RETLIF TESTING LABORATORIES | Put Us To The Test℠
101 New Boston Road
Goffstown, NH 03045 USA
Tel: (603) 497-4600 • Fax: (603) 497-5281 • www.retlif.com

# FCC Part 15, Subpart C, Section 15.247

## Test Report

## On

## Communications Management Unit
## Model: CMU-E5X

| | |
|---|---|
| **Customer Name:** | IONX, LLC |
| **Customer P.O:** | 4500515709 |
| **Date of Report:** | September 21, 2018 |
| **Test Report No:** | R-2753P-1 |
| **Test Start Date:** | October 12, 2017 |
| **Test Finish Date:** | September 20, 2018 |
| **Test Technician:** | M. Seamans, T. Hannemann |
| **Report Approved By:** | S. Wentworth |
| **Report Prepared By:** | M. Chambers |

## Technical Information

| | |
|---|---|
| **Report Number:** | R-2753P-1 |
| **Customer:** | IONX, LLC |
| **Address:** | 515 S. Franklin St. |
| | West Chester, PA 19382 |
| **Test Sample:** | Communications Management Unit |
| **Brand Name:** | IONX |
| **Model Number:** | CMU-E5X |
| **Serial Numbers:** | FTA7B, FTA73 |
| **Manufactured By:** | IONX, LLC |
| **Power Requirements:** | 7.2 VDC via internal battery pack |
| **Frequency Band of Operation:** | 2.405 GHz – 2.480 GHz |
| **Frequencies Tested (Low, Mid and High):** | 2.405 GHz, 2.440 GHz, 2.480 GHz |
| **Antenna Type:** | PCB Antenna, 3.4 dBi Peak Gain |
| **Equipment Use:** | Mobile |
| **FCC ID:** | 2ADEPCMUE5-A |

**Test Specification:**
FCC Rules and Regulations Part 15, Subpart C, Section 15.247

**Test Procedure**:
ANSI C63.4:2014
ANSI C63.10:2013
FCC DA 00-705, Released March 30, 2000, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

**Test Facility:**
Retlif Testing Laboratories
101 New Boston Road
Goffstown, NH 03045

FCC Accreditation Designation Number: US5327

**EUT Description:**

The CMU-E5X is a low-power communication management unit for remote unpowered mobile assets. It provides asset and condition monitoring information to shippers, fleet owners, and railroads that need near real-time information about asset status and condition.

Table 1 - Support Equipment

| Description | Manufacturer | Part Number | Model Number | Serial Number |
|---|---|---|---|---|
| Laptop | Lenovo | N/A | T450s | PC0A94LB |

The test methods performed on the EUT are shown below. Testing was performed in accordance with the applicable FCC requirements for the transmission mode (FHSS).

Table 2 – Test Methods Performed

| FCC Part 15, Subpart C | Test Method |
|---|---|
| 15.247(a)(1) | 20 dB Bandwidth |
| 15.247(a)(1) (iii) | Number of Hopping Channels and Time of Occupancy |
| 15.247(a)(1) | Channel Separation |
| 15.247(b)(3) | Power Output |
| 15.247(d) | Antenna Terminal Out of Band/<br>Band Edge Conducted Emissions |
| 15.247(d) | Out of Band/Band Edge Radiated Emissions |
| 15.209(a) | Radiated Spurious Emissions (Co-Location) |

The design of the test sample has not changed since the date of testing and the EUT meets the requirements of the test specifications listed herein.

This test report is for certification of the CMU-E5 family of products consisting of model numbers CMU-E5S and CMU-E5X. The only difference between the two models is the enclosure size and number of batteries in the battery pack for longer product life. The X in the model number CMU-E5X is not used as a wild card character.

## Certification and Signatures

We certify that this report is a true representation of the results obtained from the tests of the equipment stated. We further certify that the measurements shown in this report were made in accordance with the procedures indicated and vouch for the qualifications of all Retlif Testing Laboratories personnel taking them.

Scott Wentworth
Branch Manager
NVLAP Approved Signatory

Todd Hannemann
Laboratory Supervisor
iNARTE Certified Technician ATL-0255-T

**Non-Warranty Provision**
The testing services have been performed, findings obtained and reports prepared in accordance with generally accepted laboratory principles and practices. This warranty is in lieu of all others, either expressed or implied.

**Non-Endorsement**
This test report contains only findings and results arrived at after employing the specific test procedures and standards listed herein. It is not intended to constitute a recommendation, endorsement or certification of the product or material tested. This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

## Revision History

Revisions to this document are listed below; the latest revised document supersedes all previous issues of this document.

| Revision | Date | Pages Affected |
|---|---|---|
| - | September 21, 2018 | Original Release |

## Requirements and Test Results

**FCC Section 15.247 (b)(1) - Power Output**
For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

**Results**:
The maximum measured peak conducted output power was 3.22 mW. The maximum antenna gain of the antenna is 3.4 dBi. The device was found to meet the power output requirements of 15.247 (b)(3) including de facto EIRP.

**FCC Section 15.247(d) – Unwanted Emissions**

**Antenna Terminal Out of Band/Band Edge Conducted Emissions**
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under Paragraph (b)(3) of Section 15.247, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

**Results**:
All measured out of band/band edge conducted emissions were below the specified limits and the device was found to meet the requirements of 15.247 (d).

**Requirements and Test Results (con't)**

**FCC Section 15.209/ 15.247(d) – Unwanted Emissions**

**Radiated Spurious Emissions /Restricted Bands/Band Edge**
Emissions which fall into restricted bands, as defined in 15.205(a) must comply with the radiated emissions limits specified in 15.209(a) and shown below in Table 3. Emissions emanating from the EUT cabinet and cables must also comply with the radiated emissions limits. Radiated emissions measurements were also performed at the band edges to ensure band edge compliance.

Table 3 - Radiated Emission Limits

| Frequency of Emission (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 30 to 88 | 100 | 3 |
| 88 to 216 | 150 | 3 |
| 216 to 960 | 200 | 3 |
| Above 960 | 500 | 3 |

**Results**:
All spurious emissions were measured and found to be in compliance with the limits specified in 15.209(a). Band edge emissions were also found to be in compliance with the limits specified in 15.209(a).

**FCC Section 15.247 (a)(1)**
**Channel Separation and 20 dB Bandwidth**
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

**Results**:
The maximum 20 dB bandwidth of the hopping channel was 2.654 MHz. The carrier frequencies were separated by 4.922 MHz which exceeds the 20 dB bandwidth and complies with the requirements specified above.

**Requirements and Test Results (con't)**

**FCC Section 15.247 (a)(1)(iii)**

**Number of Channels and Occupancy Time**
Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

**Results**:
The frequency hopping system uses 15 Channels. The average time of occupancy did not exceed 0.4 seconds in a 20 second period which meets the above requirements.

**FCC Section 15.247(i) – RF Exposure**

Transmitters operating under 15.247 must be operated in a manner that ensures the public is not exposed to RF energy levels in access of the commission's guidelines. Based on the transmitter power and maximum antenna gain the separation distance for acceptable MPE power density levels to meet both the Occupational/Controlled Exposure and the General Population/Uncontrolled Exposure requirements of 1.1310 was calculated. The calculation below uses the more stringent General Population MPE Limits.

$$S = \frac{PG}{4\pi Dsq}$$

D = Minimum Separation Distance in cm

S = Max allowed Power Density in mW/cmsq

Per 1.1310 For the Frequency of 2405 MHz S = 1 mW/cmsq

Power = Max Power Input to Antenna = 3.22mW

Gain = Max Power Gain of Antenna = 3.4 dBi = 2.19 numeric

$$1 \text{ mW/cmsq} = \frac{3.22 \times 2.19}{4 \times (3.14) \times D^2} = \frac{7.05}{12.56 \times D^2}$$

$$D^2 = \frac{7.05}{12.56 \times 1}$$

$$D = \sqrt{0.56} = 0.75 \text{ cm}$$

The unit has an internal antenna and the minimum separation distance will always be maintained.

# EQUIPMENT LISTS

## FCC Section 15.247(b)(3) – Power Output

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5134 | NARDA MICROWAVE | ATTENUATOR, COAXIAL | 10 dB, DC - 12.4 GHz | 757C-10 | 12/2/2016 | 12/31/2017 |
| 5231 | AGILENT / HP | ANALYZER, SPECTRUM | 3 Hz - 26.5 GHz | E4440A | 5/24/2017 | 5/31/2018 |

## FCC Section 15.247(d) – Antenna Terminal Out of Band/ Band Edge Conducted Emissions, 30 MHz to 25 GHz

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5134 | NARDA MICROWAVE | ATTENUATOR, COAXIAL | 10 dB, DC - 12.4 GHz | 757C-10 | 12/2/2016 | 12/31/2017 |
| 5231 | AGILENT / HP | ANALYZER, SPECTRUM | 3 Hz - 26.5 GHz | E4440A | 5/24/2017 | 5/31/2018 |

## FCC Section 15.207/15.247(d) – Radiated Spurious Emissions / Out of Band/Band Edge Radiated Emissions

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 1232 | AGILENT / HP | PRE-AMPLIFIER | 1 - 26.5 GHz | 8449B | 5/23/2017 | 5/31/2018 |
| 3258 | ETS / EMCO RIDGED GUIDE | ANTENNA, DOUBLE | 1 - 18 GHz | 3115 | 10/13/2016 | 4/30/2018 |
| 3430 | MCS | ANTENNA, HORN | 18 - 26.5 GHz | K-5039 | No Calibration Required | |
| 4029B | RETLIF ATTENUATION | OPEN AREA TEST SITE, | 3 / 10 Meters | RNH | 4/13/2016 | 4/30/2018 |
| 443 | ELECTRO-METRICS | ANTENNA, LOG PERIODIC | 200 MHz - 1000 MHz | LPA-25 | 10/6/2016 | 4/30/2018 |
| 5231 | AGILENT / HP | ANALYZER, SPECTRUM | 3 Hz - 26.5 GHz | E4440A | 5/24/2017 | 5/31/2018 |
| 5234 | PASTERNACK | CABLE, COAXIAL | 10 kHz - 18 GHz | PE302-230 | 7/24/2017 | 7/31/2018 |
| 8550 | EMCO | ANTENNA, BICONICAL | 30 - 300 MHz | 3110B | 5/31/2016 | 5/31/2019 |
| 1232 | AGILENT / HP | PRE-AMPLIFIER | 1 - 26.5 GHz | 8449B | 5/25/2018 | 5/31/2019 |
| 3258 | ETS / EMCO RIDGED GUIDE | ANTENNA, DOUBLE | 1 - 18 GHz | 3115 | 5/10/2018 | 11/30/2019 |
| 3427B | ETS / EMCO | ANTENNA, BICONICAL | 20 - 200 MHz | 3104 | 9/21/2017 | 3/31/2019 |
| 3430 | MCS | ANTENNA, HORN | 18 - 26.5 GHz | K-5039 | No Calibration Required | |
| 4029B | RETLIF ATTENUATION | OPEN AREA TEST SITE, | 3 / 10 Meters | RNH | 8/16/2017 | 8/31/2019 |
| 443 | ELECTRO-METRICS | ANTENNA, LOG PERIODIC | 200 MHz - 1000 MHz | LPA-25 | 5/21/2018 | 11/30/2019 |
| 5231 | AGILENT / HP | ANALYZER, SPECTRUM | 3 Hz - 26.5 GHz | E4440A | 4/12/2018 | 4/30/2019 |

## EQUIPMENT LISTS (con't)

### FCC Section 15.247(a)(1) – 20 dB Bandwidth

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5134 | NARDA MICROWAVE | ATTENUATOR, COAXIAL | 10 dB, DC - 12.4 GHz | 757C-10 | 12/2/2016 | 12/31/2017 |
| 5231 | AGILENT / HP | ANALYZER, SPECTRUM | 3 Hz - 26.5 GHz | E4440A | 5/24/2017 | 5/31/2018 |

### FCC Section 15.247(a)(1) -- Channel Separation

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5134 | NARDA MICROWAVE | ATTENUATOR, COAXIAL | 10 dB, DC - 12.4 GHz | 757C-10 | 12/2/2016 | 12/31/2017 |
| 5231 | AGILENT / HP | ANALYZER, SPECTRUM | 3 Hz - 26.5 GHz | E4440A | 5/24/2017 | 5/31/2018 |

### FCC Section 15.247(a)(1)(iii) – Number of Hopping Channels and Time Occupancy

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5134 | NARDA MICROWAVE | ATTENUATOR, COAXIAL | 10 dB, DC - 12.4 GHz | 757C-10 | 12/2/2016 | 12/31/2017 |
| 5231 | AGILENT / HP | ANALYZER, SPECTRUM | 3 Hz - 26.5 GHz | E4440A | 5/24/2017 | 5/31/2018 |

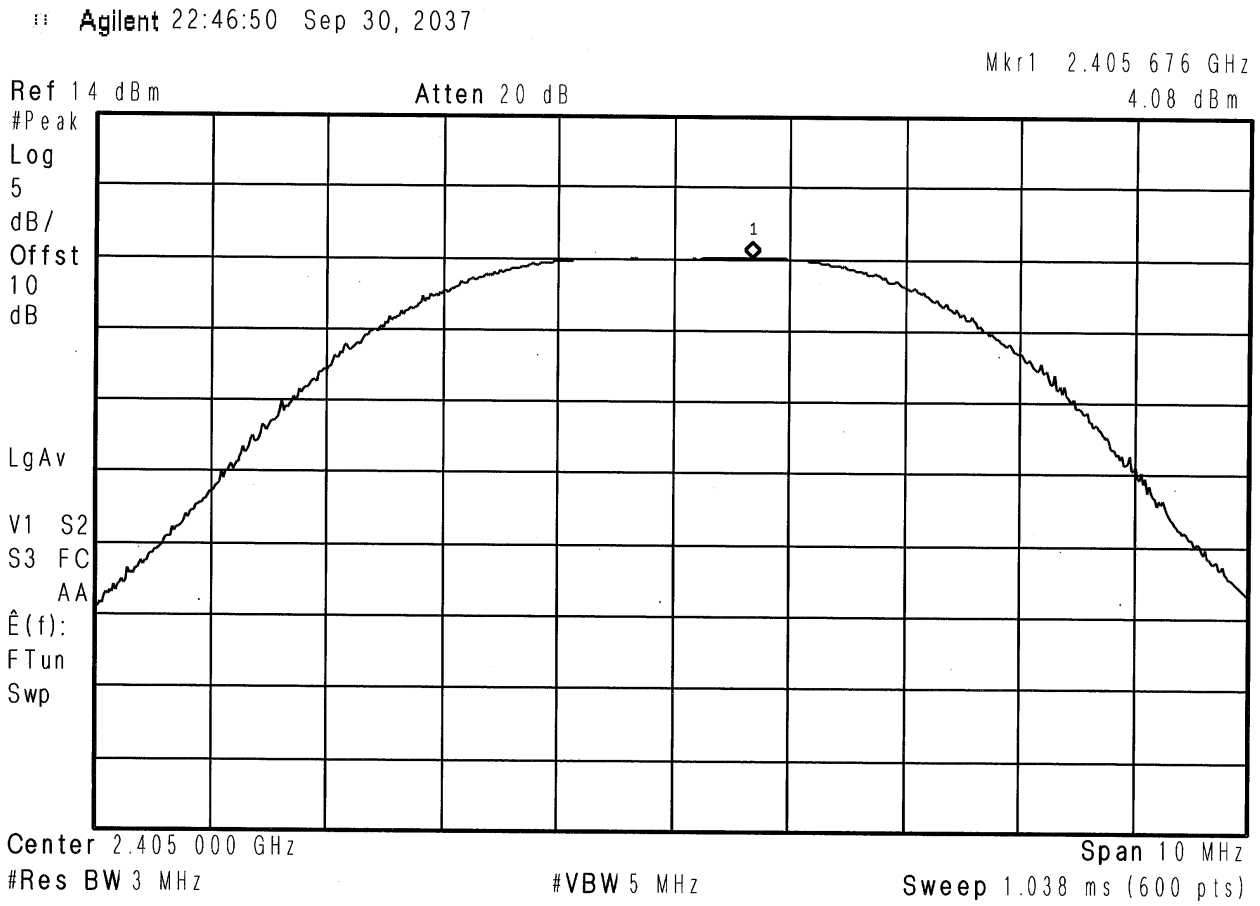
**FCC Section 15.247(b)(3)**
**Power Output**
**Test Photograph**

**Power Output**
**Test Photograph**

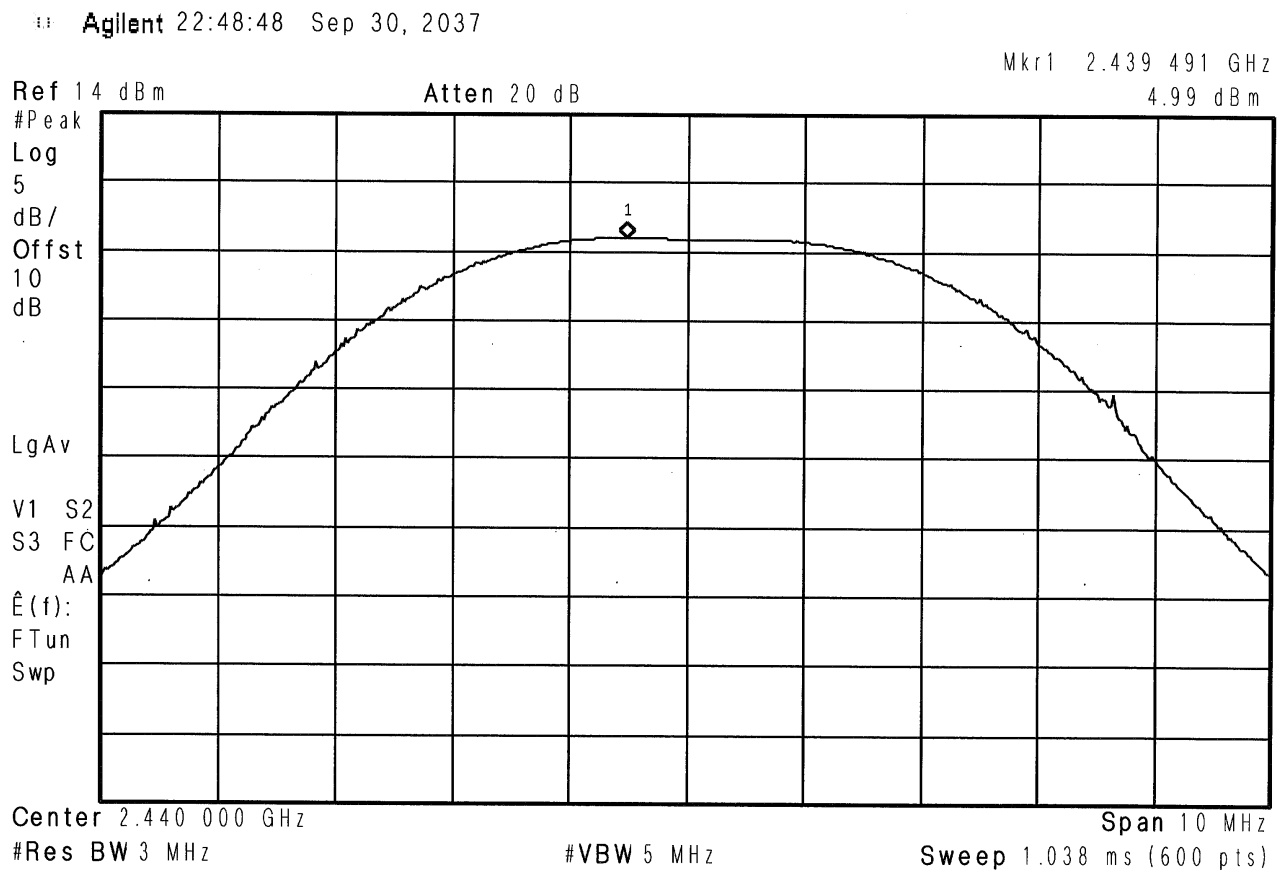
Test Setup

**Power Output**
**Test Data**

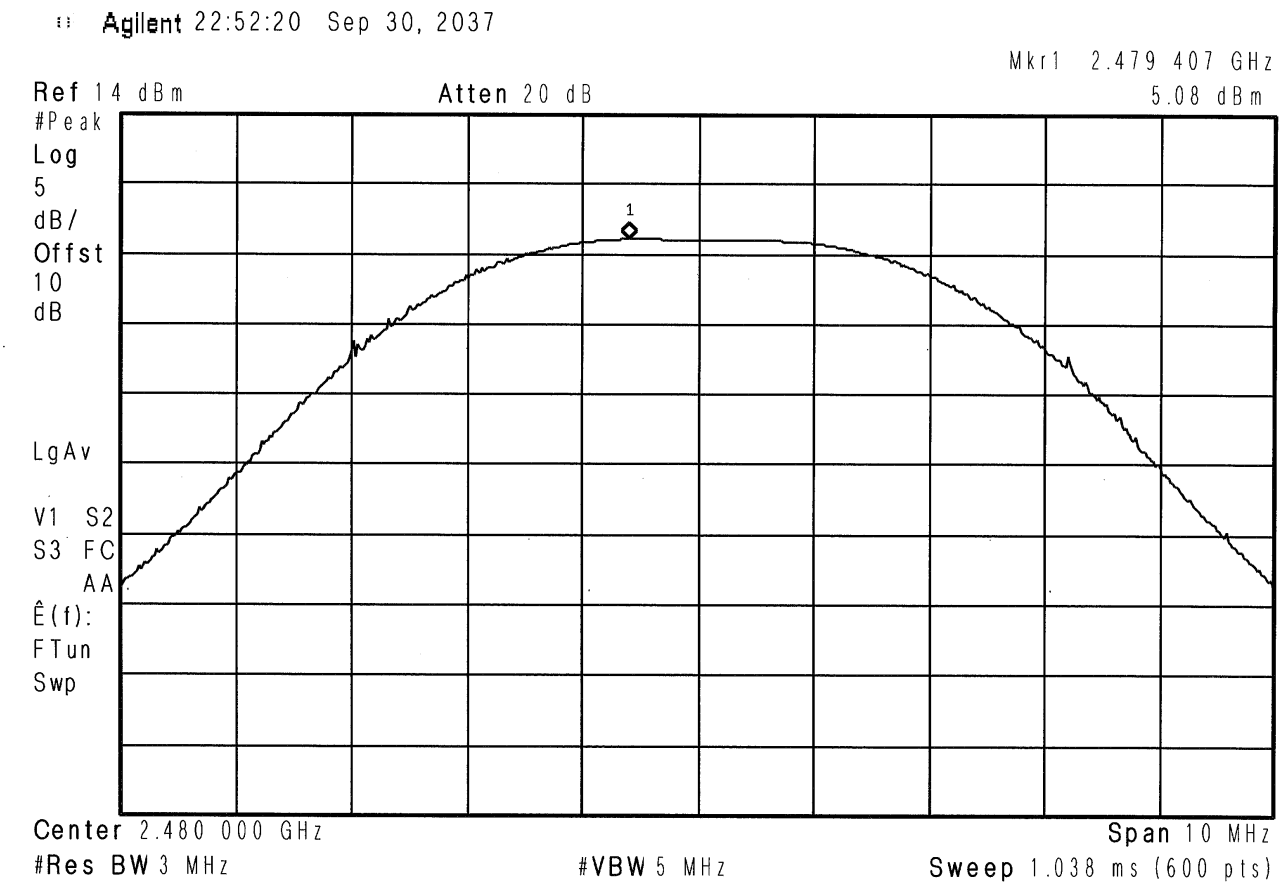
| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Peak Power Output** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (b)(3) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.405 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.1 °C / 50.7 % |
| **Notes:** | Peak Power Output: 4.08 dBm |



| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Peak Power Output** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (b)(3) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.440 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.1 °C / 50.7 % |
| **Notes:** | Peak Power Output:4.99 dBm |



| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Peak Power Output** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (b)(3) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.480 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.1 °C / 50.7 % |
| **Notes:** | Peak Power Output:5.08dBm |



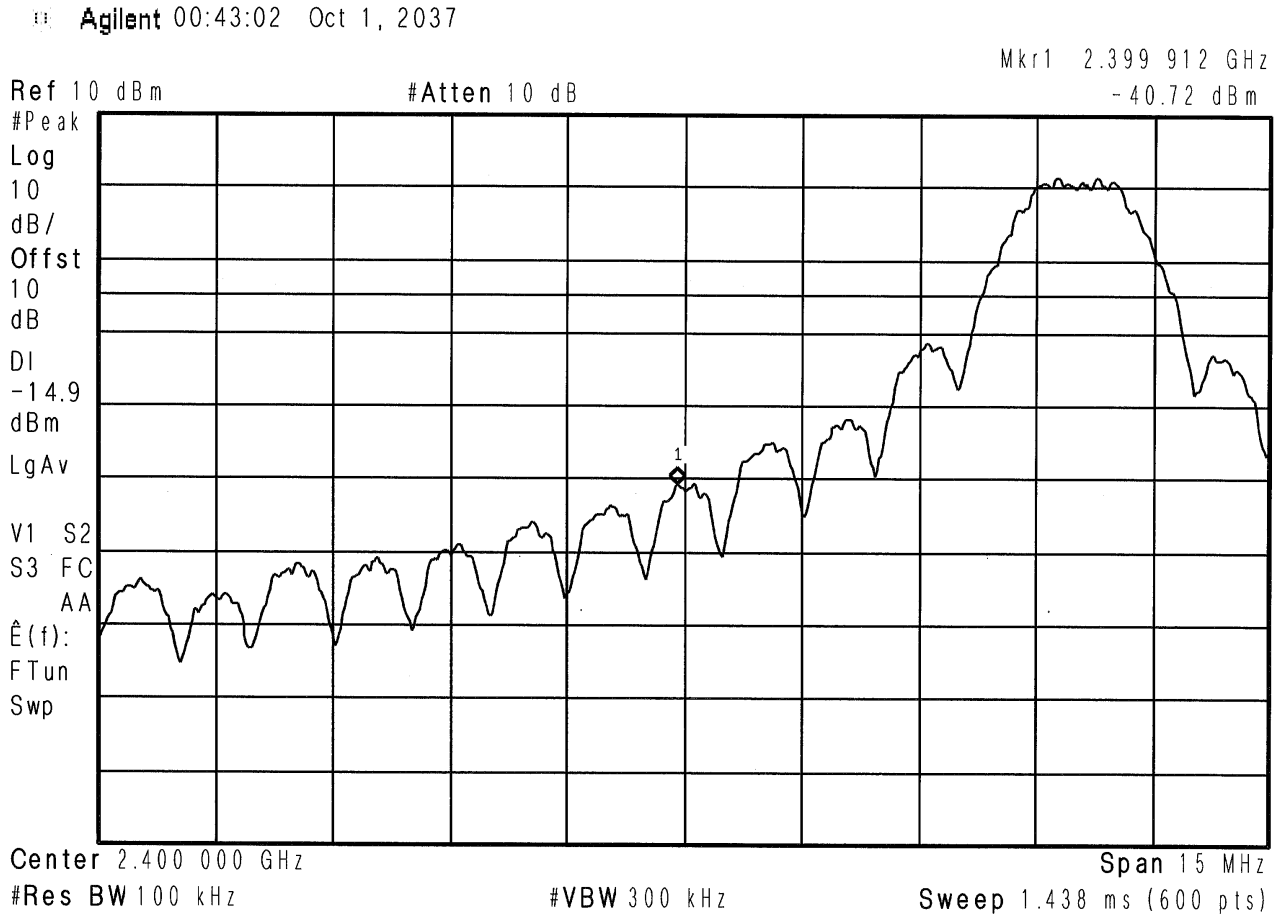
**FCC Section 15.247(d)**
**Antenna Terminal Out of Band/Band Edge Conducted Emissions,**
**30 MHz to 25 GHz**
**Test Photograph**

**Antenna Terminal Out of Band/Band Edge Conducted Emissions, 30 MHz to 25 GHz**
**Test Photograph**

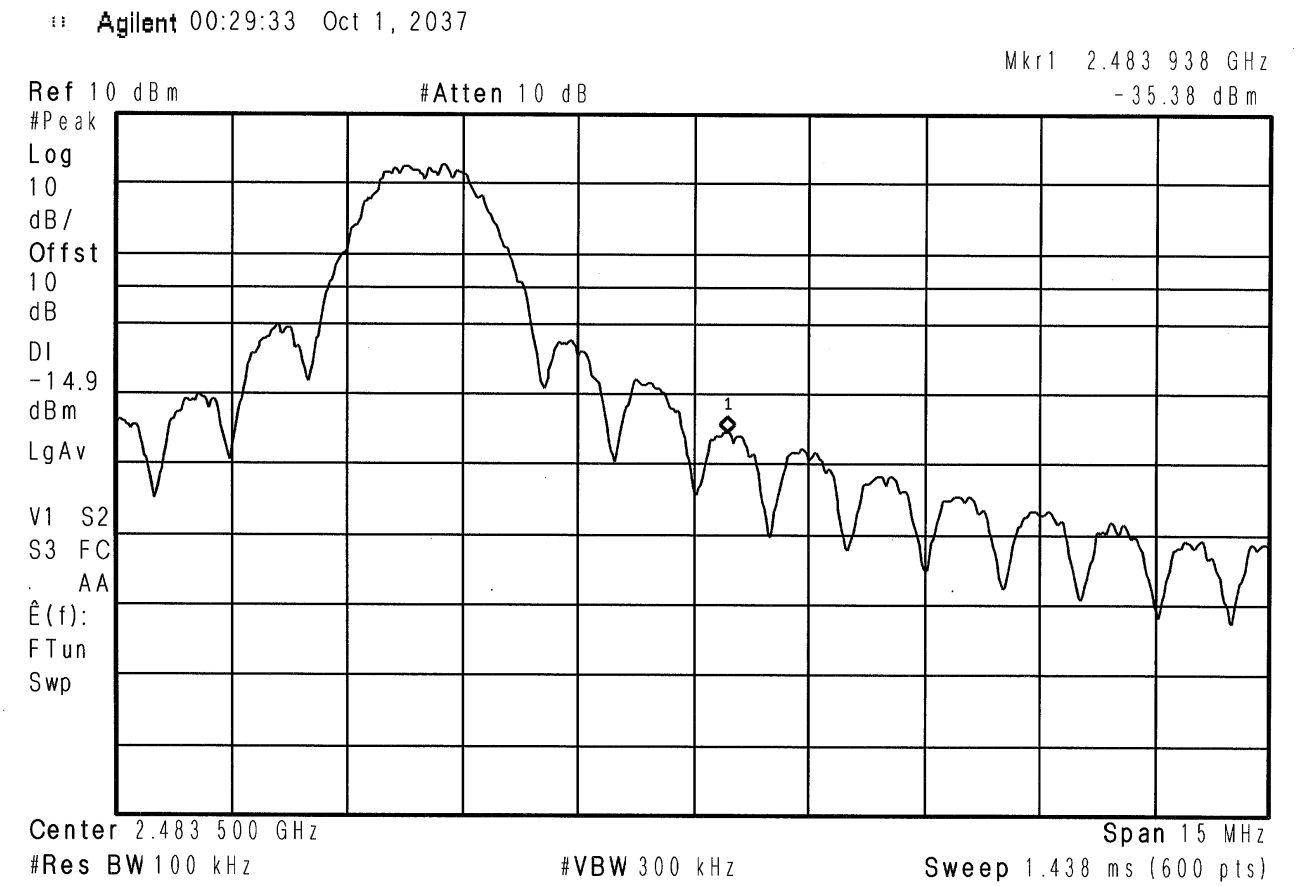
Test Setup

**Band Edge**
**Test Data**

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Band Edge** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.405 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.4 °C / 48.7 % |
| **Notes:** | Limit: -14.92 |

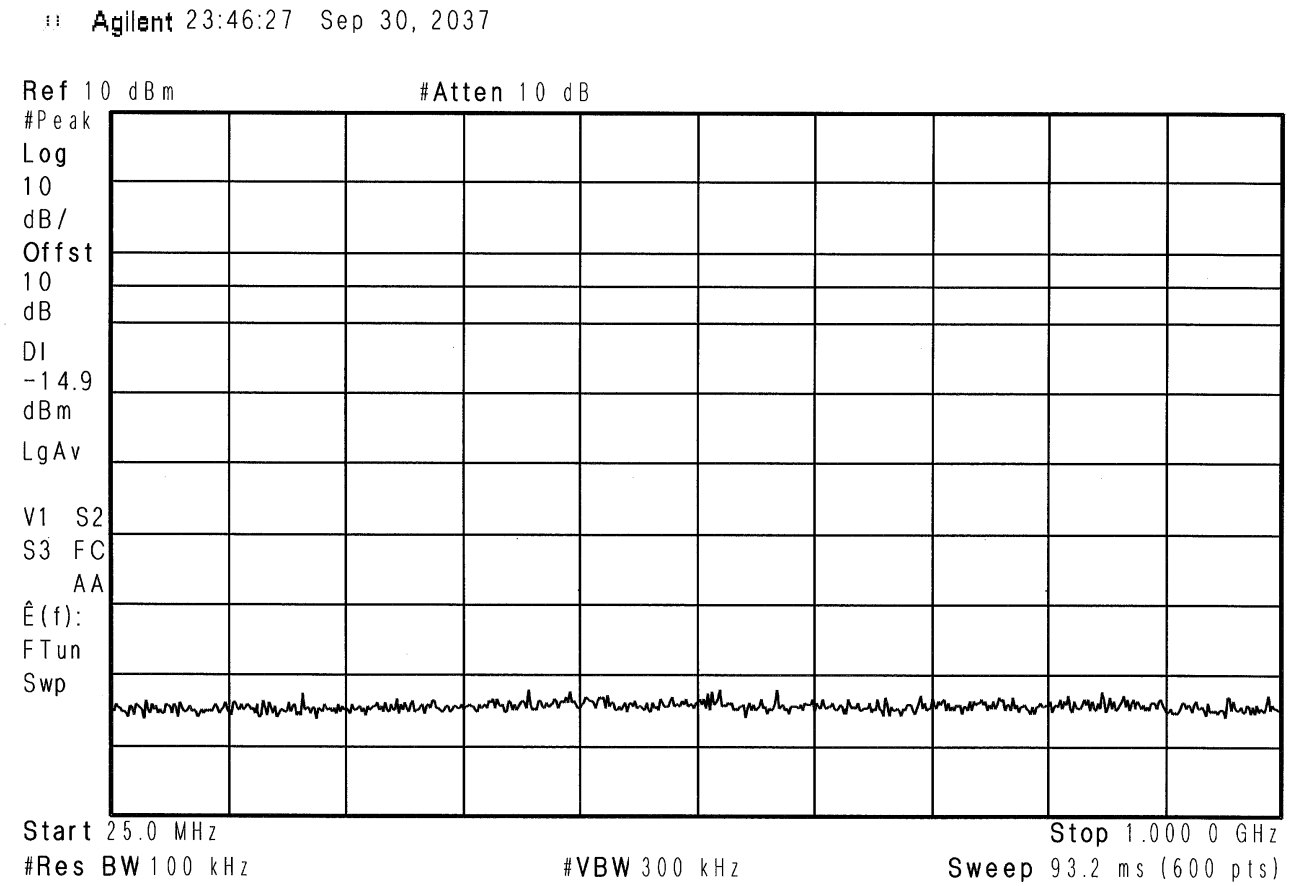


| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Band Edge** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.480 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.4 °C / 48.7 % |
| **Notes:** | Limit: -14.92 |

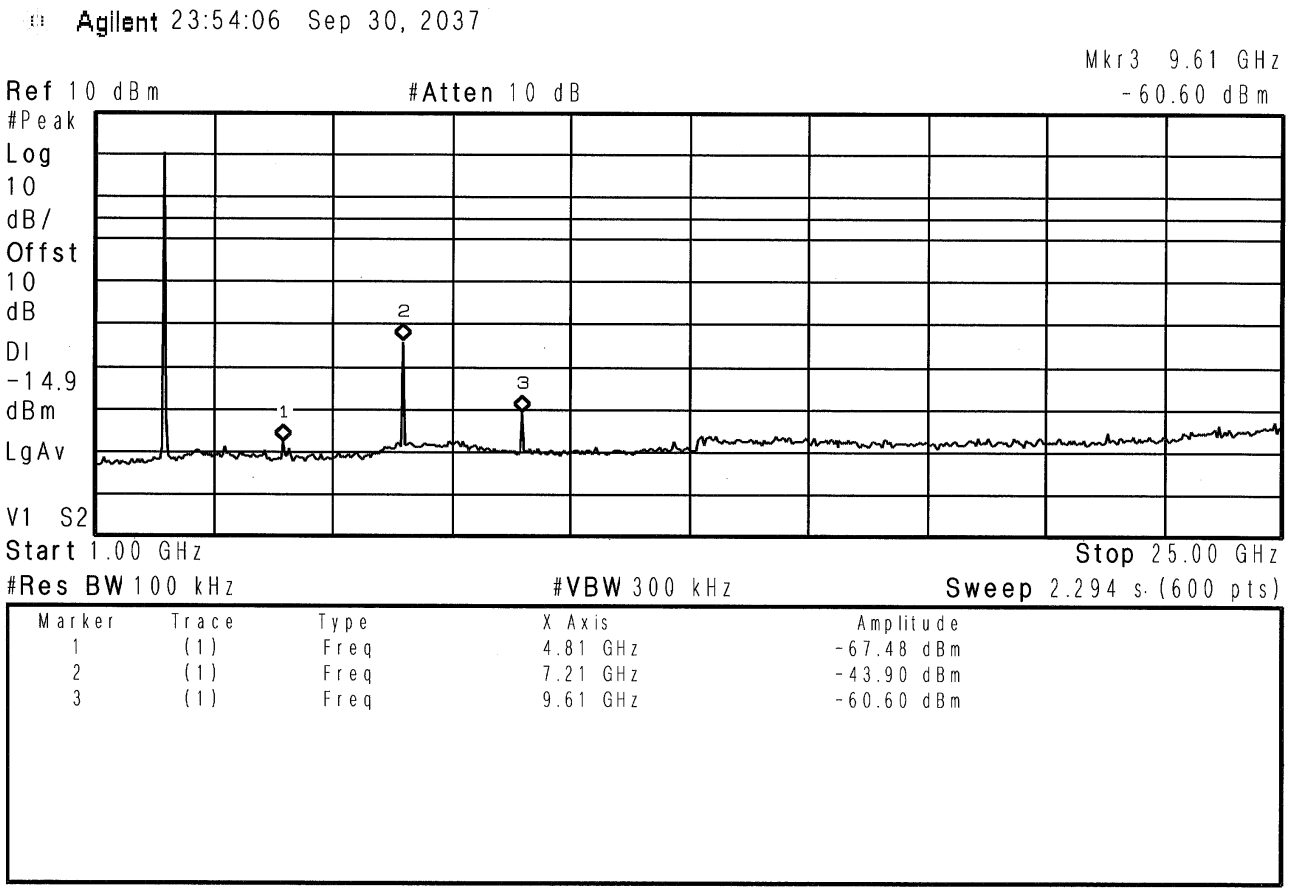


**Out of Band Conducted Emissions**
**Test Data**

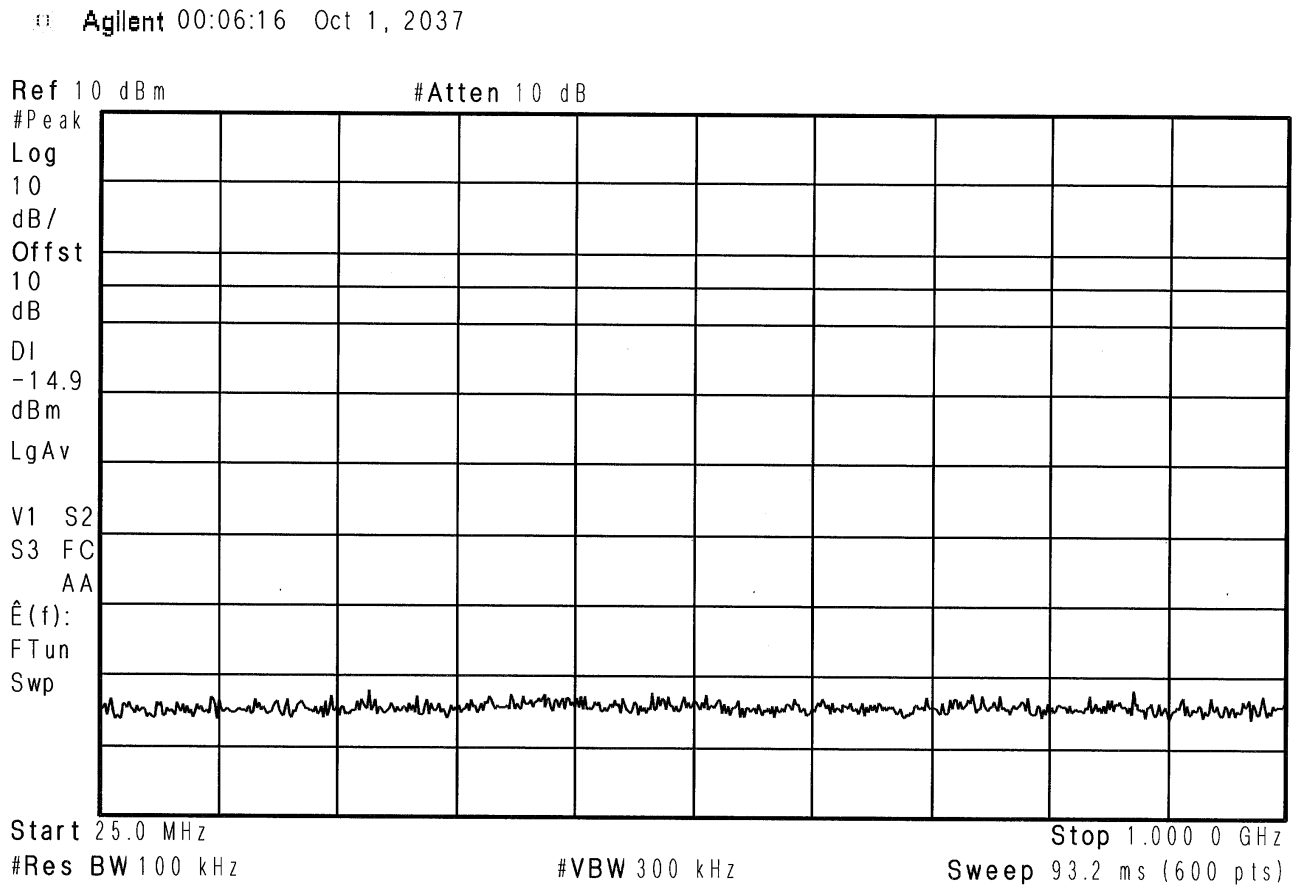
| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Conducted Out of Band** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.405 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.4 °C / 48.7 % |
| **Notes:** | Limit: -14.92 |



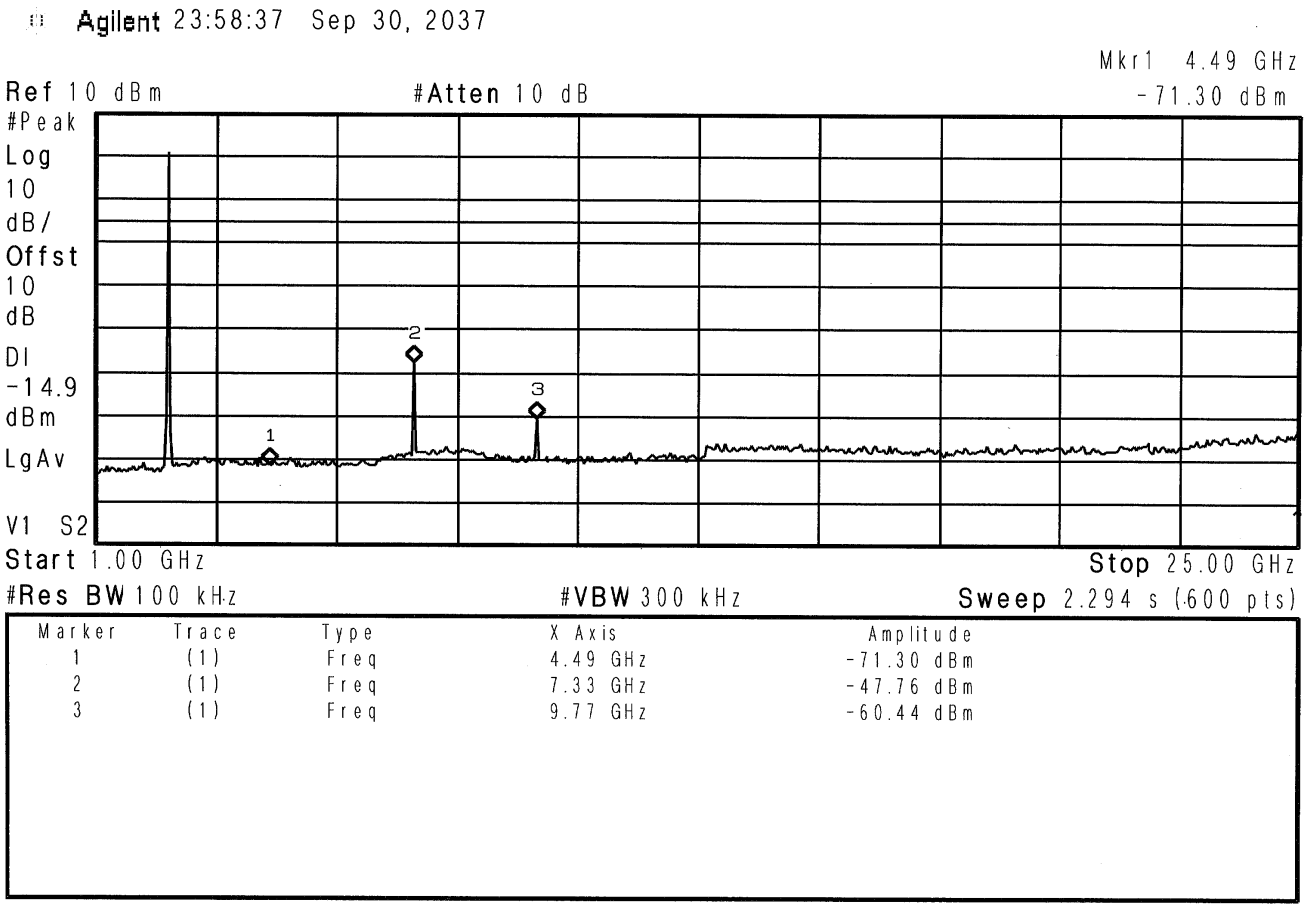
| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Conducted Out of Band** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.405 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.4 °C / 48.7 % |
| **Notes:** | Limit: -14.92 |



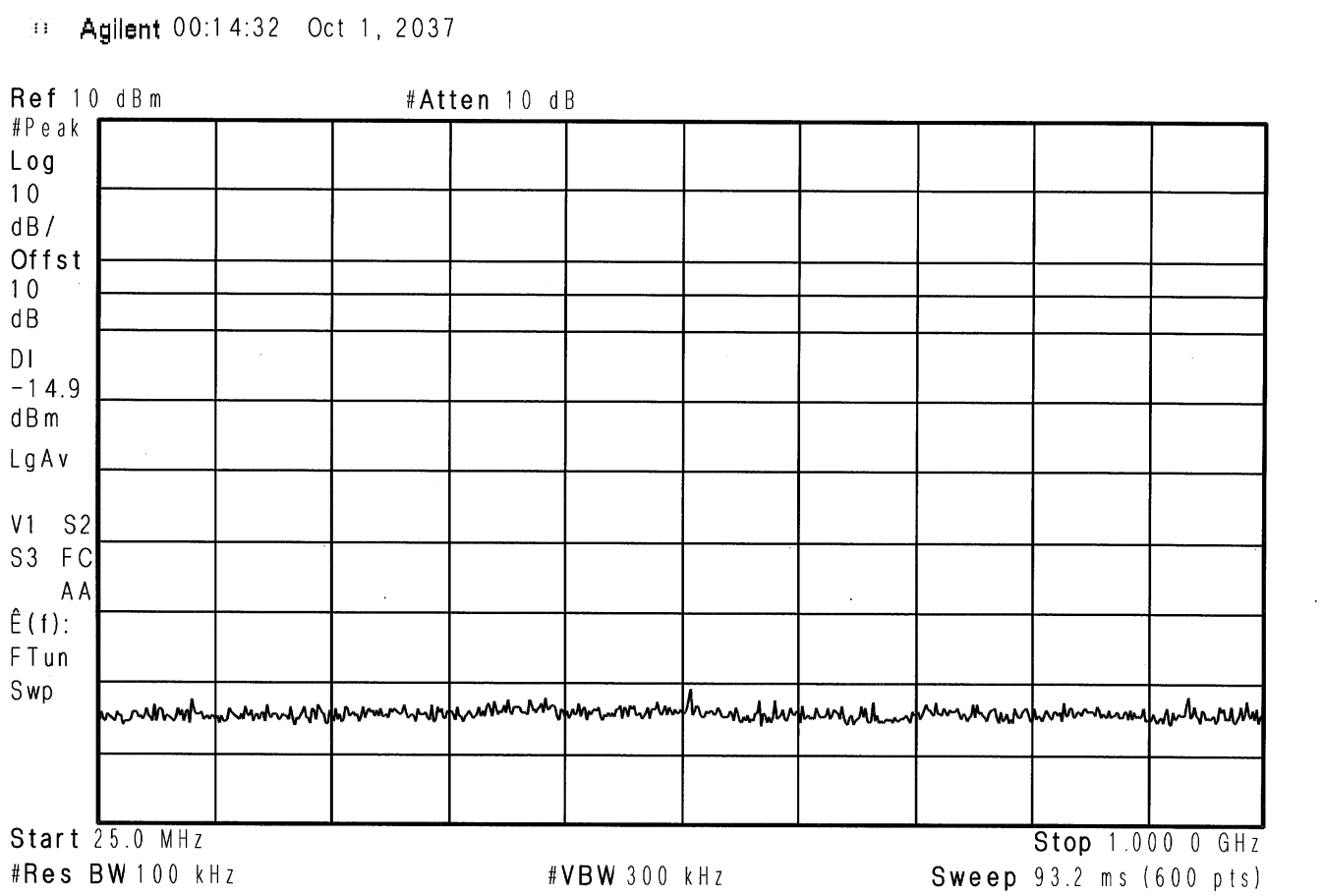
| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Conducted Out of Band** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.440 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.4 °C / 48.7 % |
| **Notes:** | Limit: -14.92 |



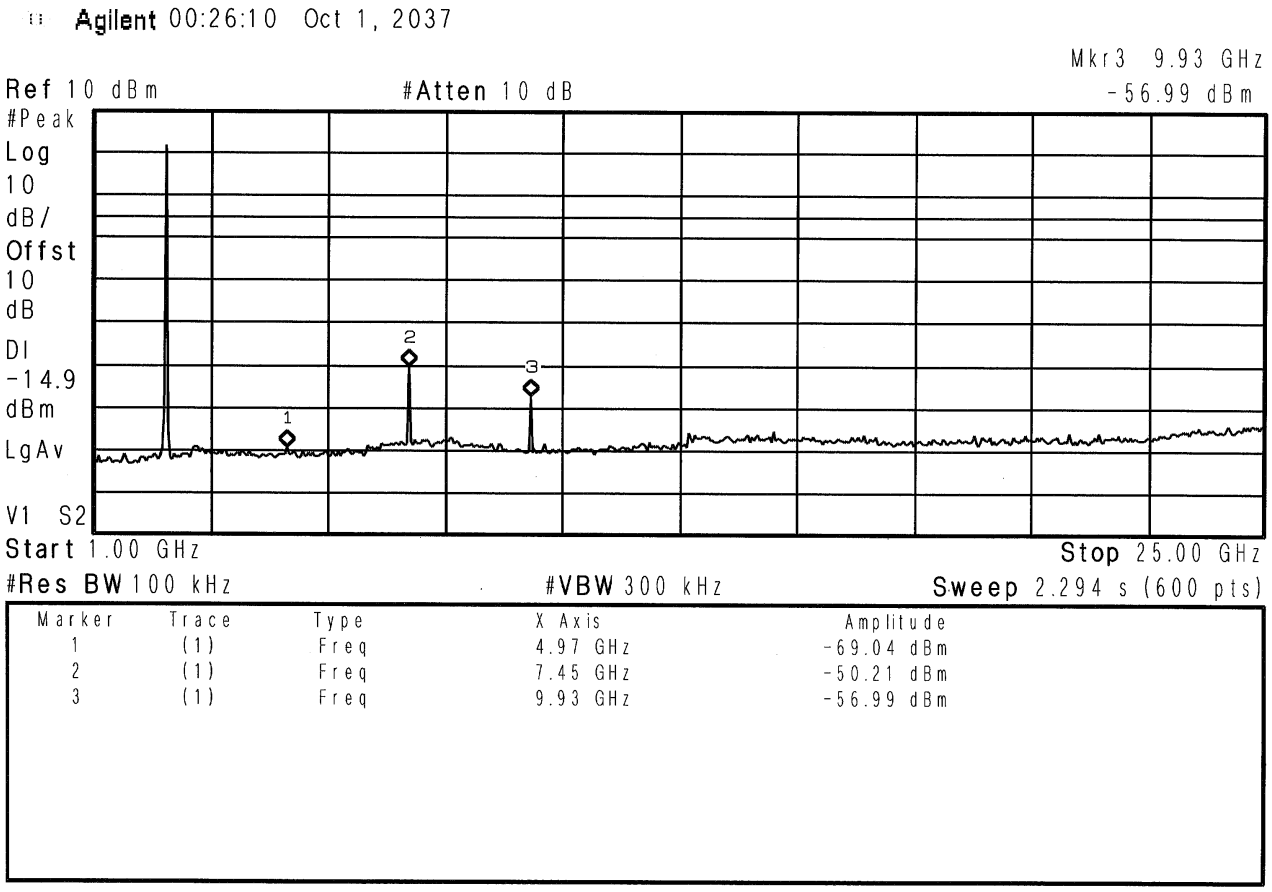
| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Conducted Out of Band** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.440 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.4 °C / 48.7 % |
| **Notes:** | Limit: -14.92 |



| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Conducted Out of Band** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.480 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.4 °C / 48.7 % |
| **Notes:** | Limit: -14.92 |



| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Conducted Out of Band** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.480 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.4 °C / 48.7 % |
| **Notes:** | Limit: -14.92 |



**FCC Section 15.207/15.247(d)**
**Radiated Spurious Emissions/Out of Band/Band Edge Radiated Emissions**
**Test Photographs**

**Radiated Spurious Emissions/Out of Band/Band Edge Radiated Emissions**
**Test Photographs**


Loop Antenna - Planer

Loop Antenna – Coplaner

**Radiated Spurious Emissions/Out of Band/Band Edge Radiated Emissions**
**Test Photographs**

30 MHz – 200 MHz, Horizontal Polarization


30 MHz – 200 MHz, Vertical Polarization

**Radiated Spurious Emissions/Out of Band/Band Edge Radiated Emissions**
**Test Photographs**


200 MHz to 1 GHz, Horizontal Polarization


200 MHz to 1 GHz, Vertical Polarization

**Radiated Spurious Emissions/Out of Band/Band Edge Radiated Emissions**
**Test Photographs**

1 to 18 GHz, Horizontal Polarization

1 to 18 GHz, Vertical Polarization

**Radiated Spurious Emissions/Out of Band/Band Edge Radiated Emissions**
**Test Photographs**


18 to 25 GHz, Horizontal Polarization


18 to 25 GHz, Vertical Polarization

**Unwanted Emissions into Restricted Frequency Bands**
**Test Data**

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Restricted Band Emissions 25 MHz to 25 GHz** |
| **Test Specification:** | FCC Part. 15.247(d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Maintaining an NFC connection while cell modem and 2.4GHz band transmit. |
| **Technician:** | M.Seamans /T. Hannemann |
| **Date(s):** | October 12th, 2017 / September 20, 2018 |
| **Temp/ Relative Humidity:** | 13 °C / 36 % / 18.3 °C / 37.0 % |
| **Notes:** | Antenna Test Distance: 3 meters Detector: Quasi-Peak < 1GHz; Average > 1GHz |

| Restricted Band | Measured Frequency | Meter Reading | Correction Factor | Corrected Reading | | | Converted Reading | Limit at 3M |
|---|---|---|---|---|---|---|---|---|
| MHz | MHz | dBuV | dB | dBuV/m | | | uV/m | uV/m |
| 37.50 | - | - | - | - | | | - | 100.00 |
| \| | 38.00* | 7.27 | 14.42 | 21.69 | | | 12.15 | I |
| 38.25 | - | - | - | - | | | - | 100.00 |
| | | | | | | | | |
| 73.00 | - | - | - | - | | | - | 100.00 |
| \| | 74.00* | 15.95 | 8.73 | 24.68 | | | 17.14 | I |
| 75.20 | - | - | - | - | | | - | 100.00 |
| | | | | | | | | |
| 108.00 | - | - | - | - | | | - | 150.00 |
| \| | 115.00* | 9.17 | 9.87 | 19.04 | | | 8.95 | I |
| 121.94 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 123.00 | - | - | - | - | | | - | 150.00 |
| \| | 130.00* | 5.65 | 9.72 | 15.37 | | | 5.87 | \| |
| 138.00 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 149.90 | - | - | - | - | | | - | 150.00 |
| \| | 150.00* | 6.94 | 11.97 | 18.91 | | | 8.82 | I |
| 150.05 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 156.52475 | - | - | - | - | | | - | 150.00 |

No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Restricted Band Emissions 25 MHz to 25 GHz** |
| **Test Specification:** | FCC Part. 15.247(d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Maintaining an NFC connection while cell modem and 2.4GHz band transmit. |
| **Technician:** | M.Seamans /T. Hannemann |
| **Date(s):** | October 12th, 2017 / September 20, 2018 |
| **Temp/ Relative Humidity:** | 13 °C / 36 % / 18.3 °C / 37.0 % |
| **Notes:** | Antenna Test Distance: 3 meters Detector: Quasi-Peak < 1GHz; Average > 1GHz |

| Restricted Band | Measured Frequency | Meter Reading | Correction Factor | Corrected Reading | | | Converted Reading | Limit at 3M |
|---|---|---|---|---|---|---|---|---|
| MHz | MHz | dBuV | dB | dBuV/m | | | uV/m | uV/m |
| \| | 156.52500* | 5.49 | 12.84 | 18.33 | | | 8.25 | \| |
| 156.52525 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 156.70 | - | - | - | - | | | - | 150.00 |
| \| | 156.80* | 6.98 | 12.87 | 19.85 | | | 9.83 | \| |
| 156.90 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 162.0125 | - | - | - | - | | | - | 150.00 |
| \| | 165.00* | 6.18 | 13.57 | 19.75 | | | 9.72 | \| |
| 167.1700 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 167.72 | - | - | - | - | | | - | 150.00 |
| \| | 170.00* | 6.43 | 13.97 | 20.40 | | | 10.47 | \| |
| 173.20 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 240.00 | - | - | - | - | | | - | 200.00 |
| \| | 260.00* | 4.28 | 18.92 | 23.20 | | | 14.45 | \| |
| 285.00 | - | - | - | - | | | - | 200.00 |
| | | | | | | | | |
| 322.00 | - | - | - | - | | | - | 200.00 |
| \| | 330.00* | 3.79 | 22.05 | 25.84 | | | 19.59 | \| |

No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Restricted Band Emissions 25 MHz to 25 GHz** |
| **Test Specification:** | FCC Part. 15.247(d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Maintaining an NFC connection while cell modem and 2.4GHz band transmit. |
| **Technician:** | M.Seamans /T. Hannemann |
| **Date(s):** | October 12th, 2017 / September 20, 2018 |
| **Temp/ Relative Humidity:** | 13 °C / 36 % / 18.3 °C / 37.0 % |
| **Notes:** | Antenna Test Distance: 3 meters Detector: Quasi-Peak < 1GHz; Average > 1GHz |

| Restricted Band | Measured Frequency | Meter Reading | Correction Factor | Corrected Reading | | | Converted Reading | Limit at 3M |
|---|---|---|---|---|---|---|---|---|
| MHz | MHz | dBuV | dB | dBuV/m | | | uV/m | uV/m |
| 335.40 | - | - | - | - | | | - | 200.00 |
| | | | | | | | | |
| 399.90 | - | - | - | - | | | - | 200.00 |
| \| | 405.00* | 0.48 | 24.70 | 25.18 | | | 18.16 | \| |
| 410.00 | - | - | - | - | | | - | 200.00 |
| | | | | | | | | |
| 608.00 | - | - | - | - | | | - | 200.00 |
| \| | 611.00* | -0.64 | 30.97 | 30.33 | | | 32.85 | \| |
| 614.00 | - | - | - | - | | | - | 200.00 |
| | | | | | | | | |
| 960.00 | - | - | - | - | | | - | 500.00 |
| \| | 975.00* | 1.22 | 36.79 | 38.01 | | | 79.52 | \| |
| 1240.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 1300.00 | - | - | - | - | | | - | 500.00 |
| \| | 1350.00* | 32.50 | -7.85 | 24.65 | | | 17.08 | \| |
| 1427.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 1435.00 | - | - | - | - | | | - | 500.00 |
| \| | 1500.00* | 32.09 | -7.00 | 25.09 | | | 17.97 | \| |
| 1646.50 | - | - | - | - | | | - | 500.00 |

No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Restricted Band Emissions 25 MHz to 25 GHz** |
| **Test Specification:** | FCC Part. 15.247(d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Maintaining an NFC connection while cell modem and 2.4GHz band transmit. |
| **Technician:** | M.Seamans /T. Hannemann |
| **Date(s):** | October 12th, 2017 / September 20, 2018 |
| **Temp/ Relative Humidity:** | 13 °C / 36 % / 18.3 °C / 37.0 % |
| **Notes:** | Antenna Test Distance: 3 meters Detector: Quasi-Peak < 1GHz; Average > 1GHz |

| Restricted Band | Measured Frequency | Meter Reading | Correction Factor | Corrected Reading | | | Converted Reading | Limit at 3M |
|---|---|---|---|---|---|---|---|---|
| MHz | MHz | dBuV | dB | dBuV/m | | | uV/m | uV/m |
| 1660.00 | - | - | - | - | | | - | 500.00 |
| \| | 1680.00* | 32.89 | -6.09 | 26.80 | | | 21.88 | \| |
| 1710.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 1718.80 | - | - | - | - | | | - | 500.00 |
| \| | 1720.00* | 31.87 | -5.90 | 25.97 | | | 19.88 | \| |
| 1722.20 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 2200.00 | - | - | - | - | | | - | 500.00 |
| \| | 2250.00* | 31.85 | -3.79 | 28.06 | | | 25.29 | \| |
| 2300.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 2310.00 | - | - | - | - | | | - | 500.00 |
| \| | 2360.00* | 31.61 | -3.43 | 28.18 | | | 25.64 | \| |
| 2390.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 2483.50 | - | - | - | - | | | - | 500.00 |
| \| | 2490.00* | 31.66 | -3.02 | 28.64 | | | 27.04 | \| |
| 2500.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 2690.00 | - | - | - | - | | | - | 500.00 |

No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Restricted Band Emissions 25 MHz to 25 GHz** |
| **Test Specification:** | FCC Part. 15.247(d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Maintaining an NFC connection while cell modem and 2.4GHz band transmit. |
| **Technician:** | M.Seamans /T. Hannemann |
| **Date(s):** | October 12th, 2017 / September 20, 2018 |
| **Temp/ Relative Humidity:** | 13 °C / 36 % / 18.3 °C / 37.0 % |
| **Notes:** | Antenna Test Distance: 3 meters Detector: Quasi-Peak < 1GHz; Average > 1GHz |

| Restricted Band | Measured Frequency | Meter Reading | Correction Factor | Corrected Reading | | | Converted Reading | Limit at 3M |
|---|---|---|---|---|---|---|---|---|
| MHz | MHz | dBuV | dB | dBuV/m | | | uV/m | uV/m |
| \| | - | - | - | - | | | - | \| |
| \| | 2750.00* | 31.55 | -2.26 | 29.29 | | | 29.14 | \| |
| \| | - | - | - | - | | | - | \| |
| 2900.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3260.00 | - | - | - | - | | | - | 500.00 |
| \| | 3263.00* | 30.64 | -0.50 | 30.14 | | | 32.14 | \| |
| 3267.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3332.00 | - | - | - | - | | | - | 500.00 |
| \| | 3336.00* | 31.43 | -0.20 | 31.23 | | | 36.43 | \| |
| 3339.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3345.80 | - | - | - | - | | | - | 500.00 |
| \| | 3350.00* | 31.31 | -0.15 | 31.16 | | | 36.14 | \| |
| 3358.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3600.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| \| | 3700.00* | 30.77 | 1.16 | 31.93 | | | 39.49 | \| |
| \| | - | - | - | - | | | - | \| |

No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Restricted Band Emissions 25 MHz to 25 GHz** |
| **Test Specification:** | FCC Part. 15.247(d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Maintaining an NFC connection while cell modem and 2.4GHz band transmit. |
| **Technician:** | M.Seamans /T. Hannemann |
| **Date(s):** | October 12th, 2017 / September 20, 2018 |
| **Temp/ Relative Humidity:** | 13 °C / 36 % / 18.3 °C / 37.0 % |
| **Notes:** | Antenna Test Distance: 3 meters Detector: Quasi-Peak < 1GHz; Average > 1GHz |

| Restricted Band | Measured Frequency | Meter Reading | Correction Factor | Corrected Reading | | | Converted Reading | Limit at 3M |
|---|---|---|---|---|---|---|---|---|
| MHz | MHz | dBuV | dB | dBuV/m | | | uV/m | uV/m |
| 4400.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 4500.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| \| | 4800.00* | 30.53 | 3.32 | 33.85 | | | 49.26 | \| |
| \| | - | - | - | - | | | - | \| |
| 5150.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 5350.00 | - | - | - | - | | | - | 500.00 |
| \| | 5400.00* | 30.06 | 4.21 | 34.27 | | | 51.70 | \| |
| \| | - | - | - | - | | | - | |
| 5460.00 | - | -- | - | - | | | - | 500.00 |
| | | | | | | | | |
| 7250.00 | - | - | - | - | | | - | 500.00 |
| \| | 7440.00* | 28.59 | 7.79 | 36.38 | | | 65.92 | |
| \| | - | - | - | - | | | - | |
| 7750.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 8025.00 | - | - | - | - | | | - | 500.00 |
| \| | 8300.00* | 29.77 | 8.87 | 38.64 | | | 85.51 | \| |
| \| | - | - | - | - | | | - | \| |

No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Restricted Band Emissions 25 MHz to 25 GHz** |
| **Test Specification:** | FCC Part. 15.247(d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Maintaining an NFC connection while cell modem and 2.4GHz band transmit. |
| **Technician:** | M.Seamans /T. Hannemann |
| **Date(s):** | October 12th, 2017 / September 20, 2018 |
| **Temp/ Relative Humidity:** | 13 °C / 36 % / 18.3 °C / 37.0 % |
| **Notes:** | Antenna Test Distance: 3 meters Detector: Quasi-Peak < 1GHz; Average > 1GHz |

| Restricted Band | Measured Frequency | Meter Reading | Correction Factor | Corrected Reading | | | Converted Reading | Limit at 3M |
|---|---|---|---|---|---|---|---|---|
| MHz | MHz | dBuV | dB | dBuV/m | | | uV/m | uV/m |
| | | | | | | | | |
| 8500.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 9000.00 | - | - | - | - | | | - | 500.00 |
| | 9100.00* | 30.34 | 9.70 | 40.04 | | | 100.46 | |
| | - | - | - | - | | | - | |
| 9200.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 9300.00 | - | - | - | - | | | - | 500.00 |
| | 9400.00* | 28.96 | 10.05 | 39.01 | | | 89.23 | |
| 9500.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 10600.00 | - | - | - | - | | | - | 500.00 |
| | 12200.00* | 27.96 | 13.97 | 41.93 | | | 124.88 | |
| 12700.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 13250.00 | - | - | - | - | | | - | 500.00 |
| | - | - | - | - | | | - | |
| 13400.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 14470.00 | - | - | - | - | | | - | 500.00 |
| | - | - | - | - | | | - | |
| 14500.00 | - | - | - | - | | | - | 500.00 |

No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Restricted Band Emissions 25 MHz to 25 GHz** |
| **Test Specification:** | FCC Part. 15.247(d) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Maintaining an NFC connection while cell modem and 2.4GHz band transmit. |
| **Technician:** | M.Seamans /T. Hannemann |
| **Date(s):** | October 12th, 2017 / September 20, 2018 |
| **Temp/ Relative Humidity:** | 13 °C / 36 % / 18.3 °C / 37.0 % |
| **Notes:** | Antenna Test Distance: 3 meters Detector: Quasi-Peak < 1GHz; Average > 1GHz |

| Restricted Band | Measured Frequency | Meter Reading | Correction Factor | Corrected Reading | | | Converted Reading | Limit at 3M |
|---|---|---|---|---|---|---|---|---|
| MHz | MHz | dBuV | dB | dBuV/m | | | uV/m | uV/m |
| 15350.00 | - | - | - | - | | | - | 500.00 |
| \| | 15800.00* | 32.17 | 15.14 | 47.31 | | | 232.01 | \| |
| 16200.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 17700.00 | - | - | - | - | | | - | 500.00 |
| \| | 19240.00* | 33.07 | -6.52 | 26.55 | | | 21.26 | \| |
| 21400.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 22010.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 23120.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 23600.00 | - | - | - | - | | | - | 500.00 |
| \| | 23800.00* | 33.52 | -4.17 | 29.35 | | | 29.34 | \| |
| 24000.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

**Radiated Spurious Emissions**
**Test Data**

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Radiated Spurious Emissions 9 kHz to 25 GHz** |
| **Test Specification:** | FCC Part 15, Subpart C, Section 15.209(a) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Maintaining an NFC connection while cell modem and 2.4GHz band transmit |
| **Technician:** | M.Seamans /T. Hannemann |
| **Date(s):** | October 12th, 2017 / September 20, 2018 |
| **Temp/ Relative Humidity:** | 13 °C / 36 % / 18.3 °C / 37.0 % |
| **Notes:** | Antenna Test Distance: 3 meters Detector: Quasi-Peak < 1GHz; Average > 1GHz |

| Frequency | Antenna Position | EUT Orientation | Meter Reading | Correction Factor | Corrected Reading | Converted to 300M | Converted Reading | Limit at 300M |
|---|---|---|---|---|---|---|---|---|
| MHz | (H/V) / Height | Degrees | dBuV | dB | dBuV/m | dBuV/m | uV/m | uV/m |
| 0.009 | - | - | - | - | - | - | - | 266.67 |
| \| | - | - | - | - | - | - | - | I |
| \| | - | - | - | - | - | - | - | I |
| \| | - | - | - | - | - | - | - | I |
| 0.490 | - | - | - | - | - | - | - | 4.89 |
| No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. | | | | | | | | |

| Frequency | Antenna Position | EUT Orientation | Meter Reading | Correction Factor | Corrected Reading | Converted to 30M | Converted Reading | Limit at 30M |
|---|---|---|---|---|---|---|---|---|
| MHz | (H/V) / Height | Degrees | dBuV | dB | dBuV/m | dBuV/m | uV/m | uV/m |
| 0.490 | - | - | - | - | - | - | - | 48.98 |
| \| | - | - | - | - | - | - | - | I |
| 1.705 | - | - | - | - | - | - | - | 14.08 |
| 1.705 | - | - | - | - | - | - | - | 30.00 |
| \| | - | - | - | - | - | - | - | \| |
| 30.00 | - | - | - | - | - | - | - | 30.00 |
| No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. | | | | | | | | |

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Radiated Spurious Emissions 9 kHz to 25 GHz** |
| **Test Specification:** | FCC Part 15, Subpart C, Section 15.209(a) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Maintaining an NFC connection while cell modem and 2.4GHz band transmit |
| **Technician:** | M.Seamans /T. Hannemann |
| **Date(s):** | October 12th, 2017 / September 20, 2018 |
| **Temp/ Relative Humidity:** | 13 °C / 36 % / 18.3 °C / 37.0 % |
| **Notes:** | Antenna Test Distance: 3 meters Detector: Quasi-Peak < 1GHz; Average > 1GHz |

| Frequency | Antenna Position | EUT Orientation | Meter Reading | Correction Factor | Corrected Reading | | Converted Reading | Limit at 3M |
|---|---|---|---|---|---|---|---|---|
| MHz | (H/V) / Height | Degrees | dBuV | dB | dBuV/m | | uV/m | uV/m |
| 30.00 | - | - | - | - | - | | | 100 |
| \| | - | - | - | - | - | | | \| |
| 38.00* | V / 1m | 0.0 | 7.27 | 14.42 | 21.69 | | 12.15 | \| |
| \| | - | - | - | - | - | | | \| |
| 88.00 | - | - | - | - | - | | | 100 |
| 88.00 | - | - | - | - | - | | | 150 |
| \| | - | - | - | - | - | | | \| |
| 115.00* | V / 1m | 0.0 | 9.17 | 9.87 | 19.04 | | 8.95 | \| |
| 170.00* | V / 1m | 0.0 | 6.43 | 13.97 | 20.40 | | 10.47 | \| |
| \| | - | - | - | - | - | | | \| |
| 216.00 | - | - | - | - | - | | | 150 |
| 216.00 | - | - | - | - | - | | | 200 |
| \| | - | - | - | - | - | | | \| |
| 611.00* | V / 1m | 0.0 | -0.64 | 30.97 | 38.01 | | 79.52 | \| |
| \| | - | - | - | - | - | | | \| |
| 960.00 | - | - | - | - | - | | | 200 |
| 960.00 | - | - | - | - | - | | | 500 |
| \| | - | - | - | - | - | | | \| |
| 975.00* | V / 1m | 0.0 | 1.22 | 36.79 | 38.01 | | 79.52 | \| |
| 3350.00* | V / 1m | 0.0 | 31.31 | -0.15 | 31.16 | | 36.14 | \| |
| \| | - | - | - | - | - | | | \| |
| \| | - | - | - | - | - | | | \| |
| 25000.00 | - | - | - | - | - | | | 500 |

No EUT emissions within 10 dB of the specified test limit were observed at the specified test distance throughout the given frequency spectrum. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

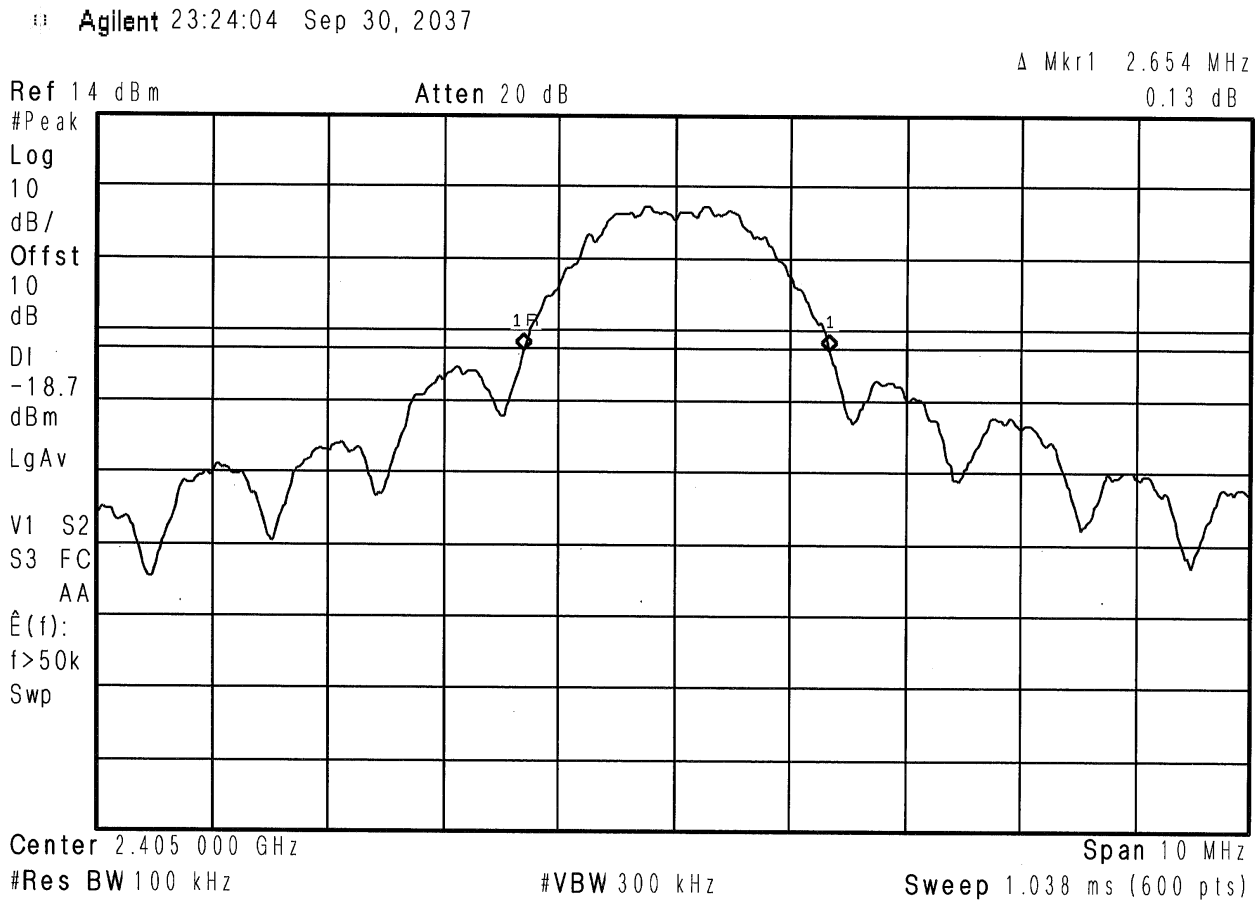
**FCC Section 15.247(a)(1)**
**20 dB Bandwidth**
**Test Photograph**

**20 dB Bandwidth**
**Test Photograph**

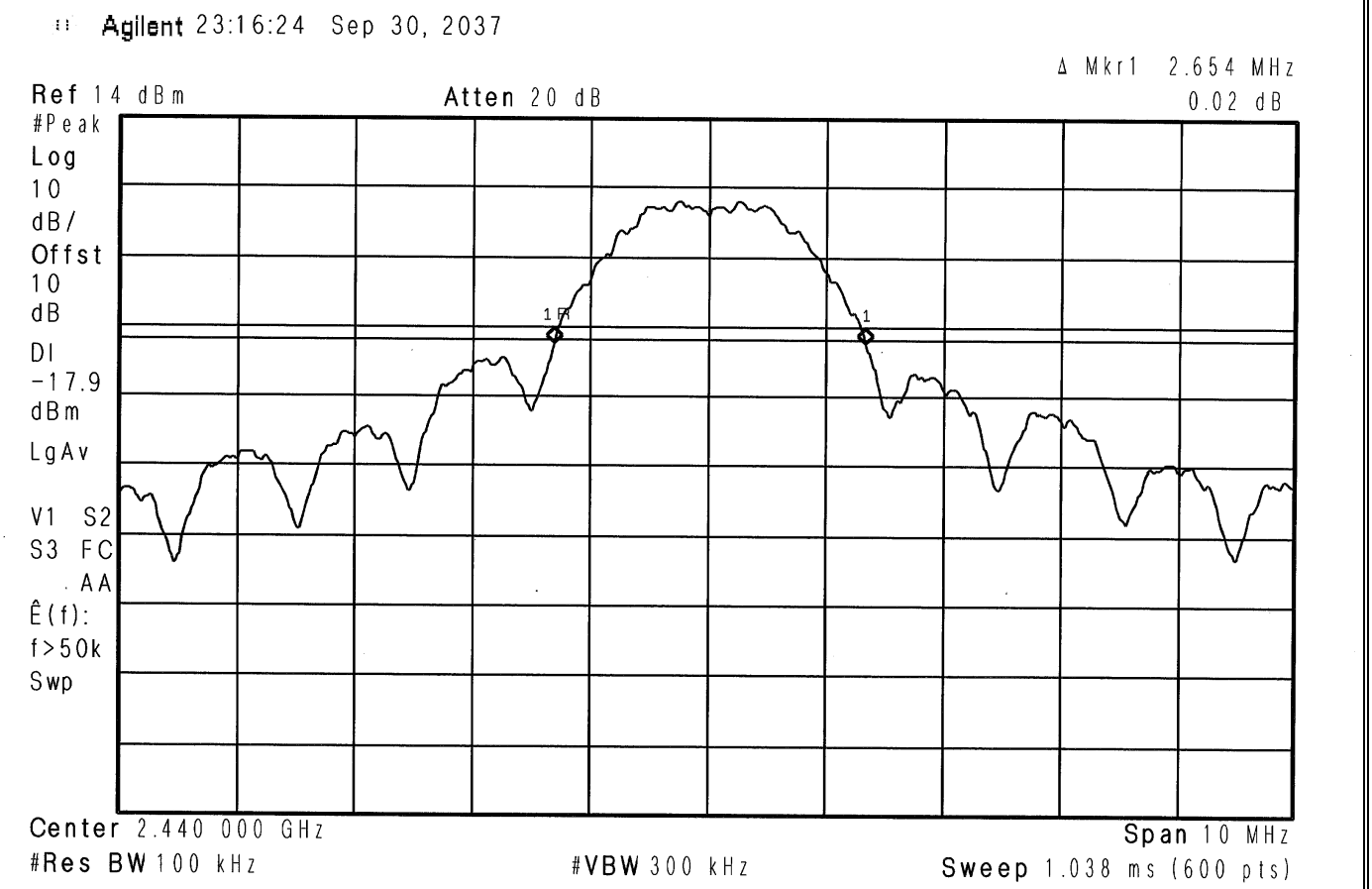
Test Setup

**20 dB Bandwidth**
**Test Data**

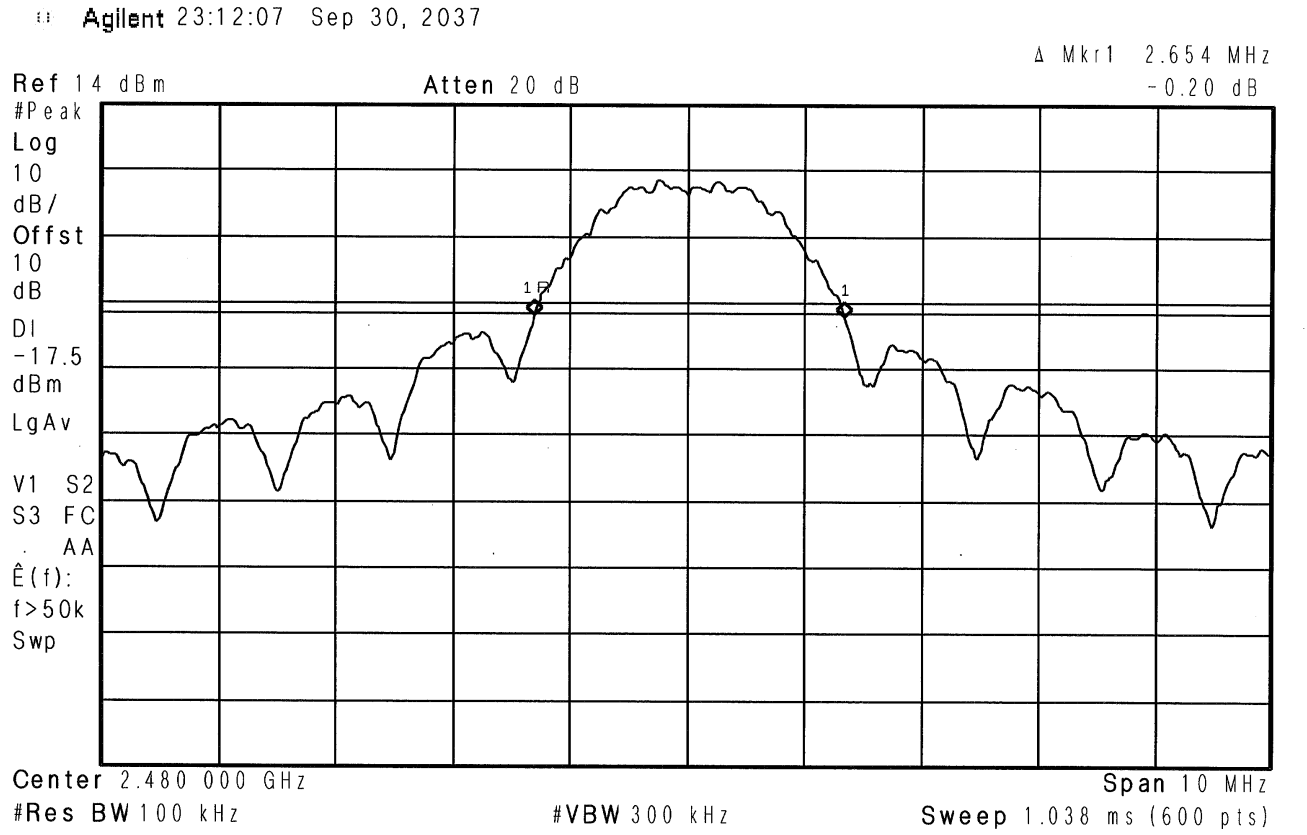
| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Occupied Bandwidth** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(iii) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.405 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 21.7 °C / 47.2 % |
| **Notes:** | 20dB Bandwidth: 2.654 MHz |



| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Occupied Bandwidth** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.440 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 21.7 °C / 47.2 % |
| **Notes:** | 20dB Bandwidth: 2.654 MHz |



| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Occupied Bandwidth** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal at 2.480 GHz |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 21.7 °C / 47.2 % |
| **Notes:** | 20dB Bandwidth: 2.654 MHz |



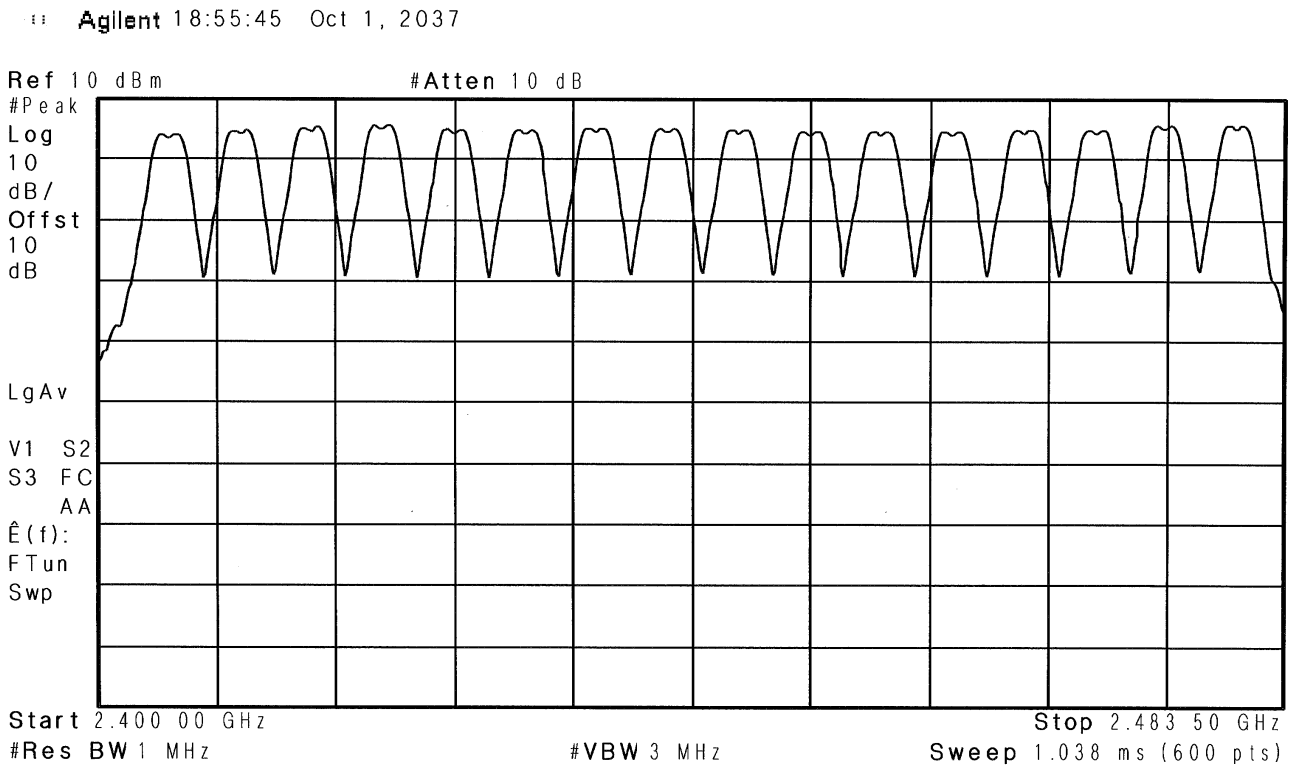
**FCC Section 15.247(a)(1)(iii)**
**Number of Hopping Channels and Time of Occupancy**
**Test Photograph**

**Number of Hopping Channels and Time of Occupancy**
**Test Photograph**

Test Setup

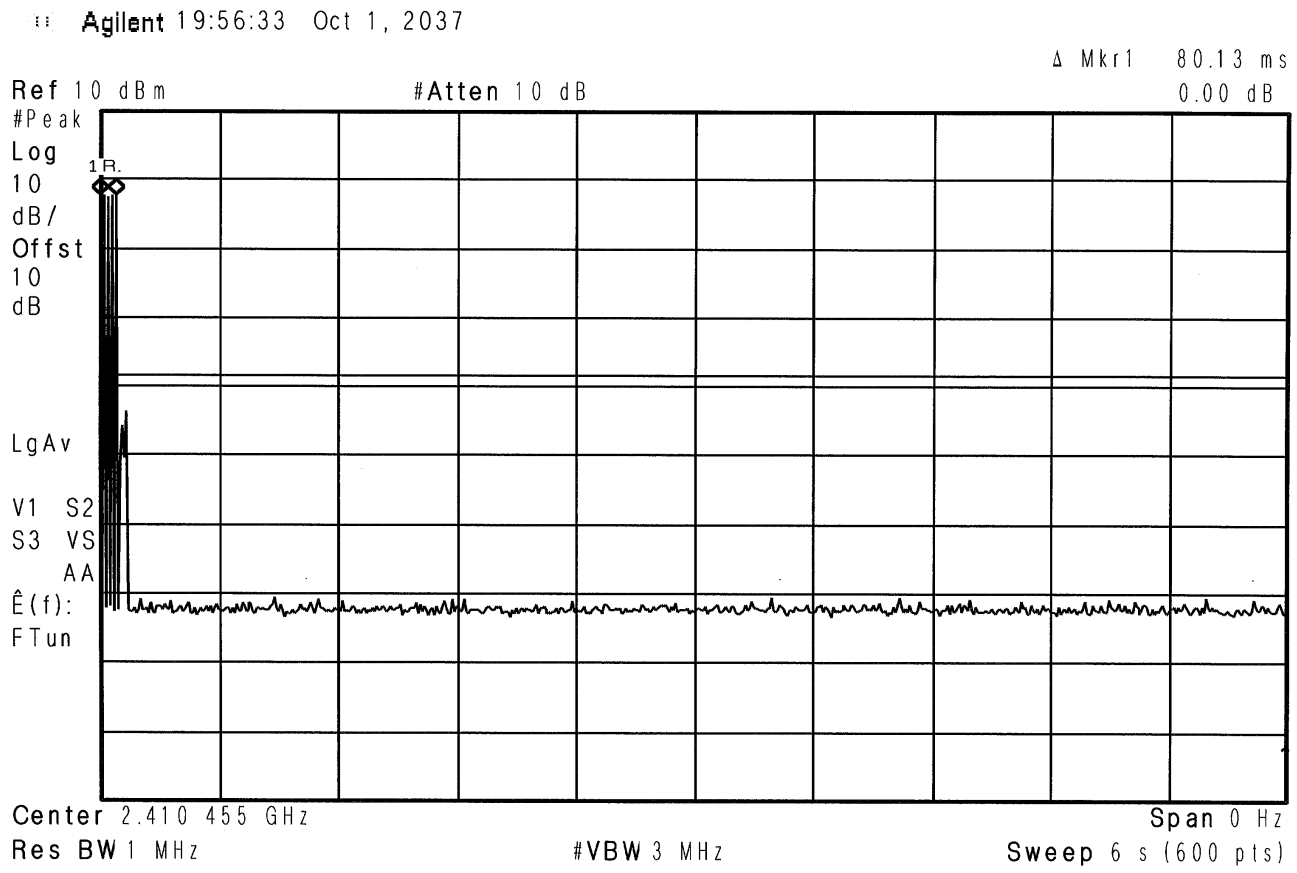
**Number of Hopping Channels and Time of Occupancy**
**Test Data**

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Number of Hopping Frequencies** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(iii) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.6 °C / 48.8 % |
| **Notes:** | Number of Hopping Frequencies: 15 |

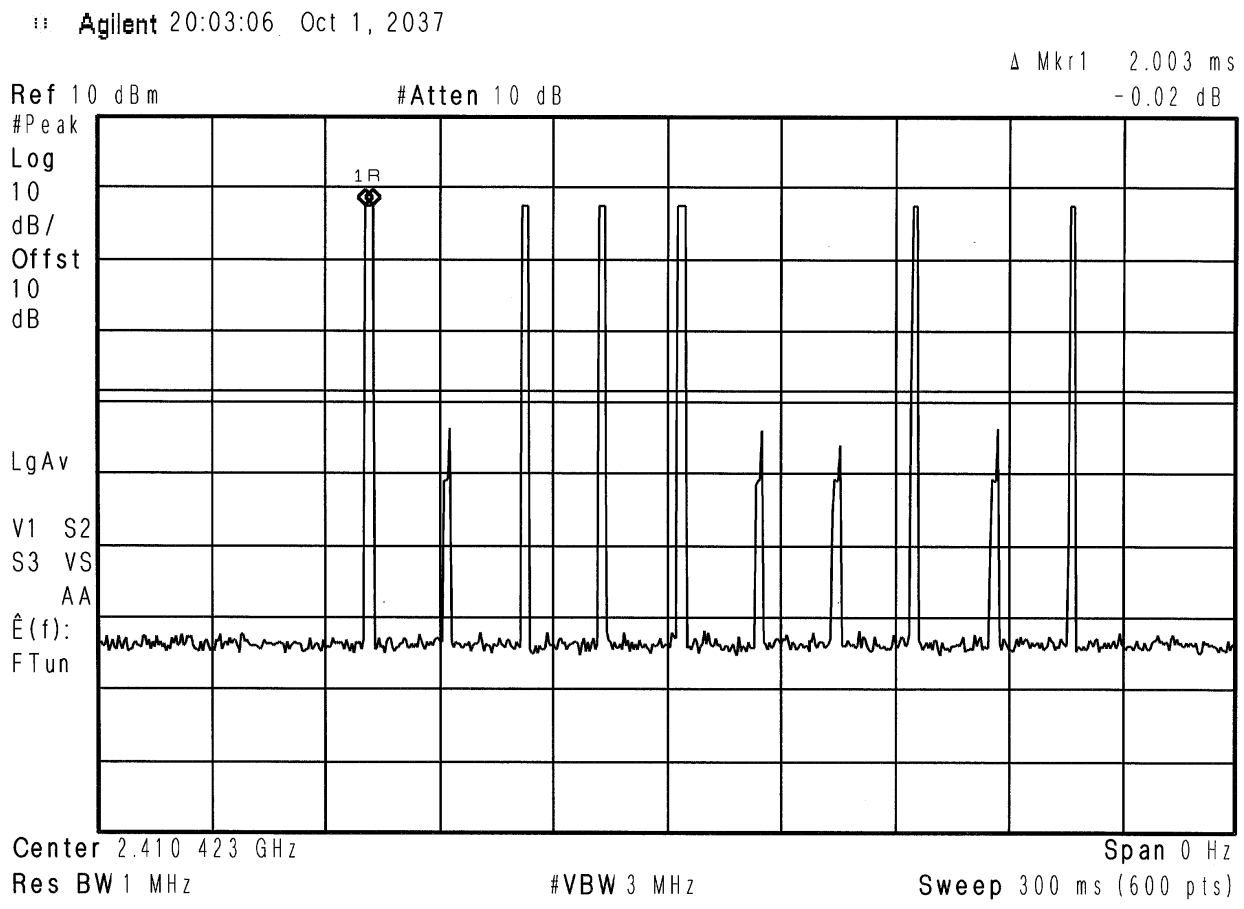


**Time of Occupancy**
**Test Data**

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Time of Occupancy** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.1 °C / 50.7 % |
| **Notes:** | Test Frequency: 2.410MHz Pulses: 3(6 second window) Pulse Width: 12.018 (2.003ms*6)<br>Time of Occupancy:36.054ms (12.018ms*3) |



| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Time of Occupancy** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.1 °C / 50.7 % |
| **Notes:** | Test Frequency: 2.410MHz Pulses: 3(6 second window) Pulse Width: 12.018 (2.003ms*6) Time of Occupancy:36.054ms (12.018ms*3) |



**FCC Section 15.247(a)(1)**
**Channel Separation**
**Test Photograph**

**Channel Separation**
**Test Photograph**

Test Setup

**Channel Separation**
**Test Data**

| EMISSIONS TEST DATA SHEET | |
|---|---|
| **Method:** | **Channel Carrier Frequency Separation** |
| **Test Specification:** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1) |
| **Job Number:** | R-2753P-1 |
| **Customer:** | IONX LLC |
| **Test Sample:** | Communications Management Unit |
| **Model Number:** | CMU-E5X |
| **Serial Number:** | FTA7B |
| **Operating Mode:** | Transmitting modulated signal |
| **Technician:** | M.Seamans |
| **Date(s):** | October 12th, 2017 |
| **Temp/ Relative Humidity:** | 20.7 °C / 48.7 % |
| **Notes:** | Channel Carrier Frequency Separation: 4.992 MHz |