FCC/IC Test Report

FOR

Manufacturer: Hanchet Entry Systems Inc.

Model Number: K100-622-PA

Product Description: Aperio Cabinet Lock

FCC ID: VC3-K100622PA
IC Certification Number: 7160A-K100622PA

FCC CFR 47 Part 15.205, 15.209

IC RSS-Gen Issue 3

TEST REPORT #: EMC_HANC1-001-13501_K100LF_RFID
DATE: March 11, 2014

FCC : Accredited

IC recognized # 3462B-1

***CETECOM* Inc.**
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1 Assessment

The following equipment, as detailed in section 3 of this test report, was evaluated against the applicable criteria specified in FCC CFR 47 Part 15.205, 15.209 and Industry Canada Standards RSS-Gen Issue 3.
No deviations were ascertained during the course of the tests performed.

Manufacturer	Description	Model #
Hanchett Entry Systems, Inc.	Aperio Wall Mounted Reader	K100-622-PA

Responsible for Testing Laboratory:

Date	Section	Name	Signature
March 11, 2014	Compliance	Franz Engert (Manager of Compliance)	Digitally signed by Franz Engert DN: cn=Franz Engert, c=US, o=CETECOM, ou=Complience, email=franz.engert@cetecom.com Date: 2014.03.11 18:09:28 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
March 11, 2014	Compliance	Josie Sabado (Test Lab Manager)	

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

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

2.2 Identification of the Client

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

2.3 Identification of the Manufacturer

Manufacturer's Name:	Hanchett Entry Systems, Inc.
Manufacturer's Street Address:	10027 S. 51st St. Ste. 102
City/Zip Code	Phoenix, AZ 85044
Country	USA

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name:	K100-622-PA Aperio Cabinet Lock
Model Number:	K100-622-PA
FCC-ID :	VC3-K100622PA
IC CERTIFICATION NUMBER:	7160A-K100622PA
Product Description:	Aperio Cabinet Lock
Technology / Type(s) of Modulation:	RFID: ASK Modulation
Nominal Channel Bandwidth:	1.5 kHz
Operating Frequency Ranges (kHz) / Channels:	125, 1 channel
Antenna info:	Custom Wire Wound Loop
Rated Operating Voltage Range:	Battery, 2 x Lithium AA Cell, 1.5VDC (Nominal)
Rated Operating Temperature Range:	-10 ^{o}C to +50 ^{o}C
Test Sample Status:	Prototype
Other Radios included:	2.4 GHz Zigbee

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	Sample	HW/SW Version	Note
1	10065	7080058.011	k100_main2_aperio_se_onl -0.0.27283_bl-0.0.27283	

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.

4 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Pass	Fail	NA	NP	Result
RSS Gen 4.6.1	99% Emissions Bandwidth	Nominal	■	☐	☐	☐	Complies
§15.209(a) RSS Gen 7.2	TX Spurious Emissions Radiated	Nominal	■	☐	☐	☐	Complies

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

5 Measurement Information

5.1 Dates of Testing

November 13, 2013 to November 14, 2013, March 2, 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: Li-ion battery supply, 3.0 VDC nominal

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^{o}C
Relative humidity: 40-60%

5.5 RF Antenna Port Conducted Measurement Procedure

1. Connect the EUT to the measurement equipment using the appropriate attenuation and power splitter.
2. Set the EUT to operate in the required mode of operation.
3. Measurements are to be performed with the EUT in all modes of operation.
    a. All measurements should be performed with the EUT transmitting at full power
    b. All measurements should be performed with all modulations supported by the EUT

5.6 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.

5.6.1 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 dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

FS (dBµV/m) = Measured Value on SA (dBµV) + Cable Loss (dB) + Antenna Factor (dB/m)
Eg:

Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/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.

5.7 Other Testing Notes

RF antenna port measurements were performed with a temporary antenna connector/cable with 0 dB loss.

6 Measurement Results

6.1 99% Occupied Bandwidth

6.1.1 References

RSS Gen – 4.6.1

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth. No limits are specified.

6.1.2 Spectrum Analyzer Settings

Center Frequency	125 kHz
Span	2 kHz
Resolution Bandwidth	100 Hz
Video Bandwidth	300 Hz
Detector	Peak
Trace Mode	Max Hold
Sweep Time	Auto

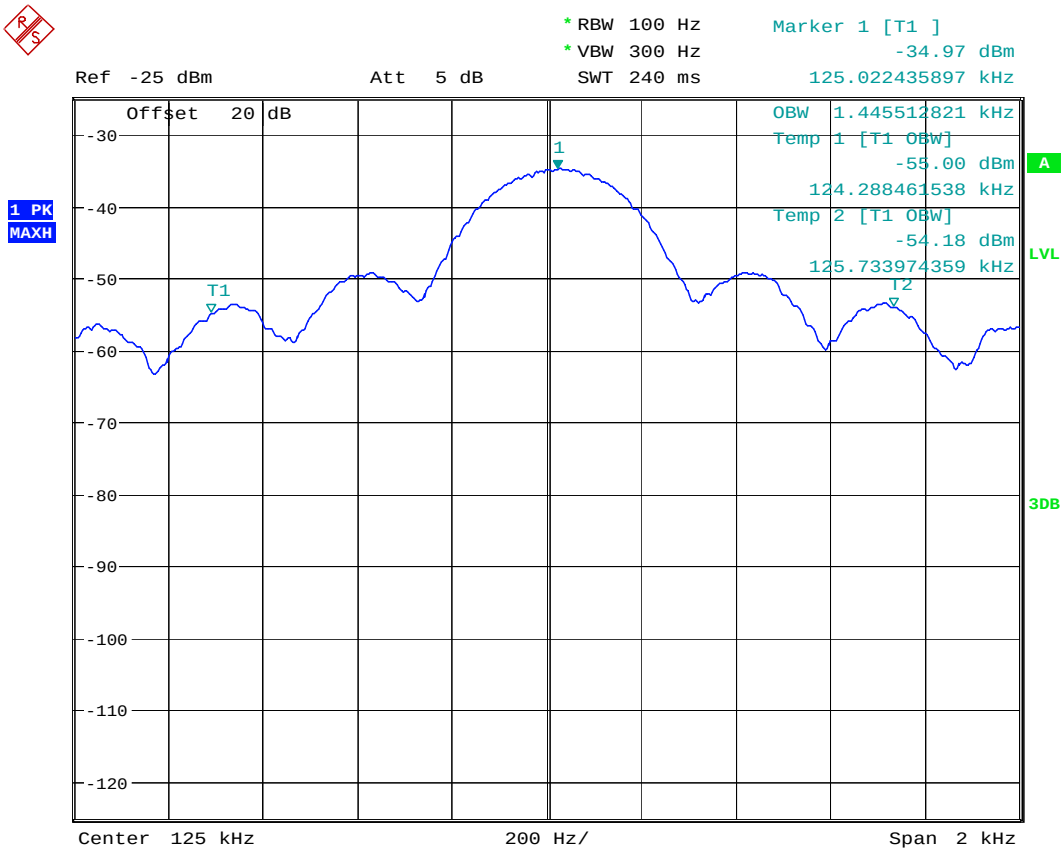
6.1.3 Test Results

Measured Conducted 99% Occupied Bandwidth (dBm)		
Mode	**Frequency (kHz)**	
	125	
RFID	1.45	

6.1.4 Measurement Verdict

Pass

6.1.5 Test Plots



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6.2 Unwanted Emissions into Restricted Bands – Radiated

6.2.1 References

§15.205 (a)
RSS-Gen 7.2.2 (c)
Only spurious emissions are permitted in any of the frequency bands listed in the tables in these sections.

§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.

§15.35 (b)
When average radiated emissions measurements are specified, the limit on the peak level of the radio frequency emissions is 20 dB above the maximum permitted average emission limit.

6.2.2 Spectrum Analyzer Settings

Transmitter Spurious Emissions 9 kHz – 30 MHz			
	9 – 150 kHz	**150 – 490 kHz**	**490 kHz – 30 MHz**
Resolution Bandwidth	200 Hz	9 kHz	9 kHz
Video Bandwidth	2 kHz	100 kHz	100 kHz
Detector	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto

6.2.3 Testing Notes

Measurement distance: 3 m

For the measurement range up to 30 MHz in the following plots the field strength results from 3m distance measurement are extrapolated to 300m and 30m distance respectively, by 40dB/decade, according to part 15.31(f)(2), per antenna factor scaling.

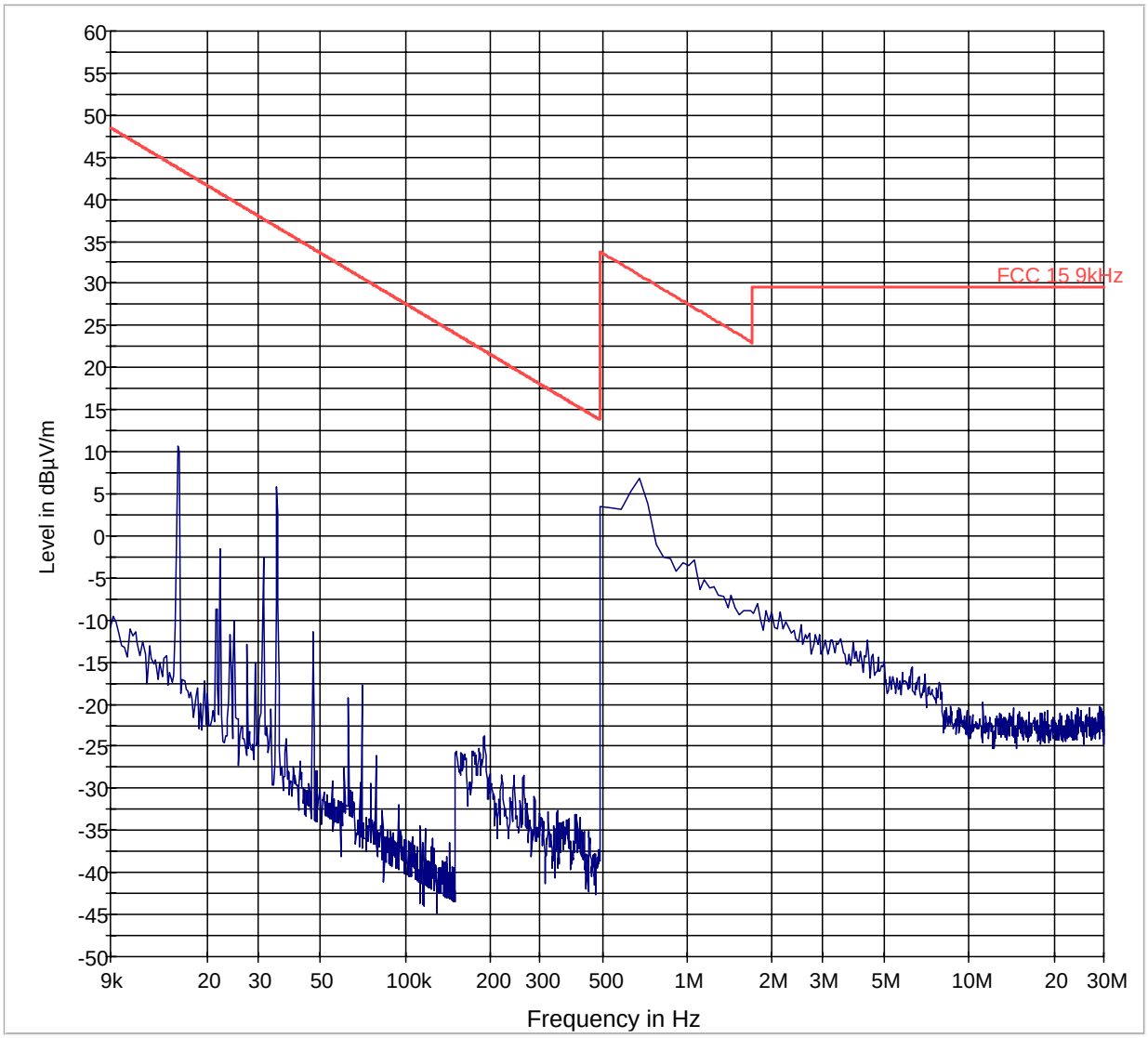
Measurements below 1000 MHz are performed with a peak detector and compared to average limits. Measurements with an average detector are not required.

6.2.4 Measurement Verdict

Pass.

6.2.5 Test Plots

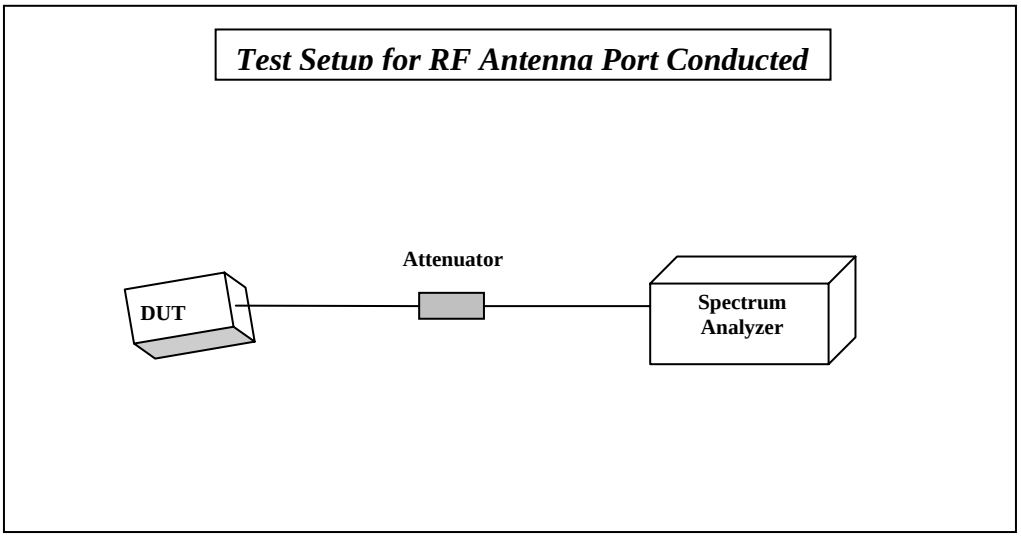
Transmitter Radiated Spurious Emission: < 30 MHz

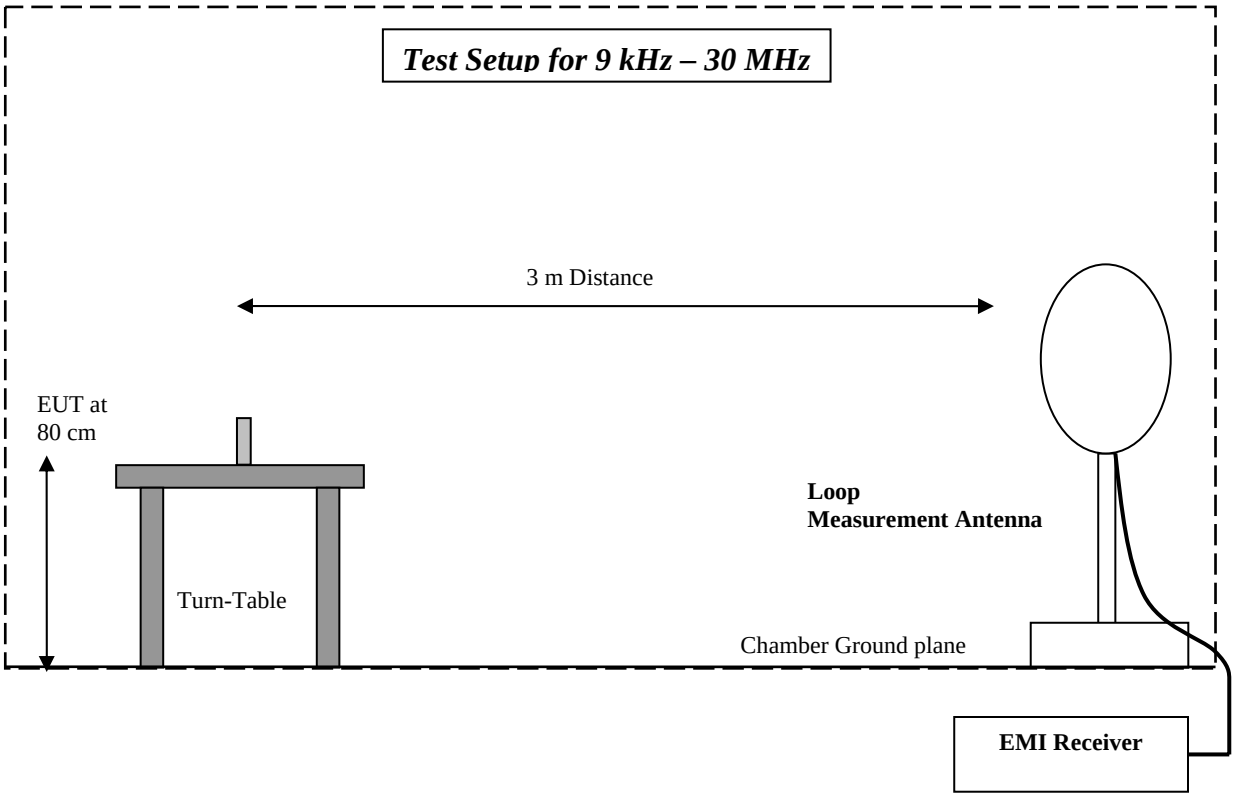


7 Test Equipment and Ancillaries used for tests

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 Block Diagrams





9 Revision History

Date	Report Name – Changes to Report	Report prepared by
March 11, 2014	**EMC_HANC1-001-13501_K100LF_RFID** 1. Original Report	J. Sabado