PHOENIX TESTLAB

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Test Report

Report Number:

F172200E1

Equipment under Test (EUT):

KD Mini-EA StandAlone

Applicant:

Jungheinrich AG

Manufacturer:

DATASCHALT engineering GmbH

ilac-MRA

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-17186-01-01
D-PL-17186-01-02
D-PL-17186-01-03

References

[1] **ANSI C63.10: 2013** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

[2] **FCC CFR 47 Part 15** Radio Frequency Devices

[3] **RSS-210 Issue 9 (August 2016)** Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

[4] **RSS-Gen Issue 5 (April 2018)** General Requirements for Compliance of Radio Apparatus

Test Result

The requirements of the tests performed as shown in the overview (clause 4) were fulfilled by the equipment under test. The complete test results are presented in the following.

Tested and written by:	Ruben BRAUN		23.07.2018
	Name	Signature	Date
Reviewed and approved by:	Bernd STEINER		23.07.2018
	Name	Signature	Date

This test report is only valid in its original form.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

Contents: Page

1 Identification

1.1 Applicant

Name:	Jungheinrich AG
Address:	Friedrich-Ebert-Damm 129 22047 Hamburg
Country:	Germany
Name for contact purposes:	Mr. Peter DIBBERN, VC R&D
Phone:	+49-40-5296-1411
Fax:	+49-40-5269-78-1411
eMail address:	peter.dibbern@jungheinrich.de
Applicant represented during the test by the following person:	None

1.2 Manufacturer

Name:	DATASCHALT engineering GmbH
Address:	An der Hülshorst 7-9 23568 Lübeck
Country:	Germany
Name for contact purposes:	Mr. Jan-Ole HENKE
Phone:	+49-451-290-59-4024
Fax:	+49-451-290-59-23
eMail address:	janole.henke@dataschalt.com
Manufacturer represented during the test by the following person:	None

1.3 Test Laboratory

The tests were carried out by:

PHOENIX TESTLAB GmbH
Königswinkel 10
32825 Blomberg
Germany

Accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-02, FCC Test Firm Accreditation with the registration number 469623, designation number DE0004 and Industry Canada Test site registration SITE# IC3469A-1.

1.4 EUT (Equipment under Test)

Test object: *	Access control system for use in industrial trucks
Type / PMN: *	KD Mini-EA StandAlone
FCC ID: *	2AK6M-MFRC523SA
IC Certification Number: *	22414-MFRC523SA
Order number: *	A000000313
Serial number: *	803A6001
PCB identifier: *	LP1223 / LP1224
HVIN (Hardware Version Identification Number): *	KD Mini-EA StandAlone
FVIN (Firmware Version Identification Number): *	V010000
Lowest internal frequency: *	100 Hz Backlight PWM
Highest internal frequency: *	48 MHz Renesas Controller

*: Declared by the applicant.

Channel 1	RX:	13.56 MHz	TX:	13.56 MHz

1.5 Technical Data of Equipment

Maximum field strength: *	< 29.5 dBµV/m at 30 m distance					
Antenna type: *	Frame antenna / printed circuit flex foil					
Number of channels: *	1					
Antenna connector: *	None / ZIF connector; internal					
Modulation: *	Amplitude Shift Keying (ASK)					
Data rate: *	106 kBit					
Supply Voltage: *	U_{nom} =	24.0 V DC	U_{min}=	12 V DC	U_{max}=	48 V DC
Temperature range: *	-28 °C to +65 °C					

*: Declared by the applicant.

Ports / Connectors				
Identification	Connector		Length during test	Shielding (Yes / No)
	EUT	Ancillary		
Relay COM	3x Laboratory plug 4 mm	Not connected	2.8 m	No
Relay NO	3x Laboratory plug 4 mm	Not connected	2.8 m	No
CAN	RS-232 male	RS-232 female	2.8 m	No
Ground	4x Laboratory plug 4 mm	Laboratory plug 4 mm	2.8 m	No
VCC in	Laboratory plug 4 mm	Laboratory plug 4 mm	2.8 m	No
Active Low	Laboratory plug 4 mm	Not connected	2.8 m	No

Ancillary equipment used for all tests
CAN to USB converter: PEAK, marked IPEH-002022 26650 *[1]
13.56 MHz coin *[1]
Power supply: Phoenix Contact MINI-PS-100-240AC/24DC/1, Serial No. 96630594 *[2]
Laptop computer: Fujitsu Lifebook, Serial No. DSBF062945, PM No. 200759 *[2]

*[1] Provided by the applicant
*[2] Provided by the laboratory

The EUT was equipped with the following radio modules which were not subject of this test report
-

1.6 Dates

Date of receipt of test sample:	02.02.2018
Start of test:	16.06.2018
End of test:	29.06.2018

2 Operational States

Description of function of the EUT:

The EUT is an access control system for use in industrial trucks. Among others it shows the battery condition, limits access by recognizing RFID TAGs, etc.

The following states were defined as the operating conditions:

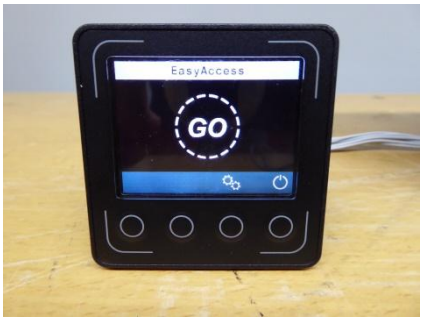
Normal operation mode.
Rated voltage for all tests and measurements: U = 24 V DC
RFID module reading the TAG (TAG placed over EUT)
CAN interface terminated with CAN to USB converter. The converter is then plugged to a laptop computer. The software *PCAN-View* is running on the laptop computer, visualizing the CAN communication of the EUT.
All other cables, except the ones connected to the power supply were left open.

Definition of the functions to be monitored and corresponding tolerance limits:

The display shows a green tick, which indicates that the EUT accepted the placed TAG. After pressing the right knob on the EUT, the EUT was set into normal operation mode. The communication was still active and the TAG remained on top of the EUT.

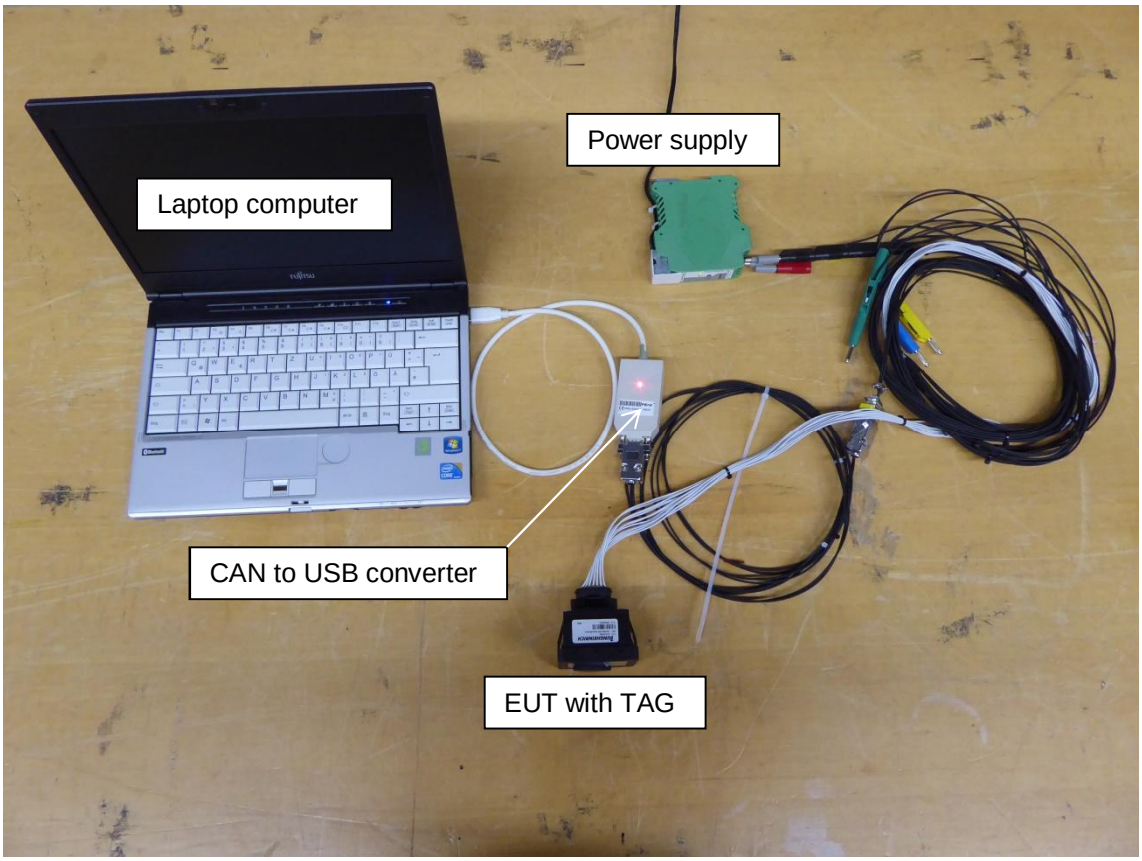
EUT waiting for TAG

TAG placed in front of EUT



EUT after confirming the TAG

The system was set up as follows:



3 Additional Information

The EUT was not labeled as required by FCC / IC.

4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 15 section [2]	RSS-Gen, Issue 5 [4] and RSS 210, Issue 9 [3]	Status	Refer page
Conducted emissions on supply line	0.15 – 30	15.207	8.8 [4]	Passed	12 et seq.
Radiated emissions	0.009 – 1.000	15.205 15.209	8.10 [4] 4.4 [3]	Passed	15 et seq.
99% bandwidth	13.56	-	6.7 [4]	Passed	29 et seq.
Antenna requirement	-	15.203	6.8 [4]	Passed *	-

*: Integrated antenna only, requirement fulfilled.

Remark: As declared by the applicant the highest internal clock frequency is < 108 MHz.
Therefore the radiated emission measurement must be carried out up to 1 GHz.

5 Results

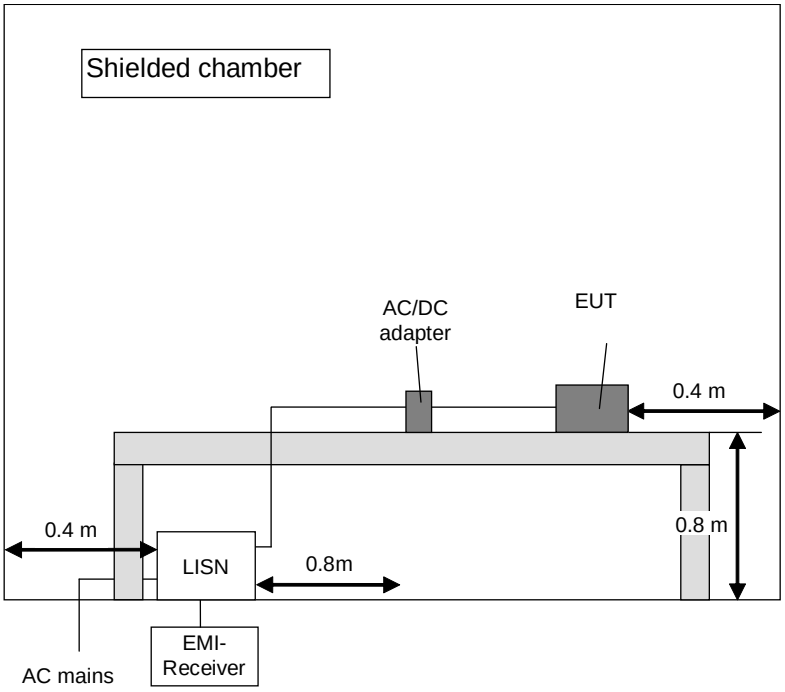
5.1 Conducted emissions on power supply lines

5.1.1 Test method

This test will be carried out in a shielded chamber. Table top devices will set up on a non-conducting support with a size of 1 m by 1.5 m and a height of 80 cm above the ground plane. Floor-standing devices will be placed directly on the ground plane. The setup of the Equipment under test will be in accordance to [1].

The frequency range 150 kHz to 30 MHz will be measured with an EMI Receiver set to MAX Hold mode with peak and average detector and a resolution bandwidth of 9 kHz. A scan will be carried out on the phase (or plus pole in case of DC powered devices) of the AC mains network. If levels detected 10 dB below the appropriable limit, this emission will be measured with the average and quasi-peak detector on all lines.

Frequency range	Resolution bandwidth
150 kHz to 30 MHz	9 kHz

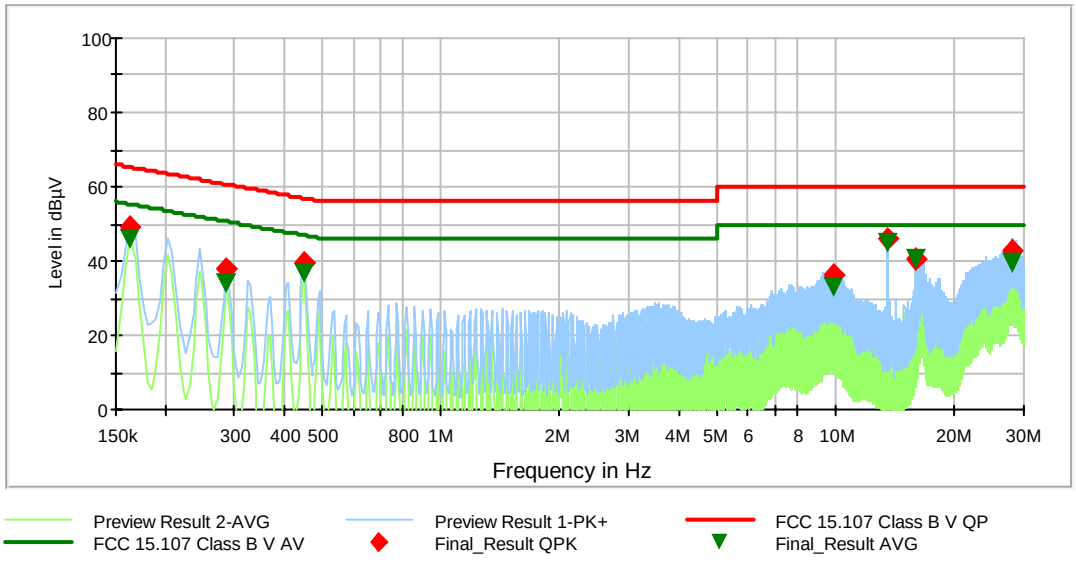


5.1.2 Results conducted emission measurement on AC mains

Ambient temperature:	22 °C	Relative humidity:	55 %

Test description:	Conducted emission measurement
EUT:	KD Mini-EA StandAlone
Manufacturer:	Dataschalt
Operating conditions:	24 V DC, CAN active
Test site:	Phoenix TESTLAB GmbH, shielded room M4
Operator:	R. Braun
Comment:	
Date of test	25.06.2018

The curves in the diagrams below only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by ◆ and the average measured points by ▼ .



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Transducer (dB)
0.163500	49.17	---	65.28	16.11	5000.0	9.000	N	FLO	9.8
0.163500	---	46.14	55.28	9.15	5000.0	9.000	N	FLO	9.8
0.285900	---	33.97	50.64	16.68	5000.0	9.000	N	FLO	9.9
0.285900	37.81	---	60.64	22.83	5000.0	9.000	N	GND	9.9
0.449700	---	36.90	46.88	9.98	5000.0	9.000	N	FLO	9.9
0.449700	39.60	---	56.88	17.28	5000.0	9.000	N	FLO	9.9
9.931200	---	33.07	50.00	16.93	5000.0	9.000	N	FLO	10.6
9.931200	36.09	---	60.00	23.91	5000.0	9.000	N	FLO	10.6
13.561800	46.16	---	60.00	13.84	5000.0	9.000	N	FLO	10.8
13.561800	---	44.99	50.00	5.01	5000.0	9.000	N	GND	10.8
16.000800	---	40.42	50.00	9.58	5000.0	9.000	N	GND	10.9
16.001700	40.45	---	60.00	19.55	5000.0	9.000	L1	GND	10.8
27.871800	42.44	---	60.00	17.56	5000.0	9.000	L1	GND	11.2
27.873600	---	39.57	50.00	10.43	5000.0	9.000	L1	FLO	11.2
Measurement uncertainty				+2.78 dB / -2.78 dB					

Test: Passed

Test equipment (please refer to chapter 6 for details)
1-5

5.2 Radiated emissions

5.2.1 Test method

The radiated emission measurement is subdivided into four stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A final measurement carried out on an outdoor test side without reflecting ground plane and a fixed antenna height in the frequency range 9 kHz to 30 MHz.
- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 30 MHz to 1 GHz.
- A final measurement carried out on an open area test site with reflecting ground plane and various antenna heights in the frequency range 30 MHz to 1 GHz.

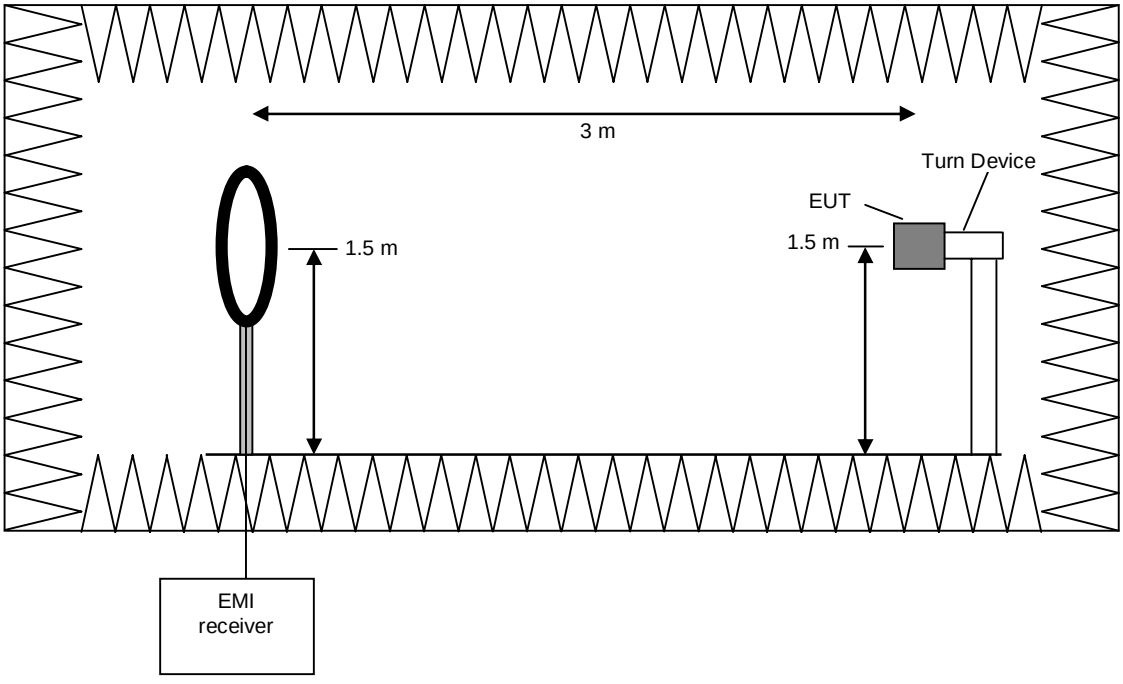
Preliminary measurement (9 kHz to 30 MHz):

In the first stage a preliminary measurement will be performed in a shielded room with a measuring distance of 3 meters. Table top devices will set up on a non-conducting turn device on the height of 1.5 m. The setup of the equipment under test will be in accordance to [1].

The frequency range 9 kHz to 30 MHz will be monitored with a spectrum analyser while the system and its cables will be manipulated to find out the configuration with the maximum emission levels if applicable. The EMI Receiver will be set to MAX Hold mode. The EUT and the measuring antenna will be rotated around their vertical axis to find the maximum emissions.

The resolution bandwidth of the spectrum analyser will be set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	10 kHz



Preliminary measurement procedure:

Prescans were performed in the frequency range 9 kHz to 150 kHz and 150 kHz to 30 MHz.

The following procedure will be used:

1) Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2) Manipulate the system cables within the range to produce the maximum level of emission.
3) Rotate the EUT by 360 ° to maximize the detected signals.
4) Make a hardcopy of the spectrum.
5) Measure the frequencies of highest detected emission with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
6) Repeat steps 1) to 5) with the other orthogonal axes of the EUT (because of EUT is a module and might be used in a handheld equipment application).
7) Rotate the measuring antenna and repeat steps 1) to 5).

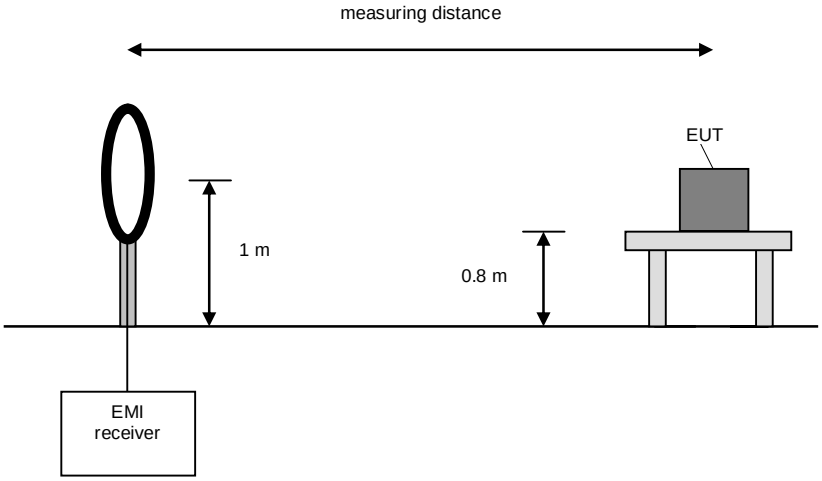
Final measurement (9 kHz to 30 MHz):

In the second stage a final measurement will be performed on an open area test site with no conducting ground plane in measuring distances of 3 m, 10 m and 30 m. In the case where larger measuring distances are required, the results will be extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with a EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 kHz to 490 kHz where an average detector will be used according Section 15.209 (d) [2].

At the frequencies, which were detected during the preliminary measurements, the final measurement will be performed while rotating the EUT and the measuring antenna in the range of 0 ° to 360 ° around their vertical axis until the maximum value is found.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
9 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz



Final measurement procedure:

The following procedure will be used:

1) Monitor the frequency range with the measuring antenna at vertical orientation parallel to the EUT at an azimuth of 0 °.
2) Rotate the EUT by 360 ° to maximize the detected signals and note the azimuth and orientation.
3) Rotate the measuring antenna to find the maximum and note the value.
4) Rotate the measuring antenna and repeat steps 1) to 3) until the maximum value is found.
5) Repeat steps 1) to 4) with the other orthogonal axes of the EUT (if the EUT is a module and might be used in a handheld equipment application).

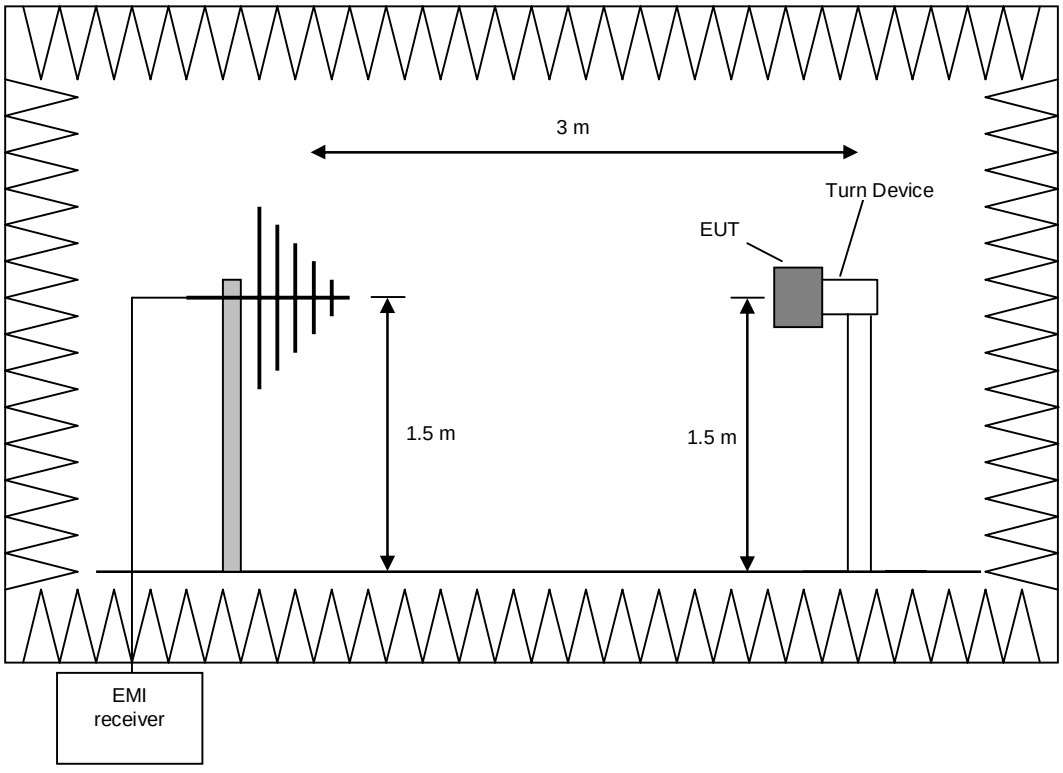
Preliminary measurement (30 MHz to 1 GHz)

In the first stage a preliminary measurement will be performed in a fully anechoic chamber with a measuring distance of 3 meter. Table top devices will set up on a non-conducting turn device on the height of 1.5 m. The set-up of the Equipment under test will be in accordance to [1].

The frequency range 30 MHz to 1 GHz will be measured with an EMI Receiver set to MAX Hold mode and a resolution bandwidth of 120 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



Procedure preliminary measurement:

Prescans were performed in the frequency range 30 MHz to 1 GHz.
The following procedure will be used:

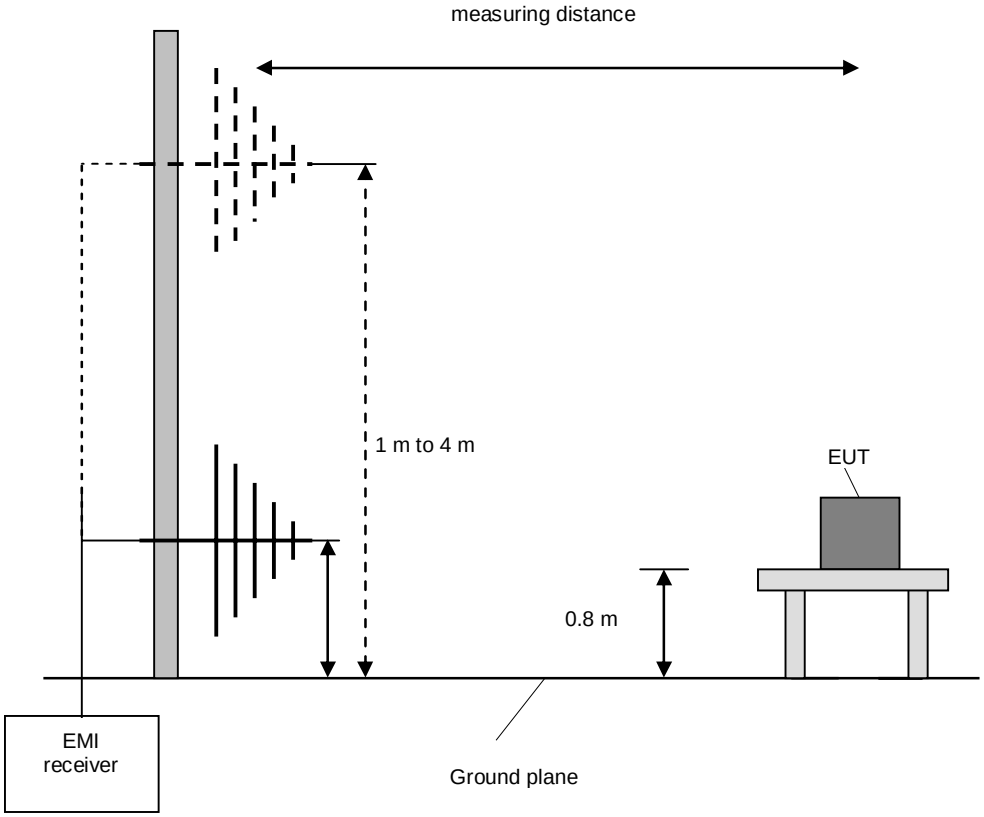
1. Monitor the frequency range at horizontal polarisation and a EUT azimuth of 0 °.
2. Manipulate the system cables within the range to produce the maximum level of emission.
3. Rotate the EUT by 360 ° to maximize the detected signals.
4. Make a hardcopy of the spectrum.
5. Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
6. Repeat 1) to 4) with the other orthogonal axes of the EUT if handheld equipment.
7. Repeat 1) to 5) with the vertical polarisation of the measuring antenna.

Final measurement (30 MHz to 1 GHz)

A final measurement on an open area test site will be performed on selected frequencies found in the preliminary measurement. During this test the EUT will be rotated in the range of
0 ° to 360 °, the measuring antenna will be set to horizontal and vertical polarisation and raised and lowered in the range from 1 m to 4 m to find the maximum level of emissions.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 1 GHz	120 kHz



Procedure final measurement:

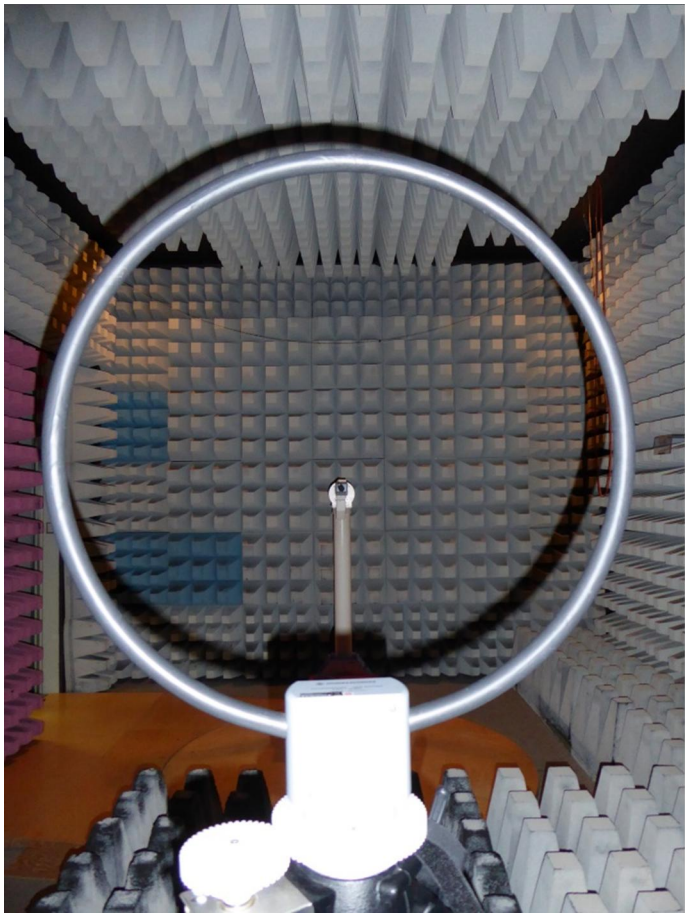
The following procedure will be used:

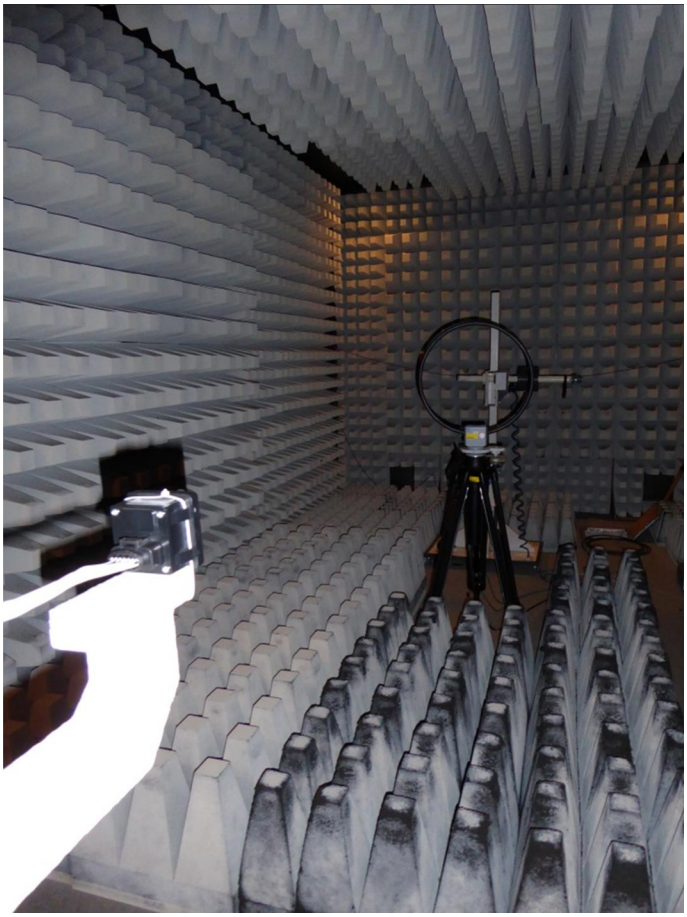
1) Measure on the selected frequencies at an antenna height of 1 m and a EUT azimuth of 23 °.
2) Move the antenna from 1 m to 4 m and note the maximum value at each frequency.
3) Rotate the EUT by 45 ° and repeat 2) until an azimuth of 337 ° is reached.
4) Repeat 1) to 3) for the other orthogonal antenna polarization.
5) Move the antenna and the turntable to the position where the maximum value is detected.
6) Measure while moving the antenna slowly +/- 1 m.
7) Set the antenna to the position where the maximum value is found.
8) Measure while moving the turntable +/- 45 °.
9) Set the turntable to the azimuth where the maximum value is found.
10) Measure with Final detector (QP and AV) and note the value.
11) Repeat 5) to 10) for each frequency.
12) Repeat 1) to 11) for each orthogonal axes of the EUT if handheld equipment.

5.2.2 Results preliminary measurement 9 kHz to 30 MHz

Ambient temperature:	22°C	Relative humidity:	26 %

Test description:	Radiated emission measurement
EUT:	KD Mini-EA StandAlone
Manufacturer:	Dataschalt
Operating conditions:	24 V DC, CAN active
Test site:	Phoenix TESTLAB GmbH, anechoic chamber M20
Operator:	Ruben Braun
Comment:	
Date of test	16.03.2018





The following frequencies were found during the preliminary radiated emission test:

Frequency (MHz)
0.026424
0.027733
0.053012
0.055731
0.140130
13.562600

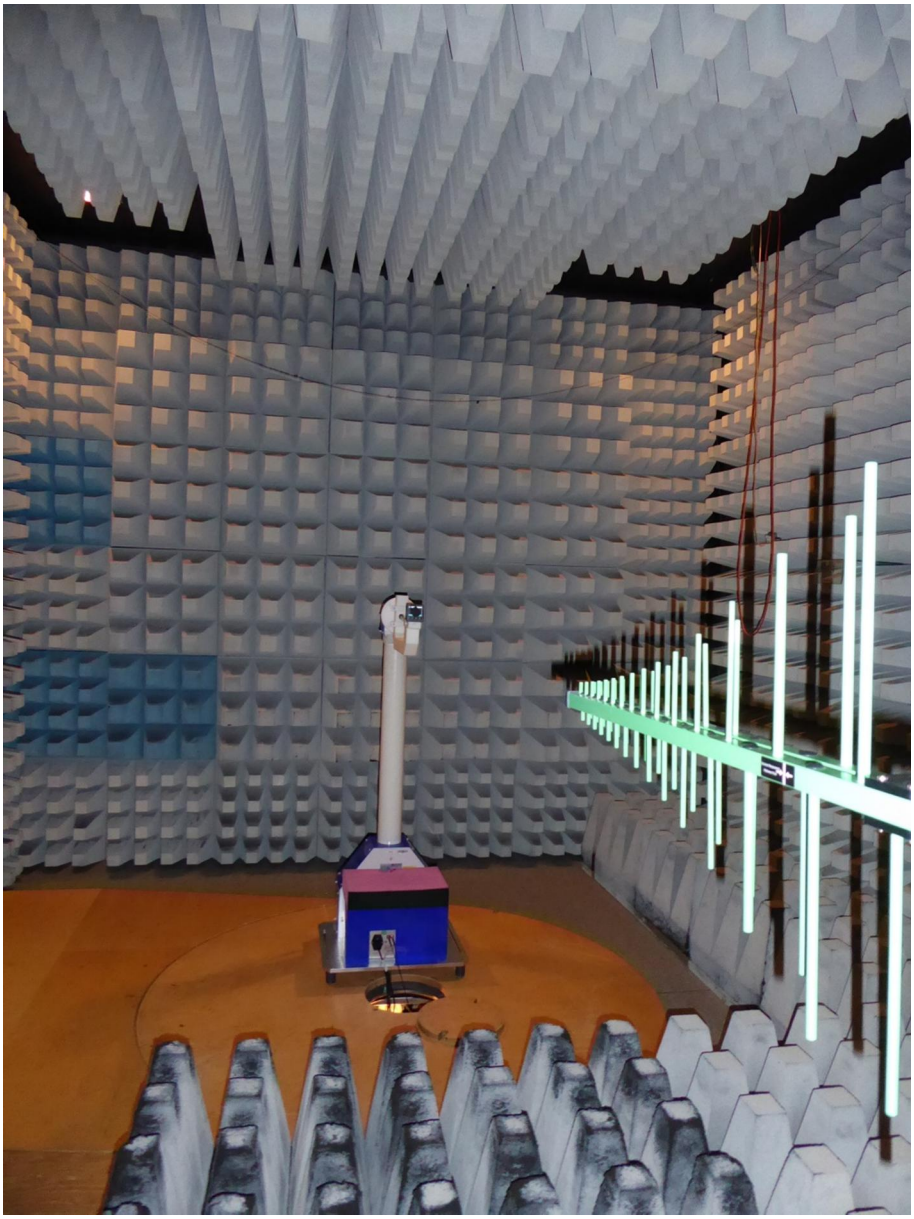
These frequencies have to be measured with in a final measurement.

Test equipment (please refer to chapter 6 for details)
2, 7, 8, 10, 13, 22, 24

5.2.3 Results preliminary measurement 30 MHz to 1 GHz

Ambient temperature:	21 °C	Relative humidity:	26 %

Test description:	Radiated emission measurement
EUT:	KD Mini-EA StandAlone
Manufacturer:	Dataschalt
Operating conditions:	24 V DC, CAN active
Test site:	Phoenix TESTLAB GmbH, anechoic chamber M20
Operator:	Ruben BRAUN
Comment:	
Date of test	16.03.2018



The following frequencies were found during the preliminary radiated emission test:

Frequency (MHz)
40.670000
67.776111
128.778333
176.308333
280.421667
289.205556
379.738889

These frequencies have to be measured with in a final measurement.

Test equipment (please refer to chapter 6 for details)
2, 6-13, 22-23

5.2.4 Result final measurement from 9 kHz to 30 MHz

Ambient temperature	24 °C

Relative humidity	60 %

Test description:	Radiated emission measurement according to FCC PART 15
EUT:	KD Mini-EA StandAlone
Manufacturer:	Dataschalt
Operating conditions:	24 V DC, CAN active
Test site:	Phoenix TESTLAB GmbH, Outdoor Test Site
Operator:	R. Braun
Comment:	
Date of test	29.06.2018

Final measurement at 3m distance

Final measurement at 10m distance

The results of the standard subsequent measurement on the outdoor test site are indicated in the table on the next page. The limits as well as the measured results (levels) refer to the above mentioned standard while taking account of the specified requirements for a 30 / 300 m measuring distance.

Results 9kHz - 30 MHz								
Frequency [MHz]	Reading [dBµV]	Result* [dBµV/m]	Limit acc. 15.209 [dBµV/m]	Margin [dB]	Detector (acc. to §15.209 (d)	Antenna factor [dB/m]	Measuring Distance [m]	Distance correction factor** [dB]
0.026242	31.4	-28.3 @ 300m	39.2	67.6	AV	20.3	3	80.0
0.027733	34.2	-25.6 @ 300m	38.7	64.3	AV	20.2	3	80.0
0.053012	15.4	-44.4 @ 300m	33.1	77.5	AV	20.2	3	80.0
0.055731	14.4	-45.4 @ 300m	32.7	78.1	AV	20.2	3	80.0
0.140130	17.4	-42.5 @ 300m	24.7	67.2	AV	20.1	3	80.0
13.561600	40.0	19.9 @ 30m	29.5	9.6	QP	19.9	3	40.0
13.561600	27.8	28.6 @ 30m	29.5	0.9	QP	19.9	10	19.1
Measurement uncertainty			+/- 4.69 dB					

Note: *Result @ normative distance = reading + antenna factor - distance extrapolation factor
** 40dB/decade according part §15.31 (f) (2)

Test: Passed

The test results were calculated with the following formula:

Result [dBµV/m] = reading [dBµV] + antenna factor [dB/m] – distance correction (dB)

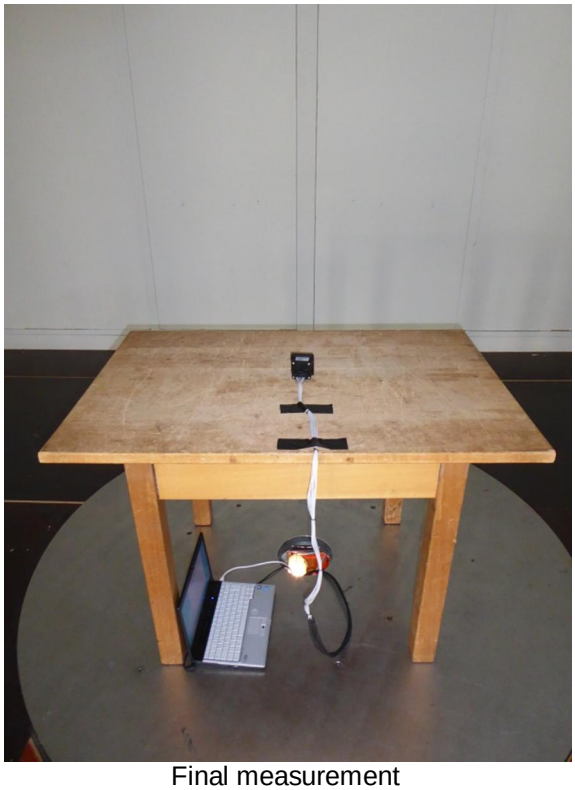
Test equipment (please refer to chapter 6 for details)
14, 24, 25

5.2.5 Result final measurement from 30 MHz to 1 GHz

Ambient temperature	7 °C	Relative humidity	21 %

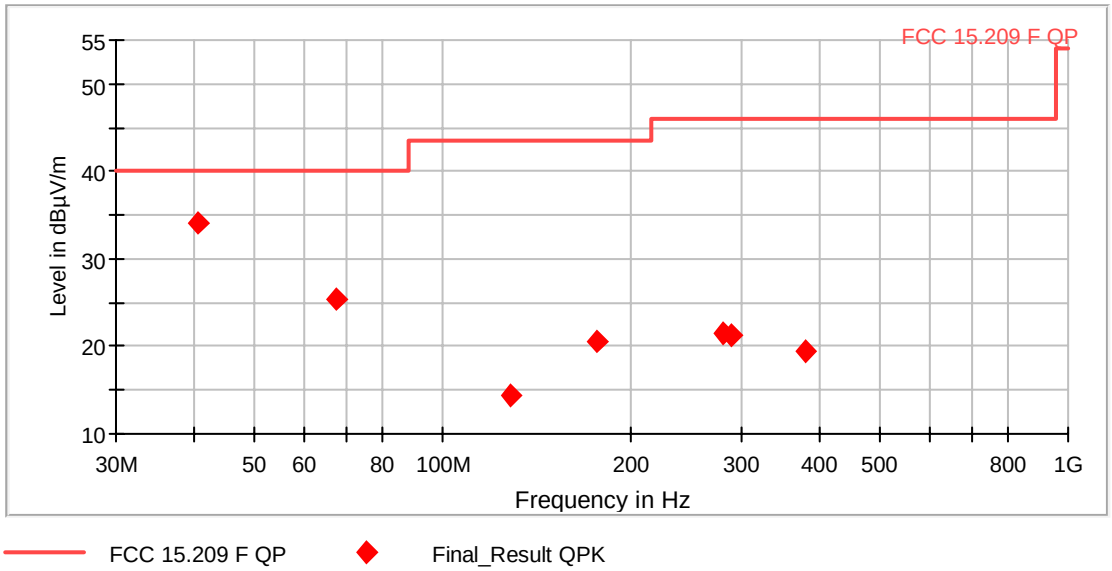
Test description:	Radiated emission measurement according to FCC PART 15
EUT:	KD Mini-EA StandAlone
Manufacturer:	Dataschalt
Operating conditions:	24 V DC
Test site:	Phoenix TESTLAB GmbH, OATS M6
Operator:	Ruben BRAUN
Comment:	
Date of test	21.03.2018

Final measurement



Final measurement

The measured points and the limit line in the following diagram refer to the standard measurement of the emitted interference in compliance with the above mentioned standard. The measured points marked with "◆" are the measured results of the standard subsequent measurement on the open area test site.



The results of the standard subsequent measurement on the open area test site are indicated in the table on the next page. The limits as well as the measured results (levels) refer to the above mentioned standard while taking account of the specified requirements for a 3 m measuring distance.

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.670000	34.20	40.00	5.80	1000.0	120.000	109.0	V	226.0	22.3
67.776111	25.37	40.00	14.63	1000.0	120.000	138.0	V	37.0	13.1
128.778333	14.26	43.50	29.24	1000.0	120.000	350.0	H	251.0	19.1
176.308333	20.48	43.50	23.02	1000.0	120.000	187.0	H	271.0	17.0
280.421667	21.47	46.00	24.53	1000.0	120.000	103.0	V	204.0	21.1
289.205556	21.19	46.00	24.81	1000.0	120.000	102.0	V	175.0	21.4
379.738889	19.40	46.00	26.60	1000.0	120.000	100.0	H	248.0	23.8
Measurement uncertainty:						+/- 4.78 dB			

Test: Passed

The correction factor was calculated as follows:

Corr. (dB) = cable attenuation (dB) + 6 dB attenuator (dB) + antenna factor (dB)

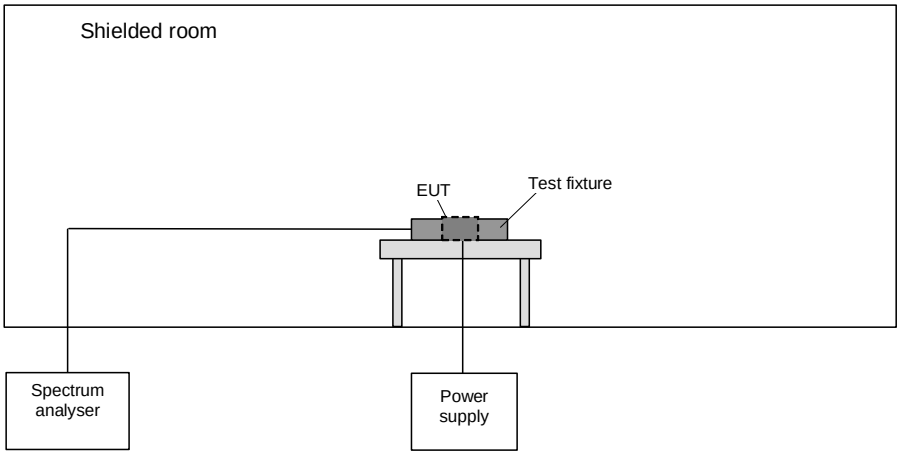
Therefore the reading can be calculated as follows:

Reading (dBµV/m) = result QuasiPeak (dBµV/m) - Corr. (dB)

Test equipment (please refer to chapter 6 for details)
2, 15-21

5.3 99 % bandwidth

5.3.1 Test method



The following procedure will be used for the occupied bandwidth measurement according to [1]:

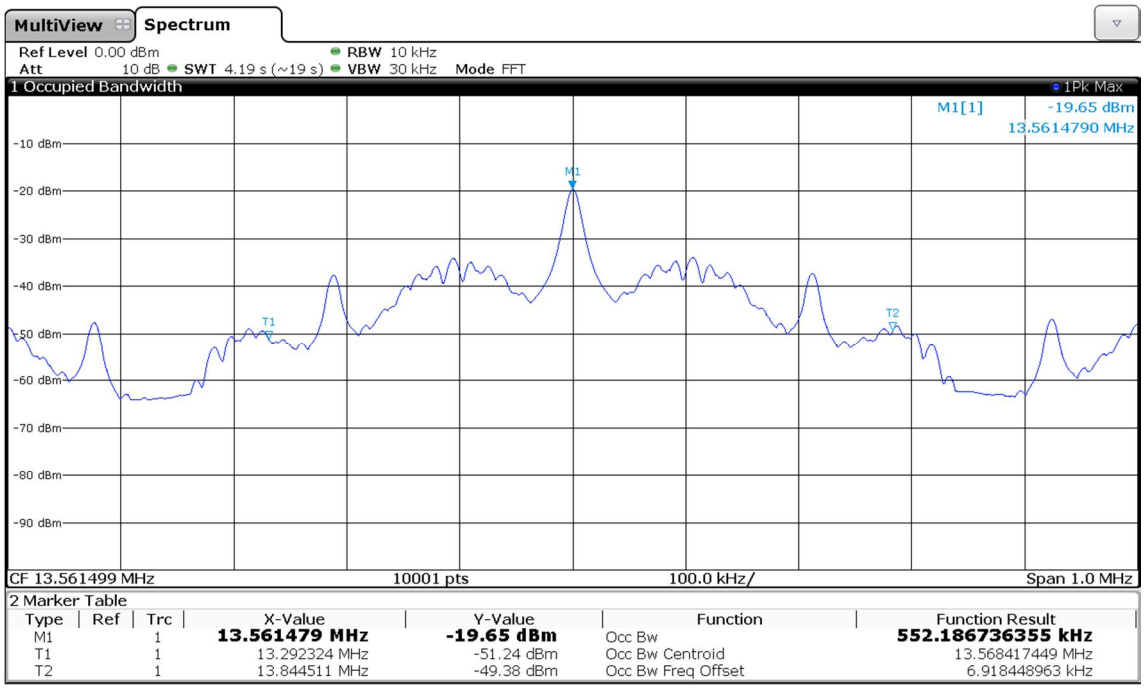
The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.
The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

5.3.2 Test results

Ambient temperature:	22 °C

Relative humidity:	45 %

Test description:	99 % measurement
EUT:	KD Mini-EA StandAlone
Manufacturer:	Dataschalt
Operating conditions:	24 V DC
Test site:	Phoenix TESTLAB GmbH, shielded room
Operator:	Ruben BRAUN
Comment:	
Date of test	12.06.2018



F_L	F_U	BW (F_U - F_L)
13.292324 MHz	13.844511 MHz	552.18674 kHz
Measurement uncertainty		< $1*10^{-7}$

Test: Passed

Test equipment (please refer to chapter 6 for details)
22, 26, 27

6 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	LISN	NSLK8128	Schwarzbeck	8128155	480058	14.03.2018	03.2020
2	Software	EMC32	Rohde & Schwarz	100061	481022	Calibration not necessary	
3	Shielded chamber M4	B83117-S1-X158	Siemens	190075	480088	Calibration not necessary	
4	EMI Receiver / Spectrum Analyser	ESIB 26	Rohde & Schwarz	100292	481182	28.02.2018	02.2020
5	Transient Filter Limiter	CFL 9206A	Teseq GmbH	38268	481982	14.03.2018	03.2020
6	Antenna mast	AS615P	Deisel	615/310	480187	Calibration not necessary	
7	Fully anechoic chamber M20	B83117-E2439-T232	Albatross Projects	103	480303	Calibration not necessary	
8	Turntable	DS420 HE	Deisel	420/620/00	480315	Calibration not necessary	
9	Antenna (Bilog)	CBL6112B	Schaffner EMV GmbH (-Chase)	2688	480328	19.06.2017	06.2020
10	Multiple Control Unit	MCU	Maturo GmbH	MCU/043/971107	480832	Calibration not necessary	
11	RF-cable No.36	Sucoflex 106B	Suhner	0587/6B / Kabel 36	480865	Calibration not necessary	
12	HF-Cable	Sucoflex 104	Huber+Suhner	517402	482392	Calibration not necessary	
13	Positioner	TDF 1.5- 10Kg	Maturo	15920215	482034	Calibration not necessary	
14	EMI Receiver / Spectrum Analyser	ESI 40	Rohde & Schwarz	100064/040	480355	27.02.2018	02.2019
15	Attenuator 6 dB	WA2-6	Weinschel	8254	410119	Calibration not necessary	
16	Open area test site M6	Freifeld M6	Phoenix Contact	-	480085	Calibration not necessary	
17	Antenna mast	MA240-0	Inn-Co GmbH	MA240-0/030/6600603	480086	Calibration not necessary	
18	Turntable	DS412	Deisel	412/316	480087	Calibration not necessary	
19	Controller	HD100	Deisel	100/349	480139	Calibration not necessary	
20	Antenna (Bilog)	CBL6111D	Schaffner Elektrotest GmbH / Teseq GmbH	25761	480894	19.10.2017	10.2020
21	EMI Receiver / Spectrum Analyser	ESR7	Rohde & Schwarz	101939	482558	19.09.2017	09.2019
22	Signal & Spectrum Analyzer	FSW43	Rohde & Schwarz	100586 & 100926	481720	15.03.2018	03.2020
23	Antenna support	AS620P	Deisel	620/375	480325	Calibration not necessary	
24	Loop antenna	HFH2-Z2	Rohde & Schwarz	100417	481912	19.12.2017	12.2018
25	Outdoor test site	-	PHOENIX TESTLAB GmbH	-	480293	Calibration not necessary	
26	Loop antenna	Loop antenna 11cm	PHOENIX TESTLAB GmbH	-	410084	Calibration not necessary	
27	Shielded chamber M21	B83117-B1232-T162	Albatross Projects	26491	481966	Calibration not necessary	

7 Report History

Report Number	Date	Comment
F172200E1	23.07.2018	Initial Test Report

8 List of Annexes

Annex A	Test Setup Photos	11 pages

172200_01: Test setup shielded room M4
172200_02: Test setup shielded room M4
172200_03: Test setup anechoic chamber M20, 9 kHz – 30 MHz
172200_04: Test setup anechoic chamber M20, 9 kHz – 30 MHz
172200_05: Test setup open area test site, 9 kHz – 30 MHz @ 3m
172200_06: Test setup open area test site, 9 kHz – 30 MHz @ 3m
172200_07: Test setup open area test site, 9 kHz – 30 MHz @ 10m
172200_08: Test setup open area test site, 9 kHz – 30 MHz @ 10m
172200_09: Test setup anechoic chamber M20, 30 MHz – 1 GHz
172200_10: Test setup open area test site M6, 30 MHz – 1 GHz
172200_11: Test setup open area test site M6, 30 MHz – 1 GHz

Annex B	EUT External Photos	9 pages

172200_12: EUT with cables
172200_13: EUT front view
172200_14: EUT back view
172200_15: EUT top view
172200_16: EUT bottom view
172200_17: EUT right side view
172200_18: EUT left side view
172200_19: EUT 3D view
172200_20: TAG

Annex C	EUT Internal Photos	12 pages

172200_21: Top view PCB 1, back cover removed
172200_22: Top view PCB 2, back cover and PCB 1 removed
172200_23: Internal view front cover
172200_24: Top view antenna, front cover removed
172200_25: Top view antenna and gasket
172200_26: Bottom view antenna and gasket
172200_27: Top view display
172200_28: Bottom view display
172200_29: Top view PCB 1
172200_30: Bottom view PCB 1
172200_31: Top view PCB 2
172200_32: Bottom view PCB 2