16 General SAR test reduction & 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 will be determined as follows.

SAR Exclusion Threshold (SARET) = 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) (including tune-up tolerance)
TSD^{A} = Min Test separation Distance or 50mm (whichever is lower) = 5mm (in this case)

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.

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

Step 2

$$\text{Step 2} = \text{Step 1} + (TSD^{B} - 50\text{mm}) * 10$$

TSD^{B} = Min Test separation Distance (mm) = 50

So,

$$\text{Step 2} = \text{Step 1} = [(NT \times TSD^{A}) / \sqrt{f_{GHz}}]$$

Step 3

a) 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

b) the power threshold determined by the equation (a) for 50 mm and 100 MHz is multiplied by ½ for test separation distances ≤ 50 mm

$$SARET = [(NT \times TSD^{A}) / \sqrt{0.1}] * [1 + \log (100/ f_{MHz})] * {}^{1}/_{2}$$
$$SARET = [(3.0 \times 50) / \sqrt{0.1}] * [1 + \log (100/ 10.6)] * {}^{1}/_{2}$$
SARET = 468 mW

The calculated output power is 3.0×10^{-10} mW (eirp) and is less than the SAR Exclusion Threshold of 468 mW, at a test separation distance ≤ 50mm, for general population and uncontrolled exposure.
Therefore standalone SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

17 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 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 the power density limit, as required under FCC rules.

Equation from IEEE C95.1

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

Where:

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

Result

Prediction Frequency (MHz)	Maximum EIRP (mW)	Power density limit (S) (mW/cm^2)	Distance (R) cm required to be less than the power density limit
10.6	3.0×10^{-10}	1.6	3.9×10^{-6}

Note: EIRP is calculated from maximum radiated field strength.