FCC/IC Test Report

FOR

Manufacturer: Hanchet Entry Systems Inc.

Model Number: KS100-640-PA

Product Description: Aperio Server Lock

FCC ID: VC3-KS100640PA
IC Certification Number: 7160A-KS100640PA

FCC CFR 47 Part 15.205, 15.207, 15.209

IC RSS-Gen Issue 3

TEST REPORT #: EMC_HANC1-001-13501_KS100LF_RFID
DATE: March 11, 2014

ilac-MRA A2LA ACCREDITED TESTING LABORATORY Certificate #2135.01 CTIA Authorized Test Lab LAB CODE 20020328-00

FCC : Accredited

IC recognized # 3462B-1

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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, 15.207, 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 Server Lock	KS100-640-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 18:13:00 -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:	KS100-640-PA Aperio Server Lock
Model Number:	KS100-640-PA
FCC-ID :	VC3-KS100640PA
IC Certification Number:	7160A-KS100640PA
Product Description:	Aperio Server Lock
Technology / Type(s) of Modulation:	RFID: ASK Modulation
Nominal Channel Bandwidth:	1.5 kHz
Operating Frequency Ranges (kHz) / Channels:	125, 1 channel
Antenna Information:	Custom wire wound loop
Rated Operating Voltage Range:	Power over Ethernet (PoE)
Rated Operating Temperature Range:	-10 °C to +50 °C
Test Sample Status:	Prototype
Other Radios included:	2.4 GHz Zigbee

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	HW Version	SW Version	Note
1	10045	7080058.012	ks100_main2_aperio_lowFreq -0.0.24416_bl-0.0.24416	

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	Unwanted Emissions into Restricted Bands - Radiated	Nominal	■	☐	☐	☐	Complies
§15.207(a) RSS Gen 7.2	AC Power Line Conducted Emissions	Nominal	■	☐	☐	☐	Complies

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

5 Measurement Information

5.1 Dates of Testing

November 13, 2014, March 2, 2014

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: Power over Ethernet through a transformer

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 AC Power Line Conducted Measurement Procedure

ANSI C63.4 (2009) Section 7.3.1: Measurements at a test site

Tabletop devices shall be placed on a nonconducting platform, of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane, when used, or wall of a screened room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground plane or on insulating material. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs. AC power-line adapters that are used with EUTs, such as notebook computers, should be placed as typically used (i.e., on the tabletop) if the adapter-to-EUT cord is too short to allow the power adapter to reach the floor. Each current-carrying conductor of the EUT power cord(s), except the ground (safety) conductor(s), shall be individually connected through a LISN to the input power source. All 50 Ω ports of the LISN shall be resistively terminated into 50 Ω loads when not connected to the measuring instrument. When the test configuration consists of multiple units (EUT and associated/peripheral equipment, or EUT consisting of multiple equipment) that have their own power cords, ac power-line conducted emissions measurements shall be performed with the ac power-line cord of the particular unit under test connected to one LISN that is connected to the measuring instrument. Those power cords for the units in the remainder of the configuration not under measurement shall be connected to a separate LISN or LISNs. This connection may be made using a multiple-receptacle device. Emissions from each current-carrying conductor of the EUT shall be individually measured. Where multiple portions of the EUT receive ac power from a common power strip, which is furnished by the manufacturer as part of the EUT, measurements need only be made on the current-carrying conductors of the common power strip. Adapters or extension cords connected between the EUT power cord plug and the LISN power receptacle shall be included in the LISN setup, such that the calibration of the combined adapter or extension cord with an adapter and the LISN meets the requirements of 5.2.3.

If the EUT consists of a number of devices that have their own separate ac power connections, e.g., a floor standing frame with independent power cords for each shelf, that are able to connect directly to the ac power network, each current-carrying conductor of one device is measured while the other devices are

connected to a second (or more) LISN(s). All devices shall be separately measured. If the manufacturer provides a power strip to supply power to all of the devices making up the EUT, only the conductors in the common power cord to the power strip shall be measured.

If the EUT is normally operated with a ground (safety) connection, the EUT shall be connected to the ground at the LISN through a conductor provided in the lead from the ac power to the LISN.

The excess length of the power cord between the EUT and the LISN receptacle (or ac power receptacle where a LISN cannot be used), or an adapter or extension cord connected to and measured with the LISN, shall be folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. If the EUT does not have a flexible power lead, the EUT shall be placed at a distance of 80 cm from the LISN (or power receptacle where a LISN cannot be used) and connected thereto by a power lead or appropriate connection no more than 1 m long. The measurement shall be made at the LISN end of this power lead or connection.

The LISN housing, measuring instrument case, reference ground plane, vertical conducting plane, if used, shall be bonded together.

ANSI C63.4 (2009) Section 7.3.3: Exploratory ac power-line conducted emission measurements
Exploratory measurements shall be used to identify the frequency of the emission that has the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable positions, and with a typical system equipment configuration and arrangement. For each mode of operation and for each ac power current-carrying conductor, cable manipulation may be performed within the range of likely configurations. For this measurement or series of measurements, the frequency spectrum of interest shall be monitored looking for the emission that has the highest amplitude relative to the limit. Once that emission is found for each current-carrying conductor of each power cord associated with the EUT (but not the cords associated with non-EUT equipment in the overall system), the one configuration and arrangement and mode of operation that produces the emission closest to the limit across all the measured conductors is recorded.

ANSI C63.4 (2009) Section 7.3.4: Final ac power-line conducted emission measurements
Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement. If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be re-maximized at the final test location before final ac power-line conducted emission measurements are performed. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without additional variation of the EUT arrangement, cable positions, or EUT mode of operation. If the EUT consists of equipment units that have their own separate ac power connections (e.g., a floor-standing frame with independent power cords for each shelf that are able to connect directly to the ac power network), then each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be measured separately. If the manufacturer provides a power strip to supply all the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.

All AC power line conducted emissions test data in this report shows the worst case representation of emissions into LINE and NEUTRAL.

5.8 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

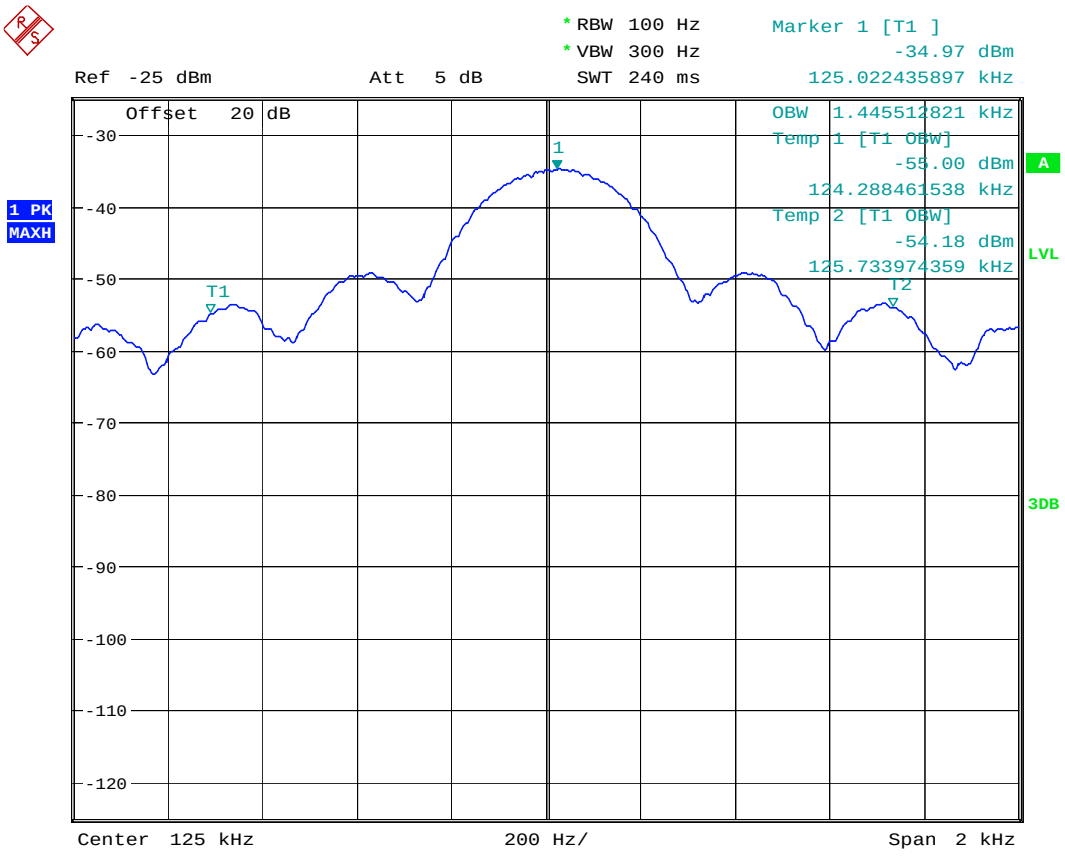
6.1.3 Test Results

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

6.1.4 Measurement Verdict

Pass

6.1.5 Test Plots



low

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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.

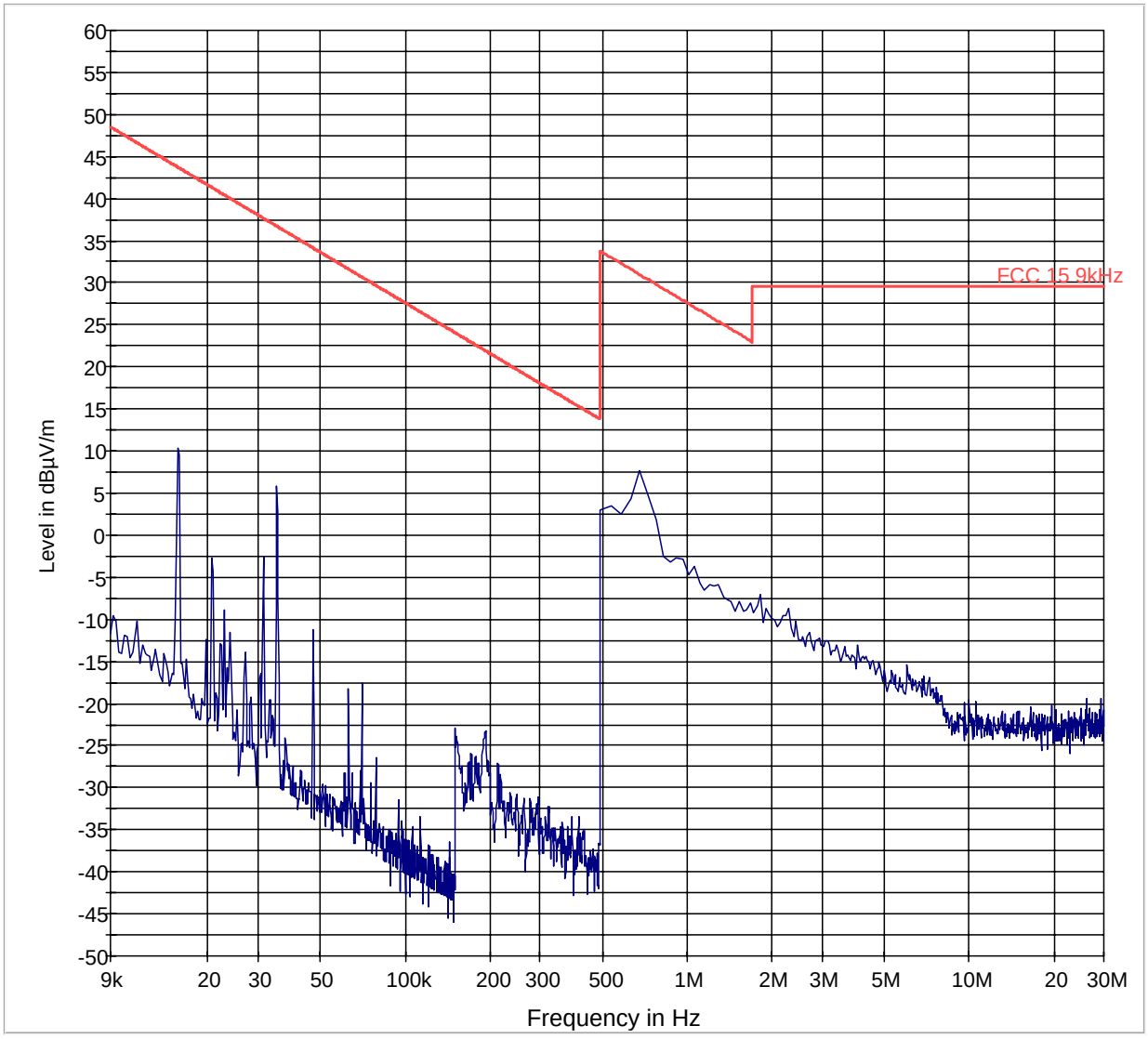
Measurements below 1000 MHz are performed with a peak detector and compared to average limits. Measurements with an average detector are not required.

6.2.4 Measurement Verdict

Pass

6.2.5 Test Plots

Transmitter Radiated Spurious Emission: < 30 MHz



6.3 AC Power Line Conducted Emissions

6.3.1 References

§15.207
RSS-Gen

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

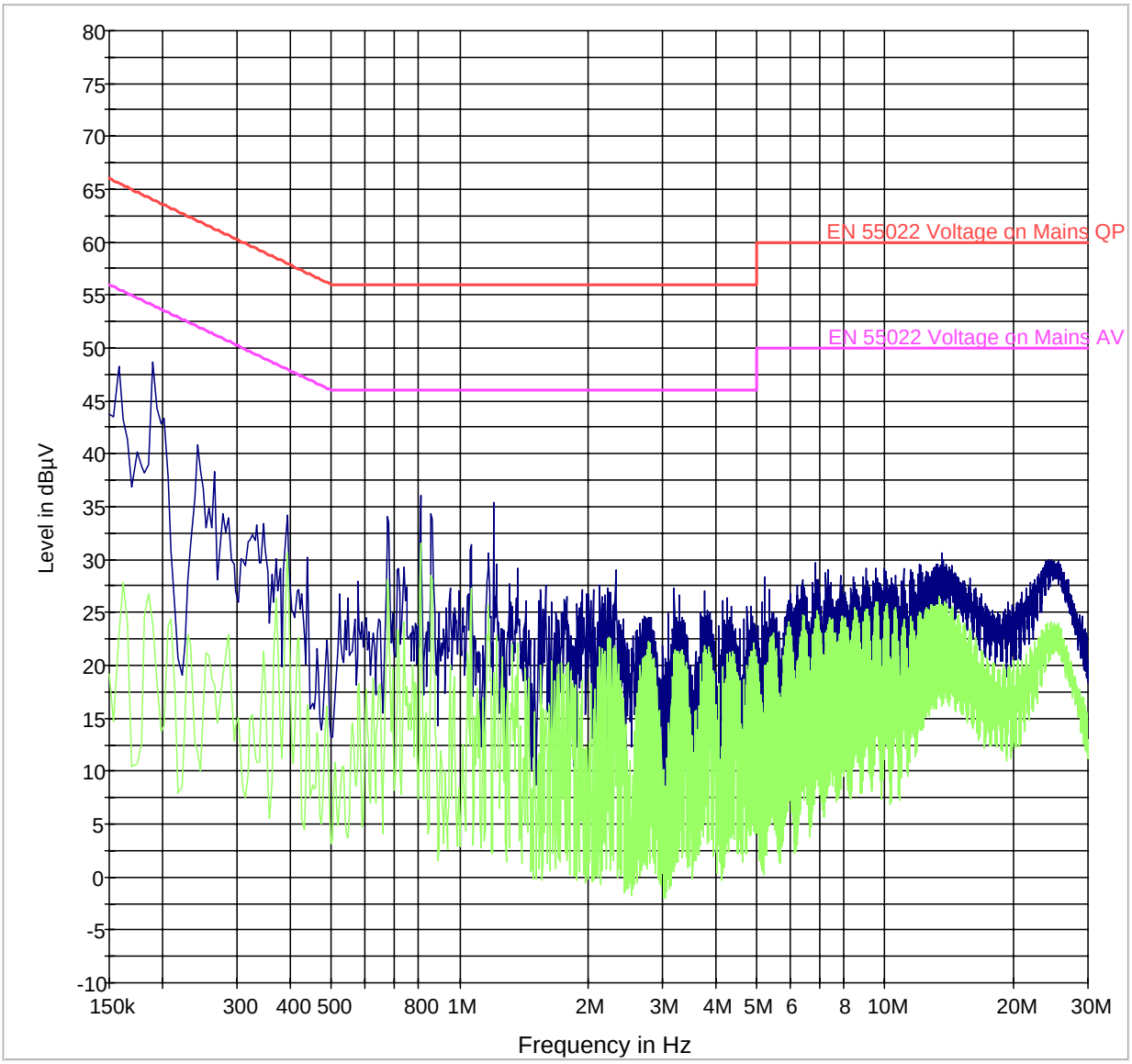
6.3.2 Spectrum Analyzer Settings

Start Frequency	150 kHz
Stop Frequency	30 MHz
Resolution Bandwidth	9 kHz
Detector	Peak Average
Trace Mode	Max Hold
Sweep Time	100 ms

6.3.3 Measurement Verdict

Pass

6.3.4 Test Plots

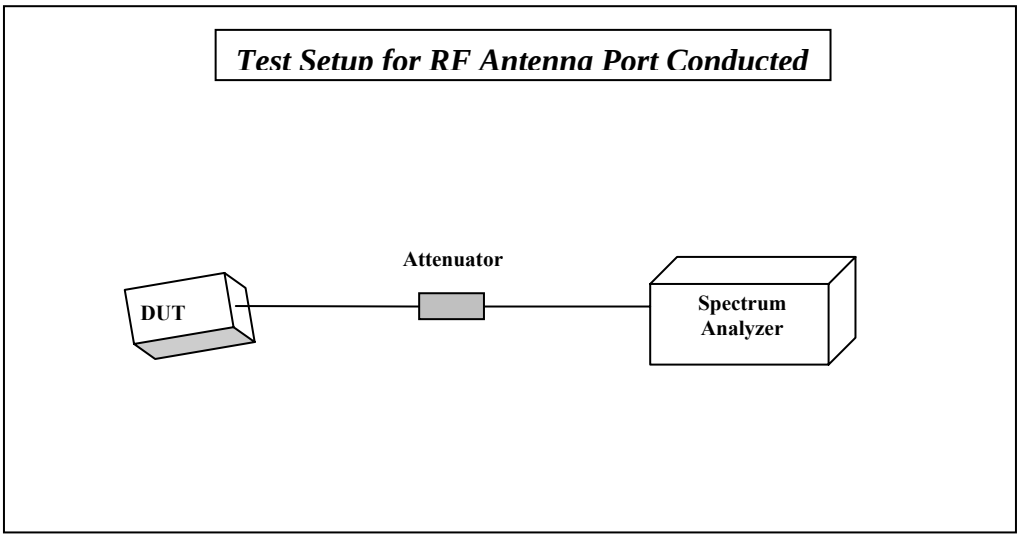


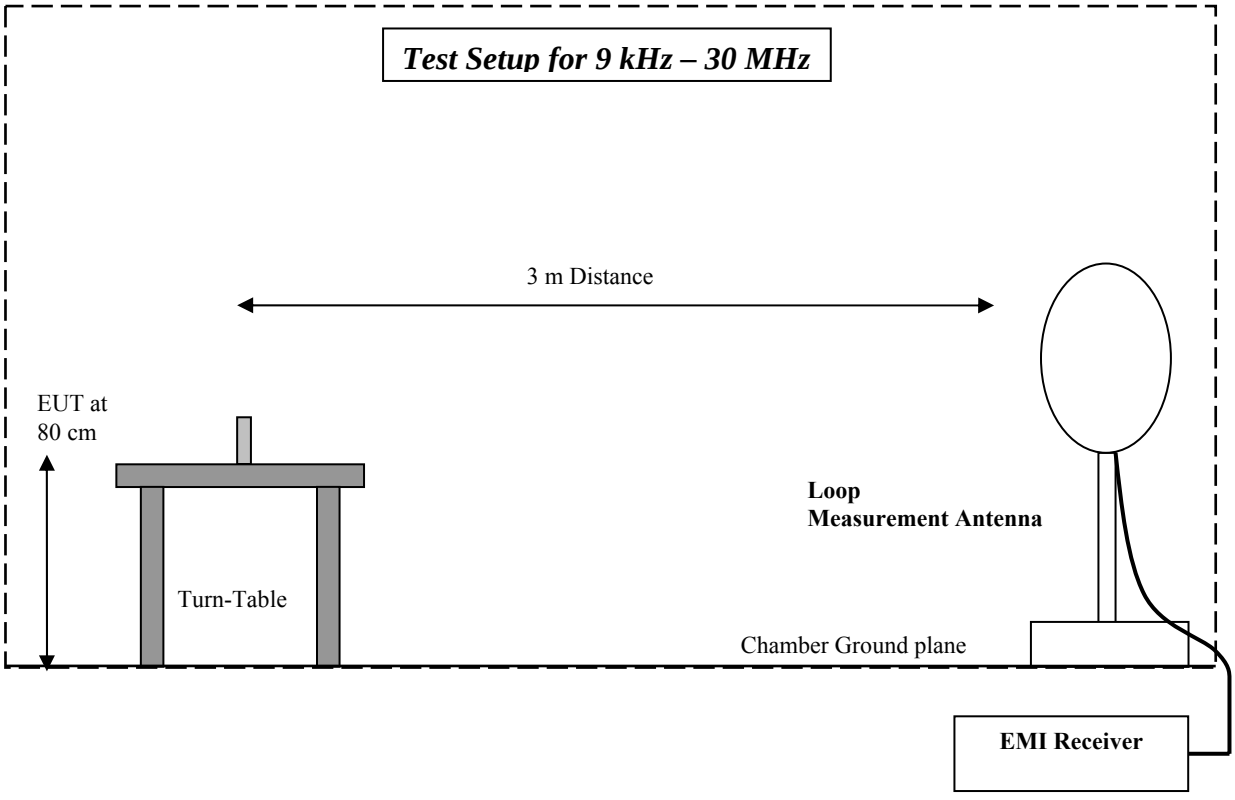
EN 55022 Voltage on Mains QP
Preview Result 1-PK+
EN 55022 Voltage on Mains AV
Preview Result 2-AVG

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_KS100LF_RFID** 1. Original Report	J. Sabado