

Compliance monitoring of Spark cellsites: annual summary 2014-15

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 51 sites carried out between June 2014 and June 2015. 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 51 sites surveyed in the period. 20 of the sites were either shared with, or nearby, 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.

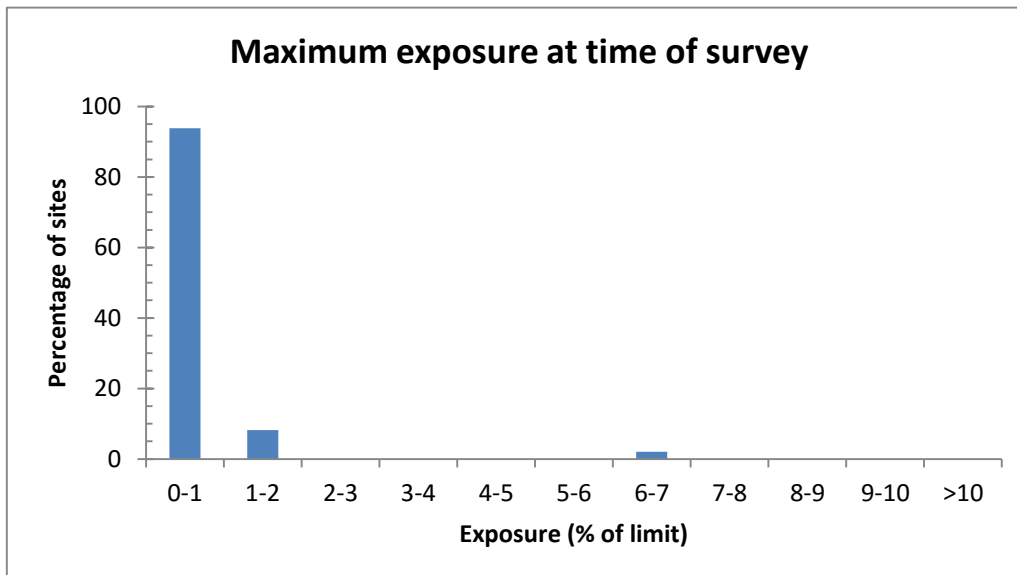


Fig 1. Histogram of maximum exposures found at the time of measurement at the 51 sites surveyed in 2014-15.

This graph shows that, for example, at 94% 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 51 sites, if all the Spark transmitters, and transmitters belonging to other cellular network operators nearby, were to transmit simultaneously at full power.

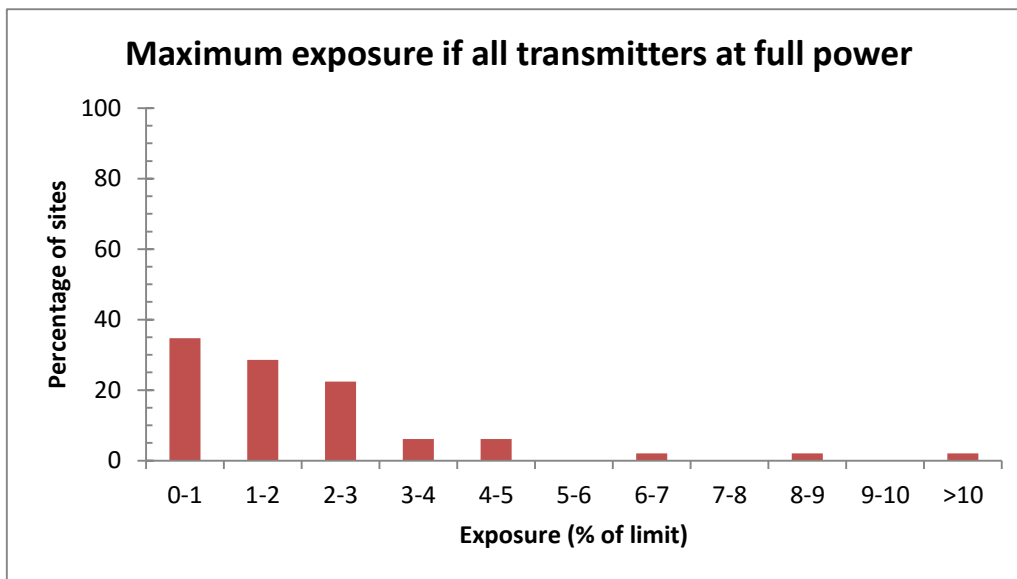


Fig 2. Histogram of maximum possible exposures at the 51 sites surveyed in 2014-15, if they and all other sites nearby were to transmit at full power.

This graph shows that at 35% of the sites tested, the maximum possible cumulative exposure would be less than 1% of the public limit, and at a further 29% of sites the maximum possible exposure would be between 1% and 2% of the limit. One site had a maximum possible exposure greater than 10% of the public limit: the maximum possible exposure at this site was 21% of the public limit. This was found about 2 meters above the ground near a site where the antennas were mounted fairly low to the ground on a water reservoir.

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, Beach Haven	16/12/14	Monopole, commercial	0.84	4.20	Vodafone and 2degrees nearby
Auckland, Benson Road	15/10/14	Rooftop, residential	0.65	3.40	2degrees on same roof
Auckland, Campbells Bay	12/09/14	Rooftop, residential	0.90	3.20	2degrees on same roof
Auckland, Crown Hill	12/09/14	Monopole, residential	0.25	0.84	
Auckland, Flat Bush School Road	3/06/15	Lamppost, residential	0.16	2.00	

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, Greenwood Corner	20/05/15	Rooftop, commercial	1.10	6.80	Vodafone and 2degrees nearby
Auckland, Howick	30/06/15	Monopole, residential	0.58	3.50	
Auckland, Howick Shops	30/06/15	Rooftop, commercial	1.10	2.20	
Auckland, Mt Albert Shops	15/10/14	Rooftop, commercial	0.63	4.30	Vodafone co-sited
Auckland, One tree Hill	19/06/14	Lamppost, residential	0.27	1.20	Vodafone nearby
Auckland, Oranga Road	19/06/14	Monopole, commercial	0.60	2.50	2degrees site nearby
Auckland, Otahuhu Overbridge	20/05/15	Monopole, residential	0.34	1.20	
Auckland, Pupuke Valley	21/05/15	Reservoir, residential	6.60	21.00	
Auckland, Sandringham	16/12/14	Rooftop, commercial	0.76	4.70	Vodafone co-site, 2degrees nearby
Auckland, Stancombe Road	3/06/15	Lamppost, residential	0.41	1.50	Vodafone and 2degrees nearby
Auckland, Waikowhai	14/10/14	Rooftop, residential	0.27	2.70	
Hamilton, Cobham Drive	10/12/14	Lamppost, residential	0.32	2.40	
Hamilton, Fairfield	13/10/14	Lamppost, residential	0.50	1.80	Vodafone close by
Hamilton, Fairview Downs	11/12/14	Monopole, residential	0.21	0.99	
Hamilton, Hamilton North	13/10/14	Rooftop, commercial	0.45	1.70	Vodafone on same roof
Hamilton, Livingstone West	10/12/14	Lamppost, residential	0.23	2.00	
Palmerston North, Fitzherbert Avenue	23/04/15	Lamppost, residential	0.26	0.80	
Waikato, Pauanui Central	4/02/15	Monopole, commercial	0.21	2.60	
Waikato, Te Aroha	11/12/14	Monopole, commercial	0.11	1.00	2degrees and Vodafone nearby
Tauranga, Brookfield	22/12/14	Monopole, residential	0.58	0.95	2degrees 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
Tauranga, Judea	30/03/15	Monopole, commercial	0.12	0.33	
Tauranga, Matua	30/03/15	Monopole, residential	0.24	0.72	
Tauranga, Pyes Pa North	30/03/15	Monopole, commercial	0.64	2.40	
Rotorua, Pomare	11/03/15	Monopole, reserve	0.34	0.72	
Rotorua, Pukehangi	11/03/15	Monopole, residential	0.17	1.50	
Rotorua, Rotorua South	11/03/15	Monopole, commercial	0.24	0.75	
Wanganui, Springvale	25/02/15	Monopole, reserve	0.10	0.21	
Wellington, Hataitai	14/08/14	Rooftop, commercial	0.26	1.60	
Wellington, Kilbirnie	14/08/14	Monopole, commercial	0.31	1.30	Vodafone and 2degrees nearby
Wellington, Northland	23/06/14	Monopole, residential	1.00	2.40	Vodafone and 2degrees nearby
Wellington, Porirua East	29/09/14	Monopole, commercial	1.60	2.50	Vodafone and 2degrees nearby
Wellington, Stokes Valley	30/09/14	Monopole, residential	0.17	0.37	
Wellington, Wadestown Road	23/06/14	Lamppost, residential	0.32	0.87	
Christchurch, Cahmere East	23/09/14	Lamppost, residential	0.24	0.49	
Christchurch, Casebrook	19/02/15	Lamppost, residential	0.88	1.00	
Christchurch, Moncks Bay	12/08/14	Lamppost, commercial	0.34	0.55	
Christchurch, Normans Road	29/07/14	Clock tower, commercial	0.54	3.00	
Christchurch, North New Brighton	18/11/14	Lamppost, residential	0.17	0.56	
Christchurch, Sumner van Asch	12/08/14	Lamppost, reserve	0.07	0.36	
Christchurch, Waimari Maidstone	18/02/15	Monopole, commercial	0.20	1.20	2degrees nearby
Christchurch, Wainoni	18/11/14	Monopole, commercial	0.61	1.60	2degrees and Vodafone nearby
Christchurch, Wairakei Road	14/05/15	Lamppost, commercial	0.47	2.80	Vodafone and 2degrees 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
Dunedin, Andersons Bay	12/04/15	Church tower, residential	0.27	2.60	
Dunedin, Maori Hill	26/02/15	Monopole, commercial	1.10	8.80	2degrees nearby
Dunedin, Morningside Exchange	25/06/14	Rooftop, residential	0.75	1.90	
Queenstown, Queenstown Central	16/07/14	Monopole, commercial	0.37	1.30	

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