

Compliance monitoring of Spark cellsites: annual summary 2016-17

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.

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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 2016 and June 2017. 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 2016 (“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. Three of the sites were repeat visits, either because new equipment had been added since the previous visit, or to check whether the contribution from other nearby sites had changed much.

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 2016/119 *Compliance testing of Spark cellsites: methodology. Revision 2..* This updates the previous (Revision 1) report 2014/66 to take account of changes in a revised version of the Australia/New Zealand exposure assessment Standard, AS/NZS 2772.2:2016, and make a few other minor updates. The measurement equipment used for these surveys was recalibrated in March 2017.

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.

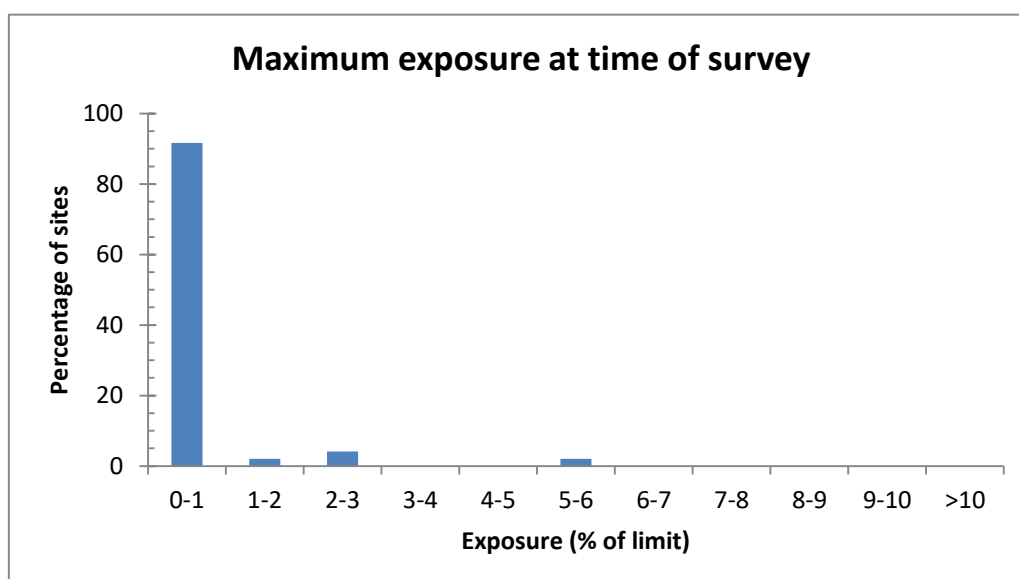


Fig 1. Histogram of maximum exposures found at the time of measurement at the 48 sites surveyed in 2016-17.

This graph shows that, for example, at 92% of the sites tested (44 out of 48), exposures at the time the measurements were made were less than 1% of the public limit. The highest exposure measured at the time of the survey was equivalent to 6% 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.

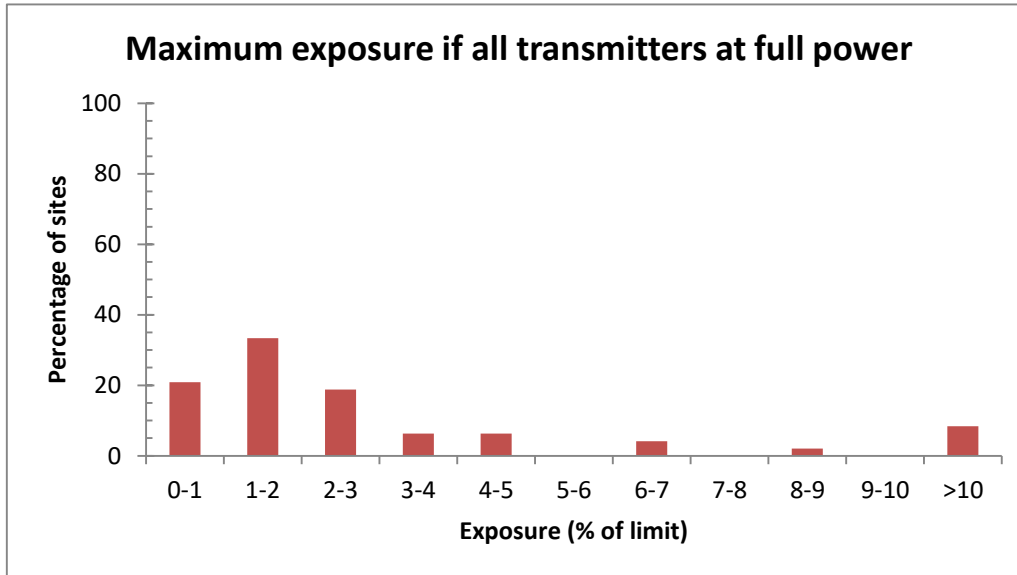


Fig 2. Histogram of maximum possible exposures at the 48 sites surveyed in 2016-17, if they and all other sites nearby were to transmit at full power.

This graph shows that at 21% 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)
On footpath near site on a water reservoir	22
Near a hilltop site shared with one other operator	18
On a grassed roadside area, two other operators nearby	13
On footpath near a rooftop site shared with one other operator	12

For two of the shared sites, a large proportion of the exposures was attributable to the Spark equipment.

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, Abbotts Way	20/12/16	Reserve, monopole	0.19	0.99	Vodafone nearby
Auckland, Alexandra Park relocate	3/11/16	Residential, rooftop	0.36	1.40	
Auckland, Avondale	21/10/16	Residential, monopole	0.43	3.00	2degrees nearby
Auckland, Bayswater	21/07/16	Rooftop, residential	0.58	2.20	Vodafone nearby
Auckland, Belmont	21/07/16	Rooftop, residential	0.81	1.90	
Auckland, Epsom South	8/03/17	Residential, rooftop	0.42	0.90	Vodafone nearby
Auckland, Glen Eden	4/11/16	Residential, monopole	0.22	1.70	2degrees nearby
Auckland, Glen Orchard	20/12/16	Residential, lamppost	1.40	8.90	2degrees, Vodafone nearby
Auckland, Herne Bay	22/05/17	Residential, lamppost	0.20	0.63	
Auckland, Highbrook South	9/03/17	Commercial, monopole	0.20	1.20	Cosite with Vodafone
Auckland, Mangere	21/07/16	Monopole, residential	0.33	1.80	
Auckland, Mangere Bridge	8/03/17	Residential, rooftop	0.40	1.50	Cosite with 2degrees
Auckland, Manly	21/12/16	Residential, rooftop	2.50	13.00	2degrees, Vodafone nearby
Auckland, Massey North	4/11/16	Commercial, monopole	0.54	1.80	
Auckland, Meadowbank Shops	8/03/17	Commercial, rooftop	0.99	7.00	Cosite with 2degrees
Auckland, New North Road	22/05/17	Commercial, monopole	0.59	2.40	
Auckland, Papatoetoe West	26/08/16	Commercial, monopole	0.11	1.10	
Auckland, Ponsonby Bowling Club	22/05/17	Residential, lamppost	0.41	2.70	2degrees nearby
Auckland, Pupuke Valley (2)	16/06/17	Residential, reservoir	6.00	22.00	
Auckland, Queenstown Road	9/01/17	Residential, monopole	0.40	2.00	2degrees, Vodafone nearby

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, Symonds Grafton	1/04/17	Commercial, lamppost	0.97	4.70	Vodafone nearby
Auckland, Te Atatu Road	4/11/16	Reserve, monopole	0.37	2.30	
Auckland, Te Atatu South	21/10/16	Commercial, monopole	1.00	11.50	Cosite with 2degrees
Auckland, Torbay	20/10/16	Residential, monopole	0.19	0.62	Cosite with mobile radio, 2degrees at 190 m.
Hamilton, Dinsdale	23/05/17	Commercial, monopole	0.61	4.20	Vodafone nearby
Hamilton, Flagstaff	19/10/16	Residential, monopole	0.50	2.80	
Waikato, Raglan Exchange	23/05/17	Commercial, monopole	0.64	6.50	
Waikato, Taupiri	24/05/17	Reserve, monopole	0.35	2.80	
Wellington, Lower Hutt	10/10/16	Commercial, monopole	0.11	0.47	2degrees nearby
Wellington, Model site	28/07/16	Indoor	0.01	0.02	
Wellington, Ngaio South	27/07/16	Residential, monopole	0.66	4.50	2degrees nearby
Wellington, Petone Exchange	10/10/16	Residential, monopole	0.08	1.10	
Wellington, Tawa	13/12/16	Rural, monopole	0.44	2.00	2degrees, Vodafone nearby
Wellington, Titahi Bay	4/05/17	Residential, monopole	0.19	1.60	
Wellington, Upper Hutt City	26/07/16	Reserve, monopole	0.20	1.20	
Wellington, Upper Hutt Exchange	26/07/16	Commercial, monopole	0.09	0.49	
Wellington, Waitangirua Exchange	13/12/16	Residential, monopole	0.89	2.60	2degrees, Vodafone nearby
Nelson, Mapua	14/12/16	Residential, monopole	0.30	1.60	Cosite with 2degrees, Vodafone
Christchurch, Hagley Park NW	18/07/16	Lamppost, reserve	0.17	1.40	
Christchurch, Moncks Bay (2)	16/12/16	Residential, lamppost	0.25	3.30	

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
Christchurch, Sumner van Asch (2)	16/12/16	Residential, monopole	0.59	3.20	
Dunedin, Dunedin Port	22/09/16	Commercial, monopole	0.58	2.10	
Dunedin, Mosgiel Exchange	22/09/16	Commercial, monopole	0.22	1.00	Vodafone and 2degrees nearby
Otago, Albert Town	18/08/16	Residential, monopole	0.67	3.90	
Otago, Balclutha	29/05/17	Commercial, lattice tower	0.03	0.09	
Otago, Bishops Bay	2/03/17	Rural, monopole	2.50	18.00	Cosite with Vodafone
Otago, Clyde	27/03/17	Rural, monopole	0.23	0.52	
Otago, Queenstown Airport	15/09/16	Commercial, monopole	0.27	1.70	

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