



166 South Carter, Genoa City, WI 53128

Company: Midmark Corporation
Model Tested: 9A4290005
Report Number: 17195
Project Number: 4699

Code of Federal Regulations 47 Part 15 – Radio Frequency Devices

Subpart C – Intentional Radiators

Section 15.249

**Operation within the bands 902 - 928 MHz,
2400 – 2483.5 MHz, 5725 – 5875 MHz,
and 24.0 – 24.5 GHz**

THE FOLLOWING MEETS THE ABOVE TEST SPECIFICATION

Formal Name:	625 Scale Hand Control
Kind of Equipment:	Transceiver
FCC ID Number:	U399A429005
Frequency Range:	2405 - 2480 MHz
Test Configuration:	Battery operated transceiver tested for intentional radiated emissions tabletop.
Model Number(s):	9A4290005
Model(s) Tested:	9A4290005
Serial Number(s):	N/A
Date of Tests:	August 29 - 30, 2011
Test Conducted For:	Midmark Corporation 60 Vista Drive Versailles, OH 45380, USA

NOTICE: “This test report relates only to the items tested and must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government”. Please see the "Description of Test Sample" page listed inside of this report.

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SIGNATURE PAGE

Tested By:

A handwritten signature in black ink that reads "Craig Brandt". The signature is written in a cursive style with a long horizontal stroke at the end.

Craig Brandt
Test Engineer

Reviewed By:

A handwritten signature in black ink that reads "William Stumpf". The signature is written in a cursive style with a long horizontal stroke at the end.

William Stumpf
OATS Manager

Approved By:

A handwritten signature in black ink that reads "Brian J. Mattson". The signature is written in a cursive style with a long horizontal stroke at the end.

Brian Mattson
General Manager



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United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 100276-0

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

is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).



2010-10-01 through 2011-09-30

Effective dates

Jolly D. Bruce
For the National Institute of Standards and Technology

NVLAP-01C (REV. 2009-01-28)



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1.0 Summary of Test Report

It was determined that the Midmark Corporation 625 Scale Hand Control, Model 9A4290005, complies with the requirements of CFR 47 Part 15 Subpart C Section 15.249.

Subpart C Section 15.249 Applicable Technical Requirements Tested:

Section	Description	Procedure	Note	Compliant?
15.215(c)	20 dB Emission Bandwidth	ANSI C63.4-2009 & ANSI C63.10-2009	1,2	Yes
15.205	Band Edge Measurement Near a Restricted Band	ANSI C63.4-2009 & ANSI C63.10-2009	1,2	Yes
15.35(c)	Duty Cycle Correction for Pulsed operation	ANSI C63.4-2009 & ANSI C63.10-2009	1,2	Yes
15.249 & 15.205 / 15.209	Field Strength of Emissions Fundamental and Spurious	ANSI C63.4-2009 & ANSI C63.10-2009	1,2	Yes

Note 1: Tested in 3 orthogonal planes.

Note 2: Radiated emission measurement.

2.0 Introduction

On August 29 - 30, 2011 the 625 Scale Hand Control, Model 9A4290005, as provided from Midmark Corporation was tested to the requirements of CFR 47 Part 15 Subpart C Section 15.249. To meet these requirements, the procedures contained within this report were performed by personnel of D.L.S Electronic Systems, Inc.

3.0 Test Facilities

D.L.S. Electronic Systems, Inc. is a full service EMC/Safety Testing Laboratory accredited to ISO 17025. NVLAP Certificate and Scope can be viewed at <http://www.dlsemc.com/certificate>. Our facilities are registered with the FCC, Industry Canada, and VCCI.

Wisconsin Test Facility:

D.L.S. Electronic Systems, Inc.
166 S. Carter Street
Genoa City, Wisconsin 53128

Wheeling Test Facility:

D.L.S. Electronic Systems, Inc.
1250 Peterson Drive
Wheeling, IL 60090



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4.0 Description of Test Sample

Description:

Wireless hand held remote with an LCD.

Type of Equipment / Frequency Range:

Hand Held / 2405 - 2480 MHz (16 channels with 4.6MHz channel separation)

Physical Dimensions of Equipment Under Test:

Length: 7 in x Width: 3.5 in x Height: 1.5 in

Power Source:

3.0 VDC

Internal Frequencies:

16 MHz

Transmit / Receive Frequencies Used For Test Purpose:

2405, 2445, 2480 MHz

Type of Modulation(s) / Antenna Type:

O-QPSK / Omni directional, integral to the PCB

Description of Circuit Board(s) / Part Number:

Scale Disply PCB	015-2674-00
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5.0 Test Equipment

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

D.L.S. Wisconsin – Site 3

Description	Manufacturer	Model Number	Serial Number	Frequency Range	Cal Dates	Cal Due Dates
30-1000 MHz						
Receiver	Rohde & Schwarz	ESI 40	837808/006	20 Hz – 40 GHz	4-11-11	4-11-12
Preamplifier	Rohde & Schwarz	TS-PR10	032001/005	9 kHz – 1 GHz	1-11-11	1-11-12
Antenna	EMCO	3104C	97014785	20 MHz – 200 MHz	9-9-10	9-9-12
Antenna	EMCO	3146	97024895	200 MHz – 1 GHz	9-9-10	9-9-12
Additional 1-18 GHz						
Preamp	Ciao	CA118-4010	101	1GHz-18GHz	1-25-11	1-25-12
Horn Antenna	EMCO	3115	9502-4451	1-18GHz	4-11-11	4-11-13
Filter- High-Pass	Q-Microwave	100462	1	4.2GHz-18GHz	5-3-11	5-3-12
Additional 18-26 GHz						
Preamp	Miteq	AMF-8B-180265-40-10P-H/S	438727	18GHz-26GHz	8-5-11	8-5-12
Horn Antenna	A.H. Systems	SAS-574	222	18 – 40GHz	5-4-10	5-4-12
High Pass Filter	Planar	CL22500-9000-CD-SS	PF1229/0728	15-40 GHz	8-3-11	8-3-12



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6.0 Test Arrangements

Emissions Measurement Arrangement:

All radiated emission measurements were performed at D.L.S. Electronic Systems, Inc. and set up according to ANSI C63.4-2009 and ANSI C63.10-2009, unless otherwise noted. Description of procedures and measurements can be found in Appendix B – Measurement Data. See Appendix A for additional photos of the test set up.

Unless otherwise noted, the bandwidth of the measuring receiver / analyzer used during testing is shown below.

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

7.0 Test Conditions

Test Conditions recorded during test:

Temperature and Humidity:

73°F at 53% RH

Battery / Supply Voltage:

3.0 VDC

8.0 Modifications Made To EUT For Compliance

None noted at time of test.



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9.0 Additional Descriptions

Continuous transmit, Continuous receive, Low, Mid, High channels
Tested in 3 orthogonal axis of rotation.

10.0 Results

Measurements were performed in accordance with ANSI C63.4-2009 and ANSI C63.10-2009.
Graphical and tabular data can be found in Appendix B at the end of this report.

11.0 Conclusion

The 625 Scale Hand Control, Model 9A4290005, as provided from Midmark Corporation tested on August 29 - 30, 2011 **meets** the requirements of CFR 47 Part 15 Subpart C Section 15.249.

Appendix A – Test Photos

Photo Information and Test Setup:

Item 0: 625 Scale Hand Control, Model 9A4290005

Radiated Emissions – Above 1 GHz



Appendix A

Radiated Emissions – 30-1000MHz



Appendix A

Radiated Emissions – 30-1000MHz





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Appendix A

Radiated Emissions – 30-1000MHz





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Appendix B – Measurement Data

1.0 Emission Bandwidth – 20 dB

Rule Part:

Section 15.215 (c)

Test Procedure:

ANSI C63.4-2009 and ANSI C63.10-2009

Limit:

Informative

Results:

Compliant
20 dB bandwidth: **2.68 MHz**

Sample Equation(s):

None

Notes:

This was a radiated emissions measurement. The maximum field strength of the emission was determined and the bandwidth was measured from the points at 20 dB down from the modulated carrier. The resolution bandwidth of the spectrum analyzer was set to a value within 1% to 5% of the emission bandwidth.



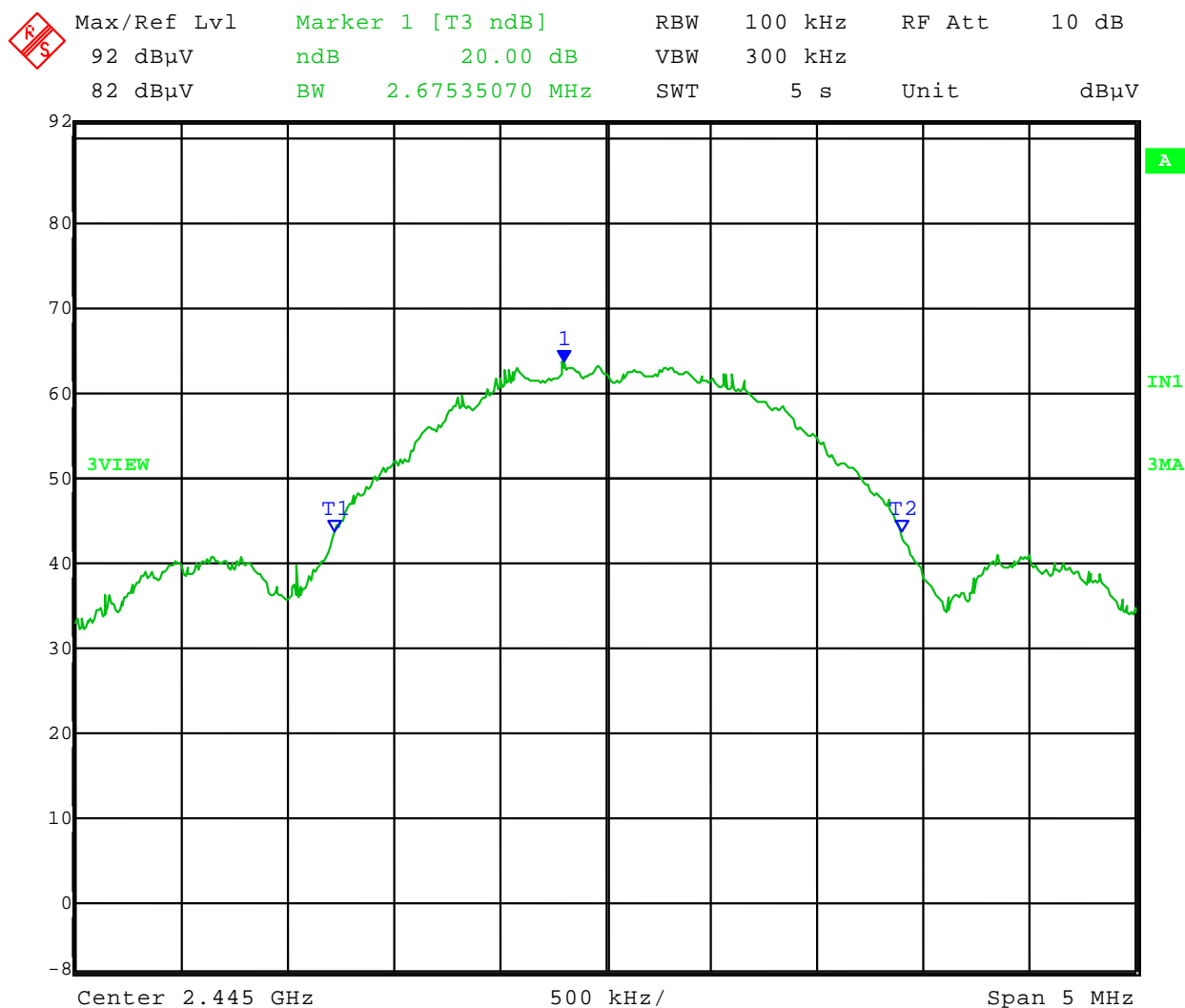
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Appendix B

Test Date: 08-29-2011
Company: Midmark
EUT: 625 Scale Hand Control
Test: 20 dB Bandwidth
Operator: Craig B

Comment: 20 dB Bandwidth = 2.68 MHz



Date: 29.AUG.2011 10:23:50



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Appendix B

2.0 Band Edge Measurement

Rule Part:

15.205

Test Procedure:

ANSI C63.4-2009 and ANSI C63.10-2009

Limit:

15.205 / 15.209

Results:

Compliant

Sample Equation(s):

None

Notes:

See below

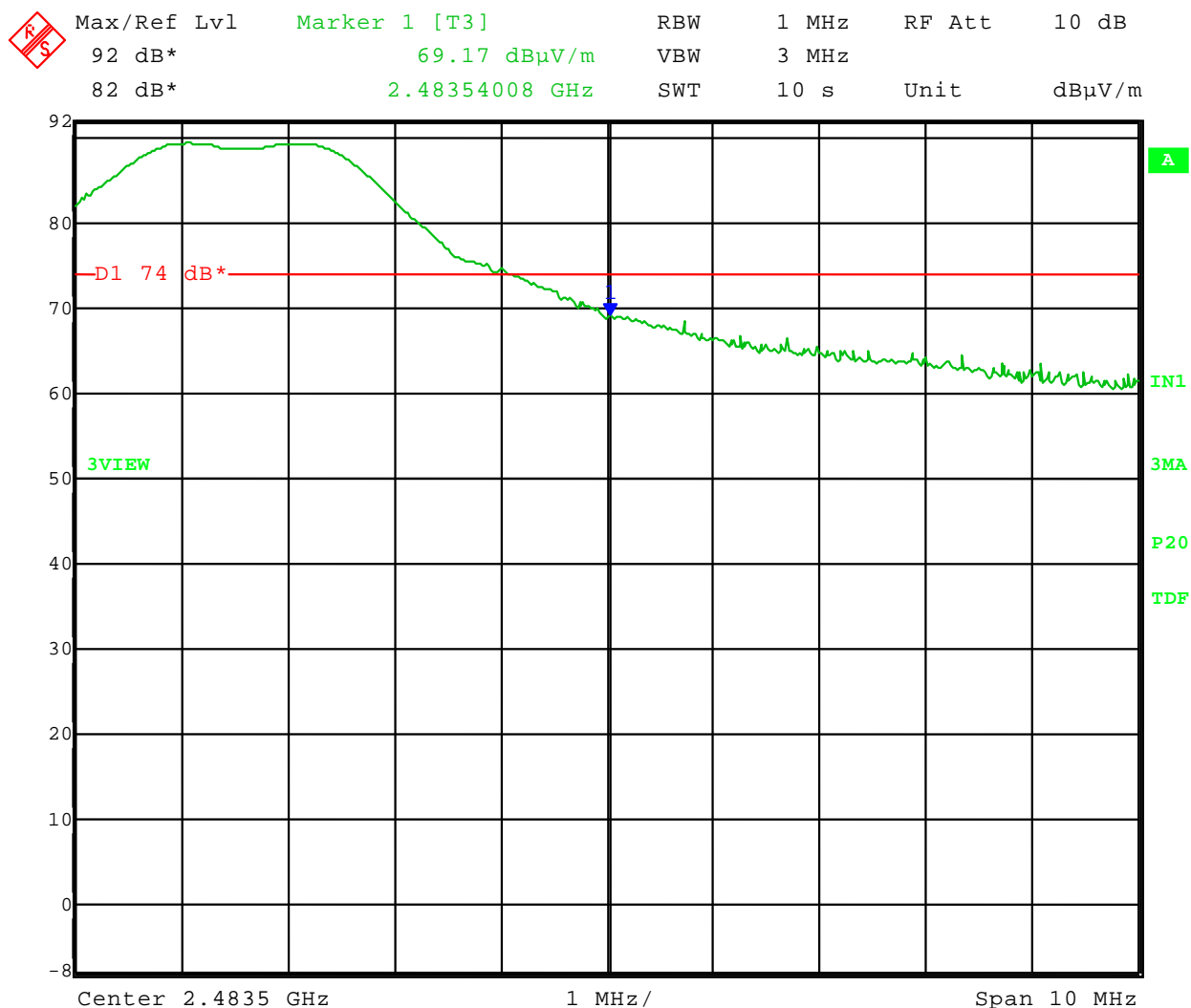


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Appendix B

Test Date: 08-29-2011
Company: Midmark Corp.
EUT: 625 Scale Hand Control
Test: Upper Band-Edge - Radiated
Rule part: FCC Part 15.249) and FCC Part 205
Band-Edge Frequency: 2.4835 GHz
Operator: Craig B
Comment: High Channel: Frequency – 2.480 GHz
Test distance: 3 meters
Peak Limit = 74 dB μ V/m; Average Limit 54 dB μ V/m
PEAK: 69.17 dB μ V/m at band edge
AVERAGE = PEAK – 34.1 dB (duty cycle correction) = 35.07 dB μ V/m at band edge



Date: 29.AUG.2011 09:51:45



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Appendix B

3.0 Duty Cycle Correction

Rule Part:

15.35 (c)

Test Procedure:

ANSI C63.4-2009 and ANSI C63.10-2009

Limit:

Informative

Results:

Duty Cycle Correction: 34.1 dB

Sample Equation(s):

See data

Notes:

2 pulses at 0.986 ms = 1.972 ms ON during 100 ms sweep.

$20 \log (1.972 \text{ ms} / 100 \text{ ms}) = -34.1$

Duty cycle correction factor = 34.1 dB



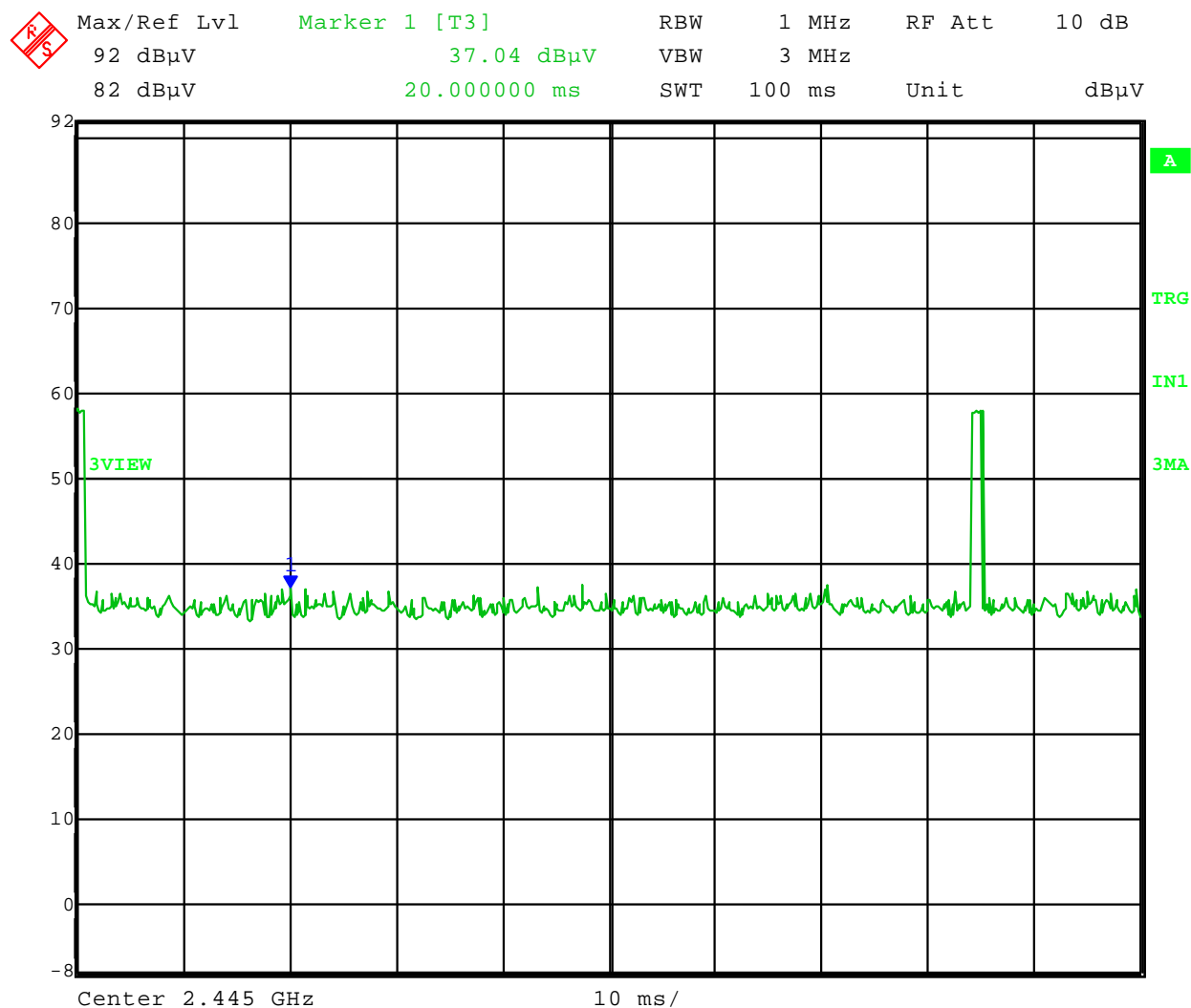
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Appendix B

Test Date: 08-29-2011
Company: Midmark
EUT: 625 Scale Hand Control
Test: Duty Cycle – Normal Operation
Operator: Craig B
Comment: 2 pulses at 0.986 ms = 1.972 ms ON during 100 ms sweep.
20 Log (1.972/100) = -34.1
Duty cycle correction factor = 34.1 dB.

100 ms sweep:



Date: 29.AUG.2011 10:07:41



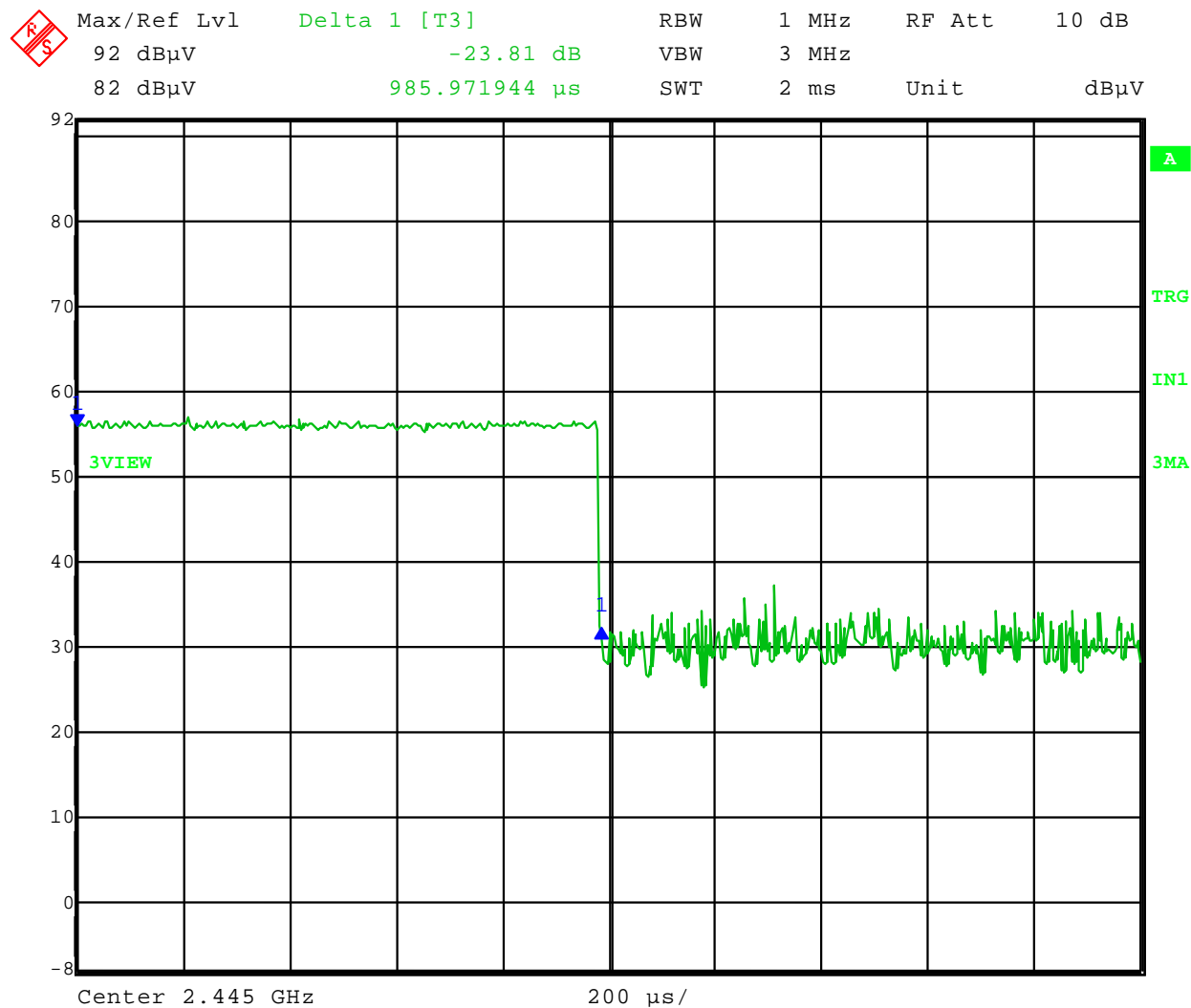
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Company: Midmark Corporation
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Appendix B

Test Date: 08-29-2011
Company: Midmark
EUT: 625 Scale Hand Control
Test: Duty Cycle – Normal Operation
Operator: Craig B
Comment: 2 pulses at 0.986 ms = 1.972 ms ON during 100 ms sweep.
20 Log (1.972/100) = -34.1
Duty cycle correction factor = 34.1 dB.

Duration of one pulse:



Date: 29.AUG.2011 10:08:54



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Appendix B

4.0 Field Strength of Emissions – Fundamental and Spurious

Rule Part:

15.249 including 15.205

Test Procedure:

ANSI C63.4-2009 and ANSI C63.10-2009

Limit:

15.249 (a)

Results:

Compliant

Sample Equation(s):

Final Corrected = Total Level - Duty Cycle Correction

Margin = Limit - Final Corrected

Level = Total Level - System Loss - Antenna Factor

Notes:

Tested at a 3 meter distance 30 MHz to 10 GHz

Tested at a 1 meter distance 10 GHz to 26 GHz

All other emissions at least 20 dB below the limit

Compliance is shown by measurement with a peak detector and applying a duty cycle corrected value to the average limit (see above equations).



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Radiated Fundamental and Spurious Emissions – 30 MHz to 26 GHz

30 MHz to 10 GHz Tested at a 3 Meter Distance

10 GHz to 26 GHz Tested at a 1 Meter Distance

EUT: Model: Midmark 625 Scale Hand Control Transceiver
Manufacturer: Midmark Corporation
Operating Condition: 70 deg F; 60% R.H.
Test Site: Site 3
Operator: Craig B
Test Specification: FCC Part 15.249 and Part 15.205
Comment: Transmit at Low channel: 2.405 GHz
Date: 08-29-2011
Notes: All other emissions at least 20 dB under the limit.

Frequency (GHz)	Measurement Type	Antenna Polarization	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Duty Cycle Correction (dB)	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	EUT Angle (deg)	Comment
2.405	Max Peak	Vert	62.74	28.33	1.7	0	92.8	114	21.2	1.00	0	Fundamental
2.405	Average	Vert	62.74	28.33	1.7	-34.1	58.7	94	35.3	1.00	0	Fundamental
2.405	Max Peak	Horz	62.76	28.33	1.7	0	92.8	114	21.2	2.20	0	Fundamental
2.405	Average	Horz	62.76	28.33	1.7	-34.1	58.7	94	35.3	2.20	0	Fundamental
4.810	Max Peak	Vert	71.34	33.04	-38.9	0	65.5	74	8.5	1.00	80	Harmonic
4.810	Average	Vert	71.34	33.04	-38.9	-34.1	31.4	54	22.6	1.00	80	Harmonic
4.810	Max Peak	Horz	72.79	33.04	-38.9	0	66.9	74	7.1	1.20	200	Harmonic
4.810	Average	Horz	72.79	33.04	-38.9	-34.1	32.8	54	21.2	1.20	200	Harmonic
7.215	Max Peak	Vert	55.73	36.11	-33.3	0	58.5	74	15.5	1.00	350	Harmonic
7.215	Average	Vert	55.73	36.11	-33.3	-34.1	24.4	54	29.6	1.00	350	Harmonic
7.215	Max Peak	Horz	58.58	36.11	-33.3	0	61.4	74	12.6	1.50	135	Harmonic
7.215	Average	Horz	58.58	36.11	-33.3	-34.1	27.3	54	26.7	1.50	135	Harmonic



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Radiated Fundamental and Spurious Emissions – 30 MHz to 26 GHz
30 MHz to 10 GHz Tested at a 3 Meter Distance
10 GHz to 26 GHz Tested at a 1 Meter Distance

EUT: Model: Midmark 625 Scale Hand Control Transceiver
Manufacturer: Midmark Corporation
Operating Condition: 70 deg F; 60% R.H.
Test Site: Site 3
Operator: Craig B
Test Specification: FCC Part 15.249 and Part 15.205
Comment: Transmit at Mid channel: 2.445 GHz
Date: 08-29-2011
Notes: All other emissions at least 20 dB under the limit.

Frequency (GHz)	Measurement Type	Antenna Polarization	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Duty Cycle Correction (dB)	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	EUT Angle (deg)	Comment
2.445	Max Peak	Vert	62.91	28.45	1.7	0	93.1	114	20.9	1.30	315	Fundamental
2.445	Average	Vert	62.91	28.45	1.7	-34.1	59.0	94	35.0	1.30	315	Fundamental
2.445	Max Peak	Horz	63.10	28.45	1.7	0	93.3	114	20.8	1.50	0	Fundamental
2.445	Average	Horz	63.10	28.45	1.7	-34.1	59.2	94	34.9	1.50	0	Fundamental
4.890	Max Peak	Vert	74.60	33.12	-39.8	0	67.9	74	6.1	1.50	270	Harmonic
4.890	Average	Vert	74.60	33.12	-39.8	-34.1	33.8	54	20.2	1.50	270	Harmonic
4.890	Max Peak	Horz	73.76	33.12	-39.8	0	67.1	74	6.9	1.40	0	Harmonic
4.890	Average	Horz	73.76	33.12	-39.8	-34.1	33.0	54	21.0	1.40	0	Harmonic
7.335	Max Peak	Vert	53.55	36.61	-32.2	0	58.0	74	16.0	1.00	170	Harmonic
7.335	Average	Vert	53.55	36.61	-32.2	-34.1	23.9	54	30.1	1.00	170	Harmonic
7.335	Max Peak	Horz	56.20	36.61	-32.2	0	60.6	74	13.4	1.50	135	Harmonic
7.335	Average	Horz	56.20	36.61	-32.2	-34.1	26.5	54	27.5	1.50	135	Harmonic



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Radiated Fundamental and Spurious Emissions – 30 MHz to 26 GHz
30 MHz to 10 GHz Tested at a 3 Meter Distance
10 GHz to 26 GHz Tested at a 1 Meter Distance

EUT: Model: Midmark 625 Scale Hand Control Transceiver
Manufacturer: Midmark Corporation
Operating Condition: 70 deg F; 60% R.H.
Test Site: Site 3
Operator: Craig B
Test Specification: FCC Part 15.249 and Part 15.205
Comment: Transmit at High channel: 2.480 GHz
Date: 08-29-2011
Notes: All other emissions at least 20 dB under the limit.

Frequency (GHz)	Measurement Type	Antenna Polarization	Level (dBuV)	Antenna Factor (dB/m)	System Loss (dB)	Duty Cycle Correction (dB)	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	EUT Angle (deg)	Comment
2.480	Max Peak	Vert	59.82	28.56	1.8	0	90.2	114	23.8	1.30	330	Fundamental
2.480	Average	Vert	59.82	28.56	1.8	-34.1	56.1	94	37.9	1.30	330	Fundamental
2.480	Max Peak	Horz	59.86	28.56	1.8	0	90.2	114	23.8	1.60	0	Fundamental
2.480	Average	Horz	59.86	28.56	1.8	-34.1	56.1	94	37.9	1.60	0	Fundamental
4.960	Max Peak	Vert	70.92	33.25	-39.1	0	65.1	74	8.9	1.30	0	Harmonic
4.960	Average	Vert	70.92	33.25	-39.1	-34.1	31.0	54	23.0	1.30	0	Harmonic
4.960	Max Peak	Horz	74.61	33.25	-39.1	0	68.8	74	5.2	1.50	210	Harmonic
4.960	Average	Horz	74.61	33.25	-39.1	-34.1	34.7	54	19.3	1.50	210	Harmonic
7.440	Max Peak	Vert	54.09	36.65	-33.8	0	56.9	74	17.1	1.00	315	Harmonic
7.440	Average	Vert	54.09	36.65	-33.8	-34.1	22.8	54	31.2	1.00	315	Harmonic
7.440	Max Peak	Horz	56.22	36.65	-33.8	0	59.1	74	14.9	1.00	225	Harmonic
7.440	Average	Horz	56.22	36.65	-33.8	-34.1	25.0	54	29.0	1.00	225	Harmonic



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END OF REPORT

Revision #	Date	Comments	By
1.0	10-21-2011	Preliminary Release	AA
1.1	10-25-2011	Added 16 channel note on page 6/ hid headers ii, iii, iv	JS