# Electromagnetic Compatibility
# Test Report

Tested to: FCC Part 15C, and ANSI C63.10

On

# LOCALIZER

**Model:**

# HB100

HEALTHBEACONS

**34 Walden St, #753**

**Concord MA 01742 USA**

Prepared by:

## TUV Rheinland of North America, Inc.

# Manufacturer's statement - attestation

The manufacturer; HEALTH BEACONS INC. as the responsible party for the equipment tested, hereby affirms:

a) That he has reviewed and concurs that the test shown in this report are reflective of the operational characteristics of the device for which certification is sought;

b) That the device in this test report will be representative of production units;

c) That all changes (in hardware and software/firmware) to the subject device will be reviewed.

d) That any changes impacting the attributes, functionality or operational characteristics documented in this report will be communicated to the body responsible for approving (certifying) the subject equipment.

| | |
|---|---|
| Nancy Confrey |  |
| Printed name of official | Signature of official |
| 34 Walden St, #753<br>Concord MA 01742 USA | 27 August 2012 |
| Address | Date |
| 978 287 4635 | nconfrey@healthbeacons.com |
| Telephone number | Email address of official |

| | | | |
|---|---|---|---|
| ***Client:*** | HEALTH BEACONS INC.<br>34 Walden St, #753<br>Concord MA 01742 USA | Nancy Confrey<br>978 287 4635 / 978 246 6019<br>nconfrey@healthbeacons.com | |
| ***Identification:*** | LOCALIZER | ***Serial No.:*** | 081622744 |
| ***Test item:*** | HB100 | ***Date tested:*** | 21 September 2016 |
| ***Testing location:*** | TUV Rheinland of North America<br>762 Park Avenue<br>Youngsville, NC 27596-9470<br>U.S.A. | Tel: (919) 554-3668<br>Fax: (919) 554-3542 | |
| ***Test specification:*** | **Emissions: FCC Part 15, Subpart C:**<br>FCC Part 15.209(a)<br>FCC Parts 15.207(a) | | |
| ***Test Result*** | **The above product was found to be Compliant to the above test standard(s)** | | |

| | |
|---|---|
| ***tested by:*** Mark Ryan | ***reviewed by:*** Robert Richards |
| 28 August 2012,<br>***Signature*** | 13 December 2016,<br>***Signature*** |
| ***Other Aspects:*** | **None** |

Abbreviations: OK, Pass, Compliant, Complies = passed
Fail, Not Compliant, Does Not Comply = failed
N/A = not applicable

| | | |
|---|---|---|
| **90552 and 100881** | **Testing Cert #3331.05** | **Industry Canada**<br>**2932H-1 and 2932H-2** |

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# 1 General Information

## 1.1 Scope

This report is intended to document the status of conformance with the requirements based on the results of testing performed on 21 September 2016 on the LOCALIZER, Model No. HB100, manufactured by HEALTH BEACONS INC. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

## 1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

## 1.3 Revision History

| Revision | Date | Description of Revision |
|---|---|---|
| -- | 1 Dec. 2016 | Initial Release |
| 1 | 2 Dec. 2016 | Removed block diagram and other items considered to be confidential. |
| 2 | 13 Dec. 2016 | Corrected typos |
| | | |
| | | |

### 1.4 *Summary of Test Results*

| | | | | | |
|---|---|---|---|---|---|
| **Applicant** | HEALTH BEACONS INC.<br>34 Walden St, #753<br>Concord MA 01742 USA | **Tel** | 978 287 4635 | **Contact** | Nancy Confrey |
| | | **Fax** | 978 246 6019 | **e-mail** | nconfrey@healthbeacons.com |

| | | | |
|---|---|---|---|
| **Description** | LOCALIZER | **Model** | HB100 |
| **Serial Number** | 081622744 | **Test Voltage/Freq.** | 3 V DC AA batteries |
| **Test Date Completed:** | 21 September 2016 | **Test Engineer** | Mark Ryan |

| Standards | Description | Severity Level or Limit | Worst-case Values | Test Result |
|---|---|---|---|---|
| FCC Part 15, Subpart C Standard | Radio Frequency Devices-Subpart C: Intentional Radiators | See called out parts below | See Below | **Complies** |
| FCC Part 15.209(a) | Radiated Emission limits; General Requirements | Below Limits | 17.85µV/m at 300m | Complies |
| FCC Parts 15.207(a) | Conducted Emissions on AC Mains in transmit mode | NA, NA | EUT is battery operated | Complies |

# 2 Laboratory Information

## *2.1 Accreditations and Endorsements*

### 2.1.1 US Federal Communications Commission

TUV Rheinland of North America located at 762 Park Avenue, Youngsville, NC 27596-9470 is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, and 18. The accreditation is updated every 3 years.

### 2.1.2 ILAC / A2LA

The laboratory has been assessed and accredited by A2LA in accordance with ISO Standard 17025:2005 (Certificate Number: 3331.05, Master Code: 134288). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

### 2.1.3 Innovation, Science and Economic Development Canada

Registration No.: 2932H-1 The OATS has been accepted by ISED to perform testing to 3 and to 10 meters, based on the test procedures described in ANSI C63.4:2014.

Registration No.: 2932H-2 The 5 meter chamber has been accepted by ISED to perform testing to 3 meters, based on the test procedures described in ANSI C63.4:2014.

### 2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Laboratory Registration No: A-0034).

### 2.1.5 Sample Calculation – radiated & conducted emissions

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

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

**Sample radiated emissions calculation @ 30 MHz**

**Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)**

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

## 2.2 Measurement Uncertainty Emissions

**Total uncertainty**

Band 1 uncertainty

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | divisor | Dependency | Unit conver'n | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +x | -x | | | multiplier | divisor | +u(Hz) | -u(Hz) |
| Time base | Time base drift (1x10-9 = 0.001ppm) | 0.05 | 0.05 | Rectangular | 1.73 | 1.00 | 1.00 | 0.03 | 0.03 |
| Counter | Counter (±20pHz/Hz+0.6Hz) | 0.60 | 0.60 | Rectangular | 1.73 | 1.00 | 1.00 | 0.35 | 0.35 |
| Temp | Ambient temperature uncertainty | 1.00 | 1.00 | Rectangular | 1.73 | 1.12 | 1.00 | 0.65 | 0.65 |
| | | | | | | | Combined (RSS) Standard Uncertainty ($U_c$): | **0.73** | **0.73** |
| | | | | | | | Expanded Uncertainty ($U_{95}$): | **1.44** | **1.44** |

Band 2 uncertainty

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | divisor | Dependency | Unit conver'n | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +x | -x | | | multiplier | divisor | +u(Hz) | -u(Hz) |
| Time base | Time base drift (1x10-9 = 0.001ppm) | 0.92 | 0.92 | Rectangular | 1.73 | 1.00 | 1.00 | 0.53 | 0.53 |
| Counter | Counter (±20pHz/Hz+0.6Hz) | 0.62 | 0.62 | Rectangular | 1.73 | 1.00 | 1.00 | 0.36 | 0.36 |
| Temp | Ambient temperature uncertainty | 1.00 | 1.00 | Rectangular | 1.73 | 1.12 | 1.00 | 0.65 | 0.65 |
| | | | | | | | Combined (RSS) Standard Uncertainty ($U_c$): | **0.91** | **0.91** |
| | | | | | | | Expanded Uncertainty ($U_{95}$): | **1.78** | **1.78** |

Band 3 uncertainty

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | divisor | Dependency | Unit conver'n | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +x | -x | | | multiplier | divisor | +u(Hz) | -u(Hz) |
| Time base | Time base drift (1x10-9 = 0.001ppm) | 2.45 | 2.45 | Rectangular | 1.73 | 1.00 | 1.00 | 1.41 | 1.41 |
| Counter | Counter (±20pHz/Hz+0.6Hz) | 0.65 | 0.65 | Rectangular | 1.73 | 1.00 | 1.00 | 0.37 | 0.37 |
| Temp | Ambient temperature uncertainty | 1.00 | 1.00 | Rectangular | 1.73 | 1.12 | 1.00 | 0.65 | 0.65 |
| | | | | | | | Combined (RSS) Standard Uncertainty ($U_c$): | **1.60** | **1.60** |
| | | | | | | | Expanded Uncertainty ($U_{95}$): | **3.13** | **3.13** |

| | | | |
|---|---|---|---|
| **Total uncertainty (all bands)** | Combined (RSS) Standard Uncertainty ($U_c$): | **1.98** | **1.98** |
| | Expanded Uncertainty ($U_{95}$): | **3.88** | **3.88** |

## 2.2.1 Total Carrier Power Measurement Uncertainty

**Total uncertainty**

Power meter & sensor

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | divisor | Dependency multiplier | Unit conver'n divisor | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +x | -x | | | | | +u(dB) | -u(dB) |
| Meter ref | Power meter reference level | 1.500 | 1.500 | Rectangular | 1.732 | 1.000 | 23.000 | 0.038 | 0.038 |
| Cal fact | Cal factor uncert | 2.300 | 2.300 | Rectangular | 1.732 | 1.000 | 23.000 | 0.058 | 0.058 |
| Range err | Range to range change error | 0.500 | 0.500 | Rectangular | 1.732 | 1.000 | 23.000 | 0.013 | 0.013 |
| Meter lin | Power meter linearity | 0.500 | 0.500 | Rectangular | 1.732 | 1.000 | 23.000 | 0.013 | 0.013 |
| | Mismatch when calibrating | 0.022 | 0.022 | | 1.000 | 1.000 | 1.000 | 0.022 | 0.022 |
| | | | | | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 |
| | | | | | | | Combined (RSS) Standard Uncertainty ($u_{c1}$): | **0.074** | **0.074** |

Uncertainty when measuring atten/cable

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | divisor | Dependency multiplier | Unit conver'n divisor | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +x | -x | | | | | +u(dB) | -u(dB) |
| | measurement | 0.175 | 0.175 | | 1.000 | 1.000 | 1.000 | 0.175 | 0.175 |
| Range err | Range to range change error | 0.500 | 0.500 | Rectangular | 1.732 | 1.000 | 23.000 | 0.013 | 0.013 |
| Meter lin | Power meter linearity | 0.500 | 0.500 | Rectangular | 1.732 | 1.000 | 23.000 | 0.013 | 0.013 |
| | | | | | | | Combined (RSS) Standard Uncertainty ($U_{c2}$): | **0.175** | **0.175** |

Carrier power measurement

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | divisor | Dependency multiplier | Unit conver'n divisor | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +x | -x | | | | | +u(dB) | -u(dB) |
| | Mismatch during power measurement | 0.643 | 0.643 | | 1.000 | 1.000 | 1.000 | 0.643 | 0.643 |
| Atten PI | Attenuator power influence | 0.750 | 0.750 | Rectangular | 1.732 | 1.000 | 1.000 | 0.433 | 0.433 |
| Temp | Temperature uncertainty | 1.000 | 1.000 | Rectangular | 1.732 | 4.176 | 23.000 | 0.105 | 0.105 |
| Supply | Supply uncertainty | 0.100 | 0.100 | Rectangular | 1.732 | 10.440 | 23.000 | 0.026 | 0.026 |
| Random | Random uncertainty (see note in section 6.4.7 , Part 1) | 0.010 | 0.010 | Normal | 1.000 | 1.000 | 1.000 | 0.010 | 0.010 |
| Time duty | Time duty cycle | 2.000 | 2.000 | Normal | 1.000 | 1.000 | 23.000 | 0.087 | 0.087 |
| | | | | | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 |
| | | | | | | | Combined (RSS) Standard Uncertainty ($U_{c3}$): | **0.788** | **0.788** |

Total uncertainty

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | divisor | Dependency multiplier | Unit conver'n divisor | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +u or x | -u or x | | | | | +u(dB) | -u(dB) |
| Uc1 | Power meter & sensor | 0.074 | 0.074 | | 1.000 | 1.000 | 1.000 | 0.074 | 0.074 |
| Uc2 | Uncertainty when measuring atten/cable | 0.175 | 0.175 | | 1.000 | 1.000 | 1.000 | 0.175 | 0.175 |
| Uc3 | Carrier power measurement | 0.788 | 0.788 | | 1.000 | 1.000 | 1.000 | 0.788 | 0.788 |
| | | | | | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 |
| | | | | | | | Combined (RSS) Standard Uncertainty ($U_c$): | **0.810** | **0.810** |
| | | | | | | | Expanded Uncertainty ($U_{95}$): | **1.588** | **1.588** |

## 2.2.2 Total Adjacent channel power Measurement Uncertainty

**Total uncertainty**

Total relative RF level uncertainty

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | divisor | Dependency multiplier | Unit conver'n divisor | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +x | -x | | | | | +u(dB) | -u(dB) |
| Filter pwr bw | Filter power bw | 0.200 | 0.200 | Rectangular | 1.732 | 1.000 | 1.000 | 0.115 | 0.115 |
| Relative acc | Relative accuracy | 0.500 | 0.500 | Rectangular | 1.732 | 1.000 | 1.000 | 0.289 | 0.289 |
| Random | Random uncertainty (see note in section 6.4.7 , Part 1) | 0.110 | 0.110 | Normal | 1.000 | 1.000 | 1.000 | 0.110 | 0.110 |
| Deviation | Deviation uncertainty | 30.000 | 30.000 | Rectangular | 1.732 | 0.054 | 23.000 | 0.041 | 0.041 |
| 6dB pt unc | Uncertainty of 6dB point | 0.075 | 0.075 | Rectangular | 1.732 | 15.524 | 1.000 | 0.672 | 0.672 |
| | | | | | 1.000 | 0.000 | 23.000 | 0.000 | 0.000 |
| | | | | | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 |
| | | | | | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 |
| | | | | | 1.000 | 1.000 | 1.000 | 0.000 | 0.000 |
| | | | | | | | Combined (RSS) Standard Uncertainty ($u_c$): | **0.750** | **0.750** |
| | | | | | | | Expanded Uncertainty ($U_{95}$): | **1.470** | **1.470** |

## 2.2.3 Total Conducted Spurious Emissions Measurement Uncertainty

**Total uncertainty**

Total uncertainty

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | divisor | Dependency multiplier | Unit conversion divisor | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +x | -x | | | | | +u(dB) | -u(dB) |
| | Total Mismatch EUT to Spectrum Anal. | 1.01 | 1.01 | | 1.00 | 1.00 | 1.00 | 1.01 | 1.01 |
| | Total Mismatch cal of Spectrum Analyzer | 0.30 | 0.30 | | 1.00 | 1.00 | 1.00 | 0.30 | 0.30 |
| SA Cal ref | Spec. Ana. Cal output reference level | 0.30 | 0.30 | Rectangular | 1.73 | 1.00 | 1.00 | 0.17 | 0.17 |
| SA freq res. | Spec. Ana. frequency response | 2.50 | 2.50 | Rectangular | 1.73 | 1.00 | 1.00 | 1.44 | 1.44 |
| SA BW Sw | Spec. Ana. Bandwidth switching | 0.50 | 0.50 | Rectangular | 1.73 | 1.00 | 1.00 | 0.29 | 0.29 |
| SA Log Fid | Spec. Ana. Log fidelity | 1.50 | 1.50 | Rectangular | 1.73 | 1.00 | 1.00 | 0.87 | 0.87 |
| Supply Volt | Supply voltage uncertainty | 0.10 | 0.10 | Rectangular | 1.73 | 10.44 | 23.00 | 0.03 | 0.03 |
| Fltr loss unc | Filter loss uncertainty | 0.15 | 0.15 | Rectangular | 1.73 | 1.00 | 1.00 | 0.09 | 0.09 |
| Atten unc | Attenuator loss uncertainty | 0.15 | 0.15 | Rectangular | 1.73 | 1.00 | 1.00 | 0.09 | 0.09 |
| SA i/p att sw | SA atten switching uncertainty | 0.20 | 0.20 | Rectangular | 1.73 | 1.00 | 1.00 | 0.12 | 0.12 |
| Att pwr coef | Attenuator power coefficient | 0.30 | 0.30 | Rectangular | 1.73 | 1.00 | 1.00 | 0.17 | 0.17 |
| Cable | Measurement cable loss uncert | 0.20 | 0.20 | Normal | 1.00 | 1.00 | 1.00 | 0.20 | 0.20 |
| Rnd | Random contribution (see note in section 6.4.7 , Part 1) | 0.20 | 0.20 | Normal | 1.00 | 1.00 | 1.00 | 0.20 | 0.20 |
| | | | | | | | Combined (RSS) Standard Uncertainty ($u_c$): | **2.05** | **2.05** |
| | | | | | | | Expanded Uncertainty ($U_{95}$): | **4.01** | **4.01** |

## 2.2.4 Total Frequency Deviation Measurement Uncertainty

**Total uncertainty**

Total deviation uncertainty

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | | Dependency | Unit conver'n | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +x | -x | divisor | | multiplier | divider | +u(%) | -u(%) |
| Dev Unc | Deviation uncertainty | 1.00 | 1.00 | Rectangular | 1.73 | 1.00 | 1.00 | 0.58 | 0.58 |
| Last Digit | +/- last digit of deviation meter display | 0.25 | 0.25 | Rectangular | 1.73 | 1.00 | 1.00 | 0.14 | 0.14 |
| Res mod | Residual modulation | 0.50 | 0.50 | Rectangular | 1.73 | 1.00 | 1.00 | 0.29 | 0.29 |
| Rand unc | Random uncertainty (see note in section 6.4.7 , Part 1) | 0.00 | 0.00 | Normal | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 |
| | | | | | | Combined (RSS) Standard Uncertainty ($u_c$): | | **0.66** | **0.66** |
| | | | | | | Expanded Uncertainty ($U_{95}$): | | **1.30** | **1.30** |

## 2.2.5 Total Response Measurement Uncertainty

Deviation uncertainty

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | | Dependency | Unit conver'n | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +x | -x | divisor | | multiplier | divider | +u(%) | -u(%) |
| Dev Unc | Deviation uncertainty | 1.00 | 1.00 | Rectangular | 1.732 | 1.00 | 1.00 | 0.58 | 0.58 |
| AF Osc | AF oscillator uncertainty | 0.70 | 0.70 | Rectangular | 1.732 | 1.00 | 1.00 | 0.40 | 0.40 |
| AC volt mtr | AC Volt meter uncertainty | 4.00 | 4.00 | Rectangular | 1.732 | 1.00 | 1.00 | 2.31 | 2.31 |
| AF gain unc | AF gain uncertainty | 2.00 | 2.00 | Rectangular | 1.732 | 1.00 | 1.00 | 1.15 | 1.15 |
| Rand unc | Random uncertainty (see note in section 6.4.7 , Part 1) | 0.00 | 0.00 | Normal | 1.000 | 1.00 | 1.00 | 0.00 | 0.00 |
| | | | | | | Combined (RSS) Standard Uncertainty ($u_{c1}$): | | **2.68** | **2.68** |

Total uncertainty

| Symbol | Source of uncertainty | Uncertainty value | | Distribution | | Dependency | Unit conver'n | Std uncertainty | |
|---|---|---|---|---|---|---|---|---|---|
| | | +u or x | -u or x | divisor | | multiplier | divider | +u(dB) | -u(dB) |
| Uc1 | Deviation uncertainty | 2.68 | 2.68 | | 1.000 | 1.00 | 11.50 | 0.23 | 0.23 |
| | | | | | 1.000 | 1.00 | 1.00 | 0.00 | 0.00 |
| | | | | | 1.000 | 1.00 | 1.00 | 0.00 | 0.00 |
| | | | | | 1.000 | 1.00 | 1.00 | 0.00 | 0.00 |
| | | | | | | Combined (RSS) Standard Uncertainty ($U_c$): | | **0.23** | **0.23** |
| | | | | | | Expanded Uncertainty ($U_{95}$): | | **0.46** | **0.46** |

## 2.3 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

## 2.4 Software Used

| Manufacturer | Name | Version |
|---|---|---|
| Quantum Change/EMC Systems LLC. | Tile | 3.2U |
| TUV | Alt "R" | 1 |
| TUV | Alt "C" | 1 |

## 2.5 Measurement Equipment Used

| Equipment | Manufacturer | Model # | Serial/Inst # | Last Cal dd/mm/yy | Next Cal dd/mm/yy |
|---|---|---|---|---|---|
| Radiated Emissions (5 Meter Chamber) | | | | | |
| Receiver, EMI | Rohde & Schwarz | ESIB40 | 100043 | 19-Aug-15 | 19-Aug-16 |
| Receiver, EMI | Rohde & Schwarz | ESCI 7 | 100917 | 19-Aug-15 | 19-Aug-16 |
| Spectrum Analyzer | Agilent Tec. | E7405A | US39440161 | 18-Aug-15 | 18-Aug-16 |
| Amplifier, preamp | Agilent Technologies | 8449B | 3008A01480 | 20-Aug-15 | 20-Aug-17 |
| Antenna Loop | EMCO | 6502 | 3336 | 17-Dec-15 | 17-Dec-17 |
| Ant. BiconiLog | Chase | CBL6140A | 1108 | 06-Oct-15 | 06-Oct-17 |
| Antenna Horn 1-18GHz | EMCO | 3115 | 2236 | 18-Nov-15 | 18-Nov-17 |
| Antenna Horn 18-26.5 GHz | ATM | 42-442-6/cal | G181104-01 | 31-Dec-14 | 31-Dec-16 |
| Cable, Coax | MicroCaox | MKR300C-0-0-1200-500500 | 002 | 20-Aug-15 | 20-Aug-16 |
| Cable, Coax | MicroCaox | MKR300C-0-1968-500310 | 005 | 20-Aug-15 | 20-Aug-16 |
| Cable, Coax | MicroCaox | UFB29C-1-5905-50U-50U | 009 | 20-Aug-15 | 20-Aug-16 |
| Cable, Coax | Andrew | FSJ1-50A | 045 | 20-Aug-15 | 20-Aug-16 |
| | | | | | |
| General Laboratory Equipment | | | | | |
| Meter, Multi | Fluke | 179 | 90580752 | 17-Aug-15 | 17-Aug-16 |
| Meter, Temp/Humid/Barom | ExTech | SD700 | Q677933 | 21-Dec-15 | 21-Dec-17 |
| Meter, Temp/Humid/Barom | ExTech | SD700 | Q677942 | 21-Dec-15 | 21-Dec-17 |

# 3 Product Information

## 3.1 Product Description

Refer to section 6.1.3 of this report

## 3.2 Equipment Modifications

No modifications were needed to bring product into compliance.

## 3.3 Equivalent Models

None.

## 3.4 Test Plan

The EUT product information, test configuration, mode of operation, test types, test procedures, test levels, pass/failure criteria, in this report were carried out per the product test plan located in Appendix A of this report

# 4 Radiated emissions

Emissions from an intentional radiator shall not exceed the field strength levels as specified in part 15.209 or RSS-210 A.2.

## 4.1 FCC Parts 15.209, RSS-GEN Table 5 – Fundamental and Spurious Emissions

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Results** | **Complies** (as tested per this report) | | | | | **Date** | 12 September 2016 |
| **Standard** | FCC Parts 15.205, 15.209, 15.215(c) and RSS-GEN Table 5 | | | | | | |
| **Product Model** | HB100 | | | **Serial#** | 081622744 | | |
| **Test Set-up** | Tested in a 5m Semi Anechoic chamber, placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane on a turn-table. | | | | | | |
| **EUT Powered By** | 3 VDC | **Temp** | 78º F | **Humidity** | 37% | **Pressure** | 1005 mbar |
| **Perf. Criteria** | (Below Limit) | | **Perf. Verification** | | Readings Under Limit | | |
| **Mod. to EUT** | None | | **Test Performed By** | | Mark Ryan | | |

### 4.1.1 Test Procedure

All testing was performed in accordance with 47 CFR Part 15, ANSI C63.10:2013, RSS-GEN Issue 4. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

### 4.1.2 Deviations

None.

### 4.1.3 Final Test

All final radiated and spurious emissions measurements were below (in compliance) the limits.

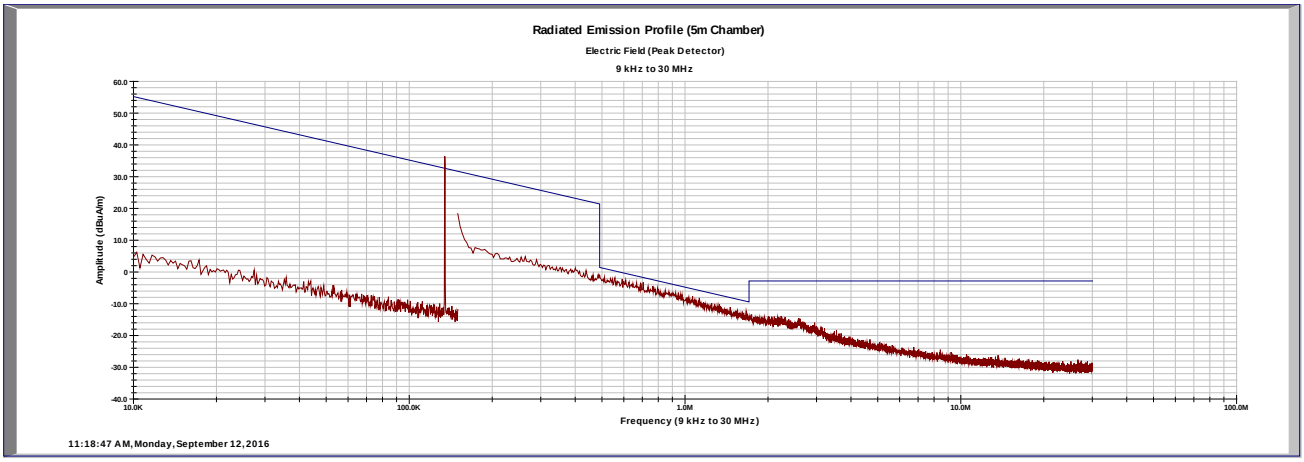
The worst –case emissions are shown below.

### 4.1.1 Final Graphs and Tabulated Data

| Emission Freq (MHz) | ANT Polar (P/p) | ANT Pos (m) | Table Pos (deg) | FIM Value (dBuV) | Amp Gain (dB) | Cable Loss (dB) | ANT Factor (dB/m) | E-Field Value (dBuA/m) |
|---|---|---|---|---|---|---|---|---|
| Frequency using Loop : | | | | | | | | |
| O 1 | (EUT Standing up) | | | | | | | |
| **0.13** | **P** | **1.0** | **0** | **75.30** | **0.00** | **0.04** | **-39.40** | **35.94** |
| 0.13 | p | 1.0 | 90 | 72.08 | 0.00 | 0.04 | -39.40 | 32.73 |
| | | | | | | | | |
| O 2 | (on long side) | | | | | | | |
| **0.13** | **P** | **1.0** | **0** | **75.78** | **0.00** | **0.04** | **-39.40** | **36.42** |
| 0.13 | p | 1.0 | 90 | 72.20 | 0.00 | 0.04 | -39.40 | 32.84 |
| | | | | | | | | |
| O 3 | (EUT Flat on table) | | | | | | | |
| **0.13** | **P** | **1.0** | **133** | **63.34** | **0.00** | **0.04** | **-39.40** | **23.98** |
| 0.13 | p | 1.0 | 0 | 38.39 | 0.00 | 0.04 | -39.40 | -0.97 |
| | | | | | | | | |
| Frequency using Pencil Probe : | | | | | | | | |
| O 1 | (EUT Vertical) | | | | | | | |
| **0.13** | **H** | **1.0** | **336** | **50.80** | **0.00** | **0.04** | **-39.40** | **11.44** |
| 0.13 | H | 1.0 | 0 | 28.10 | 0.00 | 0.04 | -39.40 | -11.26 |
| | | | | | | | | |
| O 2 | (on long side) | | | | | | | |
| **0.13** | **H** | **1.0** | **90** | **61.66** | **0.00** | **0.04** | **-39.40** | **22.30** |
| 0.13 | H | 1.0 | 0 | 57.99 | **0.00** | **0.04** | **-39.40** | **18.63** |
| | | | | | | | | |

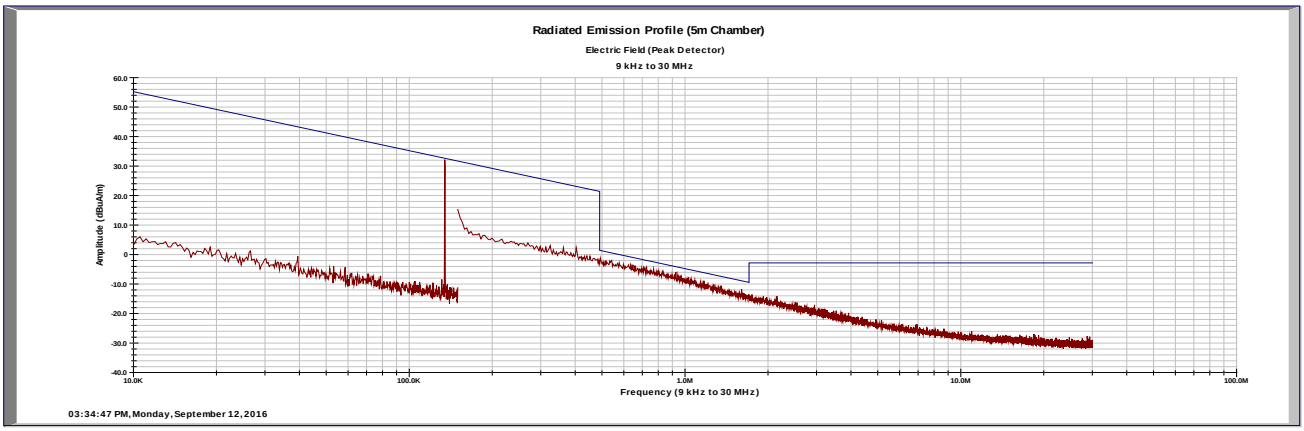
Note: Antenna Polarity is defined as: **P = Parallel**, and p = perpendicular
EUT is 80cm on table measured at 3m, Antenna at 1m height

EUT Loop Antenna – Parallel to measuring loop antenna:

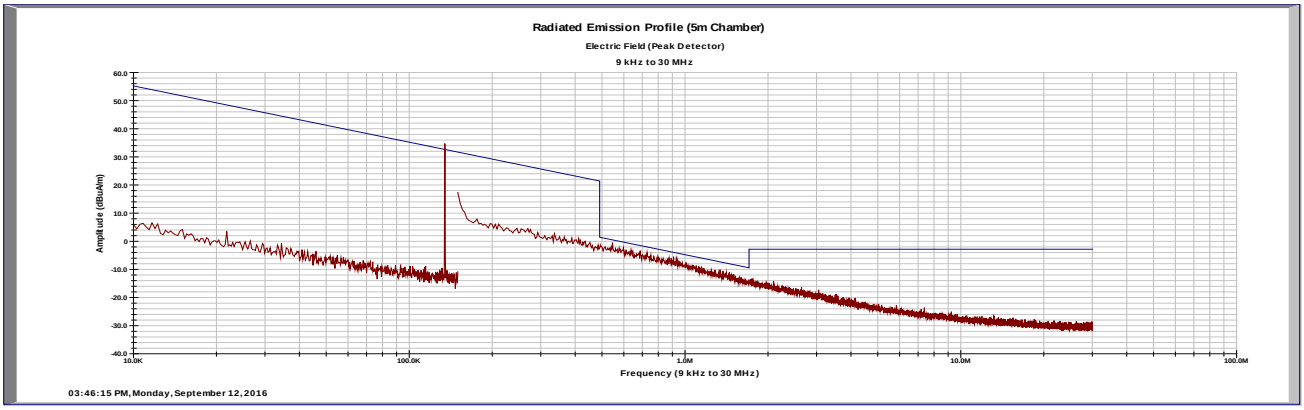



See Section 4.1.2 of this report for the emissions at distance calculation of the transmitter.

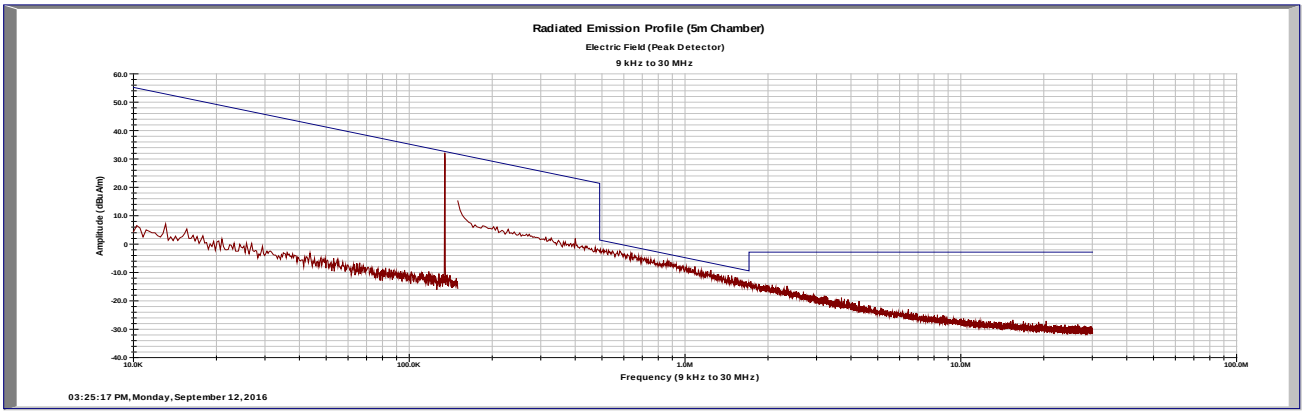
Loop Antenna – Perpendicular to measuring loop antenna:




Pencil Probe - Parallel to measuring loop antenna::



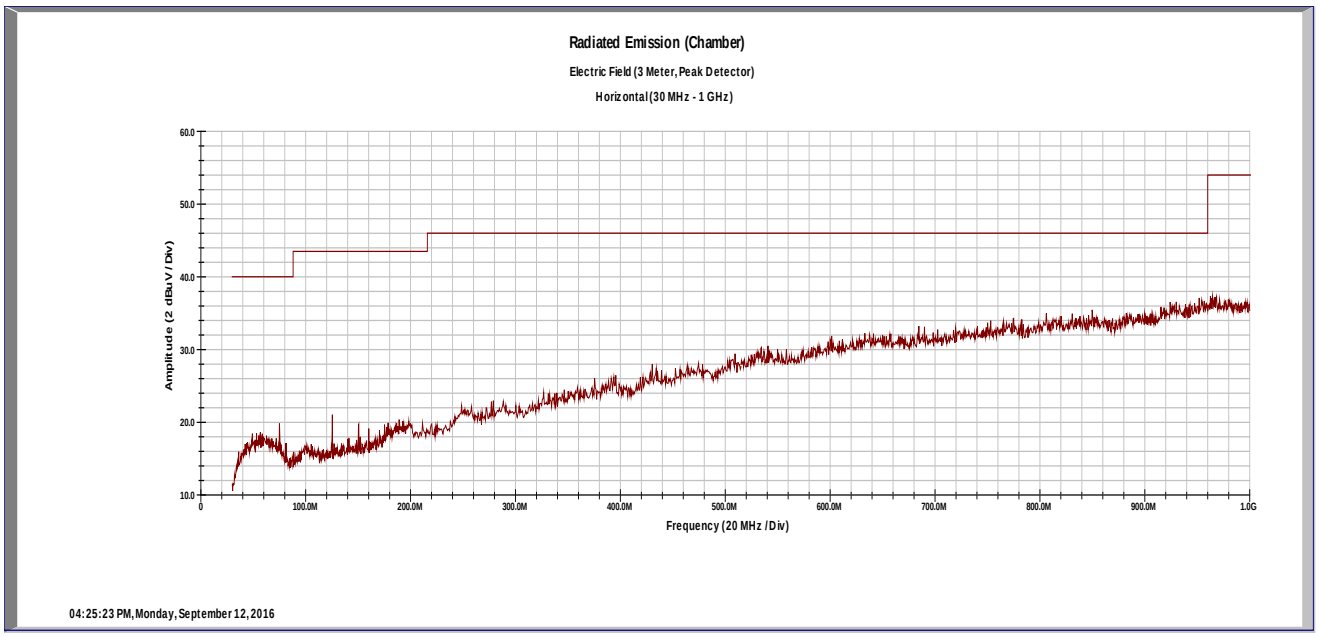

Pencil Probe - Perpendicular to measuring loop antenna:




Other than the fundamental frequency, No measurable emissions were found.

## Radiated Emissions – FCC & ISED

**Horizontal**




| Emission Freq (MHz) | ANT Polar (H/V) | ANT Pos (m) | Table Pos (deg) | FIM Value (dBuV) | Amp Gain (dB) | Cable Loss (dB) | ANT Factor (dB/m) | E-Field Value (dBuV/m) | Spec Limit (dBuV/m) | Spec Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
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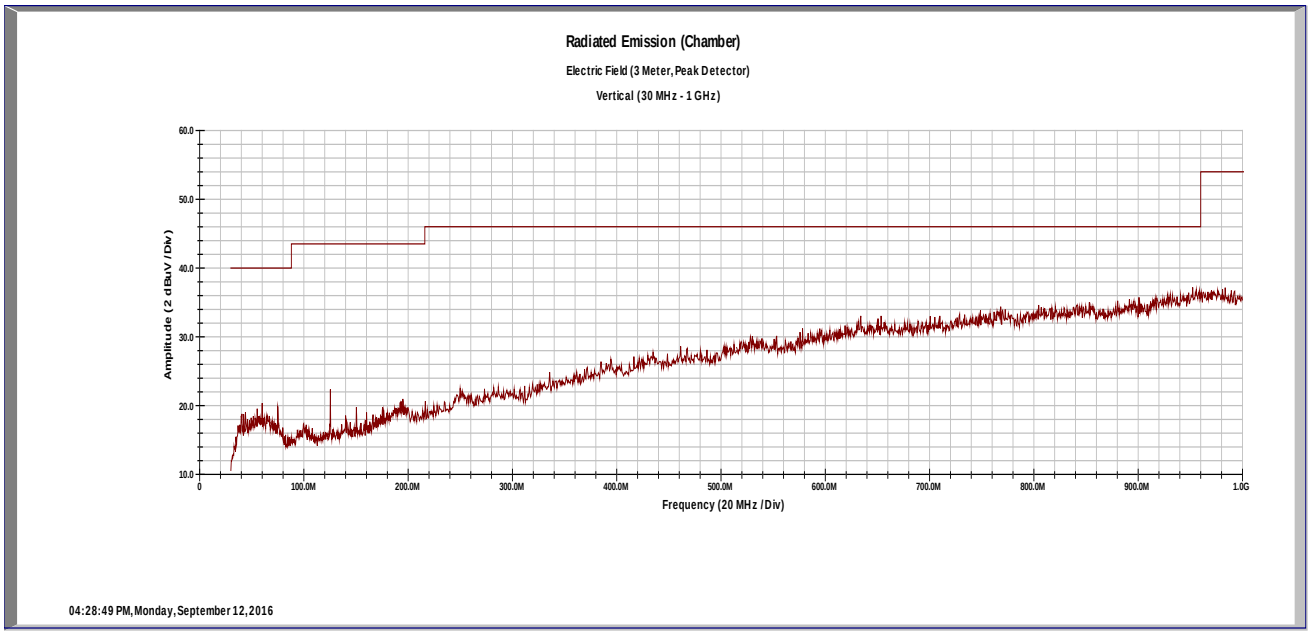
| | | | | | | | | | | |

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ±

Notes: Using the Loop antenna on the EUT.

## Radiated Emissions - FCC & ISED

**Vertical**




| Emission Freq (MHz) | ANT Polar (H/V) | ANT Pos (m) | Table Pos (deg) | FIM Value (dBuV) | Amp Gain (dB) | Cable Loss (dB) | ANT Factor (dB/m) | E-Field Value (dBuV/m) | Spec Limit (dBuV/m) | Spec Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
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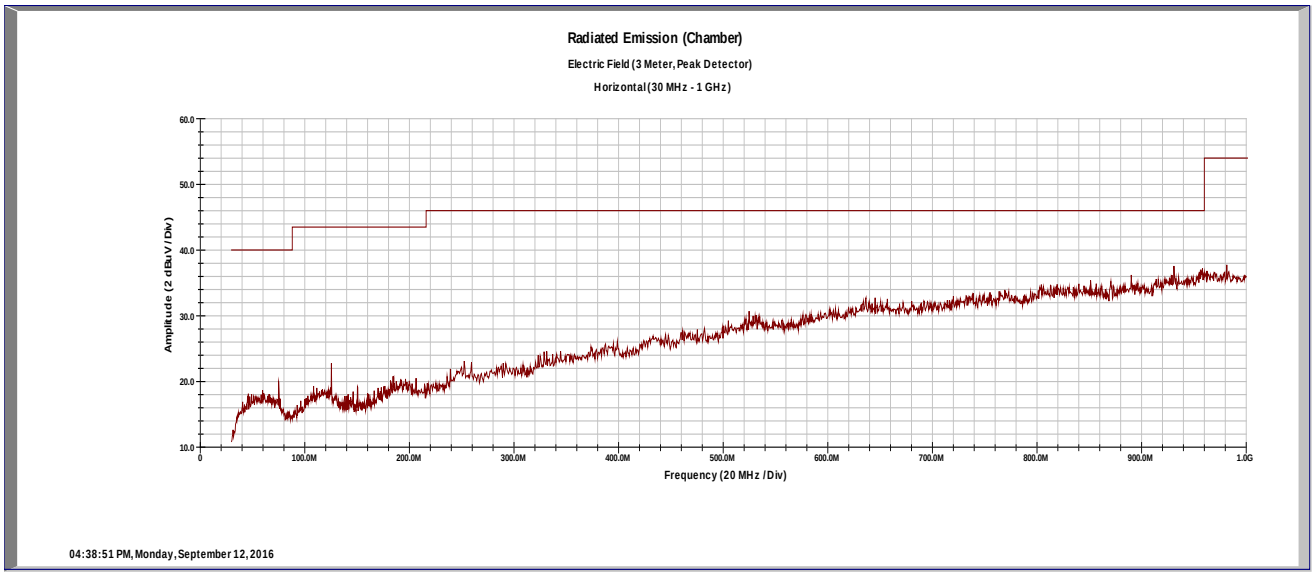
| | | | | | | | | | | |

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor

Notes: Using the Loop antenna on the EUT.

## Radiated Emissions – FCC & ISED

**Horizontal**




| Emission Freq (MHz) | ANT Polar (H/V) | ANT Pos (m) | Table Pos (deg) | FIM Value (dBuV) | Amp Gain (dB) | Cable Loss (dB) | ANT Factor (dB/m) | E-Field Value (dBuV/m) | Spec Limit (dBuV/m) | Spec Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 113.24 | H | 1.7 | 0 | 4.56 | 0.00 | 1.22 | 11.10 | 16.88 | 43.50 | -26.62 |
| | | | | | | | | | | |
| | | | | | | | | | | |
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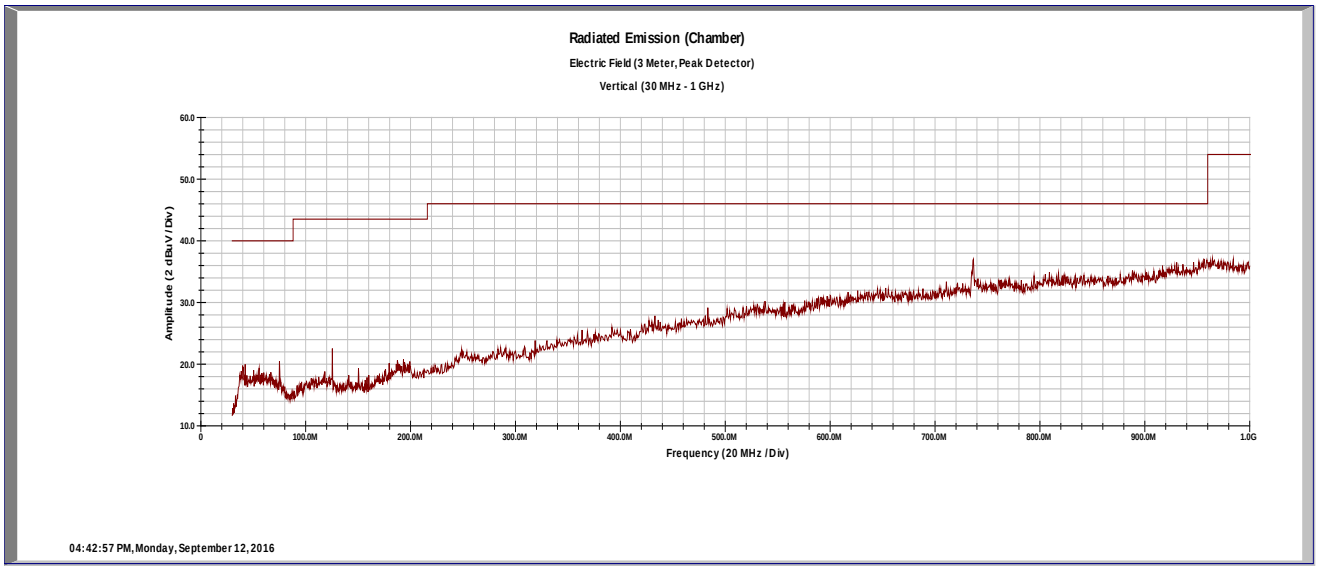
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor

Notes: Using the Pencil Probe on the EUT.

## Radiated Emissions – FCC & ISED

**Vertical**




| Emission Freq (MHz) | ANT Polar (H/V) | ANT Pos (m) | Table Pos (deg) | FIM Value (dBuV) | Amp Gain (dB) | Cable Loss (dB) | ANT Factor (dB/m) | E-Field Value (dBuV/m) | Spec Limit (dBuV/m) | Spec Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| 115.00 | V | 1.3 | 133 | 1.44 | 0.00 | 1.22 | 11.10 | 13.77 | 43.50 | -29.73 |
| 736.00 | V | 1.1 | 68 | 2.71 | 0.00 | 3.15 | 25.30 | 31.16 | 46.00 | -14.84 |
| | | | | | | | | | | |
| | | | | | | | | | | |
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Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor

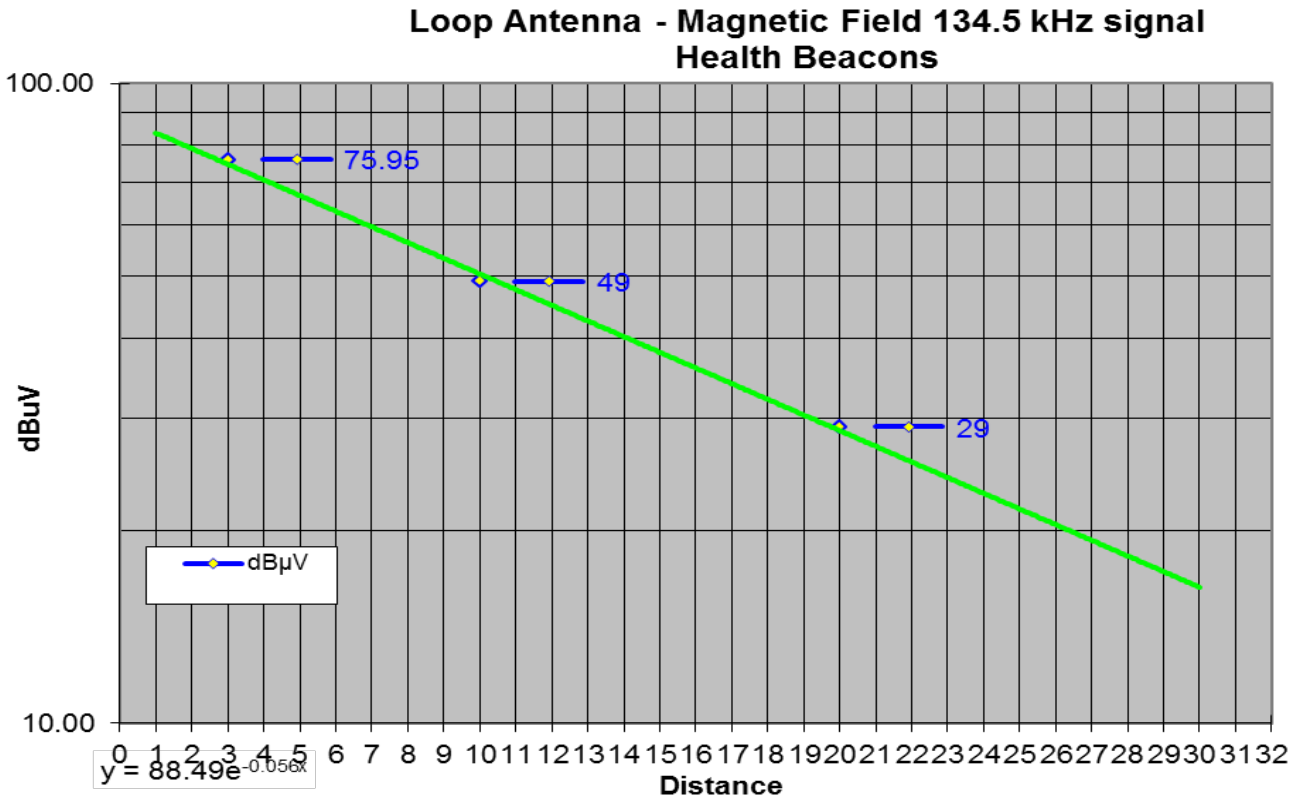
Notes: Using the Pencil Probe on the EUT.

### 4.1.1 Measurements at distance; extrapolation calculation:

| Dist (m) | Measured Level (dBµV/m) | Coax Attn (dB) | Antenna correction Factor (dB) | Corrected Level (dBµA/m) | Corrected Level (dBµV/m) | FCC & ISED Limit (dBµV/m) | Δ to Limit (dB) | Corrected Level (µV/m) | FCC & ISED Limit (µV/m) | Δ to Limit (µV) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 75.95 | 0.30 | -39.4 | 36.85 | 88.35 | NA | NA | NA | NA | NA |
| 10 | 49.00 | 0.30 | -39.4 | 9.90 | 61.40 | NA | NA | NA | NA | NA |
| 20 | 29.35 | 0.30 | -39.4 | -9.75 | 41.75 | NA | NA | NA | NA | NA |
| 30 | 16.57 | 0.30 | -39.4 | -22.53 | 28.97 | NA | NA | NA | NA | NA |
| 300 | 4.5E-06 | 0.30 | -39.4 | -39.40 | 12.10 | 25.03 | -12.93 | 4.03 | 17.85 | -13.82 |

Notes: The **Green** values were measured. The **Blue** Values were extrapolated.
The received emissions at 30m were unmeasurable. This value was extrapolated.
The Antenna Correction Factor includes the conversion from dBµV to dBµA.
Add 51.5dB to convert the corrected dBµA level to the corrected dBuV/m level.
Per FCC Part 15.31(f)(2), the multi-point extrapolation method was used to determine the value at 300m.
The EUT transmits in CW mode, so the Peak, Quasi-Peak and Average values are within 0.1 dB of each other.

Extrapolation Calculation:




Extrapolation formula: $y=88.49e^{-0.056x}$, where x = distance (m) and y= extrapolated value in dBµV/m.

## 4.2 FCC 15.207(a) Conducted Emissions on AC Mains

This test measures the electromagnet levels of spurious signals generated by the EUT on the AC power line that may affect the performance of other nearby electronic equipment.

### 4.2.1 Over View of Test

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Results** | **NA** | | | | | **Date** | NA |
| **Standard** | FCC Parts 15.207(a) | | | | | | |
| **Product Model** | ProxPad | | | **Serial#** | NA | | |
| **Test Set-up** | Tested in shielded room. EUT placed on table, see test plans for details | | | | | | |
| **EUT Powered By** | 3 VDC Battery | **Temp** | - | **Humidity** | - | **Pressure** | - |
| **Frequency Range** | 150 kHz – 30 MHz | | | | | | |
| **Perf. Criteria** | (Below Limit ) | **Perf. Verification** | | Readings Under Limit for L1 & Neutral | | | |
| **Mod. to EUT** | None | **Test Performed By** | | Mark Ryan | | | |

### 4.2.1 Test Procedure

Conducted and FCC emissions tests were performed using the procedures of ANSI C63.4:2009 including methods for signal maximizations and EUT configuration. The frequency range from NA was investigated for conducted emissions.

EUT was placed 80cm above a ground plane, using procedures specified in ANSI C63.4.

Worst-case emissions shown; EUT in transmit mode with AC power module.

### 4.2.2 Deviations

The EUT is operated by two AA alkaline batteries only. There is no provisions of connection to the AC Mains.

### 4.2.3 Final Test

EUT is battery operated only. This test is not applicable.

## 4.3 20dB Bandwidth

The -20 dBc bandwidth measurement is for the purpose of the Emission designator.

### 4.3.1 Test Over View

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Results** | **Complies** (as tested per this report) | | | | **Date** | 29 June 2012 | |
| **Standard** | FCC Part 15C | | | | | | |
| **Product Model** | LOCALIZER | | | **Serial#** | 081622744 | | |
| **Test Set-up** | Direct Measurement from antenna port | | | | | | |
| **EUT Powered By** | 3 VDC batteries | **Temp** | 78º F | **Humidity** | 36% | **Pressure** | 993 mbar |
| **Perf. Criteria** | (Below Limit) | | **Perf. Verification** | | Readings Under Limit | | |
| **Mod. to EUT** | None | | **Test Performed By** | | Mark Ryan | | |

### 4.3.2 Test Procedure

Using the procedures of RSS-GEN section 4.6.1, the 10 Hz resolution bandwidth is 1% of the 1 kHz span. The 30 Hz video bandwidth is 3 times that of the resolution bandwidth.

### 4.3.3 Deviations

There were no deviations from the test methodology listed in the test plan for the Electrical Fast transients (EFT) Immunity test.

### 4.3.4 Final Results

The measured 99% bandwidth is: 96.2 Hz.

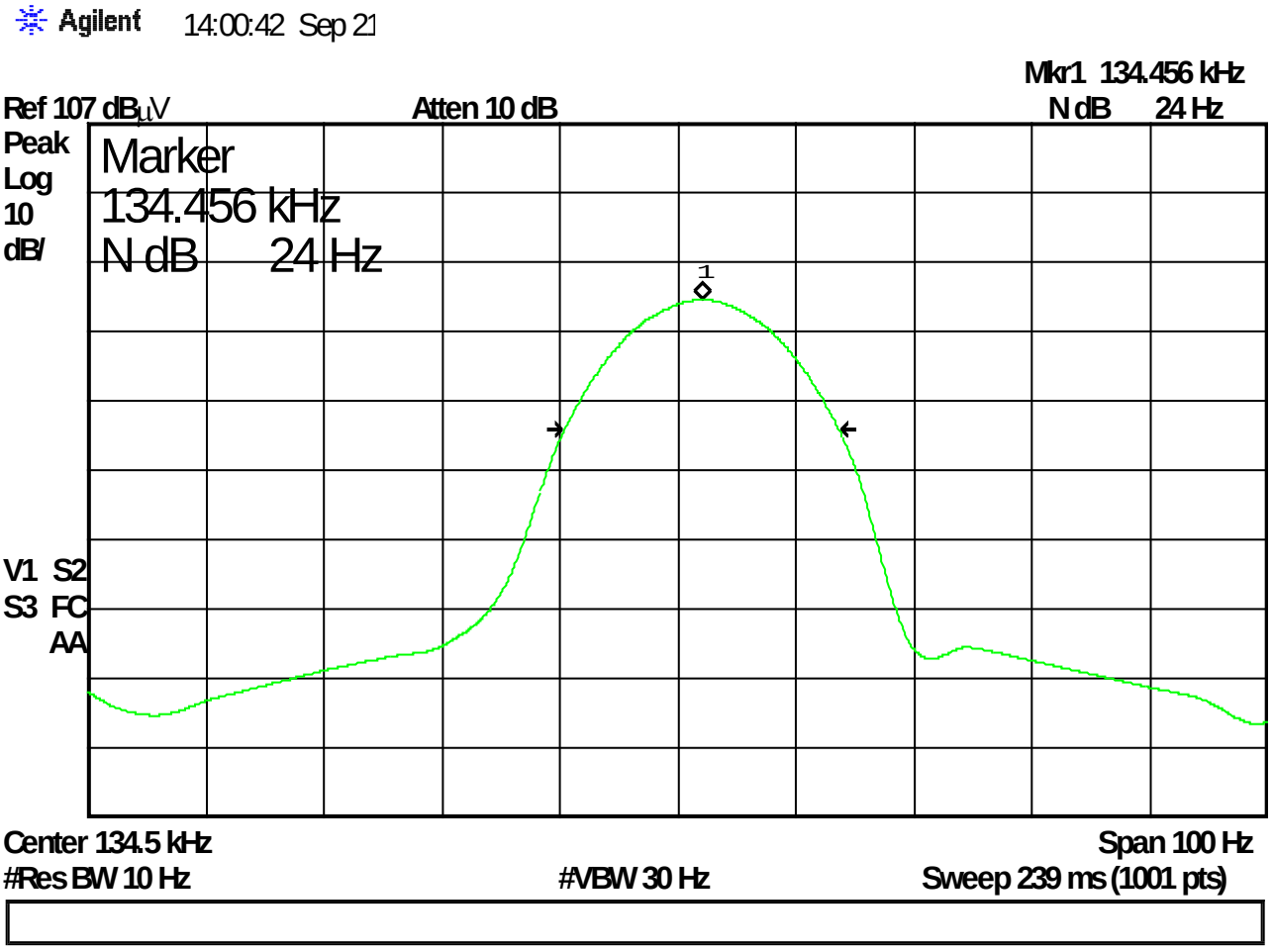
The Designation of Necessary Bandwidth per TRC-43 would be: 96H2

The EUT met the performance criteria requirement as specified in the test plan of this report and in the standards.

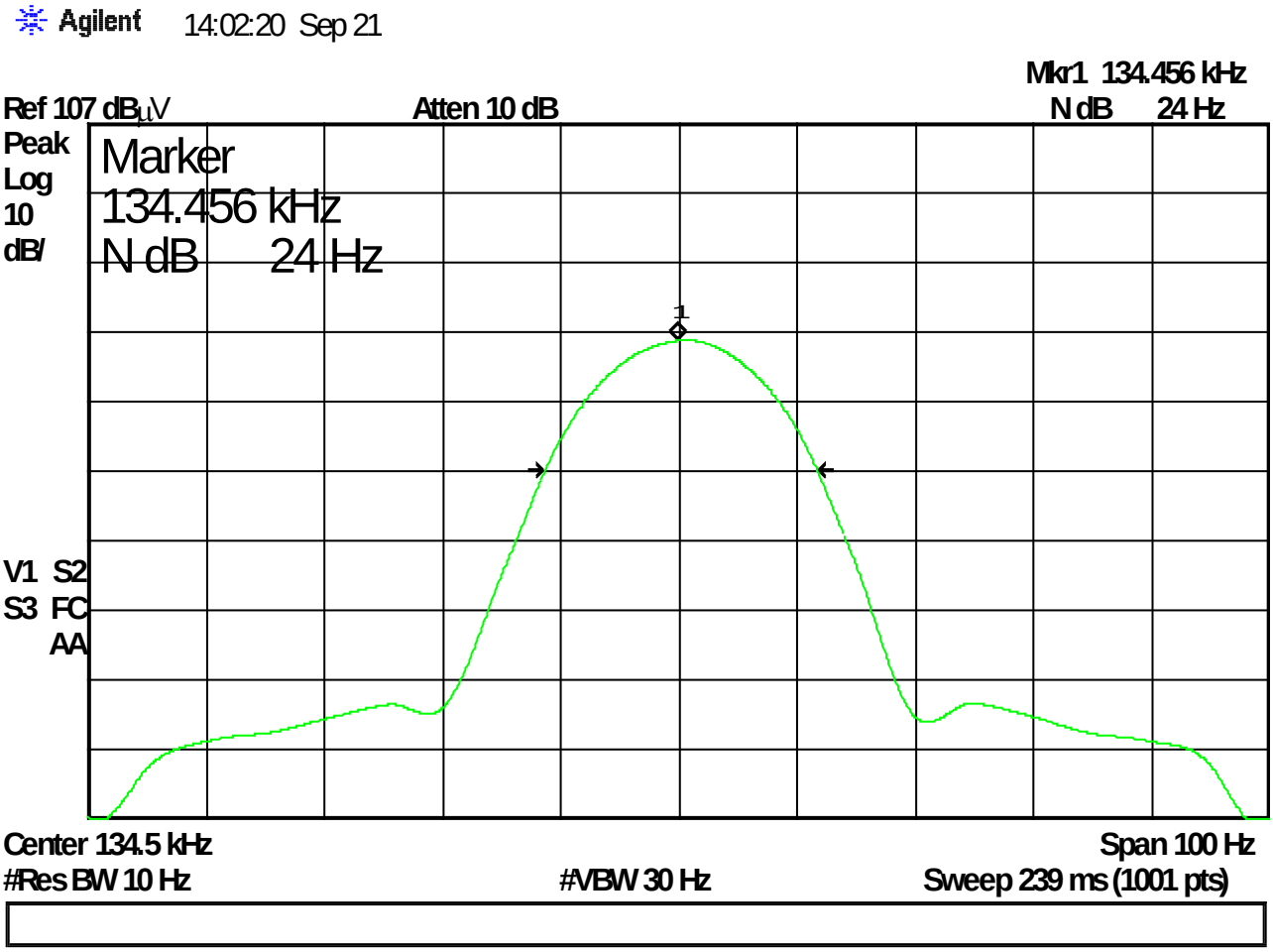
### 4.3.5 Final Data

| EUT Antenna | -20dBc Bandwidth |
|---|---|
| Internal Loop | 24 Hz |
| Pencil Probe | 24 Hz |

EUT Loop Antenna:



EUT Pencil Probe:



# Appendix A

## 5 Test Plan

This test report is intended to follow this test plan outlined here in unless otherwise stated in this report. The following test plan will give details on product information, standards to be used, test set ups and refer to TUV test procedures. The test procedures will give the steps to be taken when performing the stated test. The product information below came via client, product manual, product itself and or the internet.

### 5.1 General Information

| | |
|---|---|
| **Client** | HEALTH BEACONS INC. |
| **Address 1** | 34 Walden St, #753 |
| **Address 2** | Concord MA 01742 USA |
| **Contact Person** | Nancy Confrey |
| **Telephone** | 978 287 4635 |
| **Fax** | 978 246 6019 |
| **e-mail** | nconfrey@healthbeacons.com |

#### 5.1.1 Product Name

HB100

#### 5.1.2 Type of Product

LOCALIZER

#### 5.1.1 Equipment Under Test (EUT) Description

The LOCALIZER is a low frequency (134kHz) RFID reader that estimates the distance from the reader to an RFID tag that has been implanted in a body. It is generally used for Breast surgery.

The LOCALIZER is handheld, and operated from a battery consisting of 2 replaceable AA cells.

There are two modes of operation.

1. Using the integrated aircore coil (Loop Probe) the surgeon can locate the tag prior to cutting the skin.

2. A sterile pencil probe accessory can be used to probe within the surgical wound.

The operating modes are mutually exclusive. If the pencil probe is plugged in it is selected, but then the operator may switch back and forth between probes. The coil in either probe is driven by a 3V rectangular wave to resonance. The Aircore coil is intended for longer range operation (60mm) and has slightly higher excitation current than is used with the pencil probe. Once a Tag is detected, an audio tone increases in pitch and amplitude as the probe gets closer to the tag. The distance estimate in millimeters is displayed in large numerals. The relative signal strength is displayed as a Bar graph. When the tag is close enough, the Tag ID number is displayed. The battery level is displayed.

## 5.2 General Product Information

| | | | | | | |
|---|---|---|---|---|---|---|
| **Size** | **H** | 2.4 cm | **W** | 7.2 cm | **L** | 18 cm |
| **Weight** | 0.2 kg | | **Fork-Lift Needed** | | No | |
| **Notes** | | | | | | |

**Product environmental operating conditions:**

5 to 30° C - Operating temperature range.
15 to 93% - Operating humidity range. Non condensing
70 to 102kPa - Operating pressure range.

### 5.2.1 Electrical Power Information

| Name | Type | Voltage | | Frequency | Current Output | Notes |
|---|---|---|---|---|---|---|
| | | min | max | | | |
| AA Alkaline cells | DC | 2.0 | 5.5 | DC | 150 mA | |
| **Notes** | | | | | | |

### 5.2.2 Testing Preparation

2 AA cells should be inserted as shown. The only user controls are:

- Audio Volume
- Display brightness
- Probe select
- On/Off.

### 5.2.3 EUT Clock/Oscillator Frequencies

| | | |
|---|---|---|
| ☒ | **Less than 108MHz** | **FCC – scan up to 1GHz** |
| ☐ | **Less than 500MHz** | **FCC – scan up to 2GHz** |
| ☐ | **Less than 1000MHz** | **FCC – scan up to 5GHz** |
| ☐ | **Greater then 1000MHz** | **FCC – scan up to 5$^{th}$ Harmonic or 40GHz** |

### 5.2.4 Non - Electrical Support Equipment

| Item | N |
|---|---|
| Tag Holder test fixture | Attached to pencil probe when shipped |
| Tag Holder test fixture for LOOP probe | Can be held in place by hand or with rubber band for testing |

### 5.2.5 EUT Equipment/Cabling Information

| EUT Port | Connected To | Location | Cable Type | | |
|---|---|---|---|---|---|
| | | | Length | Shielded | Bead |
| Pencil probe | Pencil probe socket | Above display adjacent to loop. | 900 mm | No | no |

## 5.3 EUT Test Program

Uses standard Firmware: Scanning for Tag, reading Tag distance.

### 5.3.1 Monitoring of EUT during Testing

Observer should watch the display.

## *5.4 EUT Configuration*

### 5.4.1 Description

| Configuration | Description |
|---|---|
| 1. Using Loop probe | |
| 2. Using Pencil Probe | |
| **Notes** | All configurations are the same except as noted above |