



## MEASUREMENT REPORT

### FCC Part 15.247 WLAN 802.11b/g/n

**Applicant Name:**

Device Solutions Inc.  
3211 Moorefields Road  
Hillsborough, NC 27278  
United States

**Date of Testing:**

4/14-4/26/2017

**Test Site/Location:**

PCTEST Lab, Columbia, MD, USA

**Test Report Serial No.:**

1M1704120143-02.OXW

**FCC ID:**

OXW-DS0043

**APPLICANT:**

Device Solutions Inc.

**Application Type:**

Certification

**Model:**

DS0043

**EUT Type:**

WiFi Gateway

**FCC Classification:**

Digital Transmission System (DTS)

**FCC Rule Part(s):**

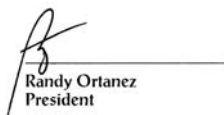
Part 15.247

**Test Procedure(s):**

KDB 558074 D01 v04



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 D01 v04. 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 Ortañez  
President

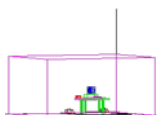


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<b>Test Report S/N:</b> 1M1704120143-02.OXW	<b>Test Dates:</b> 4/14-4/26/2017	<b>EUT Type:</b> WiFi Gateway		Page 1 of 32

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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:** DS0043

**FCC ID:** OXW-DS0043

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

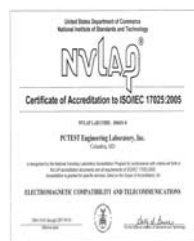
**Test Device Serial No.:** 58913, 67428 ☐ Production ☒ Pre-Production ☐ Engineering

**DATE(S) OF TEST:** 4/14-4/26/2017



**TEST REPORT S/N:** 1M1704120143-02.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'l (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.

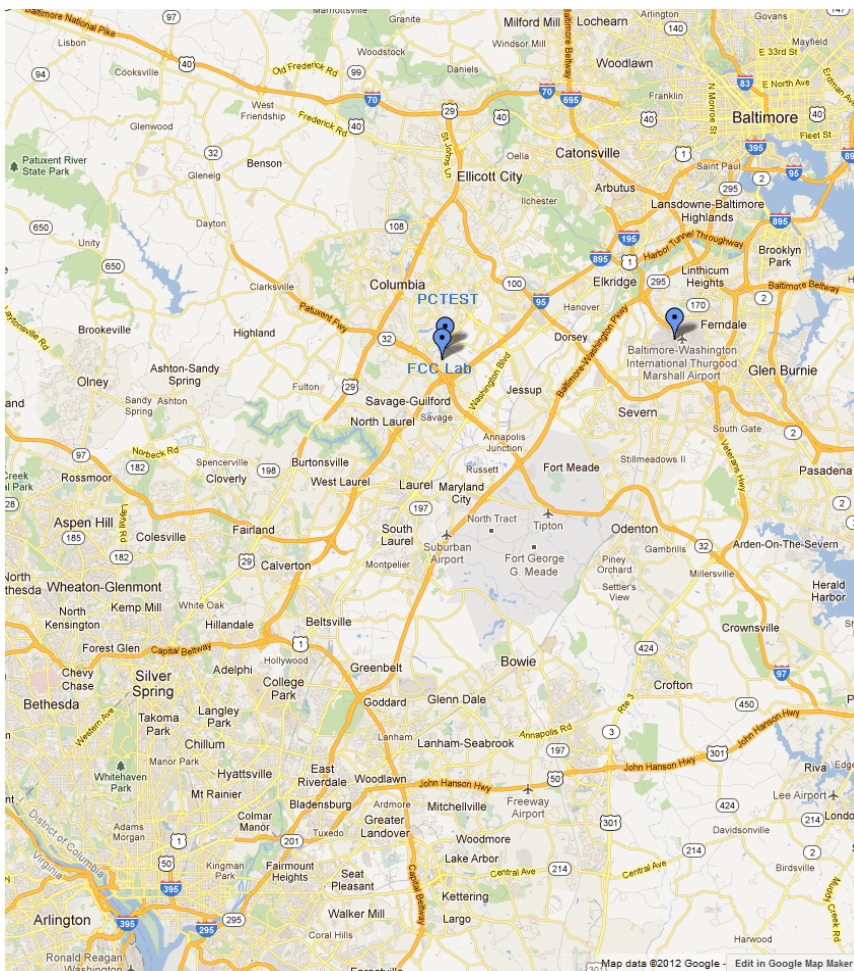




Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Device Solutions WiFi Gateway FCC ID: OXW-DS0043**. The test data contained in this report pertains only to the radiated emissions due to the EUT's 2.4GHz WLAN transmitter.

This device contains a previously certified module (FCC ID: O7P-362) 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

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		



**Table 2-1. Frequency/ Channel Operations**

**Note:** The following duty cycle values were taken from measurements in the original filing:

Maximum Achievable Duty Cycles	
802.11 Mode/Band	Duty Cycle [%]
	ANT1
2.4GHz	4.32

**Table 2-2. Measured Duty Cycles**

Data Rates Supported: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps (b)  
 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps (g)  
 6.5/7.2Mbps, 13/14.4Mbps, 19.5/21.7Mbps, 26/28.9Mbps, 39/43.3Mbps,  
 52/57.8Mbps, 58.5/65Mbps, 65/72.2Mbps (n)



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## 2.3 Test Configuration

The EUT was tested per the guidance of KDB 558074 D01 v04. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups and 3.3 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 TESTS

### 3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 v04 were used in the measurement of the EUT.

Deviation from measurement procedure.....None



### 3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

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 RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.4. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

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### 3.3 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. A raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. 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. 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 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, mode of operation, 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.

### 3.4 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 EUT are **permanently attached**.
- There are no provisions for connections to an external antenna.

### Conclusion:



The EUT unit complies with the requirement of §15.203.

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## 5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement uncertainty shown below 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)
Line Conducted Disturbance	3.09
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). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2006.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	7/11/2016	Annual	7/11/2017	RE1
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	7/30/2015	Biennial	7/30/2017	121034
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	7/6/2016	Annual	7/6/2017	441119
Emco	3115	Horn Antenna (1-18GHz)	3/10/2016	Biennial	3/10/2018	9704-5182
EMCO	3160-09	Small Horn	8/23/2016	Biennial	8/23/2018	135427
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/26/2016	Biennial	4/26/2018	125518
Huber+Suhner	Sucoflex 102A	40GHz Radiated Cable	4/26/2016	Annual	4/26/2017	251425001
K & L	11SH10-3075/U18000	High Pass Filter	7/11/2016	Annual	7/11/2017	11SH10-3075/U18000-2
PCTEST	-	EMC Switch System	7/11/2016	Annual	7/11/2017	NM1
PCTEST	-	EMC Switch System	7/6/2016	Annual	7/6/2017	NM2
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	5/16/2016	Annual	5/16/2017	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/15/2016	Annual	7/15/2017	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	7/27/2016	Annual	7/27/2017	103200
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/7/2016	Annual	5/7/2017	100040
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/2/2016	Biennial	3/2/2018	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

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

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## 7.0 TEST RESULTS

### 7.1 Summary



Company Name: Device Solutions Inc.  
 FCC ID: OXW-DS0043  
 FCC Classification: Digital Transmission System (DTS)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
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 7.2, 7.3
15.207	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits	LINE CONDUCTED	PASS	Section 7.4

**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.

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## 7.2 Radiated Spurious Emission Measurements – Above 1 GHz

§15.247(d) §15.205 & §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 7-2 per Section 15.209.***

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
Above 960.0 MHz	500	3

**Table 7-2. Radiated Limits**

### Test Procedures Used

KDB 558074 D01 v04 – Section 12.1, 12.2.7



### Test Settings

#### Average Field Strength Measurements per Section 12.2.5.1 of KDB 558074 D01 v04

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

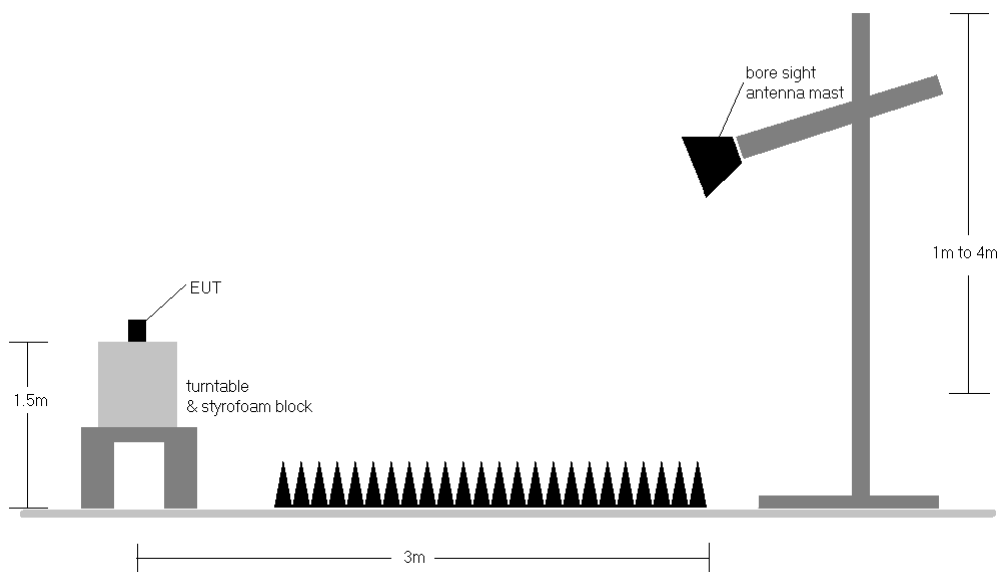
#### Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 D01 v04

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

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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**

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## Test Notes

1. The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 D01 v04 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 while powered by an AC power source.
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.
8. The "-" shown in the following RSE tables are used to denote a noise floor measurement.



## Sample Calculations

### Determining Spurious Emissions Levels

- Field Strength Level  $[\text{dB}\mu\text{V/m}] = \text{Analyzer Level} [\text{dBm}] + 107 + \text{AFCL} [\text{dB/m}]$
- $\text{AFCL} [\text{dB/m}] = \text{Antenna Factor} [\text{dB/m}] + \text{Cable Loss} [\text{dB}]$
- $\text{Margin} [\text{dB}] = \text{Field Strength Level} [\text{dB}\mu\text{V/m}] - \text{Limit} [\text{dB}\mu\text{V/m}]$

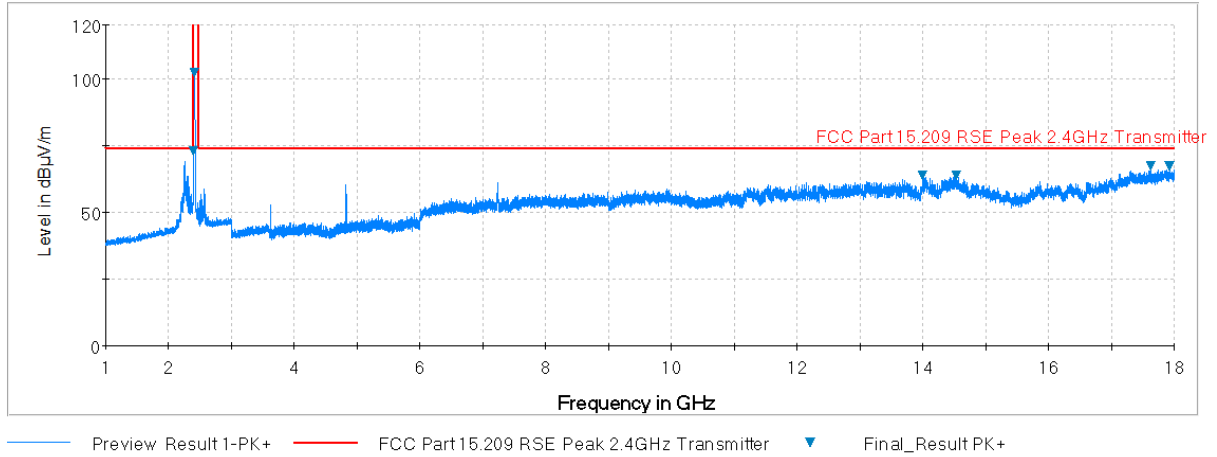
### Duty Cycle Correction Factor Calculation

- Pulse Repetition Interval = 60ms (PRI)
- Pulse Width = 2.16ms
- In the worst case 100ms window, there will be 2 pulse widths, based on a PRI of 60ms
- Worst Case Dwell Time =  $2.16\text{ms} \times 2 = 4.32\text{ms}$
- Duty Cycle Correction =  $20\log(\text{Worst Case Dwell Time}/100\text{ms}) [\text{dB}] = -27.29\text{dB}$

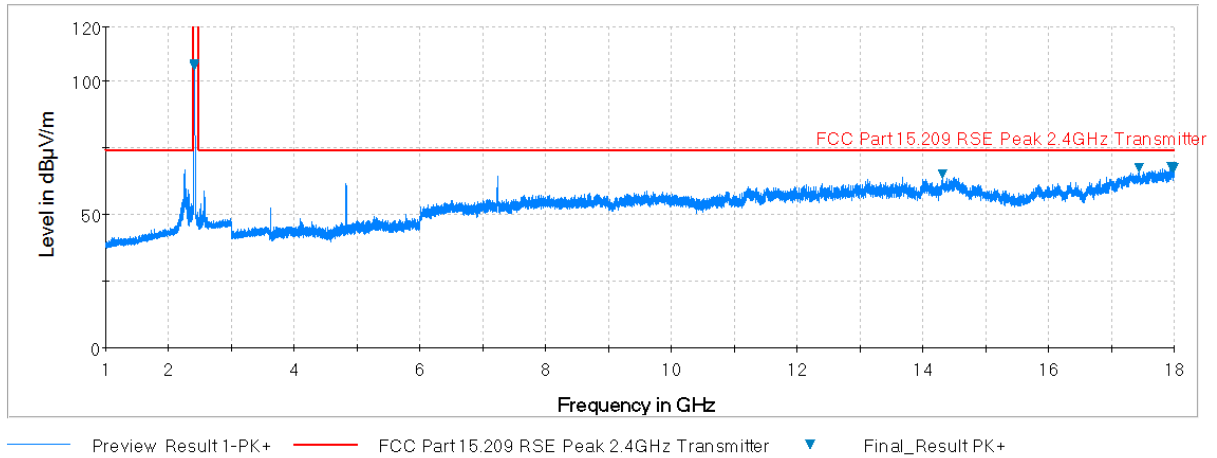
FCC ID: OXW-DS0043		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway		Page 15 of 32

## 7.2.1 Radiated Spurious Emission Measurements

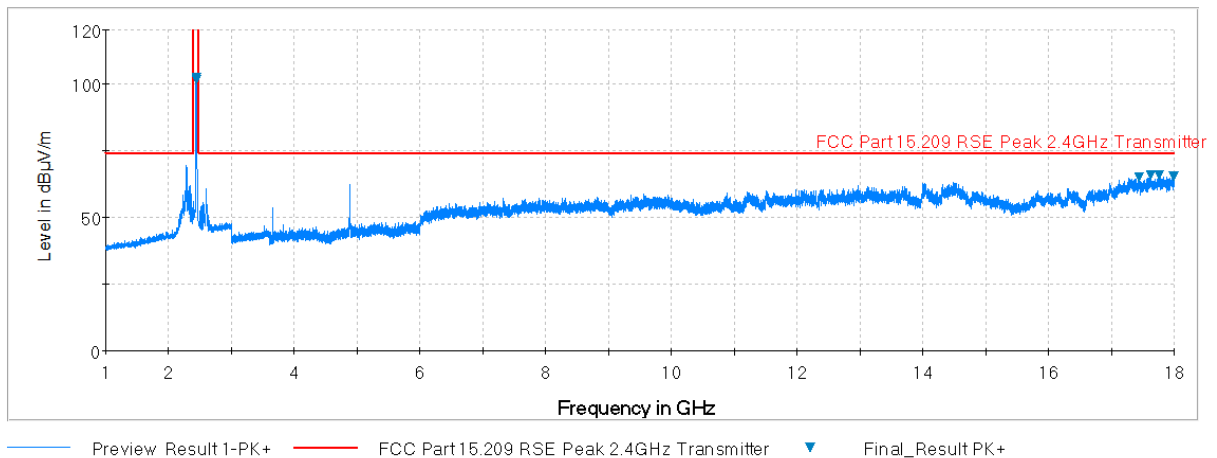
§15.247(d) §15.205 & §15.209



**Plot 7-1. Radiated Spurious Plot above 1GHz (802.11b – Ch. 1, Ant. Pol. H)**

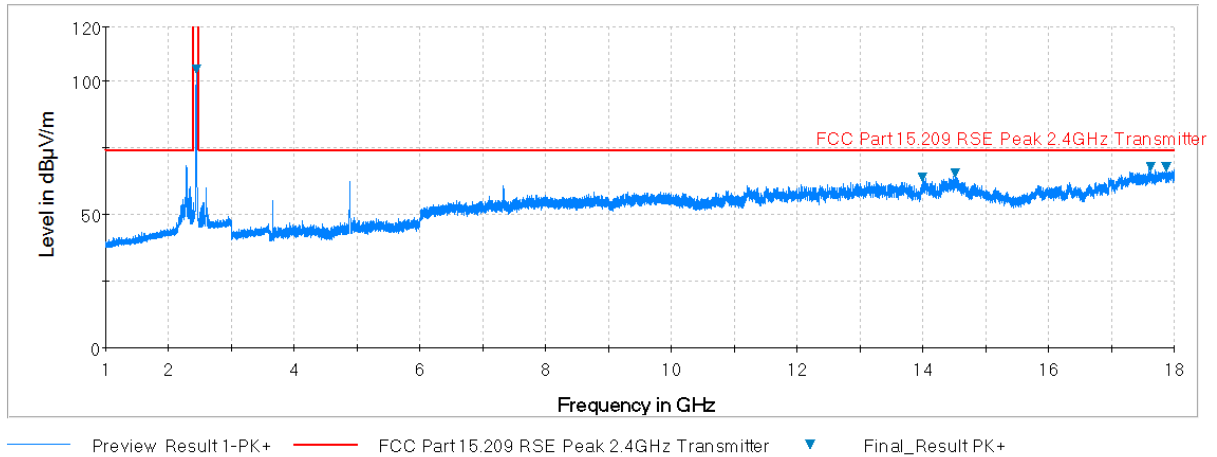


**Plot 7-2. Radiated Spurious Plot above 1GHz (802.11b – Ch. 1, Ant. Pol. V)**

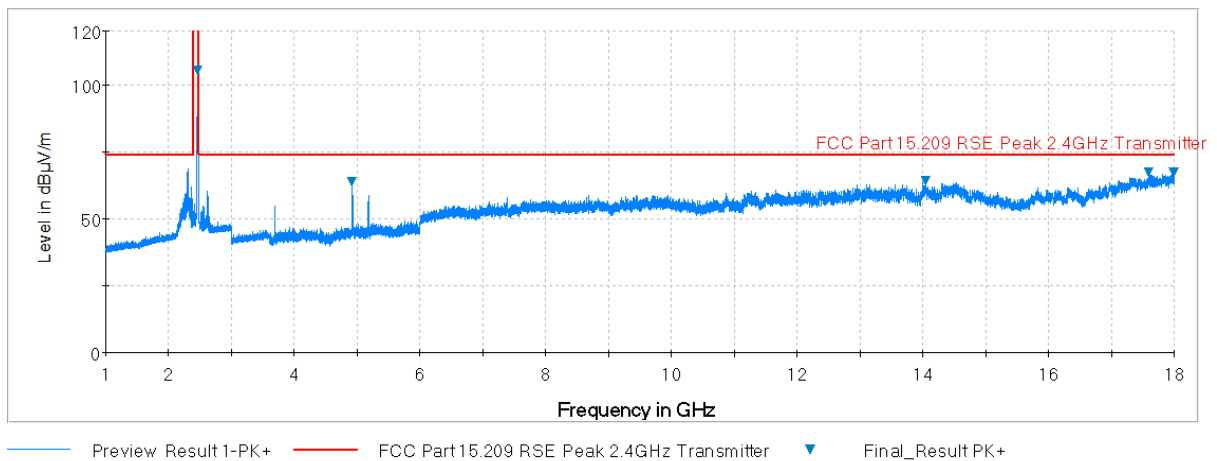


**Plot 7-3. Radiated Spurious Plot above 1GHz (802.11b – Ch. 6, Ant. Pol. H)**

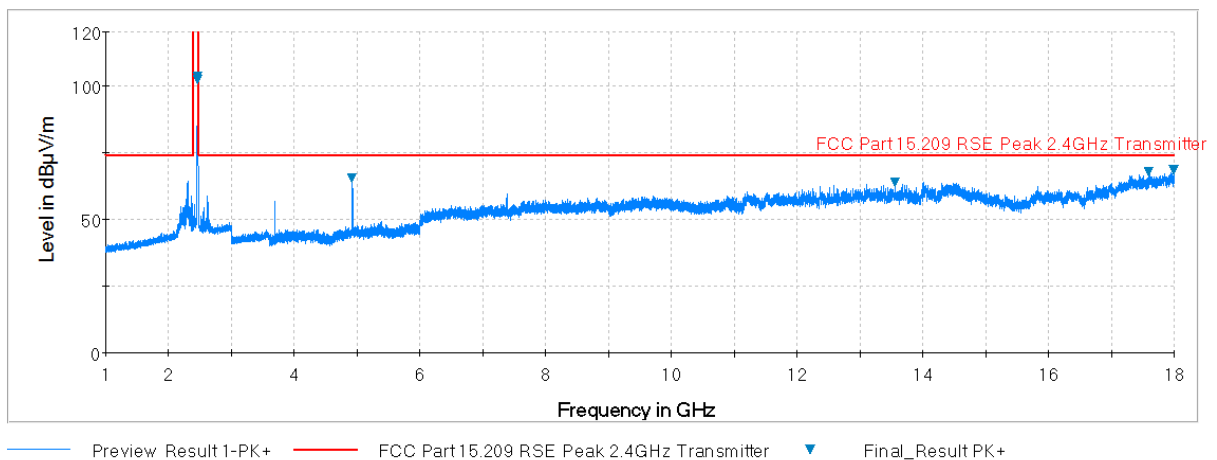
FCC ID: OXW-DS0043	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)	<b>Device Solutions</b> Integration. Tested.	Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway		Page 16 of 32



**Plot 7-4. Radiated Spurious Plot above 1GHz (802.11b – Ch. 6, Ant. Pol. V)**



**Plot 7-5. Radiated Spurious Plot above 1GHz (802.11b – Ch. 11, Ant. Pol. H)**

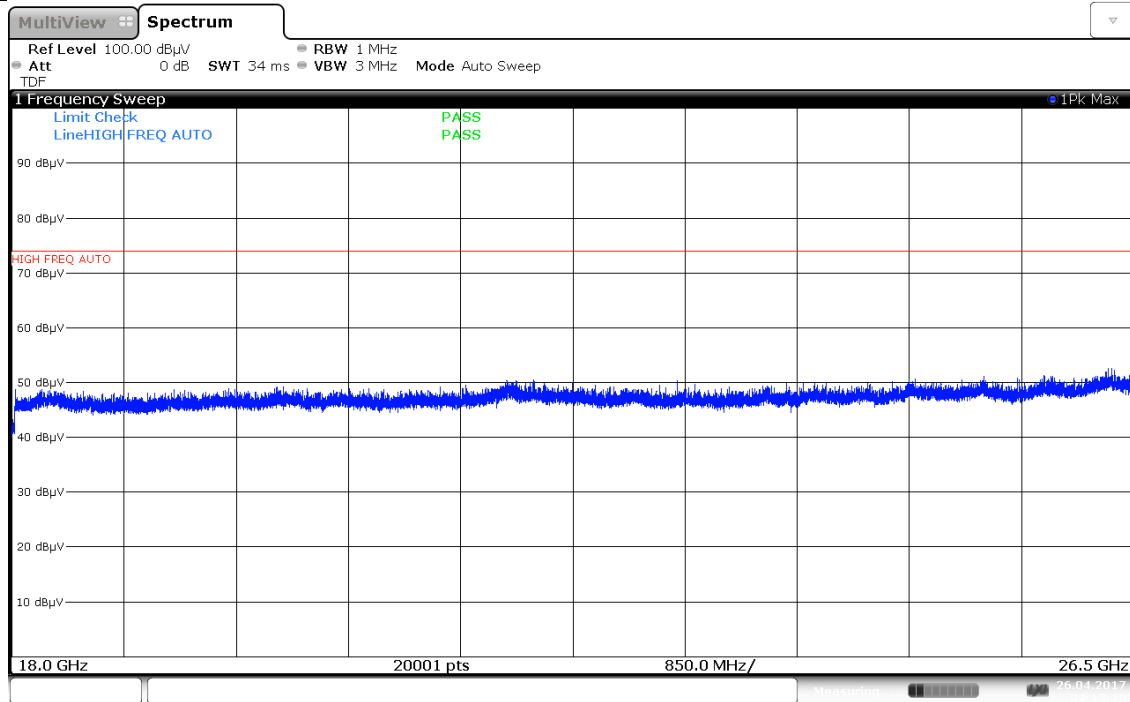


**Plot 7-6. Radiated Spurious Plot above 1GHz (802.11b – Ch. 11, Ant. Pol. V)**

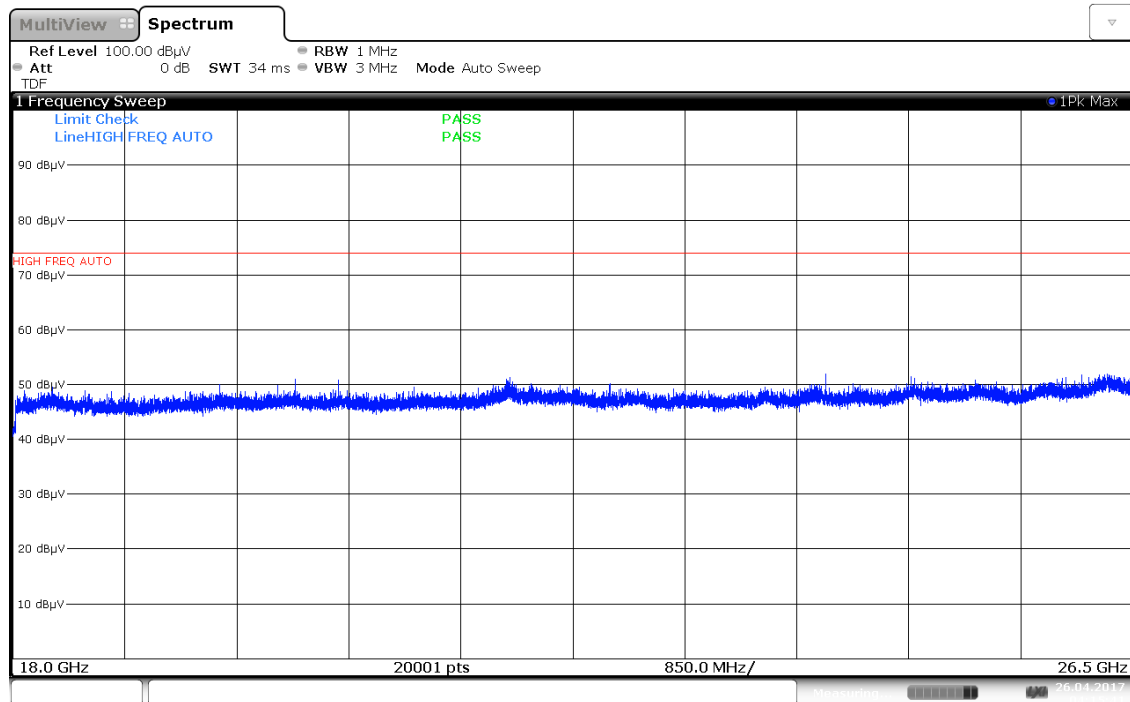
<b>FCC ID:</b> OXW-DS0043	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)</b>	<b>DeviceSolutions</b> Integration. Realized.	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1704120143-02.OXW	<b>Test Dates:</b> 4/14-4/26/2017	<b>EUT Type:</b> WiFi Gateway		Page 17 of 32

## Radiated Spurious Emissions Measurements (Above 18GHz)

### \$15.209



Plot 7-7. Radiated Spurious Plot above 18GHz (Pol. H)



Plot 7-8. Radiated Spurious Plot above 18GHz (Pol. V)

FCC ID: OXW-DS0043	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)	<b>Device Solutions</b> Integration. Tested.	Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway		Page 18 of 32

## Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209

Worst Case Mode: 802.11b  
Worst Case Transfer Rate: 1 Mbps  
Distance of Measurements: 3 Meters  
Operating Frequency: 2412MHz  
Channel: 01



Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4824.00	Avg	H	261	180	-45.45	-0.02	-27.29	34.24	53.98	-19.74
4824.00	Peak	H	261	180	-36.19	-0.02	0.00	70.79	73.98	-3.19
12060.00	Avg	H	290	264	-70.04	14.13	-27.29	23.80	53.98	-30.18
12060.00	Peak	H	290	264	-58.56	14.13	0.00	62.57	73.98	-11.41

**Table 7-3. Radiated Measurements**

Worst Case Mode: 802.11b  
Worst Case Transfer Rate: 1 Mbps  
Distance of Measurements: 3 Meters  
Operating Frequency: 2437MHz  
Channel: 06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4882.00	Avg	H	173	185	-47.11	0.38	-27.29	32.98	53.98	-21.00
4882.00	Peak	H	173	185	-36.68	0.38	0.00	70.70	73.98	-3.28
7323.00	Avg	H	251	307	-62.71	9.92	-27.29	26.92	53.98	-27.06
7323.00	Peak	H	251	307	-50.78	9.92	0.00	66.14	73.98	-7.84
12205.00	Avg	H	-	-	-70.19	14.14	0.00	50.95	53.98	-3.03
12205.00	Peak	H	-	-	-58.54	14.14	0.00	62.60	73.98	-11.38



**Table 7-4. Radiated Measurements**

FCC ID: OXW-DS0043		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway		Page 19 of 32

Worst Case Mode: 802.11b  
 Worst Case Transfer Rate: 1 Mbps  
 Distance of Measurements: 3 Meters  
 Operating Frequency: 2462MHz  
 Channel: 11

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Duty Cycle Correction [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4924.00	Avg	H	183	185	-43.79	0.66	-27.29	36.58	53.98	-17.40
4924.00	Peak	H	183	185	-34.11	0.66	0.00	73.55	73.98	-0.43
7386.00	Avg	H	245	61	-63.23	10.29	-27.29	26.77	53.98	-27.21
7386.00	Peak	H	245	61	-52.14	10.29	0.00	65.15	73.98	-8.83
12310.00	Avg	H	-	-	-70.33	15.05	0.00	51.72	53.98	-2.26
12310.00	Peak	H	-	-	-58.62	15.05	0.00	63.43	73.98	-10.55

**Table 7-5. Radiated Measurements**

<b>FCC ID:</b> OXW-DS0043		<b>FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1704120143-02.OXW	<b>Test Dates:</b> 4/14-4/26/2017	<b>EUT Type:</b> WiFi Gateway		Page 20 of 32



## 7.2.2 Radiated Restricted Band Edge Measurements

### §15.205 §15.209

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

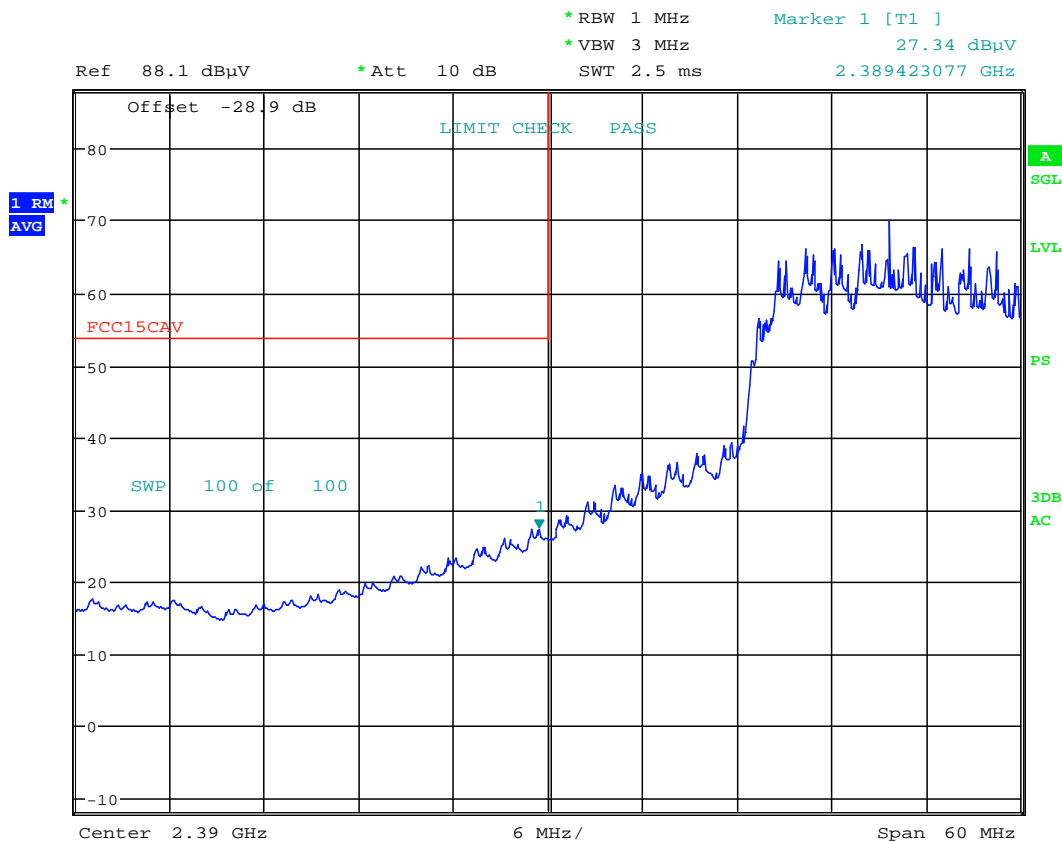
Worst Case Mode: 802.11g

Worst Case Transfer Rate: 6 Mbps

Distance of Measurements: 3 Meters



Operating Frequency: 2412MHz

Channel: 1



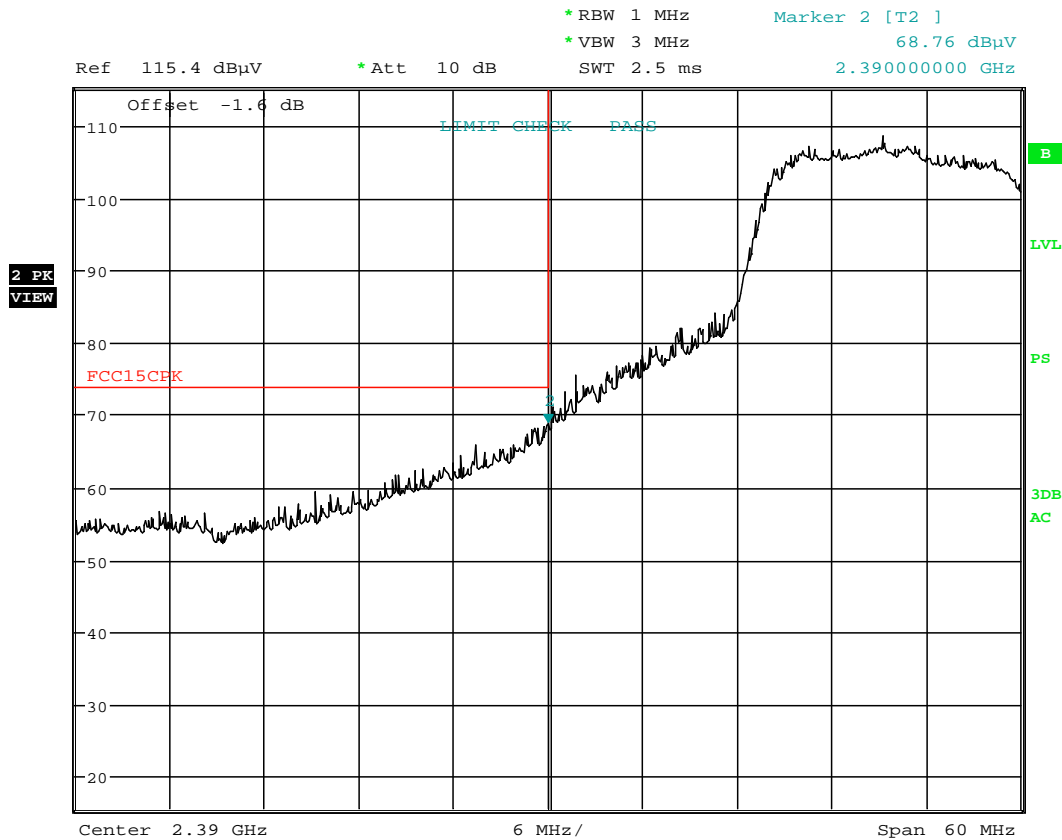
Date: 19.APR.2017 17:01:35

**Plot 7-9. Radiated Restricted Lower Band Edge Measurement (Average)**

FCC ID: OXW-DS0043	 <b>FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)</b> 		Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway	Page 21 of 32

## Radiated Restricted Band Edge Measurements

\$15.205 \$15.209



Date: 19.APR.2017 17:03:10

**Plot 7-10. Radiated Restricted Lower Band Edge Measurement (Peak)**

FCC ID: OXW-DS0043	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)	<b>DeviceSolutions</b> Integration. Tested.	Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway		Page 22 of 32

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## Radiated Restricted Band Edge Measurements

§15.205 §15.209

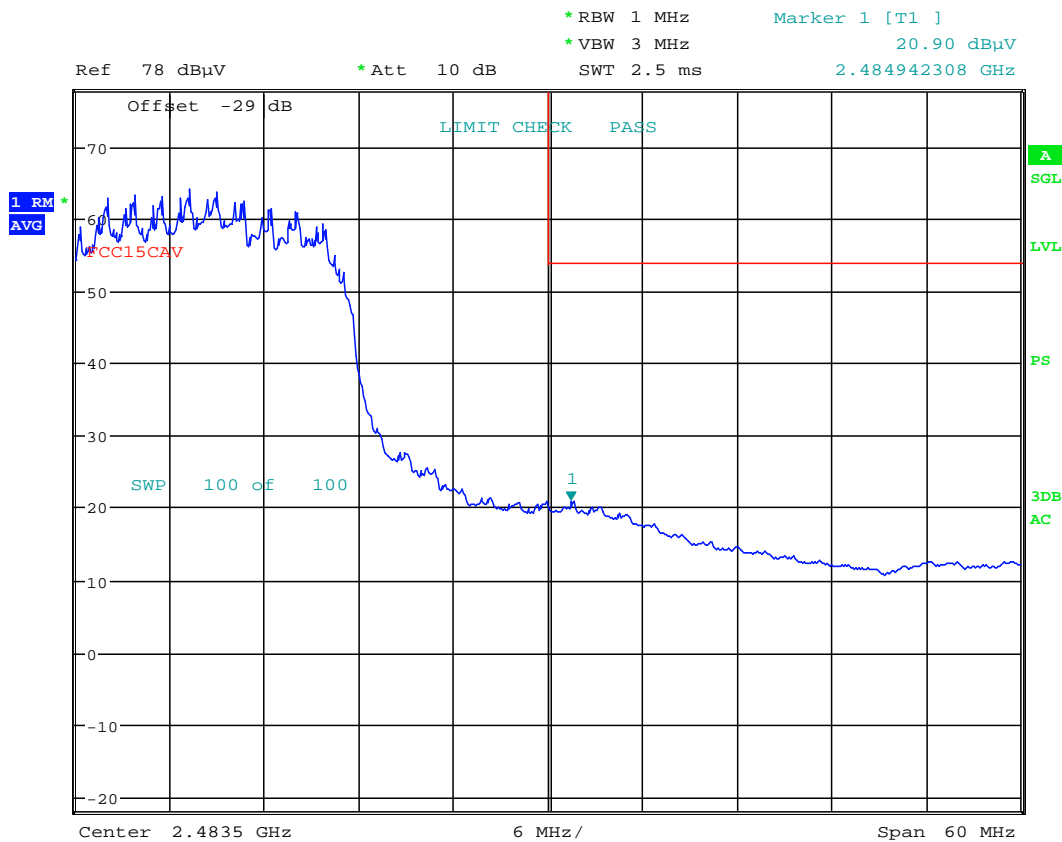
Worst Case Mode: 802.11g

Worst Case Transfer Rate: 6 Mbps

Distance of Measurements: 3 Meters

Operating Frequency: 2462MHz

Channel: 11



Date: 19.APR.2017 17:09:36

**Plot 7-11. Radiated Restricted Upper Band Edge Measurement (Average)**

FCC ID: OXW-DS0043	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)	<b>DeviceSolutions</b> Integration. Realized.	Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway		Page 23 of 32

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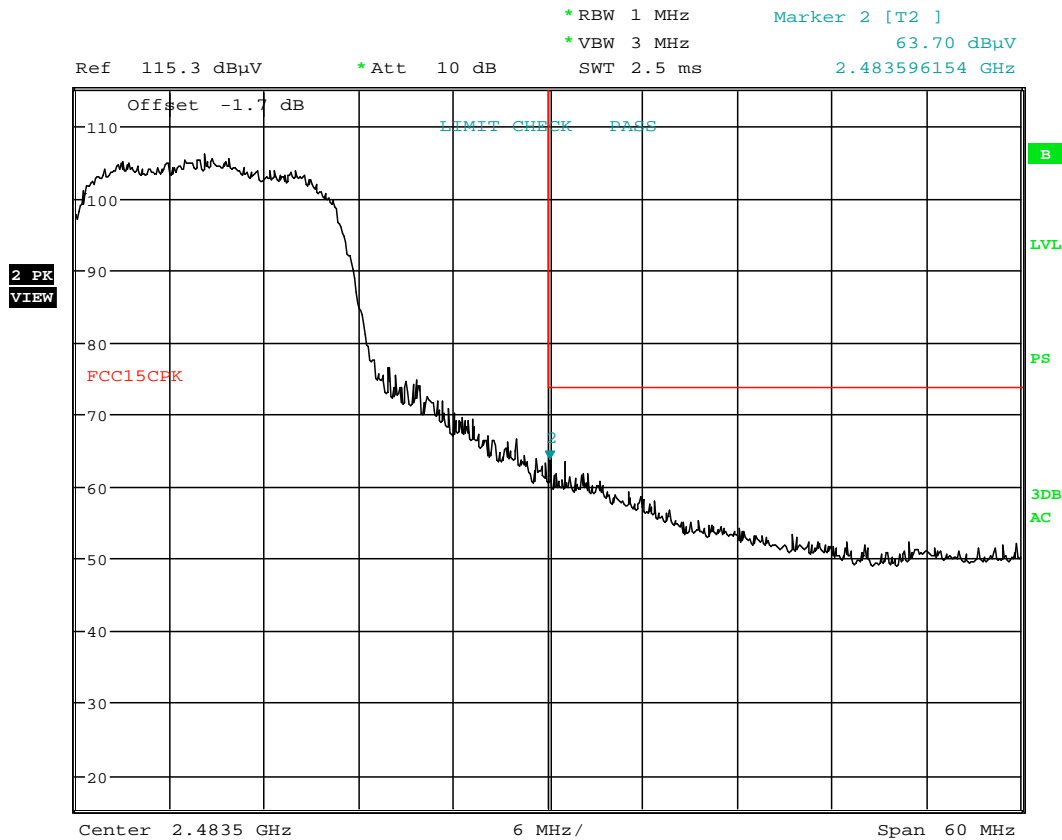
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## Radiated Restricted Band Edge Measurements

\$15.205 \$15.209



Date: 19.APR.2017 17:10:19

**Plot 7-12. Radiated Restricted Upper Band Edge Measurement (Peak)**

FCC ID: OXW-DS0043	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)	<b>DeviceSolutions</b> Integration. Tested.	Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway		Page 24 of 32

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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 [μV/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 C63.10-2013

#### Test Settings

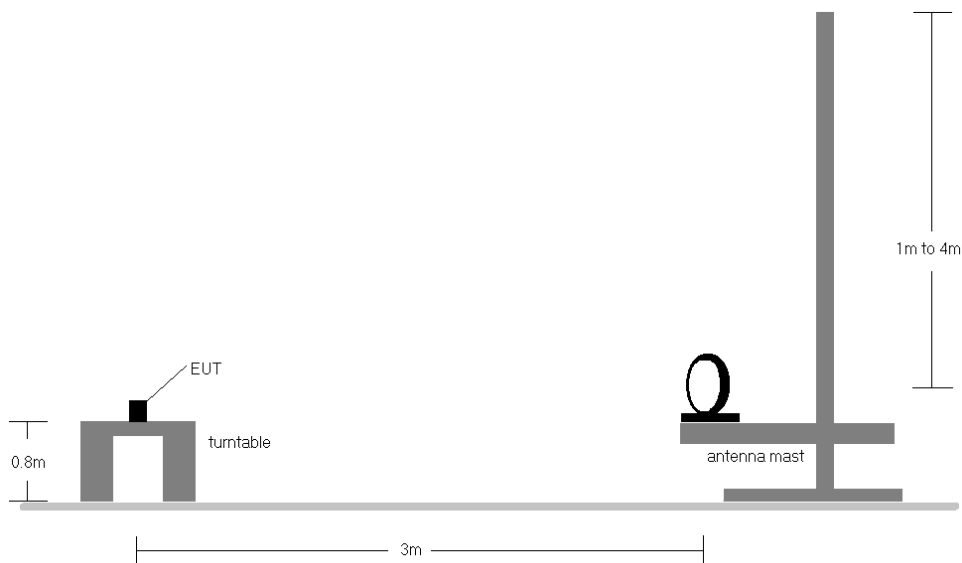
##### Quasi-Peak Field Strength Measurements

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

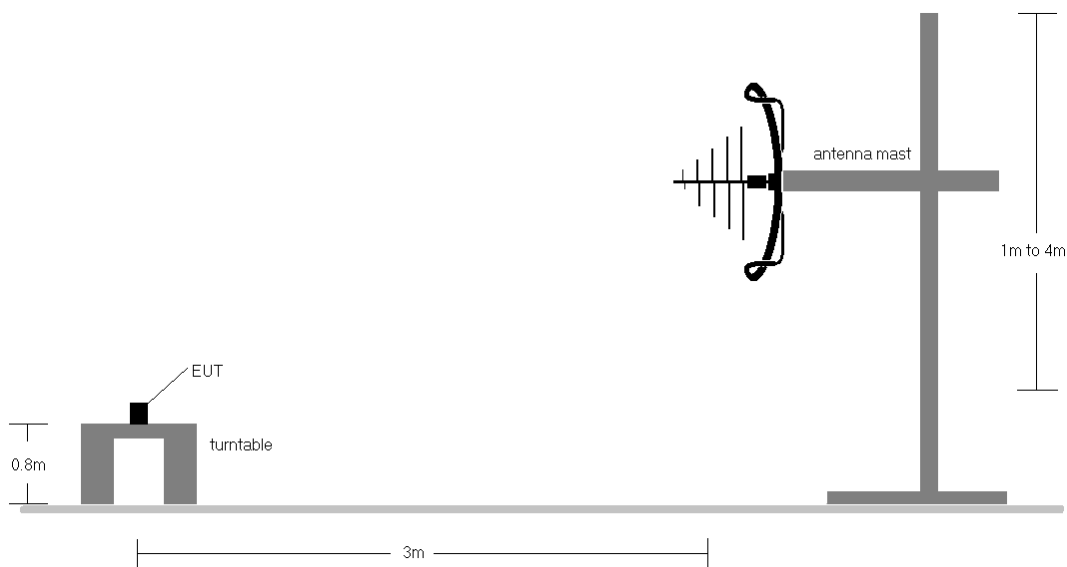
FCC ID: OXW-DS0043		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway		Page 25 of 32

## Test Setup

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



**Figure 7-2. Radiated Test Setup < 30Mhz**





**Figure 7-3. Radiated Test Setup < 1GHz**

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<b>Test Report S/N:</b> 1M1704120143-02.OXW	<b>Test Dates:</b> 4/14-4/26/2017	<b>EUT Type:</b> WiFi Gateway		Page 26 of 32



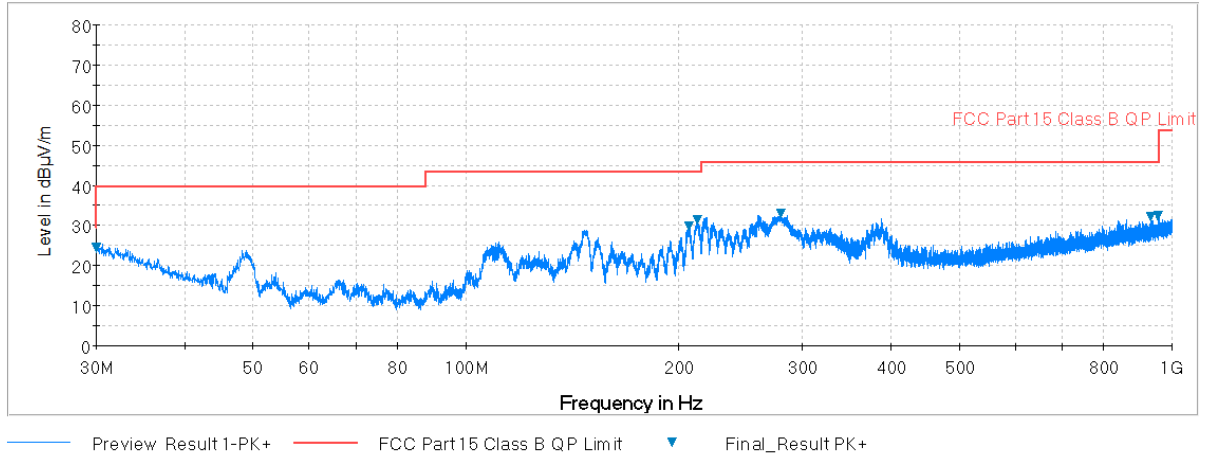
## Test Notes

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 while powered by an AC power source.
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 however emissions whose levels were not within 20dB of the respective limits were not 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. No spurious emissions were detected within 20dB of the limit below 30MHz.
8. 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.
9. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

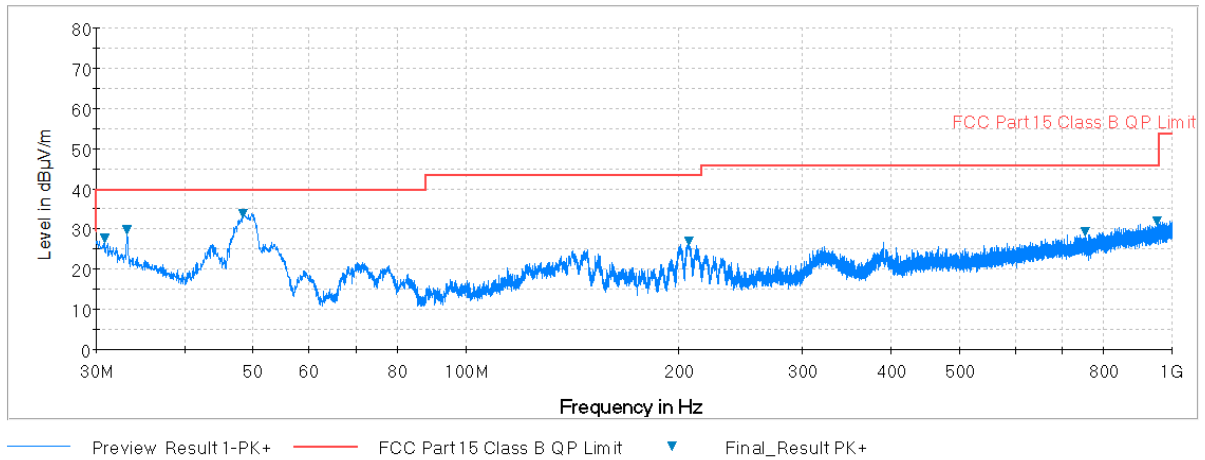
FCC ID: OXW-DS0043		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway			Page 27 of 32

## Radiated Spurious Emissions Measurements (Below 1GHz)

### §15.209



**Plot 7-13. Radiated Spurious Plot below 1GHz (Pol. H)**



**Plot 7-14. Radiated Spurious Plot below 1GHz (Pol. V)**

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Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway		Page 28 of 32

## 7.4 Line-Conducted Test Data

### §15.207

#### Test Overview and Limit

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN 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 conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

***All conducted emissions must not exceed the limits shown in the table below, per Section 15.207.***

Frequency of emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

**Table 7-7. Conducted Limits**

\*Decreases with the logarithm of the frequency.

#### Test Procedures Used

ANSI C63.10-2013, Section 6.2



#### Test Settings

##### Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

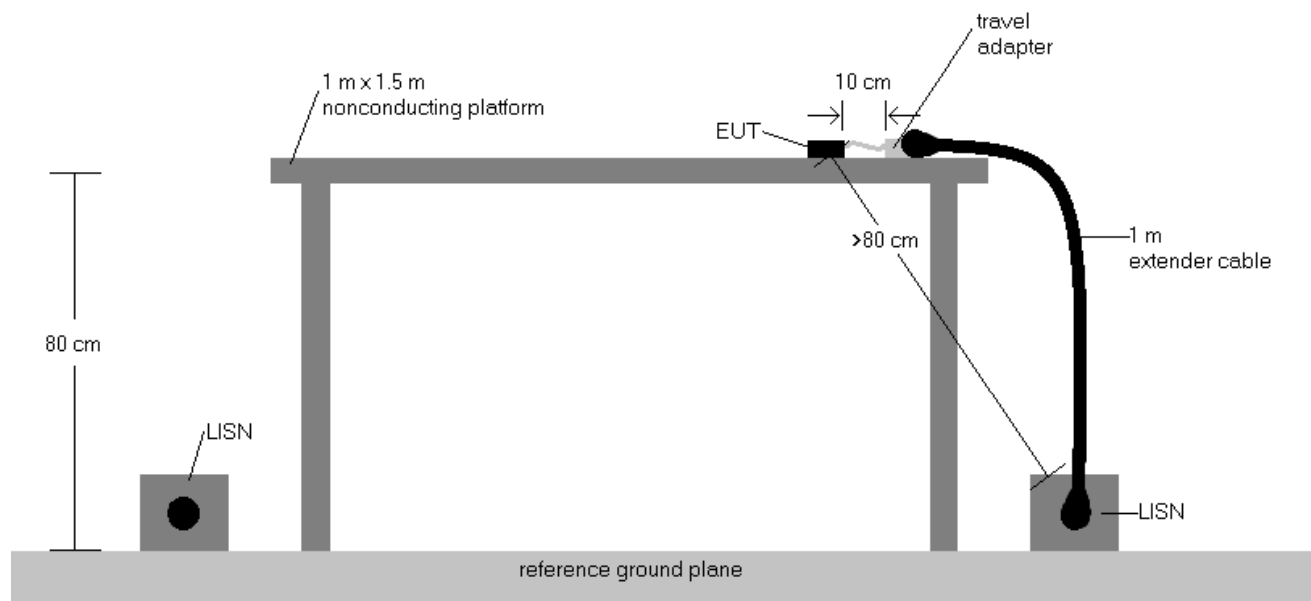
##### Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = RMS
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.

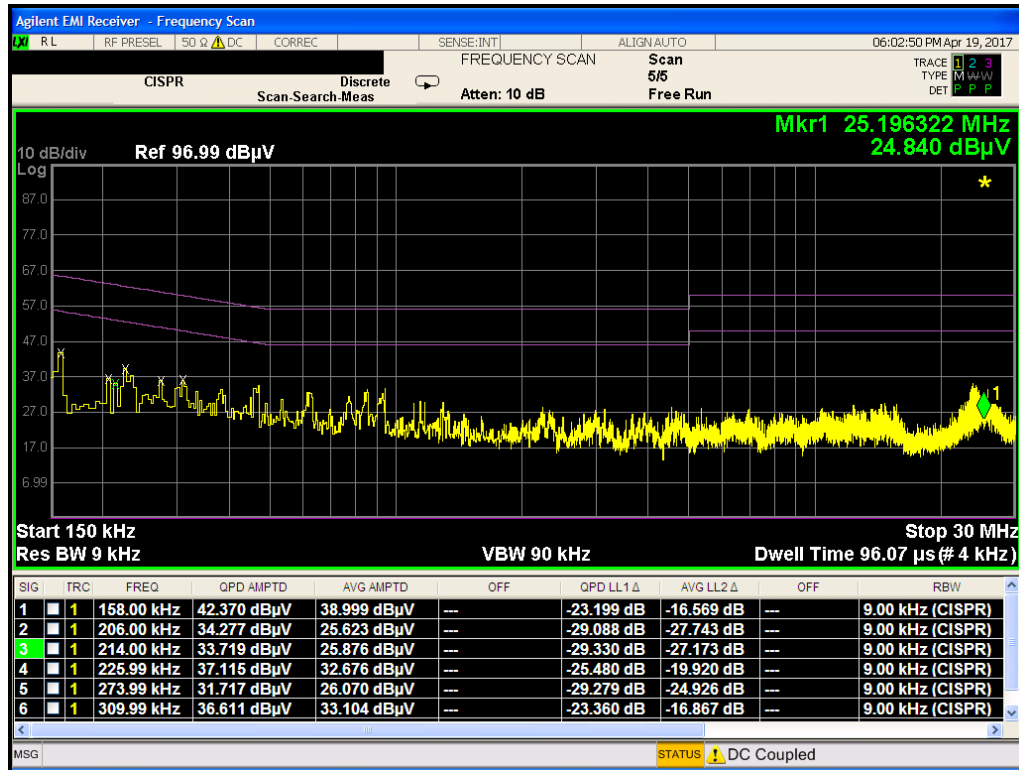


**Figure 7-4. Test Instrument & Measurement Setup**

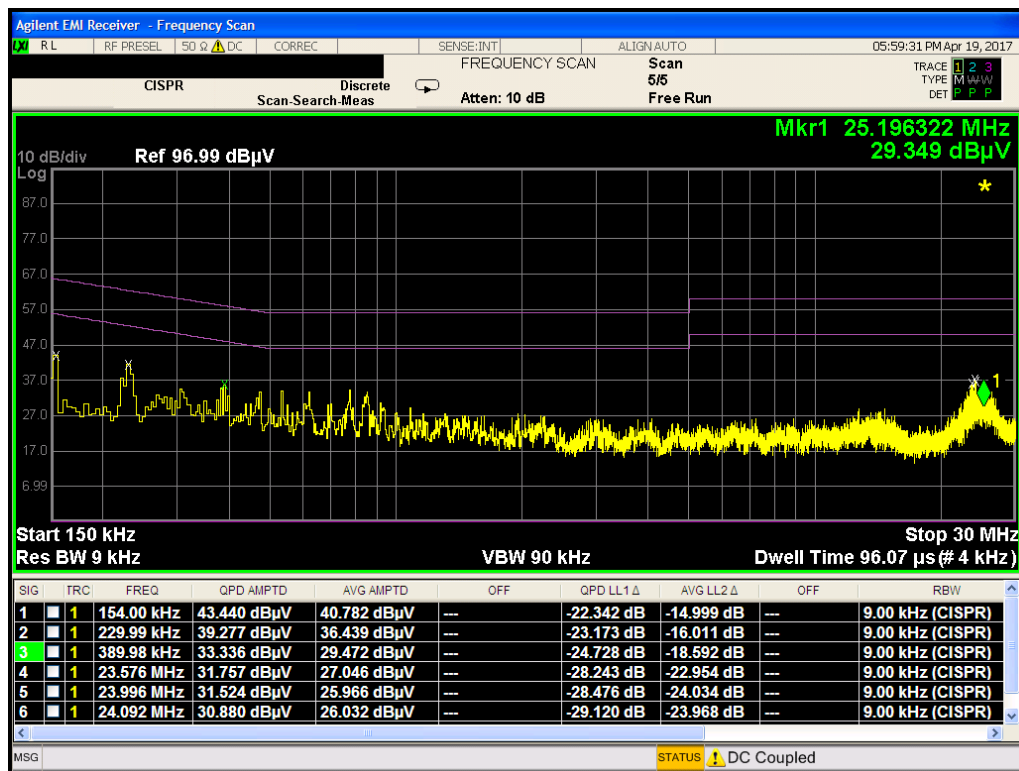
## Test Notes

1. All modes of operation were investigated and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
2. The limit for an intentional radiator from 150kHz to 30MHz are specified in 15.207.
3.  $\text{Corr. (dB)} = \text{Cable loss (dB)} + \text{LISN insertion factor (dB)}$
4.  $\text{QP/AV Level (dB}\mu\text{V)} = \text{QP/AV Analyzer/Receiver Level (dB}\mu\text{V)} + \text{Corr. (dB)}$
5.  $\text{Margin (dB)} = \text{QP/AV Limit (dB}\mu\text{V)} - \text{QP/AV Level (dB}\mu\text{V)}$
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

<b>FCC ID:</b> OXW-DS0043	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)</b>	<b>DeviceSolutions</b> Integration. Redefined.	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1704120143-02.OXW	<b>Test Dates:</b> 4/14-4/26/2017	<b>EUT Type:</b> WiFi Gateway		Page 30 of 32



Plot 7-15. Line Conducted Plot with 802.11b (L1)





Plot 7-16. Line Conducted Plot with 802.11b (N)

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## 8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Device Solutions WiFi Gateway FCC ID: OXW-DS0043** is in compliance with Part 15C of the FCC Rules.

FCC ID: OXW-DS0043		FCC Pt. 15.247 802.11b/g/n MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1704120143-02.OXW	Test Dates: 4/14-4/26/2017	EUT Type: WiFi Gateway			Page 32 of 32