Appendix G: General SAR test reduction and exclusion guidance

KDB 447498

Section 4.3 General SAR test reduction and exclusion guidance

For Standalone SAR exclusion consideration, when SAR Exclusion Threshold requirement in KDB 447498 is satisfied, standalone SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

In the frequency range below 100 MHz to 6 GHz and test separation distance of 50mm, the SAR Test Exclusion Threshold for operation in the 2400 – 2483.5 MHz band will be determined as follows

SAR Exclusion Threshold

NT= $\{ [(MP/TSD) * \sqrt{f_{GHz}}] + (TSD – 50mm) * 10] \}$

Where:

NT	=	Numeric Threshold (3.0 for 1-g SAR and 7.5 for 10-g SAR)
MP	=	Max Power of channel (mW) (inc tune up)
TSD	=	Min Test separation Distance (mm) = 50
f_{GHz}	=	Transmit frequency (or 100MHz if lower)

We can transpose this formula to allow us to find the maximum power of a channel allowed and compare this to the measured maximum power.

MP= $\{ [(NT \times TSD) / \sqrt{f_{GHz}}] + (TSD – 50) * 10] \}$

Operating Frequency 2.412 GHz

MP= $\{ [(3.0 \times 50) / \sqrt{2.412}] + (50 – 50) * 10 \}$
MP= { [150 / 1.55] + (0 * 10 }
MP= 96.77mW

Operating Frequency 2.442 GHz

MP= $\{ [(3.0 \times 50) / \sqrt{2.442}] + (50 – 50) * 10 \}$
MP= { [150 / 1.56] + (0 * 10 }
MP= 96.15mW

Operating Frequency 2.472 GHz

MP= $\{ [(3.0 \times 50) / \sqrt{2.472}] + (50 – 50) * 10 \}$
MP= { [150 / 1.57] + (0 * 10 }
MP= 95.54mW

Channel Frequency (MHz)	EIRP (mW)	SAR Exclusion Threshold	SAR Evaluation
2412	69.18	96.77	Not Required
2442	28.84	96.15	Not Required
2472	26.92	95.54	Not Required

Therefore standalone SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

Appendix H: **MPE exclusion calculation**

As per KDB 447498

47 CFR §§1.1307 and 2.1091

2.1091 Radio frequency radiation exposure evaluation: Portable devices.

For purposes of these requirements mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimetres is normally maintained between radiating structures and the body of the user or nearby persons. These devices are normally evaluated for exposure potential with relation to the MPE limits. As the 20cm separation specified under FCC rules may not be achievable under normal operation of the EUT, an RF exposure calculation is needed to show the minimum distance required to be less than 0.6mW/cm^2 power density limit, as required under FCC rules.

Prediction of MPE limit at a given distance

Equation from KDB 447498 D01

$$S = \frac{1.64ERP}{4\pi R^2} \quad \text{re-arranged } R = \sqrt{\frac{1.64ERP}{S4\pi}}$$

where:

S = power density
R = distance to the centre of radiation of the antenna
ERP = EUT Maximum power

Result:

Prediction Frequency (MHz)	Maximum ERP (mW)	Power density limit (S) (mW/cm^2)	Distance (R) cm required to be less than 0.6mW/cm^2 (cm)
2412	69.18	0.6	3.9
2442	28.84	0.6	2.5
2472	26.92	0.6	2.4