

5. RADIO FREQUENCY EXPOSURE

LIMITS for FCC RF Exposure Evaluation

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

LIMITS for FCC SAR Evaluation

KDB 447498 D04 Interim General RF Exposure Guidance v01, section 2.1.3 SAR- Based Exemption:

“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.”

LIMITS for ISED RF Exposure Evaluation

Per RSS-102, Section 2.5.2 Exemption Limits for Routine Evaluation

LIMITS for ISED SAR Evaluation

Per RSS-102, Section 2.5.1 Exemption Limits for Routine Evaluation & Table 1

CALCULATIONS for applicable limits:

RF Exposure for separation $\geq 20\text{cm}$

FCC: From §1.1310 Table 1 (B), for Public $S = 1.0 \text{ mW/cm}^2$; for Professional, $S = 5.0 \text{ mW/cm}^2$.

$S = 0.0795 * 10^{((P + G)/10)} / d^2$

ISED: EIRP limit by using formula of $1.31 \times 10^{-2} f^{0.6834} \text{ W}$ for 300MHz to 6GHz range; 0.6W for 48-300MHz. (examples are 1.37W at 902MHz, 2.67W at 2400MHz)

SAR Exclusion Thresholds for separation $\leq 5\sim 40\text{cm}$:

FCC : Use Formular in FCC § 1.1307(b)(3)(i)(B) & KDB 447498 D04

IC: Use RSS-102 Table 1. Apply duty cycle factor & 2.5 factor for extremity or limb-worn devices.

Table 1: SAR evaluation - Exemption limits for routine evaluation based on frequency and separation distance^{4,5}

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤ 5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤ 300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥ 50 mm
≤ 300	223 mW	254 mW	284 mW	313 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

1-mW Test Exemption:

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions.

RESULTS

For this EUT, operating between 103-400MHz & $d > 20$ cm, max emission level is under the 0dBm (1mW) set by the limit in Part 15.209. No RF hazard need to be concerned.

The max. emission level is 44.6dBuV/m @ 3m, the eirp= 44.6-95.3=-50.7dBm. So the max. power density can be obtain by using the max. P+G= -50.70dBm and $d=20$ cm, and plug all three items into equation, yielding,

Power Density Limit (mW/cm ²)	Max. Output Power+ Antenna] Gain (dBm)	Calculated Power Density (mW/ cm ²)
1.0/5.0	-50.70	2E-9