

## TEST REPORT

BNNetzA-CAB-02/21-102

Test report no.: 1-2724/21-03-02

### Testing laboratory

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**Accredited Testing Laboratory:**

The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)

The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

### Applicant

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### Manufacturer

**CEM S.p.A.**

Via Ca' Rossa, n. 1

46026 Quistello (MN) / ITALY

### Test standard/s

FCC - Title 47 CFR Part 15    FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices

RSS - 210 Issue 10    Spectrum Management and Telecommunications Radio Standards  
Specification - Licence-Exempt Radio Apparatus: Category I Equipment

For further applied test standards please refer to section 3 of this test report.

### Test Item

**Kind of test item:** High Pressure Gun for High Pressure Cleaner

**Model name:** K5 Premium Smart Control

**FCC ID:** ZP947754950999

**ISED certification number:** 9752A-47754950999

**Frequency:** ISM Band 902 MHz to 928 MHz

**Technology tested:** proprietary

**Antenna:** Integrated antenna

**Power supply:** 2 V to 3 V DC by battery

**Temperature range:** 0°C to +55°C



This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

### Test report authorized:



Christoph Schneider  
Lab Manager  
Radio Communications

### Test performed:



Hans-Joachim Wolsdorfer  
Lab Manager  
Radio Communications

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## 2 General information

### 2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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### 2.2 Application details

Date of receipt of order:	2021-09-01
Date of receipt of test item:	2021-10-07
Start of test:*	2021-10-13
End of test:*	2021-12-01
Person(s) present during the test:	- / -

\*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

### 2.3 Test laboratories sub-contracted

None

### 3 Test standard/s, references and accreditations

Test standard	Date	Description
FCC - Title 47 CFR Part 15		FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 210 Issue 10	December 2019	Spectrum Management and Telecommunications Radio Standards Specification - Licence-Exempt Radio Apparatus: Category I Equipment
RSS - Gen Issue 5 incl. Amendment 1 & 2	February 2021	Spectrum Management and Telecommunications Radio Standards Specification - General Requirements for Compliance of Radio Apparatus

Guidance	Version	Description
ANSI C63.4-2014	-/-	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2013	-/-	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Accreditation	Description
D-PL-12076-01-04	Telecommunication and EMC Canada <a href="https://www.dakks.de/as/ast/d/D-PL-12076-01-04e.pdf">https://www.dakks.de/as/ast/d/D-PL-12076-01-04e.pdf</a>
D-PL-12076-01-05	Telecommunication FCC requirements <a href="https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf">https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf</a>



ISED Testing Laboratory Recognized Listing Number: DE0001  
 FCC designation number: DE0002

#### 4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.

The measurement uncertainty is mentioned in this test report, see chapter 9, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."

measured value, measurement uncertainty, verdict



## 5 Test environment

Temperature :	T <sub>nom</sub> T <sub>max</sub> T <sub>min</sub>	+22 °C during room temperature tests +55 °C during high temperature tests* 0 °C during low temperature tests*
Relative humidity content :		55 %
Barometric pressure :		1021 hpa
Power supply :	V <sub>nom</sub> V <sub>max</sub> V <sub>min</sub>	3 V DC by battery 3 V 2 V

\* no tests under extreme conditions required

## 6 Test item

### 6.1 General description

Kind of test item :	High Pressure Gun for High Pressure Cleaner	
Model name :	K5 Premium Smart Control	
HMN :	-/-	
PMN :	K5 Premium Smart Control	
HVIN :	47754950	
FVIN :	-/-	
S/N serial number :	Rad.	1142100143, 1142100130,
	Cond.	1142100143
Hardware status :	16.01	
Software status :	1.0	
Firmware status :	- / -	
Frequency band :	ISM Band 902 MHz to 928 MHz	
Type of radio transmission :	modulated carrier	
Use of frequency spectrum :		
Type of modulation :	FSK	
Number of channels :	3	
Antenna :	Integrated antenna	
Power supply :	2 V to 3 V DC by battery	
Temperature range :	0°C to +55°C	

### 6.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report:

1-2724/21-01-01\_AnnexA  
 1-2724/21-01-01\_AnnexB  
 1-2724/21-01-01\_AnnexD

## 7 Description of the test setup

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Lab/Item).

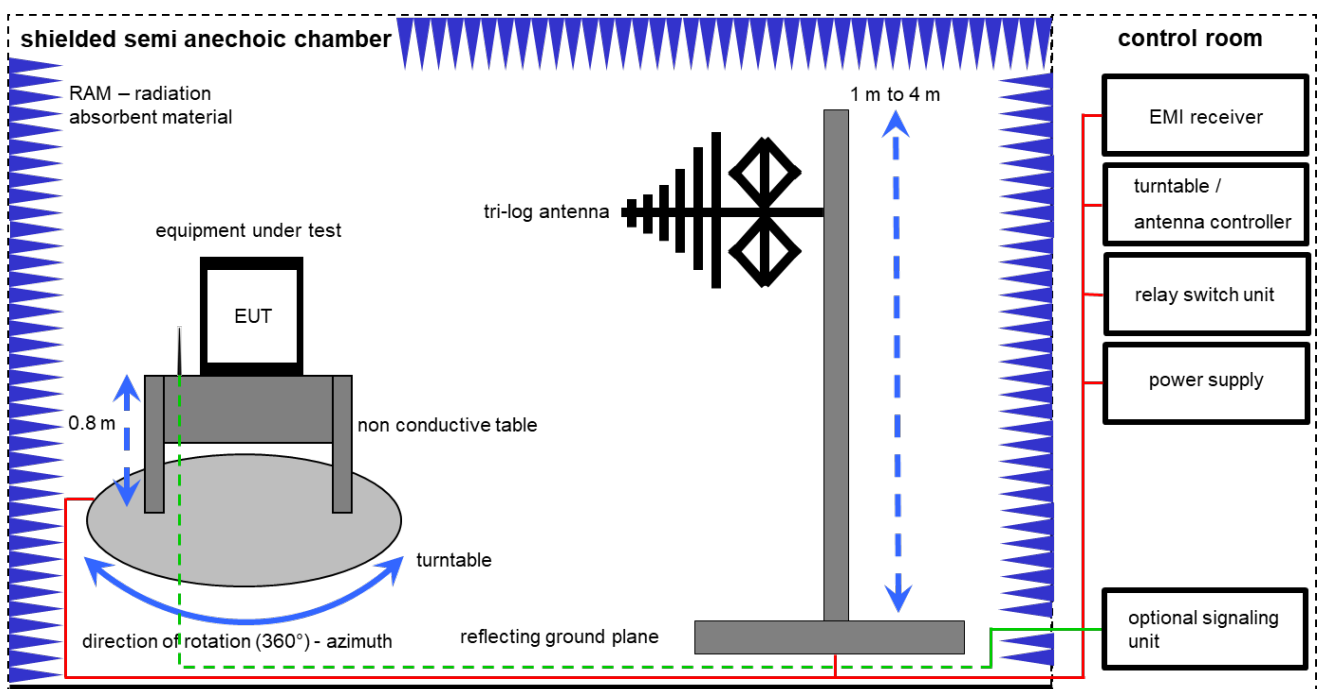
Each block diagram listed can contain several test setup configurations. All devices belonging to a test setup are identified with the same letter syntax. For example: Column Setup and all devices with an A.

### **Agenda:** Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlk!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

## 7.1 Shielded semi anechoic chamber

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 30 MHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform to specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.



Measurement distance: tri-log antenna 10 meter

EMC32 software version: 10.59.00

$$FS = UR + CL + AF$$

(FS-field strength; UR-voltage at the receiver; CL-loss of the cable; AF-antenna factor)

### Example calculation:

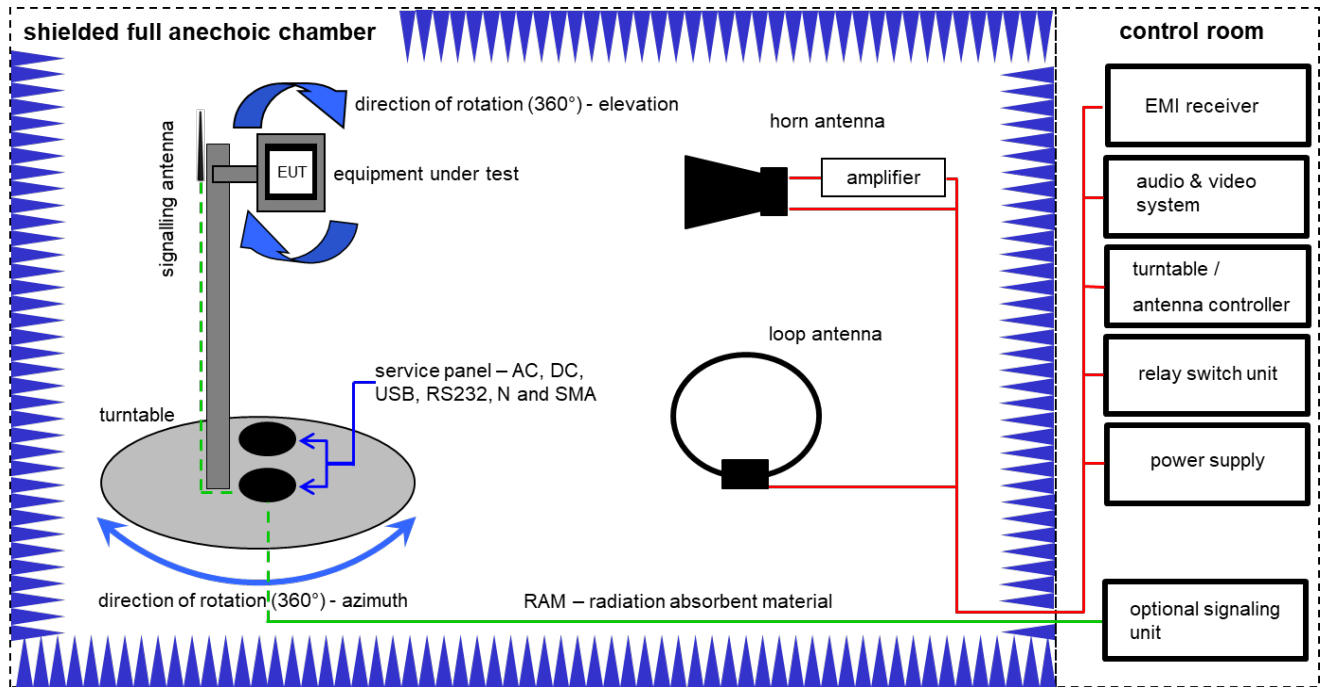
$$FS \text{ [dB}\mu\text{V/m]} = 12.35 \text{ [dB}\mu\text{V/m]} + 1.90 \text{ [dB]} + 16.80 \text{ [dB/m]} = 31.05 \text{ [dB}\mu\text{V/m]} \text{ (35.69 } \mu\text{V/m)}$$



**Equipment table:**

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch-Unit	3488A	HP	2719A14505	300000368	ev	-/-	-/-
2	A	Semi anechoic chamber	3000023	MWB AG		300000551	ne	-/-	-/-
3	A	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	vIKI!	17.01.2020	16.01.2022
4	A	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw	-/-	-/-
5	A	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw	-/-	-/-
6	A	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw	-/-	-/-
7	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck Mess - Elektronik	295	300003787	vIKI!	21.04.2021	20.04.2023
8	A	Turntable	2089-4.0	EMCO		300004394	ne	-/-	-/-
9	A	PC	TecLine	F+W		300004388	ne	-/-	-/-
10	A	EMI Test Receiver	ESR3	Rohde & Schwarz	102587	300005771	k	10.12.2020	09.12.2021

## 7.2 Shielded fully anechoic chamber



Measurement distance: horn antenna 3 meter; loop antenna 3 meter

$$FS = UR + CA + AF$$

(FS-field strength; UR-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

### Example calculation:

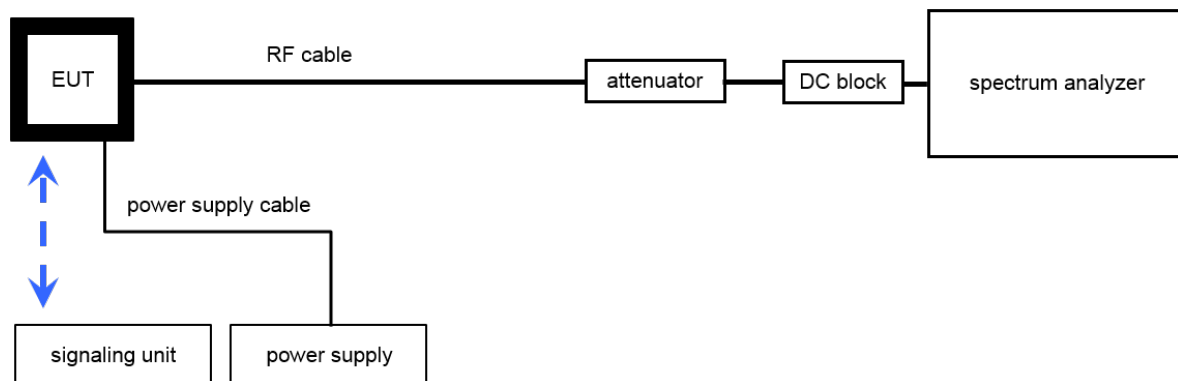
$$FS \text{ [dB}\mu\text{V/m]} = 40.0 \text{ [dB}\mu\text{V/m]} + (-35.8) \text{ [dB]} + 32.9 \text{ [dB/m]} = 37.1 \text{ [dB}\mu\text{V/m]} \text{ (71.61 } \mu\text{V/m)}$$

### Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Active Loop Antenna 9 kHz to 30 MHz	6502	EMCO	2210	300001015	vKI!	01.07.2021	30.06.2023
2	A, B	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev	-/-	-/-
3	B	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3697	300001605	vKI!	12.03.2021	11.03.2023
4	A, B	Switch / Control Unit	3488A	HP	*	300000199	ne	-/-	-/-
5	A, B	Variable isolating transformer	MPL IEC625 Bus Variable isolating transformer	ErFi	91350	300001155	ne	-/-	-/-
6	A, B	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	11.12.2020	10.12.2021
7	B	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev	-/-	-/-
8	B	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22049	300004481	ev	-/-	-/-
9	A, B	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne	-/-	-/-
10	A, B	NEXIO EMV-Software	BAT EMC V3.20.0.26	EMCO		300004682	ne	-/-	-/-
11	A, B	PC	ExOne	F+W		300004703	ne	-/-	-/-

### 7.3 Conducted measurements

#### Conducted measurements normal conditions



$$OP = AV + CA$$

(OP-output power; AV-analyzer value; CA-loss signal path)

#### Example calculation:

$$OP \text{ [dBm]} = 6.0 \text{ [dBm]} + 11.7 \text{ [dB]} = 17.7 \text{ [dBm]} \text{ (58.88 mW)}$$

#### Equipment table:

No.	Setup	Equipment	Type	Manufacturer	Serial No.	INV. No.	Kind of Calibration	Last Calibration	Next Calibration
1	A	Isolating Transformer	RT5A	Grundig	12780	300001166	ev	-/-	-/-
2	A	Signal analyzer	FSW26	Rohde&Schwarz	101455	300004528	k	25.02.2021	24.02.2022
3	A	RF-Cable SRD021 No. 1	Enviroflex 316 D	Huber & Suhner		400001311	ev	-/-	-/-

## 8 Sequence of testing

### 8.1 Sequence of testing radiated spurious 9 kHz to 30 MHz

#### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, it is placed on a table with 0.8 m height.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

#### Premeasurement\*

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1 m.
- At each turntable position the analyzer sweeps with positive-peak detector to find the maximum of all emissions.

#### Final measurement

- Identified emissions during the pre-measurement are maximized by the software by rotating the turntable from 0° to 360°.
- Loop antenna is rotated about its vertical axis for maximum response at each azimuth about the EUT. (For certain applications, the loop antenna plane may also need to be positioned horizontally at the specified distance from the EUT)
- The final measurement is done in the position (turntable and elevation) causing the highest emissions with quasi-peak (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. A plot with the graph of the premeasurement and the limit is stored.

\*Note: The sequence will be repeated three times with different EUT orientations.

## 8.2 Sequence of testing radiated spurious 30 MHz to 1 GHz

### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 10 m or 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

### Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 m to 3 m.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

### Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximize the peaks by changing turntable position  $\pm 45^\circ$  and antenna height between 1 and 4 m.
- The final measurement is done with quasi-peak detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

### 8.3 Sequence of testing radiated spurious 1 GHz to 12.75 GHz

#### Setup

- The equipment is set up to simulate normal operation mode as described in the user manual or defined by the manufacturer.
- If the EUT is a tabletop system, a 2-axis positioner with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed directly on the turn table.
- Auxiliary equipment and cables are positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- Measurement distance is 3 m (see ANSI C 63.4) – see test details.
- EUT is set into operation.

#### Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 m.
- At each turntable position and antenna polarization the analyzer sweeps with positive peak detector to find the maximum of all emissions.

#### Final measurement

- The final measurement is performed for at least six highest peaks according to the requirements of the ANSI C63.4.
- Based on antenna and turntable positions at which the peak values are measured the software maximizes the peaks by rotating the turntable from 0° to 360°. This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps) and for both antenna polarizations.
- The final measurement is done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS detector (as described in ANSI C 63.4).
- Final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit are recorded. A plot with the graph of the premeasurement with marked maximum final results and the limit is stored.

## 9 Measurement uncertainty

Measurement uncertainty	
Test case	Uncertainty
Occupied bandwidth	$\pm 100$ kHz (depends on the used RBW)
Spurious emissions radiated below 30 MHz	$\pm 3$ dB
Spurious emissions radiated 30 MHz to 1 GHz	$\pm 3$ dB
Spurious emissions radiated 1 GHz to 12.75 GHz	$\pm 3.7$ dB
Spurious emissions radiated above 12.75 GHz	$\pm 4.5$ dB

## 10 Summary of measurement results

<input checked="" type="checkbox"/>	No deviations from the technical specifications were ascertained
<input type="checkbox"/>	There were deviations from the technical specifications ascertained
<input type="checkbox"/>	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
RF-Testing	47 CFR Part 15 RSS 210 Issue 9 RSS Gen Issue 4	See table!	2021-12-07	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	C	NC	NA	NP	Remark
§15.249(a) RSS 210 B.10	Field strength of emissions (wanted signal)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
RSS Gen	Occupied bandwidth (99% bandwidth)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.209(a) / §15.249(b)(1)(2)(3) RSS Gen	Field strength of emissions (spurious)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
§15.207(a)	Conducted emissions < 30 MHz	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	battery powered
§15.109 RSS Gen	Field strength of emissions (spurious)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-

**Note:** C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed



## 11 Additional comments

Reference documents:

Customer Questionnaire\_query\_K5\_Premium\_Smart\_Control\_Gun\_SRD\_FCC\_ISED.docx

Special test descriptions: Radio\_Certification\_G180\_KNA.doc

Configuration descriptions: None

Test mode:

☐ No test mode available.  
Iperf was used to ping another device with the largest support packet size

☒ Special software is used.  
EUT is transmitting pseudo random data by itself

Antennas and transmit operating modes:

☒ Operating mode 1 (single antenna)

- *Equipment with 1 antenna,*
- *Equipment with 2 diversity antennas operating in switched diversity mode by which at any moment in time only 1 antenna is used,*
- *Smart antenna system with 2 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used)*

## 12 Measurement results

### 12.1 Field strength of emissions (wanted signal)

#### Description:

Measurement of the maximum radiated field strength of the wanted signal.

#### Measurement:

Measurement parameter	
Detector:	Peak / Quasi peak
Resolution bandwidth:	1 MHz (> OBW)
Video bandwidth:	3x RBW
Span:	Depends on the signal
Trace mode:	Max. hold

#### Limits:

FCC / ISED		
Field strength of emissions		
The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:		
Frequency [ MHz ]	Field Strength [dB $\mu$ V/m]	Measurement distance
902 – 928 MHz	94	3

\* recalculated from 10m to 3m by 10.46dB

**Result:**

Test condition	Maximum field strength	
	Frequency / MHz	Field strength / dBµV/m @ 3 m
$T_{\text{nom}} / V_{\text{nom}}$	922.6	<b>71.09*</b>
$T_{\text{nom}} / V_{\text{nom}}$	923.4	<b>70.97*</b>

\* recalculated from 10m to 3m by 10.46dB  
average value calculated (see chapter 12.2)

## 12.2 Timing of the transmitter

### Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	500ms/50ms
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	Zero
Trace-Mode:	Single sweep
Test setup	7.4 A

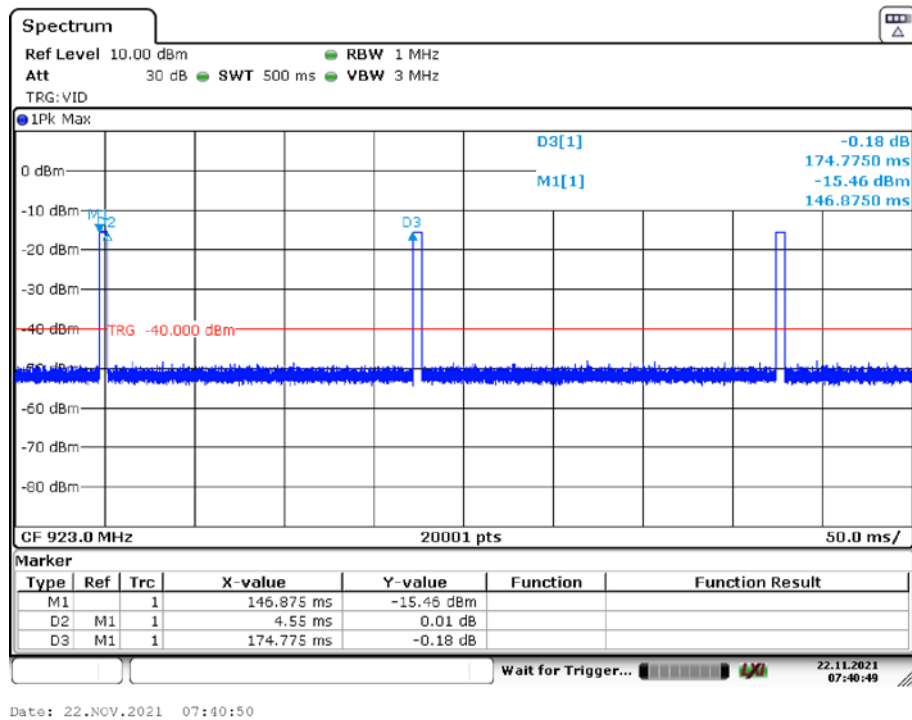
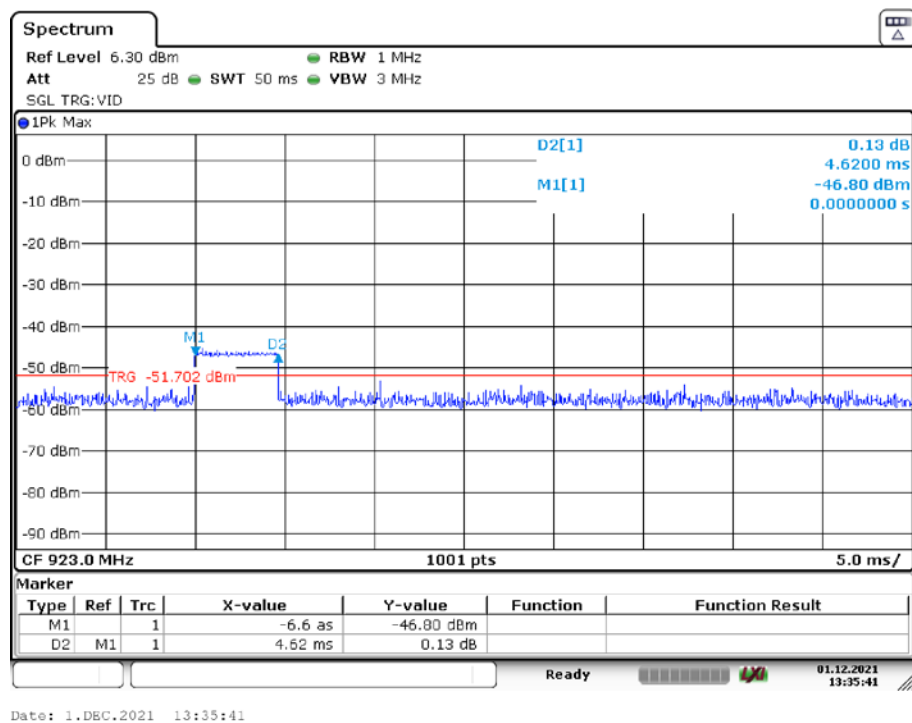
### Limits:

FCC	IC
(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.	

### Result:

Transmit time (Tx on) = 4.62mS  
 Tx on + Tx off = 100mS

The peak-to-average correction factor is calculated with  $20\log [Tx\ on/(Tx\ on + Tx\ off)]$ .  
 Hereby the peak-to-average correction factor is -26.71dB

**Plots:****Plot 1: Timing of the transmitter****Plot 2: Timing of the transmitter**

### 12.3 Occupied bandwidth (99% bandwidth)

#### Description:

Measurement of the 99% bandwidth of the wanted signal.

#### Measurement:

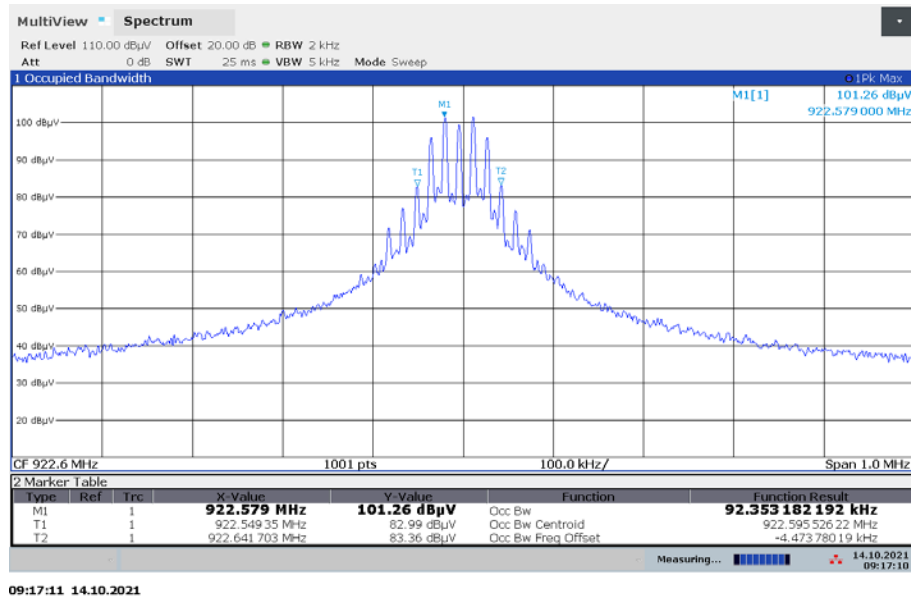
Measurement parameters	
Detector:	Peak
Resolution bandwidth:	1 % – 5 % of the occupied bandwidth
Video bandwidth:	$\geq 3 \times \text{RBW}$
Trace mode:	Max hold
Analyzer function:	99 % power function
Used equipment:	See chapter 6.3 A
Measurement uncertainty:	See chapter 9

#### Results:

Test condition	Occupied bandwidth	
	Frequency / MHz	Occupied bandwidth / kHz
$T_{\text{nom}} / V_{\text{nom}}$	922.6	92.35
$T_{\text{nom}} / V_{\text{nom}}$	923.4	92.27

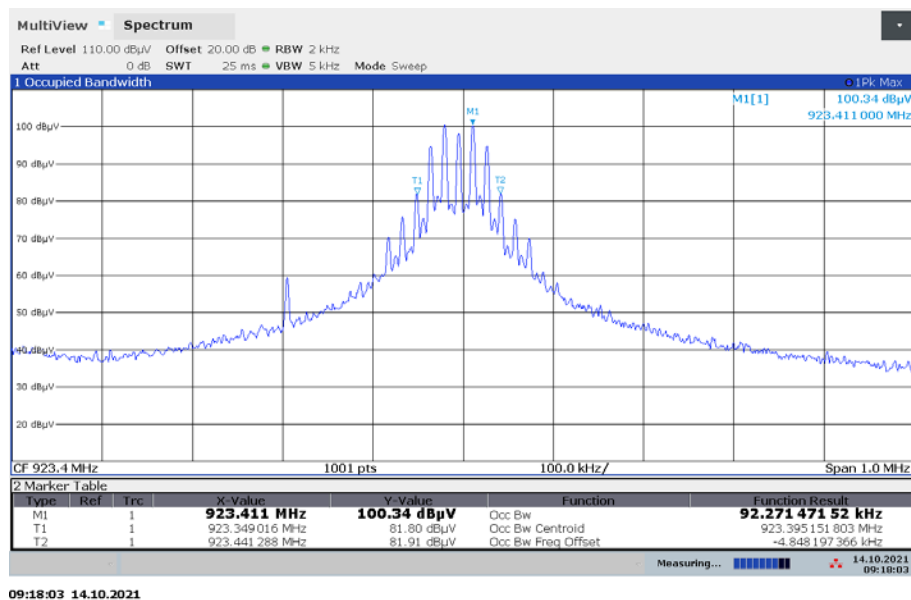
**Plots:**

Plot 1: tx ch0, 922.6 MHz



09:17:11 14.10.2021

Plot 2: tx ch0, 923.4 MHz



09:18:03 14.10.2021

## 12.4 Spurious emissions radiated below 30 MHz

### Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

### Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Video bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.2 A
Measurement uncertainty	See sub clause 9

### Limits:

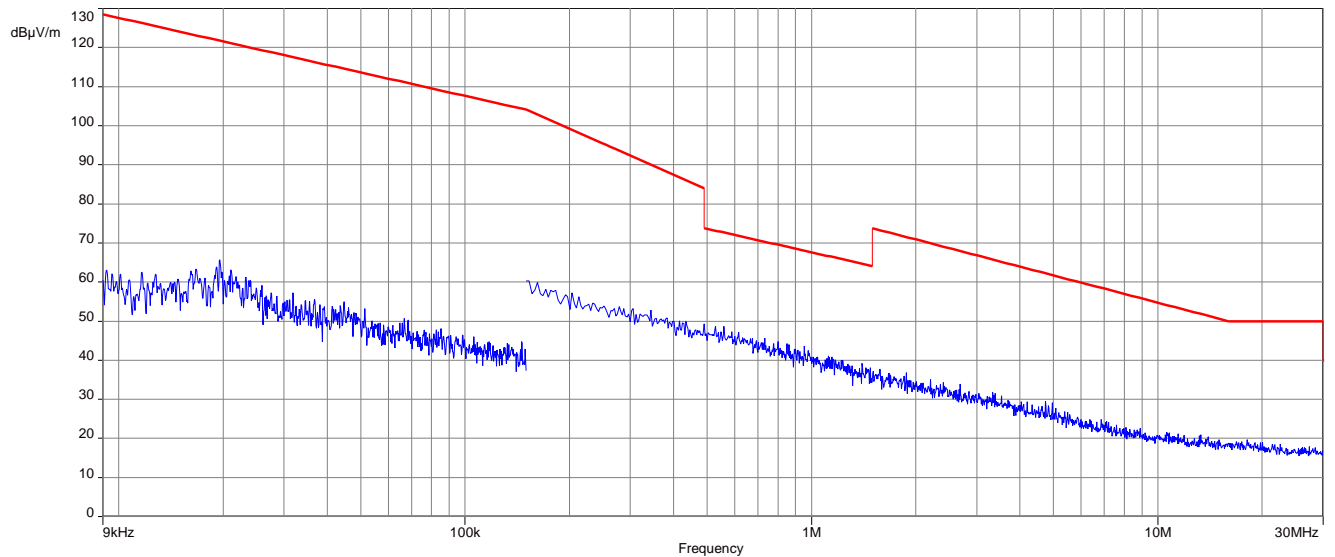
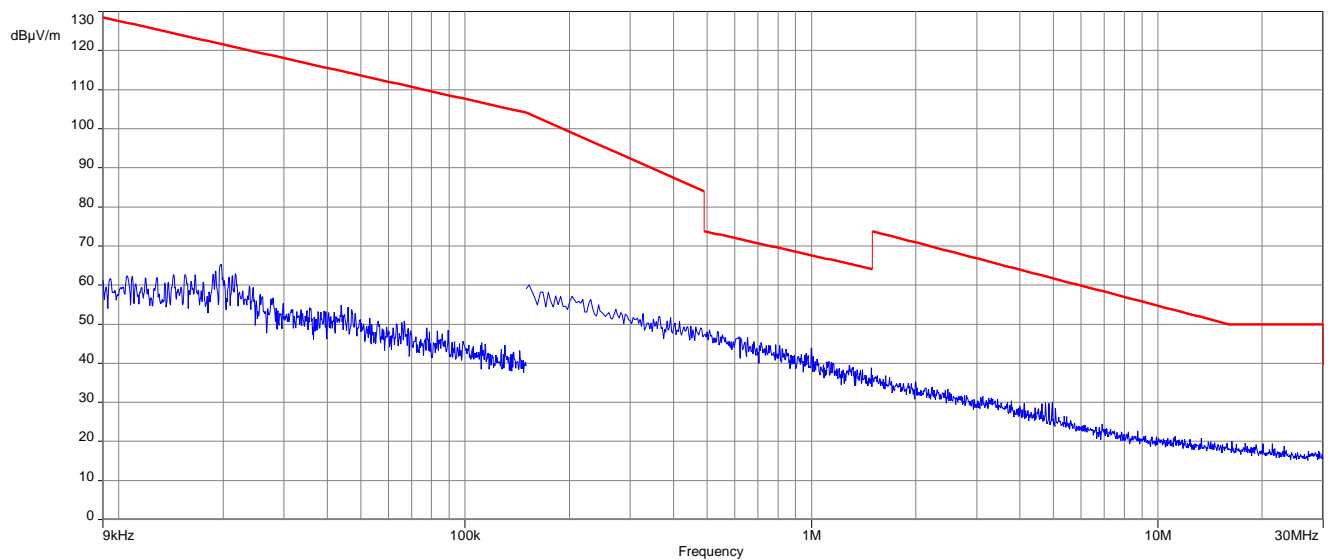
FCC		ISED
Frequency (MHz)	Field Strength (dBμV/m)	Measurement distance
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30.0	30	30



**Results:**

TX Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected peaks are more than 20 dB below the limit.		

idle mode Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
All detected peaks are more than 20 dB below the limit.		

**Plots:****Plot 1:** 9 kHz to 30 MHz, channel 0, 922.6 MHz**Plot 2:** 9 kHz to 30 MHz, channel 2, 923.4 MHz

## 12.5 Spurious emissions radiated 30 MHz to 1 GHz

### Description:

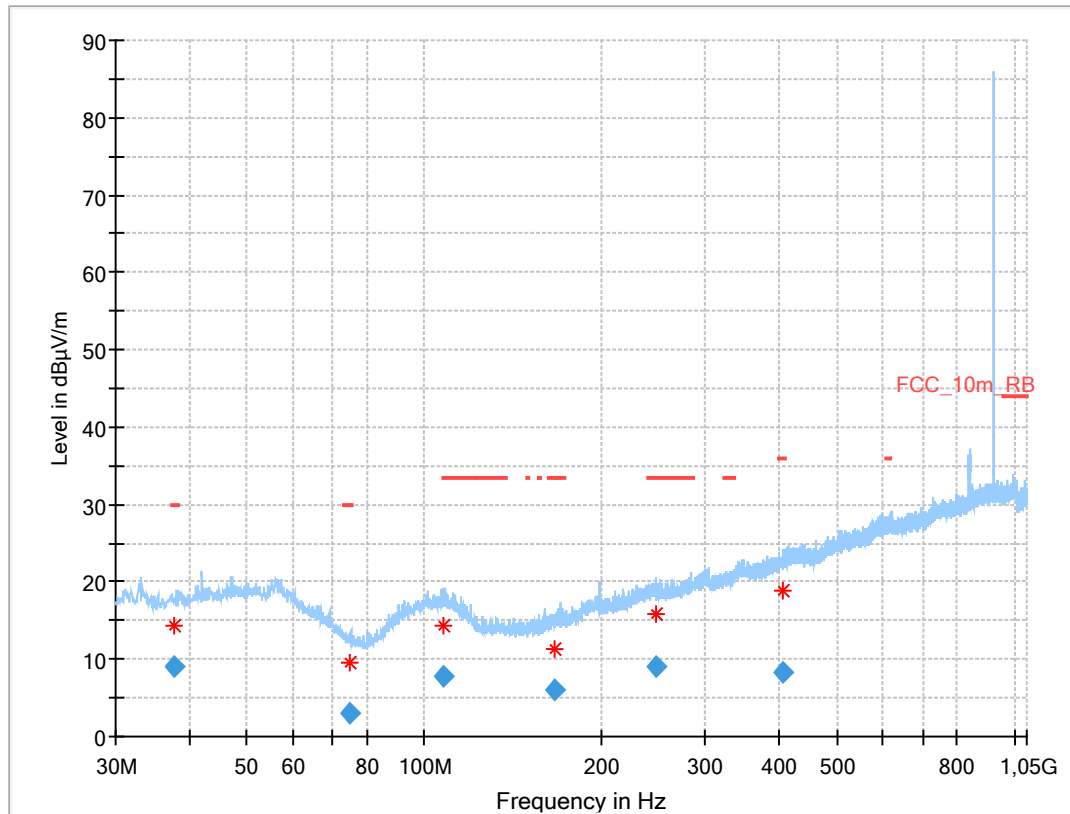
Measurement of the radiated spurious emissions and cabinet radiations below 1 GHz.

### Measurement:

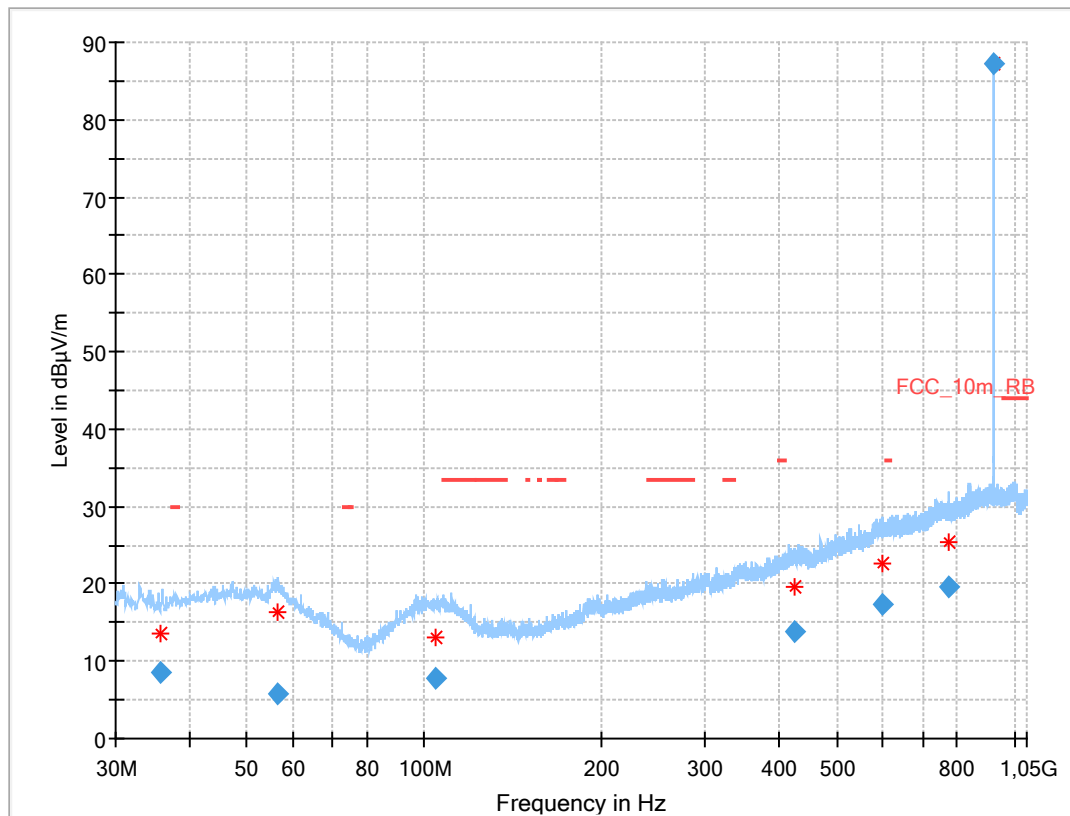
Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Resolution bandwidth:	120 kHz
Video bandwidth:	3 x RBW
Span:	30 MHz to 1 GHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.1 A
Measurement uncertainty	See sub clause 9

### Limits:

FCC		ISED
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10

**Plot:****Plot 1:** 30 MHz to 1 GHz, vertical & horizontal polarization, channel 0, 922.6 MHz

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.720	9.11	30.0	20.9	1000	120.0	277.0	V	135	14
74.811	3.05	30.0	27.0	1000	120.0	264.0	H	270	9
107.981	7.77	---	---	1000	120.0	396.0	V	180	14
166.736	6.01	33.5	27.5	1000	120.0	400.0	H	90	11
247.366	9.01	33.5	24.5	1000	120.0	342.0	V	90	14
406.560	8.26	36.0	27.7	1000	120.0	200.0	H	126	18
922.578	wanted signal								

**Plot 2:** 30 MHz to 1 GHz, vertical & horizontal polarization, channel 2, 923.4 MHz

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35.722	8.46	30.0	21.5	1000	120.0	178.0	V	246	13
56.231	5.70	30.0	24.3	1000	120.0	400.0	V	32	16
104.928	7.72	33.5	25.8	1000	120.0	104.0	V	0	14
423.638	13.71	36.0	22.3	1000	120.0	116.0	V	0	19
599.963	17.41	36.0	18.6	1000	120.0	200.0	V	45	22
776.790	19.54	36.0	16.5	1000	120.0	200.0	V	243	24
923.380	wanted signal								

## 12.6 Spurious emissions radiated above 1 GHz

### Description:

Measurement of the radiated spurious emissions above 1 GHz in transmit mode and receiver / idle mode.

### Measurement:

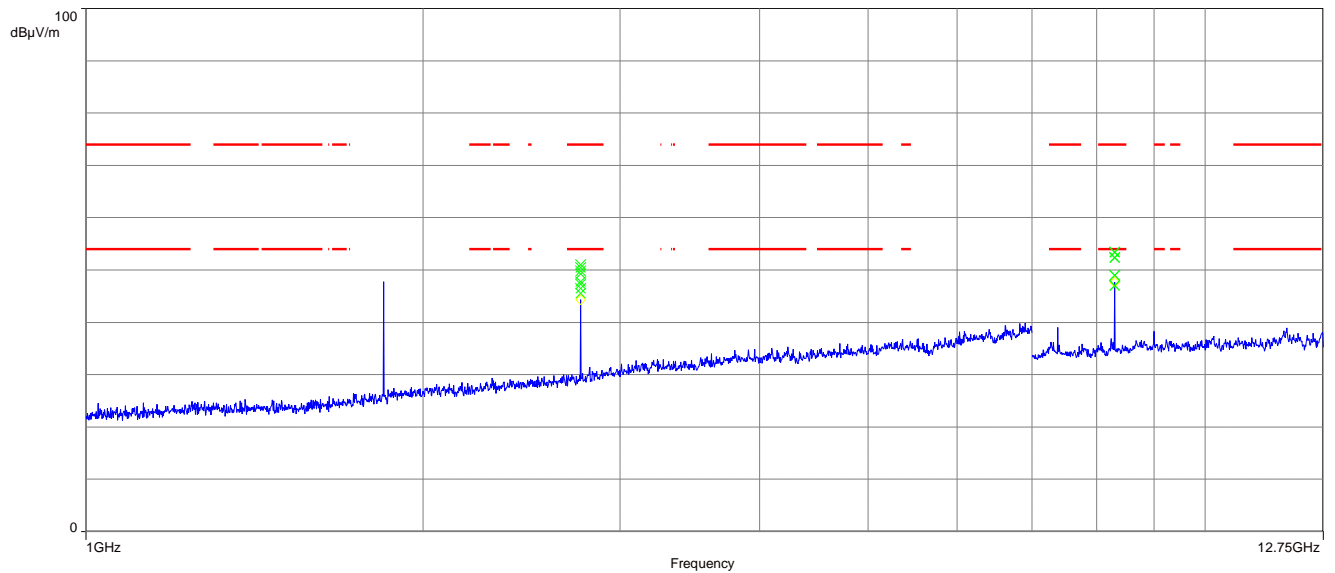
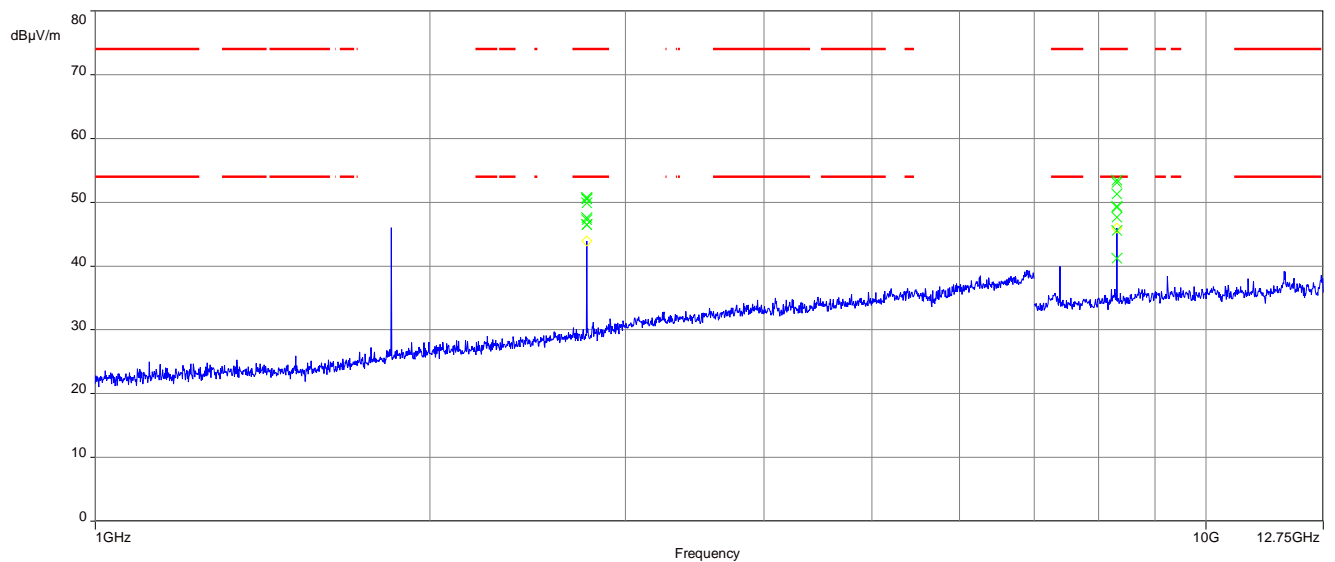
Measurement parameter	
Detector:	Peak / RMS
Sweep time:	Auto
Resolution bandwidth:	1 MHz
Video bandwidth:	3 x RBW
Span:	1 GHz to 12.75 GHz
Trace mode:	Max Hold
Test setup:	See sub clause 7.2 B
Measurement uncertainty	See sub clause 9

### Limits:

FCC		ISED
Frequency (MHz)	Field Strength (dB $\mu$ V/m)	Measurement distance
Above 960	54.0	3

### Results:

TX Spurious Emissions Radiated [dB $\mu$ V/m]								
TX 922.6 MHz			TX 923.4 MHz			-/-		
F [MHz]	Detector	Level [dB $\mu$ V/m]	F [MHz]	Detector	Level [dB $\mu$ V/m]	F [MHz]	Detector	Level [dB $\mu$ V/m]
-/-			-/-			-/-		
2767.6	Peak	51.00	2770.0	Peak	50.74	-/-	Peak	-/-
	AVG	47.77		AVG	47.54		AVG	-/-
8303.52	Peak	53.41	8310.42	Peak	53.44	-/-	Peak	-/-
	AVG	49.01		AVG	49.33		AVG	-/-

**Plots:****Plot 1:** 1 GHz to 12.75 GHz, vertical & horizontal polarization, channel 0, 922.6 MHz**Plot 2:** 1 GHz to 12.75 GHz, vertical & horizontal polarization, channel 2, 923.4 MHz

## 13 Observations

No observations except those reported with the single test cases have been made.



## 14 Glossary

<b>EUT</b>	Equipment under test
<b>DUT</b>	Device under test
<b>UUT</b>	Unit under test
<b>GUE</b>	GNSS User Equipment
<b>ETSI</b>	European Telecommunications Standards Institute
<b>EN</b>	European Standard
<b>FCC</b>	Federal Communications Commission
<b>FCC ID</b>	Company Identifier at FCC
<b>IC</b>	Industry Canada
<b>PMN</b>	Product marketing name
<b>HMN</b>	Host marketing name
<b>HVIN</b>	Hardware version identification number
<b>FVIN</b>	Firmware version identification number
<b>EMC</b>	Electromagnetic Compatibility
<b>HW</b>	Hardware
<b>SW</b>	Software
<b>Inv. No.</b>	Inventory number
<b>S/N or SN</b>	Serial number
<b>C</b>	Compliant
<b>NC</b>	Not compliant
<b>NA</b>	Not applicable
<b>NP</b>	Not performed
<b>PP</b>	Positive peak
<b>QP</b>	Quasi peak
<b>AVG</b>	Average
<b>OC</b>	Operating channel
<b>OCW</b>	Operating channel bandwidth
<b>OBW</b>	Occupied bandwidth
<b>OOB</b>	Out of band
<b>DFS</b>	Dynamic frequency selection
<b>CAC</b>	Channel availability check
<b>OP</b>	Occupancy period
<b>NOP</b>	Non occupancy period
<b>DC</b>	Duty cycle
<b>PER</b>	Packet error rate
<b>CW</b>	Clean wave
<b>MC</b>	Modulated carrier
<b>WLAN</b>	Wireless local area network
<b>RLAN</b>	Radio local area network
<b>DSSS</b>	Dynamic sequence spread spectrum
<b>OFDM</b>	Orthogonal frequency division multiplexing
<b>FHSS</b>	Frequency hopping spread spectrum
<b>GNSS</b>	Global Navigation Satellite System
<b>C/N<sub>0</sub></b>	Carrier to noise-density ratio, expressed in dB-Hz

## 15 Document history

Version	Applied changes	Date of release
-/-	Initial release	2021-12-07

## 16 Accreditation Certificate – D-PL-12076-01-04

first page	last page
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<https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-04.pdf>

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**17 Accreditation Certificate – D-PL-12076-01-05**

first page	last page
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##### END OF TEST REPORT #####