

Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-2685/21-03-08 MPE (FCC_ISED)

Certification numbers and labeling requirements	
FCC ID	2AIEO-SMSHL
ISED number	21299-SMSHL
HVIN (Hardware Version Identification Number)	BE14002, BE14003
PMN (Product Marketing Name)	SmartMonitor
FVIN (Firmware Version Identification Number)	V01
HMN (Host Marketing Name)	-/-

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:



Alexander Hnatovskiy
Lab Manager
Radio Communications & EMC



Marco Scigliano
Testing Manager
Radio Communications & EMC

EUT technologies:

Technologies:	Power Average Conducted [dBm]			Power ERP/EIRP ² [dBm]	Tune-Up Correction + ERP Correction ³ + GSM Correction ⁴ [dBm]	Max. Power for RF Exposure [dBm]
	Measured Value	Max. declared (Tune-Up)	Difference ¹ (Tune-Up Correction)			
E GPRS 850 MHz	32.2	34.0	1.8	29.3	-5.0	24.3
E GPRS 1900 MHz	29.3	31.0	1.7	32.3	-7.3	25.0
LTE FDD 2 1900 MHz Cat M1	21.2	22.0	0.8	24.2	0.8	25.0
LTE FDD 4 1750 MHz Cat M1	20.6	22.0	1.4	24.3	1.4	25.7
LTE FDD 5 850 MHz Cat M1	20.6	22.0	1.4	17.5	3.6	21.1
LTE FDD 12 700 MHz Cat M1	20.5	22.0	1.5	13.1	3.7	16.8
LTE FDD 13 700 MHz Cat M1	20.5	22.0	1.5	15.2	3.7	18.9
LTE FDD 2 1900 MHz Cat NB2	19.9	21.0	1.1	22.9	1.1	24.0
LTE FDD 4 1750 MHz Cat NB2	19.5	21.0	1.5	23.4	1.5	24.9
LTE FDD 5 850 MHz Cat NB2	19.5	21.0	1.5	16.6	3.7	20.3
LTE FDD 12 700 MHz Cat NB2	20.4	21.0	0.6	13.0	2.8	15.8
LTE FDD 13 700 MHz Cat NB2	19.9	21.0	1.1	14.7	3.3	18.0
Bluetooth LE	0.5	N/A	N/A	2.0	N/A	2.0

¹Difference (Tune-Up Correction) = Max. declared conducted power (Tune-Up) – measured conducted Power

²Output power listed is ERP below 1 GHz and EIRP above 1 GHz

³ERP Correction: EIRP = 2.15 dB + ERP

⁴GSM Correction: 1/8 Time Slots → 10 log (1/8) = - 9.03 dB

Test results in CTC advanced GmbH report:

1-2685_21-03-06 (Bluetooth LE)

1-2685_21-03-07 (GSM)

1-2685_21-03-13 (LTE Cat M1)

1-2685_21-03-14 (LTE Cat NB2)

Collocation overview:

Technology \ Active scenario:	1	2	3	4
E GPRS / LTE	x		x	
Bluetooth Low Energy	x	x		

Prediction of MPE limit at given distance - FCC

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

where: S = Power density
 P = Power input to the antenna
 G = Antenna gain
 R = Distance to the center of radiation of the antenna
 PG = Output Power including antenna gain

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled "Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure"

Frequency Range (MHz)	Power Density (mW/cm ²)	Averaging Time (minutes)
300 -1500	f/1500	30
1500 - 100000	1.0	30

where f = Frequency (MHz)

Prediction: worst case

Technologies:		GSM	GSM	LTE	BLE	
	Frequency (MHz)	850	1900	1750	2450	
PG	Declared max power (EIRP)	24.3	25.0	25.7	2.0	dBm
R	Distance	20.0	20.0	20.0	20.0	cm
S	MPE limit for uncontrolled exposure	0.5667	1.2667	1.1667	1.0000	mW/cm ²
	Calculated Power density:	0.0536	0.0629	0.0740	0.0003	mW/cm ²
	Calculated percentage of Limit:	9.45%	4.97%	6.34%	0.03%	
Collocation:						
	Scenario 1: GSM / LTE + SRD					
	Calculated percentage of Limit:	9.49%				

This prediction demonstrates the following:

The power density levels for FCC at a distance of 20 cm are below the maximum levels allowed by regulations.

Prediction of MPE limit at given distance - ISED

RSS-102, general limitations for E- and H- Field

Reference levels for general public (uncontrolled environment) exposure to time-varying electric and magnetic fields

According to: RSS 102-ISSUE 05		
Frequency Range (MHz)	Power density (W/m ²)	Reference Period (minutes)
0.003-10	--	Instantaneous*
0.1-10	--	6**
1.1-10	--	6**
10-20	2	6
20-48	$8.944 / f^{0.5}$	6
48-300	1.291	6
300-6000	$0.02619 \times f^{0.6834}$	6
6000-15000	10	6
15000-150000	10	$616000 / f^{1.2}$
150000-300000	$6.67 \times 10^{-5} \times f$	$616000 / f^{1.2}$

Note: f is frequency in MHz.
 * Based on nerve stimulation (NS).
 ** Based on specific absorption rate (SAR).

NOTE:

The resulting Limit for 850MHz is 2.63W/m²

The resulting Limit for 2450MHz is 5.42W/m²

Prediction: worst case

		GSM / LTE	BLE	
	Frequency	850	2450	MHz
R	Distance	20.0	20.0	cm
PG	Maximum EIRP	24.3	2.0	dBm
PG	Maximum EIRP	269.2	1.6	mW
S	Power density	0.5355	0.0032	W/m ²
	Exclusion Limit from above:	2.63	5.42	W/m ²
	Calculated percentage of Limit:	20.36%	0.06%	
	Scenario 1: GSM / LTE + SRD Calculated percentage of Limit:	20.42%		

Conclusion: RF exposure evaluation is not required.