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Report On

RF Exposure Assessment of the
IP Access Ltd.
219C nano3G Picocellular Base Station

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Document 75907109 Report 03 Issue 1 August 2009

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SECTION 1

REPORT SUMMARY

RF Exposure Assessment of the
IP Access Ltd.
219C nano3G Picocellular Base Station

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the RF Exposure Assessment of the 219C nano3G Picocellular Base Station to the requirements of of the applied test specifications.

Objective	To perform RF Exposure Assessment to determine the Equipment Under Test's (EUT's) compliance of the applied rules.
Manufacturer	IP Access Ltd.
Manufacturing Description	3G Picocellular Base Station (Band 4, +13dBm)
Model Number(s)	219C
Serial Number(s)	000295-0000009479
Hardware Version	Main FS Version 400.0 FS Variant 220G
Software Version	XB

Test Specification/Issue/Date

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

Related Document(s)

- National Council on Radiation Protection and Measurements (NRPC) - Report No. 86(1986) "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields".
- Health Canada's Safety Code: Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 KHz to 300 GHz.
- FCC Guidelines for Evaluating exposure to RF Emissions - 47 CFR § 1.1310; 47 CFR § 1.1307(b) & 47 CFR § 80.83.
- 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).
- IEEE Std C95.1-2005: IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3KHz to 300GHz.

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1.2 BRIEF SUMMARY OF RESULTS

1.2.1 General Public Exposure Levels

Antenna Gain (Numeric)	Peak Output Power (mW)	Field	Calculated RF Exposure at 20.0cm	General Public Exposure Limit	Standard
0 dBi	20	S	0.004mW/cm^2	1.00	FCC 47 CFR § 1.1310
		E	3.873V/m	N/A	FCC 47 CFR § 1.1310
		H	0.010A/m	N/A	FCC 47 CFR § 1.1310

The calculations have shown that they meet the General Public Exposure Levels described in the FCC 47 CFR § 1.1310 Guidelines at 20.0cm point of investigation.

1.2.2 Occupational Exposure Levels

Antenna Gain (Numeric)	Peak Output Power (mW)	Field	Calculated RF Exposure at 20.0 m (1.000 cm)	Occupational Exposure Limit	Standard
0 dBi	20	S	0.004mW/cm2	5.00	FCC 47 CFR § 1.1310
		E	3.873V/m	N/A	FCC 47 CFR § 1.1310
		H	0.010A/m	N/A	FCC 47 CFR § 1.1310

The calculations have shown that they meet the Occupational Exposure Levels described in the FCC 47 CFR § 1.1310 Guidelines at 20.0 cm point of investigation.

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1.3 PRODUCT INFORMATION

1.3.1 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).

1.3.2 Technical Description

The Equipment Under Test was a IP Access Ltd. 219C nano3G Picocellular Base Station. A full technical description can be found in the manufacturer's documentation.

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 the relevant information supplied or measured of a sample of 219C nano3G Picocellular Base Station to demonstrate compliance with the applied test specification(s) the sample assessed was found to comply with the requirements of the applied rules.

1.4 SUMMARY

The RF exposure assessment is based upon the following criteria:

The 219C nano3G Picocellular Base Station operates in the frequency range of 2110-2155MHz

The numeric gain of the 219C nano3G Picocellular Base Station is 1.
The 219C nano3G Picocellular Base Station radio power is a maximum 20 milliWatt.
The point of investigation is 20.0 cm (0.02 m).
The antenna gain 0dBi.

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SECTION 2

TEST DETAILS

RF Exposure Assessment of the
IP Access Ltd.
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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.

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

At 2112.500 MHz

Power density ($mWcm^2$)	= 1.00	FCC 47 CFR § 1.1310
E-Field (Vm-1)	= N/A	FCC 47 CFR § 1.1310
H-Field (Am-1)	= N/A	FCC 47 CFR § 1.1310

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

At 2112.500 MHz

Power density ($mWcm^2$)	= 5.00	FCC 47 CFR § 1.1310
E-Field (Vm-1)	= N/A	FCC 47 CFR § 1.1310
H-Field (Am-1)	= N/A	FCC 47 CFR § 1.1310

2.3 ESTABLISHING WAVELENGTH AND 1/4 WAVELENGTH

Frequency (MHz)	$\lambda = \frac{3x10^8}{f}$		$\frac{\lambda}{4}$	
	m	cm	m	cm
2112.5	0.1420	14.20	0.0355	3.55
2132.5	0.1407	14.07	0.0352	3.52
2152.5	0..1394	13.94	0.0348	3.48

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2.4 FAR FIELD CALCULATIONS

The following calculations are based on 0 dBi gain antenna

P = 0.02 (Power (Watts) or 20 (Power milliwatts)
G = 1 (Numeric Gain)
r = 20.0 (Distance (centimetres) or 0.02 (Distance (meters)

The power flux:

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

S = 0.040W/m2

S = 0.004mW/cm2

The electric field strength:

$$E = \frac{\sqrt{30PG}_{(\theta,\phi)}}{r}$$

E = 3.873 V/m

The magnetic field strength:

$$H = \frac{E}{\eta_o}$$

H = 0.010A/m

The calculations meet the General Public Exposure Levels described in the FCC 47CFR§1.1310

The calculations meet the Occupational Exposure Levels described in the FCC 47CFR§1.1310

2.5 FIELD REPRESENTATIONS

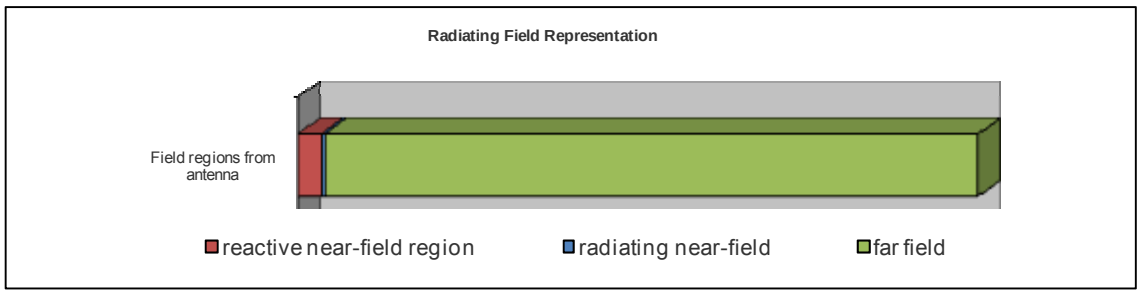

Figure 1: This graph shows the radiating field representation and is not to scale

Worst case frequency 2112.500 MHz
The Reactive near-field region (from antenna) is less than : 0.036m (3.55cm)
The Radiating near-field region is greater than : 0.036m (3.55cm)
The Radiating near-field region is less than : 0.006m (0.56cm)
The Far-field region is greater than : 0.006m (0.56cm)

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SECTION 3

FIGURES

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3.1 FIELD REPRESENTATIONS – FCC

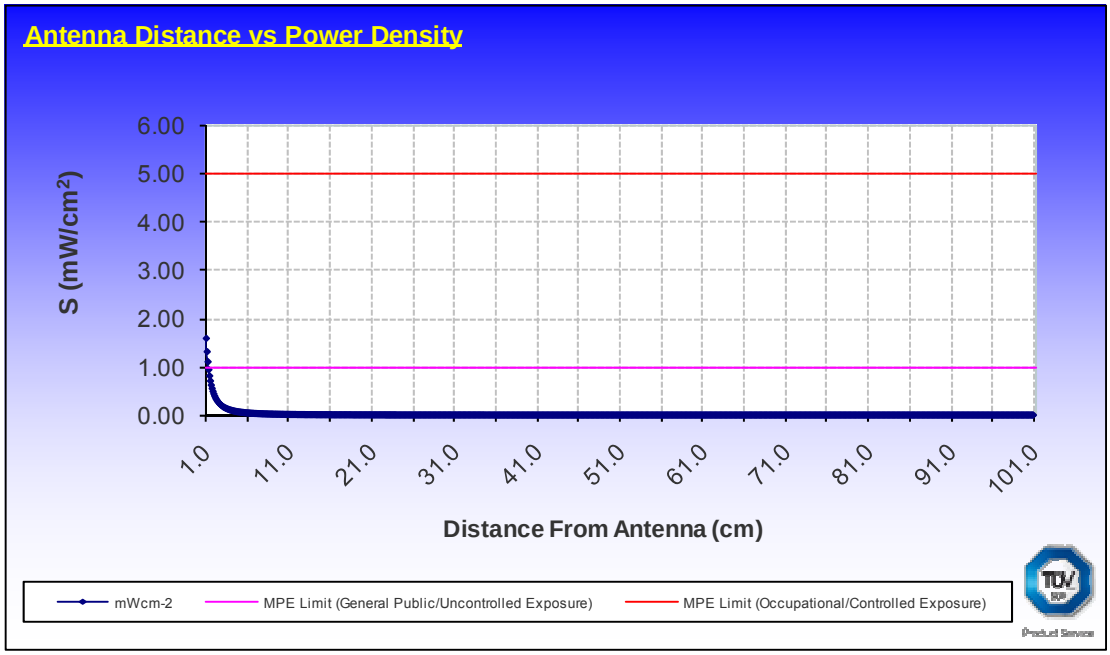

Figure 2

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

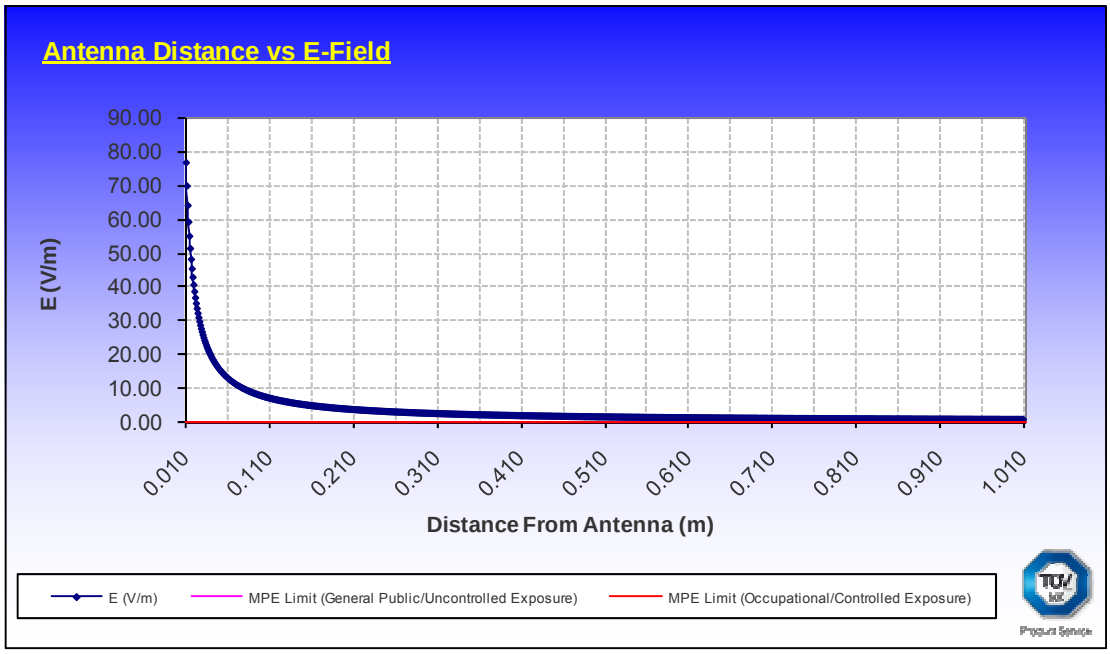

Figure 3 - This graph shows the E field (V/m) strength value with regards to distance from the Antenna (cm).

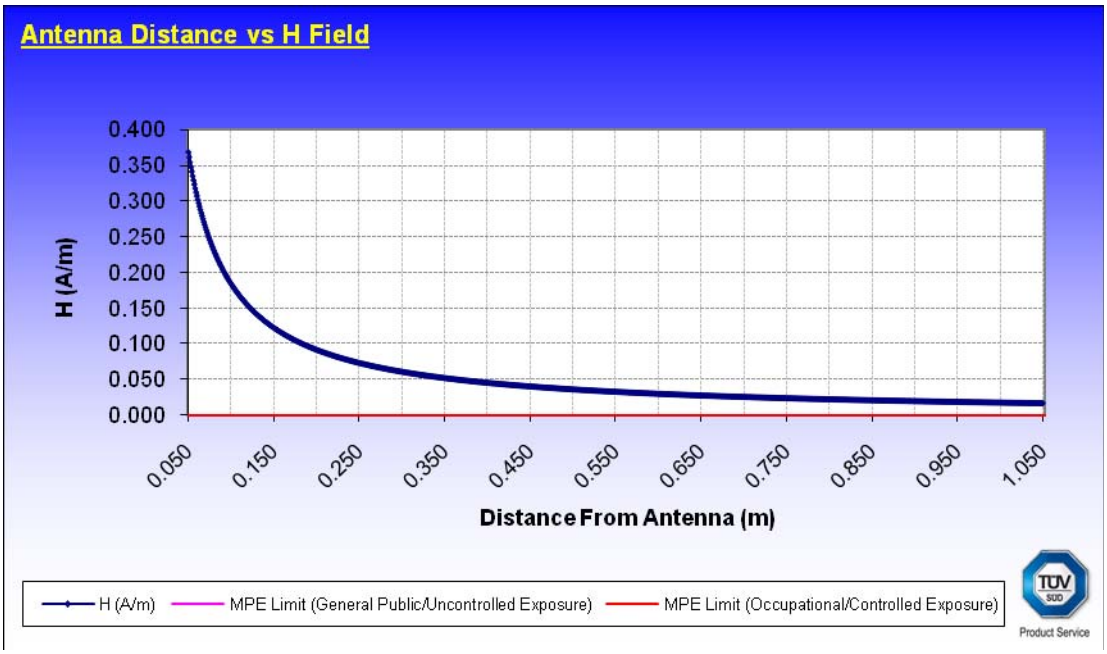

Figure 4 - This graph shows the H field (A/m) strength value with regards to distance from the Antenna (cm).

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SECTION 4

DISCLAIMERS AND COPYRIGHT

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4.1 DISCLAIMERS AND COPYRIGHT

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