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DELTA Test Report

TEST REPORT issued by an Accredited Testing Laboratory

1688
ISO/IEC 17025

Radio parameter test of RFID radio in Server lock KS100-640-SE2

Performed for Hanchett Entry Systems, Inc.

REC-E704276_11 Rev. A
Project no.: E704276

26 August 2015

DELTA Development
Technology AB
Finnslätten
Elektronikgatan 47
721 36 Västerås
Sweden

Tel. 021-31 44 80
Fax 021-31 44 81
info@delta-dt.se
www.delta-dt.se

Bankgiro 5534-7728
VAT SE 556556207001

DELTA Development
Technology AB
is a subsidiary company of
DELTA

Title	Radio parameter test of RFID radio in Server lock KS100-640-SE2
Test object	Server lock KS100-640-SE2
Report no.	REC-E704276_11 Rev. A
Project no.	E704276
Test period	23 April 2015 to 12 May 2015
Client	Hanchett Entry Systems, Inc. 10027 S. 51st St. Ste. 102 Phoenix, AZ 85044 USA
Contact person	Joshua Peabody Tel: 623-582-4626
Client observer	Fredrik Thorsell WSI AB E-mail: frth@wsi.nu
Manufacturer	Hanchett Entry Systems, Inc.
Specifications	FCC CFR47 Part 15 subpart C RSS-Gen, issue 4:2014, RSS-210, issue 8:2010
Results	The test object was found to be in compliance with the specifications, as listed in Section 1
Test personnel	Lars Johnsson
Date	26 August 2015

Project Manager

Lars Johnsson
DELTA

Responsible

Ulf Bjerke. Technical manager
DELTA

LAJ

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1. Summary of tests

Tests	Test methods	Results
Measurement of radio frequency voltage on mains (§15.207, RSS Gen 8.8)	ANSI C63.10:2013	Passed
Measurement of radio frequency electromagnetic field 9kHz-30 MHz (§15.209, 15.225 and RSS Gen 6.13)	ANSI C63.10:2013	Passed
Measurement of radio frequency electromagnetic field 30-1000 MHz (§15.209, 15.225 and RSS Gen 6.13)	ANSI C63.10:2013	Passed
Measurement of Radiated H-field at 10m RFID band 13.110-14.010 MHz (§15.31, 15.205, 15.225 and RSS Gen 6.11, 6.12)	ANSI C63.10:2013	Passed
Measurement of 99% BW (RSS Gen 6.6)	ANSI C63.10:2013	Measured
Measurement of 20 dB BW (§15.215(c))	ANSI C63.10:2013	Passed
Carrier Frequency stability (§15.225(e) and RSS Gen 6.11)	ANSI C63.10:2013	Passed

This document covers the results from radio parameter tests performed on the 13.56 MHz RFID radio. The 2.4 GHz Aperio radio which is a part of the complete test object is not included in this report.

Conclusion

The test object(s) mentioned in this report meet(s) the requirements of the standard(s) stated below.

- FCC CFR 47 Part 15C (Intentional radiator at 13.56 MHz)
- Industry Canada IC Radio Standards Specification, RSS-Gen, issue 4:2014, *General Requirements and Information for the Certification of Radio Apparatus*
- Industry Canada IC Radio Standards Specification, RSS-210, issue 8:2010, *Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment*

The test results relate only to the object(s) tested.

2. Test object(s) and auxiliary equipment

2.1 Test object(s)

Photo 2.1.1 Test object.

Test object 2.1.1

Name of test object	Server lock
Model / type	KS100-640-SE2
Part no.	KS100-640-SE2
Serial no.	MAC adress: 06 05 F5
FCC ID	VC3-KKSR100SE
IC ID	7160A-KKSR100622SE
Manufacturer	Hanchett Entry Systems, Inc.
Supply voltage	IEEE 802.3af, 48VDC Power over Ethernet (PoE)
Software version	7.2.30588
Cycle time	-
Received	Date: 23 April 2015 Status: Prototype

2.2 Radio specifications, receiver and transmitter

The RFID radio (13.56 MHz) of the test object has the following specified RF parameters. The below mentioned information regarding the receiver and the transmitter is declared by the manufacturer.

Type of equipment	:	Low power device (13.56 MHz)
Operating frequency range	:	13.56 MHz
Antenna	:	Permanently attached PCB antenna
Power level	:	Fixed
No of channels	:	1
Bandwidth	:	
Occupied bandwidths (99%)	:	0.3 MHz (Measured)
Channel separation	:	-
Modulation	:	ASK/OOK
Data rate	:	106 kbits
Temperature category	:	-20 to +50 ºC.

2.3 Auxiliary equipment

Photo 2.3.1 Auxiliary equipment. PoE injector with adaptor.

Photo 2.3.2 Auxiliary equipment. PoE injector with adaptor.

Auxiliary equipment 2.3.1

Name of auxiliary equipment	Aperio Hub
Model / type	AH30
Serial no.	MAC ID 00.17.7a.01.02.04.44.da
FCC ID	Y88-AH20R01
Manufacturer	ASSA ABLOY
Supply voltage	8-24 VDC
Comment	Auxiliary equipment supplied by the client, who also has the responsibility for its correct function and set up. Used to configure the test object before test.

Auxiliary equipment 2.3.2

Name of auxiliary equipment	Laptop PC
Model / type	HP Compaq 6910p
Part no.	gb949ET#ak8
Serial no.	cnd821lwtf
Manufacturer	HP
Supply voltage	230 VAC
Comment	Auxiliary equipment supplied by the client, who also has the responsibility for its correct function and set up. Used to configure the test object before test.

Auxiliary equipment 2.3.3

Name of auxiliary equipment	TriBee USB
Model / type	200300
Part no.	gb949ET#ak8
Serial no.	cnd821lwtf
FCC ID	YVB-200300
Manufacturer	TriTech
Supply voltage	5 VDC
Comment	Auxiliary equipment supplied by the client, who also has the responsibility for its correct function and set up. Used to configure the test object before test.

Auxiliary equipment 2.3.4

Name of auxiliary equipment	PoE Injector
Model / type	TL-POE150S
Part no.	TL-POE150S
Serial no.	2014B021001732
Manufacturer	TP-Link
Supply voltage	230 VAC to 48 VDC adaptor
Comment	Auxiliary equipment supplied by the client, who also has the responsibility for its correct function and set up. Adaptor: Leader Electronics. Model MU24-1480050-C5

3. General test conditions

3.1 Test setup during test

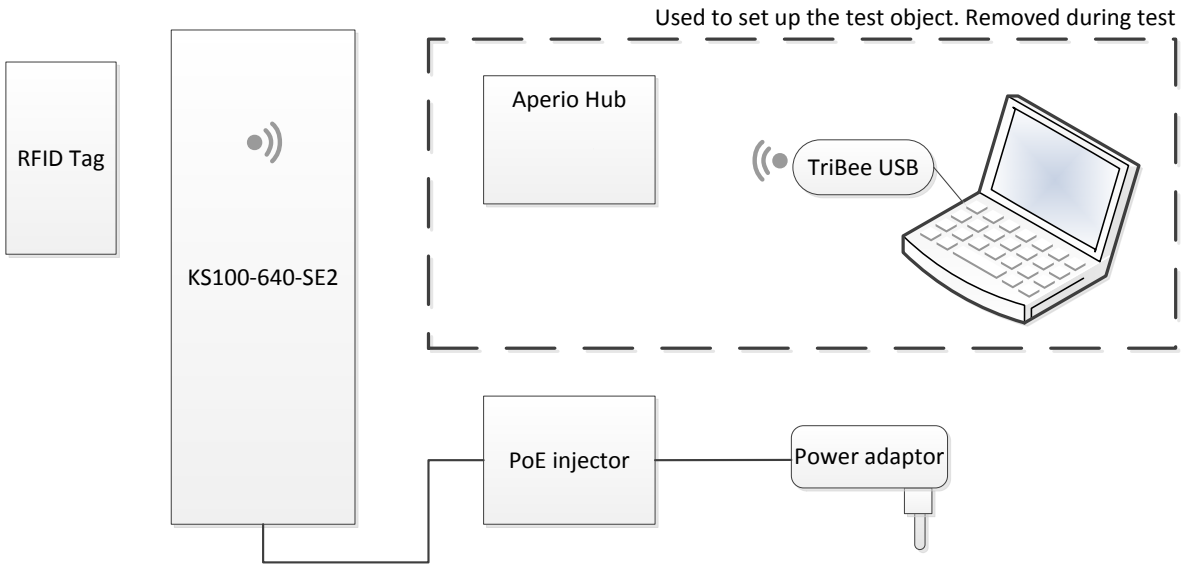


Figure 3.1.1 Block diagram of test object(s) with cables and auxiliary equipment.

3.1.1 Description and intended use of test object

The KS100-640-SE2 is a cabinet lock intended for server cabinets. It is paired to an Aperio Hub (2.4 GHz) to form real-time access control to individual server cabinet doors. It uses ID badges (13.56 MHz) for the access control.

3.1.2 Modifications of the test object

No modifications were incorporated.

3.1.3 Test sequence

The tests described in this test report were performed in the following sequence:

1. Measurement of radio frequency voltage on AC (§15.207, RSS Gen 8.8)
2. Measurement of radio frequency electromagnetic field 30-1000 MHz (§15.225,15.209 and RSS Gen 6.13)
3. Measurement of radio frequency electromagnetic field 0.009 - 30 MHz (§15.209, 15.225 and RSS Gen 6.13)
4. Measurement of 20 dB BW (§15.215(c))
5. Measurement of Carrier Frequency stability (§15.225(e) and RSS Gen 6.11)

4. Test results

4.1 Measurement of radio frequency voltage on mains

Test object	Server lock	Sheet	CE-1
Type	KS100-640-SE2	Project no.	E704276
Serial no.	MAC adress: 06 05 F5	Date	30 Apr. 2015
Client	ASSA AB	Initials	LAJ
Specification	FCC CFR47 Part 15 subpart C §15.207, RSS Gen 8.8)	Frequency	0.15-30 MHz

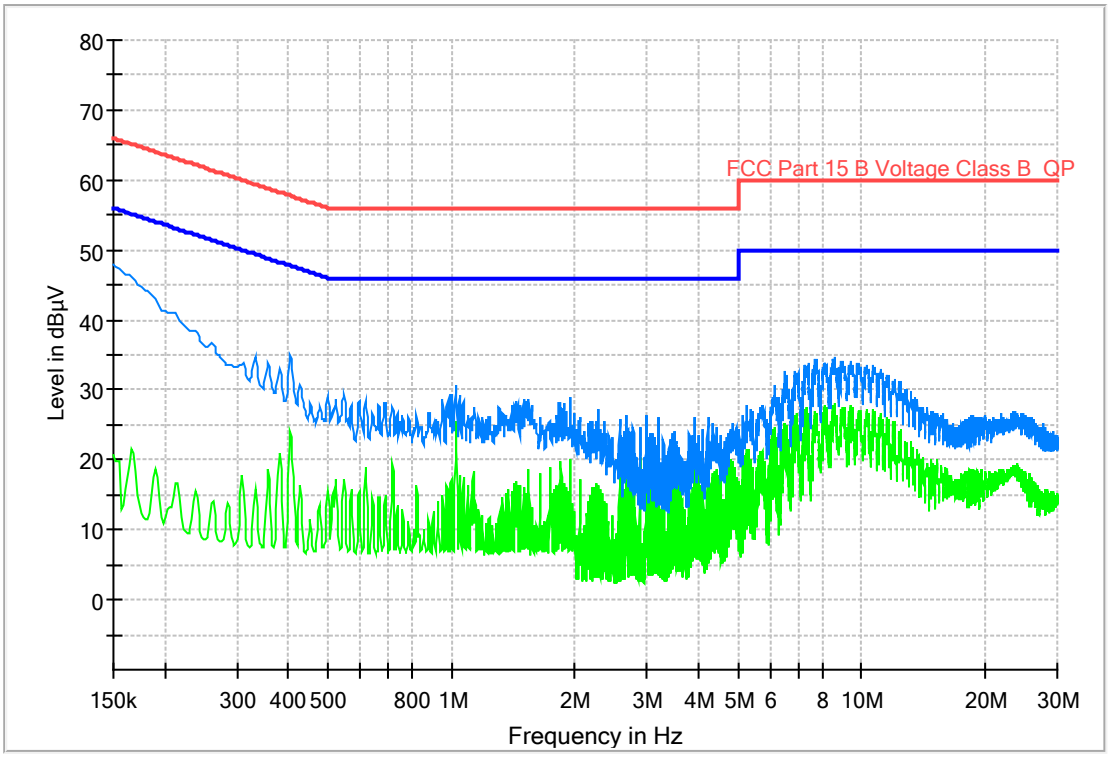
Test method Characteristics	ANSI C63.10:2013 Artificial mains network: 50 Ω, 50 µH	Temperature Humidity	21 °C 42 % RH
Detector	Peak, quasi peak, and average	Bandwidth	9 kHz
Test equipm.	EMC Hall A Västerås Setup VEA1	Uncertainty	1.8 dB

Line under test	Maximum of Line and Neutral
Test result	The measured voltages were below the limit
Compliant	Yes
Comments	Mains voltage: 115 VAC Tested in the most power consuming mode which is with the 2.4 GHz Aperio transmitter in continuous Tx.

Conducted Emission Test

Test Description:	Conducted emission. Complete measurement 150 kHz - 30 MHz
Date:	2015-04-30
EUT Name:	KS100-640-SE2
Manufacturer:	ASSA AB
Serial Number:	MAC adress: 06 05 F5
Operating Conditions:	115 VAC, 60 Hz
Test Site:	DELTA Development Technology AB
Operator Name:	Lars J
Test Specification:	FCC Part 15 B Class B
Comment:	

Full Spectrum



Preview Result 2-AVG
FCC Part 15 B Voltage Class B QP
Final_Result QPK
Preview Result 1-PK+
FCC Part 15 B Voltage Class B AV
Final_Result AVG

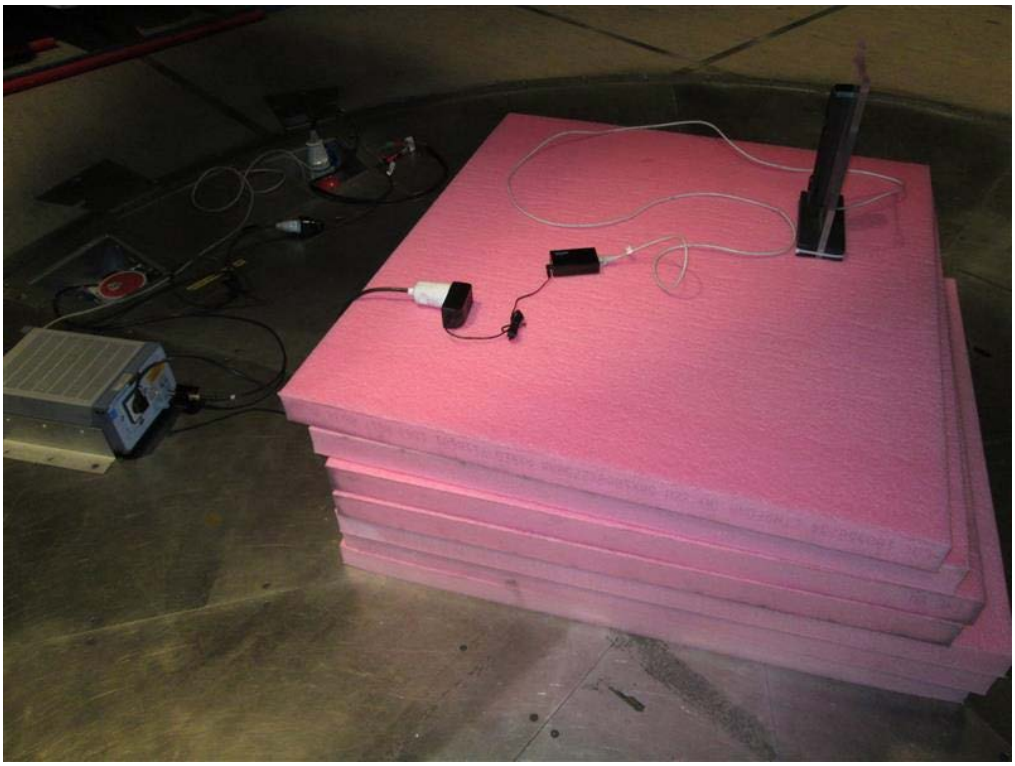


Photo 4.1.1 Test setup regarding measurement of radio frequency voltage on mains.

4.2 Measurement of radiated emission 9 kHz – 30 MHz

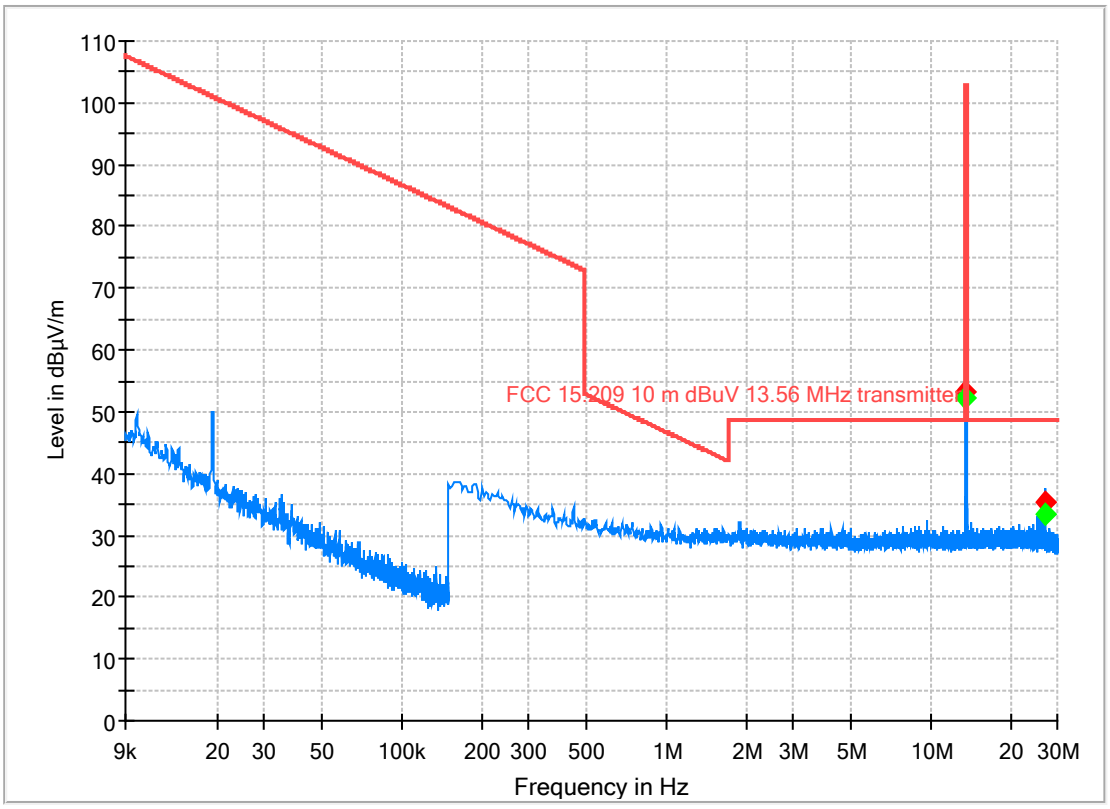
Test object	Server lock	Sheet	RE_Spur-1
Type	KS100-640-SE2	Project no.	E704276
Serial no.	MAC adress: 06 05 F5	Date	11 May 2015
Client	ASSA AB	Initials	LAJ
Specification	FCC CFR47 Part 15 subpart C §15.225,15.209 and RSS Gen 6.13	Frequency	9kHz-30MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, Antenna distance 10 m	Temperature Humidity	21 °C 41 % RH
Detector	Peak, quasi peak and average	Bandwidth	200 Hz/ 10 kHz
Test equipm.	EMC Hall A Västerås Setup VED1	Uncertainty	3.2 dB

Test result	The measured field strengths are below the limit
Test Port	Enclosure
Test mode	Continuous Tx - normal modulation
Condition	Normal temperature and supply voltage.
Compliant	Yes

Radiated Emission Test

Test Description:	Radiated emission. Complete measurement 9 kHz - 30 MHz
Date:	2015-05-11
EUT Name:	KS100-640-SE2
Manufacturer:	ASSA AB
Serial Number:	MAC adress: 06 05 F5
Operating Conditions:	Continous Tx 13.56 MHz
Test Site:	DELTA Development Technology AB
Operator Name:	Lars J
Test Specification:	FCC CFR47 Part 15 subpart C
Comment:	Maximum from 3 antenna positions



Preview Result 1-PK+
Final_Result AVG
Final_Result QPK
FCC 15.209 10 m dBuV 13.56 MHz transmitter

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
13.560000	---	52.30	103	51	1500.0	10.000	100.0	H	169.0	18.8
13.560000	53.20	---			1500.0	10.000	100.0	H	169.0	18.8
27.120000	---	33.37	---	---	1500.0	10.000	100.0	H	263.0	21.1
27.120000	35.24	---	48.60	13.36	1500.0	10.000	100.0	H	263.0	21.1

Photo 4.2.1 Test setup regarding measurement of radiated emission 9 kHz – 30 MHz. Antenna position X

Photo 4.2.2 Test setup regarding measurement of radiated emission 9 kHz – 30 MHz Antenna position Y

Photo 4.2.3 Test setup regarding measurement of radiated emission 9 kHz – 30 MHz
Antenna position Z

Photo 4.2.4 Test setup regarding measurement of radiated emission 9 kHz – 30 MHz

4.3 Measurement of radiated emission 30 – 1000 MHz

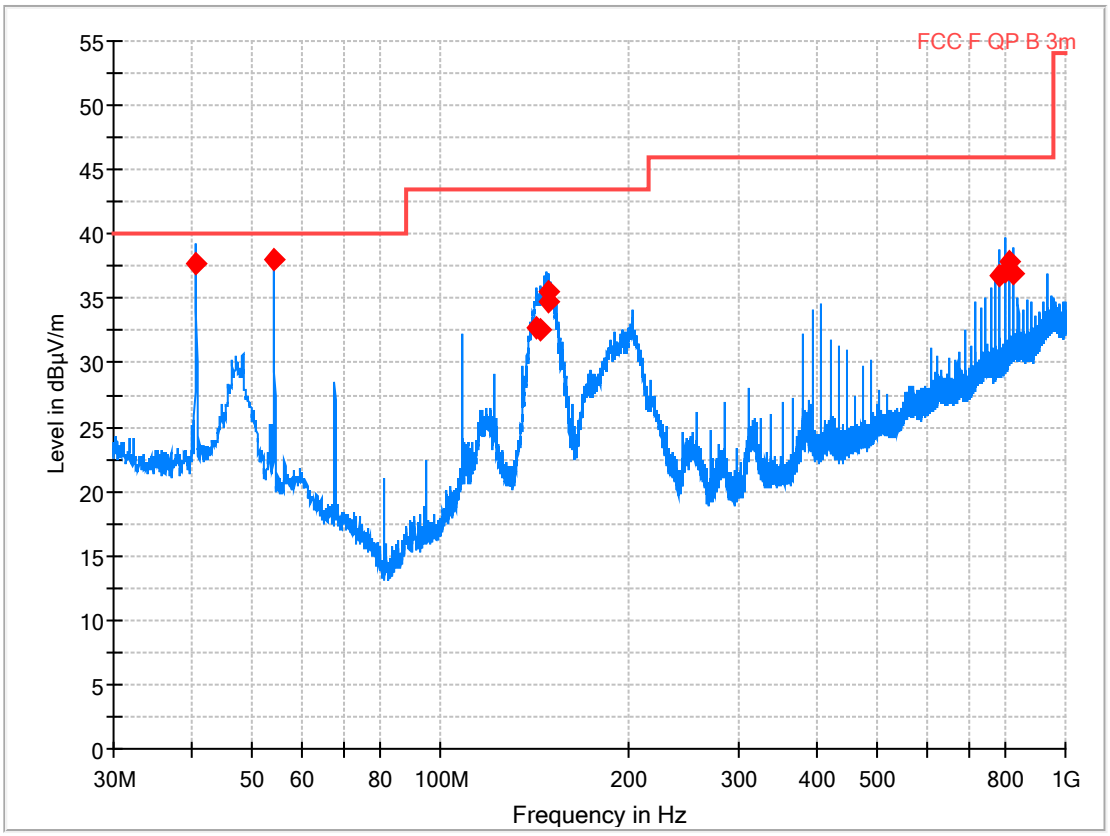
Test object	Server lock	Sheet	RE_Spur-2
Type	KS100-640-SE2	Project no.	E704276
Serial no.	MAC adress: 06 05 F5	Date	30 Apr. 2015
Client	ASSA AB	Initials	LAJ
Specification	FCC CFR47 Part 15 subpart C §15.209, 15.225, 15.249 and RSS Gen 6.13	Frequency	30-1000 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, Antenna distance 3 m	Temperature Humidity	21 °C 41 % RH
Detector	Peak and quasi peak	Bandwidth	120 kHz
Test equipm.	EMC Hall A Västerås Setup VEC1	Uncertainty	5.1 dB

Test result	The measured field strengths are below the limit
Test Port	Enclosure
Test mode	Continuous Tx - Normal modulation
Condition	Normal temperature and supply voltage.
Compliant	Yes

Radiated Emission Test

Test Description:	Radiated emission. Complete measurement 30 - 1000 MHz
Date:	30 Apr. 2015
EUT Name:	KS100-640-SE2
Manufacturer:	ASSA AB
Serial Number:	MAC adress: 06 05 F5
Operating Conditions:	Continous 13.56 MHz Tx
Test Site:	DELTA Development Technology AB
Operator Name:	Lars J
Test Specification:	FCC CFR47 part 15. Subpart C. 15.209
Comment:	



Preview Result 1-PK+ FCC F QP B 3m Final_Result QPK

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.680000	37.69	---	40.00	2.31	1000.0	120.000	103.0	V	303.0	-8.3
54.240000	38.05	---	40.00	1.95	1000.0	120.000	103.0	V	147.0	-14.2
142.770000	32.78	---	43.50	10.72	1000.0	120.000	100.0	V	113.0	-9.0
144.630000	32.53	---	43.50	10.97	1000.0	120.000	100.0	V	97.0	-9.2
148.350000	34.69	---	43.50	8.81	1000.0	120.000	203.0	H	35.0	-9.4
149.160000	35.56	---	43.50	7.94	1000.0	120.000	119.0	H	28.0	-9.4
786.450000	36.84	---	46.00	9.16	1000.0	120.000	107.0	V	150.0	2.9
800.010000	37.13	---	46.00	8.87	1000.0	120.000	106.0	V	272.0	3.0
813.570000	37.84	---	46.00	8.16	1000.0	120.000	103.0	V	147.0	3.8
827.130000	36.86	---	46.00	9.14	1000.0	120.000	103.0	V	144.0	4.2

Photo 4.3.1 Test setup regarding measurement of radiated emission 30 – 1000 MHz

Photo 4.3.2 Test setup regarding measurement of radiated emission30 – 1000 MHz

4.4 Measurement of Radiated H-field at 10m RFID band 13.110-14.010 MHz

Test object	Server lock	Sheet	RE_Spur-3
Type	KS100-640-SE2	Project no.	E704276
Serial no.	MAC adress: 06 05 F5	Date	11 May. 2015
Client	ASSA AB	Initials	LAJ
Specification	FCC CFR47 Part 15 subpart C §15.31, §15.205, §15.225 and RSS Gen 6.11, 6.12	Frequency	13.56 MHz

Test method Characteristics	ANSI C63.10:2013 Complete search, Antenna distance 10 m.	Temperature Humidity	21 °C 41 % RH
Detector	Quasi-Peak	Bandwidth	10 kHz
Test equipm.	EMC Hall A Västerås Setup VED1	Uncertainty	3.2 dB

Frequency [MHz]	Peak measurement [dBµV/m]	Peak limit [dBµV/m]	Quasi-Peak measurement [dBµV/m]	Quasi-Peak limit [dBµV/m]	Remarks
13.56	54.83	-	53.2	103	

Test result	The measured field strengths are below the limits
Test Port	Enclosure
Test frequency	13.56 MHz
Test mode	Continuous Tx
Condition	Normal temperature and supply voltage.
Compliant	Yes

Field strength of fundamental

Test Description:	Radiated emission. Complete search at 13.56 MHz
Date:	2015-05-11
EUT Name:	KS100-640-SE2
Manufacturer:	ASSA AB
Serial Number:	
Operating Conditions:	Continous Tx
Test Site:	DELTA Development Technology AB
Operator Name:	Lars J
Test Specification:	FCC CFR47 Part 15 subpart C
Comment:	Maximum from 3 antenna positions

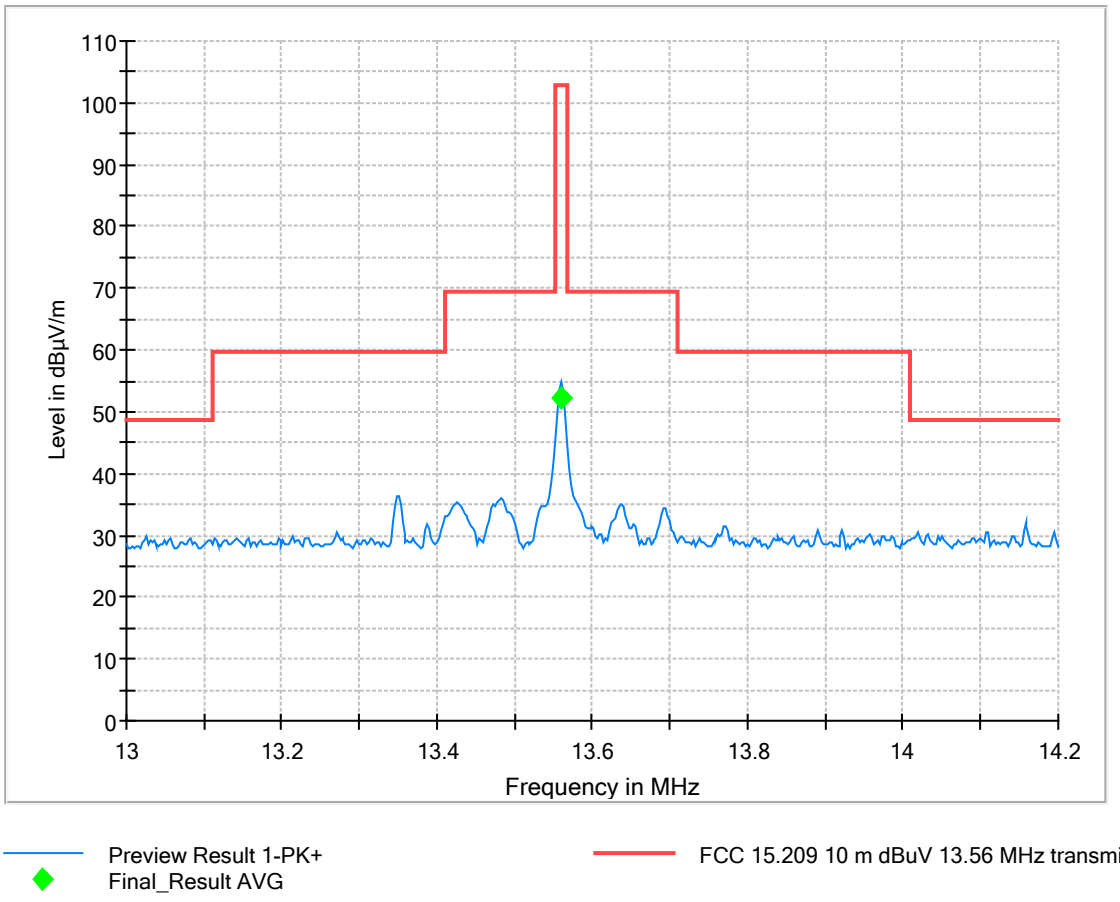


Figure 4.4.1 Field strength of fundamental.

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
13.560000	53.20	---			1500.0	10.000	100.0	H	169.0	18.8

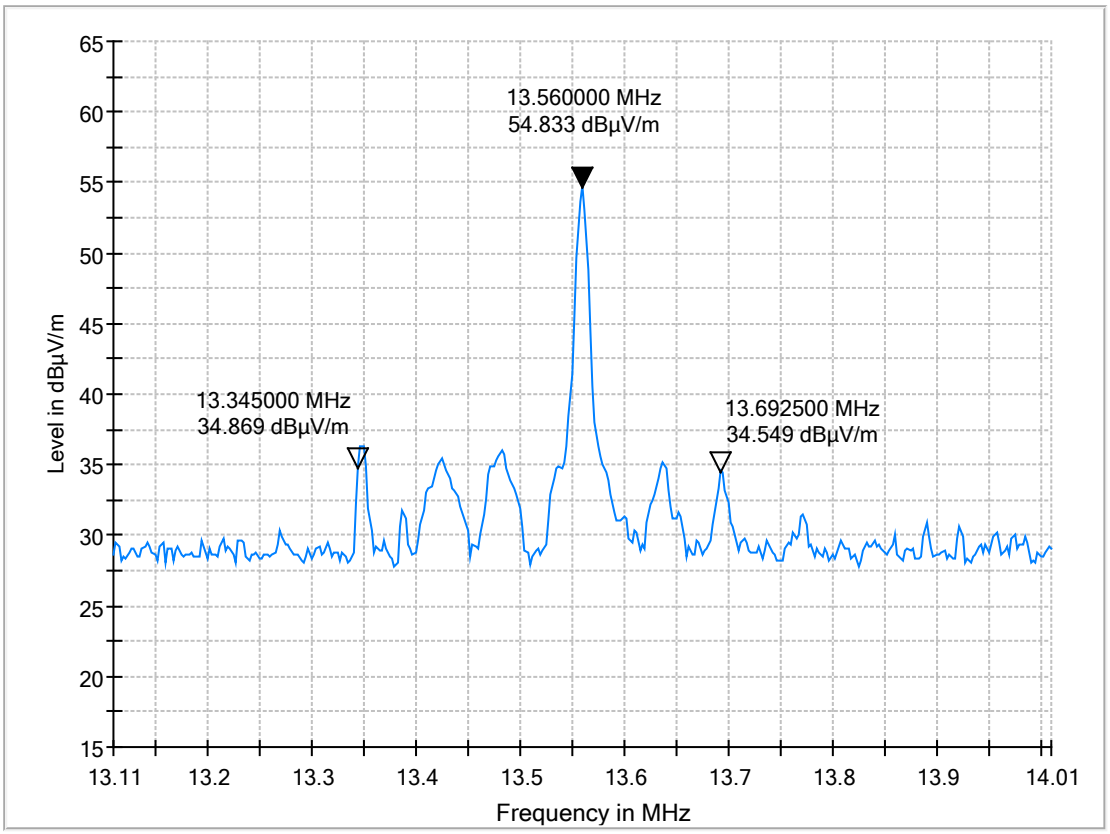
4.5 Measurement of 20 dB bandwidth

Test object	Server lock	Sheet	PROF-1
Type	KS100-640-SE2	Project no.	E704276
Serial no.	MAC adress: 06 05 F5	Date	11 May 2015
Client	ASSA AB	Initials	LAJ
Specification	FCC CFR47 Part 15 subpart C §15.215(c)		

Test method Characteristics	ANSI C63.10:2013 Test voltage: Battery power supply	Temperature Humidity	21 °C 41 % RH
Test equipm.	EMC Hall A Västerås Setup VED1	Uncertainty	3.24 dB
SA Settings	RBW: 9 kHz VBW: - SPAN: - DET: Pk CF: - Trace: Max Hold		

Operating frequency [MHz]	Peak measurement [dBµV/m]	Low frequency [MHz]	High frequency [MHz]	Remarks
13.560	54.833	13.345	13.692	

Band edge criteria	20 dB Bandwidth
Test result	The measured 20 dB bandwidth are within the designated frequency band.
Test port	Enclosure
Test frequency	13.56 MHz
Test mode	Continuous Tx, - normal modulation
Condition	Normal temperature and supply voltage
Compliant	Yes
Comments	None



Preview Result 1-PK+

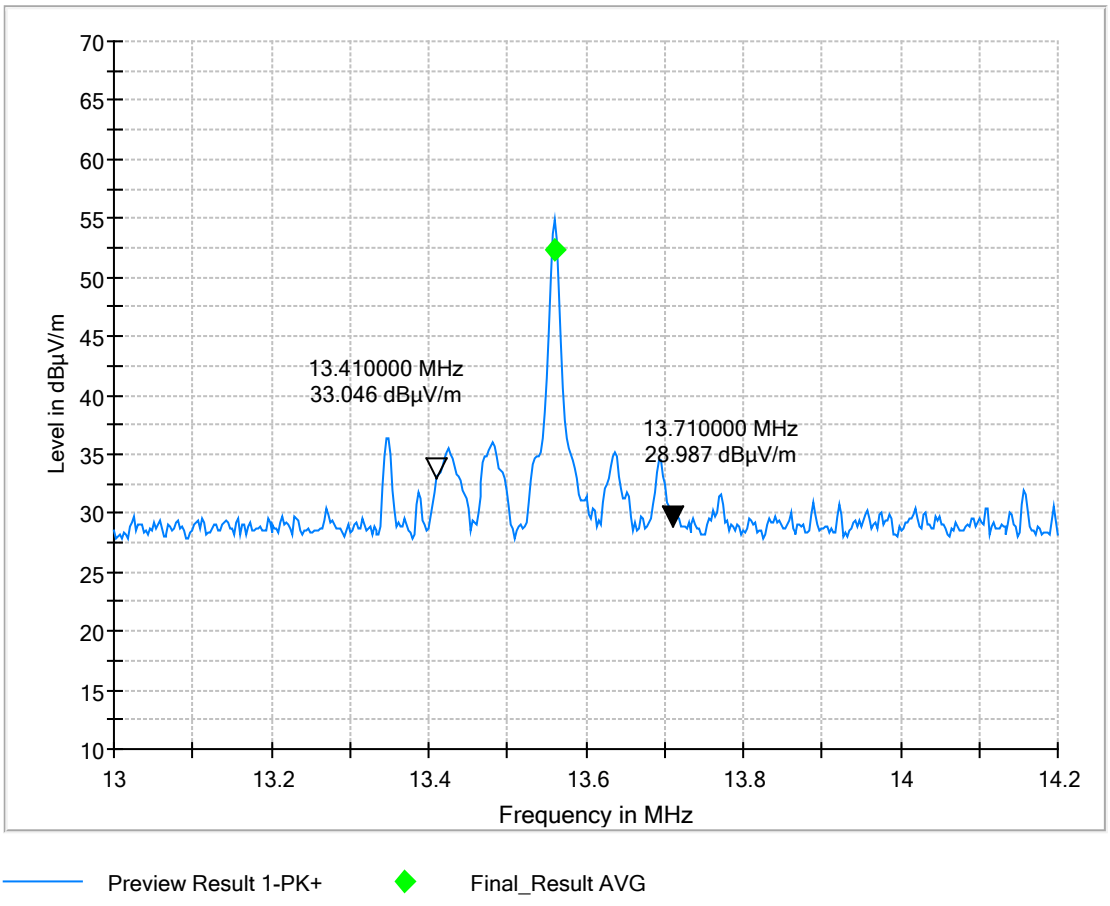
4.6 Measurement of occupied bandwidth, IC

Test object	Server lock	Sheet	PROF-2
Type	KS100-640-SE2	Project no.	E704276
Serial no.	MAC adress: 06 05 F5	Date	11 May 2015
Client	ASSA AB	Initials	LAJ
Specification	RSS Gen 6.6		

Test method Characteristics	IC Standard RSS-Gen, Issue 4:2014 - Section 6.6 Test voltage: Battery power supply	Temperature Humidity	21 °C 41 % RH
Test equipm.	Västerås Setup VEC1	Uncertainty	3.24 dB
SA Settings	RBW: 9 kHz VBW: - SPAN: - DET: Pk CF: - Trace: Max Hold		

Operating frequency [MHz]	Low frequency [MHz]	High frequency [MHz]	Measured 99% emission bandwidth [MHz]
13.5600	13.4100	13.7100	0.30

Band edge criteria	Measured 99 % emission bandwidth
Test port	Enclosure
Test frequency	13.56 MHz
Test mode	Continuous Tx - normal modulation -
Condition	Normal temperature and supply voltage.
Comments	None


70
65
60
55
50
45
40
35
30
25
20
15
10
Level in dBµV/m
13.410000 MHz
33.046 dBµV/m
13.710000 MHz
28.987 dBµV/m
13
13.2
13.4
13.6
13.8
14
14.2
Frequency in MHz
Preview Result 1-PK+
Final_Result AVG

4.7 Measurement of carrier frequency stability

Test object	Server lock	Sheet	PROF-3
Type	KS100-640-SE2	Project no.	E704276
Serial no.	MAC adress: 06 05 F5	Date	12 May. 2015
Client	ASSA AB	Initials	LAJ
Specification	FCC CFR47 Part 15 subpart C §15.215(e)	Frequency	

Test method Characteristics	ANSI C63.10:2013 Complete search, Antenna distance 3 m.	Temperature Humidity	21 °C 41 % RH
Test equipm.	Setup VEC1	Uncertainty	
SA Settings	RBW: 1 kHz VBW: 3 kHz SPAN: 20 kHz DET: Peak Trace: Clrw		

Temperature	Supply voltage	Measured frequency [MHz]	Frequency tolerance [kHz]	Limit kHz]	Remarks
Normal 22 °C	Normal	13.5597	-		Note 1
-20 °C	Normal	13.5597	<0.1	1.356	Note 1
+50 °C	Normal	13.5597	<0.1	1.356	Note 1
Note 1: Test object is supplied from ethernet port (PoE). Supply voltage variation is not applicable.					

Test result The measured peak and average field strengths at the band edge are below the peak and average limits.

Test Port Enclosure

Test frequency 13.56 MHz

Test mode Continuous Tx - normal modulation -

Condition Normal supply voltage. Extreme temperatures

Compliant Yes

Photo 4.7.1 Test setup regarding measurement of carrier frequency stability.

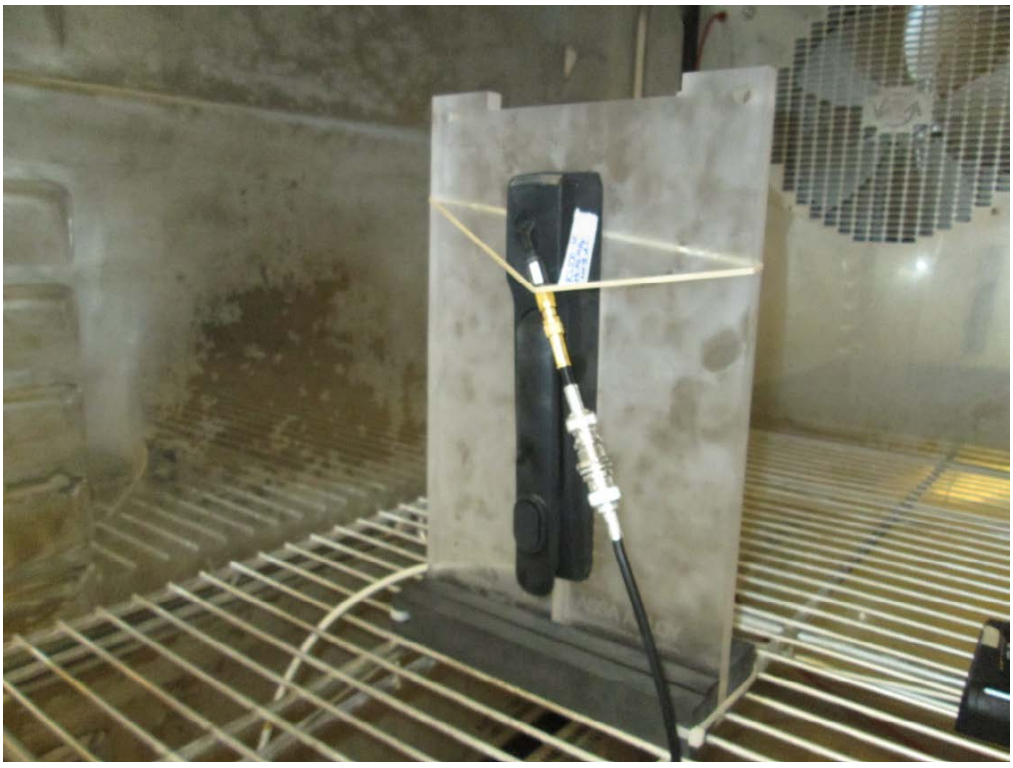


Photo 4.7.2 Test setup regarding measurement of carrier frequency stability. Test object in climate chamber.

5. National registrations and accreditations

5.1 SWEDAC Accreditation

Organization: Swedish Board for Accreditation and Conformity Assessment - SWEDAC, see www.swedac.se and www.ilac.org

Registration Number: 1688

SWEDAC is part of ILAC (International Laboratory Accreditation Cooperation) including its MRA (Mutual Recognition Arrangement).

5.2 FCC Registrations

Organization: Federal Communications Commission, USA

Registration Number: 516880

Facilities: EMC chamber A 3 and 10 m

5.3 IC Registrations

Organization: Industry Canada, Certification and Engineering Bureau

Registration Number: 9347A

Facilities: EMC chamber A (9347A-1)

6. List of instruments

Setup VEA1						
Measurement of radio frequency voltage on mains						
Last Cal.	*Next Cal.*	*ID no.*	*Description*	*Manufacturer*	*Type no.*	*Setup uncertainty*
-	-	36070	Software	Rohde & Schwarz	EMC32 ver. 9.15.01	1.8 dB
2014-08	2015-09	36020	Measuring receiver	Rohde & Schwarz	ESU26	
2014-08	2015-09	IE-B919	LISN 2 x 10 A 250 V	Rohde & Schwarz	ESH3-Z5	
2014-04	2015-04	36078	Attenuator 6 dB 10 W	BIRD	10-A-MFB-06	
2014-06	2015-06	36062	Impulse Voltage Limiter	Rohde & Schwarz	ESH3-Z2	

Setup VEC1						
Measurement of radio frequency electromagnetic field						
Last Cal.	*Next Cal.*	*ID no.*	*Description*	*Manufacturer*	*Type no.*	*Setup uncertainty*
-	-	36070	Software	Rohde & Schwarz	EMC32 ver. 9.15.01	5.1 dB 30-1000 MHz (10 m) 6.2 dB 30-1000 MHz (3 m) 4.5 dB 1-6 GHz (3 m)
2014-08	2015-08	IE-B758	Preamplifier	HP	8447F	
2014-08	2015-08	36020	Measuring receiver	Rohde & Schwarz	ESU26	
2013-07	2015-07	IE-B928	Antenna Bilog	Chase	CBL6111A	
2014-08	2015-08	36065	Measuring receiver	Rohde & Schwarz	ESL6	
-	-	36071	Controller	Maturo	NCD	
-	-	36072	Tilt antenna mast	Maturo	TAM 4.0-E	
-	-	-	Turntable	Heinrich Deisel	DT 440	

Setup VED1						
Measurement of radio frequency electromagnetic field (Loop antenna)						
Last Cal.	*Next Cal.*	*ID no.*	*Description*	*Manufacturer*	*Type no.*	*Setup uncertainty*
-	-	36070	Software	Rohde & Schwarz	EMC32 ver. 9.15.01	3.24 dB
2014-08	2015-08	36020	Measuring receiver	Rohde & Schwarz	ESU26	
2013-07	2015-07	35047	Loop antenna	Rohde & Schwarz	HFH2-Z2	

Setup Climate						
Climatic tests						
Last Cal.	*Next Cal.*	*ID no.*	*Description*	*Manufacturer*	*Type no.*	*Setup uncertainty*
-	-	36070	Climatic chamber	Weiss	WK1-1000/40/5	
-	-	IE-B758	Temperature Oven	MEMMERT	UL-40 / 791003	
2015-03	2016-03	IM-A308	Temperature- and hygrometer	Vaisala	HMI31	

7. Revision

Rev. index	Description	Date/ Init
-	New document	13 Aug 2015/ LAJ
A	Standard references updated.	26 Aug 2015/ LAJ