

## **COMPLIANCE WORLDWIDE INC. TEST REPORT 485-14**

**In Accordance with the Requirements of  
Federal Communications Commission CFR Title 47 Part 15.225, Subpart C  
Industry Canada RSS 210, Issue 8, Annex 2**

**Low Power License-Exempt Radio Communication Devices  
Intentional Radiators**

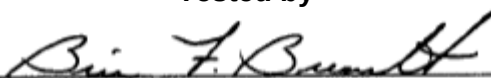
**Issued to  
Thermo Fischer Scientific, Inc.  
Life Sciences Division  
246 Good Lane, Suite 100  
Guildford, CT 06437**

**for the  
ION Torrent  
13.56 MHz RFID Reader Module**

**FCC ID: 2AD9Z-INS1011976  
IC: 12763A- INS1011976**

**Report Issued on March 4, 2015**

**Tested by**

  
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## 1. Scope

This test report certifies that the Thermo Fischer Scientific ION Torrent 13.56 MHz RFID Reader Module, as tested, meet the FCC Part 15.225 Subpart C, and Industry 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.

## 2. Product Details

- 2.1. Manufacturer:** Thermo Fischer Scientific, Inc.
- 2.2. Model Number:** ION Torrent 13.56 MHz RFID Reader Module
- 2.3. Serial Number:** 00008
- 2.4. Description of EUT:** The EUT is a 13.56 MHz RFID Reader for collecting information from tags used in various Thermo Fischer Scientific devices.
- 2.5. Power Sources:** 5 Volts DC via USB Interface
- 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 ION Torrent 13.56 MHz RFID Reader is powered up via the laptop's USB connection. After boot up, via a terminal program on the laptop the EUT is configured to continuously read RFID tags.

### 3.2. EUT Hardware

| Manufacturer   | Model/Part # / Options | Serial Number | Input Voltage | Frq (Hz) | Description/Function         |
|----------------|------------------------|---------------|---------------|----------|------------------------------|
| Thermo Fischer | ION Torrent            | 00008         | 5 VDC         |          | 13.56 MHz RFID Reader Module |

### 3.3. EUT Connected Hardware

| Manufacturer | Model         | Serial Number | Description                        |
|--------------|---------------|---------------|------------------------------------|
| Dell         | Latitude D620 | 38071886077   | Laptop used to power and setup EUT |

### 3.4. EUT Cables/Transducers

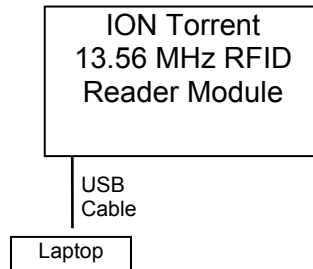
| Cable Type | Length | Shield | From | To          |
|------------|--------|--------|------|-------------|
| USB Cable  | 1M     | Yes    | EUT  | Dell Laptop |

### 3.5. Support Equipment

| Manufacturer | Model | Serial Number | Input Voltage | Frq (Hz) | Description/Function |
|--------------|-------|---------------|---------------|----------|----------------------|
| N/A          |       |               |               |          |                      |

### 3. Product Configuration (continued)

#### 3.6. 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     | 4/4/2015  | 2 Years  |
| Spectrum Analyzer 20 Hz – 40 GHz <sup>2</sup>   | Rohde & Schwarz     | FSV40     | 100899     | 6/5/2015  | 2 Years  |
| Spectrum Analyzer, 9 kHz to 40 GHz <sup>3</sup> | Rohde & Schwarz     | FSVR40    | 100909     | 5/15/2015 | 2 Years  |
| EMI Receiver                                    | Hewlett Packard     | 8546A     | 3650A00360 | 6/4/2016  | 2 Years  |
| Loop Antenna                                    | EMCO                | 6512      | 9309-1139  | 9/23/2016 | 2 Years  |
| Biconilog Antenna, 30 MHz to 2 GHz              | Sunol Sciences Corp | JB1       | 25509      | 5/15/2015 | 2 Years  |
| LISN 50 Ω 50 μH, 9 kHz to 30 MHz                | EMCO                | 3825/2    | 9109-1860  | 6/2/2015  | 1 Year   |
| Power Supply                                    | Hewlett Packard     | 6296A     | 7M0599     | 8/26/2015 | 1 Year   |
| Digital Barometer                               | Control Company     | 4195      | ID236      | 2/25/2015 | 2 Years  |
| Temperature Chamber                             | Associated Research | E-0029    | N/A        | N/A       | ---      |

<sup>1</sup> ESR7 Firmware revision: V2.26, Date installed: 8/15/2014 Previous V2.17, installed 6/11/2014.  
<sup>2</sup> FSV40 Firmware revision: V2.30 SP1 Date installed: 10/22/2014 Previous V2.30, installed 7/23/2014.  
<sup>3</sup> FSVR40 Firmware revision: V2.23, Date installed: 10/20/2014 Previous V1.63 SP1, installed 8/28/2013.

#### 4. Measurements Parameters (continued)

##### 4.2. Measurement & Equipment Setup

|                                      |                                                                                                                           |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Test Dates:                          | December 16 <sup>th</sup> , 30 <sup>th</sup> , 2014, January 22 <sup>nd</sup> , 2015                                      |
| Test Engineer:                       | Larry Stillings, Tom Charron                                                                                              |
| Normal Site Temperature (15 - 35°C): | 22.0                                                                                                                      |
| Relative Humidity (20 -75%RH):       | 33%                                                                                                                       |
| Frequency Range:                     | .150 kHz to 1 GHz                                                                                                         |
| Measurement Distance:                | 3 Meters                                                                                                                  |
| EMI Receiver IF Bandwidth:           | 200 Hz – 9 kHz to 150 kHz<br>9 kHz – 150 kHz to 30 MHz<br>120 kHz - 30 MHz to 1 GHz<br>1 MHz - Above 1 GHz                |
| EMI Receiver Avg Bandwidth:          | 300 Hz – 9 kHz to 150 kHz<br>30 kHz – 150 kHz to 30 MHz<br>300 kHz - 30 MHz to 1 GHz<br>3 MHz - Above 1 GHz               |
| Detector Function:                   | Peak, QP, Avg – 150 kHz to 30 MHz<br>Peak, QP - 30 MHz to 1 GHz<br>Peak, Avg - Above 1 GHz<br>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: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices, Section 15.

#### 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

The other, non-transmitter oscillator frequencies also used in this device are as follows:

27.12 MHz Main Board

## 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 | Reference ANSI C63.4 Annex H, Paragraph H1(b) |
| 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 | 6.7                 | 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 employs a permanent, internally mounted antenna that is etched into the PC board.

## 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.

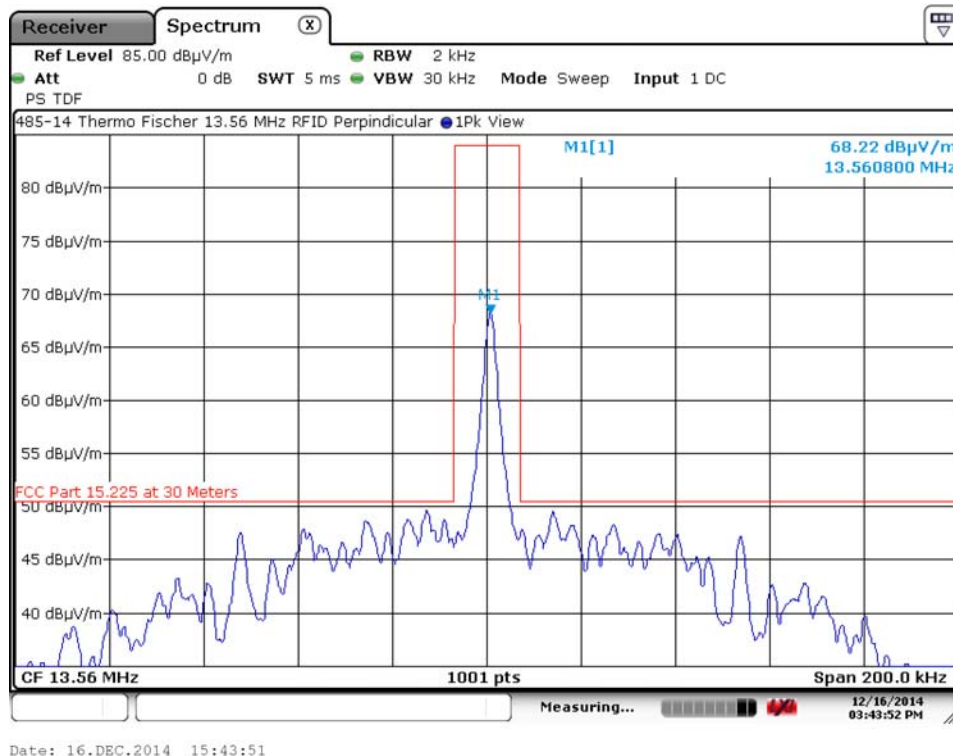
**Result:** The unit under test complies with the requirements detailed in FCC Part 15.225 (a), (b) and (c).

| Freq.<br>MHz | Dist.<br>Meters | Meas.<br>Field<br>Strength<br>dBμV | Ant.<br>Factor <sup>1</sup><br>dB | Cable<br>Loss <sup>1</sup><br>dB | Corr.<br>Field<br>Strength<br>dBμV/m | Limit <sup>2</sup><br>dBμV/m | Margin<br>(dB) |
|--------------|-----------------|------------------------------------|-----------------------------------|----------------------------------|--------------------------------------|------------------------------|----------------|
| 13.56        | 10              | 32.54                              | 35.07                             | 0.61                             | 68.22                                | 84.00                        | 15.78          |

<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



## 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. Temperature Variation

| Marker | Temp<br>°C | Meas Freq. | Limit                  |                        |            | Offset     | Result    |
|--------|------------|------------|------------------------|------------------------|------------|------------|-----------|
|        |            | (MHz)      | F <sub>MIN</sub> (MHz) | F <sub>MAX</sub> (MHz) | %          | (%)        |           |
| -      | Ambient    | 13.5609750 | N/A                    |                        |            | N/A        |           |
| 1      | -20        | 13.5611000 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00092176 | Compliant |
| 2      | -10        | 13.5611500 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00129047 | Compliant |
| 3      | 0          | 13.5611250 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00110612 | Compliant |
| 4      | +10        | 13.5611250 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00110612 | Compliant |
| 5      | +20        | 13.5610750 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00073741 | Compliant |
| 6      | +30        | 13.5611500 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00129047 | Compliant |
| 7      | +40        | 13.5610250 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00036871 | Compliant |
| 8      | +50        | 13.5610750 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00073741 | Compliant |

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

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

| Marker | VAC    | Meas Freq. | Limit                  |                        |            | Offset     | Result    |
|--------|--------|------------|------------------------|------------------------|------------|------------|-----------|
|        |        | (MHz)      | F <sub>MIN</sub> (MHz) | F <sub>MAX</sub> (MHz) | %          | (%)        |           |
| -      | 120.00 | 13.5609750 | N/A                    |                        |            | N/A        |           |
| 1      | 102.00 | 13.5610750 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00073741 | Compliant |
| 2      | 108.00 | 13.5611250 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00110612 | Compliant |
| 3      | 114.00 | 13.5609500 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00018435 | Compliant |
| 4      | 126.00 | 13.5611000 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00092176 | Compliant |
| 5      | 132.00 | 13.5610500 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00055306 | Compliant |
| 6      | 138.00 | 13.5613250 | 13.559619              | 13.562331              | $\pm 0.01$ | 0.00258094 | 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 (dB $\mu$ V/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 C63.4-2009, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

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.

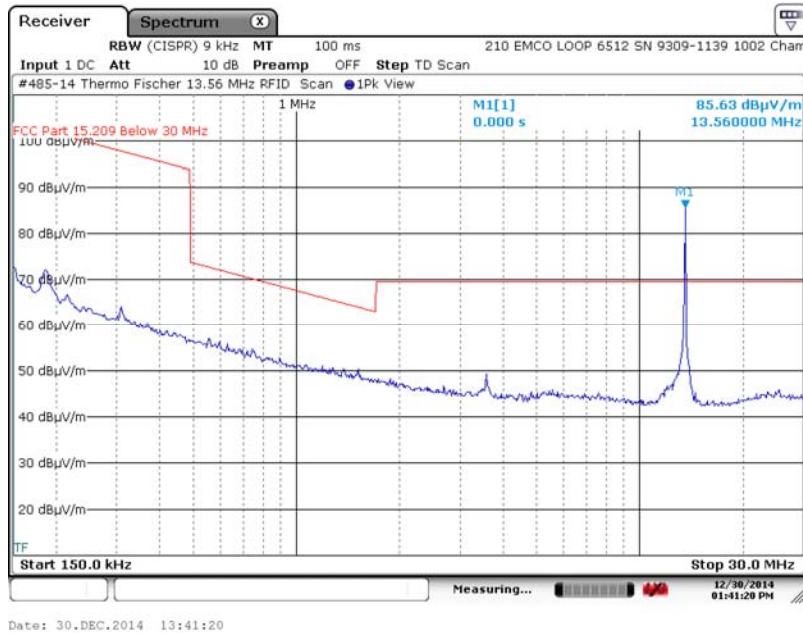
Results: The transmitter installed in the unit under test meet the FCC Part 15.209 emissions requirements.

## 7. Measurement Data (continued)

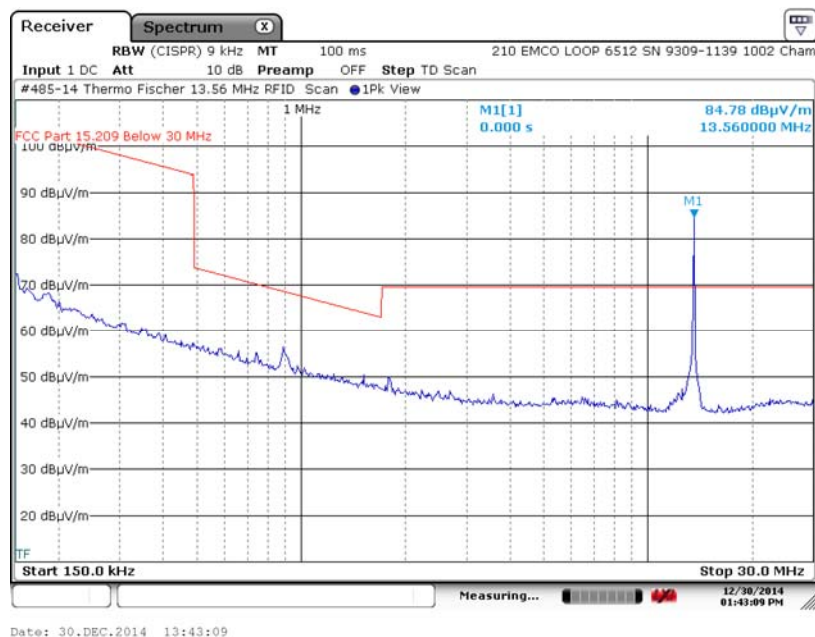
### 7.4. Transmitter Spurious Radiated Emissions (15.209) (continued)

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

##### 7.4.1.1. Antenna is Parallel to the UUT



##### 7.4.1.2. Antenna is Perpendicular to the UUT

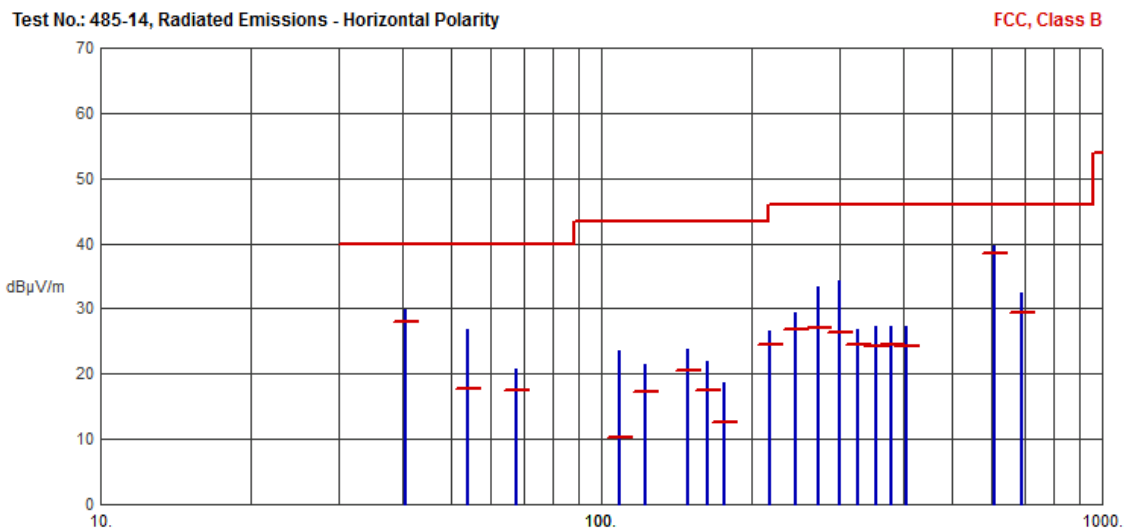


## 7. Measurement Data (continued)

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

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

##### 7.4.2.1. Antenna is Horizontal



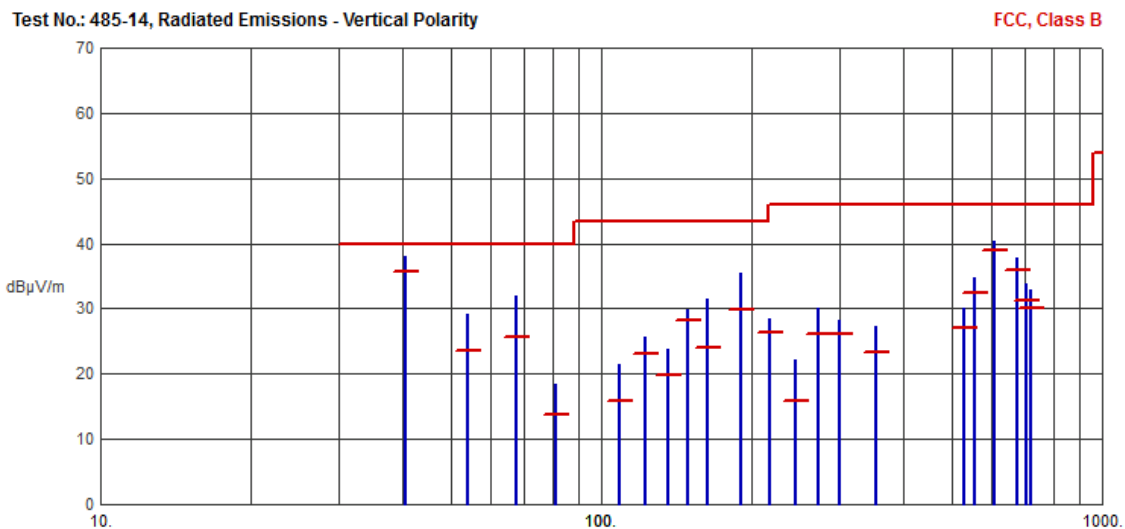
| Frequency (MHz) | Pk Amp (dBμV/m) | QP Amp (dBμV/m) | QP Limit (dBμV/m) | Margin (dB) | Ant Ht (cm) | Table (Deg) | Comments |
|-----------------|-----------------|-----------------|-------------------|-------------|-------------|-------------|----------|
| 40.6657         | 29.93           | 27.98           | 40.00             | -12.02      | N/A         | N/A         |          |
| 54.2217         | 26.82           | 17.82           | 40.00             | -22.18      | N/A         | N/A         |          |
| 67.8000         | 20.87           | 17.50           | 40.00             | -22.50      | N/A         | N/A         |          |
| 108.4507        | 23.63           | 10.21           | 43.50             | -33.29      | N/A         | N/A         |          |
| 122.0421        | 21.51           | 17.32           | 43.50             | -26.18      | N/A         | N/A         |          |
| 149.1640        | 23.71           | 20.50           | 43.50             | -23.00      | N/A         | N/A         |          |
| 162.7200        | 21.84           | 17.61           | 43.50             | -25.89      | N/A         | N/A         |          |
| 176.2870        | 18.73           | 12.71           | 43.50             | -30.79      | N/A         | N/A         |          |
| 216.9670        | 26.49           | 24.41           | 46.00             | -21.59      | N/A         | N/A         |          |
| 244.0870        | 29.32           | 26.84           | 46.00             | -19.16      | N/A         | N/A         |          |
| 271.2070        | 33.38           | 27.17           | 46.00             | -18.83      | N/A         | N/A         |          |
| 298.3270        | 34.31           | 26.36           | 46.00             | -19.64      | N/A         | N/A         |          |
| 325.4520        | 26.76           | 24.59           | 46.00             | -21.41      | N/A         | N/A         |          |
| 352.5720        | 27.32           | 24.30           | 46.00             | -21.70      | N/A         | N/A         |          |
| 379.6925        | 27.23           | 24.40           | 46.00             | -21.60      | N/A         | N/A         |          |
| 406.8125        | 27.22           | 24.37           | 46.00             | -21.63      | N/A         | N/A         |          |
| 610.2345        | 39.61           | 38.45           | 46.00             | -7.55       | N/A         | N/A         |          |
| 691.5945        | 32.42           | 29.50           | 46.00             | -16.50      | N/A         | N/A         |          |

## 7. Measurement Data (continued)

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

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

##### 7.4.2.2. Antenna is Vertical



| Frequency (MHz) | Pk Amp (dBµV/m) | QP Amp (dBµV/m) | QP Limit (dBµV/m) | Margin (dB) | Ant Ht (cm) | Table (Deg) | Comments |
|-----------------|-----------------|-----------------|-------------------|-------------|-------------|-------------|----------|
| 40.6739         | 38.03           | 35.76           | 40.00             | -4.24       | N/A         | N/A         |          |
| 54.2051         | 29.09           | 23.60           | 40.00             | -16.40      | N/A         | N/A         |          |
| 67.8180         | 32.03           | 25.71           | 40.00             | -14.29      | N/A         | N/A         |          |
| 81.3600         | 18.51           | 13.67           | 40.00             | -26.33      | N/A         | N/A         |          |
| 108.5614        | 21.36           | 15.83           | 43.50             | -27.67      | N/A         | N/A         |          |
| 122.0339        | 25.55           | 23.20           | 43.50             | -20.30      | N/A         | N/A         |          |
| 135.5939        | 23.84           | 19.88           | 43.50             | -23.62      | N/A         | N/A         |          |
| 149.1539        | 29.95           | 28.24           | 43.50             | -15.26      | N/A         | N/A         |          |
| 162.7139        | 31.46           | 23.96           | 43.50             | -19.54      | N/A         | N/A         |          |
| 189.8339        | 35.42           | 29.89           | 43.50             | -13.61      | N/A         | N/A         |          |
| 216.9568        | 28.38           | 26.28           | 46.00             | -19.72      | N/A         | N/A         |          |
| 244.1694        | 22.26           | 15.94           | 46.00             | -30.06      | N/A         | N/A         |          |
| 271.1981        | 30.13           | 26.05           | 46.00             | -19.95      | N/A         | N/A         |          |
| 298.3445        | 28.33           | 26.18           | 46.00             | -19.82      | N/A         | N/A         |          |
| 352.5667        | 27.31           | 23.30           | 46.00             | -22.70      | N/A         | N/A         |          |
| 528.8739        | 30.14           | 27.17           | 46.00             | -18.83      | N/A         | N/A         |          |
| 555.9722        | 34.66           | 32.49           | 46.00             | -13.51      | N/A         | N/A         |          |
| 610.2370        | 40.34           | 39.08           | 46.00             | -6.92       | N/A         | N/A         |          |
| 678.0513        | 37.71           | 35.97           | 46.00             | -10.03      | N/A         | N/A         |          |
| 705.1521        | 33.90           | 31.32           | 46.00             | -14.68      | N/A         | N/A         |          |
| 718.7197        | 32.88           | 30.08           | 46.00             | -15.92      | N/A         | N/A         |          |

## 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<br>(MHz) | Limits<br>(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 C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz. Specifically, Annex H, paragraph H1(b) regarding the use of a dummy load for a Part 15 transmitter.

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

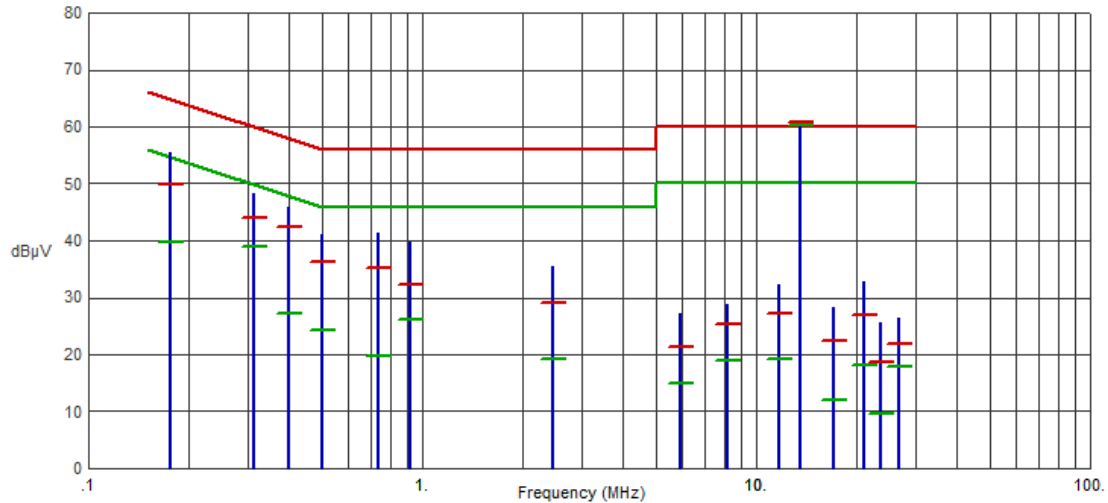
## 8. Conducted Emissions Test Results

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

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

Test No.: 485-14, 120 Volts, 60 Hz Phase

FCC, 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         |
|-----------------|---------------|---------------|-----------------|----------------|----------------|------------------|-----------------|------------------|
| .1760           | 55.49         | 49.85         | 64.67           | -14.82         | 39.64          | 54.67            | -15.03          |                  |
| .3116           | 48.22         | 43.89         | 59.93           | -16.04         | 39.03          | 49.93            | -10.90          |                  |
| .3980           | 45.95         | 42.50         | 57.90           | -15.40         | 27.27          | 47.90            | -20.63          |                  |
| .4997           | 40.94         | 36.14         | 56.00           | -19.86         | 24.27          | 46.00            | -21.73          |                  |
| .7361           | 41.42         | 35.23         | 56.00           | -20.77         | 19.78          | 46.00            | -26.22          |                  |
| .9221           | 39.84         | 32.26         | 56.00           | -23.74         | 26.07          | 46.00            | -19.93          |                  |
| 2.4602          | 35.48         | 29.03         | 56.00           | -26.97         | 19.16          | 46.00            | -26.84          |                  |
| 5.9530          | 27.15         | 21.45         | 60.00           | -38.55         | 14.89          | 50.00            | -35.11          |                  |
| 8.2373          | 28.92         | 25.44         | 60.00           | -34.56         | 18.88          | 50.00            | -31.12          |                  |
| 11.6518         | 32.29         | 27.33         | 60.00           | -32.67         | 19.32          | 50.00            | -30.68          |                  |
| 13.5607         | 61.14         | 60.81         |                 |                | 60.30          |                  |                 | Fundamental Freq |
| 17.0359         | 28.29         | 22.39         | 60.00           | -37.61         | 12.05          | 50.00            | -37.95          |                  |
| 21.1091         | 32.79         | 26.92         | 60.00           | -33.08         | 18.01          | 50.00            | -31.99          |                  |
| 23.6692         | 25.60         | 18.69         | 60.00           | -41.31         | 9.67           | 50.00            | -40.33          |                  |
| 26.6096         | 26.44         | 21.95         | 60.00           | -38.05         | 17.75          | 50.00            | -32.25          |                  |

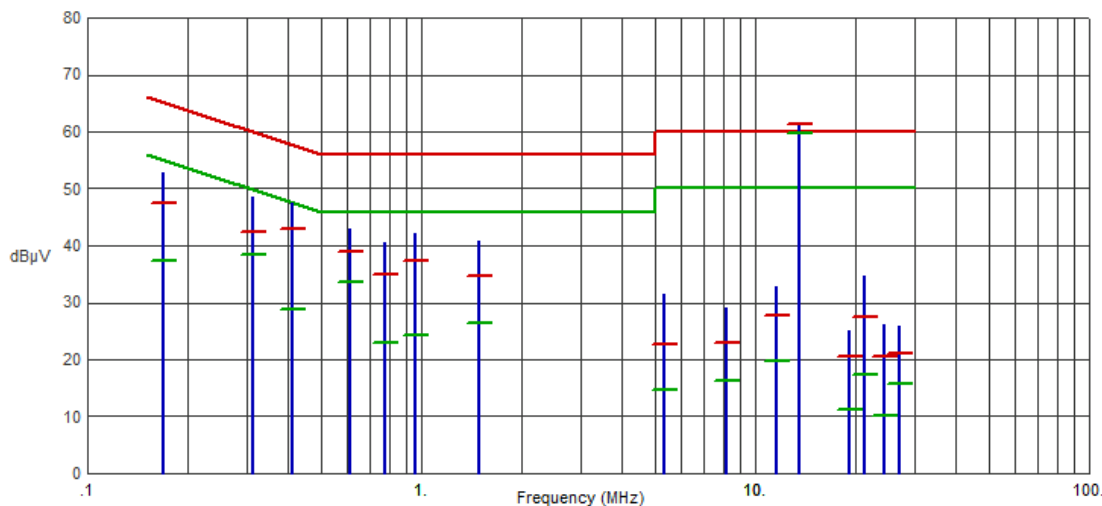
## 8. Conducted Emissions Test Results

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

#### 7.5.2. 120 Volts, 60 Hz Neutral

Test No.: 485-14, 120 Volts, 60 Hz Neutral

FCC, 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         |
|-----------------|---------------|---------------|-----------------|----------------|----------------|------------------|-----------------|------------------|
| .1680           | 52.75         | 47.56         | 65.06           | -17.50         | 37.24          | 55.06            | -17.82          |                  |
| .3115           | 48.40         | 42.38         | 59.93           | -17.55         | 38.29          | 49.93            | -11.64          |                  |
| .4096           | 47.34         | 42.97         | 57.66           | -14.69         | 28.82          | 47.66            | -18.84          |                  |
| .6132           | 43.02         | 38.97         | 56.00           | -17.03         | 33.50          | 46.00            | -12.50          |                  |
| .7755           | 40.53         | 34.81         | 56.00           | -21.19         | 22.82          | 46.00            | -23.18          |                  |
| .9560           | 42.16         | 37.33         | 56.00           | -18.67         | 24.22          | 46.00            | -21.78          |                  |
| 1.4927          | 40.68         | 34.63         | 56.00           | -21.37         | 26.46          | 46.00            | -19.54          |                  |
| 5.3282          | 31.41         | 22.70         | 60.00           | -37.30         | 14.60          | 50.00            | -35.40          |                  |
| 8.2154          | 29.02         | 22.85         | 60.00           | -37.15         | 16.18          | 50.00            | -33.82          |                  |
| 11.5932         | 32.87         | 27.84         | 60.00           | -32.16         | 19.69          | 50.00            | -30.31          |                  |
| 13.5609         | 61.62         |               |                 |                | 59.63          |                  |                 | Fundamental Freq |
| 19.2076         | 25.20         | 20.50         | 60.00           | -39.50         | 11.17          | 50.00            | -38.83          |                  |
| 21.1914         | 34.58         | 27.44         | 60.00           | -32.56         | 17.36          | 50.00            | -32.64          |                  |
| 24.2406         | 26.12         | 20.55         | 60.00           | -39.45         | 10.20          | 50.00            | -39.80          |                  |
| 27.1565         | 25.77         | 21.05         | 60.00           | -38.95         | 15.75          | 50.00            | -34.25          |                  |

## 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.

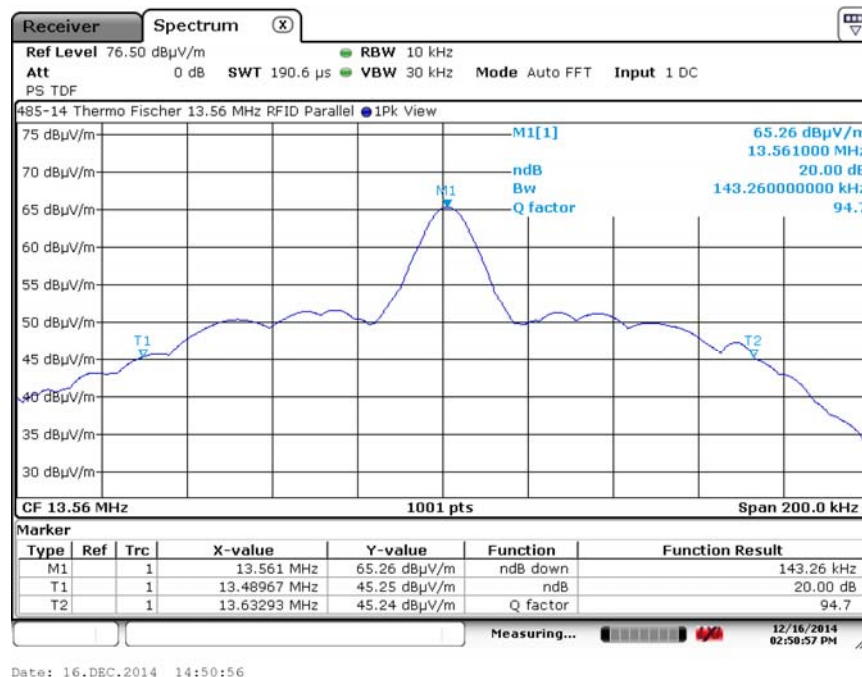
Frequency Band:  $F_{MIN} = 13.110 \text{ MHz}$

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

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                                               |                                  |
| $F_{LO}$ | 13.48967                  | 13.11                                             | Compliant ( $F_{LO} > F_{MIN}$ ) |
| $F_{HI}$ | 13.63293                  | 14.01                                             | Compliant ( $F_{HI} < F_{MAX}$ ) |

#### 7.6.1. Plot of 20 dB Bandwidth vs. Frequency Band



## 7. Measurement Data (continued)

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

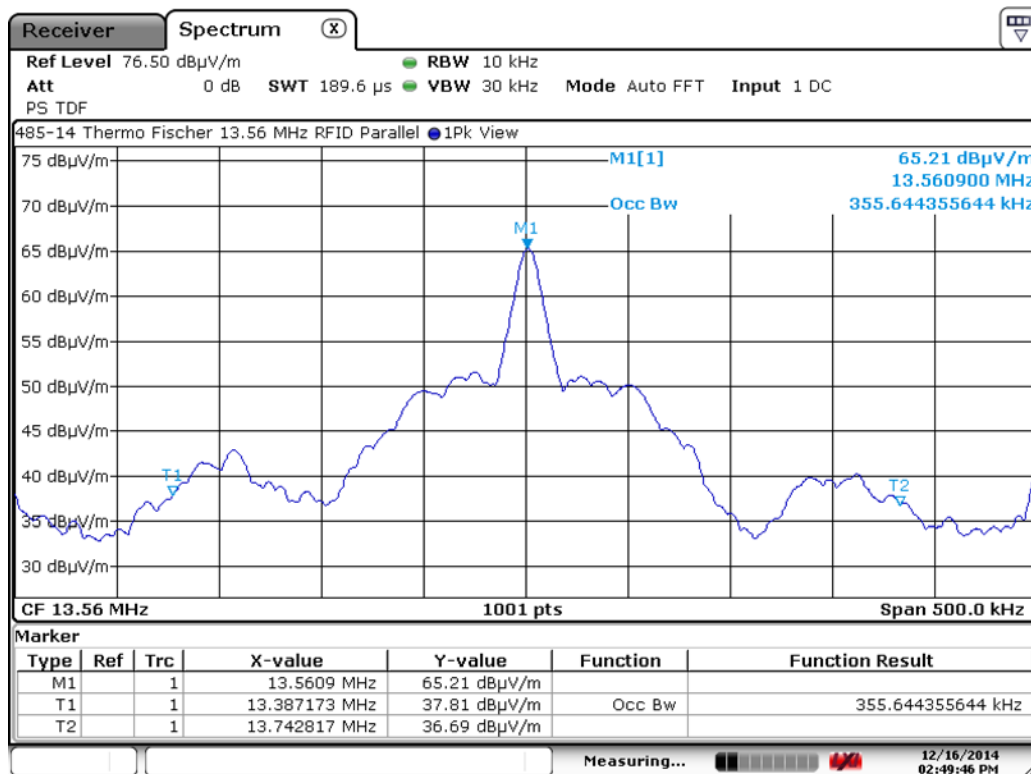
Requirement: When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

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 | 99% Power Bandwidth |
|-----------|---------------------|
| (MHz)     | (kHz)               |
| 13.56     | 355.644             |

#### 7.7.1. Plot of 99% Bandwidth



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**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 Federal Communications Commission (FCC), Industry Canada, and Voluntary Control Council Interference (VCCI) standards. A description of the test sites is on file with the FCC (registration number 96392), Industry Canada (file number IC 3023A-1).

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

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022.

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.