SUBMITTAL APPLICATION REPORT

FOR

FCC And INDUSTRY CANADA GRANT OF CERTIFICATION

FOR

Model: IFBT4E
Wireless Microphone Transmitter

FCC ID: DBZIFBT4E
IC: 8024A-IFBT4E

FOR

LECTROSONICS, INC.

581 Laser Road
Rio Rancho, NM 87124

Test Report Number: 090127

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 74H and Industry Canada, RSS-123
Wireless Microphone Transmitter

For

LECTROSONICS, INC.
581 Laser Road
Rio Rancho, NM 87124

Larry Fisher
Vice President of Engineering

Model: IFBT4E

Frequency Range 470.1-537.5 MHz
FCC ID#: DBZIFBT4E
IC: 8024A-IFBT4E

Test Date: January 27, 2009

Certifying Engineer:

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

Table of Contents

Forward

In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2008, Part 2 Subpart J, Paragraphs 2.907, 2.911, 2.925, 2.926, 2.1031 through 2.1057 and; Part 74 Subpart H; Paragraphs 74.801 through 74.861 and Industry Canada standard RSS-123 the following report is submitted.

Name of Applicant:

LECTROSONICS, INC.
581 Laser Road
Rio Rancho, NM 87124

Model: IFBT4E

FCC I.D.: DBZIFBT4E IC: 8024A-IFBT4E

Frequency Range: 470.1-537.5 MHz

Operating Power: 250 milliwatts antenna conducted

Opinion / Interpretation of Results

Tests Performed	Results
Emissions Tests	
Requirements per CFR47 paragraphs 2 2.1031-2.1057	Complies
Emissions as per CFR47 paragraphs 2 and 15.207	Complies
Emissions as per CFR47 paragraphs 2 and 74H, and RSS-123	Complies
Emissions as per CFR47 paragraphs 2 and 15.107	Complies

Environmental Conditions

Ambient Temperature 19.7° C

Relative Humidity 13%

Atmospheric Pressure 1024.0 mb

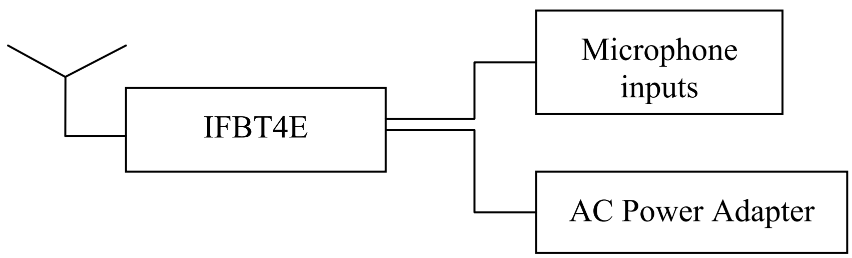
Equipment Tested

Equipment	Model	FCC ID	IC
EUT	IFBT4E	DBZIFBT4E	8024A-IFBT4E
AC Charger	CH20	N/A	N/A

Equipment Function

The IFBT4E transmitter systems are designed for use in broadcast and motion picture production to provide high quality monaural audio for communications. EUT is a 470.1-537.5 MHz radio transmitter used to provide wireless communications. The equipment was tested for compliance while operating through all normal modes available. These configurations represented the worst-case emissions profile for the equipment and results are recorded in this report. The equipment operates from external AC power supplied from the manufacturer supplied AC power adapter.

Equipment Configuration



CFR47, 2.1033(C), Application for Certification

(1) The full name and mailing address of the manufacturer of the device and the applicant for certification.

Lectrosonics, Inc.
581 Laser Road
Rio Rancho, NM 87124

(2) FCC identifier. DBZIFBT4E IC: 8024A-IFBT4E

(3) A copy of the installation and operating instructions to be furnished the user. Refer to the instruction manual furnished with this application for details.

(4) Type or types of emissions: 180KF3E

(5) Frequency range of operation: 470.1-537.5 MHz

(6) Range of operating power values or specific operating power levels, and description of any means provided for variation of operating power. The output power is factory set to 250 mW (nominal). The EUT has no provision for operator variation of the output power.

(7) Maximum power rating as defined in the applicable part(s) of the rules. As stated in CFR47, 74.861(e)(ii), the maximum permissible output power allowed is 250 mW.

(8) The dc voltages applied to and dc currents into the several elements of the final radio frequency amplifying device for normal operation over the power range. The IFBT4E model final amplification stage runs at 4.84 volts with 0.125 amps current for a power requirement of 605 mW.

(9) Tune up procedure over the power range, or at specific operating power levels. Refer to the tune-up procedure furnished with this application for details.

(10) A schematic diagram and a description of all circuitry and devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation, and for limiting power. Refer to the schematics furnished with this

application for details.

(11) A photograph or drawing of the equipment identification plate or label shows the information to be placed thereon. Refer to the identification label information furnished with this application for details.

(12) Photographs (8" x 10") of the equipment of sufficient clarity to reveal equipment construction and layout, including meters, if any, and labels for controls and meters and sufficient views of the internal construction to define component placement and chassis assembly. Insofar as these requirements are met by photographs or drawings contained in instruction manuals supplied with the certification request, additional photographs are necessary only to complete the required showing. Refer to the exhibits of this report and or additional information furnished with the application for details.

(13) For equipment employing digital modulation techniques, a detailed description of the modulation system to be used, including the response characteristics (frequency, phase, and amplitude) of any filters provided, and a description of the modulating wave train, shall be submitted for the maximum rated conditions under which the equipment will be operated. The unit does not use digital modulation. This design utilizes digital processing shaping the audio before transmission, and then converts it back to analog audio before transmission.

(14) The data required by Sections 2.1046 through 2.1057, inclusive, measured in accordance with the procedures set out in Section 2.1041.

(15) The application for certification of an external radio frequency power amplifier under Part 97 of this chapter need not be accompanied by the data required by Paragraph (b)(14) of this section. In lieu thereof, measurements shall be submitted to show compliance with the technical specifications in Subpart C of Part 97 of this chapter and such information as required by Section 2.1060 of this part. This paragraph does not apply to this equipment.

(16) An application for certification of an AM broadcast stereophonic exciter generator intended for interfacing with existing certified, or formerly type accepted or notified transmitters must include measurements made on a complete stereophonic transmitter. The instruction book must include complete specifications and circuit requirements for interconnecting with existing transmitters. The instruction book must also provide a full description of the equipment and measurement procedures to monitor modulation and to verify that the combination of stereo exciter generator and transmitter meets the emission limitations of section 73.44. This paragraph does not apply to this equipment.

(17) A single application may be filed for a composite system that incorporates devices subject to certification under multiple rule parts; however, the appropriate fee must be included for each device. Separate applications must be filed if different FCC Identifiers will be used for each device.

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 paragraphs of Part 74H and RSS-123 the following is submitted for consideration in obtaining a Grant of Certification. Test procedures used are the established Methods of Measurement of Radio-Noise Emissions as described in ANSI 63.4-2003 and TIA/EIA 603. This equipment was tested for compliance with CFR47, Industry Canada and other regulatory agencies.

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 intentional 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.

Units of Measurements

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

Test Site Locations

Conducted EMI	The AC power line conducted emissions testing was 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

NVLAP Accreditation 200087-0

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 annex 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	2/08	2/09
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

2.1046 Radio Frequency Power Output

Measurements Required

Measurements shall be made to establish the radio frequency power delivered by the transmitter into the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted below. If the power output is adjustable, measurements shall be made for the highest and lowest power levels.

Test Arrangement

The radio frequency power output was measured at the antenna terminal by replacing the antenna with a spectrum analyzer and short coaxial cable. The spectrum analyzer had an impedance of 50Ω to match the impedance of the standard antenna. A HP 8591EM Spectrum Analyzer was used to measure the radio frequency power at the antenna port. The data was taken in dBm and converted to watts as shown in the following Table. Data was taken per Paragraph 2.1046(a) and applicable parts of paragraph 74 and RSS-123.

P_{dBm} = power in dB above 1 milliwatt.
Milliwatts = $10^{(PdBm/10)}$
Watts = (Milliwatts)(0.001)(W/mW)

24.0 dBm = $10^{(24.0/10)}$
= 250 mW
= 0.25 Watts

Power Output Results

Frequency	P(dBm)	P(mw)	P(w)
470.1	24.0	250	0.25
500.0	24.0	250	0.25
537.5	24.0	250	0.25

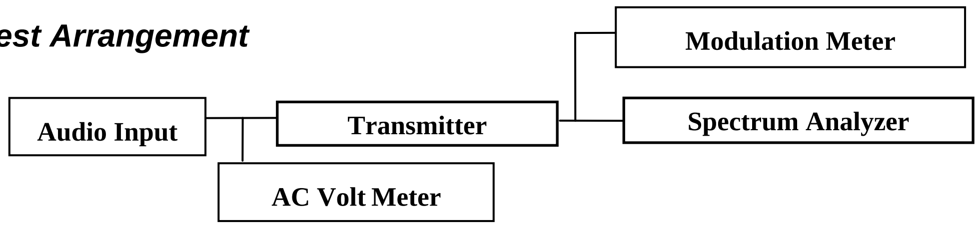
The testing procedures used conform to the procedures stated in the TIA/EIA-603 document. The specifications of Paragraph 2.1046(a) and applicable Parts of 74H and RSS-123 are met. There are no deviations to the specifications.

2.1047 Modulation Characteristics

Measurements Required

A curve or equivalent data, which shows that the equipment will meet the modulation requirements of the rules, under which the equipment is to be licensed, shall be submitted.

Test Arrangement



The radio frequency output was coupled to a HP Spectrum Analyzer and a modulation meter. The spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operating in its various modes. The modulation meter was used to measure the frequency deviation.

Modulation Characteristics Results

Figure 1 displays the graph made showing the audio frequency response of the modulator. The frequency generator was set to 1 kHz and injected into the audio input port of the EUT. The amplitude was adjusted to obtain 50% modulation at 1000 Hz. This level was then taken as the 0-dB reference. The frequency of the generator was then varied and the output level recorded while holding the input levels constant.

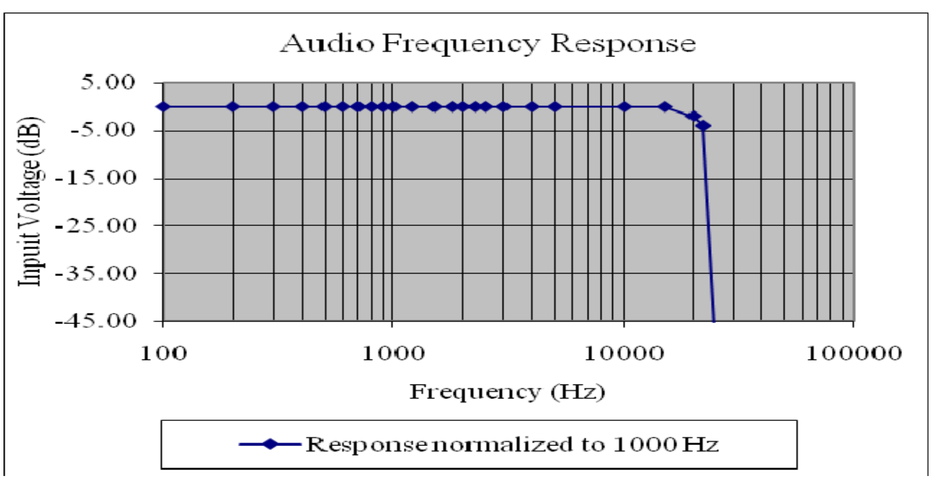


Figure one Audio Frequency Response Characteristics

Figure 2 shows the frequency deviation response for each of eight frequencies while the input voltage was varied. The frequency was held constant and the frequency deviation read from the deviation meter.

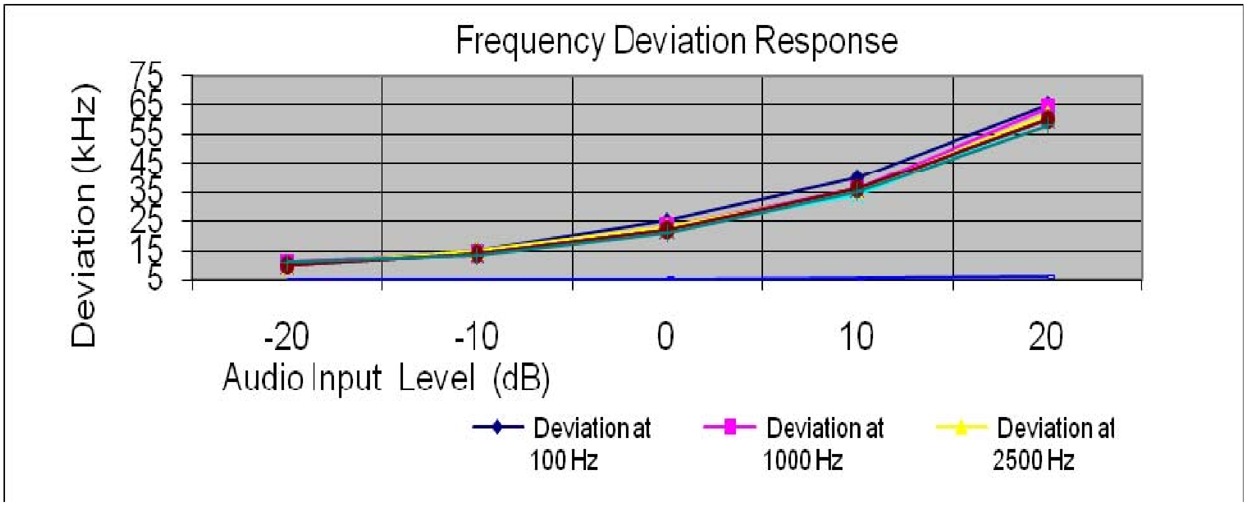


Figure two Frequency Deviation Characteristics

Figure 3 shows the frequency response of the audio low pass filter.

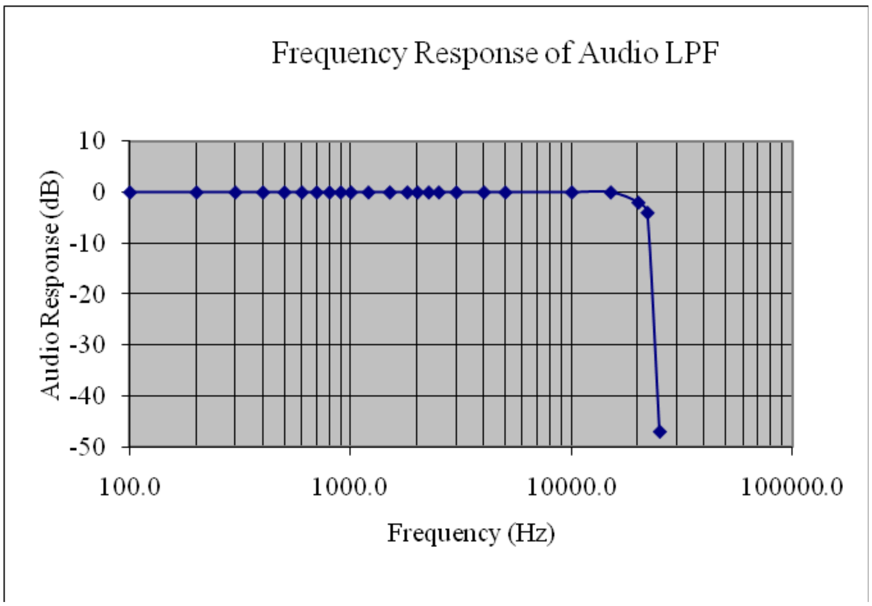


Figure three frequency response of low pass filter

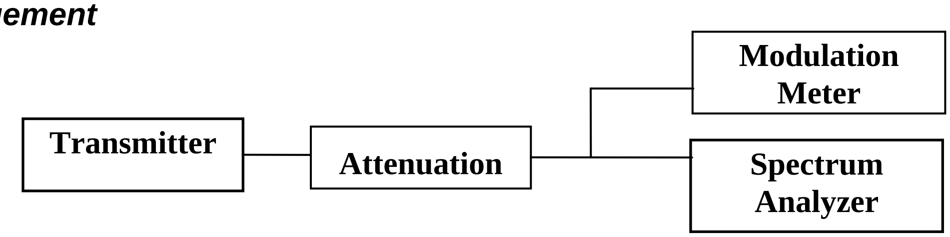
The specifications of Paragraph 2.1047 and applicable parts of 74H and RSS-123 are met.

2.1049 Occupied Bandwidth

Measurements Required

The occupied bandwidth, that is the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers radiated are equal to 0.5 percent of the total mean power radiated by a given emission.

Test Arrangement



Occupied Bandwidth Results

Frequency (MHz)	Measured Occupied Bandwidth (kHz)
470.1	172.5
500.0	179.5
537.5	174.5

A spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operating through all normal modes, modulated by a frequency of 2500 Hz and again at 21,000 Hz at a level 16 dB above 50% modulation. The power ratio in dB representing 99.5% of the total mean power was recorded from the spectrum analyzer.

The necessary bandwidth calculation for sound broadcasting equipment was as follows:

BN = 2M + 2Dk (k=1), M=15,000, and D=75,000

BN = 2(15,000) + 2(75,000)(1)

BN = 180.0 kHz Then BN equates to 180k

Refer to figures 4 and 5 for plots of 99.5% power. Requirements of 2.1049(c)(1) and applicable paragraphs of Part 74H and RSS-123 are met. There are no deviations to the specifications.

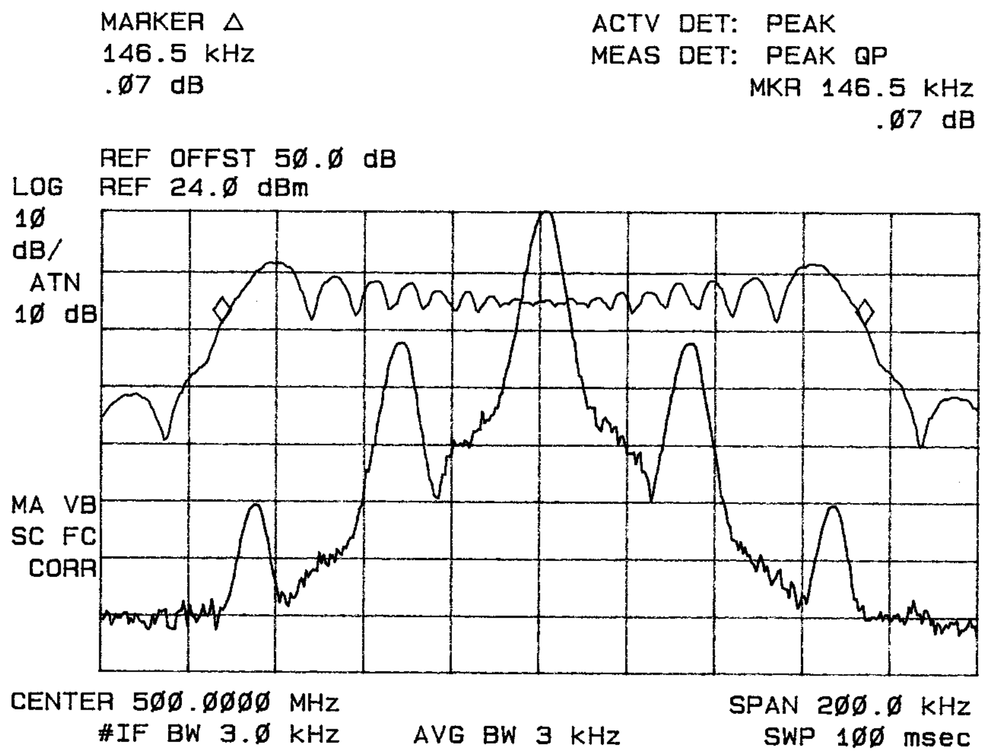


Figure four Occupied Band (with 2500 Hz input)

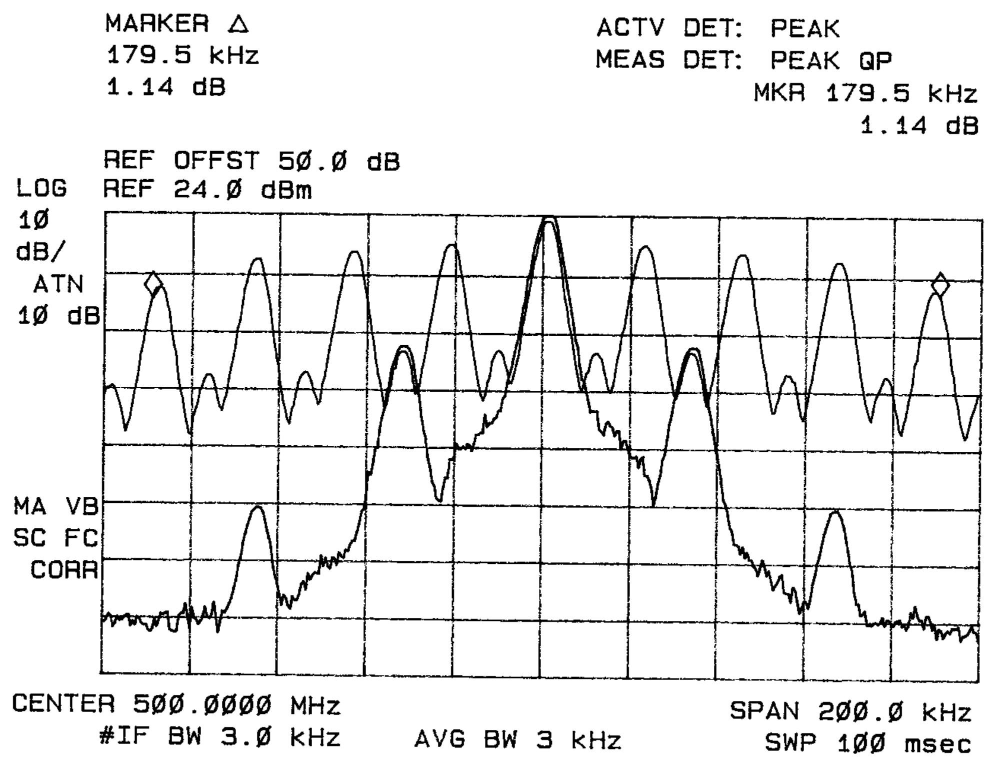


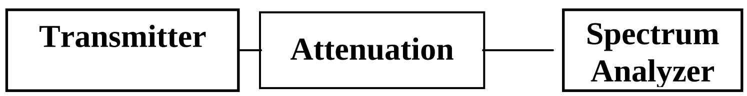
Figure five Occupied Band (maximum modulation)

2.1051 Spurious Emissions at Antenna Terminals

Measurements Required

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

Test Arrangement



The radio frequency output was coupled to a Spectrum Analyzer for antenna spurious emissions testing. The spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operated in a normal mode. The frequency spectrum from 30 MHz to 6.0 GHz was observed and plots produced of the frequency spectrum. Figures 6 and 7 represents antenna conducted emissions data for the IFBT4E. Data was taken per 2.1051, 2.1057, and applicable paragraphs of Part 74H and RSS-123.

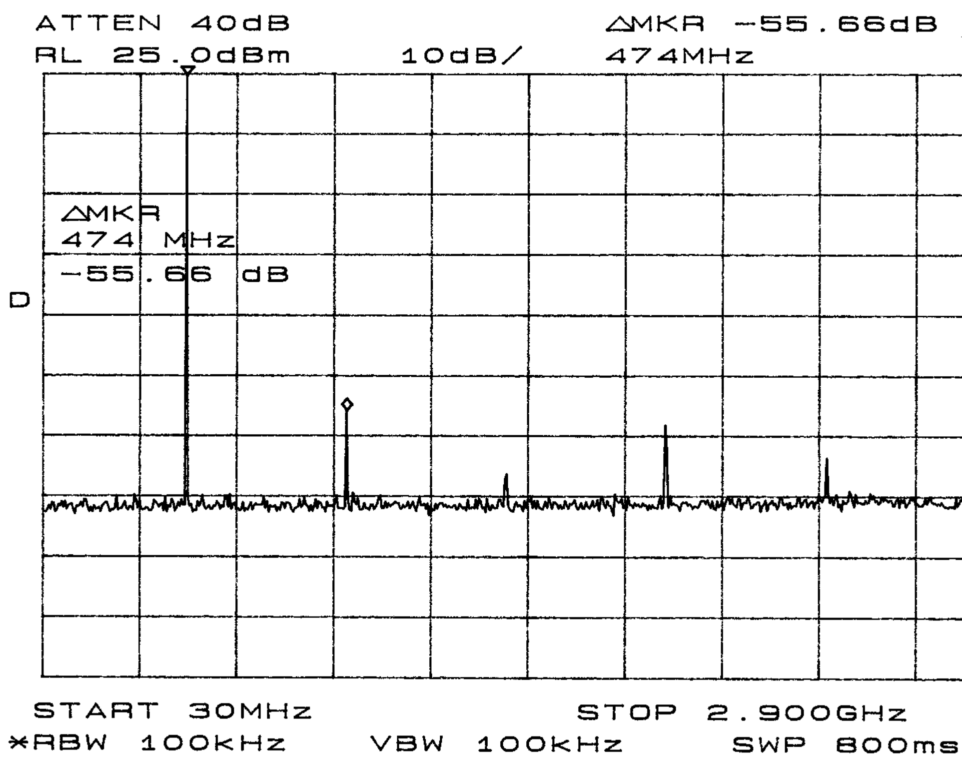


Figure six Emissions at Antenna Terminal

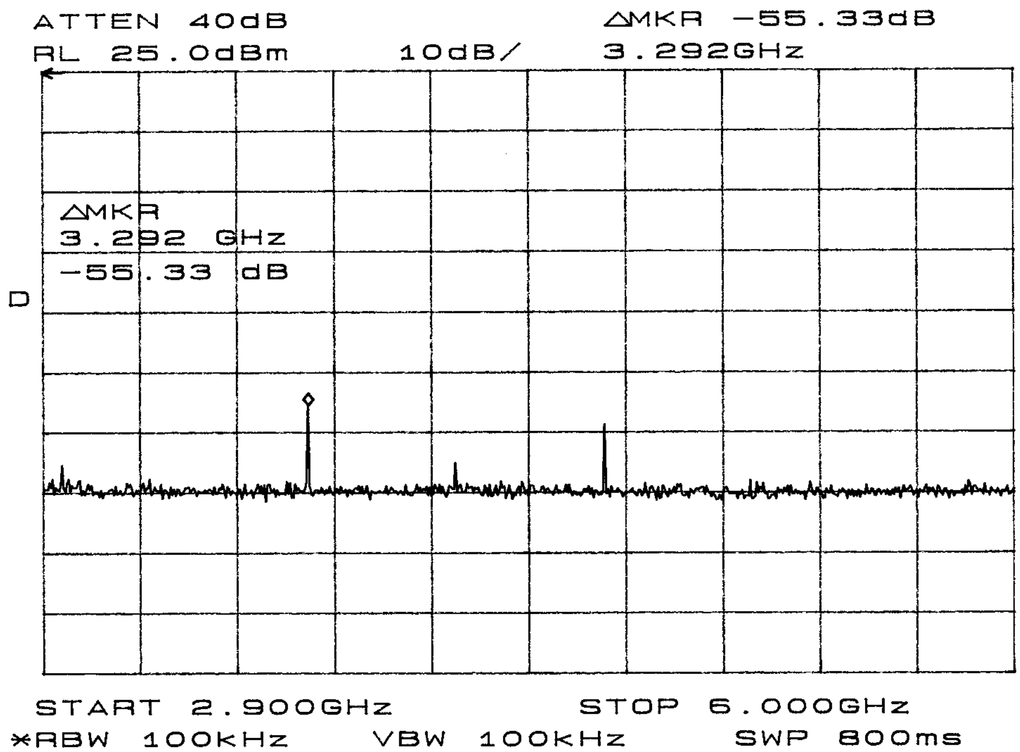


Figure seven Emissions at Antenna Terminal

Spurious Emissions at Antenna Terminal Data and Results

The output of the unit was coupled to a HP Spectrum Analyzer and the frequency emissions were measured. Data was taken as per 2.1051 and applicable paragraphs of Parts 2 and 74H and RSS-123. Specifications of Paragraphs 2.1051, 2.1057 and applicable paragraphs of parts of 2 and 74H and RSS-123 are met. There are no deviations or exceptions to the specifications.

All spurious emissions must be attenuated at least 55+10log(Po) below the fundamental emission power level. The following equations represent the calculated attenuation levels for the equipment.

0.25 Watt = 55 + 10 LOG(Po)
= 55 + 10 LOG(0.250)
= 49.0

Output Power and Spurious Emissions at Antenna Terminal Results

Channel (MHz)	Spurious Freq. (MHz)	Measured (dBm)	Level Below Carrier (dB)
470.1	470.1	24.0	0.0
	940.2	-30.5	54.6
	1410.3	-43.7	67.8
	1880.4	-34.3	58.4
	2350.5	-41.0	65.1
	2820.6	-42.0	66.1
	3290.7	-46.3	70.4
	3760.8	-34.3	58.4
	4230.9	-43.0	67.1
	4701.0	-38.3	62.4
500.0	500.0	24.0	0.0
	1000.0	-33.0	57.0
	1500.0	-46.0	70.0
	2000.0	-54.0	78.0
	2500.0	-53.0	77.0
	3000.0	-44.6	68.6
	3500.0	-40.1	64.1
	4000.0	-46.7	70.7
	4500.0	-48.3	72.3
	5000.0	-51.7	75.7
537.5	537.5	24.0	0.0
	1075.0	-28.5	52.6
	1612.5	-46.3	70.4
	2150.0	-51.8	75.9
	2687.5	-41.2	65.3
	3225.0	-44.2	68.3
	3762.5	-48.0	72.1
	4300.0	-51.1	75.2
	4837.5	-42.6	66.7
	5375.0	-55.0	79.1

2.1053 Field Strength of Spurious Radiation

Measurements Required

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation.

Test Arrangement

The transmitter, with the 50-ohm load placed on the antenna terminal, was placed on a wooden turntable 0.8 meters above the ground plane located in the screen room for preliminary testing. Figures 8 through 11 represent preliminary data plots of the radiated spurious emissions of the IFBT4E at a 1-meter distance in the screen room. Compliance testing was performed on the OATS at a distance of 3-meters. The transmitter was placed on a wooden turntable 0.8 meters above the ground plane and at a distance of 3 meters from the FSM antenna. With the EUT radiating into a resistive 50 ohm load, the receiving antenna was raised and lowered from 1m to 4m to obtain the maximum reading of spurious radiation from the EUT on the spectrum analyzer. 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. The amplitude of each spurious emission was maximized by raising and lowering the FSM antenna, and rotating the turntable before final data was recorded. A Biconilog antenna was used for frequency measurements of 30 to 1000 MHz. A log periodic antenna was used for frequencies of 1000 MHz to 5 GHz and pyramidal horn antennas were used for frequencies of 5 GHz to 40 GHz. Emission levels were measured and recorded from the spectrum analyzer in dBm. The transmitter was then removed and replaced with a substitution antenna and signal generator. The signal from the generator was then adjusted such that the amplitude received was the same as that previously recorded for each frequency. This step was repeated for both horizontal and vertical polarizations. The power in dBm required to produce the desired signal level was then recorded from the signal generator. The power in dBm was then calculated by reducing the previous readings by the power loss in the cable and further corrected for the gain in the substitution antenna. 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, Reference 90910. The testing procedures used conform to the procedures stated in the TIA/EIA-603 document.

Limit = Amplitude of the spurious emission must be attenuated by this amount below the level of the fundamental. On any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth the signal must be attenuated at least 49.1 dB below the fundamental.

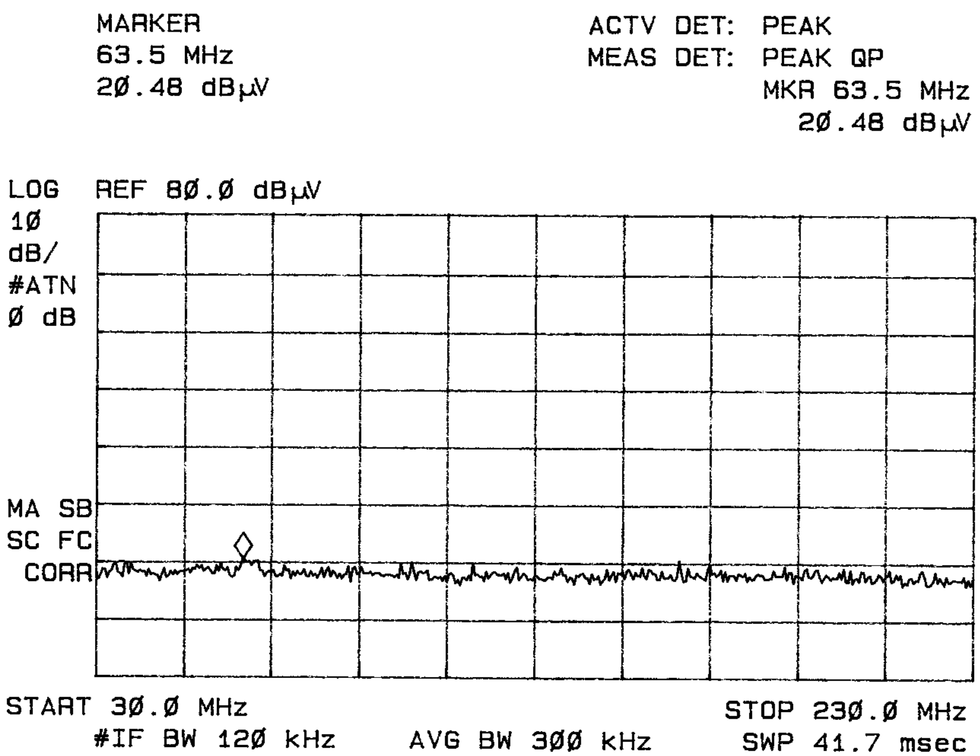


Figure eight Radiated Emissions taken at 1 meter in screen room

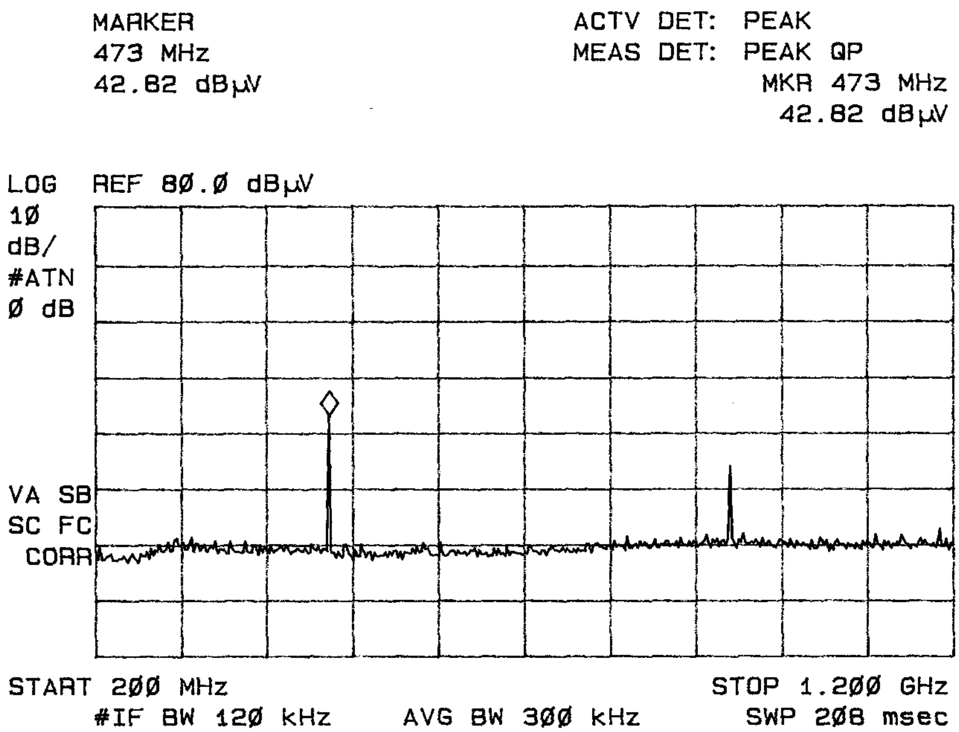


Figure nine Radiated Emissions taken at 1 meter in screen room

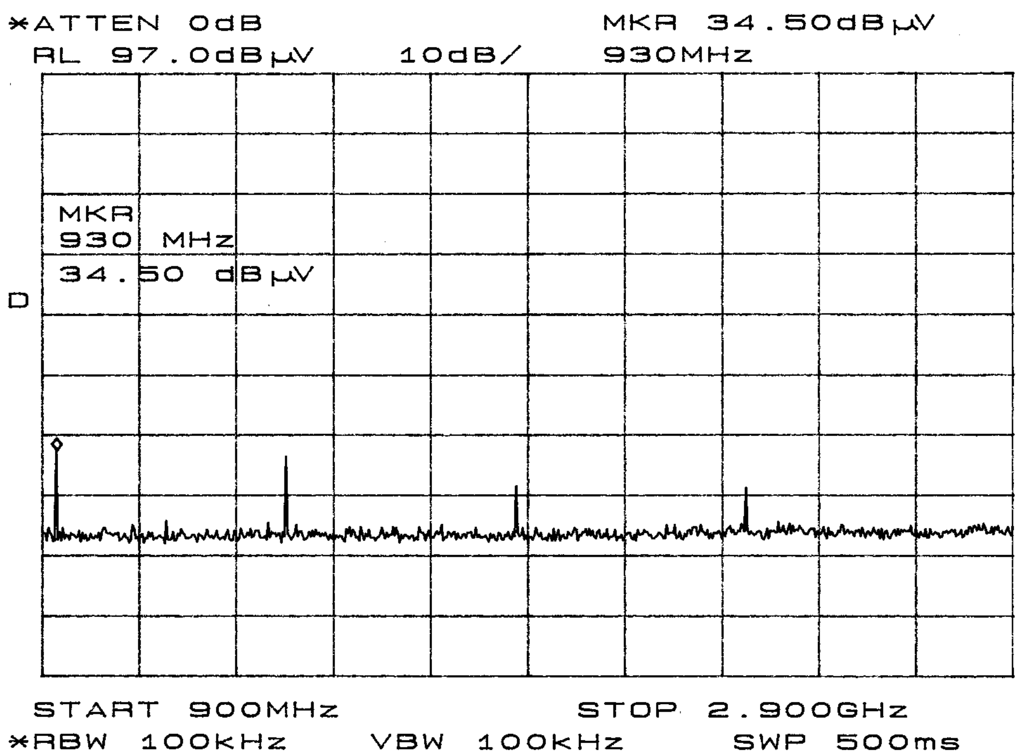


Figure ten Radiated Emissions taken at 1 meter in screen room

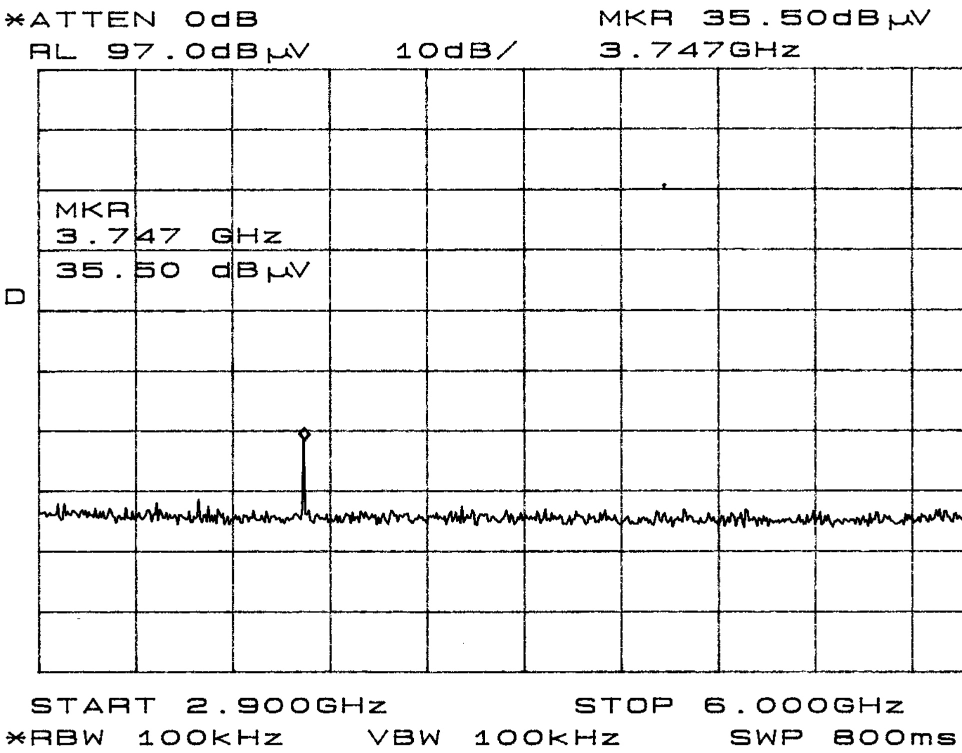


Figure eleven Radiated Emissions taken at 1 meter in screen room

Radiated Spurious Emissions Data and Results

The EUT was connected to a 50-ohm load and set to transmit at the desired frequency. The amplitude of each spurious emission was then maximized and recorded. The transmitter produces 0.250 watts of output power (24 dBm). Then the radiated spurious emission in dB is calculated from the following equation. Radiated spurious emission (dB) = RSE

RSE = 10 Log10[Tx power(W)/0.001] – signal level required to reproduce observed level

Example: For 0.250 Watt output power

RSE = 10 Log[0.25/0.001]-(-61.2) = 85.2 dBc

Channel frequency 470.1 MHz Radiated Spurious Emissions Results

Frequency of Emission	Amplitude of Spurious emission		Signal level to dipole required to reproduce		Emission level below carrier		Limit
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
(MHz)	dBμV	dBμV	dBm	dBm	dBc	dBc	dBc
940.2	36.6	46.7	-61.2	-51.6	85.3	75.7	49.1
1410.3	33.1	29.7	-59.9	-60.8	84.0	84.9	49.1
1880.4	26.5	27.0	-59.5	-60.6	83.6	84.7	49.1
2350.5	29.8	28.6	-54.9	-57.9	79.0	82.0	49.1
2820.6	22.2	24.2	-58.6	-56.0	82.7	80.1	49.1

Channel frequency 500.0 MHz Radiated Spurious Emissions Results

Frequency of Emission	Amplitude of Spurious emission		Signal level to dipole required to reproduce		Emission level below carrier		Limit
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
(MHz)	dBμV	dBμV	dBm	dBm	dBc	dBc	dBc
1000.0	37.8	47.4	-61.2	-53.0	85.3	77.1	49.1
1500.0	40.5	38.2	-55.1	-57.1	79.2	81.2	49.1
2000.0	36.2	39.1	-56.6	-53.8	80.7	77.9	49.1
2500.0	35.0	37.5	-52.8	-51.1	76.9	75.2	49.1
3000.0	29.5	33.1	-51.4	-50.7	75.5	74.8	49.1

Channel frequency 537.5 MHz Radiated Spurious Emissions Results

Frequency of Emission	Amplitude of Spurious emission		Signal level to dipole required to reproduce		Emission level below carrier		Limit
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical	
(MHz)	dBμV	dBμV	dBm	dBm	dBc	dBc	dBc
1075.0	49.8	48.6	-50.3	-51.7	74.4	75.8	49.1
1612.5	37.2	42.8	-57.2	-53.0	81.3	77.1	49.1
2150.0	40.6	43.5	-51.7	-49.4	75.8	73.5	49.1
2687.5	38.1	44.5	-49.7	-44.9	73.8	69.0	49.1
3225.0	27.0	29.0	-52.1	-52.2	76.2	76.3	49.1

All other spurious emissions measured were 20 db or more below the limit. The worst-case data is represented in this report. Specifications of Paragraph 2.1053, 2.1057, applicable paragraphs of parts 2, 74H and RSS-123 are met. There are no deviations to the specifications.

2.1055 Frequency Stability

Measurements Required

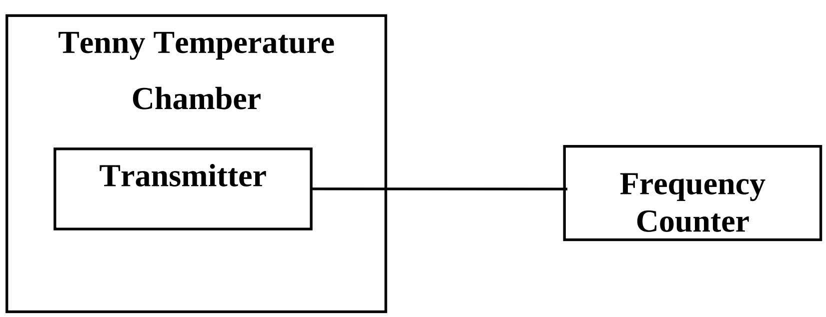
The frequency stability shall be measured with variations of ambient temperature from -30° to +50° centigrade. Measurements shall be made at the extremes of the temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. In addition to temperature stability, the frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, batteries powered equipment, reduce primary supply voltage to the battery-operating end point, which shall be specified by the manufacturer.

The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

Test Arrangement



The measurement procedure outlined below shall be followed:

(1) The transmitter shall be installed in an environmental test chamber whose temperature is controllable. Provision shall be made to measure the frequency of the transmitter.

(2) With the transmitter inoperative (power switched "OFF"), the temperature of the test

chamber shall be adjusted to +25°C. After a temperature stabilization period of one hour at +25°C, the transmitter shall be switched "ON" with standard test voltage applied.

(3) The carrier shall be keyed "ON", and the transmitter shall be operated unmodulated at full radio frequency power output at the duty cycle, for which it is rated, for duration of at least 5 minutes. The radio frequency carrier frequency shall be monitored and measurements shall be recorded.

(4) The test procedures outlined in Steps 2 and 3 shall be repeated after stabilizing the transmitter at the environmental temperatures specified, -30°C to 50°C in 10-degree increments.

The frequency stability was measured with variations in the power supply voltage from 85 to 115 percent of the nominal value. An AC power source was used to vary the AC voltage for the power input from 102 Vac to 138 Vac. The frequency was measured and the variation in parts per million was calculated. Data was taken per Paragraphs 2.1055 and applicable paragraphs of part 74H and RSS-123.

Frequency Stability Results

Frequency (MHz) 499.99913	Frequency Stability Vs Temperature In Parts Per Million (Ppm)								
Temperature	-30	-20	-10	0	10	20	30	40	50
Change(Hz)	3780.0	-230.0	-1370.0	-1770.0	-260.0	-1650.0	-520.0	-70.0	-110.0
PPM	7.560	-0.460	-2.740	-3.540	-0.520	-3.300	-1.040	-0.140	-0.220

Frequency 499.99913 MHz	Frequency Stability Vs Voltage Variation 120.0 volts nominal; Results In PPM Input Voltage		
	102.0 Vac	120.0 Vac	138.0 Vac
Change (Hz)	0.0	0.0	0.0

Specifications of Paragraphs 2.1055 and applicable paragraphs of part 74H and RSS-123 are met. There are no deviations to the specifications.

15.107 AC Line Conducted Emissions

The EUT operates using the manufacturer supplied AC power adapter. For testing purposes, the manufacturer supplied AC power adapter was used to power the EUT. 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 for the EUT 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 conducted emissions spectrum displayed by the spectrum analyzer. Plots were produced from 0.15 MHz to 30 MHz then data was recorded with maximum conducted emissions levels. Refer to figures 12 and 13 for plots of the conducted emissions.

Conducted Emissions Data per CFR47 15.107 (7 Highest Emissions)

Frequency band (MHz)	L1 Level (dBµV) Peak	Q.P.	AVE	L2 Level (dBµV) Peak	Q.P.	AVE	CISPR 22 Limit Q.P. Ave(dBµV)
0.15 – 0.5	46.7	36.5	19.0	44.6	36.8	19.2	66 – 56 / 56 - 46
0.5 – 5	28.4	21.9	14.3	25.6	20.1	15.8	56 / 46
5 – 10	23.0	16.1	9.8	20.8	16.4	10.1	60 / 50
10 – 15	20.4	15.8	9.6	20.3	15.7	9.5	60 / 50
15 – 20	20.2	15.7	9.4	20.2	15.7	9.5	60 / 50
20 – 25	20.5	15.7	9.4	19.8	15.6	9.4	60 / 50
25 – 30	20.9	15.6	9.3	21.2	15.5	9.2	60 / 50

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

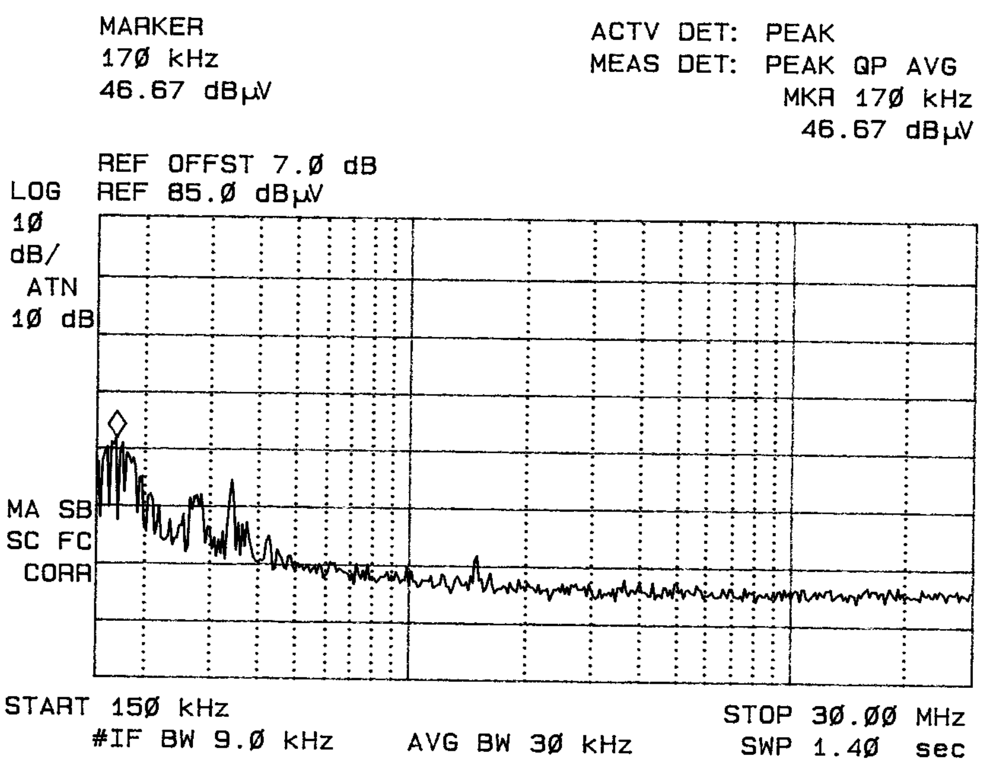


Figure twelve, AC power line conducted emissions Line L1.

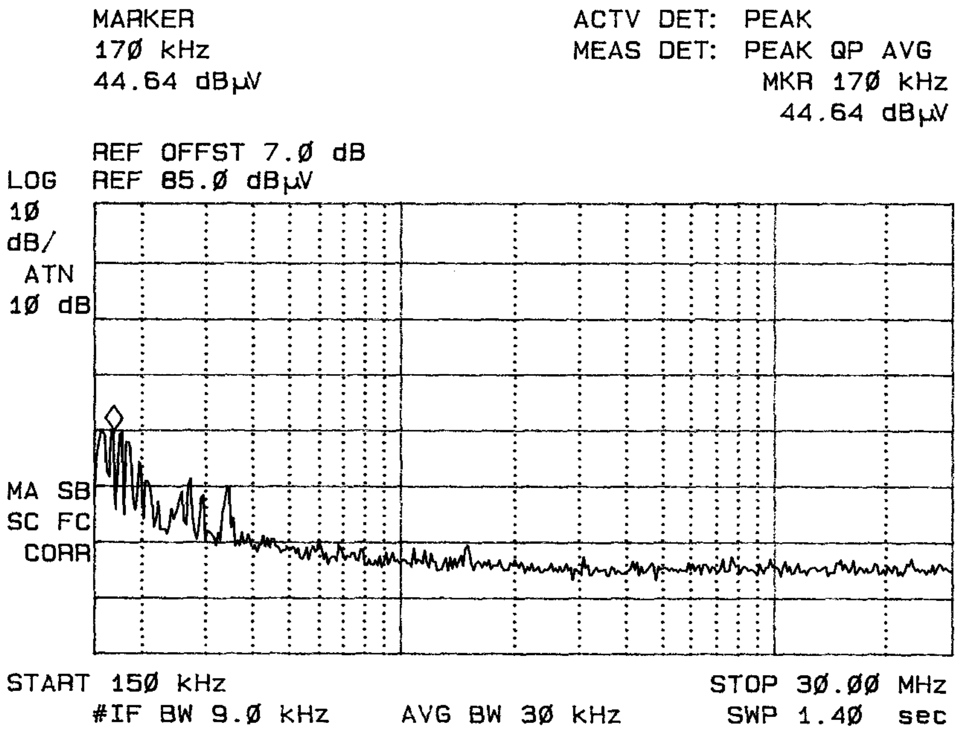


Figure thirteen, AC power line conducted emissions Line L2.

AC Line Conducted Emissions Results

The conducted emissions for the EUT meet the requirements for CISPR 22, CFR47 15B, ICES-003 Class B Devices. The EUT demonstrated a 29.2 dB minimum margin below the Quasi-Peak limit, and 31.7 dB minimum margin below the CISPR average limit. Measurements were taken using the peak, quasi peak, and average measurement function for each emissions amplitude and were below the limits stated in the specification. Other emissions were present with recorded data representing worst-case amplitudes.

Statement of Modifications and Deviations

No modifications to the EUT were required for the unit to demonstrate compliance with CFR47 Part 74H or RSS-123 emissions standards. There were no modifications, deviations or exceptions 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	2/08
Wattmeter: Bird 43 with Load Bird 8085	2/08
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/08
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/08
R.F. Generator: HP 606A	2/08
R.F. Generator: HP 8614A	2/08
R.F. Generator: HP 8640B	2/08
Spectrum Analyzer: HP 8562A,	5/08
Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	
HP Adapters: 11518, 11519, 11520	
Spectrum Analyzer: HP 8591EM	5/08
Frequency Counter: Leader LDC825	2/08
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	2/08
Antenna: C.D. B-101	2/08
Antenna: Solar 9229-1 & 9230-1	2/08
Antenna: EMCO 6509	2/08
Audio Oscillator: H.P. 201CD	2/08
R.F. Power Amp 65W Model: 470-A-1010	2/08
R.F. Power Amp 50W M185- 10-501	2/08
R.F. PreAmp CPPA-102	2/08
LISN 50 μHy/50 ohm/0.1 μf	10/08
LISN Compliance Eng. 240/20	2/08
LISN Fischer Custom Communications FCC-LISN-50-16-2-08	2/08
Peavey Power Amp Model: IPS 801	2/08
Power Amp A.R. Model: 10W 1010M7	2/08
Power Amp EIN Model: A301	2/08
ELGAR Model: 1751	2/08
ELGAR Model: TG 704A-3D	2/08
ESD Test Set 2010i	2/08
Fast Transient Burst Generator Model: EFT/B-101	2/08
Current Probe: Singer CP-105	2/08
Current Probe: Solar 9108-1N	2/08
Field Intensity Meter: EFM-018	2/08
KEYTEK Ecat Surge Generator	2/08
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