Excellence in Compliance Testing

Certification Test Report

FCC ID: OF8-TM8D

FCC Rule Part: CFR 47 Part 95, Subpart H

ACS Report Number: 15-3052.W06.1A

Applicant: Life Sensing Instrument Company
Model: TM8D

Test Begin Date: January 19, 2016
Test End Date: January 20, 2016

Report Issue Date: May 13, 2016

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

For The Scope of Accreditation Under Certificate Number AT-1921

This report must not be used by the client to claim product certification, approval, or endorsement by ANAB, ANSI, or any agency of the Federal Government.

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This report contains 14 pages

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1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with CFR 47 Part 95 Subpart H of the FCC's Code of Federal Regulations.

1.2 Product Description

Medical Telemetry Device. Transmits ECG data from patient.

Technical Information:

Detail	Description
Frequency Range	608 – 614 MHz
Number of Channels	118
Modulation Format	FSK
Data Rates	14.2Kb
Number of Inputs/Outputs	5
Operating Voltage	3.0Vdc
Antenna Type / Gain	Monopole / =<1 dBi

Manufacturer Information:
Life Sensing Instrument Company
329 W. Lincoln Street
Tullahoma, TN 37388

Test Sample Serial Numbers: TM8DWA2331611.10

Test Sample Condition: The EUT was in good functional condition with no physical damages.

1.3 Test Methodology

1.3.1 Configurations and Justification

The EUT was placed in transmit mode on 2 channels (lowest and the highest). The EUT was pre-scanned in 3 orientations and the worst case used for final testing; lying flat face up, standing up, and laying on its side. The worst case position is lying flat face up. The EUT was tested connected to an ECG simulator which provided the data for modulation.

2.0 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions, Inc.
2320 Presidential Dr. Suite 101
Durham NC 27703-8077
Phone: (919) 381-4235
www.acstestlab.com

FCC Test Firm Registration #: 637011
Industry Canada Lab Code: 20446

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS (Durham) is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board/ANAB accreditation program, and has been issued certificate number AT-1921 in recognition of this accreditation. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of an 18' x 28' x 18' shielded enclosure. The chamber is lined with Samwha Electronics Co. LTD Ferrite Absorber, model number SFA300 (HSN-1). The ferrite tile is 10cm x 10 cm and weighs approximately 1.4lbs. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber. On top of the ferrite tiles is DMAS HT-45 (Dutch Microwave Absorber Solutions) hybrid absorber on all walls except the wall behind the antenna mast which has a shorter DMAS HT-25 absorber.

The turntable is 1.50m in diameter and is located 150cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using short #6 copper wire. The turntable is aluminum, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the turntable. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane.

Behind the turntable is a 2' x 6' x 1.5' deep shielded pit used for support equipment if necessary. The pit is equipped with 2 - 4" PVC chase from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

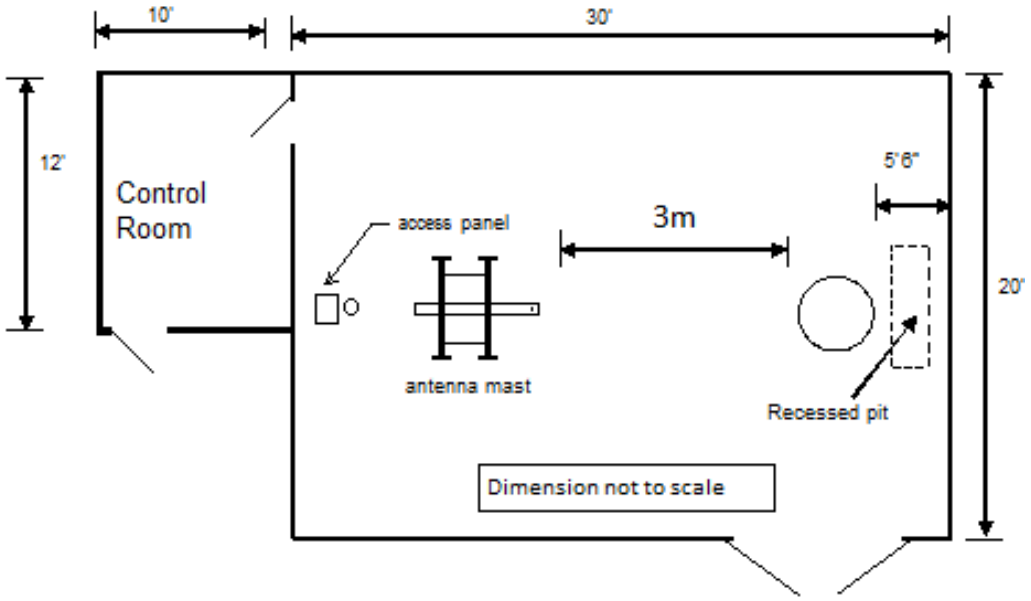

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 10' sheet galvanized steel horizontal ground reference plane (GRP) bonded every 6" to an 8' X 8' aluminum vertical ground plane.

A diagram of the room is shown below in figure 2.3.2-1:

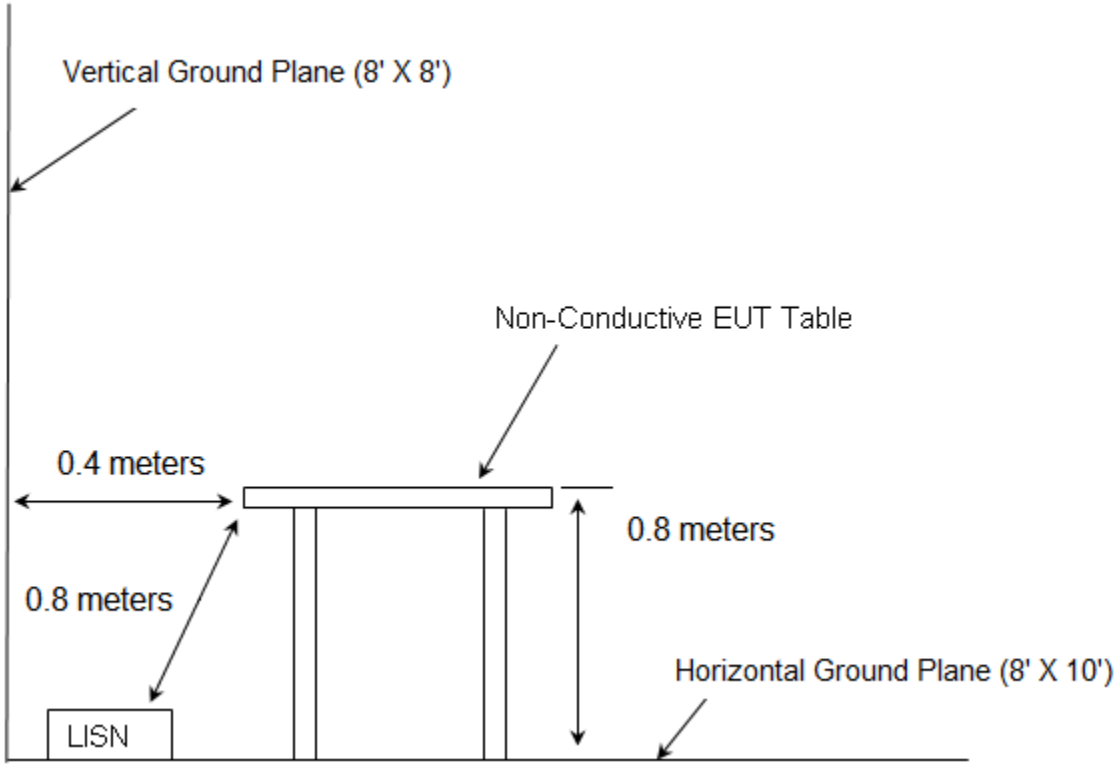

Figure 2.3.2-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

1 - ANSI C63.4-2014: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9 kHz to 40GHz - 2014
2 - US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures - 2016
3 - US Code of Federal Regulations (CFR): Title 47, Part 95, Subpart H: Wireless Medical Telemetry Service (WMTS) – 2016
4 - TIA-603-D: Land Mobile FM or PM - Communications Equipment - Measurement and Performance Standards – 2010

4.0 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
3002	Rohde & Schwarz	ESU40	Receiver	100346	7/6/2015	7/6/2016
3038	Florida RF Labs	NMSE-290AW-60.0-NMSE	Cable Set	1448	12/22/2015	12/22/2016
3039	Florida RF Labs	NMSE-290AW-396.0-NMSE	Cable Set	1447	12/22/2015	12/22/2016
3014	EMCO	3115	Antennas	9901-5653	2/10/2015	2/10/2017
626	EMCO	3110B	Antennas	9411-1945	2/26/2014	2/26/2016
277	Emco	93146	Antennas	9904-5199	9/2/2014	9/2/2016
3006	Rohde & Schwarz	TS-PR18	Amplifiers	122006	6/29/2015	6/29/2016
3055	Rohde & Schwarz	3005	Cables	3055	12/30/2015	12/30/2016
3012	Rohde & Schwarz	EMC32-EB	Software	100731	1/19/2015	7/19/2016
3008	Rohde & Schwarz	NRP2	Meter	103131	1/28/2016	1/28/2017
3009	Rohde & Schwarz	NRP-Z81	Meter	102397	1/28/2016	1/28/2017

NCR = No Calibration Required
Firmware Version: ESU40 is 4.73 SP4
Software Version: EMC32-B is 9.15

5.0 SUPPORT EQUIPMENT

Table 5-1: EUT and Support Equipment

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	LSI	TM8 Telemaster	TM8DWA2331611.10
2	Patient Simulator	Netech	MiniSim	19076

Table 5-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	ECG Leads X6	0.60m	NA	Patient Simulator

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

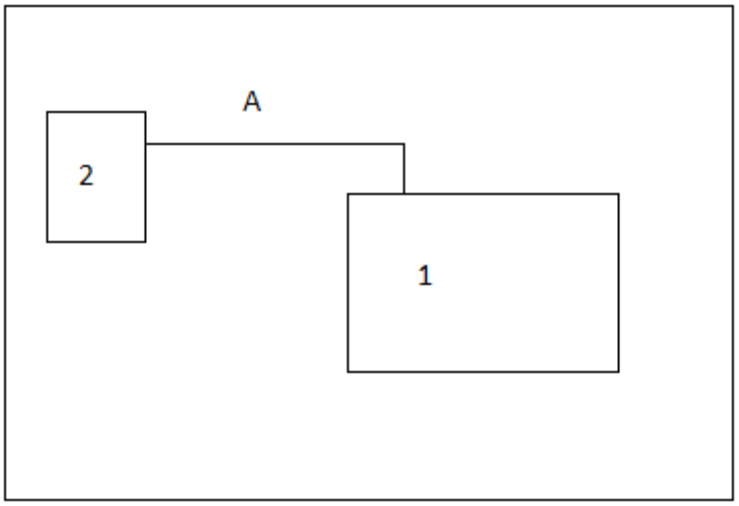

Figure 6-1: EUT Test Setup

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 RF Power Output

7.1.1 Measurement Procedure

The power output data was taken using same radiated measurement methods as radiated spurious emissions.

The FCC limit for power output is stated as a radiated field strength of 200mV/m at 3m (106 dBµV/m).

7.1.2 Measurement Results

Part 95.1115 (a)

The data captured in the table below represents the worst case (highest) fundamental emission's field strength.

Table 7.1.2-1: In–Band Field Strength – 608.3 MHz

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
608.3	65.2	64.3	H	21.58	-----	85.88	-----	106	-----	20.12
608.3	54.3	53.4	V	21.58	-----	74.98	-----	106	-----	31.02

Table 7.1.2-2: In–Band Field Strength – 613.7 MHz

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
613.7	62.9	61.9	H	21.5	-----	83.4	-----	106	-----	22.6
613.7	56.7	55.7	V	21.5	-----	77.2	-----	106	-----	28.8

The conducted RF output of the equipment under test was measured to aid the determination of compliance to the RF exposure limit. A special sample provided by the manufacturer, which attached a coaxial cable to the RF output port in place of the integral antenna was directly connected to a wide band RF power meter. The results are shown below.

Table 7.1.2-3: In – Band Conducted RF Output Power

Frequency	dBm	mW
608.3	-8.2	0.15

7.2 Occupied Bandwidth

7.2.1 Measurement Procedure

The occupied bandwidth data was taken using same radiated measurement methods as radiated spurious emissions. The spectrum analyzer resolution and video bandwidths were set to 1000 Hz and 3000 Hz respectively. The plot includes markers at the 20 dB bandwidth points. Results of the test are shown below for the worst case mode of operation.

7.2.2 Measurement Results

Part 2.1033, 2.1049

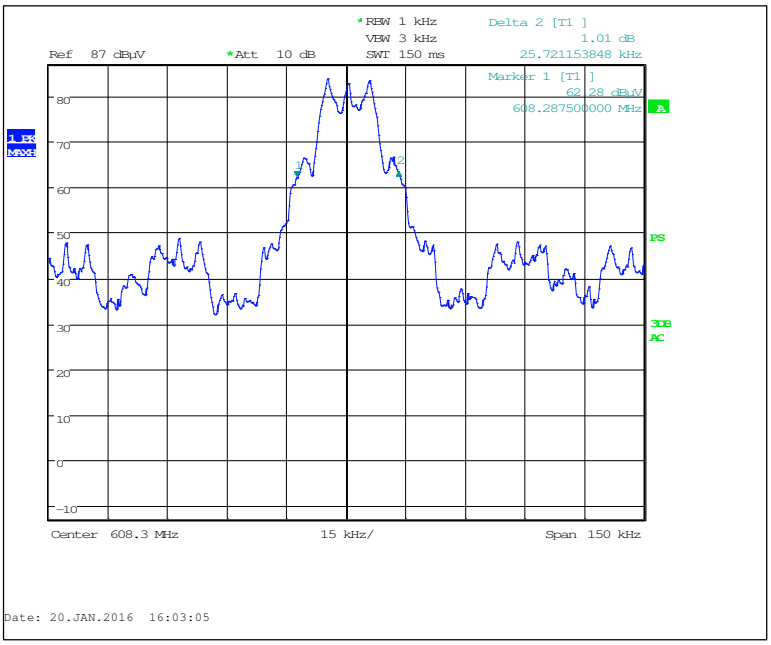

Figure 7.2.2-1: Occupied Bandwidth - 608.3 MHz

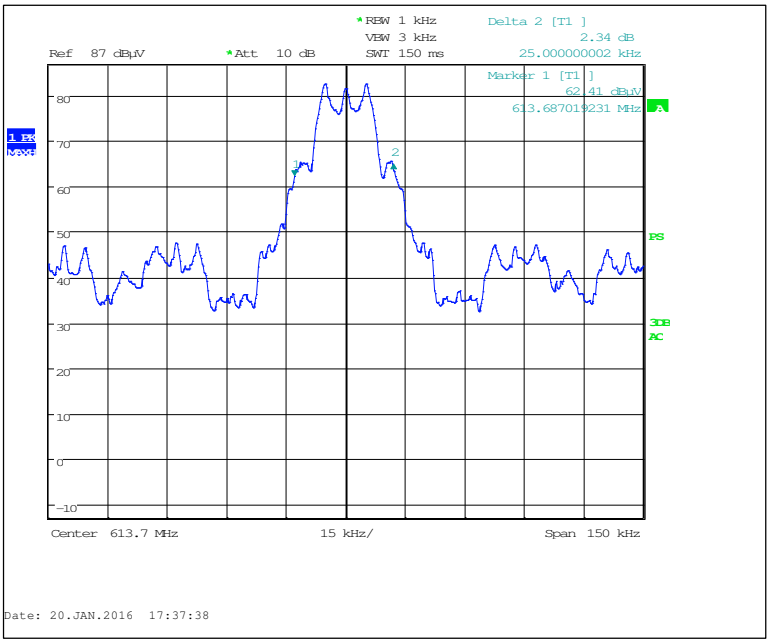

Figure 7.2.2-2: Occupied Bandwidth - 613.7 MHz

7.3 Spurious Emissions at the Antenna Terminals

The EUT has an integral antenna and this rule part has no conducted emission limits. All emissions are stated as radiated field strength levels. Compliance of the radiated spurious emissions are presented in the next section.

7.4 Field Strength of Spurious Emissions

7.4.1 Measurement Procedure

The unwanted emissions were measured radiated over the frequency range of 30MHz to 6.14GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 960 MHz, quasi-peak measurements were made using a RBW of 120 kHz and a VBW of 300 kHz. For frequencies above 960 MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively. Peak measurements are provided for reference only. This was repeated for both horizontal and vertical polarizations of the receive antenna.

The magnitude of all spurious emissions not reported were attenuated below the noise floor of the measurement system and therefore not specified in this report.

7.4.2 Measurement Results

Part 95.1115 (b), 95.1115 (b) (2)

Table 7.4.2-1: Field Strength of Spurious Emissions – 608.3 MHz – Lying Flat

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
1216.6	65.50	46.90	H	-5.72	59.78	41.18	----	54.0	----	12.8
1216.6	58.70	43.90	V	-5.72	52.98	38.18	----	54.0	----	15.8
1824.9	49.40	35.30	H	-2.74	46.66	32.56	----	54.0	----	21.4
1824.9	41.30	31.30	V	-2.74	38.56	28.56	----	54.0	----	25.4
4866.4	43.40	37.10	H	6.37	49.77	43.47	----	54.0	----	10.5
4866.4	43.70	36.60	V	6.37	50.07	42.97	----	54.0	----	11.0

Table 7.4.2-2: Field Strength of Spurious Emissions – 613.7 MHz – Lying Flat

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
1227.4	52.20	49.90	H	-5.67	46.53	44.23	----	54.0	----	9.8
1227.4	53.90	45.90	V	-5.67	48.23	40.23	----	54.0	----	13.8
1841.1	53.00	34.30	H	-2.65	50.35	31.65	----	54.0	----	22.3
1841.1	42.70	35.00	V	-2.65	40.05	32.35	----	54.0	----	21.6
3068.5	41.70	34.20	H	2.09	43.79	36.29	----	54.0	----	17.7
3068.5	42.60	36.20	V	2.09	44.69	38.29	----	54.0	----	15.7
3682.2	43.60	37.70	H	3.94	47.54	41.64	----	54.0	----	12.4
3682.2	42.20	35.50	V	3.94	46.14	39.44	----	54.0	----	14.6

7.5 Frequency Stability

7.5.1 Measurement Procedure

The equipment under test is placed inside an environmental chamber. The RF output is directly coupled through appropriate attenuation to the input of the measurement equipment. A power supply is attached to the primary supply voltage.

Frequency measurements were made at intervals of 10ºC over the manufacturer's specified temperature range of +10º C to +50º C at the normal supply voltage. A period of time sufficient to stabilize all components of the equipment was allowed at each temperature step. The equipment's normal operating voltage is 3.0 Vdc. At 20º C two additional measurements were performed at the manufacturer's specified voltage limits. The maximum variation of frequency over temperature and voltage was recorded.

The results of the test are shown below:

7.5.2 Measurement Results

Part 95.1115 (e)

Frequency Stability

Frequency (MHz): 613.7
Deviation Limit (PPM):

Temperature	Frequency	Frequency Error	Voltage	Voltage
C	MHz	(In-band)	(%)	(VDC)
-30 C		**-1000000.000**	100%	3.00
-20 C		**-1000000.000**	100%	3.00
-10 C		**-1000000.000**	100%	3.00
0 C		**-1000000.000**	100%	3.00
10 C	**613.695267**	**-7.710**	100%	3.00
20 C	**613.693178**	**-11.120**	100%	3.00
30 C	**613.690650**	**-15.240**	100%	3.00
40 C	**613.688090**	**-19.410**	100%	3.00
50 C	**613.685741**	**-23.230**	100%	3.00
20 C	**613.693170**	**-11.130**	-20%	2.40
20 C	**613.693170**	**-11.130**	+20%	3.60

Figure 7.5.2-1: Frequency Stability – 613.7 MHz

8.0 CONCLUSION

In the opinion of ACS, Inc. the model TM8D, manufactured by Life Sensing Instrument Company, meets all the requirements of FCC Part 95H where applicable.

End Report