

## COMPLIANCE WORLDWIDE INC. TEST REPORT 416-18R2

In Accordance with the Requirements of  
Federal Communications Commission CFR Title 47 Part 15.225, Subpart C  
Innovation, Science and Economic Development Canada  
RSS 210, Issue 9, Annex 2

Low Power License-Exempt Radio Communication Devices  
Intentional Radiators

Issued to  
Hypertherm, Inc.  
71 Heater Road  
Lebanon, NH 03755

for the  
SmartSYNC™ Torch RFID Module  
Models: 141463 and 141466

FCC ID: 2ASER-SMARTSYNC  
IC: 24739-SMARTSYNC

Revision R2 Report Issued on April 9, 2019  
Original report issued January 22, 2019

Tested by



\_\_\_\_\_  
Brian F. Breault

Reviewed by



\_\_\_\_\_  
Larry K. Stillings

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## 6. Scope

This test report certifies that the Hypertherm SmartSYNC™ Torch RFID Module, as tested, meet the FCC Part 15.225 Subpart C, and Innovation Science and Economic Development Canada RSS 210 requirements. The scope of this test report is limited to the test samples provided by the client, only in as much as those samples represent other production units. If any significant changes are made to the units, the changes shall be evaluated and a retest may be required. R1 report to add other model and corrections, added 99% OBW on mech. Revision R2 adds RF Exposure for Mobile device calculation exemption in Section 7.8.

## 2. Product Details

- 2.1. Manufacturer:** Hypertherm, Inc.
- 2.2. Model Number:** 141463 and 141466
- 2.3. Serial Number:** HCT18341153 and HCT18341256
- 2.4. Description of EUT:** RFID module boards are installed in the model series of torches,
- 2.5. Power Sources:** 120 VAC, 60 Hz via 15 VDC Power Supply (Bel Power Solutions PN: HB15-1.5-AG (available at Digikey/Mouser), Ancillary equipment for testing, not sold by Hypertherm  
Universal Input: 100/120/220/230/240vac  
Output: 15vdc
- 2.6. Hardware Revision:** N/A
- 2.7. Software Revision:** N/A
- 2.8. EMC Modifications:** None

## 3. Product Configuration

### 3.1. Operational Characteristics & Software

The module was configured to perform a continuous read of an RFID tag.

### 3.2. EUT Hardware

Manufacturer	Model/Part # / Options	Serial Number	Input Voltage	Freq (Hz)	Description/Function
Hypertherm	141463	HCT18341153	15VDC	0	13.56 MHz RFID Module – Hand Board
Hypertherm	141466	HCT18341256	15VDC	0	13.56 MHz RFID Module – Mechanized Board

### 3.3. EUT Cables/Transducers

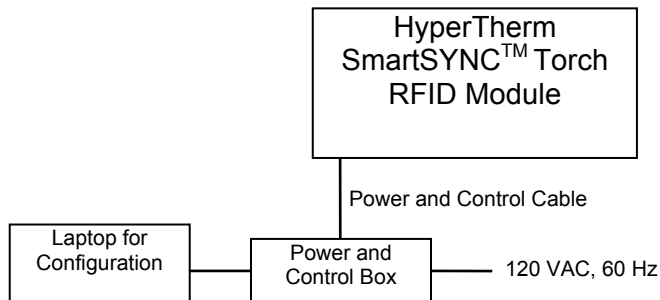
Cable Type	Length	Shield	From	To
Power & Control	3M	No	EUT	Power and Control Box

### 3. Product Configuration (continued)

#### 3.4. Support Equipment

Manufacturer	Model	Serial Number	Input Voltage	Freq (Hz)	Description/Function
Hypertherm	Power and Control Box	1	120V	60	120VAC/15VDC power supply and USB to RS422 converter
Lenovo	W541	R9-0FZ8MW 15/05	20V	0	Laptop Computer
Lenovo	ADL 170NDC2A	11S36200317ZZ0 005580CR	120V	60	AC Adapter for Laptop Computer

#### 3.5. Block Diagram



### 4. Measurements Parameters

#### 4.1. Measurement Equipment Used to Perform Tests

Device	Manufacturer	Model No.	Serial No.	Cal Due	Interval
EMI Test Receiver, 9kHz – 7GHz <sup>1</sup>	Rohde & Schwarz	ESR7	101156	9/10/2020	2 Years
EMI Test Receiver, 10 Hz – 7GHz <sup>1</sup>	Rohde & Schwarz	ESR7	101770	10/3/2020	2 Years
EMI Receiver 9 kHz – 1 GHz	Hewlett Packard	8546A	3650A00360	9/11/2020	2 Years
Loop Antenna 9 kHz – 30 MHz	EMCO	6512	9309-1139	10/26/2019	3 Years
Biconilog Antenna, 30 MHz – 2 GHz	Sunol Sciences	JB1	A050913	6/3/2019	2 Years
LISN 50 ohm 50 μH, 9 kHz – 30 MHz	EMCO	3825/2	9109-1860	9/10/2020	1 Year
Digital Multimeter	Fluke	187	83030167	3/30/2019	1 Year
Digital Barometer	Control Company	4195	ID236	4/3/2020	2 Years
Temperature Chamber	Associated Environmental	4195	ID236	4/3/2020	2 Years

<sup>1</sup> ESR7 Firmware revision: V3.46, Date installed: 12/5/2018 Previous V3.36 SP2, installed 11/2/2017.

## 4. Measurements Parameters (continued)

### 4.2. Measurement & Equipment Setup

Test Dates:	December 20 <sup>th</sup> , 2018, January 2 <sup>nd</sup> -3 <sup>rd</sup> , 2019, March 20 <sup>th</sup> , 22 <sup>nd</sup> , 2019
Test Engineer:	Larry Stillings, Sean DeFelice
Normal Site Temperature (15 – 35°C):	22.0
Relative Humidity (20 -75%RH):	33%
Frequency Range:	30 kHz to 1 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	200 Hz – 9 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 – 9 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, QP, Avg – 150 kHz to 30 MHz Peak, QP - 30 MHz to 1 GHz Peak, Avg - Above 1 GHz Unless otherwise specified.

### 4.3. Measurement Procedure

The test measurements contained in this report are based on the requirements detailed in FCC Part 15, Subpart C – Intentional Radiators, notably Section 15.225, Operation within the band 13.110 – 14.010 MHz.

The test methods used to generate the data in this test report are in accordance with ANSI C63.10:2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and Innovation Science and Economic Development Canada ISED RSS-210, Issue 9 License Exempt Radio Apparatus: Category I Equipment.

## 5. Choice of Equipment for Test Suits

### 5.1. Choice of Model

This test report is based on the test samples supplied by the manufacturer and are reported by the manufacturer to be equivalent to the production units.

### 5.2. Presentation

The test sample was tested complete with all required ancillary equipment. Refer to Section 3 of this report for the product equipment configuration.

### 5.3. Choice of Operating Frequencies

The transmitter in the unit under test utilizes a single operating frequency at approximately 13.56 MHz

## 6. Measurement Summary

Test Requirement	FCC Part 15 Reference	RSS Reference	Test Report Section	Result	Comment
Antenna Requirement	15.203	RSS-GEN Section 7.1.2	7.1	Compliant	
Operation within the Band 13.110 MHz – 14.010 MHz (Field Strength)	15.225 (a), (b), (c)	RSS-210 Section A2.6	7.2	Compliant	
Operation within the Band 13.110 MHz – 14.010 MHz (Frequency Tolerance)	15.225 (e)	RSS-210 Section A2.6	7.3	Compliant	
Spurious Radiated Emissions	15.209		7.4	Compliant	
Power Line Conducted Emissions	15.207	RSS-GEN Section 7.2.4	7.5	Compliant	
Occupied Bandwidth/ Lower and Upper Band Edges	15.215(c) C63.10	N/A	7.6	Compliant	
99% Power Bandwidth	N/A	RSS-GEN Section 4.6.1	7.7	Compliant	
Public Exposure to Radio Frequency Energy Levels	1.1307 (b)(1) 2.1091	RSS-102, Issue 5	7.8	Compliant	

## 7. Measurement Data

### 7.1. Antenna Requirement (Section 15.203, RSS-GEN 7.1.2)

**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 with the provisions of this Section.

**Result:** Compliant.

**Status:** The unit under test uses a wire wound loop antenna connected via a two port terminal block.

**7. Measurement Data (continued)**

**7.2. Operation within the Band 13.110 MHz – 14.010 MHz (15.225 (a), (b) and (c))**

**Requirement:** The field strength of any emissions within the band 13.553 - 13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

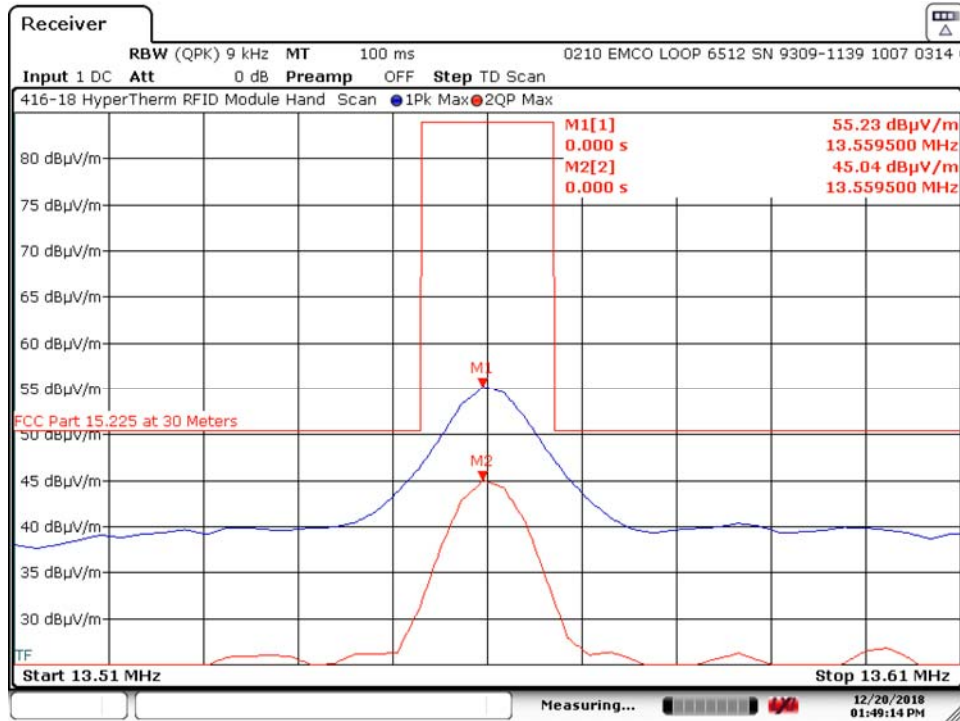
**Result:** The unit under test complies with the requirements detailed in FCC Part 15.225 (a), (b) and (c).

Freq. MHz	Measurement Distance Meters	Meas. Field Strength dBµV	Ant. Factor <sup>1</sup> dB	Cable Loss <sup>1</sup> dB	Corr. Field Strength dBµV/m	Limit <sup>2</sup> dBµV/m	Margin (dB)
13.56	10	19.55	35.07	0.61	55.23	84.00	28.77

<sup>1</sup> Correction factors are included in the measurement analyzer.

<sup>2</sup> Limit at 30 meters.

**7.2.1. Measurement Plot – Perpendicular was worse case (Hand Version)**



Date: 20.DEC.2018 13:49:14

## 7. Measurement Data (continued)

### 7.2. Operation within the Band 13.110 MHz – 14.010 MHz (15.225 (a), (b) and (c) cont)

Requirement: The field strength of any emissions within the band 13.553 - 13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

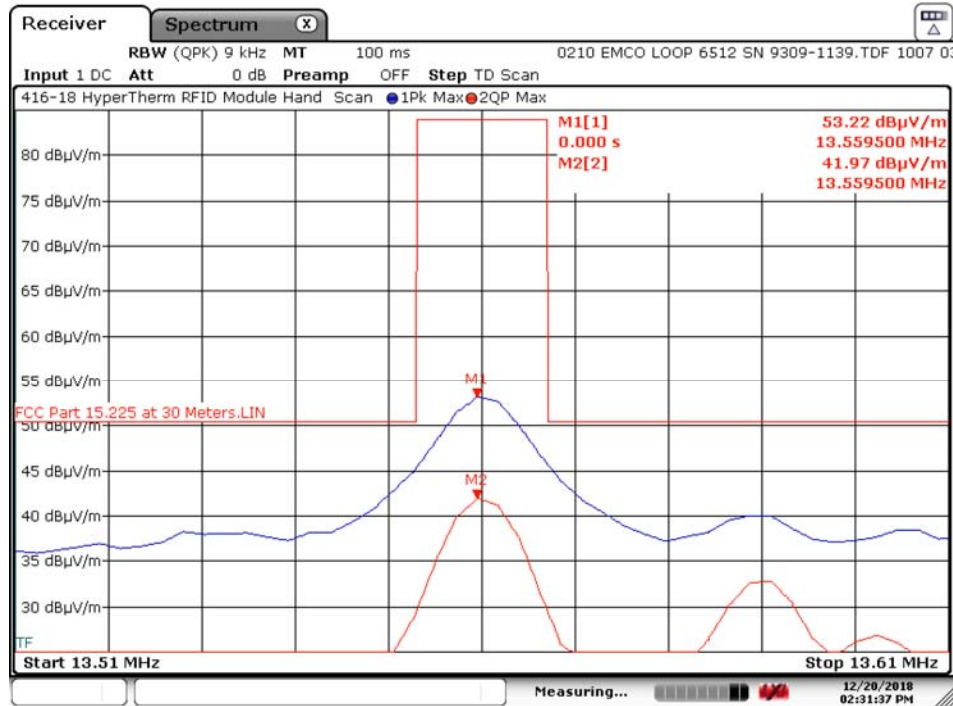
Result: The unit under test complies with the requirements detailed in FCC Part 15.225 (a), (b) and (c).

Freq. MHz	Measurement Distance Meters	Meas. Field Strength dB $\mu$ V	Ant. Factor <sup>1</sup> dB	Cable Loss <sup>1</sup> dB	Corr. Field Strength dB $\mu$ V/m	Limit <sup>2</sup> dB $\mu$ V/m	Margin (dB)
13.56	10	17.54	35.07	0.61	53.22	84.00	30.78

<sup>1</sup> Correction factors are included in the measurement analyzer.

<sup>2</sup> Limit at 30 meters.

### 7.2.2. Measurement Plot – Perpendicular was worse case (Mech Version)



Date: 20.DEC.2018 14:31:35



## 7. Measurement Data (continued)

### 7.3. Operation within the Band 13.110 MHz – 14.010 MHz (§ 15.225 (e))

**Requirement:** The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

**Result:** The unit under test complies with the requirements detailed in FCC Part 15.225 (e).

#### 7.3.1. Unit 141468-004, SN: HCT19030534

##### 7.3.1.1. Temperature Variation

Temp °C	Meas Freq. (MHz)	Limit			Offset (%)	Result
		F <sub>MIN</sub> (MHz)	F <sub>MAX</sub> (MHz)	%		
Ambient	13.5599200	N/A			N/A	
-20	13.5601200	13.558564	13.561276	$\pm 0.01$	0.00147493	Compliant
-10	13.5597550	13.558564	13.561276	$\pm 0.01$	0.00121682	Compliant
0	13.5596100	13.558564	13.561276	$\pm 0.01$	0.00228615	Compliant
+10	13.5597300	13.558564	13.561276	$\pm 0.01$	0.00140119	Compliant
+20	13.5597400	13.558564	13.561276	$\pm 0.01$	0.00132744	Compliant
+30	13.5595700	13.558564	13.561276	$\pm 0.01$	0.00258114	Compliant
+40	13.5596000	13.558564	13.561276	$\pm 0.01$	0.00235990	Compliant
+50	13.5604200	13.558564	13.561276	$\pm 0.01$	0.00368734	Compliant

<sup>1</sup> Nominal frequency at ambient (~22°C)

##### 7.3.1.2. Voltage Variation (Temperature - 22°C)

VAC	Meas Freq. (MHz)	Limit			Offset (%)	Result
		F <sub>MIN</sub> (MHz)	F <sub>MAX</sub> (MHz)	%		
120.00	13.5599200	N/A			N/A	
102.00	13.5594100	13.558564	13.561276	$\pm 0.01$	0.00376108	Compliant
108.00	13.5598600	13.558564	13.561276	$\pm 0.01$	0.00044248	Compliant
114.00	13.5597300	13.558564	13.561276	$\pm 0.01$	0.00140119	Compliant
126.00	13.5598700	13.558564	13.561276	$\pm 0.01$	0.00036873	Compliant
132.00	13.5600400	13.558564	13.561276	$\pm 0.01$	0.00088496	Compliant
138.00	13.5597400	13.558564	13.561276	$\pm 0.01$	0.00132744	Compliant

<sup>1</sup> Nominal voltage

<sup>2</sup> Nominal frequency at ambient (~22°C)

## 7. Measurement Data (continued)

### 7.3. Operation within the Band 13.110 MHz – 14.010 MHz (§ 15.225 (e))

7.3.2. Unit 141463-004, SN: HCT19021043

#### 7.3.2.1. Temperature Variation

Temp °C	Meas Freq. (MHz)	Limit			Offset (%)	Result
		F <sub>MIN</sub> (MHz)	F <sub>MAX</sub> (MHz)	%		
Ambient	13.5595800	N/A			N/A	
-20	13.5600000	13.558224	13.560936	±0.01	0.00309744	Compliant
-10	13.5599200	13.558224	13.560936	±0.01	0.00250745	Compliant
0	13.5582685	13.558224	13.560936	±0.01	0.00967213	Compliant
+10	13.5600600	13.558224	13.560936	±0.01	0.00353993	Compliant
+20	13.5599600	13.558224	13.560936	±0.01	0.00280245	Compliant
+30	13.5599400	13.558224	13.560936	±0.01	0.00265495	Compliant
+40	13.5596150	13.558224	13.560936	±0.01	0.00025812	Compliant
+50	13.5599300	13.558224	13.560936	±0.01	0.00258120	Compliant

<sup>1</sup> Nominal frequency at ambient (~22°C)

#### 7.3.2.2. Voltage Variation (Temperature - 22°C)

VAC	Meas Freq. (MHz)	Limit			Offset (%)	Result
		F <sub>MIN</sub> (MHz)	F <sub>MAX</sub> (MHz)	%		
120.00	13.5595800	N/A			N/A	
102.00	13.5599800	13.558224	13.560936	±0.01	0.00294994	Compliant
108.00	13.5599400	13.558224	13.560936	±0.01	0.00265495	Compliant
114.00	13.5599000	13.558224	13.560936	±0.01	0.00235996	Compliant
126.00	13.5600200	13.558224	13.560936	±0.01	0.00324494	Compliant
132.00	13.5600000	13.558224	13.560936	±0.01	0.00309744	Compliant
138.00	13.5599600	13.558224	13.560936	±0.01	0.00280245	Compliant

<sup>1</sup> Nominal voltage

<sup>2</sup> Nominal frequency at ambient (~22°C)

**7. Measurement Data (continued)**

**7.4. Transmitter Spurious Radiated Emissions (15.225 (d), 15.209)**

Requirement: The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table (Reference FCC 15.209):

Frequency Range (MHz)	Distance (Meters)	Limit (dBµV/m) <sup>1</sup>
0.009 to 0.490	3	128.5 to 93.8
0.490 to 1.705	3	73.8 to 63.0
1.705 to 30	3	69.5
30 to 88	3	40.0
88 to 216	3	43.5
216 to 960	3	46.0
>960	3	54.0

<sup>1</sup> Measurements in the 9 to 90 kHz, 110 to 490 kHz and above 1000 MHz ranges employ an average detector. Otherwise a quasi-peak detector is used.

<sup>2</sup> Extrapolation below 30 MHz is calculated at 40 dB/decade.

Procedure: Test measurements were made in accordance with ANSI C63.10:2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices..

Test Notes: First, the intentional radiators were disabled and a scan of the unit under test was performed. The intentional radiators were then enabled and a second scan was performed. The two scans were compared to determine the contribution of the intentional radiators to the overall emissions profile.

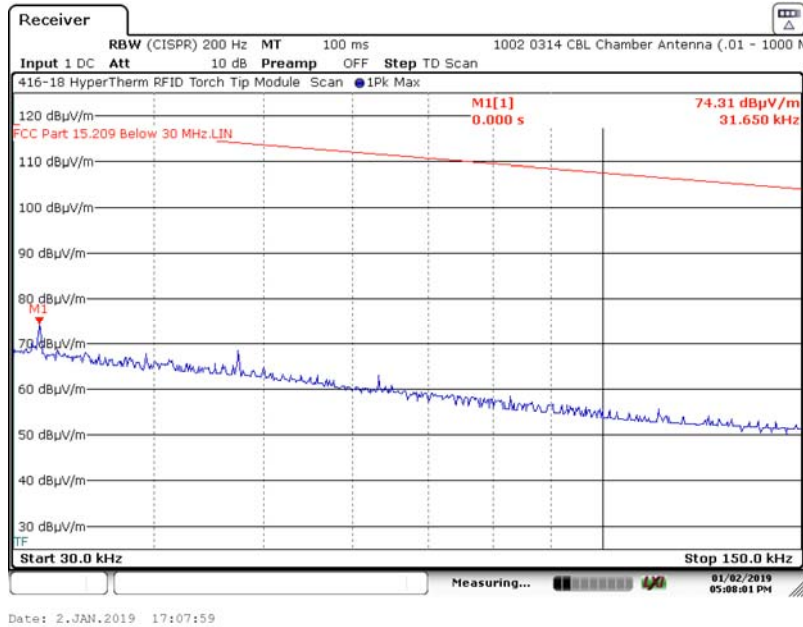
Results: The transmitter installed in the unit under test meet the FCC Part 15.209 emissions requirements.

## 7. Measurement Data (continued)

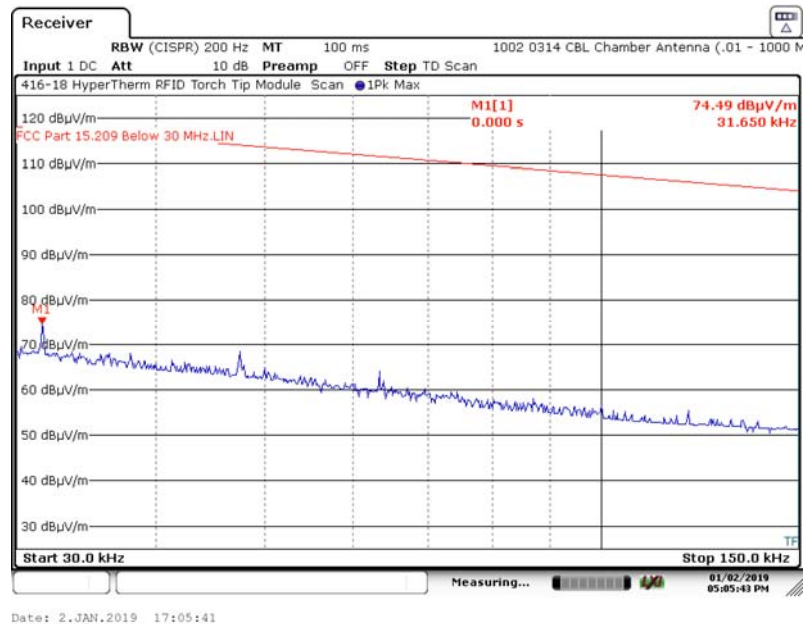
### 7.4. Transmitter Spurious Radiated Emissions (15.209) (continued)

#### 7.4.1. Transmitter Spurious Radiated Emissions – 30 to 150 kHz

##### 7.4.1.1. Antenna is Parallel to the EUT (Hand)



##### 7.4.1.2. Antenna is Perpendicular to the EUT (Hand)

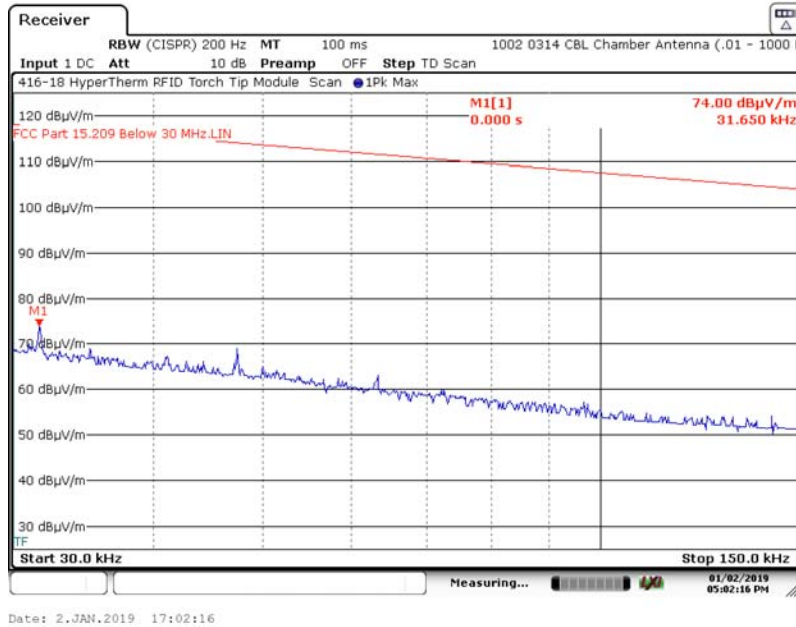


## 7. Measurement Data (continued)

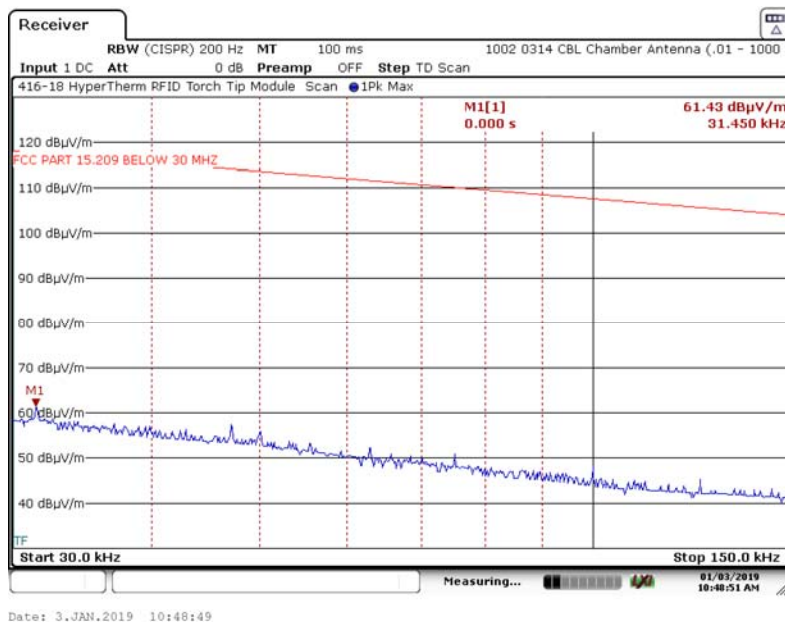
### 7.4. Transmitter Spurious Radiated Emissions (15.209) (continued)

#### 7.4.1. Transmitter Spurious Radiated Emissions – 30 to 150 kHz

##### 7.4.1.3. Antenna is Ground Parallel to the EUT (Hand)



##### 7.4.1.4. Antenna is Parallel to the EUT (Mech)

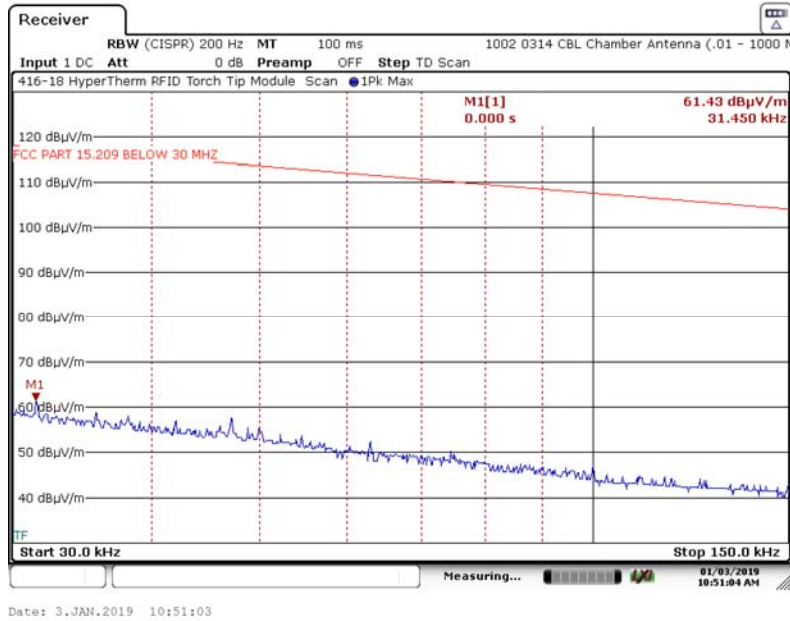


## 7. Measurement Data (continued)

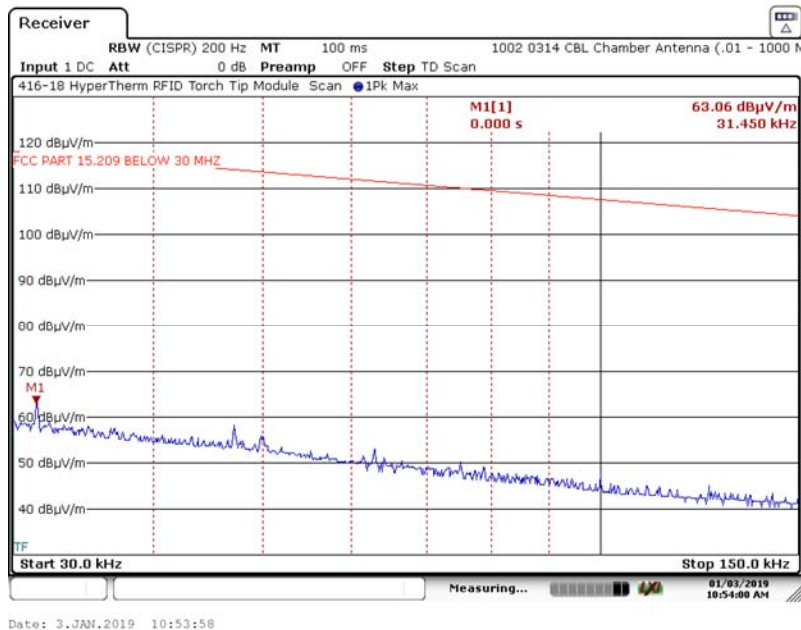
### 7.4. Transmitter Spurious Radiated Emissions (15.209) (continued)

#### 7.4.1. Transmitter Spurious Radiated Emissions – 30 to 150 kHz

##### 7.4.1.5. Antenna is Perpendicular to the EUT (Mech)



##### 7.4.1.6. Antenna is Ground Parallel to the EUT (Mech)

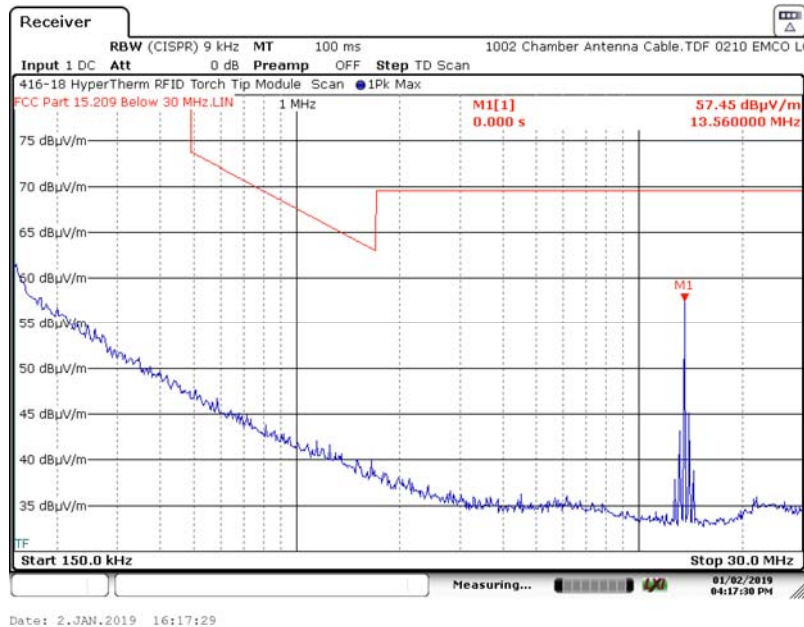


## 7. Measurement Data (continued)

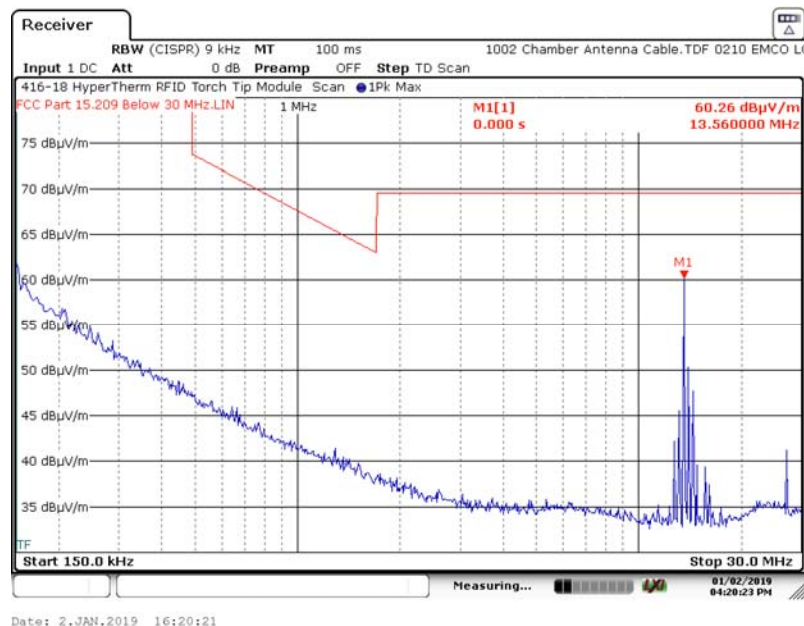
### 7.4. Transmitter Spurious Radiated Emissions (15.209) (continued)

#### 7.4.2. Transmitter Spurious Radiated Emissions – 150 kHz to 30 MHz

##### 7.4.2.1. Antenna is Parallel to the EUT (Hand)



##### 7.4.2.2. Antenna is Perpendicular to the EUT (Hand)

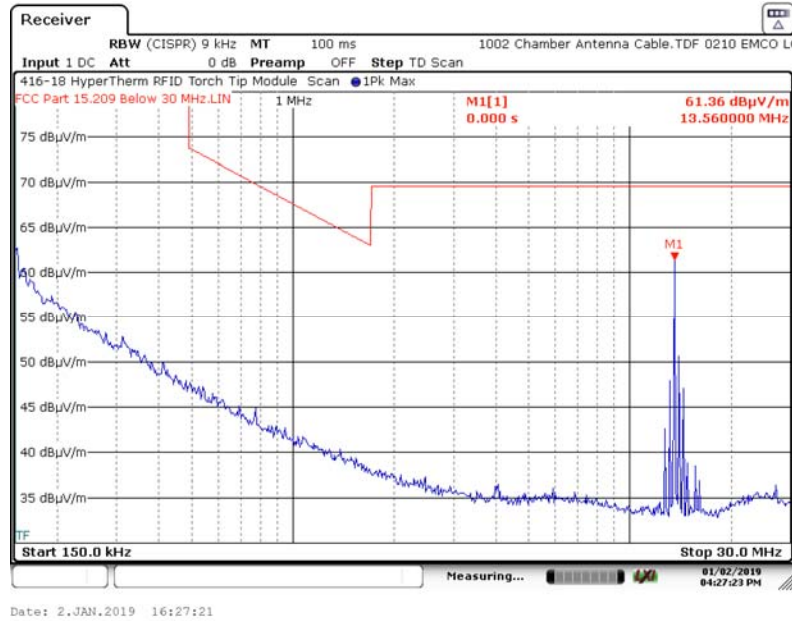


## 7. Measurement Data (continued)

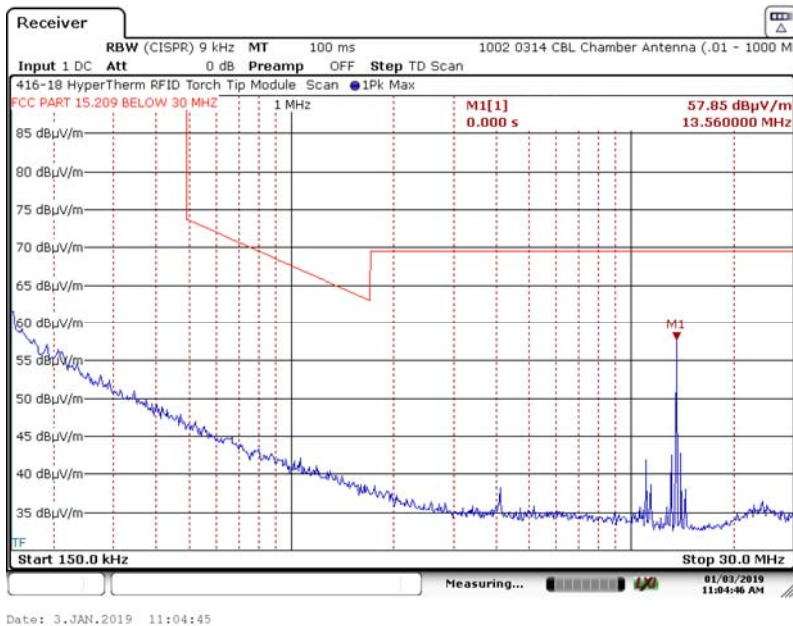
### 7.4. Transmitter Spurious Radiated Emissions (15.209) (continued)

#### 7.4.2. Transmitter Spurious Radiated Emissions – 150 kHz to 30 MHz

##### 7.4.2.3. Antenna is Ground Parallel to the EUT (Hand)



##### 7.4.2.4. Antenna is Parallel to the EUT (Mech)



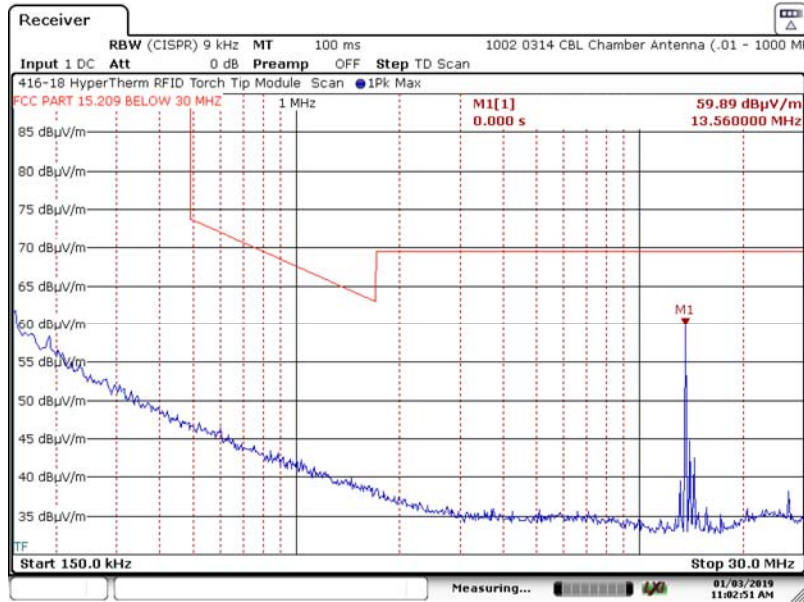


## 7. Measurement Data (continued)

### 7.4. Transmitter Spurious Radiated Emissions (15.209) (continued)

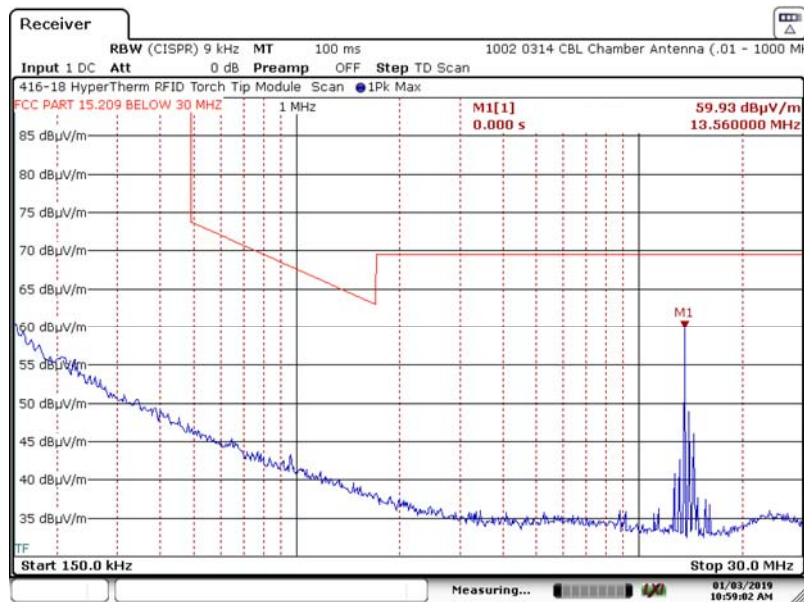
#### 7.4.2. Transmitter Spurious Radiated Emissions – 150 kHz to 30 MHz

##### 7.4.2.5. Antenna is Perpendicular to the EUT (Mech)



Date: 3.JAN.2019 11:02:49

##### 7.4.2.6. Antenna is Ground Parallel to the EUT (Mech)



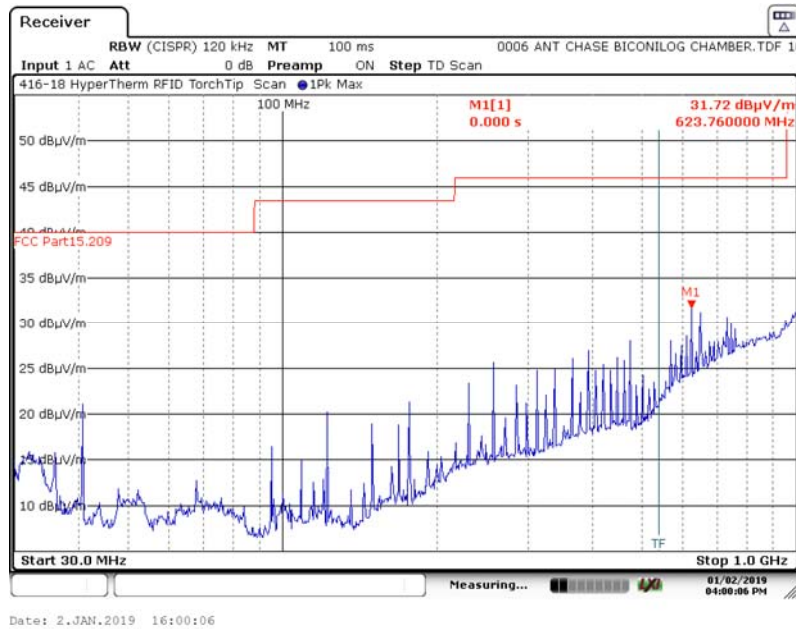
Date: 3.JAN.2019 10:59:00

## 7. Measurement Data (continued)

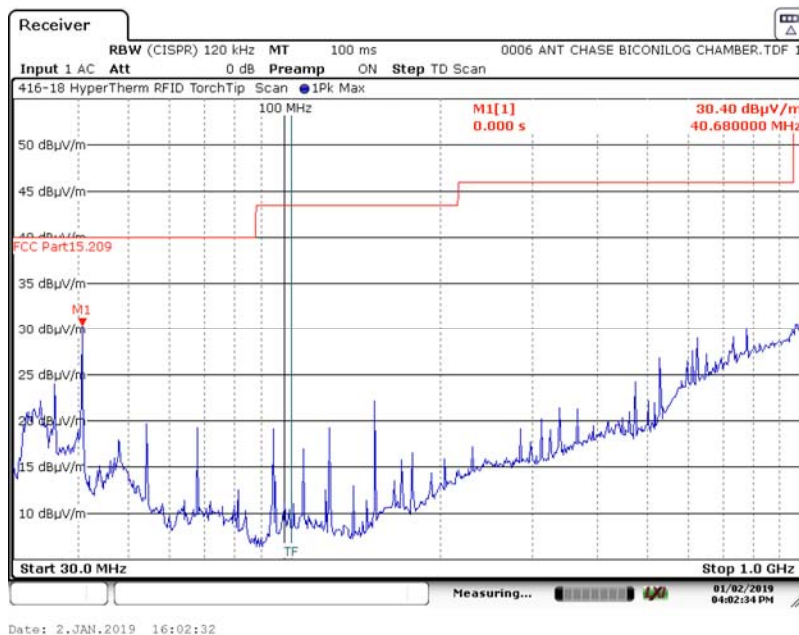
### 7.4. Spurious Radiated Emissions (15.209) (continued)

#### 7.4.3. Spurious Radiated Emissions – 30 MHz to 1 GHz

##### 7.4.3.1. Antenna is Horizontal (Hand)



##### 7.4.3.2. Antenna is Vertical (Hand)

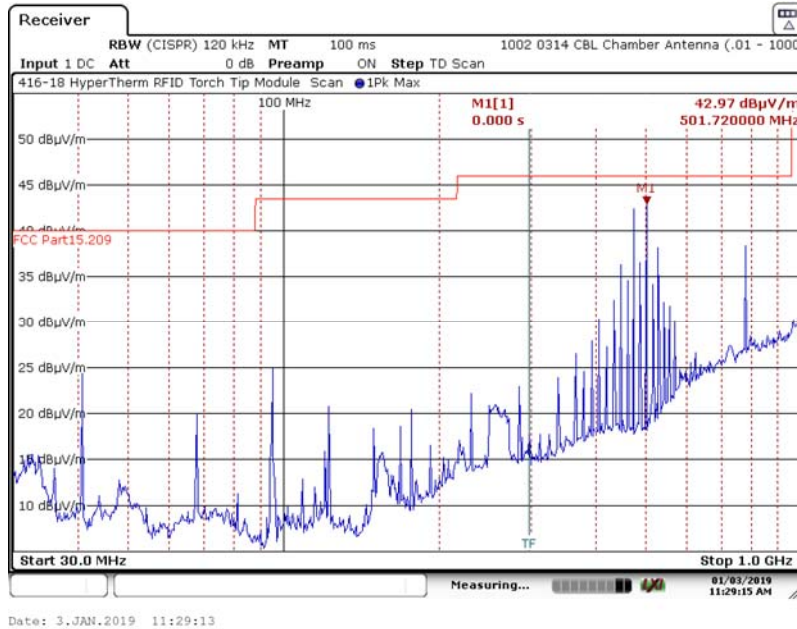


## 7. Measurement Data (continued)

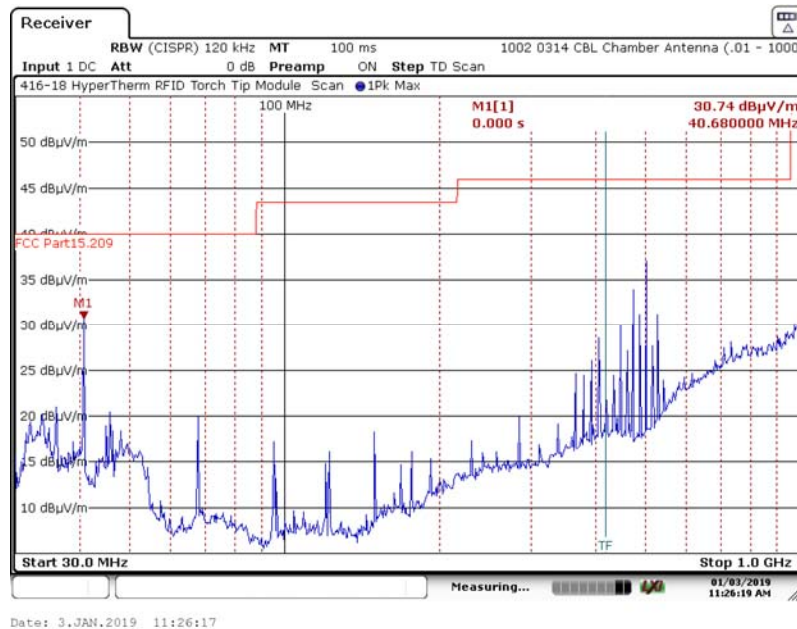
### 7.4. Spurious Radiated Emissions (15.209) (continued)

#### 7.4.3. Spurious Radiated Emissions – 30 MHz to 1 GHz

##### 7.4.3.3. Antenna is Horizontal (Mech)



##### 7.4.3.4. Antenna is Vertical (Mech)



## 7. Measurement Data (continued)

### 7.5. Power Line Conducted Emissions (15.207)

Requirement: For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	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.

Procedure: Test measurements were made in accordance with ANSI C63.10:2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices. Specifically, FCC KDB 174176 D01 Line Conducted FAQ v01r01, dated 6-3-2015 regarding the use of a dummy load for a Part 15 transmitter operating below 30 MHz was used at the fundamental frequency.

Results: The unit under test meets the FCC Part 15.207 conducted emissions requirements.

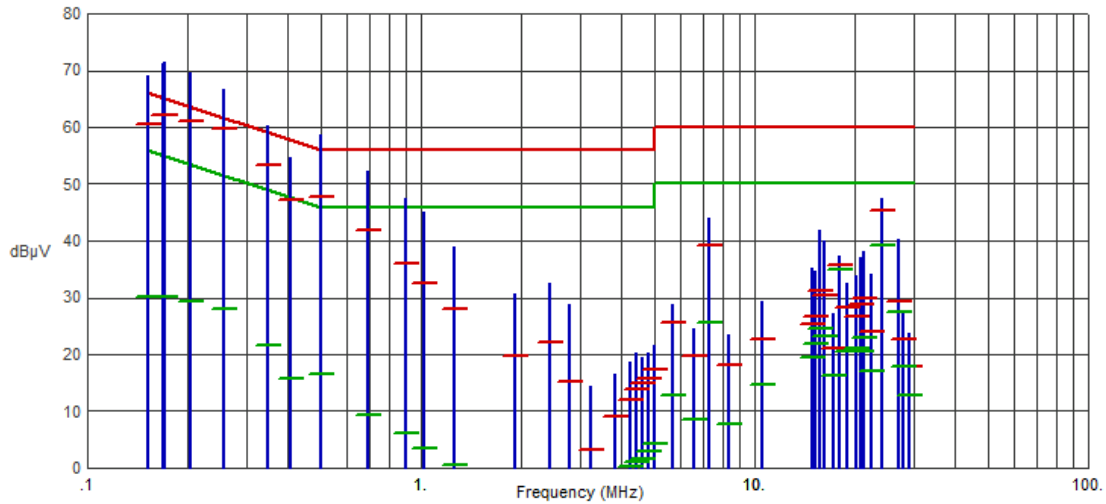
## 7. Measurement Data (continued)

### 7.5. Power Line Conducted Emissions (15.207)

#### 7.5.1. 120 Volts, 60 Hz Phase

Test No.: 413-18, 120 Volts, 60 Hz Phase

EN55011, Group 1, 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	69.16	60.64	65.87	-5.23	30.04	55.87	-25.83	
.1680	71.33	62.07	65.06	-2.99	30.20	55.06	-24.86	
.1703	71.50	62.03	64.95	-2.92	30.15	54.95	-24.80	
.2040	69.72	61.13	63.45	-2.32	29.30	53.45	-24.15	
.2558	66.67	59.74	61.57	-1.83	27.91	51.57	-23.66	
.3458	60.39	53.30	59.06	-5.76	21.51	49.06	-27.55	
.4065	54.66	47.28	57.72	-10.44	15.85	47.72	-31.87	
.4988	58.63	47.85	56.02	-8.17	16.62	46.02	-29.40	
.6968	52.15	41.94	56.00	-14.06	9.46	46.00	-36.54	
.9015	47.52	35.98	56.00	-20.02	6.02	46.00	-39.98	
1.0225	44.95	32.41	56.00	-23.59	3.41	46.00	-42.59	
1.2543	39.05	28.13	56.00	-27.87	.59	46.00	-45.41	
1.9158	30.72	19.75	56.00	-36.25	-2.93	46.00	-48.93	
2.4400	32.61	22.14	56.00	-33.86	-2.06	46.00	-48.06	
2.7820	28.71	15.18	56.00	-40.82	-3.32	46.00	-49.32	
3.2455	14.35	3.29	56.00	-52.71	-2.24	46.00	-48.24	
3.8328	16.46	9.04	56.00	-46.96	-.19	46.00	-46.19	
4.2265	18.62	12.10	56.00	-43.90	.24	46.00	-45.76	
4.4245	20.16	13.88	56.00	-42.12	1.00	46.00	-45.00	
4.6203	19.41	14.83	56.00	-41.17	1.54	46.00	-44.46	
4.8183	20.16	15.75	56.00	-40.25	2.84	46.00	-43.16	
5.0140	21.56	17.23	60.00	-42.77	4.32	50.00	-45.68	
5.6733	28.72	25.59	60.00	-34.41	12.77	50.00	-37.23	
6.5868	24.45	19.86	60.00	-40.14	8.64	50.00	-41.36	
7.3248	43.94	39.23	60.00	-20.77	25.61	50.00	-24.39	
8.3575	23.51	18.19	60.00	-41.81	7.86	50.00	-42.14	
10.5198	29.20	22.74	60.00	-37.26	14.54	50.00	-35.46	
14.8465	35.27	25.27	60.00	-34.73	19.37	50.00	-30.63	
15.1620	34.76	26.77	60.00	-33.23	21.88	50.00	-28.12	
15.6795	41.85	31.29	60.00	-28.71	24.46	50.00	-25.54	

**7. Measurement Data (continued)**

**7.5. Power Line Conducted Emissions (15.207)**

7.5.1. 120 Volts, 60 Hz Phase (continued)

Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Av Amp (dBµV)	Av Limit (dBµV)	Av Margin (dB)	Comments
16.1025	40.09	30.35	60.00	-29.65	23.23	50.00	-26.77	
17.2050	27.32	21.10	60.00	-38.90	16.29	50.00	-33.71	
18.0015	37.38	35.71	60.00	-24.29	34.97	50.00	-15.03	
18.9555	32.64	28.16	60.00	-31.84	20.43	50.00	-29.57	
20.1210	33.74	26.74	60.00	-33.26	20.98	50.00	-29.02	
20.7690	37.02	28.68	60.00	-31.32	20.56	50.00	-29.44	
21.1605	38.26	29.92	60.00	-30.08	22.84	50.00	-27.16	
22.4588	34.18	23.89	60.00	-36.11	17.20	50.00	-32.80	
24.0000	47.53	45.33	60.00	-14.67	39.32	50.00	-10.68	
27.1208	40.16	29.27	60.00	-30.73	27.57	50.00	-22.43	
27.9600	27.57	22.75	60.00	-37.25	17.94	50.00	-32.06	
29.1413	23.68	17.76	60.00	-42.24	12.92	50.00	-37.08	

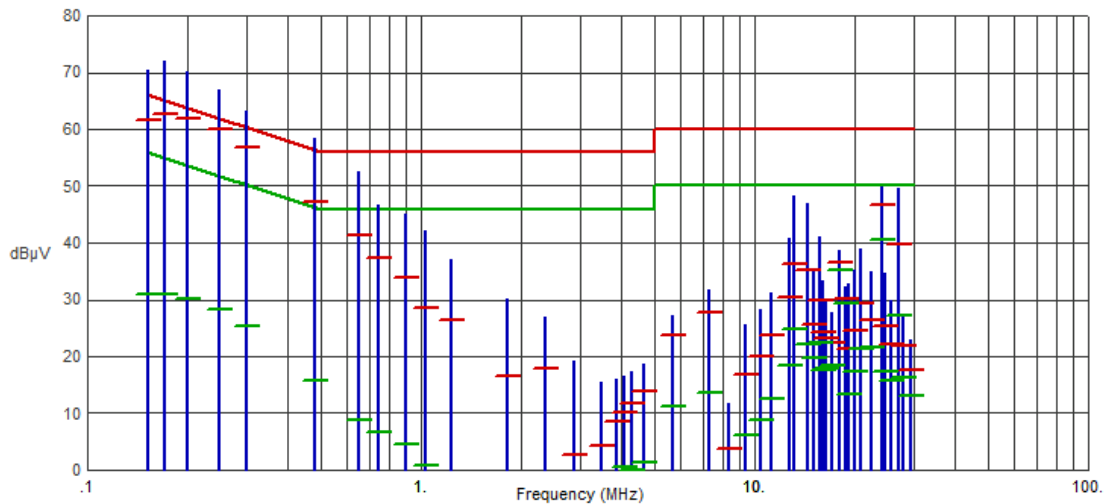
**7. Measurement Data (continued)**

**7.5. Power Line Conducted Emissions (15.207)**

7.5.2. 120 Volts, 60 Hz Neutral

Test No.: 413-18, 120 Volts, 60 Hz Neutral

EN55011, Group 1, 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	70.27	61.49	65.87	-4.38	30.90	55.87	-24.97	
.1703	72.04	62.69	64.95	-2.26	30.97	54.95	-23.98	
.1995	70.09	61.74	63.63	-1.89	30.05	53.63	-23.58	
.2490	66.88	59.96	61.79	-1.83	28.19	51.79	-23.60	
.3008	63.31	56.82	60.22	-3.40	25.27	50.22	-24.95	
.4808	58.38	47.16	56.33	-9.17	15.82	46.33	-30.51	
.6495	52.44	41.33	56.00	-14.67	8.87	46.00	-37.13	
.7463	46.72	37.45	56.00	-18.55	6.76	46.00	-39.24	
.8993	45.17	33.75	56.00	-22.25	4.45	46.00	-41.55	
1.0343	42.00	28.62	56.00	-27.38	.74	46.00	-45.26	
1.2300	36.95	26.38	56.00	-29.62	-.52	46.00	-46.52	
1.8218	30.25	16.60	56.00	-39.40	-4.33	46.00	-50.33	
2.3685	26.86	17.81	56.00	-38.19	-3.49	46.00	-49.49	
2.8748	19.11	2.60	56.00	-53.40	-4.03	46.00	-50.03	
3.4643	15.43	4.17	56.00	-51.83	-2.18	46.00	-48.18	
3.8670	16.07	8.44	56.00	-47.56	-.50	46.00	-46.50	
4.0673	16.44	10.06	56.00	-45.94	.40	46.00	-45.60	
4.2653	17.42	11.72	56.00	-44.28	.02	46.00	-45.98	
4.6613	18.80	13.87	56.00	-42.13	1.28	46.00	-44.72	
5.6535	27.09	23.73	60.00	-36.27	11.31	50.00	-38.69	
7.3320	31.86	27.73	60.00	-32.27	13.57	50.00	-36.43	
8.3670	11.86	3.74	60.00	-56.26	-1.19	50.00	-51.19	
9.4200	25.59	16.78	60.00	-43.22	6.10	50.00	-43.90	
10.4145	28.20	19.99	60.00	-40.01	8.82	50.00	-41.18	
11.2043	31.28	23.65	60.00	-36.35	12.59	50.00	-37.41	
12.7118	40.77	30.37	60.00	-29.63	18.52	50.00	-31.48	
13.1370	48.31	36.20	60.00	-23.80	24.87	50.00	-25.13	
14.4083	47.04	35.09	60.00	-24.91	22.13	50.00	-27.87	
15.0743	35.59	25.54	60.00	-34.46	19.66	50.00	-30.34	
15.6773	41.16	29.79	60.00	-30.21	22.35	50.00	-27.65	

**7. Measurement Data (continued)**

**7.5. Power Line Conducted Emissions (15.207)**

7.5.2. 120 Volts, 60 Hz Neutral (continued)

Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Av Amp (dBµV)	Av Limit (dBµV)	Av Margin (dB)	Comments
16.0665	33.40	24.24	60.00	-35.76	17.61	50.00	-32.39	
16.4400	29.49	23.28	60.00	-36.72	17.91	50.00	-32.09	
17.1218	27.75	22.28	60.00	-37.72	18.33	50.00	-31.67	
18.0015	38.74	36.41	60.00	-23.59	35.27	50.00	-14.73	
18.7058	32.36	30.25	60.00	-29.75	29.31	50.00	-20.69	
19.0770	32.92	21.26	60.00	-38.74	13.31	50.00	-36.69	
19.8780	35.26	24.58	60.00	-35.42	17.25	50.00	-32.75	
20.7263	38.81	29.20	60.00	-30.80	21.45	50.00	-28.55	
22.4588	34.88	26.52	60.00	-33.48	21.54	50.00	-28.46	
24.0000	49.94	46.60	60.00	-13.40	40.62	50.00	-9.38	
24.5963	34.58	25.41	60.00	-34.59	17.27	50.00	-32.73	
25.5863	29.92	22.14	60.00	-37.86	15.63	50.00	-34.37	
27.1208	49.51	39.70	60.00	-20.30	27.22	50.00	-22.78	
27.9600	27.36	21.91	60.00	-38.09	16.16	50.00	-33.84	
29.3573	22.84	17.61	60.00	-42.39	13.00	50.00	-37.00	



## 7. Measurement Data (continued)

### 7.6. Occupied Bandwidth (Section 15.215 (c) and ANSI C63.10, Section 6.9)

Requirement: Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Sections 15.217 through 15.255 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule.

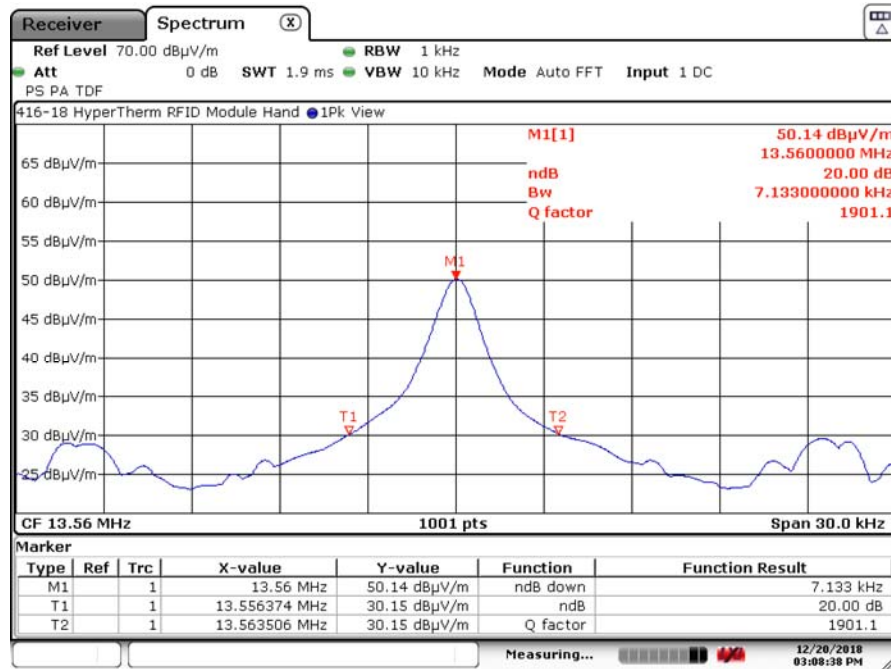
Frequency Band:  $F_{MIN} = 13.110 \text{ MHz}$

$F_{MAX} = 14.010 \text{ MHz}$

Test Note: The reported bandwidth represents the worst case measured bandwidth of the combined three transmitters.

	-20 dB Frequency Measured	Lower & Upper Band Edge ( $F_{MIN}$ & $F_{MAX}$ )	Result
	MHz	MHz	
$F_{LO}$	13.556374	13.11	Compliant ( $F_{LO} > F_{MIN}$ )
$F_{HI}$	13.563506	14.01	Compliant ( $F_{HI} < F_{MAX}$ )

#### 7.6.1. Plot of 20 dB Bandwidth vs. Frequency Band (Hand Version)



Date: 20.DEC.2018 15:08:36

**7. Measurement Data (continued)**

**7.6. Occupied Bandwidth (Section 15.215 (c) and ANSI C63.10, Section 6.9 cont)**

Requirement: Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Sections 15.217 through 15.255 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule.

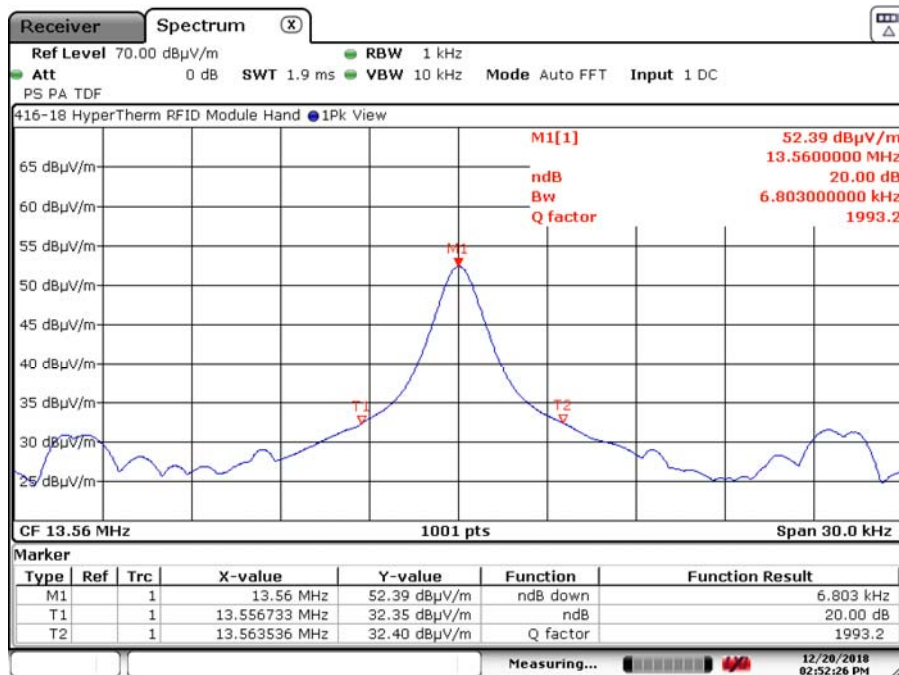
Frequency Band:  $F_{MIN} = 13.110 \text{ MHz}$

$F_{MAX} = 14.010 \text{ MHz}$

Test Note: The reported bandwidth represents the worst case measured bandwidth of the combined three transmitters.

	-20 dB Frequency Measured	Lower & Upper Band Edge ( $F_{MIN}$ & $F_{Max}$ )	Result
	MHz	MHz	
$F_{LO}$	13.556733	13.11	Compliant ( $F_{LO} > F_{MIN}$ )
$F_{HI}$	13.563536	14.01	Compliant ( $F_{HI} < F_{Max}$ )

**7.6.2. Plot of 20 dB Bandwidth vs. Frequency Band (Mech Version)**



Date: 20 DEC. 2018 14:52:25

**7. Measurement Data (continued)**

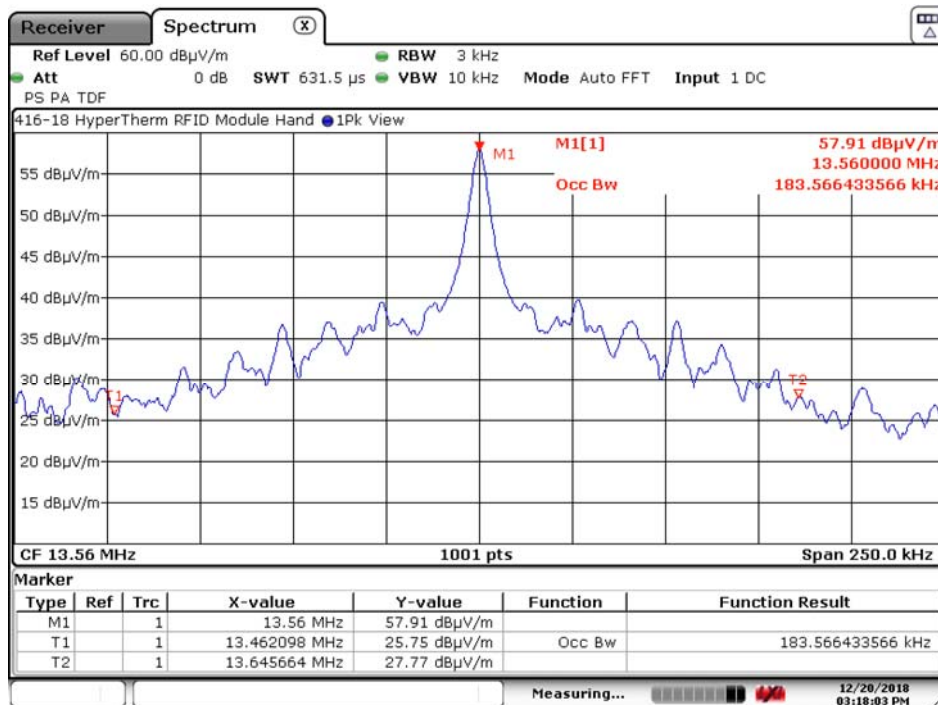
**7.7. 99% Power Bandwidth (RSS-GEN Section 4.6.1)**

Requirement: When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.  
The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

Procedure: This test was performed utilizing the automated 99% bandwidth function of the spectrum analyzer.

Frequency (MHz)	99% Power Bandwidth (kHz)
13.56	183.566

**7.7.1. Plot of 99% Bandwidth (Hand Version)**



Date: 20.DEC.2018 15:18:01

**7. Measurement Data (continued)**

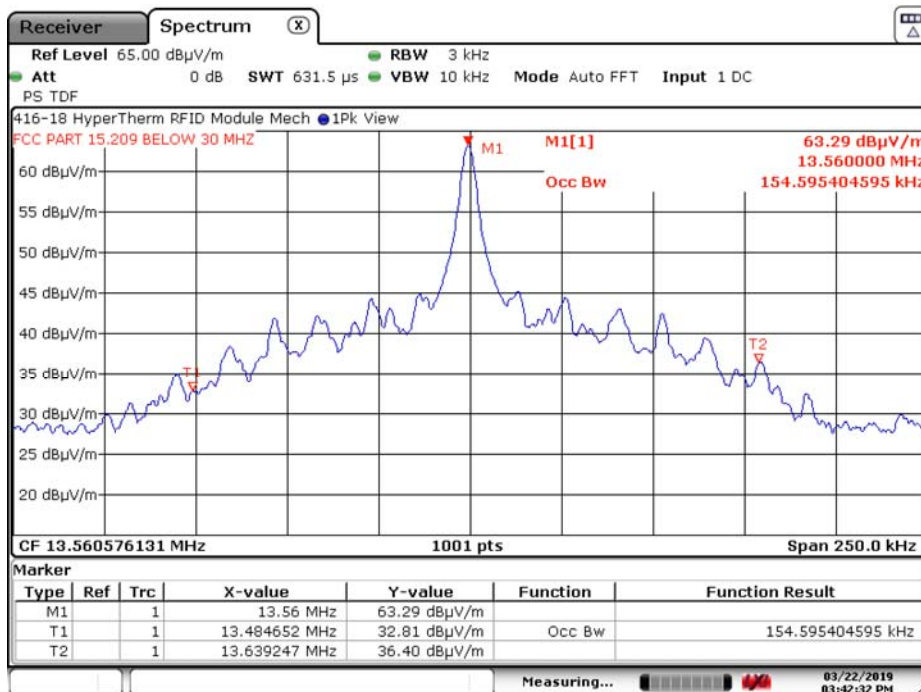
**7.7. 99% Power Bandwidth (RSS-GEN Section 4.6.1)**

Requirement: When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.  
The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

Procedure: This test was performed utilizing the automated 99% bandwidth function of the spectrum analyzer.

Frequency (MHz)	99% Power Bandwidth (kHz)
13.56	154.595

**7.7.2. Plot of 99% Bandwidth (Mech Version)**



Date: 22.MAR.2019 15:42:31

**7. Measurement Data (continued)**

**7.8. Public Exposure to Radio Frequency Energy Levels ((FCC KDB 447498 D01 v06, 1.1307 (b)(1), 2.1091(b)) RSS-GEN, RSS 102, Issue 5**

Frequency	Measured Field Strength at 10M	Converted Field Strength to Power	Converted Field Strength to Power	ISED Exemption Limit (6)
(MHz)	(dBµV/m)	(dBm)	(mW)	(mW)
13.56	55.23	-29.54	0.0011	1000

Note: EIRP (dBm) = Field Strength – 84.77

Frequency (MHz)	MPE Distance (cm)	DUT Output Power (mW)	Power Density		FCC Limit (mW/cm <sup>2</sup> )	ISED Limit (W/m <sup>2</sup> )	Result
			(mW/cm <sup>2</sup> )	(W/m <sup>2</sup> )			
(1)	(2)	(3)	(4)		(5)	(6)	
13.56	20.0	0.0011	0.00000022	0.0000022	0.979	2	Compliant

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

- PD = Power Density (mW/cm<sup>2</sup>)
- OP = DUT Output Power (dBm)
- AG = DUT Antenna Gain (dBi)
- d = MPE Distance (cm)

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 7.2 of this test report.
3. Measured power is radiated, therefore Antenna gain is 0.0 dBi.
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. Limit from 1.34 to 30 MHz is 180 / f<sup>2</sup> where f is in MHz.
6. Reference RSS-102, Issue 5 Section 2.5.2 Exemption Limits for Routine Evaluation - RF Exposure Evaluation, is below 20 MHz and the source-based, time averaged maximum e.i.r.p. of the device is equal to or less than 1 Watt. Also, Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment) has a limit of 2 W/m<sup>2</sup> from 10 to 20 MHz.

## 8. 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 32, Chinese-Taipei (Taiwan) BSMI CNS 13438 and Korea (RRA) KN 11, KN 13, KN 14-1, KN 22, KN 32, KN 61000-6-3, KN 61000-6-4.

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

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

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.