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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

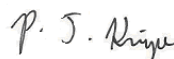
## WIFI BASE CUBE LMR400 & RBK300

### Cisco ANT-10

**Assessment Date 5 September 2014**

**Reference No. 1370-4175**

Authorised Signatory



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# Contents

|  |    |
|--|----|
| 1. Introduction.....                             | 4  |
| 2. Regulatory Exposure Limits .....              | 4  |
| 3. Modelling Methodology .....                   | 5  |
| 4. Calculation Results .....                     | 6  |
| <br>   |    |
| APPENDIX A – Antenna RF EME Exclusion Zones..... | 7  |
| APPENDIX B – References .....                    | 12 |

## 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 <sup>2</sup> ) |
|--|-------------------|--------------------------------|-----------------------------------|--|
| <b>Occupational (RF Worker)</b>          | 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> <sup>2</sup>            |
|  | 10MHz – 400 MHz   | 61.4                           | 163                               | 10                                     |
|  | 400 MHz – 2 GHz   | 3.07 x <i>f</i> <sup>0.5</sup> | 0.00814 x <i>f</i> <sup>0.5</sup> | <i>f</i> /40                           |
|  | 2 GHz – 300 GHz   | 137                            | 0.364                             | 50                                     |
|  |                   |                                |                                   |  |
| <b>Non-Occupational (General Public)</b> | 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> <sup>0.5</sup>  | 0.729/ <i>f</i>                   | –                                      |
|  | 10MHz – 400 MHz   | 27.4                           | 0.729                             | 2                                      |
|  | 400 MHz – 2 GHz   | 1.37 x <i>f</i> <sup>0.5</sup> | 0.00364 x <i>f</i> <sup>0.5</sup> | <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<br>2.4GHZ<br>LMR400 | Cisco/ANT-10<br>5.0GHZ<br>LMR400 | Cisco/ANT-10<br>2.4GHZ<br>RBK300 | Cisco/ANT-10<br>5.0GHZ<br>RBK300 |
| Non-Occupational<br>Exclusion Zone<br>Outside Cube | <1                               | <1                               | <1                               | <1                               |

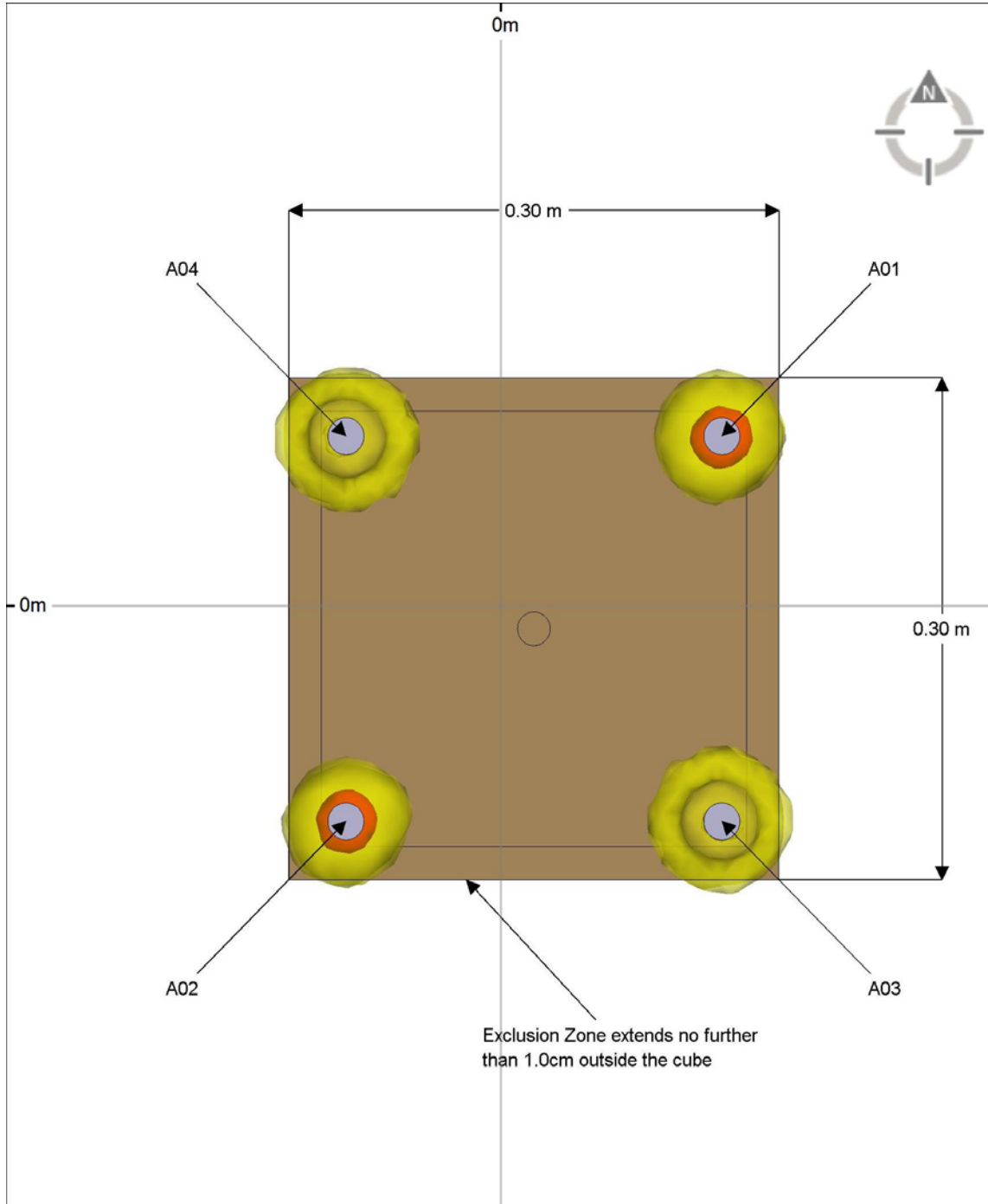
**Notes:**

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



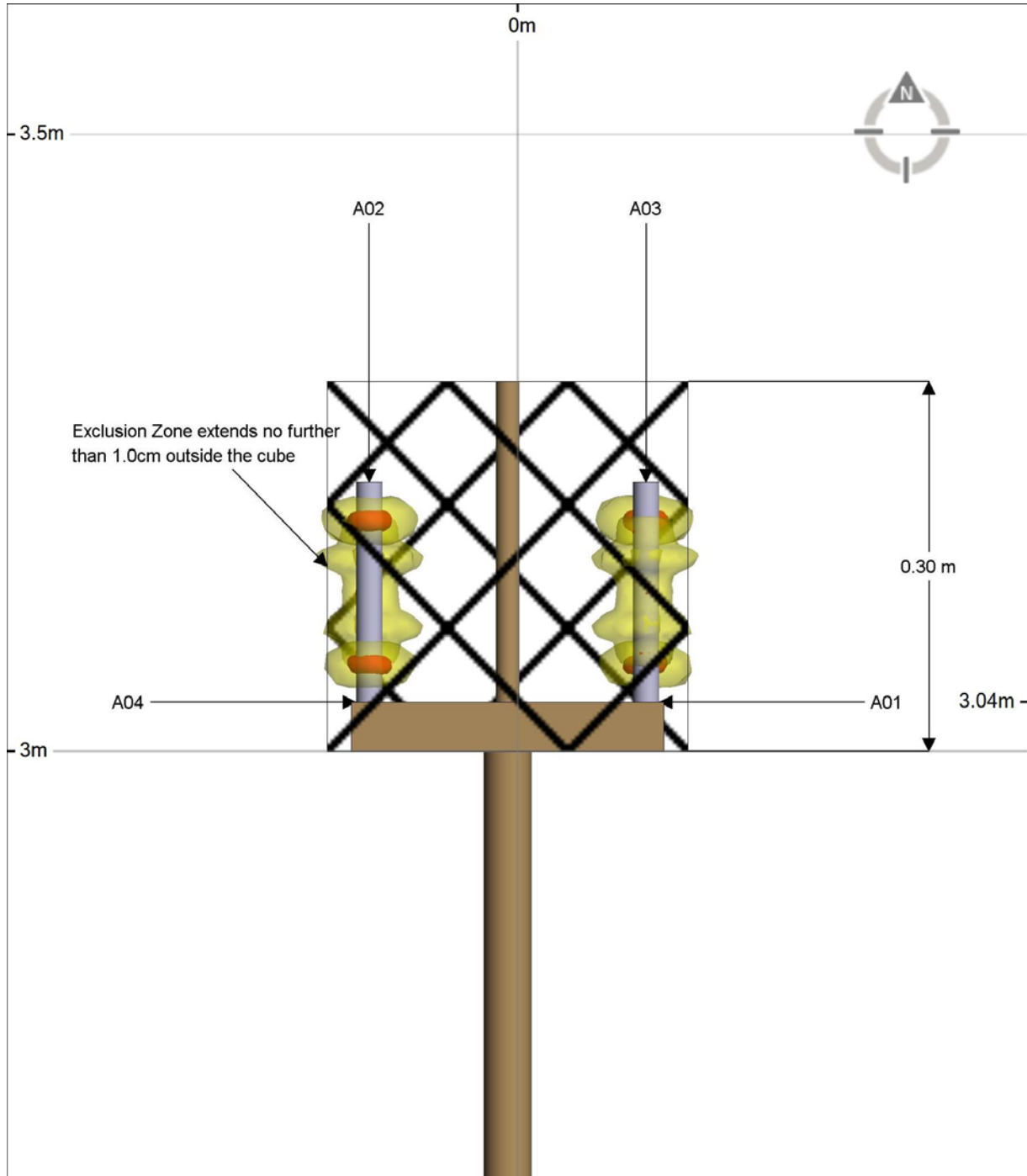
#### Exclusion zone Legend

 Areas above RPS3 public limits

 Areas above RPS3 occupational limits



### Elevation View - Wifi Base Cube – LMR400



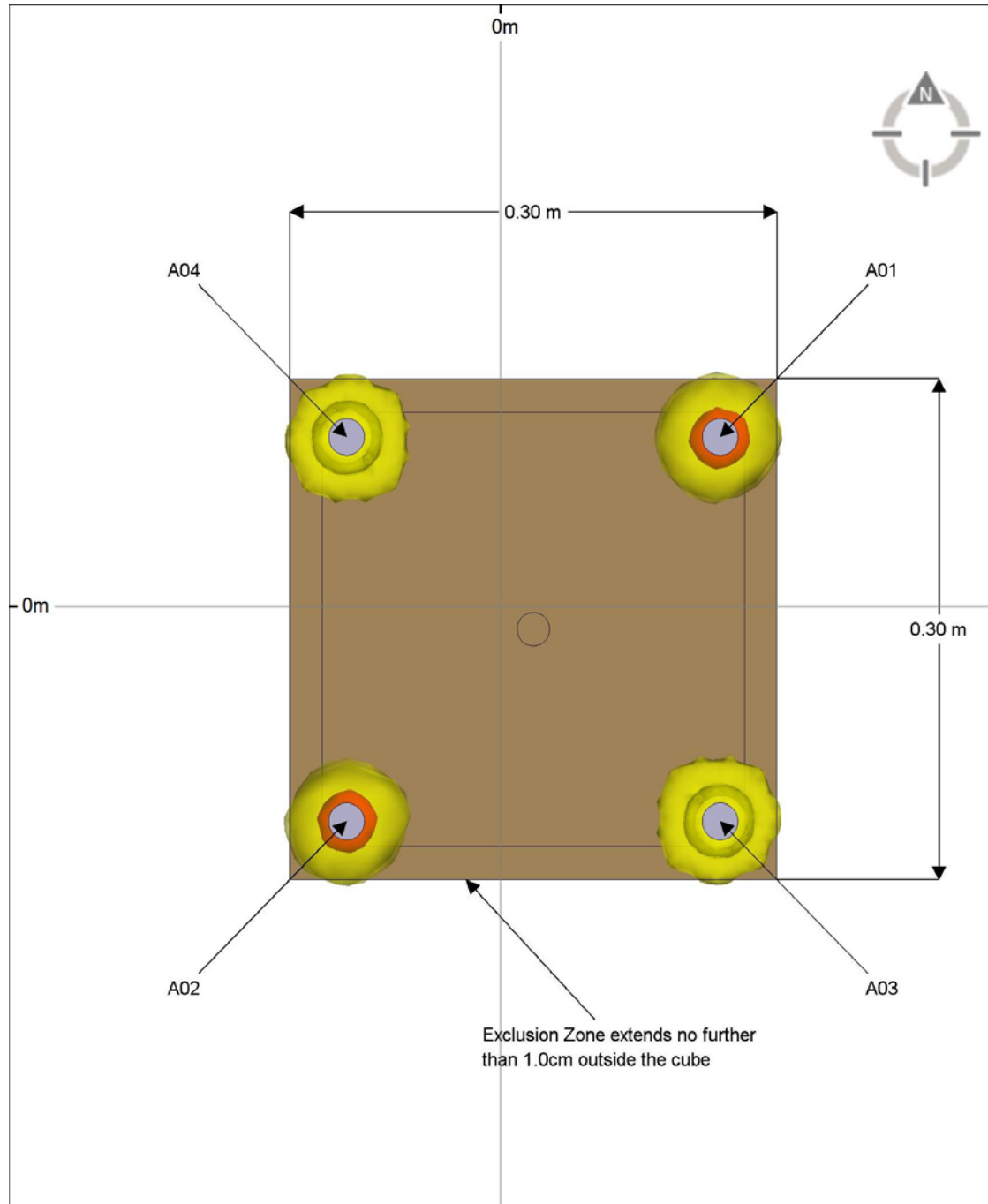
#### Exclusion zone Legend

Areas above RPS3 public limits

Areas above RPS3 occupational limits

## A.2 Wifi Base Cube – RBK300 Cable

### Plan View - Wifi Base Cube - RBK300

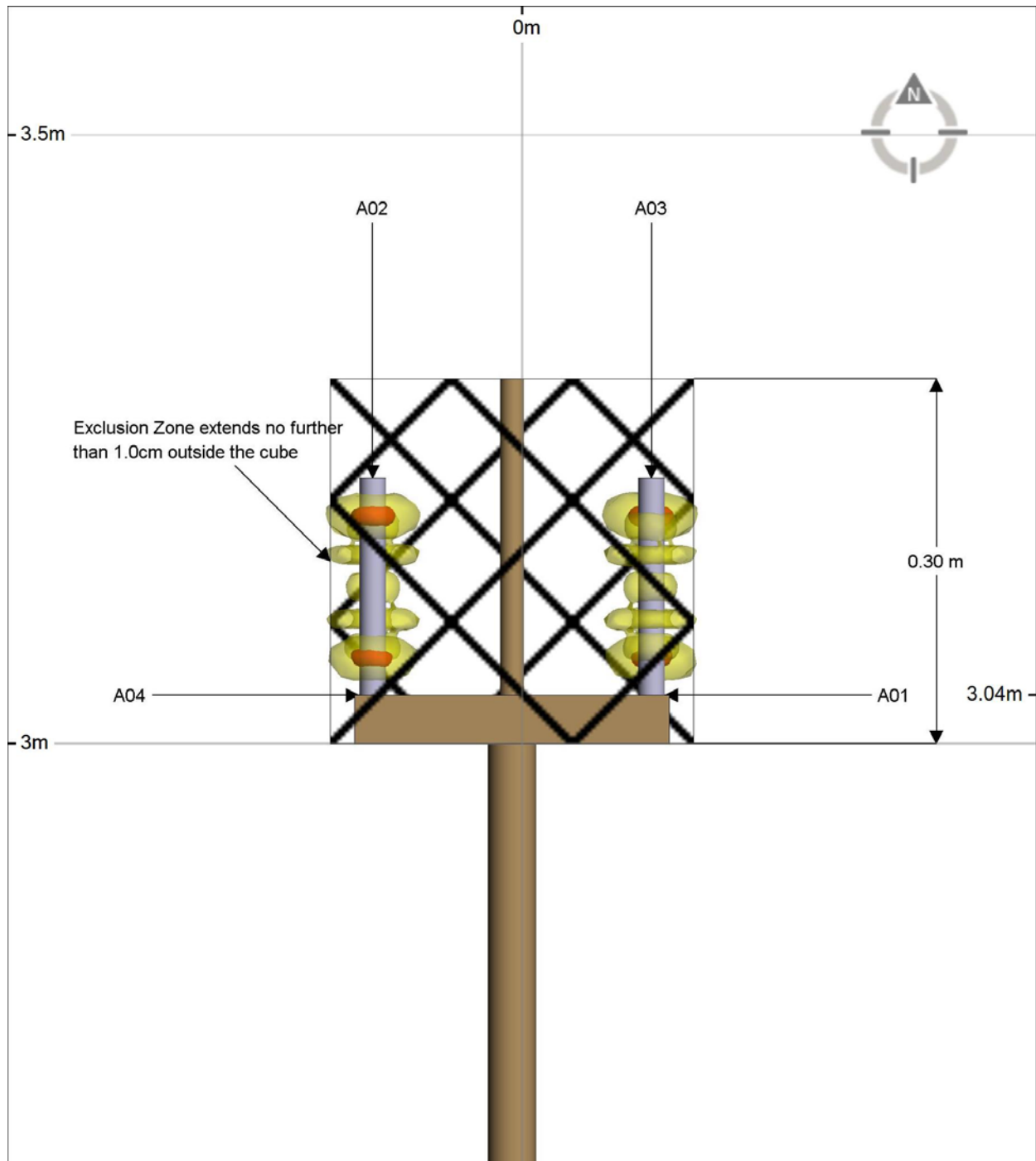


#### Exclusion zone Legend

 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.