



TEST REPORT

Test report no.: 1-1279-25-01-03_TR1-R01

RF Exposure consideration according to FCC447498D04 V1



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Akkreditierungsstelle
D-PL-12047-01-00

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 with the registration number:

D-PL-12047-01-00.

ISED Testing Laboratory Recognized Listing Number: DE0001

FCC designation number: DE0002

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Test Item

Kind of test item: Key fob transmitter (US)

Model name: 651000072

FCC ID: 2BSTUOT000072

Frequency: 902 MHz – 928 MHz

Technology: Proprietary

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.

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1 Table of contents

1	Table of contents	2
2	General Information	3
2.1	Notes and Disclaimer	3
2.2	References	3
3	General RF Exposure Test Exemptions	4
3.1	SAR-Based Test Exemption	5
4	SAR-Based Test Exemption	6
4.1	Detailed Description	6
4.2	Results.....	7
5	Conclusion.....	7

2 General Information

2.1 Notes and Disclaimer

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2.2 References

Guidance	Version	Description
47 CFR 1.1307		Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.
47 CFR 2.1091		Radiofrequency radiation exposure evaluation: mobile devices.
47 CFR 2.1093		Radiofrequency radiation exposure evaluation: portable devices.
KDB 447498 D04	v01	Interim General RF Exposure Guidance: RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices

3 General RF Exposure Test Exemptions

KDB 447498 D04 Interim General RF Exposure Guidance v01, section 2.1.1:

RF exposure test exemptions provide means to obtain certification without the need of showing data (measurements, or analytical/numerical modeling) to demonstrate compliance. Hereafter, in this context, an RF source is referred to as “exempt RF device” in the sense that it is not required to show data demonstrating compliance to RF exposure limits.

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds. However, it is always possible, especially when the potential for exposure cannot be easily determined, that an RF exposure evaluation may become required according §§ 1.1307(c) and (d).

The 1-mW and SAR-based test exemption conditions are in terms of source-based available maximum time-averaged (matched conducted) output power for all operating configurations, adjusted for tune-up tolerance, and at the minimum test separation distance required for the particular RF exposure scenario under consideration. This 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. To qualify for SAR test exemption, the test separation distances applied must be fully explained and justified (typically in the SAR measurement, or SAR analysis report, according to KDB Pub. 865664) by showing the actual operating configurations and exposure conditions of the transmitter, and applicable host platform requirements (e.g., KDB Pubs. 648474, 616217, 941225)

When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for SAR test exemption.

If RF exposure testing requirements for a specific device are covered in a KDB publication, those requirements must be satisfied before applying any SAR test exemption provisions. For example, this is the case for handheld PTT two-way radios, handsets, laptops, and tablets, etc. Finally, when 10-g extremity SAR applies, SAR test exemption may be considered by applying a factor of 2.5 to the SAR-based exemption thresholds.

KDB 447498 D04 Interim General RF Exposure Guidance v01, Appendix A:

Frequency-dependent and distance-dependent power thresholds were adopted in Report and Order FCC 19-126. Appendix D of NPRM FCC 13-39 has the derivation of the frequency- dependent and distance-dependent time-averaged power thresholds, below which single portable RF sources operating in the frequency range of 300 MHz (0.3 GHz) to 6 GHz may be exempt from RF evaluation.

The previous power exclusion thresholds for mobile devices in § 2.1091(c) were 1.5 W ERP for transmitters operating at frequencies at or below 1.5 GHz, and 3 W ERP for transmitters operating at frequencies above 1.5 GHz. The new exemption criteria are similar to the previous power exclusion thresholds above 1.5 GHz between 20 cm and 40 cm but consider the potential for whole body resonance at frequencies below 1.5 GHz. The new exemption criteria are less restrictive than the previous power exclusion thresholds between 0.8 GHz and 1.5 GHz, and additionally support extension of these exclusion thresholds down to 0.3 GHz. The new exemption criteria can be used out to a separation distance of 40 cm for mobile and fixed RF sources operating between 300 MHz and 6 GHz. At 40 cm, the MPE-based exemption criteria and the SAR-based exemption criteria are equal.

Generally, the sequence to apply for single portable RF sources includes the following steps: Generally, the sequence to apply for single portable RF sources includes the following steps:

- 1) determination of 1 mW blanket exemption under § 1.1307(b)(3)(i)(A)
- 2) determination of exemption under the MPE-based § 1.1307(b)(3)(i)(C) if 1) is not met
- 3) determination of exemption under the SAR-based § 1.1307(b)(3)(i)(B) if both 1) and 2) are not met.

[...]

3.1 SAR-Based Test Exemption

KDB 447498 D04 Interim General RF Exposure Guidance v01, section 2.1.3:

A more comprehensive exemption, considering a variable power threshold that depends on both the separation distance and power, is provided in § 1.1307(b)(3)(i)(B). This exemption is applicable to the frequency range between 300 MHz and 6 GHz, with test separation distances between 0.5 cm and 40 cm, and for all RF sources in fixed, mobile, and portable device exposure conditions.

Accordingly, a RF source is considered an RF exempt device if its available maximum time- averaged (matched conducted) power or its effective radiated power (ERP), whichever is greater, are below a specified threshold. This exemption threshold was derived based on general population 1-g SAR requirements.

4 SAR-Based Test Exemption

4.1 Detailed Description

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.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

As for devices with antennas of length greater than $\lambda/4$ where the gain is not well defined, but always less than that of a half-wave dipole (length $\lambda/2$), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (2).

$$P_{th}(mW) = \begin{cases} ERP_{20cm} \left(\frac{d}{20\text{ cm}} \right)^x, & d \leq 20\text{ cm} \\ ERP_{20cm}, & 20\text{ cm} \leq d \leq 40\text{ cm} \end{cases} \quad (2)$$

where

$$x = -\log_{10} \left(\frac{60}{ERP_{20cm} \sqrt{f}} \right) \quad (3)$$

and f is in GHz, d is the separation distance (cm), and ERP_{20cm} is per Formula (1). The example values shown in Table 2 are for illustration only.

Table 1: Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)										
		5	10	15	20	25	30	35	40	45	50
300		39	65	88	110	129	148	166	184	201	217
450		22	44	67	89	112	135	158	180	203	226
835		9	25	44	66	90	116	145	175	207	240
1900		3	12	26	44	66	92	122	157	195	236
2450		3	10	22	38	59	83	111	143	179	219
3600		2	8	18	32	49	71	96	125	158	195
5800		1	6	14	25	40	58	80	106	136	169

4.2 Results

Declared test separation distance by customer: $d = 5$ mm

SRD Technology	Frequency [MHz]		Ref.	Note	Output Power [dBm]				Output Power [mW]		Share of Limit
	f_{Min}	f_{Max}	#	#	$P_{\text{Cond.}}$	P_{EIRP}	P_{ERP}	$P_{\text{RF Exp}}$	P_{Result}	P_{Limit}	%
FHSS/DTS 915 MHz	902	928	A		-1.2	0.3	-1.8	-1.2	0.76	8	9.5%

Values:

Value	Explanation
P_{Max}	Maximum rated time-averaged power as defined in customer's tune-up.
P_{Meas}	Maximum time-averaged power as measured in the test report(s).
P_{EIRP}	Maximum time-averaged EIRP as measured in the test report(s) (for frequencies > 1 GHz).
P_{ERP}	Maximum time-averaged ERP as measured in the test report(s) (for frequencies < 1 GHz). For frequencies > 1 GHz the ERP is being recalculated: $P_{\text{ERP}} = P_{\text{EIRP}} - 2.15$ dBm
$P_{\text{RF Exp}}$	Power considered for RF Exposure: Either available maximum time-averaged power (P_{Meas}) or maximum time-averaged ERP (P_{ERP}), whichever is greater, corrected by tune-up.
P_{Result}	$P_{\text{RF Exp}}$ in mW.
P_{Limit}	SAR-based threshold in mW.
Share of Limit	$P_{\text{Result}} / P_{\text{Limit}}$

Referenced Documents:

#	Document	Document Type	Additional Information
A	1-1279-25-01-02_TR1-R01	cetecom advanced report	Pg. 18, EIRP 0.32 dBm, calculated from field strength peak

5 Conclusion

According to KDB 447498 v01 (Interim General RF Exposure Guidance: RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices) the RF Exposure Test Exemptions applies.

Result:

All ratios are below 1 (≤ 100 %). Certification can be obtained without the need of showing data (measurements, or analytical/numerical modeling) to demonstrate RF Exposure compliance.