

# Monitoring of Vodafone cellsites: annual summary 2014-16

This report was prepared for:  
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### **About EMF Services and the author of this report**

EMF Services is a division of Monitoring and Advisory Services NZ Ltd (MAASNZ), and provides professional measurement and advisory services related to possible health effects of electromagnetic fields (EMFs), such as the extremely low frequency (ELF) electric and magnetic fields found around any wiring, appliances or infrastructure carrying mains electricity, and the radiofrequency (RF) fields produced by radio transmitters and some industrial equipment.

Martin Gledhill has an MA degree in Natural Sciences (Physics) and an MSc in Medical Physics. He is a member of the Australasian Radiation Protection Society and of the Bioelectromagnetics Society. Before forming MAASNZ he was head of the non-ionising radiation section at the National Radiation Laboratory of the New Zealand Ministry of Health. In this position he provided advice to central and local government, the public and industry on the health effects of EMFs, and carried out measurement and assessment services in this area. This work included providing policy advice to the Ministries of Health and the Environment, preparation of public information material, presenting expert evidence at local authority and Environment Court hearings, and assessing exposures to EMFs by both measurements and calculations.

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## 1 Introduction

EMF Services, which provides independent electromagnetic field (EMF) measurement services, has been commissioned by Vodafone to measure exposures around their cellsites. This report presents the results of measurements at ten sites carried out between September 2014 and February 2016. The purpose of the tests is to evaluate exposures to radiofrequency (RF) fields near Vodafone cellsites to determine the maximum exposure at the time the measurements were made, and the maximum possible exposure should all the equipment at the Vodafone site (and any other transmitters nearby) operate at full power. Exposures are compared against the appropriate limits in New Zealand Standard 2772.1:1999 *Radiofrequency Fields Part 1: - Maximum exposure levels 3 kHz - 300 GHz*, as required by the Resource Management (National Environmental Standards for Telecommunications Facilities) Regulations 2008 (“the NES”).

Vodafone has made the following statement about the testing:

*Vodafone is committed to providing greater transparency and access to information for all our stakeholders on the issues of mobile phones, masts and health. To proactively address these issues and to better inform and educate our customers, employees and the general public, Vodafone has established an independent field monitoring programme to measure and monitor the total electromagnetic radio-frequency (RF) field strength in the environment, from all sources (i.e., TV, radio, mobile telephony base stations etc), near our mobile base stations.*

*The aim of the programme is to provide the public with independent, reliable and direct information on the total electromagnetic RF levels in the environment.*

*In order to preserve the transparency and validity of information provided, as well as the ongoing updating thereof, Vodafone has requested that EMF Services assume the programme’s overall scientific management. As an independent organisation EMF Services selects the locations to undertake the monitoring and measurement of RF fields, and moreover, supervises and verifies the correctness of all information, entirely independent of Vodafone.*

## 2 Overview of measurement methodology

A full description of the measurement equipment, methodology, post-processing of the data and uncertainty analysis for the monitoring is presented in EMF Services Report 2016/04 *Monitoring of Vodafone cellsites: methodology*.

In summary, a preliminary survey of the area around a site is made using a broadband measurement probe. This meter measures the overall exposure from all transmitters which might make a contribution to the total, but is not able to distinguish the individual contributions from each transmitter. Because the exposure limit in NZS 2772.1:1999 depends on the transmitter frequency, and cellsites transmit at several frequencies, it is

not possible to use the readings from the broadband measurements to determine precisely the exposure as a percentage of the public limit in the Standard. Nor is it possible to use the measurements to determine what the exposure would be if all transmitters at a nearby cellsite were operating at full power. On the other hand, the broadband measurements provide a ready means to find how exposures vary around a site, and find the locations where exposures tend to be highest.

Once the location(s) where exposures are highest have been determined using the broadband meter, a narrowband meter is used to take further measurements. The narrowband meter is able to determine the contribution to exposure in different frequency bands, and measure components of cellphone base station transmitters from which the maximum possible exposure from that transmitter can be determined. Narrowband measurements are used to:

- Determine the contributions from different transmitters to the overall total;
- Evaluate the exposure at the time of measurement as a percentage of the public limit in NZS 2772.1:1999;
- Determine what the maximum possible exposure would be if all the Vodafone equipment, and any other transmitters nearby, were operating at full power.

The measurement method used tends to result in the exposure at the time of measurement, and the maximum possible exposure, being overestimated. It is also worth noting that, in practice, there is very little likelihood of all transmitters at a cellsite operating simultaneously at full power.

### 3 Summary of results

Figure 1 presents a histogram of the maximum exposure from all sources (ie from the Vodafone site of interest and any other transmitters) measured during the survey with the narrowband meter, at the ten sites surveyed in the period. Results are expressed as a percentage of the public limit in NZS 2772.1:1999,.

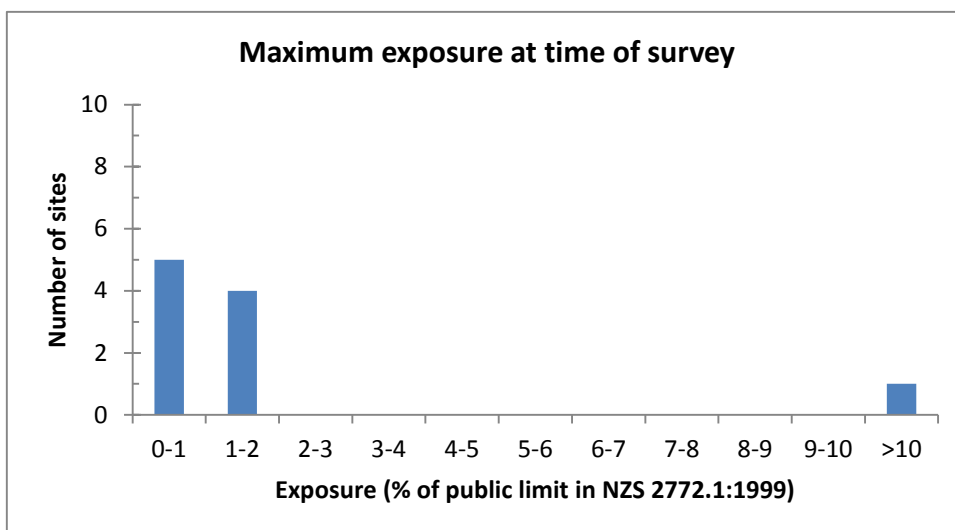


Fig 1. Histogram of maximum exposures found at the time of measurement at the ten sites surveyed in 2014-16.

All ten sites were either shared with, or nearby, sites belonging to one or two other mobile phone network operators. One site had a maximum exposure at the time of measurement greater than 10% of the public limit. The value at this site was 13% of the public limit.

Figure 2 shows the maximum possible exposure at the ten sites, if all the Vodafone transmitters, and transmitters belonging to other cellular network operators nearby, were to transmit simultaneously at full power.

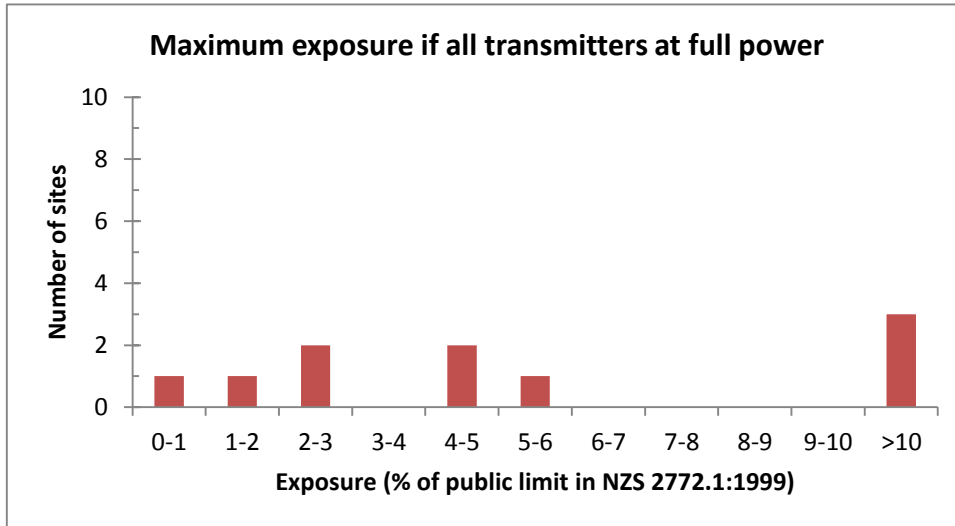


Fig 2. Histogram of maximum possible exposures at the ten sites surveyed in 2014-16, if they and all other sites nearby were to transmit at full power.

Three sites had maximum possible exposures greater than 10% of the public limit: the maximum possible exposures at these three sites were 11.2%, 12% and 58% of the public limit. The value of 58% was found about 2 meters above the ground near the edge of a skateboard park. The nearby Vodafone site was shared with both of the other New Zealand mobile network operators.

#### 4 Results table

A summary of results for the individual sites is presented in the table below.

Town/city, name of site	Date measured	Type of site*	Max exposure at time of survey (% of public limit)	Max possible exposure (% of public limit)	Comments
Auckland, Mt Albert Central	15/10/14	Rooftop, commercial	0.63	4.3	Spark co-sited
Auckland, Bayside	19/8/15	Lamppost, residential	0.69	2.5	Spark nearby
Auckland, Maraetai	17/8/15	Rooftop, residential	1.2	11.2	Spark nearby
Auckland, Newton Motorway	15/9/15	Under bridge, reserve	13	58	Spark and 2degrees co-sited

<b>Town/city, name of site</b>	<b>Date measured</b>	<b>Type of site*</b>	<b>Max exposure at time of survey (% of public limit)</b>	<b>Max possible exposure (% of public limit)</b>	<b>Comments</b>
Auckland, Hauraki corner	2/2/16	Rooftop, commercial	1.5	12.4	Spark co-sited, 2degrees nearby
Auckland, Haverstock	16/12/14	Rooftop, commercial	0.76	4.7	Spark co-sited, 2degrees nearby
Auckland, Crown Hill	2/2/16	Rooftop, residential	1.9	5.6	2degrees co-sited
Hamilton, Ulster Street	13/10/14	Rooftop, commercial	0.45	1.7	Spark co-sited
Porirua, Cannons Creek	29/9/14	Rooftop, commercial	1.6	2.5	Spark and 2degrees nearby
Christchurch, Avonhead North	25/11/15	Water tower	0.16	0.58	Spark co-sited

\*Type of site shows where the antennas are mounted, and the predominant nature of the surrounding area.