Tempus IC MPE Calculation - 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 Tempus IC covers GSM850 and PCS1900 operating bands and Bluetooth and WiFi operation in the 2.4 GHz band.

FCC Part 2.1091(c) is applicable and states that:

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.
This applies to the Part 22 GSM850 transmitter

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.
This applies to the Part 24 PCS1900, Part 15.247 Bluetooth and Part 15.247 WiFi transmitters.

The GSM850 ERP, PCS1900 ERP, Bluetooth ERP and WiFi ERP of the Tempus IC are all well below these levels and consequently an assessment is not required however the worst case power densities for each technology are given in this document for information purposes.

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 = Effective Isotropically Radiated Power

R = distance to the centre of radiation of the antenna

For GSM850

Transmitter frequency range = 824 MHz to 849 MHz

Maximum ERP = 0.1122 W (20.5 dBm)

EIRP = ERP + 2.15 dB

Therefore EIRP = 20.5 dBm + 2.15 = 22.65 dBm

EIRP = 0.1841 W

The worst case of a maximum of 8 active time slots was assumed for the GSM module

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)

Calculation for GSM850 20cm safe distance for calculated EIRP (from maximum measured ERP)

Values: EIRP = 184.1 mW   R = 20 cm

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

$S = 184.1/ (12.56 \times 20^2)$

  = 184.1/ 5024

S = 0.037 mW/cm^2

For PCS1900

Transmitter frequency range = 1850 MHz to 1910 MHz

Maximum EIRP = 0.4571 W

The worst case of a maximum of 8 active time slots was assumed for the GSM module

Requirement

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

S = 1 mW/cm^2

Calculation for PCS1900 20cm safe distance for stated maximum EIRP

Values: EIRP = 457.1 mW   R = 20 cm

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

$S = 457.1/ (12.56 \times 20^2)$

  = 457.1/ 5024

S = 0.091 mW/cm^2

For Bluetooth

Transmitter frequency range = 2402 MHz to 2480 MHz

Maximum EIRP = 0.031 W

Requirement

> From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for the band 2402 to 2480 MHz:
>
> **S = 1.0 mW/cm^2**

Calculation for 20cm safe distance for stated maximum EIRP

Values: EIRP = 3.1 mW;   R = 20 cm

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

$S = 3.1/ (12.56 \times 20^2)$

     $= 3.1/ 5024$

S = 0.0006 mW/cm^2

For WiFi

Transmitter frequency range = 2412 MHz to 2462 MHz

Maximum EIRP = 0.031 W

Requirement

> From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of FCC Rule Part 1.1310 for the band 2402 to 2480 MHz:
>
> **S = 1.0 mW/cm^2**

Calculation for 20cm safe distance for stated maximum EIRP

Values: EIRP = 3.1 mW;   R = 20 cm

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

$S = 3.1/ (12.56 \times 20^2)$

     $= 3.1/ 5024$

S = 0.0006 mW/cm^2

Conclusion

The MPE value of the Tempus IC at 20 cm meets the RF exposure limits for General Population/ Uncontrolled Exposure FCC Rule Part 1.1310.