



Electromagnetic Compatibility Test Report

Tests Performed on a Delsys, Inc.

Wireless EMG Sensor System Transciever, Model Trigno Wireless EMG System

Radiometrics Document RP-6467



Product Detail:

FCC ID: W4P-SP-W02 (Base)
W4P-SP-W01 (Sensor)
IC: 8138A-DST01
Equipment type: 2.4 GHz Transmitter

Test Standards:

US CFR Title 47, Chapter I, FCC Part 15 Subpart C
FCC Part 15 CFR Title 47: 2008
Industry Canada RSS-210, Issue 7: 2007 as required for Category I Equipment

This report concerns: Original Grant for Certification
FCC Part 15.249

Tests Performed For:

Delsys, Inc.
650 Beacon St., Floor 6
Boston, MA 02215

Test Facility:

Radiometrics Midwest Corporation
12 East Devonwood
Romeoville, IL 60446

Test Date(s): (Month-Day-Year)

January 12 thru May 11, 2009

Document RP-6467 Revisions:

Rev.	Issue Date	Affected Pages	Revised By
0	6/10/2009		
1	6/18/2009	21-25	Joseph Strzelecki
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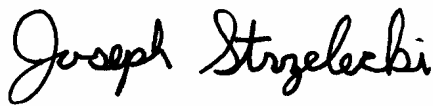
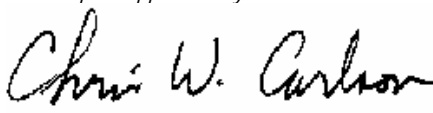
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1 ADMINISTRATIVE DATA

<i>Equipment Under Test:</i> A Delsys, Inc., Wireless EMG Sensor System Model: Trigno Wireless EMG System Serial Number: none This will be referred to as the EUT in this Report	
<i>Date EUT Received at Radiometrics: (Month-Day-Year)</i> January 8, 2009	<i>Test Date(s): (Month-Day-Year)</i> January 12 thru May 11, 2009
<i>Test Report Written By:</i> Joseph Strzelecki Senior EMC Engineer	<i>The Test was not Witnessed by Personnel from:</i> Delsys, Inc.
<i>Radiometrics' Personnel Responsible for Test:</i>  6/10/2009 Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE	<i>Test Report Approved By</i>  6/10/2009 Chris W. Carlson Director of Engineering NARTE EMC-000921-NE

2 TEST SUMMARY AND RESULTS

The EUT (Equipment Under Test) is a Wireless EMG Sensor System, Model Trigno EMG System, manufactured by Delsys, Inc. The EUT consists of a Base and Sensor. The detailed test results are presented in a separate section. The following is a summary of the test results.

Emissions Tests Results

Environmental Phenomena	Frequency Range	FCC Section	RSS-210 Section	Test Result
20 dB Bandwidth Test	2400 to 2483 MHz	15.249	A2.9	Pass
Radiated Emissions	30 MHz to 25 GHz	15.249	A2.9	Pass
AC Conducted Emissions Test	0.15-30 MHz	15.207	RSS-Gen-e 7.2.2	Pass

2.1 RF Exposure Compliance Requirements

Because the power output is 9 mW, The EUT meets 15.203 of the FCC requirement for RF exposure. Since the EUT is less than 200 mW, it is exempt from RSS-102. There are no power level adjustments and the antenna is permanently attached. The detailed calculations for RF Exposure are presented in a separate document.

3 EQUIPMENT UNDER TEST (EUT) DETAILS

3.1 EUT Description

The EUT is a Wireless EMG Sensor System, Model Trigno Wireless EMG System, manufactured by Delsys, Inc. The EUT was in good working condition during the tests, with no known defects.

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3.1.1 FCC Section 15.203 & RSS-GEN Antenna Requirements

The Base Unit antenna uses a reverse polarity SMA Connector. The connector is not readily available to public. Therefore, it meets the 15.203 Requirement.

The Sensor antenna is permanently attached to the PCB. The antenna is internal to the EUT and it is not readily available to be modified by the end user. Therefore, it meets the 15.203 Requirement.

3.2 Related Submittals

The Sensor is operated under 15.249. It is subject to the FCC requirements pursuant to the Certification equipment authorization under Part 15 Subpart C, and is being submitted as FCC ID: W4P-SP-W01.

4 TESTED SYSTEM DETAILS

4.1 Tested System Configuration

The system was configured for testing in a typical fashion. The EUT was placed on an 80-cm high, nonconductive test stand. The testing was performed in conditions as close as possible to installed conditions. Wiring was consistent with manufacturer's recommendations.

The sensor was tested as a stand-alone device with a fully charged battery. Power was supplied to the Base at 115 VAC, 60 Hz single-phase to its external power supply.

The identification for all equipment, plus descriptions of all cables used in the tested system, are:

Tested System Configuration List

Item	Description	Type*	Manufacturer	Model Number	Serial Number
1	Wireless EMG Sensor System	E	Delsys, Inc.	Trigno Wireless EMG System	None
2	Power Adaptor for Sensor system	E	Phihong	PSAM30R-120	P81500106A
3	Dell Power Supply	P	Dell	ADP-70EB	TH-09364U-17971-287-I5SK
4	Dell Notebook	P	Dell	PP05L	CN-OS5152-48643-48D-0155
5	Trigger Module	P	Delsys, Inc	Trigger Module	None

* Type: E = EUT, P = Peripheral,

List of System Cables

QTY	Length (m)	Cable Description	Shielded?
1	1.8	DC cable from Base System to Power Supply adaptor	No
2	1.8	Unterminated I/O Cable connected to Base system	Yes
1	0.9	I/O Cable from trigger module to Base	No
1	1.95	USB Cable	Yes

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4.2 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

4.3 Equipment Modifications

No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

5 TEST SPECIFICATIONS AND RELATED DOCUMENTS

Document	Date	Title
FCC CFR Title 47	2008	Code of Federal Regulations Title 47, Chapter 1, Federal Communications Commission, Part 15 - Radio Frequency Devices
ANSI C63.4-2003	2003	Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
IC RSS-210 Issue 7	2007	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands) Category I Equipment
IC RSS-Gen Issue 2	2007	General Requirements and Information for the Certification of Radiocommunication Equipment (RSS-Gen)
FCC DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
FCC 558074	2005	Measurement of Digital Transmission Systems Operating under Section 15.247

The test procedures used are in accordance with the FCC DA 00-705, or FCC 558074, Industry Canada RSS-212 and ANSI document C63.4-2003, "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters. The antenna was raised and lowered from 1 to 4 meters.

6 RADIOMETRICS' TEST FACILITIES

The results of these tests were obtained at Radiometrics Midwest Corp. in Romeoville, Illinois, USA. Radiometrics is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025: 2005 "General Requirements for the Competence of Calibration and Testing Laboratories". Radiometrics' Lab Code is 121191 and Certification Number is 1495.01. Radiometrics' scope of accreditation includes all of the test methods listed herein. A copy of the accreditation can be accessed on our web site (www.radiomet.com). Radiometrics accreditation status can be verified at A2LA's web site (www.a2la2.org).

The following is a list of shielded enclosures located in Romeoville, Illinois used during the tests:

Chamber E: Is a custom made anechoic chamber that measures 52' L X 30' W X 18' H. The walls and ceiling are fully lined with RF absorber. Pro-shield of Collinsville, Oklahoma manufactured the chamber.

Test Station F: Is an area that measures 10' D X 12' W X 10' H. The floor and back wall are metal shielded. This area is used for conducted emissions measurements.

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A separate ten-foot long, brass plated, steel ground rod attached via a 6 inch copper braid grounds each of the above chambers. Each enclosure is also equipped with low-pass power line filters.

The FCC has accepted these sites as test site number US1065. The FCC test site Registration Number is 732175. Details of the site characteristics are on file with the Industry Canada as file number IC3124A-1.

A complete list of the test equipment is provided herein. The calibration due dates are indicated on the equipment list. The equipment is calibrated in accordance to ANSI/NCSL Z540-1 with traceability to the National Institute of Standards and Technology (NIST).

7 DEVIATIONS AND EXCLUSIONS FROM THE TEST SPECIFICATIONS

There were no deviations or exclusions from the test specifications.

8 CERTIFICATION

Radiometrics Midwest Corporation certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specification. The results relate only to the EUT listed herein. Any modifications made to the EUT subsequent to the indicated test date will invalidate the data and void this certification.

9 TEST EQUIPMENT TABLE

RMC ID	Manufacturer	Description	Model No.	Serial No.	Frequency Range	Cal Period	Cal Date
AMP-05	RMC/Celeritek	Pre-amplifier	MW110G	1001	1.0-12GHz	12 Mo.	02/01/09
AMP-20	Avantek	Pre-amplifier	SF8-0652	15221	8-18GHz	12 Mo.	02/01/09
AMP-22	Anritsu	Pre-amplifier	MH648A	M23969	0.1-1200MHz	12 Mo.	02/03/09
ANT-13	EMCO	Horn Antenna	3115	2502	1.0-18GHz	24 Mo.	10/22/08
ANT-44	Impossible Machine	Super Log Antenna	SL-20M2G	1002	20-2000MHz	24 Mo.	12/26/07
HPF-03	Mini-Circuits	High Pass Filter	VHP-39	HPF-03	3-10 GHz	24 Mo.	01/30/08
LSN-01	Electrometrics	50 uH LISN	FCC/VDE 50/2	1001	0.01-30MHz	24 Mo.	05/01/09
REC-01	Hewlett Packard	Spectrum Analyzer	8566A	2106A02115, 2209A01349	30Hz-22GHz	12 Mo.	10/23/08
REC-03	Anritsu	Spectrum Analyzer	MS2601B	MT94589	0.01-2200MHz	12 Mo.	03/09/09
REC-07	Anritsu	Spectrum Analyzer	MS2601A	MT53067	0.01-2200MHz	12 Mo.	03/09/09
THM-01	Extech Inst.	Temp/Humid Meter	4465CF	001106557	N/A	24 Mo.	01/18/08

Note: All calibrated equipment is subject to periodic checks.

10 TEST SECTIONS

10.1 AC Conducted Emissions

The tests and limits are in accordance with FCC section 15.207 and RSS Gen section 7.2.2.

A computer-controlled analyzer was used to perform the conducted emissions measurements. The frequency range was divided into 500 subranges equally spaced on a logarithmic scale. The computer recorded the peak of each subrange. This data was then plotted on semi-log graph paper generated by the computer and plotter. Adjusting the positions of the cables and orientation of the test system then maximizes the highest emissions.

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Mains Conducted emission measurements were performed using a 50 Ohm/50 uH Line Impedance Stabilization Network (LISN) as the pick-up device. Measurements were repeated on both leads within the power cord. If the EUT power cord exceeded 80 cm in length, the excess length of the power cord was made into a 30 to 40 cm bundle near the center of the cord. The LISN was placed on the floor at the base of the test platform and electrically bonded to the ground plane.

Broadband conducted emissions may exceed the following limits by no more than 13 dB. An emission is defined as broadband if the average detector amplitude is 6 dB or more under the quasi-peak detector amplitude.

FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBuV)	
	Quasi-Peak	Average
0.150 - 0.50*	66 - 56	56 - 46
0.5 - 5.0	56	46
5.0 - 30	60	50
* The limit decreases linearly with the logarithm of the frequency in this range.		

The initial step in collecting conducted data is a peak detector scan and the plotting of the measurement range. Significant peaks are then marked as shown on the following table, and these signals are then measured with the quasi-peak detector. The following represents the worst case emissions from the host computer (with the EUT connected) power cord, after testing all modes of operation.

10.1.1 AC Conducted Emissions Test Results

Test Date : 5/11/2009

The Amplitude is the final corrected value with cable and LISN Loss.

This is the results from the Base. The Sensor is battery powered.

Lead Tested	Frequency MHz	QP Amplitude	QP Limit	Average Amplitude	Average Limit
AC Neutral	0.192	52.8 Q	63.9	42.7	53.9
AC Neutral	0.209	53.0 Q	63.3	43.7	53.3
AC Neutral	0.278	51.9 Q	60.9	39.6	50.9
AC Neutral	0.348	48.0 Q	59.0	36.4	49.0
AC Neutral	0.397	48.8 Q	57.9	37.4	47.9
AC Neutral	0.394	50.6 Q	58.0	39.2	48.0
AC Neutral	0.465	47.0 Q	56.6	37.4	46.6
AC Neutral	0.836	41.1 Q	56.0	30.4	46.0
AC Neutral	1.185	40.8 Q	56.0	29.8	46.0
AC Neutral	3.520	37.2 Q	56.0	25.3	46.0
AC Neutral	9.930	35.1 Q	60.0	27.6	50.0
AC Neutral	15.192	33.9 Q	60.0	24.4	50.0
AC Hot	0.200	53.4 Q	63.6	44.4	53.6
AC Hot	0.259	52.1 Q	61.4	39.6	51.4
AC Hot	0.277	53.1 Q	60.9	41.0	50.9
AC Hot	0.347	49.4 Q	59.0	37.7	49.0
AC Hot	0.393	50.0 Q	58.0	39.9	48.0
AC Hot	0.464	48.8 Q	56.6	39.3	46.6
AC Hot	0.466	48.7 Q	56.6	39.3	46.6

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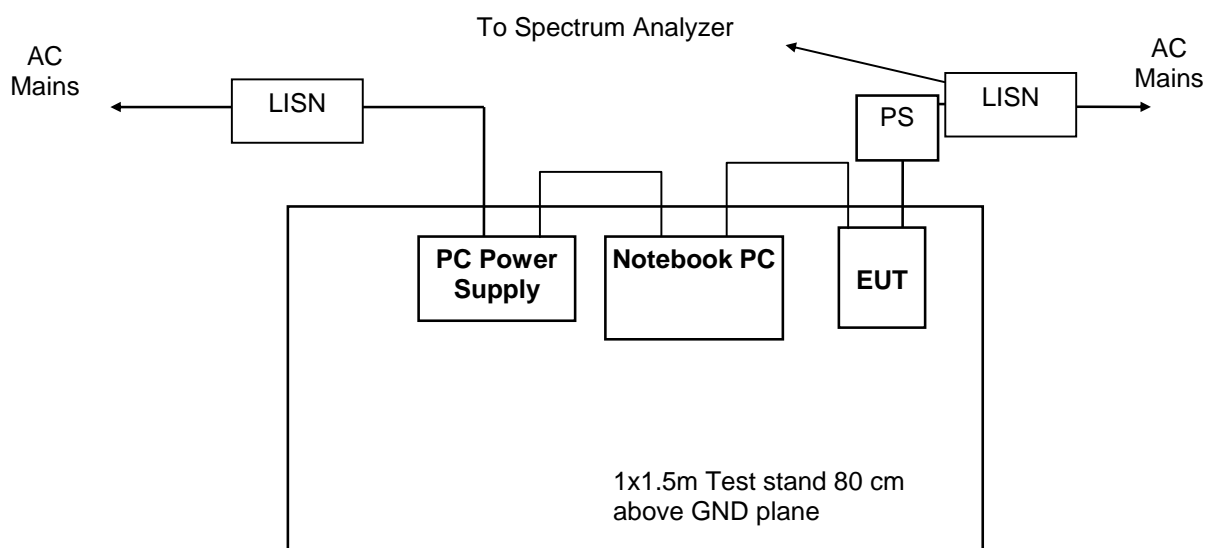
Lead Tested	Frequency MHz	QP Amplitude	QP Limit	Average Amplitude	Average Limit
AC Hot	0.553	43.3 Q	56.0	33.6	46.0
AC Hot	0.834	43.5 Q	56.0	33.1	46.0
AC Hot	1.183	41.7 Q	56.0	30.8	46.0
AC Hot	1.532	39.4 Q	56.0	27.7	46.0
AC Hot	2.507	40.5 Q	56.0	29.6	46.0
AC Hot	3.442	39.2 Q	56.0	29.1	46.0
AC Hot	7.173	32.5 Q	60.0	24.3	50.0
AC Hot	10.167	35.2 Q	60.0	28.5	50.0
AC Hot	14.257	34.6 Q	60.0	26.1	50.0

The above are the worst case results with three frequencies test for each EUT

* QP readings are quasi-peak with a 9 kHz bandwidth and no video filter.

Judgment: Passed by 7.3 dB

Figure 1. Conducted Emissions Test Setup



Notes:

- LISN's at least 80 cm from EUT chassis
- Vertical conductive plane 40 cm from rear of table top
- EUT power cord bundled

10.2 Time of Occupancy (Dwell Time)

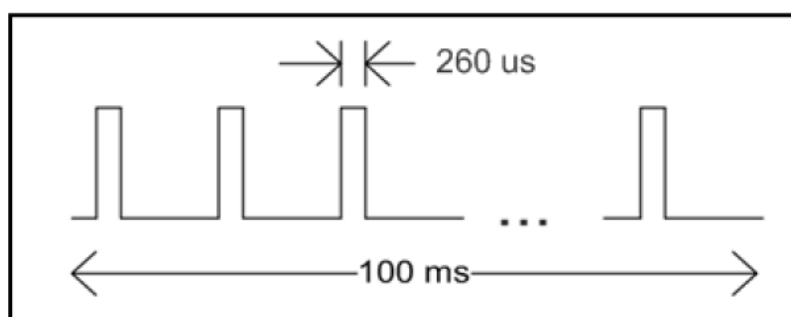
The Peak to Average factor is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is $20 * \text{Log}(\text{Duty cycle}/100)$.

As required by FCC section 15.35 and RSS-210 section 6.5, the Peak to Average correction factor was calculated.

Base Transmitter:

The transmitter sends the beacon in a 260 us burst once every 13 ms as shown below. In any interval, there will be, at most, 8 bursts, for a maximum transmitter duty cycle of 2.1%.

$$8 * 260 \text{ us} / 100 \text{ ms} = 2.1\%$$



Sensor:

The transmitter sends the data in a 700 us burst once every 13 ms as shown below. In any 100 ms interval, there will be, at most, 8 bursts, for a maximum transmitter duty cycle of 5.6%.

$$8 * 700 \text{ us} / 100 \text{ ms} = 5.6\%;$$

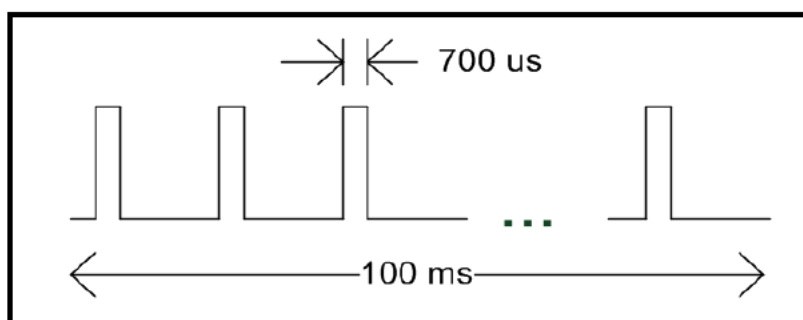


Figure 2. Duty Cycle Plot

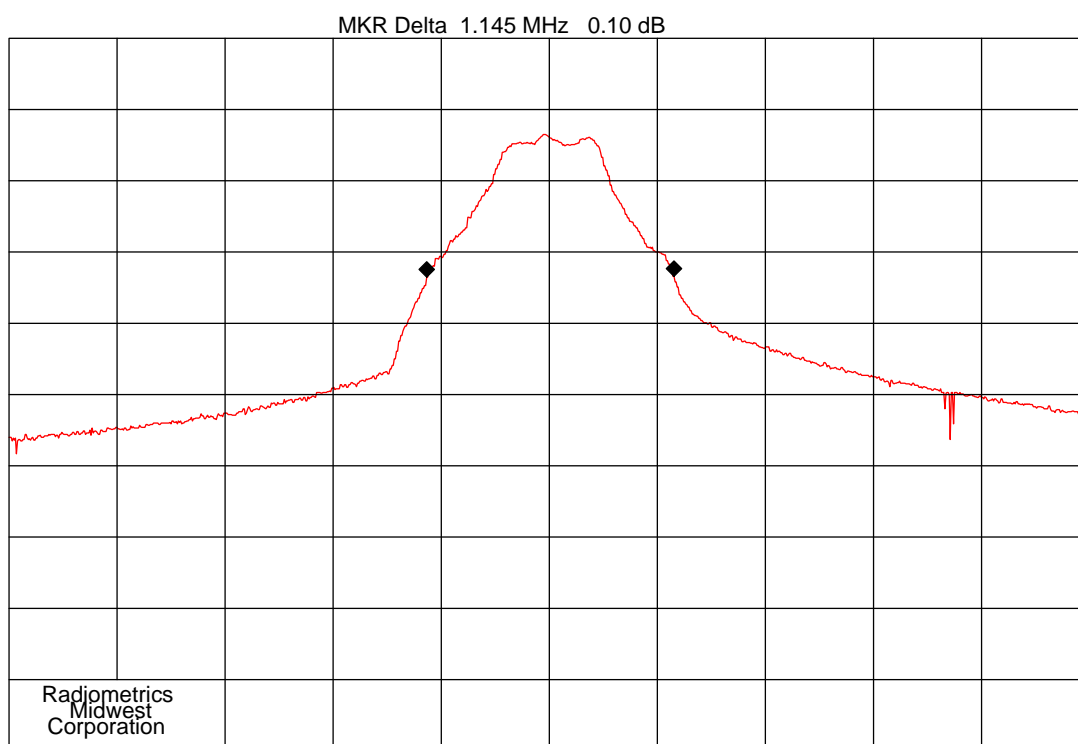
10.3 Occupied Bandwidth (20 dB)

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation. The EUT was transmitting at its maximum data rate. The trace was allowed to stabilize.

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The marker-to-peak function was set to the peak of the emission. Then the marker-delta function was used to measure 20 dB down one side of the emission. The marker-delta function was reset and then moved to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

Channel	Sensor	Base
	20 dB EBW MHz	20 dB EBW MHz
2402	1.22	1.15
2440	3.690	1.19
2474	4.92	1.43



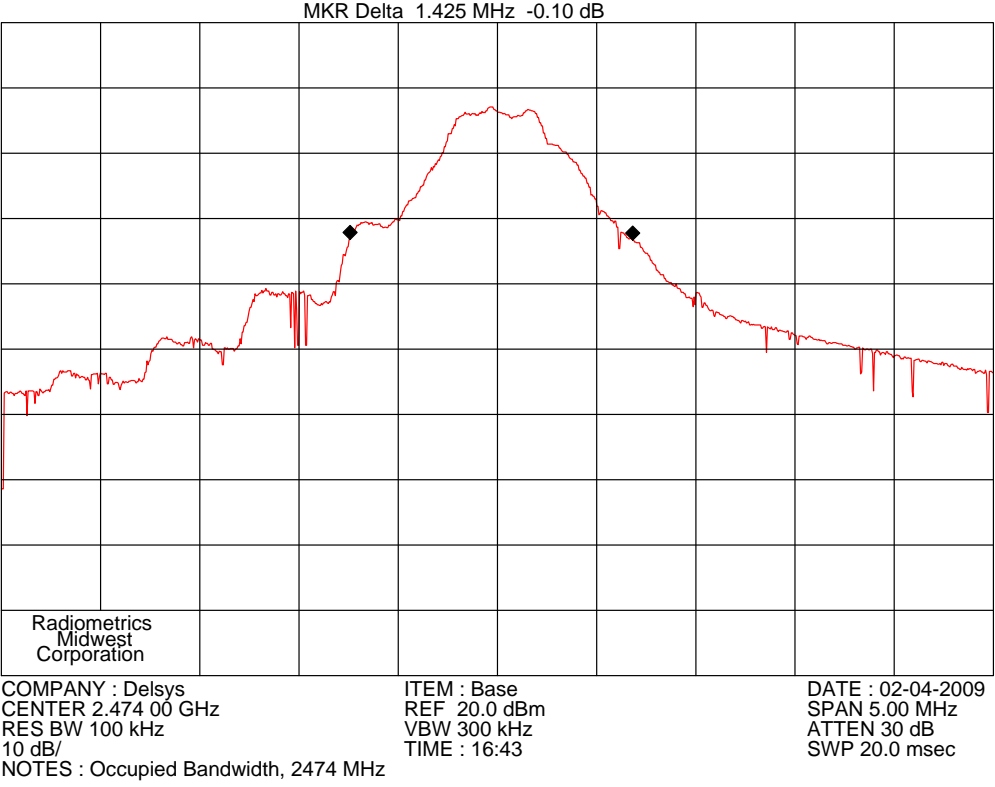
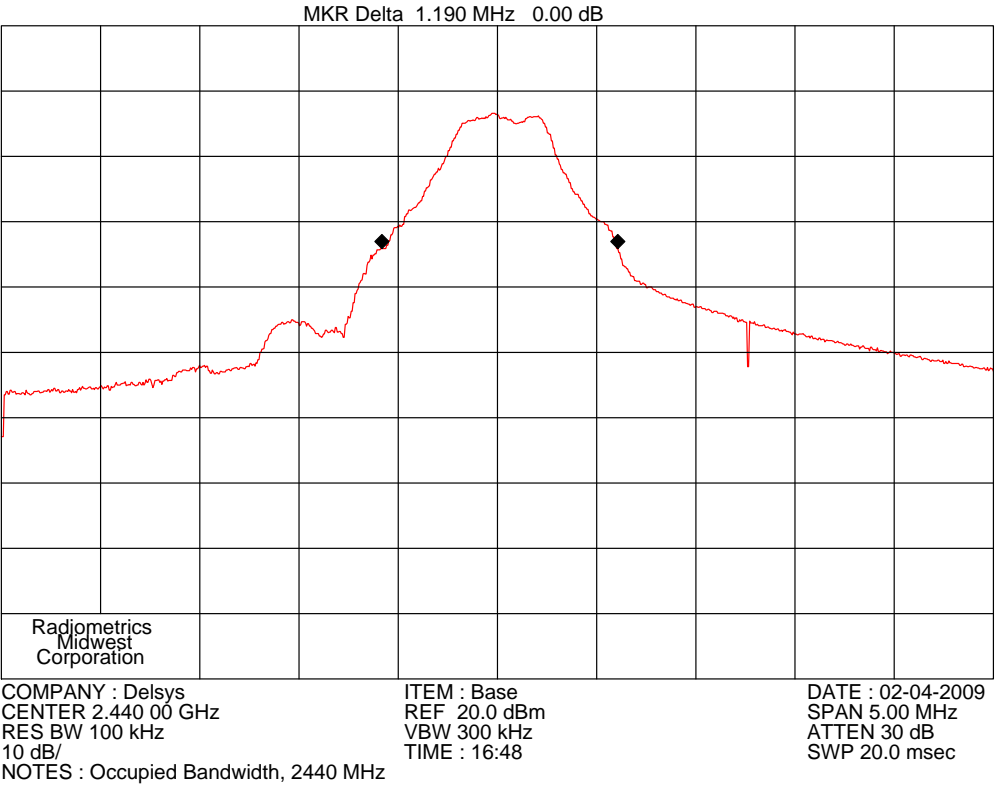
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COMPANY : Delsys
CENTER 2.402 00 GHz
RES BW 100 kHz
10 dB/
NOTES : Occupied Bandwidth, 2402 MHz

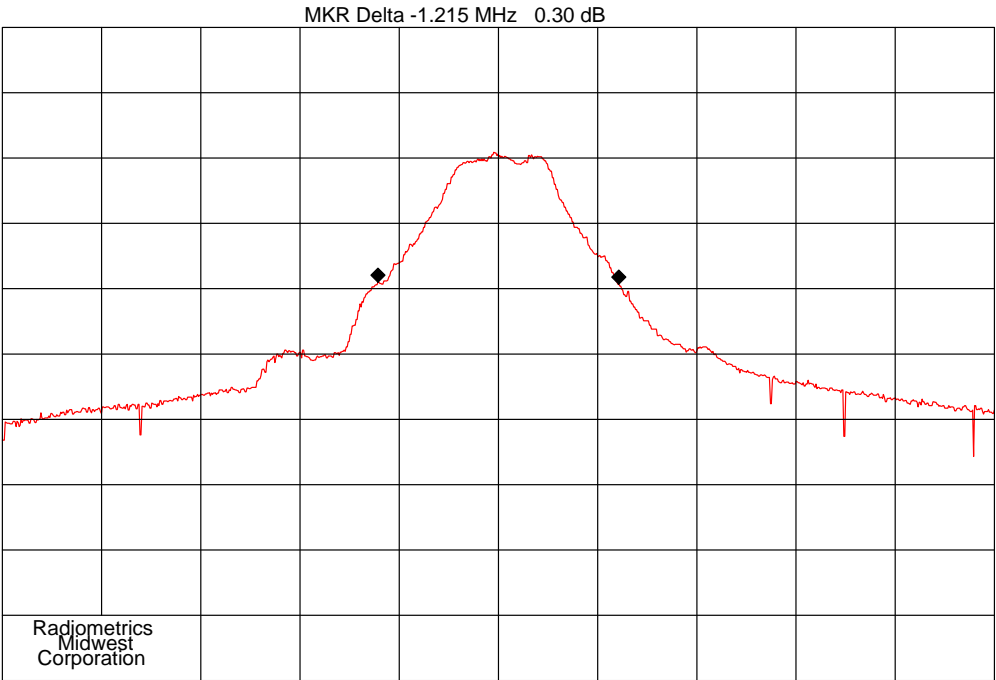
ITEM : Base
REF 20.0 dBm
VBW 300 kHz
TIME : 16:34

DATE : 02-04-2009
SPAN 5.00 MHz
ATTEN 30 dB
SWP 20.0 msec

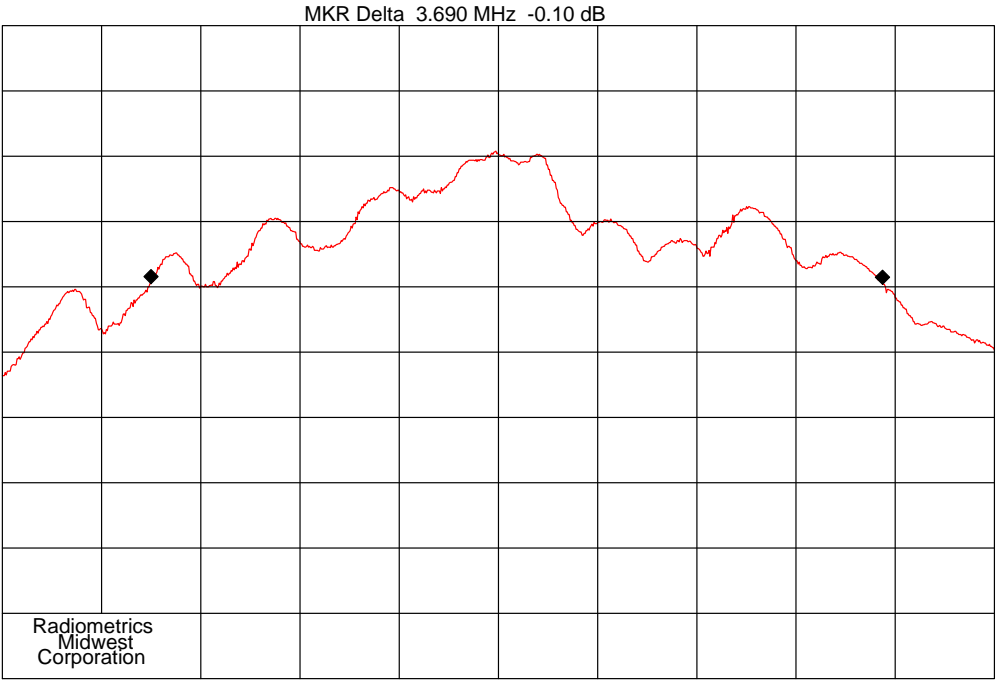
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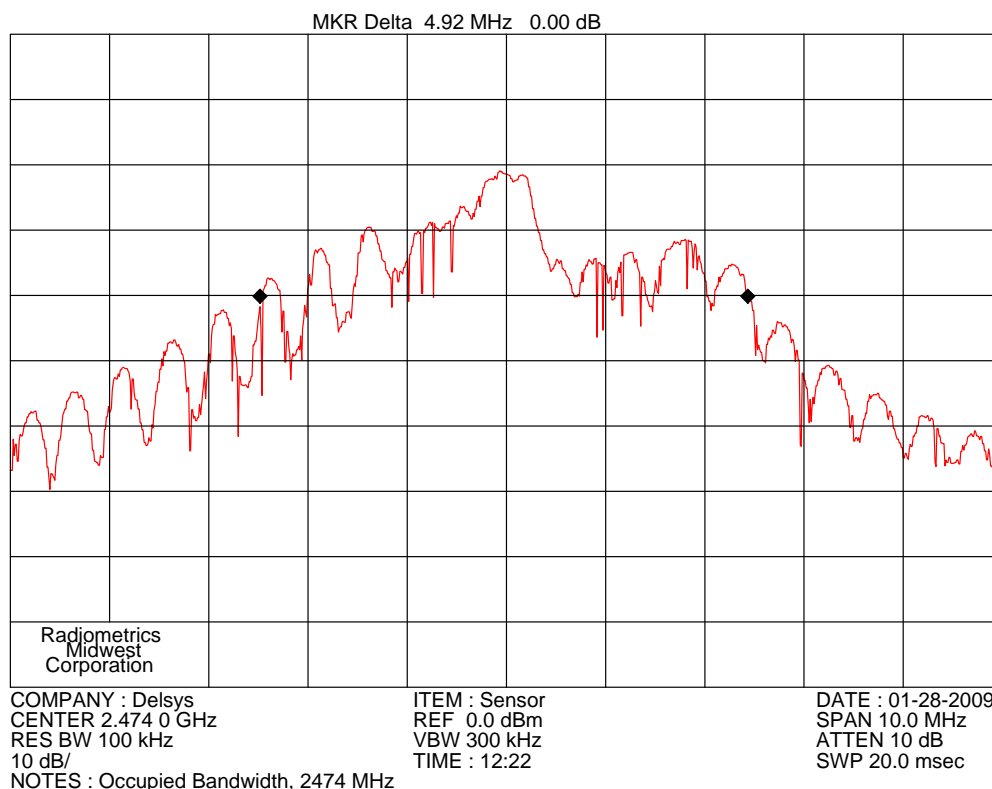


COMPANY : Delsys CENTER 2.402 00 GHz RES BW 100 kHz 10 dB/ NOTES : Occupied Bandwidth, 2402	ITEM : Sensor REF 0.0 dBm VBW 300 kHz TIME : 12:04	DATE : 01-28-2009 SPAN 5.00 MHz ATTEN 10 dB SWP 20.0 msec
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COMPANY : Delsys CENTER 2.440 00 GHz RES BW 100 kHz 10 dB/ NOTES : Occupied Bandwidth Test, 2440 MHz	ITEM : Sensor REF 0.0 dBm VBW 300 kHz TIME : 12:11	DATE : 01-28-2009 SPAN 5.00 MHz ATTEN 10 dB SWP 20.0 msec
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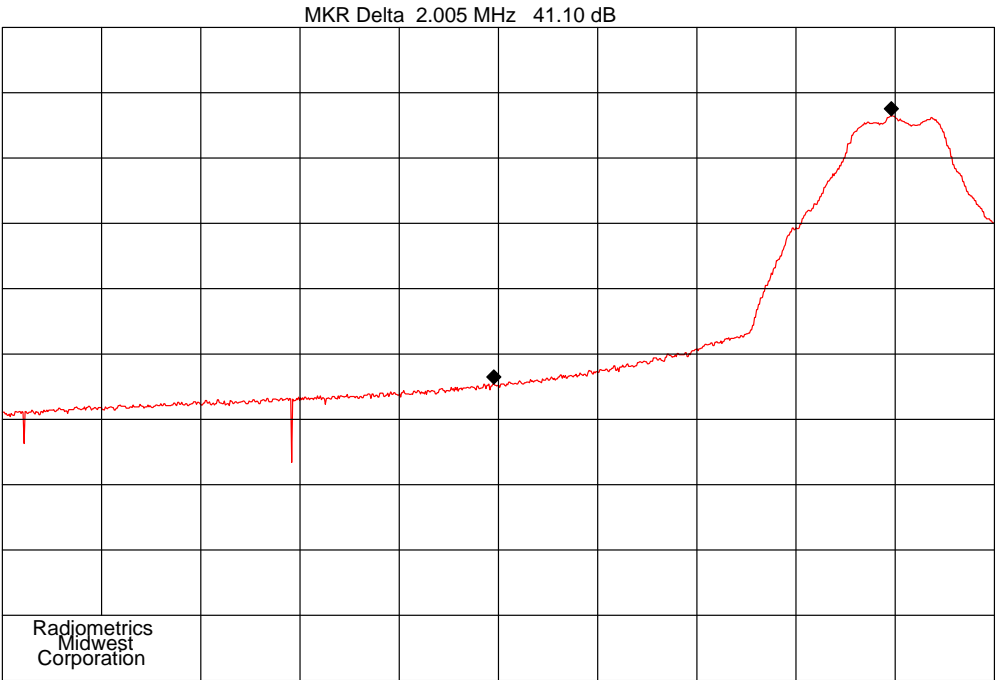


10.4 Band-edge Compliance of RF Conducted Emissions

The spectrum analyzer was set to the MAX HOLD mode to record the worst case of the modulation at the band-edge, with the EUT set to the lowest frequency. The trace was allowed to stabilize. A Delta Marker was used to measure the Difference between the peak of the inband signal and level at the band edges (2400 and 2483.5 MHz).

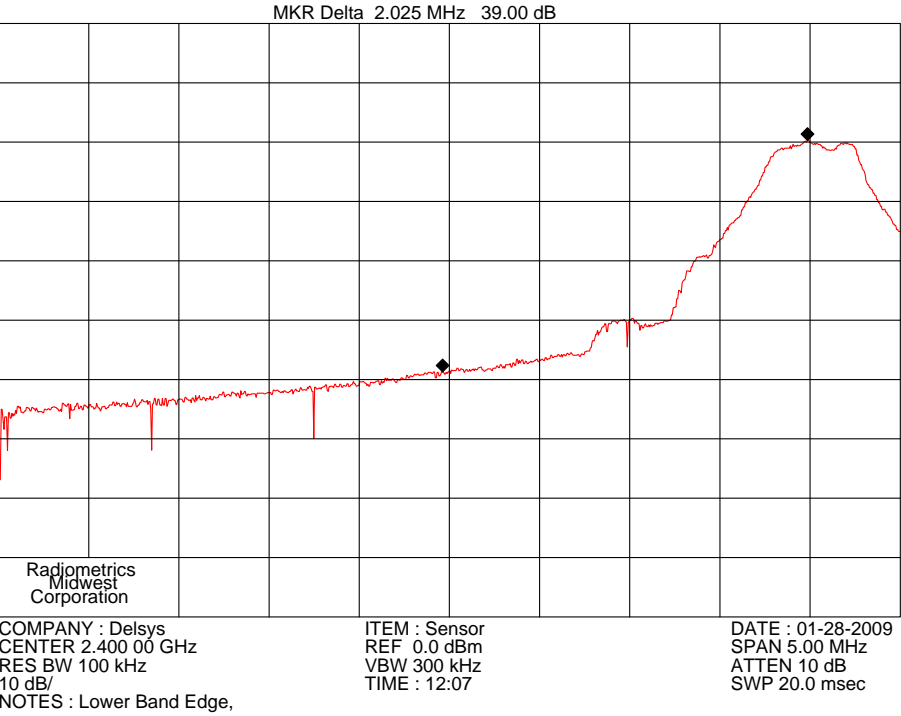
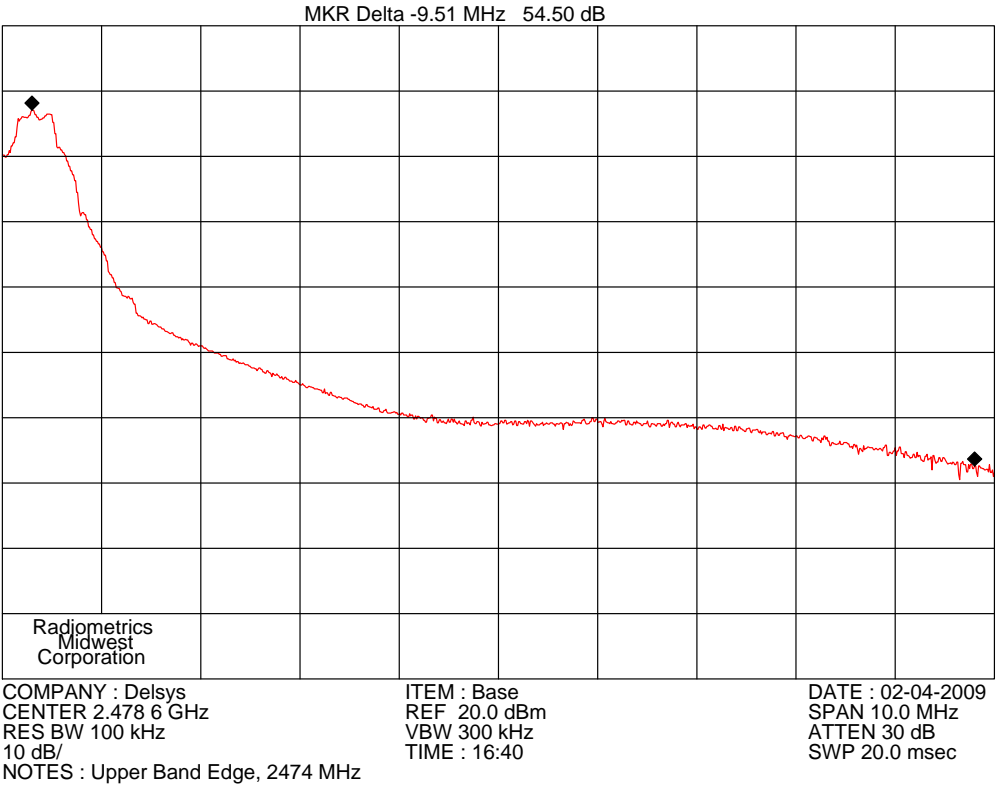
Channel	Band Edge Delta Readings in dB		
	Sensor	Base	Minimum Allowed
	Band Edge	Band Edge	dB
2402 Lower Band edge	39.0	41.1	20
2474 Upper Band edge	48.6	54.5	20

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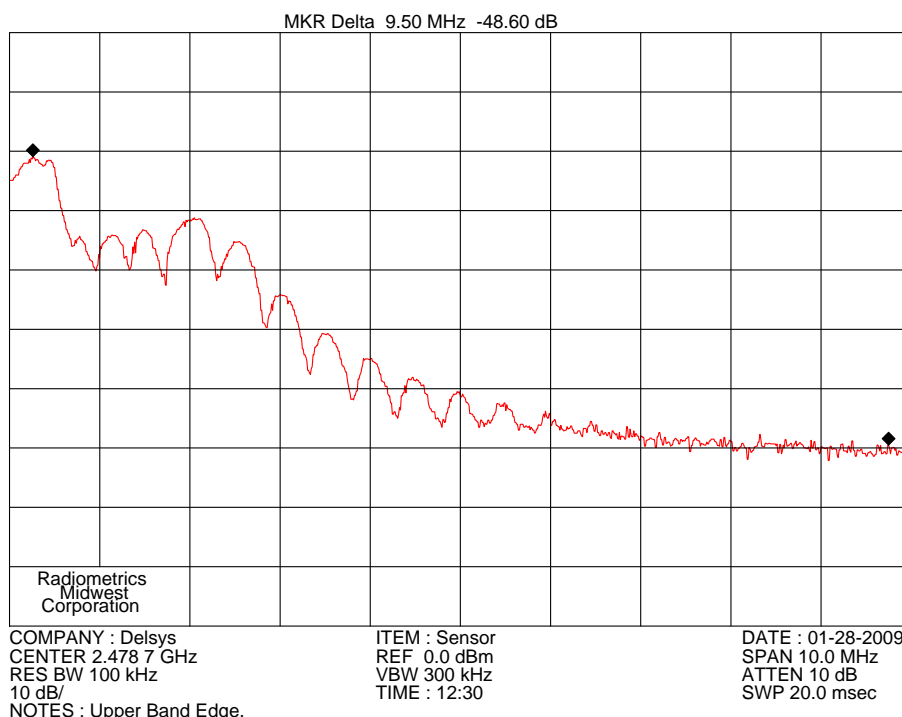


COMPANY : Delsys CENTER 2.400 00 GHz RES BW 100 kHz 10 dB/ NOTES : Lower Band Edge,	ITEM : Base REF 20.0 dBm VBW 300 kHz TIME : 16:36	DATE : 02-04-2009 SPAN 5.00 MHz ATTEN 30 dB SWP 20.0 msec
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10.5 RF Radiated Emissions

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. The radiated emission measurements were performed with a spectrum analyzer. The bandwidth used from 150 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz, a 1 MHz bandwidth is used. A 10 dB linearity check is performed prior to start of testing in order to determine if an overload condition exists.

From 30 to 1000 MHz, an Anritsu spectrum analyzer was used. For tests from 1 to 25 GHz, an HP 8566 spectrum analyzer was used. For tests from 1 to 10 GHz, a high pass filter was used to reduce the fundamental emission. A harmonic mixer was used from 18 to 25 GHz. Figure 4 herein lists the details of the test equipment used during radiated emissions tests.

The Sensor was rotated through three orthogonal axis as per 13.1.4.1 of ANSI C63.4 during the prescans and during final radiated tests.

Final radiated emissions measurements were performed inside of an anechoic chamber at a test distance of 3 meters. The anechoic chamber is designated as Chamber E. This Chamber meets the Site Attenuation requirements of ANSI C63.4 and CISPR 16-1. Chamber E is located at 12 East Devonwood Ave. Romeoville, Illinois EMI test lab.

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The entire frequency range from 30 MHz to 25 GHz was slowly scanned with particular attention paid to those frequency ranges which appeared high. Measurements were performed using two antenna polarizations, (vertical and horizontal). The worst case emissions were recorded. All measurements may be performed using either the peak, average or quasi-peak detector functions. If the peak detector data exceeds or is marginally close to the limits, the measurements are repeated using a quasi-peak detector or average function as required by the specification for final determination of compliance.

The detected emission levels were maximized by rotating the EUT, adjusting the positions of all cables, and by scanning the measurement antenna from 1 to 4 meters above the ground.

10.5.1 Radiated Emissions Field Strength Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation is as follows:

$$FS = RA + AF + CF - AG$$

Where: FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

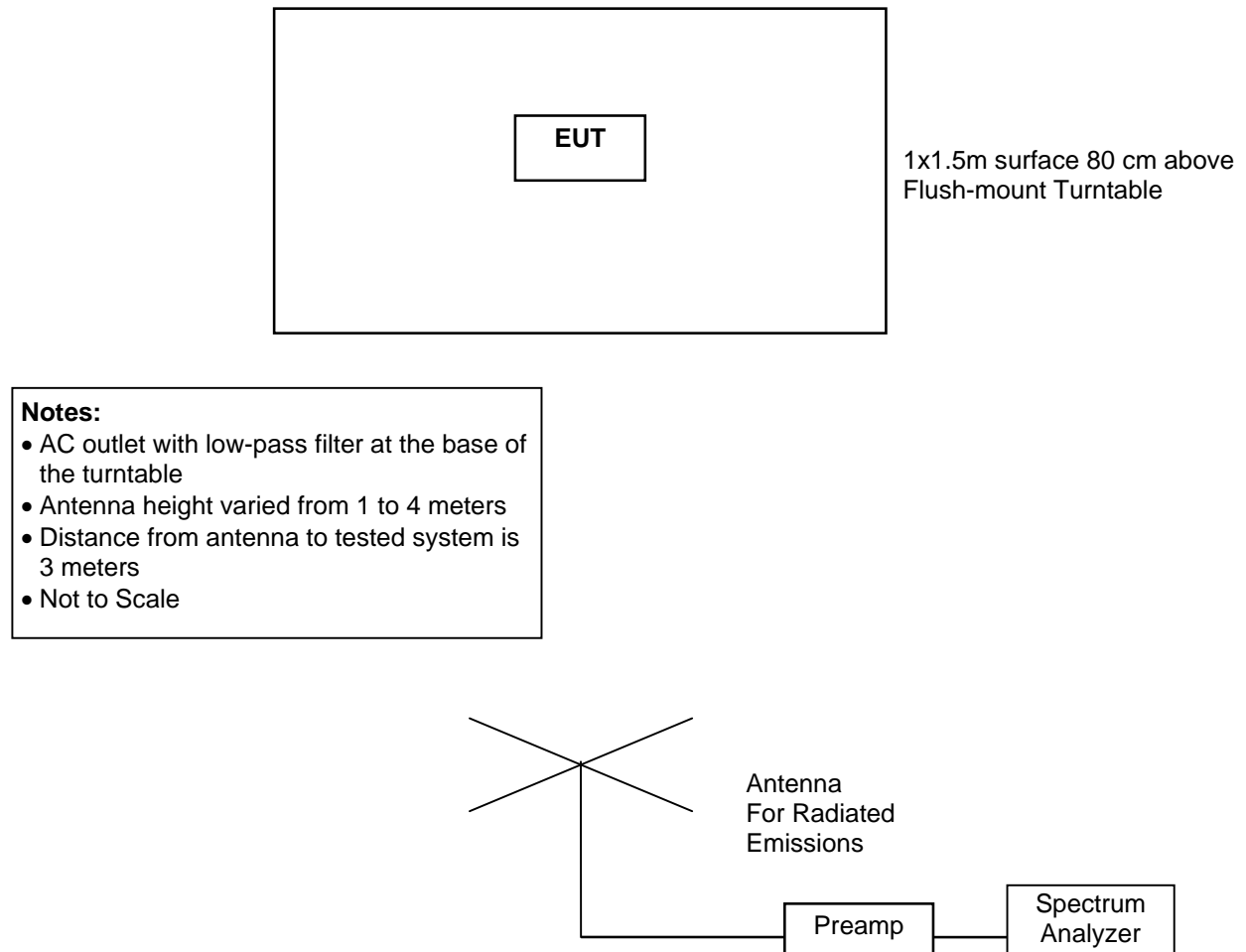
CF = Cable Attenuation Factor

AG = Amplifier Gain

PKA = Peak to Average Factor (This is zero for non-average measurements)

The Peak to average factor is used when average measurements are required. It is calculated by the highest duty cycle in percent over any 100mS transmission. The factor in dB is $20 * \text{Log}(\text{Duty cycle}/100)$.

Figure 3. Drawing of Radiated Emissions Setup



10.5.2 Spurious Radiated Emissions Test Results

The following spectrum analyzer settings were used.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

A Video Bandwidth of 10 Hz was used for Average measurements above 1 GHz.

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report			
Testing of the Delsys, Inc., Model Trigno EMG System, Wireless EMG Sensor System			

Manufacturer	Delsys, Inc.	Specification	FCC Part 15 Subpart C & RSS-210
Model	Trigno Wireless EMG System	Test Date	1/16/2009
Serial Number	none	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain		
Configuration	Base Full System		

Emissions from Base Below 2 GHz

Freq. MHz	Peak Meter Reading dBuV	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
		Factor dB	Pol/ ID#		EUT	Limit	
63.8	35.1 P	9.6	H/44	-19.7	25.0	40.0	15.0
99.6	44.7 P	9.8	H/44	-19.4	35.2	43.5	8.3
121.6	33.9 P	15.3	H/44	-19.1	30.0	43.5	13.5
133.2	35.0 P	13.8	H/44	-19.0	29.9	43.5	13.6
149.2	43.5 P	10.4	H/44	-18.8	35.1	43.5	8.4
168.8	45.5 P	9.6	H/44	-18.8	36.3	43.5	7.2
199.6	45.4 P	10.3	H/44	-18.6	37.1	43.5	6.4
201.6	33.4 P	10.3	H/44	-18.6	25.2	43.5	18.3
227.2	39.5 P	11.8	H/44	-18.4	32.9	46.0	13.1
249.2	48.4 P	12.5	H/44	-18.1	42.8	46.0	3.2
299.1	46.2 P	13.8	H/44	-17.8	42.2	46.0	3.8
320.6	32.5 P	14.1	H/44	-17.7	28.8	46.0	17.2
325.8	41.2 P	14.2	H/44	-17.7	37.7	46.0	8.3
339.1	39.5 P	14.8	H/44	-17.5	36.8	46.0	9.2
349.0	41.1 P	14.9	H/44	-17.5	38.6	46.0	7.4
367.5	36.5 P	15.4	H/44	-17.4	34.6	46.0	11.4
372.8	38.2 P	15.6	H/44	-17.3	36.5	46.0	9.5
412.2	35.2 P	16.3	H/44	-17.0	34.5	46.0	11.5
423.2	37.6 P	16.8	H/44	-17.0	37.4	46.0	8.6
455.7	40.9 P	17.1	H/44	-16.9	41.1	46.0	4.9
498.0	34.2 P	17.3	H/44	-16.5	35.0	46.0	11.0
521.0	33.6 P	17.9	H/44	-16.6	34.9	46.0	11.1
598.0	32.4 P	19.0	H/44	-16.1	35.2	46.0	10.8
668.0	29.3 P	20.1	H/44	-15.8	33.6	46.0	12.4
708.0	30.3 P	20.7	H/44	-15.6	35.4	46.0	10.6
720.0	33.4 P	20.9	H/44	-15.5	38.8	46.0	7.2
768.0	33.3 P	20.9	H/44	-15.2	39.0	46.0	7.0
801.0	34.2 P	21.7	H/44	-15.0	40.9	46.0	5.1
834.0	33.0 P	22.0	H/44	-14.9	40.1	46.0	5.9
858.0	32.5 P	21.9	H/44	-14.8	39.6	46.0	6.4
867.0	33.5 P	22.0	H/44	-14.8	40.7	46.0	5.3
900.0	29.2 P	22.6	H/44	-14.5	37.3	46.0	8.7
934.0	28.4 P	22.7	H/44	-14.4	36.7	46.0	9.3
1002.0	28.9 P	23.2	H/44	-14.1	38.0	54.0	16.0
1068.0	28.4 P	23.4	H/44	-13.8	38.0	54.0	16.0
1201.0	30.6 P	24.1	H/44	-13.4	41.3	54.0	12.7
1334.0	27.8 P	25.4	H/44	-12.9	40.3	54.0	13.7
1849.0	25.9 P	28.0	H/44	-9.8	44.2	54.0	9.8

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report							
Testing of the Delsys, Inc., Model Trigno EMG System, Wireless EMG Sensor System							

Freq. MHz	Peak Meter Reading dBuV	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
		Factor dB	Pol/ ID#		EUT	Limit	
1871.0	22.6 P	28.3	H/44	-9.6	41.2	54.0	12.8
1891.0	25.4 P	28.6	H/44	-9.5	44.4	54.0	9.6
67.5	46.5 Q	7.2	V/44	-19.7	34.0	40.0	6.0
73.6	48.1 P	6.5	V/44	-19.6	34.9	40.0	5.1
78.4	45.3 P	6.8	V/44	-19.5	32.6	40.0	7.4
99.7	46.8 Q*	10.4	V/44	-19.3	37.9	43.5	5.6
113.2	37.1 P	14.0	V/44	-19.2	31.8	43.5	11.7
148.8	45.2 P	10.7	V/44	-18.8	37.1	43.5	6.4
180.8	38.1 P	9.4	V/44	-18.8	28.7	43.5	14.8
182.8	41.2 P	9.5	V/44	-18.8	31.9	43.5	11.6
191.2	37.3 P	10.1	V/44	-18.6	28.8	43.5	14.7
199.6	41.9 P	10.1	V/44	-18.6	33.3	43.5	10.2
220.0	36.1 P	11.6	V/44	-18.4	29.3	46.0	16.7
237.6	41.9 P	12.3	V/44	-18.2	36.0	46.0	10.0
248.6	42.5 P	12.5	V/44	-18.1	36.9	46.0	9.1
249.8	40.9 P	12.5	V/44	-18.1	35.3	46.0	10.7
299.1	38.2 P	13.3	V/44	-17.8	33.7	46.0	12.3
349.0	35.6 P	14.8	V/44	-17.5	33.0	46.0	13.0
362.3	41.4 P	15.1	V/44	-17.3	39.1	46.0	6.9
390.8	33.5 P	15.6	V/44	-17.1	32.0	46.0	14.0
398.3	40.3 P	15.5	V/44	-17.1	38.7	46.0	7.3
425.5	32.0 P	16.2	V/44	-17.0	31.2	46.0	14.8
497.5	36.4 P	16.8	V/44	-16.5	36.7	46.0	9.3
528.0	35.0 P	17.4	V/44	-16.5	35.8	46.0	10.2
587.0	32.6 P	18.2	V/44	-16.2	34.6	46.0	11.4
598.0	38.3 P	18.2	V/44	-16.1	40.4	46.0	5.6
630.0	34.2 P	18.7	V/44	-16.0	36.9	46.0	9.1
697.0	32.3 P	19.5	V/44	-15.6	36.2	46.0	9.8
730.0	32.0 P	19.9	V/44	-15.5	36.4	46.0	9.6
795.0	31.4 P	20.7	V/44	-15.0	37.1	46.0	8.9
858.0	33.3 P	21.1	V/44	-14.8	39.6	46.0	6.4
867.0	30.4 P	21.1	V/44	-14.8	36.7	46.0	9.3
891.0	26.7 P	21.5	V/44	-14.6	33.6	46.0	12.4
932.0	30.8 P	21.8	V/44	-14.4	38.2	46.0	7.8
967.0	26.7 P	21.9	V/44	-14.2	34.4	54.0	19.6
1068.0	33.6 P	22.5	V/44	-13.8	42.4	54.0	11.6
1200.0	29.1 P	23.6	V/44	-13.5	39.2	54.0	14.8
1201.0	31.2 P	23.6	V/44	-13.4	41.3	54.0	12.7
1334.0	32.6 P	24.5	V/44	-12.9	44.1	54.0	9.9

The emissions in **Red** are from host Computer. There may be other emissions listed from the host computer, but since the margin is greater than 5 dB, the source was not determined
Judgment: Passed by 4.9 dB

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report	
Testing of the Delsys, Inc., Model Trigno EMG System, Wireless EMG Sensor System	

Manufacturer	Delsys, Inc.	Specification	FCC Part 15 Subpart C & RSS-210
Model	Trigno Wireless EMG System	Test Date	1/16/2009
Serial Number	none	Test Distance	3 Meters
Abbreviations	Pol = Antenna Polarization; V = Vertical; H = Horizontal; P = peak; Q = QP		
Notes	Corr. Factors = Cable Loss – Preamp Gain		
Configuration	Sensor		

Emissions from Sensor Below 2 GHz

Freq. MHz	Peak Meter Reading dBuV	Antenna		Corr. Factors dB	Field Strength dBuV/m		Margin Under Limit dB
		Factor dB	Pol/ ID#		EUT	Limit	
37.2	24.8 P	17.0	H/44	-27.7	14.1	40.0	25.9
78.0	27.0 P	7.0	H/44	-27.2	6.8	40.0	33.2
206.0	24.0 P	10.5	H/44	-26.2	8.4	43.5	35.1
332.6	24.5 P	14.5	H/44	-25.3	13.7	46.0	32.3
35.6	26.5 P	15.3	V/44	-27.8	14.0	40.0	26.0
77.2	30.4 P	6.7	V/44	-27.2	9.9	40.0	30.1
171.6	28.6 P	9.9	V/44	-26.5	12.0	43.5	31.5
330.9	23.6 P	14.2	V/44	-25.3	12.5	46.0	33.5

There were no emissions were detected from the Sensor within 15 dB of the limits from 30 MHz to 2 GHz. The readings above are the noise floor of the system.

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report												
Testing of the Delsys, Inc., Model Trigno EMG System, Wireless EMG Sensor System												

Base Emissions above 2 GHz

		Spectrum Analyzer Readings					EUT	Peak	Ave	Peak	Ave	Margin
hrm	Tx	Peak	Ave	Peak	Ave	Corr.	Emission	Tot. FS		Limit		Under
#	Freq	Vertical Polarization		Horizontal Polarization		Fact.	Freq MHz	dBuV/m		dBuV/m		Limit
1	2402	100.4	66.8	99.3	65.7	3.9	2402	104.3	70.7	114	94	9.7
be	2402	59.3	25.7	58.2	24.6	4	2400	63.3	29.7	74	54	10.7
2	2402	54.2	20.6	49.1	15.5	12.1	4804	66.3	32.7	74	54	7.7
3	2402	45.5	11.9	44.1	10.5	15.8	7206	61.3	27.7	74	54	12.7
4	2402	40.6	7.0	37.8	4.2	17	9608	57.6	24.0	74	54	16.4
1	2440	102.7	69.1	98.0	64.4	4.1	2440	106.8	73.2	114	94	7.2
2	2440	55.8	22.2	46.3	12.7	12.4	4880	68.2	34.6	74	54	5.8
3	2440	50.9	17.3	47.0	13.4	15.9	7320	66.8	33.2	74	54	7.2
4	2440	42.2	8.6	38.7	5.1	16.7	9760	58.9	25.3	74	54	15.1
1	2474	103.5	69.9	96.9	63.3	4.3	2474	107.8	74.2	114	94	6.2
Be	2474	49.0	15.4	42.4	8.8	4.4	2483.5	53.4	30.4	74	54	20.6
2	2474	57.8	24.2	47.5	13.9	12.4	4948	70.2	36.6	74	54	3.8
3	2474	52.9	19.3	51.8	18.2	16.5	7422	69.4	35.8	74	54	4.6
4	2474	41.3	7.7	39.6	6.0	16.6	9896	57.9	24.3	74	54	16.1
Column numbers (see below for explanations)												
1	2	3	4	5	6	7	8	9	10	11	12	13

Judgment: Passed by 3.8 dB

No other emissions were detected from 2 to 25 GHz.

Notes on Columns:

- Column #1. hrm = Harmonic; BE = Band Edge emissions
- Column #2. Frequency of Transmitter.
- Column #3. Uncorrected readings from the spectrum analyzer
- Column #4. Average Reading based on peak reading reduced by the Duty cycle correction
- Column #5. Uncorrected readings from the spectrum analyzer
- Column #6. Average Reading based on peak reading reduced by the Duty cycle correction
- Column #7. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
- Column #8. Frequency of Tested Emission
- Column #9. Highest peak field strength at listed frequency.
- Column #10. Highest Average field strength at listed frequency.
- Column #11. Peak Limit.
- Column #12. Average Limit.
- Column #13. The margin (last column) is the worst case margin under the peak or average limits for that row.

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report																
Testing of the Delsys, Inc., Model Trigno EMG System, Wireless EMG Sensor System																

Sensor Emissions Above 2 GHz

Spectrum Analyzer Readings																	EUT	Peak	Ave	Peak	Ave	Margin		
hrm	Tx	Peak				Ave				Peak				Ave				Corr.	Emission	Tot. FS		Limit		Under
#	Freq	Vertical Polarization				Horizontal Polarization				Fact.	Freq MHz	dBuV/m		dBuV/m		Limit								
		X	Y	Z	Max	X	Y	Z	Max															
1	2402	93.4	97.3	82.0	72.3	85.8	83.5	99.3	74.3	3.9	2412	103.2	78.2	114	94	10.8								
be	2402	55.0	58.9	43.6	33.9	47.4	45.1	60.9	35.9	4	2400	64.9	39.9	74	54	9.1								
2	2402	43.0	43.0	43.6	18.6	39.8	40.6	47.7	22.7	12.1	4804	59.8	34.8	74	54	14.2								
3	2402	47.4	47.5	48.4	23.4	46.6	47.0	47.2	22.2	15.8	7206	63.2	39.2	74	54	10.8								
4	2402	38.7	39.2	40.0	15.0	40.2	40.6	39.9	15.6	17	9608	56.9	32.6	74	54	17.1								
5	2402	37.3	37.7	38.1	13.1	37.6	38.0	37.8	13.0	19	12010	56.8	32.1	74	54	17.2								
6	2402	41.0	41.1	41.5	16.5	40.8	40.9	41.4	16.4	23.4	14412	64.8	39.9	74	54	9.2								
7	2402	41.2	41.3	41.2	16.3	40.8	40.7	41.0	16.0	22.5	16814	63.7	38.8	74	54	10.3								
1	2440	93.5	96.9	86.1	71.9	86.0	86.1	101.0	76.0	4.1	2440	105.1	80.1	114	94	8.9								
2	2440	39.3	44.7	41.3	19.7	42.8	41.2	51.1	26.1	12.4	4880	63.5	38.5	74	54	10.5								
3	2440	47.5	47.6	48.9	23.9	47.8	47.9	48.4	23.4	15.9	7320	64.3	39.8	74	54	9.7								
4	2440	38.9	40.3	39.5	15.3	38.8	40.5	40.3	15.5	16.7	9760	57.0	32.2	74	54	17.0								
5	2440	37.9	37.8	37.7	12.9	37.6	38.0	37.6	13.0	18.7	12200	56.6	31.7	74	54	17.4								
6	2440	41.2	41.1	41.3	16.3	40.6	41.0	41.0	16.0	23.1	14640	64.3	39.4	74	54	9.7								
7	2440	40.6	40.3	40.7	15.7	41.1	41.0	40.7	16.1	24.5	17080	65.2	40.6	74	54	8.8								
1	2474	92.9	95.3	85.9	70.3	85.9	87.9	100.0	75.0	4.3	2474	104.3	79.3	114	94	9.7								
Be	2474	43.9	46.3	36.9	21.3	36.9	38.9	51.0	26.0	4.4	2483.5	55.4	30.4	74	54	18.6								
2	2474	40.0	42.4	39.8	17.4	41.5	41.6	45.0	20.0	12.4	4948	57.4	32.4	74	54	16.6								
3	2474	47.4	48.8	47.4	23.8	48.6	47.4	48.8	23.8	16.5	7422	65.3	40.3	74	54	8.7								
4	2474	38.9	38.7	40.2	15.2	38.9	41.2	41.4	16.4	16.6	9896	58.0	33.0	74	54	16.0								
5	2474	37.0	37.5	37.1	12.5	37.3	37.0	37.8	12.8	18.5	12370	56.3	31.3	74	54	17.7								
6	2474	40.9	41.5	40.8	16.5	40.8	41.1	40.9	16.1	22.2	14844	63.1	38.7	74	54	10.9								
7	2474	41.1	41.1	40.8	16.1	41.0	40.9	38.6	16.0	26.1	17318	67.2	42.2	74	54	6.8								
Column numbers (see below for explanations)																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17								

Judgment: Passed by 6.8 dB

No other emissions were detected from 2 to 25 GHz.

RADIOMETRICS MIDWEST CORPORATION - EMC Test Report	
Testing of the Delsys, Inc., Model Trigno EMG System, Wireless EMG Sensor System	

Column #1. hrm = Harmonic; BE = Band Edge emissions
 Column #2. Frequency of Transmitter.
 Column #3. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
 Column #4. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
 Column #5. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
 Column #6. Average Reading based on peak reading reduced by the Duty cycle correction
 Column #7. Uncorrected readings from the spectrum analyzer with First Axis Rotation.
 Column #8. Uncorrected readings from the spectrum analyzer with Second Axis Rotation.
 Column #9. Uncorrected readings from the spectrum analyzer with Third Axis Rotation.
 Column #10. Average Reading based on peak reading reduced by the Duty cycle correction
 Column #11. Corr. Factors = Cable Loss – Preamp Gain + Antenna Factor
 Column #12. Frequency of Tested Emission
 Column #13. Highest peak field strength at listed frequency.
 Column #14. Highest Average field strength at listed frequency.
 Column #15. Peak Limit.
 Column #16. Average Limit.
 Column #17. The margin (last column) is the worst case margin under the peak or average limits for that row.