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FCC Part 15, Subpart C, Section 15.247

Test Report

On

LoRa eSensor Oil Transmitter

**Customer Name:** Senet, Inc.

**Customer P.O:** 608

**Date of Report:** February 9, 2015

**Test Report No:** R-5909N-2

**Test Start Date:** January 23, 2015

**Test Finish Date:** January 29, 2015

**Test Technician:** M. Seamans

**Approved By:** S. Wentworth

**Report Prepared By:** J. Ramsey

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## Technical Information

| | |
|---|---|
| **Report Number:** | R-5909N-2 |
| **Customer:** | Senet, Inc. |
| **Address:** | 46 River Road |
| | Hudson, NH 03051 |
| **Test Sample:** | LoRa eSensor Oil Transmitter |
| **Brand Name:** | Senet |
| **Part Number:** | 5848 |
| **Serial Number:** | 219-04-2167 Rev. C |
| **Manufactured By:** | Senet, Inc. |
| **Power Requirements:** | 3.6 VDC via one disposable lithium coin cell battery |
| **Frequency Band of Operation:** | 902.3 MHz to 927.5 MHz |
| **Frequencies Tested (Low, Mid and High):** | 902.3 MHz, 914,9 MHz, 927.5 MHz |
| **Antenna Type:** | ½ Wave Internal 2dBi |
| **Equipment Use:** | Measures Oil Tank Level and Sends Data |
| **FCC ID:** | X94-0005847 |

**Test Specification:**
FCC Rules and Regulations, Telecommunications, Part 15 Radio Frequency Devices, Subpart C, Intentional Radiators

**Test Procedure**:
ANSI C63.4:2003, Methods of Measurement of Radio Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

558074 D01, FCC Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247, June 5, 2014

DA 00-705, FCC Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems (FHSS) Operating Under 15.247, March 30, 2000

**EUT Description:**

The LoRa eSensor Oil Transmitter transmits tank data to a receiver. It is used in homes and businesses for propane tank delivery automation. The EUT has two transmission modes for Tank Data Transmissions as described below:

Tank Data Transmission – FHSS:

The tank information is transmitted over the U.S. 915 MHz ISM band using adaptive data rate LoRa modulation; not exceeding transmit power of 20 dBm over a 125 KHz channel selected randomly from 64 possible channels. Transmissions are scheduled, usually once an hour, with each transmission lasting less than 400 milliseconds.

Tank Data Transmission – DTS:

An additional operational mode may be configured, in which the device transmits tank information using 500 MHz channels with a transmit power of 20 dBm in the US 915 MHz ISM band using adaptive data rate LoRa modulation. The Senet Oil Sensor Node will use this mode to enable power-efficient and higher bit rate transmissions in locations with very low concentrations of devices using LoRa modulation

## Tests Performed

The test methods performed on the EUT are shown below. Testing was performed in accordance with the applicable FCC requirements for each of the two transmission modes (DTS & FHSS).

| FCC Part 15, Subpart C | Test Method |
|---|---|
| **DTS Test Methods Performed** | |
| 15.247(a)(2) | 6 dB Bandwidth |
| 15.247(b)(3) | Power Output |
| 15.247(d) | Antenna Terminal Out of Band/<br>Band Edge Conducted Emissions (30 MHz – 25 GHz) |
| 15.247(d) | Out of Band/Band Edge Radiated Emissions (30 MHz to 10 GHz) |
| 15.247(e) | Power Density |
| **FHSS Test Methods Performed** | |
| 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 (30 MHz – 25 GHz) |
| 15.247(d) | Out of Band/Band Edge Radiated Emissions (30 MHz to 10 GHz) |

## General Test Requirements

1. The measurement procedures of ANSI C63.4:2003 and ANSI C63.10: 2013 were utilized as specified in FCC Part 15, Subpart C, Section 15.31(a)(3) and FCC Guidance for Performing Compliance Measurements on Digital Transmission Systems, June 5, 2014.
2. All radiated emissions measurements were performed on an Open Area Test Site (OATS), listed with the FCC, in accordance with FCC Section 15.31(d).
3. All measurements were performed at the specified 3 meter test distance as required by FCC Section 15.31(f).
4. The EUT was rotated throughout 360 degrees for all radiated emissions measurements as specified in FCC Section 15.31(f)(5).
5. All readily accessible EUT controls were adjusted in such a manner as to maximize the level of emissions in accordance with FCC Section 15.31(g).
6. Appropriate accessories were attached to all EUT ports during the performance of radiated emissions measurements as required by FCC Section 15.31(i).
7. The EUT operated over the frequency range of 902.3 MHz to 927.5 MHz. Testing was performed with the device operating at 3 frequencies, 1 at the top, 1 in the middle and 1 at the bottom of the range of operation in accordance with FCC Section 15.31(m).
8. The frequency spectrum was investigated from the lowest frequency generated in the device up to the $10^{th}$ harmonic of the highest fundamental frequency in accordance with FCC Section 15.33(a)(1).
9. The EUT utilizes an internal ½ wave antenna and does not have an external antenna connector/external antenna and is therefore in compliance with 15.203.

## 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.

## Requirements and Test Results

### FCC Section 15.247 (a)(2) - DTS Bandwidth

For systems using digital modulation techniques operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725 – 5850 MHz bands the minimum 6 dB bandwidth shall be at least 500 kHz.

- **Results**: The minimum 6dB bandwidth measured was 726.7 kHz and the device was found to meet the requirement of 15.247 (a)(2).

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

For frequency hopping systems operating in the 902-928 MHz band; 1 Watt for systems employing at least 50 hopping frequencies.

- **Results**: The maximum measured peak conducted output power was 52.72 mW. The maximum antenna gain of the monopole antenna is 2.0 dBi. The device was found to meet the power output requirements of 15.247 (b)(3) including de facto EIRP.

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

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g.: alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

- **Results**: The maximum measured peak conducted output power was 52.36 mW. The maximum antenna gain of the monopole antenna is 2.0 dBi. The device was found to meet the power output requirements of 15.247 (b)(3) including de facto EIRP.

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

**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).

**FCC Section 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 1. 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 1 - 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).

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

**FCC Section 15.247(e) – Power Spectral Density**
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

- **Results**: The measured power spectral density complied with the specified power density limit and the device was found to meet the requirements of 15.247(e).

**Requirement:**
**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 165.7 kHz. The carrier frequencies were separated by 203.2 kHz which exceeds the 20 dB bandwidth and complies with the requirements specified above.

**FCC Section 15.247 (a)(1)(iii)**
**Number of Channels and Occupancy Time**
Frequency hopping systems operating in the 902 – 928 MHz band: If the 20dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

- **Results**:
  The frequency hopping system uses 64 Channels. The average time of occupancy did not exceed 0.4 seconds in a 20 second period which meets the above requirements.

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

**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 Frequency of 900 MHz = 0.6mW/cmsq

**DTS Transmission Mode:**

Power = Max Power Input to Antenna = 52.36 mW

Gain = Max Power Gain of Antenna = 2.0 dBi = 1.58 numeric

$$0.6\text{mW/cmsq} = \frac{52.36 \times 1.58}{4\ (3.14) \times Dsq} = \frac{82.73}{12.56 \times Dsq}$$

$$Dsq = \frac{82.73}{12.56 \times 0.6} = 10.98$$

D = sq. root 10.98 = 3.3 cm

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

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

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

**FHSS Transmission Mode:**

Power = Max Power Input to Antenna = 52.72 mW

Gain = Max Power Gain of Antenna = 2.0 dBi = 1.58 numeric

$$0.6\text{mW/cmsq} = \frac{52.72 \times 1.58}{4\,(3.14) \times \text{Dsq}} = \frac{83.3}{12.56 \times \text{Dsq}}$$

$$\text{Dsq} = \frac{83.3}{12.56 \times 0.6} = 11.05$$

D = sq. root 11.05 = 3.3 cm

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

# EQUIPMENT LISTS

## FCC Section 15.247(a)(2) – DTS Bandwidth

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5039 | FLUKE | 20DB ATTENUATOR | DC - 12.4 GHz | Y9305 | 12/17/2014 | 12/31/2015 |
| 5070 | ROHDE & SCHWARZ | EMI TEST RECEIVER | 20 Hz - 40 GHz | ESIB40 | 10/29/2014 | 10/31/2016 |
| R451 | AGILENT / HP | Analyzer, Spectrum | 100 Hz - 26.5 GHz | E7405A;A | 1/27/2014 | 1/31/2015 |

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

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5039 | FLUKE | 20DB ATTENUATOR | DC - 12.4 GHz | Y9305 | 12/17/2014 | 12/31/2015 |
| R451 | AGILENT / HP | Analyzer, Spectrum | 100 Hz - 26.5 GHz | E7405A;A | 1/27/2014 | 1/31/2015 |

## 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 |
|---|---|---|---|---|---|---|
| 5039 | FLUKE | 20DB ATTENUATOR | DC - 12.4 GHz | Y9305 | 12/17/2014 | 12/31/2015 |
| R451 | AGILENT / HP | Analyzer, Spectrum | 100 Hz - 26.5 GHz | E7405A;A | 1/27/2014 | 1/31/2015 |

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

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 1232 | AGILENT / HP | PRE-AMPLIFIER | 1 - 26.5GHz | 8449B | 6/24/2014 | 6/30/2015 |
| 3258 | EMCO | DOUBLE RIDGED GUIDE ANTENNA | 1 GHZ - 18GHZ | 3115 | 9/4/2013 | 3/31/2015 |
| 4029 | RETLIF | OPEN AREA TEST SITE | 3 / 10 Meters | RNH | 5/15/2013 | 5/31/2016 |
| 5039 | FLUKE | 20DB ATTENUATOR | DC - 12.4 GHz | Y9305 | 12/17/2014 | 12/31/2015 |
| 5053 | EMCO | BICONILOG ANTENNA | 26 MHz - 3 GHz | 3142C | 7/2/2013 | 1/31/2015 |
| R451 | AGILENT / HP | Analyzer, Spectrum | 100 Hz - 26.5 GHz | E7405A;A | 1/27/2014 | 1/31/2015 |

## FCC Section 15.247(e) – Power Density

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5039 | FLUKE | 20DB ATTENUATOR | DC - 12.4 GHz | Y9305 | 12/17/2014 | 12/31/2015 |
| 5070 | ROHDE & SCHWARZ | EMI TEST RECEIVER | 20 Hz - 40 GHz | ESIB40 | 10/29/2014 | 10/31/2016 |

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

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5039 | FLUKE | 20DB ATTENUATOR | DC - 12.4 GHz | Y9305 | 12/17/2014 | 12/31/2015 |
| 5070 | ROHDE & SCHWARZ | EMI TEST RECEIVER | 20 Hz - 40 GHz | ESIB40 | 10/29/2014 | 10/31/2016 |
| R451 | AGILENT / HP | Analyzer, Spectrum | 100 Hz - 26.5 GHz | E7405A;A | 1/27/2014 | 1/31/2015 |

## EQUIPMENT LISTS (continued)

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

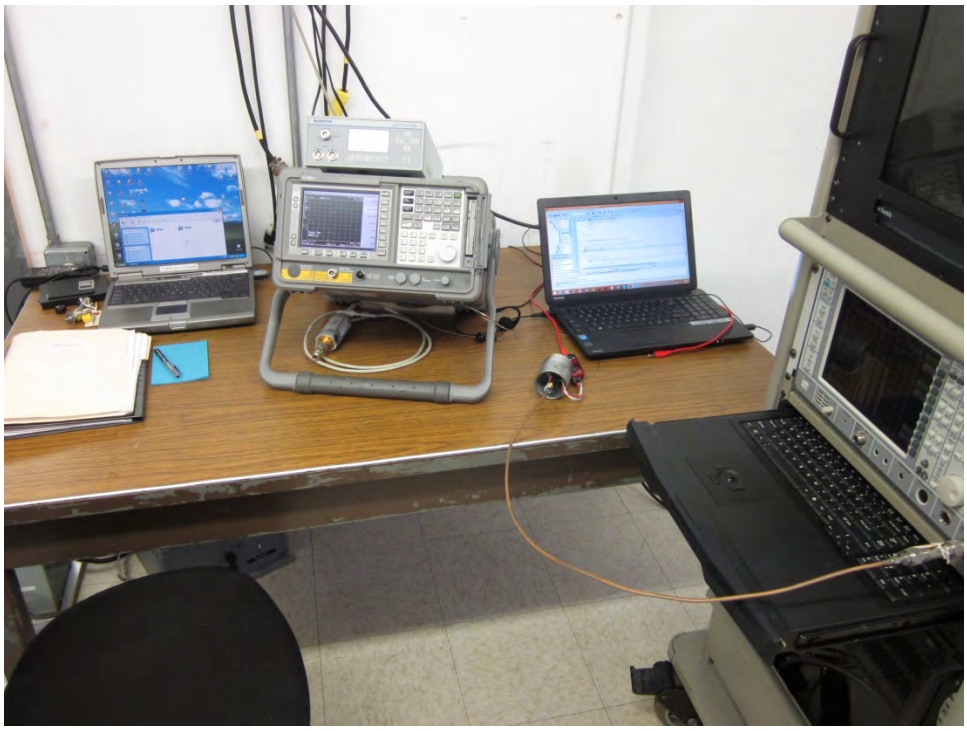
| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5039 | FLUKE | 20DB ATTENUATOR | DC - 12.4 GHz | Y9305 | 12/17/2014 | 12/31/2015 |
| R451 | AGILENT / HP | Analyzer, Spectrum | 100 Hz - 26.5 GHz | E7405A;A | 1/27/2014 | 1/31/2015 |

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

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|---|---|---|---|---|---|---|
| 5039 | FLUKE | 20DB ATTENUATOR | DC - 12.4 GHz | Y9305 | 12/17/2014 | 12/31/2015 |
| R451 | AGILENT / HP | Analyzer, Spectrum | 100 Hz - 26.5 GHz | E7405A;A | 1/27/2014 | 1/31/2015 |

**Test Photograph(s)**
**DTS Bandwidth**
**6 dB Bandwidth**
**FCC Section 15.247(a)(2)**

**Test Photograph(s)**
**6 dB Bandwidth**

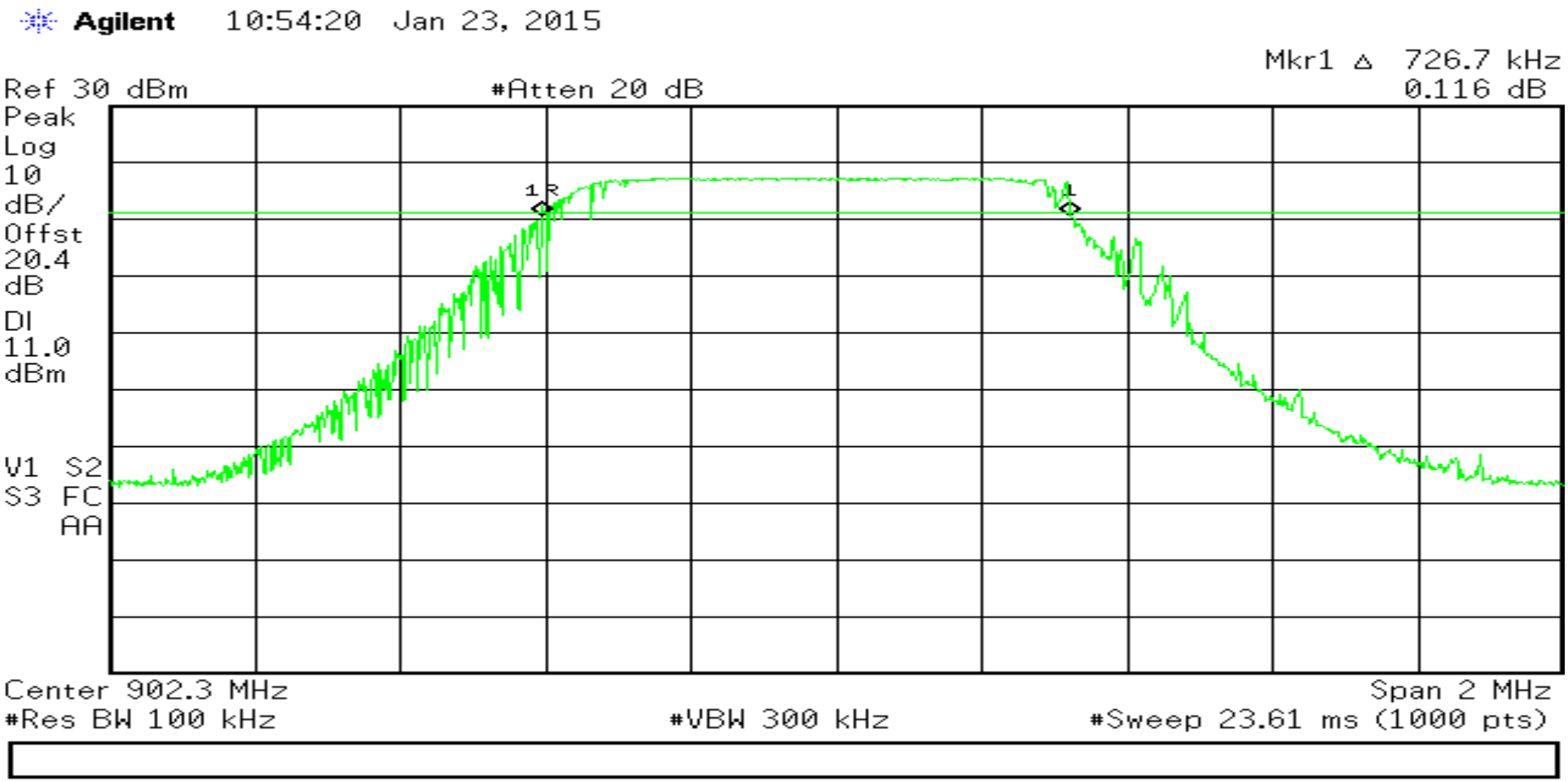


Test Setup

**DTS Bandwidth**
**6 dB Bandwidth**
**Test Data**

# RETLIF TESTING LABORATORIES

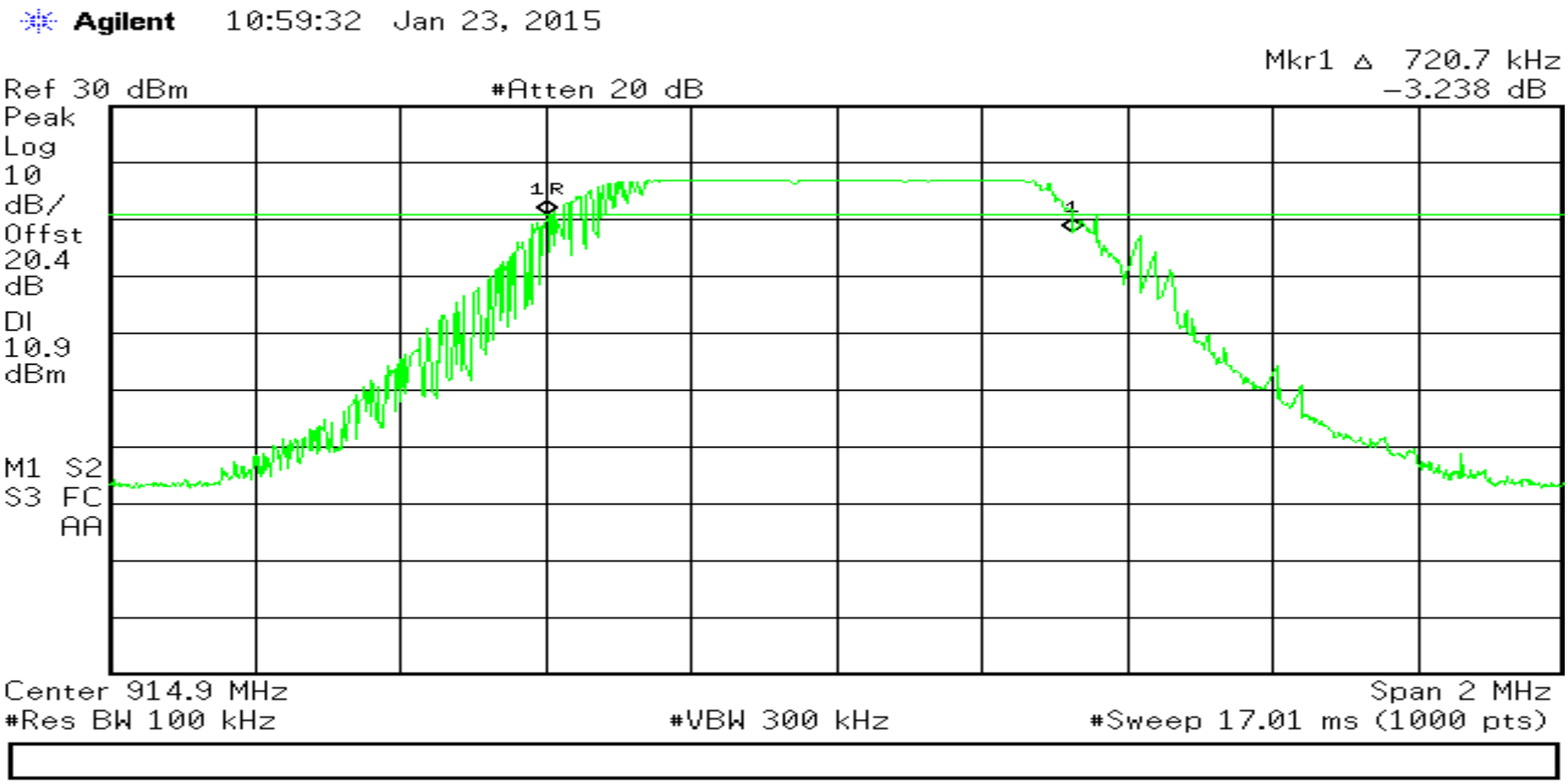
| | | | |
|---|---|---|---|
| **Test Method:** | 6dB Bandwidth | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 902.3 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(2) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Occupied Bandwidth: 726.7 kHz | | |




Page 1 of 3

# RETLIF TESTING LABORATORIES

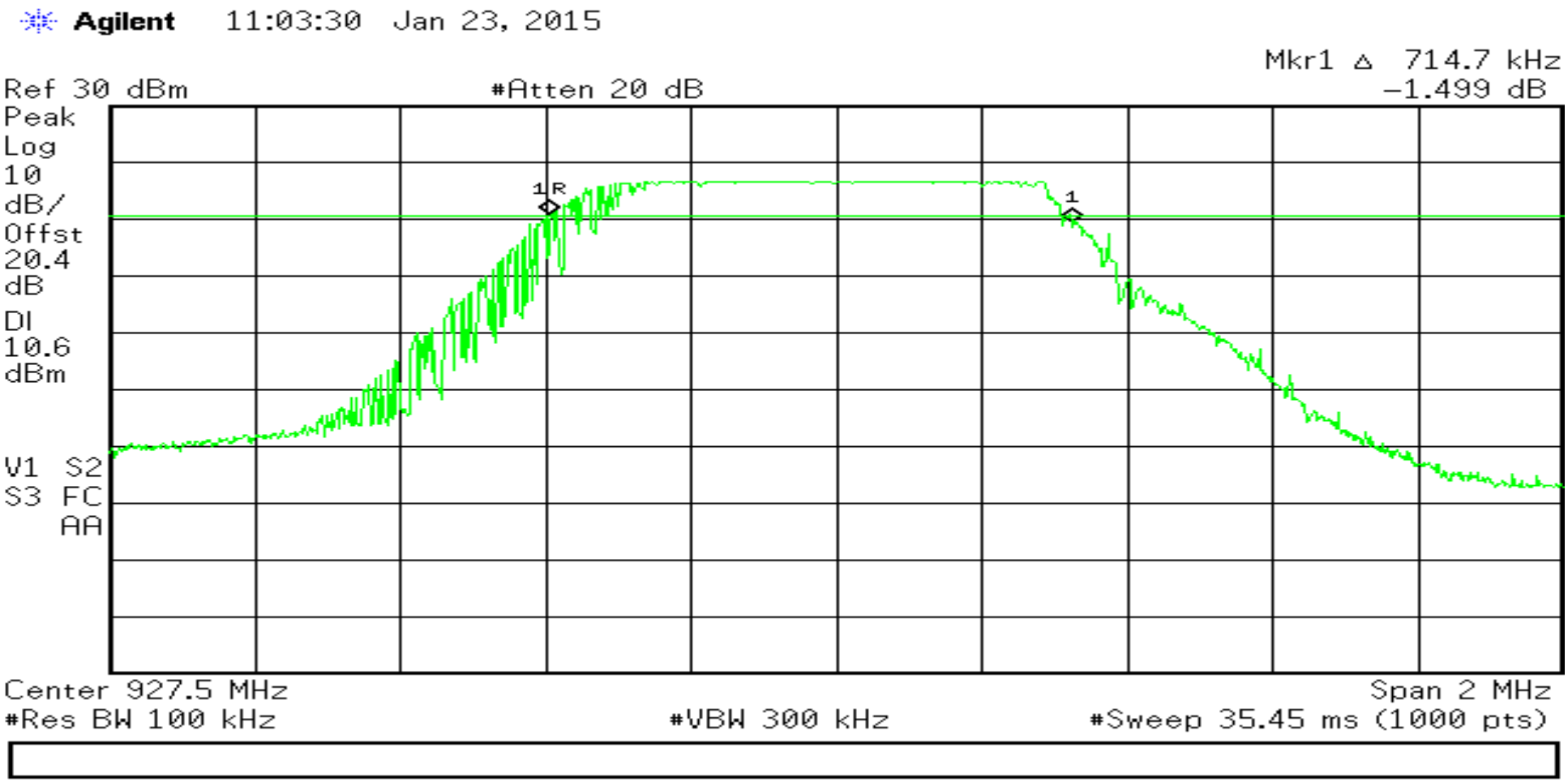
| | | | |
|---|---|---|---|
| **Test Method:** | 6dB Bandwidth | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 914.9 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(2) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Occupied Bandwidth: 720.7 kHz | | |




Page 1 of 3

# RETLIF TESTING LABORATORIES

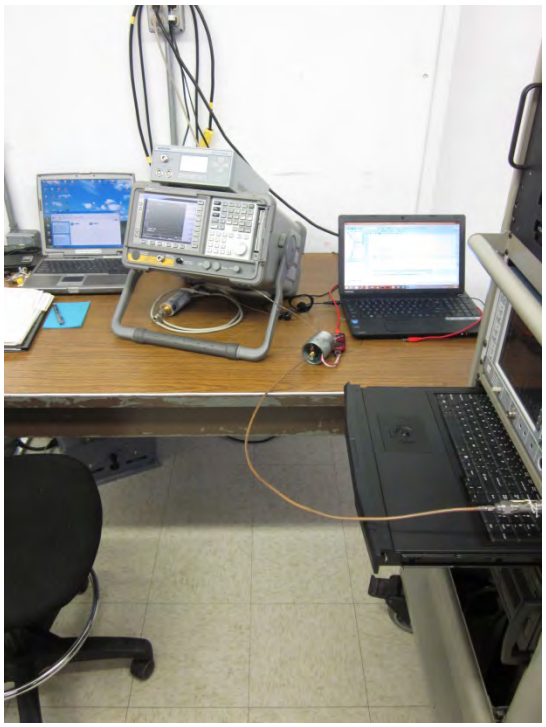
| | | | |
|---|---|---|---|
| **Test Method:** | 6dB Bandwidth | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 927.5 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(2) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Occupied Bandwidth: 714.7 kHz | | |



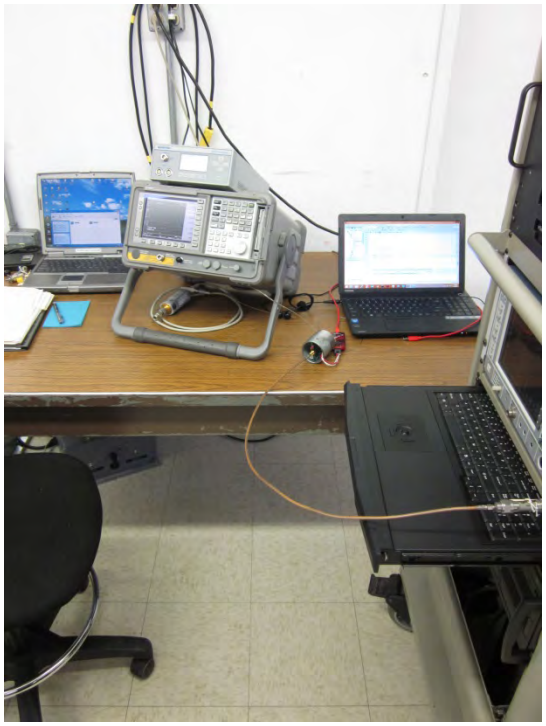

Page 1 of 3

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

**Test Photograph(s)**
**Power Output**



Test Setup, DTS



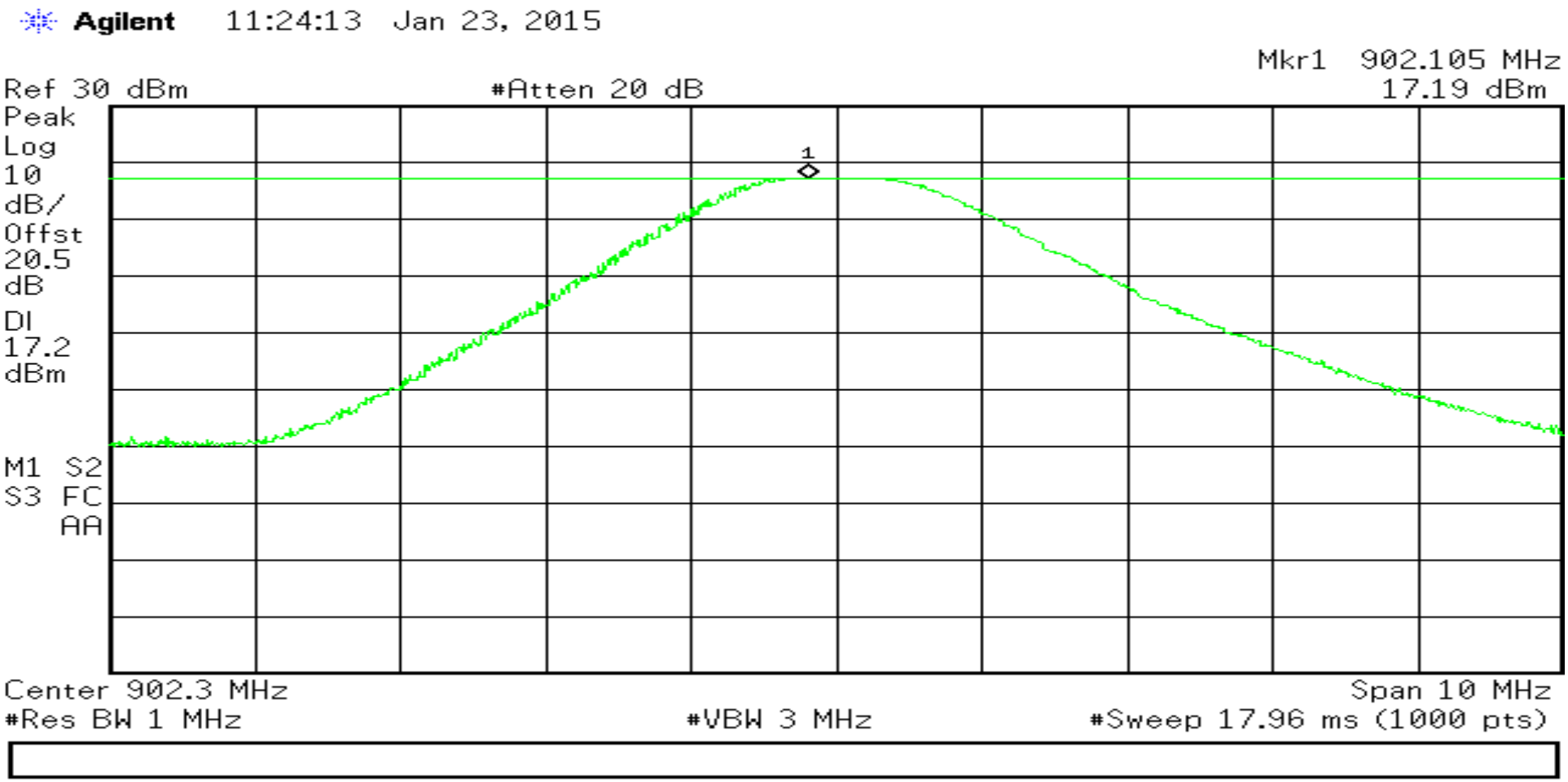
Test Setup, FHSS

**Power Output**

**DTS Test Data**

# RETLIF TESTING LABORATORIES

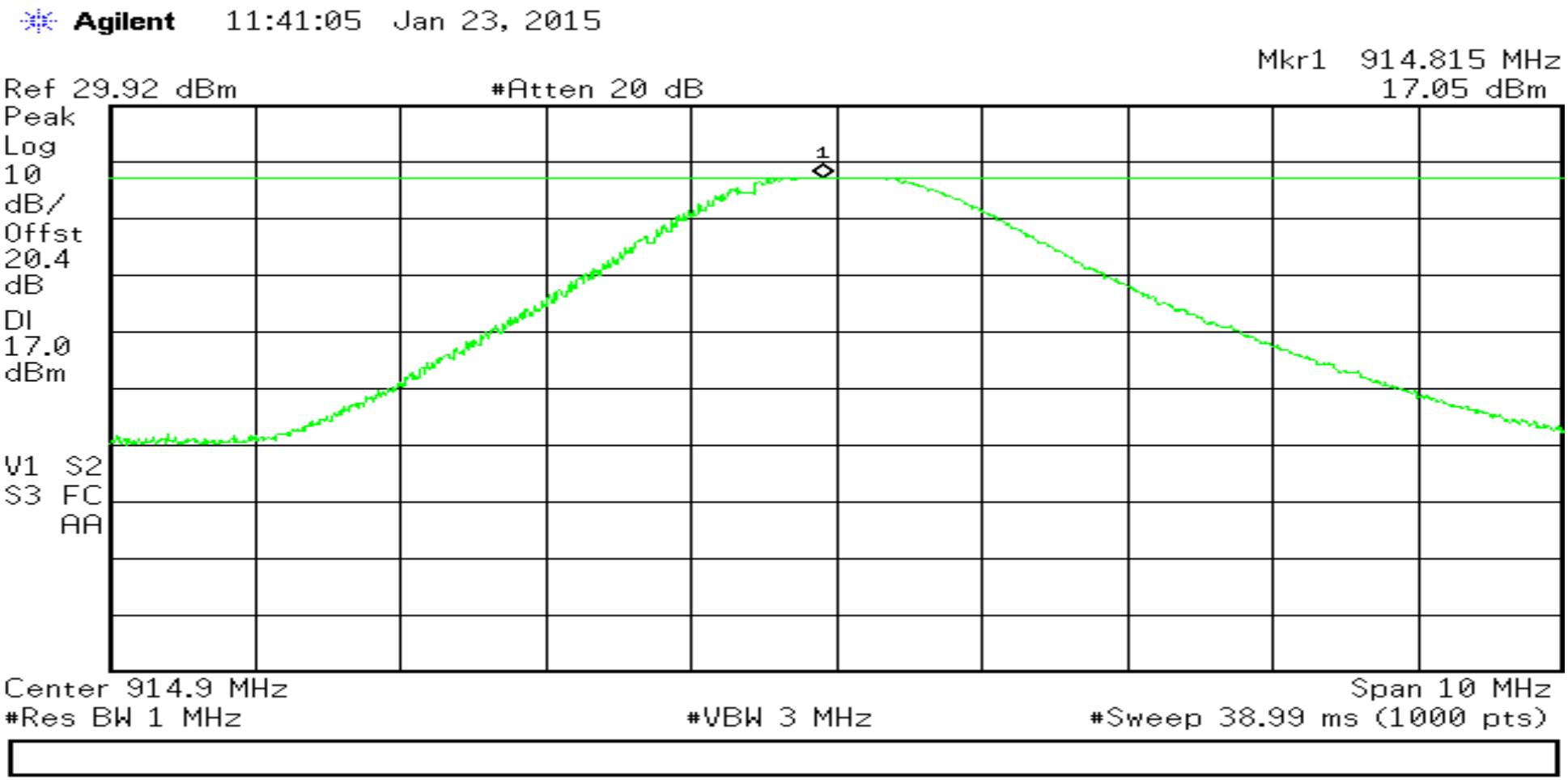
| | | | |
|---|---|---|---|
| **Test Method:** | Conducted Peak Power Output | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Model Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 902.30 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (b)(3) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Peak Power Output: 17.19 dBm | | |




Page 1 of 3

# RETLIF TESTING LABORATORIES

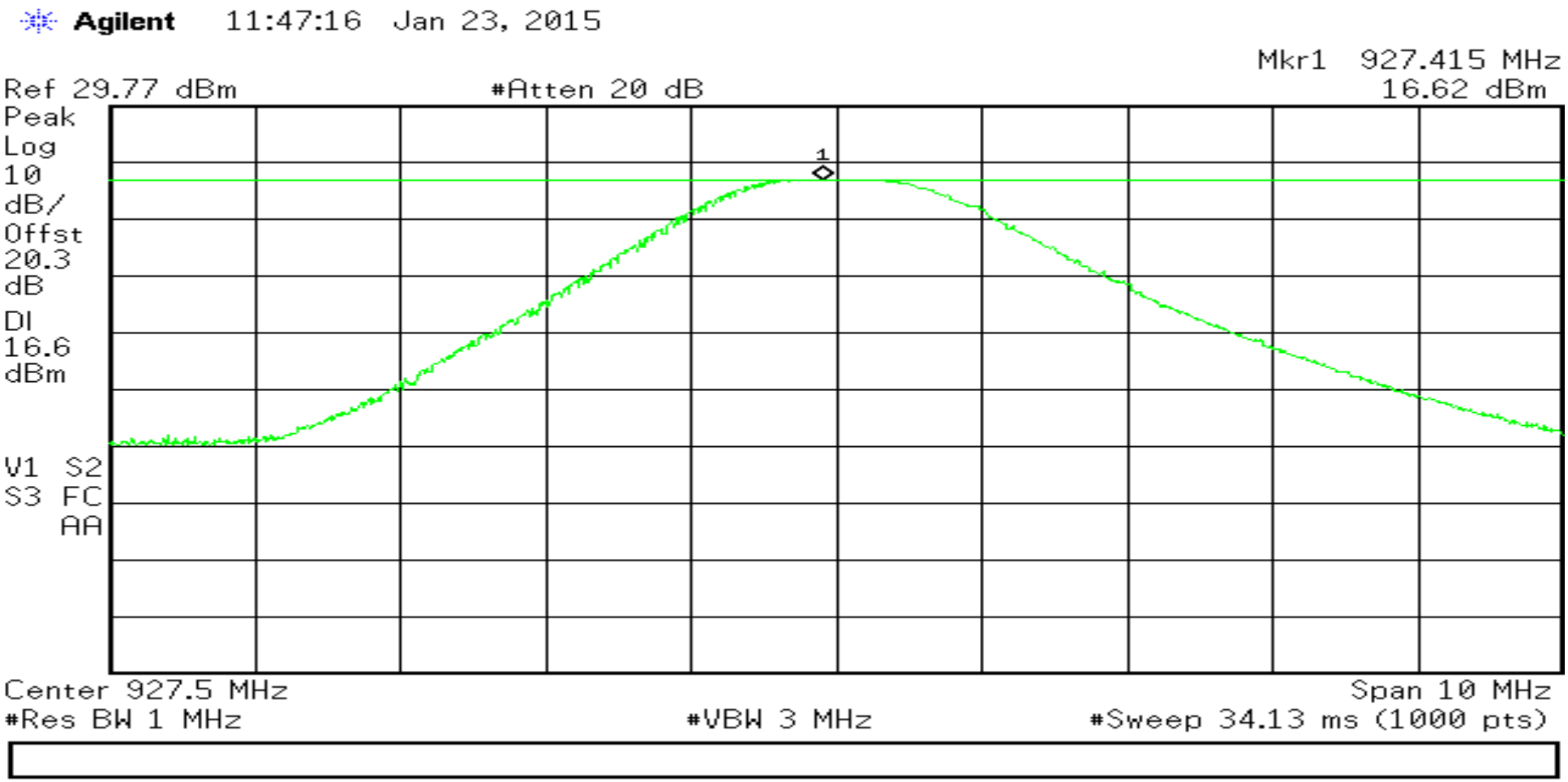
| | | | |
|---|---|---|---|
| **Test Method:** | Conducted Peak Power Output | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 914.9 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (b)(3) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Peak Power Output: 17.05dBm | | |




Page 2 of 3

# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Conducted Peak Power Output | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 927.5 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (b)(3) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Peak Power Output: 16.62dBm | | |



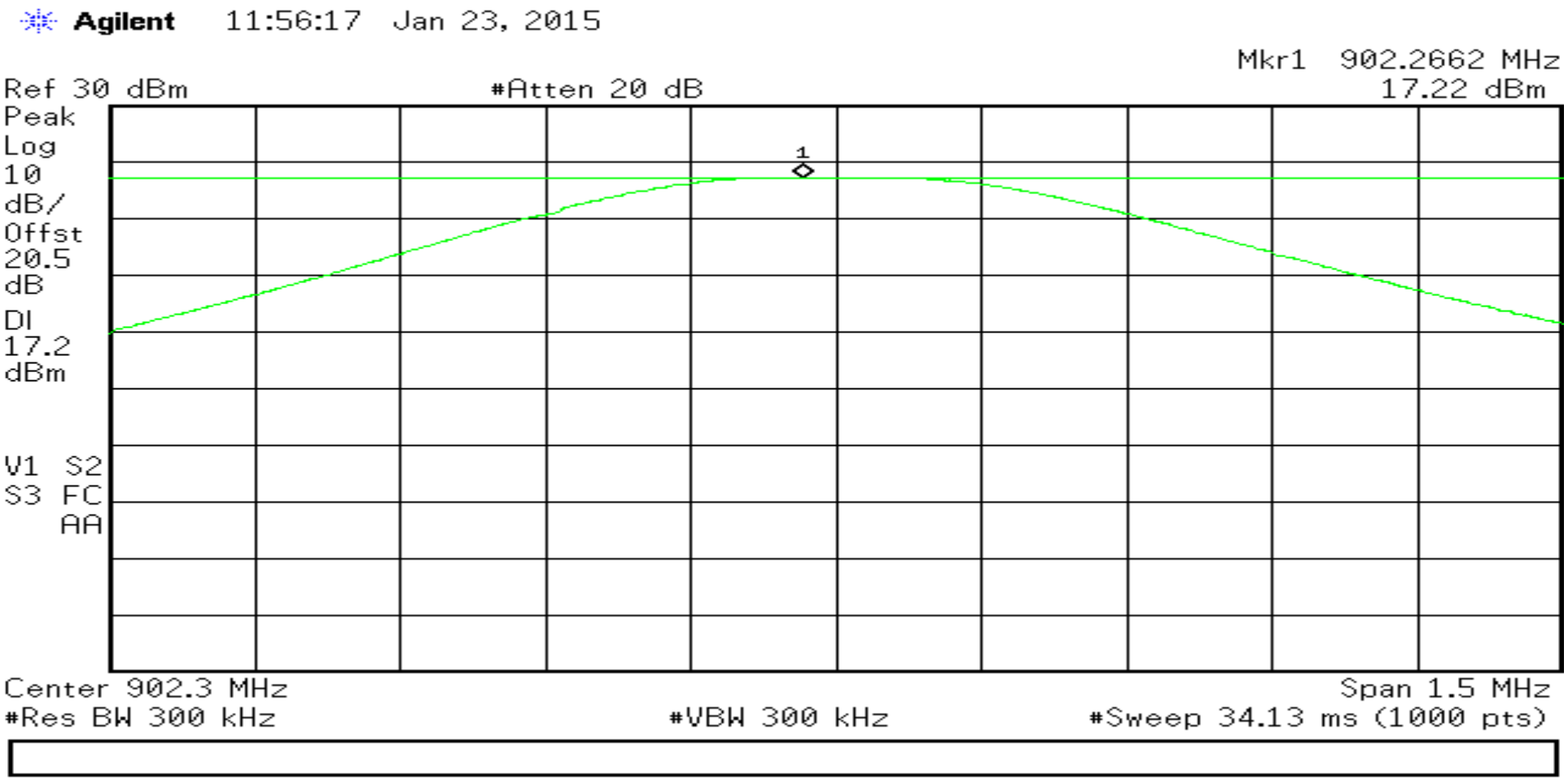

Page 3 of 3

**Peak Power**

**FHSS Test Data**

# RETLIF TESTING LABORATORIES

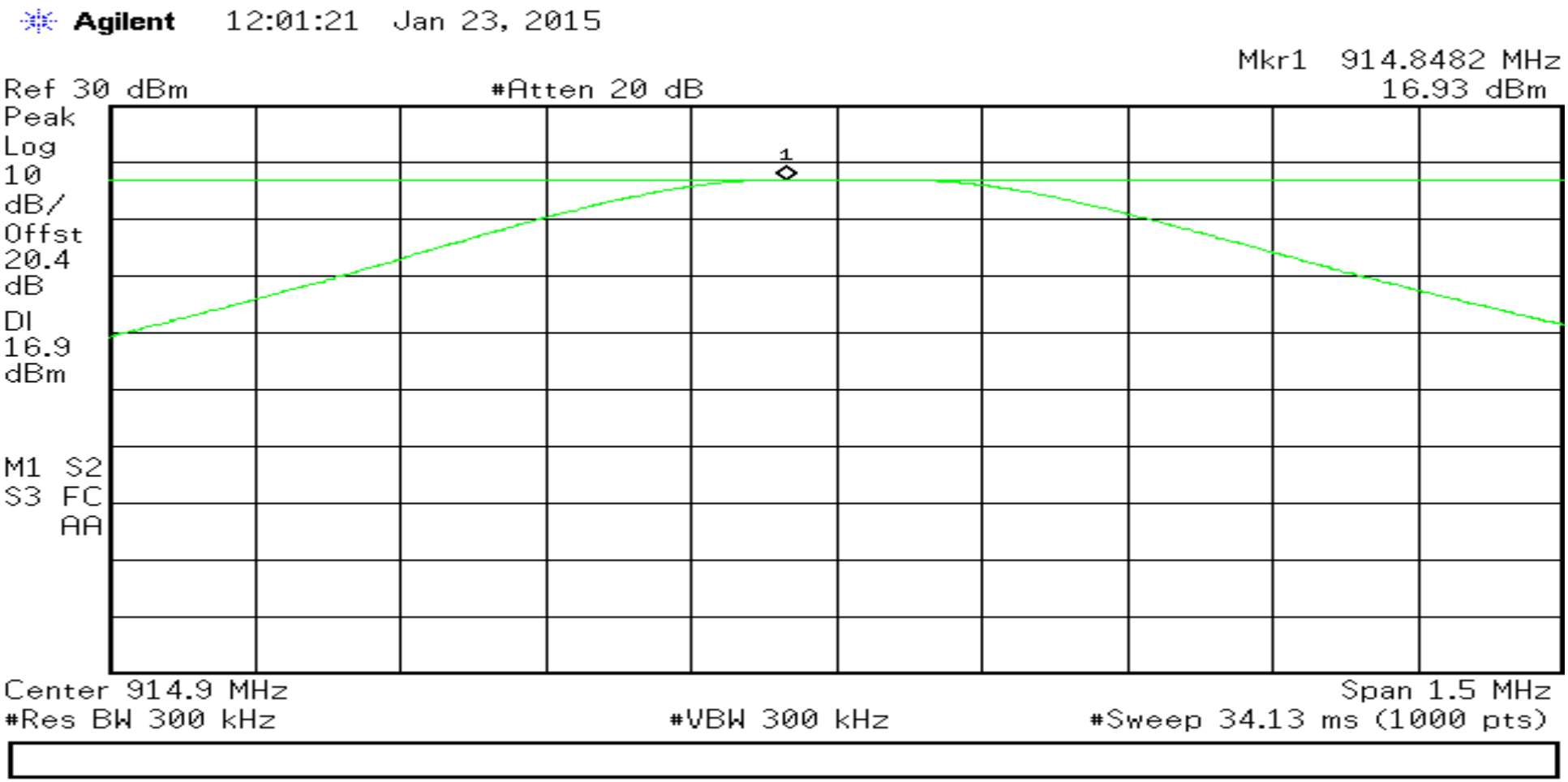
| | | | |
|---|---|---|---|
| **Test Method:** | Conducted Peak Power Output | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(FHSS) signal at 902.30 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (b)(2) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Peak Power Output: 17.22 dBm | | |




Page 1 of 3

# RETLIF TESTING LABORATORIES

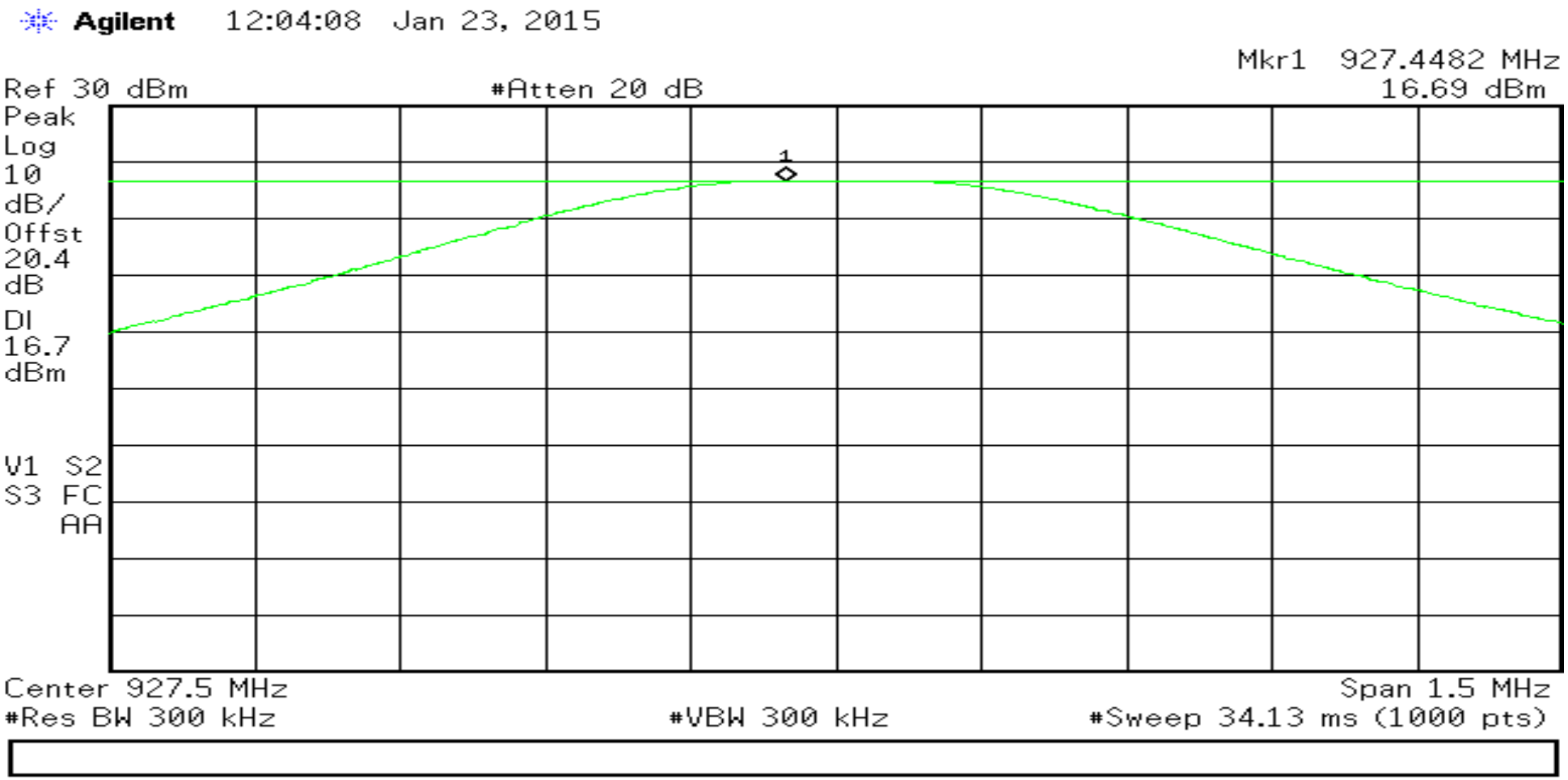
| | | | |
|---|---|---|---|
| **Test Method:** | Conducted Peak Power Output | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(FHSS) signal at 914.9 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (b)(2) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Peak Power Output: 16.93dBm | | |




Page 2 of 3

# RETLIF TESTING LABORATORIES

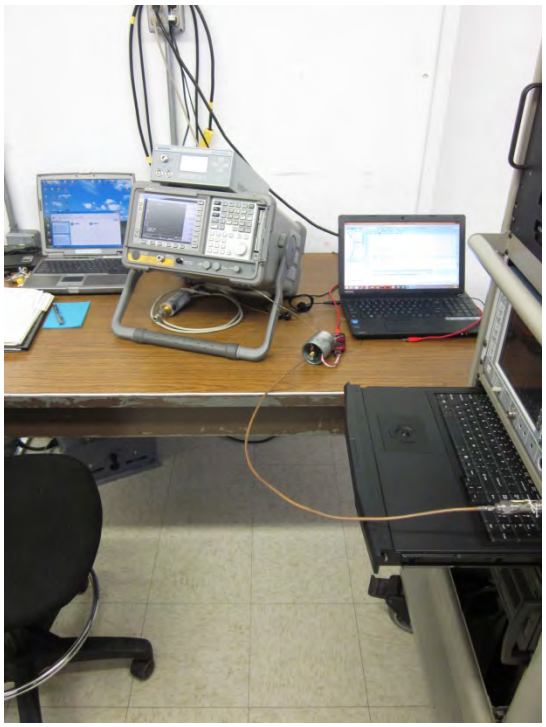
| | | | |
|---|---|---|---|
| **Test Method:** | Conducted Peak Power Output | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(FHSS) signal at 927.5 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (b)(2) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Peak Power Output: 16.69dBm | | |




Page 3 of 3

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

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

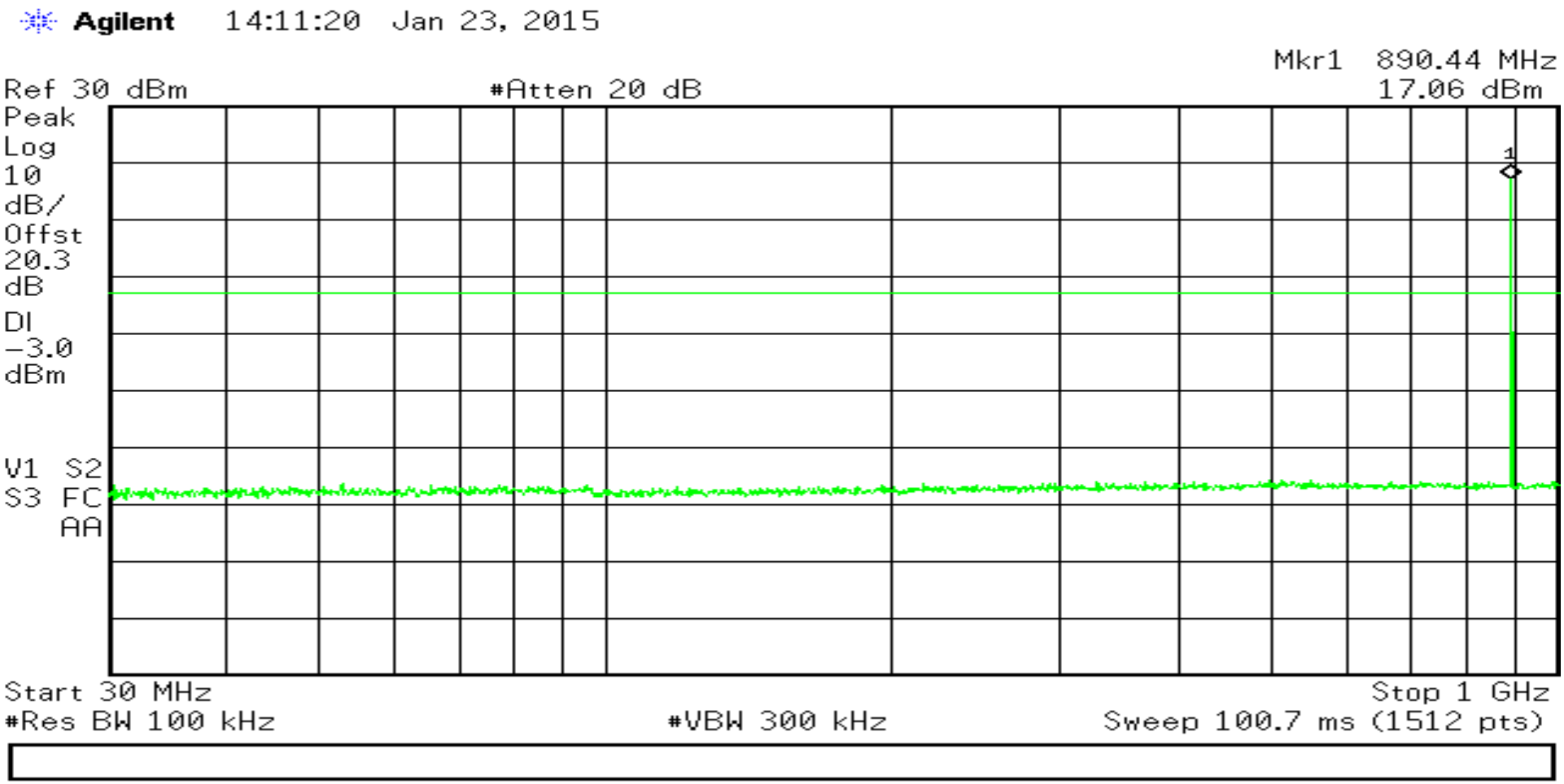


Test Setup

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

# RETLIF TESTING LABORATORIES

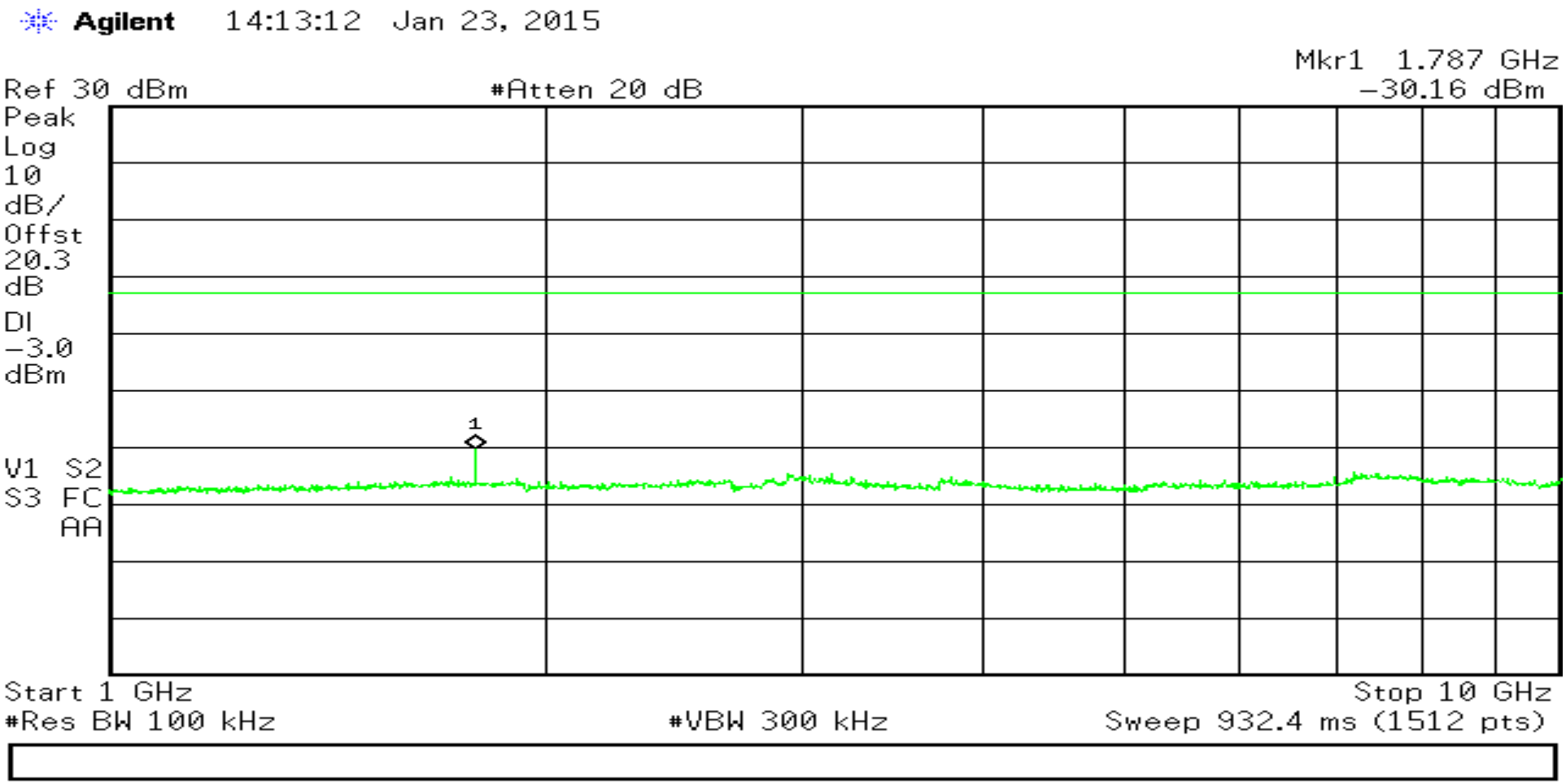
| | | | |
|---|---|---|---|
| **Test Method:** | Out of Band Conducted Emissions 30 MHz to 10 GHz | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 902.3 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (d) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Limit: -3.0 dBm | | |




Page 1 of 8

# RETLIF TESTING LABORATORIES

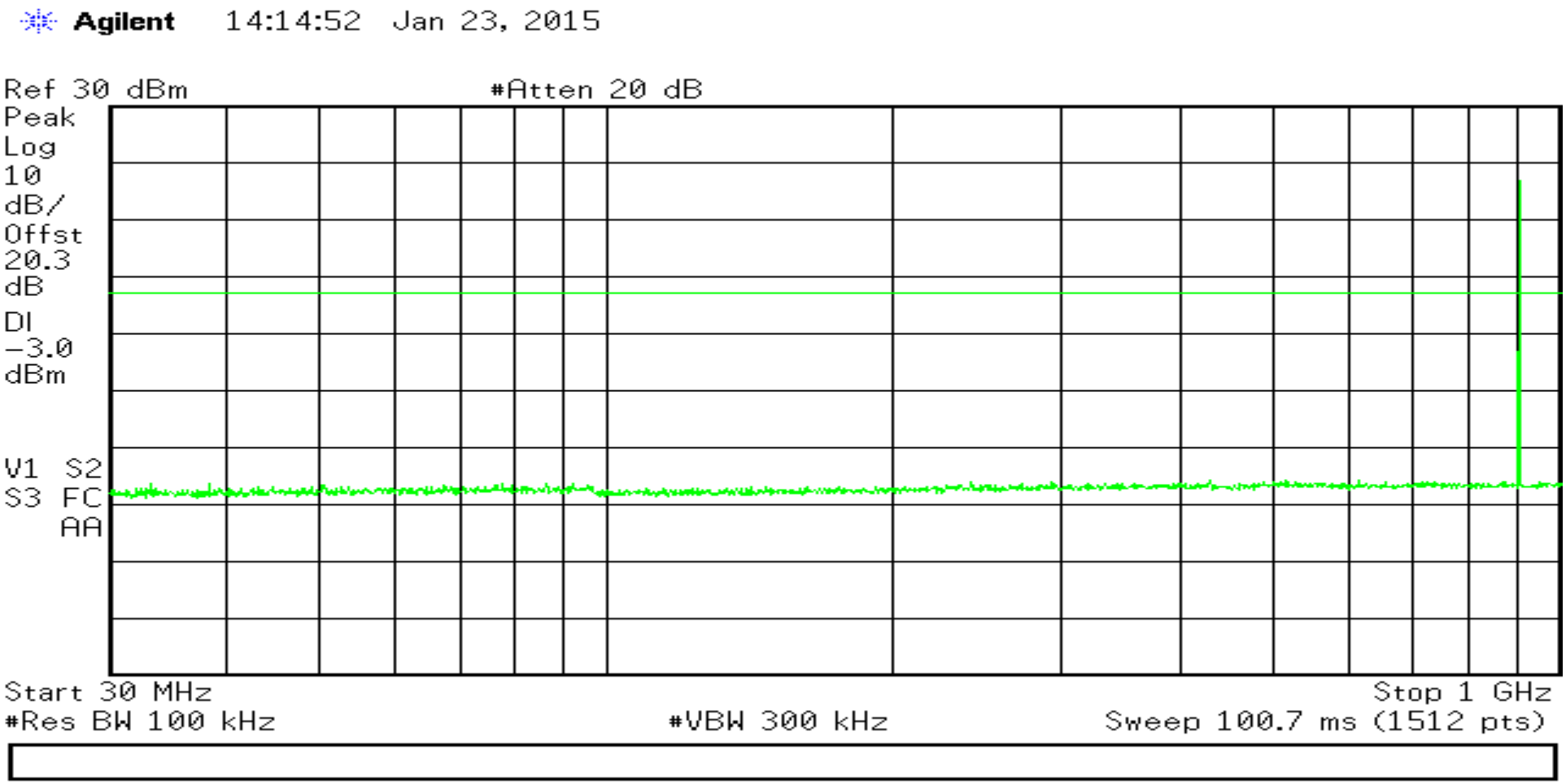
| | | | |
|---|---|---|---|
| **Test Method:** | Out of Band Conducted Emissions 30 MHz to 10 GHz | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 902.3 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (d) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Limit: -3.0 dBm | | |




Page 2 of 8

# RETLIF TESTING LABORATORIES

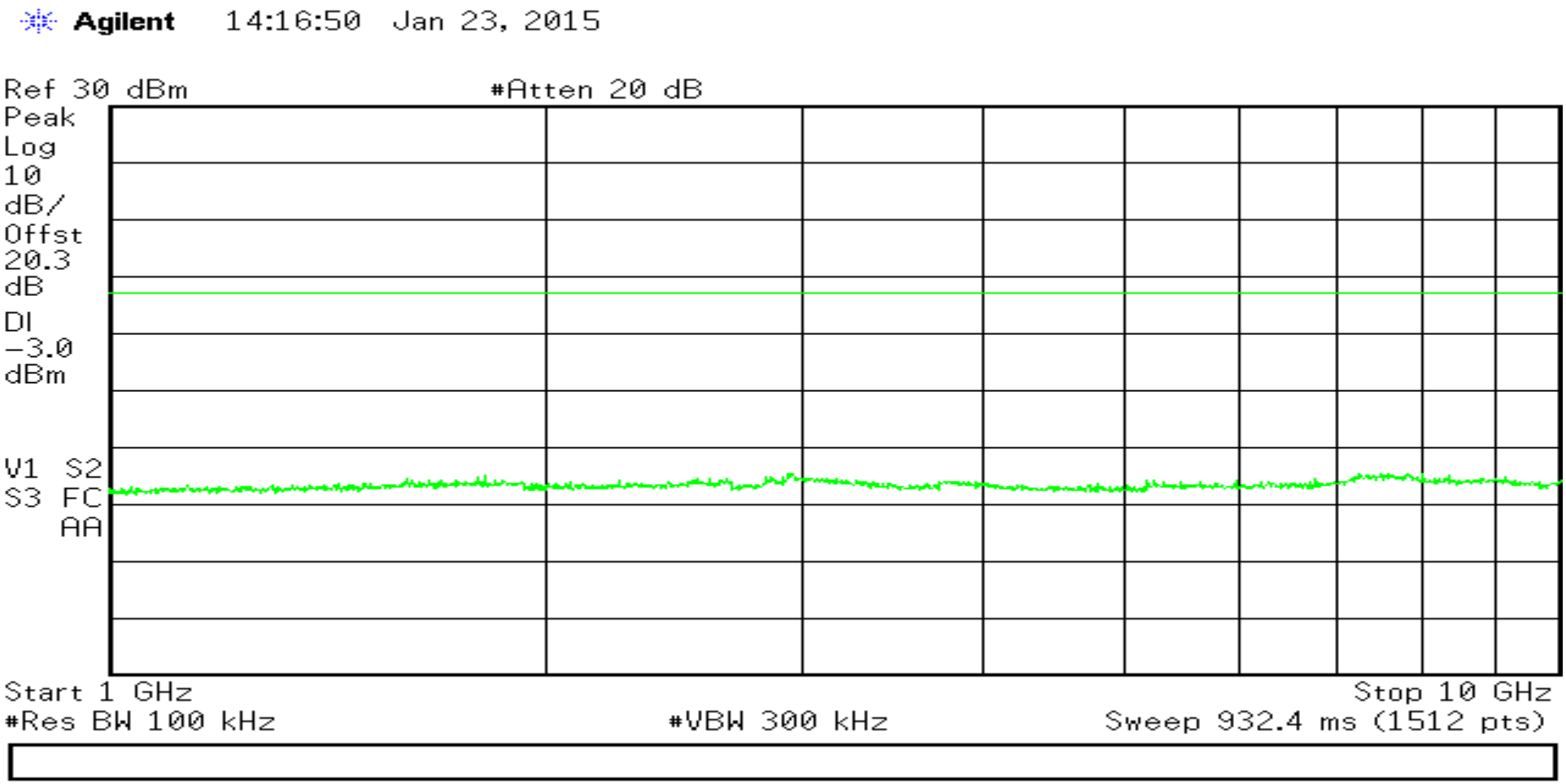
| | | | |
|---|---|---|---|
| **Test Method:** | Out of Band Conducted Emissions 30 MHz to 10 GHz | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 914.9 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (d) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Limit: -3.0 dBm | | |




Page 3 of 8

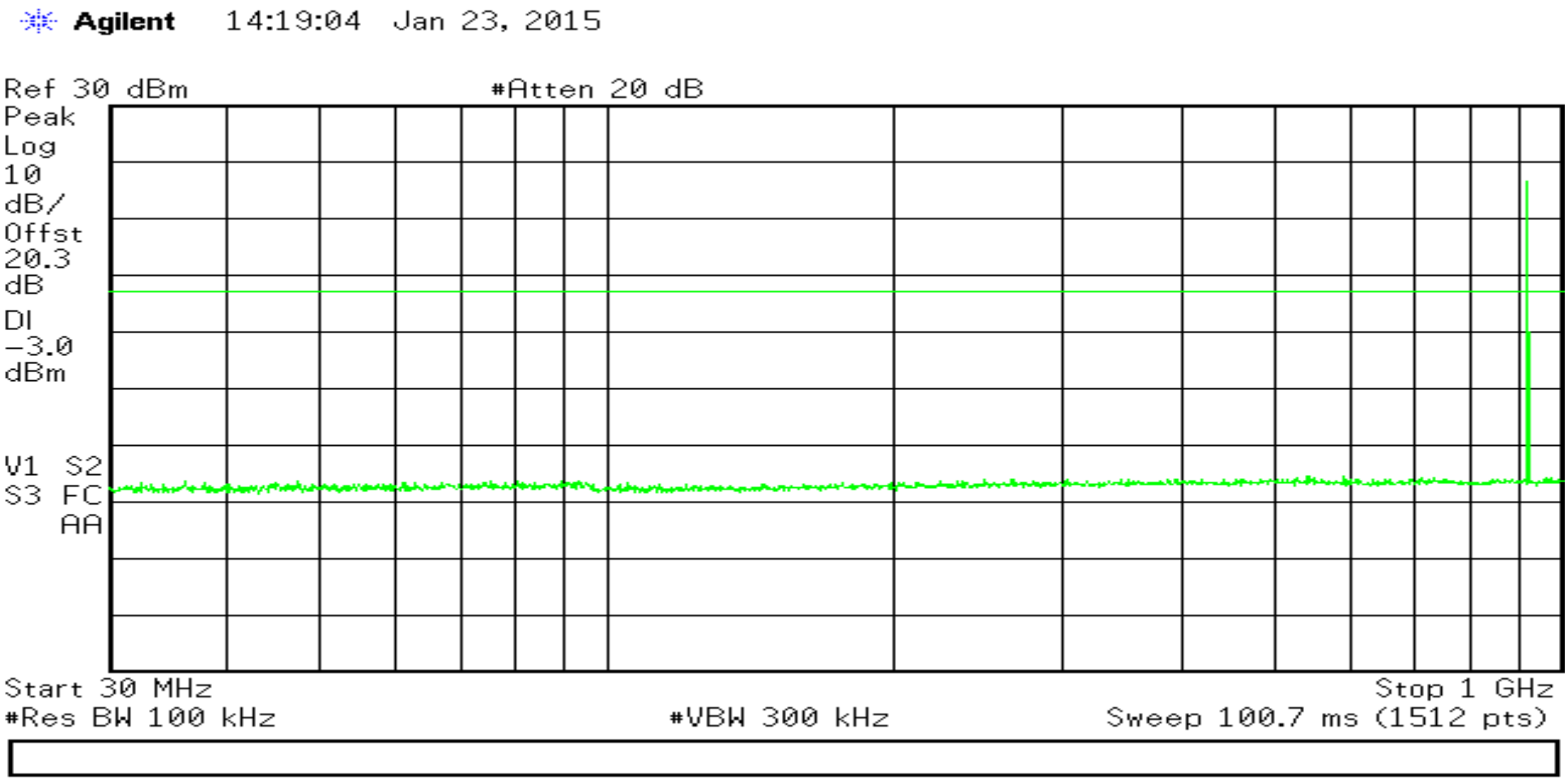
# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Out of Band Conducted Emissions 30 MHz to 10 GHz | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 914.9 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (d) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Limit: -3.0 dBm | | |



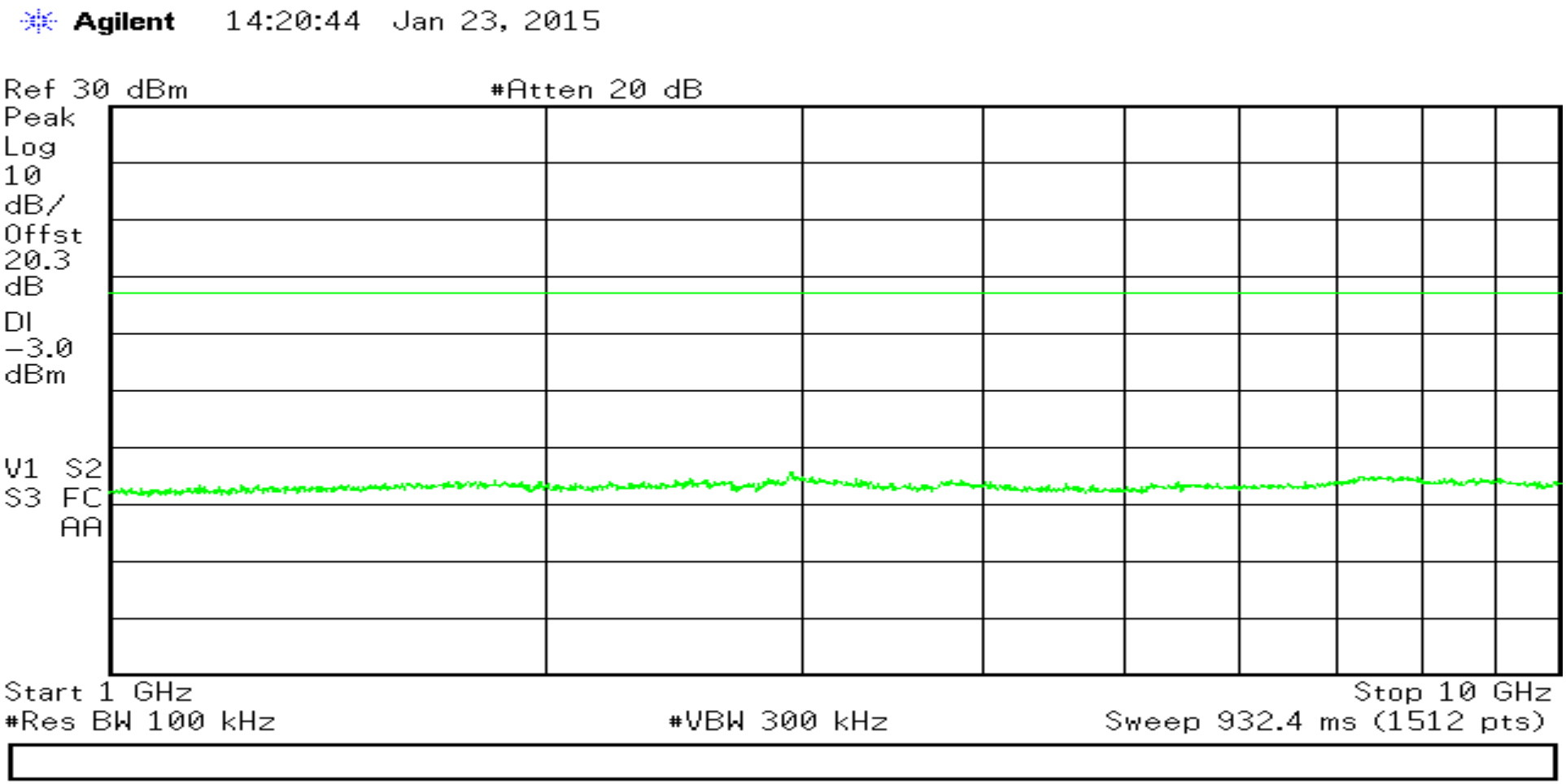
# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Out of Band Conducted Emissions 25 MHz to 10 GHz | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 927.5 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (d) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Limit: -3.0 dBm | | |



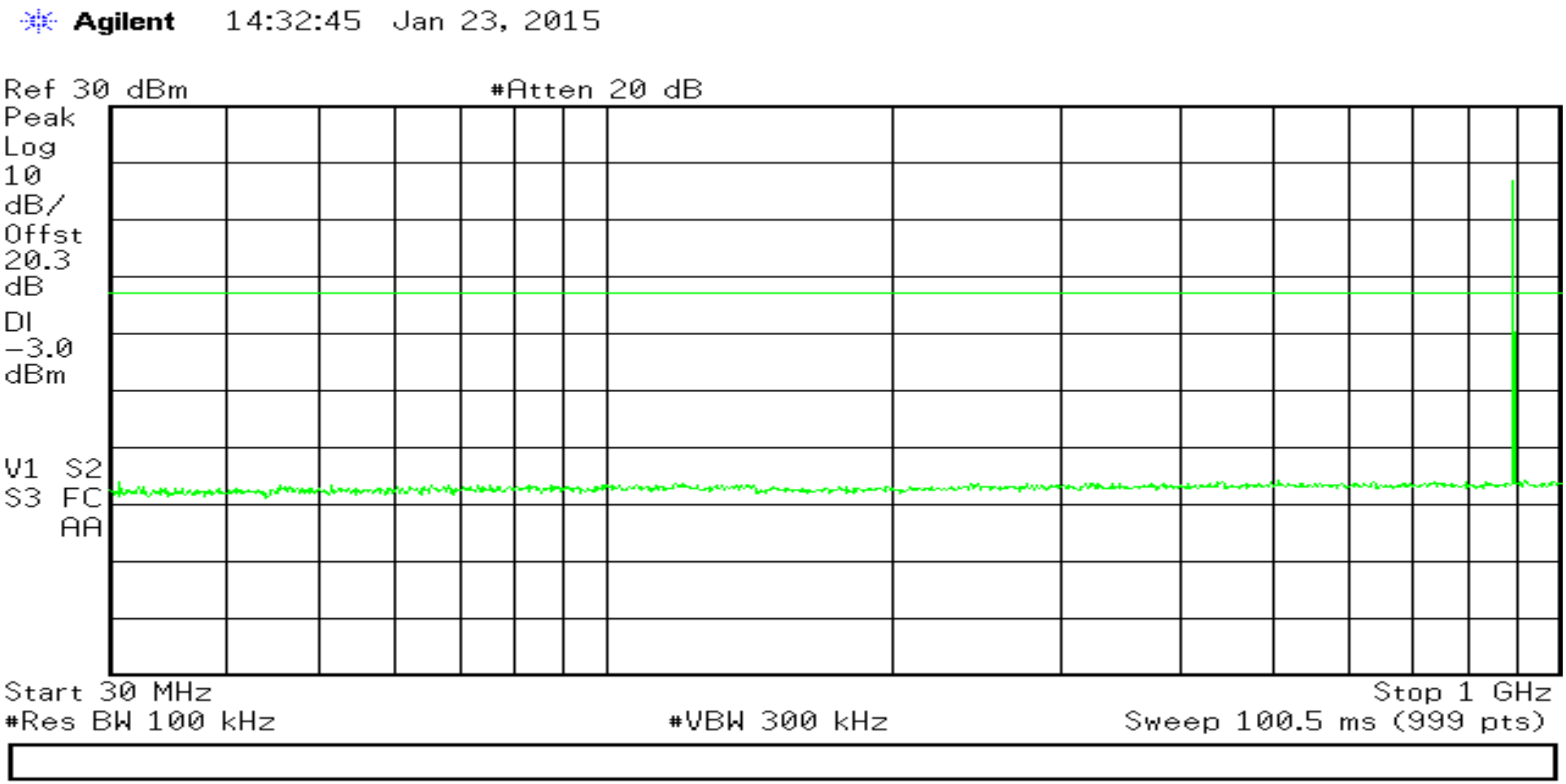
# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Out of Band Conducted Emissions 30 MHz to 10 GHz | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 927.5 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (d) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Limit: -3.0 dBm | | |



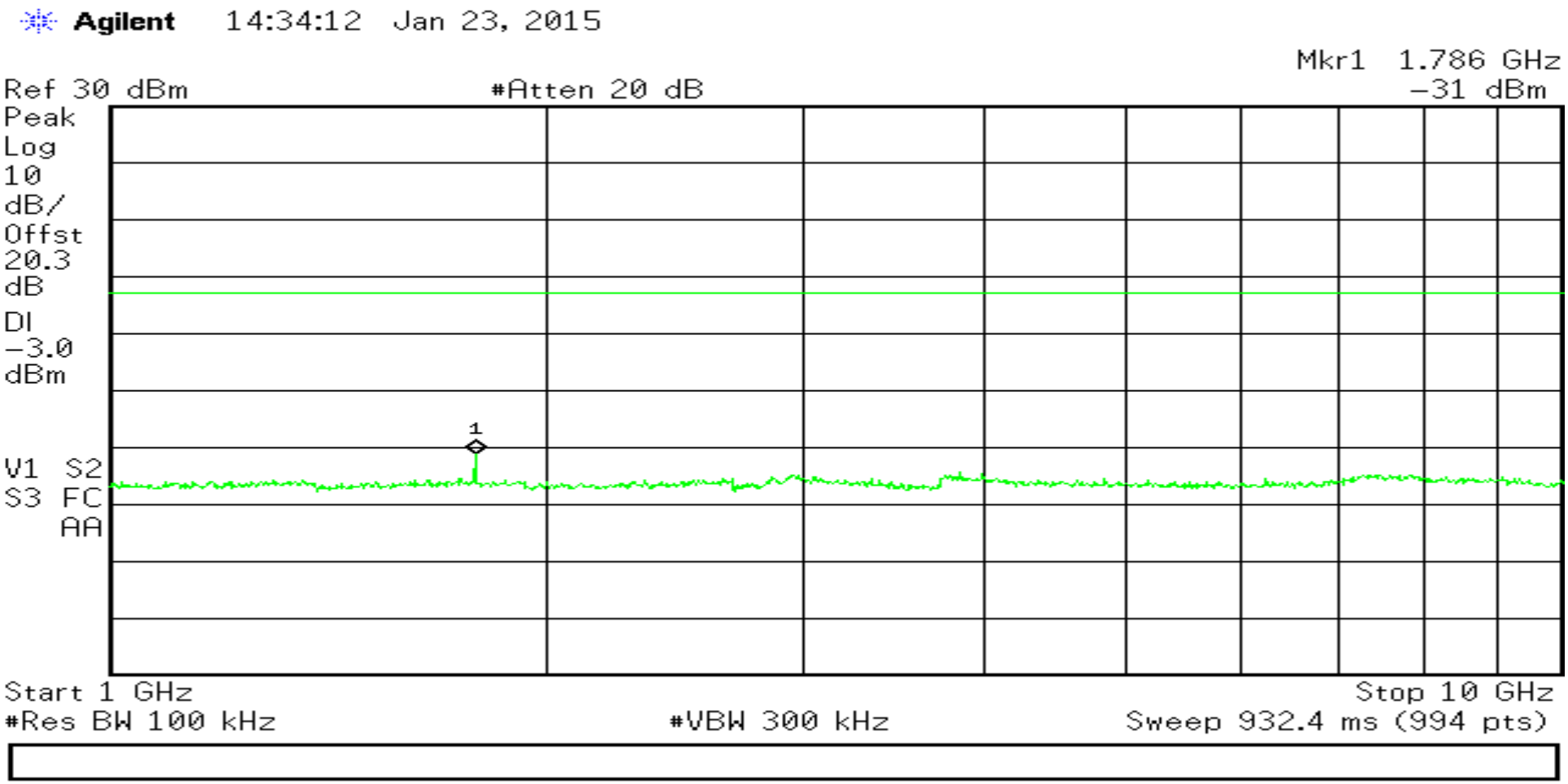
# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Out of Band Conducted Emissions 30 MHz to 10 GHz | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting hopping frequency data | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (d) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Limit: -3.0 dBm | | |



# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Out of Band Conducted Emissions 30 MHz to 10 GHz | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting hopping frequency data | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (d) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Limit: -3.0 dBm | | |

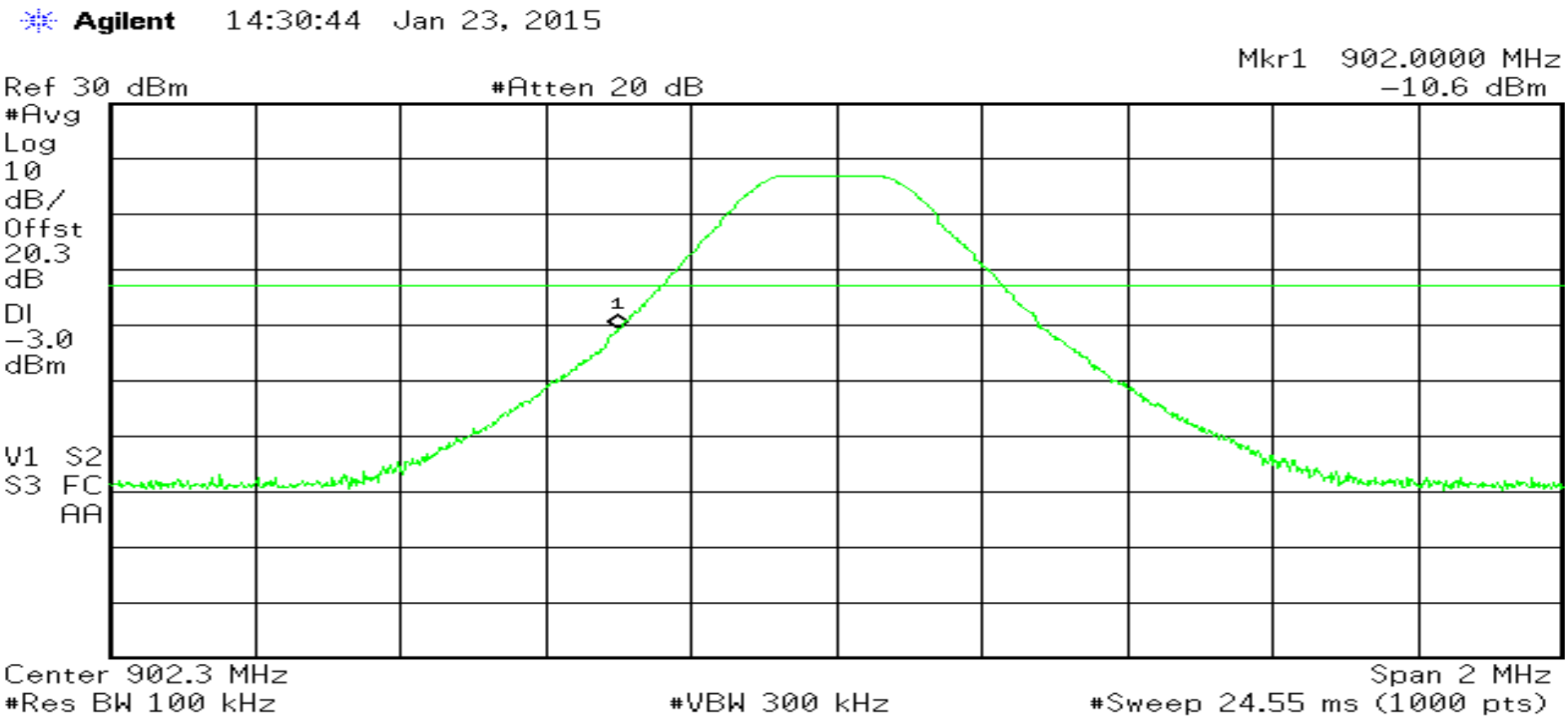



Page 8 of 8

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

# RETLIF TESTING LABORATORIES

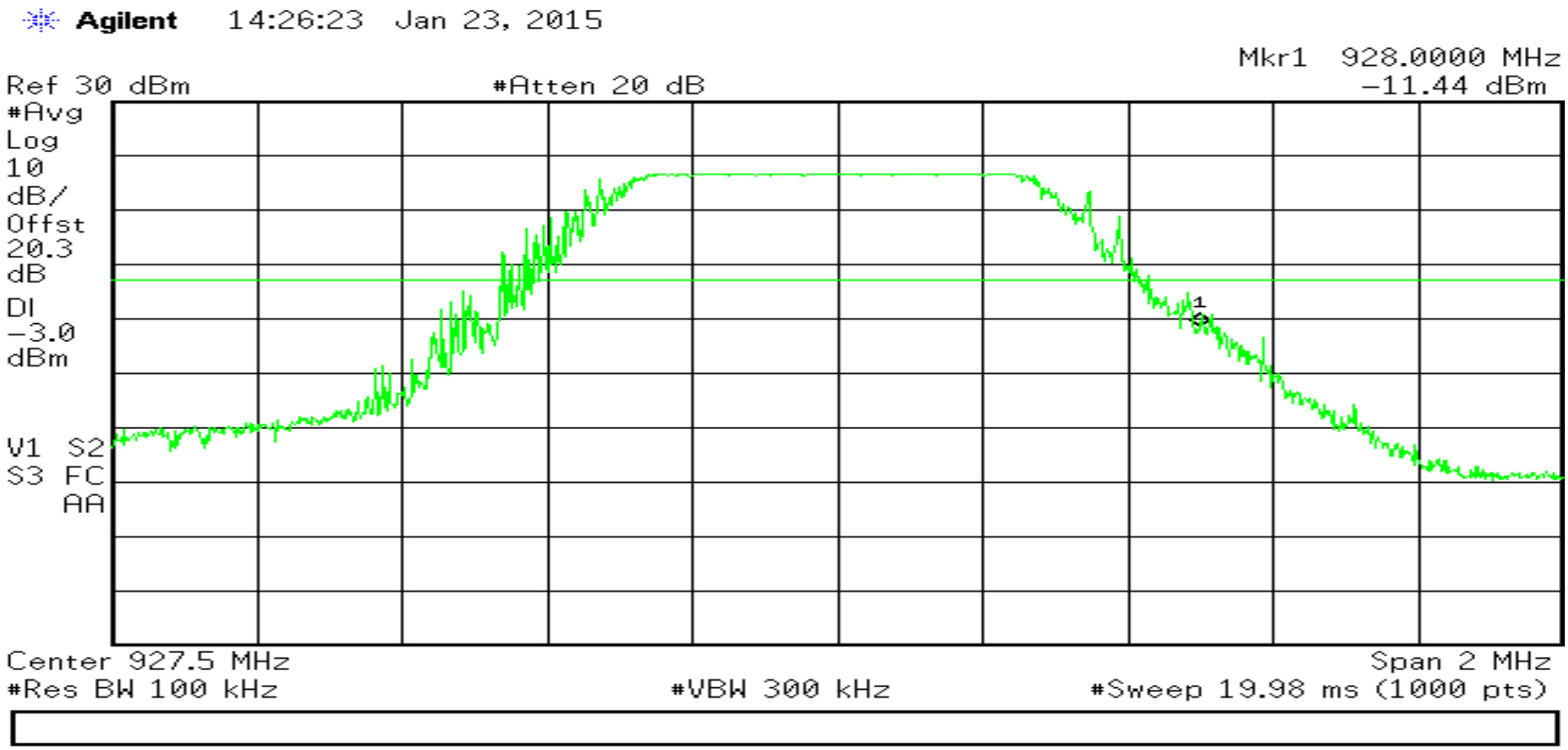
| | | | |
|---|---|---|---|
| **Test Method:** | Band Edge Conducted | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(FHSS) signal at 902.30 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (d) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Lower Band Edge Reading: -10.6 dBm Limit: -3.0 dBm | | |




Page 1 of 2

# RETLIF TESTING LABORATORIES

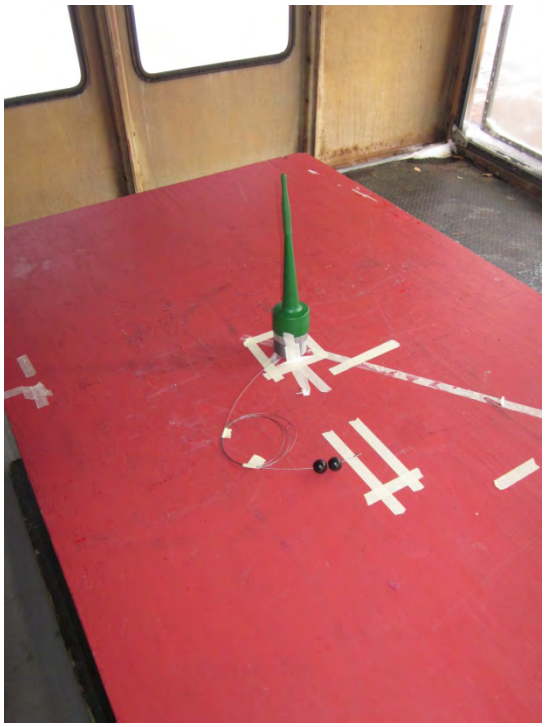
| | | | |
|---|---|---|---|
| **Test Method:** | Band Edge Conducted | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 927.5 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (d) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Upper Band Edge Reading: -11.44 dBm Limit: -3.0 dBm | | |




Page 2 of 2

**Test Photograph(s)**
**Out of Band/Band Edge Radiated Emissions, 30 MHz to 10 GHz**
**FCC Section 15.247(d)**

**Test Photograph(s)**
**Out of Band/Band Edge Radiated Emissions**



Test Setup

**Test Photograph(s)**
**Out of Band/Band Edge Radiated Emissions**

30 MHz – 1 GHz, Horizontal Polarization

30 MHz – 1 GHz, Vertical Polarization

**Test Photograph(s)**
**Out of Band/Band Edge Radiated Emissions**

1 GHz – 10 GHz, Horizontal Polarization

1 GHz – 10 GHz, Vertical Polarization

**Unwanted Emissions into Restricted Frequency Bands**
**30 MHz to 10 GHz**

**DTS Test Data**

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev. C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting modulated(DTS) signal | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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* | 7.18* | 14.42 | 21.60 | | | 12.22 | I |
| 38.25 | - | - | - | - | | | - | 100.00 |
| | | | | | | | | |
| 73.00 | - | - | - | - | | | - | 100.00 |
| \| | 73.50* | 7.77* | 8.73 | 16.50 | | | 6.68 | I |
| 75.20 | - | - | - | - | | | - | 100.00 |
| | | | | | | | | |
| 108.00 | - | - | - | - | | | - | 150.00 |
| \| | 115.00* | 3.53* | 9.87 | 13.40 | | | 4.67 | I |
| 121.94 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 123.00 | - | - | - | - | | | - | 150.00 |
| \| | 132.00* | 0.88* | 9.72 | 10.60 | | | 3.38 | \| |
| 138.00 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 149.90 | - | - | - | - | | | - | 150.00 |
| \| | 150.00* | 3.73* | 11.97 | 15.70 | | | 6.09 | 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).

Data Sheet 1 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev. C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting modulated(DTS) signal | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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* | -1.24 * | 12.84 | 11.60 | | | 3.80 | \| |
| 156.52525 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 156.70 | - | - | - | - | | | - | 150.00 |
| \| | 156.80* | -1.47* | 12.87 | 11.40 | | | 3.71 | \| |
| 156.90 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 162.0125 | - | - | - | - | | | - | 150.00 |
| \| | 164.00* | -1.07* | 13.57 | 12.50 | | | 4.21 | \| |
| 167.1700 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 167.72 | - | - | - | - | | | - | 150.00 |
| \| | 170.00* | 1.23* | 13.97 | 15.20 | | | 5.75 | \| |
| 173.20 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 240.00 | - | - | - | - | | | - | 200.00 |
| \| | 260.00* | -3.22* | 18.92 | 15.70 | | | 6.09 | \| |
| 285.00 | - | - | - | - | | | - | 200.00 |
| | | | | | | | | |
| 322.00 | - | - | - | - | | | - | 200.00 |
| \| | 330.00* | -3.55* | 22.05 | 18.50 | | | 8.41 | \| |

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).

Data Sheet 2 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev. C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting modulated(DTS) signal | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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 |
| \| | 409.00* | -3.9* | 24.70 | 20.80 | | | 10.96 | \| |
| 410.00 | - | - | - | - | | | - | 200.00 |
| | | | | | | | | |
| 608.00 | - | - | - | - | | | - | 200.00 |
| \| | 611.00* | -4.97* | 30.97 | 26.40 | | | 20.89 | \| |
| 614.00 | - | - | - | - | | | - | 200.00 |
| | | | | | | | | |
| 960.00 | - | - | - | - | | | - | 500.00 |
| \| | 980.00* | -3.39 | 36.79 | 33.40 | | | 46.77 | \| |
| 1240.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 1300.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 1427.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 1435.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 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).

Data Sheet 3 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev. C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting modulated(DTS) signal | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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 |
| \| | - | - | - | - | | | - | \| |
| 1710.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 1718.80 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 1722.20 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 2200.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 2300.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 2310.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 2390.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 2483.50 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 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).

Data Sheet 4 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev. C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting modulated(DTS) signal | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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 |
| \| | 2706.90 | 51.20 | -4.65 | 46.55 | | | 212.25 | \| |
| \| | 2744.70 | 47.32 | -4.65 | 42.67 | | | 135.98 | \| |
| \| | 2782.50 | 43.19 | -4.65 | 38.54 | | | 84.52 | \| |
| 2900.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3260.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 3267.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3332.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 3339.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3345.80 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 3358.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3600.00 | - | - | - | - | | | - | 500.00 |
| \| | 3609.02* | 42.44* | -1.64 | 40.80 | | | 109.64 | \| |
| \| | 3659.60* | 42.50* | -1.64 | 40.92 | | | 111.17 | \| |
| \| | 3710.00* | 42.60* | -1.64 | 40.96 | | | 111.68 | \| |

EUT emissions observed throughout the given frequency spectrum were recorded and evaluated. Emission levels closest to the limit are listed on this data sheet. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

Data Sheet 5 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev. C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting modulated(DTS) signal | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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 |
| \| | 4511.50* | 41.01* | 1.25 | 42.26 | | | 129.71 | \| |
| \| | 4574.50* | 41.82* | 1.25 | 43.07 | | | 142.39 | \| |
| \| | 4637.50* | 41.84* | 1.25 | 43.09 | | | 142.72 | \| |
| 5150.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 5350.00 | - | - | - | - | | | - | 500.00 |
| \| | 5413.80* | 41.23* | 2.48 | 43.71 | | | 153.28 | \| |
| \| | - | - | - | - | | | - | |
| 5460.00 | - | -- | - | - | | | - | 500.00 |
| | | | | | | | | |
| 7250.00 | - | - | - | - | | | - | 500.00 |
| \| | 7319.20* | 42.84* | 4.29 | 47.13 | | | 227.24 | |
| \| | 7420.00* | 42.53* | 4.29 | 46.82 | | | 219.28 | |
| 7750.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 8025.00 | - | - | - | - | | | - | 500.00 |
| \| | 8120.70* | 42.90* | 4.21 | 47.11 | | | 226.72 | \| |
| \| | 8234.10* | 42.86* | 4.21 | 47.07 | | | 225.68 | \| |

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).

Data Sheet 6 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev. C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting modulated(DTS) signal | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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 |
| \| | 8347.50* | 42.96* | 4.21 | 47.17 | | | 228.29 | \| |
| 8500.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 9000.00 | - | - | - | - | | | - | 500.00 |
| \| | 9023.00* | 42.89* | 5.43 | 48.23 | | | 257.92 | \| |
| \| | 9149.00* | 45.31* | 5.43 | 50.74 | | | 344.35 | \| |
| 9200.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 9300.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 10000.00 | - | - | - | - | | | - | 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).

Data Sheet 7 of 7

**Unwanted Emissions into Restricted Frequency Bands**
**30 MHz to 10 GHz**

**FHSS Test Data**

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev.C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting hopping frequency data | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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* | 7.18* | 14.42 | 21.60 | | | 12.22 | I |
| 38.25 | - | - | - | - | | | - | 100.00 |
| | | | | | | | | |
| 73.00 | - | - | - | - | | | - | 100.00 |
| \| | 73.50* | 7.77* | 8.73 | 16.50 | | | 6.68 | I |
| 75.20 | - | - | - | - | | | - | 100.00 |
| | | | | | | | | |
| 108.00 | - | - | - | - | | | - | 150.00 |
| \| | 115.00* | 3.53* | 9.87 | 13.40 | | | 4.67 | I |
| 121.94 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 123.00 | - | - | - | - | | | - | 150.00 |
| \| | 132.00* | 0.88* | 9.72 | 10.60 | | | 3.38 | \| |
| 138.00 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 149.90 | - | - | - | - | | | - | 150.00 |
| \| | 150.00* | 3.73* | 11.97 | 15.70 | | | 6.09 | 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).

Data Sheet 1 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev.C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting hopping frequency data | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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* | -1.24 * | 12.84 | 11.60 | | | 3.80 | \| |
| 156.52525 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 156.70 | - | - | - | - | | | - | 150.00 |
| \| | 156.80* | -1.47* | 12.87 | 11.40 | | | 3.71 | \| |
| 156.90 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 162.0125 | - | - | - | - | | | - | 150.00 |
| \| | 164.00* | -1.07* | 13.57 | 12.50 | | | 4.21 | \| |
| 167.1700 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 167.72 | - | - | - | - | | | - | 150.00 |
| \| | 170.00* | 1.23* | 13.97 | 15.20 | | | 5.75 | \| |
| 173.20 | - | - | - | - | | | - | 150.00 |
| | | | | | | | | |
| 240.00 | - | - | - | - | | | - | 200.00 |
| \| | 260.00* | -3.22* | 18.92 | 15.70 | | | 6.09 | \| |
| 285.00 | - | - | - | - | | | - | 200.00 |
| | | | | | | | | |
| 322.00 | - | - | - | - | | | - | 200.00 |
| \| | 330.00* | -3.55* | 22.05 | 18.50 | | | 8.41 | \| |

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).

Data Sheet 2 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev.C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting hopping frequency data | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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 |
| \| | 409.00* | -3.9* | 24.70 | 20.80 | | | 10.96 | \| |
| 410.00 | - | - | - | - | | | - | 200.00 |
| | | | | | | | | |
| 608.00 | - | - | - | - | | | - | 200.00 |
| \| | 611.00* | -4.97* | 30.97 | 26.40 | | | 20.89 | \| |
| 614.00 | - | - | - | - | | | - | 200.00 |
| | | | | | | | | |
| 960.00 | - | - | - | - | | | - | 500.00 |
| \| | 980.00* | -3.39 | 36.79 | 33.40 | | | 46.77 | \| |
| 1240.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 1300.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 1427.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 1435.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 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).

Data Sheet 3 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev.C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting hopping frequency data | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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 |
| \| | - | - | - | - | | | - | \| |
| 1710.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 1718.80 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 1722.20 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 2200.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 2300.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 2310.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 2390.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 2483.50 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 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).

Data Sheet 4 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev.C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting hopping frequency data | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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 |
| \| | 2706.90 | 43.02 | -4.65 | 38.37 | | | 82.88 | \| |
| \| | 2725.50 | 43.08 | -4.65 | 38.43 | | | 83.46 | \| |
| \| | 2744.70 | 42.95 | -4.65 | 38.30 | | | 82.22 | \| |
| 2900.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3260.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 3267.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3332.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 3339.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3345.80 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 3358.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 3600.00 | - | - | - | - | | | - | 500.00 |
| \| | 3609.02* | 42.41* | -1.64 | 40.77 | | | 109.27 | \| |
| \| | 3634.00* | 42.34* | -1.64 | 40.79 | | | 109.52 | \| |
| \| | 3659.90* | 42.56* | -1.64 | 40.92 | | | 111.17 | \| |

EUT emissions observed throughout the given frequency spectrum were recorded and evaluated. Emission levels closest to the limit are listed on this data sheet. * This emission is not from the EUT. It is a measurement of minimum measurement system sensitivity (Noise Floor).

Data Sheet 5 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev.C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting hopping frequency data | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

| 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 |
| \| | 4511.50* | 41.33* | 1.25 | 42.58 | | | 134.58 | \| |
| \| | 4542.50* | 41.31* | 1.25 | 42.56 | | | 134.27 | \| |
| \| | 4574.50* | 41.64* | 1.25 | 42.89 | | | 139.47 | \| |
| 5150.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 5350.00 | - | - | - | - | | | - | 500.00 |
| \| | 5413.80* | 41.34* | 2.48 | 43.82 | | | 155.23 | \| |
| \| | 5451.00* | 41.38* | 2.48 | 43.86 | | | 155.95 | |
| 5460.00 | - | -- | - | - | | | - | 500.00 |
| | | | | | | | | |
| 7250.00 | - | - | - | - | | | - | 500.00 |
| \| | 7268.00* | 42.79* | 4.29 | 47.08 | | | 225.94 | |
| \| | 7319.20* | 42.55* | 4.29 | 46.84 | | | 219.78 | |
| 7750.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 8025.00 | - | - | - | - | | | - | 500.00 |
| \| | 8120.70* | 42.68* | 4.21 | 46.89 | | | 221.05 | \| |
| \| | 8176.50* | 42.62* | 4.21 | 46.83 | | | 219.53 | \| |

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).

Data Sheet 6 of 7

# RETLIF TESTING LABORATORIES

## EMISSIONS TEST DATA SHEET

| | | |
|---|---|---|
| **Test Method** | **Restricted Band Emissions 25 MHz to 10 GHz** | |
| **Customer** | Senet, Inc. | |
| **Job Number** | R-5909N-2 | |
| **Test Sample** | LoRa eSensor Oil Transmitter | |
| **Part Number** | 5848 | |
| **Serial Number** | 219-04-2167 Rev.C | |
| **Test Specification** | FCC Part 15 Subpart C | Paragraph: 15.247(d) |
| **Operating Mode** | Transmitting hopping frequency data | |
| **Technician** | M. Seamans | |
| **Date** | January 30th, 2015 | |

**Notes:** Test Antenna Distance: 3 meters Detector: Quasi-Peak <1GHz, Average >1GHz

## TEST PARAMETERS

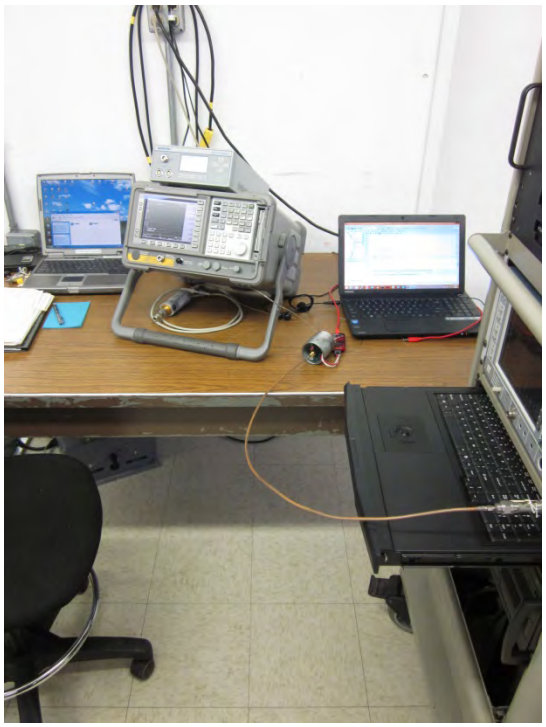
| Restricted Band | Measured Frequency | Meter Reading | Correction Factor | Corrected Reading | | | Converted Reading | Limit at 3M |
|---|---|---|---|---|---|---|---|---|
| MHz | MHz | dBuV | dB | dBuV/m | | | uV/m | uV/m |
| \| | 8234.10* | 42.81* | 4.21 | 47.02 | | | 224.388 | \| |
| 8500.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 9000.00 | - | - | - | - | | | - | 500.00 |
| \| | 9023.00* | 42.91* | 5.43 | 48.34 | | | 221.05 | \| |
| \| | 9085.00* | 43.02* | 5.43 | 48.45 | | | 264.54 | \| |
| 9200.00 | - | - | - | - | | | - | 500.00 |
| | | | | | | | | |
| 9300.00 | - | - | - | - | | | - | 500.00 |
| \| | - | - | - | - | | | - | \| |
| 10000.00 | - | - | - | - | | | - | 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).

Data Sheet 7 of 7

**Test Photograph(s)**
**Power Density**
**FCC Section 15.247(e)**

**Test Photograph(s)**
**Power Density**

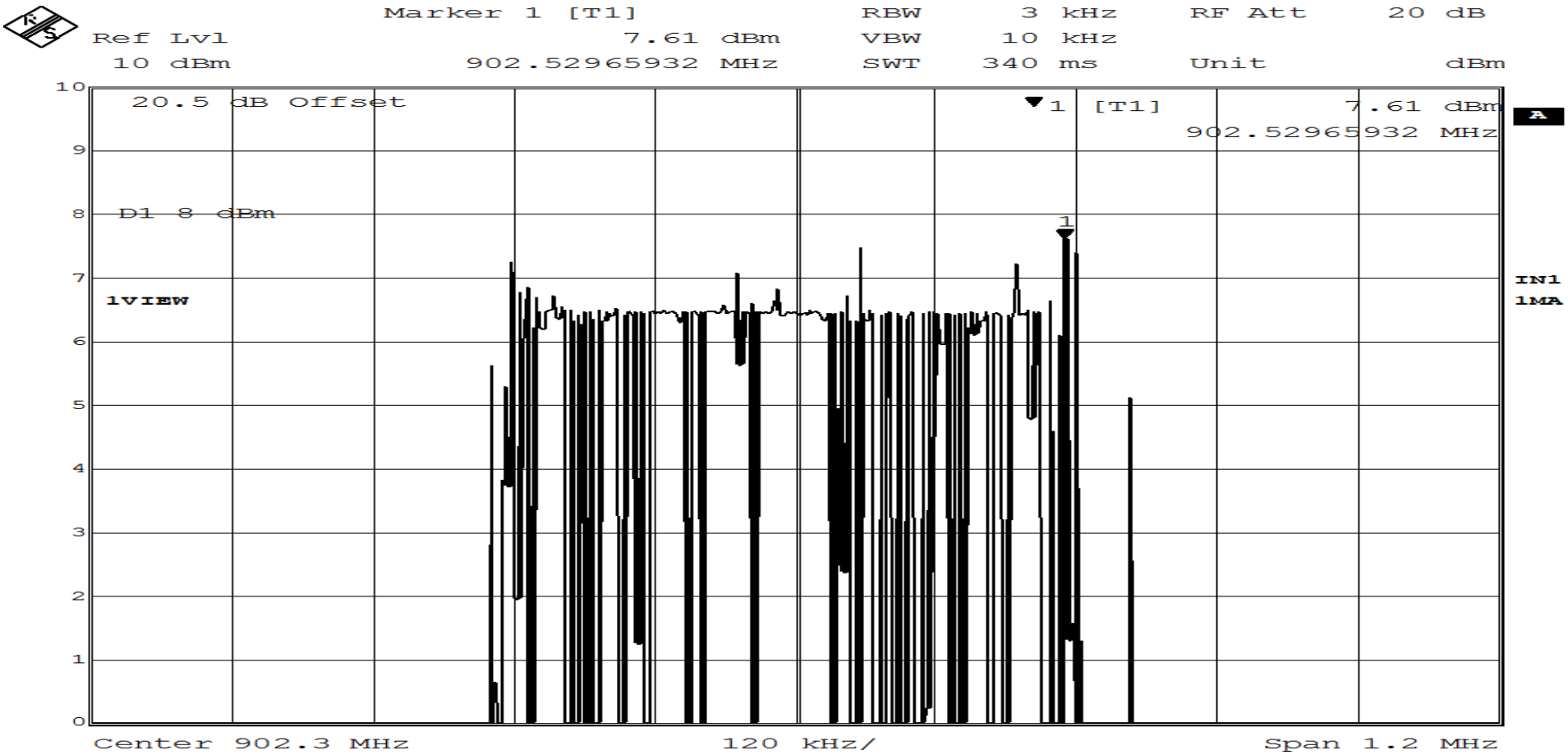


Test Configuration

**Power Spectral Density**
**Test Data**

# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Power Spectral Density | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 902.30 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (e) | | |
| **Technician** | M. Seamans | **Date** | January 26th, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Power Spectral Density: 7.61 dBm Limit: 8.0 dBm | | |

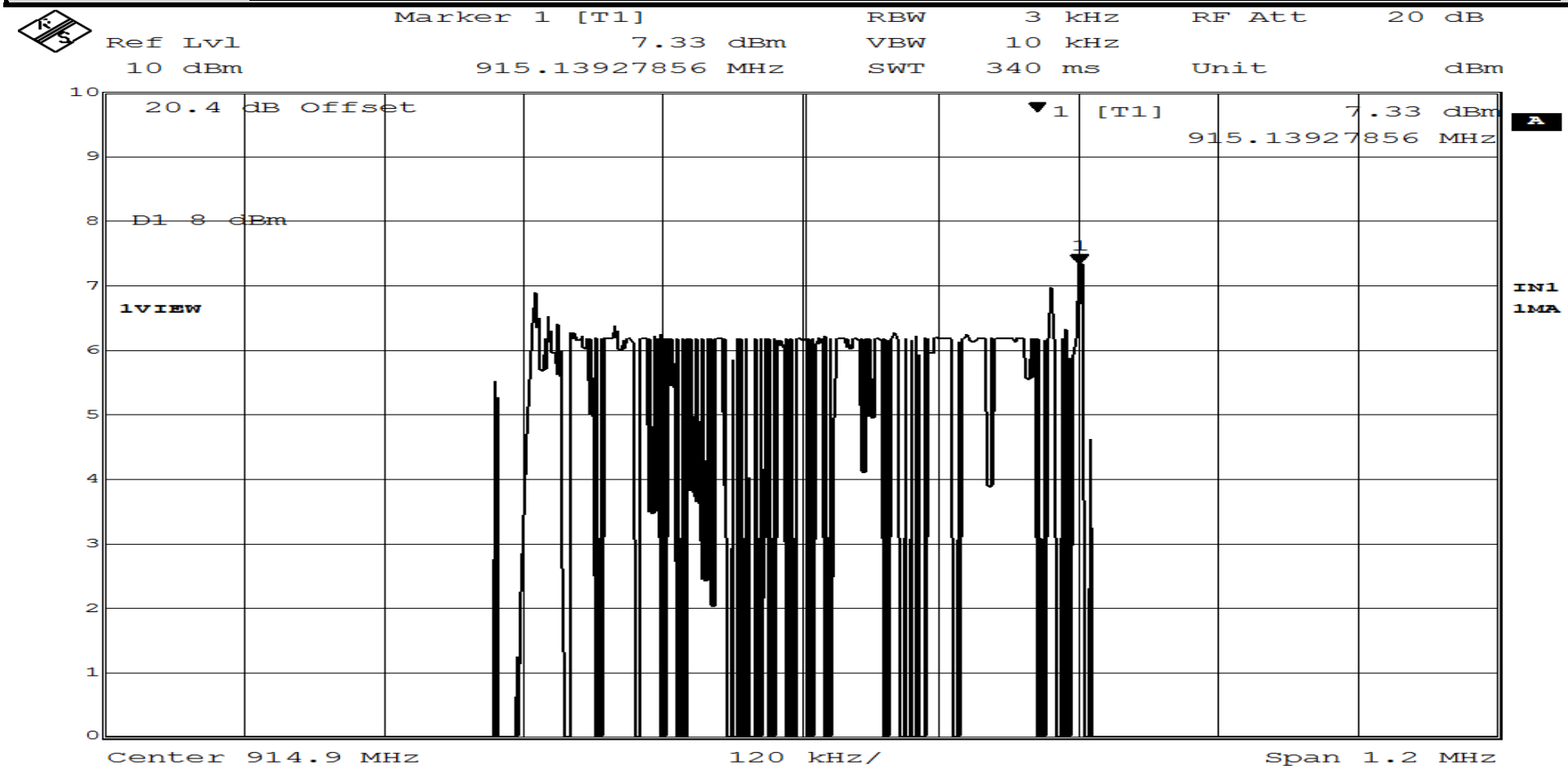



Date: 26.JAN.2015 15:16:22

Page 1 of 3

# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Power Spectral Density | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 914.9 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (e) | | |
| **Technician** | M. Seamans | **Date** | January 26th, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Power Spectral Density: 7.33 dBm Limit: 8.0 dBm | | |

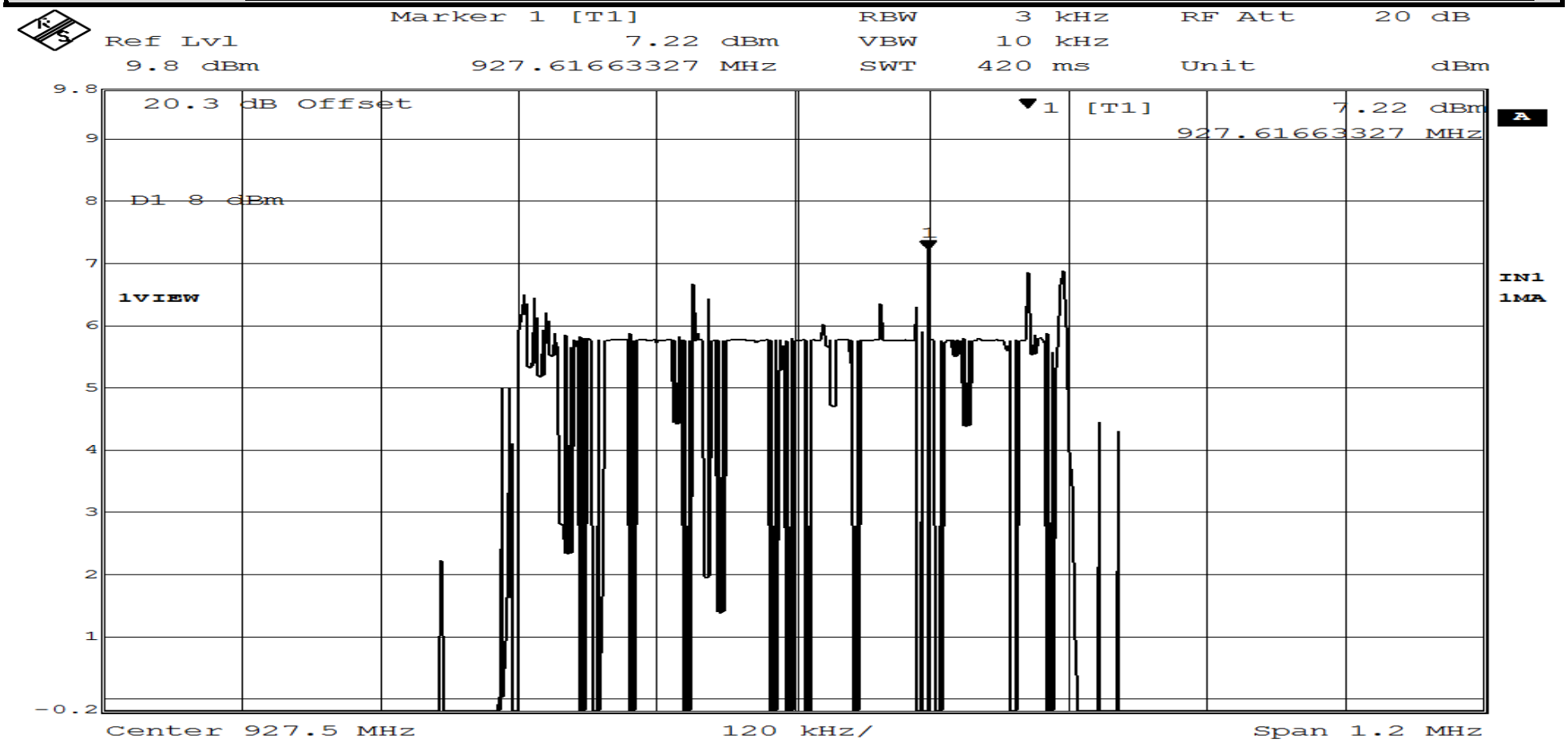



Date: 26.JAN.2015 15:21:03

Page 2 of 3

# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Power Spectral Density | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(DTS) signal at 927.5 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (e) | | |
| **Technician** | M. Seamans | **Date** | January 26th, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Power Spectral Density: 7.22 dBm Limit: 8.0 dBm | | |

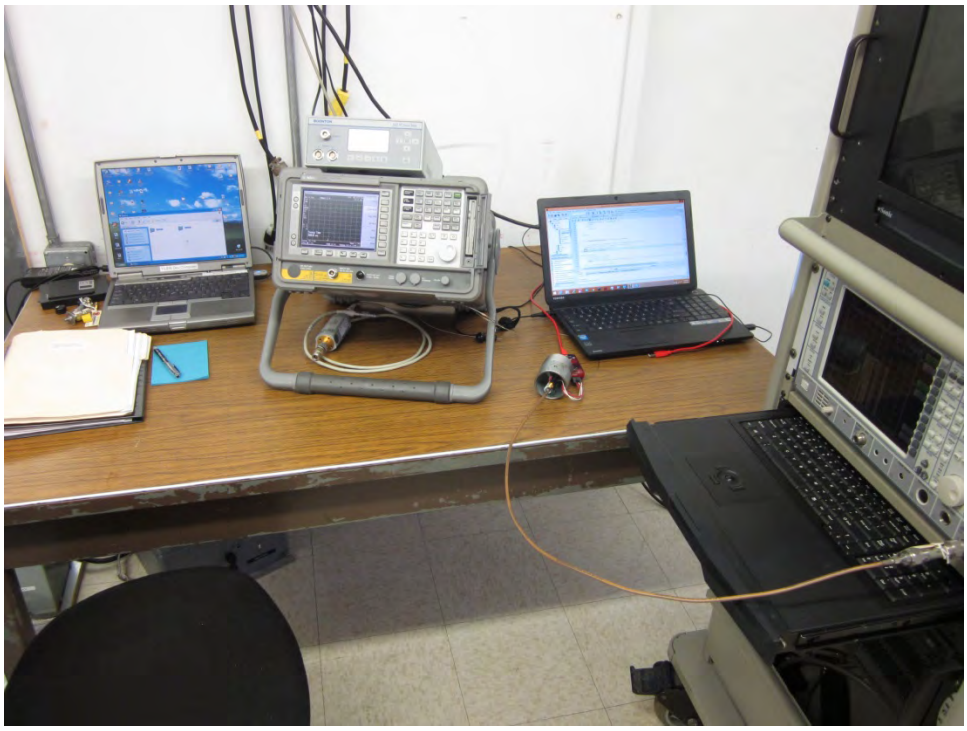



Date: 26.JAN.2015 14:53:00

Page 3 of 3

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

**Test Photograph(s)**
**20 dB Bandwidth**

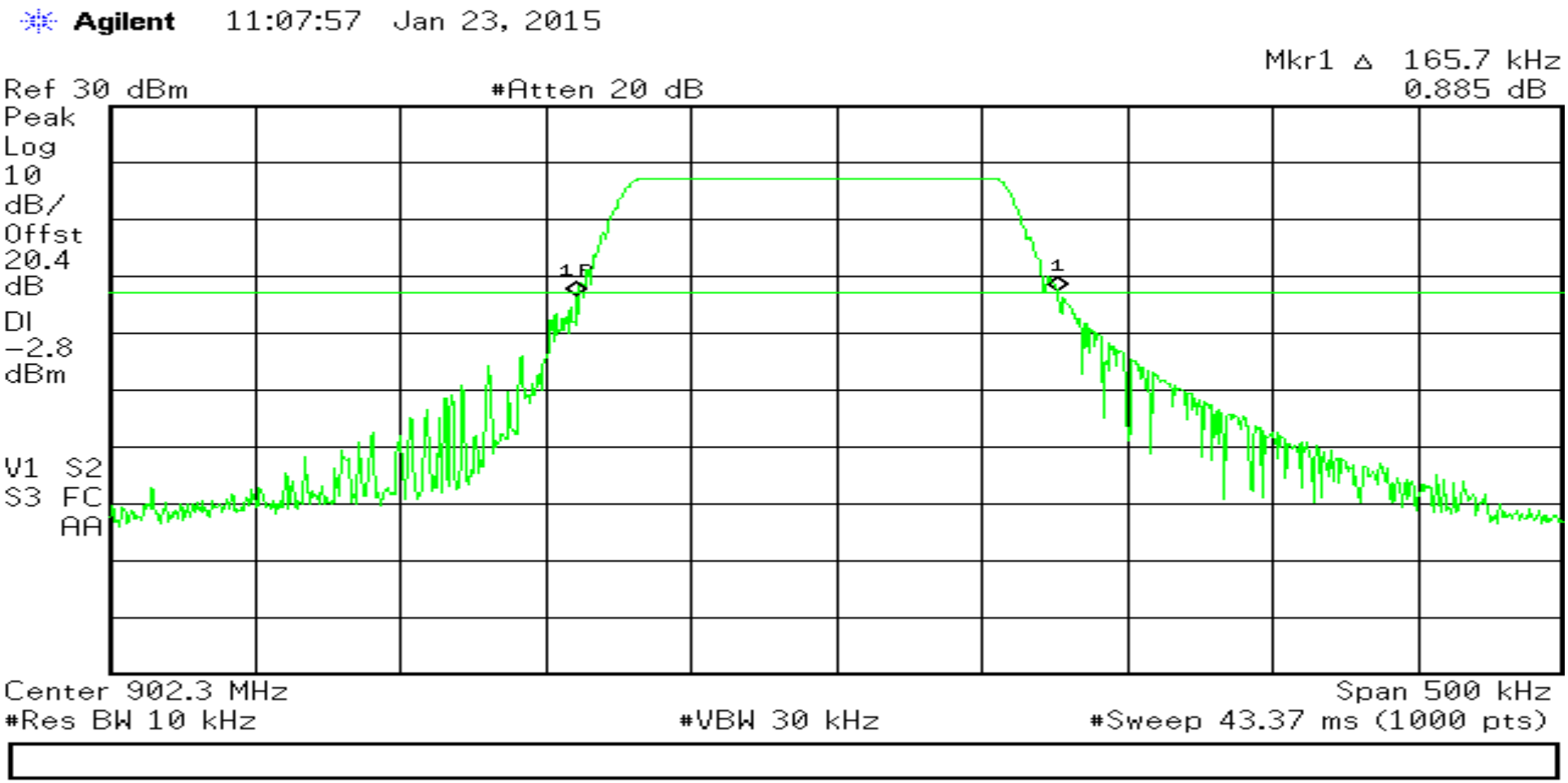


Test Setup

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

# RETLIF TESTING LABORATORIES

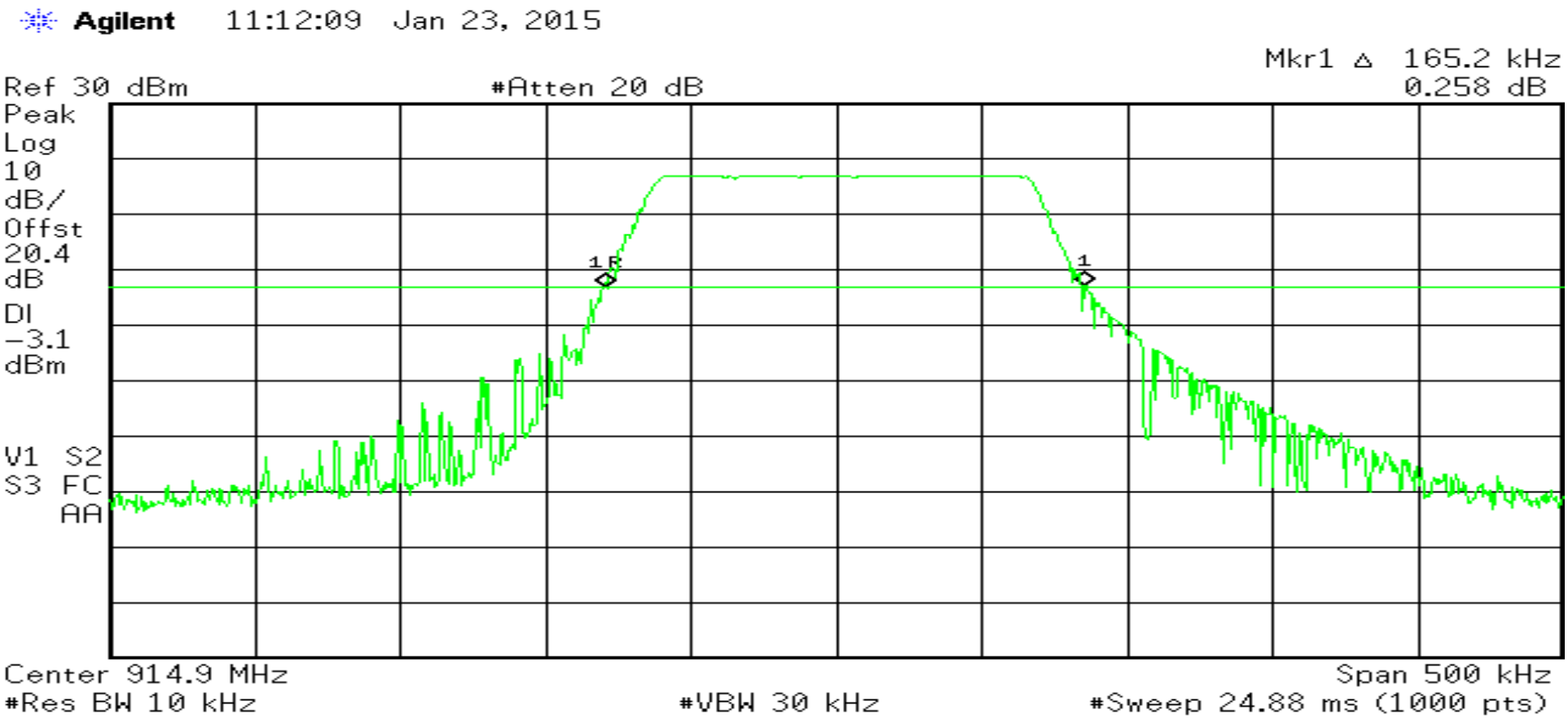
| | | | |
|---|---|---|---|
| **Test Method:** | 20dB Bandwidth | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(FHSS) signal at 902.30 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Occupied Bandwidth: 165.7 kHz | | |




Page 1 of 3

# RETLIF TESTING LABORATORIES

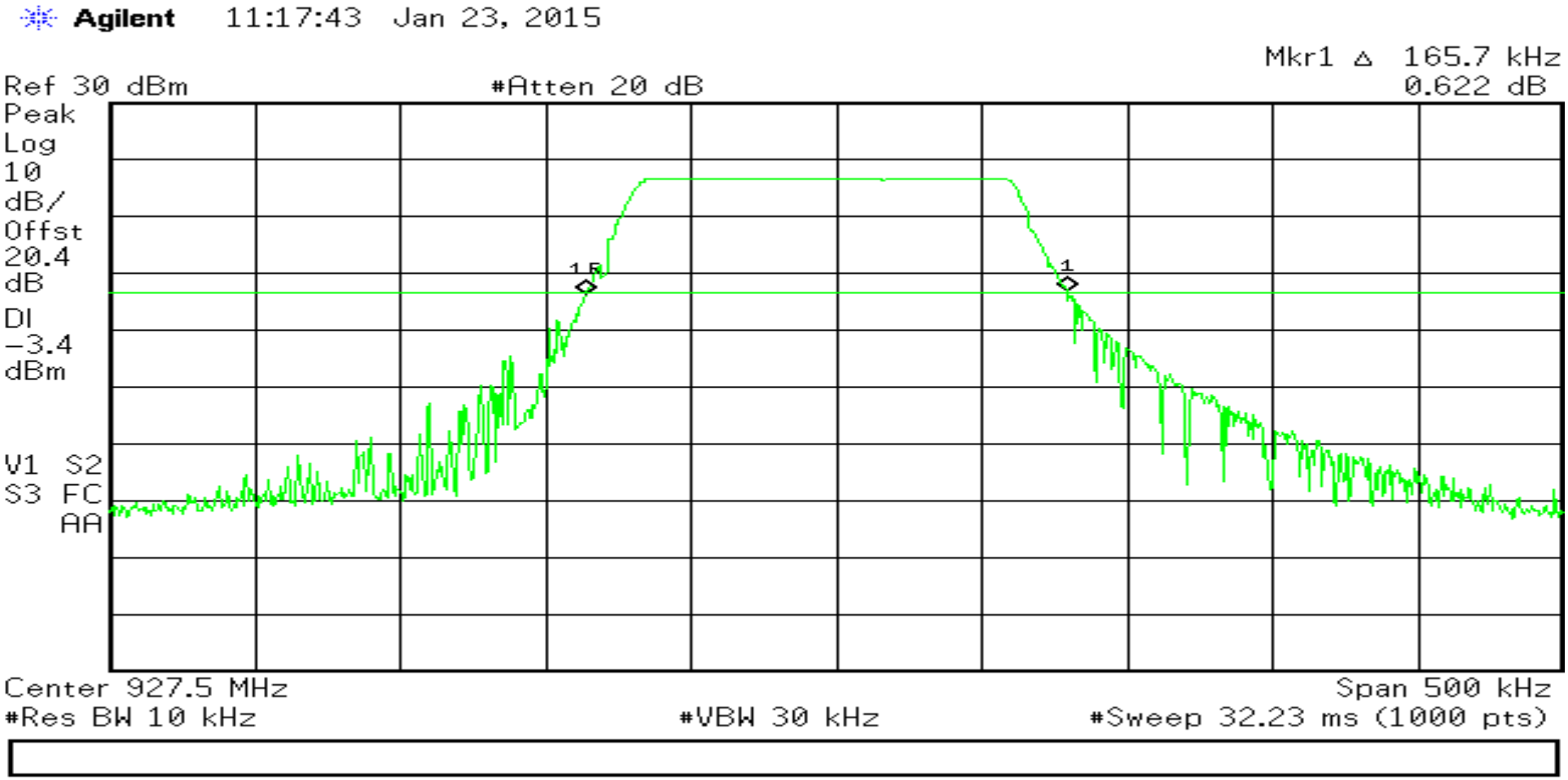
| | | | |
|---|---|---|---|
| **Test Method:** | 20dB Bandwidth | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(FHSS) signal at 914.9 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Occupied Bandwidth: 165.2 kHz | | |




Page 2 of 3

# RETLIF TESTING LABORATORIES

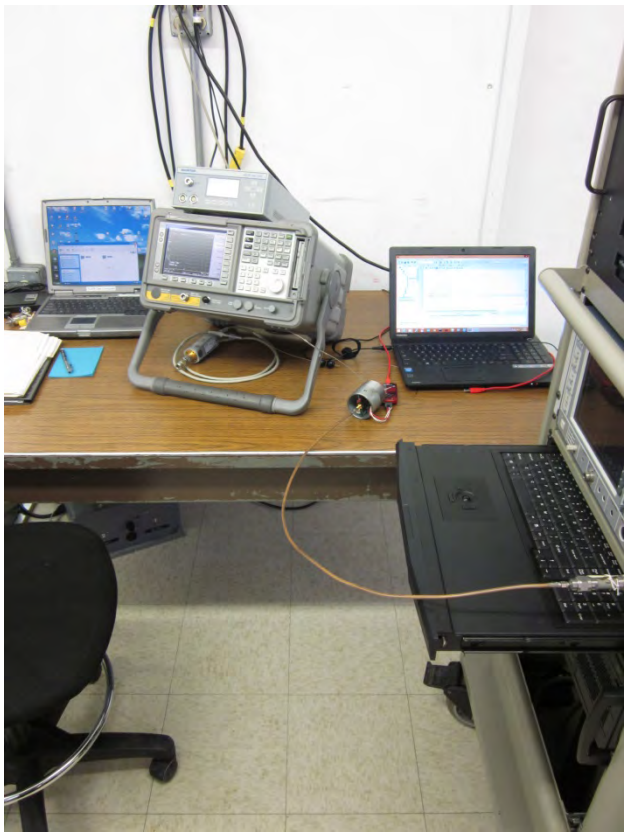
| | | | |
|---|---|---|---|
| **Test Method:** | 20dB Bandwidth | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting modulated(FHSS) signal at 927.5 MHz | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Occupied Bandwidth: 165.7 kHz | | |




Page 3 of 3

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

**Test Photograph(s)**
**Number of Hopping Channels and Time of Occupancy**

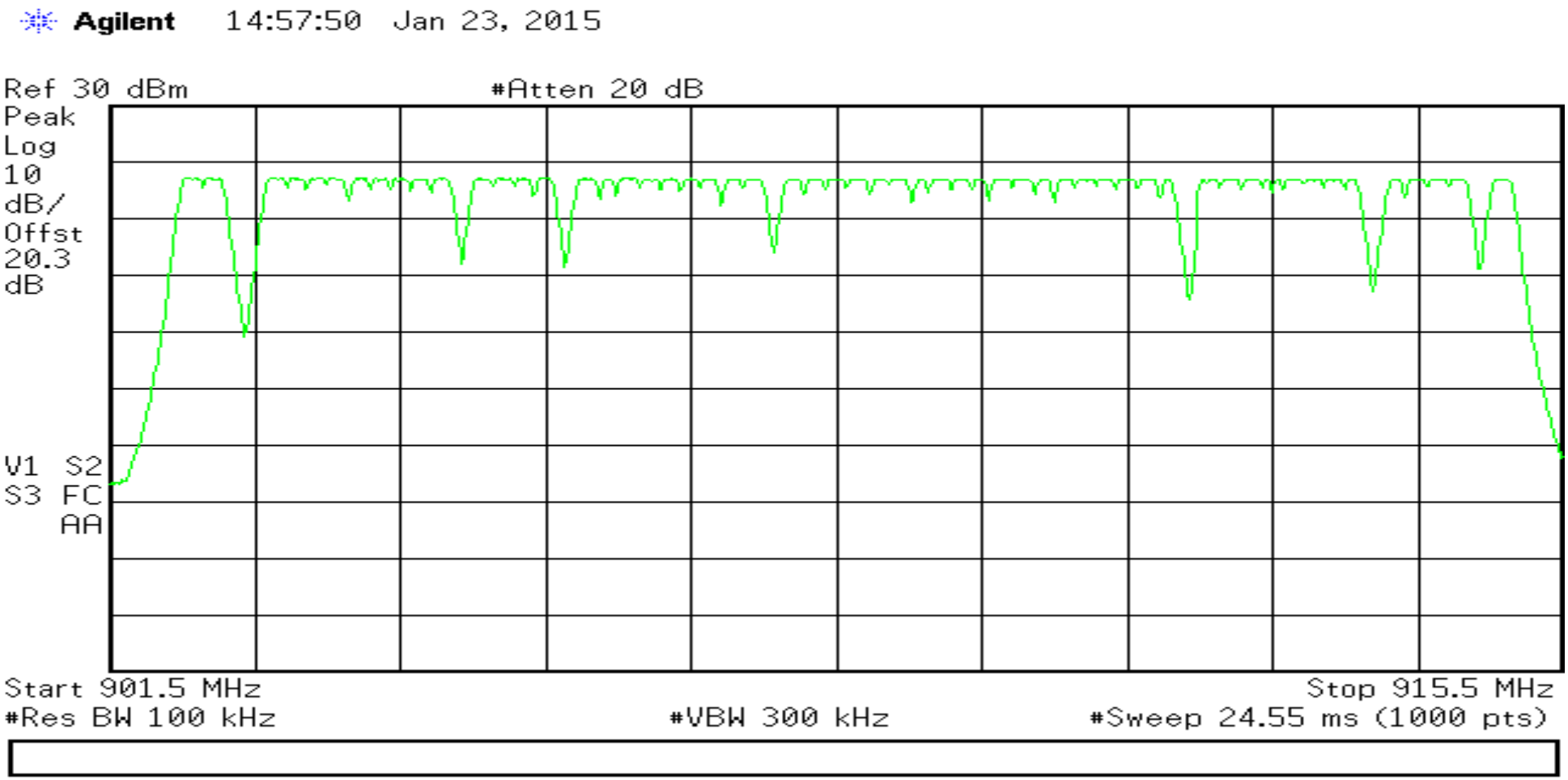


Test Setup

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

# RETLIF TESTING LABORATORIES

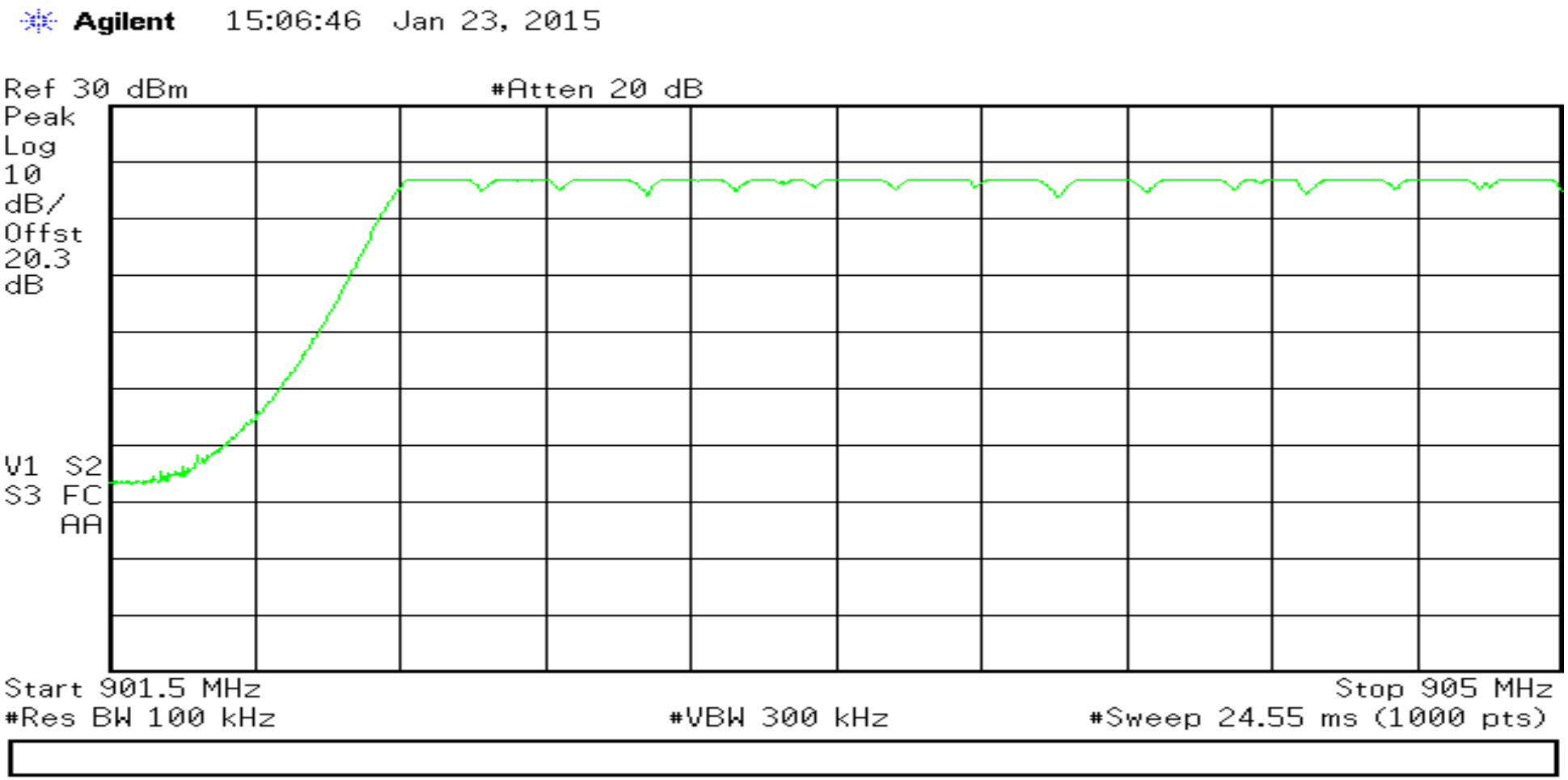
| | | | |
|---|---|---|---|
| **Test Method:** | Number of Hopping Frequencies | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting hopping frequency data | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Total Number of Hopping Frequencies: 64 | | |




Page 1 of 4

# RETLIF TESTING LABORATORIES

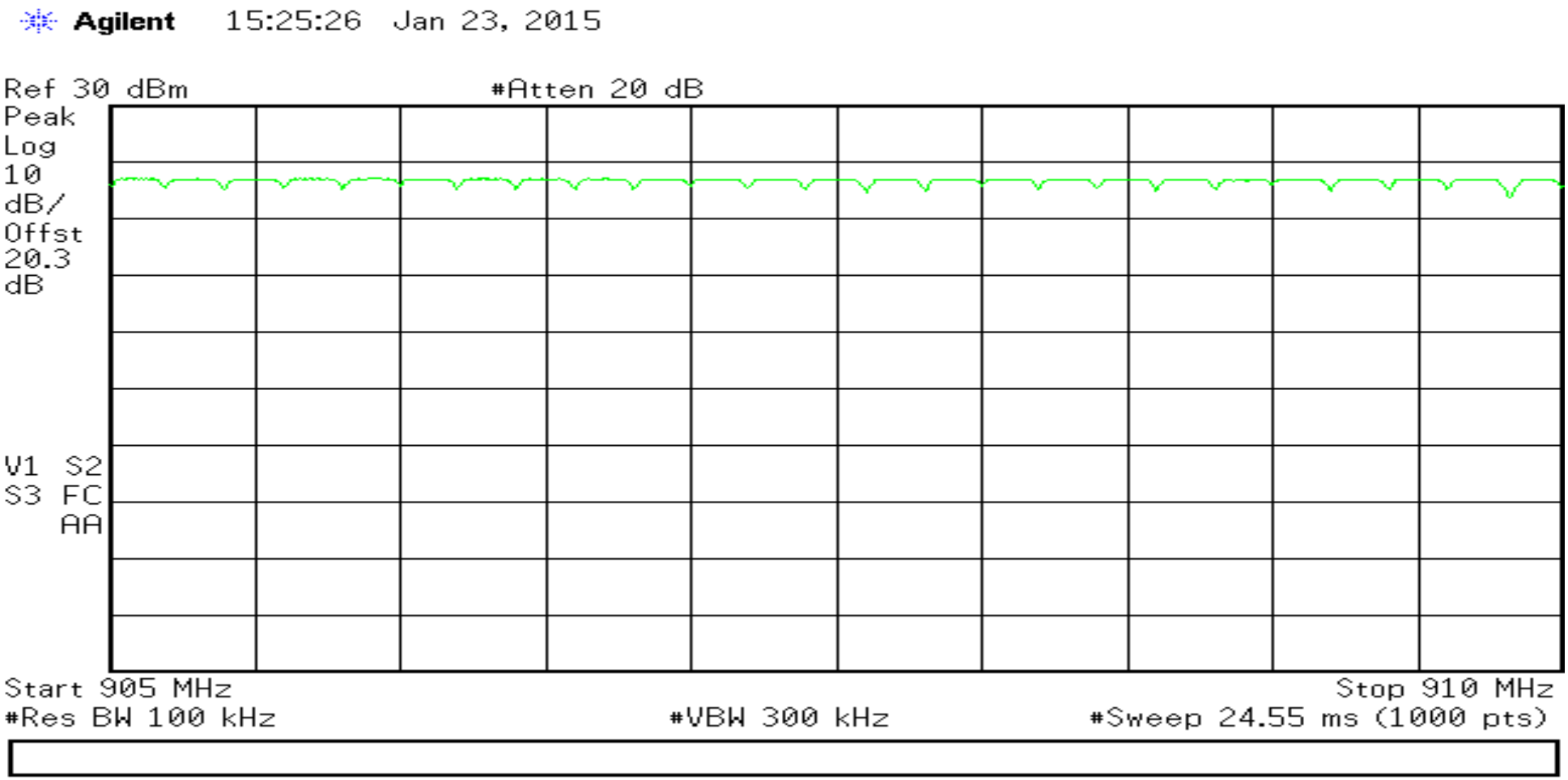
| | | | |
|---|---|---|---|
| **Test Method:** | Number of Hopping Frequencies | | |
| **Customer** | .Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting hopping frequency data | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Number of Hopping Frequencies 902MHz to 905MHz: 14 | | |




Page 2 of 4

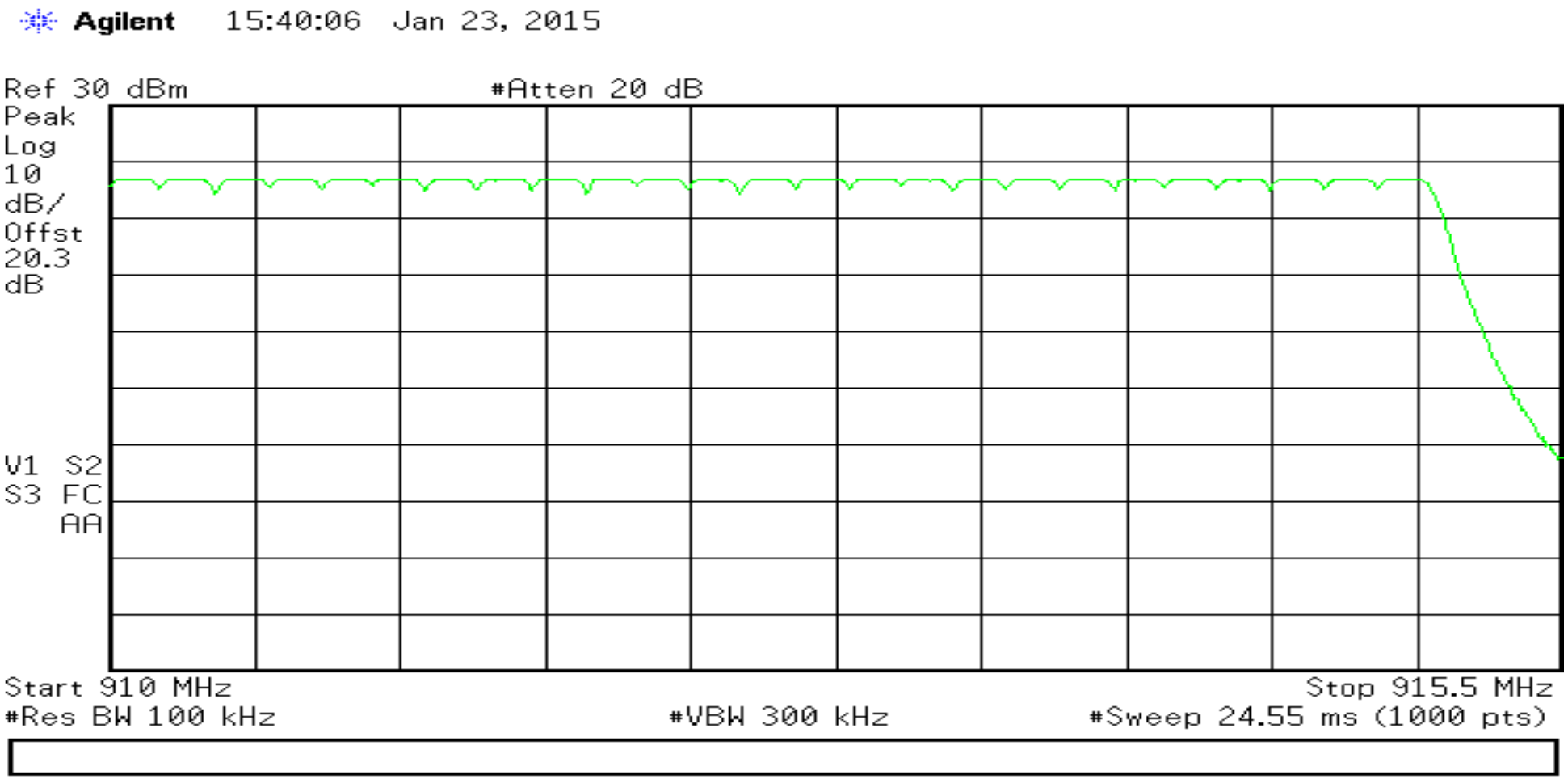
# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Number of Hopping Frequencies | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting hopping frequency data | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Number of Hopping Frequencies 905MHz to 910MHz: 25 | | |



# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Number of Hopping Frequencies | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting hopping frequency data | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1)(i) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 20.0 % | | |
| **Notes** | Number of Hopping Frequencies 910MHz to 915MHz: 25 | | |




Page 4 of 4

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

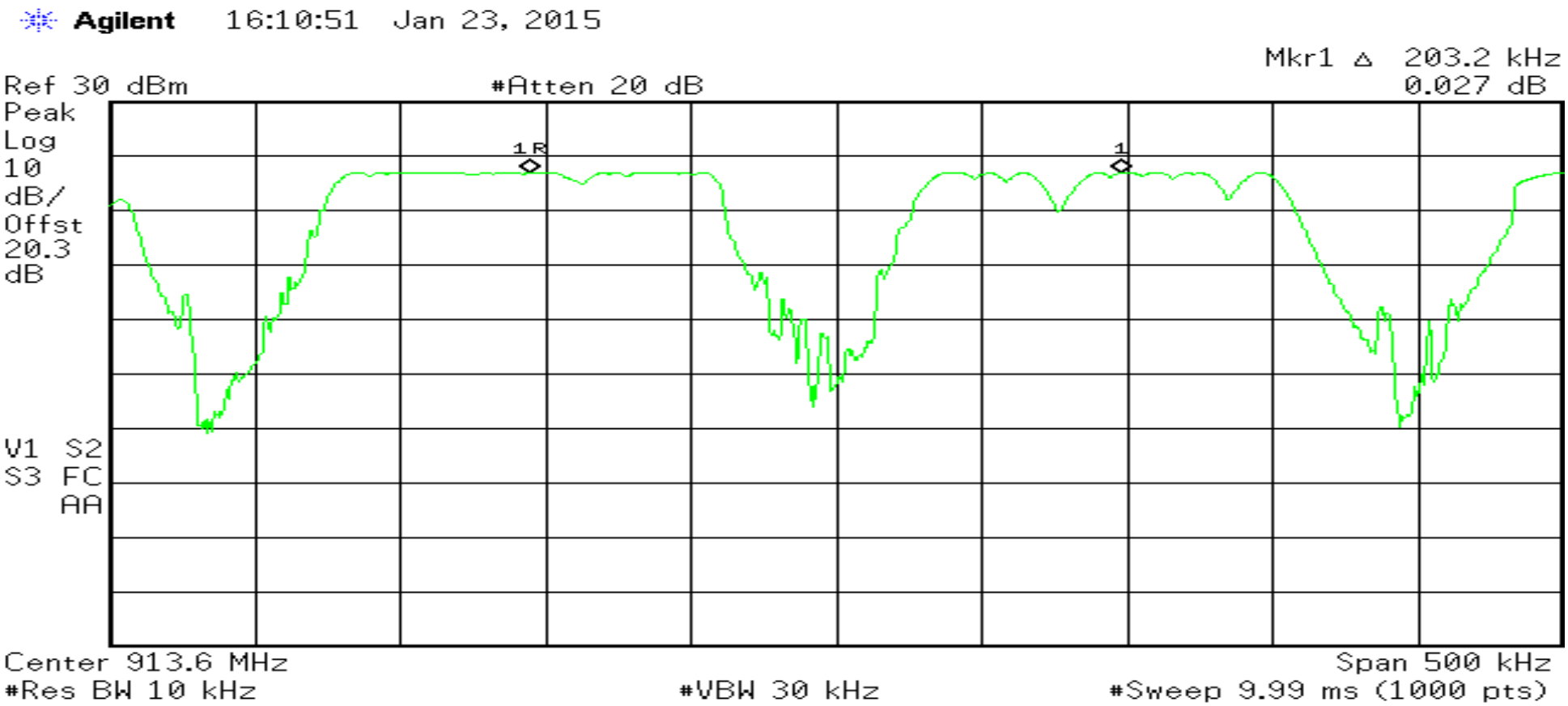
**Test Photograph(s)**
**Channel Separation**

Test Setup

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

# RETLIF TESTING LABORATORIES

| | | | |
|---|---|---|---|
| **Test Method:** | Channel Carrier Frequency Separation | | |
| **Customer** | Senet, Inc. | **Job No.** | R-5909N-2 |
| **Test Sample** | LoRa eSensor Oil Transmitter | | |
| **Part Number** | 5848 | **Serial No.** | 219-04-2167 Rev. C |
| **Operating Mode** | Transmitting hopping frequency data | | |
| **Test Specification** | FCC Part 15, Subpart C Paragraph: 15.247 (a)(1) | | |
| **Technician** | M. Seamans | **Date** | January 23rd, 2015 |
| **Climatic Conditions** | Temp: 20.0 °C Relative Humidity: 17.0 % | | |
| **Notes** | Channel Carrier Frequency Separation: 203.2kHz | | |




Page 1 of 1