ATTACHMENT 7

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Calculated Radio Frequency Emissions Report

CT1458

1837 Ponus Ridge Road, New Canaan, CT

April 5, 2022

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1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed New Cingular Wireless (AT&T) wireless communications facility located at 1837 Ponus Ridge Road in New Canaan, CT. The coordinates of the proposed tower are 41° 10' 18.89" N, 73° 32' 36.90" W.

AT&T is proposing to install ground-based equipment cabinets and antennas mounted at 106 feet AGL on the proposed tower. This report uses the planned antenna configuration for AT&T[1] to derive the resulting % MPE (Maximum Permissible Exposure), once the proposed installation has been completed.

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached “FCC Limits for Maximum Permissible Exposure (MPE)” in Attachment C of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment and who have been made fully aware of the potential for exposure, and they must be able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels that are acceptable for occupational, or radio frequency trained individuals. Attachment C contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population/uncontrolled exposure and for occupational/controlled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.

[1] As referenced to AT&T’s preliminary Radio Frequency Design Sheet dated 4/23/2021.

3. RF Exposure Calculation Methods

The calculated ground-level power density results displayed in the following figures were generated using the following formula as outlined in FCC bulletin OET 65:

$$\text{Power Density} = \left(\frac{\text{GRF}^2 \times 1.64 \times \text{ERP}}{4\pi \times R^2}\right) \text{X Off Beam Loss}$$

Where:

ERP = Effective Radiated Power

R = Radial Distance = $\sqrt{(H^2 + V^2)}$

H = Horizontal Distance from antenna

V = Vertical Distance from radiation center of antenna in meters

Off Beam Loss is determined by the selected antenna patterns

Ground Reflection Factor (GRF) of 1.6

These calculations assume that the transmitters are operating at full power and 100 percent capacity and that all radio channels are transmitting simultaneously. Obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. The calculations assume even terrain in the area of study and do not consider actual terrain elevations which could attenuate the signal. As a result, the calculated power density and corresponding % MPE levels reported below are much higher than the actual signal levels will be from the final installation.

4. Calculated % MPE Results based on Antenna Patterns

The calculated % MPE results are shown in Figure 1 below. For completeness, the calculations for this analysis range from 0 feet horizontal distance (directly below the antennas) to a value of 3,000 feet horizontal distance from the site. In addition to the other worst-case scenario considerations that were previously mentioned, the power density calculations to each horizontal distance point away from the antennas was completed using a local maximum off beam antenna gain (within ± 5 degrees of the true mathematical angle) to incorporate a realistic worst-case scenario.

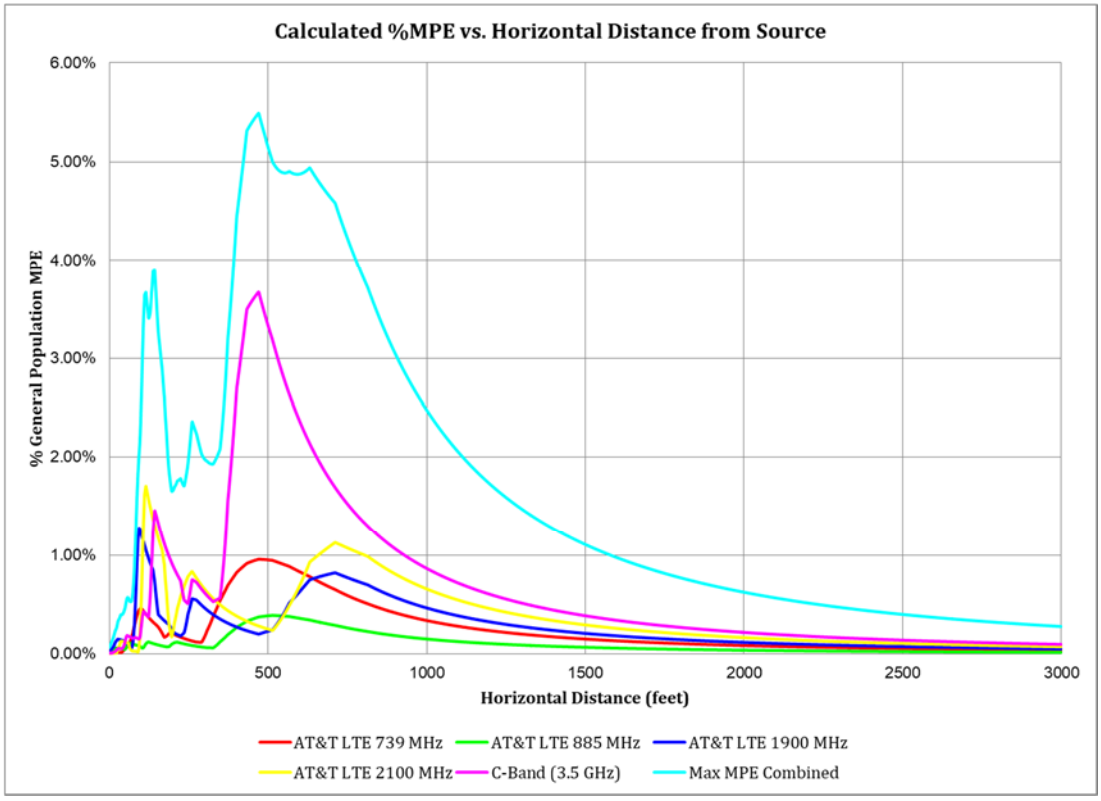

Figure 1: Graph of General Population % MPE vs. Distance for AT&T

The highest percent of MPE (**5.49%** of the General Population limit) is calculated to occur at a horizontal distance of 4709 feet from antennas. Please note that the percent of MPE calculations close to the site take into account off beam loss, which is determined from the vertical pattern of the antennas used. Therefore, RF power density levels may increase as the distance from the site increases. At distances of approximately 900 feet and beyond, one would now be in the main beam of the antenna pattern and off beam loss is no longer considered. Beyond this point, RF levels become calculated solely on distance from the site and the percent of MPE decreases significantly as distance from the site increases.

Table 2 below lists percent of MPE values as well as the associated parameters that were included in the calculations. As stated in Section 3, all calculations assume that the antennas are operating at full power and 100 percent capacity, and that all antenna channels are transmitting simultaneously. Obstructions (trees, buildings etc.) that would normally attenuate the signal are not taken into account. In addition, a six foot height offset was considered in this analysis to account for average human height. As a result, the calculated % MPE levels are significantly higher than the actual signal levels will be from the final installation. The results presented in Figure 1 and Table 2 assume level ground elevation from the base of the tower out to the horizontal distances calculated.

Carrier	Number of Transmitters	Power out of Base Station Per Transmitter (Watts)	Antenna Height (Feet)	Distance to the Base of Antennas (Feet)	Power Density (mW/cm^2)	Limit (mW/cm^2)	% MPE
AT&T LTE 1900 MHz	3	160.0	106.0	470	0.002018	1.000	0.20%
AT&T LTE 2100 MHz	2	240.0	106.0	470	0.002837	1.000	0.28%
AT&T LTE 739 MHz	2	160.0	106.0	470	0.004718	0.493	0.96%
AT&T LTE 885 MHz	1	160.0	106.0	470	0.002204	0.590	0.37%
C-Band (3.5 GHz)	1	108.5	106.0	470	0.036719	1.000	3.67%
						Total	**5.49%**

Table 1: Maximum Percent of General Population Exposure Values for AT&T

5. Alternative CSC % MPE Analysis Method

As an alternate analysis method reflecting the structure of the CT Siting Council's (CSC) Power Density database, we have also calculated the % MPE directly below the antennas.

The calculated results for AT&T in Table 3 include a nominal 10 dB off-beam pattern loss to account for the lower relative gain below the antennas for all but the 3500 MHz antennas. Similarly, a nominal 20 dB off-beam pattern loss is applied to the 3500 MHz antennas.

The calculated power density and corresponding % MPE levels reported below are expected to be much higher than the actual signal levels will be from the final installation.

Carrier	Antenna Height (Feet)	Operating Frequency (MHz)	ERP Per Transmitter (Watts)	Power Density (mw/cm^2)	Limit	% MPE
AT&T	106	739	3156	0.0114	0.4927	2.30%
AT&T	106	763	3541	0.0127	0.5087	2.50%
AT&T	106	885	3883	0.0140	0.5900	2.37%
AT&T	106	1900	5877	0.0211	1.0000	2.11%
AT&T	106	1900	5877	0.0211	1.0000	2.11%
AT&T	106	1900	5877	0.0211	1.0000	2.11%
AT&T	106	2100	9890	0.0356	1.0000	3.56%
AT&T	106	2100	9890	0.0356	1.0000	3.56%
AT&T	106	3500	24286	0.0087	1.0000	0.87%
					Total	**21.51%**

Table 2: Maximum Percent of General Population Exposure Values Directly Beneath the AT&T Antennas

6. Conclusion

The above analysis verifies that RF exposure levels from the site with AT&T's proposed antenna configuration will be well below the maximum permissible levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Using the conservative calculation methods and parameters detailed above, the maximum cumulative percent of MPE at 6' above ground level and in consideration of AT&T's proposed antenna installation is calculated to be **5.49% of the FCC limit (General Population/Uncontrolled)**. This maximum cumulative percent of MPE value is calculated to occur 470 feet away from the site.

7. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The calculations follow guidelines set forth in FCC OET Bulletin 65 Edition 97-01, IEEE Std. C95.1, IEEE Std. C95.3, and IEEE Std. C95.7.

April 5, 2022

Reviewed/Approved By: _____ Date

Senior RF Engineer
C Squared Systems, LLC

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

IEEE C95.1-2005, IEEE Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz IEEE-SA Standards Board

IEEE C95.3-2002 (R2008), IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Humhyan Exposure to Such Fields, 100 kHz-300 GHz IEEE-SA Standards Board

IEEE C95.7-2005 (R2014), IEEE Recommended Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz. IEEE-SA Standards Board

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure[2]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (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

(B) Limits for General Population/Uncontrolled Exposure[3]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (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

Table 3: FCC Limits for Maximum Permissible Exposure

[2] Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

[3] General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

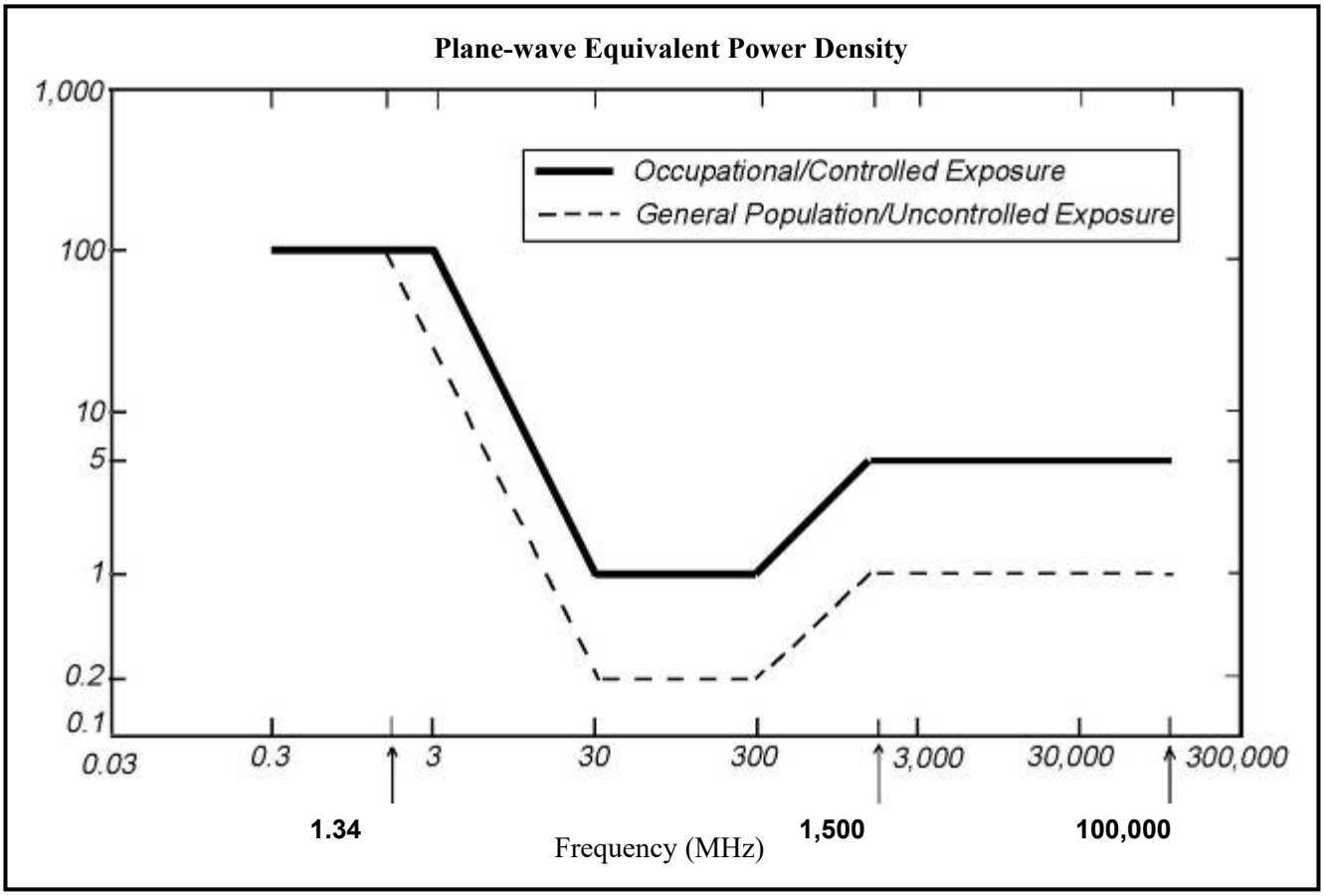

Figure 2: Graph of FCC Limits for Maximum Permissible Exposure (MPE)