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MPE Test Report for Motorola GSM Data Card (FCC ID IHDT56LV3)

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The Motorola Personal Communications Sector Product Safety & Compliance Laboratory has evaluated the Motorola GSM Data Card (FCC ID IHDT56LV3) as a mobile device per 47 CFR §1.1310 titled "Radiofrequency radiation exposure limits", generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device as "a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons." This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product, Motorola has made the following statement: **"IMPORTANT:** To meet the FCC's RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna". Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 centimeters from the user. Thus, this product is a "mobile device" as defined in section § 2.1091 paragraph (b).

Table 1 (B) of 47 CFR §1.1310 lists the limits for MPE for the General Population:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
30–300 .....	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.



The ERP of a radiating structure can be calculated by knowing the conducted power, the line loss and the antenna gain.

$$\text{ERP} = P * 10^{[(G - L - 2.1) / 10]}$$

The EIRP of a radiating structure can be calculated by knowing the conducted power, the line loss and the antenna gain.

$$\text{EIRP} = P * 10^{[(G - L) / 10]}$$

Where

P = Peak conducted power of transmitter

G = Antenna Gain in dBi

L = Line loss

The MPE of a radiating structure can be calculated by knowing the transmit EIRP and the distance at which MPE is being calculated. In this case MPE will be calculated at 20 cm, which is the minimum separation between the body of the user and nearby persons and the antenna.

The calculations for the MPE are:

$$S = (E_f * P_t * G_n) / [4 * \pi * (d^2)]$$

where:

E<sub>f</sub> = enhancement factor to account for ground reflections is 2.56

P<sub>t</sub> = maximum time averaged power output (peak power \* duty cycle)

G<sub>n</sub> = net antenna gain (antenna gain - the line loss) expressed in linear format

d = distance from antenna (20 cm in our case)

#### *For 824 – 849 MHz Operation:*

The peak transmit power for this product is **2.32 W**. When installed using a combined cable loss and antenna gain of a maximum of **2.6 dBi**, the maximum ERP will be **2.61 W**. This is below the limit of 7.0 W.

The maximum sourced based time-averaged transmit power for this product is **0.581 W** (GPRS Class 10 mode). When installed using a combined cable loss and antenna gain of a maximum of **2.6 dBi**, the MPE is **0.538 mW/cm<sup>2</sup>**. This is below the limit of 0.549 mW/cm<sup>2</sup>. Therefore, by requiring the user and nearby persons to remain at least 20 cm from the antenna, the MPE is not exceeded.

#### *For 1850 – 1910 MHz Operation:*

The peak transmit power for this product is **0.989 W**. When installed using a combined cable loss and antenna gain of a maximum of **3.0 dBi**, the maximum EIRP will be **1.97 W**. This is below the limit of 2.0 W.

The maximum sourced based time-averaged transmit power for this product is **0.247 W** (GPRS Class 10 mode). When installed using a combined cable loss and antenna gain of a maximum of **3.0 dBi**, the MPE is **0.251 mW/cm<sup>2</sup>**. This is below the limit of 1.00 mW/cm<sup>2</sup>. Therefore, by requiring the user and nearby persons to remain at least 20 cm from the antenna, the MPE is not exceeded.