

APPLICANT

X-10 USA, Inc.
19823, 58th 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

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

TEST PROCEDURE: ANSI C63.4:2001

TEST SAMPLE DESCRIPTION

BRANDNAME: X-10 USA, Inc. MODEL: SRF2

TYPE: Pulsed Transmitter

POWER REQUIREMENTS: 2 "AAA" Batteries

FREQUENCY OF OPERATION: 418 MHz

TESTS PERFORMED

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

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

Para. 15.35, Duty Cycle Determination

Para. 15.231(c), Occupied Bandwidth

**Retlif Testing Laboratories**

Test Report No. R-10067-1
FCC ID: B4SSRF2

REPORT OF MEASUREMENTS

Applicant: X-10 (USA), Inc.
Device: Pulsed Transmitter
FCC ID: B4SSRF2
Power Requirements: 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) & 15.231(a)(2): The transmitter is manually operated and ceases transmission within 5 seconds after deactivation.

15.231 (a)(3): The transmitter does not perform periodic transmissions.

15.231 (b): The fundamental field strength did not exceed 10,333 $\mu\text{V/M}$ (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 1,033 $\mu\text{V/M}$ (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



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Test Report No. R-10067-1
FCC ID: B4SSRF2

REPORT OF MEASUREMENTS (continued)

The formula below was utilized to determine the limits:

$$\text{Limit} = L1 + [(F0-F1)(L2-L1)/(F2-F1)]$$

Solving yields:

$$\text{Fundamental Limit} = 10,333 \mu\text{V/M (AVERAGE) @ 3 Meters}$$

$$\text{Harmonic Limit} = 1,033 \mu\text{V/M (AVERAGE) @ 3 Meters}$$

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.

$$\text{Transmitter On Time} = 26 \text{ milliseconds (maximum)}$$

$$\text{Transmitter Cycle Time} = 108.8 \text{ milliseconds}$$

$$\text{Transmitter Duty Cycle} = 26 \%$$

See separate e-file plots named dutycycle.pdf for additional information.



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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 650 μ s yields a minimum required bandwidth of 1,026 Hz. FCC specified bandwidths of 100 kHz and 1 MHz were utilized below and above 1 GHz, 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 4.18 GHz. All emissions not reported were more than 20 dB below the specified limit.



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FCC ID: B4SSRF2

EQUIPMENT LIST

FCC 15.231 Testing

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due
067A	Test Site Attenuation	Retlif	3 Meter	RNY	8/11/2003	8/11/2004
128	Double Ridged Guide	Electro-Mechanics	1 GHz - 18 GHz	3105	6/13/2003	6/13/2004
133	Broadband Pre-Amplifier	Electro-Metrics	10 kHz - 1 GHz, 26dB	BPA-1000	6/12/2003	6/12/2004
141	Spectrum Analyzer	Hewlett Packard	100 Hz - 40 GHz	8566B	7/23/2003	1/23/2004
141A	Graphics Plotter	Hewlett Packard	N/A	7470A	3/5/2003	3/5/2004
141B	Quasi-Peak Adaptor	Hewlett Packard	100 Hz - 1 GHz	85650A	7/23/2003	1/23/2004
206B	6.0 dB Attenuator	Texscan	0 - 1.0 GHz	FP-50 - 6 dB	6/12/2003	6/12/2004
543	Preamplifier	Hewlett Packard	1.0 GHz - 26.5 GHz	8449B	7/24/2003	7/24/2004
617	Interference Analyzer	Electro-Metrics	10 kHz - 1 GHz	EMC-30	8/23/2002	9/30/2003
767	Biconilog	EMCO	26 - 2000 MHz	3142B	9/4/2003	9/4/2004



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Test Report No. R-10067-1
FCC ID: B4SSRF2

FCC 15.231(b)
RADIATED EMISSIONS, FUNDAMENTAL & SPURIOUS CASE
(See separate e-file named Refundharm & REspur.pdf)



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Test Report No. R-10067-1
FCC ID: B4SSRF2

FCC 15.231(c)
OCCUPIED BANDWIDTH
(See separate e-file named occbw.pdf)



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Test Report No. R-10067-1
FCC ID: B4SSRF2

FCC 15.231(c)

DUTY CYCLE

(See separate e-file named dutycycle.pdf)



Retlif Testing Laboratories
Test Report No. R-10067-1

FCC ID: B4SSRF2

Test Setup Photograph



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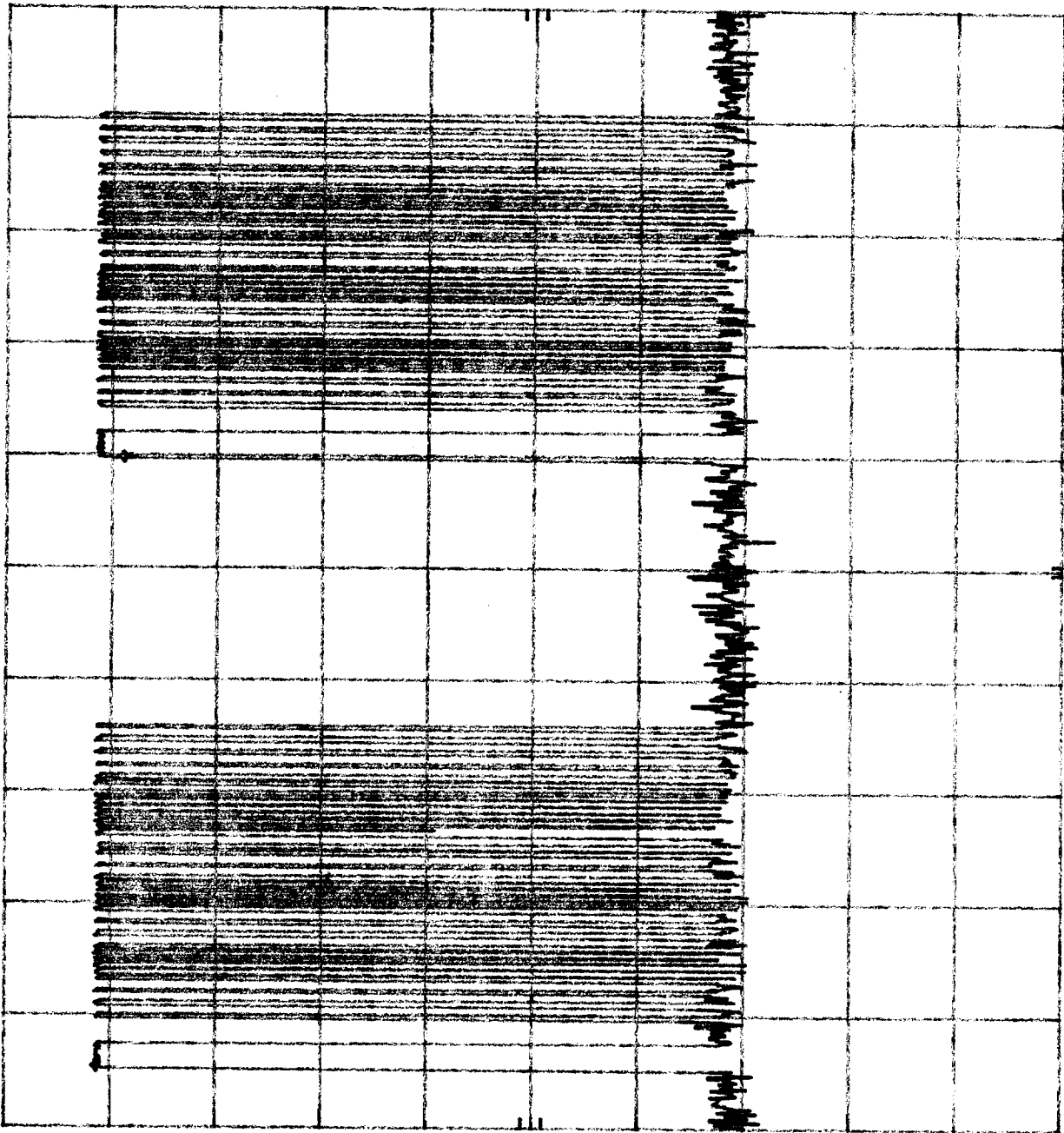
Test Report No. R-10067-1
FCC ID: B4SSRF2

R-10067- X-10 SRF1 DUTY CYCLE CW 9/23/03 MKR Δ 108.8 msec
 REF 105.0 dB_{uV} ATTN 10 dB

hp

10 dB/

OFFSET
 10.0
 dB



CENTER 418.000 000 MHz
 RES BW 100 kHz
 VBW 300 kHz
 SWP 200 msec
 SPAN 0 Hz

Customer:	X-10 Wireless Technology, Inc.		
Test Sample:	418 Mhz Transmitter		
Model No:	SRF1	FCC ID:	B4S-SRF1
Test Method:	FCC 15.35 Duty Cycle Determination		
Notes:	Transmitter Cycle Time= 108.8 msec		
	Duty Cycle= (4.5msec+ (33 x 0.65 msec)) / 100 msec = 0.260=26%		
Date:	9/24/03	Tech:	C. Weber
		Sheet	1 of 3



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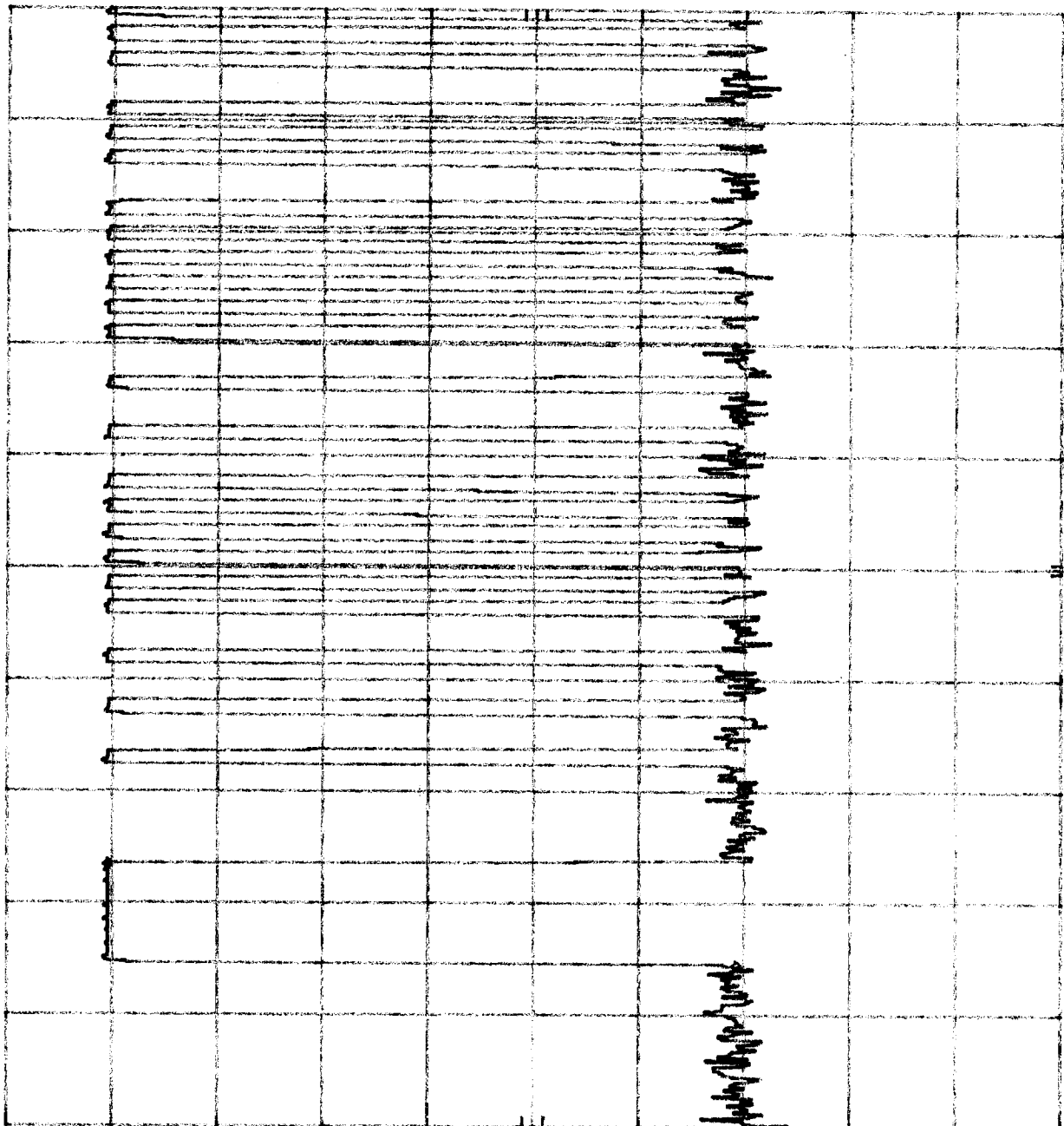
Report No. 10067-1

R-10067- X-10 SRF1 DUTY CYCLE CW 9/23/03 MKR Δ 4.500 msec
 REF 105.0 dB μ V ATTEN 10 dB

hp

10 dB/

OFFSET
 10.0
 dB



CENTER 418.000 000 MHz
 RES BW 100 kHz
 VBW 300 kHz
 SPAN 0 Hz
 SWP 50.0 msec

Customer: X-10 Wireless Technology, Inc.
 Test Sample: 418 Mhz Transmitter
 Model No: SRF-1 FCC ID: B4S-SRF1
 Test Method: FCC 15.35 Duty Cycle Determination
 Notes: Large Pulse Duration Time= 4.5 msec
 Duty Cycle= [4.5msec+ (33 x 0.65 msec)] / 100 msec = 0.260=26%
 Date: 9/24/03 Tech: C. Weber Sheet 2 of 3



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Report No. 10067-1

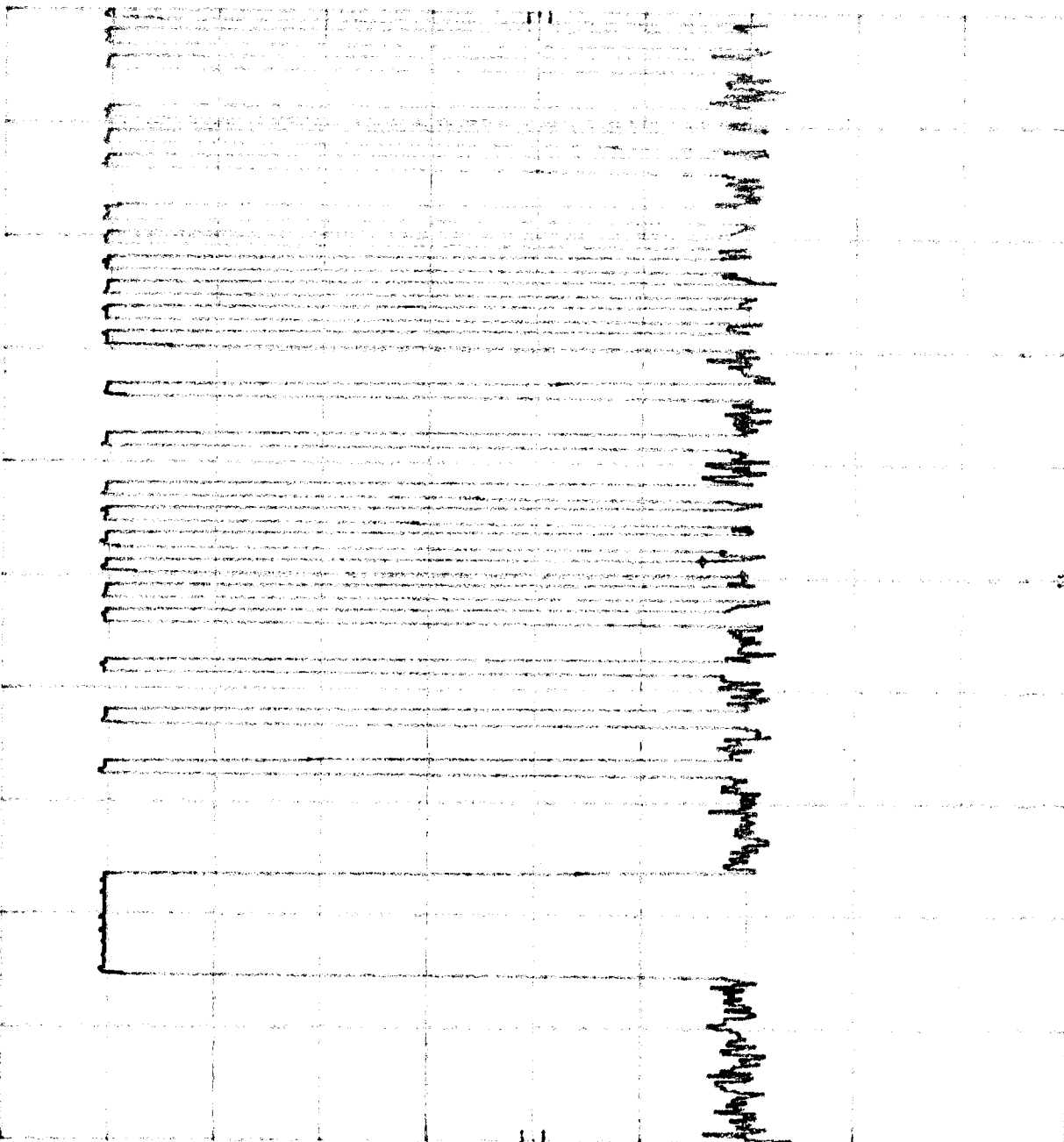
R-10067- X-10 SRF1 DUTY CYCLE CW 9/23/03 MKR Δ 650.0 μ sec
 REF 105.0 dB μ V ATTEN 10 dB

3.80 dB

10 dB

10 dB

OFFSET
 10.0
 dB



CENTER 418.000 000 MHz
 RES BW 100 kHz

VBW 300 kHz

SPAN 0 Hz
 SWP 50.0 msec

Customer: X-10 Wireless Technology, Inc.
 Test Sample: 418 Mhz Transmitter
 Model No: SRF1 FCC ID: B4S-SRF1
 Test Method: FCC 15.35 Duty Cycle Determination
 Notes: Small Pulse Duration Time= 0.65 msec
 Duty Cycle= $[4.5\text{msec} + (33 \times 0.65 \text{ msec})] / 100 \text{ msec} = 0.260 = 26\%$
 Date: 9/24/03 Tech: C. Weber Sheet 3 of 3



Retlif Testing Laboratories

Report No. 10067-1

Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	X-10 Wireless Technology, Inc.				Job No.	R-10067-1	
Test Sample:	Pulsed RF Transmitter				Paragraph:	15.231	
Model No.:	SRF2				FCC ID:	B4SSRF2	
Operating Mode:	Continuously Transmitting a pulsed 418 MHz Signal						
Technician:	C. Weber				Date:	September 24, 2003	
Notes:	Test Distance: 3 Meters Detector: Peak, Unless otherwise specified				Temp: 31°C	Humidity: 35%	
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
	H / 1.0	Y	89.7	-0.9	88.8	27,542.2	
	H / 1.0	Z	88.6	-0.9	87.9	24,266.1	
	V / 1.0	X	90.7	-0.9	89.8	30,902.9	
	V / 2.0	Y	82.9	-0.9	82.0	12,589.2	
418	V / 1.0	Z	83.0	-0.9	82.1	12,735.0	103,300
836	H / 1.0	X	37.2	+7.4	44.6	169.8*	10,330
	H / 1.0	Y	43.9	+7.4	51.3	367.2	
	H / 1.0	Z	39.7	+7.4	47.1	226.4	
	V / 1.0	X	43.6	+7.4	51.0	354.8	
	V / 1.0	Y	37.2	+7.4	44.6	169.8*	
836	V / 1.0	Z	39.5	+7.4	46.9	221.3	10,330
1254	H / 1.0	X	50.0	-1.1	48.9	278.6	10,330
	H / 1.3	Y	50.0	-1.1	48.9	278.6	
	H / 1.6	Z	45.6	-1.1	44.5	167.8	
	V / 1.5	X	46.0	-1.1	44.9	179.8	
	V / 1.0	Y	45.6	-1.1	44.5	167.8	
1254	V / 1.0	Z	49.9	-1.1	43.8	154.9	10,330
1672	H / 1.4	X	48.5	+3.2	51.7	384.5	5,000
	H / 1.2	Y	44.5	+3.2	47.7	242.6	
	H / 1.3	Z	41.1	+3.2	44.3	164.0	
	V / 1.5	X	47.3	+3.2	50.5	334.9	
	V / 1.0	Y	42.1	+3.2	45.3	184.0	
1672	V / 1.0	Z	46.1	+3.2	49.3	291.7	5,000
2090	H / 1.0	X	38.7	+11.0	49.7	305.4	10,330
	H / 1.5	Y	44.6	+11.0	55.6	602.5	
	H / 1.0	Z	40.6	+11.0	51.6	380.1	
	V / 1.3	X	47.8	+11.0	58.8	870.9	
	V / 1.0	Y	37.5	+11.0	48.5	266.0	
2090	V / 1.5	Z	40.1	+11.0	51.1	358.9	10,330
The frequency range was scanned from 30 MHz to 4.18 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)							



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Retlif Job Number R-10067-1

Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	X-10 Wireless Technology, Inc.				Job No.	R-10067-1	
Test Sample:	Pulsed RF Transmitter				Paragraph:	15.231	
Model No.:	SRF2				FCC ID:	B4SSRF2	
Operating Mode:	Continuously Transmitting a pulsed 418 MHz Signal						
Technician:	C. Weber				Date:	September 24, 2003	
Notes:	Test Distance: 3 Meters Detector: Peak, Unless otherwise specified				Temp: 31°C	Humidity: 35%	
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
	H / 1.3	Y	44.4	-1.5	42.9	139.6	
	H / 1.0	Z	37.9	-1.5	36.4	66.0*	
	V / 1.5	X	50.2	-1.5	48.7	272.2	
	V / 1.0	Y	37.9	-1.5	36.4	66.0*	
2508	V / 1.3	Z	41.1	-1.5	39.6	95.4	10,330
2926	H / 1.0	X	40.6	+0.3	40.9	110.9	10,330
	H / 1.3	Y	39.7	+0.3	40.0	100.0*	
	H / 1.0	Z	39.7	+0.3	40.0	100.0*	
	V / 1.2	X	46.3	+0.3	46.6	213.7	
	V / 1.0	Y	39.7	+0.3	40.0	100.0*	
2926	V / 1.2	Z	41.8	+0.3	42.1	127.3	10,330
3344	H / 1.0	X	40.2	+0.7	40.9	110.9	10,330
	H / 1.0	Y	36.3	+0.7	37.0	70.7*	
	H / 1.0	Z	36.3	+0.7	37.0	70.7*	
	V / 1.1	X	36.3	+0.7	37.0	70.7*	
	V / 1.0	Y	36.3	+0.7	37.0	70.7*	
3344	V / 1.0	Z	36.3	+0.7	37.0	70.7*	10,330
3762	H / 1.0	X	35.2	+1.7	36.9	69.9*	5,000
	H / 1.0	Y	35.2	+1.7	36.9	69.9*	
	H / 1.0	Z	35.2	+1.7	36.9	69.9*	
	V / 1.0	X	35.2	+1.7	36.9	69.9*	
	V / 1.0	Y	35.2	+1.7	36.9	69.9*	
3762	V / 1.2	Z	35.2	+1.7	36.9	69.9*	5,000
4180	H / 1.0	X	36.4	+2.7	39.1	90.1*	5,000
	H / 1.2	Y	36.4	+2.7	39.1	90.1*	
	H / 1.0	Z	36.4	+2.7	39.1	90.1*	
	V / 1.1	X	36.4	+2.7	39.1	90.1*	
	V / 1.0	Y	36.4	+2.7	39.1	90.1*	
4180	V / 1.0	Z	36.4	+2.7	39.1	90.1*	5,000
The frequency range was scanned from 30 MHz to 4.18 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)							



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Retlif Job Number R-10067-1

Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	X-10 Wireless Technology, Inc.				Job No.	R-10067-1	
Test Sample:	Pulsed RF Transmitter				Paragraph:	15.231	
Model No.:	SRF2				FCC ID:	B4SSRF2	
Operating Mode:	Continuously Transmitting a pulsed 418 MHz Signal						
Technician:	C. Weber				Date:	September 24, 2003	
Notes:	Test Distance: 3 Meters				Duty Cycle: 26 %		
	Detector: Peak, unless otherwise specified				Duty Cycle Correction: -11.7 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
	H / 1.0	Y	88.8	-11.7	77.1	7161.4	
	H / 1.0	Z	87.9	-11.7	76.2	6456.5	
	V / 1.0	X	89.8	-11.7	78.1	8035.2	
	V / 2.0	Y	82.0	-11.7	70.3	3273.4	
418	V / 1.0	Z	82.1	-11.7	70.4	3311.3	10,330
836	H / 1.0	X	44.1	-11.7	32.4	41.6	1,033
	H / 1.0	Y	44.6	-11.7	32.9	44.1*	
	H / 1.0	Z	47.1	-11.7	35.4	58.8	
	V / 1.0	X	51.0	-11.7	39.3	92.2	
	V / 1.0	Y	44.6	-11.7	32.9	44.1*	
836	V / 1.0	Z	46.9	-11.7	35.2	57.5	1,033
1254	H / 1.0	X	48.9	-11.7	37.2	72.4	1,033
	H / 1.3	Y	48.9	-11.7	37.2	72.4	
	H / 1.6	Z	44.5	-11.7	32.8	43.6	
	V / 1.5	X	44.9	-11.7	33.2	45.7	
	V / 1.0	Y	44.5	-11.7	32.8	43.6	
1254	V / 1.0	Z	43.8	-11.7	32.1	40.2	1,033
1672	H / 1.4	X	51.7	-11.7	40.0	100.0	500
	H / 1.2	Y	47.7	-11.7	36.0	63.1	
	H / 1.3	Z	44.3	-11.7	32.6	42.6	
	V / 1.5	X	50.5	-11.7	38.8	87.1	
	V / 1.0	Y	45.3	-11.7	33.6	47.8	
1672	V / 1.0	Z	49.3	-11.7	37.6	75.8	500
2090	H / 1.0	X	49.7	-11.7	38.0	79.4	1,033
	H / 1.5	Y	55.6	-11.7	43.9	156.6	
	H / 1.0	Z	51.6	-11.7	39.9	98.8	
	V / 1.3	X	58.8	-11.7	47.1	226.4	
	V / 1.0	Y	48.5	-11.7	36.8	69.1*	
2090	V / 1.5	Z	51.1	-11.7	39.4	93.3	1,033
	The frequency range was scanned from 30 MHz to 4.18 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)						



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Retlif Job Number R-10067-1

Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	X-10 Wireless Technology, Inc.				Job No.	R-10067-1	
Test Sample:	Pulsed RF Transmitter				Paragraph:	15.231	
Model No.:	SRF2				FCC ID:	B4SSRF2	
Operating Mode:	Continuously Transmitting a pulsed 418 MHz Signal						
Technician:	T. Schneider				Date:	July 2, 2003	
Notes:	Test Distance: 3 Meters				Duty Cycle: 26 %		
	Detector: Peak, unless otherwise specified				Duty Cycle Correction: -11.7 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
	H / 1.3	Y	42.9	-11.7	31.2	36.3	
	H / 1.0	Z	39.5	-11.7	27.8	24.5*	
	V / 1.5	X	48.7	-11.7	37.0	70.8	
	V / 1.0	Y	36.4	-11.7	24.7	17.2*	
2508	V / 1.3	Z	39.6	-11.7	27.9	24.8	1,033
2926	H / 1.0	X	40.9	-11.7	29.2	28.8	1,033
	H / 1.3	Y	40.0	-11.7	28.3	26.0*	
	H / 1.0	Z	40.0	-11.7	28.3	26.0*	
	V / 1.2	X	46.6	-11.7	34.9	55.6	
	V / 1.0	Y	40.0	-11.7	28.3	26.0*	
2926	V / 1.2	Z	42.1	-11.7	30.4	33.1	1,033
3344	H / 1.0	X	40.9	-11.7	29.2	28.8	1,033
	H / 1.0	Y	37.0	-11.7	25.3	18.4*	
	H / 1.0	Z	37.0	-11.7	25.3	18.4*	
	V / 1.1	X	37.0	-11.7	25.3	18.4*	
	V / 1.0	Y	37.0	-11.7	25.3	18.4*	
3344	V / 1.0	Z	37.0	-11.7	25.3	18.4*	1,033
3762	H / 1.0	X	36.9	-11.7	25.2	18.2*	500
	H / 1.0	Y	36.9	-11.7	25.2	18.2*	
	H / 1.0	Z	36.9	-11.7	25.2	18.2*	
	V / 1.0	X	36.9	-11.7	25.2	18.2*	
	V / 1.0	Y	36.9	-11.7	25.2	18.2*	
3762	V / 1.2	Z	36.9	-11.7	25.2	18.2*	500
4180	H / 1.0	X	39.1	-11.7	27.4	23.4*	500
	H / 1.2	Y	39.1	-11.7	27.4	23.4*	
	H / 1.0	Z	39.1	-11.7	27.4	23.4*	
	V / 1.1	X	39.1	-11.7	27.4	23.4*	
	V / 1.0	Y	39.1	-11.7	27.4	23.4*	
4180	V / 1.0	Z	39.1	-11.7	27.4	23.4*	500
	The frequency range was scanned from 30 MHz to 4.18 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)						



Retlif Testing Laboratories

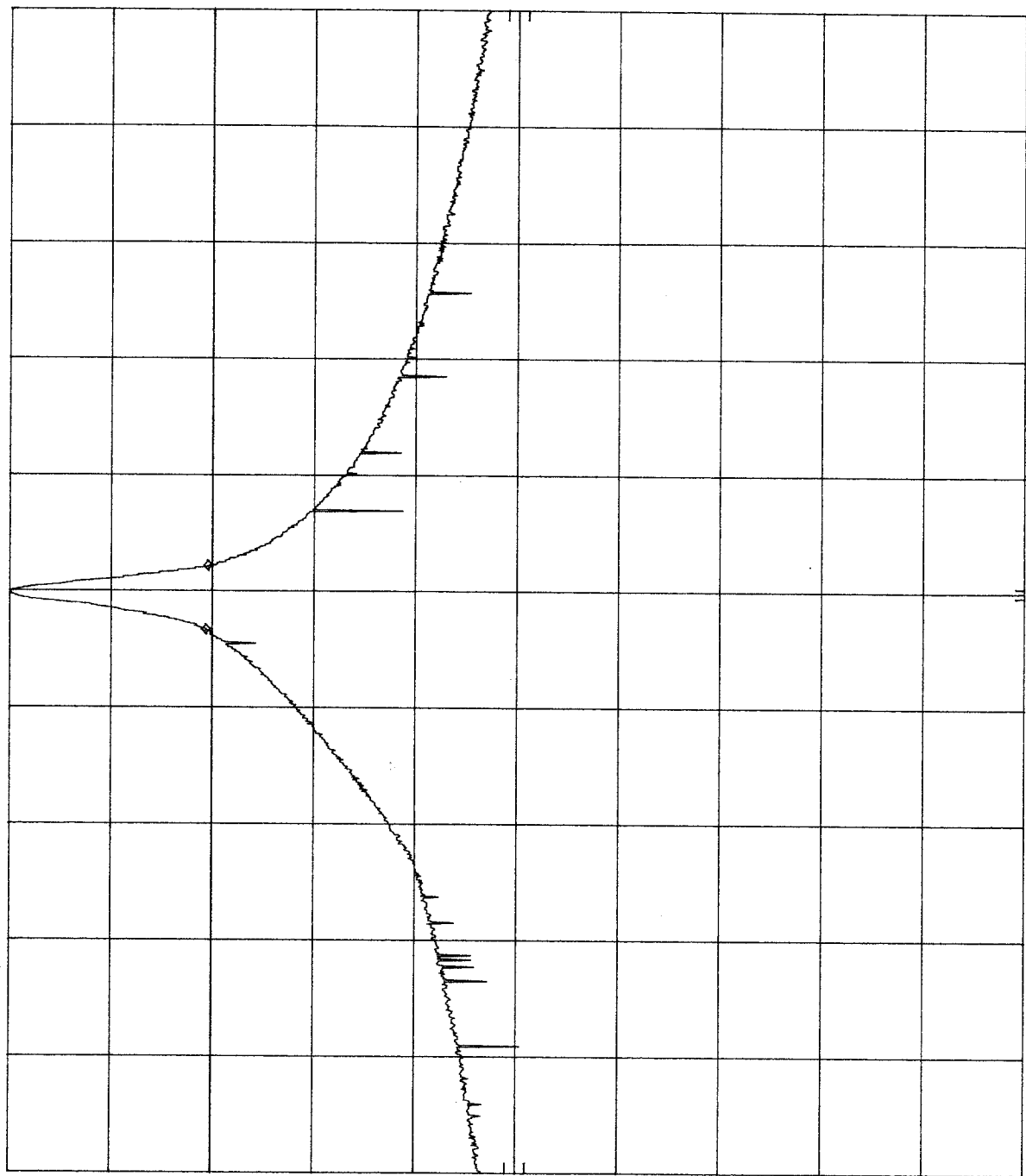
Retlif Job Number R-10067-1



R-10067-1 X-10 SRF1 OCCUPIED BW. CW 9/24/03 MKR Δ 57 kHz
 REF 87.6 dB μ V ATTN 10 dB -0.20 dB

hp
 10 dB/

DL
 67.6
 dB μ V



SPAN 1.04 MHz
 SWP 200 msec

VBW 30 kHz

CENTER 418.04 MHz
 RES BW 10 kHz

Customer:	X-10 Wireless Technology, Inc.
Test Sample:	418 MHz Pulsed RF Transmitter
Model No.:	SRF1 FCC ID: B4S-SRF2 18
Test Method:	FCC 15.231(c) Occupied Bandwidth
Notes:	20 db Bandwidth does not exceed 0.25% of center frequency (418 MHz) Maximum allowable 20 db Bandwidth= 1.045 MHz
Date:	September 24, 2003
Tech:	C. Weber
Sheet	1 of 1



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Report No. R-10067-1