

MPE / SAR exemption letter according Interim procedure KDB 447498 D04

Customer	Product	Model	Type	HW Status	SW status	FCC ID
Schmitz Cargobull AG Bahnhofstrasse 22 48612 Horstmar Germany	Telematic Device	CTU-Pro	7620000456 (with rechargeable battery); 7620000458 (without rechargeable battery)	H01	CBT.TCU3_ EVO.21.01.D.064	2BBVQ-CTUPRO

Declared minimum distance to the human body according to customer information ≥ 20 cm.
The customer thus declares that the device is not body-worn.

RF Exposure Test Exemptions for Single Source

MPE-based Exemption

According 1.1307(b)(3)(i)(C) Option C – ERP at frequencies above 300 kHz but at distances $R > \lambda/2\pi$ can be exempted as follows:

TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES
SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	–	1.34	159 m	–	35.6 m	$1,920 R^2$
1.34	–	30	35.6 m	–	1.6 m	$3,450 R^2/f^2$
30	–	300	1.6 m	–	159 mm	$3.83 R^2$
300	–	1,500	159 mm	–	31.8 mm	$0.0128 R^2 f$
1,500	–	100,000	31.8 mm	–	0.5 mm	$19.2 R^2$
Subscripts L and H are low and high; λ is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

SAR-based Exemption

According 1.1307(b)(3)(i)(B) Option B – Available maximum time-averaged power or effective radiated power (ERP) at frequencies above 300 kHz and below 6 GHz, but with distances from 0.5 cm to 40 cm may be exempted as follows:

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases} \quad (\text{B.1})$$

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

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where

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

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance (mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

Calculation based on external document "TECHNICAL_PASSPORT_CTU-PRO_7620000456_458_V3-1", provided by customer.

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GSM

SAR-based Exemption

Exemption acc. Formula of § 1.1307(b)(3)(i)(B)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION															
Band	Technology	Frequency	R	R ≥ 0.5 cm and R ≤ 40 cm fulfilled	Maximum Rated Conducted Output Power (dBm)	Maximum Tolerance (dB)	Minimum Path Loss to Antenna connector (dB)	Minimum Path Loss in Antenna cable (dB)	Maximum Antenna Gain (dBi)	Duty Cycle (%)	EIRP (dBm)	ERP (dBm)	ERP (mW)	Threshold ERP (mW)	MPE Exemption fulfilled
GSM 850	CS	824.2	0.200	yes	33.0	1.0	0.0	0.0	1.0	12.5	26.0	23.8	240.941	1681.368	yes
		836.5	0.200	yes							26.0	23.8	240.941	1706.460	yes
		848.8	0.200	yes							26.0	23.8	240.941	1731.552	yes
	GPRS 1UL slot	824.2	0.200	yes	33.0	1.0	0.0	0.0	1.0	12.5	26.0	23.8	240.941	1681.368	yes
		836.5	0.200	yes							26.0	23.8	240.941	1706.460	yes
		848.8	0.200	yes							26.0	23.8	240.941	1731.552	yes
	GPRS 2UL slot	824.2	0.200	yes	33.0	1.0	0.0	0.0	1.0	25.0	29.0	26.8	481.881	1681.368	yes
		836.5	0.200	yes							29.0	26.8	481.881	1706.460	yes
		848.8	0.200	yes							29.0	26.8	481.881	1731.552	yes
	GPRS 3UL slot	824.2	0.200	yes	33.0	1.0	0.0	0.0	1.0	37.5	30.7	28.6	722.822	1681.368	yes
		836.5	0.200	yes							30.7	28.6	722.822	1706.460	yes
		848.8	0.200	yes							30.7	28.6	722.822	1731.552	yes
	GPRS 4UL slot	824.2	0.200	yes	33.0	1.0	0.0	0.0	1.0	50.0	32.0	29.8	963.762	1681.368	yes
		836.5	0.200	yes							32.0	29.8	963.762	1706.460	yes
		848.8	0.200	yes							32.0	29.8	963.762	1731.552	yes
	EGPRS 1UL slot	824.2	0.200	yes	27.0	1.0	0.0	0.0	1.0	12.5	20.0	17.8	60.522	1681.368	yes
		836.5	0.200	yes							20.0	17.8	60.522	1706.460	yes
		848.8	0.200	yes							20.0	17.8	60.522	1731.552	yes
	EGPRS 2UL slot	824.2	0.200	yes	27.0	1.0	0.0	0.0	1.0	25.0	23.0	20.8	121.043	1681.368	yes
		836.5	0.200	yes							23.0	20.8	121.043	1706.460	yes
		848.8	0.200	yes							23.0	20.8	121.043	1731.552	yes
	EGPRS 3UL slot	824.2	0.200	yes	27.0	1.0	0.0	0.0	1.0	37.5	24.7	22.6	181.565	1681.368	yes
		836.5	0.200	yes							24.7	22.6	181.565	1706.460	yes
		848.8	0.200	yes							24.7	22.6	181.565	1731.552	yes
	EGPRS 4UL slot	824.2	0.200	yes	27.0	1.0	0.0	0.0	1.0	50.0	26.0	23.8	242.086	1681.368	yes
		836.5	0.200	yes							26.0	23.8	242.086	1706.460	yes
		848.8	0.200	yes							26.0	23.8	242.086	1731.552	yes

Exemption acc. Formula of § 1.1307(b)(3)(i)(B)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION															
Band	Technology	Frequency	R	R ≥ 0.5 cm and R ≤ 40 cm fulfilled	Maximum Rated Conducted Output Power (dBm)	Maximum Tolerance (dB)	Minimum Path Loss to Antenna connector (dB)	Minimum Path Loss in Antenna cable (dB)	Maximum Antenna Gain (dBi)	Duty Cycle (%)	EIRP (dBm)	ERP (dBm)	ERP (mW)	Threshold ERP (mW)	MPE Exemption fulfilled
GSM 1900	CS	1850.2	0.200	yes	30.0	1.0	0.0	0.0	3.5	12.5	25.5	23.3	214.739	3060.000	yes
		1880.0	0.200	yes							25.5	23.3	214.739	3060.000	yes
		1909.8	0.200	yes							25.5	23.3	214.739	3060.000	yes
	GPRS 1UL slot	1850.2	0.200	yes	30.0	1.0	0.0	0.0	3.50	12.5	25.5	23.3	214.739	3060.000	yes
		1880.0	0.200	yes							25.5	23.3	214.739	3060.000	yes
		1909.8	0.200	yes							25.5	23.3	214.739	3060.000	yes
	GPRS 2UL slot	1850.2	0.200	yes	30.0	1.0	0.0	0.0	3.50	25.0	28.5	26.3	429.477	3060.000	yes
		1880.0	0.200	yes							28.5	26.3	429.477	3060.000	yes
		1909.8	0.200	yes							28.5	26.3	429.477	3060.000	yes
	GPRS 3UL slot	1850.2	0.200	yes	30.0	1.0	0.0	0.0	3.50	37.5	30.2	28.1	644.216	3060.000	yes
		1880.0	0.200	yes							30.2	28.1	644.216	3060.000	yes
		1909.8	0.200	yes							30.2	28.1	644.216	3060.000	yes
	GPRS 4UL slot	1850.2	0.200	yes	30.0	1.0	0.0	0.0	3.50	50.0	31.5	29.3	858.954	3060.000	yes
		1880.0	0.200	yes							31.5	29.3	858.954	3060.000	yes
		1909.8	0.200	yes							31.5	29.3	858.954	3060.000	yes
	EGPRS 1UL slot	1850.2	0.200	yes	26.0	1.0	0.0	0.0	3.50	12.5	21.5	19.3	85.489	3060.000	yes
		1880.0	0.200	yes							21.5	19.3	85.489	3060.000	yes
		1909.8	0.200	yes							21.5	19.3	85.489	3060.000	yes
	EGPRS 2UL slot	1850.2	0.200	yes	26.0	1.0	0.0	0.0	3.50	25.0	24.5	22.3	170.978	3060.000	yes
		1880.0	0.200	yes							24.5	22.3	170.978	3060.000	yes
		1909.8	0.200	yes							24.5	22.3	170.978	3060.000	yes
	EGPRS 3UL slot	1850.2	0.200	yes	26.0	1.0	0.0	0.0	3.50	37.5	26.2	24.1	256.467	3060.000	yes
		1880.0	0.200	yes							26.2	24.1	256.467	3060.000	yes
		1909.8	0.200	yes							26.2	24.1	256.467	3060.000	yes
	EGPRS 4UL slot	1850.2	0.200	yes	26.0	1.0	0.0	0.0	3.50	50.0	27.5	25.3	341.956	3060.000	yes
		1880.0	0.200	yes							27.5	25.3	341.956	3060.000	yes
		1909.8	0.200	yes							27.5	25.3	341.956	3060.000	yes

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LTE Cat 1

MPE-based Exemption

Exemption acc. TABLE 1 TO § 1.1307(b)(3)(i)(C) — SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION															
Band	Technology	Frequency	$\lambda/2\pi$	R	$R \geq \lambda/2\pi$ fulfilled	Maximum Rated Conducted Output Power	Maximum Tolerance	Minimum Path Loss to Antenna connector	Minimum Path Loss in Antenna cable	Maximum Antenna Gain	Duty Cycle	EIRP	ERP	ERP	MPE Exemption fulfilled
		(MHz)	(m)	(m)		(dBm)	(dB)	(dB)	(dB)	(dBi)	(%)	(dBm)	(dBm)	(W)	(W)
B2	LTE Cat 1	1850.0	0.026	0.200	yes	23.0	1.0	0.0	0.0	3.50	100	27.5	25.4	0.343	0.768
		1880.0	0.025	0.200	yes							27.5	25.4	0.343	0.768
		1910.0	0.025	0.200	yes							27.5	25.4	0.343	0.768
B4	LTE Cat 1	1710.0	0.028	0.200	yes	23.0	1.0	0.0	0.0	4.75	100	28.8	26.6	0.457	0.768
		1732.5	0.028	0.200	yes							28.8	26.6	0.457	0.768
		1755.0	0.027	0.200	yes							28.8	26.6	0.457	0.768
B5	LTE Cat 1	824.0	0.058	0.200	yes	23.0	1.0	0.0	0.0	1.0	100	25.0	22.9	0.193	0.422
		836.5	0.057	0.200	yes							25.0	22.9	0.193	0.428
		849.0	0.056	0.200	yes							25.0	22.9	0.193	0.435
B7	LTE Cat 1	2500.0	0.019	0.200	yes	23.0	1.0	0.0	0.0	1.2	100	25.2	23.1	0.202	0.768
		2535.0	0.019	0.200	yes							25.2	23.1	0.202	0.768
		2570.0	0.019	0.200	yes							25.2	23.1	0.202	0.768
B12	LTE Cat 1	699.0	0.068	0.200	yes	23.0	1.0	0.0	0.0	1.0	100	25.0	22.9	0.193	0.358
		707.5	0.067	0.200	yes							25.0	22.9	0.193	0.362
		716.0	0.067	0.200	yes							25.0	22.9	0.193	0.367
B13	LTE Cat 1	777.0	0.061	0.200	yes	23.0	1.0	0.0	0.0	1.0	100	25.0	22.9	0.193	0.398
		782.0	0.061	0.200	yes							25.0	22.9	0.193	0.400
		787.0	0.061	0.200	yes							25.0	22.9	0.193	0.403
B26	LTE Cat 1	814.0	0.059	0.200	yes	23.0	1.0	0.0	0.0	1.0	100	25.0	22.9	0.193	0.417
		831.5	0.057	0.200	yes							25.0	22.9	0.193	0.426
		849.0	0.056	0.200	yes							25.0	22.9	0.193	0.435
B41	LTE Cat 1	2496.0	0.019	0.200	yes	23.0	1.0	0.0	0.0	1.2	100	25.2	23.1	0.202	0.768
		2593.0	0.018	0.200	yes							25.2	23.1	0.202	0.768
		2690.0	0.018	0.200	yes							25.2	23.1	0.202	0.768

WLAN

MPE-based Exemption

Exemption acc. TABLE 1 TO § 1.1307(b)(3)(i)(C) — SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION															
Band	Technology	Frequency	$\lambda/2\pi$	R	$R \geq \lambda/2\pi$ fulfilled	Maximum Rated Conducted Output Power	Maximum Tolerance	Minimum Path Loss to Antenna connector	Minimum Path Loss in Antenna cable	Maximum Antenna Gain	Duty Cycle	EIRP	ERP	ERP	MPE Exemption fulfilled
		(MHz)	(m)	(m)		(dBm)	(dB)	(dB)	(dB)	(dBi)	(%)	(dBm)	(dBm)	(W)	(W)
2.4 GHz	WLAN 802.11 b	2412.0	0.020	0.200	yes	15.0	1.0	0.0	0.0	2.0	100	18.0	15.9	0.038	0.768
		2442.0	0.020	0.200	yes							18.0	15.9	0.038	0.768
		2472.0	0.019	0.200	yes							18.0	15.9	0.038	0.768
2.4 GHz	WLAN 802.11 g	2412.0	0.020	0.200	yes	13.0	1.0	0.0	0.0	2.0	100	16.0	13.9	0.024	0.768
		2442.0	0.020	0.200	yes							16.0	13.9	0.024	0.768
		2472.0	0.019	0.200	yes							16.0	13.9	0.024	0.768
2.4 GHz	WLAN 802.11 n	2412.0	0.020	0.200	yes	11.0	1.0	0.0	0.0	2.0	100	14.0	11.9	0.015	0.768
		2442.0	0.020	0.200	yes							14.0	11.9	0.015	0.768
		2472.0	0.019	0.200	yes							14.0	11.9	0.015	0.768

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Simultaneous Transmission

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

		WLAN 802.11 b 2.4 GHz	WLAN 802.11 g 2.4 GHz	WLAN 802.11 n 2.4 GHz
	Ratio of Value/Limit	0.050077	0.031596	0.019936
GSM 850	0.573201	0.623278	0.604798	0.593137
GSM 1900	0.280704	0.330781	0.312300	0.300640
LTE B2	0.446312	0.496389	0.477909	0.466248
LTE B4	0.595167	0.645244	0.626763	0.615103
LTE B5	0.456881	0.506958	0.488477	0.476817
LTE B7	0.262808	0.312885	0.294405	0.282744
LTE B12	0.538583	0.588660	0.570180	0.558519
LTE B13	0.484517	0.534594	0.516113	0.504453
LTE B26	0.462494	0.512571	0.494090	0.482430
LTE B41	0.262808	0.312885	0.294405	0.282744

Remark: only maximum value in band / mode is shown

Maximum Value	=	0.645244
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Conclusion

MPE-/ SAR Based Exemption fulfilled

The current version of test report TR23_1_0035501T006a_C02 replaces the test report TR23_1_0035501T006a_C01 dated 2024-Jul-18. The replaced test report is herewith invalid.



B.Eng. Martin Nunier



Timo Franke

Version	Applied changes	Date of release
--	Initial release	2024-Mar-20
C01	New antenna gain information	2024-Jul-18
C02	New antenna gain information	2024-Sep-02