

SAR based exemption letter 20-1-0039701T17a_C1

SAR based exemption letter according Interim procedure KDB 447498 D04

Customer	Product	Model	Type	HW Status	SW status	FCC ID
Actia Nordic AB Datalinjen 3B 58330 Linköping Sweden	Telematic Device	105560001	--	H1	1	Cellular: Contains FDD ID: QIPEXS82-W Bluetooth: 2AGKK105560001

Declared minimum distance to human body according to customer = 7.5 cm according customer's document
"MPE Information Requirements_105560001 - Ver1.7".

RF Exposure Test Exemptions for Single Source

According 1.1307(b)(3)(i)(B) Option B – frequency range 300MHz – 6GHz, $5\text{mm} \leq \text{distance} \leq 40\text{cm}$ can be exempted if available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW)

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

11/29/2021

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).

Formula (B.1) [repeated from § 2.1091(c)(1) and § 1.1307(b)(1)(i)(B)].

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

Calculation based on external document "MPE Information Requirements_105560001 - Ver1.7".

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GSM

Exemption acc. Formula of § 1.1307(b)(3)(i)(B)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION															
Band	Technology	Frequency (MHz)	$\lambda/2\pi$ (m)	R (m)	$R \geq \lambda/2\pi$ fulfilled	Maximum Rated Conducted Output Power (dBm)	Maximum Tolerance (dBm)	Minimum Path Loss to Antenna (dB)	Maximum Antenna Gain (dBi)	Duty cycle (%)	ERP (dBm)	ERP (dBm)	ERP (mW)	Threshold P_{en} (mW)	SAR Exemption fulfilled
GSM 850	CS	824.2	0.058	0.075	yes	33.0	2.0	0.4	-0.66	12.5	24.9	22.8	188.760	423.596	yes
		836.5	0.057	0.075	yes						24.9	22.8	188.760	425.868	yes
		848.8	0.056	0.075	yes						24.9	22.8	188.760	428.118	yes
	GPRS 1UL slot	824.2	0.058	0.075	yes	33.0	2.0	0.4	-0.66	12.5	24.9	22.8	188.760	423.596	yes
		836.5	0.057	0.075	yes						24.9	22.8	188.760	425.868	yes
		848.8	0.056	0.075	yes						24.9	22.8	188.760	428.118	yes
	GPRS 2UL slot	824.2	0.058	0.075	yes	30.0	2.0	0.4	-0.66	25.0	24.9	22.8	189.208	423.596	yes
		836.5	0.057	0.075	yes						24.9	22.8	189.208	425.868	yes
		848.8	0.056	0.075	yes						24.9	22.8	189.208	428.118	yes
	EGPRS 1UL slot	824.2	0.058	0.075	yes	27.0	3.0	0.4	-0.66	12.5	19.9	17.8	59.691	423.596	yes
		836.5	0.057	0.075	yes						19.9	17.8	59.691	425.868	yes
		848.8	0.056	0.075	yes						19.9	17.8	59.691	428.118	yes
	EGPRS 2UL slot	824.2	0.058	0.075	yes	24.0	4.0	0.4	-0.66	25.0	20.9	18.8	75.325	423.596	yes
		836.5	0.057	0.075	yes						20.9	18.8	75.325	425.868	yes
		848.8	0.056	0.075	yes						20.9	18.8	75.325	428.118	yes

Exemption acc. Formula of § 1.1307(b)(3)(i)(B)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION															
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GSM 1900	CS	1850.2	0.026	0.075	yes	30.0	2.0	1.3	-1.40	12.5	20.3	18.1	64.850	502.848	yes
		1880.0	0.025	0.075	yes						20.3	18.1	64.850	501.139	yes
		1909.8	0.025	0.075	yes						20.3	18.1	64.850	499.464	yes
	GPRS 1UL slot	1850.2	0.026	0.075	yes	30.0	2.0	1.3	-1.40	12.5	20.3	18.1	64.850	502.848	yes
		1880.0	0.025	0.075	yes						20.3	18.1	64.850	501.139	yes
		1909.8	0.025	0.075	yes						20.3	18.1	64.850	499.464	yes
	GPRS 2UL slot	1850.2	0.026	0.075	yes	30.0	2.0	1.3	-1.40	25.0	23.3	21.1	129.700	502.848	yes
		1880.0	0.025	0.075	yes						23.3	21.1	129.700	501.139	yes
		1909.8	0.025	0.075	yes						23.3	21.1	129.700	499.464	yes
	EGPRS 1UL slot	1850.2	0.026	0.075	yes	26.0	3.0	1.3	-1.4	12.5	17.3	15.1	32.502	502.848	yes
		1880.0	0.025	0.075	yes						17.3	15.1	32.502	501.139	yes
		1909.8	0.025	0.075	yes						17.3	15.1	32.502	499.464	yes
	EGPRS 2UL slot	1850.2	0.026	0.075	yes	23.0	4.0	1.3	-1.40	25.0	18.3	16.1	41.015	502.848	yes
		1880.0	0.025	0.075	yes						18.3	16.1	41.015	501.139	yes
		1909.8	0.025	0.075	yes						18.3	16.1	41.015	499.464	yes

LTE

Exemption acc. Formula of § 1.1307(b)(3)(i)(B)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION															
Band	Technology	Frequency (MHz)	$\lambda/2\pi$ (m)	R (m)	$R \geq \lambda/2\pi$ fulfilled	Maximum Rated Conducted Output Power (dBm)	Maximum Tolerance (dBm)	Minimum Path Loss to Antenna (dB)	Maximum Antenna Gain (dBi)	Duty cycle (%)	ERP (dBm)	ERP (dBm)	ERP (mW)	Threshold P_{e} (mW)	SAR Exemption fulfilled
B02	LTE	1850.0	0.026	0.075	yes	20.0	2.0	1.3	-1.40	100.0	19.3	17.2	51.880	502.859	yes
		1880.0	0.025	0.075	yes						19.3	17.2	51.880	501.139	yes
		1910.0	0.025	0.075	yes						19.3	17.2	51.880	499.453	yes
B04	LTE	1710.0	0.028	0.075	yes	20.0	2.0	1.6	-1.93	100.0	18.5	16.3	42.855	511.358	yes
		1732.5	0.028	0.075	yes						18.5	16.3	42.855	509.937	yes
		1755.0	0.027	0.075	yes						18.5	16.3	42.855	508.537	yes
B05	LTE	824.0	0.058	0.075	yes	20.0	2.0	0.4	-0.66	100.0	20.9	18.8	75.683	423.559	yes
		836.5	0.057	0.075	yes						20.9	18.8	75.683	425.868	yes
		849.0	0.056	0.075	yes						20.9	18.8	75.683	428.154	yes
B12	LTE	699.0	0.068	0.075	yes	20.0	2.0	0.2	-2.48	100.0	19.3	17.2	52.119	399.132	yes
		707.5	0.067	0.075	yes						19.3	17.2	52.119	400.878	yes
		716.0	0.067	0.075	yes						19.3	17.2	52.119	402.610	yes
B13	LTE	777.0	0.061	0.075	yes	20.0	2.0	0.2	-0.35	100.0	21.5	19.3	85.114	414.672	yes
		782.0	0.061	0.075	yes						21.5	19.3	85.114	415.634	yes
		787.0	0.061	0.075	yes						21.5	19.3	85.114	416.591	yes
B25	LTE	1850.7	0.026	0.075	yes	20.0	2.0	1.3	-1.4	100.0	19.3	17.2	51.880	502.819	yes
		1882.5	0.025	0.075	yes						19.3	17.2	51.880	500.998	yes
		1905.0	0.025	0.075	yes						19.3	17.2	51.880	499.731	yes
B26	LTE	814.0	0.059	0.075	yes	20.0	2.0	0.3	-0.27	100.0	21.4	19.3	84.723	421.696	yes
		831.5	0.057	0.075	yes						21.4	19.3	84.723	424.947	yes
		849.0	0.056	0.075	yes						21.4	19.3	84.723	428.154	yes
B66	LTE	1710.0	0.028	0.075	yes	20.0	2.0	1.6	-1.81	100.0	18.6	16.4	44.055	511.358	yes
		1745.0	0.027	0.075	yes						18.6	16.4	44.055	509.156	yes
		1780.0	0.027	0.075	yes						18.6	16.4	44.055	507.007	yes
B71	LTE	665.5	0.072	0.075	yes	20.0	2.0	0.2	-7.83	100.0	14.0	11.8	15.205	392.117	yes
		680.5	0.070	0.075	yes						14.0	11.8	15.205	395.286	yes
		688.0	0.069	0.075	yes						14.0	11.8	15.205	396.853	yes

BLE

Exemption acc. Formula of § 1.1307(b)(3)(i)(B)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION															
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2.4 GHz	Bluetooth LE	2402.0	0.020	0.075	yes	4.0	0.8	1.5	1.50	100.0	4.8	2.6	1.837	475.657	yes
		2442.0	0.020	0.075	yes						4.8	2.6	1.837	473.987	yes
		2480.0	0.019	0.075	yes						4.8	2.6	1.837	472.430	yes

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Simultaneous Transmission

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

		Bluetooth LE
	Ratio of Value/Limit	0.003887
GSM 850	0.446671	0.450559
GSM 1900	0.259679	0.263566
LTE B02	0.103874	0.107761
LTE B04	0.084271	0.088158
LTE B05	0.178684	0.182572
LTE B12	0.130582	0.134469
LTE B13	0.205256	0.209143
LTE B25	0.103816	0.107703
LTE B26	0.200910	0.204797
LTE B66	0.086893	0.090781
LTE B71	0.038778	0.042665
Remark: only maximum value in band / mode is shown		
Maximum Value	=	0.450559

Maximum value for simultaneous transmission with two transmitter is $0.5 < 1$ = limit fulfilled.

Conclusion:

RF Exposure Test Exemptions for Single Source and RF Exposure Test Exemptions for Simultaneous Transmission Sources fulfilled.

The current version of exemption letter TR20-1-0039701T17a_C01 replaces the test report TR20-1-0039701T17a dated 2023-Mar-28. The replaced test report is herewith invalid.

B.Eng. Martin Nunier

Dipl.-Ing. Ninovic Perez

Version	Applied changes	Date of release
--	Initial release	2023-Mar-28
C1	LTE B02 pathloss corrected to 1.3dB	2023-Apr-13