

APPLICANT X-10 USA, Inc. 19823, 58 th Place S. Kent, WA 98032	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 C63.4:2003

TEST SAMPLE DESCRIPTION

BRANDNAME: X10 _____

MODEL: KR32A _____

TYPE: Pulsed Transmitter _____

POWER REQUIREMENTS: 6 VDC via (2) CR2016 Lithium Batteries _____

FREQUENCY OF OPERATION: 310 MHz _____

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

REPORT OF MEASUREMENTS

Applicant: X-10 (USA), Inc.
Device: Pulsed Transmitter
FCC ID: B4S-DS11A
Power Requirements: 6 VDC via (2) CR2016 Lithium Batteries
Applicable Rule Section: Part 15, Subpart C, Section 15.231

TEST RESULTS

- 15.231 (a): This device 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.
- 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).

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:

Fundamental Limit = 5833 $\mu\text{V/M}$ (AVERAGE) @ 3 Meters

Harmonic Limit = 583 $\mu\text{V/M}$ (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 = 30 milliseconds (maximum)

Transmitter Cycle Time = 115 milliseconds

Transmitter Duty Cycle = 30 %

CALCULATION:

1 Large Pulse = 9.0 milliseconds

42 x 500 μ s (small pulse) = 21 milliseconds

21+9 = 30 milliseconds

Duty Cycle (30/100) = 30 %

Correction Factor = $20 \log(0.30)$ = -10.4 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 500 μ s yields a minimum required bandwidth of 1333 Hz. FCC specified bandwidths of 100 kHz and 1MHz 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 3.1 GHz. All emissions not reported were more than 20 dB below the specified limit.

EQUIPMENT LIST

FCC 15.231 Transmitter Testing

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due
067	Open Area Test Site	Retlif	3 Meter	RNY	10/1/2003	10/1/2006
128	Double Ridged Guide	Electro-Mechanics	1 GHz - 18 GHz	3105	6/21/2004	6/21/2005
133	Broadband Pre-Amplifier	Electro-Metrics	10 kHz - 1 GHz, 26dB	BPA-1000	6/12/2004	6/12/2005
141	Spectrum Analyzer	Hewlett Packard	100 Hz - 40 GHz	8566B	8/5/2004	2/5/2005
141A	Graphics Plotter	Hewlett Packard	N/A	7470A	2/9/2004	2/9/2005
141B	Quasi-Peak Adaptor	Hewlett Packard	100 Hz - 1 GHz	85650A	8/7/2004	2/7/2005
206B	6.0 dB Attenuator	Texscan	0 - 1.0 GHz	FP-50 - 6 dB	6/12/2004	6/12/2005
543	Preamplifier	Hewlett Packard	1.0 GHz - 26.5 GHz	8449B	7/27/2004	7/27/2005
617	Interference Analyzer	Electro-Metrics	10 kHz - 1 GHz	EMC-30	10/5/2004	10/5/2005
767	Biconilog	EMCO	26 - 2000 MHz	3142B	10/7/2004	10/7/2005

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

Test Method:	FCC Part 15 Subpart C Radiated Emissions. Fundamental & Harmonic Emissions						
Customer:	X-10 Wireless Technology, Inc.			Job No.	R-10683-1		
Test Sample:	Pulsed 310MHz Transmitter			Paragraph	15.231		
Model No.:	KR32A			FCC ID:	B4SKR32A		
Operating Mode:	Continuously Transmitting a pulsed 310 MHz signal						
Technician:	R. Soodoo			Date:	December 6, 2004		
Notes:	Test Distance: 3 Meters						
	Detector: Peak, Unless otherwise specified						
Test Freq.	Antenna Pol./Height	EUT Orientation	Meter Reading	Correction Factor	Corrected Reading	Converted Reading	Peak Limit
MHz	(V/H)/Meters	X / Y / Z	dBuV	dB	dBuV/m	uV/m	uV/m
310	H / 1.8	X	62.6	-4.0	58.6	851.1	58330
	H / 1.0	Y	53.3	-4.0	49.3	291.7	
	H / 2.0	Z	63.2	-4.0	59.2	912.0	
	V / 1.0	X	51.3	-3.9	47.4	234.4	
	V / 1.5	Y	68.5	-3.9	64.6	1698.2	
310	V / 1.5	Z	68.5	-3.9	64.6	1698.2	58330
620	H / 1.0	X	51.1	3.5	54.6	537.0	5833
	H / 1.5	Y	41.1	3.5	44.6	169.8	
	H / 1.5	Z	50.9	3.5	54.4	524.8	
	V / 1.0	X	50.2	2.6	52.8	436.5	
	V / 1.5	Y	51.8	2.6	54.4	524.8	
620	V / 1.5	Z	51.9	2.6	54.5	530.9	5833
930	H / 1.0	X	30.0	8.5	38.5	84.1*	5833
	H / 1.0	Y	30.0	8.5	38.5	84.1*	
	H / 1.0	Z	30.0	8.5	38.5	84.1*	
	V / 1.0	X	30.0	8.4	38.4	83.2*	
	V / 1.0	Y	30.0	8.4	38.4	83.2*	
930	V / 1.0	Z	30.0	8.4	38.4	83.2*	5833
1240	H / 1.0	X	36.8	3.8	40.6	107.2	5000
	H / 1.0	Y	31.0	3.8	34.8	55.0*	
	H / 1.0	Z	31.0	3.8	34.8	55.0*	
	V / 1.3	X	33.5	3.8	37.3	73.3	
	V / 1.0	Y	36.1	3.8	39.9	98.9	
1240	V / 1.0	Z	44.3	3.8	48.1	254.1	5000
1550	H / 1.0	X	30.5	8.7	39.2	91.2*	5000
	H / 1.0	Y	30.5	8.7	39.2	91.2*	
	H / 1.0	Z	30.5	8.7	39.2	91.2*	
	V / 1.0	X	37.0	7.7	44.7	171.8	
	V / 1.0	Y	30.5	7.7	38.2	81.3*	
1550	V / 1.0	Z	44.3	7.7	52.0	398.1	5000
	The Frequency Range was scanned from the first to the tenth harmonic. All emissions not reported herein are at least 10 dB below the specified limit. The EUT complies with the applicable limit.						
	*=Noise Floor Measurements (Minimum system sensitivity)						

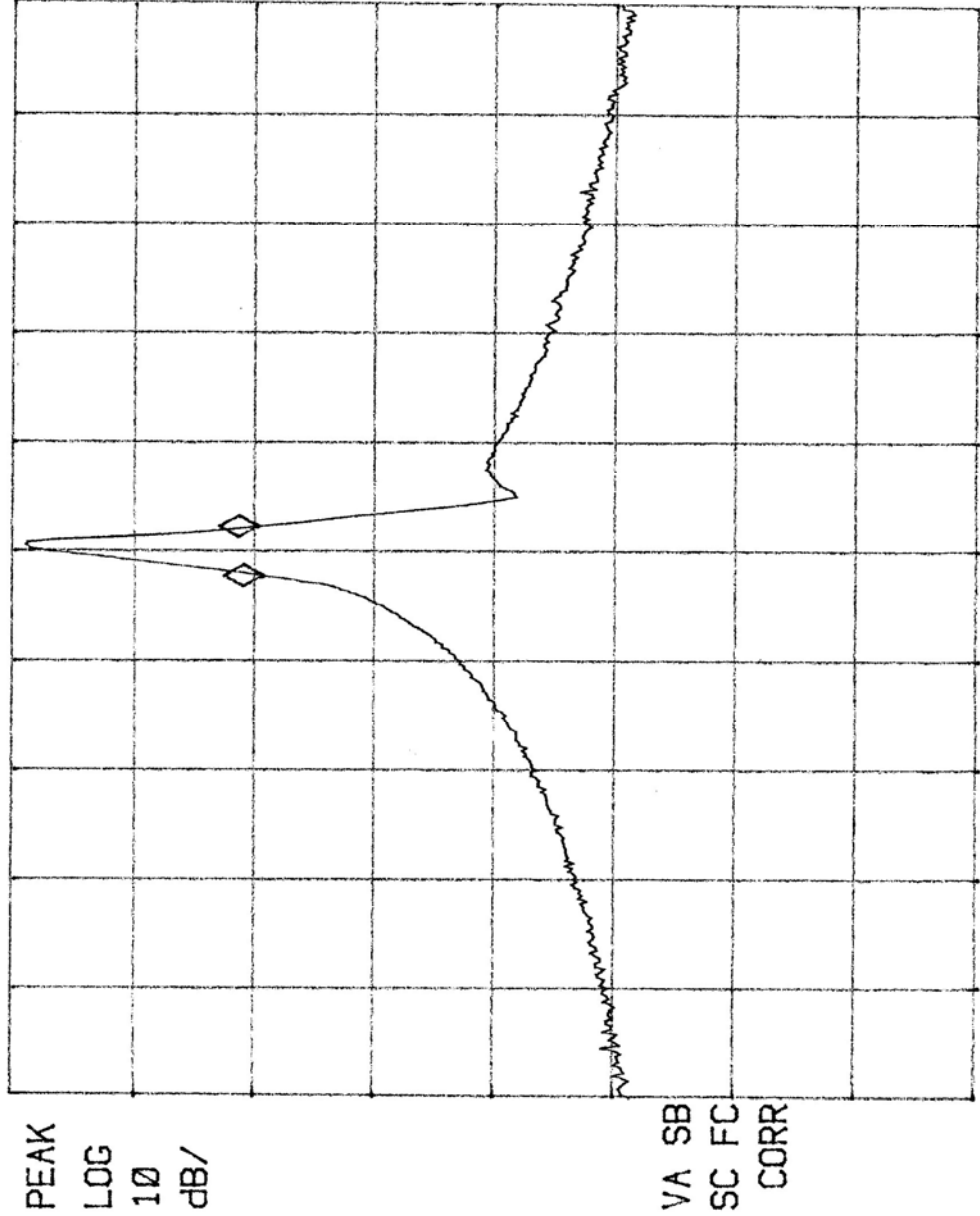
Test Method:	ECC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	X-10 Wireless Technology, Inc.		Job No.	R-10683-1			
Test Sample:	Pulsed 310MHz Transmitter		Paragraph	15.231			
Model No.:	KR32A		FCC ID:	B4SKR32A			
Operating Mode:	Continuously Transmitting a pulsed 310 MHz signal						
Technician:	R. Soodoo		Date:	December 6, 2004			
Notes:	Test Distance: 3 Meters						
	Detector: Peak, unless otherwise specified						
Test Freq.	Antenna Pol./Height	EUT Orientation	Meter Reading	Correction Factor	Corrected Reading	Converted Reading	Peak Limit
MHz	(V/H)-Meters	X / Y / Z	dBuV	dB	dBuV/m	uV/m	uV/m
1860	H / 1.0	X	34.9	11.1	46.0	199.5	5833
	H / 1.0	Y	30.5	11.1	41.6	120.2	
	H / 1.0	Z	30.5	11.1	41.6	120.2	
	V / 1.0	X	30.5	10.2	40.7	108.4	
	V / 1.0	Y	35.4	10.2	45.6	190.5	
1860	V / 1.0	Z	30.5	10.2	40.7	108.4	5833
2170	H / 1.0	X	31.1	1.7	32.8	43.7	5833
	H / 1.0	Y	31.1	1.7	32.8	43.7	
	H / 1.0	Z	31.1	1.7	32.8	43.7	
	V / 1.0	X	31.1	1.7	32.8	43.7	
	V / 1.0	Y	31.1	1.7	32.8	43.7	
2170	V / 1.0	Z	31.1	1.7	32.8	43.7	5833
2480	H / 1.0	X	31.1	3.8	34.9	55.6	5833
	H / 1.0	Y	31.1	3.8	34.9	55.6	
	H / 1.0	Z	31.1	3.8	34.9	55.6	
	V / 1.0	X	31.1	3.8	34.9	55.6	
	V / 1.0	Y	31.1	3.8	34.9	55.6	
2480	V / 1.0	Z	31.1	3.8	34.9	55.6	5833
2790	H / 1.0	X	31.1	5.1	36.2	64.6	5000
	H / 1.0	Y	31.1	5.1	36.2	64.6	
	H / 1.0	Z	31.1	5.1	36.2	64.6	
	V / 1.0	X	31.1	5.1	36.2	64.6	
	V / 1.0	Y	31.1	5.1	36.2	64.6	
2790	V / 1.0	Z	31.1	5.1	36.2	64.6	5000
3100	H / 1.0	X	31.1	6.7	37.8	77.6	5833
	H / 1.0	Y	31.1	6.7	37.8	77.6	
	H / 1.0	Z	31.1	6.7	37.8	77.6	
	V / 1.0	X	31.1	6.7	37.8	77.6	
	V / 1.0	Y	31.1	6.7	37.8	77.6	
3100	V / 1.0	Z	31.1	6.7	37.8	77.6	5833
	The Frequency Range was scanned from the first to the tenth harmonic. All emissions not reported herein are at least 10 dB below the specified limit. The EUT complies with the applicable limit.						
	*=Noise Floor Measurements (Minimum system sensitivity)						

Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	X-10 Wireless Technology, Inc.			Job No.	R-10683-1		
Test Sample:	Pulsed 310MHz Transmitter			Paragraph:	15.231		
Model No.:	KR32A			FCC ID:	B4SKR32A		
Operating Mode:	Continuously Transmitting a pulsed 310 MHz signal						
Technician:	R. Soodoo			Date:	December 6, 2004		
Notes:	Test Distance: 3 Meters			Duty Cycle: 30.0%			
	Detector: Peak, unless otherwise specified			Duty Cycle Correction:-10.4 dB			
Test Freq.	Antenna Pol./Height	EUT Orientation	Peak Reading	Correction Factor	Corrected Reading	Converted Reading	Avg. Limit
MHz	(V/H)-Meters	X / Y / Z	dBuV	dB	dBuV/m	uV/m	uV/m
310	H / 1.8	X	58.6	-10.4	48.2	257.0	5833
	H / 1.0	Y	49.3	-10.4	38.9	88.1	
	H / 2.0	Z	59.2	-10.4	48.8	275.4	
	V / 1.0	X	47.4	-10.4	37.0	70.8	
	V /1.5	Y	64.6	-10.4	54.2	512.9	
310	V / 1.5	Z	64.6	-10.4	54.2	512.9	5833
620	H / 1.0	X	54.6	-10.4	44.2	162.2	583
	H / 1.5	Y	44.6	-10.4	34.2	51.3	
	H / 1.5	Z	54.4	-10.4	44.0	158.5	
	V /1.0	X	52.8	-10.4	42.4	131.8	
	V / 1.5	Y	54.4	-10.4	44.0	158.5	
620	V / 1.5	Z	54.5	-10.4	44.1	160.3	583
930	H / 1.0	X	38.5	-10.4	28.1	25.4*	583
	H / 1.0	Y	38.5	-10.4	28.1	25.4*	
	H / 1.0	Z	38.5	-10.4	28.1	25.4*	
	V / 1.0	X	38.4	-10.4	28.0	25.1*	
	V / 1.0	Y	38.4	-10.4	28.0	25.1*	
930	V / 1.0	Z	38.4	-10.4	28.0	25.1*	583
1240	H / 1.0	X	40.6	-10.4	30.2	32.4	500
	H / 1.0	Y	34.8	-10.4	24.4	16.6*	
	H / 1.0	Z	34.8	-10.4	24.4	16.6*	
	V / 1.3	X	37.3	-10.4	26.9	22.1	
	V / 1.0	Y	39.9	-10.4	29.5	29.9	
1240	V / 1.0	Z	48.1	-10.4	37.7	76.7	500
1550	H / 1.0	X	39.2	-10.4	28.8	27.5*	500
	H / 1.0	Y	39.2	-10.4	28.8	27.5*	
	H /1.0	Z	39.2	-10.4	28.8	27.5*	
	V /1.0	X	44.7	-10.4	34.3	51.9	
	V /1.0	Y	38.2	-10.4	27.8	24.5*	
1550	V /1.0	Z	52.0	-10.4	41.6	120.2	500
	The Frequency Range was scanned from the first to the tenth harmonic. All emissions not reported herein are at least 10 dB below the specified limit. The EUT complies with the applicable limit.						
	*=Noise Floor Measurements (Minimum system sensitivity)						

Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	X-10 Wireless Technology, Inc.		Job No.	R-10683-1			
Test Sample:	Pulsed 310MHz Transmitter		Paragraph	15.231			
Model No.:	KR32A		FCC ID:	B4SKR32A			
Operating Mode:	Continuously Transmitting a pulsed 310 MHz signal						
Technician:	R. Soodoo		Date:	December 6, 2004			
Notes:	Test Distance: 3 Meters			Duty Cycle:30.0%			
	Detector: Peak, unless otherwise specified			Duty Cycle Correction: -10.4 dB			
Test Freq.	Antenna Pol./Height	EUT Orientation	Peak Reading	Correction Factor	Corrected Reading	Converted Reading	Avg. Limit
MHz	(V/H)-Meters	X / Y / Z	dBuV	dB	dBuV/m	uV/m	uV/m
1860	H / 1.0	X	46.0	-10.4	35.6	60.3	583
	H / 1.0	Y	41.6	-10.4	31.2	36.3*	
	H / 1.0	Z	41.6	-10.4	31.2	36.3*	
	V / 1.0	X	40.7	-10.4	30.3	32.7	
	V / 1.0	Y	45.6	-10.4	35.2	57.5	
1860	V / 1.0	Z	40.7	-10.4	30.3	32.7	583
2170	H / 1.0	X	32.8	-10.4	22.4	13.2*	583
	H / 1.0	Y	32.8	-10.4	22.4	13.2*	
	H / 1.0	Z	32.8	-10.4	22.4	13.2*	
	V / 1.0	X	32.8	-10.4	22.4	13.2*	
	V / 1.0	Y	32.8	-10.4	22.4	13.2*	
2170	V / 1.0	Z	32.8	-10.4	22.4	13.2*	583
2480	H / 1.0	X	34.9	-10.4	24.5	16.8*	583
	H / 1.0	Y	34.9	-10.4	24.5	16.8*	
	H / 1.0	Z	34.9	-10.4	24.5	16.8*	
	V / 1.0	X	34.9	-10.4	24.5	16.8*	
	V / 1.0	Y	34.9	-10.4	24.5	16.8*	
2480	V / 1.0	Z	34.9	-10.4	24.5	16.8*	583
2790	H / 1.0	X	36.2	-10.4	25.8	19.5*	500
	H / 1.0	Y	36.2	-10.4	25.8	19.5*	
	H / 1.0	Z	36.2	-10.4	25.8	19.5*	
	V / 1.0	X	36.2	-10.4	25.8	19.5*	
	V / 1.0	Y	36.2	-10.4	25.8	19.5*	
2790	V / 1.0	Z	36.2	-10.4	25.8	19.5*	500
3100	H / 1.0	X	37.8	-10.4	27.4	23.4*	583
	H / 1.0	Y	37.8	-10.4	27.4	23.4*	
	H / 1.0	Z	37.8	-10.4	27.4	23.4*	
	V / 1.0	X	37.8	-10.4	27.4	23.4*	
	V / 1.0	Y	37.8	-10.4	27.4	23.4*	
3100	V / 1.0	Z	37.8	-10.4	27.4	23.4*	583
	The Frequency Range was scanned from the first to the tenth harmonic. All emissions not reported herein are at least 10 dB below the specified limit. The EUT complies with the applicable limit.						
	*=Noise Floor Measurements (Minimum system sensitivity)						

FCC 15.231(c)
OCCUPIED BANDWIDTH

13:56:33 DEC 02, 2004
 R-106 X-10 KR32A Occupied Bandwidth TSKR 34.9 kHz
 REF -32.7 dBm AT 10 dB .40 dB



CENTER 310.0000 MHz
 #RES BW 9.0 kHz
 SPAN 775.0 kHz
 SWP 33.3 msec
 VBW 30 kHz

Customer:	X-10(USA) Inc.		
Test Sample:	310 MHz Pulsed Transmitter		
Model No.:	KR32A, FCC ID: B4SKR32A		
Test Method:	15.231(c) Occupied Bandwidth		
Notes:	Bandwidth does not exceed 0.25% of Center Frequency at the 20 dBc points (775 kHz)		
Date:	December 2, 2004	Tech:	T. Schneider
	Sheet	1	of 1

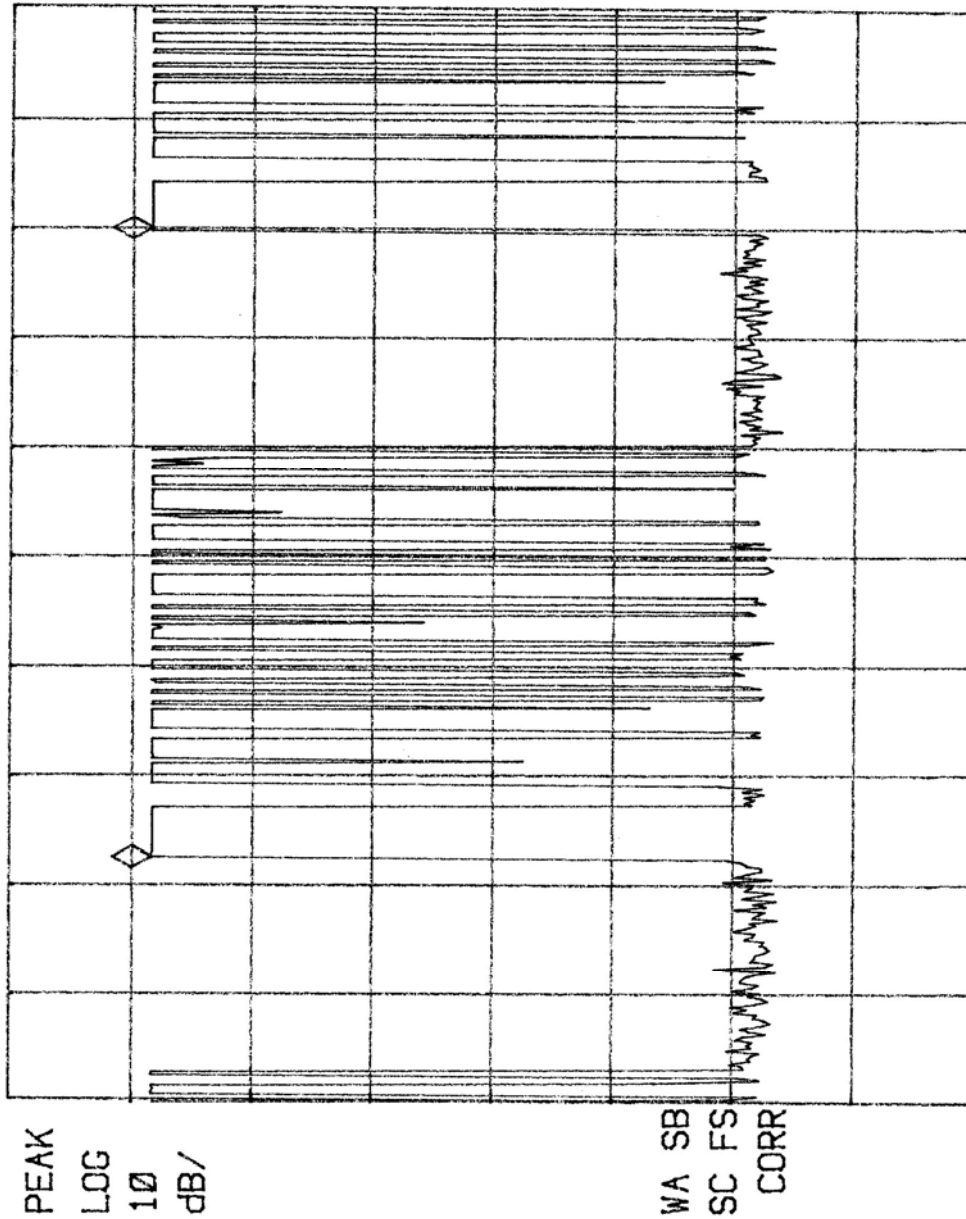


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FCC 15.231(c)
DUTY CYCLE

14:04:06 DEC 02, 2004
 R-106 X-10 KR32A Duty Cycle TS
 REF -20.0 dBm AT 10 dB MKR 115.00 msec
 -03 dB

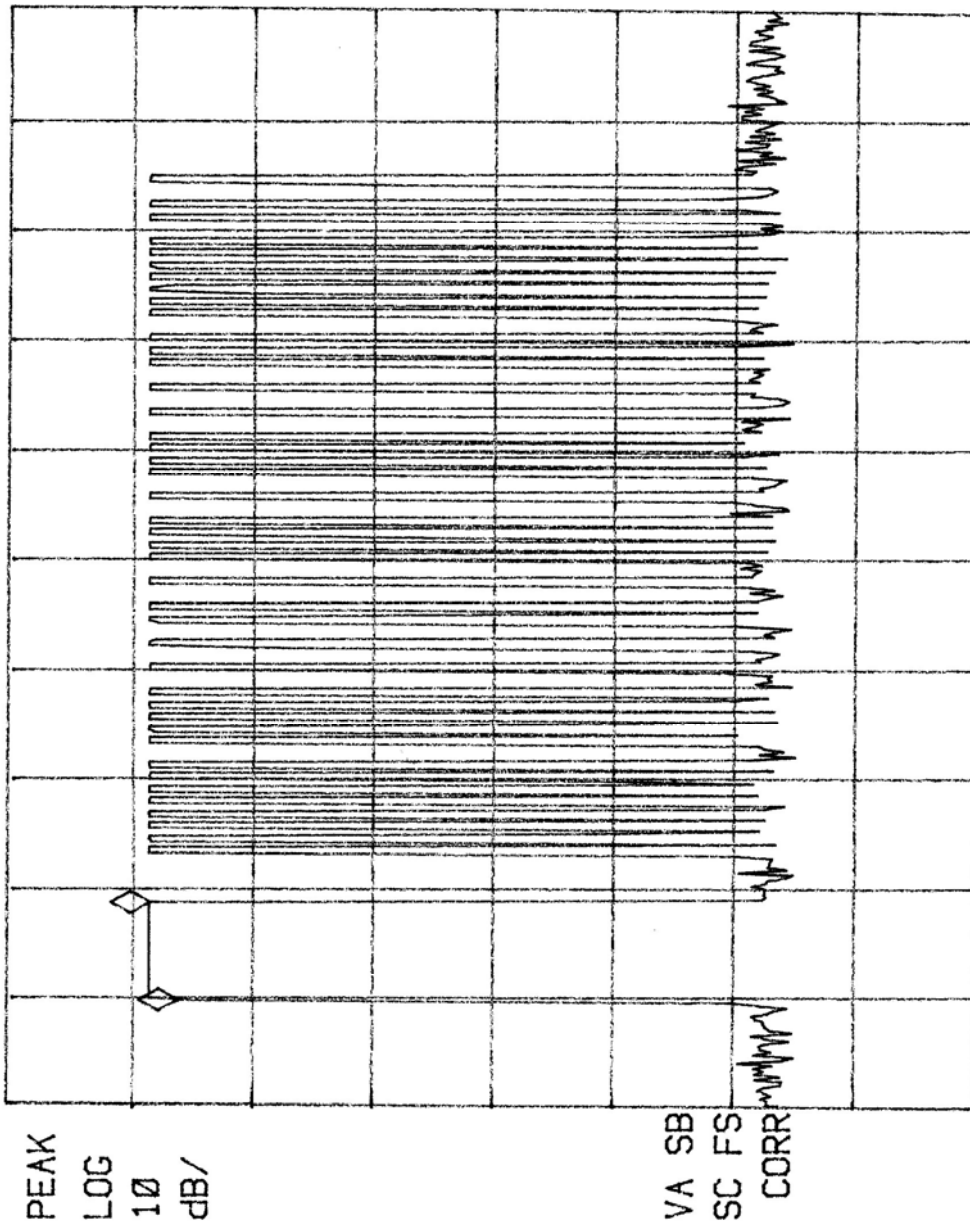


CENTER 310.000 MHz
 #RES BW 120 kHz
 VBW 300 kHz
 #SWP 200 msec
 SPAN 0 Hz

Customer:	X-10(USA) Inc.
Test Sample:	310 MHz Pulsed Transmitter
Model No.:	KR32A FCC ID: B4SKR32A
Test Method:	FCC Paragraph 15.35 Duty Cycle Determination
Notes:	Measurement of Cycle Time=115 mSec (Cycle Time > 100 mSec)
Date:	December 2, 2004
Tech:	T. Schneider
Sheet:	1 of 3

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14:14:42 DEC 02, 2004
 R-106 X-10 KR32A Duty Cycle TS MKR 9.0000 msec
 REF -20.0 dBm AT 10 dB 2.31 dB



CENTER 310.000 MHz
 #RES BW 120 kHz
 VBW 300 kHz
 #SWP 100 msec
 SPAN 0 Hz

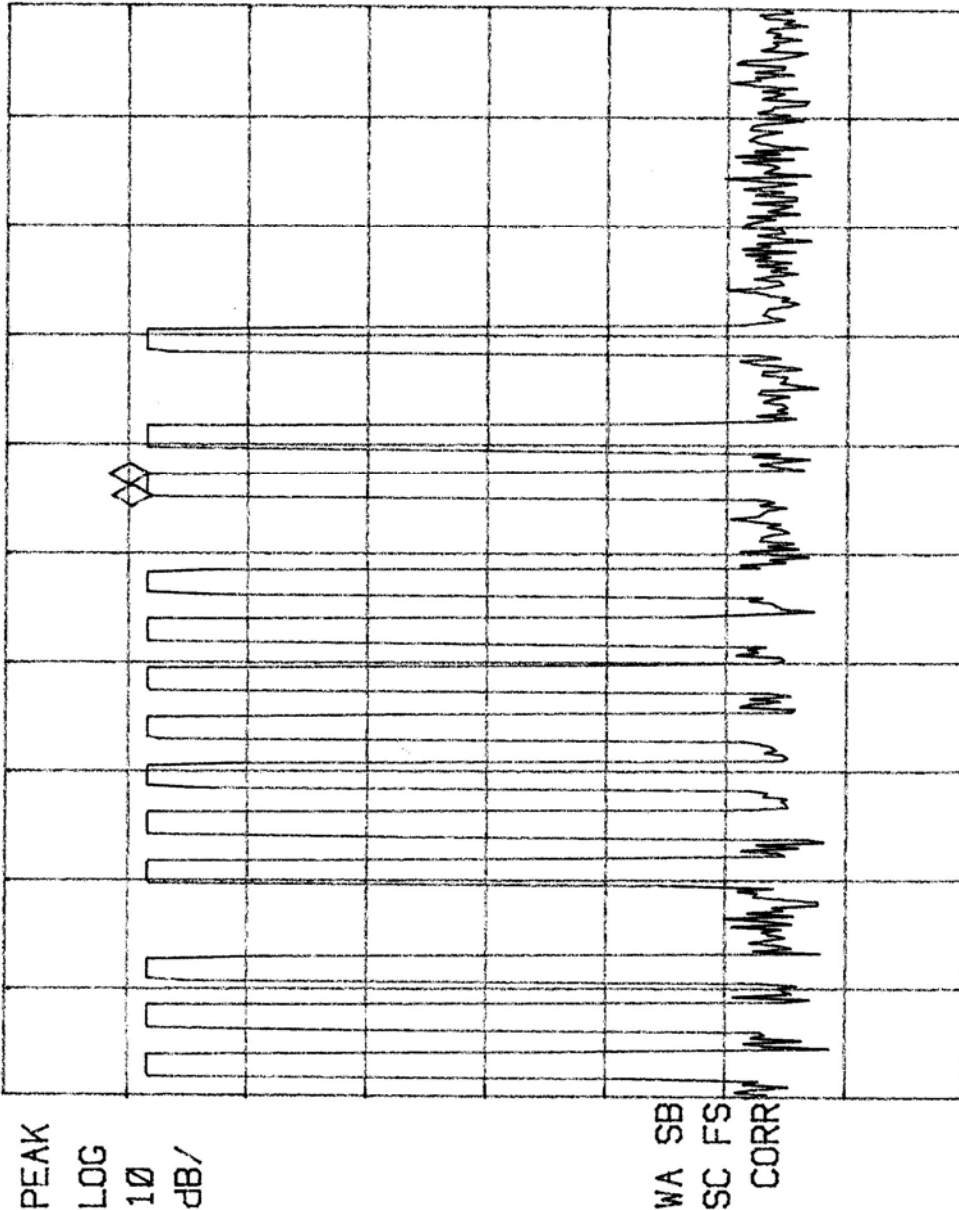
Customer:	X-10(USA) Inc.		
Test Sample:	310 MHz Pulsed Transmitter		
Model No.:	KR32A FCC ID: B4SKR32A		
Test Method:	FCC Paragraph 15.35 Duty Cycle Determination		
Notes:	Measurement of 1 Large pulse= 9.0 mSec Duty Cycle= $[9.0 + 42(0.5)]/100 = 0.30 = 30.0\% = -10.4 \text{ dB}$		
Date:	December 2, 2004	Tech:	T. Schneider
	Sheet	2	of 3



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14:25:49 DEC 02, 2004
 R-106 X-10 KR32A Duty Cycle TS
 REF -20.0 dBm AT 10 dB MKR 500.00 µsec
 .23 dB



CENTER 310.000 MHz
 #RES BW 120 kHz
 VBW 300 kHz
 #SWP 25.0 msec
 SPAN 0 Hz

Customer:	X-10(USA) Inc.		
Test Sample:	310 MHz Pulsed Transmitter		
Model No.:	KR32A FCC ID: B4SKR32A		
Test Method:	FCC Paragraph 15.35 Duty Cycle Determination		
Notes:	Measurement of 42 small pulses= 500 uSec=42(0.5)=21.0 mSec Duty Cycle= [9.0 + 42(0.5)]/100= 0.30= 30.0%= -10.4 dB		
Date:	December 2, 2004	Tech:	T. Schneider
	Sheet	3	of 3



Retlif Testing Laboratories

Report No. 10683-1