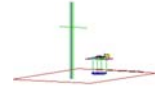




# PCTEST ENGINEERING LABORATORY, INC.

7185 Oakland Mills Road, Columbia, MD 21046 USA  
Tel. 410.290.6652 / Fax 410.290.6654  
<http://www.pctestlab.com>



## MEASUREMENT REPORT FCC Part 15.247 900MHz ISM Band

**Applicant Name:**  
Device Solutions Inc.  
3211 Moorefields Road  
Hillsborough, NC 27278  
United States


**Date of Testing:**  
8/27 - 9/17/2015  
**Test Site/Location:**  
PCTEST Lab, Columbia, MD, USA  
**Test Report Serial No.:**  
0Y1508261695.OXW

<b>FCC ID:</b>	<b>OXW-DS0039</b>
<b>APPLICANT:</b>	<b>Device Solutions Inc.</b>



**Application Type:** Certification  
**Model(s):** DS0039  
**EUT Type:** Wifi-LoRa Gateway  
**Frequency Range:** 907 – 923MHz  
**Type of Modulation:** GFSK  
**FCC Classification:** Digital Transmission System (DTS)  
**FCC Rule Part(s):** Part 15 Subpart C (15.247)  
**Test Procedure(s):** KDB 558074 v03r03

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 558074 v03r03. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



  
 Randy Ortanez  
 President

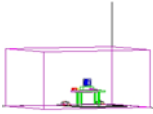


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<b>Test Report S/N:</b> 0Y1508261695.OXW	<b>Test Dates:</b> 8/27 - 9/17/2015	<b>EUT Type:</b> Wifi-LoRa Gateway	Page 1 of 22	

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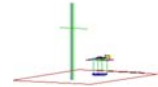
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# MEASUREMENT REPORT

## FCC Part 15.247



### § 2.1033 General Information

**APPLICANT:** Device Solutions Inc.

**APPLICANT ADDRESS:** 3211 Moorefields Road  
Hillsborough, NC 27278, United States

**TEST SITE:** PCTEST ENGINEERING LABORATORY, INC.

**TEST SITE ADDRESS:** 7185 Oakland Mills Road, Columbia, MD 21046 USA

**FCC RULE PART(S):** Part 15.247

**BASE MODEL:** DS0039

**FCC ID:** OXW-DS0039

**FCC CLASSIFICATION:** Digital Transmission System (DTS)

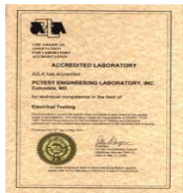
**Test Device Serial No.:** DUT1       Production     Pre-Production     Engineering

**DATE(S) OF TEST:** 8/27 - 9/17/2015



**TEST REPORT S/N:** 0Y1508261695.OXW

### Test Facility / Accreditations

Measurements were performed at **PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.**



- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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# 1.0 INTRODUCTION

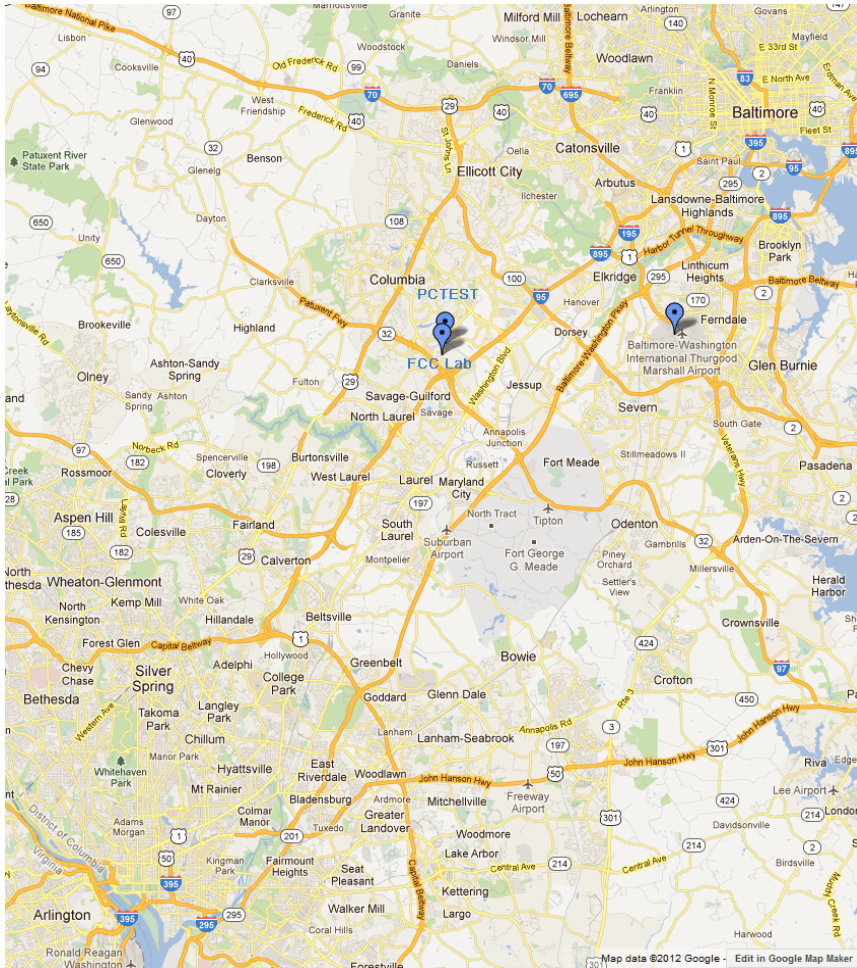
## 1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.



## 1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Intern'tl (BWI) airport, the city of Baltimore and the Washington, DC area. (See Figure 1-1).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2014 on January 22, 2015.



**Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area**

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Device Solutions Wifi-LoRa Gateway FCC ID: OXW-DS0039**. The test data contained in this report pertains only to the emissions due to the EUT's ISM (DTS) transmitter. This device contains a previously certified module (FCC ID: OXW-PA0022) whose conducted data is applied to this filing.

### 2.2 Device Capabilities

This device contains the following capabilities:



802.11b/g/n WLAN, 900MHz ISM

### 2.3 Test Configuration

The EUT (Model: DS0039) is a WiFi Gateway containing two previously certified modules: a Sensor Board Module (FCC ID: OXW-PA0022) and an 802.11 WiFi Module (FCC ID: O7P-362). The Device Solutions WiFi Gateway was tested per the guidance of KDB 558074 v03r03. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Section 3.2 for radiated emissions test setups.

### 2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

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## 3.0 DESCRIPTION OF TEST

### 3.1 Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013), and the guidance provided in KDB 558074 v03r03 were used in the measurement of the **Device Solutions Wifi-LoRa Gateway FCC ID: OXW-DS0039**.

**Deviation from measurement procedure.....None**

### 3.2 Radiated Emissions



The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, a 72.4cm high PVC support structure is placed on top of the turntable. A 3" (~7.6cm) sheet of high density polystyrene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm. For measurements above 1GHz, a high density expanded polystyrene block is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

### 3.3 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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## 4.0 ANTENNA REQUIREMENTS

**Excerpt from §15.203 of the FCC Rules/Regulations:**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”



- The antennas of the Wifi-LoRa Gateway are **permanently attached**.
- There are no provisions for connections to an external antenna.

**Conclusion:**

The **Device Solutions Wifi-LoRa Gateway FCC ID: OXW-DS0039** unit complies with the requirement of §15.203.

Ch.	Frequency (MHz)
Low	904.8
:	:
Mid	914.8
:	:
High	924.8



**Table 4-1. Frequency/ Channel Operations**

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## 5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ( $\pm$ dB)
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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## 6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	4/28/2015	Annual	4/28/2016	N/A
-	WL25-1	Conducted Cable Set (25GHz)	4/8/2015	Annual	4/8/2016	N/A
Agilent	N9020A	MXA Signal Analyzer	10/27/2014	Annual	10/27/2015	US46470561
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	7/30/2015	Biennial	7/30/2017	121034
Com-Power	PAM-118A	Pre-Amplifier	4/10/2015	Annual	4/10/2016	551042
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/8/2014	Biennial	4/8/2016	125518
K & L	13SH10-1000/U1000	N Type High Pass Filter	12/1/2014	Annual	12/1/2015	1
Rhode & Schwarz	TS-PR18	Pre-Amplifier	3/5/2015	Annual	3/5/2016	101622
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/17/2015	Annual	7/17/2016	100348
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/28/2014	Biennial	1/28/2016	A051107
VWR	62344-734	Thermometer with Clock	2/20/2014	Biennial	2/20/2016	140140336

**Table 6-1. Annual Test Equipment Calibration Schedule**

<b>FCC ID:</b> OXW-DS0039		<b>FCC Pt. 15.247 900MHz ISM MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Reviewed by:</b> Quality Manager
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## 7.0 TEST RESULTS

### 7.1 Summary



Company Name: Device Solutions Inc.  
 FCC ID: OXW-DS0039  
 FCC Classification: Digital Transmission System (DTS)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
<b>TRANSMITTER MODE (TX)</b>					
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	RADIATED	PASS	Sections 6.7, 6.8

**Table 7-1. Summary of Test Results**

**Notes:**

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

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## 7.2 Radiated Spurious Emission Measurements – Above 1GHz §15.205 §15.209 §15.247 (d)

### Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle (>98%), at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

**All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 7-2 per Section 15.209.**

Frequency	Field Strength [ $\mu\text{V/m}$ ]	Measured Distance [Meters]
Above 960.0 MHz	500	3

**Table 7-2. Radiated Limits**

### Test Procedures Used

KDB 558074 v03r03 – Section 12.1, 12.2.7



### Test Settings

#### Average Field Strength Measurements per Section 12.2.5.1 of KDB 558074 v03r03

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of measurement points = 1001 (Number of points must be  $\geq 2 \times \text{span/RBW}$ )
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces

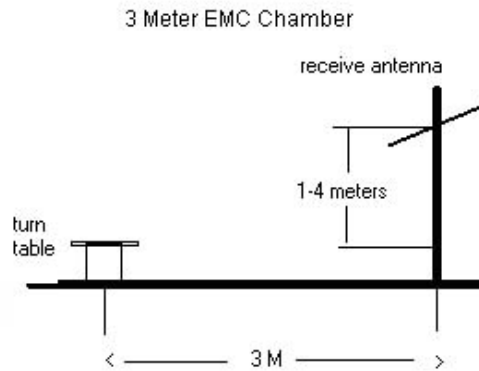
#### Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 v03r03

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

FCC ID: OXW-DS0039		FCC Pt. 15.247 900MHz ISM MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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## Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.





**Figure 7-1. Test Instrument & Measurement Setup**

## Test Notes

1. The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 v03r03 were not used to evaluate this device for compliance to radiated limits. All radiated spurious emissions levels were measured in a radiated test setup.
2. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 7-2.
3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested with its standard battery.
5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
6. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
7. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section. Rohde & Schwarz EMC32, Version 9.15.00 automated test software was used to perform the Radiated Spurious Emissions Pre-Scan testing.

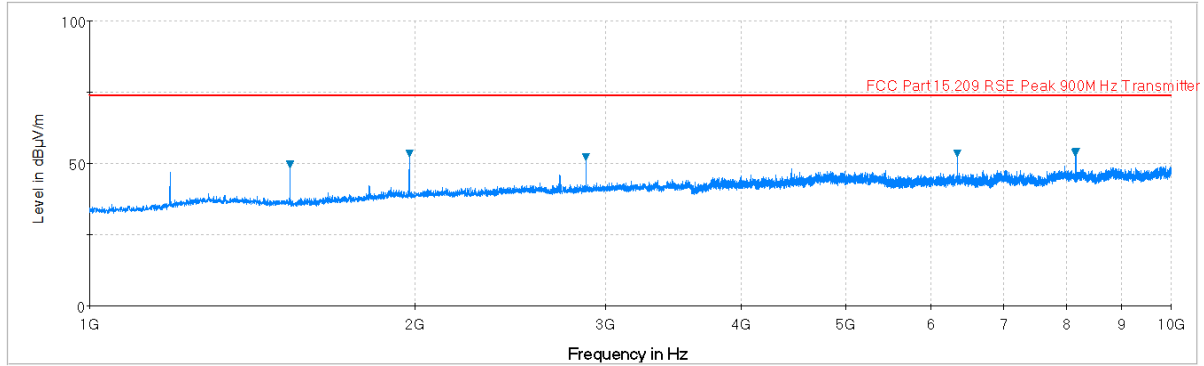
## Sample Calculation

- Field Strength Level  $_{[dB_{\mu V/m}]}$  = Analyzer Level  $_{[dBm]}$  + 107 + AFCL  $_{[dB/m]}$  + Duty Cycle Correction  $_{[dB]}$
- AFCL  $_{[dB/m]}$  = Antenna Factor  $_{[dB/m]}$  + Cable Loss  $_{[dB]}$
- Margin  $_{[dB]}$  = Field Strength Level  $_{[dB_{\mu V/m}]}$  – Limit  $_{[dB_{\mu V/m}]}$

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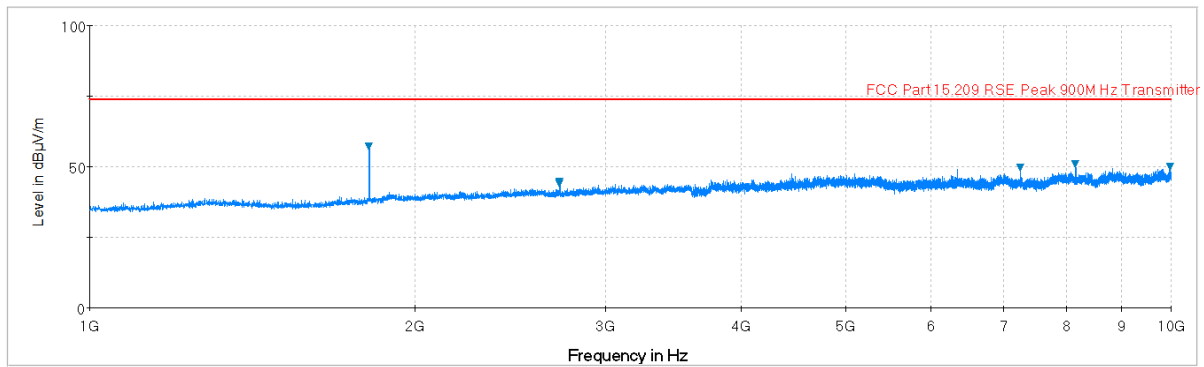
# Radiated Spurious Emission Measurements

## §15.205 §15.209 §15.247 (d)



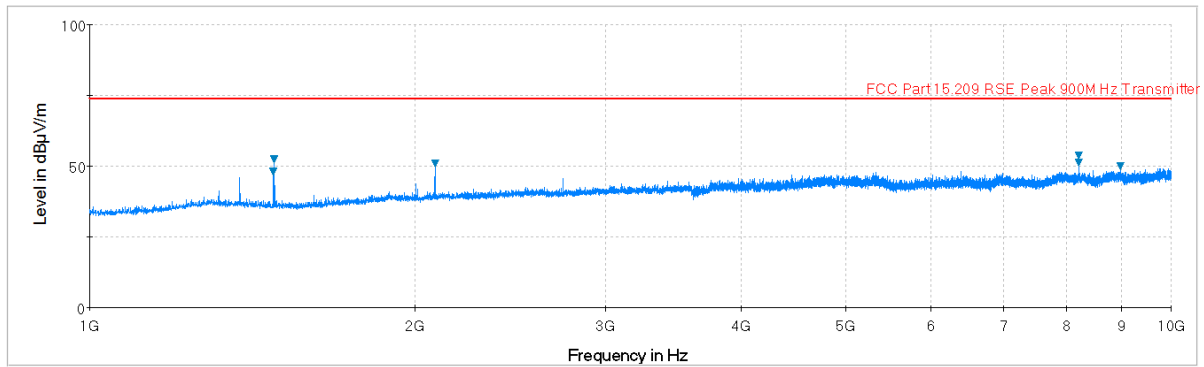
Preview Result 1-PK+    FCC Part 15.209 RSE Peak 900M Hz Transmitter    Final\_Result PK+

**Plot 7-1. Radiated Spurious Plot above 1GHz (Low Channel) (Pol. H)**





Preview Result 1-PK+    FCC Part 15.209 RSE Peak 900M Hz Transmitter    Final\_Result PK+

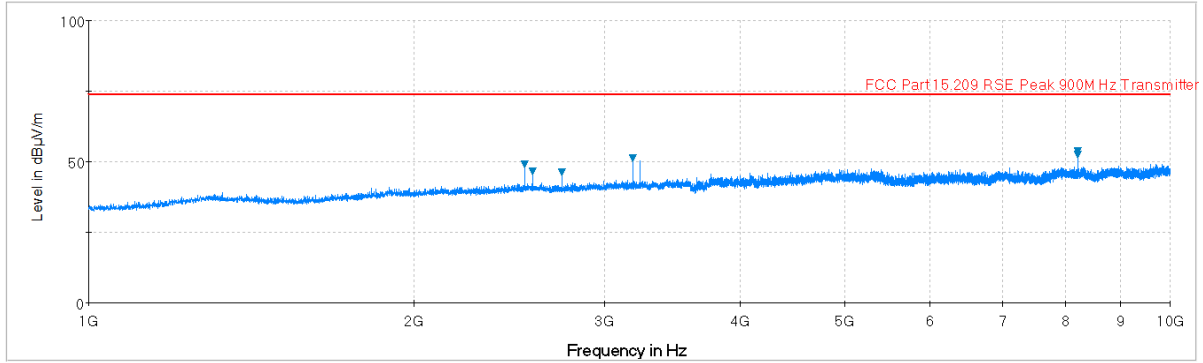
**Plot 7-2. Radiated Spurious Plot above 1GHz (Low Channel) (Pol. V)**



Preview Result 1-PK+    FCC Part 15.209 RSE Peak 900M Hz Transmitter    Final\_Result PK+

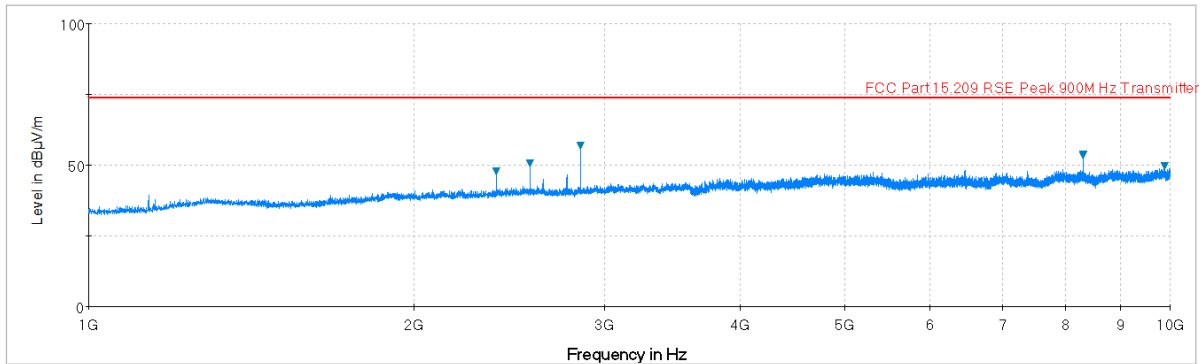
**Plot 7-3. Radiated Spurious Plot above 1GHz (Mid Channel) (Pol. H)**

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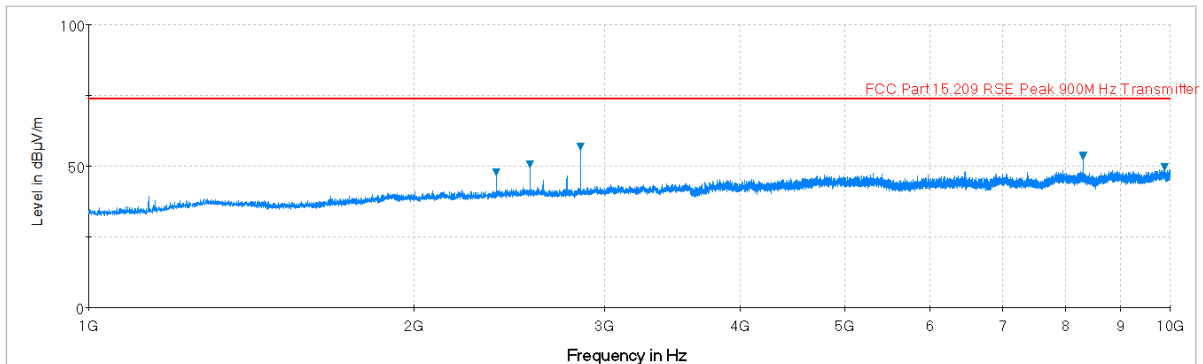
Preview Result 1-PK+    FCC Part 15.209 RSE Peak 900M Hz Transmitter    Final\_Result PK+

**Plot 7-4. Radiated Spurious Plot above 1GHz (Mid Channel) (Pol. V)**



Preview Result 1-PK+    FCC Part 15.209 RSE Peak 900M Hz Transmitter    Final\_Result PK+

**Plot 7-5. Radiated Spurious Plot above 1GHz (High Channel) (Pol. H)**



Preview Result 1-PK+    FCC Part 15.209 RSE Peak 900M Hz Transmitter    Final\_Result PK+

**Plot 7-6. Radiated Spurious Plot above 1GHz (High Channel) (Pol. V)**

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## Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247 (d)

Measurement Distance: 3 Meters  
 Operating Frequency: 907MHz

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Analyzer Level [dBm]	AFCL [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	2721.00	Avg	H	-106.35	36.62	37.27	53.98	-16.71
*	2721.00	Peak	H	-95.07	36.62	48.55	73.98	-25.43
*	3628.00	Avg	H	-106.26	37.99	38.73	53.98	-15.25
*	3628.00	Peak	H	-100.16	37.99	44.83	73.98	-29.15
*	4535.00	Avg	H	-103.75	39.91	43.16	53.98	-10.82
*	4535.00	Peak	H	-98.56	39.91	48.35	73.98	-25.63
*	5442.00	Avg	H	-105.02	40.69	42.68	53.98	-11.30
*	5442.00	Peak	H	-97.50	40.69	50.20	73.98	-23.78
*	8163.00	Avg	H	-100.74	43.99	50.25	53.98	-3.73
*	8163.00	Peak	H	-94.01	43.99	56.98	73.98	-17.00
*	9070.00	Avg	H	-105.08	44.09	46.02	53.98	-7.96
*	9070.00	Peak	H	-98.22	44.09	52.88	73.98	-21.10



**Table 7-3. Radiated Measurements**

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Measurement Distance: 3 Meters  
 Operating Frequency: 915MHz

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Analyzer Level [dBm]	AFCL [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
* 2745.00	Avg	H	-104.65	36.71	39.06	53.98	-14.92
* 2745.00	Peak	H	-94.07	36.71	49.64	73.98	-24.34
* 3660.00	Avg	H	-107.29	38.12	37.83	53.98	-16.15
* 3660.00	Peak	H	-99.59	38.12	45.53	73.98	-28.45
* 4575.00	Avg	H	-105.24	39.94	41.70	53.98	-12.28
* 4575.00	Peak	H	-98.16	39.94	48.78	73.98	-25.20
* 7320.00	Avg	H	-103.62	43.10	46.47	53.98	-7.51
* 7320.00	Peak	H	-98.53	43.10	51.56	73.98	-22.42
* 8235.00	Avg	H	-99.31	43.73	51.42	53.98	-2.56
* 8235.00	Peak	H	-93.83	43.73	56.90	73.98	-17.08
* 9150.00	Avg	H	-105.96	44.26	45.30	53.98	-8.67
* 9150.00	Peak	H	-99.21	44.26	52.05	73.98	-21.92

**Table 7-4. Radiated Measurements**

FCC ID: OXW-DS0039		FCC Pt. 15.247 900MHz ISM MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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## Radiated Spurious Emission Measurements

§15.205 §15.209 §15.247 (d)

Measurement Distance: 3 Meters  
 Operating Frequency: 932MHz

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Analyzer Level [dBm]	AFCL [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
* 2796.00	Avg	H	-103.10	36.79	40.69	53.98	-13.29
* 2796.00	Peak	H	-92.63	36.79	51.16	73.98	-22.82
* 3728.00	Avg	H	-104.23	38.25	41.02	53.98	-12.96
* 3728.00	Peak	H	-98.19	38.25	47.06	73.98	-26.92
* 4660.00	Avg	H	-104.56	39.95	42.39	53.98	-11.59
* 4660.00	Peak	H	-97.32	39.95	49.63	73.98	-24.35
* 7456.00	Avg	H	-104.07	43.27	46.20	53.98	-7.78
* 7456.00	Peak	H	-97.11	43.27	53.16	73.98	-20.82
* 8388.00	Avg	H	-98.09	43.69	52.60	53.98	-1.38
* 8388.00	Peak	H	-96.45	43.69	54.24	73.98	-19.74

**Table 7-5. Radiated Measurements**

FCC ID: OXW-DS0039		FCC Pt. 15.247 900MHz ISM MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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## 7.3 Radiated Spurious Emissions Measurements – Below 1GHz

### §15.209

#### Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

***All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 7-6 per Section 15.209.***

Frequency	Field Strength [ $\mu\text{V/m}$ ]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

**Table 7-6. Radiated Limits**



#### Test Procedures Used

ANSI C63.4-2014

#### Test Settings

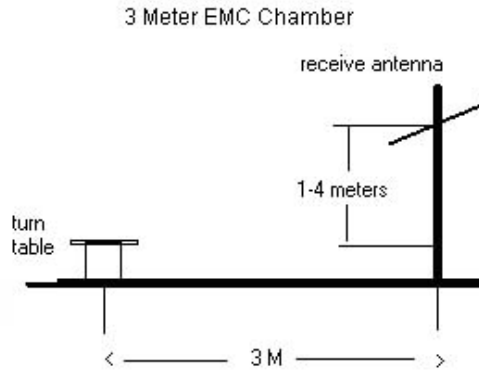
##### Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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## Test Setup



The EUT and measurement equipment were set up as shown in the diagram below.



**Figure 7-2. Test Instrument & Measurement Setup**

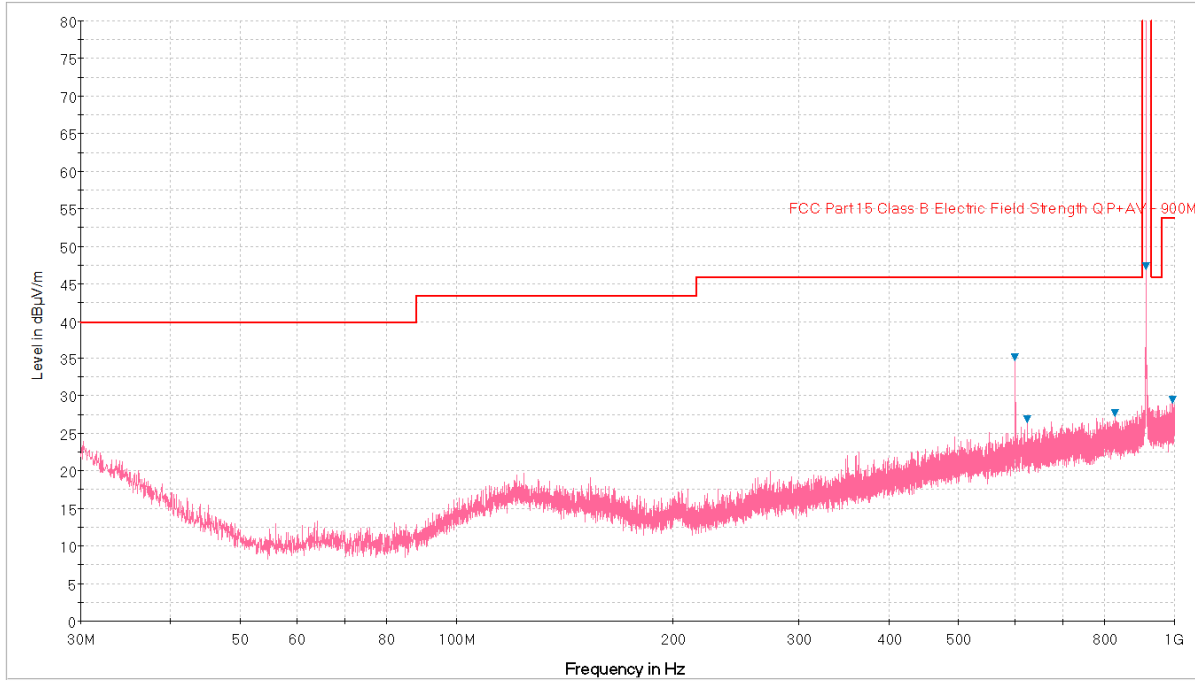
## Test Notes

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 7-6.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested with its standard battery.
4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported.
5. Emissions were measured at a 3 meter test distance.
6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
7. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.

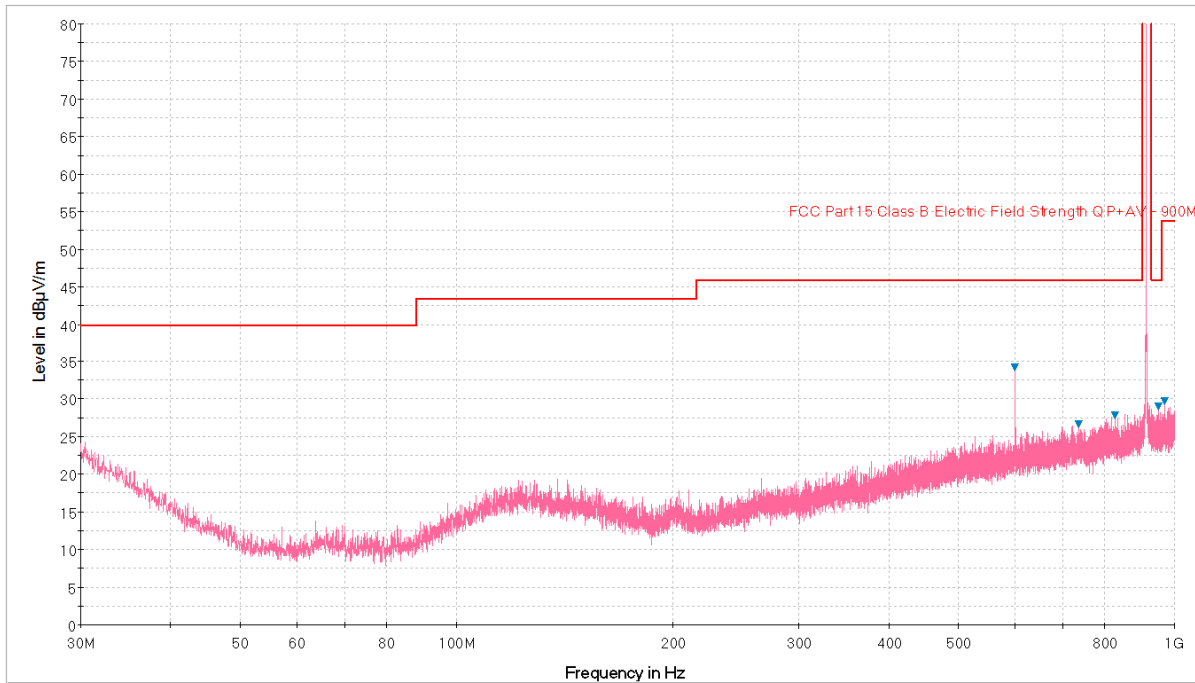
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# Radiated Spurious Emissions Measurements (Below 1GHz)

## §15.209



Plot 7-7. Radiated Spurious Plot below 1GHz (Pol. H)





Plot 7-8. Radiated Spurious Plot below 1GHz (Pol. V)

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**Radiated Spurious Emissions Measurements (Below 1GHz)**  
**§15.209**



Frequency [MHz]	Detector	Ant. Pol. [H/V]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
67.31	Quasi-Peak	H	-104.64	8.88	11.24	40.00	-28.76
232.08	Quasi-Peak	H	-104.24	13.19	15.95	46.02	-30.07
454.38	Quasi-Peak	H	-104.44	18.95	21.51	46.02	-24.52
598.94	Quasi-Peak	H	-103.94	21.49	24.55	46.02	-21.47
762.16	Quasi-Peak	H	-103.38	23.51	27.13	46.02	-18.90
984.46	Quasi-Peak	H	-103.46	25.90	29.44	53.98	-24.54

**Table 7-7. Radiated Spurious Emissions below 1GHz**

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## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Device Solutions Wifi-LoRa Gateway FCC ID: OXW-DS0039** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules.

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