



Inter**Lab**[®]

FCC Measurement/Technical Report on

Safety sensor

AZM300Z-ST-1P2P

RFID tag reader

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

Report Reference: MDE_SCHMER_1501_FCCb

Test Laboratory:

7layers GmbH
Borsigstrasse 11
40880 Ratingen
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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: 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 op-mode 1 | Setup Setup_01 | Port Enclosure | Final Result passed | | | |
| FCC Part 15, Subpart C | § 15.209 | | | | | |
| Peak Output Power | | | | | | |
| The measurement was performed according to ANSI C63.10 | | | | | | |
| OP-Mode op-mode 1 | Setup Setup_01 | Port Enclosure | Final Result passed | | | |
| FCC Part 15, Subpart C | § 15.207 | | | | | |
| Conducted Emissions AC Power line | | | | | | |
| 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 op-mode 1 | Setup Setup_01 | Port Enclosure | Final Result 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_FCCb | 2016-10-26 | This report relays to AZM safety sensors only. MDE_SCHMER_1501_FCCa_Rev.1 was used as a reference report. | valid |

Responsible for
Accreditation Scope: _____

Responsible
for Test Report: _____



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 sensor |
| Type Designation: | AZM300Z-ST-1P2P |
| Kind of Device: | 125 kHz RFID tag reader |
| 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 EUT is a SRD RFID tag reader, operating in 125 kHz frequency range.

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: DE1137000aa01) | Safety sensor | AZM300Z-ST 1P2P | 103001435 | "G" | 1.1 | - |
| Remark: | EUT A 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 | AZ/AZM300-B1 | 101218025 | M02 1A9 | - | - |

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 + AE 1 | EUT A 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-AZM

2.8.2 IC ID label

IC ID: 20745-AZM
HVIN: AZM300Z-ST 1P2P

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 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 $\pm 22.5^\circ$ 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

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 (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)+59.1dB |
| 0.49 – 1.705 | 24000/F(kHz) | 30 | Limit (dB μ V/m)+19.1dB |
| 1.705 – 30 | 30 | 30 | Limit (dB μ V/m)+19.1dB |

| 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 °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 |

| Polarisation | Frequency MHz | Corrected value dB μ V/m | | | Limit dB μ V/m | Limit dB μ V/m | Limit dB μ V/m | Delta to limit dB | Delta to limit dB |
|--------------|---------------|------------------------------|------|----|--------------------|--------------------|--------------------|-------------------|-------------------|
| | | 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 |

| Polarisation | Frequency MHz | Corrected value dB μ V/m | | | Limit dB μ V/m | Limit dB μ V/m | Limit dB μ V/m | Delta to limit dB | Delta to limit dB |
|--------------|---------------|------------------------------|------|----|--------------------|--------------------|--------------------|-------------------|-------------------|
| | | QP | Peak | AV | | | | | |
| vertical | 36.8 | 30.8 | - | - | 40.0 | - | - | 9.2 | - |
| vertical | 63.0 | 28.7 | - | - | 40.0 | - | - | 11.3 | - |
| vertical | 82.4 | 17.0 | - | - | 40.0 | - | - | 23.0 | - |
| vertical | 87.9 | 29.0 | - | - | 40.0 | - | - | 11.0 | - |
| vertical | 168.2 | 29.2 | - | - | 43.5 | - | - | 14.3 | - |
| vertical | 198.6 | 27.4 | - | - | 43.5 | - | - | 16.1 | - |
| vertical | 914.0 | 37.6 | - | - | 46.0 | - | - | 8.4 | - |

Remarks: The EUTs transmitted a continuously modulated signal.
 Please see annex for the measurement plot.

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 | |
| Output power dB μ V/m | Frequency kHz | Limit dB μ V/m at fundamental frequency for 10 m distance | Remarks |
| 57.6 | 124.5 | 84.8 | Maximum radiated field strength at fundamental frequency |

Note: The EUT 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 |
| 20 dB bandwidth kHz | 99% bandwidth kHz | Remarks |
| 9.551 | 12.156295 | 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 m ³ | | |
| | 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 m ³ 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

| <i>Single Device Name</i> | <i>Type</i> | <i>Serial Number</i> | <i>Manufacturer</i> | |
|--|---|--|----------------------------------|---|
| Antenna mast | AM 4.0 | AM4.0/180/119205 13 | Maturo GmbH | |
| Antenna mast | AS 620 P | 620/37 | HD GmbH | |
| Biconical dipole | VUBA 9117 <i>Calibration Details</i> Standard Calibration | 9117-108 | Schwarzbeck | <i>Last Execution</i> <i>Next Exec.</i> |
| | | | 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- Kabel Kusch 2 | | |
| Cable "ESI to Horn Antenna" | UFB311A+UFB293C | W18.02-2+W38.02- Rosenberger Micro-Coax 2 | | |
| Double-ridged horn | HF 906 | 357357/002 | Rohde & Schwarz GmbH & Co. KG | <i>Last Execution</i> <i>Next Exec.</i> |
| | <i>Calibration Details</i> 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 | <i>Last Execution</i> <i>Next Exec.</i> |
| | <i>Calibration Details</i> 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 | <i>Last Execution</i> <i>Next Exec.</i> |
| | <i>Calibration Details</i> 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. |
| | <i>Calibration Details</i> | | <i>Last Execution</i> <i>Next Exec.</i> |
| | 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 |
| | <i>Calibration Details</i> | | <i>Last Execution</i> <i>Next Exec.</i> |
| | Standard | | 2014/02/10 2016/02/09 |
| Spectrum Analyser | FSP3 | 836722/011 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution</i> <i>Next Exec.</i> |
| | Standard | | 2012/06/13 2015/06/12 |
| Spectrum Analyser | FSU26 | 200418 | Rohde & Schwarz GmbH & Co. KG |
| | <i>Calibration Details</i> | | <i>Last Execution</i> <i>Next Exec.</i> |
| | Standard calibration | | 2014/07/29 2015/07/28 |
| Vector Signal Generator | SMIQ 03B | 832492/061 | Rohde & Schwarz GmbH & Co. KG |



2016/03/10

Test Equipment Radio Lab Test Equipment

Lab ID: Lab 3
Description: Radio Lab Test Equipment

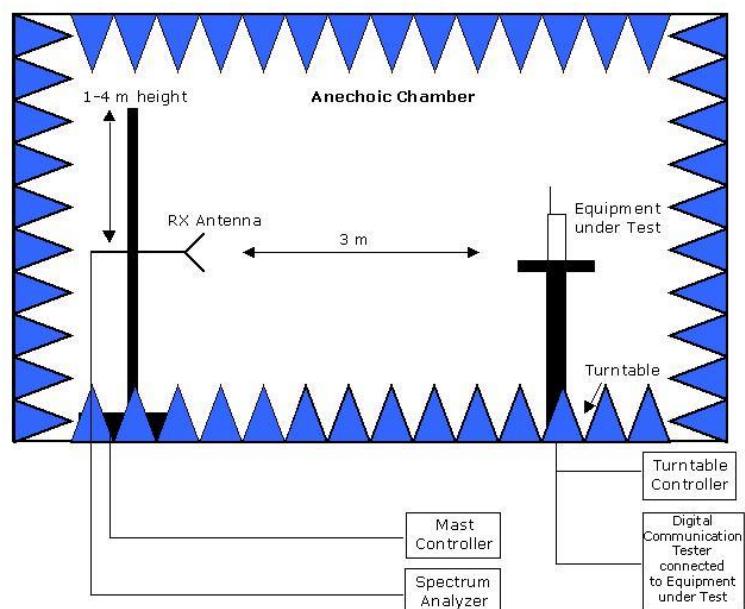
Single Devices for Radio Lab Test Equipment

| <u>Single Device Name</u> | <u>Type</u> | <u>Serial Number</u> | <u>Manufacturer</u> |
|--|----------------------------|----------------------|---|
| 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 FA210A0010003030 Micro Coax FA210A0010003030 SMA/SMA 1,0m | | 54491-2 | Rosenberger Micro-Coax |
| Signal Generator SME | SME03 | 827460/016 | Rohde & Schwarz GmbH & Co.KG |
| | <u>Calibration Details</u> | | <u>Last Execution</u> <u>Next Exec.</u> |
| | Standard calibration | | 2014/12/02 2017/12/01 |
| Signal Generator SMP | SMP02 | 836402/008 | Rohde & Schwarz GmbH & Co. KG |
| | <u>Calibration Details</u> | | <u>Last Execution</u> <u>Next Exec.</u> |
| | Standard calibration | | 2013/05/06 2016/05/05 |
| Signal Analyser | FSV30 | 103005 | Rohde & Schwarz GmbH & Co. KG |
| | <u>Calibration Details</u> | | <u>Last Execution</u> <u>Next Exec.</u> |
| | Standard Calibration | | 2014/02/10 2016/02/09 |
| Temperature Chamber Vötsch 03 | VT 4002 | 58566002150010 | Vötsch |
| | <u>Calibration Details</u> | | <u>Last Execution</u> <u>Next Exec.</u> |
| | Customized calibration | | 2014/03/11 |

6 Photo Report

Photos are included in an external report.

7 Setup Drawings



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

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 *) |

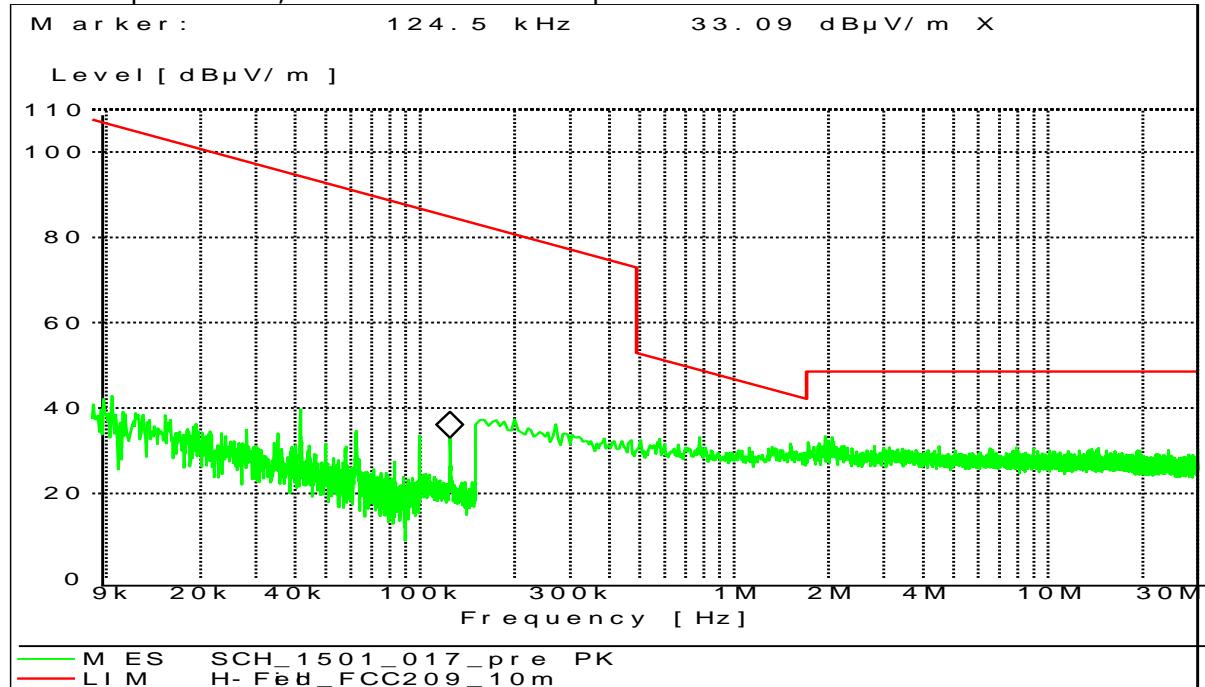
*) Receivers are exempted from certification besides if operating in stand-alone mode in the frequency range 30–960 MHz or if these are scanner receivers.

9 Annex measurement plots

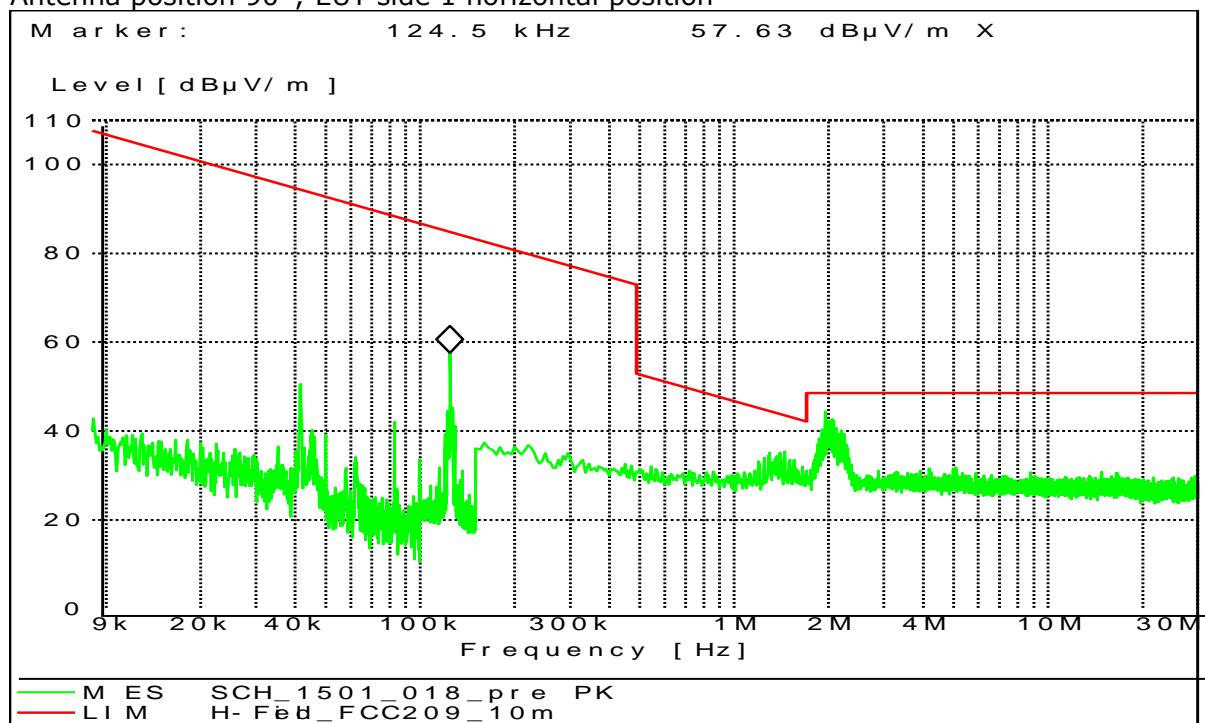
9.1 Radiated emissions and peak output power

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

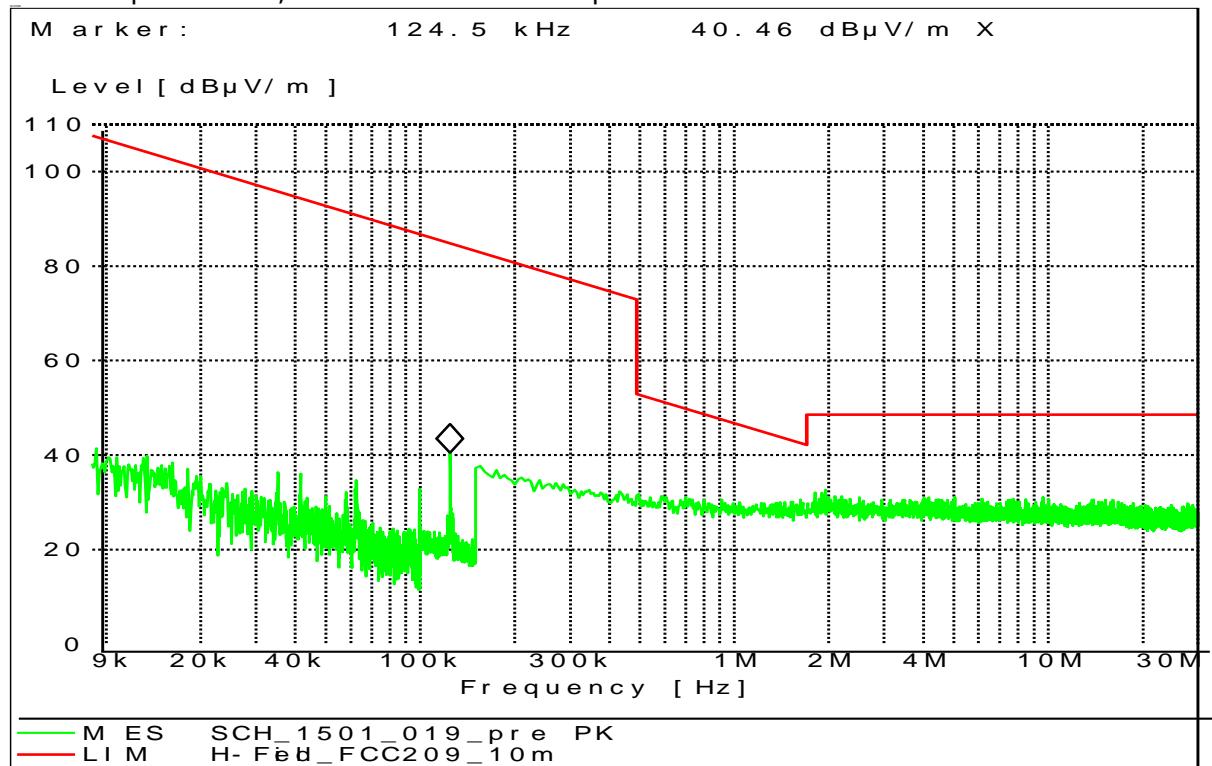
Antenna position 0°; EUT side 1 horizontal position



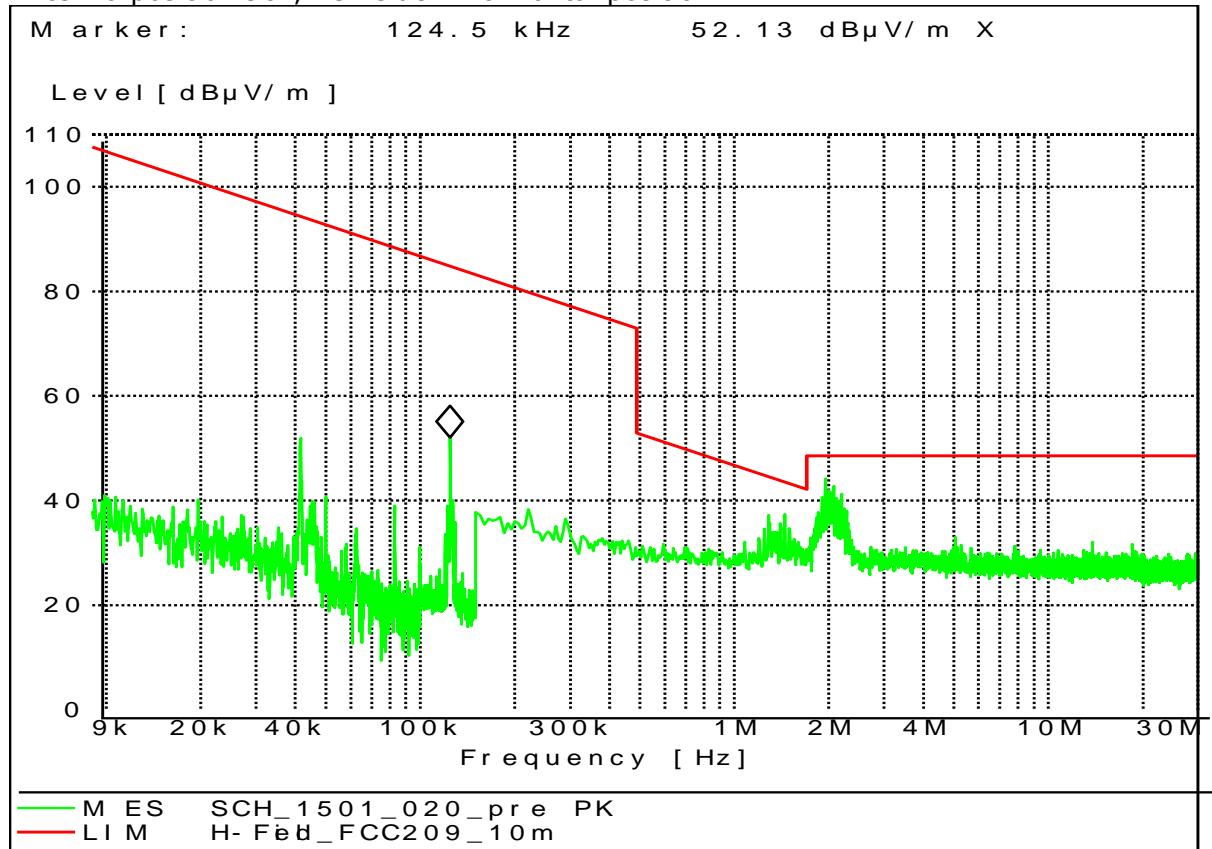
Antenna position 90°; EUT side 1 horizontal position



Antenna position 0°; EUT side 2 horizontal position



Antenna position 90°, EUT side 2 horizontal position



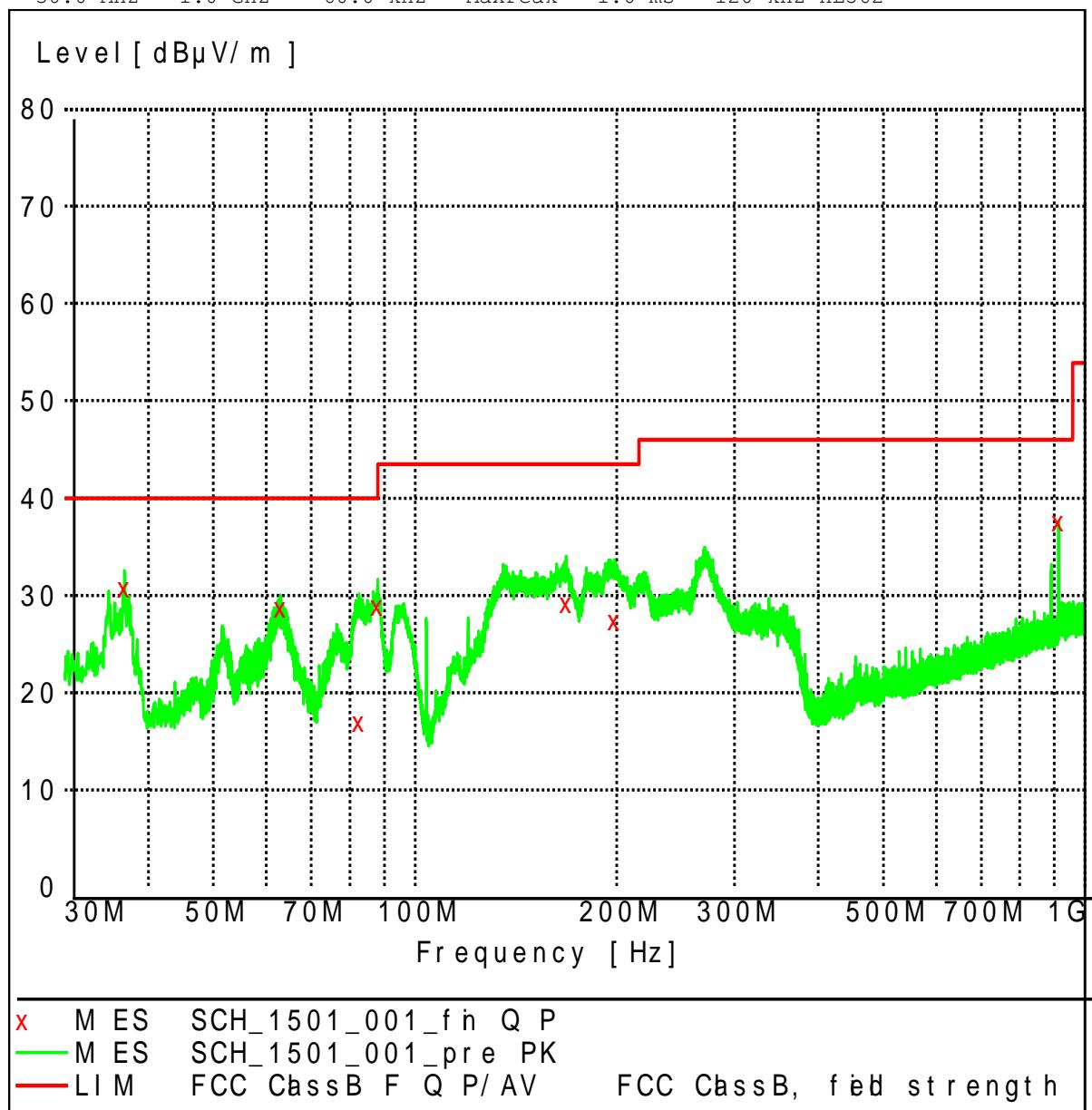
9.1.2 Spurious radiated emissions above 30 MHz – Op_Mode 1

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

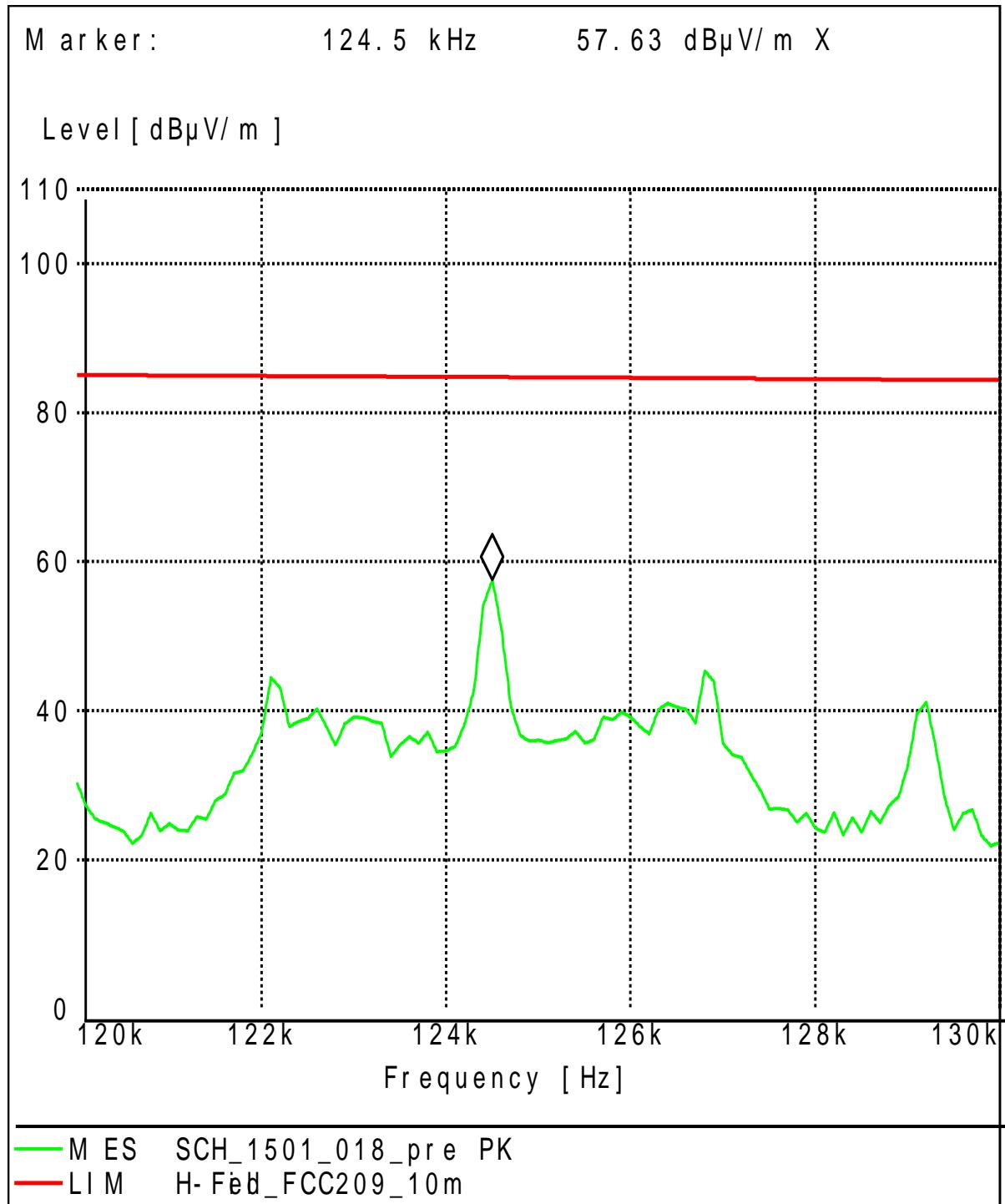
SCAN TABLE: "FCC part 15 c"

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



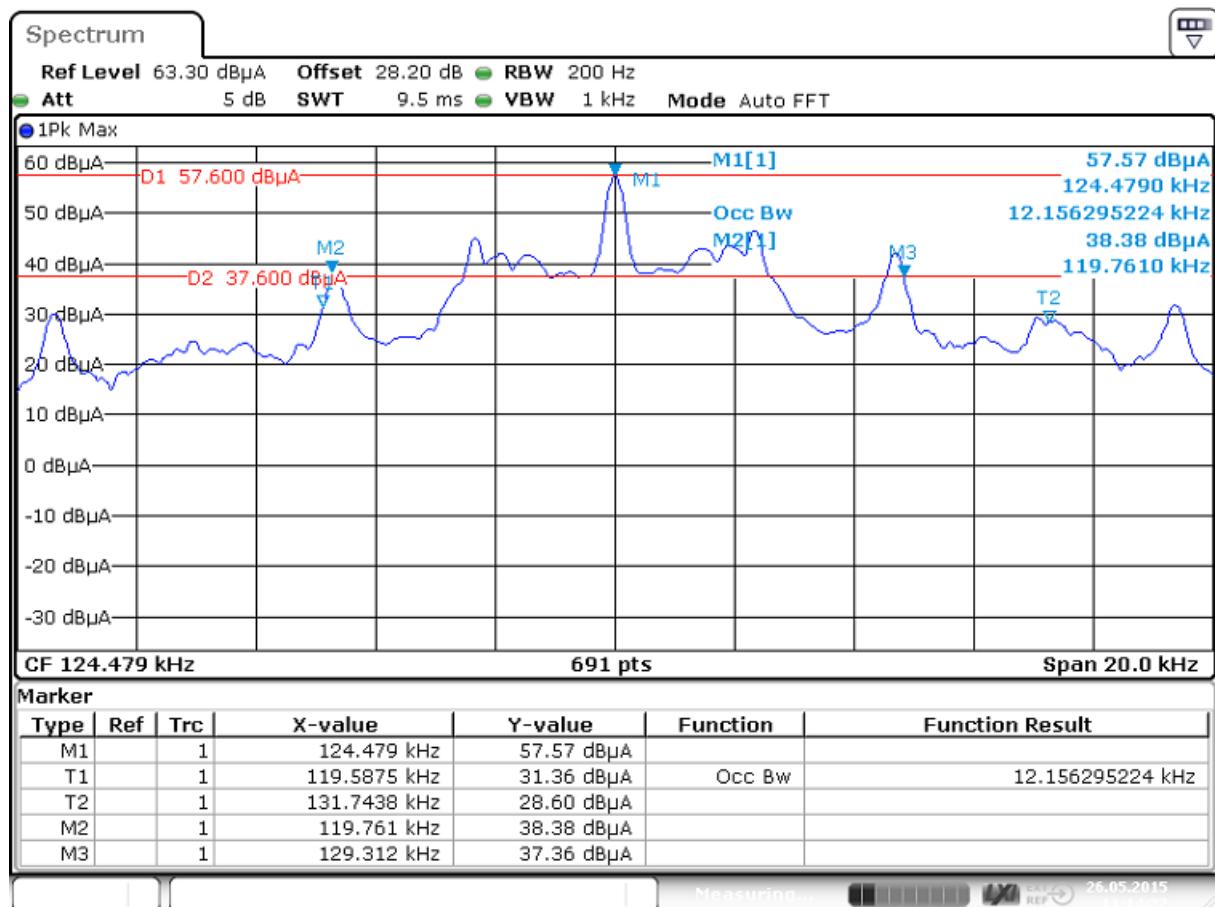
9.1.3 Peak output power

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

9.1.2 EUT A



Date: 26 MAY 2015 11:14:22

Notes: 20 dB occupied bandwidth = 9.551 kHz (M3 - M2)

99% occupied power bandwidth = 12.156295 kHz (T2 - T1)