



www.nemko.com

Nemko Canada Inc., 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2

Report number: 147129-1TRFWL

Apparatus: Onyx Remote Control

Applicant: Freedom Scientific  
11800 31<sup>st</sup> Court N  
St. Petersburg, FL 33716  
United States

FCC ID: VC26760X

**Test specification:**

Title 47 - Telecommunication  
Chapter I - Federal Communications Commission  
Subchapter A - General  
Part 15 - Radio Frequency Devices  
Subpart C - Intentional Radiators

- **§15.231- Periodic operation in the band 40.66–40.70 MHz and above 70 MHz**

Reviewed by: \_\_\_\_\_  
Signature  
Andrey Adelberg, Senior Wireless/EMC Specialist

April 14, 2010  
Date

Tested by: Kevin Ma, Wireless/EMC Specialist

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

Nemko Canada Inc. accepts no responsibility for damages, if any suffered by any third party as a result of decisions made or actions based on this report.

**This report shall not be reproduced except in full without the written approval of the testing laboratory.**



Nemko Canada Inc., a testing laboratory, is accredited by the Standards Council of Canada.  
The tests included in this report are within the scope of this accreditation.

## Table of contents

<b>Section 1: Report summary .....</b>	<b>3</b>
<b>Section 2: Equipment under test .....</b>	<b>4</b>
2.1 Identification of equipment under test (EUT) .....	4
2.2 Accessories and support equipment .....	4
2.3 EUT description .....	4
2.4 Technical specifications of the EUT .....	4
2.5 EUT setup diagram .....	5
2.6 Operation of the EUT during testing .....	5
2.7 Modifications incorporated in the EUT .....	5
<b>Section 3: Test conditions .....</b>	<b>6</b>
3.1 Deviations from laboratory tests procedures .....	6
3.2 Test conditions, power source and ambient temperatures .....	6
3.3 Measurement uncertainty .....	7
3.4 Test equipment .....	7
<b>Section 4: Result summary .....</b>	<b>8</b>
4.1 FCC Part 15 Subpart C, 15.231: Test results .....	8
<b>Appendix A: Test results .....</b>	<b>9</b>
Clause 15.31(e) Variation of the power source .....	9
Clause 15.203 Antenna requirement .....	10
Clause 15.231(a) Conditions for intentional radiators to comply with periodic operation .....	11
Clause 15.231(b) Field strength of emissions .....	14
Clause 15.231(c) Emission bandwidth .....	17
<b>Appendix B: Block diagrams of test set-ups .....</b>	<b>19</b>

 Nemko Canada Inc., 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2	Section 1: Report summary
	Report Number: 147129-1TRFWL
	Specification: FCC 15.231

## Section 1: Report summary

This report contains an assessment of apparatus against specifications based upon tests carried out on samples submitted at Nemko Canada Inc.

### Test specification:

FCC Part 15 Subpart C, 15.231

Periodic operation in the band 40.66–40.70 MHz and above 70 MHz.

Compliance status:	Complies
Exclusions:	None
Non-compliances:	None
Report release history:	Original release
Test location:	Nemko Canada Inc. 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2
Registration number:	176392 (3 m Semi anechoic chamber)

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



Nemko Canada Inc.,  
303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2

Section 2: Equipment under test

Report Number: 147129-1TRFWL

Specification: FCC 15.231

## Section 2: Equipment under test

### 2.1 Identification of equipment under test (EUT)

The following information identifies the EUT under test:

Type of equipment:	Remote control
Product marketing name:	Onyx Remote Control
Model number:	Onyx Remote
Serial number:	N/A
Nemko sample number:	1, 2 & 3
FCC ID:	VC2676OX
Date of receipt:	April 1, 2010

### 2.2 Accessories and support equipment

No accessories or support equipment was used during the test.

### 2.3 EUT description

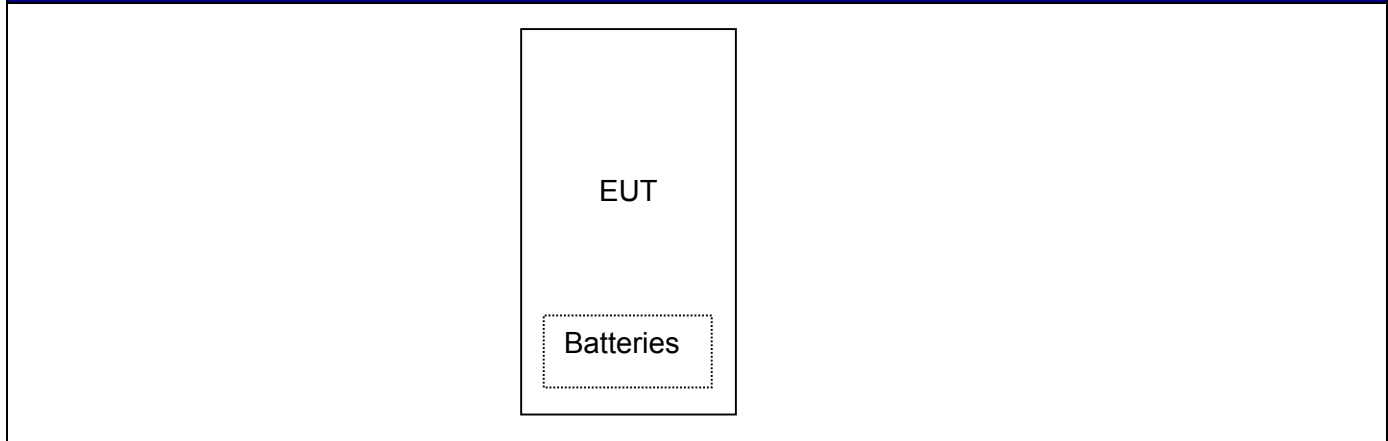
EUT is a RF remote controller that is part of the portable video magnifier system. The EUT operates at 433.2–434.5 MHz with 15 channels; the highest channel is used for "pairing". After pairing, the EUT assigns one of the lower 14 channels for use.

### 2.4 Technical specifications of the EUT

Operating frequency:	433.2–434.5 MHz
Modulation type:	FSK
Occupied bandwidth:	161.8 kHz
Emission designator:	F1D
Antenna type:	Integral Permanent fixed antenna, which may be built-in, (Equipment does not have an external 50 $\Omega$ RF connector)
Power source	2 × "AAA" type (3 VDC ) batteries powered

Section 2: Equipment under test, continued

2.5 EUT setup diagram



2.6 Operation of the EUT during testing

The EUT was set to transmit constantly when keep holding the operation button.

2.7 Modifications incorporated in the EUT

None.

 Nemko Canada Inc., 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2	Section 3: Test conditions
	Report Number: 147129-1TRFWL
	Specification: FCC 15.231

## Section 3: Test conditions

### 3.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

### 3.2 Test conditions, power source and ambient temperatures

Normal temperature, humidity and air pressure test conditions	Temperature: 15–30 °C Relative humidity: 20–75 % Air pressure: 86–106 kPa  When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.
Power supply range:	The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$ , for which the equipment was designed.



Nemko Canada Inc.,  
303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2

Section 3: Test conditions

Report Number: 147129-1TRFWL

Specification: FCC 15.231

Section 3: Test conditions, continued

### 3.3 Measurement uncertainty

Nemko Canada measurement uncertainty has been calculated using guidance of UKAS LAB 34:2003 and TIA-603-B Nov 7, 2002. All calculations have been performed to provide a confidence level of 95 % and can be found in Nemko Canada document MU-003.

### 3.4 Test equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
3 m EMI Test Chamber	TDK	SAC-3	FA002047	May 06/10
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR
Bilog	Sunol	JB3	FA002108	Jan. 18/11
Controller	Sunol	SC104V	FA002060	NCR
Mast	Sunol	TLT2	FA002061	NCR
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 26	FA002043	Dec. 16/10
International Power Supply	California Inst.	3001i	FA001021	Jan. 13/11
Spectrum Analyzer	Rohde & Schwarz	FSU46	FA001877	Sep. 29/10
Horn Antenna #2	EMCO	3115	FA000825	Jan. 21/11
1 – 18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 07/10
Attenuator	Narda	776B-20	FA001153	COU

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use

## Section 4: Result summary

### 4.1 FCC Part 15 Subpart C, 15.231: Test results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N	No : not applicable / not relevant.
Y	Yes : Mandatory i.e. the apparatus shall conform to these tests.
N/T	Not Tested, mandatory but not assessed. (See report summary)

Part	Test description	Required	Result
<b>General requirements for FCC Part 15</b>			
§15.31(e)	Variation of power source	Y	PASS
§15.203	Antenna requirement	Y	PASS
§15.207(a)	Conducted limits	N	
<b>Specific requirements for FCC Part 15 Subpart C, 15.231</b>			
§15.231(a)	Conditions for intentional radiators to comply with periodic operation	---	---
§15.231(a)(1)	Manually operated transmitter	Y	PASS
§15.231(a)(2)	Automatically activated transmitter	N	
§15.231(a)(3)	Periodic transmissions at regular predetermined intervals	N	
§15.231(a)(4)	Radiators used in cases of emergency	N	
§15.231(a)(5)	Set-up information transmission for security systems	N	
§15.231(b)	Field strength of emissions	Y	PASS
§15.231(c)	Emission bandwidth	Y	PASS
§15.231(d)	Requirements for devices operating within 40.66–40.70 MHz band	N	
§15.231(e)	Field strength of emissions for periodic radiators	N	

Notes: None



 Nemko Canada Inc., 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2	Appendix A: Test results
	Report Number: 147129-1TRFWL
	Specification: FCC 15.231

## Appendix A: Test results

### Clause 15.31(e) Variation of the power source

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. For battery-operated equipment, the equipment tests shall be performed using a new battery.

Test date: April 5, 2010

Test results: Pass

#### Test data

- All tests were performed with new batteries.

 Nemko Canada Inc., 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2	Appendix A: Test results
	Report Number: 147129-1TRFWL
	Specification: FCC 15.231

## Clause 15.203 Antenna requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Test date: April 5, 2010

Test results: Pass

### Test data

- The EUT uses a non-detachable antenna to the intentional radiator.

## Clause 15.231(a) Conditions for intentional radiators to comply with periodic operation

The provisions of this section are restricted to periodic operation within the band 40.66–40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition
- (5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

Test date: April 6, 2010

Test results: Pass

### Special notes

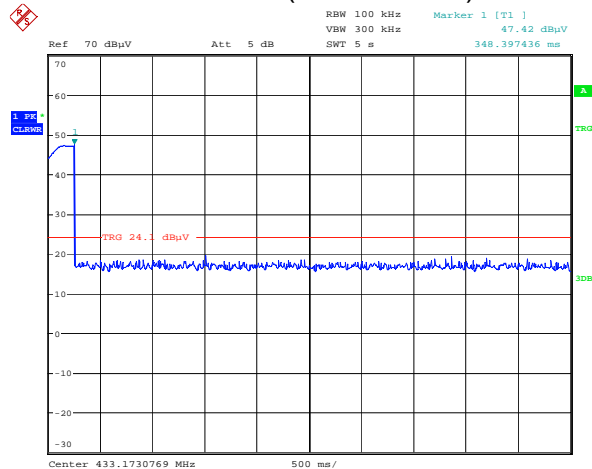
None

## Clause 15.231(a) Conditions for intentional radiators to comply with periodic operation, continued

### Test data

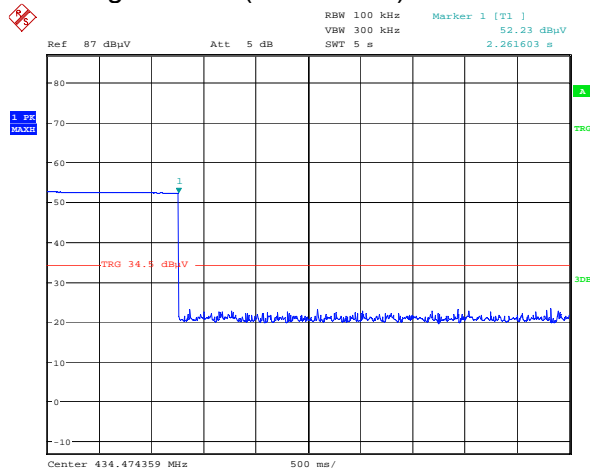
(1) The EUT is manually triggered.

#### Normal channels (channel 0-13)



Date: 5.APR.2010 08:46:14

#### Pairing channel (channel 14)



Date: 6.APR.2010 09:14:46

The maximum transmitting time is 2.26 s after being released.

Limit is 5 s.

 Nemko Canada Inc., 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2	Appendix A: Test results
	Report Number: 147129-1TRFWL
	Specification: FCC 15.231

## Clause 15.231(a) Conditions for intentional radiators to comply with periodic operation, continued

### Test data

- (2) The EUT is not activated automatically.
- (3) The EUT is not a periodic transmitter.
- (4) The EUT usage is not for radio control purposes during emergencies.
- (5) The EUT does not transmit set-up information for security systems.

## Clause 15.231(b) Field strength of emissions

In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental		Field strength of spurious emissions	
	( $\mu\text{V/m}$ )	(dB $\mu\text{V/m}$ )	( $\mu\text{V/m}$ )	(dB $\mu\text{V/m}$ )
40.66–40.70	2,250	67	225	47
70–130	1,250	61.9	125	41.9
130–174	1,250 to 3,750*	61.9 to 71.5*	125 to 375*	41.9 to 51.5*
174–260	3,750	71.5	375	51.5
260–470	3,750 to 12,500*	71.5 to 81.9*	375 to 1,250*	51.5 to 61.9*
Above 470	12,500	81.9	1,250	61.9

– \*Linear interpolations.  
– The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

The field strength of emissions appearing within restricted bands (as specified in §15.205) shall not exceed the limits from §15.209:

Frequency (MHz)	Field strength		Measurement distance (m)
	( $\mu\text{V/m}$ )	(dB $\mu\text{V/m}$ )	
0.009–0.490	2400/F	67.6–20log(F)	300
0.490–1.705	24000/F	87.6–20log(F)	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes:

- F = fundamental frequency in kHz
- In the emission table above, the tighter limit applies at the band edges.
- For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test.

Test date: April 6, 2010

Test results: Pass

## Clause 15.231(b) Field strength of emissions, continued

### Special notes

- The spectrum was searched from 30 MHz to the 10<sup>th</sup> harmonic.
- The EUT was measured on three orthogonal axis.
- All measurements were performed at a distance of 3 m.
- All measurements were performed:
  - within 30–1000 MHz range: using a quasi-peak detector with 120 kHz/300 kHz RBW/VBW,
  - above 1 GHz: using peak detector with 1 MHz/3 MHz RBW/VBW for peak results
    - and using peak detector with 1 MHz/10 Hz RBW/VBW for average results
- Only the worst data presented in the test report.
- Fresh battery was used throughout the test.

### § 15.205 Restricted bands of operation.

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

## Clause 15.231(b) Field strength of emissions, continued

### Test data, continued

#### Fundamental:

Freq. (MHz)	Pol.	Peak field strength (dB $\mu$ V/m)	Peak limit (dB $\mu$ V/m)	Peak margin (dB)	Avg field strength (dB $\mu$ V/m)	Avg limit (dB $\mu$ V/m)	Avg margin (dB)
433.20	H	73.66	100.80	27.14	73.33	80.80	7.47
	V	64.84	100.80	35.96	63.88	80.80	16.92
434.30	H	74.69	100.84	26.15	74.35	80.84	6.49
	V	66.26	100.84	34.58	66.08	80.84	14.76
434.50	H	72.90	100.84	27.94	71.99	80.84	8.85
	V	64.32	100.84	36.52	63.71	80.84	17.13

Notes: using peak detector with 100 kHz/300 kHz RBW/VBW for peak results, and using peak detector with 100 kHz/10 Hz RBW/VBW for average results

#### Harmonics:

Channel	Freq. (MHz)	Pol.	Peak field strength (dB $\mu$ V/m)	Peak limit (dB $\mu$ V/m)	Peak margin (dB)	Avg field strength (dB $\mu$ V/m)	Avg limit (dB $\mu$ V/m)	Avg margin (dB)
Low	1732.85	H	42.90	80.80	37.90	34.33	60.80	26.47
	2166.01	H	44.28	80.80	36.52	35.44	60.80	25.36
Mid	1737.50	H	43.25	80.84	37.59	35.01	60.84	25.83
	2172.00	H	41.08	80.84	39.76	32.48	60.84	28.04
High	1738.00	H	40.85	80.84	39.99	32.16	60.84	28.68
	2172.50	H	45.10	80.84	35.74	36.77	60.84	24.07

Notes: using peak detector with 1 MHz/3 MHz RBW/VBW for peak results, and using peak detector with 1 MHz/10 Hz RBW/VBW for average results.

Low channel – 433.2 MHz, mid channel – 434.3 MHz, high channel – 434.5 MHz

No emissions in the restricted bands within 20 dB below limit were found.



 Nemko Canada Inc., 303 River Road, R.R. 5, Ottawa, Ontario, Canada, K1V 1H2	Appendix A: Test results
	Report Number: 147129-1TRFWL
	Specification: FCC 15.231

## Clause 15.231(c) Emission bandwidth

The bandwidth of the emission shall be no wider than 0.25 % of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5 % of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test date: April 5, 2010

Test results: Pass

### Special notes

- The test was performed using peak detector of the spectrum analyzer with RBW no narrower than 1 % of the emission bandwidth.



## Appendix B: Block diagrams of test set-ups

### Radiated emissions set-up

