

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 the considering 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 and test separation distance ≤ 50 mm, the SAR Test Exclusion Threshold will be determined as follows

$$\text{SAR Exclusion Threshold (SARET)} \\ \text{SAR Exclusion Threshold} = ([\text{Step 1} + \text{Step 2}] * \text{Step 3a}) * \text{Step 3b}$$

Step 1

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

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 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.

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

For Distances Greater than 50 mm Step 2 applies

Step 2

$$(TSD^B - 50\text{mm}) * f_{\text{(MHz)}}/150$$

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 $[1 + \log(100/f(\text{MHz}))]$ for *test separation distances* > 50 mm and < 200 mm

3b) The power threshold determined by the equation in steps 1 and 2 for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$ for *test separation distances* ≤ 50 mm

$$\begin{aligned} \text{SARET} &= (\{ [(NT * TSD^A) / \sqrt{f_{\text{GHz}}}] + (TSD^B - 50) * [100/150] \} * (1 + \text{Log} [100 / F_{\text{MHz}}])) * \frac{1}{2} \\ \text{SARET} &= (\{ [(3.0 * 50) / \sqrt{0.1}] + (50 - 50) * [100/150] \} * (1 + \text{Log} [100 / F_{\text{MHz}}])) * \frac{1}{2} \\ \text{SARET} &= (474 * (1 + \text{Log} [100 / 13.56])) * \frac{1}{2} \\ \text{SARET} &= 442.65 \text{ mW} \end{aligned}$$

The calculated output power 1.09×10^{-10} mW (eirp) is less than the SAR Exclusion Threshold of 468mW, at 5mm test separation distance, for general population and uncontrolled exposure.

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

Prediction of MPE limit at a given distance

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 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 0.98 mW/cm² power density limit, as required under FCC rules

Equation from IEEE C95.1

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

Where:

S = power density

R = distance to the centre of radiation of the antenna

EIRP = EUT Maximum power

Note:

The EIRP value was calculated using the peak E Field measurement.

Result

| Prediction Frequency (MHz) | Maximum EIRP (mW) | Power density limit (S) (mW/cm ²) | Distance (R) cm required to be less than 0.98 mW/cm ² |
|----------------------------|----------------------|---|--|
| RX3K80 Plus | | | |
| 13.56 | 2.3x10 ⁻⁵ | 0.98 | 0.00137 |
| RX380 Plus | | | |
| 13.56 | 6.7x10 ⁻⁵ | 0.98 | 0.00234 |