

16 RF Exposure

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

SAR Exclusion Threshold (SARET)

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

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 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.

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

For Distances Greater than 50 mm Step 2 applies

Step 2

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

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 $[1 + \log(100/f(\text{MHz}))]$ 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 $1/2$ for *test separation distances* ≤ 50 mm

$$\begin{aligned} \text{SARET} &= \left(\left[\frac{(NT * TSD^A) / \sqrt{f_{GHz}}}{(TSD^B - 50) * [100/150]} \right] * (1 + \text{Log} [100 / F_{MHz}]) \right)^{1/2} \\ \text{SARET} &= \left(\left[\frac{(3.0 * 50) / \sqrt{0.1}}{(50 - 50) * [100/150]} \right] * (1 + \text{Log} [100 / F_{MHz}]) \right)^{1/2} \\ \text{SARET} &= (474.34 * (1 + \text{Log} [100 / 0.13566]))^{1/2} \\ \text{SARET} &= 917.31 \text{ mW} \end{aligned}$$

The calculated output power is 0.31 nW (eirp) is less than the SAR Exclusion Threshold of 918.22 mW, 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.

RADIO FREQUENCY RADIATION EXPOSURE

RSS-102 issue 5

Exemption Limits for Routine Evaluation

All transmitters are exempt from routine SAR and RF exposure evaluations provided that they comply with the requirements of sections RSS-102 Issue 5 sections 2.5.1 or 2.5.2

If the EUT does not meet the appropriate exemption limit, a complete SAR or RF exposure evaluation shall be performed. However, the power exemption limits in RSS-102 Issue 5 Table 1 can be applied to reduce the number of test configurations (e.g. testing of a tablet edge).

RSS-102 Issue 5 sections 2.5.1

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance^{4,5}

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤ 5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤ 300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥ 50 mm
≤ 300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

Exemption Limits for Routine Evaluation – RF Exposure Evaluation

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

where:

S = power density

R = distance to the centre of radiation of the antenna

ERP = EUT Maximum power

RSS-102 Issue 5		
Evaluation Frequency	0.13566	kHz
Section 2.5 Exemption limits		
Exemption Frequency	<300	MHz
Exemption Distance	<5	mm
Exemption Limit	71	mW
Radiated Carrier Power	-7.7	dBμV/m
Measurement Distance	300	meters
EIRP	0.31	nW
<i>Exempt</i>		