

Test Report

Electromagnetic Compatibility

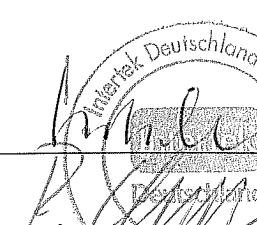
Test Report - Nr.: 07KFE007857-I-FCC-02

Date: 2007-12-04

Type:	RC-88
Description:	Wireless wall button
Serial number:	0705077-004

Manufacturer:	Jablotron s.r.o.
Customer:	Jablotron s.r.o.
Address (Customer):	Pod Skalkou 33 CZ 646601 Jablonec nad Nisou Czech Republic

Test Laboratory:	Intertek Deutschland GmbH, Innovapark 20, D- 87600 Kaufbeuren
FCC registration number:	90714
Compiled by:	Marek Svoboda Team Leader EMC
Approved by:	R. Dressler Project Engineer



This test report consists of 21 pages. All measurement results exclusively refer to the equipment, which was tested. Reproduction of this report except in its entirety is not permitted without written approval of Intertek Deutschland GmbH.

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1. General description

1.1. Product description

The device is wireless wall button with built – in antenna. The producer declared operating frequency is $f = 868.5$ MHz. It is activated by pressing the front surface. After activation the transmitter transmits the pulse train of 3 pulses each 30 ms long. The wall button can work in two modes depending on the state of DIP switch 1 on the PCB.

Dip witch 1 OFF: standard operation of button. Pulses are transmitted only after pressing the button, no periodic signal are transmitted.

Dip switch 1 ON: TAMPER contacts, supervision of battery status are activated. Periodic operation: 9 minutes interval the pulse train 3 x 30 ms to the control unit.

The device is battery operated. The source used for testing was a new battery , type CR 1425; U = 3V delivered with the device.

The wireless transmitter (connection to control unit) has operating frequency $f = 868.5$ MHz.

Antenna type : Internal, Integral

1.2. Related submittal(s) Grants

This is application for certification of the transmitter.
No related devices are present.

1.3. Test Methodology

☒ The test setup and test was done according to: **ANSI C63.4: 2003**
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.

☐ The test setup and test was done according to: **CISPR 22: 1998 + Corrigendum: 2003 + A1: 2000 + A2: 2003 and ANSI C63.4: 2003**
Compliance with CISPR 22 is being used to demonstrate conformity with FCC DoC requirements. This conforms with FCC Part 15.109(g).

The test results detailed in this report apply only to the RC-88 with the test setup described. Any modification such as a change, addition to or inclusion of another device into this product will require an additional evaluation.

The support equipment listed as part of the emission tests is required to properly exercise and test the device under test.

1.4. Test Facility

The test site was semi-anechoic chamber Intertek Germany (PM KF 1150). Measurement distance EUT – Antenna was $d = 3$ m.

1.5. List of exhibits

Following exhibits are delivered as separate pdf files. The name of file corresponds with description of exhibit with extension **.pdf**

EXHIBIT 1	Test setup photo documentation
EXHIBIT 2	External Photos
EXHIBIT 3	Internal Photos
EXHIBIT 4	Operational description
EXHIBIT 5	Block diagram
EXHIBIT 6	Circuit diagram
EXHIBIT 7	Instruction manual
EXHIBIT 8	Product label
EXHIBIT 9	Confidentiality request

2. Measurements And Test Specifications

Emission - Requirements according to

- ☐ FCC, Part 15, Class A, verification
- ☐ FCC, Part 15, Class B, DoC
- ☐ FCC, Part 15, Class B, certification
- ☒ FCC, Part 15, intentional radiator, certification

2.1. Changes to Test Report 07KFE007857-I-FCC-01

1. Corrected table in 5.3.3.3 –
 - a. column averaging factor changed according to measurement
 - b. recalculated Average value E and Margin average

3. Description Of EUT

3.1. Configuration / Operating Conditions

☒ table-top EUT

☐ floor-standing EUT

The device is battery operated. The power source delivered by producer and used for testing was a new LiMh accumulator, type CR 14505; U = 3V.

There were two samples of the device delivered :

Sample 1: was modified by manufacturer to transmit continuously. This sample was used for measurement of bandwidth and field strength ;

Sample 2 : has normal operation as specified by manufacturer . It was used for measurement of the duty cycle.

Normal operation of the device after pressing the button is transmission of 3 pulses in approximately 200 ms interval.

The equipment under test (EUT) is placed on wooden table 0,8 m above ground plane.

At all interference frequencies the height of the antenna is scanned in the range 1 m to 4 m with horizontal and vertical polarization and the turntable is rotated in the range 0° to 360° to obtain the highest field strength.

Measurements in frequency range 30 MHz – 3 GHz were performed with bilog antenna HL 562, measurements in frequency range 3 GHz – 10 GHz were performed with horn antenna HF 906 with preamplifier.

3.2. Major Subassemblies Or Internal Peripherals

Device	Manufacturer	Type	SN	FCC ID
none				

3.3. Peripheral Devices Used For Testing

Device	Manufacturer	Type	SN	FCC ID
none				

3.4. Supply- And Interconnecting Cables

Line	Length	shielded	non shielded	Shield on GND / PE
none		<input type="checkbox"/>	<input type="checkbox"/>	

4. Test Results - Overview

	required	passed	passed with modification	not passed
Bandwidth	< 2.17 MHz, 0.25 % f_{op}	<input checked="" type="checkbox"/>		
Duty cycle	< 2 s in 1 hour	<input checked="" type="checkbox"/>		
Emission				
30 MHz - 3000 MHz	FCC 15.231	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 GHz – 10 GHz	FCC 15.231	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Measurement results detailed

5.1. Duty cycle and Averaging factor

The averaging factor was measured by means of the measuring receiver/spectrum analyzer ESIB 26 in “Analyzer mode”.

Fig. 1 shows the length of single data pulse in 100 ms window.

Fig. 2 shows the pulse train after pressing the button.

Fig. 3 shows the periodic operation in the 600 s window.

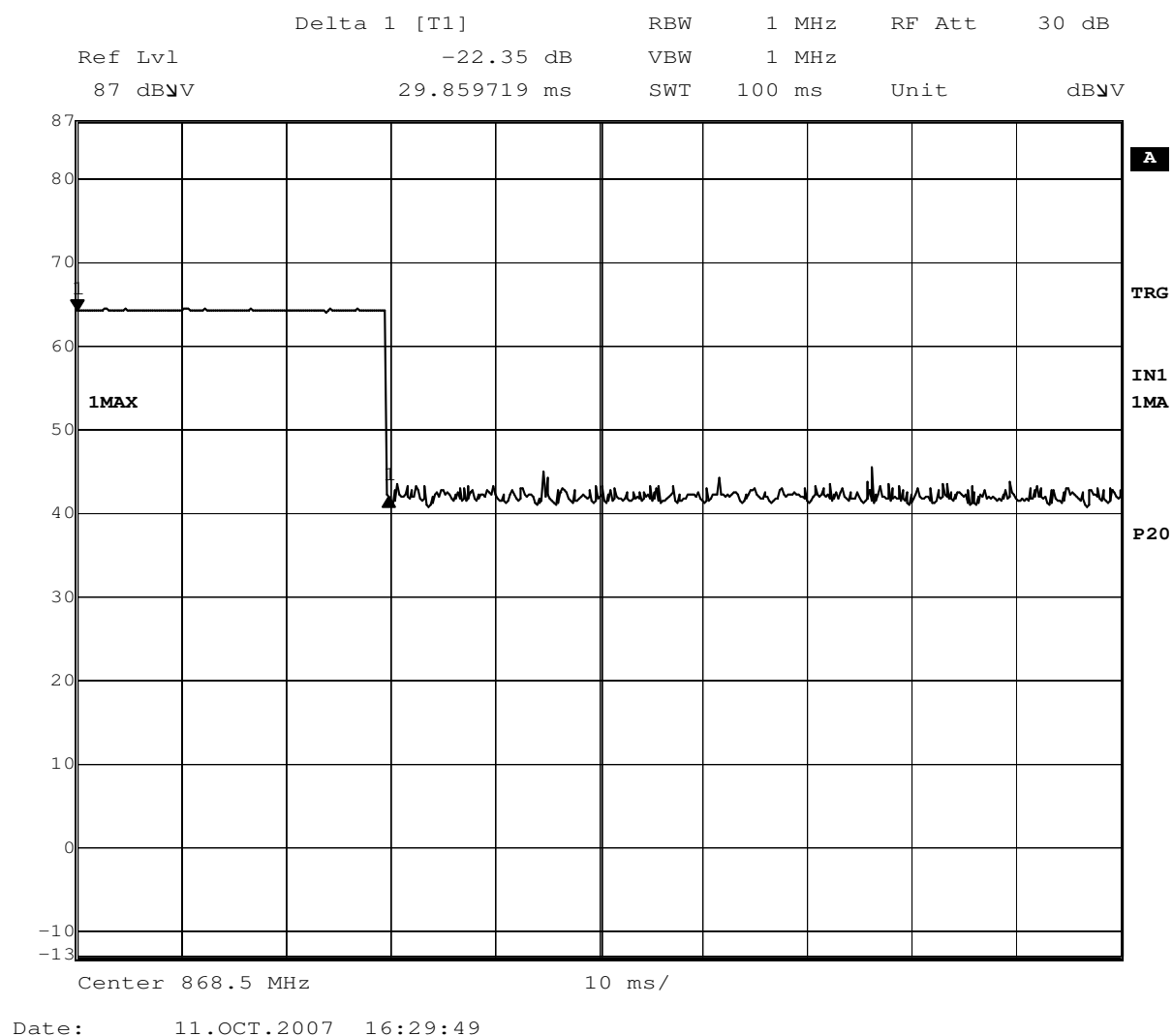


Fig .1

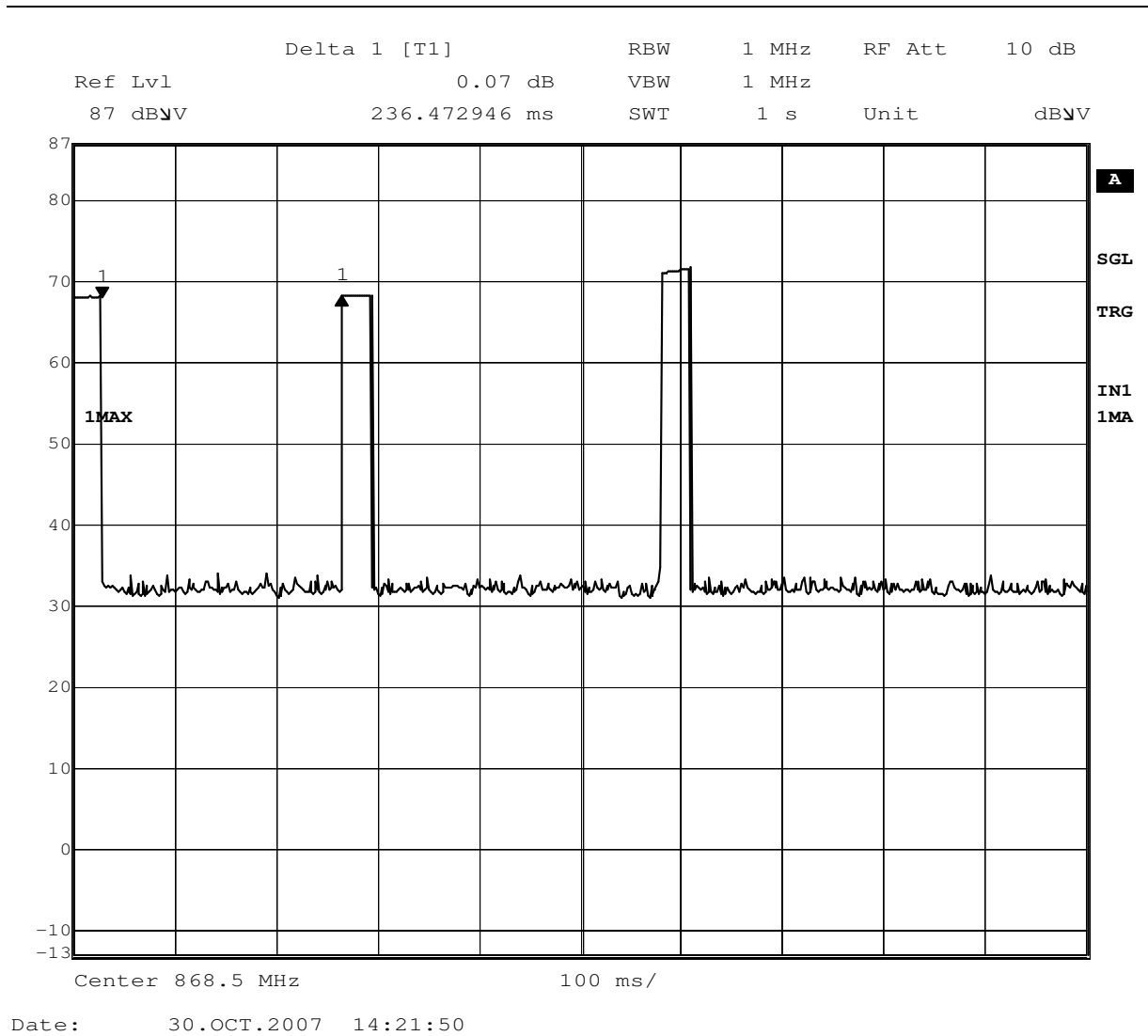


Fig. 2

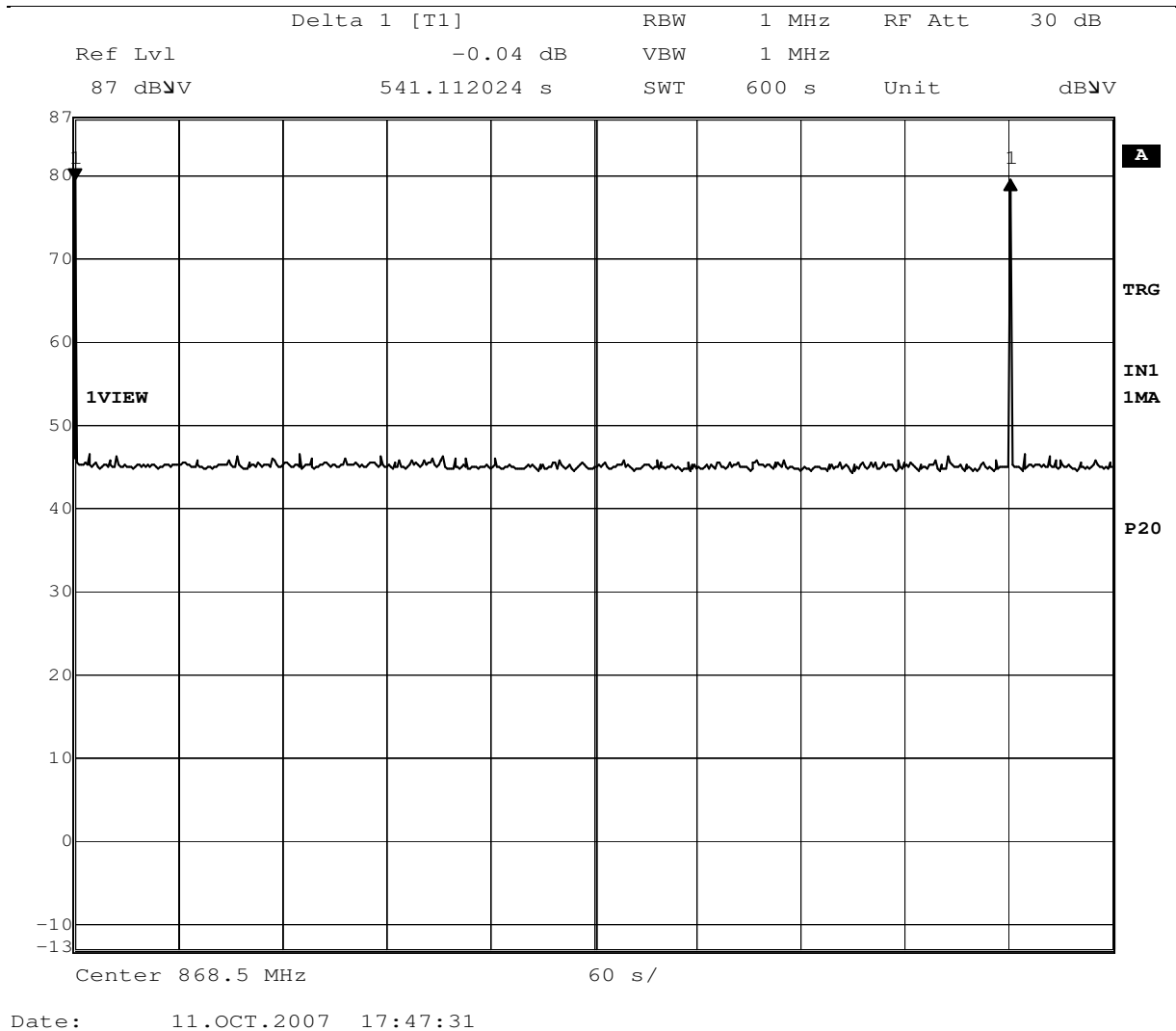


Fig. 3

Total transmission time in period $T = 100$ ms is $t = 29.65$ ms.

The Averaging factor is:

$$20 \cdot \log (29.65/100) = -10.56 \text{ dB.}$$

The measured peak values are to be reduced by averaging factor to obtain average values.

The data pulses are transmitted with period 541 s, in 9 minutes interval.

Transmission time in 1 hour period is: $\text{int}(3600/541) \cdot 29.65 = 178$ ms

5.2. Bandwidth

The measured 20 dB bandwidth is shown on Fig. 2

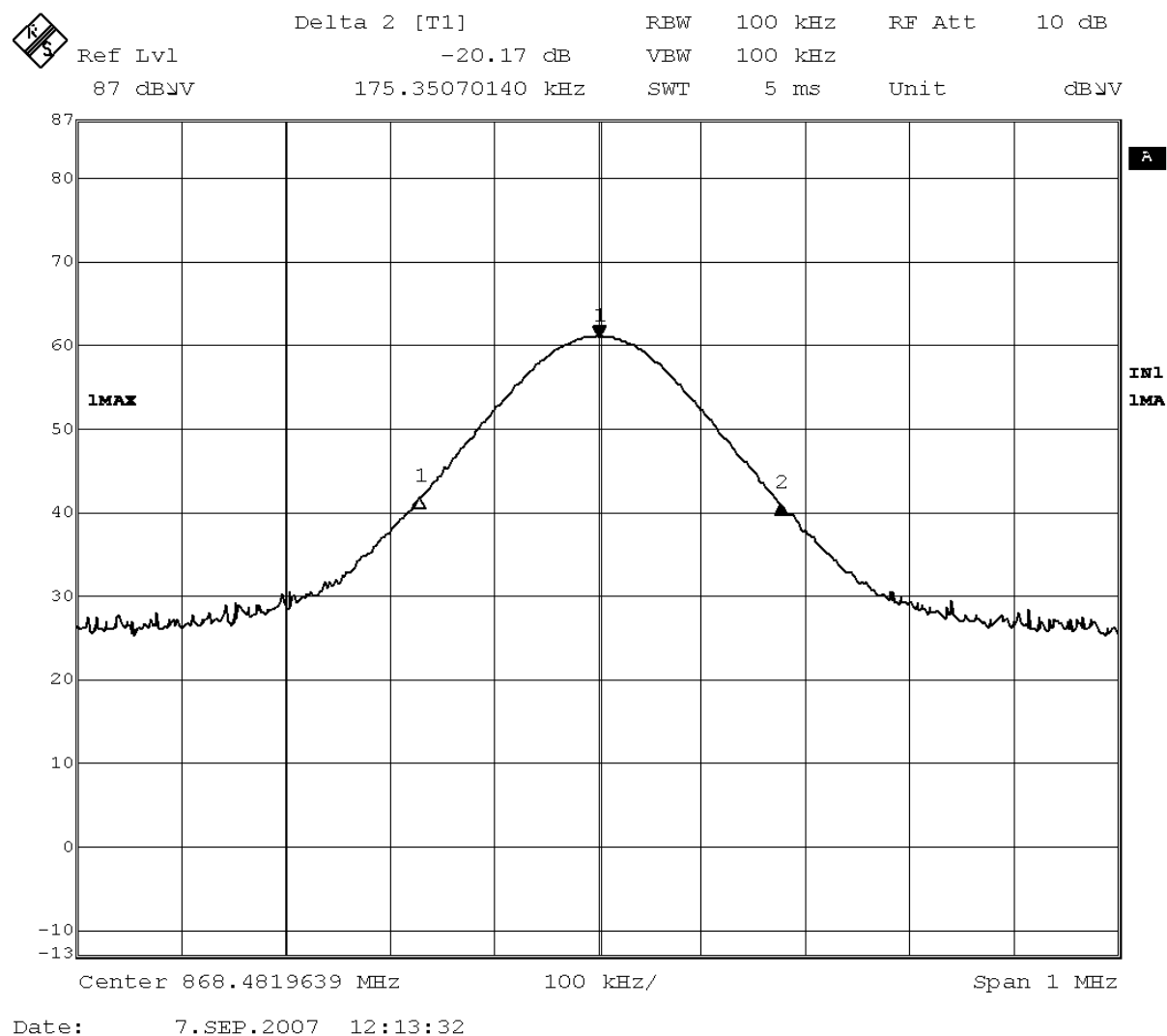


Fig .2

The BW is 350 kHz, operating frequency $f = 868.48$ MHz.

5.3. Radiated Emission 30 MHz – 10 GHz

Data was measured for worst case configuration which resulted in highest emission levels. A sample calculation, configuration photographs and data tables of emissions are included.

The detector used was PEAK.

5.3.1. Field strength calculation

The field strength is calculated by adding the reading on the measuring receiver to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when the specified limit is related to average detector and measurements are made with peak detector).

A sample of calculation is included below :

$$E = RR + AF + CF - AG + PD + AV$$

Where

E	field strength in dB μ V/m
RR	receiver reading including preamplifier in dB μ V
CF	cable attenuation factor in dB
AF	antenna factor in dB/m
AG	amplifier gain in dB
PD	pulse desensitization in dB
AV	average factor in dB

Example :

Assume that measured values and factors are as follows :

RR	= 60 dB μ V
CF	= 1.2 dB
AF	= 12.6 dB/m
AG	= 20 dB
PD	= 0 dB
AV	= -10 dB

Then

$$E = 60 + 1.2 + 12.6 - 20 + 0 - 10 = 43.8 \text{ dB}\mu\text{V/m}$$

The radiated emission tables which follow the graphical presentation of results were created by the EMC 32 software by Rohde-Schwarz. The data of field strength (peak detector) include the components given above with the exception of PD and AV.

5.3.2. Normative references

Limits equivalent:	FCC, Part 15.231, Part 15.209 where appropriate
Methods of Measurement equivalent:	ANSI C63.4, CISPR 22

Test requirement

Class	B
Distance Antenna – EUT	3 m
Frequency range	30 MHz - 10000 MHz

Place of measurement

- ☒ Semi anechoic chamber Intertek Germany PM KF 1150.
☐ Open Area Test Site

Measurement devices

Measurement device	Manufacturer	Type	SN	Asset No.	Last Calibr. at ion	Inter- val
<input checked="" type="checkbox"/> Test receiver, 20Hz-26GHz	ESIB26	Rohde & Schwarz	100150	PM KF 0948	07-03	1
<input checked="" type="checkbox"/> Antenna, 30-3000 MHz	HL562	Rohde & Schwarz	100354	PM KF 1123	07-03	2
<input checked="" type="checkbox"/> Horn antenna, 1-18 GHz	Rohde & Schwarz	HF906	100188	PM KF 0947	07-05	2
<input checked="" type="checkbox"/> Horn antenna preamp.	Bonn	BLMA0118-4A	35352	PM KF 0946	07-05	2

5.3.3. Emission Test results

Test requirements

☒ passed

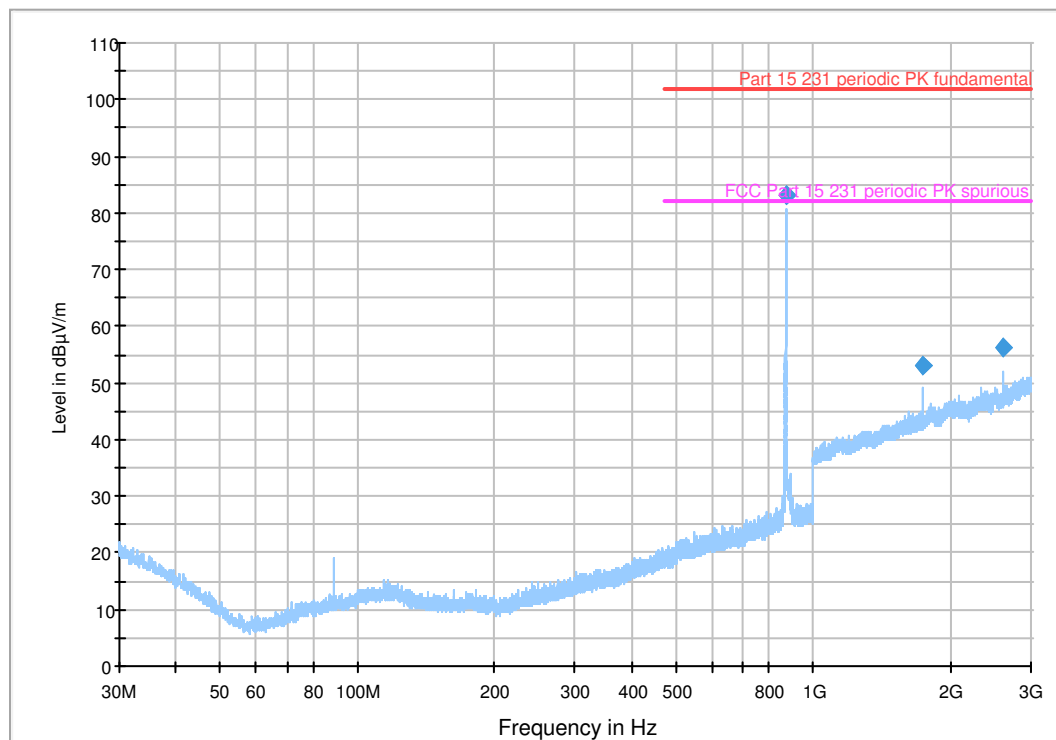
☐ passed with
modification

☐ not passed

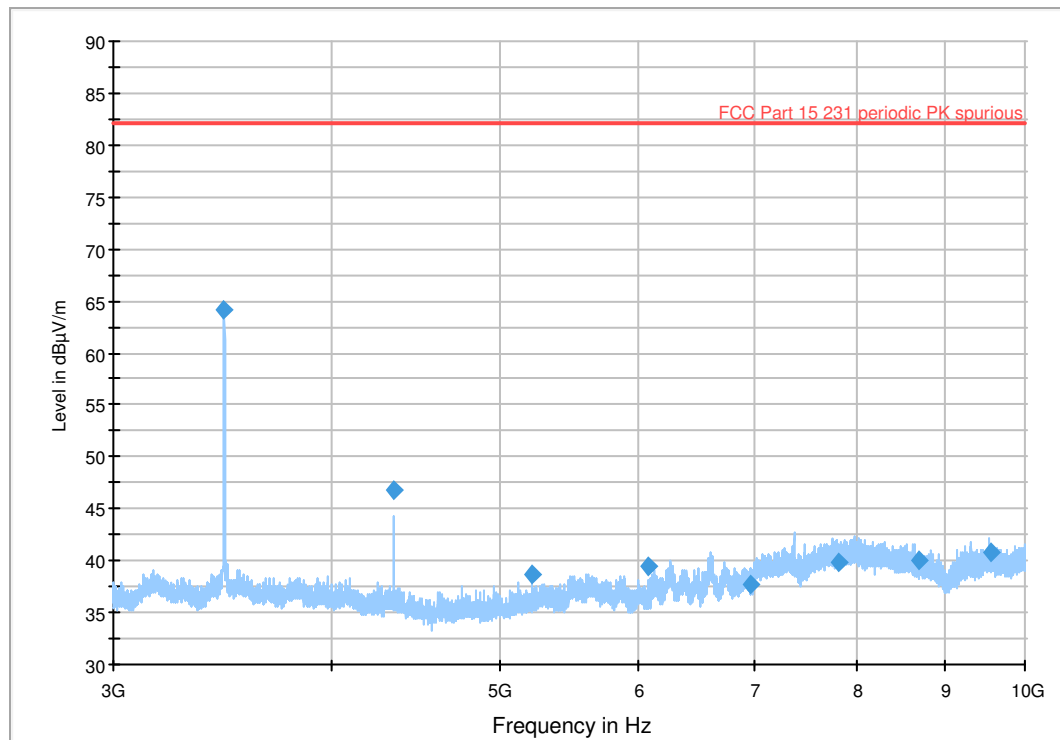
Comment:

The radiated emissions between 30 MHz and 10 000 MHz are under the limit
specified in FCC 15.231

5.3.3.1 Radiated Emission 30 MHz – 3 GHz



5.3.3.2 Radiated Emission 3 GHz – 10 GHz



5.3.3.3 Radiated Emission : table 30 MHz – 10 GHz

Measurements based on a measurement time of 10 ms unless otherwise noted.
Measurement bandwidth is 120 kHz below 1 MHz, and 1 MHz above 1000 MHz.

Frequency (MHz)	MaxPeak E (dBμV/m)	Averaging factor (dB)	Average value E (dBμV/m)	Limit Average (dBμV/m)	Margin average (dB)	Limit peak (dBμV/m)	Margin peak (dB)
868,48	83,2	-10,56	72,64	82	-9,36	102	-18,8
1736,8	53	-10,56	42,44	62	-19,56	82	-29
2605,3	56,1	-10,56	45,54	62	-16,46	82	-25,9
3473,8	64,1	-10,56	53,54	62	-8,46	82	-17,9
*)4342,3	46,8	-10,56	36,24	54	-17,76	74	-27,2
5210,8	38,6	-10,56	28,04	62	-33,96	82	-43,4
6079,3	39,4	-10,56	28,84	62	-33,16	74	-34,6
6952,2	37,7	-10,56	27,14	62	-34,86	82	-44,3
7819,5	39,9	-10,56	29,34	62	-32,66	82	-42,1
8687,2	40	-10,56	29,44	62	-32,56	82	-42
9553,7	40,9	-10,56	30,34	62	-31,66	82	-41,1

*) Frequencies governed by 15.209

6. Test setup Photo documentation

EXHIBIT 1



Fig. 1 Front view



Fig. 2 Rear view

7. EUT Photo documentation

External Photos : EXHIBIT 2

Internal Photos : EXHIBIT 3

8. Technical specification

Operational description : EXHIBIT 4

8.1. Block Diagram Of The EUT

EXHIBIT 5

8.2. Circuit Diagram Of The Layout

EXHIBIT 6

8.3. Instruction manual

EXHIBIT 7

8.4. Product Labelling

EXHIBIT 8