

TEST REPORT**Report Number: 3193461LEX-002**
Project Number: 3193461**Evaluation of the Wireless Foot Control for Universal Procedure Table**
Model Number: 9A408F**FCC ID: U399A408F1**
Industry Canada: 6978A-9A408F1**FCC Part 15 Subpart B & FCC Part 15 Subpart C**
ICES-003 & RSS-210 Issue 7**For****Midmark Corporation**

Test Performed by:

Intertek
731 Enterprise Drive
Lexington, KY 40510

Test Authorized by:

Midmark Corporation
60 Vista Drive
PO Box 286
Versailles, OH 45380Prepared By: Jason Centers Date: 11/29/2009

Jason Centers, Senior Project Engineer

Approved By: Bryan C. Taylor Date: 11/29/2009

Bryan C. Taylor, Team Leader

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1 JOB DESCRIPTION

1.1 Company Information

Company Information	
Manufacturer:	Midmark Corporation
Address:	60 Vista Drive PO Box 286 Versailles, OH 45380
Contact Name:	Randall Evers
Telephone Number:	(937) 526-8711
Email Address:	revers@midmark.com

1.2 Test Sample Information

The Wireless Foot Control for Universal Procedure Table Model 9A408F is a wireless foot controller for a powered examination chair for medical use. This report pertains only to the Wireless Foot Control for Universal Procedure Table Model 9A408F.

Test sample	
Model Number:	9A408F
Serial Number:	Not Labeled
FCC ID:	U399A408F1
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.

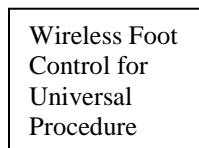
1.4 Cables Used During Testing

No cables were necessary for the evaluation.

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 Wireless Foot Control for Universal Procedure Table was powered by two AA batteries. 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: 9A408F

Receipt of Test Sample: 11/11/2009

Test Start Date: 11/11/2009

Test End Date: 11/20/2009

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	7
§15.109	ICES-003, RSS-Gen 6a	Radiated Receiver Emissions	Compliant	14
§15.207	ICES-003, RSS-Gen	Conducted Voltage Emissions	NA ¹	-

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.

¹ The EUT was not AC powered.

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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 and ANSI C63.4. 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 test site is listed with the FCC under registration number 485103. The test site is listed with Industry Canada under site number 2042M-1.

3.1 Test Equipment

Description	Manufacturer	Model Number	Serial Number	Calibration due date
Horn Antenna	EMCO	3115	6556	8/4/2010
Horn Antenna	EMCO	3116	9310-2222	5/18/2010
EMC Analyzer	HP	E7405A	2142	8/21/2010
EMI Receiver	Rohde & Schwarz	ESI 26	1088.7490	9/14/2010
Bilog Antenna	EMCO	3142C	00051864	12/24/2009
Preamplifier	Miteq	JS418004000	965178	9/21/2010
Preamplifier	Miteq	AFS44-00102000-30-10P-44	987410	6/17/2010

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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 on a thin insulating support.
- 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 Wireless Foot Control for 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.

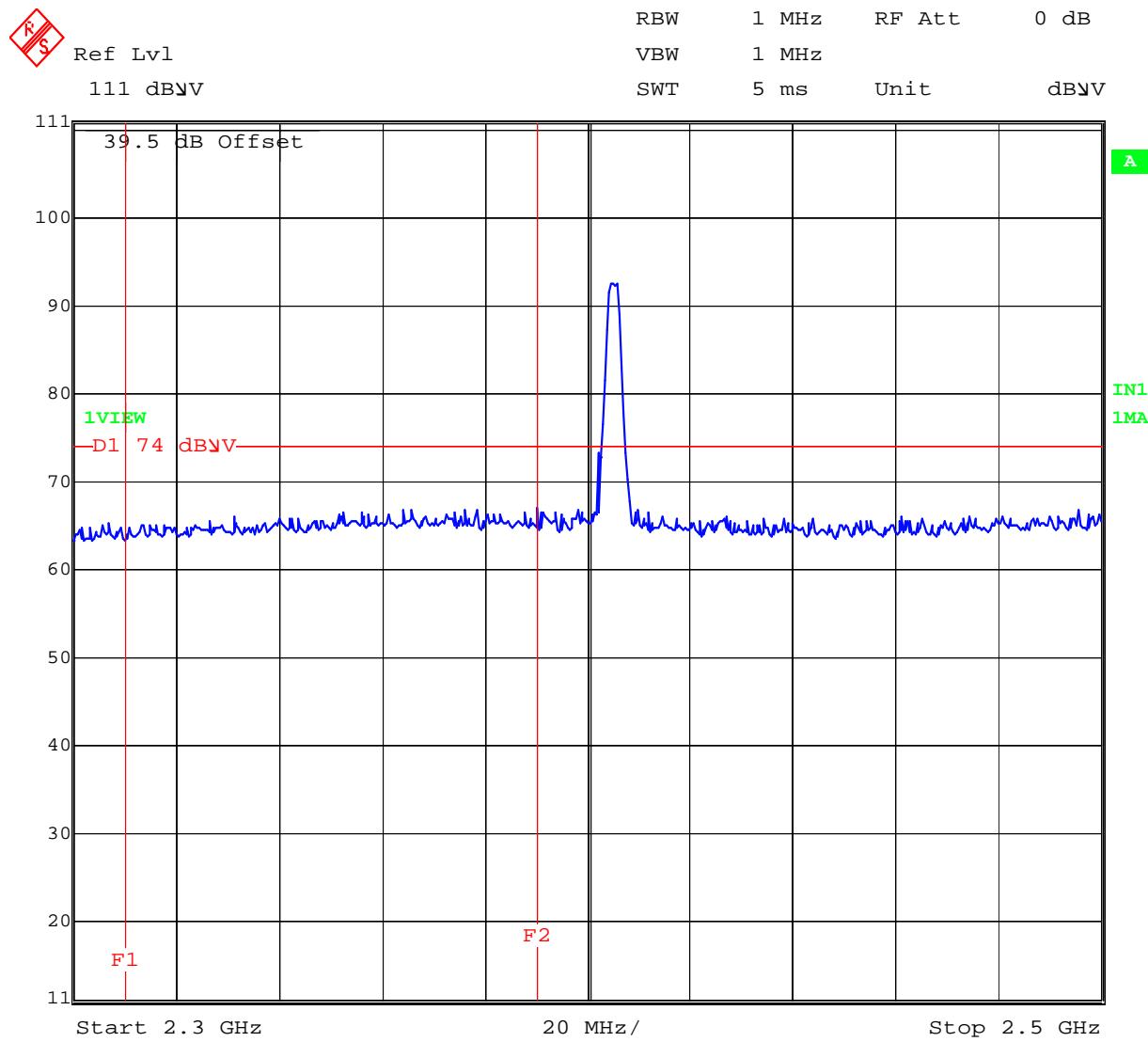
Table 4-1: Field Strength of Spurious Radiation

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 Channel	2.4046 GHz	H	92.3	72	114	94	Compliant	Fundamental
Low Channel	2.4046 GHz	V	84.752	64.542	114	94	Compliant	Fundamental
Low Channel	4.8093 GHz	H	63.964	44.474	74	54	Compliant	
Low Channel	7.2139 GHz	H	54.273	36.703	74	54	Compliant	
Low Channel	4.8092 GHz	V	61.116	32.85	74	54	Compliant	
Low Channel	7.217 GHz	V	59.353	36.16	74	54	Compliant	
Mid Channel	2.4447 GHz	H	89.571	69.791	114	94	Compliant	Fundamental
Mid Channel	2.4457 GHz	V	85.448	65.968	114	94	Compliant	Fundamental
Mid Channel	4.8912 GHz	H	62.929	43.929	74	54	Compliant	
Mid Channel	7.337 GHz	H	52.134	35.544	74	54	Compliant	
Mid Channel	4.8914 GHz	V	60.998	32.954	74	54	Compliant	
Mid Channel	7.3367 GHz	V	57.832	36.613	74	54	Compliant	
High Channel	2.4808 GHz	H	89.094	69.164	114	94	Compliant	Fundamental
High Channel	2.4807 GHz	V	84.356	65.166	114	94	Compliant	Fundamental
High Channel	4.9594 GHz	H	66.858	47.208	74	54	Compliant	
High Channel	7.4418 GHz	H	52.567	34.947	74	54	Compliant	
High Channel	4.9592 GHz	V	66.028	33.172	74	54	Compliant	
High Channel	7.4392 GHz	V	57.334	36.683	74	54	Compliant	

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

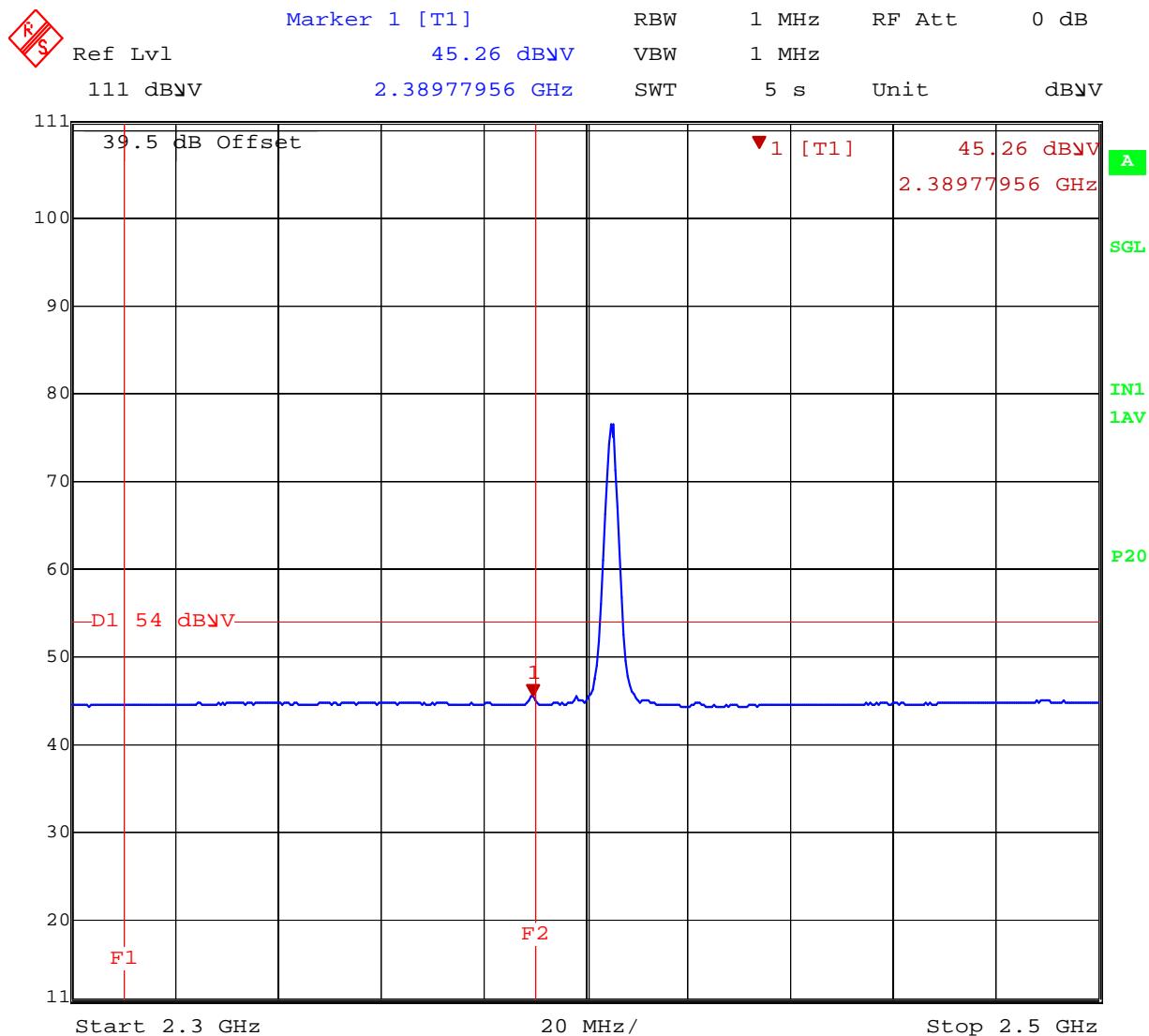


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Evaluation For: Midmark Corporation
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FCC ID: U399A408F1
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Band-Edge Compliance: 2310MHz – 2390MHz Restricted Band, Low Channel, Average Detector

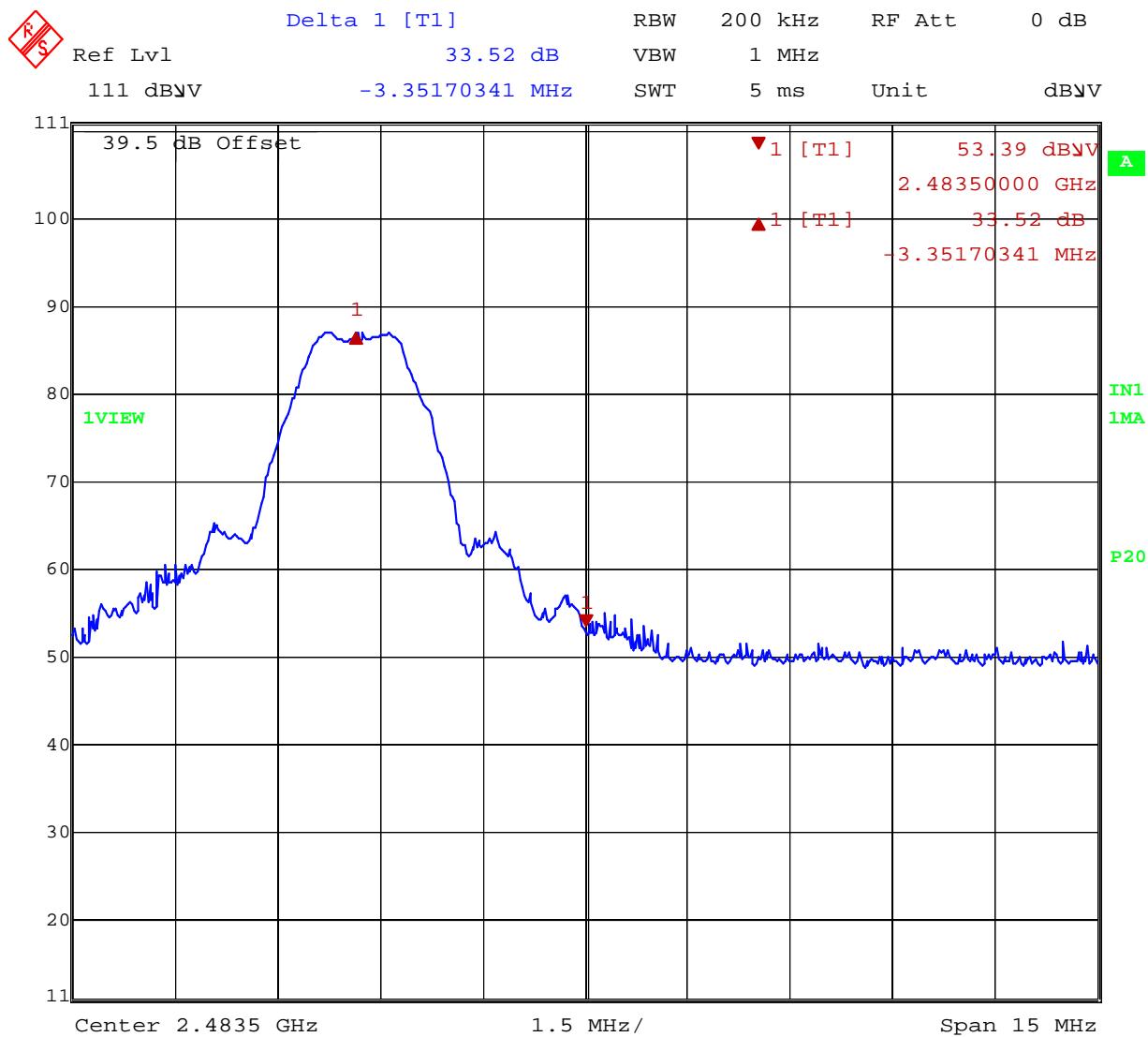


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Evaluation For: Midmark Corporation
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FCC ID: U399A408F1
IC ID: 6978A-9A408F1

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



Peak Field Strength: 89.094 dB μ V/m

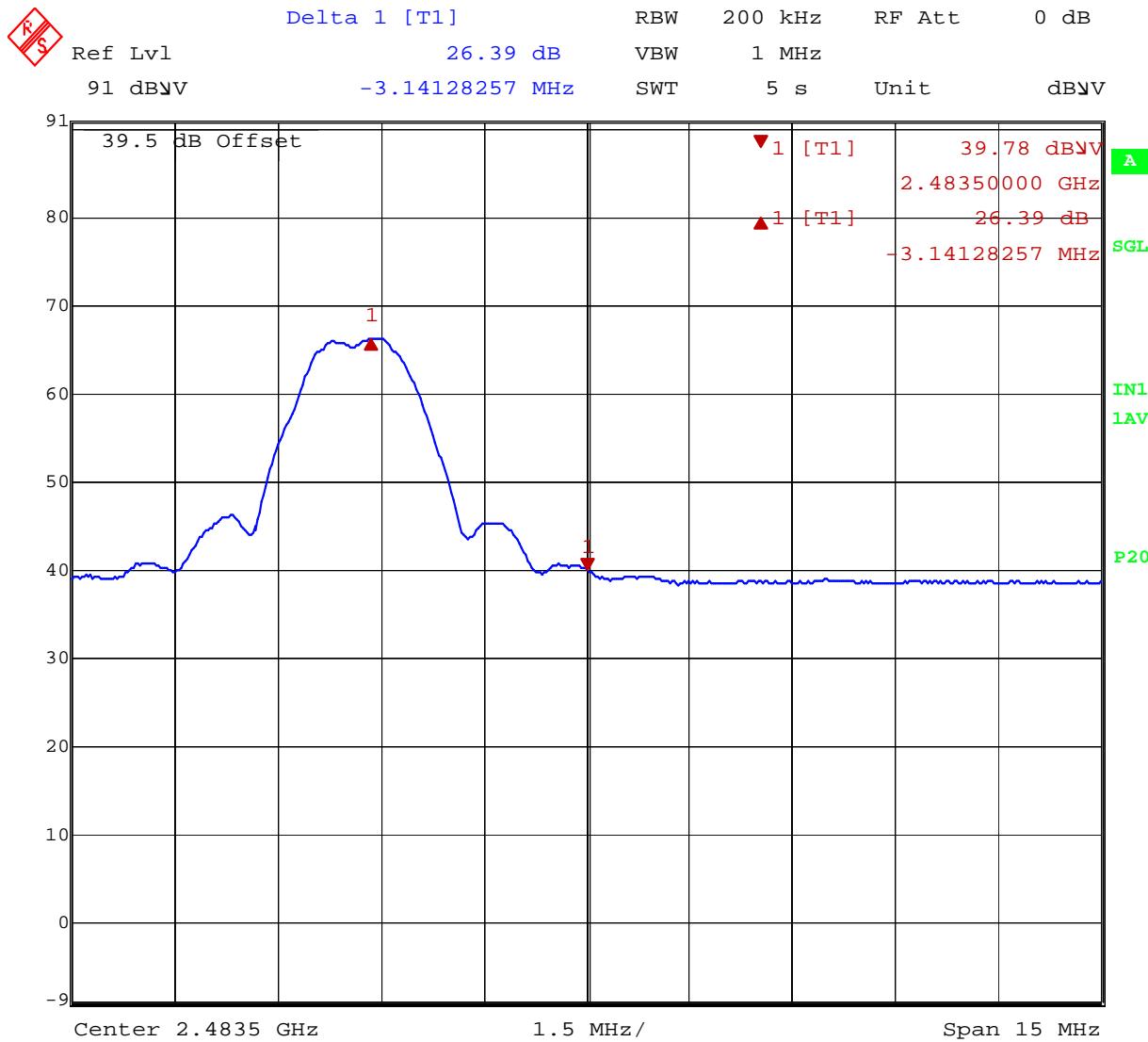
Marker Delta = 33.52 dB

Band Edge Measurement = 89.094 dB μ V/m – 33.52 dB = 55.57 dB μ V/m

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



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Average Field Strength: 69.164 dBuV/m

Marker Delta = 26.39 dB

Band Edge Measurement = $69.164 \text{ dbuV/m} - 26.39 \text{ dB} = 42.77 \text{ dbuV/m}$

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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 was a floor standing device so it was placed on the ground on a thin insulating support.
- 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:

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Example Calculation:

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$$AF = 18.52 \text{ dB}$$

$$CF = 0.78 \text{ dB}$$

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

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

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5.2 Test Results

The Wireless Foot Control for 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 5. Graphical results are shown in Exhibit 6.

Maximized Quasi Peak and Average Emissions (Sorted by Delta)

Test Engineer: Bryan Taylor

Test Start Date: 11/13/2009 **Test End Date:** 11/13/2009

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 5

Graphical Peak Scan

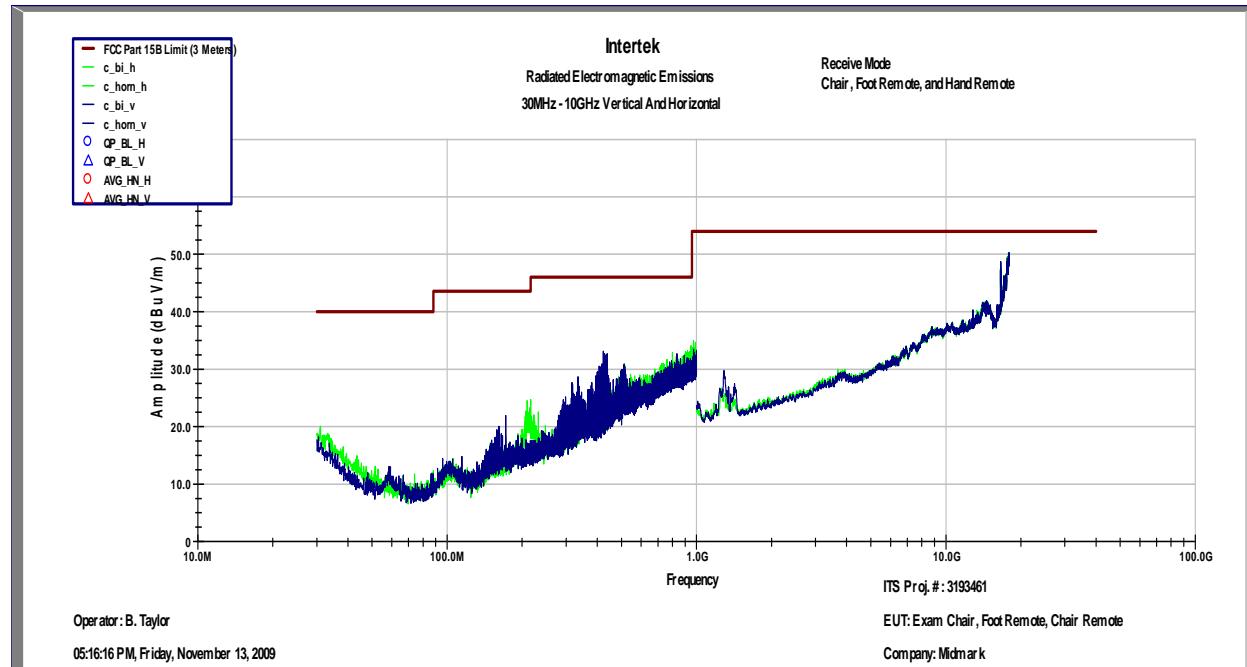


Exhibit 6