

Andrew H. Thatcher

www.rfthatcher.com

**Evaluation of Compliance with FCC Guidelines for
Human Exposure to Radiofrequency Radiation**

Site Address:

**2100 Palisades Crest Drive
Lake Oswego, OR 97034**

Site Name:

Cooks Butte

Prepared for:

Clackamas 800 Radio Group

September 10, 2019

Prepared By:

Andrew H. Thatcher, MSHP, CHP

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Environmental Health Physics

Introduction

This report details the results of the ground level analysis of the emissions created by the antennas located on a proposed emergency radio network 180' lattice tower located at 2100 Palisades Crest Drive, Lake Oswego, OR 97034.

Summary of Findings

The calculations for outdoor ground level locations indicate that wireless antennas are in compliance with the FCC general population limit as the maximum ground level outdoor exposure is significantly less than 1% of the limit.

Technical Data

This report is based on engineering data for the project provided by B. Morfin, permitting agent for Clackamas 800 Radio Group on 9/8/2019. No other significant RF transmitting facility capable of affecting the compliance evaluation is within 2,000 feet of the proposed facility. The proposed facility consists of two 800 MHz Sinclair SC479-HL omni antennas at 157', a Amphenol BCD-87010 omni antenna for the 900 MHz paging system at 107', a Comprod 884-70HDB 159 MHz omni antenna for the VHF system at 110', a Comprod 784-70HDB 450 MHz omni antenna for the UHF system at 105', and a microwave antennas at 155'. The input power for all antennas is included in Table 1.

Basis of Calculations

Equation 6 of OET Bulletin 65¹ is used as the basis for the calculations as it considers a truly upper limit prediction of power density in an outdoor environment in which 100% of incoming radiation is assumed to reflect off a ground surface, resulting in a doubling of the predicted field strength and a four fold increase in power density. The signal levels inside buildings will be substantially lower than those calculated using the FCC model because of the substantial absorption of RF energy by building materials.

The calculation used the formula from OET Bulletin 65:

$$S = [EIRP] / [\pi \cdot D^2]$$

WHERE:

S = Power density (mW/cm²)

EIRP = Effective isotropic radiated power (mW).

D = Hypotenuse distance (cm)

¹ Federal Communications Commission Office of Engineering and Technology. Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. OET Bulletin 65. 1997.

The EIRP varies with direction with respect to the main beam due to the antenna beam pattern. For the calculations presented here, the beam pattern was obtained from the manufacturer of the antenna.

Ground Level Exposures

Table 1 shows the calculated maximum cumulative RF exposure at 6’ above ground for all sectors (0°-360°) assuming all antennas operating at 100% power and complete ground reflection. To determine the maximum cumulative exposure the total RF signal levels from each antenna were summed at each location as a percent of the FCC exposure limit (which varies somewhat with frequency). The maximum cumulative exposure at any location was determined to be 0.00075 mW/cm² or 0.31% of the FCC general public exposure limit. Table 1 also provides the maximum effective radiated power in each frequency band.

Table 1: Calculated Ground Level Power Density							
Site Name:	Cooks Butte						
Location	Azimuth ~ all sectors						
					Maximum outdoor exposure (with ground reflection) (mW/cm ²)		General Population Exposure Limit (mW/cm ²)
Carrier Type	Worst Case ERP (watts)	Worst Case ERP (dBm)	Antenna Height (ft)		% of Standard		
850 MHz	500	56.99	157	2.79E-05	0.00%		0.567
800 MHz	225	53.52	157	1.25E-05	0.00%		0.533
UHF antenna	300	54.77	110	2.67E-04	0.09%		0.300
VHF antenna	432	56.35	105	4.24E-04	0.21%		0.200
900 Paging	155	51.90	107	2.22E-05	0.00%		0.619
Microwave antenna	83	49.19	155	6.41E-08	0.00%		1.000
			Total	7.54E-04	0.31%		

Note: “maximum outdoor exposure” is calculated at the point at ground level where the cumulative exposure from all sources is at a maximum.

Discussion

The RF signal levels from the proposed installation will be a tiny fraction of FCC exposure limits at any place of public access, and from the point of view of FCC exposure limits are entirely negligible.

The biological effects of RF energy have been extensively studied, and there are several thousand reports in the scientific literature on this subject. These reports have been critically reviewed by numerous independent panels, most recently the IEEE (formerly Institute of Electrical and Electronics Engineers) and the International Commission on Nonionizing Radiation Protection. These groups have affirmed existing health standards, or have developed and proposed standards for exposure to RF energy that are broadly similar to the FCC limits.

A common concern is long term and continuous exposure of these low level radio signals. A direct quote from Health Canada² on this subject is as follows:

The Safety Code 6 limits for human exposure to RF fields are designed to provide protection for all age groups, including children, on a continuous (24 hours a day/seven days a week) basis.

This means that if someone, including a small child, were to be exposed to RF fields from multiple sources for 24 hours a day, 365 days a year, within the Safety Code 6 limits, there would be no adverse health effects. Safety Code 6 exposure limits are not device specific, but the limits do take into account the total exposure from all sources of RF fields. Health Canada scientists have concluded (and the Royal Society of Canada has agreed) on the basis of current scientific data, that no adverse health effects will occur from exposure to RF fields at the levels permitted by Safety Code 6.

Health Canada reminds all Canadians that their health is protected from RF fields by the human exposure limits recommended in Safety Code 6. The current Safety Code establishes and maintains a human exposure limit that is far below the threshold for potentially adverse health effects. The limits in Safety Code 6 provide protection against all known adverse health effects for all individuals.

Other relevant quotes regarding risks from RF exposure:

Norwegian Institute of Health, 2012:

"Exposure from base stations and radio and television transmitters is significantly lower than from using a mobile phone and the available data do not suggest that such low exposure could increase the risk of cancer." "There is negligible uncertainty in the risk assessment associated with other sources, such as base stations, wireless networks, television transmitters and the use of mobile phones by other individuals."³

Swedish Radiation Safety Authority, 2015:

"In line with previous studies, new studies on adult and childhood cancer with improved exposure assessment do not indicate any health risks for the general public related to exposure from radiofrequency electromagnetic fields from far-field sources, such as base stations and radio and TV transmitters. There is no new evidence indicating a causal link to exposure from far-field sources such as mobile phone base stations or wireless local data networks in schools or at home."⁴

For further information The Federal Communications Commission (FCC) maintains a World Wide Web site at <http://www.fcc.gov>. A general information sheet about possible health and safety issues regarding radiofrequency energy is at: <https://www.fcc.gov/engineering-technology/electromagnetic-compatibility-division/radio-frequency-safety/faq/rf-safety>

²² Health Canada. http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct/safety_code_6-code_securite_6-eng.php Accessed 1/29/2017.

³ Norwegian Institute of Health. 2012. <http://www.ncradiation.net/NonIonizing/Docs/RFR%20-%20Norwegian%20Inst%20of%20Health%20on%20RFR.pdf> Accessed 1/29/2017

⁴ Swedish Radiation Safety Authority. Tenth report from SSM's Scientific Council on Electromagnetic Fields. 2015. <http://www.stralsakerhetsmyndigheten.se/Global/Publikationer/Rapport/Stralskydd/2015/SSM-Rapport-2015-19.pdf>

Conclusions/Recommendations

The maximum ground level predicted exposure is 0.00075 mW/cm² or 0.31% of the FCC general public exposure limit.

Certification

I hereby certify the following:

1. I have read and fully understand the FCC regulations concerning RF safety and the control of human exposure to RF fields.
2. To the best of my knowledge, the statements and information disclosed in this report are true, complete and accurate, based on engineering design data for the site supplied by the Clackamas 800 Radio Group.
3. The results of the analysis indicate that the site is in full compliance with the FCC regulations concerning RF exposure.
4. Transmission equipment for the facility is certified by the FCC under the equipment authorization procedures set forth in the FCC rules. This assures that the wireless facility will transmit within assigned frequency bands, and at authorized power levels. The facility will operate in accordance with all FCC rules regarding power, signal bandwidth, interference mitigation, and good RF engineering practices. The facility will comply with all FCC standards for radio frequency emissions.

Regards,

Andrew H. Thatcher, MSHP, CHP

