731 Enterprise Drive
Lexington, KY 40510

Telephone: 859-226-1000
Facsimile: 859-226-1040
www.intertek-etlsemko.com

# FCC RF Exposure Information Per KDB Inquiry Tracking Number 360152

## Operational Description

The AMS ScramGPS GPS-600 is an ankle worn offender monitoring and tracking device. The device combines cellular, GPS, and RF technologies to ascertain the offender's current location and verify compliance with program requirements. This information can be gathered at variable rates with the nominal maximum location data rate of 1 locate per minute and the maximum transmission frequency of 1 per minute. The time required to transmit a single packet of location data is constant regardless of the transmission frequency. A typical rate plan locates an offender once each minute and transmits the location data once every 10 minutes.

## RF Exposure Conditions

The GPS-600 offender monitoring and tracking device is intended for operation in the general population in an uncontrolled RF exposed environment.

## Antenna Separation Distances

~10.16mm from cellular antenna to ankle
~25.95mm from GHSS antenna to ankle

## Transmission Mode

The Locator utilizes an internal cellular 3G UMTS/GSM transmitter as well as an FHSS transmitter for communication back to the base station.

## Duty Cycle

The device features variable location and transmission rates with a **maximum** location rate of once per minute and a transmission rate of once per 10 minutes. The on air transmission time of each transmission is 3 seconds. This leads to an on air duty cycle of 0.5%.

Derived by direct measurement of the transmit completion time on the device of nominal operation for various rate plans. A typical rate plan of 1 location per minute and transmits on 10 minute intervals is shown below

Duty Cycle = Transmission Time / TOTAL Time = 3s/600s = 0.005

Duty Cycle = 0.5%

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# RF Output Power Comparison

Per KDB 447498 D01 v06 4.3.1-a "For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1-g and 10-g *SAR test exclusion thresholds* are determined by the following:
[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,[30] where $f_{(GHz)}$ is the RF channel transmit frequency in GHz"

## Cellular TRP WCDMA FDD2

Frequency = 1.9076GHz
Maximum Measured Conducted Output Power = 19dBm, 79.43mW
Source Based Time Averaged Duty Cycle = 0.5%
Source Based Time Averaged Output Power = 79.43mW x .005 = 0.39715mW

(1mW) / (10mm) x √(1.9076GHz) = 0.138 ≤ 7.5; exempt from 10-g extremity SAR

## Cellular TRP GSM Edge 850

The module is required to fall back to GSM mode if a WCDMA network is not available. Note that in the US GSM will be phased out in January 2017. Here, the operation is pulsed transmit instead of continuous as in WCDMA. In GSM transmits are permissible in 8 time slot frames of which 2 are available for use per frame. So the GSM continuous transmit time for larger transfers are not continuous in time since it is permitted to occupy 2 of the 8 slots available. So the GSM average duty cycle is 2 tx slots/ 8 max slots = ¼ tx duty cycle as shown below:

$$\frac{2\ Tx\ slots}{8\ Max\ slots} = \frac{1}{4} = .25\ GSM\ duty\ cycle$$

Frequency = 848.8GHz
Maximum Measured Conducted Output Power = 26.1dBm, 407.38mW

Source Based Time Averaged Duty Cycle = 0.5% * .25 = .00125
Source Based Time Averaged Output Power = 407.38mW x .00125 = 0.509mW

(1mW) / (10mm) x √(.8488GHz) = 0.0921 ≤ 7.5; exempt from 10-g extremity SAR

## FHSS Radio - 903MHz ISM Band

Frequency = 0.903GHz
Maximum Measured Conducted Output Power = 0.711mW
Source Based Time Averaged Duty Cycle = (1.25ms) / (15.9ms) x 100% = 7.9%
Source Based Time Averaged Output Power = 0.711mW x 0.079 = 0.0056mW

(1mW) / (26mm) x √(0.903GHz) = 0.036 ≤ 7.5; exempt from 10-g extremity SAR

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## Simultaneous Transmission Consideration

Both the cellular antenna and FHSS antenna can transmit at the same time. Per KDB 447498 D01 v06 4.3.2 “When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration.”

WCDMA operation
0.138 + 0.036 = 0.174 ≤ 7.5; exempt from 10-g extremity SAR.

or

GSM operation
0.0921 + 0.036 = 0.1281 ≤ 7.5; exempt from 10-g extremity SAR.