1601 North A.W. Grimes Blvd., Suite B
Round Rock, TX78665
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(512)244-3371 Fax:(512)244-1846

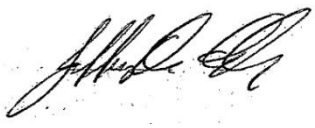
Freescale Semiconductor, Inc.
6501 William Cannon Dr
Austin, TX 78735

Dear applicant:

Enclosed is the Wireless Test Report for the Navajo Zigbee Radio by Freescale Semiconductors. This report can be used to demonstrate compliance with FCC and IC requirements for wireless devices in the United States and Canada.

If you have any questions, please contact me.

Sincerely,



Jeffrey A. Lenk
President

Enclosure

Project 13138-10

Freescale Semiconductor
Navajo Zigbee Radio

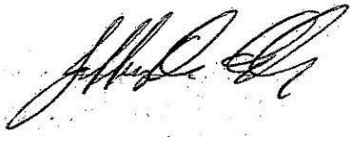
Wireless Test Report
Revision 1

Prepared for:
Freescale Semiconductor, Inc.
6501 William Cannon Dr
Austin, TX 78735

Professional Testing (EMI), Inc.
1601 N. A.W. Grimes Blvd., Suite B
Round Rock, Texas78665

February 24, 2012

Reviewed by



Jeffrey A. Lenk
President

Written by

Jesse Banda
EMC Engineer

Table of Contents

Applicant:	Freescale Semiconductor, Inc.
Applicant's Address:	6501 William Cannon Dr Austin, TX 78735
FCC ID: IC ID:	RUN1231X-MRB 6744B-1231XMRB
Project Number:	13138-10
Test Dates:	December 6, 2011 thru December 21, 2012

The Freescale Semiconductor Navajo Zigbee Radiowas tested to and found to be in compliance with FCC 47 CFR Part 15 and IC RSS-210 issue 8.

The highest emissions generated by the above equipment are listed below:

Parameter	Frequency (MHz)	Level	Limit	Margin (dB)	OBW 99%
Transmitter: Fundamental	915 (FSK)	80.4 dBµV/m @ 10 m	83.5dBµV/m	-3.1	22 kHz
Transmitter: Radiated Spurious	1830 (FSK)	53.0 dBµV/m @ 3 m	54 dBµV/m	-1.0	
Transmitter: Fundamental	915 (OOK)	82.7dBµV/m @ 10 m	83.5dBµV/m	-0.8	67 kHz
Transmitter: Radiated Spurious	499.7 (OOK)	33.3 dBµV/m @ 10 m	35.6 dBµV/m	-2.3	

I, Jesse Banda, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

Jesse Banda
EMC Engineer

This report has been reviewed and accepted by Freescale Semiconductor. The undersigned is responsible for ensuring that this devicewill continue to comply with the FCC and IC rules.

_____

Representative of Freescale Semiconductor

1.0 Introduction

1.1 Scope

This report describes the extent of the equipment under test (EUT) conformance to the intentional radiator requirements of the United States and Canada.

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates, and expressions thereof for EMC testing. The procedure of ANSI C63.4: 2009 were utilized for making all emissions measurements.

1.2 EUT Description

The Navajo Zigbee Radio is an evaluation board based on the Freescale MC12311 device. The MC12311 development platform is a highly-integrated, cost-effective, system-in-package (SIP), sub-1GHz wireless node solution with an FSK or OOK modulation-capable transceiver and low-power QE32 8-bit microcontroller. The highly integrated RF transceiver operates at 915 MHz, in the license-free Industrial, Scientific and Medical (ISM) frequency bands. The 1231X-MRB provides a platform to evaluate the MC12311 device, develop software and applications. The core device is accompanied by the 32 MHz reference oscillator crystal, RF circuitry including SMA for antenna connection and/or instrumentation, and supporting circuitry.The system tested consisted of the following:

Manufacturer	Freescale Semiconductor, Inc.
Model Number	1231X-MRB
FCC ID	RUN1231X-MRB
IC ID	6744B-1231XMRB
Power Supply	USB
Modulation Type (915 MHz)	FSK/OOK
Antenna Type	SMA
Manufacturer	Freescale Semiconductor, Inc.

The following rules apply to the operation of the EUT:

Guidelines	**FCC Rules**	**IC Rules**	
	Part 15	**RSS-GEN Issue 3**	**RSS-210 Issue 8**
Transmitter Characteristics	15.249	4.1-4.6, 7	2.2, 2.6-2.7, A2.9, A8, A9
Spurious Radiated Power	15.209	4.2, 4.7, 4.8, 6, 7	2.2, 2.6-2.7, A2.9, A8, A9
Antenna Requirement	15.203	7.1, 7.1.4	

1.3 Modifications

No modifications were made to the EUT during the performance of the test program.

1.4 Test Site

Measurements were made at the PTIsemi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas.This site is registered with the FCCunder Section 2.948 and Industry Canada per RS-212, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas, 78758, while the main office is located at 1601 N. A.W. Grimes Blvd., Suite B, Round Rock, Texas, 78665.

1.5 Applicable Documents

Document	Title	Release
ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment	2009
ANSI C63.10	American National Standard forTesting Unlicensed Wireless Devices	2009
47 CFR	Part 15 – Radio Frequency DevicesSubpart C -Intentional Radiators	
RSS-210	Low-power License-exempt Radio communication Devices (All Frequency Bands): Category I Equipment	Issue 8
RSS-Gen	General Requirements and Information for the Certification of Radio Communication Equipment	Issue 3

1.6 Applicable Tests

Test	Rule (FCC)	Rule (IC)
Output Power	15.249(a)	RSS-210 A8.5
Occupied Bandwidth	N/A	RSS-210 A8.2a
Radiated Emissions, Harmonic, Spurious, Band Edge	15.205(a), 15.209(a), 15.249(a)	RSS-Gen 7.2.2
Antenna Requirements	15.203	RSS-Gen 7.1.2

2.0 Fundamental Field Strength Measurements

Fundamental field strength measurements were made on the selected fundamental transmitting frequency of the EUT.

Tests of the fundamental field strength of the EUT also determined the worse case polarization of the device. The emissions of the device were measured with the EUT in three orthogonal axes.

2.1 Test Procedure

Radiated emission measurements were made of the fundamental field strength level for the EUT. The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable that enables 360-degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 10 meters, as measured from the closest point of the EUT. The field strength emissions were maximized by rotating the EUT. A diagram showing the test setup is given as Figure 2.1.1.

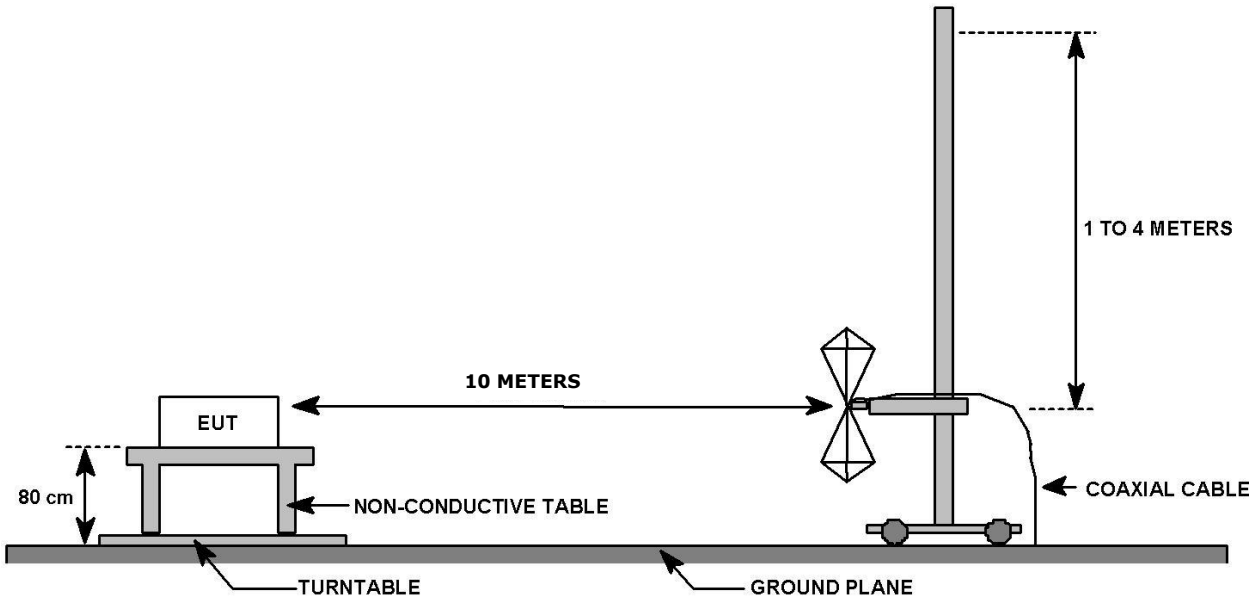


Figure 2.1.1: Radiated Emission Test Setup

2.2 Test Criteria

The maximum field strength of the fundamental frequencies is94dBuV/m at 3 m for devices operating in the frequency ranges of 915 MHz, according to FCC Section 15.249 and RSS-210.

2.3 Test Equipment

Table 2.3.1: Radiated Emissions Test Equipment (30MHz ≤ frequency < 1GHz)

Asset #	Manufacturer	Model #	Description	Calibration Due
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	8/7/2012
0586	HP	8447D	Preamp, 0.1-1300MHz, 26dB	12/14/2011
1930	Agilent	E4440A-239	Spectrum Analyzer, 3 Hz - 26.5 GHz	5/19/2012
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	4/4/2012
C027	N/A	RG214	Cable Coax, N-N, 25m	5/26/2012
1327	EMCO	1050	Controller, Antenna Mast	N/A
0942	EMCO	11968D	Turntable, 4ft.	N/A
1969	HP	11713A	Attenuator/Switch Driver	8/7/2012

2.4 Test Results

Radiated emission measurements of the fundamental field strength level for the EUT were taken on December 6, 2011 and the EUT was found to be in compliance with applicable requirements.

Table 2.4.1: Radiated Emissions on the Fundamental Strength Test

PROJECT #	DATE	FREQUENCY	RULE	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
13138-10	December 6, 2011	915 MHz	15.249	10m	Biconilog	120 kHz	120 kHz	Quasi-peak
COMMENT		**915 MHz Transmitting**						

Horizontal Polarization

Frequency Measured (MHz)	Modulation	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
915	FSK	300	1.2	Quasi-peak	74.3	80.4	83.5	-3.1
915	OOK	270	1.2	Quasi-peak	76.6	82.7	83.5	-0.8

Vertical Polarization

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
915	FSK	170	2.4	Quasi-peak	74	80.1	83.5	-3.4
915	OOK	120	3.7	Quasi-peak	74.6	80.7	83.5	-2.8

Calculated Result

Frequency Measured (MHz)	Modulation	Field Strength (dBµV)	E.I.R.P.	
			dBm	mW
915	FSK	80.4	-4.37	0.3655
915	OOK	82.7	-2.07	0.6207

Note: Calculation was performed as follows: $P = \frac{(E*d)^2}{30*G}$

P=Power in watts, E=measured maximum field strength in V/m, d=distance in meters, G=numeric gain of transmitting antenna, Distance=10 meters, Gain=0 dBi

3.0 Occupied Bandwidth

Occupied bandwidth measurements were performed on the EUT to determine compliance with RSS-210.

3.1 Test Procedure

The occupied bandwidth was measured with a spectrum analyzer connected to the antenna of the EUT while it was operating in continuous transmit mode at the appropriate center frequency. The analyzer center frequency was set to the EUT carrier frequency. A diagram showing the test setup is given as Figure 3.1.1.

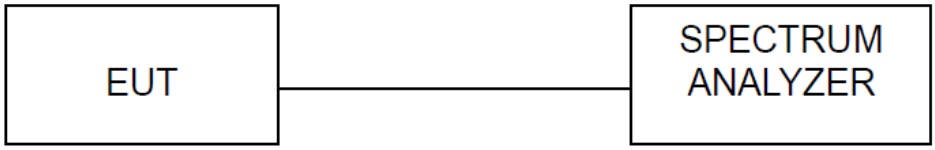


Figure 3.1.1: Conducted Measurement Method

3.2 Test Criteria

There are no requirements for FCC 15.249 or RSS-210, section A2.9.

3.3 Test Equipment

Table 3.3.1: ConductedEmissions Test Equipment for Occupied Bandwidth

Asset #	Manufacturer	Model #	Description	Calibration Due
C148	Pasternack	LLS	2 sections, total 12ft	10/25/2012
Rental	Rohde & Schwarz	FSP	Spectrum Analyzer, 9 kHz – 30 GHz	12/21/2012

3.4 Test Results

Occupied bandwidth measurements were taken on December 6, 2011.Since there are no requirements for occupied bandwidth, the EUT was found to be in compliance.

Table 3.4.1: Occupied Bandwidth Test Results, Data Sheet 1

PROJECT #	DATE	RULE	METHOD	FREQUENCY	MODE	RBW	VBW
13138-10	December 6, 2011	RSS-210	Conducted	915 MHz	FSK	3 kHz	10 kHz
COMMENT	OBW = 22 kHz						

99% BW

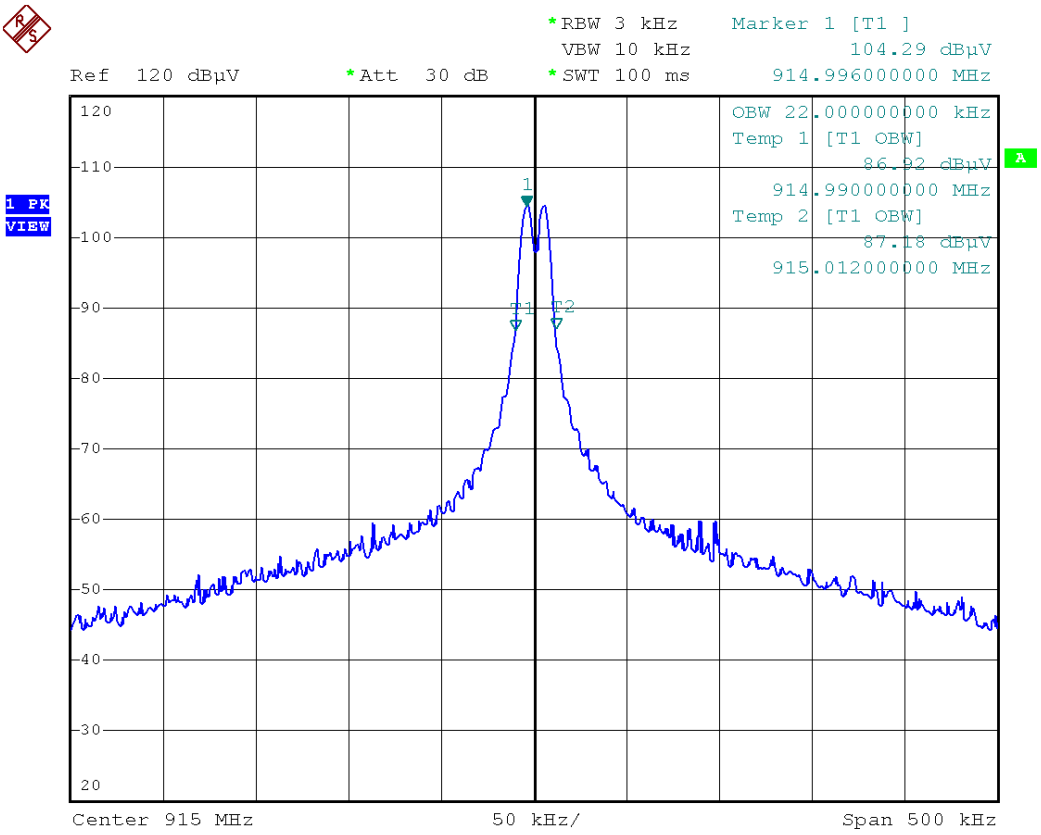
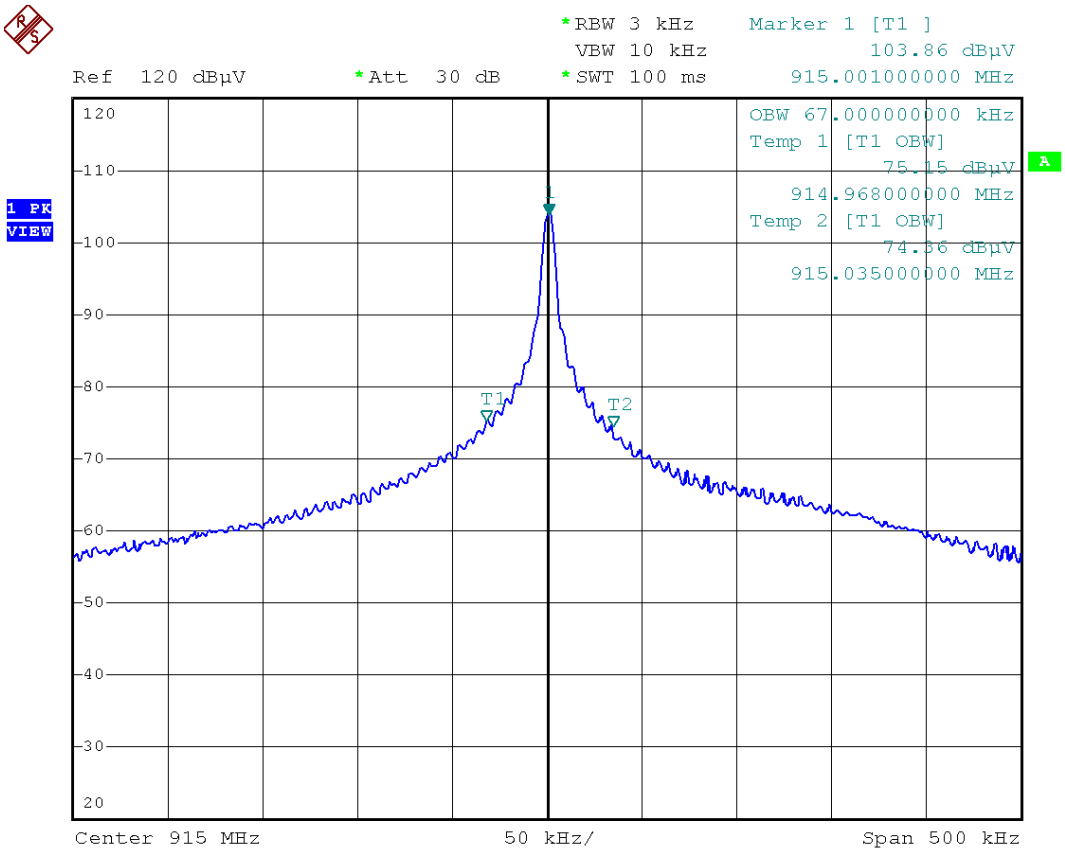


Table 3.4.2: Occupied Bandwidth Test Results, Data Sheet 2

PROJECT #	DATE	RULE	METHOD	FREQUENCY	MODE	RBW	VBW
13138-10	December 6, 2011	RSS-210	Conducted	915 MHz	OOK	3 kHz	10 kHz
COMMENT	OBW= 67 kHz						

99% BW



4.0 Out of Band Spurious Emissions

Out of band spurious/harmonic emissions measurements were performed on the EUT to determine compliance to FCC sections 15.249, 15.209and RSS-210.

4.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a rotating turntable at a distance of 3 or 10 meters from the measurement antenna.

For spurious emissions below 1 GHz, quasi-peak detection was used with a resolution bandwidth of 120 kHz. All measurements below 1 GHz were normalized to 10 meter distance using a 20 dB/decade distance extrapolation. The emissions were maximized by rotating the EUT and raising and lowering the measurement antenna from 1 to 4 meters.

Spurious/harmonic emissions above 1 GHz were measured with average and peak detection with a resolution bandwidth of 1 MHz and measured at a distance of 3 meter. Average detection was used to determine compliance of the EUT if the peak did not meet the average limit. Non-harmonic emissions must satisfy the average limit and the peak limit (20 dB above average). A diagram showing the test setup is given as Figure 2.1.1.

4.2 Test Criteria

The radiated limits of FCC 15.209 and RSS-210 are shown below. The limits specified are at 3 meters. The limits are quasi-peak for emissions below 1 GHz and average for emissions above 1 GHz. Also above 1 GHz, the peak limit is 20 dB above the average limit.

Frequency MHz	Specification Test Distance (Meters)	Field Strength (dBuV/m)	Alternative Test Distance (Meters)	Field Strength (dBuV/m)
30 to 88	3	40.0	10	29.5
88 to 216	3	43.5	10	33.1
216 to 960	3	46.0	10	35.6
Above 960	3	54.0	3	54.0

4.3 Test Equipment

Table 4.3.1: Radiated Emissions Test Equipment (frequency < 1 GHz)

Asset #	Manufacturer	Model #	Description	Calibration Due
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	8/7/2012
0586	HP	8447D	Preamp, 0.1-1300MHz, 26dB	12/14/2011
1930	Agilent	E4440A-239	Spectrum Analyzer, 3 Hz - 26.5 GHz	5/19/2012
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	4/4/2012
C027	N/A	RG214	Cable Coax, N-N, 25m	5/26/2012

Table 4.3.2: Microwave Radiated Emissions Test Equipment (1GHz ≤ frequency < 10GHz)

Asset #	Manufacturer	Model #	Description	Calibration Due
1594	Miteq	AFS44-00102650	Amplifier, 1-26.5GHz, 42dB	2/28/2012
C030	N/A	RG214	Cable Coax, N-N, 30m	5/26/2012
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	1/19/2012
1930	Agilent	E4440A-239	Spectrum Analyzer, 3 Hz - 26.5 GHz	5/19/2012

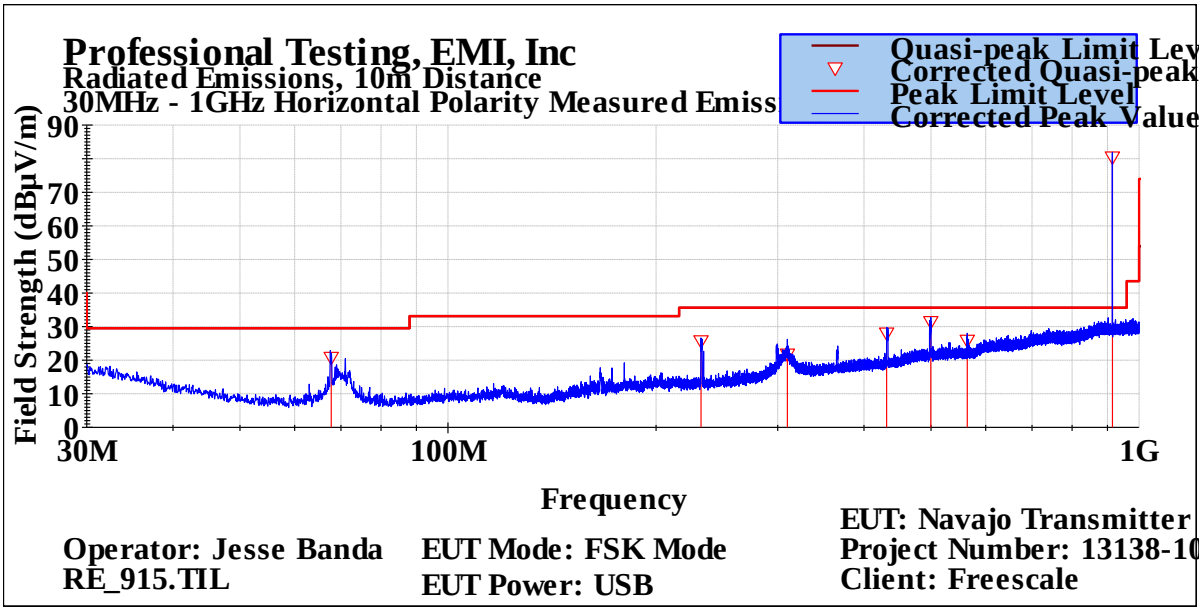
4.4 Test Results

Out of band spurious emissions measurements were taken on December 6, 2011, and the EUT was found to be in compliance with applicable requirements.

Table 4.4.1: Out of Band Spurious Emissions Test Results, 30 MHz to 1 GHz, Horizontal Polarization

FREQUENCY	MODE	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
915 MHz	FSK	December 6, 2011	FCC B	10 m	Biconilog	120 kHz	120 kHz	Quasi-peak
COMMENT	Transmitting 915 MHz Harmonics and spurious investigated up to 10 GHz							

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
67.7598	10	144	3.17	Quasi-peak	38.6	20.7	29.5	-8.8
232.334	10	249	3.45	Quasi-peak	37	25.6	35.6	-10.0
309.888	10	309	3.17	Quasi-peak	30.6	21.7	35.6	-13.9
431.36	10	4	1.33	Quasi-peak	33.1	28.0	35.6	-7.6
499.709	10	39	1.74	Quasi-peak	34.1	31.5	35.6	-4.1
564.158	10	42	1.78	Quasi-peak	27.5	25.8	35.6	-9.8

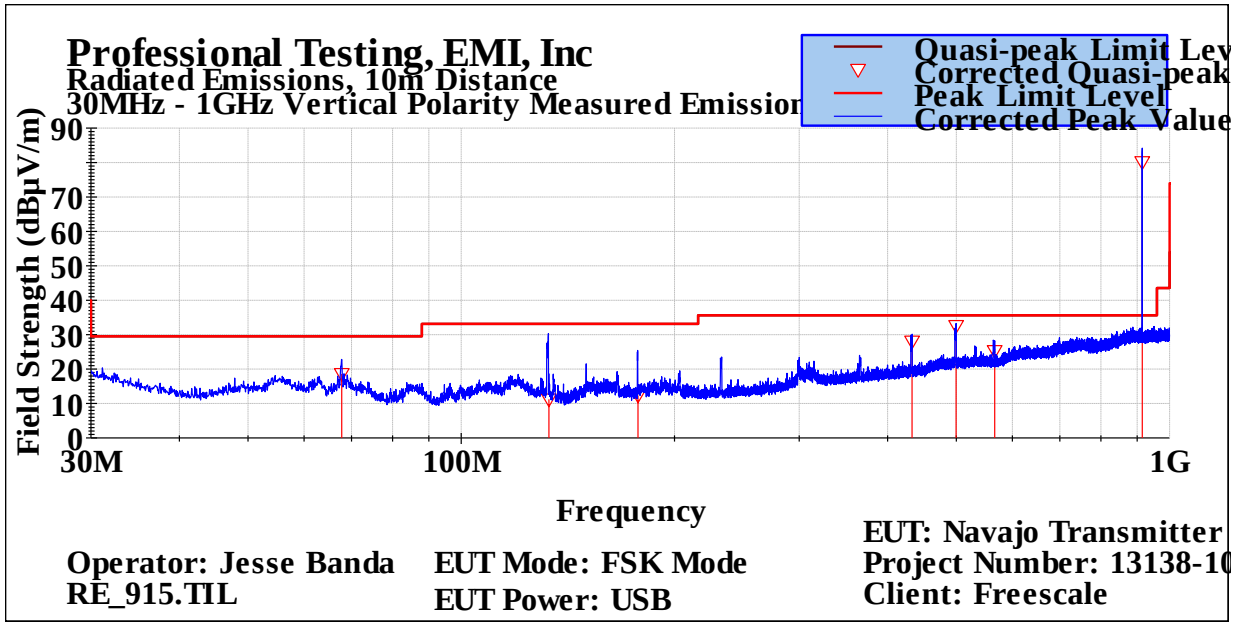


Result = Pass

Table 4.4.2: Out of Band Spurious Emissions Test Results, 30 MHz to 1 GHz, Vertical Polarization

FREQUENCY	MODE	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
915 MHz	FSK	December 6, 2011	FCC B	10 m	Biconilog	120 kHz	120 kHz	Quasi-peak
COMMENT	Transmitting 915 MHz Harmonics and spurious investigated up to 10 GHz							

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
67.8036	10	171	1.38	Quasi-peak	36.4	18.5	29.5	-11.0
132.97	10	290	1.62	Quasi-peak	28	11.2	33.1	-21.9
177.633	10	292	1.45	Quasi-peak	25.8	12.3	33.1	-20.8
433.034	10	253	3.68	Quasi-peak	33	28.0	35.6	-7.6
499.712	10	313	3.03	Quasi-peak	35.2	32.6	35.6	-3.0
566.337	10	318	2.83	Quasi-peak	26.9	25.2	35.6	-10.4



Result = Pass

Table 4.4.3: Out of Band Spurious Emissions Test Results, 1 GHz to 10 GHz, Horizontal and Vertical Polarizations

FREQUENCY	MODE	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
915 MHz	FSK	December 6, 2011	FCC B	3 m	Horn	1 MHz	1 MHz	Average
COMMENT	Transmitting 915 MHz Harmonics and spurious investigated up to 10 GHz							

Horizontal Polarization

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
1829.96	3	108	1	Average	56.6	53.0	54.0	-0.9
1829.96	3	108	1	Peak	58.1	54.5	74.0	-19.5
2745.23	3	93	1	Average	39	38.7	54.0	-15.3
2745.23	3	93	1	Peak	45.1	44.8	74.0	-29.2
3666.6	3	66	1	Average	29.6	31.0	54.0	-23.0
3666.6	3	66	1	Peak	40.1	44.2	74.0	-29.8
4580.56	3	181	1	Average	29	31.7	54.0	-22.2
4580.56	3	181	1	Peak	40.6	43.3	74.0	-30.7
5491.64	3	250	1	Average	28.6	31.0	54.0	-22.9
5491.64	3	250	1	Peak	40.5	42.9	74.0	-31.1
5736.11	3	226	1	Average	28.8	32.1	54.0	-21.9
5736.11	3	226	1	Peak	40.6	43.9	74.0	-30.1
6404.67	3	189	1	Average	28.3	33.7	54.0	-20.3
6404.67	3	189	1	Peak	37.3	42.7	74.0	-31.3
7314.28	3	57	1	Average	27.9	34.5	54.0	-19.5
7314.28	3	57	1	Peak	36	42.6	74.0	-31.4
8238.51	3	212	1	Average	26.6	34.5	54.0	-19.5
8238.51	3	212	1	Peak	36.4	44.3	74.0	-29.7
9151.31	3	314	1	Average	25.9	35.4	54.0	-18.6
9151.31	3	314	1	Peak	35.1	44.6	74.0	-29.4

Vertical Polarization

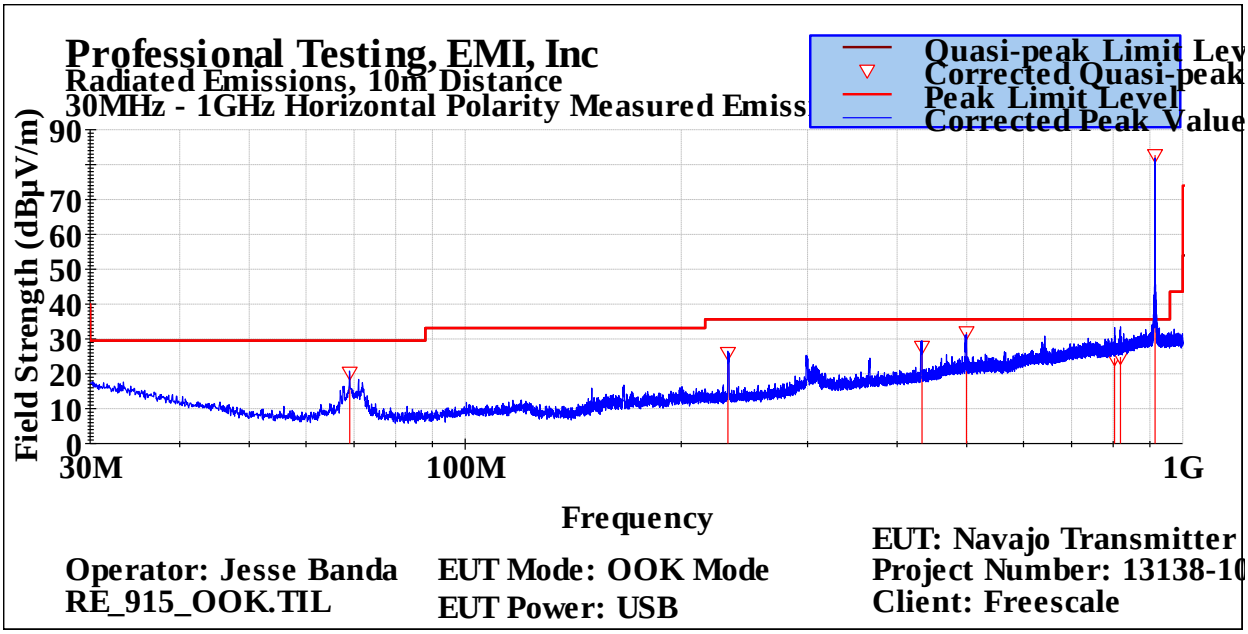
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
1829.98	3	50	1	Average	55.4	51.8	54.0	-2.2
1829.98	3	50	1	Peak	58.4	53.8	74.0	-20.2
2125.09	3	109	1	Average	31.1	29.5	54.0	-24.5
2125.09	3	109	1	Peak	43.6	42.0	74.0	-32.0
2745.07	3	40	1	Average	40.3	40.0	54.0	-14.0
2745.07	3	40	1	Peak	43.6	43.3	74.0	-30.7
3668.35	3	111	1	Average	29.5	30.9	54.0	-23.1
3668.35	3	111	1	Peak	40	41.4	74.0	-32.6
4571.59	3	127	1	Average	29	31.7	54.0	-22.2
4571.59	3	127	1	Peak	46.6	49.3	74.0	-24.7
5484.54	3	241	1	Average	28.6	31.0	54.0	-22.9
5484.54	3	241	1	Peak	40.6	43.0	74.0	-31.0
5785.56	3	189	1	Average	28.9	32.3	54.0	-21.7
5785.56	3	189	1	Peak	40.9	44.3	74.0	-29.7
6416.92	3	260	1	Average	28.1	33.5	54.0	-20.4
6416.92	3	260	1	Peak	39.8	45.2	74.0	-28.8
7319.96	3	255	1	Average	38.5	45.1	54.0	-8.9
7319.96	3	255	1	Peak	37.9	44.5	74.0	-29.5
8223.48	3	114	1	Average	26.9	34.8	54.0	-19.2
8223.48	3	114	1	Peak	36.1	44.0	74.0	-30.0
9160.32	3	30	1	Average	25.7	35.2	54.0	-18.8
9160.32	3	30	1	Peak	35.4	44.9	74.0	-29.1

Result = Pass

Table 4.4.4: Out of Band Spurious Emissions Test Results, 30 MHz to 1 GHz, Horizontal Polarization

FREQUENCY	MODE	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
915 MHz	OOK	December 6, 2011	FCC B	10 m	Biconilog	120 kHz	120 kHz	Quasi-peak
COMMENT	Transmitting 915 MHz Harmonics and spurious investigated up to 10 GHz							

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
69.0225	10	140	2.9	Quasi-peak	38.2	20.3	29.5	-9.2
232.321	10	268	4.04	Quasi-peak	37.3	25.9	35.6	-9.7
433.102	10	225	1.99	Quasi-peak	32.8	27.8	35.6	-7.8
499.689	10	23	1.34	Quasi-peak	34.6	32.0	35.6	-3.6
803.645	10	41	3.01	Quasi-peak	20.7	24.5	35.6	-11.1
818.884	10	33	1.32	Quasi-peak	20.6	24.8	35.6	-10.8

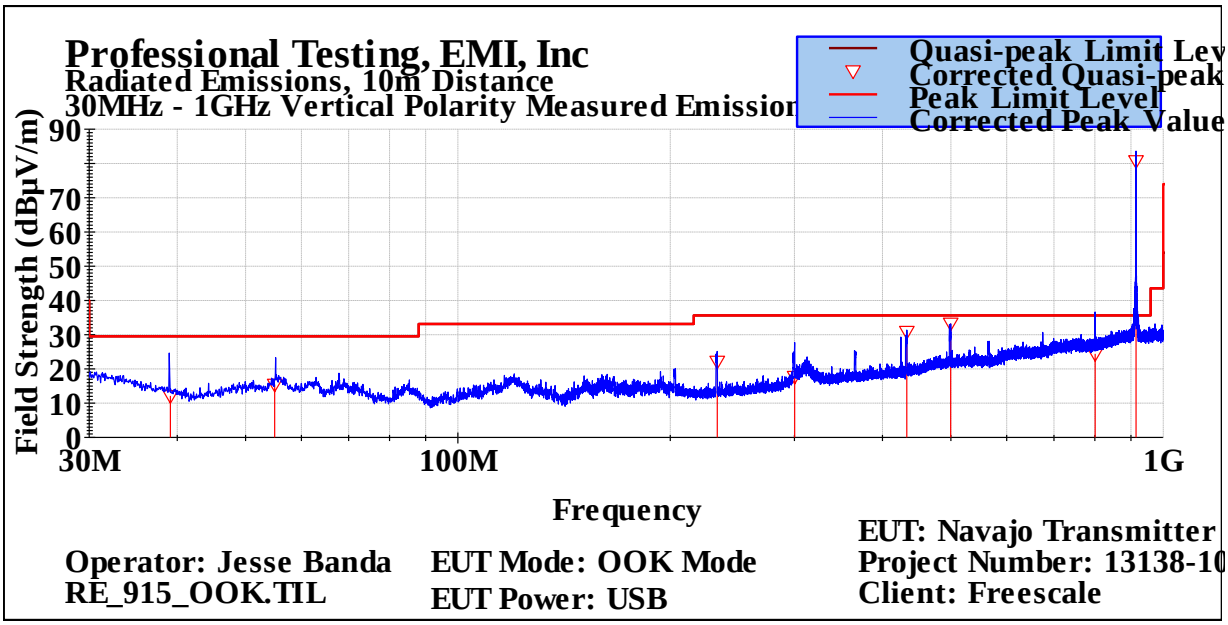


Result = Pass

Table 4.4.5: Out of Band Spurious Emissions Test Results, 30 MHz to 1 GHz, Vertical Polarization

FREQUENCY	MODE	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
915 MHz	OOK	December 6, 2011	FCC B	10 m	Biconilog	120 kHz	120 kHz	Quasi-peak
COMMENT	Transmitting 915 MHz Harmonics and spurious investigated up to 10 GHz							

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
39.1098	10	268	1.8	Quasi-peak	24.7	12.1	29.5	-17.4
54.991	10	142	4	Quasi-peak	32.8	15.4	29.5	-14.1
233.195	10	6	1.55	Quasi-peak	33.5	22.2	35.6	-13.4
300.176	10	311	1.18	Quasi-peak	26.9	17.7	35.6	-17.9
433.053	10	314	3.61	Quasi-peak	35.9	30.9	35.6	-4.7
499.719	10	320	3.06	Quasi-peak	35.9	33.3	35.6	-2.3
800.887	10	13	3.72	Quasi-peak	20.7	24.4	35.6	-11.2



Result = Pass

Table 4.4.6: Out of Band Spurious Emissions Test Results, 1 GHz to 10 GHz, Horizontal and Vertical Polarizations

FREQUENCY	MODE	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
915 MHz	OOK	December 6, 2011	FCC B	3 m	Horn	1 MHz	1 MHz	Average
COMMENT	Transmitting 915 MHz Harmonics and spurious investigated up to 10 GHz							

Horizontal Polarization

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
1468.09	3	33	1	Average	30.4	24.3	54.0	-29.6
1468.09	3	33	1	Peak	44.1	38.0	74.0	-36.0
1592.32	3	163	1	Average	32.1	26.6	54.0	-27.3
1592.32	3	163	1	Peak	48.4	42.9	74.0	-31.1
1830.1	3	21	1	Average	51.8	48.2	54.0	-5.7
1830.1	3	21	1	Peak	56.1	52.5	74.0	-21.5
1862.18	3	6	1	Average	29.7	26.4	54.0	-27.6
1862.18	3	6	1	Peak	42.1	38.8	74.0	-35.2
2748.85	3	46	1	Average	30.2	29.9	54.0	-24.1
2748.85	3	46	1	Peak	43.8	43.5	74.0	-30.5
3662.21	3	149	1	Average	29.8	31.2	54.0	-22.8
3662.21	3	149	1	Peak	42.1	43.5	74.0	-30.5
4576.04	3	353	1	Average	28.8	31.5	54.0	-22.4
4576.04	3	353	1	Peak	40.9	43.6	74.0	-30.4
5492.49	3	224	1	Average	28.6	31.0	54.0	-22.9
5492.49	3	224	1	Peak	41	43.4	74.0	-30.6
5747.41	3	121	1	Average	29	32.3	54.0	-21.7
5747.41	3	121	1	Peak	43.6	46.9	74.0	-27.1
6407.31	3	232	1	Average	28.2	33.6	54.0	-20.4
6407.31	3	232	1	Peak	37.4	42.8	74.0	-31.2
7319.83	3	6	1	Average	29	35.6	54.0	-18.4
7319.83	3	6	1	Peak	37.6	44.2	74.0	-29.8
8224.79	3	257	1	Average	26.7	34.6	54.0	-19.4
8224.79	3	257	1	Peak	38	45.9	74.0	-28.1
9160	3	257	1	Average	25.4	34.9	54.0	-19.1
9160	3	257	1	Peak	38.2	47.7	74.0	-26.3

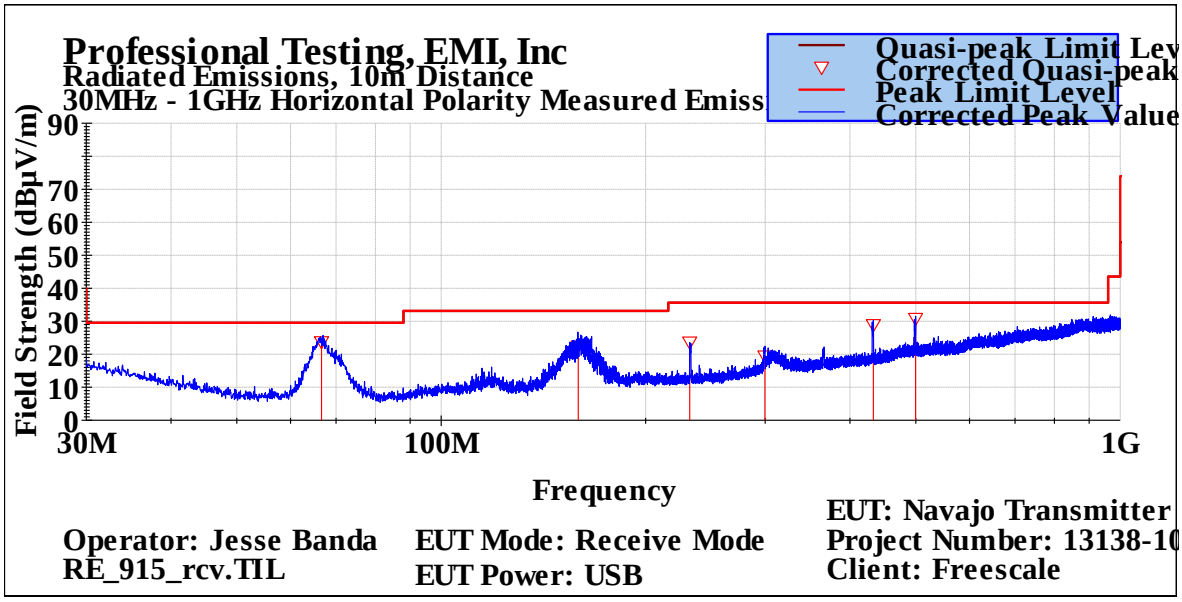
Vertical Polarization

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
1187.6	3	67	1	Average	31.2	25.8	54.0	-28.2
1187.6	3	67	1	Peak	43.5	38.1	74.0	-35.9
1466.47	3	314	1	Average	30.4	24.3	54.0	-29.6
1466.47	3	314	1	Peak	52.4	46.3	74.0	-27.7
1596.88	3	267	1	Average	32.3	26.8	54.0	-27.1
1596.88	3	267	1	Peak	54.2	48.7	74.0	-25.3
1830.11	3	50	1	Average	52.6	49.0	54.0	-4.9
1830.11	3	50	1	Peak	53.4	49.8	74.0	-24.2
1858.05	3	229	1	Average	31.2	27.9	54.0	-26.1
1858.05	3	229	1	Peak	48	44.7	74.0	-29.3
2755.23	3	215	1	Average	30.3	30.0	54.0	-24.0
2755.23	3	215	1	Peak	40.1	39.8	74.0	-34.2
3655.3	3	90	1	Average	29.6	30.9	54.0	-23.0
3655.3	3	90	1	Peak	41.6	42.9	74.0	-31.1
4581.53	3	12	1	Average	29	31.7	54.0	-22.2
4581.53	3	12	1	Peak	40.2	42.9	74.0	-31.1
5487.4	3	127	1	Average	28.6	31.0	54.0	-22.9
5487.4	3	127	1	Peak	40.8	43.2	74.0	-30.8
5766.37	3	348	1	Average	29	32.3	54.0	-21.6
5766.37	3	348	1	Peak	40.2	43.5	74.0	-30.5
6401.15	3	241	1	Average	28.1	33.5	54.0	-20.5
6401.15	3	241	1	Peak	40.9	46.3	74.0	-27.7
7320.12	3	266	0	Average	33.7	40.3	54.0	-13.7
7320.12	3	266	0	Peak	38.4	45.0	74.0	-29.0
8235.87	3	148	1	Average	26.8	34.7	54.0	-19.3
8235.87	3	148	1	Peak	36.8	44.7	74.0	-29.3
9150.02	3	75	1	Average	26.3	35.8	54.0	-18.2
9150.02	3	75	1	Peak	38.1	47.6	74.0	-26.4

Table 4.4.7: Receive Mode Radiated Emissions Test Results, 30 MHz to 1 GHz, Horizontal Polarization

FREQUENCY	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
RCV Mode	December 6, 2011	FCC B	10 m	Biconilog	CISPR 120 kHz	1 MHz	Quasi Peak
COMMENT	Receive mode Spurious investigated up to 10 GHz						

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
66.6424	10	290	3.15	Quasi-peak	41.6	23.8	29.5	-5.7
159.171	10	136	3.66	Quasi-peak	37.7	22.5	33.1	-10.6
232.296	10	238	3.99	Quasi-peak	35	23.6	35.6	-12.0
299.798	10	265	2.92	Quasi-peak	28.7	19.5	35.6	-16.1
433.046	10	131	1.43	Quasi-peak	34	29.0	35.6	-6.6
499.671	10	29	1.77	Quasi-peak	33.5	30.9	35.6	-4.7

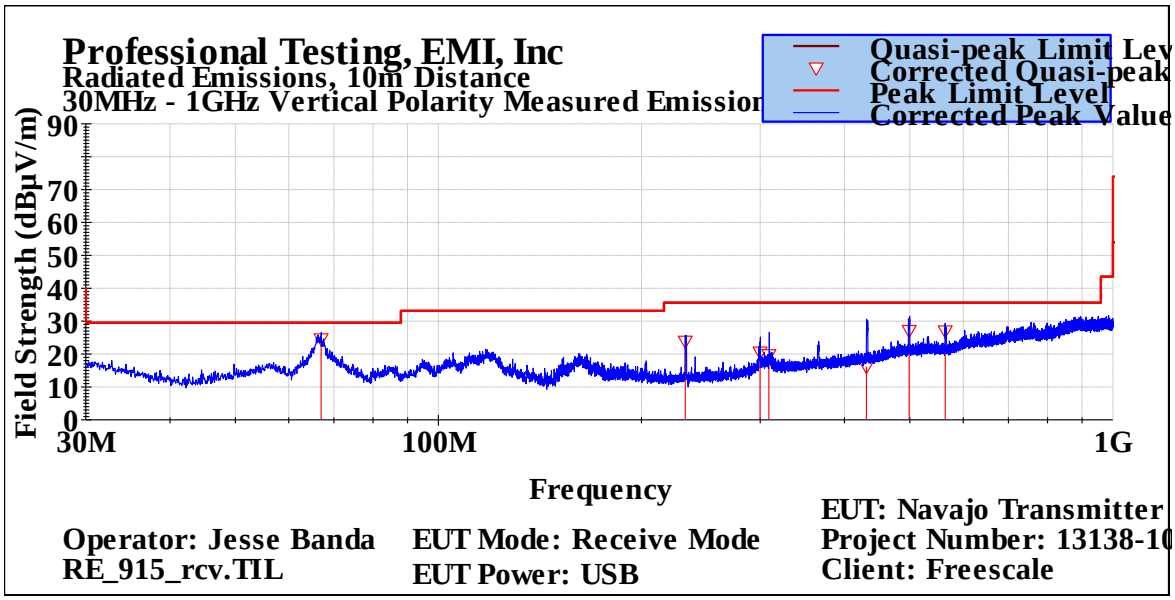


Result = Pass

Table 4.4.8: Receive Mode Radiated Emissions Test Results, 30 MHz to 1 GHz, Vertical Polarization

FREQUENCY	DATE	CLASS	DISTANCE	ANTENNA	RBW	VBW	DETECTOR
RCV Mode	December 6, 2011	FCC B	10 m	Biconilog	CISPR 120 kHz	1 MHz	Quasi Peak
COMMENT	Receive mode Spurious investigated up to 10 GHz						

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)
67.0014	10	285	1.35	Quasi-peak	42.4	24.6	29.5	-4.9
232.309	10	47	1.54	Quasi-peak	35.2	23.8	35.6	-11.8
299.809	10	46	1.17	Quasi-peak	29.8	20.6	35.6	-15.0
308.952	10	350	1.33	Quasi-peak	28.7	19.8	35.6	-15.8
431.147	10	210	3.27	Quasi-peak	21.2	16.1	35.6	-19.5
498.852	10	291	2.68	Quasi-peak	29.8	27.1	35.6	-8.5
564.149	10	230	2.55	Quasi-peak	28.7	27.0	35.6	-8.6



Result = Pass

5.0 Power Line Conducted Emissions

5.1 Test Procedure

The EUT was configured and operated in a manner consistent with typical applications. The EUT power cord in excess of one meter was folded back and forth forming a bundle 30 to 40 cm long in the approximate center of the cable. Power supply cords for the peripheral equipment were powered from an auxiliary LISN.Excess interface cable lengths were separately bundled in a non-inductive arrangement at the approximate center of the cable with the bundle 30 to 40 centimeters in length.The conducted emissions were maximized, by varying the operating states and configuration of the EUT.

The tests were performed in an 8’ x 8’ RayProof modular shielded room. The EUT was placed on a non-metallic table 0.4 meters from a vertical metal reference plane and 0.8 meters from a horizontal metal reference plane.A drawing showing the test setup is given as Figure 1.

5.2 Test Criteria

The FCC Part 15 Class B conduction limits are given below.

Frequency (MHz)	Conducted Limits (dBuV)	
	Average	Quasi-Peak
0.15 – .50	66-56*	56 – 46*
.50 - 5	56	46
5 – 30	60	50

The tighter limit shall apply at the edge between two frequency bands.
*Decreases with the logarithm of the frequency.

5.3 Test Equipment

Table 4.3.1: Radiated Emissions Test Equipment (frequency < 1 GHz)

Asset #	Manufacturer	Model #	Description	Calibration Due
991	HP	8568B	Spectrum Analyzer 100Hz-1.5GHz	11/13/2012
992	HP	85662A	Spec Anal Dsply for AN0991 6dB	N/A
238	HP	85685A	RF Preselector	8/7/2012
275	HP	85650A	Quasi-Peak Adapter CISPR	8/3/2012
27	EMCO	3825/2	LISN, 10kHz-100MHz	6/26/2012
1173	PTI	100k HPF	Filter, High Pass, 100kHz	1/11/2013
1087	PTI	PTI-ALF3	Attenuator Limiter Filter	4/17/2012
C067	N/A	RG58	Cable Coax, BNC-BNC, 9m	9/25/2012
C107	N/A	none	Cable 3.5 mm 2 m	3/28/2012
939	EMCO	3825/2	LISN, 10kHz-100MHz	6/26/2012

5.4 Test Results

Out of band spurious emissions measurements were taken on March 5, 2012, and the EUT was found to be in compliance with applicable requirements.

Table 5.4.1: Power Line Conducted Emissions Test Results, Neutral Line

PROJECT #	DATE	CLASS	LINE	RBW	VBW	DETECTOR
13138-10	March 5,2012	FCC B	Neutral	CISPR 9 kHz	100 kHz	Quasi-Peak/Avg
COMMENT	Transmitting					

Conducted Emissions Test Results Data Sheet - Neutral Lead									
EUT Line Voltage:			**120 VAC**		**EUT Line Frequency:**			**60 Hz**	
Frequency Measured (MHz)	**Peak Detector Reading (dBµV)**	**Quasi-peak Detector Reading (dBµV)**	**Quasi-peak Detector Limit (dBµV)**	**Quasi-peak Detector Margin (dB)**	**Quasi-peak Detector Test Results**	**Average Detector Reading (dBµV)**	**Average Detector Limit (dBµV)**	**Average Detector Margin (dB)**	**Average Detector Test Results**
0.30189	45.2	41.5	60.2	-18.7	PASS	30.6	50.2	-19.6	PASS
0.44923	45.5	42	56.9	-14.9	PASS	22.9	46.9	-24	PASS
0.44965	45.5	42	56.9	-14.9	PASS	22.7	46.9	-24.2	PASS
0.52002	45	39.2	56	-16.8	PASS	25.3	46	-20.7	PASS
0.521	45.1	40.7	56	-15.3	PASS	21.9	46	-24.1	PASS
0.5617	50.4	39.4	56	-16.6	PASS	20.5	46	-25.5	PASS
24.0102	53	49	60	-11	PASS	47.9	50	-2.1	PASS
24.0134	52.8	50.5	60	-9.5	PASS	49.5	50	-0.5	PASS
24.1112	52.6	50.9	60	-9.1	PASS	47.7	50	-2.3	PASS
24.1116	52.7	50.9	60	-9.1	PASS	47.7	50	-2.3	PASS

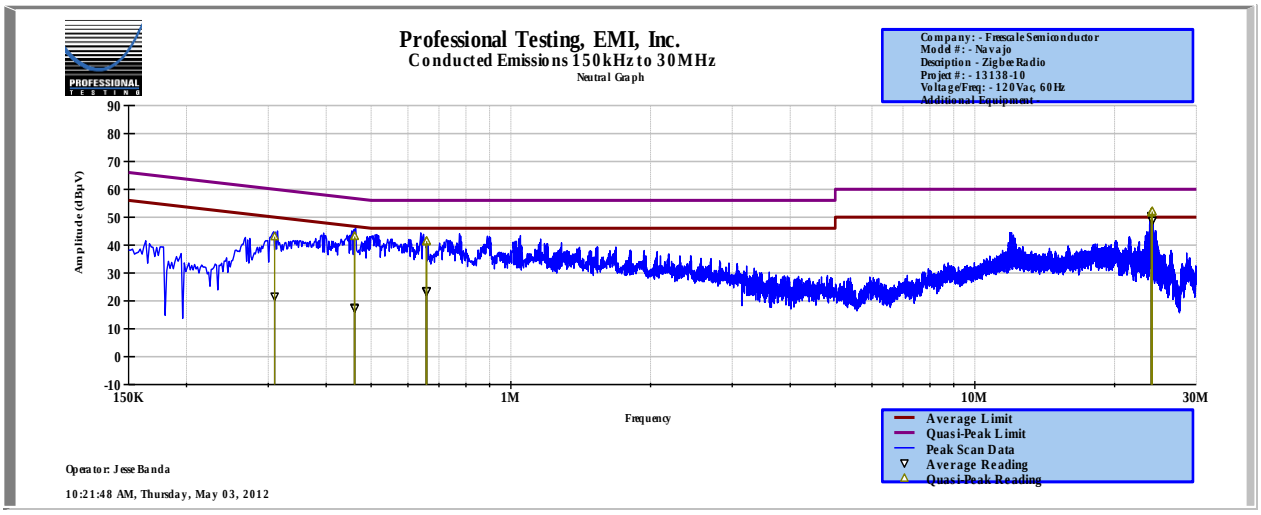
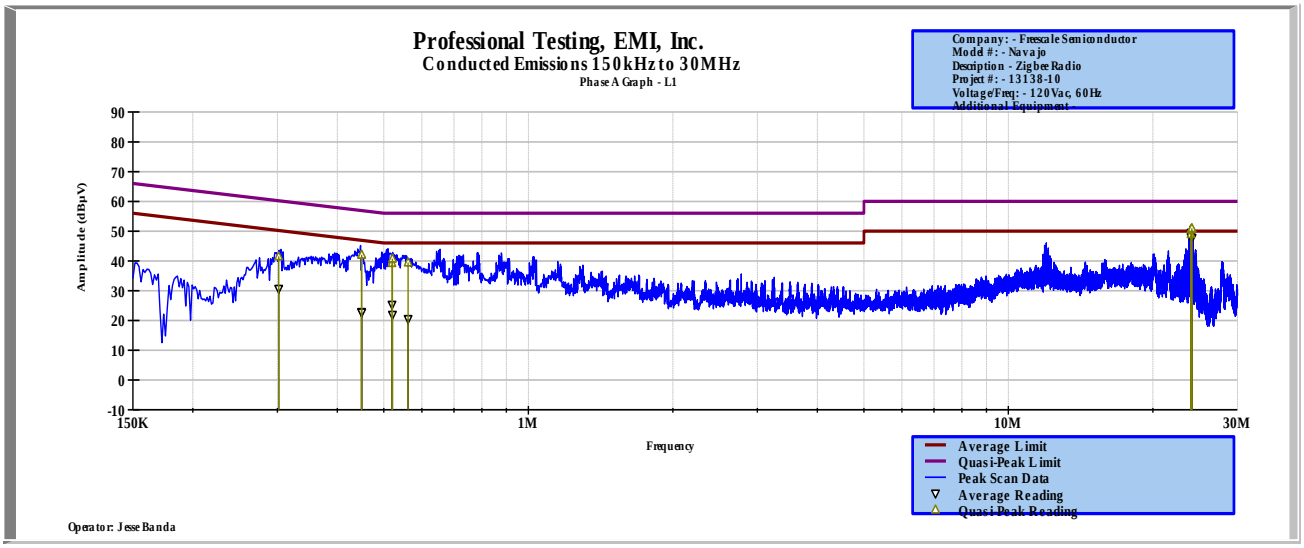


Table 5.4.2: Power Line Conducted Emissions Test Results, Phase Line

PROJECT #	DATE	CLASS	LINE	RBW	VBW	DETECTOR
13138-10	March 5,2012	FCC B	Phase	CISPR 9 kHz	100 kHz	Quasi-Peak/Avg
COMMENT	Transmitting					

Conducted Emissions Test Results Data Sheet - Phase Lead (Line 1)									
EUT Line Voltage:			**120 VAC**		**EUT Line Frequency:**			**60 Hz**	
Frequency Measured (MHz)	**Peak Detector Reading (dBµV)**	**Quasi-peak Detector Reading (dBµV)**	**Quasi-peak Detector Limit (dBµV)**	**Quasi-peak Detector Margin (dB)**	**Quasi-peak Detector Test Results**	**Average Detector Reading (dBµV)**	**Average Detector Limit (dBµV)**	**Average Detector Margin (dB)**	**Average Detector Test Results**
0.30962	45.5	43	60	-17	PASS	21.7	50	-28.3	PASS
0.46001	46.5	43.2	56.7	-13.5	PASS	17.7	46.7	-29	PASS
0.46069	46.3	43.1	56.7	-13.6	PASS	17.4	46.7	-29.2	PASS
0.6571	44.9	41.2	56	-14.8	PASS	23.5	46	-22.5	PASS
0.6578	44.8	41.3	56	-14.7	PASS	23.6	46	-22.4	PASS
0.6586	45	41.4	56	-14.6	PASS	23.6	46	-22.4	PASS
24.0149	54.1	51.7	60	-8.3	PASS	49.5	50	-0.5	PASS
24.0156	53.8	51.6	60	-8.4	PASS	49.6	50	-0.4	PASS
24.1106	54.2	52	60	-8	PASS	48.8	50	-1.2	PASS
24.111	53.9	52	60	-8	PASS	48.9	50	-1.1	PASS



6.0 Antenna Requirements

An antenna evaluation was performed on the EUTtodetermine compliance with FCC sections 15.203, 15.249(b) and RSS-210.

6.1 Evaluation Procedure

The design of the EUT antenna was evaluated for conformance to engineering requirements for gain and to prevent substitution of unapproved antennae. Gain of the antenna was assessed by reviewing the antenna manufacturer's data sheet.

6.2 Evaluation Criteria

The antenna design must meet at least one of the following criteria:

a) Antenna is permanently attached to the unit.
b) Antenna must use a unique type of connector to attach to the EUT.
c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

6.3 Evaluation Results

The Navajo Zigbee Radio met the criteria of this rule by virtue of having a professionally installed antenna.

End of Report

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