InterLab®

FCC Measurement/Technical Report on

Safety sensors

RSS16-SD-ST8H
RSS36-SD-ST
RSS260-SD-ST

RFID tag readers

FCC ID: 2AFO9-RSS
IC ID: 20745-RSS

Report Reference: MDE_SCHMER_1501_FCCc

Test Laboratory:
7layers GmbH
Borsigstrasse 11
40880 Ratingen
Germany

DAkkS Deutsche Akkreditierungsstelle D-PL-12140-01-00

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.

Table of Contents

0 Summary 3

0.1 Technical Report Summary 3
0.2 Measurement Summary 4
Revision History 5

1 Administrative Data 6

1.1 Testing Laboratory 6
1.2 Project Data 6
1.3 Applicant Data 6
1.4 Manufacturer Data 6

2 Test object Data 7

2.1 General EUT Description 7
2.2 EUT Main components 8
2.3 Ancillary Equipment 8
2.4 Auxiliary Equipment 8
2.5 EUT Setups 9
2.6 Operating Modes 9
2.7 Special software used for testing 9
2.8 Product labelling 9

3 Test Results 10

3.1 Spurious radiated emissions 10
3.2 Peak power output 14
3.3 Occupied bandwidth 15

4 Measurement uncertainty 16

5 Test equipment 17

6 Photo Report 21

7 Setup Drawings 21

8 FCC and IC Correlation of measurement requirements 22

9 Annex measurement plots 23

9.1 Radiated emissions and peak output power 23
9.2 Occupied Bandwidth 27

0 Summary

0.1 Technical Report Summary

Type of Authorization
Certification for an intentional radiator: 125 kHz RFID tag reader

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-14 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

Note:
ANSI C63.10-2013 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**		
Radiated Emissions			
The measurement was performed according to ANSI C63.10			
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_01	Enclosure	passed

FCC Part 15, Subpart C	**§ 15.209**		
Peak Output Power			
The measurement was performed according to ANSI C63.10			
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_01	Enclosure	passed

FCC Part 15, Subpart C	**§ 15.207**		
Conducted Emissions AC Power line			N/A (1)
The measurement shall be performed according to ANSI C63.10			
OP-Mode	**Setup**	**Port**	**Final Result**
–	–	–	–

FCC Part 15, Subpart C	**§ 15.215**		
Occupied Bandwidth			
The measurement was performed according to ANSI C63.10			
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_01	Enclosure	passed

Notes:

N/A = Not applicable
(1) The EUT is DC powered

Revision History

Report version control			
Version	**Release date**	**Change Description**	**Version validity**
MDE_SCHMER_1501_FCCa	2015-11-05	Initial version	invalid
MDE_SCHMER_1501_FCCa_Rev.1	2016-08-30	On front page FCC ID and IC ID are changed. On page 8: in subclause 2.8.2 HVIN added.	invalid
MDE_SCHMER_1501_FCCc	2016-10-26	This report relays to RSS safety sensors only. MDE_SCHMER_1501_FCCa_Rev.1 was used as a reference report.	valid

Responsible for Accreditation Scope: MARCO KULLIK 2016.10.28 16:59:39 +02'00'

Responsible for Test Report: DOBRIN TODOROV DOBRINOV 2016.10.28 16:50:24 +02'00'

1 Administrative Data

1.1 Testing Laboratory

Company Name:	7layers GmbH
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-12140-01-00
Responsible for Accreditation Scope:	Dipl.-Ing. Bernhard Retka Dipl.-Ing. Robert Machulec Dipl.-Ing. Andreas Petz Dipl. Ing. Marco Kullik
Report Template Version:	2013-03-14

1.2 Project Data

Responsible for testing and report:	Dipl. Ing. Dobrin Dobrinov
Date of Test(s):	2015-05-21 to 2015-05-26
Date of Report:	2016-10-26

1.3 Applicant Data

Company Name:	K.A. Schmersal GmbH & Co. KG
Address:	Möddinghofe 30 42279 Wuppertal Germany
Contact Person:	Mr. Frank Schmidt
Phone:	+49 (0)202 6474-767
Fax:	
E-Mail:	fschmidt@schmersal.com

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	Safety sensors
Type Designation:	RSS16-SD-ST8H RSS36-SD-ST RSS260-SD-ST
Kind of Device:	125 kHz RFID tag readers
Voltage Type:	DC
Voltage level:	24 V DC

General product description:

The RFID safety sensors are designed for applications in safety circuits and are used for monitoring the position of movable separating safety guards.

Specific product description for the EUT:

The EUTs are SRD RFID tag readers, operating in 125 kHz frequency range.

All the EUTs are using the same RFID module, built in three different corpuses.

The EUT provides the following ports:

Ports
- Enclosure
- DC in (24 V)

The main components of the EUT are listed and described in Chapter 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 (Code: DE1137001aa01)	Safety sensor	RSS16-SD-ST8H	103006685	"G"	1.5	-
Remark:	EUT A is equipped with an integral antenna.					
EUT B (Code: DE1137002aa01)	Safety sensor	RSS36-SD-ST	101214772	"F"	1.5	-
Remark:	EUT B is equipped with an integral antenna.					
EUT C (Code: DE1137003aa01)	Safety sensor	RSS260-SD-ST	103003605	"E"	1.5	-
Remark:	EUT C is equipped with an integral antenna.					

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	Serial No.	HW Status	SW Status	FCC ID
AE 1	tag	RST 36-1	101213820	IP 69K 2Z4		–

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
-	-	-	-	-	-	-

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, B or C + AE 1	EUT A, B or C reading the tag

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	continuous modulation	EUT is transmitting a periodic modulated signal, continuously reading tag information.

2.7 Special software used for testing

None.

2.8 Product labelling

2.8.1 FCC ID label

FCC ID: 2AFO9-RSS for RSS series

2.8.2 IC ID label

IC ID: 20745-RSS for RSS series

HVIN for RSS16: RSS16-SD-ST8H
HVIN for RSS36: RSS36-SD-ST
HVIN for RSS260: RSS260-SD-ST

2.8.3 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, Subpart C

The test was performed according to: ANSI C63.10

3.1.1. Test Description

The test set-up was made in accordance to the general provisions of ANSI C63.10 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.

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 µs
- 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° 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° 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

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

3.1.2. Test Requirements / Limits

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

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limit(dBµV/m @10m)
0.009 – 0.49	2400/F(kHz)	300	Limit (dBµV/m)+59.1dB
0.49 – 1.705	24000/F(kHz)	30	Limit (dBµV/m)+19.1dB
1.705 – 30	30	30	Limit (dBµV/m)+19.1dB

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limit (dBµV/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 (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

3.1.3. Test Protocol

Temperature: 23 °C
Air Pressure: 1009 hPa
Humidity: 38 %

3.1.1.1 Measurement up to 30 MHz

Op. Mode	Setup	Port
op-mode 1	Setup_01	Enclosure

Polari-sation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
–	–	–	–	–	–	–	–	–	–

Op. Mode	Setup	Port
op-mode 1	Setup_02	Enclosure

Polari-sation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
–	–	–	–	–	–	–	–	–	–

Remark: No relevant spurious emissions found, therefore step 2 was not performed.
Please see annex for the measurement plots.

3.1.2.1 Measurement above 30 MHz

Op. Mode	Setup	Port
op-mode 1	Setup_01	Enclosure

Polari-sation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
vertical	37.6	36.2	–	–	40.0	–	–	3.8	–
vertical	55.2	28.2	–	–	40.0	–	–	11.8	–
vertical	65.4	29.1	–	–	40.0	–	–	10.9	–
vertical	66.9	33.5	–	–	40.0	–	–	6.5	–
vertical	67.6	34.4	–	–	40.0	–	–	5.6	–
vertical	67.9	34.4	–	–	40.0	–	–	5.6	–
vertical	68.4	34.8	–	–	40.0	–	–	5.2	–
vertical	68.9	32.6	–	–	40.0	–	–	7.4	–
vertical	70.6	33.5	–	–	40.0	–	–	6.5	–

Remarks: - All the three test samples were tested to find the "worst case". The EUT A was found to have the highest emissions, therefore its results are filed in the table above.
- No further spurious emissions below the limit of 20 dB found.
- Please see annex for the measurement plots.

3.1.4. Test result: Spurious radiated emissions

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

3.2 Peak power output

Standard FCC Part 15, Subpart C

The test was performed according to: ANSI C63.10

3.2.1 Test Description

Please refer to sub-clause 3.1.1.

3.2.2 Test Limits

Please refer to sub-clause 3.1.2.

3.2.3 Test Protocol

Temperature: 22 °C
Air Pressure: 1015 hPa
Humidity: 33 %

Op. Mode	Setup	Port
op-mode 1	Setup_01	Enclosure

EUT	Output power dBµV/m	Frequency kHz	Limit dBµV/m at fundamental frequency for 10 m distance	Remarks
A	58.1	124.3	84.8	Maximum radiated field strength at fundamental frequency
B	47.5	124.5	84.8	Maximum radiated field strength at fundamental frequency
C	47.4	124.5	84.8	Maximum radiated field strength at fundamental frequency

Note: The EUTs transmitted a continuously modulated signal.

Remark: Please see annex for the measurement plots.

3.2.4 Test result: Peak power output

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

3.3 Occupied bandwidth

Standard FCC Part 15, Subpart C

The test was performed according to: ANSI C63.10

3.3.1. Test Description

The Equipment Under Test (EUT) was setup in a shielded room to perform the occupied bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The results recorded were measured with the modulation which produces the worst-case (widest) occupied bandwidth.

3.3.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.215 (c)
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. …

3.3.3 Test Protocol

Temperature: 23 °C
Air Pressure: 1015 hPa
Humidity: 33 %

Op. Mode	Setup	Port
op-mode 1	Setup_01	Enclosure
op-mode 1	Setup_02	Enclosure

EUT	20 dB bandwidth kHz	99% bandwidth kHz	Remarks
A	9.581	14.124457	The carrier is ASK modulated
B	9.609	13.285094	The carrier is ASK modulated
C	9.609	12.561505	The carrier is ASK modulated

Remark: Please see annex for the measurement plots.

3.3.4 Test result: Occupied bandwidth

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	Passed

4 Measurement uncertainty

Test Case	Parameter	Uncertainty
Peak power output	Power	± 4.5 dB
Occupied bandwidth	Power Frequency:	± 4.5 dB ± 0.125 kHz
Spurious radiated emissions	Power Frequency:	± 4.5 dB ± 11.2 kHz

5 Test equipment

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

Test Equipment Anechoic Chamber

Lab ID:	**Lab 2**		
Manufacturer:	Frankonia		
Description:	Anechoic Chamber for radiated testing		
Type:	10.58x6.38x6.00 m³		
	NSA (FCC)	2014/01/09	2017/01/09

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 m³ FCC listing 96716 3m Part15/18	none	Frankonia 2014/01/09	2017/01/08
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 Conducted emissions

Lab ID:	**Lab 1**
Manufacturer:	Rohde & Schwarz GmbH & Co.KG
Description:	EMI Conducted Auxiliary Equipment

Single Devices for Auxiliary Equipment for Conducted emissions

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber&Suhner	
Impedance Stabilization Network	ISN T800	36159	Teseq GmbH	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2014/02/06	2016/02/28
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ST08	36292	Teseq GmbH	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/01/10	2016/01/31
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN T8-Cat6	32187	Teseq GmbH	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2014/01/08	2016/01/31

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID:	**Lab 2**
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	AM 4.0	AM4.0/180/11920513	Maturo GmbH	
Antenna mast	AS 620 P	620/37	HD GmbH	
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2012/05/18	2015/05/17
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq	
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq	
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq	
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2+W38.01-2	Kabel Kusch	
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02-2+W38.02-2	Rosenberger Micro-Coax	
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2012/06/26	2015/06/25
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic	
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright	
Horn Antenna Schwarzbeck 15-26 GHz BBHA 9170	BBHA 9170			
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2012/12/18	2015/12/17
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG	
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2011/11/27	2017/11/27

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Pyramidal Horn Antenna 26,5 GHz	3160-09	00083069	EMCO Elektronik GmbH
Pyramidal Horn Antenna 40 GHz	3160-10	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 2, Lab 3**
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*	
Broadband Power Divider N (Aux)	1506A / 93459	LM390	Weinschel Associates	
Broadband Power Divider SMA	WA1515	A855	Weinschel Associates	
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.	
	Calibration Details		*Last Execution*	*Next Exec.*
	Customized calibration		2013/12/04	2015/12/03
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	
Signal Analyzer	FSV30	103005	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard		2014/02/10	2016/02/09
Spectrum Analyser	FSP3	836722/011	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard		2012/06/13	2015/06/12
Spectrum Analyser	FSU26	200418	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/07/29	2015/07/28
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG	

Test Equipment Radio Lab Test Equipment

Lab ID: **Lab 3**
Description: Radio Lab Test Equipment

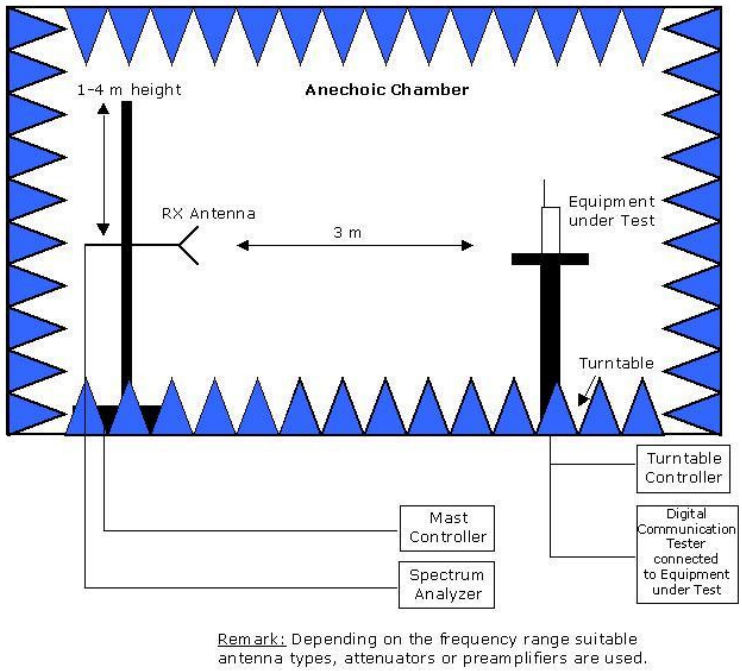
Single Devices for Radio Lab Test Equipment

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Broadband Power Divider SMA	WA1515	A856	Weinschel Associates	
Coax Attenuator 10dB SMA 2W	4T-10	F9401	Weinschel Associates	
Coax Attenuator 10dB SMA 2W	56-10	W3702	Weinschel Associates	
Coax Attenuator 10dB SMA 2W	56-10	W3711	Weinschel Associates	
Coax Cable Huber&Suhner	Sucotest 2,0m		Huber&Suhner	
Coax Cable Rosenberger Micro Coax FA210A0010003030 SMA/SMA 1,0m	FA210A0010003030	54491-2	Rosenberger Micro-Coax	
Signal Generator SME	SME03	827460/016	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/12/02	2017/12/01
Signal Generator SMP	SMP02	836402/008	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2013/05/06	2016/05/05
Signal Analyser	FSV30	103005	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2014/02/10	2016/02/09
Temperature Chamber Vötsch 03	VT 4002	58566002150010	Vötsch	
	Calibration Details		*Last Execution*	*Next Exec.*
	Customized calibration		2014/03/11	

6 Photo Report

Photos are included in an external report.

7 Setup Drawings



Drawing 1: Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.

8 FCC and IC Correlation of measurement requirements for General Radio Equipment from FCC and IC

General radio equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC Mains	§ 15.207	RSS-Gen Issue 4: 8.8
Transmitter spurious radiated emissions	§ 15.209	RSS-Gen Issue 4: 6.13/8.9/8.10; RSS-210 Issue 8: 2.5
Spurious radiated emissions below 490 kHz and restricted to emission level	§ 15.201, CFR47, Part 2, Subpart J; if all emissions ≤ 40 dB below the limit listed in §15.209	RSS-Gen Issue 4: 8.9/8.10; RSS-210 Issue 8: 2.5.1; RSS-310 Issue 3; if all emissions ≤ 40 dB below the limit listed in RSS-Gen
Wanted Emission (Carrier)	§ 15.209	RSS-210 Issue 8: 2.5.1 RSS-Gen Issue 4: 6.12, 8.9
Other requirements, e.g. Transmitter frequency stability	§15.215	RSS- Gen, Issue 4: 6.11/8.11
Antenna requirement	§ 15.203 / 15.204	RSS-Gen Issue 4: 8.3
Receiver spurious emissions	–	RSS-210 Issue 8: 2.3; RSS Gen Issue 4: 5/7 *)

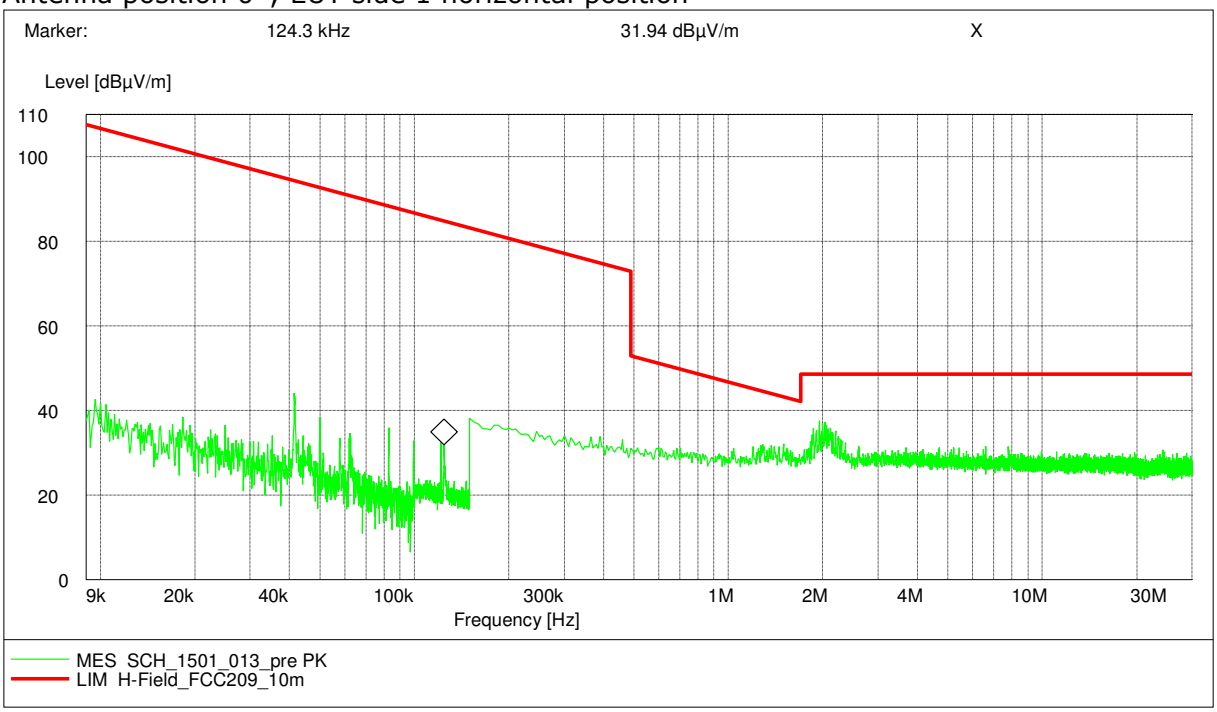
*) Receivers are exempted from certification besides if operating in stand-alone mode in the frequency range 30–960 MHz or if these are scanner receivers.

9 Annex measurement plots

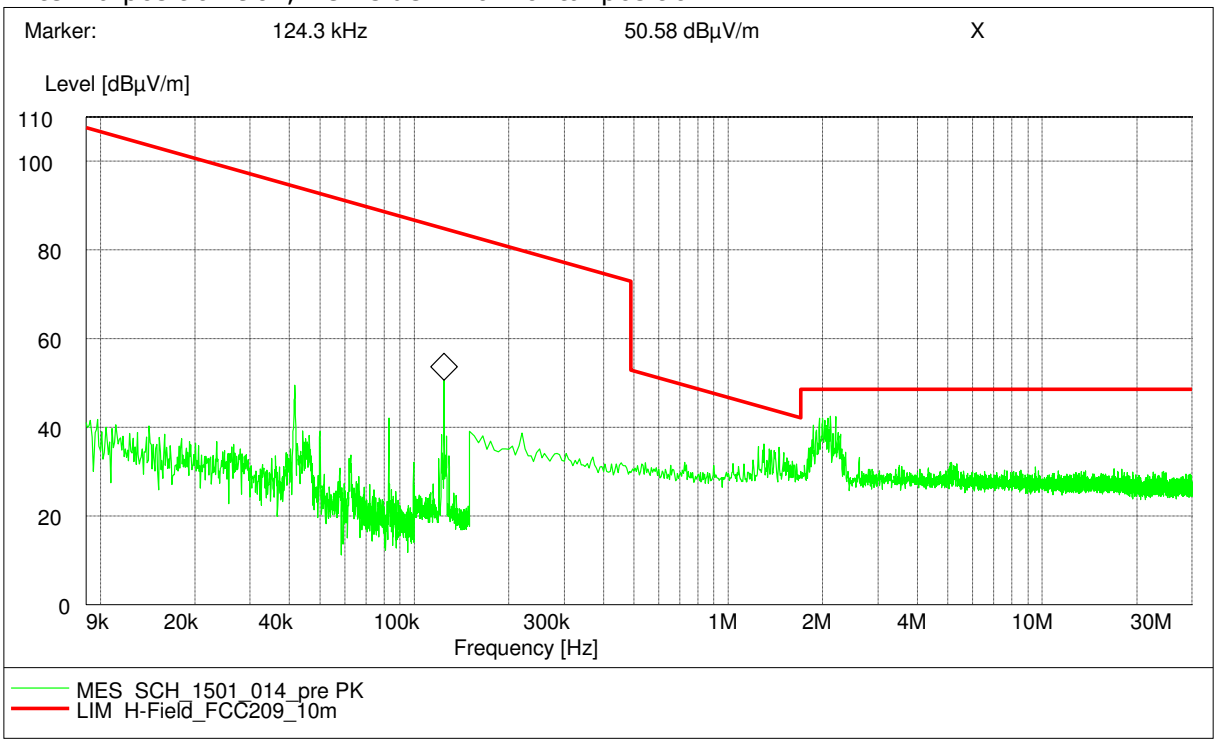
9.1 Radiated emissions and peak output power

9.1.1 Spurious radiated emissions up to 30 MHz – Op-Mode 1

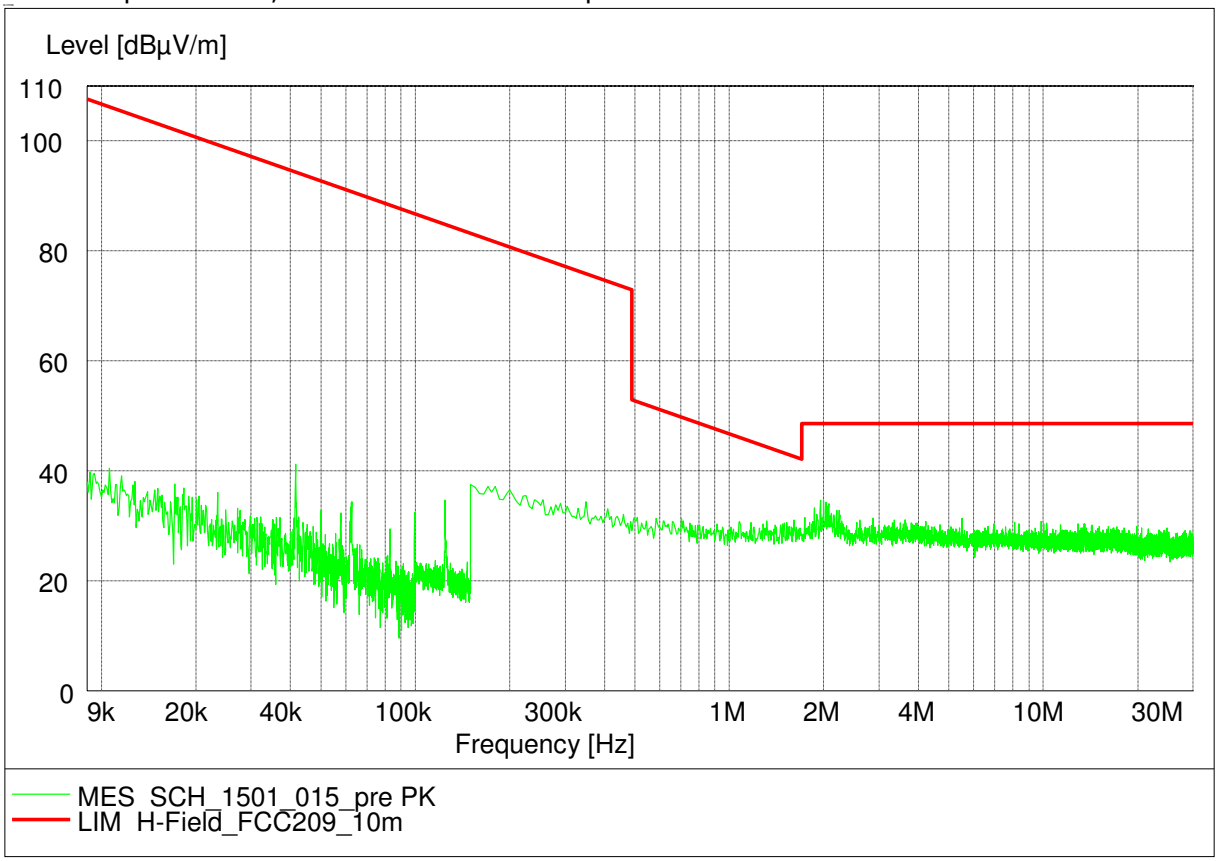
Antenna position 0°; EUT side 1 horizontal position



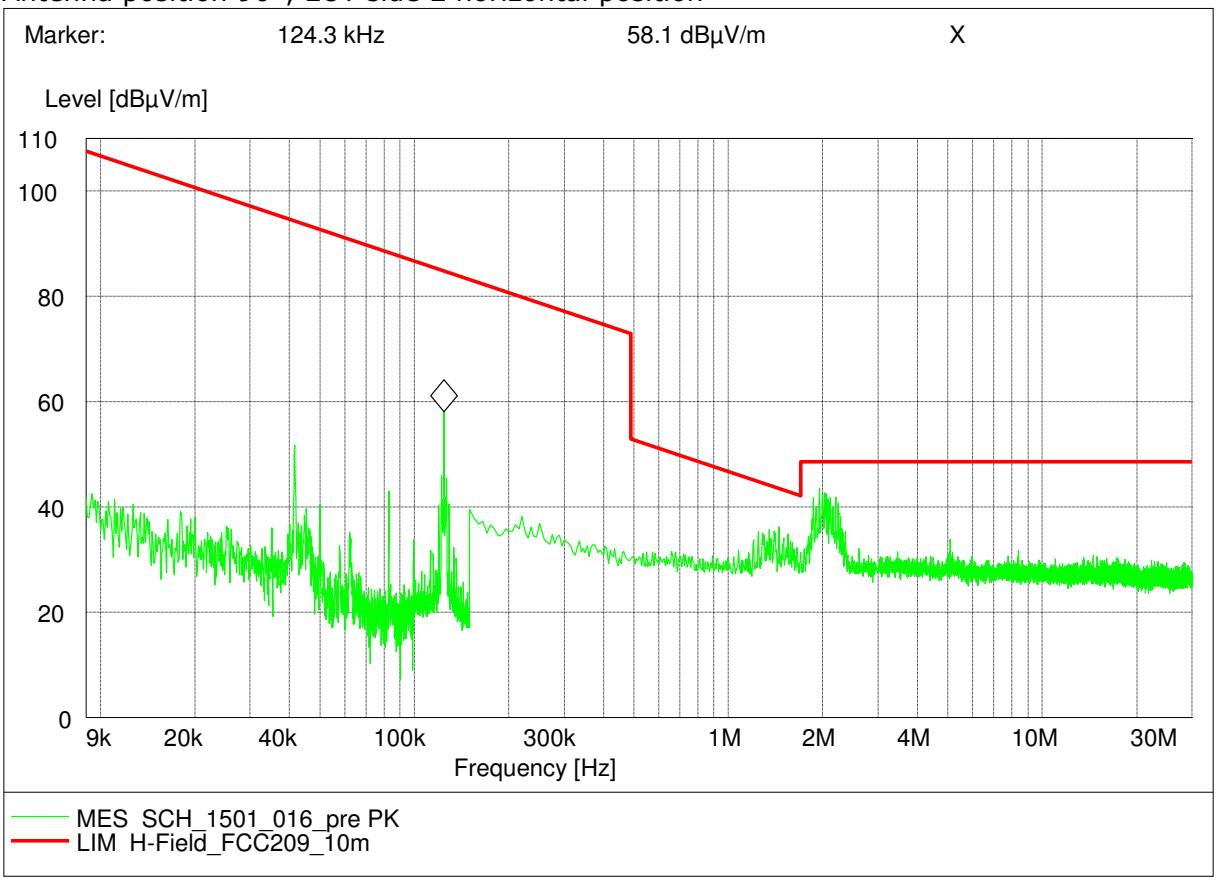
Antenna position 90°; EUT side 1 horizontal position



Antenna position 0°; EUT side 2 horizontal position



Antenna position 90°, EUT side 2 horizontal position



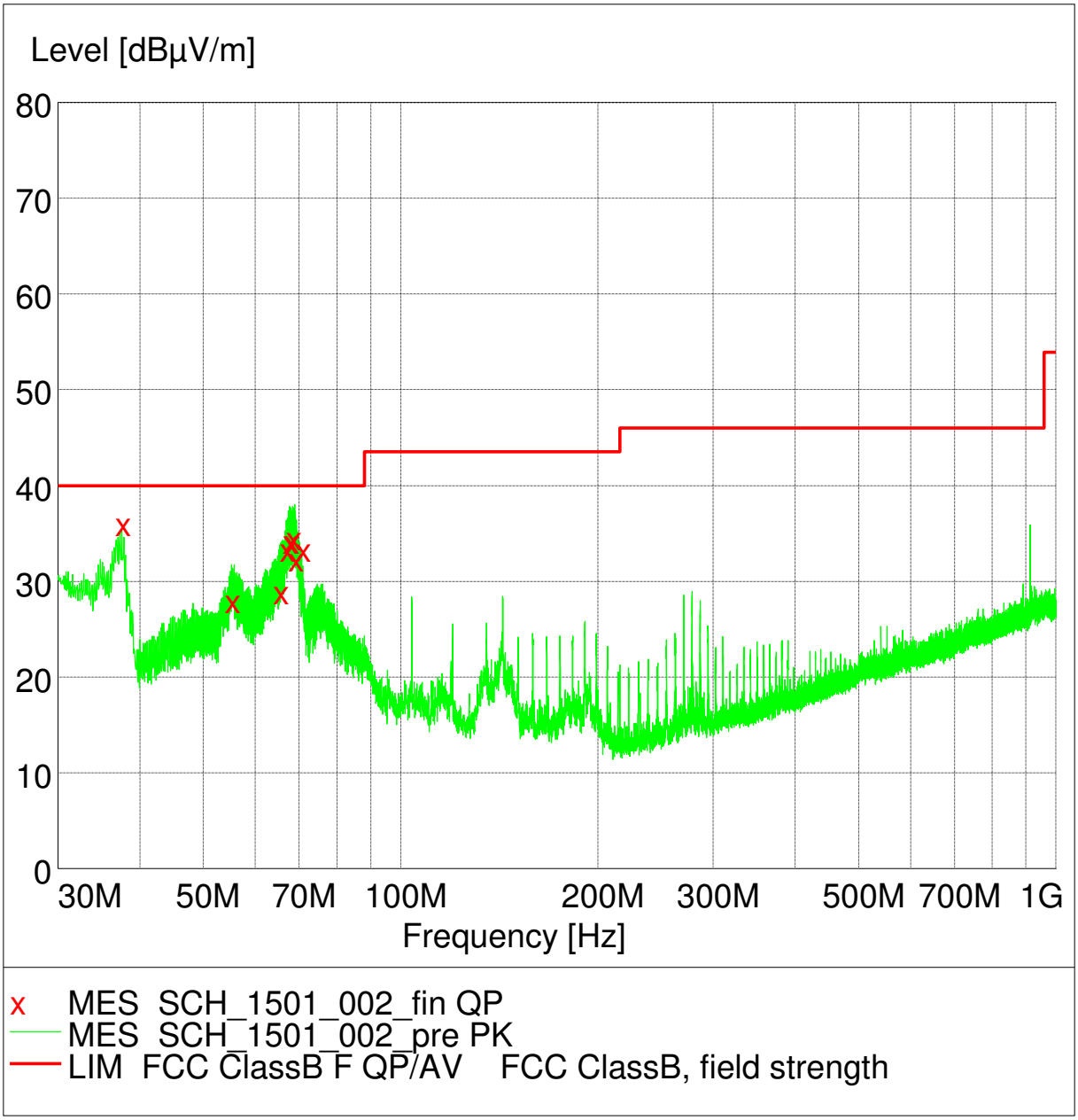
9.1.2 Spurious radiated emissions above 30 MHz – Op_Mode 1

EMI RADIATED TEST

```
EUT:                    (DE1137001aa01)
Manufacturer:
Operating Condition:    TX 125KHz; 120V/60Hz
Test Site:              7 layers, Ratingen
Test Specification:     FCC Part 15 C Class B
Comment:                Horizontal EUT position, Horizontal+Vertical antenna polaris
Start of Test:          21.05.2015 / 14:10:54
```

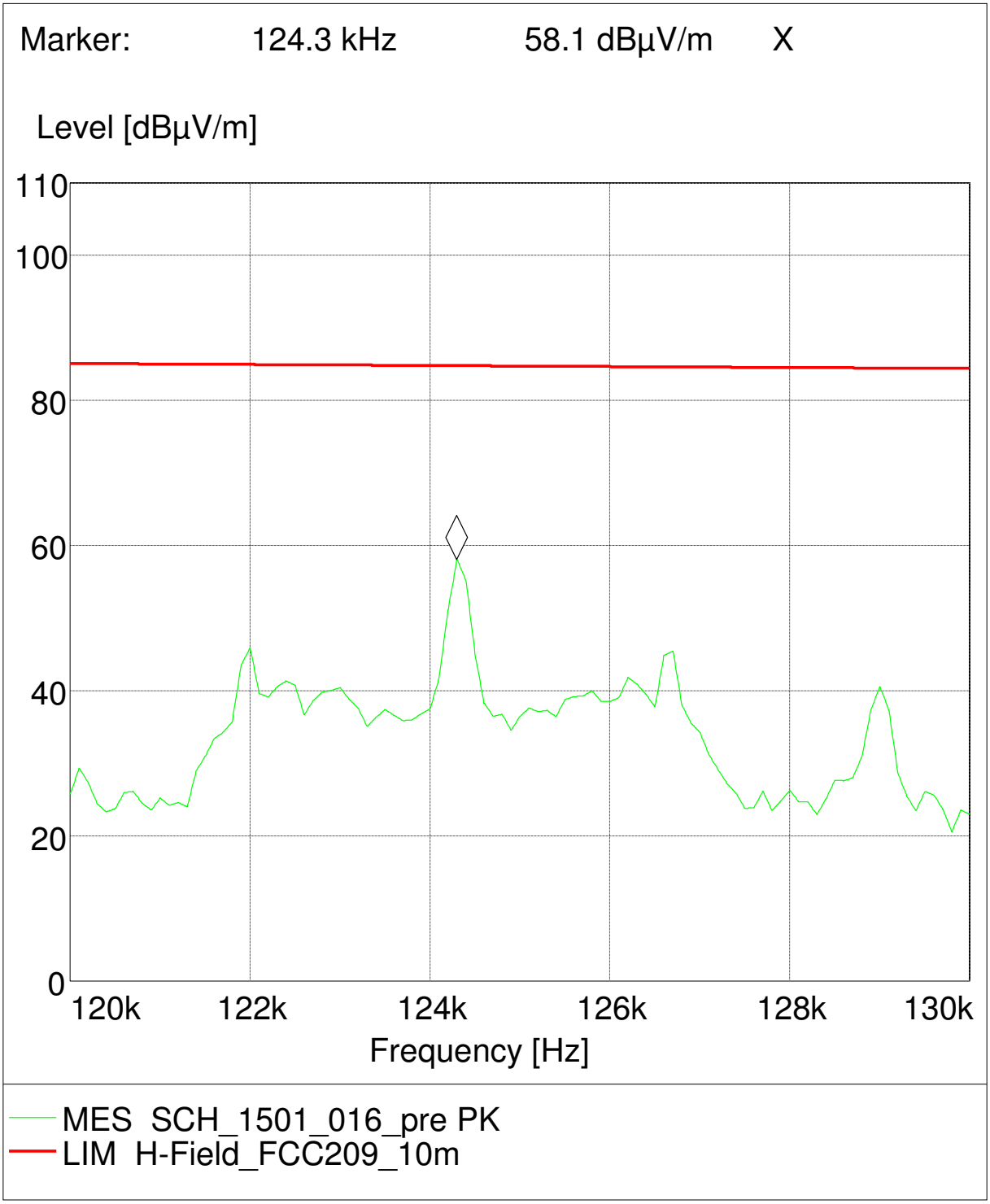
SCAN TABLE: "FCC part 15 c"

```
Short Description:              FCC part 15 b
  Start      Stop       Step       Detector  Meas.     IF       Transducer
  Frequency  Frequency  Width                Time      Bandw.
  30.0 MHz   1.0 GHz    60.0 kHz   MaxPeak   1.0 ms    120 kHz  HL562
```



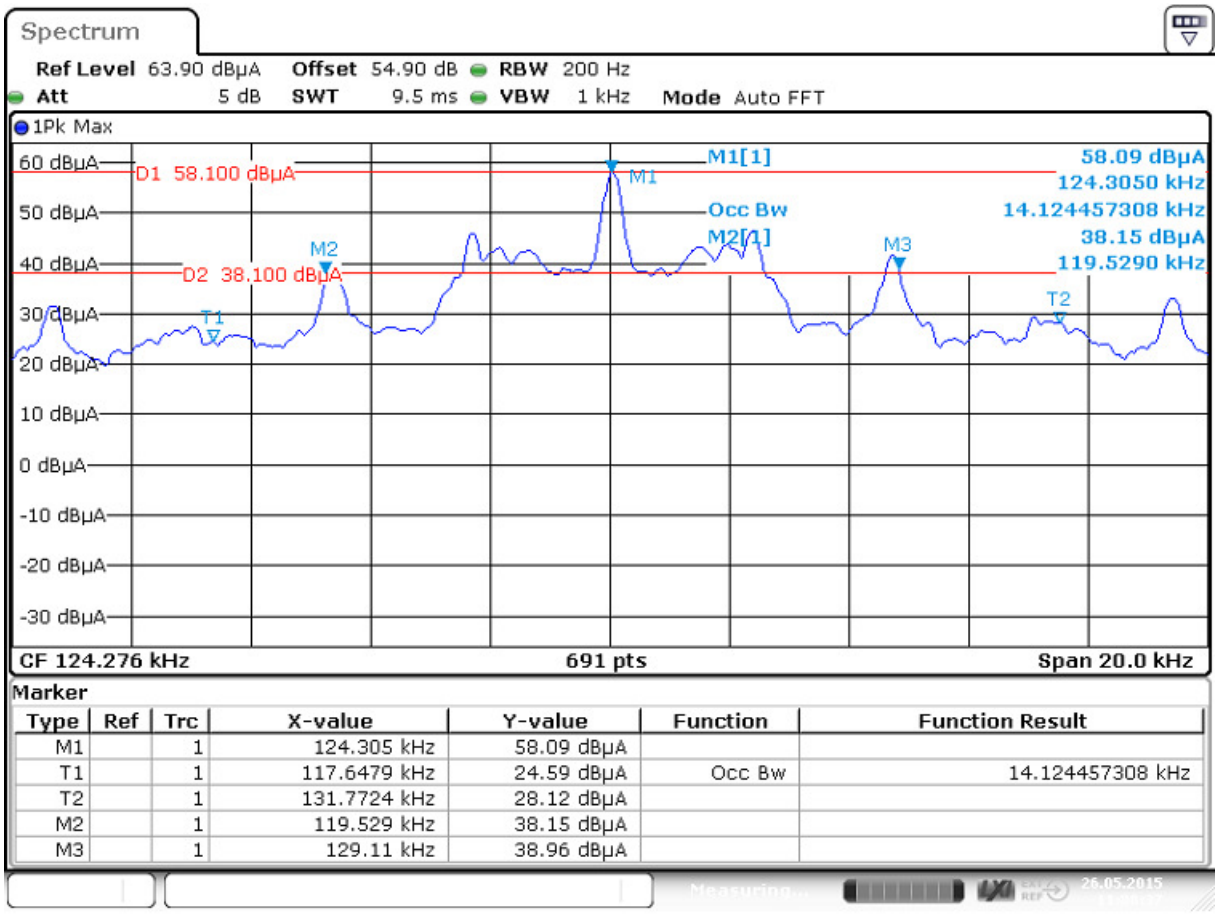
9.1.3 Peak output power

```
EUT:                    (DE1137001aa01)
Manufacturer:           SCHMERSAL
Operating Condition:    TX 125KHz; 24V DC
Test Site:              7 layers, Ratingen
Test Specification:     FCC 15.209
Comment:                Antenna position 90°
                        Side 2 horizontal EUT position
```



9.2 Occupied Bandwidth

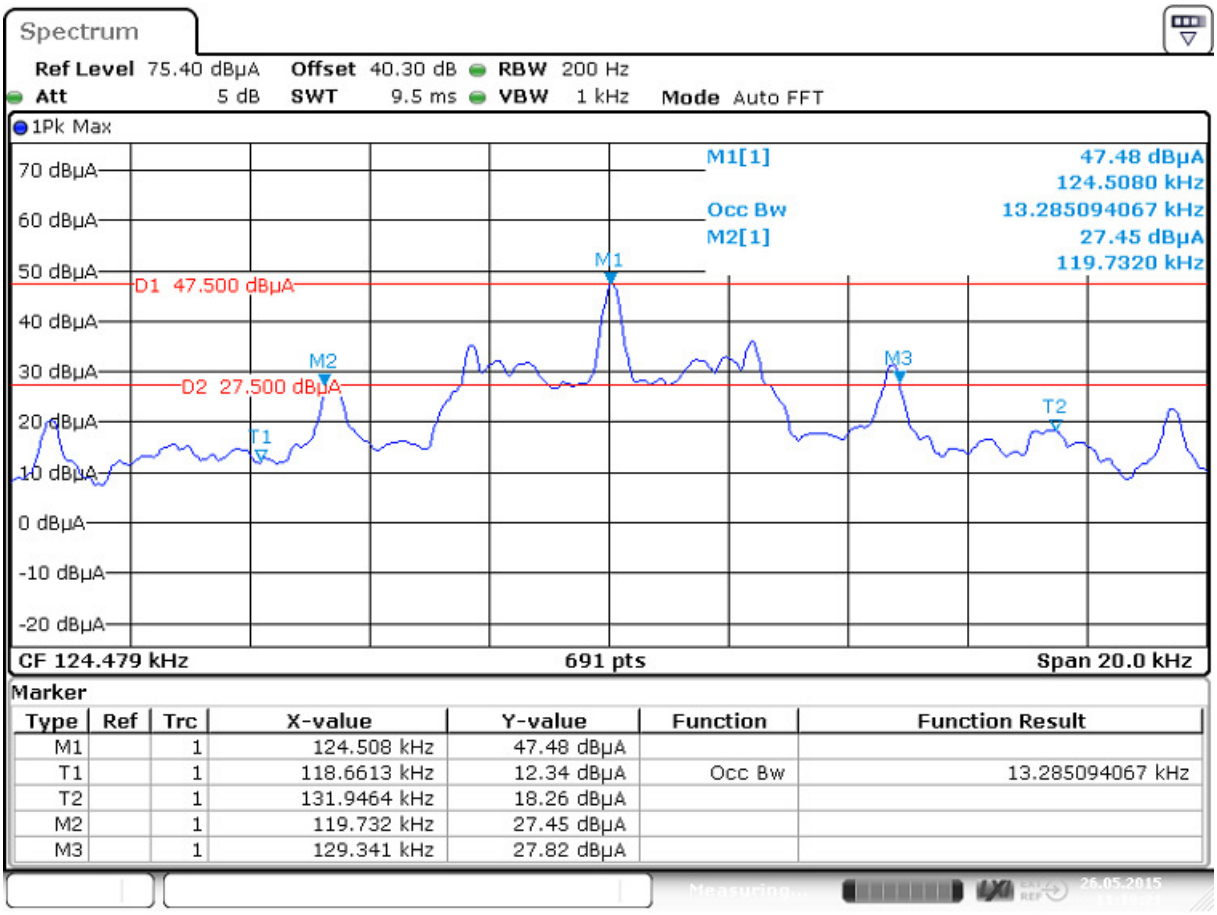
9.2.1 EUT A



Date:26.MAY.2015 11:08:37

Notes: 20 dB occupied bandwidth = 9.581 kHz (M3 – M2)
99% occupied power bandwidth = 14.124457 kHz (T2 –T1)

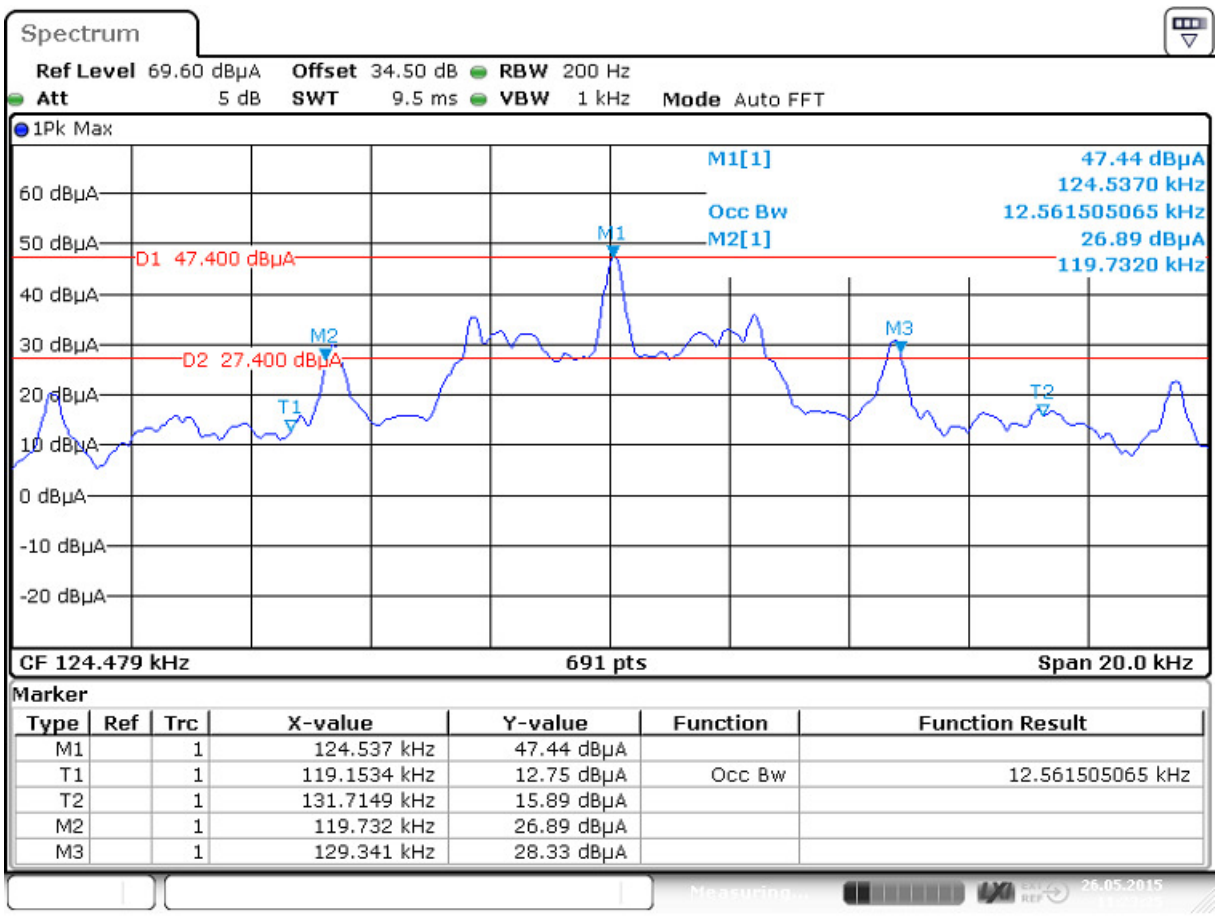
9.2.2 EUT B



Date:26.MAY.2015 11:19:20

Notes: 20 dB occupied bandwidth = 9.609 kHz (M3 – M2)
99% occupied power bandwidth = 13.285094 kHz (T2 –T1)

9.2.3 EUT C



Date:26MAY.2015 11:23:25

Notes: 20 dB occupied bandwidth = 9.609 kHz (M3 – M2)
99% occupied power bandwidth = 12.561505 kHz (T2 –T1)