



InterLab®

FCC Measurement/Technical Report on

RFID transceiver

SCR

(Circuit Board Smart Card Reader CPL)

Report Reference: MDE_S&B_1103_FCCb

Test Laboratory:

Borsigstr. 11
Germany
7Layers AG
40880 Ratingen



Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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0 Summary

0.1 Technical Report Summary

Type of Authorization

Certification for an intentional radiator RFID card reader at 13.56 MHz

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-11 Edition) and 15 (10-1-11 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.205 Restricted bands of operation

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

§ 15.215 Additional provisions to the general radiated emission limitations

§ 15.225 Operation within the band 13.110-14.010 MHz

Note:

Instead of applying ANSI C63.4–1992 which is referenced in the FCC Public Note, the newer ANSI C63.4–2009 is applied.

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 0.2 Measurement Summary.



0.2 Measurement Summary

FCC Part 15, Subpart C		§15.209	
Spurious Radiated Emissions			
The measurement was performed according to ANSI C63.4			2009
OP-Mode	Setup	Port	Final Result
op-mode 1	Setup_01/02	Enclosure	passed
FCC Part 15, Subpart C		§15.225	
Spectrum Mask			
The measurement was performed according to ANSI C63.4			2009
OP-Mode	Setup	Port	Final Result
op-mode 1	Setup_02	Enclosure	passed

**This test report covers the verification of a new antenna configuration.
Therefore not all tests which are applicable to the setups have been performed.**

Responsible for
Accreditation Scope:

A. Petk

Responsible
for Test Report:

M. Müller



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1 Administrative Data

1.1 Testing Laboratory

Company Name: 7Layers AG
Address: Borsigstr. 11
40880 Ratingen
Germany

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716.

The test facility is also accredited by the following accreditation organisation:
Laboratory accreditation no.: DAkkS D-PL-12140-01-01

Responsible for Accreditation Scope: Dipl.-Ing. Bernhard Retka
Dipl.-Ing. Robert Machulec
Dipl.-Ing. Andreas Petz

Report Template Version: 2012-03-14

1.2 Project Data

Responsible for testing and report: Dipl.-Ing. Marco Kullik
Date of Test(s): 2011-09-06 to 2012-04-10
Date of Report: 2012-04-27

1.3 Applicant Data

Company Name: Scheidt & Bachmann GmbH
Address: Breite Strasse 132
41238 Mönchengladbach
Germany
Contact Person: Mr. Dr.-Ing. Klaus Hense

1.4 Manufacturer Data

Company Name: please see applicant data
Address:
Contact Person:



2 Test object Data

2.1 General EUT Description

Equipment under Test	RFID Smart Card Reader System
Type Designation:	SCR (Circuit Board Smart Card Reader CPL)
Kind of Device: (optional)	RFID transceiver operating at 13.56 MHz
Voltage Type:	DC
Voltage level:	8–24 V (nominal voltage range) 12 V (tested voltage)

General product description:

The SCR is a 13.56 MHz contactless smartcard reader and encoder for reading RFID tags.

Specific product description for the EUT:

The Scheidt & Bachmann (S&B) 13,56 MHz RFID Smart Card Reader System "SCR" is designed for exclusive application with S&B baseboards only. It will never be sold as single system. The baseboards are exclusively used in S&B products like ticket vending machines, pay on foot machines, ticket dispensers, ticket validators etc. with 13,56 MHz RFID functionality.

The processor-based SCR solution consists of two PCBs (CPU module and baseboard): The CPU module contains the CPU together with an FPGA. All necessary interface lines are fed to two connectors. The CPU Module is plugged into the baseboard.

On the baseboard resides the power supply that converts the input voltage of 8V–12V into 5V and 3.3V. Alternatively the SCR can be supplied with a 5V power supply.

Additionally two chips are implemented to interface to two independent antennas for transactions with contact less smartcards. Another chip is used, to interface to four SAM (secure access module) sockets.

The EUT provides the following ports:

Ports

Enclosure

Antenna connector BU500

Antenna connector BU550

Power and control connector

The main components of the EUT are listed and described in Chapter 2.2.

2.2 EUT Main components

Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status	Date of Receipt
EUT A	RFID Module	SCR Base Board	– (Part-No.: 03 57688 0)	D	–	–
Remark: EUT A is equipped with two external loop antennas (see Ancillary Equipment).						
EUT B	RFID Module	CPU Board	463 488321 (Part-No. 05 53742 0)	I	–	–
Remark: EUT B is a daughter-board of EUT A.						

NOTE: The short description is used to simplify the identification of the EUT in this test report.

2.3 Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	HW Status	SW Status	Serial No.	FCC ID
AE1 (Code: U0011a01)	Original RFID antenna	Circuit Board Smartcard Antenna 3 Turns	A	–	– (Part-No. 03 57570 0 (PCB): 03 57569 0 (Assembly))	–
AE2 (Code: U0010a01)						
AE2 (Code: U0010a01)	New RFID antenna	Board Antenna Onboard Validator	Proto-type	–	–	–
AE3 (Code: U0010b02)						
AE3 (Code: U0010b02)	New RFID antenna	Board Antenna Onboard Validator	B	–	– (Part-No. PCB: 03 64128 0; 03 64127 0 (Assembly))	–

2.4 Auxiliary Equipment

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Auxiliary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status	FCC ID
AUX1	Lead-Acid Battery	Panasonic LC-R127R2PG1	–	–	–	–



2.5 EUT Setups

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

Setup No.	Combination of EUTs	Description and Rationale
Setup_01	EUT A + EUT B + AE1 + AE3 + AUX1	setup for EUT equipped with original and new RFID antenna
Setup_02	EUT A + EUT B + AE1 + AE2 + AUX1	setup for EUT equipped with original and new RFID antenna

2.6 Operating Modes

This chapter describes the operating modes of the EUTs used for testing.

Op. Mode	Description of Operating Modes	Remarks
op-mode 1	modulated carrier signal	EUT is transmitting a periodically modulated signal.

2.7 Special software used for testing

No special software is used.

2.8 Product labelling

2.8.1 FCC ID label

Please refer to the documentation of the applicant.

2.8.2 Location of the label on the EUT

Please refer to the documentation of the applicant.

3 Test Results

3.1 Spurious radiated emissions

Standard FCC Part 15, 10-1-09 Edition Subpart C

The test was performed according to: ANSI C63.4–2009

3.1.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C63.4–2009 in a typical installation configuration. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m² in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.

The measurement procedure is implemented into the EMI test software ES-K1 from R&S. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is performed at 2 axes. A pre-check is also performed while the EUT is powered from both AC and DC (battery) power in order to find the worst-case operating condition.

1. Measurement up to 30 MHz

The Loop antenna HFH2-Z2 is used.

Step 1: pre measurement

- Anechoic chamber
- Antenna distance: 10 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 – 0.15 and 0.15 – 30 MHz
- Frequency steps: 0.1 kHz and 5 kHz
- IF-Bandwidth: 0.2 kHz and 10 kHz
- Measuring time / Frequency step: 100 ms

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: final measurement

For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is to find the maximum emission level.

- Open area test side
- Antenna distance: according to the Standard
- Detector: Quasi-Peak
- Frequency range: 0.009 – 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF-Bandwidth: 200 Hz – 10 kHz
- Measuring time / Frequency step: 100 ms

2. Measurement above 30 MHz and up to 1 GHz

Step 1: Preliminary scan

Preliminary test to identify the highest amplitudes relative to the limit.

Settings for step 1:

- Antenna distance: 3 m
- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF-Bandwidth: 120 kHz

- Measuring time / Frequency step: 100 μ s
- Turntable angle range: -180° to 180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: second measurement

For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: -180° to 180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):

- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:

- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.

For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by $+- 22.5^\circ$ around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by $+- 25$ cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: -22.5° to $+22.5^\circ$ around the determined value
- Height variation range: -0.25 m to $+0.25$ m around the determined value

Step 4: final measurement with QP detector

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak(< 1 GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s



3.1.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (d)

... In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency in MHz	Limit (μ V/m)	Measurement distance (m)	Limit(dB μ V/m @10m)
0.009 – 0.49	2400/F(kHz)	300	Limit (dB μ V/m)+30dB
0.49 – 1.705	24000/F(kHz)	30	Limit (dB μ V/m)+10dB
1.705 – 30	30	30	Limit (dB μ V/m)+10dB

Frequency in MHz	Limit (μ V/m)	Measurement distance (m)	Limit (dB μ V/m)
30 – 88	100	3	40.0
88 – 216	150	3	43.5
216 – 960	200	3	46.0
above 960	500	3	54.0

§15.35(b)

..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dB μ V/m) = 20 log (Limit (μ V/m)/1 μ V/m)

3.1.3 Test Protocol

Temperature: 23 – 25 °C
 Air Pressure: 989 – 1012 hPa
 Humidity: 36 – 38 %

3.1.3.1 Measurement up to 30 MHz

Op. Mode	Setup	Port						
op-mode 1	Setup_02	Enclosure						
Frequency kHz	Corrected value dB μ V/m	Limit dB μ V/m						
	QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
–	–	–	–	–	–	–	–	–

Remark: No (further) spurious emissions in the range 20 dB below the limit found therefore step 2 was not performed. Please refer to the plots in the annex.
 The peak found at 13.56 MHz is the wanted signal of the EUT.

3.1.3.2 Measurement above 30 MHz

Op. Mode	Setup	Port							
op-mode 1	Setup_01	Enclosure							
Polari- sation	Frequency MHz	Corrected value dB μ V/m							
	QP	Peak	AV	QP	Peak	AV	QP/Peak	AV	
Horizontal	139.98	43.4	–	–	43.5	–	–	0.1	–
Vertical	176.28	37.2	–	–	43.5	–	–	6.3	–
Horizontal	189.84	40.1	–	–	43.5	–	–	3.4	–
Horizontal	203.40	39.9	–	–	43.5	–	–	3.6	–
Horizontal	230.52	45.5	–	–	46.0	–	–	0.5	–
Horizontal	240.00	41.6	–	–	46.0	–	–	4.4	–
Horizontal	359.40	35.6	–	–	46.0	–	–	10.4	–
Vertical	400.02	45.7	–	–	46.0	–	–	0.3	–
Vertical	420.00	38.5	–	–	46.0	–	–	7.5	–
Vertical	960.00	39.3	–	–	46.0	–	–	6.7	–

Remark: No (further) spurious emissions in the range 20 dB below the limit found.

3.1.4 Test result: Spurious radiated emissions

FCC Part 15, Subpart C	Op. Mode	Setup	Result
	op-mode 1	Setup_01/02	passed



3.2 Spectrum mask

Standard FCC Part 15, 10-1-11 Edition Subpart C

The test was performed according to: FCC §15.225

3.2.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4–2009. The Equipment Under Test (EUT) was set up on a non-conductive table in the anechoic chamber.

The radiated emissions measurements were made in a typical installation configuration. The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The Loop antenna HFH2-Z2 is used.

- Anechoic chamber
- Antenna distance: 10 m
- Detector: Peak-Maxhold
- Frequency range: 13.06 – 14.06 MHz
- Frequency steps: 5 kHz
- IF-Bandwidth: 10 kHz
- Measuring time / Frequency step: 100 ms

3.2.2 Test Limits

FCC Part 15, Subpart C, §15.225 (a-d), and §15.209, corrected by the means of the extrapolation of §15.31 due to the reduced measuring distance from 30 m to 10 m.

3.2.3 Test Protocol

Temperature: 25 °C
Air Pressure: 1012 hPa
Humidity: 38 %

Op. Mode	Setup	Port
op-mode 1	Setup_02	Enclosure
Maximum value dB μ V/m	Limit dB μ V/m	Remarks
67.1	103	measuring distance 10 m

Remark: Please see annex for the measurement plot.

3.2.4 Test result: Spectrum mask

FCC Part 15, Subpart C	Op. Mode	Setup	Result
	op-mode 1	Setup_02	passed

4 Test Equipment

The calibration, hardware and software states are shown for the testing period.

Test Equipment Anechoic Chamber

Lab ID: **Lab 1**
Manufacturer: Frankonia
Description: Anechoic Chamber for radiated testing
Type: 10.58x6.38x6.00 m³

Single Devices for Anechoic Chamber

Single Device Name	Type	Serial Number	Manufacturer
Air compressor	none	-	Atlas Copco
Anechoic Chamber	10.58 x 6.38 x 6.00 m ³ <i>Calibration Details</i>	none	Frankonia <i>Last Execution</i> <i>Next Exec.</i>
	FCC listing 96716 3m Part15/18	2011/01/11	2014/01/10
	IC listing 3699A-1 3m	2011/02/07	2014/02/06
Controller Maturo	MCU	961208	Maturo GmbH
EMC camera	CE-CAM/1	-	CE-SYS
EMC camera Nr.2	CCD-400E	0005033	Mitsubishi
Filter ISDN	B84312-C110-E1		Siemens&Matsushita
Filter Universal 1A	BB4312-C30-H3	-	Siemens&Matsushita

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID: **Lab 1**
Description: Equipment for emission measurements
Serial Number: see single devices

Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	Type	Serial Number	Manufacturer
Antenna mast	AS 620 P	620/37	HD GmbH
Biconical dipole	VUBA 9117 <i>Calibration Details</i>	9117-108	Schwarzbeck <i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration	2008/10/27	2013/10/26
	Standard Calibration	2012/01/18	2015/01/17
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq
	Path Calibration	2011/05/11	2011/11/10
	Path Calibration	2011/11/15	2012/05/14
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq
	Path Calibration	2011/05/11	2011/11/10
	Path Calibration	2011/11/15	2012/05/14
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq
	Path Calibration	2011/05/11	2011/11/10
	Path Calibration	2011/11/15	2012/05/14
Cable "ESI to EMI Antenna"	EcoFlex10 2	W18.01-2+W38.01- Kabel Kusch	Miteq
	Path Calibration	2011/05/11	2011/11/10
	Path Calibration	2011/11/15	2012/05/14

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	Type	Serial Number	Manufacturer	
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02-2+W38.02-2	Rosenberger Micro-Coax	
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2009/04/16	2012/04/15
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2009/04/28	2012/04/27
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic	
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright	
	Path Calibration		2011/05/11	2011/11/10
	Path Calibration		2011/11/15	2012/05/14
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2009/05/27	2012/05/26
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	DKD calibration		2008/10/07	2011/10/06
Pyramidal Horn Antenna 3160-09 26,5 GHz		00083069	EMCO Elektronik GmbH	
Pyramidal Horn Antenna 3160-10 40 GHz		00086675	EMCO Elektronik GmbH	
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5- 10kg/024/3790709	Maturo GmbH	



Test Equipment Auxiliary Test Equipment

Lab ID: Lab 1
Manufacturer: see single devices
Description: Single Devices for various Test Equipment
Type: various
Serial Number: none

Single Devices for Auxiliary Test Equipment

Single Device Name	Type	Serial Number	Manufacturer
AC Power Source	Chroma 6404	64040001304	Chroma ATE INC.
Broadband Power Divider 1506A / 93459 N (Aux)		LM390	Weinschel Associates
Broadband Power Divider WA1515 SMA		A855	Weinschel Associates
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2009/10/07 2011/10/06
	Customized calibration		2011/10/19 2013/10/18
Fibre optic link Satellite (Aux)	FO RS232 Link	181-018	Pontis
Fibre optic link Transceiver (Aux)	FO RS232 Link	182-018	Pontis
Isolating Transformer	LTS 604	1888	Thalheimer Transformatorenwerke GmbH
Notch Filter Ultra Stable (Aux)	WRCA800/960-6EEK	24	Wainwright
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG



Test Equipment Digital Signalling Devices

Lab ID:

Lab 1

Description:

Signalling equipment for various wireless technologies.

Single Devices for Digital Signalling Devices

Single Device Name	Type	Serial Number	Manufacturer
Bluetooth Signalling Unit CBT		100589	Rohde & Schwarz GmbH & Co. KG
CBT	Standard calibration		2011/11/24 2014/11/23
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2011/05/26 2013/05/25
	<i>HW/SW Status</i>		<i>Date of Start</i> <i>Date of End</i>
	Hardware: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04		2007/07/16
	Software: K21 4v21, K22 4v21, K23 4v21, K24 4v21, K42 4v21, K43 4v21, K53 4v21, K56 4v22, K57 4v22, K58 4v22, K59 4v22, K61 4v22, K62 4v22, K63 4v22, K64 4v22, K65 4v22, K66 4v22, K67 4v22, K68 4v22, K69 4v22		
	Firmware: μP1 8v50 02.05.06		

Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2008/12/01 2011/11/30
	Standard calibration		2011/12/07 2014/12/06
	<i>HW/SW Status</i>		<i>Date of Start</i> <i>Date of End</i>
	HW options: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02		2007/01/02
	SW options: K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10		
	Firmware: μP1 8v40 01.12.05		

			2008/11/03

Test Equipment Emission measurement devices

Lab ID: Lab 1
Description: Equipment for emission measurements
Serial Number: see single devices

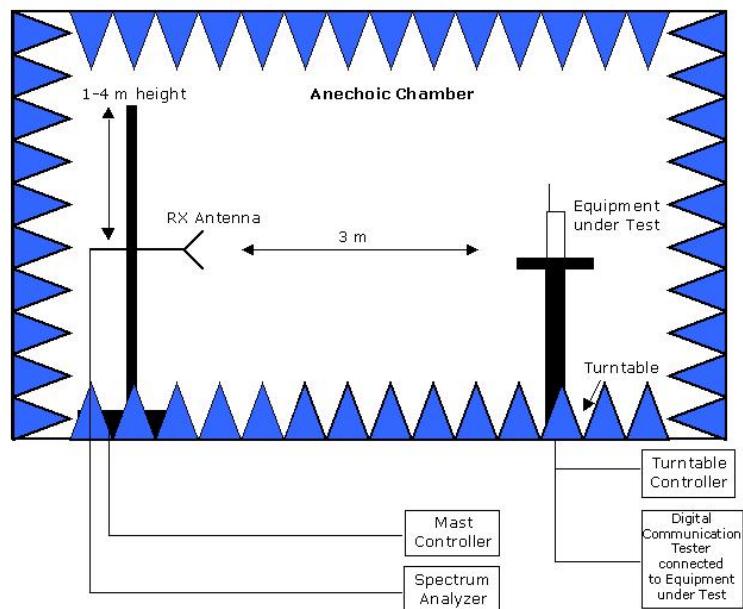
Single Devices for Emission measurement devices

Single Device Name	Type	Serial Number	Manufacturer
Personal Computer	Dell	30304832059	Dell
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2011/05/03 2012/05/02
Power Sensor	NRV-Z1	836219/005	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2009/10/20 2011/10/19
Powermeter	NRVS	836333/064	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2009/10/15 2011/10/14
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2011/05/02 2012/05/01
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	standard calibration		2011/05/12 2014/05/11
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2009/12/03 2011/12/02
	Standard Calibration		2011/12/05 2013/12/04
	<i>HW/SW Status</i>		<i>Date of Start</i> <i>Date of End</i>
			2009/12/03

5 Photo Report

Photos are included in an external report.

6 Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

Drawing 1: Setup in the Anechoic chamber:

Measurements below 1 GHz: Semi-anechoic, conducting ground plane.
Measurements above 1 GHz: Fully-anechoic, absorbers on all surfaces.



7 FCC and IC Correlation of measurement requirements

The following tables show the correlation of measurement requirements for RFID equipment and Digital Apparatus from FCC and IC standards.

RFID equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC mains	§ 15.207	RSS-Gen: 7.2.4
Spurious radiated emissions	§ 15.209	RSS-Gen: 6; RSS-210: A2.6
Occupied bandwidth	§ 15.215	RSS-Gen: 4.6
Spectrum Mask	§ 15.225	RSS-210: A2.6
Frequency Tolerance	§ 15.225	RSS-210: A2.6

Digital Apparatus

Measurement	FCC reference	IC reference
Conducted Emissions (AC Power Line)	§ 15.107	ICES-003
Spurious Radiated Emissions	§ 15.109	ICES-003

8 Annex measurement plots

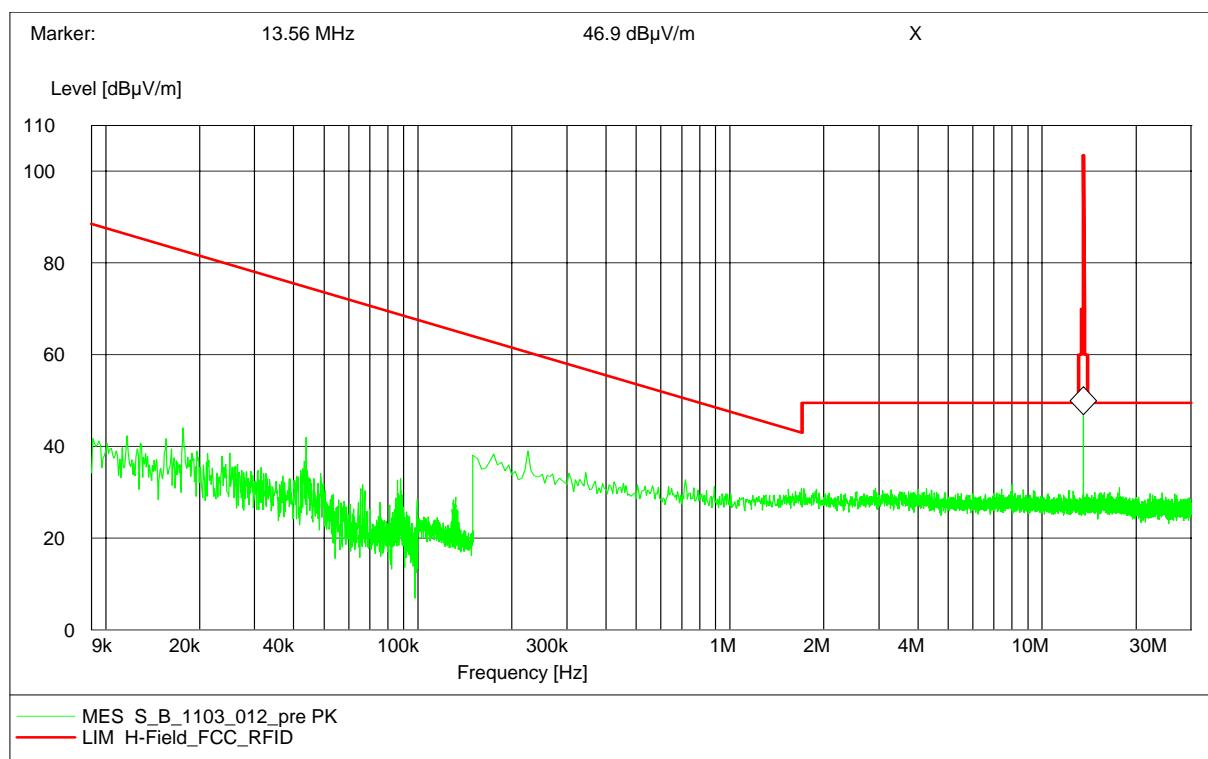
8.1 Radiated emissions

8.1.1 Radiated emissions ($f < 30$ MHz)

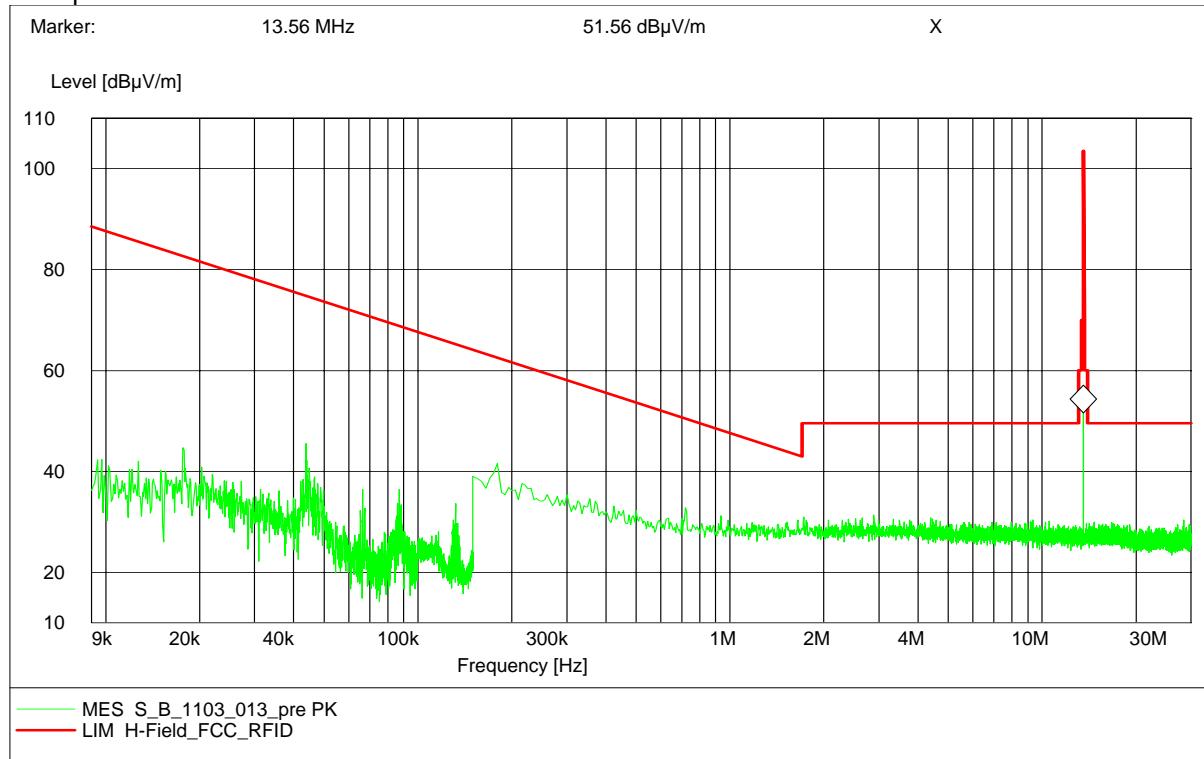
Setup_02

Antenna position 0°

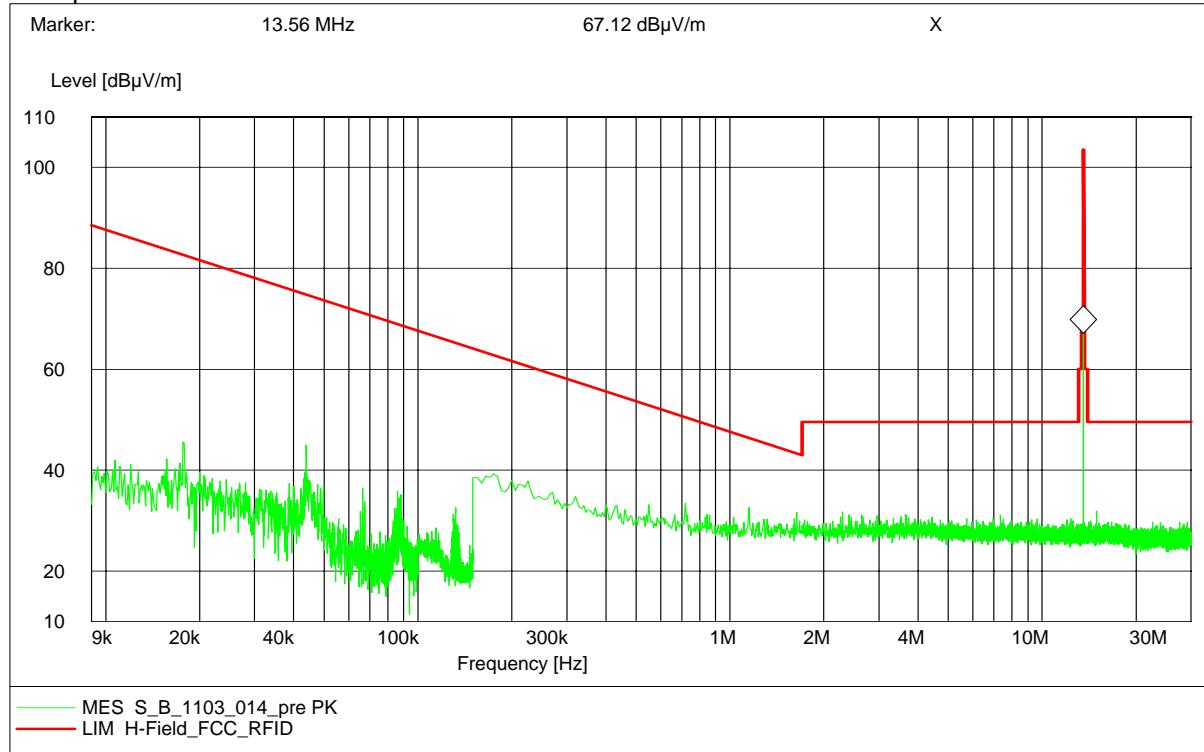
EUT position side 1



Antenna position 90°
EUT position side 1

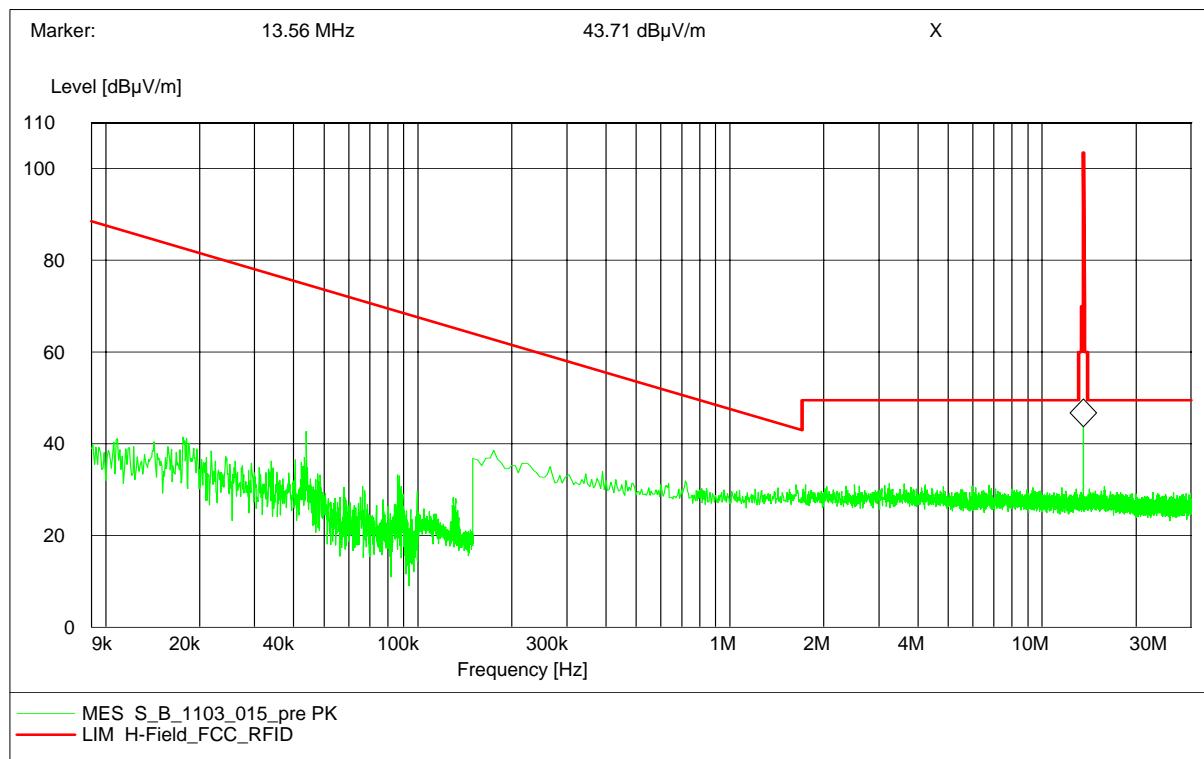


Antenna position 90°
EUT position side 2



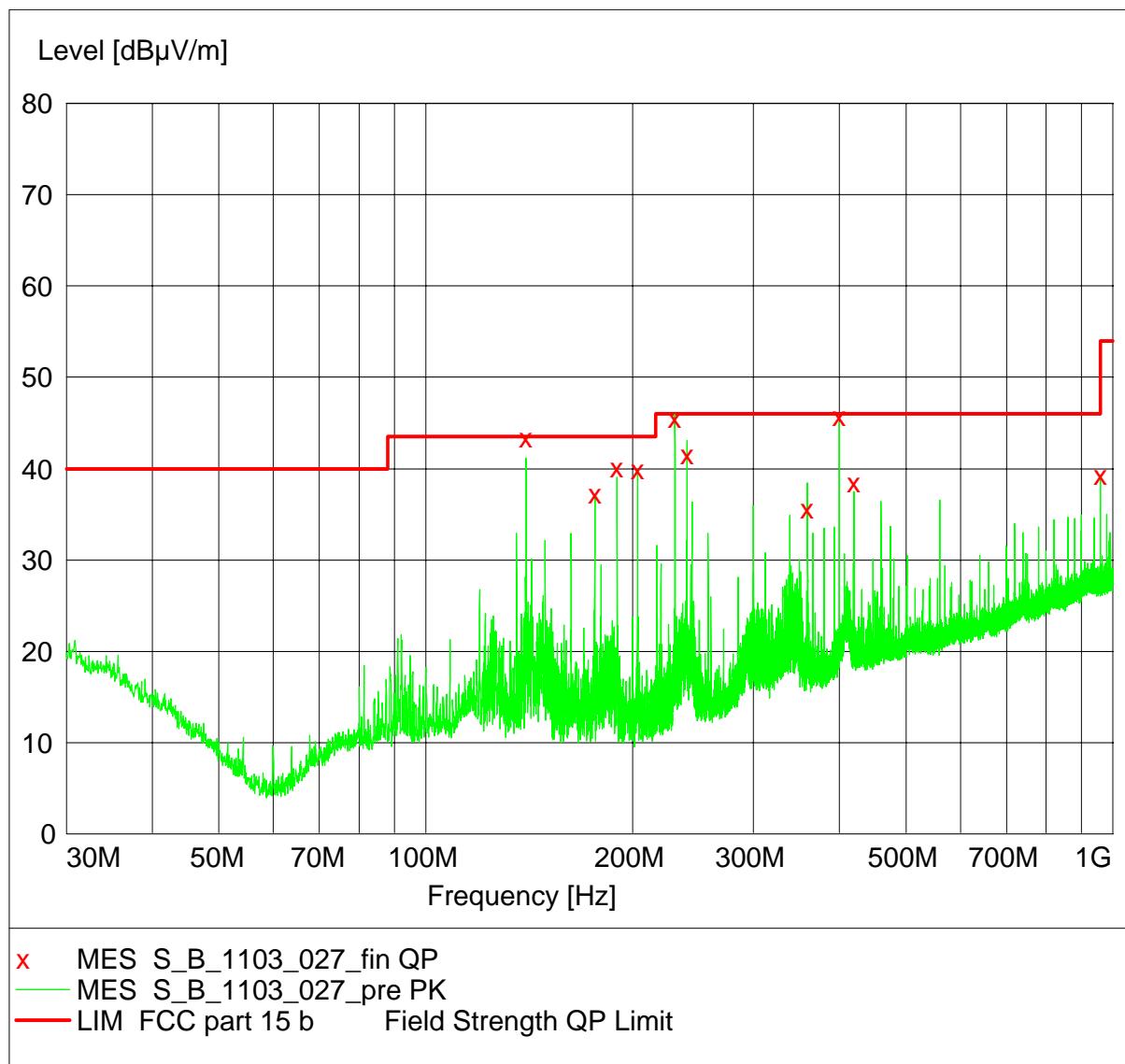


Antenna position 0°
EUT position side 2



8.1.2 Radiated emissions (f > 30 MHz)

Setup_01



8.2 Spectrum Mask

Setup_02

