# RETLIF TESTING LABORATORIES
# TEST REPORT R-4529N1
# January 6, 2006

## FCC COMPLIANCE TEST REPORT
## ON

## PHOTO CONTROL CORPORATION
## WIRELESS STROBE
## FCC ID: TXB8022249

| APPLICANT | MANUFACTURER |
|---|---|
| Nature Vision, Inc.<br>dba Photo Control Corporation<br>4800 Quebec Avenue North<br>Minneapolis, MN 55428 | SAME |

TEST SPECIFICATION: FCC Rules and Regulations Part 15, Subpart C, Para. 15.231

TEST PROCEDURE: ANSI C63.4:2003

**TEST SAMPLE DESCRIPTION:**

BRANDNAME: Photo Control

MODEL: LH52K-M

TYPE: Wireless Strobe (Photographic Flash Unit)

POWER REQUIREMENTS: DC via external battery pack

FREQUENCY BAND OF OPERATION: 344.0MHz to 354.2MHz

MODULATION: OOK (On/Off Keying)

TYPE OF TRANSMISSION: Control Signal (Pulse Recognition Codes)

FREQUENCIES TESTED: 344.03MHz, 349.68MHz, 354.12MHz

FCC ID: TXB8022249

**TESTS PERFORMED:**

15.231 (b) Spurious Radiated Emissions (30MHz to 3.6GHz)

15.231 (b) Field Strength of Fundamental

15.231 (c) Occupied Bandwidth, 0.25% of Fundamental Frequency

Duty Cycle Determination

NOTE: Testing was performed at 3 frequencies (low, mid and high) within the operational band per the requirements of 15.31 (m) for devices operating within a band exceeding 10MHz.

**TEST SAMPLE OPERATION**:

The EUT is a wireless strobe used in the photography industry. The EUT contains a rf transceiver which operates within the 344.0MHz to 354.2MHz range. The EUT is dc powered via external battery pack and has no connections to the AC mains. The device is normally manually operated and transmits a control signal for remote triggering of a strobe. Normal operation of the EUT complies with the parameters required in Part 15, Subpart C, Section 15.231. For testing purposes only the EUT was configured to continuously transmit.

**TEST SAMPLE / TEST PROGRAM**

- The transmitter is manually activated and employs a switch that automatically deactivates the transmitter within 5 seconds of being released.
- The transmitter does not perform periodic transmissions at regularly predetermined intervals.
- The device can not be employed for RC purposes involving security.
- The device uses an external permanently attached rubber coated copper spring antenna.
- The fundamental field strength at 344.03MHz did not exceed 7251μV/M (Average) at a test distance of 3 meters.
  The fundamental field strength at 349.68MHz did not exceed 7486μV/M (Average) at a test distance of 3 meters.
  The fundamental field strength at 354.12MHz did not exceed 7671μV/M (Average) at a test distance of 3 meters.
- The peak value of fundamental emissions did not exceed a peak field strength limit corresponding to 20dB above the maximum permitted average limit.
- The field strength of harmonic and spurious emissions did not exceed 725μV/M or 500μV/M as applicable for a fundamental frequency of 344.03MHz.
  The field strength of harmonic and spurious emissions did not exceed 748μV/M or 500μV/M as applicable for a fundamental frequency of 349.68MHz.
  The field strength of harmonic and spurious emissions did not exceed 767μV/M or 500μV/M as applicable for a fundamental frequency of 354.12MHz.
  No harmonic or spurious emissions were observed within 20dB of the specified limit at test distances of 1 or 3 meters.

**TEST SAMPLE / TEST PROGRAM (continued): (Bandwidth)**

- The device can operate within the range of 344.0 to 354.2MHz. The device was tested at the frequencies of 344.03MHz, 349.68MHz and 354.12MHz. The bandwidth of emissions did not exceed 0.25% of the operating frequency and was determined as follows:

| | | |
|---|---|---|
| Fundamental Frequency | = | 344.03MHz |
| 0.25% of Center Frequency | = | 0.860MHz |
| 0.860 divided by 2 | = | 0.430MHz |
| Bandwidth Range | = | Fundamental Frequency + and - 0.430MHz |
| 344.03MHz - 0.430MHz | = | 343.60MHz |
| 344.03MHz + 0.430MHz | = | 344.46MHz |
| ***Bandwidth Range*** | **=** | ***343.60MHz - 344.46MHz*** |

| | | |
|---|---|---|
| Fundamental Frequency | = | 349.68MHz |
| 0.25% of Center Frequency | = | 0.874MHz |
| 0.874 divided by 2 | = | 0.437MHz |
| Bandwidth Range | = | Fundamental Frequency + and - 0.437MHz |
| 349.68MHz - 0.437MHz | = | 349.24MHz |
| 349.68MHz + 0.437MHz | = | 350.12MHz |
| ***Bandwidth Range*** | **=** | ***349.24MHz - 350.12MHz*** |

| | | |
|---|---|---|
| Fundamental Frequency | = | 354.12MHz |
| 0.25% of Center Frequency | = | 0.885MHz |
| 0.885 divided by 2 | = | 0.4425MHz |
| Bandwidth Range | = | Fundamental Frequency + and - 0.4425MHz |
| 354.12MHz - 0.4425MHz | = | 353.6775MHz |
| 354.12Hz + 0.4425MHz | = | 354.5625MHz |
| ***Bandwidth Range*** | **=** | ***353.6775MHz - 354.5625MHz*** |

- Radiated Emissions from the EUT were measured in all three axis. The attached Radiated Emissions test data is representative of the worst case orientation.

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**TEST SAMPLE / TEST PROGRAM (continued)**

**DETERMINATION OF FIELD STRENGTH LIMITS**

The field strength limits shown below were calculated as instructed in Section 15.231.

**Fundamental Frequency: 344.03MHz**
Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strength for the band 260-470MHz, µV/m at 3 meters is as follows:

| | | |
|---|---|---|
| 41.6667(F) - 7083.3333 | = | Field Strength Limit (µV/m) |
| 41.6667 x 344.05 | = | 14335.428 |
| 14335.428 - 7083.3333 | = | 7251 |
| Field Strength Limit | = | 7251µV/m = 77.21dBuV/M |

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level which equals 725µV/m = 57.21dBuV/M

**Fundamental Frequency: 349.68MHz**
Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strength for the band 260-470MHz, µV/m at 3 meters is as follows:

| | | |
|---|---|---|
| 41.6667(F) - 7083.3333 | = | Field Strength Limit (µV/m) |
| 41.6667 x 349.68 | = | 14570 |
| 14570 - 7083.3333 | = | 7486 |
| Field Strength Limit | = | 7486µV/m = 77.49dBuV/M |

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level which equals 748µV/m = 57.49dBuV/M

**Fundamental Frequency: 354.12MHz**
Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strength for the band 260-470MHz, µV/m at 3 meters is as follows:

| | | |
|---|---|---|
| 41.6667(F) - 7083.3333 | = | Field Strength Limit (µV/m) |
| 41.6667 x 354.12 | = | 14755 |
| 14755 - 7083.3333 | = | 7671 |
| Field Strength Limit | = | 7671µV/m = 77.70dBuV/M |

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level which equals 777µV/m = 57.70dBuV/M

**DETERMINATION OF DUTY CYCLE**

The transmitter controls were adjusted to maximize the transmitted duty cycle. The analyzer was set for a frequency span of 0Hz. The sweep time was then adjusted in order to display one full pulse train. The transmitter on time was then summed and compared to the time for one full cycle in order to obtain the duty cycle. As the pulse train exceeded 100msec in duration the worst case duty cycle was determined by measuring/calculating the 100msec period with the greatest on time. The on times were determined as follows:

The worst case 100msec period contained 3 pulse bursts. The individual pulses within each burst were measured and summed in order to obtain the total "on time" within 100msec.

**Fundamental Frequency: 344.03MHz**

| | | |
|---|---|---|
| Transmitter On Time | = | .775 milliseconds |
| Transmitter Cycle Time | = | 100 milliseconds |
| Transmitter Duty Cycle | = | .775% |
| On Time divided by Cycle Time | = | Duty Cycle Factor |
| .775 divided by 100 | = | 0.00775 |
| 0.00775 converted to dB ($LOG_{10}$ .00775)20 | = | -42.2 |
| ***Duty Cycle Factor*** | **=** | ***-42.2dB*** |

**Fundamental Frequency: 349.68MHz**

| | | |
|---|---|---|
| Transmitter On Time | = | 1.098 milliseconds |
| Transmitter Cycle Time | = | 100 milliseconds |
| Transmitter Duty Cycle | = | 1.098 % |
| On Time divided by Cycle Time | = | Duty Cycle Factor |
| 1.098 divided by 100 | = | 0.01098 |
| 0.01098 converted to dB ($LOG_{10}$ .01098)20 | = | -39.18 |
| ***Duty Cycle Factor*** | **=** | ***-39.18dB*** |

**DETERMINATION OF DUTY CYCLE (continued)**

**Fundamental Frequency: 354.12MHz**

| | | |
|---|---|---|
| Transmitter On Time | = | 1.185 milliseconds |
| Transmitter Cycle Time | = | 100 milliseconds |
| Transmitter Duty Cycle | = | 1.185 % |
| On Time divided by Cycle Time | = | Duty Cycle Factor |
| 1.185 divided by 100 | = | 0.01185 |
| .01185 converted to dB ($LOG_{10}$ .01185)20 | = | -38.52 |
| ***Duty Cycle Factor*** | **=** | ***-38.52dB*** |

Duty Cycle Factor Determination Plots are included with this application as a separate attachment.

**Test Methods**

15.231 (b) Fundamental & Spurious Radiated Emissions

The test sample was placed on a 80cm high wooden test stand which was located 3 meters from the test antenna on an FCC listed open area test site. Emissions from the EUT were maximized by rotating the test sample and adjusting the test sample orientation and antenna polarization. The maximized peak field strength of each emission was measured and recorded and compared to the limit specified in 15.35 (b) (peak limit corresponds to 20dB above the maximum permitted average limit). The duty cycle factor was applied to the peak readings in order to determine the average field strength of the emissions for comparison to the specified average limits.

**Test Results:** The worst case maximum peak field strength of the fundamental frequency at 344.03MHz was 93.17dBuV/M which met the peak limit of 97.21dBuV. The maximum average field strength at 344.03MHz was 60.38dBuV which met the specified average limit of 77.21dBuV. The worst case maximum peak field strength of the fundamental frequency at 349.68MHz was 95.55dBuV/M which met the peak limit of 97.49dBuV. The maximum average field strength at 349.68MHz was 59.77dBuV which met the specified average limit of 77.49dBuV. The worst case maximum peak field strength of the fundamental frequency at 354.12MHz was 94.84BuV/M which met the peak limit of 97.70dBuV. The maximum average field strength at 354.12MHz was 56.73dBuV which met the specified average limit of 77.70dBuV. No harmonic/spurious frequencies were observed.

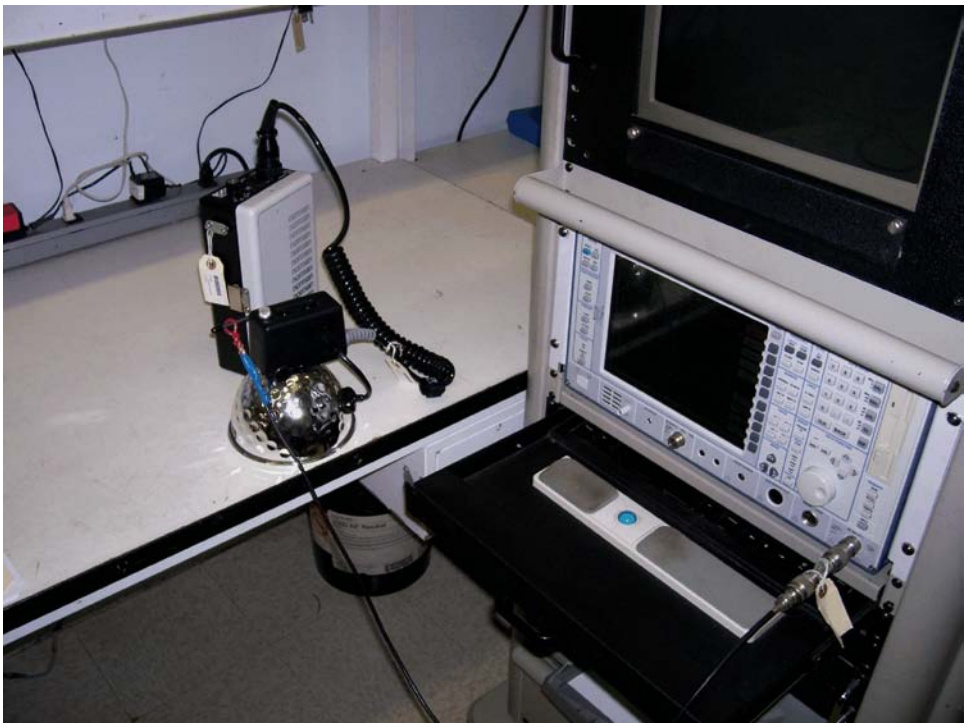
15.231 (c) Occupied Bandwidth

The test sample was placed on a test bench with nominal AC power applied and configured to transmit its normal modulated signal. The spectrum analyzers resolution bandwidth, sweep rate and span were adjusted for the frequency being measured. The upper and lower frequency points corresponding to levels 20dB down from the peak of the modulated carrier frequency were used to determine the occupied bandwidth.

**Test Results:** The bandwidth of the emission at 344.03MHz, 349.68MHz and at 354.12MHz was less than 0.25% of the center frequency and met the requirements of 15.231 (c).

RADIATED EMISSIONS SETUP PHOTOGRAPHS

OCCUPIED BANDWIDTH & DUTY CYCLE SETUP PHOTOGRAPH



# EQUIPMENT LISTS

## RADIATED EMISSIONS

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due |
|---|---|---|---|---|---|---|
| 3258 | Double Ridge Guide | EMCO | 1 - 18 GHz | 3115 | 08/21/2005 | 08/21/2006 |
| 4029B | Test Site Attenuation | Retlif | 3 / 10 Meters | RNH | 12/03/2004 | 2/03/2006 |
| 5053 | Biconilog | EMCO | 26 MHz - 3000 MHz | 3142C | 10/25/2005 | 10/25/2006 |
| 713 | EMI Test Receiver | Rohde & Schwarz | 20 Hz - 26.5 GHz | ESI26 | 03/22/2005 | 03/22/2006 |

## Occupied Bandwidth & Duty Cycle

| EN | Type | Manufacturer | Description | Model No. | Cal Date | Due |
|---|---|---|---|---|---|---|
| 5037 | 6 DB Atten. (50 ohm) | Fluke | DC - 12.4 GHz | Y9303 | 02/08/2005 | 02/08/2006 |
| 713 | EMI Test Receiver | Rohde & Schwarz | 20 Hz - 26.5 GHz | ESI26 | 03/22/2005 | 03/22/2006 |