



## Truth Hardware

Application  
For Certification  
**Sentry 2 Skylite Remote Control Transmitter**

**FCC ID: Q4F4353**

April 22, 2003



CERT NO: 1427.01

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## 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**

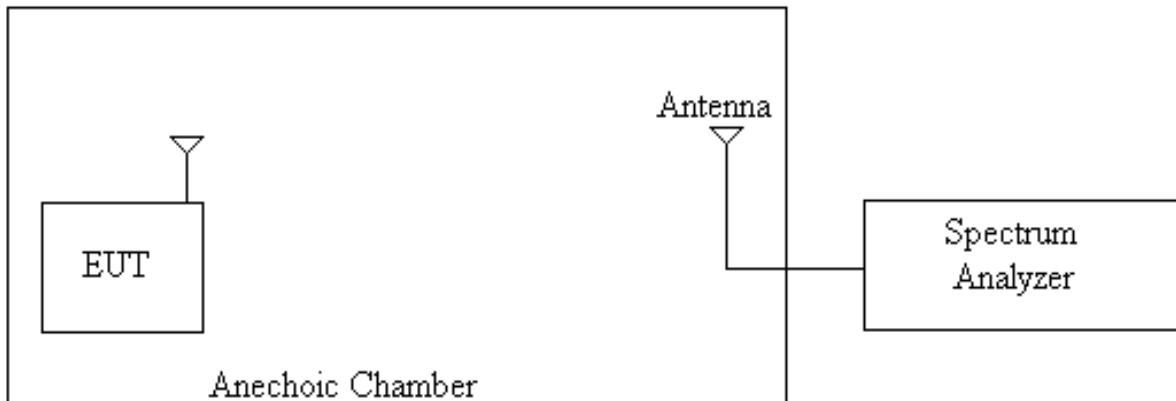
N/A

## **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 2<sup>nd</sup> 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<br>MHz | Antenna  |         |               | Total QP at 3m<br>dB $\mu$ V/m | QP Limit<br>dB $\mu$ V/m | Margin<br>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 (10<sup>th</sup> harmonic.)

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

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

**Table # 3-3-1**

| Frequency<br>MHz | Antenna  |         |              | Amplifier<br>Gain (dB) | Reading<br>dB $\mu$ V | Net at 3m.<br>dB $\mu$ V/m | Limit<br>dB $\mu$ V/m | Margin<br>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        |          |

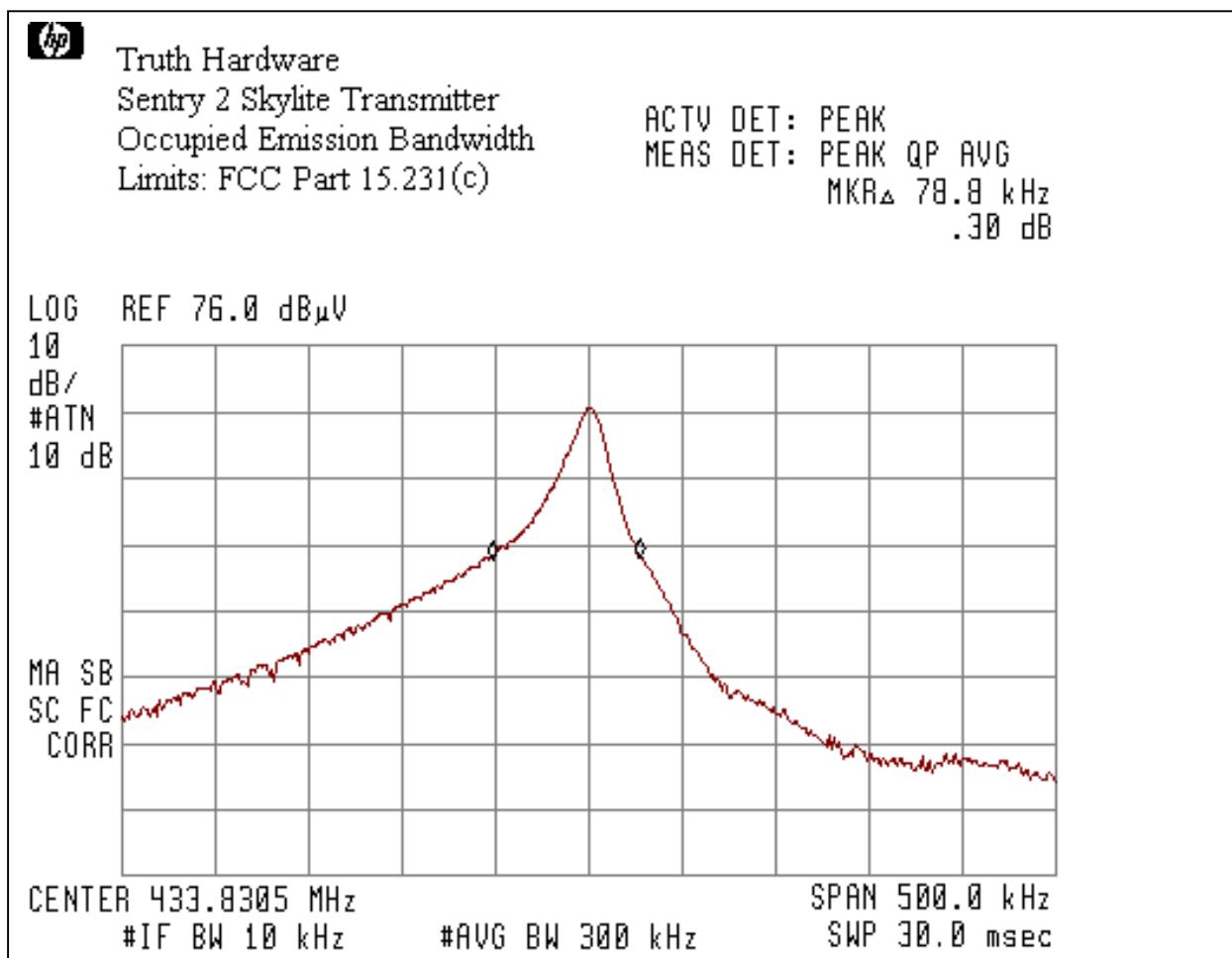
### 3.4 Bandwidth of Emissions, FCC 15.231(c)

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( $\mu$ V/m)

RA = Receiver Amplitude in dB( $\mu$ 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( $\mu$ 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( $\mu$ V/m).

RA = 48.1 dB( $\mu$ V)

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

CF = 1.6 dB

AG = 16.0 dBi

FS = RF + AF + CF - AG

FS = 48.1 + 7.4 + 1.6 - 16.0

FS = 41.1 dB( $\mu$ V/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

Norman Shpilsher

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    |