Technical Information

APPLICANT	MANUFACTURER
Name: X10 (USA), Inc.	Name: X-10 Electronics (Shenzhen) Co. Ltd.
Address: 19823 58th Place South	Address: Together Rich Industrial Park B Sanwei Industrial District, Xixiang Town
City, State, Zip: Kent, WA 98032	City, State, Zip: Baoan County, Shenzhen, China

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

TEST PROCEDURE: ANSI C63.4:2003

TEST SAMPLE DESCRIPTION

BRANDNAME(s): GE

MODEL(s): R24945

FCC ID: B4SR24945

TYPE: Pulsed Transmitter

POWER REQUIREMENTS: 2 AAA Alkaline Batteries (3 VDC)

FREQUENCY OF OPERATION: 433.95 MHz

APPLICABLE RULE SECTION: Part 15, Subpart C, Section 15.231

TESTS PERFORMED

Para. 15.231(a), Radiated Emissions, Fundamental and Harmonics

Para. 15.231(b), Radiated Emissions, Spurious Case

Para. 15.231(b), Duty Cycle Determination

Para. 15.231(c), Occupied Bandwidth

TEST RESULTS

15.231 (a): This device transmits a control signal and is used as a remote control transmitter.

15.231 (a)(1) The transmitter is manually operated. Transmission ends within 5 seconds of deactivation.

15.231 (a)(3): The transmitter does not perform periodic transmissions or the transmitter performs periodic transmissions at predetermined intervals greater than 1 hour apart and are shorter than 1 second in duration.

15.231 (b): The fundamental field strength did not exceed 11,000 µV/M (Average) at a test distance of 3 meters. In addition, the requirements of section 15.35 for averaging pulsed emissions and for limiting peak emissions were met. The field strength of harmonic and spurious emissions did not exceed 1,100 µV/M (AVERAGE).

15.231 (c) The Bandwidth of the emission was no wider than 0.25% of the center frequency (1.085 MHz) as measured 20 db down from the modulated carrier.

DETERMINATION OF FIELD STRENGTH LIMITS

The field strength limits shown below are found in Section 15.231:

	Frequency		Limit
F1 =	260	3750 =	L1
Fo =	433.95 MHz	Lo	
F2 =	470	12500 =	L2

The formula below was utilized to determine the limits:

Limit = L1 + [(Fo-F1)(L2-L1)/(F2-F1)]

Solving yields

Fundamental Limit = 11,000 µV/M (AVERAGE) @ 3 Meters

Harmonic Limit = 1,100 µV/M (AVERAGE) @ 3 Meters

DUTY CYCLE DETERMINATION

The unit's RF output was directly coupled to the input of the spectrum analyzer. 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. (See plots for additional information).

Transmitter On Time = 0.668 milliseconds (maximum)

Transmitter Cycle Time = 156.8 Milliseconds (100 ms maximum)

Transmitter Duty Cycle = 66.8 %

CALCULATION

2 Large Pulses = 4.4 milliseconds

52 x 1.2 ms (small pulse) = 62.4 milliseconds

4.4 + 62.4 = 66.8 milliseconds

Duty Cycle (0.668 x 100) = 66.8 %

Correction Factor =20 log (0.668) = -3.5 dB

SPECTRUM ANALYZER DESENSITIZATION CONSIDERATIONS

Due to the nature of the emissions being measured, care was taken to ensure that the resolution bandwidth of the spectrum analyzer was adequate to provide accurate measurements. The following formula was utilized:

Setting pulse desensitization equal to zero and utilizing the minimum observed pulse width of 1200 µs yields a minimum required bandwidth of 555.5 Hz. FCC specified bandwidths of 100 kHz and 1 MHz were utilized below and above 1GHz, respectively.

GENERAL NOTES

1. All readings were taken utilizing a peak detector function at a test distance of 3 meters.
2. The duty cycle was applied to the peak readings in order to determine the average value of the emissions.
3. The frequency range was scanned from 30 MHz to 4.34 GHz. All emissions not reported were more than 20 dB below the specified limit.