

# Report on the Exposure Calculation of:

Apple Inc, Model: A2304

In accordance with EU EN 62311, FCC CFR 47 Pt 1.1310, Health Canada Safety Code 6, Australia ARPANSA RPS No.3 and New Zealand NZS 2772.1

Prepared for: Apple Inc.  
One Apple Park Way  
Cupertino, California 95014  
USA



Add value.  
Inspire trust.

## COMMERCIAL-IN-CONFIDENCE

FCC ID: BCGA2304

IC: 579C-A2304

Document Number: 75945250-17 | Issue: 01

### SIGNATURE

A handwritten signature in black ink, appearing to read 'Jon Kenny'.

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Jon Kenny	Senior Engineer	Authorised Signatory	28 November 2019

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

### EXECUTIVE SUMMARY

The calculation of exposure for this product was found to be compliant at 20 cm with EN 62311, FCC CFR 47 Pt.1.1310, Health Canada Safety Code 6, ARPANSA RPS No.3 and New Zealand NZS 2772.1.

### DISCLAIMER AND COPYRIGHT

This non-binding report has been prepared by TÜV SÜD with all reasonable skill and care. The document is confidential to the potential Client and TÜV SÜD. No part of this document may be reproduced without the prior written approval of TÜV SÜD. © 2019 TÜV SÜD.

TÜV SÜD  
is a trading name of TÜV SÜD Ltd  
Registered in Scotland at East Kilbride,  
Glasgow G75 0QF, United Kingdom  
Registered number: SC215164

TÜV SÜD Ltd is a  
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100  
Fax: +44 (0) 1489 558101  
[www.tuv-sud.co.uk](http://www.tuv-sud.co.uk)

TÜV SÜD  
Octagon House  
Concorde Way  
Fareham  
Hampshire PO15 5RL  
United Kingdom



# Contents

<b>1</b>	<b>Report Summary .....</b>	<b>2</b>
1.1	Report Modification Record.....	2
1.2	Introduction.....	2
1.3	Brief Summary of Results .....	4
1.4	Product Information .....	7
<b>2</b>	<b>Assessment Details .....</b>	<b>9</b>
2.1	Assessment Method.....	9
2.2	Individual Antenna Port Exposure Results.....	10
2.3	Combined Antenna Port RF Exposure Results.....	12
2.4	Far Field Region Boundary Results .....	23
2.5	Uncertainty .....	23
<b>Annex A</b>	<b>Regional Requirements.....</b>	<b>A.2</b>



# 1 Report Summary

## 1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	28 November 2019

Table 1

## 1.2 Introduction

Objective	To perform electromagnetic field exposure assessment to determine the equipment under test's (EUT's) compliance with the applied specifications.
Applicant	Apple Inc.
Manufacturer	Apple Inc.
Model Number(s)	A2304
Hardware Version(s)	REV1.0
Software Version(s)	N/A
Specification/Issue/Date	<ul style="list-style-type: none"><li>• EN 50665:2017 Generic standard for assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)</li><li>• FCC 47 CFR Part 1.1310: 2019</li><li>• ISED Canada: Health Canada Safety Code 6:2015</li><li>• Australia: ARPANSA Radiation Protection Series No.3:2002</li><li>• NZS 2772.1:1999 Radiofrequency fields, Maximum exposure levels, 3 kHz to 300 GHz</li></ul>
Order Number	0540178023
Date	12.04.2019
Related Document(s)	<ul style="list-style-type: none"><li>• EN 62311:2008 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz to 300 GHz)</li><li>• Directive 2013/35/EU on minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields).</li><li>• European Council Recommendation 1999/519/EC of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz), Official Journal, L199, of 1999-7-30, p.59-70.</li><li>• OET65:97 Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields</li><li>• IEEE C95.3:2002 IEEE Recommended Practice for Measurements and Computations of Radio Frequency</li></ul>



Electromagnetic Fields with Respect to Human Exposure to Such Fields, 100 kHz–300 GHz

- RSS-102 Issue 5 Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
- AS/NZS 2772.2:2016 Radiofrequency fields, Part 2: principles and methods of measurement and computation, 3 kHz to 300 GHz



### 1.3 Brief Summary of Results

The wireless device described within this report was compliant with the restrictions related to human exposure to electromagnetic fields for both general public and worker/occupational exposures.

The calculations shown in this report were made in accordance with the procedures specified in the applied test specification(s).

#### 1.3.1 Single transmitters

Regional Requirement	RAT	RF Exposure Level at compliance boundary of 0.2 m							
		S Power Density (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)		B Field (μT)	
		Result	Limit	Result	Limit	Result	Limit	Result	Limit
EU	Bluetooth	0.13	N/A	6.89	140.00	0.0183	N/A	0.0230	0.4500
EU	2.4 GHz WLAN	0.12	N/A	6.73	140.00	0.0179	N/A	0.0224	0.4500
EU	2.4 GHz WLAN AUX	0.12	N/A	6.73	140.00	0.0179	N/A	0.0224	0.4500
EU	5 GHz WLAN	0.36	N/A	11.67	140.00	0.0310	N/A	0.0389	0.4500
EU	5 GHz WLAN AUX	0.40	N/A	12.26	140.00	0.0325	N/A	0.0409	0.4500
FCC	Bluetooth	0.13	50.00	6.89	N/A	0.0183	N/A	0.0230	N/A
FCC	2.4 GHz WLAN	1.35	50.00	22.54	N/A	0.0598	N/A	0.0751	N/A
FCC	2.4 GHz WLAN AUX	1.35	50.00	22.54	N/A	0.0598	N/A	0.0751	N/A
FCC	5 GHz WLAN	0.41	50.00	12.36	N/A	0.0328	N/A	0.0412	N/A
FCC	5 GHz WLAN AUX	0.40	50.00	12.26	N/A	0.0325	N/A	0.0409	N/A
CANADA	Bluetooth	0.13	31.64	6.89	109.21	0.0183	0.2897	0.0230	N/A
CANADA	2.4 GHz WLAN	1.35	31.70	22.54	109.32	0.0598	0.2900	0.0751	N/A
CANADA	2.4 GHz WLAN AUX	1.35	31.70	22.54	109.32	0.0598	0.2900	0.0751	N/A
CANADA	5 GHz WLAN	0.41	46.46	12.36	132.34	0.0328	0.3511	0.0412	N/A
CANADA	5 GHz WLAN AUX	0.40	46.46	12.26	132.34	0.0325	0.3511	0.0409	N/A
AUSTRALIA	Bluetooth	0.13	50.00	6.89	137.00	0.0183	0.3640	0.0230	N/A
AUSTRALIA	2.4 GHz WLAN	0.12	50.00	6.73	137.00	0.0179	0.3640	0.0224	N/A
AUSTRALIA	2.4 GHz WLAN AUX	0.12	50.00	6.73	137.00	0.0179	0.3640	0.0224	N/A
AUSTRALIA	5 GHz WLAN	0.36	50.00	11.67	137.00	0.0310	0.3640	0.0389	N/A
AUSTRALIA	5 GHz WLAN AUX	0.40	50.00	12.26	137.00	0.0325	0.3640	0.0409	N/A
NEW ZEALAND	Bluetooth	0.13	50.00	6.89	137.00	0.0183	0.3600	0.0230	N/A
NEW ZEALAND	2.4 GHz WLAN	0.12	50.00	6.73	137.00	0.0179	0.3600	0.0224	N/A
NEW ZEALAND	2.4 GHz WLAN AUX	0.12	50.00	6.73	137.00	0.0179	0.3600	0.0224	N/A
NEW ZEALAND	5 GHz WLAN	0.36	50.00	11.67	137.00	0.0310	0.3600	0.0389	N/A
NEW ZEALAND	5 GHz WLAN AUX	0.40	50.00	12.26	137.00	0.0325	0.3600	0.0409	N/A

**Table 2 – Worker/Occupational Exposure Results**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.



Regional Requirement	RAT	RF Exposure Level at compliance boundary of 0.2 m							
		S Power Density (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)		B Field (μT)	
		Result	Limit	Result	Limit	Result	Limit	Result	Limit
EU	Bluetooth	0.13	10.00	6.89	61.00	0.0183	0.1600	0.0230	0.2000
EU	2.4 GHz WLAN	0.12	10.00	6.73	61.00	0.0179	0.1600	0.0224	0.2000
EU	2.4 GHz WLAN AUX	0.12	10.00	6.73	61.00	0.0179	0.1600	0.0224	0.2000
EU	5 GHz WLAN	0.36	10.00	11.67	61.00	0.0310	0.1600	0.0389	0.2000
EU	5 GHz WLAN AUX	0.40	10.00	12.26	61.00	0.0325	0.1600	0.0409	0.2000
FCC	Bluetooth	0.13	10.00	6.89	N/A	0.0183	N/A	0.0230	N/A
FCC	2.4 GHz WLAN	1.35	10.00	22.54	N/A	0.0598	N/A	0.0751	N/A
FCC	2.4 GHz WLAN AUX	1.35	10.00	22.54	N/A	0.0598	N/A	0.0751	N/A
FCC	5 GHz WLAN	0.41	10.00	12.36	N/A	0.0328	N/A	0.0412	N/A
FCC	5 GHz WLAN AUX	0.40	10.00	12.26	N/A	0.0325	N/A	0.0409	N/A
CANADA	Bluetooth	0.13	5.35	6.89	44.91	0.0183	0.1191	0.0230	N/A
CANADA	2.4 GHz WLAN	1.35	5.37	22.54	44.97	0.0598	0.1193	0.0751	N/A
CANADA	2.4 GHz WLAN AUX	1.35	5.37	22.54	44.97	0.0598	0.1193	0.0751	N/A
CANADA	5 GHz WLAN	0.41	9.05	12.36	58.40	0.0328	0.1549	0.0412	N/A
CANADA	5 GHz WLAN AUX	0.40	9.05	12.26	58.40	0.0325	0.1549	0.0409	N/A
AUSTRALIA	Bluetooth	0.13	10.00	6.89	61.40	0.0183	0.1630	0.0230	N/A
AUSTRALIA	2.4 GHz WLAN	0.12	10.00	6.73	61.40	0.0179	0.1630	0.0224	N/A
AUSTRALIA	2.4 GHz WLAN AUX	0.12	10.00	6.73	61.40	0.0179	0.1630	0.0224	N/A
AUSTRALIA	5 GHz WLAN	0.36	10.00	11.67	61.40	0.0310	0.1630	0.0389	N/A
AUSTRALIA	5 GHz WLAN AUX	0.40	10.00	12.26	61.40	0.0325	0.1630	0.0409	N/A
NEW ZEALAND	Bluetooth	0.13	10.00	6.89	61.00	0.0183	0.1600	0.0230	N/A
NEW ZEALAND	2.4 GHz WLAN	0.12	10.00	6.73	61.00	0.0179	0.1600	0.0224	N/A
NEW ZEALAND	2.4 GHz WLAN AUX	0.12	10.00	6.73	61.00	0.0179	0.1600	0.0224	N/A
NEW ZEALAND	5 GHz WLAN	0.36	10.00	11.67	61.00	0.0310	0.1600	0.0389	N/A
NEW ZEALAND	5 GHz WLAN AUX	0.40	10.00	12.26	61.00	0.0325	0.1600	0.0409	N/A

**Table 3 – General Public Exposure Results**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.



### 1.3.2 Multiple transmitters: Scenario 1 - 5.0 GHz WLAN (Main Radio) + 2.4GHz WLAN (Aux) + Bluetooth

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
	S Power Density	E Field	H Field	B Field
	Summation for simultaneous exposure; value to be <1			
EU	N/A	0.0117	N/A	0.0126
FCC	0.0376	N/A	N/A	N/A
CANADA	0.0376	0.0377	0.0376	N/A
AUSTRALIA	0.0121	0.0122	0.0122	N/A
NEW ZEALAND	0.0121	0.0122	0.0124	N/A

**Table 4 – Worker/Occupational Exposure Results**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
	S Power Density	E Field	H Field	B Field
	Summation for simultaneous exposure; value to be <1			
EU	0.0607	0.0615	0.0629	0.0636
FCC	0.1879	N/A	N/A	N/A
CANADA	0.3195	0.3196	0.3195	N/A
AUSTRALIA	0.0607	0.0607	0.0606	N/A
NEW ZEALAND	0.0607	0.0615	0.0629	N/A

**Table 5 – General Public Exposure Results**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

### 1.3.3 Multiple transmitters: Scenario 2 - 2.4 GHz WLAN (Main Radio) + 5.0GHz WLAN (Aux) + Bluetooth

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
	S Power Density	E Field	H Field	B Field
	Summation for simultaneous exposure; value to be <1			
EU	N/A	0.0124	N/A	0.0133
FCC	0.0375	N/A	N/A	N/A
CANADA	0.0551	0.0551	0.0551	N/A
AUSTRALIA	0.0129	0.0130	0.0129	N/A
NEW ZEALAND	0.0129	0.0130	0.0132	N/A

**Table 6 – Worker/Occupational Exposure Results**



The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Regional Requirement	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
	S Power Density	E Field	H Field	B Field
	Summation for simultaneous exposure; value to be <1			
EU	0.0645	0.0653	0.0668	0.0675
FCC	0.1873	N/A	N/A	N/A
CANADA	0.3188	0.3189	0.3188	N/A
AUSTRALIA	0.0645	0.0645	0.0644	N/A
NEW ZEALAND	0.0645	0.0653	0.0668	N/A

**Table 7 – General Public Exposure Results**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

#### 1.4 Product Information

##### 1.4.1 Technical Description

The Equipment Under Test (EUT) was a rack mounted computer with Bluetooth, Bluetooth Low Energy and 802.11 a/b/g/n/ac capabilities in the 2.4GHz and 5GHz bands.

##### 1.4.2 Transmitter Description

The following radio access technologies and frequency bands are supported by the equipment under test.

Radio Access Technology	Antenna Port	Frequency Band	Minimum Frequency	Output Power	Duty Cycle
		MHz	MHz	dBm	%
Bluetooth	1	2400-2483.5	2400.0	13.5	100
2.4 GHz WLAN	1	2400-2483.5	2412.0	12.5	100
2.4 GHz WLAN AUX	1	2400-2483.5	2412.0	12.5	100
5 GHz WLAN	1	5150-5850	5180.0	15.0	100
5 GHz WLAN AUX	1	5150-5850	5180.0	15.5	100

**Table 8 – Transmitter Description (EU, Australia, New Zealand)**

Radio Access Technology	Antenna Port	Frequency Band	Minimum Frequency	Output Power	Duty Cycle
		MHz	MHz	dBm	%
Bluetooth	1	2400-2483.5	2402.0	13.5	100
2.4 GHz WLAN	1	2400-2483.5	2412.0	23.0	100
2.4 GHz WLAN AUX	1	2400-2483.5	2412.0	23.0	100
5 GHz WLAN	1	5150-5850	5180.0	15.5	100
5 GHz WLAN AUX	1	5150-5850	5180.0	15.5	100

**Table 9 – Transmitter Description (FCC, ISED)**





### 1.4.3 Antenna Description

The following antennas are supported by the equipment under test.

Antenna No	Radio Access Technology	Antenna Model	Gain	Antenna length	Minimum Separation Distance
			dBi	cm	cm
1	Bluetooth	Not Specified	4.51	69	20
1	2.4 GHz WLAN	Not Specified	5.31	69	20
1	2.4 GHz WLAN AUX	Not Specified	5.31	69	20
1	5 GHz WLAN	Not Specified	7.59	69	20
1	5 GHz WLAN AUX	Not Specified	7.5	69	20

**Table 10 – Antenna description**

### 1.4.4 Equipment Configuration

Simultaneous transmission in the following scenarios:

Scenario 1 - 5.0 GHz WLAN (Main Radio) + 2.4GHz WLAN (Aux) + Bluetooth

Scenario 2 - 2.4 GHz WLAN (Main Radio) + 5.0GHz WLAN (Aux) + Bluetooth



## 2 Assessment Details

### 2.1 Assessment Method

The assessment method is by calculation of the power density  $S$ , electric field strength  $E$ , magnetic field strength  $H$  or magnetic flux density  $B$ .

The calculation uses the spherical model applicable under far field conditions.

$$S = E \times H = \frac{E^2}{\eta} = H^2 \times \eta = \frac{P \times G_i}{4 \times \pi \times r^2}$$

Where:

$\eta$  - Impedance of free space (377 ohm in far field)

$P$  – Transmitter power W

$G_i$  – Antenna gain ratio relative to isotropic

$r$  – Separation distance m

The magnetic flux density is related to the magnetic field strength by a constant:

$$B = \mu_o \times H$$

Where:

$\mu_o$  – Permeability of free space  $4 \times \pi \times 10^{-7}$  H/m

This assessment method of RF exposure is applicable to separation distances of 20 cm or more. Separation distances of less than 20 cm require a Specific Absorption Rate (SAR) assessment.

The far field region boundary depends on the frequency and wavelength and also on the antenna dimension. The boundary of the far field region is calculated below to demonstrate the validity of using the spherical model.



## 2.2 Individual Antenna Port Exposure Results

### 2.2.1 Calculation of Exposure at Specified Separation Distance

The frequencies shown in the tables below have been chosen based on the lowest possible frequency that the EUT can transmit. A full list of the regional requirements is shown in Annex A.

Regional Requirement	Antenna Port	RAT	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m							
				S Power Density (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)		B Field (μT)	
				Result	Limit	Result	Limit	Result	Limit	Result	Limit
EU	1	Bluetooth	2400.0	0.13	N/A	6.89	140.00	0.0183	N/A	0.0230	0.4500
EU	1	2.4 GHz WLAN	2412.0	0.12	N/A	6.73	140.00	0.0179	N/A	0.0224	0.4500
EU	1	2.4 GHz WLAN AUX	2412.0	0.12	N/A	6.73	140.00	0.0179	N/A	0.0224	0.4500
EU	1	5 GHz WLAN	5180.0	0.36	N/A	11.67	140.00	0.0310	N/A	0.0389	0.4500
EU	1	5 GHz WLAN AUX	5180.0	0.40	N/A	12.26	140.00	0.0325	N/A	0.0409	0.4500
FCC	1	Bluetooth	2400.0	0.13	50.00	6.89	N/A	0.0183	N/A	0.0230	N/A
FCC	1	2.4 GHz WLAN	2412.0	1.35	50.00	22.54	N/A	0.0598	N/A	0.0751	N/A
FCC	1	2.4 GHz WLAN AUX	2412.0	1.35	50.00	22.54	N/A	0.0598	N/A	0.0751	N/A
FCC	1	5 GHz WLAN	5180.0	0.41	50.00	12.36	N/A	0.0328	N/A	0.0412	N/A
FCC	1	5 GHz WLAN AUX	5180.0	0.40	50.00	12.26	N/A	0.0325	N/A	0.0409	N/A
CANADA	1	Bluetooth	2400.0	0.13	31.64	6.89	109.21	0.0183	0.2897	0.0230	N/A
CANADA	1	2.4 GHz WLAN	2412.0	1.35	31.70	22.54	109.32	0.0598	0.2900	0.0751	N/A
CANADA	1	2.4 GHz WLAN AUX	2412.0	1.35	31.70	22.54	109.32	0.0598	0.2900	0.0751	N/A
CANADA	1	5 GHz WLAN	5180.0	0.41	46.46	12.36	132.34	0.0328	0.3511	0.0412	N/A
CANADA	1	5 GHz WLAN AUX	5180.0	0.40	46.46	12.26	132.34	0.0325	0.3511	0.0409	N/A
AUSTRALIA	1	Bluetooth	2400.0	0.13	50.00	6.89	137.00	0.0183	0.3640	0.0230	N/A
AUSTRALIA	1	2.4 GHz WLAN	2412.0	0.12	50.00	6.73	137.00	0.0179	0.3640	0.0224	N/A
AUSTRALIA	1	2.4 GHz WLAN AUX	2412.0	0.12	50.00	6.73	137.00	0.0179	0.3640	0.0224	N/A
AUSTRALIA	1	5 GHz WLAN	5180.0	0.36	50.00	11.67	137.00	0.0310	0.3640	0.0389	N/A



Regional Requirement	Antenna Port	RAT	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m							
				S Power Density (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)		B Field (μT)	
				Result	Limit	Result	Limit	Result	Limit	Result	Limit
AUSTRALIA	1	5 GHz WLAN AUX	5180.0	0.40	50.00	12.26	137.00	0.0325	0.3640	0.0409	N/A
NEW ZEALAND	1	Bluetooth	2400.0	0.13	50.00	6.89	137.00	0.0183	0.3600	0.0230	N/A
NEW ZEALAND	1	2.4 GHz WLAN	2412.0	0.12	50.00	6.73	137.00	0.0179	0.3600	0.0224	N/A
NEW ZEALAND	1	2.4 GHz WLAN AUX	2412.0	0.12	50.00	6.73	137.00	0.0179	0.3600	0.0224	N/A
NEW ZEALAND	1	5 GHz WLAN	5180.0	0.36	50.00	11.67	137.00	0.0310	0.3600	0.0389	N/A
NEW ZEALAND	1	5 GHz WLAN AUX	5180.0	0.40	50.00	12.26	137.00	0.0325	0.3600	0.0409	N/A

**Table 11 – Worker/Occupational Individual Transmitter Result**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Regional Requirement	Antenna Port	RAT	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m							
				S Power Density (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)		B Field (μT)	
				Result	Limit	Result	Limit	Result	Limit	Result	Limit
EU	1	Bluetooth	2400.0	0.13	10.00	6.89	61.00	0.0183	0.1600	0.0230	0.2000
EU	1	2.4 GHz WLAN	2412.0	0.12	10.00	6.73	61.00	0.0179	0.1600	0.0224	0.2000
EU	1	2.4 GHz WLAN AUX	2412.0	0.12	10.00	6.73	61.00	0.0179	0.1600	0.0224	0.2000
EU	1	5 GHz WLAN	5180.0	0.36	10.00	11.67	61.00	0.0310	0.1600	0.0389	0.2000
EU	1	5 GHz WLAN AUX	5180.0	0.40	10.00	12.26	61.00	0.0325	0.1600	0.0409	0.2000
FCC	1	Bluetooth	2400.0	0.13	10.00	6.89	N/A	0.0183	N/A	0.0230	N/A
FCC	1	2.4 GHz WLAN	2412.0	1.35	10.00	22.54	N/A	0.0598	N/A	0.0751	N/A
FCC	1	2.4 GHz WLAN AUX	2412.0	1.35	10.00	22.54	N/A	0.0598	N/A	0.0751	N/A
FCC	1	5 GHz WLAN	5180.0	0.41	10.00	12.36	N/A	0.0328	N/A	0.0412	N/A
FCC	1	5 GHz WLAN AUX	5180.0	0.40	10.00	12.26	N/A	0.0325	N/A	0.0409	N/A
CANADA	1	Bluetooth	2400.0	0.13	5.35	6.89	44.91	0.0183	0.1191	0.0230	N/A



Regional Requirement	Antenna Port	RAT	Frequency (MHz)	RF Exposure Level at compliance boundary of 0.2 m							
				S Power Density (W/m <sup>2</sup> )		E Field (V/m)		H Field (A/m)		B Field (μT)	
				Result	Limit	Result	Limit	Result	Limit	Result	Limit
CANADA	1	2.4 GHz WLAN	2412.0	1.35	5.37	22.54	44.97	0.0598	0.1193	0.0751	N/A
CANADA	1	2.4 GHz WLAN AUX	2412.0	1.35	5.37	22.54	44.97	0.0598	0.1193	0.0751	N/A
CANADA	1	5 GHz WLAN	5180.0	0.41	9.05	12.36	58.40	0.0328	0.1549	0.0412	N/A
CANADA	1	5 GHz WLAN AUX	5180.0	0.40	9.05	12.26	58.40	0.0325	0.1549	0.0409	N/A
AUSTRALIA	1	Bluetooth	2400.0	0.13	10.00	6.89	61.40	0.0183	0.1630	0.0230	N/A
AUSTRALIA	1	2.4 GHz WLAN	2412.0	0.12	10.00	6.73	61.40	0.0179	0.1630	0.0224	N/A
AUSTRALIA	1	2.4 GHz WLAN AUX	2412.0	0.12	10.00	6.73	61.40	0.0179	0.1630	0.0224	N/A
AUSTRALIA	1	5 GHz WLAN	5180.0	0.36	10.00	11.67	61.40	0.0310	0.1630	0.0389	N/A
AUSTRALIA	1	5 GHz WLAN AUX	5180.0	0.40	10.00	12.26	61.40	0.0325	0.1630	0.0409	N/A
NEW ZEALAND	1	Bluetooth	2400.0	0.13	10.00	6.89	61.00	0.0183	0.1600	0.0230	N/A
NEW ZEALAND	1	2.4 GHz WLAN	2412.0	0.12	10.00	6.73	61.00	0.0179	0.1600	0.0224	N/A
NEW ZEALAND	1	2.4 GHz WLAN AUX	2412.0	0.12	10.00	6.73	61.00	0.0179	0.1600	0.0224	N/A
NEW ZEALAND	1	5 GHz WLAN	5180.0	0.36	10.00	11.67	61.00	0.0310	0.1600	0.0389	N/A
NEW ZEALAND	1	5 GHz WLAN AUX	5180.0	0.40	10.00	12.26	61.00	0.0325	0.1600	0.0409	N/A

**Table 12 – General Public Individual Transmitter Result**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

### 2.3 Combined Antenna Port RF Exposure Results

As the frequency of operation for each transmitter is not the same, in order to evaluate compliance with the limit which is dependent on frequency, the fractional exposure value is calculated: The calculated S power density is divided by the limit to get a fractional exposure value. The calculated E and H fields are divided by the limit and squared to get a fractional exposure value. The summation of the fractional RF exposure results for each transmitter provides the combined result. Any values less than one are compliant with the limit.

Calculations are made on an Excel spreadsheet and numbers may not add up exactly due to rounding.



### 2.3.1 Scenario 1 - 5.0 GHz WLAN (Main Radio) + 2.4GHz WLAN (Aux) + Bluetooth

EU EN 62311 specifies the method of summation in clause 8.3 with results as follows:

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	N/A	0.0024	N/A	0.0026
1	2.4 GHz WLAN AUX	2412.0	N/A	0.0023	N/A	0.0025
1	5 GHz WLAN	5180.0	N/A	0.0069	N/A	0.0075
Summation			N/A	0.0117	N/A	0.0126

**Table 13 – EU Worker/Occupational Combined Exposure**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0126	0.0127	0.0130	0.0132
1	2.4 GHz WLAN AUX	2412.0	0.0120	0.0122	0.0124	0.0126
1	5 GHz WLAN	5180.0	0.0361	0.0366	0.0374	0.0378
Summation			0.0607	0.0615	0.0629	0.0636

**Table 14 – EU General Public Combined Exposure**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.



FCC OET 65 specifies the method of summation in clause; Multiple-Transmitter Sites and Complex Environments; with results as follows:

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0025	N/A	N/A	N/A
1	2.4 GHz WLAN AUX	2412.0	0.0270	N/A	N/A	N/A
1	5 GHz WLAN	5180.0	0.0081	N/A	N/A	N/A
Summation			0.0376	N/A	N/A	N/A

**Table 15 – FCC Worker/Occupational Combined Exposure**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0126	N/A	N/A	N/A
1	2.4 GHz WLAN AUX	2412.0	0.1348	N/A	N/A	N/A
1	5 GHz WLAN	5180.0	0.0405	N/A	N/A	N/A
Summation			0.1879	N/A	N/A	N/A

**Table 16 – FCC General Public Combined Exposure**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.



CANADA Health Canada Safety Code 6 specifies the method of summation in clause 2.2.1 Note 6 with results as follows:

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0040	0.0040	0.0040	N/A
1	2.4 GHz WLAN AUX	2412.0	0.0425	0.0425	0.0425	N/A
1	5 GHz WLAN	5180.0	0.0087	0.0087	0.0087	N/A
Summation			0.0552	0.0552	0.0552	N/A

**Table 17 – CANADA Worker/Occupational Combined Exposure**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0235	0.0235	0.0235	N/A
1	2.4 GHz WLAN AUX	2412.0	0.2512	0.2513	0.2512	N/A
1	5 GHz WLAN	5180.0	0.0448	0.0448	0.0448	N/A
Summation			0.3195	0.3196	0.3195	N/A

**Table 18 – CANADA General Public Combined Exposure**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.





AUSTRALIA ARPANSA Radiation Protection Series No.3 specifies the method of summation in clause 3.4 with results as follows:

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0025	0.0025	0.0025	N/A
1	2.4 GHz WLAN AUX	2412.0	0.0024	0.0024	0.0024	N/A
1	5 GHz WLAN	5180.0	0.0072	0.0073	0.0072	N/A
Summation			0.0121	0.0122	0.0122	N/A

**Table 19 – AUSTRALIA Worker/Occupational Combined Exposure**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0126	0.0126	0.0126	N/A
1	2.4 GHz WLAN AUX	2412.0	0.0120	0.0120	0.0120	N/A
1	5 GHz WLAN	5180.0	0.0361	0.0361	0.0361	N/A
Summation			0.0607	0.0607	0.0606	N/A

**Table 20 – AUSTRALIA General Public Combined Exposure**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.



NEW ZEALAND NZS 2772 Part 1 specifies the method of summation in clause 7 with results as follows:

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0025	0.0025	0.0026	N/A
1	2.4 GHz WLAN AUX	2412.0	0.0024	0.0024	0.0025	N/A
1	5 GHz WLAN	5180.0	0.0072	0.0073	0.0074	N/A
Summation			0.0121	0.0122	0.0124	N/A

**Table 21 – NEW ZEALAND Worker/Occupational Combined Exposure**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0126	0.0127	0.0130	N/A
1	2.4 GHz WLAN AUX	2412.0	0.0120	0.0122	0.0124	N/A
1	5 GHz WLAN	5180.0	0.0361	0.0366	0.0374	N/A
Summation			0.0607	0.0615	0.0629	N/A

**Table 22 – NEW ZEALAND General Public Combined Exposure**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.



### 2.3.2 Scenario 2 - 2.4 GHz WLAN (Main Radio) + 5.0GHz WLAN (Aux) + Bluetooth

EU EN 62311 specifies the method of summation in clause 8.3 with results as follows:

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	N/A	0.0024	N/A	0.0026
1	2.4 GHz WLAN	2412.0	N/A	0.0023	N/A	0.0025
1	5 GHz WLAN AUX	5180.0	N/A	0.0077	N/A	0.0082
Summation			N/A	0.0124	N/A	0.0133

**Table 23 – EU Worker/Occupational Combined Exposure**

The calculations show that the EUT complies with the worker/occupational exposure levels described in in the listed specifications in Annex A at the point of investigation, 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0126	0.0127	0.0130	0.0132
1	2.4 GHz WLAN	2412.0	0.0120	0.0122	0.0124	0.0126
1	5 GHz WLAN AUX	5180.0	0.0399	0.0404	0.0413	0.0418
Summation			0.0645	0.0653	0.0668	0.0675

**Table 24 – EU General Public Combined Exposure**

The calculations show that the EUT complies with the general public exposure levels described in in the listed specifications in Annex A at the point of investigation, 0.2 m.



FCC OET 65 specifies the method of summation in clause; Multiple-Transmitter Sites and Complex Environments; with results as follows:

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0025	N/A	N/A	N/A
1	2.4 GHz WLAN	2412.0	0.0270	N/A	N/A	N/A
1	5 GHz WLAN AUX	5180.0	0.0080	N/A	N/A	N/A
Summation			0.0375	N/A	N/A	N/A

**Table 25 – FCC Worker/Occupational Combined Exposure**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0126	N/A	N/A	N/A
1	2.4 GHz WLAN	2412.0	0.1348	N/A	N/A	N/A
1	5 GHz WLAN AUX	5180.0	0.0399	N/A	N/A	N/A
Summation			0.1873	N/A	N/A	N/A

**Table 26 – FCC General Public Combined Exposure**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.



CANADA Health Canada Safety Code 6 specifies the method of summation in clause 2.2.1 Note 6 with results as follows:

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0040	0.0040	0.0040	N/A
1	2.4 GHz WLAN	2412.0	0.0425	0.0425	0.0425	N/A
1	5 GHz WLAN AUX	5180.0	0.0086	0.0086	0.0086	N/A
Summation			0.0551	0.0551	0.0551	N/A

**Table 27 – CANADA Worker/Occupational Combined Exposure**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0235	0.0235	0.0235	N/A
1	2.4 GHz WLAN	2412.0	0.2512	0.2513	0.2512	N/A
1	5 GHz WLAN AUX	5180.0	0.0441	0.0441	0.0441	N/A
Summation			0.3188	0.3189	0.3188	N/A

**Table 28 – CANADA General Public Combined Exposure**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.



AUSTRALIA ARPANSA Radiation Protection Series No.3 specifies the method of summation in clause 3.4 with results as follows:

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0025	0.0025	0.0025	N/A
1	2.4 GHz WLAN	2412.0	0.0024	0.0024	0.0024	N/A
1	5 GHz WLAN AUX	5180.0	0.0080	0.0080	0.0080	N/A
Summation			0.0129	0.0130	0.0129	N/A

**Table 29 – AUSTRALIA Worker/Occupational Combined Exposure**

The calculations show that the EUT complies with the worker/occupational exposure levels described in in the listed specifications in Annex A at the point of investigation, 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0126	0.0126	0.0126	N/A
1	2.4 GHz WLAN	2412.0	0.0120	0.0120	0.0120	N/A
1	5 GHz WLAN AUX	5180.0	0.0399	0.0399	0.0398	N/A
Summation			0.0645	0.0645	0.0644	N/A

**Table 30 – AUSTRALIA General Public Combined Exposure**

The calculations show that the EUT complies with the general public exposure levels described in in the listed specifications in Annex A at the point of investigation, 0.2 m.



NEW ZEALAND NZS 2772 Part 1 specifies the method of summation in clause 7 with results as follows:

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0025	0.0025	0.0026	N/A
1	2.4 GHz WLAN	2412.0	0.0024	0.0024	0.0025	N/A
1	5 GHz WLAN AUX	5180.0	0.0080	0.0080	0.0082	N/A
Summation			0.0129	0.0130	0.0132	N/A

**Table 31 – NEW ZEALAND Worker/Occupational Combined Exposure**

The calculations show that the EUT complies with the worker/occupational exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at compliance boundary of 0.2 m as a fraction of the limit			
			S Power Density	E Field	H Field	B Field
			Summation for simultaneous exposure; value to be <1			
1	Bluetooth	2400.0	0.0126	0.0127	0.0130	N/A
1	2.4 GHz WLAN	2412.0	0.0120	0.0122	0.0124	N/A
1	5 GHz WLAN AUX	5180.0	0.0399	0.0404	0.0413	N/A
Summation			0.0645	0.0653	0.0668	N/A

**Table 32 – NEW ZEALAND General Public Combined Exposure**

The calculations show that the EUT complies with the general public exposure levels described in the listed specifications in Annex A at the point of investigation, 0.2 m.



## 2.4 Far Field Region Boundary Results

The far field region boundary calculation result is shown in Table 33:

Near Field / Far Field Boundary (Ref: IEEE C95.3 Annex B.2, EN 62311 Annex A, Technical Guide for Interpretation and Compliance Assessment of Health Canada's Radiofrequency Exposure Guidelines 7.1, AS/NZS 2772.2 Appendix B)			
RAT Name	Frequency MHz	Reactive Near Field Boundary (Wave Impedance Dependent)	Far Field Boundary (Antennas on axis)
		$\lambda/4$ (m)	$2D^2/\lambda$ (m)
Bluetooth	2400.0	0.0313	7.6176
2.4 GHz WLAN	2412.0	0.0311	7.6557
2.4 GHz WLAN AUX	2412.0	0.0311	7.6557
5 GHz WLAN	5180.0	0.0145	16.4413
5 GHz WLAN AUX	5180.0	0.0145	16.4413

**Table 33 – Far Field Boundary**

The table below shows the maximum calculated near field / far field region boundaries.

The compliance boundary of 0.2 m is in the radiating near field region and therefore, the approach described in section 2.1 is an over estimate of the exposure and therefore a conservative assessment.

Field Region	Reactive Near Field Region	Radiating Near Field Region	Far Field Region
Maximum Boundary	<0.0313 m	0.0313 – 16.4413 m	> 16.4413 m
Validity of Regions	Spherical model potential under-estimate: SAR assessment required	Spherical model over-estimate and conservative	Spherical model valid
Compliance Boundary Location	N/A	0.2 m	N/A

**Table 34 – Assessment Method Validity**

## 2.5 Uncertainty

The basic computation formulas presented in section 2.1 are conservative formulas for the estimation of RF field strength or power density. No uncertainty estimations are required when using these formulas but there is clear guidance on where and when these formulas are applicable.

For the estimate of S, E or H to be conservative, the transmitter power P and antenna gain  $G_i$  values shall be the upper bounds of uncertainty therefore maximum values are used.

The spherical formula is valid under far field conditions which are established in section 2.4.





## **ANNEX A**

### **REGIONAL REQUIREMENTS**



Frequency Range (MHz)	Power Density (W/m <sup>2</sup> )	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Magnetic Flux Density (μT)
0.1 - 1	-	610	N/A	2/f
1 - 10	-	610/f	N/A	2/f
10 - 400		61	N/A	0.2
400 - 2000		$3 \cdot f^{0.5}$	N/A	$1 \cdot 10^{-2} \cdot f^{0.5}$
2000 - 6000		140	N/A	0.45
6000 - 300000	50	140	N/A	0.45

**Table A.1 – EU: Action levels in Directive 2013/35/EU Annex III Table B1 Worker/Occupational Limits**

Frequency Range (MHz)	Power Density (W/m <sup>2</sup> )	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Magnetic Flux Density (μT)
0.003 - 0.15	-	87	5	6.25
0.15 - 1	-	87	$0.73/f$	$0.92/f$
1 - 10	-	$87/f^{0.5}$	$0.73/f$	$0.92/f$
10 - 400	2	28	0.073	0.092
400 - 2000	$f/200$	$1.375 \cdot f^{0.5}$	$0.0037 \cdot f^{0.5}$	$0.0046 \cdot f^{0.5}$
2000 - 300000	10	61	0.16	0.2

**Table A.2 – EU: Council Recommendation 1999/519/EC Annex II Table 1 General Public Limits**

Frequency Range (MHz)	Power Density (mW/cm <sup>2</sup> ) Note 1	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0 - 0.3	-	-	-
0.3 - 3	100	614	1.63
3 - 30	$900/f^2$	$1842/f$	$4.89/f$
30 - 300	1	61.4	0.163
300 - 1500	$f/300$	-	-
1500 - 100000	5	-	-

**Table A.3 – CFR 47 Pt1.1310 (2019) Worker/Occupational Limits**

Frequency Range (MHz)	Power Density (mW/cm <sup>2</sup> ) Note 1	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0 - 0.3	-	-	-
0.3 - 3	100	614	1.63
3 - 30	$180/f^2$	$824/f$	$2.19/f$
30 - 300	0.2	27.5	0.073
300 - 1500	$f/1500$	-	-
1500 - 100000	1	-	-

**Table A.4 – CFR 47 Pt1.1310 (2019) General Public Limits**



Note 1: The calculations and limits presented in this report for power density are in units of W/m<sup>2</sup>. The conversion factor is; 1 mW/cm<sup>2</sup> = 10 W/m<sup>2</sup>.

Frequency Range (MHz)	Power Density (W/m <sup>2</sup> )	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
10 - 20	10	61.4	0.163
20 - 48	$44.72/f^{0.5}$	$129.8/f^{0.25}$	$0.3444/f^{0.25}$
48 - 100	6.455	49.33	0.1309
100 - 6000	$0.6455*f^{0.5}$	$15.60*f^{0.25}$	$0.04138*f^{0.25}$
6000 - 150000	50	137	0.364

**Table A.5 – Health Canada Safety Code 6 Worker/Occupational Limits**

Frequency Range (MHz)	Power Density (W/m <sup>2</sup> )	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
10 - 20	2	27.46	0.0728
20 - 48	$8.944/f^{0.5}$	$58.07/f^{0.25}$	$0.1540/f^{0.25}$
48 - 300	1.291	22.06	0.05852
300 - 6000	$0.02619*f^{0.6834}$	$3.142*f^{0.3417}$	$0.008335*f^{0.3417}$
6000 - 15000	10	61.4	0.163

**Table A.6 – Health Canada Safety Code 6 General Public Limits**

Frequency Range (MHz)	Power Density (W/m <sup>2</sup> )	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.1 - 1	-	614	$1.63/f$
1 - 10	$1000/f^2$	$614/f$	$1.63/f$
10 - 400	10	61.4	0.163
400 - 2000	$f/40$	$3.07*f^{0.5}$	$0.00814*f^{0.5}$
2000 - 300000	50	137	0.364

**Table A.7 – ARPANSA Radiation Protection Series No.3 Worker/Occupational Limits**

Frequency Range (MHz)	Power Density (W/m <sup>2</sup> )	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.1 - 0.15	-	86.8	4.86
0.15 - 1	-	86.8	$0.729/f$
1 - 10	-	$86.8/f^{0.5}$	$0.729/f$
10 - 400	2	27.4	0.0729
400 - 2000	$f/200$	$1.37*f^{0.5}$	$0.00364*f^{0.5}$
2000 - 300000	10	61.4	0.163

**Table A.8 – ARPANSA Radiation Protection Series No.3 General Public Limits**

Frequency Range (MHz)	Power Density (W/m <sup>2</sup> )	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
-----------------------	-----------------------------------	-------------------------------	-------------------------------



0.1 - 1	-	614	1.63/f
1 - 10	$1000/f^2$	$614/f$	$1.63/f$
10 - 400	10	61.4	0.163
400 - 2000	$f/40$	$3.07*f^{0.5}$	$0.00814*f^{0.5}$
2000 - 300000	50	137	0.364

**Table A.9 – NZS 2772 Part 1:1999 Worker/Occupational Limits**

Frequency Range (MHz)	Power Density (W/m <sup>2</sup> )	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)
0.1 - 0.15	-	86.8	4.86
0.15 - 1	-	86.8	$0.729/f$
1 - 10	-	$86.8/f^{0.5}$	$0.729/f$
10 - 400	2	27.4	0.0729
400 - 2000	$f/200$	$1.37*f^{0.5}$	$0.00364*f^{0.5}$
2000 - 300000	10	61.4	0.163

**Table A.10 – NZS 2772 Part 1:1999 General Public Limits**