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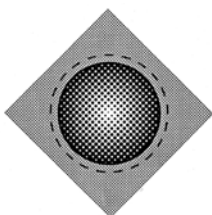
Measurement of radiofrequency emissions around the Sugar Loaf broadcasting antenna, Port Hills

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1998/1
NRL Report

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Published in April 1998 by
National Radiation Laboratory
Ministry of Health
PO Box 25099, Christchurch, New Zealand

ISBN ISSN 0111-753X

National Radiation Laboratory Web site: <http://www.nrl.moh.govt.nz>



Introduction and summary of findings

This report and measurements described in it have been undertaken to determine radio frequency levels in publicly accessible areas around the Sugar Loaf broadcasting antenna and ascertain whether it is being operated in accordance with New Zealand Standard 6609.1:1990 *Radiofrequency radiation - Part 1: Maximum exposure levels 100 kHz - 300 GHz*.

Measurements were made on 9 February 1998. Maximum exposures of $8 \mu\text{W}/\text{cm}^2$ were detected in the car park area, immediately below the Sugar Loaf antenna. This is 4% of the maximum of $200 \mu\text{W}/\text{cm}^2$ specified for public exposure levels in NZS 6609.1:1990. As the distance from the antenna increased, the exposure levels decreased markedly and, in general, were below $2 \mu\text{W}/\text{cm}^2$.

The measurements showed that the site is operating in accordance with NZS 6609.1:1990.

Site description

The Sugar Loaf transmitting antenna is located on the top of the Port Hills, near Dyers Pass. There are six main antennas that transmit TV and FM signals in the 45 MHz to 800 MHz range. The composite total power fed to all of the transmitting antennas is approximately 64 kW while the antenna gain values range from 7.8 to 16.5 dBd.

Measurement results

The instrument used to measure the radiofrequency (RF) radiation was a Holaday model HI 3004 Isotropic Broadband Field Strength Meter, with an HSE high sensitivity electric field sensing probe. Full specifications are given in Appendix 1. The magnetic field component was not measured; however, electromagnetic theory predicts that plane wave equivalent power flux density values of the magnetic and electric field components would be comparable.

Electric field strength is expressed in units of V/m (volts per metre). For ease of comparison with the limit prescribed in NZS 6609.1:1990, measurement results are listed in terms of the equivalent power flux density of a plane wave, in units of microwatts per square centimetre ($\mu\text{W}/\text{cm}^2$).

Measurements were taken along the Summit Road, at Governors Bay and also in some of the hill suburbs of Christchurch. Places to which there is easy public access, such as the scenic reserves, were also surveyed. The table below gives a summary of the measurement results.

Key	Site description	Power flux density ($\mu\text{W}/\text{cm}^2$)
1	Car park below Sugar Loaf antenna	most 1.7 - 4.2; max 8
2	Cedrics Track – NE of antenna	most 1.1 - 3.2; max 4.2
3	Cedrics Track – NW of antenna	most < 6.6
4	Access road to Sugar Loaf antenna	most < 1.7
5	Summit Rd – NE of antenna	most < 2.4
6	Lookout point – NE of antenna	most < 0.2
7	Mitchells Track	most < 0.02
8	Scotts Recreational Reserve	most 0.3 - 0.8; max 1.2
9	Top of Bowenvale mountain bike track	not detectable
10	Bowenvale Park	most < 1.4
11	Summit Road above Mt Vernon Park	most < 1.1
12	In Mt Vernon Park	most < 0.2; max 0.4
13	Summit Rd, The Tors Scenic Reserve	most 0.02 - 0.1; max 0.13
14	Castle Rock	most < 0.1; max 0.13
15	Huntsbury Ave	
(a)	– Bus Turn area	not detectable
(b)	– new re-development area	most 0.07 -0.13
16	Worsleys Rd	
(a)	– at top access gate	not detectable
(b)	– bottom part	most < 0.02
17	Sign of the Kiwi	
	– car park	most < 1.7; max 2.7
	– shop entrance	most < 1.7
18	Coronation Hill Scenic Reserve	most < 1.3
19	Summit Rd. (between Coronation Hill and Worsleys Rd)	most < 1.7; max 1.9
20	Hoon Hay Park Scenic Reserve	most < 0.6
21	Kennedy's Track to Halswell	not detectable
22	Kennedy's Bush sign – Summit Rd	most < 0.17; max 0.26
23	Sign of the Bellbird – car park	most < 0.10; max 0.2
24	Governors Bay	not detectable
25	Victoria Park (upper)	
	– 19th Memorial park	most < 0.35
	– mountain bike track	most < 0.27
	– Rangers' Hut	most < 0.27; max 0.45
	– Lookout and park benches	most not detectable; max 0.02
26	Victoria Park (middle)	
	– car park / Visitors' centre	not detectable
	– playground area	most < 0.27; max 0.6
27	Victoria Park (lower)	
	– dog exercise area	most < 0.17; max 0.2
	– near Telecom installations	not detectable
28	Sign of the Takahe	most < 0.35; max 0.1

A map of the Port Hills, which is annotated with the reference numbers of each survey site, is given in Appendix 2.

Discussion

The purpose of this report was to gain information regarding the RF exposure levels at places to which the public could reasonably gain access. In the area surrounding the Sugar Loaf antenna there are a number of lookout points, walking tracks and scenic reserves where people can be expected to be on a regular basis. The survey determined that the area of highest exposure was the car park directly below the Sugar Loaf antenna where exposures reached a maximum value of $8 \mu\text{W}/\text{cm}^2$ (4% of the public limit in NZS 6609.1:1990).

In general, the readings decreased with increased distance from the transmitting antenna. This is illustrated by the readings of less than $0.1 \mu\text{W}/\text{cm}^2$ obtained at Castle Rock and the Sign of the Bellbird, the furthest survey sites along each end of the Summit Road. As the distance from the antenna increased it became more important that the whole mast was visible in order to detect a signal. At Kennedys Bush, only the top half of the mast was visible and no signal could be detected. Even close to the mast on the Mitchell Track in the Sugar Loaf reserve, readings were less than $0.02 \mu\text{W}/\text{cm}^2$. However, the track descended quite rapidly from the road and also the slope of the hill was quite steep. These combined factors would have decreased the power flux density.

Within Victoria Park, a number of sites were surveyed. Despite being surrounded by trees, the area around the Rangers' hut produced a maximum signal of $0.45 \mu\text{W}/\text{cm}^2$. The surrounding trees were fairly young and therefore most of the mast was still actually visible through the trees.

Conclusions

The results showed that, in general, exposures measured in this survey were less than $4.0 \mu\text{W}/\text{cm}^2$, and often less than $1.0 \mu\text{W}/\text{cm}^2$. In some areas a few readings were greater than the general level in the vicinity. The effects of signals reflecting off the ground or nearby structures may account for these localised increases. All the readings taken are well below the exposure limit of $200 \mu\text{W}/\text{cm}^2$ specified for the public in NZS 6609.1:1990.

Appendix 1: Technical summary of monitor

Brand:	Holiday	
Model:	HI 3004 Isotropic Broadband Field Strength Meter no. 52310	
Probe:	Model HSE, high sensitivity electric field strength no. 556	
Ranges:	0-1, 0-3, 0-10, 0-30 V/m	
Spectrum:	1 MHz to 1 GHz	± 1 dB
Isotropy:	0-1 V/m range	± 1 dB
	other ranges	± 0.5 dB
Calibration:	by the manufacturer, June 1997	
	Uncertainty	± 0.5 dB

