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Radio Frequency Fields Survey  
at  
Warrnambool Campus  
Princes Highway, Warrnambool, VIC 3280

For  
Deakin University

EMC Technologies Report No. M060728

Date: 28<sup>th</sup> August 2006



NATA Accredited  
Laboratory  
Number: 5292

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**Radio Frequency Fields Survey  
at  
Warrnambool Campus  
Princes Highway, Warrnambool**

**Report Number: M060728**

**Site Address:** Princes Highway  
Warrnambool, VIC 3280

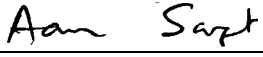
**Client:** Deakin University  
**Address:** Melbourne Campus  
Burwood, VIC 3125

**Contact:** Michael O'Donoghue  
**Phone:** (03) 9246 8175

**Survey Dates:** 27<sup>th</sup> July 2006

**Exposure Standard:** *the Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz (2002)-RPS3, published by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).*

**Measurements Performed by:**   
Steven Kolar

**Authorised Signatory:**   
Aaron Sargent  
EMR Engineer (BEng)



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# Radio Frequency Fields Survey At Princes Highway, Warrnambool

## 1.0 INTRODUCTION

The purpose of this survey was to measure the Radio Frequency (RF) field levels at the Deakin University, Princes Highway, Warrnambool, VIC 3280.

This report contains the results of the broadband RF Electromagnetic Radiation (EMR) measurements conducted at various locations around the university on the 26<sup>th</sup> of July 2006.

The RF fields were compared against the limits of *the Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz (2002)*-RPS3, published by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). The provisions of the ARPANSA standard are mandated by the Australian Communications and Media Authority (ACMA) to protect the general public from over-exposure to RF fields from radio transmitters.

The RF field measurements were performed in accordance with EMC Technologies NATA accreditation, using appropriate measurement equipment and procedures.

The terms electromagnetic radiation (EMR) and electromagnetic energy (EME) have the same meaning when used in this report.

## 2.0 EXECUTIVE SUMMARY

### Compliance with ARPANSA Radiation Protection Standard No 3

All measured RF field levels at the specified locations at the school were at least 750 times below the recommendations specified in the ARPANSA standard for general public/non-occupational exposure.

## 3.0 SCOPE OF THE MEASUREMENTS

Broadband RF Field measurements were performed in the frequency range 100kHz to 3.0 GHz for Electric (E-Field) in units of Volts per metre (V/m). The levels recorded were then converted to Power Density in Watts per metre squared ( $W/m^2$ ) and compared against the reference levels (limits) specified by the ARPANSA standard.

All results in this report are indicative only of the time they were recorded, as RF Field levels are dependent on the actual telecommunication traffic at the time of the measurement.



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## 4.0 THE AUSTRALIAN STANDARDS, REGULATIONS & DEFINITIONS

### 4.1 Reference Standards and Regulations

#### **Portable Devices and Mobile Stations**

The *Australian Communications Media Authority (ACMA) Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard 2003* is the mandatory standard for equipment compliance with the *Radiocommunications Act 1992*. It refers to the provisions of the ARPANSA standard and applies to handheld and portable RF transmitting devices such as mobile phones, walkie-talkies, WLAN devices, and similar devices using RF transmitters.

#### **Apparatus and Transmitters**

The *ACMA Radiocommunications Licence Conditions (Apparatus Licence) Determination 2003* sets out the conditions for the licence to operate transmitting equipment. It mandates the General Public/non-occupational provisions of the ARPANSA standard. Further information can be gained from the ACMA web site: <http://www.acma.gov.au/standards/index.htm>.

#### **Human Exposure Standard**

The *Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz (2002)*, referred to as the ARPANSA standard, sets limits for human exposure to RF fields to prevent adverse health effects. The ARPANSA Standard specifies basic restrictions for occupational and general public exposure. It also stipulates equipment and usage parameters in order to assist in the determination of compliance with the specified limits.

#### **RF Field Measurements and Evaluations- Methodology**

The *Australian Standard AS 2772.2:1988 Radio Frequency Radiation, Part 2: Principles and Methods of Measurements – 300kHz to 100GHz*, specifies techniques and instrumentation for the measurement of potentially hazardous electromagnetic sources. The measurements were performed in accordance with this standard.



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## 4.2 Definitions

### Basic Restrictions

Mandatory limits on exposure to RF fields are based on established health effects and are termed 'Basic Restrictions'. Protection against adverse health effects requires that these Basic Restrictions are not exceeded. However, these mandatory Basic Restrictions are impractical to measure, therefore, a set of Reference Levels utilising quantities much easier to measure was established as an alternate means of compliance with the Basic Restrictions.

### Reference Levels

The Reference Levels were conservatively formulated such that conformity with these Reference Levels will ensure compliance with the Basic Restrictions. The Reference Levels cited in the report are measured as quantities of Volts per metre (V/m), Amps per metre (A/m) and Watts per square metre ( $W/m^2$ ).

### General Public/Non-Occupational Exposure

Exposure of persons, other than in the course of or intrinsic to their work. This category includes persons of all ages and health status who will be generally unaware that exposure is taking place. The exposure of the general public and workers in the precincts of the area surveyed is regarded as General Public/Non-occupational exposure

### Occupational Exposure

Exposure under controlled conditions, in the course of and intrinsic to the nature of their work, of a population consisting of adults who are trained or informed to be aware of potential risks and to take appropriate precautions. The duration of occupational exposure is limited to the duration of the working day or duty shift per 24 hours and the duration of the working lifetime. This category excludes pregnant workers, who must not be exposed at levels in excess of the non-occupational limit.

## 4.3 Exposure Limits – Reference Levels

The ARPANSA standard defines the limits of exposure in terms of Power flux density, Electric and Magnetic fields for the relevant frequency. Compliance with the Basic Restrictions is presumed if the Reference Levels are not exceeded.

Levels cited in the report are measured as quantities of Watts per metre squared ( $W/m^2$ ).

**Table 1: Extract from Table 7 of the ARPANSA RPS3 Standard**

Frequency Range (f)	General Public Limit ( $W/m^2$ )
10 MHz – 400MHz	2
400MHz – 2,000MHz	$f / 200$
2,000MHz – 300,000MHz	10

Note: f is the frequency in MHz

The most conservative limit (10MHz – 400Mhz range) has been applied to the measured levels. The recorded values will be compared to the limit of  $2 W/m^2$  in this report.



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## 5.0 MEASUREMENT EQUIPMENT

**Table 2: Equipment Details**

Equipment	Model	Freq. Range	Last Cal	Cal Due
Broadband Probe E Field	EMR 300	100kHz – 3.0 GHz	07/04/2006	07/04/2008

### Measurement Uncertainty

The following measurement uncertainty has been conservatively determined in accordance with ISO17025 and NATA requirements.

Broadband E-field Measurement Uncertainty:

Broadband Probe	$\pm 1.2$ dB
Environmental	$\pm 1.8$ dB (Worst case)
<b>Total:</b>	<b><math>\pm 3.0</math> dB</b>



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## 6.0 MEASUREMENT PROCEDURE

Broadband RF EMR measurements were made using the Wandel and Golterman (now called NARDA) EMR-300 Electric Field Strength meter. Measurements were performed at head height (approx 1.8m) unless otherwise specified.

### 6.1 Measurement Positions

Measurements were performed in most generally accessible areas of the Deakin University, Warrnambool campus located at Princes Highway, Warrnambool, VIC 3280. See Table 3 for a list of all measurement positions. Refer to Appendix B for diagrams of measurement positions.



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## 7.0 RESULTS OF RF FIELDS MEASUREMENTS

### 7.1 Broadband Results

The broadband RF field strengths measured are listed in the following table. All measurements were taken at head height (approx 1.8m) unless otherwise stated. The measurement sensitivity of the Narda field probe was 0.1326% of the Reference Level.

**Table 3: Broadband Results**

Pos	Position Level	Power Density W/m <sup>2</sup>	Limit W/m <sup>2</sup>	% of Limit W/m <sup>2</sup>
1	General Area	< 0.002653	2.00	< 0.1326%
2	General Area	< 0.002653	2.00	< 0.1326%
3	General Area	< 0.002653	2.00	< 0.1326%
4	Entire Building	< 0.002653	2.00	< 0.1326%
5	General Area	< 0.002653	2.00	< 0.1326%
6	Perimeter	< 0.002653	2.00	< 0.1326%
7	Perimeter	< 0.002653	2.00	< 0.1326%
8	Carpark Area	< 0.002653	2.00	< 0.1326%
9	Front Fence	< 0.002653	2.00	< 0.1326%
10	Entire Area	< 0.002653	2.00	< 0.1326%
11	Entire Area	< 0.002653	2.00	< 0.1326%
12	Entire Area	< 0.002653	2.00	< 0.1326%
13	Entire Area	< 0.002653	2.00	< 0.1326%
14	Entire Area	< 0.002653	2.00	< 0.1326%
15	Entire Area	< 0.002653	2.00	< 0.1326%
16	Entire Area	< 0.002653	2.00	< 0.1326%
17	Perimeter	< 0.002653	2.00	< 0.1326%
18	Carpark Area	< 0.002653	2.00	< 0.1326%
19	Entire Building + Perimeter	< 0.002653	2.00	< 0.1326%
20	Carpark Area	< 0.002653	2.00	< 0.1326%
21	Entire Area	< 0.002653	2.00	< 0.1326%
22	Centre	< 0.002653	2.00	< 0.1326%
23	Perimeter	< 0.002653	2.00	< 0.1326%
24	Front Fence	< 0.002653	2.00	< 0.1326%
25	All Levels	< 0.002653	2.00	< 0.1326%
26	Perimeter	< 0.002653	2.00	< 0.1326%
27	Perimeter	< 0.002653	2.00	< 0.1326%
28	All Levels	< 0.002653	2.00	< 0.1326%
29	All Levels	< 0.002653	2.00	< 0.1326%
30	Entire Area	< 0.002653	2.00	< 0.1326%
31	All Levels	< 0.002653	2.00	< 0.1326%
32	Entire Building + Perimeter	< 0.002653	2.00	< 0.1326%
33	All Levels	< 0.002653	2.00	< 0.1326%
34	All Levels	< 0.002653	2.00	< 0.1326%
35	Entire Building + Perimeter	< 0.002653	2.00	< 0.1326%
36	Entire Building + Perimeter	< 0.002653	2.00	< 0.1326%
37	Perimeter	< 0.002653	2.00	< 0.1326%

*Refer to Appendix A for diagram of measurement positions.*



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## 8.0 CONCLUSION

Broadband RF EMR Measurements were performed at Deakin University, Warrnambool campus, located at Princes Highway, Warrnambool, VIC 3280. Measurements were performed outside the buildings and throughout rooms and corridors within the building.

### **Broadband RF Field Strengths**

All areas surveyed recorded RF exposure levels below limits prescribed by the ARPANSA standard. The highest field strength measured at Deakin University Warrnambool campus, located at Princes Highway, Warrnambool, VIC 3280 was at least 750 times below the General Public limit set by ARPANSA RPS3.



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**Appendix A – Photos of site – RF Sources**



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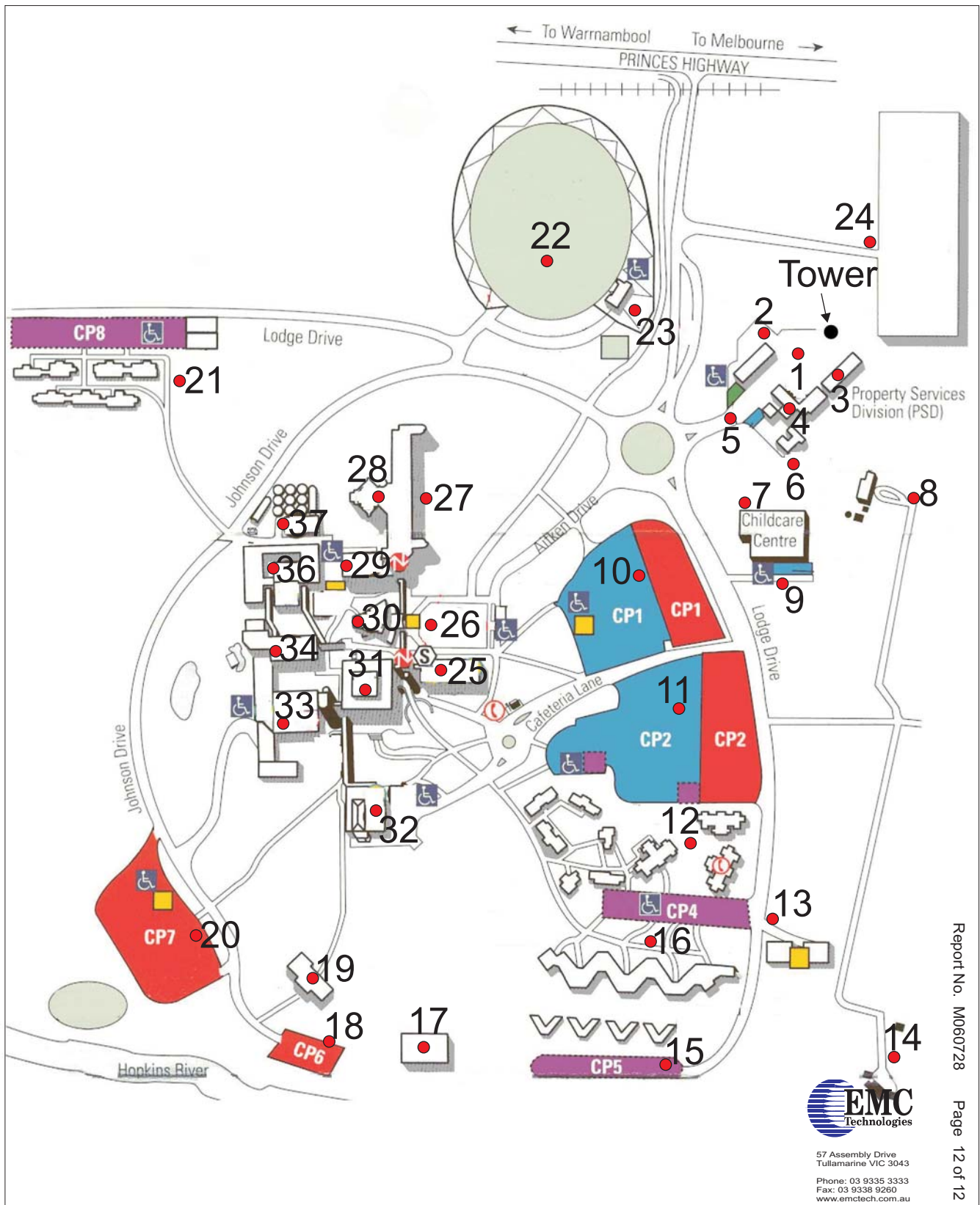


## Appendix B – Diagram of measurement positions



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LOCATION:  
 Deakin University  
 Princes Highway  
 Warrnambool  
 VIC 3280

**Figure 1: All Measurement Points**

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PROJECT No: M060728  
 DATE: 07-08-2006  
 DO NOT SCALE  
 FIGURE 1