NVLAP Lab Code 200087-0

Application For
Grant of Certification

FOR

Model: **CFIP-24**

P/N I24FEE02L

Low Power Transmitter

FCC ID: W9Z-CFIP-24

FOR

SAF TEHNIKA AS

24a, Ganibu dambis

Riga Latvia LV-1005

Test Report Number 090626A

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

Test Report For Application Of Certification

For

SAF TEHNIKA AS

24a, Ganibu dambis
Riga Latvia LV-1005

Model: CFIP-24

P/N I24FEE02L

Low Power Transmitter

Frequency Range: 24,053.5 - 24,243.50 MHz

FCC ID: W9Z-CFIP-24

Test Report Number: 090626A

Test Date: May 28, 2009

Authorized Signatory: Scot D Rogers

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

Table Of Contents

Forward

The following information is submitted for consideration in obtaining Grant of Certification for low power intentional radiator per CFR47 Paragraph 15.249 Low Power Transmitter operation in the 24.0-24.25 GHz band.

Name of Applicant: SAF TEHNIKA AS
24a, Ganibu dambis
Riga Latvia LV-1005
Model: CFIP-24, P/N I24FEE02L

FCC ID: W9Z-CFIP-24

Frequency Range: 24,053.5 - 24,243.5 MHz

Operating Power: Less than 5 mW (as design specification, measured peak 105.9 dBµV/m @ 3 meters), for operation in the 24,053.5 - 24,243.5 MHz, Occupied band width 5,500 kHz, 9,300 kHz, or 25,500 kHz

Applicable Standards & Test Procedures

In accordance with the Federal Communications Commission, Code of Federal Regulations CFR47, dated October 1, 2008, Part 2, Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057, applicable parts of paragraph 15, Part 15C paragraph 15.249 the following information is submitted for consideration in obtaining grant of certification.

Test procedures used are the established Methods of Measurement of Radio-Noise Emissions as described in the ANSI 63.4-2003 Document.

Opinion / Interpretation of Results

Tests Performed	Results
Antenna requirement per CFR47 15.203	Complies
Radiated Emissions in Restricted Bands as per as per CFR47 15.205	Complies
Conducted Emissions CFR47 15.207	Complies
Radiated Emissions as per CFR47 15.209	Complies
Emissions per CFR47 15.249	Complies

Environmental Conditions

Ambient Temperature	25.5° C
Relative Humidity	38%
Atmospheric Pressure	1014.5 mb

Equipment Tested

Equipment	Serial Number	FCC I.D.#
CFIP-24 (EUT Low)	319190100021	W9Z-CFIP-24
CFIP-24 (EUT High)	313180100022	W9Z-CFIP-24
POE (Model:BT-CAT5-P1)	N/A	N/A
AC Adapter(CFIP-AC-PSU)	317740103076	N/A
CPU (Dell)	2574199693	N/A
Printer	B94C2121X	N/A

List of Test Equipment

A Hewlett Packard 8591EM and or 8562A Spectrum Analyzer was used as the measuring device for the emissions testing. The analyzer settings used are described in the following table. Refer to the annex for a complete list of Test Equipment.

HP 8591EM Spectrum Analyzer Settings		
Conducted Emissions		
RBW	AVG. BW	Detector Function
9 kHz	30 kHz	Peak/Quasi Peak
Radiated Emissions (30 – 1000 MHz)		
RBW	AVG. BW	Detector Function
120 kHz	300 kHz	Peak/Quasi Peak
HP 8562A Spectrum Analyzer Settings		
Radiated Emissions (1 – 40 GHz)		
RBW	AVG. BW	Detector Function
1 MHz	1 MHz	Peak/Average
Antenna Conducted Emissions		
RBW	AVG. BW	Detector Function
120 kHz	300 kHz	Peak

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

2.1033(b) Application for Certification

(1) Manufacturer: SAF TEHNIKA AS
24a, Ganibu dambis
Riga Latvia LV-1005

(2) Identification: FCC I.D.: W9Z-CFIP-24

(3) Copy of the installation and operating manual: Refer to exhibit for Draft Instruction Manual.

(4) Description of Circuit Functions, Device Operation: The CFIP-24 is a point to point communications system incorporating a low power Transmitter. This device features low power transmitter operation in communications frequency band of 24.0-24.25 GHz.

(5) Block Diagram with Frequencies: Refer to exhibit for the Block Diagram

(6) Report of measurements demonstrating compliance with the pertinent FCC technical requirements is provided in this report.

(7) Photographs of equipment are provided in application exhibits.

(8) Peripheral equipment or accessories for the equipment. Optional equipment available for the EUT includes AC power adapter and Power Over Ethernet (POE) adapter. The available configuration options were investigated for this and other reports in compliance to required standards with worst-case data presented.

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

(10) The equipment is not a scanning receiver.

(11) The equipment is not a transmitter operating in the 59-64 GHz frequency range.

Statement of Modifications and Deviations

No modifications to the EUT were required for the equipment to demonstrate compliance with the FCC CFR47 Part 15C Emissions Standards. There were no deviations to the specifications.

Equipment and Cable Configuration

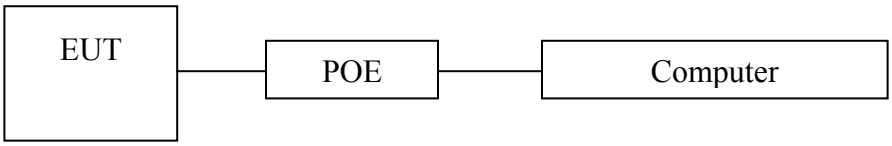
Test Setup

The CFIP-24 is a point to point transceiver offering high bandwidth and low power communications solution. The transmitter section allows for communications to other compliant devices. The EUT was arranged typical user equipment configurations for testing purposes. Two antenna options are available for the product, HAA2406_09 and HAA2403_09. The highest gain antenna (40 dBi) was used during testing. The antennas comply with requirements of CFR47 15.249, gain higher than 33 dBi and beam width less than 3.5 degrees. The transmitter offers no other interface connections than those in the configuration options shown below. The EUT is powered from externally provided power option as shown in configuration diagram. As requested by the manufacturer and required by regulations, the unit was tested for emissions compliance using the available configurations with the worst-case data presented. Test results in this report relate only to the products described in this report.

Equipment Function and Testing Procedures

The EUT is a low power point to point transmitter with operation capability in the 24.0-24.25 GHz frequency band (CFR47 15.249). The equipment offers communications to other 24.0-24.25 GHz compliant equipment. Two samples were offered for testing due to frequency band of operation. EUT (Sample #1) tunes lower frequencies and sample 2 tuned to higher frequencies (both required to cover frequency band of operation).

Configuration options for the EUT



AC Line Conducted Emission Test Procedure

Testing for the AC line-conducted emissions was performed as defined in sections 7.2.4 and 13 of ANSI C63.4. The test setup, including the EUT, was arranged in the test configurations as shown above 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. Refer to photographs in exhibits for EUT placement used during testing.

Radiated Emission Test Procedure

Testing for the radiated emissions was performed as defined in sections 8.3 and 13.1 of ANSI C63.4. The EUT was arranged in the test configurations as shown above and placed on a rotating 1 x 1.5-meter wooden platform 0.8 meters above the ground plane at a distance of 3 meters from the FSM antenna. EMI energy was maximized by equipment placement, raising and lowering the FSM antenna, changing the antenna polarization, and by rotating the turntable. Each emission was maximized before final data was taken using a spectrum analyzer. Refer to photographs in exhibits for EUT placement used during testing.

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.

Radiated Emissions Calculations:

Note: The limit is expressed for a measurement in dBμV/m when the measurement is taken at a distance of 3 meters. Data taken for this report was taken at a distance of 3 meters.

dBμV/m @ 3m = FSM(dBμV) + A.F.(dB/m) - Amp Gain(dB)
dBμV/m @ 3m = 16.3+ 23.0 – 0
= 39.3

Test Site Locations

Conducted EMI: Rogers Labs, Inc. located at 4405 W. 259th Terrace, Louisburg, KS.

Radiated EMI: The radiated emissions tests were performed at Rogers Labs, Inc. 3 meters Open Area Test Site (OATS) located at 4405 W. 259th Terrace, Louisburg, KS.

Site Approval: Refer to Annex for FCC Site Registration Letter, Reference 90910, Industry Canada Site Registration Reference 3041A-1

Subpart C - Intentional Radiators

As per CFR47 Part 15, Subpart C the following information is submitted for consideration in obtaining a grant of certification for unlicensed intentional radiators.

15.203 Antenna Requirements

The design utilizes a unique mount offering connection for approved antenna. The end product is marketed and sold for professional installation only. The antenna connection point complies with the unique antenna connection requirements. 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 the OATS. The EUT utilizes frequency, determining circuitry, which generates harmonics falling in the restricted bands. Emissions were investigated at the OATS, using appropriate antennas or pyramidal horns, amplification stages, and a spectrum analyzer. Peak and average amplitudes of frequencies above 1000 MHz were compared to the required limits with worst-case data presented below. Test procedures of ANSI 63.4-2003 paragraphs 13.1 and 8.3.1.2 were used during testing. No other significant emission was observed which fell into the restricted bands of operation. Computed emission values take into account the received radiated field strength, receive antenna correction factor, amplifier gain stage, and test system cable losses.

Radiated Emissions in Restricted Bands Data per 15.205

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)
24000.0	16.3	17.5	23.0	0	39.3	40.5	54.0
48107.0	17.8	17.7	23.0	0	40.8	40.7	54.0
48293.0	17.0	17.8	23.0	0	40.0	40.8	54.0
48487.0	17.5	18.0	23.0	0	40.5	41.0	54.0
72160.5	15.5	15.8	35.0	0	50.5	50.8	54.0
72439.5	14.5	15.0	35.0	0	49.5	50.0	54.0
72730.5	14.6	15.0	35.0	0	49.6	50.0	54.0
96214.0	13.5	14.0	39.8	0	53.3	53.8	54.0
96586.0	13.3	13.8	39.8	0	53.1	53.6	54.0
96974.0	13.9	14.0	39.8	0	53.7	53.8	54.0

Other emissions found in the restricted bands were at least 20 dB below the limits.

Summary of Results for Radiated Emissions in Restricted Bands 15.205

The EUT demonstrated compliance with the radiated emissions requirements of FCC CFR47 Part 15.205 restricted bands of operation. The EUT worst-case configuration demonstrated minimum margin of 0.2 dB below the FCC limits. Other emissions were present with amplitudes at least 20 dB below the required limits.

15.207 Conducted emissions limits; general requirements

AC Line Conducted EMI 15.207

The EUT was arranged in typical equipment configurations (AC power adapter). Testing was performed with the EUT 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. Testing for the line-conducted emissions were the procedures of ANSI 63.4-2003 paragraphs 13.1.3 and 7.2.4. The AC adapter for the EUT was connected to the LISN for line-conducted emissions testing. 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 was 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 frequencies of each of the emissions, which had the highest amplitudes. 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 data was recorded with maximum conducted emissions levels. Refer to Figures one and two showing plots of the worst-case AC Line conducted emissions frequency spectrum taken in the screen room.

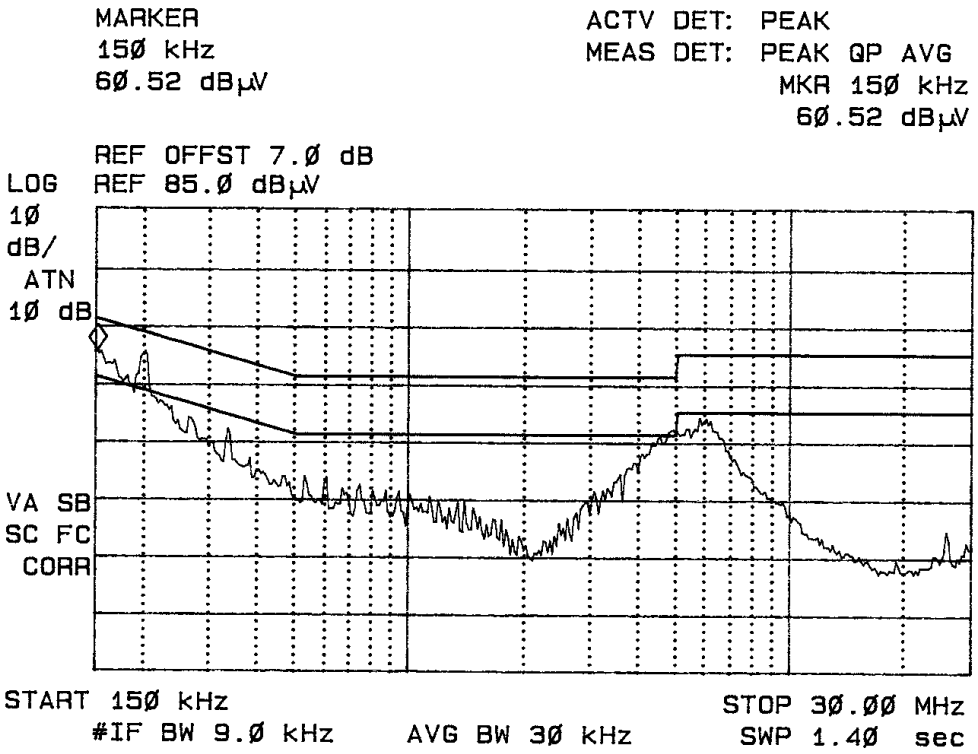


Figure One AC Line Conducted emissions of EUT line 1

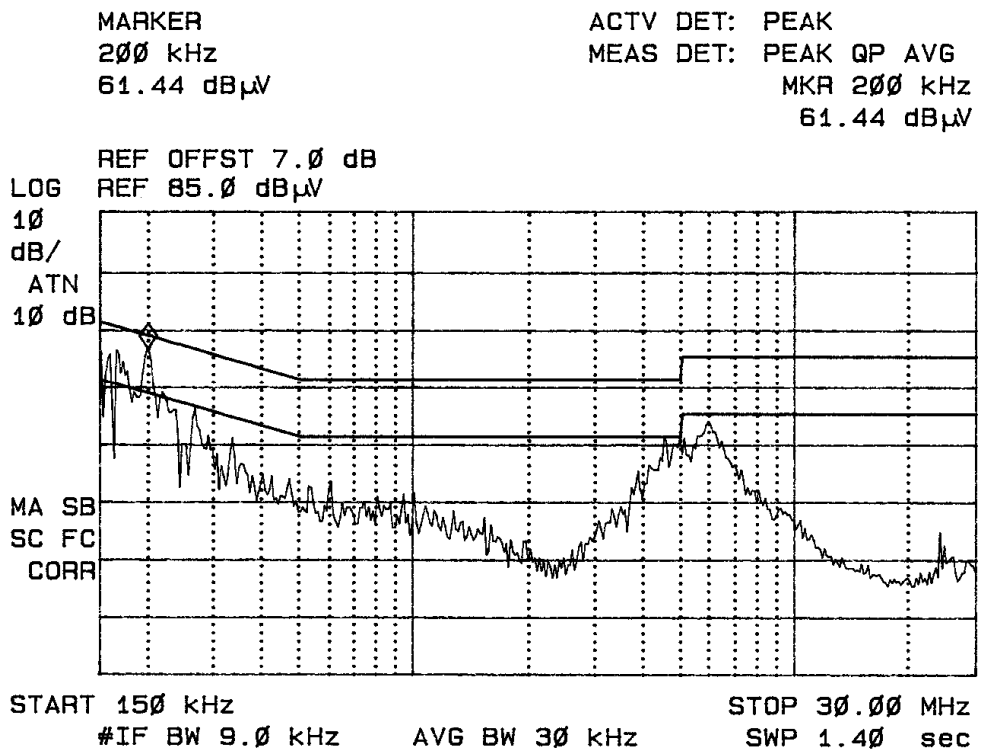


Figure Two AC Line Conducted emissions of EUT line 2

Data Conducted Emissions (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	60.5	53.2	48.4	61.4	53.3	48.9	66-56 / 56-46
0.5 – 5	56.3	53.4	45.1	55.5	53.0	45.8	56 / 46
5 – 10	45.0	41.7	37.9	45.1	42.7	40.0	60 / 50
10 – 15	27.9	23.9	17.9	31.9	27.9	22.4	60 / 50
15 – 20	24.1	19.8	13.6	23.3	18.5	12.3	60 / 50
20 – 25	27.6	18.2	10.7	23.8	19.6	11.2	60 / 50
25 – 30	23.7	18.5	10.8	27.8	19.2	11.2	60 / 50

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

Summary of Results for AC Line Conducted General Emissions 15.207

The EUT demonstrated compliance with the conducted emissions requirements of CFR47 Part 15C and other applicable standards for Intentional Radiators. The EUT worst-case configuration demonstrated minimum margin of 2.6 dB below the FCC/CISPR quasi peak limit, and 02 dB below the FCC/CISPR average limit. Other emissions were present with recorded data representing the worst-case amplitudes.

15.209 Radiated emissions limits; general requirements

General Radiated EMI per 15.209

The EUT was arranged in all typical equipment configurations 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 investigations were performed to identify the frequencies, which produced the highest emissions. Plots were made of the radiated emission frequency spectrum from 30 MHz to 110,000 MHz for preliminary transmitter testing. Refer to figures three through fourteen showing the worst-case radiated emission spectrum displayed on the spectrum analyzer taken in a screen room. The each radiated emission measured was then re-maximized at the OATS site before final radiated emissions measurements were performed. Final data was taken with the EUT located at the open field test site at a distance of 3 meters between the EUT and the receiving antenna. Test procedures of ANSI 63.4-2003 paragraphs 13.1 and 8.3.1.2 were used during radiated emissions testing. The frequency spectrum from 30 MHz to 110,000 MHz was searched for radiated emissions. Peak and average amplitudes of frequencies above 1000 MHz were compared to the required limits with worst-case data presented below. Measured emission levels were maximized by EUT placement on the table, changing cable location, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna polarization between horizontal and vertical. Antennas used were Broadband Biconical from 30 MHz to 200 MHz, Log Periodic from 200 MHz to 5 GHz, and/or Biconilog from 30 MHz to 1000 MHz, Double-Ridge horn and/or Pyramidal Horns from 5 GHz to 25 GHz, mixers above 25 GHz, and amplification stages.

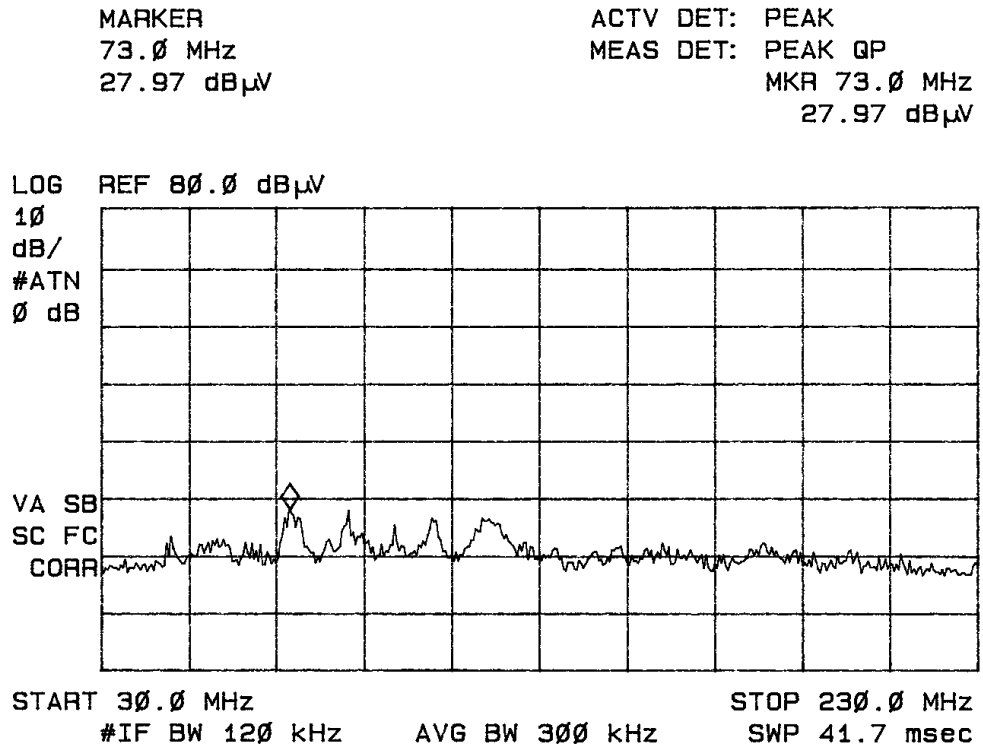


Figure Three Radiated Emissions in screen room

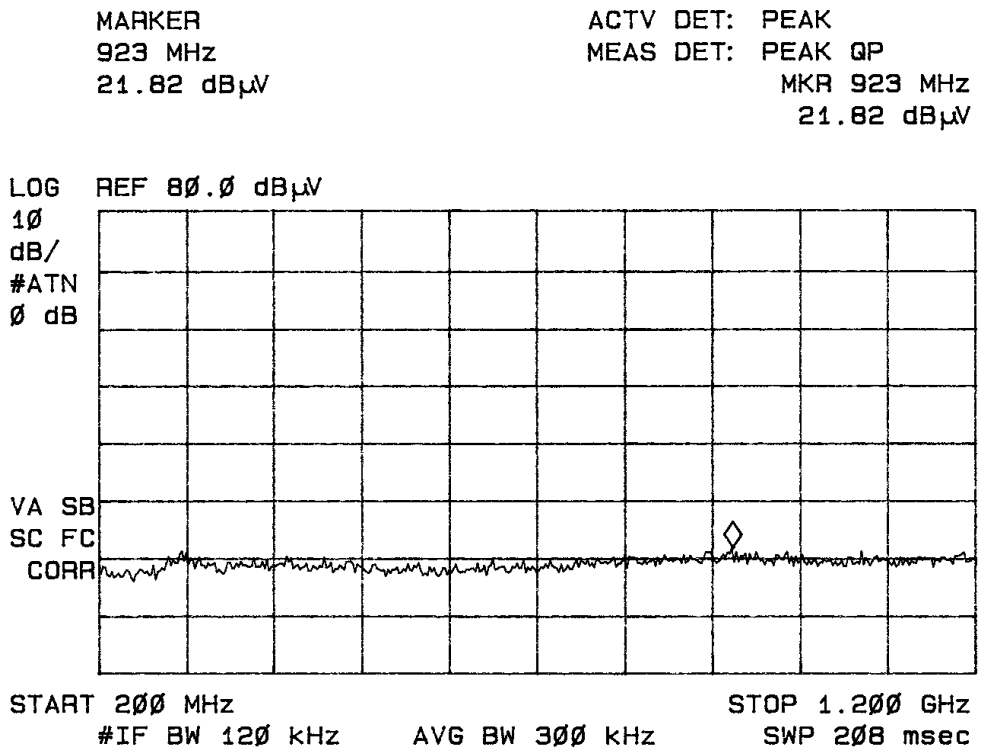


Figure four Radiated Emissions in screen room

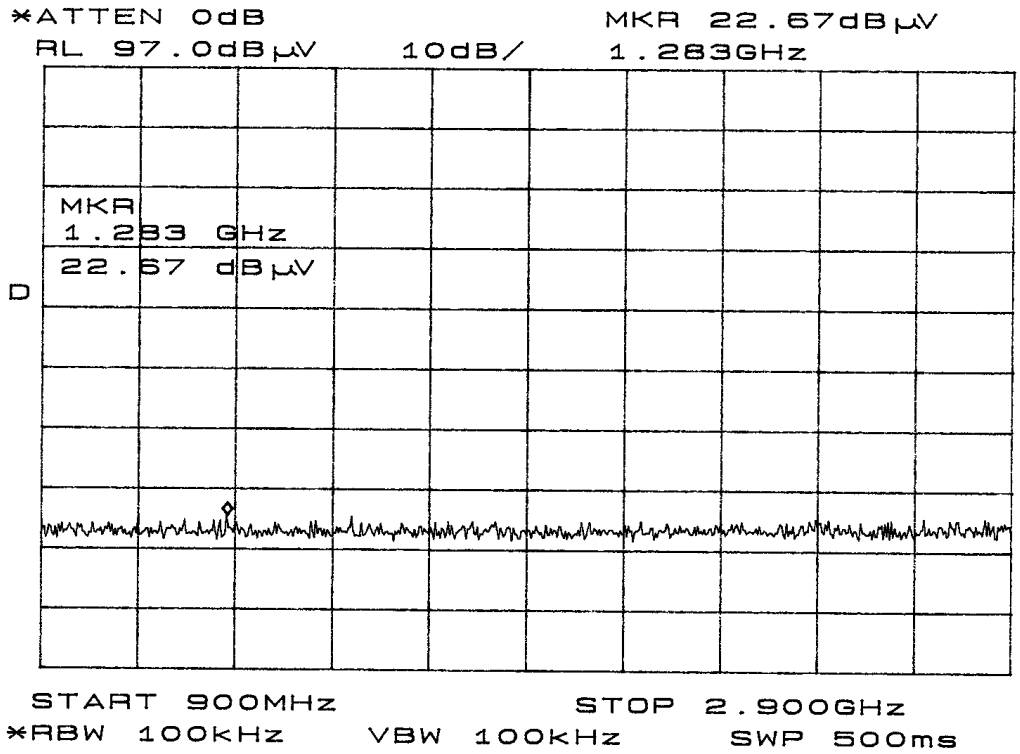


Figure Five Radiated Emissions in screen room

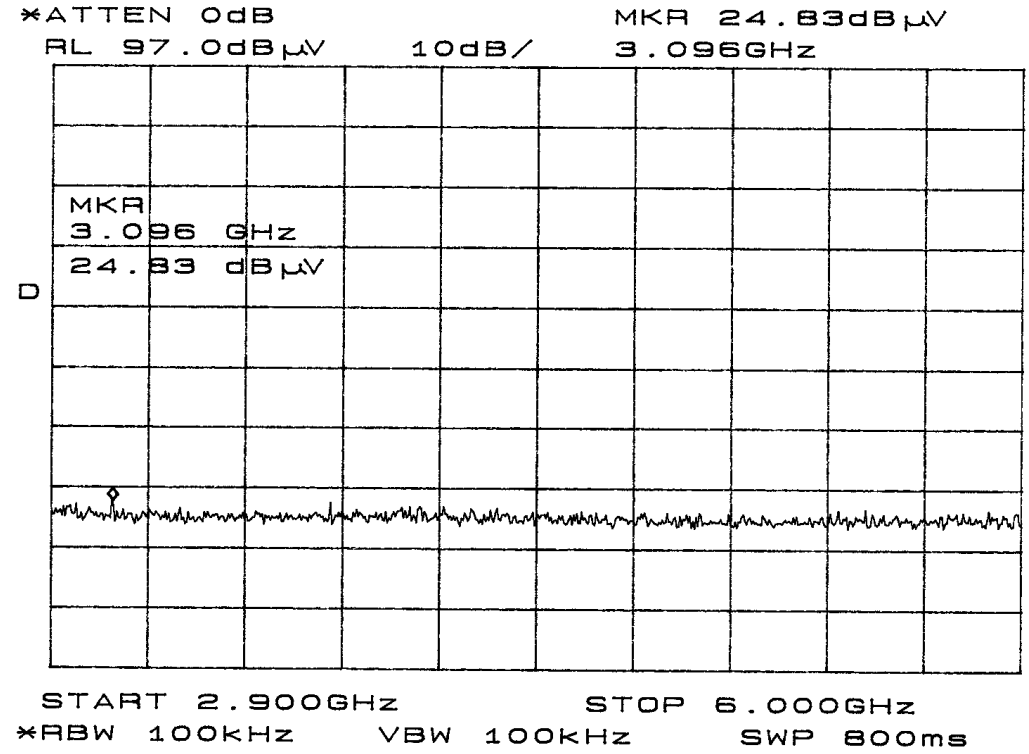


Figure Six Radiated Emissions in screen room

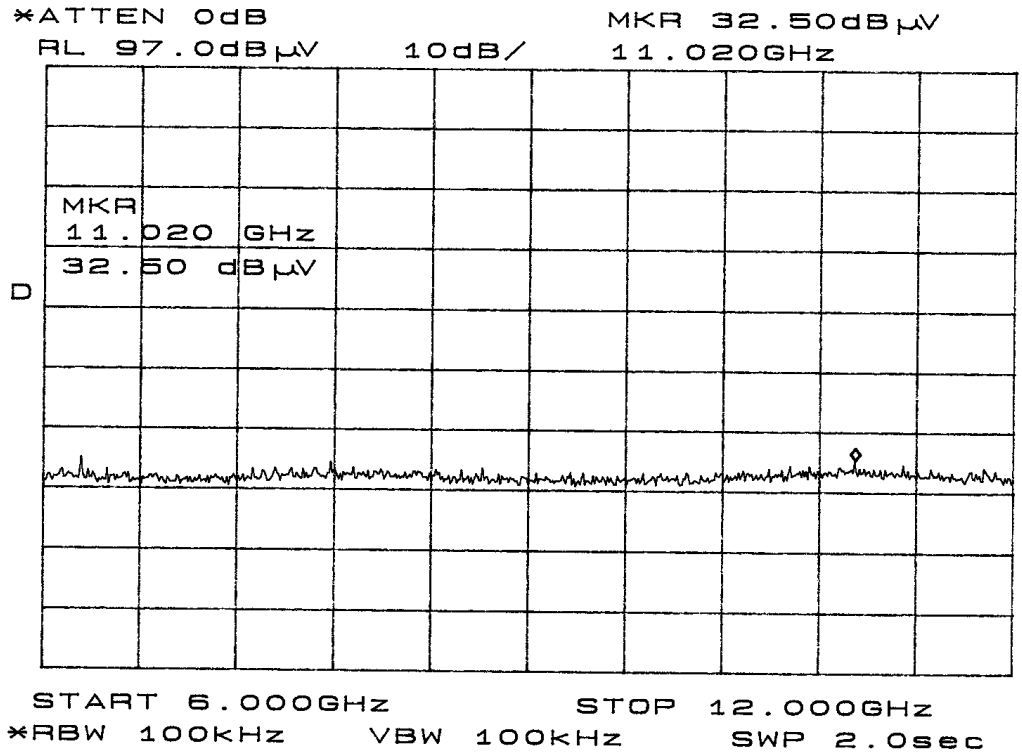


Figure Seven Radiated Emissions in screen room

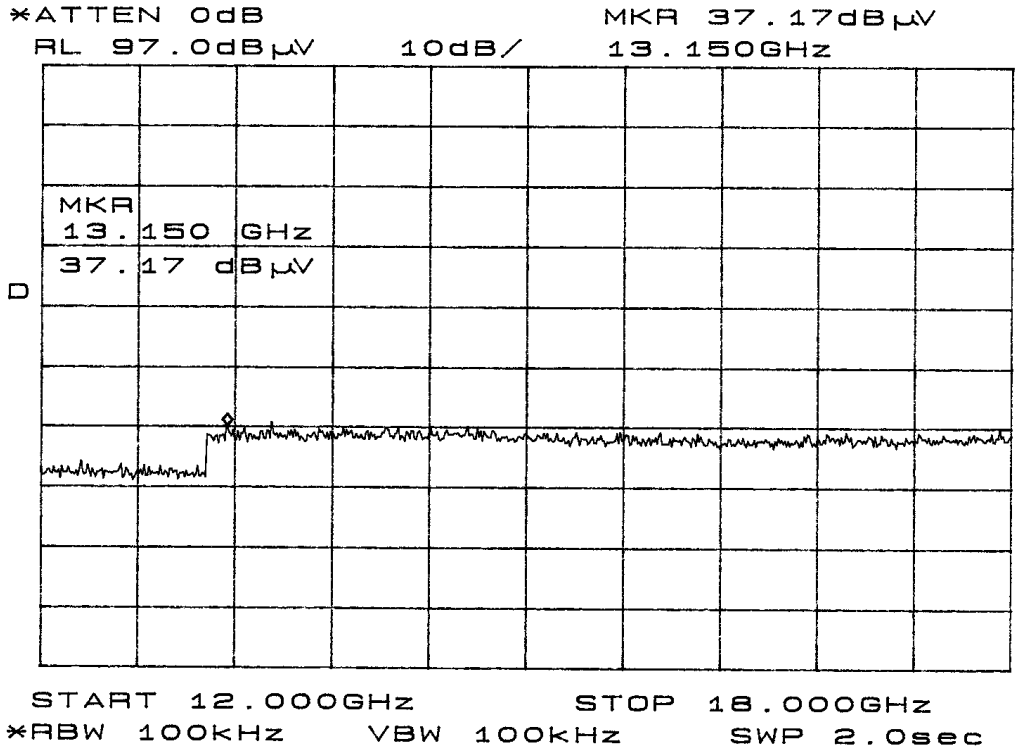


Figure Eight Radiated Emissions in screen room

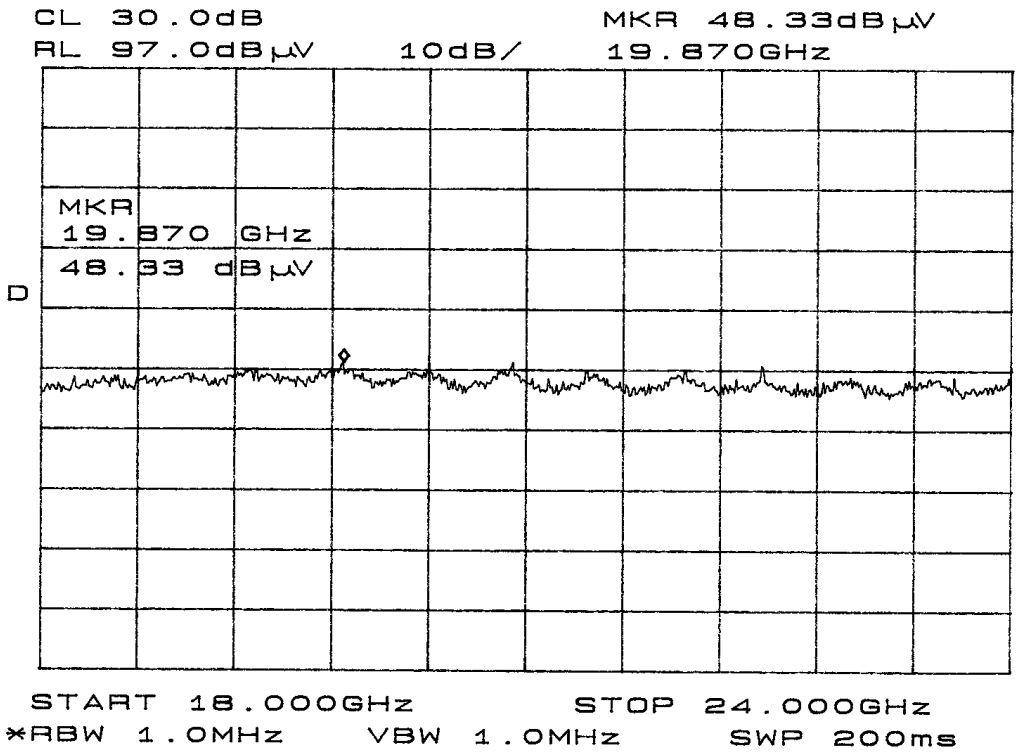


Figure Nine Radiated Emissions in screen room

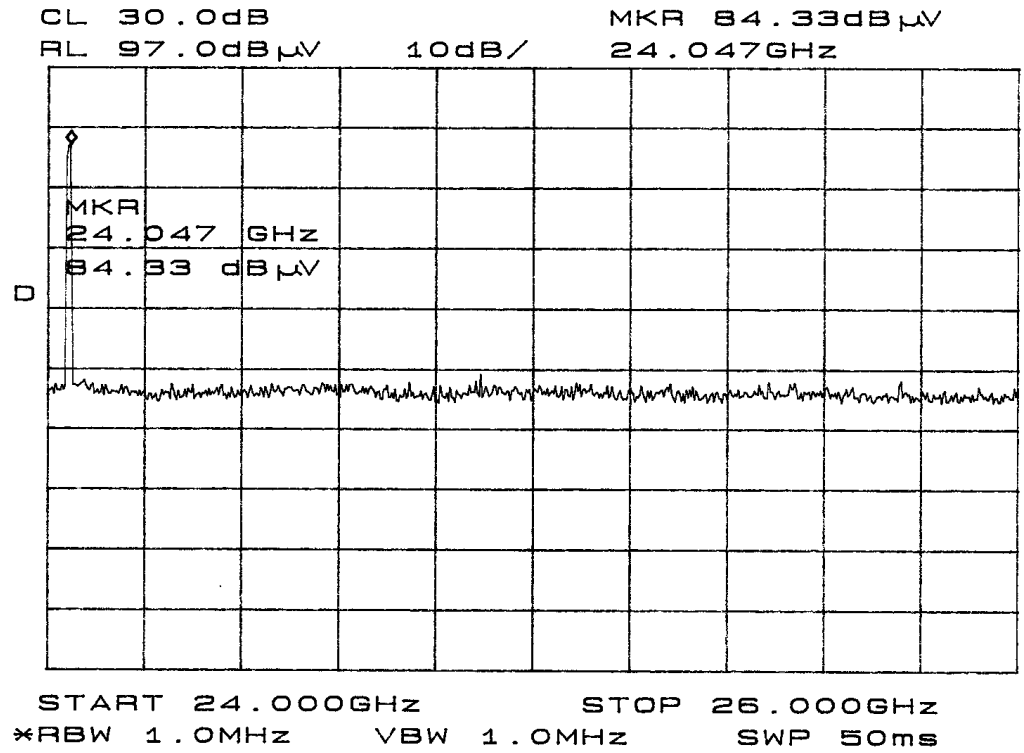


Figure Ten Radiated Emissions in screen room

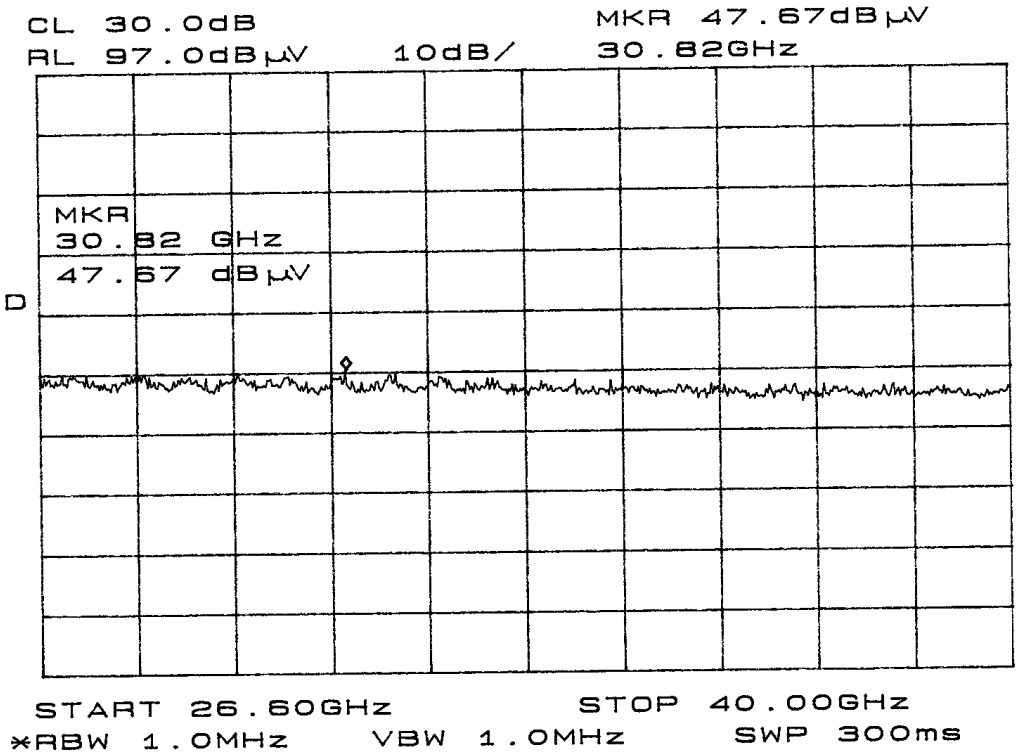


Figure Eleven Radiated Emissions in screen room

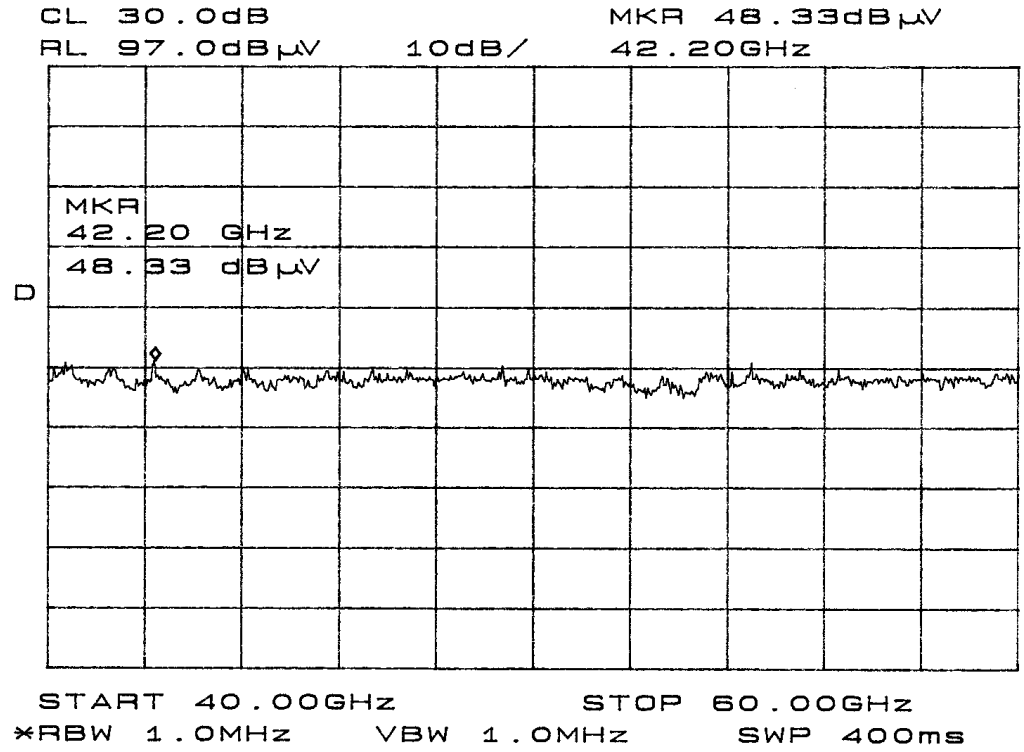


Figure Twelve Radiated Emissions in screen room

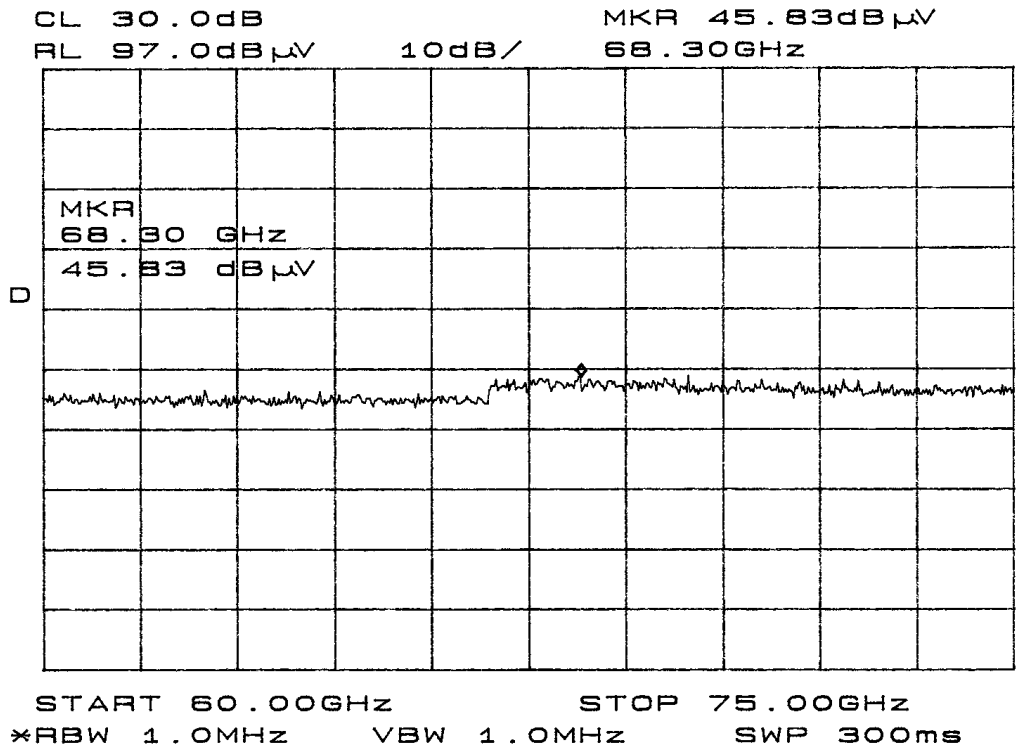


Figure Thirteen Radiated Emissions in screen room

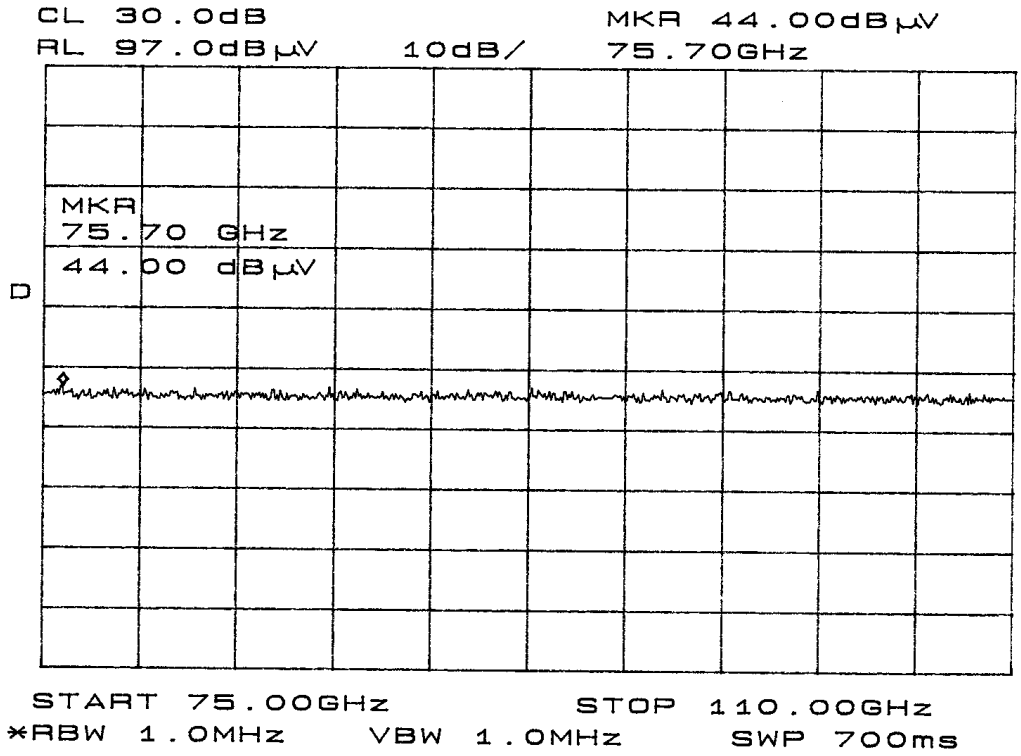


Figure Fourteen Radiated Emissions in screen room

General Radiated Emissions Data per 15.209

Emission Freq. (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)
73.7	41.0	42.4	7.7	30	18.7	20.1	40.0
85.6	42.0	41.0	7.6	30	19.6	18.6	40.0
86.0	41.9	41.3	7.6	30	19.5	18.9	40.0
88.9	40.4	42.5	7.6	30	18.0	20.1	40.0
105.5	45.1	48.5	7.0	30	22.1	25.5	43.5
117.1	42.3	48.5	7.1	30	19.4	25.6	43.5

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

Summary of Results for General Radiated Emissions per 15.209

The EUT demonstrated compliance with the radiated emissions requirements of FCC Part 15C, and other applicable standards for Intentional Radiators. The EUT worst-case configuration demonstrated minimum margin of 17.9 dB below the limits. Other emissions were present with amplitudes at least 20 dB below the Limits.

15.249 Operation in the Band 24.0-24.25 GHz

Requirements

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the provisions of this paragraph.

(b) Fixed, point-to-point operation as referred to in this paragraph shall be limited to systems employing a fixed transmitter transmitting to a fixed remote location. Point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information are not allowed. Fixed, point-to-point operation is permitted in the 24.05-24.25 GHz band subject to the following conditions:

(1) The field strength of emissions in this band shall not exceed 2500 millivolts/meter.

(2) The frequency tolerance of the carrier signal shall be maintained within ± 0.001% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(3) Antenna gain must be at least 33 dBi. Alternatively, the main lobe beamwidth must not exceed 3.5 degrees. The beamwidth limit shall apply to both the azimuth and elevation planes. At antenna gains over 33 dBi or beamwidths narrower than 3.5 degrees, power must be reduced to ensure that the field strength does not exceed 2500 millivolts/meter.

(c) Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency 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 Section 15.209, whichever is the lesser attenuation.

(e) As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

(f) Parties considering the manufacture, importation, marketing or operation of equipment under this section should also note the requirement in Section 15.37(d).

Testing and Compliance

The power output was measured on an open area test site @ 3 meters. Test procedures of ANSI 63.4-2003 paragraphs 13.1 and 8.3.1.2 were used during testing. The EUT 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 frequencies below 1000 MHz were measured using a spectrum analyzer. The peak and average amplitude of frequencies above 1000 MHZ were measured using a spectrum analyzer. The amplitude of the emission was then recorded from the analyzer display. Emissions radiated outside of the specified bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation. Refer to figures fifteen through eighteen demonstrating compliance with frequency and amplitude of emission requirements of 15.249. The amplitudes of each radiated emission were measured at the OATS at a distance of 3 meters from the FSM antenna. The amplitude of each radiated spurious emission was maximized by varying the FSM antenna height, polarization, and by rotating the turntable. A Biconilog Antenna was used for measuring emissions from 30 to 1000 MHz, a Log Periodic Antenna for 200 to 5000 MHz, and Double-ridge horn and/or Pyramidal Horn Antennas from 4 GHz to 25 GHz, and mixers above 25 GHz. Emissions were measured in dBµV/m @ 3 meters.

Frequency 24.146 (GHz)	Frequency Stability Vs Temperature In Parts Per Million (PPM)								
Temperature °C	-30	-20	-10	0	+10	+20	+30	+40	+50
Change (Hz)		208980	195390	178720	144870	69230	147440	-42300	-221790
PPM		9	8	7	6	3	6	-2	-9
%		0.001	0.001	0.001	0.001	0.000	0.001	0.000	-0.001
Limit (ppm)	--	.001	.001	.001	.001	.001	.001	.001	.001

Frequency 24.146 (GHz)	Frequency Stability Vs Voltage Variation 110.0 volts nominal; Results In Ppm Input Voltage		
Voltage V_{ac}	102.0	120.0	138.0
Change (Hz)	0.0	0.0	0.0

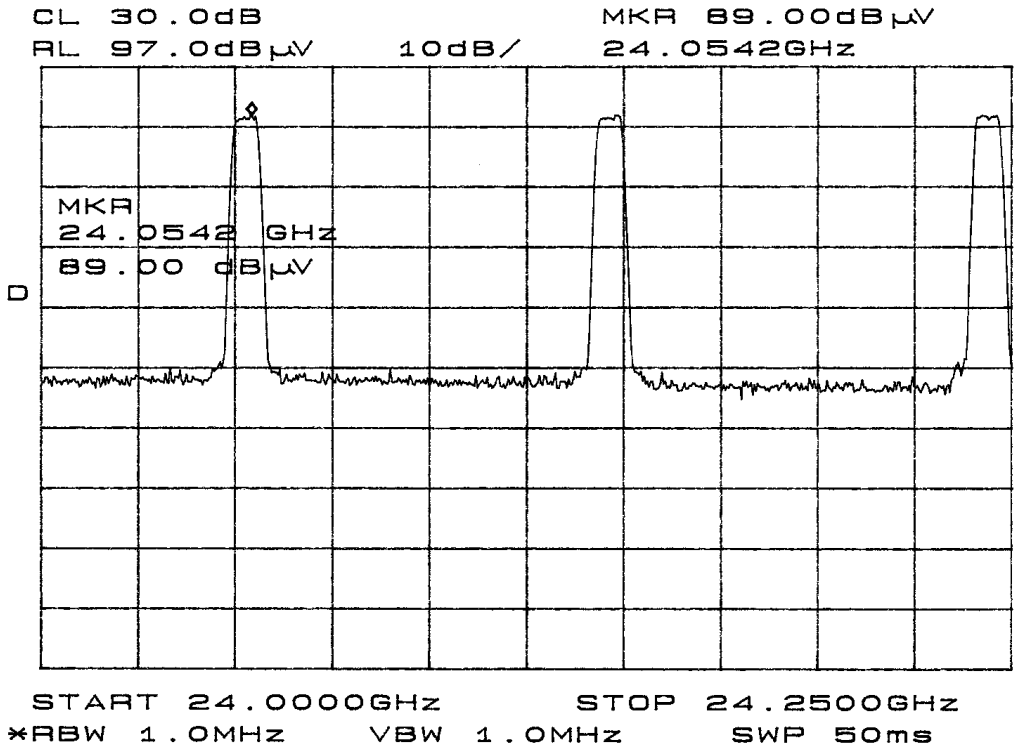


Figure Fifteen Output power across band

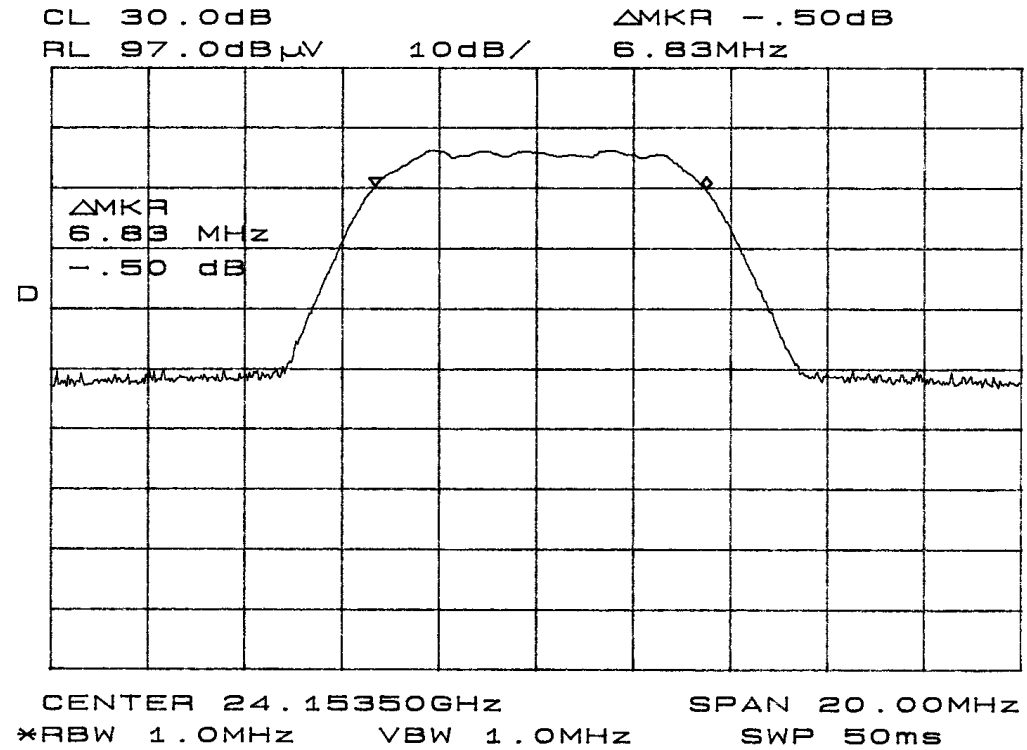


Figure Sixteen Occupied Bandwidth (7 MHz Operation)

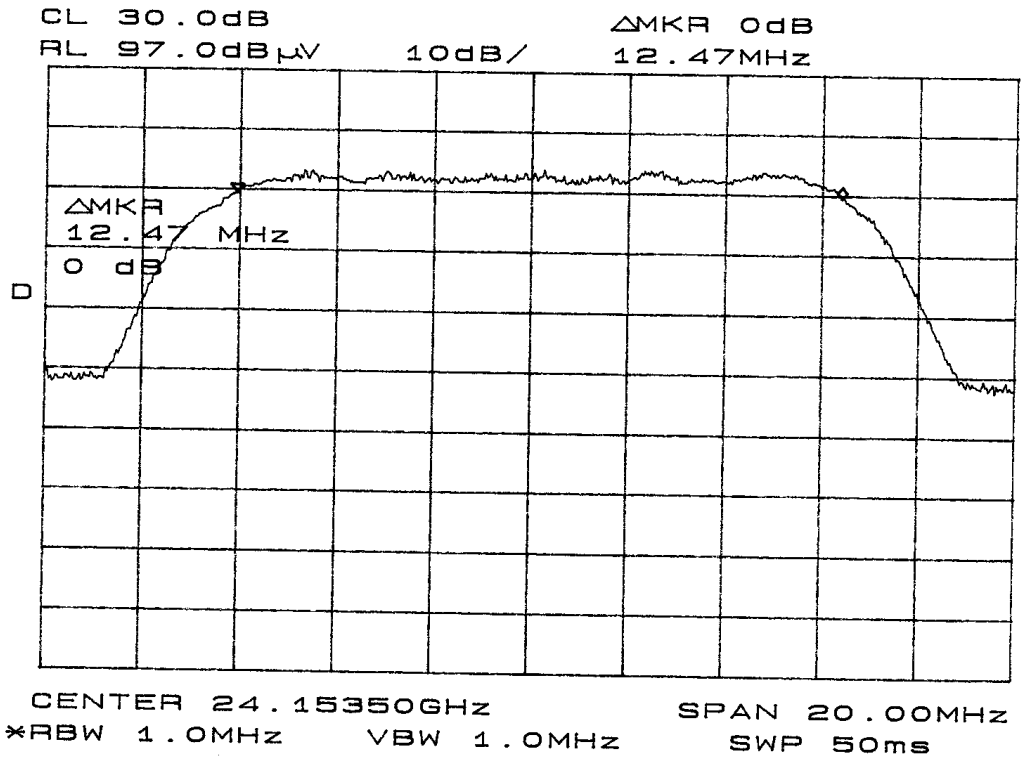


Figure Seventeen Occupied Bandwidth (14 MHz Operation)

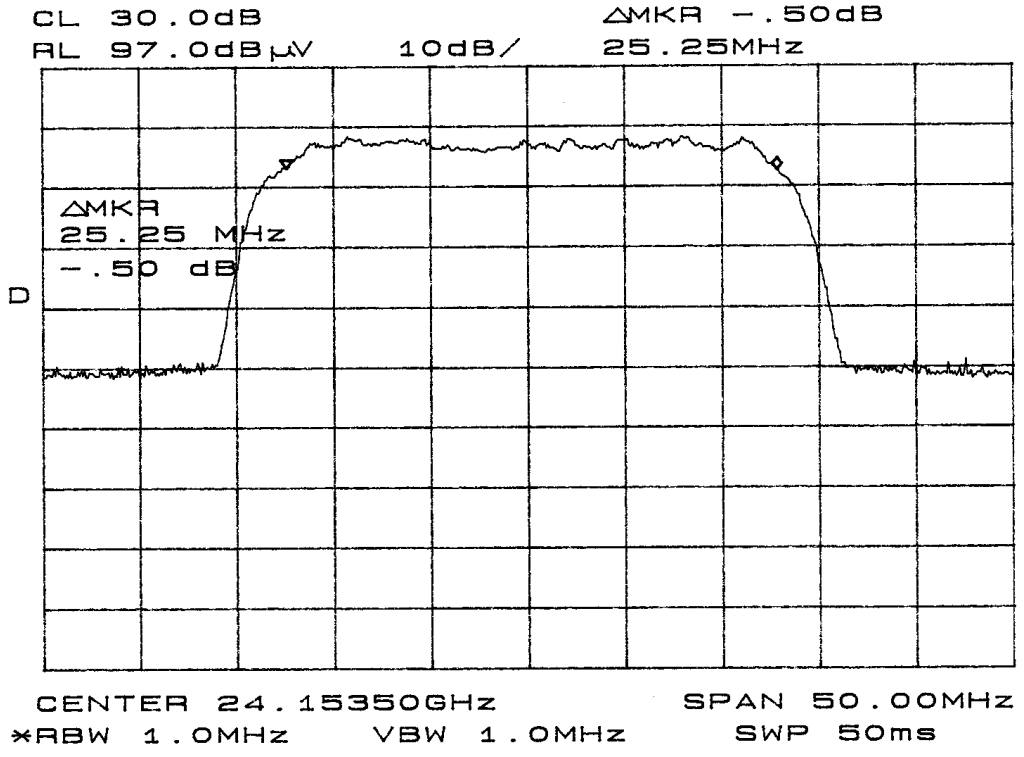


Figure Eighteen Occupied Bandwidth (28 MHz Operation)

Transmitter Radiated Emissions Data per 15.249

Frequency	FSM Hor Peak	FSM Hor Ave	FSM Vert Peak	FSM Vert Ave	AF	Amp Gain	CFS @ 3 m Hor Peak	CFS @ 3 m Hor Ave	CFS @ 3 m Vert Peak	CFS @ 3 m Vert Ave	Ave Limit
24053.5	91.3	82.1	95.7	83.8	22.0	0	113.3	104.1	117.7	105.8	108.0
48107.0	24.7	17.8	26.0	17.7	23.0	0	47.7	40.8	49.0	40.7	54.0
72160.5	23.0	15.5	23.8	15.8	35.0	0	58.0	50.5	58.8	50.8	54.0
96214.0	22.8	13.5	23.3	14.0	39.8	0	62.6	53.3	63.1	53.8	54.0
24146.5	90.3	82.3	95.3	83.4	22.0	0	112.3	104.3	117.3	105.4	108.0
48293.0	23.7	17.0	23.5	17.8	23.0	0	46.7	40.0	46.5	40.8	54.0
72439.5	23.3	14.5	23.2	15.0	35.0	0	58.3	49.5	58.2	50.0	54.0
96586.0	24.3	13.3	24.5	13.8	39.8	0	64.1	53.1	64.3	53.6	54.0
24243.5	91.6	82.5	95.2	83.9	22.0	0	113.6	104.5	117.2	105.9	108.0
48487.0	24.2	17.5	24.3	18.0	23.0	0	47.2	40.5	47.3	41.0	54.0
72730.5	23.5	14.6	23.0	15.0	35.0	0	58.5	49.6	58.0	50.0	54.0
96974.0	22.3	13.9	23.3	14.0	39.8	0	62.1	53.7	63.1	53.8	54.0
24243.5	91.6	82.5	95.2	83.9	22.0	0	113.6	104.5	117.2	105.9	108.0

Note: Levels measured @ 3-meter OATS site.

Summary of Results for Transmitter Radiated Emissions per 15.249

The EUT demonstrated compliance with the radiated emissions requirements of FCC CFR47 Part 15.249, and other applicable standards for Intentional Radiators. The EUT worst-case configuration demonstrated minimum average amplitude emission margin of 2.1 dB below limit. The EUT worst-case configuration demonstrated minimum radiated harmonic emission margin of 0.2 dB below the limits. No other radiated emissions were found in the restricted bands less than 20 dB below limits than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the Limits.

Annex

- Annex A Measurement Uncertainty Calculations
- Annex B 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 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	5/09
Spectrum Analyzer: HP 8591EM	5/09
Frequency Counter: Leader LDC825	2/09
Antenna: EMCO Biconilog Model: 3143	5/09
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

Bachelor of Science Degree in Electrical Engineering from Kansas State University

Bachelor of Science Degree in Business Administration Kansas State University

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

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 Test 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