



## RF Exposure Evaluation according to KDB 447498 D01 v06

**Report identification number: 1-8582-24-01-06\_TR1-R03\_SAR\_FCC**

| Certification numbers and labeling requirements |         |
|---|---------|
| FCC ID  | Y2ISC3X |

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

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## 1. SAR test exclusion (KDB 447498 D01 General RF Exposure Guidance v06)

### 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. 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.

- a) For 100 MHz to 6 GHz and *test separation distances*  $\leq 50$  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  $\leq 7.5$  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
- 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  $\leq 50$  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.

- b) 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 (also illustrated in Appendix B):

- 1)  $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot (f_{\text{MHz}}/150)]\}$  mW, for 100 MHz to 1500 MHz
- 2)  $\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\}$  mW, for  $> 1500$  MHz and  $\leq 6$  GHz

- c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in Appendix C):

- 1) For *test separation distances*  $> 50$  mm and  $< 200$  mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by  $[1 + \log(100/f_{\text{MHz}})]$
- 2) For *test separation distances*  $\leq 50$  mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by  $\frac{1}{2}$
- 3) SAR measurement procedures are not established below 100 MHz.

The following table from KDB 447498 D01 gives an fast overview of the applicable limits:

### Appendix A

#### ***SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and $\leq 50$ mm***

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table. The equation and threshold in 4.3.1 must be applied to determine SAR test exclusion.

| MHz  | 5  | 10 | 15  | 20  | 25  | mm   |
|------|----|----|-----|-----|-----|--|
| 150  | 39 | 77 | 116 | 155 | 194 | <i>SAR Test<br/>Exclusion<br/>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  |  |
| 5400 | 6  | 13 | 19  | 26  | 32  |  |
| 5800 | 6  | 12 | 19  | 25  | 31  |  |

## 2. EUT technologies

| Technologies:            | Max. power |       | Antenna gain max.:<br>[dBi] * | Max EIRP<br>for RF Exposure | #   |
|--------------------------|------------|-------|-------------------------------|-----------------------------|-----|
|                          | conducted  | EIRP  |                               |                             |     |
| RFID<br>13.56 MHz        | 23.0       | -/-   | N/A                           | 23.0 dBm                    | A   |
| BT Classic /<br>2450 MHz | 5.0        | 9.68  | 4.68                          | 10.0 dBm                    | B,C |
| BT LE<br>2450 MHz        | 13.0       | 17.68 |                               | 18.0 dBm                    | B,C |
| WLAN<br>2450 MHz         | 18.0       | 22.68 |                               | 23.0 dBm                    | B,C |

\*) worst case of all antenna types, channels and modulations (overrated)

**Declared minimum safety distance: 200 mm**

Referenced Documents:

| # | Information from External Annexes: |   | Kind of information used:   |
|---|------------------------------------|---|---|
| A | 1-8582-24-01-06_TR1-A101-R02       | TRF7970A<br>RFID Datasheet from Texas Instruments | Max. output power, page 1   |
| B | 1-8582-24-01-06_TR1-A201-R01       | Type 2DL<br>Wi-Fi® + Bluetooth® Module (muRata)   | Max conducted power:<br>WLAN 2450 MHz, page 35<br>BT EDR 2450 MHz, page 67<br>BT LE 2450 MHz, page 70 |
| C | 24-1-0010501T018_TR1-R01           | cetecom advanced GmbH test report                 | Ant gain max. for 2450 MHz on page 3  |

## 3. Exclusion for EUT technologies according clause 4.3.1.c)1):

Standalone SAR test exclusion below 100 MHz at test separation distances >50mm and < 200mm

| SRD<br>Technology | frequency<br>[MHz] | d <sub>separation</sub><br>[mm] | Thres-<br>hold <sub>1-g</sub> | Threshold <sub>50mm</sub><br>(100MHz) |        | Power-<br>limit<br>[mW] | P <sub>max-declared</sub> |        | Exclusion | Share of<br>Limit<br>% |
|-------------------|--------------------|---------------------------------|-------------------------------|---------------------------------------|--------|-------------------------|---------------------------|--------|-----------|------------------------|
|                   |                    |                                 |                               | < 50mm                                | > 50mm |                         | [dBm]                     | [mW]   |           |                        |
| RFID              | 13.56              | 199                             | 3                             | 1288.14                               | 573.67 | 1071.48                 | 23.00                     | 199.53 | yes       | 18.62%                 |

## 4. Exclusion for EUT technologies according clause 4.3.1.b)2):

Standalone SAR test exclusion for 1.5 GHz to 6 GHz at test separation distances ≥50mm

| SRD<br>Technology | frequency<br>[MHz] | d <sub>separation</sub><br>[mm] | Thres-<br>hold <sub>1-g</sub> | Thres-<br>hold <sub>50mm</sub> | Powerlimit<br>[mW] | P <sub>max-declared</sub> |        | Exclusion | Share of<br>Limit<br>% |
|-------------------|--------------------|---------------------------------|-------------------------------|--------------------------------|--------------------|---------------------------|--------|-----------|------------------------|
|                   |                    |                                 |                               |                                |                    | [dBm]                     | [mW]   |           |                        |
| BT Classic        | 2450.00            | 200                             | 3                             | 95.83                          | 1595.83            | 10.00                     | 10.00  | yes       | 0.63%                  |
| BT LE             | 2450.00            | 200                             | 3                             | 95.83                          | 1595.83            | 18.00                     | 63.10  | yes       | 3.95%                  |
| WLAN              | 2450.00            | 200                             | 3                             | 95.83                          | 1595.83            | 23.00                     | 199.53 | yes       | 12.50%                 |

## 5. Collocation:

| Technology           | Share of Limit [%] |
|----------------------|--------------------|
| RFID                 | 18.62%             |
| Bluetooth Classic/LE | 3.95%              |
| WLAN 2.4 GHz         | 12.50%             |
| Sum                  | <b>35.08%</b>      |

## 6. Conclusion

This prediction demonstrates the following:

The power density levels for FCC at a distance of 200 mm are below the maximum levels allowed by regulations.

**Conclusion:** RF exposure evaluation is not required.

| Version | Applied Changes  | Date of Release |
|---------|--|-----------------|
| -R02    | Editorial changes adding up from –R01 to –R02  | 2025-02-13      |
| -R03    | Corrected calculation values and references and changed to KDB 447498 D01 General RF Exposure Guidance v06 | 2025-02-21      |