
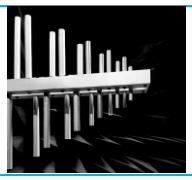
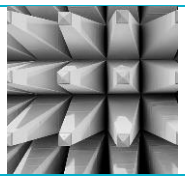

CTC advanced
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BNetzA-CAB-02/21-102

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-03

Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-7390/18-01-12 MPE (FCC_ISED)

Certification numbers and labeling requirements	
FCC ID	ZMF-TU600
ISED number	9746A-TU600
HVIN (Hardware Version Identification Number)	TU600-1, TU600-2, TU600-3, TU600-4, TU600-5, TU600-6, TU600-7,TU600-8,TU600-9
PMN (Product Marketing Name)	Trackunit
FVIN (Firmware Version Identification Number)	-/-
HMN (Host Marketing Name)	-/-

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EUT technologies:

Technologies:	Max. AVG output power* [dBm]	Frequency range (MHz)
GSM 850	**26.0**	**835**
GSM 1900	23.0	1900
LTE FDD 2	**25.0**	**1900**
LTE FDD 4	25.0	1750
LTE FDD 5	25.0	835
LTE FDD 12	**25.0**	**710**
LTE FDD 13	25.0	780
LTE FDD 26	**25.0**	**850**
BT BR-EDR (GFSK)	10.0	2450
BT BR-EDR (8 DPSK)	10.0	2450
BT LE	10.0	2450

)* declared by manufacturer

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 850	LTE FDD 12	LTE FDD 26	LTE FDD 2	BT	
	Frequency (MHz)	835	710	850	1900	2450	
PG	Declared max power (EIRP, Ant.Gain 0dB)	26.0	25.0	25.0	25.0	10.0	dBm
R	Distance	20	20	20	20	20	cm
S	MPE limit for uncontrolled exposure	0.56	0.47	0.57	1	1	mW/cm^2
	Calculated Power density:	0.08	0.06	0.06	0.06	0.00	mW/cm^2
	Calculated percentage of Limit:	14.23%	13.30%	11.11%	6.29%	0.20%	
	Collocation:						
	Scenario 1: GSM 850 + BT 2.4 MHz Calculated percentage of Limit:	14.43%					
	Scenario 2: LTE FDD 12 + BT 2.4 MHz Calculated percentage of Limit:	13.50%					
	Scenario 3: LTE FDD 26 + BT 2.4 MHz Calculated percentage of Limit:	11.31%					
	Scenario 3: LTE FDD 2 + BT 2.4 MHz Calculated percentage of Limit:	6.49%					

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, Issue 5, 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

Prediction: worst case

		GSM 850	GSM 1900	LTE FDD 12	LTE FDD 2	BT	
	Frequency	835	1900	710	1900	2450	MHz
R	Distance	20	20	20	20	20	cm
PG	Maximum EIRP (Ant.Gain 0dBi)	26	23	25	25	10	dBm
PG	**Maximum EIRP (Ant.Gain 0dB)**	398.1	199.5	316.2	316.2	10.0	mW
	Exclusion Limit from above:	1.30	2.28	1.16	2.28	2.71	W
	Calculated percentage of Limit:	30.62%	8.75%	27.18%	13.87%	0.37%	
	Collocation:						
	Scenario 1: GSM 850 + BT 2.4 MHz Calculated percentage of Limit:	30.99%					
	Scenario 2: GSM 1900 + BT 2.4 MHz Calculated percentage of Limit:	9.12%					
	Scenario 3: LTE FDD 12 + BT 2.4 MHz Calculated percentage of Limit:	27.54%					
	Scenario 4: LTE FDD 2 + BT 2.4 MHz Calculated percentage of Limit:	14.24%					