ROGERS
Consulting Labs, Inc.

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CERTIFICATION APPLICATION

For

Ken-A-Vision Mfg., Co., Inc.
5615 Raytown Road
Kansas City, MO 64133

Steve Dunn,
Manager of Operations

MODEL: 5150W
FREQUENCY: 434 MHz

FCC ID: OEV 2599

Test Date: February 3, 1999

Certifying Engineer: Scot D Rogers

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

In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 1997, Part 2 Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.915, 2.925, 2.926, 2.1031 through 2.1057, Part 15, Subpart C, Paragraphs 15.201 through 15.209, and FCC document FCC98-58, the following is submitted:

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 Appendix 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

2.1033(b) Application for Certification

(1) Manufacturer: Ken-A-Vision Mfg., Co., Inc.
5615 Raytown Road
Kansas City, MO 64133

(2) Identification: Model: 5150W
FCC I.D.: OEV 2599

(3) Instruction Book:

Draft Instruction Manual attached.

(4) Description of Circuit Functions:

Device Operation:

The VTX434LPC is a low power wireless video transmitter. Basically, the VTX434LPC consists of a SAW Resonator stabilized LO with a center frequency of 433.80 MHz nominal, a modulator/buffer stage, and a lumped-element 2 pole matching filter network. The modulation signal is a standard 1-Volt PP NTSC video input.

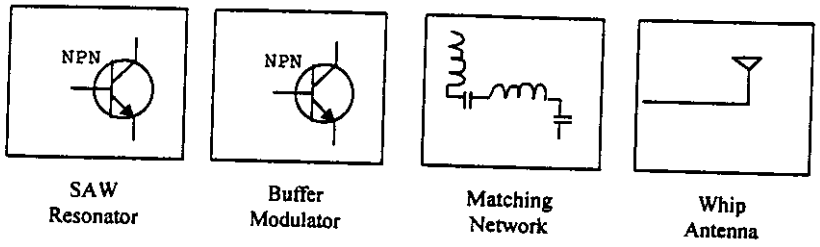
Oscillator Stage:
The oscillator consists of a SAW Resonator stabilized oscillator. Nominal frequency of operation is 433.80 MHz.

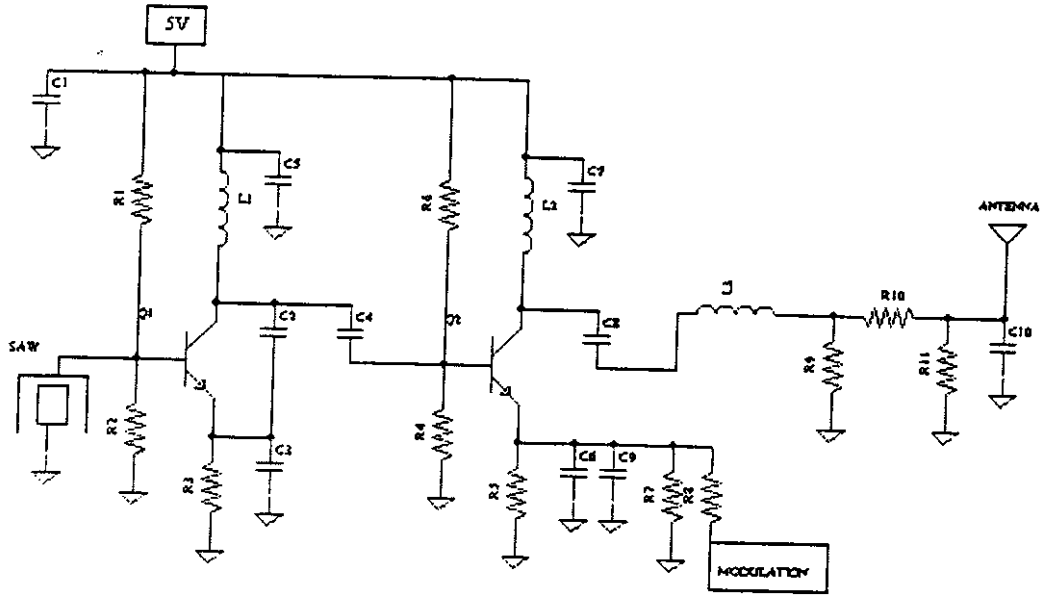
Buffer/Modulator Stage:
The Buffer/Modulator consists of a NPN high frequency transistor with appropriate Class A DC bias. The purpose of this stage is twofold: 1) To mix the modulating input with the LO signal and 2) To provide RF isolation between the LO and the load.

Lumped Element Network:
The Lumped Element Network attaches between the load and collector of the Buffer/Modulator stage. The purpose of this stage is twofold: 1) To match the output impedance of the Buffer/Modulator stage to the antenna load and 2) To effectively attenuate any out of band harmonics that might otherwise be transmitted by the antenna.

Antenna and Ground plane:
The antenna is a ¼ wave whip with nominal impedance 450 Ohms. The unit's metal housing acts as a goundplane and an EMI/RFI proof enclosure. The physical size of the enclosure is approximately 1.2" x 1".

(5) Block Diagram with Frequencies:





(6) Report of Measurements:

Follows in this Report.

(7) Photos: Construction, Component Placement, etc.:

Refer to Appendix.

(8) No Peripheral Equipment Was Necessary.

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

(10) Direct Sequence Spread Spectrum:

Not Applicable.

(11) Not Applicable; The EUT is not a Scanning Receiver.

Equipment and Cable Configuration

Conducted Emission Test Procedure:

The EUT is a stand alone CCD Camera with the ability to broadcast the image to a receiver through a RF link. A wall transformer supplying 5 Volts D.C. powers the unit. No other peripheral equipment is available.

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:

The test setup, including the EUT, was placed on top of a rotatable, 1 x 1.5 meter, wooden table, and 0.8 meters above the ground plane. The receiving antenna was located on a variable height antenna mast 3 meters from the table supporting the EUT and test system. The antenna height was varied between 1 and 4 meters above the ground plane and the antenna polarization was varied between horizontal and vertical. The measured radiated EMI

level was maximized by equipment placement, cable location and table rotation before data was taken using a spectrum analyzer.

Units of Measurement

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.

Calculations:

RFS = Radiated field strength (dBµV/m) @ 3m

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

RFS = 48.5 (dBµV) + 11.7 (dB/m) - 35 (dB)

RFS = 25.2 (dBµV/m)

Test Site Location

Conducted EMI: The AC powerline 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 tests site (OATS).

Site Approval: Refer to Appendix for FCC Site Approval Letter, Reference 31040/SIT 1300F2, Dated February 6, 1998.

Measurement Procedures

Conducted EMI:

The EUT was arranged in a typical equipment configuration and placed on a 1 x 1.5-meter wooden bench 80 cm above the conducting ground plane, floor of a screen room. The bench was positioned 40 cm away from the wall of the screen room. The LISN was positioned on the floor of the screen room 80-cm from the rear of the EUT. The power cord of 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. 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 the emissions that 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 the data was recorded with maximum conducted emissions levels.

Radiated EMI:

The EUT was arranged in a typical equipment configuration and operated through all of its various modes. The interconnecting cables of the EUT and supporting equipment were manipulated such as to obtain maximum levels of radiated emissions within the range of likely configurations. 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 that produced the highest emissions. Plots were made of the frequency spectrum from 30 MHz to 1000 MHz for the preliminary testing. The EUT, supporting equipment and cable locations were noted and reconfigured at the open field test site. The highest radiated emission was then re-maximized at this location before final radiated emissions measurements were performed. Final data was taken with the EUT located at the open field test site at a distance of 3 meters between the EUT and the receiving antenna. The frequency spectrum from 30 MHz to 1000 MHz 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,

Biconilog from 30 MHz to 1000 MHz, Log Periodic from 200 MHz to 5 GHz and/or pyramidal horn antennas from 5 to 40 GHz.

CFR 15 SubPart C Intentional Radiators

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

15.203 Antenna Requirement:

The antenna system is permanently attached and is not serviceable. The transmitter and antenna are located entirely inside the sealed base of the EUT. Therefore, the antenna system is attached such that the requirements of Paragraph 15.203 are met.

15.205 Restricted Band of Operation:

Spurious emissions falling into the restricted frequency bands of operation were measured at the OATS. The EUT utilizes frequency determining circuitry which generates harmonics falling into the restricted bands. These emissions were measured using log periodic and/or pyramidal horn antennas, amplification stages and a spectrum analyzer. No other significant emissions were recorded which fell in the restricted bands of operation.

Frequency in MHz	FSM Horz. (dBµV)	FSM Vert. (dBµV)	A.F. (dB/m)	Amp. Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	FCC CLASS A Limit @ 3m (dBµV/m)
1302.0	40.5	42.5	26.3	25	41.8	43.8	54.0
3906.0	31.0	31.0	40.4	25	46.4	46.4	54.0

15.207 Conducted Limits:

The conducted emissions for the EUT were measured in a screen room. Conducted emissions data was taken and recorded in the following table:

Conducted (6 Highest Emissions):

Frequency in MHz	Level L1 in dBµV	Level L2 in dBµV	FCC Limit In dBµV
0.67	34.2	34.4	48.0
0.75	34.6	34.0	48.0
3.6	24.7	22.1	48.0
15.7	21.0	18.2	48.0
19.1	27.7	27.6	48.0
28.7	31.7	35.6	48.0

Other emissions present had amplitudes at least 10 dB below the limit.

15.209 Radiated Emissions Limits; General Requirements:

The field strength of emissions from the EUT was measured at the OATS at a distance of 3 meters. The fundamental and harmonics were investigated and recorded in the following table.

Radiated Emissions Intentional Radiator:

FREQUENCY (MHz)	ESM HOR (dBµV)	ESM VERT (dBµV)	ANT FACTOR (dB)	AMP GAIN (dB)	CES HOR @ 3m (dBµV/m)	CES VERT @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
38.1	48.5	52.3	11.7	35	25.2	29.0	40.0
95.3	51.5	61.5	8.8	35	25.3	35.3	43.5
104.9	48.3	57.5	8.5	35	21.8	31.0	43.5
114.4	45.6	63.0	8.4	35	19.0	36.4	43.5
152.6	51.0	58.3	10.4	35	26.4	33.7	43.5
171.6	48.5	37.8	9.9	35	23.4	12.7	43.5
190.7	54.6	50.6	10.2	35	29.8	25.8	43.5
295.6	38.5	54.2	15.3	35	18.8	34.5	46.0
434.0	62.5	63.8	17.0	35	44.5	45.8	46.0
868.0	35.5	38.4	22.1	35	22.6	25.5	46.0
1302.0	40.5	42.5	26.3	25	41.8	43.8	54.0
1736.0	38.5	38.6	26.3	25	39.8	39.9	54.0
2170.0	33.0	35.0	29.0	25	37.0	39.0	54.0
2604.1	33.5	33.8	33.4	25	41.9	42.2	54.0
3038.1	38.0	35.5	25.0	35	28.0	25.5	54.0

Summary of Results

Conducted Emissions:

The Conducted Emissions for the EUT meets the requirements for FCC Part 15C Intentional Radiators. The EUT had a 12.4 dB minimum margin below the limits. Other emissions were present with amplitudes at least 10 dB below the FCC Limits.

Radiated Emissions:

The radiated emissions for the EUT meet the requirements for FCC Part 15C Intentional Radiators. There were no other measurable emissions in the restricted bands other than those recorded in this report. The EUT had a 0.2 dB margin at the fundamental and 8 dB margin below the limits otherwise. Other emissions were present with amplitudes at least 10 dB below the FCC Limits.

Statement of Modifications:

No modifications were required for the EUT to meet the requirements of Part 15. There were no deviations to the specifications.

APPENDIX

1) Photos Conducted Emissions Setup

2) Photos Radiated Emissions Setup

3) Photos of Case Front and Back

4) Photos Inside of Case

5) Photos Printed Circuit Board

6) Photo FCC Label Location

7) Test Equipment List

8) Rogers Qualifications

9) FCC Site Approval Letter

TEST EQUIPMENT LIST FOR ROGERS LABS, INC.

The equipment is used daily and kept in good calibration and operating condition. Calibration of critical items are checked for accuracy each time used.

List of Test Equipment:	Calibration Date:
Scope: Tektronix 2230	2/98
Wattmeter: Bird 43 with Load Bird 8085	2/98
Power Supplies: Sorensen SRL 20-25, DCR 150, DCR 140	2/98
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/98
R.F. Generator: Boonton 102F	2/98
R.F. Generator: HP 606A	2/98
R.F. Generator: HP 8614A	2/98
R.F. Generator: HP 8640B	2/98
Spectrum Analyzer: HP 8562A, Mixers: 11517A, 11980A & 11980K HP Adapters: 11518, 11519, 11520	2/98
Spectrum Analyzer: HP 8591 EM	6/98
Frequency Counter: Weston 1255	2/98
Frequency Counter: Leader LDC 825	2/98
Antenna: EMCO Log Periodic	9/98
Antenna: BCD 235/BNC Antenna Research	9/98
Antenna: EMCO Dipole Set 3121C	2/98
Antenna: C.D. B-100	2/98
Antenna: Solar 9229-1 & 9230-1	2/98
Antenna: EMCO 6509	2/98
Microline Freq. Meter: Model 27B	2/98
Dana Modulation Meter: Model 9008	2/98
Audio Oscillator: H.P. 200CD	2/98
R.F. Power Amp 65W Model: 470-A-1000	9/97
R.F. Power Amp 50W M185- 10-500	9/97
R.F. PreAmp CPPA-102	9/97
Shielded Room 5 M x 3 M x 3.0 M (100 dB Integrity)	
LISN 50 µHy/50 ohm/0.1 µf	9/98
LISN Compliance Eng. 240/20	2/98
SCS Power Amp Model: 2350A	2/98
Power Amp A.R. Model: 10W 1000M7	2/98
Power Amp EIN Model: A300	1/99
Linear Amp Mini Circuits: ZHL-1A (2 Units)	2/98
Combiner Unit Mini Circuits: ZSC-2-1 (2 Units)	2/98
ELGAR Model: 1751	2/98
ELGAR Model: TG 704A-3D	2/98
ELGAR Model: 400SD (PB)	2/98
ESD Test Set 2000i	10/95
Fast Transient Burst Generator Model: EFT/B-100	10/95
Current Probe: Singer CP-105	8/97
Current Probe: Solar 9108-1N	8/97
Field Intensity Meter: EFM-018	10/95

01/01/99

QUALIFICATIONS

Of

SCOT D. ROGERS, ENGINEER

ROGERS LABS, INC.

Mr. Rogers has approximately 12 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

2/8/99

Date

1/11/99