NVLAP Lab Code 200087-0

Application Submittal Report
For
FCC And Industry Canada Grant Of Certification

FOR

Model: 734W
Broadband Digital Transmission System
2412-2462 MHz

FCC ID: CCKPC0136
IC: 5251A-PC0136

FOR

Digital Monitoring Products, Inc.
2500 North Partnership Boulevard
Springfield, MO 65802-6310

Test Report Number: 120103

Authorized Signatory: Scot D Rogers
Scot D. Rogers

NVLAP Lab Code 200087-0

ROGERS LABS, INC.
4405 West 259th Terrace
Louisburg, KS 66053
Phone / Fax (913) 837-3214

Engineering Test Report For Grant Of Certification Application Submittal

CFR47, Part 15C - Intentional Radiators Paragraphs15.247
Industry Canada, RSS-210 Digital Modulation System

For

Digital Monitoring Products, Inc.

2500 North Partnership Boulevard
Springfield, MO 65802-6310

Model: 734W

Broadband Digital Transmission System
Frequency Range 2412-2462 MHz

FCC ID: CCKPC0136
IC: 5251A-PC0136

Test Date: January 3, 2012

Certifying Engineer: Scot D Rogers

Scot D. Rogers
Rogers Labs, Inc.
4405 West 259th Terrace
Louisburg, KS 66053
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The following information is submitted for consideration in obtaining Grant of Certification for a license exempt Digital Transmission System intentional radiator operating under CFR47 Paragraph 15C, 15.247 and Industry Canada Spectrum Management and Telecommunications Radio Standard Specification RSS-210, Annex 8, Issue 8.

Name of Applicant: Digital Monitoring Products, Inc
2500 North Partnership Boulevard
Springfield, MO 65802-6310

Model: 734W

FCC I.D.: CCKPC0136 IC: 5251A-PC0136

Frequency Range: 2412-2462 MHz

Operating Power: 20 dBm, 0.10 -Watts output power, 17,067 kHz Occupied Bandwidth

Opinion / Interpretation of Results

Test Performed	Minimum Margin (dB)	Results
Antenna requirement	N/A	Complies
Restricted Bands Emissions per CFR 47 15.205 and RSS-210 2.2	-2.2	Complies
AC Line Conducted Emissions as per CFR 47 15.207 and RSS-210 2.5	N/A	Complies
General Radiated Emissions as per CFR 47 15.209 and RSS-210	-2.5	Complies
Radiated Harmonic Emissions as per CFR 47 15.247 and RSS-210	-2.2	Complies

Environmental Conditions

Ambient Temperature	21.5° C
Relative Humidity	21%
Atmospheric Pressure	1024.6 mb

Equipment Tested

Equipment	Model	FCC I.D.
EUT	734W	CCKPC0136

Antenna/Type	Model	Gain
¼ Dipole (Omni directional)	W-1030	2 dBi

Application for Certification

(1) Manufacturer: Digital Monitoring Products, Inc.
2500 North Partnership Boulevard
Springfield, MO 65802-6310

(2) Identification: Model: 734W

FCC I.D.: CCKPC0136 IC: 5251A-PC0136

(3) Instruction Book:

Refer to Exhibit for Instruction Manual.

(4) Description of Circuit Functions:

Refer to Exhibit of Operational Description.

(5) Block Diagram with Frequencies:

Refer to Exhibit of Operational Description.

(6) Report of Measurements:

Report of measurements follows in this Report.

(7) Photographs: Construction, Component Placement, etc.:

Refer to Exhibit for photographs of equipment.

(8) List of Peripheral Equipment Necessary for operation. The equipment operates from power received from supporting equipment. Testing was performed with the EUT powered from manufacturer supplied 12-volt battery.

(9) Transition Provisions of CFR47 15.37 are not requested.

(10) Not Applicable. The unit is not a scanning receiver.

(11) Not Applicable. The EUT does not operate in the 59 – 64 GHz frequency band.

(12) The equipment is not software defined and this section is not applicable.

Applicable Standards & Test Procedures

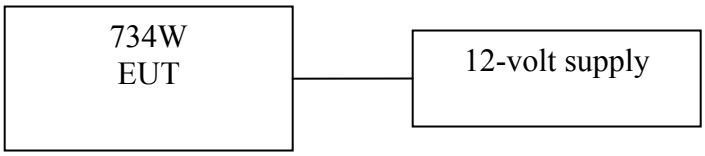
In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2010, Part 2, Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057, and applicable parts of paragraph 15, Part 15C Paragraph 15.247, and Industry Canada RSS-210 the following information is submitted.

Test procedures used are the established Methods of Measurement of Radio-Noise Emissions as described in the ANSI C63.4-2009 Document, FCC documents KDB 662911 MIMO, DA00-1407, and/or DA00-705. Testing for the AC line-conducted emissions were performed as defined in sections 7 and 13.1.3, testing of the radiated emissions was performed as defined in sections 8 and 13.1.4 of ANSI C63.4-2009. Testing of the intentional radiated emissions was performed as defined in sections 8 and 13 of ANSI C63.4-2009.

Equipment Function and Configuration

The EUT is a 2412-2462 MHz Single Input Single Output Digital Transmission System transmitter. The design incorporates reverse SMA antenna connection point for connection to authorized external antenna. The equipment is used to transmit data in applications offering broadband wireless connectivity. The equipment is marketed for use to incorporate a wireless link to exchange data information from one point to another. For testing purposes, the 734W was configured as directed by the manufacturer and powered from battery. The EUT offers connection port for authorized antennas and requires power supplied from external supply. Relay connection points are offered on EUT offering ability for connection to dry contact relay inputs. No other interfacing options are provided. For testing purposes, the 734W was powered from the manufacturer-supplied battery and set to transmit in available data modes. Worst-case data presented in this report. The device is marketed for OEM use and professional installation. The antenna connection and options comply with the unique antenna connection requirements.

Equipment Configuration



Test Site Locations

Conducted EMI — The AC power line conducted emissions testing were performed in a shielded screen room located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS

Radiated EMI — The radiated emissions tests were performed at the 3 meters, Open Area Test Site (OATS) located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS

Site Registration — Refer to Annex for Site Registration Letters

NVLAP Accreditation — Lab code 200087-0

Units of Measurements

Conducted EMI — Data is in dBµV; dB referenced to one microvolt

Radiated EMI — Data is in dBµV/m; dB/m referenced to one microvolt per meter

Sample Calculation:

RFS = Radiated Field Strength, FSM = Field Strength Measured
A.F. = Receive antenna factor, Gain = amplification gains and/or cable losses
RFS (dBµV/m @ 3m) = FSM (dBµV) + A.F. (dB) - Gain (dB)

Test Procedures

AC Line Conducted Emission Test Procedure

The EUT operates from DC power only. The EUT must be connected to power support system offering direct current power for operation. For testing purposes, the manufacturer supplied 12-volt battery was used to power the EUT. Therefore, no AC power line conducted emissions testing is required or performed.

Radiated Emission Test Procedure

The EUT was placed on a rotating 1 x 1.5-meter wooden platform, 0.8 meters above the ground plane at a distance of 3 meters from the FSM antenna. Testing for the radiated emissions was performed as defined in sections 8 and 13.1.4 of ANSI C63.4-2009. EMI energy was maximized by equipment placement, raising and lowering the FSM antenna, changing the antenna polarization, and by rotating the turntable. Each emission was maximized before data was taken using a spectrum analyzer. Refer to photographs in the test setup exhibits for EUT placement during testing.

List of Test Equipment

A Rohde and Schwarz ESU40 and/or Hewlett Packard 8591EM was used as the measuring device for the emissions testing of frequencies below 1 GHz. A Rohde and Schwarz ESU40 and/or Hewlett Packard 8562A Spectrum Analyzer was used as the measuring device for testing the emissions at frequencies above 1 GHz. The analyzer settings used are described in the following table. Refer to the appendix for a complete list of test equipment.

AC Line Conducted Emissions (0.150 -30 MHz)		
RBW	AVG. BW	Detector Function
9 kHz	30 kHz	Peak / Quasi Peak
Emissions (30-1000 MHz)		
RBW	AVG. BW	Detector Function
120 kHz	300 kHz	Peak / Quasi Peak
Emissions (Above 1000 MHz)		
RBW	Video BW	Detector Function
100 kHz	100 kHz	Peak
1 MHz	1 MHz	Peak / Average

Equipment	Manufacturer	Model	Calibration Date	Due
LISN	Comp. Design	FCC-LISN-2-MOD.CD	10/11	10/12
Antenna	ARA	BCD-235-B	10/11	10/12
Antenna	Com Power	AH-118	10/11	10/12
Antenna	EMCO	3147	10/11	10/12
Antenna	EMCO	3143	5/11	5/12
Analyzer	HP	8591EM	5/11	5/12
Analyzer	HP	8562A	5/11	5/12
Analyzer	Rohde & Schwarz	ESU40	5/11	5/12

Intentional Radiators

As per CFR47, Subpart C, paragraph 15.247 and RSS-210 the following information is submitted.

Antenna Requirements

The EUT design incorporates a reverse SMA antenna connection port for use with authorized antenna systems only. The design is marketed for OEM and professional installation and use as described in accompanying documentation. The antenna connection point complies with the unique antenna connection requirements. The antenna connection port requirements are fulfilled; there are no deviations or exceptions to the specification.

Restricted Bands of Operation

Spurious emissions falling in the restricted frequency bands of operation were measured at a distance of three meters on the OATS. The EUT utilizes frequency, determining circuitry, which generates harmonics falling in the restricted bands. Emissions were measured at the OATS, using appropriate antennas or pyramidal horns, amplification stages, and a spectrum analyzer. No other significant emission was observed which fell into the restricted bands of operation.

Radiated Emissions in Restricted Bands Data

Frequency in MHz	Horizontal Peak (dBµV/m)	Horizontal Quasi-Peak (dBµV/m)	Horizontal Average (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Quasi-Peak (dBµV/m)	Vertical Average (dBµV/m)	Limit @ 3m (dBµV/m)
120.0	42.8	33.8	N/A	40.1	31.6	N/A	43.5
125.2	45.5	37.3	N/A	39.2	33.8	N/A	43.5
125.3	46.0	37.9	N/A	38.9	34.2	N/A	43.5
125.8	44.1	37.0	N/A	37.7	33.3	N/A	43.5
126.3	43.6	38.2	N/A	37.8	34.6	N/A	43.5
126.3	44.1	38.5	N/A	37.7	34.2	N/A	43.5
132.5	42.2	38.1	N/A	35.0	32.9	N/A	43.5
133.0	42.0	39.2	N/A	35.8	32.7	N/A	43.5
133.5	42.1	38.6	N/A	35.6	31.3	N/A	43.5
134.0	41.9	38.7	N/A	35.4	31.6	N/A	43.5
251.5	33.1	28.5	N/A	28.8	19.6	N/A	46.0
2390.0	50.3	N/A	36.5	55.6	N/A	39.6	54.0
2483.5	51.2	N/A	37.1	56.5	N/A	44.1	54.0
4824.0	54.1	N/A	47.9	56.2	N/A	51.8	54.0
4874.0	54.8	N/A	49.0	55.0	N/A	48.8	54.0
4924.0	54.0	N/A	16.6	16.1	N/A	48.4	54.0
7236.0	52.7	N/A	46.6	50.7	N/A	41.7	54.0
7311.0	51.2	N/A	45.1	48.7	N/A	39.1	54.0
7386.0	54.0	N/A	16.6	16.1	N/A	38.8	54.0
12060.0	50.3	N/A	37.8	51.7	N/A	43.2	54.0
12185.0	48.2	N/A	35.4	49.9	N/A	40.2	54.0
12310.0	47.9	N/A	35.0	49.8	N/A	39.9	54.0
14472.0	51.6	N/A	38.9	51.2	N/A	38.6	54.0

Other emissions present had amplitudes at least 20 dB below the limit.
Quasi-Peak amplitude emissions are recorded above for frequency range of 30-1000 MHz.
Average amplitude emissions are recorded above for frequency range above 1000 MHz.

Summary of Results for Radiated Emissions in Restricted Bands

The EUT demonstrated compliance with the radiated emissions requirements of CFR 47 Part 15C Intentional Radiators. The EUT demonstrated a minimum margin of -2.2 dB below the radiated emissions requirements in restricted frequency bands. Peak, Quasi-peak, and average amplitudes were checked for compliance with the regulations. Worst-case emissions are reported with other emissions found in the restricted frequency bands at least 20 dB below the requirements.

AC Line Conducted Emissions Procedure

The EUT operates from DC power only. The EUT must be connected to power support system offering direct current power for operation. For testing purposes, the manufacturer supplied 12-volt battery was used to power the EUT. Therefore, no AC power line conducted emissions testing is required or performed.

Summary of Results for AC Line Conducted Emissions

The EUT operates from DC power only and offers no provision for connection to utility power system. The EUT demonstrated compliance with the conducted emissions requirements of CFR47 Part 15C and RSS-210 equipment.

General Radiated Emissions Procedure

The EUT was arranged in a typical equipment configuration and operated through all available modes with worst-case data recorded. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Radiated emissions measurements were performed to identify the frequencies, which produced the highest emissions. The frequency spectrum of 9 kHz to 25,000 MHz was searched for radiated emissions during preliminary investigation. Each radiated emission was then maximized at the OATS location before final radiated emissions measurements were performed. Final data was taken with the EUT located at the OATS at a distance of 3 meters between the EUT and the receiving antenna. The frequency spectrum from 9 kHz to 25,000 MHz was searched for general radiated emissions. Measured emission levels were maximized by EUT placement on the table, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna position between horizontal and vertical polarization. Antennas used were Broadband Biconical from 30 to 200 MHz, Biconilog from 30 to 1000 MHz, Log Periodic from 200 MHz to 1 GHz and or double Ridge or pyramidal horns and mixers from 1 GHz to 40 GHz, notch filters and appropriate amplifiers and external mixers were utilized.

General Radiated Emissions from EUT Data

Frequency in MHz	Horizontal Peak (dBµV/m)	Horizontal Quasi-Peak (dBµV/m)	Horizontal Average (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Quasi-Peak (dBµV/m)	Vertical Average (dBµV/m)	Limit @ 3m (dBµV/m)
120.0	42.8	33.8	N/A	40.1	31.6	N/A	43.5
125.2	45.5	37.3	N/A	39.2	33.8	N/A	43.5
125.3	46.0	37.9	N/A	38.9	34.2	N/A	43.5
125.8	44.1	37.0	N/A	37.7	33.3	N/A	43.5
126.3	43.6	38.2	N/A	37.8	34.6	N/A	43.5
126.3	44.1	38.5	N/A	37.7	34.2	N/A	43.5
132.5	42.2	38.1	N/A	35.0	32.9	N/A	43.5
133.0	42.0	39.2	N/A	35.8	32.7	N/A	43.5
133.5	42.1	38.6	N/A	35.6	31.3	N/A	43.5
134.0	41.9	38.7	N/A	35.4	31.6	N/A	43.5
150.7	43.9	37.4	N/A	33.3	31.4	N/A	43.5
151.2	43.8	37.3	N/A	32.4	31.5	N/A	43.5
151.7	43.3	35.1	N/A	33.2	31.5	N/A	43.5
183.0	41.4	39.7	N/A	36.6	34.3	N/A	43.5
183.4	42.2	40.5	N/A	33.3	31.5	N/A	43.5
183.9	42.3	41.0	N/A	36.5	35.1	N/A	43.5
187.7	42.2	39.7	N/A	34.0	30.4	N/A	43.5
188.1	40.9	36.4	N/A	33.1	31.3	N/A	43.5
208.5	41.6	38.0	N/A	33.7	30.3	N/A	43.5
215.8	37.9	36.6	N/A	35.8	33.8	N/A	43.5
251.5	33.1	28.5	N/A	28.8	19.6	N/A	46.0
648.1	32.6	30.2	N/A	33.0	30.9	N/A	46.0

Other emissions present had amplitudes at least 20 dB below the limit.
Quasi-Peak amplitude emissions are recorded above for frequency range of 30-1000 MHz.
Average amplitude emissions are recorded above for frequency range above 1000 MHz.

Summary of Results for General Radiated Emissions

The EUT demonstrated compliance with the radiated emissions requirements of CFR47 Part 15C paragraph 15.209 and RSS-210 Intentional Radiators. The EUT demonstrated a minimum margin of -2.5 dB below the requirements. Other emissions were present with amplitudes at least 20 dB below the Limits.

Operation in the Frequency Band of 2400 – 2483.5 MHz

The power output and emissions were measured at the antenna port and on the OATS range in compliance with regulation. The equipment utilizes external reverse SMA antenna connection port authorized antenna system. The EUT and test configuration was placed on a wooden turntable 0.8 meters above the ground plane at a distance of 3 meters from the FSM antenna. The peak and quasi-peak amplitude of the frequencies below 1000 MHz were measured using a spectrum analyzer/receiver. The peak and average amplitude of emissions above 1000 MHz including were measured using a spectrum analyzer/receiver. Data was recorded from the analyzer/receiver display result. Antennas used for radiated emissions testing were Broadband Biconical from 30 to 200 MHz, Biconilog from 30 to 1000 MHz, Log Periodic from 200 MHz to 1 GHz and or double Ridge or pyramidal horns and mixers from 1 GHz to 25 GHz, notch filters, and appropriate amplifiers and external mixers were utilized. Plots were made of transmitter antenna port conducted performance taken in a screen room. Refer to figures one through twenty-five showing plots of the EUT emissions performance displaying compliance with the specifications.

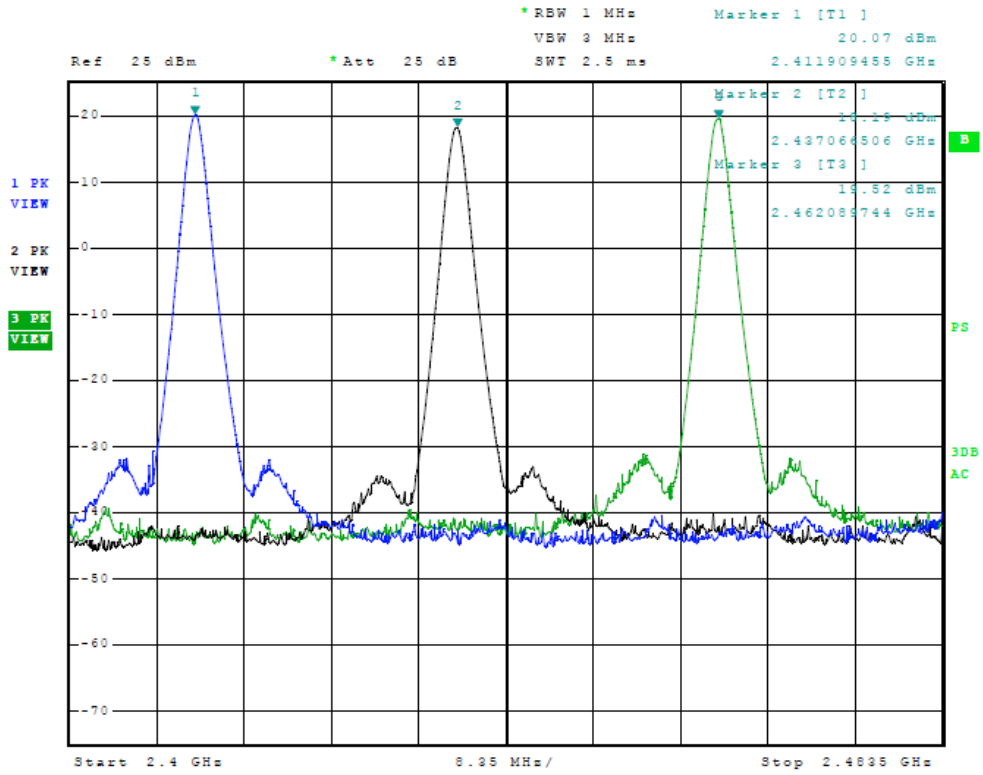


Figure 1 Plot of Antenna Port Emissions (Across Operational Band)

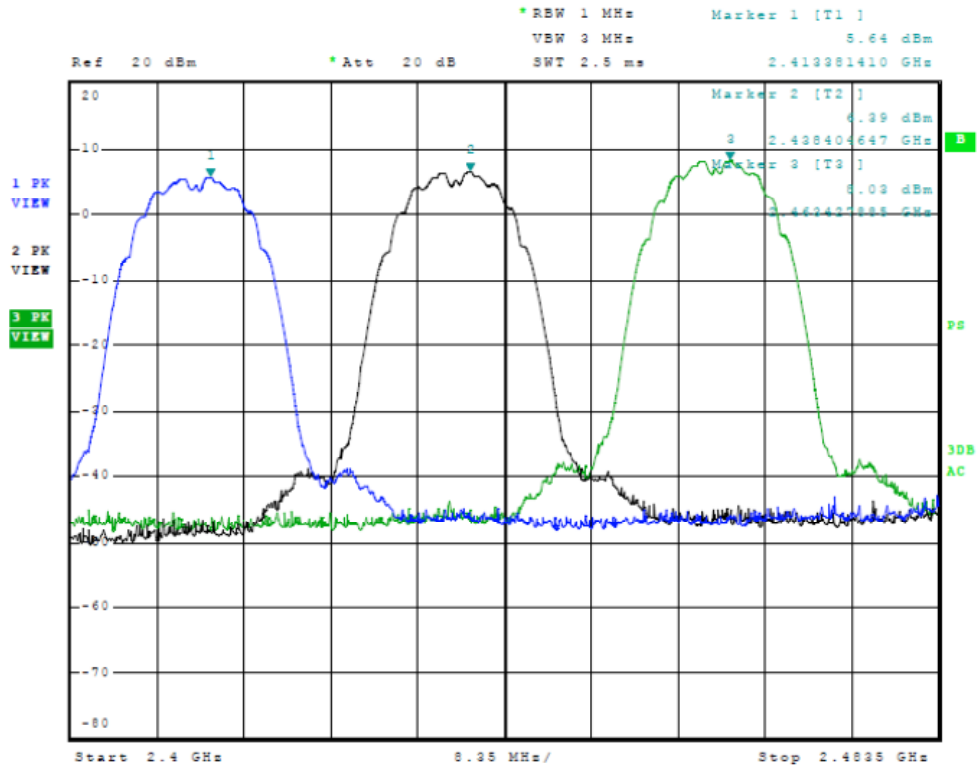


Figure 2 Plot of Antenna Port Emissions (Across Operational Band, 20MHz CCK Mode)

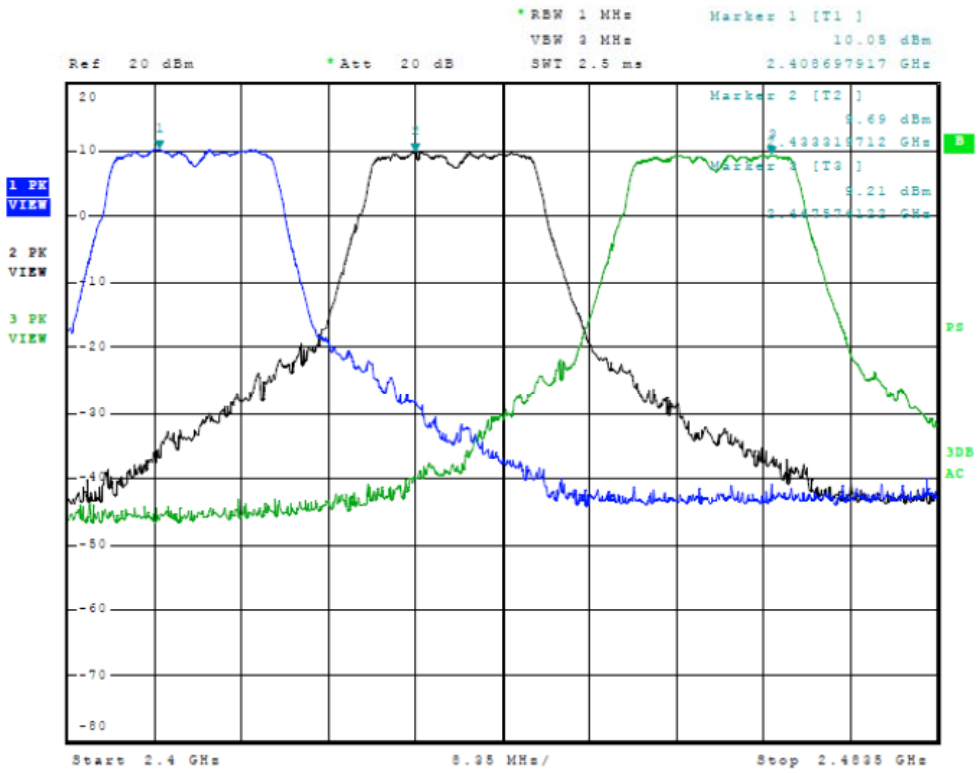


Figure 3 Plot of Antenna Port Emissions (Across Operational Band, 20MHz CCK Mode)

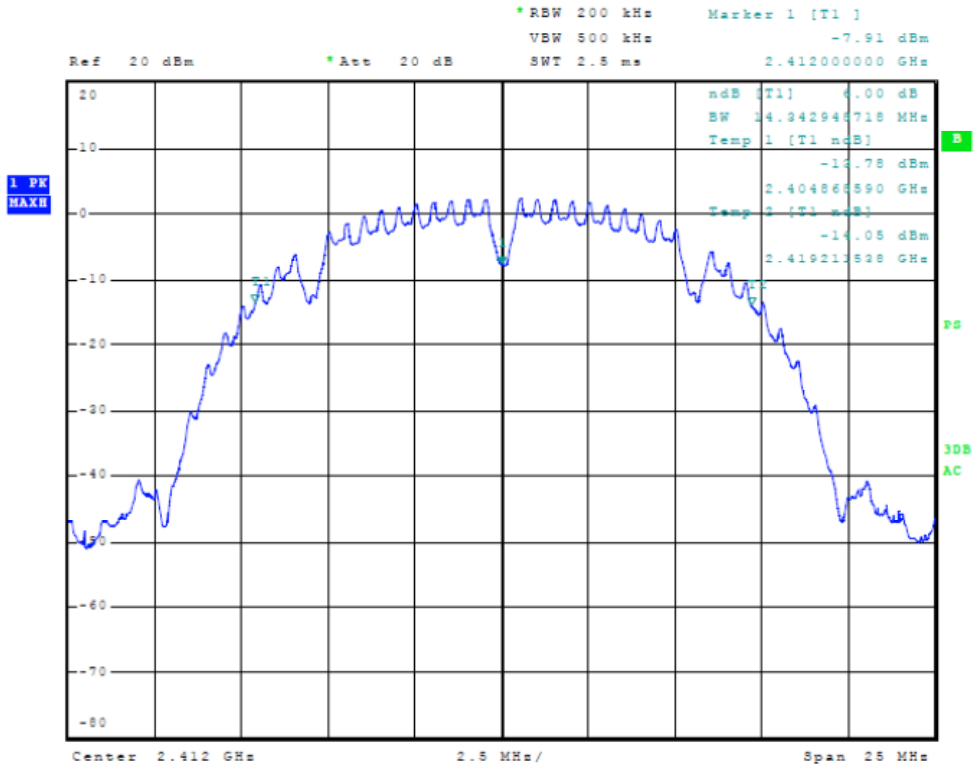


Figure 4 Plot of 6dB Band width (20 MHz Mode, CCK 2412 MHz)

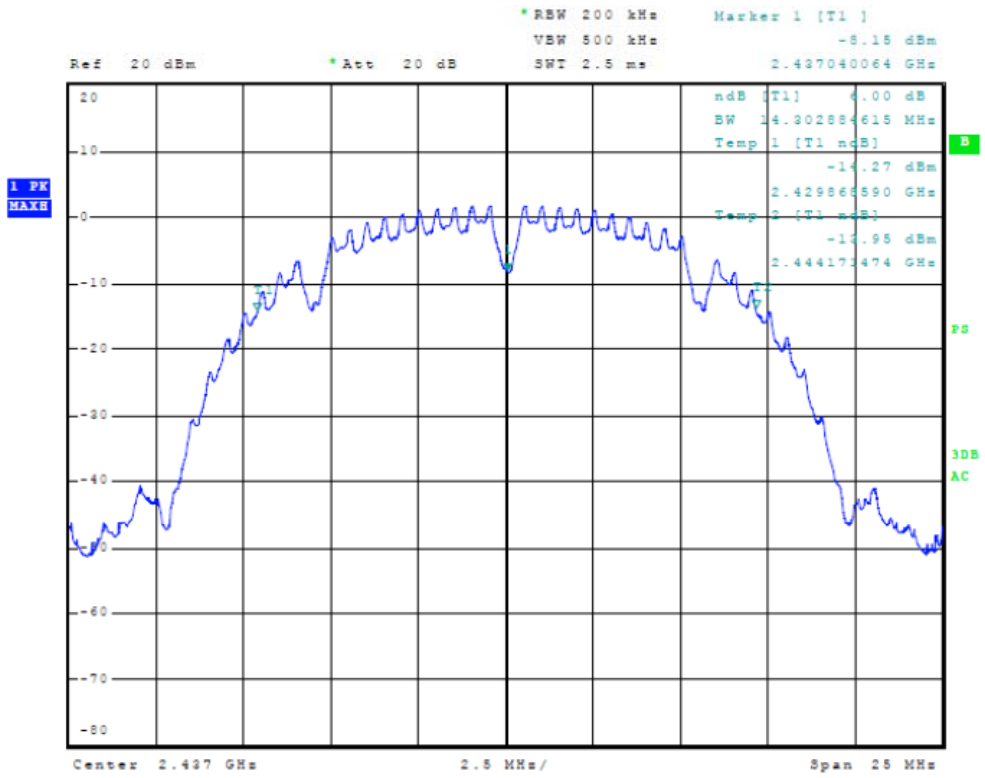


Figure 5 Plot of 6dB Band width (20 MHz Mode, CCK 2437 MHz)

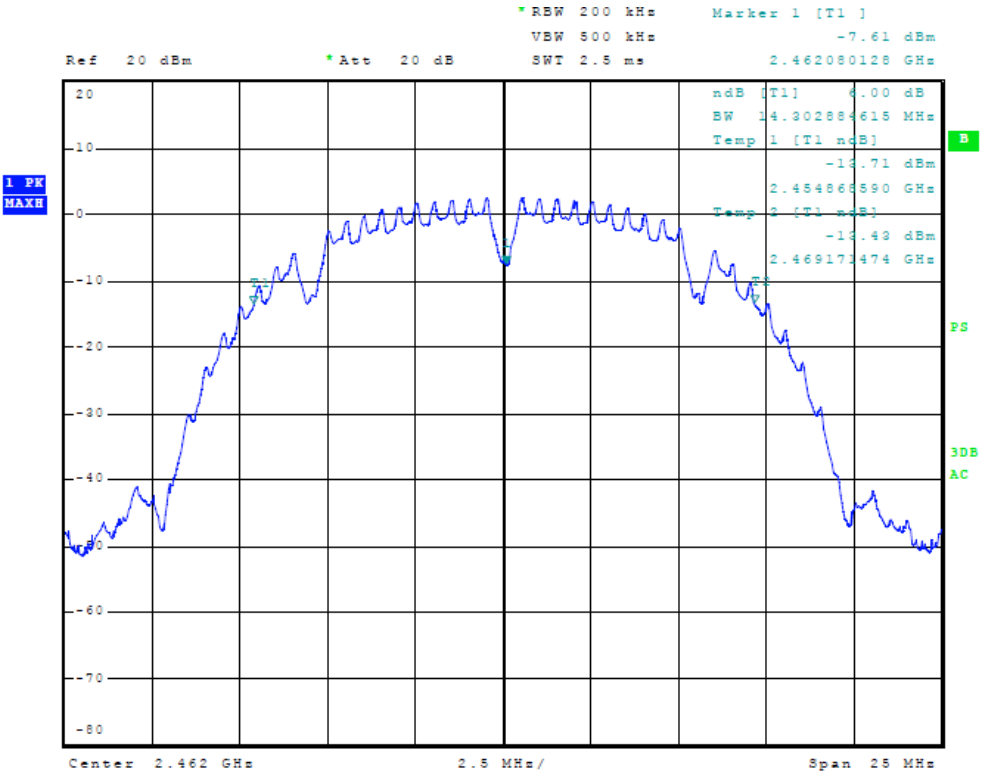


Figure 6 Plot of 6dB Band width (20 MHz Mode, CCK 2462 MHz)

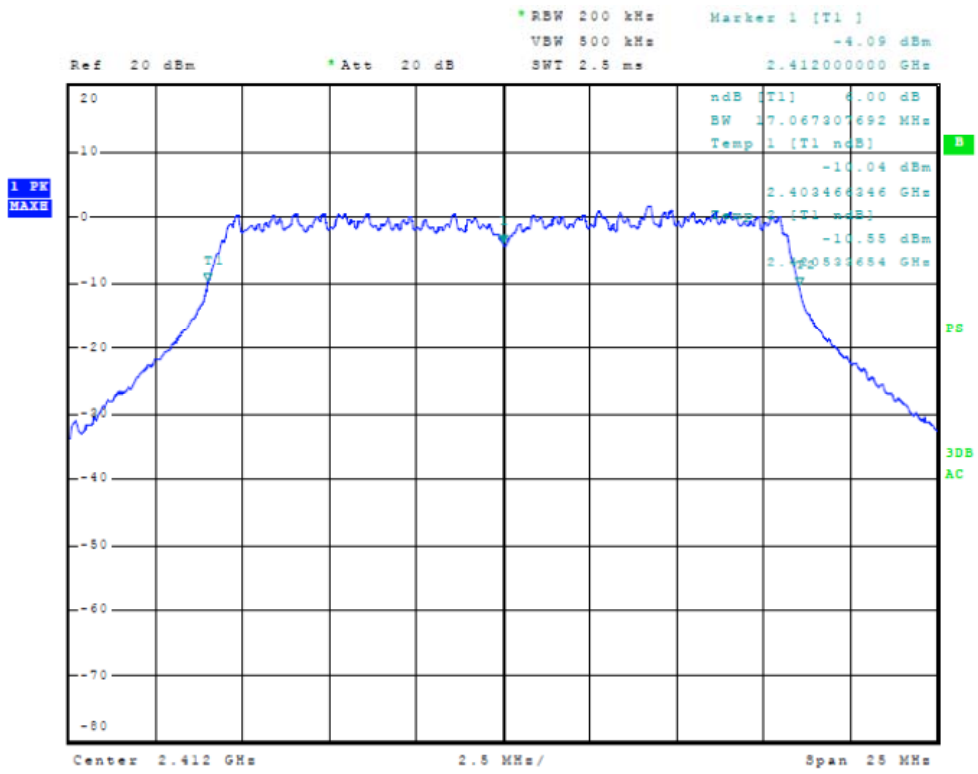


Figure 7 Plot of 6dB Band width (20 MHz Mode, OFDM 2412 MHz)

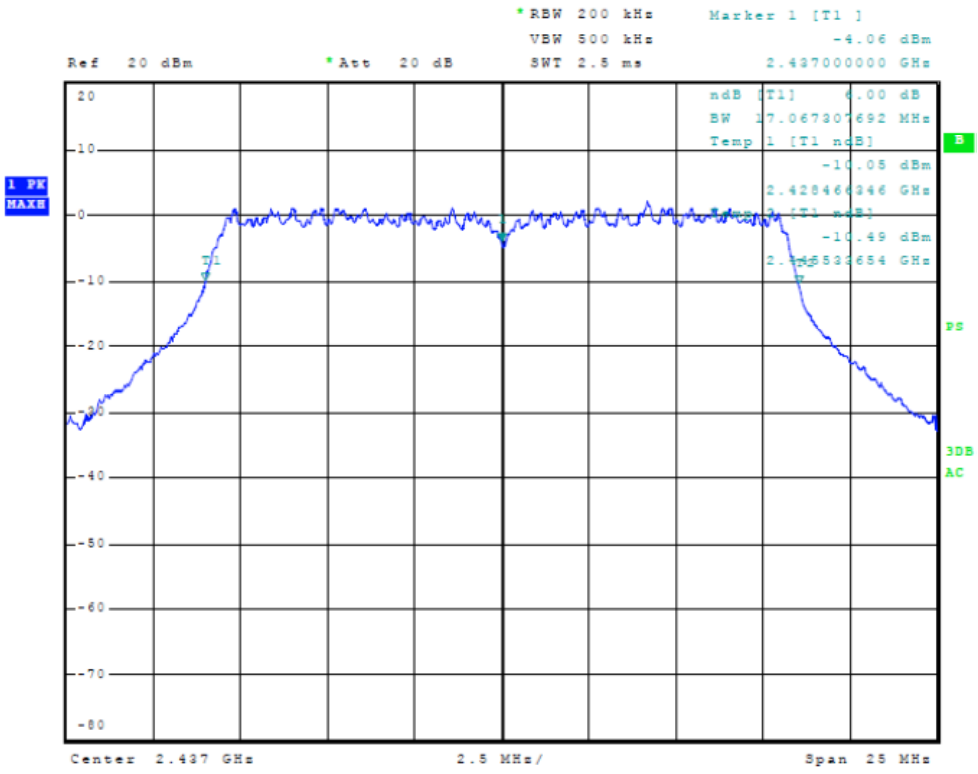


Figure 8 Plot of 6dB Band width (20 MHz Mode, OFDM 2437 MHz)

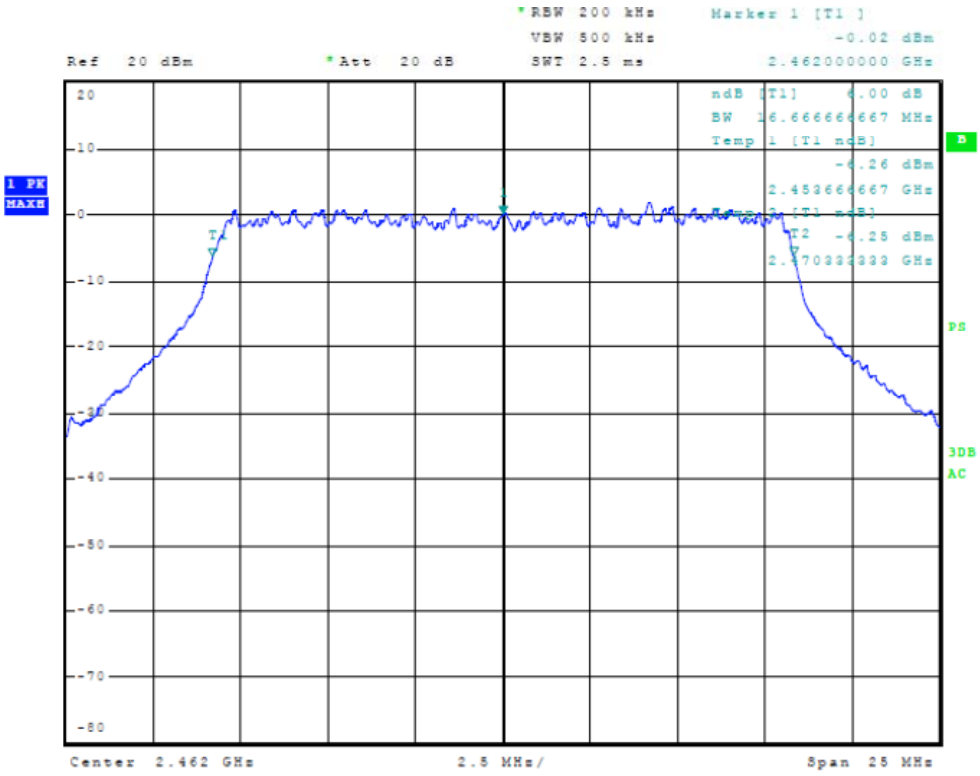


Figure 9 Plot of 6dB Band width (20 MHz Mode, OFDM 2462 MHz)

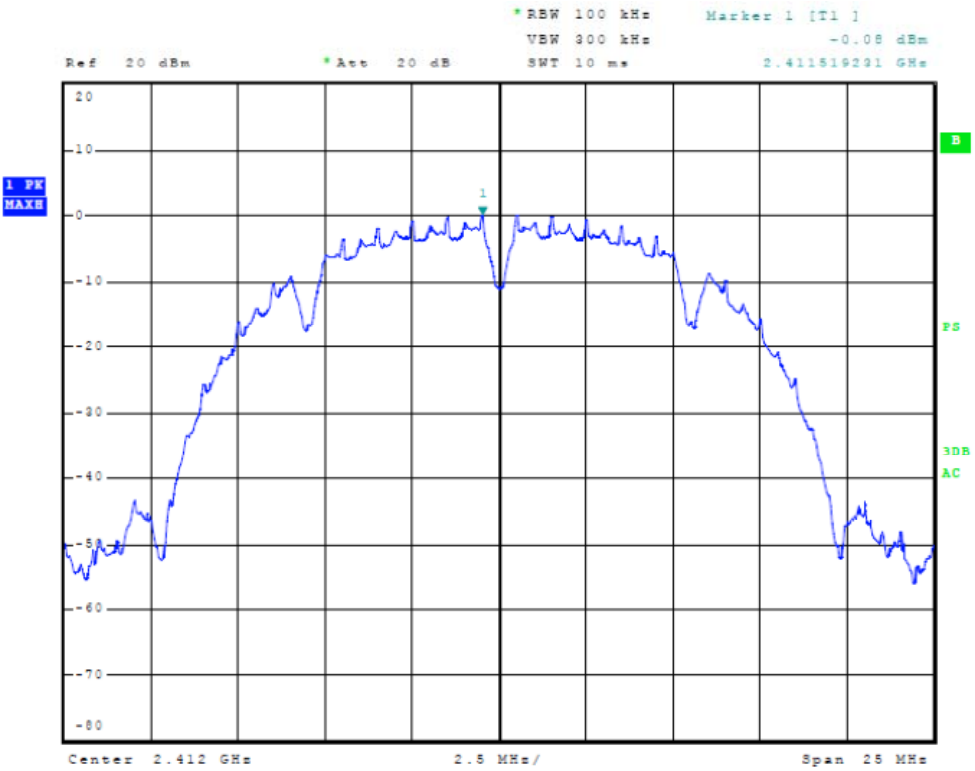


Figure 10 Plot of Power Spectral Density (20 MHz Mode, CCK 2412 MHz)

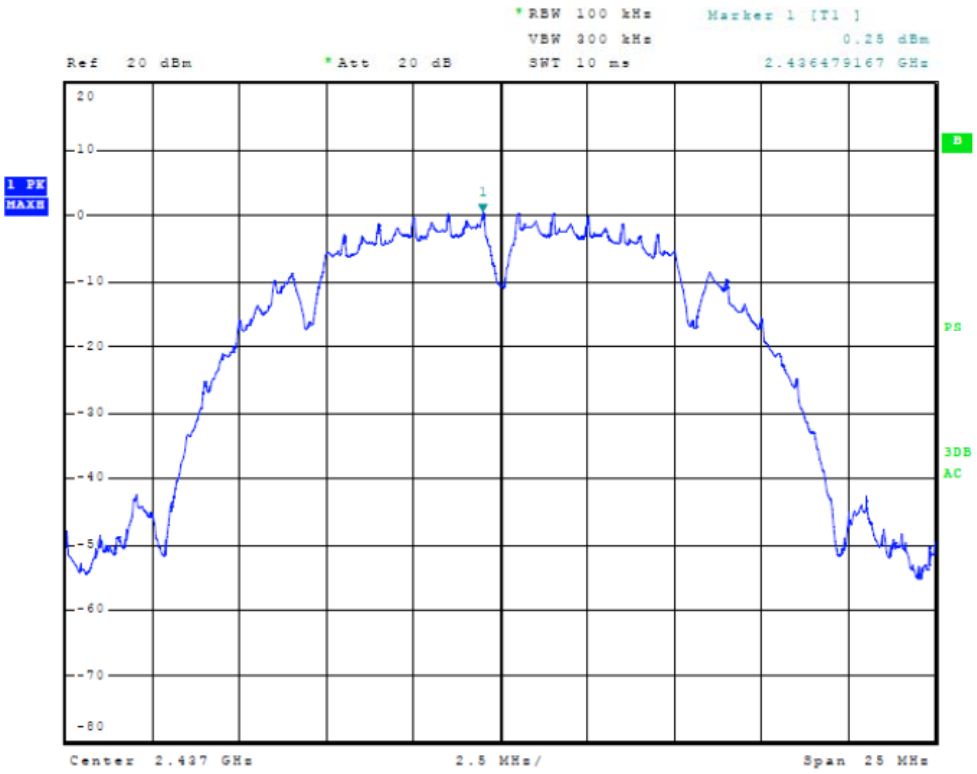


Figure 11 Plot of Power Spectral Density (20 MHz Mode, CCK 2437 MHz)

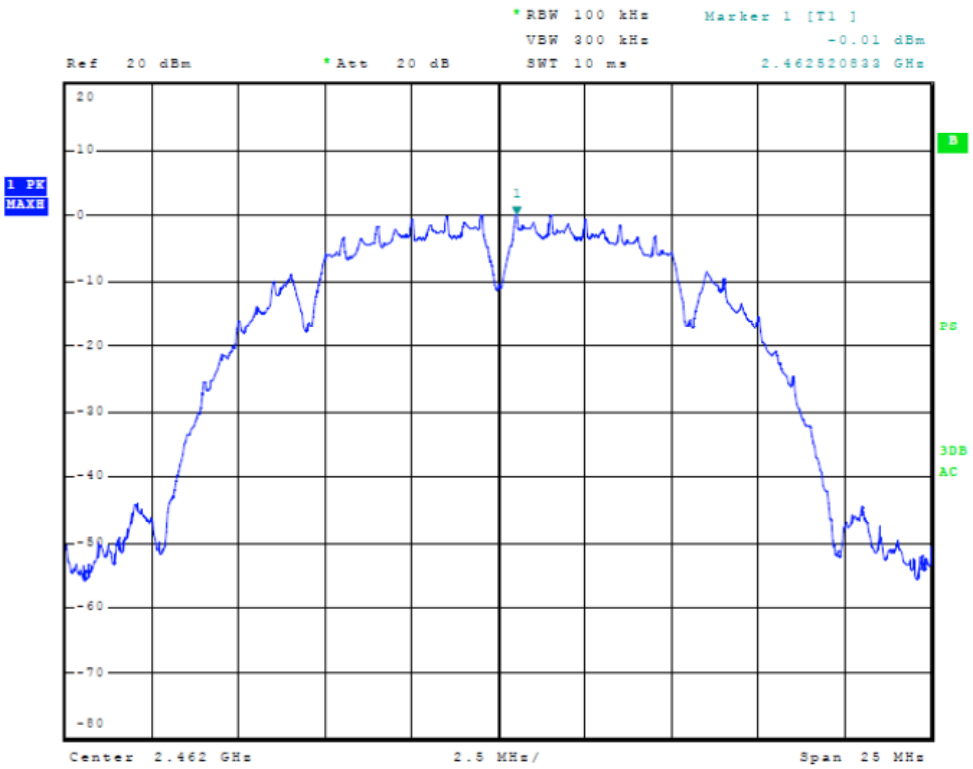


Figure 12 Plot of Power Spectral Density (20 MHz Mode, CCK 2462 MHz)

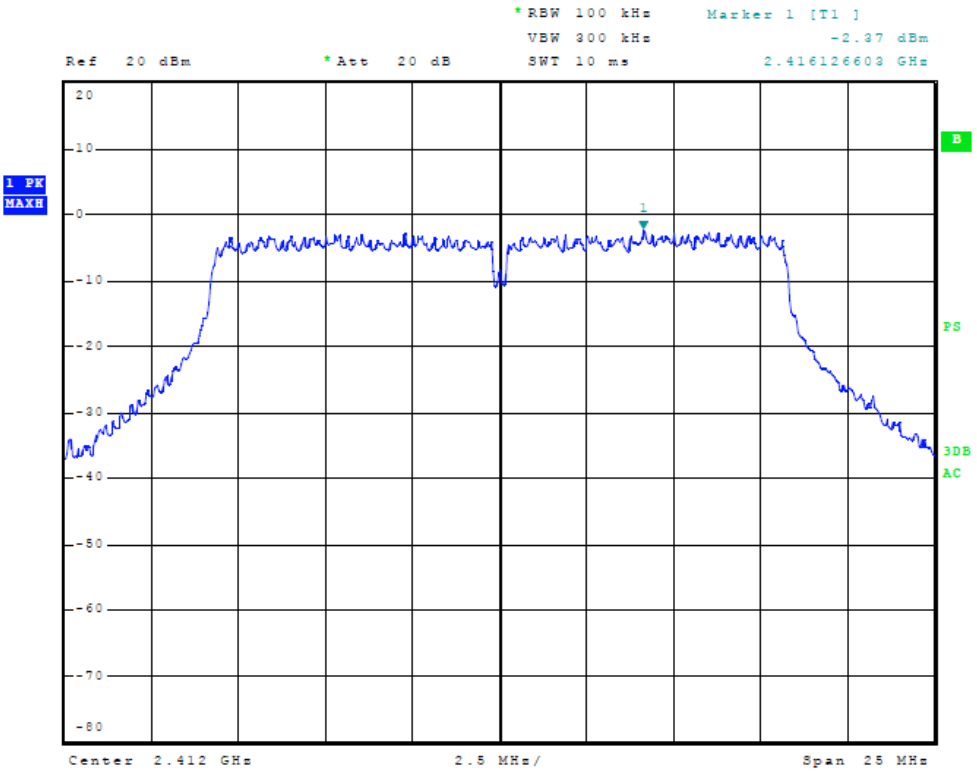


Figure 13 Plot of Power Spectral Density (20 MHz Mode, OFDM 2412 MHz)

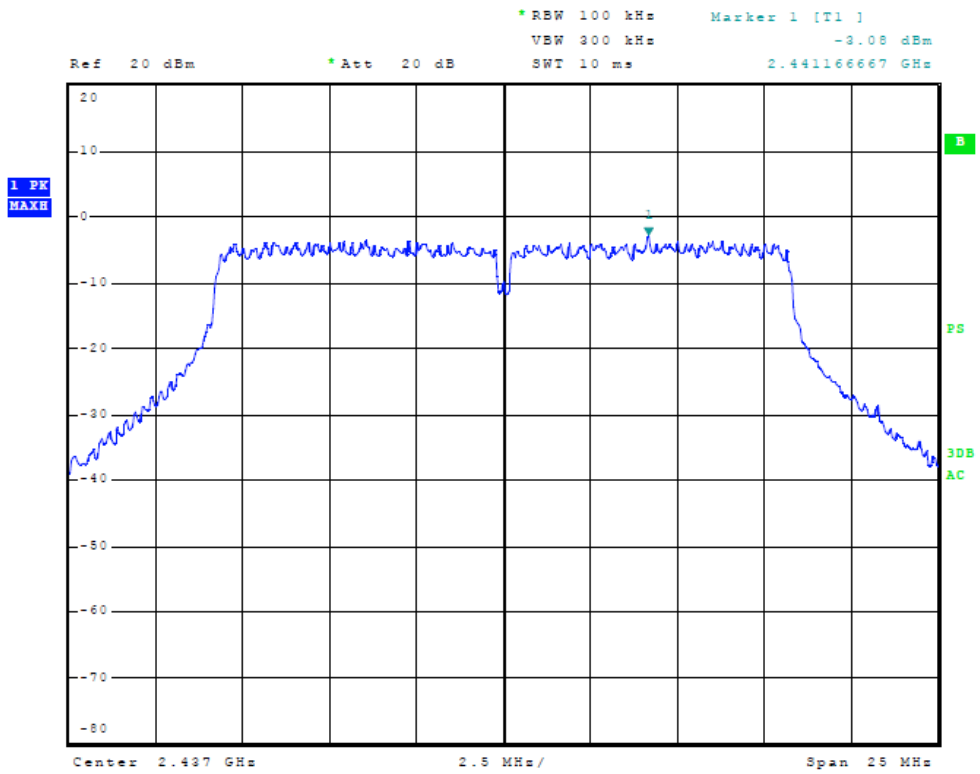


Figure 14 Plot of Power Spectral Density (20 MHz Mode, OFDM 2437 MHz)

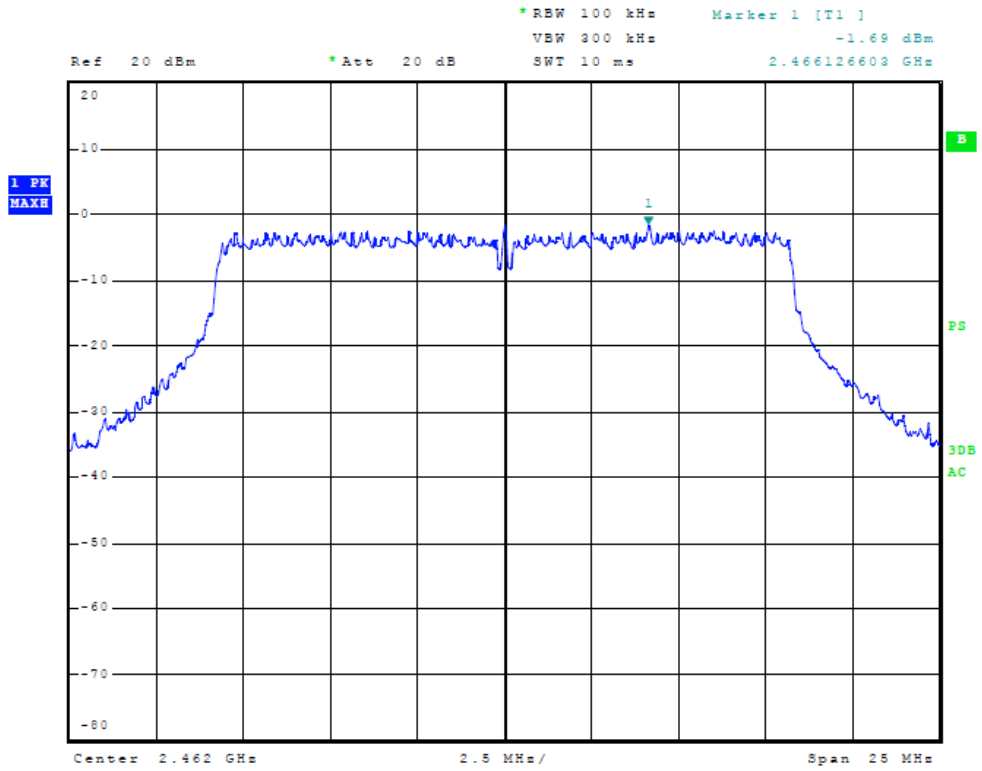


Figure 15 Plot of Power Spectral Density (20 MHz Mode, OFDM 2462 MHz)

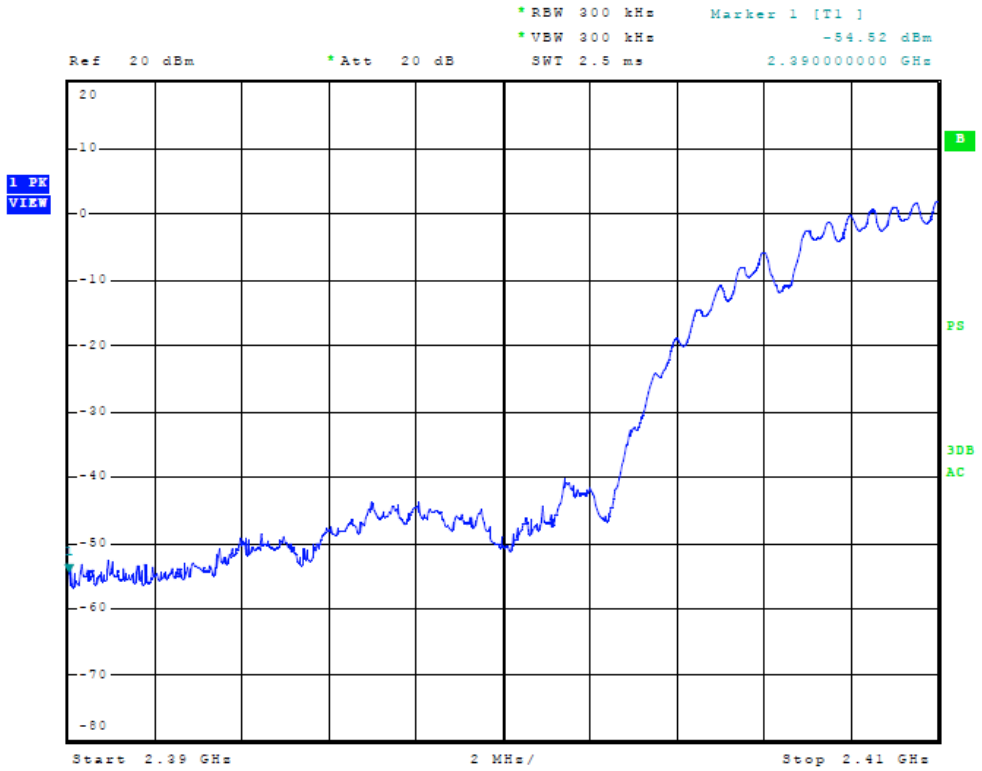


Figure 16 Plot of Band Edge Compliance at Antenna port (20 MHz CCK)

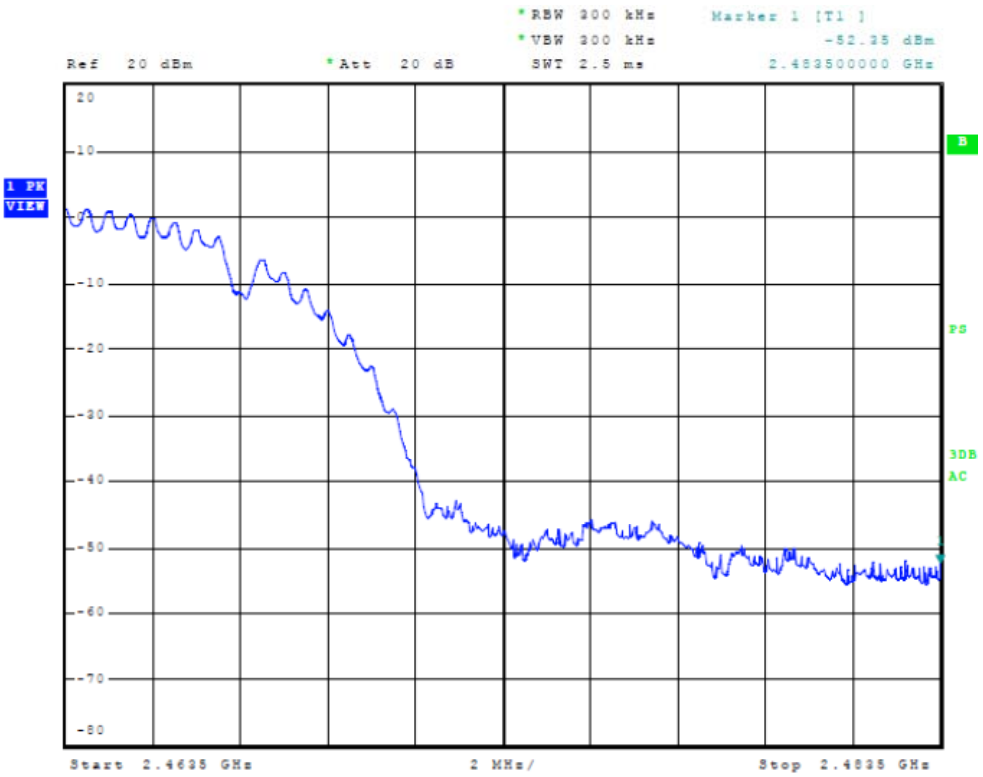


Figure 17 Plot of Band Edge Compliance at Antenna port (20 MHz CCK)

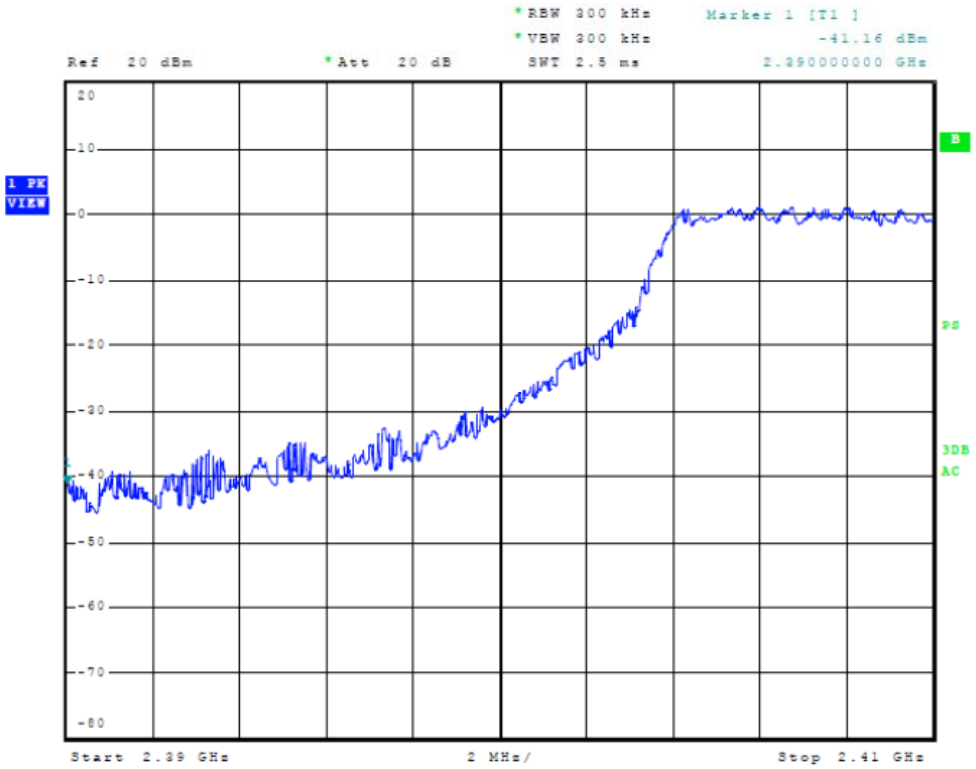


Figure 18 Plot of Band Edge Compliance at Antenna port (20 MHz OFDM)

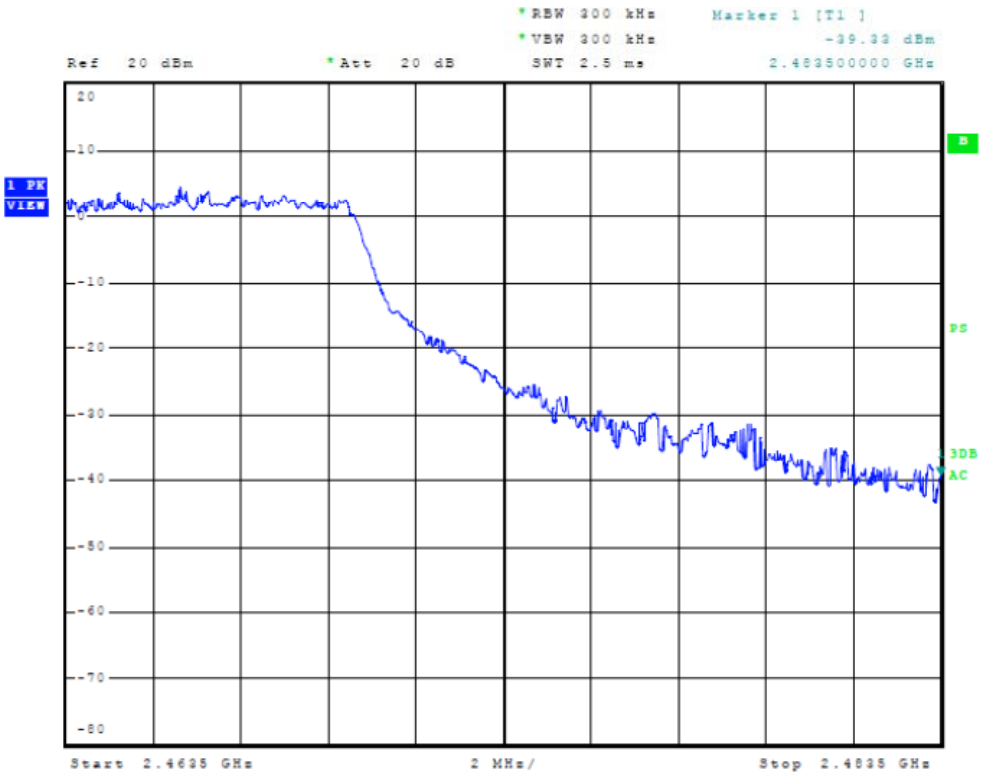


Figure 19 Plot of Band Edge Compliance at Antenna port (20 MHz OFDM)

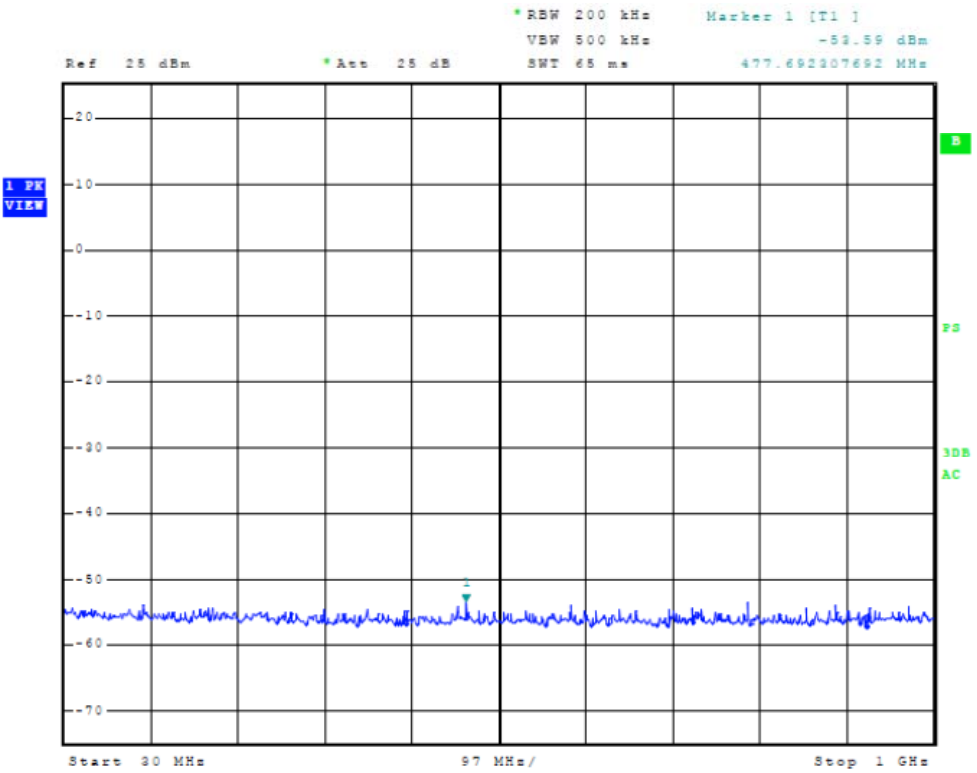


Figure 20 Plot of Antenna port conducted emissions

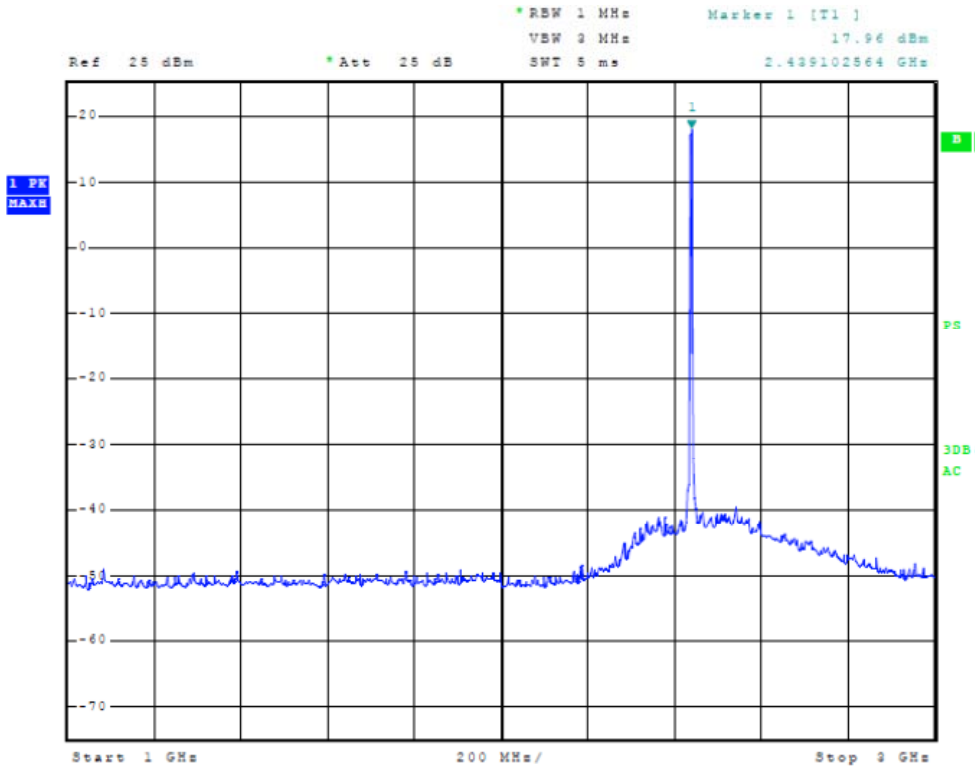


Figure 21 Plot of Antenna port conducted emissions

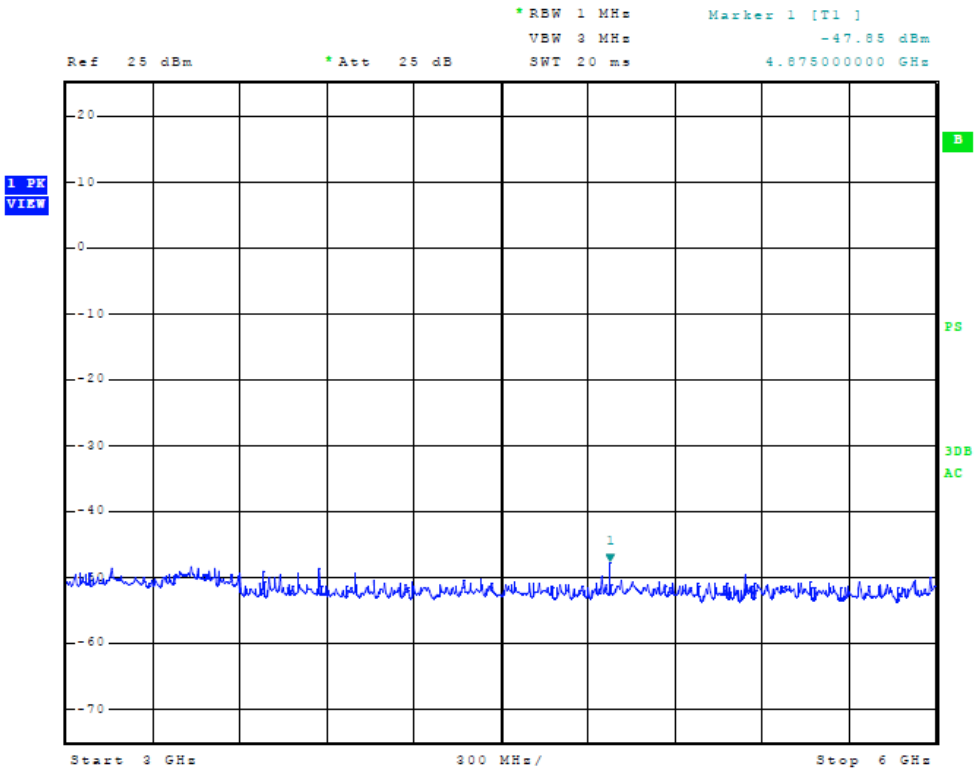


Figure 22 Plot of Antenna port conducted emissions

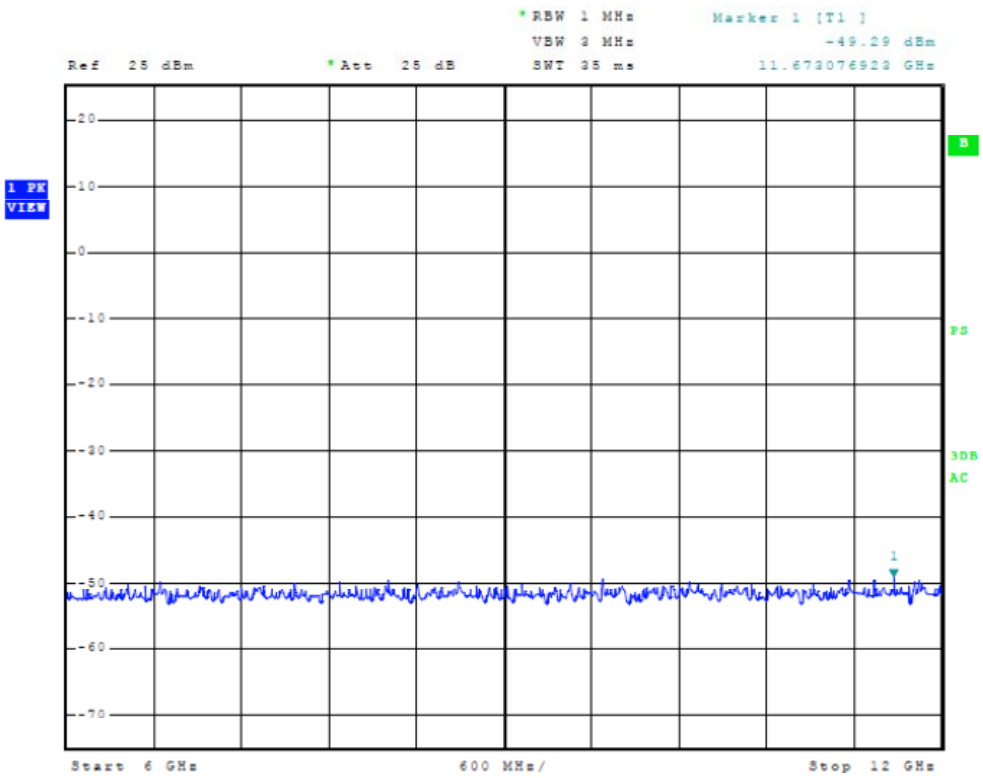


Figure 23 Plot of Antenna port conducted emissions

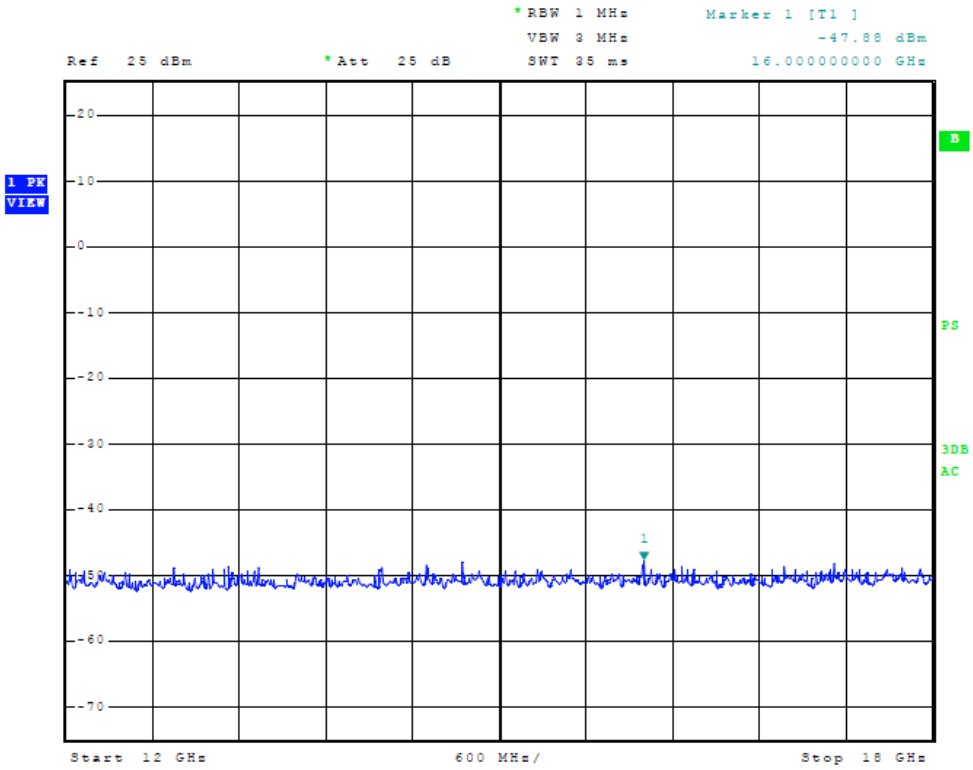


Figure 24 Plot of Antenna port conducted emissions

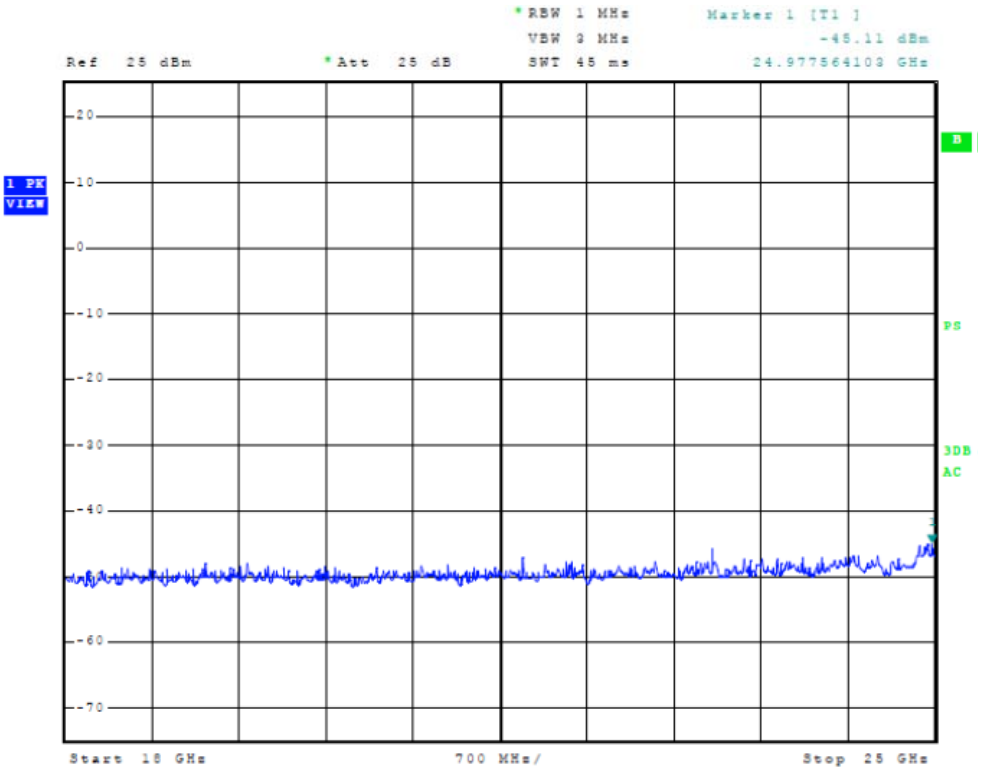


Figure 25 Plot of Antenna port conducted emissions

Transmitter Emissions Data

Transmitter Antenna Port Conducted Emissions Data Summary

Frequency MHz	Antenna Conducted Output Power dBm	Occupied Bandwidth kHz	Power Spectral Density dBm
20 MHz CCK			
2412.0	20.07	14,342.9	-15.31
2437.0	19.78	14,302.9	-14.98
2462.0	19.52	14,302.9	-15.24
20 MHz OFDM			
2412.0	17.87	17,067.3	-17.60
2437.0	17.76	17,067.3	-18.31
2462.0	17.43	16,666.7	-16.92

Transmitter Antenna Port Conducted Harmonic Emissions Data (Worst-case)

Channel MHz	Spurious Freq (MHz)	Measured Level (dBm)	Level Below Carrier (dB)
2412.0	4824.0	-39.76	-59.8
	7236.0	-58.01	-78.1
	9648.0	-58.31	-78.4
	12060.0	-58.71	-78.8
	14472.0	-57.52	-77.6
2437.0	4874.0	-44.59	-64.4
	7311.0	-57.66	-77.4
	9748.0	-58.71	-78.5
	12185.0	-58.27	-78.0
	14622.0	-58.92	-78.7
2462.0	4924.0	-45.29	-64.8
	7386.0	-57.48	-77.0
	9848.0	-58.01	-77.5
	12310.0	-58.60	-78.1
	14772.0	-58.41	-77.9

Transmitter Radiated Emission

Frequency in MHz	Horizontal Peak (dBµV/m)	Horizontal Average (dBµV/m)	Vertical Peak (dBµV/m)	Vertical Average (dBµV/m)	Limit @ 3m (dBµV/m)
2412.0	112.1	111.9	119.3	119.2	--
4824.0	54.1	47.9	56.2	51.8	54.0
7236.0	52.7	46.6	50.7	41.7	54.0
9648.0	51.6	39.7	51.7	38.2	54.0
12060.0	50.3	37.8	51.7	43.2	54.0
2437.0	115.0	114.9	119.4	119.2	--
4874.0	54.8	49.0	55.0	48.8	54.0
7311.0	51.2	45.1	48.7	39.1	54.0
9748.0	50.1	38.1	51.2	39.2	54.0
12185.0	48.2	35.4	49.9	40.2	54.0
2462.0	111.9	111.8	119.1	119.0	--
4924.0	53.7	46.1	54.1	48.4	54.0
7386.0	49.3	40.9	48.3	38.8	54.0
9848.0	51.5	40.4	50.5	38.8	54.0
12310.0	47.9	35.0	49.8	39.9	54.0

Other emissions present had amplitudes at least 20 dB below the limit.
Quasi-Peak amplitude emissions are recorded above for frequency range of 30-1000 MHz.
Average amplitude emissions are recorded above for frequency range above 1000 MHz.

Summary of Results for Transmitter Radiated Emissions of Intentional Radiator

The EUT demonstrated compliance with the conducted and radiated emissions requirements of CFR47 Part 15.247 and RSS-210. Conducted antenna port power of 20.07 dBm, 0.10 Watts was measured. The EUT demonstrated a minimum harmonic radiated emission margin of -2.2 dB below the requirements. There are no other significantly measurable emissions in the restricted bands other than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the requirements. The specifications of CFR47 15.247 and RSS-210 were met; there are no deviations or exceptions to the requirements.

Statement of Modifications and Deviations

No modifications to the EUT were required for the unit to demonstrate compliance with the CFR47 Part 15C and RSS-210 emissions requirements. There were no deviations to the specifications.

Annex

- Annex A Measurement Uncertainty Calculations
- Annex B Rogers Labs Test Equipment List
- Annex C Rogers Qualifications
- Annex D FCC Site Registration Letter
- Annex E Industry Canada Site Registration Letter

Annex A Measurement Uncertainty Calculations

Radiated Emissions Measurement Uncertainty Calculation

Measurement of vertically polarized radiated field strength over the frequency range 30 MHz to 1 GHz on an open area test site at 3m and 10m includes following uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Antenna factor calibration	normal (k = 2)	±0.58
Cable loss calibration	normal (k = 2)	±0.2
Receiver specification	rectangular	±1.0
Antenna directivity	rectangular	±0.1
Antenna factor variation with height	rectangular	±2.0
Antenna factor frequency interpolation	rectangular	±0.1
Measurement distance variation	rectangular	±0.2
Site Imperfections	rectangular	±1.5

Combined standard uncertainty $u_c(y)$ is

$$U_c(y) = \pm \sqrt{\left[\frac{1.0}{2}\right]^2 + \left[\frac{0.2}{2}\right]^2 + \left[\frac{1.0^2 + 0.1^2 + 2.0^2 + 0.1^2 + 0.2^2 + 1.5^2}{3}\right]}$$

$U_c(y) = \pm 1.6$ dB

It is probable that $u_c(y) / s(q_k) > 3$, where $s(q_k)$ is estimated standard deviation from a sample of n readings unless the repeatability of the EUT is particularly poor, and a coverage factor of k = 2 will ensure that the level of confidence will be approximately 95%, therefore:

$$s(q_k) = \sqrt{\frac{1}{(n-1)} \sum_{k-1}^{n} (q_k - \bar{q})^2}$$

$U = 2\ U_c(y) = 2 \times \pm 1.6$ dB $= \pm 3.2$ dB

Notes:

1.1 Uncertainties for the antenna and cable were estimated, based on a normal probability distribution with k = 2.

1.2 The receiver uncertainty was obtained from the manufacturer's specification for which a rectangular distribution was assumed.

1.3 The antenna factor uncertainty does not take account of antenna directivity.

1.4 The antenna factor varies with height and since the height was not always the same in use as when the antenna was calibrated an additional uncertainty is added.

1.5 The uncertainty in the measurement distance is relatively small but has some effect on the received signal strength. The increase in measurement distance as the antenna height is increased is an inevitable consequence of the test method and is therefore not considered a contribution to uncertainty.

1.6 Site imperfections are difficult to quantify but may include the following contributions:
-Unwanted reflections from adjacent objects.
-Ground plane imperfections: reflection coefficient, flatness, and edge effects.
-Losses or reflections from "transparent" cabins for the EUT or site coverings.
-Earth currents in antenna cable (mainly effect Biconical antennas).

The specified limits for the difference between measured site attenuation and the theoretical value (± 4 dB) were not included in total since the measurement of site attenuation includes uncertainty contributions already allowed for in this budget, such as antenna factor.

Conducted Measurements Uncertainty Calculation

Measurement of conducted emissions over the frequency range 9 kHz to 30 MHz includes following uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Receiver specification	rectangular	±1.5
LISN coupling specification	rectangular	±1.5
Cable and input attenuator calibration	normal (k=2)	±0.5

Combined standard uncertainty $u_c(y)$ is

$$U_c(y) = \pm \sqrt{\left[\frac{0.5}{2}\right]^2 + \frac{1.5^2 + 1.5^2}{3}}$$

$U_c(y) = \pm 1.2$ dB

As with radiated field strength uncertainty, it is probable that $u_c(y) / s(q_k) > 3$ and a coverage factor of k = 2 will suffice, therefore:

$U = 2\ U_c(y) = 2 \times \pm 1.2$ dB $= \pm 2.4$ dB

Annex B Rogers Labs Test Equipment List

The test equipment is maintained in calibration and good operating condition. Use of this calibrated equipment ensures measurements are traceable to national standards.

List of Test Equipment	Calibration Date
Spectrum Analyzer: Rohde & Schwarz ESU40	5/11
Spectrum Analyzer: HP 8562A, HP Adapters: 11518, 11519, and 11520 Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	5/11
Spectrum Analyzer: HP 8591EM	5/11
Antenna: EMCO Biconilog Model: 3143	5/11
Antenna: Sunol Biconilog Model: JB6	10/11
Antenna: EMCO Log Periodic Model: 3147	10/11
Antenna: Antenna Research Biconical Model: BCD 235	10/11
LISN: Compliance Design Model: FCC-LISN-2.Mod.cd, 50 µHy/50 ohm/0.1 µf	10/11
R.F. Preamp CPPA-102	10/11
Attenuator: HP Model: HP11509A	10/11
Attenuator: Mini Circuits Model: CAT-3	10/11
Attenuator: Mini Circuits Model: CAT-3	10/11
Cable: Belden RG-58 (L1)	10/11
Cable: Belden RG-58 (L2)	10/11
Cable: Belden 8268 (L3)	10/11
Cable: Time Microwave: 4M-750HF290-750	10/11
Cable: Time Microwave: 10M-750HF290-750	10/11
Frequency Counter: Leader LDC825	2/11
Oscilloscope Scope: Tektronix 2230	2/11
Wattmeter: Bird 43 with Load Bird 8085	2/11
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/11
R.F. Generators: HP 606A, HP 8614A, HP 8640B	2/11
R.F. Power Amp 65W Model: 470-A-1010	2/11
R.F. Power Amp 50W M185- 10-501	2/11
R.F. Power Amp A.R. Model: 10W 1010M7	2/11
R.F. Power Amp EIN Model: A301	2/11
LISN: Compliance Eng. Model 240/20	2/11
LISN: Fischer Custom Communications Model: FCC-LISN-50-16-2-08	2/11
Antenna: EMCO Dipole Set 3121C	2/11
Antenna: C.D. B-101	2/11
Antenna: Solar 9229-1 & 9230-1	2/11
Antenna: EMCO 6509	2/11
Audio Oscillator: H.P. 201CD	2/11
Peavey Power Amp Model: IPS 801	2/11
ELGAR Model: 1751	2/11
ELGAR Model: TG 704A-3D	2/11
ESD Test Set 2010i	2/11
Fast Transient Burst Generator Model: EFT/B-101	2/11
Field Intensity Meter: EFM-018	2/11
KEYTEK Ecat Surge Generator	2/11
Shielded Room 5 M x 3 M x 3.0 M	

Annex C Rogers Qualifications

Scot D. Rogers, Engineer

Rogers Labs, Inc.

Mr. Rogers has approximately 17 years experience in the field of electronics. Engineering experience includes six years in the automated controls industry and remaining years working with the design, development and testing of radio communications and electronic equipment.

Positions Held

Systems Engineer: A/C Controls Mfg. Co., Inc. 6 Years

Electrical Engineer: Rogers Consulting Labs, Inc. 5 Years

Electrical Engineer: Rogers Labs, Inc. Current

Educational Background

1) Bachelor of Science Degree in Electrical Engineering from Kansas State University.

2) Bachelor of Science Degree in Business Administration Kansas State University.

3) Several Specialized Training courses and seminars pertaining to Microprocessors and Software programming.

Scot D Rogers

Scot D. Rogers

NVLAP Lab Code 200087-0

Annex D FCC Site Registration Letter

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

November 01, 2011

Registration Number: 90910

Rogers Labs, Inc.
4405 West 259th Terrace,
Louisburg, KS 66053

Attention: Scot Rogers,

Re: Measurement facility located at Louisburg
3 & 10 meter site
Date of Renewal: November 01, 2011

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Parrish
Industry Analyst

Annex E Industry Canada Site Registration Letter

Industry Canada / Industrie Canada

December 28, 2011

OUR FILE: 46405-3041
Submission No: 152685

Rogers Labs Inc.
4405 West 259th Terrance
Louisburg, KS, 66053
USA

Attention: Mr. Scot D. Rogers

Dear Sir/Madame:

The Bureau has received your application for the renewal of 3/10m OATS. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought (**Site# 3041A-1**). Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please keep for your records the following information;

- The company address code associated to the site(s) located at the above address is: **3041A**

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 or later shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 metre OATS or 3 metre chamber). If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to **exceed three years**. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL;
http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tt00052e.html.

If you have any questions, you may contact the Bureau by e-mail at certification.bureau@ic.gc.ca Please reference our file and submission number above for all correspondence.

Yours sincerely,

Dalwinder Gill

Dalwinder Gill
For: Wireless Laboratory Manager
Certification and Engineering Bureau
3701 Carling Ave., Building 94
P.O. Box 11490, Station "H"
Ottawa, Ontario K2H 8S2
Email: dalwinder.gill@ic.gc.ca
Tel. No. (613) 998-8363
Fax. No. (613) 990-4752