

# **Compliance monitoring of Spark cellsites: annual summary 2015-16**

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

Spark New Zealand Ltd has commissioned EMF Services to carry out compliance monitoring of exposures to radiofrequency (RF) fields around their cellsites. This report presents the results of measurements at 48 sites carried out between July 2015 and June 2016. The purpose of the tests is to measure exposures to radiofrequency (RF) fields near Spark cellsites to determine the maximum exposure at the time the measurements were made, and the maximum possible exposure should all the equipment at the Spark 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”).

Sites selected for testing fall into one of four categories:

- They have been of particular interest to the public, or because of their location, might be so in the future;
- Calculations of exposure have significant uncertainty;
- It is difficult to determine the areas near a site with reasonable public access;
- Theoretical assessment of compliance is difficult due to the proximity of other transmitters (eg co-siting with another operator).

Some sites are pre-selected by Spark, while others which fall into one or more of the above categories are selected by EMF Services. Spark are not informed when the testing will take place.

## 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 2014/66 *Compliance testing of Spark cellsites: methodology. Revision 1.*

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.

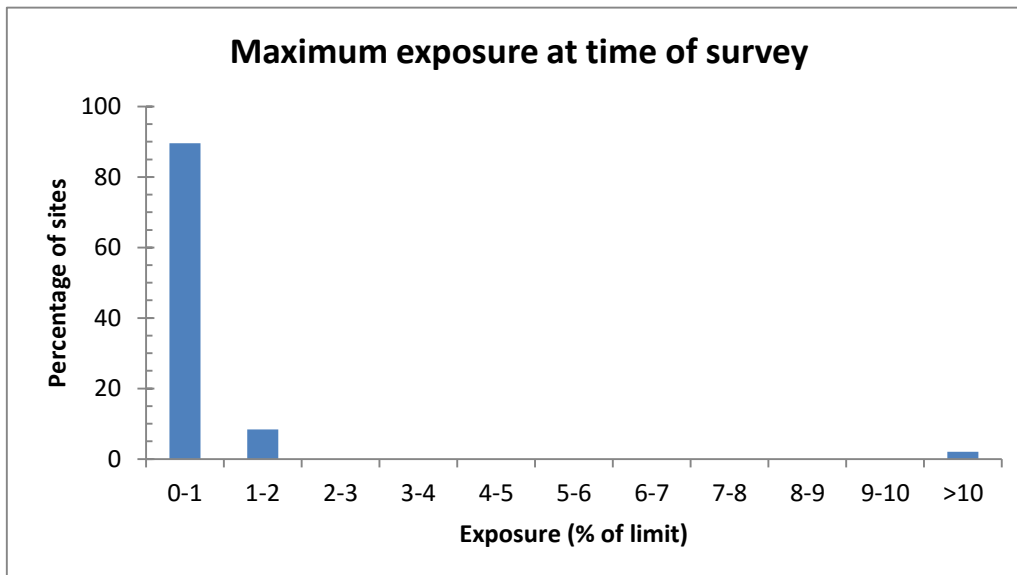
Once the location(s) where exposures are highest have been determined using the broadband meter, a narrowband meter is used to take further measurements. The narrowband meter is able to determine the contribution to exposure in different frequency bands, and measure components of cellphone base station 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 Spark 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 Spark site of interest and any other transmitters) measured during the survey with the narrowband meter, at the 48 sites surveyed in the period. 23 of the sites were either shared with, or close to, sites belonging to one or two other mobile phone network operators. Exposures are expressed as a percentage of the public limit in NZS 2772.1:1999, and the graph shows the percentage of sites falling into each exposure category.



**Fig 1. Histogram of maximum exposures found at the time of measurement at the 48 sites surveyed in 2015-16.**

This graph shows that, for example, at 90% of the sites tested, exposures at the time the measurements were made were less than 1% of the public limit.

Figure 2 shows the maximum possible cumulative exposure at the 48 sites, if all the Spark transmitters, and transmitters belonging to other cellular network operators nearby, were to transmit simultaneously at full power.

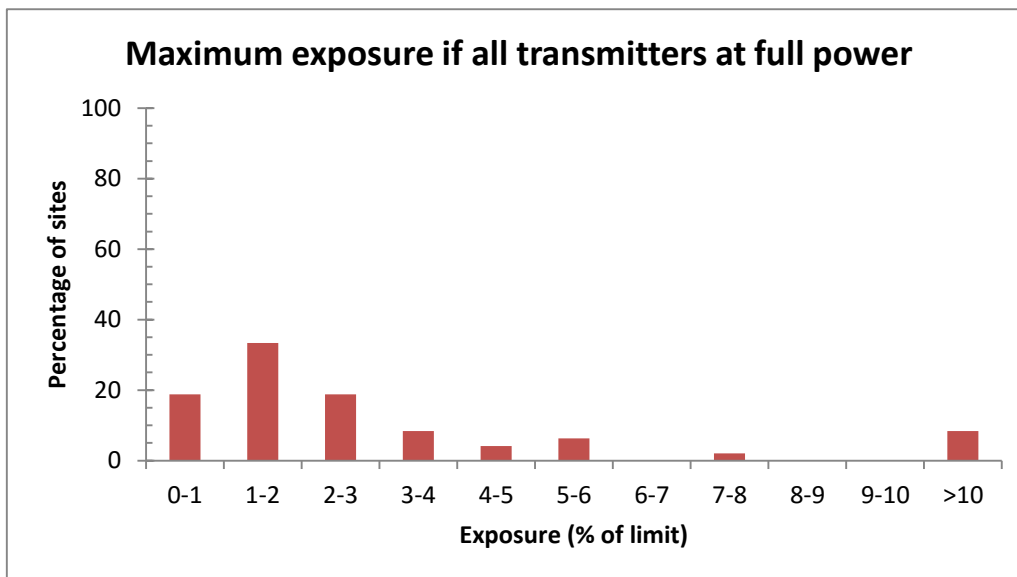


Fig 2. Histogram of maximum possible exposures at the 48 sites surveyed in 2015-16, if they and all other sites nearby were to transmit at full power.

This graph shows that at 19% of the sites tested, the maximum possible cumulative exposure would be less than 1% of the public limit, and at a further 33% of sites the maximum possible exposure would be between 1% and 2% of the limit. Four sites had a maximum possible exposure greater than 10% of the public limit and these are noted in the table below:

Location of maximum possible exposure	Maximum possible exposure (% of public limit)
2 m above a ramp at the end of a skateboarding park, two other operators at the site	58
On footpath near site, one other operator at the same site	12
On the ground near a temporary site	23
Inside a pavilion at a temporary site	18

#### 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
Far North, Kaikohe Exchange	18/08/15	Monopole, residential	0.04	0.15	

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
Far North, Kerikeri Town	18/08/15	Rooftop, commercial	0.22	1.10	Vodafone and 2degrees nearby
Auckland, Albany Exchange	15/09/15	Monopole, commercial	0.12	1.50	
Auckland, Bombay Exchange	16/03/16	Monopole, residential	0.33	0.81	
Auckland, Bond Street Bridge	15/09/15	Bridge, motorway	13.00	58.00	Vodafone and 2degrees nearby
Auckland, Browns Bay	19/08/15	Monopole, residential	0.69	2.50	Vodafone nearby
Auckland, Cockle Bay	22/04/16	Rooftop, residential	1.00	5.30	Vodafone at same site
Auckland, Dumas Place	23/02/16	Monopole, commercial	0.74	3.00	2degrees nearby
Auckland, Glendowie Metro	24/02/16	Lamppost, residential	0.27	1.30	
Auckland, Hauraki Corner	2/02/16	Rooftop, commercial	1.50	12.40	Vodafone at same site, 2degrees nearby
Auckland, Henderson NW	2/11/15	Lamppost, residential	0.51	2.10	
Auckland, Highland Park North	22/04/16	Lamppost, residential	0.29	1.30	Vodafone nearby
Auckland, Kohimarama	3/02/16	Rooftop, residential	1.10	3.90	
Auckland, Lawson Park	17/08/15	Monopole, reserve	0.37	2.70	Vodafone nearby
Auckland, Maraetai	17/08/15	Rooftop, residential	1.10	7.40	Vodafone nearby
Auckland, Mt Albert	23/02/16	Monopole, residential	0.58	3.90	2degrees nearby
Auckland, Mt Roskill Shops	3/11/15	Rooftop, Commercial	0.57	5.20	Vodafone and 2degrees nearby
Auckland, Pakuranga	16/06/16	Monopole, residential	0.18	1.20	
Auckland, Parnell Ayr St microcell	3/11/15	Lamppost, commercial	0.51	2.10	Vodafone nearby
Auckland, Point Chevalier	23/02/16	Lamppost, residential	0.54	4.20	
Auckland, Point England	21/04/16	Rooftop, residential	0.15	0.96	

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, Rawhiti Bowling Club relocation	3/02/16	Lamppost, residential	0.89	4.10	
Auckland, Riddell Road	8/11/15	Lamppost, residential	0.33	1.30	2degrees nearby
Auckland, Rosedale Road	15/09/15	Lamppost, commercial	0.66	3.90	Vodafone nearby
Auckland, Sherwood	19/08/15	Lamppost, residential	0.17	1.10	
Auckland, Three Kings Shopping Centre	8/11/15	Lamppost, commercial	0.34	1.40	Vodafone nearby
Auckland, Valley Road	15/12/15	Monopole, residential	0.94	2.40	
Auckland, West Harbour Shops	16/12/15	Lamppost, residential	0.52	3.40	
Hamilton, Melville Exchange	17/03/16	Monopole, residential	0.16	1.70	
Hamilton, Mystery Creek COW	14/06/16	Monopole, reserve	1.10	23.00	
Hamilton, Mystery Creek Pavilion	14/06/16	In-building	0.80	18.00	
Hamilton, Pukete North	17/03/16	Lamppost, commercial	0.49	2.60	
Tauranga, Katikati Town	21/03/16	Monopole, commercial	0.20	1.40	2degrees nearby
Waikato, Paeroa Exchange	23/03/16	Monopole, commercial	0.28	2.60	FM radio nearby
Wellington, Mazengarb	18/07/15	Monopole, residential	0.36	1.10	Vodafone and 2degrees nearby
Wellington, Miramar	4/04/16	Monopole, residential	0.17	1.20	
Wellington, Thorndon Motorway	5/04/16	Lamppost, motorway	0.54	2.40	
Nelson, Atawhai	18/09/15	Lamppost, residential	0.14	0.55	
Christchurch, Belfast	19/05/16	Monopole, residential	0.13	0.37	
Christchurch, Burnside	25/11/15	Rooftop, reserve	0.16	0.58	Vodafone at same site

<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>
Christchurch, Galbraith Avenue	24/07/15	Monopole, reserve	0.29	0.74	
Christchurch, Hagley Park North Transportable	30/11/15	Monopole, reserve	0.82	5.30	2degrees at same site
Christchurch, Halswell Village	23/10/15	Monopole, commercial	0.86	1.60	2degrees nearby
Christchurch, Latimer East	30/11/15	Monopole, residential	0.21	0.89	
Christchurch, North Burwood	19/05/16	Lamppost, commercial	0.31	2.00	Vodafone amd 2degrees nearby
Christchurch, Prebbleton	27/10/15	Lamppost, residential	0.46	1.30	
Invercargill, Heidelberg	6/05/16	Monopole, reserve	0.36	1.80	Vodafone site nearby
Invercargill, Windsor	5/05/16	Monopole, commercial	0.38	1.00	

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