NVLAP Lab Code 200087-0

APPLICATION SUBMITTAL REPORT

FOR
FCC And INDUSTRY CANADA
GRANT OF CERTIFICATION

FOR

Model: 33011009
FTU (Fixture Transceiver Unit)
902 - 928 MHz Transmitter

FCC ID: YVC33011009
IC: 9287A-33011009

FOR

VEKTEK, INC.
1334 East 6th Ave.
Emporia, KS 66801

Test Report Number: 110223

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
APPLICATION SUBMITTAL for
GRANT of CERTIFICATION

Per

CFR47, PART 15C - INTENTIONAL RADIATORS
Paragraph 15.249 and Industry Canada, RSS-210
Low Power Transmitter

For

VEKTEK, INC.
1334 East 6th Ave.
Emporia, KS 66801
Michael Farmer

Model: 33011009 (FTU)

Frequency 902-928 MHz
FCC ID#: YVC33011009, IC: 9287A-33011009

Test Date: February 23, 2011

Certifying Engineer: Scot D Rogers

Scot D. Rogers
Rogers Labs, Inc.
4405 West 259th Terrace
Louisburg, KS 66053
Phone: (913) 837-3214
Facsimile: (913) 837-3214

Table of Contents

Forward

The following information is submitted for consideration in obtaining Grant of Certification for a license exempt low power intentional radiator operating under CFR47 Paragraph 15.249 and Industry Canada standard RSS-210.

Name of Applicant:

VekTek, Inc.
1334 East 6th Ave.
Emporia, KS 66801

Model: 33011009 wireless transceiver (FTU)

FCC I.D.: YVC33011009 IC: 9287A-33011009
Frequency Range: 902-928 MHz.
Operating Power: 85.4 dBµV/m @ 3-meters (3 meter radiated measurement), Occupied Bandwidth 384.6 kHz, Receiver worst-case emission 26.9 dBµV/m

Opinion / Interpretation of Results

Test Performed	Minimum Margin (dB)	Results
Antenna requirement per CFR 47 15.203	N/A	Complies
Restricted Bands Emissions as per CFR 47 15.205 and RSS-210 A2.2	-19.1	Complies
AC Line Conducted Emissions as per CFR 47 15.207	N/A	Complies
Radiated Emissions as per CFR 47 15.209 and RSS-210 A2.2	-23.4	Complies
Radiated Emissions per CFR 47 15.249 and RSS-210 A2.9	-8.6	Complies
Receivers emissions per CFR 47 15.111 and RSS-210 and RSS-GEN	-19.1	Complies

Environmental Conditions

Ambient Temperature 22.9° C

Relative Humidity 19%

Atmospheric Pressure 1015.1 mb

Application for Certification

(1) Manufacturer: VekTek, Inc.
1334 East 6th Ave.
Emporia, KS 66801

(2) Identification: Model: 33011009 (Fixture Transceiver Unit, FTU)
FCC I.D.: YVC33011009
IC: 9287A-33011009

(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) No Peripheral Equipment was Necessary.

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

(10) Equipment is not a scanning receiver and this section is not applicable.

(11) The equipment does not operate in the 59 – 64 GHz frequency band and this section is not applicable.

(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 15.249, and Industry Canada standard 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 DA00-1407 and DA00-705 and/or TIA/EIA 603-1.

Equipment Tested

Equipment	Model	FCC I.D.	IC
EUT	33011009 (FTU)	YVC33011009	9287A-33011009

Equipment Function and Testing Procedures

The EUT is a 902-928 MHz radio transmitter used to transmit sensor information conditions for use in industrial applications. The 33011009 wireless transmitter is a wireless link used for transmitting remote sensor information in installation environments. The design offers the installation of the equipment to machinery fixtures allowing remote monitoring of sensor information. The device communicates the sensor information upon a change of state or as requested from compliant system components. The unit is marketed for use to incorporate a wireless link in industrial applications. The design operates from internal DC battery power only and offers interface termination point for passive compliant sensors.

Equipment and Cable Configurations

Radiated Emission Test Procedure

Testing of the radiated emissions was performed as defined in sections 8.3 and/or 13.1.4 of ANSI C63.4-2009. 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. 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 test setup photographs in the exhibits for EUT placement.

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.

Test Site Locations

Conducted EMI — The AC power line conducted emissions testing 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 Approval — Refer to Annex for FCC Site Registration Letter, # 90910, and Industry Canada Site Registration Letter, IC3041A-1.

List of Test Equipment

A Rohde & Schwarz ESU40 and/or Hewlett Packard 8591EM Spectrum Analyzer was used as the measuring device for the emissions testing of frequencies below 1 GHz. A Rohde & 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.

Analyzer Settings		
AC Line Conducted Emissions:		
RBW	AVG. BW	Detector Function
9 kHz	30 kHz	Peak/Quasi Peak
Radiated Emissions 30-1000 MHz		
RBW	AVG. BW	Detector Function
100 kHz	100 kHz	Peak
120 kHz	300 kHz	Peak/Quasi Peak
Radiated Emissions Above 1000 MHz		
RBW	Video BW	Detector Function
1 MHz	1 MHz	Peak / Average

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

General Emissions (Unintentional Radiators)

The unit operates from internal DC battery power only. The replaceable batteries are accessed by removing the transmitter from the fixture offering access to batteries. The EUT was arranged in a typical equipment configuration and placed on a 1 x 1.5-meter wooden bench 80 cm above the conducting ground plane.

Radiated EMI

The EUT was arranged in a typical equipment configuration and operated through all of its various modes. 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. Plots were made of the radiated frequency spectrum from 30 MHz to 10,000 MHz for the preliminary testing. Refer to figures one through five showing plots of the radiated emissions spectrum taken in a screen room. Each radiated emission was then re-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 30 MHz to 10,000 MHz was searched for 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 Biconilog from 30 to 6,000 MHz, Biconilog from 30 to 1000 MHz, Log Periodic from 200 MHz to 5 GHz and or, pyramidal horns and mixers from 4 GHz to 12 GHz, notch filters and appropriate amplifiers were utilized.

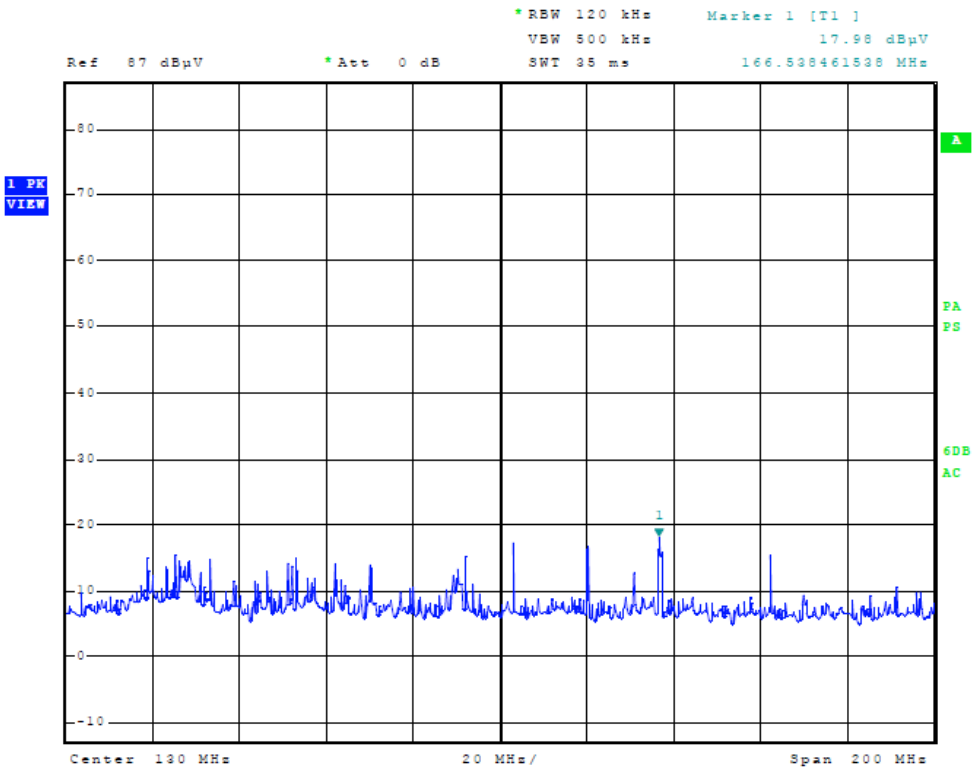

Figure One Plot of General Radiated Emissions

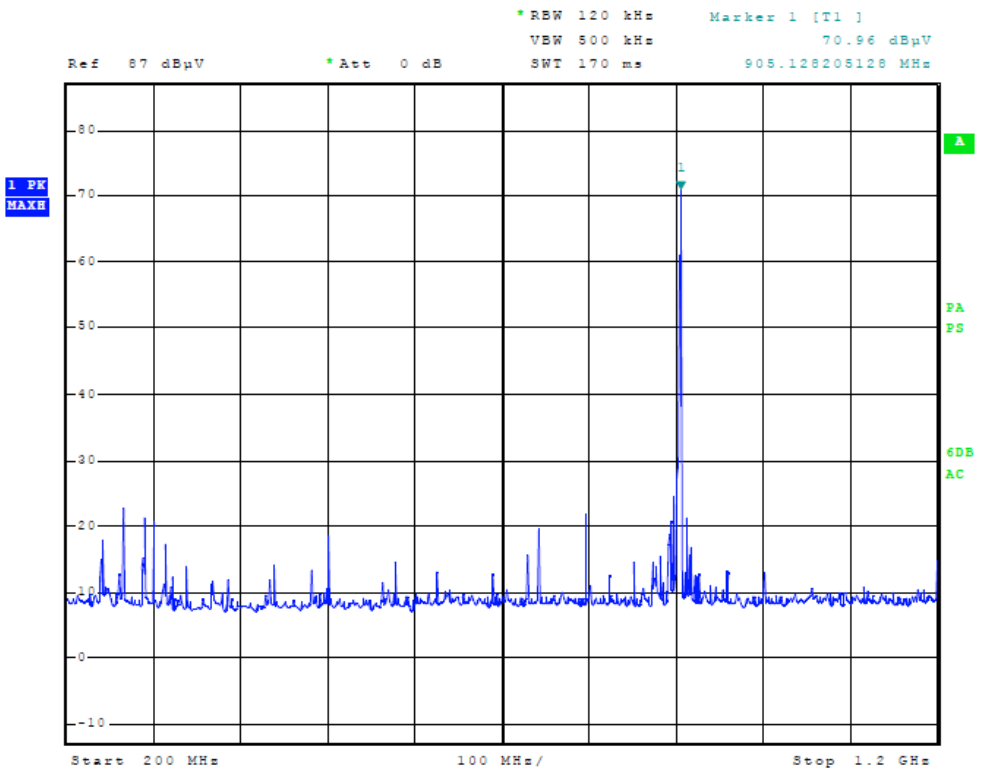

Figure Two Plot of General Radiated Emissions

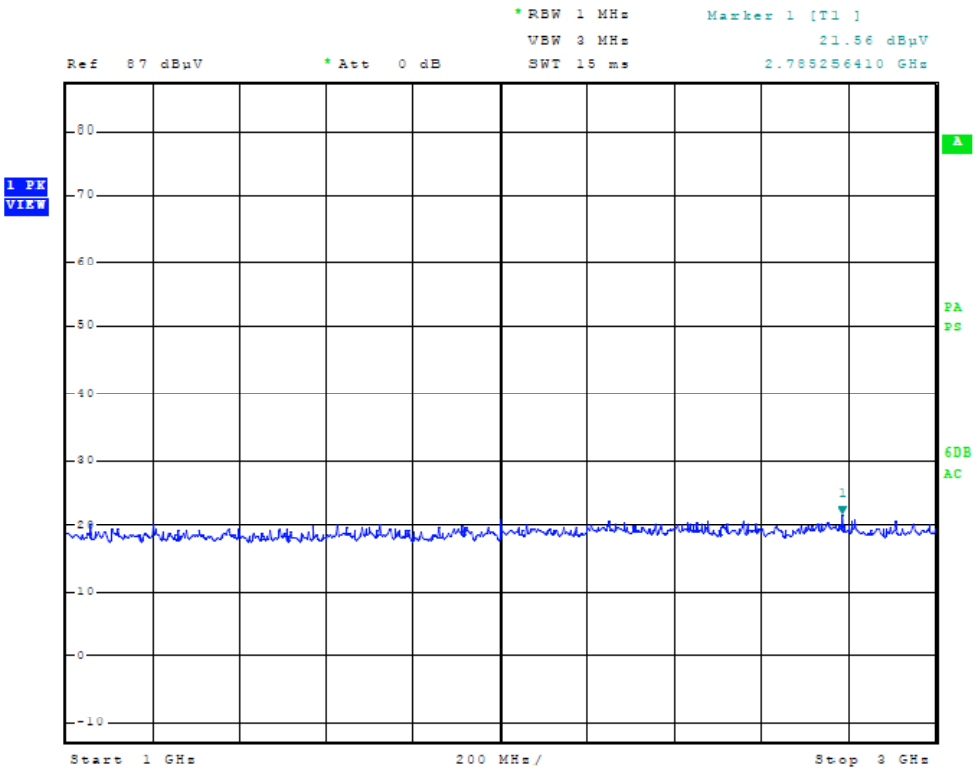

Figure Three Plot of General Radiated Emissions

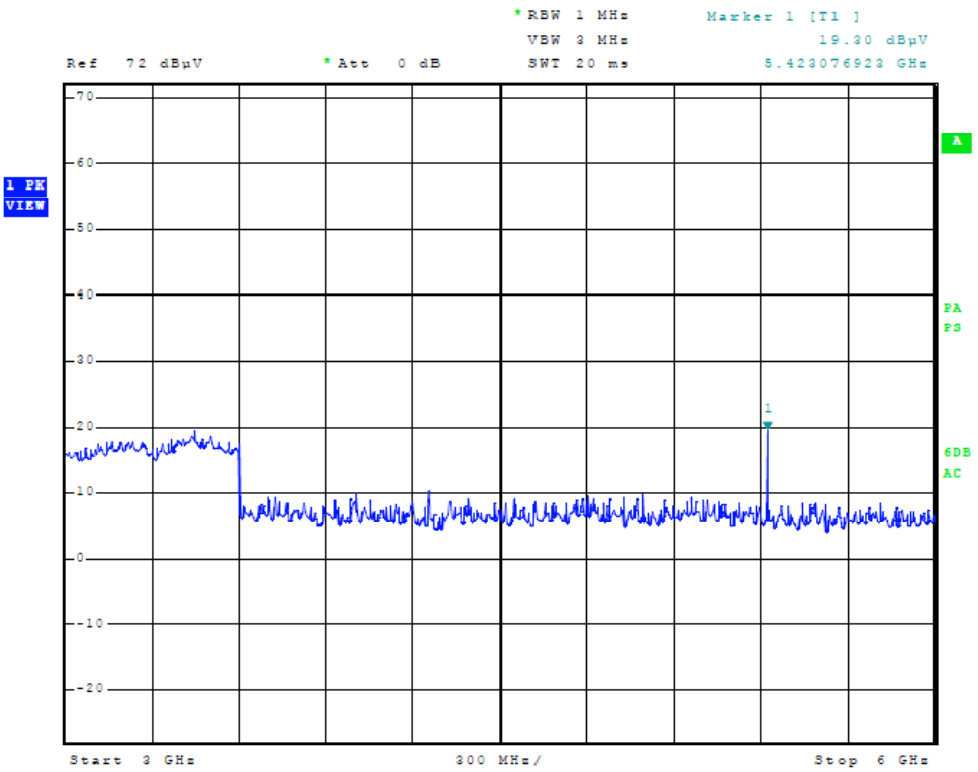

Figure Four Plot of General Radiated Emissions

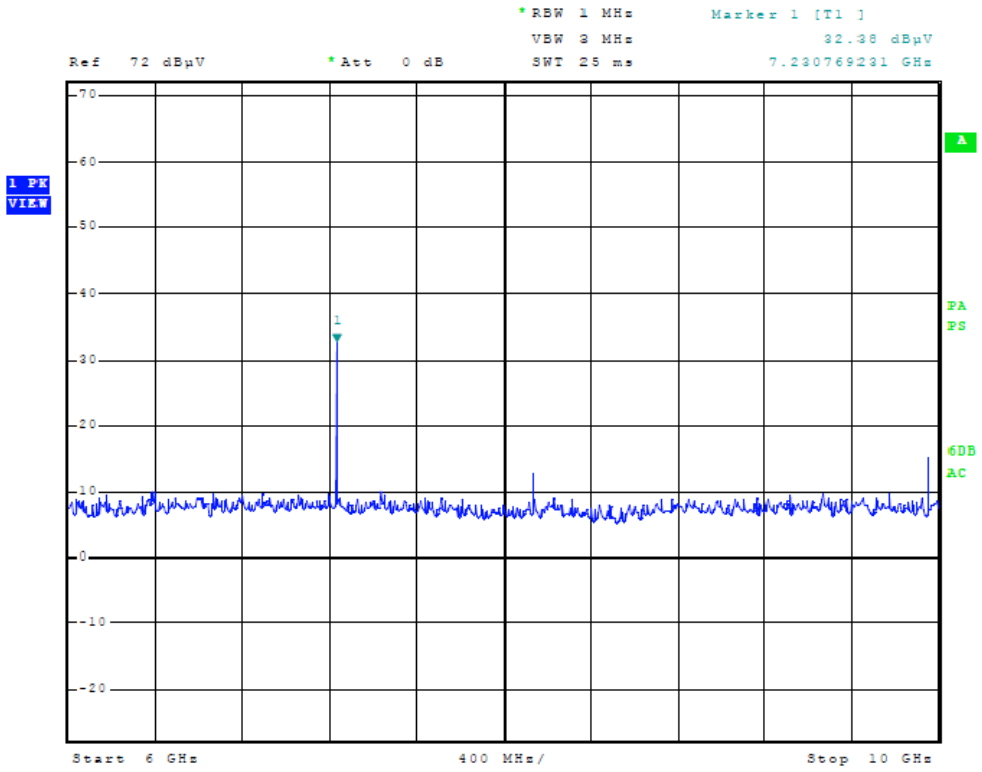

Figure Five Plot of General Radiated Emissions

General Radiated Emissions Data from EUT

Frequency in MHz	FSM Horz. (dBµV)	FSM Vert. (dBµV)	A.F. (dB/m)	Amp. Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
162.0	33.6	31.0	12.9	30	16.5	13.9	40.0
135.0	33.1	32.4	13.5	30	16.6	15.9	40.0
175.5	30.9	29.3	11.9	30	12.8	11.2	40.0
189.0	30.4	31.1	11.5	30	11.9	12.6	40.0
288.1	27.7	28.1	13.9	30	11.6	12.0	43.5
246.1	28.1	28.6	13.3	30	11.4	11.9	43.5

Other emissions present had amplitudes at least 20 dB below the limit.

Summary of Results for Radiated Emissions

The EUT demonstrated compliance with requirements of CISPR 22, CFR47, and Industry Canada requirements. The EUT demonstrated a 23.4 dB minimum margin below requirements. Other emissions were present with amplitudes at least 20 dB below the limit.

Intentional Radiators Emissions

As per CFR47 Part 15, Subpart C, paragraphs 15.203, 15.205, 15.209, 15.249 and RSS-210 the following information is submitted.

Antenna Requirements

The unit is produced with a permanently attached antenna and has no provision for user service, replacement, or antenna modification. The antenna requirements are fulfilled and 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 at the OATS. The EUT utilizes frequency, determining circuitry, which generates harmonics falling in the restricted bands. Emissions were checked 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.

Sample Calculation:

RFS (dBμV/m @ 3m)= FSM (dBμV) + Antenna Factor (dB) - Amplifier Gain (dB)

Restricted Bands Radiated Emissions Data

Frequency in MHz	FSM Horz. (dBµV)	FSM Vert. (dBµV)	A.F. (dB/m)	Amp. Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
2711.9	19.3	19.1	31.8	25.0	26.1	25.9	54.0
2745.8	19.2	19.1	32.1	25.0	26.3	26.2	54.0
2775.1	19.2	18.9	32.1	25.0	26.3	26.0	54.0
3615.8	18.3	18.7	35.3	25.0	28.6	29.0	54.0
3661.0	18.1	16.5	35.2	25.0	28.3	26.7	54.0
3700.2	16.3	17.1	35.6	25.0	26.9	27.7	54.0
4519.8	22.1	20.9	37.8	25.0	34.9	33.7	54.0
4576.3	21.9	21.5	37.6	25.0	34.5	34.1	54.0
4625.2	21.2	20.9	38.0	25.0	34.2	33.9	54.0
5423.7	25.8	24.6	33.1	25.0	33.9	32.7	54.0
7231.7	15.8	14.1	36.3	25.0	27.1	25.4	54.0
7322.0	13.3	11.9	36.4	25.0	24.7	23.3	54.0
7400.3	13.4	12.3	36.5	25.0	24.9	23.8	54.0

Other emissions present had amplitudes at least 20 dB below the margin.

Summary of Results for Radiated Emissions in Restricted Bands

The EUT demonstrated compliance with requirements of CFR47 15C, and Industry Canada RSS-210 requirements. The EUT demonstrated a 19.1 dB minimum margin below requirements. Both average and peak amplitudes of frequencies above 1000 MHz were measured for demonstration of compliance with the regulations. No other emissions where found in the restricted frequency bands. Other emissions were present with amplitudes at least 20 dB below the Limits.

Operation in the Band 902-928 MHz

The power output was measured on an Open Area Test Site at a 3 meters distance. The EUT 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 including carrier frequency was measured using a spectrum analyzer. The peak and average amplitude of emissions above 1000 MHz including spurious emissions were measured using a spectrum analyzer then data was recorded from the analyzer display. Emissions radiated outside of the specified bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 15.209 (and/or RSS-210), whichever is the lesser attenuation. The amplitude of each emission was maximized by varying the FSM antenna height, polarization, and by rotating the turntable. A Biconilog Antenna was used for measuring emissions from 30 to 6,000 MHz, a Log Periodic Antenna for 200 to 5,000 MHz, and or Pyramidal Horn Antennas from 4 GHz to 25 GHz. Emissions were measured in dBµV/m @ 3 meters.

The power output was measured at the open area test site at a three-meter distance. Data was taken per Paragraph 2.1046(a), 15.249 and RSS-210. The 902 and 928 MHz band edges are protected due to the 903 – 925 MHz channels used for frequency of operation. Refer to figures six through eleven showing plots taken of the EUT performance displaying compliance with the specifications.

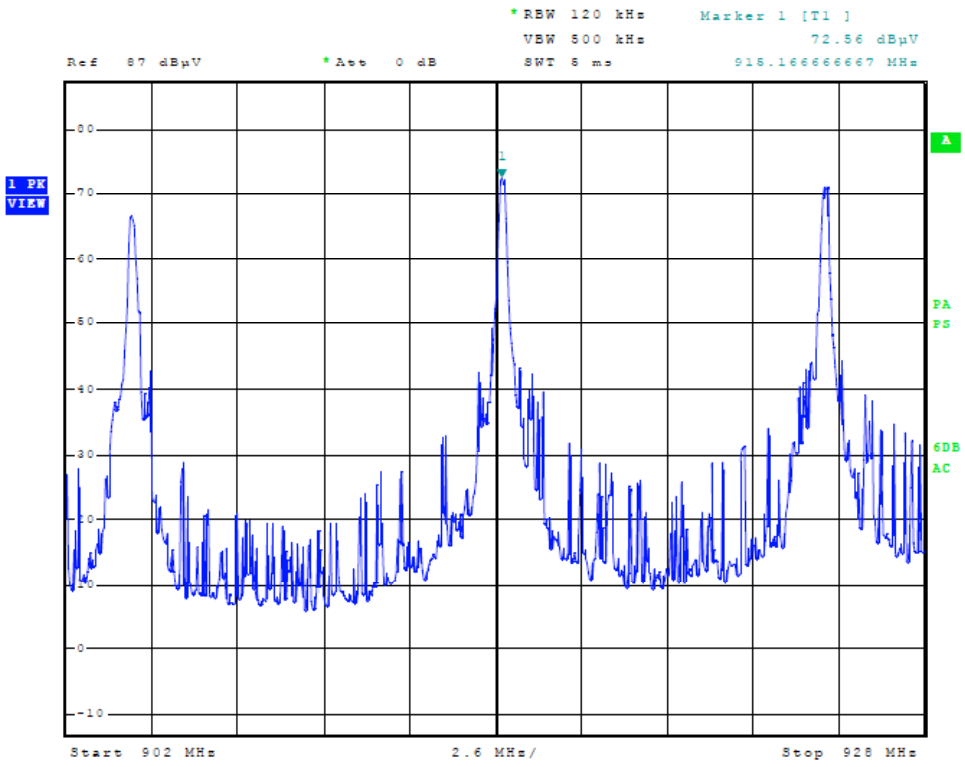

Figure Six Operation across Frequency Band

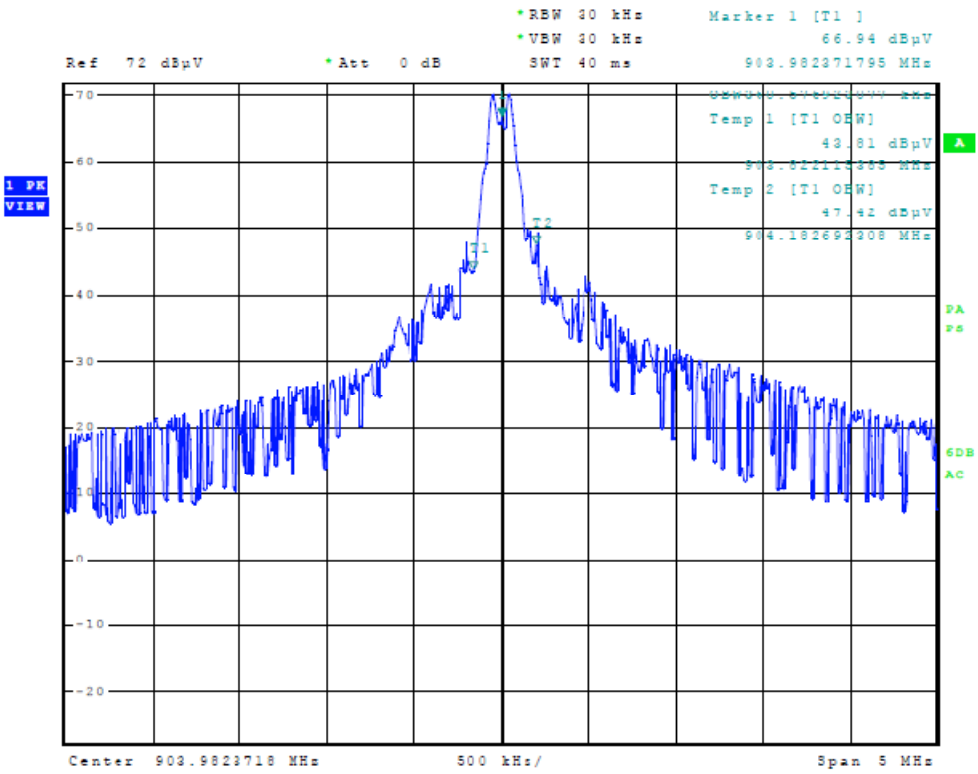

Figure Seven Occupied Band Width Low channel

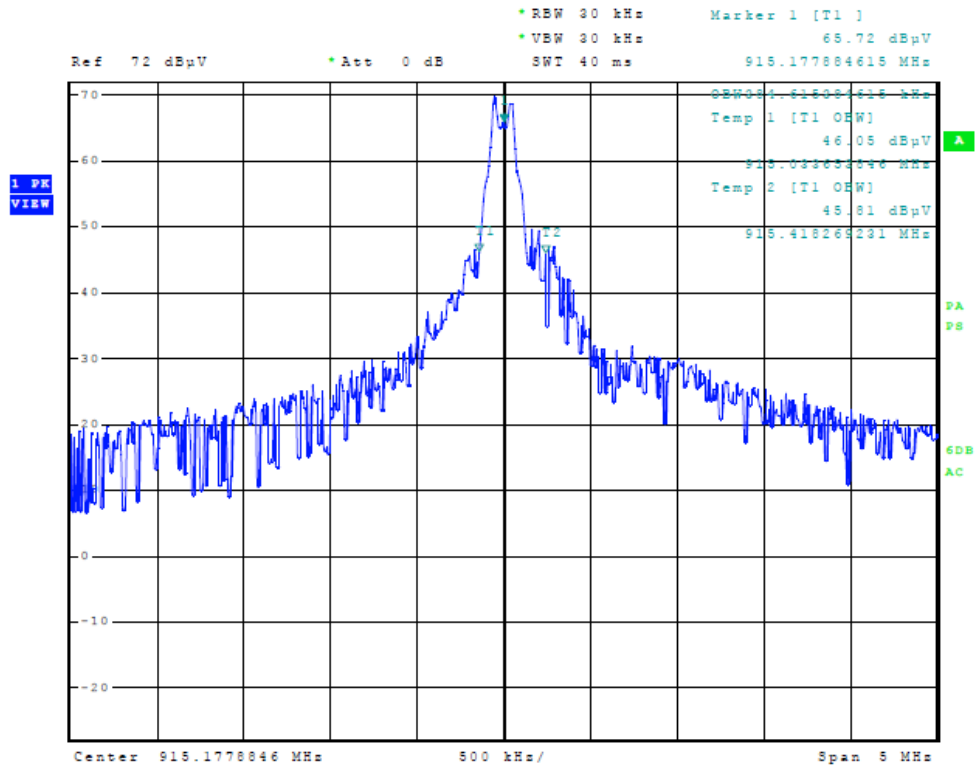

Figure Eight Occupied Band Width Middle channel

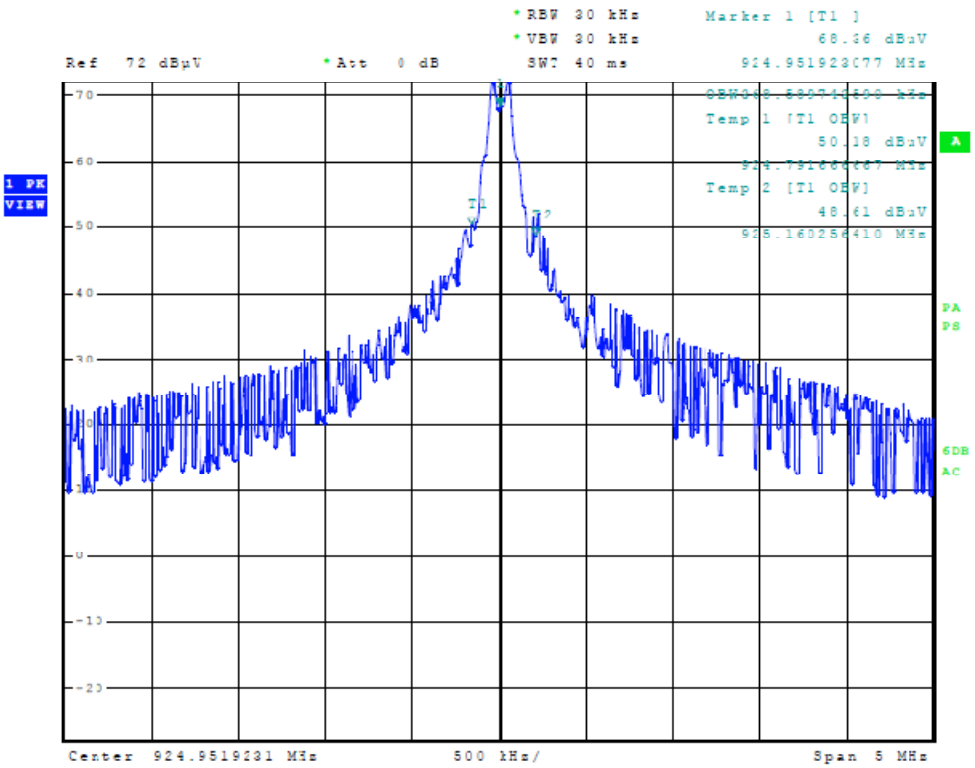

Figure Nine Occupied Band Width High channel

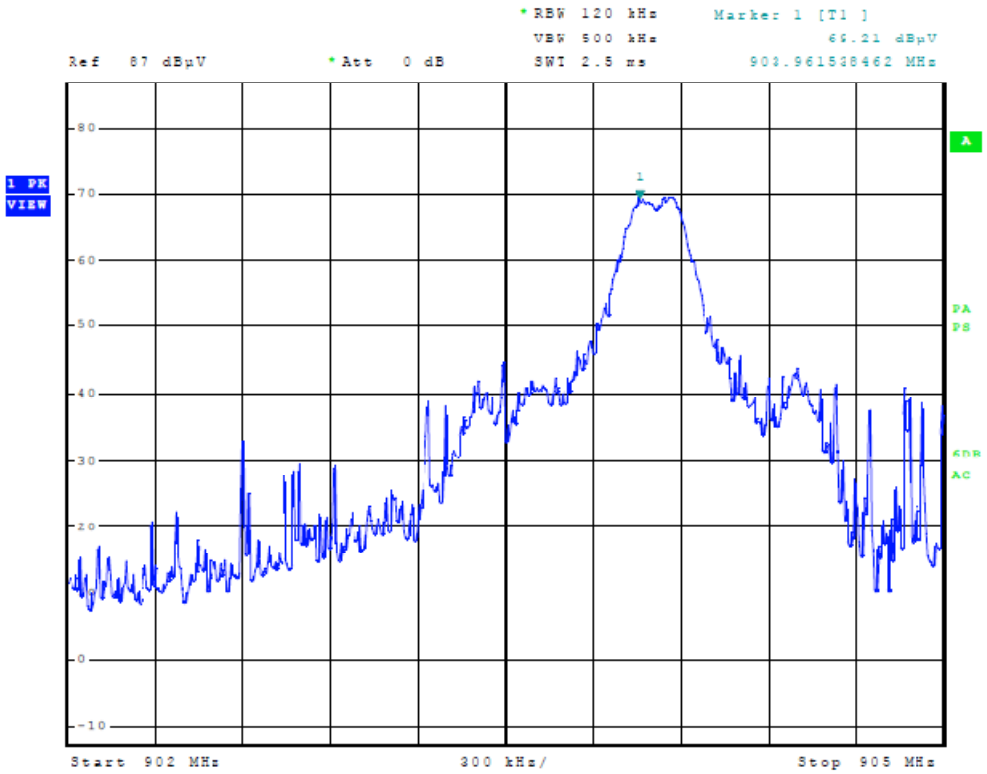

Figure Ten Lower Band Edge

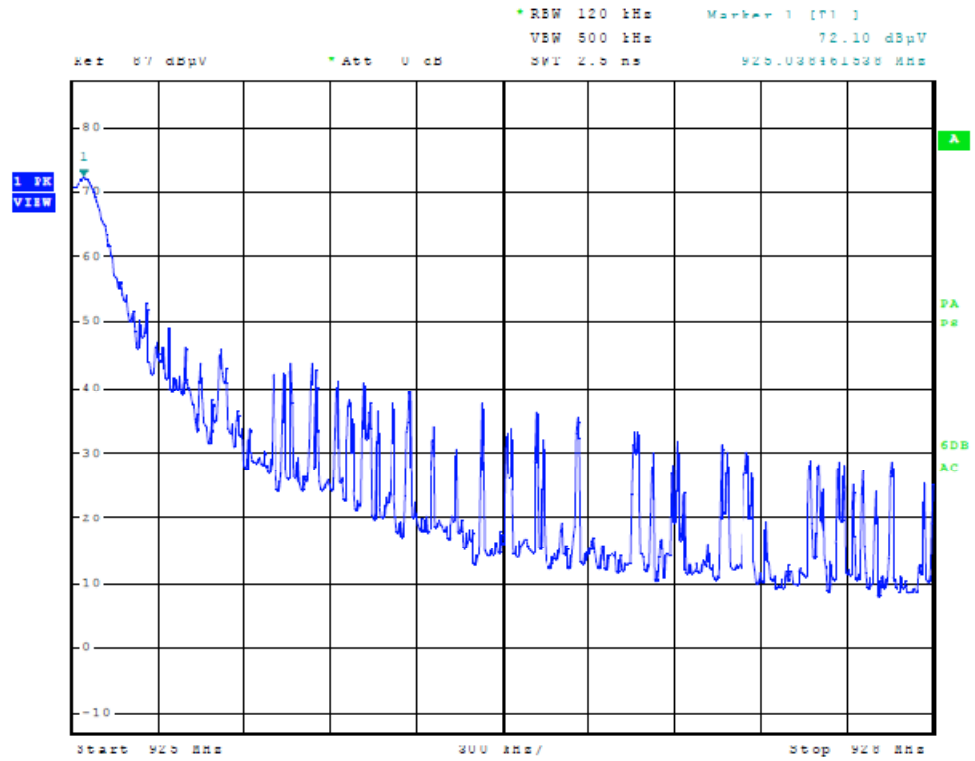

Figure Eleven Upper Band Edge

Transmitter Radiated Emissions Data

Emission Frequency (MHz)	FSM Horz. (dBµV)	FSM Vert. (dBµV)	Ant. Factor (dB)	Amp Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
903.95	92.8	87.7	22.6	30	85.4	80.3	94.0
1807.9	18.7	19.6	28.2	25	21.9	22.8	54.0
2711.9	19.3	19.1	31.8	25	26.1	25.9	54.0
3615.8	18.3	18.7	35.3	25	28.6	29.0	54.0
4519.8	22.1	20.9	37.8	25	34.9	33.7	54.0
5423.7	25.8	24.6	33.1	25	33.9	32.7	54.0
6327.7	18.8	20.6	34.0	25	27.8	29.6	54.0
7231.6	15.8	14.1	36.3	25	27.1	25.4	54.0
915.25	91.9	87.0	22.7	30	84.6	79.7	94.0
1830.5	18.8	18.6	28.4	25	22.2	22.0	54.0
2745.8	19.2	19.1	32.1	25	26.3	26.2	54.0
3661.0	18.1	16.5	35.2	25	28.3	26.7	54.0
4576.3	21.9	21.5	37.6	25	34.5	34.1	54.0
5491.5	27.3	23.9	33.1	25	35.4	32.0	54.0
6406.8	19.8	21.8	34.1	25	28.9	30.9	54.0
7322.0	13.3	11.9	36.4	25	24.7	23.3	54.0
925.04	90.0	87.0	22.8	30	82.8	79.8	94.0
1850.1	18.4	18.5	28.4	25	21.8	21.9	54.0
2775.1	19.2	18.9	32.1	25	26.3	26.0	54.0
3700.2	16.3	17.1	35.6	25	26.9	27.7	54.0
4625.2	21.2	20.9	38.0	25	34.2	33.9	54.0
5550.2	28.7	23.3	33.1	25	36.8	31.4	54.0
6475.3	19.7	20.2	34.2	25	28.9	29.4	54.0
7400.3	13.4	12.3	36.5	25	24.9	23.8	54.0

Other emissions present had amplitudes at least 20 dB below the margin.

Summary of Results for Radiated Emissions of Intentional Radiator

The EUT demonstrated compliance with the requirements of CFR47 Part 15.249 and RSS-210 Intentional Radiators. The EUT highest fundamental transmitting frequency demonstrated emission level of 85.4 dBμV/m at 3 meters. The EUT presented worst-case margin of 17.2 dB margin requirements for the harmonic emissions. There were no other measurable emissions greater than 20 dB below requirements in the restricted bands than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the limits. The EUT demonstrated compliance with specifications of 15.249 and RSS-210. There are no deviations or exceptions to the requirements.

Statement of Modifications and Deviations

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

Receiver Spurious Emissions

Measurements Required

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna.

Test Arrangement

As the EUT offers no antenna connection point for measurements, compliance with this requirement is demonstrated in emissions section below.

Spurious Emissions at Antenna Terminal Results

As the EUT offers no antenna connection point for measurements, compliance with this requirement is demonstrated in emissions section below.

Field Strength of Receiver Spurious Radiation

Measurements Required

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. This equipment offers no active interface opportunity and operates from batteries located inside plastic enclosure.

Test Arrangement

The test setup was assembled in a screen room for preliminary screening. The transmitter was placed on a wooden turntable 0.8 meters above the ground plane and at a distance of 1 meter from the receive antenna, plots were taken of the radiated emissions. Refer to figures twelve though sixteen showing plots of the spectrum analyzer display of the receiver radiated emissions frequency spectrum taken in the screen room.

Final radiated emissions testing were performed with the transmitter placed on a wooden turntable 0.8 meters above the ground plane and at a distance of 3 meters from the Field Strength Measuring (FSM) antenna. The EUT was operational and radiating into the standard antenna as no antenna port connection is provided. The receiving antenna was raised and lowered from 1m to 4m in height to obtain the maximum reading of spurious radiation from the EUT. The turntable was rotated though 360 degrees to locate the position registering the highest amplitude of emission. The frequency spectrum was then searched for spurious emissions generated from the transmitter, interface cabling, and test setup. The amplitude of each spurious emission was maximized by raising and lowering the FSM antenna, and rotating the turntable before final data was recorded. The frequency spectrum from 30 MHz to 12,000 MHz was investigated during radiated emissions testing. A Biconilog antenna was used for frequency measurements of 30 to 6,000 MHz. A double-ridge horn antenna was used for frequencies of 5,000 MHz to 12,000 MHz. Emission levels were measured and recorded from the spectrum analyzer in dBµV. Data was taken at the Rogers Labs, Inc. 3 meters open area test site (OATS). A description of the test facility is on file with the FCC and Industry Canada (refer to annex for site registration letters).

The EUT was operated in all available test modes emulating worst-case operation while radiated emissions testing were performed. The amplitude of each spurious emission was maximized and amplitude levels recorded while operating at the open area test site at a distance of 3-meters.

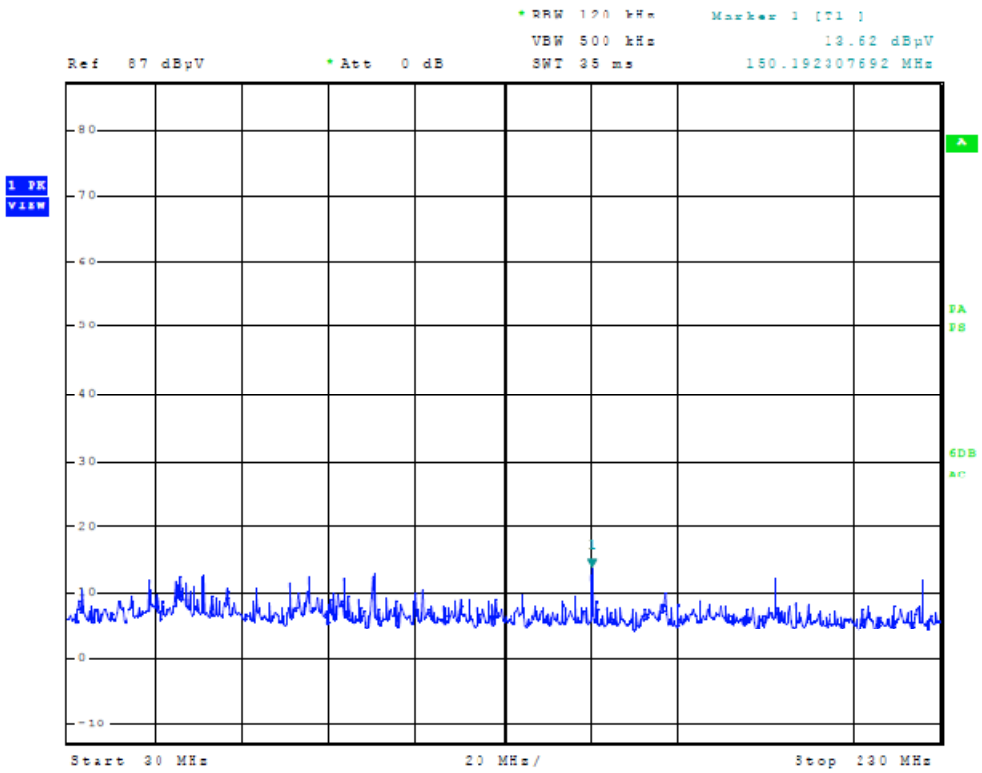

Figure Twelve Radiated emissions taken at 1 meter in screen room

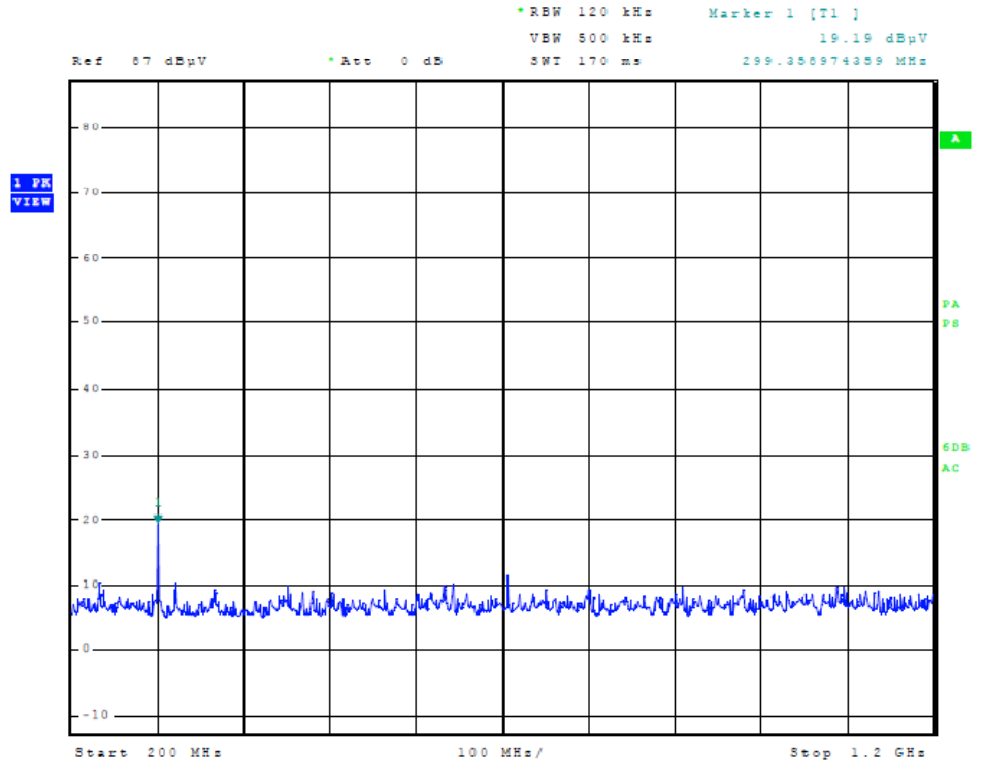

Figure Thirteen Radiated emissions taken at 1 meter in screen room

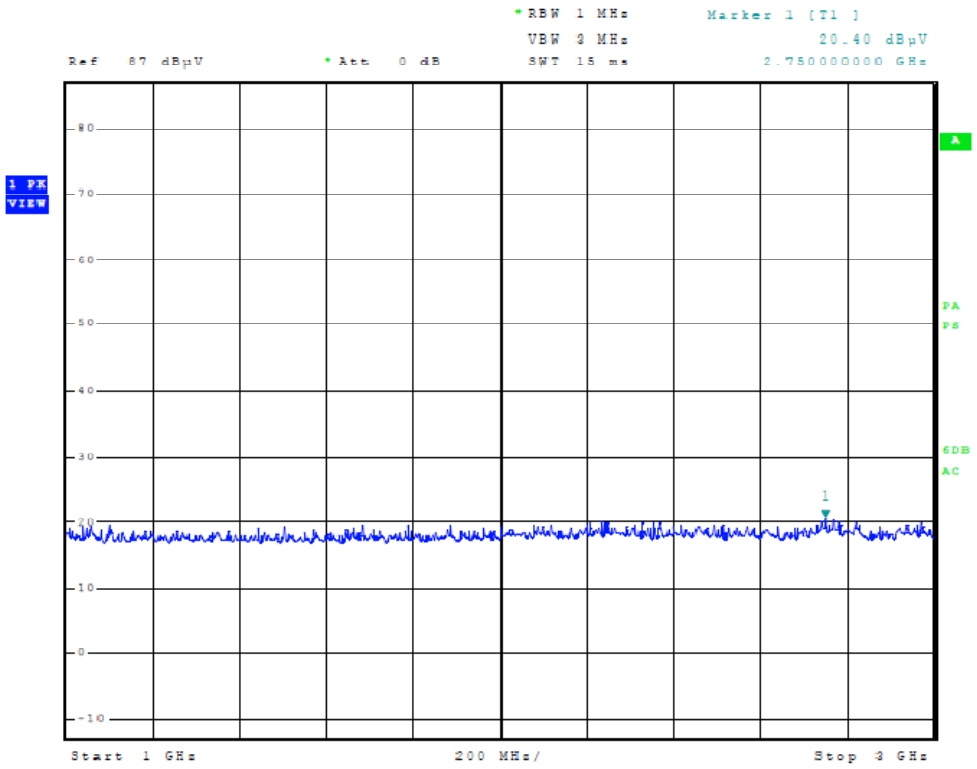

Figure Fourteen Radiated emissions taken at 1 meter in screen room

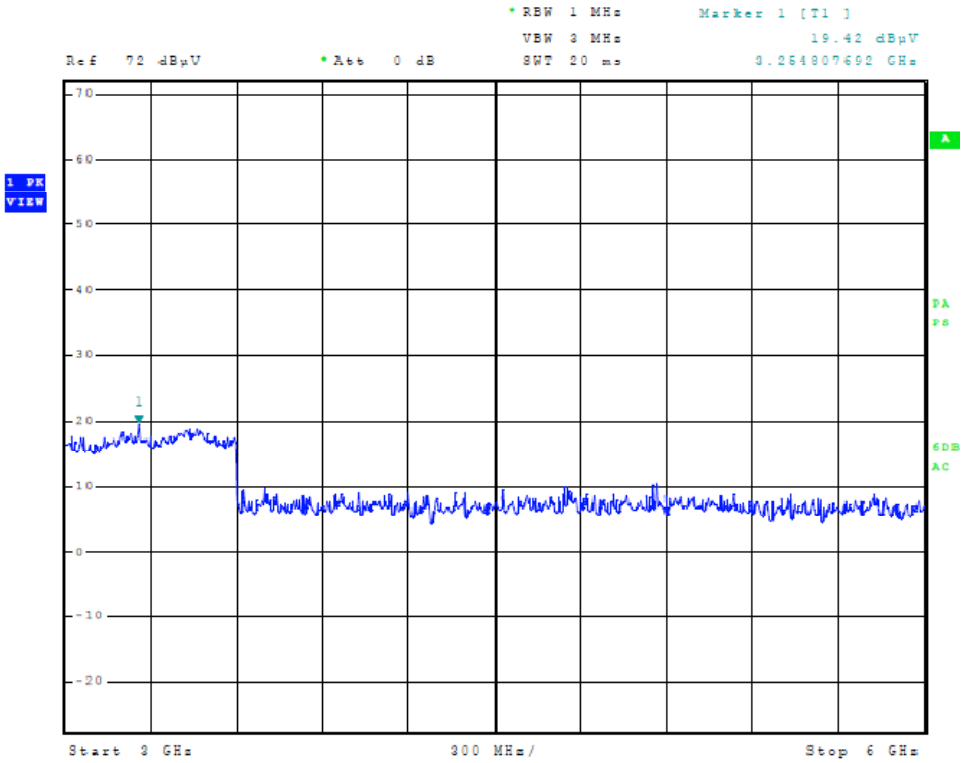

Figure Fifteen Radiated emissions taken at 1 meter in screen room

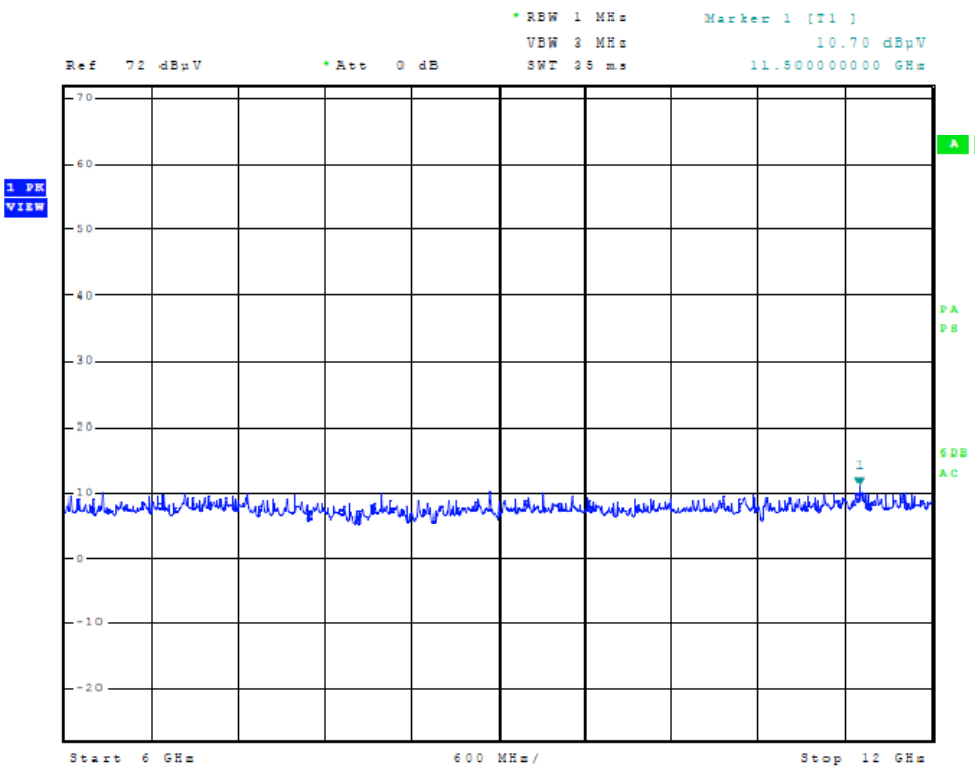

Figure Sixteen Radiated emissions taken at 1 meter in screen room

Receiver Radiated Emissions Data

Frequency (MHz)	FSM Hor. (dBµV)	FSM Vert. (dBµV)	Ant. Fact. (dB/m)	Amp. Gain (dB)	Comp. Hor. (dBµV/m) @ 3m	Comp. Vert. (dBµV/m) @ 3 m	Limit (dBµV)
915.3	32.9	34.2	22.7	30	25.6	26.9	46.0
1830.5	15.8	16.8	28.4	25	19.2	20.2	54.0
2745.8	17.3	18.8	32.1	25	24.4	25.9	54.0
3661.0	17.5	18.3	35.2	25	27.7	28.5	54.0
4576.3	16.6	16.5	37.6	25	29.2	29.1	54.0

Other Emissions present with amplitudes at least 20 dB below limit.

Receiver Spurious Radiated Emission Results

The EUT demonstrated compliance with specifications of CFR47 Paragraph 2.1046(a) and applicable Parts of 2 and 15C and RSS-210. The EUT demonstrated compliance with the radiated emissions requirements for FCC Part 15B and CISPR 22 Devices with a minimum of 19.1 dB margin below requirements. There are no deviations to the specifications. There are no deviations or exceptions to the specifications.

Annex

- Annex A Measurement Uncertainty Calculations
- Annex B Rogers Labs Test Equipment List
- Annex C Rogers Qualifications
- Annex D FCC Test Site Registration Letter
- Annex E Industry Canada Test 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
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
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/11
R.F. Generator: HP 606A	2/11
R.F. Generator: HP 8614A	2/11
R.F. Generator: HP 8640B	2/11
Spectrum Analyzer: Rohde & Schwarz ESU40	2/11
Spectrum Analyzer: HP 8562A, HP Adapters: 11518, 11519, 11520 Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	5/10
Spectrum Analyzer: HP 8591EM	5/10
Frequency Counter: Leader LDC825	2/11
Antenna: Sunol Biconilog Model: JB6	5/10
Antenna: EMCO Biconilog Model: 3143	5/10
Antenna: EMCO Log Periodic Model: 3147	10/10
Antenna: Antenna Research Biconical Model: BCD 235	10/10
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
Antenna: Large Loop Antenna	2/11
Audio Oscillator: H.P. 201CD	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. Preamp CPPA-102	2/11
LISN 50 µHy/50 ohm/0.1 µf	10/10
LISN Compliance Eng. 240/20	2/11
LISN Fischer Custom Communications FCC-LISN-50-16-2-08	2/11
Peavey Power Amp Model: IPS 801	2/11
Power Amp A.R. Model: 10W 1010M7	2/11
Power Amp EIN Model: A301	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
Current Probe: Singer CP-105	2/11
Current Probe: Solar 9108-1N	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. Work experience includes six years working 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.

NVLAP Lab Code 200087-0

Annex D FCC Test Site Registration Letter

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

May 18, 2010

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: May 18, 2010

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

NVLAP Lab Code 200087-0

Annex E Industry Canada Test Site Registration Letter

Industry Canada Industrie Canada

May 26, 2010

OUR FILE: 46405-3041
Submission No: 140719

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

Attention: Mr. Scot D. Rogers

Dear Sir/Madame:

The Bureau has received your application for the renewal of a 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 **(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;

- Your primary code is: **3041**

- The company number 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 two 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