Excellence in Compliance Testing

Certification Test Report

FCC ID: KJ8-0002386
IC: 3540A-0002386

FCC Rule Part: 15.231
IC Radio Standards Specification: RSS-210

ACS Report Number 08-0499-15_231

Manufacturer: **Wayne-Dalton Corporation**
Model(s): **4500-372**

Test Begin Date: December 1, 2008
Test End Date: December 9, 2008

Report Issue Date: March 25, 2009

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

Prepared by: Ken Rivers

Ken Rivers
Wireless Certifications Technician
ACS, Inc.

Reviewed by: _____

Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

This report contains 15 pages

Table of Contents

Additional Exhibits Included In Filing

Internal Photographs
External Photographs
Test Setup Photographs
Label Information
Manual
Theory of Operation
System Block Diagram
Schematics

1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210.

1.2 Product Description

1.2.1 General

The idrive™ TorqueMaster (OP45) model 4500-372 is a header-mounted dc-motor driven garage door operator. The idrive™ TorqueMaster (OP45) model 4500-372 contains a 433.92 MHz transmitter and 372 MHz receiver.

Manufacturer Information:
Wayne-Dalton Corporation
3395 Addison Drive
Pensacola Florida 32514
(850) 475-6030

Test Sample Serial Number(s):
ACS#2

Test Sample Condition:
The test samples were provided on working order with no visible defects.

Detailed photographs of the EUT are filed separately with this filing.

1.2.2 Intended Use

The idrive™ TorqueMaster (OP45) model 4500-372 is a header-mounted dc-motor driven garage door operator.

1.3 Test Methodology and Considerations

The 4500-372 was tested mounted to a wooden test fixture and positioned as typically installed.

2.0 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment. In addition, ACS is compliant to ISO 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. The following certification numbers have been issued in recognition of these accreditations and certifications:

FCC Registration Number: 894540
Industry Canada Lab Code: IC 4175
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

NVLAP Lab Code: 200612-0

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

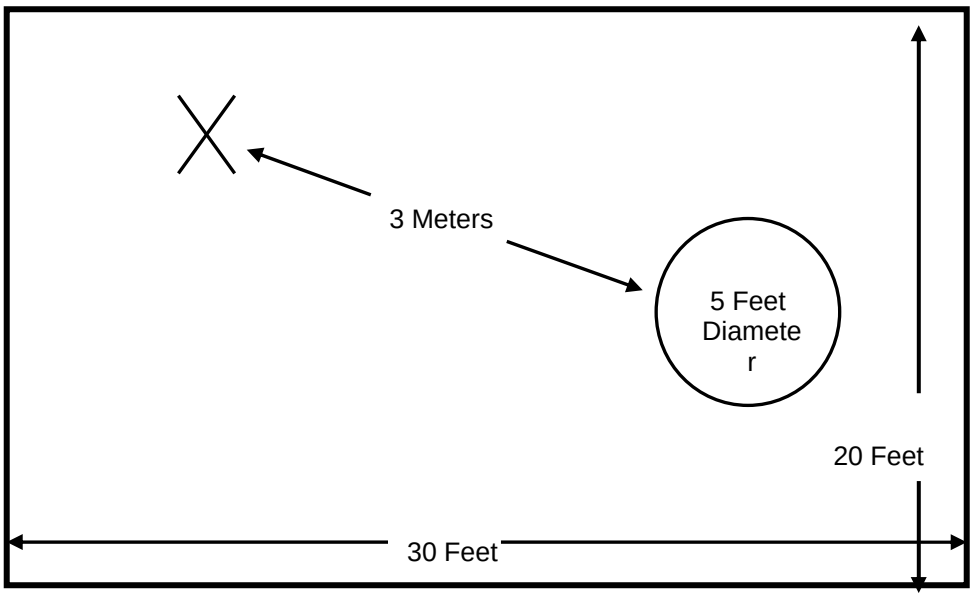

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

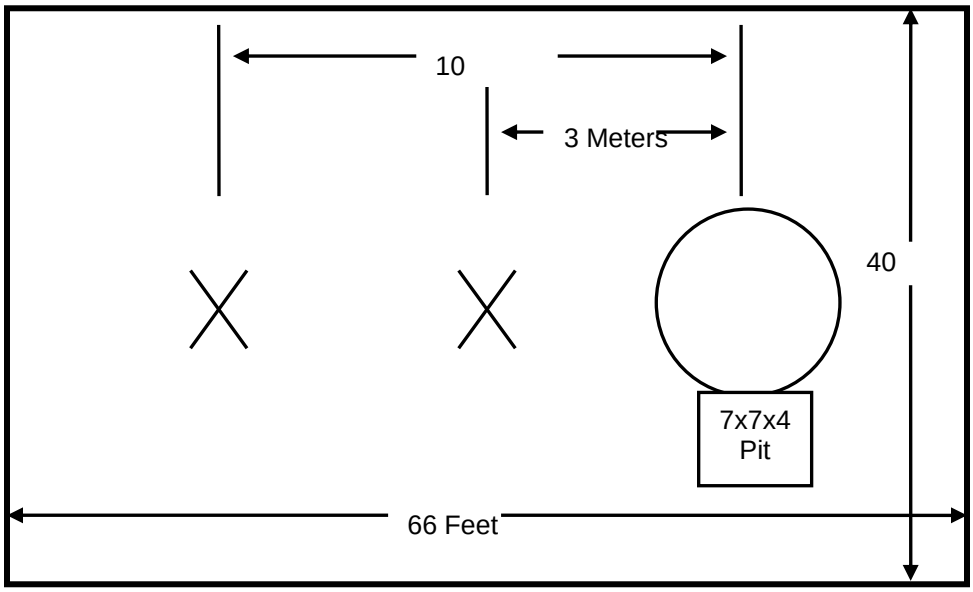

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

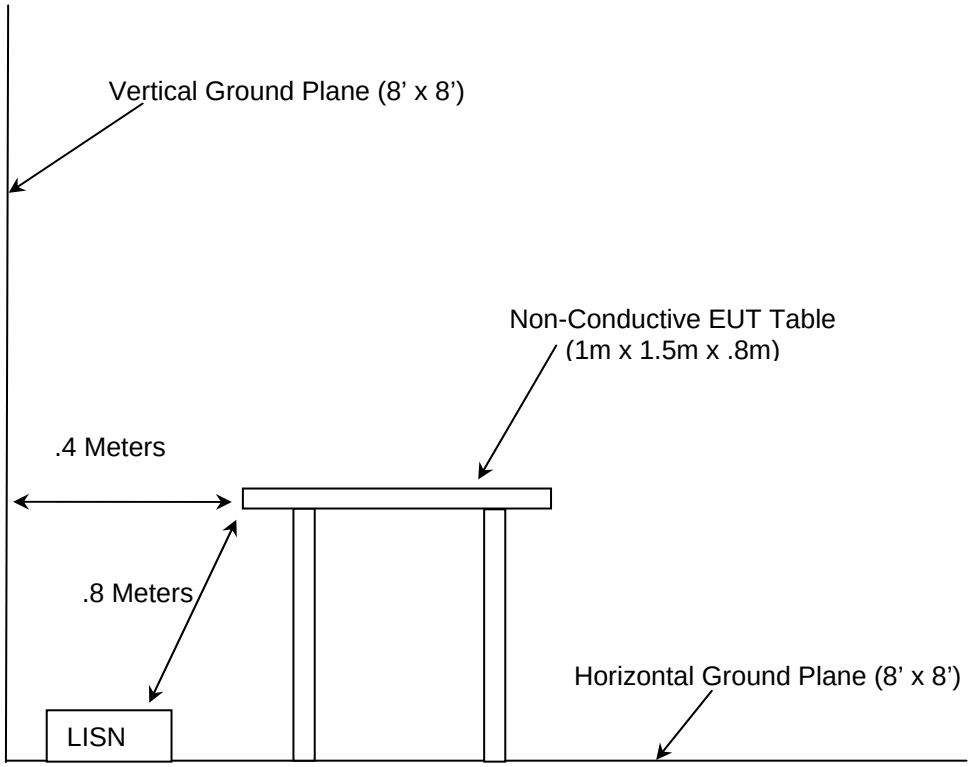

Figure 2.4-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2008
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2008
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 7 June 2007
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue2, June 2007.

4.0 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
1	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	833771/007	09-19-2009
2	Rohde & Schwarz	Spectrum Analyzers	ESMI-Receiver	839587/003	09-19-2009
22	Agilent	Amplifiers	8449B	3008A00526	10-22-2009
25	Chase	Antennas	CBL6111	1043	08-22-2009
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-07-2009
152	EMCO	LISN	3825/2 9111	1905	03-26-2009
167	ACS	Cable Set	Chamber EMI Cable Set	167	02-06-2010 (See Note1)
168	Hewlett Packard	Attenuators	11947A	44829	02-10-2010 (See Note2)
283	Rohde & Schwarz	Spectrum Analyzers	FSP40	1000033	09-19-2009
291	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	None	11-24-2009 (See Note1)
292	Florida RF Cables	Cables	SMR-290AW-480.0-SMR	None	11-24-2009 (See Note1)
321	Hewlett Packard	Amplifiers	HPC 8447D	1937A02809	10-08-2009
337	Microwave Circuits	Filters	H1G513G1	282706	04-08-2009 (See Note1)
338	Hewlett Packard	Amplifiers	8449B	3008A01111	10-22-2009
422	Florida RF	Cables	SMS-200AW-72.0-SMR	805	02-05-2010 (See Note1)
NA	Rohde & Schwarz	Test Receiver	ESH3	872318/049	06-11-2009

Note1: Items characterized on an annual cycle. The date shown indicates the next characterization due date.
Note2: Items verified on an annual cycle. The date shown indicates the next verification due date.

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Wonder Box Device Controller	Rheonetic	NA	NA
2	Sensor Send Unit	Wayne Dalton	260597	NA
3	Sensor Receive Unit	Wayne Dalton	260600	NA
4	AC Adapter	CUI INC	DSA-0151F-12	NA

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

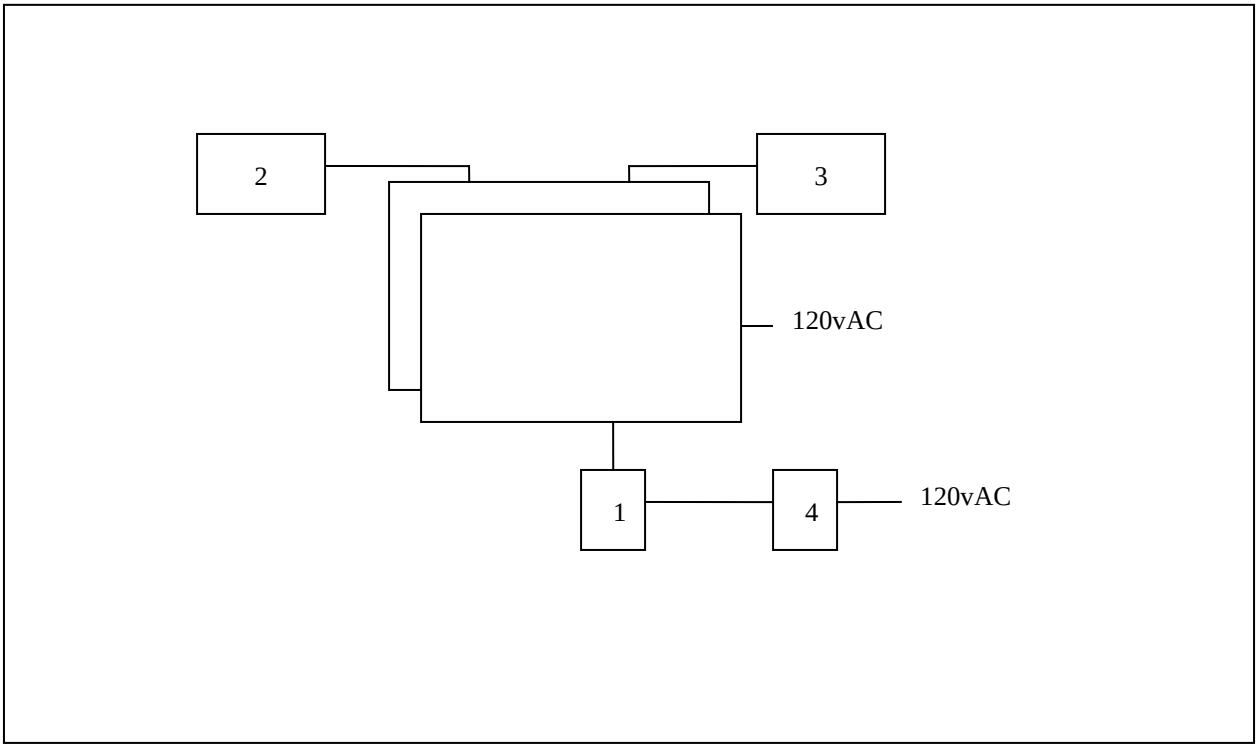

Figure 6-1: EUT Test Setup

*See Test Setup photographs for additional detail.

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: CFR 47 Part 15.203

The 4500-372 utilizes an insulated solid wire monopole type antenna that is soldered to the board assembly and may not be removed by the product consumer. The wire monopole antenna approximates a 3/10 wavelength for the 433.92 MHz transmitter and has a maximum gain of approximately 3 dBi.

7.2 Power Line Conducted Emissions – FCC: CFR 47 Part 15.207 IC: RSS-GEN 7.2.2

7.2.1 Test Methodology

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.2.2 Test Results

Results of the test are shown below in and Table 7.2.2-1.

Table 7.2.2-1: Conducted EMI Results

Frequency (MHz)	Uncorrected Reading (dBuV)		Total Correction Factor (dB)	Corrected Level (dBuV)		Limit (dBuV)		Margin (dB)		Line
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	
Line 1										
0.2	43.5	33.7	9.80	53.30	43.50	63.61	53.61	10.3	10.1	GND
0.26	32.4	11.5	9.81	42.21	21.31	61.43	51.43	19.2	30.1	GND
0.34	31.6	14.1	9.81	41.41	23.91	59.20	49.20	17.8	25.3	GND
0.55	26.4	20.3	9.90	36.30	30.20	56.00	46.00	19.7	15.8	GND
0.72	27.9	16.1	9.90	37.80	26.00	56.00	46.00	18.2	20.0	GND
12.06	26	22.9	10.00	36.00	32.90	60.00	50.00	24.0	17.1	GND
Line 2										
0.2	43.6	33.8	9.80	53.40	43.60	63.61	53.61	10.2	10.0	GND
0.25	36.5	33.2	9.81	46.31	43.01	61.76	51.76	15.4	8.7	GND
0.5	28.8	25.6	9.90	38.70	35.50	56.00	46.00	17.3	10.5	GND
0.75	29.5	25.1	9.90	39.40	35.00	56.00	46.00	16.6	11.0	GND
3.25	17.7	7.1	9.90	27.60	17.00	56.00	46.00	28.4	29.0	GND
13.24	25.2	20.1	10.01	35.21	30.11	60.00	50.00	24.8	19.9	GND

7.3 Radiated Emissions – FCC: Section 15.109(Unintentional Radiation) IC: RSS-210 2.6

7.3.1 Test Methodology

Radiated emissions tests were performed over the frequency range of 30MHz to 2.5 GHz. Measurements of the radiated field strength were made at a distance of 3m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements above 30MHz and below 1GHz were made with the Spectrum Analyzer's resolution bandwidth set to 120 KHz using a Quasi-peak detector. Above 1GHz, peak and average measurements are taken with the RBW and VBW were set to 1MHz and 3MHz respectively.

7.3.2 Test Results

Results of the test are given in Table 7.3.2-1 below:

Table 7.3.2-1: Radiated Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
78.6	---------	50.47	V	-19.05	---------	31.42	--------	40.0	---------	8.58
442.79	---------	40.54	V	-7.30	---------	33.24	--------	46.0	---------	12.76
452.49	---------	38.74	V	-7.15	---------	31.59	--------	46.0	---------	14.41
467.58	---------	32.46	V	-6.55	---------	25.91	--------	46.0	---------	20.09
677.74	---------	40.84	V	-2.18	---------	38.66	--------	46.0	---------	7.34
696.06	---------	39.58	V	-1.72	---------	37.86	--------	46.0	---------	8.14
1160	54.01	29.34	V	-4.70	49.31	24.64	74.0	54.0	24.69	29.36

* Note: All emissions above 1160 MHz were attenuated below the permissible limit.

7.4 Periodic Operation – FCC: CFR 47 15.231(a) (1)/ IC: RSS-210 A1.1.1(a)

7.4.1 Test Methodology

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter after 5 seconds of being released. A transmitter activated automatically shall cease transmission within 5 seconds after activation.

The 4500-372 is activated automatically and ceases transmissions after 1.23 seconds. The transmitter was activated and evaluated using a spectrum analyzer at zero span.

7.4.2 Test Results

The results are shown in Figure 7.4.2-1.

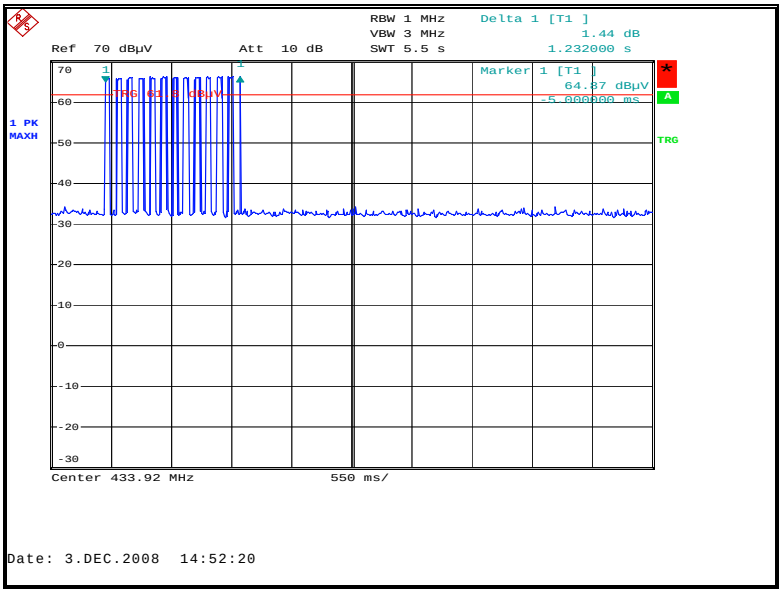

Figure 7.4.2-1: Transmitter Hold Time

7.5 Occupied Bandwidth – FCC: CFR 47 15.231(c) (1) IC: RSS-210 A1.1.3

7.5.1 Test Methodology

For devices operating above 70MHz and below 900 MHz, the bandwidth of the emission shall be no wider than 0.25% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier for FCC compliance and the 99% bandwidth for IC compliance.

7.5.2 Test Results

The 20dB and 99% bandwidth was measured as 198.0 kHz and 428.0 kHz respectively. 0.25% of the center frequency 433.92 MHz is equivalent to 1084.8 kHz. Therefore the 20dB and 99% bandwidths of the emission is less than 0.25% of the center frequency. The results are shown in Figure 7.5.2-1 and 7.5.2-2.

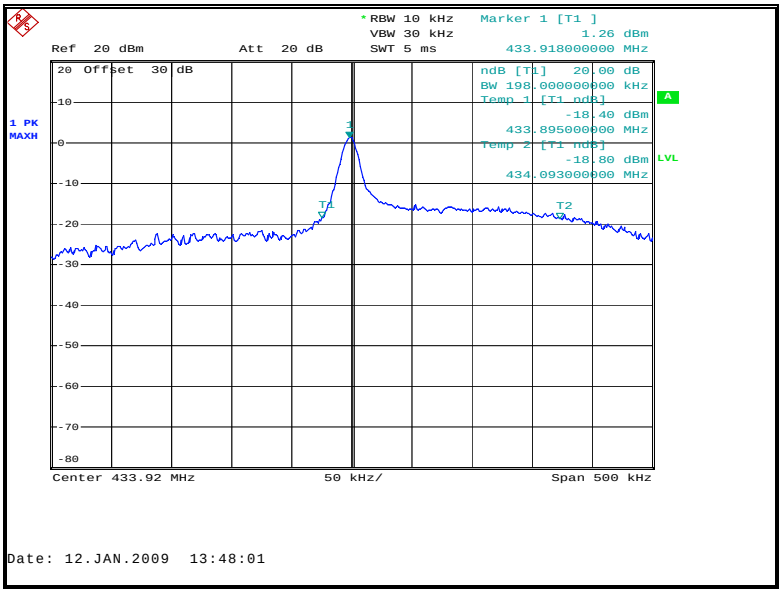

Figure 7.5.2-1: Occupied Bandwidth – 20dB

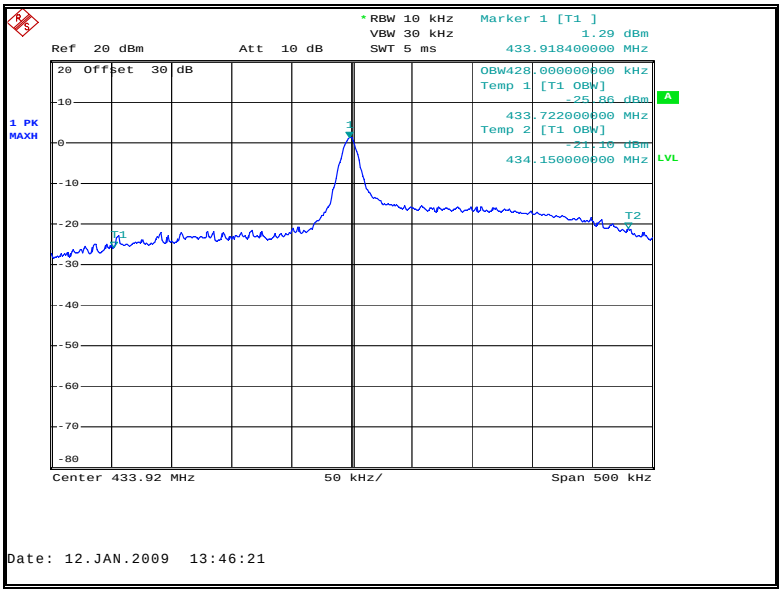

Figure 7.5.2-2: Occupied Bandwidth – 99%

7.6 Radiated Emissions (Field Strength/Spurious) – FCC: CFR 47 15.231(b) IC: RSS-210 A1.1.2

7.6.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 5GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth (RBW) of 120 kHz and a video bandwidth (VBW) of 300 kHz. Above 1GHz, peak and average measurements are taken with the RBW and VBW were set to 1MHz and 3MHz respectively.

The EUT was caused to generate a continuous carrier signal on the hopping channel.

7.6.2 Duty Cycle Correction

For average radiated measurements, the measured level was reduced by a factor 10.82dB to account for the duty cycle of the EUT. The worst case duty cycle within the 93.8ms pulse period is 28.78%. After each data transmission of 43.8 ms, there will be an off time of 50 ms. Within the 43.8ms transmission, the total on time is 27ms. The duty cycle correction factor is determined using the formula: 20*log (27ms/93.8ms))= -10.82dB.

The more detailed justification of duty cycle can be found in the Theory of Operations.

7.6.3 Test Results

Radiated spurious emissions found in the band of 30MHz to 5GHz are reported in Table 7.6.3-1.

Table 7.6.3-1: Radiated Emissions

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Fundamental Emissions										
433.92	76.10	68.19	H	20.64	96.74	78.01	100.8	80.8	4.09	2.81
433.92	75.05	69.24	V	20.46	95.51	78.88	100.8	80.8	5.32	1.95
Spurious Emissions										
867.84	72.61	62.32	H	3.00	75.61	54.50	80.8	60.8	5.22	6.32
867.84	72.27	61.96	V	2.52	74.79	53.66	80.8	60.8	6.03	7.16
1301.76	74.51	55.05	H	-6.96	67.55	37.27	74.0	54.0	6.45	16.73
1301.76	78.67	59.50	V	-6.94	71.73	41.74	74.0	54.0	2.27	12.26
1735.68	71.30	55.56	H	-4.90	66.40	39.84	80.8	60.8	14.42	20.98
1735.68	73.69	56.92	V	-4.89	68.80	41.21	80.8	60.8	12.03	19.61
2169.6	73.75	49.70	H	-3.13	70.62	35.75	80.8	60.8	10.20	25.07
2169.6	66.06	44.74	V	-3.26	62.80	30.66	80.8	60.8	18.03	30.17
2603.52	71.82	43.28	H	-1.26	70.56	31.20	80.8	60.8	10.27	29.62
2603.52	75.13	46.70	V	-1.46	73.67	34.42	80.8	60.8	7.16	26.40
3037.44	63.79	40.71	H	0.02	63.81	29.91	80.8	60.8	17.01	30.91
3037.44	67.37	43.38	V	-0.16	67.21	32.40	80.8	60.8	13.62	28.43
3471.36	57.96	39.13	H	1.45	59.41	29.76	80.8	60.8	21.41	31.06
3471.36	66.19	45.12	V	1.44	67.63	35.74	80.8	60.8	13.20	25.08
3905.28	54.28	36.50	H	2.97	57.25	28.65	74.0	54.0	16.75	25.35
3905.28	57.15	39.26	V	3.05	60.20	31.49	74.0	54.0	13.80	22.51
4339.2	60.34	36.92	V	3.64	63.98	29.74	74.0	54.0	10.02	24.26

***** The magnitude of all emissions not reported were below the noise floor of the measurement system.

7.6.4 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation

PEAK:
Corrected Level: 72.61+ 3.0 = 75.61dBuV
Margin: 100.8dBuV – 75.61dBuV = 5.22dB

AVERAGE:
Corrected Level: 62.32 + 3.0 - 10.82 = 54.5dBuV
Margin: 60.8dBuV – 54.5dBuV = 6.3dB

8.0 CONCLUSION
In the opinion of ACS, Inc. the 4500-372 manufactured by Wayne Dalton Corporation met the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT