

**MPE EVALUATION REPORT
FOR THE
MOBILE DATA RADIO TRANSCEIVER, MODEL M64700G25**

**FCC OET BULLETIN 65, EDITION 97-01, ANSI / IEEE C95.1-1992,
AND ANSI / IEEE C95.3-1992**

RF EXPOSURE COMPLIANCE

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PREPARED FOR:

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ADMINISTRATIVE INFORMATION

PURPOSE OF TEST:

To demonstrate the compliance of the Mobile Data Radio Transceiver, Model M64700G25 with the RF Exposure Requirements for mobile devices.

REPRESENTATIVE:

Eric Tanner

SUMMARY OF RESULTS

VEHICLE MOUNTED ANTENNA

For General Population / Uncontrolled Exposure, the Maximum Permissible Exposure (MPE) limit for the operating frequency range (806 MHz to 821 MHz) is 0.537 mW/cm². The data in this report demonstrates that this device complies with the Maximum Permissible Exposure (MPE) requirements set forth in 47 CFR §2.1091, §1.1310, and OET Bulletin 65, Edition 97-01 for General Population / Uncontrolled Exposure environment at a minimum distance of 10 cm through a ground plane from the vehicle mounted antenna (operator requirement), and for General Population / Uncontrolled Exposure environment at a minimum distance of 40 cm laterally from the vehicle mounted antenna (bystander requirement).

APPROVALS

Steve Behm, Director of Engineering Services

QUALITY ASSURANCE:



Joyce Walker, Quality Assurance Administrative Manager

TEST PERSONNEL:



Stuart Yamamoto, EMC Engineer

EQUIPMENT UNDER TEST (EUT)

Mobile Data Radio Transceiver

Manuf: IP MobileNet
Model: M64700G25
Serial: 04363311
FCC ID: pending

Antenna Used with Magnetic Mount

Manuf: Maxrad
Model: (B)MFT800
Serial: NA
FCC ID: NA

Vehicle Magnetic Mount for Antenna

Manuf: Antenex, Inc.
Model: G8UNS
Serial: NA
FCC ID: NA

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Laptop Computer

Manuf: Dell Corporation
Model: PP02L Inspiron I2500
Serial: 5TZ6611
FCC ID: DoC

GPS Antenna

Manuf: San Jose Navigation, Inc.
Model: SM-25
Serial: 2569918
FCC ID: NA

DC Power Supply

Manuf: Samlex America
Model: SEC 1223
Serial: 03061-0D01-0632
FCC ID: DoC

SPECIFICATIONS AND REQUIREMENTS

The following summarizes the specifications and requirements for Maximum Permissible Exposure for mobile devices applied during RF exposure evaluation.

Excerpt from 47 CFR §1.1310 Radio Frequency radiation exposure limits

Table 1. - Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposures

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (V/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1	6
300-1500	---	---	f/300	6
1500-100,000	---	---	5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (V/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	---	---	f/1500	30
1500-100,000	---	---	1	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.

SUMMARY OF RF EXPOSURE CONDITIONS

Operator Exposure Condition

Operating Frequency Range (MHz)	806 MHz to 821 MHz
Rated Power Output (Watts)	20 (conducted)

MPE Limit =	f/1500 (mW/cm ²)
=	0.537 (mW/cm ²)

Bystander Exposure Condition

Operating Frequency Range (MHz)	806 MHz to 821 MHz
Rated Power Output (Watts)	20 (conducted)

MPE Limit =	f/1500 (mW/cm ²)
=	0.537 (mW/cm ²)

Applicable Exposure Condition

Operator Exposure Condition

	Occupational / Controlled Exposure
X	General Population / Uncontrolled Exposure

Bystander Exposure Condition

	Occupational / Controlled Exposure
X	General Population / Uncontrolled Exposure

Device and Antenna Operating Configuration

Vehicle Mounted Antenna

The antenna used for this test was a magnetically mounted vehicle antenna with a gain of 0dBi in the frequency range of 806 MHz to 821 MHz. The mobile data radio transceiver was transmitting at its rated output power of 20 Watts to this antenna. The transceiver is set to output at the center frequency of 813.5 MHz in order to obtain the maximum output.

REPORT OF MEASUREMENTS

VEHICLE MOUNTED ANTENNA

The following tables show the measurements performed to determine conformity with the applicable limits for RF exposure. Measurements were performed at the center of the equipment's operating band; this allows the maximum power output through the device.

Frequency Range

Frequency investigated: 813.5MHz

Operator Exposure Measurements

Measurement for the operator exposure was made under the ground plane at a separation of 10cm directly beneath the base of the transmitting antenna.

d (m)	mW/cm ²	Limit	Result
0.1	0.19618	0.537	Pass

Bystander Exposure Measurements

Measurements on point grid in mW/cm².

	A	B	C	Height (m)
1	0.00003	0.00007	0.00003	1.75
2	0.00094	0.00082	0.00101	1.12
3	0.00001	0.00003	0.00001	0.50

The spatially averaged power density is

X (m)	mW/cm ²	Limit	Result
0.4	0.00033	0.537	Pass

Evaluation was performed at the following measurement distances: 0.40m, 0.50m, 0.6m and 0.70m. The maximum power density measurements were obtained at 0.40m representing the edge of the conductive plane simulating vehicular installation.

TEST CONFIGURATION

The EUT antenna is placed in a configuration typical of normal installation. In this case, with a magnetically mounted vehicle antenna, a reference ground plane is used to simulate actual installation. In order to limit external interference effects, the test is performed in a fully-anechoic chamber. The EUT is setup in a configuration representative of normal use. Support equipment for the measurement instruments is located outside of the chamber.

TEST PROCEDURE

The method for performing spatially averaged measurements is as follows:

1. Determine the location of the maximum field.
2. Establish around the location of the maximum field a grid of points within approximately 0.35 m (width) x 1.25 m (height) surface area, at a reasonable distance (e.g., 0.5 m) above the floor or ground and perpendicular to it. These points should be uniformly spaced within the grid with the point of the maximum field included.
3. Measure the field strength in all points of the grid.
4. Calculate the average field.

To determine the location of the maximum field, the detector is moved throughout the RF field generated by the transmit antenna. The detector is positioned at a minimum of 12 radials and at varying distances (0.4m, 0.5m, 0.6m, and 0.7m) from the antenna along each radial. The area of maximum RF energy determined during preliminary investigation shall be used for the remainder of the tests. In the case where a transmitter may have multiple frequency bands, the preliminary investigation shall be repeated for each band.

To determine the spatially averaged value, local values including the maximum value are measured over a surface area of 0.35 m (width) x 1.25 m (height) perpendicular to the ground beginning at 0.5m from the ground reference plane. Preliminary investigation is performed in order to determine the orientation and height which yields the highest power density or field strength measurements. The height of the center row of local points is determined during preliminary investigation and corresponds to a location at which a local maximum exists. Where the field is reasonably uniform (within +20%), e.g., in the far-field, measurements will suffice in one location, representative of the space that is occupied by a person. Where the field is not uniform, measurements are made at a series of locations. The measurement points are uniformly spaced within the sampling area. Local values are measured at nine points within the sampling grid.

Since the applicable limits exist in several different measurement units, the following outlines the most common calculations used for determining the spatially averaged field.

Case 1: Where limits are applied in electric field strength (V/m), the spatially averaged electric field strength along a grid of n points is calculated using:

$$E = \left[\frac{1}{n} \sum_{i=1}^n E_i^2 \right]^{\frac{1}{2}}$$

Case 2: Where limits are applied in units of power density (mW/cm²), assuming measurements are made in the far field, where the E and H vectors are mutually orthogonal, power density is first calculated using:

$$S = \frac{E^2}{377}$$

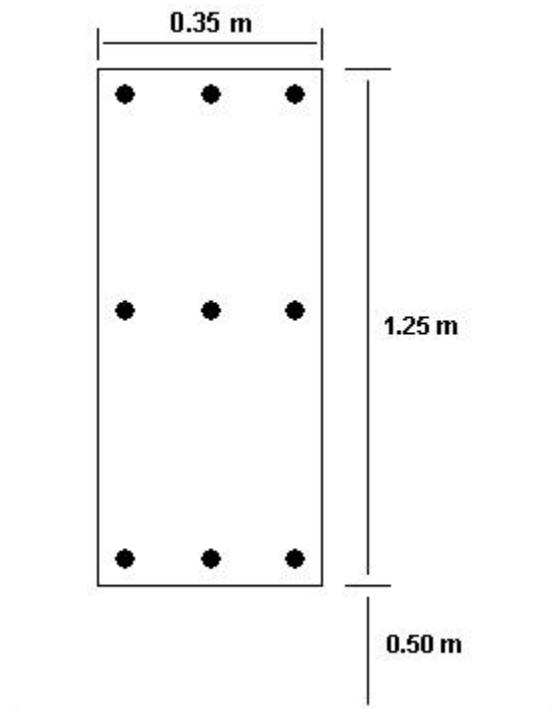
And the spatially averaged power density along a grid of n points is calculated using:

$$S = \frac{1}{n} \sum_{i=1}^n S_i$$

The following diagram is an example of the grid used to perform local measurements for RF exposure evaluation over a whole-body spatial average.

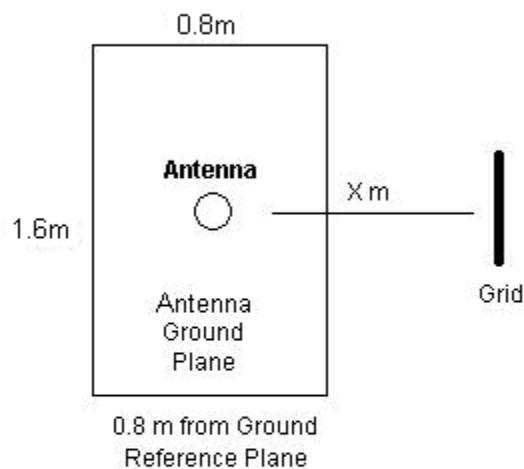
**Example Grid used for
RF Exposure Measurements**

- Represents local points used for whole-body spatial averaging



The following diagram is an example of the setup used for vehicle mounted antennas. In the case where vehicle glass mounted antennas are used, this setup shall not apply. The letter X represents the test distance used for RF exposure measurements. The distance X is measured from the phase center of the transmitting antenna to the volumetric center of the measurement instrument. In order to more accurately simulate normal installation, the antenna ground plane is not bonded to the ground reference plane. The transmitting antenna is placed in the center of the antenna ground plane.

Setup Used for Vehicle-Mounted Antennas



Top View

REFERENCE DOCUMENTS

ANSI IEEE C95.1-1991. IEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz.

ANSI IEEE C95.3-1991. IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave

FCC OET Bulletin 65 Supplement C. Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

Health Canada Safety Code 6. Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz.

APPENDIX A
PHOTOGRAPH OF THE TEST SETUP USED



Vehicle Mounted Antenna

APPENDIX B

TEST EQUIPMENT LIST

<i>Description</i>	<i>Asset #</i>	<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Cal Date</i>	<i>Cal Due</i>
Field Probe	00638	AR	FP2000	14318	04/30/03	04/30/05
Field Monitor	00636	AR	FM2000	14294	04/30/03	04/30/05
Power Sensor	02036	HP	8482A	1551A01004	06/18/04	06/18/06
Power Meter	02082	HP	435B	2445A11881	06/17/04	06/17/06
Spectrum Analyzer	02467	Agilent	E7405A	US40240225	03/31/03	03/31/05
Bilog Antenna	00851	Schaffner Chase EMC	CBL6111C	2629	03/16/04	03/16/05