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TEST: FCC 47 CFR 1.1310 Maximum Permissible Exposure

ENVIRONMENTAL ASSESSMENT

On the TMAH5-B22 Mobile Transceiver S/N: 3004663

In accordance with

ANSI/IEEE Std C95.1, 1999

OET Bulletin 65 97-01 and Supplement C (Edition 01-01)

DATE:	May 2004	
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Summary of Results:

Antenna Gain	Antenna Position	Measurement Position	Result
2.15 dBi	Roof	External: Side	**COMPLIES**
2.15 dBi	Trunk	External: Rear Side	**COMPLIES**
2.15 dBi	Trunk	External: Rear Corner	**COMPLIES**
2.15 dBi	Trunk	External: Centre rear	**COMPLIES**
5.15 dBi	Roof	External: Side	**COMPLIES**
5.15 dBi	Trunk	External: Rear Side	**COMPLIES**
5.15 dBi	Trunk	External: Rear Corner	**COMPLIES**
5.15 dBi	Trunk	External: Centre rear	**COMPLIES**
2.15 dBi	Roof	Internal: Front Seat	**COMPLIES**
2.15 dBi	Roof	Internal: Back Seat	**COMPLIES**
2.15 dBi	Trunk	Internal: Front Seat	**COMPLIES**
2.15 dBi	Trunk	Internal: Back Seat	**COMPLIES**
5.15 dBi	Roof	Internal: Front Seat	**COMPLIES**
5.15 dBi	Roof	Internal: Back Seat	**COMPLIES**
5.15 dBi	Trunk	Internal: Front Seat	**COMPLIES**
5.15 dBi	Trunk	Internal: Back Seat	**COMPLIES**

See Appendix A for details of the measurement positions.

Operating and Exposure conditions:

Operating Conditions: Mobile transmitter using vehicle mounted antennas only

Exposure conditions: Occupational/Controlled Exposure (operator).
General Population/Uncontrolled (passengers and bystanders)

Safe Distance:

Recommended Minimum lateral safe distance from the antenna: 90 cm

Limit:

Occupational/Controlled Exposure:

30 - 300 MHz: 1.0 mW/cm^2
300 – 1500 MHz: F/300 mW/cm^2

With a test frequency of 463.725 MHz the test limit is **1.546** mW/cm^2

General population/Uncontrolled Exposure:

30 - 300 MHz: 0.2 mW/cm^2
300 – 1500 MHz: F/1500 mW/cm^2

With a test frequency of 463.725 MHz the test limit is **0.309** mW/cm^2

Recommended Antennas:

Antenna Type: Monopole (λ/4 antenna)

Antenna Gain: 2.15 dBi

Antenna Type: Monopole (5λ/8 antenna)

Antenna Gain: 5.15 dBi

Measurement Guidance:

2) Mobile PTT – Parts 80, 90
a) §2.1033(c)(3) requires device operating and installation instructions to be submitted during equipment certification; instructions should include the minimum separation distance and other constraints required for the device and its antenna(s) to meet MPE limits

b) Per definition of a mobile device a minimum separation distance of 20 cm is required
i) Antenna installation conditions should maintain the estimated minimum MPE separation distance
ii) A separation distance based on MPE evaluation (measurement or computer modelling) that is smaller than the estimated MPE distance may be used if it is applicable for the antenna installation conditions
c) Basic RF exposure instructions are requested for devices that meet general population exposure requirements, as part of the §2.1033(c)(3) required operating instructions; RF exposure training instructions and labelling info are requested for devices that satisfy occupational exposure requirements
Federal Communications Commission OET Laboratory Division
March 18, 2004

Test Results:

NAME OF TEST: TRANSMITTER OUTPUT POWER (CONDUCTED)

TEST CONDITIONS: Ambient Temperature 22.5 ^{o}C
Relative Humidity 55 %

SPECIFICATION: FCC 47 CFR 2.1046

GUIDE: TIA/EIA-603 2.2.1

MEASUREMENT PROCEDURE:
1. The Equipment Under Test (EUT) was connected to a RF Power meter using a coaxial attenuator with an impedance of 50 Ohms.
2. The unmodulated output power was measured.

MEASUREMENT RESULTS:

Transmit Frequency:	463.725	MHz
Manufacturer's Rated Output Power	25	Watts
Supply Voltage, motor idling, transmitting.	13.6	Volts
Measured Output Power	27.91	Watts
Measurement Uncertainty (dB)	± 0.5	dB

Maximum Transmit Power is set in the factory to 26 watts +2 / -1 watt. This setting is not adjustable by the user. The MPE results are scaled to simulate results from a 28 watt carrier with a 50% duty cycle.

NAME OF TEST: ENVIRONMENTAL ASSESSMENT

SPECIFICATION: FCC 47 CFR 1.1310

Measurement Method:

Field strength measurements were performed for two antenna positions on a representative vehicle (Honda Accord 2001 LXI four door sedan, dimensions 185.5 long, 71.5 wide and 57.1 inches high). See Appendix A for details.

External Field strength readings were recorded at four positions 20 cm's from the car body, to represent the closest position for a bystander. Measurements were taken at 20 cm intervals vertically over a height of 2 metres.

Internal field strength readings were recorded in the front and back seat locations in the areas where the highest field strength is found.

Measurements were made in an area 40cm wide representing the head and upper and lower torso.

Spatial averaging is carried out to determine the MPE result (IEEE C95.1 3.29).

Roof mounted antenna:

1. Position A: 90 degrees to side of car, 20 cm's from the body, on a line intersecting the roof antenna position.

Trunk mounted antenna:

2. Position B: 90 degrees to side of car, 20 cm's from the body, on a line intersecting the trunk antenna position.
3. Position C: Rear of car, 20 cm's from the body, on a line intersecting the trunk antenna position and the rear corner of the car.
4. Position D: 90 degrees to rear of car, 20 cm's from the bumper, on a line intersecting the trunk antenna position.

Calculations of average power (sum of results/number of results):

External to vehicle:

Test Distance metres	λ/4 antenna				5λ/8 antenna			
Units	Power Density, mW/cm^2							
Probe Height metres	Position							
	A	B	C	D	A	B	C	D
0.2	0.003	0.034	0.028	0.008	0.002	0.018	0.026	0.017
0.4	0.004	0.016	0.018	0.018	0.002	0.006	0.012	0.026
0.6	0.008	0.050	0.406	0.030	0.005	0.019	0.026	0.030
0.8	0.014	0.065	0.406	0.055	0.011	0.019	0.015	0.056
1.0	0.020	0.105	0.064	0.204	0.015	0.026	0.014	0.068
1.2	0.029	0.151	0.083	0.319	0.019	0.019	0.006	0.061
1.4	0.065	0.168	0.111	0.240	0.028	0.013	0.012	0.348
1.6	0.100	0.114	0.103	0.147	0.018	0.027	0.048	0.476
1.8	0.128	0.094	0.080	0.088	0.011	0.066	0.086	0.335
2.0	0.104	0.067	0.052	0.056	0.036	0.093	0.101	0.186
Average	**0.047**	**0.086**	**0.135**	**0.116**	**0.015**	**0.031**	**0.035**	**0.160**

MPE Inside Vehicle:

Roof mounted Antenna		
Internal, Front Seat	λ/4 antenna	5λ/8 antenna
Units	Power Density, mW/cm^2	
Head	0.023	0.009
Upper torso	0.015	0.013
Lower torso	0.035	0.015
Average	**0.024**	**0.012**

Roof Mounted Antenna		
Internal, Back Seat	λ/4 antenna	5λ/8 antenna
Units	Power Density, mW/cm^2	
Head	0.046	0.012
Upper torso	0.401	0.026
Lower torso	0.062	0.028
Average	**0.170**	**0.022**

Trunk Mounted Antenna		
Internal, Front Seat	λ/4 antenna	5λ/8 antenna
Units	Power Density, mW/cm^2	
Head	0.071	0.013
Upper torso	0.092	0.022
Lower torso	0.071	0.014
Average	**0.078**	**0.016**

Trunk Mounted Antenna		
Internal, Back Seat	λ/4 antenna	5λ/8 antenna
Units	Power Density, mW/cm^2	
Head	0.369	0.058
Upper torso	0.178	0.050
Lower torso	0.161	0.049
Average	**0.236**	**0.052**

Measurement Uncertainty:

Field Probe: ± 1 dB

Test Equipment Used:

Equipment	Type	Serial Number	Calibration date	Calibration Due
RF Power Sensor	HP11722A	2320A00688	2003-10-15	2004-10-15
Modulation Analyser	HP8901B (OPT 002)	3704A05837	2003-10-15	2004-10-15
Isotropic Field Probe	Holaday HI-422	95661	2002-05-28	2005-05-28
Antenna Mast	Tait Electronics Ltd	-	-	-

Information to be placed in User/Installation manual:

Warning:

Warning: RF Exposure Hazard
To comply with FCC RF exposure limits, this product must be installed using an externally mounted antenna with either a 2.15dBi or 5.15dBi gain. This antenna must not be mounted at a location such that any person or persons can come closer than 0.9m (35 inches) to the antenna.

Safety Training Information:

Warning: FCC RF Exposure Limits
This product generates RF (radio frequency) energy during transmissions. This device must be restricted to work-related use in an occupational/controlled exposure environment. The radio operator must have control of the exposure conditions and duration of all persons exposed to the antenna of this transmitter to satisfy FCC RF exposure compliance.

- This device is not approved for general population use.
- This device must only be used with authorised accessories and antennas.

The operator must ensure that the minimum safe distance of 0.9m (35 inches) between persons and the antenna is maintained during transmissions. This minimum safe distance is based on the assumption that there is a duty cycle of 50% transmit mode to stand-by or receive modes. The radio is in transmit mode when the PTT (press-to-talk) key on the microphone is pressed and the control head red LED (light emitting diode) glows.

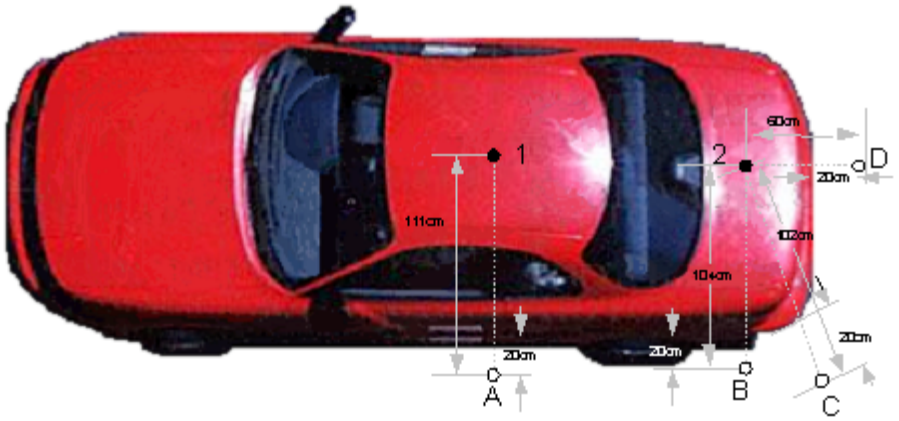
Please refer to the following website for more information on what RF energy is and how to control your exposure to assure compliance with established RF exposure limits.

Website: http://www.fcc.gov/oet/rfsafety/rf-faqs.html

END

Appendix A

'Antenna Location Drawing with Test Locations Identified'

1 Roof (center)
2 Trunk (center)

External Test Positions