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RF EME ANALYSIS REPORT
TELSTRA CORPORATION LIMITED
WIFI BASE CUBE
LMR400 & RBK300

September 2014

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RF EME ANALYSIS REPORT

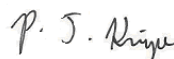
WIFI BASE CUBE LMR400 & RBK300

Cisco ANT-10

Assessment Date 5 September 2014

Reference No. 1370-4175

Authorised Signatory



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1. Introduction

Telstra Corporation Limited (Telstra) requested Total Radiation Solutions Pty Ltd (TRS) to undertake a radio frequency (RF) electromagnetic energy (EME) assessment of the Wifi Base Cube that contains a number of Cisco ANT-10 omni antennas.

The purpose of this assessment was to establish if the non-occupational boundaries for the antennas extend outside the cube shroud.

This report is based on information provided by Telstra and the manufacturer's technical sheet for the Cisco ANT-10 omni antennas.

2. Regulatory Exposure Limits

ARPANSA, an agency of the Commonwealth Department of Health has established a Radiation Protection Standard (ARPANSA 2002) specifying limits for continuous exposure of the general public to RF EME transmissions (Table 1). Further information can be gained from the ARPANSA web site.

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) (ARPANSA 2002)

Exposure Category	Frequency Range	E-field (V/m)	H-field (A/m)	Power Flux Density (W/m ²)
Occupational (RF Worker)	100 kHz – 1 MHz	614	163/ <i>f</i>	–
	1 MHz – 10 MHz	614/ <i>f</i>	163/ <i>f</i>	1000/ <i>f</i> ²
	10MHz – 400 MHz	61.4	163	10
	400 MHz – 2 GHz	3.07 x <i>f</i> ^{0.5}	0.00814 x <i>f</i> ^{0.5}	<i>f</i> /40
	2 GHz – 300 GHz	137	0.364	50
Non-Occupational (General Public)	100 kHz – 150 kHz	86.8	4.86	–
	150 kHz – 1 MHz	86.8	0.729/ <i>f</i>	–
	1 MHz – 10 MHz	86.8/ <i>f</i> ^{0.5}	0.729/ <i>f</i>	–
	10MHz – 400 MHz	27.4	0.729	2
	400 MHz – 2 GHz	1.37 x <i>f</i> ^{0.5}	0.00364 x <i>f</i> ^{0.5}	<i>f</i> /200
	2 GHz – 300 GHz	61.4	0.163	10

f is frequency in MHz

3. Modelling Methodology

Using the IXUS modelling software in conjunction with the NATA accredited inspection body process, the occupational and non-occupation exclusion zones for the antennas listed in Table 2 were calculated.

Table 2 Wifi Base Cube configuration

Number of Antennas	Manufacturer	Model	Frequency	Type
2	Cisco	ANT-10	2.4 GHz	Omni
2	Cisco	ANT-10	5 GHz	Omni

Table 3 Antenna Parameters

LMR400 setup

Diagram Ref	Mech. Tilt (°)	Elec. Tilt (°)	Pol	Cable Loss (dB)	System/Function/Sector	Port Power (dBm)
A01, A02	0	0	V	0.78	2.4 GHz	26
A03, A04	0	0	V	1.44	5 GHz	26

RBK300 setup

Diagram Ref	Mech. Tilt (°)	Elec. Tilt (°)	Pol	Cable Loss (dB)	System/Function/Sector	Port Power (dBm)
A01, A02	0	0	V	1.04	2.4 GHz	26
A03, A04	0	0	V	1.95	5 GHz	26

4. Calculation Results

Table 4 Antenna Pattern Comparisons

Description	Distance (cm)			
	Cisco/ANT-10 2.4GHZ LMR400	Cisco/ANT-10 5.0GHZ LMR400	Cisco/ANT-10 2.4GHZ RBK300	Cisco/ANT-10 5.0GHZ RBK300
Non-Occupational Exclusion Zone Outside Cube	<1	<1	<1	<1

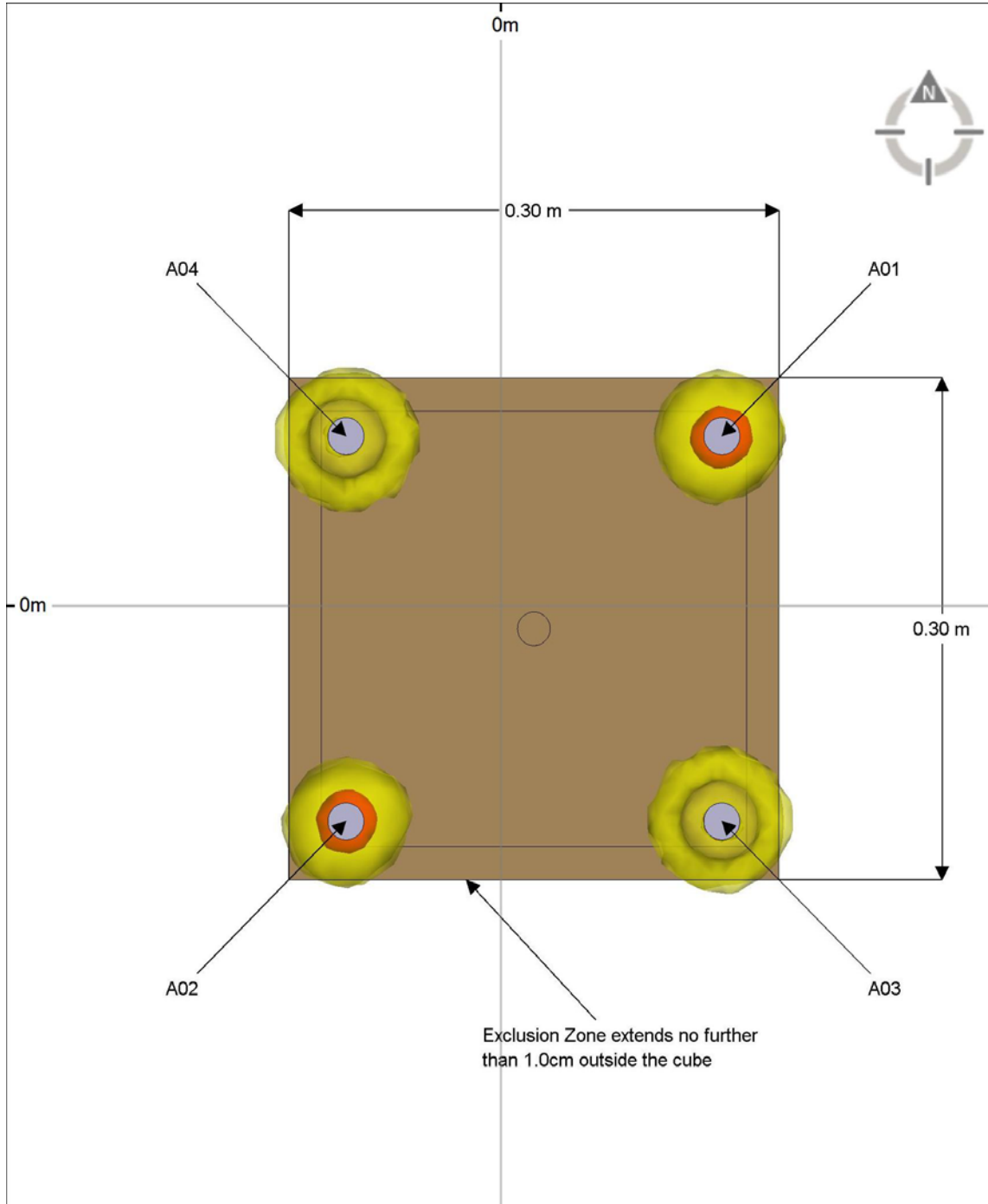
Notes:

1. RF EME exclusion zones have been calculated based on the formulae specified in AS2772.2 using the specified parameters for the system by the IXUS software
2. Assessment was conducted within the specified limits of the IXUS software

APPENDIX A – Antenna RF EME Exclusion Zones

A.1 Wifi Base Cube – LMR400 Cable

Plan View - Wifi Base Cube – LMR400

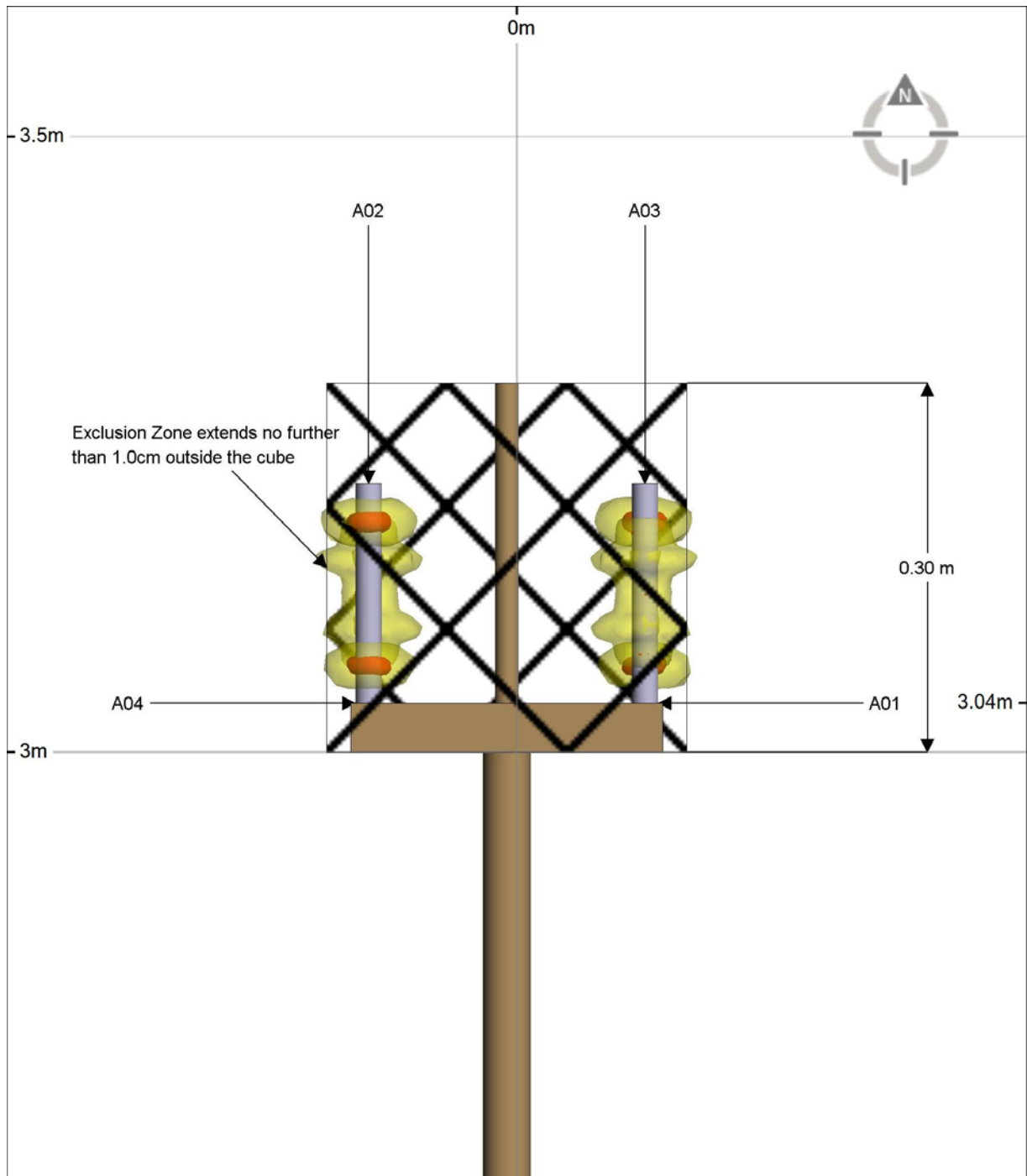


Exclusion zone Legend

 Areas above RPS3 public limits

 Areas above RPS3 occupational limits

Elevation View - Wifi Base Cube – LMR400



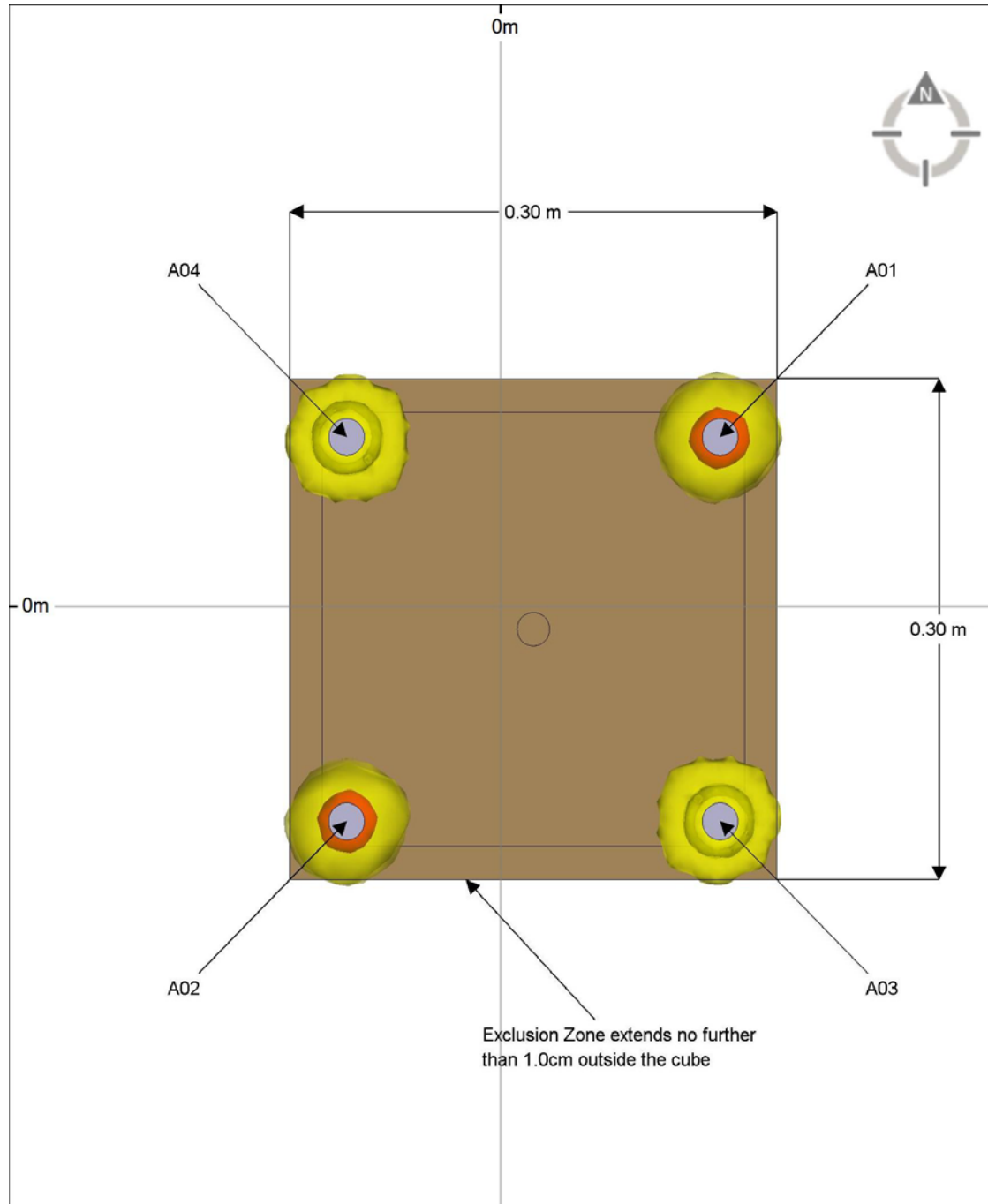
Exclusion zone Legend

 Areas above RPS3 public limits

 Areas above RPS3 occupational limits

A.2 Wifi Base Cube – RBK300 Cable

Plan View - Wifi Base Cube - RBK300

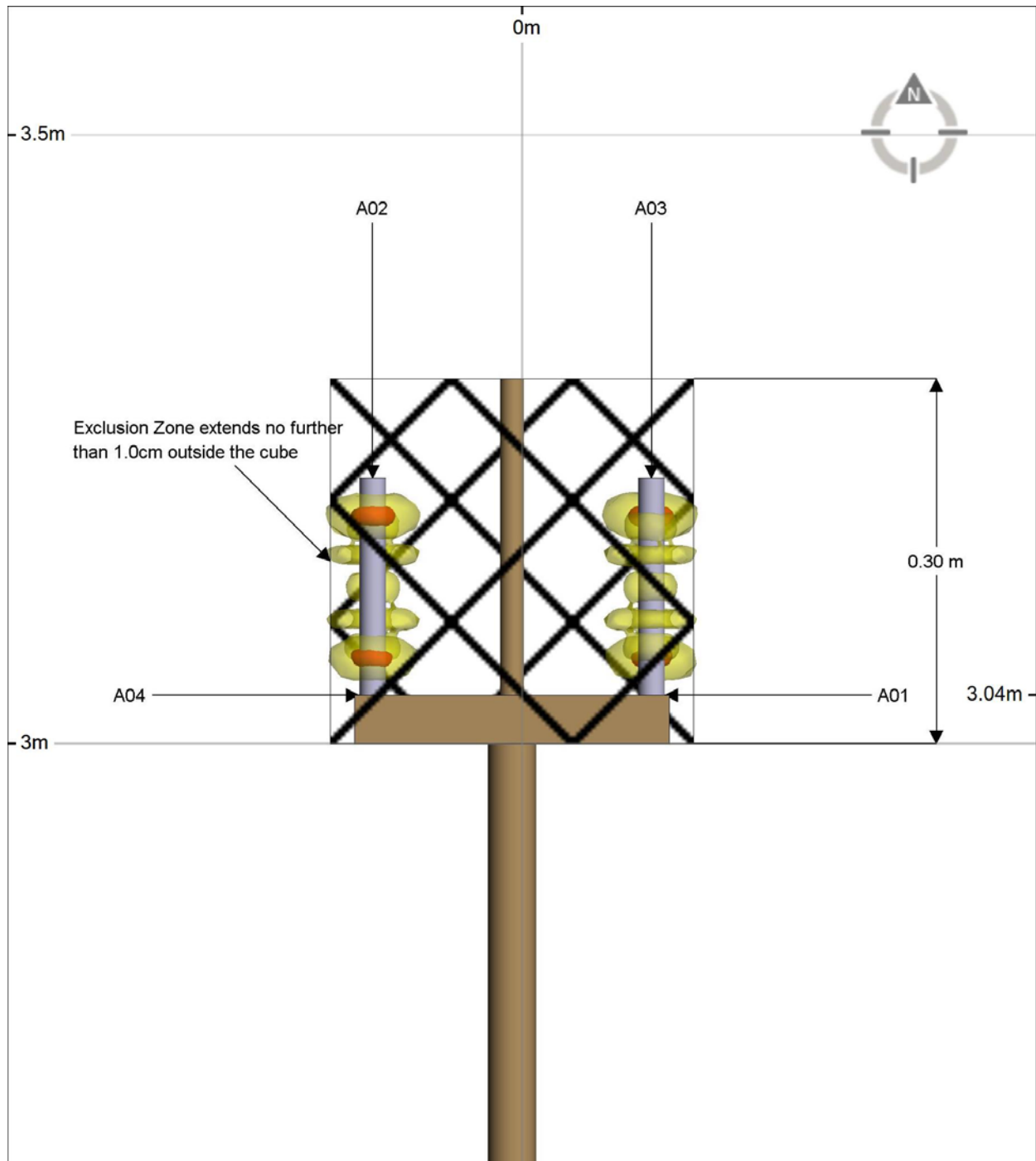


Exclusion zone Legend

 Areas above RPS3 public limits

 Areas above RPS3 occupational limits

Elevation View - Wifi Base Cube - RBK300



Exclusion zone Legend

 Areas above RPS3 public limits

 Areas above RPS3 occupational limits

APPENDIX B – References

ARPANSA (2002). Radiation Protection Standard - Maximum Exposure Levels to Radiofrequency Fields - 3 kHz to 300 GHz, Chief Executive Officer of ARPANSA.

AS/NZS (2011). Radiofrequency fields Part 2: Principles and methods of measurement and computation - 3 kHz to 300 GHz. AS/NZS 2772.2:2011. Australia, Standards Australia.