



Truth Hardware

Application
For Certification
Sentry 2 Skylite Remote Control Transmitter

FCC ID: Q4F4353

April 22, 2003



CERT NO: 1427.01

This report is for the exclusive use of ITS's Client and is provided pursuant to the agreement between ITS and its Client. ITS's responsibility and liability are limited to the terms and conditions of the agreement. ITS assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report and then only in its entirety. Any use of the ITS name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by ITS. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an ITS certification program.

Intertek

7250 Hudson Boulevard, Suite 100, Oakdale, MN 51228
Telephone 651-730-1188, Fax 651-730-1282 Home Page www.etlsemko.com

TABLE OF CONTENTS

1.0	General Description	1
1.1	Related Submittal(s) Grants.....	1
1.2	Product Description	1
1.3	Test Methodology	2
1.4	Test Facility	2
2.0	System Test Configuration	3
2.1	Justification	3
2.2	EUT Exercising Software	3
2.3	Special Accessories.....	3
2.4	Equipment Modification	3
2.5	Support Equipment List and Description	3
2.6	Test Configuration Block Diagram	4
3.0	Test Results	5
3.1	Radiated Emissions, FCC 15.109, Class B	6
3.2	Transmitting Time, FCC 15.231(a)(1).....	7
3.3	Field Strength of Fundamental and Spurious Emissions, FCC 15.231(b)	8
3.4	Bandwidth of Emissions, FCC 15.231(c)	9
3.5	Test Procedure	10
3.6	Field Strength Calculation.....	11
4.0	Test Equipment.....	12
	EXHIBIT I	
	Test Set Up Photographs	13
	EXHIBIT II	
	FCC ID Label Location	16
	EXHIBIT III	
	External Photographs	17
	EXHIBIT IV	
	Internal Photographs	20
	EXHIBIT V	
	Electrical Schematics and Block Diagram.....	23
	EXHIBIT VI	
	User Manual and Operational Description	24

1.0 GENERAL DESCRIPTION

1.1 Related Submittals Grants

This is single application of the *Truth Hardware Remote Control Transmitter Model: Sentry 2 Skylite* for Certification under FCC Part 15, Subpart C.

There are no other simultaneous applications.

The Receiver portion will be verified under Declaration of Conformity.

1.2 Product Description

The *Sentry 2 Skylite Remote Control Transmitter* is a RF remote control operating in 433.8MHz. The intended use of the *Sentry 2 Skylite Remote Control Transmitter* is to generate and transmit a RF signal to control window opener. The *Sentry 2 Skylite Remote Control Transmitter* powered at 4.5VDC from three AAA-size internal batteries.

Antenna Description:

Integrated antenna

1.3 Test Methodology

Emission measurements were performed according to the procedures in ANSI C63.4-2000. All field strength radiated emissions measurements were performed in the semi-anechoic chamber, and for each scan, the procedure for maximizing emissions in Appendices D and E were followed. All field strength radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The test site facility used to collect the radiated and conducted measurement data is located at 7250 Hudson Blvd., Suite 100, Oakdale, Minnesota. This test facility has been fully described in a report dated on March 2003 submitted to FCC. Please reference the site registration number: 90706, dated April 18, 2003.

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

N/A

2.2 EUT Exercising Software

N/A

2.3 Special Accessories

There are no special accessories necessary for compliance of these products.

2.4 Equipment Modification

No modifications were installed during the testing.

2.5 Support Equipment List and Description

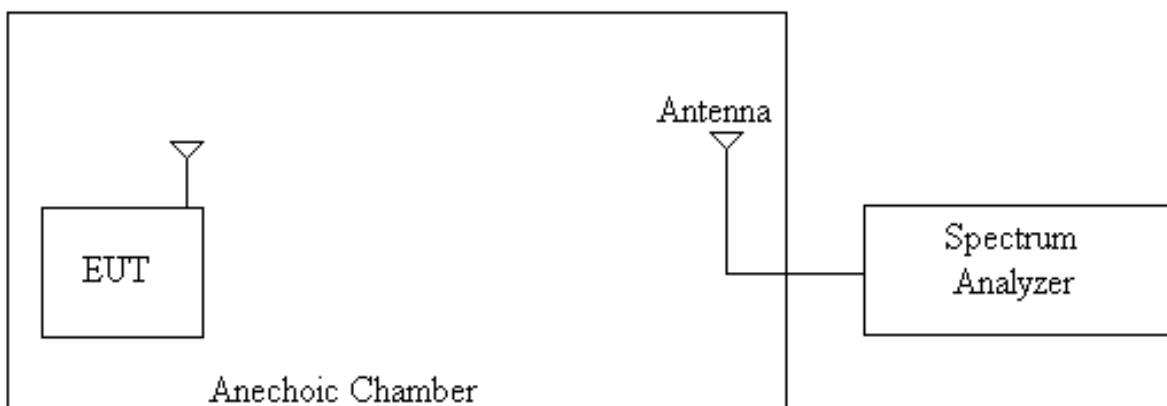
N/A

2.6 Test Configuration Block Diagrams

The EUT was setup as tabletop equipment.

The EUT was powered at 4.5VDC from three AAA-size fresh internal batteries.

Field Strength Measurements



3.0 TEST RESULTS

Data is included for the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs, data tables and graphical representations of the emissions are included.

The EUT is intended for operation under the requirements of Part 15 Subpart C. Specific test requirements include the following:

47 CFR 15.109, Class B	Radiated Emissions
47 CFR 15.231(a)(1)	Transmitting Time
47 CFR 15.231(b))	Field Strength of Fundamental and Spurious Emissions
47 CFR 15.231(c)	Bandwidth of Emissions

Note: Conducted emissions testing was not performed as battery powered equipment.

3.1 Radiated Emissions, FCC 15.109, Class B

Table below shows Radiated Emissions for digital part of the Transmitter in frequency range from 30MHz to 1GHz, emissions at transmitter fundamental frequency and 2nd harmonic were excluded from the Table.

Radiated Emissions **Date:** 04-18-2003
Company: Truth Hardware
Model: Sentry 2 Skylite Transmitter
Test Engineer: Norman Shpilsher
Special Info:
Standard: FCC Part15.109, Class B
Test Site: 3m Anechoic Chamber, 3m measurement distance
Note: The table shows the worst case radiated emissions
 All measurements were taken using a CISPR Quasi-peak detector

Table # 3-1-1

Frequency MHz	Antenna			Total QP at 3m dBμV/m	QP Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)	Factor(dB1/m)				
30.02	V	100	20.6	24.3	40.0	-15.7	
34.25	V	125	18.1	22.1	40.0	-17.9	
41.16	V	115	14.2	21.8	40.0	-18.2	
55.93	V	100	8.3	19.5	40.0	-20.5	
68.18	V	100	7.2	18.9	40.0	-21.1	
85.94	V	128	9.1	15.6	40.0	-24.4	
109.58	H	158	12.8	18.5	43.5	-25.0	
114.94	H	192	13.3	16.9	43.5	-26.6	
137.50	H	127	13.4	17.2	43.5	-26.3	
149.58	H	192	12.5	18.3	43.5	-25.2	
226.15	H	127	13.0	18.2	46.0	-27.8	
312.87	H	135	16.0	19.8	46.0	-26.2	
449.52	H	119	19.6	20.8	46.0	-25.2	
991.25	H	110	26.2	25.1	54.0	-28.9	

3.2 Transmitting Time, FCC 15.231(a)(1)

Measured total transmitting time after pressing the activation button is 940 msec. According to FCC Part 15.231(a)(1) a manually operated transmitter should stop transmitting within 5 sec after release the activation button. Therefore the maximum transmitting time after releasing the activation button is 0.94 sec.

3.3 Field Strength of Fundamental and Spurious Emissions, FCC 15.231(b)

Field Strength of Fundamental and Spurious Emissions measurements were made at Fundamental frequency of 433.833MHz, Spurious Emissions were tested up to 4.5GHz (10th harmonic.)

The Table # 3-3-1 shows the Field Strength of Fundamental Radiation and Spurious Emissions.

Radiated Emissions	Date: 04-18-2003
Company:	Truth Hardware
Model:	Sentry 2 Skylite Transmitter
Test Engineer:	Norman Shpilsher
Special Config. Info:	
Standard:	FCC Part 15.231(b)
Test Site:	3 m Anechoic Chamber
Note:	Readings below 1GHz were taken with RBW 100kHz and above 1GHz with RBW 1MHz; and VBW 1Hz - Average Readings

Table # 3-3-1

Frequency MHz	Antenna			Amplifier Gain (dB)	Reading dBμV	Net at 3m. dBμV/m	Limit dBμV/m	Margin dB	Comments
	Polarity	Hts(cm)	Factor(dB/m)						
433.834	V	136	19.2	0.0	41.3	60.5	80.8	-20.3	Fund.
433.834	H	210	19.2	0.0	40.7	59.9	80.8	-20.9	Fund.
867.662	V	122	24.7	0.0	27.0	51.7	60.8	-9.1	
867.662	H	100	24.7	0.0	28.3	53.0	60.8	-7.8	
1296.674	V	115	28.3	33.9	53.7	48.1	60.8	-12.7	
1296.674	H	124	28.3	33.9	53.9	48.3	60.8	-12.5	
1732.296	V	168	30.5	33.9	51.7	48.3	60.8	-12.5	
1735.296	H	100	30.6	33.9	49.5	46.1	60.8	-14.7	
2164.163	V	134	32.7	34.0	45.7	44.4	60.8	-16.4	
2164.163	H	110	32.7	34.0	44.1	42.8	60.8	-18.0	
2599.785	V	189	34.3	33.7	47.2	47.9	60.8	-12.9	
2599.785	H	141	34.3	33.7	46.5	47.2	60.8	-13.6	
3032.904	V	106	35.4	33.3	34.2	36.3	60.8	-24.5	
3032.904	H	202	35.4	33.3	39.2	41.3	60.8	-19.5	
3468.526	V	113	36.9	32.9	33.2	37.2	60.8	-23.6	
3468.526	H	159	36.9	32.9	36.2	40.2	60.8	-20.6	
3899.142	V	118	38.7	32.6	35.8	42.0	60.8	-18.9	
3899.142	H	121	38.7	32.6	36.2	42.4	60.8	-18.5	

3.4 Bandwidth of Emissions, FCC 15.231(c)

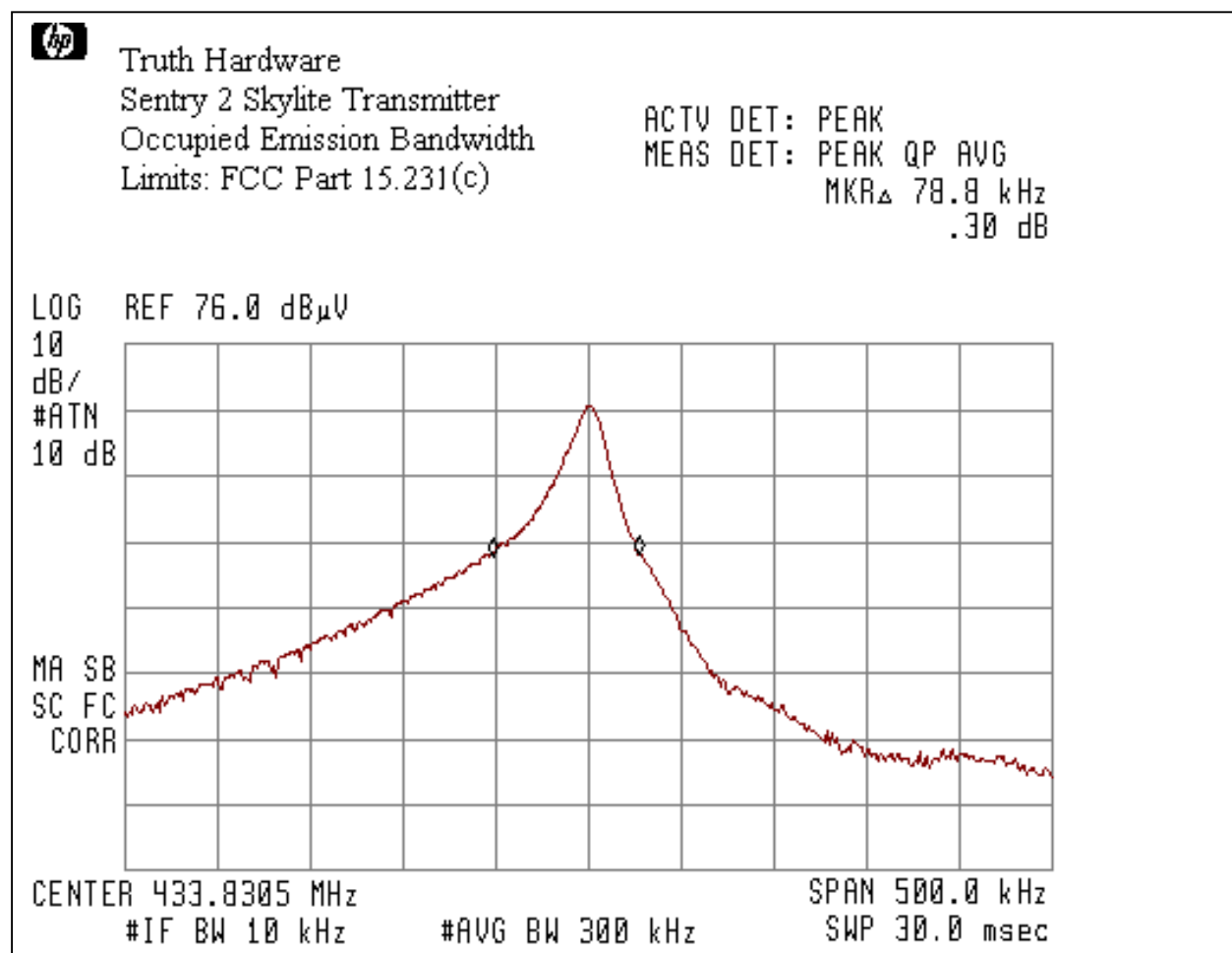
Bandwidth of Emissions measurements was made for frequency of 433.833MHz.

Bandwidth of Emissions at -20dB level was measured at 78.8kHz.

The maximum allowed level is $433.833\text{MHz} \times 0.25\% = 1084.6\text{kHz}$

The # 3-4-1 shows the Bandwidth of Emissions.

Graph 3-4-1



3.5 Test Procedure

Field Strength Measurements

The EUT was placed on a non-conductive table 0.8m above the ground plane inside the Anechoic Chamber. The table was centered on a motorized turntable, which allows 360-degree rotation. The measurement antenna was positioned at 3m distance. The Bicono-Log antenna was used in frequency range from 30MHz to 1GHz, and the Horn antenna was used in frequency range above 1GHz. The radiated emissions were maximized by configuring the EUT through its placement in three orthogonal axes, by rotating the EUT, by changing antenna polarization, and by changing antenna height from 1 to 4m. Method of the direct Field Strength Calculation is shown in Section 3.6.

Frequency Tolerance

The EUT was placed in an environmental test chamber and powered such that control element received normal voltage and the transmitter provided maximum RF output. The Chamber was programmed to cool from room temperature to minus 20 degrees C and then step in 10-degree increments to plus 55 degrees C.

For Frequency Stability testing with variation of primary supply voltage the EUT power supply was powered at rated supply voltage at 120VAC/60Hz and then at 102VAC/60Hz and 138VAC/60Hz

Conducted Emissions

For conducted emissions testing, the equipment is moved to an insulating platform over the ground plane, and the EUT is powered from a LISN. Both sides of the AC line are measured and the results are compared to the applicable limits. Measurements are taken using CISPR quasi-peak and average detectors when the peak readings approach or exceed the average limit. Only quasi-peak readings are taken when the emissions from the EUT meet the average limit as measured with the quasi-peak detector.

3.6 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.

The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude in dB(μ V)

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB(m^{-1})

AG = Amplifier Gain in dBi

Assume a receiver reading of 48.1 dB(μ V) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dBi is subtracted giving field strength of 41.1 dB(μ V/m).

$$RA = 48.1 \text{ dB}(\mu\text{V})$$

$$AF = 7.4 \text{ dB}(m^{-1})$$

$$CF = 1.6 \text{ dB}$$

$$AG = 16.0 \text{ dBi}$$

$$FS = RF + AF + CF - AG$$

$$FS = 48.1 + 7.4 + 1.6 - 16.0$$

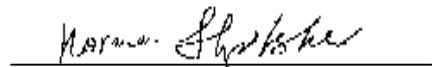
$$FS = 41.1 \text{ dB}(\mu\text{V}/\text{m})$$

In the tables the Cable correction factors are included to the Antenna Factors.

Tested by:

Norman Shpilsher
EMC Project Engineer
Intertek Testing Services NA, Inc.

Signature



Signature

Date: April 22, 2003

4.0 TEST EQUIPMENT

Receivers/Spectrum Analyzers

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
HP85462A Receiver RF Section	3325A00106	08/02	08/03	X
HP85460A RF Filter Section	3330A00109	08/02	08/03	X
HP85462A Receiver RF Section	3549A00306	12/02	12/03	
HP85460A RF Filter Section	3448A00276	12/02	12/03	
Advantest Spectrum Analyzer R3271A	55050084	05/02	05/03	X

Antennas/Pre-Amplifiers

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
Schaffner-Chase Bicono-Log Antenna	2468	12/02	12/03	X
Schaffner-Chase Bicono-Log Antenna	2630	05/02	05/03	
EMCO Horn Antenna 3115	9507-4513	09/02	09/03	X
EMCO Horn Antenna 3115	6579	12/02	12/03	
Roberts Antenna A100	00599	06/02	06/03	
HP 83017A Pre-Amplifier	3123A00475	05/02	05/03	X