

Compliance monitoring of Spark cellsites: annual summary 2018-19

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 mid-May 2018 and mid-May 2019. 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. Six 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 2018/104 *Compliance testing of Spark cellsites: methodology. Revision 4..* This updates the previous (Revision 3) report 2017/112 to update the methods used to determine maximum possible exposures from LTE (4G) transmitters, and make a few other minor changes. The measurement equipment used for these surveys was calibrated in March 2017 and December 2018.

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 that might contribute 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 locations 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

3.1 Results for 2018-19

Figure 1 presents a histogram of the maximum exposure from all sources (ie from the Spark site of interest and any other transmitters nearby) measured during the survey with the narrowband meter, at the 48 sites surveyed in the 2018-19 period. 21 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.

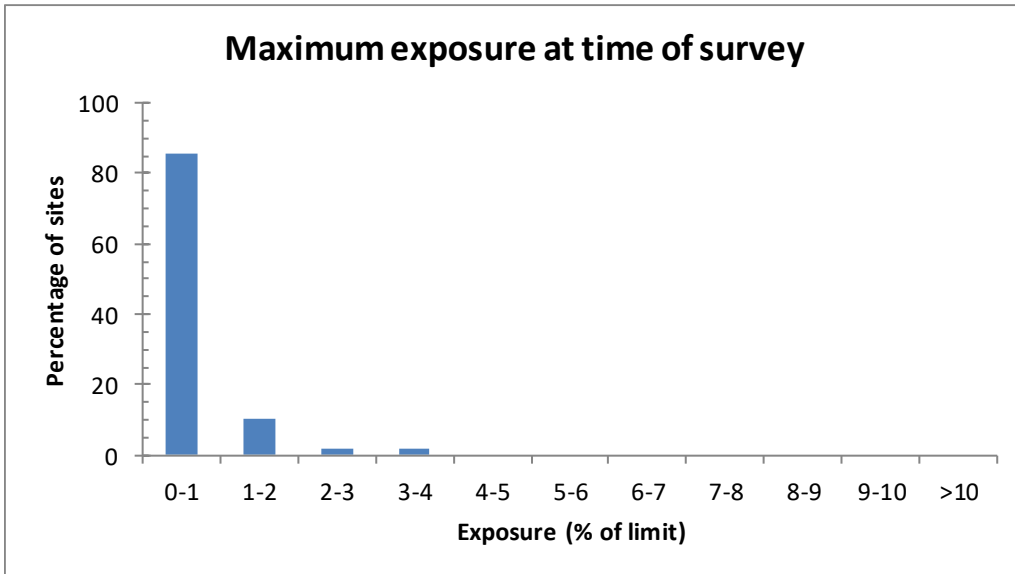


Fig 1. Histogram of maximum exposures found at the time of measurement at the 48 sites surveyed in 2018-19.

This graph shows that, for example, at 85% of the sites tested (41 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 3.1% 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.

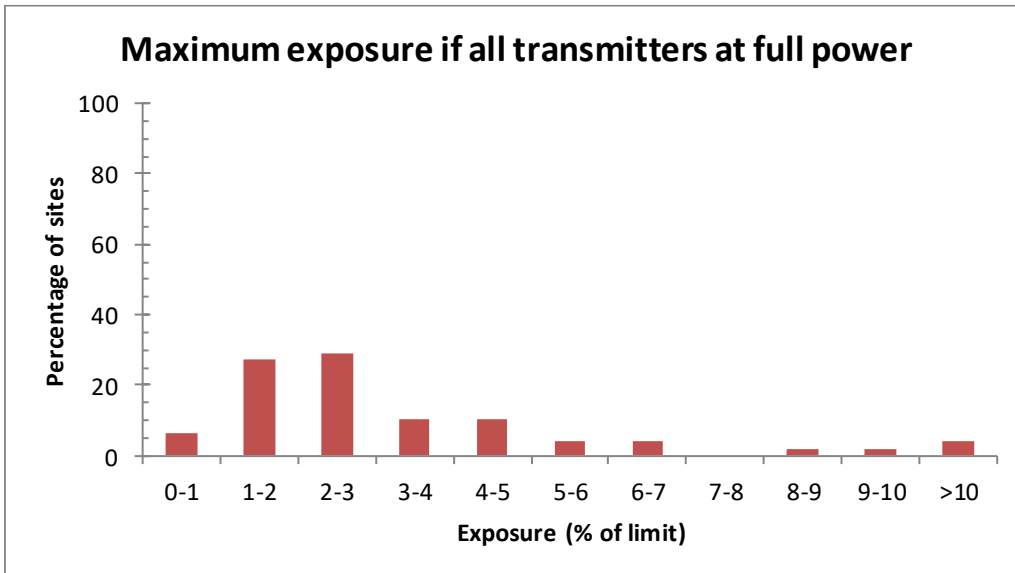


Fig 2. Histogram of maximum possible exposures at the 48 sites surveyed in 2018-19, if they and all other sites nearby were to transmit at full power.

This graph shows that at 6.3% of the sites tested, the maximum possible cumulative exposure would be less than 1% of the public limit, and at a further 27% of sites the maximum possible exposure would be between 1% and 2% of the limit. Two 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)
By a building next to a car park (possibility of the exposure being increased by reflections off the building)	16
At the end of a skateboard park, two other operators nearby. (This site had been measured previously and the exposures had decreased since then because nearby trees had grown and were shielding this area.)	11

3.2 Results for 2014-18

Figures 3 and 4 present the same data for all 243 sites measured since 2014.

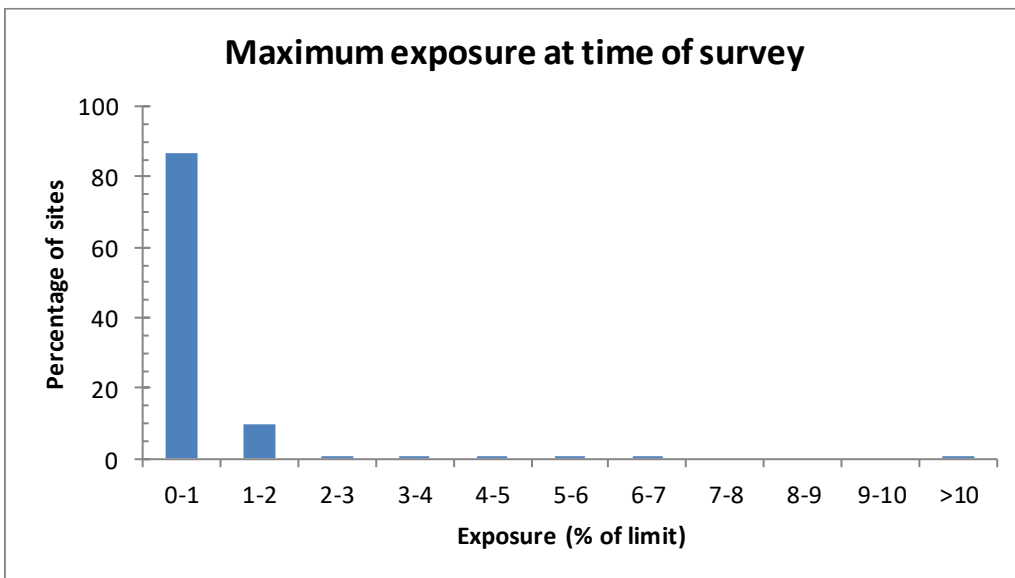


Fig 3. Histogram of maximum exposures found at the time of measurement for all 243 sites surveyed since 2014.

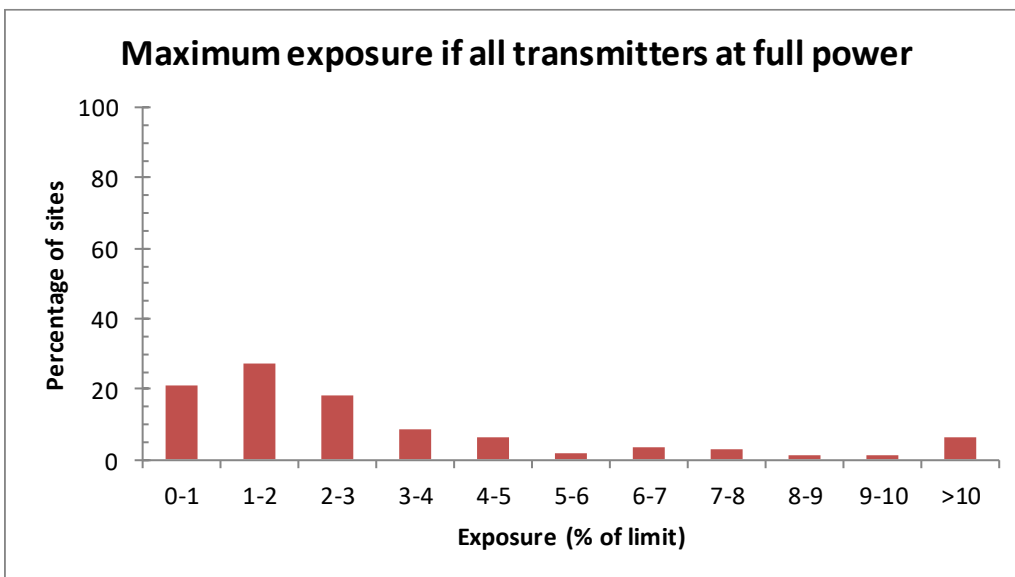


Fig 4. Histogram of maximum possible exposures for all 243 sites surveyed since 2014, if they and all other sites nearby were to transmit at full power.

4 Results table

A summary of results for the individual sites surveyed in 2018-19 is presented in the table below. A number in brackets after the site name indicates if this is the second time this site has been checked.

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, Devonport	31/10/18	Monopole, residential	0.21	0.68	
Auckland, Sunnynook	31/10/18	Monopole, residential	0.67	3.50	2degrees nearby
Auckland, Titirangi North	31/10/18	Lamppost, residential	0.74	1.40	2degrees nearby
Auckland, Wairere Road	29/08/18	Lamppost, residential	0.61	2.70	Vodafone nearby
Auckland, Waitakere Village	1/11/18	Monopole, residential	0.26	1.10	Shared with Vodafone, 2degrees
Auckland, Bairds Road	9/05/19	Rooftop, commercial	0.88	3.60	2degrees and Vodafone cosited
Auckland, Bond Street Bridge (2)	23/11/18	Bridge, motorway	2.90	11.00	Shared with Vodafone, 2degrees
Auckland, Carrington	30/05/18	Monopole, residential	0.26	1.40	
Auckland, Chapel Road	25/01/19	Monopole, commercial	0.97	3.80	Vodafone and 2degrees nearby
Auckland, Dannemora Drive	15/02/19	Lamppost, reserve	3.10	16.00	
Auckland, Greenwood Corner relocation	23/11/18	Lamppost, commercial	1.10	4.40	Vodafone and 2degrees nearby
Auckland, Meadowbank Shops	9/05/19	Rooftop, residential	1.10	8.60	2degrees cosited
Auckland, New Lynn East	15/02/19	Monopole, commercial	0.58	3.00	Vodafone nearby
Auckland, Onehunga	11/12/18	Monopole, commercial	0.80	3.10	Vodafone nearby
Auckland, Oranga (2)	28/05/18	Monopole, residential	0.47	4.30	2degrees nearby
Auckland, Oranga South	29/08/18	Lamppost, residential	0.36	1.20	
Auckland, Otahuhu Overbridge relocation	22/11/18	Monopole, residential	0.69	2.00	
Auckland, Otara	31/05/18	Monopole, commercial	0.69	4.10	Vodafone nearby
Auckland, Pukekohe	10/12/18	Monopole, commercial	0.97	2.50	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, Waiuku Town	29/05/18	Monopole, commercial	0.31	2.20	Vodafone nearby
Tairua, Tairua Exchange temporary	23/01/19	Monopole, commercial	0.64	2.20	
Whangamata, Whangamata Exchange	24/01/19	Monopole, commercial	0.92	4.50	
Ngaruawahia, Ngaruawahia	27/08/18	Monopole, residential	0.27	1.20	
Te Awamutu, Te Awamutu	13/02/19	Monopole, commercial	0.49	0.75	
Cambridge, Watkins Tulip	28/08/18	Lamppost, residential	0.69	6.70	
Tauranga, Matua (2)	28/08/18	Monopole, residential	0.27	4.10	
Napier/Hastings, Flaxmere relocation	14/05/19	Monopole, reserve	0.45	0.71	
Napier/Hastings, Mayfair	15/05/19	Monopole, commercial	0.34	1.30	
Napier/Hastings, Taradale Exchange	14/05/19	Monopole, residential	0.30	1.20	
Whanganui, Aramoho	15/05/19	Monopole, residential	0.72	2.30	
Wellington, Mazengarb (2)	8/08/18	Monopole, residential	0.87	3.20	Vodafone and 2degrees nearby
Wellington, Mid Karori	30/04/19	Lamppost, commercial	2.00	6.30	
Wellington, Woburn	16/10/18	Monopole, commercial	0.50	2.20	2degrees nearby
Christchurch, Beckenham	8/05/19	Monopole, residential	0.54	2.50	2degrees nearby
Christchurch, Christchurch Southern Motorway	21/05/18	Monopole, residential	1.00	5.40	
Christchurch, Malvern	22/05/18	Lamppost, residential	0.28	1.90	Vodafone nearby
Christchurch, Marshland	6/09/18	Lamppost, residential	0.23	2.40	
Christchurch, Papanui Road	21/05/18	Monopole, residential	0.38	2.90	
Christchurch, Rolleston Town	8/03/19	Monopole, reserve	0.49	1.20	
Christchurch, St Albans	19/02/19	Monopole, residential	0.75	1.90	Colocation with 2degrees
Christchurch, Wainoni (2)	8/03/19	Monopole, commercial	0.81	2.60	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
Fairlie, Fairlie Town	7/09/18	Monopole, residential	0.16	2.00	
Wanaka, Beacon Point	1/10/18	Monopole, reserve	0.83	10.00	
Otago, Alexandra Town	17/04/19	Lattice tower, commercial	0.66	2.60	
Dunedin, Andersons Bay Roadside	21/01/19	Lamppost, residential	1.10	5.40	
Dunedin, Dundas Titan	21/01/19	Monopole, residential	0.33	1.10	
Dunedin, Dunedin Oval	12/04/19	Monopole, commercial	1.20	2.80	
Dunedin, Mornington Exchange (2)	23/08/18	Rooftop, residential	0.58	2.80	

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