Application: M9HOT8X0RF

Prediction of MPE limit at 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 the antenna
      G = Antenna gain (including cable losses)
      R = Distance to the center of radiation of the antenna

This equation is generally accurate in the far-field of an antenna but will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction.

Solving this equation for G:

$$G = S (4 \pi R^2) / P$$

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)

Based on the above table the limits are for
Part 22 device: 0.549 mW/cm^2
Part 24 device: 1 mW/cm^2

Prediction for Part 22:

P	Max power input to the antenna:	1690 mW (32.3 dBm)
R	Distance:	20 cm
S	MPE limit for uncontrolled exposure:	0. 549 mW/cm^2
G	Antenna gain (including cable losses):	1.634 numerical (0 dBd)

ERP power limit according to §22.913(a):   7 W (38.4 dBm)
ERP power limit according to §2.1091(c):   1.5 W (31.7 dBm)

Therefore the maximum antenna gain (including cable losses) for part 22 shall not exceed -0.6 dBd. So, the Maximum Permissible Exposure (MPE) for part 22 is 0.49 mW/cm^2 for 1/8 Duty cycle and 20cm distance.

Prediction for Part 24:

P	Max power input to the antenna:	790 mW (29.0 dBm)
R	Distance:	20 cm
S	MPE limit for uncontrolled exposure:	1 mW/cm^2
G	Antenna gain (including cable losses):	6.363 numerical (8.0 dBi)

EIRP power limit according to §24.232(b):   2 W (33.0 dBm)
EIRP power limit according to §2.1091(c):   4.9 W (36.9 dBm)

Therefore the maximum antenna gain (including cable losses) for part 24 shall not exceed 4.0 dBi. So, the Maximum Permissible Exposure (MPE) for part 24 is 0.39 mW/cm^2 for 1/8 Duty cycle and 20cm distance.

Sagem Wireless

EPM, Xu Subing 2010.1.28