

# FCC Measurement/Technical Report on

## BMW Keyless Ride ECU

### HUF8485

FCC ID: YGOHUF8485

IC: 4008C-HUF8485

**Test Report Reference:** MDE\_HUF\_2107\_FCC\_01

**Test Laboratory:**

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Borsigstrasse 11  
40880 Ratingen  
Germany



Deutsche  
Akkreditierungsstelle  
D-PL-12140-01-01  
D-PL-12140-01-02  
D-PL-12140-01-03

**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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## 1 APPLIED STANDARDS AND TEST SUMMARY

### 1.1 APPLIED STANDARDS

#### **Type of Authorization**

Certification for an Intentional Radiator.

#### **Applicable FCC Rules**

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 and 15 (10-1-20 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

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

## 1.2 FCC-IC CORRELATION TABLE

### Correlation of measurement requirements for FCC and IC for general radio equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC Mains	§ 15.207	RSS-Gen Issue 5: 8.8
Transmitter spurious radiated emissions	§ 15.209 (a)	RSS-Gen Issue 5: 6.13/8.9/8.10; RSS-210 Issue 10: 7.2/7.3
Restricted Bands	§ 15.205	RSS-Gen Issue 5: 8.10; RSS-210 Issue 10: 4.1;
Wanted Emission (Carrier)	§ 15.209	RSS-210 Issue 10: 7.3 RSS-Gen Issue 5: 6.12, 8.9
Other requirements, e.g. Transmitter frequency stability	-	RSS- Gen, Issue 5: 6.11/8.11
Receiver spurious emissions	-	RSS Gen Issue 5: 5.7
Occupied bandwidth	§2.1049	RSS Gen Issue 5: 6.7

Note: This EUT is subject to RSS-210, 7.3

### 1.3 MEASUREMENT SUMMARY

**47 CFR CHAPTER I FCC PART 15 § 2.1049**  
**Subpart C §15.209**

Occupied Bandwidth

The measurement was performed according to ANSI C63.10

**Final Result**

<b>OP-Mode</b>	<b>Setup</b>	<b>Date</b>	<b>FCC</b>	<b>IC</b>
Radio Technology, Operating Mode				
134.2 kHz, Operating Mode 1 Remark: Keyless	S01_AA01	2022-01-10	Passed	Passed
134.2 kHz, Operating Mode 2 Remark: Immobilizer	S02_AA01	2022-01-10	Passed	Passed

**47 CFR CHAPTER I FCC PART 15 § 15.209**  
**Subpart C §15.209**

Wanted Emissions (Carrier)

The measurement was performed according to ANSI C63.10

**Final Result**

<b>OP-Mode</b>	<b>Setup</b>	<b>Date</b>	<b>FCC</b>	<b>IC</b>
Radio Technology, Operating Mode				
134.2 kHz, Operating Mode 1 Remark: Keyless unmodulated carrier used	S01_AA01	2021-12-05	Passed	Passed
134.2 kHz, Operating Mode 2 Remark: Immobilizer modulated carrier used	S02_AA01	2021-12-05	Passed	Passed

**47 CFR CHAPTER I FCC PART 15 § 15.209**  
**Subpart C §15.209**

Spurious Emissions Radiated

The measurement was performed according to ANSI C63.10

**Final Result**

<b>OP-Mode</b>	<b>Setup</b>	<b>Date</b>	<b>FCC</b>	<b>IC</b>
Radio Technology, Operating Mode, Measurement range				
134.2 kHz, Operating Mode 1, 30 MHz - 1 GHz Remark: Keyless	S01_AA01	2021-11-09	Passed	Passed
134.2 kHz, Operating Mode 1, 9 kHz - 30 MHz Remark: Keyless	S01_AA01	2021-11-09	Passed	Passed
134.2 kHz, Operating Mode 2, 30 MHz - 1 GHz Remark: Immobilizer	S02_AA01	2021-11-09	Passed	Passed
134.2 kHz, Operating Mode 2, 9 kHz - 30 MHz Remark: Immobilizer	S02_AA01	2021-11-09	Passed	Passed

N/A: Not applicable  
 N/P: Not performed

2 REVISION HISTORY / SIGNATURES

Report version control			
Version	Release date	Change Description	Version validity
initial	2022-01-12	--	valid
--	--	--	--

COMMENT: -



(responsible for accreditation scope)  
Dipl.-Ing. Marco Kullik



(responsible for testing and report)  
M.Sc. Joel Asongwe



7 layers GmbH, Borsigstr. 11  
40880 Ratingen, Germany  
Phone +49 (0)2102 749 0

### 3 ADMINISTRATIVE DATA

#### 3.1 TESTING LABORATORY

Company Name: 7layers GmbH  
Address: Borsigstr. 11  
40880 Ratingen  
Germany

The test facility is accredited by the following accreditation organisation:

Laboratory accreditation no: DAKKS D-PL-12140-01-01 | -02 | -03  
FCC Designation Number: DE0015  
FCC Test Firm Registration: 929146  
ISED CAB Identifier: DE0007; ISED#: 3699A  
Responsible for accreditation scope: Dipl.-Ing. Marco Kullik  
Report Template Version: 2020-06-15

#### 3.2 PROJECT DATA

Responsible for testing and report: M.Sc. Joel Asongwe  
Employees who performed the tests: documented internally at 7Layers  
Date of Report: 2022-01-12  
Testing Period: 2021-11-09 to 2022-01-10

#### 3.3 APPLICANT DATA

Company Name: Huf Hülbeck & Fürst GmbH & Co. KG  
Address: Steeger Straße 17  
42551 Velbert  
Germany  
Contact Person: Dipl.-Ing. Thomas Herzog

#### 3.4 MANUFACTURER DATA

Please see Applicant Data

## 4 TEST OBJECT DATA

### 4.1 GENERAL EUT DESCRIPTION

Kind of Device product description	BMW motorcycle Keyless Ride ECU (Electronic Control Unit) operates the Electronic Control Unit function sequences based on received messages and signals. Short Range Device (SRD) immobilizer system for BMW motorcycle. LF transmitter in 134.2 kHz
Product name	Electronic Control Unit (ECU)
Type	HUF8485
<b>Declared EUT data by the supplier</b>	
Power Supply Type	DC (lead acid battery of a vehicle)
Nominal Voltage / Frequency	12.0 V
Highest internal frequency	80 MHz
Ports	DC, Antenna, Data, Enclosure,
Special software used for testing	-
Operating mode 1	Transmitter is on, working on Keyless mode
Operating mode 2	Transmitter is on, working on Immobilizer mode

### 4.2 EUT MAIN COMPONENTS

Sample Name	Sample Code	Description
EUT A	DE1068024aa01	Radiated sample
Sample Parameter	Value	
Serial No.	-	
HW Version	003.001.000	
SW Version	003.008.002	
Comment	Sample with external antenna	

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



### 4.3 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.

Device	Details (Manufacturer, Type Model, HW, SW, S/N)	Description
ANC 1	BMW, 8 531 633, -, -, -	LF Antenna Keyless Ride
ANC 2	BMW, 8549495-02, -, -, -	Fuel Cap

### 4.4 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.

Description	Details (Manufacturer, Type, S/N, HW, SW)	Reason for using
AUX 1	Huf Hüsbeck & Fürst, HUF5794, -, Rev. 001, Rev. 002 (SW02.05)	BMW Motorcycle Keyless Ride ID device key used with ECU as immobilizer
AUX 2	Vector, CANCaseXL, VN1630A, VN1640A, -, -, -	CAN Interface For CAN bus

### 4.5 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	Combination of EUTs	Description and Rationale
S01_AA01	EUT A + ANC 1 + ANC 2 + AUX 2	Keyless mode
S02_AA01	EUT A + ANC 1 + ANC 2 + AUX 1 + AUX 2	Immobilizer mode

#### 4.6 OPERATING MODES / TEST CHANNELS

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

Local TX on 134.2 kHz

#### 4.7 PRODUCT LABELLING

##### 4.7.1 FCC ID LABEL

Please refer to the documentation of the applicant.

##### 4.7.2 LOCATION OF THE LABEL ON THE EUT

Please refer to the documentation of the applicant.

## 5 TEST RESULTS

### 5.1 OCCUPIED BANDWIDTH

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**  
ANSI C63.10

#### 5.1.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up 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 EUT was connected to spectrum analyzer via a short coax cable with a known loss.

Analyzer settings:

- Resolution Bandwidth (RBW): 200 Hz
- Video Bandwidth (VBW): 2 kHz
- Span: 2 kHz
- Trace: Maxhold
- Sweeps: 2000
- Sweeptime: 9.4 ms
- Detector: RMS

The 99 % measurement function of the spectrum analyser function was used to determine the 99 % bandwidth.

#### 5.1.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.209 does not contain any requirement related to the bandwidth.

#### 5.1.3 TEST PROTOCOL

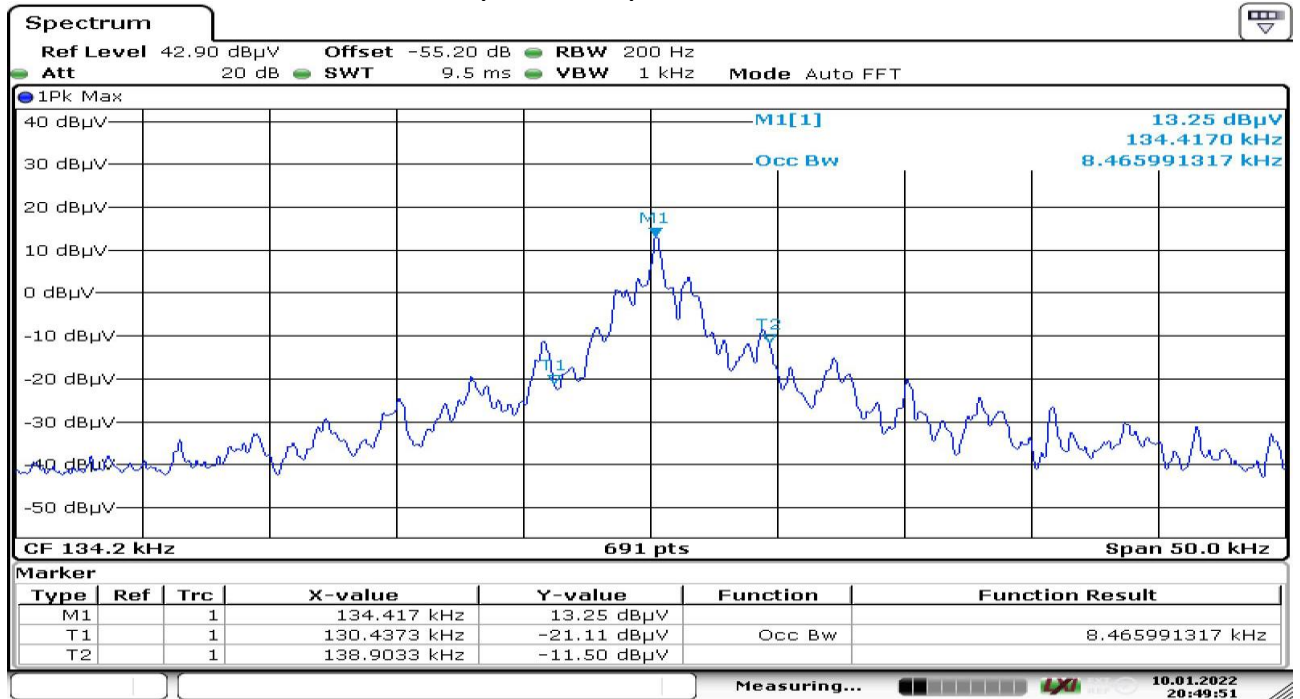
Ambient temperature: 24 °C  
Air Pressure: 1009 hPa  
Humidity: 40 %

Band	Operating Mode	Frequency [kHz]	99 % Bandwidth [kHz]
134.2 kHz	Mode 1	134.42	8.46
134.2 kHz	Mode 2	134.42	9.98

Remark: Please see next sub-clause for the measurement plot.

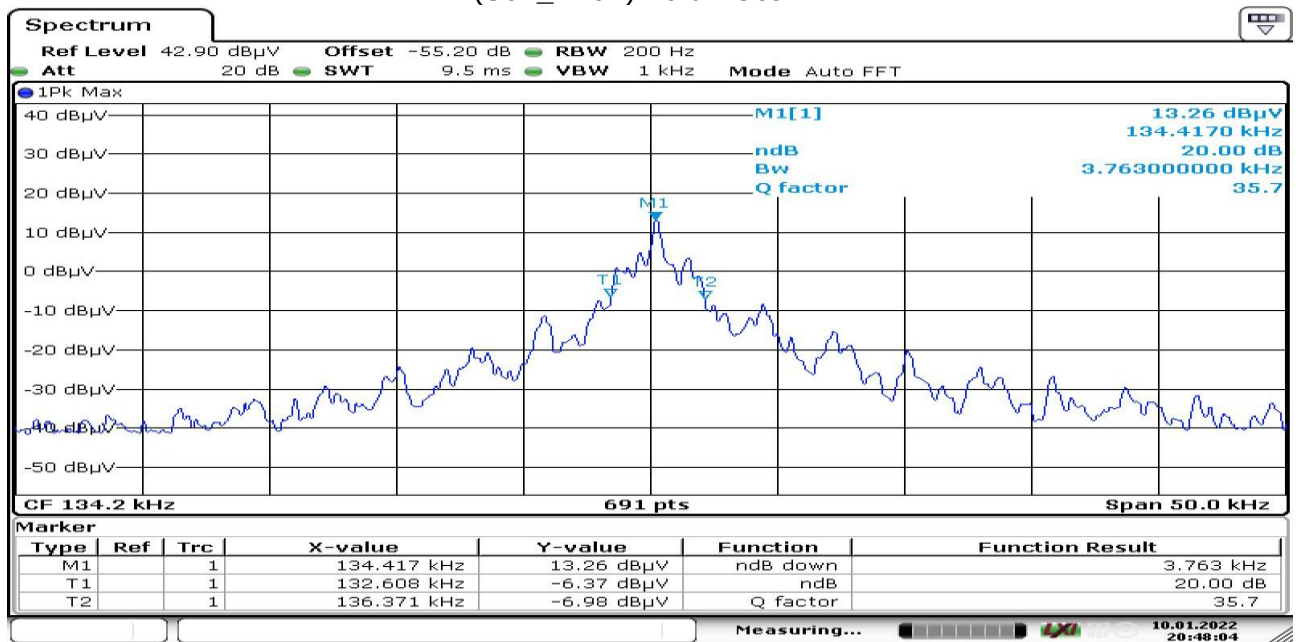
### 5.1.4 MEASUREMENT PLOTS

Radio Technology = 134.2 kHz, Operating Mode = Operating Mode 1  
(S01\_AA01) 99 % OccBW



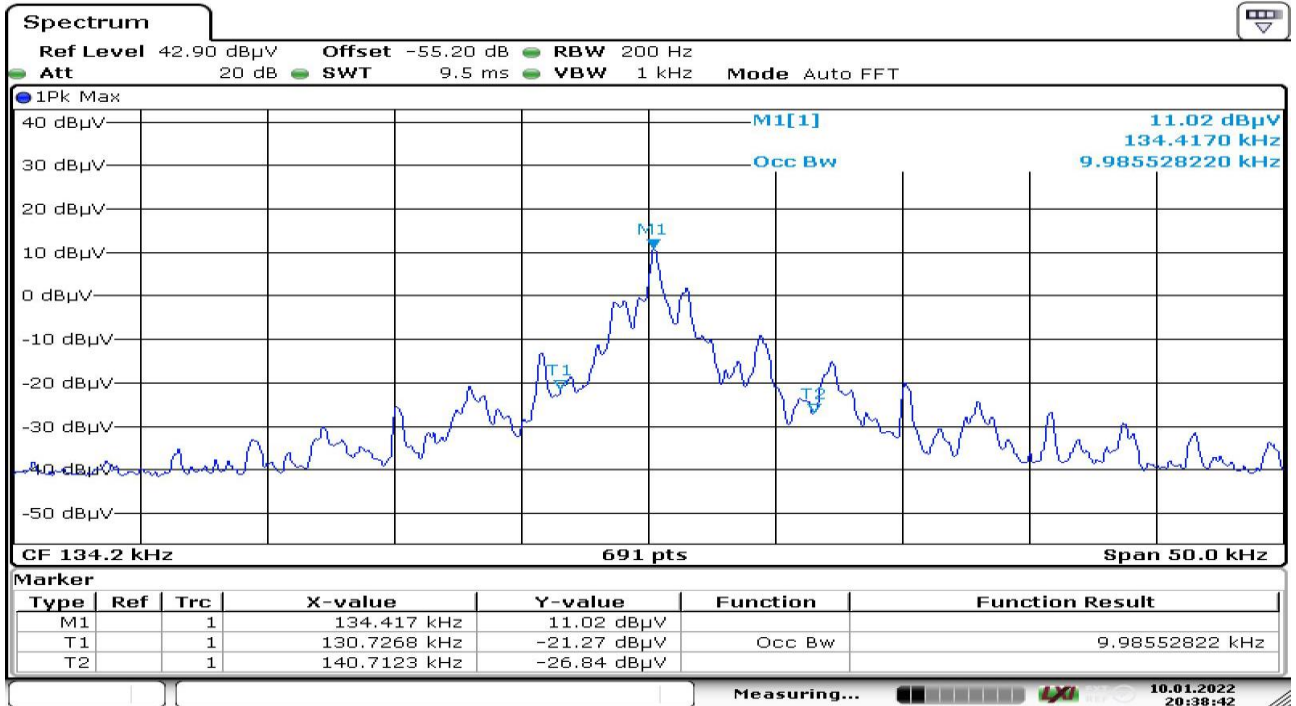
Date: 10.JAN.2022 20:49:52

Radio Technology = 134.2 kHz, Operating Mode = Operating Mode 1  
(S01\_AA01) 20 dB OccBW



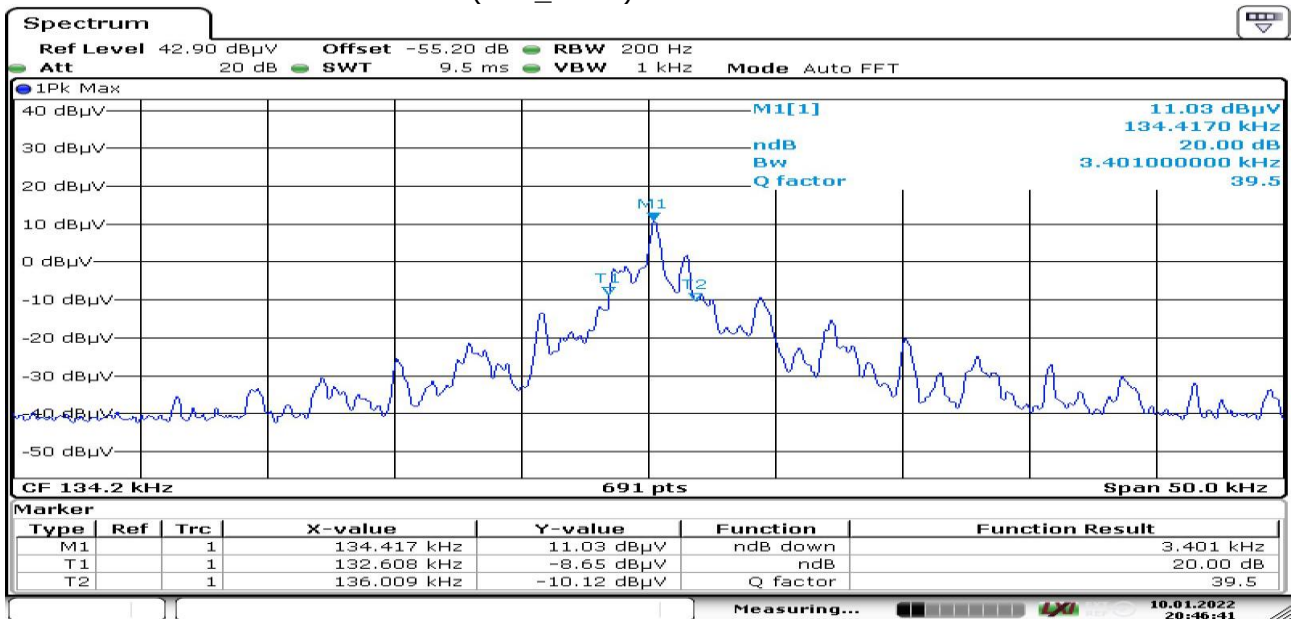
Date: 10.JAN.2022 20:48:04

Radio Technology = 134.2 kHz, Operating Mode = Operating Mode 2  
(S02\_AA01) 99 % OccBW



Date: 10.JAN.2022 20:38:42

Radio Technology = 134.2 kHz, Operating Mode = Operating Mode 2  
(S02\_AA01) 20 dB OccBW



Date: 10.JAN.2022 20:46:41

### 5.1.5 TEST EQUIPMENT USED

- Radio lab

## 5.2 WANTED EMISSIONS (CARRIER)

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**  
ANSI C63.10

### 5.2.1 TEST DESCRIPTION

Please see test description for the test case "Spurious Radiated Emissions", abstract 1.

### 5.2.2 TEST REQUIREMENTS / LIMITS

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

The fundamental emission of the EUT must be outside the restricted bands of operation as defined in §15.205.

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
0.009 – 0.49	2400/F(kHz)@300m	3	(48.5 – 13.8)@300m
0.49 – 1.705	24000/F(kHz)@30m	3	(33.8 – 23.0)@30m
1.705 – 30	30@30m	3	29.5@30m

The measured values are corrected with an inverse linear distance extrapolation factor (40 dB/decade) according FCC 15.31 (2).

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
30 – 88	100@3m	3	40.0@3m
88 – 216	150@3m	3	43.5@3m
216 – 960	200@3m	3	46.0@3m
960 – 26000	500@3m	3	54.0@3m
26000 – 40000	500@3m	1	54.0@3m

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

§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)

### 5.2.3 TEST PROTOCOL

Ambient temperature: 22 °C  
 Air Pressure: 993 hPa  
 Humidity: 32 %

Band	Operating Mode	Frequency [MHz]	Output Power [dBμV/m]	Limit [dBμV/m]	Margin to Limit [dB]
134.2 kHz	Mode 1	134.4	13.6	45.0	31.4
134.2 kHz	Mode 2	134.4	11.2	45.0	33.8

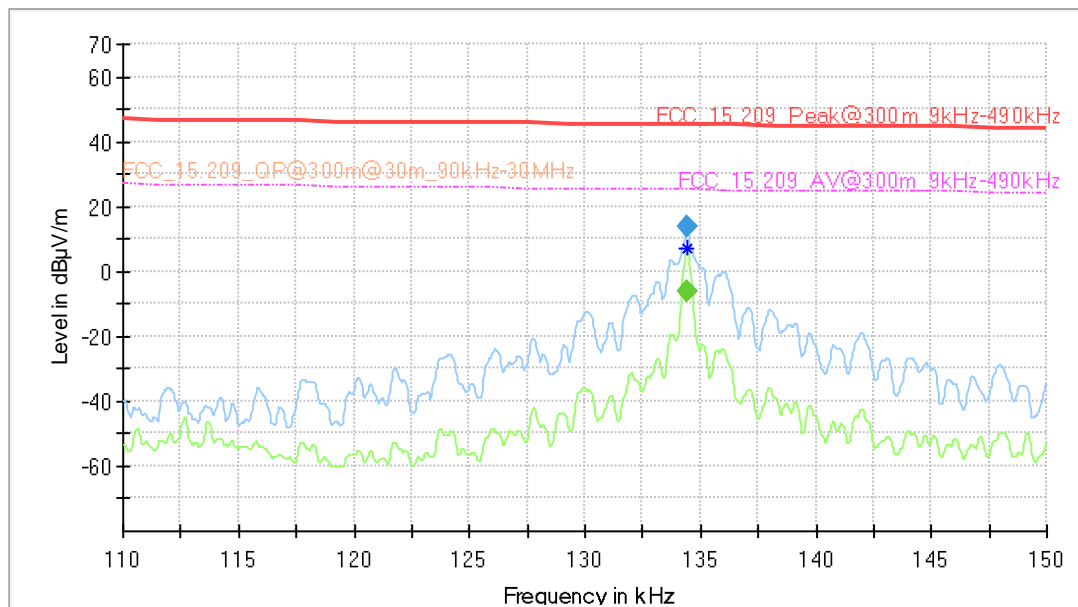
Remark: Please see next sub-clause for the measurement plot.

### 5.2.4 MEASUREMENT PLOTS

Radio Technology = 134.2 kHz, Operating Mode = Operating Mode 1  
 (S01\_AA01)

#### Common Information

Test Description: Radiated Emissions, Test Site: Semi Anechoic Chamber @ 3 m  
 Test Standard: FCC 15c.209  
 EUT / Setup Code: DE1068024aa01  
 Operating Conditions: 12.0 V DC, keyless mode  
 (134.2 kHz, carrier modulated)  
 Operator Name: ASO  
 Comment: EUT vertical  
 Legend: Trace: blue = Peak; green = AV, Star: = critical frequency; Rhombus: blue = final QP



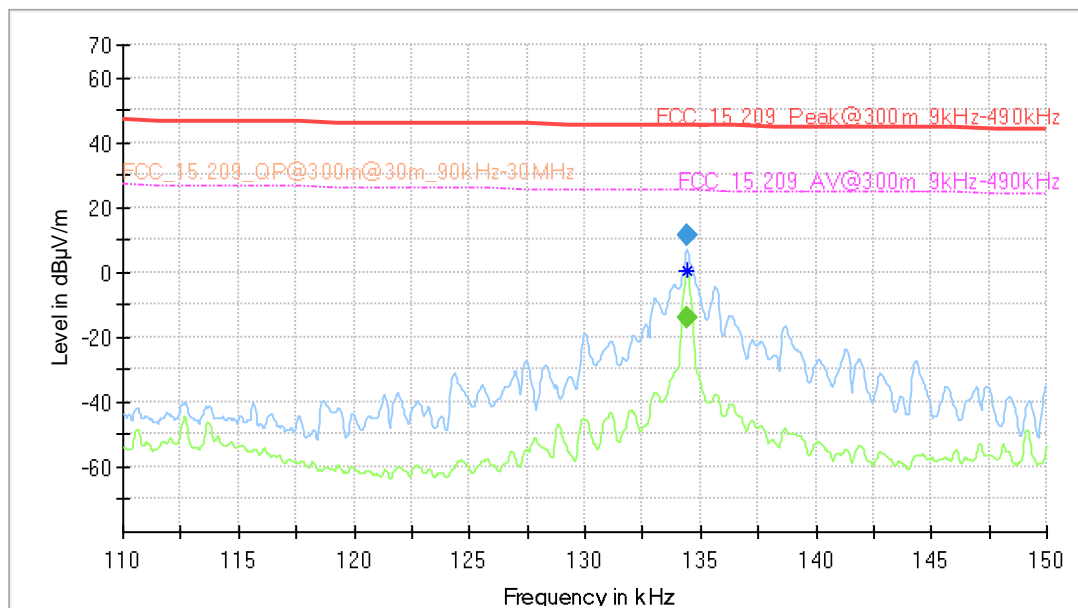
#### Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)
0.134400	---	-6.16	25.06	31.22	1000.0	0.200	300.0	95.0	-59.7
0.134400	13.61	---	45.06	31.44	1000.0	0.200	300.0	95.0	-59.7

Radio Technology = 134.2 kHz, Operating Mode = Operating Mode 2  
(S02\_AA01)

### Common Information

Test Description:	Radiated Emissions, Test Site: Semi Anechoic Chamber @ 3 m
Test Standard:	FCC 15c.209
EUT / Setup Code:	DE1068024aa01
Operating Conditions:	12.0 V DC, immobilizer mode (134.2 kHz, carrier modulated)
Operator Name:	MER/DOB
Comment:	EUT vertical
Legend:	Trace: blue = Peak; green = AV, Star: = critical frequency; Rhombus: blue = final QP



### Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)
0.134400	---	-14.11	25.06	39.16	1000.0	0.200	200.0	-41.0	-59.7
0.134400	11.21	---	45.06	33.85	1000.0	0.200	200.0	-41.0	-59.7

### 5.2.5 TEST EQUIPMENT USED

- Radiated Emissions



## 5.3 SPURIOUS EMISSIONS RADIATED

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**  
ANSI C63.10

### 5.3.1 TEST DESCRIPTION

The test set-up was made in accordance to the general provisions of ANSI C63.10 in a typical installation configuration. The measurements were performed according the following sub-chapters of ANSI C63.10:

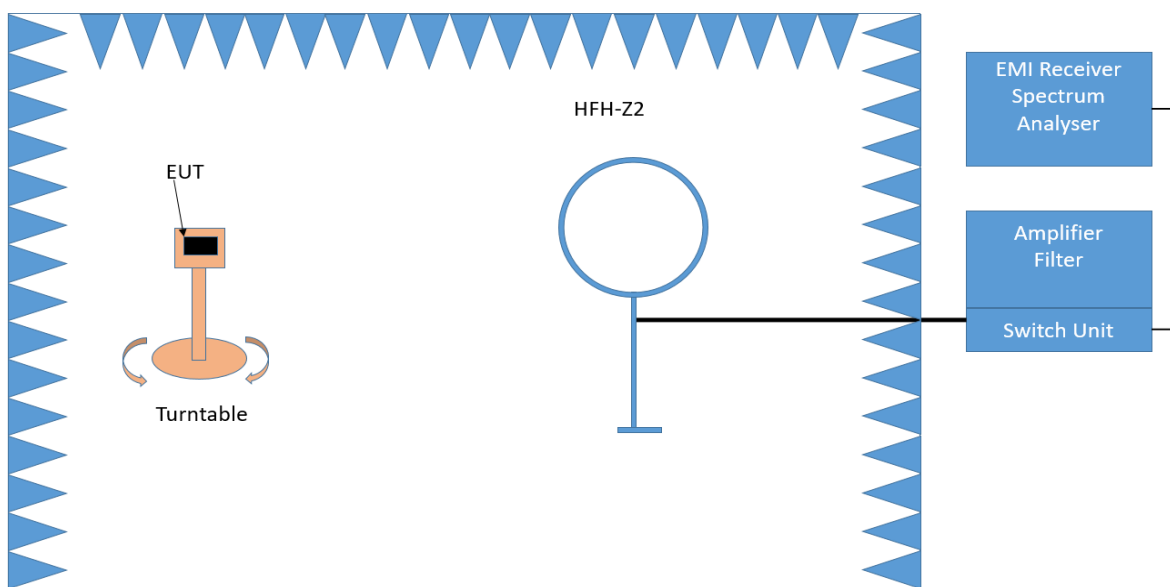
- < 30 MHz: Chapter 6.4
- 30 MHz – 1 GHz: Chapter 6.5
- > 1 GHz: Chapter 6.6 (procedure according 6.6.5 used)

The measurement procedure is implemented into the EMI test software EMC32 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 also performed at 3 axes. A pre-check is performed while the EUT is powered.

#### **Below 1 GHz:**

The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.

#### **1. Measurement up to 30 MHz**



Test Setup; Spurious Emission Radiated (SAC), 9 kHz – 30 MHz

The Loop antenna HFH2-Z2 is used.

**Step 1: pre measurement**

- Anechoic chamber
- Antenna distance: 3 m
- Antenna height: 1 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 - 0.15 MHz and 0.15 - 30 MHz
- Frequency steps: 0.05 kHz and 2.25 kHz
- IF-Bandwidth: 0.2 kHz and 9 kHz
- Measuring time / Frequency step: 100 ms (FFT-based)

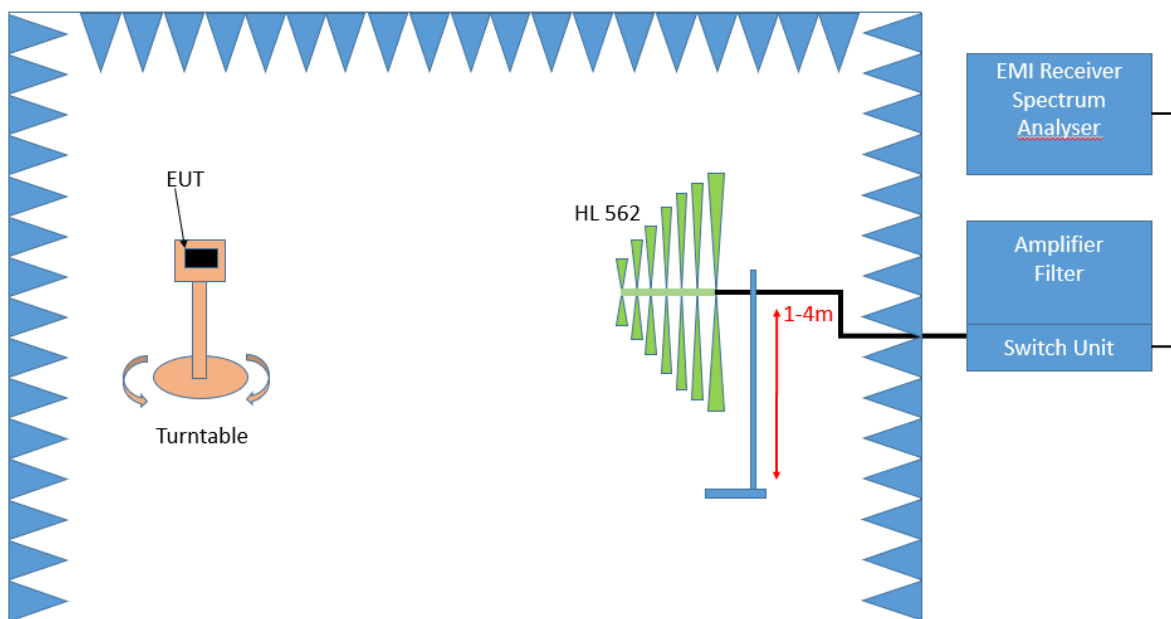
Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

**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.

- Detector: Quasi-Peak (9 kHz - 150 kHz, Peak / Average 150 kHz- 30 MHz)
- Frequency range: 0.009 - 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF-Bandwidth: 0.2 - 10 kHz
- Measuring time / Frequency step: 1 s

**2. Measurement above 30 MHz and up to 1 GHz**



Test Setup; Spurious Emission Radiated (SAC), 30 MHz- 1GHz

### **Step 1:** Preliminary scan

This is a preliminary test to identify the highest amplitudes relative to the limit.

Settings for step 1:

- Antenna distance: 3 m
- Detector: Peak-Maxhold / Quasipeak (FFT-based)
- Frequency range: 30 – 1000 MHz
- Frequency steps: 30 kHz
- IF-Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 ms
- Turntable angle range:  $-180^{\circ}$  to  $90^{\circ}$
- Turntable step size:  $90^{\circ}$
- Height variation range: 1 – 4 m
- Height variation step size: 1.5 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:** Adjustment 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 slowly vary by  $360^{\circ}$ . 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 will also slowly vary between 1 – 4 meter. 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:  $360^{\circ}$
- Height variation range: 1 – 4 m
- Antenna Polarisation: max. value determined in step 1

### **Step 3:** Final measurement with QP detector

With the settings determined in step 2, the final measurement will be performed:

EMI receiver settings for step 3:

- 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.

### 5.3.2 TEST REQUIREMENTS / LIMITS

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

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
0.009 – 0.49	2400/F(kHz)@300m	3	(48.5 – 13.8)@300m
0.49 – 1.705	24000/F(kHz)@30m	3	(33.8 – 23.0)@30m
1.705 – 30	30@30m	3	29.5@30m

The measured values are corrected with an inverse linear distance extrapolation factor (40 dB/decade) according FCC 15.31 (2).

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
30 – 88	100@3m	3	40.0@3m
88 – 216	150@3m	3	43.5@3m
216 – 960	200@3m	3	46.0@3m
960 – 26000	500@3m	3	54.0@3m
26000 – 40000	500@3m	1	54.0@3m

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

§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:  $\text{Limit (dBµV/m)} = 20 \log (\text{Limit (µV/m)}/1µV/m)$

### 5.3.3 TEST PROTOCOL

Ambient temperature: 21 °C  
 Air Pressure: 1015 hPa  
 Humidity: 44 %

Ch. Center Freq. [kHz]	Operating Mode	Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detector	RBW [kHz]	Limit [dBµV/m]	Margin to Limit [dB]
134.2	Mode 1	-	-	-	-	-	> 20 dB
134.2	Mode 2	-	-	-	-	-	> 20 dB

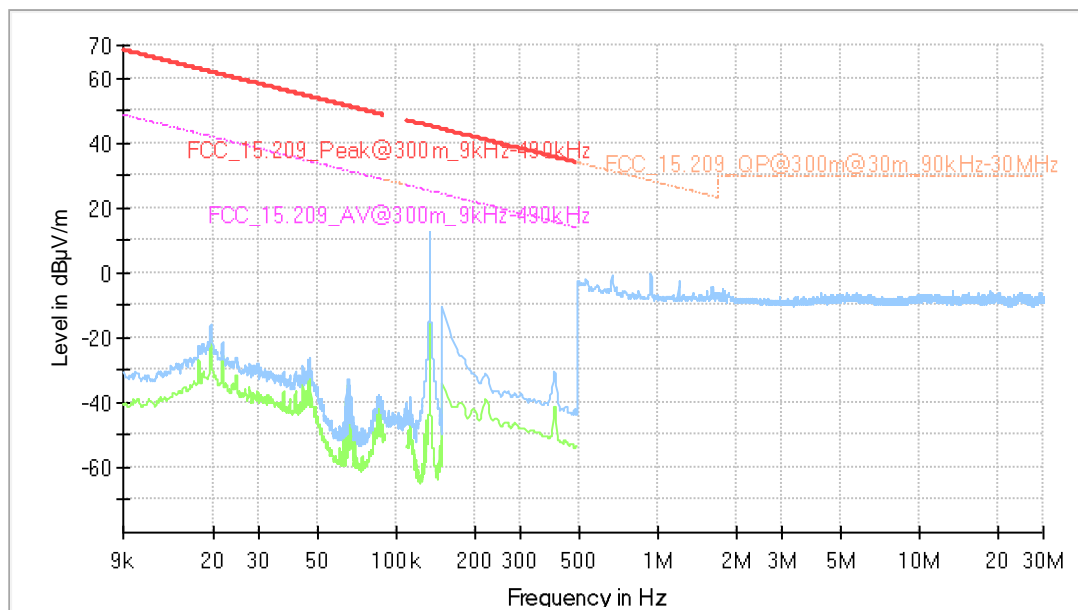
Remark: Please see next sub-clause for the measurement plot.

### 5.3.4 MEASUREMENT PLOTS (WORST CASE)

Radio Technology = 134.2 kHz, Operating Mode = Operating Mode 1,  
Measurement range = 9 kHz - 30 MHz  
(S01\_AA01)

#### Common Information

Test Description:	Radiated Emissions, Test Site: Semi Anechoic Chamber @ 3 m
Test Standard:	FCC 15c.209
EUT / Setup Code:	DE1068024aa01
Operating Conditions:	12.0 V DC, keyless mode (134.2 kHz, carrier modulated)
Operator Name:	MER/DOB
Comment:	EUT vertical
Legend:	Trace: blue = Peak; green = AV, Star: = critical frequency; Rhombus: blue = final QP



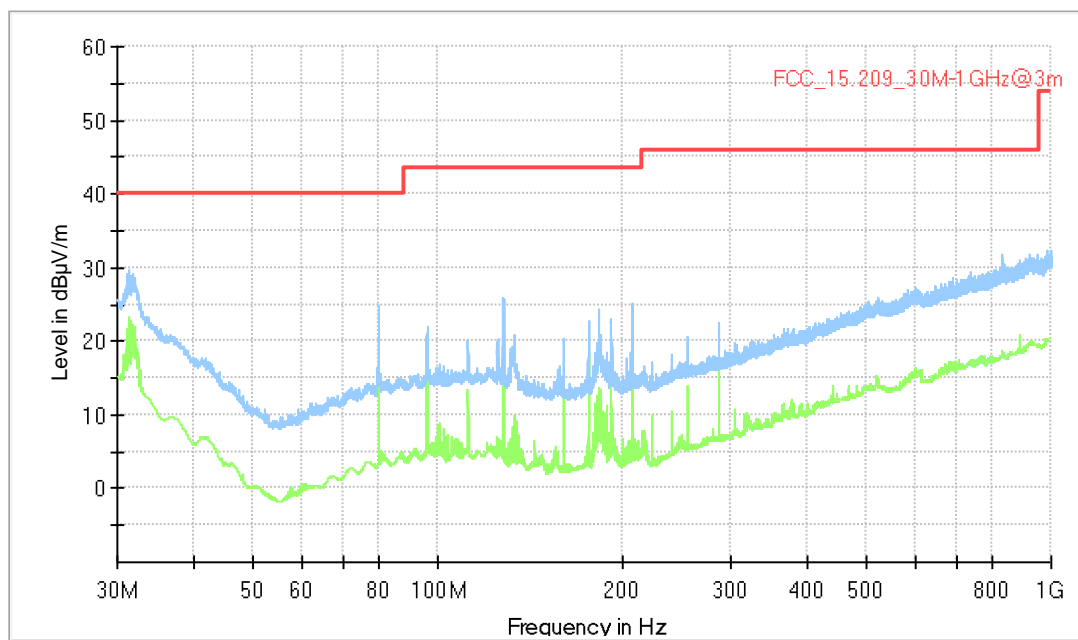
#### Final\_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Azimuth (deg)	Corr. (dB/m)
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Radio Technology = 134.2 kHz, Operating Mode = Operating Mode 1,  
Measurement range = 30 MHz - 1 GHz  
(S01\_AA01)

### Common Information

Test Description:	Radiated Emissions, Test Site: Semi Anechoic Chamber @ 3 m
Test Standard	FCC 15c.209
EUT / Setup Code:	DE1068024aa01
Operating Conditions:	12.0 V DC, keyless (134.2 kHz, continuous modulated)
Operator Name:	MER/DOB
Comment:	EUT vertical



### Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
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### 5.3.5 TEST EQUIPMENT USED

- Radiated Emissions

## 6 TEST EQUIPMENT

- 1 Radiated Emissions  
Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	N5000/NP	Filter for EUT, 2 Lines, 250 V, 16 A	ETS-LINDGREN	241515		
1.2	Opus10 TPR (8253.00)	T/P Logger 13	Lufft Mess- und Regeltechnik GmbH	13936	2021-10	2023-10
1.3	ESW44	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz GmbH & Co. KG	101603	2019-12	2021-12
1.4	Anechoic Chamber 01	SAC/FAR, 10.58 m x 6.38 m x 6.00 m	Frankonia	none	2021-04	2023-04
1.5	FS-Z220	Harmonic Mixer 140 - 220 GHz	Rohde & Schwarz Messgerätebau GmbH	101005	2020-03	2023-03
1.6	AMF- 7D00101800- 30-10P-R	Broadband Amplifier 100 MHz - 18 GHz	Miteq			
1.7	5HC2700/12750 -1.5-KK	High Pass Filter	Trilithic	9942012		
1.8	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-		
1.9	Anechoic Chamber 03	FAR, 8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001- PRB	2021-04	2023-04
1.10	Fluke 177	Digital Multimeter 03 (Multimeter)	Fluke Europe B.V.	86670383	2020-04	2022-04
1.11	PONTIS Con4101	PONTIS Camera Controller		6061510370		
1.12	EP 1200/B, NA/B1	AC Source, Amplifier with integrated variable Oscillator	Spitzenberger & Spies GmbH & Co. KG	B6278		
1.13	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronik GmbH	00083069		
1.14	WHKX 7.0/18G- 8SS	High Pass Filter	Wainwright Instruments GmbH	09		
1.15	DS 420S	Turn Table 2 m diameter	HD GmbH	420/573/99		
1.16	4HC1600/12750 -1.5-KK	High Pass Filter	Trilithic	9942011		
1.17	Temperature Chamber KWP 120/70	Temperature Chamber Weiss 01	Weiss	59226012190010	2020-05	2022-05
1.18	JS4-00102600- 42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368		

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.19	TT 1.5 WI	Turn Table	Maturo GmbH	-		
1.20	HL 562 ULTRALOG	Biconical-log-per Antenna (30 MHz - 3 GHz)	Rohde & Schwarz GmbH & Co. KG	100609	2019-05	2022-05
1.21	HF 906	Double-ridged horn	Rohde & Schwarz	357357/001		
1.22	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronik GmbH	00086675		
1.23	MA4985-XP-ET	Bore Sight Antenna Mast	innco systems GmbH	none		
1.24	VLFX-650+	Low Pass Filter DC650 MHz	Mini-Circuits	15542		
1.25	JUN-AIR Mod. 6-15	Air Compressor	JUN-AIR Deutschland GmbH	612582		
1.26	5HC3500/18000-1.2-KK	High Pass Filter	Trilithic	200035008		
1.27	HFH2-Z2	Loop Antenna + 3 Axis Tripod	Rohde & Schwarz GmbH & Co. KG	829324/006	2021-01	2024-01
1.28	Voltcraft M-3860M	Digital Multimeter 01 (Multimeter)	Conrad	IJ096055		
1.29	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2021-01	2023-01
1.30	SB4-100.OLD20-3T/10 Airwin 2 x 1.5 kW	Air compressor (oil-free)	airWin Kompressoren UG	901/00503		
1.31	UNI-T UT195E	True RMS Digital Multimeter	UNI-T UNI-TREND TECHNOLOGY (CHINA) CO., LTD.	C190729561		
1.32	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037		
1.33	AS 620 P	Antenna Mast (pneumatic polarisation)	HD GmbH	620/37		
1.34	TD1.5-10kg	EUT Tilt Device (Rohacell)	Maturo GmbH	TD1.5-10kg/024/3790709		
1.35	Innco Systems CO3000	Controller for bore sight mast SAC	innco systems GmbH	CO3000/967/39371016/L		
1.36	HF 907-2	Double-ridged horn	Rohde & Schwarz	102817	2019-04	2022-04
1.37	PAS 2.5 - 10 kg	Antenna Mast	Maturo GmbH	-		
1.38	AFS42-00101800-25-S-42	Broadband Amplifier 25 MHz - 18 GHz	Miteq	2035324		
1.39	AM 4.0	Antenna Mast 4 m	Maturo GmbH	AM4.0/180/11920513		

2 Radio Lab  
Conducted Radio Test Lab



Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.1	FSV30	Signal Analyzer 10 Hz - 30 GHz	Rohde & Schwarz	103005	2020-05	2022-05
2.2	Fluke 177	Digital Multimeter 03 (Multimeter)	Fluke Europe B.V.	86670383	2020-04	2022-04
2.3	SMP03	Signal Generator 2 GHz - 27 GHz	Rohde & Schwarz	833680/003		
2.4	Chroma 6404	AC Source	Chroma ATE INC.	64040001304		
2.5	EX520	Digital Multimeter 07	Extech Instruments Corp	06110393	2020-04	2022-04
2.6	A8455-4	4 Way Power Divider (SMA)		-		
2.7	FSU26	Spectrum Analyser (20 Hz to 26.5 GHz)	Rohde & Schwarz GmbH & Co. KG	100136		

The calibration interval is the time interval between "Last Calibration" and "Calibration Due"

## 7 ANTENNA FACTORS, CABLE LOSS AND SAMPLE CALCULATIONS

This chapter contains the antenna factors with their corresponding path loss of the used measurement path for all antennas as well as the insertion loss of the LISN.

### 7.1 LISN R&S ESH3-Z5 (150 KHZ – 30 MHZ)

Frequency MHz	Corr. dB	LISN insertion loss ESH3- Z5 dB	cable loss (incl. 10 dB atten- uator) dB
0.15	10.1	0.1	10.0
5	10.3	0.1	10.2
7	10.5	0.2	10.3
10	10.5	0.2	10.3
12	10.7	0.3	10.4
14	10.7	0.3	10.4
16	10.8	0.4	10.4
18	10.9	0.4	10.5
20	10.9	0.4	10.5
22	11.1	0.5	10.6
24	11.1	0.5	10.6
26	11.2	0.5	10.7
28	11.2	0.5	10.7
30	11.3	0.5	10.8

#### Sample calculation

$$U_{\text{LISN}} (\text{dB } \mu\text{V}) = U (\text{dB } \mu\text{V}) + \text{Corr. (dB)}$$

U = Receiver reading

LISN Insertion loss = Voltage Division Factor of LISN

Corr. = sum of single correction factors of used LISN, cables, switch units (if used)

Linear interpolation will be used for frequencies in between the values in the table.

## 7.2 ANTENNA R&S HFH2-Z2 (9 KHZ – 30 MHZ)

Frequency MHz	AF HFH-Z2) dB (1/m)	Corr. dB	cable loss 1 (inside chamber) dB	cable loss 2 (outside chamber) dB	cable loss 3 (switch unit) dB	cable loss 4 (to receiver) dB	distance corr. (-40 dB/ decade) dB	d <sub>Limit</sub> (meas. distance (limit) m	d <sub>used</sub> (meas. distance (used) m
0.009	20.50	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.01	20.45	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.015	20.37	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.02	20.36	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.025	20.38	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.03	20.32	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.05	20.35	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.08	20.30	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.1	20.20	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.2	20.17	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.3	20.14	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.49	20.12	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.490001	20.12	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.5	20.11	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.8	20.10	-39.6	0.1	0.1	0.1	0.1	-40	30	3
1	20.09	-39.6	0.1	0.1	0.1	0.1	-40	30	3
2	20.08	-39.6	0.1	0.1	0.1	0.1	-40	30	3
3	20.06	-39.6	0.1	0.1	0.1	0.1	-40	30	3
4	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
5	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
6	20.02	-39.5	0.2	0.1	0.1	0.1	-40	30	3
8	19.95	-39.5	0.2	0.1	0.1	0.1	-40	30	3
10	19.83	-39.4	0.2	0.1	0.2	0.1	-40	30	3
12	19.71	-39.4	0.2	0.1	0.2	0.1	-40	30	3
14	19.54	-39.4	0.2	0.1	0.2	0.1	-40	30	3
16	19.53	-39.3	0.3	0.1	0.2	0.1	-40	30	3
18	19.50	-39.3	0.3	0.1	0.2	0.1	-40	30	3
20	19.57	-39.3	0.3	0.1	0.2	0.1	-40	30	3
22	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
24	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
26	19.54	-39.3	0.3	0.1	0.2	0.1	-40	30	3
28	19.46	-39.2	0.3	0.1	0.3	0.1	-40	30	3
30	19.73	-39.1	0.4	0.1	0.3	0.1	-40	30	3

### Sample calculation

$$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

distance correction =  $-40 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values

### 7.3 ANTENNA R&S HL562 (30 MHz – 1 GHz)

( $d_{Limit} = 3\text{ m}$ )

Frequency	AF R&S HL562	Corr.
MHz	dB (1/m)	dB
30	18.6	0.6
50	6.0	0.9
100	9.7	1.2
150	7.9	1.6
200	7.6	1.9
250	9.5	2.1
300	11.0	2.3
350	12.4	2.6
400	13.6	2.9
450	14.7	3.1
500	15.6	3.2
550	16.3	3.5
600	17.2	3.5
650	18.1	3.6
700	18.5	3.6
750	19.1	4.1
800	19.6	4.1
850	20.1	4.4
900	20.8	4.7
950	21.1	4.8
1000	21.6	4.9

cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-20 dB/ decade)	$d_{Limit}$ (meas. distance (limit))	$d_{used}$ (meas. distance (used))
dB	dB	dB	dB	dB	m	m
0.29	0.04	0.23	0.02	0.0	3	3
0.39	0.09	0.32	0.08	0.0	3	3
0.56	0.14	0.47	0.08	0.0	3	3
0.73	0.20	0.59	0.12	0.0	3	3
0.84	0.21	0.70	0.11	0.0	3	3
0.98	0.24	0.80	0.13	0.0	3	3
1.04	0.26	0.89	0.15	0.0	3	3
1.18	0.31	0.96	0.13	0.0	3	3
1.28	0.35	1.03	0.19	0.0	3	3
1.39	0.38	1.11	0.22	0.0	3	3
1.44	0.39	1.20	0.19	0.0	3	3
1.55	0.46	1.24	0.23	0.0	3	3
1.59	0.43	1.29	0.23	0.0	3	3
1.67	0.34	1.35	0.22	0.0	3	3
1.67	0.42	1.41	0.15	0.0	3	3
1.87	0.54	1.46	0.25	0.0	3	3
1.90	0.46	1.51	0.25	0.0	3	3
1.99	0.60	1.56	0.27	0.0	3	3
2.14	0.60	1.63	0.29	0.0	3	3
2.22	0.60	1.66	0.33	0.0	3	3
2.23	0.61	1.71	0.30	0.0	3	3

( $d_{Limit} = 10\text{ m}$ )

30	18.6	-9.9
50	6.0	-9.6
100	9.7	-9.2
150	7.9	-8.8
200	7.6	-8.6
250	9.5	-8.3
300	11.0	-8.1
350	12.4	-7.9
400	13.6	-7.6
450	14.7	-7.4
500	15.6	-7.2
550	16.3	-7.0
600	17.2	-6.9
650	18.1	-6.9
700	18.5	-6.8
750	19.1	-6.3
800	19.6	-6.3
850	20.1	-6.0
900	20.8	-5.8
950	21.1	-5.6
1000	21.6	-5.6

0.29	0.04	0.23	0.02	-10.5	10	3
0.39	0.09	0.32	0.08	-10.5	10	3
0.56	0.14	0.47	0.08	-10.5	10	3
0.73	0.20	0.59	0.12	-10.5	10	3
0.84	0.21	0.70	0.11	-10.5	10	3
0.98	0.24	0.80	0.13	-10.5	10	3
1.04	0.26	0.89	0.15	-10.5	10	3
1.18	0.31	0.96	0.13	-10.5	10	3
1.28	0.35	1.03	0.19	-10.5	10	3
1.39	0.38	1.11	0.22	-10.5	10	3
1.44	0.39	1.20	0.19	-10.5	10	3
1.55	0.46	1.24	0.23	-10.5	10	3
1.59	0.43	1.29	0.23	-10.5	10	3
1.67	0.34	1.35	0.22	-10.5	10	3
1.67	0.42	1.41	0.15	-10.5	10	3
1.87	0.54	1.46	0.25	-10.5	10	3
1.90	0.46	1.51	0.25	-10.5	10	3
1.99	0.60	1.56	0.27	-10.5	10	3
2.14	0.60	1.63	0.29	-10.5	10	3
2.22	0.60	1.66	0.33	-10.5	10	3
2.23	0.61	1.71	0.30	-10.5	10	3

#### Sample calculation

$$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + \text{AF (dB 1/m)} + \text{Corr. (dB)}$$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

distance correction =  $-20 * \text{LOG} (d_{Limit} / d_{used})$

Linear interpolation will be used for frequencies in between the values in the table.

Tables show an extract of values.

### 7.4 ANTENNA R&S HF907 (1 GHZ – 18 GHZ)

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
1000	24.4	-19.4
2000	28.5	-17.4
3000	31.0	-16.1
4000	33.1	-14.7
5000	34.4	-13.7
6000	34.7	-12.7
7000	35.6	-11.0

cable loss 1 (relay + cable inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit, attenuator & pre-amp)	cable loss 4 (to receiver)		
dB	dB	dB	dB		
0.99	0.31	-21.51	0.79		
1.44	0.44	-20.63	1.38		
1.87	0.53	-19.85	1.33		
2.41	0.67	-19.13	1.31		
2.78	0.86	-18.71	1.40		
2.74	0.90	-17.83	1.47		
2.82	0.86	-16.19	1.46		

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
3000	31.0	-23.4
4000	33.1	-23.3
5000	34.4	-21.7
6000	34.7	-21.2
7000	35.6	-19.8

cable loss 1 (relay inside chamber)	cable loss 2 (inside chamber)	cable loss 3 (outside chamber)	cable loss 4 (switch unit, attenuator & pre-amp)	cable loss 5 (to receiver)	used for FCC 15.247
dB	dB	dB	dB	dB	
0.47	1.87	0.53	-27.58	1.33	
0.56	2.41	0.67	-28.23	1.31	
0.61	2.78	0.86	-27.35	1.40	
0.58	2.74	0.90	-26.89	1.47	
0.66	2.82	0.86	-25.58	1.46	

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
7000	35.6	-57.3
8000	36.3	-56.3
9000	37.1	-55.3
10000	37.5	-56.2
11000	37.5	-55.3
12000	37.6	-53.7
13000	38.2	-53.5
14000	39.9	-56.3
15000	40.9	-54.1
16000	41.3	-54.1
17000	42.8	-54.4
18000	44.2	-54.7

cable loss 1 (relay inside chamber)	cable loss 2 (High Pass)	cable loss 3 (pre-amp)	cable loss 4 (inside chamber)	cable loss 5 (outside chamber)	cable loss 6 (to receiver)
dB	dB	dB	dB	dB	dB
0.56	1.28	-62.72	2.66	0.94	1.46
0.69	0.71	-61.49	2.84	1.00	1.53
0.68	0.65	-60.80	3.06	1.09	1.60
0.70	0.54	-61.91	3.28	1.20	1.67
0.80	0.61	-61.40	3.43	1.27	1.70
0.84	0.42	-59.70	3.53	1.26	1.73
0.83	0.44	-59.81	3.75	1.32	1.83
0.91	0.53	-63.03	3.91	1.40	1.77
0.98	0.54	-61.05	4.02	1.44	1.83
1.23	0.49	-61.51	4.17	1.51	1.85
1.36	0.76	-62.36	4.34	1.53	2.00
1.70	0.53	-62.88	4.41	1.55	1.91

#### Sample calculation

$$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + \text{AF (dB 1/m)} + \text{Corr. (dB)}$$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

Tables show an extract of values.

### 7.5 ANTENNA EMCO 3160-09 (18 GHZ – 26.5 GHZ)

Frequency MHz	AF EMCO 3160-09 dB (1/m)	Corr. dB
18000	40.2	-23.5
18500	40.2	-23.2
19000	40.2	-22.0
19500	40.3	-21.3
20000	40.3	-20.3
20500	40.3	-19.9
21000	40.3	-19.1
21500	40.3	-19.1
22000	40.3	-18.7
22500	40.4	-19.0
23000	40.4	-19.5
23500	40.4	-19.3
24000	40.4	-19.8
24500	40.4	-19.5
25000	40.4	-19.3
25500	40.5	-20.4
26000	40.5	-21.3
26500	40.5	-21.1

cable loss 1 (inside chamber) dB	cable loss 2 (pre- amp) dB	cable loss 3 (inside chamber) dB	cable loss 4 (switch unit) dB	cable loss 5 (to receiver) dB
0.72	-35.85	6.20	2.81	2.65
0.69	-35.71	6.46	2.76	2.59
0.76	-35.44	6.69	3.15	2.79
0.74	-35.07	7.04	3.11	2.91
0.72	-34.49	7.30	3.07	3.05
0.78	-34.46	7.48	3.12	3.15
0.87	-34.07	7.61	3.20	3.33
0.90	-33.96	7.47	3.28	3.19
0.89	-33.57	7.34	3.35	3.28
0.87	-33.66	7.06	3.75	2.94
0.88	-33.75	6.92	3.77	2.70
0.90	-33.35	6.99	3.52	2.66
0.88	-33.99	6.88	3.88	2.58
0.91	-33.89	7.01	3.93	2.51
0.88	-33.00	6.72	3.96	2.14
0.89	-34.07	6.90	3.66	2.22
0.86	-35.11	7.02	3.69	2.28
0.90	-35.20	7.15	3.91	2.36

#### Sample calculation

$$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

## 7.6 ANTENNA EMCO 3160-10 (26.5 GHZ – 40 GHZ)

Frequency GHz	AF EMCO 3160-10 dB (1/m)	Corr. dB	cable loss 1 (inside chamber) dB	cable loss 2 (outside chamber) dB	cable loss 3 (switch unit) dB	cable loss 4 (to receiver) dB	distance corr. (-20 dB/ decade) dB	d <sub>Limit</sub> (meas. distance (limit) m	d <sub>used</sub> (meas. distance (used) m
26.5	43.4	-11.2	4.4				-9.5	3	1.0
27.0	43.4	-11.2	4.4				-9.5	3	1.0
28.0	43.4	-11.1	4.5				-9.5	3	1.0
29.0	43.5	-11.0	4.6				-9.5	3	1.0
30.0	43.5	-10.9	4.7				-9.5	3	1.0
31.0	43.5	-10.8	4.7				-9.5	3	1.0
32.0	43.5	-10.7	4.8				-9.5	3	1.0
33.0	43.6	-10.7	4.9				-9.5	3	1.0
34.0	43.6	-10.6	5.0				-9.5	3	1.0
35.0	43.6	-10.5	5.1				-9.5	3	1.0
36.0	43.6	-10.4	5.1				-9.5	3	1.0
37.0	43.7	-10.3	5.2				-9.5	3	1.0
38.0	43.7	-10.2	5.3				-9.5	3	1.0
39.0	43.7	-10.2	5.4				-9.5	3	1.0
40.0	43.8	-10.1	5.5				-9.5	3	1.0

### Sample calculation

$$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + \text{AF (dB 1/m)} + \text{Corr. (dB)}$$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

$$\text{distance correction} = -20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$$

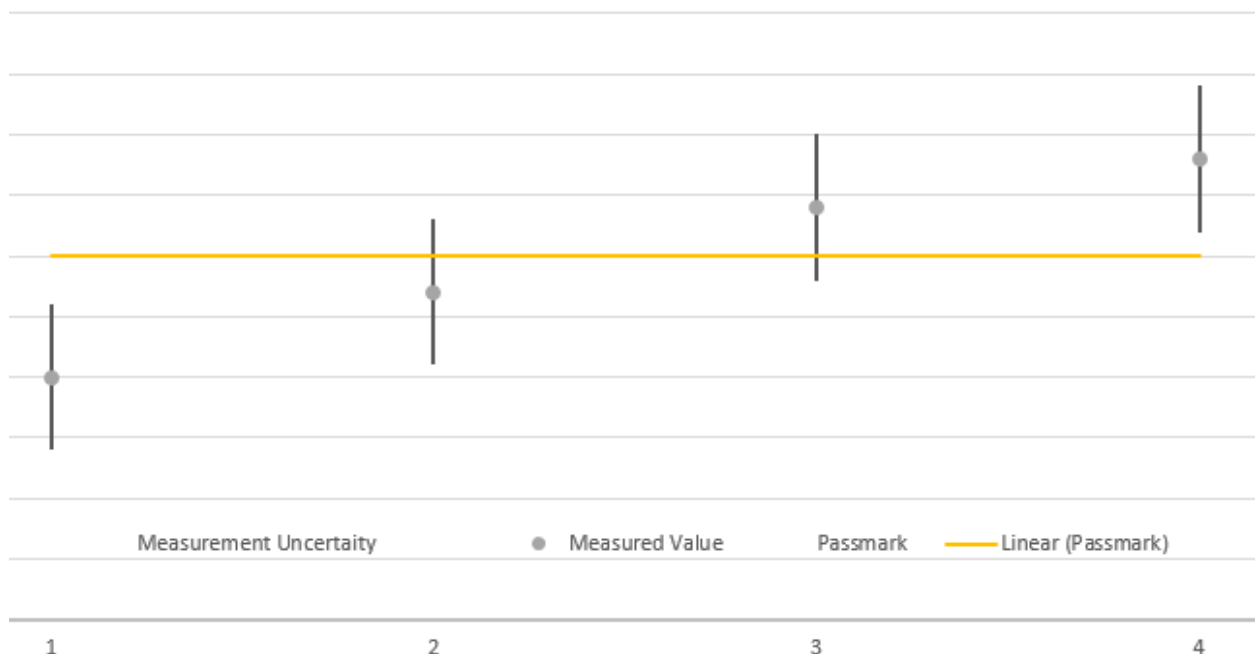
Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

## 8 MEASUREMENT UNCERTAINTIES

Test Case	Parameter	Uncertainty
AC Power Line	Voltage	± 3.4 dB
Field Strength of spurious radiation	Voltage	± 5.5 dB

The measurement uncertainties for all parameters are calculated with an expansion factor (coverage factor)  $k = 1.96$ . This means, that the true value is in the corresponding interval with a probability of 95 %.



The verdicts in this test report are given according the above diagram:

Case	Measured Value	Uncertainty Range	Verdict
1	below pass mark	below pass mark	Passed
2	below pass mark	within pass mark	Passed
3	above pass mark	within pass mark	Failed
4	above pass mark	above pass mark	Failed

That means, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so called shared risk principle.



## 9 PHOTO REPORT

Please see separate photo report.