

APPLICATION SUBMITTAL

**FOR
FCC GRANT OF CERTIFICATION
Per 15.249**

FOR

**MODEL: RD-24M
24,125 MHz Transmitter
K-Band Radar Transmitter**

FOR

**SYSTEMS INNOVATION, INC.
One Technology Drive, PO Box 430
Hallstead, PA 18822**



ROGERS LABS, INC.

4405 West 259th Terrace
Louisburg, KS 66053
Phone / Fax (913) 837-3214

TEST REPORT

For

APPLICATION of CERTIFICATION

For

SYSTEMS INNOVATION, INC.

One Technology Drive, PO Box 430
Hallstead, PA 18822

MODEL: RD-24M
K-Band Radar Transmitter
Frequency 24.125 GHz
FCC ID: TU9-SII-RD24

Test Date: November 22, 2005

Certification Date: November 22, 2005

Certifying Engineer: *Scot D. Rogers*

Scot D. Rogers
ROGERS LABS, INC.
4405 West 259th Terrace
Louisburg, KS 66053
Phone: (913) 837-3214
FAX: (913) 837-3214

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TABLE OF CONTENTS

TABLE OF CONTENTS.....	3
FORWARD:	4
1) APPLICABLE STANDARDS & TEST PROCEDURES.....	4
2.1033(b) Application for Certification.....	5
2) EQUIPMENT TESTED	6
3) EQUIPMENT FUNCTION AND TESTING PROCEDURES.....	6
4) EQUIPMENT AND CABLE CONFIGURATIONS.....	6
Conducted Emission Test Procedure	6
Radiated Emission Test Procedure	6
5) LIST OF TEST EQUIPMENT.....	7
6) UNITS OF MEASUREMENTS.....	8
7) TEST SITE LOCATIONS.....	8
8) SUBPART B – UNINTENTIONAL RADIATORS	8
Conducted EMI Test Procedure, Part 15.107	8
Radiated EMI Test Procedure, Part 15.109	8
Data EUT Radiated Emissions (Highest), Part 15.109	11
Summary of Results for Conducted Emissions, Part 15.107.....	11
Summary of Results for Radiated Emissions, Part 15.109.....	11
Statement of Modifications Unintentional Radiators	11
9) SUBPART C - INTENTIONAL RADIATORS	12
Antenna Requirements, Part 15.203	12
Restricted Bands of Operation Test Procedure, Part 15.205	12
Data EUT Restricted bands of operation Emissions (Highest), Part 15.205	12
Radiated Emissions Limits; General Requirements, Part 15.209	13
Radiated EMI Test Procedure, Part 15.209	13
Data EUT and System Radiated Emissions (Highest), Part 15.209.....	19
Summary of Results for Intentional Radiators, Part 15.209.....	19
Operation in the Band 24,075-24,175 MHz Test Procedure, Part 15.249	20
Transmitter Fundamental Emissions (Highest), Part 15.249.....	20
Harmonic Radiated Emissions (Highest), Part 15.249	21
Summary of Results of Intentional Radiator Emissions, Part 15.249.....	21
Statement of Modifications, Part 15.249.....	21
APPENDIX.....	22

FORWARD:

The following information is submitted for consideration in obtaining a Grant of Certification for low power intentional radiators operated under CFR 47, paragraph 15.249.

Name of Manufacturer:

SYSTEMS INNOVATION, INC.
One Technology Drive, PO Box 430
Hallstead, PA 18822

Name of Distributor:

Kustom Siganls, Inc.
9325 Pflumm
Lenexa, KS 66215

Model: RD-24M

FCC I.D.: TU9-SII-RD24

Frequency Range: 24,075 MHz to 24,175 MHz

Maximum Operating Power: 2,500 mV/m @ 3 Meters (102.8 dBµv/m
@ 3 meters)

1) Applicable Standards & Test Procedures

a) In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2004, Part 2, Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057, Part 15C Paragraph 15.249 the following is submitted.

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

2.1033(b) Application for Certification

- (1) Manufacturer:
SYSTEMS INNOVATION, INC.
One Technology Drive, PO Box 430
Hallstead, PA 18822

Distributor:
Kustom Siganls, Inc.
9325 Pflumm
Lenexa, KS 66215
- (2) Identification: Model: RD-24M
 FCC I.D.: TU9-SII-RD24
- (3) Instruction Book:
Refer to the instruction manual furnished with this application for details.
- (4) Description of Circuit Functions:
Refer to the circuit description furnished with this application for details.
- (5) Block Diagram with Frequencies:
Refer to exhibit for block diagram furnished with this application for details.
- (6) Report of Measurements:
Report of measurements follows in this Report.
- (7) Photographs: Construction, Component Placement, etc.:
Refer to appendix of this report and exhibits furnished with this application for photographs of equipment.
- (8) Brief description of peripheral equipment used with EUT.
The EUT has no provision to interface with any other device.
- (9) Transition Provisions of 15.37 are not being requested.
- (10) Direct Sequence Spread Spectrum. Not Applicable.
- (11) The EUT is not a Scanning Receiver. Not Applicable.

2) Equipment Tested

EQUIPMENT	MODEL/PART#	FCC I.D.
EUT	RD-24M	TU9-SII-RD24

3) Equipment Function and Testing Procedures

The EUT is a low power 24.125 GHz K-Band radar transmitter.

The product was designed to increase safety by triggering a K-Band alert on any radar detector that comes into range of the unit. The EUT operates from 12-volt direct current only and has no provision for connection to the utility power system. Since the EUT is battery operated, no AC power line-conducted emissions testing was performed.

4) Equipment and Cable Configurations***Conducted Emission Test Procedure***

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. Since the EUT is battery operated, no line-conducted emissions testing was performed.

Radiated Emission Test Procedure

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.

5) 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 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

<u>EQUIPMENT</u>	<u>MFG.</u>	<u>MODEL</u>	<u>CAL. DATE</u>	<u>DUE.</u>
LISN	Comp. Design	FCC-LISN-2-MOD.CD	10/05	10/06
LISN	FCC	FCC-LISN-50-16-2-08	6/05	6/06
LISN	Comp. Design	1762	2/05	2/06
Antenna	ARA	BCD-235-B	10/05	10/06
Antenna	EMCO	3147	10/05	10/06
Antenna	EMCO	3143	5/05	5/06
Analyzer	HP	8591EM	5/05	5/06
Analyzer	HP	8562A	2/05	2/06

6) Units of Measurements

Conducted EMI: Data is in dB μ V; dB referenced to one microvolt.

Radiated EMI: Data is in dB μ V/m; dB/m referenced to one microvolt per meter.

7) Test Site Locations

Conducted EMI: The AC power-line conducted emissions tests were 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 Rogers Labs, Inc. 3 meter Open Area Test Site (OATS).

Site Approval: Refer to Appendix for FCC Site Approval FCC registration number 90910

NVLAP Accredited: Lab Code 200087-0.

8) SUBPART B – Unintentional Radiators***Conducted EMI Test Procedure, Part 15.107***

The EUT is battery operated only and has no provision to connect to utility power. Therefore no AC power line-conducted emissions testing were performed.

Radiated EMI Test Procedure, Part 15.109

The EUT was arranged in a typical equipment configuration. Testing was performed with the unit operating through all modes of operation with worst-case data presented. 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 1200 MHz for general emissions and to 100 GHz for the fundamental and related harmonics. Refer to figures 1 and 2 for plots of the general emissions frequency spectrum produced by the EUT taken at a distance of 1 meter located in the screen room. The EUT location and orientation was noted and reconfigured at the open area test site before final testing was performed. 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 OATS at a distance of 3 meters between the EUT and the receiving antenna. The frequency spectrum from 30 MHz to 1200 MHz was searched for general radiated emissions. Measured emission levels were maximized by EUT placement on the table, changing cable location, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna position between horizontal and vertical polarization. Antennas used were Broadband Biconical from 30 to 200 MHz, Log Periodic from 200 MHz to 5 GHz, and or a Biconilog from 30 to 1000 MHz, and pyramidal horns and/or mixers from 4 GHz to 100 GHz.

Sample Calculations:

$$\begin{aligned}\text{RFS} &= \text{Radiated Field Strength} \\ \text{dB}\mu\text{V/m @ 3m} &= \text{dB}\mu\text{V} + \text{A.F.} - \text{Amplifier Gain} \\ \text{dB}\mu\text{V/m @ 3m} &= 36.2 + 7.8 - 30 \\ &= 14.0\end{aligned}$$

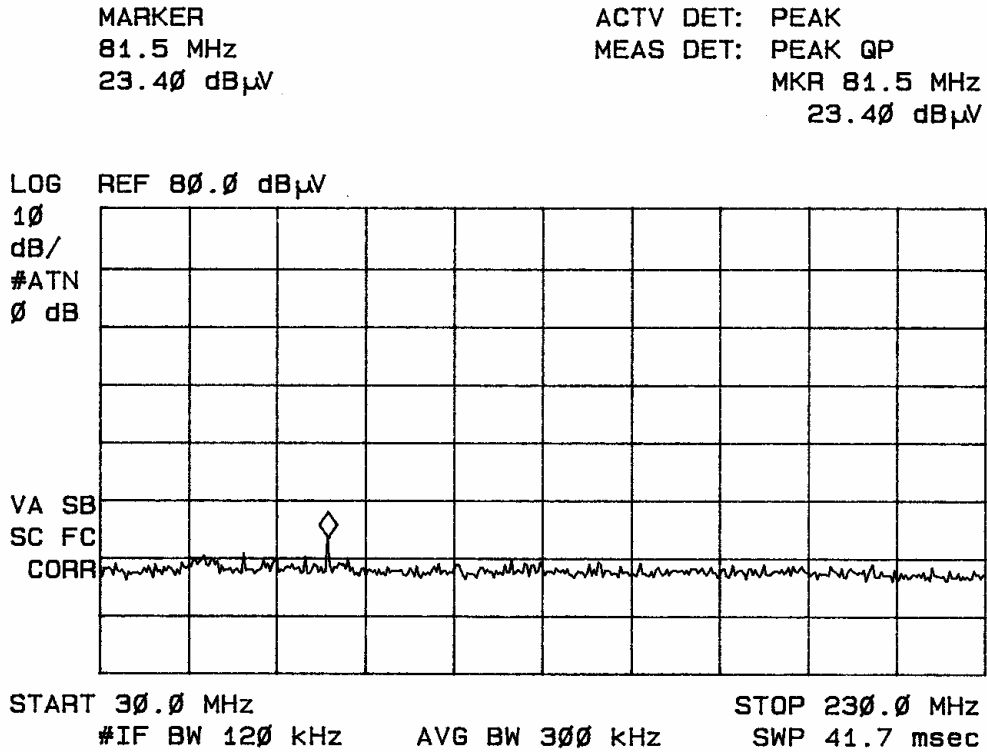


Figure one Radiated Emissions taken in screen room.

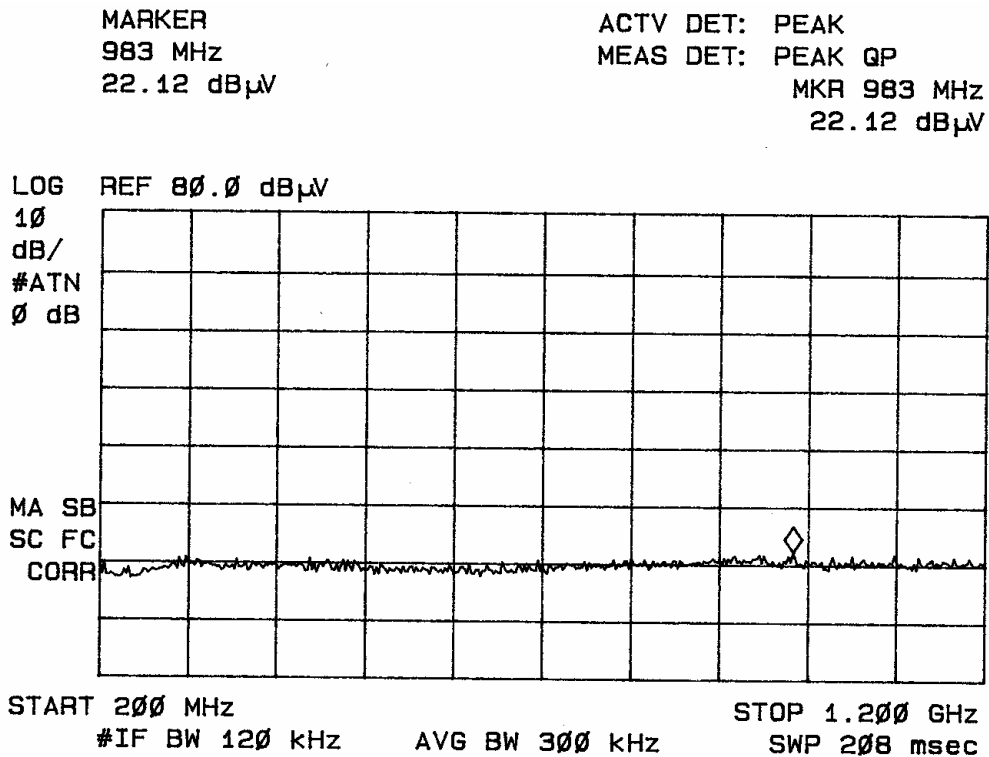


Figure two Radiated Emissions taken in screen room.

NOTE: No conducted emissions measurements taken for this battery operated device.

Data EUT Radiated Emissions (Highest), Part 15.109

Frequency In MHz	FSM Hor. (dBµV) Quasi-Peak	FSM Vert. (dBµV) Quasi-Peak	Ant. Fact. (dB)	Amp. Gain (dB)	Comp. Hor. (dBµV/m) @ 3m	Comp. Vert. (dBµV/m) @ 3 m	FCC Limit (dBµV)
81.1	36.2	41.3	7.8	30	14.0	19.1	40
983.0	24.7	24.7	23.7	30	18.4	18.4	54

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

Summary of Results for Conducted Emissions, Part 15.107

The conducted emissions for the EUT meet the requirements for FCC Part 15B CLASS B Digital Devices.

Summary of Results for Radiated Emissions, Part 15.109

The radiated emissions for the EUT meet the requirements for FCC Part 15B CLASS B Digital Devices. The EUT had a 9.8 dB minimum margin below the limit. Other emissions were present with amplitudes at least 20 dB below the limit.

Statement of Modifications Unintentional Radiators

No modifications to the EUT were required for the unit to meet the FCC Part 15B CLASS B emissions standards. There were no deviations to the specifications.

9) Subpart C - Intentional Radiators

As per CFR Part 15, Subpart C, The following information is submitted.

Antenna Requirements, Part 15.203

The unit is produced with a permanently attached antenna. The antenna is not replaceable or user serviceable. The requirements of 15.203 are met. There are no deviations or exceptions to the specification.

Restricted Bands of Operation Test Procedure, Part 15.205

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 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. Both peak and average amplitudes were investigated with worst-case data presented.

Sample Calculations

$$\begin{aligned}\text{Computed Quasi-Peak (dB}\mu\text{V/m @ 3m)} &= \text{FSM(dB}\mu\text{V)} + \text{A.F. (dB)} \\ &= 22.3 + 23 \\ &= 45.3\end{aligned}$$

Data EUT Restricted bands of operation Emissions (Highest), Part 15.205

Emission Frequency (MHz)	FSM Horz. (dB μ V)	FSM Vert. (dB μ V)	Ant. Factor (dB)	RFS Horz. @ 3m (dB μ V/m)	RFS Vert. @ 3m (dB μ V/m)	Limit @ 3m (dB μ V/m)
48250.0	22.3	23.0	23	45.3	46.0	54.0

No other emissions found in the restricted bands.

Radiated Emissions Limits; General Requirements, Part 15.209***Radiated EMI Test Procedure, Part 15.209***

The EUT was arranged in a typical equipment configuration and operated in all standard modes for testing. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Radiated emissions measurements were performed to identify the frequencies, which produced the highest emissions. Plots were made of the frequency spectrum from 30 MHz to 100 GHz for the preliminary testing. Refer to Figures 3 through 13 showing plots taken in the screen room from the spectrum analyzer at a distance of 1 meter. The highest radiated emission was then re-maximized at the open area test location 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. The frequency spectrum from 30 MHz to 100 GHz was searched for radiated emissions. Measured emission levels were maximized by EUT placement on the table, changing cable location, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna 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; and pyramidal horns and or mixers from 4 GHz to 100 GHz.

Sample Calculations:

$$\begin{aligned}\text{RFS} &= \text{Radiated Field Strength} \\ \text{dB}\mu\text{V/m @ 3m} &= \text{dB}\mu\text{V} + \text{Antenna factor-amplifier} \\ \text{dB}\mu\text{V/m @ 3m} &= 36.2 + 7.8 - 30 \\ &= 14.0\end{aligned}$$

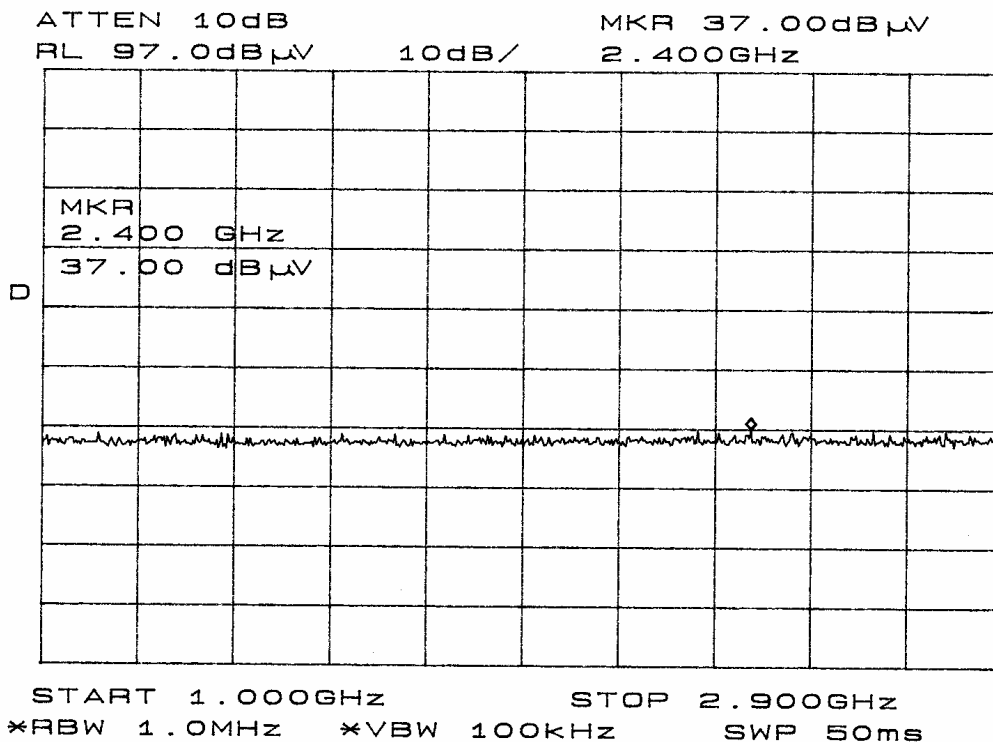


Figure three Radiated Emissions taken in screen room.

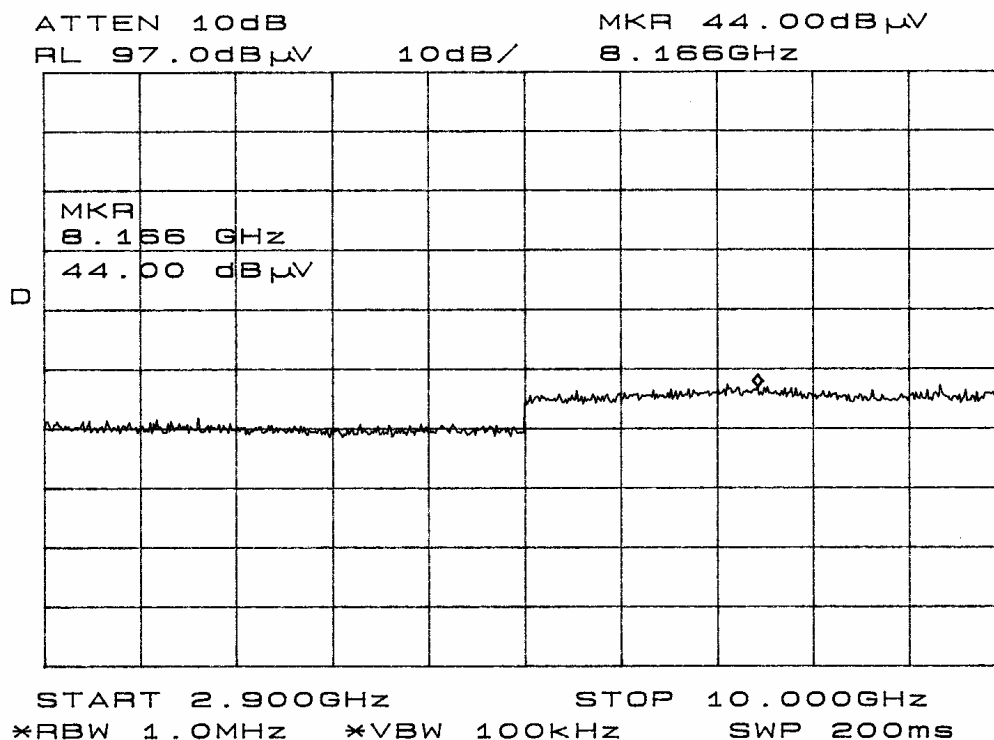


Figure four Radiated Emissions taken in screen room.

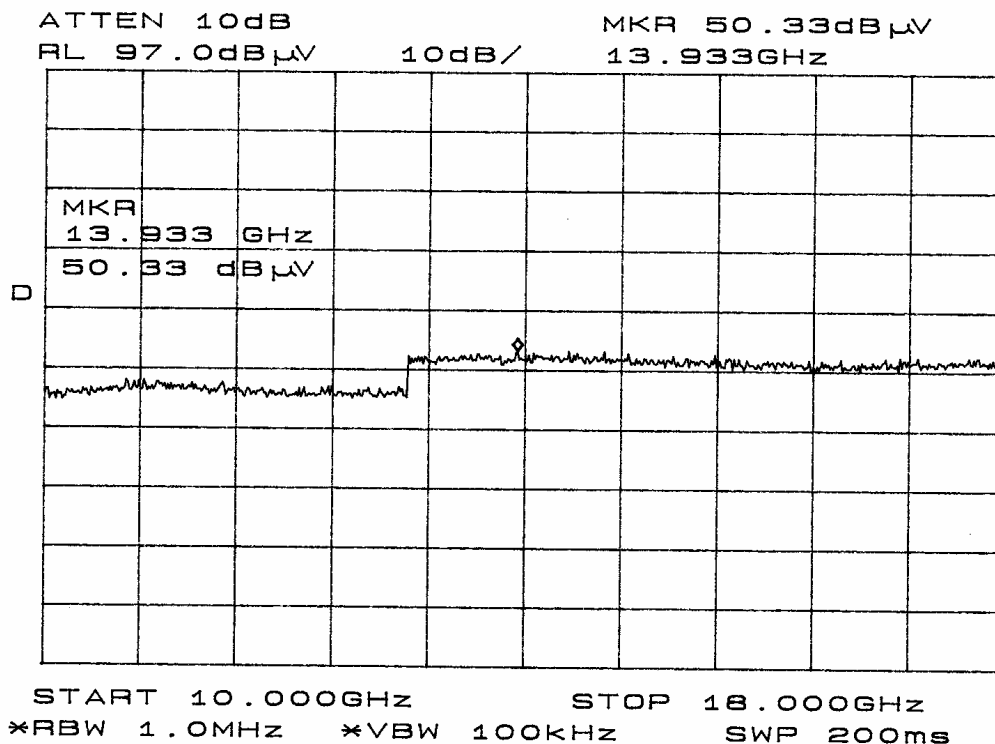


Figure five Radiated Emissions taken in screen room.

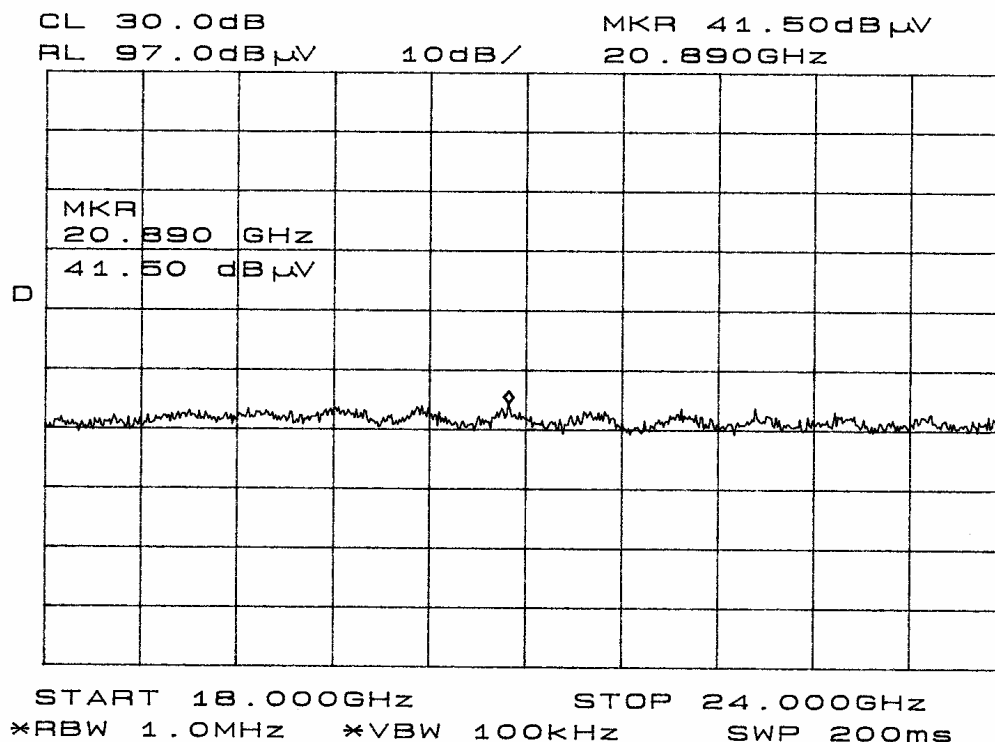


Figure six Radiated Emissions taken in screen room.

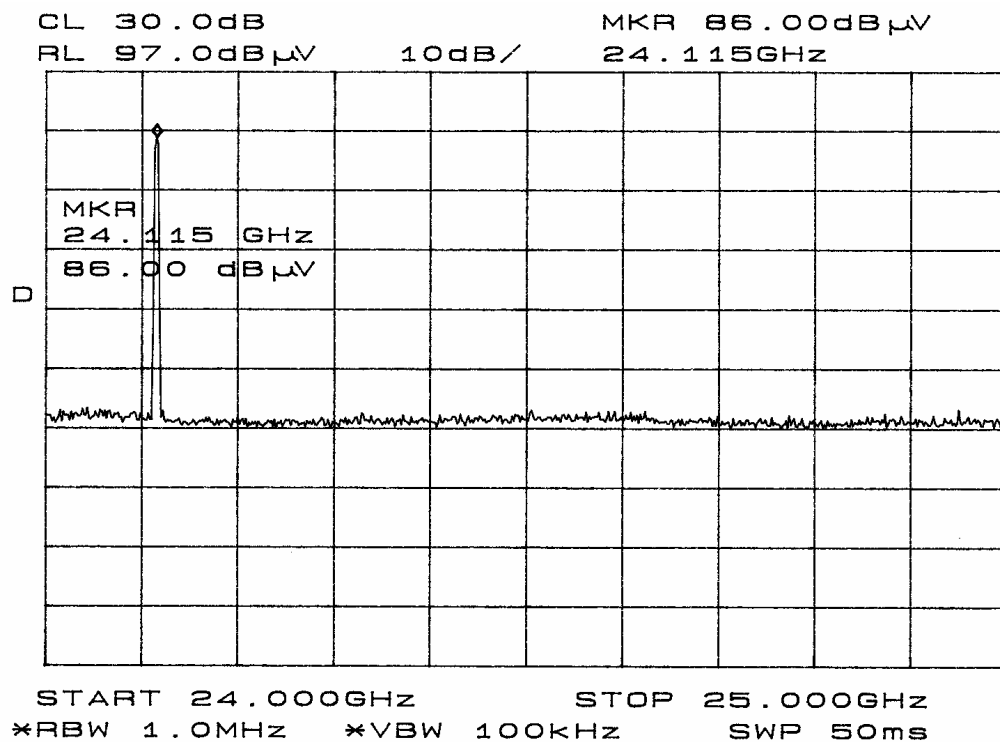


Figure seven Radiated Emissions taken in screen room.

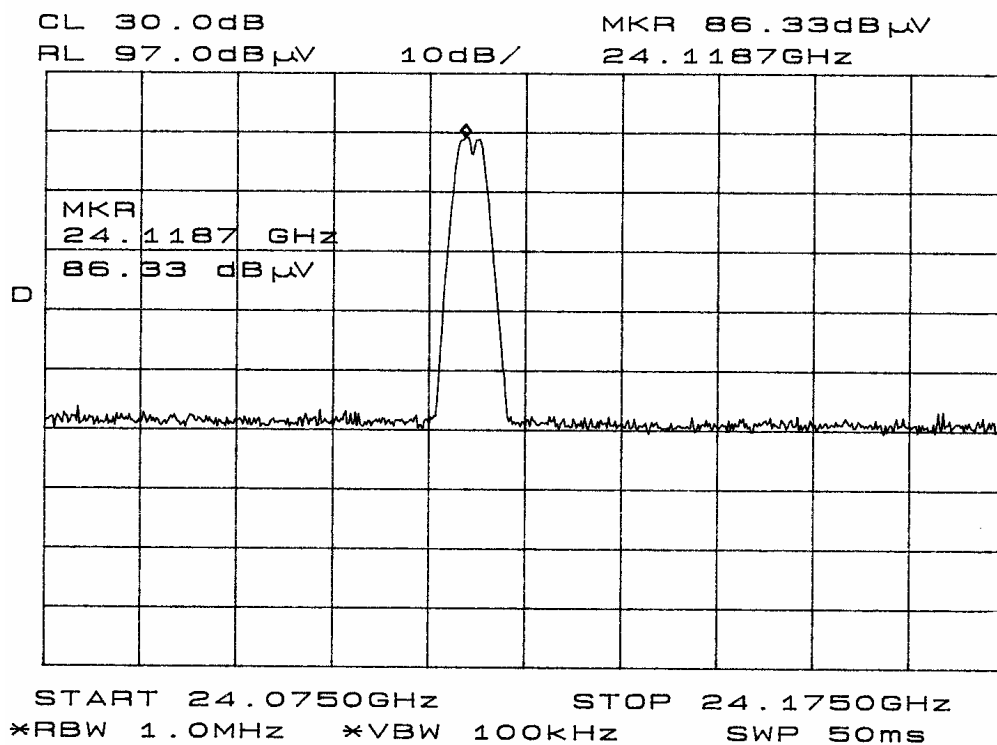


Figure eight Radiated Emissions taken in screen room.

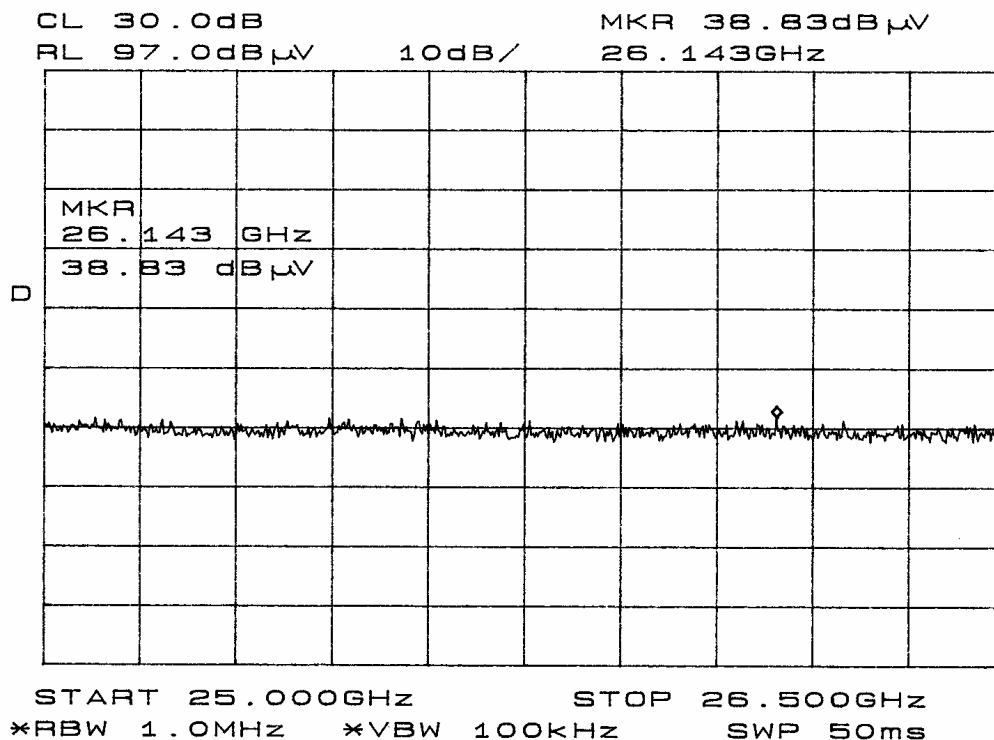


Figure nine Radiated Emissions taken in screen room.

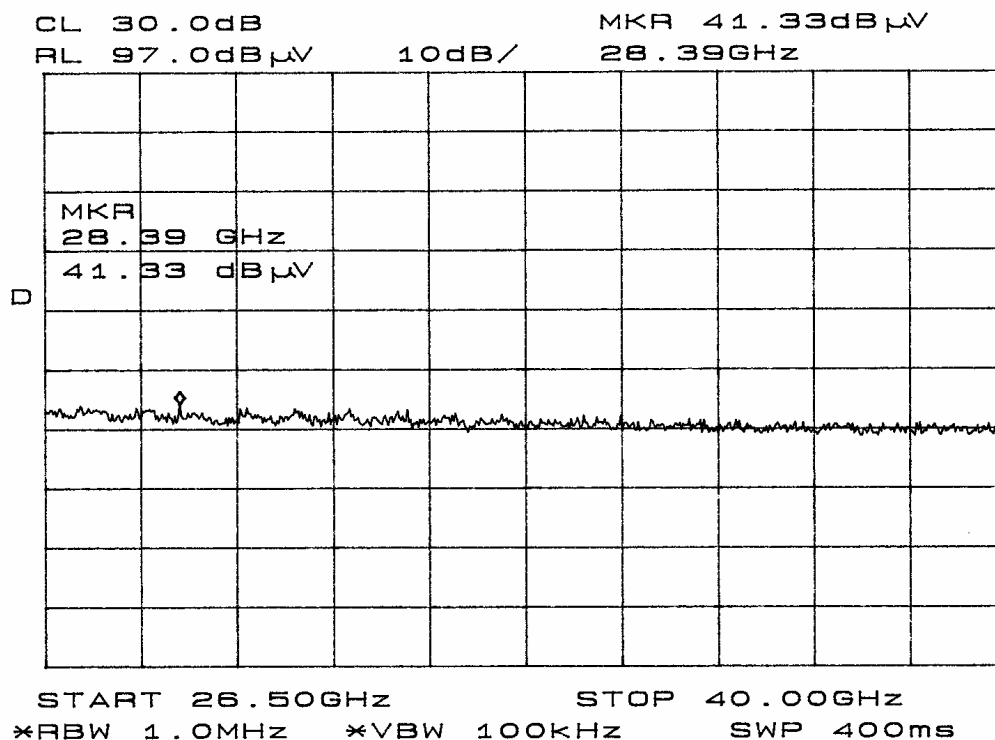


Figure ten Radiated Emissions taken in screen room.

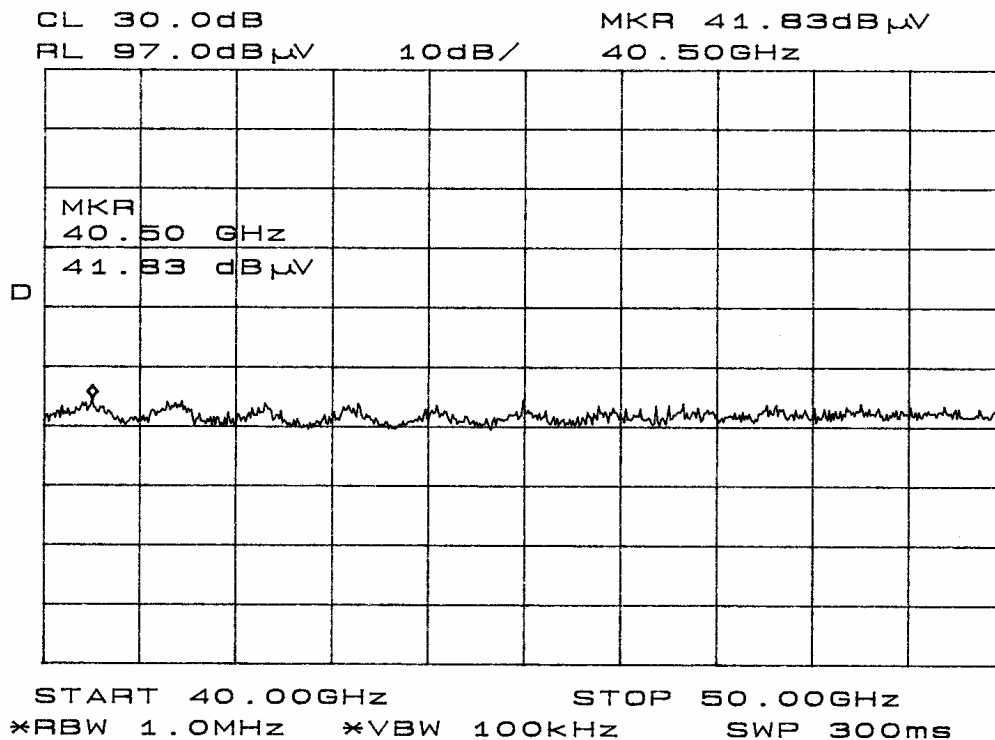


Figure eleven Radiated Emissions taken in screen room.

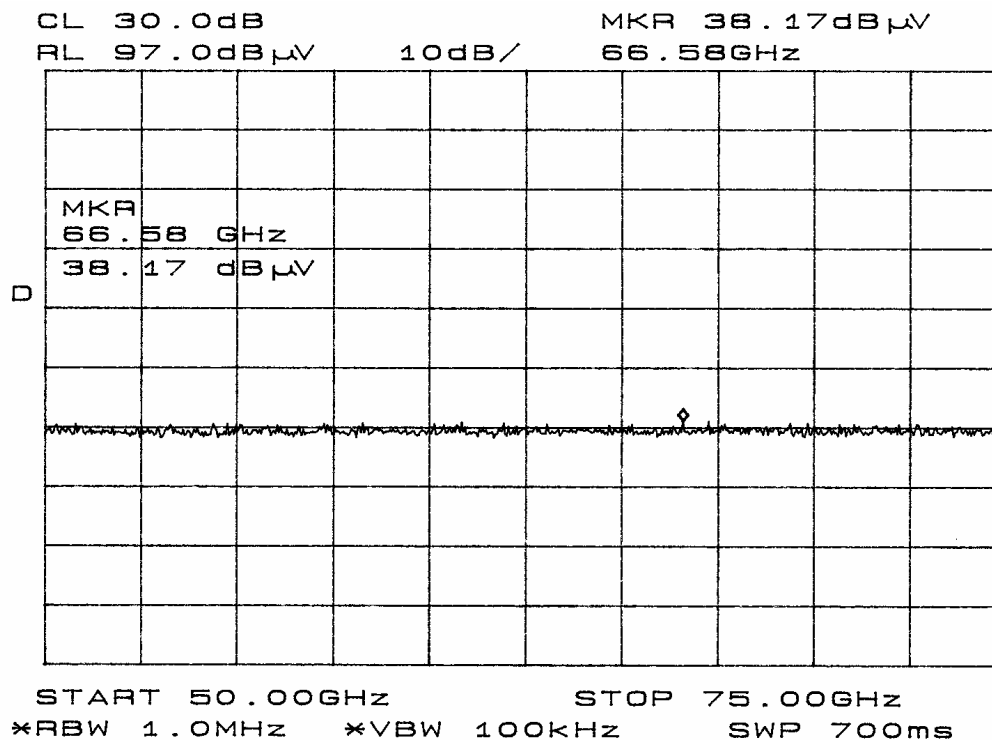


Figure twelve Radiated Emissions taken in screen room.

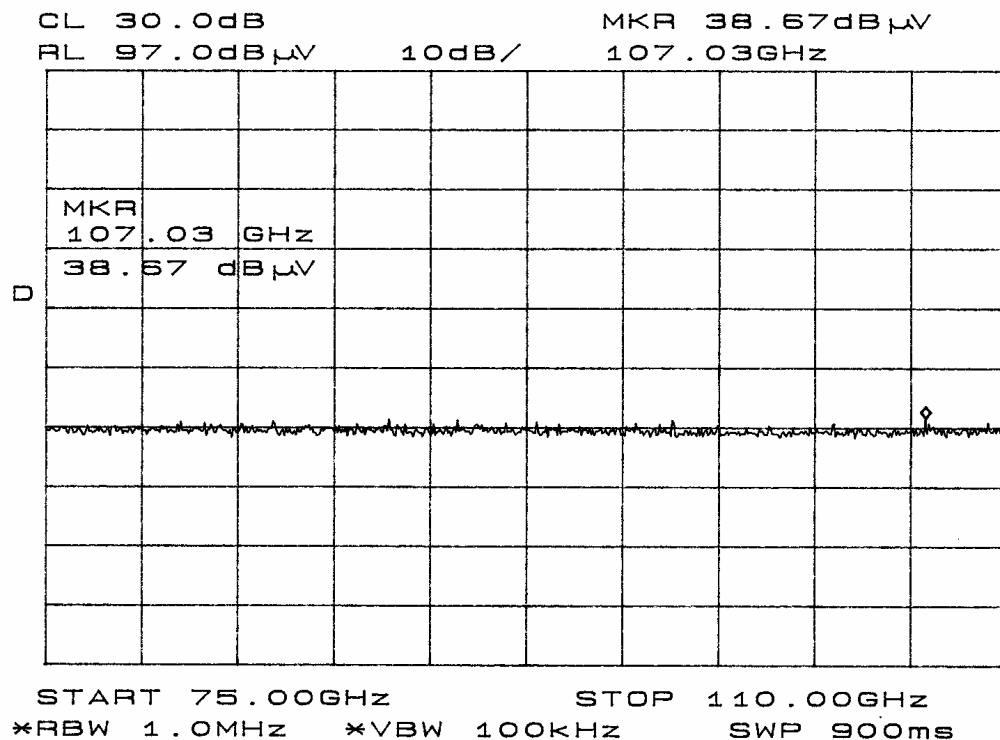


Figure thirteen Radiated Emissions taken in screen room.

Data EUT and System Radiated Emissions (Highest), Part 15.209

Frequency In MHz	FSM Hor. (dB μ V) Quasi-Peak	FSM Vert. (dB μ V) Quasi-Peak	Ant. Fact. (dB)	Amp. Gain (dB)	Comp. Hor. (dB μ V/m) @ 3m	Comp. Vert. (dB μ V/m) @ 3 m	FCC Limit (dB μ V)
81.1	36.2	41.3	7.8	30	14.0	19.1	40
983.0	24.7	24.7	23.7	30	18.4	18.4	54

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

Summary of Results for Intentional Radiators, Part 15.209

The radiated emissions for the EUT meet the requirements for FCC Part 15C Intentional Radiators. The EUT had a 9.8 dB minimum margin below the limits. Other emissions were present with amplitudes at least 20 dB below the FCC Limits.

Operation in the Band 24,075-24,175 MHz Test Procedure, Part 15.249

The power output was measured on an open field test site @ 3 meters. Data was taken per Paragraph 2.1046(a) and 15.249. 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 amplitude of the carrier frequency was measured using a spectrum analyzer. The amplitude of the emission was then recorded from the analyzer display. Harmonic emissions radiated outside of the specified bands, shall not exceed the field strength limits shown in 15.205, or 15.249. The amplitude of each spurious emission was measured at a distance of 3 meters from the FSM antenna at the OATS. The amplitude of each 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/or Pyramidal Horn Antennas from 4 to 18 GHz, and appropriate mixers from 18 GHz to 100 GHz. Both peak and average amplitudes of emissions over 1 GHz were measured at the OATS with worst-case data presented.

$$\begin{aligned}
 \text{dB}\mu\text{V/m@ 3m} &= \text{FSM} + \text{Antenna factor} \\
 &= 81.80 + 21.0 \\
 &= 102.8
 \end{aligned}$$

Transmitter Fundamental Emissions (Highest), Part 15.249

Frequency (MHz)	FSM IN HOR dB μ V	FSM IN VERT dB μ V	ANT FACT dB	CFS LEVEL IN dB μ V/m @ 3m HOR	CFS LEVEL IN dB μ V/m @ 3m VERT	Limit dB μ V/m @ 3m
24,125	81.8	66.0	21.0	102.8	87.0	108.0

Note: Level was measured @ 3-meter site.

Harmonic Radiated Emissions (Highest), Part 15.249

Frequency (MHz)	FSM IN HOR dBμV	FSM IN VERT dBμV	ANT FACT dB	CFS LEVEL IN dBμV/m @ 3m HOR	CFS LEVEL IN dBμV/m @ 3m VERT	Limit dBμV/m @ 3m
48,272	22.3	23.0	23.0	45.3	46.0	54.0
72,375	10.3	13.0	34.7	45.0	47.7	54.0
96,500	8.2	8.0	39.8	48.0	47.8	54.0

Note: Level was measured @ 3-meter site.

Summary of Results of Intentional Radiator Emissions, Part 15.249

The EUT had a 5.2 dB margin below the limit for the fundamental emission. The EUT had a 6.0 dB margin below the limit for the harmonic emissions falling in the restricted bands above 38.6 GHz. Both peak and average measurements were made with the worst-case data presented. The radiated emissions for the EUT meet the requirements for FCC Part 15C, paragraph 15.249, Intentional Radiators. 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 FCC Limits. The specification of 15.249 are met, there are no deviations or exceptions to the requirements.

Statement of Modifications, Part 15.249

No modifications to the EUT were required for the unit to meet the FCC Part 15B CLASS B emissions standards. There were no deviations to the specifications.

APPENDIX

Model: RD-24M

1. Rogers Qualifications
2. Test Equipment List
3. FCC Site Approval Letter

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.

<u>List of Test Equipment:</u>	<u>Calibration Date:</u>
Scope: Tektronix 2230	2/05
Wattmeter: Bird 43 with Load Bird 8085	2/05
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/05
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/05
R.F. Generator: HP 606A	2/05
R.F. Generator: HP 8614A	2/05
R.F. Generator: HP 8640B	2/05
Spectrum Analyzer: HP 8562A,	2/05
Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	
HP Adapters: 11518, 11519, 11520	
Spectrum Analyzer: HP 8591 EM	5/05
Frequency Counter: Leader LDC 825	2/05
Antenna: EMCO Biconilog Model: 3143	5/05
Antenna: EMCO Log Periodic Model: 3147	10/05
Antenna: Antenna Research Biconical Model: BCD 235	10/05
Antenna: EMCO Dipole Set 3121C	2/05
Antenna: C.D. B-101	2/05
Antenna: Solar 9229-1 & 9230-1	2/05
Antenna: EMCO 6509	2/05
Audio Oscillator: H.P. 201CD	2/05
R.F. Power Amp 65W Model: 470-A-1010	2/05
R.F. Power Amp 50W M185- 10-501	2/05
R.F. PreAmp CPPA-102	2/05
LISN 50 μ Hy/50 ohm/0.1 μ f	10/05
LISN Compliance Eng. 240/20	2/05
LISN Fischer Custom Communications FCC-LISN-50-16-2-08	6/05
Peavey Power Amp Model: IPS 801	2/05
Power Amp A.R. Model: 10W 1010M7	2/05
Power Amp EIN Model: A301	2/05
ELGAR Model: 1751	2/05
ELGAR Model: TG 704A-3D	2/05
ESD Test Set 2010i	2/05
Fast Transient Burst Generator Model: EFT/B-101	2/05
Current Probe: Singer CP-105	2/05
Current Probe: Solar 9108-1N	2/05
Field Intensity Meter: EFM-018	2/05
KEYTEK Ecat Surge Generator	2/05
Shielded Room 5 M x 3 M x 3.0 M (101 dB Integrity)	

10/20/2005

QUALIFICATIONS
Of
SCOT D. ROGERS, ENGINEER
ROGERS LABS, INC.

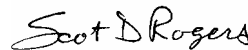
Mr. Rogers has approximately 17 years experience in the field of electronics. Six years working in the automated controls industry and remaining years working with the design, development and testing of radio communications and electronic equipment.

POSITIONS HELD:

Systems Engineer:	A/C Controls Mfg. Co., Inc. 6 Years
Electrical Engineer:	Rogers Consulting Labs, Inc. 5 Years
Electrical Engineer:	Rogers Labs, Inc. Current

EDUCATIONAL BACKGROUND:

- 1) Bachelor of Science Degree in Electrical Engineering from Kansas State University.
- 2) Bachelor of Science Degree in Business Administration Kansas State University.
- 3) Several Specialized Training courses and seminars pertaining to Microprocessors and Software programming.


Scot D. Rogers

November 22, 2005
Date

1/11/03

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

August 15, 2003

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: August 15, 2003

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,



Ms. Phyllis Parrish
Information Technician