



Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-5417/17-02-03-B MPE (FCC_IC)

Certification numbers and labeling requirements	
FCC ID	X46XT07 + integrated UMTS / LTE module LE910-NA1 (FCC ID: R17LE910NAV2)
IC number	8816A-XT07 + integrated UMTS / LTE module LE910-NA1 (IC ID: 5131A-LE910NAV2)
HVIN (Hardware Version Identification Number)	XTO640
PMN (Product Marketing Name)	XTO640
FVIN (Firmware Version Identification Number)	-/-
HMN (Host Marketing Name)	-/-

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Document History:

Version	Applied Changes	Date of Release
	Initial Release	2018-09-21
-A	Added Collocation	2018-11-06
-B	Corrected Module Type to LE910-NA1	2018-12-03

EUT technologies:

Technologies:	Max. EIRP:
DTS 902 to 928 MHz (FHSS)	Measured PEAK: 23.95 dBm @904.4MHz
WCDMA 850* (LE910-NA1)	24.5 dBm (including antenna gain 0dBi)
WCDMA 1900* (LE910-NA1)	24.5 dBm (including antenna gain 0dBi)
LTE FDD 2 – 1900MHz* (LE910-NA1)	24 dBm (including antenna gain 0dBi)
LTE FDD 4 – 1750MHz* (LE910-NA1)	24 dBm (including antenna gain 0dBi)
LTE FDD 5 – 850MHz* (LE910-NA1)	24 dBm (including antenna gain 0dBi)
LTE FDD 12 – 700MHz* (LE910-NA1)	24 dBm (including antenna gain 0dBi)
LTE FDD 13 – 700MHz* (LE910-NA1)	24 dBm (including antenna gain 0dBi)

NOTE: Result from CTC advanced report 1-5417/17-02-02-A.

*) taken from max Tune Up declarations for LE910-NA1

WCDMA 850: $24.0 \pm 0.5 = 24.5$ dBm

WCDMA 1900: $24.0 \pm 0.5 = 24.5$ dBm

LTE FDD 2: $23.5 \pm 0.5 = 24$ dBm

LTE FDD 4: $23.5 \pm 0.5 = 24$ dBm

LTE FDD 5: $23.5 \pm 0.5 = 24$ dBm

LTE FDD 12: $23.5 \pm 0.5 = 24$ dBm

LTE FDD 13: $23.5 \pm 0.5 = 24$ dBm

Collocation worst case scenario:

Technologies transmitting simultaneous:	Max. EIRP:
DTS 902 to 928 MHz (FHSS)	Measured PEAK: 23.95 dBm @904.4MHz
LTE 12 ** - 700 MHz (LE910-NA1)	24.0 dBm (including antenna gain 0dBi)

****)** LTE 12 uses a much stricter output power limit at 700 MHz whilst irradiating almost the same amount of energy as WCDMA 850. As a result it provides a greater exhaustion of the limit even though WCDMA 850 provides 0.5 dB more output power.

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:	DTS	LTE 12	
Frequency (MHz)	904.4	700	
PG Declared max power (EIRP)	23.95	24.00	dBm
R Distance	20	20	cm
S MPE limit for uncontrolled exposure	0.60	0.47	mW/cm ²
Calculated Power density:	0.05	0.0500	mW/cm ²
Calculated percentage of Limit:	8.20%	10.71%	
Collocation:			
Scenario 1: DTS + GSM 850 Calculated percentage of Limit:	18.91%		

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 - IC

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

		DTS	LTE 12	
	Frequency	904.4	700	MHz
R	Distance	20	20	cm
PG	Maximum EIRP	23.50	24.00	dBm
PG	Maximum EIRP	223.9	251.2	mW
	Exclusion Limit from above:	1.37	1.15	W
	Calculated percentage of Limit:	16.31%	21.80%	
Collocation:				
	Scenario 1: DTS + GSM 850	38.10%		
	Calculated percentage of Limit:			

Conclusion: RF exposure evaluation is not required.

For applications where minimum distance to radiating element is 20cm Annex C of RSS-102 should be filled out.