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RF EME SURVEY REPORT

NIMBIN, NSW

July 2013

Prepared by

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RF EME SURVEY REPORT

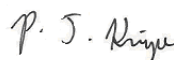
**Nimbin, NSW
2480**

Measurement Date 18 July 2013

Reference No. 2275-3311

Measurement Officer: Michael Bangay

Approved Signatory



Name: Phill Knipe
Title: Consultant Physicist
Date: 25 July 2013
Total Radiation Solutions Pty Ltd



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1. Introduction

The NBN Company proposes to install a Fixed Radio Base Station in the Nimbin District, New South Wales.

The NBN through their representative Ms Jacqueline Crompton, requested Michael Bangay to undertake a Radiofrequency Electromagnetic Energy (RF EME) survey at various locations around the Nimbin township. To enable the measurement to be performed Michael Bangay arranged for the use of the measurement instruments owned by Total Radiation Solutions Pty Ltd (TRS). Mr Phill Knipe from TRS who is a NATA authorised signatory has signed and released this measurement report.

The purpose of this survey is to determine the existing environmental RF EME levels present before the proposed NBN base station is built.

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.
4. Body current limits are also part of the applicable standard. The survey did not investigate the levels associated with these limits.

3. Measurement Methodology

Measurements were conducted on 18 July 2013, at the marked locations shown on the aerial map in Appendix B and in listed in Table 2 in Section 5. The measurements were performed between 4:00 PM and 5:30 PM.

- Using a NARDA SRM-3000 Selective Radiation Meter with an E-Field (27 MHz to 3 GHz) probe, the RF EME levels due to the existing environmental RF EME sources were measured at the various locations. The measured band of radio signals includes all radio signals from FM radio, 2-way radio, all TV signals, all mobile phone and mobile phone base station signals.
- The meter was set to average (1 min) to measure the representative level across the 27 MHz to 3 GHz bandwidth.
- The measurements were taken at an approximate height of 1.5m above standing level.
- These measurements determined the representative RF EME levels present at the time of measurements.

4. Measurement Equipment

- NARDA SRM-3000 Selective Radiation Meter
Frequency Range 100 kHz – 3 GHz
Model Number 3001/01
Serial Number J-0039
- NARDA 3-Axis Antenna
Frequency Range 27 MHz – 3 GHz
Model Number 3501/01
Serial Number H-0009

5. Measurement Results

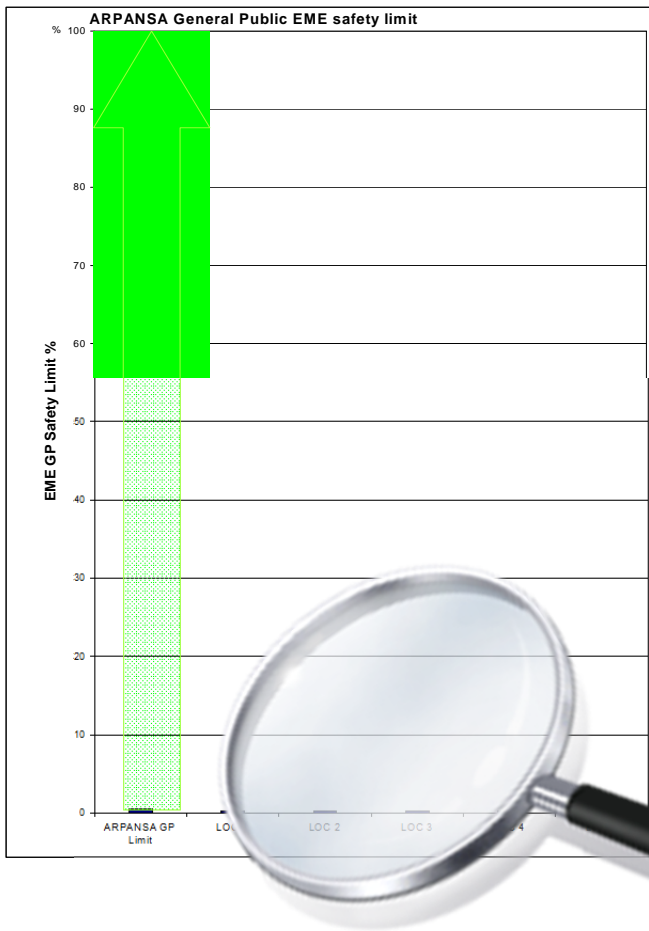
Table 2 Measurement Results – See Appendix B for the aerial map and Appendix C for frequency scan of environmental RF EME at Location 9

Location	Measured RF EME Level					
	FM radio RPS3 %	UHF TV RPS3 %	Combined RPS3 %	Times below RPS3 limit	FM radio V/m	FM radio $\mu\text{W}/\text{cm}^2$
1. Community Centre office	0.138	0.0003	0.147	680	1.02	0.276
2. Outside Community Centre (car park)	0.64	0.0022	0.68	147	2.2	1.28
3. Alongside war memorial	0.049	0.0011	0.065	1,538	0.61	0.098
4. Outside shop	0.00076	0.00008	0.0041	24,390	0.076	0.00152
5. Inside shop	0.00017	0.00005	0.0014	71,428	0.036	0.00034
6. Hospital car park	0.001	0.000055	0.0043	23,255	0.086	0.002
7. School quadrangle	0.002	0.0001	0.0049	20,408	0.123	0.004
8. Skate park	0.0033	0.0016	0.0127	7,874	0.158	0.0066
9. Outside Rainbow Power building	0.0091	0.0072	0.0403	2,481	0.262	0.0182

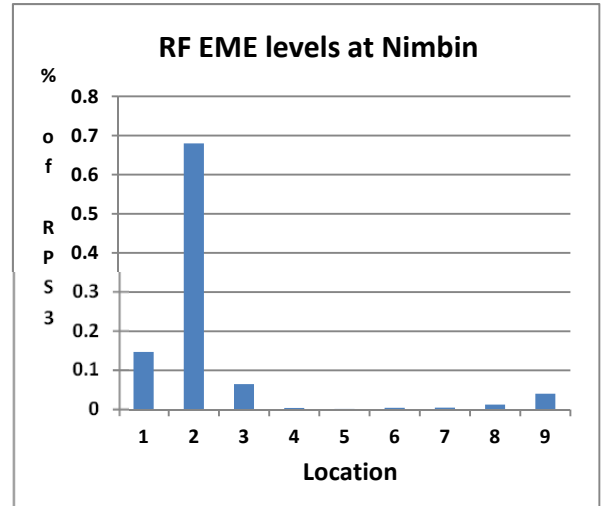
Notes:

1. The recorded measurements were taken from the SRM-3000 for the respective services.
2. The measurements were taken as per Australian Standard AS 2772.2 – 2011 Radiofrequency radiation Part 2: Principles and Methods of Measurement and Computation– 3 kHz to 300 GHz.
3. The measurements with the SRM instrument hand-held have an expanded uncertainty of ± 5.0 dB.
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-3000 were frequency – MHz and percentage of general public limit. The levels for the FM radio were also converted from the equivalent power density to electric field strength using the unit of volt per metre (V/m) and power density with unit of microwatt per metre squared ($\mu\text{W}/\text{cm}^2$).
6. Only the significant measured RF EME levels are reported in the measurement results.

Chart 1 - Comparison of Nimbin environmental RF EME and RPS3 Limits



Magnified view of RF EME levels – less than 0.8% of RPS3 GP limit



6. Discussion and Summary

The results of the survey are shown in Table 2 above and on Chart 1 above. The measurements of environmental RF EME at Nimbin showed that the levels of radio signal energy were mainly dominated by the community radio station where the highest level measured from this service was in the car park nearby the transmitting antenna. This was 0.64% of the general public limit. The cumulative level of all the signals in the survey band 27 MHz to 3.0 GHz band at this same location was 0.68% of the RPS3 General Public Limits.

The other major contributor to the environmental RF EME was UHF TV signals, the highest cumulative level of TV signal expressed as a percentage of RPS3 was 0.0072% and was at Location 9 which is outside the Rainbow Power building.

The measured environmental RF EME levels at Nimbin were below the 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).

APPENDIX A - Glossary and Abbreviations

Radio Frequency Electromagnetic Energy (RF EME)

RF EME is the radio waves generated by transmitting devices such as antennas.

ARPANSA RPS3 General Public Limit

Current Australian Radiation Protection Standard limits or reference levels for continuous exposure of the general public to radio frequency transmissions.

Power Density

The rate of or the amount of electromagnetic energy flowing through a given area.

Broadcast

Public transmission services such as radio and TV.

APPENDIX B – Aerial map of Nimbin showing measurement locations



APPENDIX C – Scan of environmental RF EME at Location 9, Nimbin

