



TEST REPORT

Report Number: 3112645LEX-001
Project Number: 3112645

Evaluation of the Universal Procedure Table
Model Number: 9A408T

FCC ID: U399A408T
Industry Canada: 6978A-9A408T

FCC Part 15 Subpart B & FCC Part 15 Subpart C
ICES-003 & RSS-210 Issue 6

For

Midmark Corporation

Test Performed by:

Intertek
731 Enterprise Drive
Lexington, KY 40510

Test Authorized by:

Midmark Corporation
PO Box 286
Versailles, OH 45380

Prepared By: Jason Centers Date: 3/16/2007

Jason Centers, Senior Project Engineer

Approved By: Bryan C. Taylor Date: 3/16/2007

Bryan C. Taylor, Team Leader

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1 JOB DESCRIPTION

1.1 Company Information

Company Information	
Manufacturer:	Midmark Corporation
Address:	PO Box 286 Versailles, OH 45380
Contact Name:	Bob Menke
Telephone Number:	(937) 526-8312
Email Address:	bmenke@midmark.com

1.2 Test Sample Information

The Universal Procedure Table Model 9A408T is a powered examination chair for medical use. The chair can be controlled with either wired or wireless remotes. This report pertains only to the transmitter and receiver section of the Universal Procedure Table Model 9A408T.

Test sample	
Model Number:	9A408T
Serial Number:	Not Labeled
FCC ID:	U399A408T
Device Category:	Mobile
RF Exposure Category:	General Population/Uncontrolled Environment
Transmission:	Zigbee, 0-QPSK Modulation
Frequency Range (MHz)	2405-2480
Antenna Type:	Maxrad Model # MMSO2300 (Gain = 0dBi) with 8 inch RG-188/AU cable
Antenna Location:	External

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1.3 System Support Equipment

No support equipment was necessary for evaluation.

1.4 Cables Used During Testing

Table 1-1 contains the details of the cables used during the testing.

Table 1-1: Interconnecting Cables Used During Testing

Description	Cables				Connection	
	Length	Shielding	Ferrites	Connection		
				From	To	
AC Power Cable	6 ft	None	None	AC Power Source		AC Power Input

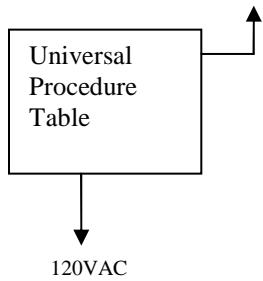
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1.5 System Block Diagram(s)

The diagrams below detail the interconnection of the EUT and its accessories during the testing.

Figure 1-1: Test Configuration



1.6 Mode(s) of operation / Engineering Judgments

The Universal Procedure Table was powered by 120VAC. Midmark Corporation provided a sample with special firmware that allowed constant transmission at the maximum duty cycle that will be used in normal operation. Tests were performed on the high, middle, and lowest channels at maximum output power.

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2 EXECUTIVE SUMMARY

Testing performed for: Midmark Corporation

Equipment Under Test: 9A408T

Receipt of Test Sample: 1/29/2007

Test Start Date: 1/29/2007

Test End Date: 3/15/2007

FCC RULE	IC RULE	DESCRIPTION OF TEST	RESULT	PAGE
§15.249, §15.209	RSS-210:2.6, RSS-210:A2.9	Field Strength of Spurious Radiation	Compliant	8
§15.109	ICES-003, RSS-Gen 6a	Radiated Receiver Emissions	Compliant	14
§15.207	ICES-003, RSS-Gen	Conducted Voltage Emissions	Compliant	17

2.1 Modifications required for compliance

No modifications were implemented by Intertek. All results in this report pertain to the un-modified sample provided to Intertek.

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3 TEST FACILITY

All testing was completed at the INTERTEK-Lexington location at 731 Enterprise Drive, Lexington Kentucky, 40510. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1: 1993 and ANSI C63.4: 1992. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

For radiated immunity testing, removable ferrite tiles are positioned between the transmitting antenna and the area occupied by the equipment under test. The remaining tests typically are performed outside the chamber on the conducting ground reference plane.



The Industry Canada filing number for this site is 2055. The FCC registration number is 485103. The VCCI registration numbers are R-2056, C-2214, and T-195.

3.1 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Horn Antenna	EMCO	3115	6556	7/28/2007
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	9/6/2007
Bilog Antenna	EMCO	3142C	00051864	11/14/2007
Preamplifier	Miteq	AFS44-00102000-30-10P-44	987410	6/15/2007
LISN	Fischer Custom Communication	FCC-LISN-50-50-2M	1026	5/9/2007

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4 FIELD STRENGTH OF SPURIOUS RADIATION

FCC §15.209, §15.249

RSS-210:2.6, RSS-210:A2.9

4.1 Test Procedure

- Measurements are made over the frequency range of 30 MHz to ten times the highest frequency operating within the device.
- The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.
- From 30 to 1000 MHz, a quasi-peak detector was used for measurement. Above 1000 MHz, average measurements were performed.
- The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.
- The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.
- The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.
- The EUT was a floor standing device so it was placed on the ground plane.
- Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4.
- The test was performed on the low, middle, and highest transmitting frequencies at maximum output power.
- For fundamental emissions near the restricted bands of §15.205, measurements were performed to show compliance with the limits in the restricted band. If the fundamental emission is within two standard bandwidths of the restricted band, the “marker delta-method” was performed. The EUT azimuth and antenna height were varied to obtain a maximum field-strength reading. The analyzer reading was corrected for cable loss, antenna factor, and pre-amp gain. Using bandwidths and detectors required by ANSI C63.4 an in-band measurement of the fundamental emission was performed. After obtaining a corrected reading for the fundamental emission, the spectrum analyzer was setup with a span large enough to capture the fundamental emission and the band-edge under investigation. A resolution bandwidth of 1% of the span (not less than 30kHz) was used. Several sweeps were performed in peak-hold mode. The amplitude delta between the peak of the fundamental emission and the peak emission at the restricted band edge was recorded. The amplitude delta is subtracted from the maximized field strength reading to determine compliance at the band-edge.
- If the fundamental emission is more than two standard bandwidths from the restricted band, a spectrum analyzer was setup to sweep through the restricted band. The analyzer reading was corrected for cable loss, antenna factor, and pre-amp gain. The EUT azimuth and antenna height were varied to obtain a maximum field-strength reading. Several sweeps were performed in max-hold mode and the result was compared to the limits of §15.209.
- The readings obtained from the measurement receiver were corrected for antenna factor, cable loss, and pre-amp gain. An example calculation is shown below.

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Example of Field Strength Calculation Method:

The measured field strength was calculated by summing the readings taken from the spectrum analyzer with the appropriate correction factors associated with the antenna losses and cable losses. The calculation formula and sample calculation are listed below.

Formula:

$$FS = RA + AF + CF$$

FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (Quasi-Peak) in dB μ V

AF = Antenna Factor in dB

CF = Cable Attenuation Factor in dB

Example Calculation:

RA = 19.48 dB μ V

AF = 18.52 dB

CF = 0.78 dB

$$FS = 19.48 + 18.52 + 0.78 = 38.78 \text{ dB}\mu\text{V/m}$$

Level in μ V/m = Common Antilogarithm $[(38.78 \text{ dB}\mu\text{V/m})/20] = 86.89 \mu\text{V/m}$

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4.2 Test Results

The Universal Procedure Table met the field strength requirements of FCC §15.249 for the fundamental, harmonics and spurious emissions. See Table 4-1 and for the measured fundamental and spurious emissions. All other spurious emissions not shown below were greater than 20dB below the limit.

Table 4-1: Field Strength of Spurious Radiation

TX Channel	Frequency	Polarity	Corr. Peak Reading. (dBuV/m)	Corr. Avg Reading. (dBuV/m)	Peak Limit (dBuV/m)	Avg. Limit (dBuV/m)	Results	Comments
Low	2.4044 GHz	H	60.51	49.83	114	94	Compliant	Fundamental
Low	2.4044 GHz	V	65.095	47.55	114	94	Compliant	Fundamental
Low	4.8091 GHz	H	46.866	25.34	74	54	Compliant	
Low	7.2137 GHz	H	51.337	26.53	74	54	Compliant	
Low	4.809 GHz	V	48.515	23.24	74	54	Compliant	
Low	7.2167 GHz	V	52.157	26.08	74	54	Compliant	
Middle	2.4446 GHz	V	67.6	49.31	114	94	Compliant	Fundamental
Middle	2.4455 GHz	H	61.405	51.19	114	94	Compliant	Fundamental
Middle	4.889 GHz	H	51.551	23.75	74	54	Compliant	
Middle	7.3368 GHz	H	51.867	27.05	74	54	Compliant	
Middle	4.8911 GHz	H	46.33	34.04	74	54	Compliant	
Middle	7.3337 GHz	V	54.186	36.7	74	54	Compliant	
High	2.4795 GHz	V	59.609	48.8	114	94	Compliant	Fundamental
High	2.4806 GHz	H	68.378	51.55	114	94	Compliant	Fundamental
High	4.9611 GHz	H	48.604	35.26	74	54	Compliant	
High	7.4387 GHz	H	51.565	34.79	74	54	Compliant	
High	4.959 GHz	V	55.218	25.48	74	54	Compliant	
High	7.4417 GHz	V	53.115	36.23	74	54	Compliant	

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Band-Edge Compliance: 2310MHz – 2390MHz Restricted Band, Low Channel

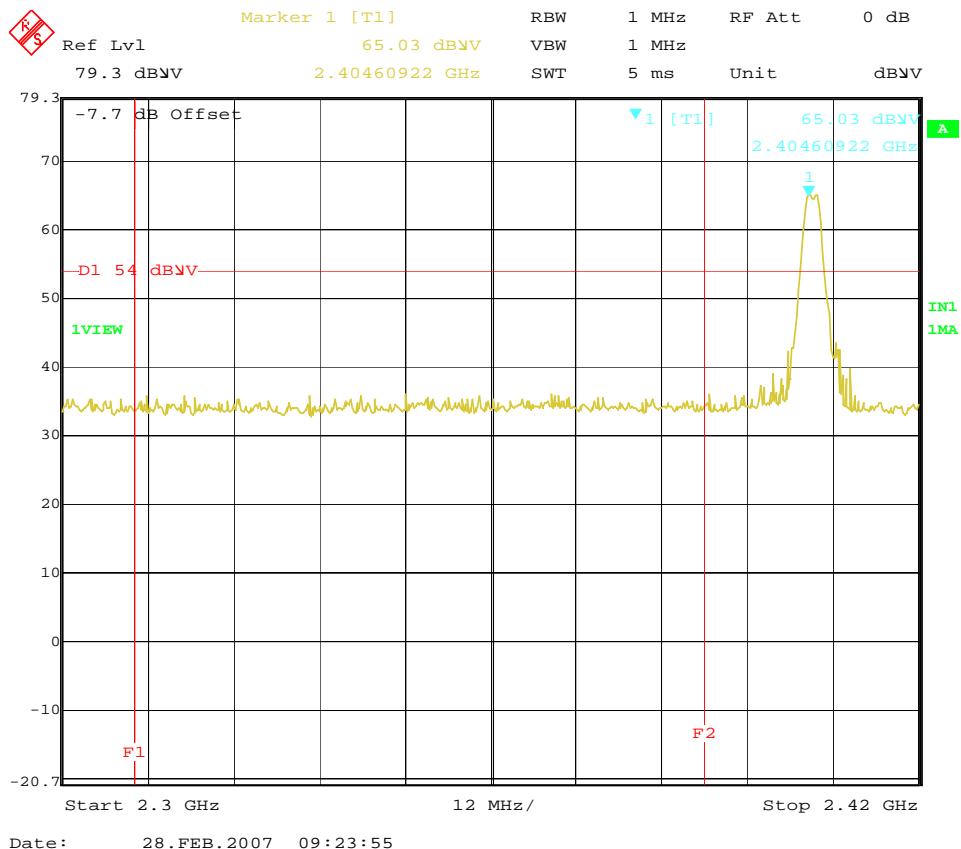


Exhibit 1

Evaluation For: Midmark Corporation
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Band-Edge Compliance (Marker-Delta Method): 2483.5MHz – 2500MHz Restricted Band, High Channel Peak Detector

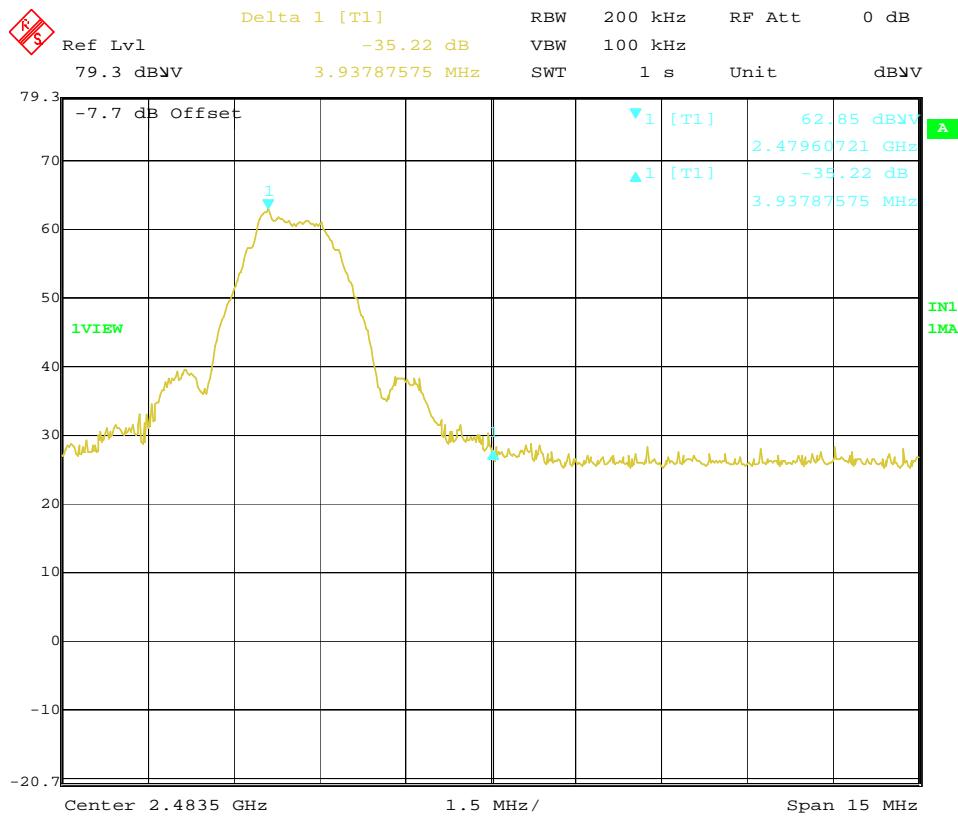


Exhibit 2

Peak Field Strength: 68.38 dBuV/m

Marker Delta Peak: 35.22 dB

Band-Edge Measurement = 68.38 dBuV/m – 35.22 dB = 33.16 dBuV/m

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Band-Edge Compliance (Marker-Delta Method): 2483.5MHz – 2500MHz Restricted Band, High Channel Average Detector

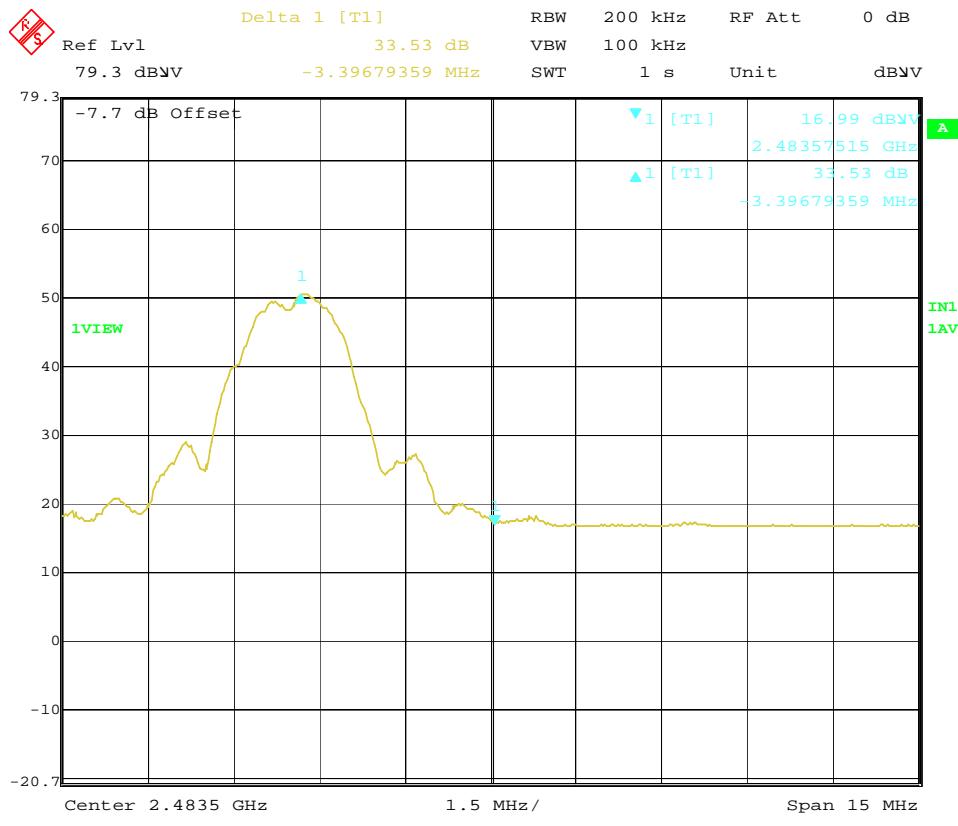


Exhibit 3

Average Field Strength: 51.55 dBuV/m

Marker Delta Average: 33.53 dB

Band-Edge Measurement = 51.55 dBuV/m -33.53 dB = 18.02 dBuV/m

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5 RADIATED RECEIVER EMISSIONS

FCC §15.109

ICES-003, RSS-Gen 6a

5.1 Test Procedure

- Measurements are made over the frequency range of 30 MHz to five times the highest frequency operating within the device.
- The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.
- From 30 to 1000 MHz, a quasi-peak detector was used for measurement. Above 1000 MHz, average measurements were performed.
- The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.
- The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.
- The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.
- The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.
- The test was performed on the device while in receive mode.
- Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4.
- The readings obtained from the measurement receiver were corrected for antenna factor, cable loss, and pre-amp gain. An example calculation is shown below.

Example of Field Strength Calculation Method:

The measured field strength was calculated by summing the readings taken from the spectrum analyzer with the appropriate correction factors associated with the antenna losses and cable losses. The calculation formula and sample calculation are listed below.

Formula:

$$FS = RA + AF + CF$$

FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (Quasi-Peak) in dB μ V

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Example Calculation:

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$$FS = 19.48 + 18.52 + 0.78 = 38.78 \text{ dB}\mu\text{V/m}$$

$$\text{Level in }\mu\text{V/m} = \text{Common Antilogarithm } [(38.78 \text{ dB}\mu\text{V/m})/20] = 86.89 \mu\text{V/m}$$

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5.2 Test Results

The Universal Procedure Table was **compliant** with the radiated emissions requirements of FCC §15.109 of Class B limits. The maximized radiated emissions data can be found in Exhibit 4. Graphical results are shown in Exhibit 5.

Maximized Quasi Peak and Average Emissions (Sorted by Delta)

Test Engineer: Jason Centers

Test Start Date: 3/19/2007 **Test End Date:** 3/19/2007

Emission Limit Tested To: Class B **Test Distance (EUT to Antenna):** 3m

All radiated emissions above the noise floor from the device were greater than 10dB below the limit when measured with a peak detector.

Exhibit 4

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Graphical Peak Scan

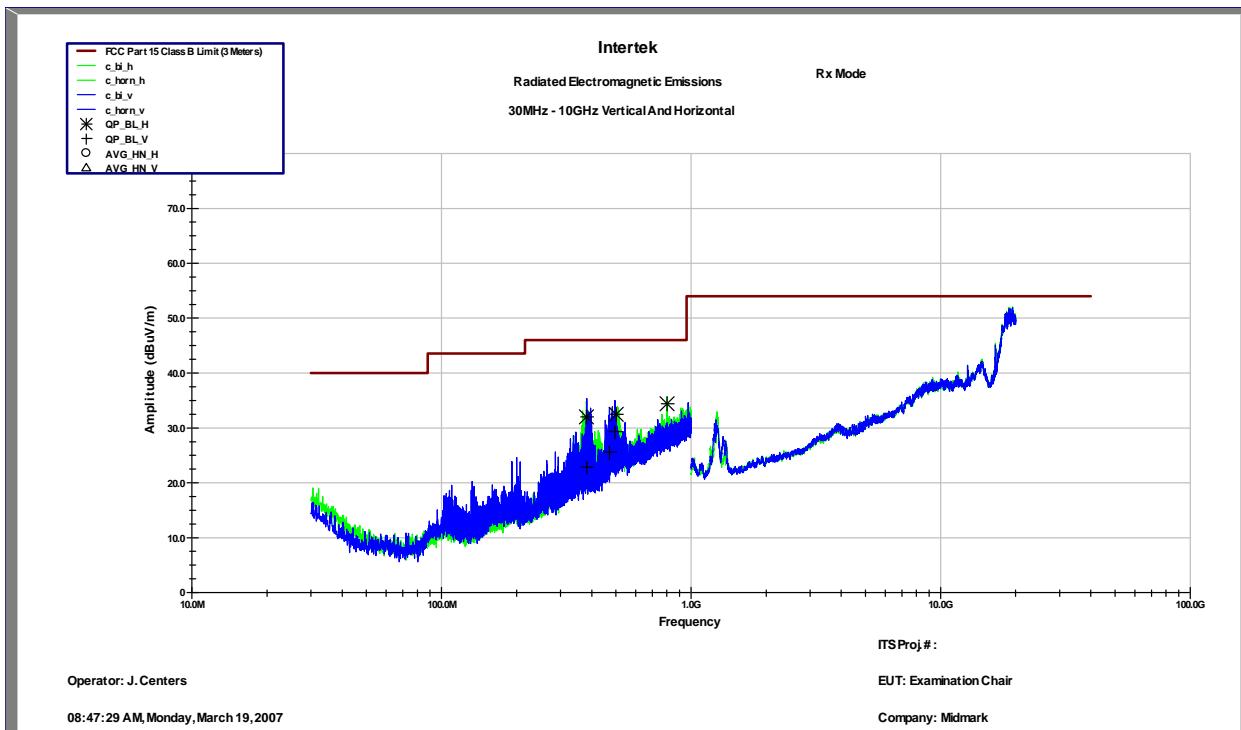


Exhibit 5

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6 CONDUCTED VOLTAGE EMISSIONS

§15.207

ICES-003

RSS-Gen 7.2.2

6.1 Test Method:

Conducted voltage emission measurements were performed as follows:

- The Universal Procedure Table was connected to the power source using a Line Impedance Stabilization Network (LISN) in line with each current carrying conductor.
- A spectrum analyzer was connected to the RF port of the LISN installed on the line under test.
- The LISNs installed on all lines not under test were terminated into 50Ω .
- The Universal Procedure Table was powered.
- The orientation of each connecting cable was varied to find the configuration that maximized the conducted emission.
- The insertion loss of the measurement cable, the LISN insertion loss, and the output of the spectrum analyzer were added together to give a corrected reading in dBuV.
- The corrected reading was compared to the limit above to determine compliance.
- A quasi-peak and/or average detector was used for measurements close to or exceeding the limit with a peak detector.
- The test was performed on the low, middle and highest transmitting frequencies at maximum output power.

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6.2 Test Results:

The Universal Procedure Table was **compliant** with conducted voltage emissions requirements of Part 15.207. No conducted voltage emissions on the AC power interface exceeded the quasi-peak or average limits. See Exhibit 6 for tabular results of conducted voltage emissions and Exhibit 7 through Exhibit 10 for graphical test results.

Conducted Voltage Emissions Tabular Data (L1 & L2)

Test Engineer: Jason Centers

Test Start Date: 1/31/2007 **Test End Date:** 3/19/2007

Emission Limit Tested To: 15.207

General Notes / Comments / Performance Monitoring Method:

Device powered by 120VAC, 60Hz

All emissions were greater than 20dB below the average limit when measured with the peak detector.

Exhibit 6

Evaluation For: Midmark Corporation
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Conducted Voltage Emissions Graphical Data – Low Channel

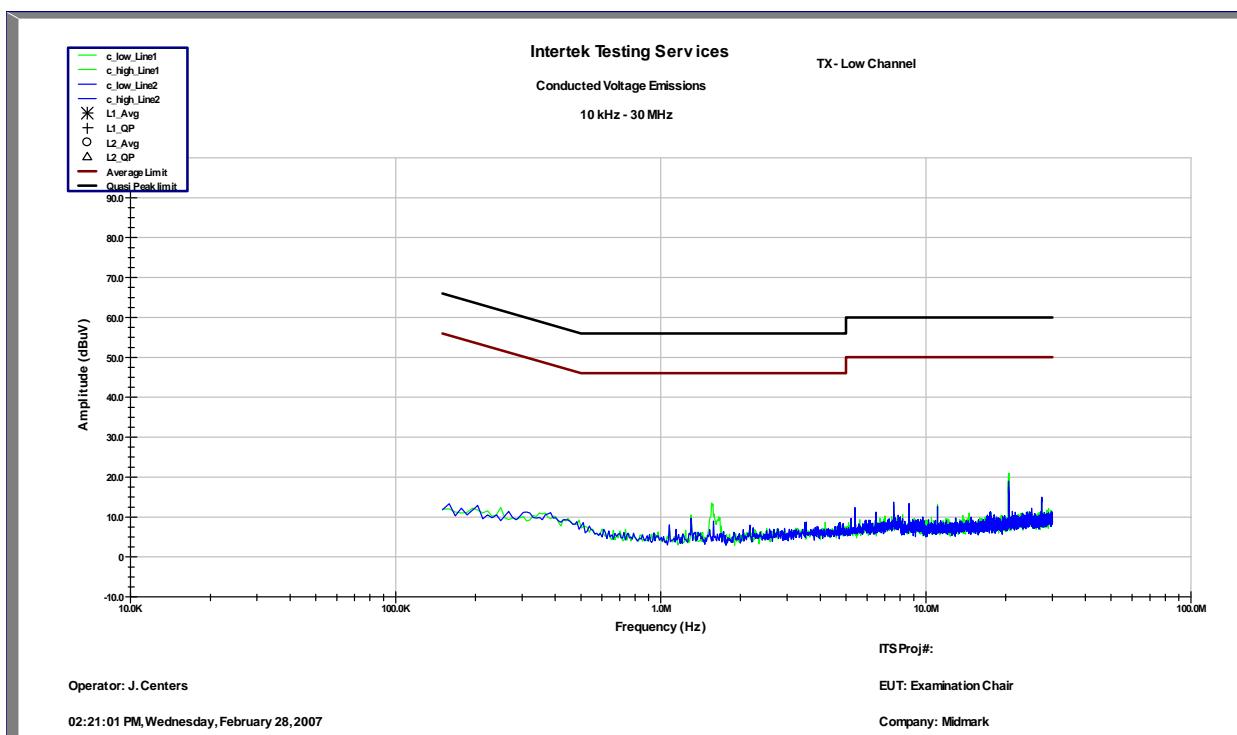


Exhibit 7
Conducted Voltage Emissions Graphical Data – Middle Channel

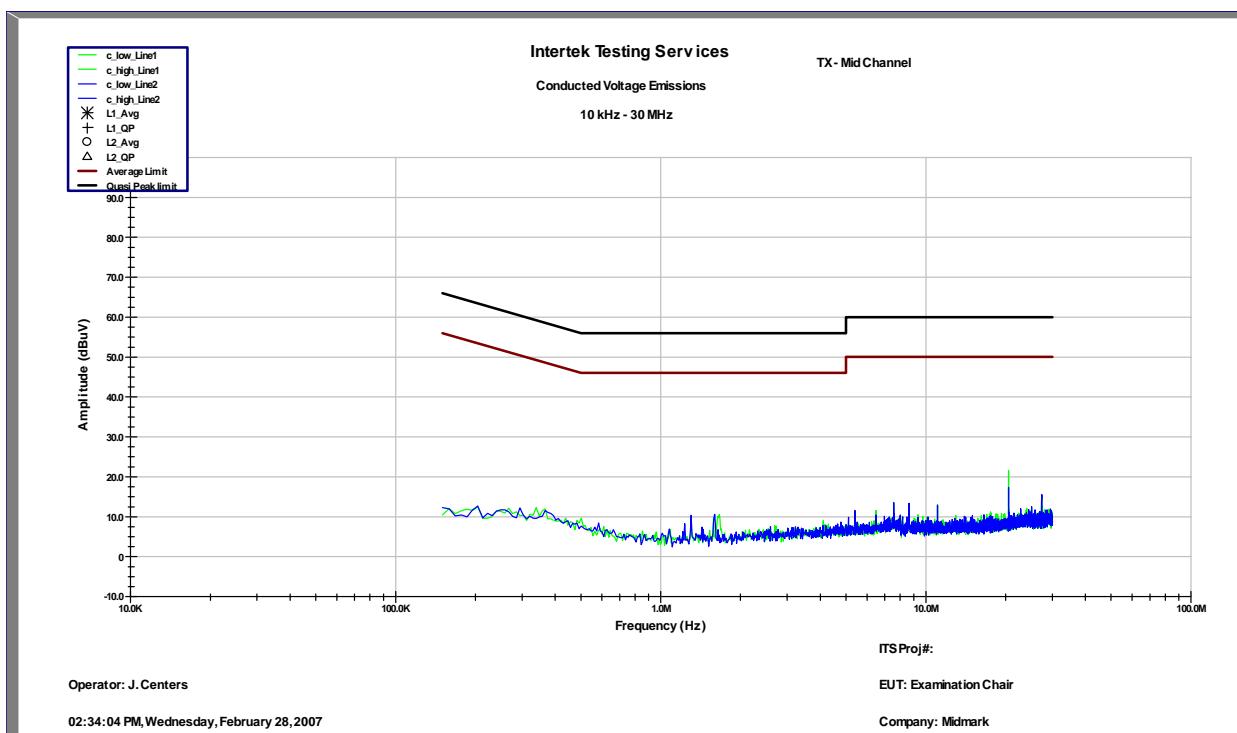


Exhibit 8

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Conducted Voltage Emissions Graphical Data – High Channel

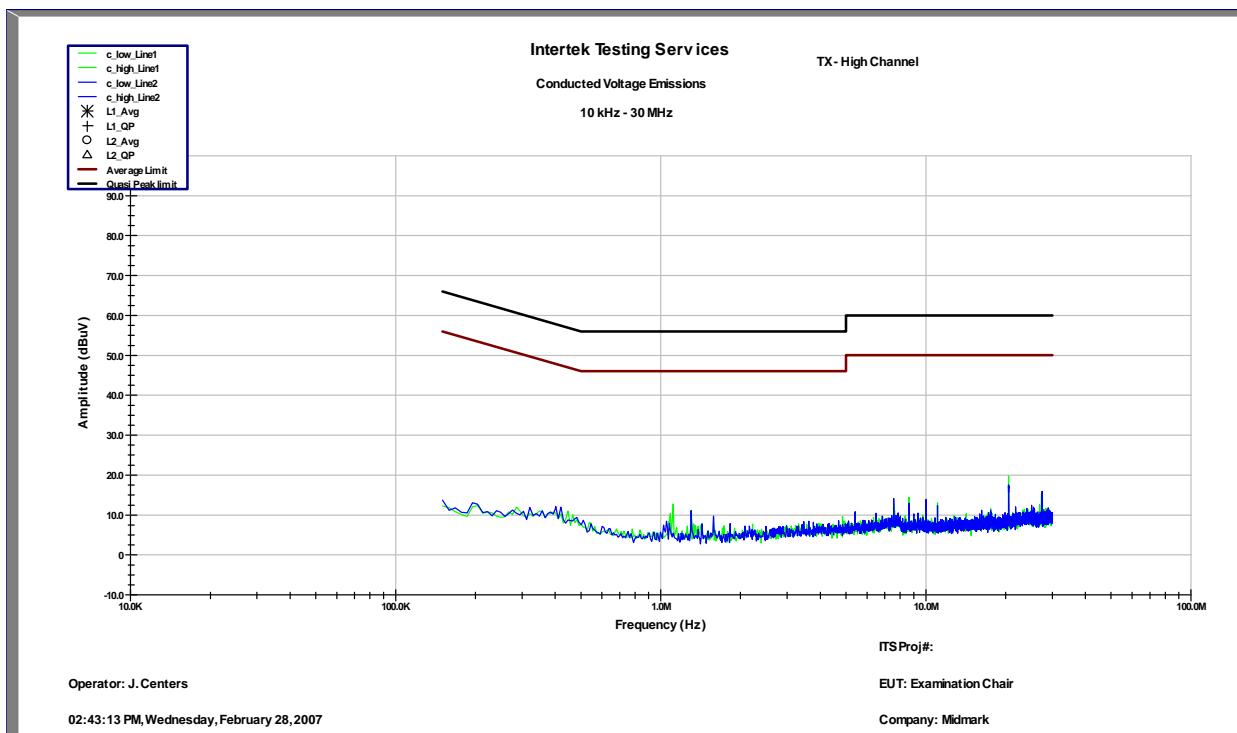


Exhibit 9 Conducted Voltage Emissions Graphical Data – Rx Channel

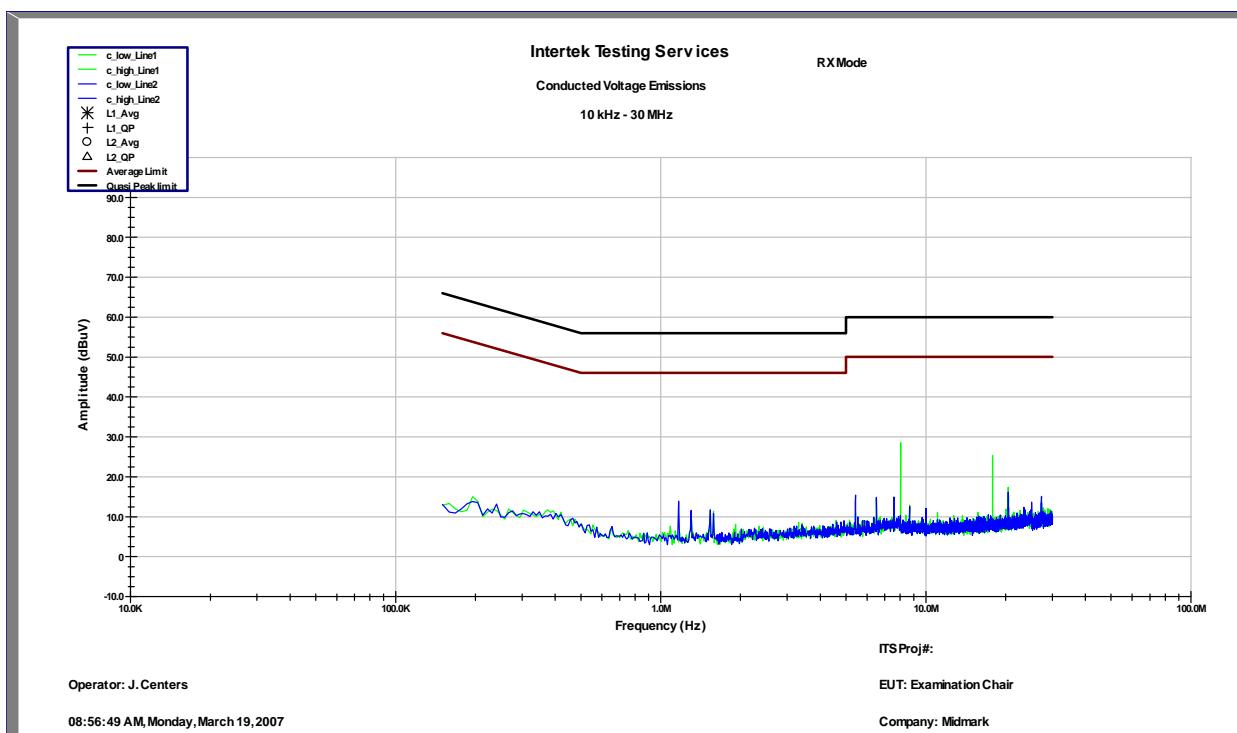


Exhibit 10