

REPORT OF MEASUREMENTS
PART 15C - INTENTIONAL RADIATOR

DEVICE: TRANSMITTER
MODEL: KF40
MANUFACTURER: SILENT WITNESS ENTERPRISES LTD.
ADDRESS: 6554 176TH STREET
SURREY BRITISH COLUMBIA
CANADA V3S 4G5

THE DATA CONTAINED IN THIS REPORT WAS
COLLECTED ON 11 FEBRUARY 1999 AND COMPILED BY:

PAUL G. SLAVENS
CHIEF EMC ENGINEER

WORK ORDER: 10768-5

DATE OF ISSUANCE: 22 MARCH 1999 REPORT NUMBER: 990042 FCC ID: OHWKF40 PAGE 1 OF 18

1. GENERAL	3
1.1 PURPOSE	3
1.2 MANUFACTURER	3
1.3 TEST LOCATION	3
1.4 TEST PERSONNEL.....	3
2. TEST RESULTS SUMMARY.....	4
3. DESCRIPTION OF EQUIPMENT AND PERIPHERALS	5
3.1 EQUIPMENT UNDER TEST (EUT)	5
3.2 EUT PERIPHERALS	5
3.3 THE MODE OF OPERATION DURING TESTING.....	5
3.4 MODIFICATIONS REQUIRED FOR COMPLIANCE.....	5
4. ANTENNA REQUIREMENT	6
4.1 REGULATION	6
4.2 RESULT	6
5. CONDUCTED EMISSIONS TESTS	7
5.1 TEST EQUIPMENT	7
5.2 PURPOSE	7
5.3 TEST PROCEDURES	7
5.4 TEST RESULTS	7
6. PERIODIC OPERATION	8
6.1 REGULATION	8
6.2 RESULT	8
7. MANUALLY OPERATED TRANSMITTER DEACTIVATION	9
7.1 REGULATION	9
7.2 RESULT	9
8. AUTOMATICALLY OPERATED TRANSMITTER DEACTIVATION.....	10
8.1 REGULATION	10
8.2 RESULT	10
9. PROHIBITION OF PERIODIC TRANSMISSION	11
9.1 REGULATION	11
9.2 RESULT	11
10. CONTINUOUS TRANSMISSION DURING AN ALARM CONDITION.....	12
10.1 REGULATION	12
10.2 RESULT	12
11. RADIATED SPURIOUS EMISSIONS.....	13
11.1 REGULATION	13
11.2 TEST EQUIPMENT	14
11.3 TEST PROCEDURES	15
11.4 CALCULATION OF FIELD STRENGTH LIMITS	15
11.5 CALCULATION OF AVERAGE CORRECTION FACTOR	15
11.6 TEST RESULTS	16
12. 20 DB BANDWIDTH.....	17
12.1 REGULATION	17
12.2 TEST EQUIPMENT	17
12.3 CALCULATION OF 20 dB BANDWIDTH AND RESULT	17
13. MISCELLANEOUS COMMENTS AND NOTES	18

1. General

1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for unlicensed devices operating under section 15.231 of the Code of Federal Regulations title 47.

1.2 Manufacturer

Company Name: Silent Witness Enterprises Ltd.
Contact: Les Tocko
Street Address: 6554 176th Street
City/Province: Surrey British Columbia
Country/Postal Code: Canada V3S 4G5
Telephone: 604 574-1526
Fax: 604 574-7736
Web site: www.silent-witness.com

1.3 Test location

Company: Acme Testing Inc.
Street Address: 2002 Valley Highway
Mailing Address: PO Box 3
City/State/Zip: Acme WA 98220-0003
Laboratory: Test Site 1
Telephone: 888 226-3837
Fax: 360 595-2722
E-mail: acmetest@acmetesting.com
Web: www.acmetesting.com
Receipt of EUT: 05 February 1999

1.4 Test Personnel

Paul G. Slavens, Chief EMC Engineer

2. Test Results Summary

Summary of Test Results Transmitter, model KF40

Requirement	CFR Section	Test Result
Antenna Requirement	15.203	Pass
Radiated Spurs < 15.209	15.205(b)	Pass
Conducted Emissions < 48.0 dBuV	15.207	*
Periodic Operation Characteristics	15.231(a)	Pass
Field Strength Limits	15.231(b)	Pass
20 dB Bandwidth	15.231(c)	Pass

* Not required, the EUT is battery powered.

The signed original of this report, supplied to the client, represents the only “official” copy. Retention of any additional copies (electronic or non-electronic media) is at Acme Testing’s discretion to meet internal requirements only. The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the “Correction Factor” documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the procedure ANSI C63.4 - 1992 and all applicable Public Notices received prior to the date of testing. All emissions from the device were found to be within the limits outlined in this report. Acme Testing assumes responsibility only for the accuracy and completeness of this data as it pertains to the sample tested.

Paul G. Slavens
Chief EMC Engineer

Date of Issuance

3. Description of Equipment and Peripherals

3.1 Equipment Under Test (EUT)

Device: Remote Control (RF) for Video Surveillance Camera
Model Number: KF40
Serial Number: None
FCC ID: KF40
Power: Battery
Grounding: Local
Antenna Distance: 3 meters

3.2 EUT Peripherals

The EUT was tested as a stand-alone device.

3.3 The Mode of Operation During Testing

The EUT was modified to transmit constantly.

3.4 Modifications Required for Compliance

The EUT required the following modifications during testing to bring the product into compliance:

1. Changed C102 to 3pF.

4. Antenna requirement

4.1 Regulation

15.203 An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

4.2 Result

Antenna is a trace on the PCB.

5. Conducted Emissions Tests

Test Requirement: FCC CFR47, Part 15C

Test Procedure: ANSI C63.4:1992

5.1 Test Equipment

Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2410A-00168, Calibrated: 31 December 1997, Calibration due Date: 31 December 1998

RF Preselector: Hewlett-Packard 85685A, Serial Number 2648A-00519, Calibrated: 31 December 1997, Calibration due Date: 31 December 1998

Quasi Peak Adapter: Hewlett-Packard 85650A, Serial Number 2043A-00327, Calibrated: 31 December 1997, Calibration due Date: 31 December 1998

Line Impedance Stabilization Network: EMCO 3825/2, Serial Number 9002-1601, Calibrated: 27 August 1997, Calibration due Date: 31 December 1998

5.2 Purpose

The purpose of this test is to evaluate the level of conducted noise the EUT imposes on the AC mains.

5.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that is placed above the groundplane. Floor standing equipment is placed directly on the groundplane. Any supplemental grounding mechanisms are connected, if appropriate. The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter. The EUT is connected to a dedicated LISN and all peripherals are connected to a second separate LISN circuit. The LISNs are bonded to the groundplane.

Preview tests are performed to determine the “worst case” mode of operation. With the EUT operating in “worst case” mode, final conducted measurements are taken. Conducted measurements are made on each current carrying conductor with respect to ground.

Conducted Emissions Test Characteristics

Frequency range	0.45 MHz - 30.0 MHz
Test instrumentation resolution bandwidth	9 kHz
Lines Tested	Line 1/Line 2

5.4 Test Results

Conducted Emissions is not required, the EUT is battery powered.

6. Periodic Operation

6.1 Regulation

15.231(a) The provisions of this Section are restricted to periodic operation within the band 40.66 - 40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Radio control of toys is not permitted. Continuous transmissions, such as voice or video, and data transmissions are not permitted. The prohibition against data transmissions does not preclude the use of recognition codes. Those codes are used to identify the sensor that is activated or to identify the particular component as being part of the system.

6.2 Result

The EUT meets the requirements of this section.

7. Manually Operated Transmitter Deactivation

7.1 Regulation

15.231(a1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

7.2 Result

The EUT meets the requirements of this section. Transmitter ceases immediately after being released.

8. Automatically Operated Transmitter Deactivation

8.1 Regulation

15.231(a2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

8.2 Result

The EUT does not have automatic transmission.

9. Prohibition of Periodic Transmission

9.1 Regulation

15.231(a3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

9.2 Result

The EUT meets the requirements of this section.

10. Continuous Transmission During an Alarm Condition

10.1 Regulation

15.231(a4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

10.2 Result

This section is not applicable to the EUT.

11. Radiated Spurious Emissions

11.1 Regulation

15.231(b) In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	75
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** Linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = $56.81818(F) - 6136.3636$; for the band 260-470 MHz, uV/m at 3 meters = $41.6667(F) - 7083.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in Section 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of Section 15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength

11.2 Test Equipment

Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2747A-05662, Calibrated: 9 September 1998, Calibration due Date: 9 September 1999

RF Preselector: Hewlett-Packard 85685A, Serial Number 2510A-00106, Calibrated: 9 September 1998, Calibration due Date: 9 September 1999

Quasi Peak Adapter: Hewlett-Packard 85650A, Serial Number 2521A-00931, Calibrated: 9 September 1998, Calibration due Date: 9 September 1999

Line Impedance Stabilization Network: Rhode & Schwarz ESH2-Z5, Serial Number ACMERS1, Calibrated: 4 June 1997, Calibration due Date: 1 March 1999

Broadband Biconical Antenna (20 MHz to 200 MHz): EMCO 3110, Serial Number 1115, Calibrated: 27 June 1998, Calibration due Date: 27 June 1999

Broadband Log Periodic Antenna (200 MHz to 1000 MHz): EMCO 3146, Serial Number 2853, Calibrated: 27 June 1998, Calibration due Date: 27 June 1999

EUT Turntable Position Controller: EMCO 1061-3M 9003-1441, No Calibration Required

Antenna Mast: EMCO 1051 9002-1457, No Calibration Required

2 GHz to 10 GHz Low Noise Preamplifier: Milliwave 593-2898, Serial Number 2494, Calibrated: 31 December 1998, Calibration due Date: 31 December 1999

Double Ridge Guide Horn Antenna: EMCO 3115, Serial Number 5534, Calibrated: 28 December 1998, Calibration due Date: 28 December 1999

11.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. Floor standing equipment is placed directly on the flush mounted metal turntable. The EUT is connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter.

Preview tests are performed to determine the “worst case” mode of operation. With the EUT operating in “worst case” mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions.

Radiated Emissions Test Characteristics

Frequency range	30 MHz - 5000 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz (30 MHz - 1000 MHz) 1 MHz (1000 MHz - 5000 MHz)
Receive antenna scan height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal

11.4 Calculation of Field Strength Limits

Fundamental field strength limits for the band 260 – 470 MHz, uV/m at 3 meters = $41.6667(F) - 7083.3333 = 41.6667 * 433.7 - 7083.3 = 10,985$ uV = 80.8 dBuV/m.

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level = 60.8 dBuV/m.

11.5 Calculation of Average Correction Factor

The average correction factor is computed by analyzing the “worst case” on time in **any** 100 mSec time period and using the formula:

$$\text{Corrections Factor (dB)} + 20 * \log(\text{worst case on time}/100 \text{ mSec})$$

Analysis of the remote transmitter worst case on time in any 100 mSec time period is an on time of 26.4 mSec, therefor the correction factor is $20 * \log(26.4/100) = -11.5$ dB.

The maximum correction factor to be applied is 20 dB per section 15.35 of the FCC rules.

11.6 Test Results

**PRODUCT EMISSIONS
AVERAGE DATA
15.231 BANDS**

No	EMISSION FREQUENCY MHz	SPEC LIMIT	MEASUREMENTS			POL	SITE HGT cm	AZM deg
			ABS dBuV/m	dLIM dB	MODE			
1	433.707	80.8	74.0	-6.8	AVG	H	100	113
2	867.442	60.8	53.8	-7.0	AVG	H	106	360
3	1734.93	60.8	39.2	-21.6	AVG	H	100	263
4	2168.63	60.8	32.0	-28.8	AVG	H	100	149
5	2602.38	60.8	36.4	-24.4	AVG	H	100	197
6	3036.08	60.8	23.0	-37.8	AVG	H	100	81

**PRODUCT EMISSIONS
AVERAGE DATA
15.205 BANDS**

No	EMISSION FREQUENCY MHz	SPEC LIMIT	MEASUREMENTS			POL	SITE HGT cm	AZM deg
			ABS dBuV/m	dLIM dB	MODE			
1	1301.08	54.0	49.7	-4.3	AVG	H	100	058

12. 20 dB bandwidth

12.1 Regulation

15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

12.2 Test Equipment

Spectrum Analyzer: Hewlett-Packard 8566B, Serial Number 2747A-05662, Calibrated: 9 September 1998, Calibration due Date: 9 September 1999

RF Preselector: Hewlett-Packard 85685A, Serial Number 2510A-00106, Calibrated: 9 September 1998, Calibration due Date: 9 September 1999

Quasi Peak Adapter: Hewlett-Packard 85650A, Serial Number 2521A-00931, Calibrated: 9 September 1998, Calibration due Date: 9 September 1999

Line Impedance Stabilization Network: Rhode & Schwarz ESH2-Z5, Serial Number ACMERS1, Calibrated: 4 June 1997, Calibration due Date: 1 March 1999

12.3 Calculation of 20 dB Bandwidth and Result

The 20 dB bandwidth limit = $0.0025 * 433.7 \text{ MHz}$
1.08 MHz

The Measured 20 dB bandwidth is 68.6 kHz

13. Miscellaneous Comments and Notes

1. None.