1   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.

The SAR Test Exclusion Threshold for frequency range below 100 MHz is determined as follows.

SAR Exclusion Threshold (SARET)   =   (Step 1 + Step 2) * Step 3

Step 1

$$NT = [(MP/TSD^A) * \sqrt{f_{GHz}}]$$

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^A	=	Min Test separation Distance or 50mm (whichever is lower) = 50
f_{GHz}	=	Transmit frequency (or 100 MHz 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.

$$MP = [(NT \times TSD^A) / \sqrt{f_{GHz}}]$$

For Distances Greater than 50 mm Step 2 applies

Step 2

$$(TSD^B – 50mm) * f_{(MHz)}/150$$

Where:
f_{MHz}	=	Transmit frequency
TSD^B	=	Min Test separation Distance (mm) = 50

Step 3

3a)   The power threshold at the corresponding test separation distance at 100 MHz in step 2) is multiplied by $[1 + log(100/f(MHz))]$ for *test separation distances* > 50 mm and < 200 mm

3b)   The power threshold determined by the equation in steps 3a for 50 mm and 100 MHz is multiplied by ½ for *test separation distances* ≤ 50 mm

SARET = $(\{ [(NT \times TSD^A) / \sqrt{f_{GHz}}] + (TSD^B – 50) * [100/150] \} * (1 + Log [100 / F_{MHz}])) * \frac{1}{2}$
SARET = $(\{ [(3.0 \times 50) / \sqrt{0.1}] + (50 – 50) * [100/150] \} * (1 + Log [100 / 100]) * \frac{1}{2}$
SARET =   237.2 mW

Channel Frequency (MHz)	Maximum EIRP (mW)	SAR Exclusion Threshold (mW)	SAR Evaluation
13.56	3.0×10^{-8}	237.2	Not Required

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

2   MPE Calculation

Prediction of MPE limit at a given distance

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 centimeters 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 20 cm 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 the power density limit, as required under FCC rules.

Equation from IEEE C95.1

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

Where:

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

Result

Channel Frequency (MHz)	Maximum EIRP (mW)	Power density limit (S) (mW/cm²)	Distance (R) cm required to be less than the power density limit
13.56	3.0×10^{-8}	0.98	5.0×10^{-5}