

SAR Test exemption documentation according to CFR 47 §1.1307

Report identification number: 1-1604/20-06-06 Exemption / MPE (FCC)

contains the module with the following certification numbers	
FCC ID	PFJGM20A

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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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	2.0	6.4	6.6 (=4.57mW)	4.45 (=2.79mW)	A

MPE based exempted technologies:

Technologies:	Max. measured E.I.R.P. per BW=1MHz:		BW (MHz)	Max. declared E.I.R.P. per BW=1MHz: (dBm)	Max. Effective Power (Calculated) Max.meas.E.I.R.P. @1MHz x (BW/1MHz)	Max. declared E.I.R.P. for Full BW: Max.decl.E.I.R.P. @1MHz x (BW/1MHz)	#
	(dBm)	(μW)					
UWB 6.2 to 6.8 GHz	-43.3	0.047	558.7	< -41.3 (=0.07413μW)	26.26 μW	0.07413μW x 558.7 = 41.416μW (ERP: 25.254 μW)	B
UWB 7.6 to 8.3 GHz	-41.6	0.069	561.7	< -41.3 (=0.07413μW)	38.76 μW	0.07413μW x 561.7 = 41.639μW (ERP: 25.390 μW)	B

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

#	Results from:	Additional information
A	1-1604/20-01-03-A CTC Advanced GmbH	Antenna gain page 19, Max conducted page 23
B	1-1604/20-06-02 CTC Advanced GmbH	--

Declared minimum safety distance: 1cm

According the manual a safety distance of 1cm shall be applied between the user (and/or bystanders) to the EUT antenna whilst active transmitting.

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).

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

where

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

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

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

Technology	Transmitter frequency (MHz)	Max. decl. ERP (mW)	Treshhold ERP		Minimal Safety (mm)	Verdict
			(mW)	(dBm)		
BT	2450	2.79	10.26	10.1	10	EXCEMPTED

MPE-Based Exemption following 47 CFR 1.1307 amendment:

If the declared ERP does not exceed the specified threshold based on the calculations below, the device is exempt from routine evaluation.

Transmitter Frequency (MHz)	Treshhold ERP (W)
0.3 – 1.34	$1.920 R^2$
1.34 – 30	$3.450 R^2/f^2$
30 – 300	$3.83 R^2$
300 – 1500	$0.0128 R^2$
1500 – 100 000	$19.2 R^2f$

where

f is the frequency (MHz)

R is the separation distance (at least $\lambda/2\pi$)

Prediction: worst case

Technology	Transmitter frequency (MHz)	$R_{\min}$ (mm)	Max. decl. ERP (mW)	Treshhold ERP		Minimal Safety Distance (mm)
				(mW)	(dBm)	
UWB	6200	8	0.02525	1.92	2.8	10
UWB	6800	7	0.02525	1.92	2.8	10
UWB	7600	6	0.02539	1.92	2.8	10
UWB	8300	6	0.02539	1.92	2.8	10

Collocation:

Overview:

Technology, [MHz]	BT, 2450	UWB, 6200	UWB, 6800	UWB, 7600	UWB, 8300
Exemption for 10mm distance based on	SAR	MPE	MPE	MPE	MPE
Limit ERP [mW]:	10.26	1.92	1.92	1.92	1.92
Result ERP [mW]:	2.79	0.0252	0.0252	0.0253	0.0253
Limit-Exhaustion [%]	27.2	1.3	1.3	1.3	1.3

Collocation-Scenarios:

Scenario 1:

BT + WC UWB = 28.3 % of Limit

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.