

Compliance monitoring of Spark cellsites: annual summary 2021-22

This report was prepared for:
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Finalised: 19 January 2023

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 39 sites carried out between May 2021 and the end of May 2022. 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.

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 2020/98 *Compliance testing of Spark cellsites: methodology. Revision 6*. The measurement equipment used for these surveys was calibrated in October 2020.

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 2021-22

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 39 sites surveyed in the 2021-22 period. 14 of the sites were either shared with, or close to, sites belonging to one or two other mobile phone network operators. Six of the sites had Spark 5G equipment installed. 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.

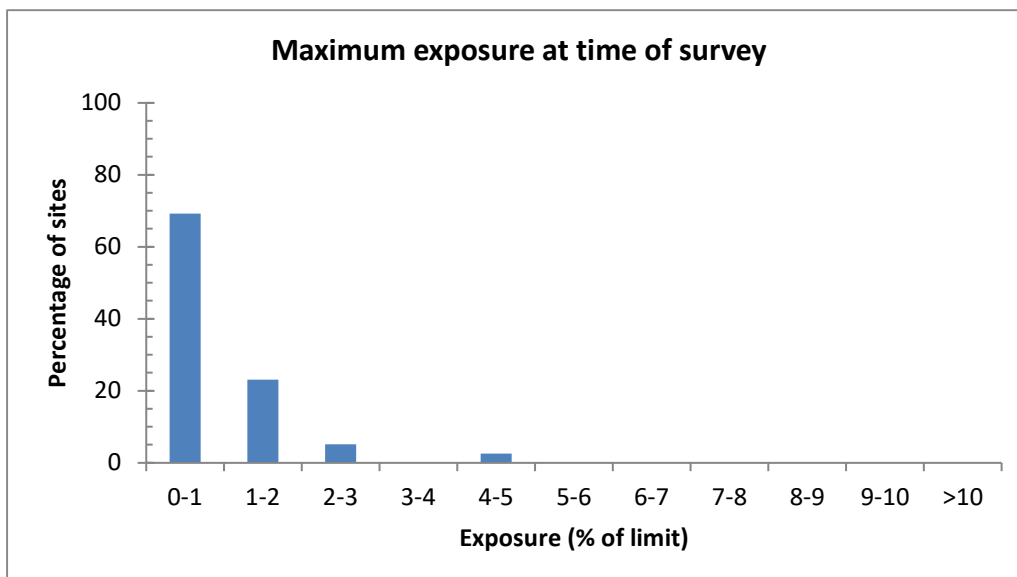


Fig 1. Histogram of maximum exposures found at the time of measurement at the 39 sites surveyed in 2021-22.

This graph shows that, for example, at 69% of the sites tested (27 out of 39), 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 4.3% of the public limit.

Figure 2 shows the theoretical maximum possible cumulative exposure¹ at the 39 sites, if all the Spark transmitters, and transmitters belonging to other cellular network operators nearby, were to transmit simultaneously at full power.

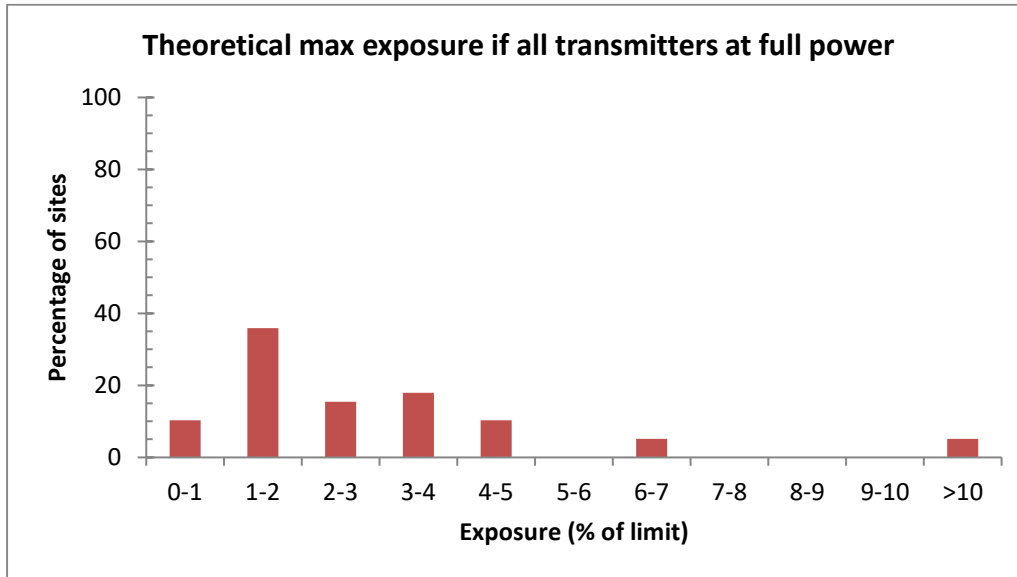


Fig 2. Histogram of theoretical maximum possible exposures at the 39 sites surveyed in 2021-22, if they and all other sites nearby were to transmit at full power.

This graph shows that at 10.3% of the sites tested the theoretical maximum possible cumulative exposure would be less than 1% of the public limit, and at a further 36% of sites the theoretical maximum possible exposure would be between 1% and 2% of the limit. The highest theoretical maximum possible exposure was 12% of the public limit.

3.2 Results for 2014-22

Figures 3 and 4 present the same data for all 367 sites measured since 2014.

¹ This is referred to as a “theoretical maximum” because in practice there is no chance that this would happen.

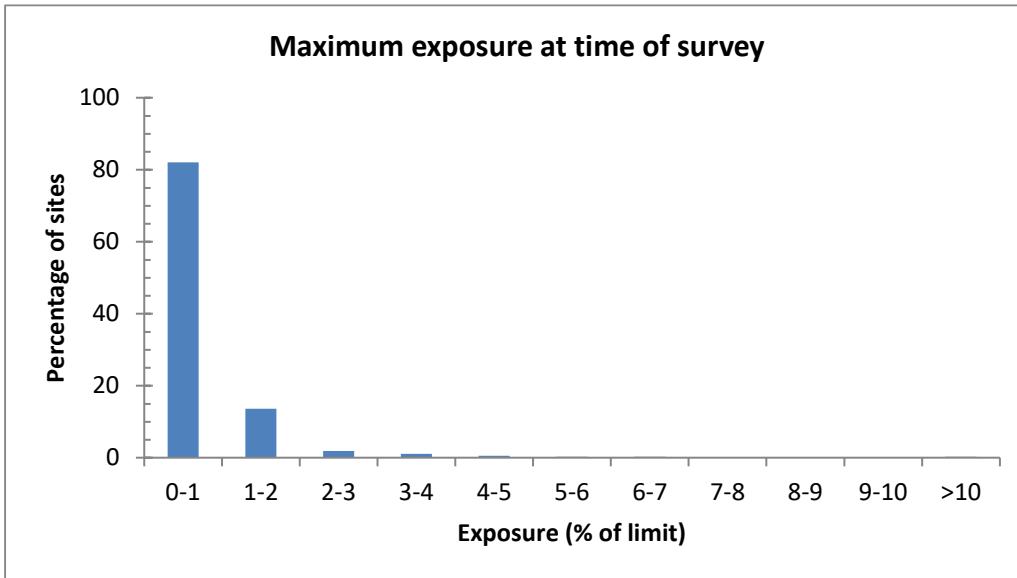


Fig 3. Histogram of maximum exposures found at the time of measurement for all 367 sites surveyed since 2014.

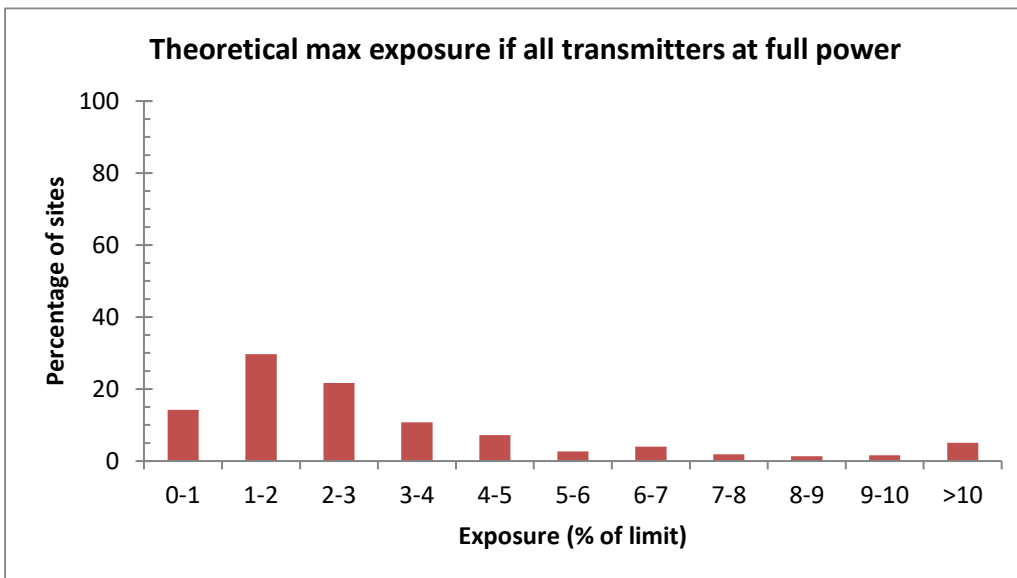


Fig 4. Histogram of theoretical maximum possible exposures for all 367 sites surveyed since 2014, if they and all other sites nearby were to transmit at full power.

4 Results table

A summary of results for the individual sites surveyed in 2021-22 is presented in the table below. The “Type of site” column shows where the antennas are mounted, and the predominant nature of the surrounding area. The “5G” column shows whether Spark 5G transmitters are operating at the site.

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, Sunnypark Avenue	18/05/21	Lamppost, residential	0.47	1.30	
Auckland, Granville Drive	19/05/21	Lamppost, residential	0.81	3.30	
Auckland, Te Atatu South relocation	19/05/21	Monopole, commercial	1.80	6.30	2degrees nearby
Auckland, Massey West Shops	19/05/21	Lamppost, commercial	1.00	3.70	Vodafone and 2degrees nearby
Auckland, Pakuranga Road	20/05/21	Lamppost, residential	0.59	2.20	
Auckland, Mangere Bridge South	20/05/21	Lamppost, residential	0.30	1.10	
Auckland, Randwick Park	3/08/21	Monopole, residential	1.50	1.90	
Auckland, Rathmar Drive	3/08/21	Lamppost, residential	0.48	1.80	
Auckland, Red Hill North	3/08/21	Lamppost, residential	0.80	1.30	
Auckland, Papakura North	6/08/21	Lamppost, residential	0.92	3.80	Vodafone nearby
Auckland, Porchester road	28/02/22	Lamppost, residential	1.20	1.40	
Auckland, Settlement Road	28/02/22	Lamppost, residential	1.10	2.40	
Auckland, Kellaway Drive	1/03/22	Lamppost, residential	0.43	0.53	
Auckland, Botany Road	1/03/22	Lamppost, residential	0.71	4.00	
Auckland, Greenhithe	2/03/22	Monopole, residential	0.34	1.50	Vodafone and 2degrees nearby
Auckland, Westpark Drive	2/03/22	Monopole, residential	1.10	1.40	
Auckland, Royal Road	2/03/22	Monopole, residential	0.22	0.53	
Auckland, Hingaia Road	25/03/22	Lamppost, residential	0.87	2.10	
Auckland, Wattle Farm Road	25/03/22	Lamppost, residential	1.30	4.30	
Auckland, Walter Stevens Drive	13/05/22	Lamppost, residential	1.00	6.30	Vodafone and 2degrees nearby
Waihi, Waihi South	9/12/21	Lamppost, commercial	1.20	2.90	
Tauranga, Papamoa South	10/12/21	Lamppost, residential	4.30	12.00	Vodafone nearby
Hamilton, Flagstaff	23/03/22	Monopole, residential	0.74	1.70	

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
Hamilton, Fairview Downs	24/03/22	Monopole, residential	1.50	4.10	
Whakatane, Ohope Beach Mid	1/07/21	Lamppost, residential	0.64	3.10	
New Plymouth, Lynmouth South	12/05/22	Monopole, residential	2.70	10.40	
Napier/Hastings, Marewa Exchange	7/12/21	Monopole, residential	0.81	1.60	2degrees nearby
Wanganui, Wanganui East	20/10/21	Monopole, residential	0.67	1.40	
Feilding, Feilding Town	22/10/21	Monopole, residential	0.87	2.70	Vodafone nearby
Foxton Beach, Foxton Beach	19/10/21	Monopole, residential	0.32	1.50	
Wellington, Parkway	18/10/21	Monopole, commercial	0.33	0.97	
Wellington, Terrace Bowen	11/05/22	Monopole, commercial	2.40	4.60	Vodafone and 2degrees nearby
Westport, Westport	1/10/21	Monopole, commercial	0.27	1.90	Vodafone and 2degrees nearby
Christchurch, St Asaph St Relocation	5/05/22	Monopole, commercial	0.80	3.20	Vodafone and 2degrees nearby
Christchurch, Bryndwr	6/05/22	Monopole, residential	0.87	3.80	Vodafone nearby
Fox Glacier, Fox Glacier	2/10/21	Monopole, commercial	0.33	2.40	Vodafone and 2degrees nearby
Winton, Winton Town	12/11/21	Monopole, commercial	0.18	0.48	
Invercargill, Heidelberg	27/04/22	Monopole, residential	1.40	4.10	Vodafone nearby
Bluff, Bluff Town	11/11/21	Lamppost, commercial	0.58	1.40	