

Andrew H. Thatcher

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T-Mobile Proposed Facility

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

Site ID: SE02744B

EAST CARNATION - PUBLIC WORKS - VB

Site Address:

33284 Tolt River Rd NE

Carnation, WA 98014



March 22, 2023

Prepared By:

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Introduction

This report assesses levels of exposure to radiofrequency (RF) energy from a proposed monopole with antennas located at 33284 Tolt River Rd NE, Carnation, WA 98014.. The location will have 6 new antennas operating at 650 MHz, 750 MHz, 1900 MHz, and 2100 MHz, and 2500 MHz bands of service. The new antennas will be mounted at the elevation of 150' above grade. This report analyses the cumulative RF exposures from the proposed T-Mobile antennas at ground level.

Executive Summary

Analysis shows that the cumulative emissions from the proposed T-Mobile transmitters will comply with FCC limits for human exposure to RF energy at any place of public access. Maximum RF exposures at all ground level locations will be less than 1% of the FCC exposure limits for the general public. This report has assumed there are three sectors with two antennas per sector. No other RF sources in the vicinity capable of affecting compliance for this site were identified.

MPE Calculations

The IXUS electromagnetic field (EMF) calculation software is used to assess all the RF field levels presented in this study. IXUS (<https://ixusapp.com/>) is a software product of Alphawave Mobile Network Products (Pty) Ltd, who specialize in electromagnetic software and systems. All calculations comply with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields (OET-65).

The IXUS software uses a fast and accurate EMF calculation tool that allows for the determination of radio-frequency (RF) field strength in the vicinity of radio communication base stations (RBS) and transmitters. At its core, the IXUS EMF calculation module implements field evaluation techniques detailed in the ITU-T K.61, CENELEC 50383, and IEC62232 specifications. The calculation of EMF results at any point in 3-D space is achieved by either a synthetic ray tracing technique, a conservative cylindrical envelope method, or through full-wave EM simulation results obtained from a computational electromagnetic software tool, FEKO (<https://www.altair.com/feko/>). The selection of the solution method is determined by the particular antenna being considered. In addition, a conservative and verified modelling technique for 5G beamforming antennas in IXUS is also used. The simulation accuracy of the IXUS calculation module has been verified extensively with full-wave EM simulations using FEKO.

Furthermore, all antenna models that are used in the IXUS modeller undergoes a rigorous verification process, whereby manufacturer data obtained from datasheets or pattern information is compared to that of the IXUS antenna model, during the synthesis process.

At ground level the analysis conservatively assumed a peak spatial result.

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T-Mobile Antenna Inventory

Sector	Antenna Number	Technology	Antenna Make	Antenna Model	Azimuth (°)	Height AGL (ft)
Alpha	1	L+N 600	Commscope	FFVV-65C-R3	140	150
Alpha	1	L 700	Commscope	FFVV-65C-R3	140	150
Alpha	1	L+N 1900	Commscope	FFVV-65C-R3	140	150
Alpha	1	L+N 2100	Commscope	FFVV-65C-R3	140	150
Alpha	2	AWS3	Commscope	FFVV-65C-R4	140	150
Alpha	2	N2500	Nokia	AEHC	140	150
Beta	3	L+N 600	Commscope	FFVV-65C-R3	230	150
Beta	3	L 700	Commscope	FFVV-65C-R3	230	150
Beta	3	L+N 1900	Commscope	FFVV-65C-R3	230	150
Beta	3	L+N 2100	Commscope	FFVV-65C-R3	230	150
Beta	3	AWS3	Commscope	FFVV-65C-R4	230	150
Beta	4	N2500	Nokia	AEHC	230	150
Gamma	5	L+N 600	Commscope	FFVV-65C-R3	0	150
Gamma	5	L 700	Commscope	FFVV-65C-R3	0	150
Gamma	5	L+N 1900	Commscope	FFVV-65C-R3	0	150
Gamma	5	L+N 2100	Commscope	FFVV-65C-R3	0	150
Gamma	5	AWS3	Commscope	FFVV-65C-R4	0	150
Gamma	6	N2500	Nokia	AEHC	0	150

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Ground Level Exposures

To determine the maximum cumulative exposure the total RF signal levels from each T-Mobile antenna was summed at each location as a percent of the FCC exposure limit (which varies somewhat with frequency). The maximum cumulative exposure at any ground level location was determined to be less than 0.706% of the FCC general public exposure limit.

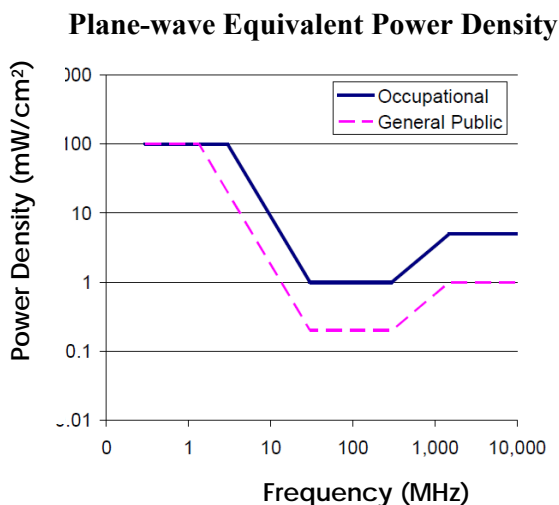
FCC Rules and Regulations

The guideline from the FCC Office of Engineering and Technology is Bulletin 65 (“OET Bulletin 65”), *Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields*, Edition 97-01, published August 1997, are used as the basis for evaluating a site.

FCC regulations define two separate tiers of exposure limits: Occupational or “Controlled environment” and General Public or “Uncontrolled environment”. The General Public limits are five times more conservative or restrictive than the Occupational limit. These limits apply to *accessible* areas where workers or the general public may be exposed to Radio Frequency (RF) electromagnetic fields.

The theoretical modelling of the RF electromagnetic fields has been performed in accordance with OET Bulletin 65. The Maximum Permissible Exposure (MPE) limits utilized in this analysis are outlined in the following diagram:

FCC Limits for Maximum Permissible Exposure (MPE)



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Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (E) in (V/m)	Magnetic Field Strength (H) in (A/m)	Power Density (S) in (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	f/300	6
1500-100,000	-	-	5	6

Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (E) in (V/m)	Magnetic Field Strength (H) in (A/m)	Power Density (S) in (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

Summary

Analysis shows that the cumulative emissions from the proposed T-Mobile transmitters will comply with FCC limits for human exposure to RF energy at any place of public access. Maximum RF exposures at all ground level locations will be less than 1% of the FCC exposure limits for the general public. No other RF sources in the vicinity capable of affecting compliance for this site were identified.

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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 to me by T-Mobile.
3. The results of the analysis indicate that the site is in full compliance with the FCC regulations concerning RF exposure at all areas of public access.
4. Transmission equipment for the T-Mobile 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 T-Mobile facility will operate in accordance with all FCC rules regarding power, signal bandwidth, interference mitigation, and good RF engineering practices. The T-Mobile facility will comply with all FCC standards for radio frequency emissions.

Regards,



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