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FCC SAR Exemption Evaluation Report

Report No. : W7L-P23030020SA02
Applicant : Marquardt GmbH
Address : Schloss-str.16,78604 Rietheim-Weilheim,Germany
Product : V216 keyfob
FCC ID : IYZGK2
Brand : Marquardt
Model No. : GK2
Standards : FCC 47 CFR Part 2 (2.1093) / Part 1 (1.1307)
KDB 447498 D04 v01
Sample Received Date : Jun. 08, 2023
Date of Testing : Jun. 08, 2023 ~ Aug. 29, 2023

CERTIFICATION: The above equipment have been tested by **HUARUI 7LAYERS HIGH TECHNOLOGY (SUZHOU) CO., LTD.**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by A2LA or any government agencies.

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Release Control Record

Report No.	Reason for Change	Date Issued
W7L-P23030020SA02	Initial release	Aug. 29, 2023



1. Description of Equipment Under Test

EUT Type*	V216 keyfob
Brand Name*	Marquardt
Model Name*	GK2
Tx Frequency Bands (Unit: MHz)	BT-LE: 2402 ~ 2480 UWB: CH5: 6489.6MHz/ CH9: 7987.2MHz
Uplink Modulations	BT-LE: GFSK UWB: BPSK
Maximum Tune-up Conducted Power (Unit: dBm)	BT-LE: 0.7dBm UWB: CH5:-18.72/ CH9: -14.65 dBm
Antenna Type*	PCB Antenna
EUT Stage*	Production Unit

NOTE:

- *Since the above data and/or information is provided by the client relevant results or conclusions of this report are only made for these data and/or information , Test Lab is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.
- The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

3. List of Accessory:

ACCESSORIES	BRAND	MANUFACTURER	MODEL	SPECIFICATION
Battery	Panasonic	Panasonic Corporation	CR2450	Capacity:3.0 Vdc, 620mAh



2. SAR Exemption Evaluation

Following FCC KDB 447498 D04 “Interim General RF Exposure Guidance” v01

SAR-based Exemption:

The corresponding SAR Exclusion Threshold condition, listed below:

1) SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time averaged power or maximum time-averaged ERP, whichever is greater.

2) Per § 1.1307(b)(3)(i)(B), for single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

3) The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);



Blanket 1 mW Blanket Exemption:

The 1 mW Blanket Exemption of § 1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1 mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph § 1.1307(b)(3)(ii)(A).

The 1 mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

For multiple RF sources: Multiple RF sources are exempt if:

In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Smallest distance from the antenna and radiating structures or outer surface of the device

The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander.

2.1 Maximum Tune-up Power (declared by manufacturer)

Mode	Tune-up Power
Bluetooth LE	0.7 dBm
UWB (CH5)	-18.72 dBm
UWB (CH9)	-14.65 dBm



2.2 SAR Test Exclusion Thresholds

Mode	Frequency (MHz)	Antenna Gain (dBi)	Max. Tune-up Power (dBm)	Max. Tune-up Power (mW)	ERP (dBm)	ERP (mW)	Minimum separation distance (mm)	Pth (mW)	Verdict
Bluetooth LE	2480	2.2	0.70	1.17	0.75	1.19	5	2.72	Exempt from SAR

Mode	Frequency (MHz)	Max. Tune-up Power (dBm)	Max. Tune-up Power (mW)	Minimum separation distance (mm)	Exception Limit (mW)	Verdict
UWB (CH5)	6489.6	-18.72	0.01	5	1	Exempt from SAR
UWB (CH9)	7987.2	-14.65	0.03	5	1	Exempt from SAR

Simultaneous transmitting consideration (worst case):

$$\text{The ratio} = P_{BT}/P_{th} + P_{UWB}/P_{th} = 1.19/2.72 + 0.03/1 = 0.468 < 1.0$$

Conclusion

According to the table above, the device can meet the SAR test exclusion thresholds requirement of FCC KDB 447498 D04 v01 and SAR evaluation is not required.

Therefore this device complies with FCC's RF radiation exposure limits for general population without SAR evaluation.



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3. Information on the Testing Laboratories

We, Huarui 7layers High Technology (Suzhou) Co., Ltd., were founded in 2020 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Suzhou EMC/RF Lab:

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