# EMC TEST REPORT

**Report Number: 100360832ATL-001e**
**Project Number: G100360832**

**Report Issue Date:** May 8, 2014

**Product Designation:** L90

**Standards:** CFR47 FCC Part 15 Subpart C:2014 Section 15.225, CFR47 FCC Part 15 Subpart B:2014 Section 15.109
Industry Canada RSS-210 Issue 8 December 2010, Annex 2 Section A2.6
Industry Canada RSS-GEN Issue 3 December 2010

Tested by:
Intertek Testing Services NA, Inc.
1950 Evergreen Blvd, Suite 100
Duluth, GA 30096 USA

Client:
Salto Systems S.L.
Pol. Lanbarren, C/ Arkotz 9
20180-OIARTZUN Gipuzkoa
Spain

Report prepared by Mary Sampson

Mary Sampson/Senior Project Engineer

Report reviewed by

Vathana Van/Senior Project Engineer

## 1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

## 2 Test Summary

| Section | Test full name | Result |
|---|---|---|
| 3 | Client Information | |
| 4 | Description of Equipment Under Test | |
| 5 | System Setup and Method | |
| 6 | Fundamental Frequency Radiated Emissions<br>FCC Part 15 Subpart C: 2014 15.225(a), (b), (c), (d)<br>IC RSS-210 Issue 8 December 2010 Annex A2.6 (a), (b), (c), (d) | Pass |
| 7 | Transmitter Spurious Emissions Below 30 MHz<br>FCC Part 15 Subpart C: 2014 15.209, 15.225(d)<br>IC RSS-210 Issue 8 December 2010 A2.6(d) | Pass |
| 8 | Transmitter Spurious Emission Above 30MHz<br>FCC Part 15 Subpart C: 2014 15.209, 15.225(d)<br>IC RSS-210 Issue 8 December 2010 A2.6(d) | Pass |
| 9 | Receiver Spurious Emissions Above 30MHz<br>FCC Part 15 Subpart B: 2014 15.109<br>IC RSS-Gen Issue 3 December 2010: Section 6.0 | Pass |
| 10 | 20dB and Occupied Bandwidth<br>FCC Part 15 Subpart C:2014 15.225<br>IC RSS-Gen Issue 3 December 2010 Section 4.6 | Pass |
| 11 | Frequency Stability<br>FCC Part 15 Subpart C:2014 15.225(e)<br>IC RSS-Gen Issue 3 December 2010 Section 4.7<br>IC RSS-210 December 2010 Annex A2.6 | Pass |
| 12 | Revision History | |

| Section | Test full name | Result |
|---|---|---|

## 3 Client Information

This EUT was tested at the request of:

**Client:** Salto Systems S.L.
Pol. Lanbarren, C/ Arkotz 9
20180-OIARTZUN Gipuzkoa
Spain

**Contact:** Julen Gutierrez
**Telephone:** +34 943 344 550
**Fax:** +34 943 341 621
**Email:** j.gutierrez@saltosystems.com

## 4 Description of Equipment Under Test

**Manufacturer:** Salto Systems S.L.
Pol. Lanbarren, C/ Arkotz 9
20180-OIARTZUN Gipuzkoa
Spain

| Equipment Under Test | | | |
|---|---|---|---|
| Description | Manufacturer | Model Number | Serial Number |
| SALTO Locker | Salto systems S.L. | L90 | 908083 |
| | | | |
| | | | |
| | | | |

| | |
|---|---|
| Receive Date: | 11/25/2013 |
| Received Condition: | Good |
| Type: | Production |

Description of Equipment Under Test (provided by client)

The SALTO L90 is a locker lock designed to bring all the advantages of an electronic access control for locker, and cabinets. Its ergonomic frontal knob has been design to make easier the use of the locker. The electronical and the mechanical components are located on the inside to enhance the security against vandalism or manipulation.

The L90 uses DESfi re Mifare RFID communication and offers no end of interesting possibilities as multi-application with others systems using the same card. Simple and intuitive use and the possibilities that the key can any shape make this system a good option for your special needs.

The L90 is perfect for controlling access to lockers, cupboards, cabinets, cabins, boxes, show cases, where access control and full audit trailing are required, eg where valuables such as medical drugs, electronic equipment, museum pieces, confidential documentation, are stored.

| Equipment Under Test Power Configuration | | | |
|---|---|---|---|
| Rated Voltage | Rated Current | Rated Frequency | Number of Phases |
| 4.5 Vdc | Standby 28uA Opening 180mA | DC | DC |

**Operating modes of the EUT:**

| No. | Descriptions of EUT Exercising |
|---|---|
| 1 | The EUT was powered with 3.825 to 5.175 Vdc by power supply during frequency stability testing and 3 'AAA" batteries for remaining test cases and placed in a continuous transmit state with normal modulation and standby mode for testing. |

**Software used by the EUT:**

| No. | Descriptions of EUT Exercising |
|---|---|
| 1 | None |

## 5 System Setup and Method

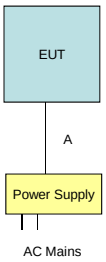
| Cables | | | | | |
|---|---|---|---|---|---|
| ID | Description | Length (m) | Shielding | Ferrites | Termination |
| A | DC Input | 2.0 | None | None | Power Supply |

| Support Equipment | | | |
|---|---|---|---|
| Description | Manufacturer | Model Number | Serial Number |
| Power Supply | Tektronix | PS2510G | TW50295 |

### 5.1 Method:

Configuration as required by ANSI C63.4-2003.

### 5.2 EUT Block Diagram:




General notes: For Frequency Stability, a power supply was used to power device. All other test cases, battery powered.

# 6 Fundamental Frequency Radiated Emissions

## 6.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C: 2014 15.225(a)(b)(c)(d), IC RSS-210 Issue 8 December 2010 A2.6(a)(b)(c)(d), ANSI C63.4-2003.

**TEST SITE:** 10m Semi-Anechoic Chamber

**10 Meter Semi-Anechoic Chamber** The test site for radiated emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096. It is a 10 meter semi-anechoic chamber manufactured by Panashield. Embedded in the floor is a 3 meter diameter turntable.

**Measurement Uncertainty**

For radiated emissions, $U_{lab}$ (3.9 dB at 3m and 3.6 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < $U_{CISPR}$ (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

**Sample Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

**Example:**

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

### 6.2 Test Equipment Used:

| Asset | Description | Manufacturer | Model | Serial | Cal Date | Cal Due |
|---|---|---|---|---|---|---|
| 213108; | EMI Receiver, Preselector section | Hewlett Packard | 85460A | 3348A00203 | 01/03/2013 | 01/03/2014 |
| 213109; | EMI Receiver | Hewlett Packard | 8546A | 3410A00173 | 01/03/2013 | 01/03/2014 |
| 213071; | Antenna, Active Loop (1kHz to 30 MHz) | EMCO | 6507 | 9204-1283 | 04/04/2013 | 04/04/2014 |
| 211897; | Digital Pocket Thermometer and Hydrometer | Mannix | SAM700BAR | none | 12/18/2012 | 12/18/2013 |
| ST-4; | 7m Cable, 0.01-18GHz | Storm Products Co. | A81-0303-275.6 | 12-07-001 | 08/21/2013 | 08/21/2014 |
| MP3; | Cable MP3, 18 GHz, N, 10m | Megaphase | G919-NKNK-394 | MP3 | 05/13/2013 | 05/13/2014 |
| E205; | Cable, N-N, 3 meters, 18GHz | Megaphase | TM18-NKNK-118 | 9053201 003 | 05/08/2013 | 05/08/2014 |

**Software Utilized:**

| Name | Manufacturer | Version |
|---|---|---|
| Tile | Quantum Change | 3.4.K.22 |

### 6.3 Results:

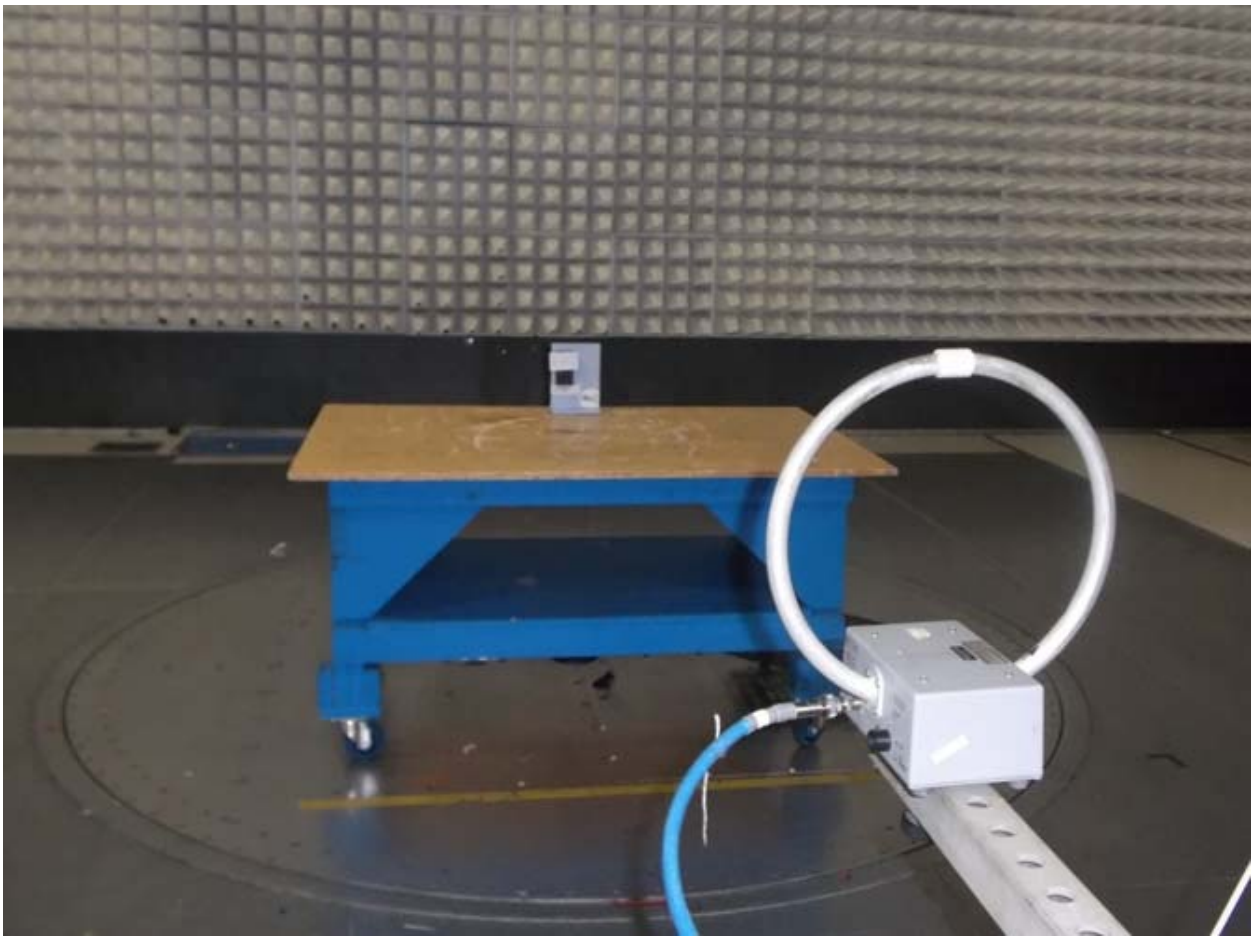
The sample tested was found to Comply.

The Field Strength of any emissions shall not exceed the limits as follows:

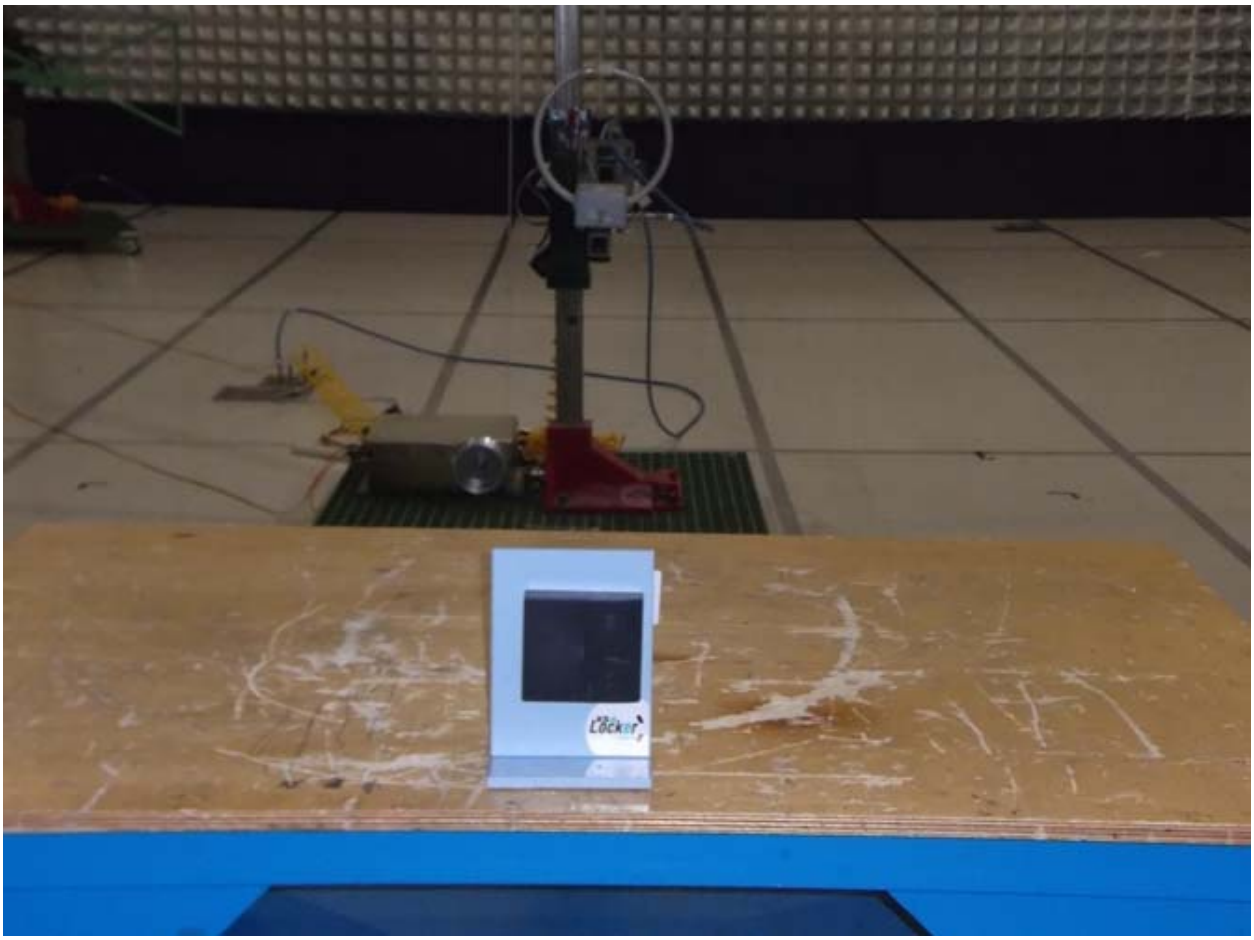
| Frequency Bands | Field Strength Limits | | Test Distance |
|---|---|---|---|
| (MHz) | µV/m | dBµV/m | (meters) |
| 13.553-13.567 | 15,848 | 84.0 | 30 |
| 13.410-13.553 | 334 | 50.5 | 30 |
| 13.567-13.710 | 334 | 50.5 | 30 |
| 13.110-13.410 | 106 | 40.51 | 30 |
| 13.710-14.010 | 106 | 40.51 | 30 |
| Outside of 13.110-14.010 | §15.209 | | |

### 6.4 Setup Photographs:

Front



Rear



## 6.5 Plots/Data:

**Client:** Salto Systems
**Model Number:** L90
**Project Number:** G100360832
**Tested By:** MS
**Date:** 12/9/13
**Frequency Range (MHz):** Fundamental
**Input power:** Battery, 3x1.5 V =4.5V

**Receiver:** HP 8546A
**Antenna:** EMCO 6507 h
**Cables:** ST-4+MP3+E-205
**Preamp:**
**Test Distance (m):** 3
**Limit:** FCC 15
**Modifications for compliance (y/n):** n

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Ant. Pol. (V/H)** | **Frequency MHz** | **Reading dB(uV)** | **Antenna Factor dB(1/m)** | **Cable Loss dB** | **Pre-amp Factor dB** | **Net dB(uV/m)** | **Limit dB(uV/m)** | **Margin dB** | **Detectors / Bandwidths Det/RBW/VBW** |
| **Co-Axial** | | | | | | | | | |
| V | 13.560 | 32.9 | 34.4 | 0.6 | 0.0 | 67.8 | 124.0 | -56.2 | QP/9k/30k |
| V | 13.553 | 20.5 | 34.4 | 0.5 | 0.0 | 55.4 | 90.5 | -35.1 | QP/9k/30k |
| V | 13.567 | 21.3 | 34.4 | 0.6 | 0.0 | 56.2 | 90.5 | -34.3 | QP/9k/30k |
| V | 13.410 | 9.4 | 34.4 | 0.5 | 0.0 | 44.3 | 80.5 | -36.2 | QP/9k/30k |
| V | 13.710 | 9.1 | 34.4 | 0.6 | 0.0 | 44.0 | 80.5 | -36.5 | QP/9k/30k |
| V | 13.110 | 8.0 | 34.4 | 0.5 | 0.0 | 42.8 | 69.5 | -26.7 | QP/9k/30k |
| V | 14.010 | 7.7 | 34.4 | 0.6 | 0.0 | 42.7 | 69.5 | -26.8 | QP/9k/30k |
| | | | | | | | | | |
| Co-Planar | | | | | | | | | |
| V | 13.560 | 39.2 | 34.4 | 0.6 | 0.0 | 74.2 | 124.0 | -49.8 | QP/9k/30k |
| V | 13.553 | 26.2 | 34.4 | 0.5 | 0.0 | 61.1 | 90.5 | -29.4 | QP/9k/30k |
| V | 13.567 | 27.0 | 34.4 | 0.6 | 0.0 | 61.9 | 90.5 | -28.5 | QP/9k/30k |
| V | 13.410 | 13.6 | 34.4 | 0.5 | 0.0 | 48.5 | 80.5 | -32.0 | QP/9k/30k |
| V | 13.710 | 12.8 | 34.4 | 0.6 | 0.0 | 47.7 | 80.5 | -32.8 | QP/9k/30k |
| V | 13.110 | 7.5 | 34.4 | 0.5 | 0.0 | 42.4 | 69.5 | -27.1 | QP/9k/30k |
| V | 14.010 | 7.3 | 34.4 | 0.6 | 0.0 | 42.2 | 69.5 | -27.3 | QP/9k/30k |
| | | | | | | | | | |
| **Calculations** | | G=C+D+E-F | | I=G-H | | | | | |

Test Personnel: Mary Sampson
Supervising/Reviewing Engineer: (Where Applicable)
Product Standard: FCC 15.225, IC RSS-210
Input Voltage: Battery, 3 AAA
Pretest Verification w/ Ambient Signals or BB Source: **BB Source**

Test Date: 12/9/13
Limit Applied: Per Section 6.3
Ambient Temperature: 21.7 ºC
Relative Humidity: 44.4 %
Atmospheric Pressure: 986.9 mbars

Deviations, Additions, or Exclusions: None

# 7 Transmitter Spurious Emissions Below 30MHz

## 7.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C:2014 15.209, 15.225(d), IC RSS-210 Issue 8 December 2010 A2.6(d), ANSI C63.4-2003.

**TEST SITE:** 10m Semi-Anechoic Chamber

**The EMC Lab** has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

**10 Meter Semi-Anechoic Chamber** The test site for radiated emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096. It is a 10 meter semi-anechoic chamber manufactured by Panashield. Embedded in the floor is a 3 meter diameter turntable.

**Measurement Uncertainty**

For conducted emissions, $U_{lab}$ (2.8 dB in worst case) < $U_{CISPR}$ (3.6 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

**Sample Calculations**

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF
Where NF = Net Reading in dBμV
RF = Reading from receiver in dBμV
LF = LISN or ISN Correction Factor in dB
CF = Cable Correction Factor in dB
AF = Attenuator Loss Factor in dB

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

**Example:**

NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 dBμV
$UF = 10^{(49.1\ dB\mu V / 20)}$ = 285.1 μV/m

### 7.2 Test Equipment Used:

| Asset | Description | Manufacturer | Model | Serial | Cal Date | Cal Due |
|---|---|---|---|---|---|---|
| 200162; | EMI Receiver (20Hz-40GHz) | Rohde & Schwarz | ESU 40 | 100314 | 02/15/2013 | 02/15/2014 |
| NYM EMC36; | Antenna, Active Loop (10kHz to 30 MHz) | EMCO | 6512 | 9810-1228 | 12/02/2013 | 12/02/2014 |
| 211566; | Preamplifier, 100 Hz to 30 MHz | Com-Power | PA-010 | 171001 | 11/08/2013 | 11/08/2014 |
| ST-4; | 7m Cable, 0.01-18GHz | Storm Products Co. | A81-0303-275.6 | 12-07-001 | 08/21/2013 | 08/21/2014 |
| MP3; | Cable MP3, 18 GHz, N, 10m | Megaphase | G919-NKNK-394 | MP3 | 05/13/2013 | 05/13/2014 |
| E206; | Cable, N-N, 3 meters, 18GHz | Megaphase | TM18-NKNK-118 | 9053201 004 | 05/13/2013 | 05/13/2014 |
| 211897; | Digital Pocket Thermometer and Hydrometer | Mannix | SAM700BAR | none | 12/27/2013 | 12/27/2014 |

**Software Utilized:**

| Name | Manufacturer | Version |
|---|---|---|
| Tile | Quantum Change | 3.4.K.22 |

### 7.3 Results:

The sample tested was found to Comply.

The Field Strength of any emissions shall not exceed the limits as follows:

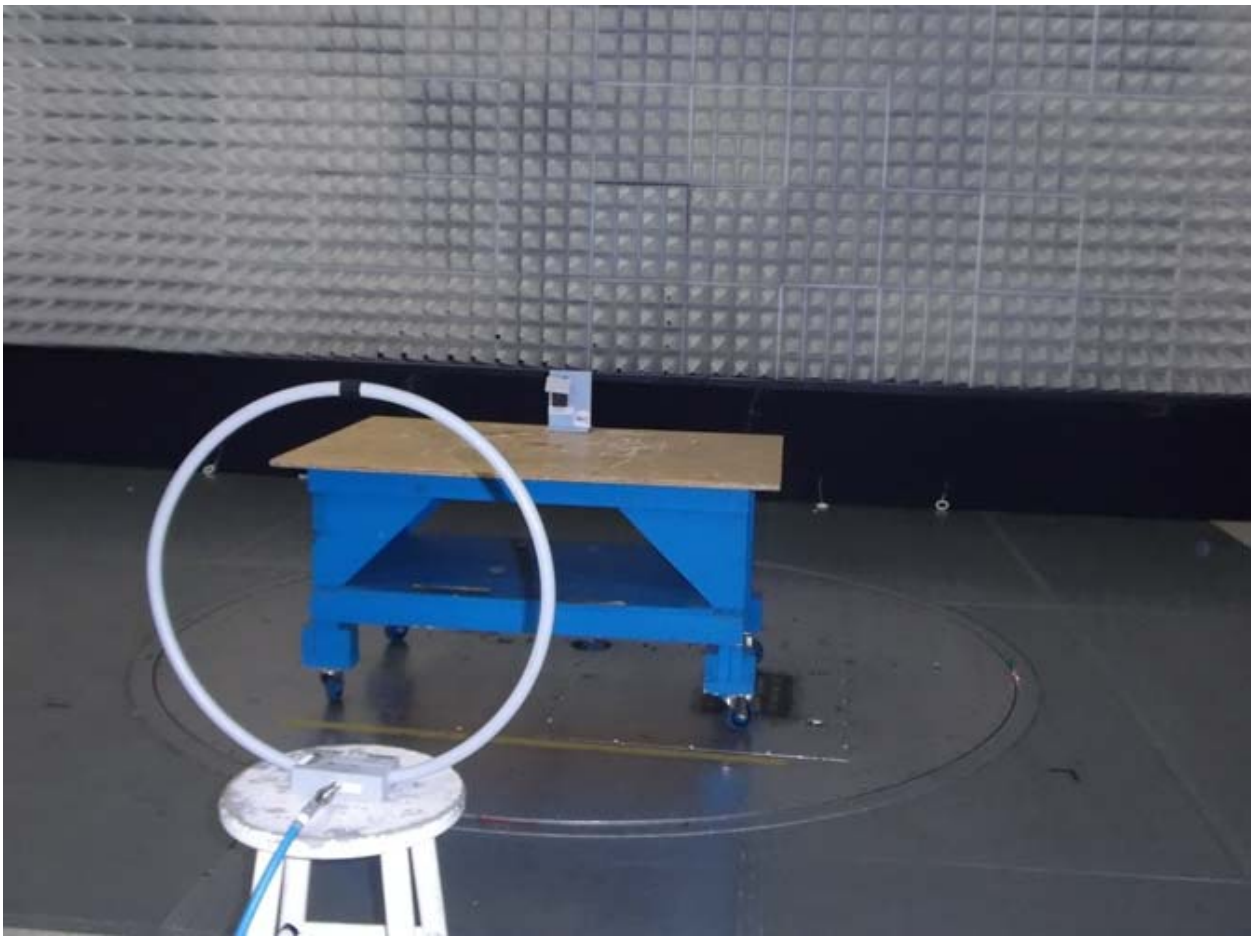
FCC Part 15.209

| Frequency | Field Strength | | Test Distance |
|---|---|---|---|
| (MHz) | µV/m | dBµV/m | (meters) |
| 0.009-0.490 | 2400/F(kHz) | 20*Log(2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 20*Log(24000/F(kHz) | 30 |
| 1.705-30.0 | 30.00 | 29.54 | 30 |

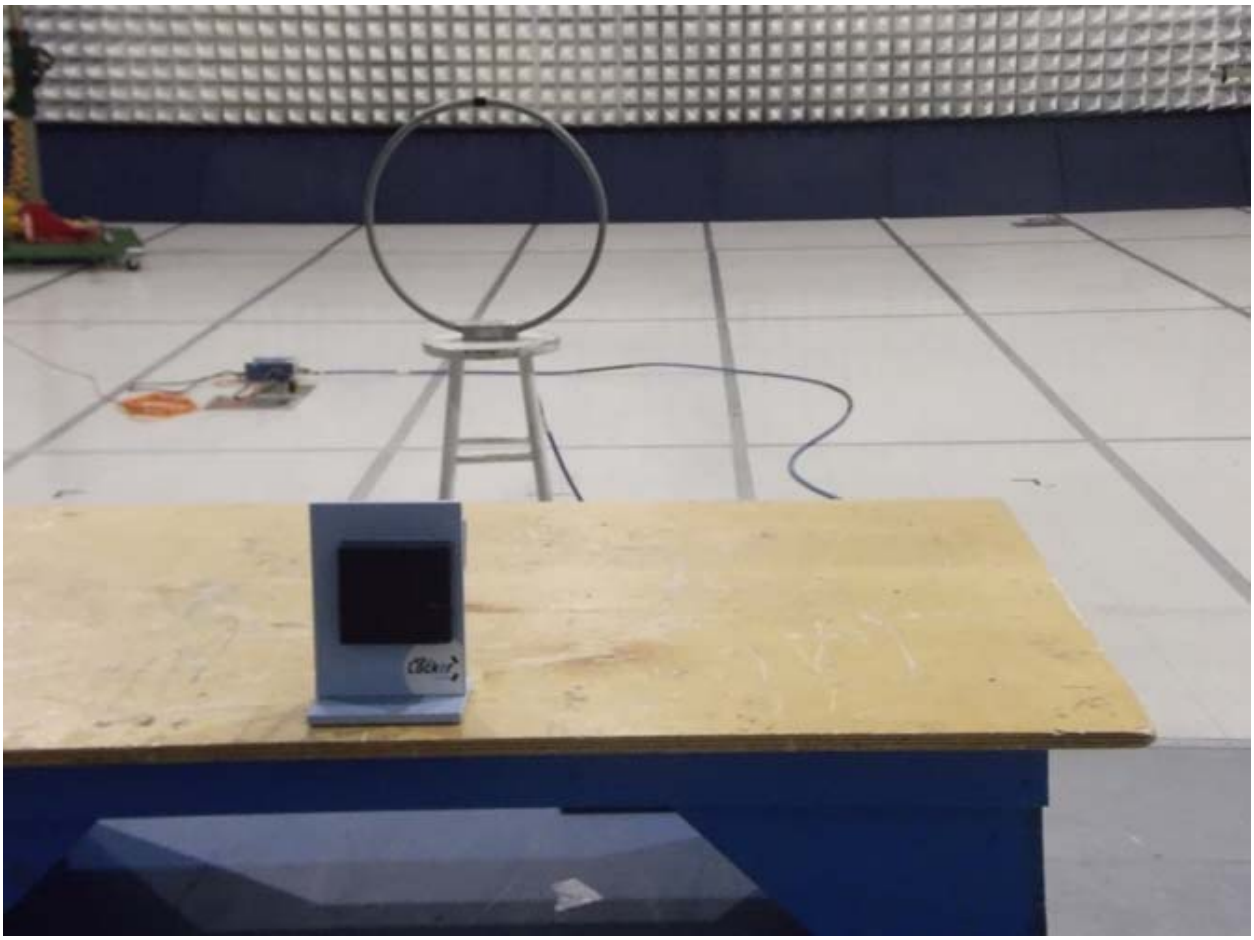
IC RSS-210 Annex A2.6(d): Emissions outside the band 13.110-14.010 must not exceed 30 microvolts/m (29.5 dBµV/m) at 30 m (69.5 dBµV/m) at 3 m.

### 7.4 Setup Photographs:

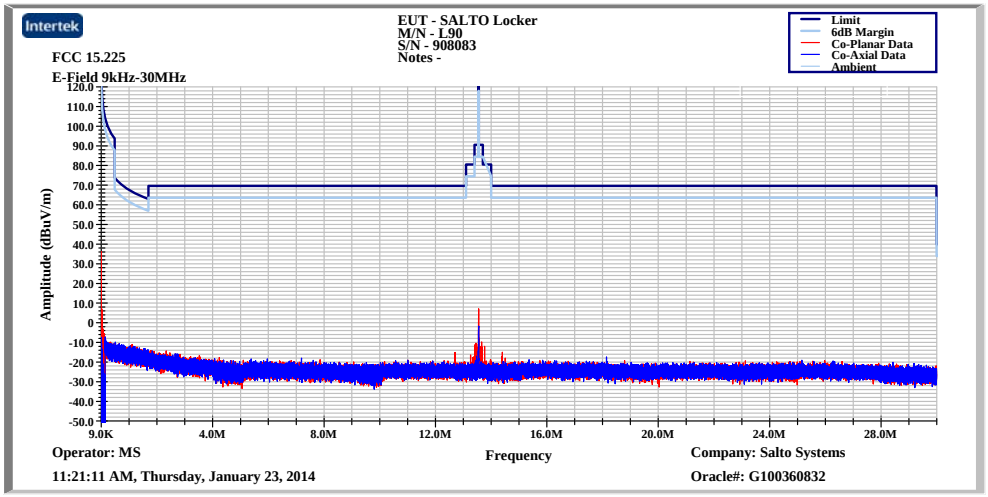
Front



Rear



### 7.5 Plots/Data:




| | | | |
|---|---|---|---|
| Test Personnel: | Mary Sampson | Test Date: | 01/23/14 |
| Supervising/Reviewing Engineer: (Where Applicable) | | | |
| Product Standard: | FCC 15.225, IC RSS-210 | Limit Applied: | Per Section 7.3 |
| Input Voltage: | Battery, 3 AAA | Ambient Temperature: | 22.7 ºC |
| Pretest Verification w/ Ambient Signals or BB Source: | **BB Source** | Relative Humidity: | 24.2 % |
| | | Atmospheric Pressure: | 992.4 mbars |

Deviations, Additions, or Exclusions: None

# 8 Transmitter Spurious Above 30MHz

## 8.1 Method

Tests are performed in accordance with FCC Part Subpart C:2014 15.209, 15.225(d), IC RSS-210 Issue 8 December 2010 A2.6(d), ANSI C63.4-2003.

**TEST SITE:** 10m Semi-Anechoic Chamber

**The EMC Lab** has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

## 8.2 Test Equipment Used:

| Asset | Description | Manufacturer | Model | Serial | Cal Date | Cal Due |
|---|---|---|---|---|---|---|
| T006217; | THDX | Oregon Scientific | BA888 | NSN | 12/11/2013 | 12/11/2014 |
| 213108; | EMI Receiver, Preselector section | Hewlett Packard | 85460A | 3348A00203 | 01/03/2013 | 01/03/2014 |
| 213109; | EMI Receiver | Hewlett Packard | 8546A | 3410A00173 | 01/03/2013 | 01/03/2014 |
| 211518; | Antenna, BiLog, 20-2000MHz | Chase | CBL6112A | 2228 | 03/04/2013 | 03/04/2014 |
| TW2 211411; | Cable TW2 | Andrews | Cable TW2 | TW2 | 05/08/2013 | 05/08/2014 |
| ST-5; | 7m Cable, 0.01-18GHz | Storm Products Co. | A81-0303-275.6 | 121-07-002 | 08/05/2013 | 08/05/2014 |
| E205; | Cable, N-N, 3 meters, 18GHz | Megaphase | TM18-NKNK-118 | 9053201 003 | 05/08/2013 | 05/08/2014 |
| E206; | Cable, N-N, 3 meters, 18GHz | Megaphase | TM18-NKNK-118 | 9053201 004 | 05/13/2013 | 05/13/2014 |
| 200074; | Preamplifier, 10 MHz to 2000 MHz, 27 dB gain | Mini-Circuits | ZKL-2 | D052005 | 10/22/2013 | 10/22/2014 |

**Software Utilized:**

| Name | Manufacturer | Version |
|---|---|---|
| Tile | Quantum Change | 3.4.K.22 |

## 8.3 Results:

The sample tested was found to Comply.

FCC Part 15.209

| Frequency | Field Strength | | Test Distance |
|---|---|---|---|
| (MHz) | µV/m | dBµV/m | (meters) |
| 30-88 | 100 | 40.0 | 3 |
| 88-216 | 150 | 43.52 | 3 |
| 216-960 | 200 | 46.02 | 3 |
| Above 960 | 500 | 53.98 | 3 |

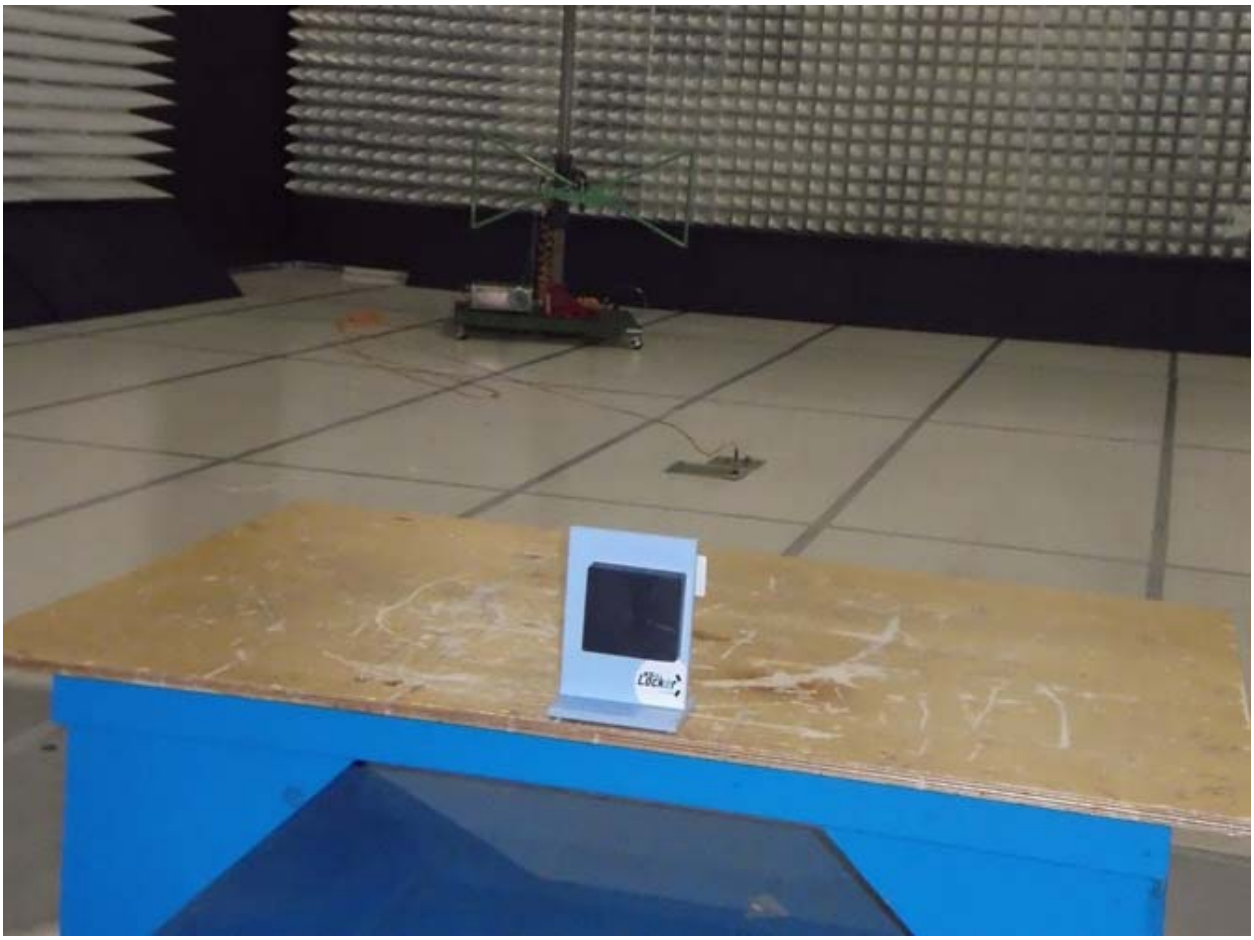
IC RSS-210 A2.6(d): emissions outside the band 13.110-14.010 MHz must not exceed 30 microvolts/m (29.5 dBµV/m) at 30 m (49.5 dBµV/m) at 3 m.

Since the IC RSS-210 limits are less stringent than the FCC 15.209 limits under 960 MHz, the FCC limits were used.

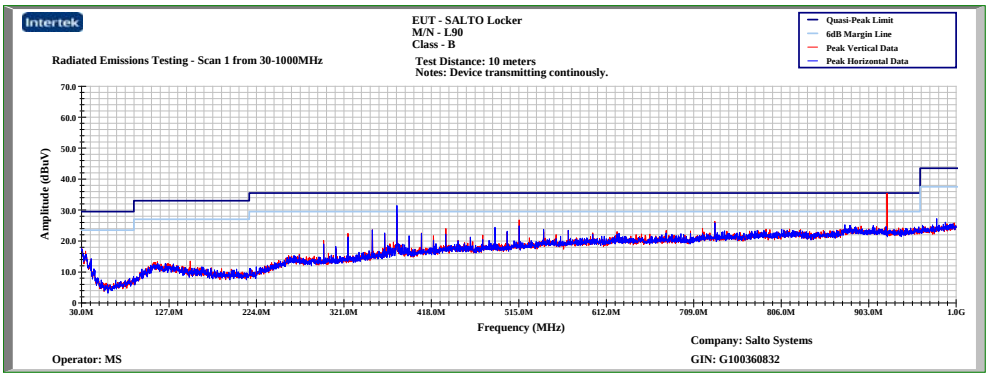
### 8.4 Setup Photographs:

Front

Rear



## 8.5 Plots/Data:




**Client:** Salto Systems
**Model Number:** L90
**Project Number:** G1001360832
**Tested By:** MS
**Date:** 12/17/13
**Frequency Range (MHz):** 30-1000
**Input power:** Battery, 3x1.5V=4.5V

**Receiver:** HP 8546A
**Antenna:** Chase 2228
**Cables:** ST-5+TW2+E-205+E-206
**Preamp:** ZKL-2 200074
**Test Distance (m):** 10
**Limit:** FCC15 Class B-10m
**Modifications for compliance (y/n):** n

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Ant. Pol. (V/H)** | **Frequency MHz** | **Reading dB(uV)** | **Antenna Factor dB(1/m)** | **Cable Loss dB** | **Pre-amp Factor dB** | **Net dB(uV/m)** | **10m Limit dB(uV/m)** | **Margin dB** | **Detectors / Bandwidths Det/RBW/VBW** |
| H | 379.685 | 42.5 | 15.7 | 3.2 | 31.2 | 30.2 | 35.5 | -5.3 | QP/120k/300k |
| V | 433.953 | 27.9 | 16.6 | 3.5 | 31.2 | 16.7 | 35.5 | -18.8 | QP/120k/300k |
| V | 515.255 | 29.6 | 17.6 | 3.8 | 31.1 | 19.9 | 35.5 | -15.6 | QP/120k/300k |
| V | 732.260 | 30.7 | 19.3 | 4.7 | 30.9 | 23.7 | 35.5 | -11.8 | QP/120k/300k |
| V | 924.858 | 22.3 | 20.3 | 5.4 | 30.7 | 17.3 | 35.5 | -18.2 | QP/120k/300k |
| H | 978.418 | 22.0 | 21.5 | 5.8 | 30.6 | 18.6 | 43.5 | -24.9 | QP/120k/300k |
| **Calculations** | | G=C+D+E-F | | I=G-H | | | | | |

Test Personnel: Mary Sampson
Supervising/Reviewing Engineer: (Where Applicable)
Product Standard: FCC 15.225
Input Voltage: Battery, 3 AAA
Pretest Verification w/ BB Source: **Yes**

Test Date: 12/17/13
Limit Applied: Per Section 8.3
Ambient Temperature: 21.5 ºC
Relative Humidity: 27 %
Atmospheric Pressure: 988 mbars

Deviations, Additions, or Exclusions: None

# 9 Receiver Spurious Emissions Above 30 MHz

## 9.1 Method

Tests are performed in accordance with FCC Subpart B:2014 15.109, IC RSS-Gen Issue 3 December 2010, Section 6.0, ANSI C63.4-2003.

**TEST SITE:** 10m Semi-Anechoic Chamber

**The EMC Lab** has two Semi-anechoic Chambers and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

## 9.2 Test Equipment Used:

| Asset | Description | Manufacturer | Model | Serial | Cal Date | Cal Due |
|---|---|---|---|---|---|---|
| 211897; | Digital Pocket Thermometer and Hydrometer | Mannix | SAM700BAR | none | 12/18/2012 | 12/18/2013 |
| 211518; | Antenna, BiLog, 20-2000MHz | Chase | CBL6112A | 2228 | 03/04/2013 | 03/04/2014 |
| 213108; | EMI Receiver, Preselector section | Hewlett Packard | 85460A | 3348A00203 | 01/03/2013 | 01/03/2014 |
| 213109; | EMI Receiver | Hewlett Packard | 8546A | 3410A00173 | 01/03/2013 | 01/03/2014 |
| 200074; | Preamplifier, 10 MHz to 2000 MHz, 27 dB gain | Mini-Circuits | ZKL-2 | D052005 | 10/22/2013 | 10/22/2014 |
| ST-5; | 7m Cable, 0.01-18GHz | Storm Products Co. | A81-0303-275.6 | 121-07-002 | 08/05/2013 | 08/05/2014 |
| E205; | Cable, N-N, 3 meters, 18GHz | Megaphase | TM18-NKNK-118 | 9053201 003 | 05/08/2013 | 05/08/2014 |
| E206; | Cable, N-N, 3 meters, 18GHz | Megaphase | TM18-NKNK-118 | 9053201 004 | 05/13/2013 | 05/13/2014 |
| TW2 211411; | Cable TW2 | Andrews | Cable TW2 | TW2 | 05/08/2013 | 05/08/2014 |

**Software Utilized:**

| Name | Manufacturer | Version |
|---|---|---|
| Tile | Quantum Change | 3.4.K.22 |

## 9.3 Results:

The sample tested was found to Comply.

FCC Part 15.109

| Frequency | Field Strength | | Test Distance |
|---|---|---|---|
| (MHz) | µV/m | dBµV/m | (meters) |
| 30-88 | 100 | 40.0 | 3 |
| 88-216 | 150 | 43.52 | 3 |
| 216-960 | 200 | 46.02 | 3 |
| Above 960 | 500 | 53.98 | 3 |

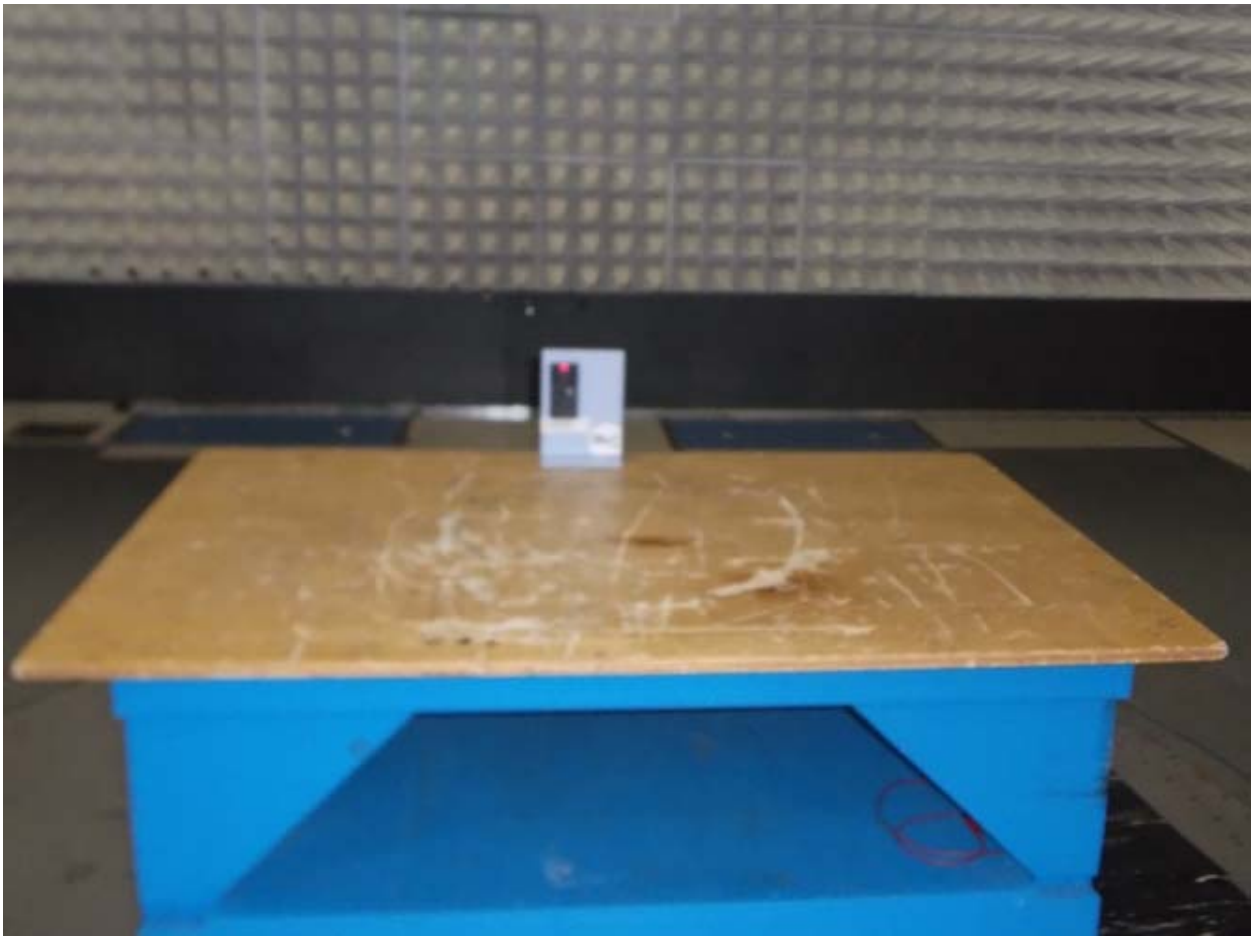
IC RSS-Gen Table 2:

| Frequency (MHz) | Field Strength (microvolts/m at 3 metres)* |
|---|---|
| 30-88 | 100 |
| 88-216 | 150 |
| 216-960 | 200 |
| Above 960 | 500 |

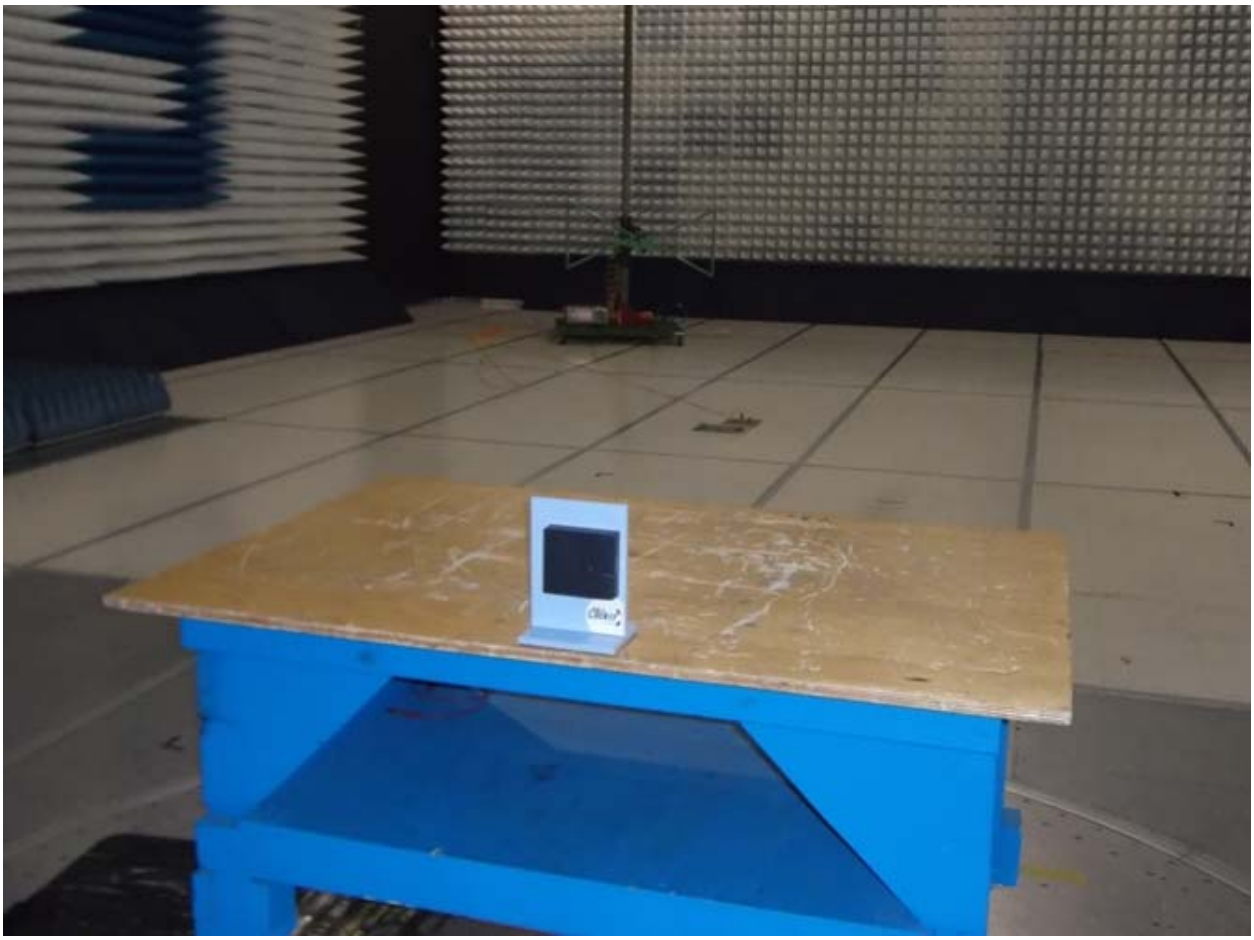
*Measurements for compliance with limits in the above table may be performed at distances other than 3 metres, in accordance with Section 7.2.7.

### 9.4 Setup Photographs:

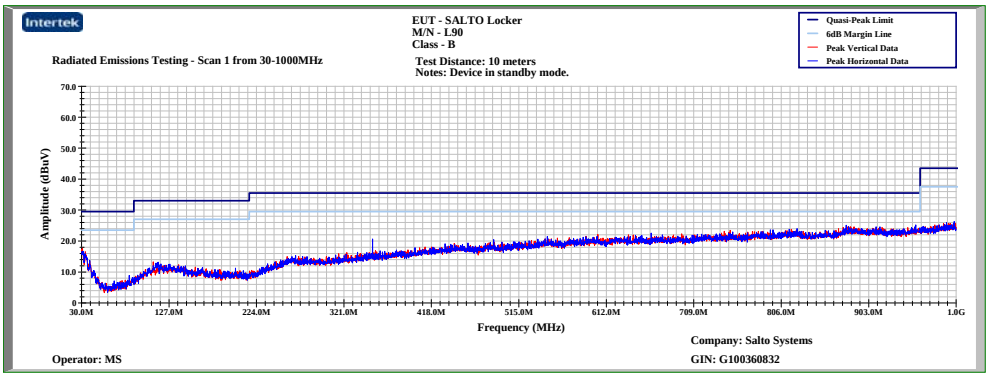
Front



Rear



### 9.5 Plots/Data:




**Client:** Salto Systems
**Model Number:** L90
**Project Number:** G100360832
**Tested By:** MS
**Date:** 12/13/13
**Frequency Range (MHz):** 30-1000
**Input power:** Battery, 3xAAA

**Receiver:** HP 8546A
**Antenna:** Chase 2228
**Cables:** ST-5+TW2+E-205+E-206
**Preamp:** ZKL-2 200074

**Test Distance (m):** 10
**Limit:** FCC15 Class B-10m

**Modifications for compliance (y/n):** n

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Ant. Pol. (V/H)** | **Frequency MHz** | **Reading dB(uV)** | **Antenna Factor dB(1/m)** | **Cable Loss dB** | **Pre-amp Factor dB** | **Net dB(uV/m)** | **10m Limit dB(uV/m)** | **Margin dB** | **Detectors / Bandwidths Det/RBW/VBW** |
| H | 352.768 | 23.2 | 14.4 | 3.1 | 31.3 | 9.5 | 35.5 | -26.0 | QP/120k/300k |
| H | 823.460 | 22.3 | 20.5 | 4.9 | 30.8 | 16.8 | 35.5 | -18.7 | QP/120k/300k |
| H | 878.023 | 22.2 | 20.9 | 5.1 | 30.8 | 17.5 | 35.5 | -18.0 | QP/120k/300k |
| H | 955.138 | 22.0 | 21.5 | 5.6 | 30.7 | 18.5 | 35.5 | -17.0 | QP/120k/300k |
| H | 989.330 | 22.0 | 21.6 | 5.9 | 30.6 | 18.9 | 43.5 | -24.6 | QP/120k/300k |
| H | 997.817 | 21.9 | 21.6 | 6.0 | 30.6 | 18.9 | 43.5 | -24.6 | QP/120k/300k |
| **Calculations** | | G=C+D+E-F | | I=G-H | | | | | |

Test Personnel: Mary Sampson
Test Date: 12/13/13
Supervising/Reviewing Engineer: (Where Applicable)
Product Standard: FCC 15.109 IC RSS-Gen
Limit Applied: Per section 9.3
Input Voltage: Battery, 3 AAA
Ambient Temperature: 21.6 ºC
Pretest Verification w/ BB Source: **Yes**
Relative Humidity: 29.3 %
Atmospheric Pressure: 993.4 mbars

Deviations, Additions, or Exclusions: None

# 10 20dB and Occupied Bandwidth

## 10.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C:2014, IC RSS-Gen Issue 3 December 2010 Section 4.6, ANSI C63.4-2003.

**TEST SITE:** 10m Semi-Anechoic Chamber

**The EMC Lab** has one Semi-anechoic Chamber and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

## 10.2 Test Equipment Used:

| Asset | Description | Manufacturer | Model | Serial | Cal Date | Cal Due |
|---|---|---|---|---|---|---|
| 200162; | EMI Receiver (20Hz-40GHz) | Rohde & Schwarz | ESU 40 | 100314 | 11/21/2013 | 11/21/2014 |
| NYM EMC36; | Antenna, Active Loop (10kHz to 30 MHz) | EMCO | 6512 | 9810-1228 | 12/02/2013 | 12/02/2014 |
| T006217; | THDX | Oregon Scientific | BA888 | NSN | 12/11/2013 | 12/11/2014 |

**Software Utilized:**

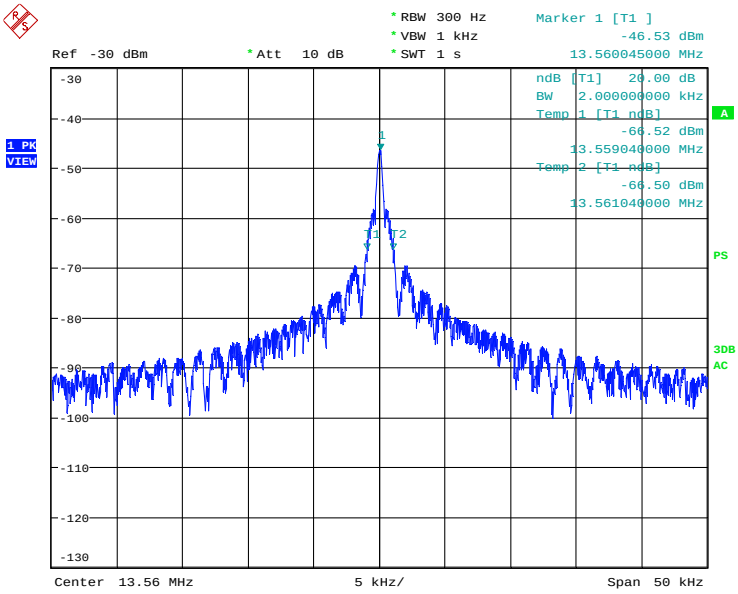
| Name | Manufacturer | Version |
|---|---|---|
| None (Spectrum Analyzer Firmware) | | |

## 10.3 Results:

The sample tested was found to Comply.

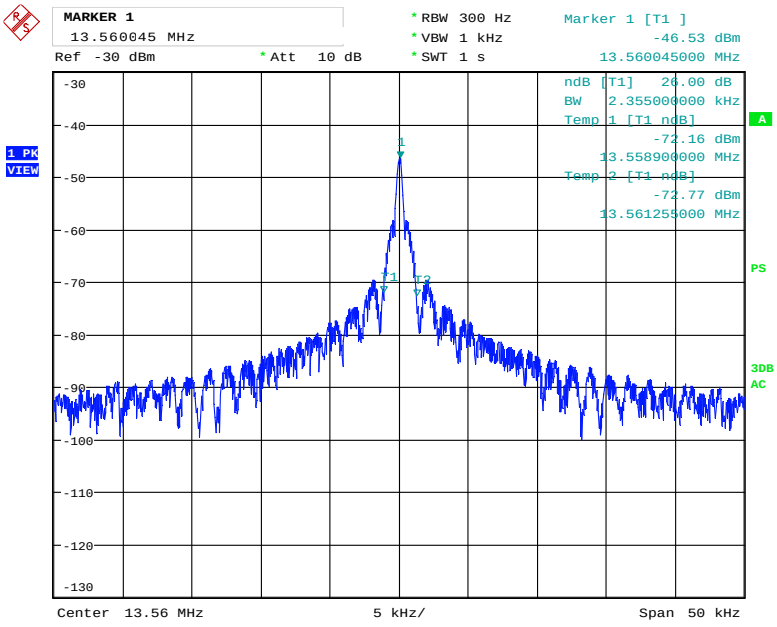
## 10.4 Data:

20 dB Bandwidth




Date: 8.MAY.2014 11:48:09

Occupied Bandwidth




Date: 8.MAY.2014 11:47:42

| | | | |
|---|---|---|---|
| Test Personnel: | Mary Sampson | Test Date: | 05/08/14 |
| Supervising/Reviewing Engineer: (Where Applicable) | | | |
| Product Standard: | FCC 15.225, IC RSS-210 | | |
| Input Voltage: | Battery, 3 AAA | | |
| | | Ambient Temperature: | 23 ºC |
| Pretest Verification w/ BB Source | **BB Source** | Relative Humidity: | 39 % |
| | | Atmospheric Pressure: | 988 mbars |

Notes:

(1) The EUT met the requirements without any degradation of performance.

Deviations, Additions, or Exclusions: None

# 11 Frequency Stability

## 11.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C:2012 15.225, IC RSS-GEN Issue 3 December 2010 Section 4.7, IC RSS-210 December 2010 A2.6, ANSI C63.4-2003.

**TEST SITE: Temperature/humidity chamber in the Safety Lab**

## 11.2 Test Equipment Used:

| Asset | Description | Manufacturer | Model | Serial | Cal Date | Cal Due |
|---|---|---|---|---|---|---|
| 211678; | Power Supply | Tektronix | PS2510G | TW50295 | VBU | Verified |
| Rental; | EMC Analyzer | Agilent | 7405A | MY42000128 | 8/23/13 | 8/23/14 |
| 211540; | Walk-In Enviromental Chamber | Thermotron | WP-867-THCM1-5-5AC | 32891 | 04/10/2013 | 04/10/2014 |
| 213047; | Multimeter | Fluke | 87 | 65290209 | 01/09/2013 | 01/09/2014 |

**Software Utilized:**

| Name | Manufacturer | Version |
|---|---|---|
| None (Spectrum Analyzer Firmware) | | |

## 11.3 Results:

The sample tested was found to Comply.

### 11.4 Setup Photographs:

### 11.5 Data:

Intertek

**Frequency Stability**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Company: | Salto Systems S.L. | | | | | | Test Equipment Used: | | | |
| Model #: | L90 | | | | | | | | | |
| Serial #: | 908083 | | | | | | | | | |
| Engineer(s): | Mary Sampson | | | Location: | Safety | | | | | |
| Project #: | G101360832 | | Date(s): | 12/12/13 | | | | | | |
| Standard: | FCC Part 15.225, IC RSS-Gen, IC RSS-210 | | | | | | | | | |
| | | Limit: | 100 | PPM | | | | | | |
| | | Nominal f: | 13.56 | MHz | | | Voltage: | 4.5 | VDC | |

| % | Voltage Volts | Frequency MHz | Deviation kHz | Limit kHz |
|---|---|---|---|---|
| -15% | 3.825 | 13.560500 | -0.5 | 1.36 |
| -10% | 4.05 | 13.561000 | 0 | 1.36 |
| -5% | 4.275 | 13.560500 | -0.5 | 1.36 |
| +0% | 4.5 | 13.561000 | 0 | 1.36 |
| +5% | 4.725 | 13.560500 | -0.5 | 1.36 |
| +10% | 4.95 | 13.561000 | 0 | 1.36 |
| +15% | 5.175 | 13.560500 | -0.5 | 1.36 |

| Temp Celsius | Frequency MHz | Deviation kHz | Limit kHz |
|---|---|---|---|
| -30 | 13.561000 | 0 | 1.36 |
| -20 | 13.560500 | -0.5 | 1.36 |
| -10 | 13.561500 | 0.5 | 1.36 |
| 0 | 13.560500 | -0.5 | 1.36 |
| 10 | 13.561000 | 0 | 1.36 |
| 20 | 13.561000 | 0 | 1.36 |
| 30 | 13.560500 | -0.5 | 1.36 |
| 40 | 13.560500 | -0.5 | 1.36 |
| 50 | 13.561000 | 0 | 1.36 |

| | | | |
|---|---|---|---|
| Test Personnel: | Mary Sampson | Test Date: | 12/12/13 |
| Supervising/Reviewing Engineer: (Where Applicable) | | | |
| Product Standard: | FCC 15.225, IC RSS-Gen, IC RSS-210 | Test Levels: | Per Section 11.3 |
| Input Voltage: | 3.825 Vdc to 5.175 Vdc | | |
| Pretest Verification w/Ambient Signals or BB Source: | **Ambient Signals** | Ambient Temperature: | 23.2 ºC |
| | | Relative Humidity: | 36.4 % |
| | | Atmospheric Pressure: | 995.0 mbars |

Notes:

(1) The EUT met the requirements without any degradation of performance.

Deviations, Additions, or Exclusions: None

## 12 Revision History

| Revision Level | Date | Report Number | Prepared By | Reviewed By | Notes |
|---|---|---|---|---|---|
| 0 | 01/24/2014 | 101360832ATL-001e | MS MTS | VV VJV | Original Issue |
| 1 | 05/08/2014 | 101360832ATL-001e | MS MTS | VV VJV | Updated with comments from TCB Reviewer. |
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