NVLAP Lab Code 200087-0

SUBMITTAL APPLICATION REPORT

FOR
FCC And INDUSTRY CANADA GRANT OF CERTIFICATION

FOR

Model: PT2-A-01-RPT0
902.7 – 927.3 MHz FHSS Transmitter

FCC ID: WCF-PT2RPT

FOR

PURPLE TREE TECHNOLOGIES

2511 Old Highway 63 South
Columbia, Missouri 65201

Test Report Number: 090212

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 of
GRANT of CERTIFICATION

FOR

CFR47, PART 15C - INTENTIONAL RADIATORS
Paragraph 15.247 and Industry Canada, RSS-210
Frequency Hopping Spread Spectrum Transmitter

For

PURPLE TREE TECHNOLOGIES
2511 Old Highway 63 South
Columbia, Missouri 65201
Jason Lockett
System Engineer

Model: PT2-A-01-RPT0

Frequency 902.7-927.3 MHz
FCC ID#: WCF-PT2RPT

Test Date: February 12, 2009

Certifying Engineer: Scot D Rogers

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

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The following information is submitted for consideration in obtaining Grant of Certification for frequency hopping spread spectrum intentional radiator operating under CFR47 Paragraph 15.247 and Industry Canada standard RSS-210.

Name of Applicant:

Purple Tree Technologies
2511 Old Highway 63 South
Columbia, Missouri 65201

Model: PT2-A-01-RPT0 wireless transceiver

FCC I.D.: WCF-PT2RPT IC:

Frequency Range: 902.7-927.3 MHz

Operating Power: 1 Watt antenna port conducted, 133.0 dBµV/m @ 3-meters (3- meter radiated measurement)

Opinion / Interpretation of Results

Tests Performed	Results
Emissions Tests	
Emissions as per CFR47 paragraphs 2 and 15.205	Complies
Emissions as per CFR47 paragraphs 2 and 15.207	Complies
Emissions as per CFR47 paragraphs 2 and 15.209	Complies
Emissions as per CFR47 paragraphs 2 and 15.247, and RSS-210	Complies

Environmental Conditions

Ambient Temperature	20.0° C
Relative Humidity	21%
Atmospheric Pressure	1016.4 mb

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.

2.1033(b) Application for Certification

(1) Manufacturer: Purple Tree Technologies

2511 Old Highway 63 South

Columbia, Missouri 65201

(2) Identification: Model: PT2-A-01-RPT0 Wireless Transceiver

FCC I.D.: WCF-PT2RPT

IC:

(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) A laptop computer was used to interface with the EUT through the USB interface port during testing. No other 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.

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 and Industry Canada Site Registration Letters

List of Test Equipment

A Hewlett Packard 8591EM Spectrum Analyzer was used as the measuring device for the emissions testing of frequencies below 1 GHz. A 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.

HP 8591 EM Analyzer Settings		
Conducted Emissions		
RBW	AVG. BW	Detector Function
9 kHz	30 kHz	Peak / Quasi Peak
Radiated Emissions		
RBW	AVG. BW	Detector Function
120 kHz	300 kHz	Peak / Quasi Peak
HP 8562A Analyzer Settings		
RBW	Video BW	Detector Function
100 kHz	100 kHz	Peak
1 MHz	1 MHz	Peak / Average

Equipment	Manufacturer	Model	Calibration Date	Due
LISN	Comp. Design	FCC-LISN-2-MOD.CD	10/08	10/09
LISN	Comp. Design	1762	2/09	2/10
Antenna	ARA	BCD-235-B	10/08	10/09
Antenna	EMCO	3147	10/08	10/09
Antenna	EMCO	3143	5/08	5/09
Analyzer	HP	8591EM	5/08	5/09
Analyzer	HP	8562A	5/08	5/09

Applicable Standards & Test Procedures

In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2008, Part 2, Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057, and applicable parts of paragraph 15, Part 15C Paragraph 15.247, and Industry Canada 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 63.4-2003 Document FCC, documents DA00-1407 and DA00-705 and/or TIA/EIA 603-1.

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. 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.

Radiated Emission Test Procedure

Testing for the radiated emissions was performed as defined in section 8 and 13.1.4 of ANSI C63.4. 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 photographs in the exhibits for EUT placement.

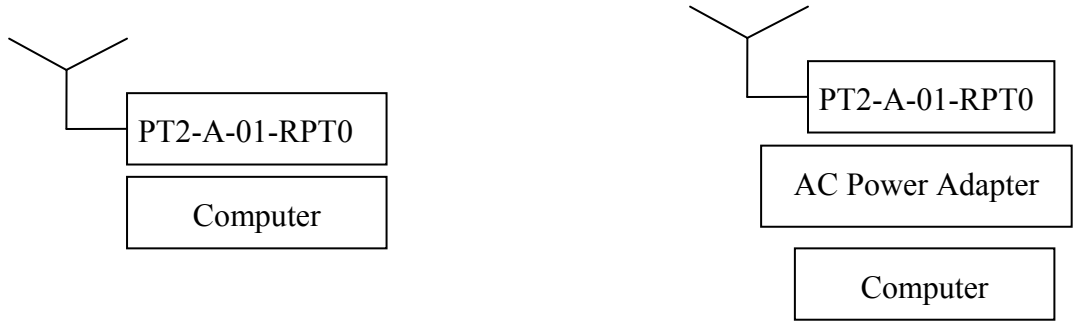
Equipment Tested

Equipment	Model	FCC ID	IC
EUT	PT2-A-01-RPT0	WCF-PT2RPT	
5 dBi Omni Directional Rubber Whip	HG905RD-RSP		
6 dBi Omni Directional Fiberglass	HGV906U		
8.15 dBi Yagi	PC904N		
AC Adapter	HK-H1-A06	N/A	
CPU	IBM 2373	N/A	
AC Adapter	IBM 08K820B	N/A	

Equipment Function

The EUT is a 902.7-927.3 MHz radio transmitter used to wirelessly interface with remote compliant equipment offering communications and data information exchange. The PT2-A-01-RPT0 functions as a remote wireless communications point for interfacing with complaint equipment. The unit is marketed for use to incorporate a wireless security alert system. Test software was installed in the test sample allowing for special testing requirements and purposes. The modified software allowed the transmitter to be set to transmit and receive on channels for testing purposes. The equipment may be connected to computer equipment for maintenance or alert information input to the system. The equipment was tested for compliance while operating through all normal modes available with utilizing maximum gain alternative antenna options. These configurations represented the worst-case emissions profile for the equipment with results recorded in this report. The equipment operates from external AC power provided through the AC adapter option and upon power failure resumes operation using the internal rechargeable battery power.

Equipment Configuration



Subpart B – 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 adapter option 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 one and two for plots of the AC Line conducted emissions.

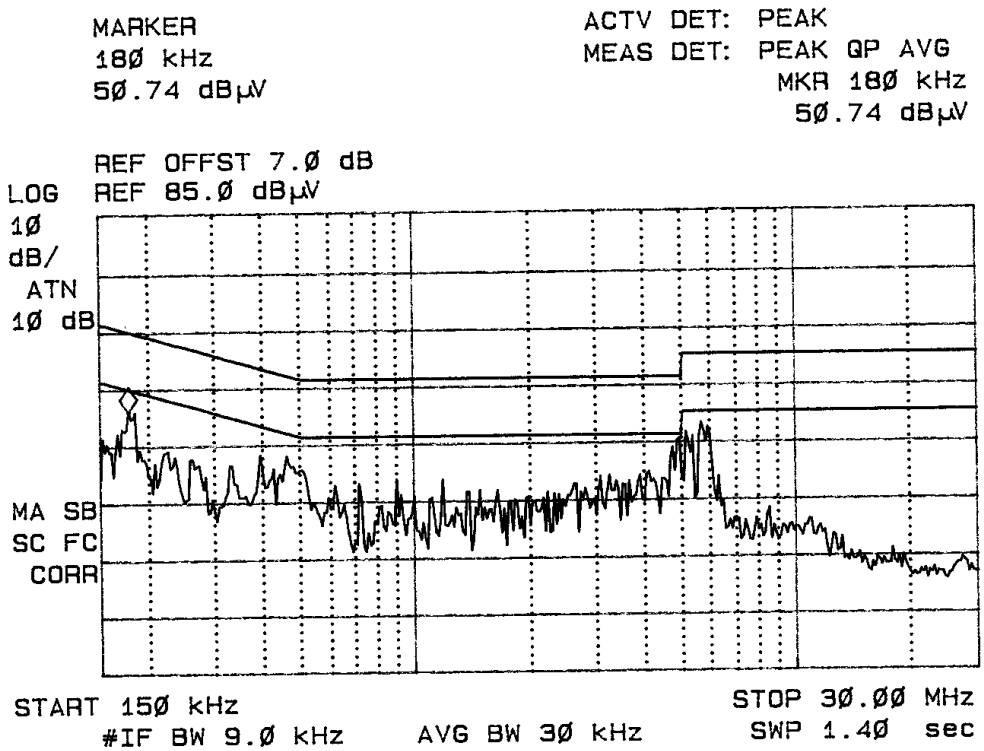


Figure One AC Line Conducted Emissions Line 1

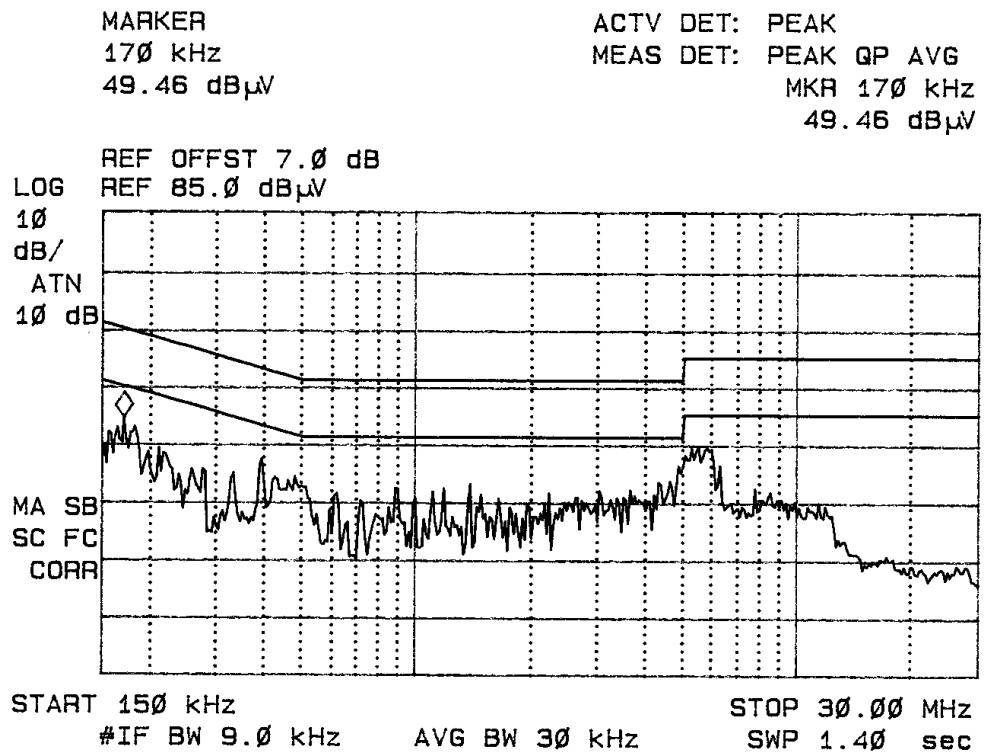


Figure Two AC Line Conducted Emissions Line 2

Radiated EMI

The unit typically receives power from the external AC adapter and may continue operation receiving power from the internal battery upon power failure. For testing purposes the equipment was powered from the AC power adapter during testing. The EUT was arranged as a typical worst-case 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. 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 10,000 MHz for the preliminary testing. Refer to figures three through seven showing plots of the radiated emissions spectrum taken in a screen room. The highest 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 were Broadband Biconical from 30 to 200 MHz, Biconilog from 30 to 1000 MHz, Log Periodic from 200 MHz to 5 GHz and or, double ridge or pyramidal horns and mixers from 4 GHz to 40 GHz, notch filters and appropriate amplifiers were utilized.

Sample Calculations:

RFS (dBμV/m @ 3m)= FSM(dBμV) + A.F.(dB) - Gain(dB)

= 47.5+ 6.5 - 30

= 24.0

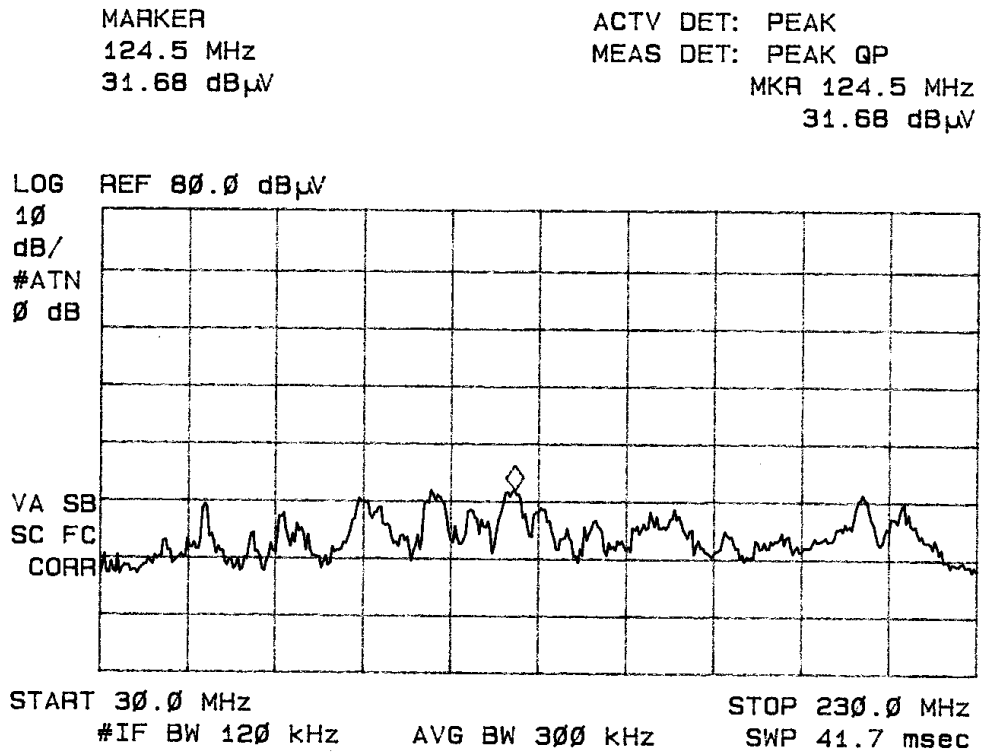


Figure Three Plot of General Radiated Emissions

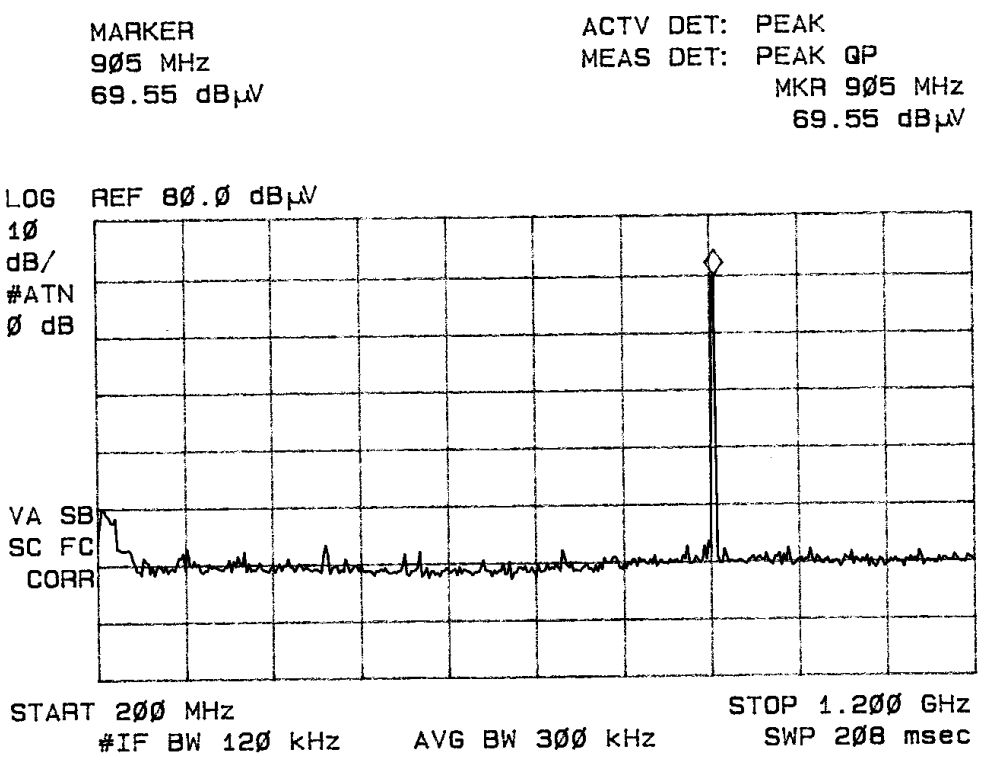


Figure Four Plot of General Radiated Emissions

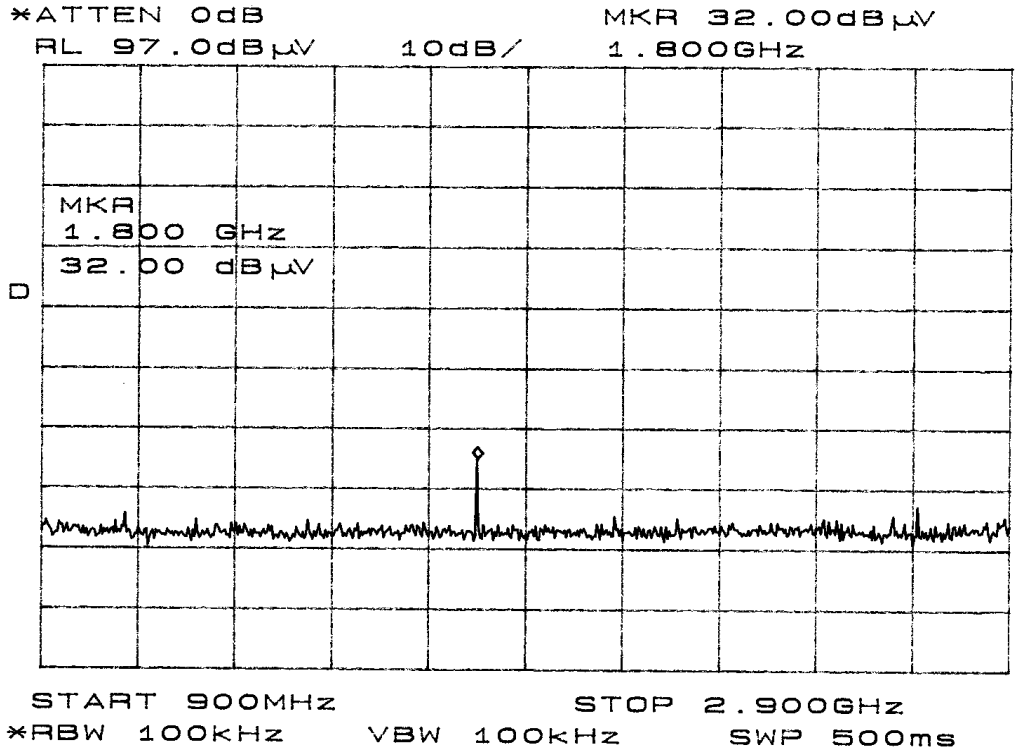


Figure Five Plot of General Radiated Emissions

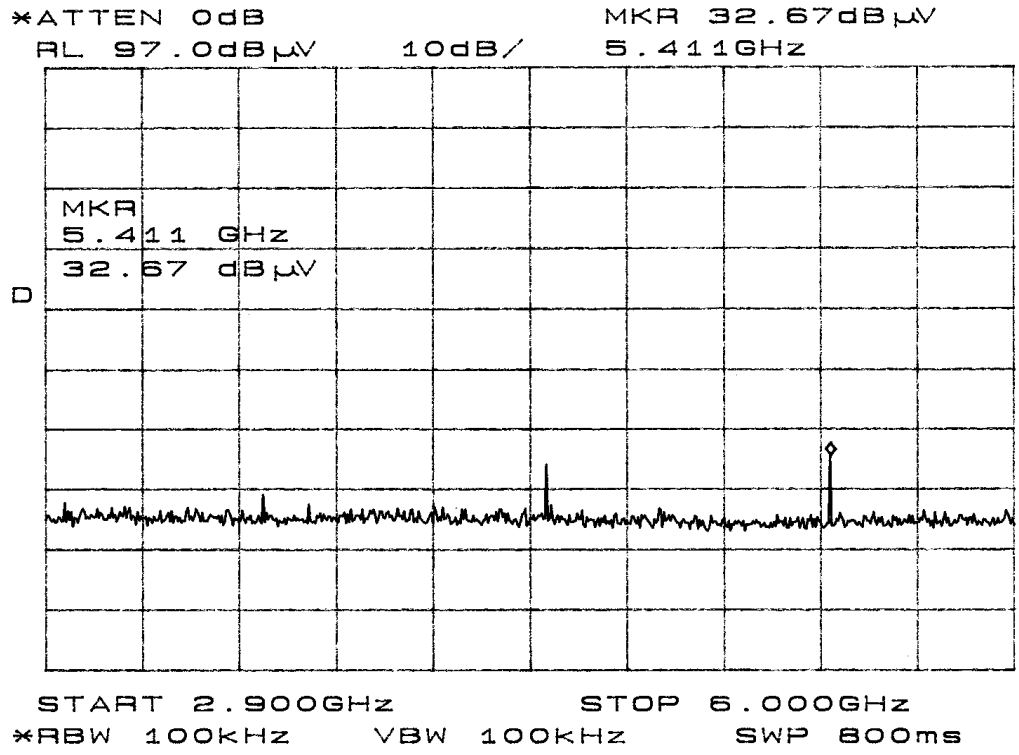


Figure Six Plot of General Radiated Emissions

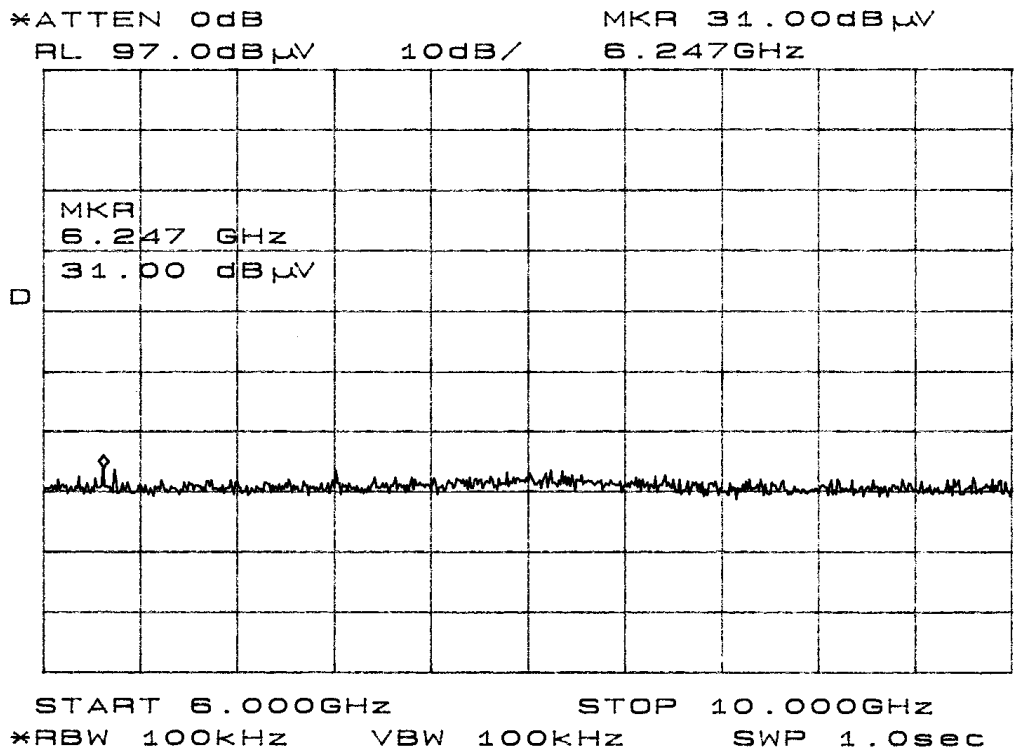


Figure Seven Plot of General Radiated Emissions

AC Line Conducted Emissions Data (7 Highest Emissions)

Frequency band (MHz)	L1 Level (dBµV)			L2 Level (dBµV)			CISPR 22 Limit Q.P. Ave(dBµV)
	Peak	Q.P.	AVE	Peak	Q.P.	AVE	
0.15 – 0.5	50.7	43.2	30.7	49.5	45.2	36.0	66 / 56
0.5 – 5	47.7	43.8	32.6	42.6	39.1	30.0	56 / 46
5 – 10	47.4	43.8	31.3	45.0	41.5	30.1	60 / 50
10 – 15	35.8	33.3	29.9	34.9	32.1	30.0	60 / 50
15 – 20	27.9	23.5	17.0	22.7	17.4	10.7	60 / 50
20 – 25	23.6	18.3	11.9	25.8	20.4	14.1	60 / 50
25 – 30	24.9	20.6	14.4	25.8	19.7	13.6	60 / 50

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

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)	Class B Limit @ 3m (dBµV/m)
50.3	47.5	46.5	6.5	30	24.0	23.0	40.0
93.8	47.5	38.8	7.5	30	25.0	16.3	43.5
93.9	47.0	46.2	7.5	30	24.5	23.7	43.5
130.2	46.2	42.1	8.0	30	24.2	20.1	43.5
130.3	42.2	46.1	8.0	30	20.2	24.1	43.5
162.2	48.2	39.1	8.8	30	27.0	17.9	43.5
165.8	47.7	45.5	8.7	30	26.4	24.2	43.5
200.5	52.7	38.7	10.4	30	33.1	19.1	43.5
200.5	55.0	41.7	10.4	30	35.4	22.1	43.5
203.8	50.4	44.8	10.5	30	30.9	25.3	43.5
209.8	51.5	38.0	11.0	30	32.5	19.0	43.5
211.8	48.8	36.8	11.0	30	29.8	17.8	43.5
229.1	52.5	43.5	11.3	30	33.8	24.8	46.0
260.2	46.9	43.3	12.8	30	29.7	26.1	46.0
261.7	46.1	41.7	12.8	30	28.9	24.5	46.0
458.3	40.6	46.6	17.8	30	28.4	34.4	46.0

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 the conducted emissions requirements for CFR47 and RSS-210. The EUT demonstrated minimum margin of 12.2 dB below the Quasi-Peak limit, and 13.4 dB below the average limit. Measurements were taken using the peak, quasi peak, and average, measurement function for each emission and were below the limits stated in the specification. Other emissions were present with recorded data representing worst-case amplitudes.

Summary of Results for General Radiated Emissions

The EUT demonstrated compliance with the radiated emissions requirements for CFR47, and Industry Canada. The EUT and test system demonstrated minimum margin of 8.1 dB below the limit. Other emissions were present with amplitudes at least 20 dB below the limit.

Statement of Modifications and Deviations

No modifications to the EUT were required for the unit to demonstrate compliance with the CISPR 22, CFR47, and Industry Canada requirements. There were no deviations or exceptions to the specifications.

Subpart C - Intentional Radiators

As per CFR47 Part 15, Subpart C, paragraphs 15.203, 15.205, 15.209, 15.247 and RSS-210 the following information is submitted.

15.203 Antenna Requirements

The unit is produced with a unique antenna connection used by authorized service personnel and approved installers only. The equipment utilizes reverse SMA antenna port connector for use with approved antenna configurations. The equipment offers no other provision for user service, replacement, or antenna modification. The requirements of 15.203 are fulfilled and there are no deviations or exceptions to the specification.

15.205 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.

Radiated Emissions Data in Restricted Bands (Worst-case)

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)
2708.3	35.4	35.4	34.5	30	39.9	39.9	54.0
2744.3	35.9	36.2	34.4	30	40.3	40.6	54.0
2781.8	35.7	36.3	34.5	30	40.2	40.8	54.0
3611.0	36.1	34.1	38.5	30	44.6	42.6	54.0
3659.0	35.8	34.3	39.2	30	45.0	43.5	54.0
3709.0	35.3	34.7	38.9	30	44.2	43.6	54.0
4513.8	36.3	34.8	41.5	30	47.8	46.3	54.0
4573.8	35.3	34.5	41.7	30	47.0	46.2	54.0
4636.3	34.4	34.5	42.2	30	46.6	46.7	54.0
2708.3	35.4	35.4	34.5	30	39.9	39.9	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 the radiated emissions in restricted bands requirements of CFR47 and RSS-210. The EUT demonstrated a minimum margin of 6.2 dB below the limits for restricted bands of operation. Both average and peak amplitudes above 1000 MHz were checked for 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.

15.209 Radiated Emissions Limits; General Requirements

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. Emissions were checked in the screen room from 30 to 12,000 MHz and plots were made of the frequency spectrum from 30 MHz to 12,000 MHz for the preliminary testing. The highest radiated emission was then re-maximized at this location before final radiated emissions measurements were performed. Final data was taken with the EUT located at the open area test site 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 polarization between horizontal and vertical. Antennas used were Broadband Biconical from 30 MHz to 200 MHz, Biconilog from 30 MHz to 1000 MHz, Log Periodic from 200 MHz to 5 GHz, and/or Pyramidal Horns from 4 GHz to 40 GHz.

General Radiated Emissions Data from EUT (15.209)

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)	FCC Class B Limit @ 3m (dBµV/m)
50.3	47.5	46.5	6.5	30	24.0	23.0	40.0
93.8	47.5	38.8	7.5	30	25.0	16.3	43.5
93.9	47.0	46.2	7.5	30	24.5	23.7	43.5
130.2	46.2	42.1	8.0	30	24.2	20.1	43.5
130.3	42.2	46.1	8.0	30	20.2	24.1	43.5
162.2	48.2	39.1	8.8	30	27.0	17.9	43.5
165.8	47.7	45.5	8.7	30	26.4	24.2	43.5
200.5	52.7	38.7	10.4	30	33.1	19.1	43.5
200.5	55.0	41.7	10.4	30	35.4	22.1	43.5
203.8	50.4	44.8	10.5	30	30.9	25.3	43.5
209.8	51.5	38.0	11.0	30	32.5	19.0	43.5
211.8	48.8	36.8	11.0	30	29.8	17.8	43.5
229.1	52.5	43.5	11.3	30	33.8	24.8	46.0
260.2	46.9	43.3	12.8	30	29.7	26.1	46.0
261.7	46.1	41.7	12.8	30	28.9	24.5	46.0
458.3	40.6	46.6	17.8	30	28.4	34.4	46.0

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

Summary of Results for Radiated Emissions (15.209)

The EUT demonstrated compliance with the radiated emissions requirements for CFR47 15C and Industry Canada RSS-210. The EUT and test system demonstrated minimum margin of 8.1 dB below the limit. Other emissions were present with amplitudes at least 20 dB below the limit.

15.247 Operation in the Band 902.7-927.3 MHz

The power output was measured at the antenna pot and again on an Open Area Test Site at a 3 meters distance utilizing the three antenna configurations listed. The EUT and test fixture was placed on a wooden turntable 0.8 meters above the ground plane and at a distance of 3 meters from the FSM antenna. The peak and quasi-peak amplitude of the carrier frequency was measured using a spectrum analyzer. The peak and average amplitude of the spurious emissions above 1000 MHz were measured using a spectrum analyzer then data was recorded from the analyzer display. Refer to figures eight through twenty for plots of the transmitter emissions taken at the antenna port demonstrating compliance to the specifications. The EUT is a frequency hopping spread spectrum intentional radiator utilizing at least 50 hopping channels. The 20-dB bandwidth of 130 kHz complies with the requirement of less than 250 kHz wide and utilizing at least 50 hopping frequencies. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a twenty-second-time period. Figures seventeen and eighteen demonstrate dwell time on channel and number of times on channel in a 20-second period. These plots demonstrate compliance with 385 mS dwell time and number of times on channel in a 20-second period. As described in the operational description exhibit, the equipment complies with requirements of channel occupancy. The 902 and 928 MHz band edges are protected due to the 902.7– 927.3 MHz channels used for frequency of operation. Figures nineteen and twenty demonstrate compliance at band edges. The amplitude of each emission was maximized by varying the FSM antenna height, polarization, and by rotating the turntable. Emissions were measured in dBμV/m at three meters. The amplitude of each radiated emission measured 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 1000 MHz, a Log Periodic Antenna for 200 to 5000 MHz, and Double Ridge and/or Pyramidal Horn Antennas from 4 GHz to 40 GHz. Data was taken per Paragraph 2.1046(a), 15.247 and RSS-210.

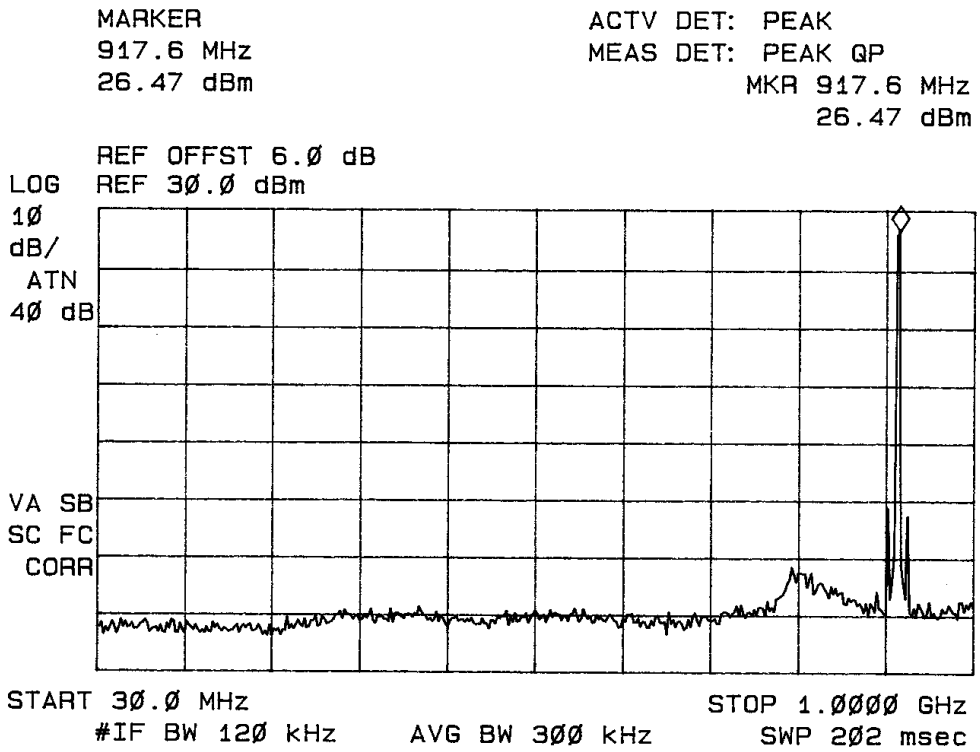


Figure Eight Plot of Antenna Port Conducted Emissions

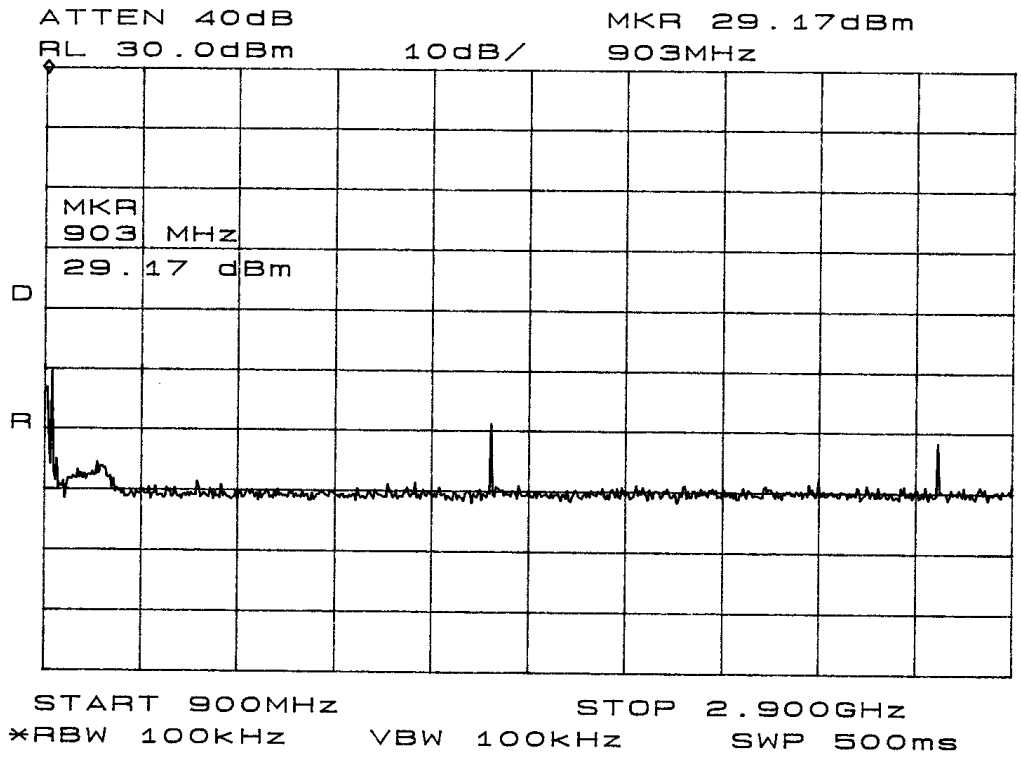


Figure Nine Plot of Antenna Port Conducted Emissions

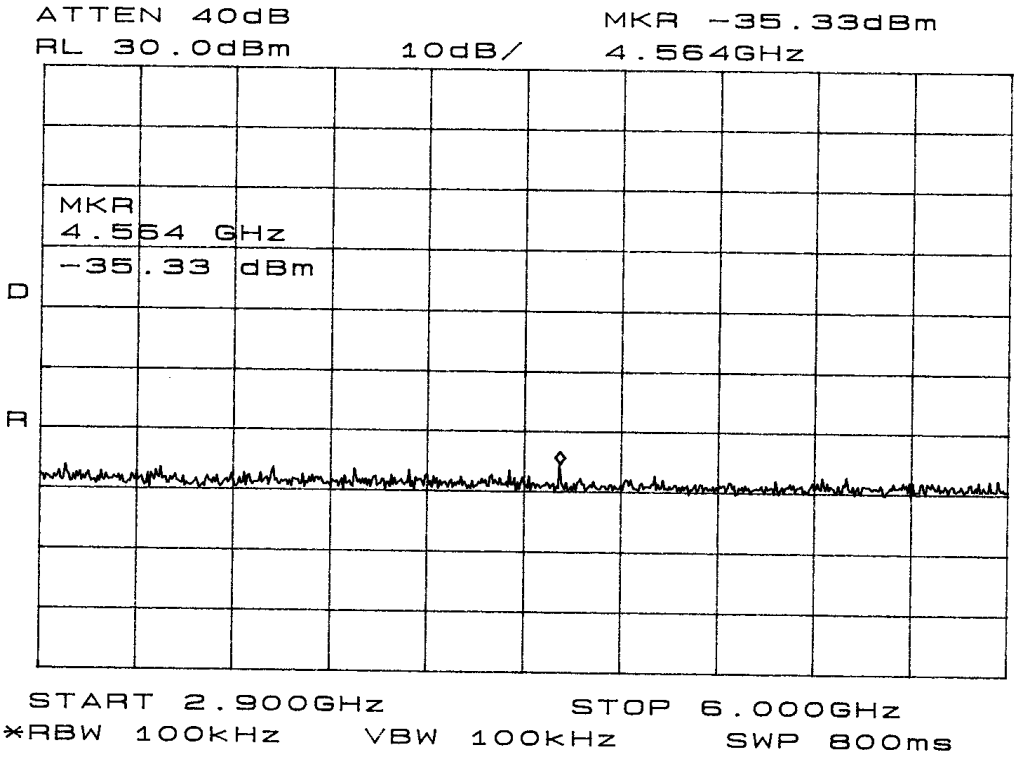


Figure Ten Plot of Antenna Port Conducted Emissions

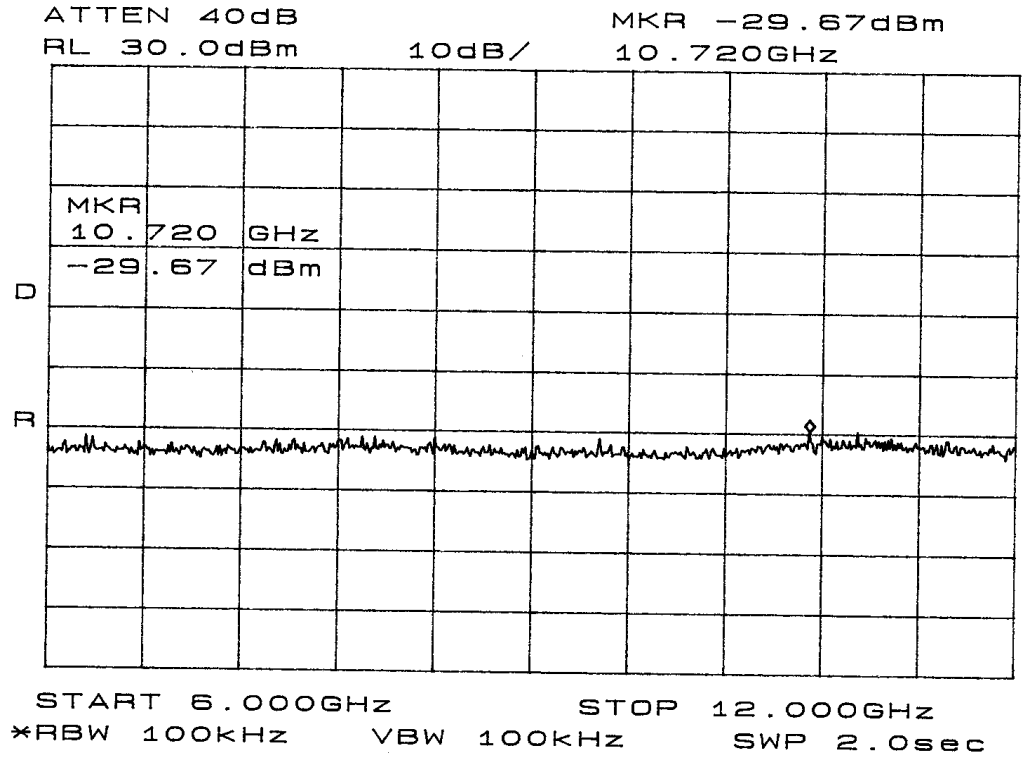


Figure Eleven Plot of Antenna Port Conducted Emissions

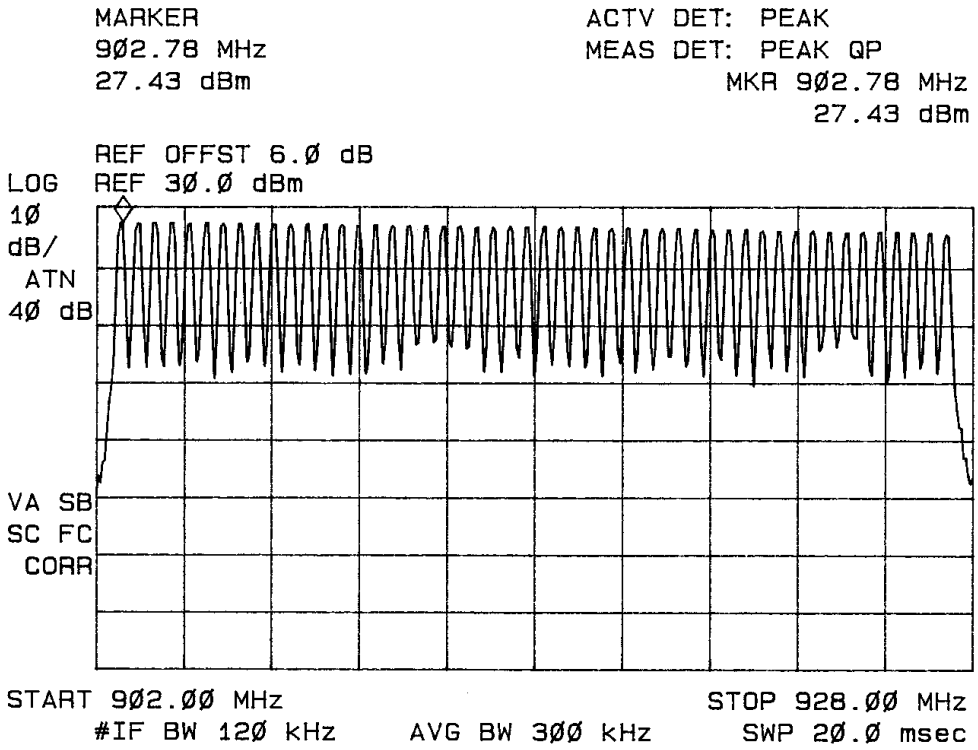


Figure Twelve Plot of Antenna Port Conducted Emissions Power and Channels

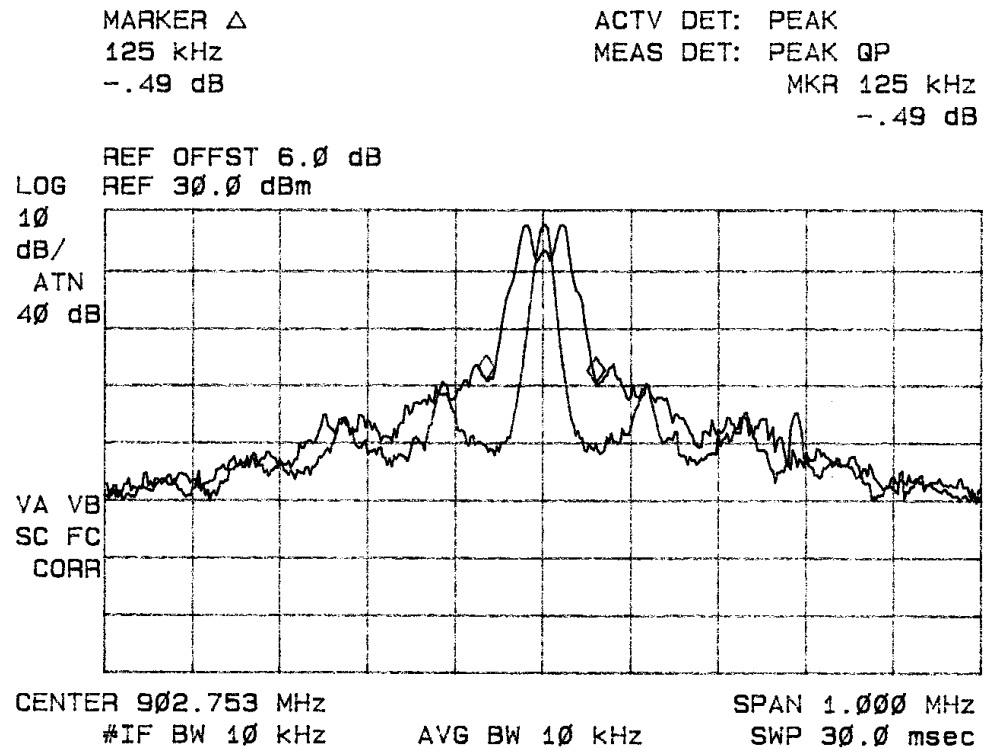


Figure Thirteen Plot of Occupied Bandwidth

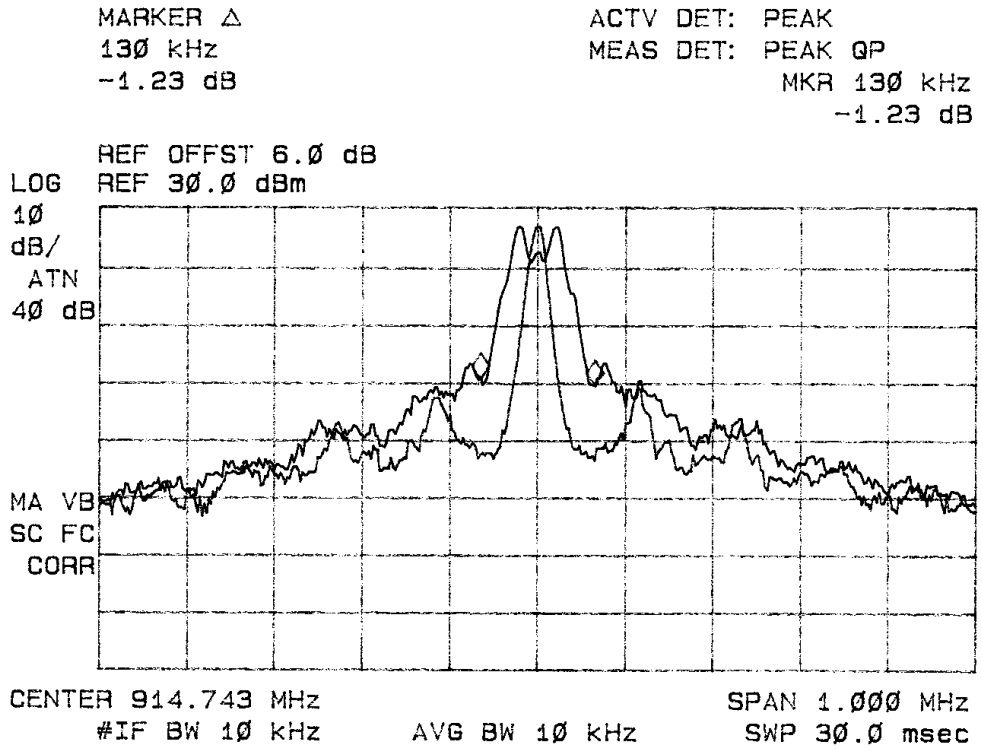


Figure Fourteen Plot of Occupied Bandwidth

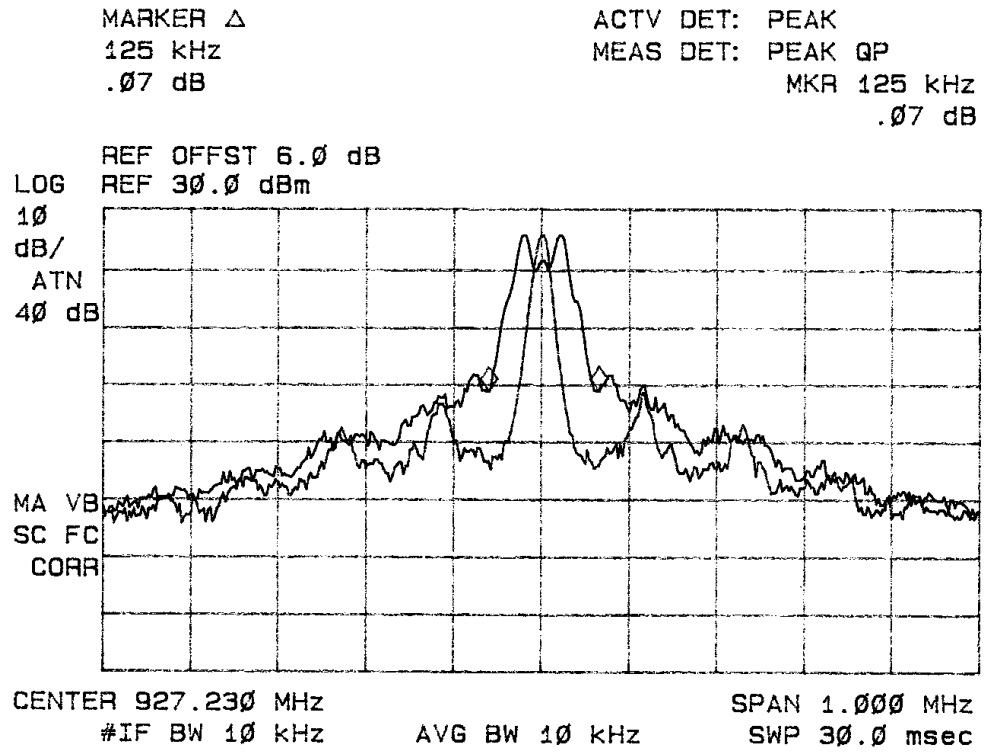


Figure Fifteen Plot of Occupied Bandwidth

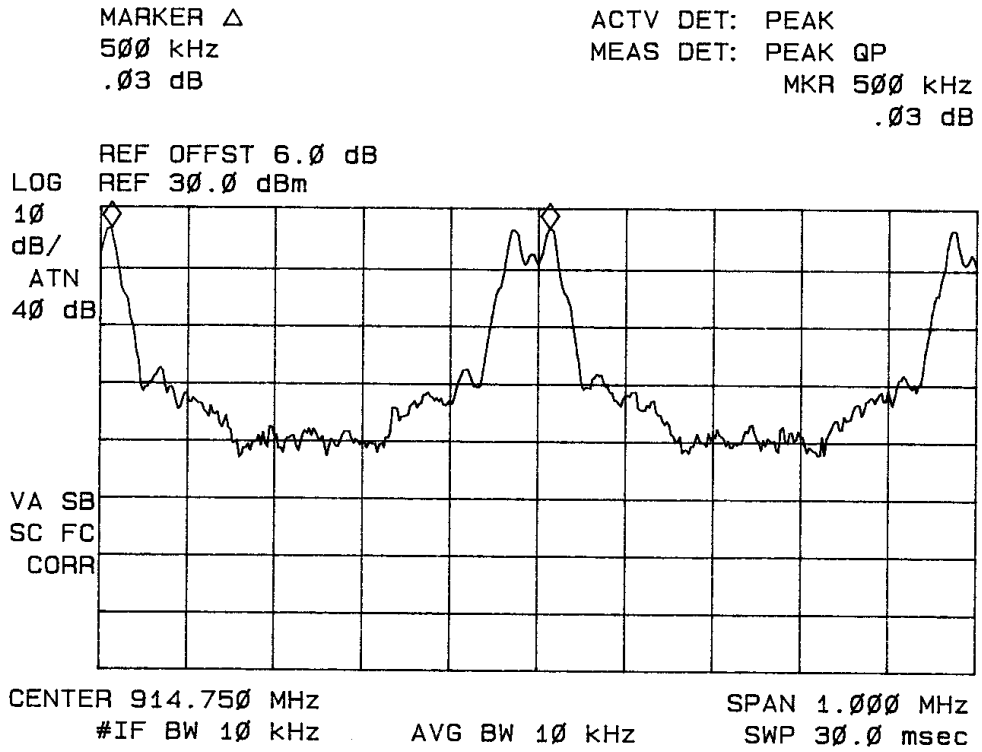


Figure Sixteen Plot of Channel Spacing

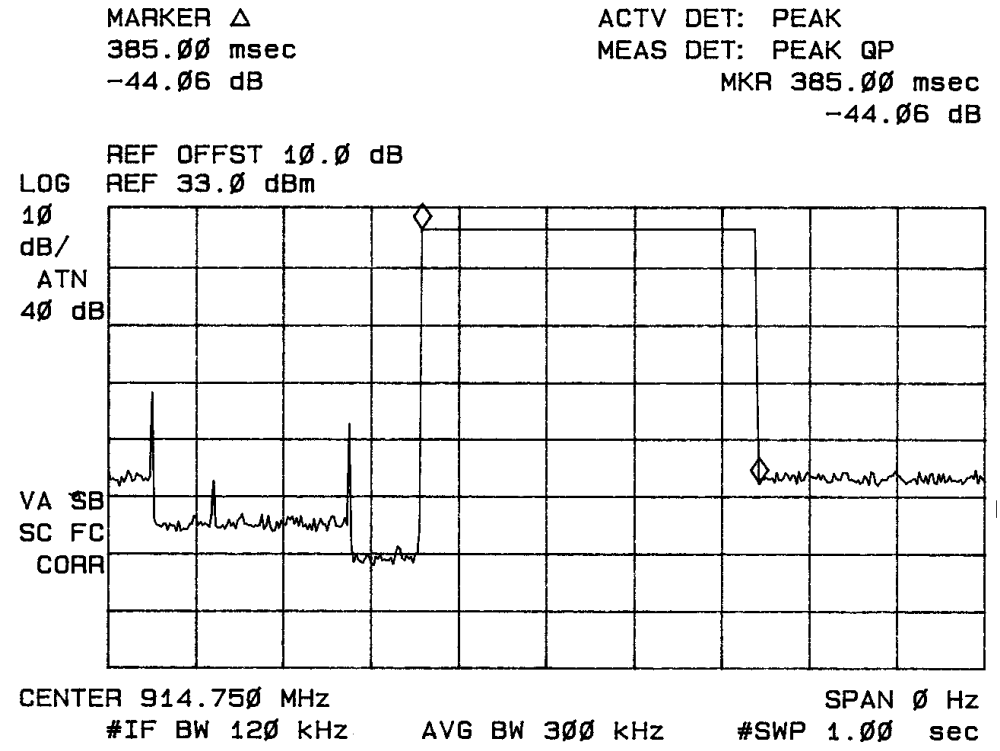


Figure Seventeen Plot Dwell Time on Channel

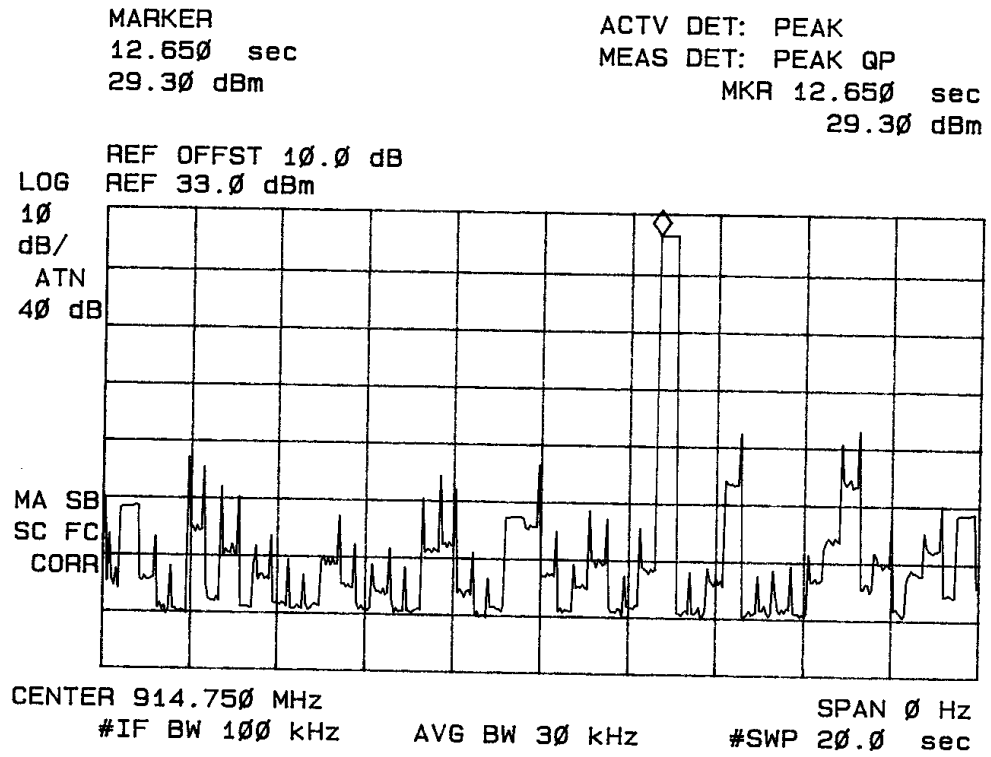


Figure Eighteen Plot of Channel Occupancy over 20-second period

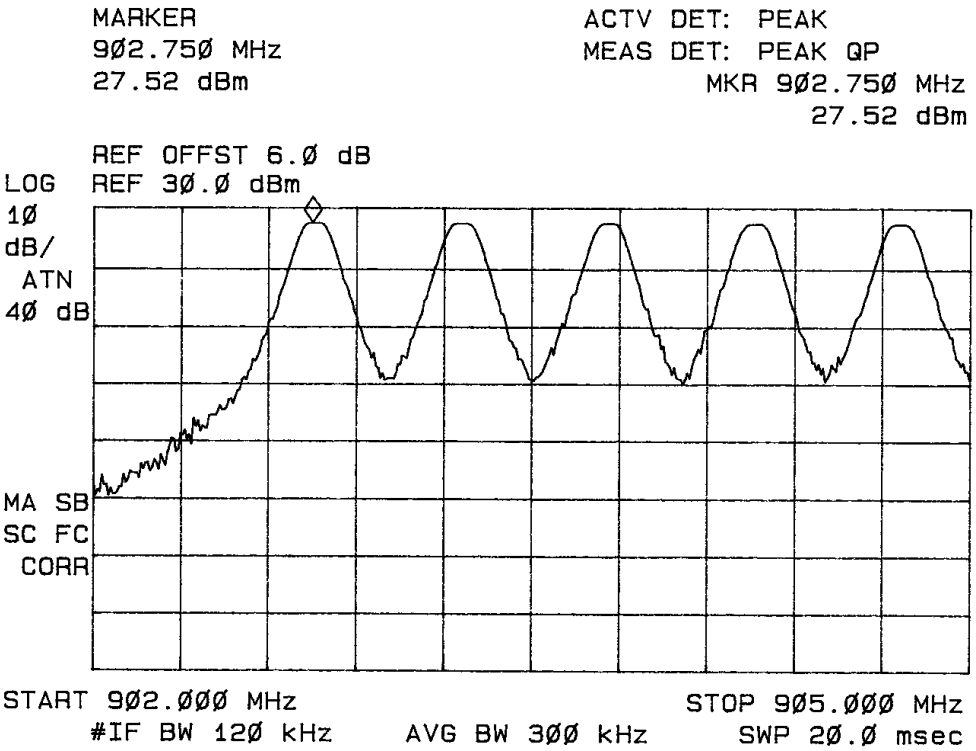


Figure Nineteen Plot of Lower Band Edge

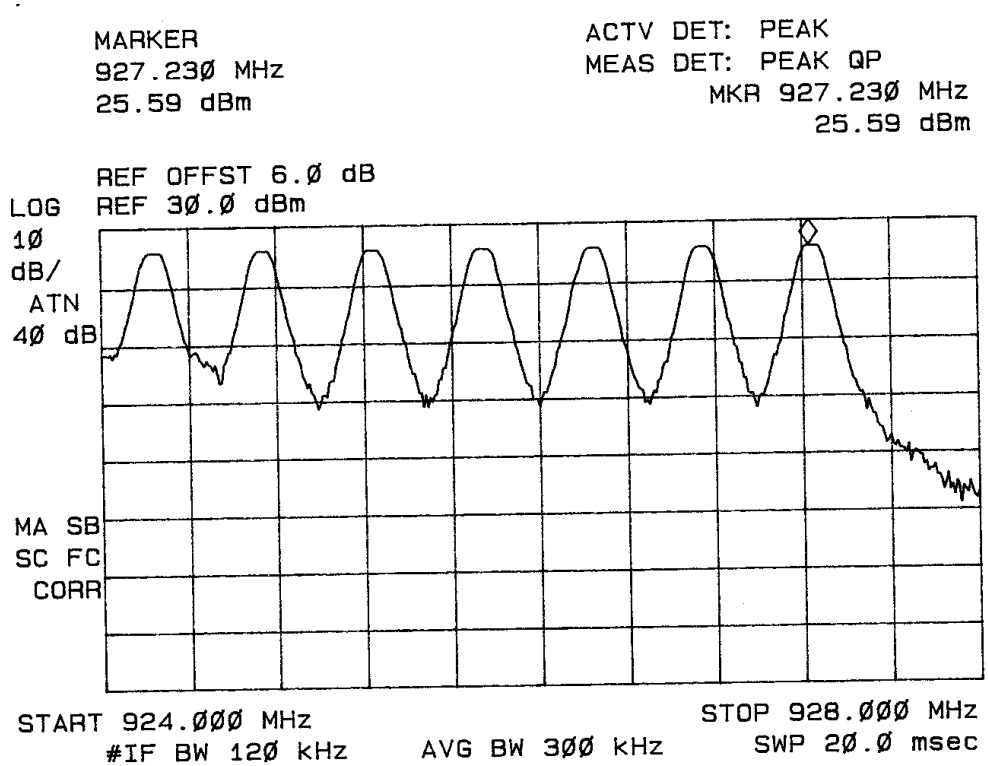


Figure Twenty Plot of Upper Band Edge

Antenna Port Peak Conducted Output Power

Frequency (MHz)	902.7	914.7	927.3
Output Power (Watts)	1.0	1.0	1.0

Sample Calculation

RFS (dBµV/m @ 3m) = FSM(dBµV) + A.F.(dB) - Gain(dB)

= 99.3 + 23.3 -0

= 122.6

Radiated Emissions Data per 15.247 (5 dBi Omni Directional Rubber Whip)

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)
902.8	99.3	106.3	23.3	0	122.6	129.6	--
1805.5	33.1	32.0	29.3	30	32.4	31.3	54.0
2708.3	36.3	37.1	34.5	30	40.8	41.6	54.0
3611.0	37.8	37.2	38.5	30	46.3	45.7	54.0
4513.8	35.5	33.5	41.5	30	47.0	45.0	54.0
5416.5	36.0	34.5	33.1	30	39.1	37.6	54.0
914.8	96.5	105.5	23.3	0	119.8	128.8	--
1829.5	34.8	33.6	29.2	30	34.0	32.8	54.0
2744.3	35.8	35.7	34.4	30	40.2	40.1	54.0
3659.0	37.1	36.2	39.2	30	46.3	45.4	54.0
4573.8	34.9	34.5	41.7	30	46.6	46.2	54.0
5488.5	36.3	35.4	33.1	30	39.4	38.5	54.0
927.3	95.8	105.3	23.4	0	119.2	128.7	--
1854.5	31.8	33.0	29.3	30	31.1	32.3	54.0
2781.8	35.6	35.0	34.5	30	40.1	39.5	54.0
3709.0	38.6	35.8	38.9	30	47.5	44.7	54.0
4636.3	33.3	32.8	42.2	30	45.5	45.0	54.0
5563.5	34.4	34.4	33.1	30	37.5	37.5	54.0

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

Radiated Emissions Data per 15.247 (6 dBi Omni Directional Fiberglass)

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)
902.8	96.3	106.5	23.3	0	119.6	129.8	--
1805.5	33.9	33.5	29.3	30	33.2	32.8	54.0
2708.3	35.4	35.4	34.5	30	39.9	39.9	54.0
3611.0	36.1	34.1	38.5	30	44.6	42.6	54.0
4513.8	36.3	34.8	41.5	30	47.8	46.3	54.0
5416.5	35.6	36.1	33.1	30	38.7	39.2	54.0
914.8	96.4	105.6	23.3	0	119.7	128.9	--
1829.5	33.6	34.0	29.2	30	32.8	33.2	54.0
2744.3	35.9	36.2	34.4	30	40.3	40.6	54.0
3659.0	35.8	34.3	39.2	30	45.0	43.5	54.0
4573.8	35.3	34.5	41.7	30	47.0	46.2	54.0
5488.5	33.2	32.2	33.1	30	36.3	35.3	54.0
927.3	96.1	105.8	23.4	0	119.5	129.2	--
1854.5	33.8	33.7	29.3	30	33.1	33.0	54.0
2781.8	35.7	36.3	34.5	30	40.2	40.8	54.0
3709.0	35.3	34.7	38.9	30	44.2	43.6	54.0
4636.3	34.4	34.5	42.2	30	46.6	46.7	54.0
5563.5	33.9	34.6	33.1	30	37.0	37.7	54.0

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

Radiated Emissions Data per 15.247 (8.2 dBi Yagi)

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)
902.8	93.3	109.7	23.3	0	116.6	133.0	--
1805.5	33.5	33.6	29.3	30	32.8	32.9	54.0
2708.3	35.5	35.4	34.5	30	40.0	39.9	54.0
3611.0	32.1	32.1	38.5	30	40.6	40.6	54.0
4513.8	32.8	32.9	41.5	30	44.3	44.4	54.0
5416.5	31.4	35.2	33.1	30	34.5	38.3	54.0
914.8	93.4	109.7	23.3	0	116.7	133.0	--
1829.5	33.6	33.4	29.2	30	32.8	32.6	54.0
2744.3	35.9	36.2	34.4	30	40.3	40.6	54.0
3659.0	32.2	32.4	39.2	30	41.4	41.6	54.0
4573.8	32.5	32.4	41.7	30	44.2	44.1	54.0
5488.5	33.1	32.5	33.1	30	36.2	35.6	54.0
927.3	90.7	109.6	23.4	0	114.1	133.0	--
1854.5	33.9	33.7	29.3	30	33.2	33.0	54.0
2781.8	35.7	36.7	34.5	30	40.2	41.2	54.0
3709.0	32.4	32.7	38.9	30	41.3	41.6	54.0
4636.3	32.5	32.5	42.2	30	44.7	44.7	54.0
5563.5	32.1	32.4	33.1	30	35.2	35.5	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 15C and RSS-210 emissions. The EUT fundamental frequency of operation demonstrated the highest radiated peak emission of 133.0 dBµV/m at 3 meters distance. The EUT demonstrated worst-case harmonic emission of 6.2 dB below the limit. The EUT demonstrated compliance with the radiated emissions requirements of CFR47 Part 15.247 Intentional Radiators and RSS-210. There are no measurable emissions in the restricted bands other than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the limits. The specifications of 15.247 and RSS-210 were met; there are no deviations or exceptions to the requirements.

Statement of Modifications and Deviations

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

Annex

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

Annex A Measurement Uncertainty Calculations

Radiated Emissions Measurement Uncertainty Calculation

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

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

Combined standard uncertainty $u_c(y)$ is

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

$U_c(y) = \pm 1.6$ dB

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

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

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

Notes:

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

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

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

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

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

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

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

Conducted Measurements Uncertainty Calculation

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

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

Combined standard uncertainty $u_c(y)$ is

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

$U_c(y) = \pm 1.2$ dB

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

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

Annex B Test Equipment List For Rogers Labs, Inc.

The test equipment used 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	2/09
Wattmeter: Bird 43 with Load Bird 8085	2/09
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/09
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/09
R.F. Generator: HP 606A	2/09
R.F. Generator: HP 8614A	2/09
R.F. Generator: HP 8640B	2/09
Spectrum Analyzer: HP 8562A, Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W HP Adapters: 11518, 11519, 11520	5/08
Spectrum Analyzer: HP 8591EM	5/08
Frequency Counter: Leader LDC825	2/09
Antenna: EMCO Biconilog Model: 3143	5/08
Antenna: EMCO Log Periodic Model: 3147	10/08
Antenna: Antenna Research Biconical Model: BCD 235	10/08
Antenna: EMCO Dipole Set 3121C	2/09
Antenna: C.D. B-101	2/09
Antenna: Solar 9229-1 & 9230-1	2/09
Antenna: EMCO 6509	2/09
Audio Oscillator: H.P. 201CD	2/09
R.F. Power Amp 65W Model: 470-A-1010	2/09
R.F. Power Amp 50W M185- 10-501	2/09
R.F. PreAmp CPPA-102	2/09
LISN 50 µHy/50 ohm/0.1 µf	10/08
LISN Compliance Eng. 240/20	2/09
LISN Fischer Custom Communications FCC-LISN-50-16-2-08	2/09
Peavey Power Amp Model: IPS 801	2/09
Power Amp A.R. Model: 10W 1010M7	2/09
Power Amp EIN Model: A301	2/09
ELGAR Model: 1751	2/09
ELGAR Model: TG 704A-3D	2/09
ESD Test Set 2010i	2/09
Fast Transient Burst Generator Model: EFT/B-101	2/09
Current Probe: Singer CP-105	2/09
Current Probe: Solar 9108-1N	2/09
Field Intensity Meter: EFM-018	2/09
KEYTEK Ecat Surge Generator	2/09
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. Six years working in the automated controls industry and 6 years working with the design, development and testing of radio communications and electronic equipment.

Positions Held:

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

Electrical Engineer: Rogers Consulting Labs, Inc. 5 Years

Electrical Engineer: Rogers Labs, Inc. Current

Educational Background:

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

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

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

Scot D Rogers

Scot D. Rogers

Annex D FCC Site Registration Letter

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

June 18, 2008

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: June 18, 2008

Dear Sir or Madam:

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

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

Sincerely,

Phyllis Parrish
Industry Analyst

Annex E Industry Canada Site Registration Letter

Industry Canada Industrie Canada

July 29th, 2008

OUR FILE: 46405-3041
Submission No: 127059

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

Attention: Scot D. Rogers

Dear Sir/Madame:

The Bureau has received your application for the registration / 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 **(3040A-1).** Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please be informed that the Bureau is now utilizing a **new site numbering scheme** in order to simplify the electronic filing process. Our goal is to reduce the number of secondary codes associated to one particular company. The following changes have been made to your records.

Your primary code is: **3041**
The company number associated to the site(s) located at the above address is: **3041A**
The table below is a summary of the changes made to the unique site registration number(s):

New Site Number	Obsolete Site Number	Description of Site	Expiry Date (YYYY-MM-DD)
3041A-1	3041-1	3 / 10m OATS	2010-07-29

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 shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 meter OATS or 3 meter 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;

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,

S. Proulx Wireless Laboratory
Manager Certification and
Engineering Bureau Industry Canada
3701 Carling Ave., Building 94
Ottawa, Ontario K2H 8S2
Canada

Canada