Radio Frequency Exposure

LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

EUT Specification

EUT	GPS Tracker
Model	ES310
Frequency band (Operating)	GSM850 TX: 824~849MHz; RX: 869~894MHz PCS1900 TX: 1850~1910MHz; RX: 1930~1990MHz WCDMA Band II: 1850~1910MHz; RX: 1930~1990MHz WCDMA Band V: 824~849MHz; RX: 869~894MHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation)
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)
Antenna diversity	☐ Single antenna ☒ Multiple antennas 　☐ Tx diversity 　☐ Rx diversity 　☒ Tx/Rx diversity
Max. output power	GSM850: 31.61 dBm (1.449 W) PCS1900: 25.42 dBm (0.348 W) WCDMA Band II: 22.64 dBm (0.095 W) WCDMA Band V: 22.14dBm (0.162 W)
Antenna gain (Max)	GSM850/ WCDMA Band V: 2.0dBi PCS1900/ WCDMA Band II: 2.9dBi
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Remark:

1. *The maximum output power is <u>31.61 dBm (1.449W)</u> at <u>848.8 MHz</u> (with <u>numeric 1.58 antenna gain</u>.)*
2. *For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density would be larger.*

Note: Simultaneous transmission is not applicable for this EUT.

Cerpass Technology Corp.
Tel: 886-2-2655-8100　　Fax: 886-2-2655-8200

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TEST RESULTS

No non-compliance noted.

Calculation

Given $E = \dfrac{\sqrt{30 \times P \times G}}{d}$ & $S = \dfrac{E^2}{3770}$

> *Where E = Field strength in Volts / meter*
> *P = Power in Watts*
> *G = Numeric antenna gain*
> *d = Distance in meters*
> *S = Power density in milliwatts / square centimeter*

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

> *P (mW) = P (W) / 1000 and*
> *d (cm) = d(m) / 100*

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \qquad \textbf{\textit{Equation 1}}$$

> *Where d = Distance in cm*
> *P = Power in mW*
> *G = Numeric antenna gain*
> *S = Power density in mW / cm^2*

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Maximum Permissible Exposure

Modulation Mode	Frequency band (MHz)	Max. Conducted output power(dBm)	Antenna gain (dBi)	Distance (cm)	Power density (mW/cm2)	Limit (mW/cm2)
850 band	824~849	31.61	2.0	20	0.456	1
1900 band	1850~1910	25.42	2.9	20	0.135	1

NOTE:

Total (Chain0+Chain1) , the formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density