



# FCC/IC Partial Scope Test Report

**FOR:**

**Manufacturer: Securitron Magnalock Corp.**

**Model Number: R100-1-SE**

**Product Description: Aperio Wall Mounted Reader**

**FCC ID: KSF-R1001SE**

**IC Certification Number: 11564A-R1001SE**

**FCC CFR 47 Part 15.225**

**IC RSS-210 Issue 8, Annex 2, Section 6**

**TEST REPORT #: EMC\_HANC1\_002\_13502\_R100\_RFID-R**

**DATE: March 11, 2014**



**FCC:  
Accredited**

**IC recognized #  
3462B-1**

**CETECOM Inc.**

411 Dixon Landing Road ♦ Milpitas, CA 95035 ♦ U.S.A.

Phone: + 1 (408) 586 6200 ♦ Fax: + 1 (408) 586 6299 ♦ E-mail: [info@cetecomusa.com](mailto:info@cetecomusa.com) ♦ <http://www.cetecom.com>

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## 1 Assessment

The following device, as detailed in section 3 of this test report, was evaluated against the applicable criteria specified in FCC CFR 47 Parts 15.209, 15.215, 15.225, and Industry Canada Radio Standard Specification RSS 210 Issue 8, Annex 2.6.

No deviations were ascertained during the course of the tests performed.

This partial scope test report only contains the details of radiated measurements of the above listed rules. The conducted RF antenna port measurements are documented in a separate test report as identified in section 4.

| Manufacturer               | Description                | Model #   |
|----------------------------|----------------------------|-----------|
| Securitron Magnalock Corp. | Aperio Wall Mounted Reader | R100-1-SE |

### Responsible for Testing Laboratory:

Franz Engert

March 11, 2014    Compliance    (Manager of Compliance)

| Date | Section | Name | Signature |
|------|---------|------|-----------|
|------|---------|------|-----------|

### Responsible for the Report:

Josie Sabado

March 11, 2014    Compliance    (Test Lab Manager)

| Date | Section | Name | Signature |
|------|---------|------|-----------|
|------|---------|------|-----------|

The test results of this test report relate exclusively to the test item specified in Section 3.

CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

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## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory Issuing the Test Report

|                                 |  |
|---------------------------------|--|
| <b>Company Name:</b>            | CETECOM Inc.   |
| <b>Department:</b>              | Compliance   |
| <b>Address:</b>                 | 411 Dixon Landing Road<br>Milpitas, CA 95035<br>U.S.A. |
| <b>Telephone:</b>               | +1 (408) 586 6200                                      |
| <b>Fax:</b>                     | +1 (408) 586 6299                                      |
| <b>Acting Test Lab Manager:</b> | Franz Engert   |
| <b>Test Engineer:</b>           | Josie Sabado   |

### 2.2 Identification of the Client

|                          |                            |
|--------------------------|----------------------------|
| <b>Applicant's Name:</b> | Assa Abloy                 |
| <b>Street Address:</b>   | 10027 S. 51st St. Ste. 102 |
| <b>City/Zip Code</b>     | Phoenix, AZ 85044          |
| <b>Country</b>           | USA                        |
| <b>Contact Person:</b>   | Josh Peabody               |
| <b>Phone No.</b>         | 623-582-4626               |
| <b>e-mail:</b>           | josh.peabody@assaabloy.com |

### 2.3 Identification of the Manufacturer

|                               |                            |
|-------------------------------|----------------------------|
| <b>Manufacturer's Name:</b>   | Securitron Magnalock Corp. |
| <b>Manufacturers Address:</b> | 10027 S. 51st St. Ste. 102 |
| <b>City/Zip Code</b>          | Phoenix, AZ 85044          |
| <b>Country</b>                | USA                        |

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### **3 Equipment under Test (EUT)**

#### **3.1 Details of the Equipment under Test**

|  |                                    |
|--|------------------------------------|
| <b>Marketing Name:</b>                             | R100-1-SE Aperio Reader            |
| <b>Model Number:</b>                               | R100 HF R100-1-SE                  |
| <b>FCC ID:</b>                                     | KSF-R1001SE                        |
| <b>IC Certification Number:</b>                    | 11564A-R1001SE                     |
| <b>Product Description:</b>                        | Aperio Wall Mounted Reader         |
| <b>Technology / Type(s) of Modulation:</b>         | RFID, ASK Modulation               |
| <b>Nominal Channel Bandwidth:</b>                  | 500 kHz                            |
| <b>Operating Frequency Range (MHz) / Channels:</b> | 13.56, 1 Channel                   |
| <b>Antenna Information:</b>                        | Custom wire wound loop             |
| <b>Max. Field strength:</b>                        | 26.709 dB $\mu$ V/m @ 3 m distance |
| <b>Rated Operating Voltage Range:</b>              | Battery, type CR2, 3.0V Li-ion     |
| <b>Rated Operating Temperature Range:</b>          | -40 °C to +50 °C                   |
| <b>Test Sample Status:</b>                         | Prototype                          |
| <b>Other Radios included:</b>                      | 2.4 GHz Zigbee                     |

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### 3.2 Identification of the Equipment Under Test (EUT)

| EUT # | Serial Number | HW Version  | SW Version   | Note |
|-------|---------------|-------------|--|------|
| 1     | 10046         | 7080058.014 | r100_main2_aperio_lowFreq-<br>0.0.24450_bl-0.0.24450 |      |

### 3.3 Identification of Accessory equipment

No accessory equipment

### 3.4 Other EUT Notes

The device was configured with manufacturer provided test software, which allowed the EUT to be operated with 100% duty cycle during testing.

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#### 4 Summary of Measurement Results

| Test Specification                    | Test Case                                  | Temperature and Voltage Conditions | Pass                                | Fail                     | NA                       | NP                                  | Result   |
|---------------------------------------|--|------------------------------------|-------------------------------------|--------------------------|--------------------------|-------------------------------------|----------|
| §15.215(c)                            | 20 dB Emission Bandwidth                   | Nominal                            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Note 1   |
| RSS Gen 4.6.1                         | Occupied Bandwidth                         | Nominal                            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Note 1   |
| §15.225(e)<br>RSS 210 A2.6            | Frequency Stability                        | Extreme                            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Note 1   |
| §15.225 (a)(b)(c)<br>RSS 210 A2.6     | In Band TX Spurious Emissions Radiated     | Nominal                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | Complies |
| §15.225(d)<br>§15.209<br>RSS 210 A2.6 | Out of Band TX Spurious Emissions Radiated | Nominal                            | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            | Complies |
| §15.207(a)                            | AC Power Line Conducted Emissions          | Nominal                            | <input type="checkbox"/>            | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Note 2   |

**Note:** NA= Not Applicable; NP= Not Performed.

1. Conducted RF antenna port measurements are documented in a separate test report described in section 5.6.
2. EUT is battery operated. AC line conducted emissions not applicable.

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## **5 Measurement Information**

### **5.1 Dates of Testing**

November 20, 2013

### **5.2 Measurement Uncertainty**

The following measurement uncertainties are applicable to the measurements described in this test report:

Conducted power and emission measurements: +/- 0.5dB

Radiated power and emission measurements: +/- 3.0 dB

### **5.3 Nominal EUT Conditions During Test**

The following nominal EUT conditions were used during the course of testing, unless otherwise stated:

EUT Voltage: Battery, type CR2, 3.0V Li-ion

### **5.4 Nominal Environmental Conditions During Test**

The following nominal environmental conditions were maintained during the course of testing, unless otherwise stated:

Ambient Temperature: 20-25°C

Relative humidity: 40-60%



## **5.5 Radiated Measurement Procedure**

### **ANSI C63.4 (2009) Section 8.3.1.1: Exploratory radiated emission measurements**

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT. At near distances, for EUTs of comparably small size, it is relatively easy to determine the spectrum signature of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. A shielded room may be used for exploratory testing, but may have anomalies that can lead to significant errors in amplitude measurements.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of testing. It is recommended that either a headset or loudspeaker be connected as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT when the exploratory and final testing is performed in an OATS with strong ambient signals. Caution should be taken if either antenna height between 1 and 4 meters or EUT azimuth is not fully explored. Not fully exploring these parameters during exploratory testing may require complete testing at the OATS or semi-anechoic chamber when the final full spectrum testing is conducted.

The EUT should be set up in its typical configuration and arrangement, and operated in its various modes. For tabletop systems, cables or wires should be manipulated within the range of likely arrangements. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. For combination EUTs, the tabletop and floor-standing portions of the EUT shall follow the procedures for their respective setups and cable manipulation. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions.

For each mode of operation required to be tested, the frequency spectrum shall be monitored. Variations in antenna height between 1 and 4 m, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) shall be explored to produce the emission that has the highest amplitude relative to the limit. A step-by-step technique for determining this emission can be found in Annex C.

When measuring emissions above 1 GHz, the frequencies of maximum emission shall be determined by manually positioning the antenna close to the EUT and by moving the antenna over all sides of the EUT while observing a spectral display. It will be advantageous to have prior knowledge of the frequencies of emissions above 1 GHz. If the EUT is a device with dimensions approximately equal to that of the measurement antenna beam width, the measurement antenna shall be aligned with the EUT.

### **ANSI C63.4 (2009) Section 8.3.1.2: Final radiated emission measurements**

Based on the measurement results in 8.3.1.1, the one EUT, cable and wire arrangement, and mode of operation that produces the emission that has the highest amplitude relative to the limit is selected for the final measurement. The final measurement is then performed on a site meeting the requirements of 5.3, 5.4, or 5.5 as appropriate without variation of the EUT arrangement or EUT mode of operation. If the EUT is relocated from an exploratory test site to a final test site, the highest emission shall be re-maximized at the final test location before final radiated emissions measurements are performed.

However, antenna height and polarity and EUT azimuth are to be varied. In addition, the full frequency spectrum (for the range to be checked for meeting compliance) shall be investigated.

This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. During the full frequency spectrum investigation, particular focus should be made on those frequencies found in exploratory testing that were used to find the final test configuration, mode of operation, and arrangement (associated with achieving the least margin with respect to the limit). This full spectrum test constitutes the compliance measurement.

For measurements above 1 GHz, use the cable, EUT arrangement, and mode of operation determined in the exploratory testing to produce the emission that has the highest amplitude relative to the limit. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the antenna in the “cone of radiation” from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response. The antenna may have to be higher or lower than the EUT, depending on the EUT’s size and mounting height, but the antenna should be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. If the transmission line for the measurement antenna restricts its range of height and polarization, the steps needed to ensure the correct measurement of the maximum emissions, shall be described in detail in the report of measurements. Data collected shall satisfy the report requirements of Clause 10.

#### NOTES

- 1— Where limits are specified by agencies for both average and peak (or quasi-peak) detection, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.
- 2—Use of waveguide and flexible waveguide may be necessary at frequencies above 10 GHz to achieve usable signal-to noise ratios at required measurement distances. If so, it may be necessary to restrict the height search of the antenna, and special care should be taken to ensure that maximum emissions are correctly measured.
- 3—All presently known devices causing emissions above 10 GHz are physically small compared with the beam-widths of typical horn antennas used for EMC measurements. For such EUTs and frequencies, it may be preferable to vary the height and polarization of the EUT instead of the receiving antenna to maximize the measured emissions.

All radiated test data in this report shows the worst case emissions for H/V measurement antenna polarizations and for all three orthogonal orientations of the EUT.

### 5.5.1 Sample Calculations for Radiated Measurements

Measurements from the Spectrum Analyzer/ Receiver are used to calculate the Field Strength, taking into account the following parameters:

1. Measured reading in dB $\mu$ V
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

FS (dB $\mu$ V/m) = Measured Value on SA (dB $\mu$ V) + Cable Loss (dB) + Antenna Factor (dB/m)

Eg:

| Frequency<br>(MHz) | Measured SA<br>(dB $\mu$ V) | Cable Loss<br>(dB) | Antenna Factor<br>Correction<br>(dB) | Field Strength<br>Result<br>(dB $\mu$ V/m) |
|--------------------|-----------------------------|--------------------|--------------------------------------|--|
| 1000               | 80.5                        | 3.5                | 14                                   | 98.0                                       |

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the above equation.

### 5.6 Associated Test Reports

Conducted RF antenna port measurements are documented in test report number EMC\_HANC1\_002\_13502\_R100\_RFID-C issued by CETECOM Inc.

## 6 Measurement Results

### 6.1 In Band Transmitter Spurious Emissions

#### 6.1.1 References

§15.225(a)(b)(c)

#### RSS 210 A2.6

The Field strength of any emissions within the band 13.110 – 14.010 MHz shall not exceed the following limits:

| Frequency (MHz) | Field strength limit in $\mu\text{V/m}$ @ 30m | Field strength limit in $\text{dB}\mu\text{V/m}$ @ 3m extrapolated as per FCC part 15.31(f)(2), 40dB/decade |
|-----------------|---|---|
| 13.110 – 13.410 | 106   | 80.5  |
| 13.410 – 13.533 | 334   | 90.4  |
| 13.553 – 13.567 | 15848   | 124   |
| 13.567 – 13.710 | 334   | 90.4  |
| 13.710 – 14.010 | 106   | 80.5  |

#### 6.1.2 Spectrum Analyzer settings

|                      |          |
|----------------------|----------|
| Start Frequency      | 13 MHz   |
| Stop Frequency       | 14.1 MHz |
| Resolution Bandwidth | 9 kHz    |
| Video Bandwidth      | 100 kHz  |
| Detector             | Peak     |
| Trace Mode           | Max Hold |
| Sweep Time           | Auto     |

#### 6.1.3 Testing Notes

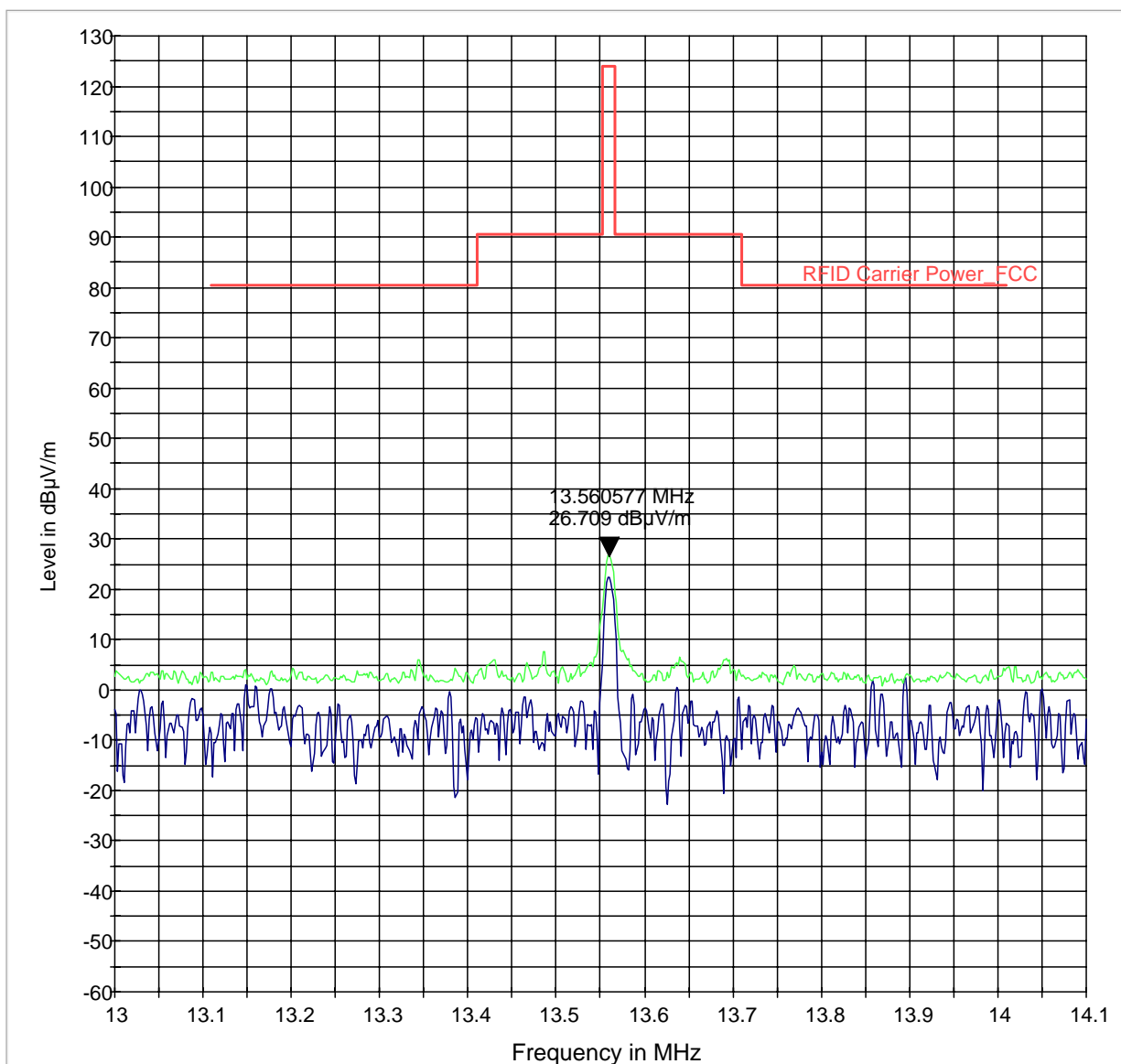
Measurements are performed at a 3 m distance.

The red colored line in the following plots show the limit according to §15.225 extrapolated to 3 m distance according to 15.31(f)(2), i.e. 40dB/decade.

#### 6.1.4 Measurement Verdict

Pass

## 6.1.5 Test Plots



— MaxPeak-ClearWrite-PK+ — MaxPeak-MaxHold-PK+ — RFID Carrier Power\_FCC

The red colored line shows the limit per part 15.225 extrapolated to 3m distance according to 15.31(f)(2), i.e. 40dB/decade.

## 6.2 Out of Band Transmitter Spurious Radiated Emissions

### 6.2.1 References

#### §15.225(d)

#### RSS-210 2.5

The field strength of unwanted emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 and RSS-Gen 7.2.5.

#### §15.209

#### RSS-Gen 7.2.5

The emissions from an intentional radiator shall not exceed the limits in the tables in these sections using an average detector.

### 6.2.2 Spectrum Analyzer Settings

|                             | Transmitter Spurious Emissions 9 kHz – 1 GHz |               |                  |                |
|-----------------------------|--|---------------|------------------|----------------|
|                             | 9 – 150 kHz                                  | 150 – 490 kHz | 490 kHz – 30 MHz | 30 MHz – 1 GHz |
| <b>Resolution Bandwidth</b> | 200 Hz                                       | 9 kHz         | 9 kHz            | 120 kHz        |
| <b>Video Bandwidth</b>      | 2 kHz  | 100 kHz       | 100 kHz          | 1 MHz          |
| <b>Detector</b>             | Peak   | Peak          | Peak             | Peak           |
| <b>Trace Mode</b>           | Max Hold                                     | Max Hold      | Max Hold         | Max Hold       |
| <b>Sweep Time</b>           | Auto   | Auto          | Auto             | Auto           |

### 6.2.3 Testing Notes

Measurements are performed with a 3 meter distance.

In the following plots, the field strength measurements are extrapolated to 300 m between 9 kHz to 490 kHz and to 30 m between 490 kHz to 30 MHz. The measurements are extrapolated by 40 dB/decade as required by §15.31(f)(2).

The red limit line shows the 300 m limit between 9 kHz to 490 kHz, the 30m limit between 490 kHz to 30 MHz, and 3m limit above 30MHz.

### 6.2.4 Measurement Verdict

Pass

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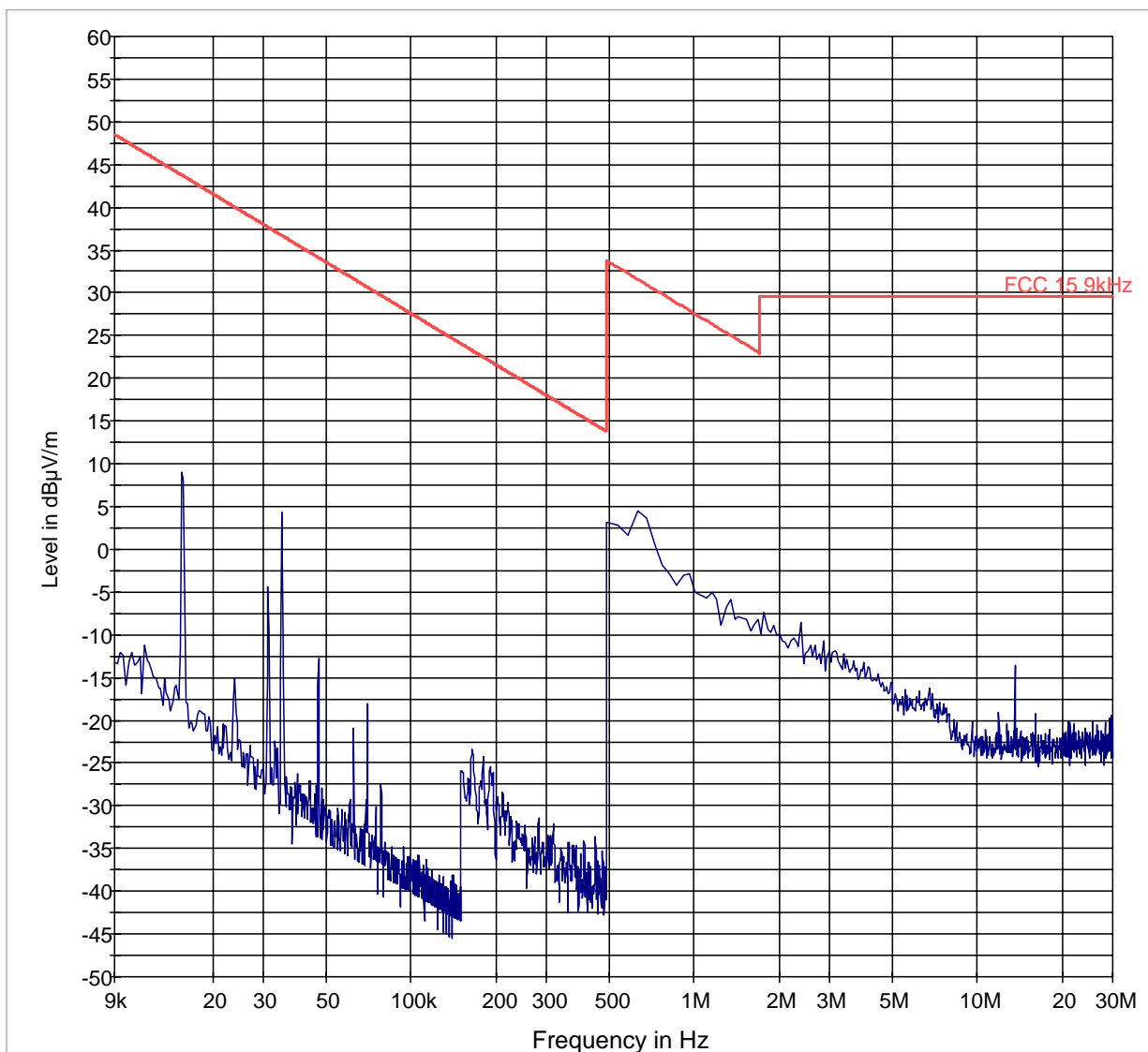
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## 6.2.5 Test Plots

### Radiated Emissions: 9 kHz - 30 MHz



— FCC 15.9kHz — Preview Result 1-PK+

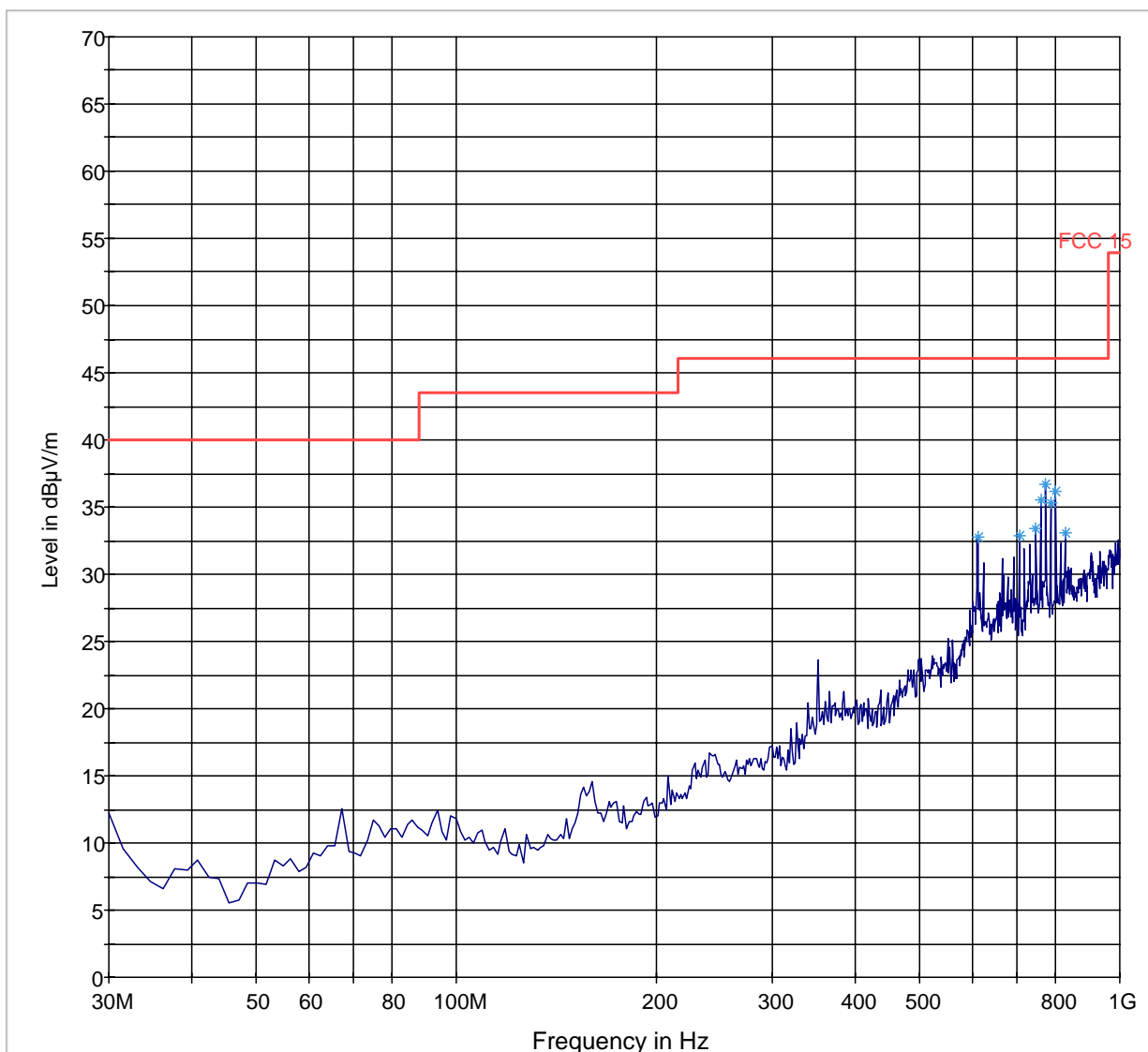
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## Radiated Emissions: 30 MHz – 1 GHz



— FCC 15    — Preview Result 1-PK+    \* Data Reduction Result 1 [3]-PK+



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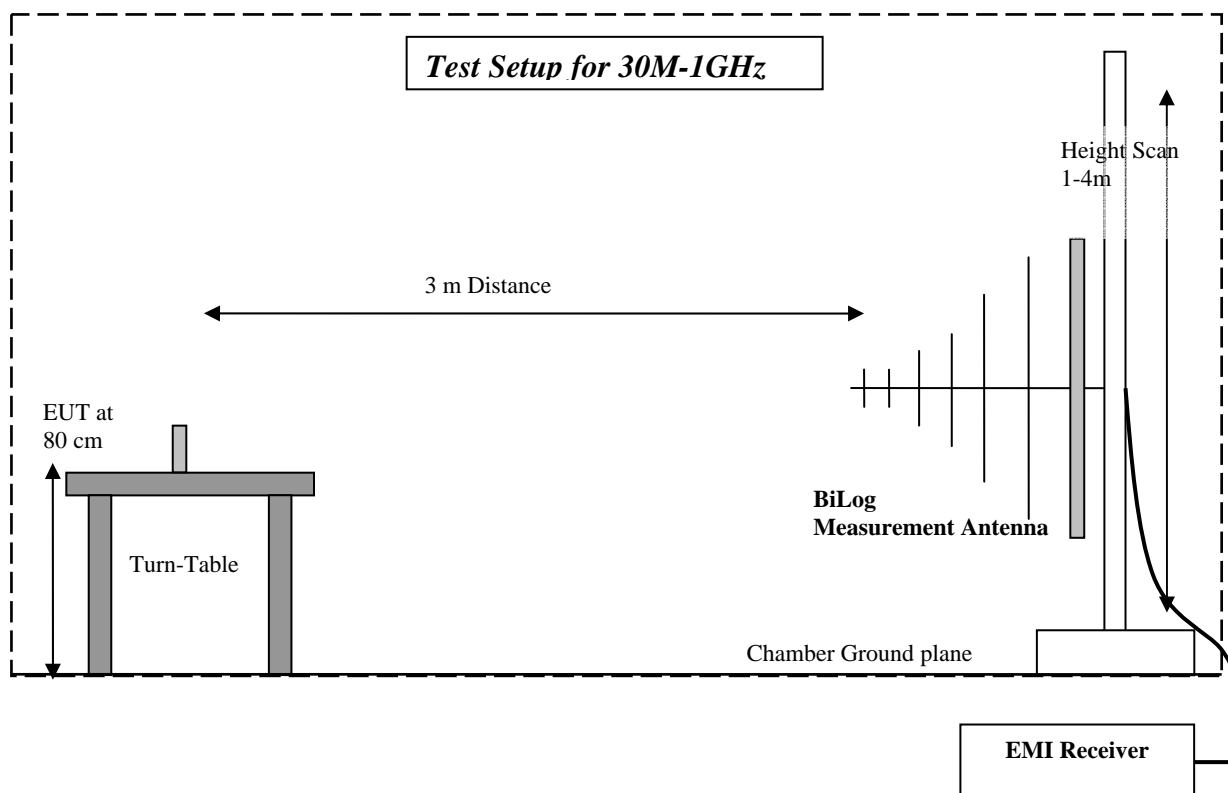
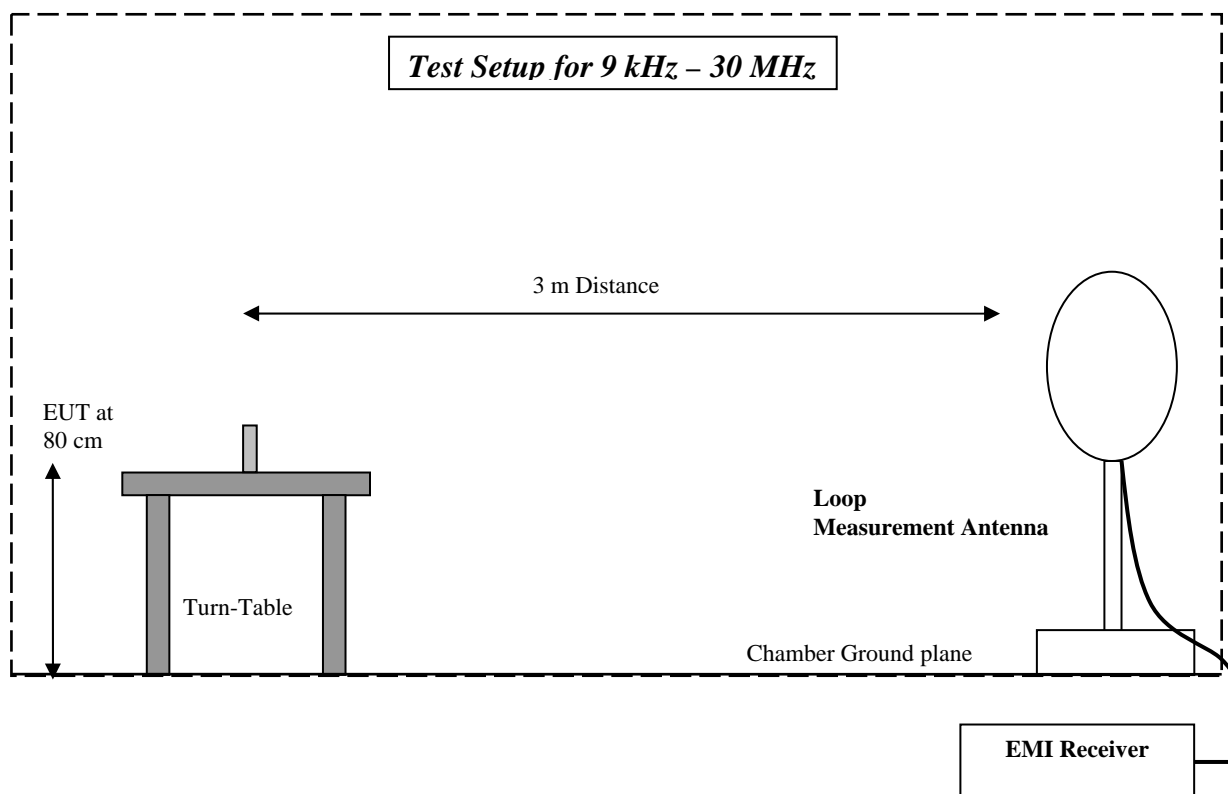
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## 7 Test Equipment and ancillaries used for tests

| No.                        | Equipment Name              | Manufacturer  | Type/model | Serial No. | Cal Date | Cal Interval |
|----------------------------|-----------------------------|---------------|------------|------------|----------|--------------|
| 3m Semi- Anechoic Chamber: |                             |               |            |            |          |              |
|                            | EMC32 Measurement Software  | Rohde&Schwarz | 8.52.0     | N/A        | N/A      | N/A          |
|                            | Turn table                  | EMCO          | 2075       | N/A        | N/A      | N/A          |
|                            | MAPS Position Controller    | ETS Lindgren  | 2092       | 0004-1510  | N/A      | N/A          |
|                            | Antenna Mast                | EMCO          | 2075       | N/A        | N/A      | N/A          |
|                            | Relay Switch Unit           | Rohde&Schwarz | RSU        | 338964/001 | N/A      | N/A          |
|                            | EMI Receiver/Analyzer(*)    | Rohde&Schwarz | ESU 40     | 100365     | Feb 2013 | 1 Year       |
|                            | 1500MHz HP Filter           | Filtek        | HP12/1700  | 14c48      | N/A      | N/A          |
|                            | 2800 MHz HP Filter          | Filtek        | HP12/2800  | 14C47      | N/A      | N/A          |
|                            | Pre-Amplifier               | Miteq         | JS40010260 | 340125     | N/A      | N/A          |
|                            | Binconilog Antenna          | EMCO          | 3141       | 0005-1186  | Apr 2012 | 3 Years      |
|                            | Binconilog Antenna          | ETS           | 3149       | J000123908 | Feb 2012 | 3 years      |
|                            | Horn Antenna                | EMCO          | 3115       | 35114      | Mar 2012 | 3 Years      |
|                            | LISN                        | FCC           | 50-25-2-08 | 08014      | Jul 2012 | 2 Year       |
| Ancillary equipment        |                             |               |            |            |          |              |
|                            | Multimeter                  | Klein Tools   | MM200      | 001        | Apr 2011 | 3 Years      |
|                            | Humidity Temperature Logger | Dickson       | TM320      | 03280063   | Apr 2013 | 1 Year       |
|                            | Digital Barometer           | VWR           | 35519-055  | 91119547   | Nov 2011 | 3 Years      |
|                            | DC Power Supply             | HP            | E3610A     | KR83023316 | N/A      | N/A          |
|                            | DC Power Supply             | Protek        | 3003B      | H012771    | N/A      | N/A          |
|                            | Communication Antenna       | IBP5-900/1940 | Kathrein   | N/A        | N/A      | N/A          |

## 8 Test Setup Diagrams



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## 9 Revision History

| Date           | Report Name – Changes to Report                              | Report prepared by |
|----------------|--|--------------------|
| March 11, 2014 | <b>EMC_HANC1_002_13502_R100_RFID-R</b><br>1. Original Report | J. Sabado          |