



Company: Digi-Code Inc.
Model Tested: DC 5018
Report Number: 11872

1250 Peterson Dr., Wheeling, IL 60090

FCC Rules and Regulations / Intentional Radiators

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

Part 15, Subpart C, Section 15.231

THE FOLLOWING "**MEETS**" THE ABOVE TEST SPECIFICATION

Formal Name: Digi-Code Radio Transmitter
Kind of Equipment: RF Transmitter
Test Configuration: NA (Tested at 9 vdc)
Model Number(s): DC 5018
Model(s) Tested: DC 5018
Serial Number(s): NA
Date of Tests: December 9, 2005
Test Conducted For: Digi-Code Inc.
180 Engelwood Dr., Suite G
Orion, Michigan 48359

NOTICE: "This report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government". Please see the "Additional Description of Equipment Under Test" page listed inside of this report. This report must not be reproduced (except in full), without the approval of D.L.S. Electronic Systems.



Company: Digi-Code Inc.
Model Tested: DC 5018
Report Number: 11872

1250 Peterson Dr., Wheeling, IL 60090

SIGNATURE PAGE

Report By:

Arnom C. Rowe
Test Engineer
EMC-001375-NE

Reviewed By:

William Stumpf
OATS Manager

Approved By:

Brian Mattson
General Manager

Company Official:

Digi-Code Inc.



Company: Digi-Code Inc.
Model Tested: DC 5018
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United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:1999

NVLAP LAB CODE: 100276-0

D.L.S. Electronic Systems, Inc.
Wheeling, IL

is recognized by the National Voluntary Laboratory Accreditation Program for conformance with criteria set forth in
NIST Handbook 150:2001 and all requirements of ISO/IEC Guide 17025:1999.
Accreditation is granted for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS



2005-10-01 through 2006-09-30

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**National Voluntary
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SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999

D.L.S. Electronic Systems, Inc.

1250 Peterson Drive

Wheeling, IL 60090-6454

Mr. Brian J. Mattson

Phone: 847-537-6400 Fax: 847-537-6488

E-Mail: bmattson@dlsemc.com

URL: <http://www.dlsemc.com>

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NVLAP LAB CODE 100276-0

NVLAP Code Designation / Description

Emissions Test Methods:

12/160D21	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 21 - Emission of Radio Frequency Energy
12/300220a	EN 300 220-1 V1.3.1 (2000-09): Electromagnetic compatibility and Radio spectrum Matters; Short Range Devices; Radio equipment to be used in the 25 MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Technical characteristics and test methods
12/300386a	EN 300 386 V.1.2.1: Electromagnetic compatibility and radio spectrum matter (ERM); Telecommunication network equipment; Electromagnetic compatibility (EMC) requirements
12/C63.17	ANSI C63.17-1998: American National Standard for Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices
12/C6317a	ANSI C63.17-1998: American National Standard for Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices
12/CIS11	IEC/CISPR 11 + A1 (1997), EN 55011 (1998), AS/NZS CISPR 11 (2002), and CNS 13803 (1997): Limits and Methods of Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific, and Medical Radio-Frequency Equipment

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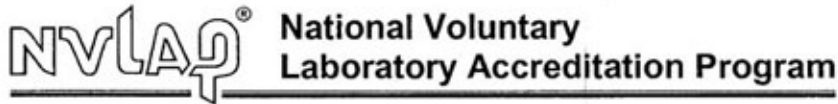
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<i>NVLAP Code</i>	<i>Designation / Description</i>
12/CIS13	IEC/CISPR 13 (2001-04), EN 55013 (2001), AS/NZS CISPR 13 (2003), and CNS 13439 (2001): Sound and television broadcast receivers and associated equipment - Radio disturbance characteristics - Limits and methods of measurement
12/CIS14	CISPR 14-1 (March 30, 2000): Limits and Methods of Measurement of Radio interference Characteristics of Household Electrical Appliances, Portable Tools and Similiar Electrical Apparatus - Part 1: Emissions
12/CIS14a	EN 55014-1 (1993), A1 (1997), A2 (1999):
12/CIS14d	IEC/CISPR 14-1 (2001) and A1 (2001): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emissions
12/CIS14e	EN 55014-1 (2001) and A1 (2001): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
12/CIS14f	AS/NZS 1044 (2001) and A1 (2001): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
12/CIS14g	CNS 13783-1 (2001) and A1 (2001): Electromagnetic Compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
12/CIS15	IEC/CISPR 15 (2000) + A1 (2001): Limits and methods of measurements of radio disturbance characteristics of electrical lighting and similar equipment
12/CIS15a	AS/NZS CISPR 15 (2002): Limits and methods of measurements of radio disturbance characteristics of electrical lighting and similar equipment
12/CIS15b	CNS 13439 (2000) + A1 (2001): Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
12/CIS15c	EN 55015 (2000) + A1 (2001): Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment
12/CIS22	IEC/CISPR 22 (1997) & EN 55022 (1998) + A1(2000): Limits and methods of measurement of radio disturbance characteristics of information technology equipment

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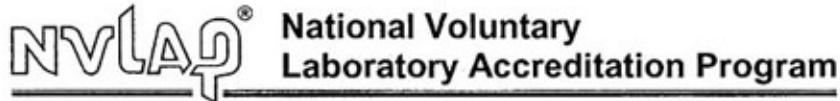
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<i>NVLAP Code</i>	<i>Designation / Description</i>
12/CIS22a	IEC/CISPR 22 (1993) and EN 55022 (1994): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1 (1995) and Amendment 2 (1996)
12/CIS22b	CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
12/EM02a	IEC 61000-3-2, Edition 2.1 (2001-10), EN 61000-3-2 (2000), and AS/NZS 2279.1 (2000): Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A)
12/EM03	IEC 61000-3-3(1995); EN 61000-3-3(1995); AS/NZS 2279.3(1995): EMC - Part 3: Limits - Section 3. Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to 16A
12/F18	FCC OST/MP-5 (1986): FCC Methods of Measurement of Radio Noise Emissions for ISM Equipment (cited in FCC Method 47 CFR Part 18 - Industrial, Scientific, and Medical Equipment)
12/FCC15b	ANSI C63.4 (2003) with FCC Method 47 CFR Part 15, Subpart B: Unintentional Radiators
12/FCC15c	ANSI C63.4 (2003) with FCC Method 47 CFR Part 15, Subpart C: Intentional Radiators
12/FCC15d	ANSI C63.17(1998) and ANSI C63.4 (2003): with FCC Method - 47 CFR Part 15, Subpart D: Unlicensed Personal Communications Service Devices
12/FCC15e	ANSI C63.4 (2003) with FCC Method 47 CFR Part 15, Subpart E: Unlicensed National Information Infrastructure Service Devices
12/T51a	AS/NZS CISPR 22 (2004): Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
12/VCCIa	VCCI: Agreement of Voluntary Control Council for Interference by Information Technology Equipment - Technical Requirements: V-3/2005.04

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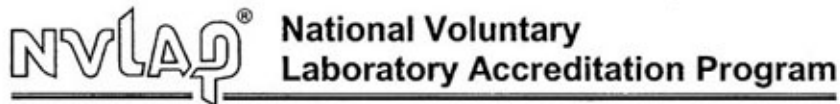
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Immunity Test Methods:

12/1089a	GR-1089-CORE, Issue 3, October 2002: Electromagnetic Compatibility and Electrical Safety - Generic Criteria for Network Telecommunications Equipment (sections 2, 3.3, and 3.5)
12/160D16	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 16 - Power Input
12/160D17	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 17 - Voltage Spike
12/160D18	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 18 - Audio Frequency Conducted Susceptibility - Power Inputs
12/160D19	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 19 - Induced Signal Susceptibility
12/160D20	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 20 - Radio Frequency Susceptibility (Radiated and Conducted)
12/160D22	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 22 - Lightning Induced Transient Susceptibility
12/160D25	RTCA/DO-160D (1997): Environmental Conditions and Test Procedures for Airborne Equipment - Section 25 - Electrostatic Discharge (ESD)
12/101	IEC 61000-4-2, Ed. 1.2 (2001) + A1, A2; EN 61000-4-2: Electrostatic Discharge Immunity Test
12/102	IEC 61000-4-3, Ed. 2.0 (2002-03); EN 61000-4-3 (2002): Radiated Radio-Frequency Electromagnetic Field Immunity Test
12/103	IEC 61000-4-4(1995), A1(2000), A2(2001); EN 61000-4-4: Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical Fast Transient/Burst Immunity Test

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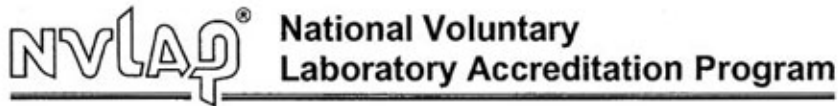
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<i>NVLAP Code</i>	<i>Designation / Description</i>
12/I04	IEC 61000-4-5, Ed. 1.1 (2001-04); EN 61000-4-5: Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
12/I05	IEC 61000-4-6, Ed. 2.0 (2003-05); EN 61000-4-6: Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
12/I06	IEC 61000-4-8, Ed. 1.1 (2001); EN 61000-4-8: Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
12/I07	IEC 61000-4-11, Ed. 1.1 (2001-03); EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
12/J111324	SAE J1113/24: Immunity to radiated electromagnetic fields; 10 kHz to 200 MHz - Crawford TEM cell and 10 kHz to 5 GHz - Wideband TEM cell
12/J111341	SAE J1113/41 (1995-07): Limits and methods of measurement of radio disturbance characteristics of components and modules for the protection of receivers used on board vehicles

Radio Test Methods

12/RSS119	RSS-119, Issue 6 (March 25, 2000): Land Mobile and Fixed Radio Transmitters and Receivers, 27.41 to 960 MHz
12/RSS123	RSS-123, Issue 1, Rev. 2 (November 6, 1999): Low Power Licensed Radiocommunication Devices
12/RSS125	RSS-125 (March 25, 2000): Land Mobile and Fixed Radio Transmitters and Receivers, 1.705 to 50.0 MHz, Primarily Amplitude Modulated
12/RSS131	RSS-131, Issue 2 (July 2003): Zone Enhancers for the Land Mobile Service
12/RSS132	RSS-132, Issue 1 (August 2002): 800 MHz Cellular Telephones Employing New Technologies
12/RSS133	RSS-133, Issue 3 (June 2005): 2GHz Personal Communications Services

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<i>NVLAP Code</i>	<i>Designation / Description</i>
12/RSS134	RSS-134, Issue 1, Rev. 1 (March 25, 2000): 900 MHz Narrowband Personal Communication Service
12/RSS135	RSS-135, Issue 1 (October 26, 1996): Digital Scanner Receivers
12/RSS136	RSS-136, Issue 5 (October 2002): Land and Mobile Station Radiotelephone Transmitters and Receivers Operating in the 26.960 - 27.410 MHz General Radio Service Band
12/RSS137	RSS-137, Issue 1, Rev. 1 (September 25, 1999): Location and Monitoring Service (902 - 928 MHz)
12/RSS139	RSS-139, Issue 1 (February 5, 2000): Licensed Radiocommunications Devices in the Band 2400 - 2483.5 MHz
12/RSS141	RSS-141, Issue 1, Revision 1 (February 7, 2004): Aeronautical Radiocommunication Equipment in the Frequency Band 117.975 - 137 MHz
12/RSS142	RSS-142, Issue 2 (August 2002): Narrowband Multipoint Communication Systems in the 1,427 - 1,430 MHz and 1,493.5 - 1,496.5 MHz Bands
12/RSS170	RSS-170, Issue 1, Rev. 1 (November 6, 1999): Satellite Mobile Earth Stations
12/RSS191	RSS-191, Issue 2 (August 2002): Local Multipoint Communication Systems in the 28 GHz Band; Point-to-Point and Point-to-Multipoint Broadband Communication Systems in the 24 GHz and 38 GHz Bands
12/RSS192	RSS-192, Issue 2 (2004): Fixed Wireless Access Systems in the Band 3450 - 3650 MHz
12/RSS193	RSS-193, Issue 1 (July 2003): Multipoint and Point-to-Point Communication Systems (MCS) in the Fixed Service Operating in the 2,150 - 2,160 MHz, 2,500 - 2,596 MHz and 2,686 - 2,690 MHz Bands
12/RSS210	RSS-210, Issue 6 (Sept. 2005): Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category 1 Equipment
12/RSS212	RSS-212, Issue 1 (February 27, 1999): Test Facilities and Test Methods for Radio Equipment

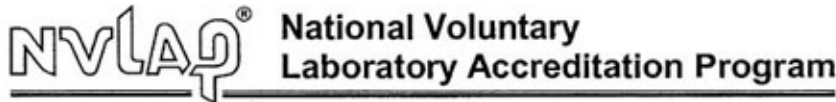
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NVLAP Code Designation / Description

12/RSS213	RSS-213, Issue 1 (April 24, 1999): 2 GHz Licence-Exempt Personal Communications Service Devices (PCS)
12/RSS215	RSS-215, Issue 1 (November 6, 1999): Analogue Scanner Receivers
12/RSS310	RSS-310, Issue 1 (Sept. 2005): Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment
12/RSSgen	RSS-Gen, Issue 1 (Sept. 2005): General Requirements and Information for the Certification of Radiocommunication Equipment

Telecommunications Test Methods:

12/FCC2a2	TIA/EIA 603-B (2002) with 47 CFR Part 2: Public Mobile Services in 47 CFR Part 22
12/FCC2b2	TIA/EIA 603-B (2002) with 47 CFR Part 2: Private Land Mobile Radio Services in 47 CFR Part 90
12/FCC2d1	TIA/EIA 603-B (2002) with 47 CFR Part 2: Experimental Radio, Auxiliary, Special Broadcast and Other Program Distributional Services in 47 CFR Part 74
12/FCC2e1	TIA/EIA 603-B (2002) with 47 CFR Part 2: International Fixed Public Radiocommunication Services in 47 CFR Part 23

MIL-STD-462 : Conducted Emissions:

12/A13	MIL-STD-462 Version D Method CE101
12/A14	MIL-STD-462 Version D Method CE102
12/A16	MIL-STD-461 Version E Method CE101
12/A17	MIL-STD-461 Version E Method CE102
12/A18	MIL-STD-461 Version E Method CE106

MIL-STD-462 : Conducted Susceptibility:

12/B12	MIL-STD-462 Version D Method CS101
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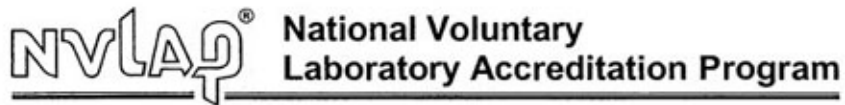
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<i>NVLAP Code</i>	<i>Designation / Description</i>
12/B13	MIL-STD-462 Version D Method CS103
12/B25	MIL-STD-461 Version E Method CS114
12/B26	MIL-STD-461 Version E Method CS115
12/B27	MIL-STD-461 Version E Method CS116

MIL-STD-462 : Radiated Emissions:

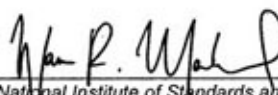
12/D04	MIL-STD-462 Version D Method RE101
12/D05	MIL-STD-462 Version D Method RE102
12/D06	MIL-STD-462 Version D Method RE103

MIL-STD-462 : Radiated Susceptibility:

12/E08	MIL-STD-462 Version D Method RS101
12/E09	MIL-STD-462 Version D Method RS103

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1.0 SUMMARY OF TEST REPORT

It was found that the Digi-Code Radio Transmitter, Model Number DC 5018, "meets" the radio interference radiated emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Section 15.231 for periodic operational in the 40.66-40.70 MHz Band and above 70 MHz. The AC Power Line Conducted emissions test was not required because the Digi-Code Radio Transmitter is powered from a D.C. power source. It does not have a line cord to plug into the A.C. power line.

This test report relates only to the items tested and contains the following number of pages.

Text: 37

2.0 INTRODUCTION

On December 9, 2005, a series of radio frequency interference measurements was performed on Digi-Code Radio Transmitter, Model Number DC 5018, Serial Number: N/A. The tests were performed according to the procedures of the FCC as stated in the "Methods of Measurement of Radio-Noise Emissions for Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" found in the American National Standards Institute, ANSI C63.4-2003. Tests were performed by personnel of D.L.S. Electronic Systems, Inc. who are responsible to Donald L. Sweeney, Senior EMC Engineer.

3.0 OBJECT

The purpose of this series of tests was to determine if the test sample could meet the radio frequency interference emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Sections 15.33, 15.35, 15.205, 15.209 & 15.231 for Intentional Radiators operating in the Band 40.66-40.70 and above 70 MHz.

4.0 TEST SET-UP

All emission tests were performed at D.L.S. Electronic Systems, Inc. and set up according to the American National Standards Institute, ANSI C63.4-2003, Section 8, (Figures 11a and 11b). All radiated emissions tests were performed with the test item placed on a 80 cm high rotating non-conductive table, located in the test room. Equipment normally operated on the floor was placed on a metal covered turntable which is flush with the surrounding conducting ground plane. The ground plane has an electrical isolation layer over its surface approximately 7 mm thick. The EUT is separated from the turntable ground plane by a non-conductive layer. The equipment under test was set up according to ANSI C63.4-2003, Sections 6 and 8.



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5.0 TEST EQUIPMENT (Bandwidths and Detector Function)

All preliminary data below 1000 MHz was automatically plotted using the HP Spectrum Analyzer or ESI 26/40 Fixed Tuned Receiver. The data was taken using Peak, Quasi-Peak or the Average Detector Functions as required. This information was then used to determine the frequencies of maximum emissions. Above 1000 MHz, final data was taken using the Average Detector.

Below 1000 MHz, final data was taken using the HP Spectrum Analyzer and/or ESI 26/40 Fixed Tuned Receiver. These plots were made using the Peak or Quasi-Peak Detector functions, with manual measurements performed on the questionable frequencies using the Quasi-Peak or the Average Detector Function of the Analyzer or ESI 26/40 Fixed Tuned Receiver as required. Above 1000 MHz, final data was taken using the Average Detector on the Spectrum Analyzer.

The bandwidths shown below are specified by ANSI C63.4-2003, Section 4.2.

Frequency Range	Bandwidth (-6 dB)
10 to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz
Above 1 GHz	1 MHz

A list of the equipment used can be found in Table 1. All primary equipment was calibrated against known reference standards with a verified traceable path to NIST.



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6.0 AMBIENT MEASUREMENTS

For emissions measurements, broadband antennas and an EMI Test Receiver with a panoramic spectrum display are used. First the frequency range is scanned and displayed on the test receiver display. Next the scanned frequency range is divided into smaller ranges, and then it is manually tuned through to determine the emissions from the EUT. A headset or loudspeaker is connected to the test receiver's AM/FM demodulated output as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT. If there is any doubt as to the source of the emission, it is further investigated by rotating the EUT, or by disconnecting the power from the EUT.

The EUT is set up in its typical configuration and operated in its various modes. For tabletop systems, cables are manipulated within the range of likely configurations. For floor-standing equipment, the cables are located in the same manner as the user would install them and no further manipulation is made. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions. For each mode of operation, the frequency spectrum is monitored. Variations in antenna height, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) are explored to produce the emissions that have the highest amplitude relative to the limit. These methods are performed to the specifications in MP-5 or ANSI C63.4-2003, as appropriate.



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7.0 DESCRIPTION OF TEST SAMPLE: (See also Paragraph 8.0)

7.1 Description:

433 MHz Super Heat Radio Transmitter used as a part of an RF access control system.

7.2 PHYSICAL DIMENSIONS OF EQUIPMENT UNDER TEST

Length: 3.75" x Width: 2.5" x Height: 0.75"

7.3 LINE FILTER USED:

NA

7.4 INTERNAL CLOCK FREQUENCIES:

Switching Power Supply Frequencies:

NA

Clock Frequencies:

4 MHz

7.5 DESCRIPTION OF ALL CIRCUIT BOARDS:

- | | |
|--------------------------------------|-------------|
| 1. Circuit Board Assembly | PN: 05-5017 |
| 2. PC Board Sub-Assembly (Hand) | PN: 06-5017 |
| 3. PC Board Sub-Assembly (Radial) | PN: 07-5017 |
| 4. PC Board Sub-Assembly (SMD) | PN: 08-5017 |
| 5. PC Board Sub-Assembly (IC) | PN: 09-5017 |
| 6. Microprocessor - Programmed (KDS) | PN: 14-5010 |
| 7. Microprocessor - OTP (Motorola) | PN: 14-1250 |



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8.0 ADDITIONAL DESCRIPTION OF TEST SAMPLE:
(See also Paragraph 7.0)

1: There were no additional descriptions noted at the time of test.

I certify that the above, as described in paragraph 7.0, describes the equipment tested and will be manufactured as stated.

By: _____
Signature Title

For: _____
Company Date



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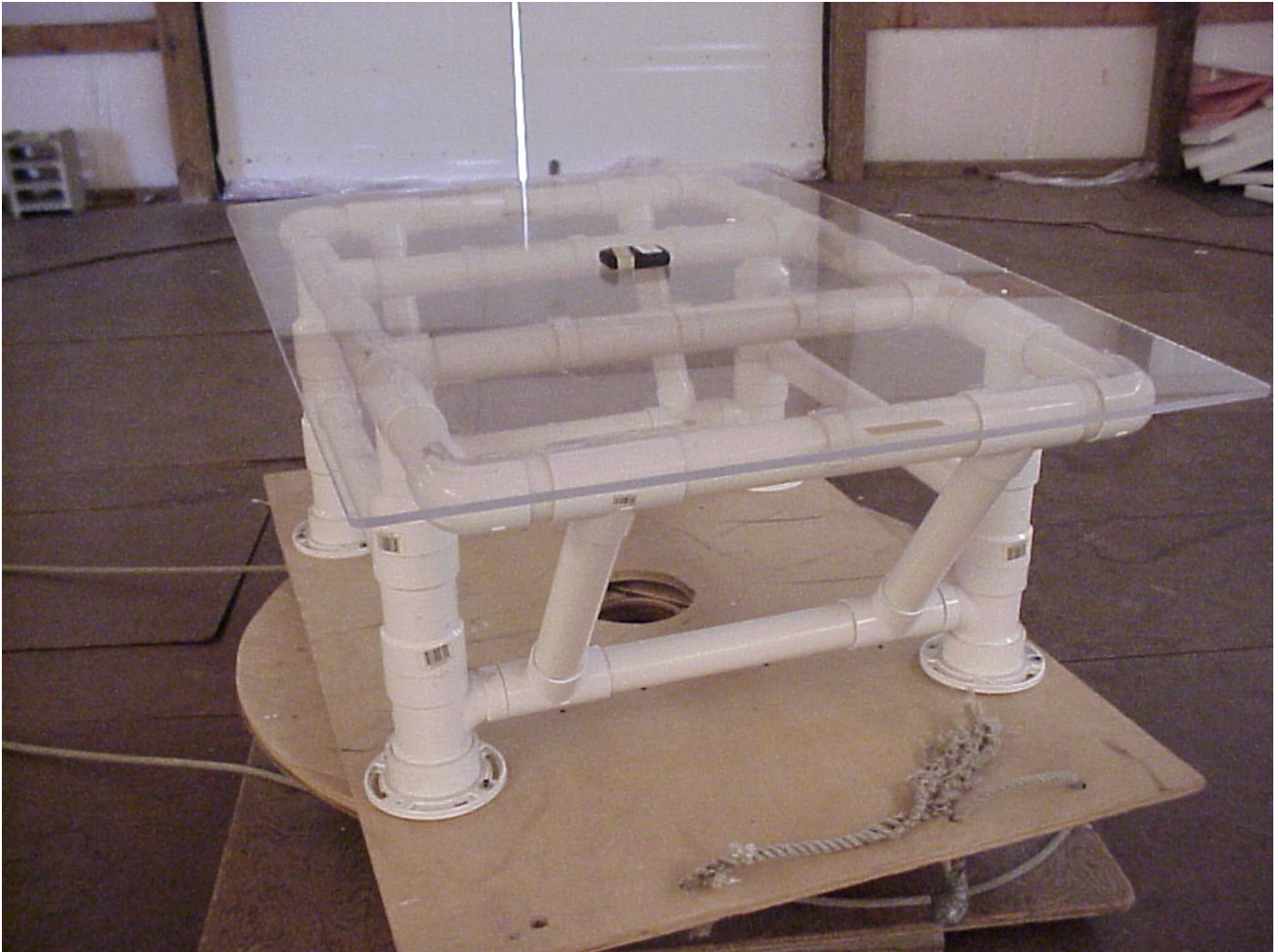
9.0 PHOTO INFORMATION AND TEST SET-UP

Item 0 Digi-Code Radio Transmitter

Model Number: DC 5018 Serial Number: N/A

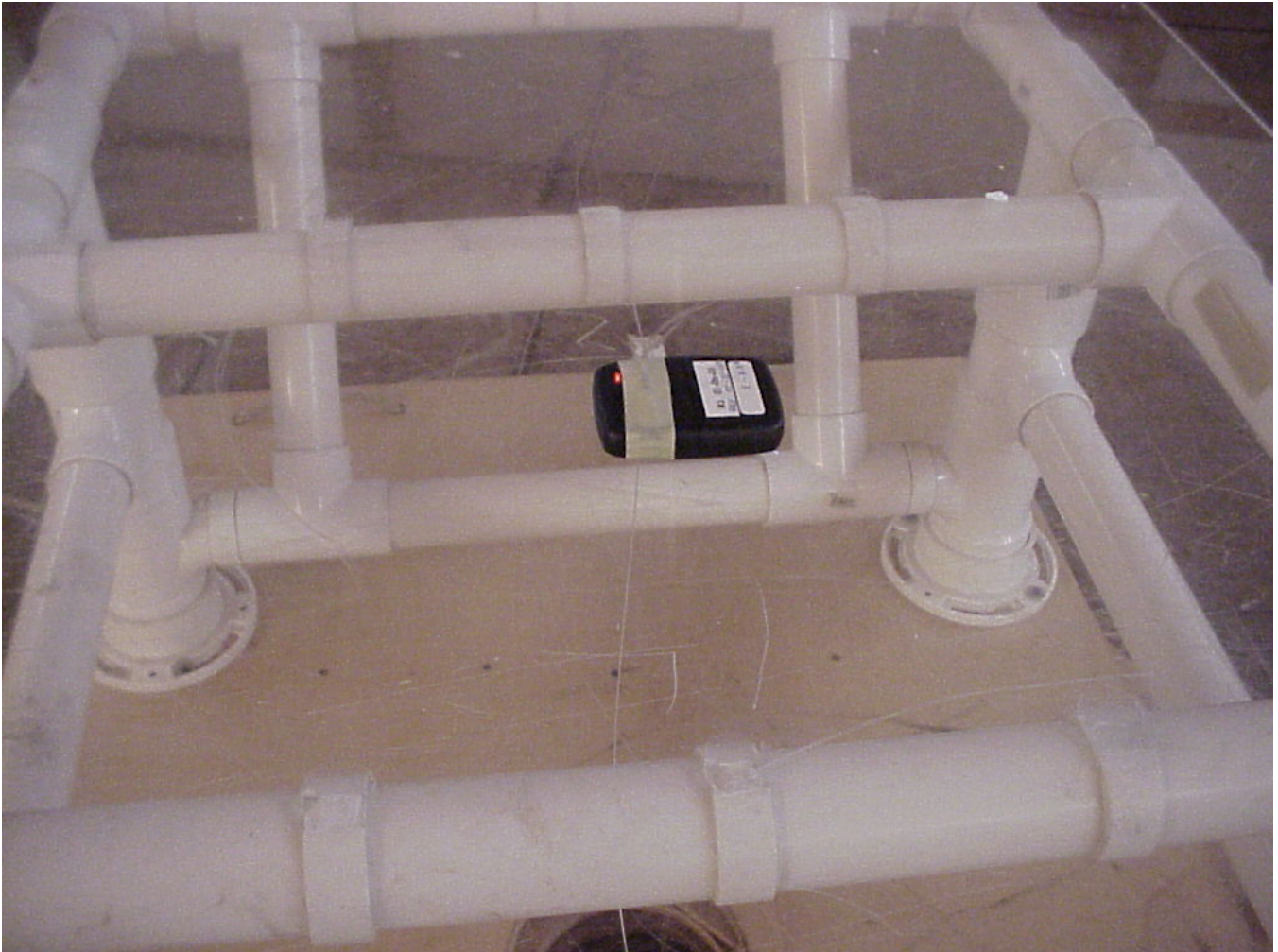
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10.0 RADIATED PHOTOS TAKEN DURING TESTING



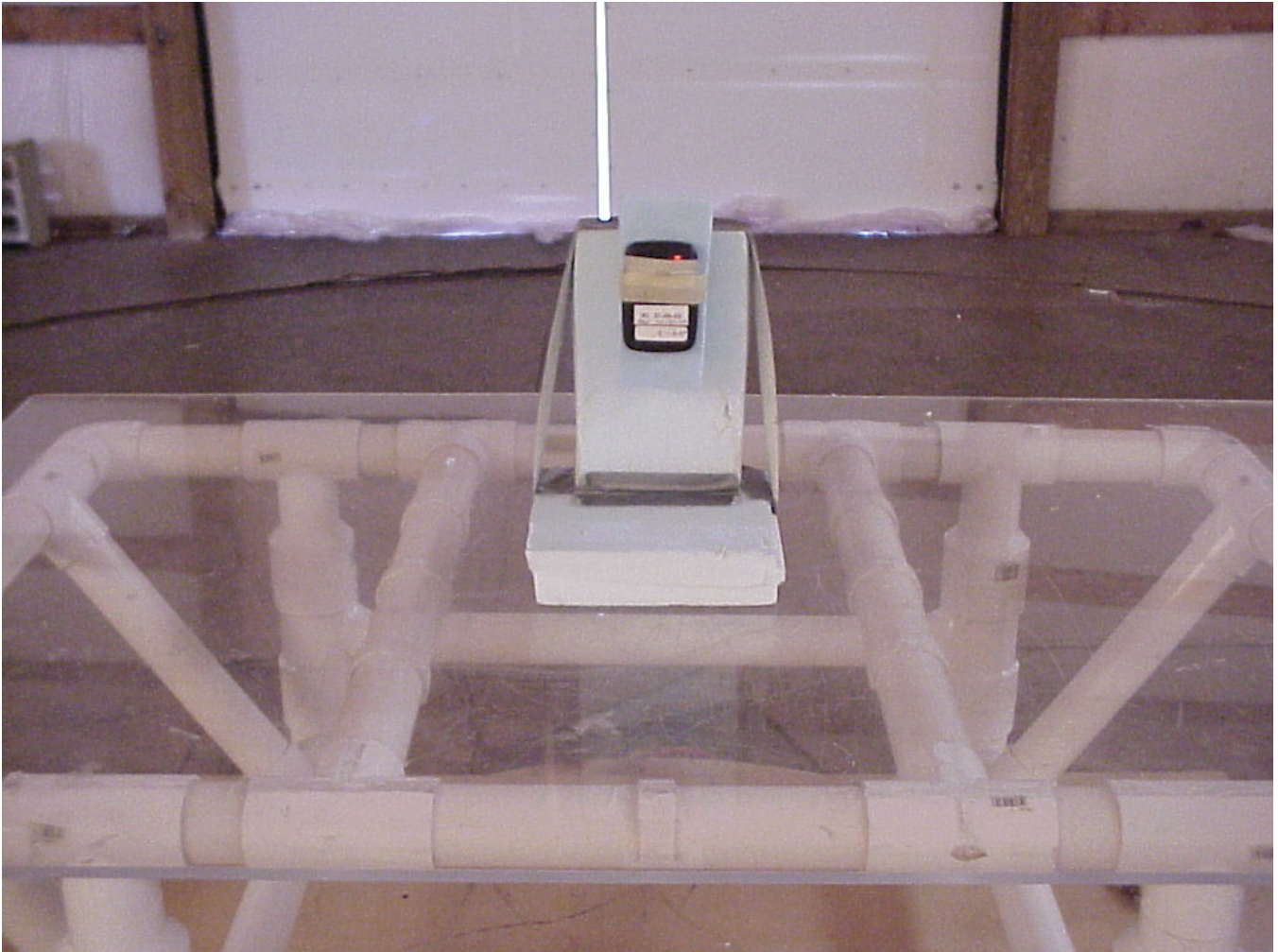
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10.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)



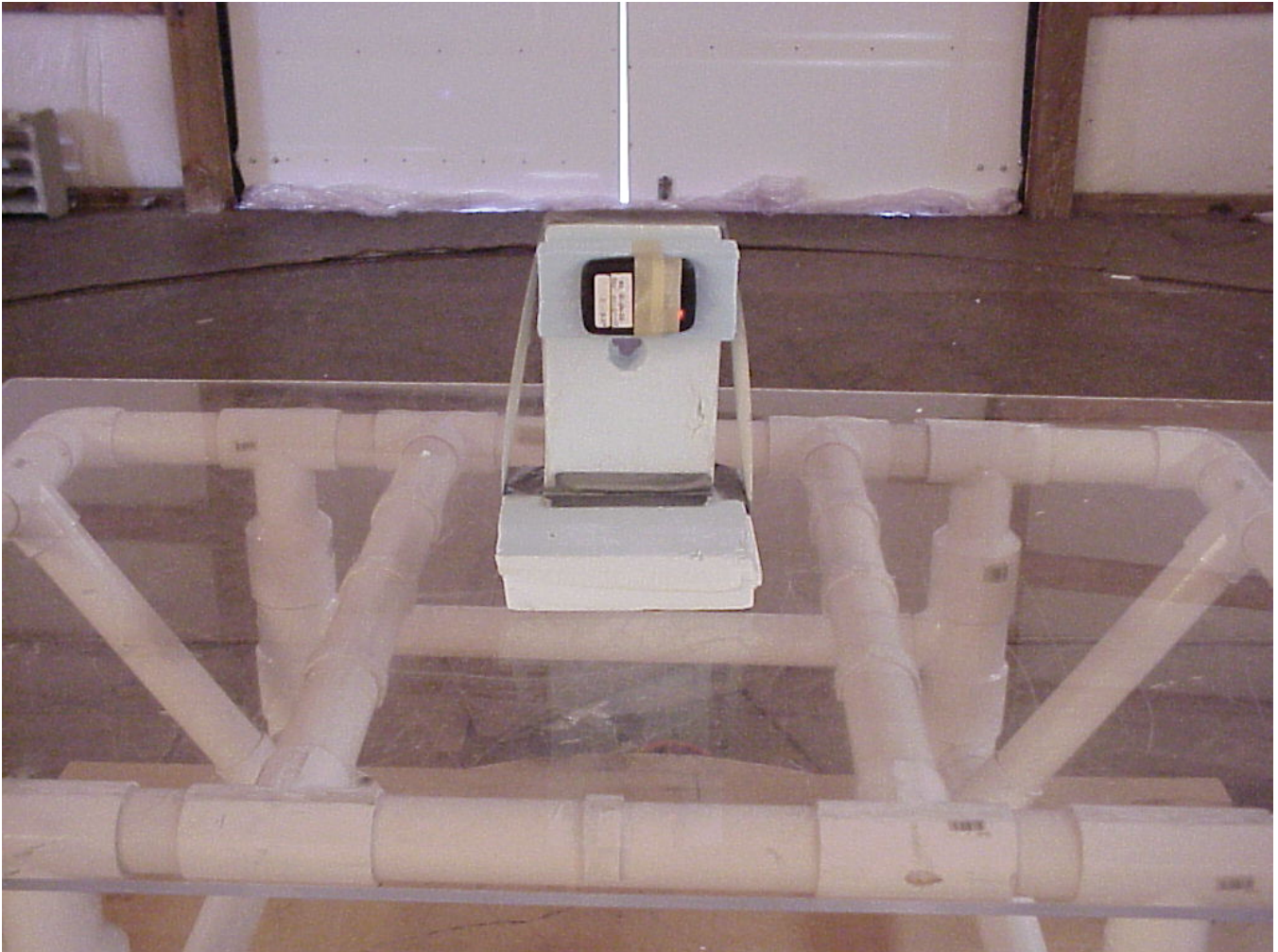
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10.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)



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10.0 RADIATED PHOTOS TAKEN DURING TESTING (CON'T)





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11.0 RESULTS OF TESTS

The radio interference emission charts results can be seen on the pages at the end of this report. Data sheets indicating the test measurements taken during testing can also be found at the end of this report. Points on the emission charts shown with a yellow mark are background frequencies that were verified during testing.

12.0 CONCLUSION

It was found that the Digi-Code Radio Transmitter, Model Number(s) DC 5018 "meets" the radio interference radiated emission requirements of the FCC "Rules and Regulations", Part 15, Subpart C, Section 15.231 for periodic operation in the 40.66-40.70 MHz Band and above 70 MHz. The AC Power Line Conducted emissions test was not required because the Digi-Code Radio Transmitter is powered from a D.C. power source. It does not have a line cord to plug into the A.C. power line.



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TABLE 1 – EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
Receiver	Rohde & Schwarz	ESI 26	837491/010	20 Hz – 26 GHz	11/06
Receiver	Rohde & Schwarz	ESI 40	837808/006	20 Hz – 40 GHz	12/06
Receiver	Rohde & Schwarz	ESI 40	837808/005	20 Hz – 40 GHz	12/06
Antenna	EMCO	3104C	00054891	20 MHz – 200 MHz	2/06
Antenna	Electrometrics	LPA-25	1114	200 MHz – 1 GHz	3/06
Antenna	EMCO	3104C	00054892	20 MHz – 200 MHz	3/06
Antenna	Electrometrics	3146	1205	200 MHz – 1 GHz	3/06
Antenna	EMCO	3104C	97014785	20 MHz – 200 MHz	2/06
Antenna	EMCO	3146	97024895	200 MHz – 1 GHz	3/06
Antenna	EMCO	3115	2479	1 GHz – 18 GHz	8/06
Antenna	EMCO	3115	99035731	1 GHz – 18 GHz	4/06
Antenna	Rohde & Schwarz	HUF-Z1	829381001	20 MHz – 1 GHz	2/06
Antenna	Rohde & Schwarz	HUF-Z1	829381005	20 MHz – 1 GHz	8/06

All primary equipment is calibrated against known reference standards with a verified traceable path to NIST.



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TABLE 1 – EQUIPMENT LIST

Test Equipment	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Due Dates
LISN	Solar	8012-50-R-24-BNC	8305116	10 MHz – 30 MHz	8/06
LISN	Solar	8012-50-R-24-BNC	814548	10 MHz – 30 MHz	8/06
LISN	Solar	9252-50-R-24-BNC	961019	10 MHz – 30 MHz	12/06
LISN	Solar	9252-50-R-24-BNC	971612	10 MHz – 30 MHz	10/06
LISN	Solar	9252-50-R-24-BNC	92710620	10 MHz – 30 MHz	7/06

All primary equipment is calibrated against known reference standards with a verified traceable path to NIST.



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APPENDIX A

TEST PROCEDURE

Part 15, Subpart C, Section 15.231e

ELECTRIC FIELD RADIATED EMISSIONS TEST



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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

1.0 PULSED OPERATION (Duty Cycle Correction Factor)

The radiated emission tests made at D.L.S. Electronic Systems, Inc. for the Digi-Code Radio Transmitter, Model Number DC 5018, are shown by the graphs on the following pages. The actual total "on time" during the 100 ms is 47.662 msec with a total "off time" of 52.34 msec resulting in a **6.44 dB Duty Cycle Correction Factor**.

To find the actual "on time" during the 100 msec period, the data word is multiplied by the number of data words per 100 msec, yielding actual on time. Taking this number and dividing it by the 100 msec period gives us the Duty Cycle. We then take the Log of the Duty Cycle and multiply it by 20. This gives us the Duty Cycle Correction Factor. The following method was used to determine the Duty Cycle Correction Factor:

Total on time during 100 msec.

$0.88577 \text{ usec/pulse on time} * 9 \text{ pulses} = 7.97193 \text{ msec (data word on time)}$

$1.89 \text{ msec/pulse on time} * 21 \text{ pulses} = 39.69 \text{ msec (data word on time)}$

$7.97193 \text{ msec (data on time)} + 39.69 \text{ msec (data on time)} = 47.66193 \text{ msec total "on time"}$

$47.662 \text{ msec (total "on time")} / 100 \text{ msec} = .4766193 \text{ Duty Cycle}$

$20 * \text{LOG}_{10} .4766193 = \mathbf{6.44 \text{ dB Duty Cycle Correction Factor}}$

NOTE:

For pulsed operation, the switches were set to generate their maximum "on" time, and measurements were made with the peak detector. As stated in Docket 86-422, the duty cycle of the pulse is determined from the total "on" time for the worst case condition during 100 msec. Using the percentage of the total "on" time over a 100 msec period, the total absolute average value was determined. As stated in Section 3, a maximum of 20 dB can be used.

See the following pages for the graphs of the actual measurements that were made:



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GRAPH(S) TAKEN OF THE PULSED OPERATION

PART 15.231

GRAPHS TAKEN OF THE PULSE TRAIN SHOWING THE FOLLOWING:

1. Number of Bits per Data Word
2. Number of Pulses per 100 msec
3. Off Time between Data Words
4. Data Word On Time

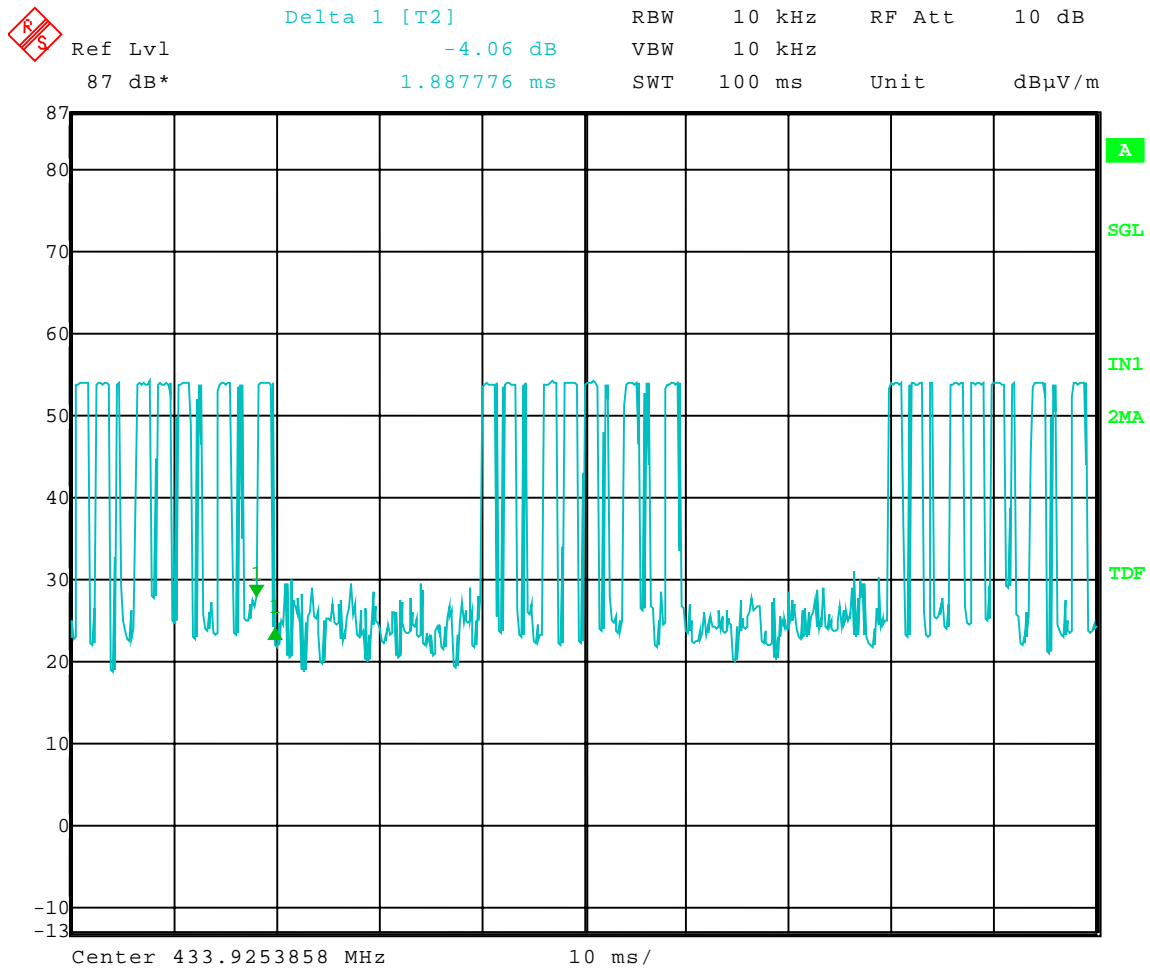


Company: Digi-Code Inc.
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Test Date: 12-09-2005
Company: Digi-Code, Inc.
EUT: DC-5018
Test: Duty Cycle
Operator: Craig Brandt
Comment: Small Pulse – $9 \times 885.77 \mu\text{s} = 7.97 \text{ ms}$
Large Pulse – $21 \times 1.89 \text{ ms} = 39.69 \text{ ms}$
Total on Time = 47.66 ms during 100 ms Sweep
 $20 \log (47.66/100) = -6.437$
Duty Cycle Correction Factor = 6.4 dB

Large Pulse ON Time:



Date: 9.DEC.2005 11:11:57

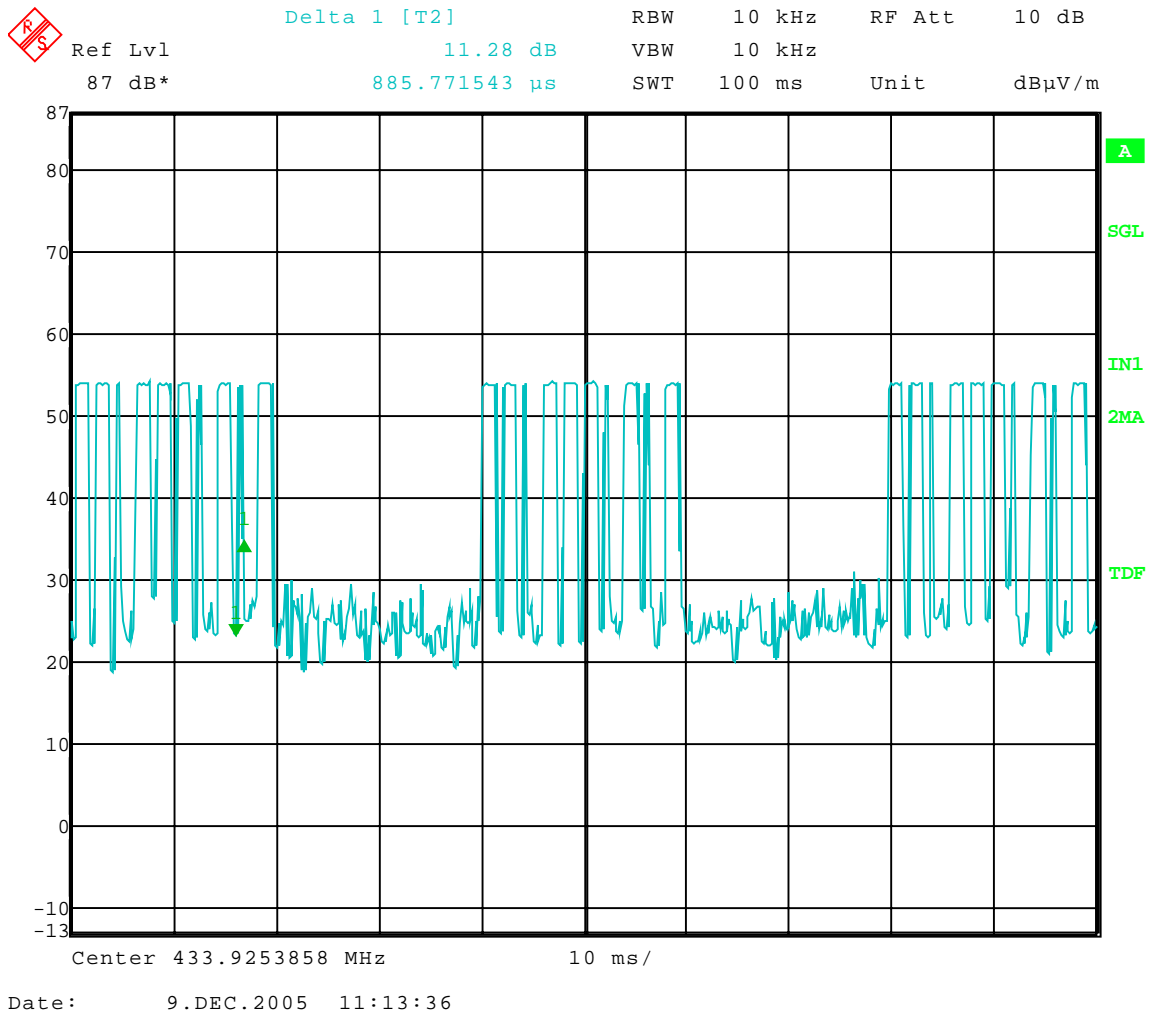


Company: Digi-Code Inc.
Model Tested: DC 5018
Report Number: 11872

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Test Date: 12-09-2005
Company: Digi-Code, Inc.
EUT: DC-5018
Test: Duty Cycle
Operator: Craig Brandt

Small Pulse ON Time:





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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

2.0 BANDWIDTHS

The bandwidth of the transmitter shall be confined to the following specifications as specified in Section 15.231c & d:

40.66 MHz to 40.7 MHz	$\pm 0.01\%$ within the band edges
70 MHz to 900 MHz	.25% of the center frequency
Above 900 MHz	.50% of the center frequency

The bandwidth is determined at the points 20 dB down from the modulated carrier.

As shown by the graph(s) on the following page(s), the bandwidth for the Digi-Code DC 5018 Radio Transmitter was measured at 11.8201 kHz, which meets the above specification. With a fundamental frequency of 433.924 MHz, the FCC Bandwidth limit is 108.481 kHz when multiplying the fundamental by 0.25%, with a margin of 96.661 kHz.



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GRAPH(S) TAKEN OF THE BANDWIDTH EMISSIONS

PART 15.231c & d

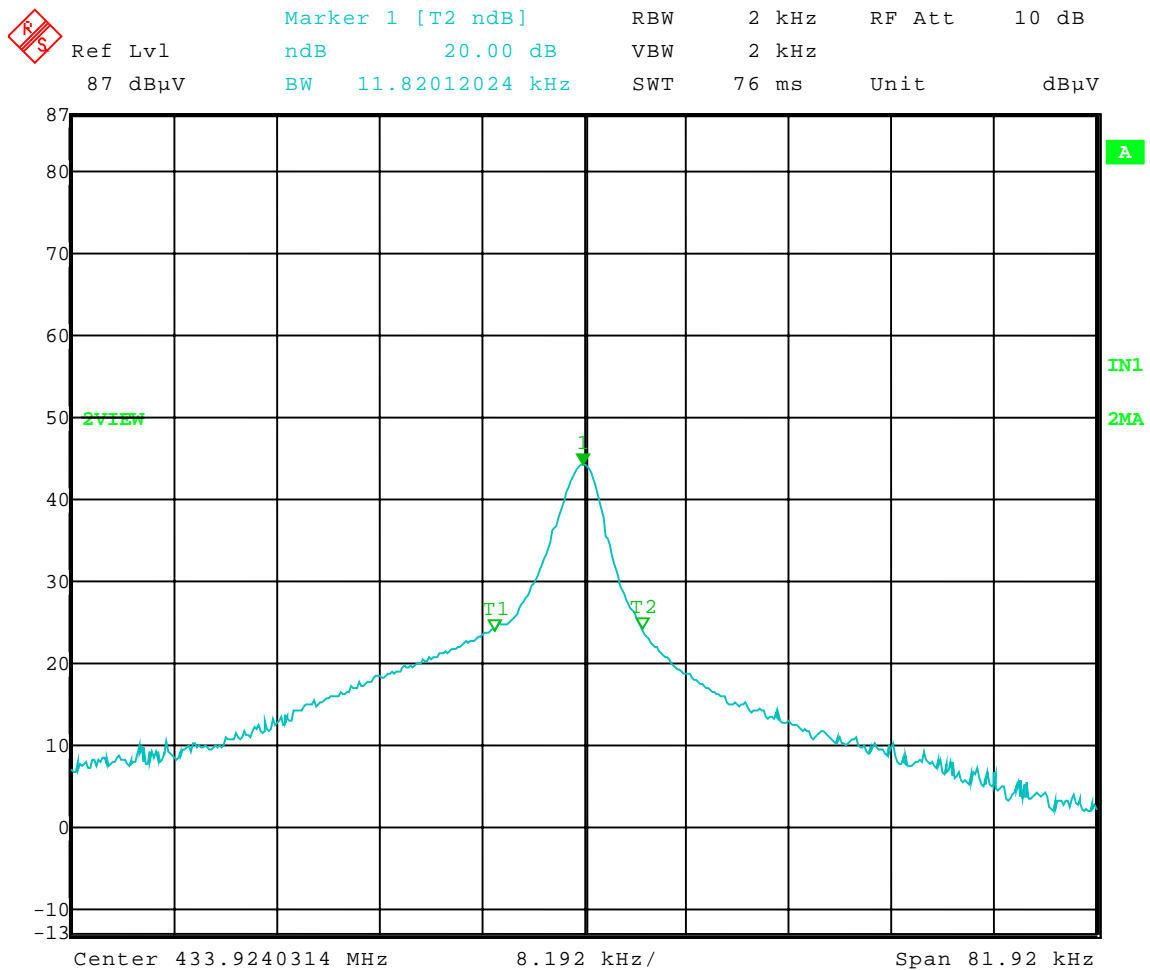


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Test Date: 12-09-2005
Company: Digi-Code, Inc.
EUT: DC-5018
Test: 20 dB Bandwidth
Operator: Craig Brandt
Comment: Frequency – 433.92 MHz

20 dB Bandwidth = 11.82 kHz



Date: 9.DEC.2005 11:31:20



Company: Digi-Code Inc.
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APPENDIX A

TEST PROCEDURE

ELECTRIC FIELD RADIATED EMISSIONS TEST

3.0 FIELD STRENGTH OF SPURIOUS EMISSION MEASUREMENTS - SECTION 15.231e

For operation in the band 40.66 to 40.70 MHz and above 70 MHz the field strength of any emissions within this band shall not exceed the following table at a distance of 3 meters as specified in FCC, Part 15, Section 15.231(e), based on the average value of the measured emissions. The limits are shown in the following table.

Fundamental Frequency in MHz	Field Strength of Fundamental (uV/m at 3m)	Field Strength of Harmonics (uV/m at 3m)
40.66 to 40.70	1000 (60.00 dBuV)	100 (40.00 dBuV)
70 to 130	500 (53.98 dBuV)	50 (33.98 dBuV)
130 to 174	500 (53.98 dBuV) to 1500 (63.52 dBuV)	50 (41.94 dBuV) to 150 (43.52 dBuV)
174 to 260	1500 (63.52 dBuV)	150 (43.52 dBuV)
260 to 470	1500 (63.52 dBuV) to 5000 (81.84 dBuV)	150 (43.52 dBuV) to 500 (61.94 dBuV)
470 and above	5000 (73.98 dBuV)	500 (53.98 dBuV)

NOTE:

Preliminary radiation measurements may have been performed at a 3 meters or ten meters test distance. The frequency range from 30 MHz to 1000 MHz was scanned at receive antenna heights from one to four meters, and with a 360° rotation of the EUT. Plots were made and the worst-case emissions were recorded.

As stated in 15.35b the 20 dB peak-to-average limit is applicable to all devices measured using an average detector.



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GRAPH(S) TAKEN OF FUNDAMENTAL AND SPURIOUS EMISSIONS

PART 15.231e



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Radiated Fundamental and Spurious Emissions – 30 MHz to 5 GHz Tested at a 3 Meter Distance

EUT: DC-5018
Manufacturer: Digi-Code, Inc.
Operating Condition: 68 deg F; 29% R.H.
Test Site: Site 2
Operator: Craig Brandt
Test Specification: FCC Part 15.231(b) and FCC Part 15.205
Comment: Continuous Transmit
Date: 12/09/2005

Notes: (1) The EUT was measured in 3 orthogonal axis and placed in the worst case axis for the following measurements.
 (2) All other emissions at least 20 dB under the limit.

Frequency (MHz)	Measurement Detector	Ant. Pol.	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Total Level (dBuV/m)	Duty Cycle Correction (dB)	Final Corrected (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Height (m)	EUT Angle (deg)	Comment
433.92	Max Peak	Vert	47.42	15.88	4.7	68.0	6.4	61.6	80.8	19.2	1.20	270	Fundamental
433.92	Max Peak	Horz	46.40	15.88	4.7	67.0	6.4	60.6	80.8	20.2	2.10	225	Fundamental
867.84	Max Peak	Vert	58.46	22.60	-18.7	62.4	6.4	56.0	60.8	4.8	1.10	90	Harmonic
867.84	Max Peak	Horz	57.67	22.60	-18.7	61.6	6.4	55.2	60.8	5.6	1.00	0	Harmonic
1301.76	Max Peak	Vert	63.75	24.74	-37.1	51.4	6.4	45.0	54.0	9.0	1.10	80	Res. Band
1301.76	Max Peak	Horz	65.33	24.74	-37.1	53.0	6.4	46.6	54.0	7.4	1.30	20	Res. Band
1735.68	Max Peak	Vert	61.16	26.20	-37.1	50.2	6.4	43.8	60.8	17.0	1.30	135	Harmonic
1735.68	Max Peak	Horz	66.09	26.20	-37.1	55.2	6.4	48.8	60.8	12.0	1.00	90	Harmonic
2169.60	Max Peak	Vert	59.45	27.78	-36.7	50.5	6.4	44.1	60.8	16.7	1.10	225	Harmonic
2169.60	Max Peak	Horz	63.34	27.78	-36.7	54.4	6.4	48.0	60.8	12.8	1.00	120	Harmonic



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4.0 RESTRICTED BANDS

As stated in Section 15.205a, the fundamental emission from the Digi-Code DC 5018 Radio Transmitter shall not fall within any of the bands listed below:

Frequency in MHz	Frequency in MHz	Frequency in MHz	Frequency in GHz
.0900 to .1100	162.0125 to 167.17	2310.0 to 2390	9.30 to 9.50
.4900 to .5100	167.72 to 173.20	2483.5 to 2500	10.60 to 12.70
2.1735 to 2.1905	240.00 to 285.00	2655.0 to 2900	13.25 to 13.40
8.362 to 8.3660	322.20 to 335.40	3260.0 to 3267	14.47 to 14.50
13.36 to 13.410	399.90 to 410.00	3332.0 to 3339	15.35 to 16.20
25.50 to 25.670	608.00 to 614.00	3345.8 to 3358	17.70 to 21.40
37.50 to 38.250	960.00 to 1240.00	3600.0 to 4400	22.01 to 23.13
73.00 to 75.500	1300.00 to 1427.00	4500.0 to 5250	23.60 to 24.00
108.00 to 121.94	1435.00 to 1626.50	5350.0 to 5450	31.20 to 31.80
123.00 to 138.00	1660.00 to 1710.00	7250.0 to 7750	36.43 to 36.50
149.90 to 150.00	1718.80 to 1722.20	8025.0 to 8500	ABOVE 38.60
156.70 to 156.90	2200.00 to 2300.00	9000.0 to 9200	

NOTE:

The noise floor within the Restricted Bands for the EMC Receiver and HP Spectrum Analyzer will typically lay 20 dB below the limit.