

Technical Information

APPLICANT	MANUFACTURER
Name: X10 (USA), Inc.	Name: X-10 Electronics (Shenzhen) Co. Ltd.
Address: 19823 58 th 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

Test Sample:	433 MHz Pulsed Transmitter
Brandname(s):	X10 (USA)
Model Number:	VR46A and RadioShack Cat. No. 151-2572T
FCC ID:	B4SVR46A
Type:	Pulsed Transmitter
Power Requirements:	6 VDC derived from external AC Adapter
Frequency of Operation:	433 MHz
Applicable Rule Section:	Part 15, Subpart C, Section 15.231

Tests Performed

- Para. 15.207(a), Conducted Emissions
- 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

- 15.207(a): The radio frequency voltage that was conducted back on to the AC power line on any frequency/frequencies within the bandwidth of 150 kHz to 30 MHz did not exceed Class B limits as specified in CISPR 22.
- 15.231 (a): This device transmits a control signal and is used as a remote control transmitter.
- 15.231 (a)(2) The transmitter is automatically operated. Transmission ends 5 seconds after activation.
- 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 11000 $\mu\text{V/M}$ (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 1100 $\mu\text{V/M}$ (AVERAGE).
- 15.231 (c) The Bandwidth of the emission was no wider than 0.25% of the center frequency (1083 kHz) 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 =	<u>433 MHz</u>		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

$$\text{Fundamental Limit} = \underline{11000} \text{ } \mu\text{V/M (AVERAGE) @ 3 Meters}$$

$$\text{Harmonic Limit} = \underline{1100} \text{ } \mu\text{V/M (AVERAGE) @ 3 Meters}$$

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 0 Hz. 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.)

$$\text{Transmitter On Time} = \underline{26.62} \text{ milliseconds (maximum per cycle)}$$

$$\text{Transmitter Cycle Time} = \underline{102.4} \text{ milliseconds (100 ms maximum)}$$

$$\text{Transmitter Duty Cycle} = \underline{26.6} \%$$

Calculation

$$\underline{33} \text{ } \mu\text{s (small pulse)} \times \underline{540} \text{ } \mu\text{s (small pulse)} = \underline{17.82} \text{ milliseconds}$$

$$\underline{8.8} + \underline{17.82} = \underline{26.62} \text{ milliseconds}$$

$$\text{Duty Cycle (XX/100)} = \underline{26.6} \%$$

$$\text{Correction Factor} = 20 \log \underline{(0.XX)} = \underline{-11.5} \text{ dB}$$

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: minimum bandwidth = $1/\{\text{minimum pulse width (in seconds)} \times 1.5\} =$ Hz

Setting pulse desensitization equal to zero and utilizing the minimum observed pulse width of 540 μs yields a minimum required bandwidth of 1,234.0 Hz. FCC specified bandwidths of 100 kHz and 1 MHz were utilized below and above 1 GHz, respectively.

General Notes

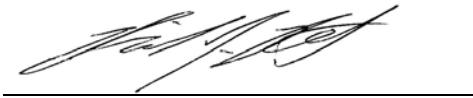
1. All readings were taken utilizing a peak detector function at a test distance of 3 meters.
2. The duty cycle was applied to the peak readings in order to determine the average value of the emissions.
3. The frequency range was scanned from 30 MHz to 4.4 GHz. All emissions not reported were more than 20 dB below the specified limit.

Certification and Signatures

We certify that this report is a true representation of the results obtained from the tests of the equipment stated. We further certify that the measurements shown in this report were made in accordance with the procedures indicated and vouch for the qualifications of all Retlif Testing Laboratories personnel taking them.



Donald C. Lerner
EMC Test Engineer



Richard J. Reitz
Laboratory Manager

Non-Warranty Provision

The testing services have been performed, findings obtained and reports prepared in accordance with generally accepted laboratory principles and practices. This warranty is in lieu of all others, either expressed or implied.

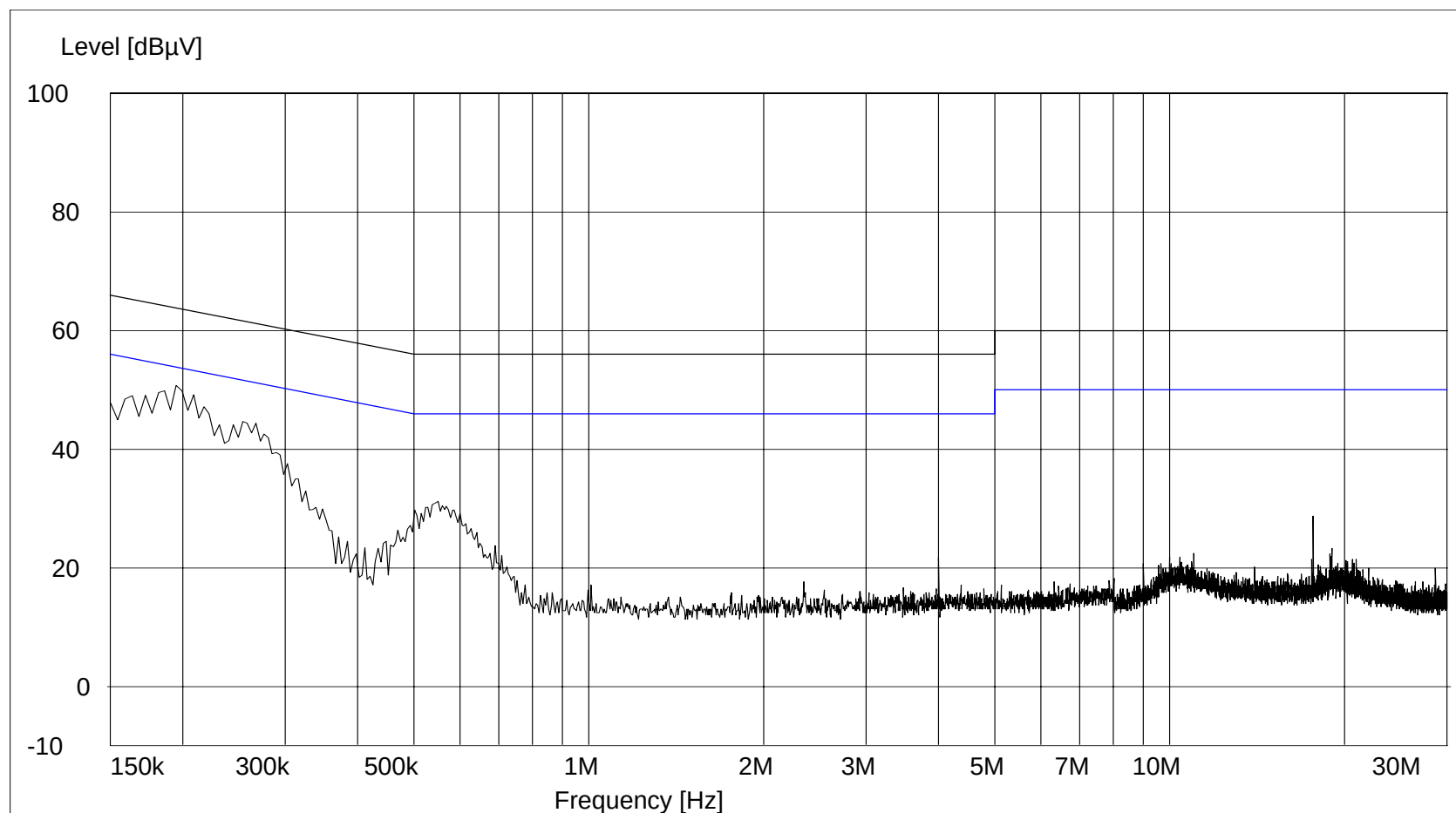
Non-Endorsement

This test report contains only findings and results arrived at after employing the specific test procedures and standards listed herein. It is not intended to constitute a recommendation, endorsement or certification of the product or material tested. This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

FCC Part 15, Subpart C, Conducted Emissions, Power Leads,
Test Data

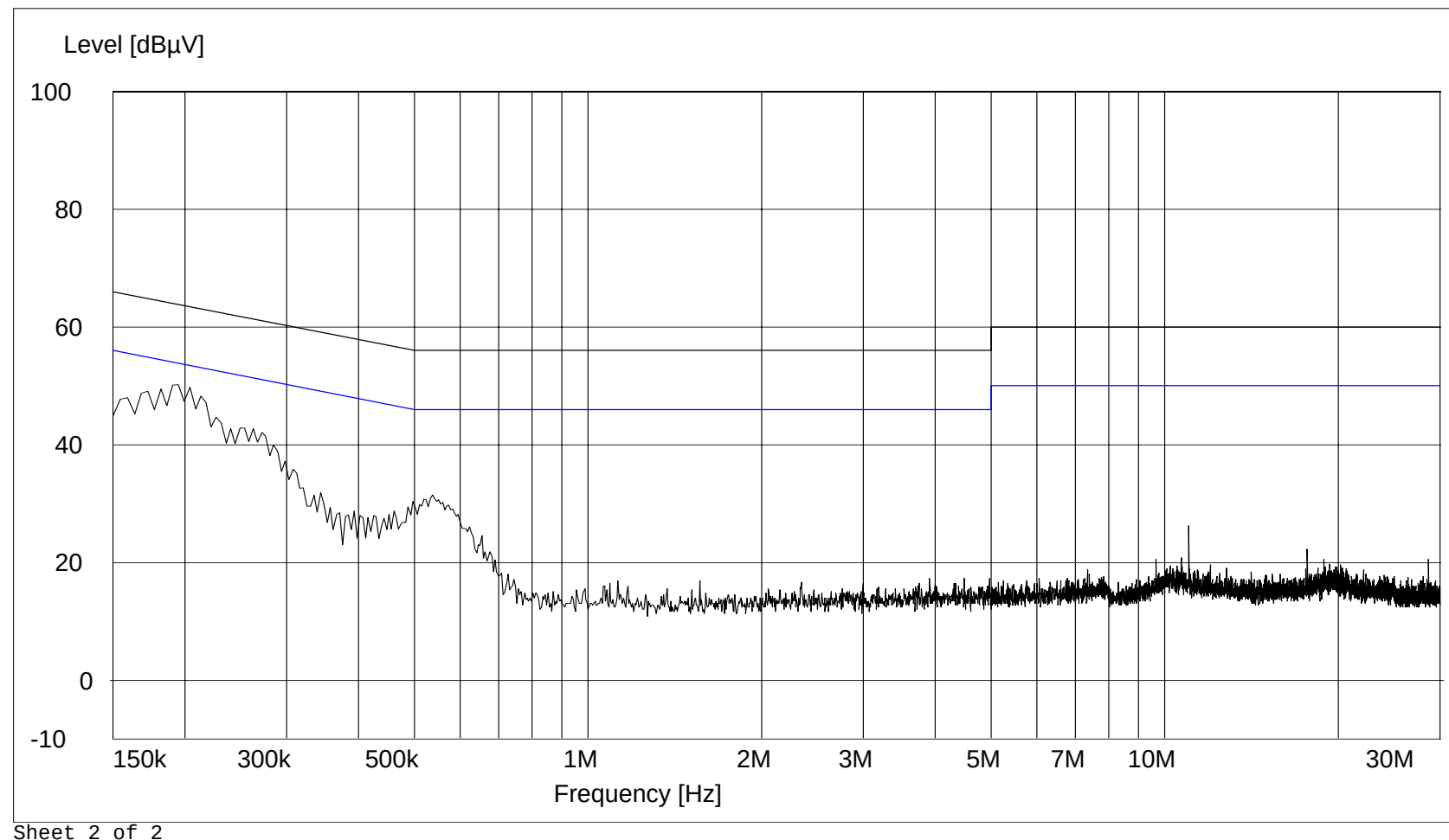
FCC Part 15 Subpart C, Conducted Emissions, 150 kHz to 30 MHz.

Customer: X-10 (USA), Inc.
Test Sample: 433 MHz Pulsed Transmitter
Model Number: VR46A Serial No.: N/A
Test Specification: FCC Part 15 Subpart B, 15.209
Mode of Operation: Continuously transmitting a pulsed 433 MHz signal
Lead Tested: Hot input to ac adapter
Technician / Date: R. S / August 04, 2006.
Detector / Note: Peak / Peak passed average limit



FCC Part 15 Subpart C, Conducted Emissions, 150 kHz to 30 MHz.

Customer: X-10 (USA), Inc.
Test Sample: 433 MHz Pulsed Transmitter
Model Number: VR46A Serial No.: N/A
Test Specification: FCC Part 15 Subpart B, 15.209
Mode of Operation: Continuously transmitting a pulsed 433 MHz signal
Lead Tested: Neutral input to ac adapter
Technician / Date: R. S / August 04, 2006.
Detector / Note: Peak / Peak passed average limit



FCC Part 15 Subpart C Radiated Emissions
Test Data

Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	X-10 (USA), Inc.				Job No.	R-11570-1	
Test Sample:	433 MHz Pulsed Transmitter				Paragraph:	15.231	
Model No.:	VR46A				FCC ID:	B4SVR46A	
Operating Mode:	Continuously transmitting a 433 MHz signal						
Technician:	D. Lerner				Date:	August 12, 2006.	
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
433.8	V / 1.0	X	91.9	-0.5	91.4	37153.5	110000
	V / 1.0	Y	84.5	-0.5	84.0	15848.9	
	V / 1.0	Z	85.7	-0.5	85.2	18197.0	
	H / 1.5	X	88.2	-0.5	87.7	24266.1	
	H / 1.0	Y	85.8	-0.5	85.3	18407.7	
433.8	H / 1.0	Z	85.7	-0.5	85.2	18197.0	110000
867.7	V / 1.0	X	48.0	7.1	55.1	568.9	11000
	V / 1.5	Y	40.0	7.1	47.1	226.5	
	V / 1.0	Z	35.4	7.1	42.5	133.4	
	H / 1.5	X	40.0	7.1	47.1	226.5	
	H / 1.0	Y	44.9	7.1	52.0	398.1	
867.7	H / 1.5	Z	42.0	7.1	49.1	285.1	11000
1301.4	V / 1.0	X	44.0	-3.9	40.9	110.9	5000
	V / 1.0	Y	51.8	-3.9	47.9	248.3	
	V / 1.0	Z	51.2	-3.9	47.3	231.7	
	H / 1.0	X	57.4	-3.9	53.5	473.2	
	H / 1.0	Y	52.8	-3.9	48.9	278.6	
1301.4	H / 1.0	Z	50.2	-3.9	46.3	206.5	5000
1735.0	V / 1.0	X	44.0	-2.0	42.0	125.9	11000
	V / 1.0	Y	48.5	-2.0	46.5	211.3	
	V / 1.0	Z	46.0	-2.0	44.0	158.5	
	H / 1.0	X	46.9	-2.0	44.9	175.8	
	H / 1.0	Y	47.2	-2.0	45.2	182.0	
1735.0	H / 1.0	Z	44.1	-2.0	42.1	127.4	11000
2168.0	V / 1.0	X	36.0	1.2	37.2 *	72.4	11000
	V / 1.0	Y	36.0	1.2	37.2 *	72.4	
	H / 1.0	Z	36.0	1.2	37.2 *	72.4	
	H / 1.0	X	36.0	1.2	37.2 *	72.4	
	H / 1.0	Y	36.0	1.2	37.2 *	72.4	
2168.0	V / 1.0	Z	36.0	1.2	37.2 *	72.4	11000
	The frequency range was scanned from 30 MHz to 4.4GHz. All emissions not recorded were more						
	Than 20 dB below the specified limit. Emissions from the EUT do not exceed the specified limits.						
	*= Noise Floor Measurements (minimum sensitivity).						

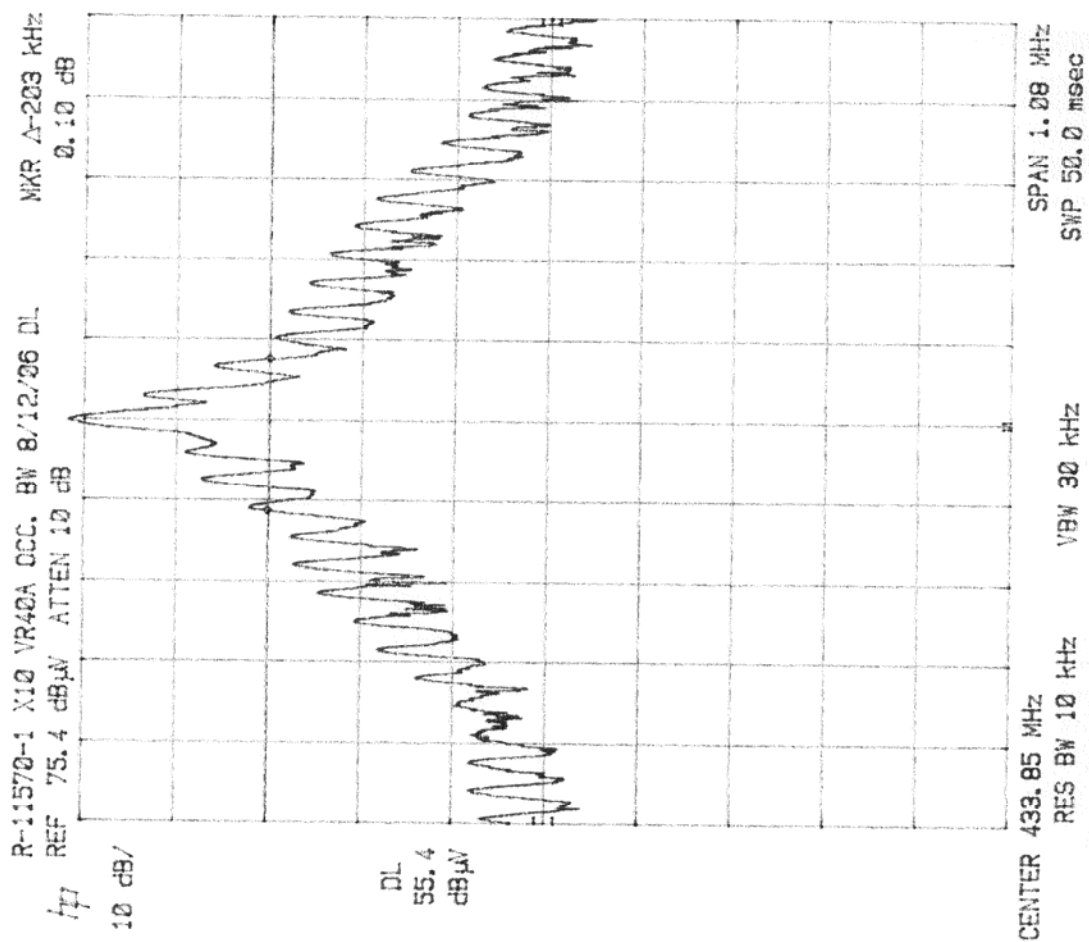
Test Method:	FCC Part 15 Subpart C Radiated Emissions, Fundamental & Harmonic Emissions						
Customer:	X-10 (USA), Inc.				Job No.	R-11570-1	
Test Sample:	433 MHz Pulsed Transmitter				Paragraph:	15.231	
Model No.:	VR46A				FCC ID:	B4SVR46A	
Operating Mode:	Continuously transmitting a 433 MHz signal						
Technician:	D. Lerner				Date:	August 12, 2006.	
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
2602.8	V / 1.0	X	40	-1.7	38.3 *	82.2	11000
	V / 1.0	Y	40	-1.7	38.3 *	82.2	
	V / 1.0	Z	40	-1.7	38.3 *	82.2	
	H / 1.0	X	40	-1.7	38.3 *	82.2	
	H / 1.0	Y	40	-1.7	38.3 *	82.2	
2602.8	H / 1.0	Z	40	-1.7	38.3 *	82.2	11000
3036.6	V / 1.0	X	40	-0.5	39.5 *	94.4	11000
	V / 1.0	Y	40	-0.5	39.5 *	94.4	
	V / 1.0	Z	40	-0.5	39.5 *	94.4	
	H / 1.0	X	40	-0.5	39.5 *	94.4	
	H / 1.0	Y	40	-0.5	39.5 *	94.4	
3036.6	H / 1.0	Z	40	-0.5	39.5 *	94.4	11000
3470.4	V / 1.0	X	38.5	0.8	39.3 *	92.3	11000
	V / 1.0	Y	38.5	0.8	39.3 *	92.3	
	V / 1.0	Z	38.5	0.8	39.3 *	92.3	
	H / 1.0	X	38.5	0.8	39.3 *	92.3	
	H / 1.0	Y	38.5	0.8	39.3 *	92.3	
3470.4	H / 1.0	Z	38.5	0.8	39.3 *	92.3	11000
3904.2	V / 1.0	X	38.2	2.5	40.7 *	108.4	5000
	V / 1.0	Y	38.2	2.5	40.7 *	108.4	
	V / 1.0	Z	38.2	2.5	40.7 *	108.4	
	H / 1.0	X	38.2	2.5	40.7 *	108.4	
	H / 1.0	Y	38.2	2.5	40.7 *	108.4	
3904.2	H / 1.0	Z	38.2	2.5	40.7 *	108.4	5000
				-11.5			
4338.0	V / 1.0	X	39.3	3.1	42.4 *	131.8	5000
	V / 1.0	Y	39.3	3.1	42.4 *	131.8	
	V / 1.0	Z	39.3	3.1	42.4 *	131.8	
	H / 1.0	X	39.3	3.1	42.4 *	131.8	
	H / 1.0	Y	39.3	3.1	42.4 *	131.8	
4338.0	H / 1.0	Z	39.3	3.1	42.4 *	131.8	5000
	The frequency range was scanned from 30 MHz to 4.4 GHz. All emissions not recorded were more						
	Than 20 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, Fundamental & Harmonic Emissions						
Customer:	X-10 (USA), Inc.				Job No.	R-11570-1	
Test Sample:	433 MHz Pulsed Transmitter				Paragraph:	15.231	
Model No.:	VR46A				FCC ID:	B4SVR46A	
Operating Mode:	Continuously transmitting a 433 MHz signal						
Technician:	D. Lerner				Date:	August 12, 2006.	
Notes:	Test Distance: 3 Meters				Duty Cycle: 26.7%		
	Detector: Peak, unless otherwise specified				Duty Cycle Correction: -11.5dB		
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
433.8	V / 1.0	X	91.4	-11.5	79.9	9885.5	11000
	V / 1.0	Y	84.0	-11.5	72.5	4217.0	
	V / 1.0	Z	85.2	-11.5	73.7	4841.7	
	H / 1.5	X	87.7	-11.5	76.2	6456.5	
	H / 1.0	Y	85.3	-11.5	73.8	4897.8	
433.8	H / 1.0	Z	85.2	-11.5	73.7	4841.7	11000
867.7	V / 1.0	X	55.1	-11.5	43.6	151.4	1100
	V / 1.5	Y	47.1	-11.5	35.6	60.3	
	V / 1.0	Z	42.5	-11.5	31	35.5	
	H / 1.5	X	47.1	-11.5	35.6	60.3	
	H / 1.0	Y	52.0	-11.5	40.5	105.9	
867.7	H / 1.5	Z	49.1	-11.5	37.6	75.9	1100
1301.4	V / 1.0	X	40.9	-11.5	29.4	29.5	500
	V / 1.0	Y	47.9	-11.5	36.4	66.1	
	V / 1.0	Z	47.3	-11.5	35.8	61.7	
	H / 1.0	X	53.5	-11.5	42	125.9	
	H / 1.0	Y	48.9	-11.5	37.4	74.1	
1301.4	H / 1.0	Z	46.3	-11.5	34.8	55.0	500
1735.0	V / 1.0	X	42.0	-11.5	30.5	33.5	1100
	V / 1.0	Y	46.5	-11.5	35	56.2	
	V / 1.0	Z	44.0	-11.5	32.5	42.2	
	H / 1.0	X	44.9	-11.5	33.4	46.8	
	H / 1.0	Y	45.2	-11.5	33.7	48.4	
1735.0	H / 1.0	Z	42.1	-11.5	30.6	33.9	1100
2168.0	V / 1.0	X	37.2 *	-11.5	25.7	19.3	1100
	V / 1.0	Y	37.2 *	-11.5	25.7	19.3	
	H / 1.0	Z	37.2 *	-11.5	25.7	19.3	
	H / 1.0	X	37.2 *	-11.5	25.7	19.3	
	H / 1.0	Y	37.2 *	-11.5	25.7	19.3	
2168.0	V / 1.0	Z	37.2 *	-11.5	25.7	19.3	1100
	The frequency range was scanned from 30 MHz to 4.4GHz. All emissions not recorded were more						
	Than 20 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, Fundamental & Harmonic Emissions						
Customer:	X-10 (USA), Inc.				Job No.	R-11570-1	
Test Sample:	433 MHz Pulsed Transmitter				Paragraph:	15.231	
Model No.:	VR46A				FCC ID:	B4SVR46A	
Operating Mode:	Continuously transmitting a 433 MHz signal						
Technician:	D. Lerner				Date:	August 12, 2006.	
Notes:	Test Distance: 3 Meters				Duty Cycle: 26.7%		
	Detector: Peak, unless otherwise specified				Duty Cycle Correction: -11.3dB		
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
2602.8	V / 1.0	X	38.3 *	-11.5	26.8	21.9	1100
	V / 1.0	Y	38.3 *	-11.5	26.8	21.9	
	V / 1.0	Z	38.3 *	-11.5	26.8	21.9	
	H / 1.5	X	38.3 *	-11.5	26.8	21.9	
	H / 1.0	Y	38.3 *	-11.5	26.8	21.9	
2602.8	H / 1.0	Z	38.3 *	-11.5	26.8	21.9	1100
3036.6	V / 1.0	X	39.5 *	-11.5	28.0	25.1	1100
	V / 1.5	Y	39.5 *	-11.5	28.0	25.1	
	V / 1.0	Z	39.5 *	-11.5	28.0	25.1	
	H / 1.5	X	39.5 *	-11.5	28.0	25.1	
	H / 1.0	Y	39.5 *	-11.5	28.0	25.1	
3036.6	H / 1.5	Z	39.5 *	-11.5	28.0	25.1	1100
3470.4	V / 1.0	X	39.3 *	-11.5	27.8	24.5	1100
	V / 1.0	Y	39.3 *	-11.5	27.8	24.5	
	V / 1.0	Z	39.3 *	-11.5	27.8	24.5	
	H / 1.0	X	39.3 *	-11.5	27.8	24.5	
	H / 1.0	Y	39.3 *	-11.5	27.8	24.5	
3470.4	H / 1.0	Z	39.3 *	-11.5	27.8	24.5	1100
3904.2	V / 1.0	X	40.7 *	-11.5	29.2	28.8	500
	V / 1.0	Y	40.7 *	-11.5	29.2	28.8	
	V / 1.0	Z	40.7 *	-11.5	29.2	28.8	
	H / 1.0	X	40.7 *	-11.5	29.2	28.8	
	H / 1.0	Y	40.7 *	-11.5	29.2	28.8	
3904.2	H / 1.0	Z	40.7 *	-11.5	29.2	28.8	500
4338.0	V / 1.0	X	42.4 *	-11.5	30.9	35.1	500
	V / 1.0	Y	42.4 *	-11.5	30.9	35.1	
	H / 1.0	Z	42.4 *	-11.5	30.9	35.1	
	H / 1.0	X	42.4 *	-11.5	30.9	35.1	
	H / 1.0	Y	42.4 *	-11.5	30.9	35.1	
4338.0	V / 1.0	Z	42.4 *	-11.5	30.9	35.1	500
	The frequency range was scanned from 30 MHz to 4.4 GHz. All emissions not recorded were more						
	Than 20 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, Spurious Case Radiated Emissions, Paragraph 15.209(a)						
Customer:	X-10 (USA) Inc.				Job No.	R-11570-1	
Test Sample:	433 MHz Pulsed Transmitter				FCC ID:	BS4VR46A	
Model No.:	VR46A						
Operating Mode:	Continuously transmitting a 433 MHz signal						
Technician:	D. Lerner				Date:	August 12, 2006	
Notes:	Test Distance: 3 Meters Temp: 26°C Humidity: 44% Detector: Quasi-Peak from 30 MHz to 1 GHz, Peak above 1 GHz						
Frequency	Antenna Position	EUT Orientation	Meter Readings	Correction Factor	Corrected Reading	Converted Reading	LIMIT
MHz	(V/H) / Meters	Degrees	dBuV	dB	dBuV/m	uV/m	uV/m
30							100
88							100
88							150
	No Emissions Observed at specified test distance						
216							150
216							200
960							200
960							500
4338							500
The frequency range was scanned from 30 MHz to 4.338 GHz.							
The emissions observed from the EUT do not exceed the specified limits.							
Emissions not recorded were more than 20dB under the specified limit.							

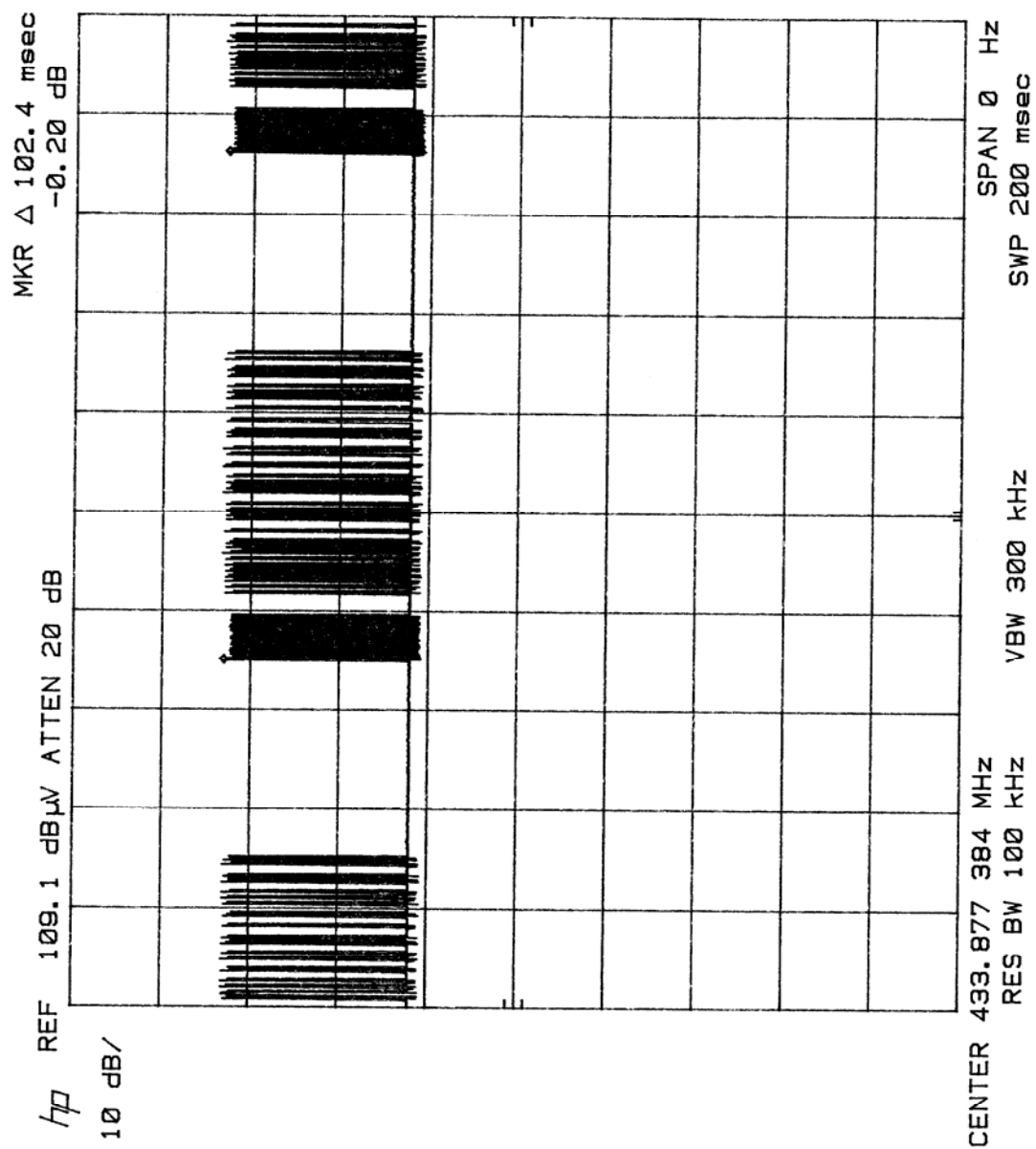
FCC Part 15 Subpart C Occupied Bandwidth
Test Data



Test Method: FCC Part 15, Subpart C, 15.231(c), Occupied Bandwidth.

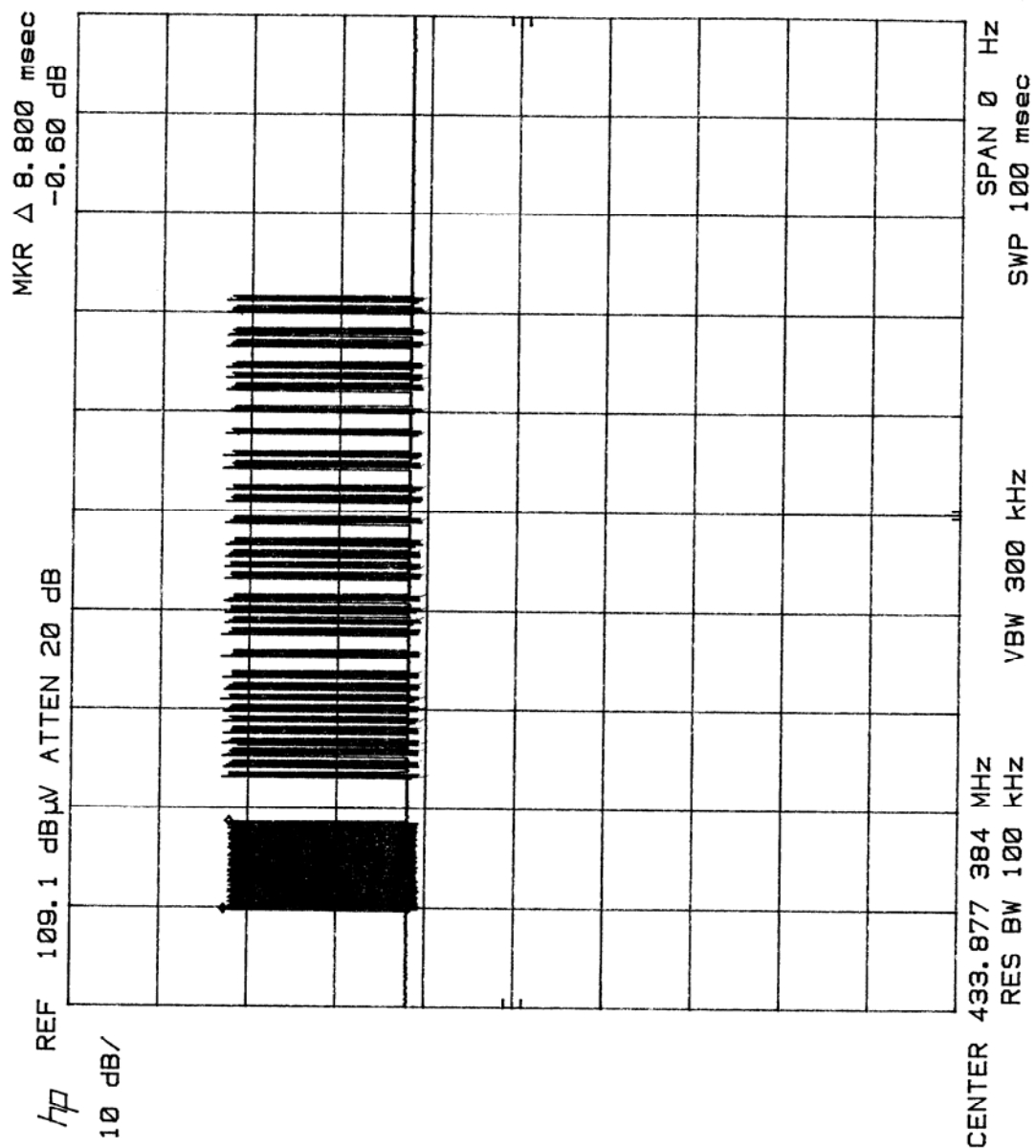
Notes: Bandwidth of 203 kHz does not exceed 0.25% of center frequency at the 20 dBc points (1045 kHz)

FCC Part 15 Subpart C Duty Cycle
Test Data



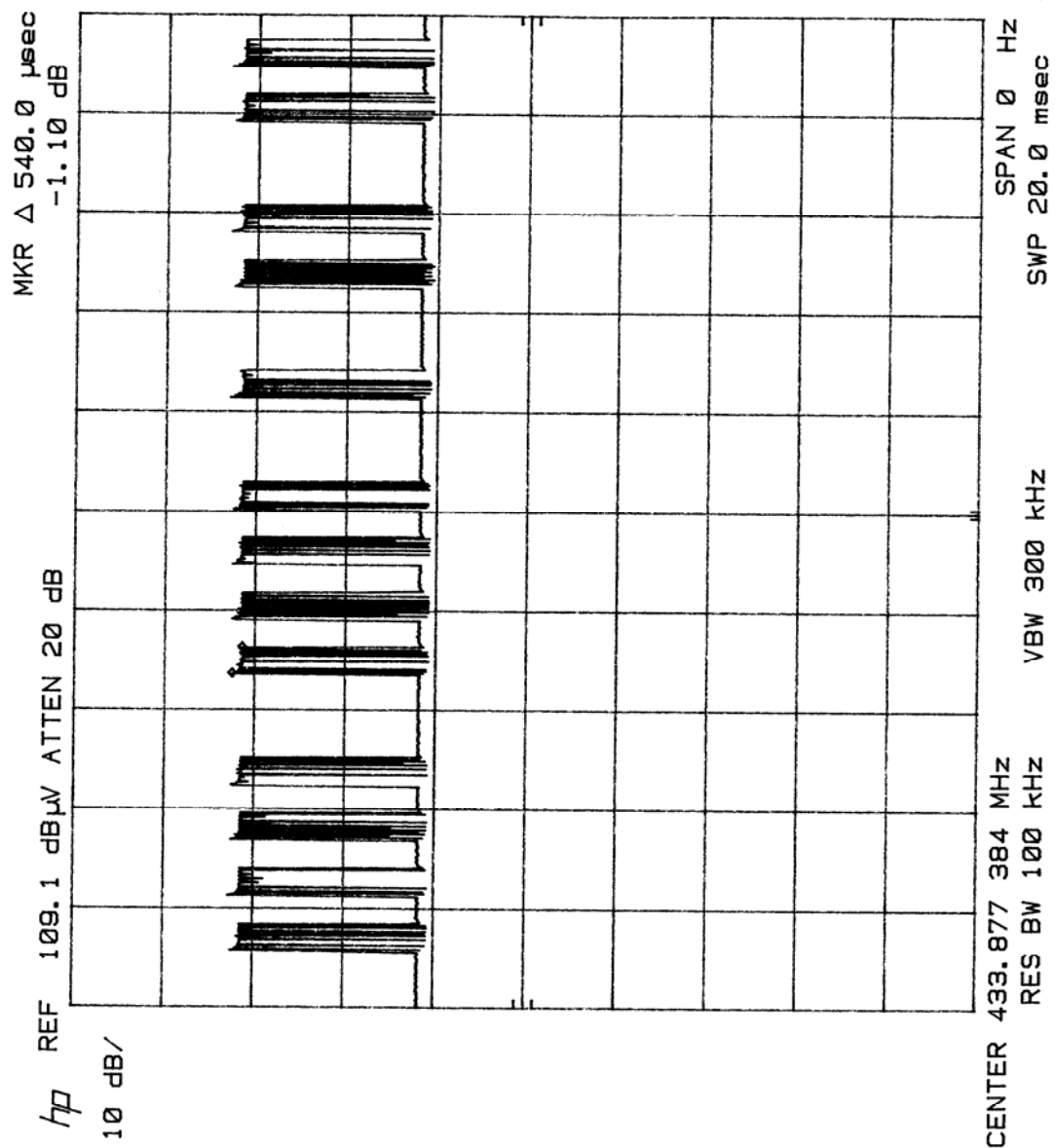
Test Method: FCC Part 15.35, Duty Cycle Determination.

Notes: Measurement of cycle time = 102.4 mSec.



Test Method: FCC Part 15.35, Duty Cycle Determination.

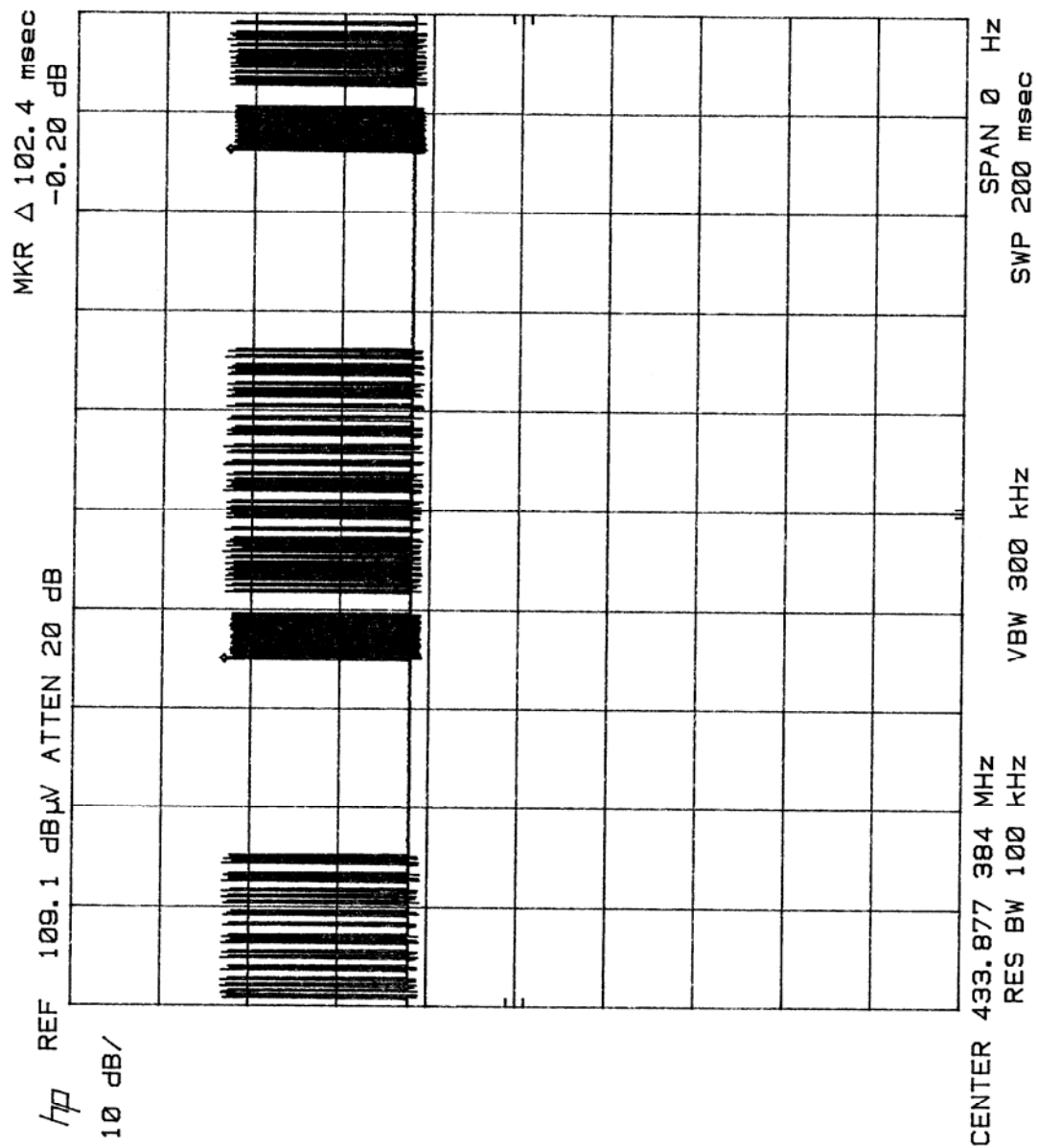
Notes: Measurement of 1 large pulse = 8.8 mSec.



Test Method: FCC Part 15.35, Duty Cycle Determination.

Notes: Measurement of 1 small pulse = 540μSec.

Measurements of 33 small pulses = 33(540μSec) = 17.82 mSec.



Test Method: FCC Part 15.35, Duty Cycle Determination.

Notes: Duty cycle = (1)(8.8mSec) + (33) (540μSec) = 26.62 mSec.

= 26.62 mSec / 100 mSec = 26.62 % = 0.26

= 20 log 0.262 = -11.5 dB