18 General SAR test reduction and exclusion guidance & MPE Calculation

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 operation in the 2400 – 2483.5 MHz band will be determined as follows

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

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) = 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.

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

For Distances Greater than 50 mm Step 2 applies

Step 2

$$(TSD^B - 50mm) * 10\}$$

Where:
TSD^B = Min Test separation Distance (mm) = 50

Note: Step 2 is not required here as the TSD^A is 5mm.

Operating Frequency 2.402 GHz
SARET = $[(3.0 \times 5) / \sqrt{2.402}]$
SARET = 9.68mW

Operating Frequency 2.426 GHz
SARET = $[(3.0 \times 5) / \sqrt{2.426}]$
SARET = 9.63mW

Operating Frequency 2.480 GHz
SARET = $[(3.0 \times 5) / \sqrt{2.480}]$
SARET = 9.53mW

Channel Frequency (MHz)	EIRP (mW)	SAR Exclusion Threshold (mW)	SAR Evaluation
2402	1.94	9.68	Not Required
2426	1.98	9.63	Not Required
2480	1.85	9.53	Not Required

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

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

Where:

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

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
2426	1.98	1.00	0.40