

Nemko Test Report: 116932-1TRFWL

Applicant: Digital Security Control, a Division of Tyco Safety
Products Canada Ltd.
3301 Langstaff Road
Concord, Ontario
L4K 4L2

Apparatus: Wireless Keypad (M/N: WT5500-433/WT5500P-433)

FCC ID: F5309WT5500

In Accordance With: FCC Part 15 Subpart C, 15.231
Periodic operation in the band 40.66-40.70MHz and
above 70 MHz.

Authorized By:

A handwritten signature in blue ink, appearing to read 'Andrey Adelberg', is written over a faint, large 'NEMKO' watermark.

Andrey Adelberg, EMC/Wireless Specialist

Date: December 15, 2008

Total Number of Pages: 21

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Section 1 : Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003.

The assessment summary is as follows:

Apparatus Assessed:	Wireless Keypad (M/N: WT5500-433/WT5500P-433)
Specification:	FCC Part 15 Subpart C, 15.231
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release
Test Location:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Registration Number:	176392 (3m Semi-Anechoic Chamber)
Tests Performed By:	Jason Nixon, Wireless/Telecom Specialist
Test Dates:	December 8 to 10, 2008

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.

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Section 2 : Equipment Under Test

2.1 Identification of Equipment Under Test (EUT)

The following information identifies the EUT under test:

Type of Equipment:	Wireless Keypad
Brand Name:	DSC
Model Name or Number:	WT5500-433
Serial Number:	Test06, Constant carrier
Nemko Sample Number:	1, 4
FCC ID:	F5309WT5500
Date of Receipt:	December 4, 2008

2.2 Accessories

The following information identifies accessories used to exercise the EUT during testing:

Description:	Power adapter
Brand Name:	Sino-American
Model Name or Number:	SA103A-0506-6
Serial Number:	None
Nemko Sample Number:	3
Connection Port:	DC power input
Cable Length and Type:	2m, two conductor

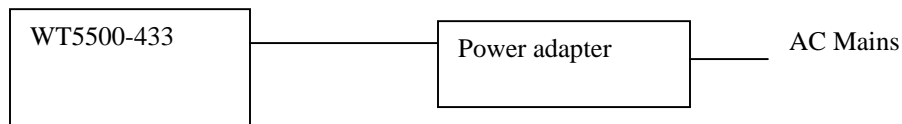
2.3 EUT Description

The EUT is a wireless keypad for use in an alarm system. The WT5500-433 and the WT5500P-433 only differ in that the WT5500P-433 has an additional proximity tag feature.

2.4 Technical Specifications of the EUT

Operating Frequency:	433.92MHz
Modulation:	On-Off keying – Manchester coding
Occupied Bandwidth:	69kHz
Emission Designator:	K1D
Antenna Data:	Integral
Power Supply Requirements:	120VAC 60Hz

2.5 EUT Setup diagram



2.6 Operation of the EUT during testing

Pressing any of the keys on the keypad operated the EUT. A modified sample, which transmitted a CW signal, was provided for radiated emissions measurements.

2.7 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

Section 3 : Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.231

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

3.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 °C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

3.4 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.

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Cal. Date	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSP40	FA001920	April 14/08	April 14/09
3m EMI Test Chamber	TDK	SAC-3	FA002047	May 06/08	May 06/09
Bilog	Sunol	JB3	FA002108	Jan. 21/08	Jan. 21/09
Flush Mount Turntable	Sunol	FM2022	FA002082	NCR	NCR
Controller	Sunol	SC104V	FA002060	NCR	NCR
Mast	Sunol	TLT2	FA002061	NCR	NCR
LISN	Rohde & Schwarz	ENV216	FA002023	Sept. 02/08	Sept. 02/09
Receiver/Spectrum Analyzer	Rohde & Schwarz	ESU 40	FA002071	Nov. 25/08	Nov. 25/09
50 Coax cable	HUBER + SUHNER	None	FA002015	Aug. 05/08	Aug. 05/09
50 Coax cable	HUBER + SUHNER	None	FA002022	July 07/08	July 07/09
50 Coax cable	HUBER + SUHNER	None	FA002074	July 07/08	July 07/09
Horn Antenna #2	EMCO	3115	FA000825	Jan. 15/08	Jan. 15/09
1 – 18 GHz Amplifier	JCA	JCA118-503	FA002091	Oct 2/08	Oct 2/09

COU – Calibrate on Use

NCR – No Calibration Required

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart C : 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)

4.1 FCC Part 15 Subpart C : Test Results

Part 15	Test Description	Required	Result
15.31(e)	Variation of Power source	Y	PASS
15.207(a)	Powerline Conducted Emissions	Y	PASS
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
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 for security systems	N	
15.231(b)	Radiated Emissions	Y	PASS
15.231(c)	20dB Bandwidth	Y	PASS
15.231(d)	Devices operating within the frequency band 40.66-40.70 MHz	N	
15.231(e)	Radiated emissions for Periodic radiators	N	

Notes:



Appendix A : Test Results

Clause 15.207(a) Powerline Conducted Emissions

Frequency of Conducted limit (dB μ V)		
Emission (MHz)	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

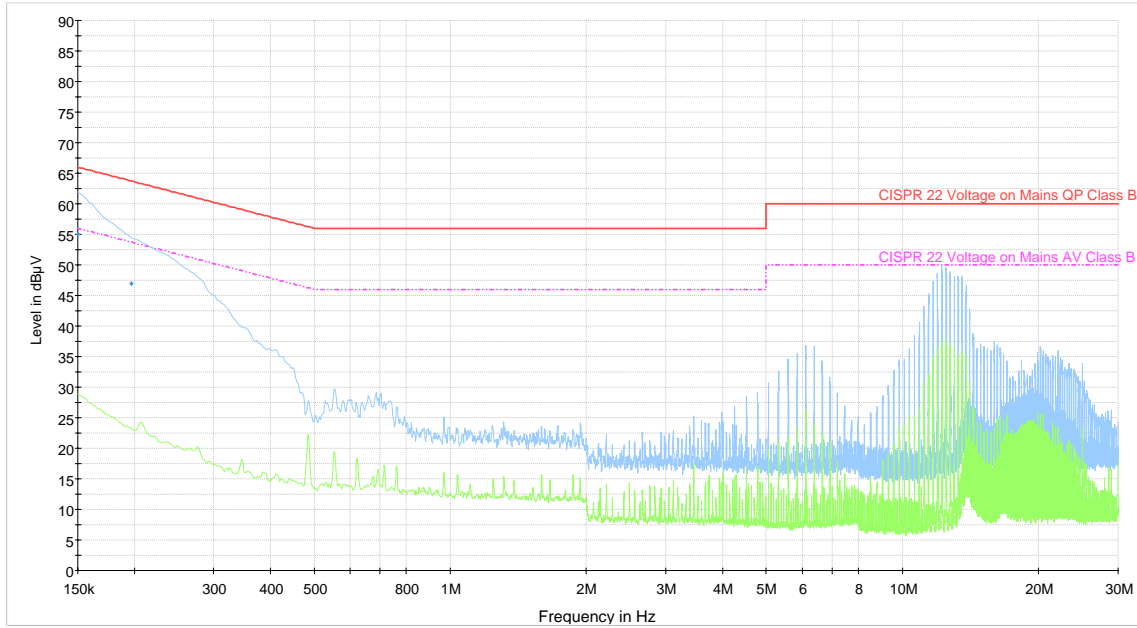
* Decreases with the logarithm of the frequency.

Test Results: Pass

Additional Observations:

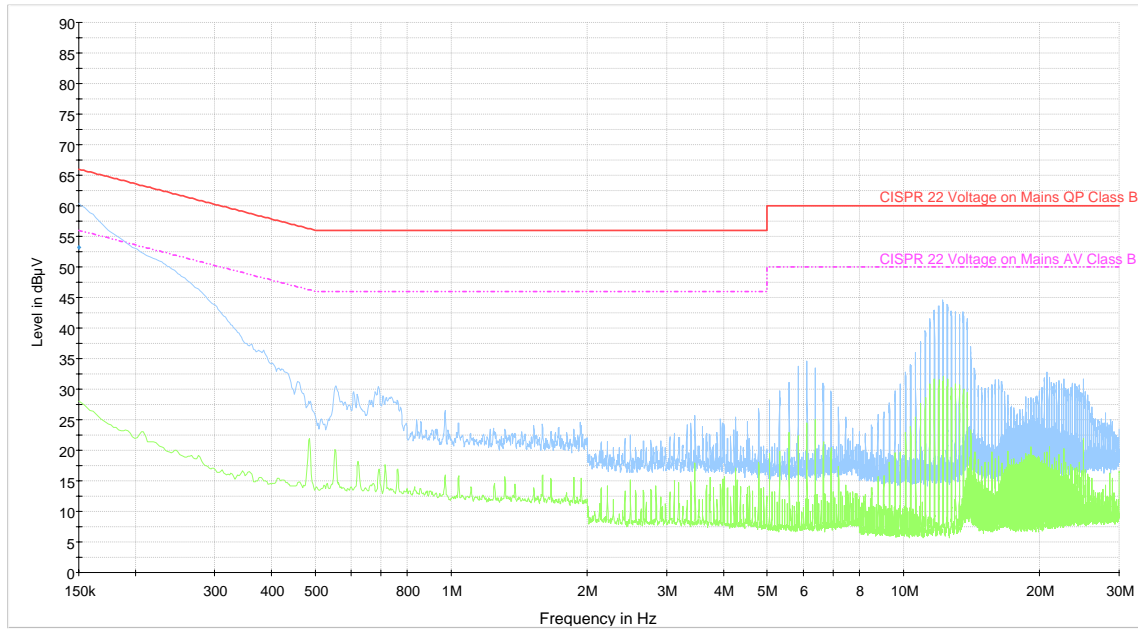
All plots were obtained using a sweeping receiver with an IF of 9kHz using a Peak and Average detector. The plots have been corrected with the cable loss and LISN loss to show compliance.

Phase



120VAC/60Hz, Phase (PC9155D-433)
 — CISPR 22 QP Class B Limit - - - CISPR 22 AV Class B Limit — Preview Peak Detector — Preview Average Detector • Final Q-Peak Detector

Neutral



120VAC/60Hz, Neutral (PC9155D-433)
 — CISPR 22 QP Class B Limit - - - CISPR 22 AV Class B Limit — Preview Peak Detector — Preview Average Detector • Final Q-Peak Detector



Clause 15.209(a) Radiated Emissions within Restricted Bands

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvoltsmeter) (kHz)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Results: Pass

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

These results apply to emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205.

All measurements were performed using a Peak Detector with 100kHz RBW/VBW below 1GHz and a 1MHz RBW/VBW above 1GHz at a distance of 3 meters.

Peak Detector

Freq. (MHz)	Pol. V/H	RCVD Signal (dBμV)	Ant. Factor (dB)	Cable Loss (dB)	Amp. gain (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)
1301.76	V	63.69	24.8	3.2	46.3	45.39	74	28.61
1301.76	H	61.04	25	3.2	46.3	42.94	74	31.06
3905.28	V	57.76	32.3	5.9	45.9	50.06	74	23.94
3905.28	H	57.89	32.5	5.9	45.9	50.39	74	23.61
Level (peak) = RCVD + Ant factor + Cable loss – Amp Gain								

Average Detector

Freq. (MHz)	Pol. V/H	Peak Level (dBμV)	Duty Cycle Corr. (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)
1301.76	V	45.39	18	27.29	54	26.71
1301.76	H	42.94	18	24.84	54	29.16
3905.28	V	50.06	18	31.96	54	22.04
3905.28	H	50.39	18	32.29	54	21.71
Level (Avg) = Level (Peak) –duty cycle corr						

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

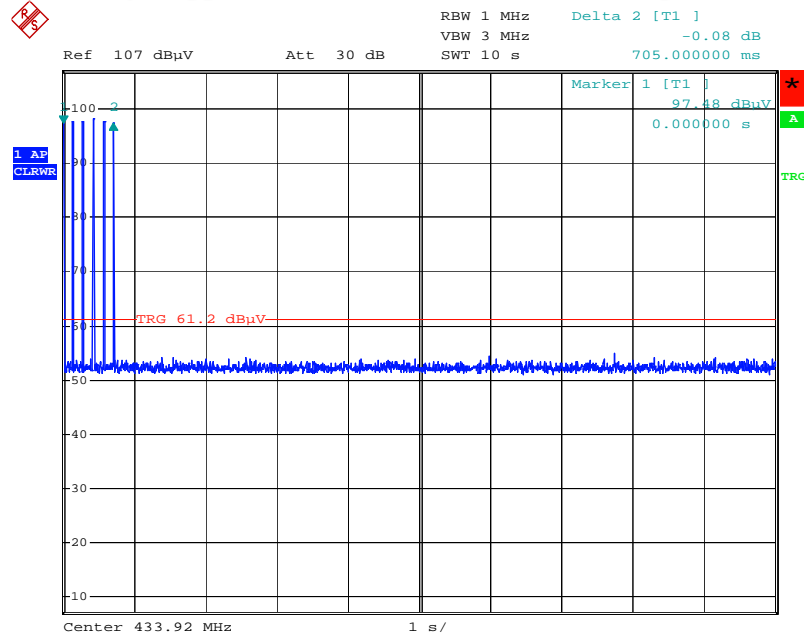
The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote 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 Results: Pass

- (1) The EUT is manually trigger and ceases transmission within 0.705sec. See attached plot.
- (2) The EUT is not automatically triggered.
- (3) The EUT is not a periodic transmitter.
- (4) The EUT is used as port of a security system, but complies with the requirements of 1.
- (5) The EUT does not have an installer command.

Manually trigger transmission – not acknowledged



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Clause 15.231(b) Radiated 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 (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750	125 to 375
174-260	3,750	375
260-470	3,750 to 12,500	375 to 1,250
Above 470	12,500	1,250

Test Results: Pass

Additional Observations:

The Spectrum was searched from 30MHz to the 10th Harmonic.

The input power was varied +/-15% and there was no change in output field strength observed.

All measurements were performed using a Peak Detector with 100kHz RBW/VBW below 1GHz and a 1MHz RBW/VBW above 1GHz at a distance of 3 meters.

Peak Detector

Freq. (MHz)	Pol. V/H	RCVD Signal (dBμV)	Ant. Factor (dB)	Cable Loss (dB)	Amp. gain (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)
433.92	V	78.63	16.4	1.8	0.0	96.83	100.8	3.97
433.92	H	77.60	16.9	1.8	0.0	96.30	100.8	4.50
867.84	V	25.77	21.7	2.6	0.0	50.07	80.8	30.73
867.84	H	23.08	22.3	2.6	0.0	47.98	80.8	32.82
1735.68	V	67.68	26.2	3.8	46.4	51.28	80.8	29.52
1735.68	H	70.02	26.2	3.8	46.4	53.62	80.8	27.18
2169.6	V	74.45	27.6	4.2	46.1	60.15	80.8	20.65
2169.6	H	77.05	27.8	4.2	46.1	62.95	80.8	17.85
2603.52	V	64.49	28.5	4.7	45.7	51.99	80.8	28.81
2603.52	H	66.81	28.9	4.7	45.7	54.71	80.8	26.09
3037.44	V	58.54	29.9	5	45.8	47.64	80.8	33.16
3037.44	H	59.25	30	5	45.8	48.45	80.8	32.35

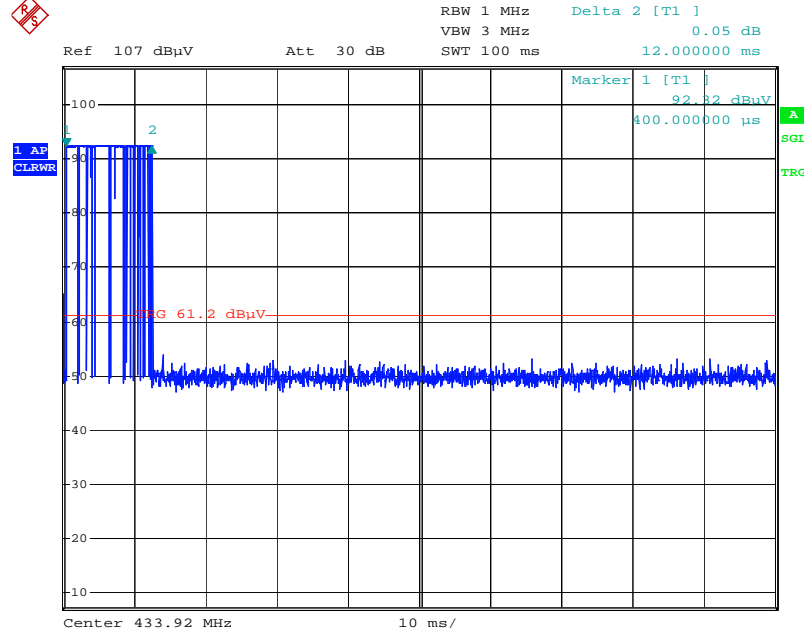
Level (peak) = RCVD + Ant factor + Cable loss – Amp Gain

Average Detector

Freq. (MHz)	Pol. V/H	Peak Level (dBμV)	Duty Cycle Corr. (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)
433.92	V	96.68	18.1	78.73	80.8	2.07
433.92	H	95.26	18.1	78.20	80.8	2.60
867.84	V	59.06	18.1	31.97	60.8	28.83
867.84	H	61.64	18.1	29.88	60.8	30.92
1735.68	V	51.28	18.1	33.18	60.8	27.62
1735.68	H	53.62	18.1	35.52	60.8	25.28
2169.6	V	60.15	18.1	42.05	60.8	18.75
2169.6	H	62.95	18.1	44.85	60.8	15.95
2603.52	V	51.99	18.1	33.89	60.8	26.91
2603.52	H	54.71	18.1	36.61	60.8	24.19
3037.44	V	47.64	18.1	29.54	60.8	31.26
3037.44	H	48.45	18.1	30.35	60.8	30.45

Level (Avg) = Level (Peak) –duty cycle corr

Duty Cycle:
Example packet



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Worst-case transmission time 24.8msec using 50% Manchester coding

Duty cycle = $20\log((24.8/2)/100) = -18.1\text{dB}$



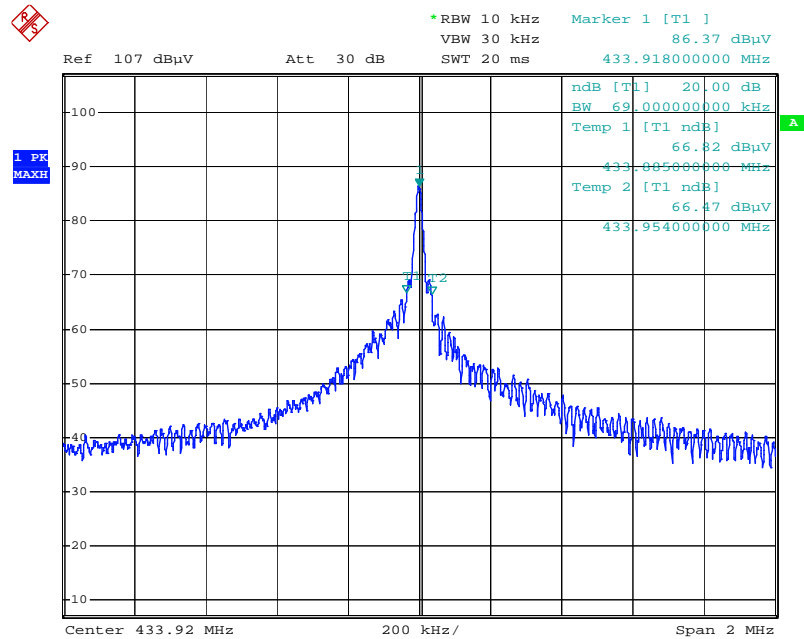
Nemko Canada Inc.

Clause 15.231(c) 20dB 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 Results: Pass

20dB Bandwidth:



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Appendix B : Setup Photographs

Conducted Emissions Setup:

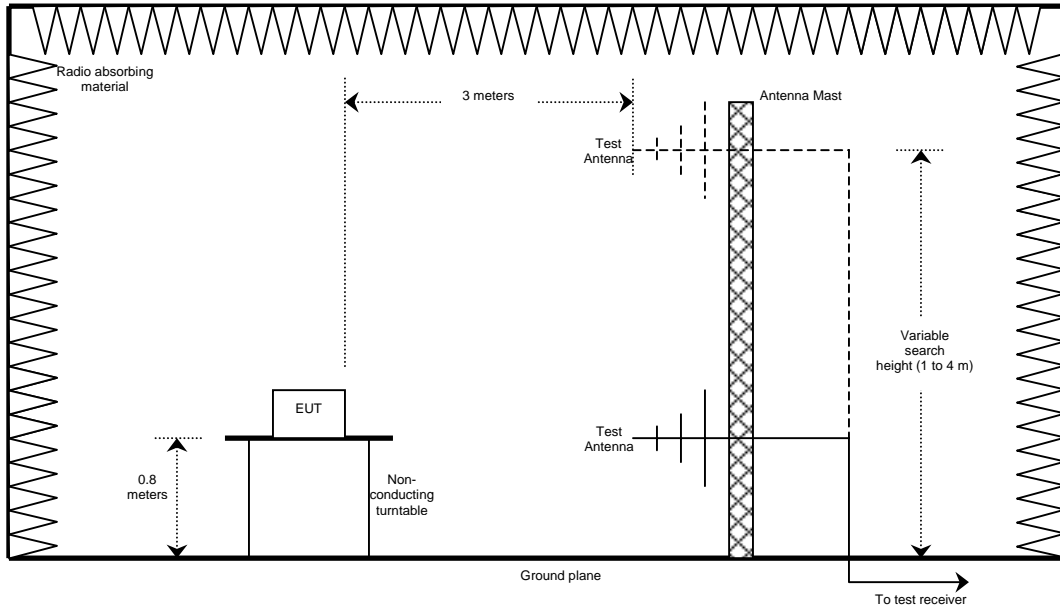


Spurious Emissions Setup:



Appendix C : Block Diagram of Test Setups

Radiated Emissions above 30MHz Test Site



Conducted Emissions Test Site

