

RF Exposure Letter

According to KDB447498 D01 General RF Exposure Guidance v06Section 4.3.1 Standalone SAR test exclusion considerations: “Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.22 The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & LAPTOPs etc. “

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where:}$

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 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 5) in section 4.1 is applied to determine SAR test exclusion.

When one of the following test exclusion conditions is satisfied for all combinations of simultaneous transmission configurations, further equipment approval is not required to incorporate transmitter modules in host devices that operate in the mixed mobile and portable host platform exposure conditions. The grantee is responsible for documenting this according to Class I permissive change requirements. Antennas that qualify for standalone SAR test exclusion must apply the estimated standalone SAR to determine simultaneous transmission test exclusion.

a)The $[\sum \text{ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg}] + [\sum \text{ of MPE ratios}]$ is ≤ 1.0 .

b)The SAR to peak location separation ratios of all simultaneously transmitting antenna pairs operating in portable device exposure conditions are all ≤ 0.04 , and the $[\sum \text{ of MPE ratios}]$ is ≤ 1.0 .

According to KDB 616217 D04 SAR for laptop and LAPTOPs v01r02Section 4.2Laptop host platform test requirements, When the modular approach is applied, transmitters and modules must be tested initially without using a representative host for incorporation in the display and/or keyboard of qualified laptop computers for standalone use according to the following minimum test separation distance and antenna installation requirements. The separation distance required for incorporation in qualified hosts is described in KDB Publication 447498 D01; item e) of 4.1 and item a) of 5.2.2 etc

a) ≤ 25 mm between the antenna and user for incorporation in laptop display screens

b) ≤ 5 mm between the antenna and user; only when incorporation in the keyboard compartment is required by the hosts, for bottom surface and edge exposure conditions

c)the antennas used by the host must have been tested for equipment approval or qualify for SAR test exclusion

d)the antenna polarization, physical orientation, rotation and installation configurations used by the host must have been tested for compliance for the required display and/or keyboard installation conditions and test separation distance(s) or qualify for SAR test exclusion

When the SAR Test Exclusion Threshold in KDB Publication 447498 D01 applies, a minimum test separation distance of 25 mm is required to determine test exclusion for the display, and 5 mm for the keyboard compartment.

Bluetooth BR/EDR:

pt=6.71dBm=4.69 mW at 2441MHz

So $(4.69\text{mW}/5\text{mm})x \sqrt{2.441\text{GHz}} = 1.4649 < 3$

Bluetooth Low Energy:

pt=1.33dBm=1.36 mW at 2440MHz

So $(1.36\text{mW}/5\text{mm})x \sqrt{2.440\text{GHz}} = 0.4244 < 3$

2.4G WIFI :

pt=5.97dBm=3.95mW at 2437MHz

So $(3.95\text{mW}/5\text{mm})x \sqrt{2.437\text{GHz}} = 1.2344 < 3$

5.2G WIFI :

pt=4.54dBm=2.84 mW at 5210MHz

So $(2.84\text{mW}/5\text{mm})x \sqrt{5.210\text{GHz}} = 1.2985 < 3$

5.8G WIFI :

pt=3.65dBm=2.23mW at 5745MHz

So $2.23\text{mW}/5\text{mm}) \times \sqrt{5.745\text{GHz}} = 1.1109 < 3$

Simultaneous transmission mode	Band	Result	Limit	Result Ratio	Total Ratio	Simultaneous transmission Ratio Limit
Bluetooth& 2.4G WIFI	Bluetooth	1.4649	3.0000	0.4883	0.8998	1.0
	2.4GHz WIFI	1.2344	3.0000	0.4115		
2.4G WIFI& 2.4G WIFI	2.4GHz WIFI	1.2344	3.0000	0.4115	0.8443	1.0
	5GWIFI	1.2985	3.0000	0.4328		

Conclusion:

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06.