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T-Mobile Proposed Facility

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

Site ID: SE02629A
Mercer Island Water Tank

Site Address:
4350 88th Ave SE
Mercer Island, WA 98040

December 28, 2024

Prepared By:
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Introduction

This report assesses levels of exposure to radiofrequency (RF) energy from proposed roof mounted location at4350 88th Ave SE., Mercer Island, WA 98040, with antennas located on a lattice tower. The location will have 6 new antennas operating at 650 MHz, 750 MHZ, 1900 MHz, 2100 MHz, and 2500 MHz bands of service. The new antennas will be mounted at the elevation of 85.5' above grade. This report analyses the cumulative RF exposures from the proposed T-Mobile antennas and the existing other carrier antennas at ground level and any accessible other location.

Executive Summary

Analysis shows that the cumulative emissions from the proposed T-Mobile transmitters along with the other carrier antennas 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 2% of the FCC exposure limits for the general public. Predicted exposure on the nearby water tanks will be less than 4% of the FCC general public exposure limits.

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.

T-Mobile Antenna Inventory

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Sector	Carrier	Antenna Number	Technology	Antenna Make	Antenna Model	Azimuth (°)	Height AGL (ft)
A	T-Mobile	1	650 MHz	Commscope	FFVV- 65C-R2N23	45	85.5
A	T-Mobile	1	LTE 700	Commscope	FFVV- 65C-R2N23	45	85.5
A	T-Mobile	1	UMTS	Commscope	FFVV- 65C-R2N23	45	85.5
A	T-Mobile	1	GSM 1900	Commscope	FFVV- 65C-R2N23	45	85.5
A	T-Mobile	1	LTE 1900	Commscope	FFVV- 65C-R2N23	45	85.5
A	T-Mobile	1	LTE 2100	Commscope	FFVV- 65C-R2N23	45	85.5
A	T-Mobile	2	2.5 GHz	Nokia	AEHC	45	85.5
B	T-Mobile	3	650 MHz	Commscope	FFVV- 65C-R2N23	180	85.5
B	T-Mobile	3	LTE 700	Commscope	FFVV- 65C-R2N23	180	85.5
B	T-Mobile	3	UMTS	Commscope	FFVV- 65C-R2N23	180	85.5
B	T-Mobile	3	GSM 1900	Commscope	FFVV- 65C-R2N23	180	85.5
B	T-Mobile	3	LTE 1900	Commscope	FFVV- 65C-R2N23	180	85.5
B	T-Mobile	3	LTE 2100	Commscope	FFVV- 65C-R2N23	180	85.5
B	T-Mobile	4	2.5 GHz	Nokia	AEHC	180	85.5
A	Other	5	GSM 850	Kathrein	742-265	30	92.5
A	Other	6	LTE 700	Commscope	SBJAH4-1D65B-DL	30	92.5
A	Other	6	LTE 1900	Commscope	SBJAH4-1D65B-DL	30	92.5
A	Other	7	LTE 2100	Commscope	NNH4-65C-R6	30	92.5
A	Other	7	LTE 700	Commscope	NNH4-65C-R6	30	92.5
A	Other	8	LTE 2300	Commscope	SBNHH-1D65B	30	92.5
A	Other	8	GSM 850	Commscope	SBNHH-1D65B	30	92.5
B	Other	9	GSM 850	Kathrein	742-265	180	92.5
B	Other	10	LTE 700	Commscope	SBJAH4-1D65B-DL	180	92.5
B	Other	10	LTE 1900	Commscope	SBJAH4-1D65B-DL	180	92.5
B	Other	11	LTE 2100	Commscope	NNH4-65C-R6	180	92.5
B	Other	11	LTE 700	Commscope	NNH4-65C-R6	180	92.5
B	Other	12	LTE 2300	Commscope	SBNHH-1D65B	180	92.5
B	Other	12	GSM 850	Commscope	SBNHH-1D65B	180	92.5
G	T-Mobile	13	650 MHz	Commscope	FFVV- 65C-R2N23	330	85.5
G	T-Mobile	13	LTE 700	Commscope	FFVV- 65C-R2N23	330	85.5
G	T-Mobile	13	UMTS	Commscope	FFVV- 65C-R2N23	330	85.5
G	T-Mobile	13	GSM 1900	Commscope	FFVV- 65C-R2N23	330	85.5
G	T-Mobile	13	LTE 1900	Commscope	FFVV- 65C-R2N23	330	85.5
G	T-Mobile	13	LTE 2100	Commscope	FFVV- 65C-R2N23	330	85.5
G	T-Mobile	14	2.5 GHz	Nokia	AEHC	330	85.5
G	Other	15	GSM 850	Kathrein	742-265	340	92.5
G	Other	16	LTE 700	Commscope	SBJAH4-1D65B-DL	340	92.5
G	Other	16	LTE 1900	Commscope	SBJAH4-1D65B-DL	340	92.5
G	Other	17	LTE 2100	Commscope	NNH4-65C-R6	340	92.5
G	Other	17	LTE 700	Commscope	NNH4-65C-R6	340	92.5
G	Other	18	LTE 2300	Commscope	SBNHH-1D65B	340	92.5
G	Other	18	GSM 850	Commscope	SBNHH-1D65B	340	92.5

Ground Level Exposures

To determine the maximum cumulative exposure the total RF signal levels from each T-Mobile and other carrier 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 ground level location was determined to be 1.4% of the FCC general public exposure limit. On top of the nearby water tanks the maximum cumulative exposure was determined to be 3.4% of the FCC general public exposure limit.

FCC Rules and Regulations

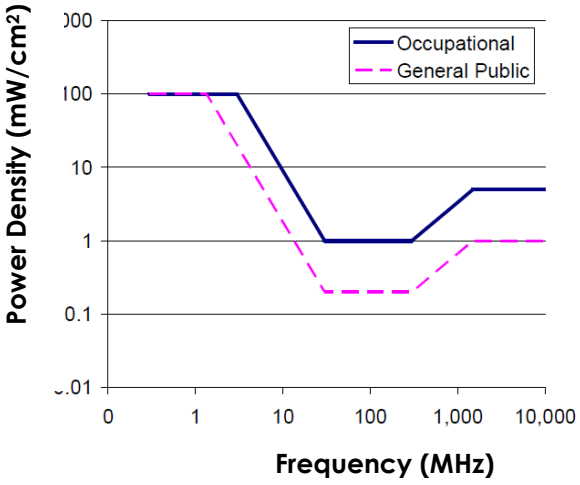
The guideline from the FCC Office of Engineering and Technology is Bulletin 65 ("OET Bulletin 65"), *Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields*, Edition 97-01, published August 1997, are used as the basis for evaluating a site.

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)

Plane-wave Equivalent Power Density



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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 along with the other carrier antennas 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 2% of the FCC exposure limits for the general public. Predicted exposure on the nearby water tanks will be less than 4% of the FCC general public exposure limits.

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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,

Andrew H. Thatcher, MSHP, CHP