15. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

15.1. 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 §2.1093 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

15.2. Maximum Permissible Exposure (MPE) Evaluation

Max. Rated Avg. Power + Max. Tolerance (± 0.5dBm): 4.24dBm

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
2402	3.83	0.002	1
2441	4.24	0.003	1
2480	3.89	0.002	1

MPE Prediction (GFSK)

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 average output power at antenna input	4.24	(dBm)
Maximum average output power at antenna input	2.6546056	(mW)
Duty cycle:	94	(%)
Maximum Pav :	2.4953292	(mW)
Antenna gain (Maximum):	3.92	(dBi)
Antenna gain (linear):	2.4660393	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2441	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0012248	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.0012248mW/cm^2. This is below the uncontrolled exposure limit of 1mW/cm^2 at 2441MHz.

Max. Rated Avg. Power + Max. Tolerance (± 1dBm): 1.48dBm

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
2402	1.04	0.001	1
2441	1.48	0.001	1
2480	1.16	0.001	1

MPE Prediction (π4DQPSK)

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 average output power at antenna input	1.48	(dBm)
Maximum average output power at antenna input	1.4060475	(mW)
Duty cycle:	94	(%)
Maximum Pav :	1.3216847	(mW)
Antenna gain (Maximum):	3.92	(dBi)
Antenna gain (linear):	2.4660393	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2441	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0006488	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.0006488mW/cm^2. This is below the uncontrolled exposure limit of 1mW/cm^2 at 2441MHz.

Max. Rated Avg. Power + Max. Tolerance (± 1dBm): 1.44dBm

Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)
2402	1.03	0.001	1
2441	1.44	0.001	1
2480	1.12	0.001	1

MPE Prediction (π4DQPSK)

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 average output power at antenna input	1.44	(dBm)
Maximum average output power at antenna input	1.3931568	(mW)
Duty cycle:	94	(%)
Maximum Pav :	1.3095674	(mW)
Antenna gain (Maximum):	3.92	(dBi)
Antenna gain (linear):	2.4660393	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2441	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0006428	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.0006428mW/cm^2. This is below the uncontrolled exposure limit of 1mW/cm^2 at 2441MHz.