



**Starkey Laboratories, Inc.**

**24HALOXF13**

**FCC 15.247:2013**

**Report #: STAK0027**



Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – [www.nwemc.com](http://www.nwemc.com)

California – Minnesota – Oregon – New York – Washington

**Last Date of Test: January 14, 2013**  
**Starkey Laboratories, Inc.**  
**Model: 24HALOXF13**

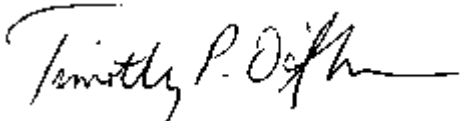
## Emissions

| Test Description             | Specification   | Test Method      | Pass/Fail |
|------------------------------|-----------------|------------------|-----------|
| Duty Cycle                   | FCC 15.247:2013 | ANSI C63.10:2009 | Pass      |
| Occupied Bandwidth           | FCC 15.247:2013 | ANSI C63.10:2009 | Pass      |
| Output Power                 | FCC 15.247:2013 | ANSI C63.10:2009 | Pass      |
| Band Edge Compliance         | FCC 15.247:2013 | ANSI C63.10:2009 | Pass      |
| Spurious Conducted Emissions | FCC 15.247:2013 | ANSI C63.10:2009 | Pass      |
| Power Spectral Density       | FCC 15.247:2013 | ANSI C63.10:2009 | Pass      |
| Spurious Radiated Emissions  | FCC 15.247:2013 | ANSI C63.10:2009 | Pass      |

## Deviations From Test Standards

None

### Approved By:



*Tim O'Shea, Operations Manager*



**NVLAP Lab Code: 200881-0**

### Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.  
9349 W Broadway Ave.,  
Brooklyn Park, MN 55445

Phone: (763) 425-2281      Fax: (763) 424-3469

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834E-1).

*This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.*

*Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.*

| Revision Number | Description | Date | Page Number |
|-----------------|-------------|------|-------------|
| 00              | None        |      |             |

## Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

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## United States

**FCC** - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

**A2LA** - Accredited by A2LA to ISO / IEC Guide 65 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

**NVLAP** - Each laboratory is accredited by NVLAP to ISO 17025

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## Canada

**IC** - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

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## European Union

**European Commission** – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

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## Australia/New Zealand

**ACMA** - Recognized by ACMA as a CAB for the acceptance of test data.

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## Korea

**KCC / RRA** - Recognized by KCC's RRA as a CAB for the acceptance of test data.

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## Japan

**VCCI** - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

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## Taiwan

**BSMI** – Recognized by BSMI as a CAB for the acceptance of test data.

**NCC** - Recognized by NCC as a CAB for the acceptance of test data.

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## Singapore

**IDA** – Recognized by IDA as a CAB for the acceptance of test data.

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## Hong Kong

**OFTA** – Recognized by OFTA as a CAB for the acceptance of test data.

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## Vietnam

**MIC** – Recognized by MIC as a CAB for the acceptance of test data.

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## Russia

**GOST** – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards.

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## SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>

## Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

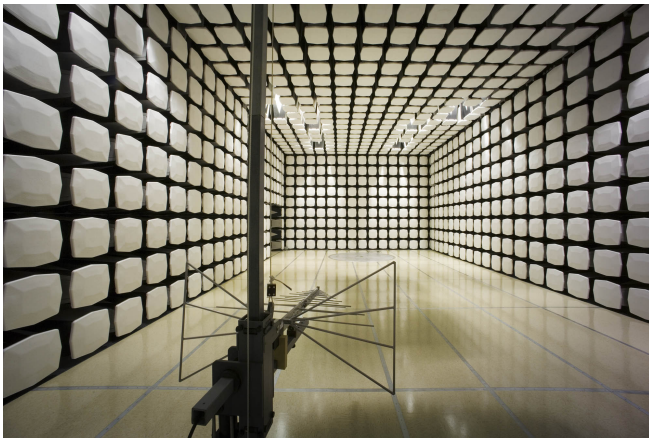
A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-1 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

| <b>Test</b>                           | <b>+ MU</b> | <b>- MU</b> |
|---------------------------------------|-------------|-------------|
| Frequency Accuracy (Hz)               | 0.12        | -0.01       |
| Amplitude Accuracy (dB)               | 0.49        | -0.49       |
| Conducted Power (dB)                  | 0.41        | -0.41       |
| Radiated Power via Substitution (dB)  | 0.69        | -0.68       |
| Temperature (degrees C)               | 0.81        | -0.81       |
| Humidity (% RH)                       | 2.89        | -2.89       |
| Field Strength (dB)                   | 4.00        | -4.00       |
| AC Powerline Conducted Emissions (dB) | 2.70        | -2.70       |



|   |   |  |   |   |
|---|---|--|---|---|
| <b>Oregon</b><br>Labs EV01-12<br>22975 NW Evergreen Pkwy<br>Hillsboro, OR 97124<br>(503) 844-4066 | <b>California</b><br>Labs OC01-13<br>41 Tesla<br>Irvine, CA 92618<br>(949) 861-8918 | <b>New York</b><br>Labs WA01-04<br>4939 Jordan Rd.<br>Elbridge, NY 13060<br>(315) 685-0796 | <b>Minnesota</b><br>Labs MN01-08<br>9349 W Broadway Ave.<br>Brooklyn Park, MN 55445<br>(763) 425-2281 | <b>Washington</b><br>Labs NC01-05, SU02, SU07<br>19201 120 <sup>th</sup> Ave. NE<br>Bothell, WA 98011<br>(425) 984-6600 |
| <b>VCCI</b>   |   |  |   |   |
| A-0108  | A-0029  |  | A-0109  | A-0110  |
| <b>Industry Canada</b>  |   |  |   |   |
| 2834D-1, 2834D-2  | 2834B-1, 2834B-2, 2834B-3   |  | 2834E-1   | 2834C-1   |





WTD 12.5.23

# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

|                                 |                            |
|---------------------------------|----------------------------|
| <b>Company Name:</b>            | Starkey Laboratories, Inc. |
| <b>Address:</b>                 | 6600 Washington Ave. SO.   |
| <b>City, State, Zip:</b>        | Eden Prairie, MN 55344     |
| <b>Test Requested By:</b>       | Ken Meyer                  |
| <b>Model:</b>                   | 24HALOXF13                 |
| <b>First Date of Test:</b>      | January 14, 2013           |
| <b>Last Date of Test:</b>       | January 14, 2013           |
| <b>Receipt Date of Samples:</b> | January 14, 2013           |
| <b>Equipment Design Stage:</b>  | Pre-Production             |
| <b>Equipment Condition:</b>     | No Damage                  |

## Information Provided by the Party Requesting the Test

|   |
|---|
| <b>Functional Description of the EUT (Equipment Under Test):</b>          |
| Hearing aid containing Bluetooth LE radio module with 1 internal antenna. |
| <b>Testing Objective:</b>   |
| To demonstrate compliance to FCC 15.247 requirements.                     |



# CONFIGURATIONS

## Configuration STAK0027- 1

| EUT         |                            |                   |               |
|-------------|----------------------------|-------------------|---------------|
| Description | Manufacturer               | Model/Part Number | Serial Number |
| Hearing Aid | Starkey Laboratories, Inc. | 24HALOXF13        | 12826579      |

## Configuration STAK0027- 2

| EUT         |                            |                   |               |
|-------------|----------------------------|-------------------|---------------|
| Description | Manufacturer               | Model/Part Number | Serial Number |
| Hearing Aid | Starkey Laboratories, Inc. | 24HALOXF13        | 12826583      |



## Equipment Modifications

| Item | Date      | Test                         | Modification                         | Note  | Disposition of EUT                                |
|------|-----------|------------------------------|--------------------------------------|---|---|
| 1    | 1/14/2013 | Band Edge Compliance         | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 2    | 1/14/2013 | Output Power                 | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 3    | 1/14/2013 | Occupied Bandwidth           | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 4    | 1/14/2013 | Power Spectral Density       | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 5    | 1/14/2013 | Spurious Conducted Emissions | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 6    | 1/14/2013 | Duty Cycle                   | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 7    | 1/14/2013 | Spurious Radiated Emissions  | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | Scheduled testing was completed.                  |

## Duty Cycle

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

### TEST EQUIPMENT

| Description              | Manufacturer       | Model    | ID  | Last Cal. | Interval |
|--------------------------|--------------------|----------|-----|-----------|----------|
| Attenuator - 20db, 'SMA' | SM Electronics     | SA26B-20 | RFW | 4/19/2012 | 12       |
| 40 GHz DC block          | Fairview Microwave | SD3379   | AMI | 10/5/2012 | 12       |
| Signal Generator MXG     | Agilent            | N5183A   | TIK | 6/7/2012  | 36       |
| Spectrum Analyzer        | Agilent            | E4440A   | AAX | 5/15/2012 | 24       |

### TEST DESCRIPTION

The Duty Cycle (x) were measured for each of the EUT operating modes. The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

If the transmit duty cycle < 98 percent, burst gating was used during some of the other tests in this report to only measure during the burst duration.



# Duty Cycle

|                                      |                        |
|--------------------------------------|------------------------|
| EUT: 24HALOXF13                      | Work Order: STAK0027   |
| Serial Number: 12826579              | Date: 01/14/13         |
| Customer: Starkey Laboratories, Inc. | Temperature: 23.4°C    |
| Attendees: Larry McNabb              | Humidity: 12%          |
| Project: None                        | Barometric Pres.: 1030 |
| Tested by: Trevor Buls               | Power: Battery         |
|                                      | Job Site: MN08         |
| <b>TEST SPECIFICATIONS</b>           |                        |
| FCC 15.247:2013                      | Test Method            |
|                                      | ANSI C63.10:2009       |

**COMMENTS**

None

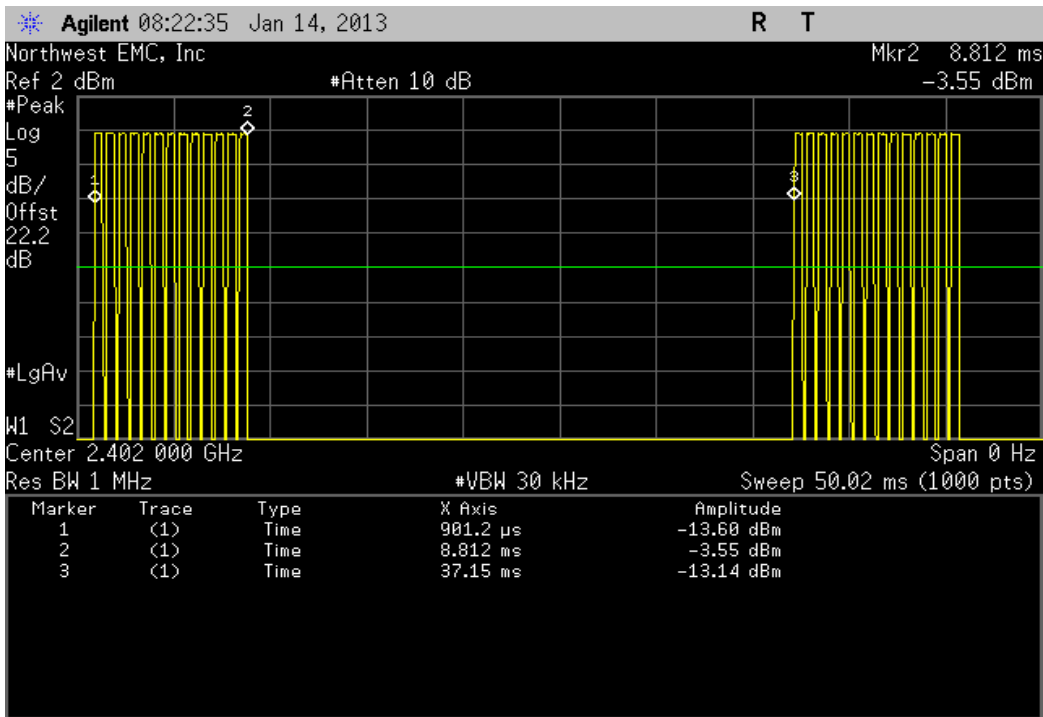
**DEVIATIONS FROM TEST STANDARD**

None

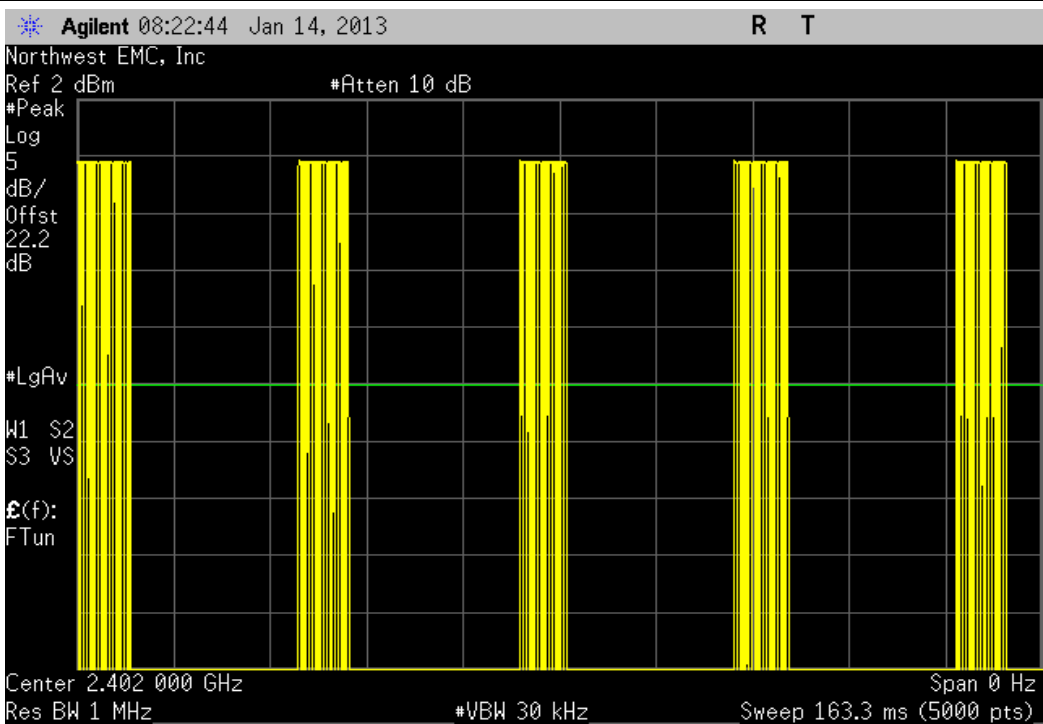
|                 |   |                              |
|-----------------|---|------------------------------|
| Configuration # | 1 | Signature <i>Trevor Buls</i> |
|-----------------|---|------------------------------|

|                          | Pulse Width | Period    | Number of Pulses | Value (%) | Limit | Result |
|--------------------------|-------------|-----------|------------------|-----------|-------|--------|
| <b>BLE - Advertising</b> |             |           |                  |           |       |        |
| Low Channel, 2402 MHz    | 7.911 mS    | 36.248 mS | 1                | 21.8      | N/A   | N/A    |
| Low Channel, 2402 MHz    | N/A         | N/A       | 5                | N/A       | N/A   | N/A    |
| Mid Channel, 2426 MHz    | 8.511 mS    | 37.5 mS   | 1                | 22.7      | N/A   | N/A    |
| Mid Channel, 2426 MHz    | N/A         | N/A       | 5                | N/A       | N/A   | N/A    |
| High Channel, 2480 MHz   | 8.561 mS    | 37.5 mS   | 1                | 22.8      | N/A   | N/A    |
| High Channel, 2480 MHz   | N/A         | N/A       | 5                | N/A       | N/A   | N/A    |
| <b>BLE - Data</b>        |             |           |                  |           |       |        |
| Low Channel, 2404 MHz    | 9.163 mS    | 37.5 mS   | 1                | 24.4      | N/A   | N/A    |
| Low Channel, 2404 MHz    | N/A         | N/A       | 5                | N/A       | N/A   | N/A    |
| Mid Channel, 2442 MHz    | 7.91 mS     | 36.248 mS | 1                | 21.8      | N/A   | N/A    |
| Mid Channel, 2442 MHz    | N/A         | N/A       | 5                | N/A       | N/A   | N/A    |
| High Channel, 2478 MHz   | 7.909 mS    | 36.248 mS | 1                | 21.8      | N/A   | N/A    |
| High Channel, 2478 MHz   | N/A         | N/A       | 5                | N/A       | N/A   | N/A    |

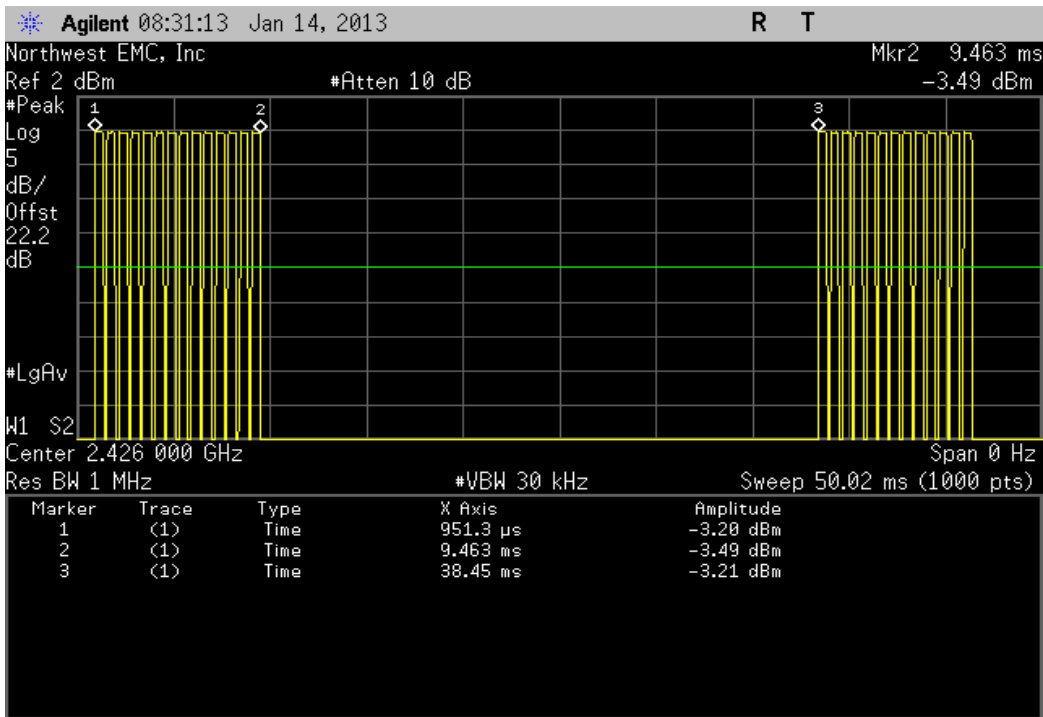
| BLE - Advertising, Low Channel, 2402 MHz |           |                  |           |       |        |  |
|--|-----------|------------------|-----------|-------|--------|--|
| Pulse Width                              | Period    | Number of Pulses | Value (%) | Limit | Result |  |
| 7.911 mS                                 | 36.248 mS | 1                | 21.8      | N/A   | N/A    |  |



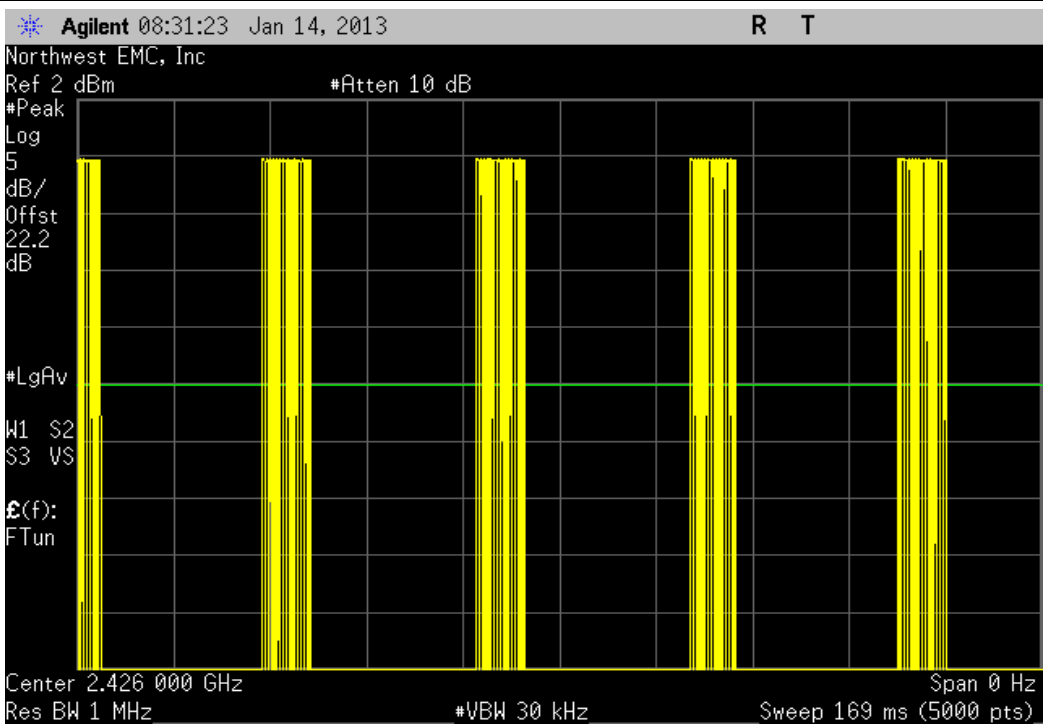
| BLE - Advertising, Low Channel, 2402 MHz |        |                  |           |       |        |  |
|--|--------|------------------|-----------|-------|--------|--|
| Pulse Width                              | Period | Number of Pulses | Value (%) | Limit | Result |  |
| N/A                                      | N/A    | 5                | N/A       | N/A   | N/A    |  |



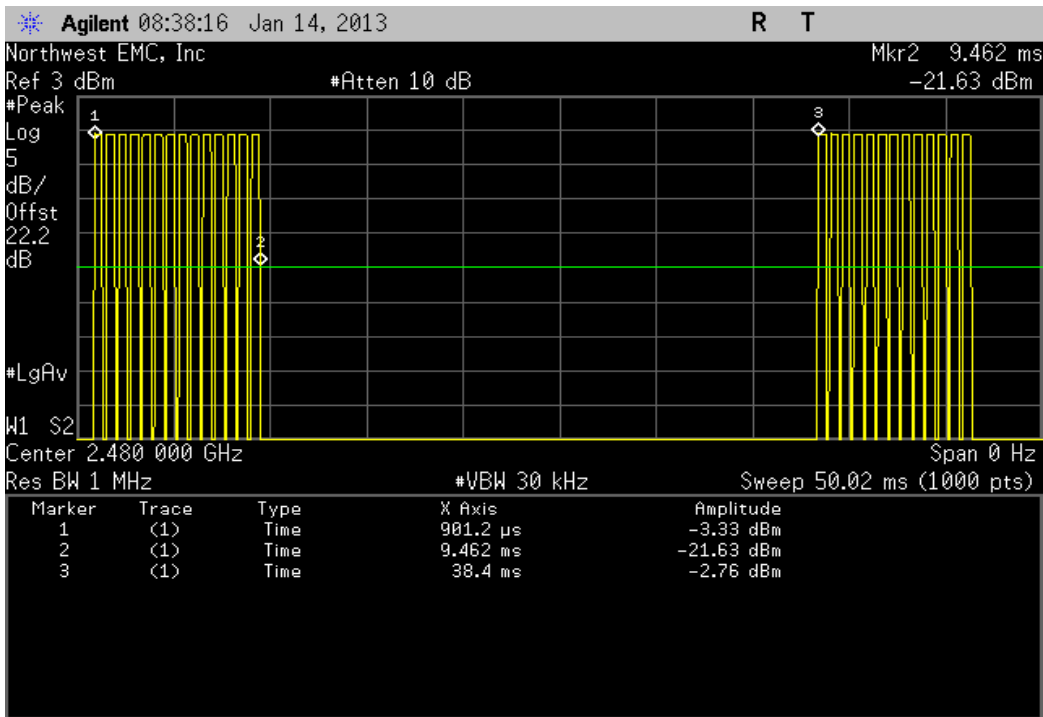
| BLE - Advertising, Mid Channel, 2426 MHz |         |                  |           |       |        |  |
|--|---------|------------------|-----------|-------|--------|--|
| Pulse Width                              | Period  | Number of Pulses | Value (%) | Limit | Result |  |
| 8.511 mS                                 | 37.5 mS | 1                | 22.7      | N/A   | N/A    |  |



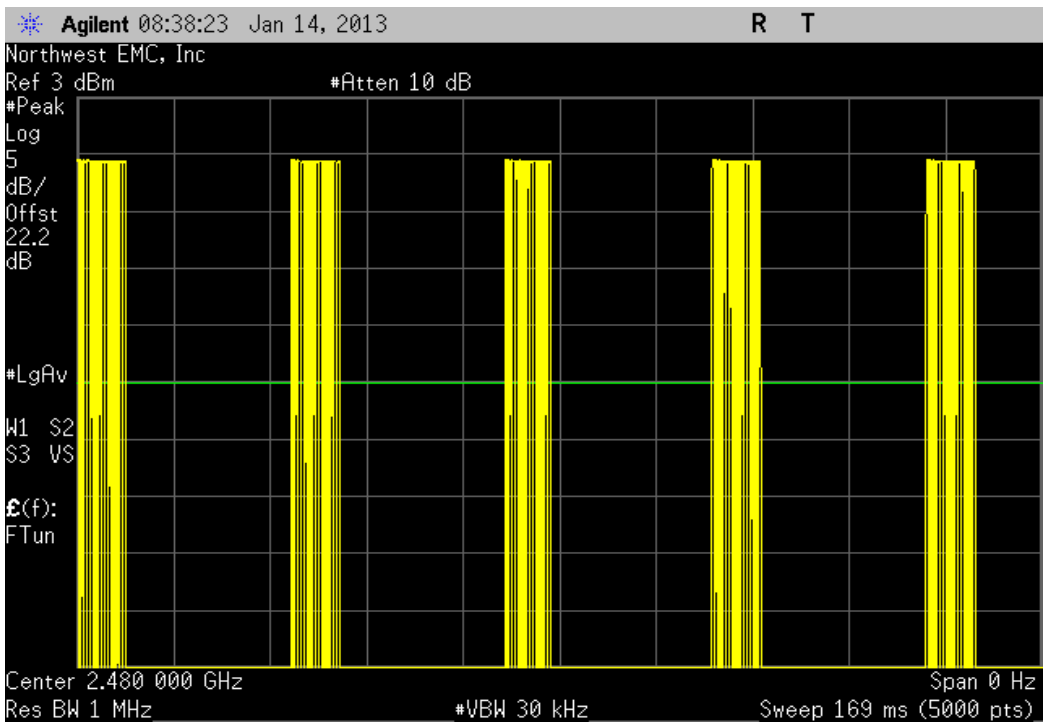
| BLE - Advertising, Mid Channel, 2426 MHz |        |                  |           |       |        |  |
|--|--------|------------------|-----------|-------|--------|--|
| Pulse Width                              | Period | Number of Pulses | Value (%) | Limit | Result |  |
| N/A                                      | N/A    | 5                | N/A       | N/A   | N/A    |  |



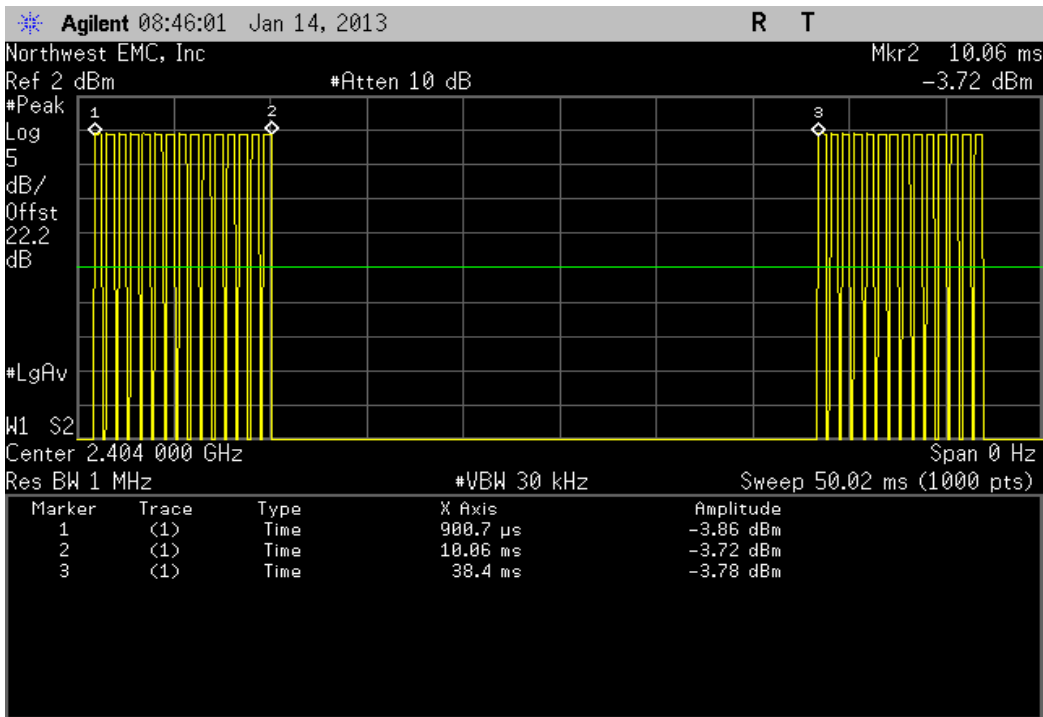
| BLE - Advertising, High Channel, 2480 MHz |         |                  |           |       |        |  |
|---|---------|------------------|-----------|-------|--------|--|
| Pulse Width                               | Period  | Number of Pulses | Value (%) | Limit | Result |  |
| 8.561 mS                                  | 37.5 mS | 1                | 22.8      | N/A   | N/A    |  |



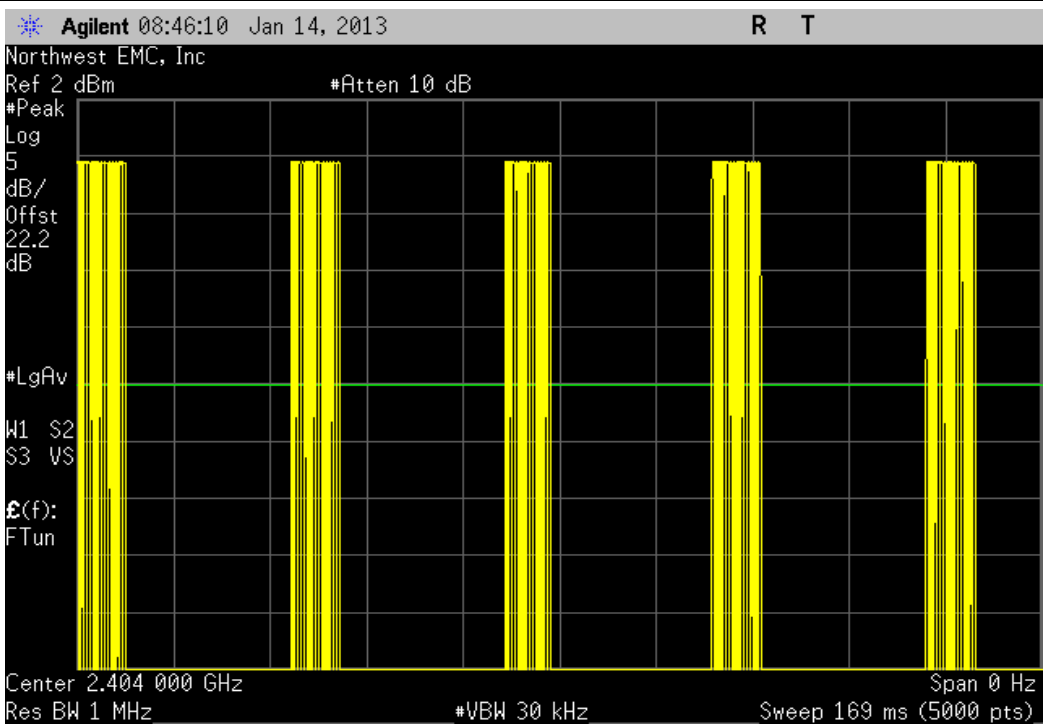
| BLE - Advertising, High Channel, 2480 MHz |        |                  |           |       |        |  |
|---|--------|------------------|-----------|-------|--------|--|
| Pulse Width                               | Period | Number of Pulses | Value (%) | Limit | Result |  |
| N/A                                       | N/A    | 5                | N/A       | N/A   | N/A    |  |



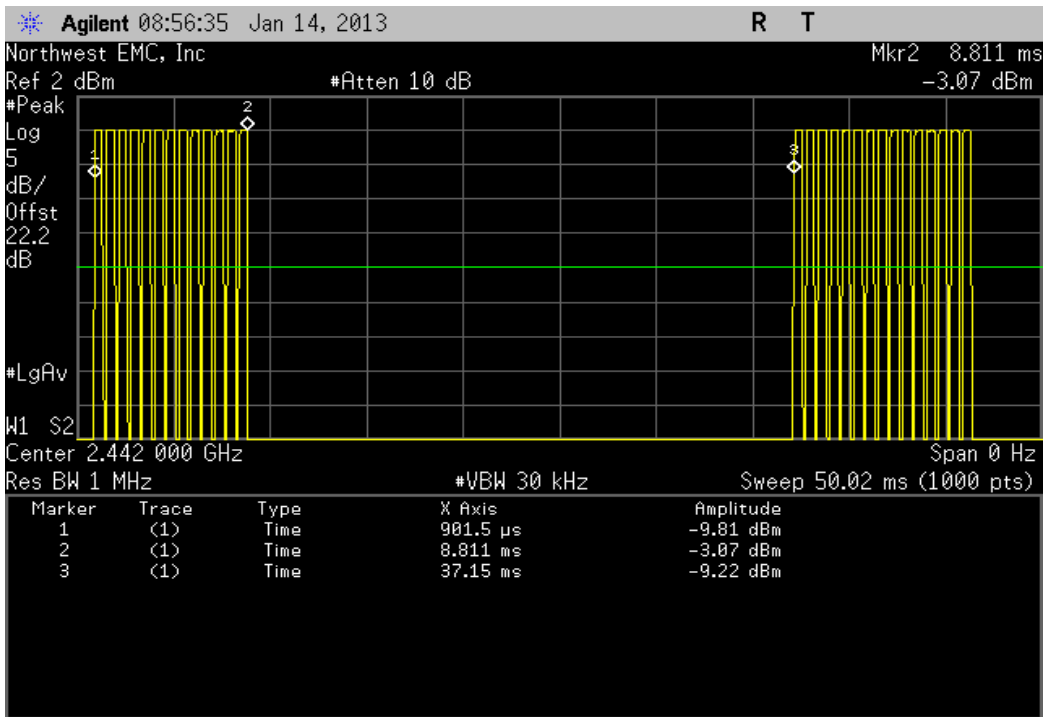
| BLE - Data, Low Channel, 2404 MHz |         |                  |           |       |        |  |
|-----------------------------------|---------|------------------|-----------|-------|--------|--|
| Pulse Width                       | Period  | Number of Pulses | Value (%) | Limit | Result |  |
| 9.163 mS                          | 37.5 mS | 1                | 24.4      | N/A   | N/A    |  |



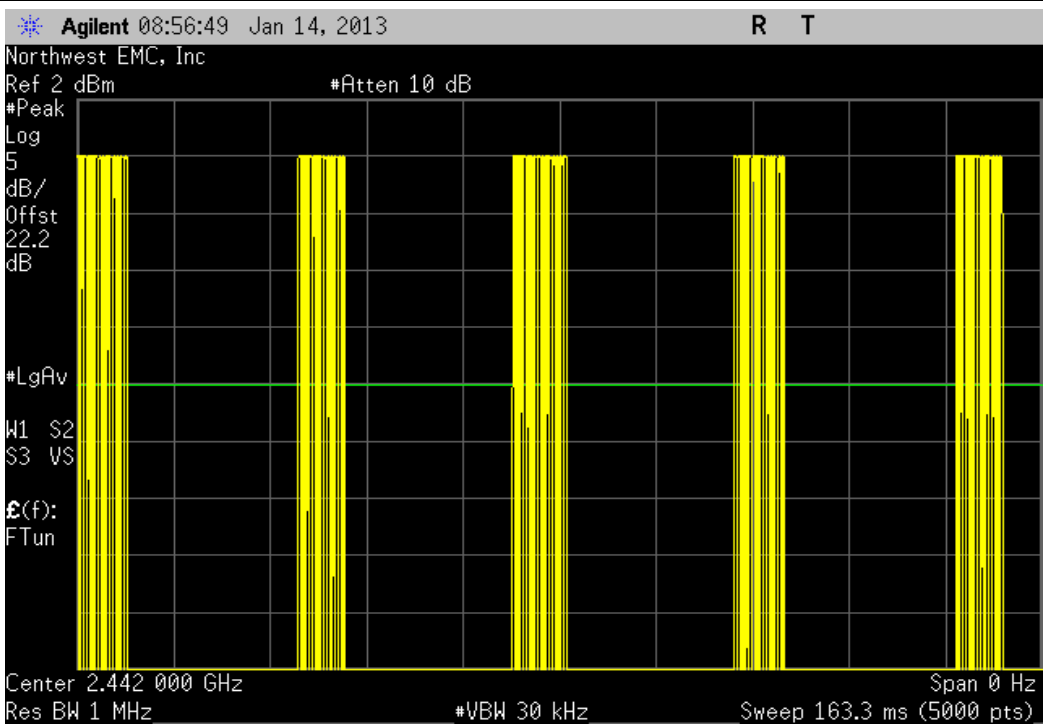
| BLE - Data, Low Channel, 2404 MHz |        |                  |           |       |        |  |
|-----------------------------------|--------|------------------|-----------|-------|--------|--|
| Pulse Width                       | Period | Number of Pulses | Value (%) | Limit | Result |  |
| N/A                               | N/A    | 5                | N/A       | N/A   | N/A    |  |



| BLE - Data, Mid Channel, 2442 MHz |           |                  |           |       |        |  |
|-----------------------------------|-----------|------------------|-----------|-------|--------|--|
| Pulse Width                       | Period    | Number of Pulses | Value (%) | Limit | Result |  |
| 7.91 mS                           | 36.248 mS | 1                | 21.8      | N/A   | N/A    |  |

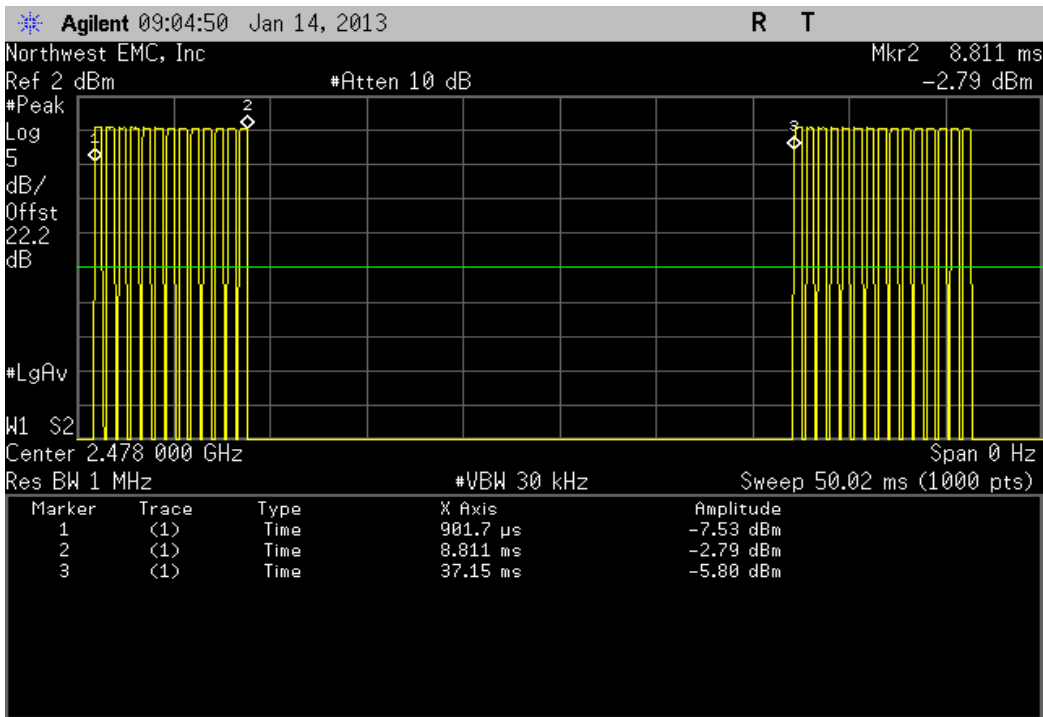


| BLE - Data, Mid Channel, 2442 MHz |        |                  |           |       |        |  |
|-----------------------------------|--------|------------------|-----------|-------|--------|--|
| Pulse Width                       | Period | Number of Pulses | Value (%) | Limit | Result |  |
| N/A                               | N/A    | 5                | N/A       | N/A   | N/A    |  |

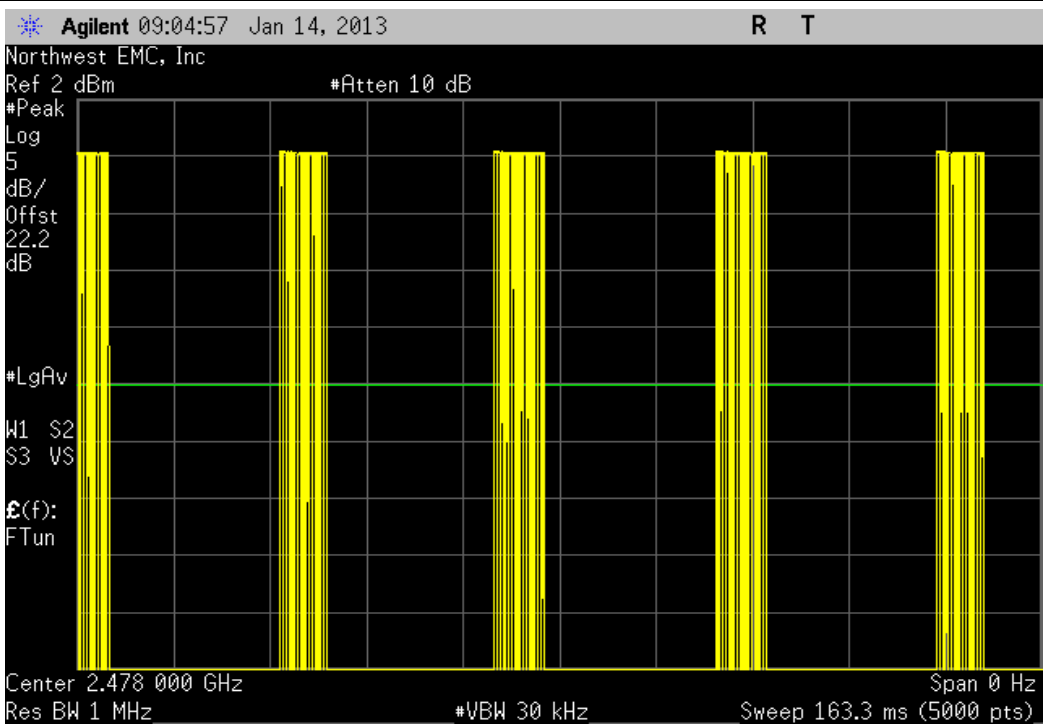




| BLE - Data, High Channel, 2478 MHz |           |                  |           |       |        |  |
|------------------------------------|-----------|------------------|-----------|-------|--------|--|
| Pulse Width                        | Period    | Number of Pulses | Value (%) | Limit | Result |  |
| 7.909 mS                           | 36.248 mS | 1                | 21.8      | N/A   | N/A    |  |



| BLE - Data, High Channel, 2478 MHz |        |                  |           |       |        |  |
|------------------------------------|--------|------------------|-----------|-------|--------|--|
| Pulse Width                        | Period | Number of Pulses | Value (%) | Limit | Result |  |
| N/A                                | N/A    | 5                | N/A       | N/A   | N/A    |  |



## Occupied Bandwidth

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

### TEST EQUIPMENT

| Description              | Manufacturer       | Model    | ID  | Last Cal. | Interval |
|--------------------------|--------------------|----------|-----|-----------|----------|
| Attenuator - 20db, 'SMA' | SM Electronics     | SA26B-20 | RFW | 4/19/2012 | 12       |
| 40 GHz DC block          | Fairview Microwave | SD3379   | AMI | 10/5/2012 | 12       |
| Signal Generator MXG     | Agilent            | N5183A   | TIK | 6/7/2012  | 36       |
| Spectrum Analyzer        | Agilent            | E4440A   | AAX | 5/15/2012 | 24       |

### TEST DESCRIPTION

The 6dB occupied bandwidth was measured. The 26 dB (99.9%) emission bandwidth (EBW) was also measured at the same time.

The EUT was set to low, medium and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet.



# Occupied Bandwidth

|                                      |                        |
|--------------------------------------|------------------------|
| EUT: 24HALOXF13                      | Work Order: STAK0027   |
| Serial Number: 12826579              | Date: 01/14/13         |
| Customer: Starkey Laboratories, Inc. | Temperature: 23.4°C    |
| Attendees: Larry McNabb              | Humidity: 12%          |
| Project: None                        | Barometric Pres.: 1030 |
| Tested by: Trevor Buls               | Power: Battery         |
|                                      | Job Site: MN08         |

|                     |                  |
|---------------------|------------------|
| TEST SPECIFICATIONS | Test Method      |
| FCC 15.247:2013     | ANSI C63.10:2009 |

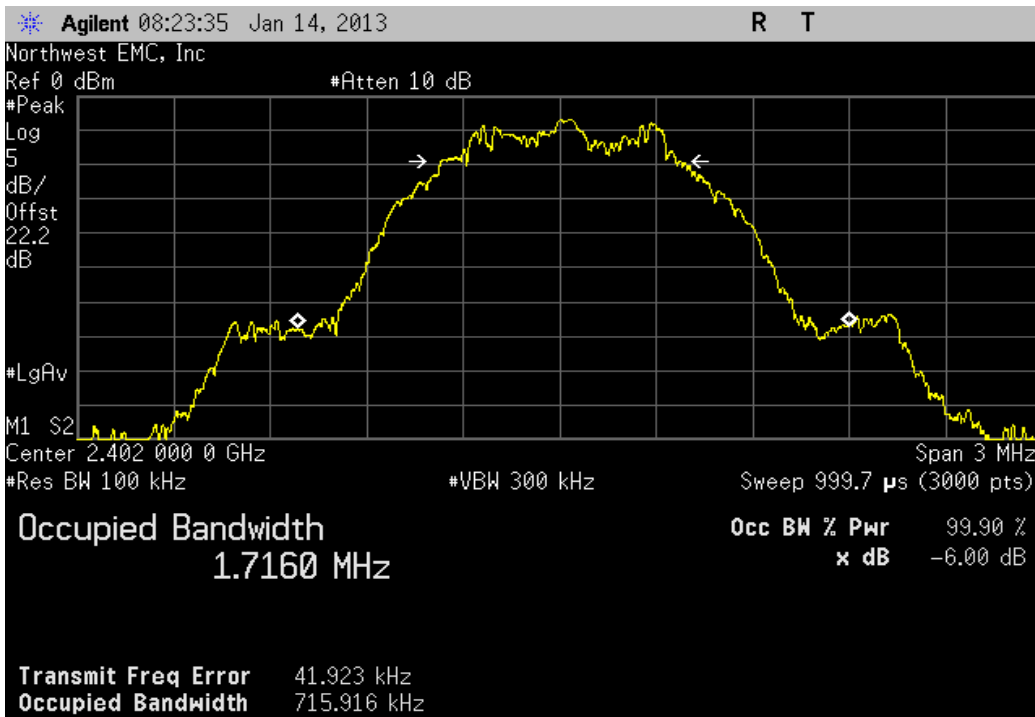
COMMENTS  
None

DEVIATIONS FROM TEST STANDARD  
None

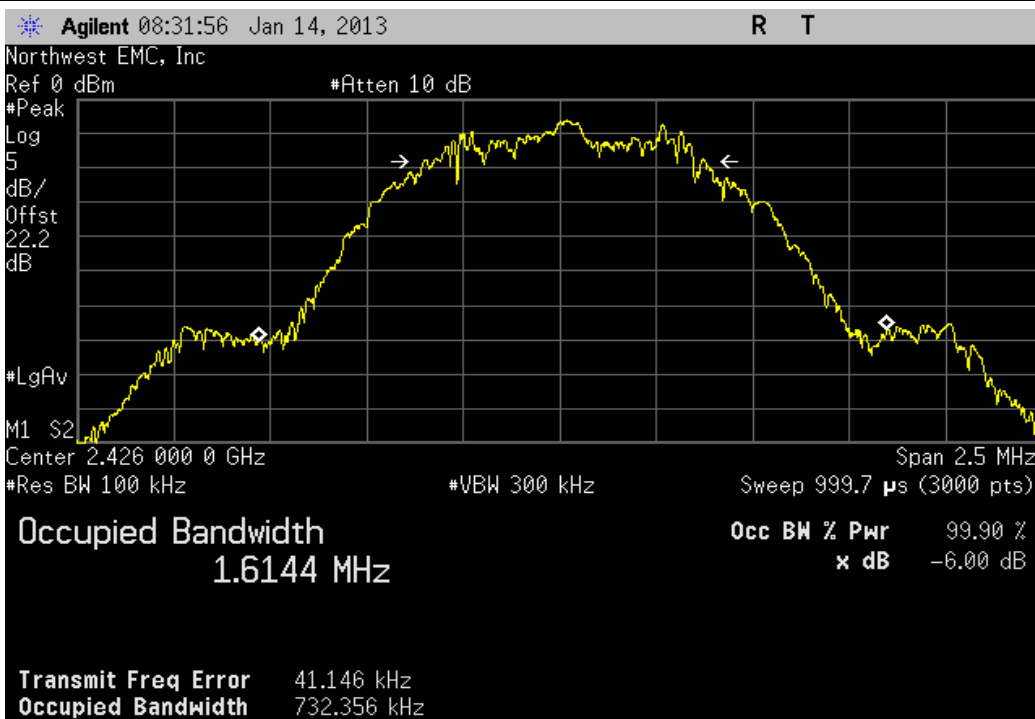
|                 |   |                              |
|-----------------|---|------------------------------|
| Configuration # | 1 | Signature <i>Trevor Buls</i> |
|-----------------|---|------------------------------|

|                          | Value       | Limit     | Result |
|--------------------------|-------------|-----------|--------|
| <b>BLE - Advertising</b> |             |           |        |
| Low Channel, 2402 MHz    | 715.916 kHz | ≥ 500 kHz | Pass   |
| Mid Channel, 2426 MHz    | 732.356 kHz | ≥ 500 kHz | Pass   |
| High Channel, 2480 MHz   | 670.448 kHz | ≥ 500 kHz | Pass   |
| <b>BLE - Data</b>        |             |           |        |
| Low Channel, 2404 MHz    | 717.977 kHz | ≥ 500 kHz | Pass   |
| Mid Channel, 2442 MHz    | 688.496 kHz | ≥ 500 kHz | Pass   |
| High Channel, 2478 MHz   | 682.763 kHz | ≥ 500 kHz | Pass   |

| BLE - Advertising, Low Channel, 2402 MHz |             |           |        |
|--|-------------|-----------|--------|
|  | Value       | Limit     | Result |
|  | 715.916 kHz | ≥ 500 kHz | Pass   |

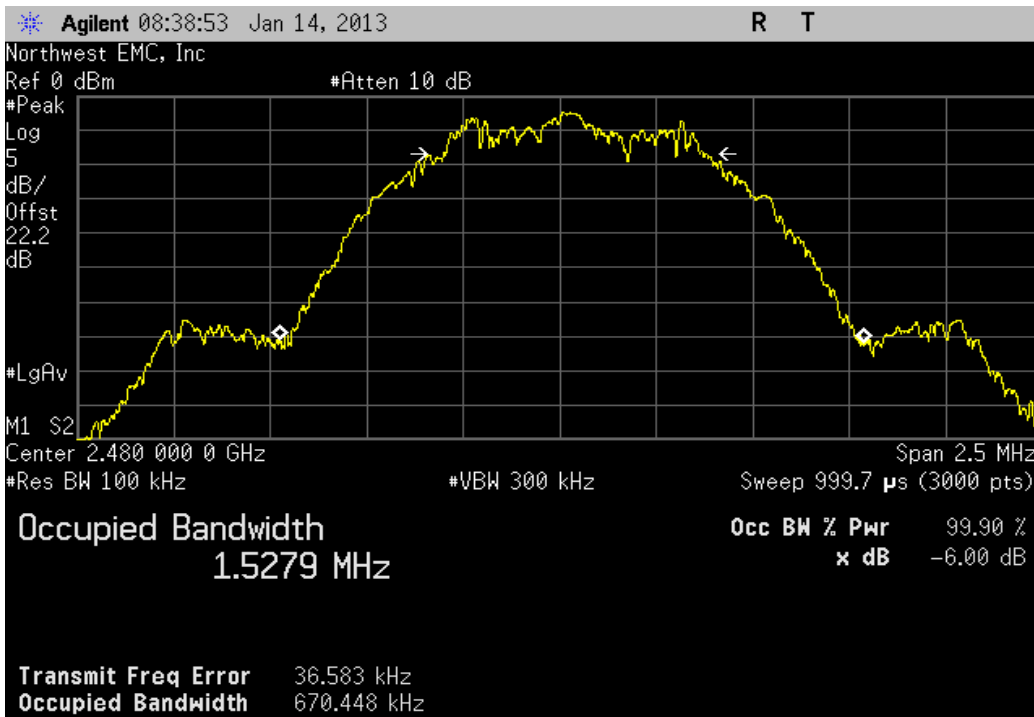


| BLE - Advertising, Mid Channel, 2426 MHz |             |           |        |
|--|-------------|-----------|--------|
|  | Value       | Limit     | Result |
|  | 732.356 kHz | ≥ 500 kHz | Pass   |



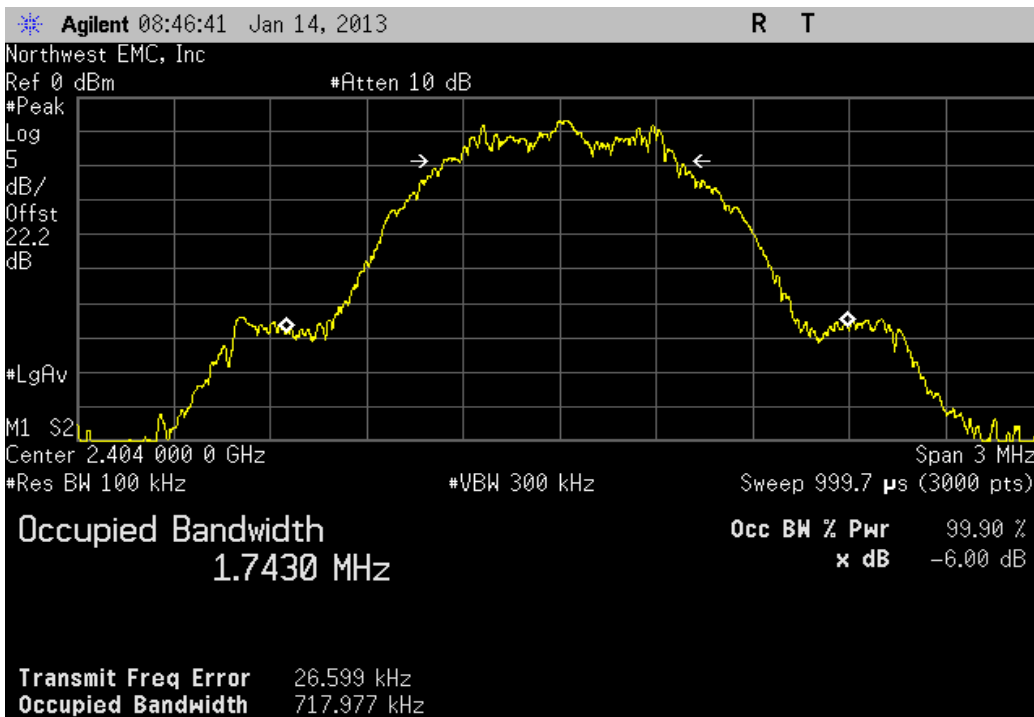
BLE - Advertising, High Channel, 2480 MHz

| Value       | Limit     | Result |
|-------------|-----------|--------|
| 670.448 kHz | ≥ 500 kHz | Pass   |



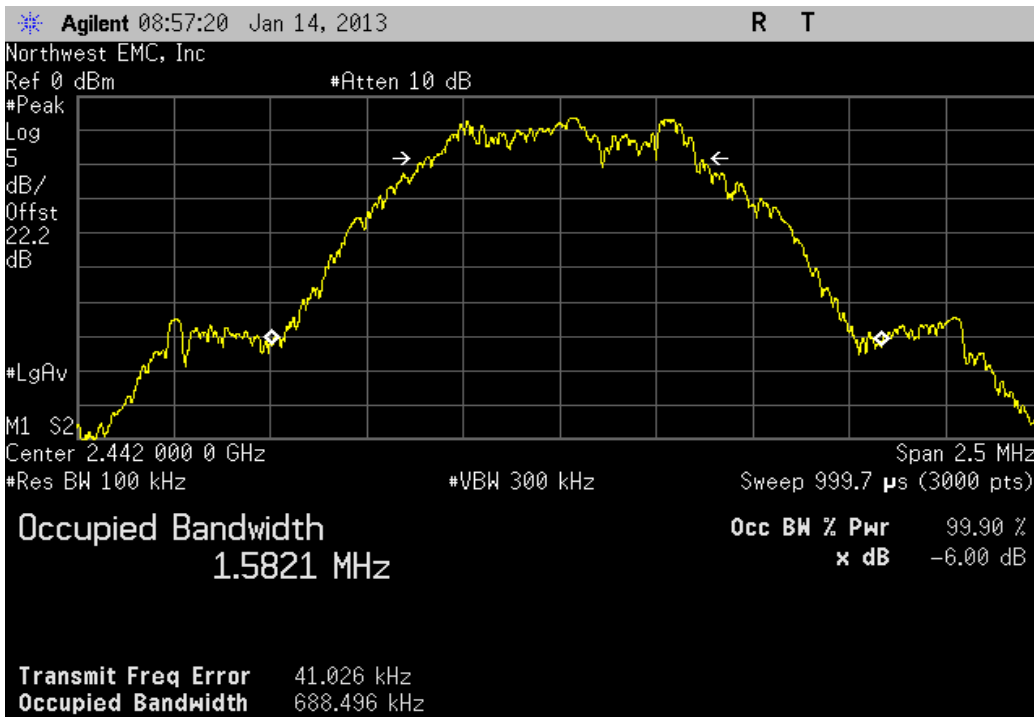
BLE - Data, Low Channel, 2404 MHz

| Value       | Limit     | Result |
|-------------|-----------|--------|
| 717.977 kHz | ≥ 500 kHz | Pass   |



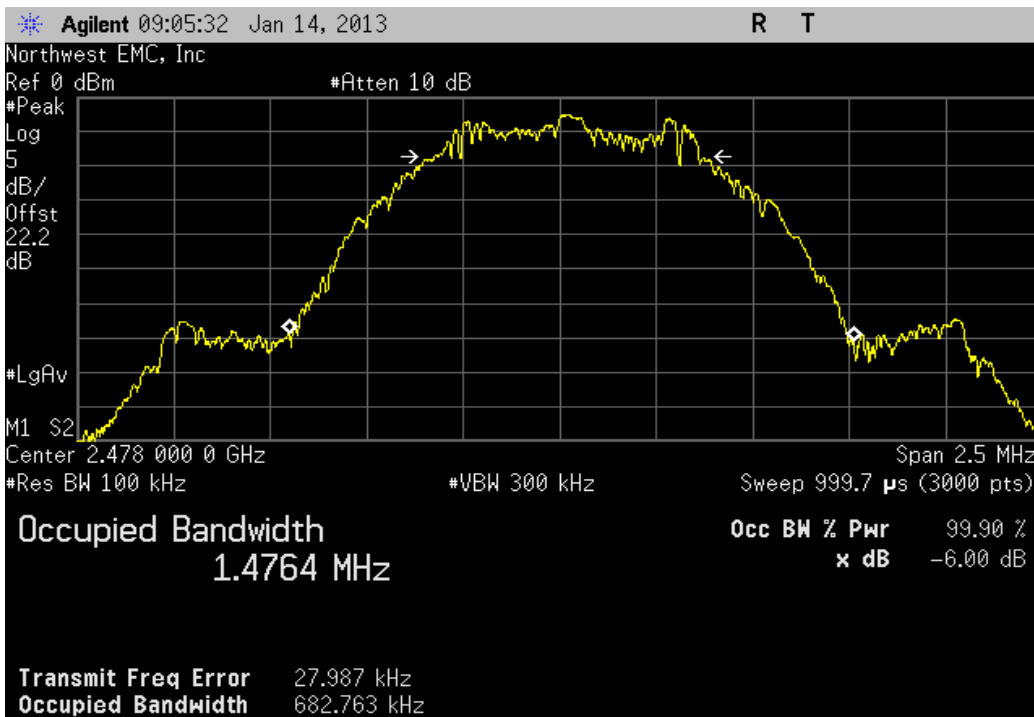
BLE - Data, Mid Channel, 2442 MHz

|  | Value       | Limit     | Result |
|--|-------------|-----------|--------|
|  | 688.496 kHz | ≥ 500 kHz | Pass   |



BLE - Data, High Channel, 2478 MHz

|  | Value       | Limit     | Result |
|--|-------------|-----------|--------|
|  | 682.763 kHz | ≥ 500 kHz | Pass   |



## Output Power

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

### TEST EQUIPMENT

| Description              | Manufacturer       | Model    | ID  | Last Cal. | Interval |
|--------------------------|--------------------|----------|-----|-----------|----------|
| Attenuator - 20db, 'SMA' | SM Electronics     | SA26B-20 | RFW | 4/19/2012 | 12       |
| 40 GHz DC block          | Fairview Microwave | SD3379   | AMI | 10/5/2012 | 12       |
| Signal Generator MXG     | Agilent            | N5183A   | TIK | 6/7/2012  | 36       |
| Spectrum Analyzer        | Agilent            | E4440A   | AAX | 5/15/2012 | 24       |

### TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

Method Option 1 found in KDB 558074 DTS D01 Measurement Section 8.1.1 was used because the RBW on the analyzer was greater than the Emission Bandwidth of the radio.

De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.



# Output Power

XMit 2012.09.20  
PsaTx 2013.01.10

|                                      |                        |
|--------------------------------------|------------------------|
| EUT: 24HALOXF13                      | Work Order: STAK0027   |
| Serial Number: 12826579              | Date: 01/14/13         |
| Customer: Starkey Laboratories, Inc. | Temperature: 23.4°C    |
| Attendees: Larry McNabb              | Humidity: 12%          |
| Project: None                        | Barometric Pres.: 1030 |
| Tested by: Trevor Buls               | Power: Battery         |
|                                      | Job Site: MN08         |

|                     |                  |
|---------------------|------------------|
| TEST SPECIFICATIONS | Test Method      |
| FCC 15.247:2013     | ANSI C63.10:2009 |

COMMENTS  
None

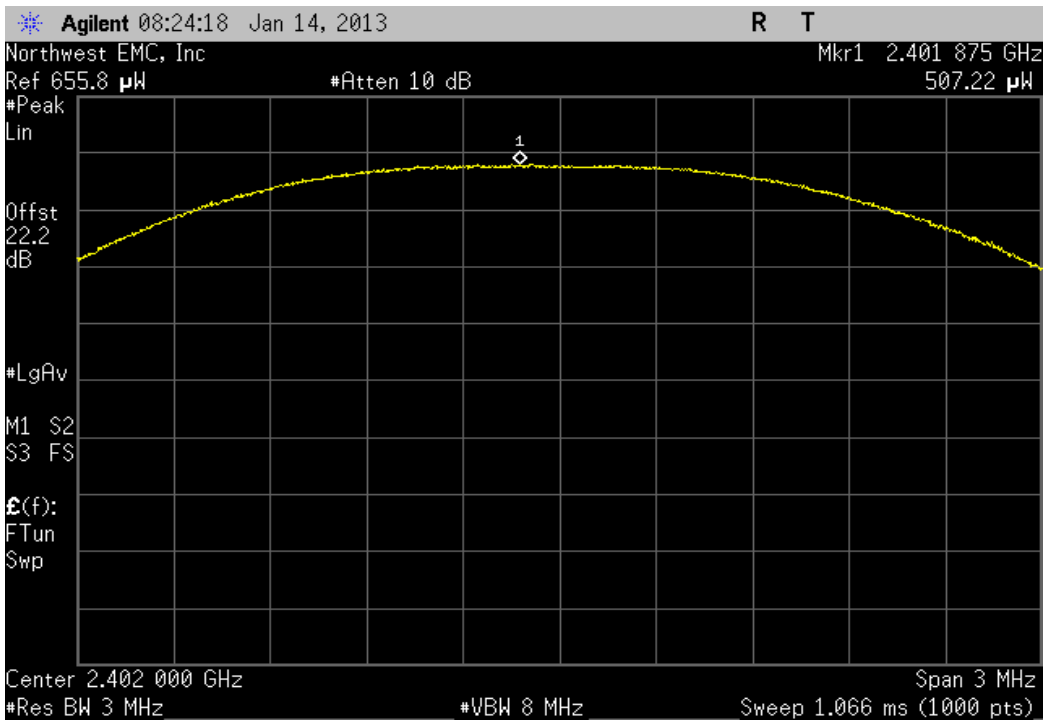
DEVIATIONS FROM TEST STANDARD  
None

|                 |   |           |                    |
|-----------------|---|-----------|--------------------|
| Configuration # | 1 | Signature | <i>Trevor Buls</i> |
|-----------------|---|-----------|--------------------|

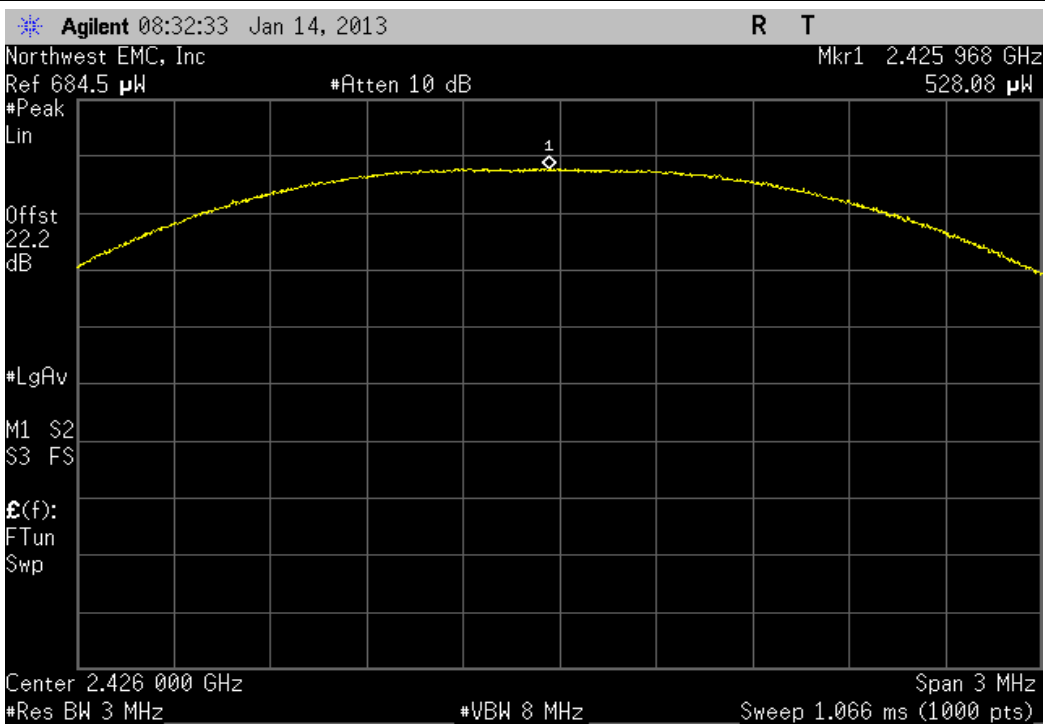
|                          | Value      | Limit | Result |
|--------------------------|------------|-------|--------|
| <b>BLE - Advertising</b> |            |       |        |
| Low Channel, 2402 MHz    | 507.224 uW | < 1 W | Pass   |
| Mid Channel, 2426 MHz    | 528.08 uW  | < 1 W | Pass   |
| High Channel, 2480 MHz   | 621.727 uW | < 1 W | Pass   |
| <b>BLE - Data</b>        |            |       |        |
| Low Channel, 2404 MHz    | 506.524 uW | < 1 W | Pass   |
| Mid Channel, 2442 MHz    | 565.067 uW | < 1 W | Pass   |
| High Channel, 2478 MHz   | 612.632 uW | < 1 W | Pass   |



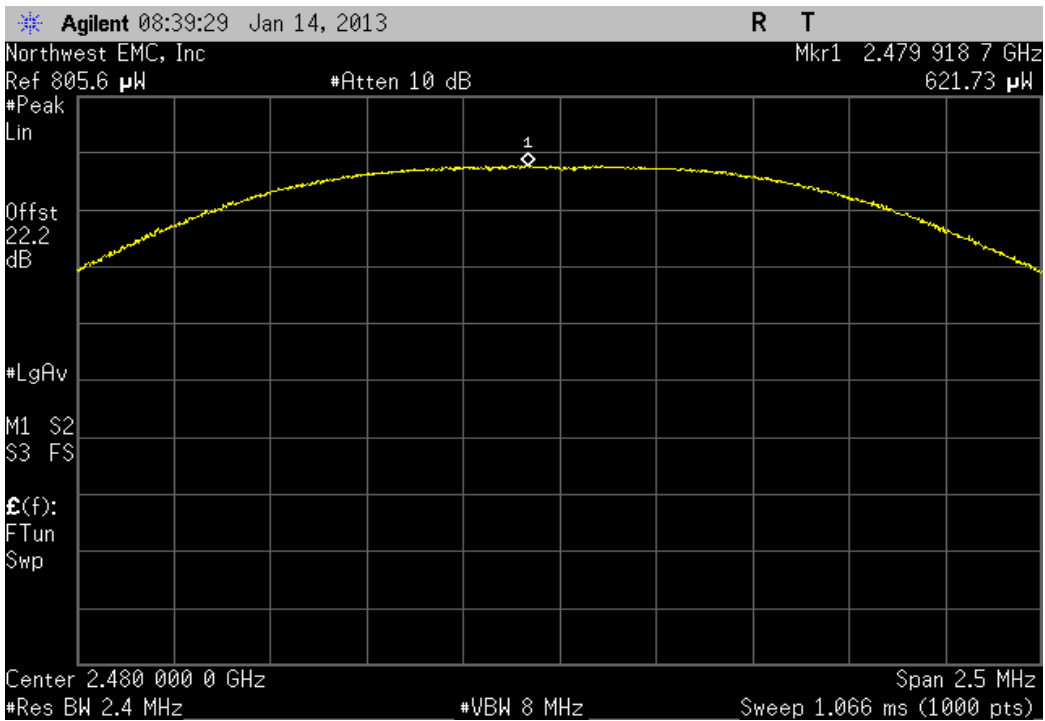
| BLE - Advertising, Low Channel, 2402 MHz |            |       |        |
|--|------------|-------|--------|
|  | Value      | Limit | Result |
|  | 507.224 uW | < 1 W | Pass   |



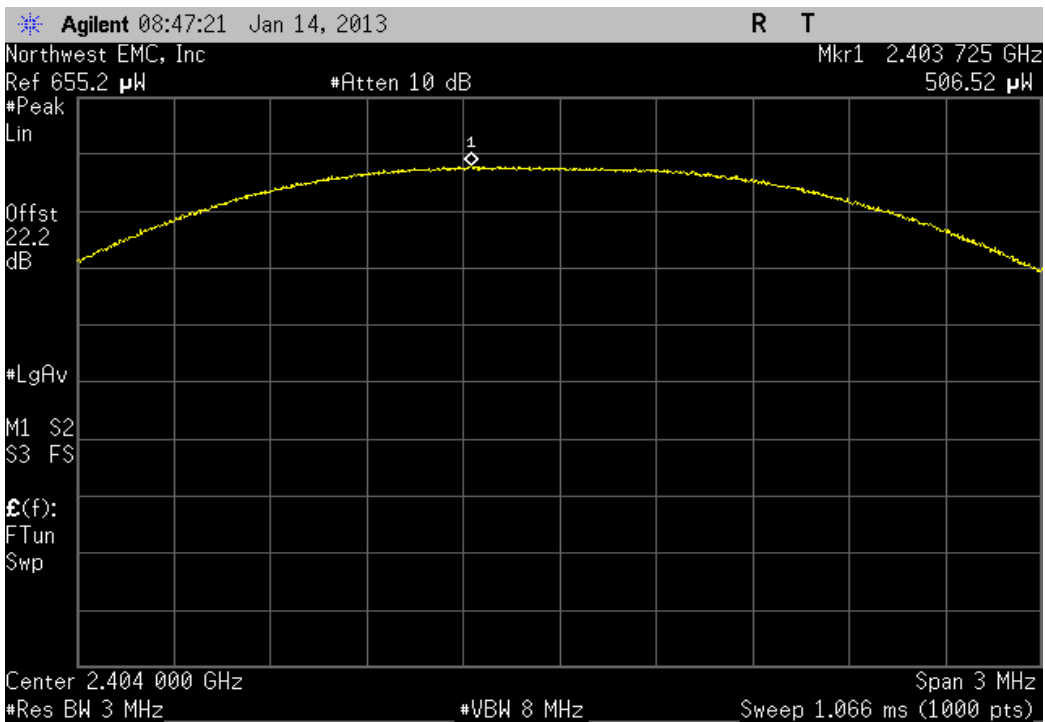
| BLE - Advertising, Mid Channel, 2426 MHz |           |       |        |
|--|-----------|-------|--------|
|  | Value     | Limit | Result |
|  | 528.08 uW | < 1 W | Pass   |



| BLE - Advertising, High Channel, 2480 MHz |            |       |        |
|---|------------|-------|--------|
|   | Value      | Limit | Result |
|   | 621.727 uW | < 1 W | Pass   |

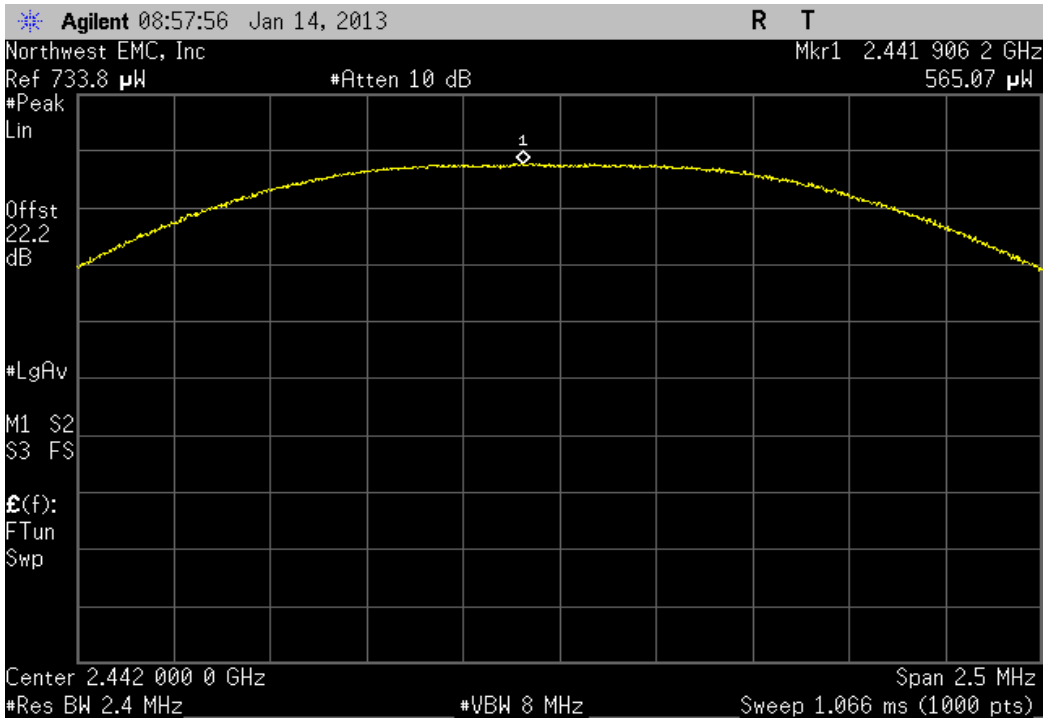


| BLE - Data, Low Channel, 2404 MHz |            |       |        |
|-----------------------------------|------------|-------|--------|
|                                   | Value      | Limit | Result |
|                                   | 506.524 uW | < 1 W | Pass   |



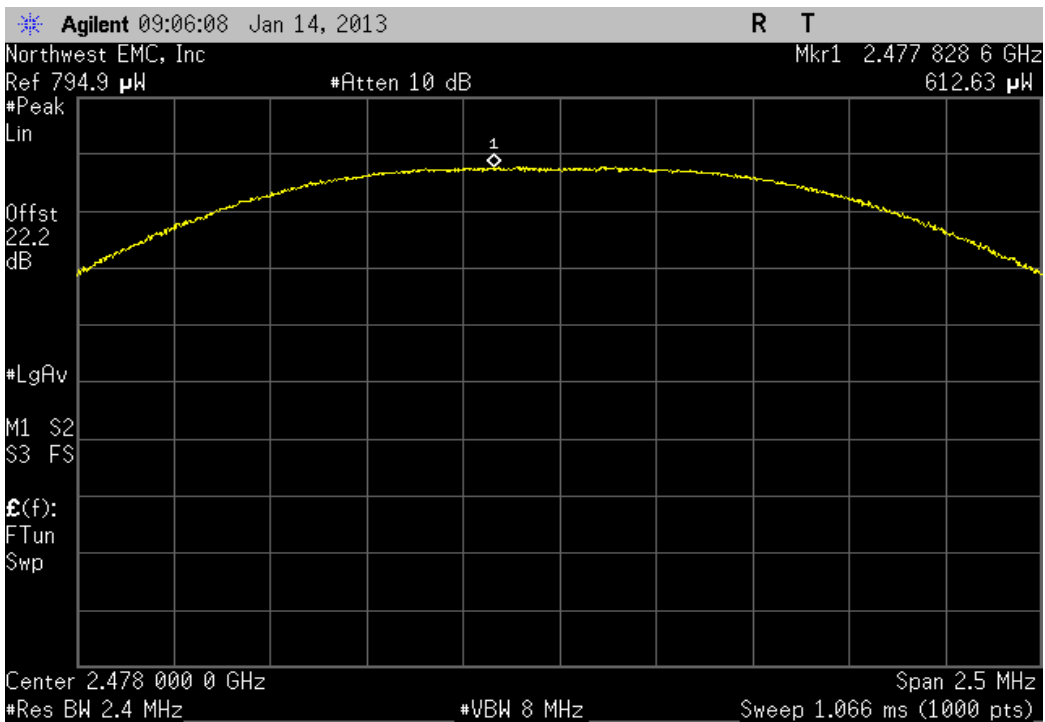
BLE - Data, Mid Channel, 2442 MHz

| Value      | Limit | Result |
|------------|-------|--------|
| 565.067 uW | < 1 W | Pass   |



BLE - Data, High Channel, 2478 MHz

| Value      | Limit | Result |
|------------|-------|--------|
| 612.632 uW | < 1 W | Pass   |



## Band Edge Compliance

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

### TEST EQUIPMENT

| Description              | Manufacturer       | Model    | ID  | Last Cal. | Interval |
|--------------------------|--------------------|----------|-----|-----------|----------|
| Attenuator - 20db, 'SMA' | SM Electronics     | SA26B-20 | RFW | 4/19/2012 | 12       |
| 40 GHz DC block          | Fairview Microwave | SD3379   | AMI | 10/5/2012 | 12       |
| Signal Generator MXG     | Agilent            | N5183A   | TIK | 6/7/2012  | 36       |
| Spectrum Analyzer        | Agilent            | E4440A   | AAX | 5/15/2012 | 24       |

### TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.



# Band Edge Compliance

XMit 2012.09.20  
PsaTx 2013.01.10

|                                      |                        |
|--------------------------------------|------------------------|
| EUT: 24HALOXF13                      | Work Order: STAK0027   |
| Serial Number: 12826579              | Date: 01/14/13         |
| Customer: Starkey Laboratories, Inc. | Temperature: 23.4°C    |
| Attendees: Larry McNabb              | Humidity: 12%          |
| Project: None                        | Barometric Pres.: 1030 |
| Tested by: Trevor Buls               | Power: Battery         |
|                                      | Job Site: MN08         |

|                     |                  |
|---------------------|------------------|
| TEST SPECIFICATIONS |                  |
| FCC 15.247:2013     | ANSI C63.10:2009 |
| TEST METHOD         |                  |

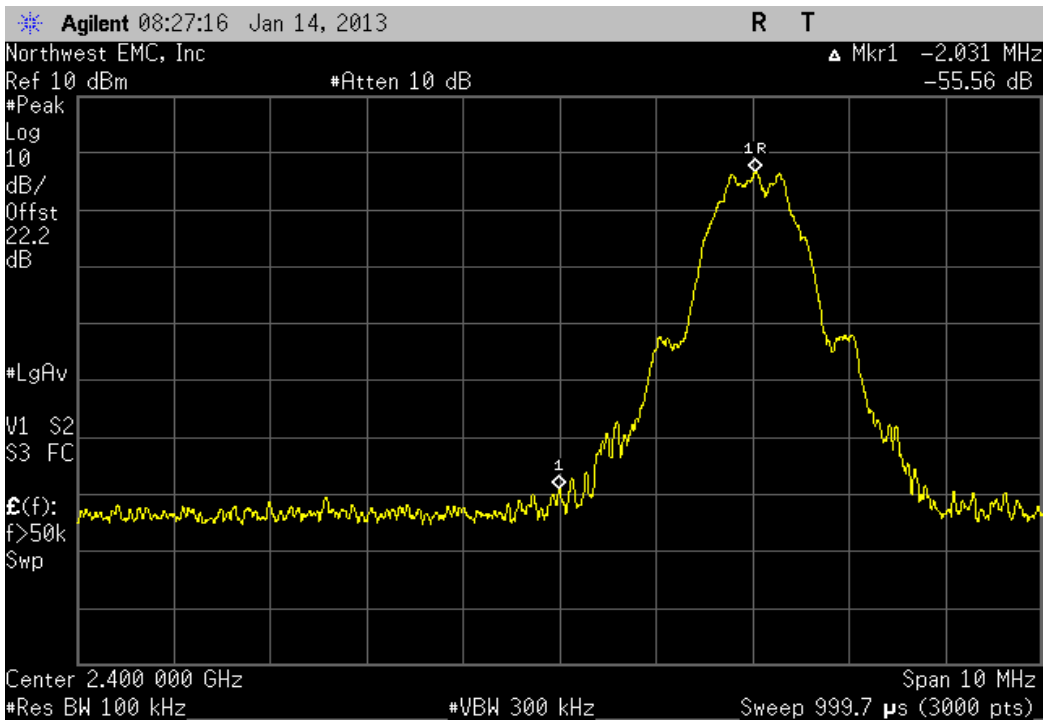
COMMENTS  
None

DEVIATIONS FROM TEST STANDARD  
None

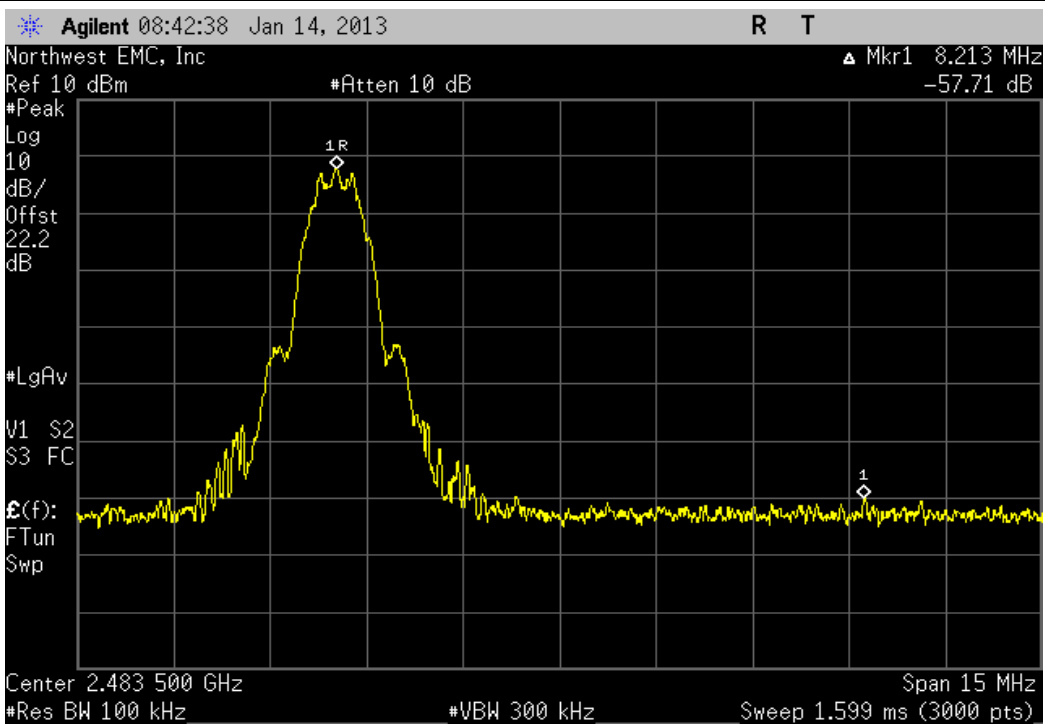
|                 |   |                              |
|-----------------|---|------------------------------|
| Configuration # | 1 | Signature <i>Trevor Buls</i> |
|-----------------|---|------------------------------|

|                          |                        | Value      | Limit     | Result |
|--------------------------|------------------------|------------|-----------|--------|
| <b>BLE - Advertising</b> |                        |            |           |        |
|                          | Low Channel, 2402 MHz  | -55.57 dBc | ≤ -20 dBc | Pass   |
|                          | High Channel, 2480 MHz | -57.71 dBc | ≤ -20 dBc | Pass   |
| <b>BLE - Data</b>        |                        |            |           |        |
|                          | Low Channel, 2404 MHz  | -57.71 dBc | ≤ -20 dBc | Pass   |
|                          | High Channel, 2478 MHz | -58.09 dBc | ≤ -20 dBc | Pass   |

| BLE - Advertising, Low Channel, 2402 MHz |            |           |        |
|--|------------|-----------|--------|
|  | Value      | Limit     | Result |
|  | -55.57 dBc | ≤ -20 dBc | Pass   |

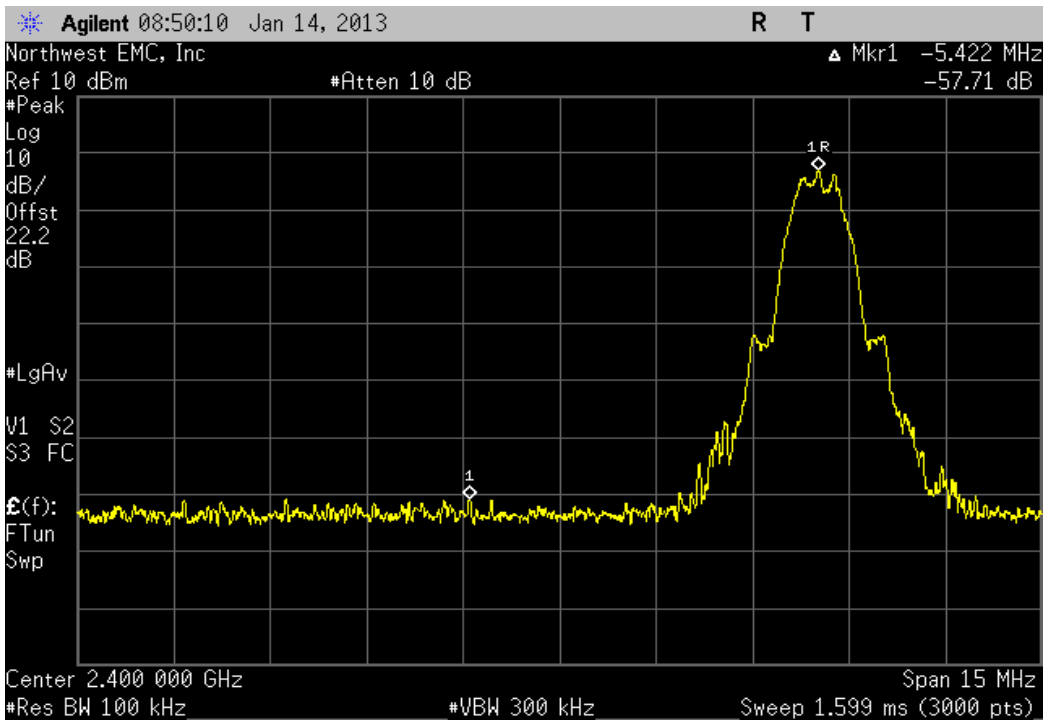


| BLE - Advertising, High Channel, 2480 MHz |            |           |        |
|---|------------|-----------|--------|
|   | Value      | Limit     | Result |
|   | -57.71 dBc | ≤ -20 dBc | Pass   |



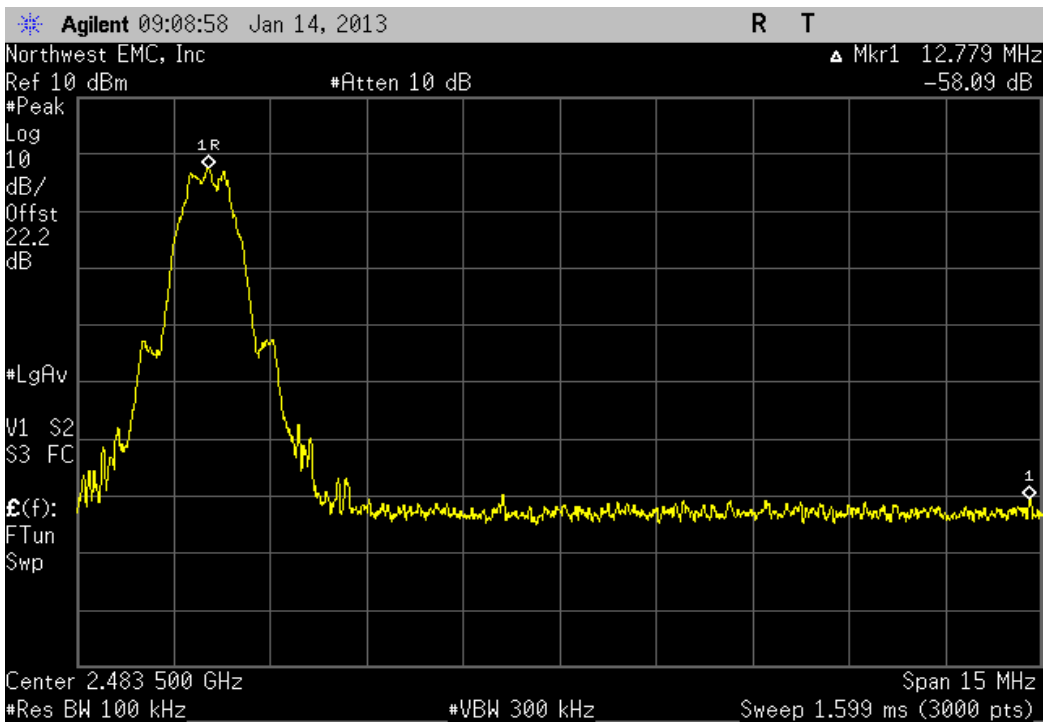
BLE - Data, Low Channel, 2404 MHz

| Value      | Limit     | Result |
|------------|-----------|--------|
| -57.71 dBc | ≤ -20 dBc | Pass   |



BLE - Data, High Channel, 2478 MHz

| Value      | Limit     | Result |
|------------|-----------|--------|
| -58.09 dBc | ≤ -20 dBc | Pass   |



## Spurious Conducted Emissions

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

### TEST EQUIPMENT

| Description              | Manufacturer       | Model    | ID  | Last Cal. | Interval |
|--------------------------|--------------------|----------|-----|-----------|----------|
| Attenuator - 20db, 'SMA' | SM Electronics     | SA26B-20 | RFW | 4/19/2012 | 12       |
| 40 GHz DC block          | Fairview Microwave | SD3379   | AMI | 10/5/2012 | 12       |
| Signal Generator MXG     | Agilent            | N5183A   | TIK | 6/7/2012  | 36       |
| Spectrum Analyzer        | Agilent            | E4440A   | AAX | 5/15/2012 | 24       |

### TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.





# Spurious Conducted Emissions

XMit 2012.09.20  
PsaTx 2013.01.10

|                                      |                        |
|--------------------------------------|------------------------|
| EUT: 24HALOXF13                      | Work Order: STAK0027   |
| Serial Number: 12826579              | Date: 01/14/13         |
| Customer: Starkey Laboratories, Inc. | Temperature: 23.4°C    |
| Attendees: Larry McNabb              | Humidity: 12%          |
| Project: None                        | Barometric Pres.: 1030 |
| Tested by: Trevor Buls               | Power: Battery         |
|                                      | Job Site: MN08         |

|                            |                    |
|----------------------------|--------------------|
| <b>TEST SPECIFICATIONS</b> | <b>Test Method</b> |
| FCC 15.247:2013            | ANSI C63.10:2009   |

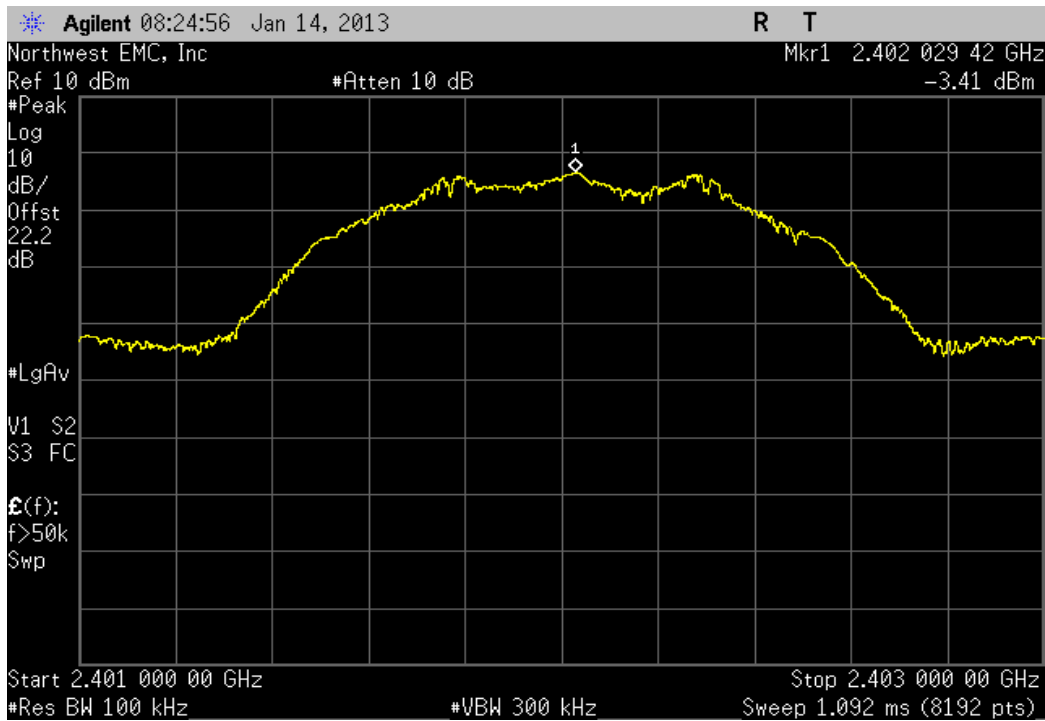
**COMMENTS**  
None

**DEVIATIONS FROM TEST STANDARD**  
None

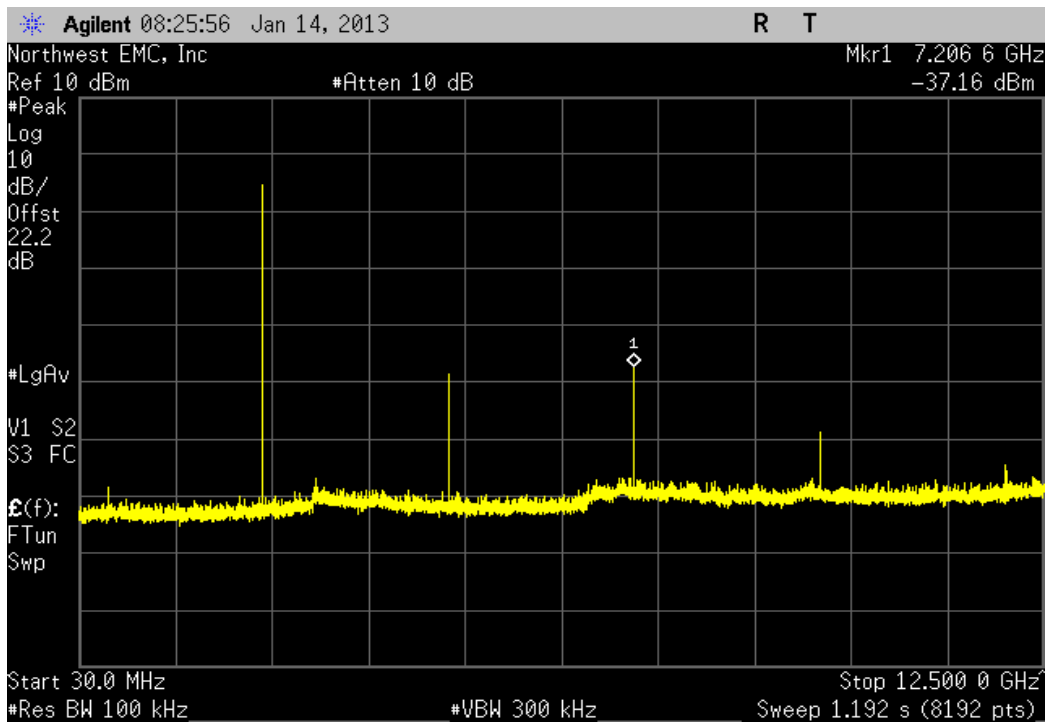
|                 |   |                              |
|-----------------|---|------------------------------|
| Configuration # | 1 | Signature <i>Trevor Buls</i> |
|-----------------|---|------------------------------|

|                          | Frequency Range   | Value      | Limit     | Result |
|--------------------------|-------------------|------------|-----------|--------|
| <b>BLE - Advertising</b> |                   |            |           |        |
| Low Channel, 2402 MHz    | Fundamental       | N/A        | N/A       | N/A    |
| Low Channel, 2402 MHz    | 30 MHz - 12.5 GHz | -33.74 dBc | ≤ -20 dBc | Pass   |
| Low Channel, 2402 MHz    | 12.5 GHz - 25 GHz | -48.6 dBc  | ≤ -20 dBc | Pass   |
| Mid Channel, 2426 MHz    | Fundamental       | N/A        | N/A       | N/A    |
| Mid Channel, 2426 MHz    | 30 MHz - 12.5 GHz | -35.16 dBc | ≤ -20 dBc | Pass   |
| Mid Channel, 2426 MHz    | 12.5 GHz - 25 GHz | -49.34 dBc | ≤ -20 dBc | Pass   |
| High Channel, 2480 MHz   | Fundamental       | N/A        | N/A       | N/A    |
| High Channel, 2480 MHz   | 30 MHz - 12.5 GHz | -37.98 dBc | ≤ -20 dBc | Pass   |
| High Channel, 2480 MHz   | 12.5 GHz - 25 GHz | -49.53 dBc | ≤ -20 dBc | Pass   |
| <b>BLE - Data</b>        |                   |            |           |        |
| Low Channel, 2404 MHz    | Fundamental       | N/A        | N/A       | N/A    |
| Low Channel, 2404 MHz    | 30 MHz - 12.5 GHz | -33.91 dBc | ≤ -20 dBc | Pass   |
| Low Channel, 2404 MHz    | 12.5 GHz - 25 GHz | -48.37 dBc | ≤ -20 dBc | Pass   |
| Mid Channel, 2442 MHz    | Fundamental       | N/A        | N/A       | N/A    |
| Mid Channel, 2442 MHz    | 30 MHz - 12.5 GHz | -36.07 dBc | ≤ -20 dBc | Pass   |
| Mid Channel, 2442 MHz    | 12.5 GHz - 25 GHz | -48.89 dBc | ≤ -20 dBc | Pass   |
| High Channel, 2478 MHz   | Fundamental       | N/A        | N/A       | N/A    |
| High Channel, 2478 MHz   | 30 MHz - 12.5 GHz | -40.4 dBc  | ≤ -20 dBc | Pass   |
| High Channel, 2478 MHz   | 12.5 GHz - 25 GHz | -49.36 dBc | ≤ -20 dBc | Pass   |

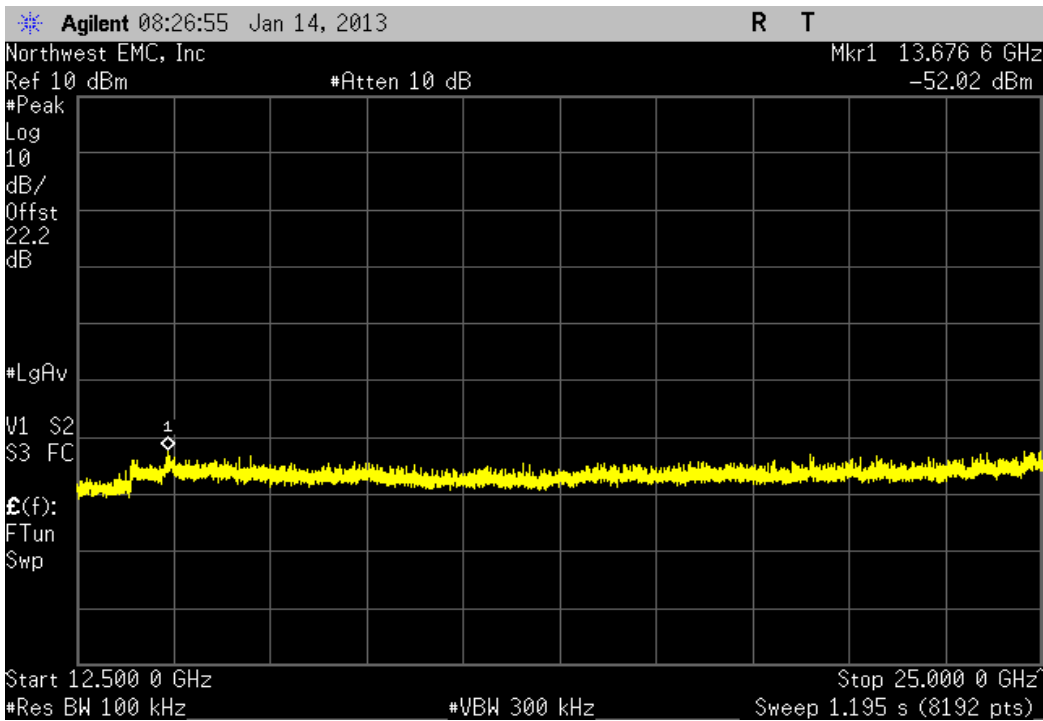
| BLE - Advertising, Low Channel, 2402 MHz |       |       |        |  |
|--|-------|-------|--------|--|
| Frequency Range                          | Value | Limit | Result |  |
| Fundamental                              | N/A   | N/A   | N/A    |  |



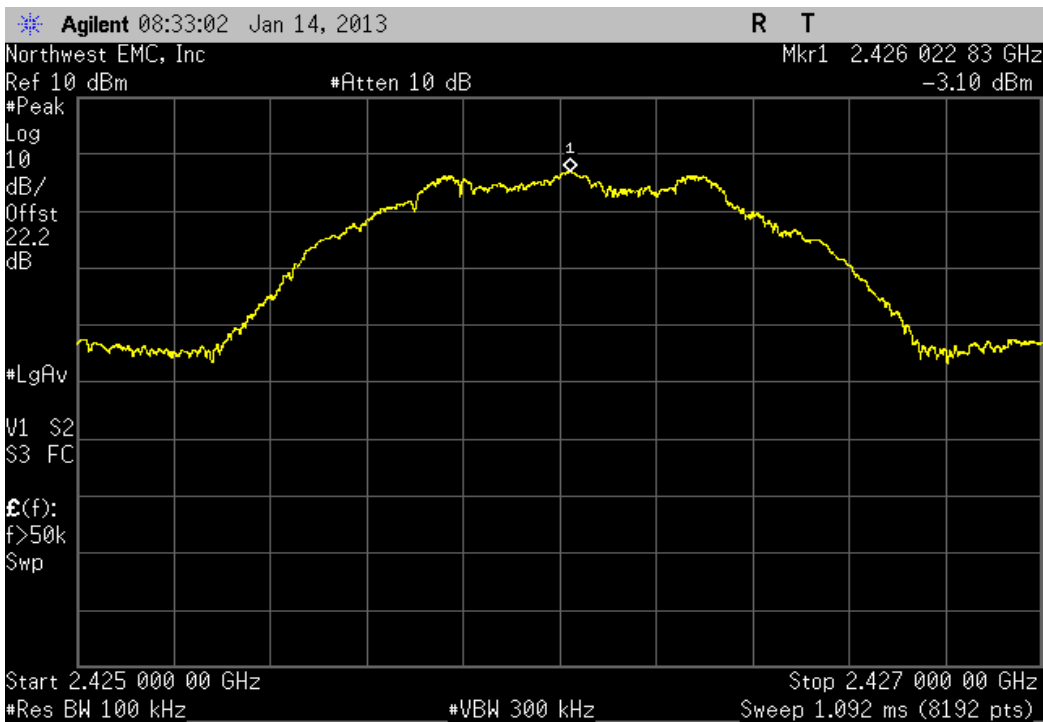
| BLE - Advertising, Low Channel, 2402 MHz |            |           |        |  |
|--|------------|-----------|--------|--|
| Frequency Range                          | Value      | Limit     | Result |  |
| 30 MHz - 12.5 GHz                        | -33.74 dBc | ≤ -20 dBc | Pass   |  |



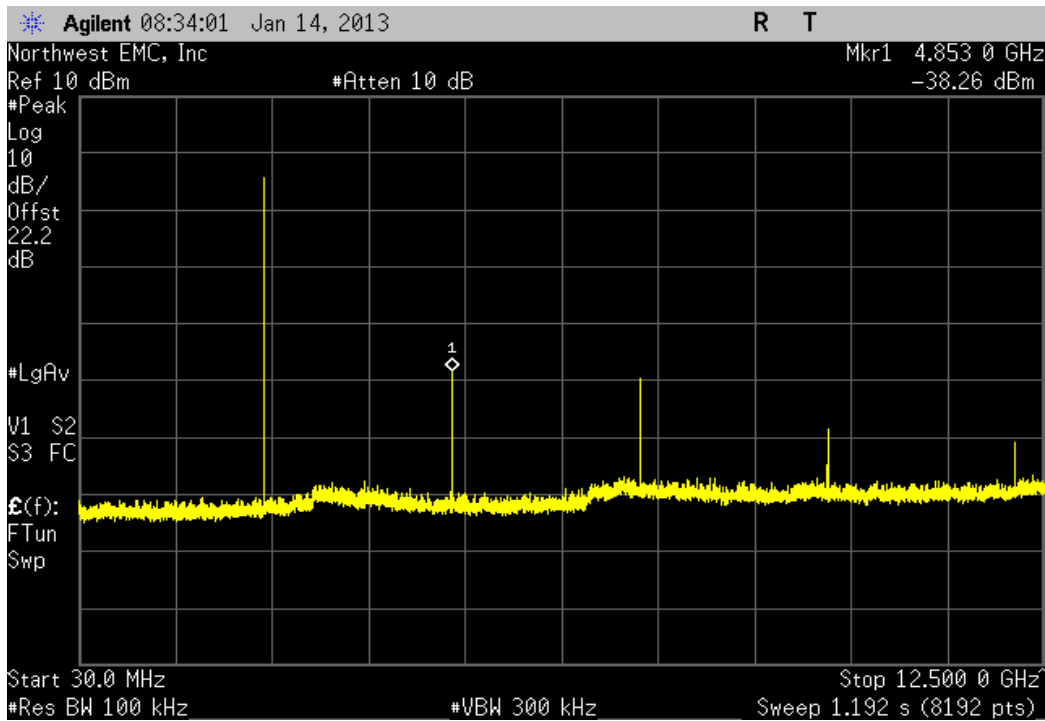
| BLE - Advertising, Low Channel, 2402 MHz |           |           |        |
|--|-----------|-----------|--------|
| Frequency Range                          | Value     | Limit     | Result |
| 12.5 GHz - 25 GHz                        | -48.6 dBc | ≤ -20 dBc | Pass   |



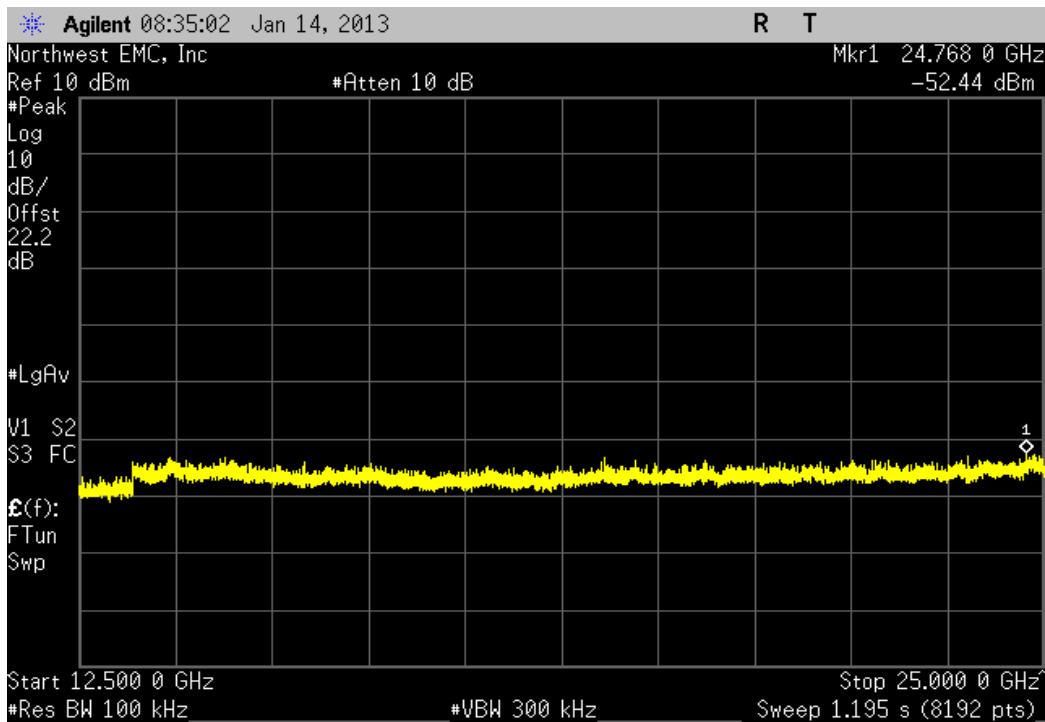
| BLE - Advertising, Mid Channel, 2426 MHz |       |       |        |
|--|-------|-------|--------|
| Frequency Range                          | Value | Limit | Result |
| Fundamental                              | N/A   | N/A   | N/A    |



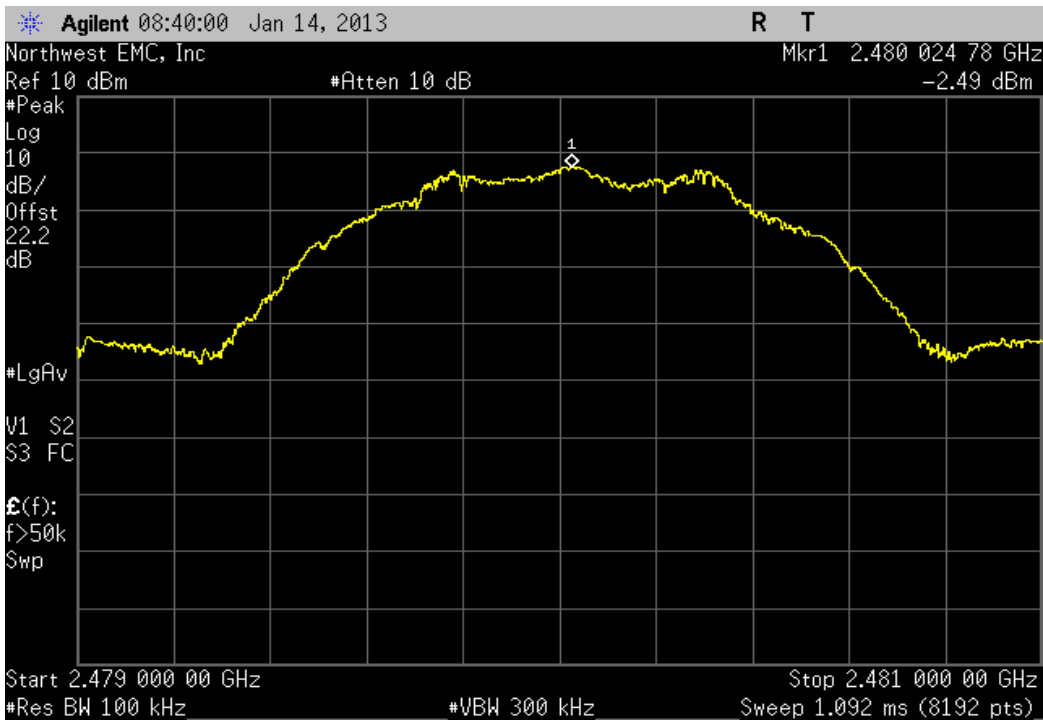
| BLE - Advertising, Mid Channel, 2426 MHz |            |           |        |
|--|------------|-----------|--------|
| Frequency Range                          | Value      | Limit     | Result |
| 30 MHz - 12.5 GHz                        | -35.16 dBc | ≤ -20 dBc | Pass   |



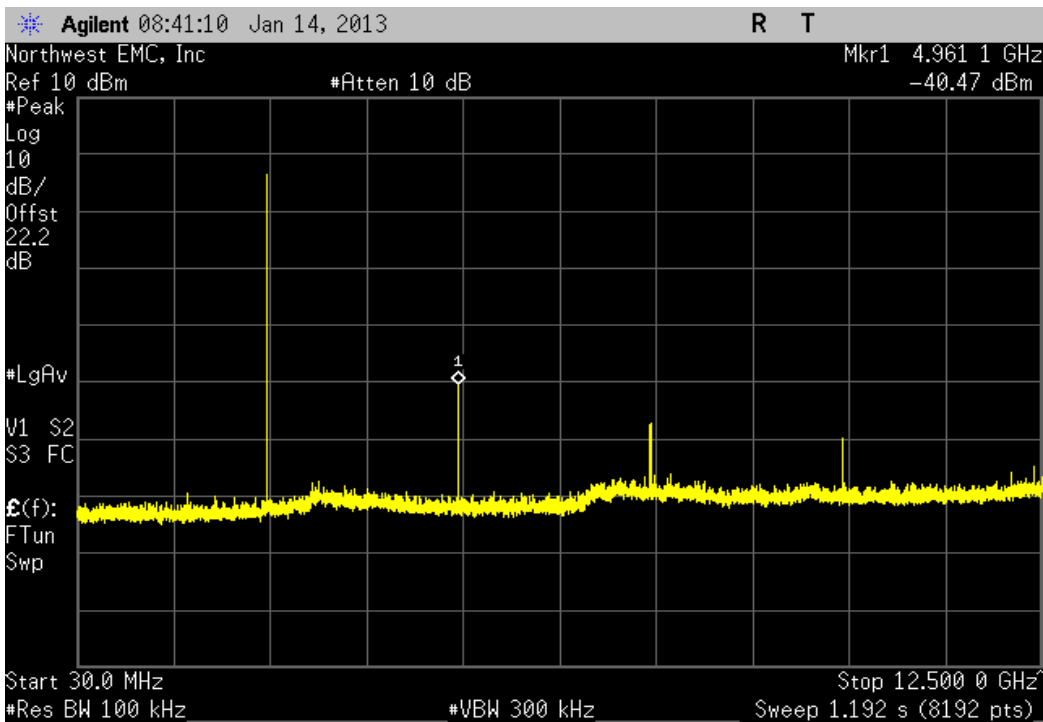
| BLE - Advertising, Mid Channel, 2426 MHz |            |           |        |
|--|------------|-----------|--------|
| Frequency Range                          | Value      | Limit     | Result |
| 12.5 GHz - 25 GHz                        | -49.34 dBc | ≤ -20 dBc | Pass   |



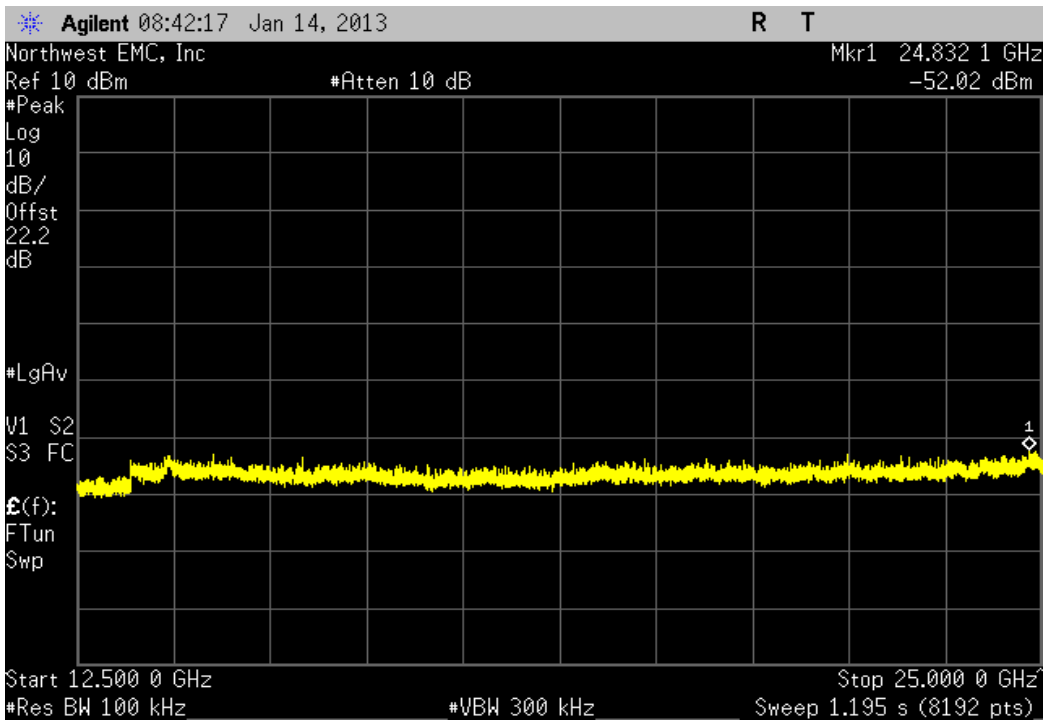
| BLE - Advertising, High Channel, 2480 MHz |       |       |        |  |
|---|-------|-------|--------|--|
| Frequency Range                           | Value | Limit | Result |  |
| Fundamental                               | N/A   | N/A   | N/A    |  |



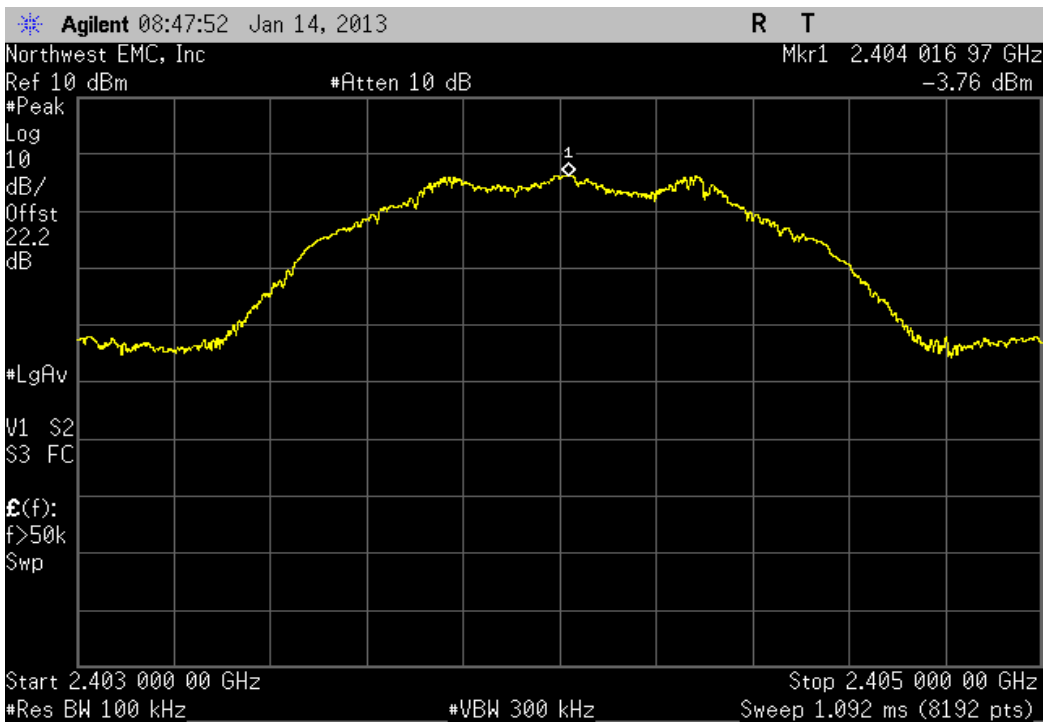
| BLE - Advertising, High Channel, 2480 MHz |            |           |        |  |
|---|------------|-----------|--------|--|
| Frequency Range                           | Value      | Limit     | Result |  |
| 30 MHz - 12.5 GHz                         | -37.98 dBc | ≤ -20 dBc | Pass   |  |



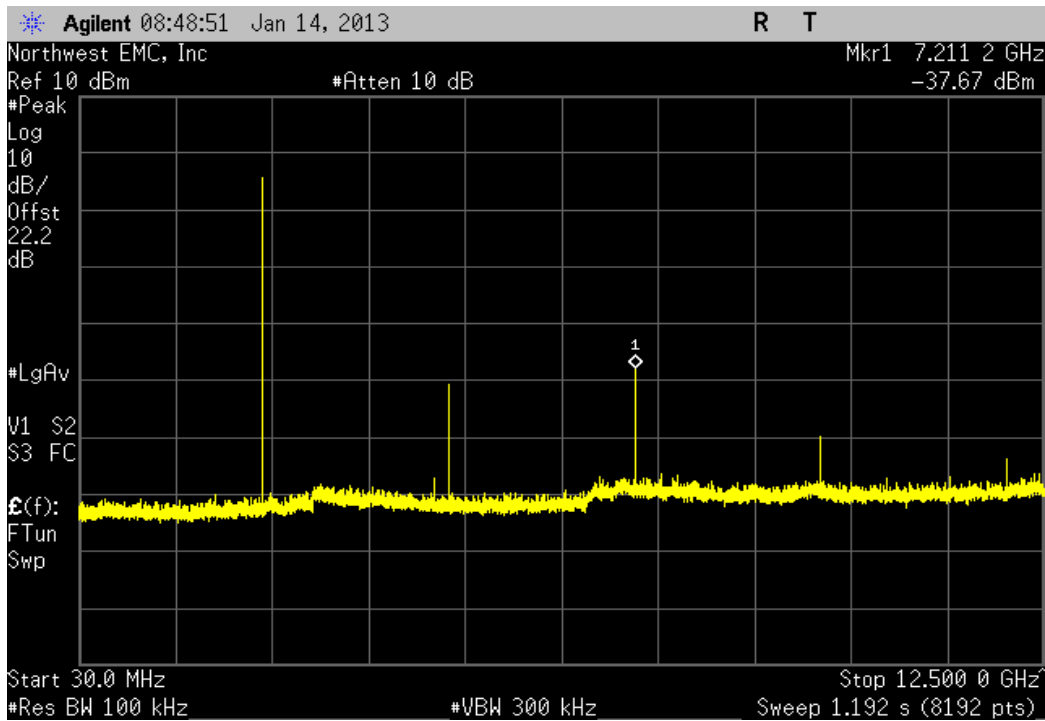
| BLE - Advertising, High Channel, 2480 MHz |            |           |        |
|---|------------|-----------|--------|
| Frequency Range                           | Value      | Limit     | Result |
| 12.5 GHz - 25 GHz                         | -49.53 dBc | ≤ -20 dBc | Pass   |



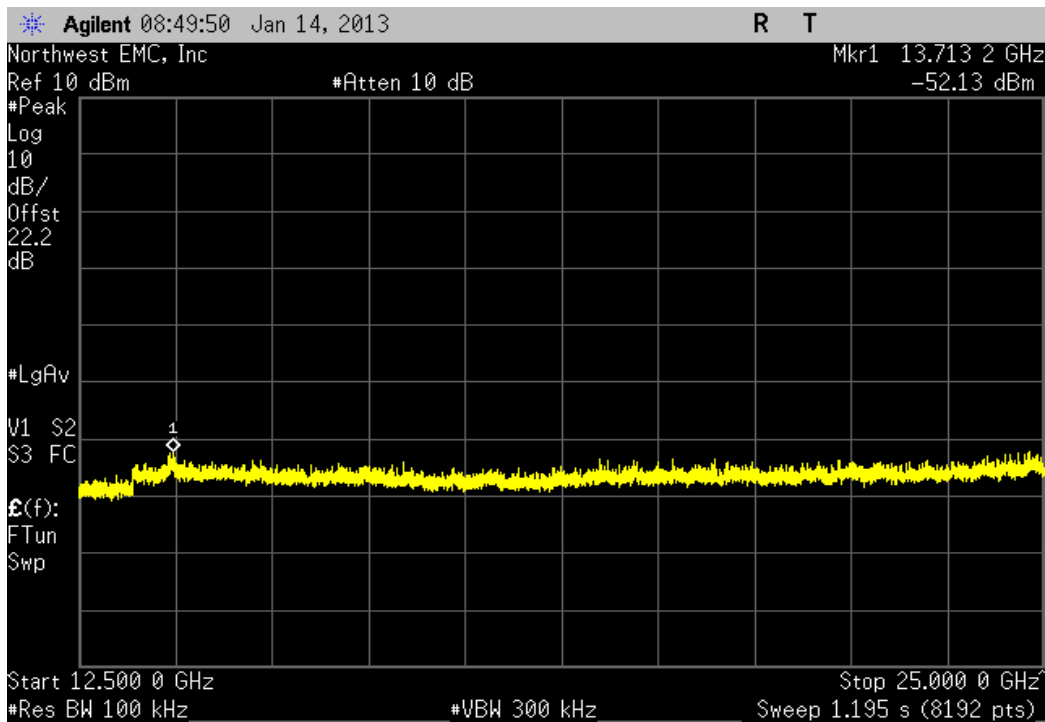
| BLE - Data, Low Channel, 2404 MHz |       |       |        |
|-----------------------------------|-------|-------|--------|
| Frequency Range                   | Value | Limit | Result |
| Fundamental                       | N/A   | N/A   | N/A    |



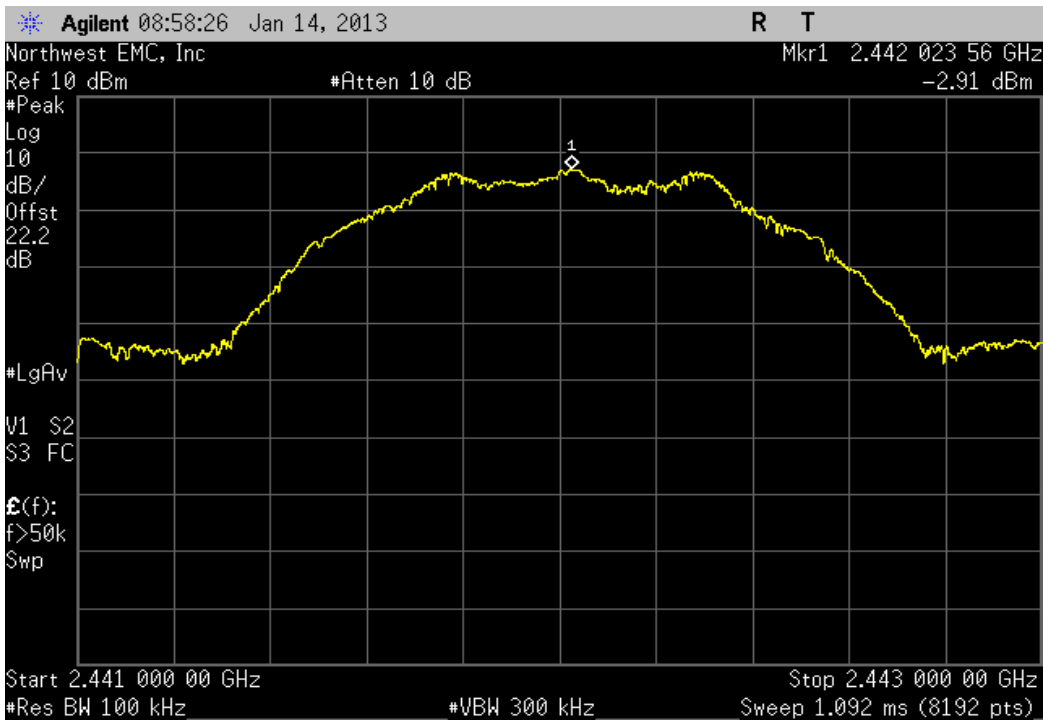
| BLE - Data, Low Channel, 2404 MHz |            |           |        |
|-----------------------------------|------------|-----------|--------|
| Frequency Range                   | Value      | Limit     | Result |
| 30 MHz - 12.5 GHz                 | -33.91 dBc | ≤ -20 dBc | Pass   |



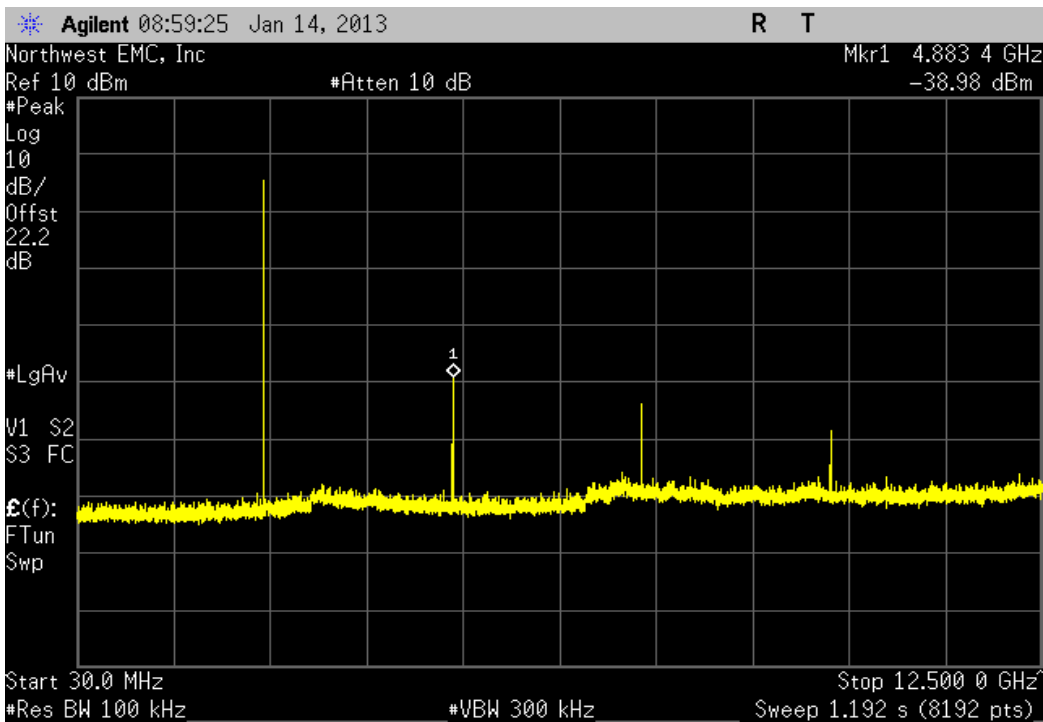
| BLE - Data, Low Channel, 2404 MHz |            |           |        |
|-----------------------------------|------------|-----------|--------|
| Frequency Range                   | Value      | Limit     | Result |
| 12.5 GHz - 25 GHz                 | -48.37 dBc | ≤ -20 dBc | Pass   |



| BLE - Data, Mid Channel, 2442 MHz |  |       |       |        |
|-----------------------------------|--|-------|-------|--------|
| Frequency Range                   |  | Value | Limit | Result |
| Fundamental                       |  | N/A   | N/A   | N/A    |

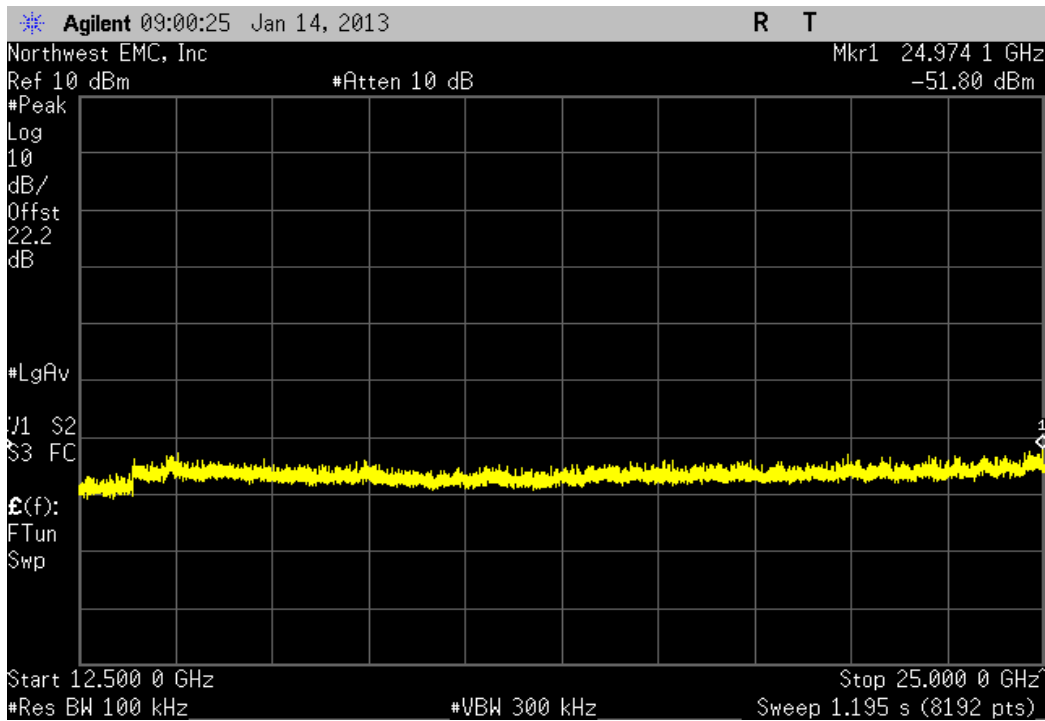


| BLE - Data, Mid Channel, 2442 MHz |  |            |           |        |
|-----------------------------------|--|------------|-----------|--------|
| Frequency Range                   |  | Value      | Limit     | Result |
| 30 MHz - 12.5 GHz                 |  | -36.07 dBc | ≤ -20 dBc | Pass   |

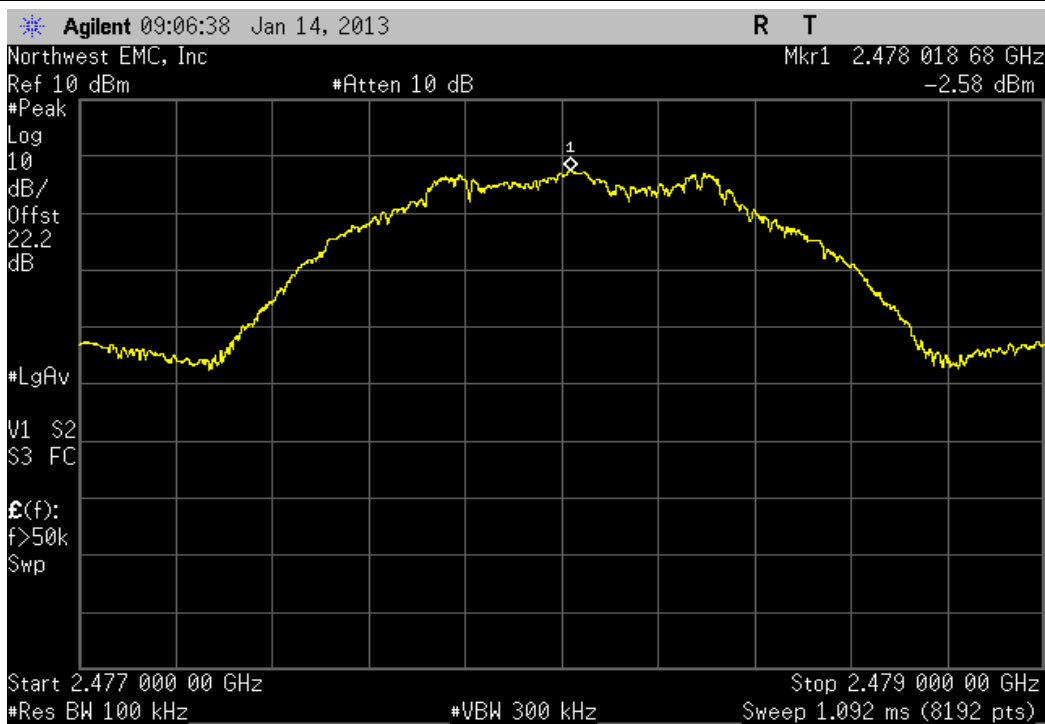




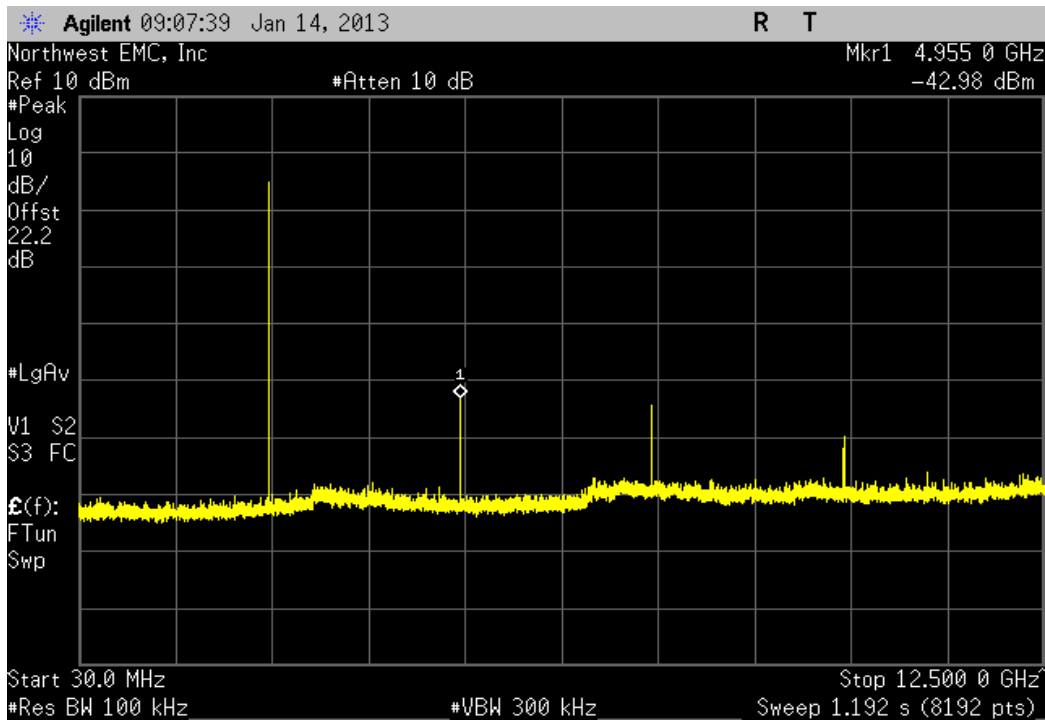
| BLE - Data, Mid Channel, 2442 MHz |            |           |        |
|-----------------------------------|------------|-----------|--------|
| Frequency Range                   | Value      | Limit     | Result |
| 12.5 GHz - 25 GHz                 | -48.89 dBc | ≤ -20 dBc | Pass   |



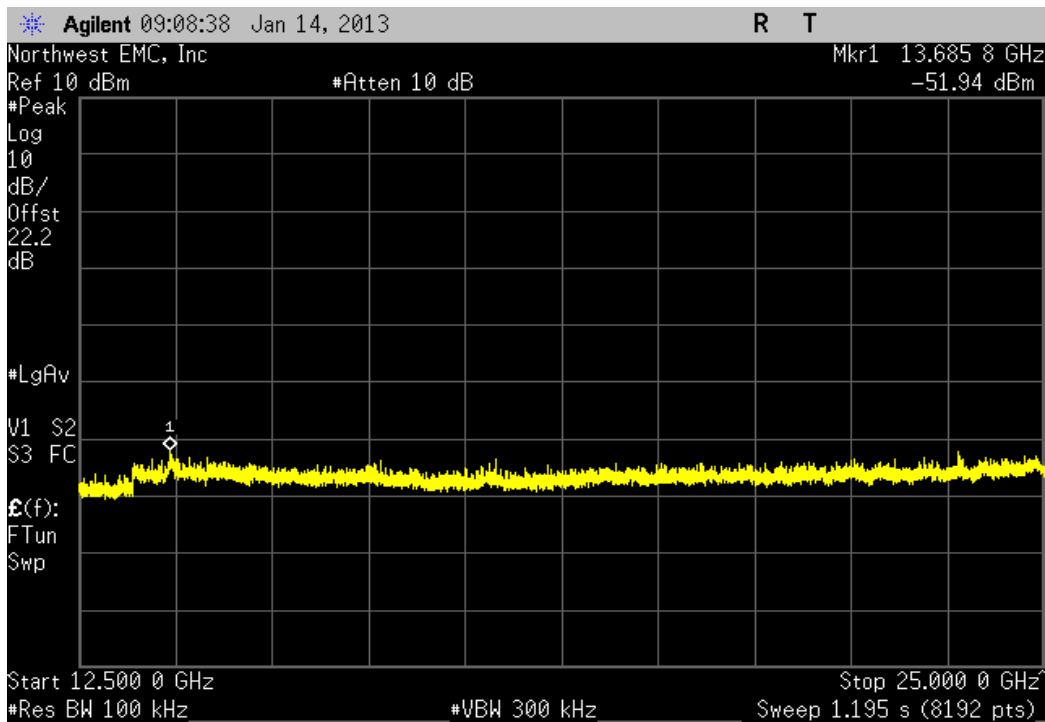
| BLE - Data, High Channel, 2478 MHz |       |       |        |
|------------------------------------|-------|-------|--------|
| Frequency Range                    | Value | Limit | Result |
| Fundamental                        | N/A   | N/A   | N/A    |



| BLE - Data, High Channel, 2478 MHz |           |           |        |  |
|------------------------------------|-----------|-----------|--------|--|
| Frequency Range                    | Value     | Limit     | Result |  |
| 30 MHz - 12.5 GHz                  | -40.4 dBc | ≤ -20 dBc | Pass   |  |



| BLE - Data, High Channel, 2478 MHz |            |           |        |  |
|------------------------------------|------------|-----------|--------|--|
| Frequency Range                    | Value      | Limit     | Result |  |
| 12.5 GHz - 25 GHz                  | -49.36 dBc | ≤ -20 dBc | Pass   |  |



## Power Spectral Density

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

### TEST EQUIPMENT

| Description              | Manufacturer       | Model    | ID  | Last Cal. | Interval |
|--------------------------|--------------------|----------|-----|-----------|----------|
| Attenuator - 20db, 'SMA' | SM Electronics     | SA26B-20 | RFW | 4/19/2012 | 12       |
| 40 GHz DC block          | Fairview Microwave | SD3379   | AMI | 10/5/2012 | 12       |
| Signal Generator MXG     | Agilent            | N5183A   | TIK | 6/7/2012  | 36       |
| Spectrum Analyzer        | Agilent            | E4440A   | AAX | 5/15/2012 | 24       |

### TEST DESCRIPTION

The maximum power spectral density measurements were measured with the EUT set to the required transmit frequencies in each band. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the lowest, middle, and maximum data rate for each modulation type available.

Per the procedure outlined in FCC KDB 558074 D01 DTS Measurement Section 5.3.1, the spectrum analyzer was used as follows:

- RBW = 100 kHz
- VBW = 300 kHz
- Detector = Peak (to match method used for power measurement)
- Trace = Max hold

The observed power level is then scaled to an equivalent value in 3 kHz by adding a Bandwidth Correction Factor (BWCF) where:

$$BWCF = 10 \cdot \text{LOG} (3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$$

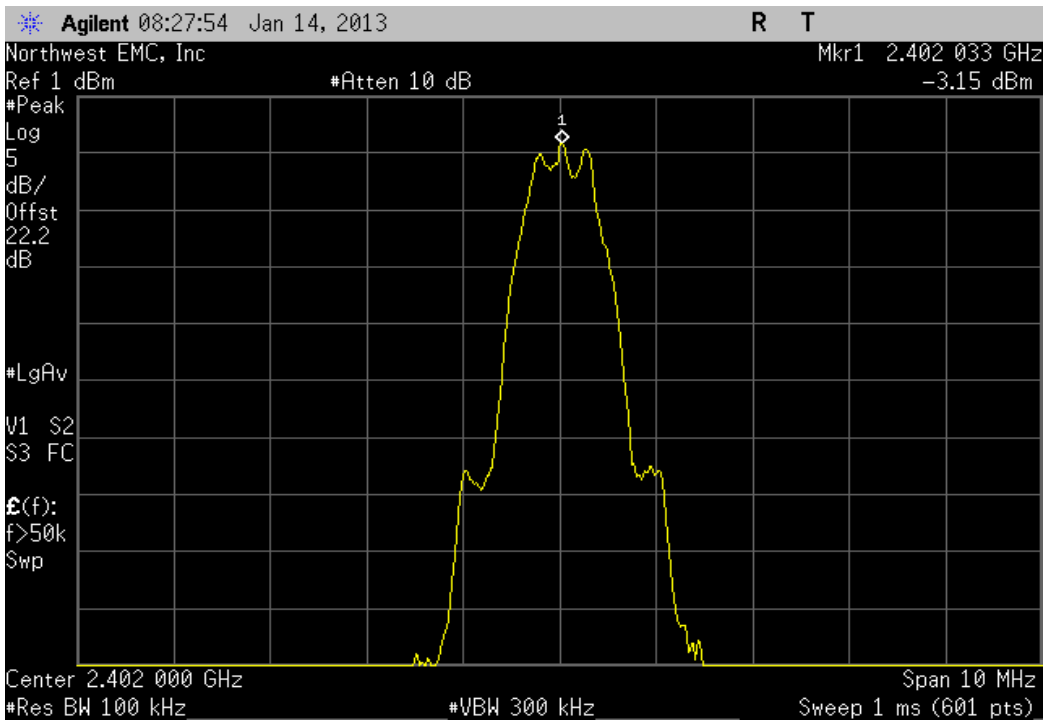


Power Spectral Density

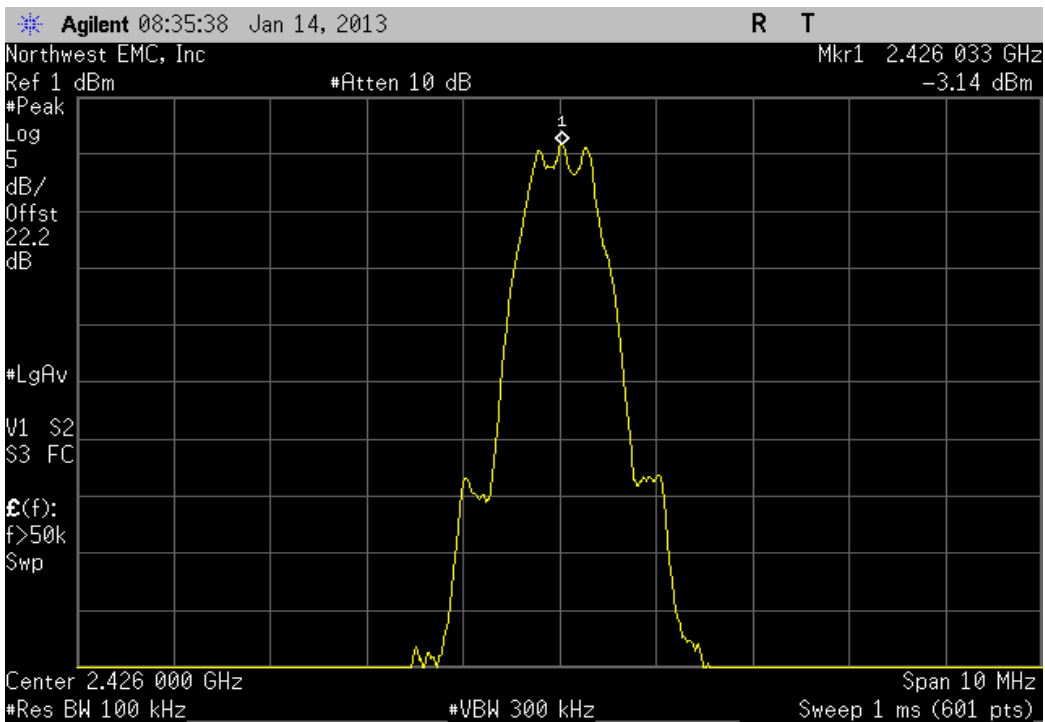
XMit 2012.09.20  
PsaTx 2013.01.10

|                                      |                        |                              |                   |
|--------------------------------------|------------------------|------------------------------|-------------------|
| EUT: 24HALOXF13                      |                        | Work Order: STAK0027         |                   |
| Serial Number: 12826579              |                        | Date: 01/14/13               |                   |
| Customer: Starkey Laboratories, Inc. |                        | Temperature: 23.4°C          |                   |
| Attendees: Larry McNabb              |                        | Humidity: 12%                |                   |
| Project: None                        |                        | Barometric Pres.: 1030       |                   |
| Tested by: Trevor Buls               |                        | Power: Battery               |                   |
|                                      |                        | Job Site: MN08               |                   |
| TEST SPECIFICATIONS                  |                        | Test Method                  |                   |
| FCC 15.247:2013                      |                        | ANSI C63.10:2009             |                   |
| COMMENTS                             |                        |                              |                   |
| None                                 |                        |                              |                   |
| DEVIATIONS FROM TEST STANDARD        |                        |                              |                   |
| None                                 |                        |                              |                   |
| Configuration #                      | 1                      | Signature <i>Trevor Buls</i> |                   |
|                                      |                        | Value<br>dBm/100kHz          | Limit<br>dBm/3kHz |
| BLE - Advertising                    |                        |                              |                   |
|                                      | Low Channel, 2402 MHz  | -3.153                       | 8                 |
|                                      | Mid Channel, 2426 MHz  | -3.145                       | 8                 |
|                                      | High Channel, 2480 MHz | -2.17                        | 8                 |
| BLE - Data                           |                        |                              |                   |
|                                      | Low Channel, 2404 MHz  | -3.156                       | 8                 |
|                                      | Mid Channel, 2442 MHz  | -2.987                       | 8                 |
|                                      | High Channel, 2478 MHz | -2.199                       | 8                 |

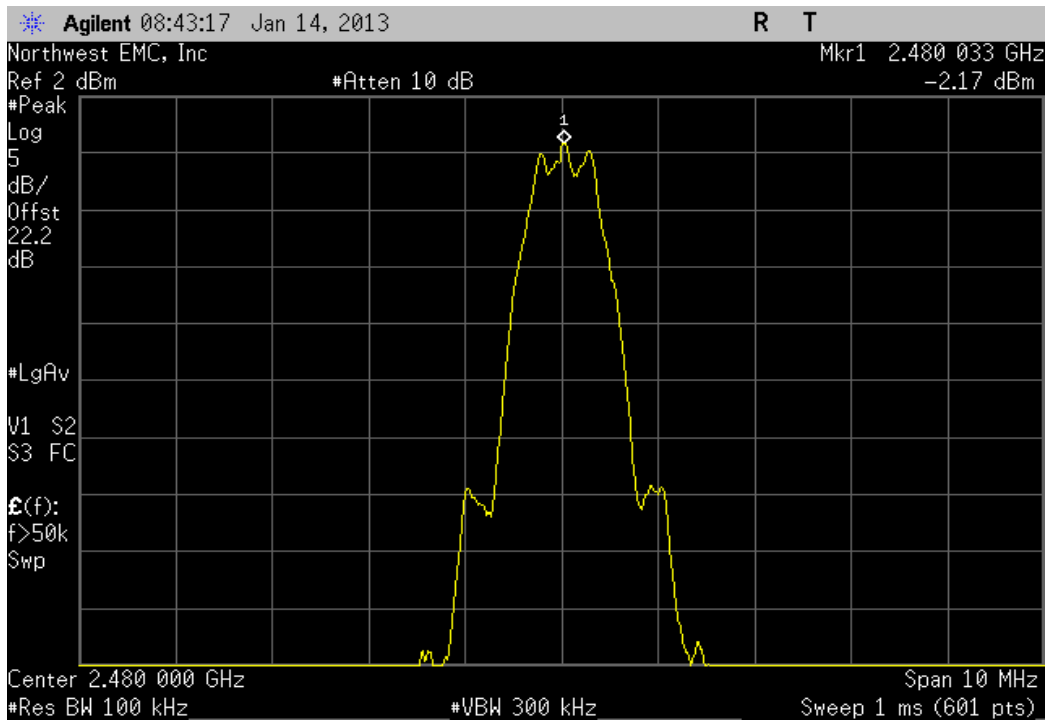
| BLE - Advertising, Low Channel, 2402 MHz |            |             |          |       |        |
|--|------------|-------------|----------|-------|--------|
| Value                                    | dBm/100kHz | To dBm/3kHz | Value    | Limit | Result |
|  |            |             | dBm/3kHz |       |        |
|  | -3.153     | -15.2       | -18.353  | 8     | Pass   |



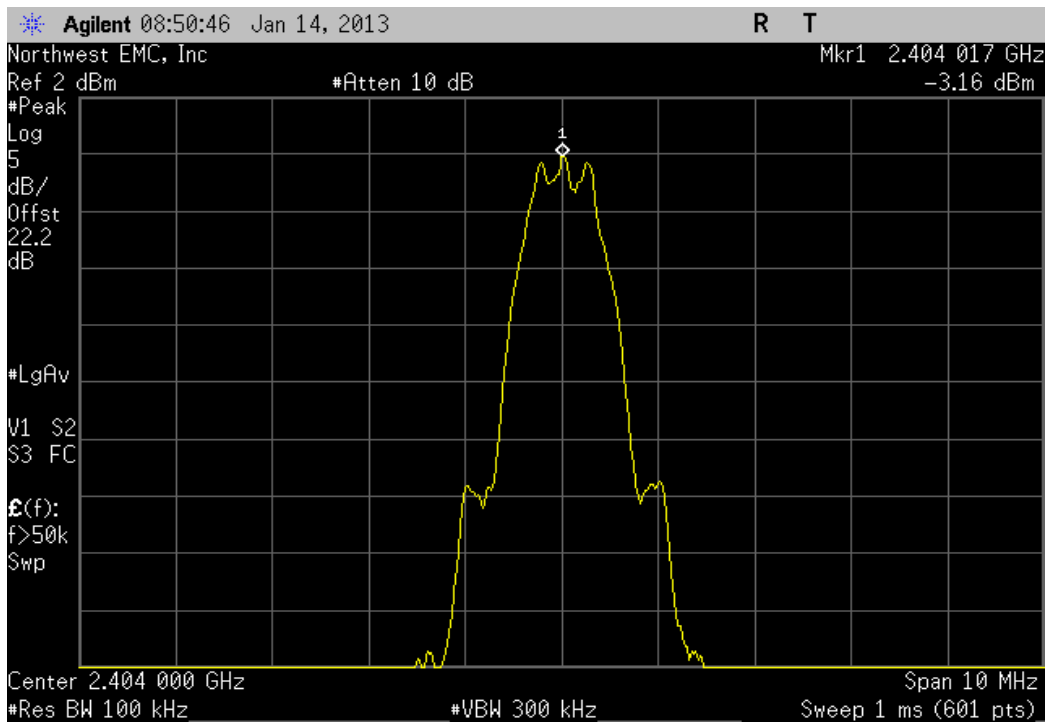
| BLE - Advertising, Mid Channel, 2426 MHz |            |             |          |       |        |
|--|------------|-------------|----------|-------|--------|
| Value                                    | dBm/100kHz | To dBm/3kHz | Value    | Limit | Result |
|  |            |             | dBm/3kHz |       |        |
|  | -3.145     | -15.2       | -18.345  | 8     | Pass   |



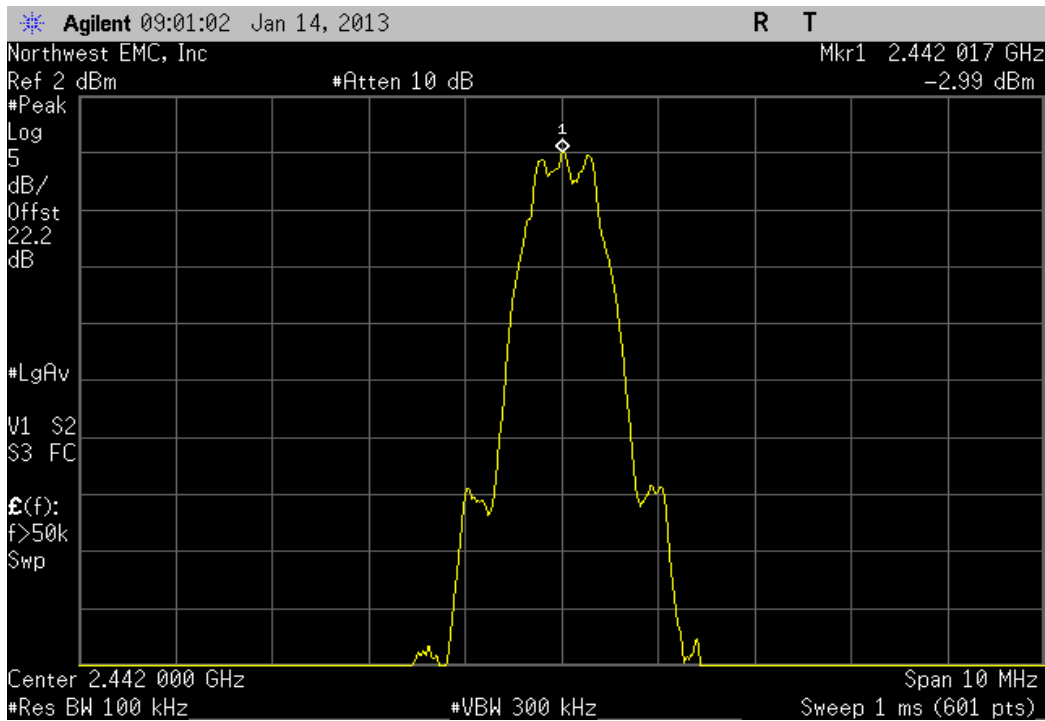
| BLE - Advertising, High Channel, 2480 MHz |            |             |          |       |        |
|---|------------|-------------|----------|-------|--------|
| Value                                     | dBm/100kHz | To dBm/3kHz | Value    | Limit | Result |
|   |            |             | dBm/3kHz |       |        |
|   | -2.17      | -15.2       | -17.37   | 8     | Pass   |



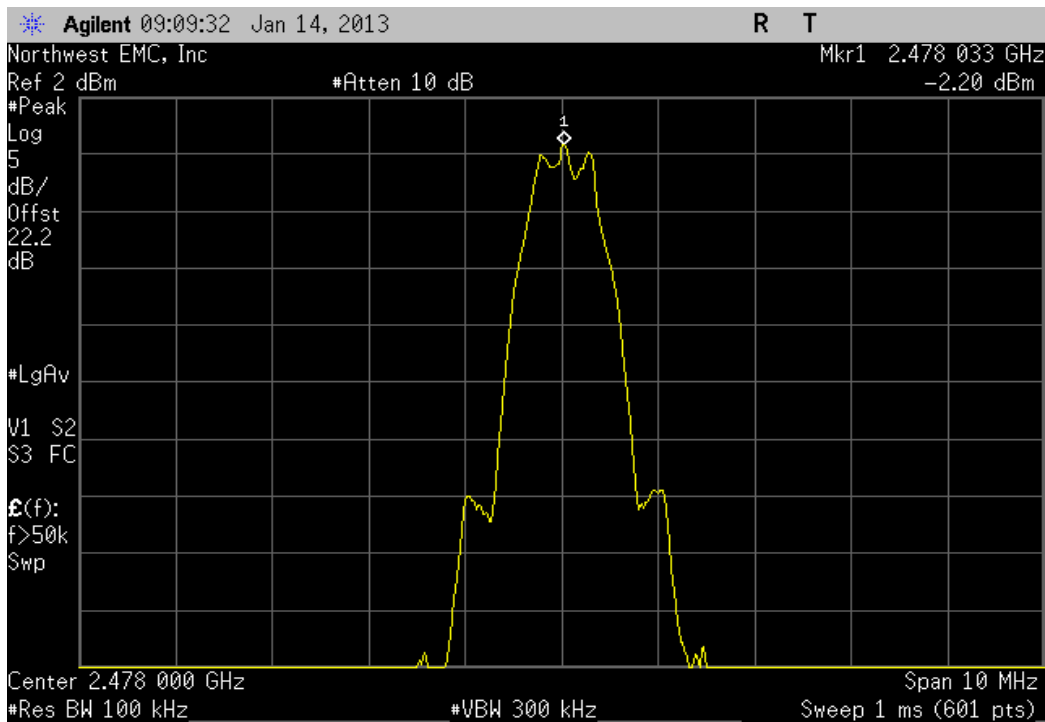
| BLE - Data, Low Channel, 2404 MHz |            |             |          |       |        |
|-----------------------------------|------------|-------------|----------|-------|--------|
| Value                             | dBm/100kHz | To dBm/3kHz | Value    | Limit | Result |
|                                   |            |             | dBm/3kHz |       |        |
|                                   | -3.156     | -15.2       | -18.356  | 8     | Pass   |



| BLE - Data, Mid Channel, 2442 MHz |        |            |             |         |       |
|-----------------------------------|--------|------------|-------------|---------|-------|
|                                   | Value  | dBm/100kHz | To dBm/3kHz | Value   | Limit |
|                                   |        |            |             |         |       |
|                                   | -2.987 |            | -15.2       | -18.187 | 8     |
|                                   |        |            |             |         | Pass  |



| BLE - Data, High Channel, 2478 MHz |        |            |             |         |       |
|------------------------------------|--------|------------|-------------|---------|-------|
|                                    | Value  | dBm/100kHz | To dBm/3kHz | Value   | Limit |
|                                    |        |            |             |         |       |
|                                    | -2.199 |            | -15.2       | -17.399 | 8     |
|                                    |        |            |             |         | Pass  |



## Spurious Radiated Emissions

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

### MODES OF OPERATION

Transmitting BLE, Low, Mid, High, Chan: Data: 2402, 2426, 2480 MHz, Advertising: 2404, 2442, 2478 MHz (See Comments)

### POWER SETTINGS INVESTIGATED

Battery

### CONFIGURATIONS INVESTIGATED

STAK0027 - 2

### FREQUENCY RANGE INVESTIGATED

|                 |        |                |        |
|-----------------|--------|----------------|--------|
| Start Frequency | 30 MHz | Stop Frequency | 25 GHz |
|-----------------|--------|----------------|--------|

### SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

### TEST EQUIPMENT

| Description              | Manufacturer    | Model                             | ID  | Last Cal.  | Interval |
|--------------------------|-----------------|-----------------------------------|-----|------------|----------|
| High Pass Filter         | Micro-Tronics   | HPM50111                          | HGQ | 6/1/2012   | 24 mo    |
| Low Pass Filter          | Micro-Tronics   | LPM50004                          | HGK | 5/31/2012  | 24 mo    |
| Attenuator, 20 dB, 'SMA' | SM Electronics  | SA6-20                            | REO | 5/31/2012  | 12 mo    |
| MN05 Cables              | N/A             | 18-26GHz Standard Gain Horn Cable | MNP | 10/5/2012  | 12 mo    |
| Pre-Amplifier            | Miteq           | JSD4-18002600-26-8P               | APU | 10/5/2012  | 12 mo    |
| Antenna, Horn            | ETS             | 3160-09                           | AHG | NCR        | 0 mo     |
| MN05 Cables              | ESM Cable Corp. | Standard Gain Horn Cables         | MNJ | 5/30/2012  | 12 mo    |
| Antenna, Horn            | ETS Lindgren    | 3160-08                           | AIQ | NCR        | 0 mo     |
| Antenna, Horn            | ETS             | 3160-07                           | AXP | NCR        | 0 mo     |
| Pre-Amplifier            | Miteq           | AMF-6F-12001800-30-10P            | AVW | 5/30/2012  | 12 mo    |
| Pre-Amplifier            | Miteq           | AMF-6F-08001200-30-10P            | AVV | 5/30/2012  | 12 mo    |
| Pre-Amplifier            | Miteq           | AMF-3D-00100800-32-13P            | AVX | 5/30/2012  | 12 mo    |
| MN05 Cables              | ESM Cable Corp. | Double Ridge Guide Horn Cables    | MNI | 5/30/2012  | 12 mo    |
| Antenna, Horn (DRG)      | ETS Lindgren    | 3115                              | AIP | 6/29/2011  | 24 mo    |
| Pre-Amplifier            | Miteq           | AM-1616-1000                      | PAD | 8/28/2012  | 12 mo    |
| MN05 Cables              | ESM Cable Corp. | Bilog Cables                      | MNH | 5/31/2012  | 12 mo    |
| Antenna, Bilog           | Teseg           | CBL 6141B                         | AYD | 12/17/2012 | 12 mo    |
| Spectrum Analyzer        | Agilent         | E4446A                            | AAT | 6/28/2012  | 24 mo    |

### MEASUREMENT BANDWIDTHS

| Frequency Range (MHz) | Peak Data (kHz) | Quasi-Peak Data (kHz) | Average Data (kHz) |
|-----------------------|-----------------|-----------------------|--------------------|
| 0.01 - 0.15           | 1.0             | 0.2                   | 0.2                |
| 0.15 - 30.0           | 10.0            | 9.0                   | 9.0                |
| 30.0 - 1000           | 100.0           | 120.0                 | 120.0              |
| Above 1000            | 1000.0          | N/A                   | 1000.0             |

### TEST DESCRIPTION

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.



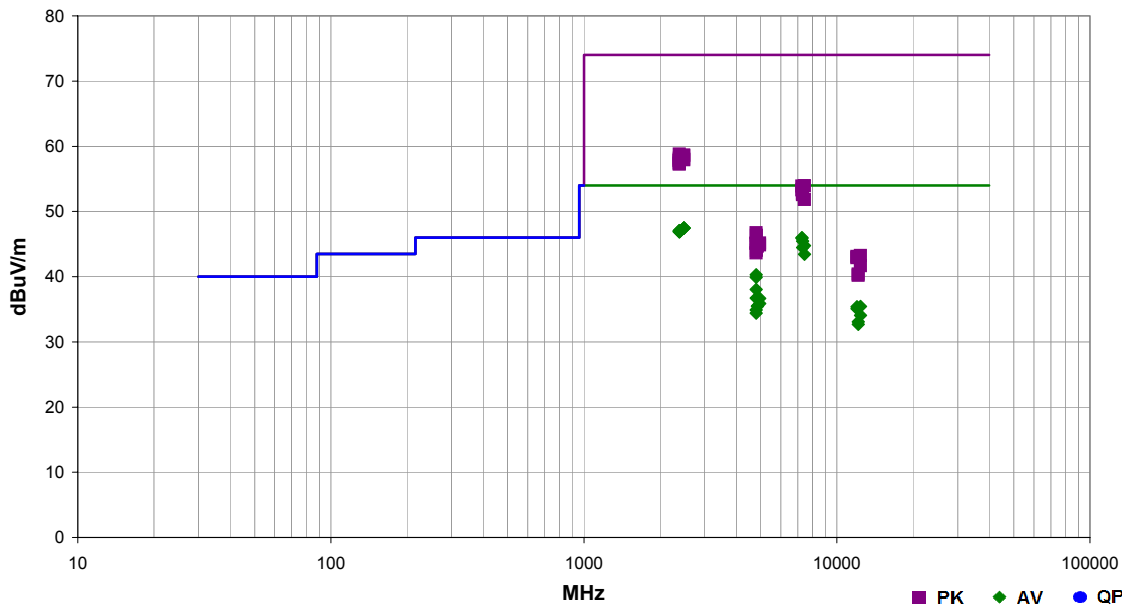


# Spurious Radiated Emissions

PSA-ESCI 2012.12.14  
PSA-ESCI Version 2011.12.21

|                 |   |                   |             |                    |
|-----------------|---|-------------------|-------------|--------------------|
| Work Order:     | STAK0027  | Date:             | 01/14/13    | <i>Trevor Buls</i> |
| Project:        | None  | Temperature:      | 23.5 °C     |                    |
| Job Site:       | MN05  | Humidity:         | 11.6% RH    |                    |
| Serial Number:  | 12826583  | Barometric Pres.: | 1031.1 mbar |                    |
| EUT:            |   | 24HALOXF13        |             |                    |
| Configuration:  | 2   |                   |             |                    |
| Customer:       | Starkey Laboratories, Inc.  |                   |             |                    |
| Attendees:      | Larry McNabb  |                   |             |                    |
| EUT Power:      | Battery   |                   |             |                    |
| Operating Mode: | Transmitting BLE, Low, Mid, High Chan: Data: 2402, 2426, 2480 MHz, Advertising: 2404, 2442, 2478 MHz (See Comments) |                   |             |                    |
| Deviations:     | None  |                   |             |                    |
| Comments:       | None  |                   |             |                    |

| Test Specifications | Test Method      |                   |   |                   |      |         |      |
|---------------------|------------------|-------------------|---|-------------------|------|---------|------|
| FCC 15.247:2013     | ANSI C63.10:2009 |                   |   |                   |      |         |      |
| Run #               | 1                | Test Distance (m) | 3 | Antenna Height(s) | 1-4m | Results | Pass |



| Freq (MHz) | Amplitude (dBuV) | Factor (dB) | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments                          |
|------------|------------------|-------------|-------------------------|-------------------|------------------------|---------------------------|--------------------------|----------|--------------------------|-------------------|----------------------|------------------------|-----------------------------------|
| 2487.925   | 31.2             | -3.7        | 1.0                     | 100.0             | 3.0                    | 20.0                      | Vert                     | AV       | 0.0                      | 47.5              | 54.0                 | -6.5                   | EUT Horizontal, BLE AV, High CH   |
| 2485.617   | 31.2             | -3.8        | 2.4                     | 232.0             | 3.0                    | 20.0                      | Horz                     | AV       | 0.0                      | 47.4              | 54.0                 | -6.6                   | EUT Vertical, BLE AV, High CH     |
| 2484.717   | 31.2             | -3.8        | 3.2                     | 320.0             | 3.0                    | 20.0                      | Horz                     | AV       | 0.0                      | 47.4              | 54.0                 | -6.6                   | EUT Vertical, BLE DATA, High CH   |
| 2484.708   | 31.2             | -3.8        | 3.5                     | 111.0             | 3.0                    | 20.0                      | Vert                     | AV       | 0.0                      | 47.4              | 54.0                 | -6.6                   | EUT Horizontal, BLE DATA, High CH |
| 2386.225   | 31.1             | -4.0        | 1.0                     | 345.0             | 3.0                    | 20.0                      | Horz                     | AV       | 0.0                      | 47.1              | 54.0                 | -6.9                   | EUT Horizontal, BLE AV, Low CH    |
| 2386.717   | 31.1             | -4.0        | 1.1                     | 107.0             | 3.0                    | 20.0                      | Horz                     | AV       | 0.0                      | 47.1              | 54.0                 | -6.9                   | EUT Vertical, BLE AV, Low CH      |
| 2385.850   | 31.0             | -4.0        | 1.0                     | 215.0             | 3.0                    | 20.0                      | Horz                     | AV       | 0.0                      | 47.0              | 54.0                 | -7.0                   | EUT Vertical, BLE DATA, Low CH    |
| 2386.350   | 31.0             | -4.0        | 1.0                     | 36.0              | 3.0                    | 20.0                      | Horz                     | AV       | 0.0                      | 47.0              | 54.0                 | -7.0                   | EUT on Side, BLE AV, Low CH       |
| 2386.450   | 31.0             | -4.0        | 1.0                     | 127.0             | 3.0                    | 20.0                      | Vert                     | AV       | 0.0                      | 47.0              | 54.0                 | -7.0                   | EUT Horizontal, BLE DATA, Low CH  |
| 2387.117   | 31.0             | -4.0        | 1.4                     | 84.0              | 3.0                    | 20.0                      | Vert                     | AV       | 0.0                      | 47.0              | 54.0                 | -7.0                   | EUT on Side, BLE AV, Low CH       |
| 2385.417   | 30.9             | -4.0        | 1.0                     | 94.0              | 3.0                    | 20.0                      | Vert                     | AV       | 0.0                      | 46.9              | 54.0                 | -7.1                   | EUT Horizontal, BLE AV, Low CH    |
| 2387.775   | 30.9             | -4.0        | 1.0                     | 267.0             | 3.0                    | 20.0                      | Vert                     | AV       | 0.0                      | 46.9              | 54.0                 | -7.1                   | EUT Vertical, BLE AV, Low CH      |
| 7277.492   | 34.2             | 11.8        | 1.0                     | 134.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 46.0              | 54.0                 | -8.0                   | EUT Horizontal, BLE AV, Mid CH    |
| 7277.500   | 34.1             | 11.8        | 1.6                     | 84.0              | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 45.9              | 54.0                 | -8.1                   | EUT Vertical, BLE AV, Mid CH      |
| 7325.383   | 33.4             | 12.1        | 1.0                     | 312.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 45.5              | 54.0                 | -8.5                   | EUT Horizontal, BLE DATA, Mid CH  |
| 7439.600   | 32.1             | 12.6        | 1.5                     | 57.0              | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 44.7              | 54.0                 | -9.3                   | EUT Vertical, BLE AV, High CH     |
| 7325.542   | 32.4             | 12.1        | 1.8                     | 113.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 44.5              | 54.0                 | -9.5                   | EUT Vertical, BLE DATA, Mid CH    |
| 7439.625   | 30.8             | 12.6        | 1.0                     | 323.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 43.4              | 54.0                 | -10.6                  | EUT Horizontal, BLE AV, High CH   |
| 4804.050   | 36.3             | 4.0         | 1.0                     | 90.0              | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 40.3              | 54.0                 | -13.7                  | EUT Vertical, BLE AV, Low CH      |
| 4803.992   | 35.9             | 4.0         | 1.0                     | 313.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 39.9              | 54.0                 | -14.1                  | EUT Horizontal, BLE AV, Low CH    |
| 2385.067   | 42.8             | -4.0        | 1.0                     | 267.0             | 3.0                    | 20.0                      | Vert                     | PK       | 0.0                      | 58.8              | 74.0                 | -15.2                  | EUT Vertical, BLE AV, Low CH      |
| 2487.000   | 42.4             | -3.8        | 2.4                     | 232.0             | 3.0                    | 20.0                      | Horz                     | PK       | 0.0                      | 58.6              | 74.0                 | -15.4                  | EUT Vertical, BLE AV, High CH     |
| 2483.633   | 42.3             | -3.8        | 3.5                     | 111.0             | 3.0                    | 20.0                      | Vert                     | PK       | 0.0                      | 58.5              | 74.0                 | -15.5                  | EUT Horizontal, BLE DATA, High CH |
| 2386.958   | 42.2             | -4.0        | 1.0                     | 215.0             | 3.0                    | 20.0                      | Horz                     | PK       | 0.0                      | 58.2              | 74.0                 | -15.8                  | EUT Vertical, BLE DATA, Low CH    |
| 2484.017   | 41.8             | -3.8        | 1.0                     | 100.0             | 3.0                    | 20.0                      | Vert                     | PK       | 0.0                      | 58.0              | 74.0                 | -16.0                  | EUT Horizontal, BLE AV, High CH   |
| 4804.017   | 34.0             | 4.0         | 1.0                     | 316.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 38.0              | 54.0                 | -16.0                  | EUT on Side, BLE AV, Low CH       |
| 2484.417   | 41.7             | -3.8        | 3.2                     | 320.0             | 3.0                    | 20.0                      | Horz                     | PK       | 0.0                      | 57.9              | 74.0                 | -16.1                  | EUT Vertical, BLE DATA, High CH   |

| Freq (MHz) | Amplitude (dBuV) | Factor (dB) | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/ Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments                         |
|------------|------------------|-------------|-------------------------|-------------------|------------------------|---------------------------|---------------------------|----------|--------------------------|-------------------|----------------------|------------------------|----------------------------------|
| 2385.625   | 41.9             | -4.0        | 1.4                     | 84.0              | 3.0                    | 20.0                      | Vert                      | PK       | 0.0                      | 57.9              | 74.0                 | -16.1                  | EUT on Side, BLE AV, Low CH      |
| 2387.967   | 41.9             | -4.0        | 1.0                     | 127.0             | 3.0                    | 20.0                      | Vert                      | PK       | 0.0                      | 57.9              | 74.0                 | -16.1                  | EUT Horizontal, BLE DATA, Low CH |
| 2387.358   | 41.8             | -4.0        | 1.0                     | 94.0              | 3.0                    | 20.0                      | Vert                      | PK       | 0.0                      | 57.8              | 74.0                 | -16.2                  | EUT Horizontal, BLE AV, Low CH   |
| 2385.033   | 41.5             | -4.0        | 1.0                     | 36.0              | 3.0                    | 20.0                      | Horz                      | PK       | 0.0                      | 57.5              | 74.0                 | -16.5                  | EUT on Side, BLE AV, Low CH      |
| 2385.317   | 41.3             | -4.0        | 1.1                     | 107.0             | 3.0                    | 20.0                      | Horz                      | PK       | 0.0                      | 57.3              | 74.0                 | -16.7                  | EUT Vertical, BLE AV, Low CH     |
| 2386.133   | 41.3             | -4.0        | 1.0                     | 345.0             | 3.0                    | 20.0                      | Horz                      | PK       | 0.0                      | 57.3              | 74.0                 | -16.7                  | EUT Horizontal, BLE AV, Low CH   |
| 4803.942   | 32.7             | 4.0         | 1.0                     | 56.0              | 3.0                    | 0.0                       | Horz                      | AV       | 0.0                      | 36.7              | 54.0                 | -17.3                  | EUT Horizontal, BLE AV, Low CH   |
| 4960.042   | 32.1             | 4.6         | 1.0                     | 113.0             | 3.0                    | 0.0                       | Horz                      | AV       | 0.0                      | 36.7              | 54.0                 | -17.3                  | EUT Vertical, BLE AV, High CH    |
| 4959.983   | 31.3             | 4.6         | 1.0                     | 275.0             | 3.0                    | 0.0                       | Vert                      | AV       | 0.0                      | 35.9              | 54.0                 | -18.1                  | EUT Horizontal, BLE AV, High CH  |
| 4852.150   | 31.3             | 4.2         | 1.0                     | 102.0             | 3.0                    | 0.0                       | Horz                      | AV       | 0.0                      | 35.5              | 54.0                 | -18.5                  | EUT Vertical, BLE AV, Mid CH     |
| 4852.108   | 31.3             | 4.2         | 1.0                     | 261.0             | 3.0                    | 0.0                       | Vert                      | AV       | 0.0                      | 35.5              | 54.0                 | -18.5                  | EUT Horizontal, BLE AV, Mid CH   |
| 12399.140  | 41.1             | -5.6        | 1.1                     | 320.0             | 3.0                    | 0.0                       | Horz                      | AV       | 0.0                      | 35.5              | 54.0                 | -18.5                  | EUT Vertical, BLE AV, High CH    |
| 12008.940  | 42.0             | -6.6        | 1.1                     | 92.0              | 3.0                    | 0.0                       | Horz                      | AV       | 0.0                      | 35.4              | 54.0                 | -18.6                  | EUT Vertical, BLE AV, Low CH     |
| 12008.960  | 41.7             | -6.6        | 1.2                     | 280.0             | 3.0                    | 0.0                       | Vert                      | AV       | 0.0                      | 35.1              | 54.0                 | -18.9                  | EUT Horizontal, BLE AV, Low CH   |
| 4803.933   | 30.9             | 4.0         | 1.0                     | 249.0             | 3.0                    | 0.0                       | Vert                      | AV       | 0.0                      | 34.9              | 54.0                 | -19.1                  | EUT Vertical, BLE AV, Low CH     |
| 4804.108   | 30.4             | 4.0         | 1.0                     | 260.0             | 3.0                    | 0.0                       | Vert                      | AV       | 0.0                      | 34.4              | 54.0                 | -19.6                  | EUT on Side, BLE AV, Low CH      |
| 12399.020  | 39.7             | -5.6        | 1.2                     | 271.0             | 3.0                    | 0.0                       | Vert                      | AV       | 0.0                      | 34.1              | 54.0                 | -19.9                  | EUT Horizontal, BLE AV, High CH  |
| 7440.842   | 41.3             | 12.7        | 1.5                     | 57.0              | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 54.0              | 74.0                 | -20.0                  | EUT Vertical, BLE AV, High CH    |
| 7278.958   | 42.1             | 11.8        | 1.6                     | 84.0              | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 53.9              | 74.0                 | -20.1                  | EUT Vertical, BLE AV, Mid CH     |
| 7277.400   | 41.5             | 11.8        | 1.0                     | 134.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 53.3              | 74.0                 | -20.7                  | EUT Horizontal, BLE AV, Mid CH   |
| 12129.020  | 39.4             | -6.3        | 1.2                     | 336.0             | 3.0                    | 0.0                       | Horz                      | AV       | 0.0                      | 33.1              | 54.0                 | -20.9                  | EUT Horizontal, BLE AV, Mid CH   |
| 7325.833   | 40.7             | 12.1        | 1.0                     | 312.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 52.8              | 74.0                 | -21.2                  | EUT Horizontal, BLE DATA, Mid CH |
| 12128.900  | 39.0             | -6.3        | 1.2                     | 276.0             | 3.0                    | 0.0                       | Vert                      | AV       | 0.0                      | 32.7              | 54.0                 | -21.3                  | EUT Vertical, BLE AV, Mid CH     |
| 7326.967   | 40.5             | 12.1        | 1.8                     | 113.0             | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 52.6              | 74.0                 | -21.4                  | EUT Vertical, BLE DATA, Mid CH   |
| 7439.650   | 39.2             | 12.6        | 1.0                     | 323.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 51.8              | 74.0                 | -22.2                  | EUT Horizontal, BLE AV, High CH  |
| 4804.092   | 42.7             | 4.0         | 1.0                     | 90.0              | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 46.7              | 74.0                 | -27.3                  | EUT Vertical, BLE AV, Low CH     |
| 4804.367   | 42.3             | 4.0         | 1.0                     | 313.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 46.3              | 74.0                 | -27.7                  | EUT Horizontal, BLE AV, Low CH   |
| 4960.400   | 40.6             | 4.6         | 1.0                     | 113.0             | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 45.2              | 74.0                 | -28.8                  | EUT Vertical, BLE AV, High CH    |
| 4803.758   | 41.1             | 4.0         | 1.0                     | 56.0              | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 45.1              | 74.0                 | -28.9                  | EUT Horizontal, BLE AV, Low CH   |
| 4803.550   | 41.1             | 4.0         | 1.0                     | 316.0             | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 45.1              | 74.0                 | -28.9                  | EUT on Side, BLE AV, Low CH      |
| 4852.308   | 40.8             | 4.2         | 1.0                     | 102.0             | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 45.0              | 74.0                 | -29.0                  | EUT Vertical, BLE AV, Mid CH     |
| 4960.617   | 40.3             | 4.6         | 1.0                     | 275.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 44.9              | 74.0                 | -29.1                  | EUT Horizontal, BLE AV, High CH  |
| 4851.875   | 40.5             | 4.2         | 1.0                     | 261.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 44.7              | 74.0                 | -29.3                  | EUT Horizontal, BLE AV, Mid CH   |
| 4806.042   | 40.0             | 4.0         | 1.0                     | 249.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 44.0              | 74.0                 | -30.0                  | EUT Vertical, BLE AV, Low CH     |
| 4803.500   | 39.6             | 4.0         | 1.0                     | 260.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 43.6              | 74.0                 | -30.4                  | EUT on Side, BLE AV, Low CH      |
| 12399.000  | 48.9             | -5.6        | 1.1                     | 320.0             | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 43.3              | 74.0                 | -30.7                  | EUT Vertical, BLE AV, High CH    |
| 12011.760  | 49.7             | -6.6        | 1.1                     | 92.0              | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 43.1              | 74.0                 | -30.9                  | EUT Vertical, BLE AV, Low CH     |
| 12011.800  | 49.5             | -6.6        | 1.2                     | 280.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 42.9              | 74.0                 | -31.1                  | EUT Horizontal, BLE AV, Low CH   |
| 12399.220  | 47.3             | -5.6        | 1.2                     | 271.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 41.7              | 74.0                 | -32.3                  | EUT Horizontal, BLE AV, High CH  |
| 12128.640  | 46.7             | -6.3        | 1.2                     | 276.0             | 3.0                    | 0.0                       | Vert                      | PK       | 0.0                      | 40.4              | 74.0                 | -33.6                  | EUT Vertical, BLE AV, Mid CH     |
| 12131.270  | 46.5             | -6.3        | 1.2                     | 336.0             | 3.0                    | 0.0                       | Horz                      | PK       | 0.0                      | 40.2              | 74.0                 | -33.8                  | EUT Horizontal, BLE AV, Mid CH   |