MPE Calculation for AutOS - 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 AutOS covers GSM850 and PCS1900 operating bands, together with the 802.11 2.4GHz band.

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 = Transmitter Power x Antenna gain

R = distance to the centre of radiation of the antenna

For GSM 850 band (2G)

Transmitter frequency range = 824MHz to 849MHz

Transmitter Power (HSPA LGA module specified power) = 33dBm (2.0W)

EDGE Class 12 GPRS reduces Tx power by 4/ 8 (time averaged power reduction of 4 uplink timeslots in 8).

Antenna Gain = -7dBi @850MHz (extrapolated from -8.5dBi@ 824MHz and -5.1dBi @ 890MHz)

For GSM 850 band (3G)

Transmitter frequency range = 826MHz to 847MHz

Transmitter Power (HSPA LGA module specified power) = 23dBm (0.2W)

Antenna Gain = -7dBi @850MHz (extrapolated from 8.5dBi@ 824MHz and 5.1dBi @ 890MHz)

MPE Requirement (Based on 2G values as worst case)

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 for AutOS

Values: R = 20cm

EIRP = 2000 x 4/8 x 0.2 (-7dBi)

EIRP = 200

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

$S = 200/(12.56 \times 20^2)$

$S = 200/ 5024$

$S = 0.04$ mW/cm^2

For PCS1900 band

Transmitter frequency range = 1850MHz to 1910MHz

Transmitter Power (specified) = 30dBm (1.0W)

EDGE Class 12 GPRS reduces Tx power by 4/ 8 (time averaged power reduction of 4 uplink timeslots in 8).

Antenna Gain = -3.2dBi @1850MHz

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MPE Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of

FCC Rule Part 1.1310 for PCS1900

$S = 1.0$ mW/cm^2

MPE Calculation for AutOS

Values: R = 20cm
EIRP = 1000 x 4/8 x 0.48 (-3.2dBi)
EIRP = 240

S = EIRP/4 π R^2
S = 240/(12.56 x 20^2)
S = 240/ 5024
S = 0.048 mW/cm^2

For 2.4GHz band (WIFI)

Transmitter frequency range = 2412 – 2462MHz band

Max. measured Transmitter EIRP = 19.1dBm max. (81.3mW)

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MPE Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for PCS1900

S = 1.0 mW/cm^2

MPE Calculation for AutOS

Values: R = 20cm
EIRP = 81.3

S = EIRP/4 π R^2
S = 81.3/(12.56 x 20^2)
S = 81.3/ 5024
S = 0.016 mW/cm^2

For 2.4GHz band (Bluetooth®)

Transmitter frequency range = 2402 – 2480MHz band
Max. measured Transmitter EIRP = 4.0dBm max. (2.5mW)

ie: 2.4GHz operation has Tx powers below the 60/f$_{(GHz)}$ mW level for RF exposure consideration of KDB447498

Conclusion
The MPE value of the AutOS at 20 cm meets the FCC Rule Part 1.1310
RF exposure limits operating in the respective GSM850 and PCS1900 and 2.4GHz 802.11 bands.