

13 .Radio Frequency Exposure

13.1 Applicable Standard

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §RSS-102, Devices that have a radiating element normally operating at separation distances greater than 20 cm between the user and the device shall undergo an RF exposure evaluation. SAR evaluation may be performed in lieu of an RF exposure evaluation for devices operating below 6 GHz with a separation distance of greater than 20 cm between the user and the device.

According to §1.1310, KDB447498 and §2.1093 RF exposure is required.

OET Bulletin 65 Supplement C [June 2001]: Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields

KDB447498 D01 General RF Exposure Guidance v06: RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices

13.2 Limit

According to KDB447498 D01 General RF Exposure Guidance v06 Section 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(s), listed below, is (are) 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.²⁸ The minimum test separation distance defined in 4.1 f) 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. To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified, typically in the SAR measurement or SAR analysis report, by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting are required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for 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 and tablets, etc.²⁹"

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances $\leq 50\text{mm}$ are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR,}^{30} \text{ where}$

- $f(\text{GHz})$ 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 $\leq 50\text{ mm}$ and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation

distance is < 5mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion. According to KDB447498 D01 General RF Exposure Guidance v06 Appendix A: SAR Test Exclusion .Thresholds for 100 MHz-6 GHz and ≤ 50 mm, Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table.

| MHz | 5 | 10 | 15 | 20 | 25 | mm |
|------|-----|-----|-----|-----|-----|--|
| 150 | 39 | 77 | 116 | 155 | 194 | <i>SAR Test Exclusion Threshold (mW)</i> |
| 300 | 27 | 55 | 82 | 110 | 137 | |
| 450 | 22 | 45 | 67 | 89 | 112 | |
| 835 | 16 | 33 | 49 | 66 | 82 | |
| 900 | 16 | 32 | 47 | 63 | 79 | |
| 1500 | 12 | 24 | 37 | 49 | 61 | |
| 1900 | 11 | 22 | 33 | 44 | 54 | |
| 2450 | 10 | 19 | 29 | 38 | 48 | |
| 3600 | 8 | 16 | 24 | 32 | 40 | |
| 5200 | 7 | 13 | 20 | 26 | 33 | |
| MHz | 30 | 35 | 40 | 45 | 50 | mm |
| 150 | 232 | 271 | 310 | 349 | 387 | <i>SAR Test Exclusion Threshold (mW)</i> |
| 300 | 164 | 192 | 219 | 246 | 274 | |
| 450 | 134 | 157 | 179 | 201 | 224 | |
| 835 | 98 | 115 | 131 | 148 | 164 | |
| 900 | 95 | 111 | 126 | 142 | 158 | |
| 1500 | 73 | 86 | 98 | 110 | 122 | |
| 1900 | 65 | 76 | 87 | 98 | 109 | |
| 2450 | 57 | 67 | 77 | 86 | 96 | |
| 3600 | 47 | 55 | 63 | 71 | 79 | |
| 5200 | 39 | 46 | 53 | 59 | 66 | |
| 5400 | 39 | 45 | 52 | 58 | 65 | |
| 5800 | 37 | 44 | 50 | 56 | 62 | |

TEST RESULTS

BR1M:

| Test Frequency (MHz) | Output Power (dBm) | Output Power including Power Drift (dBm) | Output Power including Power Drift (mW) | Separation Distance (mm) | Evaluated SAR test exclusion | SAR test exclusion thresholds | Verdict |
|----------------------|--------------------|--|---|--------------------------|------------------------------|-------------------------------|---------|
| 2402 | 3.17 | 4.120 | 2.58 | 5 | 0.799 | 3 | PASS |
| 2441 | 5.76 | 6.515 | 4.48 | 5 | 1.400 | 3 | PASS |
| 2480 | 6.07 | 7.280 | 5.35 | 5 | 1.685 | 3 | PASS |

EDR2M:

| Test Frequency (MHz) | Output Power (dBm) | Output Power including Power Drift (dBm) | Output Power including Power Drift (mW) | Separation Distance (mm) | Evaluated SAR test exclusion | SAR test exclusion thresholds | Verdict |
|----------------------|--------------------|--|---|--------------------------|------------------------------|-------------------------------|---------|
| 2402 | -0.14 | 1.530 | 1.42 | 5 | 0.440 | 3 | PASS |
| 2441 | 2.61 | 3.460 | 2.22 | 5 | 0.693 | 3 | PASS |
| 2480 | 2.93 | 3.321 | 2.15 | 5 | 1.046 | 3 | PASS |

EDR3M:

| Test Frequency (MHz) | Output Power (dBm) | Output Power including Power Drift (dBm) | Output Power including Power Drift (mW) | Separation Distance (mm) | Evaluated SAR test exclusion | SAR test exclusion thresholds | Verdict |
|----------------------|--------------------|--|---|--------------------------|------------------------------|-------------------------------|---------|
| 2402 | 0.11 | 1.291 | 1.35 | 5 | 0.418 | 3 | PASS |
| 2441 | 2.91 | 3.360 | 2.17 | 5 | 0.678 | 3 | PASS |
| 2480 | 3.17 | 4.350 | 2.72 | 5 | 1.370 | 3 | PASS |

13.4 Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB447498 D01 General RF Exposure Guidance v06.