MPE Calculation for Q2686 - OET Bulletin 65

The FCC requires that the calculated MPE be equal to or less than a given limit dependent on frequency at a distance of 20 cm from a device to the body of a user.

The transmitter operation for the Q2686 covers GSM850 and PCS1900 operating bands.

The following FCC Rule Parts are applicable:

Part 2.1091(c)
Part 22 GSM850 devices operating at frequencies at or below 1.5GHz with effective radiated power (ERP) of 1.5 watts or more are subject to routine RF exposure evaluation, otherwise they are categorically excluded.
Part 24 PCS1900 devices operating at frequencies above 1.5GHz with effective radiated power (ERP) of 3 watts or more are subject to routine RF exposure evaluation, otherwise they are categorically excluded.

Part 24.232 (b)
Mobile/ Portable stations are limited to 2 Watts EIRP peak power

Part 22.913 (a)(2)
The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

The MPE calculation as given in FCC OET Bulletin 65, page 19 is used to calculate the safe operating distance for the user.

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$S = EIRP/4 \pi R^2$

Where S = Power density

EIRP = Effective Isotropic Radiated Power (EIRP = P x G)

P = Conducted Transmitter Power

G = Antenna Gain (relative to an isotropic radiator)

R = distance to the centre of radiation of the antenna

For Q2686 GSM 850

Transmitter frequency range = 824MHz to 849MHz

Max. Conducted Transmitter Power = 33dBm (2.0W) @ antenna socket

MPE Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for GSM850

$S = f/1500$ mW/cm^2 (f = operating frequency)

$S = 824/1500 = 0.55$ mW/cm^2 (worst case)

MPE Calculation to Determine Q2686 Safe Maximum Antenna Gain (G)

Values: $S = 0.55$ mW/cm^2

P = 2000/4 mW

(1/4 Source Based Time Average Tx Power duty cycle – For GPRS Class 10 operation two Tx time slots in eight).

= 500 mW

R = 20cm

$S = PxG/4 \pi R^2$

$0.55 = 500xG/(12.56 \times 20^2)$

$0.55 \times (12.56 \times 20^2) = 500 \times G$

$0.55 \times (12.56 \times 20^2)/ 500 = G$

G = 5.53 (7.4dBi)

Calculation for Q2686 Maximum radiated power output

For 7.4 dBi gain antenna

Power = 2.0x 5.53 = 11.06W EIRP (40.4dBm)

ERP = EIRP – 2.1dB (half wave dipole gain)

Max. ERP = 40.4 – 2.1dBm = 38.3dBm (6.8W)

This is below the Part 22.913 (a)(2) limit of 7W ERP

The 7.4 dBi maximum gain antenna will therefore comply with the required FCC rule parts.

For Q2686 PCS1900

Transmitter frequency range = 1850MHz to 1910MHz

Max. Conducted Transmitter Power P = 30dBm (1.0W) @ antenna socket

Calculation for Q2686 Maximum radiated power output

Maximum antenna gain G that can be used to comply with the maximum transmitter power limit of 2W EIRP of Part 24.232(b) is calculated as:

P x G = 2

ie: **G = 2/1 = 2 (3dBi)**

For 3dBi antenna gain maximum ERP is < 3.0W, so from Part 2.1091(c), routine RF exposure evaluation is categorically excluded. The 3dBi maximum gain antenna will therefore comply with the required FCC rule parts.

Conclusion

The required 20cm RF exposure limits for General Population/ Uncontrolled Exposure FCC Rule Part 1.1310, and ERP Part 22.913 (a)(2), EIRP Part 24.232 (b) maximum transmitter power limits will not be exceeded for the Q2686 using antennas having a maximum gain of 7.4dBi (850MHz) and 3.0dBi (1900MHz) respectively