

# NORTHWEST EMC

**Honeywell, Automation and Control Solutions**

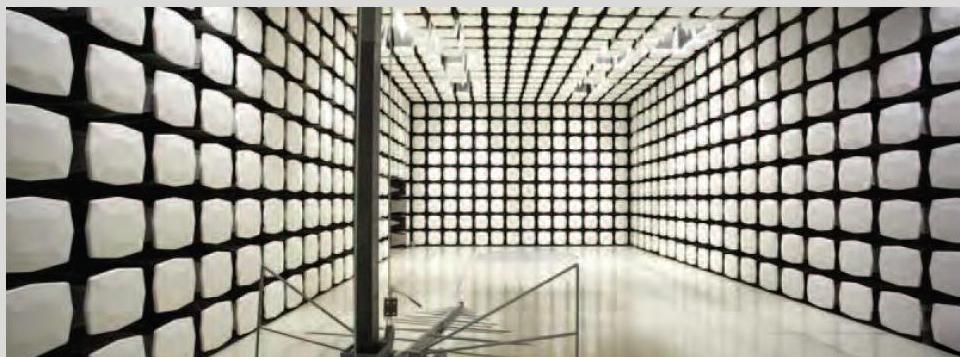
**TH8321R01**

**FCC 15.207:2016**

**FCC 15.247:2016**

**902-928 MHz Transceiver**

**Report # HNYW0180.1**



NVLAP Lab Code: 200881-0

*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. This Report may only be duplicated in its entirety*

# CERTIFICATE OF TEST

Last Date of Test: August 4, 2016  
Honeywell, Automation and Control Solutions  
Model:TH8321R1001

## Radio Equipment Testing

### Standards

| Specification   | Method           |
|-----------------|------------------|
| FCC 15.207:2016 |                  |
| FCC 15.247:2016 | ANSI C63.10:2013 |

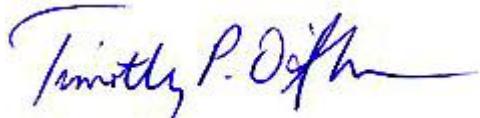
### Results

| Method Clause | Test Description                    | Applied | Results | Comments                             |
|---------------|-------------------------------------|---------|---------|--------------------------------------|
| 6.2           | Powerline Conducted Emissions       | Yes     | Pass    |                                      |
| 6.5, 6.6      | Spurious Radiated Emissions         | Yes     | Pass    |                                      |
| 7.5           | Duty Cycle                          | Yes     | N/A     | Characterization of radio operation. |
| 7.8.2         | Carrier Frequency Separation        | Yes     | Pass    |                                      |
| 7.8.3         | Number of Hopping Frequencies       | Yes     | Pass    |                                      |
| 7.8.4         | Dwell Time                          | Yes     | Pass    |                                      |
| 7.8.5         | Output Power                        | Yes     | Pass    |                                      |
| 7.8.6         | Band Edge Compliance                | Yes     | Pass    |                                      |
| 7.8.6         | Band Edge Compliance - Hopping Mode | Yes     | Pass    |                                      |
| 7.8.7         | Occupied Bandwidth                  | Yes     | Pass    |                                      |
| 7.8.8         | Spurious Conducted Emissions        | Yes     | Pass    |                                      |
| 11.10.2       | Power Spectral Density              | No      | N/A     | Not required for FHSS devices.       |

### Deviations from Test Standards

None

### Approved By:



Tim O'Shea, Operations Manager

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. 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. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

# REVISION HISTORY

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

# ACCREDITATIONS AND AUTHORIZATIONS

## 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 17065 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

## Canada

**ISED** - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

## European Union

**European Commission** – Validated by the European Commission as a Notified Body under the R&TTE Directive.

## Australia/New Zealand

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

## Korea

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

## Japan

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

## 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.

## Singapore

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

## Israel

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

## Hong Kong

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

## Vietnam

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

## SCOPE

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

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

<http://gsi.nist.gov/global/docs/cabs/designations.html>

# MEASUREMENT UNCERTAINTY

## 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 16-4-2 as applicable), and are available upon request.

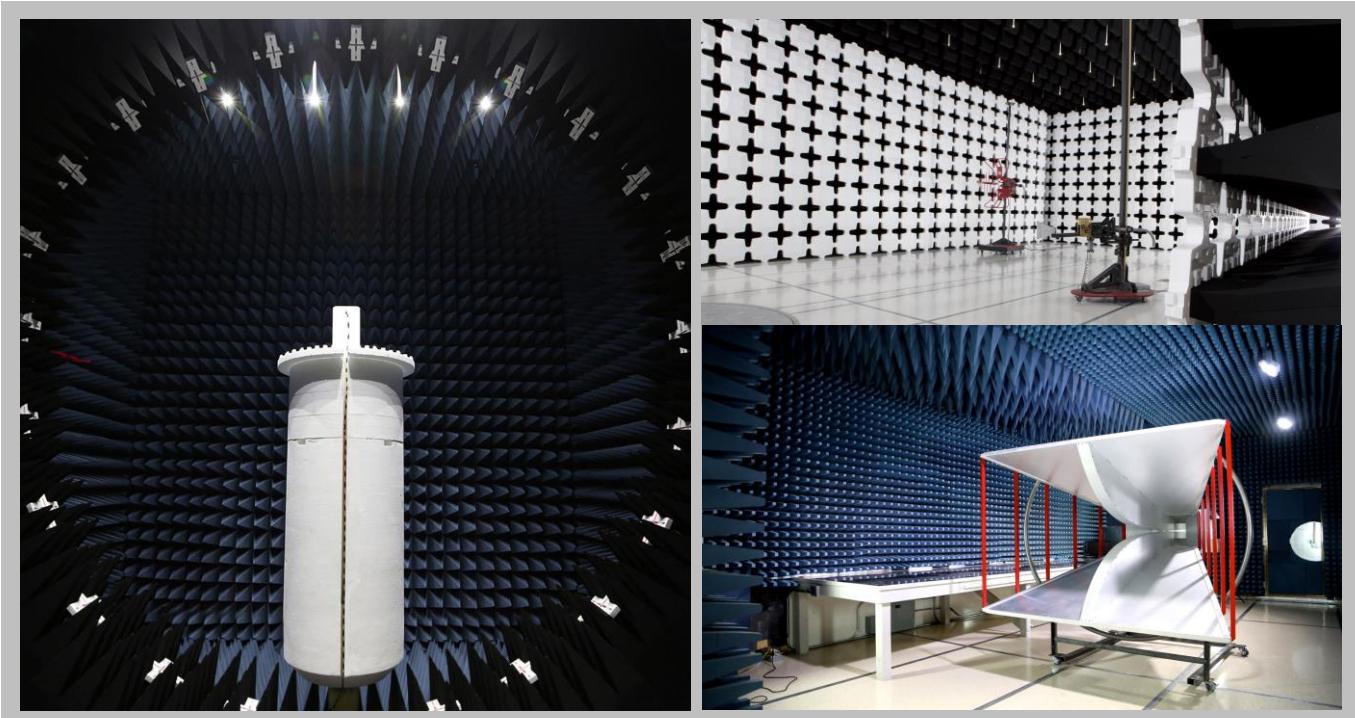
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

| Test                                  | + MU    | - MU     |
|---------------------------------------|---------|----------|
| Frequency Accuracy (Hz)               | 0.0007% | -0.0007% |
| Amplitude Accuracy (dB)               | 1.2 dB  | -1.2 dB  |
| Conducted Power (dB)                  | 0.3 dB  | -0.3 dB  |
| Radiated Power via Substitution (dB)  | 0.7 dB  | -0.7 dB  |
| Temperature (degrees C)               | 0.7°C   | -0.7°C   |
| Humidity (% RH)                       | 2.5% RH | -2.5% RH |
| Voltage (AC)                          | 1.0%    | -1.0%    |
| Voltage (DC)                          | 0.7%    | -0.7%    |
| Field Strength (dB)                   | 5.2 dB  | -5.2 dB  |
| AC Powerline Conducted Emissions (dB) | 2.4 dB  | -2.4 dB  |

# FACILITIES



| California  | Minnesota   | New York  | Oregon   | Texas  | Washington   |
|---|---|---|--|--|--|
| Labs OC01-13<br>41 Tesla<br>Irvine, CA 92618<br>(949) 861-8918                  | Labs MN01-08, MN10<br>9349 W Broadway Ave.<br>Brooklyn Park, MN 55445<br>(612)-638-5136 | Labs NY01-04<br>4939 Jordan Rd.<br>Elbridge, NY 13060<br>(315) 554-8214 | Labs EV01-12<br>22975 NW Evergreen Pkwy<br>Hillsboro, OR 97124<br>(503) 844-4066 | Labs TX01-09<br>3801 E Plano Pkwy<br>Plano, TX 75074<br>(469) 304-5255 | Labs NC01-05<br>19201 120 <sup>th</sup> Ave NE<br>Bothell, WA 98011<br>(425)984-6600 |
| <b>NVLAP</b>  |   |   |  |  |  |
| NVLAP Lab Code: 200676-0  | NVLAP Lab Code: 200881-0  | NVLAP Lab Code: 200761-0  | NVLAP Lab Code: 200630-0   | NVLAP Lab Code: 201049-0   | NVLAP Lab Code: 200629-0   |
| <b>Innovation, Science and Economic Development Canada</b>                      |   |   |  |  |  |
| 2834B-1, 2834B-3  | 2834E-1   | N/A   | 2834D-1, 2834D-2   | 2834G-1  | 2834F-1  |
| <b>BSMI</b>   |   |   |  |  |  |
| SL2-IN-E-1154R  | SL2-IN-E-1152R  | N/A   | SL2-IN-E-1017  | SL2-IN-E-1158R   | SL2-IN-E-1153R   |
| <b>VCCI</b>   |   |   |  |  |  |
| A-0029  | A-0109  | N/A   | A-0108   | A-0201   | A-0110   |
| <b>Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA</b> |   |   |  |  |  |
| US0158  | US0175  | N/A   | US0017   | US0191   | US0157   |



# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

|                                 |   |
|---------------------------------|---|
| <b>Company Name:</b>            | Honeywell, Automation and Control Solutions |
| <b>Address:</b>                 | 1985 Douglas Drive North                    |
| <b>City, State, Zip:</b>        | Golden Valley, MN 55422                     |
| <b>Test Requested By:</b>       | Job Villafuerte                             |
| <b>Model:</b>                   | TH8321R001                                  |
| <b>First Date of Test:</b>      | August 2, 2016                              |
| <b>Last Date of Test:</b>       | August 4, 2016                              |
| <b>Receipt Date of Samples:</b> | August 2, 2016                              |
| <b>Equipment Design Stage:</b>  | Production                                  |
| <b>Equipment Condition:</b>     | No Damage                                   |

## Information Provided by the Party Requesting the Test

|   |
|---|
| <b>Functional Description of the EUT:</b>   |
| Thermostat  |
| <b>Client Justification:</b>  |
| On the original grant under FCC ID: HS9-TH8321R01, there were three different models being approved for FCC and Industry Canada: TH8321R1001, TH8320R1003, TH8110R1008. They all share common PCBs, but differentiate by component population. The transceiver and related RF circuitry remain identical across the three models. Model TH8321R1001, which is the maximum populated device, was used for testing. |
| The changes to the product for this Class II Permissive Change consist of a new RF switch and the removal of a shield.  |
| <b>Testing Objective:</b>   |
| Demonstrate compliance for a Class II Permissive Change to FCC ID: HS9-TH8321R01 under FCC Part 15.247 for operation in the 902-928 MHz band.   |

# CONFIGURATIONS

## Configuration HNYW0180- 1

| <b>EUT</b>               |   |  |                          |                      |  |
|--------------------------|---|--|--------------------------|----------------------|--|
| <b>Description</b>       | <b>Manufacturer</b>                       |  | <b>Model/Part Number</b> | <b>Serial Number</b> |  |
| AC Adaptor               | CUI Inc.                                  |  | 48A-24-500               | EPA240050-S/T-SZ     |  |
| Wall Plate               | Honeywell, Automation and Control Systems |  | 1620                     | 4174001 0363215      |  |
| Thermostat<br>DUT 315029 | Honeywell, Automation and Control Systems |  | TH8321R1001              | 5191101 0315029      |  |

| <b>Peripherals in test setup boundary</b> |   |  |                          |                      |  |
|---|---|--|--------------------------|----------------------|--|
| <b>Description</b>                        | <b>Manufacturer</b>                       |  | <b>Model/Part Number</b> | <b>Serial Number</b> |  |
| Stand                                     | Honeywell, Automation and Control Systems |  | None                     | None                 |  |

| <b>Cables</b>     |               |                   |                |                     |                     |
|-------------------|---------------|-------------------|----------------|---------------------|---------------------|
| <b>Cable Type</b> | <b>Shield</b> | <b>Length (m)</b> | <b>Ferrite</b> | <b>Connection 1</b> | <b>Connection 2</b> |
| Power Cord        | No            | 1.8m              | No             | AC Adaptor          | Wall Plate          |

## Configuration HNYW0180- 3

| <b>EUT</b>               |   |  |                          |                      |  |
|--------------------------|---|--|--------------------------|----------------------|--|
| <b>Description</b>       | <b>Manufacturer</b>                       |  | <b>Model/Part Number</b> | <b>Serial Number</b> |  |
| AC Adaptor               | CUI Inc.                                  |  | 48A-24-500               | EPA240050-S/T-SZ     |  |
| Wall Plate               | Honeywell, Automation and Control Systems |  | 1620                     | 4174001 0363215      |  |
| Thermostat<br>DUT 315015 | Honeywell, Automation and Control Systems |  | TH8321R1001              | 5191101 0315015      |  |

| <b>Peripherals in test setup boundary</b> |   |  |                          |                      |  |
|---|---|--|--------------------------|----------------------|--|
| <b>Description</b>                        | <b>Manufacturer</b>                       |  | <b>Model/Part Number</b> | <b>Serial Number</b> |  |
| Stand                                     | Honeywell, Automation and Control Systems |  | None                     | None                 |  |

| <b>Cables</b>     |               |                   |                |                     |                     |
|-------------------|---------------|-------------------|----------------|---------------------|---------------------|
| <b>Cable Type</b> | <b>Shield</b> | <b>Length (m)</b> | <b>Ferrite</b> | <b>Connection 1</b> | <b>Connection 2</b> |
| Power Cord        | No            | 1.8m              | No             | AC Adaptor          | Wall Plate          |

# MODIFICATIONS

## Equipment Modifications

| Item | Date     | Test                                | Modification                         | Note  | Disposition of EUT                                |
|------|----------|-------------------------------------|--------------------------------------|---|---|
| 1    | 8/2/2016 | Powerline 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. |
| 2    | 8/2/2016 | Spurious Radiated 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. |
| 3    | 8/4/2016 | 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. |
| 4    | 8/4/2016 | Carrier Frequency Separation        | 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    | 8/4/2016 | Number of Hopping Frequencies       | 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    | 8/4/2016 | Dwell Time                          | 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    | 8/4/2016 | 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. |
| 8    | 8/4/2016 | 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. |
| 9    | 8/4/2016 | Band Edge Compliance – Hopping Mode | 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. |
| 10   | 8/4/2016 | Occupied Bandwidth                  | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | Scheduled testing was completed.                  |

# POWERLINE CONDUCTED EMISSIONS

## TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically, those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

## TEST EQUIPMENT

| Description                      | Manufacturer      | Model            | ID   | Last Cal. | Cal. Due  |
|----------------------------------|-------------------|------------------|------|-----------|-----------|
| LISN                             | Solar Electronics | 9252-50-R-24-BNC | LIY  | 3/21/2016 | 3/21/2017 |
| Cable - Conducted Cable Assembly | Northwest EMC     | MNC, HGN, TYK    | MNCA | 1/29/2016 | 1/29/2017 |
| Receiver                         | Rohde & Schwarz   | ESR7             | ARI  | 6/14/2016 | 6/14/2017 |

## MEASUREMENT UNCERTAINTY

| Description  |        |  |         |
|--------------|--------|--|---------|
| Expanded k=2 | 2.4 dB |  | -2.4 dB |

## CONFIGURATIONS INVESTIGATED

HNYW0180-1

## MODES INVESTIGATED

Transmit mode mid channel 914.6 MHz, antenna A.

# POWERLINE CONDUCTED EMISSIONS

|                   |   |                    |            |
|-------------------|---|--------------------|------------|
| EUT:              | TH8321R1001                                 | Work Order:        | HNW0180    |
| Serial Number:    | 5191101 0315029                             | Date:              | 08/02/2016 |
| Customer:         | Honeywell, Automation and Control Solutions | Temperature:       | 23.6°C     |
| Attendees:        | None  | Relative Humidity: | 61.4%      |
| Customer Project: | None  | Bar. Pressure:     | 1020 mb    |
| Tested By:        | Cole Ghizzone, Kyle McMullan                | Job Site:          | MN03       |
| Power:            | 110VAC/60Hz                                 | Configuration:     | HNW0180-1  |

## TEST SPECIFICATIONS

|                 |                  |
|-----------------|------------------|
| Specification:  | Method:          |
| FCC 15.207:2016 | ANSI C63.10:2013 |

## TEST PARAMETERS

|        |   |       |           |                             |   |
|--------|---|-------|-----------|-----------------------------|---|
| Run #: | 5 | Line: | High Line | Add. Ext. Attenuation (dB): | 0 |
|--------|---|-------|-----------|-----------------------------|---|

## COMMENTS

None.

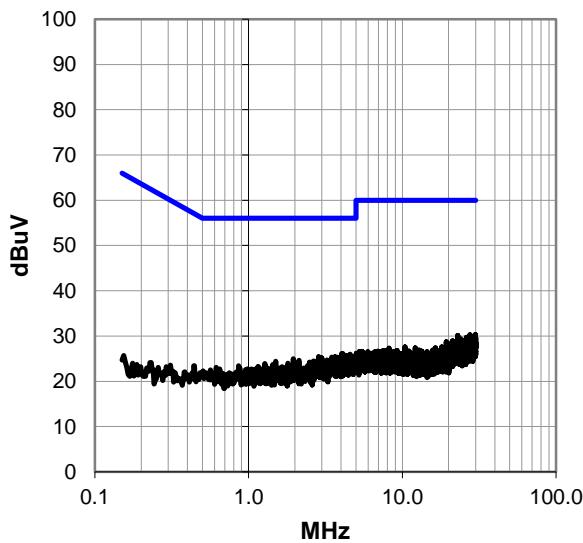
## EUT OPERATING MODES

Transmit mode mid channel 914.6 MHz, antenna A.

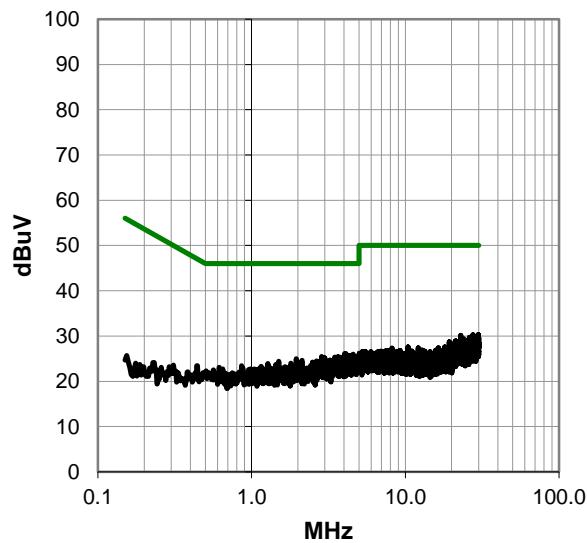
## DEVIATIONS FROM TEST STANDARD

None.

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #5

Peak Data - vs - Quasi Peak Limit

| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
|------------|-------------|-------------|-----------------|--------------------|-------------|
| 27.504     | 8.0         | 22.3        | 30.3            | 60.0               | -29.7       |
| 29.791     | 7.7         | 22.6        | 30.3            | 60.0               | -29.7       |
| 29.884     | 7.7         | 22.6        | 30.3            | 60.0               | -29.7       |
| 4.023      | 5.8         | 20.3        | 26.1            | 56.0               | -29.9       |
| 4.097      | 5.8         | 20.3        | 26.1            | 56.0               | -29.9       |
| 22.997     | 8.3         | 21.8        | 30.1            | 60.0               | -29.9       |
| 29.743     | 7.5         | 22.6        | 30.1            | 60.0               | -29.9       |
| 4.575      | 5.7         | 20.3        | 26.0            | 56.0               | -30.0       |
| 29.619     | 7.4         | 22.6        | 30.0            | 60.0               | -30.0       |
| 29.638     | 7.2         | 22.6        | 29.8            | 60.0               | -30.2       |
| 26.168     | 7.6         | 22.1        | 29.7            | 60.0               | -30.3       |
| 4.280      | 5.3         | 20.3        | 25.6            | 56.0               | -30.4       |
| 4.332      | 5.3         | 20.3        | 25.6            | 56.0               | -30.4       |
| 4.418      | 5.3         | 20.3        | 25.6            | 56.0               | -30.4       |
| 4.955      | 5.2         | 20.4        | 25.6            | 56.0               | -30.4       |
| 26.277     | 7.5         | 22.1        | 29.6            | 60.0               | -30.4       |
| 28.276     | 7.2         | 22.4        | 29.6            | 60.0               | -30.4       |
| 28.687     | 7.2         | 22.4        | 29.6            | 60.0               | -30.4       |
| 28.978     | 7.1         | 22.5        | 29.6            | 60.0               | -30.4       |
| 29.978     | 7.0         | 22.6        | 29.6            | 60.0               | -30.4       |
| 2.859      | 5.3         | 20.2        | 25.5            | 56.0               | -30.5       |
| 4.847      | 5.1         | 20.4        | 25.5            | 56.0               | -30.5       |
| 26.986     | 7.3         | 22.2        | 29.5            | 60.0               | -30.5       |
| 28.426     | 7.1         | 22.4        | 29.5            | 60.0               | -30.5       |
| 29.123     | 7.0         | 22.5        | 29.5            | 60.0               | -30.5       |
| 29.388     | 7.0         | 22.5        | 29.5            | 60.0               | -30.5       |

Peak Data - vs - Average Limit

| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
|------------|-------------|-------------|-----------------|--------------------|-------------|
| 27.504     | 8.0         | 22.3        | 30.3            | 50.0               | -19.7       |
| 29.791     | 7.7         | 22.6        | 30.3            | 50.0               | -19.7       |
| 29.884     | 7.7         | 22.6        | 30.3            | 50.0               | -19.7       |
| 4.023      | 5.8         | 20.3        | 26.1            | 46.0               | -19.9       |
| 4.097      | 5.8         | 20.3        | 26.1            | 46.0               | -19.9       |
| 22.997     | 8.3         | 21.8        | 30.1            | 50.0               | -19.9       |
| 29.743     | 7.5         | 22.6        | 30.1            | 50.0               | -19.9       |
| 4.575      | 5.7         | 20.3        | 26.0            | 46.0               | -20.0       |
| 29.619     | 7.4         | 22.6        | 30.0            | 50.0               | -20.0       |
| 29.638     | 7.2         | 22.6        | 29.8            | 50.0               | -20.2       |
| 26.168     | 7.6         | 22.1        | 29.7            | 50.0               | -20.3       |
| 4.280      | 5.3         | 20.3        | 25.6            | 46.0               | -20.4       |
| 4.332      | 5.3         | 20.3        | 25.6            | 46.0               | -20.4       |
| 4.418      | 5.3         | 20.3        | 25.6            | 46.0               | -20.4       |
| 4.955      | 5.2         | 20.4        | 25.6            | 46.0               | -20.4       |
| 26.277     | 7.5         | 22.1        | 29.6            | 50.0               | -20.4       |
| 28.276     | 7.2         | 22.4        | 29.6            | 50.0               | -20.4       |
| 28.687     | 7.2         | 22.4        | 29.6            | 50.0               | -20.4       |
| 28.978     | 7.1         | 22.5        | 29.6            | 50.0               | -20.4       |
| 29.978     | 7.0         | 22.6        | 29.6            | 50.0               | -20.4       |
| 2.859      | 5.3         | 20.2        | 25.5            | 46.0               | -20.5       |
| 4.847      | 5.1         | 20.4        | 25.5            | 46.0               | -20.5       |
| 26.986     | 7.3         | 22.2        | 29.5            | 50.0               | -20.5       |
| 28.426     | 7.1         | 22.4        | 29.5            | 50.0               | -20.5       |
| 29.123     | 7.0         | 22.5        | 29.5            | 50.0               | -20.5       |
| 29.388     | 7.0         | 22.5        | 29.5            | 50.0               | -20.5       |

## CONCLUSION

Pass



Tested By

# POWERLINE CONDUCTED EMISSIONS

|                   |   |                    |            |
|-------------------|---|--------------------|------------|
| EUT:              | TH8321R1001                                 | Work Order:        | HNW0180    |
| Serial Number:    | 5191101 0315029                             | Date:              | 08/02/2016 |
| Customer:         | Honeywell, Automation and Control Solutions | Temperature:       | 23.6°C     |
| Attendees:        | None  | Relative Humidity: | 61.4%      |
| Customer Project: | None  | Bar. Pressure:     | 1020 mb    |
| Tested By:        | Cole Ghizzone, Kyle McMullan                | Job Site:          | MN03       |
| Power:            | 110VAC/60Hz                                 | Configuration:     | HNW0180-1  |

## TEST SPECIFICATIONS

|                 |                  |
|-----------------|------------------|
| Specification:  | Method:          |
| FCC 15.207:2016 | ANSI C63.10:2013 |

## TEST PARAMETERS

|        |   |       |         |                             |   |
|--------|---|-------|---------|-----------------------------|---|
| Run #: | 6 | Line: | Neutral | Add. Ext. Attenuation (dB): | 0 |
|--------|---|-------|---------|-----------------------------|---|

## COMMENTS

None.

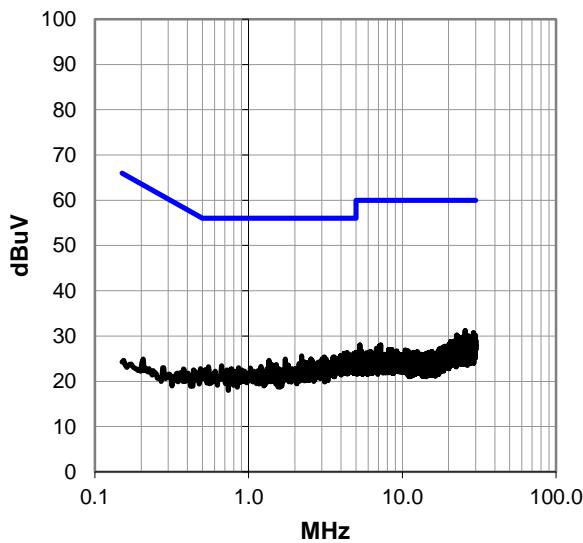
## EUT OPERATING MODES

Transmit mode mid channel 914.6 MHz, antenna A.

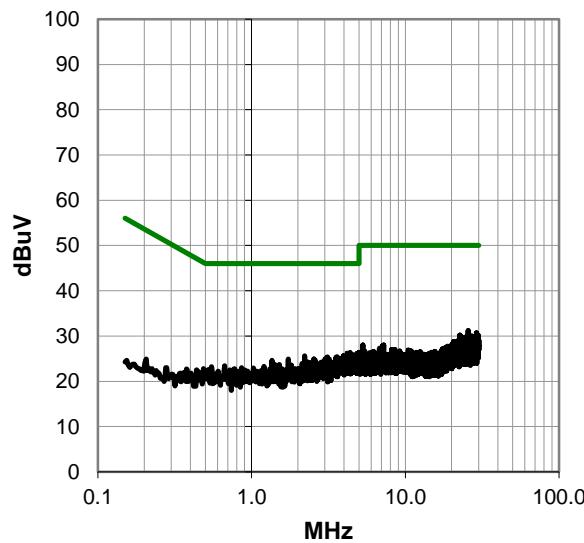
## DEVIATIONS FROM TEST STANDARD

None.

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



# POWERLINE CONDUCTED EMISSIONS

## RESULTS - Run #6

Peak Data - vs - Quasi Peak Limit

| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
|------------|-------------|-------------|-----------------|--------------------|-------------|
| 25.594     | 9.1         | 22.1        | 31.2            | 60.0               | -28.8       |
| 29.045     | 8.2         | 22.5        | 30.7            | 60.0               | -29.3       |
| 4.996      | 6.0         | 20.4        | 26.4            | 56.0               | -29.6       |
| 4.377      | 6.0         | 20.3        | 26.3            | 56.0               | -29.7       |
| 4.183      | 5.9         | 20.3        | 26.2            | 56.0               | -29.8       |
| 22.628     | 8.4         | 21.8        | 30.2            | 60.0               | -29.8       |
| 29.731     | 7.6         | 22.6        | 30.2            | 60.0               | -29.8       |
| 4.828      | 5.7         | 20.4        | 26.1            | 56.0               | -29.9       |
| 25.135     | 7.9         | 22.1        | 30.0            | 60.0               | -30.0       |
| 27.056     | 7.8         | 22.2        | 30.0            | 60.0               | -30.0       |
| 28.944     | 7.5         | 22.5        | 30.0            | 60.0               | -30.0       |
| 22.967     | 8.1         | 21.8        | 29.9            | 60.0               | -30.1       |
| 28.870     | 7.4         | 22.5        | 29.9            | 60.0               | -30.1       |
| 29.168     | 7.4         | 22.5        | 29.9            | 60.0               | -30.1       |
| 29.291     | 7.4         | 22.5        | 29.9            | 60.0               | -30.1       |
| 4.545      | 5.5         | 20.3        | 25.8            | 56.0               | -30.2       |
| 26.445     | 7.7         | 22.1        | 29.8            | 60.0               | -30.2       |
| 29.407     | 7.3         | 22.5        | 29.8            | 60.0               | -30.2       |
| 4.399      | 5.4         | 20.3        | 25.7            | 56.0               | -30.3       |
| 4.743      | 5.4         | 20.3        | 25.7            | 56.0               | -30.3       |
| 29.858     | 7.1         | 22.6        | 29.7            | 60.0               | -30.3       |
| 2.209      | 5.4         | 20.2        | 25.6            | 56.0               | -30.4       |
| 3.952      | 5.3         | 20.3        | 25.6            | 56.0               | -30.4       |
| 4.843      | 5.2         | 20.4        | 25.6            | 56.0               | -30.4       |
| 23.721     | 7.7         | 21.9        | 29.6            | 60.0               | -30.4       |
| 28.082     | 7.2         | 22.4        | 29.6            | 60.0               | -30.4       |

Peak Data - vs - Average Limit

| Freq (MHz) | Amp. (dBuV) | Factor (dB) | Adjusted (dBuV) | Spec. Limit (dBuV) | Margin (dB) |
|------------|-------------|-------------|-----------------|--------------------|-------------|
| 25.594     | 9.1         | 22.1        | 31.2            | 50.0               | -18.8       |
| 29.045     | 8.2         | 22.5        | 30.7            | 50.0               | -19.3       |
| 4.996      | 6.0         | 20.4        | 26.4            | 46.0               | -19.6       |
| 4.377      | 6.0         | 20.3        | 26.3            | 46.0               | -19.7       |
| 4.183      | 5.9         | 20.3        | 26.2            | 46.0               | -19.8       |
| 22.628     | 8.4         | 21.8        | 30.2            | 50.0               | -19.8       |
| 29.731     | 7.6         | 22.6        | 30.2            | 50.0               | -19.8       |
| 4.828      | 5.7         | 20.4        | 26.1            | 46.0               | -19.9       |
| 25.135     | 7.9         | 22.1        | 30.0            | 50.0               | -20.0       |
| 27.056     | 7.8         | 22.2        | 30.0            | 50.0               | -20.0       |
| 28.944     | 7.5         | 22.5        | 30.0            | 50.0               | -20.0       |
| 22.967     | 8.1         | 21.8        | 29.9            | 50.0               | -20.1       |
| 28.870     | 7.4         | 22.5        | 29.9            | 50.0               | -20.1       |
| 29.168     | 7.4         | 22.5        | 29.9            | 50.0               | -20.1       |
| 29.291     | 7.4         | 22.5        | 29.9            | 50.0               | -20.1       |
| 4.545      | 5.5         | 20.3        | 25.8            | 46.0               | -20.2       |
| 26.445     | 7.7         | 22.1        | 29.8            | 50.0               | -20.2       |
| 29.407     | 7.3         | 22.5        | 29.8            | 50.0               | -20.2       |
| 4.399      | 5.4         | 20.3        | 25.7            | 46.0               | -20.3       |
| 4.743      | 5.4         | 20.3        | 25.7            | 46.0               | -20.3       |
| 29.858     | 7.1         | 22.6        | 29.7            | 50.0               | -20.3       |
| 2.209      | 5.4         | 20.2        | 25.6            | 46.0               | -20.4       |
| 3.952      | 5.3         | 20.3        | 25.6            | 46.0               | -20.4       |
| 4.843      | 5.2         | 20.4        | 25.6            | 46.0               | -20.4       |
| 23.721     | 7.7         | 21.9        | 29.6            | 50.0               | -20.4       |
| 28.082     | 7.2         | 22.4        | 29.6            | 50.0               | -20.4       |

## CONCLUSION

Pass



Tested By

# 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

Continuous transmit, low channel, 903 MHz, ant. A  
Continuous transmit, low channel, 903 MHz, ant. B  
Continuous transmit, mid channel, 914.6 MHz, ant. A  
Continuous transmit, mid channel, 914.6 MHz, ant. B  
Continuous transmit, high channel, 926.4 MHz, ant. A  
Continuous transmit, high channel, 926.4 MHz, ant. B

## POWER SETTINGS INVESTIGATED

110VAC/60Hz

## CONFIGURATIONS INVESTIGATED

HNW0180 - 1

## FREQUENCY RANGE INVESTIGATED

|                 |        |                |           |
|-----------------|--------|----------------|-----------|
| Start Frequency | 30 MHz | Stop Frequency | 10000 MHz |
|-----------------|--------|----------------|-----------|

## 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 |
|------------------------------|--------------------|--------------------------------|-----|------------|----------|
| Analyzer - Spectrum Analyzer | Agilent            | N9010A                         | AFI | 1/27/2016  | 12 mo    |
| Antenna - Biconilog          | Teseq              | CBL 6141B                      | AYD | 1/6/2016   | 24 mo    |
| Antenna - Double Ridge Guide | ETS Lindgren       | 3115                           | AJA | 6/23/2016  | 24 mo    |
| Attenuator                   | Fairview Microwave | SA18E-10                       | TYA | 10/21/2015 | 12 mo    |
| Attenuator                   | Fairview Microwave | SA18E-20                       | TWZ | 10/21/2015 | 12 mo    |
| Filter - Low Pass            | Micro-Tronics      | LPM50004                       | LFK | 10/21/2015 | 12 mo    |
| Filter - High Pass           | Micro-Tronics      | HPM50108                       | LFM | 10/21/2015 | 12 mo    |
| Amplifier - Pre-Amplifier    | Miteq              | AMF-3D-00100800-32-13P         | AVT | 3/1/2016   | 12 mo    |
| Amplifier - Pre-Amplifier    | Miteq              | AM-1616-1000                   | AVO | 12/10/2015 | 12 mo    |
| Antenna - Standard Gain      | ETS Lindgren       | 3160-07                        | AXP | NCR        | 0 mo     |
| Cable                        | ESM Cable Corp.    | Double Ridge Guide Horn Cables | MNI | 12/7/2015  | 12 mo    |
| Cable                        | ESM Cable Corp.    | Standard Gain Horn Cables      | MNJ | 12/7/2015  | 12 mo    |
| Amplifier - Pre-Amplifier    | Miteq              | AMF-6F-08001200-30-10P         | AVV | 3/1/2016   | 12 mo    |

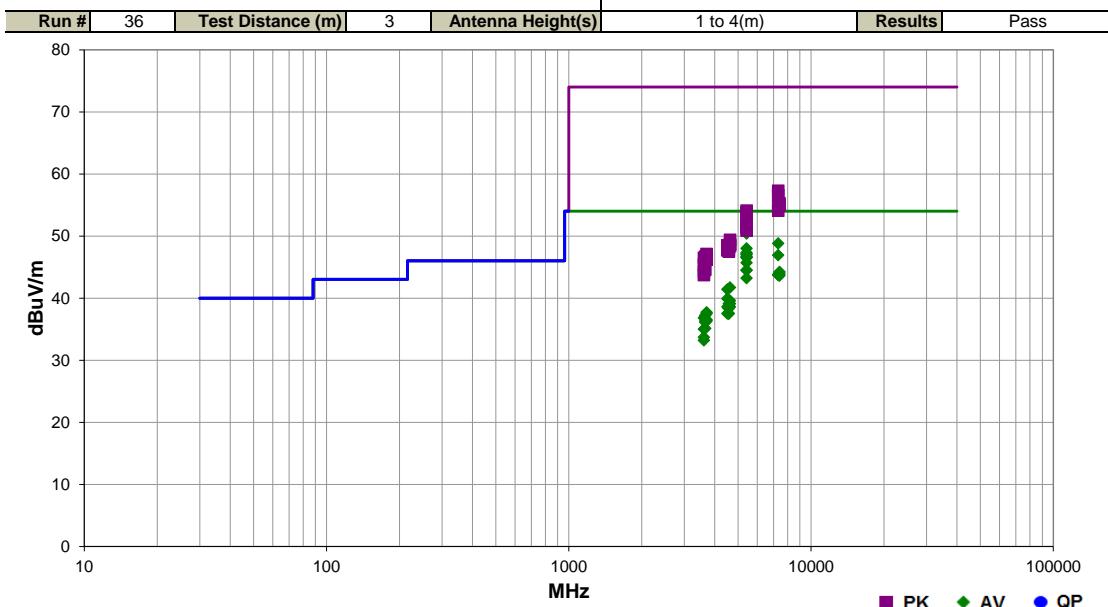
## TEST DESCRIPTION

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

**NORTHWEST**  
**EMC**  
PSA-ESCI 2016.04.26.1  
EmR5 2016.04.26.1

|                     |   |                   |           |  |
|---------------------|---|-------------------|-----------|--|
| Work Order:         | HNYW0180  | Date:             | 08/02/16  |  |
| Project:            | None  | Temperature:      | 23.8 °C   |  |
| Job Site:           | MN05  | Humidity:         | 57.4% RH  |  |
| Serial Number:      | 5191101 0315029   | Barometric Pres.: | 1020 mbar | Tested by: Cole Ghizzone, Kyle McMullan  |
| EUT:                | TH8321R1001   |                   |           |  |
| Configuration:      | 1   |                   |           |  |
| Customer:           | Honeywell, Automation and Control Solutions   |                   |           |  |
| Attendees:          | None  |                   |           |  |
| EUT Power:          | 110VAC/60Hz   |                   |           |  |
| Operating Mode:     | Continuous transmit, reference the data comments for channel, frequency and antenna |                   |           |  |
| Deviations:         | None.   |                   |           |  |
| Comments:           | See data comments for EUT orientation.  |                   |           |  |
| Test Specifications |   | Test Method       |           |  |
| FCC 15.247:2016     |   | ANSI C63.10:2013  |           |  |



| 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                                    |
|------------|------------------|-------------|-------------------------|-------------------|------------------------|---------------------------|--------------------------|----------|--------------------------|-------------------|----------------------|------------------------|---|
| 5417.992   | 43.4             | 7.0         | 1.0                     | 121.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 50.4              | 54.0                 | -3.6                   | Low channel, 903 MHz, Ant. A, EUT on side   |
| 7316.725   | 35.6             | 13.2        | 1.1                     | 285.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 48.8              | 54.0                 | -5.2                   | Mid channel, 914.6 MHz, Ant. B, EUT horz    |
| 5417.983   | 41.0             | 7.0         | 1.0                     | 234.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 48.0              | 54.0                 | -6.0                   | Low channel, 903 MHz, Ant. B, EUT horz      |
| 5417.975   | 40.3             | 7.0         | 1.0                     | 325.9             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 47.3              | 54.0                 | -6.7                   | Low channel, 903 MHz, Ant. B, EUT vert      |
| 5417.975   | 40.1             | 7.0         | 2.0                     | 321.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 47.1              | 54.0                 | -6.9                   | Low channel, 903 MHz, Ant. B, EUT horz      |
| 5418.000   | 40.0             | 7.0         | 1.0                     | 92.0              | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 47.0              | 54.0                 | -7.0                   | Low channel, 903 MHz, Ant. B, EUT on side   |
| 7316.767   | 33.7             | 13.2        | 1.0                     | 250.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 46.9              | 54.0                 | -7.1                   | Mid channel, 914.6 MHz, Ant. B, EUT vert    |
| 5417.958   | 39.7             | 7.0         | 2.0                     | 235.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 46.7              | 54.0                 | -7.3                   | Low channel, 903 MHz, Ant. A, EUT horz      |
| 5418.025   | 39.6             | 7.0         | 2.7                     | 203.1             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 46.6              | 54.0                 | -7.4                   | Low channel, 903 MHz, Ant. A, EUT on side   |
| 5418.000   | 39.5             | 7.0         | 1.0                     | 303.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 46.5              | 54.0                 | -7.5                   | Low channel, 903 MHz, Ant. B, EUT vert      |
| 5417.983   | 38.7             | 7.0         | 1.0                     | 143.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 45.7              | 54.0                 | -8.3                   | Low channel, 903 MHz, Ant. A, EUT horz      |
| 5418.025   | 37.5             | 7.0         | 1.0                     | 220.1             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 44.5              | 54.0                 | -9.5                   | Low channel, 903 MHz, Ant. A, EUT vert      |
| 5417.958   | 37.5             | 7.0         | 1.1                     | 236.9             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 44.5              | 54.0                 | -9.5                   | Low channel, 903 MHz, Ant. B, EUT vert      |
| 7411.075   | 31.1             | 13.1        | 3.8                     | 306.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 44.2              | 54.0                 | -9.8                   | High channel, 926.4 MHz, Ant. B, EUT horz   |
| 7408.600   | 30.9             | 13.1        | 1.0                     | 167.1             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 44.0              | 54.0                 | -10.0                  | High channel, 926.4 MHz, Ant. B, EUT horz   |
| 7316.830   | 30.6             | 13.2        | 1.0                     | 167.1             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 43.8              | 54.0                 | -10.2                  | Mid channel, 914.6 MHz, Ant. A, EUT on side |
| 7409.770   | 30.7             | 13.1        | 1.4                     | 290.9             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 43.8              | 54.0                 | -10.2                  | High channel, 926.4 MHz, Ant. A, EUT horz   |
| 7316.842   | 30.5             | 13.2        | 3.8                     | 110.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 43.7              | 54.0                 | -10.3                  | Mid channel, 914.6 MHz, Ant. A, EUT horz    |
| 7409.520   | 30.5             | 13.1        | 1.6                     | 289.9             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 43.6              | 54.0                 | -10.4                  | High channel, 926.4 MHz, Ant. A EUT on side |
| 5417.983   | 36.2             | 7.0         | 1.0                     | 322.9             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 43.2              | 54.0                 | -10.8                  | Low channel, 903 MHz, Ant. B, EUT on side   |
| 4631.945   | 37.0             | 4.7         | 1.6                     | 188.1             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 41.7              | 54.0                 | -12.3                  | High channel, 926.4 MHz, Ant. A EUT horz    |
| 4514.950   | 37.1             | 4.3         | 1.0                     | 109.1             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 41.4              | 54.0                 | -12.6                  | Low channel, 903 MHz, Ant. A, EUT on side   |
| 4514.967   | 35.6             | 4.3         | 1.0                     | 252.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 39.9              | 54.0                 | -14.1                  | Low channel, 903 MHz, Ant. B, EUT horz      |
| 4631.983   | 34.9             | 4.7         | 1.1                     | 335.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 39.6              | 54.0                 | -14.4                  | High channel, 926.4 MHz, Ant. B, EUT vert   |
| 4572.992   | 34.7             | 4.4         | 4.0                     | 70.1              | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 39.1              | 54.0                 | -14.9                  | Mid channel, 914.6 MHz, Ant. A, EUT horz    |
| 4632.000   | 34.4             | 4.7         | 2.9                     | 1.1               | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 39.1              | 54.0                 | -14.9                  | High channel, 926.4 MHz, Ant. A EUT on side |
| 4514.983   | 34.3             | 4.3         | 1.0                     | 16.1              | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 38.6              | 54.0                 | -15.4                  | Low channel, 903 MHz, Ant. A, EUT horz      |
| 4632.025   | 33.9             | 4.7         | 1.0                     | 228.1             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 38.6              | 54.0                 | -15.4                  | High channel, 926.4 MHz, Ant. B, EUT horz   |
| 4573.008   | 33.9             | 4.4         | 3.3                     | 228.1             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 38.3              | 54.0                 | -15.7                  | Mid channel, 914.6 MHz, Ant. B, EUT horz    |

| 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                                     |
|------------|------------------|-------------|-------------------------|-------------------|------------------------|---------------------------|--------------------------|----------|--------------------------|-------------------|----------------------|------------------------|--|
| 3705.525   | 36.0             | 1.7         | 1.0                     | 229.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 37.7              | 54.0                 | -16.3                  | High channel, 926.4 MHz, Ant. B, EUT horz    |
| 4572.920   | 33.1             | 4.4         | 2.9                     | 340.9             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 37.5              | 54.0                 | -16.5                  | Mid channel, 914.6 MHz, Ant. A, EUT on side  |
| 3705.545   | 35.8             | 1.7         | 1.0                     | 178.1             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 37.5              | 54.0                 | -16.5                  | High channel, 926.4 MHz, Ant. A, EUT on side |
| 4514.945   | 33.2             | 4.3         | 1.0                     | 250.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 37.5              | 54.0                 | -16.5                  | Low channel, 903 MHz, Ant. B, EUT vert       |
| 4572.975   | 33.1             | 4.4         | 1.0                     | 344.9             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 37.5              | 54.0                 | -16.5                  | Mid channel, 914.6 MHz, Ant. B, EUT vert     |
| 7316.525   | 44.1             | 13.2        | 1.1                     | 285.0             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 57.3              | 74.0                 | -16.7                  | Mid channel, 914.6 MHz, Ant. B, EUT horz     |
| 3658.408   | 35.9             | 1.3         | 1.1                     | 333.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 37.2              | 54.0                 | -16.8                  | Mid channel, 914.6 MHz, Ant. B, EUT vert     |
| 3611.933   | 36.0             | 0.8         | 1.0                     | 250.9             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 36.8              | 54.0                 | -17.2                  | Low channel, 903 MHz, Ant. B, EUT horz       |
| 7316.775   | 43.4             | 13.2        | 1.0                     | 250.0             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 56.6              | 74.0                 | -17.4                  | Mid channel, 914.6 MHz, Ant. B, EUT vert     |
| 3705.605   | 34.8             | 1.7         | 1.2                     | 192.1             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 36.5              | 54.0                 | -17.5                  | High channel, 926.4 MHz, Ant. A EUT horz     |
| 3658.430   | 35.0             | 1.3         | 1.0                     | 186.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 36.3              | 54.0                 | -17.7                  | Mid channel, 914.6 MHz, Ant. A, EUT on side  |
| 3705.458   | 34.6             | 1.7         | 1.0                     | 332.0             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 36.3              | 54.0                 | -17.7                  | High channel, 926.4 MHz, Ant. B, EUT vert    |
| 3658.350   | 34.8             | 1.3         | 1.0                     | 224.1             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 36.1              | 54.0                 | -17.9                  | Mid channel, 914.6 MHz, Ant. B, EUT horz     |
| 7409.375   | 42.2             | 13.1        | 3.8                     | 306.0             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 55.3              | 74.0                 | -18.7                  | High channel, 926.4 MHz, Ant. B, EUT horz    |
| 3658.375   | 33.8             | 1.3         | 1.0                     | 46.0              | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 35.1              | 54.0                 | -18.9                  | Mid channel, 914.6 MHz, Ant. A, EUT horz     |
| 7411.460   | 41.9             | 13.1        | 1.6                     | 289.9             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 55.0              | 74.0                 | -19.0                  | High channel, 926.4 MHz, Ant. A EUT on side  |
| 3612.065   | 34.2             | 0.8         | 1.0                     | 80.1              | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 35.0              | 54.0                 | -19.0                  | Low channel, 903 MHz, Ant. B, EUT vert       |
| 7317.560   | 41.7             | 13.2        | 1.0                     | 167.1             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 54.9              | 74.0                 | -19.1                  | Mid channel, 914.6 MHz, Ant. A, EUT on side  |
| 7410.835   | 41.8             | 13.1        | 1.4                     | 290.9             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 54.9              | 74.0                 | -19.1                  | High channel, 926.4 MHz, Ant. A EUT horz     |
| 7411.083   | 41.8             | 13.1        | 1.0                     | 167.1             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 54.9              | 74.0                 | -19.1                  | High channel, 926.4 MHz, Ant. B, EUT vert    |
| 5417.808   | 47.1             | 7.0         | 1.0                     | 121.0             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 54.1              | 74.0                 | -19.9                  | Low channel, 903 MHz, Ant. A, EUT on side    |
| 7316.633   | 40.9             | 13.2        | 3.8                     | 110.0             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 54.1              | 74.0                 | -19.9                  | Mid channel, 914.6 MHz, Ant. A, EUT horz     |
| 5417.875   | 46.8             | 7.0         | 1.0                     | 234.0             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 53.8              | 74.0                 | -20.2                  | Low channel, 903 MHz, Ant. B, EUT horz       |
| 3612.067   | 32.9             | 0.8         | 1.0                     | 264.9             | 3.0                    | 0.0                       | Horz                     | AV       | 0.0                      | 33.7              | 54.0                 | -20.3                  | Low channel, 903 MHz, Ant. A, EUT on side    |
| 5418.025   | 46.7             | 7.0         | 1.0                     | 325.9             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 53.7              | 74.0                 | -20.3                  | Low channel, 903 MHz, Ant. B, EUT vert       |
| 3612.017   | 32.4             | 0.8         | 1.8                     | 263.0             | 3.0                    | 0.0                       | Vert                     | AV       | 0.0                      | 33.2              | 54.0                 | -20.8                  | Low channel, 903 MHz, Ant. A, EUT horz       |
| 5417.825   | 46.2             | 7.0         | 2.0                     | 321.0             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 53.2              | 74.0                 | -20.8                  | Low channel, 903 MHz, Ant. B, EUT horz       |
| 5417.825   | 45.9             | 7.0         | 1.0                     | 92.0              | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 52.9              | 74.0                 | -21.1                  | Low channel, 903 MHz, Ant. B, EUT on side    |
| 5418.083   | 45.4             | 7.0         | 1.0                     | 306.0             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 52.4              | 74.0                 | -21.6                  | Low channel, 903 MHz, Ant. A, EUT vert       |
| 5418.233   | 45.0             | 7.0         | 2.0                     | 235.0             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 52.0              | 74.0                 | -22.0                  | Low channel, 903 MHz, Ant. A, EUT horz       |
| 5418.175   | 44.9             | 7.0         | 2.7                     | 203.1             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 51.9              | 74.0                 | -22.1                  | Low channel, 903 MHz, Ant. A, EUT on side    |
| 5417.983   | 44.8             | 7.0         | 1.1                     | 236.9             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 51.8              | 74.0                 | -22.2                  | Low channel, 903 MHz, Ant. B, EUT vert       |
| 5418.075   | 44.3             | 7.0         | 1.0                     | 143.0             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 51.3              | 74.0                 | -22.7                  | Low channel, 903 MHz, Ant. A, EUT horz       |
| 5417.850   | 44.3             | 7.0         | 1.0                     | 322.9             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 51.3              | 74.0                 | -22.7                  | Low channel, 903 MHz, Ant. B, EUT on side    |
| 5417.667   | 43.9             | 7.0         | 1.0                     | 220.1             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 50.9              | 74.0                 | -23.1                  | Low channel, 903 MHz, Ant. A, EUT vert       |
| 4631.945   | 44.7             | 4.7         | 1.6                     | 188.1             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 49.4              | 74.0                 | -24.6                  | High channel, 926.4 MHz, Ant. A EUT horz     |
| 4631.992   | 44.0             | 4.7         | 1.0                     | 228.1             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 48.7              | 74.0                 | -25.3                  | High channel, 926.4 MHz, Ant. B, EUT horz    |
| 4632.535   | 43.9             | 4.7         | 2.9                     | 1.1               | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 48.6              | 74.0                 | -25.4                  | High channel, 926.4 MHz, Ant. A EUT on side  |
| 4514.775   | 44.2             | 4.3         | 1.0                     | 252.0             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 48.5              | 74.0                 | -25.5                  | Low channel, 903 MHz, Ant. B, EUT horz       |
| 4515.008   | 44.1             | 4.3         | 1.0                     | 109.1             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 48.4              | 74.0                 | -25.6                  | Low channel, 903 MHz, Ant. A, EUT on side    |
| 4631.617   | 43.7             | 4.7         | 1.1                     | 335.0             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 48.4              | 74.0                 | -25.6                  | High channel, 926.4 MHz, Ant. B, EUT vert    |
| 4572.875   | 43.9             | 4.4         | 3.3                     | 228.1             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 48.3              | 74.0                 | -25.7                  | Mid channel, 914.6 MHz, Ant. B, EUT horz     |
| 4573.425   | 43.7             | 4.4         | 1.0                     | 344.9             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 48.1              | 74.0                 | -25.9                  | Mid channel, 914.6 MHz, Ant. B, EUT vert     |
| 4514.817   | 43.6             | 4.3         | 1.0                     | 16.1              | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 47.9              | 74.0                 | -26.1                  | Low channel, 903 MHz, Ant. A, EUT horz       |
| 4573.208   | 43.3             | 4.4         | 4.0                     | 70.1              | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 47.7              | 74.0                 | -26.3                  | Mid channel, 914.6 MHz, Ant. A, EUT horz     |
| 4515.700   | 43.4             | 4.3         | 1.0                     | 250.0             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 47.7              | 74.0                 | -26.3                  | Low channel, 903 MHz, Ant. B, EUT vert       |
| 4572.805   | 43.1             | 4.4         | 2.9                     | 340.9             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 47.5              | 74.0                 | -26.5                  | Mid channel, 914.6 MHz, Ant. A, EUT on side  |
| 3704.942   | 45.4             | 1.7         | 1.0                     | 229.0             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 47.1              | 74.0                 | -26.9                  | High channel, 926.4 MHz, Ant. B, EUT horz    |
| 3705.875   | 45.0             | 1.7         | 1.2                     | 192.1             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 46.7              | 74.0                 | -27.3                  | High channel, 926.4 MHz, Ant. A EUT horz     |
| 3658.717   | 45.4             | 1.3         | 1.1                     | 333.0             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 46.7              | 74.0                 | -27.3                  | Mid channel, 914.6 MHz, Ant. B, EUT vert     |
| 3612.475   | 45.7             | 0.8         | 1.0                     | 250.9             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 46.5              | 74.0                 | -27.5                  | Low channel, 903 MHz, Ant. B, EUT horz       |
| 3658.650   | 45.0             | 1.3         | 1.0                     | 186.0             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 46.3              | 74.0                 | -27.7                  | Mid channel, 914.6 MHz, Ant. A, EUT on side  |
| 3705.870   | 44.6             | 1.7         | 1.0                     | 178.1             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 46.3              | 74.0                 | -27.7                  | High channel, 926.4 MHz, Ant. A EUT on side  |
| 3658.133   | 45.0             | 1.3         | 1.0                     | 224.1             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 46.3              | 74.0                 | -27.7                  | Mid channel, 914.6 MHz, Ant. B, EUT horz     |
| 3705.383   | 44.5             | 1.7         | 1.0                     | 332.0             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 46.2              | 74.0                 | -27.8                  | High channel, 926.4 MHz, Ant. B, EUT vert    |
| 3612.205   | 44.6             | 0.8         | 1.0                     | 80.1              | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 45.4              | 74.0                 | -28.6                  | Low channel, 903 MHz, Ant. B, EUT vert       |
| 3658.300   | 43.3             | 1.3         | 1.0                     | 46.0              | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 44.6              | 74.0                 | -29.4                  | Mid channel, 914.6 MHz, Ant. A, EUT horz     |
| 3611.883   | 43.5             | 0.8         | 1.8                     | 263.0             | 3.0                    | 0.0                       | Vert                     | PK       | 0.0                      | 44.3              | 74.0                 | -29.7                  | Low channel, 903 MHz, Ant. A, EUT horz       |
| 3612.025   | 42.9             | 0.8         | 1.0                     | 264.9             | 3.0                    | 0.0                       | Horz                     | PK       | 0.0                      | 43.7              | 74.0                 | -30.3                  | Low channel, 903 MHz, Ant. A, EUT on side    |

## **DUTY CYCLE**

### **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.

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

The EUT operates at 100% Duty Cycle.

# CARRIER FREQUENCY SEPARATION

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.  | Cal. Due   |
|------------------------------|--------------------|-----------------|-----|------------|------------|
| Generator - Signal           | Agilent            | N5183A          | TIK | 10/17/2014 | 10/17/2017 |
| Cable                        | ESM Cable Corp.    | TTBJ141 KMMK-72 | MNU | 9/18/2015  | 9/18/2016  |
| Attenuator                   | S.M. Electronics   | SA26B-20        | RFW | 2/26/2016  | 2/26/2017  |
| Block - DC                   | Fairview Microwave | SD3379          | AMI | 9/18/2015  | 9/18/2016  |
| Analyzer - Spectrum Analyzer | Agilent            | E4440A          | AAX | 3/24/2016  | 3/24/2017  |

## TEST DESCRIPTION

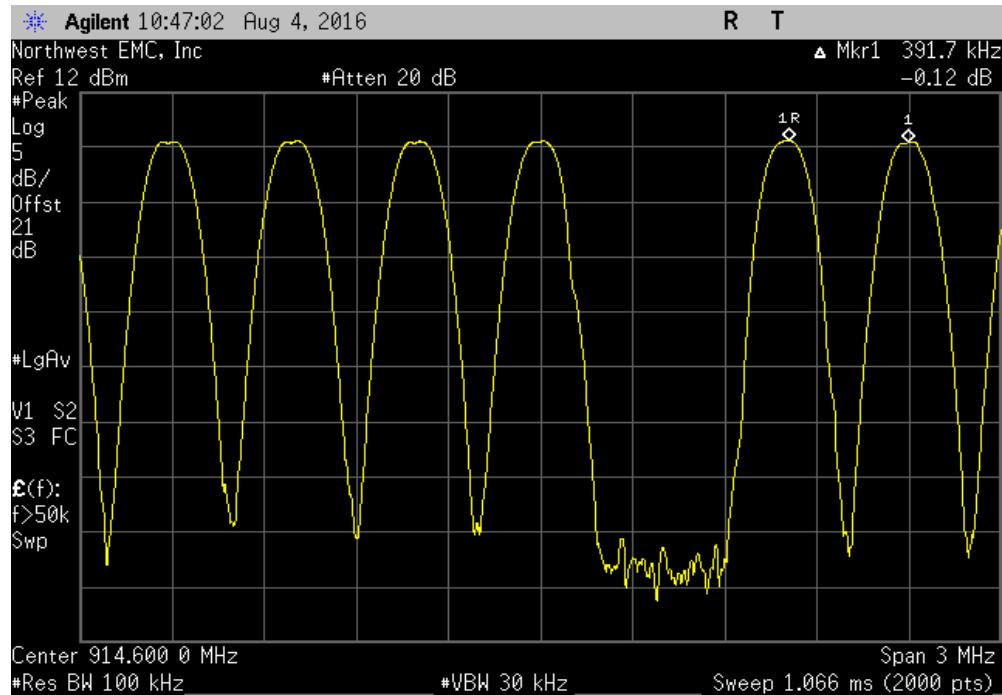
The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The channel carrier frequencies in the 900-928MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels was measured.

# CARRIER FREQUENCY SEPARATION

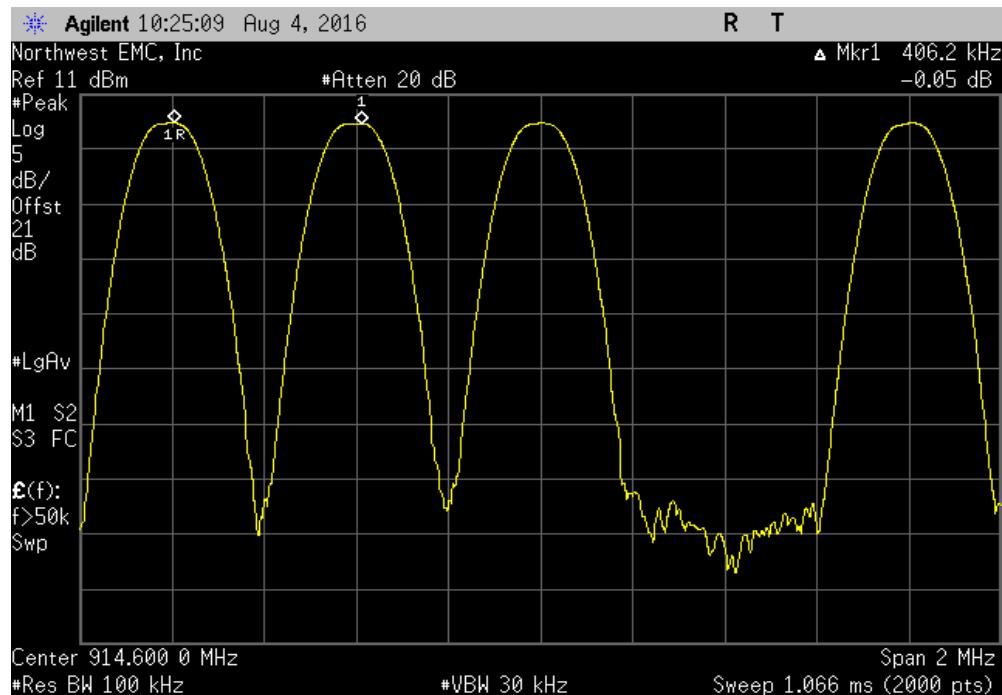
| EUT:   | TH8321R1001                                 | Work Order:   | HNYW0180         |         |
|--|---|---|------------------|---------|
| Serial Number:                                 | 5191101 0315015                             | Date:   | 08/04/16         |         |
| Customer:                                      | Honeywell, Automation and Control Solutions | Temperature:  | 23.4 °C          |         |
| Attendees:                                     | None  | Humidity:   | 60.8% RH         |         |
| Project:                                       | None  | Barometric Pres.:   | 1012 mbar        |         |
| Tested by:                                     | Dustin Sparks                               | Job Site:   | MN08             |         |
| TEST SPECIFICATIONS                            |   | Power:  | 110VAC/60Hz      |         |
| FCC 15.247:2016                                |   | Test Method:  | ANSI C63.10:2013 |         |
| COMMENTS                                       |   |   |                  |         |
| Limit is based on the 20dB occupied bandwidth. |   |   |                  |         |
| DEVIATIONS FROM TEST STANDARD                  |   |   |                  |         |
| None   |   |   |                  |         |
| Configuration #                                | 3   |  |                  |         |
|  |   | Signature   |                  |         |
|  |   | Value   | Limit            | Results |
| Antenna A                                      | Mid Channel, 914.6 MHz                      | 392 kHz   | >65 kHz          | Pass    |
| Antenna B                                      | Mid Channel, 914.6 MHz                      | 406 kHz   | >65 kHz          | Pass    |

# CARRIER FREQUENCY SEPARATION

| Antenna A, Mid Channel, 914.6 MHz |         |         |
|-----------------------------------|---------|---------|
| Value                             | Limit   | Results |
| 392 kHz                           | >65 kHz | Pass    |



| Antenna B, Mid Channel, 914.6 MHz |         |         |
|-----------------------------------|---------|---------|
| Value                             | Limit   | Results |
| 406 kHz                           | >65 kHz | Pass    |



# NUMBER OF HOPPING FREQUENCIES

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.  | Cal. Due   |
|------------------------------|--------------------|-----------------|-----|------------|------------|
| Generator - Signal           | Agilent            | N5183A          | TIK | 10/17/2014 | 10/17/2017 |
| Cable                        | ESM Cable Corp.    | TTBJ141 KMMK-72 | MNU | 9/18/2015  | 9/18/2016  |
| Attenuator                   | S.M. Electronics   | SA26B-20        | RFW | 2/26/2016  | 2/26/2017  |
| Block - DC                   | Fairview Microwave | SD3379          | AMI | 9/18/2015  | 9/18/2016  |
| Analyzer - Spectrum Analyzer | Agilent            | E4440A          | AAX | 3/24/2016  | 3/24/2017  |

## TEST DESCRIPTION

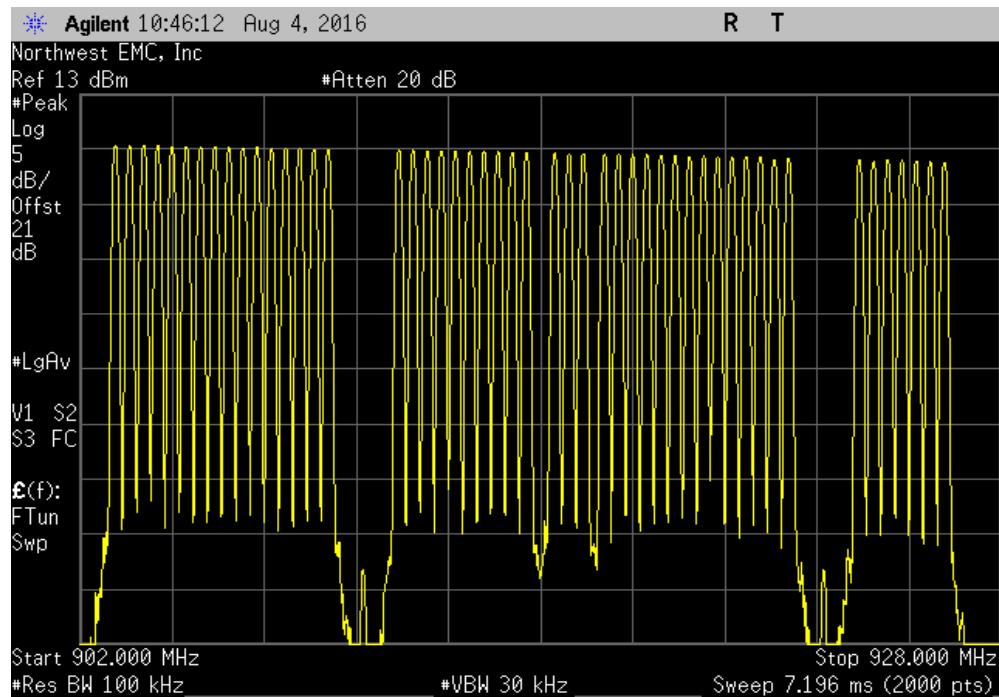
The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The number of hopping frequencies was measured across the authorized band. The hopping function of the EUT was enabled.

# NUMBER OF HOPPING FREQUENCIES

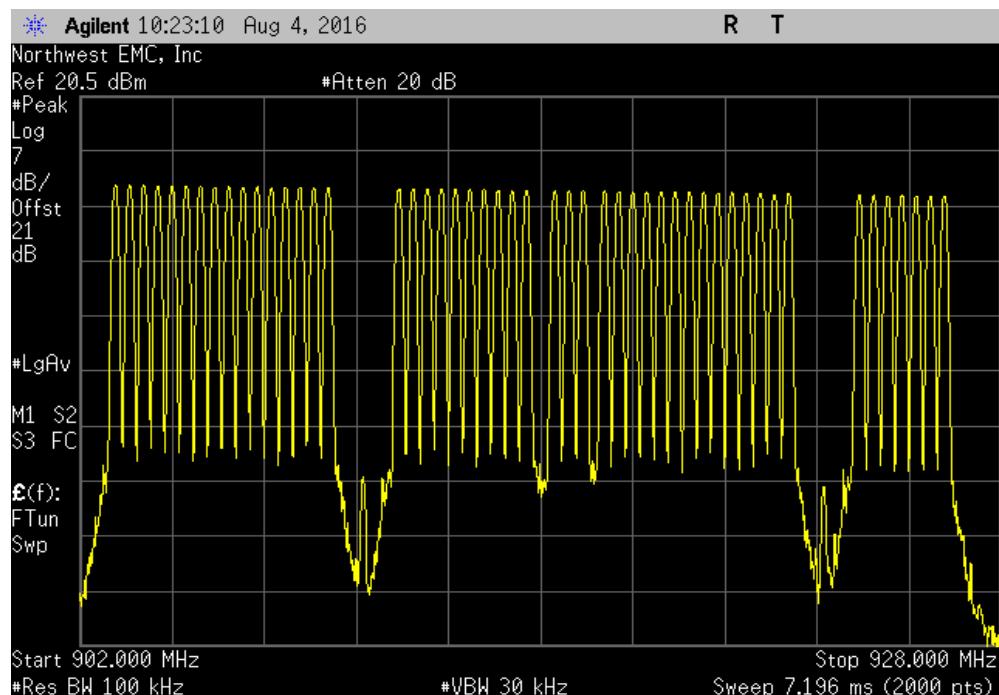
|                               |   |           |                   |                    |           |         |
|-------------------------------|---|-----------|-------------------|--------------------|-----------|---------|
| EUT:                          | TH8321R1001                                 |           | Work Order:       | HNYW0180           |           |         |
| Serial Number:                | 5191101 0315015                             |           | Date:             | 08/04/16           |           |         |
| Customer:                     | Honeywell, Automation and Control Solutions |           | Temperature:      | 23.5 °C            |           |         |
| Attendees:                    | None  |           | Humidity:         | 61.2% RH           |           |         |
| Project:                      | None  |           | Barometric Pres.: | 1012 mbar          |           |         |
| Tested by:                    | Dustin Sparks                               | Power:    | 110VAC/60Hz       |                    | Job Site: | MN08    |
| TEST SPECIFICATIONS           |   |           | Test Method       |                    |           |         |
| FCC 15.247:2016               |   |           | ANSI C63.10:2013  |                    |           |         |
| COMMENTS                      |   |           |                   |                    |           |         |
| None                          |   |           |                   |                    |           |         |
| DEVIATIONS FROM TEST STANDARD |   |           |                   |                    |           |         |
| None                          |   |           |                   |                    |           |         |
| Configuration #               | 3   | Signature | Dustin Sparks     | Number of Channels | Limit     | Results |
| Antenna A                     | Mid Channel, 914.6 MHz                      |           |                   | 50                 | ≥ 50      | Pass    |
| Antenna B                     | Mid Channel, 914.6 MHz                      |           |                   | 50                 | ≥ 50      | Pass    |

# NUMBER OF HOPPING FREQUENCIES

| Antenna A, Mid Channel, 914.6 MHz |  |  |  | Number of Channels | Limit | Results |
|-----------------------------------|--|--|--|--------------------|-------|---------|
| 50                                |  |  |  | 50                 |       | N/A     |



| Antenna B, Mid Channel, 914.6 MHz |  |  |  | Number of Channels | Limit | Results |
|-----------------------------------|--|--|--|--------------------|-------|---------|
| 50                                |  |  |  | 50                 |       | N/A     |



# DWELL TIME

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.  | Cal. Due   |
|------------------------------|--------------------|-----------------|-----|------------|------------|
| Generator - Signal           | Agilent            | N5183A          | TIK | 10/17/2014 | 10/17/2017 |
| Cable                        | ESM Cable Corp.    | TTBJ141 KMKM-72 | MNU | 9/18/2015  | 9/18/2016  |
| Attenuator                   | S.M. Electronics   | SA26B-20        | RFW | 2/26/2016  | 2/26/2017  |
| Block - DC                   | Fairview Microwave | SD3379          | AMI | 9/18/2015  | 9/18/2016  |
| Analyzer - Spectrum Analyzer | Agilent            | E4440A          | AAX | 3/24/2016  | 3/24/2017  |

## TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band. The hopping function of the EUT was enabled.

The dwell time limit is based on the Number of Hopping Channels \* 400 mS. For this radio, it is 50 Channels \* 400mS = 20.0 Sec.

On Time During 20.0 Sec = Pulse Width \* Average Number of Pulses \* Scale Factor

➤Average Number of Pulses is based on 4 samples.

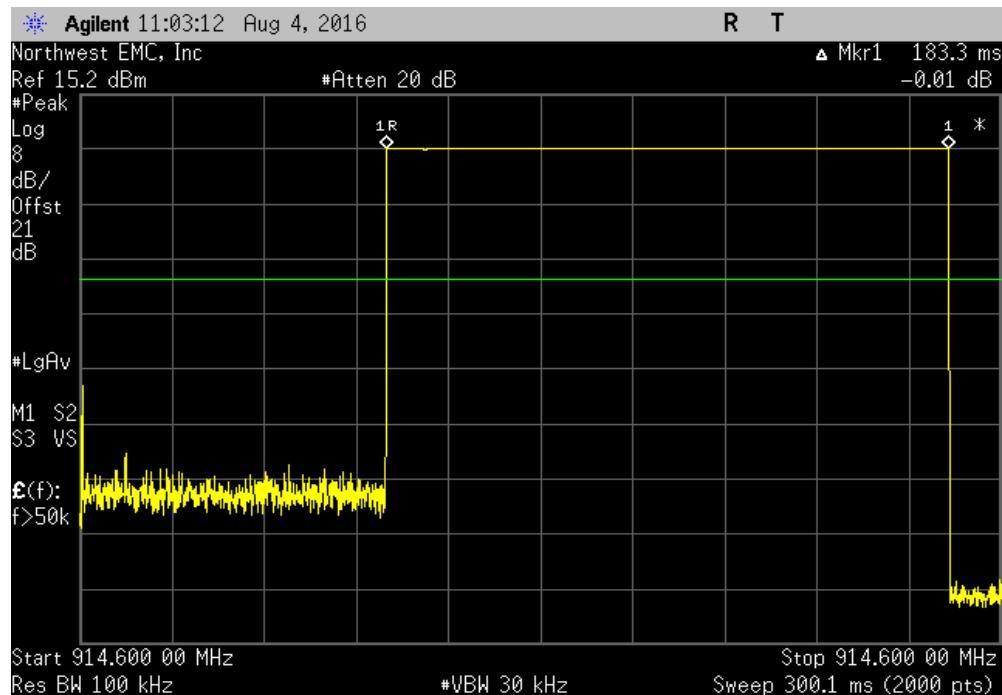
➤Scale Factor = 20.0 Sec / Screen Capture Sweep Time = 20.0 Sec / 60.0 Sec = 1/3

# DWELL TIME

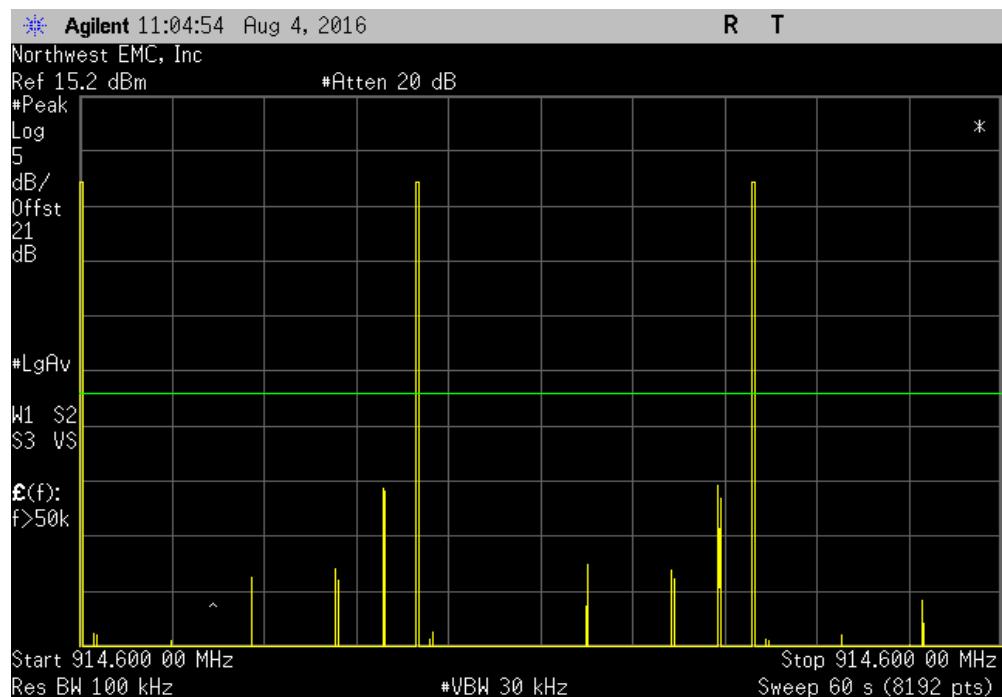
| EUT:                          | TH8321R1001                                 |           | Work Order:       | HNYW0180         |                        |              |                          |            |
|-------------------------------|---|-----------|-------------------|------------------|------------------------|--------------|--------------------------|------------|
| Serial Number:                | 5191101 0315015                             |           | Date:             | 08/04/16         |                        |              |                          |            |
| Customer:                     | Honeywell, Automation and Control Solutions |           | Temperature:      | 23.4 °C          |                        |              |                          |            |
| Attendees:                    | None  |           | Humidity:         | 60.8% RH         |                        |              |                          |            |
| Project:                      | None  |           | Barometric Pres.: | 1011 mbar        |                        |              |                          |            |
| Tested by:                    | Dustin Sparks                               | Power:    | 110VAC/60Hz       |                  | Job Site:              | MN08         |                          |            |
| TEST SPECIFICATIONS           |   |           | Test Method       |                  |                        |              |                          |            |
| FCC 15.247:2016               |   |           | ANSI C63.10:2013  |                  |                        |              |                          |            |
| COMMENTS                      |   |           |                   |                  |                        |              |                          |            |
| None                          |   |           |                   |                  |                        |              |                          |            |
| DEVIATIONS FROM TEST STANDARD |   |           |                   |                  |                        |              |                          |            |
| None                          |   |           |                   |                  |                        |              |                          |            |
| Configuration #               | 3   | Signature | Dustin Sparks     |                  |                        |              | Results                  |            |
|                               |   |           | Pulse Width (ms)  | Number of Pulses | Average High Time (ms) | Scale Factor | On Time (ms) During 20 s | Limit (ms) |
| Antenna A                     |   |           | 183.313           | N/A              | N/A                    | N/A          | N/A                      | N/A        |
| Mid Channel, 914.6 MHz        |   |           | 183.313           | 3                | 549.939                | 1/3          | 183.313                  | 400        |
| Mid Channel, 914.6 MHz        |   |           |                   |                  |                        |              |                          | Pass       |
| Antenna B                     |   |           | 183.313           | N/A              | N/A                    | N/A          | N/A                      | N/A        |
| Mid Channel, 914.6 MHz        |   |           | 183.313           | 3                | 549.939                | 183.313      | 183.313                  | 400        |
| Mid Channel, 914.6 MHz        |   |           |                   |                  |                        |              |                          | Pass       |

# DWELL TIME

| Antenna A, Mid Channel, 914.6 MHz |                  |                        |              |                          |            |         |
|-----------------------------------|------------------|------------------------|--------------|--------------------------|------------|---------|
| Pulse Width (ms)                  | Number of Pulses | Average High Time (ms) | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
| 183.313                           | N/A              | N/A                    | N/A          | N/A                      | N/A        | N/A     |

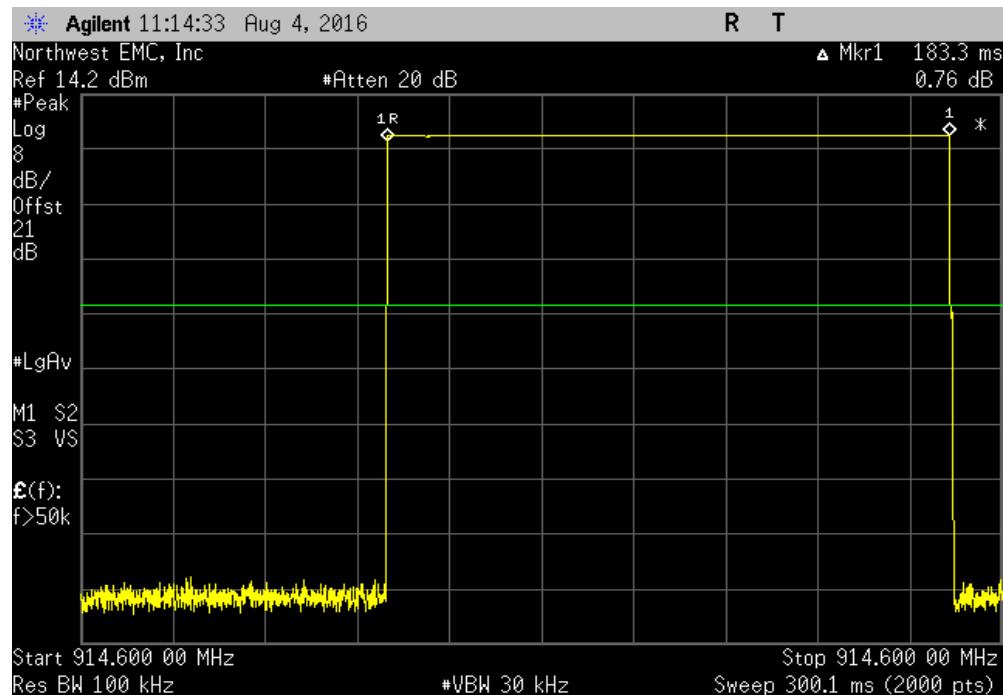


| Antenna A, Mid Channel, 914.6 MHz |                  |                        |              |                          |            |         |
|-----------------------------------|------------------|------------------------|--------------|--------------------------|------------|---------|
| Pulse Width (ms)                  | Number of Pulses | Average High Time (ms) | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
| 183.313                           | 3                | 549.9                  | 1/3          | 183.3                    | 400        | Pass    |

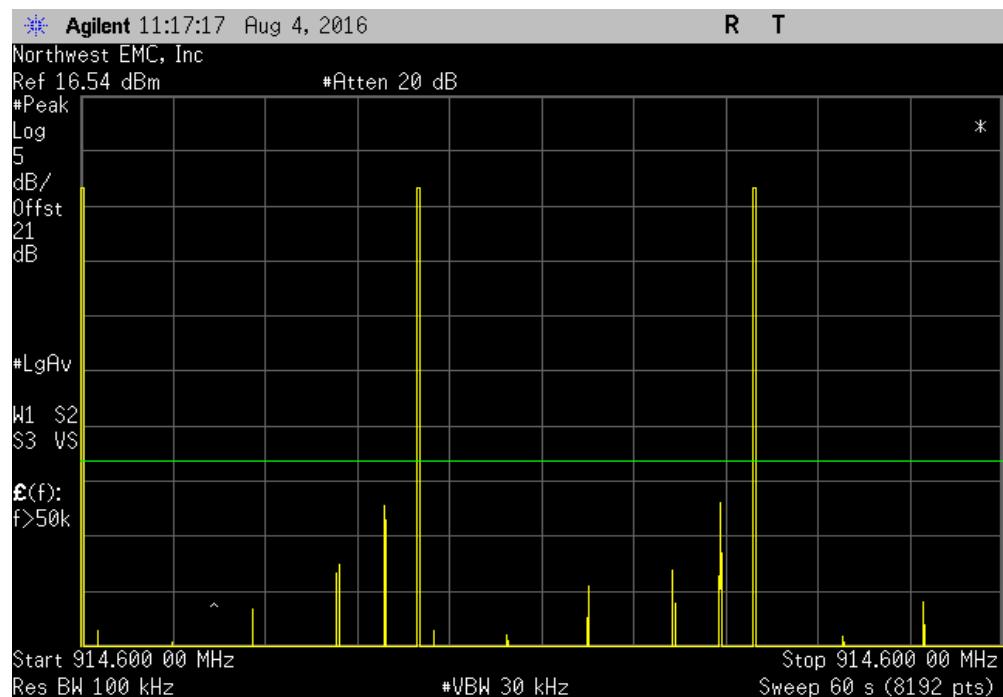


# DWELL TIME

| Antenna B, Mid Channel, 914.6 MHz |                  |                        |              |                          |            |         |
|-----------------------------------|------------------|------------------------|--------------|--------------------------|------------|---------|
| Pulse Width (ms)                  | Number of Pulses | Average High Time (ms) | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
| 183.313                           | N/A              | N/A                    | N/A          | N/A                      | N/A        | N/A     |



| Antenna B, Mid Channel, 914.6 MHz |                  |                        |              |                          |            |         |
|-----------------------------------|------------------|------------------------|--------------|--------------------------|------------|---------|
| Pulse Width (ms)                  | Number of Pulses | Average High Time (ms) | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
| 183.313                           | 3                | 549.939                | 183.313      | 183.313                  | 400        | 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.  | Cal. Due   |
|------------------------------|--------------------|-----------------|-----|------------|------------|
| Generator - Signal           | Agilent            | N5183A          | TIK | 10/17/2014 | 10/17/2017 |
| Cable                        | ESM Cable Corp.    | TTBJ141 KMKM-72 | MNU | 9/18/2015  | 9/18/2016  |
| Attenuator                   | S.M. Electronics   | SA26B-20        | RFW | 2/26/2016  | 2/26/2017  |
| Block - DC                   | Fairview Microwave | SD3379          | AMI | 9/18/2015  | 9/18/2016  |
| Analyzer - Spectrum Analyzer | Agilent            | E4440A          | AAX | 3/24/2016  | 3/24/2017  |

## TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

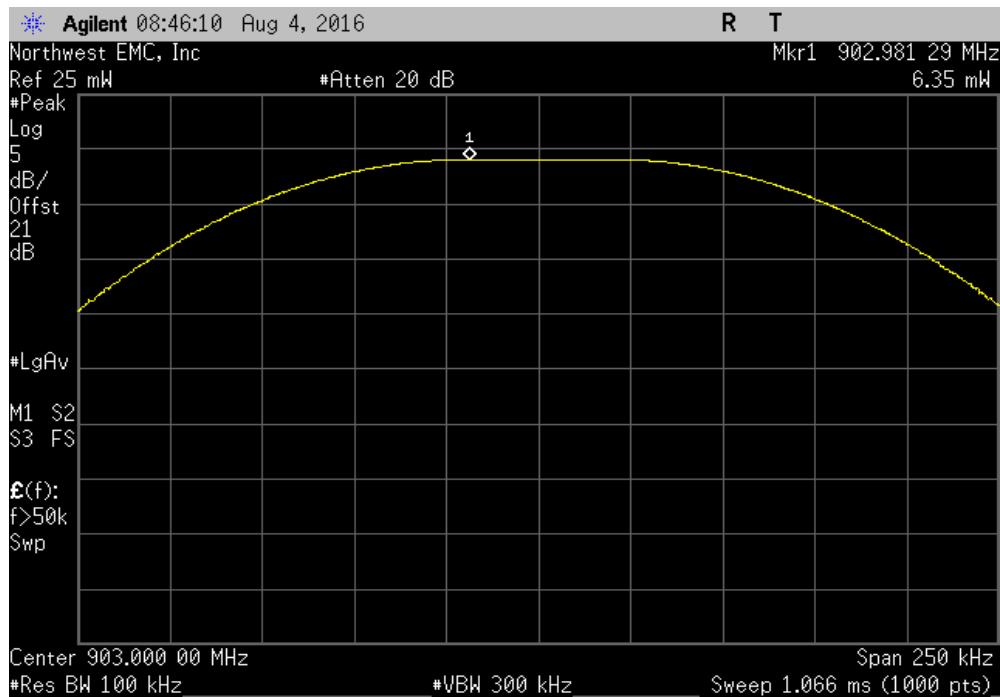
**De Facto EIRP Limit:** Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.

# OUTPUT POWER

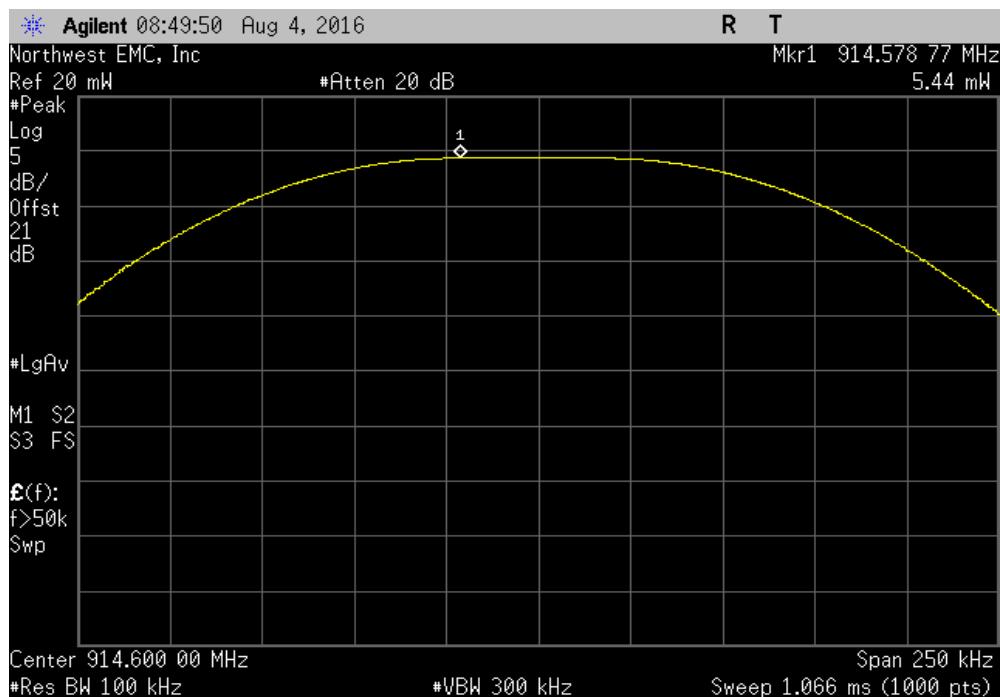
|                               |   |                   |   |
|-------------------------------|---|-------------------|---|
| EUT:                          | TH8321R1001                                 | Work Order:       | HNW0180   |
| Serial Number:                | 5191101 0315015                             | Date:             | 08/04/16  |
| Customer:                     | Honeywell, Automation and Control Solutions | Temperature:      | 23.3 °C   |
| Attendees:                    | None  | Humidity:         | 60.1% RH  |
| Project:                      | None  | Barometric Pres.: | 1013 mbar   |
| Tested by:                    | Dustin Sparks                               | Power:            | 110VAC/60Hz   |
| TEST SPECIFICATIONS           |   | Test Method       |   |
| FCC 15.247:2016               |   | ANSI C63.10:2013  |   |
| COMMENTS                      |   |                   |   |
| None                          |   |                   |   |
| DEVIATIONS FROM TEST STANDARD |   |                   |   |
| None                          |   |                   |   |
| Configuration #               | 3   | Signature         |  |
|                               |   | Value             | Limit (<)   |
| Antenna A                     |   | 6.353 mW          | 1 W   |
|                               |   | 5.438 mW          | 1 W   |
|                               |   | 4.474 mW          | 1 W   |
| Antenna B                     |   | 7.547 mW          | 1 W   |
|                               |   | 6.59 mW           | 1 W   |
|                               |   | 5.526 mW          | 1 W   |

# OUTPUT POWER

| Antenna A, Low Channel, 903.0 MHz |          |              |
|-----------------------------------|----------|--------------|
|                                   | Value    | Limit<br>(<) |
|                                   | 6.353 mW | 1 W          |

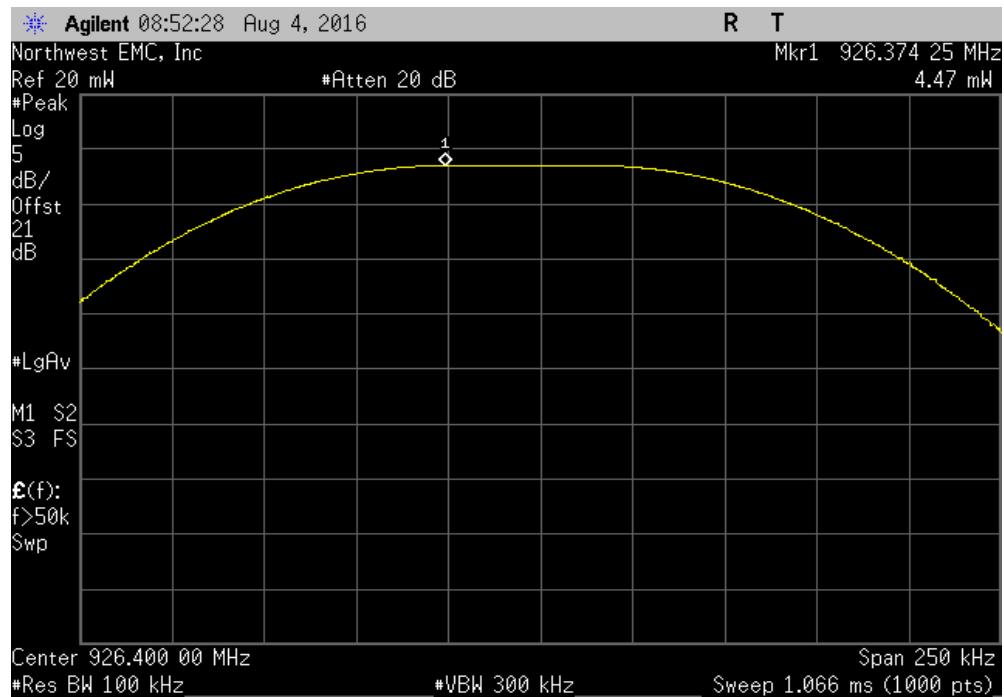


| Antenna A, Mid Channel, 914.6 MHz |          |              |
|-----------------------------------|----------|--------------|
|                                   | Value    | Limit<br>(<) |
|                                   | 5.438 mW | 1 W          |

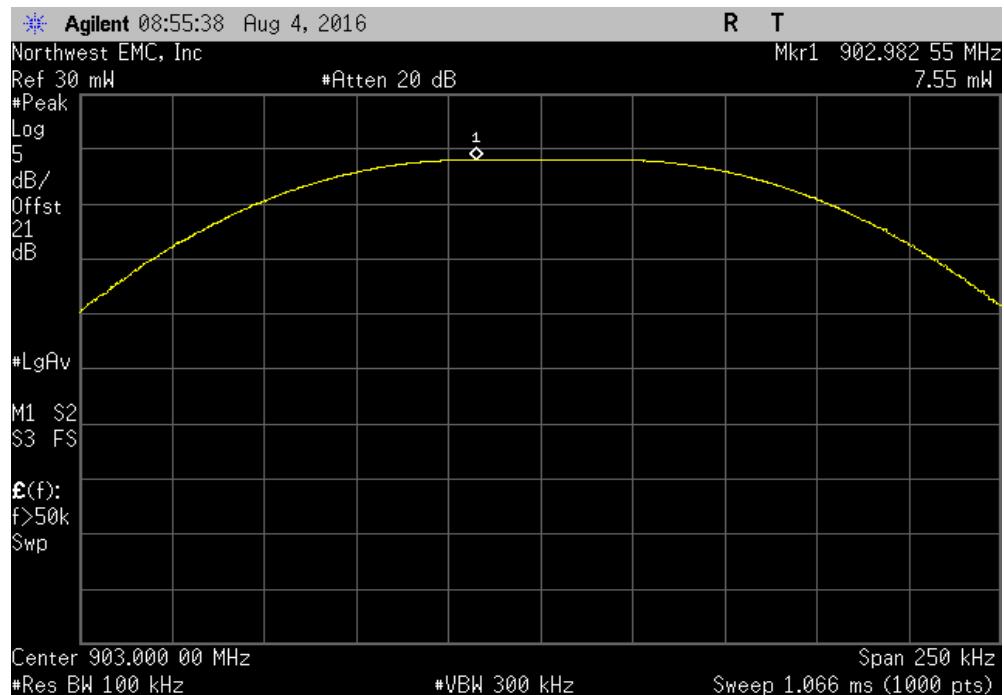


# OUTPUT POWER

| Antenna A, High Channel, 926.4 MHz |           |        |
|------------------------------------|-----------|--------|
| Value                              | Limit (<) | Result |
| 4.474 mW                           | 1 W       | Pass   |

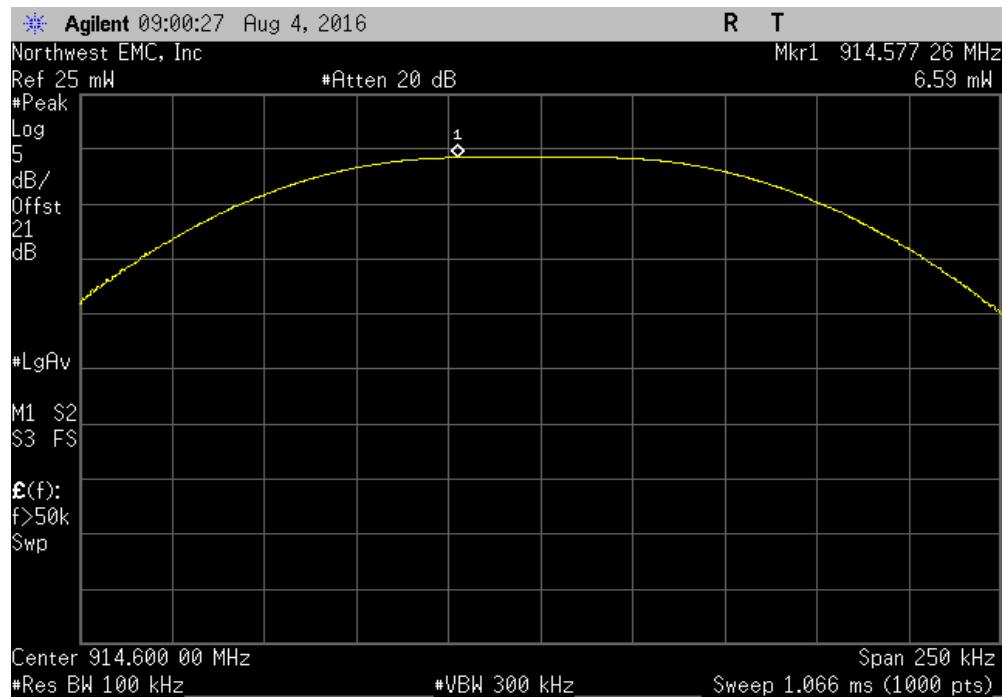


| Antenna B, Low Channel, 903.0 MHz |           |        |
|-----------------------------------|-----------|--------|
| Value                             | Limit (<) | Result |
| 7.547 mW                          | 1 W       | Pass   |

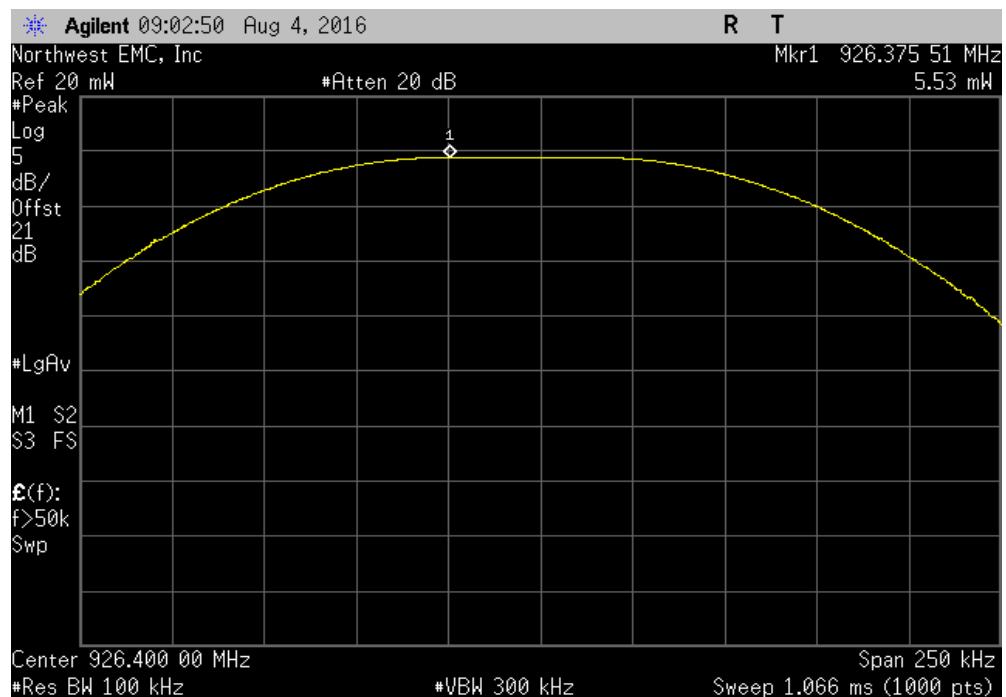


# OUTPUT POWER

| Antenna B, Mid Channel, 914.6 MHz |           |        |
|-----------------------------------|-----------|--------|
| Value                             | Limit (<) | Result |
| 6.59 mW                           | 1 W       | Pass   |



| Antenna B, High Channel, 926.4 MHz |           |        |
|------------------------------------|-----------|--------|
| Value                              | Limit (<) | Result |
| 5.526 mW                           | 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.  | Cal. Due   |
|------------------------------|--------------------|-----------------|-----|------------|------------|
| Generator - Signal           | Agilent            | N5183A          | TIK | 10/17/2014 | 10/17/2017 |
| Cable                        | ESM Cable Corp.    | TTBJ141 KMKM-72 | MNU | 9/18/2015  | 9/18/2016  |
| Attenuator                   | S.M. Electronics   | SA26B-20        | RFW | 2/26/2016  | 2/26/2017  |
| Block - DC                   | Fairview Microwave | SD3379          | AMI | 9/18/2015  | 9/18/2016  |
| Analyzer - Spectrum Analyzer | Agilent            | E4440A          | AAX | 3/24/2016  | 3/24/2017  |

## TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

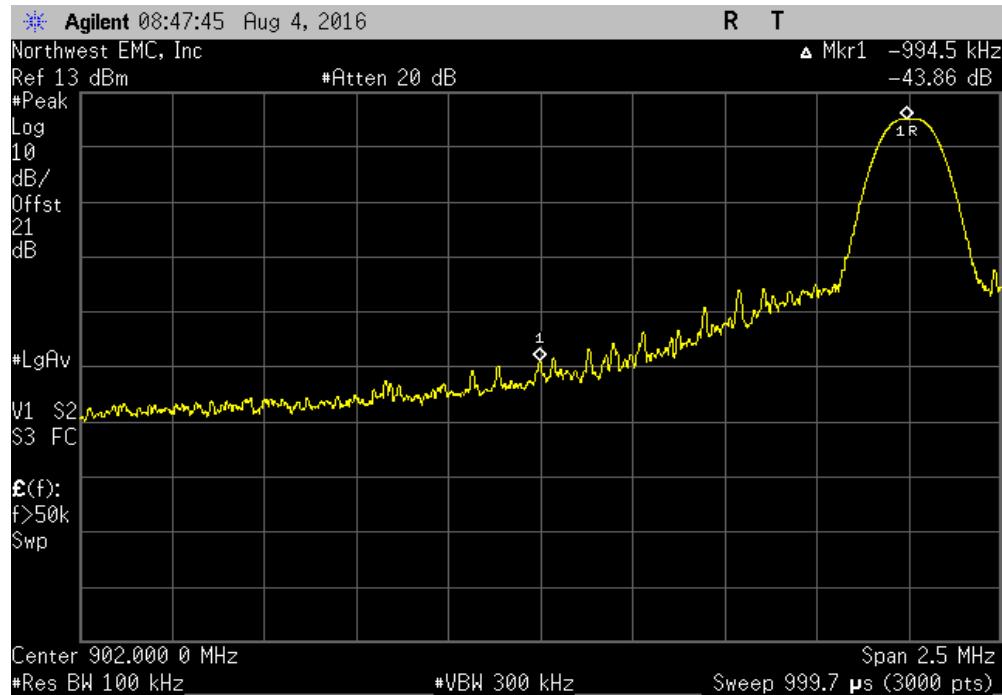
The spectrum was scanned below the lower band edge and above the higher band edge.

# BAND EDGE COMPLIANCE

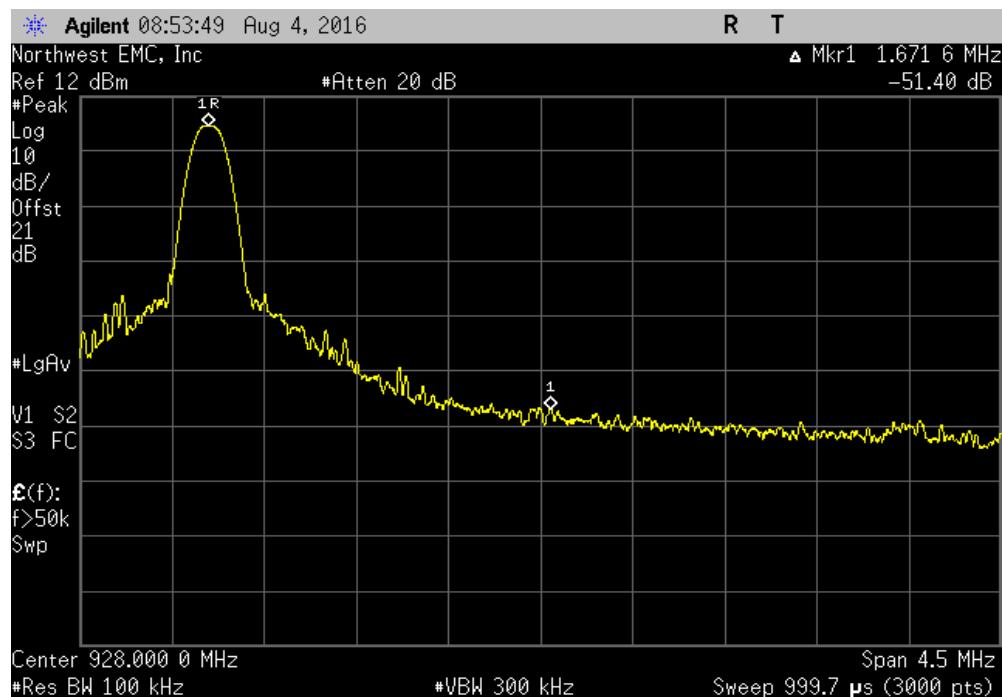
|                               |   |                         |                   |             |               |        |
|-------------------------------|---|-------------------------|-------------------|-------------|---------------|--------|
| EUT:                          | TH8321R1001                                 |                         | Work Order:       | HNYW0180    |               |        |
| Serial Number:                | 5191101 0315015                             |                         | Date:             | 08/04/16    |               |        |
| Customer:                     | Honeywell, Automation and Control Solutions |                         | Temperature:      | 23.3 °C     |               |        |
| Attendees:                    | None  |                         | Humidity:         | 59.9% RH    |               |        |
| Project:                      | None  |                         | Barometric Pres.: | 1013 mbar   |               |        |
| Tested by:                    | Dustin Sparks                               | Power:                  | 110VAC/60Hz       |             | Job Site:     | MN08   |
| TEST SPECIFICATIONS           |   |                         | Test Method       |             |               |        |
| FCC 15.247:2016               |   |                         | ANSI C63.10:2013  |             |               |        |
| COMMENTS                      |   |                         |                   |             |               |        |
| None                          |   |                         |                   |             |               |        |
| DEVIATIONS FROM TEST STANDARD |   |                         |                   |             |               |        |
| None                          |   |                         |                   |             |               |        |
| Configuration #               | 3   | Signature               | Dustin Sparks     | Value (dBc) | Limit ≤ (dBc) | Result |
| Antenna A                     |   | Low Channel, 903.0 MHz  |                   | -43.86      | -20           | Pass   |
|                               |   | High Channel, 926.4 MHz |                   | -51.4       | -20           | Pass   |
| Antenna B                     |   | Low Channel, 903.0 MHz  |                   | -45.4       | -20           | Pass   |
|                               |   | High Channel, 926.4 MHz |                   | -51.89      | -20           | Pass   |

# BAND EDGE COMPLIANCE

| Antenna A, Low Channel, 903.0 MHz |  |  |  | Value<br>(dBc) | Limit<br>≤ (dBc) | Result |
|-----------------------------------|--|--|--|----------------|------------------|--------|
|                                   |  |  |  | -43.86         | -20              | Pass   |

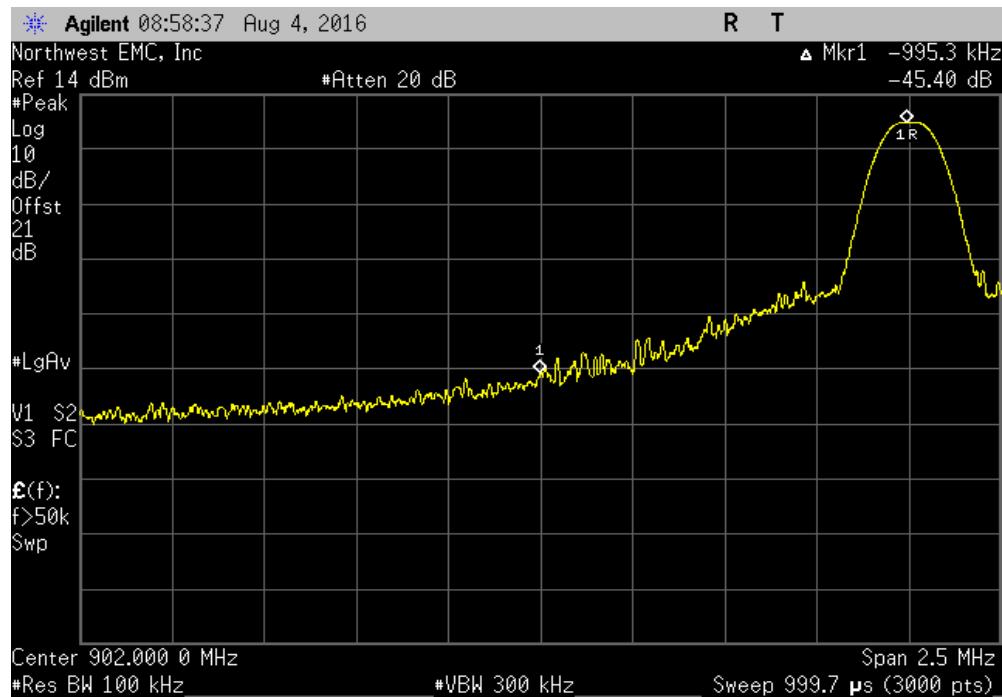


| Antenna A, High Channel, 926.4 MHz |  |  |  | Value<br>(dBc) | Limit<br>≤ (dBc) | Result |
|------------------------------------|--|--|--|----------------|------------------|--------|
|                                    |  |  |  | -51.4          | -20              | Pass   |

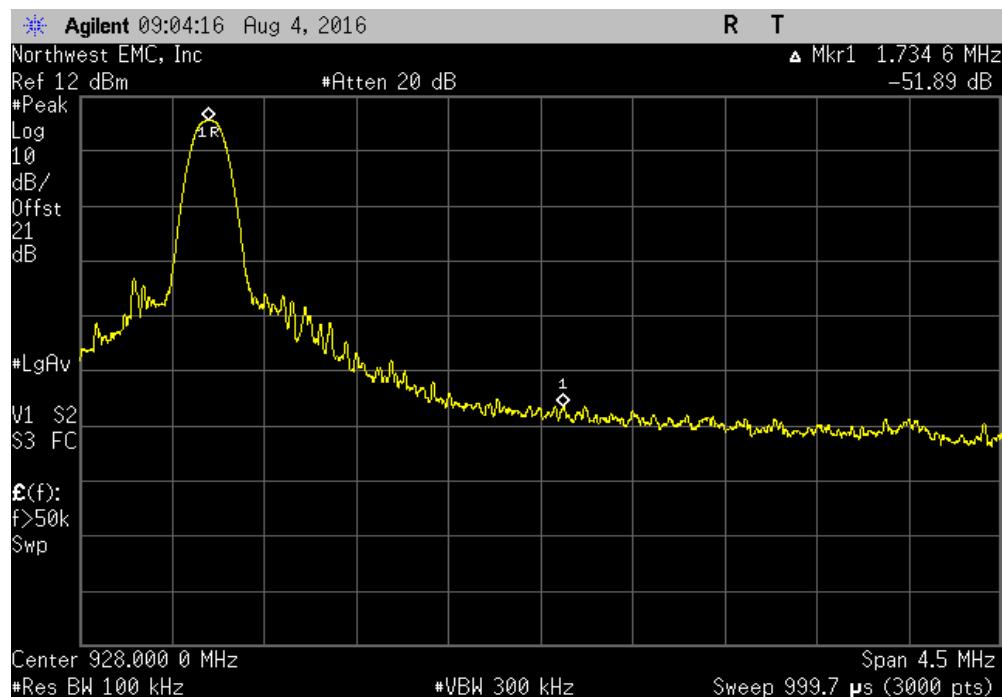


# BAND EDGE COMPLIANCE

| Antenna B, Low Channel, 903.0 MHz |  |  |  | Value<br>(dBc) | Limit<br>≤ (dBc) | Result |
|-----------------------------------|--|--|--|----------------|------------------|--------|
|                                   |  |  |  | -45.4          | -20              | Pass   |



| Antenna B, High Channel, 926.4 MHz |  |  |  | Value<br>(dBc) | Limit<br>≤ (dBc) | Result |
|------------------------------------|--|--|--|----------------|------------------|--------|
|                                    |  |  |  | -51.89         | -20              | Pass   |



# BAND EDGE COMPLIANCE - HOPPING MODE

**NORTHWEST**  
**EMC**  
XMit 2016.05.06

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.  | Cal. Due   |
|------------------------------|--------------------|-----------------|-----|------------|------------|
| Generator - Signal           | Agilent            | N5183A          | TIK | 10/17/2014 | 10/17/2017 |
| Cable                        | ESM Cable Corp.    | TTBJ141 KMKM-72 | MNU | 9/18/2015  | 9/18/2016  |
| Attenuator                   | S.M. Electronics   | SA26B-20        | RFW | 2/26/2016  | 2/26/2017  |
| Block - DC                   | Fairview Microwave | SD3379          | AMI | 9/18/2015  | 9/18/2016  |
| Analyzer - Spectrum Analyzer | Agilent            | E4440A          | AAX | 3/24/2016  | 3/24/2017  |

## TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to its normal pseudo-random hopping sequence. The EUT was transmitting at the data rate(s) listed in the datasheet.

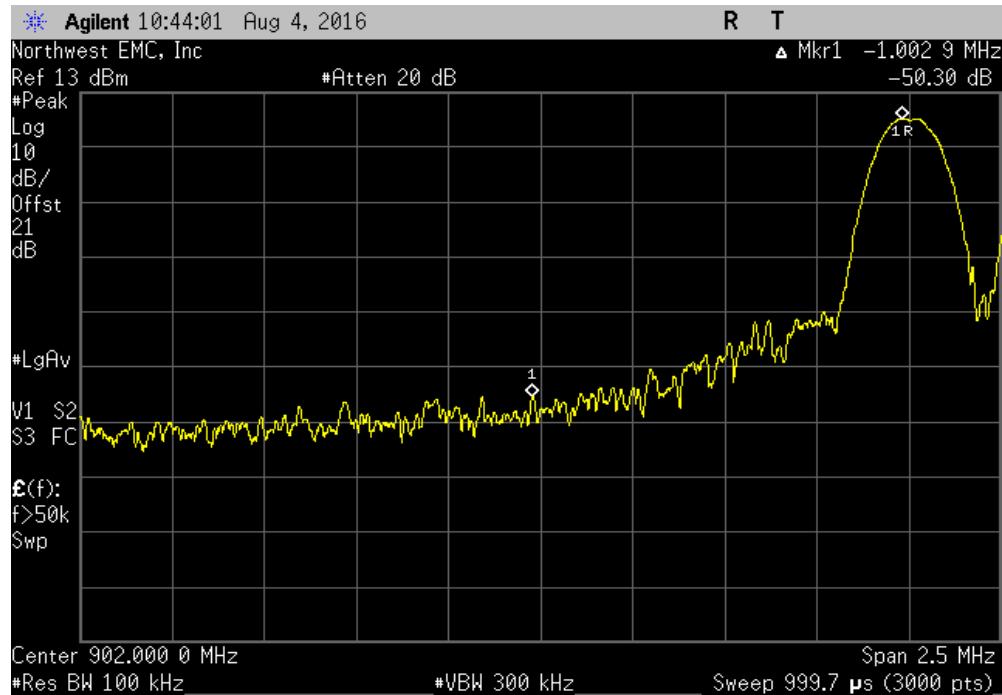
The spectrum was scanned below the lower band edge and above the higher band edge.

# BAND EDGE COMPLIANCE - HOPPING MODE

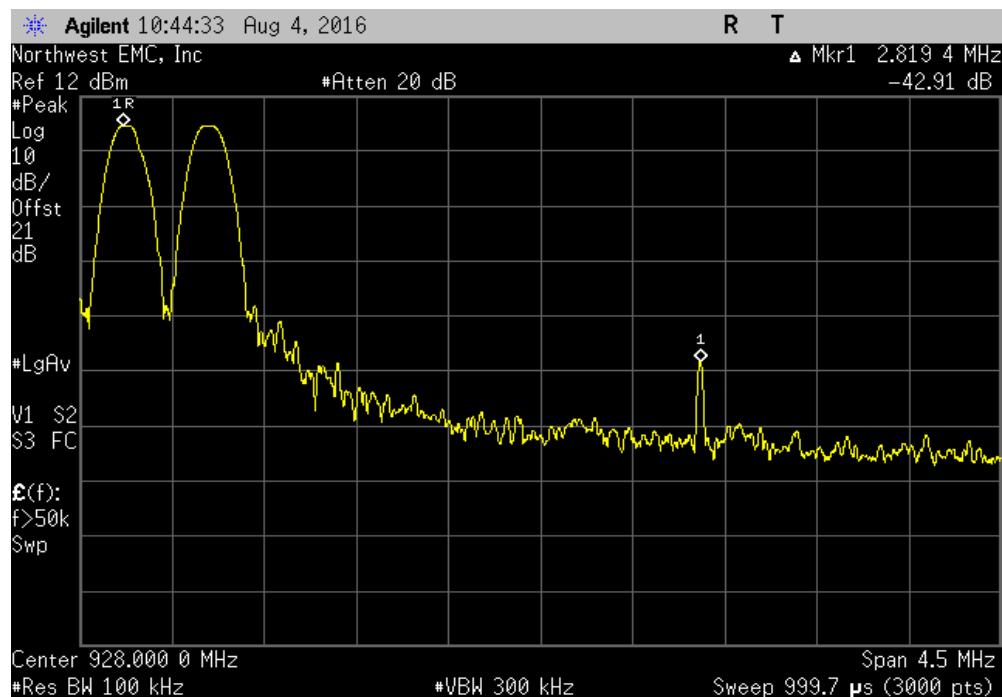
|                               |   |           |                         |             |               |        |
|-------------------------------|---|-----------|-------------------------|-------------|---------------|--------|
| EUT:                          | TH8321R1001                                 |           | Work Order:             | HNYW0180    |               |        |
| Serial Number:                | 5191101 0315015                             |           | Date:                   | 08/04/16    |               |        |
| Customer:                     | Honeywell, Automation and Control Solutions |           | Temperature:            | 23.4 °C     |               |        |
| Attendees:                    | None  |           | Humidity:               | 60.9% RH    |               |        |
| Project:                      | None  |           | Barometric Pres.:       | 1012 mbar   |               |        |
| Tested by:                    | Dustin Sparks                               | Power:    | 110VAC/60Hz             |             | Job Site:     | MN08   |
| TEST SPECIFICATIONS           |   |           | Test Method             |             |               |        |
| FCC 15.247:2016               |   |           | ANSI C63.10:2013        |             |               |        |
| COMMENTS                      |   |           |                         |             |               |        |
| None                          |   |           |                         |             |               |        |
| DEVIATIONS FROM TEST STANDARD |   |           |                         |             |               |        |
| None                          |   |           |                         |             |               |        |
| Configuration #               | 3   | Signature | Dustin Sparks           | Value (dBc) | Limit ≤ (dBc) | Result |
| Antenna A                     |   |           | Low Channel, 903.0 MHz  | -50.31      | -20           | Pass   |
|                               |   |           | High Channel, 926.4 MHz | -42.91      | -20           | Pass   |
| Antenna B                     |   |           | Low Channel, 903.0 MHz  | -50.27      | -20           | Pass   |
|                               |   |           | High Channel, 926.4 MHz | -43.4       | -20           | Pass   |

# BAND EDGE COMPLIANCE - HOPPING MODE

| Antenna A, Low Channel, 903.0 MHz |  |  |  | Value<br>(dBc) | Limit<br>≤ (dBc) | Result |
|-----------------------------------|--|--|--|----------------|------------------|--------|
|                                   |  |  |  | -50.31         | -20              | Pass   |

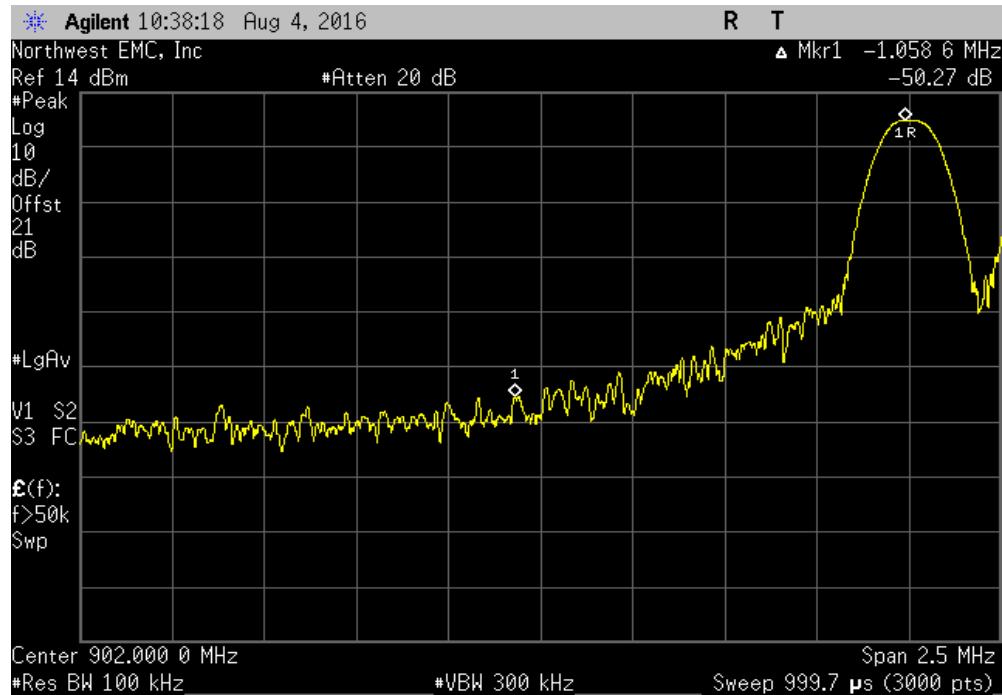


| Antenna A, High Channel, 926.4 MHz |  |  |  | Value<br>(dBc) | Limit<br>≤ (dBc) | Result |
|------------------------------------|--|--|--|----------------|------------------|--------|
|                                    |  |  |  | -42.91         | -20              | Pass   |

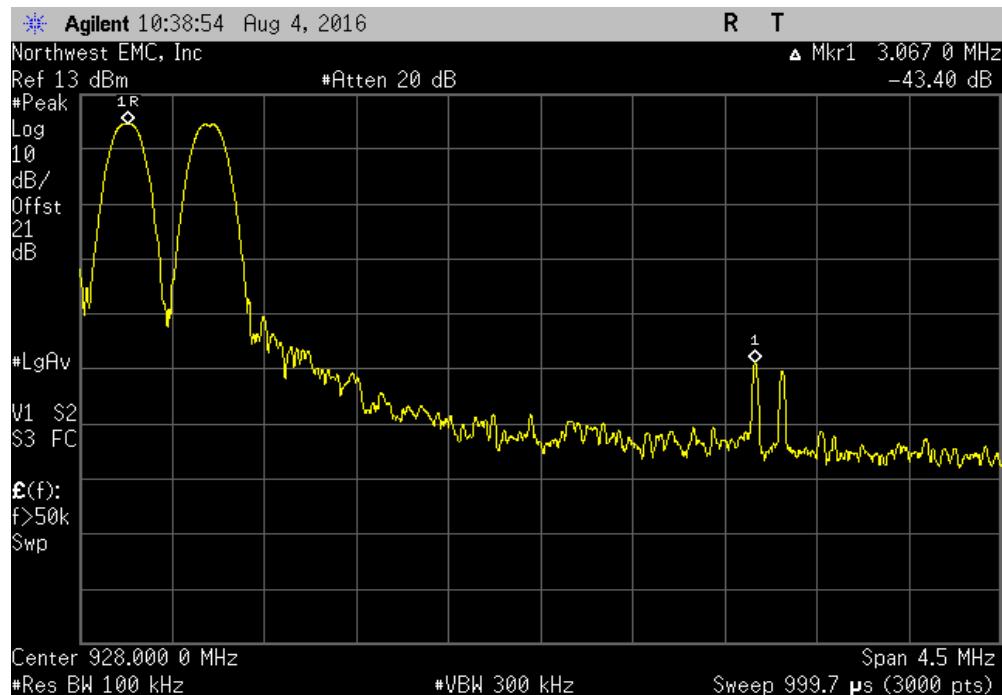


# BAND EDGE COMPLIANCE - HOPPING MODE

| Antenna B, Low Channel, 903.0 MHz |  |  |  | Value<br>(dBc) | Limit<br>$\leq$ (dBc) | Result |
|-----------------------------------|--|--|--|----------------|-----------------------|--------|
|                                   |  |  |  | -50.27         | -20                   | Pass   |



| Antenna B, High Channel, 926.4 MHz |  |  |  | Value<br>(dBc) | Limit<br>$\leq$ (dBc) | Result |
|------------------------------------|--|--|--|----------------|-----------------------|--------|
|                                    |  |  |  | -43.4          | -20                   | Pass   |



# 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.  | Cal. Due   |
|------------------------------|--------------------|-----------------|-----|------------|------------|
| Generator - Signal           | Agilent            | N5183A          | TIK | 10/17/2014 | 10/17/2017 |
| Cable                        | ESM Cable Corp.    | TTBJ141 KMKM-72 | MNU | 9/18/2015  | 9/18/2016  |
| Attenuator                   | S.M. Electronics   | SA26B-20        | RFW | 2/26/2016  | 2/26/2017  |
| Block - DC                   | Fairview Microwave | SD3379          | AMI | 9/18/2015  | 9/18/2016  |
| Analyzer - Spectrum Analyzer | Agilent            | E4440A          | AAX | 3/24/2016  | 3/24/2017  |

## TEST DESCRIPTION

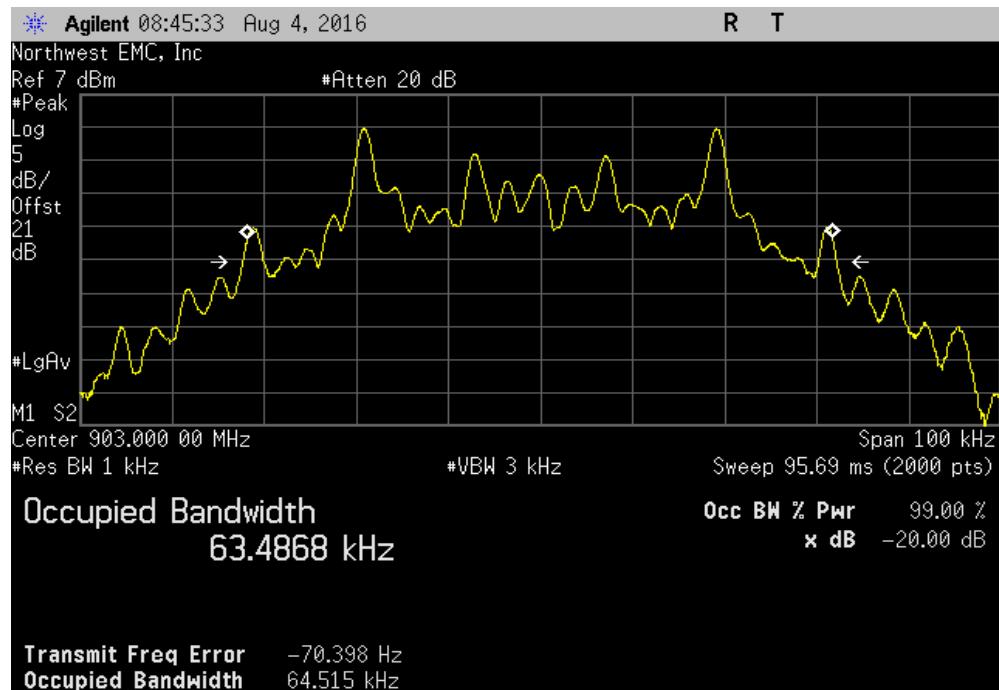
The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The 20 dB occupied bandwidth was measured with the EUT set to low, medium and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode.

# OCCUPIED BANDWIDTH

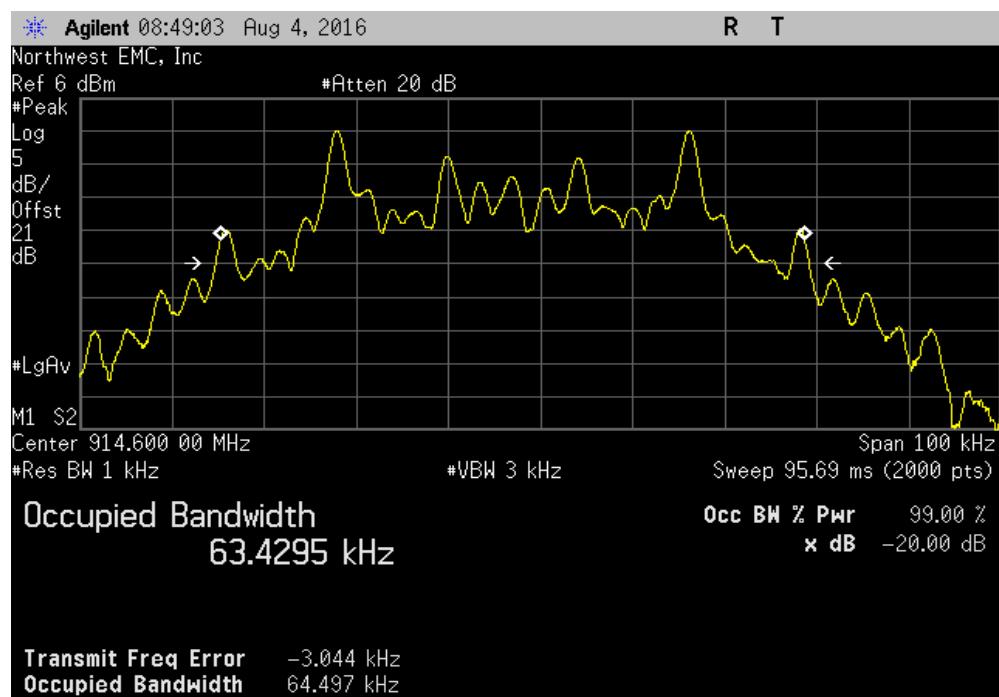
| EUT:                          | TH8321R1001                                 | Work Order:          | HNYW0180    |
|-------------------------------|---|----------------------|-------------|
| Serial Number:                | 5191101 0315015                             | Date:                | 08/04/16    |
| Customer:                     | Honeywell, Automation and Control Solutions | Temperature:         | 23.3 °C     |
| Attendees:                    | None  | Humidity:            | 59.8% RH    |
| Project:                      | None  | Barometric Pres.:    | 1014 mbar   |
| Tested by:                    | Dustin Sparks                               | Power:               | 110VAC/60Hz |
| TEST SPECIFICATIONS           |   | Test Method          |             |
| FCC 15.247:2016               |   | ANSI C63.10:2013     |             |
| COMMENTS                      |   |                      |             |
| None                          |   |                      |             |
| DEVIATIONS FROM TEST STANDARD |   |                      |             |
| None                          |   |                      |             |
| Configuration #               | 3   | Signature            |             |
|                               |   | <i>Dustin Sparks</i> |             |
|                               |   | Value                | Limit (\$)  |
| Antenna A                     |   | Result               |             |
| Low Channel, 903.0 MHz        |   | 64.515 kHz           | 250 kHz     |
| Mid Channel, 914.6 MHz        |   | 64.497 kHz           | 250 kHz     |
| High Channel, 926.4 MHz       |   | 64.497 kHz           | 250 kHz     |
| Antenna B                     |   | Pass                 |             |
| Low Channel, 903.0 MHz        |   | 64.516 kHz           | 250 kHz     |
| Mid Channel, 914.6 MHz        |   | 64.54 kHz            | 250 kHz     |
| High Channel, 926.4 MHz       |   | 64.517 kHz           | 250 kHz     |

# OCCUPIED BANDWIDTH

| Antenna A, Low Channel, 903.0 MHz |  |  | Value      | Limit (≤) | Result |
|-----------------------------------|--|--|------------|-----------|--------|
|                                   |  |  | 64.515 kHz | 250 kHz   | Pass   |

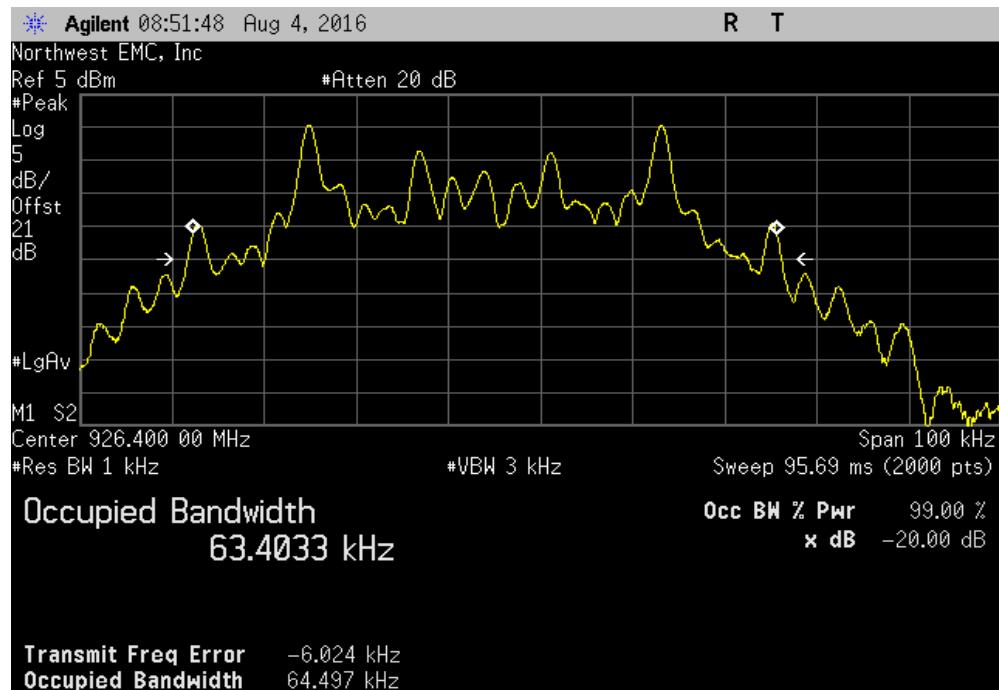


| Antenna A, Mid Channel, 914.6 MHz |  |  | Value      | Limit (≤) | Result |
|-----------------------------------|--|--|------------|-----------|--------|
|                                   |  |  | 64.497 kHz | 250 kHz   | Pass   |

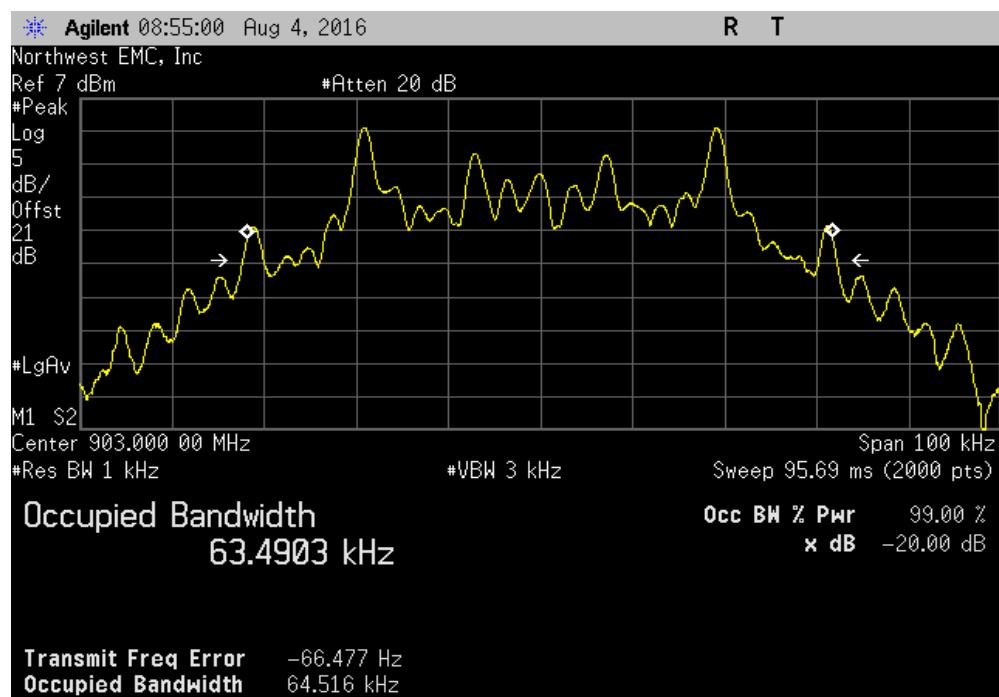


# OCCUPIED BANDWIDTH

| Antenna A, High Channel, 926.4 MHz |  |  | Value      | Limit (≤) | Result |
|------------------------------------|--|--|------------|-----------|--------|
|                                    |  |  | 64.497 kHz | 250 kHz   | Pass   |

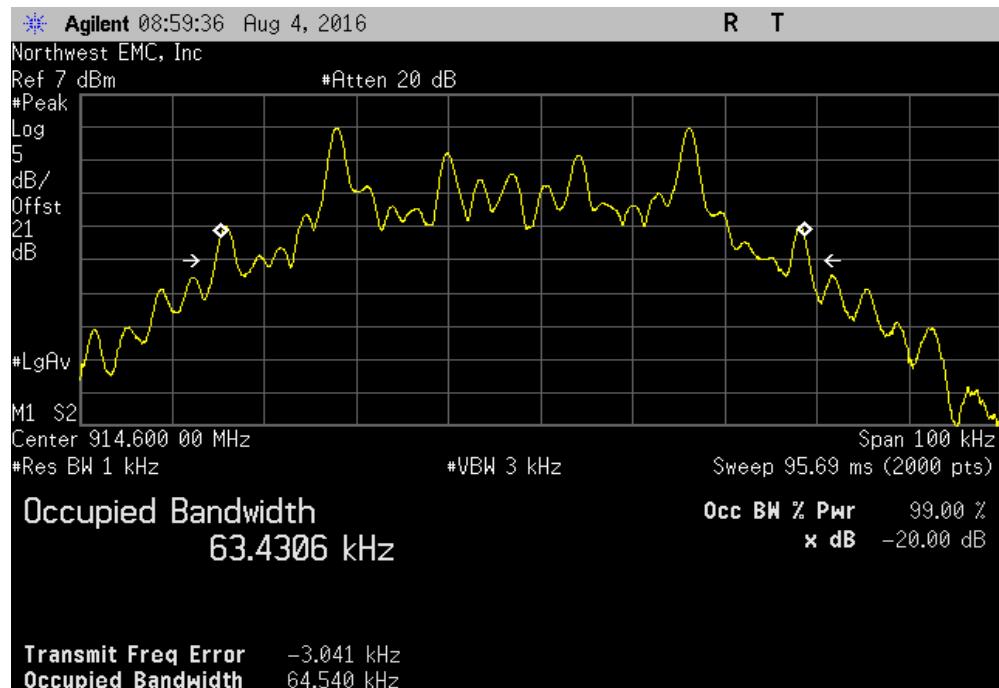


| Antenna B, Low Channel, 903.0 MHz |  |  | Value      | Limit (≤) | Result |
|-----------------------------------|--|--|------------|-----------|--------|
|                                   |  |  | 64.516 kHz | 250 kHz   | Pass   |

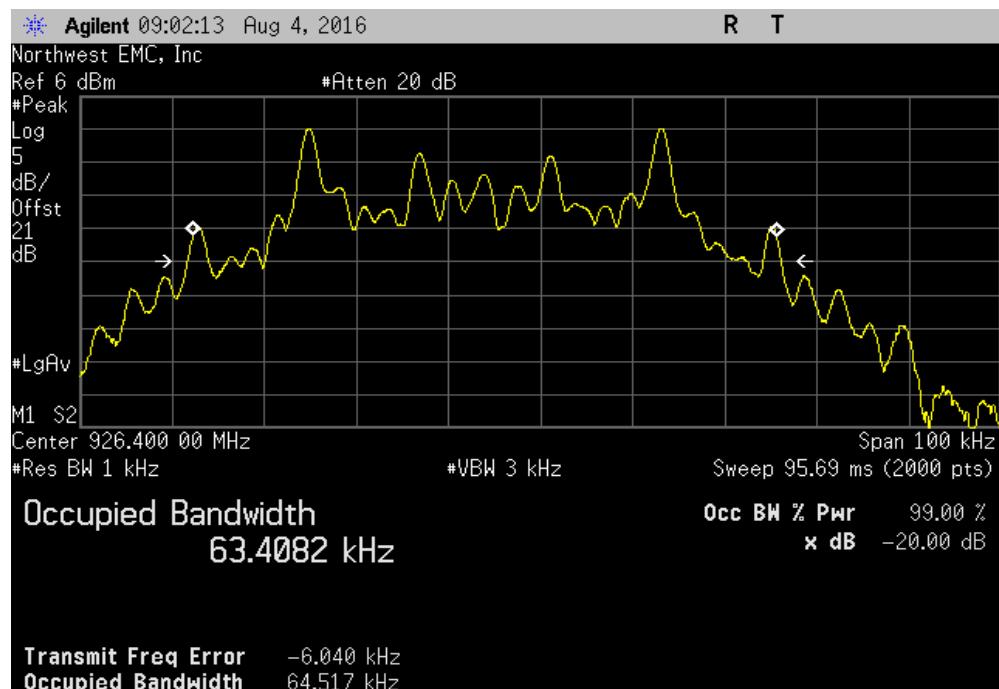


## OCCUPIED BANDWIDTH

| Antenna B, Mid Channel, 914.6 MHz |  |  |           |           |        |  |
|-----------------------------------|--|--|-----------|-----------|--------|--|
|                                   |  |  | Value     | Limit (≤) | Result |  |
|                                   |  |  | 64.54 kHz | 250 kHz   | Pass   |  |



| Antenna B, High Channel, 926.4 MHz |  |  |  |            |           |        |
|------------------------------------|--|--|--|------------|-----------|--------|
|                                    |  |  |  | Value      | Limit (≤) | Result |
|                                    |  |  |  | 64.517 kHz | 250 kHz   | 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.  | Cal. Due   |
|------------------------------|--------------------|-----------------|-----|------------|------------|
| Generator - Signal           | Agilent            | N5183A          | TIK | 10/17/2014 | 10/17/2017 |
| Cable                        | ESM Cable Corp.    | TTBJ141 KMKM-72 | MNU | 9/18/2015  | 9/18/2016  |
| Attenuator                   | S.M. Electronics   | SA26B-20        | RFW | 2/26/2016  | 2/26/2017  |
| Block - DC                   | Fairview Microwave | SD3379          | AMI | 9/18/2015  | 9/18/2016  |
| Analyzer - Spectrum Analyzer | Agilent            | E4440A          | AAX | 3/24/2016  | 3/24/2017  |

## TEST DESCRIPTION

---

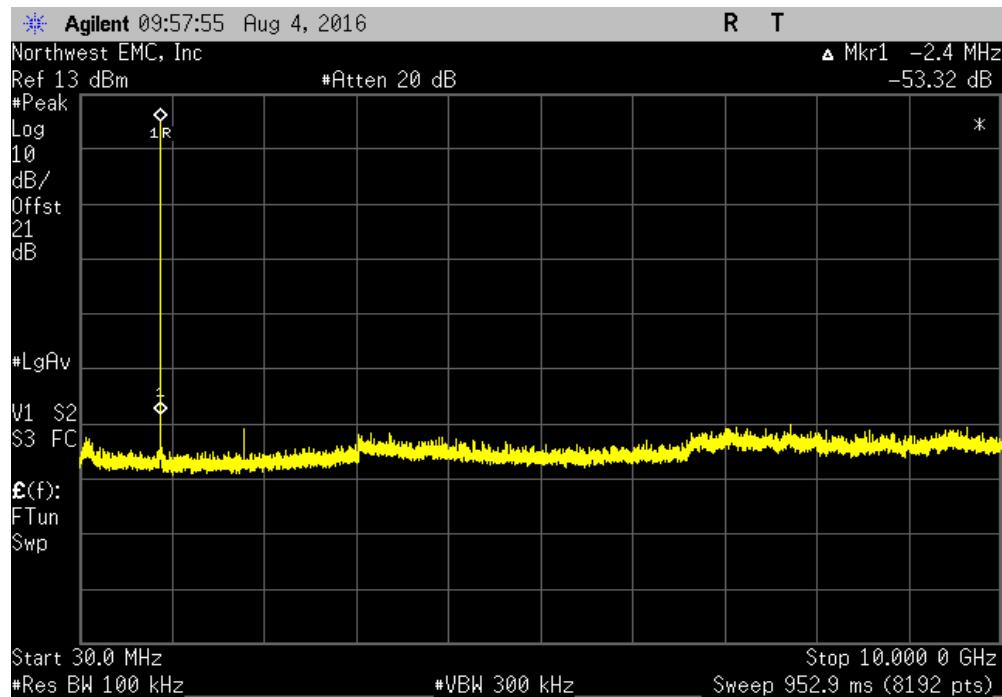
The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

# SPURIOUS CONDUCTED EMISSIONS

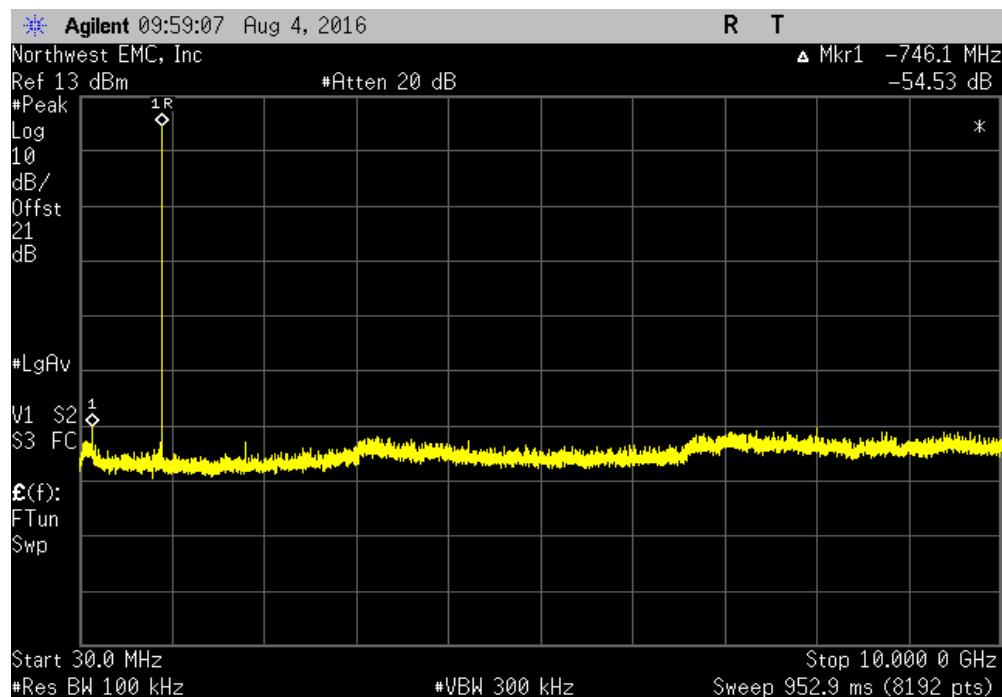
| EUT:                          | TH8321R1001                                 | Work Order:          | HNW0180         |               |        |
|-------------------------------|---|----------------------|-----------------|---------------|--------|
| Serial Number:                | 5191101 0315015                             | Date:                | 08/04/16        |               |        |
| Customer:                     | Honeywell, Automation and Control Solutions | Temperature:         | 23.4 °C         |               |        |
| Attendees:                    | None  | Humidity:            | 60.4% RH        |               |        |
| Project:                      | None  | Barometric Pres.:    | 1013 mbar       |               |        |
| Tested by:                    | Dustin Sparks                               | Power:               | 110VAC/60Hz     |               |        |
| TEST SPECIFICATIONS           |   | Test Method          |                 |               |        |
| FCC 15.247:2016               |   | ANSI C63.10:2013     |                 |               |        |
| COMMENTS                      |   |                      |                 |               |        |
| None                          |   |                      |                 |               |        |
| DEVIATIONS FROM TEST STANDARD |   |                      |                 |               |        |
| None                          |   |                      |                 |               |        |
| Configuration #               | 3   | Signature            |                 |               |        |
|                               |   | <i>Dustin Sparks</i> |                 |               |        |
|                               |   | Frequency Range      | Max Value (dBc) | Limit ≤ (dBc) | Result |
| Antenna A                     |   | 30 MHz - 10 GHz      | -53.32          | -20           | Pass   |
|                               |   | 30 MHz - 10 GHz      | -54.53          | -20           | Pass   |
|                               |   | 30 MHz - 10 GHz      | -52.95          | -20           | Pass   |
| Antenna B                     |   | 30 MHz - 10 GHz      | -54.61          | -20           | Pass   |
|                               |   | 30 MHz - 10 GHz      | -54.8           | -20           | Pass   |
|                               |   | 30 MHz - 10 GHz      | -54.15          | -20           | Pass   |

# SPURIOUS CONDUCTED EMISSIONS

| Antenna A, Low Channel, 903.0 MHz |                 |                    |        |
|-----------------------------------|-----------------|--------------------|--------|
| Frequency Range                   | Max Value (dBc) | Limit $\leq$ (dBc) | Result |
| 30 MHz - 10 GHz                   | -53.32          | -20                | Pass   |

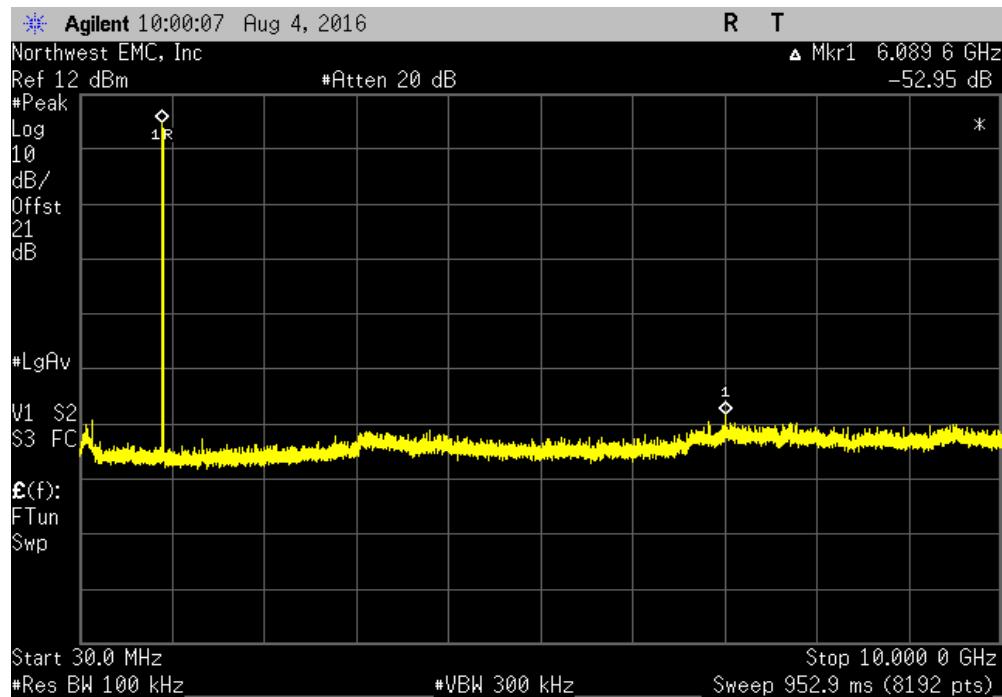


| Antenna A, Mid Channel, 914.6 MHz |                 |                    |        |
|-----------------------------------|-----------------|--------------------|--------|
| Frequency Range                   | Max Value (dBc) | Limit $\leq$ (dBc) | Result |
| 30 MHz - 10 GHz                   | -54.53          | -20                | Pass   |

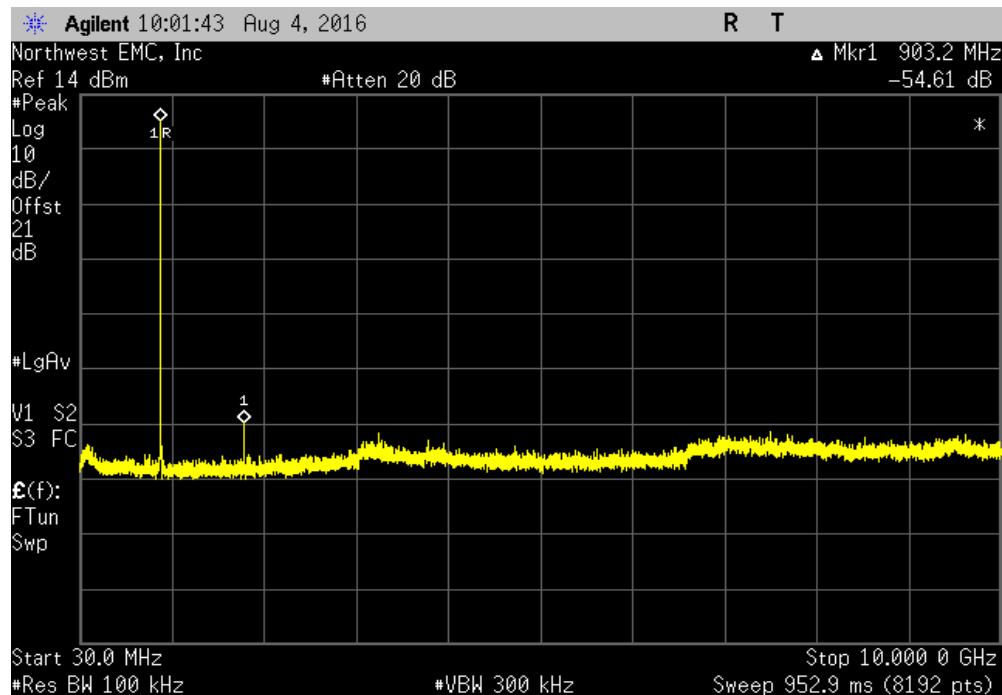


# SPURIOUS CONDUCTED EMISSIONS

| Antenna A, High Channel, 926.4 MHz |                 |                    |        |  |
|------------------------------------|-----------------|--------------------|--------|--|
| Frequency Range                    | Max Value (dBc) | Limit $\leq$ (dBc) | Result |  |
| 30 MHz - 10 GHz                    | -52.95          | -20                | Pass   |  |

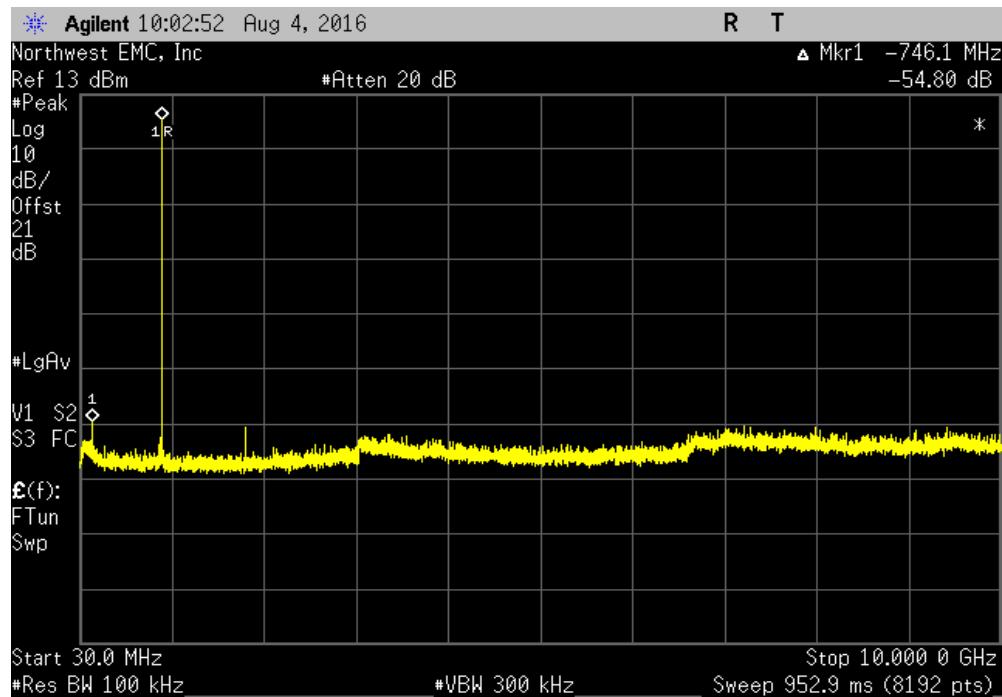


| Antenna B, Low Channel, 903.0 MHz |                 |                    |        |  |
|-----------------------------------|-----------------|--------------------|--------|--|
| Frequency Range                   | Max Value (dBc) | Limit $\leq$ (dBc) | Result |  |
| 30 MHz - 10 GHz                   | -54.61          | -20                | Pass   |  |



# SPURIOUS CONDUCTED EMISSIONS

| Antenna B, Mid Channel, 914.6 MHz |                 |                    |        |
|-----------------------------------|-----------------|--------------------|--------|
| Frequency Range                   | Max Value (dBc) | Limit $\leq$ (dBc) | Result |
| 30 MHz - 10 GHz                   | -54.8           | -20                | Pass   |



| Antenna B, High Channel, 926.4 MHz |                 |                    |        |
|------------------------------------|-----------------|--------------------|--------|
| Frequency Range                    | Max Value (dBc) | Limit $\leq$ (dBc) | Result |
| 30 MHz - 10 GHz                    | -54.15          | -20                | Pass   |

