REPORT ON

RF Exposure Assessment
Giant Electronics Limited USB Modem Model Number D301

Doc Number 75902059 Report 01 Issue 2 **August 2007**

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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

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Principal Engineer

APPROVED BY

M Jenkins
Authorised Signatory

DATED 30th August 2007

This report has been up-issued to Issue 2 due to the point of investigation being corrected to 20cm.

CONTENTS

SECTION 1

REPORT SUMMARY

SUMMARY Based upon the supplied data for USB Modem Model Number D301 and point of investigation being **20.0 cm** (0.200 m).
GENERAL PUBLIC LIMITS The calculations have shown that they **meet** the General Public Exposure Levels described in the FCC 47 CFR § 1.1310 Guidelines **OCCUPATIONAL LIMITS** The calculations have shown that they **meet** the Occupational Exposure Levels described in the FCC 47CFR § 1.1310 Guidelines

1.1 STATUS

APPLICANT	Giant Electronics Limited
MANUFACTURING DESCRIPTION	USB Modem
STATUS OF TEST	Specific Absorption Rate Testing
WIRELESS RADIO POWER CLASS	GSM 850 MHz Class 4 GSM 900 MHz Class 4 DCS 1800 MHz Class 1 PCS 1900 MHz Class 1
WIRELESS RADIO GPRS CLASS	Class B
GPRS MULTISLOT CLASS	10(4Dn,2Up,5 Sum)
WCDMA FREQUENCY BAND	FDD1 (1922.4 to 1977.6 MHz) FDD2 (1852.4 to 1906.6 MHz) FDD5 (826.4 to 846.6 MHz)
WCDMA POWER CLASS	Power Class 3 (+24dBm)
MANUFACTURER	Giant Electronics Limited
TYPE OR MODEL NUMBER	D301
HARDWARE VERSION	ES2.0
SOFTWARE VERSION	SLE-2.00PRETEST1
SERIAL NUMBER	20-022F

1.2 TEST SPECIFICATIONS

1. OET Bulletin 65 Edition 97-01 August 1997 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

1.3 REFERENCES

2. National Council on Radiation Protection and Measurements (NRPC) - Report No. 86(1986) "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields".

3. FCC Guidelines for Evaluating exposure to RF Emissions - 47 CFR § 1.1310; 47 CFR § 1.1307(b) & 47 CFR § 80.83.

4. 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).

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

1.4 SUMMARY

The equipment subject to the RF exposure assessment is a USB Modem model number D301**.** The RF exposure assessment is based upon the following criteria:-

- The Vehicle Tracking Device operates in the frequency range of
  GSM 850: 824 – 849MHz / 869 – 894 MHz
  GSM 900: 880 – 915MHz / 925 – 960 MHz
  GSM1800: 1710 - 1785MHz / 1805 – 1880 MHz
  GSM1900: 1850 – 1910MHz / 1930 – 1990 MHz
  WCDMA FDD1: 1920 – 1980 / 2110 – 2170 MHz
  WCDMA FDD2: 1850 – 1910 / 1930 – 1990 MHz
  WCDMA FDD5: 824 – 849 / 869 – 894 MHz
  For the purpose of this assessment the frequency 824.200 MHz coupled with the Antenna gain of -3.5 dBi provided the maximum distance in reference to the point of investigation from the antenna.
- The numeric gain of the USB Modem is 0.447 gain.
- D301 radio power is a maximum 2 Watt.
- The point of investigation is calculated to be 20.0 cm (0.200 m) with a maximum antenna gain of -3.5 dBi.

The UE is fully compliant with 3GPP Rel5 standards defining required UMTS spreading factors. The DPCCH spreading factor is 256 per 3GPP TS 25.213 section 4.3.1.2.1. The DPDCH spreading factor is dependent on number of DPDCH channels and data range. For a single channel the spreading factor can range from 4 to 256. For more then one DPDCH channel the spreading factor is 4. Further details are defined by 3GPP in TS 25.213 section 4.3.1.2.1. HS-DPCCH spreading factor is 256. Further details can be found in 3GPP TS 25.213 section 4.3.1.2.2.

1.5 REQUIRED MINIMUM SEPARATION DISTANCES

Power Density Field 'S'

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

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

P = 2000.0 *mW; G* = 0.447*; S = 2.747 mW/cm*^{2}
Therefore 'r' = 5.087 *cm*

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

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

P = 2000.0 *mW; G* = 0.447*; S = 0.549 mW/cm*^{2}
Therefore 'r' = 11.375 *cm*

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 BS EN50383:2002 Clause 5.2; E-filed or H-field calculation. The method of calculation used is defined in BS EN50383:2002; Clause 8.2.2, 8.2.3 and 8.2.4.

The calculated values have been compared with limits provided in the ICNIRP guidelines. 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. The defined limits are in accordance with 47 CFR § 1.1310 Radiofrequency radiation exposure limits.

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

At 824.200 MHz

Power density (mW/cm^2) = 2.747

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

At 824.200MHz

Power density (mW/cm^2) = 0.549

2.3 ESTABLISHING WAVELENGTH AND 1/4 WAVELENGTH

Frequency (MHz)	$\lambda = \frac{3x10^8}{f}$		$\frac{\lambda}{4}$	
	m	cm	m	cm
848.800	0.3534	35.34	0.0884	8.84
836.400	0.3587	35.87	0.0897	8.97
824.200	0.3640	36.40	0.0910	9.10

2.4 FAR FIELD CALCULATIONS

The following calculations are based on: dBi gain antenna

P = 2 (Power (Watts)) or 2000.0 (Power milliwatts)
G = 0.447 (Numeric Gain)
r = 20.0 (Distance (centimetres)) or 0.200 (Distance (meters))

The power flux:

$$S = \frac{PG_{(\theta,\phi)}}{4\pi r^2}$$ S = 0.178 mW/cm^2

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

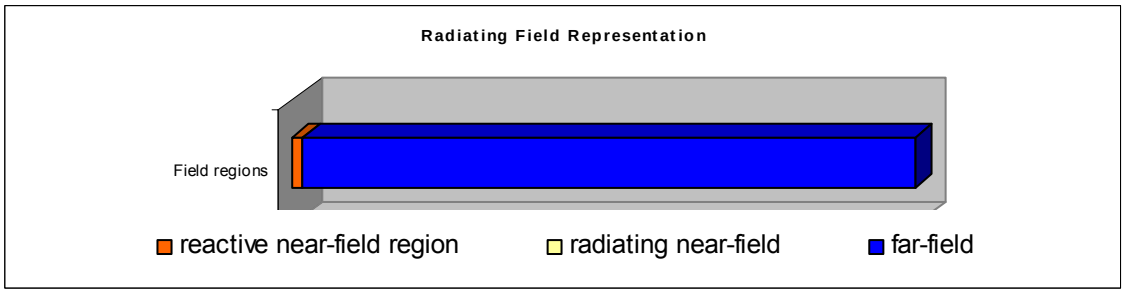

Figure 1 - This graph shows the radiating field representation and is not to scale

Worst case frequency 824.200 MHz
The Reactive near-field region (from antenna) is less than.....: 8.836 cm
The Radiating near-field region is greater than.....: 8.836 cm
The Radiating near-field region is less than.....: 0.007 cm
The Far-field region is greater than..... : 0.007 cm

SECTION 3

FIGURES

3.1 FIELD REPRESENTATIONS

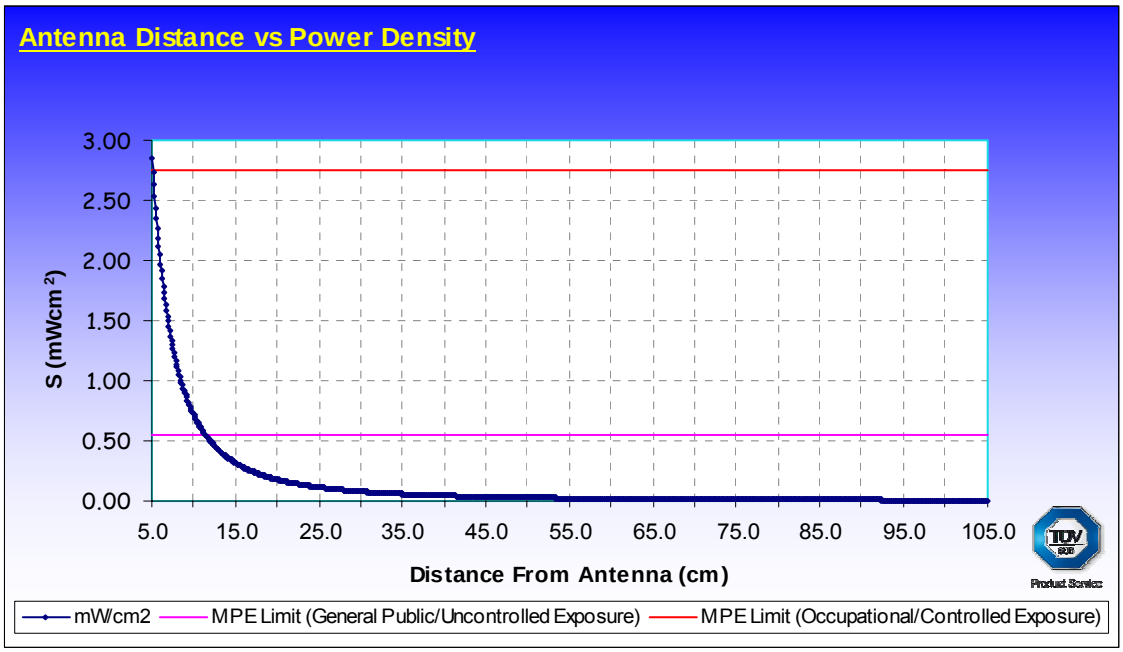

Figure 2 - This graph shows the S field (mW/cm^2) strength value with regards to distance from the Antenna (cm)

SECTION 4

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4.1 DISCLAIMERS AND COPYRIGHT

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