

Test Report

Report Number:

F181073E3

Equipment under Test (EUT):

**KPD5/2 HID SF2F
and
PRD5/2 HID SF2F**

Applicant:

deister electronic GmbH

Manufacturer:

deister electronic GmbH



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

References

- [1] **ANSI C63.4:2014** American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- [2] **FCC 47 CFR Part 2:** General Rules and Regulations
- [3] **FCC 47 CFR Part 15:** Radio Frequency Devices (Subpart B)
- [4] **ICES-003 Issue 6: (January 2016)** Spectrum Management and Telecommunications. Interference-Causing Equipment Standard. Information Technology Equipment (Including Digital Apparatus) —Limits and Methods of Measurement

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:	<u>Michael DINTER</u> Name	<u></u> Signature	<u>29.11.2019</u> Date
Reviewed and approved by:	<u>Bernd STEINER</u> Name	<u></u> Signature	<u>29.11.2019</u> Date

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Contents:	Page
1 Identification	4
1.1 Applicant.....	4
1.2 Manufacturer	4
1.3 Test Laboratory	4
1.4 EUT (Equipment under Test)	5
1.5 Technical Data of Equipment	5
1.6 Dates	6
2 Operational States	7
3 Additional Information	7
4 Overview.....	8
5 Results.....	9
5.1 Conducted emissions on power supply lines	9
5.1.1 Test method.....	9
5.1.2 Results conducted emission measurement on AC mains.....	10
5.2 Radiated emissions	12
5.2.1 Test method.....	12
5.2.2 Results preliminary measurement 30 MHz to 1 GHz	15
5.2.3 Result final measurement from 30 MHz to 1 GHz.....	17
6 Test Equipment used for Tests	19
7 Test site Validation	20
8 Report History.....	20
9 List of Annexes	20

1 Identification

1.1 Applicant

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Fax:	+49-(0)- 5105-516-266
eMail Address:	info@deister-gmbh.de
Applicant represented during the test by the following person:	None

1.2 Manufacturer

Name:	deister electronic GmbH
Address:	Hermann-Bahlsen-Str. 11 30890 Barsinghausen
Country:	Germany
Name for contact purposes:	Mr. Stefan EICHLER
Phone:	+49-(0)-5105-516-129
Fax:	+49-(0)- 5105-516-266
eMail Address:	info@deister-gmbh.de
Applicant 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 and D-PL-17186-01-05, FCC Test Firm Designation Number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT (Equipment under Test)

Type of equipment	13.56 MHz and 125 kHz RFID Reader
Product model name (PMN): *	KPD5/2 HID SF2F (with Keypad) PRD5/2 HID SF2F (without Keypad)
Model name (HVIN): *	KPD5/2 HID SF2F (with Keypad) PRD5/2 HID SF2F (without Keypad)
Order No.: *	02581.000 (with Keypad) 02570.000 (without Keypad)
Serial No.: *	7217601243 (with Keypad) 7217304787 (without Keypad)
FCC ID: *	IXLPRD52HIDSF2F
IC: *	1893B-PRD52HIDSF2
PCB identifier:*	Not provided by the applicant
Software version (FVIN): *	c41
Lowest internal frequency: *	Not provided by the applicant
Highest internal frequency: *	13.56 MHz
Antenna type:*	Internal loop antenna

*: declared by the applicant.

Note: Phoenix Testlab GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

1.5 Technical Data of Equipment

Power supply: *	24 V DC supplied by external power supply		
Supply voltage: *	$U_{nom} = 12 \text{ V DC}$ or 24 V DC	$U_{min} = 8 \text{ V DC}$	$U_{max} = 30 \text{ V DC}$
Type of modulation: *	ASK		
Operating frequency range: *	125kHz and 13.56 MHz		
Number of channels: *	1		
Antenna type: *	Two internal loop antennas		
Duty cycle: *	100%		
Rated RF power: *	< 250 mW		
Data rate: *	2 kbaud up to 424 kbaud		
Temperature range: *	-25°C to 60°C		

* declared by the applicant.

Ports / Connectors			
Identification	Connector		Length during test
	EUT	Ancillary	
I/O and power supply	12 PIN	customized	2 m

The following ancillary devices were used for the measurements:	
Laptop (delivered by the LAB)	Lenovo Think Pad x201 tablet
External power supply (delivered by the applicant)	AC Adapter Deister FW 3288
RFID TAGs (delivered by the applicant)	RFID TAG type 13.56 MHz: DESFire EV1 RFID TAG type 125 kHz: HID (ISO Prox II)

1.6 Dates

Date of receipt of test sample:	07.08.2018
Start of test:	27.08.2018
End of test:	31.08.2018

2 Operational States

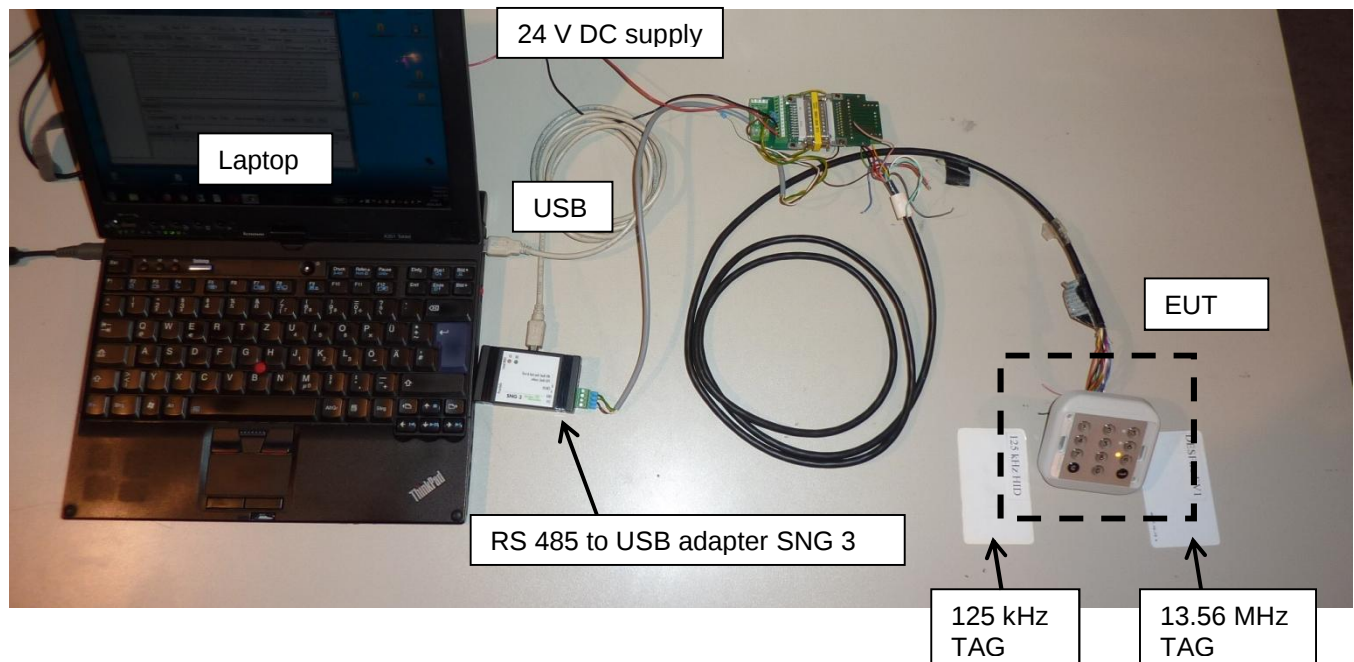
The EUT is a RFID transponder for universal use with additional keypad.
 All tests were carried out with an unmodified test sample, which operates in normal mode.
 During all test the EUT was reading a TAG.
 Additionally, a RS 485 connection was established with an RS 485 to USB adapter SNG 3.
 The transponder code was shown on the Laptop with a terminal program.

The conducted emission measurement on the power supply line was carried out on an AC/DC adapter Deister FW 3288.
 As pretest has shown the KPD5/2 HID SF2F was the worst-case setup and there was no significant difference between 12 V DC or 24 V DC supply.
 Therefore, during the radiated tests the EUT was supplied with 24 V DC and during the conducted tests with 12 V DC via an AC/DC adapter by an AC-mains network with 120 V AC / 60 Hz.

No spurious emission measurement of the receiver was carried out, because the co located transmitter transmits continuously.

The physical boundaries of the EUT are shown below.

Physical boundaries of the EUT



3 Additional Information

The EUT was not loaded as required by FCC / IC.
 As declared by the applicant the difference between the KPD5/2 HID SF2F and PRD5/2 HID SF2F is only the keypad. As pretests has shown that the KPD5/2 HID SF2F was the more emitting variant. Therefore, all final measurements were carried out with the KPD5/2 HID SF2F. The conducted emission was carried out with the KPD5/2 HID SF2F as ordered by the applicant.

4 Overview

Conducted emissions FCC 47 CFR Part 15 section 15.107 (b) [3] / ICES-003 Issue 6 section 6.1 [4]					
Application	Frequency range	Limits	Reference standard	Remark	Status
AC supply line	0.15 to 0.5 MHz 0.5 to 30 MHz	79 dB μ V (QP) 66 dB μ V (AV) 73 dB μ V (QP) 60 dB μ V (AV)	ANSI C63.4	Class A	-
AC supply line	0.15 to 0.5 MHz 0.5 to 5 MHz 5 to 30 MHz	66 to 56 dB μ V (QP)* 56 to 46 dB μ V (AV)* 56 dB μ V (QP) 46 dB μ V (AV) 60 dB μ V (QP) 50 dB μ V (AV)	ANSI C63.4	Class B	Passed
*: Decreases with the logarithm of the frequency					
Radiated emissions FCC 47 CFR Part 15 section 15.109 (b) [3] / ICES-003 Issue 6 section 6.2 [4]					
Application	Frequency range	Limits	Reference standard	Remark	Status
Radiated Emission	30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz above 1000 MHz	39.0 dB μ V /m QP at 10 m 43.5 dB μ V /m QP at 10 m 46.5 dB μ V /m QP at 10 m 49.5 dB μ V /m QP at 10 m 49.5 dB μ V /m AV at 10 m and 69.5 dB μ V /m PK at 10 m	ANSI C63.4	Class A	-
Radiated Emission	30 to 88 MHz 88 to 216 MHz 216 to 960 MHz 960 to 1000 MHz above 1000 MHz	40.0 dB μ V/m QP at 3 m 43.5 dB μ V/m QP at 3 m 46.0 dB μ V/m QP at 3 m 54.0 dB μ V/m QP at 3 m 54.0 dB μ V/m AV at 3 m and 74.0 dB μ V/m PK at 3 m	ANSI C63.4	Class B	Passed

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.

The EUT was classified by the applicant as CLASS B equipment.

5 Results

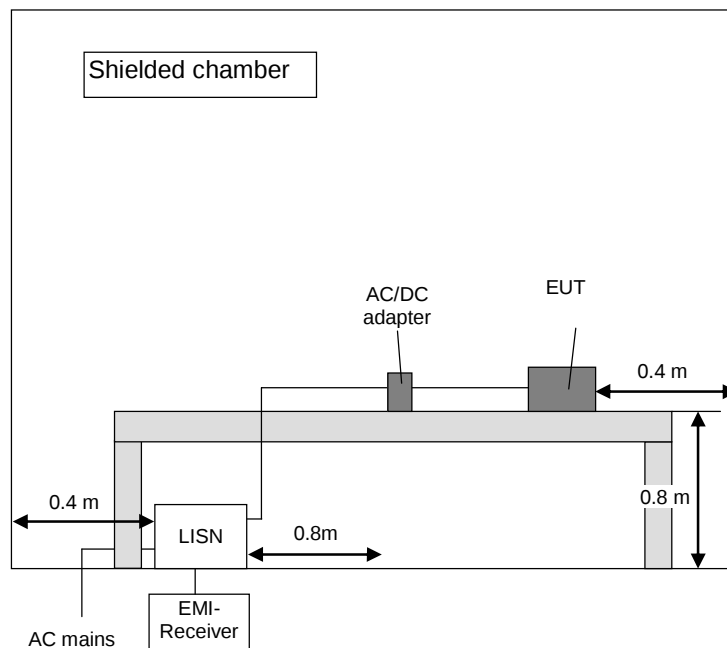
5.1 Conducted emissions on power supply lines

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 appropriate 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

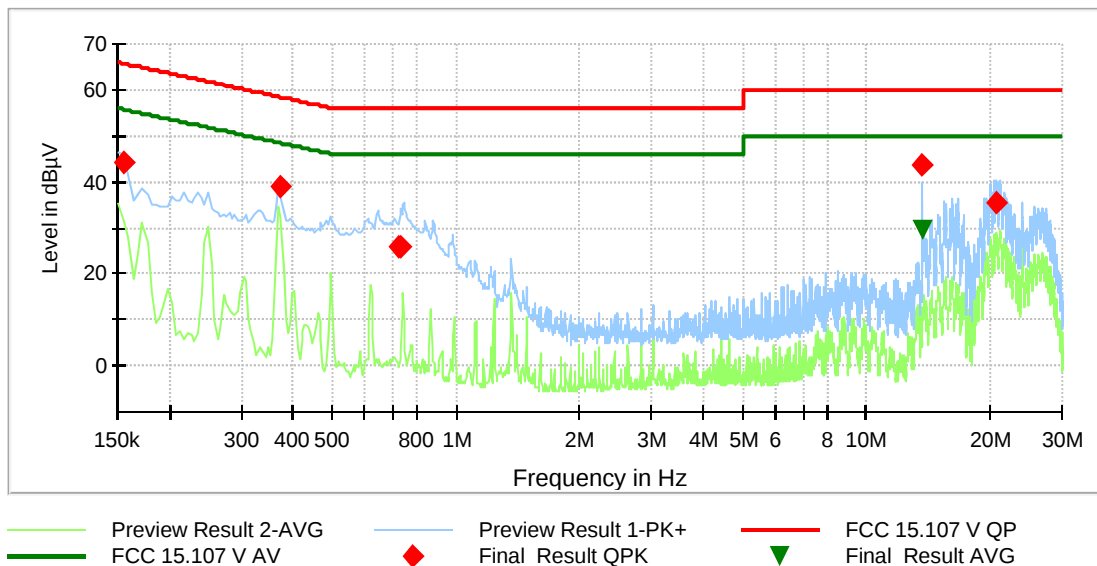


5.1.2 Results conducted emission measurement on AC mains

Ambient temperature:	21 °C	Date:	27.08.2018
Relative humidity:	42 %	Tested by:	M. Dinter

- Position of EUT:** The EUT was set-up on a non-conducting table of a height of 0.8 m.
- Cable guide:** The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.
- Test record:** The test was carried out reading a TAG continuously (refer also clause 2 of this test report). All results are shown in the following.
- Supply voltage:** During this test the EUT was powered with 12 V_{DC} by the AC Adapter Deister FW 3288 delivered by the applicant, which was itself supplied by an AC mains Network with 120 V_{AC} / 60 Hz.
As declared by the applicant 12 VDC represents the worst case related to this measurement

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 ▼.



Final_Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Transducer (dB)
0.154500	44.31	---	65.75	21.45	5000.0	9.000	L1	GND	9.8
0.371400	38.90	---	58.47	19.57	5000.0	9.000	L1	GND	9.9
0.722400	25.98	---	56.00	30.02	5000.0	9.000	N	GND	9.9
0.733200	25.92	---	56.00	30.08	5000.0	9.000	N	GND	9.9
13.560000	43.04	---	60.00	16.96	5000.0	9.000	L1	FLO	10.7
13.563600	---	18.37	50.00	31.63	5000.0	9.000	L1	FLO	10.7
20.600700	35.47	---	60.00	24.53	5000.0	9.000	N	GND	11.0
Measurement uncertainty				+2.76 dB / -2.76 dB					

Test result Passed

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

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 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.
- A preliminary measurement carried out in a fully anechoic chamber with a various antenna height of 100 to 250 cm at a distance of 1.90 m to the EUT position in the frequency range 1 GHz to 40 GHz.
- A final measurement carried out in a fully anechoic chamber and various antenna height of 100 to 250 cm at a distance of 1.90 m to the EUT position in the frequency range 1 GHz to 40 GHz.

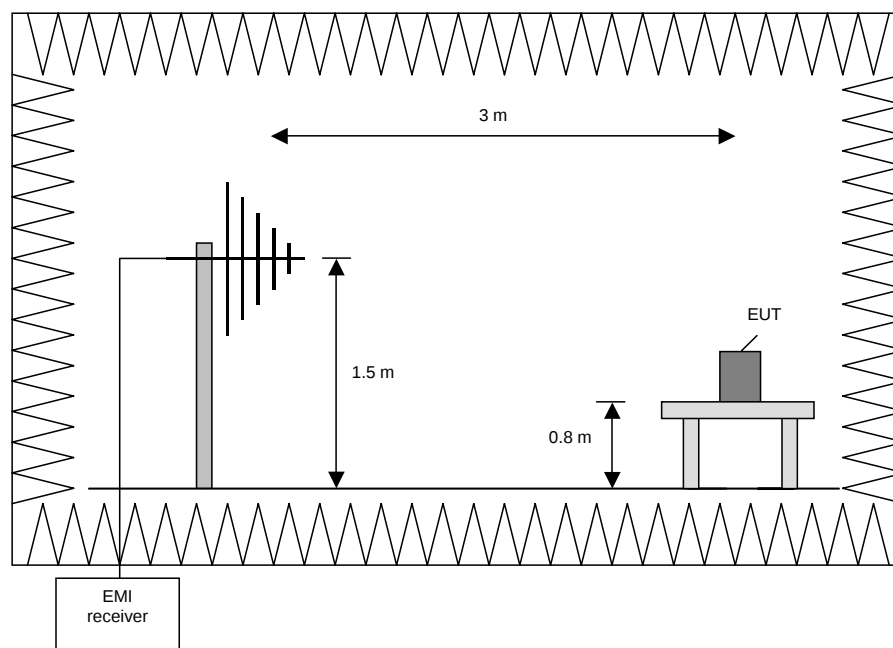
Preliminary measurement (30 MHz to 1 GHz)

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 support with a size of 1 m by 1.5 m and a height of 80 cm. Floor-standing devices will be placed directly on the turntable/ground plane. The setup 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 polarization 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:

Monitor the frequency range at horizontal polarization and a EUT azimuth of 0 °.

Manipulate the system cables within the range to produce the maximum level of emission.

Rotate the EUT by 360 ° to maximize the detected signals.

Make a hardcopy of the spectrum.

Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

Repeat 1) to 4) with the other orthogonal axes of the EUT if handheld equipment.

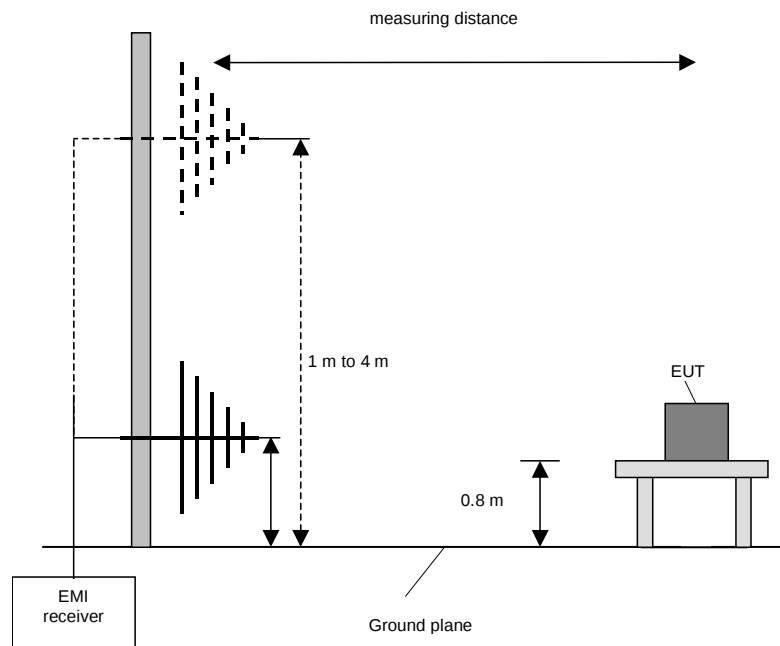
Repeat 1) to 5) with the vertical polarization of the measuring antenna.

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 polarization 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:

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

5.2.2 Results preliminary measurement 30 MHz to 1 GHz

Ambient temperature:	21 °C	Date:	28.08.2018
Relative humidity:	42 %	Tested by:	M. Dinter

Position of EUT: The EUT was set-up on a non-conducting table.

Cable guide: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out reading a TAG continuously (refer also clause 2 of this test report). The tests were carried out in normal positions as declared by the applicant.

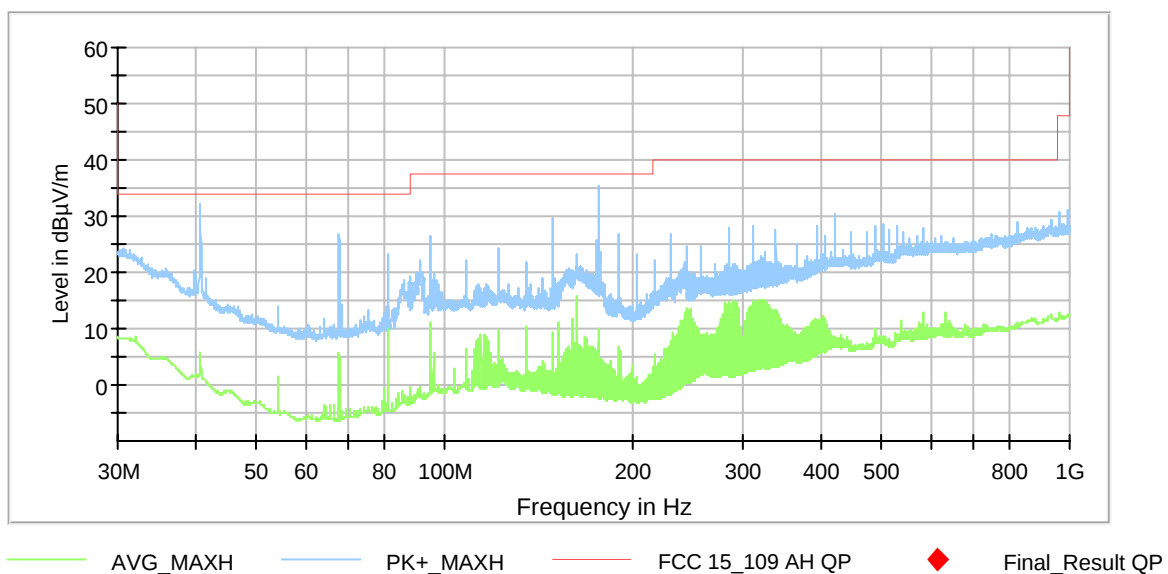
Power supply: During this test the EUT was powered with 24 V_{DC}.

Remark: As pre-tests have shown there were no noticeable differences between 24 V_{DC} and 12 V_{DC} power supply.

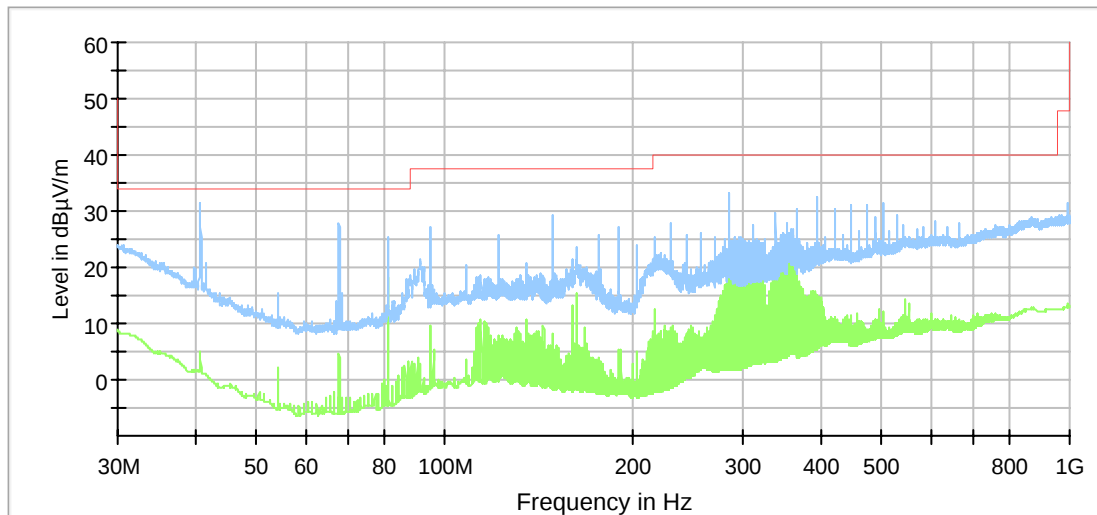
Frequency range: According to [2] from 9 kHz to 1 GHz.

Emissions from 30 MHz to 1000 MHz
reading a 125 kHz and a 13.56 MHz TAG simultaneously

Preliminary measurement KPD5/2 HID SF2F with keypad.



Preliminary measurement PRD5/2 HID SF2F without keypad.



— AVG_MAXH — PK+_MAXH — FCC 15_109 AH QP ♦ Final_Result QP

The following frequencies were found emission test outside and inside restricted bands during the preliminary radiated:

Frequency (MHz)
40.680000
67.800000
81.360000
149.160000
176.280000
284.760000
339.000000
474.600000

These frequencies of the KPD5/2 HID SF2F have to be measured on the open area test site. The results were presented in the following.

Test equipment (please refer to chapter 6 for details)
7 – 14

5.2.3 Result final measurement from 30 MHz to 1 GHz

Ambient temperature:	24 °C	Date:	28.08.2018
Relative humidity:	54 %	Tested by:	M. Dinter

Position of EUT: The EUT was set-up on a non-conducting table.

Cable guide: The cables of the EUT were fixed on the non-conducting table. For further information of the cable guide refer to the pictures in annex A of this test report.

Test record: The test was carried out reading a TAG continuously (refer also clause 2 of this test report). The tests were carried out in normal positions as declared by the applicant.

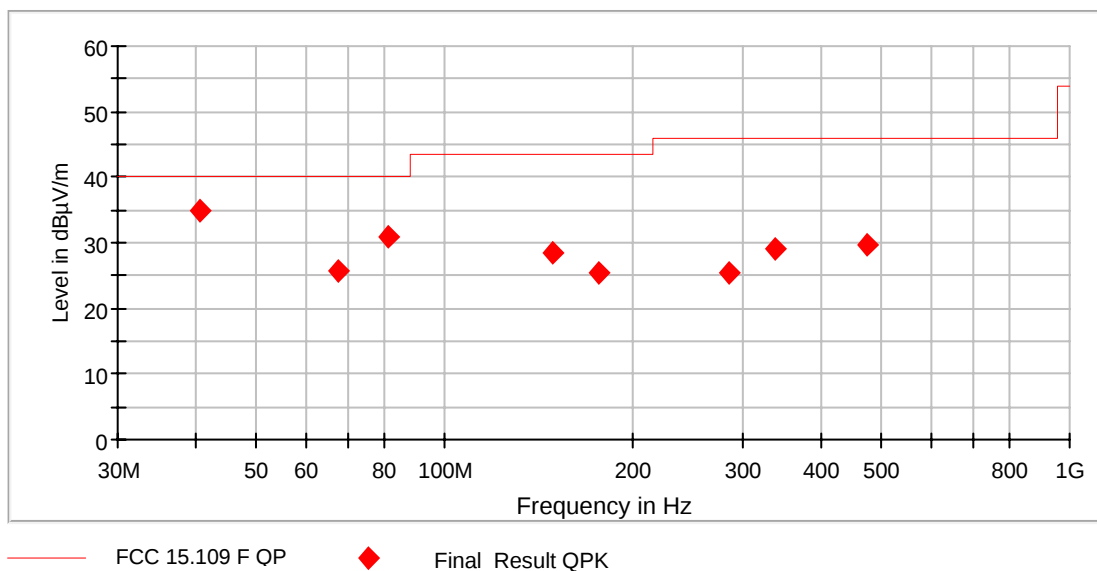
Power supply: During this test the EUT was powered with 12 V_{DC}

Test results: The test results were calculated with the following formula:
Result [dBμV/m] = reading [dBμV] + antenna factor [dB/m]

Final measurement KPD5/2 HID SF2F with keypad.

The measured points and the limit line in the following diagrams refer to the standard measurement of the emitted interference in compliance with the above-mentioned standard. The measured points marked with an are the

♦ measured results of the standard final measurement on the open area test site.



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The results of the standard subsequent measurement on the open area test site are indicated in the table below. 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.

The measurement time with the quasi-peak measuring detector is 1 seconds.

Final Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
40.680000	34.97	40.00	5.03	1000.0	120.000	132.0	V	338.0	22.4
67.800000	25.63	40.00	14.37	1000.0	120.000	154.0	V	242.0	13.2
81.360000	30.85	40.00	9.15	1000.0	120.000	150.0	V	90.0	15.4
149.160000	28.52	43.50	14.98	1000.0	120.000	254.0	H	316.0	19.0
176.280000	25.54	43.50	17.96	1000.0	120.000	123.0	H	208.0	17.2
284.760000	25.29	46.00	20.71	1000.0	120.000	150.0	V	226.0	21.6
339.000000	29.07	46.00	16.93	1000.0	120.000	103.0	H	316.0	22.9
474.600000	29.80	46.00	16.20	1000.0	120.000	197.0	H	237.0	27.2
Measurement uncertainty ± 4.78 dB									

Result: 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)

3, 5, 15 - 20

6 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	Transient Filter Limiter	CFL 9206A	Teseq GmbH	38268	481982	14.03.2018	03.2020
2	LISN	NSLK8128	Schwarzbeck	8128155	480058	14.03.2018	03.2020
3	Software	EMC32	Rohde & Schwarz	100061	481022	Calibration not necessary	
4	Shielded chamber M4	B83117-S1-X158	Siemens	190075	480088	Calibration not necessary	
5	EMI Receiver / Spectrum Analyser	ESIB 26	Rohde & Schwarz	100292	481182	28.02.2018	02.2020
6	AC Supply	AC6803A AC Quelle 2000VA	Keysight	JPVJ002509	482350	Calibration not necessary	
7	Antenna mast	AS615P	Deisel	615/310	480187	Calibration not necessary	
8	Fully anechoic chamber M20	B83117-E2439-T232	Albatross Projects	103	480303	Calibration not necessary	
9	Turntable	DS420 HE	Deisel	420/620/00	480315	Calibration not necessary	
10	Antenna (Bilog)	CBL6112B	Schaffner EMV GmbH (-Chase)	2688	480328	19.06.2017	06.2020
11	Multiple Control Unit	MCU	Maturo GmbH	MCU/043/971107	480832	Calibration not necessary	
12	Software	WMS32	Rohde & Schwarz		481800	Calibration not necessary	
13	EMI Receiver / Spectrum Analyser	ESW44	Rohde & Schwarz	101635	482467	29.03.2018	03.2020
14	HF-Cable	Sucoflex 104	Huber+Suhner	517402	482392	Calibration not necessary	
15	Open area test site M6	Freifeld M6	Phoenix Contact	-	480085	Calibration not necessary	
16	Antenna support	MA240-0	Inn-Co GmbH	MA240-0/030/6600603	480086	Calibration not necessary	
17	Turntable	DS412	Deisel	412/316	480087	Calibration not necessary	
18	Controller	HD100	Deisel	100/349	480139	Calibration not necessary	
19	Antenna (Bilog)	CBL6111D	Schaffner Elektrottest GmbH / Teseq GmbH	25761	480894	19.10.2017	10.2020
20	Attenuator 6 dB	WA2-6	Weinschel		482794	Calibration not necessary	

7 Test site Validation

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
OATS M6	480085	30 – 1000 MHz	NSA	ANSI C63.4-2014	25.10.2018	24.10.2020
Fully anechoic chamber M20	480303	30 – 1000 MHz	NSA	ANSI C63.4-2014	13.02.2018	12.02.2020
Shielded chamber M4	480088	9 kHz – 30 MHz	GND-Plane	ANSI C63.4-2014	06.11.2018	05.11.2020

8 Report History

Report Number	Date	Comment
F181073E3	29.11.2019	Initial Test Report

9 List of Annexes

Annex A	Test Setup Photos	3 pages
Annex B	EUT External Photos	5 pages
Annex C	EUT Internal Photos	8 pages