

# Application Submittal Report For FCC And Industry Canada Grant Of Certification

FOR

Models: C782M4IB and C782M5IB  
2403 - 2480 MHz Transmitter

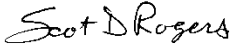
FCC ID: O6R1823  
IC: 3797A-1823

FOR

**Dynastream Innovations, Inc.**

#201, 100 Grande Blvd.  
Cochrane, Alberta T4C 0S4, Canada

Test Report Number: 110815B

Authorized Signatory:   
Scot D. Rogers



NVLAP Lab Code 200087-0



## **ROGERS LABS, INC.**

4405 West 259<sup>th</sup> Terrace  
Louisburg, KS 66053  
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# Engineering Test Report For Grant Of Certification Application Submittal

CFR47, Part 15C - Intentional Radiators Paragraph 15.249,  
Industry Canada, RSS-210  
Low Power Transmitter

For


## **Dynastream Innovations, Inc.**

#201, 100 Grande Blvd.  
Cochrane, Alberta T4C 0S4, Canada  
Phone: (913) 397-8200  
Mr. Jim Rooney  
President

## **Models: C782M4IB and C782M5IB**

Frequency 2403 - 2480 MHz  
FCC ID#: O6R1823  
IC: 3797A-1823

Test Date: August 15, 2011

Certifying Engineer:   
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Revision 1

Dynastream Innovations, Inc.  
Models: C782M4IB and C782M5IB  
Test #: 110815B  
Test to: CFR47 Parts 2, 15.249, RSS-210  
File: Dynastream 1823 TstRpt110815B

FCC ID: O6R1823  
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SN: 8990000000012  
Date: September 12, 2011  
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## 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 Spectrum Management and Telecommunications Radio Standard Specification RSS-210, Issue 8.

Name of Applicant: Dynastream Innovations, Inc.  
#201, 100 Grande Blvd.  
Cochrane, Alberta T4C 0S4, Canada

Models: C782M4IB and C782M5IB

FCC I.D.: O6R1823 IC: 3797A-1823, Frequency Range: 2403 - 2480 MHz

Operating Power: Average emission of 93.8 dBµV/m (3 meter radiated measurement), 99%  
Occupied Bandwidth 1,109.8 kHz, Receiver worst-case emission 43.9 dBµV/m

## Applicable Standards & 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 Spectrum Management and Telecommunications Radio Standard Specification RSS-210, Issue 8 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, RSS-210, and appropriate FCC documents DA00-1407 and DA00-705 and/or TIA/EIA 603-1.

## 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 2.2	-4.3	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	-18.6	Complies
Transmitter Radiated Emissions per CFR 47 15.249 and RSS-210 A2.9	-0.2	Complies
Receivers emissions per CFR 47 15.111 and RSS-210 and RSS-GEN	-10.1	Complies

## Application for Certification

- (1) Manufacturer: Dynastream Innovations, Inc.  
#201, 100 Grande Blvd.  
Cochrane, Alberta T4C 0S4, Canada
- (2) Identification: Models: C782M4IB and C782M5IB  
FCC I.D.: O6R1823 IC: 3797A-1823
- (3) Instruction Book: Refer to Exhibit for Instruction Manual.
- (4) Description of Circuit Functions: Refer to Operational Description Exhibit
- (5) Block Diagram with Frequencies: Refer to Block Diagram Exhibit
- (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) Peripheral equipment or accessories for the equipment. No optional equipment is available for the EUT. The available configuration options were investigated for this and other reports in compliance with required standards with worst-case data presented.
- (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.

## Statement of Modifications and Deviations

No modifications to the EUT were required for the equipment to demonstrate compliance with CFR47 Part 15C, or RSS-210 Emission Requirements. There were no deviations or modification to the specifications.

## Equipment Tested

<u>Equipment</u>	<u>Models / PN</u>	<u>Serial Number</u>
(EUT)	C782M4IB and C782M5IB	8990000000012

## Equipment Function and Testing Procedures

The EUT is a low power transmitter operating in the 2400-2483.5 MHz frequency band (CFR 47 15.249 and RSS-210). The design functions as remote digital interface device allowing information to be transmitted to compliant equipment. The transmitter offers no other interface connections than those in the configuration option shown below. The EUT receives power from internal batteries only and offers no alternative power source options. Test software was used during testing enabling the transmitter to function at maximum duty cycle modes across the operational frequency band. As requested by the manufacturer and required by the regulations, the unit was tested for emissions compliance using the available configurations with the worst-case data presented. Test results in this report relate only to the products described in this report.

### ***Test Setup***

The EUT was arranged as a test sample emulating typical user equipment configurations for testing purposes. The transmitter offers no interface connection and operates solely from replaceable internal button battery. Test software was supplied from manufacturer offering ability to set EUT transmit/receive parameters for testing purposes. The test sample was set to transmit in non-typical operating mode of continuous transmit for power and harmonic emissions testing. This transmit mode of operation offered worst-case emissions to be measured. As requested by the manufacturer and required by regulations, the equipment was tested for emissions compliance using the available configurations with the worst-case data presented. Test results in this report relate only to the products described in this report.

## Equipment Configurations for C782M4IB and C782M5IB



### **AC Line Conducted Emission Test Procedure**

Testing for the AC line-conducted emissions was performed as defined in sections 7.2.4 and 13.3 of ANSI C63.4-2009. The test setup, including the EUT, was arranged in the test configurations as shown above during testing. The test configuration was placed on a 1 x 1.5-meter wooden bench, 0.8 meters high located in a screen room. The power lines of the system were isolated from the power source using a standard LISN with a 50- $\mu$ Hy choke. EMI was coupled to the spectrum analyzer through a 0.1  $\mu$ F capacitor internal to the LISN. The LISN was positioned on the floor beneath the wooden bench supporting the EUT. The power lines and cables were draped over the back edge of the table. Refer to photographs in exhibits for EUT placement used during testing.

### **Radiated Emission Test Procedure**

Testing for the radiated emissions was performed as defined in sections 8.3 and 13.4 of ANSI C63.4-2009. The EUT was arranged in the test configurations as shown above during testing. The test configuration 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 final data was taken using a spectrum analyzer. Refer to photographs in exhibits for EUT placement used during testing.

### **Environmental Conditions**

Ambient Temperature	24.1° C
Relative Humidity	48%
Atmospheric Pressure	1009.3 mb

### **Units of Measurements**

Conducted EMI	Data is in dB $\mu$ V; dB referenced to one microvolt.
Radiated EMI	Data is in dB $\mu$ V/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. 259<sup>th</sup> 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. 259<sup>th</sup> Terrace, Louisburg, KS.
- Site Registration**      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

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Calibration Date</u>	<u>Due</u>
LISN	Comp. Design	FCC-LISN-2-MOD.CD	10/10	10/11
Antenna	ARA	BCD-235-B	10/10	10/11
Antenna	Sunol	JB6	10/10	10/11
Antenna	EMCO	3147	10/10	10/11
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



## **General Emissions (Unintentional Radiators)**

### ***AC Line Conducted EMI Procedure***

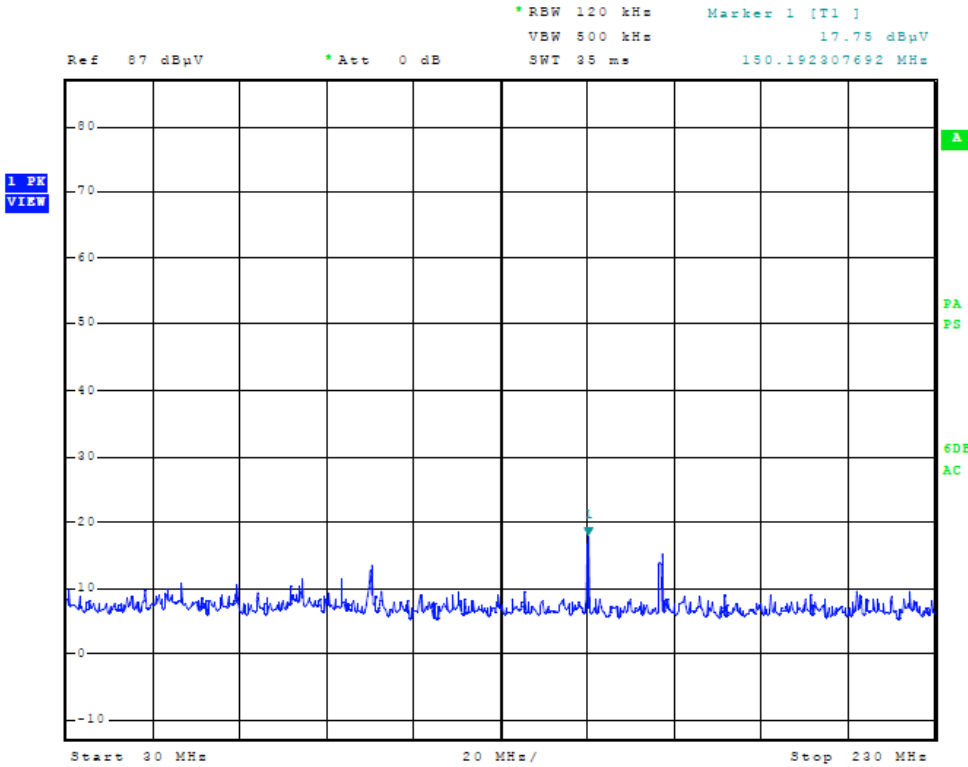
The EUT operates from internal DC battery power only and offers no provision for connection to utility power systems. Therefore, no AC line power line conducted emissions testing required or performed.

### ***Summary of Results for AC Line Conducted Emissions***

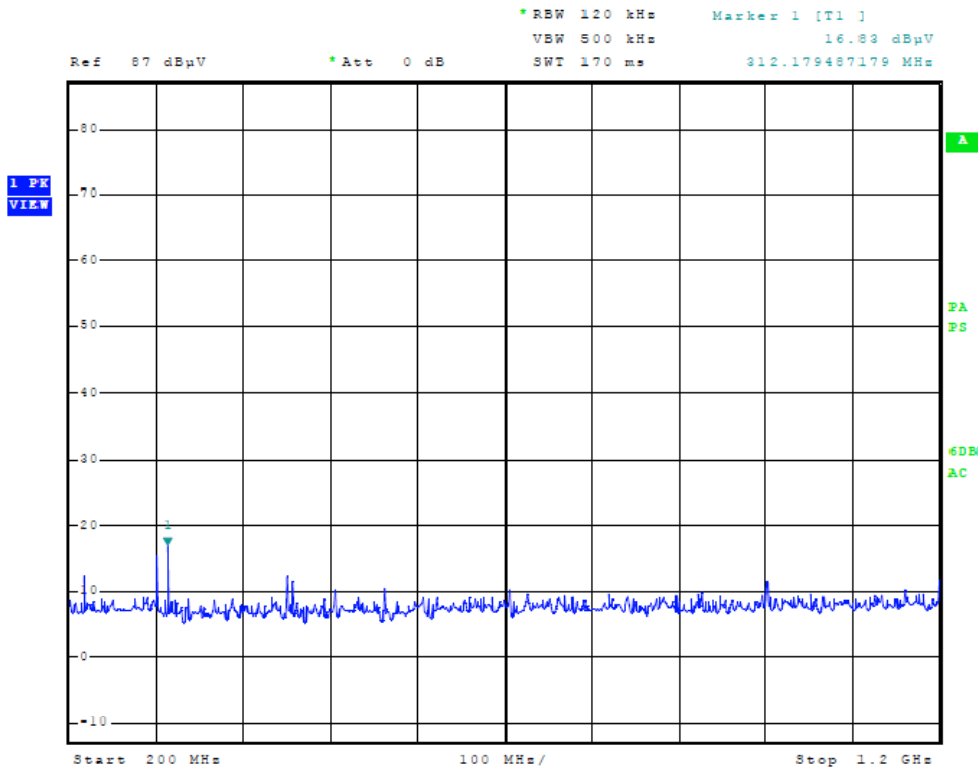
The EUT operates from internal DC battery power only and offers no provision for connection to utility power systems. The EUT demonstrated compliance with the AC Line Conducted Emissions requirements of CFR 47 Part 15B, RSS-GEN, and other applicable standards.

### ***Radiated EMI***

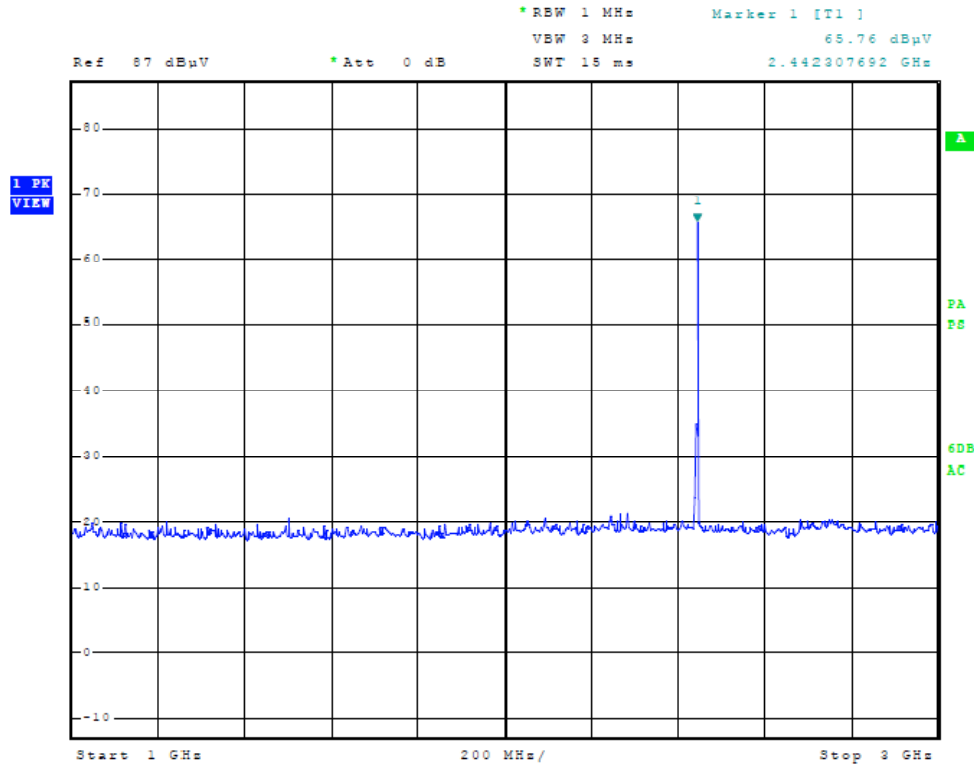
The EUT was arranged in typical equipment configurations and operated through all various modes. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Radiated emissions measurements were performed to identify the frequencies, which produced the highest emissions. Plots were made of the worst-case radiated frequency spectrum from 30 MHz to 25,000 MHz for the preliminary testing. Refer to figures one through seven showing plots of the worst-case radiated emissions spectrum taken in the 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 25,000 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. Appropriate receive test antennas used during radiated emissions testing were selected from; Biconilog - 30 to 1,000 MHz, Log Periodic - 200 MHz to 1 GHz, Double Ridge or pyramidal horns - 1 GHz to 25 GHz, notch filters and appropriate amplifiers.



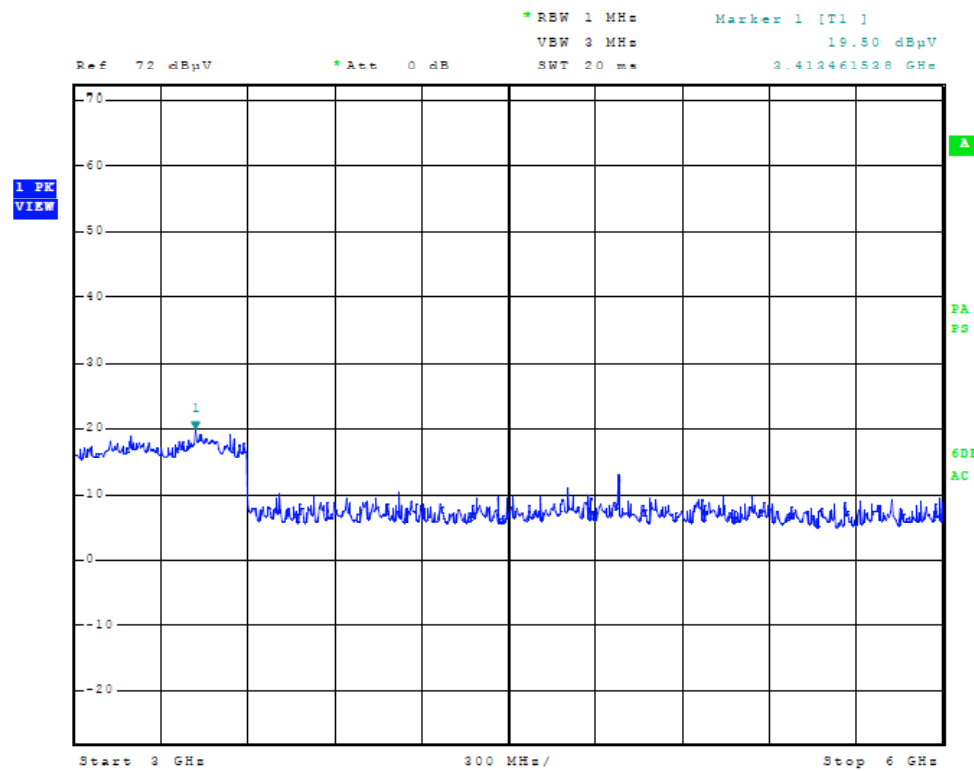
**Figure One Plot of General Radiated Emissions**



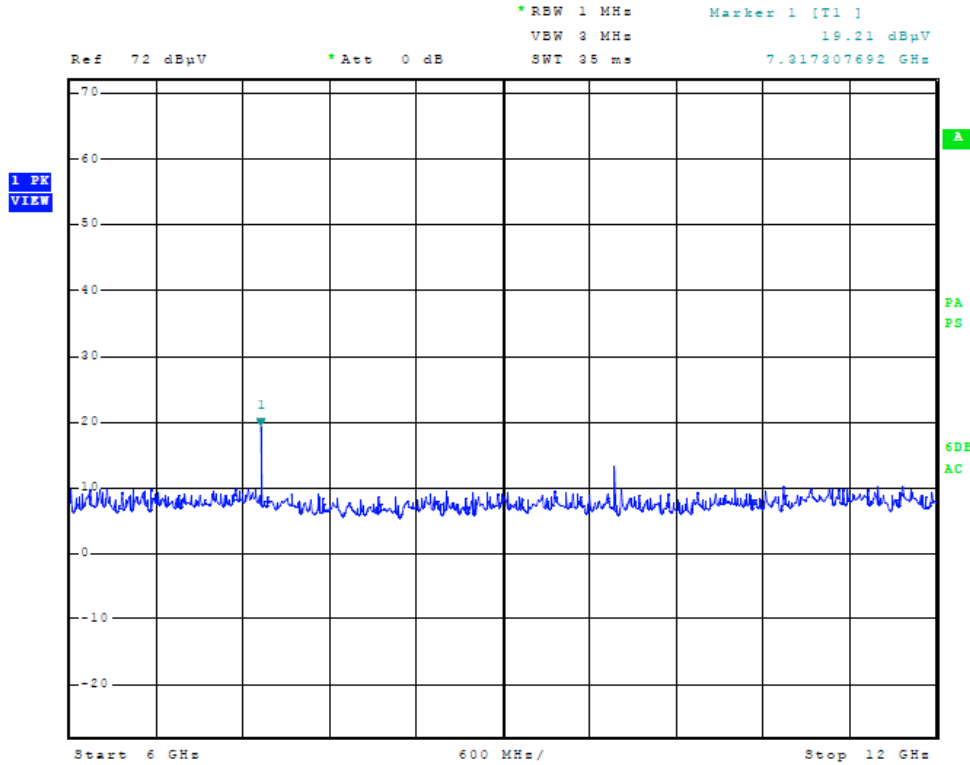
**Figure Two Plot of General Radiated Emissions**



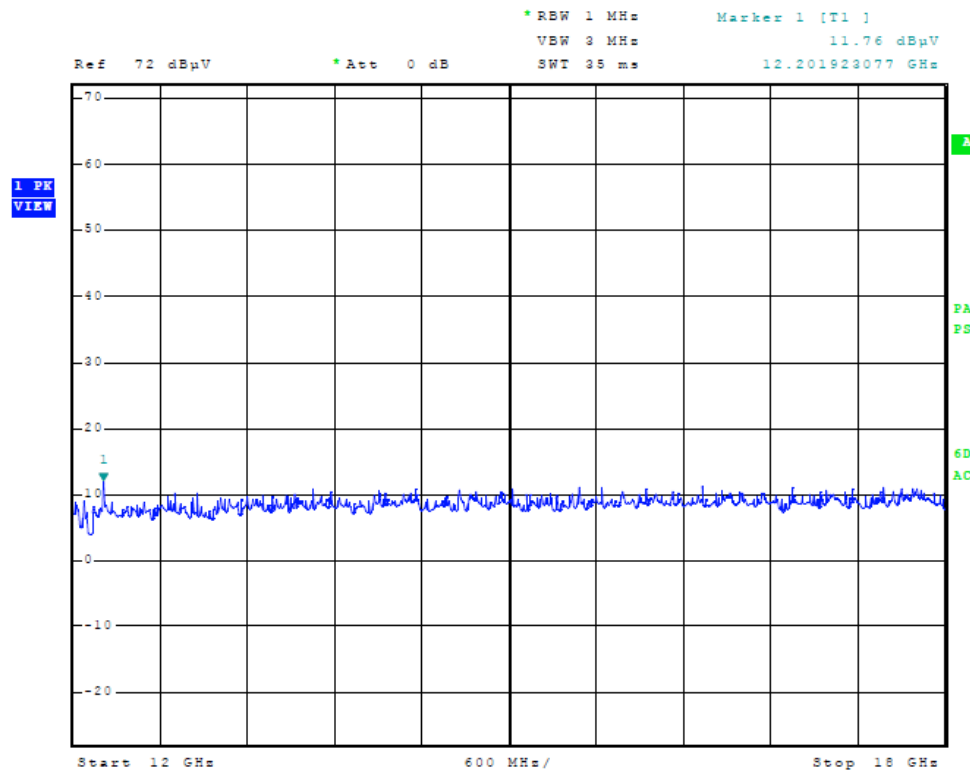
**Figure Three Plot of General Radiated Emissions**



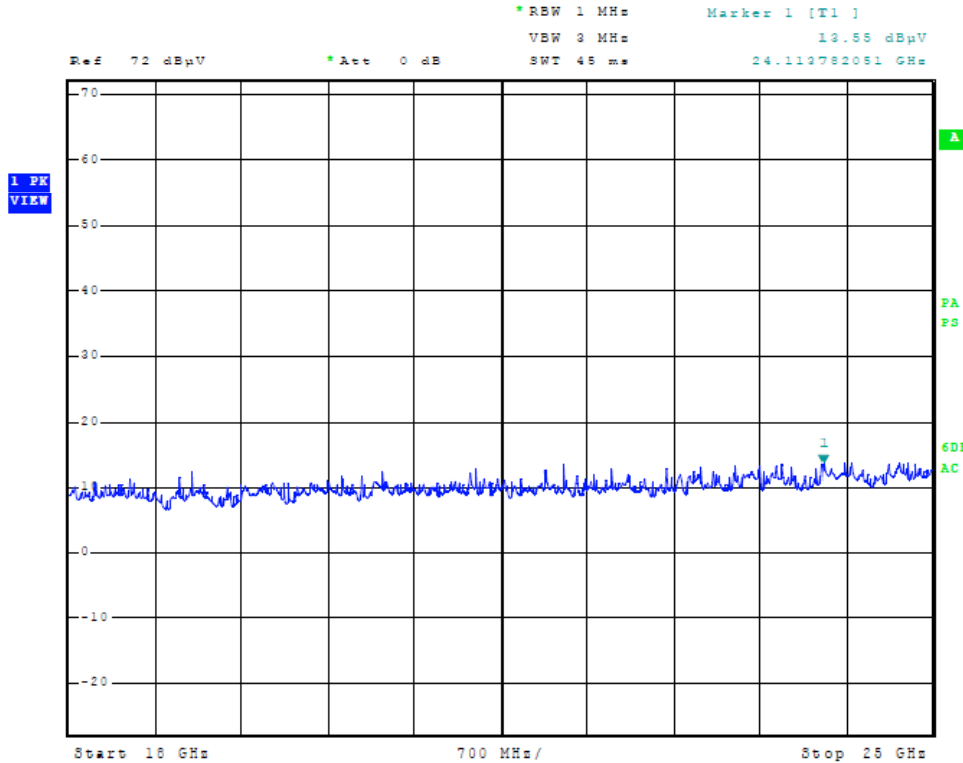
**Figure Four Plot of General Radiated Emissions**



**Figure Five Plot of General Radiated Emissions**



**Figure Six Plot of General Radiated Emissions**



**Figure Seven Plot of General Radiated Emissions**

**General Radiated Emissions Data from EUT**

Frequency in MHz	FSM Horz. (dBμV/m)	FSM Vert. (dBμV/m)	A.F. (dB/m)	Amp. Gain (dB)	RFS Horz. @ 3m (dBμV/m)	RFS Vert. @ 3m (dBμV/m)	Limit @ 3m (dBμV/m)
150.0	41.9	38.1	13.0	30	24.9	21.1	43.5
312.5	42.2	40.2	14.4	30	26.6	24.6	46.0
300.0	34.5	34.3	14.0	30	18.5	18.3	46.0

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 CFR47, and Industry Canada requirements. The EUT presented general radiated emissions demonstrating a minimum margin of -18.6 dB below requirements. No other measurable emissions were observed during emissions testing than those recorded. 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 transmitter antenna and has no provision for user service, replacement, or antenna modification. The requirements of unique antenna and/or connection 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 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:

$$\text{RFS (dB}\mu\text{V/m @ 3m)} = \text{FSM (dB}\mu\text{V)} + \text{Antenna Factor (dB/m)} - \text{Amplifier Gain (dB)}$$

**Radiated Emissions Data in Restricted Bands**

Frequency in MHz	FSM Horz. (dBµV/m)	FSM Vert. (dBµV/m)	A.F. (dB/m)	Amp. Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
150.0	38.4	30.9	13.0	30	21.4	13.9	43.5
2390.0	18.3	18.3	30.6	25	23.9	23.9	54.0
2483.5	43.3	36.6	31.4	25	49.7	43.0	54.0
4806.0	30.5	29.2	32.9	25	38.4	37.1	54.0
4882.0	31.7	29.6	31.4	25	38.1	36.0	54.0
4960.0	28.5	28.8	32.9	25	36.4	36.7	54.0
7209.0	29.5	25.5	36.0	25	40.5	36.5	54.0
7323.0	24.7	23.7	36.7	25	36.4	35.4	54.0
7440.0	23.0	21.1	36.7	25	34.7	32.8	54.0
12015.0	21.6	21.6	40.0	25	36.6	36.6	54.0
12205.0	20.7	20.8	40.0	25	35.7	35.8	54.0
12400.0	20.0	19.8	40.8	25	35.8	35.6	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 minimum margin of -4.3 dB below requirements. Peak and Quasi-peak amplitudes of frequencies below 1000 MHz were measured and average and peak amplitudes of frequencies above 1000 MHz were measured for demonstration of compliance with the regulations. No other significant emissions were found in the restricted frequency bands. Other emissions were present with amplitudes at least 20 dB below the Limits.



**Operation in the Band 2400 – 2483.5 MHz**

The power output was measured on an Open Area Test Site at a 3 meters distance. The frequency spectrum was investigated from the lowest radio frequency signal generated in the device up to at least the tenth harmonic of the highest fundamental frequency generated or to 40 GHz. 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 average amplitude of emissions above 1000 MHz including spurious emissions were measured using a spectrum analyzer/receiver. Data was then 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. Appropriate receive test antennas used during radiated emissions testing were selected from; Biconilog - 30 to 6,000 MHz, Log Periodic - 200 MHz to 5 GHz, Double Ridge or pyramidal horns - 1 GHz to 25 GHz, notch filters and appropriate amplifiers. Emissions were measured in dB $\mu$ V/m @ 3 meters. Refer to figures eight through thirteen showing the radiated emission as displayed on the spectrum analyzer. Operational band compliance plots were taken of the EUT emissions for demonstration of compliance and reference.

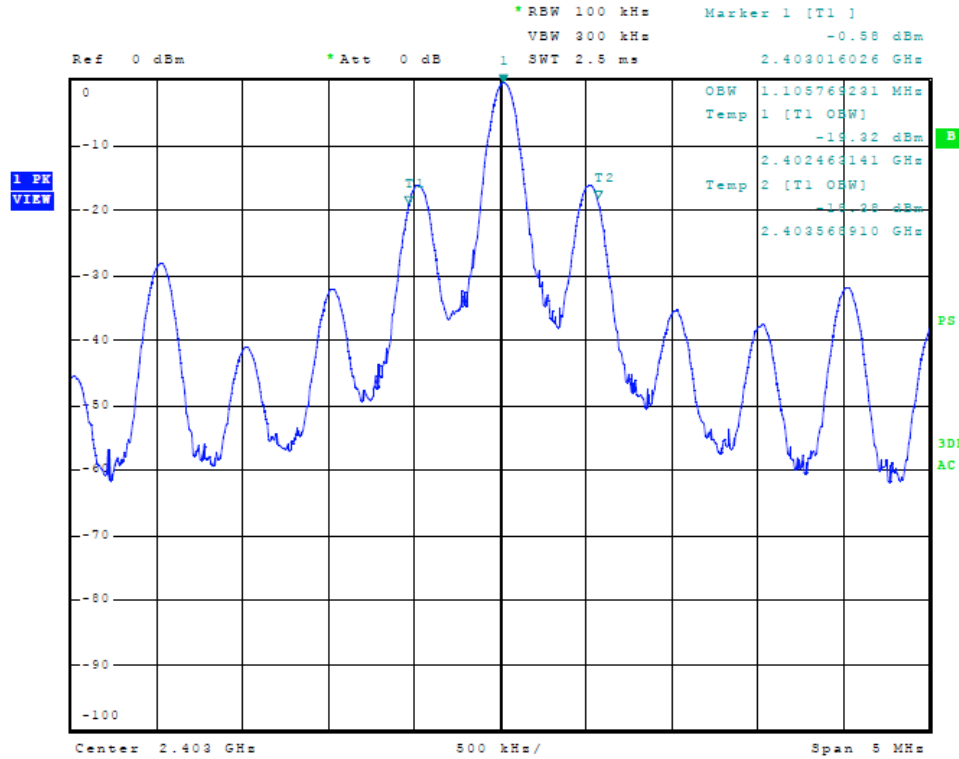


Figure Eight Plot of Occupied Bandwidth (Low channel)

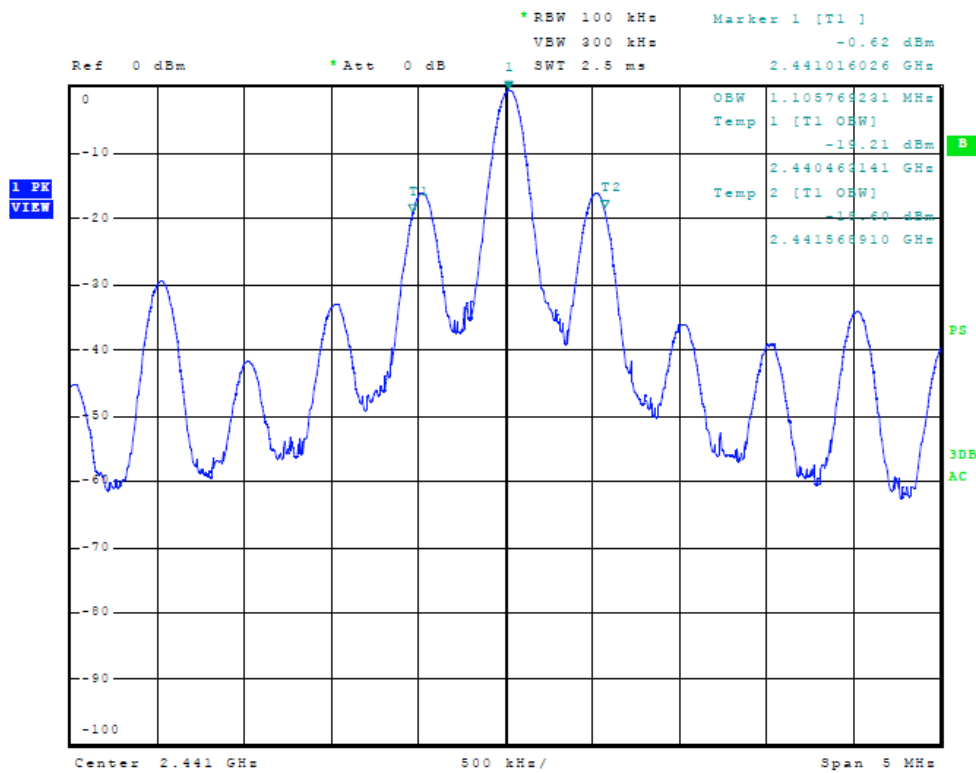


Figure Nine Plot of Occupied Bandwidth (Middle channel)

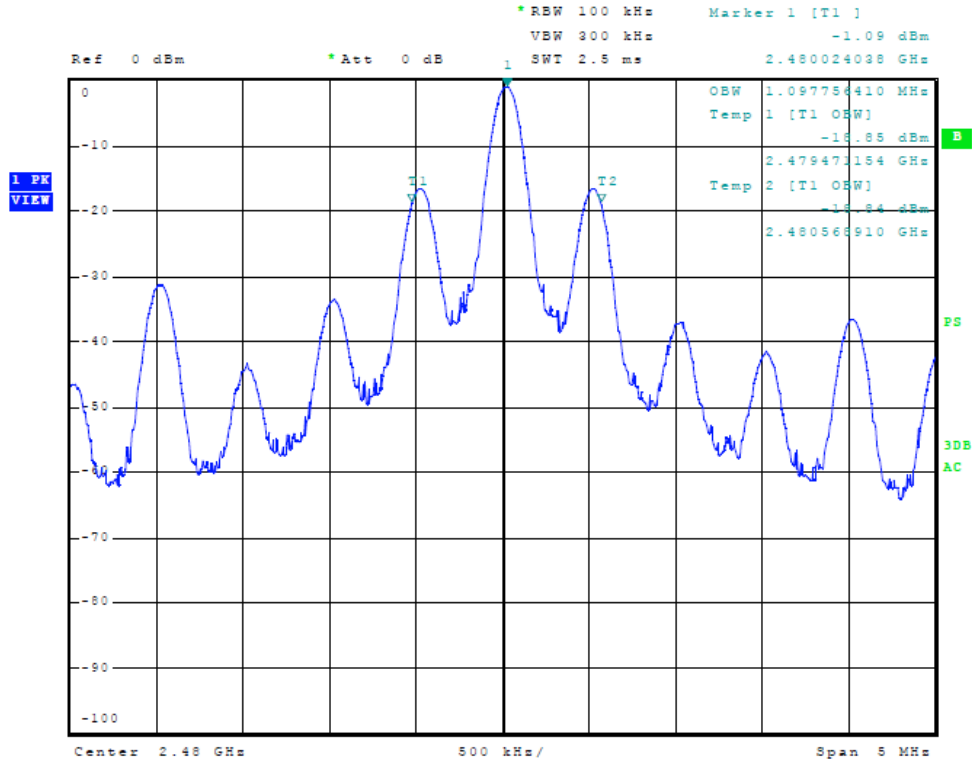


Figure Ten Plot of Occupied Bandwidth (High channel)

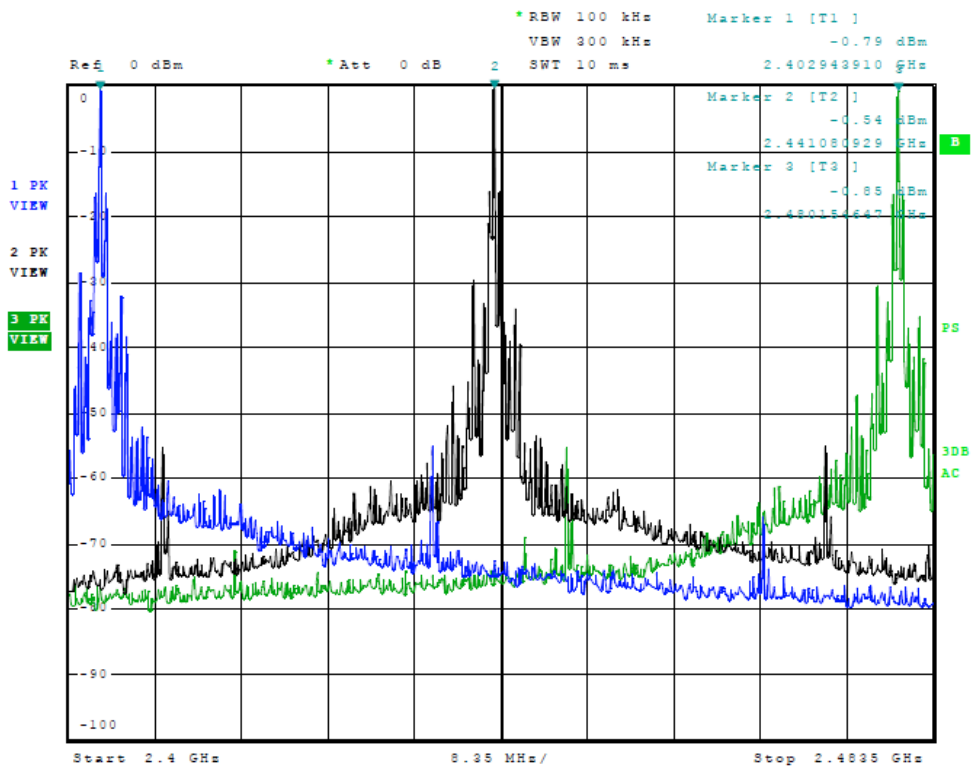
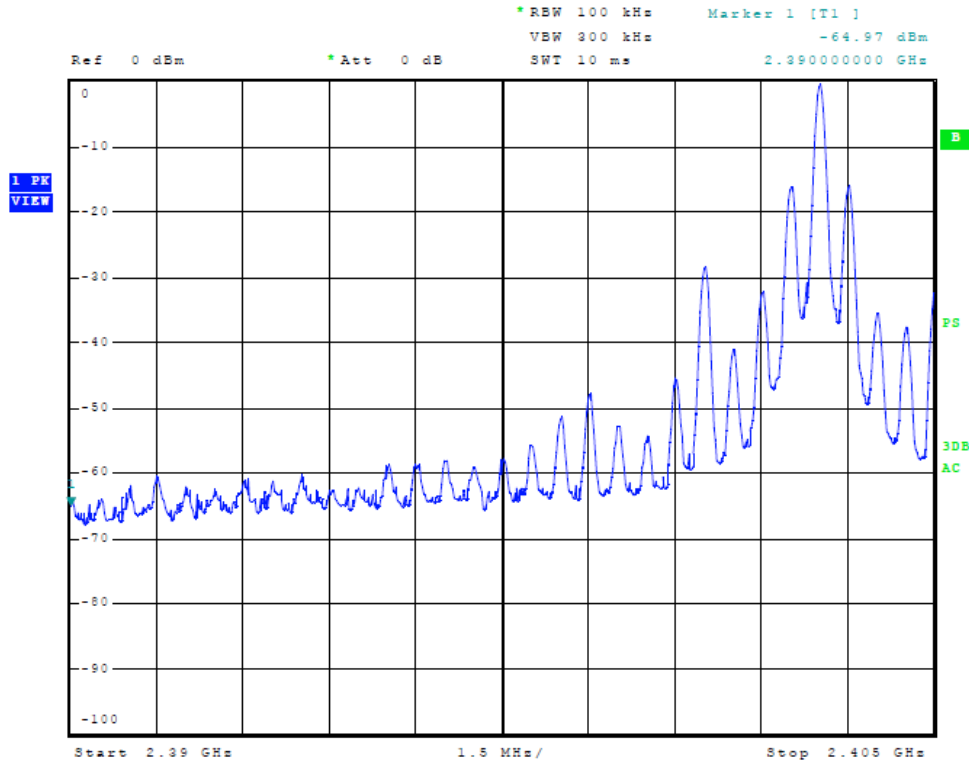
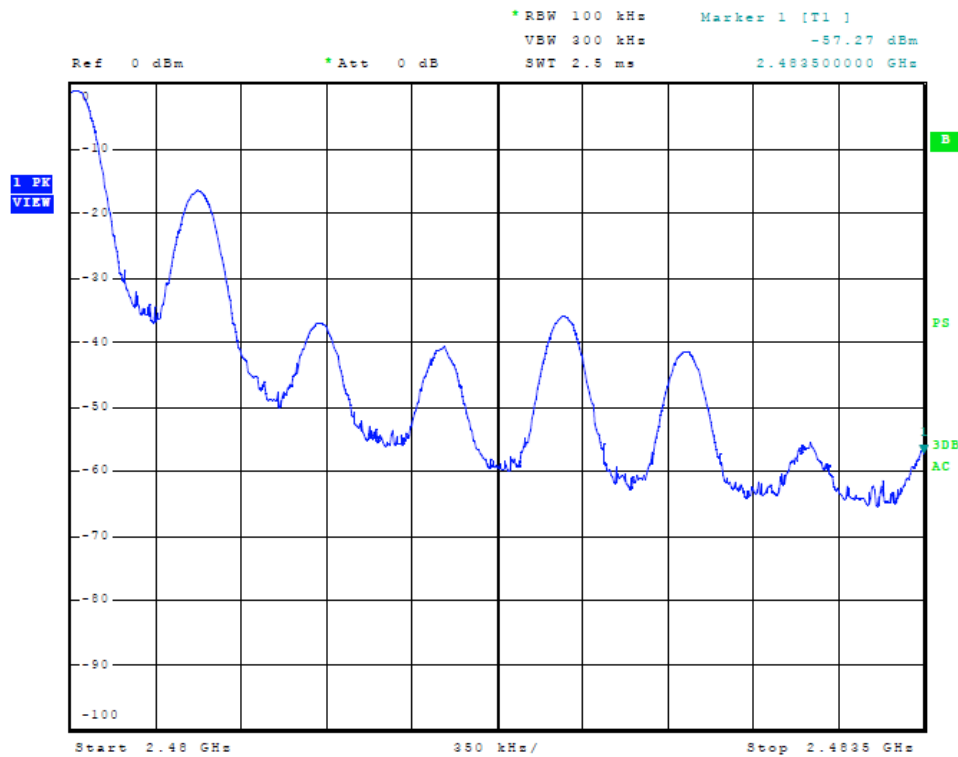


Figure Eleven Plot of Operation across frequency band



**Figure Twelve Plot of Lower Frequency Band Edge**



**Figure Thirteen Plot of Higher Frequency Band Edge**



**Transmitter Emissions Data**

**Transmitter Summary Data**

Frequency MHz	Output Power dBμV/m	Occupied Bandwidth kHz
2403.0	93.6	1,105.8
2441.0	93.8	1,105.8
2480.0	93.6	1,109.8

**Transmitter Radiated Emissions (data in dBμV/m)**

Frequency	FSM Hor Peak	FSM Hor Ave	FSM Vert Peak	FSM Vert Ave	AF	Amp Gain	RFS @ 3 m Hor Peak	RFS @ 3 m Hor Ave	RFS @ 3 m Vert Peak	RFS @ 3 m Vert Ave	Ave Limit
2403.0	87.9	87.7	88.2	88.0	30.6	25	93.5	93.3	93.8	93.6	94.0
4806.0	42.5	30.5	42.6	29.2	32.9	25	50.4	38.4	50.5	37.1	54.0
7209.0	38.3	29.5	36.5	25.5	36.0	25	49.3	40.5	47.5	36.5	54.0
9612.0	40.2	32.9	38.6	27.9	38.1	25	53.3	46.0	51.7	41.0	54.0
12015.0	34.1	21.6	34.1	21.6	40.0	25	49.1	36.6	49.1	36.6	54.0
14418.0	33.5	21.3	34.2	21.2	45.3	25	53.8	41.6	54.5	41.5	54.0
2441.0	87.9	87.6	88.2	87.9	30.9	25	93.8	93.5	94.1	93.8	94.0
4882.0	42.7	31.7	41.9	29.6	31.4	25	49.1	38.1	48.3	36.0	54.0
7323.0	35.2	24.7	35.5	23.7	36.7	25	46.9	36.4	47.2	35.4	54.0
9764.0	40.1	32.0	38.2	25.3	38.4	25	53.5	45.4	51.6	38.7	54.0
12205.0	33.8	20.7	33.6	20.8	40.0	25	48.8	35.7	48.6	35.8	54.0
14646.0	34.2	21.3	34.4	21.4	45.3	25	54.5	41.6	54.7	41.7	54.0
2480.0	87.0	86.9	87.5	87.2	31.4	25	93.4	93.3	93.9	93.6	94.0
4960.0	41.8	28.5	40.7	28.8	32.9	25	49.7	36.4	48.6	36.7	54.0
7440.0	34.7	23.0	34.0	21.1	36.7	25	46.4	34.7	45.7	32.8	54.0
9920.0	38.0	25.9	37.5	25.3	38.4	25	51.4	39.3	50.9	38.7	54.0
12400.0	33.2	20.0	32.2	19.8	40.8	25	49.0	35.8	48.0	35.6	54.0
14880.0	34.4	22.3	24.8	22.4	45.3	25	54.7	42.6	45.1	42.7	54.0

Other emissions were present with amplitudes at least 20 dB below limits.

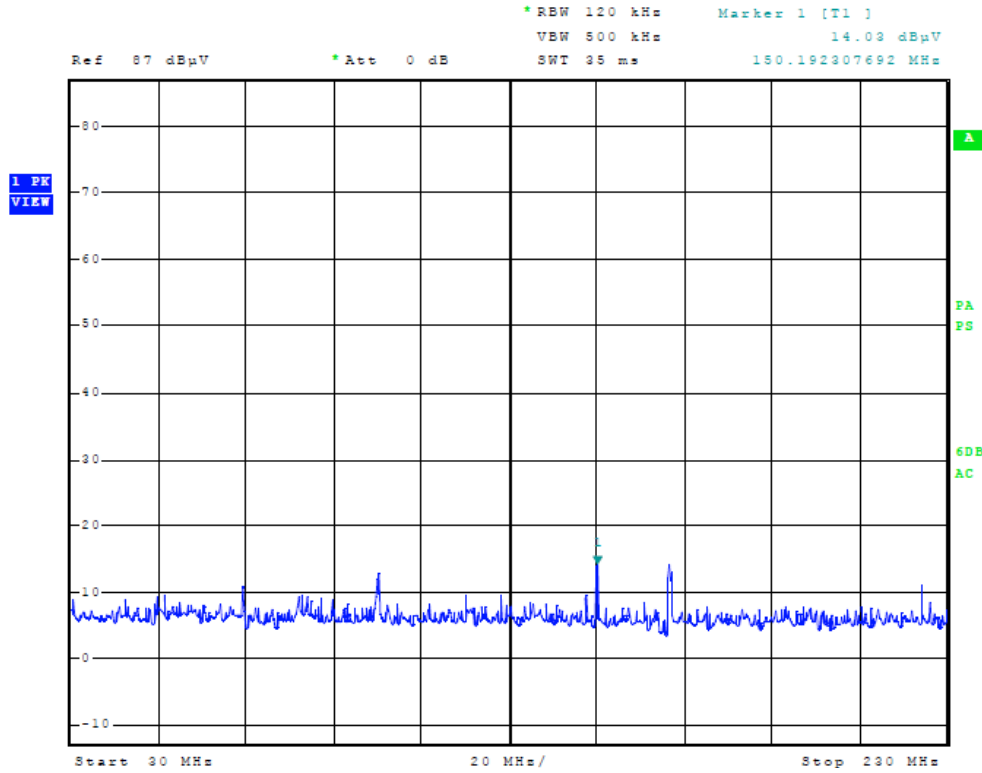
Note: Levels measured @ 3-meter OATS site.

## **Summary of Results for Transmitter Radiated Emissions**

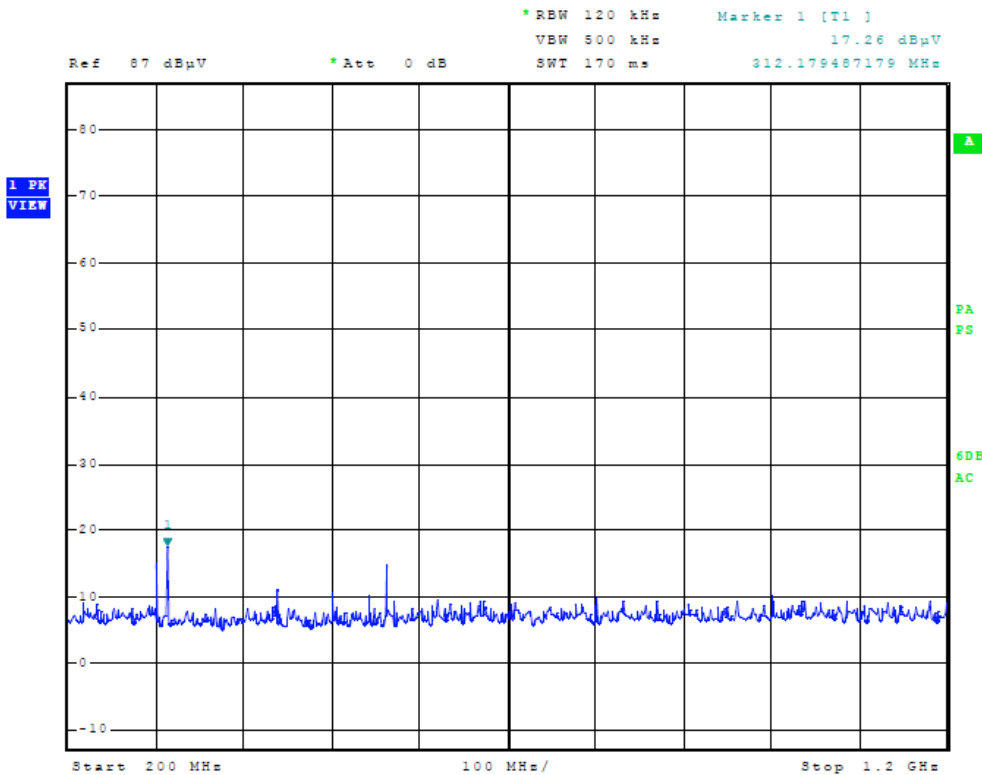
The EUT demonstrated compliance with the requirements and specifications of CFR47 Part 15.249 and RSS-210 Intentional Radiators. The EUT demonstrated highest peak emission level of the fundamental of 94.1 dB $\mu$ V/m, and average emission of 93.8 dB $\mu$ V/m with a minimum margin of -0.2 dB, as measured at 3 meters. The EUT demonstrated a minimum margin of -8.0 dB below limits for the harmonic emissions. There were no other measurable emissions greater than 20 dB below requirements than those recorded in this report. There are no deviations or exceptions to the requirements.

## **Receiver Spurious Emissions**

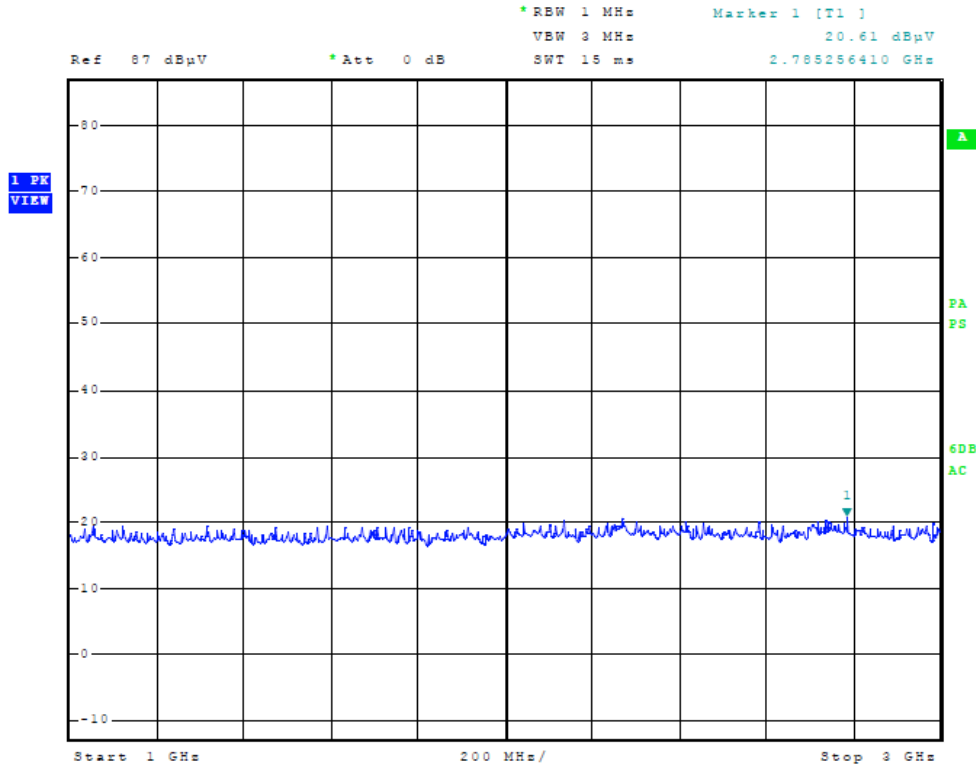
The EUT was arranged as shown in the testing configuration shown above and operated in worst-case receiver mode during testing. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Radiated emissions measurements were performed to identify the frequencies, which produced the highest emissions. Plots were made of the frequency spectrum from 30 MHz to 25,000 MHz for the preliminary testing. Refer to figures fourteen through twenty showing plots of the worst-case radiated emissions spectrum taken in the screen room. The EUT position was noted and reconfigured at the open area test site. The 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 30 MHz to 25,000 MHz was searched for radiated emissions. Measured emission levels were maximized by EUT placement on the table, changing cable location, 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. Appropriate receive test antennas used during radiated emissions testing were selected from; Biconilog - 30 to 6,000 MHz, Log Periodic - 200 MHz to 5 GHz, Double Ridge or pyramidal horns - 1 GHz to 25 GHz, notch filters and appropriate amplifiers. Data presented below demonstrates compliance with regulations.



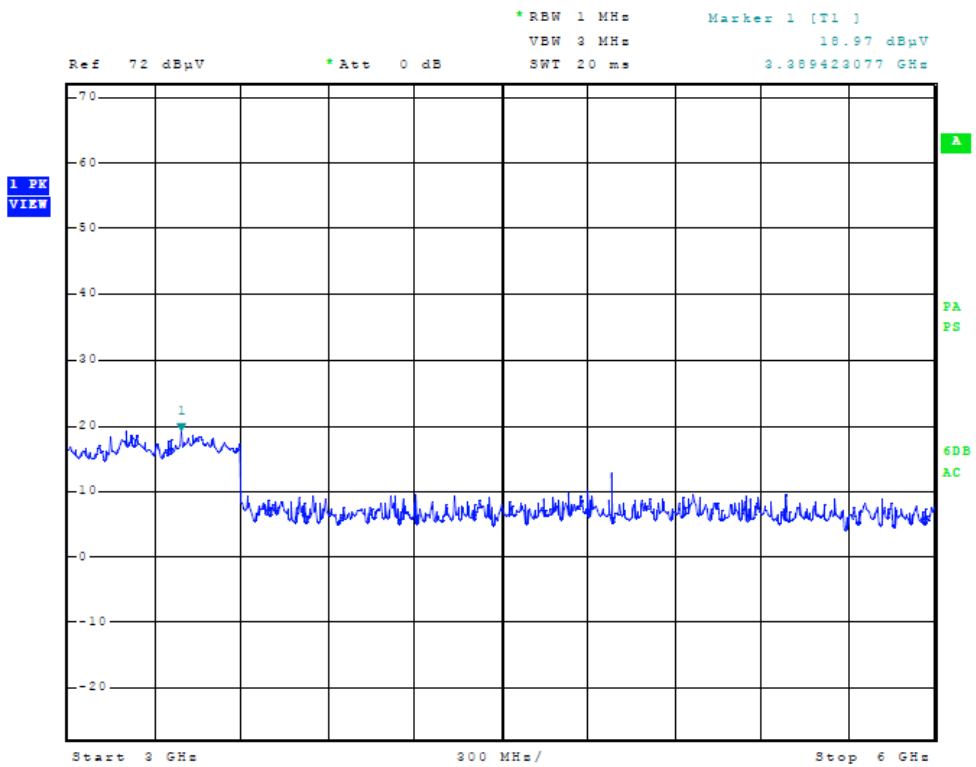
**Figure Fourteen Receiver Temporary Antenna Port Conducted Emissions**



**Figure Fifteen Receiver Temporary Antenna Port Conducted Emissions**

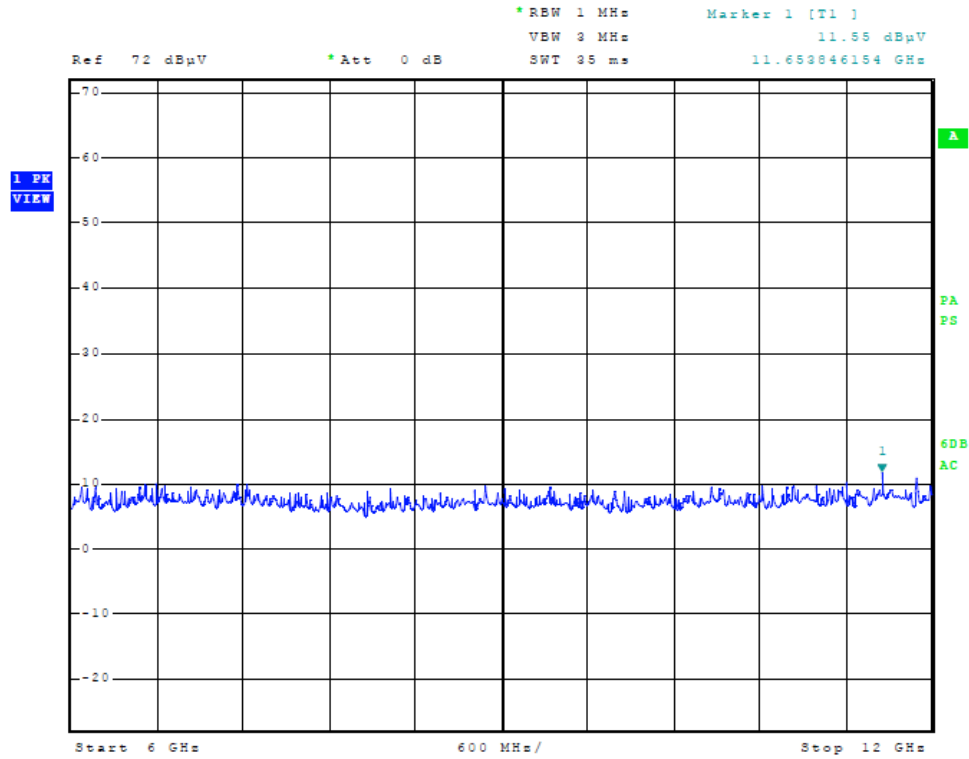


**Figure Sixteen Receiver Temporary Antenna Port Conducted Emissions**

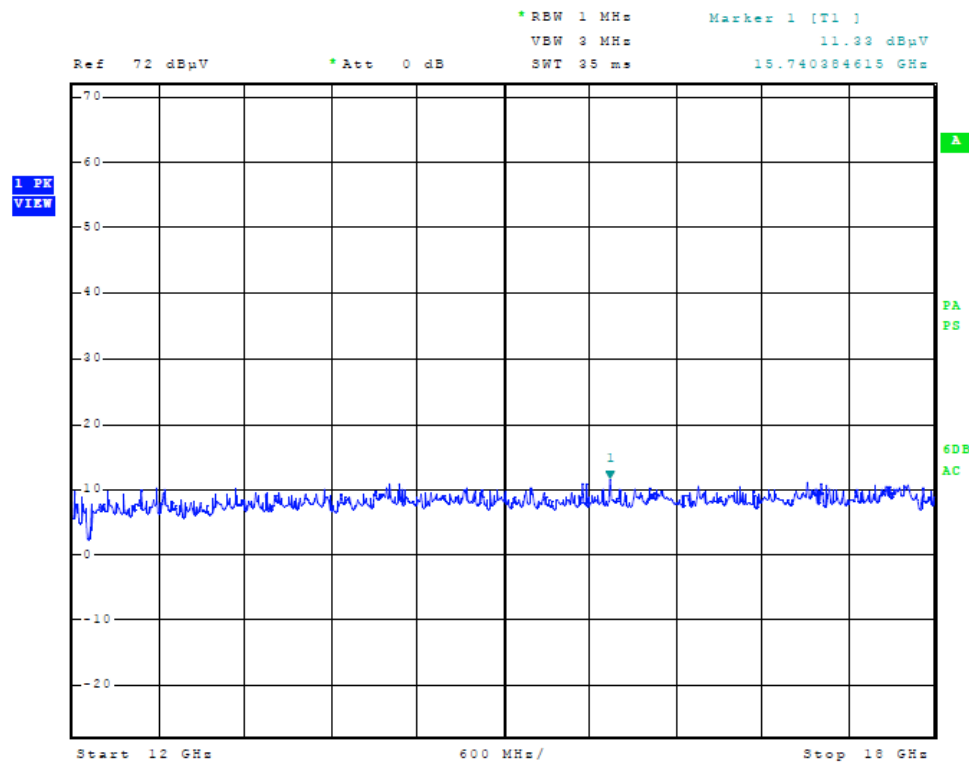


**Figure Seventeen Receiver Temporary Antenna Port Conducted Emissions**

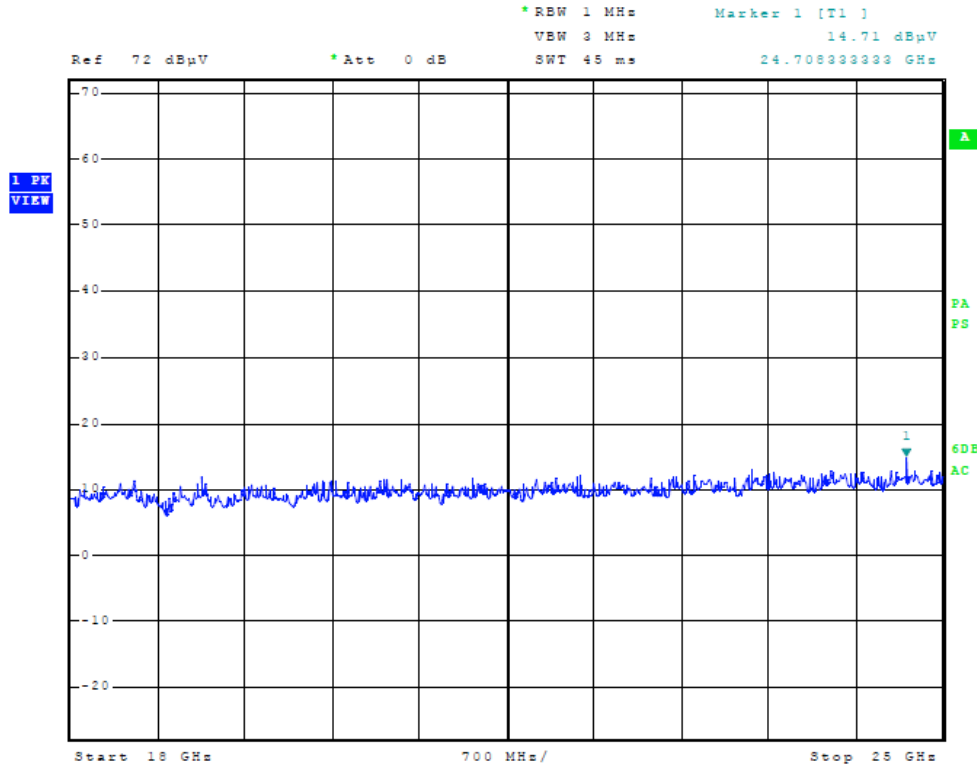




**Figure Eighteen Receiver Temporary Antenna Port Conducted Emissions**



**Figure Nineteen Receiver Temporary Antenna Port Conducted Emissions**



**Figure Twenty Receiver Temporary Antenna Port Conducted Emissions Receiver Radiated Emissions Data**

Emission Freq. (MHz)	FSM Horz. (dBμV/m)	FSM Vert. (dBμV/m)	Ant. Factor (dB)	Amp. Gain (dB)	RFS Horz. @ 3m (dBμV/m)	RFS Vert. @ 3m (dBμV/m)	Limit @ 3m (dBμV/m)
150.0	41.8	35.6	13.0	30	24.8	18.6	43.5
300.0	34.6	34.3	14.0	30	18.6	18.3	46.0
312.5	39.1	28.7	14.3	30	23.4	13.0	46.0
4804.0	28.3	28.9	32.9	25	36.2	36.8	54.0
4880.0	27.7	28.6	31.4	25	34.1	35.0	54.0
4958.0	30.2	36.0	32.9	25	38.1	43.9	54.0

Other emissions were present with amplitudes at least 20 dB below limits.

**Summary of Results for Receiver Emissions**

The EUT demonstrated compliance with the radiated emissions requirements of CFR 47 Part 15B and RSS-GEN with a minimum -10.1 dB margin below requirements. Other emissions were present with amplitudes at least 20 dB below the CFR 47 and RSS-GEN limits.



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## **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		

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

$$U_c(y) = \pm 1.6 \text{ dB}$$

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:

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

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

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 ( $\pm 4$  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	$\pm 1.5$
LISN coupling specification	rectangular	$\pm 1.5$
Cable and input attenuator calibration	normal (k=2)	$\pm 0.5$

Combined standard uncertainty  $u_c(y)$  is

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

$$U_c(y) = \pm 1.2 \text{ dB}$$

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:

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



**Annex B Rogers Labs Test Equipment List**

List of Test Equipment

Calibration Date

Spectrum Analyzer: Rohde & Schwarz ESU40	5/11
Spectrum Analyzer: HP 8562A, HP Adapters: 11518, 11519, and 11520	5/11
Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	
Spectrum Analyzer: HP 8591EM	5/11
Antenna: EMCO Biconilog Model: 3143	5/11
Antenna: Sunol Biconilog Model: JB6	10/10
Antenna: EMCO Log Periodic Model: 3147	10/10
Antenna: Antenna Research Biconical Model: BCD 235	10/10
LISN: Compliance Design Model: FCC-LISN-2.Mod.cd, 50 µHy/50 ohm/0.1 µf	10/10
R.F. Preamp CPPA-102	10/10
Attenuator: HP Model: HP11509A	10/10
Attenuator: Mini Circuits Model: CAT-3	10/10
Attenuator: Mini Circuits Model: CAT-3	10/10
Cable: Belden RG-58 (L1)	10/10
Cable: Belden RG-58 (L2)	10/10
Cable: Belden 8268 (L3)	10/10
Cable: Time Microwave: 4M-750HF290-750	10/10
Cable: Time Microwave: 10M-750HF290-750	10/10
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. 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](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Farrish  
Industry Analyst

Rogers Labs, Inc.  
4405 West 259<sup>th</sup> Terrace  
Louisburg, KS 66053  
Phone/Fax: (913) 837-3214  
Revision 1

Dynastream Innovations, Inc.  
Models: C782M4IB and C782M5IB  
Test #: 110815B  
Test to: CFR47 Parts 2, 15.249, RSS-210  
File: Dynastream 1823 TstRpt110815B

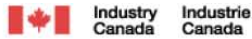
FCC ID: O6R1823  
IC: 3797A-1823  
SN: 8990000000012  
Date: September 12, 2011  
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NVLAP Lab Code 200087-0

## Annex E Industry Canada Test Site Registration Letter



May 26, 2010

OUR FILE: 46405-3041  
Submission No: 140719

**Rogers Labs Inc.**  
4405 West 259<sup>th</sup> 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](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](mailto:certification.bureau@ic.gc.ca) Please reference our file and submission number above for all correspondence.

Yours sincerely,

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](mailto:dalwinder.gill@ic.gc.ca)  
Tel. No. (613) 998-8363  
Fax. No. (613) 990-4752

Rogers Labs, Inc.  
4405 West 259<sup>th</sup> Terrace  
Louisburg, KS 66053  
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File: Dynastream 1823 TstRpt110815B

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IC: 3797A-1823  
SN: 8990000000012  
Date: September 12, 2011  
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