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MacKay Guardian™ Solo MPE Calculation

RF Exposure Considerations for FCC ID: ZPZ0213MGSOLO

The transmitter operation for FCC ID: ZPZ0213MGSOLO covers GSM850 and PCS1900 operating bands, and also contains independent 125kHz and 13.56MHz transmitters. The GSM850 and PCS1900 operation is provided by an integrated Q2687 Sierra Wireless module.

The transmission for the parking meter are expected to be sporadic and limited to short durations for credit card transaction or service requests (a maximum of 400 bytes of data is transmitted which takes a few seconds).

The distance between the GSM antenna and the operator, while GSM transmission occurs, is expected to be 20 cm or more. The elapsed time between operator activity (i.e. removal of credit card from the card reader) and GSM transmission is 3 seconds at which time the distance between the GSM antenna and the operator is much greater than 20cm. The parking meter will also send a GSM transmission for any service problems that occur in real time for maintenance purposes.

The device supports GPRS and EGPRS but since GPRS is rated for higher power it will be used in the analysis as the worst case mode.

MPE Calculation for 20cm compliance

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

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

Where S = Power density

EIRP (source base power) = Transmitter Power x Antenna gain

R = distance to the centre of radiation of the antenna

For GSM850

Transmitter frequency range = 824MHz to 849MHz

Transmitter Maximum Avg Power (Q2687 module specified power) = 35dBm (3.2W)

GPRS Class 10 operation reduces Tx power by 2/ 8 (time averaged power reduction of 2 uplink timeslots in 8).

ie: Source Base Average Power = Transmitter Maximum Avg Power + 10 log(2/8) = 0.8W

Antenna Gain = -1.7dBi (x 0.68)

EIRP = 0.8 x 0.68 = 0.540W

MPE Requirement

From From OET Bulletin 65 table 1 (b) – Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for GSM 850:

$S = f/1500$ W/m^2 (f = operating frequency)

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

Calculation for GSM850 20cm safe distance

Values: R = 20 cm

EIRP = 540 mW

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

$S = 540/(12.56 \times 20^2)$

$= 540/ 5024$

$S = 0.1$ mW/cm^2

For PCS 1900 band

Transmitter frequency range = 1850MHz to 1910MHz

Transmitter Maximum Avg Power (Q2687 module specified power) = 32dBm (1.6W)

GPRS Class 10 operation reduces Tx power by 2/ 8 (time averaged power reduction of 2 uplink timeslots in 8).

ie: Source Based Average Power = Transmitter Maximum Avg Power + 10 log(2/8) = 0.4W

Antenna Gain = -0.48dBi (x 0.89)

EIRP = 0.4 x 0.89 = 360 mW

MPE Requirement

From From OET Bulletin 65 table 1 (b) – Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for GSM 1900:

$S = 1.0\ mW/cm^2$

MPE Calculation

Values: R = 20cm

EIRP = 360 mW

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

$S = 360/(12.56 \times 20^2)$

$= 360/ 5024$

$S = 0.07\ mW/cm^2$

For 125KHz and 13.56MHz Operation

These transmitters operate independently of the GSM850 and PCS1900 transmitters. Also the 125KHz and 13.56MHz transmitters are not included in the RF exposure requirements of 2.1091(c) for product usage at >20cm operating distance (mobile)

Conclusion

FCC ID: ZPZ0213MGSOLO meets the FCC Rule Part 1.1310 RF exposure requirements