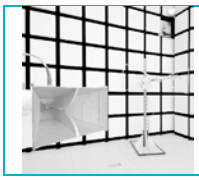
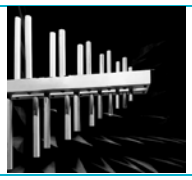
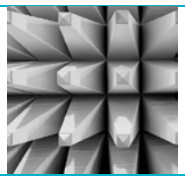

CTC advanced
member of RWTÜV group

Bundesnetzagentur

BNetzA-CAB-02/21-102

# SAR Test exemption documentation according to CFR 47 §1.1307

## Report identification number: 1-9546/19-02-16 Exemption (FCC)

| contains the module with the following certification numbers | |
|---|---|
| FCC ID | W4G-PCA5537 |

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.

## Document authorised:

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Marco Scigliano
Testing Manager
Radio Communications & EMC

**EUT technologies:**

SAR based exempted technologies:

| Technologies: | Max. measured power [dBm] | | Max. declared EIRP [dBm] | **Max. declared ERP [dBm]** | # |
|---|---|---|---|---|---|
| | conducted | EIRP | | | |
| BT LE 2450 MHz | 6.2 | 7.9 (including 1.7dBi) | 8.0 (=6.31mW) | 5.85 (=3.85mW) | A |
| Proprietary 2450 MHz | 10.2 | 11.7 (including 1.5dBi) | 12.0 (=15.84mW) | 9.85 (=9.66mW) | B |

Details and origins of the measurements shown in the table above:

| # | Results from: | | Additional information |
|---|---|---|---|
| A | 1-9546/19-02-07 | CTC Advanced GmbH | Antenna gain page 19, Max conducted page 23 |
| B | 1-9546/19-02-06 | CTC Advanced GmbH | -- |

**NOTE:**
The test results were corrected with a duty cycle correction of 13% (= -8.7dB) for proprietary to adjust the peak measured test results represent the real behavior of the EUT.

BT LE was calculated without a peak to average correction.

(Annex A shows a plot of the Duty cycle measurement for proprietary)

**Declared minimum safety distances:**
According the construction of the device and use case the following safety distances need to be maintained:

| Technology: | Distance [mm] | Use case scenario: |
|---|---|---|
| Proprietary 2450 MHz | 53.65 | Smallest distance between integrated antenna and head / body |
| | 38 | Module to thumb (limbs) |
| BT LE 2450 MHz | 26.86 | Smallest distance between integrated antenna and head / body |
| | 15 | Module to thumb (limbs) |

Detailed pictures of the positions are added in Annex B of this document.

All standalone calculations already pass with a distance of 10mm.
Collocation with all technologies fully transmitting simultaneous is satisfied at a distance of 15mm

## Blanket test exemption according CFR 47 §1.1307:

§1.1307(b)(3)(i)(A) – A single RF source is exempt if the available maximum time-averaged power is **no more than 1 mW**, regardless of separation distance.
*(Applicable from 100 kHz to 100 GHz)*

**SAR-Based Exemption following 47 CFR 1.1307 amendment:**

The SAR-based exemption formula of § 1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold $P_{th}$ (mW). This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). $P_{th}$ is given by Formula (B.2).

$$P_{th}(mW) = \begin{cases} ERP_{20cm}\,(\frac{d}{20cm})^{x} & d \le 20cm \\ ERP_{20cm} & 20cm \le\ d \le 40cm \end{cases} \quad (B.2)$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20cm}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20cm}$ is per Formula (B.1).

$$P_{th}(mW) = ERP_{20cm}(mW) = \begin{cases} ERP_{20cm}\,(\frac{d}{20cm})^{x} & d \le 20cm \\ ERP_{20cm} & 20cm \le\ d \le 40cm \end{cases} \quad (B.1)$$

| Technology | Transmitter frequency | Max. decl. ERP | Treshold ERP | | Minimal Safety | Verdict |
|---|---|---|---|---|---|---|
| | (MHz) | (mW) | (mW) | (dBm) | (mm) | |
| Proprietary | 2450 | 9.66 | 22.18 | 13.4 | 15 | EXCEMPTED |
| BT LE | 2450 | 3.85 | 22.18 | 13.4 | 15 | EXCEMPTED |
| | | | | | | |

**Collocation:**

Overview:

| Technology , [MHz] | Proprietary, 2450 | BT, 2450 |
|---|---|---|
| Exemption based on | **SAR , 15mm distance** | |
| Limit ERP [mW]: | 22.18 | 22.18 |
| Result ERP [mW]: | 9.66 | 3.85 |
| Limit-Exhaustion [%] | 43.6 | 17.4 |
| Collocated percentage [%] | **60.9** | |
| Verdict: | **pass** | |

**This prediction demonstrates the following:**

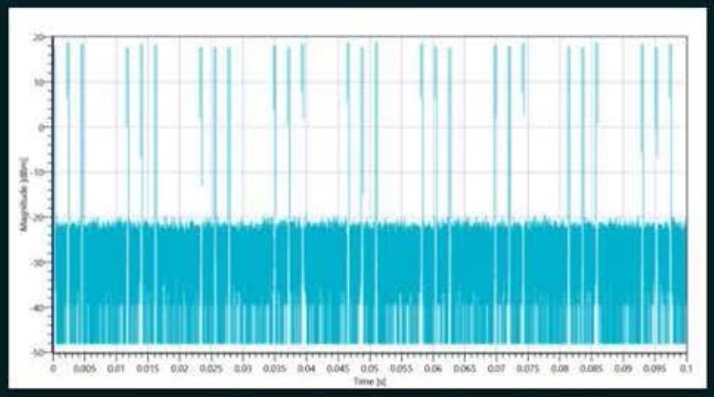
The power density levels for FCC that are larger than the minimum safety-distances stated above, are below the maximum levels allowed by regulations.

## Annex A: Duty cycle

Correction factor 8.7dB
Duty cycle 13.5 %

Duty Cycle evaluation

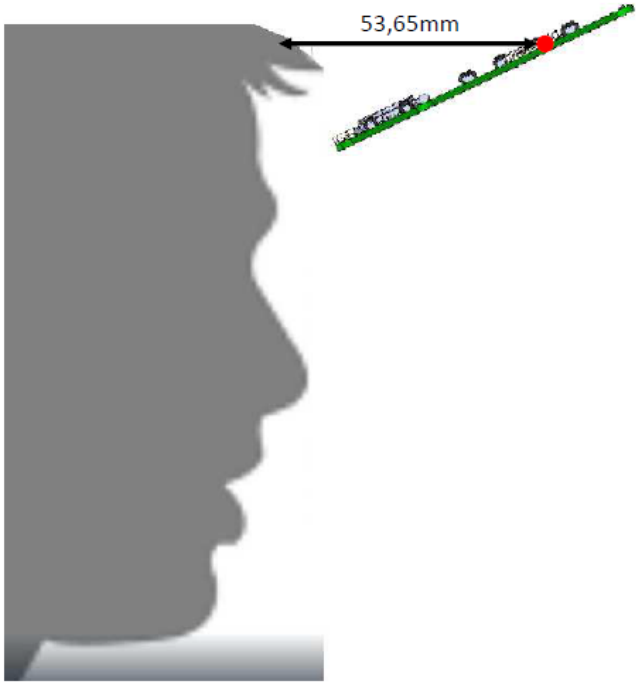
| Test Description | Lower Limit | Upper Limit | Measured | Unit |
|---|---|---|---|---|
| **Result Summary** | | | | |
| **Number of detected Bursts:25** | | | | |
| Duty Cycle (Burst Ratio) max | – | – | 0.135 | – |
| Duty Cycle max | – | – | 8.697 | dB |
| Duty Cycle (Burst Ratio) min | – | – | 0.042 | – |
| Duty Cycle min | – | – | 13.768 | dB |
| Max TX Burst Length | – | – | 0.298 | ms |
| Min Gap Length | – | – | 1.914 | ms |
| Max Gap Length | – | – | 6.884 | ms |
| Accumulated Burst Length (25) | – | – | 7.4552 | ms |
| Duty Cycle Correction of Accumulated Burst lenght within observation time | – | – | 11.275 | dB |
| Found Peak cond. | – | – | 18.84 | dBm |

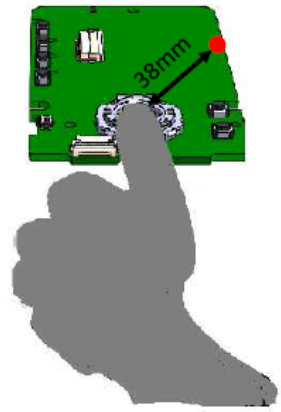


Plot_Duty Cycle with Power Meter Tool ~ 2439 MHz - DutyCycle_12012022_103855.png

## Annex B: Minimum distances

RADIO




BLE