	-47.60	2.22	50.00	-47.78	
23.1293	20.83	14.30	60.00	-45.70	8.28	50.00	-41.72	
24.0000	21.93	15.51	60.00	-44.49	8.09	50.00	-41.91	
24.9023	20.19	14.05	60.00	-45.95	6.22	50.00	-43.78	
25.6965	21.47	15.21	60.00	-44.79	7.00	50.00	-43.00	
26.6078	21.40	13.54	60.00	-46.46	7.94	50.00	-42.06	
27.1590	20.84	12.11	60.00	-47.89	5.06	50.00	-44.94	
28.6890	18.96	12.01	60.00	-47.99	3.95	50.00	-46.05	
29.2403	20.85	12.60	60.00	-47.40	4.44	50.00	-45.56	

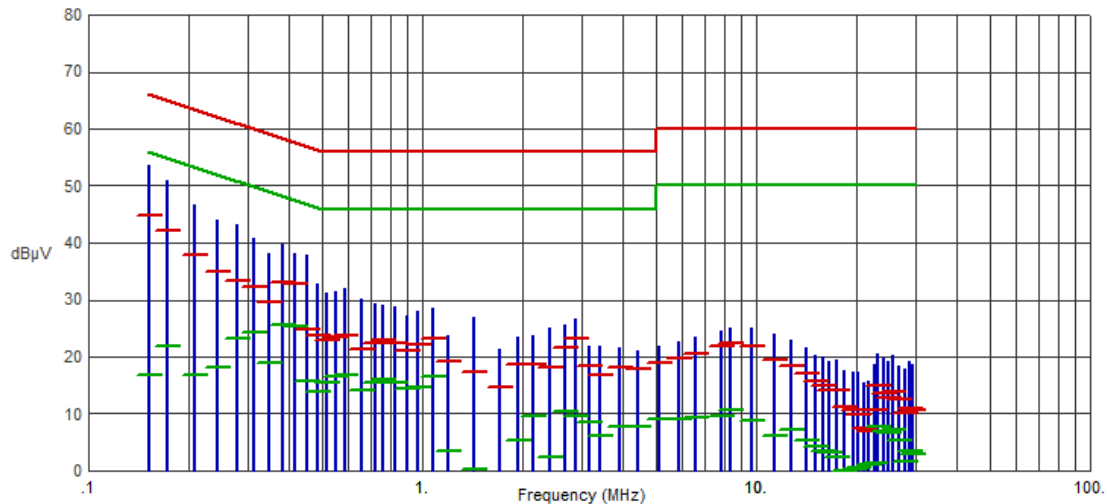
6. Measurement Data (continued)

6.10 Conducted Emissions Test Results (continued)

6.10.2. 120 Volts, 60 Hz Neutral

Test No.: 159-24, 120 Volts, 60 Hz Neutral

EN55032, Class B



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	53.53	44.87	65.87	-21.00	16.70	55.87	-39.17	
.1725	50.93	42.11	64.84	-22.73	21.81	54.84	-33.03	
.2085	46.73	37.97	63.26	-25.29	16.78	53.26	-36.48	
.2423	44.08	35.05	62.02	-26.97	18.24	52.02	-33.78	
.2783	43.22	33.28	60.87	-27.59	23.17	50.87	-27.70	
.3120	40.89	32.28	59.92	-27.64	24.32	49.92	-25.60	
.3458	38.25	29.60	59.06	-29.46	18.88	49.06	-30.18	
.3818	39.64	33.05	58.24	-25.19	25.47	48.24	-22.77	
.4155	38.14	32.75	57.54	-24.79	25.38	47.54	-22.16	
.4493	37.92	24.67	56.89	-32.22	15.64	46.89	-31.25	
.4853	32.78	23.74	56.25	-32.51	13.84	46.25	-32.41	
.5190	31.22	22.88	56.00	-33.12	15.35	46.00	-30.65	
.5528	31.60	23.38	56.00	-32.62	16.55	46.00	-29.45	
.5888	32.02	23.77	56.00	-32.23	16.80	46.00	-29.20	
.6585	30.22	21.21	56.00	-34.79	14.26	46.00	-31.74	
.7260	29.38	22.51	56.00	-33.49	15.52	46.00	-30.48	
.7620	29.09	22.84	56.00	-33.16	16.04	46.00	-29.96	
.8318	28.81	22.35	56.00	-33.65	15.38	46.00	-30.62	
.8993	27.24	21.17	56.00	-34.83	14.37	46.00	-31.63	
.9713	27.88	22.19	56.00	-33.81	14.73	46.00	-31.27	
1.0748	28.44	23.28	56.00	-32.72	16.42	46.00	-29.58	
1.2008	23.81	19.21	56.00	-36.79	3.48	46.00	-42.52	
1.4348	26.97	17.25	56.00	-38.75	0.38	46.00	-45.62	
1.7115	21.41	14.72	56.00	-41.28	-0.87	46.00	-46.87	
1.9320	23.36	18.57	56.00	-37.43	5.30	46.00	-40.70	
2.1435	23.78	18.64	56.00	-37.36	9.64	46.00	-36.36	
2.4135	25.12	18.11	56.00	-37.89	2.34	46.00	-43.66	
2.6678	25.48	21.66	56.00	-34.34	10.35	46.00	-35.65	

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
2.8725	26.56	23.30	56.00	-32.70	9.54	46.00	-36.46	
3.1515	21.92	18.52	56.00	-37.48	8.41	46.00	-37.59	
3.3990	21.81	16.91	56.00	-39.09	6.24	46.00	-39.76	
3.8828	21.65	18.07	56.00	-37.93	7.75	46.00	-38.25	
4.4025	21.07	17.94	56.00	-38.06	7.84	46.00	-38.16	
5.1270	21.81	18.82	60.00	-41.18	9.03	50.00	-40.97	
5.8830	22.74	19.85	60.00	-40.15	9.17	50.00	-40.83	
6.6075	23.38	20.62	60.00	-39.38	9.31	50.00	-40.69	
7.8540	24.65	21.83	60.00	-38.17	9.59	50.00	-40.41	
8.3805	25.11	22.36	60.00	-37.64	10.61	50.00	-39.39	
9.7013	25.12	21.83	60.00	-38.17	8.93	50.00	-41.07	
11.3010	23.95	19.54	60.00	-40.46	6.18	50.00	-43.82	
12.7500	22.89	18.41	60.00	-41.59	7.17	50.00	-42.83	
14.1473	21.68	16.96	60.00	-43.04	5.27	50.00	-44.73	
15.0833	20.39	15.79	60.00	-44.21	4.21	50.00	-45.79	
15.8078	19.97	14.85	60.00	-45.15	3.52	50.00	-46.48	
16.5728	19.26	14.12	60.00	-45.88	3.28	50.00	-46.72	
17.3423	19.46	14.20	60.00	-45.80	2.29	50.00	-47.71	
18.2940	17.66	11.08	60.00	-48.92	0.08	50.00	-49.92	
19.5855	17.24	10.76	60.00	-49.24	0.30	50.00	-49.70	
20.2628	17.30	9.82	60.00	-50.18	0.59	50.00	-49.41	
21.0345	15.47	7.43	60.00	-52.57	-1.63	50.00	-51.63	
21.6668	15.61	6.92	60.00	-53.08	1.13	50.00	-48.87	
22.5780	18.66	10.62	60.00	-49.38	1.32	50.00	-48.68	
23.1293	20.65	15.01	60.00	-44.99	7.77	50.00	-42.23	
24.0000	19.78	13.70	60.00	-46.30	7.03	50.00	-42.97	
24.9000	19.29	12.88	60.00	-47.12	6.56	50.00	-43.44	
25.6943	20.20	13.78	60.00	-46.22	7.19	50.00	-42.81	
26.6100	18.42	12.52	60.00	-47.48	5.41	50.00	-44.59	
27.9465	17.89	10.07	60.00	-49.93	1.56	50.00	-48.44	
28.6845	19.27	10.99	60.00	-49.01	3.56	50.00	-46.44	
29.2358	18.56	10.62	60.00	-49.38	2.99	50.00	-47.01	

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 11, AS/NZS CISPR 14-1, AS/NZS CISPR 15, AS/NZS CISPR 32, Chinese-Taipei (Taiwan) BSMI CNS 15936 and Korea (RRA) KS C 9811, KS C 9814-1, KS C 9815, KS C 9832, KS C 9610-6-3 & KS C 9610-6-4.

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 tabletop.

8. Test Images

8.1. Spurious and Harmonic Emissions – 30 kHz to 960 MHz Front



8. Test Images

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



8. Test Images

8.3. Spurious and Harmonic Emissions – 30 MHz to 960 MHz Rear



8. Test Images

8.4. Spurious and Harmonic Emissions – 960 MHz to 18 GHz Front



8. Test Images

8.5. Spurious and Harmonic Emissions – 960 MHz to 18 GHz Rear



8. Test Images

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



8. Test Images (continued)

8.7. Conducted Emissions, Front View



8. Test Images (continued)

8.8. Conducted Emissions, Rear View

