

**FCC Portable RF exposure Exemption Calculations  
KDB 447498 D01**

	<b>1-g</b>	<b>10-g</b>	
<b>Limit</b>	1		<b>Contributor</b>
Duty Cycle	100	%	1
Tune up Tolerance	10	%	1.1
Antenna Gain	0	dBi	1
Min. Separation	5	mm	

<b>Frequency</b>	<b>Power</b>	<b>Power + tune up tolerance</b>	<b>Value</b>	<b>Limit</b>	<b>Exempt?</b>
<b>GHz</b>	<b>mW</b>		<b>no unit</b>	<b>no unit</b>	<b>Yes/No</b>
2.4020	2.42	2.66	0.93	3.0	YES
2.4400	2.36	2.60	0.94	3.0	YES
2.4800	2.36	2.60	0.94	3.0	YES

Value =

$$[(\text{power} \times \text{ant. gain} \times [1 + \text{tune up tolerance}] \times \text{duty cycle}) / (\text{min separation distance})] \times [\text{frequency}^{0.5}]$$

Power was rounded up to the nearest 1 mW as required in the KDB

Value is calculated using KDB 447498 D01, Section 4.3.1(a) as shown in red box on following page

**Conducted output power:**

<b>CHANNEL</b>	<b>CHANNEL FREQUENCY (MHz)</b>	<b>AVG OUTPUT POWER (dBm)</b>	<b>AVG OUTPUT POWER (mW)</b>	<b>Method</b>	<b>RESULT</b>	<b>Transmitter</b>
Low	2402	3.832	2.42	Conducted	PASS	GFSK
Mid	2440	3.737	2.36	Conducted	PASS	GFSK
High	2480	3.726	2.36	Conducted	PASS	GFSK



### 4.3. General SAR test exclusion guidance

#### 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.<sup>28</sup> 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.<sup>29</sup>

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

$$\left[ \frac{(\text{max. power of channel, including tune-up tolerance, mW})}{(\text{min. test separation distance, mm})} \cdot \sqrt{f_{(\text{GHz})}} \right] \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR,}^{30} \text{ where}$$

- $f_{(\text{GHz})}$  is the RF channel transmit frequency in GHz

<sup>27</sup> Maximum conducted and radiated power should both be taken into consideration to establish the worst case aggregate maximum output power.

<sup>28</sup> Test exclusion is applied to the required test channels on a channel by channel basis.

<sup>29</sup> When SAR evaluation is required by the hotspot mode or UMPC mini-tablet procedures, that is, where an antenna is  $\leq 2.5$  cm from a surface or edge, the *test separation distance* from the phantom to the antenna or device enclosure, as appropriate, should be applied to determine further SAR test exclusion according to the criteria in this document. Do not use the antenna to device surface or edge distance.

<sup>30</sup> This is equivalent to the formula written as:  $\left[ \frac{(\text{max. power of channel, including tune-up tolerance, mW})}{(60/\sqrt{f_{(\text{GHz})}} \text{ mW})} \right] \cdot \left[ \frac{20 \text{ mm}}{(\text{min. test separation distance, mm})} \right] \leq 1.0$  for 1-g SAR; also see Appendix A for approximate exclusion threshold numerical values at selected frequencies and distances.

- Power and distance are rounded to the nearest mW and mm before calculation<sup>31</sup>
- 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  $\leq 50$  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):<sup>32</sup>
- 1)  $\{[\text{Power allowed at } \textit{numeric threshold} \text{ for } 50 \text{ mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot (f_{\text{MHz}}/150)]\}$  mW, for 100 MHz to 1500 MHz
  - 2)  $\{[\text{Power allowed at } \textit{numeric threshold} \text{ for } 50 \text{ mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\}$  mW, for  $> 1500$  MHz and  $\leq 6$  GHz
- c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in Appendix C):<sup>33</sup>
- 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*  $\leq 50$  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.

When SAR test exclusion cannot be applied, a KDB inquiry is required to determine SAR evaluation requirements for any SAR test results below 100 MHz to be acceptable.<sup>34</sup>