

Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-7488/18-01-16 MPE (FCC_IC)

Certification numbers and labeling requirements	
FCC ID	2AS7RTQ377MCG RI7ME910C1WW (WWAN module) XF6-M15SB (WLAN/BT module)
IC number	-/-
HVIN (Hardware Version Identification Number)	-/-
PMN (Product Marketing Name)	-/-
FVIN (Firmware Version Identification Number)	-/-
HMN (Host Marketing Name)	-/-

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EUT technologies:

Technologies:	Max. power conducted:	Max. antenna gain:	Max. EIRP
GSM 850	34.5 dBm (slotted) 25.5 dBm (1 slot avg.)	Declared: 1.6 dBi	36.1 dBm 27.1 dBm
GSM 1900	30.5 dBm (slotted) 21.5 dBm (1 slot avg.)	Declared: 3.5 dBi	34 dBm 25 dBm
LTE FDD 2	24.5 dBm	Declared: 3.5 dBi	27.5 dBm
LTE FDD 4	24.5 dBm	Declared: 3.5 dBi	27.5 dBm
LTE FDD 5	24 dBm	Declared: 1.6 dBi	25.6 dBm
LTE FDD 12	24 dBm	Declared: 0.4 dBi	24.4 dBm
LTE FDD 13	24 dBm	Declared: 0.4 dBi	24.4 dBm
LTE FDD 26	24 dBm	Declared: 1.6 dBi	25.6 dBm
Bluetooth	16.5 (BT BR/EDR) 17.0 (BT LE)	Measured: -0.9 dBi	16.1 dBm
WLAN	16.5 (802.11b) 17.5 (802.11g/n)	Measured: -0.9 dBi	16.6 dBm

References:

- Tune-up info of Telit ME910-C1-WW GSM/LTE NB-IoT module
- FCC MPE Report of FCC-ID RI7ME910C1WW for Telit ME910-C1-WW GSM/LTE NB-IoT module
- Antenna Inversa SR4L034I data sheet
- FCC MPE Report of WLAN module Redpine Signals Inc. M15SB (FCC-ID XF6-M15SB)
- WLAN/BT antenna gain from CTC advanced radiated RF test reports 1-7488/18-01-02; 1-7488/18-01-03;

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

Note: GSM 850 has been determined as the WWAN frequency band with highest EIRP in relation to the limits above.

Technologies:		WWAN	WLAN	BT	
	Frequency (MHz)	824	2412	2412	
PG	Declared max power (EIRP)	27.1	16.6	16.1	dBm
R	Distance	20	20	20	cm
S	MPE limit for uncontrolled exposure	0.549	1	1	mW/cm ²
	Calculated Power density:	0.1021	0.0091	0.0081	mW/cm ²
	Calculated percentage of Limit:	18.58%	0.91%	0.81%	
Collocation:					
	Scenario 1: WWAN + WLAN Calculated percentage of Limit:	19.49%			
	Scenario 2: WWAN + BT Calculated percentage of Limit:	19.39%			
	Scenario 3: WWAN + WLAN + BT Calculated percentage of Limit:	20.30%			

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 $4.49/f^{0.5} \text{ W}$ (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 $1.31 \times 10^{-2} f^{0.6834} \text{ W}$ (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

Note: GSM 850 has been determined as the WWAN frequency band with highest EIRP in relation to the limits above.

		WWAN	WLAN	BT	
	Frequency	824	2412	2412	MHz
R	Distance	20	20	20	cm
P	Max power input to the antenna	25.5	17.5	17	dBm
G	Antenna gain	1.6	-0.9	0.9	dBi
PG	Maximum EIRP	27.1	16.6	17.9	dBm
PG	Maximum EIRP	512.9	45.7	61.7	mW
	Exclusion Limit from above:	1.29	2.68	2.68	W
	Calculated percentage of Limit:	39.81%	1.70%	2.30%	
Collocation:					
	Scenario 1: WWAN + WLAN Calculated percentage of Limit:	41.51%			
	Scenario 2: WWAN + BT Calculated percentage of Limit:	42.11%			
	Scenario 3: BWAN + WLAN + BT Calculated percentage of Limit:	43.81%			

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.