

1 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

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1.2 Maximum Permissible Exposure (MPE) Evaluation

BLE mode:

CH	Frequency (MHz)	Peak Power Output (dBm)	Required Limit
0	2402	3.06	1 Watt = 30 dBm
20	2442	3.94	1 Watt = 30 dBm
39	2480	1.41	1 Watt = 30 dBm

BLE mode:

CH	Frequency (MHz)	Max. Avg. Output include tune up tolerance Power (dBm)	Required Limit
0	2402	2.81	1 Watt = 30 dBm
20	2442	3.44	1 Watt = 30 dBm
39	2480	1.09	1 Watt = 30 dBm

*Note: Measured by power meter, cable loss as 0.9 dB that offsets on the power meter in Peak

*Note: Measured by power meter, **as cable loss+ Duty cycle factor that offsets on the power meter**

*Note: Max. Output include tune up tolerance Power is average power

MPE Prediction

Prediction of MPE limit at a given distance

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 antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

Max. output power including tune-up tolerance:	3.44	(dBm)
Max. output power including tune-up tolerance:	2.2080047	(mW)
Duty cycle:	66	(%)
Maximum Pav :	1.4572831	(mW)
Peak Antenna gain (Maximum):	1.48	(dBi)
Peak Antenna gain (linear):	1.4060475	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2442	(MHz)
MPE limit for uncontrolled exposure at prediction frequency	1	(mW/cm ²)
Power density at predication frequency for 20 (cm) distance	0.000	(mW/cm ²)
Measurement Result		
The predicted power density level at 20 cm is 0 mW/cm ² .		
This is below the uncontrolled exposure limit of 1 mW/cm ² at 2442MHz.		

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2 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

2.1 Standard Applicable

According to RSS 102 March 19,2015 issue 5 §2.5.2 RF Exposure Evaluation

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 $22.48/f^{0.5}W$ (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;

This is a Mobile device, at which separation distance between the user and the device's antenna is 20cm. Therefore, section 2.5.2 shall be complied with.

2.2 Maximum Permissible Exposure (MPE) Exemption

BLE:

Max. output power including tune-up tolerance:	3.44	(dBm)
Max. output power including tune-up tolerance:	2.2080047	(mW)
Antenna gain (Peak):	1.48	(dBi)
Maximum antenna gain:	1.4060475	(numeric)
Frequency	2442	MHz
Limit	2.7068	W
EIRP	0.0031	W

Evaluation Result

The radiated power is $3.44 + 1.48 = 4.92 \text{ dBm(EIRP)} = 3.105 \text{ mW} = 0.003105 \text{ W}$ that is less than or equal to 2.707W. Hence, following section 2.5.2 of RSS102 issue 5, RF exposure evaluation is no longer required.

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