FCC Part 15
433.92 MHz Transmitter Certification
& 372 MHz Receiver Declaration of Conformity

Test Report

FCC ID: KJ8-ID372R2
FCC Rule Part: 15.231

ACS Report Number: 03-0197-15C231

Manufacturer: Wayne-Dalton Corporation
Equipment Type: RF Controlled Garage Door Opener
Model: Operator 40XR (Torsion *i*drive™)
Model Variants: 3660-372, 3661-372, 3662-372, 3663-372, 3740-372, 3760-372, 3761-372, 3762-372

Test Begin Date: October 7, 2003
Test End Date: October 7, 2003

Report Issue Date: February 18, 2004

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612

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This report contains 16 pages

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Additional Exhibits Included In Filing

1.0 GENERAL

1.1 Introduction

The purpose of this report is to demonstrate compliance with 15.231 of the FCC's Code of Federal Regulations.

1.2 Product Description

Operator 40XR (Torquemaster *i*driveTM) product description:

The Torsion *i*driveTM is a header-mounted dc-motor driven garage door opener that is subject to UL 325 / 991 and FCC 47 CFR Part 15 compliance. The Torsion *i*driveTM is an electromechanical garage door operating system intended for residential use. This operator system is consists of three main parts: 1.) The "light kit" which mounts to the ceiling; 2.) The "header operator" which mounts directly above the garage door; 3.) The garage door itself. The light kit is a separate unit and has been evaluated as a luminarie and is covered as a Listed Accessory. The light kit contains no circuitry that that is needed for the proper operation of the door operator; there is no electrical connection between it and the door operator. The light kit receives a radio frequency transmission from the operator for on/off activation. The operator connects to the branch circuit via a detachable power supply cord or by permanent wiring means. The header operator contains a 120 V dc drive motor and a logic control board. The doors themselves should be considered part of the Listed product since they form part of the obstruction sensing system. The door's counter-balance system is mechanically linked to a slide potentiometer, which relates the position of the door to the microprocessor and serves as the inherent entrapment protection system. The control board is provided with a microprocessor that monitors the motor current sensing circuit. The software allows the downward force of the closing door to reach a maximum of 25 lbs. only if sensors are attached to the operator (in compliance with UL 325, 5th ed. Paragraphs 32.1.2b and 42.3). If the photo-eyes are not connected, the software will only allow a maximum 15 lbs. downward force before stopping and reversing the door (in compliance with UL 325, 5th ed. Paragraph 46.1.1). The software is designed to comply with the requirements of UL 1998. The photoelectric eye safety sensors serve as secondary entrapment protection devices. The operator's control circuit monitors the external entrapment protection device including the wiring to it, so that any failure of the device will cause a closing door to open and prevent the system from automatically closing the door. However, for security purposes, the operator is designed so that constant pressure on the control will close the door even if the external devices fail. The inherent entrapment protection is still operational during the attended closing and the remote control unit is inoperative for closing the door. This operator is provided with a conventional red emergency release handle. The doors are not directly mechanically linked to the doors and the system is compliant with the exception to UL 325, 5th ed. Paragraph 32.4. However this operator is provided with a mechanical releasing mechanism. The unit is not provided with adjustable open/ close force limits. The operator employs a selflearning force limiting feature. This feature continually monitors the amount of force needed to move the door at various positions during door travel. An incremental offset or force cushion is added to this measured force, and the result is stored in the operator memory. During the next door travel, the actual force needed to move the door is compared to the "door profile" value stored in the memory (actual force from the last travel plus small cushion). If the force needed to move the door exceeds the stored value, the operator treats this as an obstruction and reverses a closing door or stops an opening door. This system results in the operator providing a force of only that which is needed to move it, plus a small offset to account for minor fluctuations in required force due to door condition, climatic conditions, etc. This feature is considered an additional redundant system since the door position potentiometer (indicating door position) is considered to be the secondary entrapment protection system. This operator can be provided with a variety of accessories for convenience purposes such as various radio transmitters, wireless keyless entry system, etc.

The 433.92 MHz transmitter on board, is used to activate a wireless light kit to turn on household lights when the garage door is activated. When the operator receives the normal 372MHz signal to open the door or the wired push button is depressed, a signal is sent to the 433.92MHz transmitter to send a command to activate the wireless light kit. The 372 MHz transmitter and 433MHz receiver are approved separately and are not included in this filing.

The 433.925 MHz transmitter activates under the following conditions:

- Upon reception of a light toggle command from a 372.5 MHz transmitter.
- Upon reception of a door move command from a 372.5 MHz transmitter or external manual switch.
- Approximately ten seconds after reception of a door move command from a 372.5 MHz transmitter or external manual switch (upon completion of a door cycle).
- Approximately five minutes after a door cycle ends (5-minute timer to turn off light).

The Torsion *i*drive ™ is offered in 8 packaging variants as defined below:

- Model #: 3660-372 retail
- Model #: 3661-372 retail 4-pack
- Model #: 3662-372 retail Sam's Club
- Model #: 3663-372 retail 4-pack
- Model #: 3740-372 dealer 120 cycle (operator ceases unless paid for before 120 cycle operations)
- Model #: 3760-372 dealer 4-pack
- Model #: 3761-372 dealer
- Model #: 3762-372 dealer remanufactured

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

1.2.1 Intended Use

The Torsion *i*driveTM is an electromechanical garage door operating system intended for residential use.

2.0 LOCATION OF TEST FACILTY

All testing was performed by qualified ACS personnel located at the following address:

ACS, Inc.
5015 B.U. Bowman Drive
Buford, GA 30518

2.1 DESCRIPTION OF TEST FACILITY

Both the 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: 89450
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

2.1.1 Open Area Test Site

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 2.1-1 below:

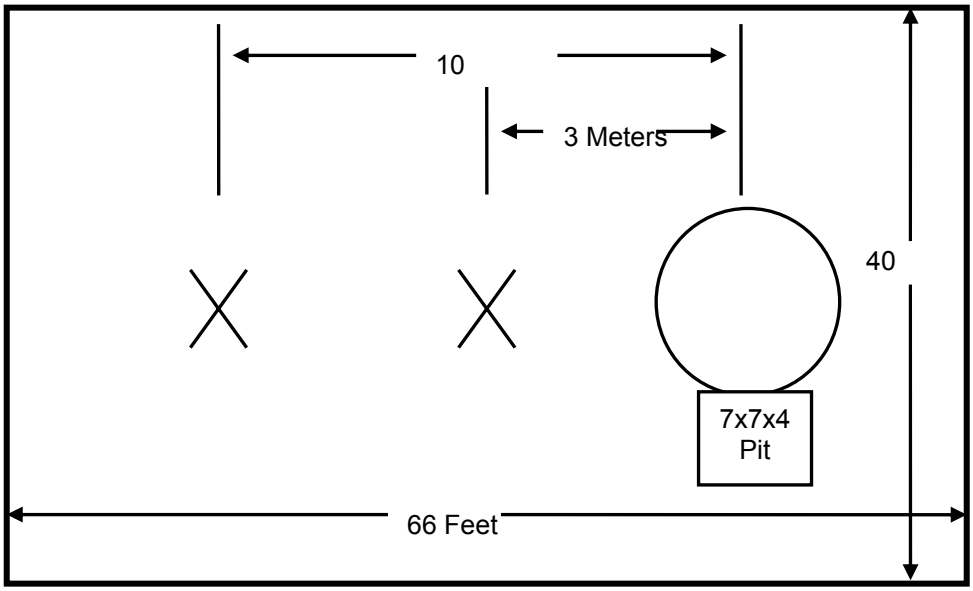

Figure 2.1-1: Open Area Test Site

2.1.2 Conducted Emissions Test Site Description
The AC mains conducted EMI site is a shielded room with the following dimensions:

- Height: 3.0 Meters
- Width: 3.6 Meters
- Length: 4.9 Meters

The room is manufactured by Rayproof Corporation and installed by Panashield, Inc. Earth ground is provided to the room via an 8' copper ground rod. Each panel of the room is connected electrically at intervals of 4".

Power to the room is filtered to prevent ambient noise from coupling to the EUT and measurement equipment. Filters are models 1B42-60P manufactured by Rayproof Corporation.

The room 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 2.1.2-1:

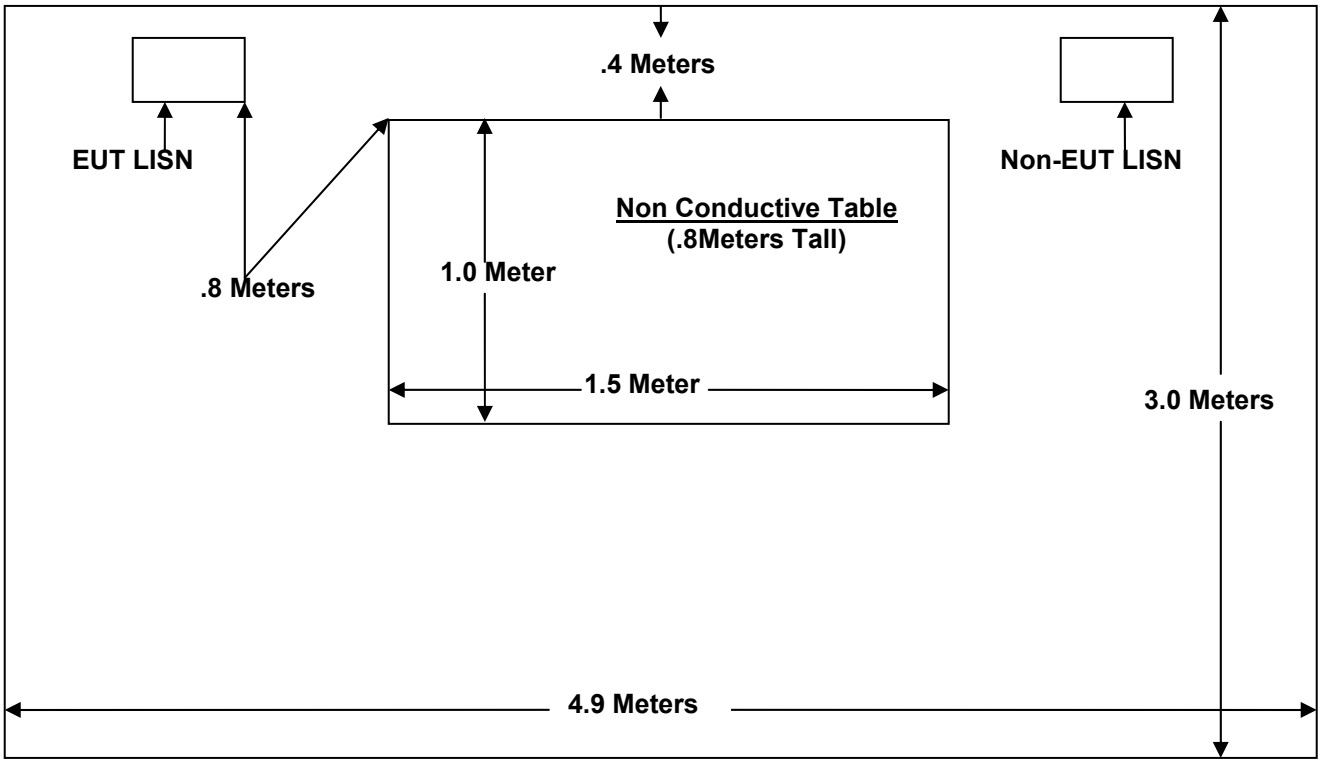

Figure 2.1.2-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-1992: 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 (October 2002)
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators (October 2002)
- FCC OET Bulletin 65 Appendix C - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

4.0 LIST OF TEST EQUIPMENT

All test equipment used for regulatory testing is calibrated yearly or according to manufacturer's specifications.

Table 4-1: Test Equipment

Equipment Calibration Information					
ACS #	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
---	Agilent	Spectrum Analyzer	E7402A	US40240259	11/08/04
---	Agilent	Spectrum Analyzer	8563EC	4111A01283	10/10/04
26	Chase	Bi-Log Antenna	CBL6111	1044	10/14/04
152	EMCO	LISN	3825/2	9111-1905	12/11/03
153	EMCO	LISN	3825/2	9411-2268	12/11/03
193	ACS	OATS Cable Set	RG8	193	1/09/05
167	ACS	Conducted EMI Cable Set	RG8	167	1/09/05
5	ACS	Cable	LL-335	None	8/20/04
6	ACS	Cable	LL-335	None	8/6/04
22	Agilent	Pre-Amplifier	8449B	3008A00526	9/18/04
73	Agilent	Pre-Amplifier	8447D	272A05624	04/15/04
30	Spectrum Technologies	Horn Antenna	DRH-0118	970102	5/8/04
105	Microwave Circuits	High Pass Filter	H1G810G1	2123-01 DC0225	6/17/04
40	EMCO	Biconical Antenna	3104	3211	9/19/04

5.0 SYSTEM BLOCK DIAGRAM

Table 5.0: System Block Diagram

Diagram Number	Manufacturer	Equipment Type	Model Number	Serial Number	FCC ID
1	EUT	Garage Door Opener	Operator 40XR (Torsion *i*drive™)	None	KJ8-TID372R2

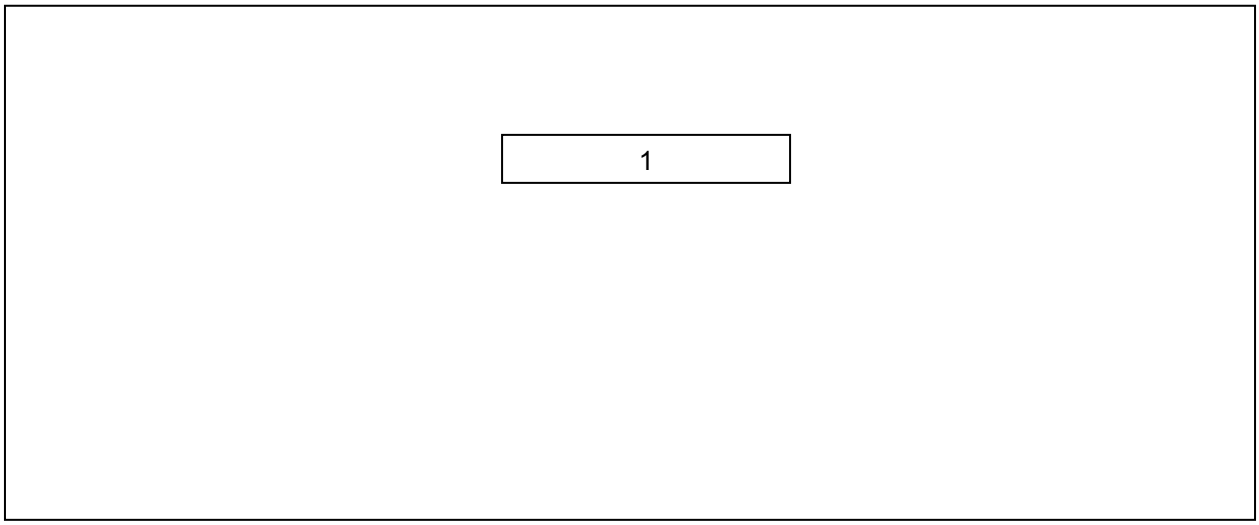

Figure 5.0-1: EUT Test Setup

6.0 SUMMARY OF TESTS

6.1 Power Line Conducted Emissions - FCC Section 15.207

6.1.1 Test Methodology

Conducted emissions were evaluated from 0.45 to 30 MHz. The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are recorded. Final data was taken only for the worse case mode of operation determined from the preliminary scan.

6.1.2 Test Results

PHASE MEASUREMENT

FREQUENCY (MHz)	TEST DATA (dBm) PHASE	LISN LOSS (dB) PHASE	CABLE FACTOR (dB)	RESULTS (uV) PHASE	FCC CLASS B LIMITS (uV)	MARGIN BELOW LIMIT (dB) PHASE
2.28	-89.4	0.1	0.3	7.9	250.0	30.0
5.02	-82.1	0.1	0.4	18.5	250.0	22.6
6.14	-88.3	0.1	0.4	9.2	250.0	28.7
7.82	-85.5	0.1	0.4	12.6	250.0	26.0
9.49	-81.4	0.1	0.5	20.5	250.0	21.7
10.6	-67.7	0.1	0.5	98.5	250.0	8.1

SAMPLE CALCULATIONS:
RESULTS uV = Antilog ((-89.4 + 0.1 + 0.3 + 107)/20) = 7.9
CONVERSION FROM dBm TO dBuV = 107 dB

NEUTRAL MEASUREMENT

FREQUENCY (MHz)	TEST DATA (dBm) NEUTRAL	LISN LOSS (dB) NEUTRAL	CABLE FACTOR (dB)	RESULTS (uV) NEUTRAL	FCC CLASS B LIMITS (uV)	MARGIN BELOW LIMIT (dB) NEUTRAL
2.37	-91.0	0.1	0.3	6.6	250.0	31.6
4.73	-86.2	0.1	0.4	11.6	250.0	26.7
5.04	-82.5	0.1	0.4	17.8	250.0	22.9
10.6	-67.0	0.1	0.5	107.4	250.0	7.3
19.5	-77.0	0.1	0.7	34.8	250.0	17.1
27.4	-82.9	0.1	0.8	17.9	250.0	22.9

SAMPLE CALCULATIONS:
RESULTS uV = Antilog ((-91.0 + 0.1 + 0.3 + 107)/20) = 6.6
CONVERSION FROM dBm TO dBuV = 107 dB

6.2 Radiated/Receiver Spurious Emissions - FCC Section 15.209(Unintentional Radiation)

6.2.1 Test Methodology

Radiated emissions were evaluated from 30 MHz to 2 GHz. Measurements were made with the analyzer's bandwidth set to 120 kHz for measurements made less than 1 GHz and 1 MHz for measurements made greater then or equal to 1 GHz. The following data lists the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit.

6.2.2 Test Results

Results of the test are given in Table 6.2.2-1 below:

Measurements 30 MHz to 1 GHz

Frequency (MHz)	Test Data (dBm) @3m	Ant. Factor + Cable Atten. - Amp Gain	Results (uV/m)	FCC Limits (uV/m) @3m	Margin Below FCC Limit (dB)
37.0	-90.0	16.9	49.4	100.0	6.1
53.2	-90.0	9.6	21.4	100.0	13.4
87.5	-94.0	10.7	15.3	100.0	16.3

Peak Measurements >1GHz

Frequency (MHz)	Test Data (dBm) @3m	Ant. Factor + Cable Atten. - Amp Gain	Results (uV/m)	FCC Limits (uV/m) @3m	Margin Below FCC Limit (dB)
No Emissions detected above 1 GHz, all signals in ground plane.					

Average Measurements >1GHz

Frequency (MHz)	Test Data (dBm) @3m	Ant. Factor + Cable Atten. - Amp Gain	Results (uV/m)	FCC Limits (uV/m) @3m	Margin Below FCC Limit (dB)
No Emissions detected above 1 GHz, all signals in ground plane.					

6.3 FCC Section 15.231 (a)(2) – Automatic Transmission Duration

6.3.1 Test Requirement
A transmitter activated automatically shall cease transmission within 5 seconds after activation.

6.3.2 Test Methodology
The span of the spectrum analyzer was set to 0Hz and the sweep to 5 seconds. The EUT was caused to activate a normal transmission.

6.3.3 Test Results
The results are shown in the figure 6.3.3-1 below.

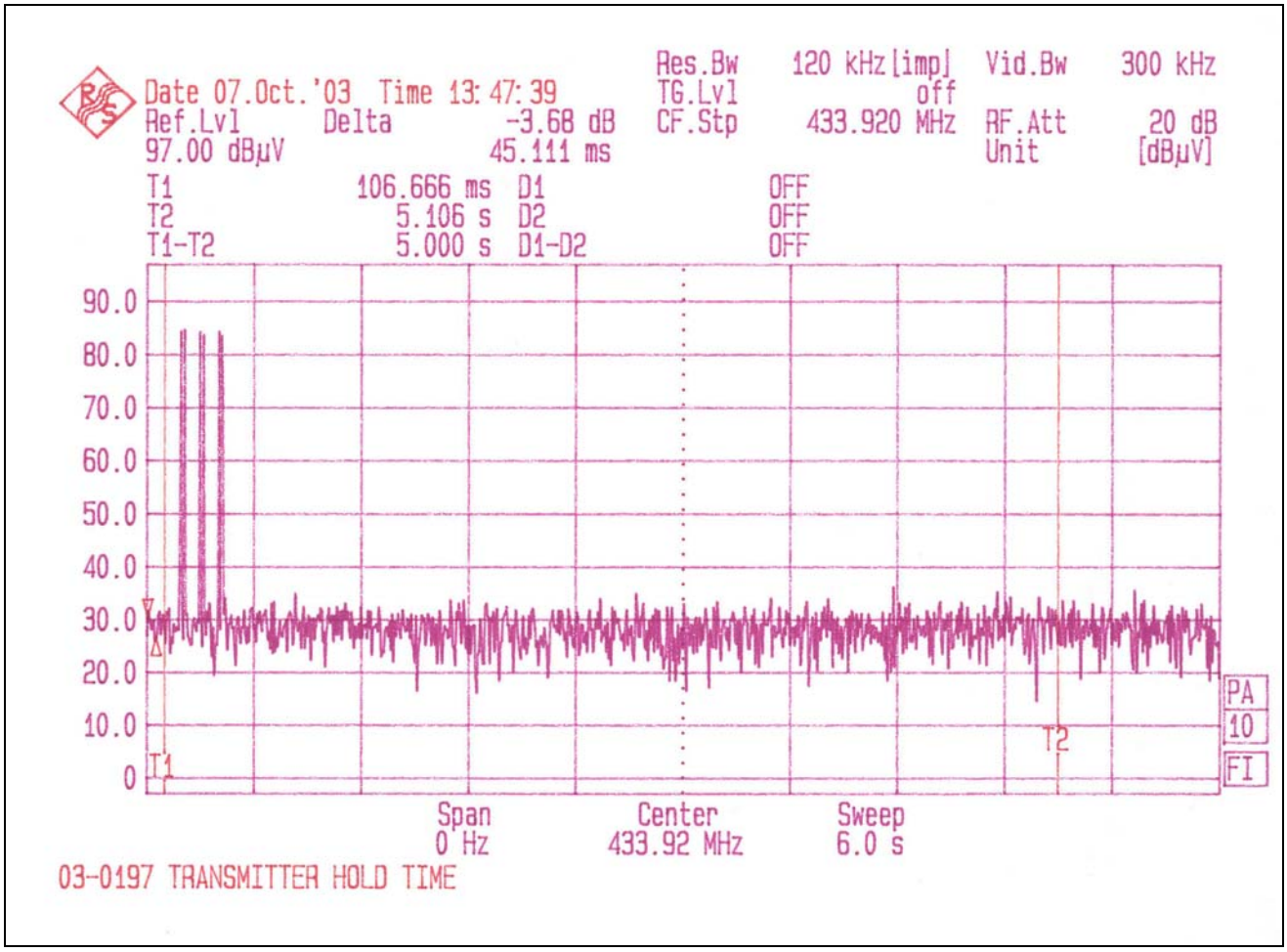

Figure 6.3.3-1: Transmission Duration Timing Diagram

6.4 FCC Section 15.231 (b) – Field Strength of Emissions

6.4.1 Test Requirement

In addition to the provisions of Section 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

** linear interpolations

Spurious emissions that fall within the restricted band as identified in 15.205, must comply with the general radiated limits in 15.209.

6.4.2 Test Methodology

ANSI C63.4 Sections 6 and 8 were the guiding documents for this evaluation. Radiated emissions tests were performed over the frequency range of 30MHz to 5000MHz. 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 were made with the Spectrum Analyzer's resolution bandwidth set to 120KHz for measurements below 1000MHz and 1Mhz for measurements above 1000MHz. All measurements were made using an average detector.

The EUT was modified to operate continuously for this test.

6.4.3 Test Results

6.4.3.1 Duty Cycle Correction Factor

The EUT transmits 10 packets separated by 56.4mS each for a burst period of 100mS. The cycle time of the entire transmission is 1000mS. A single packet is shown below:

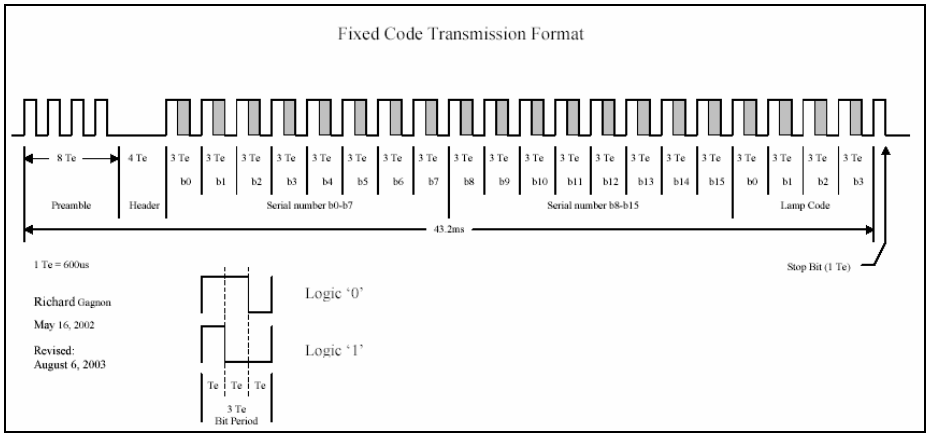

Figure 6.4.3.1-1: Single Packet Timing Diagram

In accordance with 15.35, the duty cycle was based on the amount of time the transmitter is "on" in any 100ms or Period(T) whichever is shorter. The EUT is designed to transmit only when the transmitter is activated and ceases to operate within the 5 second requirement of 15.231(a)(2). The EUT transmits ten packets of 43.2mS bursts as shown below in figure 6.4.3.2-2. Each burst consists of forty five 600uS pulses as shown in figure 6.4.3.1 above. This equates to a total "on" time of 27mS or 27%. The transmission is more clearly defined below:

- Cycle Time = 1000mS
- Single Packet Burst Period is 100mS(From Start of first packet to start of second)
- On Time within each packet = 45 x 600uS Pulses = 27mS (See figure 6.4.3-1 above)

The formula used to determine the duty cycle correction factor is log(.27)*20 = -11.37 dB.

6.4.3.2 Fundamental Field Strength

The results are shown in table and figure 6.4.3.2-1 below.

Table 6.4.3.2-1

Fundamental Field Strength	
Fundamental Frequency (MHz)	433.885
Field Strength(dBuV/m):	89.2
*Correction Factors(dB):	-7.53
Duty Cycle Correction Factor(dB):	-11.37
**Corrected Level(dBuV/m):	70.3
Corrected Level(uV/m):	3273
Limit(uV/m):	10997
Margin(uV/m):	7724
Result:	Pass

* Correction factors include Antenna Factor + Cable Loss - Pre-amp gain
** Corrected Level = FS + Correction Factors – Duty Cycle Correction

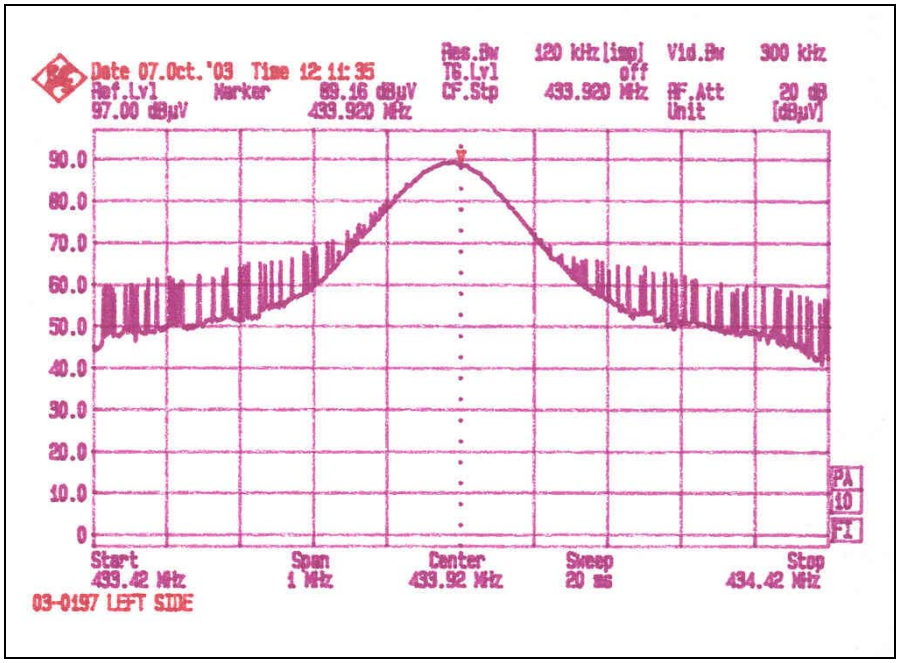

Figure 6.4.3.2-1: Fundamental Field Strength

6.4.3.3 Field Strength of Spurious Emissions

The results are shown in table 6.4.3.3-1 below.

Enter ACS Project #:	**03-0197**
Enter Test Date:	**1/6/2004**
Enter Technician Name:	**H Orozco**
Enter Manufacturer:	**Wayne Dalton**
Enter EUT Name:	**OP41XR**
Enter Antenna Distance:	**3**
Enter Class:	**B**
Duty Cycle Factor(dB):	**11.37**

Frequency (MHz)	Uncorrected Reading (dBµV)	Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Position (°)	Total Correction Factor (dB)	Corrected Reading (dBµV)	Limit (dBµV)	Margin (dB)
867	66.14	V	150	221	-11.86	54.28	60.83	6.5
1301.76*	31.36	V	100	232	-13.34	18.02	54.00	36.0
1735.71	25.01	V	100	0	-10.48	14.53	60.83	46.3

***Restricted Band**

6.5 FCC Section 15.231 (c) – Bandwidth Limitation

6.5.1 Test Requirement

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.

The EUT operates at 433.92 MHz, therefore the BW limit is 1.08MHz.

6.5.2 Test Methodology

This was a radiated measurement made a distance of 3 meters. Both polarities were checked and the worst case is given in 6.5.3 below. The EUT was modified to operate continuously.

6.5.3 Test Results

The measured bandwidth at the 20dB points was kHz as is shown below in figure 6.5.3-1 below:

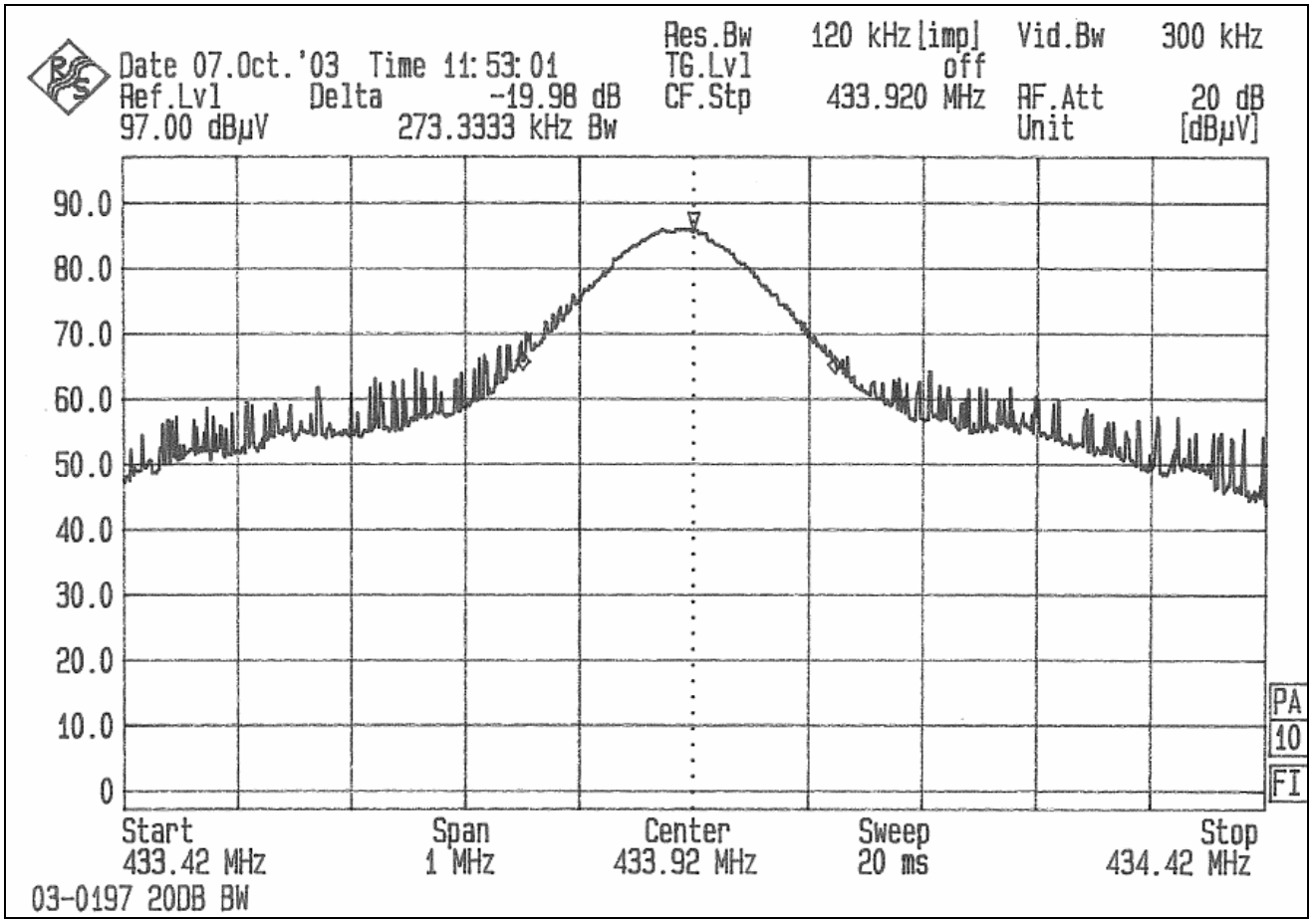

Figure 6.5.3-1: 20dB Bandwidth

7.0 CONCLUSION

In the opinion of ACS, Inc. the Operator 40XR (Torsion *i*drive™) and all model variants, manufactured by Wayne-Dalton Corporation meets the relevant requirements of FCC Part 15 as required.