PCTEST ENGINEERING LABORATORY, INC.
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MEASUREMENT REPORT
FCC PART 15.247 / IC RSS-210 900MHz ISM Band

Applicant Name:
Device Solutions Inc.
3211 Moorefields Road
Hillsborough, NC 27278
USA

Date of Testing:
07/20 - 07/24/2012
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
0Y1207190976.OXW

FCC ID:	**OXW-PA0002**
APPLICANT:	**Device Solutions Inc.**

Application Type:	Certification
Model(s):	PA0002
EUT Type:	Sensor Board Module
Max. RF Output Power:	3.491 mW (5.43dBm) Conducted
Frequency Range:	904.8 – 924.8MHz
Type of Modulation:	GFSK
FCC Classification:	FCC Part 15 Spread Spectrum Transmitter (DSS)
FCC Rule Part(s):	Part 15 Subpart C (15.247)
IC Specification(s):	RSS-210 Issue 8
Test Procedure(s):	ANSI C63.4-2003/2009, ANSI C63.10-2009, DA 00-705

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 ANSI C63.4-2003/2009, ANSI C63.10-2009, and DA 00-705. 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.

PCTEST certifies that no party to this application has been subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Randy Ortanez
President

ACCREDITED
TESTING LABORATORY
CERTIFICATE #2041.01

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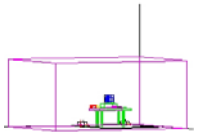
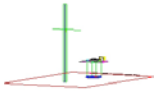


MEASUREMENT REPORT
FCC Part 15.247



§ 2.1033 General Information

APPLICANT:	Device Solutions Inc.
APPLICANT ADDRESS:	3211 Moorefields Road
	Hillsborough, NC 27278, USA
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA
FCC RULE PART(S):	Part 15 Subpart C (15.247)
IC SPECIFICATION(S):	RSS-210 Issue 8
BASE MODEL:	PA0002
FCC ID:	OXW-PA0002
Test Device Serial No.:	N/A ☐ Production ☒ Pre-Production ☐ Engineering
FCC CLASSIFICATION:	FCC Part 15 Spread Spectrum Transmitter (DSS)
Method/System:	Frequency Hopping Spread Spectrum (FHSS)
DATE(S) OF TEST:	07/20 - 07/24/2012
TEST REPORT S/N:	0Y1207190976.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.

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 Internt'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 C63.4-2003 on February 15, 2012.

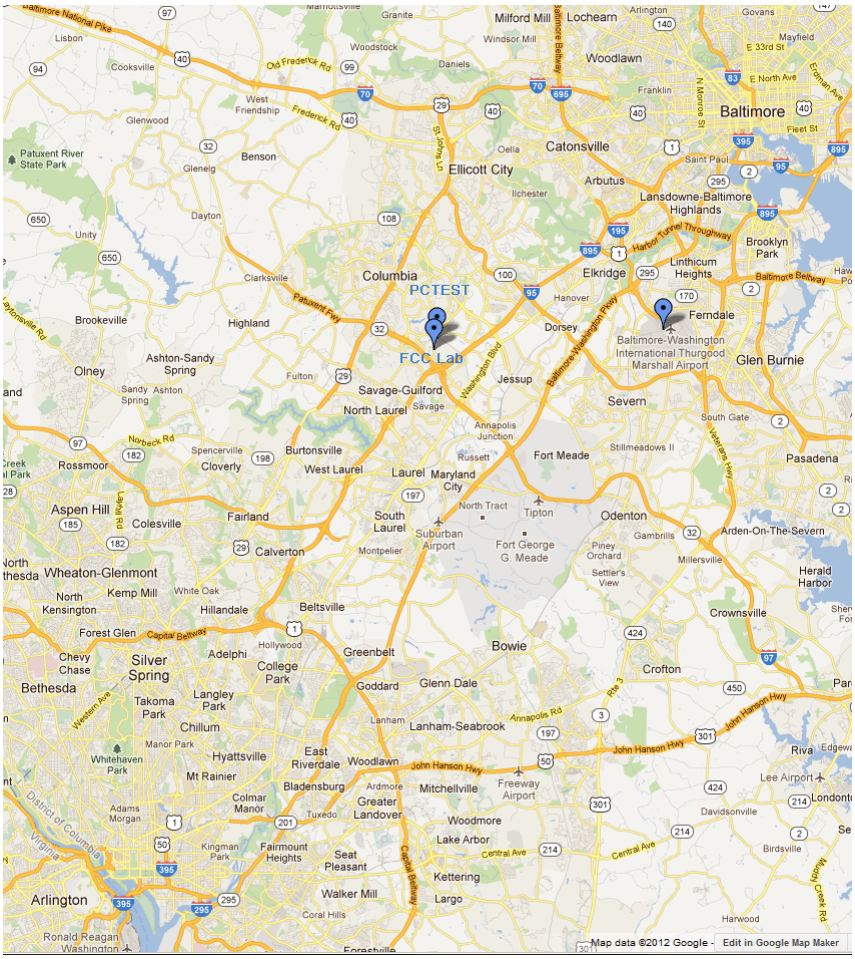


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Device Solutions Sensor Board Module FCC ID: OXW-PA0002**. The test data contained in this report pertains only to the emissions due to the EUT's hopping transmitter.

2.2 Device Capabilities

This device contains the following capabilities:

900MHz ISM Band Hopping Transmitter

2.3 Test Configuration

The **Device Solutions Sensor Board Module FCC ID: OXW-PA0002** was tested per the guidance of ANSI C63.10-2009 and DA 00-705. See Sections 3.2, 3.3, and 6.1 of this test report for a description of the AC line conducted emissions, radiated emissions, and antenna port conducted emissions test setups, respectively.

2.4 EMI Suppression Device(s)/Modifications

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

2.5 Labeling Requirements

Per 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(b)(2).
Please see attachment for FCC ID label and label location.

3.0 DESCRIPTION OF TEST

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2003/2009), the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009), and the "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems" (DA 00-705) were used in the measurement of the **Device Solutions Sensor Board Module FCC ID: OXW-PA0002.**

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. Each emission was also maximized by varying: power lines, the mode of operation or resolution, clock or data exchange speed, scrolling H pattern to the EUT and/or support equipment whichever determined the worst-case 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 6.10. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 8.51.0.

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. 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, the absorbers are removed. An ETS Lindgren Model 2188 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. A 78cm high PVC support structure is placed on top of the turntable. A ¾" (~1.9cm) sheet of high density polyethylene 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 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 varying: the mode of operation or resolution, clock or data rate, scrolling H pattern to the EUT and/or support equipment, and changing the polarity of the receive antenna, whichever produced the worst-case emissions. To record the final measurements, the analyzer detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 120kHz for frequencies below 1GHz or 1MHz for frequencies above 1GHz. For average measurements above 1GHz, the analyzer was set to peak detector with a reduced VBW setting (RBW = 1MHz, VBW $\geq$ 1/T Hz, where T = pulse width).

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 Device Solutions Sensor Board Module are **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The **Device Solutions Sensor Board Module FCC ID: OXW-PA0002** 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

5.0 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)	7/10/2012	Annual	7/10/2013	N/A
-	RE2	Radiated Emissions Cable Set (VHF/UHF)	2/13/2012	Annual	2/13/2013	N/A
Agilent	8447D	Broadband Amplifier	5/8/2012	Annual	5/8/2013	2443A01900
Agilent	N9020A	MXA Signal Analyzer	10/10/2011	Annual	10/10/2012	US46470561
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	7/22/2011	Biennial	7/22/2013	125518
Mini-Circuits	VHF-1200+	High Pass Filter	1/15/2012	Annual	1/15/2013	30923
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	6/26/2012	Annual	6/26/2013	100071
Rohde & Schwarz	ESU26	EMI Test Receiver	12/15/2011	Annual	12/15/2012	100342
Solar Electronics	8012-50-R-24-BNC	LISN	6/23/2011	Biennial	6/23/2013	310233
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/26/2012	Biennial	1/26/2014	A051107

Table 5-1. Annual Test Equipment Calibration Schedule

6.0 TEST RESULTS

6.1 Summary

Company Name: Device Solutions Inc.

FCC ID: OXW-PA0002

Method/System: Frequency Hopping Spread Spectrum (FHSS)

Number of Channels: 50

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
TRANSMITTER MODE (Tx)						
15.247(a)(1)(i)	RSS-210 [A8.1(c)]	20dB Bandwidth	< 500 kHz	CONDUCTED	PASS	Section 6.2
15.247(b)(2)	RSS-210 [A8.4(1)]	Peak Transmitter Output Power	< 1 Watt if ≥ 50 non-overlapping channels used		PASS	Section 6.3
15.247(a)(1)	RSS-210 [A8.1(b)]	Channel Separation	> 20 dB BW		PASS	Section 6.5
15.247(a)(1)(i)	RSS-210 [A8.1(c)]	Number of Channels	> 50 Channels		PASS	Section 6.7
15.247(a)(1)(i)	RSS-210 [A8.1(c)]	Time of Occupancy	< 0.4 sec in 20 sec period		PASS	Section 6.6
15.247(d)	RSS-210 [A8.5]	Band Edge / Out-of-Band Emissions	Conducted < 20dBc		PASS	Section 6.4, Section 6.8
15.205 15.209	RSS-210 [A8.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-210 table 3 limits)	RADIATED	PASS	Section 6.9
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits or < RSS-Gen table 2 limits	LINE CONDUCTED	PASS	Section 6.10
RECEIVER MODE (Rx) / DIGITAL DEVICE						
15.107	RSS-Gen [7.2.2]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.107 limits or < RSS-Gen table 2 limits	LINE CONDUCTED	PASS	Part 15B Test Report
15.109	RSS-Gen [7.2.3.2]	General Field Strength Limits (Restricted Bands and Radiated Emissions Limits)	< FCC 15.109 limits or < RSS-Gen limits [Section 6; Table1]	RADIATED (30MHz-1GHz) (1-25 GHz)	PASS	Part 15B Test Report

Table 6-1. 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, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT 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, attenuators, and couplers.

6.2 20dB Bandwidth Measurement

§15.247 (a)(1)(i); RSS-210 (A8.1(c))

The bandwidth at 20dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies. ***The maximum permissible 20dB bandwidth is 500 kHz.***

Frequency [MHz]	20dB Bandwidth Test Results	
	[kHz]	Pass/Fail
904.8	192.33	Pass
914.8	192.83	Pass
924.8	192.17	Pass

Table 6-2. Conducted 20dB Bandwidth Measurements

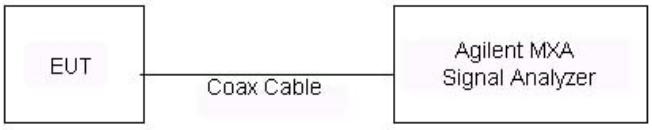
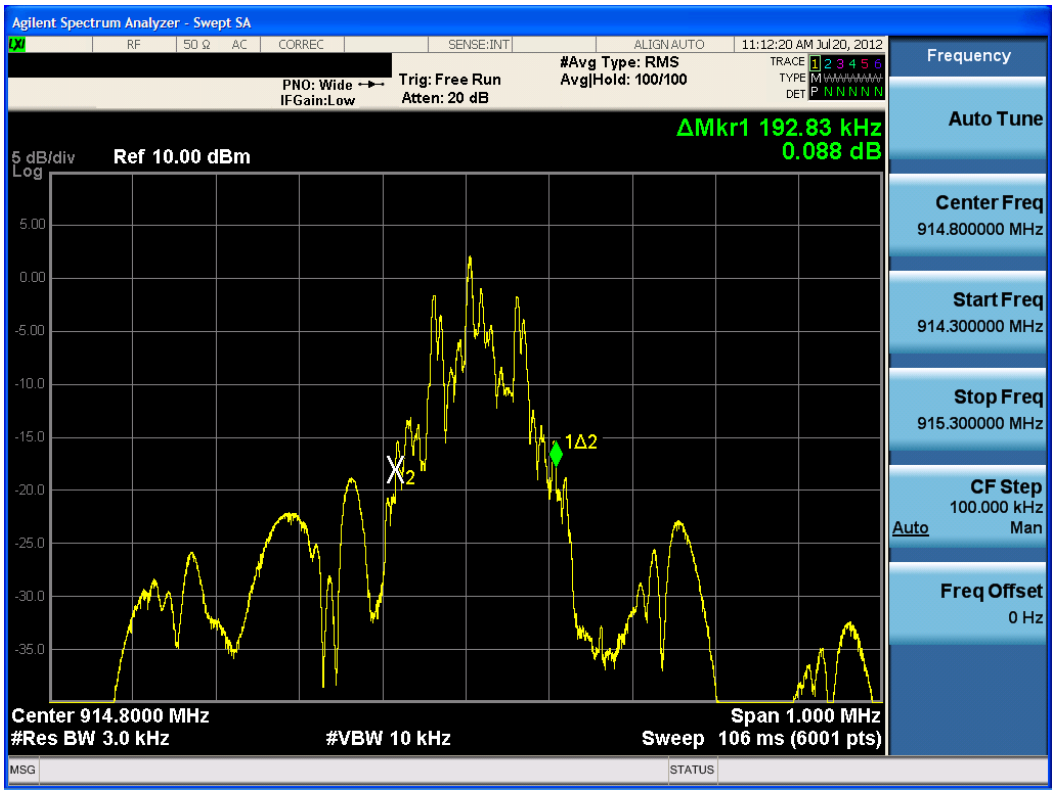


Figure 6-1. Test Instrument & Measurement Setup

Plot 6-1. 20dB Bandwidth Plot (Low Channel)



Plot 6-2. 20dB Bandwidth Plot (Mid Channel)

Plot 6-3. 20dB Bandwidth Plot (High Channel)

6.3 Output Power Measurement

§15.247 (b)(2); RSS-210 (A8.4 (1))

Measurement is made while the EUT is operating in non-hopping transmission mode. The powers shown below were measured using a spectrum analyzer. Peak power measurements are performed in the analyzers' swept spectrum mode using a peak detector with RBW = VBW = 3MHz. ***Since at least 50 hopping channels are used, the maximum permissible output power is 1 Watt.***

Frequency [MHz]	Peak Conducted Power	
	[dBm]	[mW]
904.8	4.87	3.069
914.8	5.11	3.243
924.8	5.43	3.491

Table 6-3. Conducted Output Power Measurements

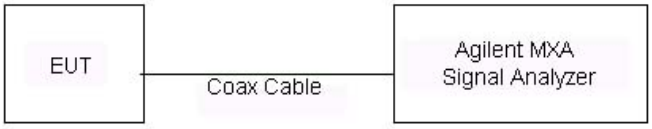


Figure 6-2. Test Instrument & Measurement Setup

Note

Final results were obtained using calibrated attenuators and cables. The following formula was used:

Output Power (dBm) = Raw Analyzer Level (dBm) + Cable Loss (dB) + Attenuator Loss (dB)

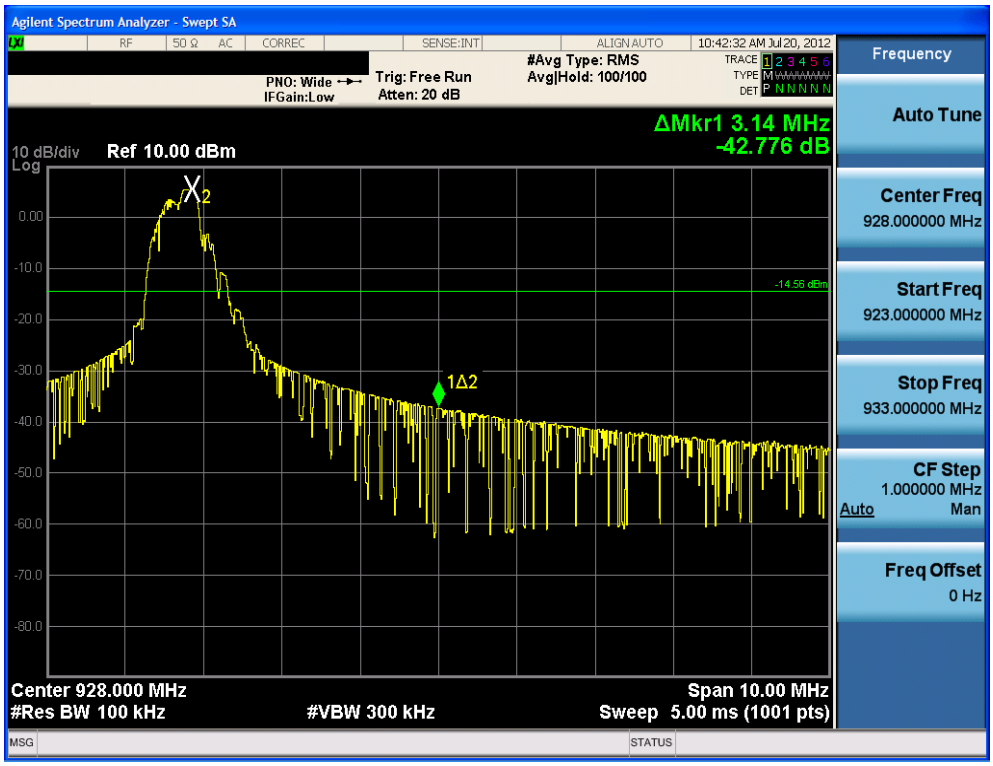
6.4 Band Edge Compliance

§15.247 (d); RSS-210 (A8.5)

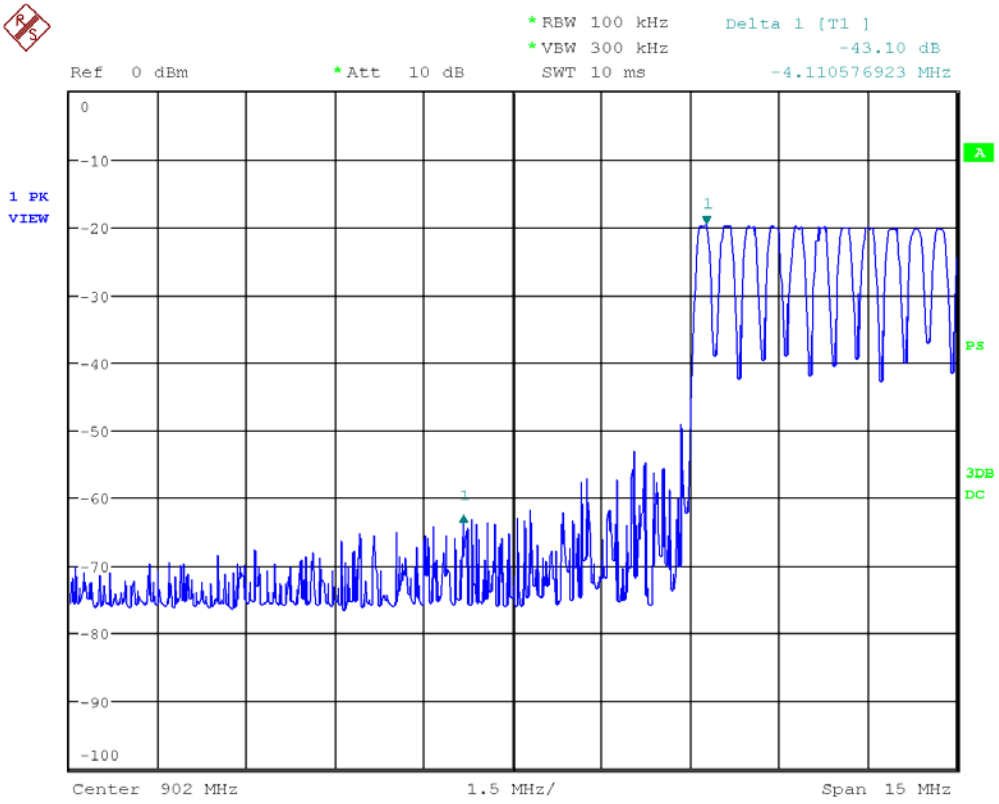
Measurement is taken at the highest point located outside of the emission bandwidth. ***The maximum permissible emission level is 20 dBc. Any emission lying outside of the emission bandwidth and in a restricted band is subject to a field strength limit specified in Section 15.209 of the Title 47 CFR.***

Out of band conducted spurious emissions at the band edge were investigated with the EUT transmitting at its maximum power in hopping and non-hopping modes. Plots of the worst case emissions are shown below.

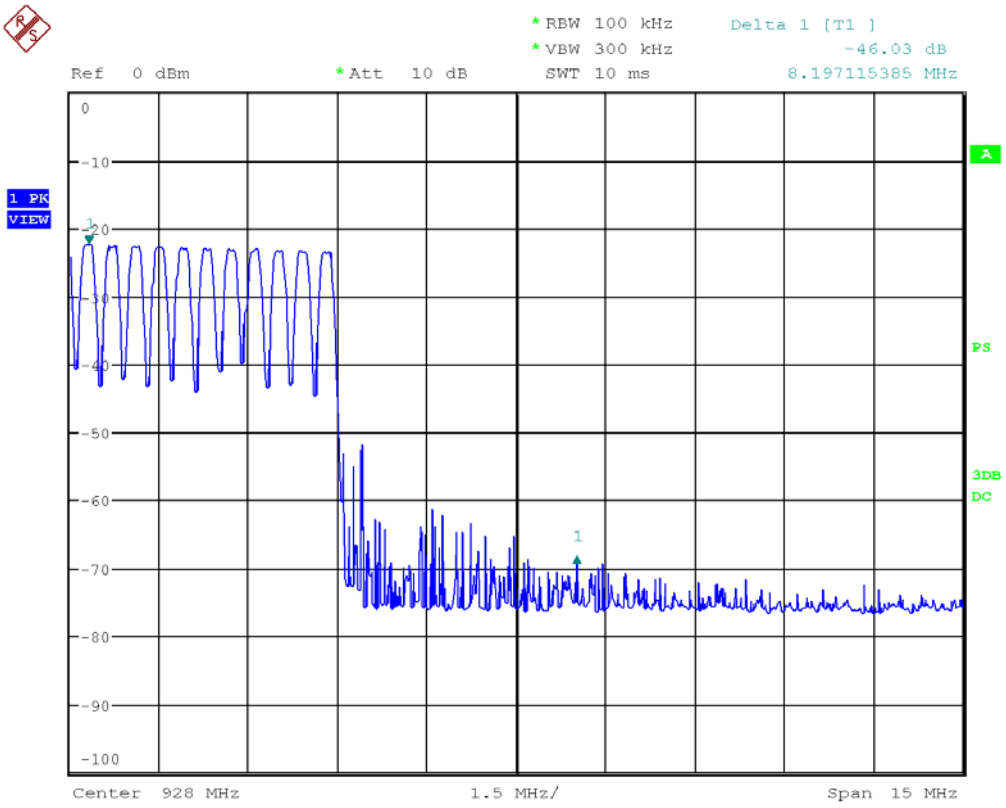
Plot 6-4. Lower Band Edge Plot (Hopping Disabled)



Plot 6-5. Upper Band Edge Plot (Hopping Disabled)



Plot 6-6. Lower Band Edge Plot (Hopping Enabled)



Plot 6-7. Upper Band Edge Plot (Hopping Enabled)

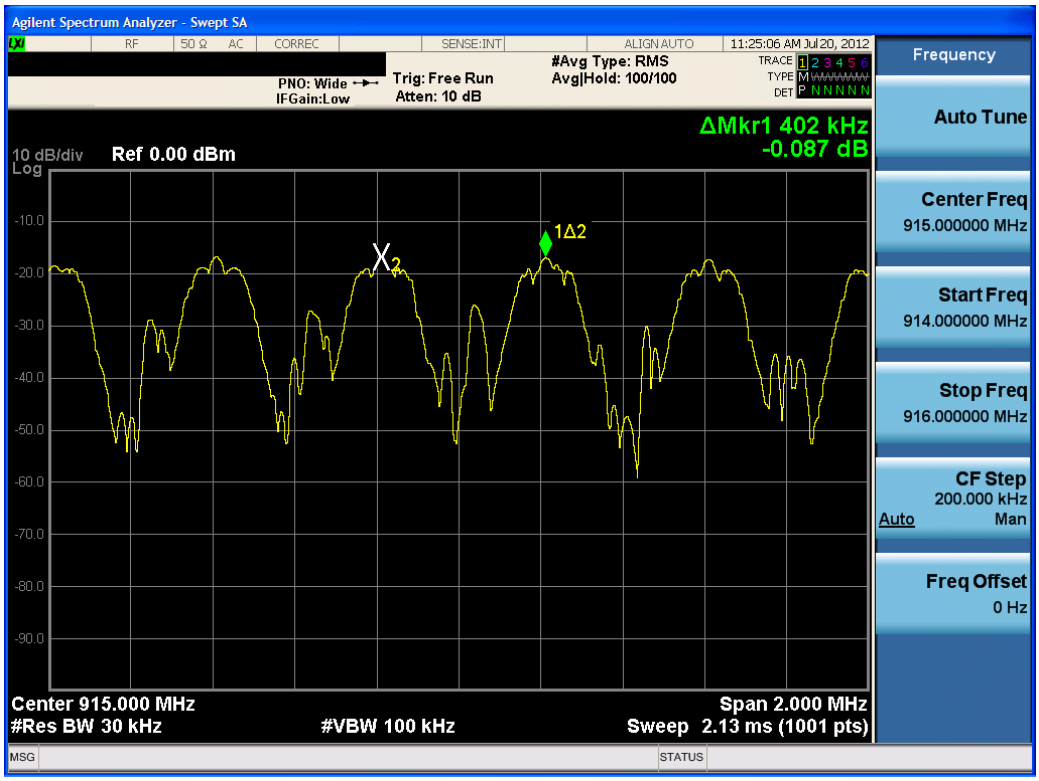
6.5 Carrier Frequency Separation

§15.247 (a)(1); RSS-210 (A8.1 (b))

Measurement is made with EUT operating in hopping mode. ***The minimum permissible channel separation for this system is equal to the value of the 20dB BW.***

Frequency [MHz]	Min. Channel Separation [MHz]
904.8	0.1923
914.8	0.1928
924.8	0.1922

Table 6-4. Minimum Channel Separation



Plot 6-8. Channel Spacing Plot

6.6 Time of Occupancy

§15.247 (a)(1)(i); RSS-210 (A8.1 (c))

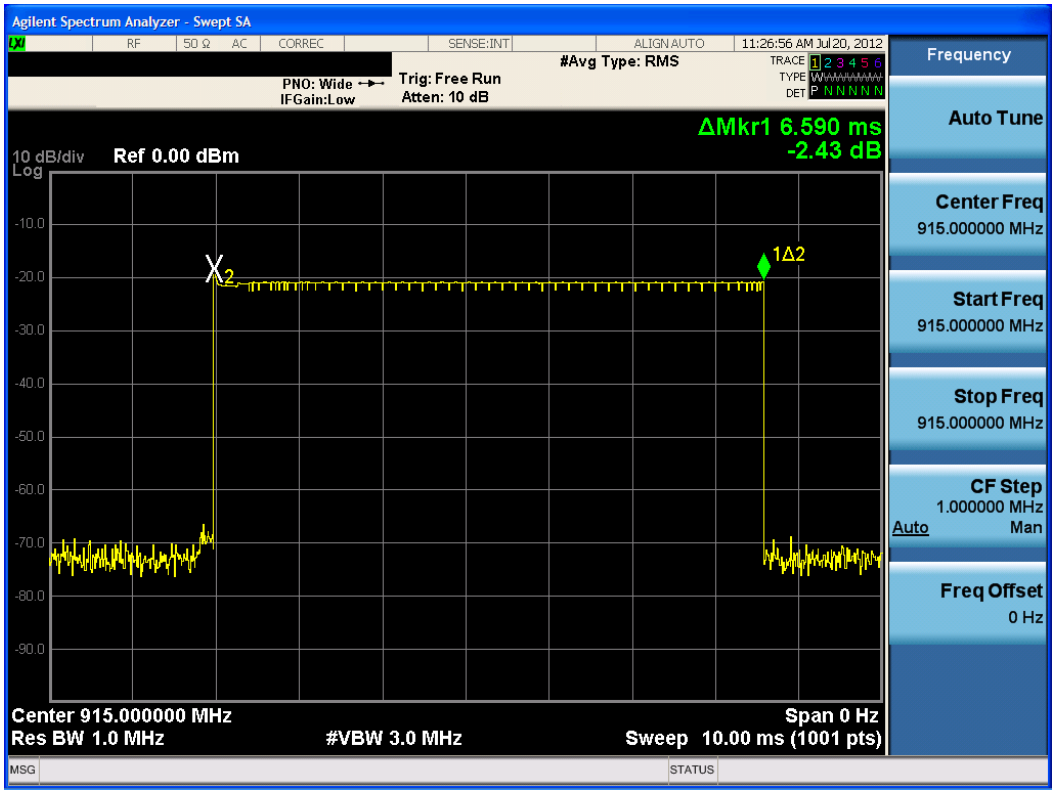
Measurement is made while EUT is operating in hopping mode with the spectrum analyzer set to zero span. ***The maximum permissible time of occupancy is 400 ms within a period of 20 seconds.***

This device operates by sending bursts comprised of 60 pulses (Plot 6-10) each having a pulse width of 6.59ms (Plot 6-9). As the device pseudo-randomly hops through its hop table, it takes roughly 90 seconds (Plot 6-11) before the device returns to the original transmitting channel. Thus, the worst case dwell time over any 20 second window (Plot 6-12) would only include one 60-pulse burst.

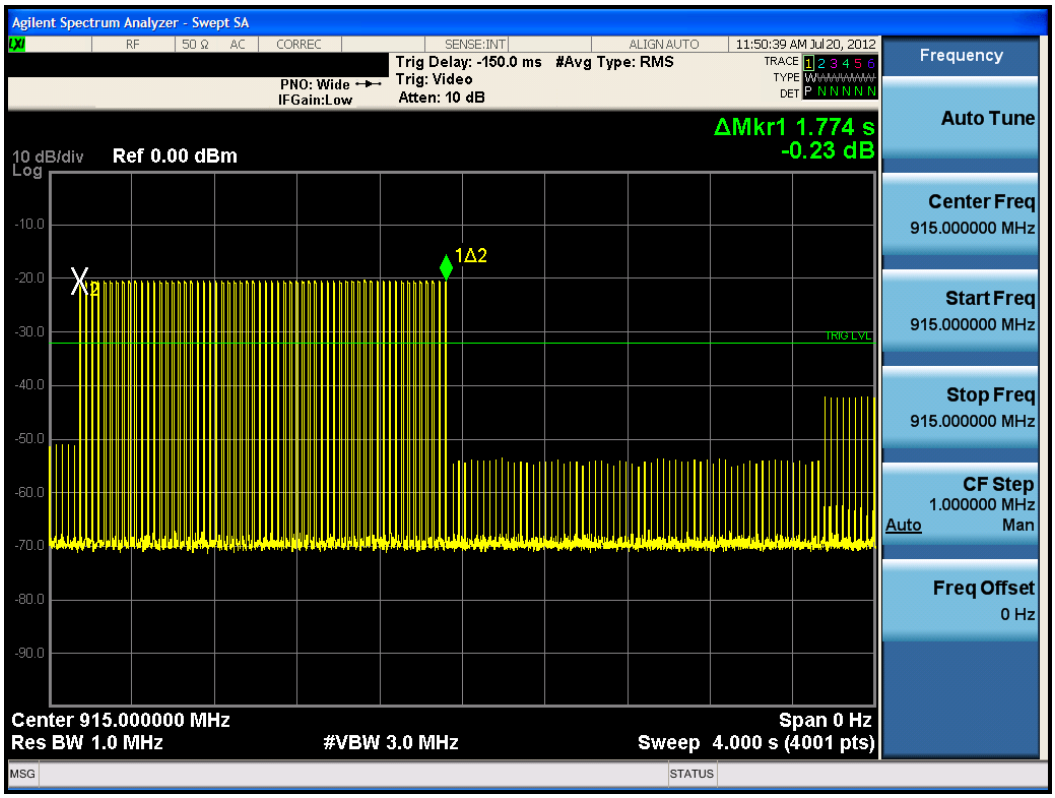
Time of Occupancy Calculation

The maximum allowed time of occupancy is 400 ms within any 20 second period.

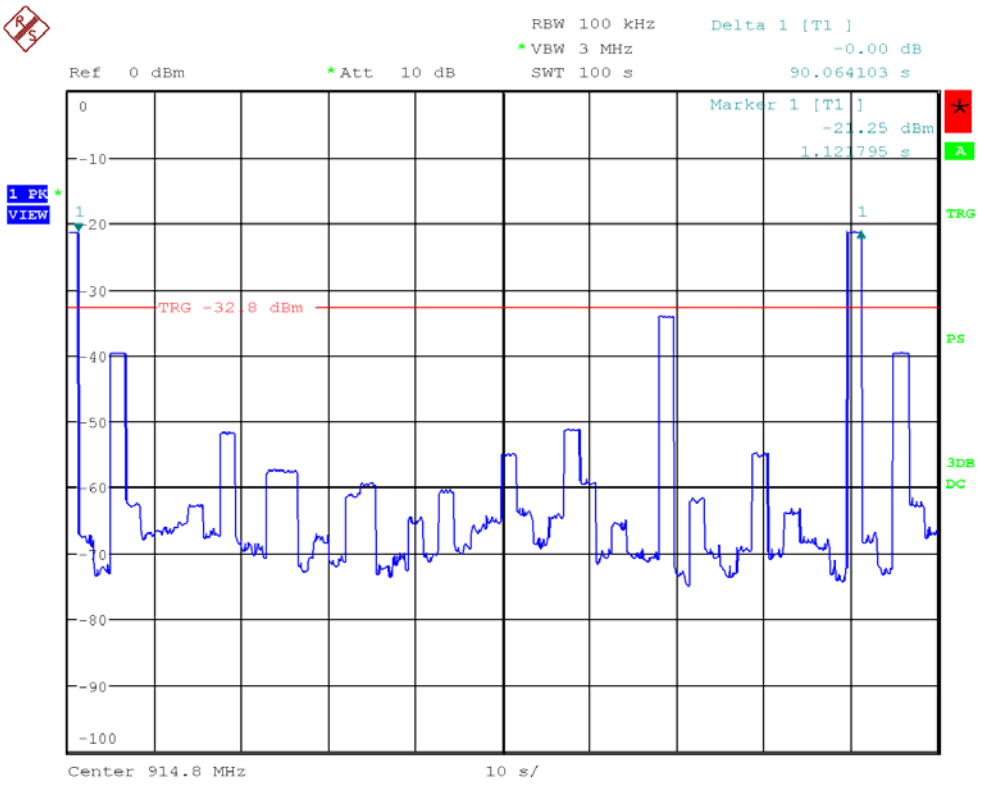
- Worst case 20 second period includes only one occurrence of a 60-pulse burst
- 6.59ms x 60 pulses/burst = 395.4ms (worst case dwell time for one channel)



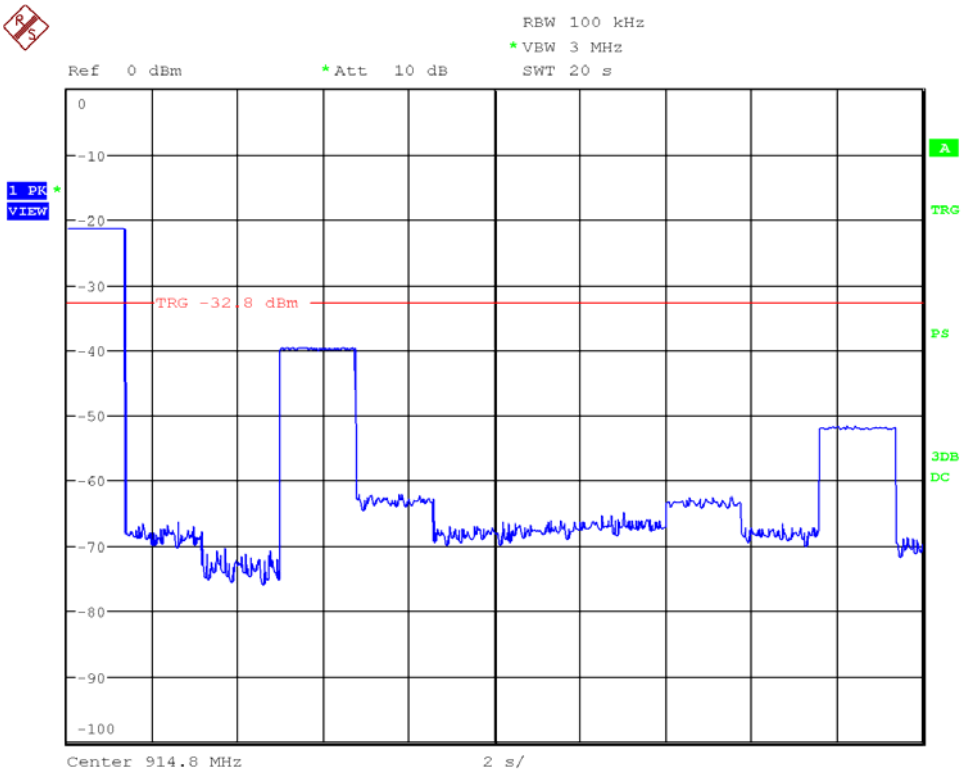
Plot 6-9. Pulse Width Plot



Plot 6-10. Burst Length Plot



Plot 6-11. Time Required to Hop Through All Channels

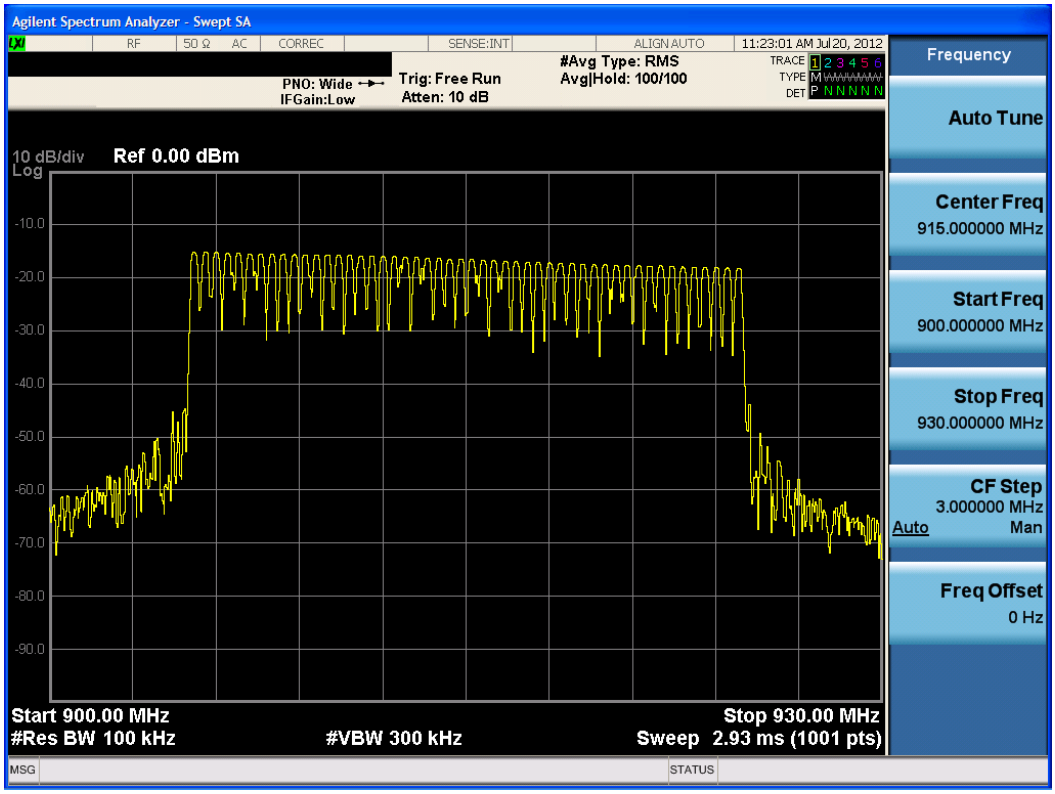


Plot 6-12. Worst Case Dwell Time in a 20 second Period

6.7 Number of Hopping Channels

§15.247 (a)(1)(ii; RSS-210 (A8.1 (c))

Measurement is made while EUT is operating in hopping mode. ***This frequency hopping system must employ a minimum of 50 hopping channels since the 20dB BW is less than the required 250 kHz.***



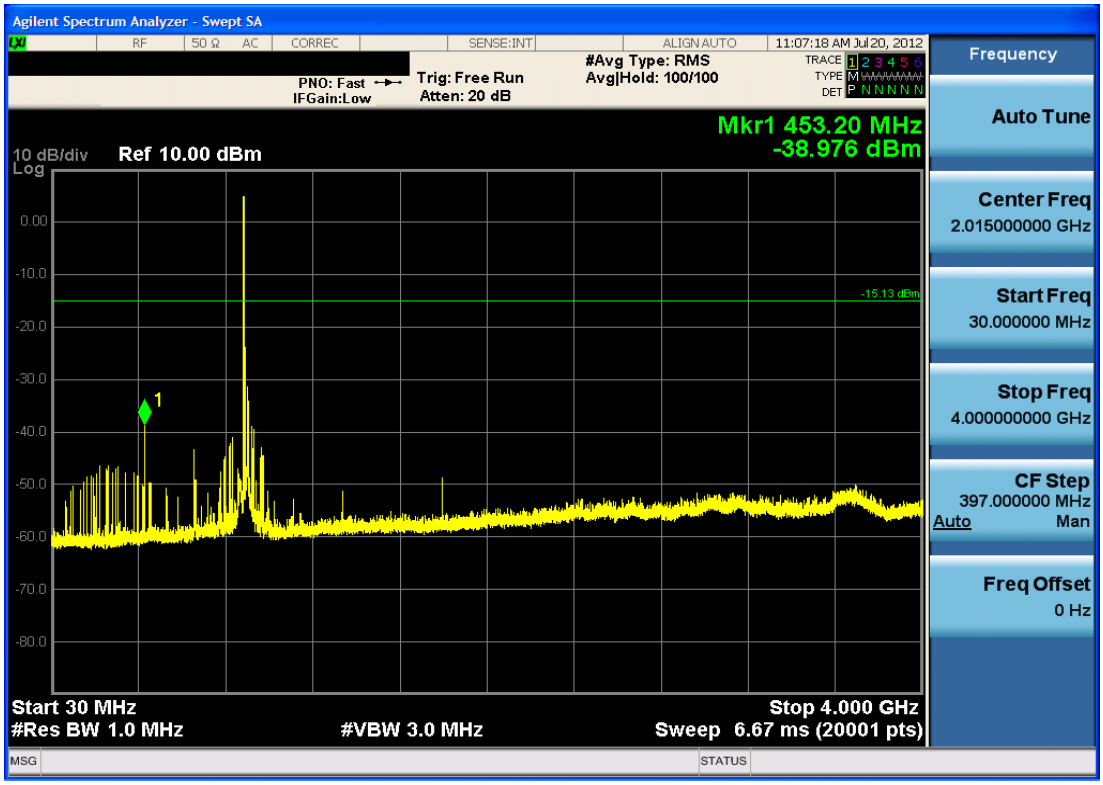
Plot 6-13. Channel Hopping Plot

6.8 Conducted Spurious Emissions

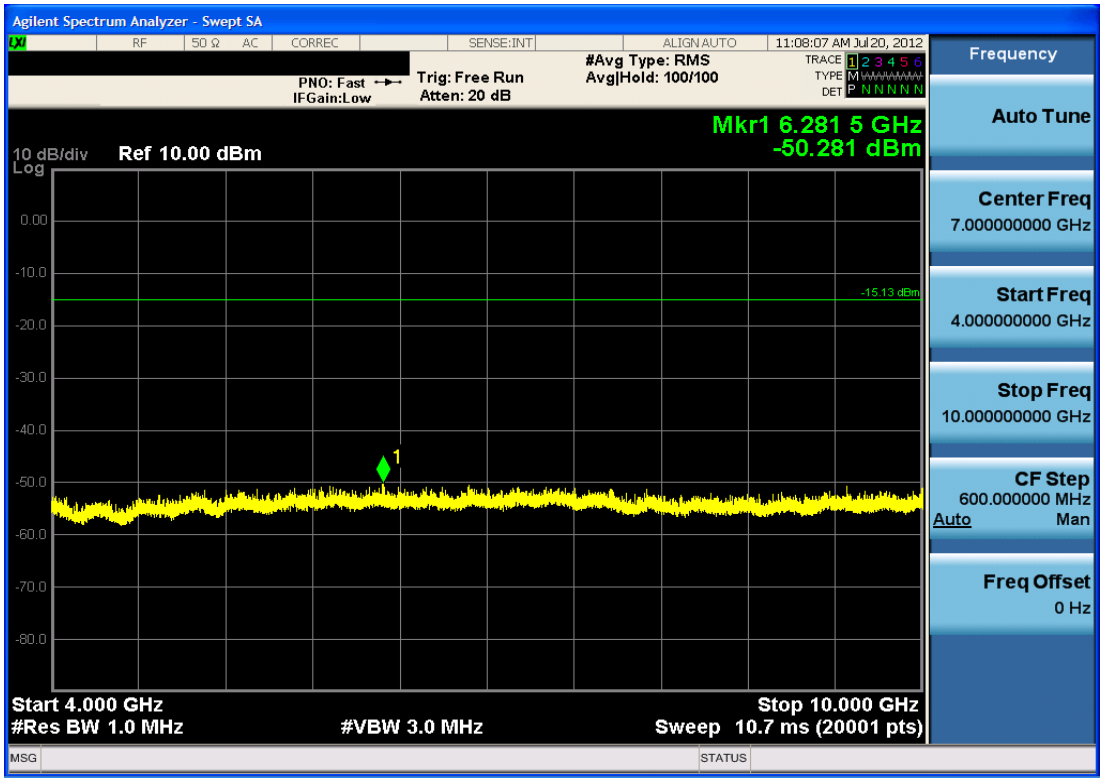
§15.247 (d)

Out of band conducted spurious emissions were performed with the EUT in non-hopping mode. Plots of the worst case emissions are shown below.

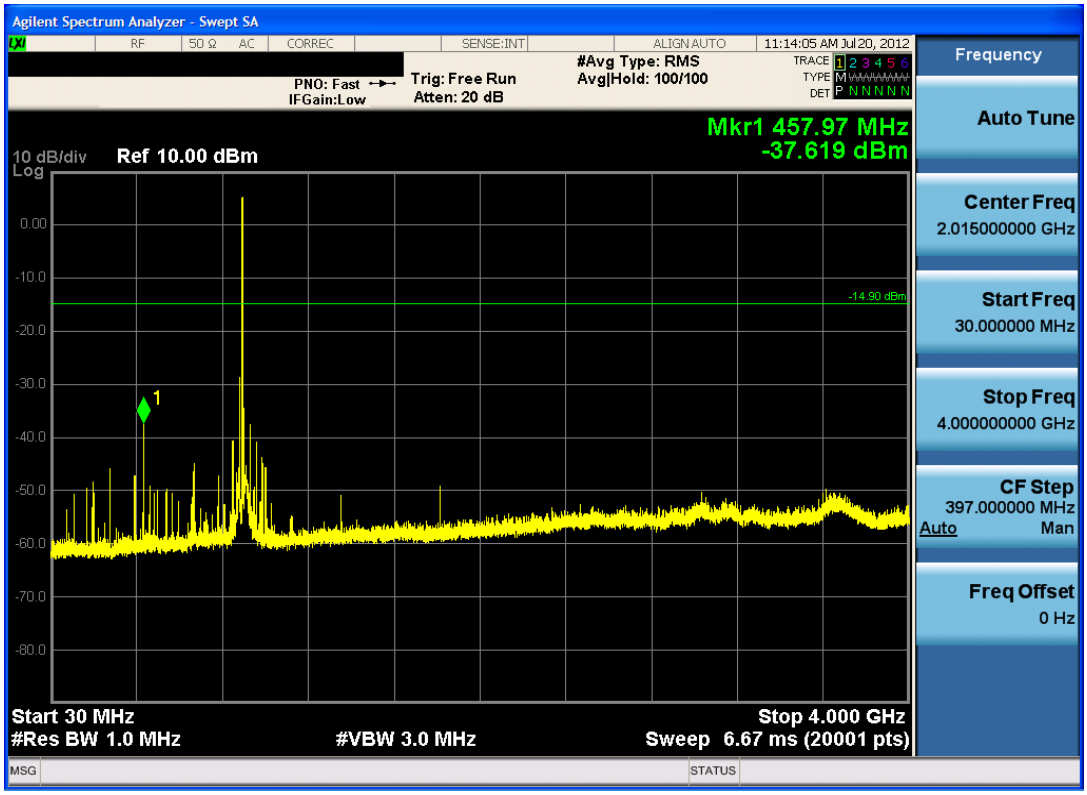
The display line shown in the following plots denotes the limit at 20dB below the fundamental emission level measured in a 100kHz bandwidth. However, since the traces in the following plots are measured with a 1MHz RBW, the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1MHz bandwidth.



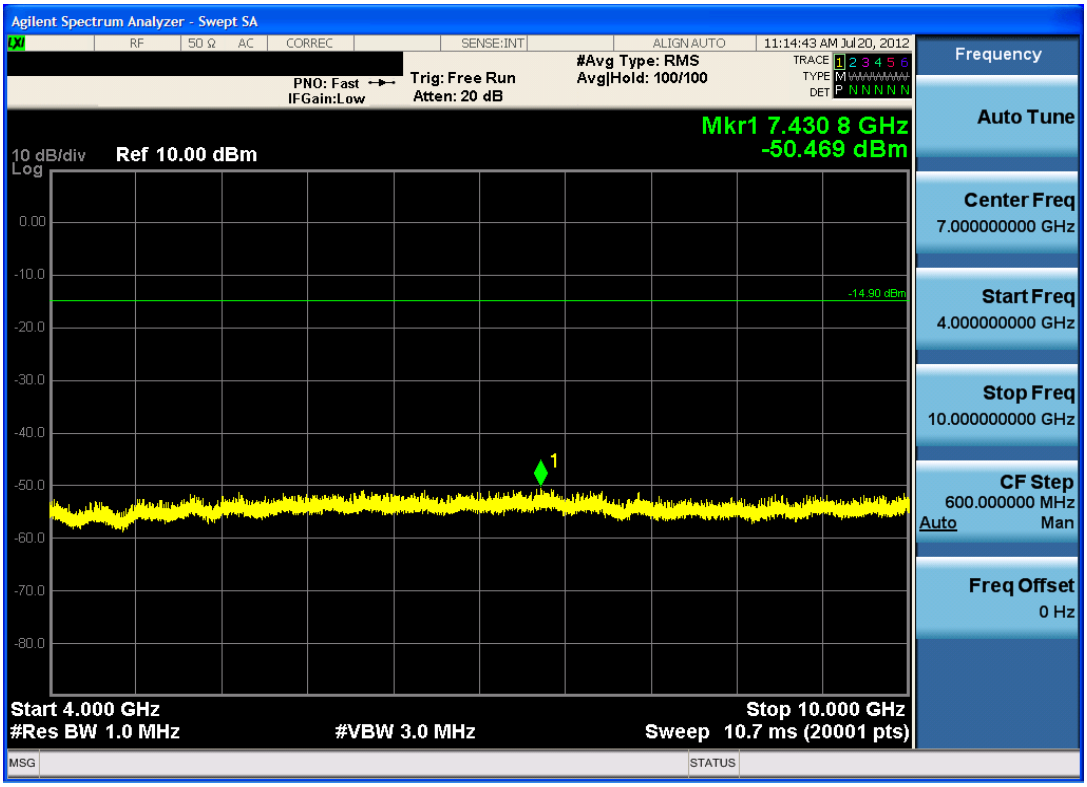
Plot 6-14. Conducted Spurious Plot (Low Channel)



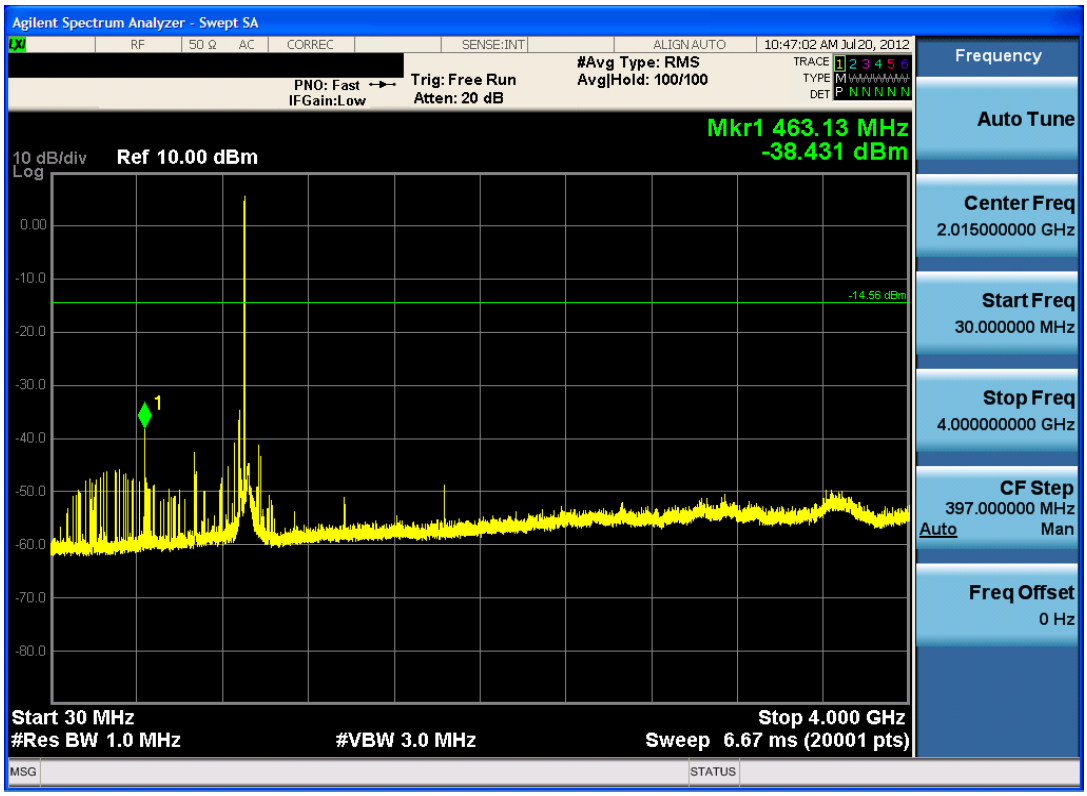
Plot 6-15. Conducted Spurious Plot (Low Channel)



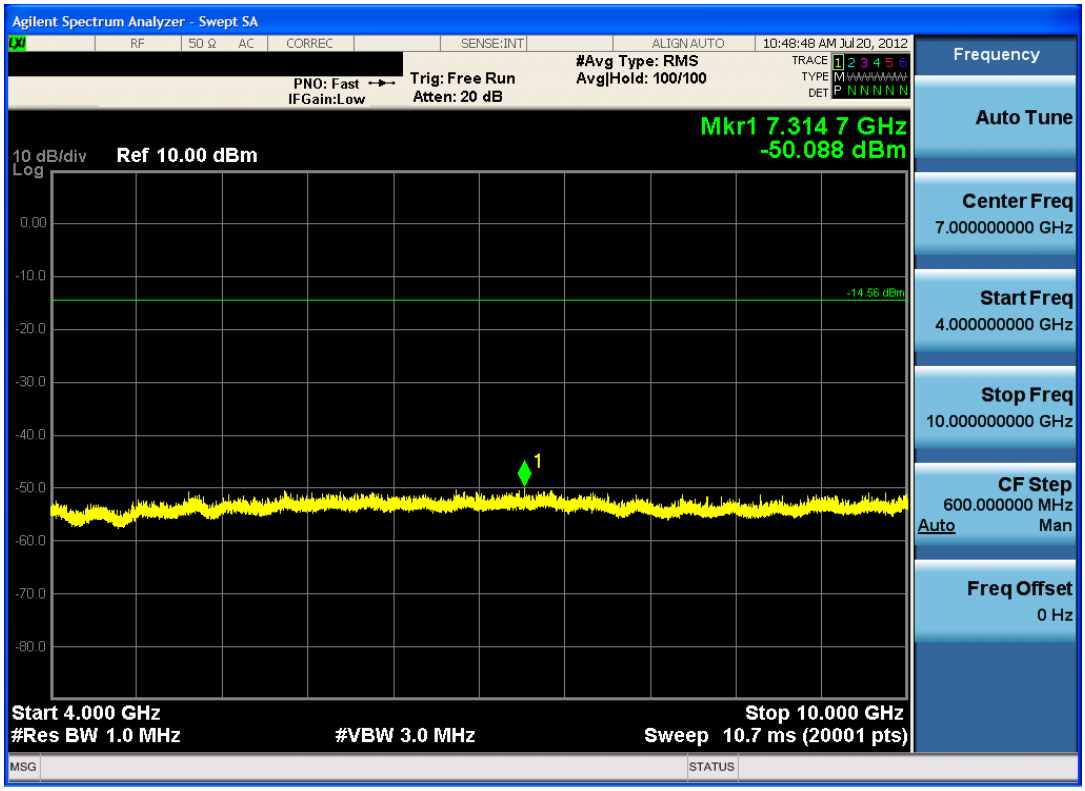
Plot 6-16. Conducted Spurious Plot (Mid Channel)



Plot 6-17. Conducted Spurious Plot (Mid Channel)



Plot 6-18. Conducted Spurious Plot (High Channel)



Plot 6-19. Conducted Spurious Plot (High Channel)

6.9 Radiated Spurious Emission Measurements

§15.205 & §15.209, §15.247 (d); RSS-210 (A8.5)

The EUT was tested from 9kHz and up to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average measurement was used, using RBW = 1MHz, VBW = 1kHz $\geq 1/\tau$ Hz, where τ is the emission pulse width in seconds, and linearly polarized horn antennas. 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 6-5 per Section 15.209. No significant radiated emissions were found in the 2310 - 2390MHz restricted band.

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 6-5. Radiated Limits

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 $_{[dB\mu V/m]}$

- Duty Cycle Correction Factor Calculation:
  - Pulse Repetition Interval = 30ms (PRI)
  - Pulse Width = 6.59ms
  - In the worst case 100ms window, there will be 4 pulse widths, based on a PRI of 30ms
  - Worst Case Dwell Time = 6.59ms x 4 = 26.36ms
  - Duty Cycle Correction = 20log(Worst Case Dwell Time/100ms) $_{[dB]}$ = -11.581dB

Radiated Spurious Emission Measurements (Cont'd)

§15.205 & §15.209, §15.247 (d); RSS-210 (A8.5)

Measurement Distance: 3 Meters

Operating Frequency: 904.8MHz

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Duty Cycle Correction [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
2714.40	-95.06	Avg	H	38.42	-11.58	38.78	53.98	-15.20
2714.40	-92.58	Peak	H	38.42	0.00	52.84	73.98	-21.14
3619.20	-92.42	Avg	H	38.42	-11.58	41.42	53.98	-12.56
3619.20	-87.51	Peak	H	38.42	0.00	57.91	73.98	-16.07
4524.00	-111.53	Avg	H	39.83	-11.58	23.71	53.98	-30.27
4524.00	-99.76	Peak	H	39.83	0.00	47.07	73.98	-26.91
5428.80	-135.00	Avg	H	41.59	0.00	13.59	53.98	-40.39
5428.80	-125.00	Peak	H	41.59	0.00	23.59	73.98	-50.39

Table 6-6. Radiated Measurements

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 and are below the limit shown in Table 6-5.

2. Average measurements > 1GHz using RBW = 1MHz and VBW = 1kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds. Peak measurements > 1GHz using RBW = 1MHz and VBW = 3MHz.

3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.

4. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.

5. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.

6. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.

7. Above 960MHz the limit is 500 μV/m (54dBμ/m) at 3 meters radiated.

Radiated Spurious Emission Measurements (Cont'd)

§15.205 & §15.209, §15.247 (d); RSS-210 (A8.5)

Measurement Distance: 3 Meters

Operating Frequency: 914.8MHz

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Duty Cycle Correction [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
2744.40	-92.86	Avg	H	38.55	-11.58	41.10	53.98	-12.88
2744.40	-90.92	Peak	H	38.55	0.00	54.62	73.98	-19.36
3659.20	-95.85	Avg	H	38.68	-11.58	38.25	53.98	-15.73
3659.20	-92.96	Peak	H	38.68	0.00	52.72	73.98	-21.26
4574.00	-106.76	Avg	H	39.95	-11.58	28.62	53.98	-25.36
4574.00	-98.39	Peak	H	39.95	0.00	48.57	73.98	-25.41
5488.80	-109.74	Avg	H	41.70	-11.58	27.38	53.98	-26.60
5488.80	-99.04	Peak	H	41.70	0.00	49.66	73.98	-24.32

Table 6-7. Radiated Measurements

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 and are below the limit shown in Table 6-5.

2. Average measurements > 1GHz using RBW = 1MHz and VBW = 1kHz ≥ 1/τ Hz, where τ = pulse width in seconds. Peak measurements > 1GHz using RBW = 1MHz and VBW = 3MHz.

3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.

4. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.

5. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.

6. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.

7. Above 960MHz the limit is 500 μV/m (54dBμ/m) at 3 meters radiated.

Radiated Spurious Emission Measurements (Cont'd)

§15.205 & §15.209, §15.247 (d); RSS-210 (A8.5)

Measurement Distance: 3 Meters

Operating Frequency: 924.8MHz

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Duty Cycle Correction [dB]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
2774.40	-91.76	Avg	H	38.85	-11.58	42.51	53.98	-11.47
2774.40	-89.87	Peak	H	38.85	0.00	55.98	73.98	-18.00
3699.20	-89.55	Avg	H	38.94	-11.58	44.81	53.98	-9.17
3699.20	-87.79	Peak	H	38.94	0.00	58.15	73.98	-15.83
4624.00	-105.31	Avg	H	40.08	-11.58	30.18	53.98	-23.80
4624.00	-97.54	Peak	H	40.08	0.00	49.53	73.98	-24.44
5548.80	-105.48	Avg	H	41.91	-11.58	31.85	53.98	-22.13
5548.80	-97.66	Peak	H	41.91	0.00	51.26	73.98	-22.72
7398.40	-135.00	Avg	H	46.58	0.00	18.58	53.98	-35.40
7398.40	-125.00	Peak	H	46.58	0.00	28.58	73.98	-45.40

Table 6-8. Radiated Measurements

NOTES:

1. All emissions shown lie in the restricted bands specified in §15.205 and are below the limit shown in Table 6-5.

2. Average measurements > 1GHz using RBW = 1MHz and VBW = 1kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds. Peak measurements > 1GHz using RBW = 1MHz and VBW = 3MHz.

3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.

4. The EUT is supplied with nominal AC voltage and/or a new/fully-recharged battery.

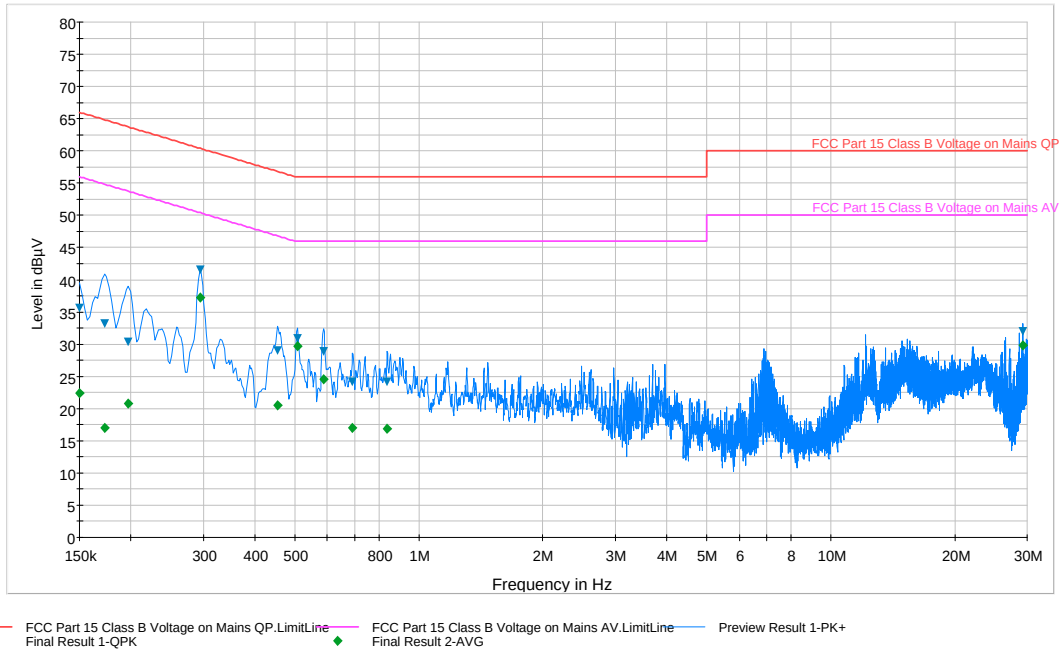
5. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.

6. Levels at - 135 dBm represent the analyzer noise floor and signify that no emission was detected.

7. Above 960MHz the limit is 500 μV/m (54dBμ/m) at 3 meters radiated.

6.10 Line Conducted Measurement Data

§15.207; RSS-Gen (7.2.2)



Plot 6-20. Line-Conducted Test Plot (L1)

Frequency MHz	Line	Corr. dB	QuasiPeak dBµV	Limit dBµV	Margin dB	Average dBµV	Limit dBµV	Margin dB
0.150	L1	0.2	35.60	66.00	30.40	22.50	56.00	33.50
0.173	L1	0.2	33.30	64.80	31.50	17.00	54.80	37.80
0.197	L1	0.2	30.40	63.70	33.30	20.80	53.70	32.90
0.294	L1	0.1	41.50	60.40	18.90	37.20	50.40	13.20
0.454	L1	0.1	29.00	56.80	27.80	20.50	46.80	26.30
0.508	L1	0.1	30.80	56.00	25.20	29.70	46.00	16.30
0.587	L1	0.1	28.80	56.00	27.20	24.60	46.00	21.40
0.690	L1	0.1	24.10	56.00	31.90	17.00	46.00	29.00
0.839	L1	0.1	24.10	56.00	31.90	16.90	46.00	29.10
29.236	L1	1.0	31.90	60.00	28.10	29.90	50.00	20.10

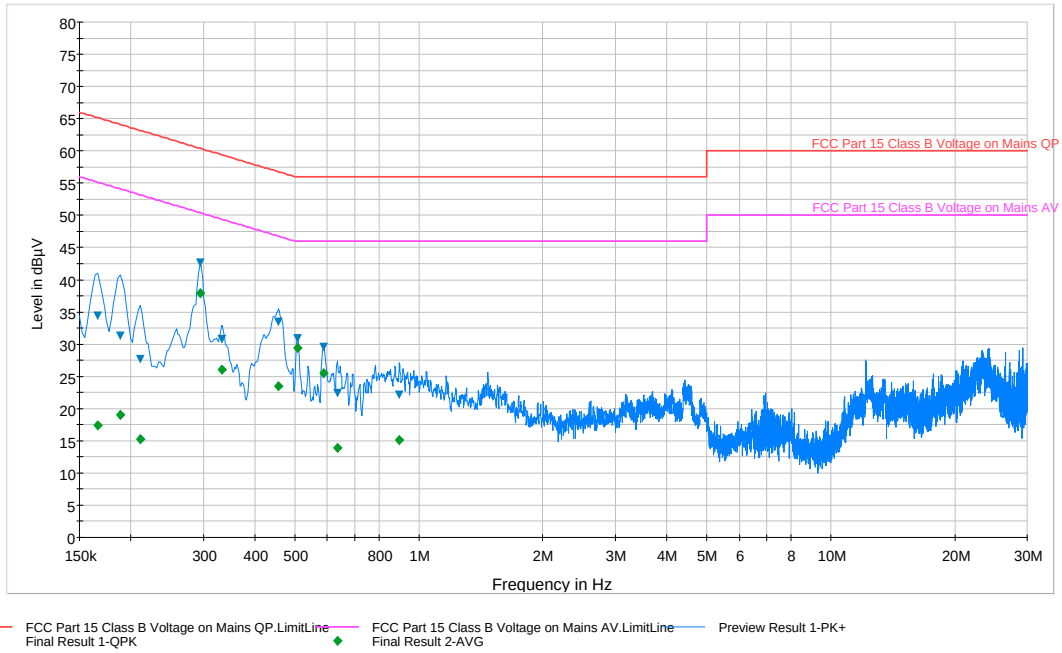
Table 6-9. Line-Conducted Test Data (L1)

Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
5. Margin (dB) = QP/AV Limit (dBµV) - QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

Line Conducted Measurement Data (Cont'd)

§15.207; RSS-Gen (7.2.2)



Plot 6-21. Line-Conducted Test Plot (N)

Frequency MHz	Line	Corr. dB	QuasiPeak dBµV	Limit dBµV	Margin dB	Average dBµV	Limit dBµV	Margin dB
0.166	N	0.2	34.40	65.20	30.80	17.40	55.20	37.80
0.188	N	0.2	31.30	64.10	32.80	19.00	54.10	35.10
0.211	N	0.2	27.70	63.20	35.50	15.20	53.20	38.00
0.294	N	0.2	42.60	60.40	17.80	37.90	50.40	12.50
0.332	N	0.1	30.80	59.40	28.60	26.00	49.40	23.40
0.456	N	0.1	33.50	56.80	23.30	23.50	46.80	23.30
0.508	N	0.1	30.90	56.00	25.10	29.40	46.00	16.60
0.587	N	0.1	29.60	56.00	26.40	25.50	46.00	20.50
0.634	N	0.1	22.40	56.00	33.60	13.90	46.00	32.10
0.897	N	0.1	22.20	56.00	33.80	15.20	46.00	30.80

Table 6-10. Line-Conducted Test Data (N)

Notes:

1. All Modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
5. Margin (dB) = QP/AV Limit (dBµV) - QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Device Solutions Sensor Board Module FCC ID: OXW-PA0002** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules and RSS-210 of the Industry Canada Rules.