



Inter**Lab**<sup>®</sup>

FCC Measurement/Technical Report on

BMW CSM 3.0 ECE

Car Sharing Main module  
61 35 9 363 068-01 (BMW)  
2515-057-001-51 (peiker)

RFID card reader

**Report Reference:** MDE\_PEIKER\_1219\_FCCb\_rev.4

**Test Laboratory:**

7Layers AG  
Borsigstrasse 11  
40880 Ratingen  
Germany



**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.

7 layers AG  
Borsigstrasse 11  
40880 Ratingen, Germany  
Phone: +49 (0) 2102 749 0  
Fax: +49 (0) 2102 749 350  
[www.7Layers.com](http://www.7Layers.com)

Aufsichtsratsvorsitzender •  
Chairman of the Supervisory Board:  
Peter Mertel  
Vorstand • Board:  
Dr. H. Ansorge

Registergericht • registered in:  
Düsseldorf, HRB 44096  
USt-IdNr • VAT No.:  
DE 203159652  
TAX No. 147/5869/0385  
A Bureau Veritas Group Company



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## 0 Summary

### 0.1 Technical Report Summary

#### Type of Authorization

Certification for an intentional radiator: 125 kHz RFID card reader

#### Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-13 Edition) and 15 (10-1-13 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:

None

#### 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 C63.4			2009
<b>OP-Mode</b>	<b>Setup</b>	<b>Port</b>	<b>Final Result</b>
op-mode 1	Setup_01	Enclosure	passed
FCC Part 15, Subpart C	§ 15.209		
Peak Output Power			
The measurement was performed according to ANSI C63.4			2009
<b>OP-Mode</b>	<b>Setup</b>	<b>Port</b>	<b>Final Result</b>
op-mode 1	Setup_01	Enclosure	passed
FCC Part 15, Subpart C	§ 15.207		
Conducted Emissions AC Power line			N/A <sup>(1)</sup>
The measurement shall be performed according to ANSI C63.4			2009
<b>OP-Mode</b>	<b>Setup</b>	<b>Port</b>	<b>Final Result</b>
-	-	-	-
FCC Part 15, Subpart C	§ 15.215		
Occupied Bandwidth			
The measurement was performed according to FCC § 2.1049			10-1-13
<b>OP-Mode</b>	<b>Setup</b>	<b>Port</b>	<b>Final Result</b>
op-mode 1	Setup_01	Enclosure	passed

### Notes:

N/A = Not applicable

(1) The EUT is DC powered by lead-acid vehicles battery

## 0.3 Report revision

Report version control			
Version	Release date	Changes	Version validity
rev.1	04.08.2014	Section 0.1. of the initial version	not valid
		Section 2.12.3. of the initial version	
rev.2	25.11.2014	Type of Authorization specified	not valid
		Op. Mode in the table corrected	
rev.3	09.12.2014	Section 6: FCC and IC Correlation of measurement requirements table updated	not valid
rev.4	03.02.2015	Section 6: FCC and IC Correlation of measurement requirements table updated	valid

Responsible for Accreditation Scope:



Responsible for Test Report:





## 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  
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): 2014-04-28 to 2014-07-27  
Date of Report: 2014-02-03

### 1.3 Applicant Data

Company Name: peiker acoustic GmbH & Co. KG  
Address: Max-Planck-Strasse 28-32  
61381 Friedrichsdorf/Ts  
Germany  
Contact Person: Mr. Stefan Hofmann  
Phone: +49 6172-767 220  
Fax:  
E-Mail: stefan.hofmann@peiker.de

### 1.4 Manufacturer Data

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



## 2 Test object Data

### 2.1 General EUT Description

<b>Equipment under Test</b>	BMW CSM 3.0 ECE
<b>Type Designation:</b>	Car Sharing Main module
<b>Kind of Device:</b>	125 kHz RFID card reader
<b>Voltage Type:</b>	DC from vehicle lead-acid battery
<b>Voltage level:</b>	12 V DC

#### General product description:

The BMW CSM 3.0 ECE Main module is a part of the BMW CSM 3.0 Car Sharing module. It comprises GSM/UMTS and BT communication modules, NFC and RFID card readers built in the Main module and NFC card reader built in the external module as well.

#### Specific product description for the EUT:

The object of this test report is the RFID card reader built in the external module, operating in 125 kHz frequency range.

#### The EUT provides the following ports:

##### Ports

- Enclosure
- DC in (12 V)
- CAN bus interface (to the Body CAN of the vehicle)
- LIN bus (communication to the AE module of the CSM)
- High speed USB (for communication to the HeadUnit)
- BT A2D or HFP (for communication to the Head Unit)
- GSM/UMTS connector for external antenna
- SIM card (voice/data) tray

**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 (Code: BI340x04)	Car Sharing Main module	Car Sharing Main module 61 35 9 363 068-01 (BMW) 2515-057-001-51 (peiker)	-	D1-AI02	4.22 V1.0 - V1.1	-

Remark: EUT A is equipped with an integral antenna (gain = 2.15 dBi).

**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	LIN-Gateway for CSM test setup	peiker; CSM3.0 PCB C1;	E229342	-	V-06	-

## 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
AUX 1	RFID test Tag	-	UID: 4BEAA7E	-	-	-
AUX 2	Laptop	Fujitsu-Siemens E-Lifebook	S/N: DSCK 013817	E 781	Win 7 Pro	-
AUX 3	Laptop AC adapter	Fujitsu-Siemens SED100P2-19.0	S/N: 07Y17323A	-	-	-



## 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 + AUX1 - 3 + AE 1	EUT reading a tag (representative setup for radiated measurements in normal and extreme conditions)

## 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 periodic modulated signal and is continuously reading TAG information.

## 2.7 Special software used for testing

None.

## 2.8 Product labelling

### 2.8.1 FCC ID label

QWY-CSM3-MM-US

### 2.8.2 IC ID label

6588A-CSM3MMUS

### 2.8.3 Location of the label on the EUT

Please refer to the documentation of the applicant.

## 2.9 Test Results

### 2.10 Spurious radiated emissions

**Standard** FCC Part 15, Subpart C

**The test was performed according to:** ANSI C63.4

#### 2.10.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C63.4 in a typical installation configuration. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m<sup>2</sup> 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  $\mu$ 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° 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. Measurement above 1 GHz**

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:

The Equipment Under Test (EUT) was set up on a non-conductive support at 1.4 m height in the fully-anechoic chamber. The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear distance for field strength measurements, inverse linear-distance squared for the power reference level measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18-25 GHz) are used, the steps 2-4 are omitted. Step 1 was performed with one height of the receiving antenna only.

EMI receiver settings:

- Detector: Peak, Average
- IF Bandwidth = 1 MHz

#### **2.10.2 Test Requirements / Limits**

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

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

Frequency in MHz	Limit ( $\mu$ V/m)	Measurement distance (m)	Limit (dB $\mu$ 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 $\mu$ V/m) = 20 log (Limit ( $\mu$ V/m)/1 $\mu$ V/m)

### 2.10.3 Test Protocol

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

#### 2.10.3.1 Measurement up to 30 MHz

Op. Mode	Setup	Port						
op-mode 1	Setup_01	Enclosure and Loop antenna						
Polarisation	Frequency MHz	Corrected value dB $\mu$ V/m						
		QP	Peak	AV	QP	Peak	AV	QP/Peak
-	-	-	-	-	-	-	-	-

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

#### 2.10.3.2 Measurement above 30 MHz

Op. Mode	Setup	Port							
op-mode 1	Setup_01	Enclosure							
Polarisation	Frequency MHz	Corrected value dB $\mu$ V/m							
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
vertical	48.000	33.6	-	-	40.0	-	-	6.4	-
vertical	119.940	36.4	-	-	43.5	-	-	7.1	-
vertical	143.940	36.5	-	-	43.5	-	-	7.0	-
vertical	167.940	38.7	-	-	43.5	-	-	4.8	-
vertical	191.940	35.4	-	-	43.5	-	-	8.1	-
vertical	215.880	37.6	-	-	43.5	-	-	5.9	-
vertical	332.040	38.8	-	-	46.0	-	-	7.2	-
vertical	517.800	39.8	-	-	46.0	-	-	6.2	-
vertical	519.300	36.4	-	-	46.0	-	-	9.6	-
vertical	519.660	39.5	-	-	46.0	-	-	6.5	-

Remark: No further spurious emissions below the limit of 20 dB found.  
 Please see annex for the measurement plots.

#### 2.10.4 Test result: Spurious radiated emissions

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



## 2.11 Peak power output

**Standard** FCC Part 15, Subpart C

**The test was performed according to:** FCC §15.209, ANSI C63.4

### 2.11.1 Test Description

Please refer to sub-clause 2.10.1.

### 2.11.2 Test Limits

Please refer to sub-clause 2.10.2.

### 2.11.3 Test Protocol

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

Op. Mode	Setup	Port	
op-mode 1	Setup_01	Enclosure	
Output power dB $\mu$ V/m	Frequency kHz	Limit dB $\mu$ V/m at fundamental frequency for 10 m distance	Remarks
52.05	124.6	84.8	Maximum radiated field strength at fundamental frequency

Note: The EUT transmitted continuously modulated signal.

Remark: Please see annex for the measurement plots.

### 2.11.4 Test result: Peak power output

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



## 2.12 Occupied bandwidth

**Standard** FCC Part 15, 10-1-12 Edition Subpart C

**The test was performed according to:** FCC §15.31

### 2.12.1 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.

### 2.12.2 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. ...

### 2.12.3 Test Protocol

Temperature: 23 °C

Air Pressure: 1015 hPa

Humidity: 33 %

Op. Mode	Setup	Port
op-mode 1	Setup_01	Enclosure and Loop antenna
20 dB bandwidth kHz	99% bandwidth kHz	Remarks
50.601	81.162	The carrier is an ASK modulated transmitter

Remark: Please see annex for the measurement plots.

### 2.12.4 Test result: Occupied bandwidth

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

### 3 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 <sup>3</sup>	2014/01/09	2017/01/09
							NSA (FCC)		

#### 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 <sup>3</sup> 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
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2014/02/06 2016/02/28
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ENY41	100002	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2013/03/01 2015/03/31
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ST08	36292	Teseq GmbH
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2014/01/10 2016/01/31
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN T8-Cat6	32187	Teseq GmbH
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2014/01/08 2016/01/31



### Single Devices for Auxiliary Equipment for Conducted emissions (continued)

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>	
One-Line V-Network	ESH 3-Z6	100489	Rohde & Schwarz GmbH & Co. KG	
One-Line V-Network	ESH 3-Z6	100570	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2013/11/25	2016/11/24
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standart Calibration		2013/03/01	2015/02/28
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2013/03/01	2015/02/28



## Test Equipment Auxiliary Equipment for Radiated emissions

**Lab ID:**

Description:

Serial Number:

**Lab 2**

Equipment for emission measurements

see single devices

### Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	Type	Serial Number	Manufacturer
Antenna mast	AM 4.0	AM4.0/180/119205 13	Maturo GmbH
Antenna mast	AS 620 P	620/37	HD GmbH
Biconical Broadband Antenna	SBA 9119	9119-005	Schwarzbeck
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2009/06/04 2014/06/03
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2012/01/18 2015/01/17
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	357357/001	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2012/05/18 2015/05/17
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		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>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</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>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2011/10/27 2014/10/26



## 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 Divider1506A / 93459 N (Aux)		LM390	Weinschel Associates
Broadband Power DividerWA1515 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>
	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		2013/07/29   2014/07/28
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG



## Test Equipment Radio Lab Test Equipment

**Lab ID:**

Description:

**Lab 3**

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	FA210A0010003030	54491-2	Rosenberger Micro-Coax
	SMA/SMA 1,0m		
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2013/05/03 2014/05/02
RF Step Attenuator RSP	RSP	833695/001	Rohde & Schwarz GmbH & Co.KG
Rubidium Frequency Standard	Datum, Model: MFS	5489/001	Datum-Beverly
	Standard calibration		2013/06/24 2014/06/23
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2013/04/30 2014/04/29
Signal Generator SME	SME03	827460/016	Rohde & Schwarz GmbH & Co.KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2011/11/25 2014/11/24
Signal Generator SMP	SMP02	836402/008	Rohde & Schwarz GmbH & Co.KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2013/05/06 2016/05/05
Spectrum Analyser	FSIQ26	840061/005	Rohde & Schwarz GmbH & Co.KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2013/02/12 2015/02/11
Temperature Chamber Vötsch 03	VT 4002	58566002150010	Vötsch
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Customized calibration		2012/03/12 2014/03/11
	Customized calibration		2014/03/11 2016/03/10



### Test Equipment Temperature Chamber 01

**Lab ID:** Lab 4  
**Manufacturer:** see single devices  
**Description:** Temperature Chamber KWP 120/70  
**Type:** Weiss  
**Serial Number:** see single devices

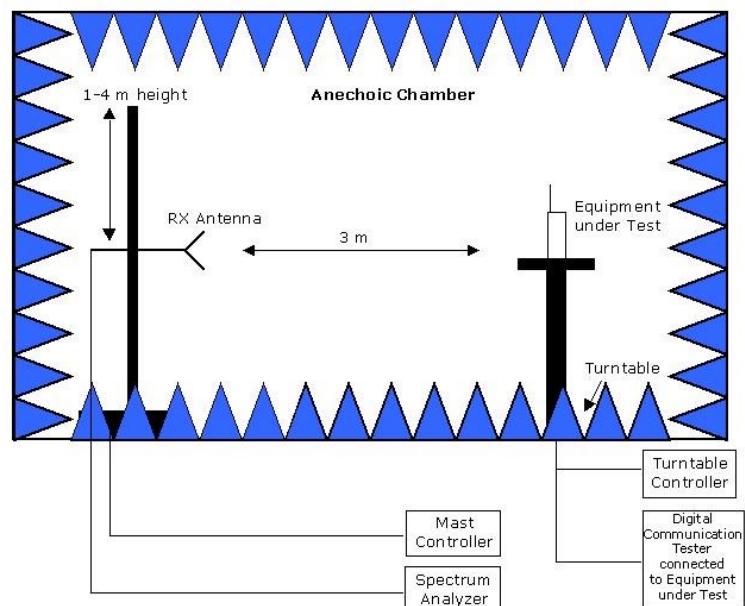
### Single Devices for Temperature Chamber 01

Single Device Name	Type	Serial Number	Manufacturer
Temperature Chamber Weiss 01	KWP 120/70	59226012190010	Weiss Umwelttechnik GmbH
<i>Calibration Details</i>			
	Customized calibration	2012/03/12	2014/03/11
	Customized calibration	2014/03/12	2016/03/11

## 4 Photo Report

Photos are included in an external report.

## 5 Setup Drawings



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

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

### General radio equipment

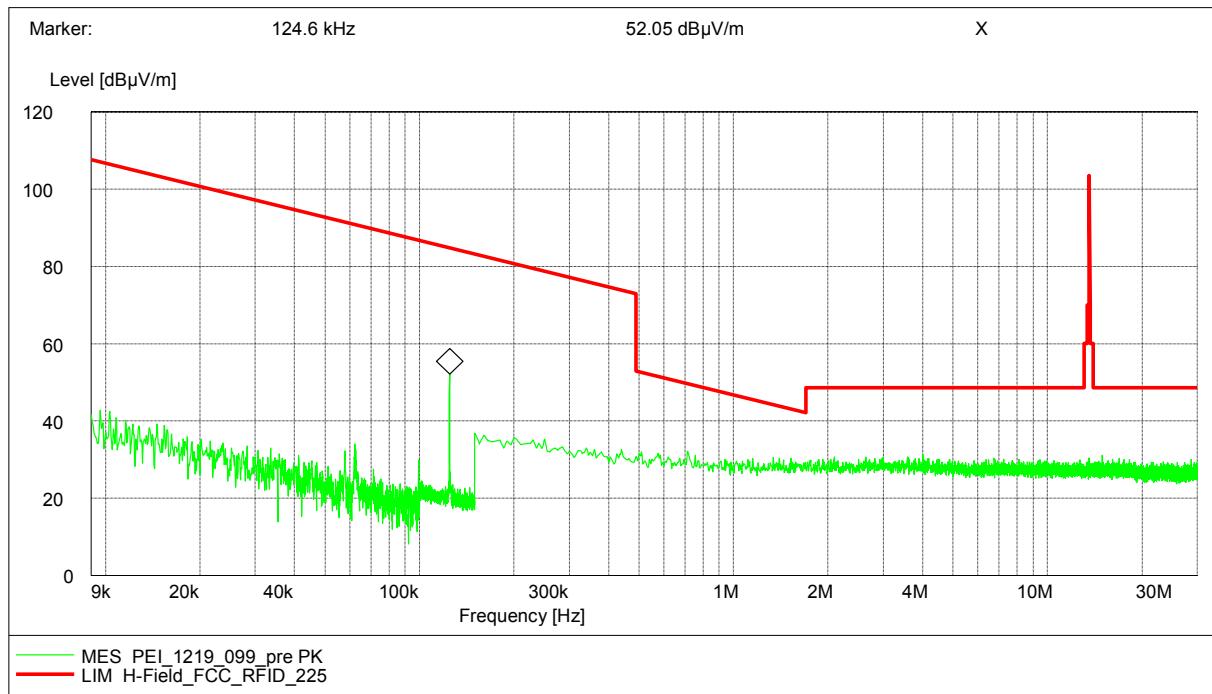
Measurement	FCC reference	IC reference
Conducted emissions on AC Mains	§ 15.207	RSS-Gen Issue 4: 8.8
Transmitter spurious radiated emissions	§ 15.209	RSS-Gen Issue 4: 6.13/8.9/8.10; RSS-210 Issue 8: 2.5
Spurious radiated emissions below 490 kHz and restricted to emission level	§ 15.201, CFR47, Part 2, 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.

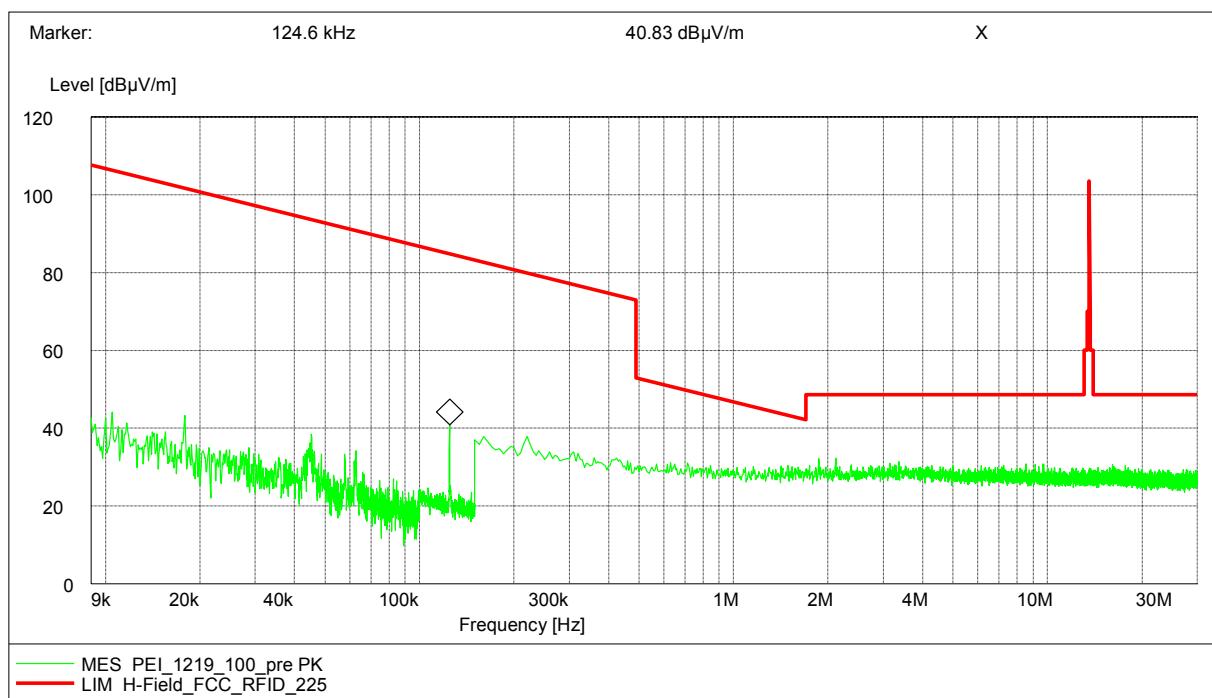
## 7 Annex measurement plots

### 7.1 Radiated emissions and peak output power

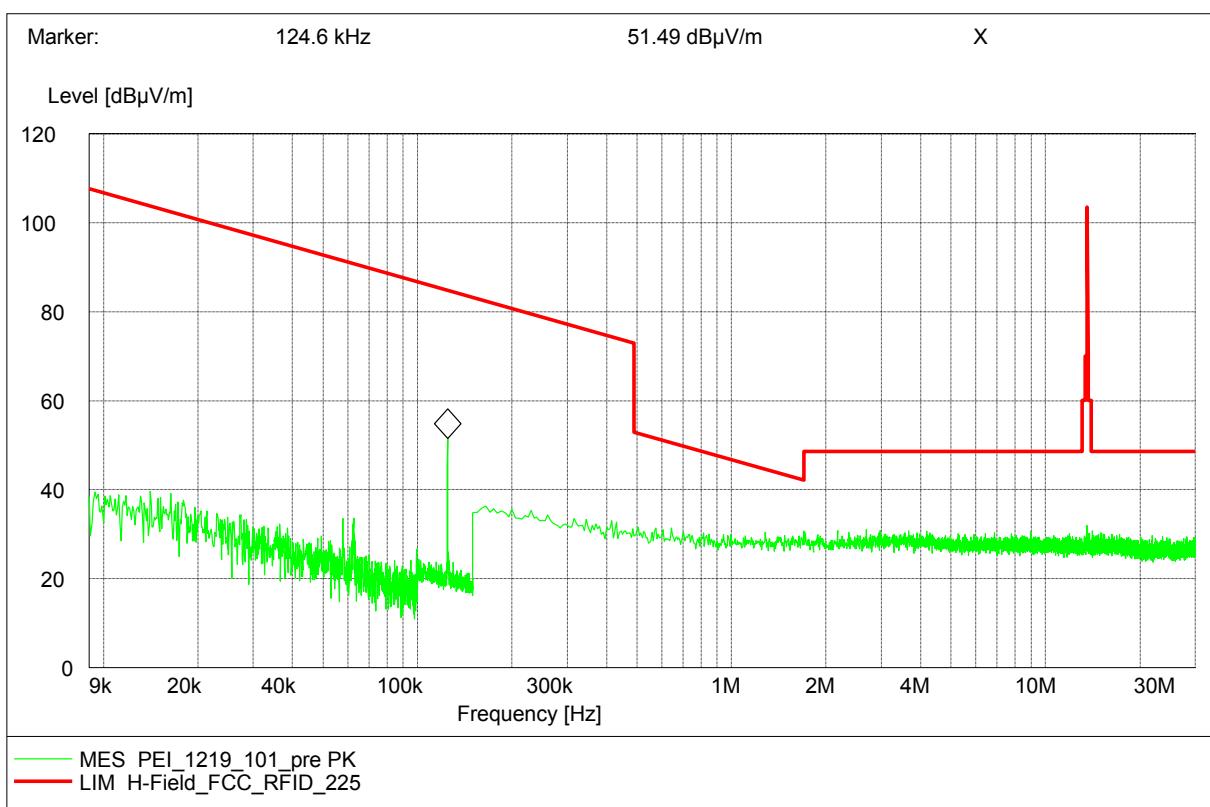
#### 7.1.1 Spurious radiated emissions up to 30 MHz – Op-Mode 1



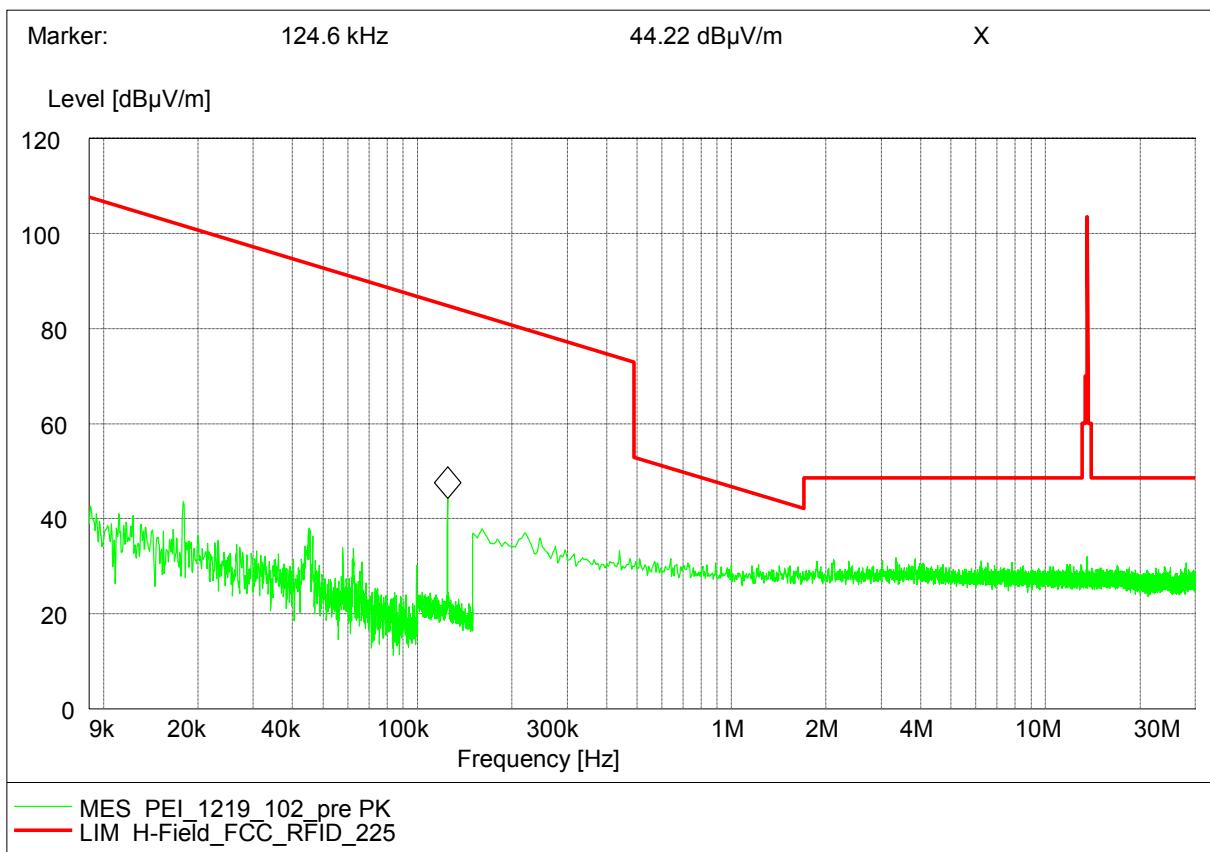
Antenna position 0°  
EUT side 1 horizontal position



Antenna position 90°  
EUT side 1 horizontal position



Antenna position 0°  
EUT side 2 horizontal position



Antenna position 90°  
EUT side 2 horizontal position

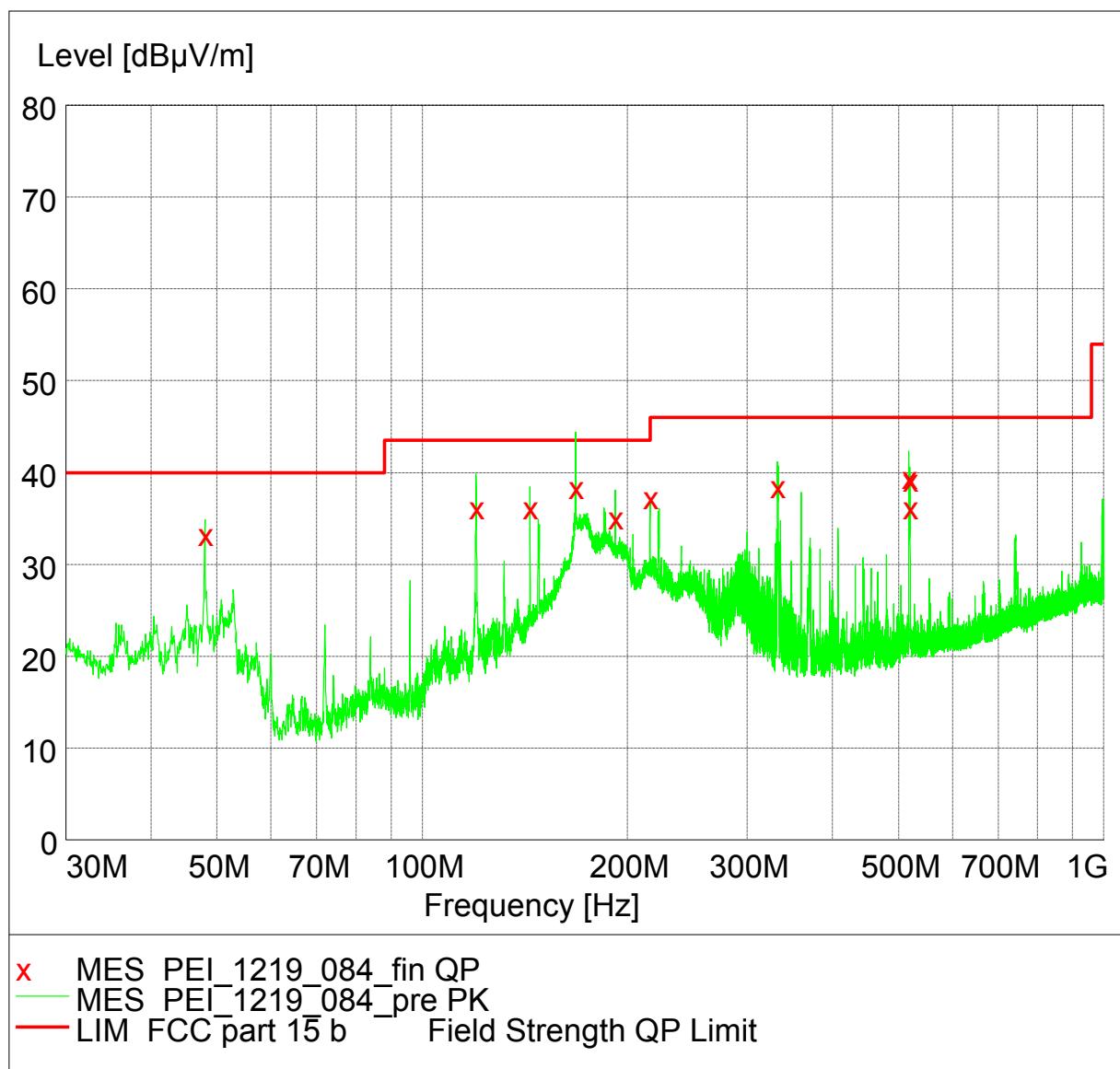
### 7.1.2 Spurious radiated emissions above 30 MHz – Op\_Mode 1

#### EMI RADIATED TEST

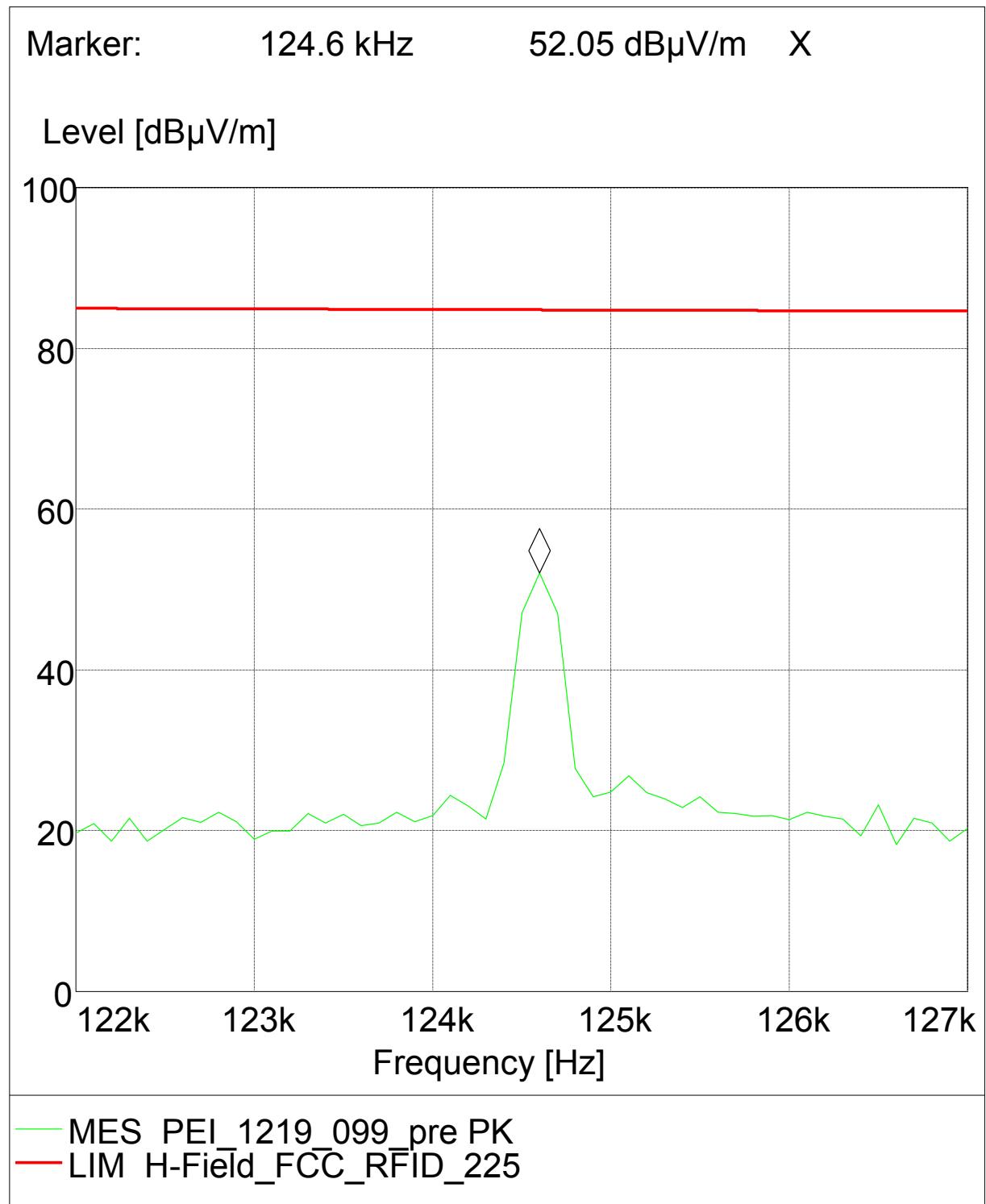
EUT: (BI340x04)  
 Manufacturer: Peiker  
 Operating Condition: RFID TX on 124,6 kHz  
 Test Site: 7 layers, Ratingen  
 Test Specification: FCC 15.209  
 Comment: Horizontal EUT position  
 Start of Test: 11.07.2014 / 10:53:14

#### SCAN TABLE: "FCC part 15 c"

Short Description:			FCC part 15 c			
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

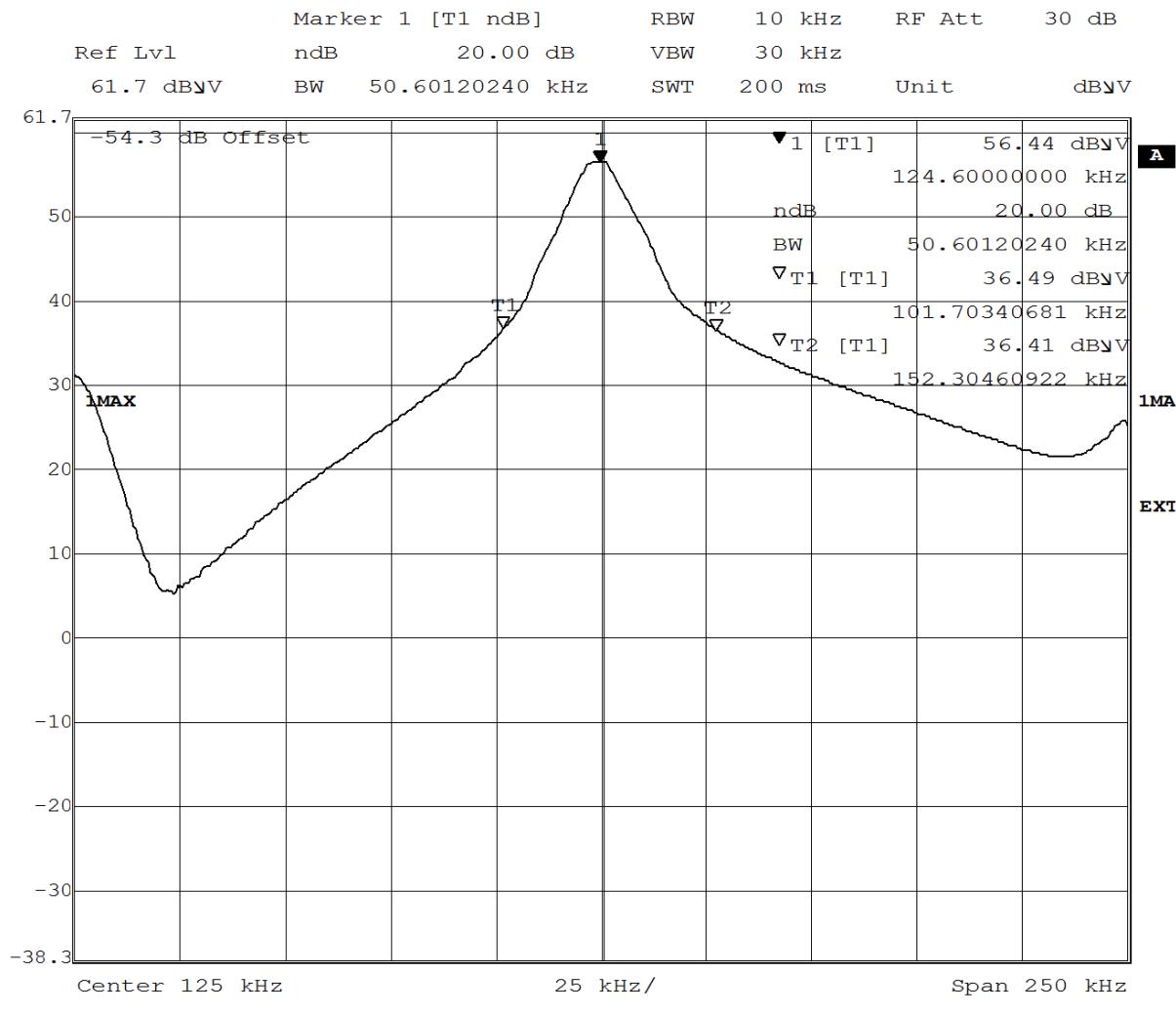


### 7.1.3 Peak output power



## 7.2 Occupied Bandwidth

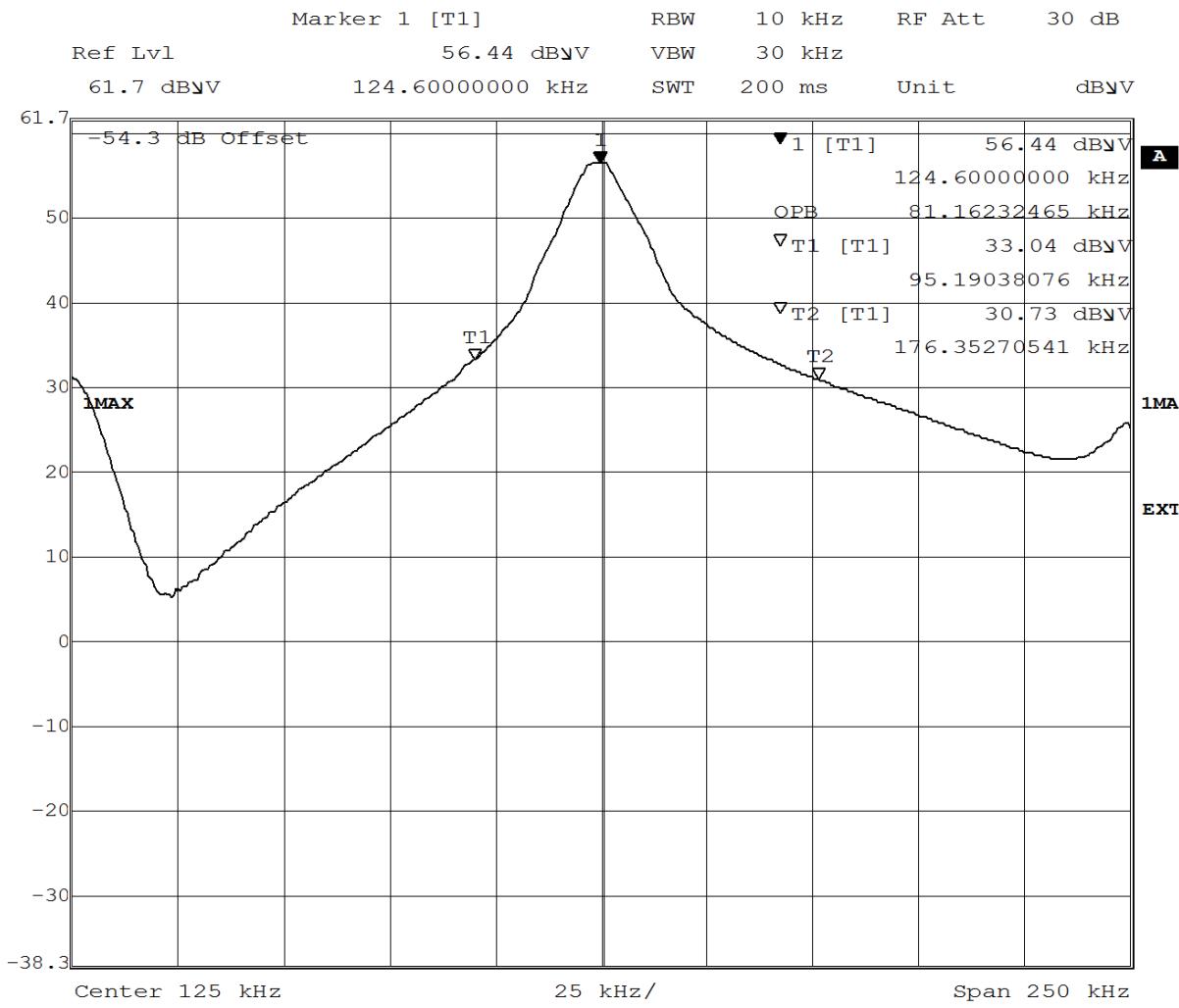
### 7.2.1 Op-Mode 1



Date: 16.JUL.2014 12:31:12

20 dB occupied bandwidth.

### 7.2.2 Op-Mode 1



99% occupied bandwidth.