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RF EME SURVEY REPORT

CAROLINE SPRINGS-V

NSA No. 3023022

CAROLINE SPRINGS VIC 3023

September2016

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RF EME SURVEY REPORT

For

Vodafone Hutchinson Australia
Level 4, 31 Duncan Street
Fortitude Valley QLD 4006

At

Caroline Springs-V NSA No.3023022
72-80 Caroline Springs Boulevard
Caroline Springs VIC 3023

Measurement Date: 26 September 2016

Reference No: 3650-5602

Measurement Officer: Phillip Knipe

Approved Signatory

P. J. Knipe

Name: Dr Phillip Knipe
Title: Consultant Physicist
Date: 26/09/2016
Total Radiation Solutions Pty Ltd

NATA Accredited Laboratory Number: 15096

This document is issued in accordance with requirements for compliance with ISO/IEC 17025.

The results of the measurements included in this document are traceable to Australian / National Standards.

Contents

1. Introduction

Vodafone Hutchinson Australia (Vodafone) has installed a mobile phone base station (RBS) at 72-80 Caroline Springs Boulevard, Caroline Springs, VIC, 3023.

Consequently, Vodafone requested that Total Radiation Solutions (TRS) complete a radiofrequency electromagnetic energy (RF EME) survey.

The purpose of this survey is to determine the existing environmental RF EME levels, including those due to the RBS, at selected locations of interest.

This report is based on measurements taken during the survey.

2. Regulatory Exposure Limits

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), an agency of the Commonwealth Department of Health has established a Radiation Protection Standard (RPS3) specifying limits for continuous exposure to RF EME transmissions (Table 1). Further information can be gained from the ARPANSA web site at http://www.arpansa.gov.au .

The Australian Communications and Media Authority (ACMA) mandates exposure limits for continuous exposure of the general public to RF EME. Further information can be found at the ACMA website at http://www.acma.gov.au.

Table 1 Reference Levels for Time Averaged Exposure to RMS Electric and Magnetic Fields (Unperturbed Fields) (ARPANSA)

Exposure Category	Frequency Range	E-Field Strength (V/m rms)	H-Field Strength (A/m rms)	Power Flux Density (W/m^2)
Occupational (RF Worker)	100 kHz – 1 MHz	614	1.63/f	N/A
	1 MHz – 10 MHz	614/f	1.63/f	1000 / f^2
	10MHz – 400 MHz	61.4	0.163	10
	400 MHz – 2 GHz	3.07 x $f^{0.5}$	0.00814 x $f^{0.5}$	f / 40
	2 GHz – 300 GHz	137	0.364	50
Non-Occupational (General Public)	100 kHz – 150 kHz	86.8	4.86	N/A
	150 kHz – 1 MHz	86.8	0.729/f	N/A
	1 MHz – 10 MHz	86.8 / $f^{0.5}$	0.729/f	N/A
	10MHz – 400 MHz	27.4	0.0729	2
	400 MHz – 2 GHz	1.37 x $f^{0.5}$	0.00364 x $f^{0.5}$	f / 200
	2 GHz – 300 GHz	61.4	0.163	10

NOTES:

1. f is frequency in MHz.
2. For frequencies between 100 kHz and 10 GHz, S_{eq}, E^2, and H^2, must be averaged over any six minute period.
3. There are also applicable limits for exposure to instantaneous RMS electric and magnetic fields (unperturbed fields). These limits are less restrictive than the limits specified in Table 1 and as a result are not referenced in this measurement report.

3. Measurement Methodology

Measurements were conducted on 26 September 2016 at the locations listed in Table 2.

Using a NARDA SRM-3006 Selective Radiation Meter with an E-Field (27 MHz to 3 GHz) probe and 5m RF-Cable (9 kHz – 6 GHz), the cumulative RF EME levels due to existing environmental RF EME sources were measured, at the selected locations.

- The meter was set to measure the representative average RF EME level across the 27 MHz to 3 GHz bandwidth.
- The measured band includes all radio signals from 27 MHz to 3 GHz. Signals present in this band are FM radio, Wi-Fi, TV signals and other mobile phone base station signals. A scan showing the measured spectrum at Location 4 is shown in Appendix D.
- The measurement height was 1.5m above standing level for all locations.
- The measurement locations (Table 2) were determined in consultation with a Melton City Council representative.
- These measurements determined the representative RF EME levels present at the time of measurements for each of the services (Table 3) measured at the selected locations.

Table 2 – Measurement Location Description

Measurement Location	Location Description	Photo Reference
1	In-front of Brookside Children's and Community Centre	1
2	In-front of Brookside Early Learning Centre	2
3	Centre of Synthetic Soccer Pitch	3
4	Brookside College	4

4. Measurement Equipment

- NARDA SRM-3006 Selective Radiation Meter
  Frequency Range 100 kHz – 6 GHz
  Model Number 3006/01
  Serial Number K-0092

- NARDA 3-Axis Antenna
  Frequency Range 27 MHz – 3 GHz
  Model Number 3501/03
  Serial Number K-1128

- NARDA RF-Cable SRM, Length 5m, 50 Ohms
  Frequency Range 9 kHz – 6 GHz
  Model Number 3602/02
  Serial Number AC-0135

5. Measurement Results

Table 3 RF EME Measurement Results

Measurement Location	Total Measured Cumulative RF EME Level -27MHz - 3GHz (% RPS3 GP Limit)	Times Below RPS3 GP Limit
1	0.00308	32,468
2	0.00316	31,646
3	0.00565	17,699
4	0.025	4,000

Notes:

1. The recorded measurements were taken from the SRM-3006 for the 27 MHz – 3 GHz band.
2. The measurements were taken as per Australian Standard AS 2772.2 – 2011 Radiofrequency fields Part 2: Principles and methods of measurement and computation– 3 kHz to 300 GHz.
3. The measurements conducted with the SRM-3006 instrument with tripod mounted probe and 5m cable have an expanded uncertainty of ± 4.4 dB. See uncertainty excel spreadsheet in the specific job folder for the calculations.
4. The coverage factor (k) value used to give an expanded uncertainty with a 95% confidence interval was 1.96.
5. The recorded measurements taken from the SRM-3006 were percentage of RPS3 general public limit and frequency.
6. % RPS3 GP Limit – Percentage of the Australian Regulatory General Public Exposure Limit.

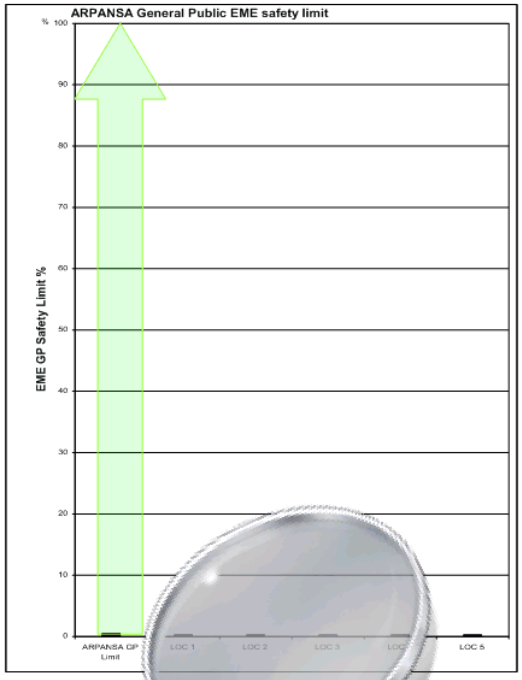
6. Summary

The highest measured cumulative RF EME level for the selected measurement locations was 0.025% of the RPS3 general public limit at Location 4.

The measured levels of cumulative environmental RF EME (27 MHz – 3 GHz) at the selected locations were below the general public exposure limits specified by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Radiation Protection Standard – Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz (RPS 3).

See Chart 1 below for representation of the levels obtained.

Chart 1 - Comparison of Measured RF EME and RPS3 GP Limits



Magnified View of RF EME Levels

APPENDIX A - Glossary and Abbreviations

ARPANSA RPS3 General Public Limit	Current Australian Radiation Protection Standard limits (reference levels) for continuous exposure of the general public to radio frequency transmissions
Broadcast	Public transmission services such as radio and TV.
Power Density	The amount of electromagnetic energy flowing through a given area.
Radio Frequency Electromagnetic Energy (RF EME)	RF EME is the radio waves generated by transmitting devices such as antennas.

APPENDIX B – Measurement Location Photos

Photo 1 – Location 1

Photo 2 – Location 2

Photo 3 – Location 3

Photo 4 – Location 4

APPENDIX C – Measurement Location Map

APPENDIX D – Scan of Environmental RF EME at Location 4