

Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-2594/21-01-06 MPE (FCC_ISED)

Certification numbers and labeling requirements	
FCC ID	2AJW5ACCM
ISED number	21979-ACCM
HVIN (Hardware Version Identification Number)	ACCM +
PMN (Product Marketing Name)	ACCM +
FVIN (Firmware Version Identification Number)	-/-
HMN (Host Marketing Name)	-/-

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EUT technologies:

Technologies:	Max. decl. cond. avg. power:	Max. gain:	Max. EIRP
LTE 2 1900MHz	23.0 dBm ¹⁾	< 0dBi ²⁾	--
LTE 4 1700 MHz	23.0 dBm ¹⁾	< 0dBi ²⁾	--
LTE 12 700 MHz	23.0 dBm ¹⁾	< 0dBi ²⁾	--
BT LE 2450 MHz ³⁾	--	--	5.94 dBm (Peak)
Proprietary technologies: ⁴⁾			
312.0 to 318.0 MHz	--	--	73.25 dB μ V/m @3m = -21.98 dBm
431.9 to 435.9 MHz	--	--	76.08 dB μ V/m @3m = -19.15 dBm
868.1 to 868.5 MHz	--	--	79.50 dB μ V/m @3m = -15.73 dBm
902.375 to 927.675 MHz	--	--	77.29 dB μ V/m @3m = - 17.94 dBm

NOTE:

- 1) Max. decl. cond. avg. power taken from DataSheet_UBX-16005783 (LARA-R203)
- 2) Max. possible antenna gain according DataSheet_AMMAL013_190123
- 3) BT LE result taken from CTC advanced test report 1-2594/21-01-03 (Page 18)
- 4) Proprietary technologies results taken from CTC advanced test report 1-2594/21-01-04 (Page 52)

Collocation overview:

Active scenario: Technology	1	2	3	4
LTE	x		x	x
BT LE	x	x		x
Proprietary		x	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:	Proprietary	LTE 12	LTE 2	BT LE	
Frequency (MHz)	300	700	1900	2450	
PG Declared max power (EIRP)	<< 0	23	23	5.94	dBm
R Distance	20	20	20	20	cm
S MPE limit for uncontrolled exposure	0.2	0.47	1	1	mW/cm ²
Calculated Power density:	<< 0.0002	0.0397	0.0397	0.0008	mW/cm ²
Calculated percentage of Limit:	<< 0.10 %	8.51%	3.97%	0.08%	
Collocation:					
Scenario 4: Proprietary + LTE + BT LE Calculated percentage of Limit:	8.69%				

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

		Proprietary	LTE 12	LTE 2	BT LE	
	Frequency	300	700	1900	2450	MHz
R	Distance	20	20	20	20	cm
PG	Maximum EIRP	<< 0	23	23	5.94	dBm
PG	Maximum EIRP	<< 1	199.5	199.5	3.9	mW
	Exclusion Limit from above:	0.65	1.15	2.28	2.71	W
	Calculated percentage of Limit:	<< 0.15%	17.31%	8.75%	0.14%	
Collocation:						
	Scenario 4: Proprietary + LTE + BT LE	17.61%				
	Calculated percentage of Limit:					

Conclusion: RF exposure evaluation is not required.