REPORT ON

RF Exposure Assessment
Park Air Systems Limited Ground to Air VHF Transceiver Model Number 6525 MDR

Report No WS615642/02 Issue 1 **May 2007**

Product Service

Choose certainty. Add value.

Commercial-in-Confidence

TUV Product Service Ltd, Octagon House, Concorde Way, Segensworth North,
Fareham, Hampshire, United Kingdom, PO15 5RL
Tel: +44 (0) 1489 558100. Website: www.tuvps.co.uk; www.babt.com

REPORT ON RF Exposure Assessment Park Air Systems Limited Ground to Air VHF Transceiver Model Number 6525 MDR

Report No WS615642/02 Issue 1

May 2007

PREPARED FOR

Park Air Systems Limited
Northfields
Market Deeping
Peterborough
PE6 8UE
England
United Kingdom

ATTESTATION

The wireless device described within this report has been shown to be capable of compliance with the basic restrictions related to human exposure to electromagnetic fields (10 MHz - 300 MHz) - General public.
The calculations shown in this report were made in accordance the procedures specified in the applied test specification(s).

All reported calculations were carried out on a sample of equipment to demonstrate compliance with the applied test specification(s) the sample tested was found to comply with the requirements of the applied rules.

PREPARED BY

A Miller
Principal Engineer

APPROVED BY

M Jenkins
Authorised Signatory

DATED 4th May 2007

CONTENTS

SECTION 1

REPORT SUMMARY

SUMMARY

Based upon the supplied data for Ground to Air VHF Transceiver Model Number 6525 MDR and point of investigation being **1.260 m** (126.000 cm)

RF LIMITS FOR DEVICS USED BY THE GENERAL PUBLIC

The calculations have shown that they **meet** the RF limits for Devices used by General Public Exposure Levels described in the Health Canada's RF exposure guideline Safety Code 6 [3].

RF LIMITS FOR CONTROLLED USE DEVICES

The calculations have shown that they **meet** the RF limits for Controlled use Devices Exposure Levels described in Health Canada's RF exposure guideline Safety Code 6 [3]

1.1 STATUS

APPLICANT	Park Air Systems Limited
MANUFACTURING DESCRIPTION	Ground to Air VHF Transceiver
MODEL NUMBER	6525 MDR

1.2 TEST SPECIFICATIONS

1. RSS-102 Issue 2 November 2005 Radio frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

1.3 REFERENCES

2. IEEE Std C95.3-2005: IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3KHz to 300GHz

3. Health Canada's Safety Code: Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 KHz to 300 GHz.

4. IEEE Std C95.1-2005: IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3KHz to 300GHz.

5. EN 50383:2002 - Basic standard for the calculation and measurement of electromagnetic field strength and SAR related to human exposure from radio base stations and fixed terminal stations for wireless telecommunication systems (110 MHz - 40 GHz).

1.4 SUMMARY

The equipment subject to the RF exposure assessment is a Ground to Air VHF Transceiver model number 6525 MDR**.** The RF exposure assessment is based upon the following criteria:-

- The Ground to Air VHF Transceiver operates in the frequency range of 118.000 MHz to 136.975 MHz, the numeric gain of the Ground to Air VHF Transceiver is assumed as a maximum of 1.585 gain.
- The length of the Ground to Air VHF Transceiver is an assumed 40.34 centimeters.
- 6525 MDR radio power is declared as a maximum 25 Watt with a declared duty cycle of 100%.
- The point of investigation is calculated to be 1.260 m with an assumed maximum antenna gain of 2.0 dBi.

1.5 REQUIRED MINIMUM SEPARARTION DISTANCES

Power Density Field 'S'

The minimum separation distance based upon occupational limit level for the Power Density field 'S' is:

$$S = \frac{PG_{(\theta,\phi)}}{4\pi r^2}$$ Transposed to find '*r*' = $$r = \sqrt{\frac{PG_{(\theta,\phi)}}{4\pi S}}$$

P = 25.0 *W; G* = 1.585*; S = 10.000 W/m*^{2}

Therefore minimum separation distance 'r' = 0.562 *m*

The minimum separation distance based upon general public limit level for the Power Density field 'S' is:

$$S = \frac{PG_{(\theta,\phi)}}{4\pi r^2}$$ Transposed to find '*r*' = $$r = \sqrt{\frac{PG_{(\theta,\phi)}}{4\pi S}}$$

P = 25.0 *W; G* = 1.585*; S = 2.000 W/m*^{2}

Therefore minimum separation distance 'r' = 1.256 *m*

1.5 REQUIRED MINIMUM DISTANCES - CONTINUED

Electric Field 'E'

The minimum separation distance based upon occupational limit level for the electric field 'E' is:

$$E = \frac{\sqrt{30PG}_{(\theta,\phi)}}{r} \qquad \text{Transposed to find 'r' =} \qquad r = \frac{\sqrt{30PG}_{(\theta,\phi)}}{E}$$

P = 25 *W; G = ; E = 60.000 V/m*
Therefore minimum separation distance 'r' = 0.5746 *m*

The minimum separation distance based upon general public limit level for the electric field 'E' is:

$$E = \frac{\sqrt{30PG}_{(\theta,\phi)}}{r} \qquad \text{Transposed to find 'r' =} \qquad r = \frac{\sqrt{30PG}_{(\theta,\phi)}}{E}$$

P = 25 *W; G* = 1.585*; E = 28.000 V/m*
Therefore minimum separation distance = 1.2313 *m*

Magnetic Field 'H'

The minimum separation distance based upon occupational limit level for the Magnetic field 'H' is:

$$H = \frac{E}{\eta_o} \qquad \text{Transposed to find 'r' =} \qquad r = \frac{\sqrt{30PG}}{\eta_o H}$$

P = 25 *W; G = ; H = 0.163 A/m; η_0 = free space wave impedance = 120 π (377)* Ω
Therefore minimum separation distance = 0.5611 *m*

The minimum separation distance based upon general public limit level for the Magnetic field 'H' is:

$$H = \frac{E}{\eta_o} \qquad \text{Transposed to find 'r' =} \qquad r = \frac{\sqrt{30PG}}{\eta_o H}$$

P = 25 *W; G = ; H = 0.073 A/m; η_0 = free space wave impedance = 120 π (377)* Ω
Therefore minimum separation distance 'r' = 1.2528 *m*

SECTION 2

TEST DETAILS

2.1 RATIONALE FOR ASSESSMENT OF THE RF EXPOSURE

The aim of the assessment report is to evaluate the compliance boundary for a set of given input power(s) according to the basic restrictions (directly or indirectly via compliance with reference levels) related to human exposure to radio frequency electromagnetic fields.

The chosen assessment method to establish the compliance boundary in the far-field region is the reference method as defined in EN50383:2002 Clause 5.2; E-filed or H-field calculation. The method of calculation used is defined in EN50383:2002; Clause 8.2.2, 8.2.3 and 8.2.4.

The calculated values have been compared with limits provided in the Health Canada's Safety Code 6 [3]. Calculations can be made in three separate regions, based on distance from the antenna. These are called:-

- far-field region,
- radiating near-field region,
- reactive near-field region.

The theory that defines these regions is given in EN50383:2002 Annex A.

Far-field region
As shown in EN50383 Annex A, the far-field calculations are accurate when the distance, r, from an antenna of length D to a point of investigation is greater than

$$r = \frac{2D^2}{\lambda}$$

Where, r is the distance from the antenna to the point of investigation.

Radiating near-field region
The radiating near-field region of an antenna of length D as shown in EN50383 Annex A, this region is defined by

$$\frac{\lambda}{4} < r > \frac{2D^2}{\lambda}$$

Reactive near-field region
The reactive near-field region of an antenna as shown in EN50383 Annex A, this region is defined by

$$r \leq \frac{\lambda}{4}$$

Where, r is the distance from the antenna to the point of investigation.

Recommend λ/4 as the boundary between the radiated near-field and reactive near-field for RF exposure compliance assessment.

2.2 DEFINED LIMITS

Normative Reference: ICNIRP Advice on Limiting Exposure to Electromagnetic Fields (0-300GHz). Table A4, Reference Levels for General Public Exposure to Time Varying Electric & Magnetic Fields. Vol 15 No.2. 2004.

Reference levels for occupational exposure to time-varying electric and magnetic fields (unperturbed rms values)

At 118.000 MHz

E-Field (Vm^{-1}) = 60.000

H-Field (Am^{-1}) = 0.163

Power density (mW/cm^2) = 10.000

Reference levels for general public exposure to time-varying electric and magnetic fields (unperturbed rms values)

At 118.000MHz

E-Field (Vm^{-1}) = 28.000

H-Field (Am^{-1}) = 0.073

Power density (mW/cm^2) = 2.000

2.3 ESTABLISHING WAVELENGTH AND 1/4 WAVELENGTH

Frequency (MHz)	$\lambda = \frac{3x10^8}{f}$		$\frac{\lambda}{4}$	
	m	cm	m	cm
136.975	2.1902	219.02	0.5475	54.75
127.488	2.3532	235.32	0.5883	58.83
118.000	2.5424	254.24	0.6356	63.56

2.4 FAR FIELD CALCULATIONS

The following calculations are based on: 2.0 dBi gain antenna

P = 25.0 (Power (Watts)) or 25000.0 (Power milliwatts)
G = 1.585 (Numeric Gain)
r = 1.260 (Distance (meters)) or 126.00 (Distance (centimetres))

The power flux:

$$S = \frac{PG_{(\theta,\phi)}}{4\pi r^2}$$ *S = 1.986* W/m^2

The electric field strength

$$E = \frac{\sqrt{30PG}_{(\theta,\phi)}}{r}$$ *E = 27.363* Eeff V/m

The magnetic field strength

$$H = \frac{E}{\eta_o}$$ *H = 0.073* A/m

The calculations **meet** the General Public Exposure Levels described in the ICNIRP Guidelines
The calculations **meet** the Occupational Exposure Levels described in the ICNIRP Guidelines

2.5 FIELD REPRESENTATIONS

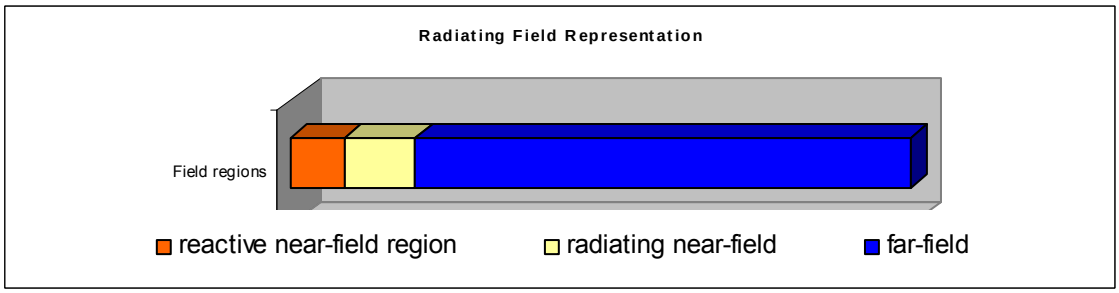

Figure 1 - This graph shows the radiating field representation and is not to scale

Worst case frequency 118.000 MHz
The Reactive near-field region (from antenna) is less than.....: 54.755 cm
The Radiating near-field region is greater than.....: 54.755 cm
The Radiating near-field region is less than.....: 71.282 cm
The Far-field region is greater than.....: 71.282 cm

SECTION 3

FIGURES

3.1 FIELD REPRESENTATIONS

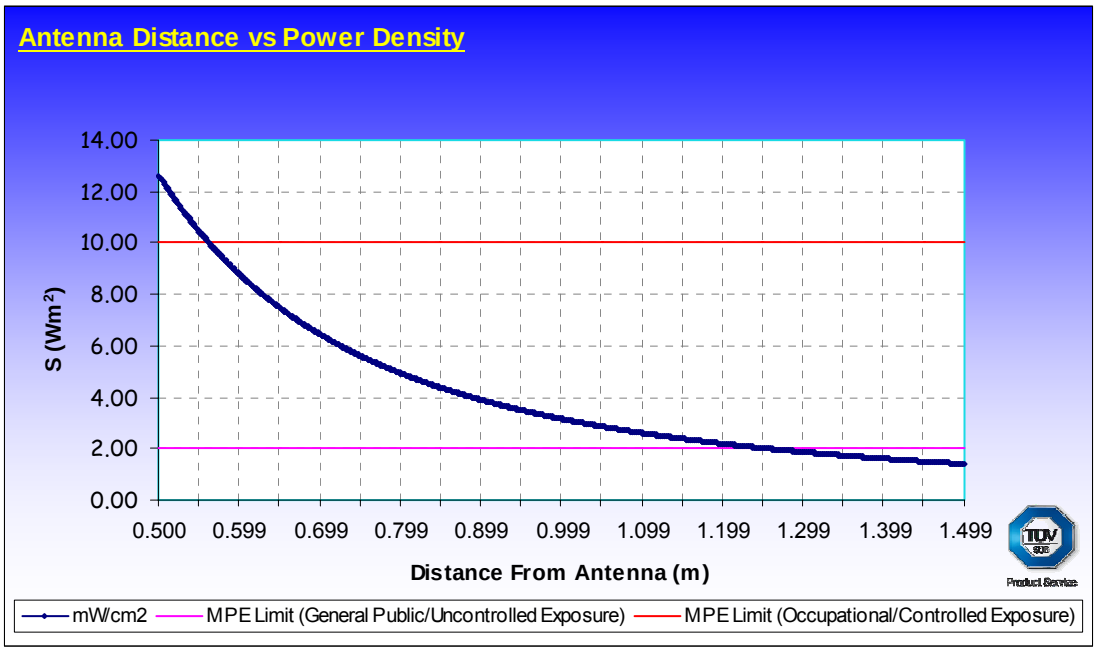

Figure 2 - This graph shows the S field (W/m^2) strength value with regards to distance from the Antenna (m)

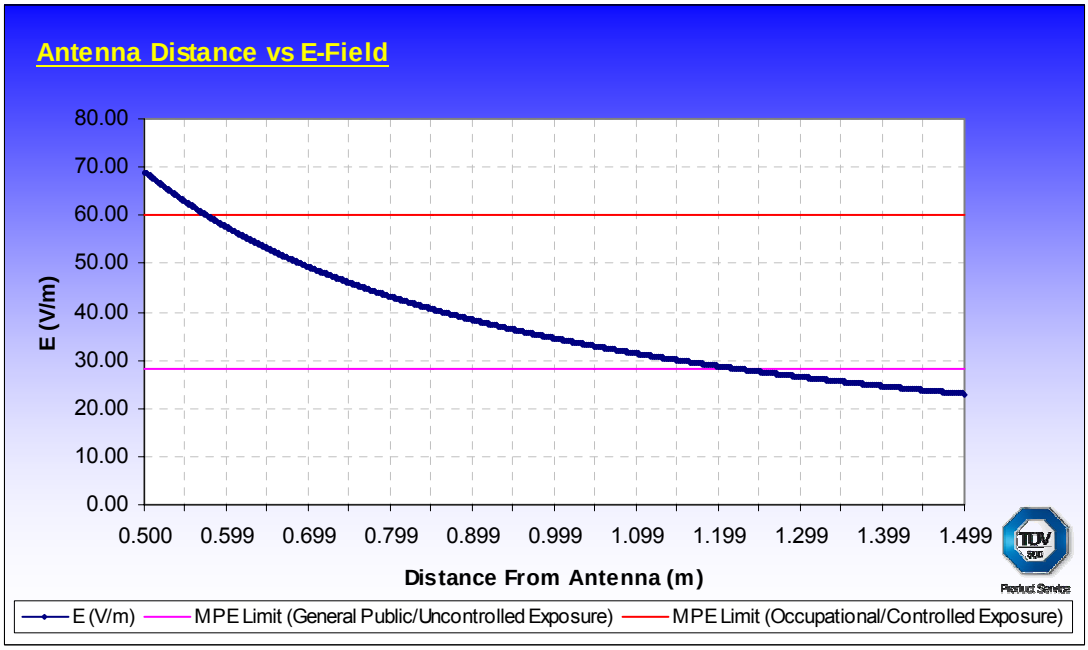

Figure 3 - This graph shows the E field (V/m) strength value with regards to distance from the Antenna (m).

3.1 FIGURES

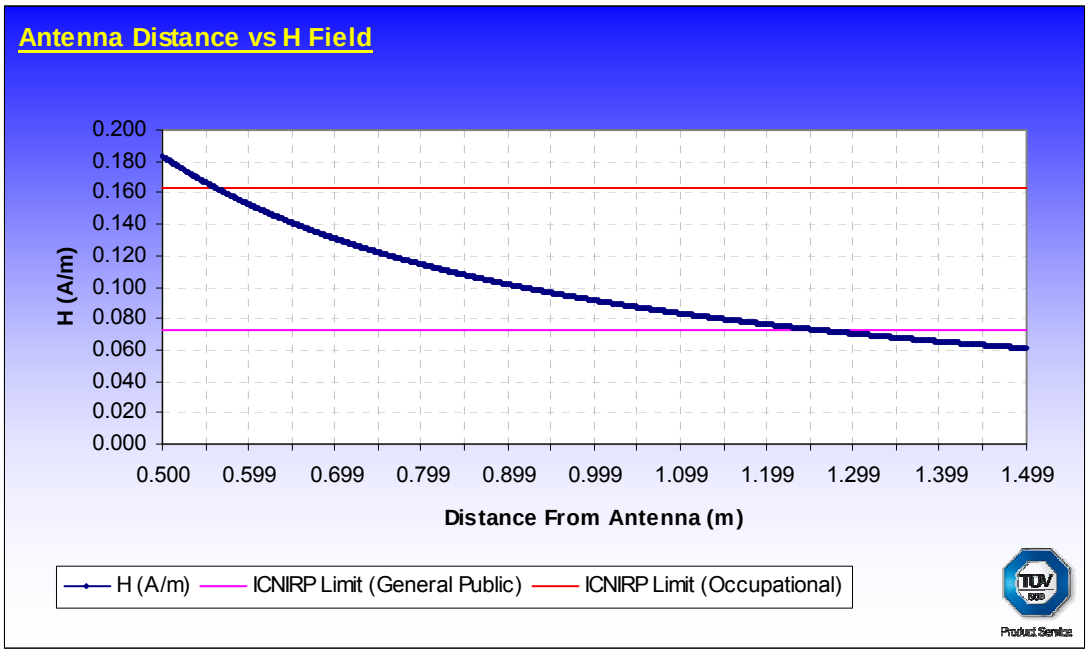

Figure 4 - This graph shows the H field (A/m) strength value with regards to distance from the Antenna (m).

SECTION 4

DISCLAIMERS AND COPYRIGHT

4.1 DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

This report must not be reproduced, except in its entirety, without the written permission of

TUV Product Service Limited