

RF Exposure Evaluation according to KDB 447498 D01 v06

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Certification numbers and labeling requirements	
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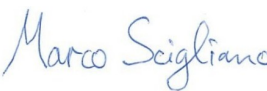
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Document authorised:



cn=Alexander Hnatovskiy, o=cetecom
advanced GmbH, ou=HNA-230601,
email=alexander.hnatovskiy@cetecomadva
nced.com, c=DE
2024.04.25 12:10:18 +02'00'

Alexander Hnatovskiy
Lab Manager
Radio Labs



cn=Marco Scigliano, o=cetecom
advanced GmbH, ou=SCI-230601,
email=Marco.Scigliano@cetecomadvan
ced.com, c=DE
2024.04.25 10:38:09 +02'00'

Marco Scigliano
Testing Manager
Radio Labs

1. SAR test exclusion (KDB 447498 D01 General RF Exposure Guidance v06)

4.3.1. Standalone SAR test exclusion considerations

Unless specifically required by the *published RF exposure KDB procedures*, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding *SAR Test Exclusion Threshold* condition(s), listed below, is (are) satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum *test separation distance* required for the exposure conditions. The minimum *test separation distance* defined in 4.1 f) 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 exclusion, the *test separation distances* applied must be fully explained and justified, typically in the SAR measurement or SAR analysis report, by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, according to the required *published RF exposure KDB procedures*. When no other RF exposure testing or reporting are 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 exclusion. When required, the device specific conditions described in the other *published RF exposure KDB procedures* must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops and tablets, etc.

- a) For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{\text{GHz}}}] \leq 3.0$ for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR, where

- f_{GHz} is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as *numeric thresholds* in step b) below

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

- b) For 100 MHz to 6 GHz and *test separation distances* > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following (also illustrated in Appendix B):

- 1) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot (f_{\text{MHz}}/150)]\}$ mW, for 100 MHz to 1500 MHz
- 2) $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\}$ mW, for > 1500 MHz and ≤ 6 GHz

- c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in Appendix C):

- 1) For *test separation distances* > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by $[1 + \log(100/f_{\text{MHz}})]$
- 2) For *test separation distances* ≤ 50 mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$
- 3) SAR measurement procedures are not established below 100 MHz.

2. EUT technologies

Declared minimum safety distance: **d = 5 mm** (Limb worn)

SRD Technology	Frequency [MHz]		Ref.	Note	Output Power [dBm]				Output Power [mW]		Share of Limit
	f _{Min}	f _{Max}	#	#	P _{Cond.}	P _{EIRP}	P _{ERP}	P _{RF Exp}	P _{Result}	P _{Limit}	%
Proprietary 21.85 kHz Transponder Mode	0.2185	0.2185	A	--	31.1	N/A	N/A	31.1	1300	2763	47.1%
Proprietary 21.85 kHz Key Tracking Mode	0.2185	0.2185	A	--	19.0	N/A	N/A	19.0	79	2763	2.9%

Referenced Documents:

#	Document
A	Customer declaration - MK3, Human Exposure (Marquardt)

Calculation of limit according to the formula from KDB 447498 D01 (excerpt):

(3b) Standalone SAR test exclusion below 100 MHz < 50 mm¶

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$$0.5 \cdot \cdot (\text{Threshold}_{100\text{MHz}}) \cdot \cdot (1 + \log(100/f)) \cdot \cdot$$

¶

where ¶

¶

Threshold_{1-g,10-g} → is 3 for 1-g; 7.5 for 10-g¶

f ·

→ is the RF channel transmit frequency¶

Threshold_{100MHz,50mm} → is Threshold_{1-g,10-g} · x · d · / · f^{0.5} · ; with f = 100 MHz and d = 50 mm¶

¶

The table below gives the calculated maximal power that could be used for source based time averaged conducted power, adjusted for tune up tolerance. If this is below the calculated value¶
SAR testing is excluded.¶

frequency [MHz]	Threshold _{1-g,10-g}	Threshold _{100MHz,50mm}	Powerlimit [mW]	Limb / Hand worn limit* [mW]
0.0219	3	474.34	1105.35	2763.37
0.0219	3	474.34	1105.35	2763.37

*) Hand worn / limb worn Limit = 2.5 x body worn limit

3. Conclusion

This prediction demonstrates the following:

The power density levels for FCC at a distance of 5mm are below the maximum levels allowed by regulations.

Conclusion: RF exposure evaluation is not required.