


RF Exposure Exemption

Applicant : Verkada Inc
Product Name : Door Reader
Trade Name : 
Model Number : AD34-HW
Applicable Standard : 47 CFR § 2.1093
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Taiwan Accreditation Foundation accreditation number: 1330

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Approved By :



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Revision History

<i>Rev.</i>	<i>Issued Date</i>	<i>Description</i>	<i>Revised by</i>
00	Jul. 05, 2024	Initial Issue	Rowan Hsieh

1. General Information

1.1 Reference Applicable Standard

Standard	Description	Version
IEEE C95.1	American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 KHz to 100 GHz, New York.	1992
47 CFR § 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.	-
47 CFR § 1.1310	Radiofrequency radiation exposure limits.	-
KDB 447498 D04	RF exposure procedures and equipment authorization policies for mobile and portable devices	v01

1.2 Testing Location

Test Facilities

Company Name: Eurofins E&E Wireless Taiwan Co., Ltd.
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Test Site Location

- No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan
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Laboratory Accreditation

Location	TAF	FCC	ISED
No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan	Accreditation No.: 1330	Designation No.: TW0010	Company No.: 7381A CAB ID: TW1330
No. 2, Wuquan 5th Rd. Wugu Dist., New Taipei City, Taiwan	Accreditation No.: 1330	Designation No.: TW0034	Company No.: 28922 CAB ID: TW1330

2. Description of Equipment under Test (EUT)

Applicant	Verkada Inc 405 E. 4th Ave. San Mateo California 94401 United States				
Product Name	Door Reader				
Trade Name	✔ Verkada				
Model Number	AD34-HW				
FCC ID	2AWUU6074001				
Antenna Information	Trade Name	Model No.	Type	Gain	
	LITEON	Nordic nRF5340-QKAA-R	Printed antenna	2.4 GHz	-0.2 dBi
				2.45 GHz	-1.6 dBi
				2.5 GHz	-1.0 dBi
	Liteon	NF-W-F0-R2-04-001-2	Coil Antenna	---	
Liteon	NF-C-F9-R0-218-2	FPCB Antenna	---		

Note:

The above information of DUT was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

2.1 RF Specification

Bluetooth	
Support type:	<input type="checkbox"/> BR <input type="checkbox"/> EDR <input checked="" type="checkbox"/> BLE-1 Mbps <input checked="" type="checkbox"/> BLE-2 Mbps
Note: This device support Bluetooth Tethering.	
RFID	
Operation Frequency	0.125 MHz
Modulation	ASK
NFC	
Operation Frequency	13.56 MHz
Modulation	ASK

3. Low Power Exemption Assessment

3.1 Introduction

According to 47 CFR §2.1093, a portable 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 the RF source's radiating structure(s) is/are within 20 centimeters of the body of the user. The exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for portable devices having single RF sources with more than an available maximum time-averaged power of 1 mW, more than the ERP listed in Table 1 to § 1.1307(b)(3)(i)(C), or more than the P_{th} in the following formula, whichever is greater. The following formula shall only be used in conjunction with portable devices not exempt by § 1.1307(b)(3)(i)(C) at distances from 0.5 centimeters to 20 centimeters and frequencies from 0.3 GHz to 6 GHz.

3.2 Determination of Exemption for Low Power Devices

For Single RF Sources, a single RF source is exempt if:

Option A :

The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph §1.1307(b)(3)(ii)(A). Medical implant devices may only use this exemption and that in paragraph §1.1307(b)(3)(ii)(A).

Option B :

The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (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). P_{th} is given by:

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

Where

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

and

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

d = the separation distance (cm).

Option C :

Using *Table 1* and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in *Table 1* to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1: Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency (MHz)	Threshold ERP (Watts)
0.3 – 1.34	$1.920 \times R^2$
1.34 – 30	$3.450 \times R^2 / f^2$
30 – 300	$3.83 \times R^2$
300 – 1500	$0.0128 \times R^2 \times f$
1500 – 100000	$19.2 \times R^2$

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

Option A :

The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is §1.1307(b)(3)(i)(A). Medical implant devices may only use this exemption and that in §1.1307(b)(3)(i)(A).

Option B :

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.

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

Where:

- a** = number of fixed, mobile, or portable RF sources claiming exemption per §1.1307(b)(3)(i)(B) for P_{th} , including existing exempt transmitters and those being added.
- b** = number of fixed, mobile, or portable RF sources claiming exemption per §1.1307(b)(3)(i)(C) for Threshold ERP, including existing exempt transmitters and those being added.
- c** = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.
- P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).
- $P_{th,i}$ = the exemption threshold power (P_{th}) according to §1.1307(b)(3)(i)(B) for fixed, mobile, or portable RF source i .
- ERP_j = the ERP of fixed, mobile, or portable RF source j .
- $ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$ according to the applicable formula of §1.1307(b)(3)(i)(C).
- $Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.
- $Exposure\ Limit_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k , as applicable from §1.1310.

4. Result

Tx Bands	Frequency (MHz)	Max. Tune-up Power (dBm)	Max. Tune-up Power (mW)	Peak Antenna / Directional Gain (dBi)	ERP (mW)	LPE Level in Option A (mW)	LPE Level in Option B (mW)	Low-Power Exemption Verdict
Bluetooth	2402	3.28	2.13	-0.2	1.24	N/A	2.72	Pass by Option B

Tx Bands	Frequency (MHz)	E-Field at 1m (dBuV/m)	EIRP (dBm)	ERP (mW)	LPE Level in Option A (mW)	LPE Level in Option B (mW)	Low-Power Exemption Verdict
NFC	13.56	22.28	-82.49	0.0000	1.00	N/A	Pass by Option A
RFID	0.125	22.08	-82.69	0.0000	1.00	N/A	Pass by Option A

Note:

$EIRPd_{Bm} = E\text{-Field Strength} + 20 \cdot \log(D) - 104.77$; $EIRPW = 10^{(EIRPd_{Bm}/10)}/1000$.

5. Conclusion

Summary:

Since the maximum EIRP of this device is less than the LPE level and this device is qualified for Low Power Exemption under the field reference level exposure exemption limits of §1.1310, the emitted RF fields will be incapable of producing exposures that exceed the exposure limits. Hence, this device complies with the reference levels and a complete SAR evaluation is not required.

***** End of Report *****