COMPLIANCE WORLDWIDE INC.
TEST REPORT 268-18R1

In Accordance with the Requirements of

Federal Communications Commission 47 CFR Part 15.517, Subpart F
Technical Requirements for Indoor UWB Systems

Innovation, Science and Economic Development Canada
ISED RSS-220, Issue 1 (March 2009) + Amendment 1 (July 2018)
Devices Using Ultra-Wideband (UWB) Technology

Issued to

ShotTracker, Inc.
7220 W Frontage Road
Merriam, KS 66203
(844) 385 1073

For the
Court Sensor
Model: S8A1

FCC ID: 2AC4B-S8A1
IC: 12327A-S8A1

Report Issued on July 26, 2018
Revision R1 Issued on June 18, 2019

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 ShotTracker Court Sensor 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. Revision R1 – Added 99% bandwidth measurements. Reference Section 6.11.

2. Product Details

2.1. Manufacturer:	ShotTracker
2.2. Model Numbers:	S8A1
2.3. Serial Numbers:	Pre-production
2.4. Description:	Basketball Location Sensor. Receives UWB location beacons from nearby tags and balls, processes them, and then relays the location data to a server.
2.5. Power Source:	DC 48 Volts, POE
2.6. Hardware Revision:	Rev D
2.7. Software Revision:	1.2.395
2.8. Modulation Type:	Pulse Modulation, Frequency Hopping
2.9. Operating Frequencies:	4.576 GHz (Channel 3), 6.490 GHz (Channel 5) Nominal (500 MHz BW) and 6.490 GHz (Channel 7) Center Frequency, Nominal (900 MHz BW)
2.10. EMC Modifications:	None

3. Product Configuration

3.1 Operational Characteristics & Software

Hardware Setup:

Using the remote laptop the EUT is configured to transmit on each of the operating channels and corresponding PRFs of 16M or 64M.

3.2. EUT Hardware

Manufacturer	Model/Part # / Options	Serial Number	Input Volts	Freq (Hz)	Description/Function
ShotTracker	S8A1	Pre-production	3.7	DC	UWB Tag

3.3. EUT Cables/Transducers

Cable Type	Length	Shield	From	To
Ethernet	Variable	No	PC	ShotTracker Anchor

3.4. Support Equipment

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
Dell	Inspiron E1505	5573349937	120	60	Laptop used for configuration

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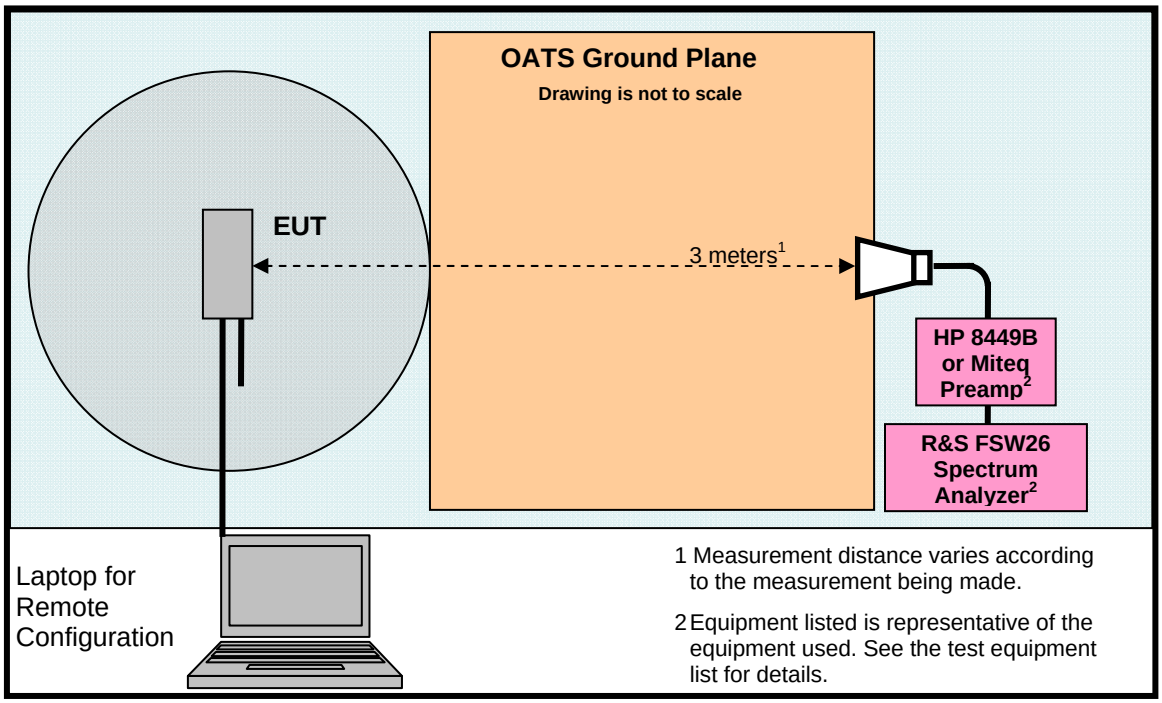
3. Product Configuration (cont.)

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	7/23/2018	3 Years
Spectrum Analyzer 9 kHz to 40 GHz	Rohde & Schwarz	FSV40	100899	7/23/2018	3 Years
Spectrum Analyzer 10 Hz to 40 GHz	Rohde & Schwarz	FSVR40	100909	7/23/2018	3 Years
Spectrum Analyzer 3 Hz to 26.5 GHz	Rohde & Schwarz	FSW26	102057	12/7/2018	2 Years
Bilog Antenna 30 to 2000 MHz	Sunol Sciences	JB1	A050913	6/3/2019	3 Years
Loop Antenna 9 kHz to 30 MHz	EMCO	6512	9309-1139	10/26/2018	2 Years
Preamplifier 100 MHz to 7 GHz	Miteq	AFS3-00100200-10-15P-4	988773	4/17/2020	2 Year
Preamplifier 100 MHz to 18 GHz	Miteq	AMF-7D-00101800-30-10P	1953081	4/16/2019	1 Year
Preamplifier 1 to 26.5 GHz	Hewlett Packard	8449B	3008A01323	7/22/2018	3 Years
Preamplifier 18 to 40 GHz	Miteq	JSD42-21004200-40-5P	649199/649219	11/1/2019	1 Year
Horn Antenna 960 MHz to 18 GHz	ETS-Lindgren	3117	00143292	2/22/2019	3 Years
Horn Antenna 18 to 40 GHz	Com Power	AH-840	3075	10/11/2018	2 Years
High Pass Filter 8 to 18 GHz	Micro-Tronics	HPM50107	G036	7/20/2019	1 Year
Barometer	Control Company	4195	Cal ID# 236	10/8/2018	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:	6/19/2018, 6/20/2018, 6/25/2018, 6/26/2018, 6/29/2019, 5/22/2019, 5/23/2019
Test Engineers:	Larry Stillings
Normal Site Temperature (15 - 35°C):	21.6
Relative Humidity (20 -75%RH):	35
Frequency Range:	30 kHz to 40 GHz
Measurement Distance:	3 Meters, 1 Meter, 0.5 Meter
EMI Receiver IF Bandwidth:	200 Hz – 30 kHz to 150 kHz 9 kHz – 150 kHz to 30 MHz 120 kHz - 30 MHz to 1 GHz 1 MHz - Above 1 GHz
EMI Receiver Avg Bandwidth:	300 Hz – 30 kHz to 150 kHz 30 kHz – 150 kHz to 30 MHz 300 kHz - 30 MHz to 1 GHz 3 MHz - Above 1 GHz
Detector Function:	Peak, Quasi-Peak & Average

4.3. Measurement Procedure

Test measurements were made in accordance FCC Parts 15.209, 15.517 Subpart F and 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	± 4.55 dB
Radiated Emission of Receiver	± 4.55 dB
Temperature	$\pm 0.91^{o}$ C
Humidity	± 5%

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5. Measurements Summary

Test Requirement	FCC Rule Requirement	ISED Rule Requirement	Test Report Section	Result	Comment
Antenna Requirement	15.203	RSS-220 5.1 (b)	6.1	Compliant	
Operational Requirements	15.517 (a)	RSS-220	6.2	Compliant	
UWB Bandwidth	15.503 (a) (d) 15.517 (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	15.517 (c) 15.521 (d)	RSS-220 3.4	6.5	Compliant	
Radiated Emissions in GPS Bands	15.517 (d)	RSS-220 5.2.1 (e)	6.6	Compliant	
RMS Emissions of UWB Transmission in a 1 MHz Bandwidth	15.517 (c) 15.521 (d)	RSS-220 5.2.1 (d)	6.7	Compliant	
Peak Emissions in a 50 MHz Bandwidth	15.517 (e) 15.521 (g)	RSS-220 5.2.1 (g)	6.8	Compliant	
Conducted Emissions	15.207	RSS-GEN	6.9 6.10	Compliant	
99% Occupied Bandwidth	N/A	RSS-GEN 6.7	6.11	Compliant	
Radio Frequency Exposure	1.1307 (b) (1) 2.1091	RSS-102 RSS-GEN	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 contains an RP SMA connector.

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6. Measurement Data (continued)

6.2. Operational Requirements of the Device under Test (15.517 (a))

Requirement: (1) Indoor UWB devices, by the nature of their design, must be capable of operation only indoors. The necessity to operate with a fixed indoor infrastructure, e.g., a transmitter that must be connected to the AC power lines, may be considered sufficient to demonstrate this.

Result: Compliant, the EUT is an indoor anchor designed to receive location information from a tag filed under a separate application. The statement required by Section 15.517(f) is located in the manual regarding the use of indoor equipment.

(2) The emissions from the equipment operated under this section shall not be intentional directed outside of the building in which the equipment is located, such as through a window or a doorway, to perform an outside function, such as the detection of persons about to enter a building.

Result: Not Applicable, Compliant.

(3) The use of outdoor mounted antennas, e.g. antennas mounted on the outside of a building or on a telephone pole, or any other outdoors infrastructure is prohibited.

Result: Not Applicable, Compliant.

(4) Field disturbance sensors installed inside of metal or underground storage tanks are considered to operate indoors provided the emissions are directed towards the ground.

Result: Not Applicable, Compliant.

(5) A communications system shall transmit only when the intentional radiator is sending information to an associated receiver.

Result: Compliant.

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6. Measurement Data (continued)

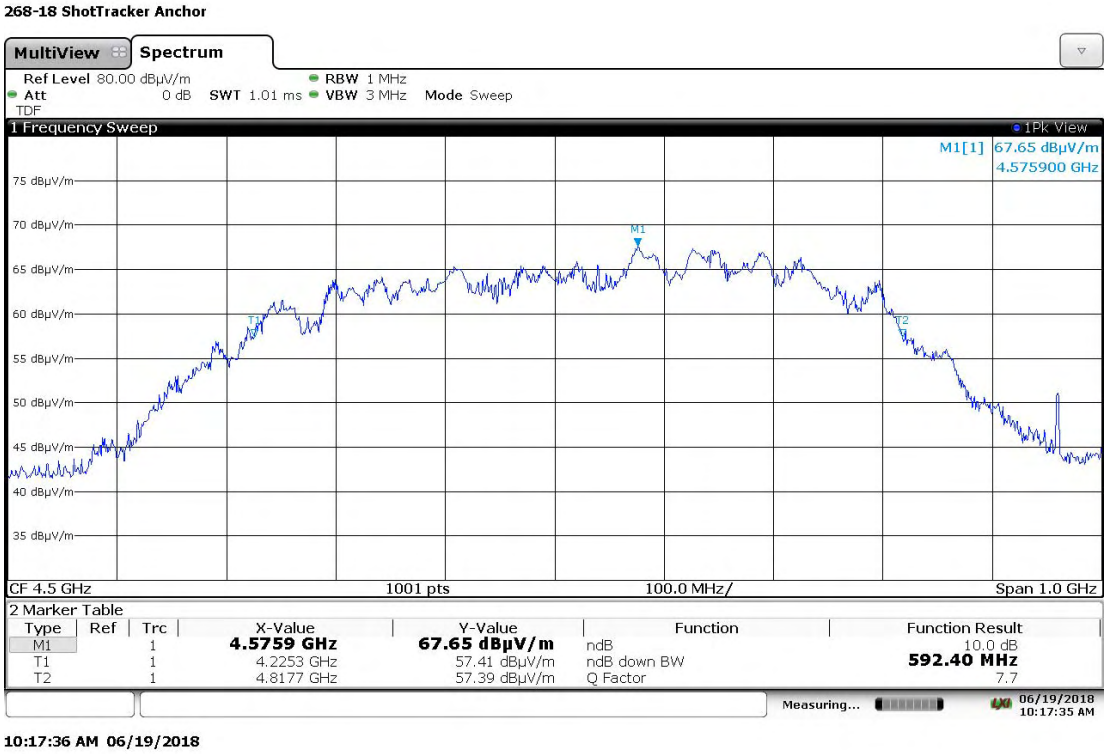
6.3. UWB Bandwidth (15.503 (a) (d), 15.517 (b), RSS-220 5.1)

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 16M	CH3 64M	CH5 16M	CH5 64M	CH7 16M	CH7 64M
f_M	The highest emission peak	4.5759	4.5769	6.512	6.493	6.3661	6.501
f_L	10 dB below the highest peak	4.2253	4.2842	6.2253	6.2323	6.0702	6.1272
f_H	10 dB above the highest peak	4.8177	4.8077	6.7527	6.7468	6.8438	6.8408
f_C	Calculated: $(f_H + f_L) / 2$	4.5215	4.5460	6.4890	6.4896	6.4570	6.4840
Bandwidth	Calculated: $(f_H - f_L)$	0.5924	0.5235	0.5274	0.5145	0.7736	0.7136
Fractional BW	Calculated: $2*(f_H - f_L) / (f_H + f_L)$	0.1310	0.1152	0.0814	0.0793	0.1198	0.1101

6.3.2. Measurement Plot of 10 dB frequencies (Channel 3, 16M PRF)



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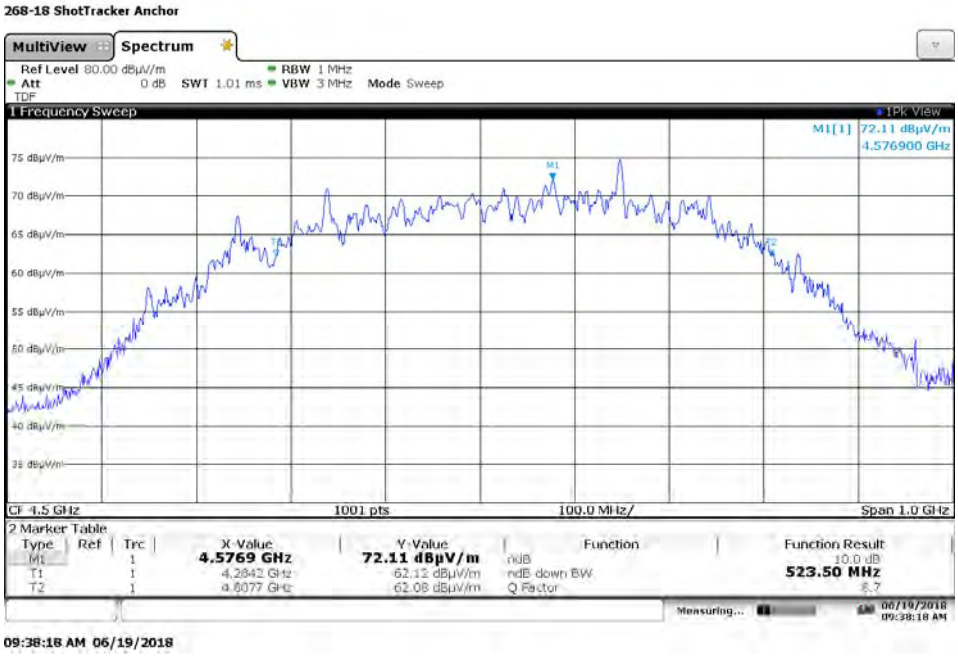
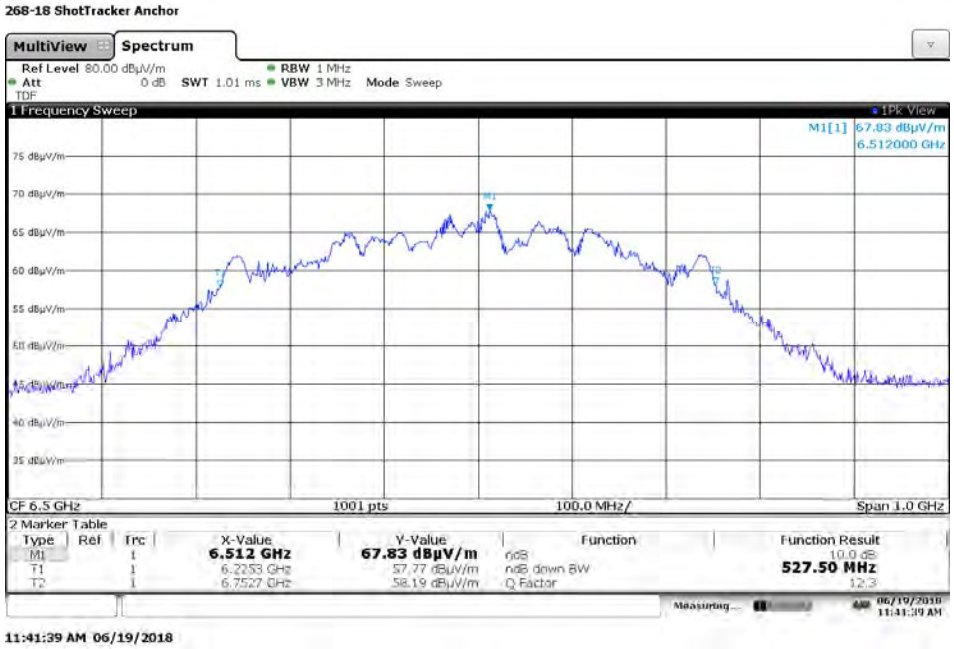
6. Measurement Data (continued)

6.3. UWB Bandwidth (15.503 (a) (d), 15.517 (b), RSS-220 5.1)

6.3.3. Measurement Plot of 10 dB frequencies (Channel 3, 64M PRF)



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



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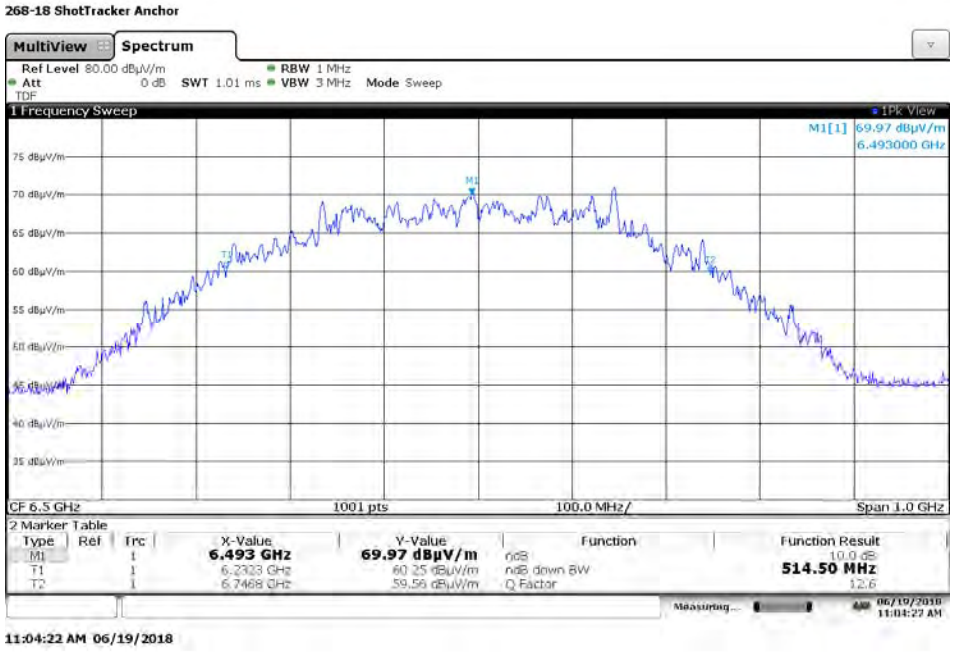
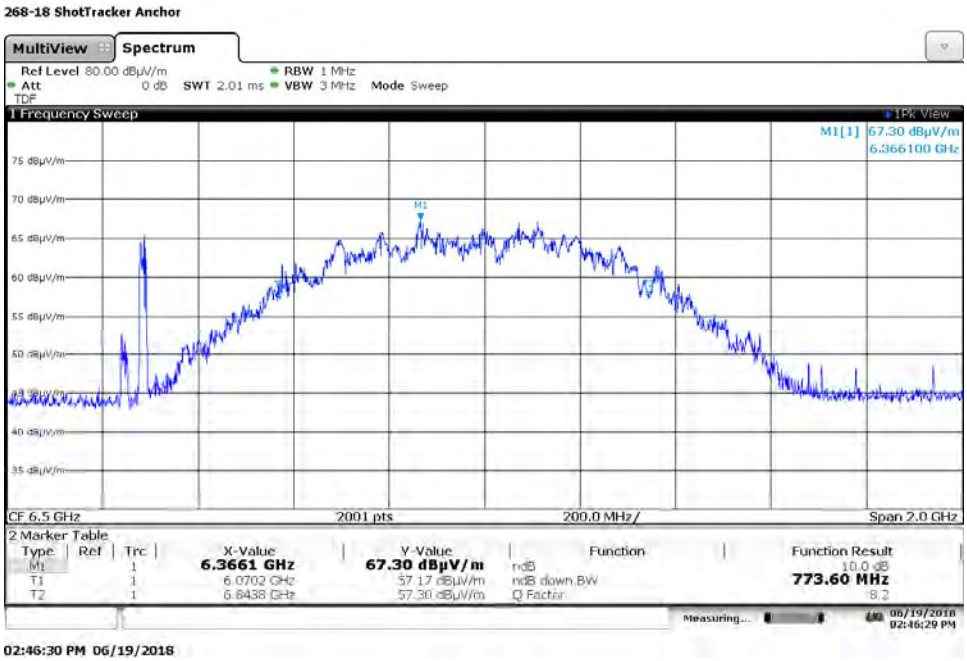
6. Measurement Data (continued)

6.3. UWB Bandwidth (15.503 (a) (d), 15.517 (b), RSS-220 5.1)

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



6.3.6. Measurement Plot of 10 dB frequencies (Channel 7, 16M PRF)



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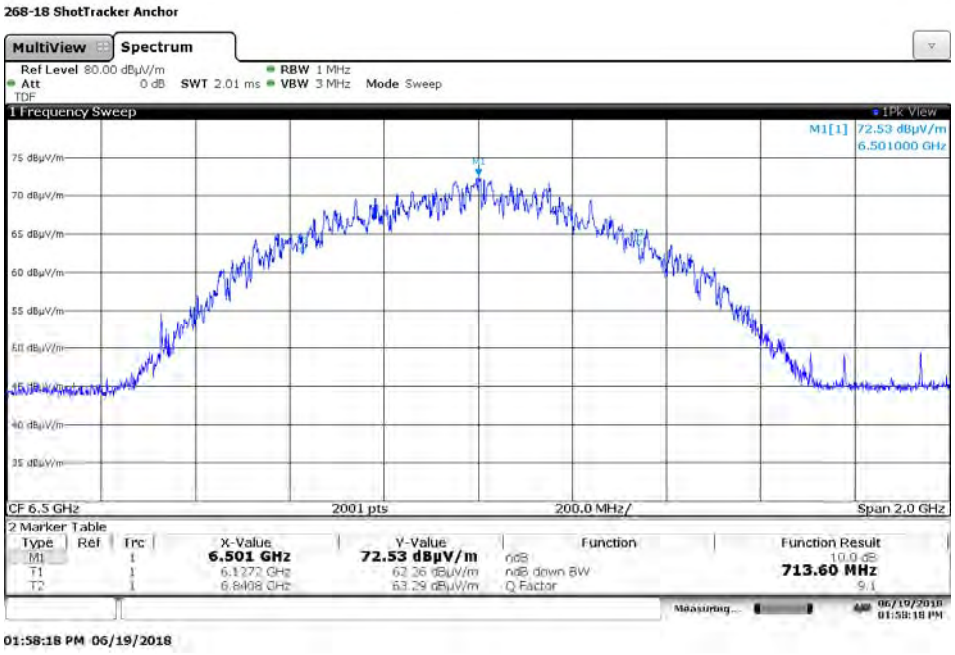
6. Measurement Data (continued)

6.3. UWB Bandwidth (15.503 (a) (d), 15.517 (b), RSS-220 5.1)

6.3.7. Measurement Plot of 10 dB frequencies (Channel 7, 64M PRF)



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6. Measurement Data (continued)

6.4. Spurious Radiated Emissions below 960 MHz (15.517 (c), 15.209, RSS-220 3.4)

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:	10 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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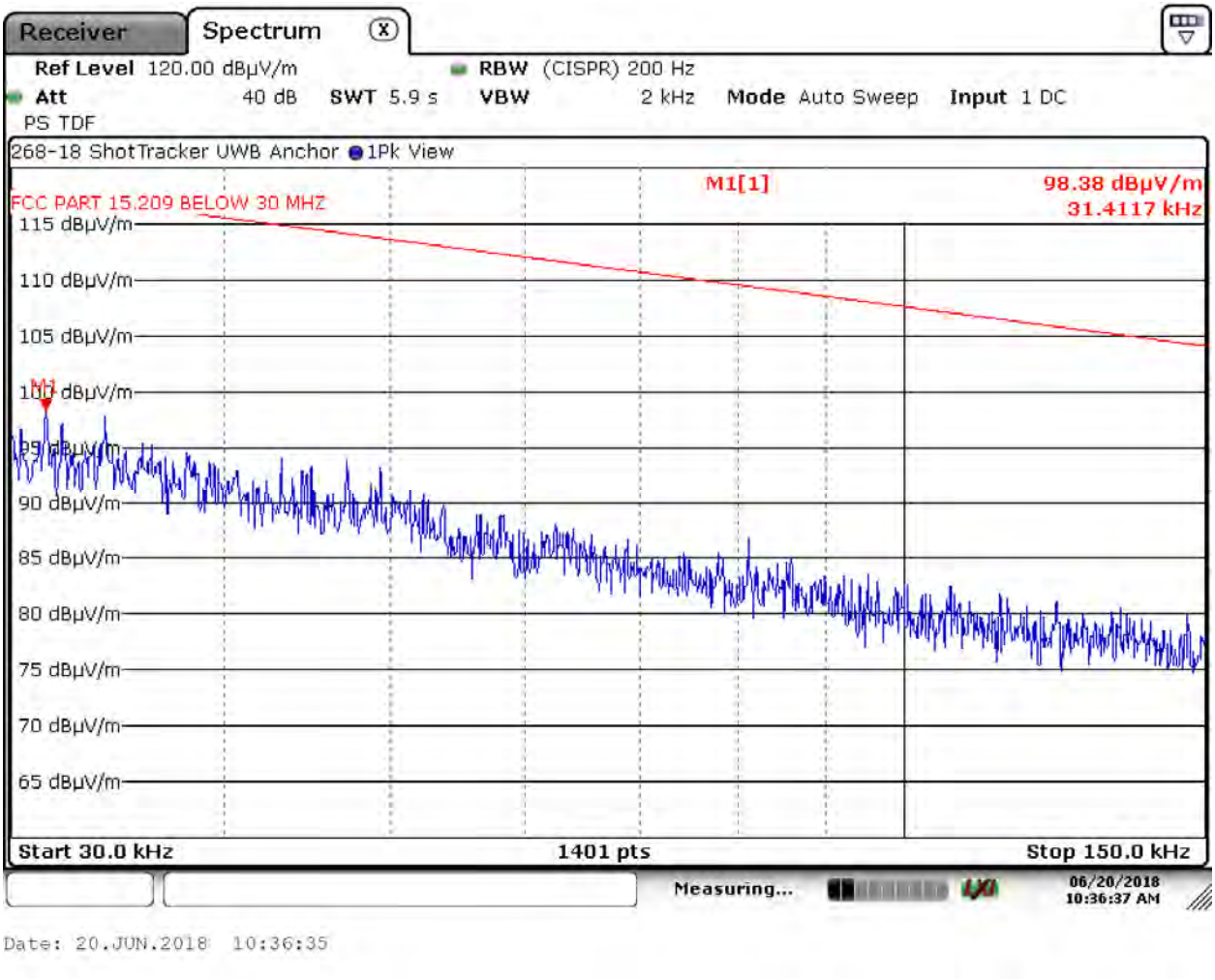
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.517 (c), 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 – Channel 7



Note: All other channels were noise floor

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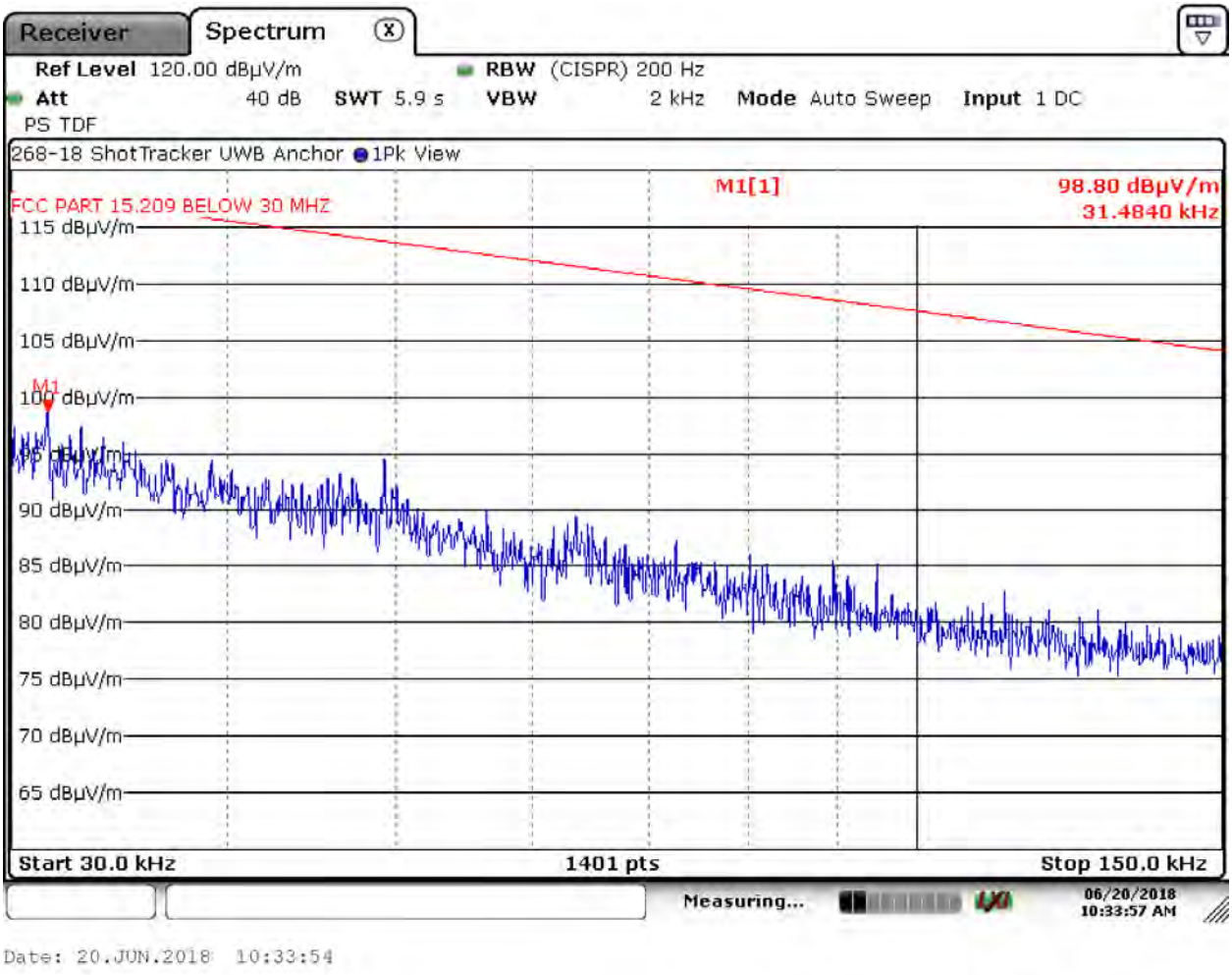
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.517 (c), 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 – Channel 7



Note: All other channels were noise floor

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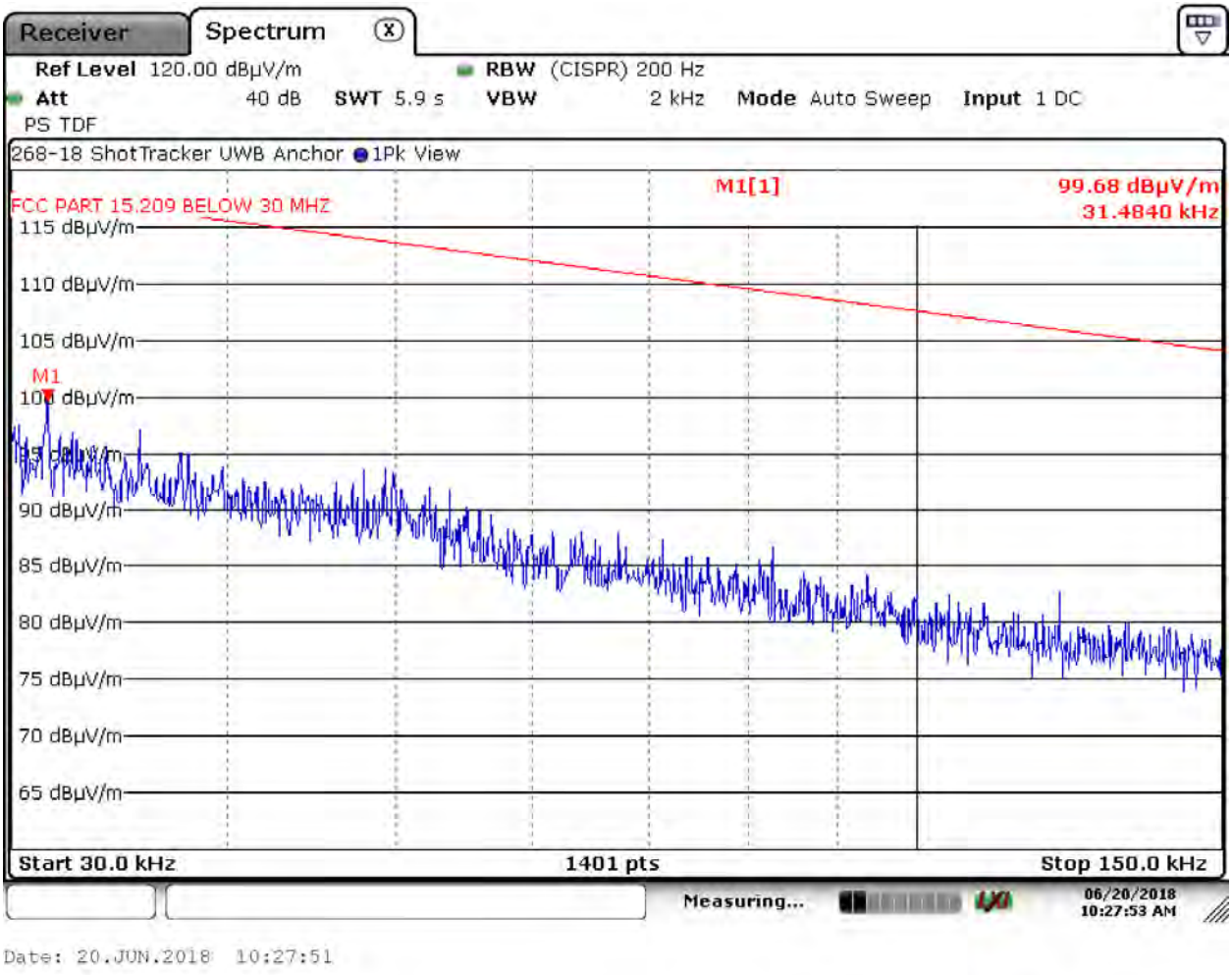
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.517 (c), 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 – Channel 7



Note: All other channels were noise floor

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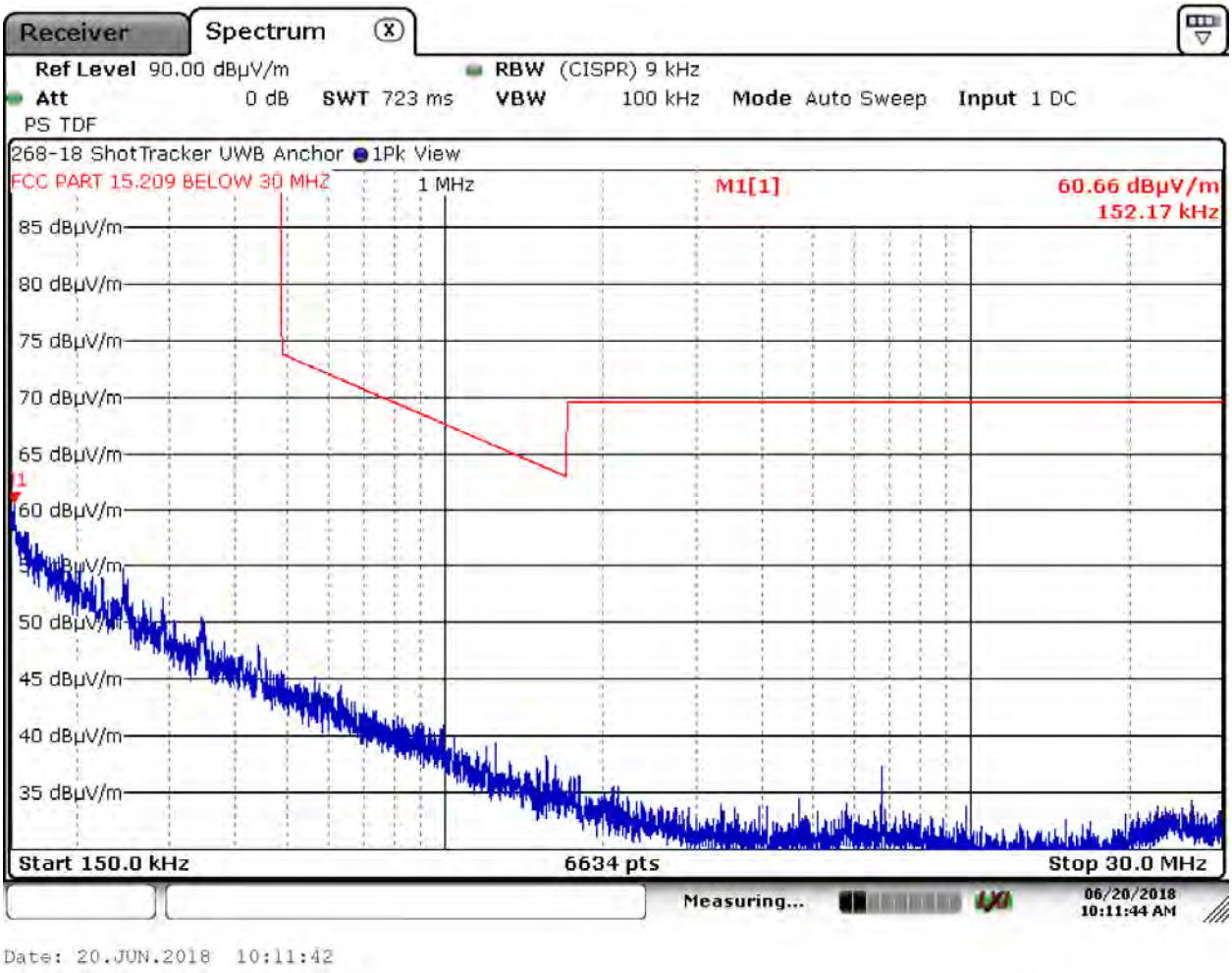
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.517 (c), 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 – Channel 7



Note: All other channels were noise floor

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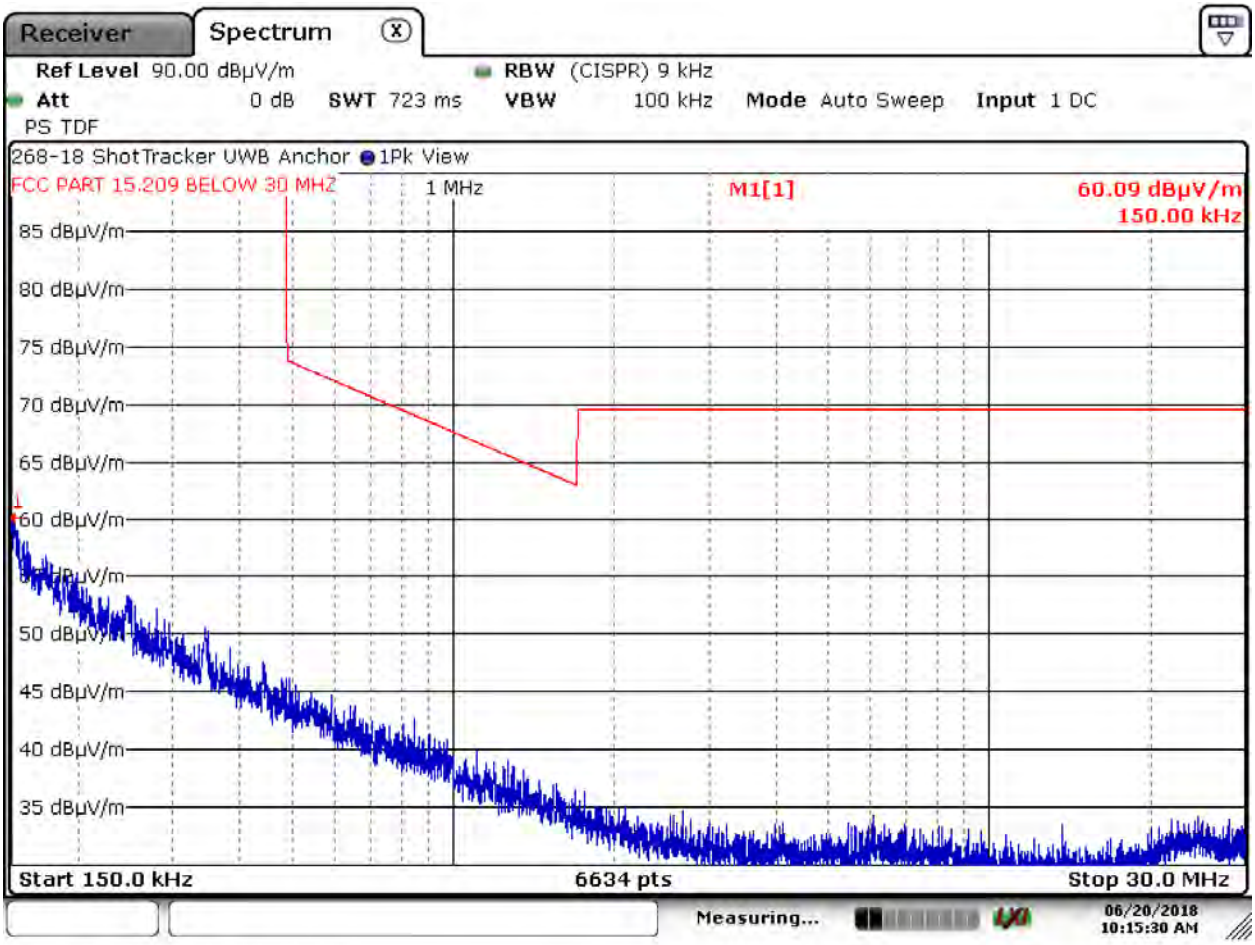
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.517 (c), 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 – Channel 7



Note: All other channels were noise floor

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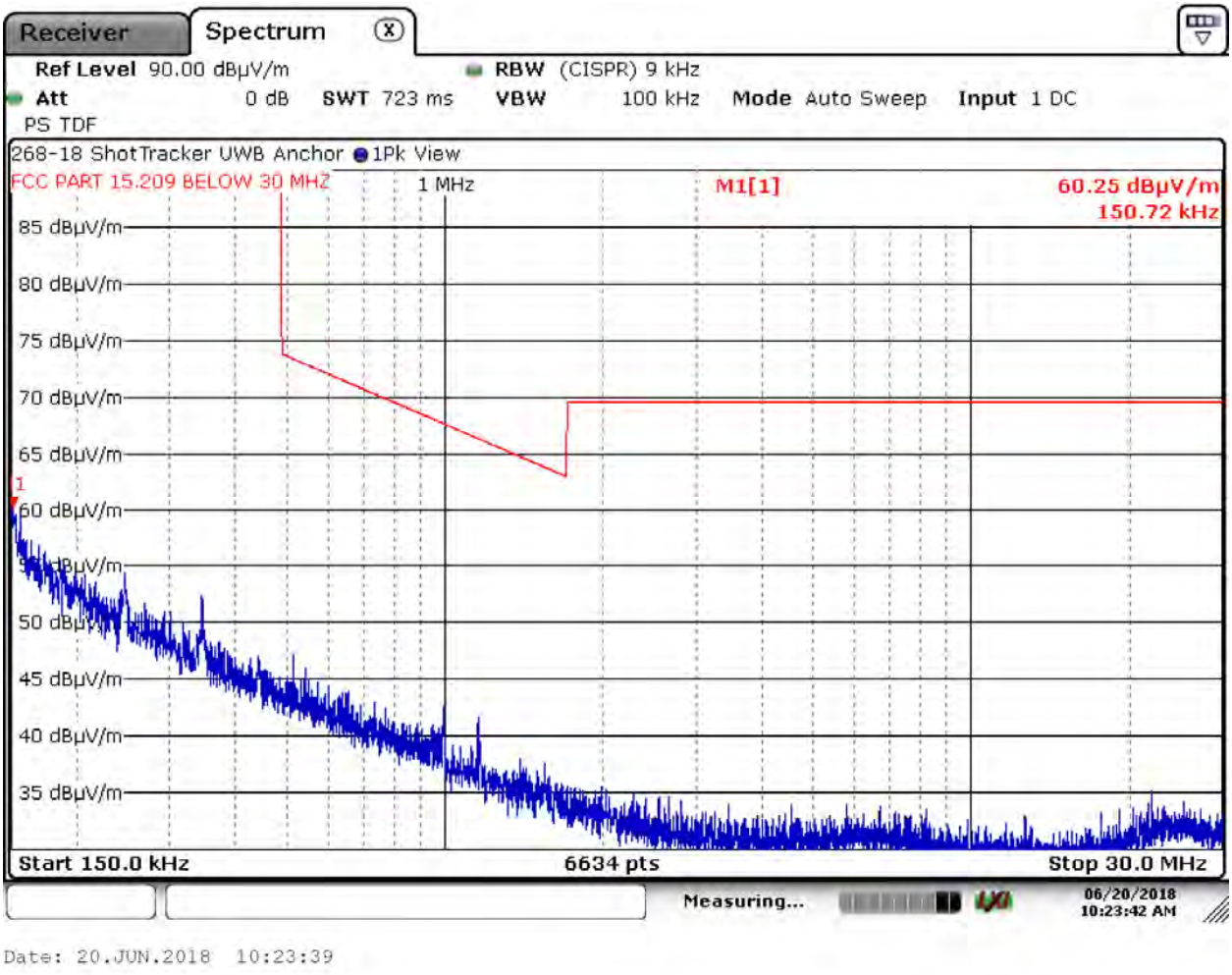
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.517 (c), 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 – Channel 7



Note: All other channels were noise floor

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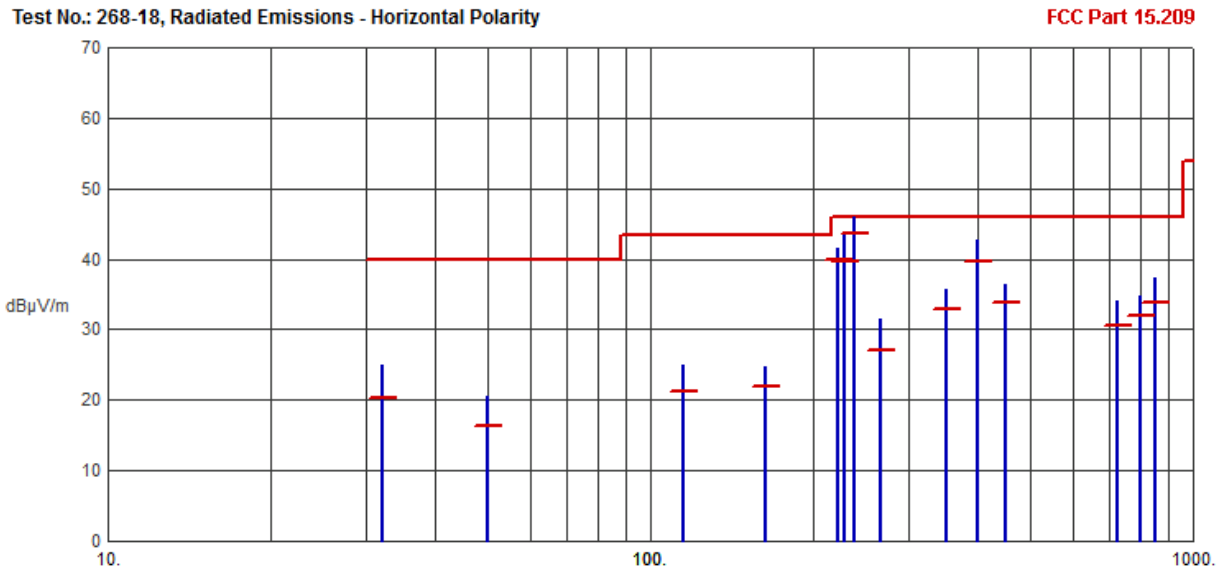
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.517 (c), 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. The device was then tested on our 3M OATS from 30 to 960 MHz.

6.4.1.7 Horizontal Polarity – 30 to 960 MHz – Channel 7



Note: All other channels were similar.

Frequency (MHz)	Pk Amp (dBµV/m)	QP Amp (dBµV/m)	QP Limit (dBµV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
32.0179	25.08	20.27	40.00	-19.73	N/A	N/A	
49.9640	20.43	16.44	40.00	-23.56	N/A	N/A	
115.2792	24.88	21.19	43.50	-22.31	N/A	N/A	
163.3043	24.82	21.85	43.50	-21.65	N/A	N/A	
221.3719	41.56	39.95	46.00	-6.05	N/A	N/A	
227.0882	43.39	39.58	46.00	-6.42	N/A	N/A	
237.0762	45.86	43.67	46.00	-2.33	N/A	N/A	
266.0117	31.45	27.07	46.00	-18.93	N/A	N/A	
350.0047	35.80	32.92	46.00	-13.08	N/A	N/A	
399.9736	42.70	39.78	46.00	-6.22	N/A	N/A	
449.9779	36.37	33.81	46.00	-12.19	N/A	N/A	
724.9689	33.96	30.55	46.00	-15.45	N/A	N/A	
799.9928	34.67	31.95	46.00	-14.05	N/A	N/A	
849.9726	37.28	33.72	46.00	-12.28	N/A	N/A	

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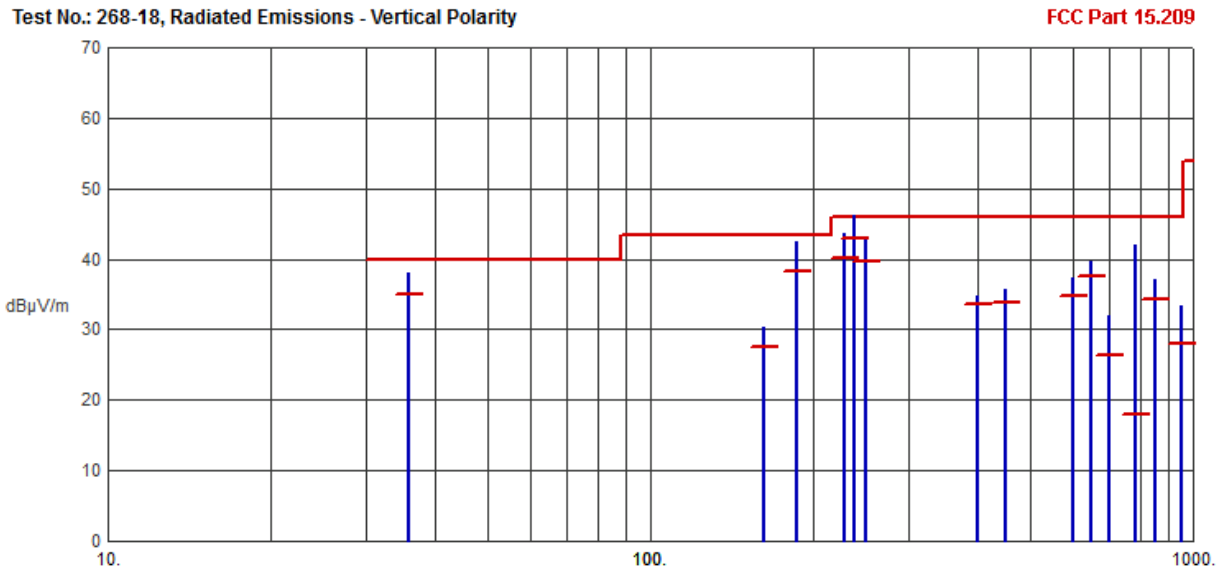
6. Measurement Data (continued)

6.4. Spurious Radiated Emissions (15.517 (c), 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. The device was then tested on our 3M OATS from 30 to 960 MHz.

6.4.1.8 Vertical Polarity – 30 to 960 MHz – Channel 7



Note: All other channels were similar

Frequency (MHz)	Pk Amp (dBµV/m)	QP Amp (dBµV/m)	QP Limit (dBµV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
35.7778	38.02	34.90	40.00	-5.10	N/A	N/A	
161.7044	30.33	27.61	43.50	-15.89	N/A	N/A	
186.2967	42.51	38.30	43.50	-5.20	N/A	N/A	
228.5740	43.52	40.12	46.00	-5.88	N/A	N/A	
237.0072	46.14	42.88	46.00	-3.12	N/A	N/A	
248.9792	43.11	39.78	46.00	-6.22	N/A	N/A	
399.9673	34.69	33.53	46.00	-12.47	N/A	N/A	
449.9918	35.70	33.78	46.00	-12.22	N/A	N/A	
599.9724	37.27	34.82	46.00	-11.18	N/A	N/A	
649.9950	39.76	37.48	46.00	-8.52	N/A	N/A	
700.0463	31.92	26.47	46.00	-19.53	N/A	N/A	
781.2600	42.10	18.01	46.00	-27.99	N/A	N/A	
849.9946	36.99	34.32	46.00	-11.68	N/A	N/A	
950.0000	33.42	27.90	46.00	-18.10	N/A	N/A	

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6. Measurement Data (continued)

6.5. Spurious Radiated Emissions above 960 MHz (15.517 (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	-53.3	41.9
1990 - 3100	-51.3	43.9
3100 - 10600	-41.3	53.9
Above 10600	-51.3	43.9

Frequency Range:	960 MHz to 40 GHz
Measurement Distance:	1 Meter and 0.5 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 0.5 meters and a -15.56 dB distance offset was programmed into the spectrum analyzer.

Narrow band spikes in 960 to 8000 MHz plots are created by digital circuitry and not subjected to this limit.

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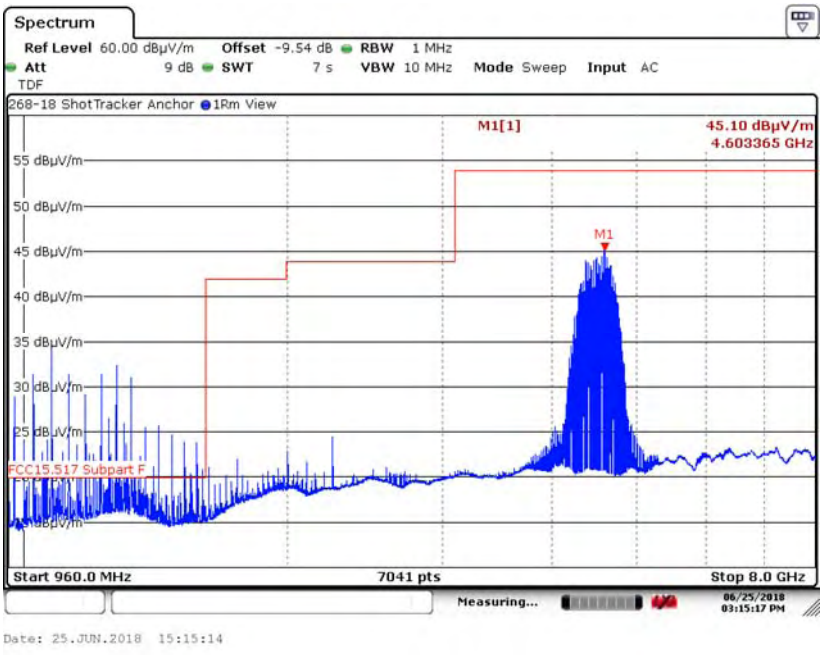
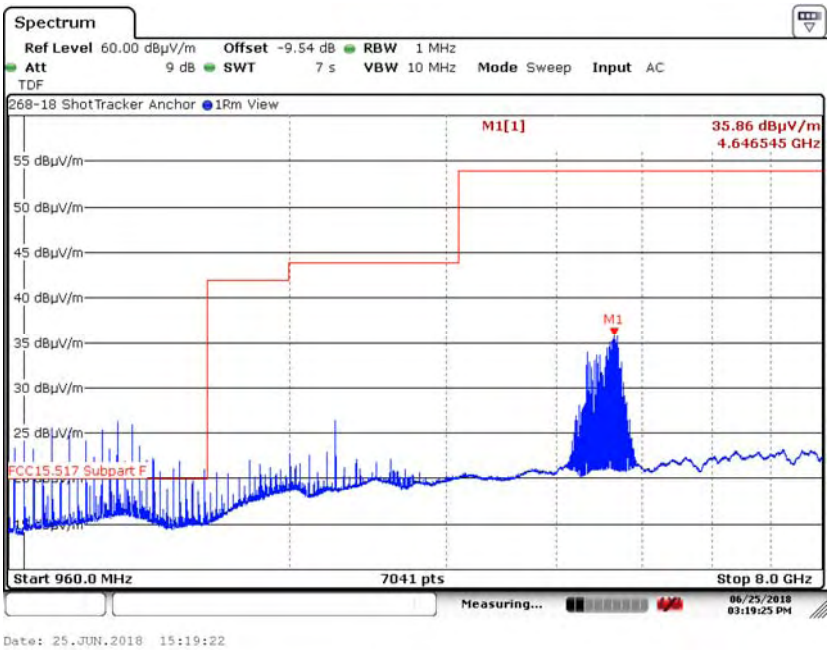
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.1. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH3,16M



6.5.2. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH3,16M



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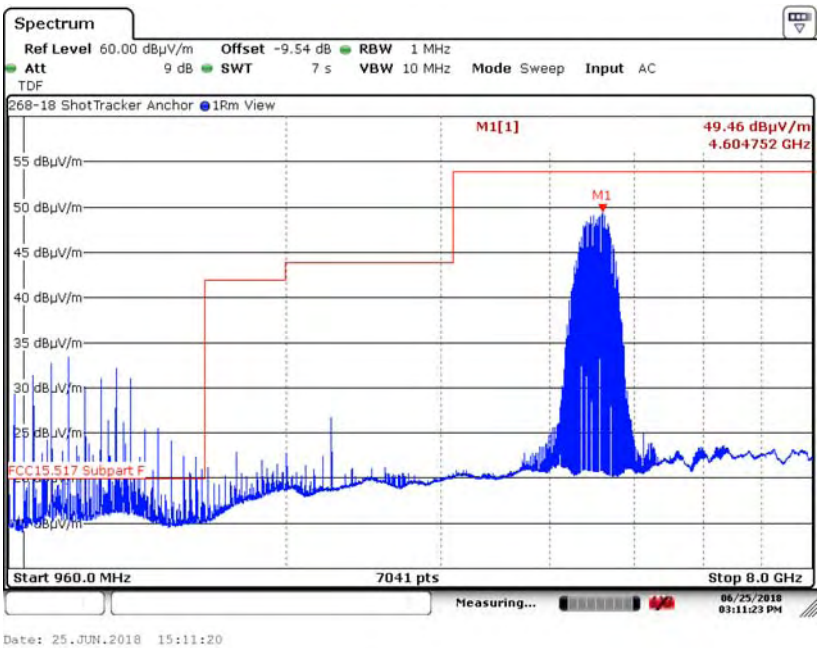
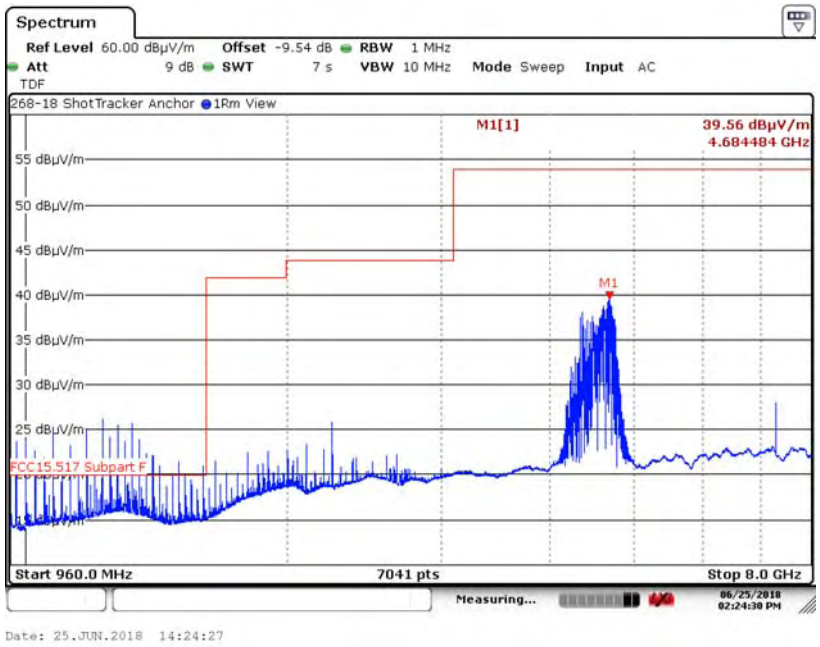
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.3. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH3,64M



6.5.4. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH3,64M



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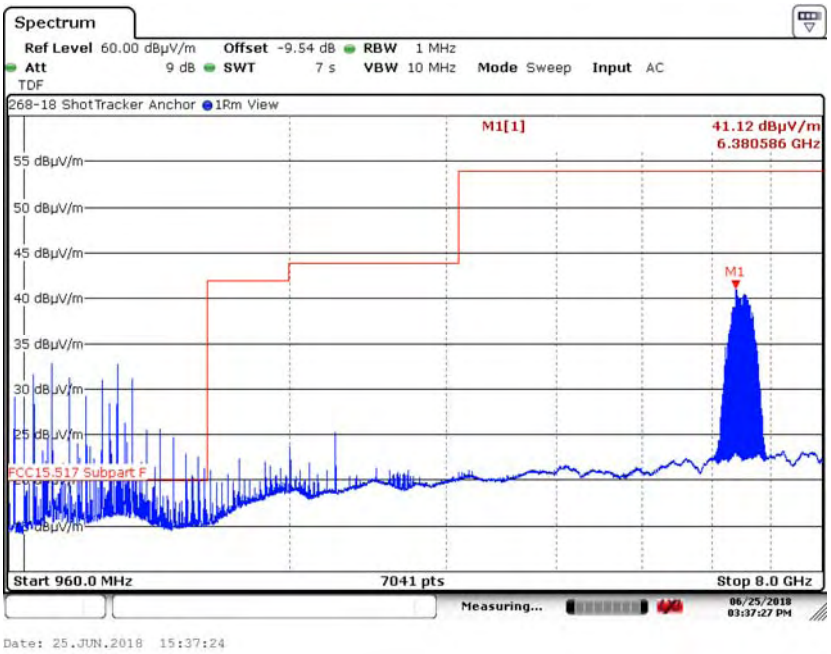
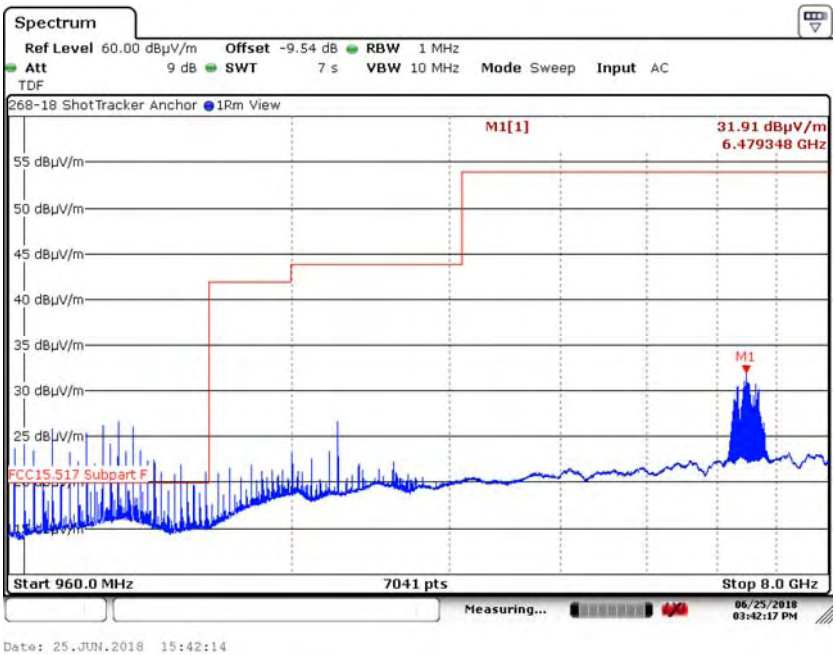
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.5. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH5,16M



6.5.6. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH5,16M



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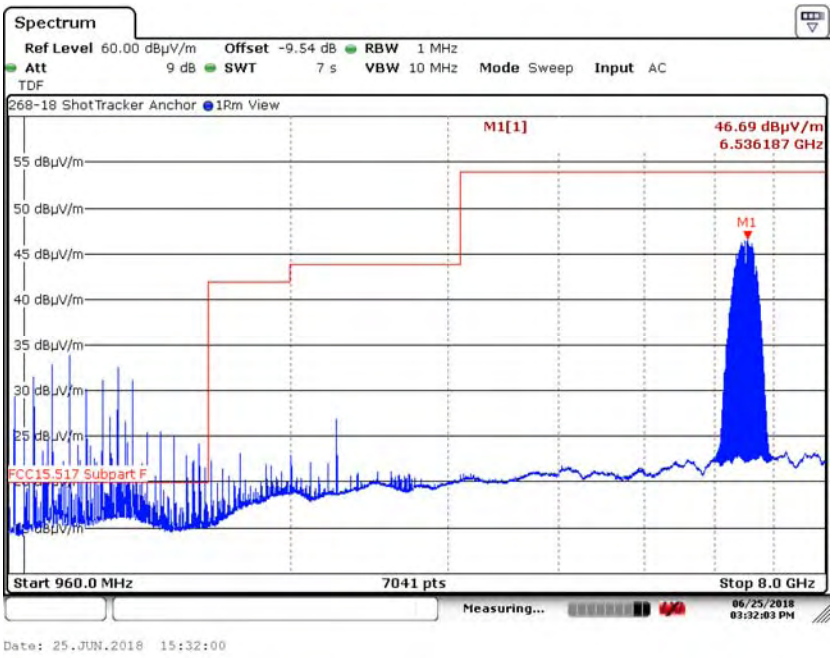
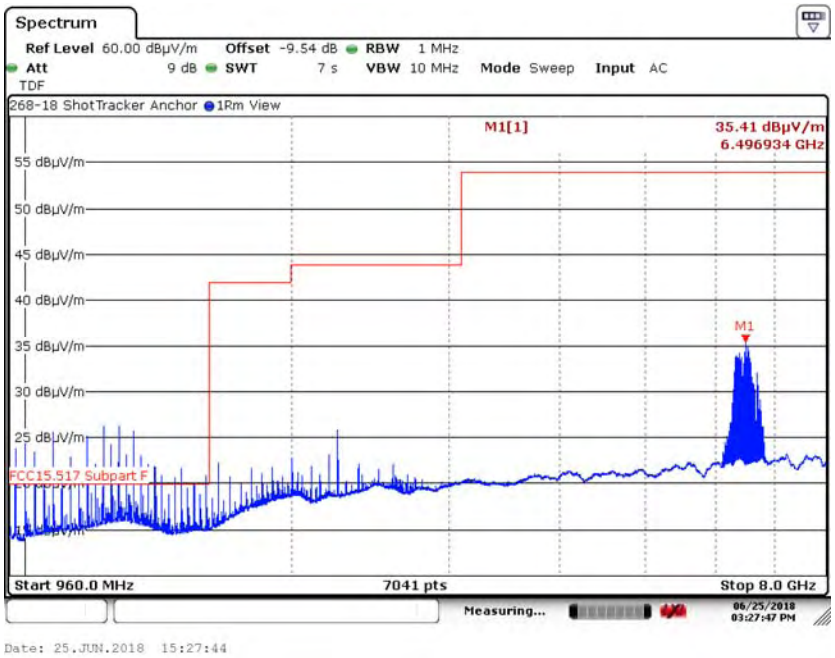
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.7. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH5,64M



6.5.8. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH5,64M



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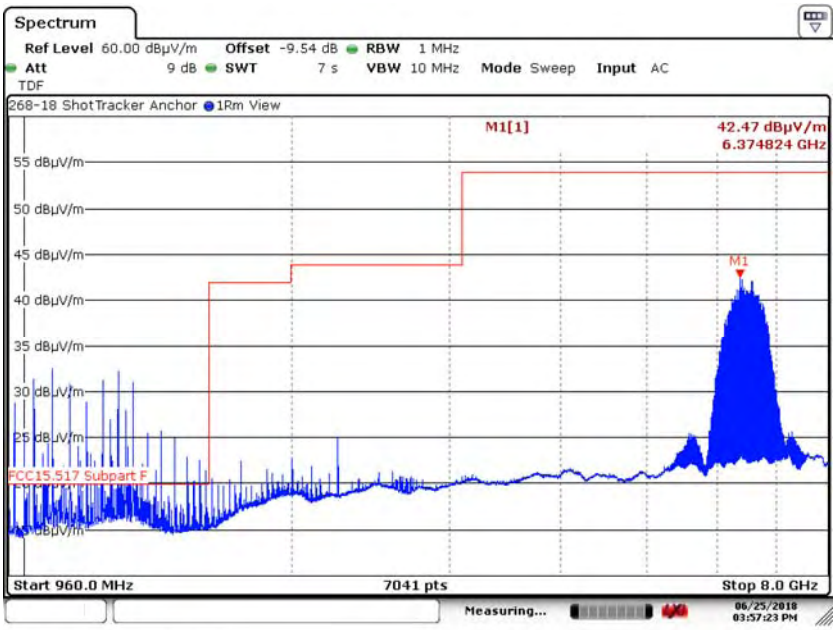
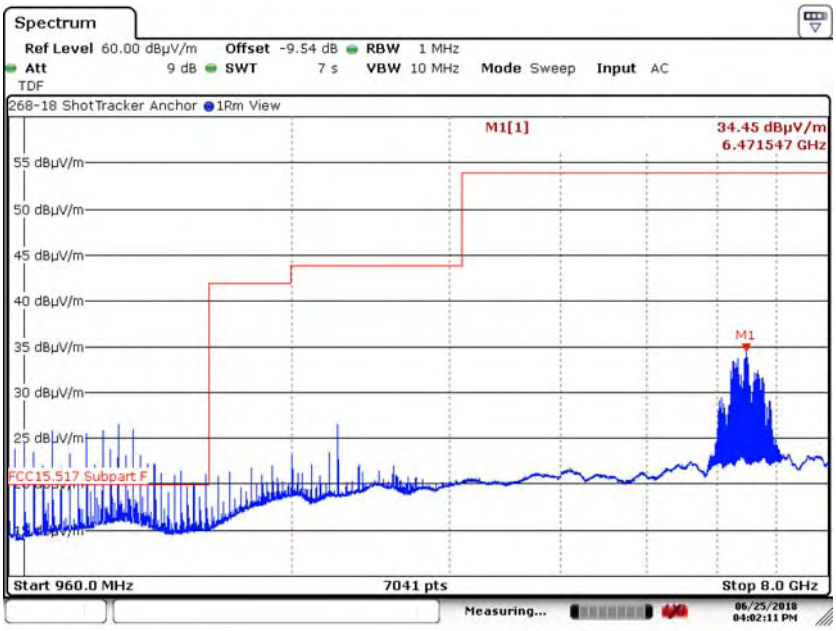
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.9. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH7,16M



6.5.10. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH7,16M



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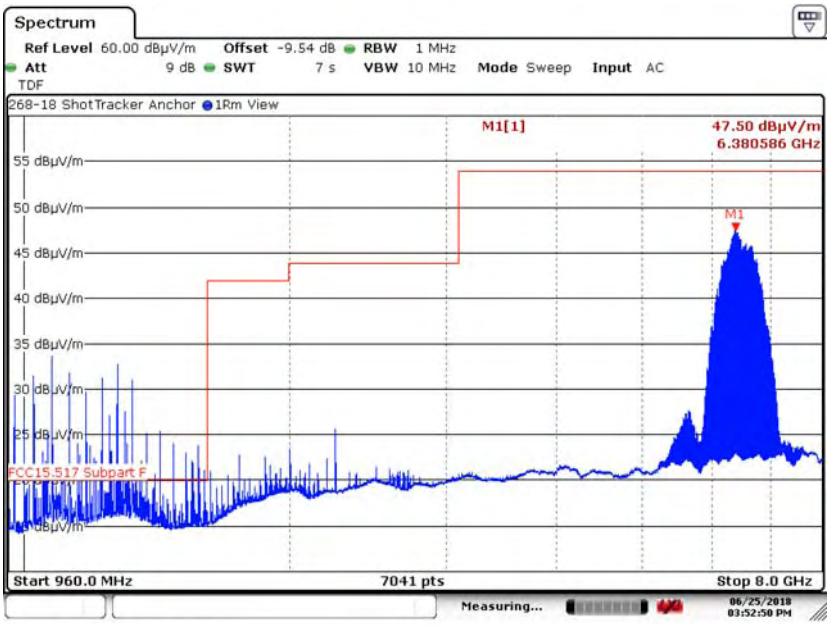
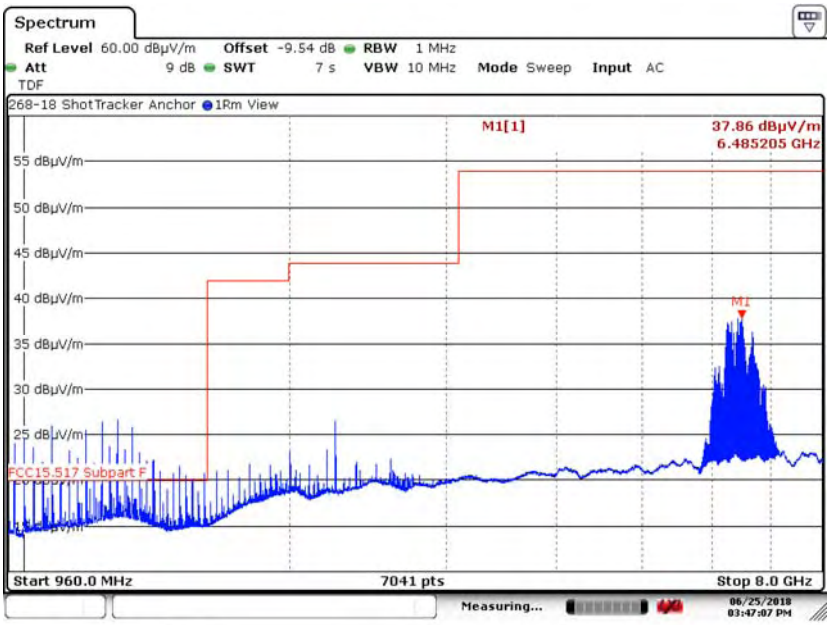
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.11. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH7,64



6.5.12. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH5,64M



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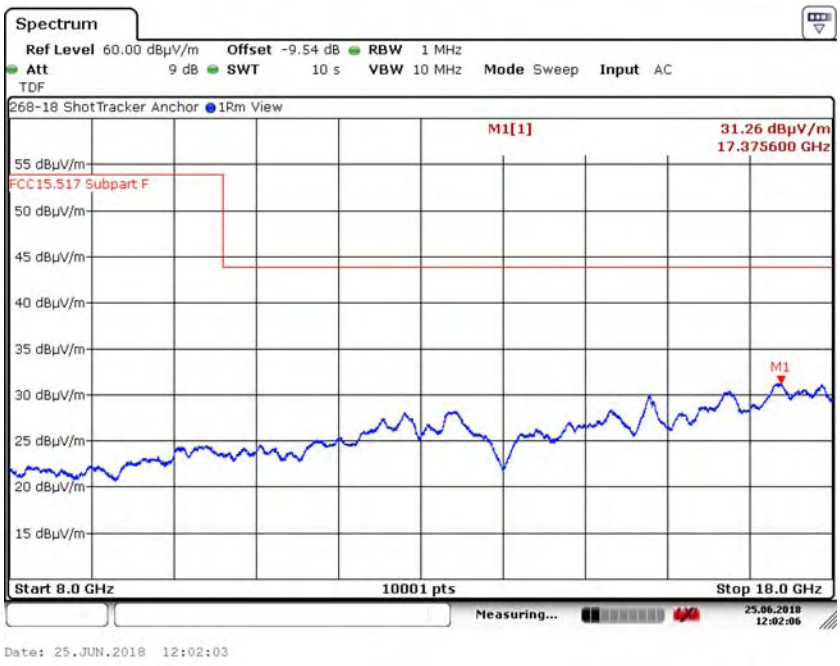
6. Measurement Data (continued)

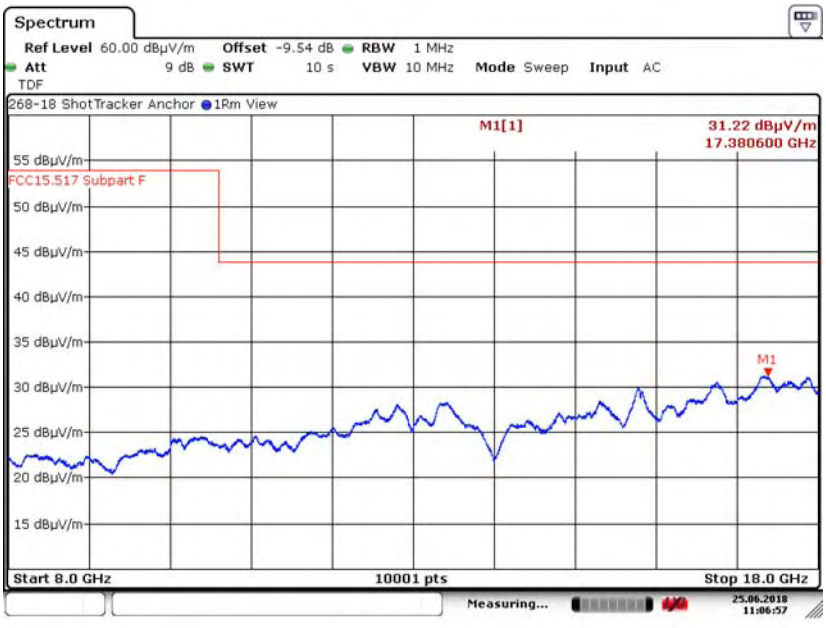
6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.13. 8 to 18 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH3, 16M



Date: 25.JUN.2018 12:02:03

6.5.14. 8 to 18 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH3, 16M



Date: 25.JUN.2018 11:06:54

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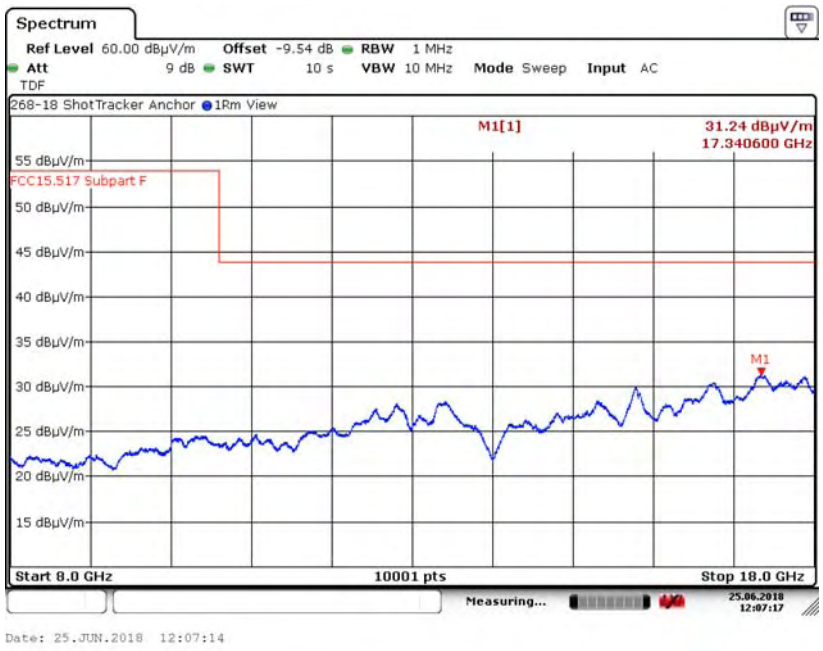
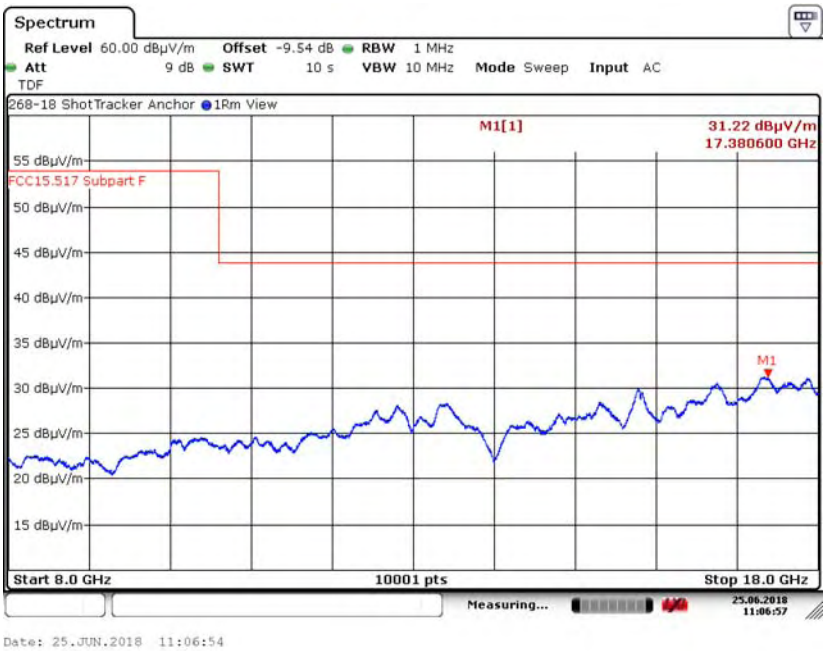
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.15. 8 to 18 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH3, 64M



6.5.16. 8 to 18 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH3, 64M



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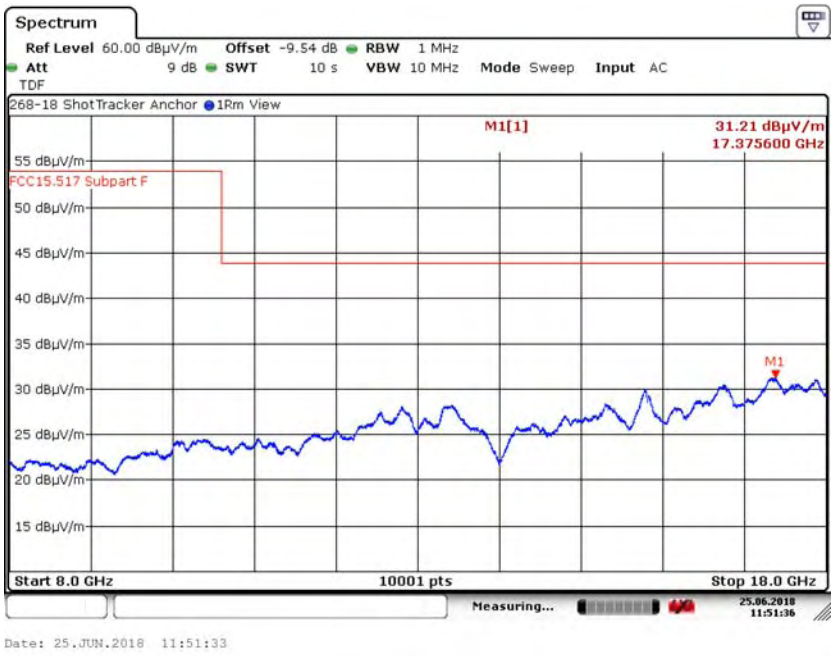
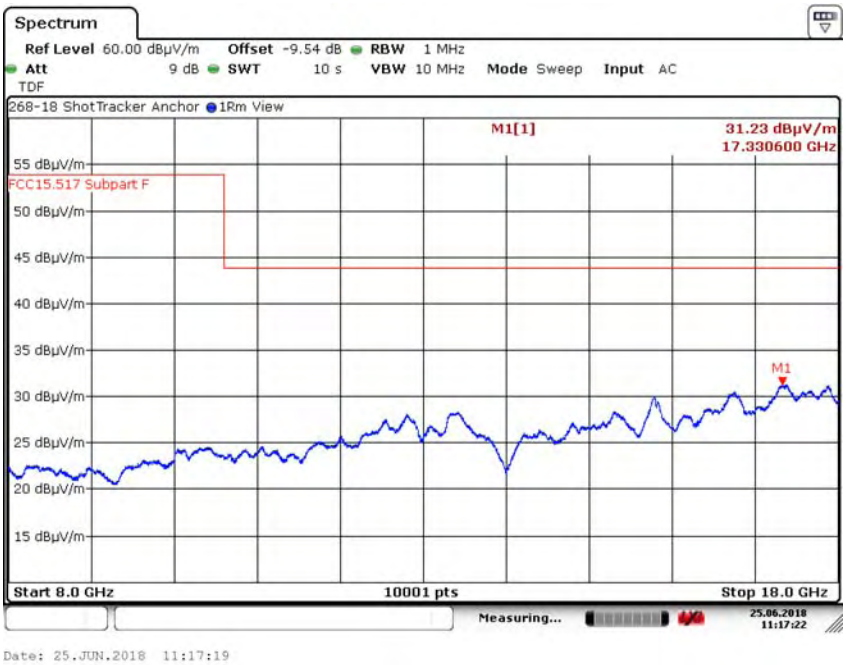
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.17. 8 to 18 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH5, 16M



6.5.18. 8 to 18 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH5, 16M



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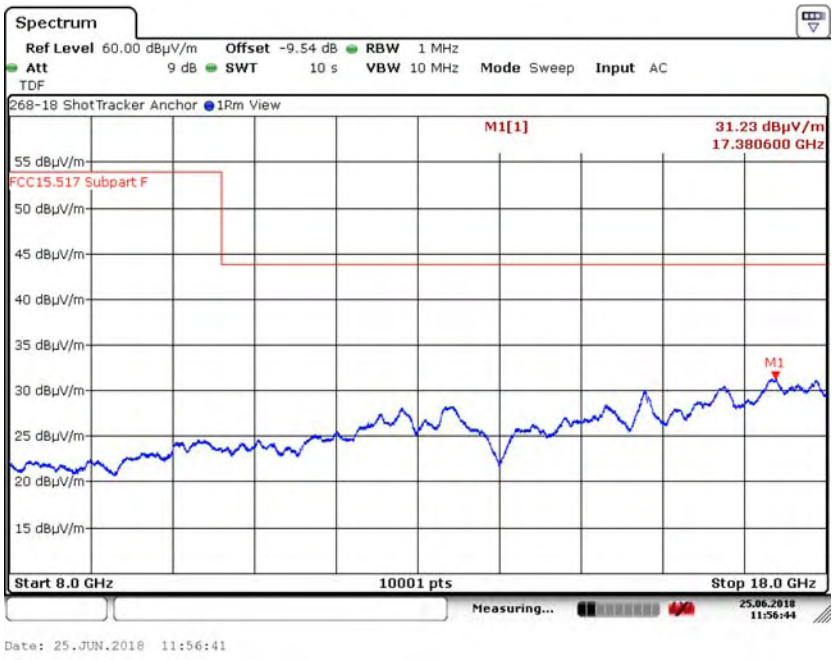
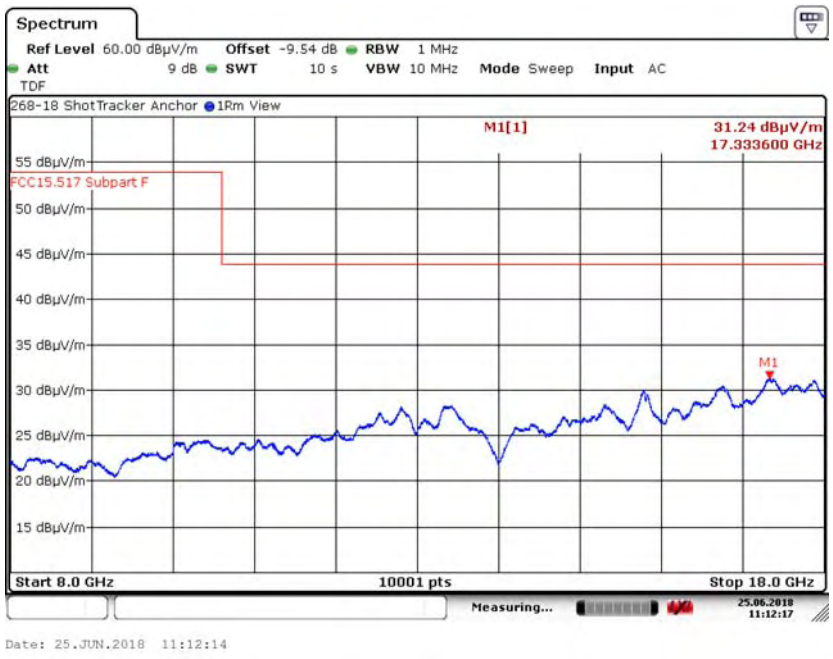
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

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



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



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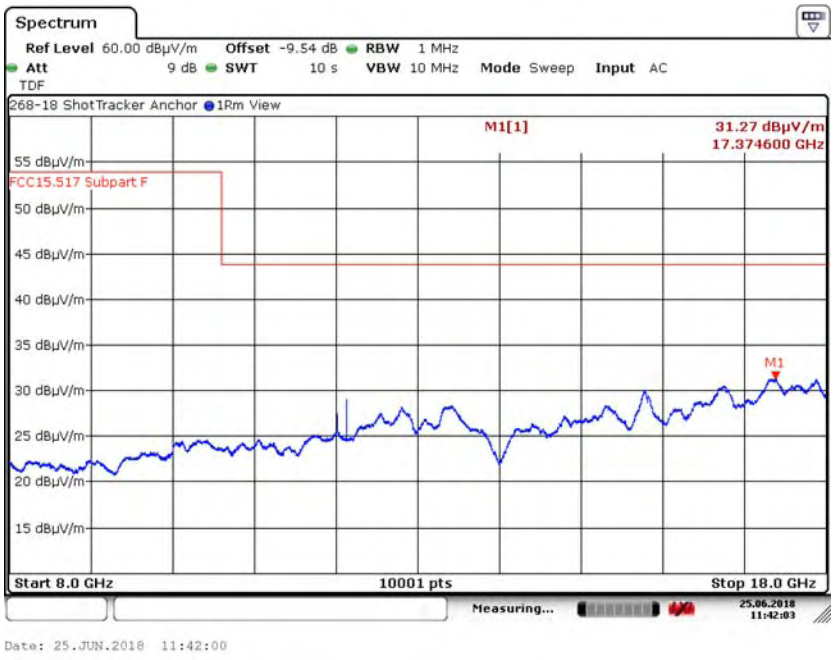
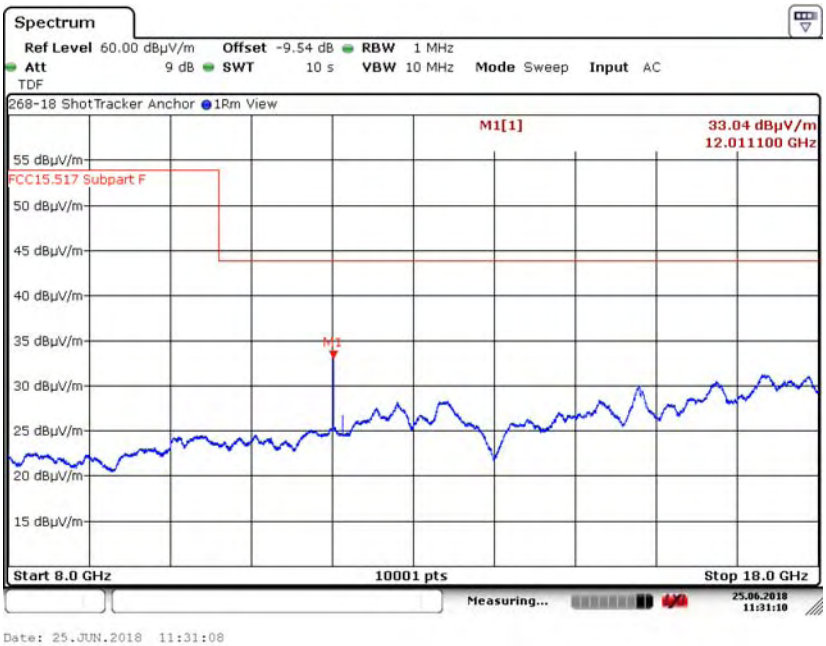
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.21. 8 to 18 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH7, 16M



6.5.22. 8 to 18 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH7, 16M



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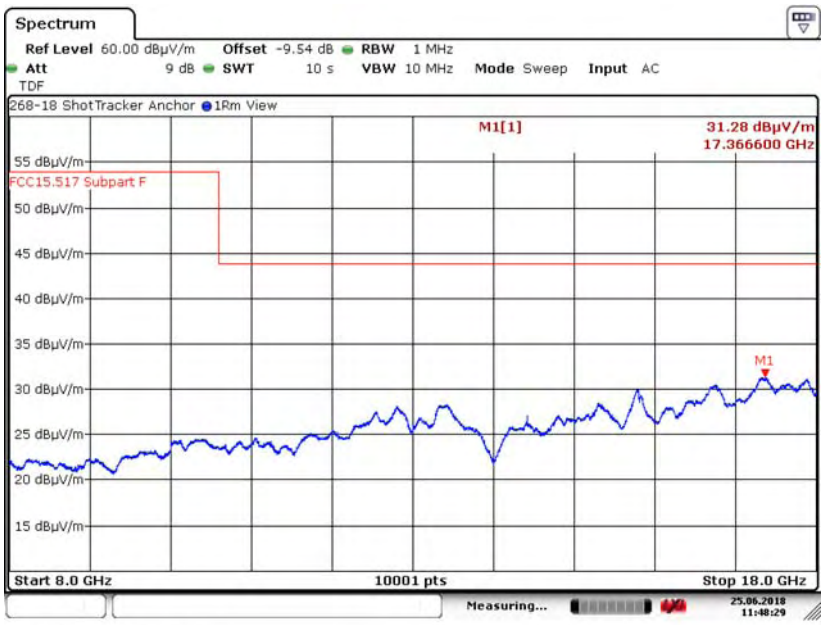
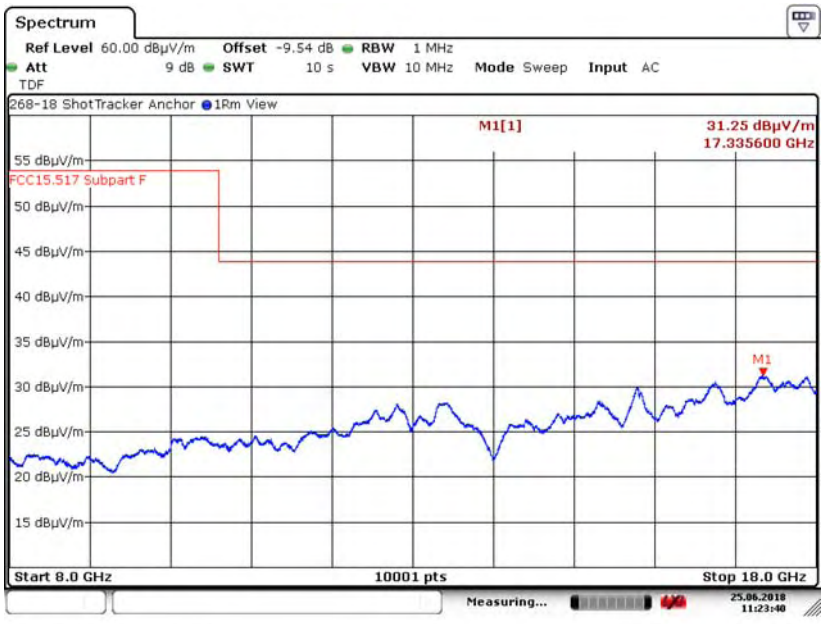
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.23. 8 to 18 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH7, 64M



6.5.24. 8 to 18 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH7, 64M



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6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.25. 18 to 40 GHz Horizontal at 0.5 Meter, -15.56 dB offset in analyzer CH3, 16M

6.5.26. 18 to 40 GHz Vertical at 0.5 Meter, -15.56 dB offset in analyzer CH3,16M

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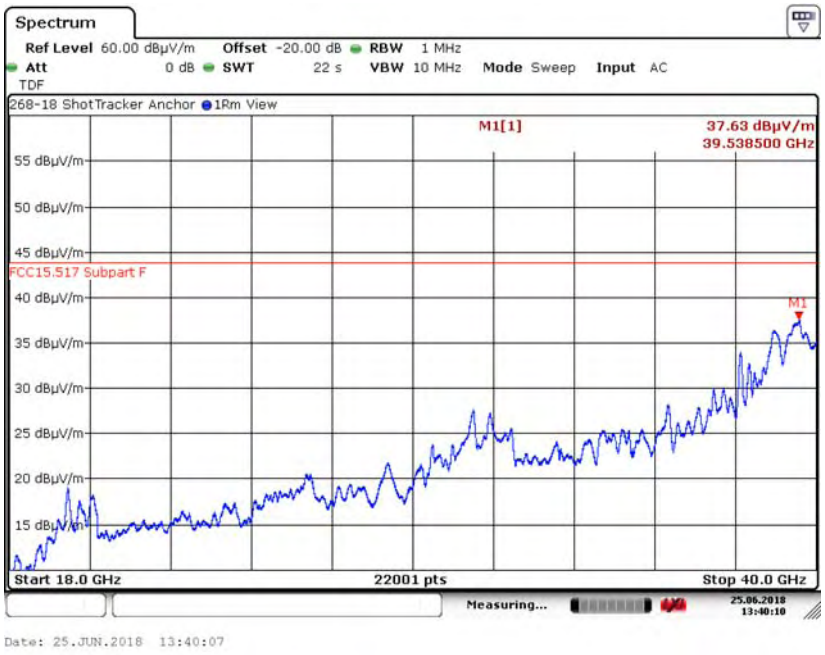
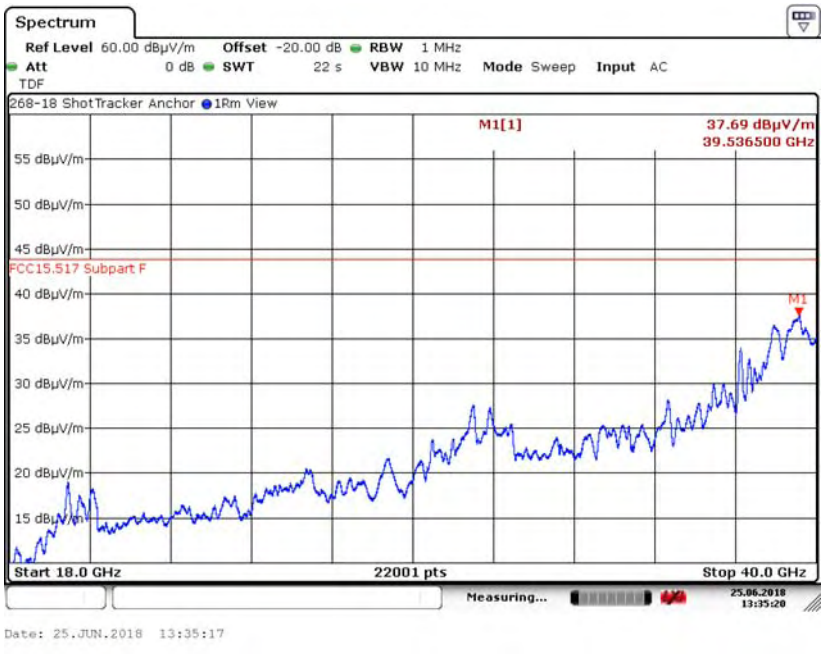
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.27. 18 to 40 GHz Horizontal at 0.5 Meter, -15.56 dB offset in analyzer CH3, 64M



6.5.28. 18 to 40 GHz Vertical at 0.5 Meter, -15.56 dB offset in analyzer CH3,64M



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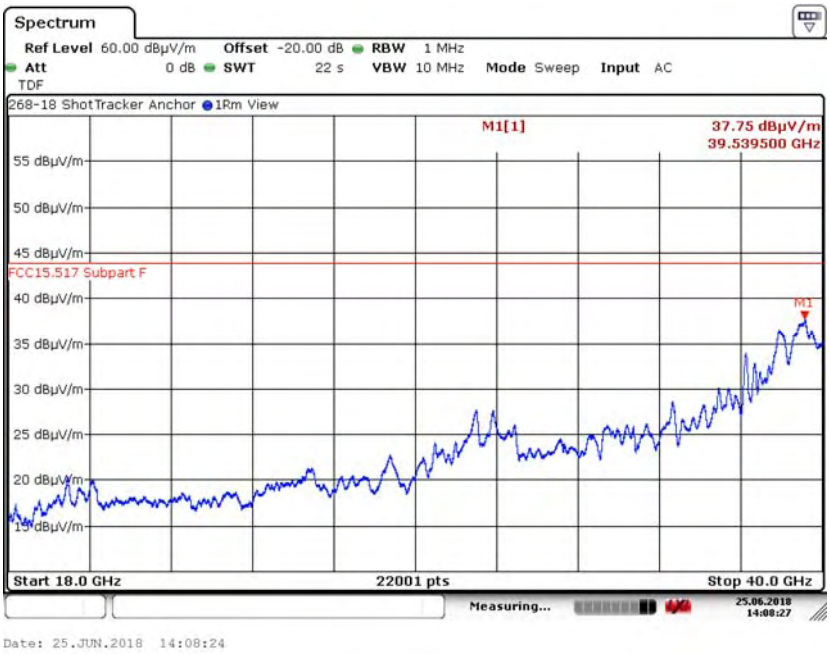
6. Measurement Data (continued)

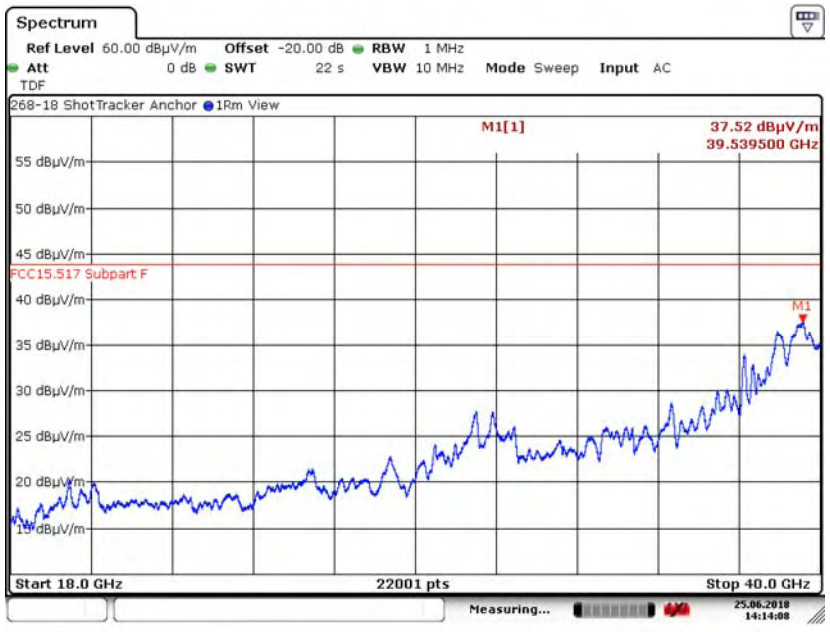
6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.29. 18 to 40 GHz Horizontal at 0.5 Meter, -15.56 dB offset in analyzer CH5, 16M



Date: 25.JUN.2018 14:08:24

6.5.30. 18 to 40 GHz Vertical at 0.5 Meter, -15.56 dB offset in analyzer CH5,16M



Date: 25.JUN.2018 14:14:05

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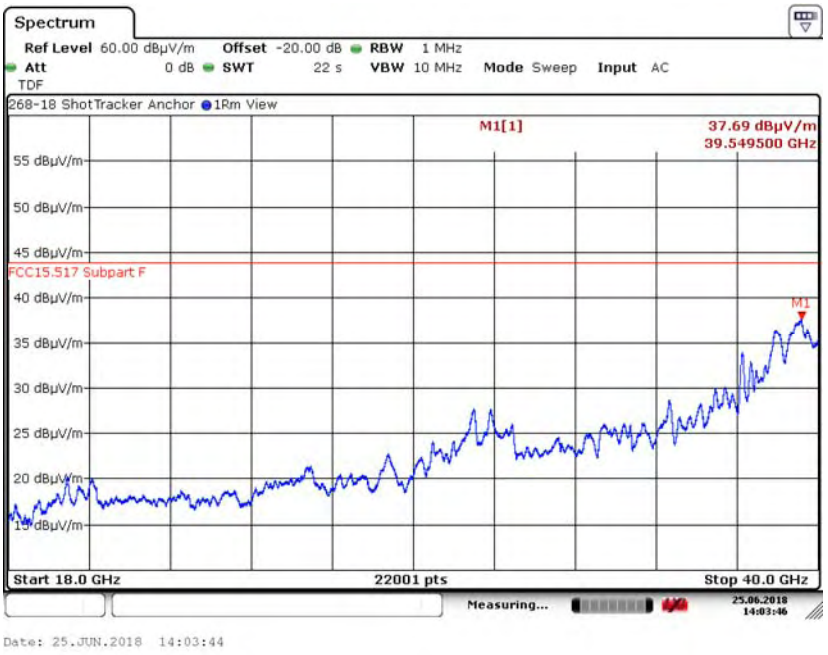
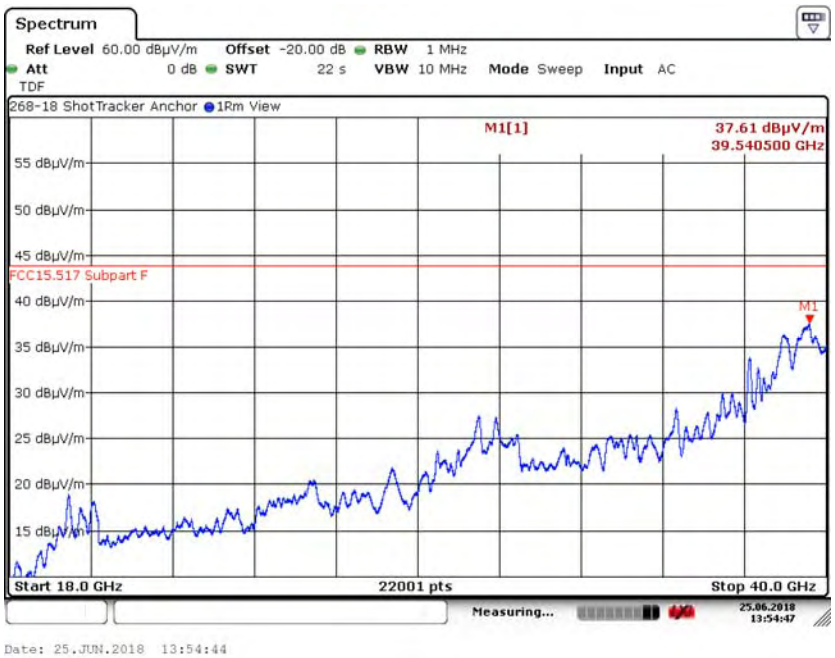
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.31. 18 to 40 GHz Horizontal at 0.5 Meter, -15.56 dB offset in analyzer CH5, 64M



6.5.32. 18 to 40 GHz Vertical at 0.5 Meter, -15.56 dB offset in analyzer CH5,64M



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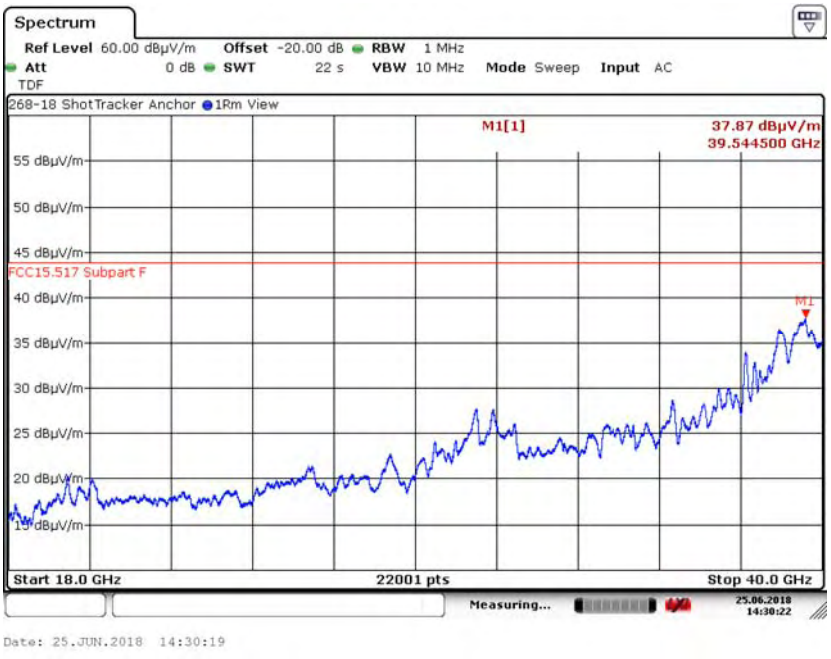
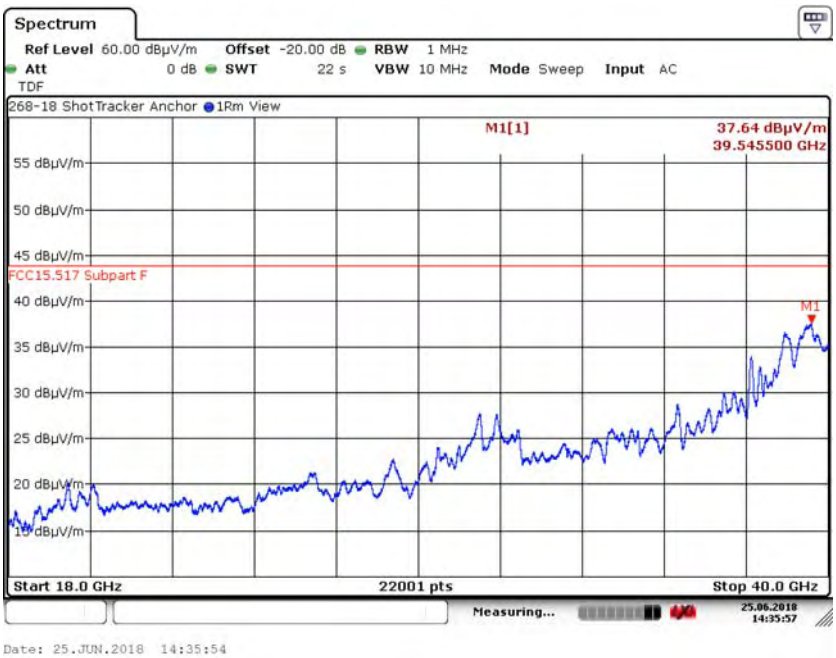
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.33. 18 to 40 GHz Horizontal at 0.5 Meter, -15.56 dB offset in analyzer CH7, 16M



6.5.34. 18 to 40 GHz Vertical at 0.5 Meter, -15.56 dB offset in analyzer CH7,16M



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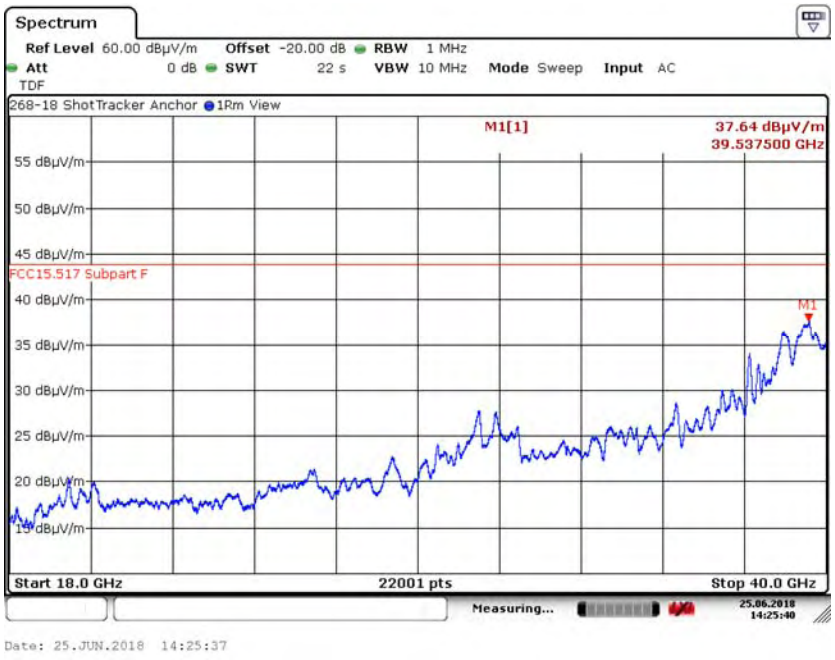
6. Measurement Data (continued)

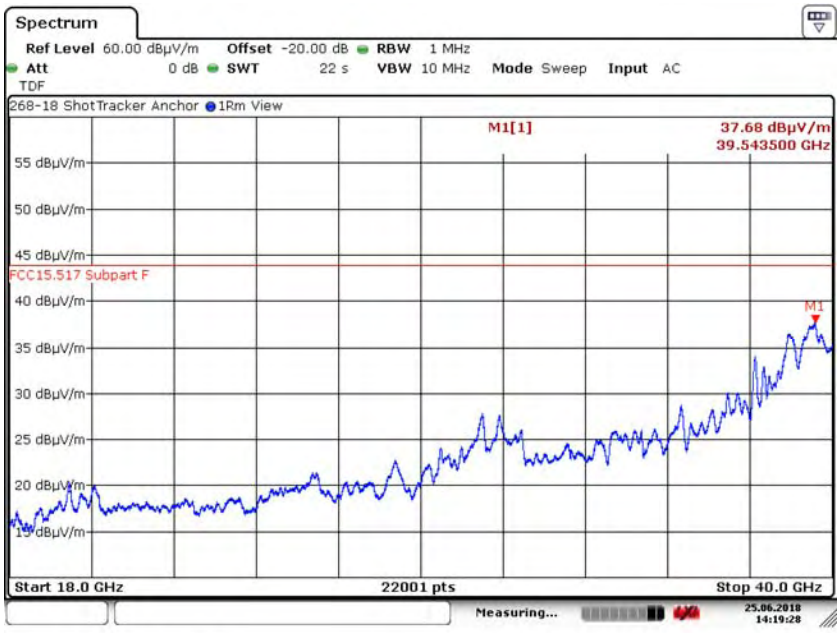
6.5. Spurious Radiated Emissions (15.517 (d) continued)

6.5.35. 18 to 40 GHz Horizontal at 0.5 Meter, -15.56 dB offset in analyzer CH7, 64M



Date: 25.JUN.2018 14:25:37

6.5.36. 18 to 40 GHz Vertical at 0.5 Meter, -15.56 dB offset in analyzer CH7,64M



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6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (RSS-220 5.2.1 (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	-51.3	43.9

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 6.5.13 to 6.5.36 on the previous pages.

Narrow band spikes in 960 to 8000 MHz plots are created by digital circuitry and not subjected to this limit.

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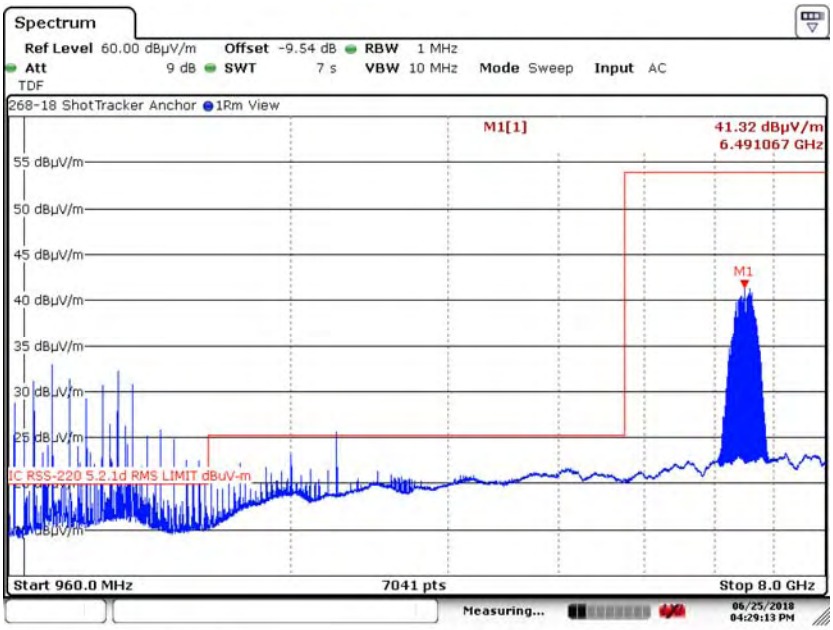
6. Measurement Data (continued)

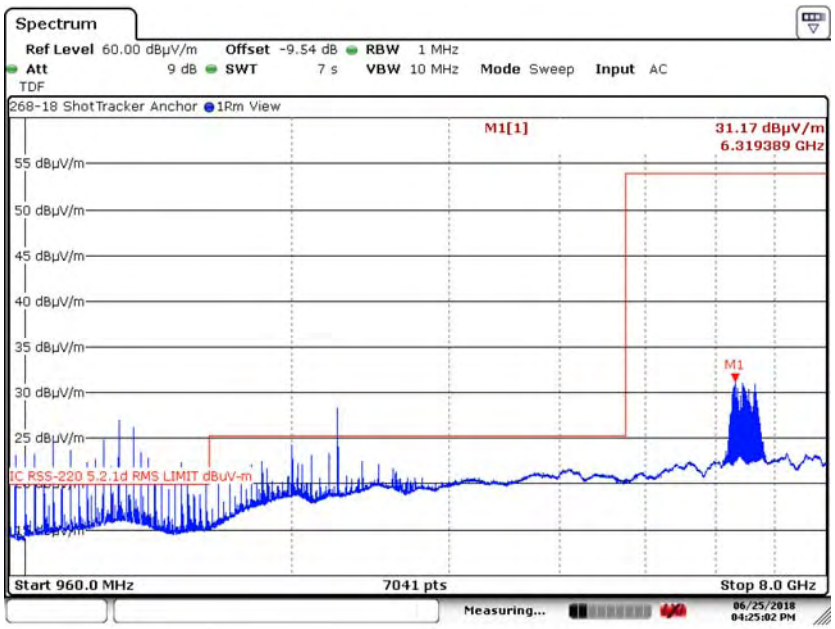
6.5. Spurious Radiated Emissions (RSS-220 5.2.1 (d)) continued)

6.5.37. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH5,16



Date: 25.JUN.2018 16:29:10

6.5.38. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH5,16M



Date: 25.JUN.2018 16:24:59

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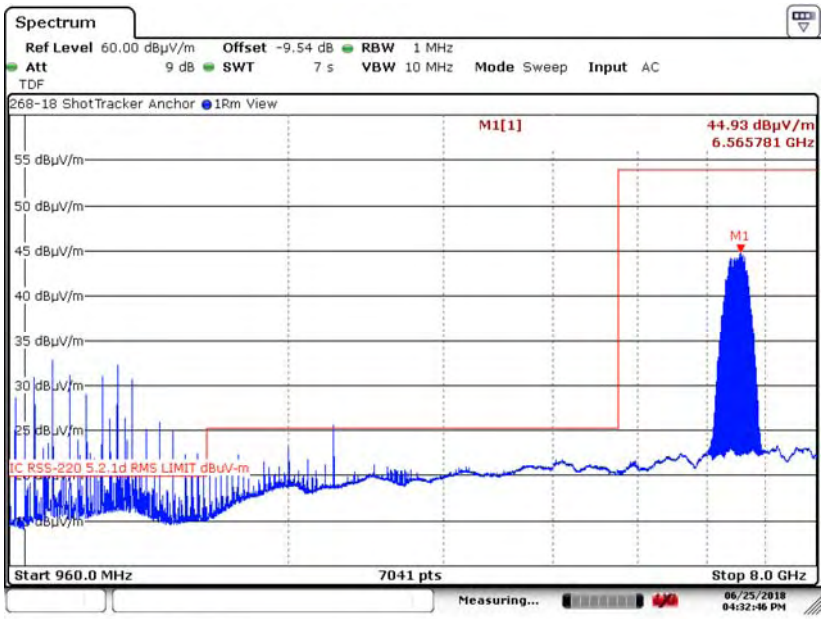
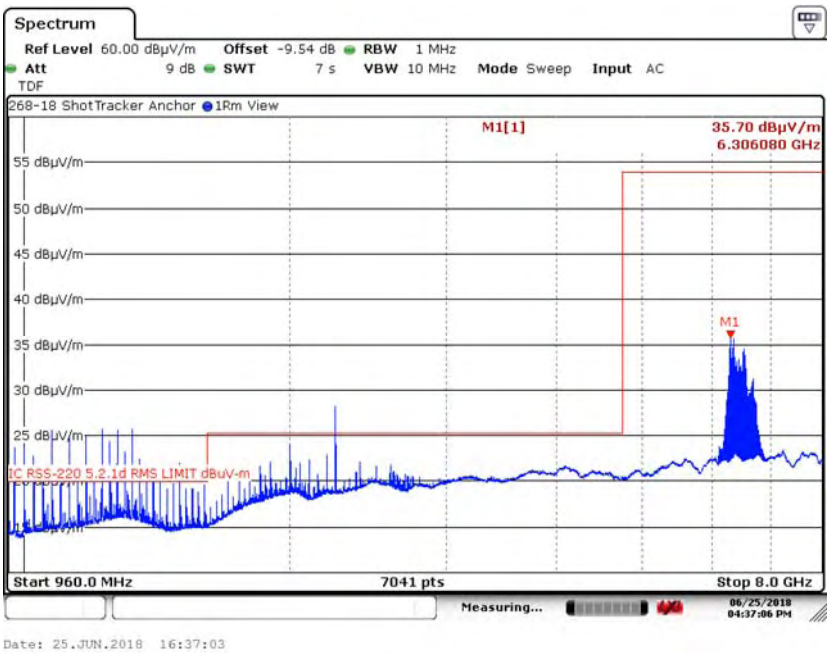
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (RSS-220 5.2.1 (d)) continued)

6.5.39. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH5,64



6.5.40. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH5,64M



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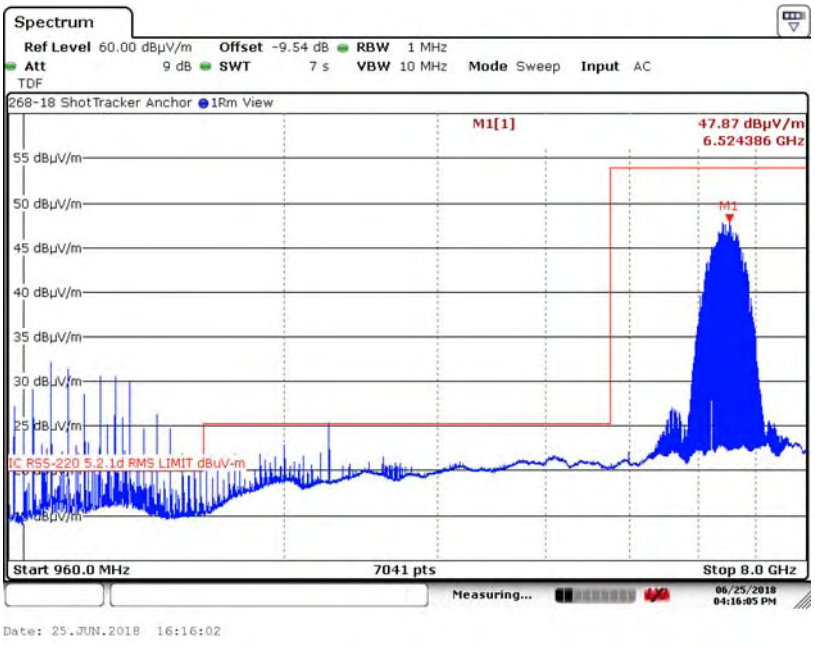
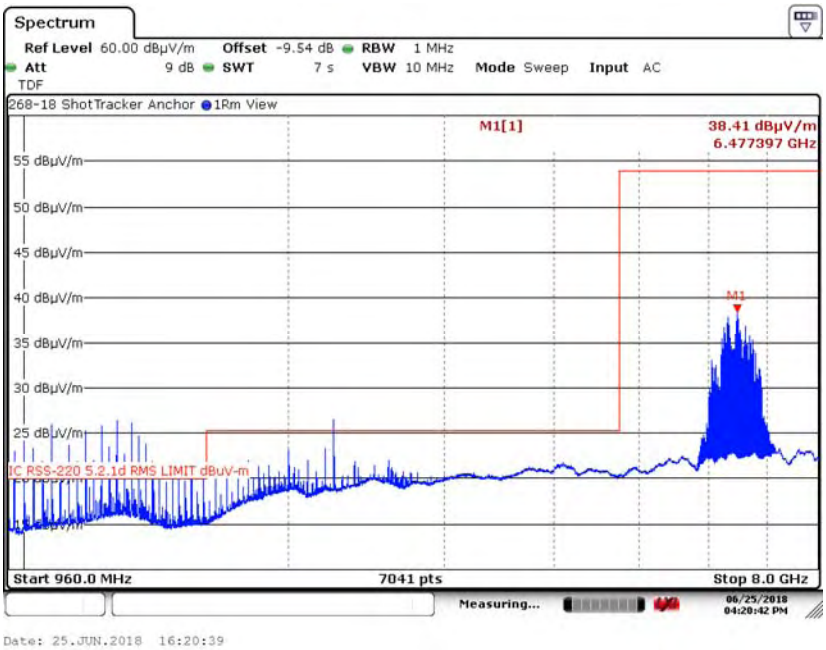
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (RSS-220 5.2.1 (d)) continued)

6.5.41. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH7,16



6.5.42. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH7,16M



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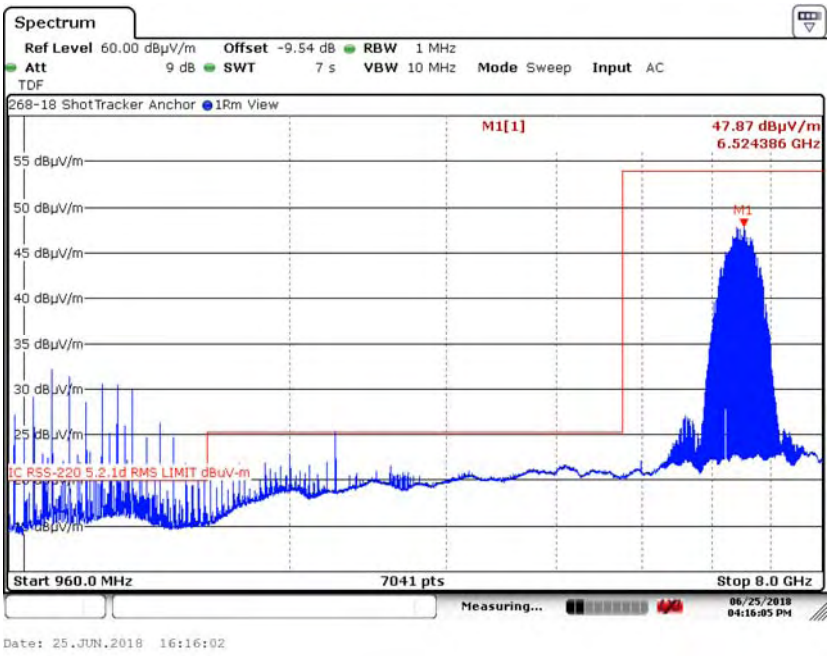
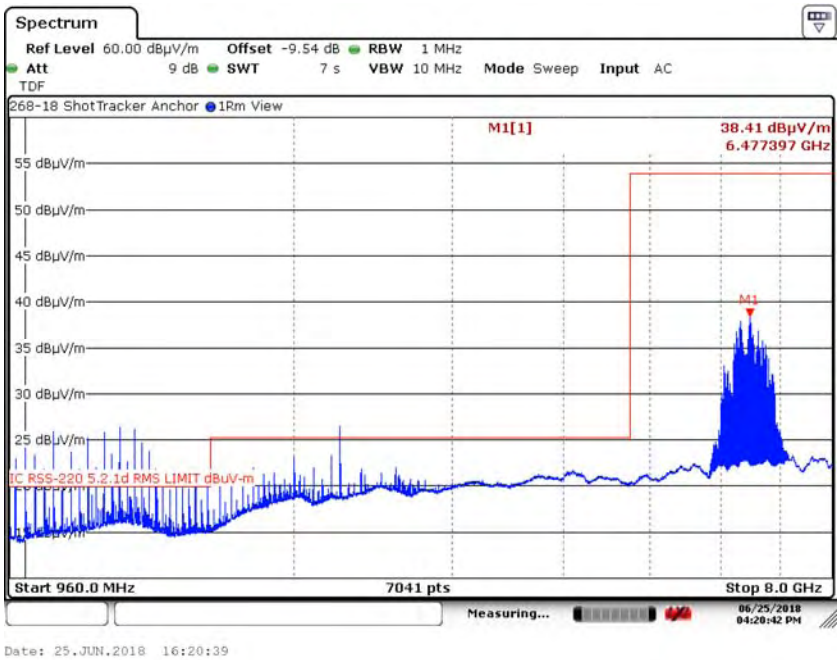
6. Measurement Data (continued)

6.5. Spurious Radiated Emissions (RSS-220 5.2.1 (d)) continued)

6.5.43. 960 MHz to 8 GHz Horizontal at 1 Meter, -9.54 dB offset in analyzer CH7,64



6.5.44. 960 MHz to 8 GHz Vertical at 1 Meter, -9.54 dB offset in analyzer CH7,64M



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6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d), RSS 5.2.1 (e))

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 1mS / point

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 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: Narrow band spikes in plots are created by digital circuitry and not subjected to this limit.

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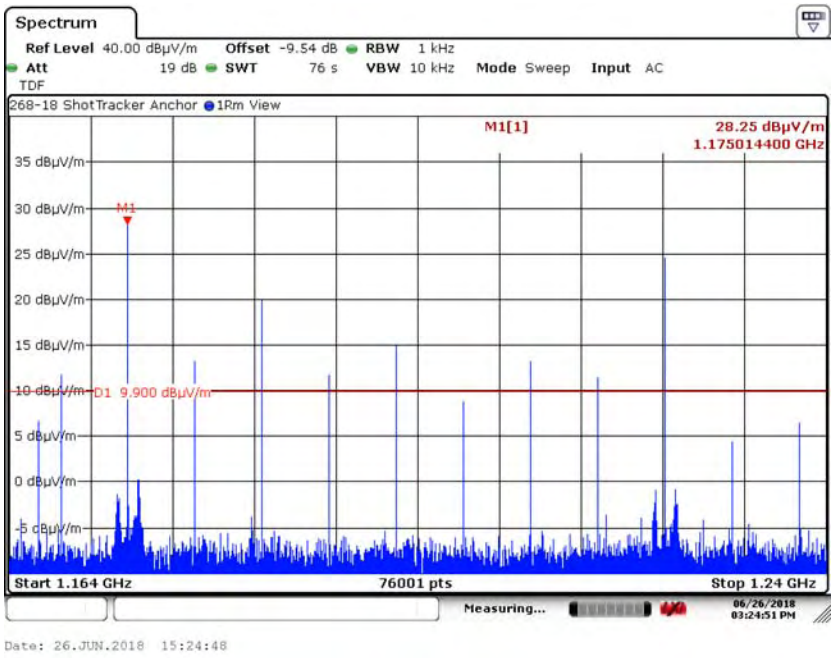
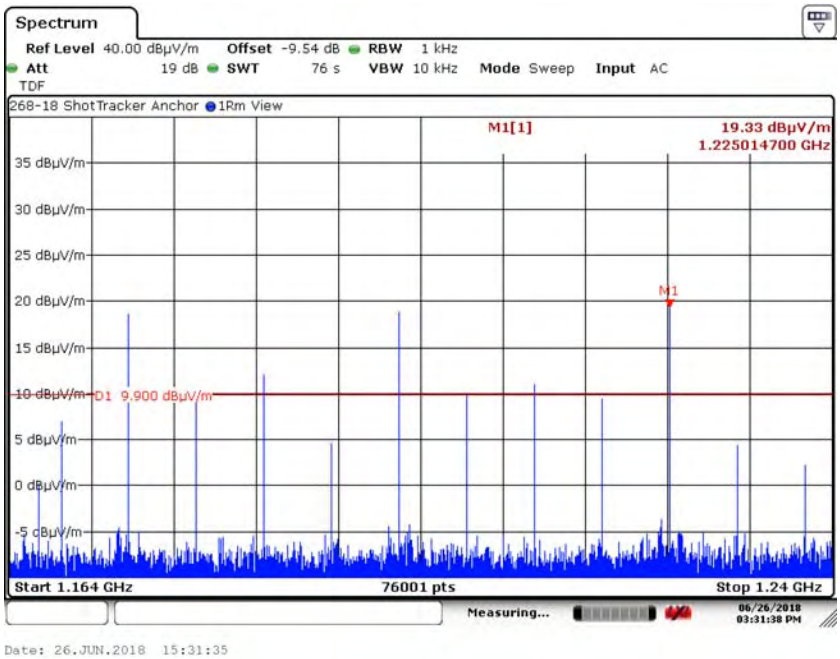
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.1 Horizontal Measurement Polarity 1164 to 1240 MHz, CH3, 16M



6.6.3.2 Vertical Measurement Polarity 1164 to 1240 MHz, CH3, 16M



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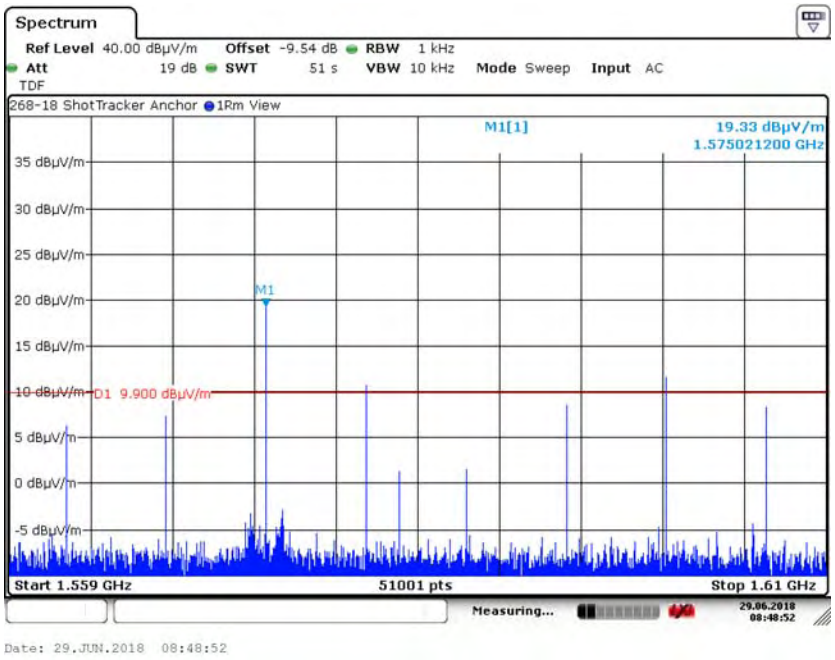
6. Measurement Data (continued)

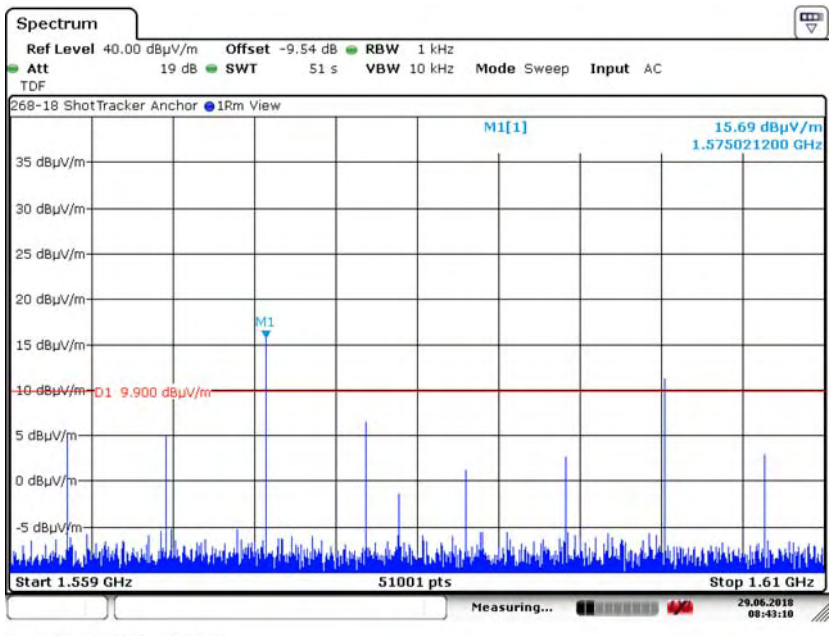
6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.3 Horizontal Measurement Polarity 1559 to 1610 MHz, CH3, 16M



Date: 29.JUN.2018 08:48:52

6.6.3.4 Vertical Measurement Polarity 1559 to 1610 MHz, CH3, 16M



Date: 29.JUN.2018 08:43:10

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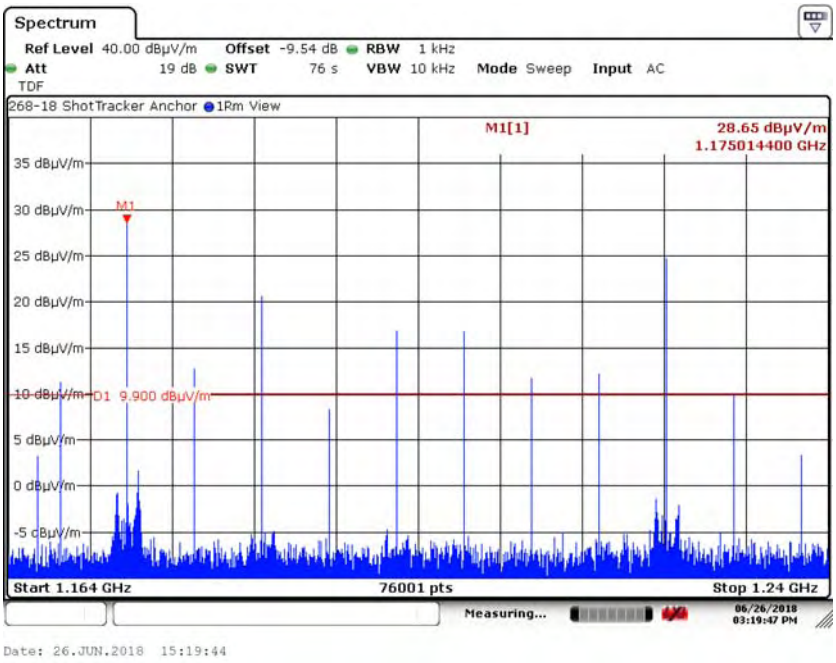
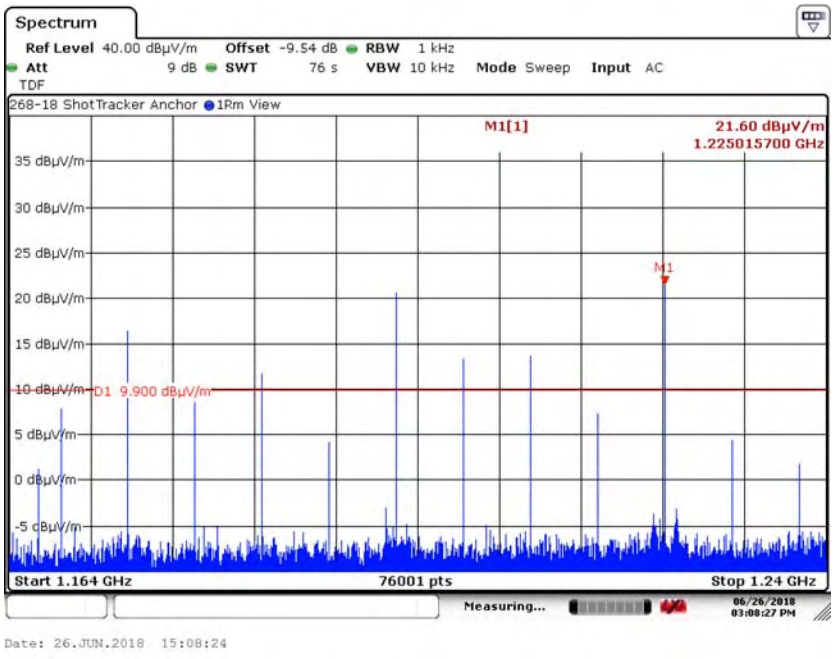
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.5 Horizontal Measurement Polarity 1164 to 1240 MHz, CH3, 64M



6.6.3.6 Vertical Measurement Polarity 1164 to 1240 MHz, CH3, 64M



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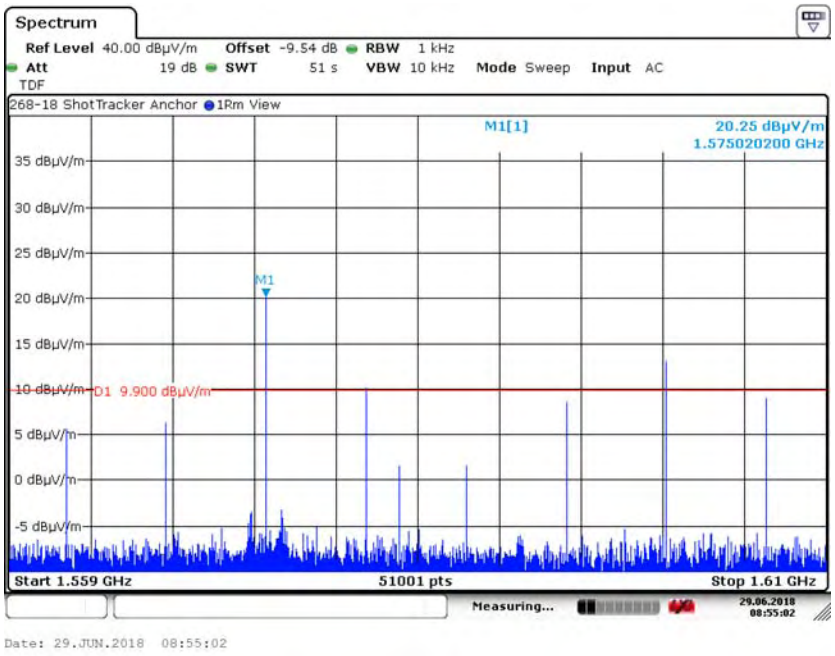
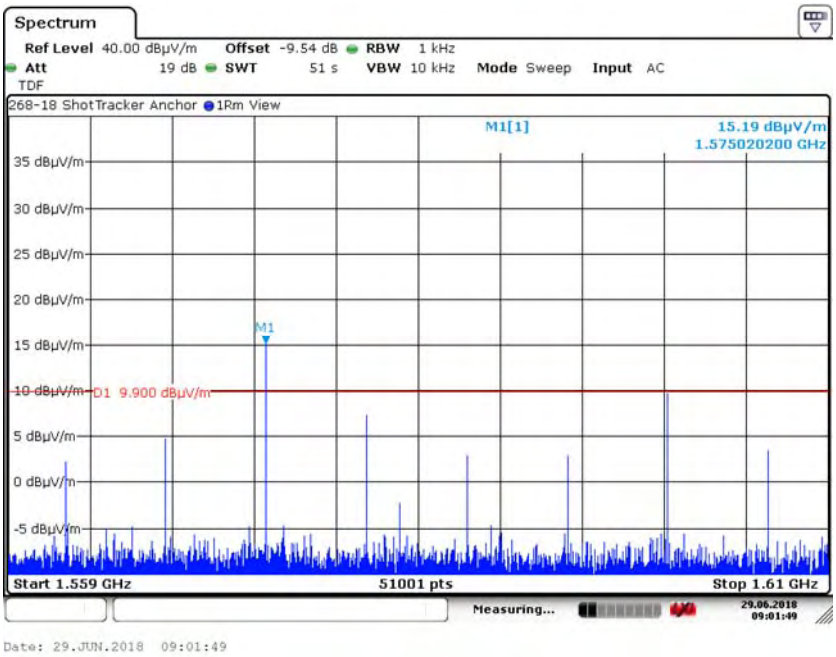
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.7 Horizontal Measurement Polarity 1559 to 1610 MHz, CH3, 64M



6.6.3.8 Vertical Measurement Polarity 1559 to 1610 MHz, CH3, 64M



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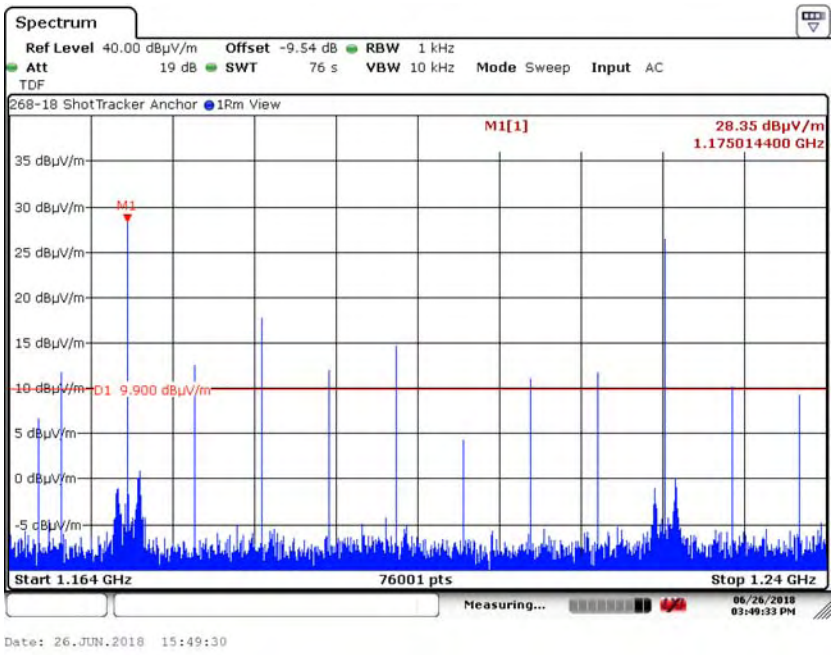
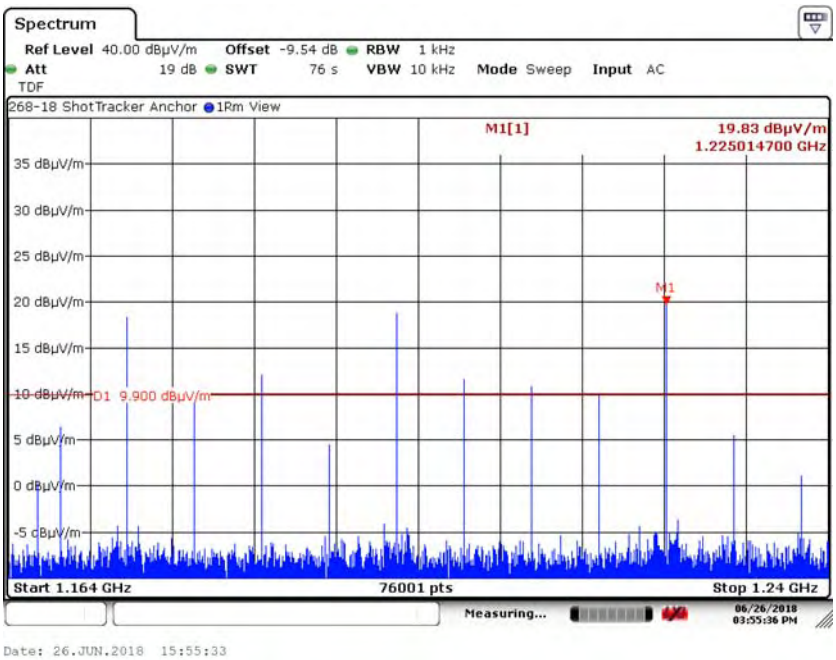
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.9 Horizontal Measurement Polarity 1164 to 1240 MHz, CH5, 16M



6.6.3.10 Vertical Measurement Polarity 1164 to 1240 MHz, CH5, 16M



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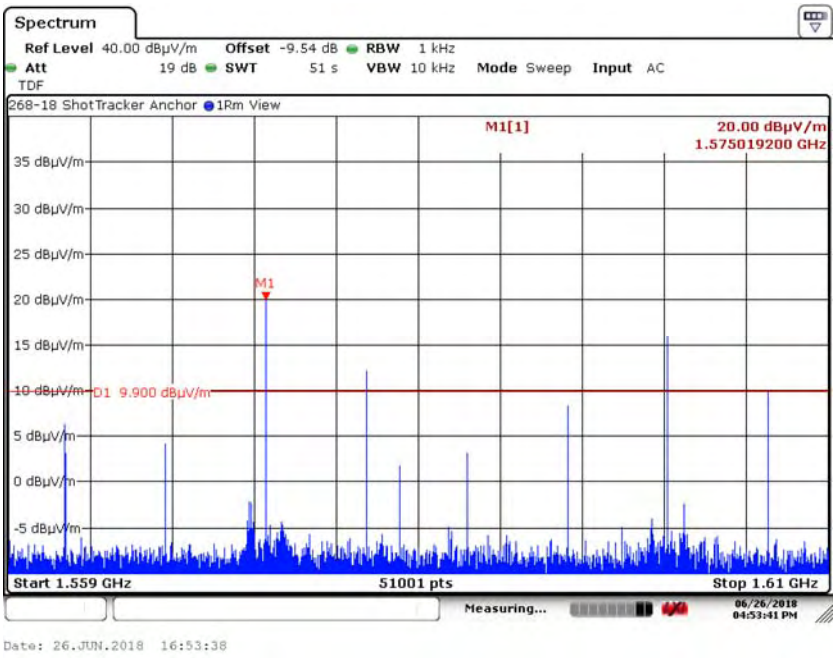
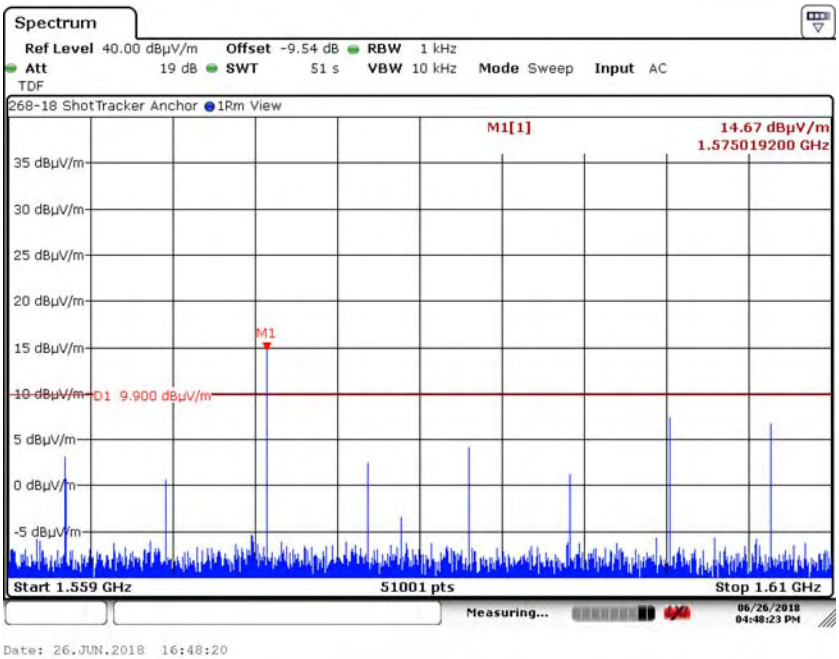
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.11 Horizontal Measurement Polarity 1559 to 1610 MHz, CH5, 16M



6.6.3.12 Vertical Measurement Polarity 1559 to 1610 MHz, CH5, 16M



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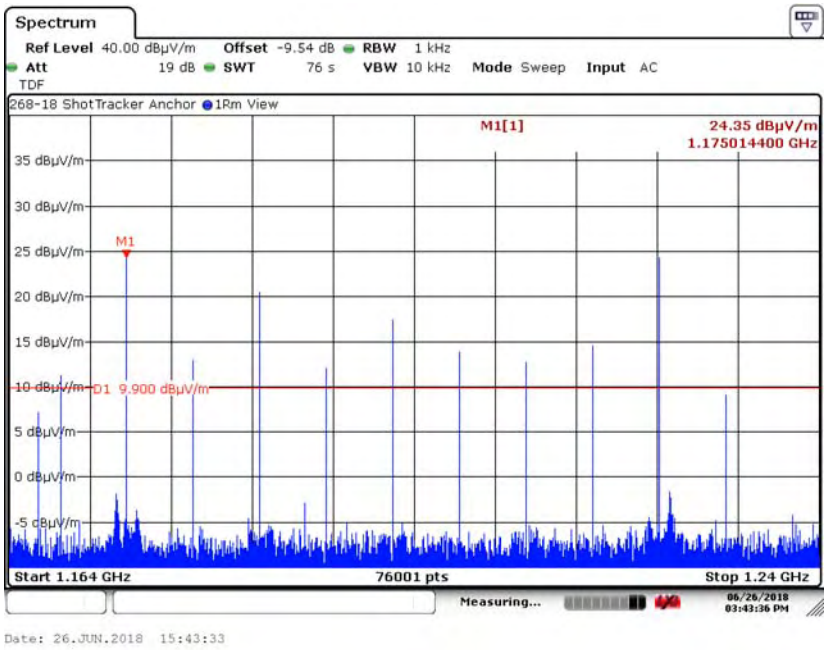
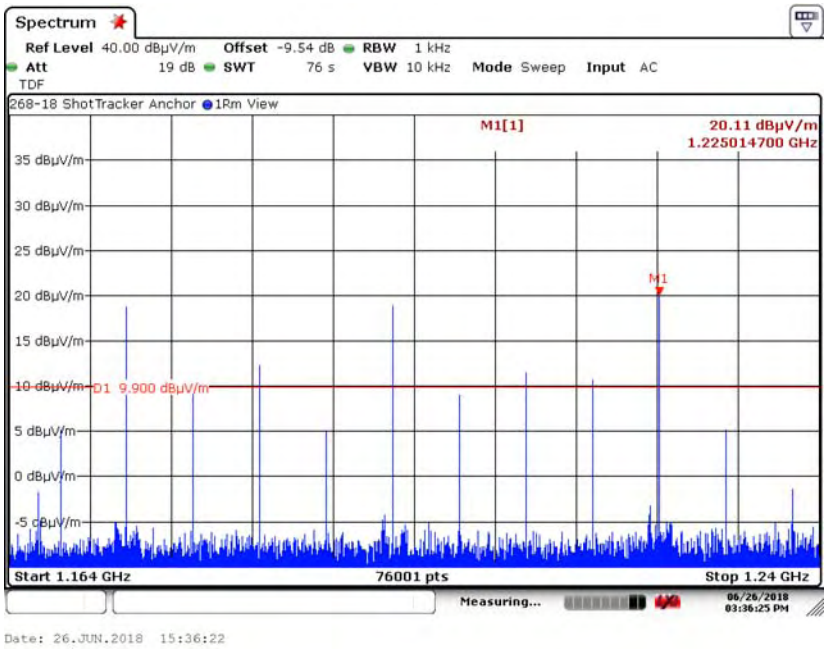
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.13 Horizontal Measurement Polarity 1164 to 1240 MHz, CH5, 64M



6.6.3.14 Vertical Measurement Polarity 1164 to 1240 MHz, CH5, 64M



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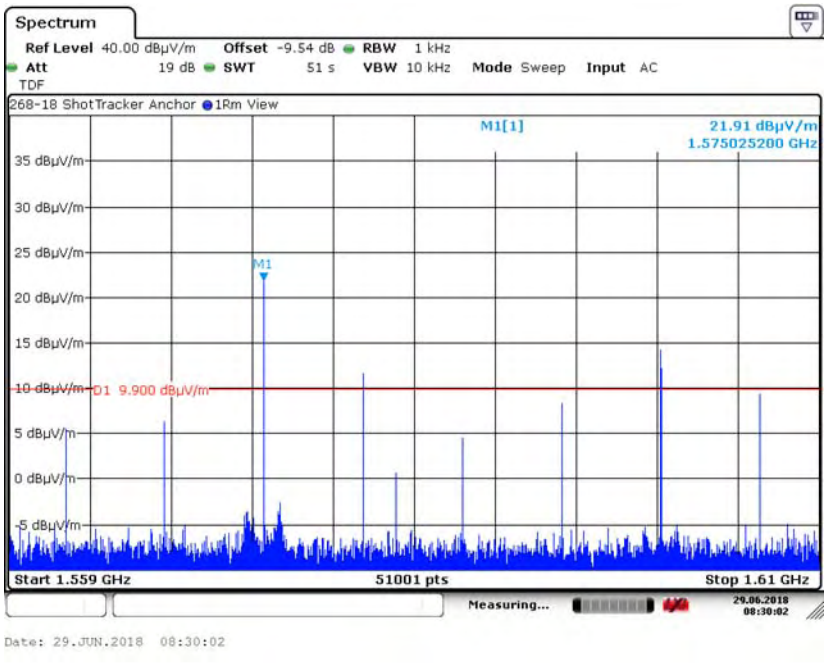
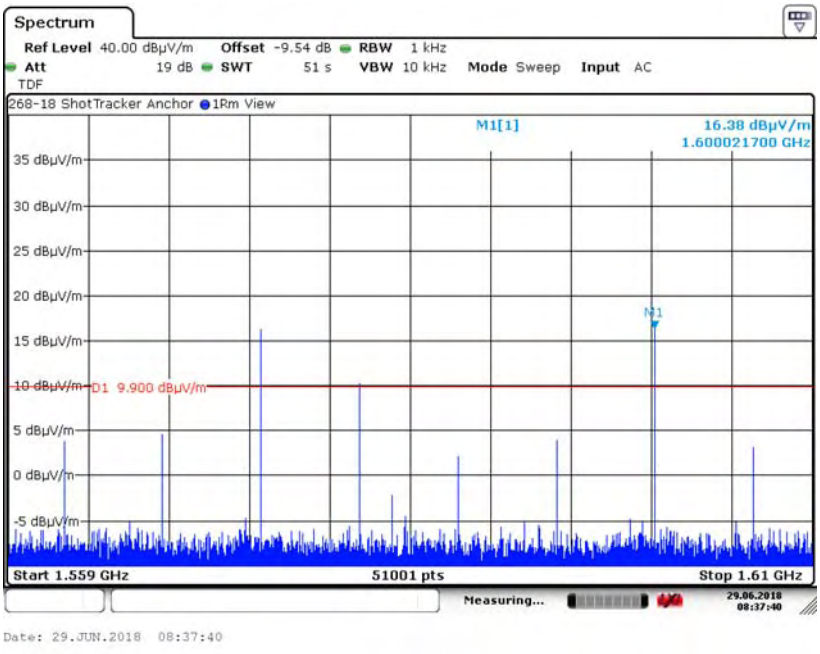
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.15 Horizontal Measurement Polarity 1559 to 1610 MHz, CH5, 64M



6.6.3.16 Vertical Measurement Polarity 1559 to 1610 MHz, CH5, 64M



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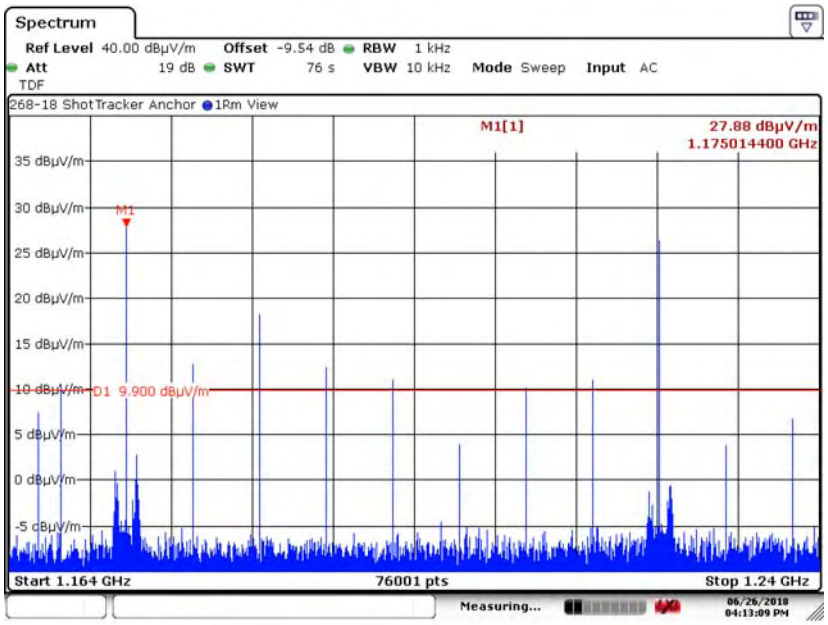
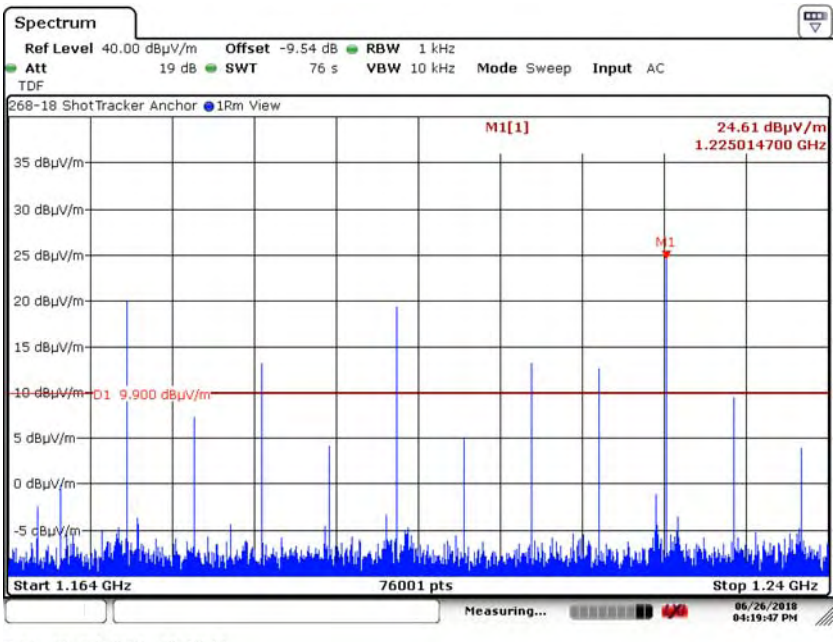
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.17 Horizontal Measurement Polarity 1164 to 1240 MHz, CH7, 16M



6.6.3.18 Vertical Measurement Polarity 1164 to 1240 MHz, CH7, 16M



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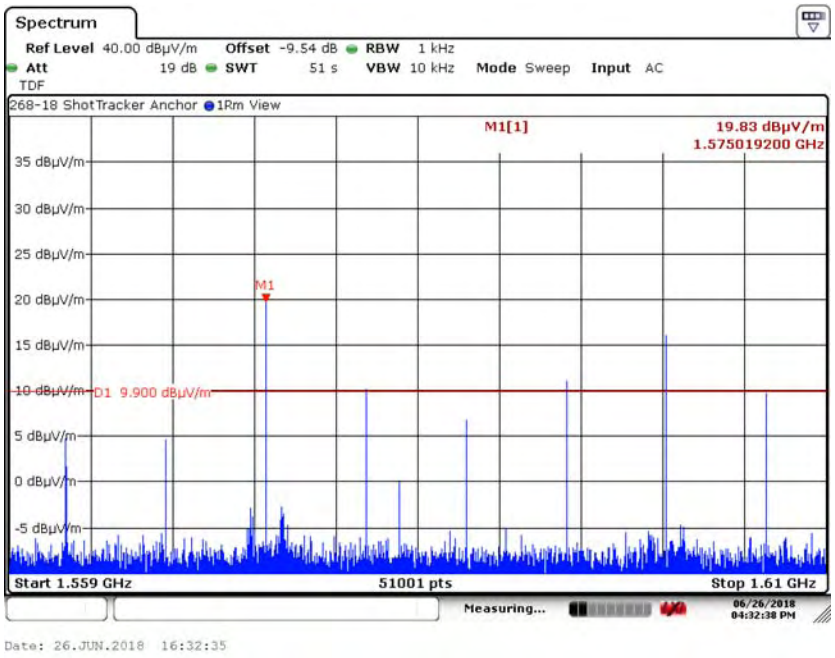
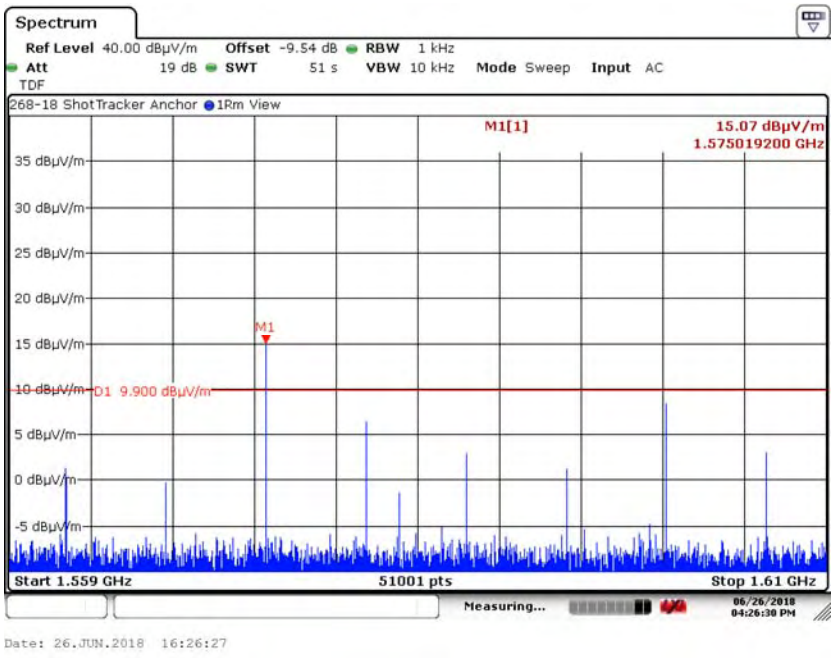
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.19 Horizontal Measurement Polarity 1559 to 1610 MHz, CH7, 16M



6.6.3.20 Vertical Measurement Polarity 1559 to 1610 MHz, CH7, 16M



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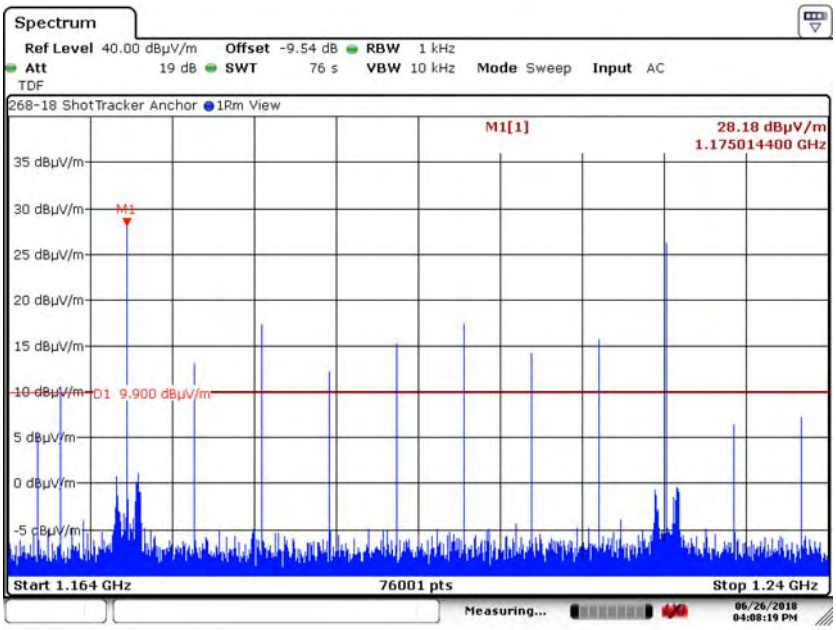
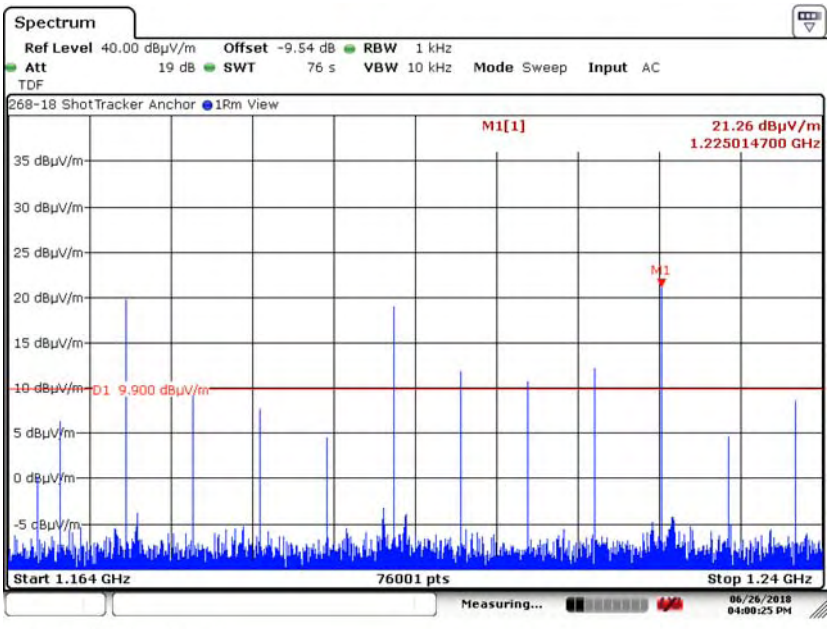
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.21 Horizontal Measurement Polarity 1164 to 1240 MHz, CH7, 64M



6.6.3.22 Vertical Measurement Polarity 1164 to 1240 MHz, CH7, 64M



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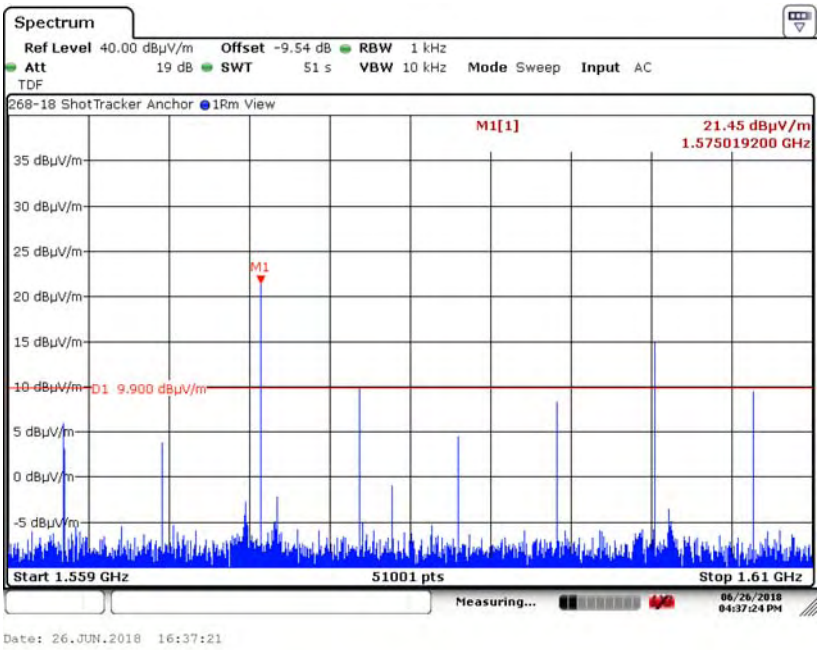
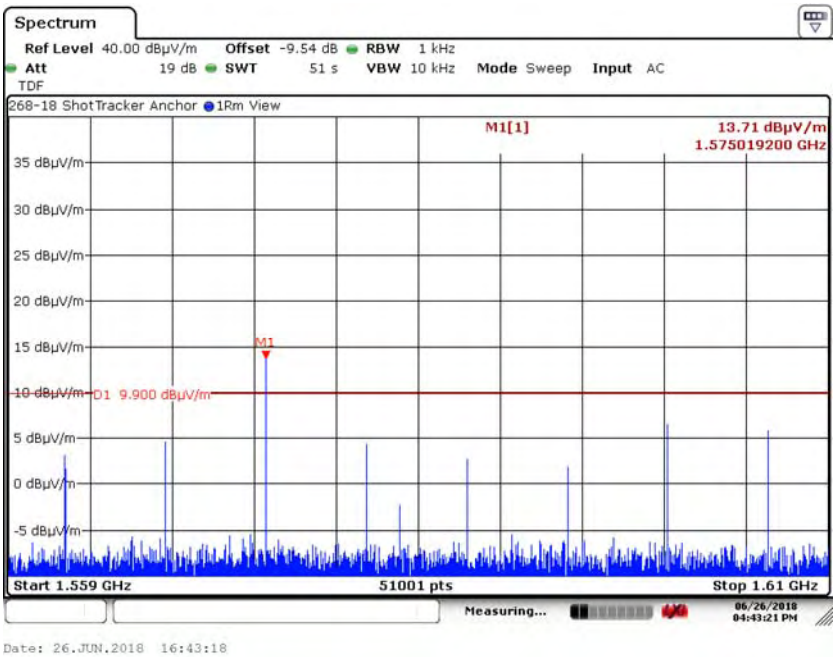
6. Measurement Data (continued)

6.6. Spurious Radiated Emissions in GPS Bands (15.517 (d) continued)

6.6.3.23 Horizontal Measurement Polarity 1559 to 1610 MHz, CH7, 64M



6.6.3.24 Vertical Measurement Polarity 1559 to 1610 MHz, CH7, 64M



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6. Measurement Data (continued)

6.7. Radiated Emissions of UWB Transmission (15.517 (c), 15.521 (d), RSS-220 5.2.1)

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:	4 to 5 GHz, 6 to 7 GHz & 5.5 to 7.5 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)

.

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6. Measurement Data (continued)

6.7. Spurious Radiated Emissions (15.517 (c), 15.521(d), RSS-220 5.2.1 (d))

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

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
4.4939	49.70	53.90	-4.20	H	104	314	Compliant

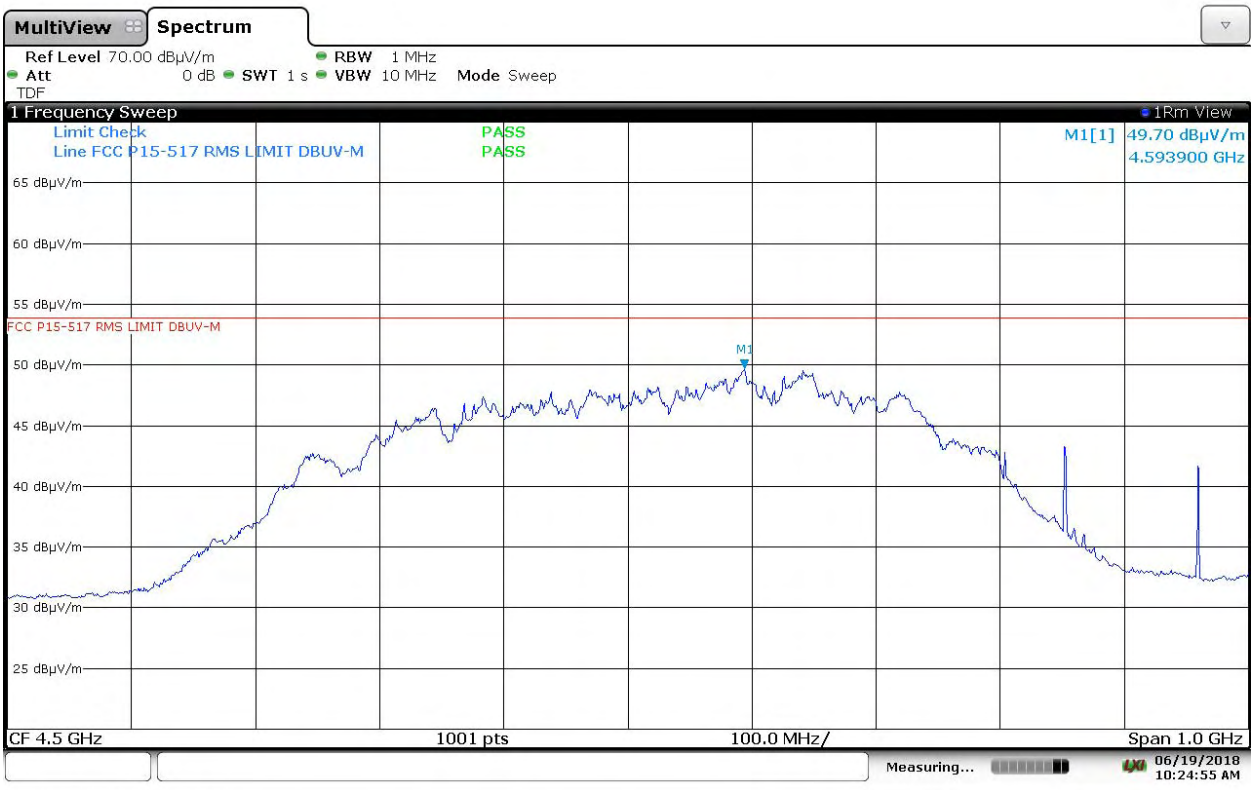
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
4.4939	-45.50	-41.30	-4.20	H	104	314	Compliant

268-18 ShotTracker Anchor



10:24:56 AM 06/19/2018

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6. Measurement Data (continued)

6.7. Spurious Radiated Emissions (15.517 (c), 15.521(d), RSS-220 5.2.1(d)) continued

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

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
4.5939	53.50	53.90	-0.40	H	104	314	Compliant

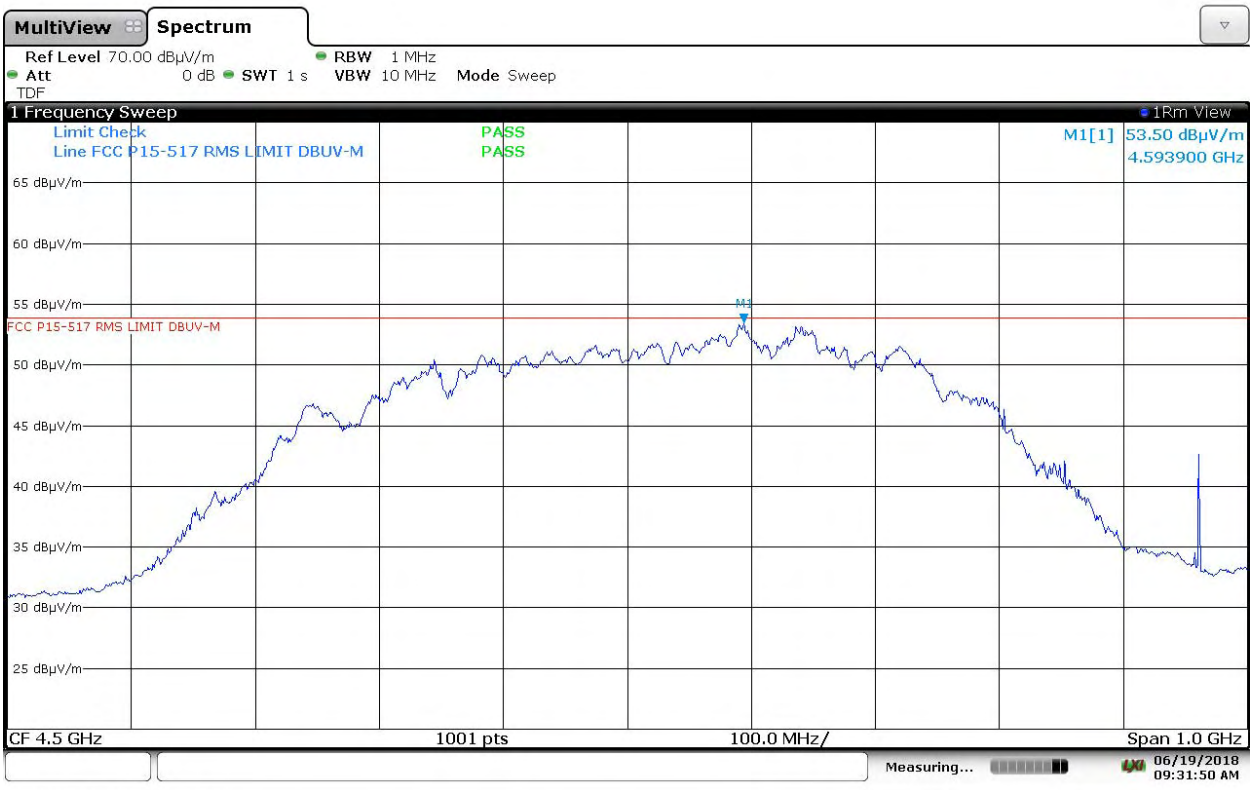
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
4.5939	-41.70	-41.30	-0.40	H	104	314	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.7. Spurious Radiated Emissions (15.517 (c), 15.521(d), RSS-220 5.2.1(d)) continued

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

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.490	49.14	53.90	-4.76	H	107	319	Compliant

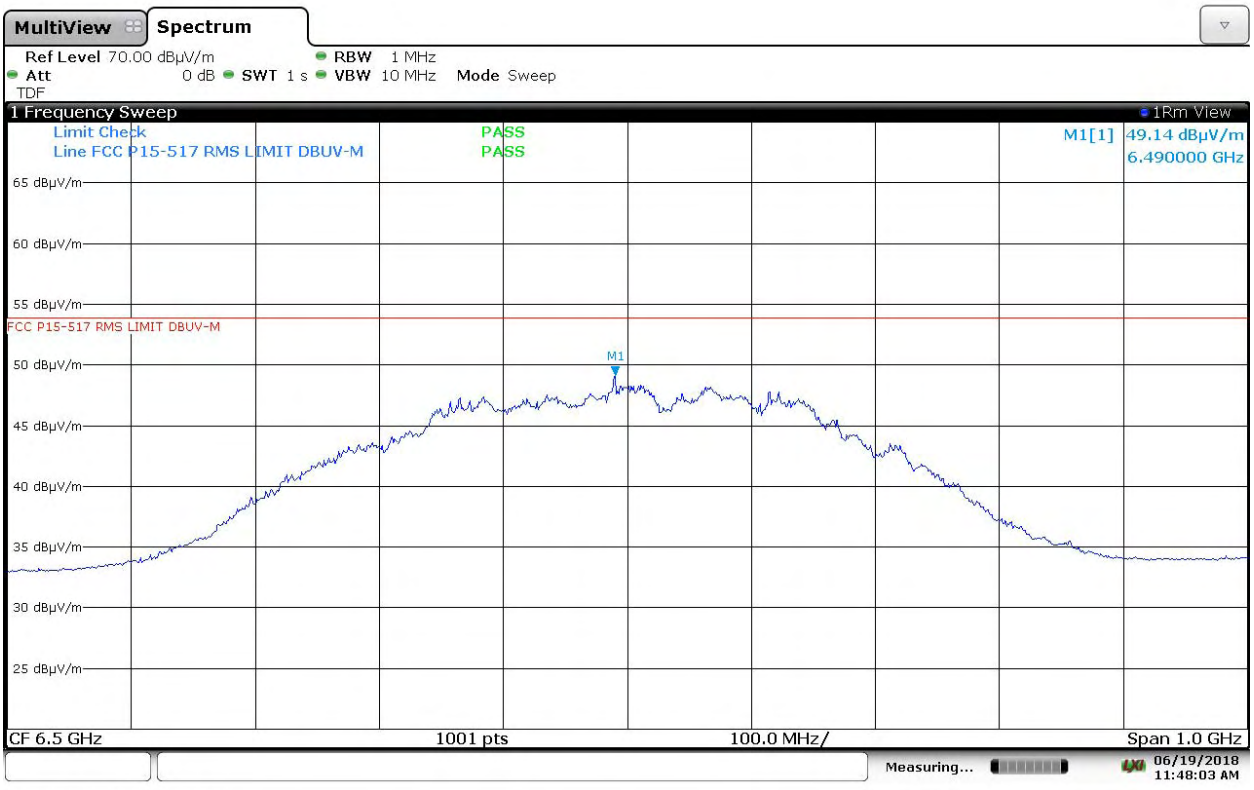
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	-46.06	-41.30	-4.76	H	107	319	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.7. Spurious Radiated Emissions (15.517 (c), 15.521(d), RSS-220 5.2.1(d)) continued

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

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.490	52.45	53.90	-1.45	H	107	319	Compliant

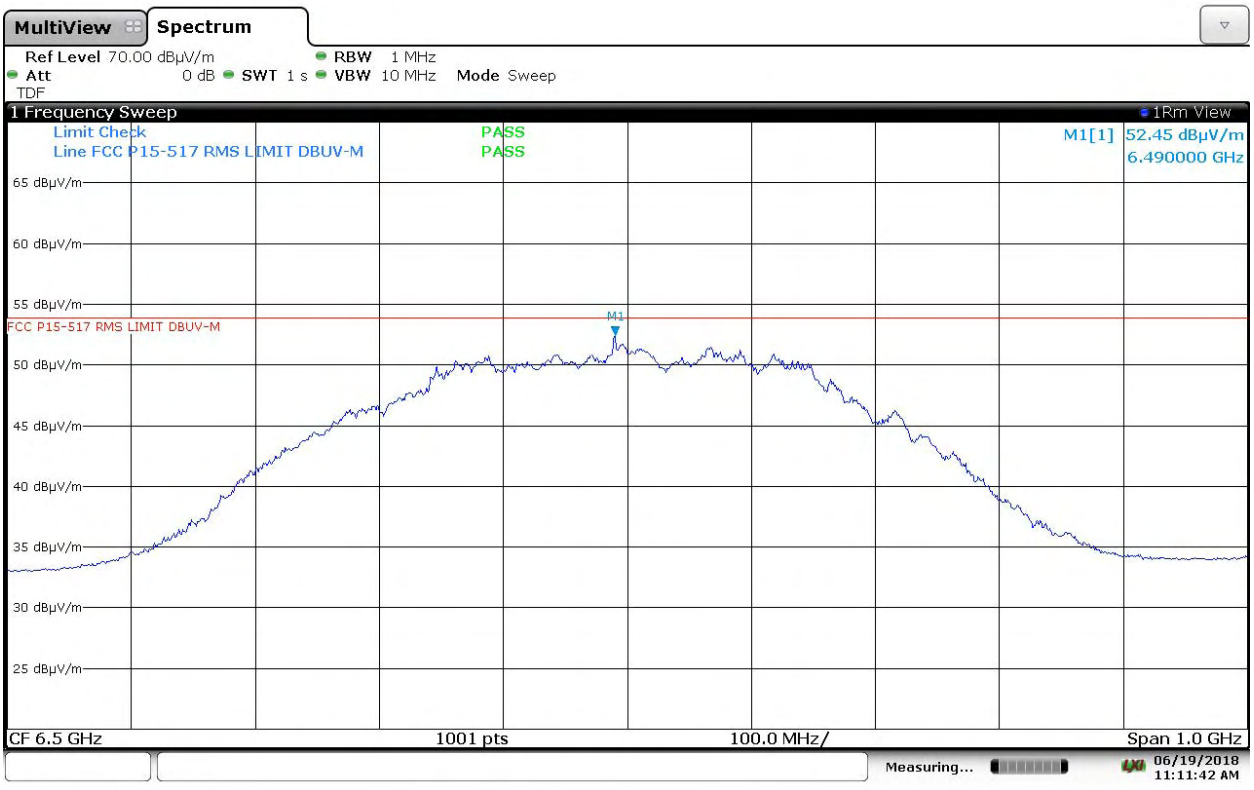
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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

EIRP (dBm) = E_{meas} (dBµV/m) – 95.2

Frequency (GHz)	Amplitude[1] (dBm)	Limit (dBm)	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	EIRP	EIRP	(dB)	H/V	cm	Deg	
6.490	-42.75	-41.30	-1.45	H	107	319	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.7. Spurious Radiated Emissions (15.517 (c), 15.521(d), RSS-220 5.2.1(d)) continued

6.7.5. Plot of RMS Power at 3 Meters (Channel 7, 16M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.494	49.25	53.90	-4.65	H	107	319	Compliant

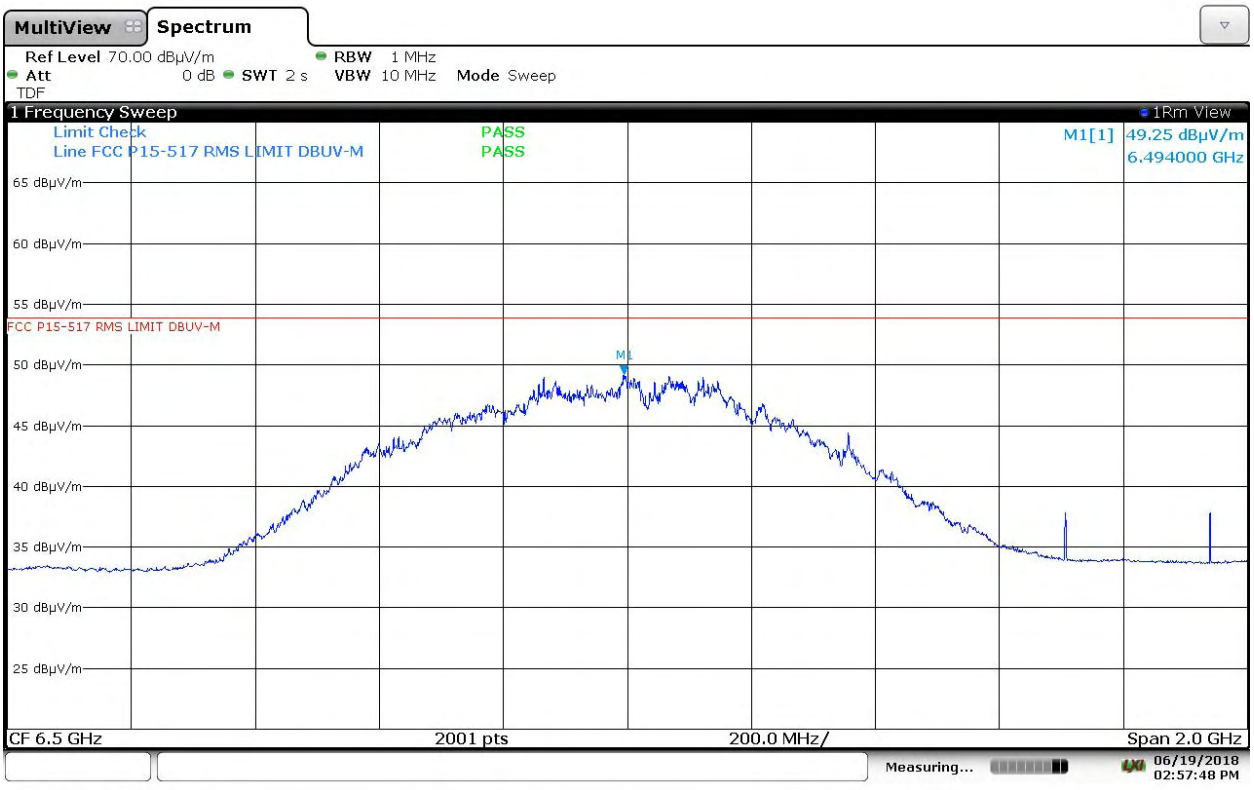
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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

EIRP (dBm) = E_{meas} (dBµV/m) – 95.2

Frequency (GHz)	Amplitude[1] (dBm)	Limit (dBm)	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	EIRP	EIRP	(dB)	H/V	cm	Deg	
6.494	-45.95	-41.30	-4.65	H	107	319	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.7. Spurious Radiated Emissions (15.517 (c), 15.521(d), RSS-220 5.2.1(d)) continued

6.7.6. Plot of RMS Power at 3 Meters (Channel 7, 64M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.501	52.98	53.90	-0.92	H	107	319	Compliant

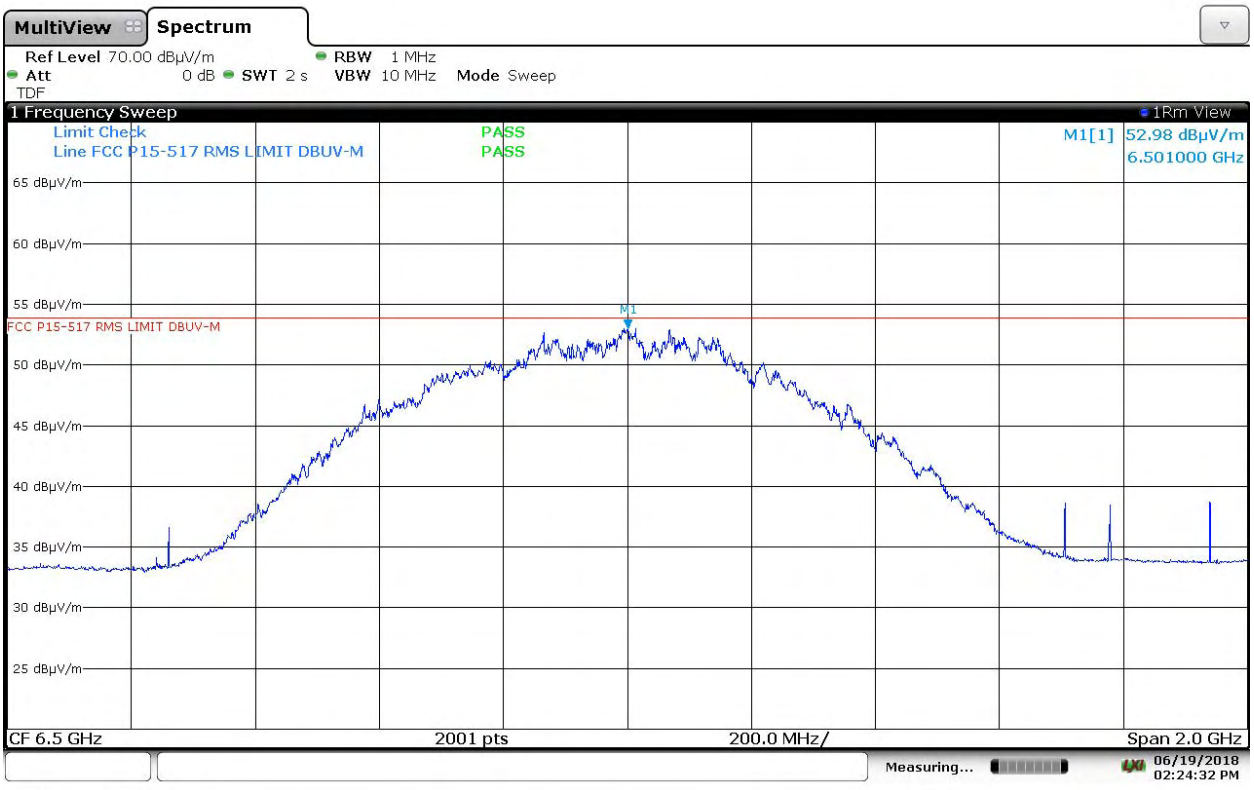
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
6.501	-42.22	-41.30	-0.92	H	107	319	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.8. Peak Emissions in a 50 MHz Bandwidth (15.517 (e), 15.521 (g), RSS-220 5.2.1(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:	4 to 5 GHz, 6 to 7 GHz & 5.5 to 7.5 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 (15.517 (e), 15.521 (g) continued)

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

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
4.5719	95.19	95.20	-0.01	H	104	314	Compliant

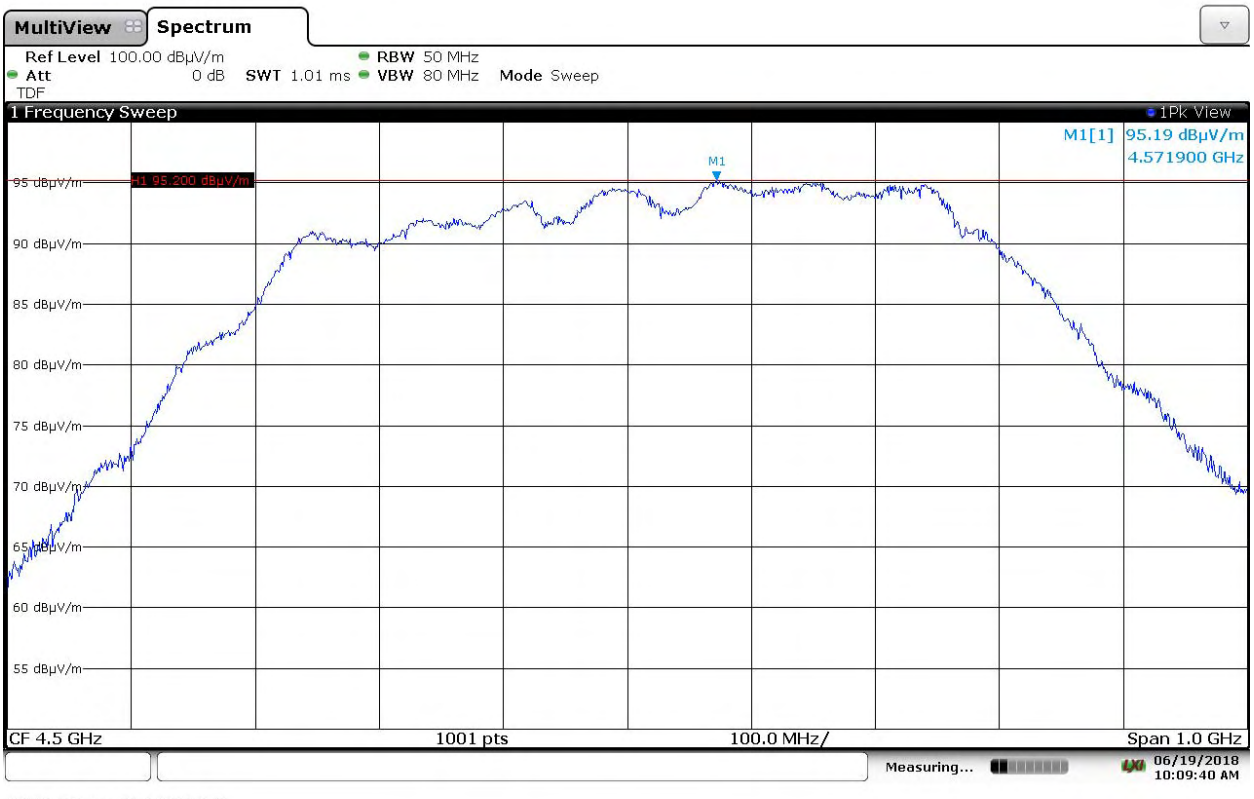
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
4.5719	-0.01	0.00	-0.01	H	104	314	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.8. Peak Emissions in a 50 MHz Bandwidth (15.517 (e), 15.521 (g) continued)

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

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
4.490	95.13	95.20	-0.07	H	104	314	Compliant

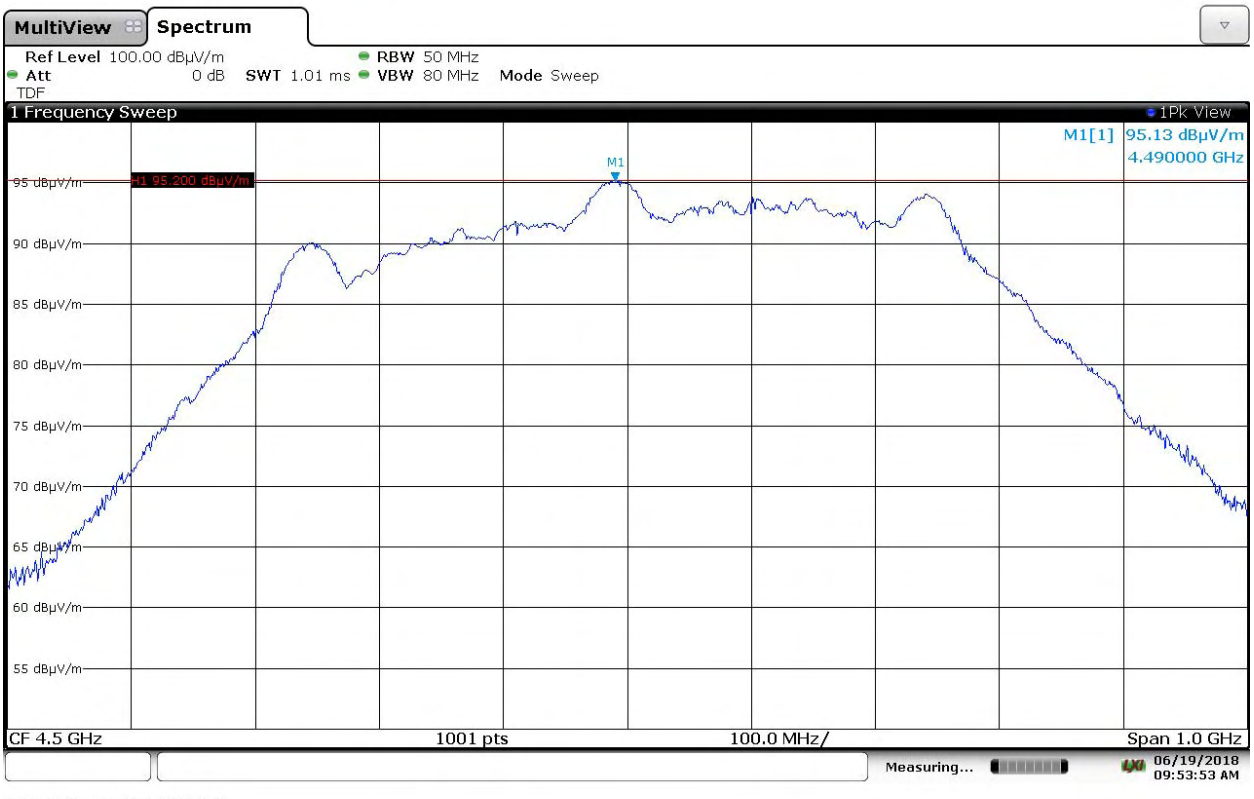
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
4.490	-0.07	0.00	-0.07	H	104	314	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.8. Peak Emissions in a 50 MHz Bandwidth (15.517 (e), 15.521 (g) continued)

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

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.492	95.06	95.20	-0.14	H	107	319	Compliant

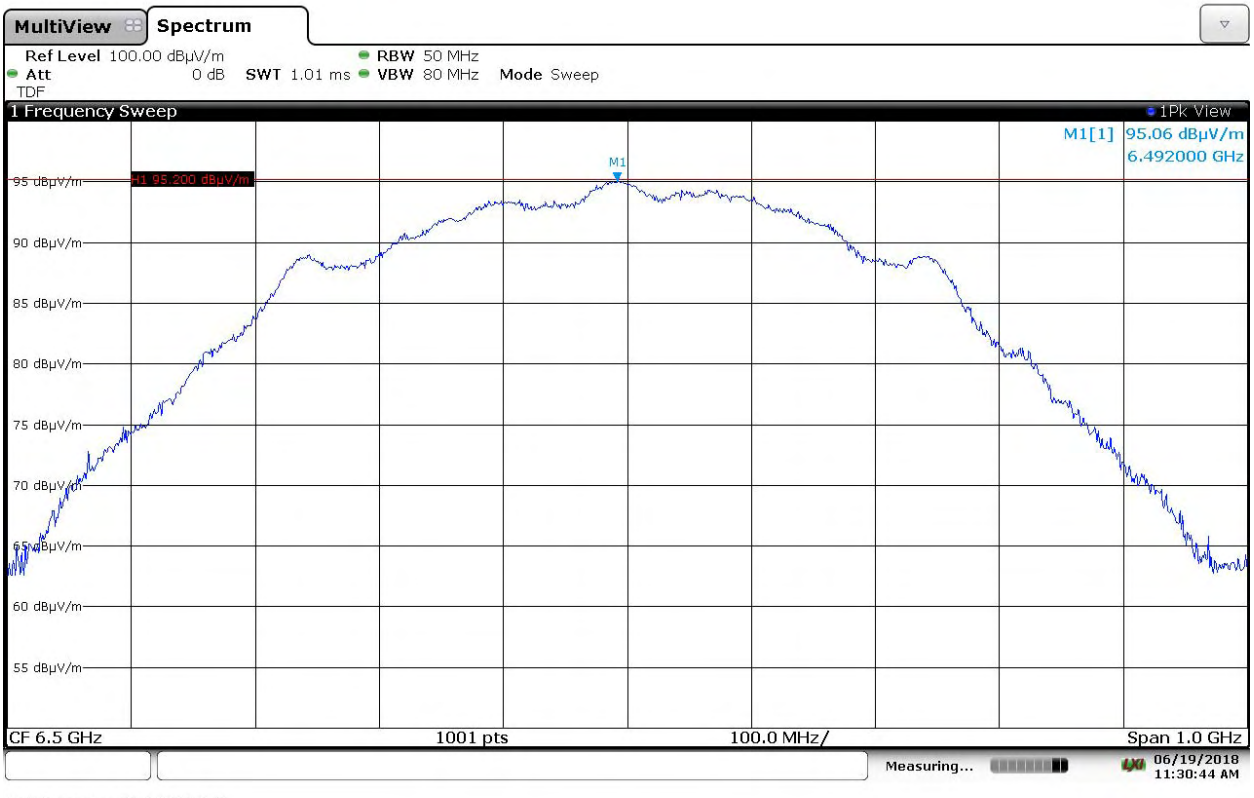
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
6.492	-0.14	0.00	-0.14	H	107	319	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.8. Peak Emissions in a 50 MHz Bandwidth (15.517 (e), 15.521 (g) continued)

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

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.495	94.97	95.20	-0.23	H	107	319	Compliant

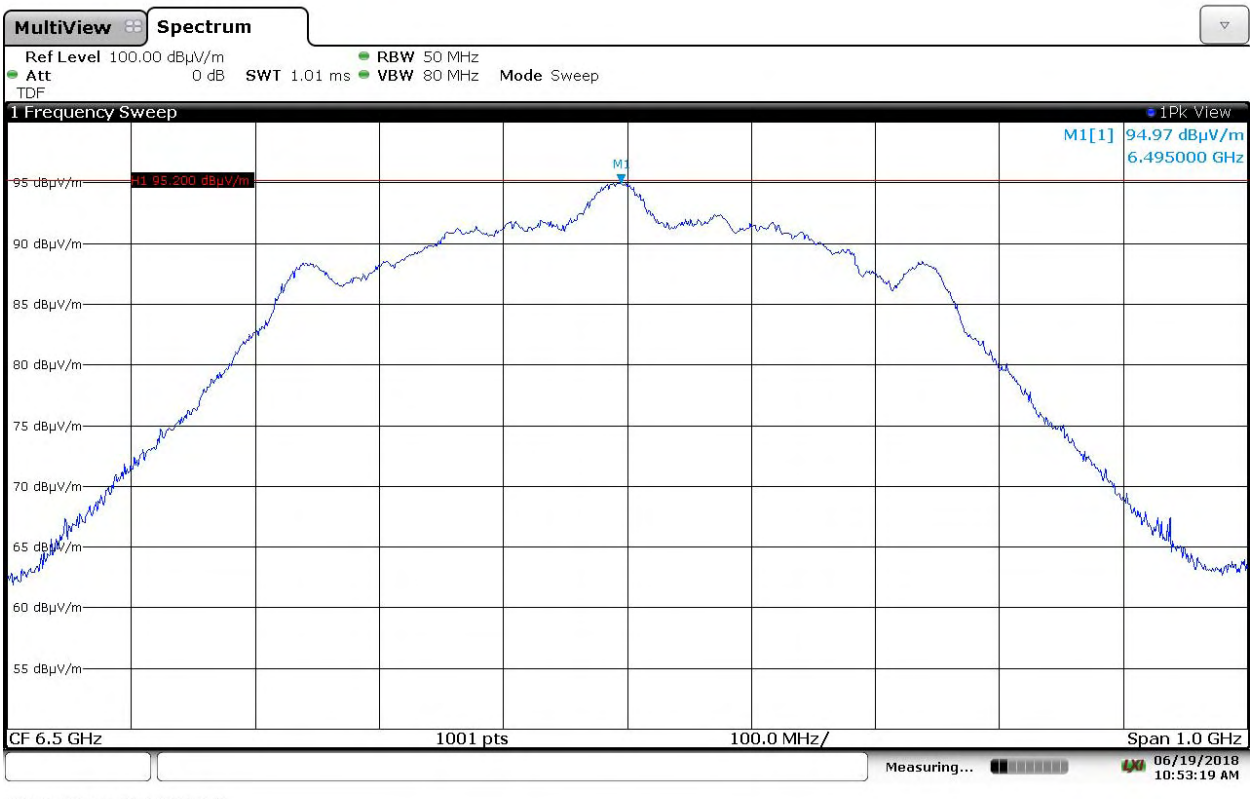
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
6.495	-0.23	0.00	-0.23	H	107	319	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.8. Peak Emissions in a 50 MHz Bandwidth (15.517 (e), 15.521 (g) continued)

6.8.5 Plot of Peak Power at 3 Meters (Channel 7, 16M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.593	95.09	95.20	-0.11	H	107	319	Compliant

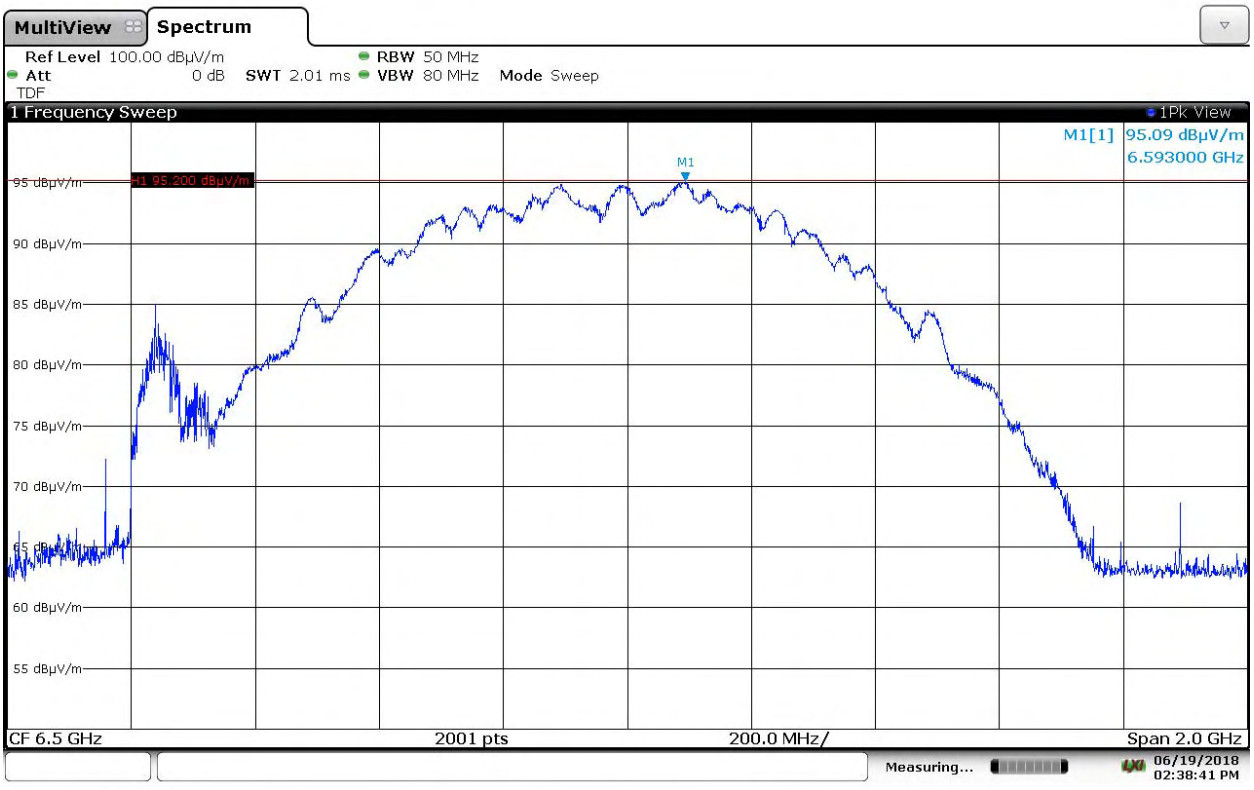
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
6.593	-0.11	0.00	-0.11	H	107	319	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.8. Peak Emissions in a 50 MHz Bandwidth (15.517 (e), 15.521 (g) continued)

6.8.6 Plot of Peak Power at 3 Meters (Channel 7, 64M PRF)

Frequency (GHz)	Amplitude[1]	Limit	Margin	Ant Polarity	Ant Height	Turntable Azimuth	Result
	(dBµV/m)	(dBµV/m)	(dB)	H/V	cm	Deg	
6.498	95.07	95.20	-0.13	H	107	319	Compliant

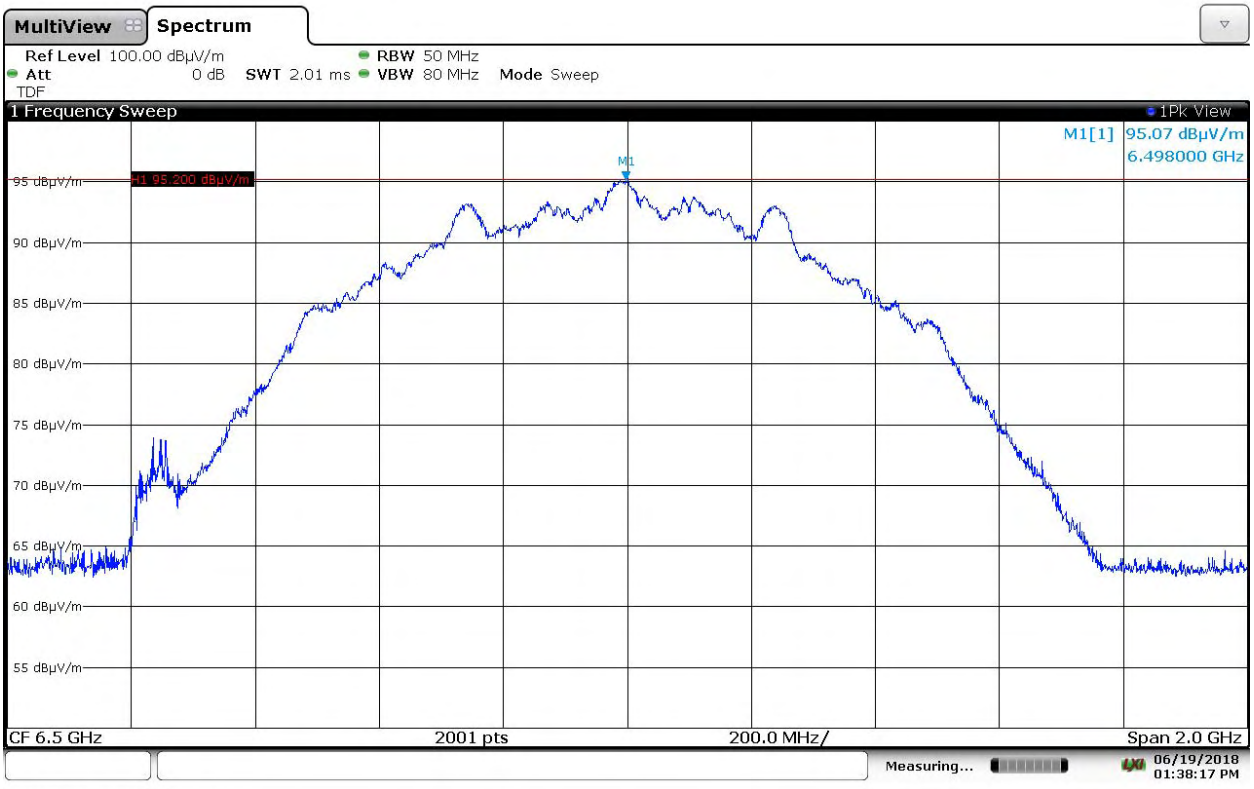
Notes: [1] Antenna Factor (AF), Cable Factor (CF) and External Preamplifier Gain (PAG) have been entered into the analyzer as transducer factors.

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	
6.498	-0.13	0.00	-0.13	H	107	319	Compliant

268-18 ShotTracker Anchor



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6. Measurement Data (continued)

6.9 Conducted Emissions Test Setup

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

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

6.9.2 Measurement Equipment and Software Used to Perform Test

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

6.9.3. Measurement & Equipment Setup

Test Date:	07/03/2018
Test Engineer:	Sean Defelice
Site Temperature (°C):	23.3
Relative Humidity (%RH):	40.9
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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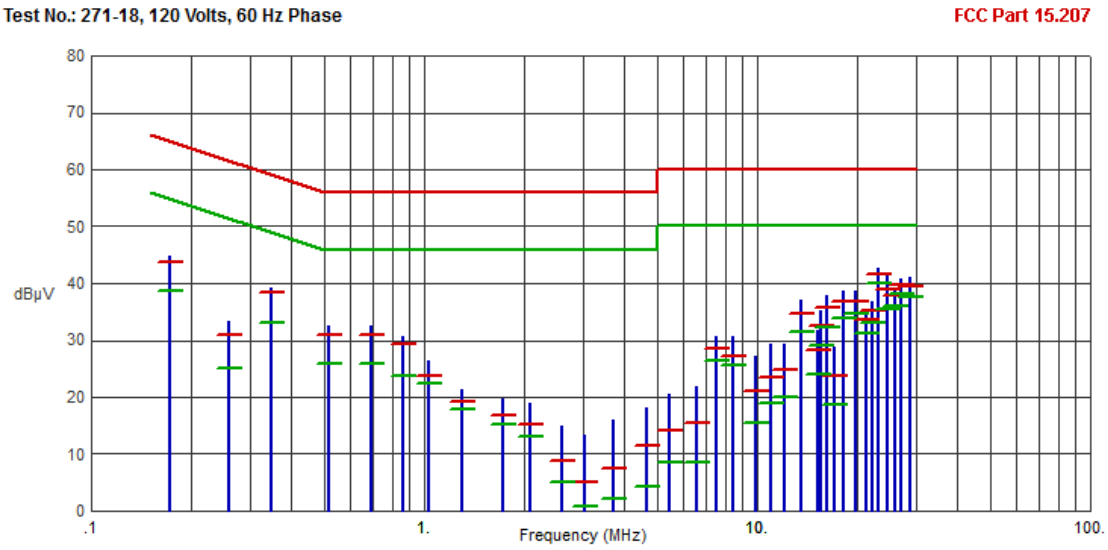
6. Measurement Data (continued)

6.10. Conducted Emissions (FCC Part 15.207) continued

6.10.1. 120 Volts, 60 Hz Phase (Page 1 of 2)



Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
.1725	44.85	43.79	64.84	-21.05	38.78	54.84	-16.06	
.2603	33.25	31.00	61.42	-30.42	25.09	51.42	-26.33	
.3458	39.13	38.36	59.06	-20.70	33.17	49.06	-15.89	
.5190	32.48	30.88	56.00	-25.12	25.91	46.00	-20.09	
.6923	32.43	31.05	56.00	-24.95	25.87	46.00	-20.13	
.8633	30.66	29.36	56.00	-26.64	23.63	46.00	-22.37	
1.0365	26.40	23.71	56.00	-32.29	22.50	46.00	-23.50	
1.2953	21.42	19.08	56.00	-36.92	17.91	46.00	-28.09	
1.7273	19.70	16.91	56.00	-39.09	15.24	46.00	-30.76	
2.0738	18.82	15.19	56.00	-40.81	13.03	46.00	-32.97	
2.5913	14.85	8.71	56.00	-47.29	5.08	46.00	-40.92	
3.0233	13.25	5.19	56.00	-50.81	.67	46.00	-45.33	
3.7163	16.05	7.58	56.00	-48.42	2.10	46.00	-43.90	
4.6658	18.06	11.59	56.00	-44.41	4.26	46.00	-41.74	
5.4443	20.56	14.04	60.00	-45.96	8.57	50.00	-41.43	
6.5670	21.89	15.51	60.00	-44.49	8.40	50.00	-41.60	
7.5278	30.75	28.61	60.00	-31.39	26.52	50.00	-23.48	
8.4683	30.55	27.13	60.00	-32.87	25.55	50.00	-24.45	
9.8498	27.29	21.18	60.00	-38.82	15.48	50.00	-34.52	
10.9748	29.34	23.52	60.00	-36.48	18.82	50.00	-31.18	
12.0120	29.20	24.77	60.00	-35.23	20.11	50.00	-29.89	
13.4790	37.03	34.71	60.00	-25.29	31.51	50.00	-18.49	
15.1283	31.85	28.14	60.00	-31.86	23.98	50.00	-26.02	
15.5558	35.31	32.52	60.00	-27.48	29.10	50.00	-20.90	
16.1655	37.89	35.63	60.00	-24.37	32.33	50.00	-17.67	
17.0228	28.77	23.82	60.00	-36.18	18.70	50.00	-31.30	
18.2423	38.60	36.67	60.00	-23.33	33.76	50.00	-16.24	
19.7093	38.60	36.89	60.00	-23.11	34.54	50.00	-15.46	
21.1740	35.29	33.54	60.00	-26.46	31.29	50.00	-18.71	

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6. Measurement Data (continued)

6.10. Conducted Emissions (FCC Part 15.207)

6.10.1. 120 Volts, 60 Hz Phase (Page 2 of 2)

Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
22.2135	36.75	35.07	60.00	-24.93	33.04	50.00	-16.96	
23.1293	42.61	41.67	60.00	-18.33	39.88	50.00	-10.12	
24.5333	41.34	38.93	60.00	-21.07	35.53	50.00	-14.47	
25.8765	38.76	37.78	60.00	-22.22	36.05	50.00	-13.95	
27.1590	40.72	39.61	60.00	-20.39	38.01	50.00	-11.99	
28.6845	40.95	39.39	60.00	-20.61	37.63	50.00	-12.37	

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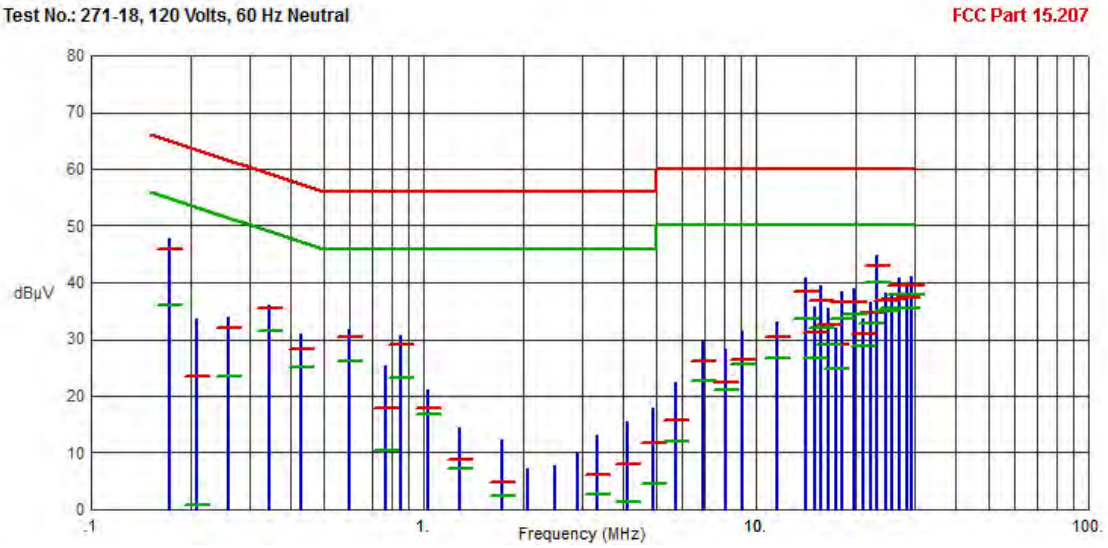
6. Measurement Data (continued)

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

6.10.2. 120 Volts, 60 Hz Neutral (1 of 2)



Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
.1725	47.76	45.98	64.84	-18.86	35.98	54.84	-18.86	
.2085	33.48	23.58	63.26	-39.68	0.85	53.26	-52.41	
.2580	33.78	31.96	61.50	-29.54	23.51	51.50	-27.99	
.3435	36.09	35.36	59.12	-23.76	31.36	49.12	-17.76	
.4290	31.00	28.39	57.27	-28.88	24.96	47.27	-22.31	
.6000	31.72	30.50	56.00	-25.50	26.11	46.00	-19.89	
.7710	25.41	17.80	56.00	-38.20	10.49	46.00	-35.51	
.8588	30.70	28.98	56.00	-27.02	23.08	46.00	-22.92	
1.0298	21.04	17.77	56.00	-38.23	16.69	46.00	-29.31	
1.2863	14.38	8.90	56.00	-47.10	7.32	46.00	-38.68	
1.7160	12.29	4.68	56.00	-51.32	2.42	46.00	-43.58	
2.0580	7.29	-2.44	56.00	-58.44	-5.02	46.00	-51.02	
2.4878	7.79	-1.76	56.00	-57.76	-4.63	46.00	-50.63	
2.9175	9.76	-0.08	56.00	-56.08	-3.14	46.00	-49.14	
3.3450	13.17	6.12	56.00	-49.88	2.64	46.00	-43.36	
4.1168	15.56	7.98	56.00	-48.02	1.24	46.00	-44.76	
4.8885	17.94	11.65	56.00	-44.35	4.52	46.00	-41.48	
5.7480	22.40	15.86	60.00	-44.14	11.88	50.00	-38.12	
6.8978	29.98	26.25	60.00	-33.75	22.68	50.00	-27.32	
8.1510	28.15	22.44	60.00	-37.56	21.05	50.00	-28.95	
9.0938	31.45	26.45	60.00	-33.55	25.49	50.00	-24.51	
11.5868	33.11	30.30	60.00	-29.70	26.69	50.00	-23.31	
14.1518	40.87	38.41	60.00	-21.59	33.61	50.00	-16.39	
15.0990	35.64	31.24	60.00	-28.76	26.59	50.00	-23.41	
15.6165	39.40	36.74	60.00	-23.26	31.92	50.00	-18.08	
16.4715	35.38	32.55	60.00	-27.45	29.04	50.00	-20.96	
17.3265	31.93	28.96	60.00	-31.04	24.93	50.00	-25.07	
18.2423	38.43	36.49	60.00	-23.51	33.60	50.00	-16.40	
19.7093	38.80	36.65	60.00	-23.35	34.30	50.00	-15.70	

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6. Measurement Data (continued)

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

6.10.2. 120 Volts, 60 Hz Neutral (2 of 2)

Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
20.9288	33.50	31.03	60.00	-28.97	28.70	50.00	-21.30	
22.2135	36.58	34.73	60.00	-25.27	32.78	50.00	-17.22	
23.1293	44.92	42.88	60.00	-17.12	39.93	50.00	-10.07	
24.5333	38.23	36.78	60.00	-23.22	35.02	50.00	-14.98	
25.6943	38.26	37.03	60.00	-22.97	35.42	50.00	-14.58	
27.1590	40.68	39.54	60.00	-20.46	37.98	50.00	-12.02	
28.5630	39.75	37.29	60.00	-22.71	35.39	50.00	-14.61	
29.2358	40.95	39.54	60.00	-20.46	37.85	50.00	-12.15	

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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.

6.11.1 Plot of 99% Emission Bandwidth (Channel 3, 16M PRF)

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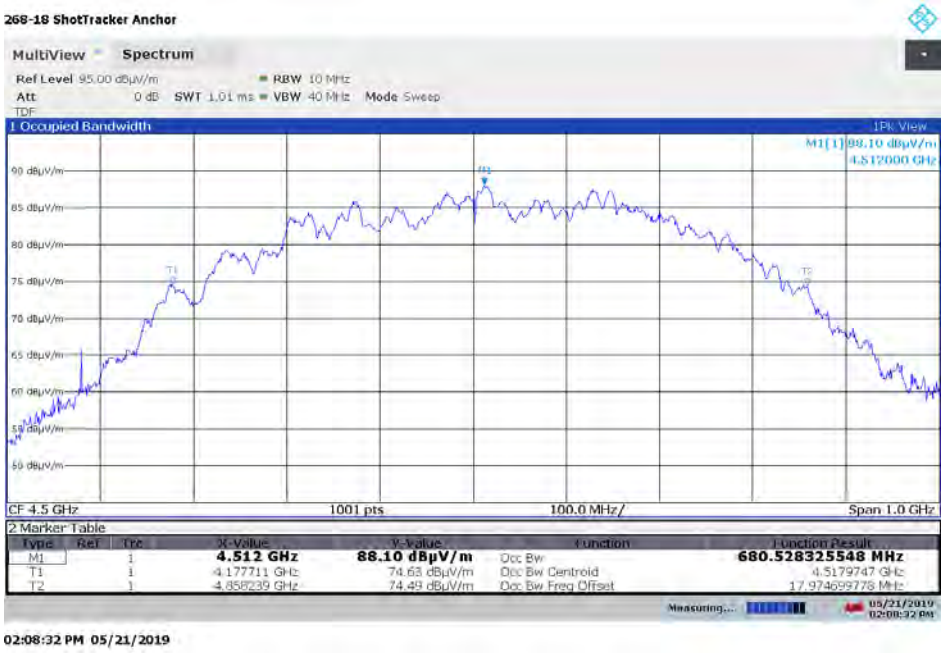
6. Measurement Data (continued)

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

6.11.2 Plot of 99% Emission Bandwidth (Channel 3, 64M PRF)



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

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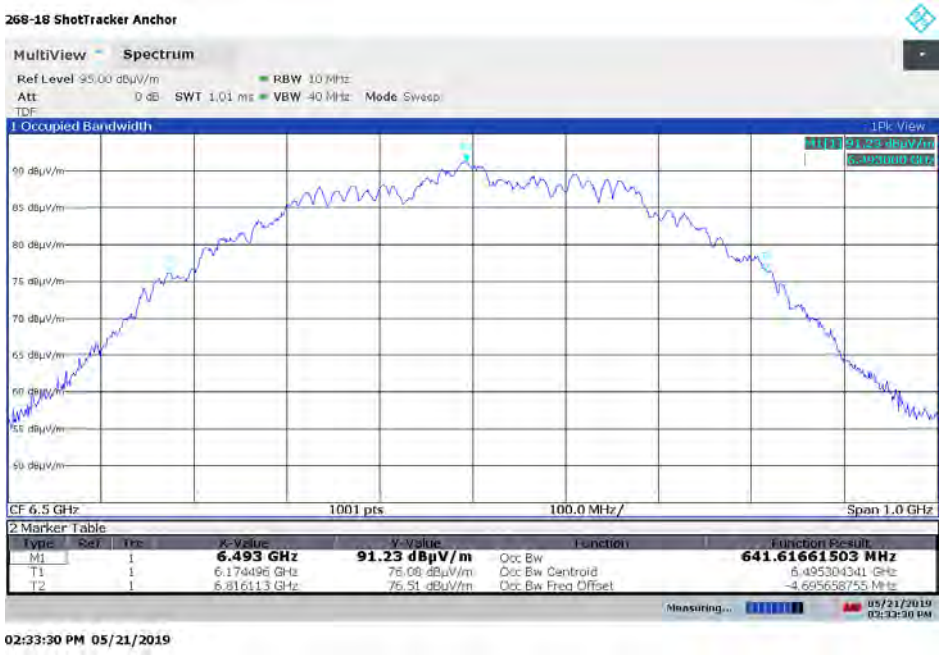
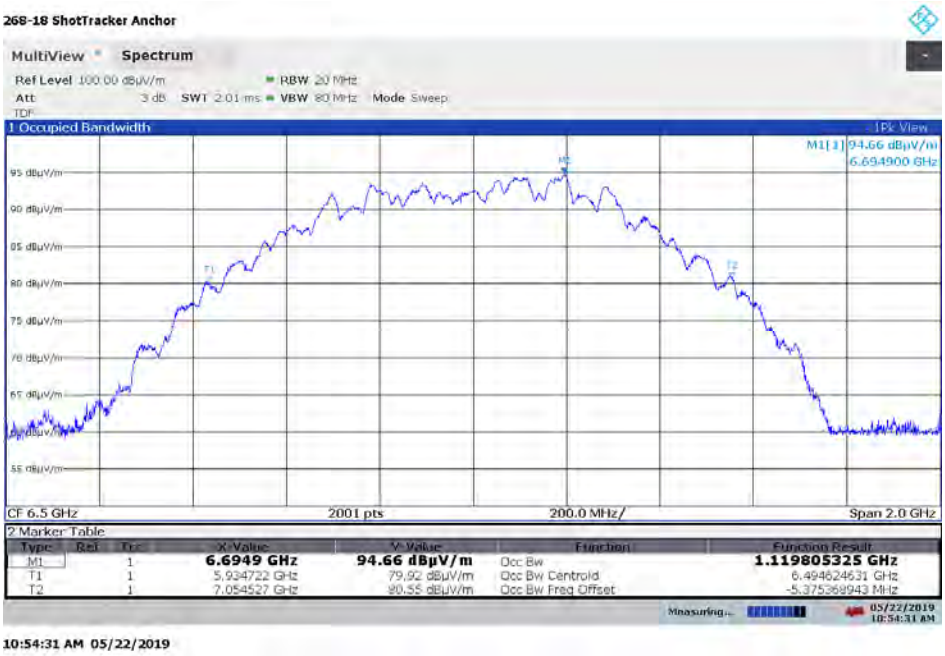
6. Measurement Data (continued)

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

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



6.11.5 Plot of 99% Emission Bandwidth (Channel 7, 16M PRF)



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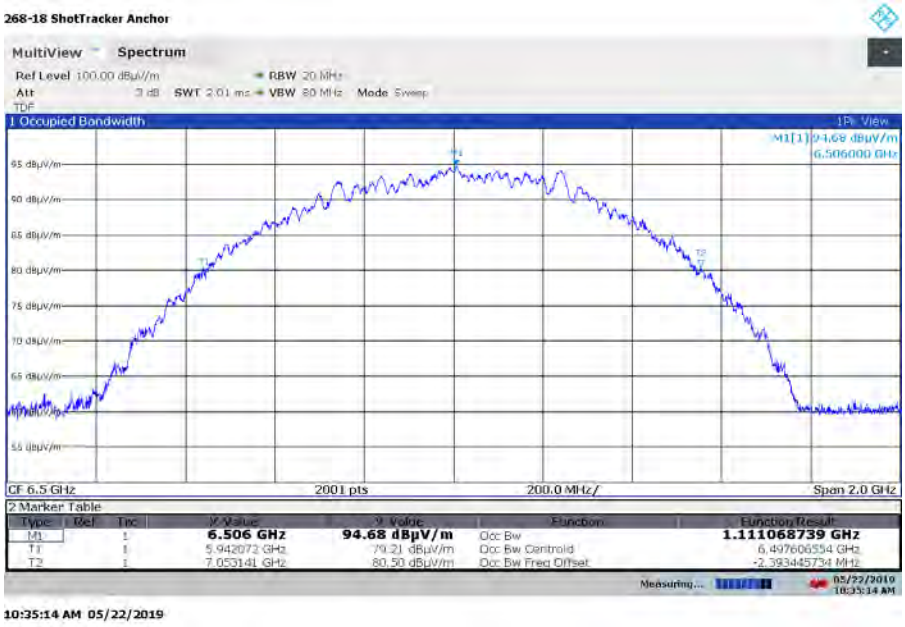
6. Measurement Data (continued)

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

6.11.6 Plot of 99% Emission Bandwidth (Channel 7, 64M PRF)



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6. Measurement Data (continued)

6.12. Public Exposure to Radio Frequency Energy Levels (1.1307 (b)(1), RSS 102)

6.12.1 RF Exposure for devices that operate at 20cm or greater distance

Center Frequency (GHz)	MPE Distance (cm)	DUT Output Power (dBm EIRP)	DUT Antenna Gain (dBi)	Power Density		FCC Limit	ISED Limit
				(mW/cm^2)	(W/m^2)	(mW/cm^2)	(W/m^2)
	(1)	(2)	(3)	(4)		(5)	(6)
4.5720	20	-0.01	0.0	0.0001985	0.0019849	1	8.31
4.4900	20	-0.07	0.0	0.0001958	0.0019576	1	8.21
6.4920	20	-0.14	0.0	0.0030821	0.0308212	1	10
6.4950	20	-0.23	0.0	0.0030189	0.0301891	1	10
6.5930	20	-0.11	0.0	0.0031035	0.0310349	1	10
6.4980	20	-0.13	0.0	0.0030892	0.0308923	1	10

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

1. Reference CFR 2.1091(b): For purposes of this section, a mobile device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is at least 20 centimeters of distance from the body of the user or nearby persons.
2. Section 6.8 of this test report.
3. Radiated Power Measurements were made therefore the antenna gain is included.
4. Power density is calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure. The limit above 1500 MHz is 1 mW/cm^2
6. Reference ISED RSS-102 Section 4 Table 4 RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment). 300 to 6000 MHz the limit is 0.02619 * f ^ 0.6834, where f is in MHz, above 6000 MHz the limit is 10 W/m^2

Test Notes: The Bluetooth and UWB Radios do not operate simultaneously.

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7. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with the Federal Communications Commission (FCC) and Industry Canada standards. Through our American Association for Laboratory Accreditation (A2LA) ISO Guide 17025:2005 Accreditation our test sites are designated with the FCC (designation number **US1091**), Industry Canada (file number **IC 3023A-1)** and VCCI (Member number 3168) under registration number A-0274.

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

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

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

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

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