

## 1. Maximum Permissible Exposure (MPE)

### 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 <sup>2</sup> )	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 <sup>2</sup> )	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

According to RSS 102 issue 5.

### 2.5.2 Exemption Limits for Routine Evaluation – 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;
- 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).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

## Maximum Permissible Exposure (MPE) Evaluation

2.4GHz mode: BT

The worst case: refer to FCC test report for detail measurement date.

Power measurement:

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
Low	-9.95	0.00010	1
Mid	-11.24	0.00008	1
High	-13.03	0.00005	1

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

Maximum output power at antenna input terminal:	-9.95	(dBm)
Maximum output power at antenna input terminal:	0.101157945	(mW)
Tune-Up power Tolerance:	0.5	dB
Duty cycle:	100	(%)
Maximum Pav :	0.113501082	(mW)
Antenna gain (typical):	2	(dBi)
Maximum antenna gain:	1.584893192	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0000358	(mW/cm <sup>2</sup> )

### Measurement Result:

The predicted power density level at 20 cm is 0.0000358 mW/cm<sup>2</sup>.. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup>.

2.4GHz mode: BLE

The worst case: refer to FCC test report for detail measurement data.

Power measurement:

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
Low	4.62	0.00289	1
Mid	5.36	0.00343	1
High	5.79	0.00379	1

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

Maximum output power at antenna input terminal:	5.79	(dBm)
Maximum output power at antenna input terminal:	3.79314985	(mW)
Tune-Up power Tolerance:	0.5	dB
Duty cycle:	61.905	(%)
Maximum Pav :	2.634666977	(mW)
Antenna gain (typical):	2	(dBi)
Maximum antenna gain:	1.584893192	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm)	0.0008311	(mW/cm <sup>2</sup> )

**Measurement Result:**

The predicted power density level at 20 cm is 0.0008311 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup>.

**IC EIRP/Conducted Power level: 2.4GHz, BT mode**

IC EIRP level

Frequency:	2402	MHz
Maximum output power at antenna input terminal:	-9.95	(dBm)
Tune-Up power Tolerance:	0.5	dB
Duty cycle:	100	(%)
Antenna gain (typical):	2	(dBi)
EIRP:	0.180	mW
EIRP:	0.00018	W
EIRP Limit	2.676	W

**Measurement Result:**

The EIRP level is 0.00018W which less than RSS102 section 2.5.2 Exemption Limits above 300 MHz and below 6 GHz condition.

**IC EIRP/Conducted Power level: 2.4GHz, BLE mode**

IC EIRP level

Frequency:	2480	MHz
Maximum output power at antenna input terminal:	5.79	(dBm)
Tune-Up power Tolerance:	0.5	dB
Duty cycle:	61.905	(%)
Antenna gain (typical):	2	(dBi)
EIRP:	6.745	mW
EIRP:	0.00675	W
EIRP Limit	2.736	W

**Measurement Result:**

The EIRP level is 0.00675W which less than RSS102 section 2.5.2 Exemption Limits above 300 MHz and below 6 GHz condition.

~ End of Report ~