

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: PH750T

TYPE: Pulsed Transmitter

POWER REQUIREMENTS: 3 VDC via two (2) "AAA" batteries

FREQUENCY OF OPERATION: 418 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: B4SPH750T
Power Requirements: 3 VDC via two (2) "AAA" 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 10333 $\mu\text{V/M}$ (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 1033 $\mu\text{V/M}$ (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	=	418		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 = 10333 $\mu\text{V/M}$ (AVERAGE) @ 3 Meters

Harmonic Limit = 1033 $\mu\text{V/M}$ (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 = 21.925 milliseconds (maximum)

Transmitter Cycle Time = 45 milliseconds

Transmitter Duty Cycle = 48.7%

CALCULATION:

1 Large Pulse	=	2.5 milliseconds
9 x 1.425 ms (medium pulse)	=	12.825 milliseconds
11 x 600 μ s (small pulse)	=	6.6 milliseconds
2.5 + 12.825 + 6.6	=	21.925 milliseconds
Duty Cycle (21.925/45)	=	48.7 %
Correction Factor = 20 log (0.487)	=	-6.2 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 600 μ s yields a minimum required bandwidth of 1111 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 4.2 GHz. All emissions not reported were more than 20 dB below the specified limit.

EQUIPMENT LIST

Low Power Pulsed 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-10698-1	
Test Sample:		Pulsed 418 MHz Transmitter			Paragraph:	15.231	
Model No.:		PH750T			FCC ID:	B4SPH750T	
Operating Mode:		Continuously Transmitting a pulsed 418 MHz signal					
Technician:		R. Soodoo			Date:	December 16, 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
418	V/1.0	X	71.4	-2.2	69.2	2884.0	103333
	V/1.0	Y	72.8	-2.2	70.6	3388.4	
	V/1.0	Z	73.4	-2.2	71.2	3630.8	
	H/1.8	X	69.3	-1.7	67.6	2398.8	
	H/1.0	Y	67.1	-1.7	65.4	1862.1	
418	H/1.5	Z	65.2	-1.7	63.5	1496.2	103333
836	V/1.0	X	35.0	6.8	41.8	123.0	10333
	V/1.0	Y	36.7	6.8	43.5	149.6	
	V/1.0	Z	40.1	6.8	46.9	221.3	
	H/1.0	X	36.6	6.9	43.5	149.6	
	H/1.5	Y	36.1	6.9	43.0	141.3	
836	H/2.0	Z	34.8	6.9	41.7	121.6	10333
1254	V/1.5	X	38.5	3.6	42.1	127.4	10333
	V/1.3	Y	37.8	3.6	41.4	117.5	
	V/1.5	Z	37.5	3.6	41.1	113.5	
	H/1.0	X	34.7	3.7	38.4	83.2	
	H/1.0	Y	37.3	3.7	41.0	112.2	
1254	H/1.5	Z	36.5	3.7	40.2	102.3	10333
1672	V/1.3	X	33.9	8.7	42.6	134.9	5000
	V/1.3	Y	34.8	8.7	43.5	149.6	
	V/1.3	Z	35.2	8.7	43.9	156.7	
	H/1.0	X	32.4	7.7	40.1	101.2*	
	H/1.0	Y	32.4	7.7	40.1	101.2*	
1672	H/1.0	Z	34.9	7.7	42.6	134.9	5000
2090	V/1.0	X	41.2	-1.2	40.0	100.0*	10333
	V/1.0	Y	41.2	-1.2	40.0	100.0*	
	V/1.0	Z	41.2	-1.2	40.0	100.0*	
	H/1.0	X	41.2	-1.2	40.0	100.0*	
	H/1.0	Y	41.2	-1.2	40.0	100.0*	
2090	H/1.0	Z	41.2	-1.2	40.0	100.0*	10333
	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)						

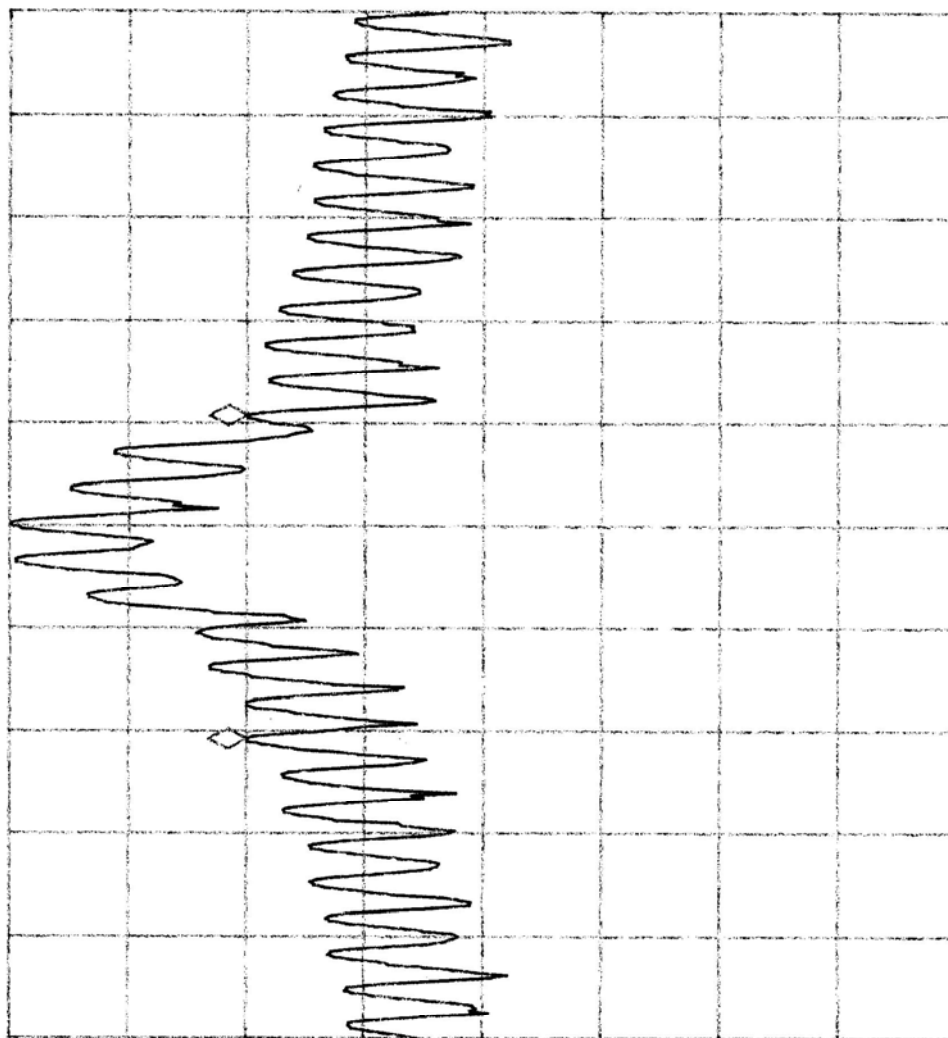
Test Method:		FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions					
Customer:		X-10 Wireless Technology, Inc.			Job No.		R-10698-1
Test Sample:		Pulsed 418 MHz Transmitter			Paragraph:		15.231
Model No.:		PH750T			FCC ID:		B4SPH750T
Operating Mode:		Continuously Transmitting a pulsed 418 MHz signal					
Technician:		R. Soodoo			Date:		December 16, 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
2508	V/1.0	X	43.0	-3.8	39.2	91.2*	10333
	V/1.0	Y	43.0	-3.8	39.2	91.2*	
	V/1.0	Z	43.0	-3.8	39.2	91.2*	
	H/1.0	X	43.0	-3.8	39.2	91.2*	
	H/1.0	Y	43.0	-3.8	39.2	91.2*	
2508	H/1.0	Z	43.0	-3.8	39.2	91.2*	10333
2926	V/1.0	X	41.8	-6.2	35.6	60.3*	10333
	V/1.0	Y	41.8	-6.2	35.6	60.3*	
	V/1.0	Z	41.8	-6.2	35.6	60.3*	
	H/1.0	X	41.8	-6.2	35.6	60.3*	
	H/1.0	Y	41.8	-6.2	35.6	60.3*	
2926	H/1.0	Z	41.8	-6.2	35.6	60.3*	10333
3344	V/1.0	X	41.9	-7.8	34.1	50.7*	10333
	V/1.0	Y	41.9	-7.8	34.1	50.7*	
	V/1.0	Z	41.9	-7.8	34.1	50.7*	
	H/1.0	X	41.9	-7.8	34.1	50.7*	
	H/1.0	Y	41.9	-7.8	34.1	50.7*	
3344	H/1.0	Z	41.9	-7.8	34.1	50.7*	10333
3762	V/1.0	X	41.7	-12.1	29.6	30.2*	5000
	V/1.0	Y	41.7	-12.1	29.6	30.2*	
	V/1.0	Z	41.7	-12.1	29.6	30.2*	
	H/1.0	X	41.7	-12.1	29.6	30.2*	
	H/1.0	Y	41.7	-12.1	29.6	30.2*	
3762	H/1.0	Z	41.7	-12.1	29.6	30.2*	5000
4180	V/1.0	X	41.3	-17.8	23.5	15.0*	5000
	V/1.0	Y	41.3	-17.8	23.5	15.0*	
	V/1.0	Z	41.3	-17.8	23.5	15.0*	
	H/1.0	X	41.3	-17.8	23.5	15.0*	
	H/1.0	Y	41.3	-17.8	23.5	15.0*	
4180	H/1.0	Z	41.3	-17.8	23.5	15.0*	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:		FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions					
Customer:		X-10 Wireless Technology, Inc.			Job No.		R-10698-1
Test Sample:		Pulsed 418 MHz Transmitter			Paragraph:		15.231
Model No.:		PH750T			FCC ID:		B4SPH750T
Operating Mode:		Continuously Transmitting a pulsed 418 MHz signal					
Technician:		R. Soodoo			Date:		December 16, 2004
Notes:		Test Distance: 3 Meters			Duty Cycle: 48.7%		
		Detector: Peak, unless otherwise specified			Duty Cycle Correction:-6.2 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
418	V/1.0	X	69.2	-6.2	63.0	1412.5	10333
	V/1.0	Y	70.6	-6.2	64.4	1659.6	
	V/1.0	Z	71.2	-6.2	65.0	1778.3	
	H/1.8	X	67.6	-6.2	61.4	1174.9	
	H/1.0	Y	65.4	-6.2	59.2	912.0	
418	H/1.5	Z	63.5	-6.2	57.3	732.8	10333
836	V/1.0	X	41.8	-6.2	35.6	60.3	1033
	V/1.0	Y	43.5	-6.2	37.3	73.3	
	V/1.0	Z	46.9	-6.2	40.7	108.4	
	H/1.0	X	43.5	-6.2	37.3	73.3	
	H/1.5	Y	43.0	-6.2	36.8	69.2	
836	H/2.0	Z	41.7	-6.2	35.5	59.6	1033
1254	V/1.5	X	42.1	-6.2	35.9	62.4	1033
	V/1.3	Y	41.4	-6.2	35.2	57.5	
	V/1.5	Z	41.1	-6.2	34.9	55.6	
	H/1.0	X	38.4	-6.2	32.2	40.7	
	H/1.0	Y	41.0	-6.2	34.8	55.0	
1254	H/1.5	Z	40.2	-6.2	34.0	50.1	1033
1672	V/1.3	X	42.6	-6.2	36.4	66.1	500
	V/1.3	Y	43.5	-6.2	37.3	73.3	
	V/1.3	Z	43.9	-6.2	37.7	76.7	
	H/1.0	X	40.1	-6.2	33.9	49.5*	
	H/1.0	Y	40.1	-6.2	33.9	49.5*	
1672	H/1.0	Z	42.6	-6.2	36.4	66.1	500
2090	V/1.0	X	40.0	-6.2	33.8	49.0*	1033
	V/1.0	Y	40.0	-6.2	33.8	49.0*	
	V/1.0	Z	40.0	-6.2	33.8	49.0*	
	H/1.0	X	40.0	-6.2	33.8	49.0*	
	H/1.0	Y	40.0	-6.2	33.8	49.0*	
2090	H/1.0	Z	40.0	-6.2	33.8	49.0*	1033
	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-10698-1	
Test Sample:		Pulsed 418 MHz Transmitter			Paragraph:	15.231	
Model No.:		PH750T			FCC ID:	B4SPH750T	
Operating Mode:		Continuously Transmitting a pulsed 418 MHz signal					
Technician:		R. Soodoo			Date:	December 16, 2004	
Notes:		Test Distance: 3 Meters			Duty Cycle: 48.7%		
		Detector: Peak, unless otherwise specified			Duty Cycle Correction: -6.2 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
2508	V/1.0	X	39.2	-6.2	33.0	44.7*	1033
	V/1.0	Y	39.2	-6.2	33.0	44.7*	
	V/1.0	Z	39.2	-6.2	33.0	44.7*	
	H/1.0	X	39.2	-6.2	33.0	44.7*	
	H/1.0	Y	39.2	-6.2	33.0	44.7*	
2508	H/1.0	Z	39.2	-6.2	33.0	44.7*	1033
2926	V/1.0	X	35.6	-6.2	29.4	29.5*	1033
	V/1.0	Y	35.6	-6.2	29.4	29.5*	
	V/1.0	Z	35.6	-6.2	29.4	29.5*	
	H/1.0	X	35.6	-6.2	29.4	29.5*	
	H/1.0	Y	35.6	-6.2	29.4	29.5*	
2926	H/1.0	Z	35.6	-6.2	29.4	29.5*	1033
3344	V/1.0	X	34.1	-6.2	27.9	24.8*	1033
	V/1.0	Y	34.1	-6.2	27.9	24.8*	
	V/1.0	Z	34.1	-6.2	27.9	24.8*	
	H/1.0	X	34.1	-6.2	27.9	24.8*	
	H/1.0	Y	34.1	-6.2	27.9	24.8*	
3344	H/1.0	Z	34.1	-6.2	27.9	24.8*	1033
3762	V/1.0	X	29.6	-6.2	23.4	14.8*	500
	V/1.0	Y	29.6	-6.2	23.4	14.8*	
	V/1.0	Z	29.6	-6.2	23.4	14.8*	
	H/1.0	X	29.6	-6.2	23.4	14.8*	
	H/1.0	Y	29.6	-6.2	23.4	14.8*	
3762	H/1.0	Z	29.6	-6.2	23.4	14.8*	500
4180	V/1.0	X	23.5	-6.2	17.3	7.3*	500
	V/1.0	Y	23.5	-6.2	17.3	7.3*	
	V/1.0	Z	23.5	-6.2	17.3	7.3*	
	H/1.0	X	23.5	-6.2	17.3	7.3*	
	H/1.0	Y	23.5	-6.2	17.3	7.3*	
4180	H/1.0	Z	23.5	-6.2	17.3	7.3*	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)						

FCC 15.231(c)
OCCUPIED BANDWIDTH

13:04:16 DEC 14, 2004
 R-10968 X-10 418MHz PH750T OCCUPIED BW RSNKR 329 KHz
 REF -48.5 dBm #AT 0 dB



PEAK
 LOG
 10
 dB/

MA SB
 SC FC
 CORR

CENTER 418.000 MHz
 #RES BW 10 KHz
 SPAN 1.045 MHz
 SWP 31.4 msec
 #VBW 30 KHz

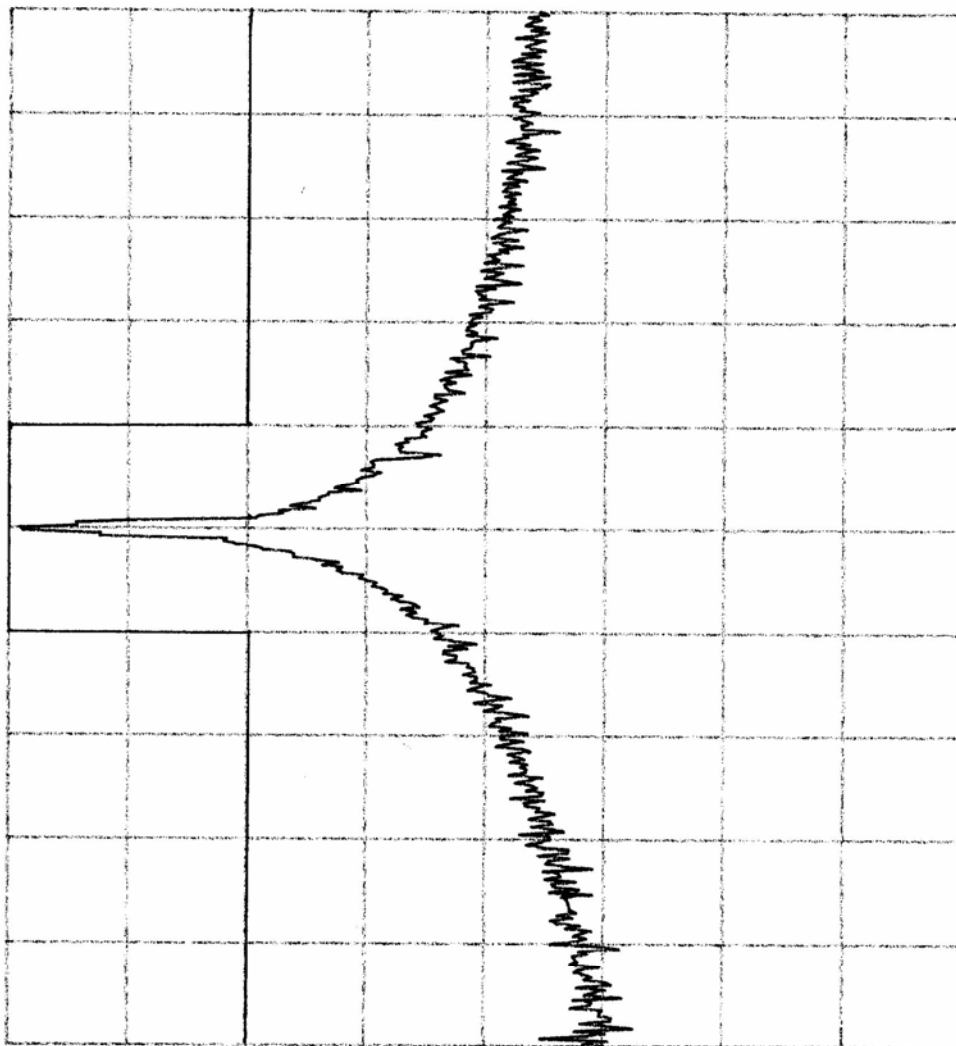
Customer:	X-10 Wireless Technology Inc.
Test Sample:	418 MHz Pulsed Transmitter.
Model No.:	PH750T, FCC ID: B4SPH750T
Test Method:	FCC Part 15 Subpart C 15.231(c), Occupied Bandwidth
Notes:	Bandwidth does not exceed 0.25% of Center Frequency at the 20 dBc points(1.045 MHz)
Date:	December 14, 2004.
Tech:	R. Soodoo
Sheet	1 of 2



Retlif Testing Laboratories

Report No. R-10698-1

13:07:40 DEC 14, 2004
 R-10968 X-10 418MHz PH750T OCCUPIED BW RS
 REF -48.5 dBm #AT 0 dB



CENTER 418.00 MHz
 #RES BW 10 KHz
 #VBW 30 KHz
 SPAN 10.45 MHz
 SWP 314 msec

PEAK
 LOG
 10
 dB/

VA SB
 SC FC
 CORR

Customer:	X-10 Wireless Technology Inc.
Test Sample:	418 MHz Pulsed Transmitter
Model No.:	PH750T, FCC ID: B4SPH750T
Test Method:	FCC Part 15 Subpart C 15.231 (c), Occupied Bandwidth.
Notes:	Bandwidth does not exceed 0.25% of the center frequency at 20dBc points (1.045 MHz)
Date:	December 14, 2004
Tech:	R.Soodoo
Sheet:	2 of 2



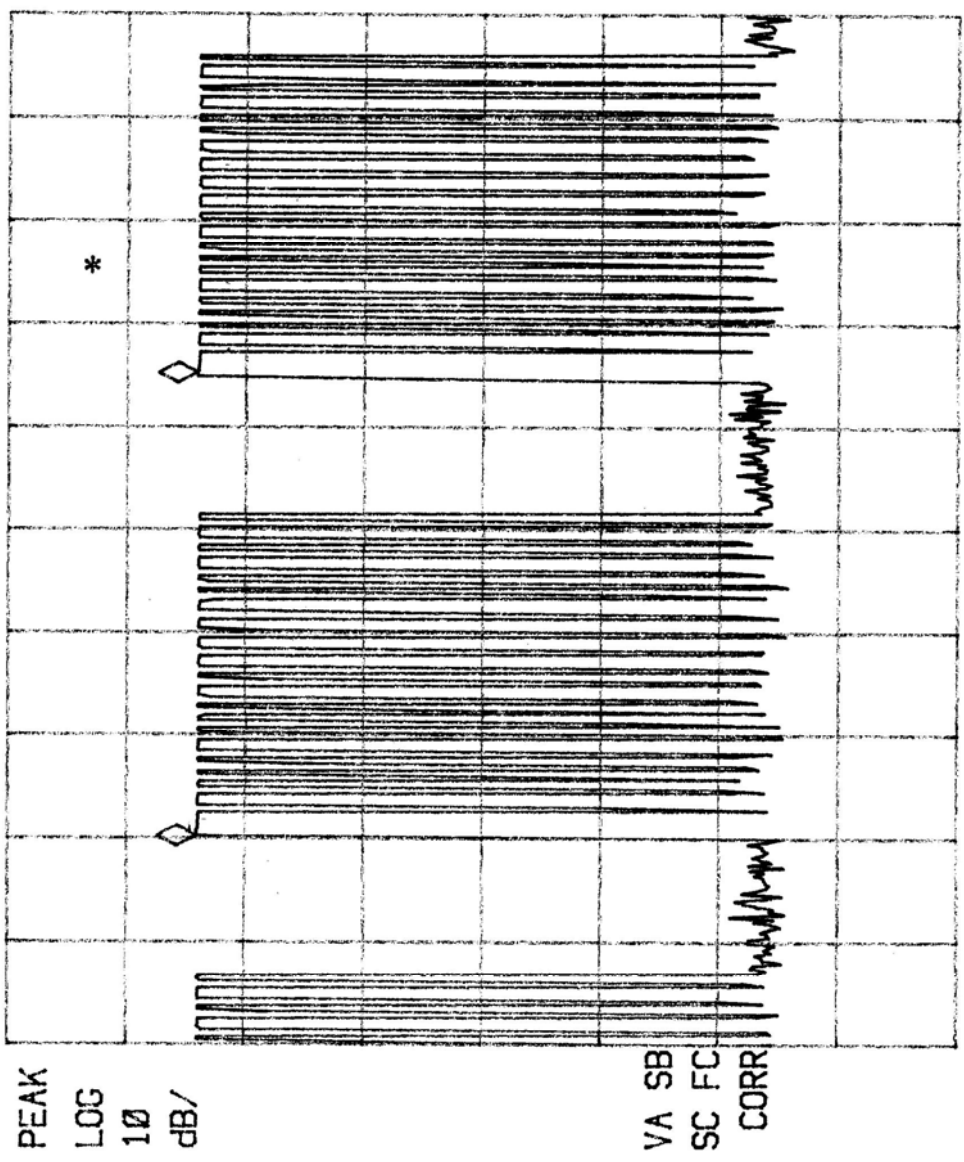
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Report No. R-10968-1

FCC 15.231(c)
DUTY CYCLE

10:02:43 DEC 14, 2004

MKR 45.000 msec
REF -35.0 dBm #AT 0 dB

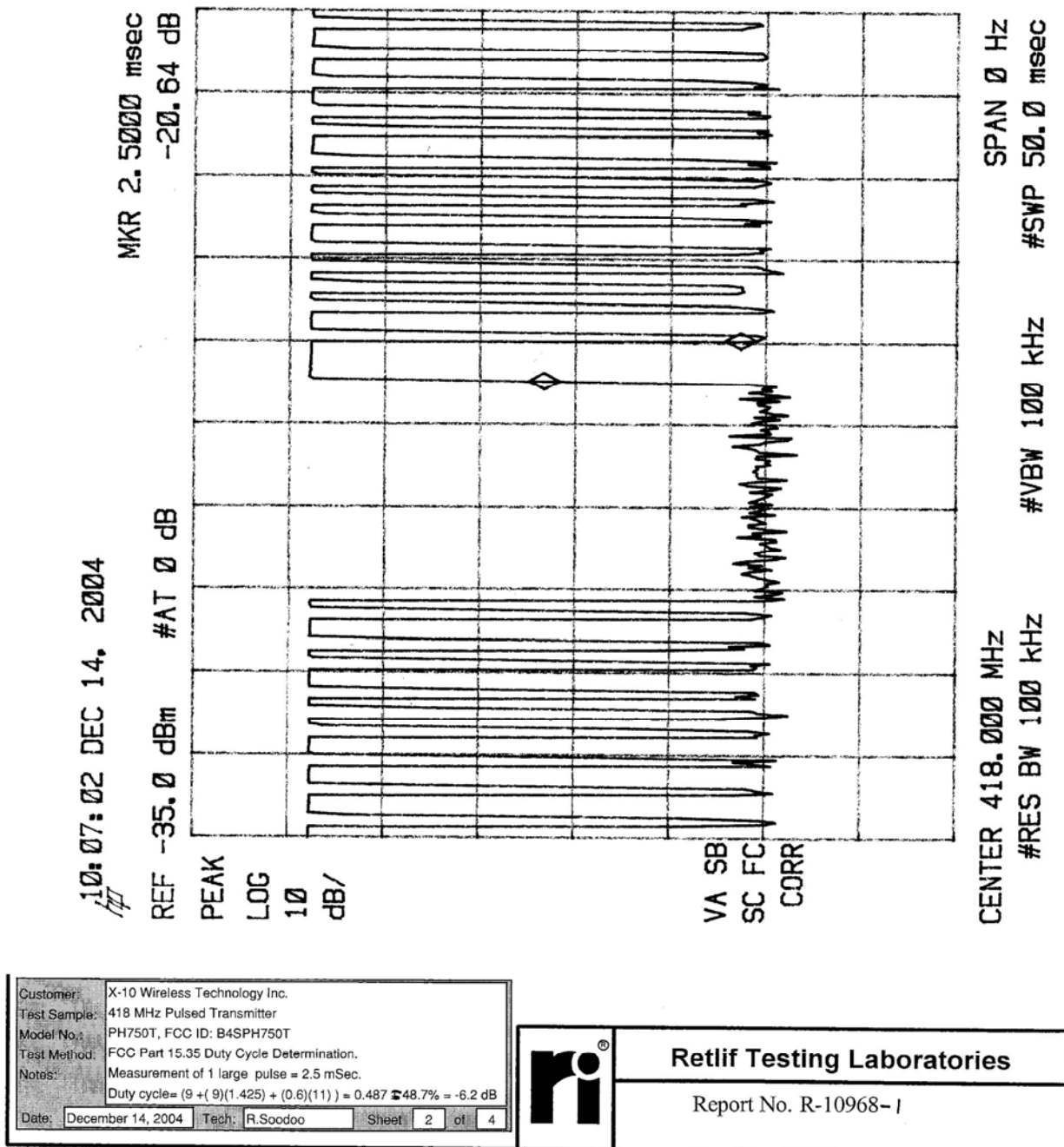


CENTER 418.000 MHz
SPAN 0 Hz
#RES BW 100 kHz
#VBW 100 kHz
#SWP 100 msec

Customer:	X-10 Wireless Technology Inc.
Test Sample:	418 MHz Pulsed Transmitter
Model No.:	PH750T, FCC ID: B4SPH750T
Test Method:	FCC Part 15.35 Duty Cycle Determination.
Notes:	Measurement of cycle time =45 mSec
Date:	December 14, 2004
Tech:	R.Soodoo
Sheet	1 of 4



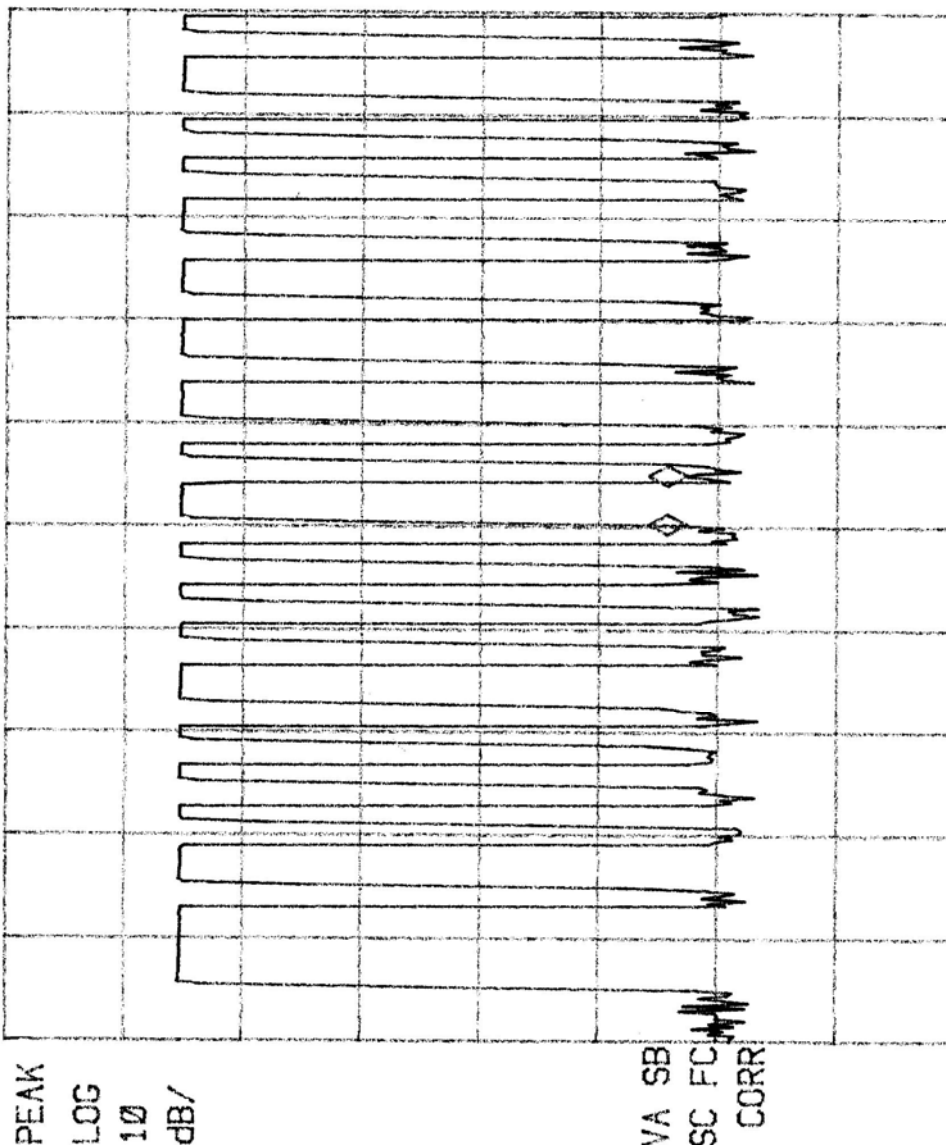
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Report No. R-10968-1



10:20:57 DEC 14, 2004

MRK 1.4250 msec
-07 dB

REF -35.0 dBm #AT 0 dB



CENTER 418.000 MHz
#RES BW 100 kHz
#VBW 100 kHz
#SWP 30.0 msec
SPAN 0 Hz

Customer: X-10 Wireless Technology Inc.
Test Sample: 418 MHz Pulsed Transmitter
Model No.: PH750T, FCC ID: B4SPH750T
Test Method: FCC Part 15.35 Duty Cycle Determination.
Notes: Measurement of 9 ^{10.42} pulses = 1.425mSec = 9(1.425) = 12.8mSec
Duty cycle = $(9 + (9)(1.425) + (0.6)(11)) = 0.487 \approx 48.7\% = -6.2 \text{ dB}$
Date: December 14, 2004 Tech: R.Soodoo Sheet 3 of 4



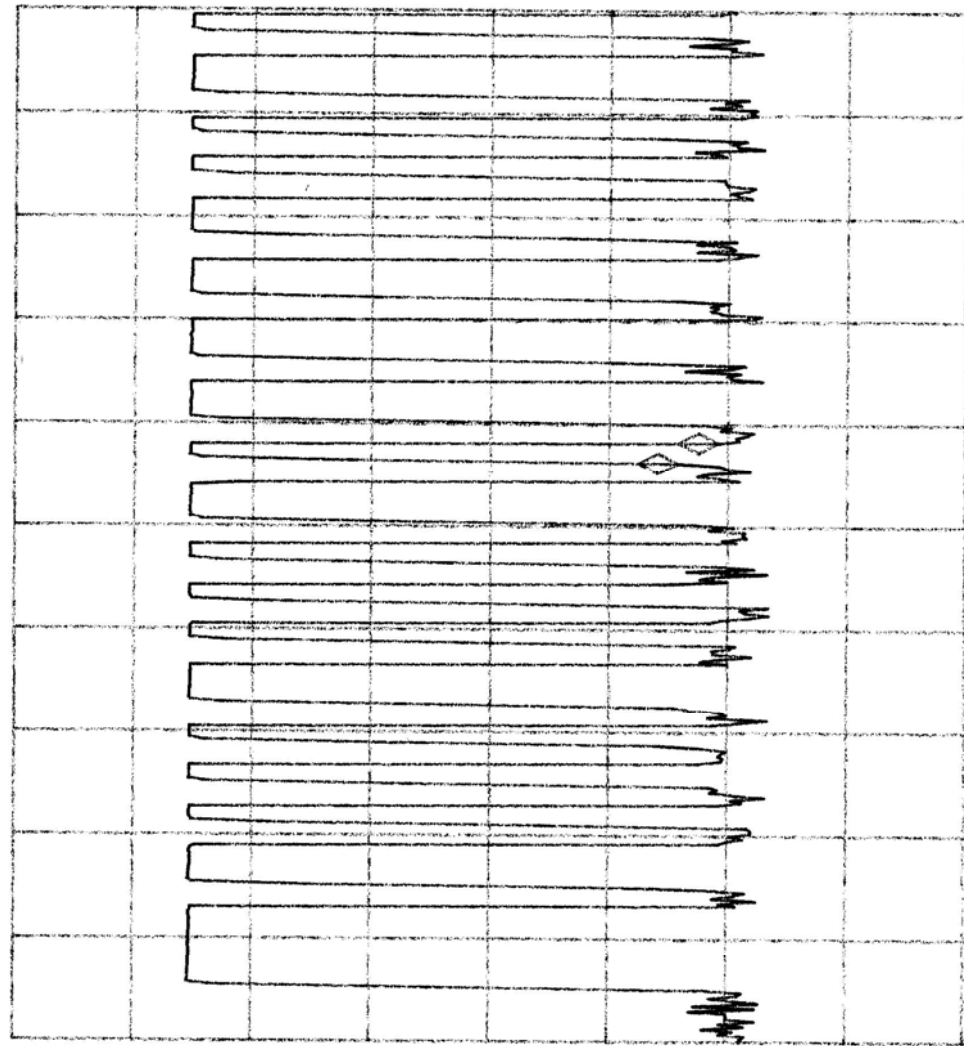
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Report No. R-10968-1

10:23:30 DEC 14, 2004

MKR 600.00 μ sec
-3.40 dB

REF -35.0 dBm #AT 0 dB



CENTER 418.000 MHz
#RES BW 100 KHz
SPAN 0 Hz
#SWP 30.0 msec
#VBW 100 KHz

Customer:	X-10 Wireless Technology Inc.		
Test Sample:	418 MHz Pulsed Transmitter		
Model No.:	PH750T, FCC ID: B4SPH750T		
Test Method:	FCC Part 15.35 Duty Cycle Determination.		
Notes:	Measurement of 11 small pulses = 600uSec= 11(.6)= 6.6mSec Duty cycle= $(9 + (9)(1.425) + (0.6)(11)) = 0.487 + 48.7\% = -6.2$ dB		
Date:	December 14, 2004	Tech:	R.Soodoo
Sheet	4	of	4



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Report No. R-10968-1