Test report

Customer:

PowerBox-Systems GmbH

Ludwig-Auer-Straße 5
86609 Donauwörth
Germany

Tel.: +49 906 99999-0

EMC test report

171026-AU03+W03

Industry Canada

PowerBox-Systems GmbH

Receiver

PBR-9D

EMV **TESTHAUS** GmbH

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94315 Straubing
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Email: info@emv-testhaus.com

Accreditation:

FCC test firm accreditation expiration date: 2021-05-30
MRA US-EU, FCC designation number: DE0010
BnetzA-CAB-02/21-02/5 Valid until 2023-11-26

Recognized on March 14th, 2019 by the
Department of Innovation, Science and Economic Development (ISED) Canada
as a wireless testing laboratory
CAB identifier: DE0011

Location of Testing:

EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing

The technical accuracy is guaranteed through the quality management of the EMV **TESTHAUS** GmbH.

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List of tables

1 Test regulations

Standard	*Title*
RSS-102 Issue 5 March 2015	Spectrum Management and Telecommunications Radio Standards Specification Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)
SPR-002 Issue 1 September 2016	Spectrum Management and Telecommunications Supplementary Procedure Supplementary Procedure for Assessing Compliance with RSS-102 Nerve Stimulation Exposure Limits
Safety Code 6 (2015)	Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz
IEEE C95.3-2002 (R2008) Approved December 11, 2002 Reaffirmed June 12, 2008	IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz–300 GHz
KDB 680106 D01 May 31, 2013 (published by the Federal Communications Commission FCC)	RF Exposure Considerations for Low Power Consumer Wireless Power Transfer Applications
OET Bulletin 65, 65A, 65B Edition 97-01, August 1997	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields
Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: portable device
KDB 447498 D01 v06	Mobile and portable devices RF Exposure procedures and equipment authorisation policies, October 23, 2015.
KDB 865664 D01	SAR Measurement Requirements for 100 MHz to 6 GHz, August 7, 2015.
ANSI C95.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

2 Summary of test results

Standard	*Result*	*Remark*
RSS-102 Issue 5 March 2015	Passed	---
Part 1, Subpart 2, Section 2.1091	Passed	---

Straubing, October 14, 2019

Konrad Graßl
Head of radio department
EMV **TESTHAUS** GmbH

Christian Kiermeier
Technical executive
EMV **TESTHAUS** GmbH

3 Equipment under test (EUT)

Product type:	Receiver
Model Name:	PBR-9D
Manufacturer:	PowerBox-Systems GmbH
Serial number:	n.a.
FCC ID:	2ASCM-PBR-09D
IC certification number:	24594-PBR09D
Application frequency band:	2400 MHz – 2483.5 MHz
Antenna types:	Wire antenna ☐ detachable ☒ not detachable
Power supply:	DC supply nominal voltage: 5 V
Type of device:	☐ Body-supported device ☐ Body-worn (or body-mount) radio ☐ Limb-Worn device ☒ other
Separation distance:	☐ ≤ 20 cm ☒ > 20 cm
Evaluated against exposure limits:	☒ General public use ☐ Controlled use

4 Photographs of EUT

See Annex B

5 Test results

This clause gives details about the test results as collected on page 5.

The climatic conditions are recorded during the tests. It is ensured that the climatic conditions are within the following ranges:

Ambient temperature	*Ambient humidity*	*Ambient pressure*
15°C to 35°C	30 % to 75 %	86 kPa to 106 kPa

5.1 FCC

5.1.1 Evaluation for separation distance > 20 cm, except WPT

Reference: Part 1, Subpart 2, Section 2.1091

Basic standard: n/a

Performed by:	Konrad Graßl	Date of test:	October 14, 2019
Result:	☒ Limits kept	☐ Limits not kept	

5.1.1.1 Data of equipment under test (EUT)

Note: The data for the RF technology is taken out of the Test report 171026-AU03+W01 of the test laboratory EMV Testhaus GmbH

Antenna connector:	permanent
Antenna detachable:	No
Maximum antenna gain:	0 dBi
Maximum conducted output power	19.04 dBm at 2401.984 MHz
Operation frequency range:	2400 MHz – 2483.5 MHz
Tune-up tolerance:	±1 dB
Applicable duty cycle:	As worst case not applied

5.1.1.2 Requirements and limits for separation distance > 20 cm

This estimation follows the general guidelines for RF Exposure according to KDB 447498.

As noted in §2.1091(b) a mobile device is defined as “a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a **separation distance of at least 20 centimeters** is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.”
According to §2.1091(c) the limits to be used for evaluation are defined in §1.1310.

As specified in §1.1310(d)(2) at operating frequencies less than or equal to 6 GHz, the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1 of §1.1310(e) may be used.

Frequency range (MHz)	**Electric field strength (V/m)**	**Magnetic field strength (A/m)**	**Power density (mW/cm^2)**	**Averaging time (minutes)**
(A) Limits for Occupational/Controlled Exposure				
0.3 - 3.0	614	1.63	*100	6
3.0 - 30	1842/f	4.89/f	*900/f2	6
30 - 300	61.4	0.163	1.0	6
300 - 1500			f/300	6
1500 - 100000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3 - 1.34	614	1.63	*100	30
1.34 - 30	824/f	2.19/f	$*180/f^2$	30
30 - 300	27.5	0.073	0.2	30
300 - 1500			f/1500	30
1500 - 100000			1.0	30

Table 1: Limits for maximum permissible exposure (MPE) according to table 1 of §1.1310(e)

Notes:
1. f = frequency in MHz.
2. * = Plane-wave equivalent power density.

5.1.1.3 Results

Channel Frequency (MHz)	*PEIRP + tuneup tolerance (dBm)*	*P (mW)*	*P (W)*	*Pd (mW/cm2)*	*Limit Pd (mW/cm2)*	*Result*
2401.984	20.04	100.925	0.1009	0.0201	1.0	Passed

Table 2: Result of MPE

5.2 Canada

5.2.1 Evaluation for separation distance > 20 cm, except 3 kHz – 10 MHz

Reference: RSS 102

Basic standard: n/a

Performed by:	Konrad Graßl	Date of test:	October 14, 2019
Result:	☒ Limits kept	☐ Limits not kept	

5.2.1.1 Data of equipment under test (EUT)

Note: The data for the RF technology is taken out of the Test report 171026-AU03+W01 of the test laboratory EMV Testhaus GmbH.

Antenna connector:	permanent
Antenna detachable:	No
Maximum antenna gain:	0 dBi
Maximum conducted output power	19.04 dBm at 2401.984 MHz
Operation frequency range:	2400 MHz – 2483.5 MHz
Tune-up tolerance:	±1 dB
Applicable duty cycle:	As worst case not applied

5.2.1.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

According to RSS 102 Clause 2.5.2:
RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:
• below 20 MHz6 and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
• at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 4.49/f0.5 W (adjusted for tune-up tolerance), where f is in MHz;
• at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
• at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10^{-2} $f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
• at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

5.2.1.3 Results

Channel Frequency (MHz)	*PEIRP + tuneup tolerance (dBm)*	*P (W)*	*Limit (W)*	*Result*
2401.984	20.04	0.1009	2.70	Passed

Table 3: Result of MPE

6 Revision history

Revision	*Date*	*Issued by*	*Description of modifications*
0	2019-10-14	Konrad Graßl	First edition