

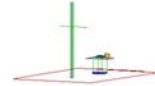


PCTEST ENGINEERING LABORATORY, INC.

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MEASUREMENT REPORT FCC PART 15.247 / IC RSS-210

Applicant Name:
Elster Solutions, LLC
208 S. Rogers Lane
Raleigh, NC 27610
United States

Date of Testing:
11/27/2013 - 3/21/2014
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
0Y1311132153.QZC

FCC ID:	QZCWWIC3EVM
IC CERTIFICATION NO.:	4557A-WWIC3EVM
APPLICANT:	Elster Solutions, LLC

Application Type:	Certification
Model:	EA_NMGK3_EVXV
EUT Type:	Modular Gatekeeper with Wireless WIC3G
Max. RF Output Power:	171.672mW (22.35 dBm) Conducted
Frequency Range:	902.8 – 927.6MHz
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 C63.10-2009, 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 C63.10-2009 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.


Randy Ortanez
President







FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G	Page 1 of 33	

TABLE OF CONTENTS

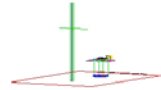
FCC PART 15.247 MEASUREMENT REPORT.....	3
1.0 INTRODUCTION.....	4
1.1 SCOPE.....	4
1.2 TESTING FACILITY	4
2.0 PRODUCT INFORMATION	5
2.1 EQUIPMENT DESCRIPTION.....	5
2.2 DEVICE CAPABILITIES.....	5
2.3 TEST CONFIGURATION	5
2.4 EMI SUPPRESSION DEVICE(S)/MODIFICATIONS.....	5
2.5 LABELING REQUIREMENTS	5
3.0 DESCRIPTION OF TEST	6
3.1 EVALUATION PROCEDURE.....	6
3.2 AC LINE CONDUCTED EMISSIONS.....	6
3.3 RADIATED EMISSIONS	7
4.0 ANTENNA REQUIREMENTS	8
5.0 TEST EQUIPMENT CALIBRATION DATA.....	9
6.0 TEST RESULTS	10
6.1 SUMMARY	10
6.2 20DB BANDWIDTH MEASUREMENT	11
6.3 OUTPUT POWER MEASUREMENT	13
6.4 BAND EDGE COMPLIANCE	16
6.5 CARRIER FREQUENCY SEPARATION.....	19
6.6 NUMBER OF HOPPING CHANNELS	20
6.7 TIME OF OCCUPANCY	22
6.8 CONDUCTED SPURIOUS EMISSIONS.....	24
6.9 RADIATED SPURIOUS EMISSION MEASUREMENTS.....	28
6.10 LINE CONDUCTED MEASUREMENT DATA	31
7.0 CONCLUSION	33

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G	Page 2 of 33	



MEASUREMENT REPORT

FCC Part 15.247

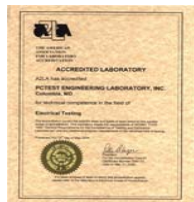


§ 2.1033 General Information



APPLICANT: Elster Solutions, LLC
APPLICANT ADDRESS: 208 S. Rogers Lane
 Raleigh, NC 27610, United States
TEST SITE: PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS: 6660-B Dobbin Road, Columbia, MD 21045 USA
FCC RULE PART(S): Part 15 Subpart C (15.247)
IC SPECIFICATION(S): RSS-210 Issue 8
MODEL: EA_NMKG3_EVXV
FCC ID: QZCWWIC3EVM
Test Device Serial No.: 16672617 ☐ Production ☒ Pre-Production ☐ Engineering
FCC CLASSIFICATION: FCC Part 15 Spread Spectrum Transmitter (DSS)
Method/System: Frequency Hopping Spread Spectrum (FHSS)
DATE(S) OF TEST: 11/27/2013 - 3/21/2014
TEST REPORT S/N: 0Y1311132153.QZC

Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21045, 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.

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 3 of 33

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 Testing Facility

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 C63.4-2009 on February 15, 2012.

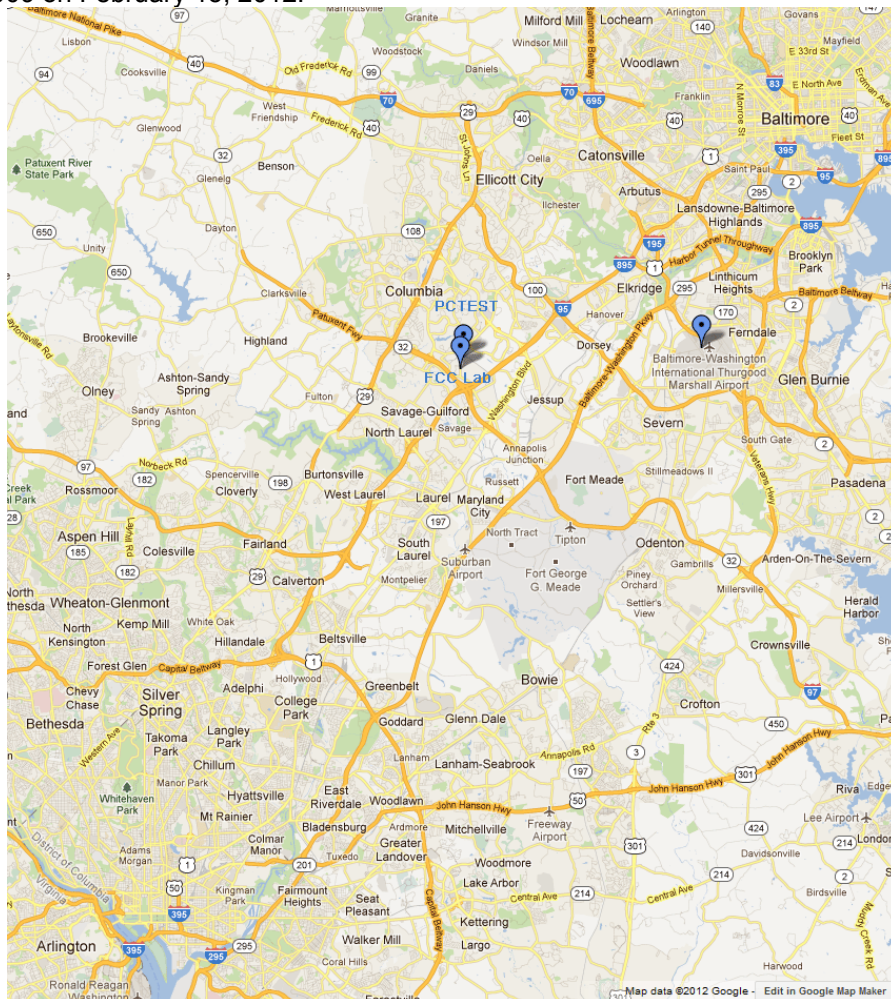


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)	Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G	Page 4 of 33

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Elster Modular Gatekeeper with Wireless WIC3G FCC ID: QZCWWIC3EVM**. The test data contained in this report pertains only to the emissions due to the EUT's 900MHz transmitter.

- This module has been previously approved and we confirm the following:
 - A) The hopping sequence is pseudorandom
 - B) All channels are used equally on average
 - C) The receiver input bandwidth equals the transmit bandwidth
 - D) The receiver hops in sequence with the transmit signal
- 15.247(g): The system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.
- 15.247(h): The system does not coordinate its channels selection/ hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO, 900MHz ISM Tx

Note: This device operates on 50 channels over the 900MHz ISM band however only 25 channels can operate at a time. The other 25 channels will not operate until the device switches over to that network. For additional information, see the technical description document.

2.3 Test Configuration

The Elster Modular Gatekeeper with Wireless WIC3G FCC ID: QZCWWIC3EVM was tested per the guidance of ANSI C63.10-2009 and DA 00-705. The EUT was connected to a laptop via an optical probe connection. The EUT operation was controlled via software installed on the laptop. See Sections 3.2, 3.3, and 6.0 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.

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G	Page 5 of 33	

3.0 DESCRIPTION OF TEST

3.1 Evaluation Procedure

The measurement procedure described in 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 **Elster Modular Gatekeeper with Wireless WIC3G FCC ID: QZCWWIC3EVM**.

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.



FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 6 of 33

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 changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. For the EUT positioning, "H" is defined with the EUT lying flat on the test surface and "V" is defined with the EUT standing up on its side.

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G	Page 7 of 33	

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 900MHz antenna of the Elster Modular Gatekeeper with Wireless WIC3G is **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The **Elster Modular Gatekeeper with Wireless WIC3G FCC ID: QZCWWIC3EVM** unit complies with the requirement of §15.203.

Ch.	Frequency (MHz)
1	902.8
:	:
31	914.8
:	:
63	927.6

Table 4-1. Frequency/ Channel Operations

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 8 of 33



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)	3/29/2013	Annual	3/29/2014	N/A
-	RE2	Radiated Emissions Cable Set (VHF/UHF)	3/29/2013	Annual	3/29/2014	N/A
-	WL40-1	Conducted Cable Set (40GHz)	7/22/2013	Annual	7/22/2014	N/A
Agilent	8447D	Broadband Amplifier	5/31/2013	Annual	5/31/2014	2443A01900
Agilent	N9030A	PXA Signal Analyzer (44GHz)	1/11/2013	Annual	1/11/2014	MY52350166
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	6/26/2013	Annual	6/26/2014	121034
Emco	3816/2	Line Impedance Stabilization Network	2/12/2013	Biennial	2/12/2015	9709-1077
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	7/24/2013	Biennial	7/24/2015	125518
Mini-Circuits	VHF-1200+	High Pass Filter	1/17/2013	Annual	1/17/2014	30923
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	5/31/2013	Annual	5/31/2014	100071
Rohde & Schwarz	ESU26	EMI Test Receiver	2/25/2013	Annual	2/25/2014	100342
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/26/2012	Biennial	1/26/2014	A051107

Table 5-1. Annual Test Equipment Calibration Schedule

Note: For equipment list above that has a calibration due date that falls within the test date range, care was taken to ensure that this equipment was utilized prior to the calibration due date.

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G	Page 9 of 33	

6.0 TEST RESULTS

6.1 Summary



Company Name: Elster Solutions, LLC
 FCC ID: QZCWWIC3EVM
 Method/System: Frequency Hopping Spread Spectrum (FHSS)
 Number of Channels: 50 channels (25 per network)

FCC Part Section(s)	RSS Section	Test Description	Test Limit	Test Condition	Test Result	Reference
TRANSMITTER MODE (Tx)						
15.247(a)(1)(i)	RSS-210 [A8.1(a)]	20dB Bandwidth	$\leq 500\text{kHz}$	CONDUCTED	PASS	Section 6.2
15.247(b)(2)	RSS-210 [A8.4(1)]	Peak Transmitter Output Power	≤ 0.25 Watts if using at least 25 channels		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	≥ 63 Channels, if 20dB BW is $> 250\text{kHz}$		PASS	Section 6.6
15.247(a)(1)(i)	RSS-210 [A8.1(c)]	Time of Occupancy	< 0.4 sec in 10 sec period		PASS	Section 6.7
15.247(d)	RSS-210 [A8.5]	Band Edge / Out-of-Band Emissions	Conducted $> 20\text{dBc}$		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	$< \text{FCC 15.207 limits or}$ $< \text{RSS-Gen table 2 limits}$	LINE CONDUCTED	PASS	Section 6.10

Table 6-1. Summary of Test Results

Notes:

- All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 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.
- 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.

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G	Page 10 of 33	

6.2 20dB Bandwidth Measurement

§15.247 (a)(1)(i); RSS-210[A8.1(a)]

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]	Channel No.	20dB Bandwidth Test Results	
		[kHz]	Pass/Fail
902.8	1	323.7	Pass
914.8	31	317.4	Pass
927.6	63	325.6	Pass

Table 6-2. Conducted 20dB Bandwidth Measurements

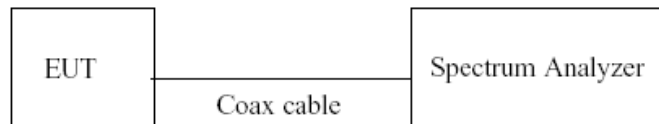
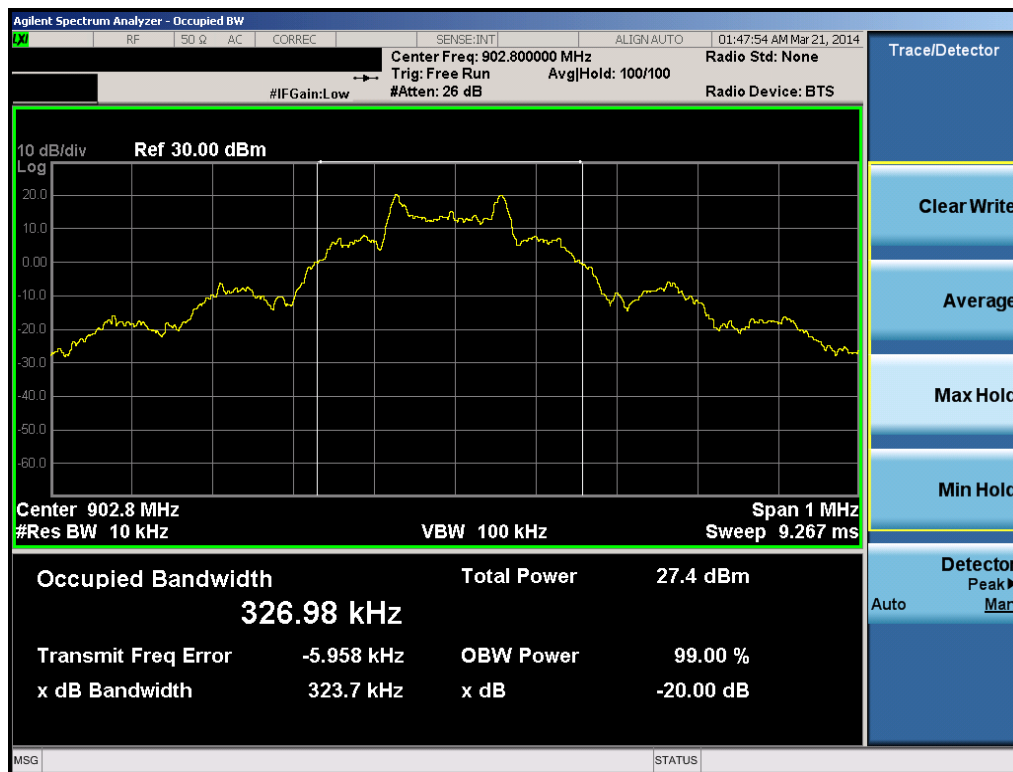
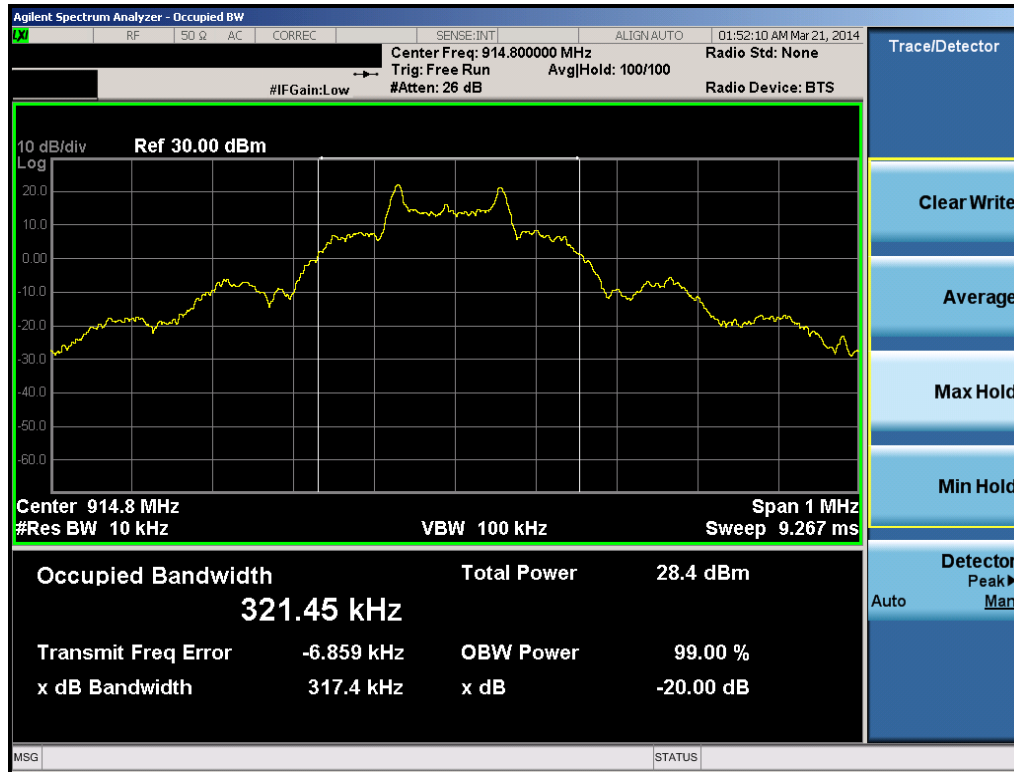


Figure 6-1. Test Instrument & Measurement Setup

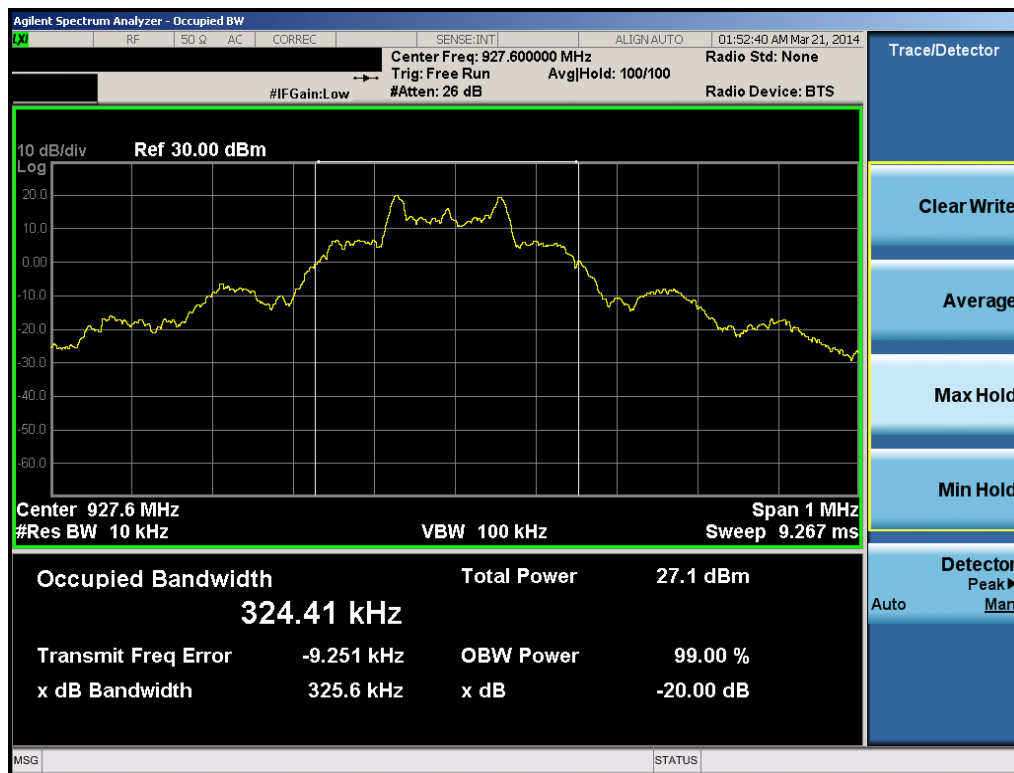


Plot 6-1. 20dB Bandwidth Plot (900MHz ISM Band – Ch. 1)

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)	elster	Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 11 of 33



Plot 6-2. 20dB Bandwidth Plot (900MHz ISM Band – Ch. 31)



Plot 6-3. 20dB Bandwidth Plot (900MHz ISM Band – Ch. 63)

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)	elster	Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 12 of 33

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 are peak powers measured using a spectrum analyzer. Peak power measurements are performed in the analyzers' swept spectrum mode using a peak detector with RBW = 3MHz and VBW ≥ RBW. **The maximum permissible output power for a device employing at least 25 channels is 0.25 Watts.**

Frequency [MHz]	Channel No.	Conducted Power		Limit [dBm]	Margin [dB]
		[dBm]	[mW]		
902.8	1	21.64	145.949	23.98	-2.34
914.8	31	22.35	171.672	23.98	-1.63
927.6	63	21.23	132.801	23.98	-2.75

Table 6-3. Conducted Output Power Measurements





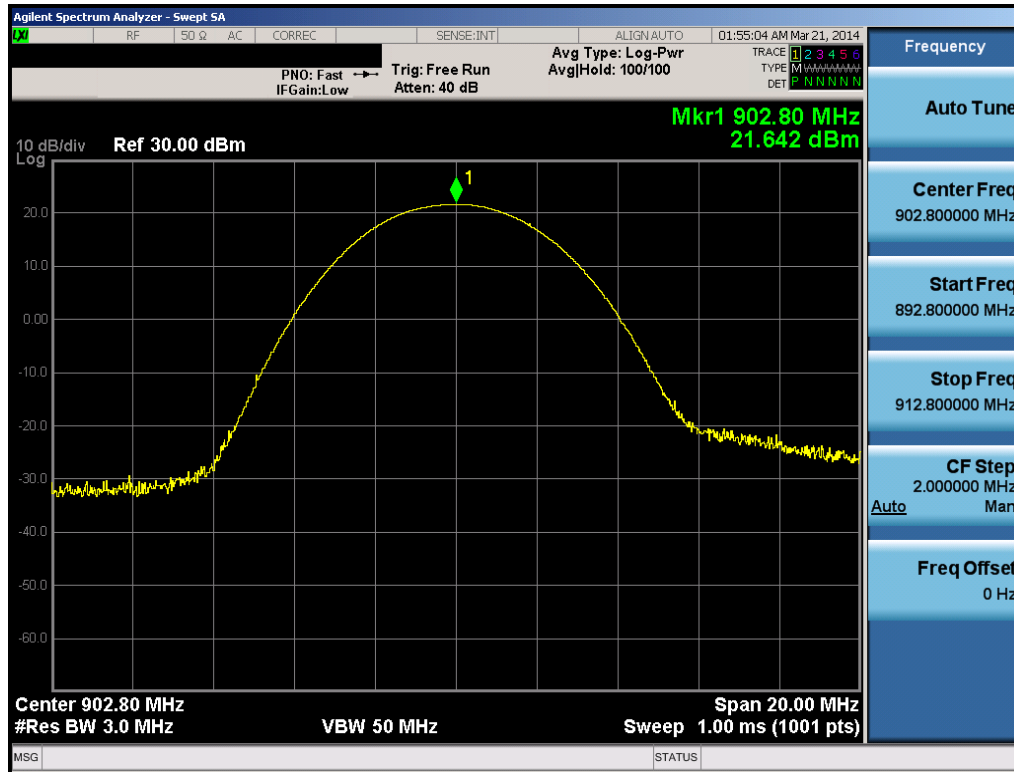
Figure 6-2. Test Instrument & Measurement Setup

Note

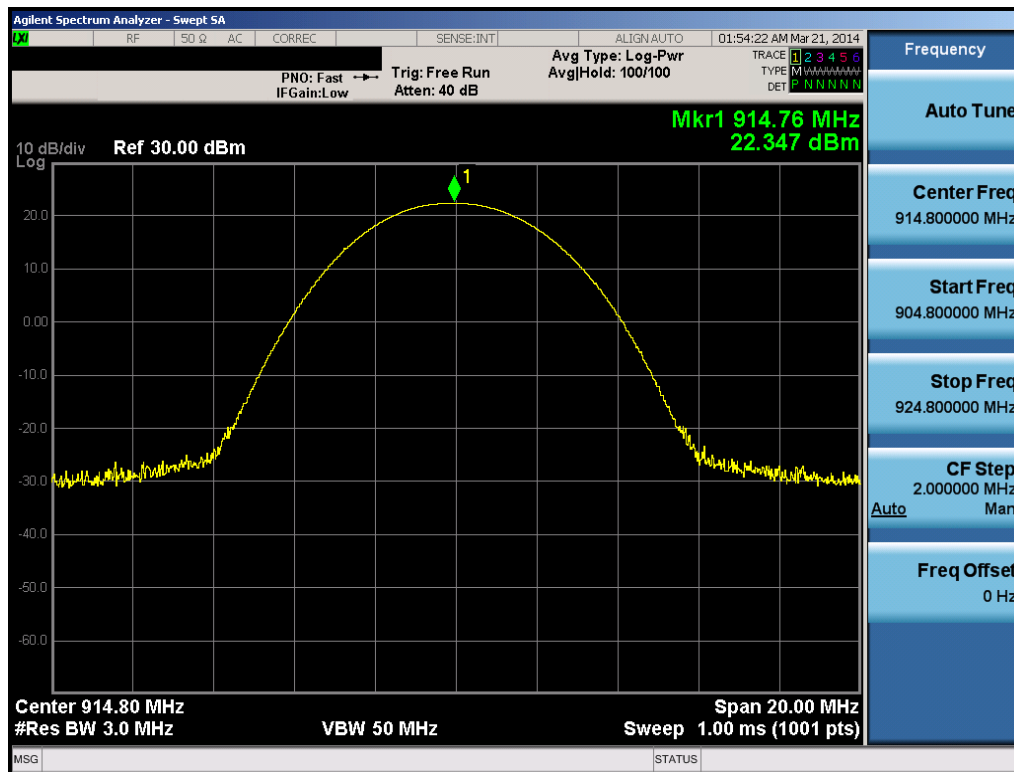
Final results were obtained using calibrated couplers, attenuators and cables. The following formula was used:

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

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 13 of 33

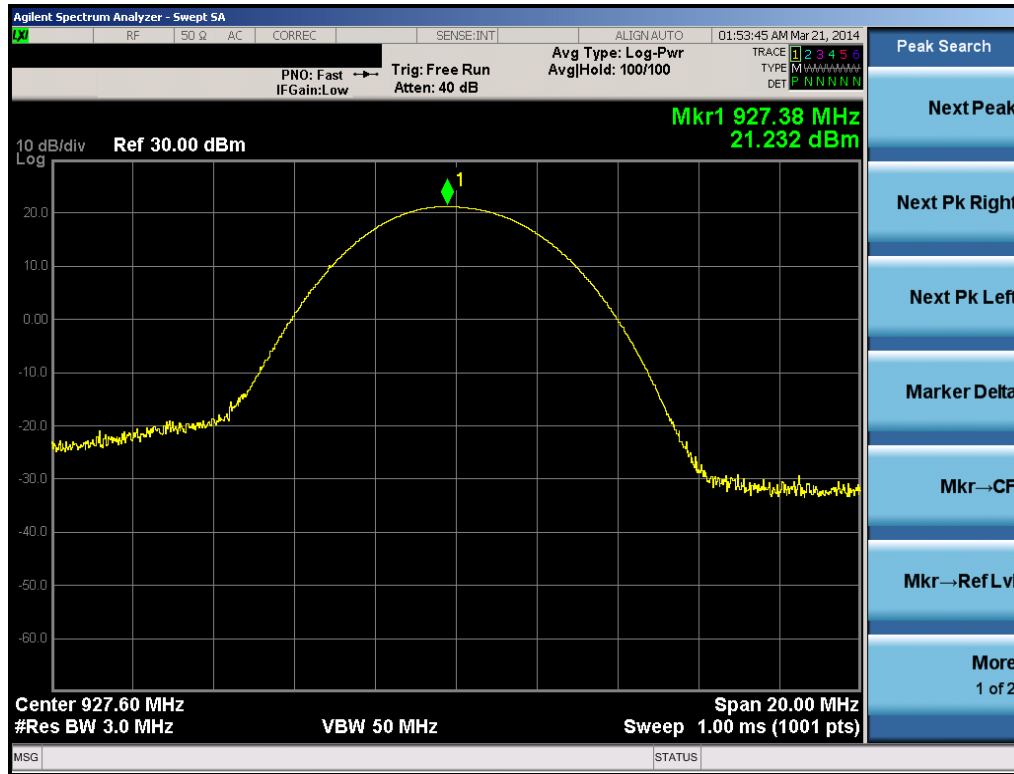


Plot 6-4. Peak Conducted Power (Ch. 1)



Plot 6-5. Peak Conducted Power (Ch. 31)

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 14 of 33



Plot 6-6. Peak Conducted Power (Ch. 63)

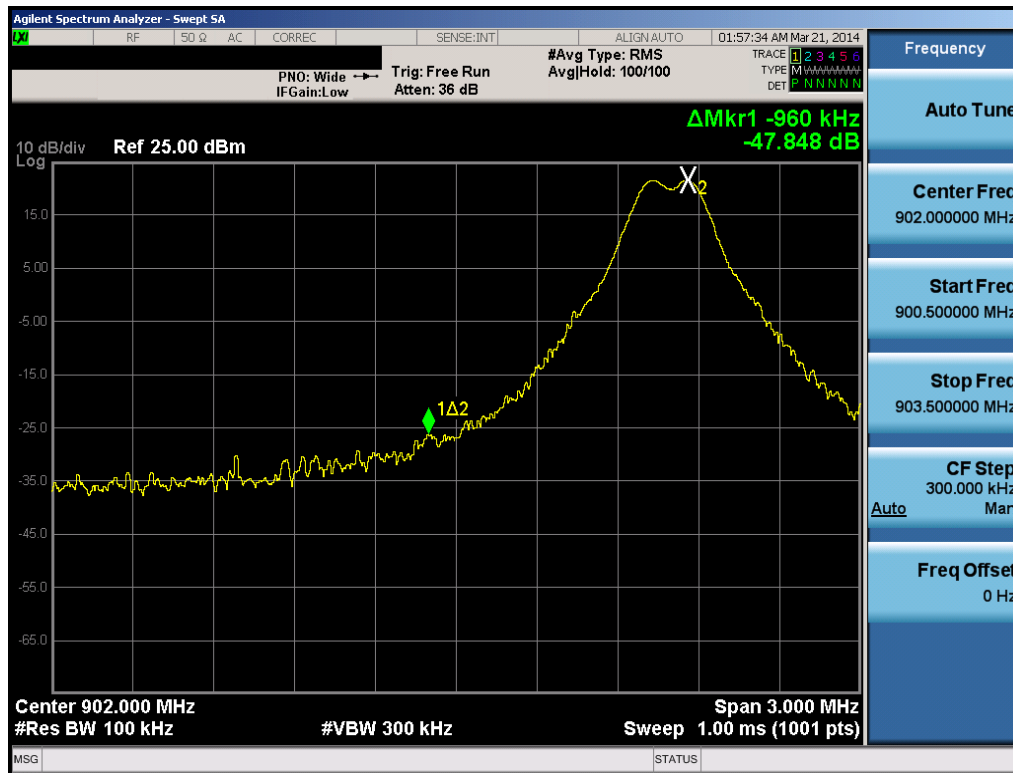
FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)	elster	Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 15 of 33

6.4 Band Edge Compliance

\$15.247 (d); RSS-210(A8.5)

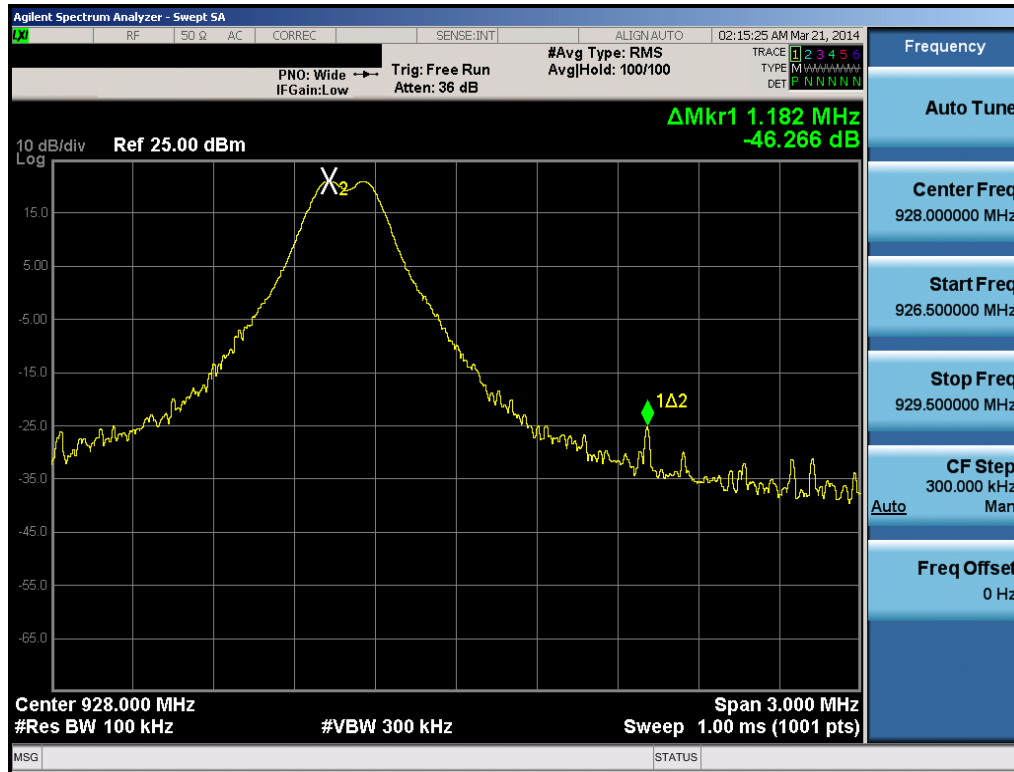
Measurement is taken at the highest point located outside of the emission bandwidth. **The maximum permissible emission level is 20 dBc. Any emission lying outside of the emission bandwidth and in a restricted band is subject to a field strength limit specified in Section 15.209 of the Title 47 CFR.**

Out of band conducted spurious emissions at the band edge were investigated while the device was operating in hopping and non-hopping mode. Plots of the worst case emissions are shown below.

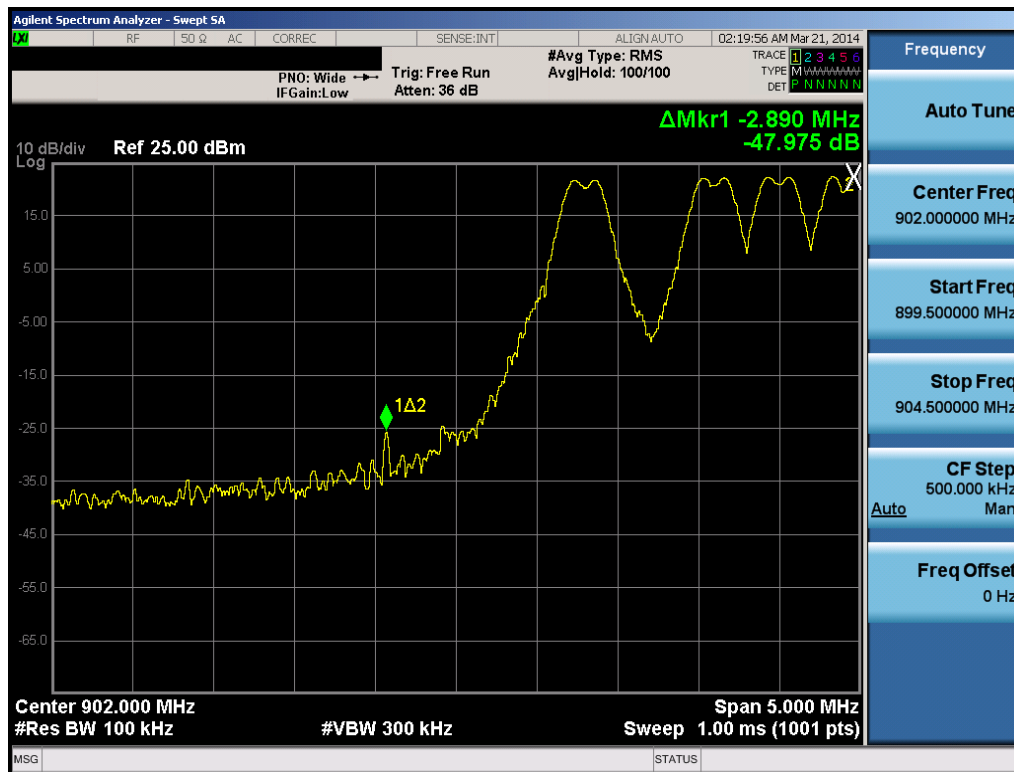


Plot 6-7. Band Edge Plot (Hopping Disabled, 900MHz ISM Band – Ch. 1)

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 16 of 33

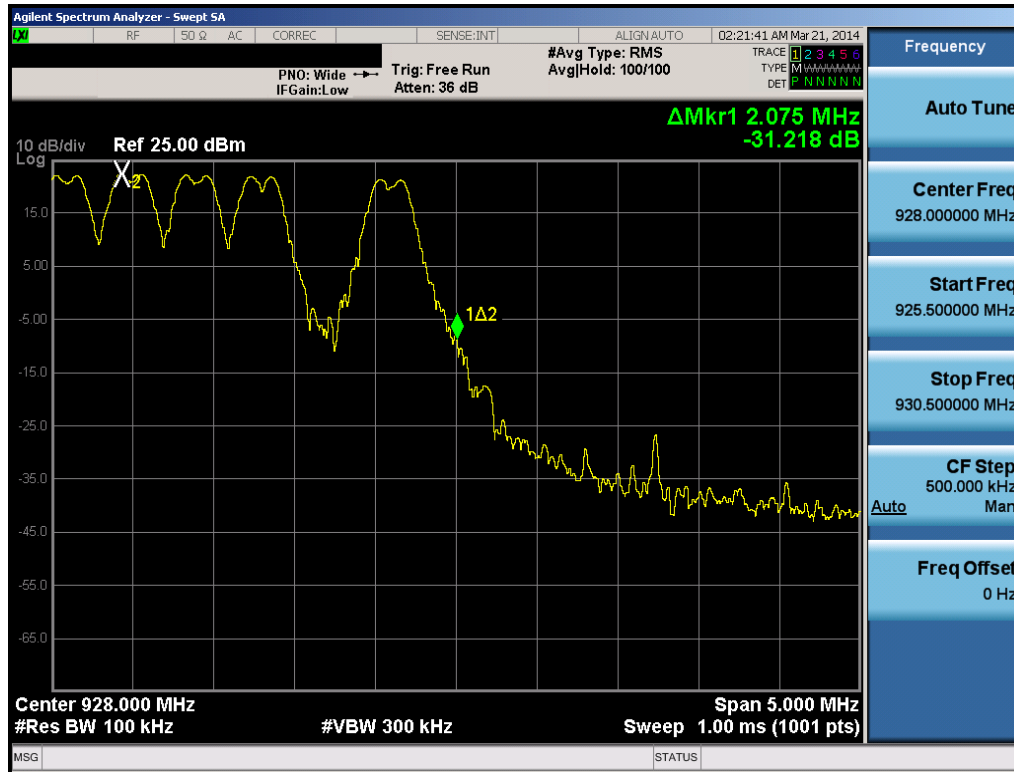


Plot 6-8. Band Edge Plot (Hopping Disabled, 900MHz ISM Band – Ch. 63)



Plot 6-9. Band Edge Plot (Hopping Enabled)

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 17 of 33



Plot 6-10. Band Edge Plot (Hopping Enabled)

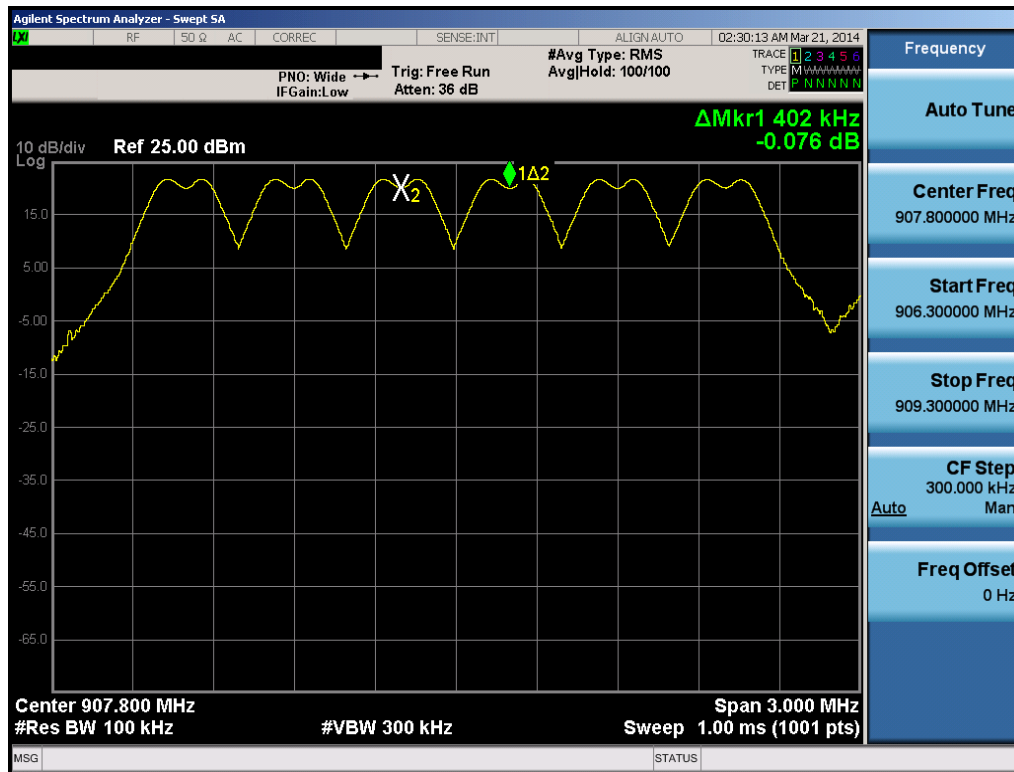
FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 18 of 33

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 the 20dB BW, which is equal to 0.325 MHz.***

The EUT complies with the minimum channel separation requirement when it is operating in normal hopping mode.



Plot 6-11. Channel Spacing Plot (900MHz ISM Band)

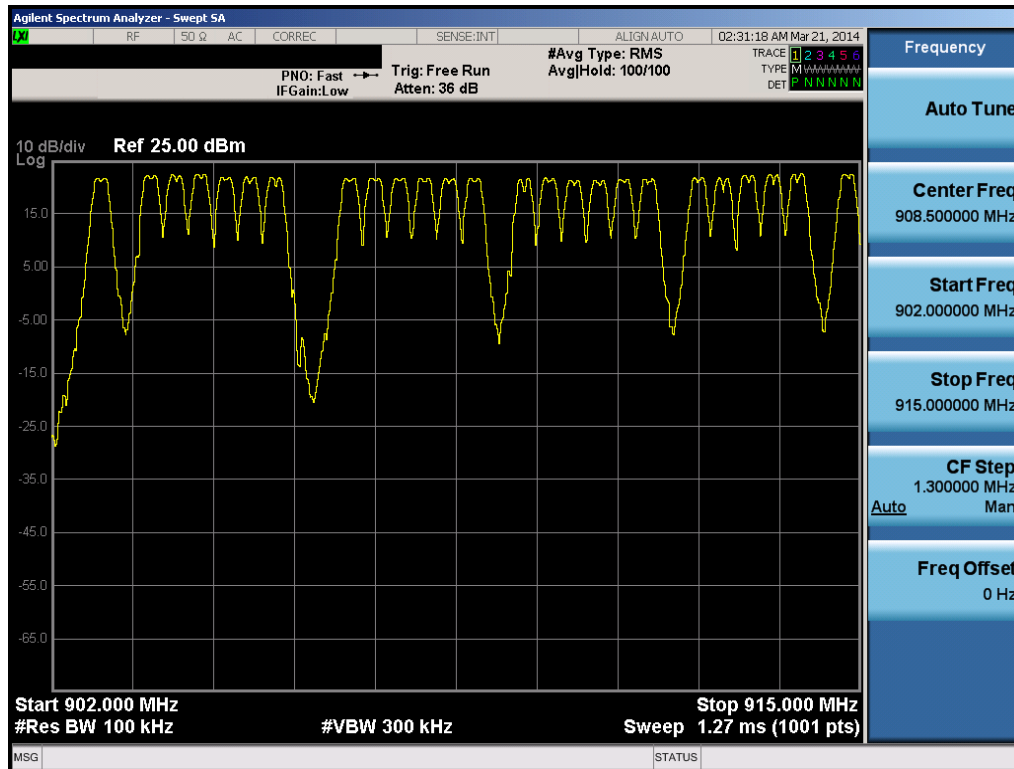
FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 19 of 33

6.6 Number of Hopping Channels

§15.247 (a)(1)(i); RSS-210 [A8.1(c)]

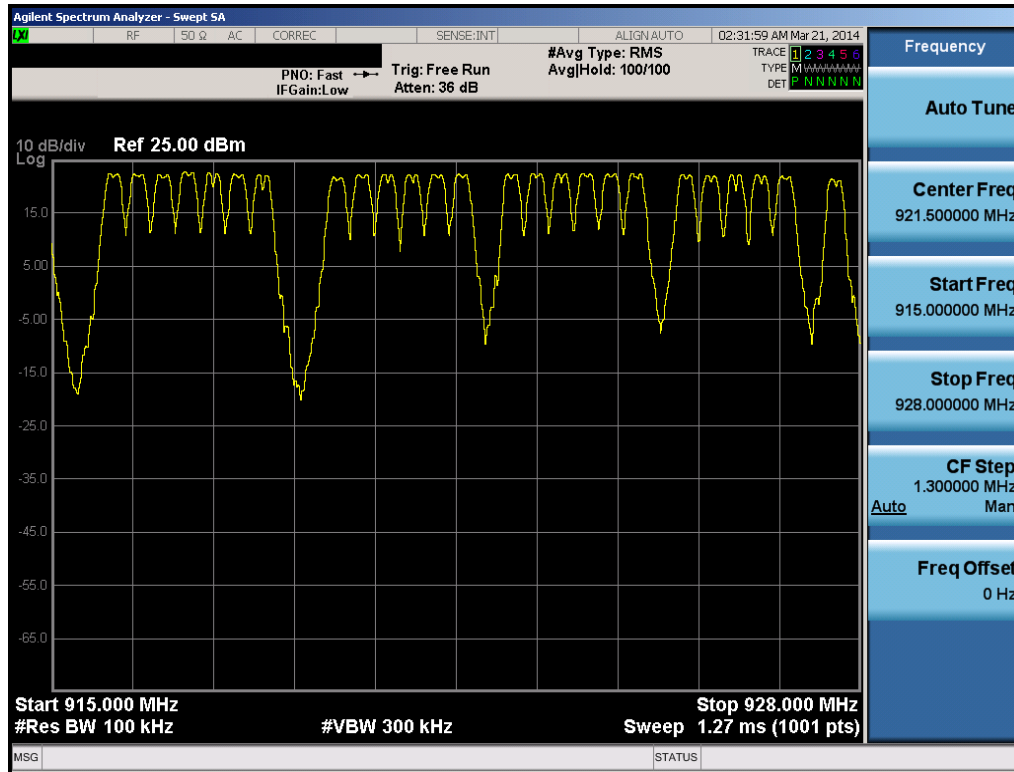
Measurement is made while EUT is operating in hopping mode. ***This frequency hopping system must employ a minimum of 25 hopping channels.***

The EUT employs 25 channels per network, for a total of 50 different channels throughout the 902 – 928MHz ISM band while operating in hopping mode. Since the unit operates with a minimum of 25 channels, the “number of channels” requirement is satisfied.



Plot 6-12. Channel Hopping Plot – Lower Half (900MHz ISM Band)

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 20 of 33



Plot 6-13. Channel Hopping Plot – Upper Half (900MHz ISM Band)

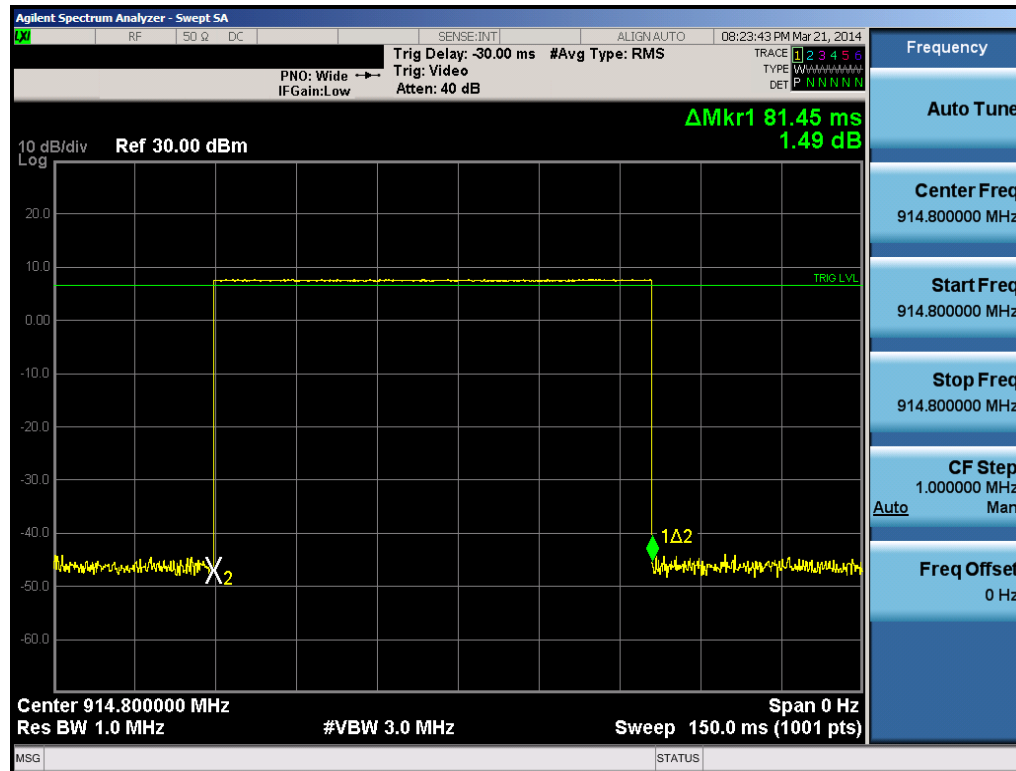
FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 21 of 33

6.7 Time of Occupancy

§15.247 (a)(1)(i); RSS-210 [A8.1(c)]

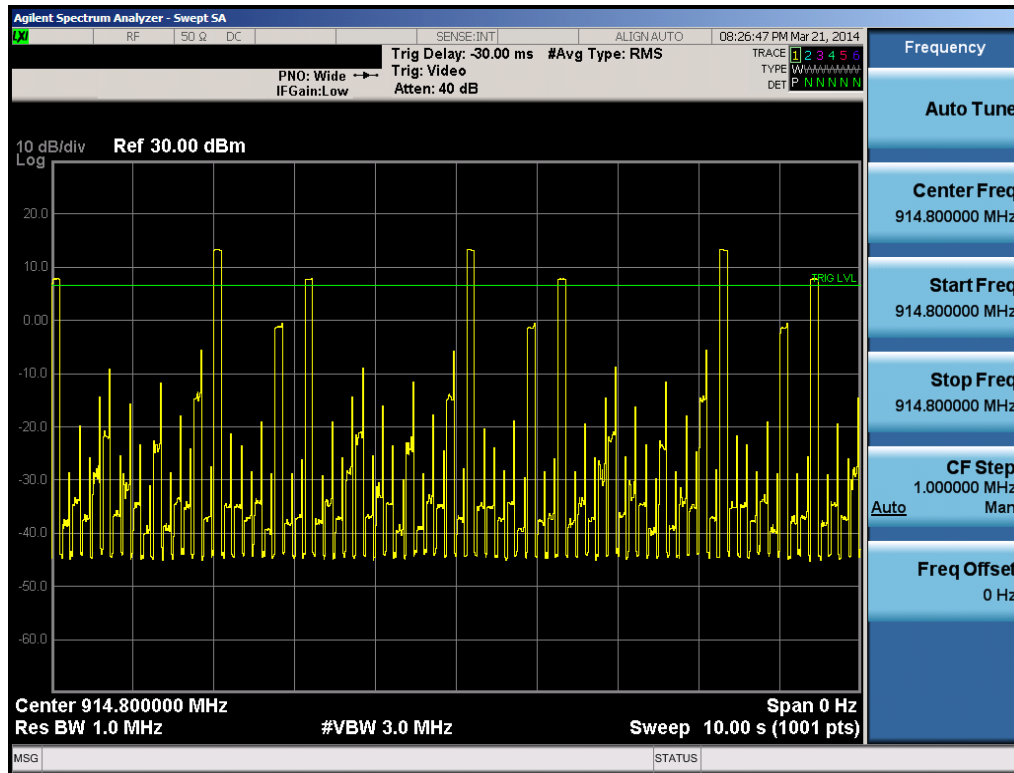
Measurement is made while EUT is operating in hopping mode with the spectrum analyzer set to zero span. **The maximum permissible time of occupancy is 400 ms within a 10 second period.**

The pulse width for this device was measured on a spectrum analyzer and found to be 81.45ms, as shown in Plot 6-14 below. After determining the pulse width, the analyzer was set to capture 10 seconds worth of data to determine the maximum number of times that one particular channel is transmitting. As shown in Plot 6-15 below, the maximum occurrence of a channel is 2 times within a 10 second window.



Plot 6-14. Pulse Width Plot (900MHz ISM Band)

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 22 of 33



Plot 6-15. 10 Second Sweep Time



Time of Occupancy Calculation

Based on the previous two plots, the time of occupancy can be determined as follows:

- Pulse Width = 81.45ms (See Plot 6-14)
- Number of times that one particular channel appears in a 10 second period = 3 (See Plot 6-15)
- Time of Occupancy = 81.45ms/pulse x 3 pulses/10 sec = 244.35ms/10 sec

Note:

Since the EUT was operating in hopping mode, there are several pulses shown in Plot 6-15 due to operation on adjacent channels. Only the three pulses with the highest amplitude are used in the “time of occupancy” calculation because they are from the channel on which the analyzer was tuned.

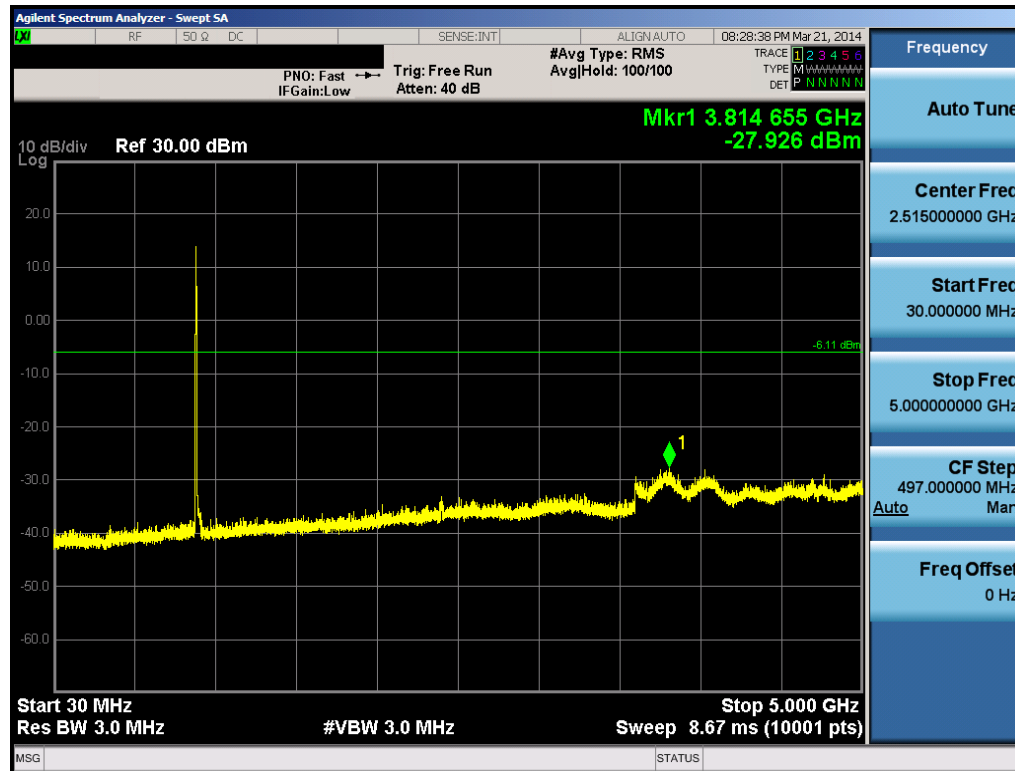
FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 23 of 33

6.8 Conducted Spurious Emissions

§15.247 (d); RSS-210 [A8.5]

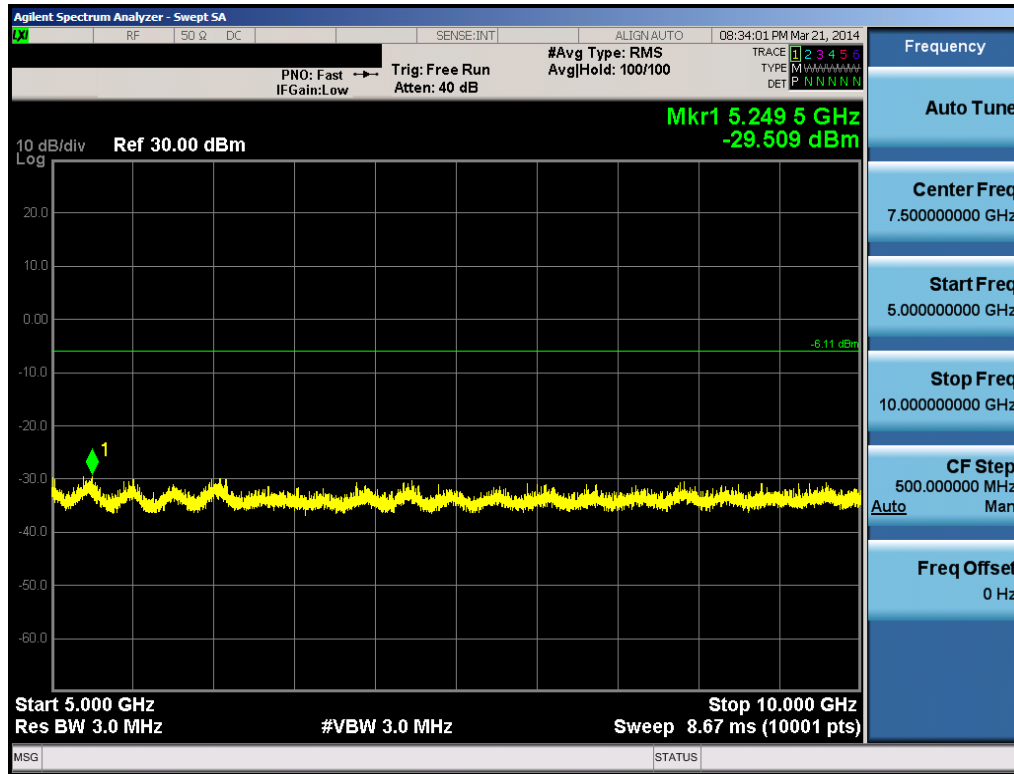
Out of band conducted spurious emissions were found with the EUT transmitting at maximum power in non-hopping mode. Plots of the worst case emissions are shown below.

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.

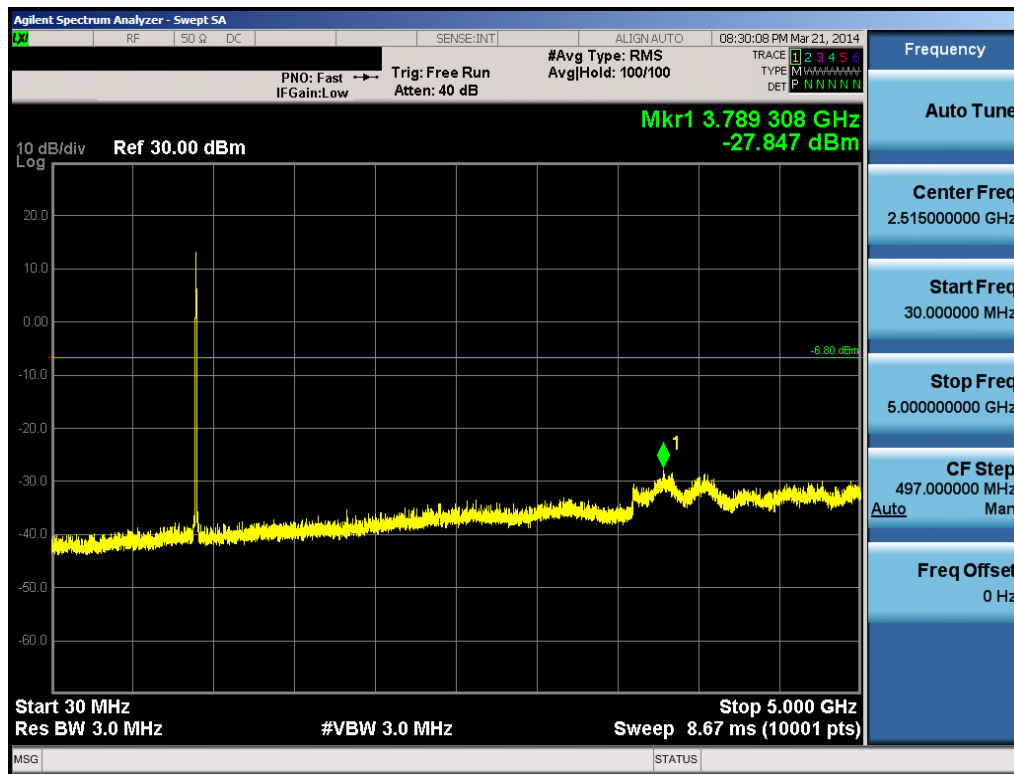


Plot 6-16. Conducted Spurious Plot (900MHz ISM Band – Ch. 1)

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 24 of 33

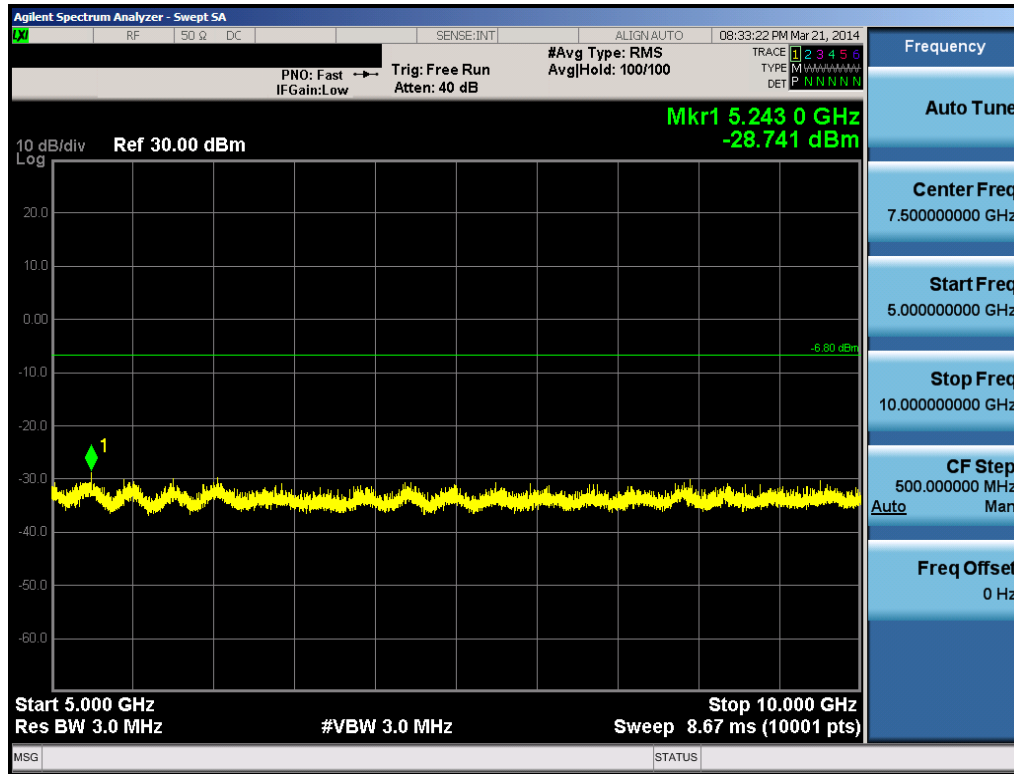


Plot 6-17. Conducted Spurious Plot (900MHz ISM Band – Ch. 1)

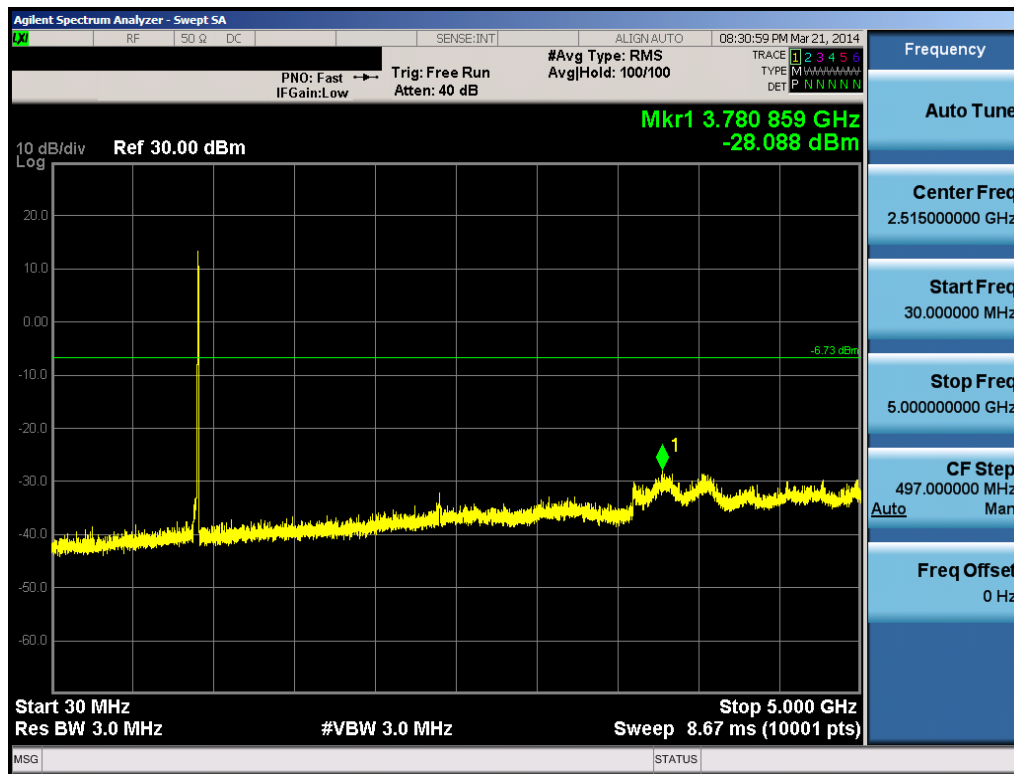


Plot 6-18. Conducted Spurious Plot (900MHz ISM Band – Ch. 31)

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 25 of 33

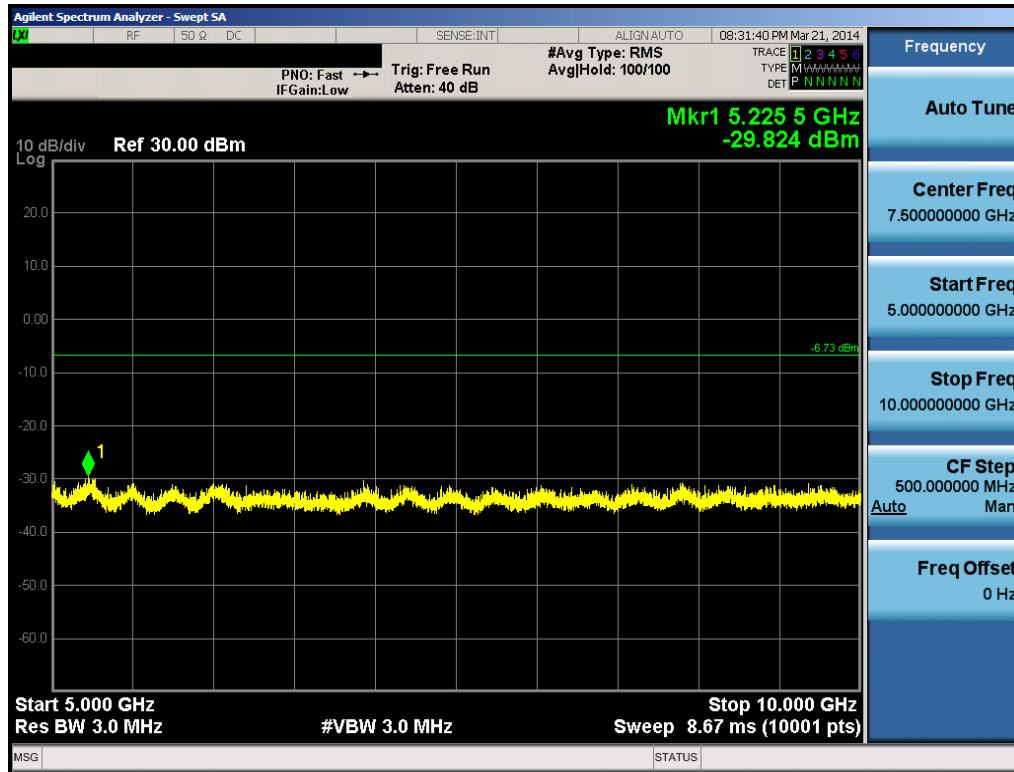


Plot 6-19. Conducted Spurious Plot (900MHz ISM Band – Ch. 31)



Plot 6-20. Conducted Spurious Plot (900MHz ISM Band – Ch. 63)

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 26 of 33



6.9 Radiated Spurious Emission Measurements

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

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 6-4. Radiated Limits

Sample Calculation

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

Test Notes

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 6-4.
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. Both average and peak measurements were made using a peak detector.
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 and the worst-case emissions are reported. Emissions whose levels were not within 20dB of the respective limits were not reported.
6. Average levels at -135 dBm and peak levels at -125dBm represent the analyzer noise floor and signify that no emission was detected.

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 28 of 33

Radiated Spurious Emission Measurements (Cont'd)

§15.247 (d) / §15.205 & §15.209; RSS-210 [A8.5]

Mode: Continuous Tx
 Measurement Distance: 3 Meters
 Operating Frequency: 902.8MHz
 Channel: 1



Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Field Strength [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
2708.40	-90.88	Avg	H	37.12	53.24	53.98	-0.74
2708.40	-88.04	Peak	H	37.12	56.08	73.98	-17.90
3611.20	-135.00	Avg	H	38.68	10.68	53.98	-43.30
3611.20	-125.00	Peak	H	38.68	20.68	73.98	-53.30
4514.00	-135.00	Avg	H	41.43	13.43	53.98	-40.55
4514.00	-125.00	Peak	H	41.43	23.43	73.98	-50.55
5416.80	-135.00	Avg	H	43.33	15.33	53.98	-38.65
5416.80	-125.00	Peak	H	43.33	25.33	73.98	-48.65

Table 6-5. Radiated Measurements

Mode: Continuous Tx
 Measurement Distance: 3 Meters
 Operating Frequency: 914.8MHz
 Channel: 31

Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Field Strength [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
2744.40	-91.81	Avg	H	37.21	52.39	53.98	-1.59
2744.40	-88.81	Peak	H	37.21	55.39	73.98	-18.59
3659.20	-102.55	Avg	H	38.81	43.26	53.98	-10.72
3659.20	-95.11	Peak	H	38.81	50.70	73.98	-23.28
4574.00	-135.00	Avg	H	41.60	13.60	53.98	-40.38
4574.00	-125.00	Peak	H	41.60	23.60	73.98	-50.38
7318.40	-135.00	Avg	H	47.45	19.45	53.98	-34.53
7318.40	-125.00	Peak	H	47.45	29.45	73.98	-44.53

Table 6-6. Radiated Measurements

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 29 of 33



Radiated Spurious Emission Measurements (Cont'd)

§15.247 (d) / §15.205 & §15.209; RSS-210 [A8.5]

Mode: Continuous Tx
 Measurement Distance: 3 Meters
 Operating Frequency: 927.6MHz
 Channel: 63

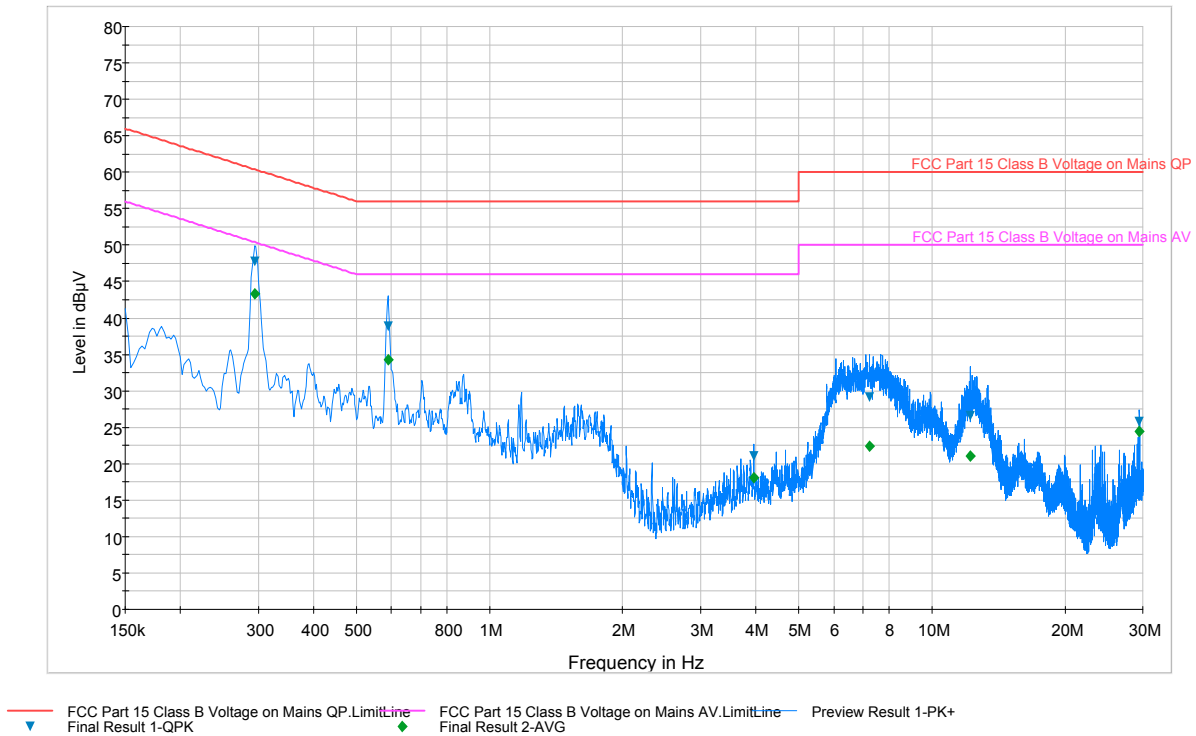
Frequency [MHz]	Analyzer Level [dBm]	Detector	Pol [H/V]	AFCL [dB]	Field Strength [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
2782.80	-91.93	Avg	H	37.30	52.38	53.98	-1.60
2782.80	-89.04	Peak	H	37.30	55.27	73.98	-18.71
3710.40	-102.44	Avg	H	38.95	43.51	53.98	-10.47
3710.40	-95.51	Peak	H	38.95	50.44	73.98	-23.54
4638.00	-135.00	Avg	H	41.68	13.68	53.98	-40.30
4638.00	-125.00	Peak	H	41.68	23.68	73.98	-50.30
7420.80	-135.00	Avg	H	47.63	19.63	53.98	-34.35
7420.80	-125.00	Peak	H	47.63	29.63	73.98	-44.35

Table 6-7. Radiated Measurements

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 30 of 33

6.10 Line Conducted Measurement Data

§15.207; RSS-Gen (7.2.2)



Plot 6-22. Line-Conducted Test Plot (L1)

Frequency MHz	Line	Corr. dB	QuasiPeak dBμV	Limit dBμV	Margin dB	Average dBμV	Limit dBμV	Margin dB
0.294	L1	0.1	47.80	60.40	12.60	43.30	50.40	7.10
0.589	L1	0.0	38.90	56.00	17.10	34.20	46.00	11.80
3.962	L1	0.3	21.00	56.00	35.00	18.10	46.00	27.90
7.235	L1	0.4	29.20	60.00	30.80	22.30	50.00	27.70
12.194	L1	0.7	26.60	60.00	33.40	21.10	50.00	28.90
29.492	L1	2.0	25.70	60.00	34.30	24.40	50.00	25.60

Table 6-8. Line-Conducted Test Data (L1)

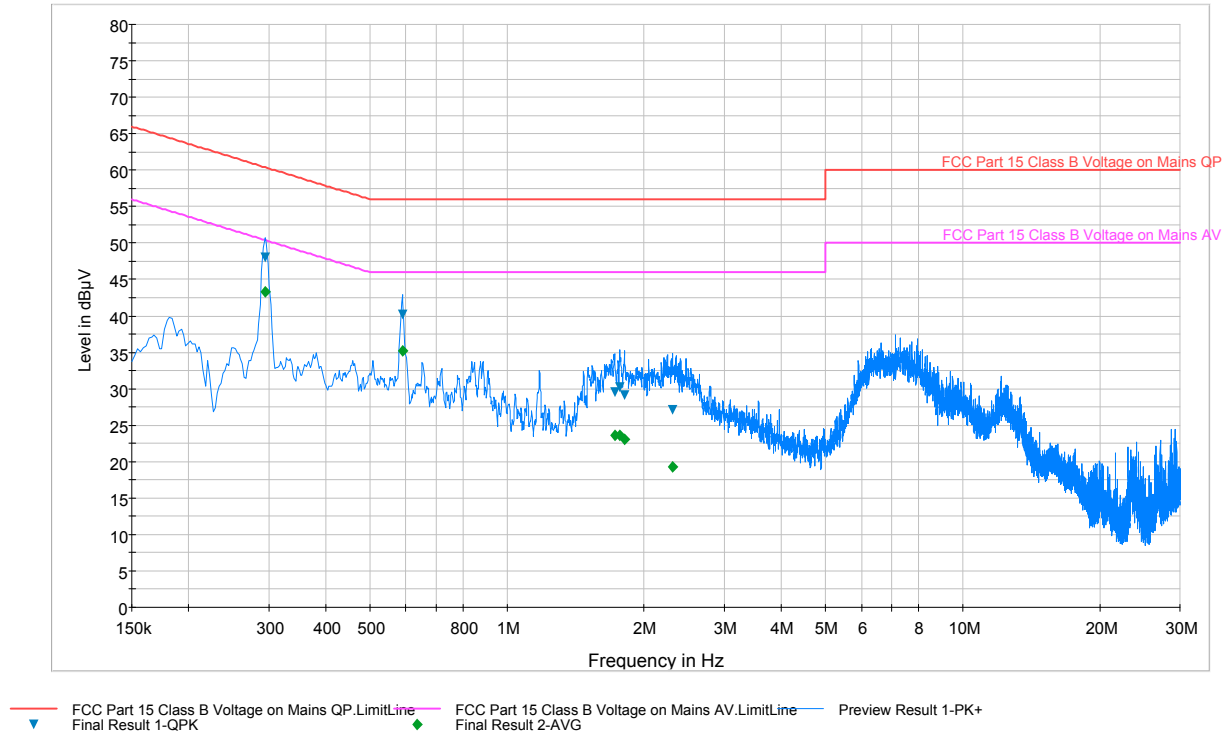
Notes:

- All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in non-hopping mode on Channel 31. The emissions found were not affected by the choice of channel used during testing.
- The limit for an intentional radiator from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
- Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
- QP/AV Level (dBμV) = QP/AV Analyzer/Receiver Level (dBμV) + Corr. (dB)
- Margin (dB) = QP/AV Limit (dBμV) - QP/AV Level (dBμV)
- Traces shown in plot are made using a peak detector.
- Deviations to the Specifications: None.

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 31 of 33

Line Conducted Measurement Data (Cont'd)

§15.207; RSS-Gen (7.2.2)



Plot 6-23. Line-Conducted Test Plot (N)

Frequency MHz	Line	Corr. dB	QuasiPeak dBμV	Limit dBμV	Margin dB	Average dBμV	Limit dBμV	Margin dB
0.294	N	0.1	48.00	60.40	12.40	43.30	50.40	7.10
0.589	N	0.1	40.20	56.00	15.80	35.30	46.00	10.70
1.723	N	0.2	29.60	56.00	26.40	23.60	46.00	22.40
1.768	N	0.2	30.20	56.00	25.80	23.60	46.00	22.40
1.811	N	0.2	29.20	56.00	26.80	23.00	46.00	23.00
2.310	N	0.2	27.10	56.00	28.90	19.30	46.00	26.70

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



Notes:

- All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in non-hopping mode on Channel 31. The emissions found were not affected by the choice of channel used during testing.
- The limit for an intentional radiator from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
- Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
- QP/AV Level (dBμV) = QP/AV Analyzer/Receiver Level (dBμV) + Corr. (dB)
- Margin (dB) = QP/AV Limit (dBμV) - QP/AV Level (dBμV)
- Traces shown in plot are made using a peak detector.
- Deviations to the Specifications: None.

FCC ID: QZCWWIC3EVM	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)	Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G	Page 32 of 33

7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Elster Modular Gatekeeper with Wireless WIC3G FCC ID: QZCWWIC3EVM** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules and RSS-210 of the Industry Canada Rules.

FCC ID: QZCWWIC3EVM		FCC Pt. 15.247 900MHz ISM BAND TEST REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1311132153.QZC	Test Dates: 11/27/2013 - 3/21/2014	EUT Type: Modular Gatekeeper with Wireless WIC3G		Page 33 of 33