Exposure Calculation Report

Apple Inc Model: A2348

In accordance with EN 50665, FCC CFR 47 Pt 1.1310, Health Canada Safety Code 6, Australia ARPANSA RPS No.3 and New Zealand NZS 2772.1

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Prepared for: Apple Inc.
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NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Jon Kenny	Manager (RF)	Authorised Signatory	21 October 2020

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 50665, FCC CFR 47 Pt.1.1310, Health Canada Safety Code 6, ARPANSA RPS No.3 and New Zealand NZS 2772.1 assuming continuous exposure of 6 minutes or more. If alternative antennas are used with greater gains, the distance must be recalculated.

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Contents

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	21 October 2020

Table 1

1.2 Introduction

Applicant	Apple Inc.
Manufacturer	Apple Inc.
Model Number(s)	A2348
Hardware Version(s)	REV1.0
Software Version(s)	20W102770t and 20A2326
Specification/Issue/Date	• EN 50665:2017 Generic standard for assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz) • FCC 47 CFR Part 1.1310: 2018 • ISED Canada: Health Canada Safety Code 6:2015 • Australia: ARPANSA Radiation Protection Series No.3:2002 • NZS 2772.1:1999 Radiofrequency fields, Maximum exposure levels, 3 kHz to 300 GHz
Order Number Date	0540205400 07-April-2020
Related Document(s)	• EN 62311:2008 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz to 300 GHz) • Directive 2013/35/EU on minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields). • 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. • OET65:97 Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields • IEEE C95.3:2002 IEEE Recommended Practice for Measurements and Computations of Radio Frequency 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 Configuration 1 - single transmitters

Regional Requirement	RAT	Calculated RF exposure level at minimum compliance boundary of 0.2 m							
		S Power Density (W/m^2)		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	6.88	140.00	0.0182	N/A	0.0229	0.4500
EU	2.4 GHz WLAN	0.13	N/A	6.88	140.00	0.0182	N/A	0.0229	0.4500
EU	5 GHz WLAN	0.32	N/A	10.90	140.00	0.0289	N/A	0.0363	0.4500
FCC	Bluetooth	0.63	50.00	15.40	N/A	0.0409	N/A	0.0513	N/A
FCC	2.4 GHz WLAN	1.12	50.00	20.54	N/A	0.0545	N/A	0.0685	N/A
FCC	5 GHz WLAN	0.56	50.00	14.54	N/A	0.0386	N/A	0.0485	N/A
Canada	Bluetooth	0.63	31.64	15.40	109.21	0.0409	0.2897	0.0513	N/A
Canada	2.4 GHz WLAN	1.12	31.70	20.54	109.32	0.0545	0.2900	0.0685	N/A
Canada	5 GHz WLAN	0.56	46.46	14.54	132.34	0.0386	0.3511	0.0485	N/A
Australia	Bluetooth	0.13	50.00	6.88	137.00	0.0182	0.3640	0.0229	N/A
Australia	2.4 GHz WLAN	0.13	50.00	6.88	137.00	0.0182	0.3640	0.0229	N/A
Australia	5 GHz WLAN	0.32	50.00	10.90	137.00	0.0289	0.3640	0.0363	N/A
New Zealand	Bluetooth	0.13	50.00	6.88	137.00	0.0182	0.3600	0.0229	N/A
New Zealand	2.4 GHz WLAN	0.13	50.00	6.88	137.00	0.0182	0.3600	0.0229	N/A
New Zealand	5 GHz WLAN	0.32	50.00	10.90	137.00	0.0289	0.3600	0.0363	N/A

Table 2 – Worker/Occupational Exposure Results

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, a minimum of 0.2 m.

Regional Requirement	RAT	Calculated RF exposure level at minimum compliance boundary of 0.2 m							
		S Power Density (W/m^2)		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	6.88	61.00	0.0182	0.1600	0.0229	0.2000
EU	2.4 GHz WLAN	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	0.2000
EU	5 GHz WLAN	0.32	10.00	10.90	61.00	0.0289	0.1600	0.0363	0.2000
FCC	Bluetooth	0.63	10.00	15.40	N/A	0.0409	N/A	0.0513	N/A
FCC	2.4 GHz WLAN	1.12	10.00	20.54	N/A	0.0545	N/A	0.0685	N/A
FCC	5 GHz WLAN	0.56	10.00	14.54	N/A	0.0386	N/A	0.0485	N/A
Canada	Bluetooth	0.63	5.35	15.40	44.91	0.0409	0.1191	0.0513	N/A
Canada	2.4 GHz WLAN	1.12	5.37	20.54	44.97	0.0545	0.1193	0.0685	N/A
Canada	5 GHz WLAN	0.56	9.05	14.54	58.40	0.0386	0.1549	0.0485	N/A
Australia	Bluetooth	0.13	10.00	6.88	61.40	0.0182	0.1630	0.0229	N/A
Australia	2.4 GHz WLAN	0.13	10.00	6.88	61.40	0.0182	0.1630	0.0229	N/A
Australia	5 GHz WLAN	0.32	10.00	10.90	61.40	0.0289	0.1630	0.0363	N/A
New Zealand	Bluetooth	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	N/A
New Zealand	2.4 GHz WLAN	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	N/A
New Zealand	5 GHz WLAN	0.32	10.00	10.90	61.00	0.0289	0.1600	0.0363	N/A

Table 3 – General Public Exposure Results

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, a minimum of 0.2 m.

1.3.1 Configuration 2 - multiple transmitters

Regional Requirement	RAT	Calculated RF exposure level at minimum 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	Bluetooth (SISO)	N/A	0.0024	N/A	0.0026
EU	2.4 GHz WLAN (SISO)	N/A	0.0024	N/A	0.0026
EU	5 GHz WLAN (SISO)	N/A	0.0061	N/A	0.0065
EU	2.4 GHz WLAN (2x2 MIMO)	N/A	0.0048	N/A	0.0052
EU	5 GHz WLAN (2x2 MIMO)	N/A	0.0121	N/A	0.0130
EU	Bluetooth (2x2 MIMO)	N/A	0.0048	N/A	0.0052
FCC	Bluetooth (SISO)	0.0126	N/A	N/A	N/A
FCC	2.4 GHz WLAN (SISO)	0.0224	N/A	N/A	N/A
FCC	5 GHz WLAN (SISO)	0.0112	N/A	N/A	N/A
FCC	2.4 GHz WLAN (2x2 MIMO)	0.0447	N/A	N/A	N/A
FCC	5 GHz WLAN (2x2 MIMO)	0.0224	N/A	N/A	N/A
FCC	Bluetooth (2x2 MIMO)	0.0252	N/A	N/A	N/A
Canada	Bluetooth (SISO)	0.0199	0.0199	0.0199	N/A
Canada	2.4 GHz WLAN (SISO)	0.0353	0.0353	0.0353	N/A
Canada	5 GHz WLAN (SISO)	0.0121	0.0121	0.0121	N/A
Canada	2.4 GHz WLAN (2x2 MIMO)	0.0706	0.0706	0.0706	N/A
Canada	5 GHz WLAN (2x2 MIMO)	0.0241	0.0241	0.0241	N/A
Canada	Bluetooth (2x2 MIMO)	0.0398	0.0398	0.0398	N/A
Australia	Bluetooth (SISO)	0.0025	0.0025	0.0025	N/A
Australia	2.4 GHz WLAN (SISO)	0.0025	0.0025	0.0025	N/A
Australia	5 GHz WLAN (SISO)	0.0063	0.0063	0.0063	N/A
Australia	2.4 GHz WLAN (2x2 MIMO)	0.0050	0.0050	0.0050	N/A
Australia	5 GHz WLAN (2x2 MIMO)	0.0126	0.0127	0.0126	N/A
Australia	Bluetooth (2x2MIMO)	0.0050	0.0050	0.0050	N/A
New Zealand	Bluetooth (SISO)	0.0025	0.0025	0.0026	N/A
New Zealand	2.4 GHz WLAN (SISO)	0.0025	0.0025	0.0026	N/A
New Zealand	5 GHz WLAN (SISO)	0.0063	0.0063	0.0065	N/A
New Zealand	2.4 GHz WLAN (2x2 MIMO)	0.0050	0.0050	0.0051	N/A
New Zealand	5 GHz WLAN (2x2 MIMO)	0.0126	0.0127	0.0129	N/A
New Zealand	Bluetooth (2x2 MIMO)	0.0050	0.0050	0.0051	N/A

Table 4 – Worker/Occupational Exposure Results

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, a minimum of 0.2 m.

Regional Requirement	RAT	Calculated RF exposure level at minimum 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	Bluetooth (SISO)	0.0126	0.0127	0.0130	0.0131
EU	2.4 GHz WLAN (SISO)	0.0126	0.0127	0.0130	0.0131
EU	5 GHz WLAN (SISO)	0.0315	0.0319	0.0327	0.0330
EU	2.4 GHz WLAN (2x2 MIMO)	0.0251	0.0254	0.0260	0.0263
EU	5 GHz WLAN (2x2 MIMO)	0.0631	0.0639	0.0653	0.0660
EU	Bluetooth (MIMO 2x2)	0.0251	0.0254	0.0260	0.0263
FCC	Bluetooth (SISO)	0.0629	N/A	N/A	N/A
FCC	2.4 GHz WLAN (SISO)	0.1119	N/A	N/A	N/A
FCC	5 GHz WLAN (SISO)	0.0561	N/A	N/A	N/A
FCC	2.4 GHz WLAN (2x2 MIMO)	0.2237	N/A	N/A	N/A
FCC	5 GHz WLAN (2x2 MIMO)	0.1121	N/A	N/A	N/A
FCC	Bluetooth (MIMO 2x2)	0.1258	N/A	N/A	N/A
Canada	Bluetooth (SISO)	0.1176	0.1176	0.1176	N/A
Canada	2.4 GHz WLAN (SISO)	0.2085	0.2085	0.2085	N/A
Canada	5 GHz WLAN (SISO)	0.0620	0.0620	0.0620	N/A
Canada	2.4 GHz WLAN (2x2 MIMO)	0.4170	0.4170	0.4170	N/A
Canada	5 GHz WLAN (2x2 MIMO)	0.1240	0.1240	0.1239	N/A
Canada	Bluetooth (MIMO 2x2)	0.2351	0.2352	0.2351	N/A
Australia	Bluetooth (SISO)	0.0126	0.0126	0.0125	N/A
Australia	2.4 GHz WLAN (SISO)	0.0126	0.0126	0.0125	N/A
Australia	5 GHz WLAN (SISO)	0.0315	0.0315	0.0315	N/A
Australia	2.4 GHz WLAN (2x2 MIMO)	0.0251	0.0251	0.0251	N/A
Australia	5 GHz WLAN (2x2 MIMO)	0.0631	0.0631	0.0630	N/A
Australia	Bluetooth (MIMO 2x2)	0.0251	0.0251	0.0251	N/A
New Zealand	Bluetooth (SISO)	0.0126	0.0127	0.0130	N/A
New Zealand	2.4 GHz WLAN (SISO)	0.0126	0.0127	0.0130	N/A
New Zealand	5 GHz WLAN (SISO)	0.0315	0.0319	0.0327	N/A
New Zealand	2.4 GHz WLAN (2x2 MIMO)	0.0251	0.0254	0.0260	N/A
New Zealand	5 GHz WLAN (2x2 MIMO)	0.0631	0.0639	0.0653	N/A
New Zealand	Bluetooth (MIMO 2x2)	0.0251	0.0254	0.0260	N/A

Table 5 – General Public Exposure Results

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, a minimum of 0.2 m.

1.4 Product Information

1.4.1 Technical Description

The Equipment Under Test (EUT) was a desktop computer with Bluetooth, Bluetooth Low Energy and 802.11 a/b/g/n/ac/ax capabilities in the 2.4 GHz and 5 GHz 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 (MHz)	Minimum Frequency (MHz)	Output Power (dBm)	Duty Cycle (%)
Bluetooth (SISO)	1	2402 - 2480	2402	20.0	100
Bluetooth (SISO)	2	2402 - 2480	2402	20.0	100
Bluetooth (SISO)	3	2402 - 2480	2402	20.0	100
Bluetooth (MIMO)	1+2	2402 - 2480	2402	20.0	100
Bluetooth (MIMO)	1+3	2402 - 2480	2402	20.0	100
Bluetooth (MIMO)	2+3	2402 - 2480	2402	20.0	100
2.4 GHz WLAN (SISO)	1	2412 - 2472	2412	22.5	100
2.4 GHz WLAN (SISO)	2	2412 - 2472	2412	22.5	100
2.4 GHz WLAN (SISO)	3	2412 - 2472	2412	22.5	100
2.4 GHz WLAN (2x2 MIMO)	1+2	2412 - 2472	2412	22.5	100
2.4 GHz WLAN (2x2 MIMO)	1+3	2412 - 2472	2412	22.5	100
2.4 GHz WLAN (2x2 MIMO)	2+3	2412 - 2472	2412	22.5	100
5 GHz WLAN (SISO)	1	5180 - 5825	5180	20.5	100
5 GHz WLAN (SISO)	2	5180 - 5825	5180	20.5	100
5 GHz WLAN (2x2 MIMO)	1+2	5180 - 5825	5180	20.5	100

Table 6 – Transmitter Description- FCC / Canada

Radio Access Technology	Antenna Port	Frequency Band (MHz)	Minimum Frequency (MHz)	Output Power (dBm)	Duty Cycle (%)
Bluetooth (SISO)	1	2402 - 2480	2402	13.0	100
Bluetooth (SISO)	2	2402 - 2480	2402	13.0	100
Bluetooth (SISO)	3	2402 - 2480	2402	13.0	100
Bluetooth (MIMO)	1+2	2402 - 2480	2402	13.0	100
Bluetooth (MIMO)	1+3	2402 - 2480	2402	13.0	100
Bluetooth (MIMO)	2+3	2402 - 2480	2402	13.0	100
2.4 GHz WLAN (SISO)	1	2412 - 2472	2412	13.0	100
2.4 GHz WLAN (SISO)	2	2412 - 2472	2412	13.0	100
2.4 GHz WLAN (SISO)	3	2412 - 2472	2412	13.0	100
2.4 GHz WLAN (2x2 MIMO)	1+2	2412 - 2472	2412	13.0	100
2.4 GHz WLAN (2x2 MIMO)	1+3	2412 - 2472	2412	13.0	100
2.4 GHz WLAN (2x2 MIMO)	2+3	2412 - 2472	2412	13.0	100
5 GHz WLAN (SISO)	1	5180 - 5825	5180	18.0	100
5 GHz WLAN (SISO)	2	5180 - 5825	5180	18.0	100
5 GHz WLAN (2x2 MIMO)	1+2	5180 - 5825	5180	18.0	100

Table 7 – Transmitter Description- EU / Australia / New Zealand

1.4.3 Antenna Description

The following antennas are supported by the equipment under test.

Antenna No	Radio Access Technology	Antenna Model	Gain (dBi)	Antenna length (cm)
1	Bluetooth	Not Specified	5.0	5.10
2	Bluetooth	Not Specified	5.0	3.74
3	Bluetooth	Not Specified	5.0	1.67
1	2.4 GHz WLAN	Not Specified	5.0	5.10
2	2.4 GHz WLAN	Not Specified	5.0	3.74
3	2.4 GHz WLAN	Not Specified	5.0	1.67
1	5 GHz WLAN	Not Specified	4.0	5.10
2	5 GHz WLAN	Not Specified	4.0	3.74

Table 8 – Antenna description

In the case of more than one type of antenna being supported by the equipment, the calculation is based on the maximum of the antenna gains. If other antennas can be used that have greater gains, the minimum separation distances will need to be recalculated.

1.4.4 Equipment Configuration

Simultaneous transmission of the following configurations:

Bluetooth + 2.4 GHz WLAN (SISO) +5 GHz WLAN (SISO)
Bluetooth + 2.4 GHz WLAN (SISO)
Bluetooth + 5 GHz WLAN (SISO)
Bluetooth + 2.4 GHz WLAN (2x2 MIMO)
Bluetooth + 5 GHz WLAN (2x2 MIMO)
Bluetooth TxBF +2.4 GHz WLAN (SISO)
Bluetooth TxBF +5 GHz WLAN (SISO)

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:
η - Impedance of free space (377 ohm in far field)
P – Average transmitter power W (P_{av} = P_{max} x Duty Cycle)
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:
μ_o – Permeability of free space 4 x π E-7 H/m

This assessment assumes that exposure is continuous for 6 minutes or more in accordance with the averaging time required by the exposure standards at the stated minimum compliance boundary separation distance. Exposures of less than 6 minutes at other separation distances are not addressed by this report.

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.

The result is compared to the limits in Annex A to determine compliance or to calculate the required compliance distance. The calculation is based on the lowest frequency in each band as the most onerous requirement as the limits increase with frequency for frequencies above 10-50 MHz (dependent on region).

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 minimum compliance boundary of 0.2 m							
				S Power Density (W/m^2)		E Field (V/m)		H Field (A/m)		B Field (µT)	
				Result	Limit	Result	Limit	Result	Limit	Result	Limit
EU	1,2,3	Bluetooth (SISO)	2402	0.13	N/A	6.88	140.00	0.0182	N/A	0.0229	0.4500
EU	1,2,3	Bluetooth (MIMO)	2402	0.13	N/A	6.88	140.00	0.0182	N/A	0.0229	0.4500
EU	1,2,3	2.4 GHz WLAN (SISO)	2412	0.13	N/A	6.88	140.00	0.0182	N/A	0.0229	0.4500
EU	1,2,3	2.4 GHz WLAN (2x2 MIMO)	2412	0.13	N/A	6.88	140.00	0.0182	N/A	0.0229	0.4500
EU	1,2	5 GHz WLAN (SISO)	5180	0.32	N/A	10.90	140.00	0.0289	N/A	0.0363	0.4500
EU	1,2	5 GHz WLAN (2x2 MIMO)	5180	0.32	N/A	10.90	140.00	0.0289	N/A	0.0363	0.4500
Australia	1,2,3	Bluetooth (SISO)	2402	0.13	50.00	6.88	137.00	0.0182	0.3640	0.0229	N/A
Australia	1,2,3	Bluetooth (MIMO)	2402	0.13	50.00	6.88	137.00	0.0182	0.3640	0.0229	N/A
Australia	1,2,3	2.4 GHz WLAN (SISO)	2412	0.13	50.00	6.88	137.00	0.0182	0.3640	0.0229	N/A
Australia	1,2,3	2.4 GHz WLAN (2x2 MIMO)	2412	0.13	50.00	6.88	137.00	0.0182	0.3640	0.0229	N/A
Australia	1,2	5 GHz WLAN (SISO)	5180	0.32	50.00	10.90	137.00	0.0289	0.3640	0.0363	N/A
Australia	1,2	5 GHz WLAN (2x2 MIMO)	5180	0.32	50.00	10.90	137.00	0.0289	0.3640	0.0363	N/A
New Zealand	1,2,3	Bluetooth (SISO)	2402	0.13	50.00	6.88	137.00	0.0182	0.3600	0.0229	N/A
New Zealand	1,2,3	Bluetooth (MIMO)	2402	0.13	50.00	6.88	137.00	0.0182	0.3600	0.0229	N/A
New Zealand	1,2,3	2.4 GHz WLAN (SISO)	2412	0.13	50.00	6.88	137.00	0.0182	0.3600	0.0229	N/A
New Zealand	1,2,3	2.4 GHz WLAN (2x2 MIMO)	2412	0.13	50.00	6.88	137.00	0.0182	0.3600	0.0229	N/A

New Zealand	1,2	5 GHz WLAN (SISO)	5180	0.32	50.00	10.90	137.00	0.0289	0.3600	0.0363	N/A
New Zealand	1,2	5 GHz WLAN (2x2 MIMO)	5180	0.32	50.00	10.90	137.00	0.0289	0.3600	0.0363	N/A
FCC	1,2,3	Bluetooth (SISO)	2402	0.63	50.00	15.40	N/A	0.0409	N/A	0.0513	N/A
FCC	1,2,3	Bluetooth (MIMO)	2402	0.63	50.00	15.40	N/A	0.0409	N/A	0.0513	N/A
FCC	1,2,3	2.4 GHz WLAN (SISO)	2412	1.12	50.00	20.54	N/A	0.0545	N/A	0.0685	N/A
FCC	1,2,3	2.4 GHz WLAN (2x2 MIMO)	2412	1.12	50.00	20.54	N/A	0.0545	N/A	0.0685	N/A
FCC	1,2	5 GHz WLAN (SISO)	5180	0.56	50.00	14.54	N/A	0.0386	N/A	0.0485	N/A
FCC	1,2	5 GHz WLAN (2x2 MIMO)	5180	0.56	50.00	14.54	N/A	0.0386	N/A	0.0485	N/A
Canada	1,2,3	Bluetooth (SISO)	2402	0.63	31.64	15.40	109.21	0.0409	0.2897	0.0513	N/A
Canada	1,2,3	Bluetooth (MIMO)	2402	0.63	31.64	15.40	109.21	0.0409	0.2897	0.0513	N/A
Canada	1,2,3	2.4 GHz WLAN (SISO)	2412	1.12	31.70	20.54	109.32	0.0545	0.2900	0.0685	N/A
Canada	1,2,3	2.4 GHz WLAN (2x2 MIMO)	2412	1.12	31.70	20.54	109.32	0.0545	0.2900	0.0685	N/A
Canada	1,2	5 GHz WLAN (SISO)	5180	0.56	46.46	14.54	132.34	0.0386	0.3511	0.0485	N/A
Canada	1,2	5 GHz WLAN (2x2 MIMO)	5180	0.56	46.46	14.54	132.34	0.0386	0.3511	0.0485	N/A

Table 9 – Worker/Occupational Individual Transmitter Result

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, a minimum distance of 0.2 m.

Regional Requirement	Antenna Port	RAT	Frequency (MHz)	RF Exposure Level at minimum compliance boundary of 0.2 m							
				S Power Density (W/m^2)		E Field (V/m)		H Field (A/m)		B Field (µT)	
				Result	Limit	Result	Limit	Result	Limit	Result	Limit
EU	1,2,3	Bluetooth (SISO)	2402	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	0.2000
EU	1,2,3	Bluetooth (MIMO)	2402	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	0.2000
EU	1,2,3	2.4 GHz WLAN (SISO)	2412	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	0.2000
EU	1,2,3	2.4 GHz WLAN (2x2 MIMO)	2412	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	0.2000
EU	1,2	5 GHz WLAN (SISO)	5180	0.32	10.00	10.90	61.00	0.0289	0.1600	0.0363	0.2000
EU	1,2	5 GHz WLAN (2x2 MIMO)	5180	0.32	10.00	10.90	61.00	0.0289	0.1600	0.0363	0.2000
Australia	1,2,3	Bluetooth (SISO)	2402	0.13	10.00	6.88	61.40	0.0182	0.1630	0.0229	N/A
Australia	1,2,3	Bluetooth (MIMO)	2402	0.13	10.00	6.88	61.40	0.0182	0.1630	0.0229	N/A
Australia	1,2,3	2.4 GHz WLAN (SISO)	2412	0.13	10.00	6.88	61.40	0.0182	0.1630	0.0229	N/A
Australia	1,2,3	2.4 GHz WLAN (2x2 MIMO)	2412	0.13	10.00	6.88	61.40	0.0182	0.1630	0.0229	N/A
Australia	1,2	5 GHz WLAN (SISO)	5180	0.32	10.00	10.90	61.40	0.0289	0.1630	0.0363	N/A
Australia	1,2	5 GHz WLAN (2x2 MIMO)	5180	0.32	10.00	10.90	61.40	0.0289	0.1630	0.0363	N/A
New Zealand	1,2,3	Bluetooth (SISO)	2402	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	N/A
New Zealand	1,2,3	Bluetooth (MIMO)	2402	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	N/A
New Zealand	1,2,3	2.4 GHz WLAN (SISO)	2412	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	N/A
New Zealand	1,2,3	2.4 GHz WLAN (2x2 MIMO)	2412	0.13	10.00	6.88	61.00	0.0182	0.1600	0.0229	N/A
New Zealand	1,2	5 GHz WLAN (SISO)	5180	0.32	10.00	10.90	61.00	0.0289	0.1600	0.0363	N/A
New Zealand	1,2	5 GHz WLAN (2x2 MIMO)	5180	0.32	10.00	10.90	61.00	0.0289	0.1600	0.0363	N/A
FCC	1,2,3	Bluetooth (SISO)	2402	0.63	10.00	15.40	N/A	0.0409	N/A	0.0513	N/A

FCC	1,2,3	Bluetooth (MIMO)	2402	0.63	10.00	15.40	N/A	0.0409	N/A	0.0513	N/A
FCC	1,2,3	2.4 GHz WLAN (SISO)	2412	1.12	10.00	20.54	N/A	0.0545	N/A	0.0685	N/A
FCC	1,2,3	2.4 GHz WLAN (2x2 MIMO)	2412	1.12	10.00	20.54	N/A	0.0545	N/A	0.0685	N/A
FCC	1,2	5 GHz WLAN (SISO)	5180	0.56	10.00	14.54	N/A	0.0386	N/A	0.0485	N/A
FCC	1,2	5 GHz WLAN (2x2 MIMO)	5180	0.56	10.00	14.54	N/A	0.0386	N/A	0.0485	N/A
Canada	1,2,3	Bluetooth (SISO)	2402	0.63	5.35	15.40	44.91	0.0409	0.1191	0.0513	N/A
Canada	1,2,3	Bluetooth (MIMO)	2402	0.63	5.35	15.40	44.91	0.0409	0.1191	0.0513	N/A
Canada	1,2,3	2.4 GHz WLAN (SISO)	2412	1.12	5.37	20.54	44.97	0.0545	0.1193	0.0685	N/A
Canada	1,2,3	2.4 GHz WLAN (2x2 MIMO)	2412	1.12	5.37	20.54	44.97	0.0545	0.1193	0.0685	N/A
Canada	1,2	5 GHz WLAN (SISO)	5180	0.56	9.05	14.54	58.40	0.0386	0.1549	0.0485	N/A
Canada	1,2	5 GHz WLAN (2x2 MIMO)	5180	0.56	9.05	14.54	58.40	0.0386	0.1549	0.0485	N/A

Table 10 – General Public Individual Transmitter Result

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, a minimum distance of 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.

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 minimum 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 (TxBF)	2402	N/A	0.0024	N/A	0.0026
2	Bluetooth (TxBF)	2402	N/A	0.0024	N/A	0.0026
3	2.4 GHz WLAN (SISO	2412	N/A	0.0024	N/A	0.0026
		Summation	N/A	0.0072	N/A	0.0078

Table 11 – EU Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	N/A	0.0024	N/A	0.0026
2	Bluetooth (TxBF)	2402	N/A	0.0024	N/A	0.0026
3	5 GHz WLAN (SISO)	5180	N/A	0.0061	N/A	0.0065
		Summation	N/A	0.0109	N/A	0.0117

Table 12 – EU Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	N/A	0.0024	N/A	0.0026
2	2.4 GHz WLAN (MIMO)	2412	N/A	0.0024	N/A	0.0026
3	2.4 GHz WLAN (MIMO)	2412	N/A	0.0024	N/A	0.0026
		Summation	N/A	0.0072	N/A	0.0078

Table 13 – EU Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	N/A	0.0024	N/A	0.0026
2	5 GHz WLAN (MIMO)	5180	N/A	0.0061	N/A	0.0065
3	5 GHz WLAN (MIMO)	5180	N/A	0.0061	N/A	0.0065
		Summation	N/A	0.0145	N/A	0.0156

Table 14 – EU Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	N/A	0.0024	N/A	0.0026
2	2.4 GHz WLAN (SISO)	2412	N/A	0.0024	N/A	0.0026
3	5 GHz WLAN (SISO)	5180	N/A	0.0061	N/A	0.0065
		Summation	N/A	0.0109	N/A	0.0117

Table 15 – 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, a minimum distance of 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0126	0.0127	0.0130	0.0131
2	Bluetooth (TxBF)	2402	0.0126	0.0127	0.0130	0.0131
3	2.4 GHz WLAN (SISO	2412	0.0126	0.0127	0.0130	0.0131
		Summation	0.0377	0.0382	0.0390	0.0394

Table 16– EU General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0126	0.0127	0.0130	0.0131
2	Bluetooth (TxBF)	2402	0.0126	0.0127	0.0130	0.0131
3	5 GHz WLAN (SISO)	5180	0.0315	0.0319	0.0327	0.0330
		Summation	0.0566	0.0574	0.0587	0.0593

Table 17 – EU General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	0.0127	0.0130	0.0131
2	2.4 GHz WLAN (MIMO)	2412	0.0126	0.0127	0.0130	0.0131
3	2.4 GHz WLAN (MIMO)	2412	0.0126	0.0127	0.0130	0.0131
		Summation	0.0377	0.0382	0.0390	0.0394

Table 18 – EU General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	0.0127	0.0130	0.0131
2	5 GHz WLAN (MIMO)	5180	0.0315	0.0319	0.0327	0.0330
3	5 GHz WLAN (MIMO)	5180	0.0315	0.0319	0.0327	0.0330
		Summation	0.0756	0.0766	0.0783	0.0792

Table 19 – EU General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	0.0127	0.0130	0.0131
2	2.4 GHz WLAN (SISO)	2412	0.0126	0.0127	0.0130	0.0131
3	5 GHz WLAN (SISO)	5180	0.0315	0.0319	0.0327	0.0330
		Summation	0.0566	0.0574	0.0587	0.0593

Table 20 – 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, a minimum distance of 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 minimum 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 (TxBF)	2402	0.0126	N/A	N/A	N/A
2	Bluetooth (TxBF)	2402	0.0126	N/A	N/A	N/A
3	2.4 GHz WLAN (SISO	2412	0.0224	N/A	N/A	N/A
		Summation	0.0475	N/A	N/A	N/A

Table 21 – FCC Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0126	N/A	N/A	N/A
2	Bluetooth (TxBF)	2402	0.0126	N/A	N/A	N/A
3	5 GHz WLAN (SISO)	5180	0.0112	N/A	N/A	N/A
		Summation	0.0364	N/A	N/A	N/A

Table 22 – FCC Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	N/A	N/A	N/A
2	2.4 GHz WLAN (MIMO)	2412	0.0224	N/A	N/A	N/A
3	2.4 GHz WLAN (MIMO)	2412	0.0224	N/A	N/A	N/A
		Summation	0.0573	N/A	N/A	N/A

Table 23 – FCC Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	N/A	N/A	N/A
2	5 GHz WLAN (MIMO)	5180	0.0112	N/A	N/A	N/A
3	5 GHz WLAN (MIMO)	5180	0.0112	N/A	N/A	N/A
		Summation	0.0350	N/A	N/A	N/A

Table 24 – FCC Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	N/A	N/A	N/A
2	2.4 GHz WLAN (SISO)	2412	0.0224	N/A	N/A	N/A
3	5 GHz WLAN (SISO)	5180	0.0112	N/A	N/A	N/A
		Summation	0.0462	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 in the listed specifications in Annex A at the point of investigation, a minimum distance of 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0629	N/A	N/A	N/A
2	Bluetooth (TxBF)	2402	0.0629	N/A	N/A	N/A
3	2.4 GHz WLAN (SISO	2412	0.1119	N/A	N/A	N/A
		Summation	0.2377	N/A	N/A	N/A

Table 26– FCC General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0629	N/A	N/A	N/A
2	Bluetooth (TxBF)	2402	0.0629	N/A	N/A	N/A
3	5 GHz WLAN (SISO)	5180	0.0561	N/A	N/A	N/A
		Summation	0.1819	N/A	N/A	N/A

Table 27 – FCC General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0629	N/A	N/A	N/A
2	2.4 GHz WLAN (MIMO)	2412	0.1119	N/A	N/A	N/A
3	2.4 GHz WLAN (MIMO)	2412	0.1119	N/A	N/A	N/A
		Summation	0.2867	N/A	N/A	N/A

Table 28 – FCC General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0629	N/A	N/A	N/A
2	5 GHz WLAN (MIMO)	5180	0.0561	N/A	N/A	N/A
3	5 GHz WLAN (MIMO)	5180	0.0561	N/A	N/A	N/A
		Summation	0.1751	N/A	N/A	N/A

Table 29 – FCC General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0629	N/A	N/A	N/A
2	2.4 GHz WLAN (SISO)	2412	0.1119	N/A	N/A	N/A
3	5 GHz WLAN (SISO)	5180	0.0561	N/A	N/A	N/A
		Summation	0.2309	N/A	N/A	N/A

Table 30 – FCC 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, a minimum distance of 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 minimum 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 (TxBF)	2402	0.0199	0.0199	0.0199	N/A
2	Bluetooth (TxBF)	2402	0.0199	0.0199	0.0199	N/A
3	2.4 GHz WLAN (SISO	2412	0.0353	0.0353	0.0353	N/A
		Summation	0.0751	0.0751	0.0751	N/A

Table 31 – Canada Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0199	0.0199	0.0199	N/A
2	Bluetooth (TxBF)	2402	0.0199	0.0199	0.0199	N/A
3	5 GHz WLAN (SISO)	5180	0.0121	0.0121	0.0121	N/A
		Summation	0.0518	0.0518	0.0518	N/A

Table 32 – Canada Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0199	0.0199	0.0199	N/A
2	2.4 GHz WLAN (MIMO)	2412	0.0353	0.0353	0.0353	N/A
3	2.4 GHz WLAN (MIMO)	2412	0.0353	0.0353	0.0353	N/A
		Summation	0.0905	0.0905	0.0905	N/A

Table 33 – Canada Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0199	0.0199	0.0199	N/A
2	5 GHz WLAN (MIMO)	5180	0.0121	0.0121	0.0121	N/A
3	5 GHz WLAN (MIMO)	5180	0.0121	0.0121	0.0121	N/A
		Summation	0.0440	0.0440	0.0440	N/A

Table 34 – Canada Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0199	0.0199	0.0199	N/A
2	2.4 GHz WLAN (SISO)	2412	0.0353	0.0353	0.0353	N/A
3	5 GHz WLAN (SISO)	5180	0.0121	0.0121	0.0121	N/A
		Summation	0.0672	0.0672	0.0672	N/A

Table 35 – Canada 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, a minimum distance of 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.1176	0.1176	0.1176	N/A
2	Bluetooth (TxBF)	2402	0.1176	0.1176	0.1176	N/A
3	2.4 GHz WLAN (SISO	2412	0.2085	0.2085	0.2085	N/A
		Summation	0.4436	0.4437	0.4436	N/A

Table 36– Canada General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.1176	0.1176	0.1176	N/A
2	Bluetooth (TxBF)	2402	0.1176	0.1176	0.1176	N/A
3	5 GHz WLAN (SISO)	5180	0.0620	0.0620	0.0620	N/A
		Summation	0.2971	0.2972	0.2971	N/A

Table 37 – Canada General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.1176	0.1176	0.1176	N/A
2	2.4 GHz WLAN (MIMO)	2412	0.2085	0.2085	0.2085	N/A
3	2.4 GHz WLAN (MIMO)	2412	0.2085	0.2085	0.2085	N/A
		Summation	0.5345	0.5346	0.5345	N/A

Table 38 – Canada General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.1176	0.1176	0.1176	N/A
2	5 GHz WLAN (MIMO)	5180	0.0620	0.0620	0.0620	N/A
3	5 GHz WLAN (MIMO)	5180	0.0620	0.0620	0.0620	N/A
		Summation	0.2415	0.2416	0.2415	N/A

Table 39 – Canada General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.1176	0.1176	0.1176	N/A
2	2.4 GHz WLAN (SISO)	2412	0.2085	0.2085	0.2085	N/A
3	5 GHz WLAN (SISO)	5180	0.0620	0.0620	0.0620	N/A
		Summation	0.3880	0.3881	0.3880	N/A

Table 40 – Canada 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, a minimum distance of 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 minimum 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 (TxBF)	2402	0.0025	0.0025	0.0025	N/A
2	Bluetooth (TxBF)	2402	0.0025	0.0025	0.0025	N/A
3	2.4 GHz WLAN (SISO	2412	0.0025	0.0025	0.0025	N/A
		Summation	0.0075	0.0076	0.0075	N/A

Table 41 – Australia Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0025	0.0025	0.0025	N/A
2	Bluetooth (TxBF)	2402	0.0025	0.0025	0.0025	N/A
3	5 GHz WLAN (SISO)	5180	0.0063	0.0063	0.0063	N/A
		Summation	0.0113	0.0114	0.0113	N/A

Table 42 – Australia Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0025	0.0025	0.0025	N/A
2	2.4 GHz WLAN (MIMO)	2412	0.0025	0.0025	0.0025	N/A
3	2.4 GHz WLAN (MIMO)	2412	0.0025	0.0025	0.0025	N/A
		Summation	0.0075	0.0076	0.0075	N/A

Table 43 – Australia Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0025	0.0025	0.0025	N/A
2	5 GHz WLAN (MIMO)	5180	0.0063	0.0063	0.0063	N/A
3	5 GHz WLAN (MIMO)	5180	0.0063	0.0063	0.0063	N/A
		Summation	0.0151	0.0152	0.0151	N/A

Table 44 – Australia Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0025	0.0025	0.0025	N/A
2	2.4 GHz WLAN (SISO)	2412	0.0025	0.0025	0.0025	N/A
3	5 GHz WLAN (SISO)	5180	0.0063	0.0063	0.0063	N/A
		Summation	0.0113	0.0114	0.0113	N/A

Table 45 – 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, a minimum distance of 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0126	0.0126	0.0125	N/A
2	Bluetooth (TxBF)	2402	0.0126	0.0126	0.0125	N/A
3	2.4 GHz WLAN (SISO	2412	0.0126	0.0126	0.0125	N/A
		Summation	0.0377	0.0377	0.0376	N/A

Table 46– Australia General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0126	0.0126	0.0125	N/A
2	Bluetooth (TxBF)	2402	0.0126	0.0126	0.0125	N/A
3	5 GHz WLAN (SISO)	5180	0.0315	0.0315	0.0315	N/A
		Summation	0.0566	0.0566	0.0565	N/A

Table 47 – Australia General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	0.0126	0.0125	N/A
2	2.4 GHz WLAN (MIMO)	2412	0.0126	0.0126	0.0125	N/A
3	2.4 GHz WLAN (MIMO)	2412	0.0126	0.0126	0.0125	N/A
		Summation	0.0377	0.0377	0.0376	N/A

Table 48 – Australia General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	0.0126	0.0125	N/A
2	5 GHz WLAN (MIMO)	5180	0.0315	0.0315	0.0315	N/A
3	5 GHz WLAN (MIMO)	5180	0.0315	0.0315	0.0315	N/A
		Summation	0.0756	0.0756	0.0755	N/A

Table 49 – Australia General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	0.0126	0.0125	N/A
2	2.4 GHz WLAN (SISO)	2412	0.0126	0.0126	0.0125	N/A
3	5 GHz WLAN (SISO)	5180	0.0315	0.0315	0.0315	N/A
		Summation	0.0566	0.0566	0.0565	N/A

Table 50 – 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, a minimum distance of 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 minimum 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 (TxBF)	2402	0.0025	0.0025	0.0025	N/A
2	Bluetooth (TxBF)	2402	0.0025	0.0025	0.0025	N/A
3	2.4 GHz WLAN (SISO	2412	0.0025	0.0025	0.0025	N/A
		Summation	0.0075	0.0076	0.0075	N/A

Table 51 – New Zealand Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0025	0.0025	0.0025	N/A
2	Bluetooth (TxBF)	2402	0.0025	0.0025	0.0025	N/A
3	5 GHz WLAN (SISO)	5180	0.0063	0.0063	0.0063	N/A
		Summation	0.0113	0.0114	0.0113	N/A

Table 52 – New Zealand Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0025	0.0025	0.0025	N/A
2	2.4 GHz WLAN (MIMO)	2412	0.0025	0.0025	0.0025	N/A
3	2.4 GHz WLAN (MIMO)	2412	0.0025	0.0025	0.0025	N/A
		Summation	0.0075	0.0076	0.0075	N/A

Table 53 – New Zealand Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0025	0.0025	0.0025	N/A
2	5 GHz WLAN (MIMO)	5180	0.0063	0.0063	0.0063	N/A
3	5 GHz WLAN (MIMO)	5180	0.0063	0.0063	0.0063	N/A
		Summation	0.0151	0.0152	0.0151	N/A

Table 54 – New Zealand Worker/Occupational Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0025	0.0025	0.0025	N/A
2	2.4 GHz WLAN (SISO)	2412	0.0025	0.0025	0.0025	N/A
3	5 GHz WLAN (SISO)	5180	0.0063	0.0063	0.0063	N/A
		Summation	0.0113	0.0114	0.0113	N/A

Table 55 – New Zealand 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, a minimum distance of 0.2 m.

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0126	0.0126	0.0125	N/A
2	Bluetooth (TxBF)	2402	0.0126	0.0126	0.0125	N/A
3	2.4 GHz WLAN (SISO	2412	0.0126	0.0126	0.0125	N/A
		Summation	0.0377	0.0377	0.0376	N/A

Table 56– New Zealand General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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 (TxBF)	2402	0.0126	0.0126	0.0125	N/A
2	Bluetooth (TxBF)	2402	0.0126	0.0126	0.0125	N/A
3	5 GHz WLAN (SISO)	5180	0.0315	0.0315	0.0315	N/A
		Summation	0.0566	0.0566	0.0565	N/A

Table 57 – New Zealand General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	0.0126	0.0125	N/A
2	2.4 GHz WLAN (MIMO)	2412	0.0126	0.0126	0.0125	N/A
3	2.4 GHz WLAN (MIMO)	2412	0.0126	0.0126	0.0125	N/A
		Summation	0.0377	0.0377	0.0376	N/A

Table 58 – New Zealand General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	0.0126	0.0125	N/A
2	5 GHz WLAN (MIMO)	5180	0.0315	0.0315	0.0315	N/A
3	5 GHz WLAN (MIMO)	5180	0.0315	0.0315	0.0315	N/A
		Summation	0.0756	0.0756	0.0755	N/A

Table 59 – New Zealand General Public Combined Exposure

Antenna Port	RAT	Frequency (MHz)	Calculated RF exposure level at minimum 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	2402	0.0126	0.0126	0.0125	N/A
2	2.4 GHz WLAN (SISO)	2412	0.0126	0.0126	0.0125	N/A
3	5 GHz WLAN (SISO)	5180	0.0315	0.0315	0.0315	N/A
		Summation	0.0566	0.0566	0.0565	N/A

Table 60 – New Zealand 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, a minimum distance of 0.2 m.

Note: In the above tables, simultaneous transmission has been considered for configurations where all antennas are in use.

2.4 Far Field Region Boundary Results

The far field region boundary calculation result is shown in Table 71

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	Antenna	Frequency MHz	Reactive Near Field Boundary (Wave Impedance Dependent)	Far Field Boundary (Antennas on axis)
			λ/4 (m)	$2D^2/\lambda$ (m)
Bluetooth	1	2402	0.0312	0.0417
2.4 GHz WLAN	1	2412	0.0311	0.0418
5 GHZ WLAN	1	5180	0.0145	0.0898
Bluetooth	2	2402	0.0312	0.0224
2.4 GHz WLAN	2	2412	0.0311	0.0225
5 GHZ WLAN	2	5180	0.0145	0.0483
Bluetooth	3	2402	0.0312	0.0045
2.4 GHz WLAN	3	2412	0.0311	0.0045
5 GHZ WLAN	3	5180	0.0145	0.0096

Table 61 – Far Field Boundary

Field Region	Reactive Near Field Region	Radiating Near Field Region	Far Field Region
Maximum Boundary	< 0.0312 m	0.0312 – 0.0898 m	> 0.0898 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	N/A	0.2 m

Table 62 – Assessment Method Validity - Antenna 1

Field Region	Reactive Near Field Region	Radiating Near Field Region	Far Field Region
Maximum Boundary	< 0.0312 m	0.0312 – 0.0483 m	> 0.0483 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	N/A	0.2 m

Table 63 – Assessment Method Validity - Antenna 2

Field Region	Reactive Near Field Region	Radiating Near Field Region	Far Field Region
Maximum Boundary	< 0.0312 m	0.0312 – 0.0096 m	> 0.0096 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	N/A	0.2 m

Table 64 – Assessment Method Validity - Antenna 3

The compliance boundary of 0.2 m is in the far field region and therefore, the approach described in section 2.1 is valid.

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^2)	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*f^0.5	N/A	1E-2*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^2)	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*f^0.5	0.0037*f^0.5	0.0046*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^2) 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 Worker/Occupational Limits

Frequency Range (MHz)	Power Density (mW/cm^2) 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 General Public Limits

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

Frequency Range (MHz)	Power Density (W/m^2)	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^2)	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^2)	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^2)	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^2)	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 Worker/Occupational Limits

Frequency Range (MHz)	Power Density (W/m^2)	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 General Public Limits

Frequency Range (MHz)	Power Density (W/m^2)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m) (Converted from µT)	Magnetic Flux Density (µT)
All	100	N/A	N/A	N/A

Table A.11 – IEC 60945 Worker/Occupational Limits

Frequency Range (MHz)	Power Density (W/m^2)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m) (Converted from µT)	Magnetic Flux Density (µT)
All	10	N/A	N/A	N/A

Table A.12 – IEC 60945 General Public Limits