NVLAP Lab Code 200087-0

APPLICATION SUBMITTAL REPORT

FOR
FCC And INDUSTRY CANADA
GRANT OF CERTIFICATION

FOR

Model: 05726
915 MHz Transmitter Module

FCC ID: FIH05726
IC: 1584A-05726

FOR

TRANSCORE - AMTECH TECHNOLOGY CENTER

8600 Jefferson Street, NE
Albuquerque, NM 87113

Test Report Number: 101123

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

Per

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

For

TRANSCORE - AMTECH TECHNOLOGY CENTER
8600 Jefferson Street, NE
Albuquerque, NM 87113

Larry Barnsdale
Senior Quality Engineer III

Model: 05726

915 MHz Transmitter Module
FCC ID#: FIH05726, IC: 1584A-05726

Test Date: November 23, 2010

Certifying Engineer: Scot D Rogers

Scot D. Rogers
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4405 West 259th Terrace
Louisburg, KS 66053
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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 Spectrum Management and Telecommunications Radio Standards Specification RSS-210.

Name of Applicant:

Transcore - Amtech Technology Center
8600 Jefferson Street, NE
Albuquerque, NM 87113

Model: 05726

FCC I.D.: FIH05726 IC: 1584A-05726

Frequency Range: 915 MHz.
Operating Power: Peak emission of 110.9 dBµV/m and average emission of 51.9 dBµV/m (3 meter radiated measurement), 6-dB Occupied Bandwidth 105.77 kHz, Receiver worst-case emission 38.9 dBµV/m

Opinion / Interpretation of Results

Test Performed	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	-19.7	Complies
AC Line Conducted Emissions as per CFR 47 15.207	-5.9	Complies
Radiated Emissions as per CFR 47 15.209 and RSS-210 A2.2	-7.1	Complies
Radiated Emissions per CFR 47 15.249 and RSS-210 A2.9	-42.1	Complies
Receivers emissions per CFR 47 15.111 and RSS-210 and RSS-GEN	-7.1	Complies

Environmental Conditions

Ambient Temperature 22.2° C

Relative Humidity 26%

Atmospheric Pressure 1023.9 mb

Application for Certification

(1) Manufacturer: Transcore - Amtech Technology Center
8600 Jefferson Street, NE
Albuquerque, NM 87113

(2) Identification: Model: 05726
FCC I.D.: FIH05726
IC: 1584A-05726

(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

In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2009, 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 Paragraphs15.212, 15.249, and Industry Canada Spectrum Management and Telecommunications Radio Standards Specification RSS-210 the following information is submitted. Test procedures used during evaluation include the established Methods of Measurement of Radio-Noise Emissions as described in the ANSI 63.4-2009, RSS-210, and FCC documents DA00-1407 and DA00-705.

Equipment Tested

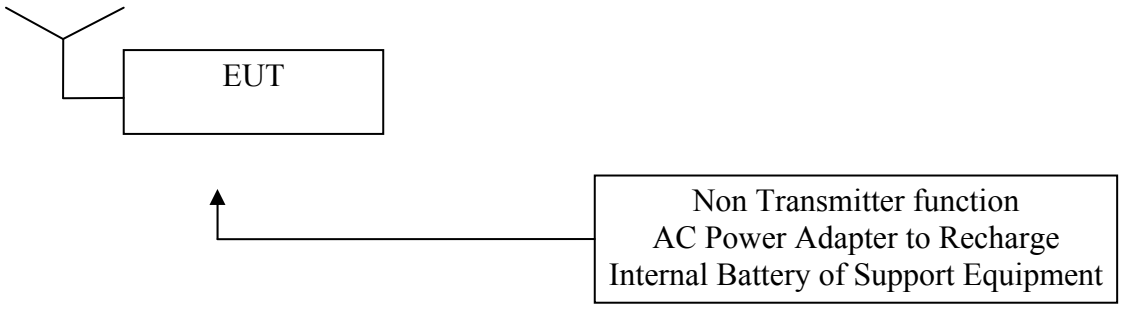
Equipment	Model	FCC I.D.	IC
EUT	05726	FIH05726	1584A-05726

Equipment Function

The EUT is a low power transceiver module operating at 915 MHz. The equipment offers user ability to remotely read RFID tag information to the portable handheld support system. The 05726 is received as a module and incorporated into OEM system design. The unit is marketed for use to incorporate a wireless link to retrieve RFID information. The EUT transmits a defined modulated radio signal and interprets backscatter signal from RFID tag. For testing purposes the 05726 was connected to the support digital equipment supplying power to EUT and communicating to the support system allowing for operational control of the transmitter and communications. The 05726 receives power form the support system circuitry and offers no provision to connect directly to utility AC power systems. The module is a complete transceiver offering connection points for power and data only. Other requirements for modular certification are addressed in cover letter exhibit submitted with this filing. No other interfacing options are provided on the modular design. For testing purposes the 05726 and support equipment were powered from the internal battery power of the support equipment and set to transmit through all data modes available. AC line conducted and radiated emission testing and data were also performed and recorded with the system in the battery charge mode. The device is marketed as a modular solution for incorporation into OEM designed systems and used with approved antennas

only. The design complies with the unique antenna connection requirements.

Equipment Configuration



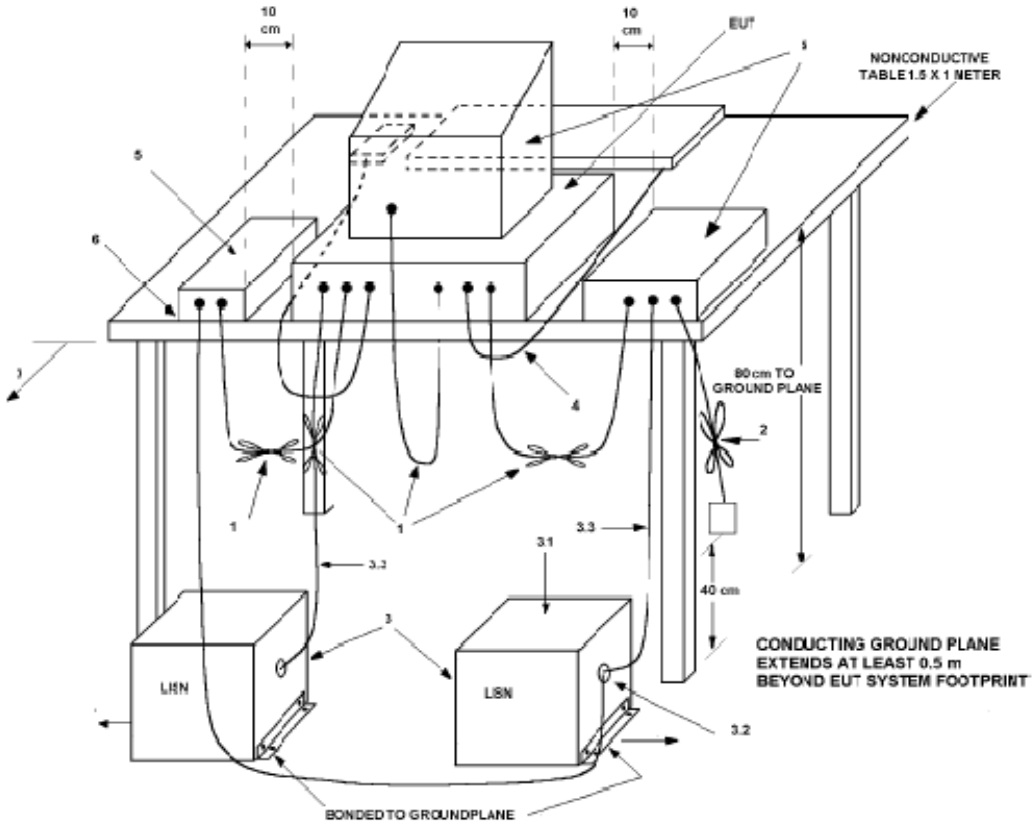
Units of Measurements and Test Procedures

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.

AC Line Conducted Emission Test Procedure

Testing for the AC line-conducted emissions testing was performed as defined in sections 7 and 13.1.3 of ANSI C63.4-2009. The test setup including the EUT was arranged in a typical equipment configuration and 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 µHy choke. EMI was coupled to the spectrum analyzer through a 0.1 µF 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.

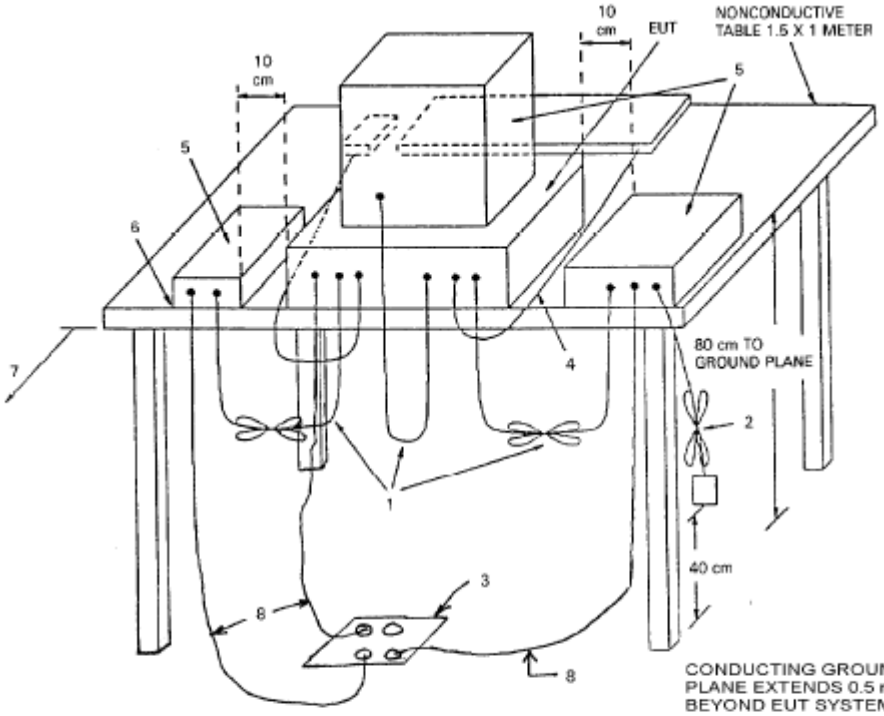


1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long (see 6.2.4, also 11.5.4).
2. Input/output (I/O) cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m (see 6.2.4).
3. EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated into 50 Ω loads. LISN can be placed on top of, or immediately beneath, reference ground plane (see 5.2.3 and 7.3.1).
   3.1 All other equipment powered from additional LISN(s).
   3.2 Multiple outlet strips can be used for multiple power cords of non-EUT equipment.
   3.3 LISN at least 80 cm from nearest part of EUT chassis.
4. Cables of hand-operated devices, such as keyboards, mice, and so on, shall be placed as for normal use (see 6.3.1.3 and 11.5.4).
5. Non-EUT components of EUT system being tested (see also Figure 6).
6. Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop (see 6.3.1.1 and 6.3.1.2).
7. Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane (see 5.2.2 for options).

Figure One Test Arrangement for AC Line Conducted Emissions (Table Top Equipment)

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.



1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center, forming a bundle 30 cm to 40 cm long (see 6.2.4 and 11.5.4).
2. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated if required using the correct terminating impedance. The total length shall not exceed 1 m (see 6.2.4).
3. If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground plane with the receptacle flush with the ground plane (see 6.2.4).
4. Cables of hand-operated devices, such as keyboards, mice, and so on, shall be placed as for normal use (see 6.3.1.3 and 11.5.4).
5. Non-EUT components of EUT system being tested (see also Figure 6).
6. Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop (see 6.3.1.1 and 6.3.1.2).
7. No vertical conducting plane used (see 5.2.2).
8. Power cords drape to the floor and are routed over to receptacle (see 6.2.4).

Figure Two Test Arrangement for Radiated Emissions

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)

AC Line Conducted EMI

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, floor of a screen room. The bench was positioned 40 cm away from the wall of the screen room. The LISN was positioned on the floor of the screen room 80-cm from the rear of the EUT. The manufacturer supplied AC power cord was connected to the LISN. A second LISN was positioned on the floor of the screen room 80-cm from the rear of the supporting equipment of the EUT. All power cords except the EUT were then powered from the second LISN. EMI was coupled to the spectrum analyzer through a 0.1 μF capacitor, internal to the LISN. Power line conducted emissions testing were carried out individually for each current carrying conductor of the EUT. The excess length of lead between the system and the LISN receptacle was folded back and forth to form a bundle not exceeding 40 cm in length. The screen room, conducting ground plane, analyzer, and LISN were bonded together to the protective earth ground. Preliminary testing was performed to identify the frequency of each radio frequency emission displaying the highest amplitude. The cables were repositioned to obtain maximum amplitude of measured EMI level. Once the worst-case configuration was identified, plots were made of the EMI from 0.15 MHz to 30 MHz then the data was recorded with maximum conducted emissions levels. Refer to figures three and four displaying plots of the AC Line conducted emissions.

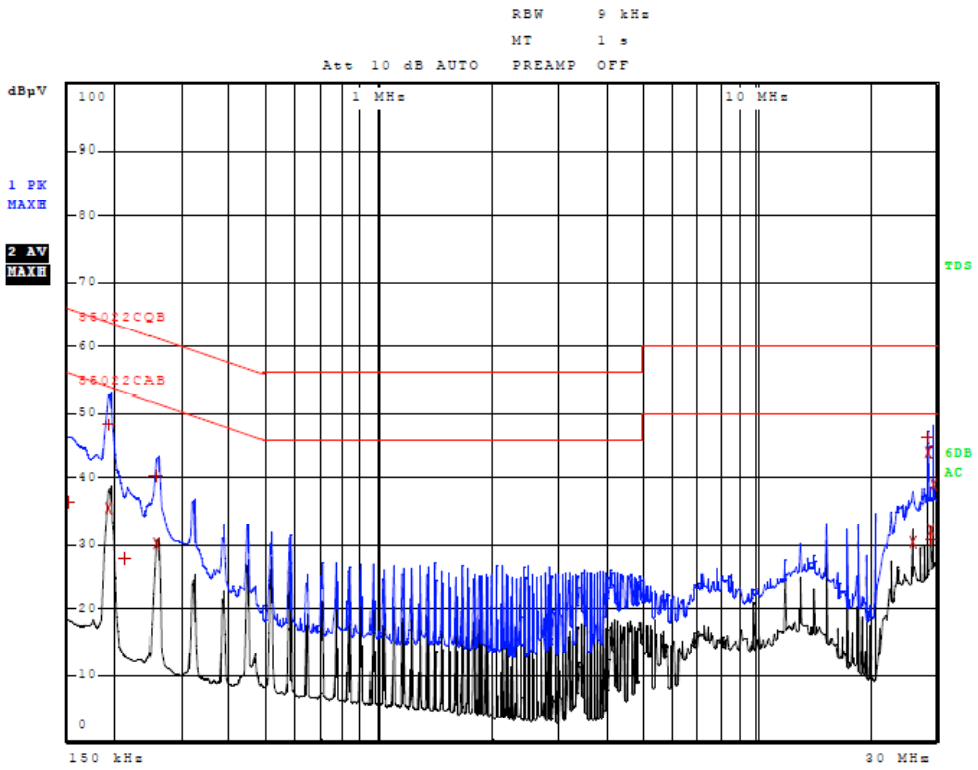


Figure Three AC Line Conducted Emissions Line 1

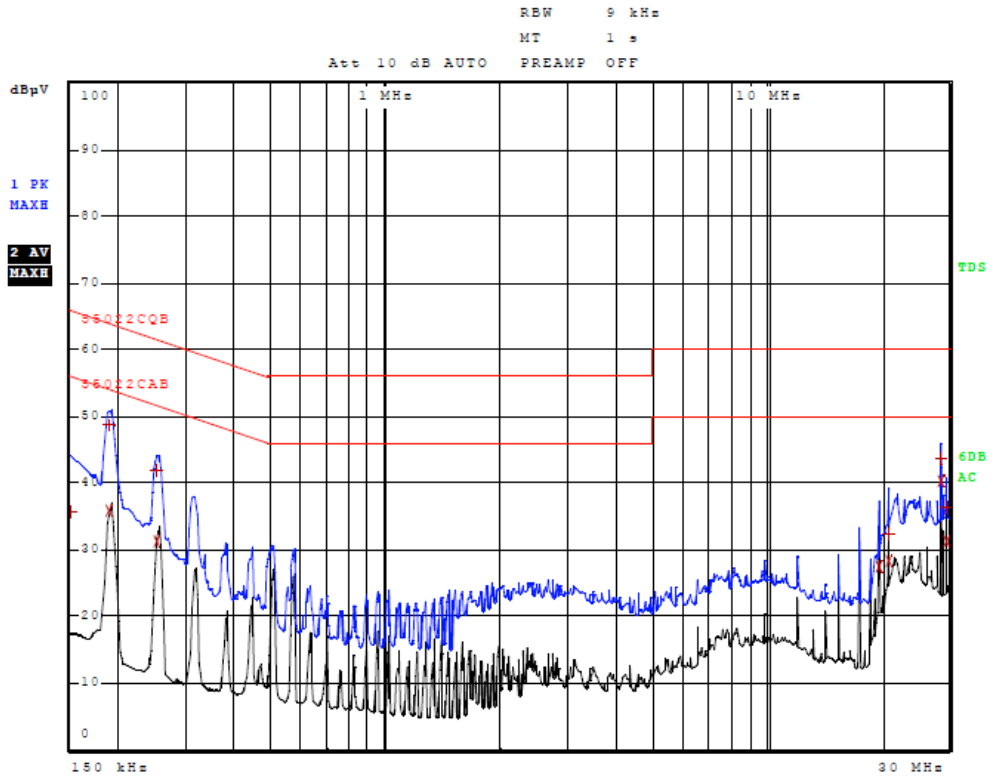


Figure Four AC Line Conducted Emissions Line 2

AC Line Conducted Emissions Data

Line L1

Trace	Frequency	Level (dBµV)	Detector	Delta Limit/dB
1	150.000000000 kHz	36.23	Quasi Peak	-29.77
1	194.000000000 kHz	48.12	Quasi Peak	-15.74
2	194.000000000 kHz	35.32	Average	-18.54
1	214.000000000 kHz	27.85	Quasi Peak	-35.20
1	258.000000000 kHz	40.23	Quasi Peak	-21.27
2	258.000000000 kHz	30.19	Average	-21.31
2	26.216000000 MHz	30.27	Average	-19.73
2	28.400000000 MHz	44.07	Average	-5.93
1	28.400000000 MHz	46.29	Quasi Peak	-13.71
2	28.948000000 MHz	32.24	Average	-17.76
1	29.000000000 MHz	30.68	Quasi Peak	-29.32
2	29.496000000 MHz	39.05	Average	-10.95

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

Line L2

Trace	Frequency	Level (dBµV)	Detector	Delta Limit/dB
1	150.000000000 kHz	35.67	Quasi Peak	-30.33
2	190.000000000 kHz	35.77	Average	-18.26
1	190.000000000 kHz	48.67	Quasi Peak	-15.36
1	254.000000000 kHz	41.86	Quasi Peak	-19.76
2	254.000000000 kHz	31.29	Average	-20.34
2	19.664000000 MHz	27.32	Average	-22.68
2	20.756000000 MHz	28.20	Average	-21.80
1	20.756000000 MHz	32.16	Quasi Peak	-27.84
2	28.400000000 MHz	40.16	Average	-9.84
1	28.404000000 MHz	43.64	Quasi Peak	-16.36
2	29.492000000 MHz	31.21	Average	-18.79
1	29.496000000 MHz	36.27	Quasi Peak	-23.73

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

Summary of Results for AC Line Conducted Emissions

The EUT demonstrated compliance with requirements of CFR47 and RSS-210. The EUT demonstrated a minimum margin of 5.9 dB below the limit. Emissions measurements were taken using the peak, quasi peak, and average measurement functions as required. Emission amplitude levels were below the limits stated in the specification. Other emissions were present with recorded data representing worst-case amplitudes.

Radiated EMI

The EUT was arranged in a typical equipment configuration to charge internal battery of support equipment and operated in typical battery charge mode. 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 12,000 MHz for the preliminary testing. Refer to figures five through nine 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 12,000 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 during testing include Broadband Biconical from 30 to 200 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.

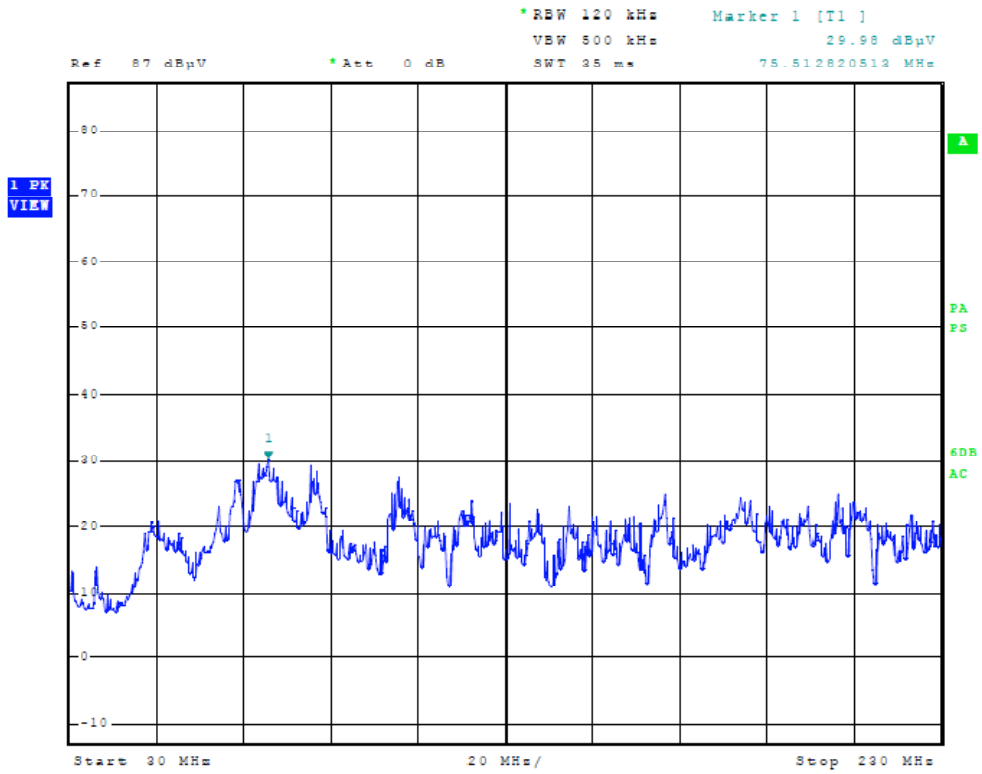


Figure Five Plot of General Radiated Emissions

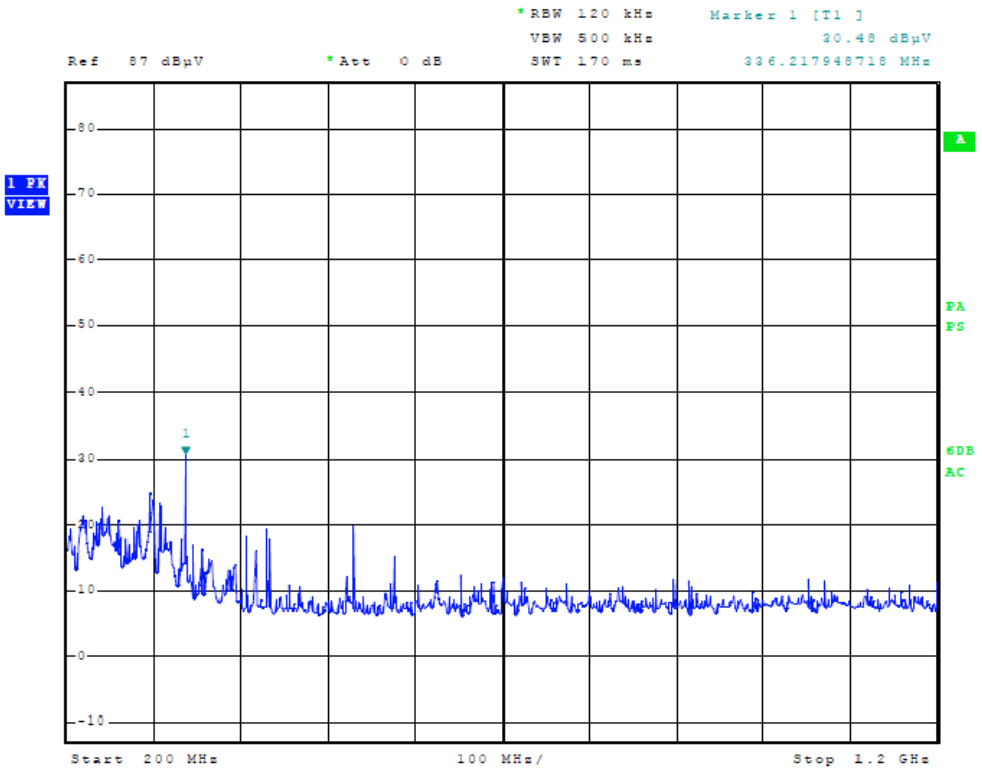


Figure Six Plot of General Radiated Emissions

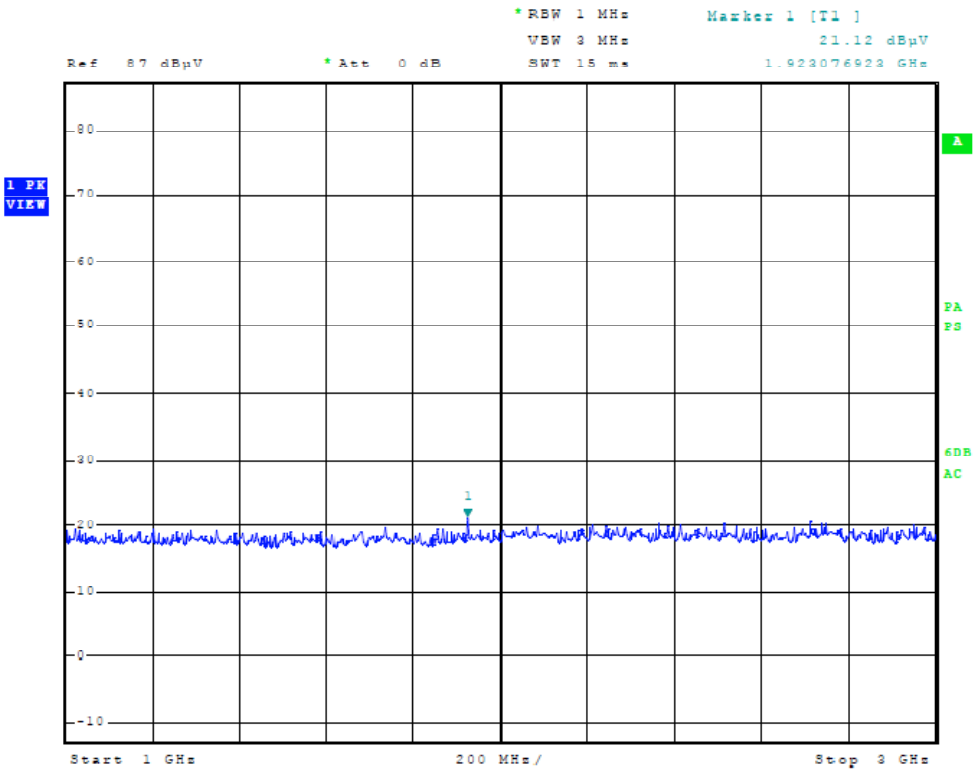


Figure Seven Plot of General Radiated Emissions

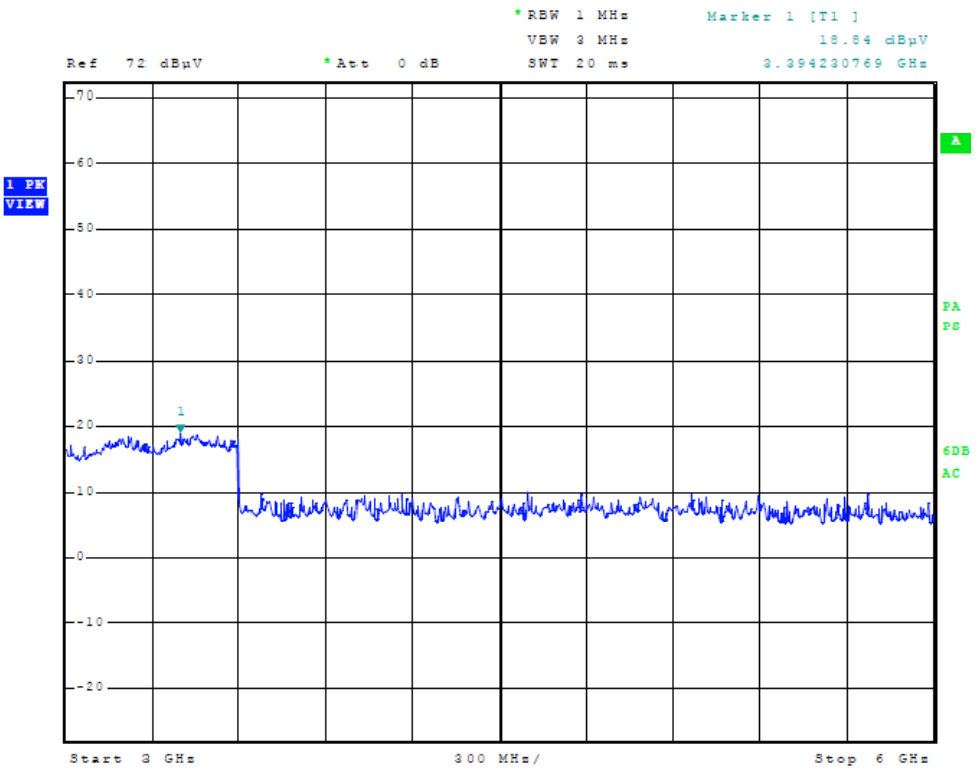


Figure Eight Plot of General Radiated Emissions

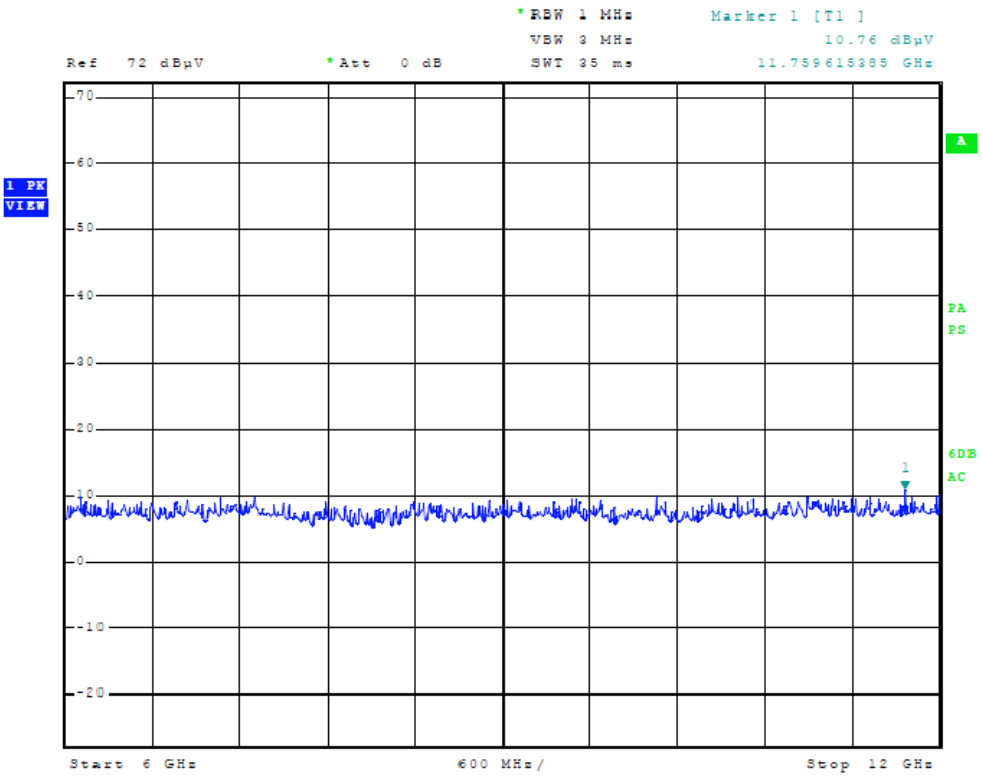


Figure Nine Plot of General Radiated Emissions

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)
73.5	41.1	41.8	8.0	30	19.1	19.8	40.0
74.3	40.4	42.3	8.0	30	18.4	20.3	40.0
75.3	42.4	43.2	8.0	30	20.4	21.2	40.0
84.1	39.6	44.9	7.9	30	17.5	22.8	40.0
85.2	38.9	42.3	7.9	30	16.8	20.2	40.0
86.3	38.7	43.6	7.9	30	16.6	21.5	40.0
104.9	40.3	41.4	11.6	30	21.9	23.0	43.5
158.5	39.9	31.1	12.9	30	22.8	14.0	43.5
240.0	44.0	42.6	12.1	30	26.1	24.7	46.0
294.0	42.8	32.0	13.9	30	26.7	15.9	46.0
299.1	42.6	32.0	14.0	30	26.6	16.0	46.0
305.1	42.3	32.9	14.1	30	26.4	17.0	46.0
336.0	54.2	50.3	14.7	30	38.9	35.0	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 15C and Industry Canada RSS-210 requirements. The EUT demonstrated a 7.1 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 unique antenna requirements of 15.203 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:

Nomenclature:
RFS – Corrected measurement of Radiated Field Strength for comparison to limits
FSM – Measured Field Strength recorded from test equipment during testing

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

Radiated Emissions Data in Restricted Bands

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)
73.5	41.1	41.8	8.0	30	19.1	19.8	40
74.3	40.4	42.3	8.0	30	18.4	20.3	40
240.0	44.0	42.6	12.1	30	26.1	24.7	46
2745.00	22.5	20.8	32.1	25	29.6	27.9	54
2660.00	17.2	16.6	35.2	25	27.4	26.8	54
4575.00	16.3	15.8	37.6	25	28.9	28.4	54

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 19.7 dB below requirements. Both average and peak amplitudes of frequencies above 1000 MHz were measured for demonstration of compliance with the regulations. No other significant 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 below 1000 MHz including carrier frequency were measured using a spectrum analyzer. The peak and average amplitude of emissions above 1000 MHz including spurious emissions were measured using a spectrum analyzer data recorded from the analyzer measurement result. 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 (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 supporting the EUT. Antennas used during measurement of emissions include; 30 to 6000 MHz Biconilog, Double Ridged Horn and Pyramidal Horn Antennas from 2 GHz to 25 GHz with appropriate amplification stages and cabling. 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 915 MHz frequency of operation. Plots were made of transmitter performance in a screen room for reference purposes. Refer to figures ten through sixteen showing plots taken of the EUT performance displaying compliance with the specifications.

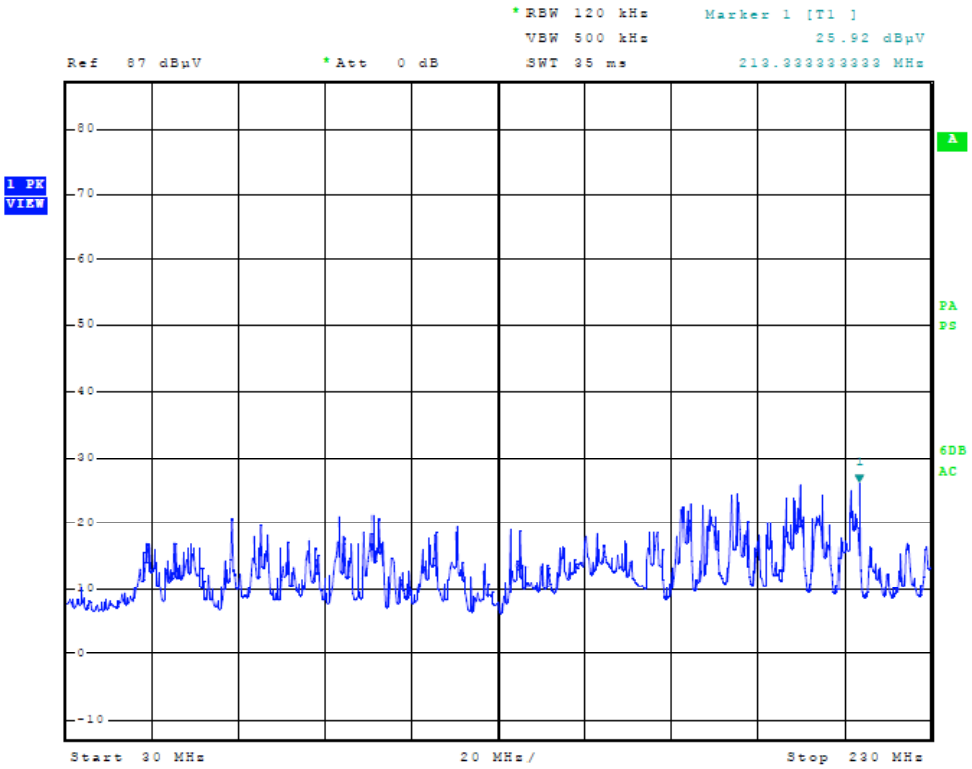


Figure Ten Plot of Radiated Emissions (Transmitter Operation)

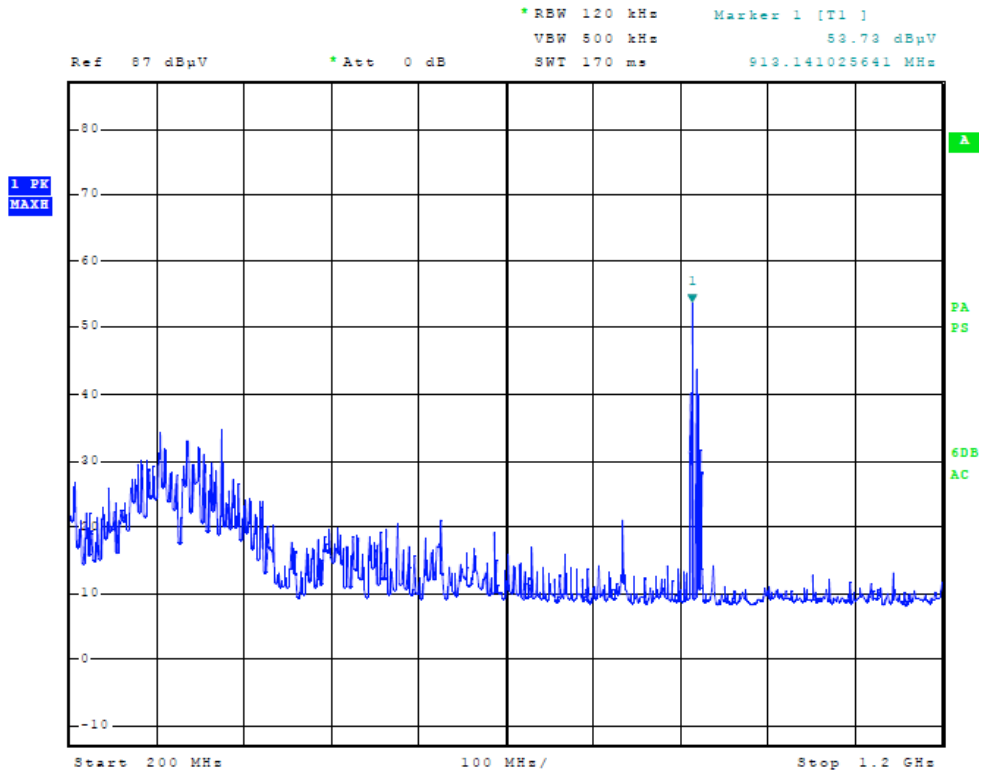


Figure Eleven Plot of Radiated Emissions (Transmitter Operation)

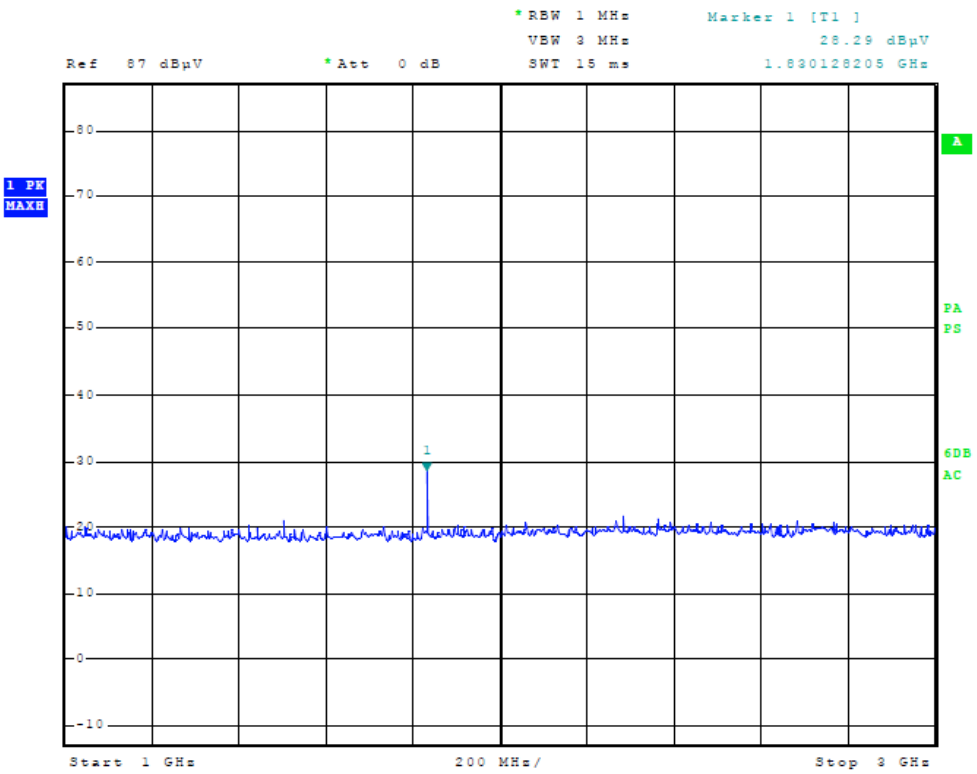


Figure Twelve Plot of Radiated Emissions (Transmitter Operation)

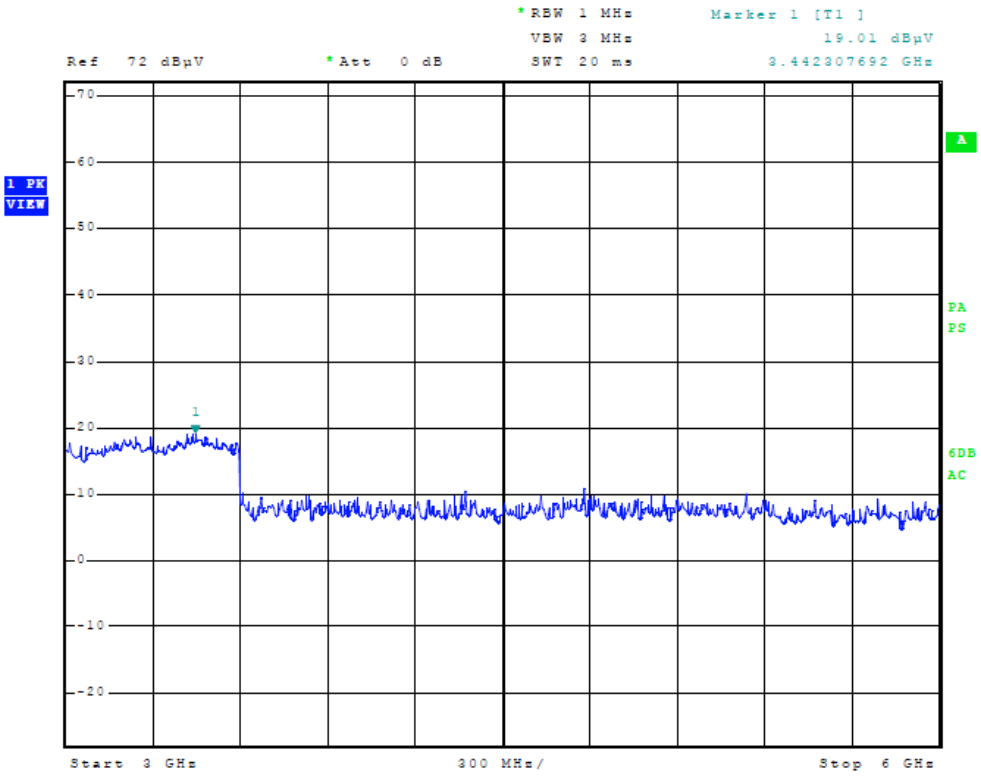


Figure Thirteen Plot of Radiated Emissions (Transmitter Operation)

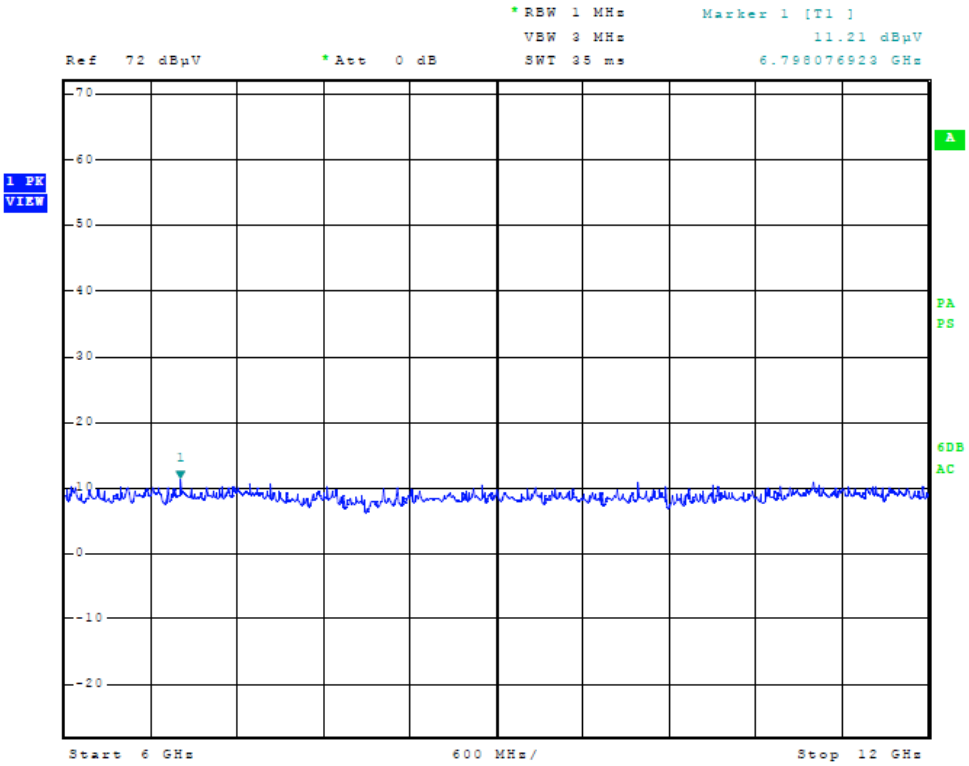


Figure Fourteen Plot of Radiated Emissions (Transmitter Operation)

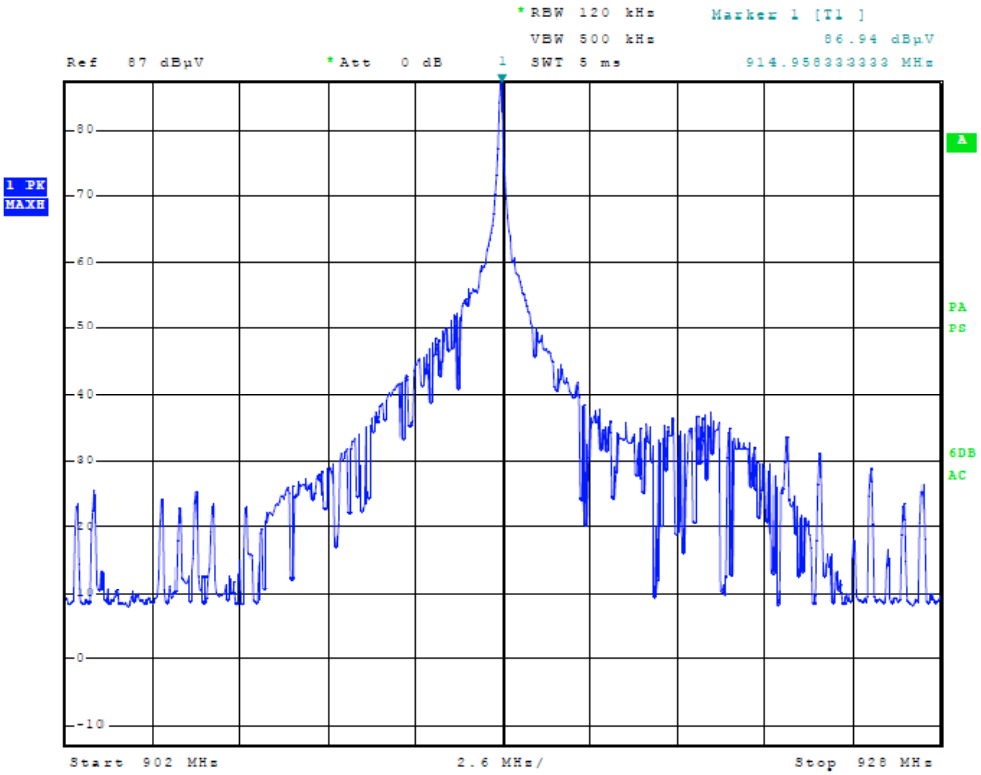


Figure Fifteen Operation across Frequency Band

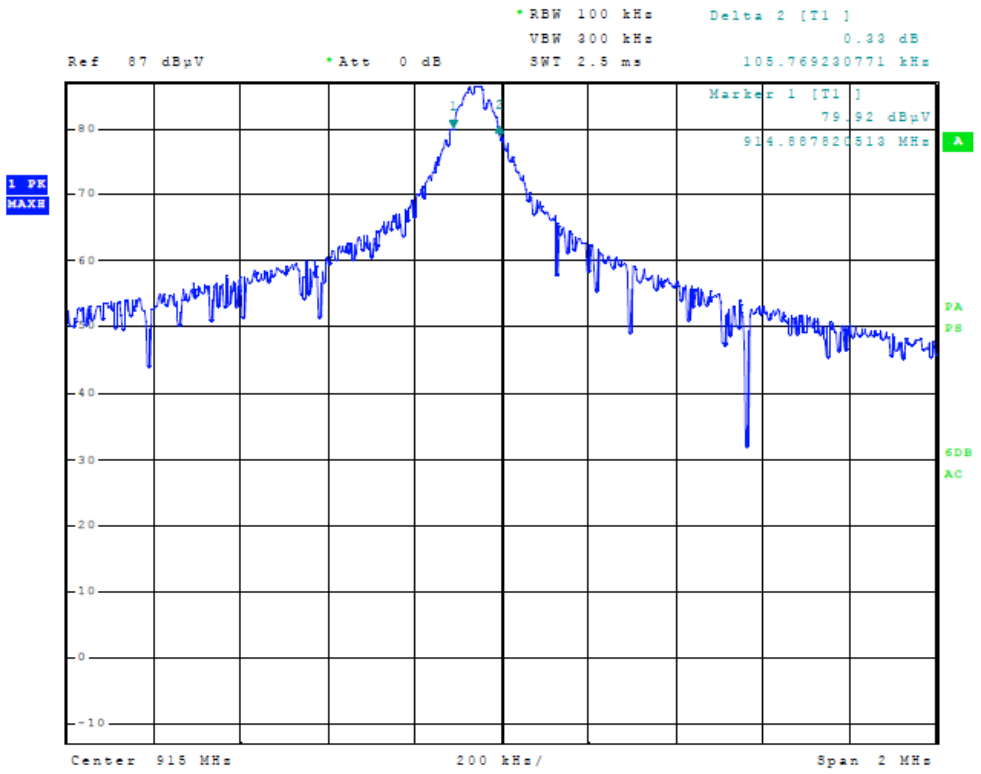


Figure Sixteen 6-dB Occupied Band Width

Transmitter Radiated Emissions Data Field Strength Measured

Emission Frequency (MHz)	Peak FSM Horizontal (dBµV)	Q.P/Ave FSM Horizontal (dBµV)	Peak FSM Vertical (dBµV)	Q.P/Ave FSM Vertical (dBµV)	Antenna Factor (dB)	Amp Gain (dB)
915.00	113.2	54.2	106.0	42.6	22.7	30
1830.00	48.3	15.4	48.4	16.7	28.4	25
2745.00	58.2	22.5	53.3	20.8	32.1	25
3660.00	49.8	17.2	50.2	16.6	35.2	25
4575.00	45.8	16.3	47.9	15.8	37.6	25
5490.00	35.8	16.4	35.7	16.4	39.0	25
6405.00	34.8	15.8	32.6	15.8	39.4	25

Transmitter Radiated Field Strength

Emission Frequency (MHz)	Peak RFS Horizontal (dBµV/m)	Q.P/Ave RFS Horizontal (dBµV/m)	Peak RFS Vertical (dBµV/m)	Q.P/Ave RFS Vertical (dBµV/m)	Limit @ 3m (dBµV/m)	Minimum Margin (dB)
915.00	110.9	51.9	103.7	40.3	94.0	-42.1
1830.00	51.7	18.8	51.8	20.1	54.0	-33.9
2745.00	65.3	29.6	60.4	27.9	54.0	-24.4
3660.00	60.0	27.4	60.4	26.8	54.0	-26.6
4575.00	58.4	28.9	60.5	28.4	54.0	-25.1
5490.00	49.8	30.4	49.7	30.4	54.0	-23.6
6405.00	49.2	30.2	47.0	30.2	54.0	-23.8

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 demonstrated highest peak emission level of the fundamental of 110.9 dBμV/m with a minimum margin of 3.1 dB, and average emission of 51.9 dBμV/m with a minimum margin of 42.1 dB, as measured at 3 meters. The EUT demonstrated a minimum margin of 23.6 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. 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.

Receiver Spurious Emissions

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

Spurious Emissions at Antenna Terminal Results

As the EUT offers no antenna connection point for measurement requirements of antenna port conducted emissions are demonstrated through the radiated emissions measurements as documented in this report.

Field Strength of Receiver Spurious Radiation

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. 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. Final radiated emissions testing were performed with the transceiver 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. . Antennas used during testing include Broadband Biconical from 30 to 200 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. 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.

Receiver Radiated Emissions Data

Frequency (MHz)	FSM Hor. (dBµV) Quasi-Peak	FSM Vert. (dBµV) Quasi-Peak	Ant. Fact. (dB/m)	Amp. Gain (dB)	Comp. Hor. (dBµV/m) @ 3m	Comp. Vert. (dBµV/m) @ 3 m	Limit (dBµV)
73.5	41.1	41.8	8.0	30	19.1	19.8	40.0
74.3	40.4	42.3	8.0	30	18.4	20.3	40.0
75.3	42.4	43.2	8.0	30	20.4	21.2	40.0
84.1	39.6	44.9	7.9	30	17.5	22.8	40.0
85.2	38.9	42.3	7.9	30	16.8	20.2	40.0
86.3	38.7	43.6	7.9	30	16.6	21.5	40.0
240.0	44.0	42.6	12.1	30	26.1	24.7	46.0
294.0	42.8	32.0	13.9	30	26.7	15.9	46.0
299.1	42.6	32.0	14.0	30	26.6	16.0	46.0
305.1	42.3	32.9	14.1	30	26.4	17.0	46.0
336.0	54.2	50.3	14.7	30	38.9	35.0	46.0

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 receivers, RSS-GEN, and RSS-210 with a minimum of 7.1 dB margin below requirements. There are no deviations to the specifications. There are no deviations or exceptions to the specifications.

Statement of Modifications and Deviations

No modifications to the EUT were performed or 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.

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

Equipment	Date of last Calibration
Oscilloscope Scope: Tektronix 2230	2/10
Wattmeter: Bird 43 with Load Bird 8085	2/10
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/10
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/10
R.F. Generator: HP 606A	2/10
R.F. Generator: HP 8614A	2/10
R.F. Generator: HP 8640B	2/10
Spectrum Analyzer: Rohde & Schwarz ESU40	5/10
Spectrum Analyzer: HP 8562A, Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W HP Adapters: 11518, 11519, 11520	5/10
Spectrum Analyzer: HP 8591EM	5/10
Frequency Counter: Leader LDC825	2/10
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	2/10
Antenna: C.D. B-101	2/10
Antenna: Solar 9229-1 & 9230-1	2/10
Antenna: EMCO 6509	2/10
Audio Oscillator: H.P. 201CD	2/10
R.F. Power Amp 65W Model: 470-A-1010	2/10
R.F. Power Amp 50W M185- 10-501	2/10
R.F. Preamp CPPA-102	2/10
LISN 50 µHy/50 ohm/0.1 µf	10/10
LISN Compliance Eng. 240/20	2/10
LISN Fischer Custom Communications FCC-LISN-50-16-2-08	2/10
Peavey Power Amp Model: IPS 801	2/10
Power Amp A.R. Model: 10W 1010M7	2/10
Power Amp EIN Model: A301	2/10
ELGAR Model: 1751	2/10
ELGAR Model: TG 704A-3D	2/10
ESD Test Set 2010i	2/10
Fast Transient Burst Generator Model: EFT/B-101	2/10
Current Probe: Singer CP-105	2/10
Current Probe: Solar 9108-1N	2/10
Field Intensity Meter: EFM-018	2/10
KEYTEK Ecat Surge Generator	2/10
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
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