

RF Exposure evaluation

According to 447498 D01 General RF Exposure Guidance v06

4.3. General SAR test exclusion guidance

4.3.1. Standalone SAR test exclusion considerations

- a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following: $[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,³⁰ where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation³¹
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as numeric thresholds in step b) below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

³⁰ This is equivalent to the formula written as: $[(\text{max. power of channel, including tune-up tolerance, mW}) / (60 / \sqrt{f(\text{GHz})} \text{ mW})] \cdot [20 \text{ mm} / (\text{min. test separation distance, mm})] \leq 1.0$ for 1-g SAR; also see Appendix A for approximate exclusion threshold numerical values at selected frequencies and distances.

$$\text{eirp} = \text{pt} \times \text{gt} = (\text{EXd})^2 / 30$$

where:

pt = transmitter output power in watts,

gt = numeric gain of the transmitting antenna (unitless),

E = electric field strength in V/m, --- $10^{[(\text{dBuV/m})/20]}/10^6$

d = measurement distance in meters (m)---3m

$$\text{So pt} = (\text{EXd})^2 / 30 \times \text{gt}$$

RF Exposure evaluation

Copied from the FCC test report:

Radiated spurious emissions:

470.200 MHz, Horizontal							
Spurious Emission Frequency (MHz)	Read value (dBm)	Cable Loss (dB)	Antenna Factor (dB)	1-18GHz Pre-amplifier (dB)	Ture value (dBm)	Limit/ dBm	Margin(dB)
Fundamental: 470.2	-19.6	2.7	18.0	0	1.1	24	-22.9
940.4	-45.1	4.0	23.6	0	-17.5	-13	-4.5
1410.6	-29.6	4.2	24.5	30	-30.9	-13	-17.9
3291.4	-44.1	6.0	31.0	30	-37.1	-13	-24.1
470.200 MHz, Vertical							
Fundamental: 470.2	-24.9	2.7	18.0	0	-4.2	24	-28.2
940.4	-44.3	4.0	23.6	0	-16.7	-13	-3.7
1410.6	-28.0	4.2	24.5	30	-29.3	-13	-16.3
3291.4	-44.6	6.0	31.0	30	-37.6	-13	-24.6
486.976, Horizontal							
Fundamental: 487.0	-19.6	2.7	18.1	0	1.2	24	-22.8
974.0	-44.9	4.0	23.7	0	-17.2	-13	-4.2
1460.9	-29.2	4.2	24.5	30	-30.5	-13	-17.5
3408.8	-44.2	6.1	31.1	30	-37.0	-13	-24.0
486.976, Vertical							
Fundamental: 487.0	-24.8	2.7	18.1	0	-4.0	24	-28.0
974.0	-44.3	4.0	23.7	0	-16.6	-13	-3.6
1460.9	-28.3	4.2	24.5	30	-29.6	-13	-16.6
3408.8	-44.4	6.1	31.1	30	-37.2	-13	-24.2

607.800 MHz, Horizontal							
Fundamental: 607.8	-21.6	2.9	19.9	0	1.2	24	-22.8
1015.6	-16.8	4.0	25.5	30	-17.3	-13	-4.3
1523.4	-28.2	4.3	23.8	30	-30.1	-13	-17.1
3554.6	-45.3	6.2	31.6	30	-37.5	-13	-24.5
607.800 MHz, Vertical							
Fundamental: 607.8	-27.1	2.9	19.9	0	-4.3	24	-28.3
1015.6	-16.4	4.0	25.5	30	-16.9	-13	-3.9
1523.4	-27.7	4.3	23.8	30	-29.6	-13	-16.6
3554.6	-45.1	6.2	31.6	30	-37.3	-13	-24.3

tune-up tolerance= ± 1 dB,

min. test separation distance = 5 mm, since the min distance from the antenna to the outer = 3 mm

The max Field strength = 1.2 dBm in 486.976 MHz or 607.800 MHz

Max. power of channel after included tune-up tolerance

Field strength = 2.2 dBm= 1.66 mW in 643.000 MHz

So (1.66 mW)/5.0mm)x $\sqrt{0.486976 \text{ GHz}}$ = 0.23 <3

So (1.66 mW)/5.0mm)x $\sqrt{0.607800 \text{ GHz}}$ = 0.26 <3

Then SAR evaluation is not required