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# TEST REPORT #: 315364 LSR Job #: C-2386

Compliance Testing of:

IoT Gateway Module

Test Date(s):

1/26/16 – 2/16/16 8/11/16

Prepared For:

Kim Cannon: Georgia-Pacific 1915 Marathon Avenue Neenah, WI 54956

| This Test Report is issued und  | er the Authority of:      |                          |          |         |
|---------------------------------|---------------------------|--------------------------|----------|---------|
| Michael Hintzke, EMC Enginee    | er                        |                          |          |         |
| LAT                             |                           |                          |          |         |
| Signature:                      |                           |                          | Date:    | 3/21/16 |
| Test Report Reviewed by:        |                           | Project Engineer:        |          |         |
| Khairul Aidi Zainal, Engineerin | g Manager-Test Services   | Michael Hintzke, EMC E   | Engineer |         |
| thyfid                          |                           | SHA                      | 2        |         |
| Signature:                      | Date: 3/21/16             | Signature:               | Date:    | 3/21/16 |
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# TABLE OF CONTENTS

| EXHIBIT 1 | INTRODUCTION                                                  | 5  |
|-----------|---------------------------------------------------------------|----|
| 1.1       | Scope                                                         | 5  |
| 1.2       | Normative References                                          | 5  |
| 1.3       | LS Research, LLC Test Facility                                | 6  |
| 1.4       | Location of Testing                                           | 6  |
| 1.5       | Test Equipment Utilized                                       | 6  |
| EXHIBIT 2 | PERFORMANCE ASSESSMENT                                        | 7  |
| 2.1       | Client Information                                            | 7  |
| 2.2       | Equipment Under Test (EUT) Information                        | 7  |
| 2.3       | Associated Antenna Descriptions                               | 7  |
| 2.4       | EUT'S Technical Specifications                                | 8  |
| 2.5       | Product Description                                           | 9  |
| EXHIBIT 3 | EUT OPERATING CONDITIONS & TEST CONFIGURATIONS                | 10 |
| 3.1       | Climate Test Conditions                                       | 10 |
| 3.2       | Applicability & Summary of EMC Emission Test Results          | 10 |
| 3.3       | Modifications Incorporated In The EUT For Compliance Purposes | 10 |
| 3.4       | Deviations & Exclusions From Test Specifications              | 10 |
| EXHIBIT 4 | DECLARATION OF CONFORMITY                                     | 11 |
| EXHIBIT 5 | OCCUPIED BANDWIDTH                                            | 12 |
| 5.1       | Measurement Procedure                                         | 12 |
| 5.2       | Measurement Limit                                             | 12 |
| 5.3       | Test Data                                                     | 12 |
| 5.4       | Screen Captures                                               | 13 |
| EXHIBIT 6 | MAXIMUM CONDUCTED (AVERAGE) OUTPUT POWER                      | 31 |
| 6.1       | Measurement Procedure                                         | 31 |
| 6.2       | Limit                                                         | 31 |
| 6.3       | Test Data                                                     | 31 |
| 6.4       | Conducted (Average) Output Power Screen Captures              | 32 |
| 6.5       | Duty Cycle Screen Captures                                    | 38 |
| EXHIBIT 7 | POWER SPECTRAL DENSITY                                        | 41 |
| 7.1       | Measurement Procedure                                         | 41 |
| 7.2       | Limit                                                         | 41 |
| 7.3       | Test Data                                                     | 41 |
| 7.4       | Screen Captures                                               | 42 |

| LS Research, LLC              |                              | Page 2 of 111     |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

| EXHIBIT 8   | FREQUENCY STABILITY                                                        | 48   |
|-------------|----------------------------------------------------------------------------|------|
| 8.1         | Measurement Procedure                                                      | 48   |
| 8.2         | Test Data                                                                  | 48   |
| EXHIBIT 9   | BAND EDGE MEASUREMENTS                                                     | 49   |
| 9.1         | Method of Measurements                                                     | 49   |
| 9.2         | Limit(s)                                                                   | 49   |
| 9.3         | Test Data                                                                  | 50   |
| 9.3.1 Band  | edges in 100 kHz Bandwidth                                                 | 50   |
| 9.3.2 Band  | edges in the 2310 MHz – 2390 MHz Restricted Band – Radiated Measurements   | 56   |
| 9.3.2 Band  | edges in the 2483.5 MHz – 2500 MHz Restricted Band – Radiated Measurements | 62   |
| EXHIBIT 10  | Transmitter Spurious Emissions                                             | 68   |
| 10.1        | Method of Measurements                                                     | 69   |
| 10.2        | Limit                                                                      | 69   |
| 10.3        | Test Data                                                                  | 69   |
| 10.3.1 Fund | amental Emission in 100 kHz Bandwidth                                      | 69   |
| 10.3.2 Cond | ducted Spurious Emissions in 100 kHz Bandwidth                             | 71   |
| 10.3.2 Radi | ated Spurious Emissions – 802.11                                           | 74   |
| 10.3.2 Radi | ated Spurious Emissions – BLE                                              | 80   |
| EXHIBIT 11  | CONDUCTED AC LINE EMISSIONS                                                | 82   |
| 11.1 - Meth | od of Measurements                                                         | 82   |
| 11.2        | Limits                                                                     |      |
| 11.3        | Test Data                                                                  | 83   |
| EXHIBIT 1   | 2 CO-EXISTENCE MEASUREMENTS                                                | 86   |
| 12.1        | Test Data                                                                  | 86   |
| 12.1.1      | 2310 MHz – 2390 Restricted Band Test Data                                  | 87   |
| 12.1.2      | 2483.5 MHz – 2500 Restricted Band Test Data                                | 90   |
| 12.1.2      | Transmitter Radiated Spurious Emissions                                    | 93   |
| EXHIBIT 1   | 3 BLE TRANSMITTER RADIATED SPURIOUS EMISSIONS                              | 95   |
| 13.1        | Test Data                                                                  | 95   |
| 13.2        | Screen Captures                                                            | 96   |
| 13.2.1      | 30 MHz – 200 MHz                                                           | 96   |
| 13.2.2      | 200 MHz – 1000 MHz                                                         | 97   |
| 13.2.3      | 1000 MHz – 2310 MHz                                                        | 98   |
| 13.2.4      | 2310 MHz - 2390 MHz Restricted Band                                        | 99   |
| 13.2.5      | 2483.5 MHz - 2500 MHz Restricted Band                                      | .100 |
| 13.2.6      | 2500 MHz - 4000 MHz                                                        | .101 |
| 13.2.7      | 4000 MHz - 18000 MHz                                                       | .102 |
| 13.2.8      | 18000 MHz - 25000 MHz                                                      | .103 |
|             |                                                                            |      |

# LS Research, LLC

Page 3 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

| APPENDIX A | Test Equipment List                | 104 |
|------------|------------------------------------|-----|
| APPENDIX B | Current Standard Publication Dates | 106 |
| APPENDIX C | Uncertainty Statement              | 107 |
| APPENDIX D | Test Setup Photos                  | 108 |

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Page 4 of 111

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# EXHIBIT 1 INTRODUCTION

# <u>1.1 Scope</u>

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| References:      | FCC Part 15, Subpart C, Section 15.247<br>RSS GEN issue 4 and RSS 247 issue 1                                                                                                                                                                |  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Title:           | <ul> <li>FCC: Telecommunication – Code of Federal Regulations,<br/>CFR 47, Part 15.</li> <li>IC: Digital Transmission Systems (DTSs), Frequency Hopping Systems<br/>(FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices</li> </ul> |  |
| Purpose of Test: | To gain FCC and IC Certification Authorization for Low-Power License-<br>Exempt Transmitters.                                                                                                                                                |  |
| Test Procedures: | FCC KDB 558074 D01 DTS Measurement Guidance v03r04<br>ANSI C63.10                                                                                                                                                                            |  |

# **1.2 Normative References**

| Publication                                              | Year | Title                                                                                                                                                                         |
|----------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC CFR Parts 0-15                                       | 2016 | Code of Federal Regulations –<br>Telecommunications                                                                                                                           |
| ANSI C63.4                                               | 2014 | American National Standard for Methods of<br>Measurement of Radio-Noise Emissions from<br>Low-Voltage Electrical and Electronic Equipment<br>in the Range of 9 kHz to 40 GHz. |
| RSS-247 Issue 1                                          | 2015 | Digital Transmission Systems (DTSs), Frequency<br>Hopping Systems (FHSs) and Licence-Exempt<br>Local Area Network (LE-LAN) Devices                                            |
| RSS-GEN Issue 4                                          | 2014 | General Requirements and Information for the<br>Certification of Radio Apparatus                                                                                              |
| ANSI C63.10                                              | 2013 | American National Standard for Testing<br>Unlicensed Wireless Devices                                                                                                         |
| FCC KDB 558074 D01 DTS<br>Measurement Guidance<br>v03r04 | 2016 | Guidance for Performing Compliance<br>Measurements on Digital Transmission Systems<br>(DTS) Operating Under §15.247                                                           |

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Page 5 of 111

# 1.3 LS Research, LLC Test Facility

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) as conforming to ISO/IEC 17025, 2005 "General Requirements for the Competence of Calibration and Testing Laboratories".

LS Research, LLC's scope of accreditation includes all test methods listed herein, unless otherwise noted. Accreditation status can be verified at A2LA's web site: <u>www.a2la2.net</u>.

### **<u>1.4 Location of Testing</u>**

All testing was performed at the following location utilizing the facilities listed below, unless otherwise noted.

LS Research, LLC W66 N220 Commerce Court Cedarburg, Wisconsin, 53012 USA,

List of Facilities Located at LS Research, LLC:

Semi-Anechoic Chamber

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# 1.5 Test Equipment Utilized

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated by a calibration laboratory accredited to the requirements of ISO/IEC 17025, and traceable to the SI standard.

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Page 6 of 111

# EXHIBIT 2 PERFORMANCE ASSESSMENT

# 2.1 Client Information

| Manufacturer Name: | Georgia-Pacific      |
|--------------------|----------------------|
| Address:           | 1915 Marathon Avenue |
| Contact Name:      | Kim Cannon           |
| E-mail:            | kim.cannon@gapac.com |

# 2.2 Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

| Product Name:  | IoT Gateway        |
|----------------|--------------------|
| Model Number:  | A-100278           |
| Serial Number: | Engineering Sample |

# 2.3 Associated Antenna Descriptions

WiFi: Ceramic Chip Antenna , 0.5 dBi gain BLE: PCB Trace, -4.2 dBi gain

LS Research, LLC

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Page 7 of 111

# 2.4 EUT'S Technical Specifications

| EUT Frequency Range (in MHz)                  | 2412MHz – 2462MHz (WLAN)                                                                                                   |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Conducted Output Power, average (in dBm)      | <u>2.4GHz WLAN</u><br>802.11 b: Maximum = 0.066 W<br>Minimum = 0.049 W<br>802.11 g: Maximum = 0.047 W<br>Minimum = 0.028 W |
|                                               | 802.11 n: Maximum = 0.030 W<br>(HT20) Minimum = 0.022 W                                                                    |
| Field Strength at 3 meters (Maximum)          | Peak: 64.4 dBµV/m @ 2388.7 MHz<br>Average: 49.5 dBµV/m @ 2390.0 MHz                                                        |
| 99% Bandwidth                                 | <u>2.4GHz WLAN:</u><br>802.11 b: 11.2 MHz<br>802.11 g: 17.2 MHz<br>802.11 n (HT20): 18.3 MHz                               |
| Type of Modulation                            | OFDM (WLAN), DSSS(WLAN)                                                                                                    |
| DTS Bandwidth (6dB BW)                        | <u>2.4GHz WLAN:</u><br>802.11 b: 8.1 MHz<br>802.11 g: 16.4 MHz<br>802.11 n (HT20): 17.8 MHz                                |
| Transmitter Spurious (worst case) at 3 meters | 55.3 dBµV/m at 7386 MHz                                                                                                    |
| Frequency Tolerance %, Hz, ppm                | Better than 100 ppm                                                                                                        |
| Antenna Information                           |                                                                                                                            |
| Detachable/non-detachable                     | Non-detachable                                                                                                             |
| Туре                                          | Ceramic Chip                                                                                                               |
| Gain                                          | Peak Gain in 2.4GHz band = 0.5 dBi                                                                                         |
| EUT will be operated under FCC Rule Part(s)   | Title 47 part 15.247                                                                                                       |
| EUT will be operated under RSS Rule Part(s)   | RSS 247                                                                                                                    |
| Modular Filing                                | Yes No                                                                                                                     |
| Portable or Mobile?<br>FCC ID / IC ID         | 2AALY-528GP / 21620-528GP                                                                                                  |
|                                               | ZAAL 1-520GF / 21020-520GF                                                                                                 |

| LS Research, LLC              |                              | Page 8 of 111     |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# 2.5 Product Description

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The Georgia Pacific daughter card is a communication gateway for transporting data between a proprietary Bluetooth network and a WiFi network. It consists of a certified Bluetooth module, a certified WiFi module, and a voltage regulator. Data and power are supplied by a proprietary connection to a host product.

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |
|                               |                              |                   |

Page 9 of 111

# EXHIBIT 3 EUT OPERATING CONDITIONS & TEST CONFIGURATIONS

# 3.1 Climate Test Conditions

| Temperature: | 70 -71° F   |
|--------------|-------------|
| Humidity:    | 32-42%      |
| Pressure:    | 728-741mmHg |

# 3.2 Applicability & Summary of EMC Emission Test Results

| FCC Reference                                | Test Requirements                                                   | Compliance |
|----------------------------------------------|---------------------------------------------------------------------|------------|
| FCC: 15.207                                  | Conducted AC Line Emissions                                         | Yes        |
| FCC:15.247 (a)(2)                            | DTS Bandwidth                                                       | Yes        |
| FCC: 15.247(b)<br>FCC 1.1310                 | Maximum Output Power                                                | Yes        |
| FCC :15.247(d)                               | RF Conducted Transmitter Spurious Emissions at the Antenna Terminal | Yes        |
| FCC:15.247 (d)<br>IC: RSS 247 5.2            | Power Spectral Density of a Digital Modulation<br>System            | Yes        |
| FCC: 15.247(c)<br>FCC: 15.209<br>FCC: 15.205 | Transmitter Radiated Emissions                                      | Yes        |

# 3.3 Modifications Incorporated In The EUT For Compliance Purposes

🛛 None

Ŷes (explain below)

### 3.4 Deviations & Exclusions From Test Specifications

🛛 None

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Yes (explain below)

| ,                             |                              |                   |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Page 10 of 111

# EXHIBIT 4 DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247, and Industry Canada RSS-247, Issue 1.

Note: If some emissions are seen to be within 3 dB of their respective limits; as these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

LS Research, LLC

Page 11 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# **EXHIBIT 5 OCCUPIED BANDWIDTH**

| Manufacturer     | Georgia-Pacific                                                              |
|------------------|------------------------------------------------------------------------------|
| Date             | 1/27/16, 1/28/16                                                             |
| Operator         | Michael Hintzke                                                              |
| Temp. / R.H.     | 20 - 25° C / 30-60% R.H.                                                     |
| Rule Part        | FCC 15.247 (a)(2)                                                            |
|                  | RSS-247 sect. 5.2                                                            |
| Additional Notes | Peak detector used                                                           |
|                  | <ul> <li>Continuous transmit modulated used for this test.</li> </ul>        |
|                  | <ul> <li>Sample Calculation: Margin (dB) = Limit – Measured level</li> </ul> |

### 5.1 Measurement Procedure

ANSI C63.10-2013 Sections 6.9.2 and 11.8.2 FCC KDB 558074 DTS Meas Guidance v03r04 Section 8.2 RSS-Gen Sect. 6.6

### 5.2 Measurement Limit

The minimum 6 dB bandwidth shall be at least 500 kHz for systems using digital modulation techniques.

### 5.3 Test Data

| 802.11<br>Standard | Data Rate<br>(MBPS) | Channel | 6dB<br>Bandwidth<br>(MHz) | 99%<br>Bandwidth<br>(MHz) | 20dB<br>Bandwidth<br>(MHz) | 6dB<br>Bandwidth<br>minimum<br>limit (MHz) |
|--------------------|---------------------|---------|---------------------------|---------------------------|----------------------------|--------------------------------------------|
|                    |                     | 1       | 8.1                       | 10.7                      | 12.8                       | 0.5                                        |
| ь                  | 1(DBPSK)            | 6       | 8.1                       | 10.8                      | 12.8                       | 0.5                                        |
|                    |                     | 11      | 8.1                       | 10.7                      | 12.8                       | 0.5                                        |
|                    |                     | 1       | 7.6                       | 11.2                      | 13.0                       | 0.5                                        |
| ь                  | 11 (8QPSK)          | 6       | 7.8                       | 11.2                      | 12.9                       | 0.5                                        |
|                    |                     | 11      | 7.9                       | 11.2                      | 12.9                       | 0.5                                        |
|                    |                     | 1       | 16.4                      | 17.2                      | 20.4                       | 0.5                                        |
| 9                  | 6 (BPSK)            | 6       | 16.4                      | 17.2                      | 20.4                       | 0.5                                        |
|                    |                     | 11      | 16.4                      | 17.1                      | 20.5                       | 0.5                                        |
|                    |                     | 1       | 16.4                      | 16.7                      | 19.3                       | 0.5                                        |
| 9                  | 54 (64QAM)          | 6       | 16.4                      | 16.7                      | 19.3                       | 0.5                                        |
|                    |                     | 11      | 16.4                      | 16.7                      | 19.2                       | 0.5                                        |
|                    |                     | 1       | 17.6                      | 18.3                      | 21.0                       | 0.5                                        |
| n                  | MCS0<br>(BPSK)      | 6       | 17.6                      | 18.3                      | 21.1                       | 0.5                                        |
|                    | (=: =: y            | 11      | 17.6                      | 18.3                      | 21.1                       | 0.5                                        |
|                    |                     | 1       | 17.8                      | 18.0                      | 20.5                       | 0.5                                        |
| n                  | MCS7<br>(64QAM)     | 6       | 17.8                      | 18.0                      | 20.5                       | 0.5                                        |
|                    | (                   | 11      | 17.8                      | 18.0                      | 20.4                       | 0.5                                        |

LS Research, LLC

Page 12 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# 5.4 Screen Captures

#### 802.11b - 1 Mbps

#### Low Channel



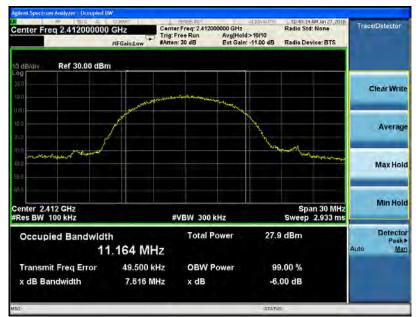




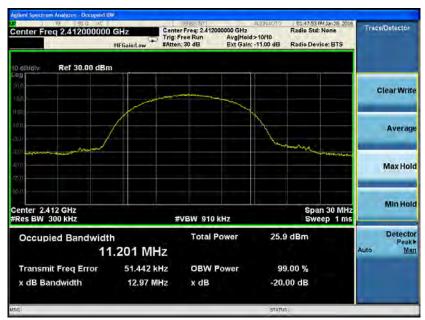
| LS Research, LLC              |                              | Page 13 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11b - 11 Mbps







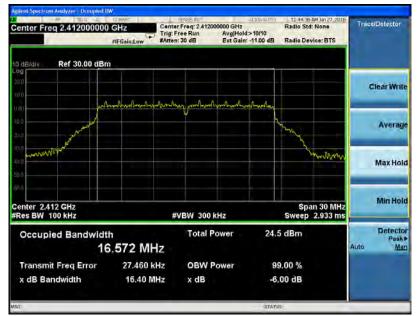


-20 dB & 99 % OBW

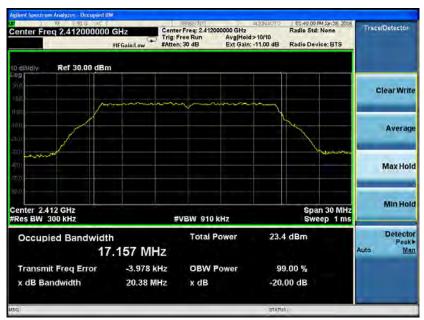
| LS Research, LLC              |                              | Page 14 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11g - 6 Mbps

#### Low Channel



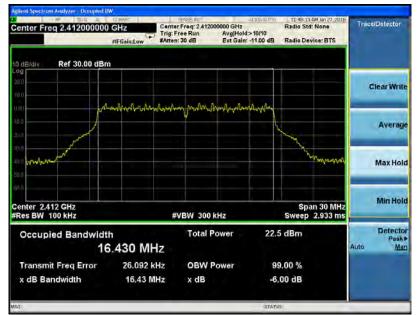
6 dB OBW



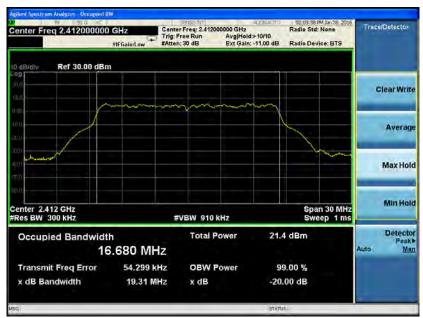
| LS Research, LLC              |                              | Page 15 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11g - 54 Mbps

#### Low Channel



6 dB OBW



-20 dB & 99 % OBW

| LS Research, LLC              |                              | Page 16 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11n - MCS0

#### Low Channel



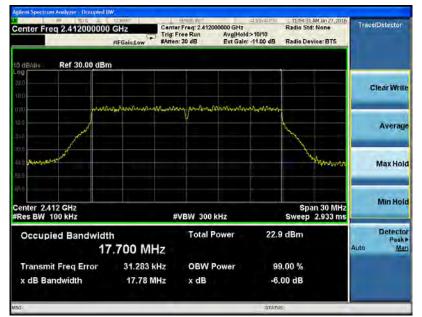
6 dB OBW



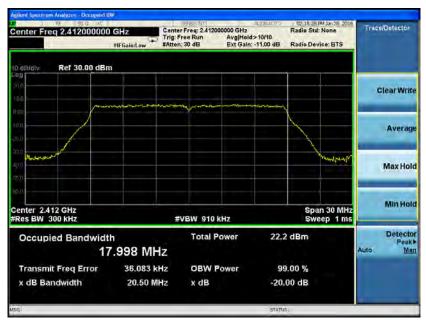
| LS Research, LLC              |                              | Page 17 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11n - MCS7

#### Low Channel







| LS Research, LLC              |                              | Page 18 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11b - 1 Mbps

#### Middle Channel



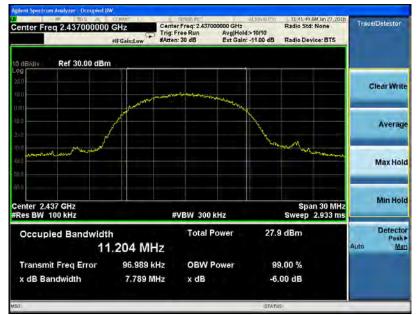
6 dB OBW



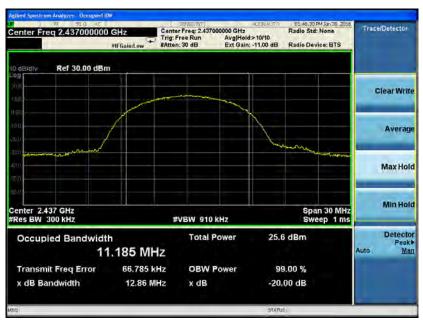
| LS Research, LLC              |                              | Page 19 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11b - 11 Mbps

#### Middle Channel



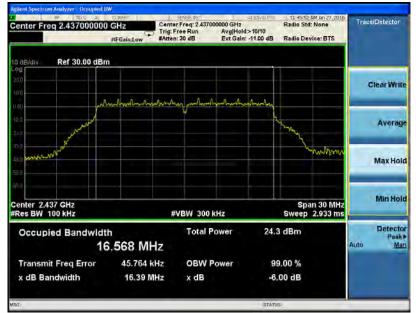
6 dB OBW



| LS Research, LLC              |                              | Page 20 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11g - 6 Mbps

#### Middle Channel



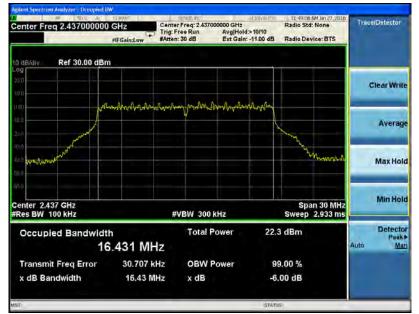
6 dB OBW



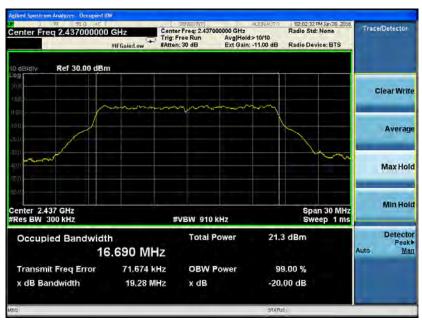
| LS Research, LLC              |                              | Page 21 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11g - 54 Mbps

#### Middle Channel



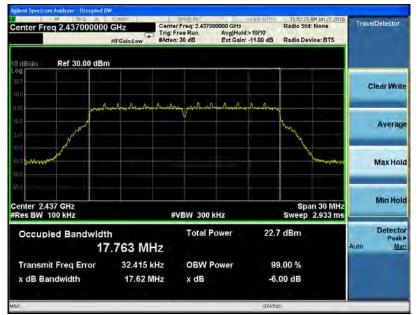
6 dB OBW



| LS Research, LLC              |                              | Page 22 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11n - MCS0

#### **Middle Channel**



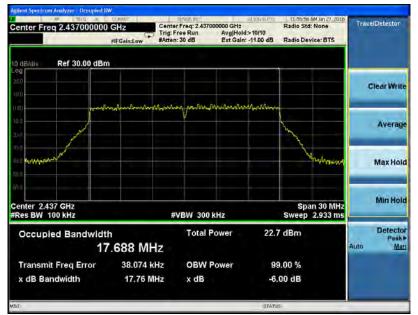
6 dB OBW



| LS Research, LLC              |                              | Page 23 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11n - MCS7

#### **Middle Channel**



6 dB OBW



| LS Research, LLC              |                              | Page 24 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11b - 1 Mbps





6 dB OBW

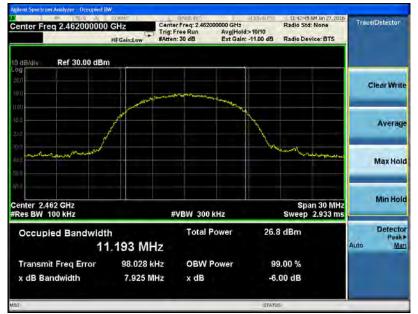


-20 dB & 99 % OBW

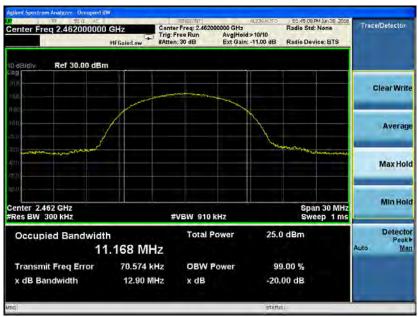
| LS Research, LLC              |                              | Page 25 of 111    |  |
|-------------------------------|------------------------------|-------------------|--|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |  |

#### 802.11b - 11 Mbps

#### **High Channel**



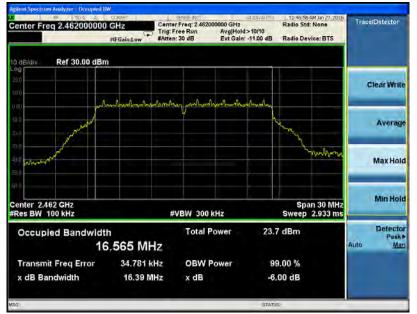
6 dB OBW



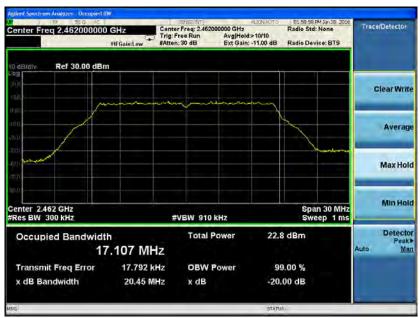
| LS Research, LLC              |                              | Page 26 of 111    |
|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11g - 6 Mbps

#### **High Channel**



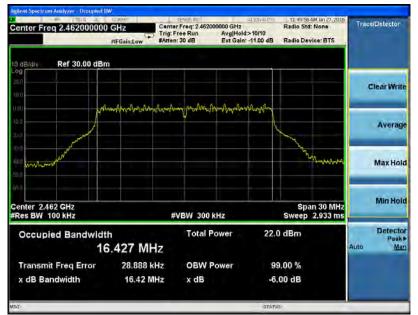
6 dB OBW



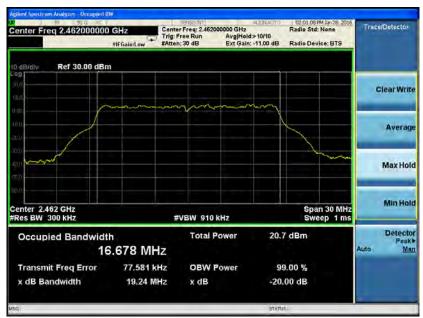
| LS Research, LLC              |                              | Page 27 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11g - 54 Mbps

#### **High Channel**



6 dB OBW

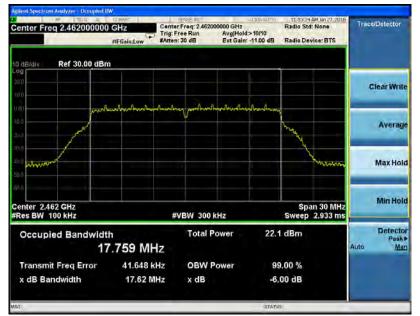


-20 dB & 99 % OBW

| LS Research, LLC              |                              | Page 28 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 802.11n – MCS0

#### **High Channel**





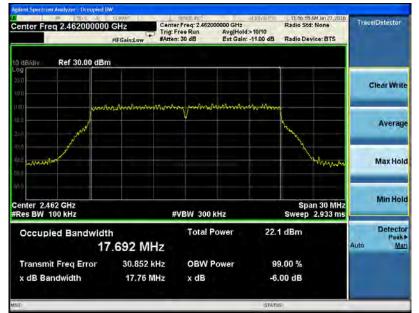


-20 dB & 99 % OBW

| LS Research, LLC              |                              | Page 29 of 111    |  |
|-------------------------------|------------------------------|-------------------|--|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |  |

#### 802.11n - MCS7

#### **High Channel**



6 dB OBW



| LS Research, LLC              |                              | Page 30 of 111    |
|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# EXHIBIT 6 MAXIMUM CONDUCTED (AVERAGE) OUTPUT POWER

| Manufacturer     | Georgia-Pacific                                                              |  |  |
|------------------|------------------------------------------------------------------------------|--|--|
| Date             | 1/27/16                                                                      |  |  |
| Test Engineer    | Michael Hintzke                                                              |  |  |
| Temp. / R.H.     | 20 - 25° C / 30-60% R.H.                                                     |  |  |
| Rule Part        | FCC 15.247 (b)                                                               |  |  |
|                  | RSS-247 Sect. 5.4                                                            |  |  |
|                  | Averagedetector used                                                         |  |  |
| Additional Notes | <ul> <li>Continuous transmit modulated used for this test.</li> </ul>        |  |  |
|                  | <ul> <li>Sample Calculation: Margin (dB) = Limit – Measured level</li> </ul> |  |  |

### 6.1 Measurement Procedure

ANSI C63.10-2013 Section 11.9.1.3 FCC KDB 558074 DTS Meas Guidance v03r04 Section 9.1.2 RSS-Gen Section 6.12

#### <u>6.2 Limit</u>

The maximum peak conducted output power for systems using digital modulation shall not exceed 1 Watt (30 dBm).

### 6.3 Test Data

| 802.11<br>Standard | Data Rate<br>(MBPS)      | Channel | Max (Avg)<br>Conducted<br>Power<br>(dBm) | D.C<br>correction<br>(dB) | Corrected<br>Maximum<br>Conducted<br>Power<br>(dBm) | Power Limit<br>(dBm) | Power<br>margin (dB) |
|--------------------|--------------------------|---------|------------------------------------------|---------------------------|-----------------------------------------------------|----------------------|----------------------|
|                    |                          | 1       | 17.8                                     | 0.02                      | 17.9                                                | 30.0                 | 12.2                 |
| ь                  | 1(DBPSK)                 | 6       | 17.8                                     | 0.02                      | 17.8                                                | 30.0                 | 12.2                 |
|                    |                          | 11      | 16.9                                     | 0.02                      | 16.9                                                | 30.0                 | 13.1                 |
|                    |                          | 1       | 18.0                                     | 0.18                      | 18.2                                                | 30.0                 | 12.0                 |
| ь                  | 11 (8QPSK)               | 6       | 17.8                                     | 0.18                      | 18.0                                                | 30.0                 | 12.2                 |
|                    |                          | 11      | 17.0                                     | 0.18                      | 17.2                                                | 30.0                 | 13.0                 |
|                    |                          | 1       | 16.6                                     | 0.12                      | 16.7                                                | 30.0                 | 13.4                 |
| 9                  | 6 (BPSK)                 | 6       | 16.6                                     | 0.12                      | 16.7                                                | 30.0                 | 13.4                 |
|                    |                          | 11      | 15.8                                     | 0.12                      | 15.9                                                | 30.0                 | 14.2                 |
|                    |                          | 1       | 14.3                                     | 0.87                      | 15.1                                                | 30.0                 | 15.7                 |
| 9                  | 54 (64QAM)               | 6       | 14.3                                     | 0.87                      | 15.2                                                | 30.0                 | 15.7                 |
|                    |                          | 11      | 13.6                                     | 0.87                      | 14.4                                                | 30.0                 | 16.4                 |
|                    |                          | 1       | 14.7                                     | 0.13                      | 14.8                                                | 30.0                 | 15.3                 |
| n                  | MCS0<br>(BPSK)           | 6       | 14.7                                     | 0.13                      | 14.8                                                | 30.0                 | 15.3                 |
|                    | <b>(</b> =: <b>1</b> :1) | 11      | 14.1                                     | 0.13                      | 14.2                                                | 30.0                 | 15.9                 |
|                    |                          | 1       | 13.3                                     | 0.93                      | 14.2                                                | 30.0                 | 16.7                 |
| n                  | MCS7<br>(64QAM)          | 6       | 13.3                                     | 0.93                      | 14.3                                                | 30.0                 | 16.7                 |
|                    | (1.13/ 11/1)             | 11      | 12.4                                     | 0.93                      | 13.4                                                | 30.0                 | 17.6                 |

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Page 31 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# 6.4 Conducted (Average) Output Power Screen Captures 1 Mbps



Low Channel



**Middle Channel** 



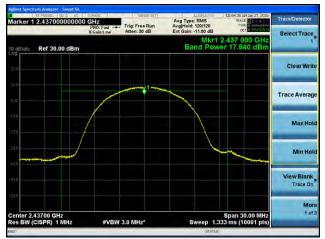
**High Channel** 

| LS Research, LLC              |                              | Page 32 of 111    |  |
|-------------------------------|------------------------------|-------------------|--|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |  |

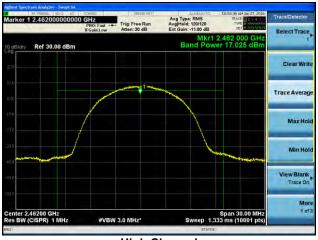
#### 11 Mbps



Low Channel



Middle Channel



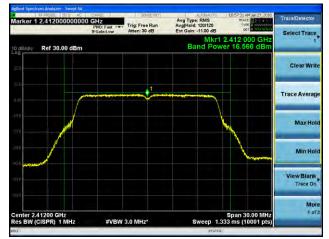
High Channel

6 Mbps

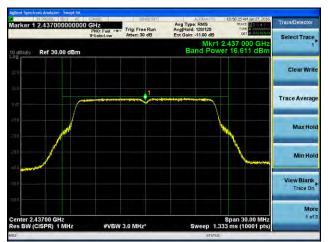
| LS Research, LLC              |                              |
|-------------------------------|------------------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            |
| EUT: IoT Gateway              | Serial #: Engineering Sample |

| Page | 33 | of | 111 |  |
|------|----|----|-----|--|
|------|----|----|-----|--|

| Report #: 315364  |
|-------------------|
| LSR Job #: C-2368 |



Low Channel



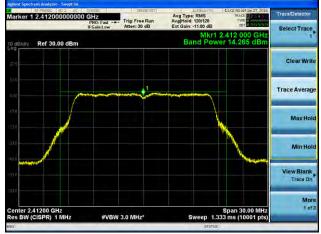
Middle Channel



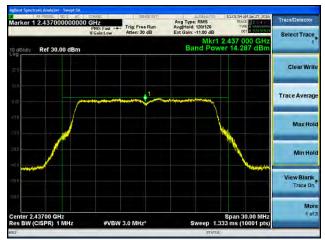
**High Channel** 

| LS Research, LLC              |                              | Page 34 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

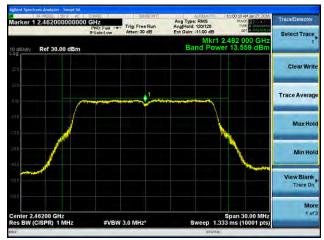




Low Channel



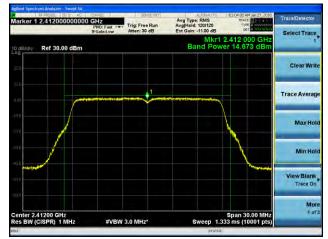
Middle Channel



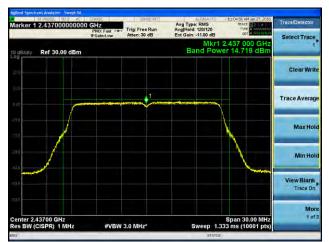
**High Channel** 

MCS0

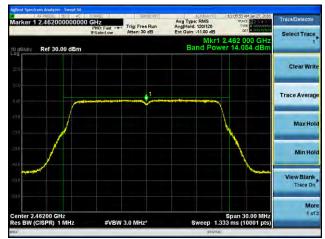
| LS Research, LLC              |                              | Page 35 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |



Low Channel



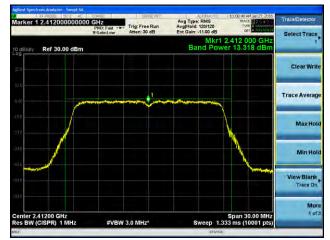
Middle Channel

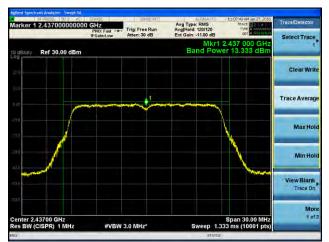


**High Channel** 

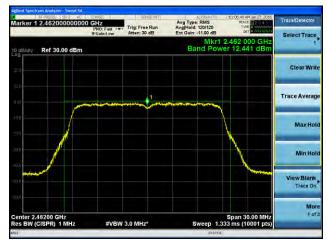
MCS7

| LS Research, LLC              |                              | Page 36 of 111    |
|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |



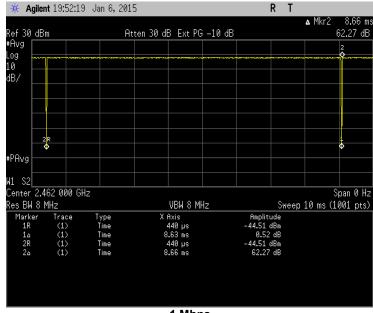


Middle Channel

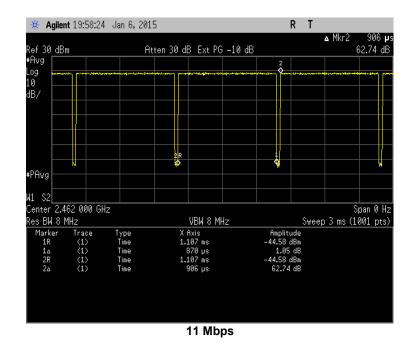


| LS Research, LLC              |                              | Page 37 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# 6.5 Duty Cycle Screen Captures



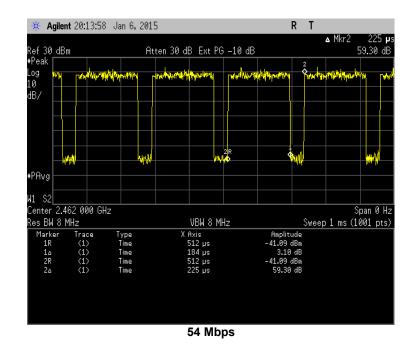




| LS Research, LLC              |                              | Page 38 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

| dDm       |         |         | 0.            | tan 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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                                                                                                                                                                                                                                                                                                                                                         |
|           | dBm<br> | dBm<br> | dBm<br>       | dBm At<br>Attraction Attraction At | 2.462 000 GHz<br>8 MHz<br>r Trace Type<br>(1) Time<br>(1) Time | dBm Atten 30 dB<br>Atten 40 dB | dBm Atten 30 dB Ext PG | dBm Atten 30 dB Ext PG -10 dB | dBm Atten 30 dB Ext PG -10 dB<br>ANTU-Marcal Activity Acti | dBm         Atten 30 dB         Ext PG         10 dB           Anthinking and the standard andard andard and the standard and the standard and the stan | dBm         Atten 30 dB         Ext PG         10 dB           Anthibition         Atten 30 dB         Atten 30 dB         10 dB           Atten 30 dB         Atten 30 dB         Atten 30 dB         10 dB           Atten 30 dB         Atten 30 dB         Atten 30 dB         10 dB           Atten 30 dB         Atten 30 dB         Atten 30 dB         10 dB           Atten 30 dB         Atten 30 dB         Atten 30 dB         10 dB           Atten 30 dB         Atten 30 dB         Atten 30 dB         10 dB           Atten 30 dB | dBm Atten 30 dB Ext PG -10 dB | ▲ Mkr2<br>dBm Atten 30 dB Ext PG -10 dB<br>▲ Mkr2<br>▲ Mkr3<br>▲ Mkr2<br>▲ Mkr2 |

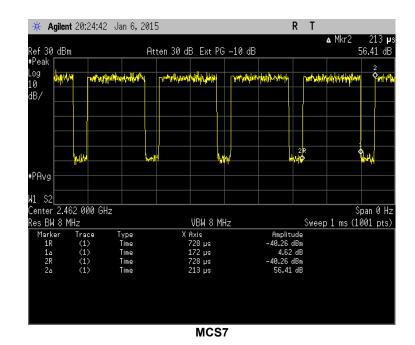




| LS Research, LLC              |                              | Page 39 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

| 🔆 Agiler               | <b>it</b> 20:15:5           | 2 Jan I      | 5,2015                  | )                |                    |             |                    | R       | 1     |             |      |               |
|------------------------|-----------------------------|--------------|-------------------------|------------------|--------------------|-------------|--------------------|---------|-------|-------------|------|---------------|
|                        |                             |              |                         |                  |                    |             |                    |         |       | <b>∆</b> Mk |      | 1.382         |
| ef 30 dBi              | m                           |              | At                      | ten 30 d         | B Ext PG           | 5 –10 dB    |                    |         |       |             |      | 55.04 c       |
| <sup>D</sup> eak       |                             |              |                         |                  |                    |             |                    |         |       |             | 2    |               |
| og <mark>wyw</mark>    | <b>n hi</b> nnin han an han | n runn       | white the second states | heythelyelyelyel | bethe which the    | aderthetere | ~ alerteller alert | l an fr | unun  | NAL YOU     | 944  | at the second |
| 0,                     |                             |              |                         |                  |                    |             |                    |         |       |             | +    |               |
| B/                     |                             |              |                         |                  |                    |             |                    |         |       |             | _    |               |
|                        |                             |              |                         |                  |                    |             |                    |         |       |             |      |               |
|                        |                             |              |                         |                  |                    |             |                    |         |       |             |      |               |
|                        |                             |              |                         |                  |                    |             |                    |         |       |             |      |               |
|                        |                             | -2R          |                         |                  |                    |             |                    |         |       | <u> </u>    | _    |               |
|                        |                             |              |                         |                  |                    |             |                    |         |       | 4           | ÷    |               |
|                        |                             |              |                         |                  |                    |             |                    |         |       |             |      |               |
| PAvg                   |                             |              |                         |                  |                    |             |                    |         |       |             |      |               |
| 1 \$2                  |                             |              |                         |                  |                    |             |                    |         |       |             |      |               |
|                        | 62 000 G                    | ∐⊸           |                         |                  |                    |             |                    |         |       |             | 0    | ipan 0        |
| enter 2.4<br>es BW 8 I |                             | ΠZ           |                         |                  | VBW 8 M            | 1-          |                    |         |       | . ^         |      | 001 pt        |
| es DM o I<br>Marker    | Inz<br>Trace                | T            |                         |                  | VDM O I'll<br>Axis | 12          | Ón – lite          |         | pweet | JZM         | 5 (1 | υστ μι        |
| narker<br>1R           | (1)                         | Type<br>Time |                         |                  | пхіs<br>352 µs     |             | Amplit<br>-37.69   |         |       |             |      |               |
| 1۵                     |                             | Time         |                         | 1.               | 342 ms             |             | -1.15              | dB      |       |             |      |               |
| 2R                     | (1)                         | Time         |                         |                  | 352 µs             |             | -37.69             |         |       |             |      |               |
| 2۵                     | (1)                         | Time         |                         | 1.               | 382 ms             |             | 55.04              | dB      |       |             |      |               |
|                        |                             |              |                         |                  |                    |             |                    |         |       |             |      |               |
|                        |                             |              |                         |                  |                    |             |                    |         |       |             |      |               |
|                        |                             |              |                         |                  |                    |             |                    |         |       |             |      |               |
|                        |                             |              |                         |                  |                    |             |                    |         |       |             |      |               |

MCS0



| LS Research, LLC              |                              | Page 40 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# EXHIBIT 7 POWER SPECTRAL DENSITY

| Manufacturer     | Georgia-Pacific                                                                                                                                                                                                                                   |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date             | 1/28/16                                                                                                                                                                                                                                           |
| Operator         | Michael Hintzke                                                                                                                                                                                                                                   |
| Temp. / R.H.     | 20 - 25° C / 30-60% R.H.                                                                                                                                                                                                                          |
| Rule Part        | FCC 15.247 (e)<br>RSS-247 Sect.5.2                                                                                                                                                                                                                |
| Additional Notes | <ul> <li>Average detector used</li> <li>Continuous transmit modulated used for this test.</li> <li>Sample Calculation: Margin (dB) = Limit – Measured level</li> <li>Measurement utilized <ul> <li>RBW=100 kHz (conducted)</li> </ul> </li> </ul> |

### 7.1 Measurement Procedure

ANSI C63.10-2013 Section 11.10.2 FCC KDB 558074 DTS Meas Guidance v03r04 Section 10.2

### 7.2 Limit

For digitally modulated systems, the conducted power spectral density shall not be greater than 8 dBm in any 3 kHz band.

## 7.3 Test Data

| 802.11<br>Standard | Data Rate<br>(MBPS) | Channel  | Peak PSD<br>in 100kHz<br>Minimum<br>BV (dBm) | Corrected<br>PSD (dBm) | PSD in<br>3kHz<br>limit(dBm) | PSD margin<br>(dBm) |      |
|--------------------|---------------------|----------|----------------------------------------------|------------------------|------------------------------|---------------------|------|
|                    |                     | 1        | 1.2                                          | 1.2                    | 8.0                          | 6.8                 |      |
| ь                  | 1(DBPSK)            | 6        | 1.2                                          | 1.2                    | 8.0                          | 6.8                 |      |
|                    |                     | 11       | 0.1                                          | 0.1                    | 8.0                          | 7.9                 |      |
|                    |                     | 1        | 0.4                                          | 0.4                    | 8.0                          | 7.6                 |      |
| ь                  | 11(8QPSK)           | 6        | 0.5                                          | 0.5                    | 8.0                          | 7.5                 |      |
|                    |                     | 11       | -0.7                                         | -0.7                   | 8.0                          | 8.7                 |      |
|                    |                     | 1        | -3.8                                         | -3.8                   | 8.0                          | 11.8                |      |
| g                  | 6 (BPSK)            | 6 (BPSK) | 6                                            | -3.8                   | -3.8                         | 8.0                 | 11.8 |
|                    |                     | 11       | -4.3                                         | -4.3                   | 8.0                          | 12.3                |      |
|                    |                     | 1        | -4.8                                         | -4.8                   | 8.0                          | 12.8                |      |
| g                  | 54 (64QAM)          | 6        | -5.0                                         | -5.0                   | 8.0                          | 13.0                |      |
|                    |                     | 11       | -5.8                                         | -5.8                   | 8.0                          | 13.8                |      |
|                    |                     | 1        | -6.8                                         | -6.8                   | 8.0                          | 14.8                |      |
| n                  | MCS0<br>(BPSK)      | 6        | -6.1                                         | -6.1                   | 8.0                          | 14.1                |      |
|                    | (=. 6(1)            | 11       | -6.9                                         | -6.9                   | 8.0                          | 14.9                |      |
|                    |                     | 1        | -6.3                                         | -6.3                   | 8.0                          | 14.3                |      |
| n                  | MCS7<br>(64QAM)     | 6        | -6.4                                         | -6.4                   | 8.0                          | 14.4                |      |
|                    | (1.2)               | 11       | -7.3                                         | -7.3                   | 8.0                          | 15.3                |      |

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Page 41 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# 7.4 Screen Captures





Low Channel



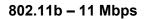
Middle Channel

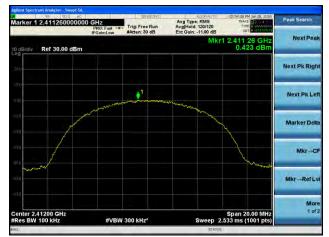


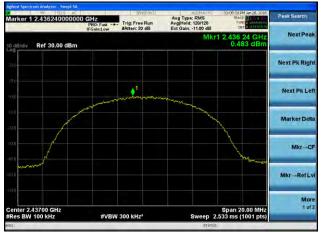
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| Prepared For: Georgia-Pacific | Model #: A-100278            |
| EUT: IoT Gateway              | Serial #: Engineering Sample |

| Page | 42 | of | 111 |  |
|------|----|----|-----|--|
|------|----|----|-----|--|

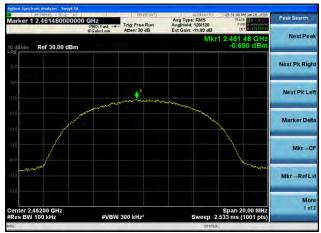
| Report #: 315364  |
|-------------------|
| LSR Job #: C-2368 |



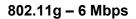


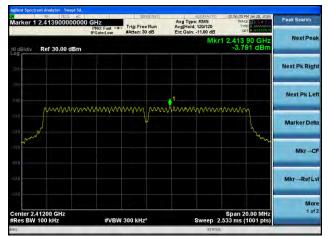


Middle Channel



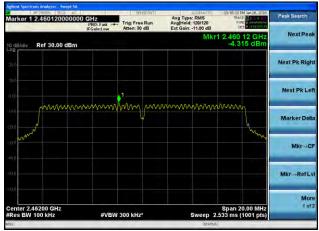
| LS Research, LLC              |                              | Page 43 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |



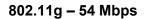


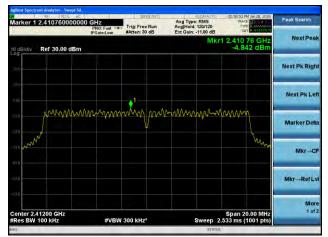


Middle Channel



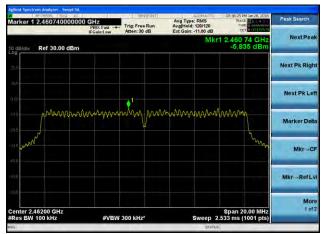
| LS Research, LLC              |                              | Page 44 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |





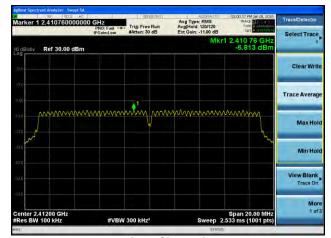


Middle Channel



| LS Research, LLC              |                              | Page 45 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

802.11n - MCS0



Low Channel

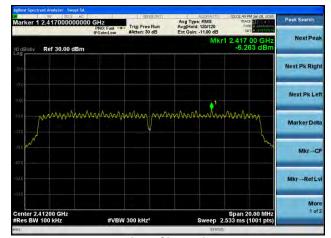


Middle Channel



| LS Research, LLC              |                              | Page 46 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

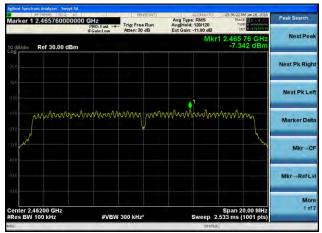
802.11n - MCS7



Low Channel



Middle Channel



| LS Research, LLC              |                              | Page 47 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# EXHIBIT 8 FREQUENCY STABILITY

| Manufacturer     | Georgia-Pacific                                                          |
|------------------|--------------------------------------------------------------------------|
| Date             | 2/16/15                                                                  |
| Operator         | Adam Alger                                                               |
| Temp. / R.H.     | 20 - 25° C / 30-60% R.H.                                                 |
| Rule Part        | FCC 2.1055 (d)                                                           |
| Additional Notes | Peak detector used                                                       |
| Additional Notes | <ul> <li>Continuous transmit un-modulated used for this test.</li> </ul> |

## 8.1 Measurement Procedure

ANSI C63.10-2013 Section 6.8.2 RSS-Gen Section 6.11

# 8.2 Test Data

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| Channel | 3.13        | VDC            | 3.3         | VDC            | 3.46        | VDC            |            |
|---------|-------------|----------------|-------------|----------------|-------------|----------------|------------|
| Channel | Power (dBm) | Frequency (Hz) | Power (dBm) | Frequency (Hz) | Power (dBm) | Frequency (Hz) | Drift (Hz) |
| Low     | 10.9        | 2411988305     | 10.9        | 2411988290     | 10.9        | 2411988540     | 250        |
| Mid     | 10.7        | 2436987660     | 10.7        | 2436987440     | 10.7        | 2436987590     | 220        |
| High    | 10.6        | 2461987250     | 10.6        | 2461987450     | 10.6        | 2461987150     | 300        |

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Page 48 of 111

# EXHIBIT 9 BAND EDGE MEASUREMENTS

| Manufacturer                               | Georgia-Pacific                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                           |  |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--|
| Date                                       | 1/27/16, 1/29/16, 2/8/16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           |  |
| Operator                                   | Michael Hintzke                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                           |  |
| Temp. / R.H.                               | 20 - 25° C / 30-60% R.H.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                           |  |
| Rule Part                                  | FCC 15.247 (d) / RSS-247 Sect 5.5<br>FCC 15.209 (a) / RSS-Gen Sect 8.9<br>FCC 15.205 (a) / RSS-Gen Sect 8.10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                           |  |
| Measurement<br>Detectors                   | Conducted:<br>RBW = 100 kHz<br>VBW = ≥ 300 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Radiated:<br>RBW = 1 MHz<br>VBW = ≥ 3 MHz |  |
| Description of<br>Radiated<br>Measurements | <ol> <li>The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed. The data is gathered and reported as the corrected values.</li> <li>The EUT is placed on a 150 cm non-conductive pedestal centered on a turn-table in the test location with the antenna 3 meters from the EUT.</li> <li>Maximum radiated RF emissions are determined by rotation of azimuth and scanning the sense antenna between 1 and 4 meters in height using both horizontal and vertical antenna polarities. Maximized levels are manually noted at degree values of azimuth and at sense antenna height.</li> </ol> |                                           |  |
| Example<br>Calculations                    | Reported Measurement data = Raw receiver measurement + Antenna Correction<br>Factor + Cable factor (dB) - amplification factor (when applicable) + Additional<br>factor (when applicable)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                           |  |

# 9.1 Method of Measurements

ANSI C63.10-2013 Section 11.13.2 FCC KDB 558074 DTS Meas Guidance v03r04 Section 13.2

## 9.2 Limit(s)

#### Conducted Measurement:

The spurious emissions produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth that contains the highest level of the desired power.

#### Radiated Measurement:

| Frequency<br>(MHz) | 3 m Limit<br>(μV/m) | 3 m Limit<br>(dBμV/m) | Detector<br>Type |
|--------------------|---------------------|-----------------------|------------------|
| Above 960          | 500                 | 54.0                  | Average (>1 GHz) |
| Above 960          | -                   | 74.0                  | Peak(>1 GHz)     |

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Page 49 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### 9.3 Test Data

## 9.3.1 Bandedges in 100 kHz Bandwidth



#### 802.11b - 1 Mbps

Lower Bandedge



Upper Bandedge

| IS | Research,     |  |
|----|---------------|--|
|    | i toocui oii, |  |

Page 50 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

802.11b – 11 Mbps



Lower Bandedge



| LS Research, LLC              |                              | Page 51 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

802.11g - 6 Mbps

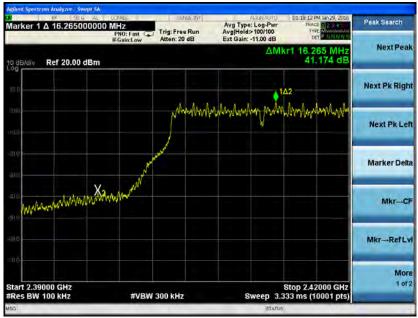


Lower Bandedge



| LS Research, LLC              |                              | Page 52 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

802.11g - 54 Mbps



Lower Bandedge



| LS Research, LLC              | search, LLC                  |                   |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

802.11n - MCS0

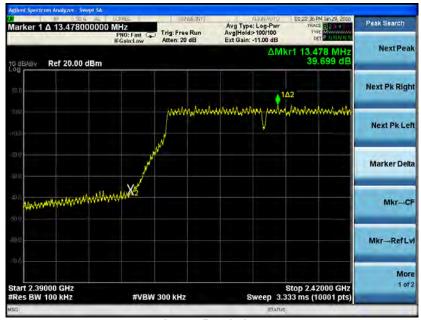


Lower Bandedge



| LS Research, LLC              |                              | Page 54 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

802.11n - MCS7



Lower Bandedge



| LS Research, LLC              |                              | Page 55 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# <u>9.3.2 Bandedges in the 2310 MHz – 2390 MHz Restricted Band –</u> <u>Radiated Measurements</u>

| REPRESEL SD 9 40                       |                                      | SEM SEM S                      | Avg Type: Voltage                    | 102:18:21 PM Jan 27, 2016<br>TRACE 12 2 4 1 | Peak Search   |
|----------------------------------------|--------------------------------------|--------------------------------|--------------------------------------|---------------------------------------------|---------------|
| ker 1 2.3896800000                     | PNO: Fast C                          | Trig: Free Run<br>#Atten: 0 dB | Avg Hold>120/120                     | DET P P N N N N                             |               |
| aldiv. Ref 80.00 dBpV                  | //m                                  |                                | Mkr1                                 | 2.389 680 GHz<br>57.699 dBµV/m              | NextPeal      |
|                                        |                                      |                                |                                      | 71/2 (8)//*                                 | Next Pk Righ  |
| her fallen her ster ster ster fan de s | ul <sub>ement</sub> i seri ketakékke | galdziekowa bob                | alain Africian yelaikan yisilagan ka | 1 minunger and the second                   | Next Pk Lef   |
|                                        |                                      |                                |                                      |                                             | Marker Delt   |
|                                        |                                      |                                |                                      |                                             | Mkr→Cl        |
|                                        |                                      |                                |                                      |                                             | Mkr→RefLv     |
| t 2.31000 GHz<br>s BW (CISPR) 1.0 MHz  | #VBW :                               |                                |                                      | Stop 2.39000 GHz<br>333 ms (10001 pts)      | Mon<br>1 of 2 |

#### 802.11b – 1 Mbps

Peak



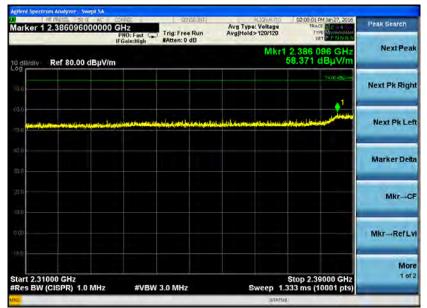
Average

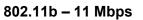
| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuVim) | Peak limit<br>(dBuV/m) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuV/m) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2389.7                     | 57.7             | 74.0                   | 16.3               | 2390.0                        | 49.3                | 54.0                         | 4.7                   |

| LS | Researc | h, L | LC. |
|----|---------|------|-----|
|----|---------|------|-----|

Page 56 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |





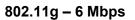
| arker 1 2.387544000000                     |            | Avg Type: Voltage | 01:50:16 PM Jan 27, 2016<br>TRACE 12 2 44<br>TYPE MUNICIPAL DET P. P. N.N.N. 11 | Peak Search  |
|--------------------------------------------|------------|-------------------|---------------------------------------------------------------------------------|--------------|
| dB/div Ref 80.00 dBµV/                     | n          |                   | 2.387 544 GHz<br>46.714 dBµV/m                                                  | NextPeak     |
| u,ų                                        |            |                   |                                                                                 | Next Pk Righ |
| a0                                         |            |                   | Stit da                                                                         | Next Pk Lef  |
| 0.0<br>0.0                                 |            |                   |                                                                                 | MarkerDelt   |
| 10<br>10                                   |            |                   |                                                                                 | Mkr-+C       |
| ő,                                         |            |                   |                                                                                 | Mkr-RefL     |
| tart 2.31000 GHz<br>Res BW (CISPR) 1.0 MHz | #VBW 10 Hz | Sweep             | Stop 2.39000 GHz<br>9.174 s (10001 pts)                                         | Mor<br>1 of  |

Average

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuVłm) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuVłm) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2386.1                     | 58.4             | 74.0                   | 15.6               | 2487.5                        | 46.7                | 54.0                         | 7.3                   |

| LS Research, LLC              |                              | Page 57 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

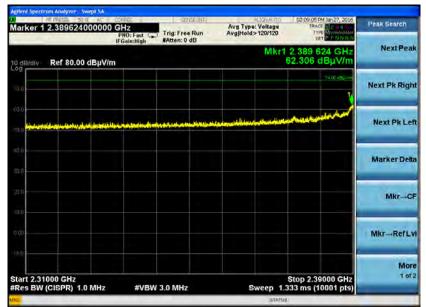


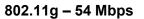


| arker 1 2.39000000000000                                    |            | ee Run Ave | g Type: Voltage<br>Hold: 2/120 | 02:05:19 PM Jan 27, 2016<br>TRACE 12 244<br>TYPE MUNICIPALITY DET P. P. N. N. U. T | Peak Search<br>Next Peak |  |  |
|-------------------------------------------------------------|------------|------------|--------------------------------|------------------------------------------------------------------------------------|--------------------------|--|--|
| Mkr1 2.390 000 GHz<br>طقاطات Ref 80.00 dBμV/m 51.334 dBμV/m |            |            |                                |                                                                                    |                          |  |  |
| 0,0 )                                                       |            |            |                                |                                                                                    | Next Pk Righ             |  |  |
| a.0                                                         |            |            |                                | State State                                                                        | Next Pk Le               |  |  |
| að<br>99                                                    |            |            |                                |                                                                                    | Marker Delt              |  |  |
| uo                                                          |            |            |                                |                                                                                    | Mkr-C                    |  |  |
| ŵ                                                           |            |            |                                |                                                                                    | Mkr-RefL                 |  |  |
| tart 2.31000 GHz<br>Res BW (CISPR) 1.0 MHz                  | #VBW 10 Hz |            | Sweep                          | Stop 2.39000 GHz<br>9.174 s (10001 pts)                                            | Mor<br>1 of              |  |  |

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuVłm) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuVłm) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2389.7                     | 64.2             | 74.0                   | 9.8                | 2390.0                        | 51.3                | 54.0                         | 2.7                   |

| LS Research, LLC              | Page 58 of 111               |                   |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |



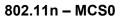


| ref Friedstal 190 st AC 000<br>larker 1 2,3900000000000 Gi<br>IFI |            | Avg Type: Voltage<br>Avg Hold: 4/120 | 02:07:44 PM Jan 27, 2016<br>TRACE 1 2:54<br>TYPE MANAGANAY<br>DET P. P. N. N. D | Peak Search    |
|-------------------------------------------------------------------|------------|--------------------------------------|---------------------------------------------------------------------------------|----------------|
| dB/div Ref 80.00 dBµV/m                                           |            |                                      | 2,390 000 GHz<br>47.620 dBµV/m                                                  | Next Peak      |
| 0.0                                                               |            |                                      |                                                                                 | Next Pk Righ   |
| no                                                                |            |                                      | SAL AL                                                                          | Next Pk Lef    |
| a 0<br>20                                                         |            |                                      |                                                                                 | MarkerDelt     |
| UO.                                                               |            |                                      |                                                                                 | Mkr→C          |
| ώ                                                                 |            |                                      |                                                                                 | Mkr-RefL       |
| tart 2.31000 ĜHz<br>Res BW (CISPR) 1.0 MHz                        | #VBW 10 Hz | Sweep                                | Stop 2.39000 GHz<br>9.174 s (10001 pts)                                         | More<br>1 of 3 |

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuV/m) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuV/m) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2389.6                     | 62.3             | 74.0                   | 11.7               | 2390.0                        | 47.6                | 54.0                         | 6.4                   |

| LS Research, LLC              |                              | Page 59 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

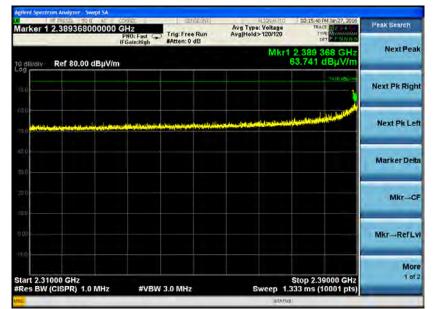


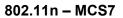


| arker 1 2.38999200000                      | BND Fast Trig: | Free Run<br>n: 0 dB | Avg Type: Voltage<br>Avg Hold: 4/120 | 02:12:24 PM Jan 27, 2016<br>TRACE 2 2 24<br>TYPE MANAGEMENT<br>DET P. P. N. N. H. | Peak Search  |
|--------------------------------------------|----------------|---------------------|--------------------------------------|-----------------------------------------------------------------------------------|--------------|
| dB/div Ref 80.00 dBµV/                     | m              |                     |                                      | 2.389 992 GHz<br>49.602 dBµV/m                                                    | NextPeal     |
| 0,0                                        |                |                     |                                      |                                                                                   | Next Pk Righ |
| no                                         |                |                     |                                      | 540.60/1                                                                          | Next Pk Le   |
| að<br>90                                   |                |                     |                                      |                                                                                   | Marker Delt  |
| u0.                                        |                |                     |                                      |                                                                                   | Mkr-C        |
| ώ                                          |                |                     |                                      |                                                                                   | Mkr→RefL     |
| tart 2.31000 GHz<br>Res BW (CISPR) 1.0 MHz | #VBW 10 H      |                     | Swaan                                | Stop 2.39000 GHz<br>9.174 s (10001 pts)                                           | Mor<br>1 of  |

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuVłm) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuV/m) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2388.7                     | 64.4             | 74.0                   | 9.6                | 2390.0                        | 49.6                | 54.0                         | 4.4                   |

| LS Research, LLC              |                              | Page 60 of 111    |  |  |
|-------------------------------|------------------------------|-------------------|--|--|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |  |  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |  |  |





| arker 1 2.390000000000000                  |            | Avg Type: Voltage<br>Avg Hold: 2/120 | D2:14:45 PM Jan 27, 2016<br>TRACE 1 2 E 4<br>TYPE MUSEUM | Peak Search  |
|--------------------------------------------|------------|--------------------------------------|----------------------------------------------------------|--------------|
| derdiv Ref 80.00 dBµV/m                    | Contrage   |                                      | 2.390 000 GHz<br>47.910 dBµV/m                           | NextPeak     |
| 0.0                                        |            |                                      |                                                          | Next Pk Righ |
| no                                         |            |                                      | succession 1                                             | Next Pk Le   |
| a à                                        |            |                                      |                                                          | Marker Delt  |
| uo.                                        |            |                                      |                                                          | Mkr-C        |
| ŵ                                          |            |                                      |                                                          | Mkr→RefL     |
| tart 2.31000 GHz<br>Res BW (CISPR) 1.0 MHz | #VBW 10 Hz | Sweep                                | Stop 2.39000 GHz<br>9.174 s (10001 pts)                  | Mor<br>1 of  |

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuVim) | Peak limit<br>(dBuV/m) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuVłm) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2389.4                     | 63.7             | 74.0                   | 10.3               | 2390.0                        | 47.9                | 54.0                         | 6.1                   |

| LS Research, LLC              |                              | Page 61 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# <u>9.3.2 Bandedges in the 2483.5 MHz – 2500 MHz Restricted Band –</u> <u>Radiated Measurements</u>

| er 1 2.483597350000 GHz<br>IFGainHigh                                                                                | Trig: Free Run<br>#Atten: 0 dB | AUGHAUTO<br>Avg Type: Voltage<br>Avg Hold>100/100 | 02:20:14 PM Feb 08, 2016<br>TRACE 1874 TYPE<br>TYPE MULTING | Peak Search   |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------|-------------------------------------------------------------|---------------|
| div Ref 80.00 dBµV/m                                                                                                 |                                | Mkr1 2.4                                          | 183 597 35 GHz<br>57.251 dBμV/m                             | NextPeak      |
|                                                                                                                      |                                |                                                   | 74.00 00641/m                                               | Next Pk Righ  |
| 1<br>Micesepter and an installant and a final state of the state | unter al a c attances          | d gestation of the second second                  | nethlisefficient fordprodutions                             | Next Pk Lef   |
|                                                                                                                      |                                |                                                   |                                                             | Marker Delta  |
|                                                                                                                      |                                |                                                   |                                                             | Mkr-+Cf       |
|                                                                                                                      |                                |                                                   |                                                             | Mkr→RefLv     |
| 2.483500 GHz<br>3W (CISPR) 1 MHz #VBW 3                                                                              | 3.0 MHz                        | Swaan 1                                           | top 2.500000 GHz<br>333 ms (10001 pts)                      | More<br>1 of: |

#### 802.11b – 1 Mbps

Peak

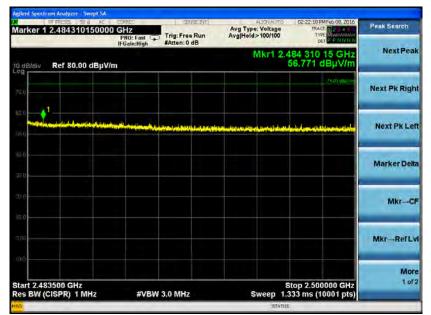


| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuVim) | Peak limit<br>(dBuV/m) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuVim) | Average<br>limit<br>(dBuV/m) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2483.6                     | 57.3             | 74.0                   | 16.8               | 2483.5                        | 49.4                | 54.0                         | 4.6                   |

LS Research, LLC

Page 62 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |



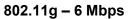
802.11b - 11 Mbps

| arker 1 2.483500000000                  |            | Avg Type: Voltage<br>Avg Hold: 9/100 | 02:23:01 PM Feb 00, 2016<br>TRACE 2 2 4 5 7<br>TYPE MULLIN | Peak Search  |
|-----------------------------------------|------------|--------------------------------------|------------------------------------------------------------|--------------|
| dB/div Ref 80.00 dBµV/r                 | n          | Mkr1 2.4                             | 83 500 00 GHz<br>5.980 dBµV/m                              | NextPeak     |
| τΰ                                      |            |                                      |                                                            | Next Pk Righ |
| 10                                      |            |                                      | 54 00 valip Mar.                                           | Next PK Le   |
| 0                                       |            |                                      |                                                            | Marker Del   |
| ro                                      |            |                                      |                                                            | Mkr→C        |
| na)                                     |            |                                      |                                                            | Mkr→RefL     |
| art 2.483500 GHz<br>es BW (CISPR) 1 MHz | #VBW 10 Hz | Succent                              | top 2.500000 GHz<br>.893 s (10001 pts)                     | Mor<br>1 of  |

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuV/m) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuVim) | Average<br>limit<br>(dBuV/m) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2484.3                     | 56.8             | 74.0                   | 17.2               | 2483.5                        | 46.0                | 54.0                         | 8.0                   |

| LS Research, LLC              |                              | Page 63 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |



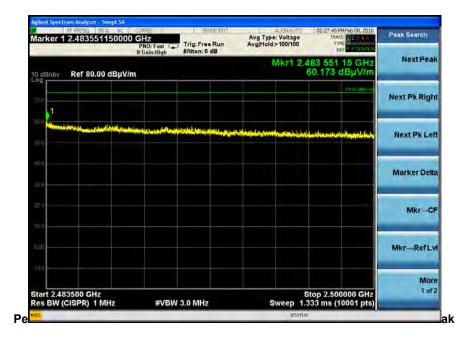


| larker 1 2.483500000000 (                |            | Avg Type: Voltage<br>Avg[Hold: 8/100 | 02:24:51 PM Feb 00, 2016<br>TRACE 1 2 2 4 5<br>TYPE MONITOR | Peak Search<br>Next Peak |  |  |  |
|------------------------------------------|------------|--------------------------------------|-------------------------------------------------------------|--------------------------|--|--|--|
| то dB/div Ref 80.00 dBµV/m 49.042 dBµV/m |            |                                      |                                                             |                          |  |  |  |
| 70.0                                     |            |                                      |                                                             | Next Pk Righ             |  |  |  |
| is 0<br>in 1                             |            |                                      | 54 00 ally Vie                                              | Next Pk Let              |  |  |  |
| £0<br>                                   |            |                                      |                                                             | Marker Delt              |  |  |  |
| no                                       |            |                                      |                                                             | Mkr→C                    |  |  |  |
| (f)                                      |            |                                      |                                                             | Mkr→RefL                 |  |  |  |
| tart 2.483500 GHz<br>es BW (CISPR) 1 MHz | #VBW 10 Hz | S<br>Sweep                           | top 2.500000 GHz<br>1.893 s (10001 pts)                     | Mor<br>1 of              |  |  |  |

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuVim) | Peak limit<br>(dBuVłm) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuVłm) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2483.5                     | 61.7             | 74.0                   | 12.3               | 2483.5                        | 49.0                | 54.0                         | 5.0                   |

| LS Research, LLC              |                              | Page 64 of 111    |  |
|-------------------------------|------------------------------|-------------------|--|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |  |

802.11g – 54 Mbps



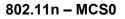
| Minker 1 2.483500000000                  | GHZ    | Trig: Free Run<br>#Atten: 0 dB | Avg Type: Voltage<br>Avg Hold: 10/100 |                                            | Peak Search  |
|------------------------------------------|--------|--------------------------------|---------------------------------------|--------------------------------------------|--------------|
| 0 dB/div Ref 80.00 dBµV/r                | n      |                                | Mkr1 :                                | 2.483 500 00 GHz<br>46.777 dBµV/m          | NextPea      |
| ητή)                                     |        |                                |                                       |                                            | Next Pk Righ |
| an)<br>au)                               |        |                                |                                       |                                            | Next Pk Le   |
| #0<br>00                                 |        |                                |                                       |                                            | Marker Del   |
| 3D                                       |        |                                |                                       |                                            | MkrC         |
| vo:                                      |        |                                |                                       |                                            | Mkr→RefL     |
| tart 2.483500 GHz<br>es BW (CISPR) 1 MHz | #VBW 1 | 0.117                          | Sweet                                 | Stop 2.500000 GHz<br>p 1.893 s (10001 pts) | Mor<br>1 of  |

Average

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuV/m) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuV/m) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2483.6                     | 60.2             | 74.0                   | 13.8               | 2483.5                        | 46.8                | 54.0                         | 7.2                   |

| LS Research, LLC              |                              | Page 65 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Marker 1 2.483813500000 GHz PND: Fast Fight IFGein:High 02:31:25 PM Feb 00. TRACE 1 2 T TYPE M DET F F 1 008.2016 Peak Search Avg Type: Voltage Avg|Hold>100/100 NextPeak Mkr1 2.483 813 50 GHz 62.176 dBµV/m Ref 80.00 dBµV/m 1440.00 Next Pk Right <1 6.11 al.a. Next Pk Left Marker Delta Mkr-CF Mkr-RefLvi More 1 of 2 Stop 2.500000 GHz Sweep 1.333 ms (10001 pts) Start 2.483500 GHz Res BW (CISPR) 1 MHz #VBW 3.0 MHz



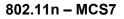
Peak

| larker 1 2.483500000000 (               | GHz    | Trig: Free Run<br>#Atten: 0 dB | Avg Type: Voltage<br>Avg Hold: 10/100 | 02:30:22 PM Feb 08, 2016<br>TRACE 2 2 4 5<br>TYPE M | Peak Search  |
|-----------------------------------------|--------|--------------------------------|---------------------------------------|-----------------------------------------------------|--------------|
| dB/div Ref 80.00 dBµV/m                 |        |                                | Mkr1 2.                               | 483 500 00 GHz<br>47.933 dBµV/m                     | NextPeal     |
| α.ġ                                     |        |                                |                                       |                                                     | Next Pk Righ |
| αη                                      |        |                                |                                       | 54.05 viligi Mite                                   | Next Pk Let  |
| 0.0<br>                                 |        |                                |                                       |                                                     | Marker Deit  |
|                                         |        |                                |                                       |                                                     | MkrC         |
| ria                                     |        |                                |                                       |                                                     | MkrRefL      |
| art 2.483500 GHz<br>es BW (CISPR) 1 MHz | #VBW 1 | 0.82                           | Sween                                 | Stop 2.500000 GHz<br>1.893 s (10001 pts)            | Mor<br>1 of  |

| F | Peak<br>Frequency<br>(MHz) | Peak<br>(dBuVłm) | Peak limit<br>(dBuV/m) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuVłm) | Average<br>Margin (B) |
|---|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
|   | 2483.8                     | 62.2             | 74.0                   | 11.8               | 2483.5                        | 47.9                | 54.0                         | 6.1                   |

| LS Research, LLC              |                              | Page 66 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Marker 1 2.483813500000 GHz PND: Fast IFGain:High Trig: Free Run #Atten: 0 dB 08,2016 Peak Search Avg Type: Voltage Avg|Hold>100/100 TYPE M NextPeak Mkr1 2.483 813 50 GHz 60.963 dBµV/m Ref 80.00 dBµV/m 14.00 00 Next Pk Right •<sup>1</sup> 6 A.B. ad beat is 14. Next Pk Left Marker Delta Mkr-CF Mkr-RefLvi More 1 of 2 Stop 2.500000 GHz Sweep 1.333 ms (10001 pts) Start 2.483500 GHz Res BW (CISPR) 1 MHz #VBW 3.0 MHz



Peak

| Marker 1 2.483513200000                    |      | Trig: Free Run<br>#Atten: 0 dB | Avg Type: Voltage<br>Avg[Hold: 3/100 | 02:34:08 PM Feb 08, 2016<br>TRACE 224 4<br>Type Manual Det P F MININ | Peak Search  |
|--------------------------------------------|------|--------------------------------|--------------------------------------|----------------------------------------------------------------------|--------------|
| 0 dB/div Ref 80.00 dBµV/n                  |      |                                |                                      | 483 513 20 GHz<br>46.571 dBµV/m                                      | NextPeak     |
| π.0                                        |      |                                |                                      |                                                                      | Next Pk Righ |
| 63.0<br>50.0 1                             |      |                                |                                      | 5415 (B) (M)                                                         | Next Pk Lef  |
| (c.o.<br>10 o                              |      |                                |                                      |                                                                      | Marker Delt  |
| 00<br>                                     |      |                                |                                      |                                                                      | Mkr→C        |
| cia, r                                     |      |                                |                                      |                                                                      | Mkr→RefLy    |
| ttart 2.483500 GHz<br>tes BW (CISPR) 1 MHz | #VBW | 10 Hz                          | Sween                                | Stop 2.500000 GHz<br>1.893 s (10001 pts)                             | Mor<br>1 of: |

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuVIm) | Peak limit<br>(dBuV/m) | Peak<br>Margin (B) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuVłm) | Average<br>Margin (B) |
|----------------------------|------------------|------------------------|--------------------|-------------------------------|---------------------|------------------------------|-----------------------|
| 2483.8                     | 61.0             | 74.0                   | 13.0               | 2483.5                        | 46.6                | 54.0                         | 7.4                   |

| LS Research, LLC              |                              | Page 67 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# EXHIBIT 10 Transmitter Spurious Emissions

| Manufacturer               | Georgia-Pacific                   |                       |                    |           |                      |
|----------------------------|-----------------------------------|-----------------------|--------------------|-----------|----------------------|
| Date(s)                    | 1/29/16, 2/1/15, 2/5/1            | 5                     |                    |           |                      |
| Test                       | Michael Hintzke                   | 10                    |                    |           |                      |
| Engineer(s)                | Coty Hammerer                     |                       |                    |           |                      |
| Temp. / R.H.               | 20 - 25° C / 30-60% R.H.          |                       |                    |           |                      |
| •                          | FCC 15.247 (d) / RS               |                       |                    |           |                      |
| Rule Part                  | FCC 15.209 / RSS-G                | en Sect 8.9           |                    |           |                      |
|                            | Conducted:                        |                       | adiated:           |           | Radiated:            |
| Measurement                | RBW = 100 kH                      | 7                     | 2 -1000 MHz        |           | 1 GHz -40 GHz        |
| Detectors                  | VBW = ≥ 300 kH                    | <sub>HZ</sub>   RBW   | = 120 kHz          |           | RBW = 1 MHz          |
|                            |                                   | VBW                   | <u>= ≥ 300 kHz</u> | \<br>\    | VBW = ≥ 3 MHz        |
|                            | EUT Placeme                       | <u>ent &gt; 1 GHz</u> | EUT                | Placem    | ent > 1 GHz          |
|                            | 150 cm height non                 | -conductive table     | 80 cm he           | ight nor  | n-conductive table   |
|                            | above reference gro               | und plane covered     | above r            | eferenc   | ce ground plane      |
|                            | with abs                          | orbers                |                    |           |                      |
|                            | 1. The antenna,                   | cable, pre-amp, ar    | d other necessa    | ary mea   | surement system      |
|                            | correction fac                    | tors are loaded ont   | o the EMI receiv   | ver / spe | ectrum analyzer      |
|                            | when the mea                      | asurements are per    | formed. The dat    | a is gat  | hered and reported   |
| Description of             | as the correct                    | ed values.            |                    | _         |                      |
| Description of<br>Radiated |                                   | aced on a 150 cm      |                    |           |                      |
| Measurements               | turn-table in th                  | he test location with | the antenna 3      | meters    | from the EUT.        |
| Measurements               | <ol><li>Maximum rad</li></ol>     | iated RF emissions    | are determined     | l by rota | ation of azimuth     |
|                            |                                   | the sense antenna     |                    |           |                      |
|                            |                                   | al and vertical ante  |                    |           |                      |
|                            | manually note                     | ed at degree values   | of azimuth and     | at sens   | se antenna height.   |
|                            |                                   | Log Periodic          |                    |           | Standard Gain        |
|                            | Biconical                         | Dipole Array:         | Double-Ric         |           | Horn:                |
|                            | 30 MHz- 300 MHz                   | 300 MHz -1000         | Waveguide          |           | 18 GHz – 25 GHz      |
|                            |                                   | MHz                   | 1 GHz -18          | GHZ       |                      |
| Example                    | Reported Measureme                |                       |                    |           |                      |
| Example<br>Calculations    | Factor + Cable factor             | (dB) - amplification  | n factor (when a   | pplicabl  | e) + Additional      |
|                            | factor (when applicab             |                       | -                  |           |                      |
|                            | Continuous transmit               | t, modulated EUT o    | peration.          |           |                      |
|                            | •The EUT was position             | oned in 3 orthogon    | al orientations.   |           |                      |
|                            | •The EUT was meas                 | Ŭ                     |                    |           |                      |
|                            | • The data rate of 1 M            |                       |                    | s in the  | following frequency  |
| Additional                 | ranges:                           |                       |                    |           |                      |
| Notes:                     | • 30 MHz – 2310                   | MHz                   |                    |           |                      |
|                            | <ul> <li>2500 MHz – 25</li> </ul> |                       |                    |           |                      |
|                            | • The radiated screen             |                       | are representati   | ive of th | e low mid and high   |
|                            | channels.                         | i captules provided   | are representati   |           | ie iow, mie and nigh |
|                            |                                   |                       |                    |           |                      |
|                            |                                   |                       |                    |           |                      |

| LS Research, LLC              |                              | Page 68 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# **10.1 Method of Measurements**

ANSI C63.10-2013 Sections 6.5 and 6.6 FCC KDB 558074 DTS Meas Guidance v03r04 Section 11

## 10.2 Limit

#### Conducted Measurement:

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth that contains the highest level of the desired power.

#### Radiated Measurement:

The emissions from an intentional radiator shall not exceed the field strength levels of FCC 15.209.

| Frequency<br>(MHz) | 3 m Limit<br>(μV/m) | 3 m Limit<br>(dBμV/m) | Detector<br>Type |
|--------------------|---------------------|-----------------------|------------------|
| 30-88              | 100                 | 40.0                  | Quasi-Peak       |
| 88-216             | 150                 | 43.5                  | Quasi-Peak       |
| 216-960            | 200                 | 46.0                  | Quasi-Peak       |
| Above 960          | 500                 | 54.0                  | Average (>1 GHz) |

## 10.3 Test Data

IS Research IIC

## 10.3.1 Fundamental Emission in 100 kHz Bandwidth

Note: The fundamental emission measured in 100 kHz bandwidth is used to establish the limit of the conducted spurious emissions in 100 kHz bandwidth. These emissions were measured using the 1 Mbps data since produced the greatest output power.

| Lo Research, LLo              |                              | Tage 05 01 111    |
|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Page 69 of 111



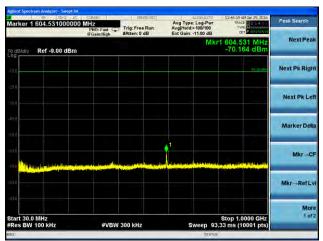


Middle Channel

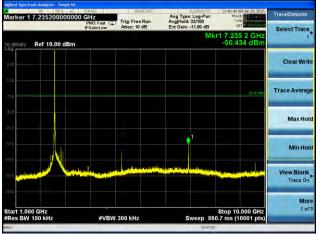


| LS Research, LLC              |                              | Page 70 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

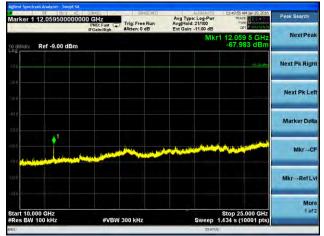
## <u>10.3.2 Conducted Spurious Emissions in 100 kHz Bandwidth</u> Low Channel:



30 MHz – 1000 MHz



1000 MHz - 10000 MHz



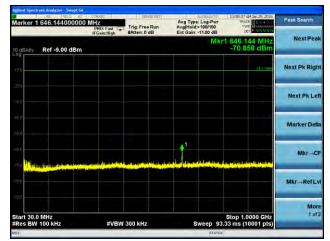
10000 MHz – 25000 MHz

| LS Research. LLC | LS | Research, LLC |
|------------------|----|---------------|
|------------------|----|---------------|

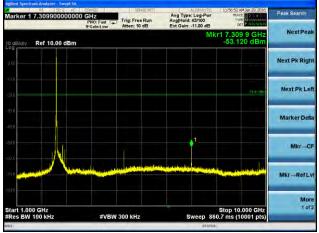
Page 71 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### Middle Channel:



30 MHz – 1000 MHz



1000 MHz – 100 MHz



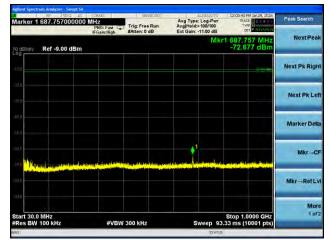
10000 MHz – 25000 MHz

| LS | Research, LLC |  |
|----|---------------|--|
|----|---------------|--|

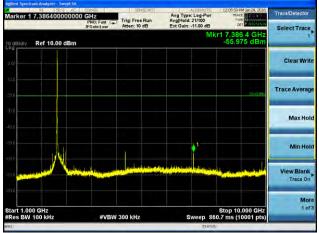
Page 72 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### High Channel:



30 MHz – 1000 MHz



1000 MHz - 100 MHz



10000 MHz – 25000 MHz

| LS | Research, LLC |  |
|----|---------------|--|
|----|---------------|--|

Page 73 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# 10.3.2 Radiated Spurious Emissions – 802.11

# Data

| Frequency<br>(MHz) | Height (m) | Azimuth<br>(degree) | Реаk<br>Reading<br>(dBµV/m) | Avg Reading<br>(dBµV/m) | Avg Limit<br>(dBµV/m) | Margin (dB) | Antenna<br>Polarity | EUT<br>orientation |
|--------------------|------------|---------------------|-----------------------------|-------------------------|-----------------------|-------------|---------------------|--------------------|
| 4824               | 1.00       | 240                 | 40.9                        | 39.3                    | 54                    | 14.7        | Horizontal          | Flat               |
| 4874               | 1.09       | 142                 | 49                          | 42.7                    | 54                    | 11.3        | Vertical            | Vertical           |
| 4924               | 1.13       | 258                 | 47.8                        | 41.1                    | 54                    | 12.9        | Horizontal          | Flat               |
| 7311               | 2.98       | 158                 | 54.5                        | 48.6                    | 54                    | 5.4         | Vertical            | Flat               |
| 7386               | 1.05       | 138                 | 55.3                        | 49.4                    | 54                    | 4.6         | Horizontal          | Side               |
| 12060              | 2.30       | 275                 | 50.5                        | 48.7                    | 54                    | 5.3         | Horizontal          | Vertical           |
| 12185              | 1.98       | 222                 | 53.2                        | 44.6                    | 54                    | 9.4         | Horizontal          | Side               |
| 12310              | 2.00       | 113                 | 51.4                        | 40.5                    | 54                    | 13.5        | Vertical            | Vertical           |

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|----|-----------|-----|
|----|-----------|-----|

Page 74 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### **Screen Captures**

### 30 MHz - 200 MHz



**Horizontal Polarity** 



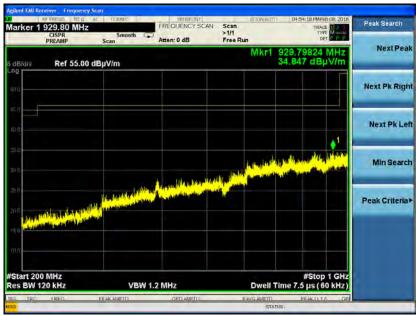
Vertical Polarity

### 200 MHz - 1000 MHz

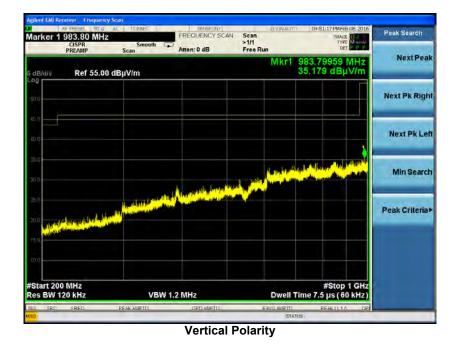
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Page 75 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |



Horizontal Polarity



Note: The screen captures above utilize the peak detector of the analyzer and were determined to be an appropriate representation of the spectrum scan. The plots shown below are not plots of maximized emissions.

| LS Research, LLC              |                              | Page 76 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# <u>1000 MHz - 2310 MHz</u>



Peak

| arker 1 1,968614000000                 |      | Trig: Free Run<br>#Atten: 0 dB | Avg Type: Voltage<br>Avg Hold: 35/100 | 01:48:48 PM Feb 06, 2016<br>TRACE 2 2 5<br>TYPE MANAGEMENT<br>DET P P 2111/21 | Peak Search  |
|----------------------------------------|------|--------------------------------|---------------------------------------|-------------------------------------------------------------------------------|--------------|
| dB/div Ref 80.00 dBµV/n                | n    |                                | Mikr                                  | 1 1.968 614 GHz<br>44.138 dBµV/m                                              | Next Peak    |
| a.0                                    |      |                                |                                       |                                                                               | Next Pk Righ |
| 0.0                                    |      |                                | •1                                    |                                                                               | Next Pk Lef  |
| α.η<br>α.η                             |      |                                |                                       |                                                                               | Marker Delt  |
| ο,0)<br>πή                             |      |                                |                                       |                                                                               | Mkr→Cl       |
| ia                                     |      |                                |                                       |                                                                               | MkrRefLv     |
| tart 1.0000 GHz<br>es BW (CISPR) 1 MHz | #VBW | 3.0. kHz                       | Sween 5                               | Stop 2.3100 GHz<br>01.3 ms (10001 pts)                                        | Mon<br>1 of: |

Reduced VBW

| LS Research, LLC              |                              | Page 77 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# <u>4000 MHz - 18000 MHz</u>



Low Channel



Mid Channel



High Channel

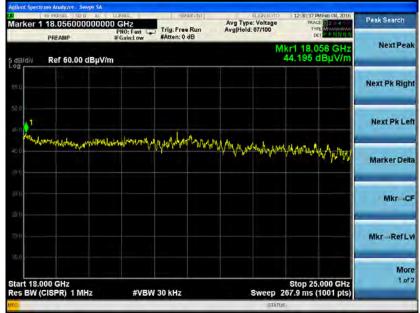
| LS Research, LL | C |
|-----------------|---|
|-----------------|---|

Page 78 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

## 18000 MHz - 25000 MHz

# 1 Mbps



Reduced VBW

| LS Research, LLC              |                              | Page 79 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

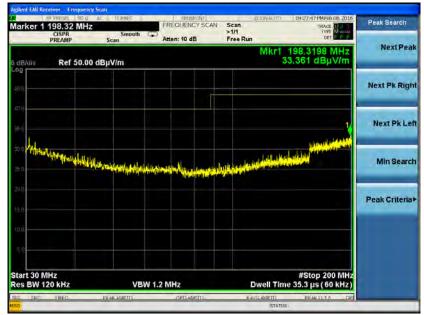
**10.3.2 Radiated Spurious Emissions – BLE** 

### **Screen Captures**

### 30 MHz - 200 MHz



Horizontal Polarity



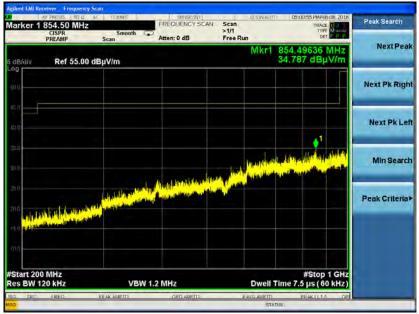
Vertical Polarity

| LS Research, LLC              |                              | Page 80 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### 200 MHz - 1000 MHz



**Horizontal Polarity** 



Vertical Polarity

| LS Research, LLC              |                              | Page 81 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# EXHIBIT 11 CONDUCTED AC LINE EMISSIONS

| Manufacturer                  | Georgia-Pacific                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date                          | 2/15/16, 2/16/16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Test Engineer                 | Michael Hintzke                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                               | Shane Dock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Temp. / R.H.                  | 20 - 25° C / 30-60% R.H.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Rule Part                     | FCC 15.207                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                               | RSS-Gen Sect 8.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Measurement                   | ANSI C63.4 - 2014                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Procedure                     | ANSI C63.10 - 2013 Section 6.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Test Voltage                  | 3.3 VDC (BLE), 6.4 VDC (802.11)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| EUT Placement                 | 80 cm height non-conductive table, 40 cm from vertical ground plane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Detectors                     | Peak, Quasi-Peak, Average                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Delectors                     | RBW = 9 kHz; VBW ≥ 27 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Description of<br>Measurement | <ul> <li>The LISN, cable, limiter, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed. The data is gathered and reported as the corrected values.</li> <li>The EUT is placed on a non-conductive pedestal at appropriate distance from ground planes and plugged into LISN. The LISN used has the ability to terminate the unused port with a 50Ω (ohm) load when switched to either L1 (line) or L2 (neutral).</li> <li>Maximum emissions are determined with peak detector and measurements at select points are made with quasi-peak and average detectors. Results are recorded and compared to limit.</li> </ul> |
| Example                       | Reported Measurement data = Raw receiver measurement + LISN Factor +                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Calculations                  | Cable factor (dB) + Additional factor (when applicable)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Additional Notes              | Continuous transmit modulated EUT operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                               | There was no significant difference between transmit channels                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## **11.1 - Method of Measurements**

ANSI C63.4 - 2014 ANSI C63.10 - 2013 Section 6.2

## 11.2 Limits

| Frequency Range                                                                   | Class B Limits (dBµV) |         |  |
|-----------------------------------------------------------------------------------|-----------------------|---------|--|
| (MHz)                                                                             | Quasi-Peak            | Average |  |
| 0.150 -0.50 *                                                                     | 66-56                 | 56-46   |  |
| 0.5 – 5.0                                                                         | 56                    | 46      |  |
| 5.0 - 30                                                                          | 60                    | 50      |  |
| * The limit decreases linearly with the logarithm of the frequency in this range. |                       |         |  |

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Page 82 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

## 11.3 Test Data

LS Research, LLC

Note: The emissions listed are characteristic of the EUT power supply used and not that of the transmitter. Changing transmit channels did not change the emissions.

| Line | Frequency<br>(MHz) | Q-Peak<br>Reading<br>(dBµV) | Q-Peak<br>Limit<br>(dBµV) | Quasi-<br>Peak<br>Margin<br>(dB) | Average<br>Reading<br>(dBµV) | Average<br>Limit<br>(dBµV) | Average<br>Margin<br>(dB) |
|------|--------------------|-----------------------------|---------------------------|----------------------------------|------------------------------|----------------------------|---------------------------|
| 1    | 0.250              | 39.0                        | 61.8                      | 22.8                             | 36.2                         | 51.8                       | 15.6                      |
| 1    | 0.275              | 36.3                        | 61.0                      | 24.7                             | 31.5                         | 51.0                       | 19.5                      |
| 1    | 0.622              | 31.0                        | 56.0                      | 25.0                             | 25.2                         | 46.0                       | 20.8                      |
| 2    | 0.248              | 28.6                        | 61.8                      | 33.2                             | 25.3                         | 51.8                       | 26.5                      |
| 2    | 0.275              | 25.8                        | 61.0                      | 35.2                             | 23.2                         | 51.0                       | 27.8                      |
| 2    | 0.622              | 31.5                        | 56.0                      | 24.5                             | 25.5                         | 46.0                       | 20.5                      |

<sup>3.3</sup> VDC

| Line | Frequency<br>(MHz) | Q-Peak<br>Reading<br>(dBµV) | Q-Peak<br>Limit<br>(dBµV) | Quasi-<br>Peak<br>Margin<br>(dB) | Average<br>Reading<br>(dBµV) | Average<br>Limit<br>(dBµV) | Average<br>Margin<br>(dB) |
|------|--------------------|-----------------------------|---------------------------|----------------------------------|------------------------------|----------------------------|---------------------------|
| 1    | 0.150              | 38.3                        | 66.0                      | 27.7                             | 26.4                         | 56.0                       | 29.6                      |
| 1    | 0.271              | 32.6                        | 61.1                      | 28.5                             | 23.6                         | 51.1                       | 27.5                      |
| 1    | 1.000              | 38.2                        | 56.0                      | 17.8                             | 36.6                         | 46.0                       | 9.4                       |
| 2    | 0.181              | 45.3                        | 64.4                      | 19.1                             | 33.8                         | 54.4                       | 20.6                      |
| 2    | 0.195              | 42.5                        | 63.8                      | 21.3                             | 33.4                         | 53.8                       | 20.4                      |
| 2    | 1.000              | 44.7                        | 56.0                      | 11.3                             | 43.1                         | 46.0                       | 2.9                       |

6.4 VDC

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Page 83 of 111





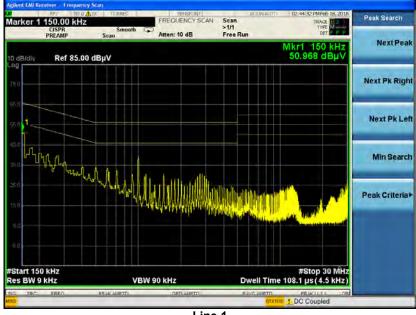
Line 1



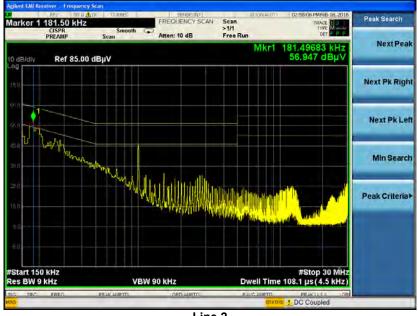
| Line | 2 |
|------|---|
|------|---|

| LS Research, LLC              |                              | Page 84 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### 6.4 VDC







| Line 2 |
|--------|
|--------|

| LS Research, LLC              |                              | Page 85 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# **EXHIBIT 12 CO-EXISTENCE MEASUREMENTS**

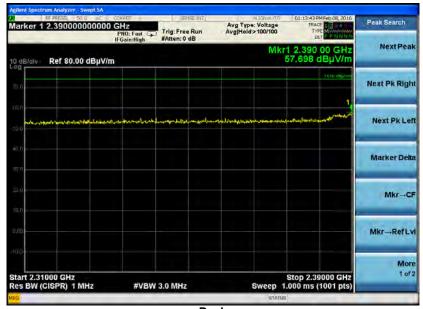
| Manufacturer                               | Georgia-Pacific                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date                                       | 2/5/16, 2/8/16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Test Engineer                              | Michael Hintzke<br>Coty Hammerer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Temp. / R.H.                               | 20 - 25° C / 30-60% R.H.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Rule Part                                  | FCC 15.209<br>FCC 15.205                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Measurement<br>Detectors                   | Radiated:<br>RBW = 1 MHz<br>VBW = ≥ 3 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Description of<br>Radiated<br>Measurements | <ol> <li>The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed. The data is gathered and reported as the corrected values.</li> <li>The EUT is placed on a 150 cm non-conductive pedestal centered on a turn-table in the test location with the antenna 3 meters from the EUT.</li> <li>Maximum radiated RF emissions are determined by rotation of azimuth and scanning the sense antenna between 1 and 4 meters in height using both horizontal and vertical antenna polarities. Maximized levels are manually noted at degree values of azimuth and at sense antenna height.</li> </ol> |
| Example<br>Calculations                    | Reported Measurement data = Raw receiver measurement + Antenna Correction<br>Factor + Cable factor (dB) - amplification factor (when applicable) + Additional<br>factor (when applicable)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Additional<br>Notes                        | <ul> <li>Co-existence measurements were performed when both 802.11 and Bluetooth transmitters were programmed to operate simultaneously at the same frequency.</li> <li>Radiated bandedge measurements were performed at the following data rates: 1 Mbps, 6 Mbps and MCS0.</li> <li>Radiated transmitter spurious emissions within the FCC 15.205 restricted bands were investigated at 1 Mbps.</li> </ul>                                                                                                                                                                                                                                                                                                           |

# 12.1 Test Data

| LS Research, LLC              |                              | Page 86 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

## 12.1.1 2310 MHz - 2390 Restricted Band Test Data

<u>1 Mbps</u>



Peak

| arker 1 2.39000000000                   |      | Trig: Free Run<br>#Atten: 0 dB | Avg Type: Voltage<br>Avg Hold: 4/100 | 01:15:29 PM Feb 06, 2016<br>TRACE 2 2 5 5<br>TYPE MWWWWWW<br>DUT 9 P 71 1, 04 4 | Peak Search  |
|-----------------------------------------|------|--------------------------------|--------------------------------------|---------------------------------------------------------------------------------|--------------|
| dB/div Ref 80.00 dBµV                   | /m   |                                | Mkr                                  | 1 2.390 00 GHz<br>47.518 dBµV/m                                                 | Next Pea     |
| 0.0                                     |      |                                |                                      |                                                                                 | Next Pk Righ |
| a.0                                     |      |                                |                                      | 54.00 vites, 14m                                                                | Next Pk Le   |
| πη                                      |      |                                |                                      |                                                                                 | Marker Del   |
| 0.0<br>a n                              |      |                                |                                      |                                                                                 | Mkr→C        |
| à                                       |      |                                |                                      |                                                                                 | MkrRefL      |
| tart 2.31000 GHz<br>es BW (CISPR) 1 MHz | #VBW |                                |                                      | Stop 2.39000 GHz<br>9.173 s (1001 pts)                                          | Moi<br>1 of  |

Average

|   | Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuV/m) | Peak<br>Margin<br>(dB) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuV/m) | Average<br>Margin<br>(dB) |
|---|----------------------------|------------------|------------------------|------------------------|-------------------------------|---------------------|------------------------------|---------------------------|
| [ | 2390.0                     | 57.7             | 74.0                   | 16.3                   | 2390.0                        | 47.5                | 54.0                         | 6.5                       |

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Page 87 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

| 6 Mbps |
|--------|
|--------|

| REFRESEL SO D AC CORREC                        | 30年14月                                      | DTUM/JOLD                              | 01:29:58 PM Feb 06, 2016                                                                                        | Peak Search  |
|------------------------------------------------|---------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------|
| rker 1 2.389696000000 GHz<br>PNO: F<br>IFGain: | ast Trig: Free Run<br>#Atten: 0 dB          | Avg Type: Voltage<br>Avg Hold:>100/100 | TYPE MWWWWWWW                                                                                                   | T DER GEBIER |
| aB/div Ref 80.00 dBµV/m                        |                                             |                                        | 2.389 696 GHz<br>3.398 dBµV/m                                                                                   | Next Peal    |
|                                                |                                             |                                        | 74.00 atty/vie<br>1                                                                                             | Next Pk Righ |
| a<br>1                                         | halaya ya ana ana ana ana ana ana ana ana a | والمتحديد والمتعادية والمتحاد والمتحدث | And the second secon | Next Pk Lei  |
| n<br>n                                         |                                             |                                        |                                                                                                                 | Marker Delt  |
| 0                                              |                                             |                                        |                                                                                                                 | Mkr→C        |
| 0                                              |                                             |                                        |                                                                                                                 | MkrRef L     |
| art 2.31000 GHz<br>s BW (CISPR) 1 MHz          | #VBW 3.0 MHz                                | Sweep 1.3                              | Stop 2.39000 GHz<br>33 ms (10001 pts)                                                                           | Mor<br>t of  |

Peak

| Peak Search   | 01:28:47 PM Feb 05, 2016<br>TRACE 12 2 4<br>TYPE Mysterior<br>DET P P N N 44 | e: Voltage<br>d: 5/100 | Avg Ty<br>Avg Ho | Trig: Free Run<br>#Atten: 0 dB | 0 GHz  | 2.39000000000000000000000000000000000000 |                |
|---------------|------------------------------------------------------------------------------|------------------------|------------------|--------------------------------|--------|------------------------------------------|----------------|
| NextPeal      | 2.390 000 GHz<br>50.445 dBµV/m                                               | Mkr1                   |                  |                                | /m     | Ref 80.00 dBµV/r                         | 0 dB/div       |
| Next Pk Righ  |                                                                              |                        |                  |                                |        |                                          | mo             |
| Next Pk Lei   | 54.00,06,/1                                                                  |                        |                  |                                |        |                                          | 19.0           |
| Marker Delt   |                                                                              |                        |                  |                                |        |                                          | 10.00<br>10.00 |
| Mkr→C         |                                                                              |                        |                  |                                |        |                                          | 30.0)<br>Incó  |
| Mkr→RefLy     |                                                                              |                        |                  |                                |        |                                          | i,âņ :         |
| Mon<br>1 of : | Stop 2.39000 GHz<br>174 s (10001 pts)                                        |                        |                  |                                | #VBW 1 | 000 GHz<br>CISPR) 1 MHz                  |                |

Average

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuV/m) | Peak<br>Margin<br>(dB) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuV/m) | Average<br>Margin<br>(dB) |
|----------------------------|------------------|------------------------|------------------------|-------------------------------|---------------------|------------------------------|---------------------------|
| 2389.7                     | 63.4             | 74.0                   | 10.6                   | 2390.0                        | 50.4                | 54.0                         | 3.6                       |

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Page 88 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

MCS0



Peak

|                                                               | OTLANELLA                                                    | 01:37:30 PM Feb 08, 2016                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Peak Search                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CHZ<br>PNO: Fast ( Trig: Free Run<br>IFGain:High #Atten: 0 dB | Avg Type: Voltage<br>Avg Hold: 7/100                         | TYPE M<br>DET P P NN 0 D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | rean Search                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                               | Mkr1                                                         | 2.389 976 GHz<br>48.145 dBµV/m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | NextPeal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                               |                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Next Pk Righ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                               |                                                              | 540000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Next Pk Lef                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                               |                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Marker Delt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                               |                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Mkr-C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                               |                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Mkr→RefL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                               |                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Mor<br>1 of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| #VBW 10 Hz                                                    | Sweep                                                        | Stop 2.39000 GHz<br>9.174 s (10001 pts)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1 01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                               | GHZ<br>PNO: Fast Trig: Free Run<br>IF Gain:High #Atten: 0 dB | CH2: Frat Trig: Frae Run PRO: Frai High Trig: Frae Run PRO: Frai High Mrth RAtten: 0 dB Mrth RAtten: 0 | GHz<br>PND: Fax<br>PND: Fax |

Average

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuV/m) | Peak<br>Margin<br>(dB) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuV/m) | Average<br>Margin<br>(dB) |
|----------------------------|------------------|------------------------|------------------------|-------------------------------|---------------------|------------------------------|---------------------------|
| 2390.0                     | 63.1             | 74.0                   | 10.9                   | 2390.0                        | 48.1                | 54.0                         | 5.9                       |

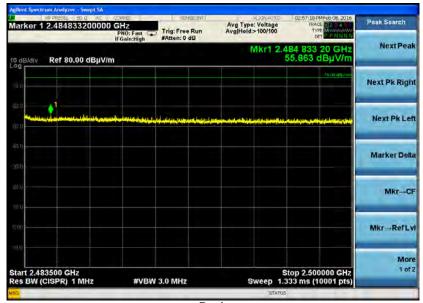
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Page 89 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

## **12.1.2 2483.5 MHz - 2500 Restricted Band Test Data**

<u>1 Mbps</u>



Peak

| Marker 1 2.483500000000                    | GHz .  | rig: Free Run<br>Atten: 0 dB | Avg Type: Vol<br>Avg[Hold: 9/10 |                                           | Peak Search       |
|--------------------------------------------|--------|------------------------------|---------------------------------|-------------------------------------------|-------------------|
| 0 dB/div Ref 80.00 dBµV/n                  |        |                              | Mk                              | 1 2.483 500 00 GH<br>46.271 dBµV/r        | z NextPeal        |
| (u ů)                                      |        |                              |                                 |                                           | Next Pk Righ      |
| ຍມມ<br>ກາດ <mark>1</mark>                  |        |                              |                                 |                                           | Next Pk Let       |
| # 0                                        |        |                              |                                 |                                           | Marker Del        |
| (J L)                                      |        |                              |                                 |                                           | Mkr→C             |
| 7.00                                       |        |                              |                                 |                                           | Mkr⇒RefL          |
| itart 2.483500 GHz<br>tes BW (CISPR) 1 MHz | #VBW 1 | 0 Hz                         | Sw                              | Stop 2.500000 GH<br>eep 1.893 s (10001 pt | Mor<br>1 of<br>5) |

Average

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuVim) | Peak limit<br>(dBuV/m) | Peak<br>Margin<br>(dB) | Average<br>Frequency<br>(MHz) | Average<br>(dBuVim) | Average<br>limit<br>(dBuV/m) | Average<br>Margin<br>(dB) |
|----------------------------|------------------|------------------------|------------------------|-------------------------------|---------------------|------------------------------|---------------------------|
| 2483.8                     | 55.9             | 74.0                   | 18.1                   | 2483.5                        | 46.3                | 54.0                         | 7.7                       |

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Page 90 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

| 6 | Mbps |
|---|------|
|   |      |

| arker 1 2.484828250000 GHz<br>PN0: Fast C<br>IFGainfligh                                                                  | Trig: Free Run<br>#Atten: 0 dB | Avg Type: Voltage<br>Avg Hold>100/100 | 02:51:19 PM Feb 05, 2016<br>TRACE 12 2 4 3<br>TYPE MUNICIPAL<br>DET 9 9:11 04 1 | Peak Search<br>Next Peak |  |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------------|---------------------------------------------------------------------------------|--------------------------|--|
| dB/div Ref 80.00 dBµV/m 59.073 dBµV/m                                                                                     |                                |                                       |                                                                                 |                          |  |
|                                                                                                                           |                                |                                       | 74 бо периле                                                                    | Next Pk Righ             |  |
| n<br>Mangan Manina ang kang ang kan<br>G | to fine de a sistema di que    |                                       | entrich synchronister at                                                        | Next Pk Lef              |  |
| n                                                                                                                         |                                |                                       |                                                                                 | Marker Delt              |  |
| 0<br>n                                                                                                                    |                                |                                       |                                                                                 | Mkr→C                    |  |
| p                                                                                                                         |                                |                                       |                                                                                 | MkrRefL                  |  |
| art 2.483500 GHz<br>s BW (CISPR) 1 MHz #VBW                                                                               | 3.0 MHz                        | Sweep 13                              | top 2.500000 GHz<br>133 ms (10001 pts)                                          | Mon<br>t of :            |  |

Peak

| Marker 1 2.483566000                      |      | Trig: Free Run<br>#Atten: 0 dB | Avg Type: Voltage<br>Avg Hold: 7/100 | 02:49:31 PM Feb 06, 2016<br>TRACE 2 2 3 4<br>TYPE MWWWWWW<br>DET 9 9 71 0/41 | Peak Search<br>Next Peak |
|-------------------------------------------|------|--------------------------------|--------------------------------------|------------------------------------------------------------------------------|--------------------------|
| 0 dB/div − Ref 80.00 dBμV/m 45.095 dBμV/m |      |                                |                                      |                                                                              |                          |
| mn)                                       |      |                                |                                      |                                                                              | Next Pk Righ             |
| n.0<br>9.0 1                              |      |                                |                                      | 54,02,05,05                                                                  | Next Pk Lei              |
| π.0                                       |      |                                |                                      |                                                                              | Marker Del               |
| 0.0<br>6.0                                |      |                                |                                      |                                                                              | Mkr⇒C                    |
| .00                                       |      |                                |                                      |                                                                              | MkrRefL                  |
| tart 2.483500 GHz<br>es BW (CISPR) 1 MHz  | #VBW | 10 42                          | Swaan 1                              | top 2.500000 GHz<br>.893 s (10001 pts)                                       | Mor<br>1 of              |

Average

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuV/m) | Peak<br>Margin<br>(dB) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuVłm) | Average<br>Margin<br>(dB) |
|----------------------------|------------------|------------------------|------------------------|-------------------------------|---------------------|------------------------------|---------------------------|
| 2484.8                     | 59.1             | 74.0                   | 14.9                   | 2483.6                        | 45.1                | 54.0                         | 8.9                       |

| LS Research, LLC              |                              | Page 91 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### MCS0 Mbps

| Irker 1 2.483562700000 GHz<br>PN0: Fast<br>IFGain-Bligh                   | Trig: Free Run<br>#Atten: 0 dB | Avg Type: Voltage<br>Avg Hold>100/100 | 02:44:41 PM Feb 06, 2016<br>TRACE 2 2 4 4<br>TYPE MUSEUM | Peak Search  |  |
|---------------------------------------------------------------------------|--------------------------------|---------------------------------------|----------------------------------------------------------|--------------|--|
| Mkr1 2.483 562 70 GHz<br>dB/div Ref 80.00 dBµV/m 55.874 dBµV/m            |                                |                                       |                                                          |              |  |
| 6                                                                         |                                |                                       | 74 Co co <sub>10</sub> 434                               | Next Pk Righ |  |
| 0 ) 1<br>Helleterstraff (Index), 16(4), and an anguna land bein (Aug<br>0 | eletite a state a second of    | n A Assimulan, an ainn an a'          | an an ann a' san an a   | Next Pk Lef  |  |
| n                                                                         |                                |                                       |                                                          | Marker Delt  |  |
| 0                                                                         |                                |                                       |                                                          | Mkr→C        |  |
| 0                                                                         |                                |                                       |                                                          | MkrRefL      |  |
| art 2.483500 GHz<br>s BW (CISPR) 1 MHz #VBW (                             | 3.0 MHz                        | Sween 1.                              | top 2.500000 GHz<br>333 ms (10001 pts)                   | Mor<br>1 of  |  |

Peak

| arker 1 2.48350825000                    | 0 GHz  | Trig: Free Run<br>#Atten: 0 dB | Avg Type: Voltage<br>Avg Hold: 16/100 | 02:43:37 PM Feb 06, 2016<br>TRACE 2 2 5 5<br>TYPE MWWWWWW<br>DLT 2 P 71 1, 01 1 | Peak Search<br>Next Peak |
|------------------------------------------|--------|--------------------------------|---------------------------------------|---------------------------------------------------------------------------------|--------------------------|
| dB/div Ref 80.00 dBµV/m 43.917 dBµV/m    |        |                                |                                       |                                                                                 |                          |
|                                          |        |                                |                                       |                                                                                 | Next Pk Righ             |
| no                                       |        |                                |                                       | 54.00 (8, 0-                                                                    | Next Pk Le               |
| π.0<br>π.0                               |        |                                |                                       |                                                                                 | Marker Del               |
| 0.0<br>a.d                               |        |                                |                                       |                                                                                 | Mkr→C                    |
| .00                                      |        |                                |                                       |                                                                                 | MkrRefL                  |
| tart 2.483500 GHz<br>es BW (CISPR) 1 MHz | #VBW * | 10 Hz                          | Sween                                 | top 2.500000 GHz<br>1.893 s (10001 pts)                                         | Mor<br>1.of              |

Average

| Peak<br>Frequency<br>(MHz) | Peak<br>(dBuV/m) | Peak limit<br>(dBuV/m) | Peak<br>Margin<br>(dB) | Average<br>Frequency<br>(MHz) | Average<br>(dBuV/m) | Average<br>limit<br>(dBuV/m) | Average<br>Margin<br>(dB) |
|----------------------------|------------------|------------------------|------------------------|-------------------------------|---------------------|------------------------------|---------------------------|
| 2483.6                     | 55.9             | 74.0                   | 18.1                   | 2483.5                        | 43.9                | 54.0                         | 10.1                      |

| LS Research, LLC              |                              | Page 92 of 111    |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

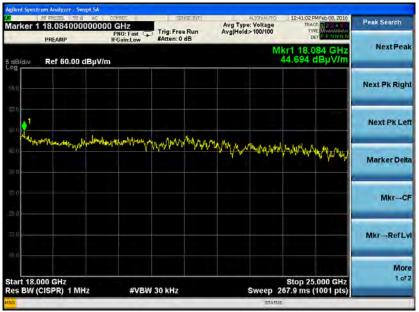
### Page 92 of 111

# **12.1.2 Transmitter Radiated Spurious Emissions**



Low Channel - 2412 MHz

4 GHz – 18 GHz



18 GHz – 25 GHz

| LS Research, LLC              |                              | Page 93 of 111    |
|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### <u>High Channel – 2462 MHz</u>



4 GHz – 18 GHz

| AC CORREC<br>100000 GHz<br>PNO: Fast (+)<br>IFGain:Low | Trig: Free Run<br>#Atten: 0 dB           | Avg Type: Voltage<br>Avg Hold>100/100                                     | 12:37:15 PM Feb 00, 2016<br>1HACE 12 314 5<br>1YPEL MANNED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Peak Search                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| μV/m                                                   |                                          | M                                                                         | r1 18.084 GHz<br>44.462 dBµV/m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Next Pea                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                        |                                          |                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Next Pk Righ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                        |                                          |                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Next Pk Le                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| ware                                                   | have we address                          | water when                                                                | humanalisty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Marker Del                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                        |                                          |                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mkr→C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                        |                                          |                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MkrRefL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| #VBW                                                   | 30 kHz                                   | Sweep 2                                                                   | Stop 25.000 GHz<br>57.9 ms (1001 pts)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Mor<br>1 of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                        | DODO GHZ<br>PHOF em<br>IFGainLow<br>μV/m | PRO:Fast Trig: Free Run<br>PRO:Fast Affective<br>If Gain:Low #Atten: 0 dB | DODO CHIZ<br>PROF. Fast _ Trig: Free Run<br>IF GainLow If Atten: 0 dB<br>Avg Type: Voltage<br>Avg | D000 CHz         Trig: Free Run         Avg Type: Voltage         Macro I         Macro I         D000 CHz         D000 CHz |

18 GHz – 25 GHz

| LS Research, LLC              |                              | Page 94 of 111    |
|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# EXHIBIT 13 BLE TRANSMITTER RADIATED SPURIOUS EMISSIONS

| Manuel factures                            | Coursia Douifia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| Manufacturer                               | Georgia-Pacific                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |
| Date                                       | 2/8/16, 8/4/16, 8/11/16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |
| Test Engineer                              | Michael Hintzke                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |
|                                            | Kim Bay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |
| Temp. / R.H.                               | 20 - 25° C / 30-60% R.H.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |
| Rule Part                                  | FCC 15.209                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |
| Rule Fait                                  | FCC 15.205                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |
| Measurement                                | Radiated:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |
| modelarement                               | RBW = 1 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |
| Detectors                                  | VBW = ≥ 3 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |
| Description of<br>Radiated<br>Measurements | <ol> <li>The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are performed. The data is gathered and reported as the corrected values.</li> <li>The EUT is placed on a non-conductive pedestal (80 cm for f &lt; 1GHz; 150 cm for f &gt; 1GHz) centered on a turn-table in the test location with the antenna 3 meters from the EUT.</li> <li>Maximum radiated RF emissions are determined by rotation of azimuth and scanning the sense antenna between 1 and 4 meters in height using both horizontal and vertical antenna polarities. Maximized levels are manually noted at degree values of azimuth and at sense antenna height.</li> </ol> |  |  |  |  |
| Example<br>Calculations                    | Reported Measurement data = Raw receiver measurement + Antenna Correction<br>Factor + Cable factor (dB) - amplification factor (when applicable) + Additional<br>factor (when applicable)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |
| Additional<br>Notes                        | <ul> <li>Radiated spurious emissions were investigated in 3 orthogonal EUT orientations at the low, middle and high channels of the transmitter operation.</li> <li>Radiated bandedge measurements were performed to demonstrate compliance to the restricted bands of operation specified in 15.205.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |

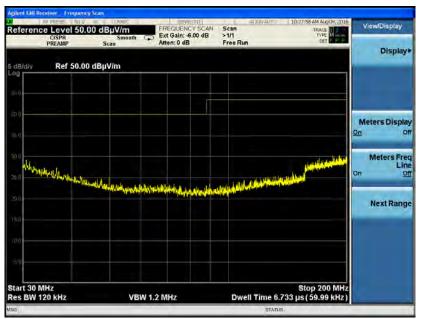
# 13.1 Test Data

| Frequency<br>(MHz) | Height (m) | Azimuth<br>(degree) | Реаk<br>Reading<br>(dBµV/m) | Avg Reading<br>(dBµV/m) | Avg Limit<br>(dBµV/m) | Margin (dB) | Antenna<br>Polarity | EUT<br>orientation |
|--------------------|------------|---------------------|-----------------------------|-------------------------|-----------------------|-------------|---------------------|--------------------|
| 4806               | 2.59       | 0                   | 45.2                        | 36.5                    | 54.0                  | 17.5        | Horizontal          | Side               |
| 4882               | 2.52       | 0                   | 44.7                        | 36.5                    | 54.0                  | 17.5        | Horizontal          | Side               |
| 4958               | 1.57       | 0                   | 45.4                        | 37.6                    | 54.0                  | 16.4        | Horizontal          | Side               |

| LS Research, LLC              |                              | Page 95 of 111    |
|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### 13.2 Screen Captures

### <u>13.2.1 30 MHz – 200 MHz</u>



**Horizontal Polarity** 



Vertical Polarity

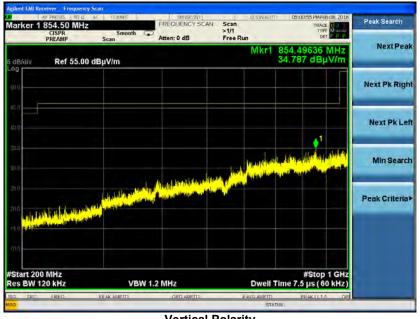
Note: The above screen captures are representative of each channel and EUT orientation investigated.

| LS Research, LLC              |                              | Page 96 of 111    |
|-------------------------------|------------------------------|-------------------|
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#### 13.2.2 200 MHz - 1000 MHz



**Horizontal Polarity** 



- Vertical Polarity
- Note: The above screen captures are representative of each channel and EUT orientation investigated.

| LS Research, LLC              |                              | Page 97 of 111    |
|-------------------------------|------------------------------|-------------------|
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#### 13.2.3 1000 MHz - 2310 MHz



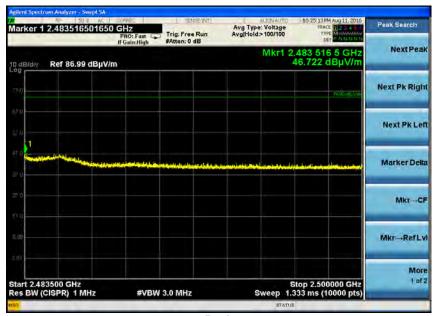
**Horizontal Polarity** 



Note: The above screen captures are representative of each channel and EUT orientation investigated.

| LS Research, LLC              |                              | Page 98 of 111    |
|-------------------------------|------------------------------|-------------------|
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## 13.2.4 2310 MHz - 2390 MHz Restricted Band



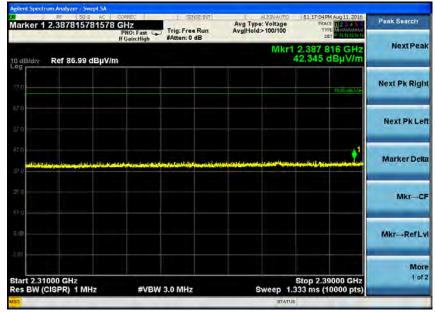
Peak

| arker 1 2.485148514851                   |      | Trig: Free Run<br>#Atten: 0 dB | Avg Type: Voltage<br>Avg[Hold>100/100 | 10:30:53 PM Aug 11, 2016<br>IRACE 12 2 4 5<br>TYPE M | Peak Search  |
|------------------------------------------|------|--------------------------------|---------------------------------------|------------------------------------------------------|--------------|
| 0 dB/div Ref 85.99 dBµV/r                | n    |                                | Mkr1 2                                | .485 148 5 GHz<br>35.662 dBµV/m                      | NextPeak     |
| 10                                       |      |                                |                                       |                                                      | Next Pk Righ |
| 20                                       |      |                                |                                       | Skaragern                                            | Next Pk Le   |
|                                          |      |                                |                                       |                                                      | MarkerDell   |
| r o                                      |      |                                |                                       |                                                      | Mkr—C        |
|                                          |      |                                |                                       |                                                      | Mkr-Ref Li   |
| tart 2.483500 GHz<br>es BW (CISPR) 1 MHz | #VBW | 10 Hz                          | Sweep                                 | top 2.500000 GHz<br>1.892 s (10000 pts)              | Mor<br>1 of  |

Average

| LS Research, LLC              |                              | Page 99 of 111    |
|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

## 13.2.5 2483.5 MHz - 2500 MHz Restricted Band





| 8 GHZ<br>BµV/m<br>Next Pk Righ |
|--------------------------------|
|                                |
| Next Pk Le                     |
| Standards                      |
| Marker Del                     |
| Mkr-C                          |
| Mkr→RefL                       |
| Mo<br>100 GHz<br>000 pts)      |
|                                |

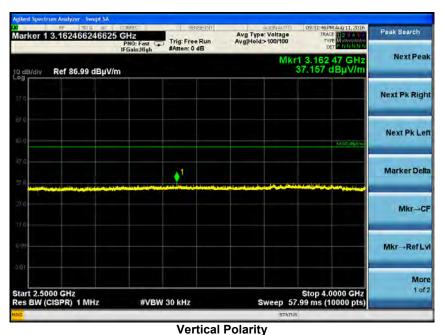
Average

| LS Research, LLC              |                              | Page 100 of 111   |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

## 13.2.6 2500 MHz - 4000 MHz



**Horizontal Polarity** 



Note: The above screen captures are representative of each channel and EUT orientation investigated.

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|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### <u>13.2.7 4000 MHz - 18000 MHz</u>



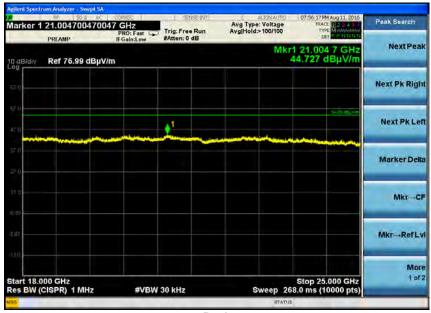




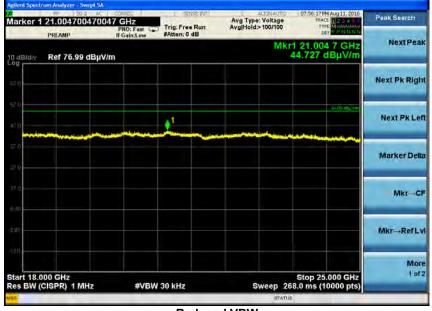
Reduced VBW

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|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### <u>13.2.8 18000 MHz - 25000 MHz</u>



Peak



Reduced VBW

Note: The above screen captures are representative of each channel and EUT orientation investigated.

| LS Research, LLC              |                              | Page 103 of 111   |
|-------------------------------|------------------------------|-------------------|
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| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

#### **Test Equipment List APPENDIX A**



| Pre         | pared By. Mike Hintzke        | Customer :   | Georgia-Pacific | _          | -         | Quote        | #: 315364          |  |
|-------------|-------------------------------|--------------|-----------------|------------|-----------|--------------|--------------------|--|
| lo. Asset # | Description                   | Manufacturer | Model #         | Serial #   | Cal Date  | Cal Due Date | Equipment Status   |  |
| EE 96008    | 5 N9038A MXE 26.5GHz Receiver | Agilent      | N9038A          | MY51210148 | 5/12/2016 | 5/12/2017    | Active Calibration |  |
| AA 960143   | Phaseflex                     | Gore         | EKD01D01048.0   | 5546519    | 6/26/2015 | 6/26/2017    | Active Calibration |  |



ireless Product Developmen Equipment Calibration

LS Research, LLC

Date: 26-Jan-2016 Type Test: Radiated / Conducted Emissions Job #: C-2368 Prepared By: Mike Hintzke Customer : Georgia-Pacific Quote #: 315364 No. Asset # Manufacturer Model # Serial # Cal Date Cal Due Date Equipment Status Description Double Ridge Horn Antenna EMCO 3/7/2017 Active Calibration AA 960081 3115 6907 3/7/2016 EE 960096 0.8 - 21GHz LNA Mini-Circuits ZVA-213X-S+ 40201429 3/7/2016 37/2017 Active Calibration AA 960154 2.4GHz High Pass Filter KWM HPF-L-14186 7272-02 7/25/2016 7/25/2017 Active Calibration MY53400296 Active Calibration EE 960087 4 44GHz EXA Spectrum Analyzer Agilent N9010A 12/18/2015 12/19/2016 EE 960085 N9038A MXE 26.5GHz Receiver N9038A MY51210148 5/12/2016 Agilent 5/12/2017 Active Calibration  $\overline{5}$ RE 16001 Horn Antenna 18-40 GHz A.H. Systems, I n SAS-574 193 11/30/2015 11/30/2016 Active Calibration 6 AA 960144 Phaseflex Gore EKD01D010720 5800373 Verification Verification System 7 EKD01D01048.0 Phaseflex 5546519 Active Calibration 8 AA 960143 Gore 6/26/2015 6/26/2017 EMCO Active Calibration AA 960005 **Biconical** Antenna 93110B 9601-2280 114/2016 114/2017 9 10 AA 960163 Log Periodic Antenna A.H. Systems, In: SAS-512-2 500 3/13/2016 3/18/2017 Active Calibration 11 EE 960089 LISN - 15A COM-POWER: LI-215A 191943 3/8/2016 38/2017 Active Calibration 12 AA 960162 EM Series Cable EM26-S1S1-128 12024301.001 6/29/2016 Active Verification MegaPhase 6/29/2017 13 EE 960085 N9038A MXE 26.5GHz Receiver N9038A MY51210148 5/12/2016 5/12/2017 Active Calibration Agilent 14 AA 960158 Double Ridge Horn Antenna ETS Lindgren 3117 109300 2/4/2016 2/4/2017 Active Calibration 15 EE 960159 0.8 - 21GHz LNA Mini-Circuits ZVA-213X-5+ 40201429 2/4/2016 2/4/2017 Active Calibration Small Hom Antenna 18-40 GHz 16 AA 960174 ETS-Lindgren 3116C-PA 00206880 4/23/2016 4/23/2017 Active Calibration Saucert -CARE Project Engineer: Quality Assurance

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

Page 104 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

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Page 105 of 111

# APPENDIX B Current Standard Publication Dates

| STANDARD                           | DATE |
|------------------------------------|------|
| ANSI C63.4                         | 2014 |
| ANSI C63.10                        | 2013 |
| FCC 47 CFR, Parts 0-15, 18, 90, 95 | 2016 |
| RSS-247                            | 2015 |
| RSS-Gen                            | 2014 |

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |
|                               |                              |                   |

Page 106 of 111

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# **APPENDIX C** Uncertainty Statement

#### Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

| Measurement Type             | Particular Configuration             | Uncertainty Values |
|------------------------------|--------------------------------------|--------------------|
| Radiated Emissions           | 3 – Meter chamber, Biconical Antenna | 4.82 dB            |
|                              | 3-Meter Chamber, Log Periodic        |                    |
| Radiated Emissions           | Antenna                              | 4.88 dB            |
| Radiated Emissions           | 3-Meter Chamber, Horn Antenna        | 4.85 dB            |
| Radiated Emissions           | 10-Meter OATS, Biconical Antenna     | 4.32 dB            |
| Radiated Emissions           | 10-Meter OATS, Log Periodic Antenna  | 3.63 dB            |
| Absolute Conducted Emissions | Agilent PSA/ESA Series               | 1.38 dB            |
| AC Line Conducted Emissions  | Shielded Room/EMCO LISN              | 3.20 dB            |
| Radiated Immunity            | 3 Volts/Meter in 3-Meter Chamber     | 2.05 Volts/Meter   |
| Conducted Immunity           | 3 Volts level                        | 2.33 V             |
| EFT Burst, Surge, VDI        | 230 VAC                              | 54.4 V             |
| ESD Immunity                 | Discharge at 15kV                    | 3200 V             |
| Temperature/Humidity         | Thermo-hygrometer                    | 0.64° / 2.88 %RH   |

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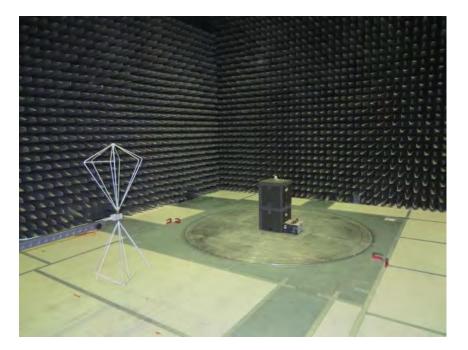
Page 107 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

# APPENDIX DTest Setup Photos

### **Radiated Measurements**

<u>30 MHz – 1000 MHz</u>





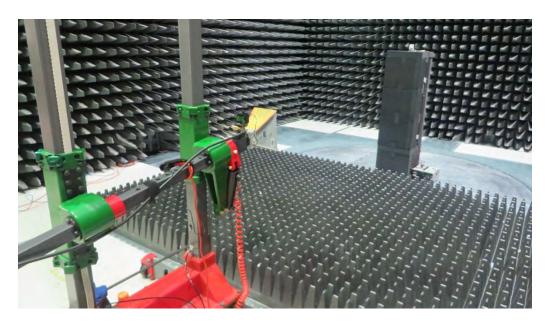
LS Research, LLC

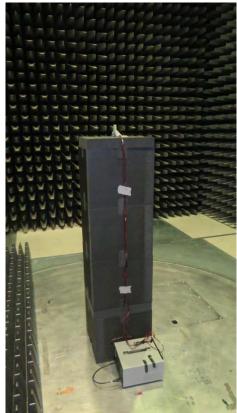
Page 108 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### **Radiated Measurements**

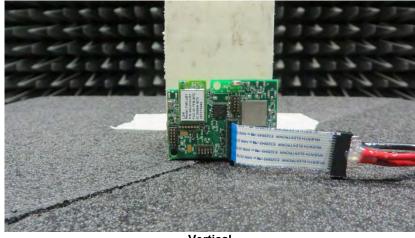
#### <u>1000 MHz – 25000 MHz</u>



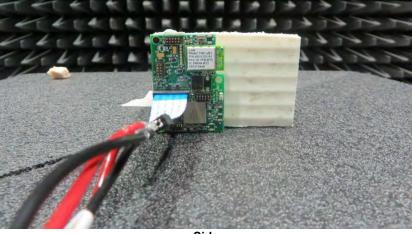


| LS Research, LLC              |                              | Page 109 of 111   |
|-------------------------------|------------------------------|-------------------|
| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

### **EUT Orientations**



Vertical



Side



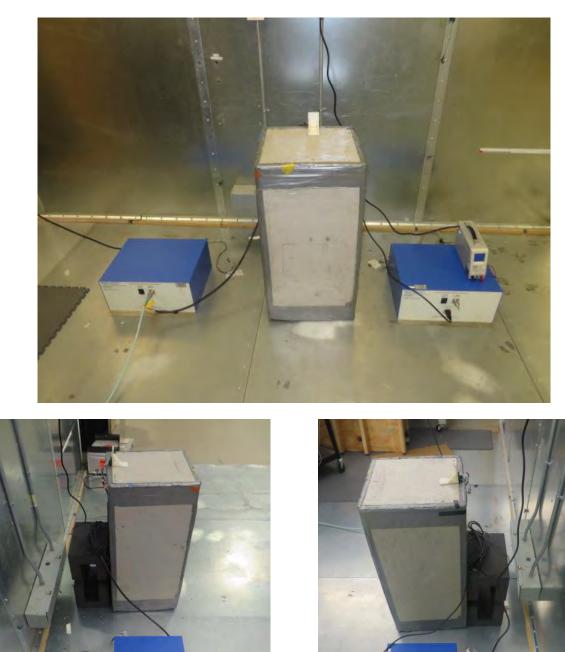
Flat

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Page 110 of 111

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |

## **Conducted Line Emissions**



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| Page  | 111 | of 111          |
|-------|-----|-----------------|
| i ago |     | <b>VI I I I</b> |

TE

81 MP

| Prepared For: Georgia-Pacific | Model #: A-100278            | Report #: 315364  |
|-------------------------------|------------------------------|-------------------|
| EUT: IoT Gateway              | Serial #: Engineering Sample | LSR Job #: C-2368 |