

SUBMITTAL  
APPLICATION  
REPORT  
FOR  
GRANT OF CERTIFICATION

MODEL: MT16U  
UHF TRANSCEIVER

FCC ID: Q4X-HHTU1

Operating under rule of CFR 47, Paragraph 90, Subpart I

FOR  
Speedcam, Inc.  
1755 Lexington Avenue  
Deland, FL 32724

Test Report Number 060515U



# ROGERS LABS, INC.

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## TEST REPORT For APPLICATION of CERTIFICATION

For

### Speedcam, Inc.

1755 Lexington Avenue  
Deland, FL 32724

MODEL: MT16U  
UHF TRANSCEIVER  
FREQUENCY: 450-470 MHz

FCC ID: Q4X-HHTU1

Test Date: May 15, 2006

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## TABLE OF CONTENTS

<b>TABLE OF CONTENTS</b>	<b>3</b>
<b>FORWARD</b>	<b>4</b>
<b>APPLICABLE STANDARDS &amp; TEST PROCEDURES</b>	<b>4</b>
<b>LIST OF TEST EQUIPMENT</b>	<b>4</b>
<b>2.1033(C) APPLICATION FOR CERTIFICATION</b>	<b>5</b>
<b>2.1046 RF POWER OUTPUT</b>	<b>6</b>
Measurements Required	6
Test Arrangement	7
Results	7
<b>2.1047 MODULATION CHARACTERISTICS</b>	<b>8</b>
Measurements Required	8
Test Arrangement	8
Results	9
<b>2.1049 OCCUPIED BANDWIDTH</b>	<b>11</b>
Measurements Required	11
Test Arrangement	11
Results	11
<b>2.1051 SPURIOUS EMISSIONS AT ANTENNA TERMINALS</b>	<b>15</b>
Measurements Required	15
Test Arrangement	15
Results	18
<b>2.1053 FIELD STRENGTH OF SPURIOUS RADIATION</b>	<b>19</b>
Measurements Required	19
Test Arrangement	19
Results	21
<b>2.1055 FREQUENCY STABILITY</b>	<b>22</b>
Measurements Required	22
Test Arrangement	23
Results	25
<b>TRANSIENT FREQUENCY BEHAVIOR, PER 90.214</b>	<b>25</b>
Measurements Required	25
Test Arrangement	26
Results	27
<b>APPENDIX</b>	<b>28</b>

## FORWARD

In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2005, Part 2 Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.915, 2.925, 2.926, 2.1031 through 2.1057, applicable parts of paragraphs 15, and 90, the following information is submitted.

## Applicable Standards & Test Procedures

In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2005, 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 90 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.

## 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		
AC LINE 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

<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	Comp. Design	1762	2/06	2/07
Antenna	ARA	BCD-235-B	10/05	10/06
Antenna	EMCO	3147	10/05	10/06
Antenna	EMCO	3143	5/06	5/07
Analyzer	HP	8591EM	5/06	5/07
Analyzer	HP	8562A	2/06	2/07

## 2.1033(c) Application for Certification

(1) Manufacturer/Marketer/Vendor

Speedcam, Inc.  
1755 Lexington Avenue  
Deland, FL 32724

(2) Identification: FCC I.D.: Q4X-HHTU1

Model: MT16U S/N: 308SU-1

(3) Instruction Book:

Refer to exhibit for Draft Instruction Manual.

(4) Emission Type: 15K0F3E

(5) Frequency Range: 450 to 470 MHz,

(6) Operating Power Level: 1.0-watt low power, 3.5-Watts high power.

(7) Max Po: 3.5 Watts

(8) Power into final amplifier:

3.5-Watt operation, 10.8 Watts, (7.2V @ 1.5A)  
1.0-Watt operation, 8.5 Watts (7.2V @ 1.0)

(9) Tune Up Procedure for Output Power:

Refer to Exhibit for Transceiver Alignment Procedure.

(10) Circuit Diagrams; description of circuits, frequency stability, spurious suppression, and power and modulation limiting:

Refer to Exhibit for Circuit Diagrams.

Refer to Exhibit for Theory of Operation.

(11) Photograph or drawing of the Identification Plate:

Refer to Exhibit for Photograph or Drawing.

(12) Drawings of Construction and Layout:

Refer to Exhibit for Drawings of Components Layout and Chassis Drawings.

(13) Detail Description of Digital Modulation:  
Not applicable.

(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) 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.

(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.

## 2.1046 RF 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, 12-dB attenuation. The spectrum analyzer had an impedance of 50W 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 90.

$P_{dBm}$  = power in dB above 1 milliwatt.

Milliwatts =  $10^{(P_{dBm}/10)}$

Watts = (Milliwatts)(0.001)(W/mW)

$$\begin{array}{ll}
 35.2 \text{ dBm} & = 10^{(35.2/10)} \\
 & = 3,311.3 \text{ mW} \\
 & = 3.3 \text{ Watts} \\
 29.4 \text{ dBm} & = 10^{(29.4/10)} \\
 & = 871.0 \text{ mW} \\
 & = 0.9 \text{ Watts}
 \end{array}$$

### Results

FREQUENCY	P(dBm)	P(mw)	P(w)
450.025	35.2	3,311.3	3.3
460.025	35.2	3,311.3	3.3
469.975	35.4	3,467.4	3.5
450.025	29.4	871.0	0.9
460.025	29.4	871.0	0.9
469.975	29.8	955.0	1.0

The specifications of Paragraph 2.1046(a) and applicable Parts of 90 are met. There are no deviations to the specifications.

The following data was taken per TIA/EIA-603. The testing procedures used conform to the procedures stated in the TIA/EIA-603 document.

High and low power radiated emission of fundamental.

Frequency (MHz)	Power (W)	FSM horizontal (dB $\mu$ V/m)	FSM vertical (dB $\mu$ V/m)	antenna factor (dB/m)	CFS horizontal (dB $\mu$ V/m)	CFS vertical (dB $\mu$ V/m)
450.025	1.0	98.2	107.0	18.4	116.6	125.4
460.025	1.0	98.5	106.8	18.5	117.0	125.3
469.975	1.0	98.3	106.5	18.4	116.7	124.9
450.025	3.5	108.2	111.9	18.4	126.6	130.3
460.025	3.5	108.0	111.5	18.5	126.5	130.0
469.975	3.5	108.1	111.8	18.4	126.5	130.2

Using the substitution method the following data was taken.

Power output using substitution method.

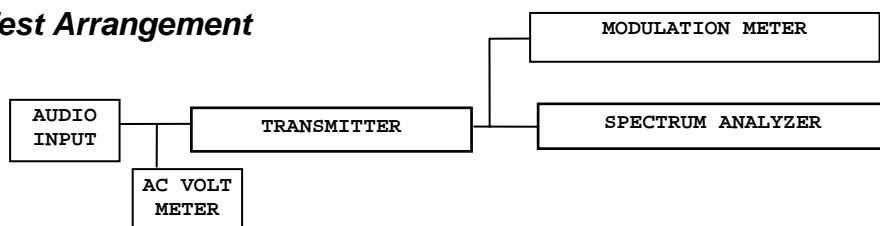
Frequency of Emission (MHz)	Output Power Watts	Amplitude of emission		Signal level to dipole required to reproduce	
		Horizontal dB $\mu$ V	Vertical dB $\mu$ V	Horizontal dBm	Vertical dBm
450.025	1.0	98.2	107.0	21.4	30.1
460.025	1.0	98.5	106.8	21.7	30.1
469.975	1.0	98.3	106.5	21.5	29.7
450.025	3.5	108.2	111.9	31.4	35.1
460.025	3.5	108.0	111.5	31.3	34.8
469.975	3.5	108.1	111.8	31.3	35.0

## 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.

### 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.

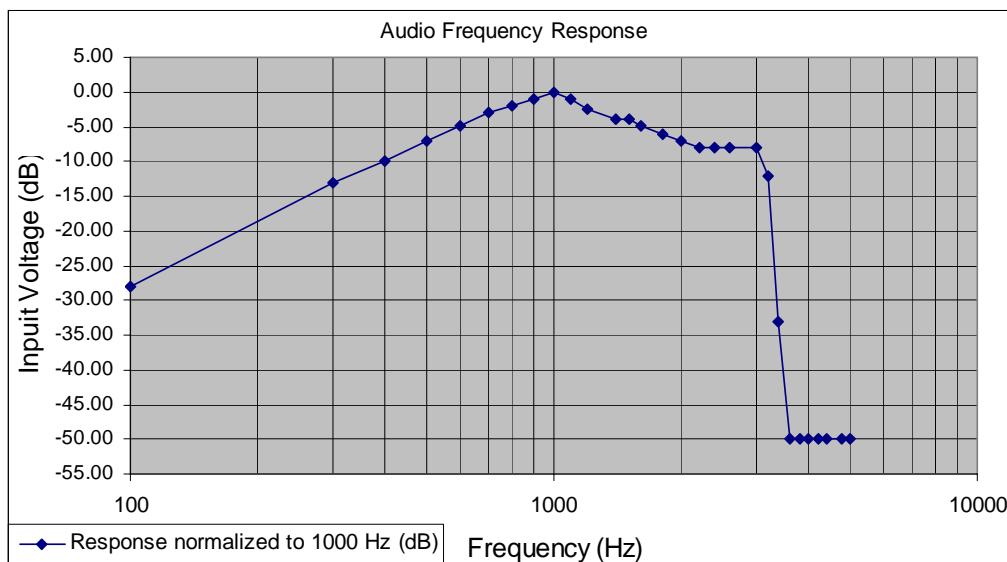


Figure one Audio Frequency Response Characteristics.

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

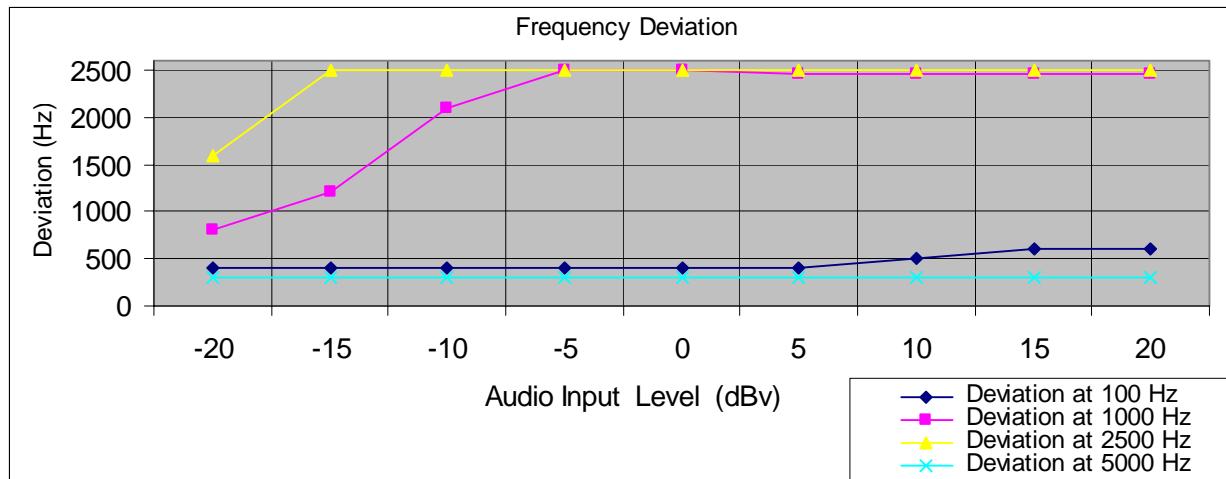


Figure two Deviation Characteristics.

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

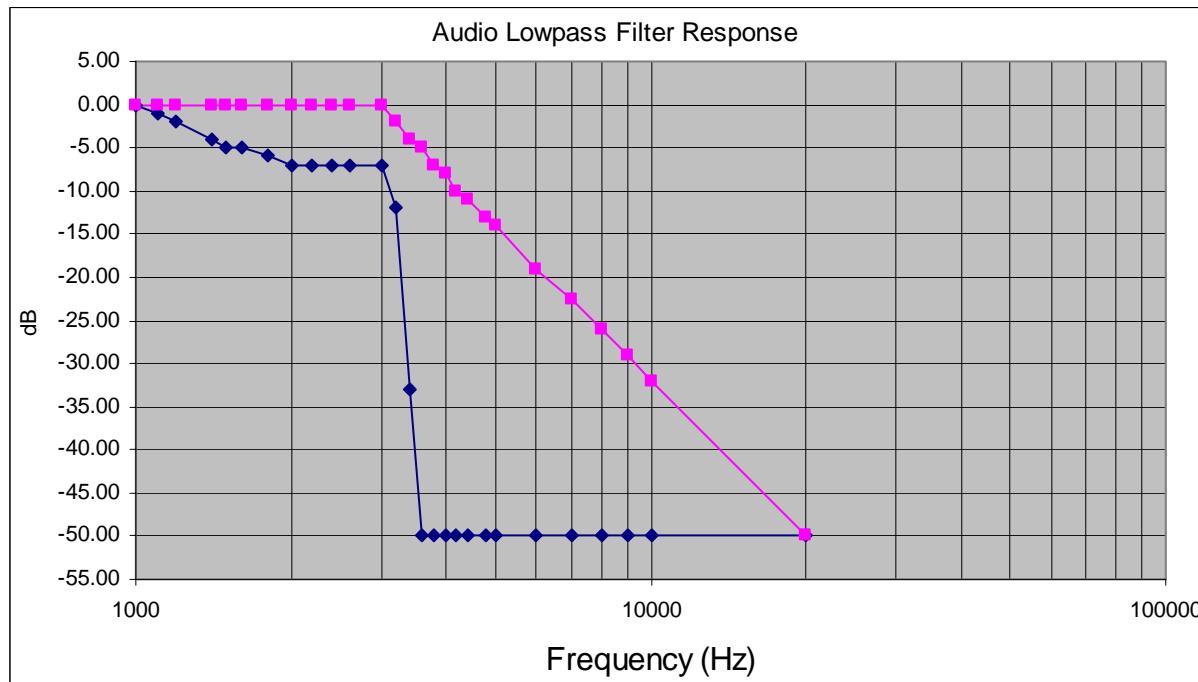


Figure three frequency response of low pass filter.

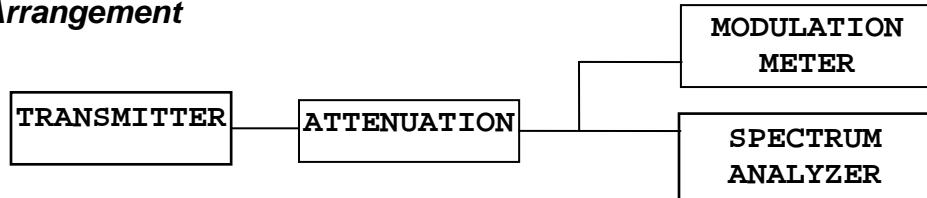
The specifications of Paragraph 2.1047 and applicable parts of 90 are met.

## 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



### Results

Mode / Squelch	Occupied Bandwidth (kHz)
Wide / None	15.0
Wide / CTCSS	11.9
Wide / DCS	14.3
Narrow / None	10.0
Narrow / CTCSS	9.5
Narrow / DCS	9.5

A spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operating in a normal mode, modulated by a frequency of 2500 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. Refer to figures 4 through 9 for plots of 99.5% power.

The necessary bandwidth calculation for this unit is as follows:

$$BN = 2M + 2Dk \quad (k=1), \quad M=5000, \quad \text{and} \quad D=2200$$

$$BN = 2(5000) + 2(2200)(1)$$

$$BN = 14.4 \text{ kHz}$$

Then BN equates to 15k0.

Requirements of 2.1049(c)(1) and applicable paragraphs of Part 90 are met. There are no deviations to the specifications.

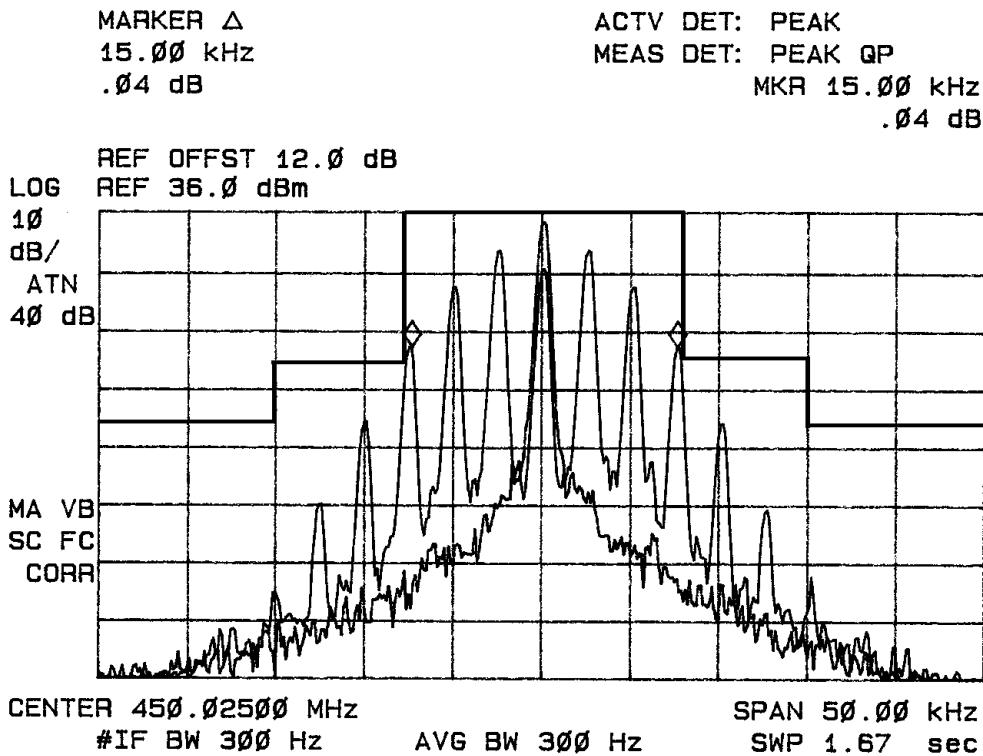


Figure four Occupied Band Width, wide band, no squelch tone

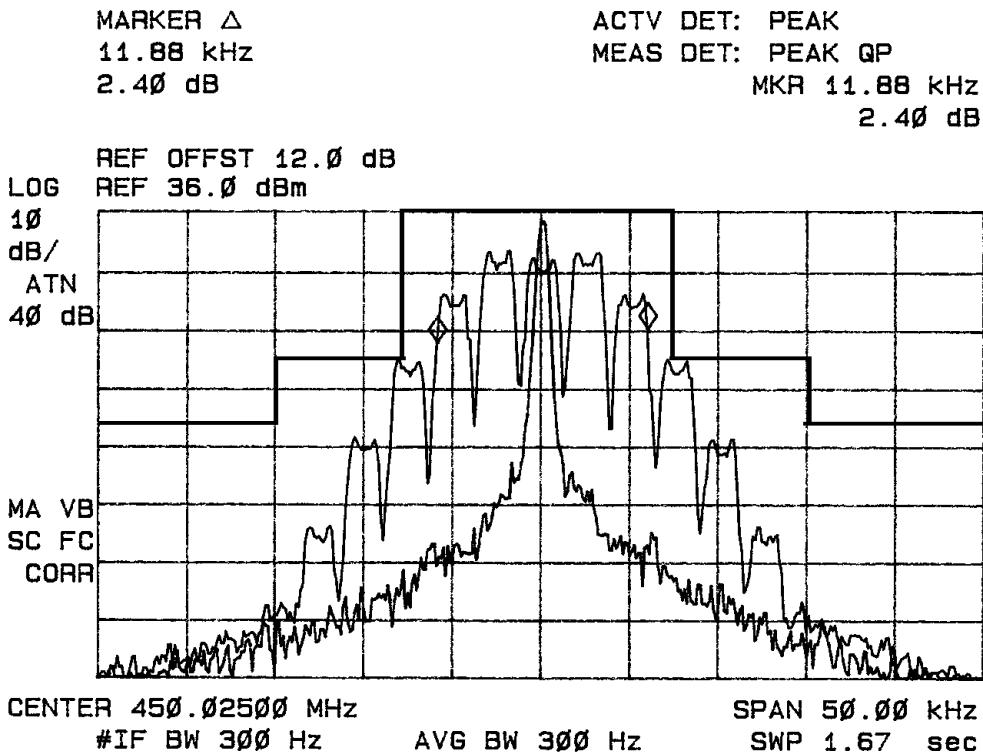


Figure five Occupied Band Width, wide band, CTCSS

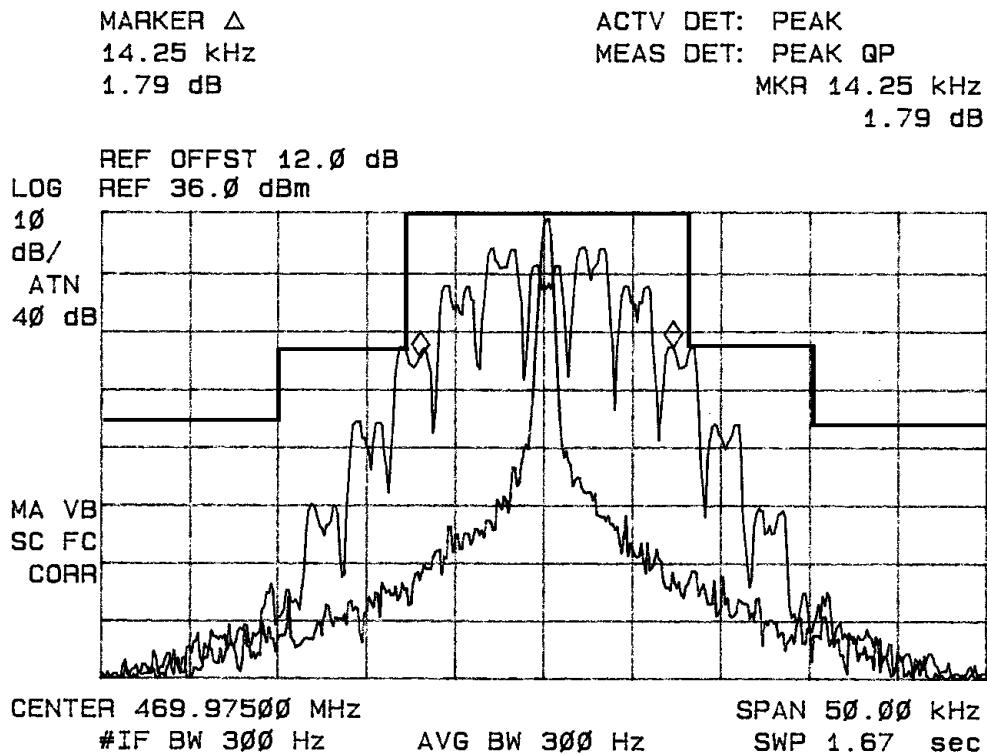


Figure six Occupied Band Width, wide band, DCS

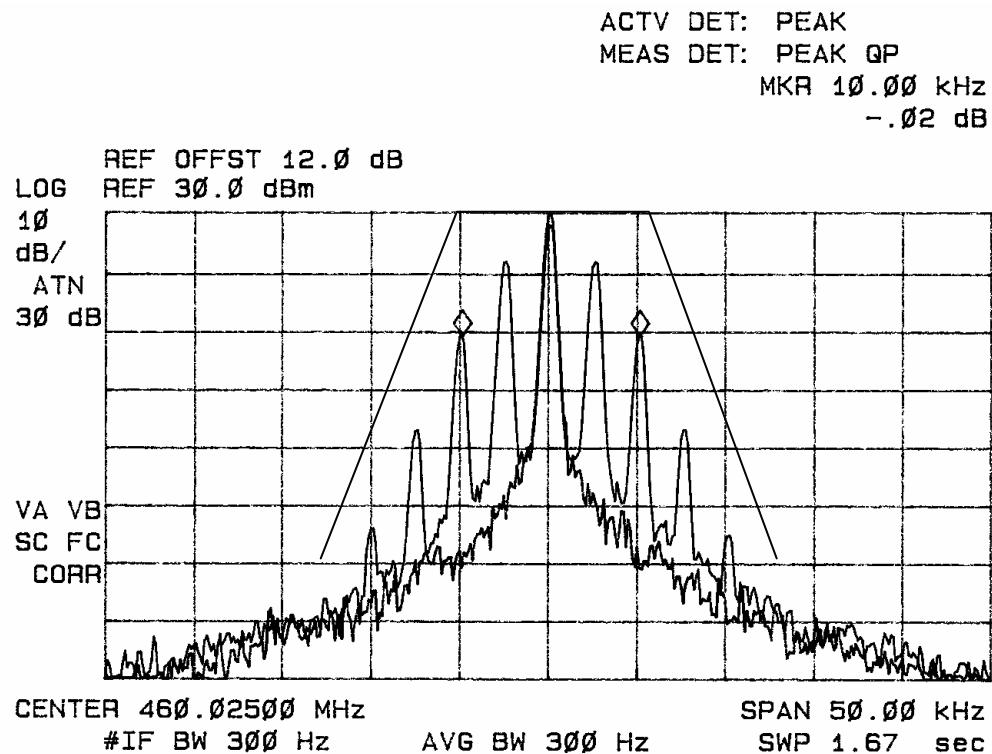


Figure seven Occupied Band Width, Narrow band, no squelch tone

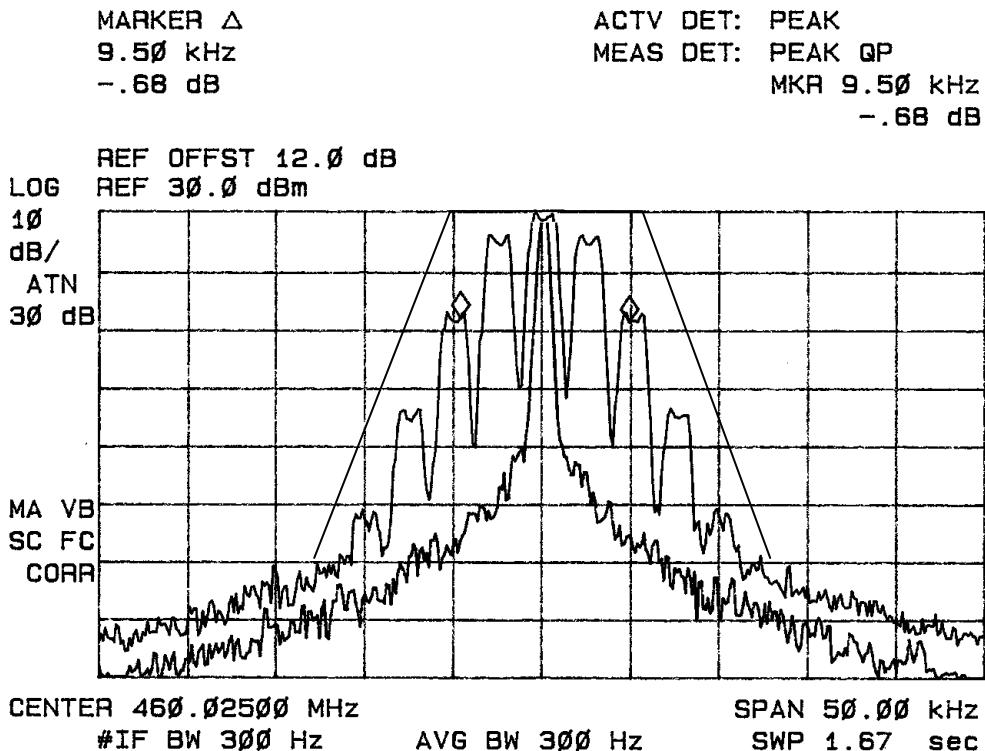


Figure eight Occupied Band Width, Narrow band, CTCSS

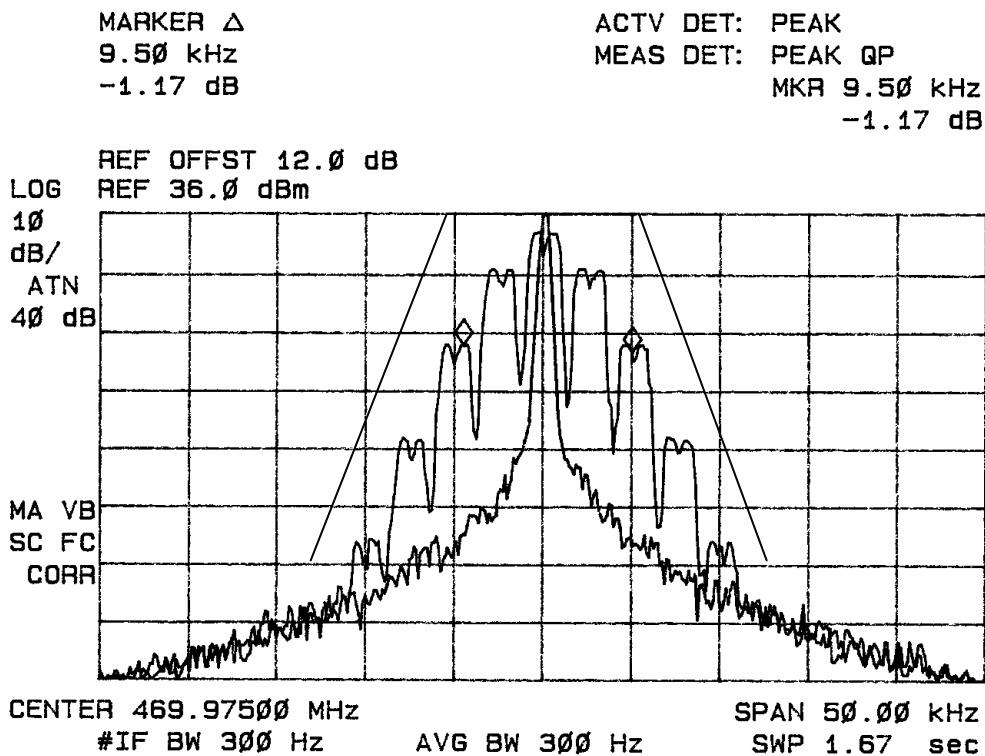


Figure nine Occupied Band Width, Narrow band, DCS

## 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 HP 8562 Spectrum Analyzer. The spectrum analyzer was used to observe the radio frequency spectrum with the transmitter operated in a normal mode. The frequency spectrum from 100 MHz to 5.0 GHz was observed and plots produced of the frequency spectrum. Figures 10 through 13 represent data for the MT16U. Data was taken per 2.1051, 2.1057, and applicable paragraphs of Part 90.

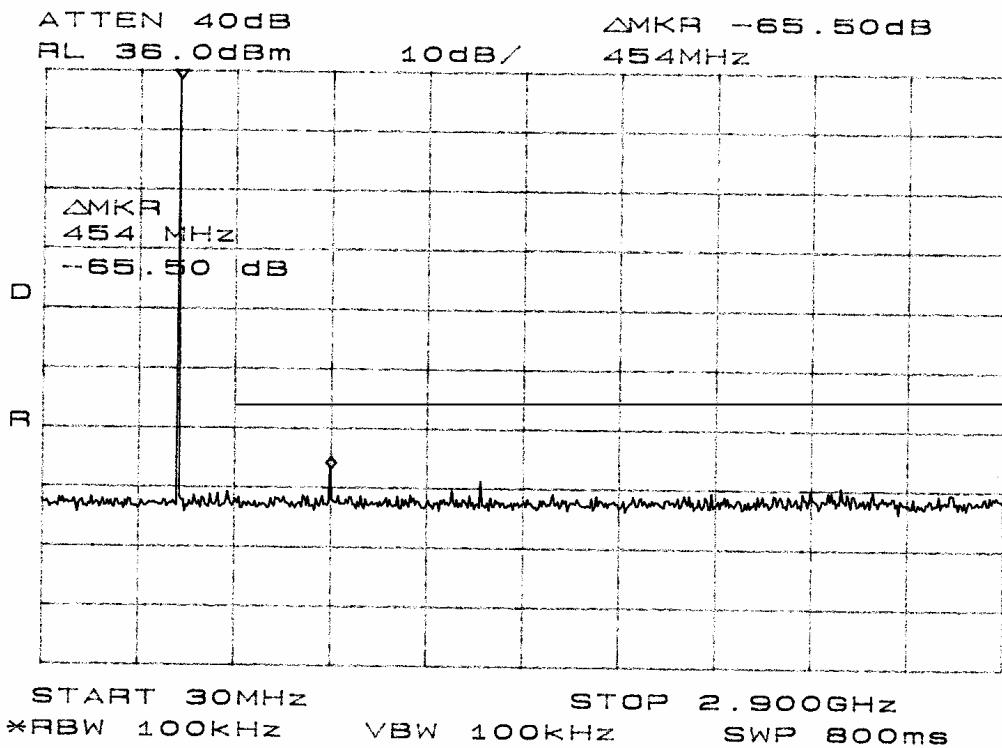


Figure ten Emissions at Antenna Terminal (3.5 watt)

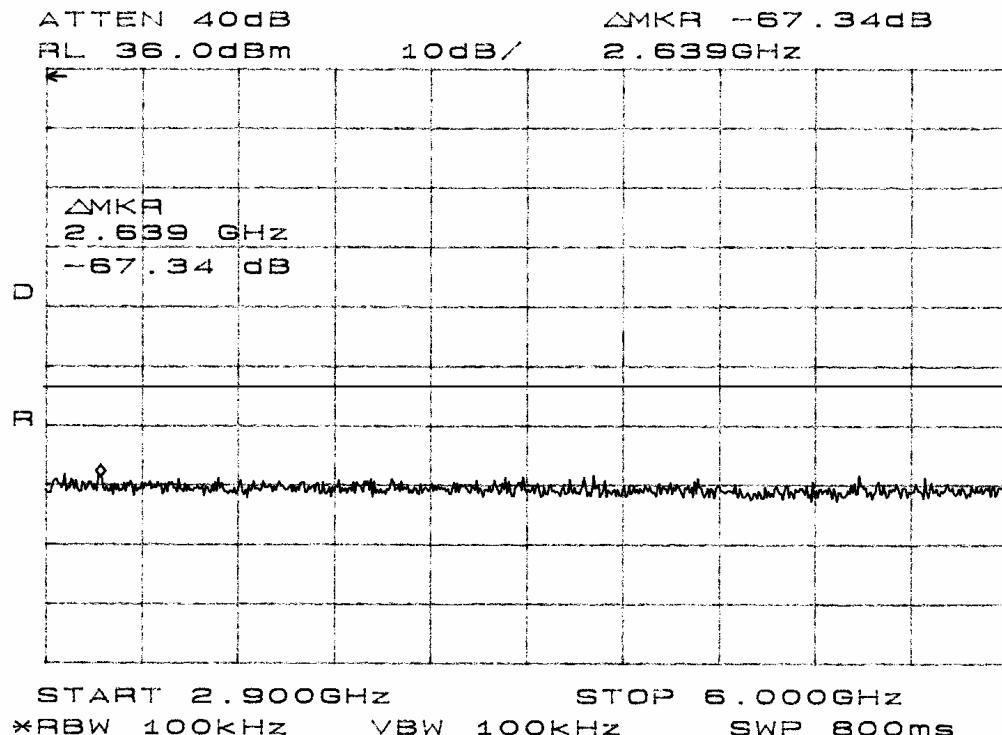


Figure eleven Emissions at Antenna Terminal (3.5 watt)

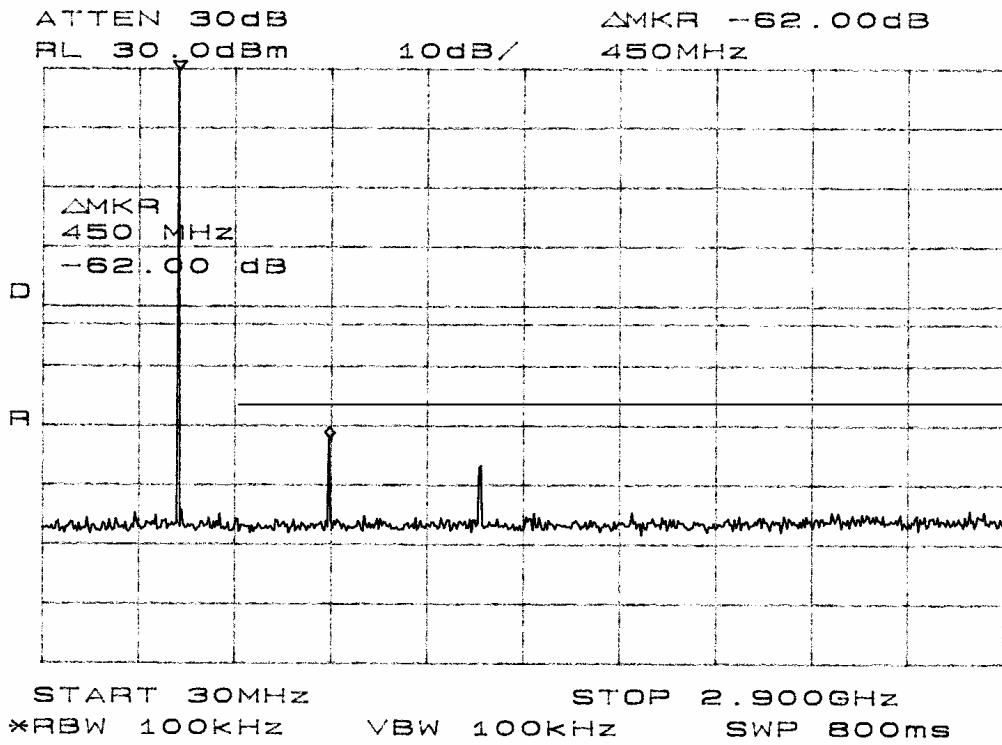


Figure twelve Emissions at Antenna Terminal (1.0 Watt)

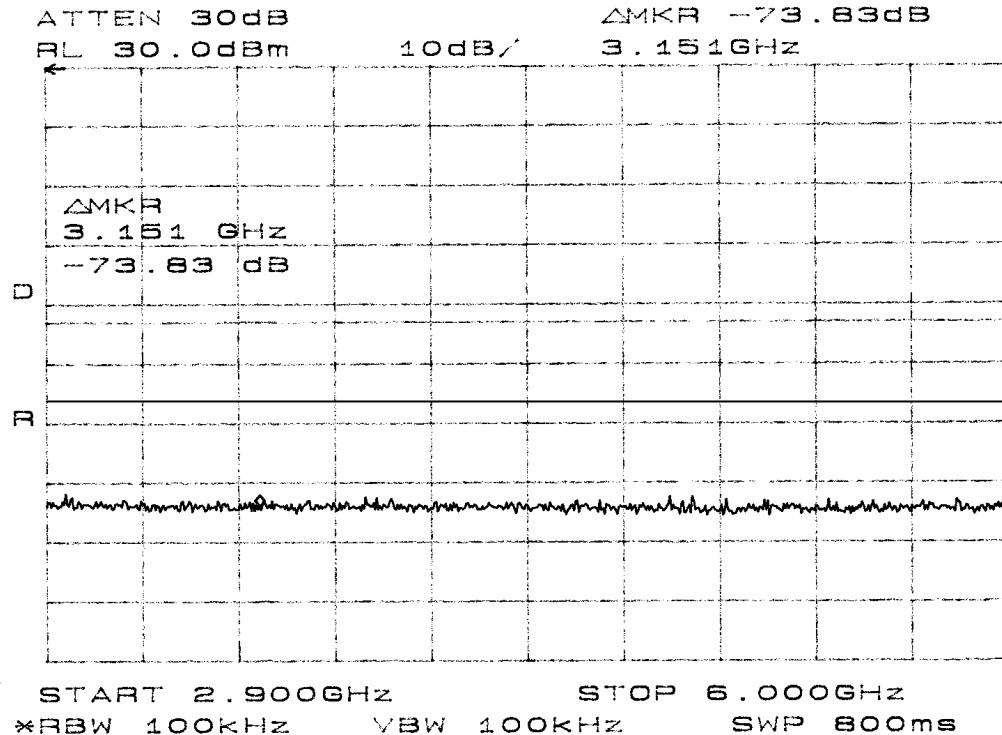


Figure thirteen Emissions at Antenna Terminal (1.0 Watt)

## 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 22, 74, 90, and 97. Specifications of Paragraphs 2.1051, 2.1057 and applicable paragraphs of parts of 22, 74, 90, and 97 are met. There are no deviations to the specifications.

All spurious emissions must be attenuated at least  $43 + 10 \log(P_o)$  below the fundamental emission power level. The following equations represent the calculated attenuation levels for the equipment.

$$\begin{aligned}
 3.5 \text{ Watt} &= 43 + 10 \log(P_o) & 1.0 \text{ Watt} &= 43 + 10 \log(P_o) \\
 &= 43 + 10 \log(3.5) & &= 43 + 10 \log(1.0) \\
 &= 48.4 & &= 43.0
 \end{aligned}$$

### 1.0 Watt Output Power

CHANNEL MHz	SPURIOUS FREQ. (MHz)	Measured (dBm)	LEVEL BELOW CARRIER (dB)
450.025	900.1	-43.0	72.8
	1350.1	-42.5	72.3
	1800.1	-45.0	74.8
	2250.1	-47.5	77.3
	2700.2	-47.8	77.6
	3150.2	-44.6	74.4
460.025	920.1	-41.7	71.2
	1380.1	-44.6	74.1
	1840.1	-44.5	74.0
	2300.1	-46.6	76.1
	2760.2	-47.0	76.5
	3220.2	-45.0	74.5
469.975	940.0	-44.1	73.8
	1409.9	-48.0	77.7
	1879.9	-42.0	71.7
	2349.9	-45.5	75.2
	2819.9	-45.2	74.9
	3289.8	-45.0	74.7

**3.5 Watt Output Power**

CHANNEL MHz	SPURIOUS FREQ. (MHz)	Measured (dBm)	LEVEL BELOW CARRIER (dB)
450.025	900.1	-33.6	68.3
	1350.1	-40.3	75.0
	1800.1	-41.0	75.7
	2250.1	-47.3	82.0
	2700.2	-46.6	81.3
	3150.2	-44.3	79.0
460.025	920.1	-34.3	68.8
	1380.1	-38.1	72.6
	1840.1	-38.6	73.1
	2300.1	-45.5	80.0
	2760.2	-47.0	81.5
	3220.2	-45.0	79.5
469.975	940.0	-35.0	69.7
	1409.9	-38.3	73.0
	1879.9	-41.5	76.2
	2349.9	-45.0	79.7
	2819.9	-45.0	79.7
	3289.8	-45.0	79.7

**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 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 dummy 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.

The limits for the spurious radiated emissions are defined by the following equation.

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.

Limit = Attenuation at least  $43+10\log(P_0)$  dB below fundamental.

1.0-watt low power transmitter.  
 Attenuation =  $43 + 10 \log_{10}(P_w)$   
                  =  $43 + 10 \log_{10}(1.0)$   
                  = 43.0 dB  
 3.5-watt high power transmitter.  
 Attenuation =  $43 + 10 \log_{10}(P_w)$   
                  =  $43 + 10 \log_{10}(3.5)$   
                  = 48.4 dB

### 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 3.5 or 1.0 watts of output power (35.4 or 30 dBm).

Then the radiated spurious emission in dB is calculated from the following equation.

Radiated spurious emission (dB) = RSE  
 Radiated spurious emission (dB) =  
 $10 \log_{10}[\text{Tx power}(W)/0.001] - \text{signal level required to reproduce observed level}$

Example:

For 3.5 Watt output power  
 RSE =  $10 \log[3.5/0.001] - (-60.9)$  = 92.3 dBc

Channel frequency 450.025 MHz (3.5-Watt power)

Frequency of Emission (MHz)	Amplitude of Spurious emission		Signal level to dipole required to reproduce		Emission level below carrier		Limit dBc
	Horizontal	Vertical	dBm	dBm	dBc	dBc	
	dB $\mu$ V	dB $\mu$ V	dBm	dBm	dBc	dBc	
900.1	41.5	48.8	-60.93	-53.63	82.3	83.8	48.4
1350.1	39.8	36.5	-59.43	-62.73	80.8	92.9	48.4
1800.1	41.8	38.3	-54.33	-57.83	75.7	88.0	48.4
2250.1	30.3	24.6	-63.63	-69.33	85.0	99.5	48.4
2700.2	24.7	21.8	-65.03	-67.93	86.4	98.1	48.4

Channel frequency 460.025 MHz (3.5-Watt power)

Frequency of Emission (MHz)	Amplitude of Spurious emission		Signal level to dipole required to reproduce		Emission level below carrier		Limit dBc
	Horizontal dB $\mu$ V	Vertical dB $\mu$ V	Horizontal dBm	Vertical dBm	Horizontal dBc	Vertical dBc	
920.1	37.0	44.8	-64.83	-57.03	86.6	87.1	48.4
1380.1	38.0	40.3	-61.33	-59.03	83.1	89.1	48.4
1840.1	37.0	32.3	-59.13	-63.83	80.9	93.9	48.4
2300.1	26.6	14.1	-66.93	-79.43	88.7	109.5	48.4
2760.2	21.0	25.1	-69.53	-65.43	91.3	95.5	48.4

Channel frequency 469.975 MHz (3.5-Watt power)

Frequency of Emission (MHz)	Amplitude of Spurious emission		Signal level to dipole required to reproduce		Emission level below carrier		Limit dBc
	Horizontal dB $\mu$ V	Vertical dB $\mu$ V	Horizontal dBm	Vertical dBm	Horizontal dBc	Vertical dBc	
940.0	36.1	41.6	-65.63	-60.13	87.1	89.8	48.4
1409.9	33.5	36.1	-65.03	-62.43	86.5	92.1	48.4
1879.9	37.3	27.8	-58.83	-68.33	80.3	98.0	48.4
2349.9	35.3	27.6	-57.53	-65.23	79.0	94.9	48.4
2819.9	19.3	19.8	-70.53	-70.03	92.0	99.7	48.4

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 and 90 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.

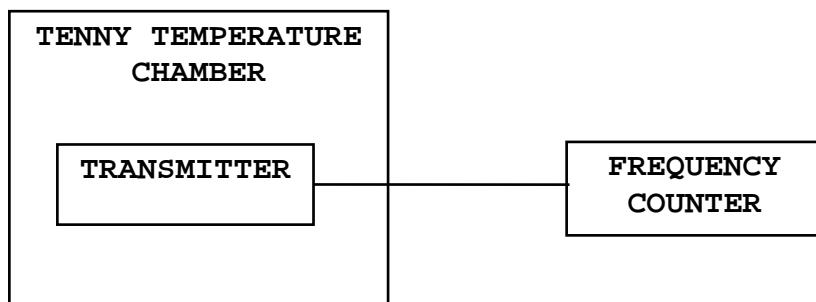
Measurements shall be made at the extremes of the temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. In 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 a 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. A Topward 6303A DC Power Supply was used to vary the dc voltage for the power input from 6.1 Vdc to 8.3 Vdc. 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 90.

## Results

Frequency (MHz) 460.0000	Frequency Stability Vs Temperature In Parts Per Million (Ppm)								
	Temperature in °C								
Temperature	-30	-20	-10	0	10	20	30	40	50
Change (Hz)	70.00	-230.0	-220.0	-220.0	20.0	50.0	-50.0	60.0	230.0
PPM	0.1	-0.5	-0.5	-0.5	0.0	0.1	-0.1	0.1	0.5

Frequency 469.97501 MHz	Frequency Stability Vs Voltage Variation 7.2 volts nominal; RESULTS IN PPM		
	INPUT VOLTAGE		
Change (Hz)	6.1 Vdc	7.2 Vdc	8.3 Vdc
	0.0	0.0	0.0

Frequency 469.97501 MHz	Frequency Stability Vs Voltage Variation 7.2 volts nominal; RESULTS IN PPM	
	BATTERY ENDPOINT VOLTAGE 6.0 Vdc	
Change (Hz)	0.0	
	0.0	

Specifications of Paragraphs 2.1055 and applicable paragraphs of part 90 are met. There are no deviations to the specifications.

## Transient Frequency Behavior, Per 90.214

### Measurements Required

When a transmitter is turned on, the radio frequency may take some time to stabilize. During this initial period, the frequency error must not exceed the limits specified in 90.214.

## Minimum Standard

Transient Behavior for Equipment Designed to Operate on 25 kHz Channels			
Time Intervals	Maximum Frequency Difference (kHz)	Frequency Range	
		138-174 MHz	406.1-470 MHz
t <sub>1</sub>	± 25	5 mS	10 mS
t <sub>2</sub>	± 12.5	20 mS	25 mS
t <sub>3</sub>	± 25	5 mS	10 mS

Transient Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
Time Intervals	Maximum Frequency Difference (kHz)	Frequency Range	
		138-174 MHz	406.1-470 MHz
t <sub>1</sub>	± 12.5	5 mS	10 mS
t <sub>2</sub>	± 6.25	20 mS	25 mS
t <sub>3</sub>	± 12.5	5 mS	10 mS

## POWER INPUT:

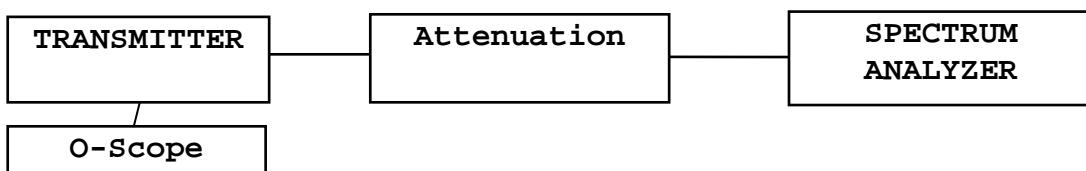
7.2 Vdc Battery

## TEST EQUIPMENT:

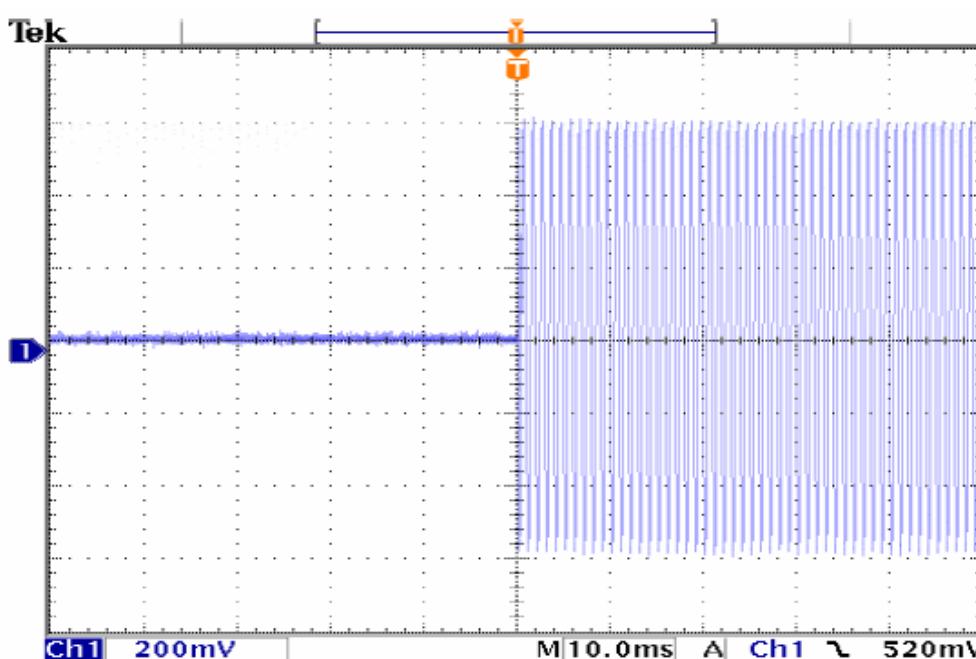
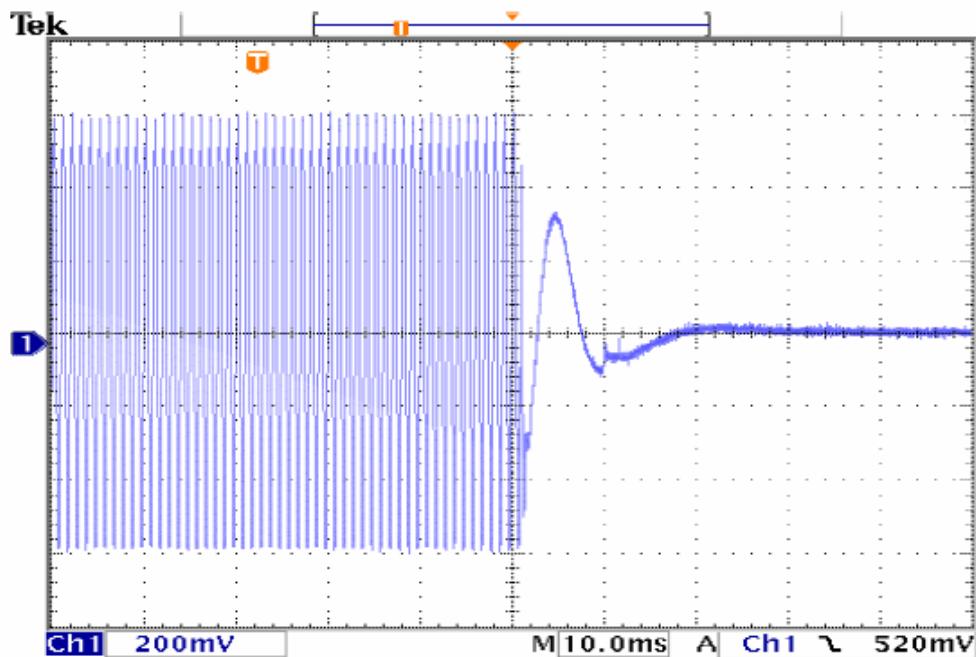
- Tektronix Digital Storage Oscilloscope, Model 2230, S/N: 2230 B012508.
- Hewlett Packard Spectrum Analyzer, Model 8591EM, S/N: 3628A00871, Frequency Range 9 kHz to 1.8 GHz.
- Attenuators (50 Ohm IN/OUT), frequency generator, modulation meter, and combining network.

***Test Arrangement***

As recommended, the method given in ETA/TIA standard 603, was used. Refer to figures 14 and 15 displaying the transient behavior of the transmitter.



## Results



Specifications of Paragraph 90.214 are met. There are no deviations to the specifications.

## APPENDIX

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

ROGERS LABS, INC.  
4405 West 259th Terrace  
Louisburg, KS 66053  
Phone/Fax: (913) 837-3214

Speedcam Inc.  
MODEL: MT16U UHF Transceiver  
Test #:060515U  
Test to: FCC Parts 2, 15, and 90

IC: 6725A-HHTU1  
FCC ID#: Q4X-HHTU1  
SN:308SU-1  
Page 28 of 31

## 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	2/06
Wattmeter: Bird 43 with Load Bird 8085	2/06
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/06
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/06
R.F. Generator: HP 606A	2/06
R.F. Generator: HP 8614A	2/06
R.F. Generator: HP 8640B	2/06
Spectrum Analyzer: HP 8562A,	2/06
Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	
HP Adapters: 11518, 11519, 11520	
Spectrum Analyzer: HP 8591 EM	5/06
Frequency Counter: Leader LDC 825	2/06
Antenna: EMCO Biconilog Model: 3143	5/06
Antenna: EMCO Log Periodic Model: 3147	10/05
Antenna: Antenna Research Biconical Model: BCD 235	10/05
Antenna: EMCO Dipole Set 3121C	2/06
Antenna: C.D. B-101	2/06
Antenna: Solar 9229-1 & 9230-1	2/06
Antenna: EMCO 6509	2/06
Audio Oscillator: H.P. 201CD	2/06
R.F. Power Amp 65W Model: 470-A-1010	2/06
R.F. Power Amp 50W M185- 10-501	2/06
R.F. PreAmp CPPA-102	2/06
LISN 50 $\mu$ Hy/50 ohm/0.1 $\mu$ f	10/05
LISN Compliance Eng. 240/20	2/06
LISN Fischer Custom Communications FCC-LISN-50-16-2-08	6/05
Peavey Power Amp Model: IPS 801	2/06
Power Amp A.R. Model: 10W 1010M7	2/06
Power Amp EIN Model: A301	2/06
ELGAR Model: 1751	2/06
ELGAR Model: TG 704A-3D	2/06
ESD Test Set 2010i	2/06
Fast Transient Burst Generator Model: EFT/B-101	2/06
Current Probe: Singer CP-105	2/06
Current Probe: Solar 9108-1N	2/06
Field Intensity Meter: EFM-018	2/06
KEYTEK Ecat Surge Generator	2/06
Shielded Room 5 M x 3 M x 3.0 M (101 dB Integrity)	
5/2/2006	

## 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 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

May 15, 2006  
Date

## FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division  
7435 Oakland Mills Road  
Columbia, MD 21046

May 16, 2006

Registration Number: 90910

Rogers Labs, Inc.  
4405 West 259th Terrace  
Louisburg, KS 66053

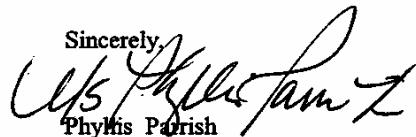
Attention: Scot Rogers

Re: Measurement facility located at Louisburg  
3 & 10 meter site  
Date of Renewal: May 16, 2006

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](http://www.fcc.gov) under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,  
  
Phyllis Parish  
Information Technician

ROGERS LABS, INC.	Speedcam Inc.	IC: 6725A-HHTU1
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Certification\Speedcam MT16U Test Report 9/20/2006