

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

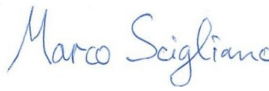
This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

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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).

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

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).

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

Technology	Transmitter frequency (MHz)	Max. decl. ERP (mW)	Threshold ERP		Minimal Safety (mm)	Verdict
			(mW)	(dBm)		
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:

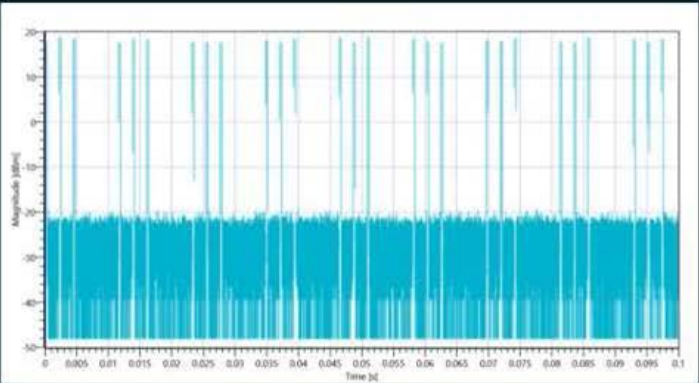
The power density levels for FCC that are larger than the minimum safety-distances stated above, are below the maximum levels allowed by regulations.

Annex A: Duty cycle

Correction factor 8.7dB

Duty cycle 13.5 %

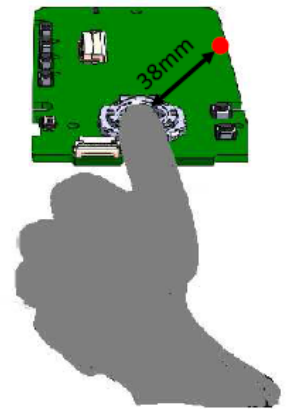
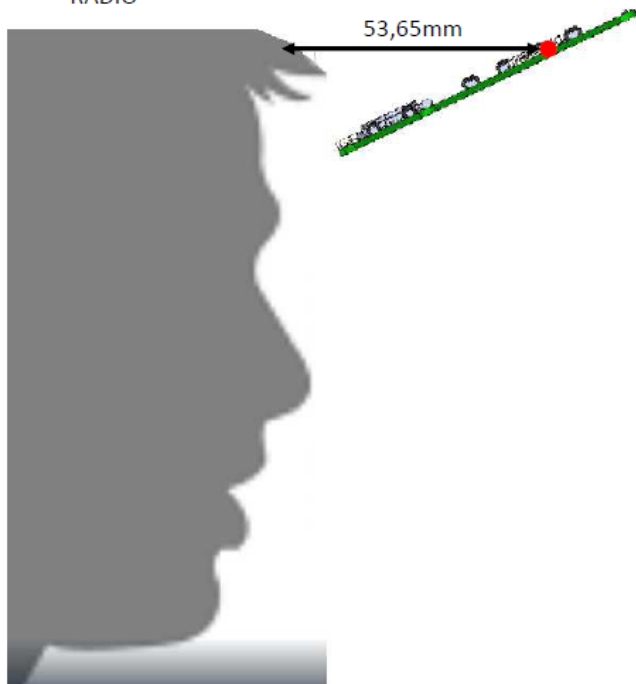
Duty Cycle evaluation				
Test Description	Lower Limit	Upper Limit	Measured	Unit
Result Summary				
Number of detected Bursts: 25				
Duty Cycle (Burst Ratio) max	—	—	0.135	—
Duty Cycle max	—	—	8.697	dB
Duty Cycle (Burst Ratio) min	—	—	0.042	—
Duty Cycle min	—	—	13.768	dB
Max TX Burst Length	—	—	0.298	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 length 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

