

APPLICANT X-10 (USA), Inc. 91 Ruckman Road Closter, NJ 07624-0420	MANUFACTURER X-10 Electronics Shenzhen Co. Ltd. X-10 Building Labour Industrial District Shenzhen, Xixiang, Bao An Guang Dong, China, 518102
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TEST SPECIFICATION: FCC Rules and Regulations Part 15, Subpart C, Para. 15.231

TEST PROCEDURE: ANSI C63.4:1992

TEST SAMPLE DESCRIPTION

BRANDNAME: X-10 (USA), Inc. MODEL: UR28A

TYPE: 310 MHz RF Transmitter

POWER REQUIREMENTS: 6.0 VDC derived from 4 "AAA" batteries

FREQUENCY OF OPERATION: 310 MHz

TESTS PERFORMED

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

Para. 15.231(c), Occupied Bandwidth

Duty Cycle Determination

REPORT OF MEASUREMENTS

Applicant: X-10 (USA), Inc.

Device: 310 MHz RF Remote Control

FCC ID: B4SUR28A

Power Requirements: 6 VDC

Applicable Rule Section: Part 15, Subpart C, Section 15.231

REPORT OF MEASUREMENTS (continued)

TEST RESULTS

- 15.231 (a) - The device is used as a transmitter for security purposes.
- 15.231 (a)(1) & - The transmitter is manually operated and ceases transmission within 5
15.231(2) seconds after deactivation.
- 15.231 (a)(3) - The transmitter does not perform periodic transmissions.
- 15.231 (a)(4)- The device is employed for RC purposes involving security.
- 15.231 (b) - The fundamental field strength did not exceed 5833 $\mu\text{V/M}$ (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 583 $\mu\text{V/M}$ (AVERAGE).
- 15.231 (c) - The device operates at 310 MHz. The bandwidth of emissions did not exceed 0.25% of the operating frequency (775 kHz).

DETERMINATION OF FIELD STRENGTH LIMITS

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

Frequency			Limit		
F1	=	260	3750	=	L1
Fo	=	310			Lo
F2	=	470	12500	=	L2

The formula below was utilized to determine the limits:

$$\text{Limit} = L1 + [(Fo-F1)(L2-L1)/(F2-F1)]$$

Solving yields:

$$\text{Fundamental Limit} = 5,833 \mu\text{V/M (AVERAGE) @ 3 Meters}$$

$$\text{Harmonic Limit} = 583 \mu\text{V/M (AVERAGE) @ 3 Meters}$$

REPORT OF MEASUREMENTS (continued)

DETERMINATION OF DUTY CYCLE

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	=	29.3 milliseconds (maximum- worst case in 100 ms)
Transmitter Cycle Time	=	> 100 milliseconds
Transmitter Duty Cycle	=	29.3 %

CALCULATION:

1 Large Pulse	=	9.5 milliseconds
33 x 600 μ s (small pulse)	=	19.8 milliseconds
9.5 + 19.8	=	29.3 milliseconds
Duty Cycle	=	29.3 %
Correction Factor = $20 \log(0.293) = -10.6$		

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 600 μ s yields a minimum required bandwidth of 1111 Hz. FCC specified bandwidths of 100kHz and 1MHz were utilized below and above 1GHz, respectively.

REPORT OF MEASUREMENTS (continued)

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. All measurements were made with 6 VDC being derived from 4 new “AAA” batteries.
4. The frequency range was scanned from 30 MHz to 3.1 GHz . All emissions not reported were more than 20 dB below the specified limit.

EQUIPMENT LIST

FCC Part 15 Subpart C Radiated Emissions Paragraph 15.231(b)

EN	Type	Manufacturer	Frequency Range	Model No.	Cal Date	Due Date
067	Open Area Test Site	Retlif	3 Meter	RNY	8/30/97	8/30/99
128C	Double Ridge Guide	Eaton Corporation	1 GHz - 18 GHz	96001	10/6/98	10/6/99
133	Broadband Pre-Amplifier	Electro-Metrics	10 kHz - 1 GHz, 26dB	BPA-1000	6/22/98	6/22/99
206B	6.0 dB Attenuator	Texscan	0 - 1.0 GHz	FP-50 - 6 dB	6/22/98	6/22/99
523	Biconilog	Electro-Mechanics	26 - 2000 MHz	3142B	10/22/98	4/22/00
543	Preamplifier	Hewlett Packard	1.0 GHz - 26.5 GHz	8449B	9/3/98	9/3/99
544	EMC Analyzer	Hewlett Packard	9.0 kHz - 1.8 GHz	8591EM	8/6/98	8/6/99
575	Graphics Plotter	Hewlett Packard	N/A	7470A	4/28/98	4/28/99
R092	Spectrum Analyzer	Hewlett Packard	30 Hz - 40 GHz	8564E	7/16/98	7/16/99

FCC 15.231(b)
RADIATED EMISSIONS, FUNDAMENTAL & SPURIOUS CASE

Test Method:	FCC Part 15 Subpart C Radiated Emissions Paragraph 15.231(b)						
Customer:	X-10 (USA) Inc.			Job No.	R-7991-1		
Test Sample:	Remote Control Transmitter			FCC ID:	B4SUR28A		
Model No.:	UR28A			Serial No.	N/A		
Operating Mode:	Continuously Transmitter 311.3 Mhz Signal						
Technician:	Dennis Cortes			Date:	March 17,1999		
Notes:	Test Distance: 3 Meters Temp: 09C Humidity:48% Detector: Peak						
Test Freq.	Antenna Pol./Height	EUT Orientation	Meter Reading	Correction Factor	Corrected Reading	Converted Reading	Peak Limit
Mhz	(V/H) / Degrees	X / Y / Z	dBuv	dB	dBuV/m	uV/m	uV/m
311.3	H / 1.0	X	78.3	-3.9	74.4	5248.1	58330
311.3	H / 1.0	Y	83.6	-3.9	79.7	9660.5	58330
311.3	H / 1.0	Z	82.7	-3.9	78.8	8709.6	58330
311.3	V / 1.4	X	83.1	-3.9	79.2	9120.1	58330
311.3	V / 1.5	Y	80.6	-3.9	76.7	6839.1	58330
311.3	V / 1.9	Z	76.5	-3.9	72.6	4265.8	58330
622.6	H / 1.0	X	50.8	3.2	54.0	501.2	5833
622.6	H / 1.0	Y	55.0	3.2	58.2	812.8	5833
622.6	H / 1.1	Z	54.0	3.2	57.2	724.4	5833
622.6	V / 1.6	X	53.6	3.2	56.8	691.8	5833
622.6	V / 1.4	Y	49.3	3.2	52.5	421.7	5833
622.6	V / 1.6	Z	50.7	3.2	53.9	495.5	5833
933.9	H / 1.2	X	36.7	7.4	44.1	160.3	5833
933.9	H / 1.0	Y	33.2	7.4	40.6	107.2	5833
933.9	H / 1.3	Z	35.8	7.4	43.2	144.5	5833
933.9	V / 1.1	X	35.6	7.4	43.0	141.3	5833
933.9	V / 1.0	Y	35.9	7.4	43.3	146.2	5833
933.9	V / 1.0	Z	33.0	7.4	40.4	104.7	5833
1245.2	H / 1.0	X	41.8	-4.0	37.8	*77.6	5833
1245.2	H / 1.0	Y	41.8	-4.0	37.8	*77.6	5833
1245.2	H / 1.0	Z	41.8	-4.0	37.8	*77.6	5833
1245.2	V / 1.0	X	41.8	-4.0	37.8	*77.6	5833
1245.2	V / 1.0	Y	41.8	-4.0	37.8	*77.6	5833
1245.2	V / 1.0	Z	41.8	-4.0	37.8	*77.6	5833
1556.5	H / 1.0	X	41.7	0.8	42.5	*133.4	5000
1556.5	H / 1.0	Y	41.7	0.8	42.5	*133.4	5000
1556.5	H / 1.0	Z	41.7	0.8	42.5	*133.4	5000
1556.5	V / 1.0	X	41.7	0.8	42.5	*133.4	5000
1556.5	V / 1.0	Y	41.7	0.8	42.5	*133.4	5000
1556.5	V / 1.0	Z	41.7	0.8	42.5	*133.4	5000
	The frequency range was scanned from 30 Mhz to 3.1 Ghz. All emissions not recorded were more Than 10 dB below the specified limit. Emissions from the EUT do not exceed the specified limits.						
	*=Noise Floor Measurements (Minimum system sensitivity)						

Test Method:	FCC Part 15 Subpart C Radiated Emissions Paragraph 15.231(b)						
Customer:	X-10 (USA) Inc.			Job No.	R-7991-1		
Test Sample:	Remote Control Transmitter			FCC ID:	B4SUR28A		
Model No.:	UR28A			Serial No.	N/A		
Operating Mode:	Continuously Transmitter 311.3 Mhz Signal						
Technician:	Dennis Cortes			Date:	March 17,1999		
Notes:	Test Distance: 3 Meters Detector: Quasi-Peak						
Test Freq.	Antenna Pol./Height	EUT Orientation	Meter Reading	Correction Factor	Corrected Reading	Converted Reading	Peak Limit
Mhz	(V/H) / Degrees	X / Y / Z	dBuv	dB	dBuV/m	UV/m	uV/m
1867.8	H / 1.0	X	41.3	-2.7	38.6	*85.1	5833
1867.8	H / 1.0	Y	41.3	-2.7	38.6	*85.1	5833
1867.8	H / 1.0	Z	41.3	-2.7	38.6	*85.1	5833
1867.8	V / 1.0	X	41.3	-2.7	38.6	*85.1	5833
1867.8	V / 1.0	Y	41.3	-2.7	38.6	*85.1	5833
1867.8	V / 1.0	Z	41.3	-2.7	38.6	*85.1	5833
2179.1	H / 1.0	X	41.6	-1.3	40.3	*103.5	5833
2179.1	H / 1.0	Y	41.6	-1.3	40.3	*103.5	5833
2179.1	H / 1.0	Z	41.6	-1.3	40.3	*103.5	5833
2179.1	V / 1.0	X	41.6	-1.3	40.3	*103.5	5833
2179.1	V / 1.0	Y	41.6	-1.3	40.3	*103.5	5833
2179.1	V / 1.0	Z	41.6	-1.3	40.3	*103.5	5833
2490.4	H / 1.0	X	41.7	-0.4	41.3	*116.1	5000
2490.4	H / 1.0	Y	41.7	-0.4	41.3	*116.1	5000
2490.4	H / 1.0	Z	41.7	-0.4	41.3	*116.1	5000
2490.4	V / 1.0	X	41.7	-0.4	41.3	*116.1	5000
2490.4	V / 1.0	Y	41.7	-0.4	41.3	*116.1	5000
2490.4	V / 1.0	Z	41.7	-0.4	41.3	*116.1	5000
2801.7	H / 1.0	X	41.7	1.1	42.8	*138.0	5000
2801.7	H / 1.0	Y	41.7	1.1	42.8	*138.0	5000
2801.7	H / 1.0	Z	41.7	1.1	42.8	*138.0	5000
2801.7	V / 1.0	X	41.7	1.1	42.8	*138.0	5000
2801.7	V / 1.0	Y	41.7	1.1	42.8	*138.0	5000
2801.7	V / 1.0	Z	41.7	1.1	42.8	*138.0	5000
3113.0	H / 1.0	X	42.0	3.1	45.1	*179.9	5833
3113.0	H / 1.0	Y	42.0	3.1	45.1	*179.9	5833
3113.0	H / 1.0	Z	42.0	3.1	45.1	*179.9	5833
3113.0	V / 1.0	X	42.0	3.1	45.1	*179.9	5833
3113.0	V / 1.0	Y	42.0	3.1	45.1	*179.9	5833
3113.0	V / 1.0	Z	42.0	3.1	45.1	*179.9	5833
	The frequency range was scanned from 30 Mhz to 3.1 Ghz. All emissions not recorded were more Than 10 dB below the specified limit. Emissions from the EUT do not exceed the specified limits.						
	*=Noise Floor Measurements (Minimum system sensitivity)						

Test Method:	FCC Part 15 Subpart C Radiated Emissions Paragraph 15.231(b)						
Customer:	X-10 (USA) Inc.				Job No.	R-7991-1	
Test Sample:	Remote Control Transmitter				FCC ID:	B4SUR28A	
Model No.:	UR28A				Serial No.	N/A	
Operating Mode:	Continuously Transmitter 311.3 Mhz Signal						
Technician:	Dennis Cortes				Date:	March 17,1999	
Notes:	Test Distance: 3 Meters Duty Cycle: 29.3% Detector: Peak Duty Cycle Correction: -10.6 dB						
Test Freq.	Antenna Pol./Height	EUT Orientation	Peak Reading	Correction Factor	Corrected Reading	Converted Reading	Average Limit
Mhz	(V/H) / Degrees	X / Y / Z	dBuv	dB	dBuV/m	uV/m	uV/m
311.3	H / 1.0	X	74.4	-10.6	63.8	1548.8	5833
311.3	H / 1.0	Y	79.7	-10.6	69.1	2851.0	5833
311.3	H / 1.0	Z	78.8	-10.6	68.2	2570.4	5833
311.3	V / 1.4	X	79.2	-10.6	68.6	2691.5	5833
311.3	V / 1.5	Y	76.7	-10.6	66.1	2018.4	5833
311.3	V / 1.9	Z	72.6	-10.6	62.0	1258.9	5833
622.6	H / 1.0	X	54.0	-10.6	43.4	147.9	583
622.6	H / 1.0	Y	58.2	-10.6	47.6	239.9	583
622.6	H / 1.1	Z	57.2	-10.6	46.6	213.8	583
622.6	V / 1.6	X	56.8	-10.6	46.2	204.2	583
622.6	V / 1.4	Y	52.5	-10.6	41.9	124.5	583
622.6	V / 1.6	Z	53.9	-10.6	43.3	146.2	583
933.9	H / 1.2	X	44.1	-10.6	33.5	47.3	583
933.9	H / 1.0	Y	40.6	-10.6	30.0	31.6	583
933.9	H / 1.3	Z	43.2	-10.6	32.6	42.7	583
933.9	V / 1.1	X	43.0	-10.6	32.4	41.7	583
933.9	V / 1.0	Y	43.3	-10.6	32.7	43.2	583
933.9	V / 1.0	Z	40.4	-10.6	29.8	30.9	583
1245.2	H / 1.0	X	37.8	-10.6	27.2	*22.9	583
1245.2	H / 1.0	Y	37.8	-10.6	27.2	*22.9	583
1245.2	H / 1.0	Z	37.8	-10.6	27.2	*22.9	583
1245.2	V / 1.0	X	37.8	-10.6	27.2	*22.9	583
1245.2	V / 1.0	Y	37.8	-10.6	27.2	*22.9	583
1245.2	V / 1.0	Z	37.8	-10.6	27.2	*22.9	583
1556.5	H / 1.0	X	42.5	-10.6	31.9	*39.4	500
1556.5	H / 1.0	Y	42.5	-10.6	31.9	*39.4	500
1556.5	H / 1.0	Z	42.5	-10.6	31.9	*39.4	500
1556.5	V / 1.0	X	42.5	-10.6	31.9	*39.4	500
1556.5	V / 1.0	Y	42.5	-10.6	31.9	*39.4	500
1556.5	V / 1.0	Z	42.5	-10.6	31.9	*39.4	500
	The frequency range was scanned from 30 Mhz to 3.1 Ghz. All emissions not recorded were more Than 10 dB below the specified limit. Emissions from the EUT do not exceed the specified limits.						
	*=Noise Floor Measurements (Minimum system sensitivity)						

Test Method:	FCC Part 15 Subpart C Radiated Emissions Paragraph 15.231(b)						
Customer:	X-10 (USA) Inc.			Job No.	R-7991-1		
Test Sample:	Remote Control Transmitter			FCC ID:	B4SUR28A		
Model No.:	UR28A			Serial No.	N/A		
Operating Mode:	Continuously Transmitter 311.3 Mhz Signal						
Technician:	Dennis Cortes			Date:	March 17,1999		
Notes:	Test Distance: 3 Meters Duty Cycle: 29.3% Detector: Peak Duty Cycle Correction: -10.6 dB						
Test Freq.	Antenna Pol./Height	EUT Orientation	Peak Reading	Correction Factor	Corrected Reading	Converted Reading	Average Limit
Mhz	(V/H) / Degrees	X / Y / Z	dBuv	dB	dBuV/m	UV/m	uV/m
1867.8	H / 1.0	X	38.6	-10.6	28.0	*25.1	583
1867.8	H / 1.0	Y	38.6	-10.6	28.0	*25.1	583
1867.8	H / 1.0	Z	38.6	-10.6	28.0	*25.1	583
1867.8	V / 1.0	X	38.6	-10.6	28.0	*25.1	583
1867.8	V / 1.0	Y	38.6	-10.6	28.0	*25.1	583
1867.8	V / 1.0	Z	38.6	-10.6	28.0	*25.1	583
2179.1	H / 1.0	X	40.3	-10.6	29.7	*30.5	583
2179.1	H / 1.0	Y	40.3	-10.6	29.7	*30.5	583
2179.1	H / 1.0	Z	40.3	-10.6	29.7	*30.5	583
2179.1	V / 1.0	X	40.3	-10.6	29.7	*30.5	583
2179.1	V / 1.0	Y	40.3	-10.6	29.7	*30.5	583
2179.1	V / 1.0	Z	40.3	-10.6	29.7	*30.5	583
2490.4	H / 1.0	X	41.3	-10.6	30.7	*34.3	500
2490.4	H / 1.0	Y	41.3	-10.6	30.7	*34.3	500
2490.4	H / 1.0	Z	41.3	-10.6	30.7	*34.3	500
2490.4	V / 1.0	X	41.3	-10.6	30.7	*34.3	500
2490.4	V / 1.0	Y	41.3	-10.6	30.7	*34.3	500
2490.4	V / 1.0	Z	41.3	-10.6	30.7	*34.3	500
2801.7	H / 1.0	X	42.8	-10.6	32.2	*40.7	500
2801.7	H / 1.0	Y	42.8	-10.6	32.2	*40.7	500
2801.7	H / 1.0	Z	42.8	-10.6	32.2	*40.7	500
2801.7	V / 1.0	X	42.8	-10.6	32.2	*40.7	500
2801.7	V / 1.0	Y	42.8	-10.6	32.2	*40.7	500
2801.7	V / 1.0	Z	42.8	-10.6	32.2	*40.7	500
3113.0	H / 1.0	X	45.1	-10.6	34.5	*53.1	583
3113.0	H / 1.0	Y	45.1	-10.6	34.5	*53.1	583
3113.0	H / 1.0	Z	45.1	-10.6	34.5	*53.1	583
3113.0	V / 1.0	X	45.1	-10.6	34.5	*53.1	583
3113.0	V / 1.0	Y	45.1	-10.6	34.5	*53.1	583
3113.0	V / 1.0	Z	45.1	-10.6	34.5	*53.1	583
	The frequency range was scanned from 30 Mhz to 3.1 Ghz. All emissions not recorded were more than 10 dB below the specified limit. Emissions from the EUT do not exceed the specified limits.						
	*=Noise Floor Measurements (Minimum system sensitivity)						

FCC 15.231(c)

OCCUPIED BANDWIDTH

Please refer to separate electronic file named Occbw.Doc

DUTY CYCLE PLOTS

Please refer to separate electronic file named Duty Cycle Plots.Doc