

## **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**



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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A handwritten signature in black ink, appearing to read "M. R. de Aranzeta".

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**Kirby Munroe  
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Advanced Compliance Solutions, Inc.**

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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 / $\leq 1$ 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](http://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:

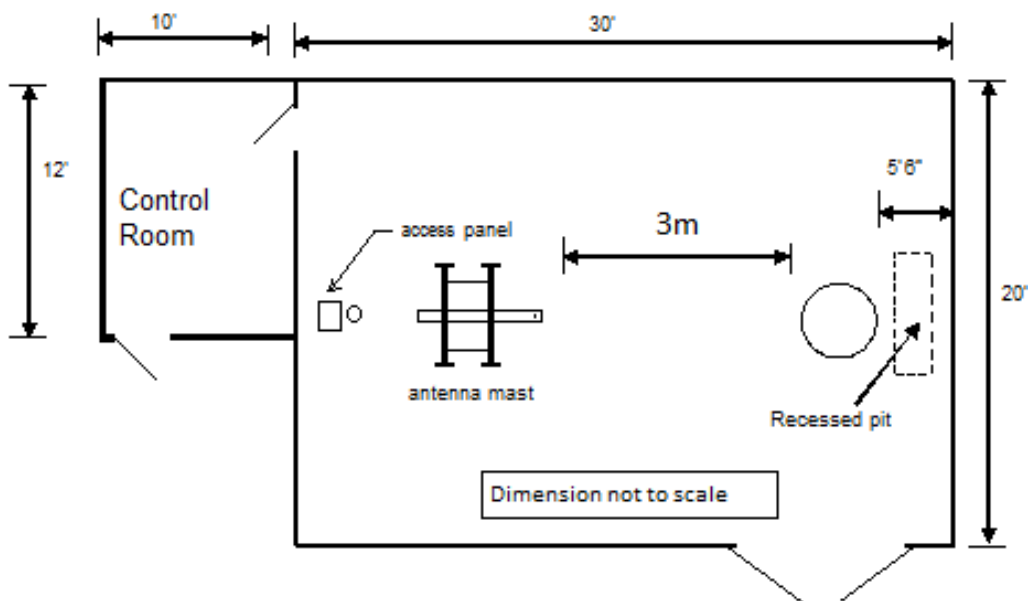


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

### 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:

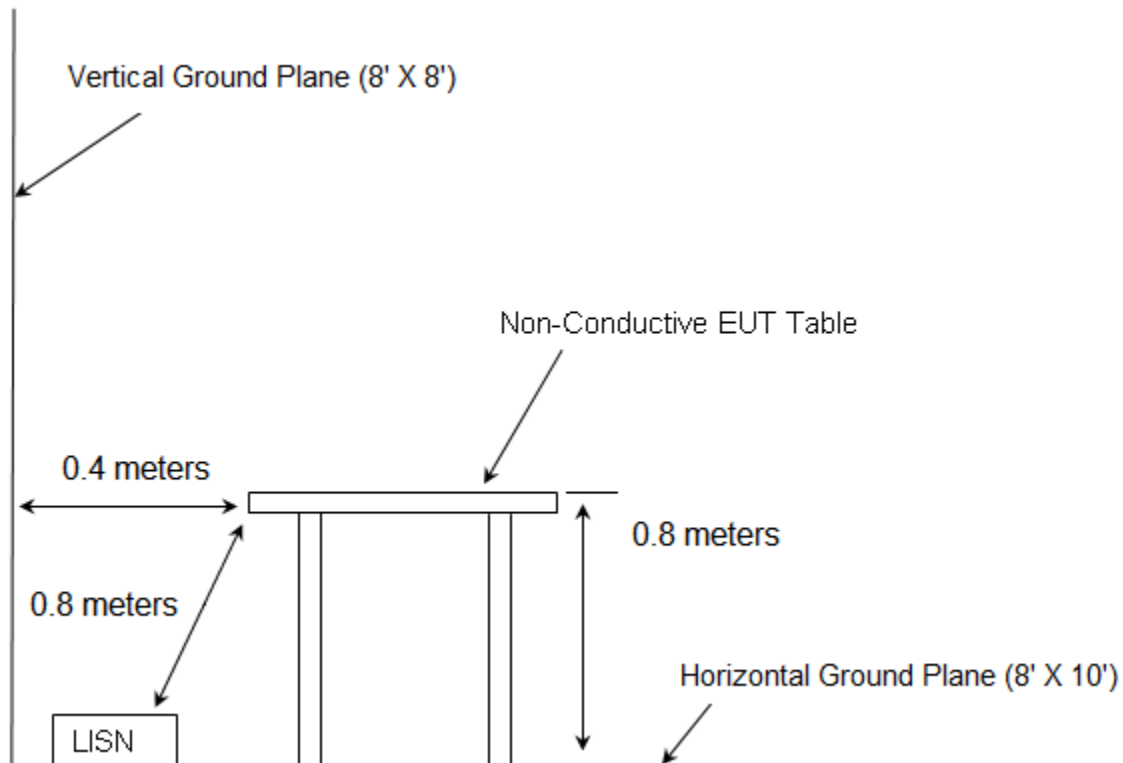


Figure 2.3.2-1: AC Mains Conducted EMI Site

### 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

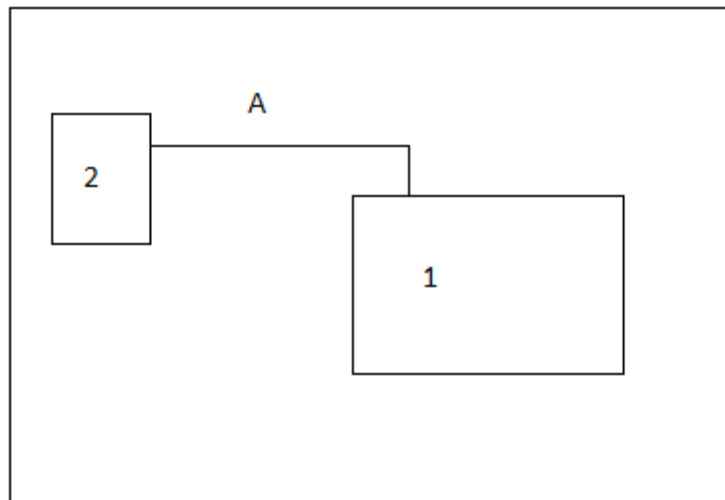


Figure 6-1: EUT Test Setup

## 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 dB $\mu$ V/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 (dB $\mu$ V) |         | Antenna Polarity | Correction Factors | Corrected Level (dB $\mu$ V/m) |         | Limit (dB $\mu$ V/m) |         | Margin (dB) |         |
|-----------------|--------------------|---------|------------------|--------------------|--------------------------------|---------|----------------------|---------|-------------|---------|
|                 | pk                 | Qpk/Avg |                  |                    | 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 (dB $\mu$ V) |         | Antenna Polarity | Correction Factors | Corrected Level (dB $\mu$ V/m) |         | Limit (dB $\mu$ V/m) |         | Margin (dB) |         |
|-----------------|--------------------|---------|------------------|--------------------|--------------------------------|---------|----------------------|---------|-------------|---------|
|                 | pk                 | Qpk/Avg |                  |                    | 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

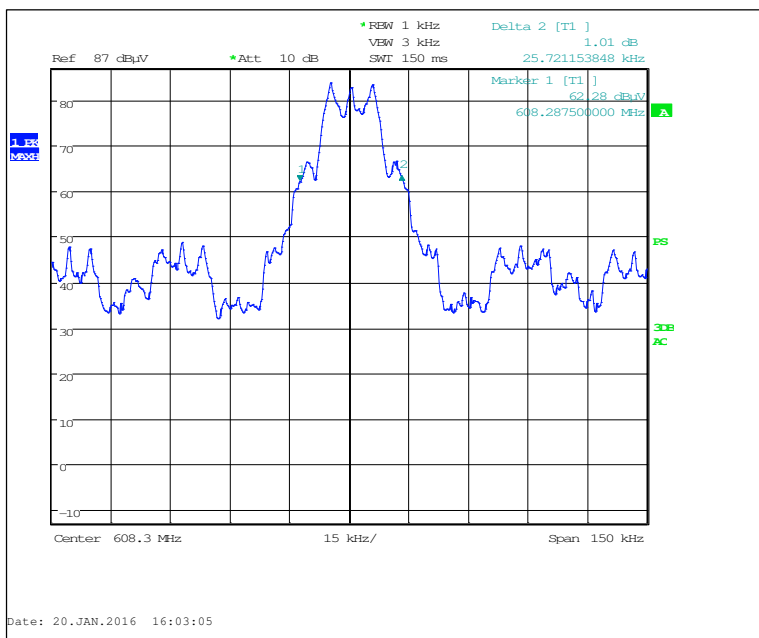


Figure 7.2.2-1: Occupied Bandwidth - 608.3 MHz

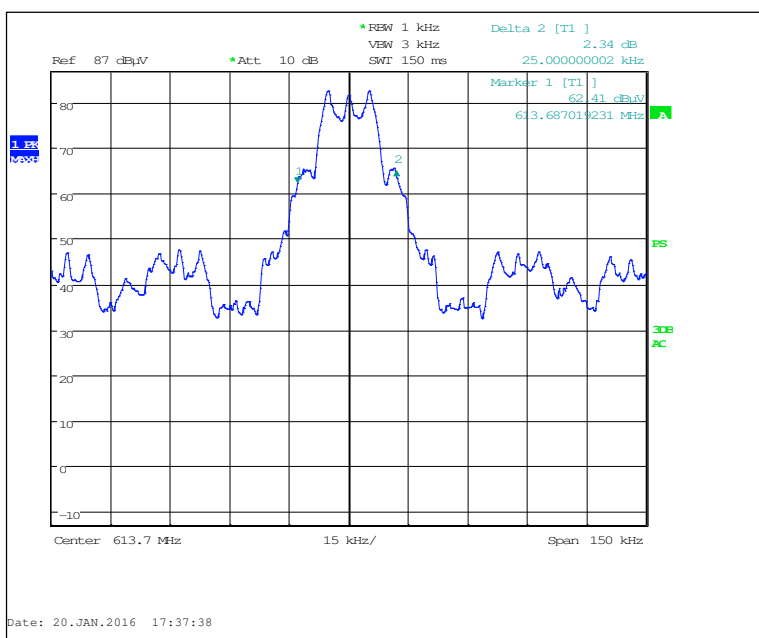


Figure 7.2.2-2: Occupied Bandwidth - 613.7 MHz

### **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 (H/V) | Correction Factors (dB) | Corrected Level (dBuV/m) |         | Limit (dBuV/m) |         | Margin (dB) |         |
|-----------------|--------------|---------|------------------------|-------------------------|--------------------------|---------|----------------|---------|-------------|---------|
|                 | pk           | Qpk/Avg |                        |                         | 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 (H/V) | Correction Factors (dB) | Corrected Level (dBuV/m) |         | Limit (dBuV/m) |         | Margin (dB) |         |
|-----------------|--------------|---------|------------------------|-------------------------|--------------------------|---------|----------------|---------|-------------|---------|
|                 | pk           | Qpk/Avg |                        |                         | 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 10°C over the manufacturer's specified temperature range of +10° C to +50° 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 20° 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