STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

PETITION OF NEW CINGULAR WIRELESS PCS, LLC ("AT&T") TO THE CONNECTICUT SITING COUNCIL FOR A DECLARATORY RULING THAT NO CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED IS REQUIRED TO INSTALL A STEALTH ROOFTOP WIRELESS TELECOMMUNICATIONS TOWER ON THE EXISTING BUILDING LOCATED AT 79 PARK AVENUE, DANBURY, CONNECTICUT	**PETITION NO. 1101** **AUGUST 12, 2014**

SUPPLEMENTAL SUBMISSION OF NEW CINGULAR WIRELESS

New Cingular Wireless PCS, LLC ("AT&T") (the "Petitioner"), submits the following supplemental information to the State of Connecticut Siting Council in furtherance of the captioned proceeding:

1. Supplemental RF Emissions Report, prepared by C-Squared Systems, dated August 8, 2014.

Respectfully submitted,

By:_____

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ATTACHMENT 1

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Calculated Radio Frequency Emissions

CT2315B

79 Park Avenue, Danbury, CT 06810

August 8, 2014

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1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed installation of AT&T antenna arrays within a stealth penthouse to be located on the building at 79 Park Avenue in Danbury, CT. The coordinates of the proposed site are 41-23-11.72 N, 73-27-48.91 W.

AT&T is proposing the following:

1) Install twelve multi-band antennas (700/850/1900/2300 MHz) for their UMTS and LTE networks (four per sector).

This report uses the planned antenna configuration for AT&T to derive the resulting % MPE, 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 B 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 B 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.

3. RF Exposure Prediction Methods

The emission field calculation results displayed in the following figures were generated using the following formula as outlined in FCC bulletin OET 65:

$$\text{Power Density} = \left(\frac{1.6^2 \times EIRP}{4\pi \times R^2} \right) \text{x Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power

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

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Off Beam Loss is determined by the selected antenna patterns

Ground reflection factor of 1.6

These calculations assume that the antennas are operating at 100 percent capacity, that all antenna channels are transmitting simultaneously, and that the radio transmitters are operating at full power. Obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. As a result, the predicted signal levels reported below are much higher than the actual signal levels will be from the finished modifications.

The percent of MPE values presented in this report reflect levels that one may encounter from one sector of a carrier's antennas. Most carriers use 3 sectors per site with azimuths approximately 120 degrees apart, therefore one could not be standing in the main beam of all 3 sectors at the same time. In cases where antenna models are not uniform across all 3 sectors, the antenna model with the highest gain was used for the calculations. This results in a conservative or "worst case" assumption for percent of MPE calculations.

4. Proposed Antenna Inventory

Table 1 below outlines AT&T's antenna configuration for the site. The associated data sheets and antenna patterns for these antenna models are included in Attachment C.

Operator	Sector	TX Freq. (MHz)	Power at Antenna (Watts)	Ant Gain (dBi)	Power EIRP (Watts)	Antenna Model	Beam Width	Length (feet)	Antenna Centerline Height (ft.)
AT&T	Alpha	850	40	16.2	1667.5	HPA-65R-BUU-H8	61	7.7	47.5
		1900	40	17.1	2051.5		62		
		700	60	15.3	2033.1	HPA-65R-BUU-H8	65	7.7	47.5
		2300	60	17.7	3533.1		60		
		850	60	16.2	2501.2	HPA-65R-BUU-H8	61	7.7	47.5
		700	60	15.3	2033.1	HPA-65R-BUU-H8	65	7.7	47.5
		1900	120	17.1	6154.3		62		
	Beta	850	40	16.2	1667.5	HPA-65R-BUU-H8	61	7.7	47.5
		1900	40	17.1	2051.5		62		
		700	60	15.3	2033.1	HPA-65R-BUU-H8	65	7.7	47.5
		2300	60	17.7	3533.1		60		
		850	60	16.2	2501.2	HPA-65R-BUU-H8	61	7.7	47.5
		700	60	15.3	2033.1	HPA-65R-BUU-H8	65	7.7	47.5
		1900	120	17.1	6154.3		62		
	Gamma	850	40	16.2	1667.5	HPA-65R-BUU-H8	61	7.7	47.5
		1900	40	17.1	2051.5		62		
		700	60	15.3	2033.1	HPA-65R-BUU-H8	65	7.7	47.5
		2300	60	17.7	3533.1		60		
		850	60	16.2	2501.2	HPA-65R-BUU-H8	61	7.7	47.5
		700	60	15.3	2033.1	HPA-65R-BUU-H8	65	7.7	47.5
		1900	120	17.1	6154.3		62		

Table 1: Proposed Antenna Inventory[1] [2]

[1] Transmit power assumes 0 dB of cable loss.

[2] Antenna heights for AT&T are in reference to the Dewberry Engineers, Inc. Zoning Drawings dated January 13, 2014.

5. Calculation Results

The calculated power density results are shown in Figure 1 below. Each frequency band and technology is calculated as well as the resulting cumulative percent of MPE. For completeness, the calculations for this analysis range from 0 feet horizontal distance (directly below the antennas) to a value of 1,500 feet horizontal distance from the antennas. 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 were completed using a local maximum off beam antenna gain (within ± 5 degrees of the true mathematical angle) to incorporate a realistic worst case scenario. The calculated results presented in Figure 1 and Table 2 assumes even ground elevation out to 1,500 feet.

Figure 1: Graph of Percent of MPE vs. Distance

The highest composite percent of MPE (6.07%) was calculated to occur at a horizontal distance of 262 feet from the 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 300 feet and beyond, one would now be in the main beam of most antenna patterns 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 for each technology as well as the associated parameters that were included in the calculations. The highest composite percent of MPE value was calculated to occur at a horizontal distance of 262 feet from the antennas (reference Figure 1).

As stated in Section 3, all calculations assume that the antennas are operating at 100 percent capacity, that all antenna channels are transmitting simultaneously, and that the radio transmitters are operating at full power. Obstructions (trees, buildings etc.) that would normally attenuate the signal are not taken into account. In addition, 6 feet was subtracted from the height of the antennas for this analysis to account for average human height. As a result, the predicted signal levels are significantly higher than the actual signal levels will be from the finished modifications.

Carrier	Number of Trans.	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 1900MHz	2	30.0	47.5	262	0.006755	1.000	0.68%
AT&T LTE 2300MHz	2	30.0	47.5	262	0.006274	1.000	0.63%
AT&T LTE 750MHz (B/C)	2	30.0	47.5	262	0.005818	0.500	1.16%
AT&T LTE 750MHz (D/E)	2	30.0	47.5	262	0.005818	0.500	1.16%
AT&T LTE 850MHz	2	30.0	47.5	262	0.006772	0.567	1.20%
AT&T UMTS 1900MHz	1	40.0	47.5	262	0.004503	1.000	0.45%
AT&T UMTS 850MHz	1	40.0	47.5	262	0.004515	0.567	0.80%
						Total	**6.07%**

Table 2: Maximum Percent of Emissions Values (Level Terrain)[3]

[3] Frequencies listed in Table 2 are representative of the operating band of the particular carrier and are not the carriers' specific operating frequency.

Due to the close proximity of the proposed site and the Park Avenue School, %MPE calculations were performed for a selection of specific points located on or near the school property. These calculations take into account the ground elevation difference between each point relative to the proposed site. Table 3 below lists the %MPE calculated at these selected locations in the vicinity of the proposed site. The highest %MPE calculated was **6.60%** (Average Uncontrolled/General Population MPE) and was calculated at location 2 (the sidewalk near the Park Avenue School entrance). These calculated values incorporate the antenna pattern of the particular antenna model specified by AT&T to determine the "Off Beam Loss" factor shown in the power density formula from Section 3. All % MPE values are in reference to the FCC Uncontrolled/General Population exposure limit.

Meas. Location	Latitude	Longitude	Dist. From Site (feet)	Ground Elevation Difference (feet)	Calculated % MPE (750MHz LTE)	Calculated % MPE (850MHz Cellular)	Calculated % MPE (1900MHz PCS)	Calculated % MPE (2300MHz AWS)	Composite % MPE (Uncontrolled / General)
1	41.3860	-73.4630	202	-1.6	2.73%	1.89%	0.42%	0.35%	5.39%
2	**41.3858**	**-73.4630**	**267**	**-2.5**	**2.37%**	**2.09%**	**1.32%**	**0.82%**	**6.60%**
3	41.3853	-73.4631	459	-5.1	0.85%	0.77%	0.54%	0.37%	2.53%
4	41.3860	-73.4628	256	-1.1	2.44%	2.10%	1.19%	0.67%	6.40%
5	41.3856	-73.4628	378	-3.0	1.25%	1.13%	0.79%	0.54%	3.71%
6	41.3853	-73.4628	468	-4.2	0.82%	0.74%	0.52%	0.36%	2.43%
7	41.3859	-73.4626	305	-0.8	1.88%	1.69%	1.14%	0.76%	5.47%
8	41.3857	-73.4626	357	-1.6	1.40%	1.26%	0.88%	0.61%	4.15%
9	41.3853	-73.4626	490	-3.7	0.75%	0.68%	0.47%	0.32%	2.22%
10	41.3851	-73.4625	578	-4.1	0.54%	0.49%	0.34%	0.23%	1.60%
11	41.3856	-73.4621	476	-0.7	0.79%	0.71%	0.50%	0.34%	2.35%
12	41.3856	-73.4615	590	10.1	0.51%	0.47%	0.32%	0.22%	1.53%
13	41.3859	-73.4617	487	10.3	0.75%	0.68%	0.47%	0.33%	2.23%
14	41.3860	-73.4623	332	4.3	1.58%	1.41%	0.94%	0.62%	4.55%
15	41.3865	-73.4613	527	6.4	0.64%	0.58%	0.41%	0.28%	1.91%
16	41.3865	-73.4605	764	-0.1	0.31%	0.28%	0.19%	0.13%	0.92%

Table 3: Calculated Results at Selected Points[4] [5]

[4] Ground elevations are based upon the National Elevation Dataset (NED), as provided by the USGS.

[5] Positive ground elevation differences indicate the selected point's ground elevation is lower than that of the proposed site, negative values indicated selected point is above the proposed site.

Figure 2 below is an aerial view of the 79 Park Avenue facility, the Park Avenue School, and the surrounding area. Labeled points indicate the locations of the %MPE calculations, as listed above in Table 3.

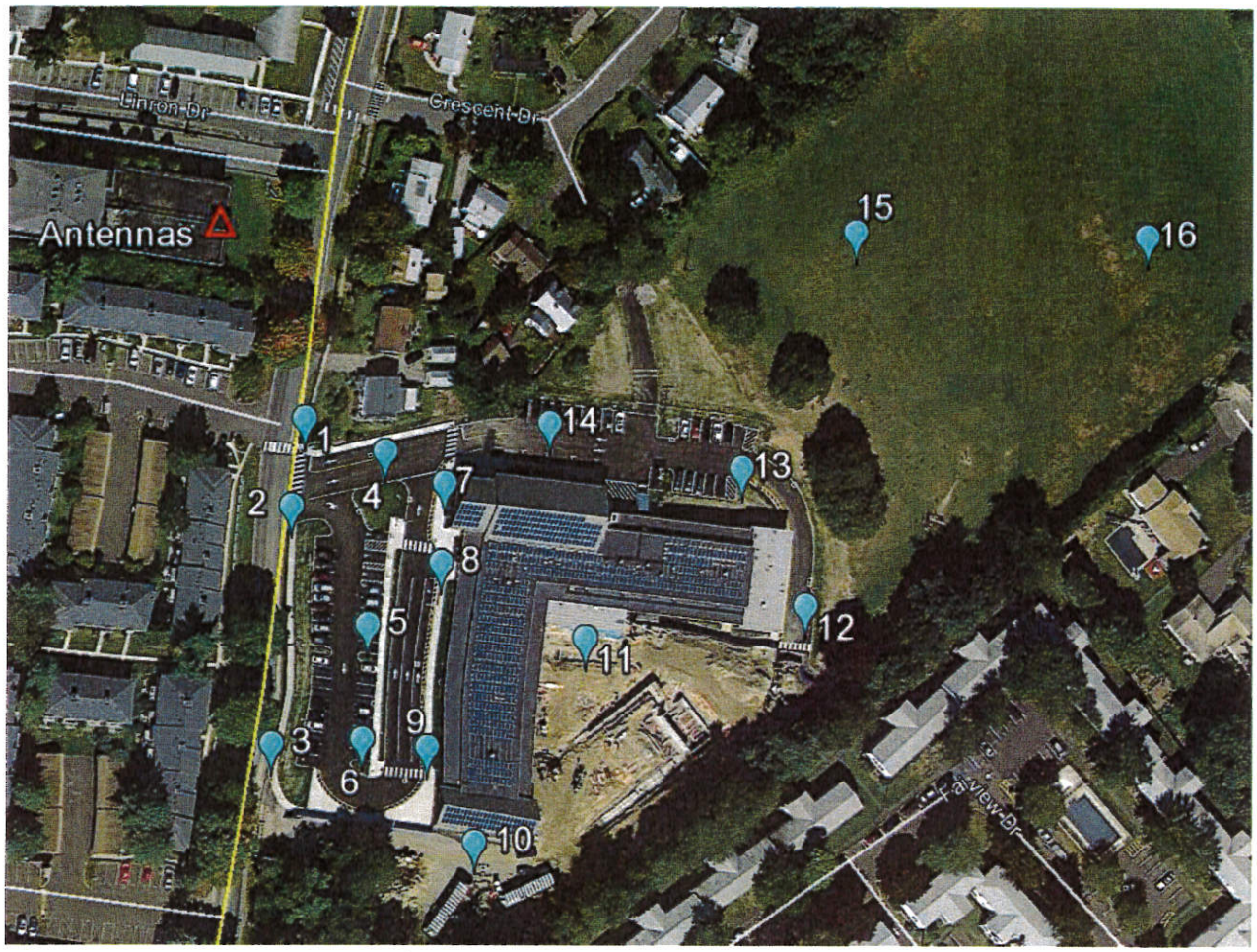


Figure 2: Aerial View of Selected Locations

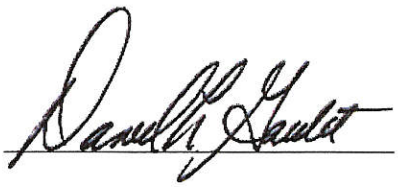
6. Conclusion

The above analysis verifies that RF exposure from the site will be well below the maximum levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Using the conservative calculation methods described above, the maximum composite percent of MPE from the site is **6.07% of the FCC limit (General Population/Uncontrolled)** when considering level ground elevation around the proposed site. This maximum percent of MPE is calculated to occur at 262' away from the proposed site.

The maximum composite percent of MPE (General Population/Uncontrolled) of the selected points around the proposed site, in consideration of any ground elevation differences, is calculated to be **6.60% of the FCC limit (General Population/Uncontrolled).** This maximum percent of MPE value is calculated to occur 267' away from the site, at the sidewalk near the Park Avenue School entrance (location 5).

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 ANSI/IEEE Std. C95.3, ANSI/IEEE Std. C95.1 and FCC OET Bulletin 65 Edition 97-01.



August 8, 2014

Dan Goulet
C Squared Systems, LLC

Date

Attachment A: References

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

ANSI C95.1-1982, American National Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz IEEE-SA Standards Board

IEEE Std C95.3-1991 (Reaff 1997), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave IEEE-SA Standards Board

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

(A) Limits for Occupational/Controlled Exposure[6]

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[7]

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 4: FCC Limits for Maximum Permissible Exposure

[6] 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.

[7] 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.

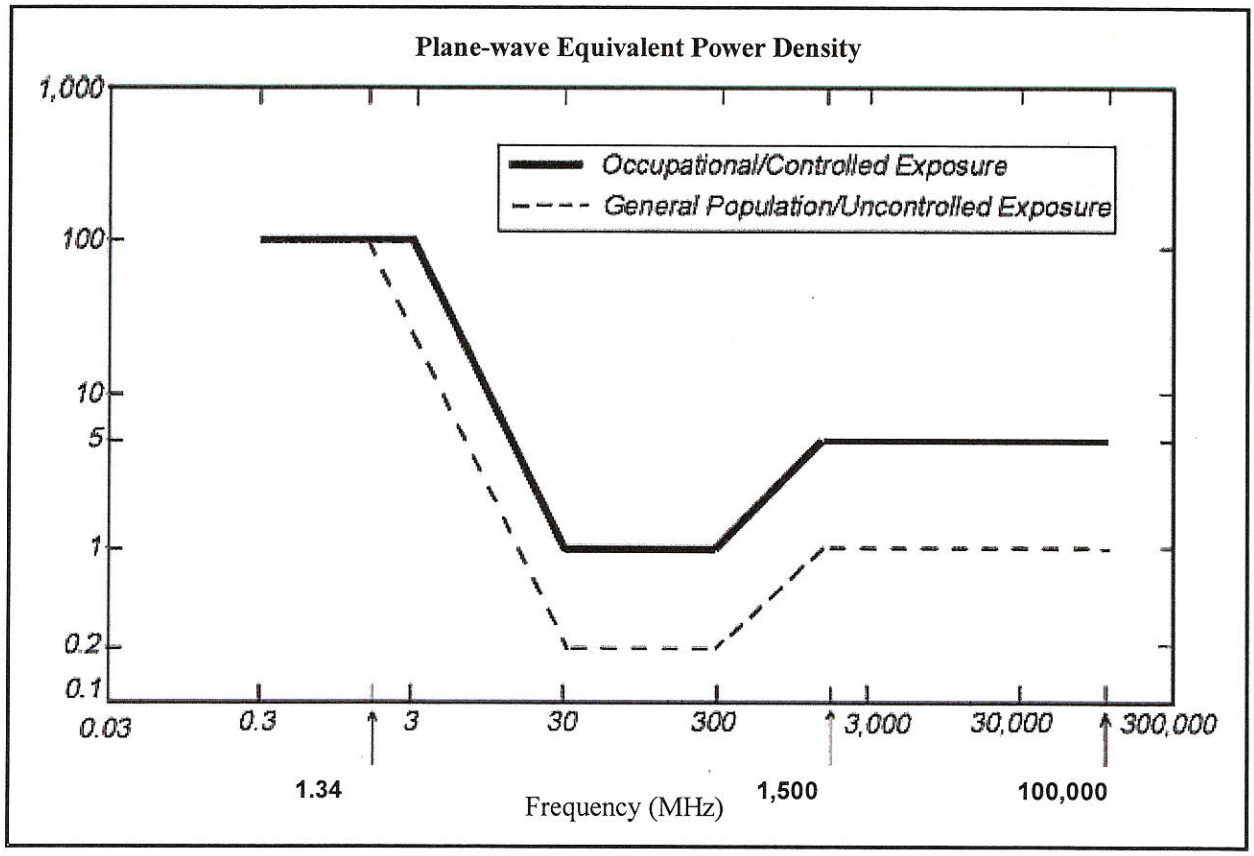
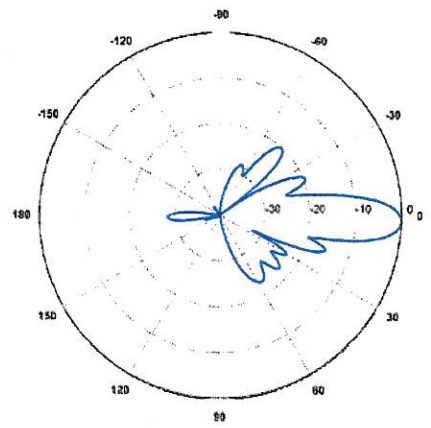
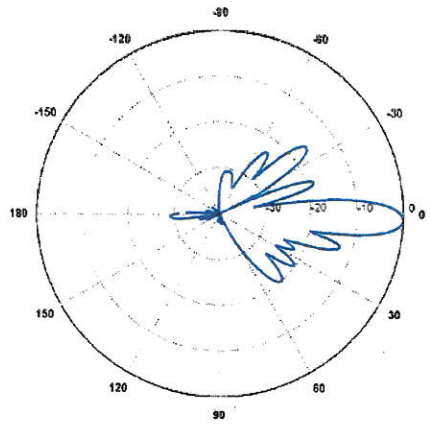
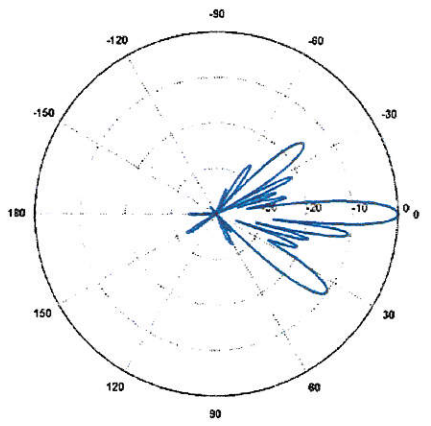


Figure 3: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Antenna Model Data Sheets and Electrical Patterns

750 MHz Manufacturer: CCI Products Model #: HPA-65R-BUU-H8 Frequency Band: 698-806 MHz Gain: 13.2 dBd Vertical Beamwidth: 10.1° Horizontal Beamwidth: 65° Polarization: Dual Pol ± 45° Size L x W x D: 92.4" x 14.8" x 7.4"	
850 MHz Manufacturer: CCI Products Model #: HPA-65R-BUU-H8 Frequency Band: 824-894 MHz Gain: 14.1 dBd Vertical Beamwidth: 8.4° Horizontal Beamwidth: 61° Polarization: Dual Pol ± 45° Size L x W x D: 92.4" x 14.8" x 7.4"	
1900 MHz Manufacturer: CCI Products Model #: HPA-65R-BUU-H8 Frequency Band: 1850-1990 MHz Gain: 15.0 dBd Vertical Beamwidth: 5.6° Horizontal Beamwidth: 62° Polarization: Dual Pol ± 45° Size L x W x D: 92.4" x 14.8" x 7.4"	

2300 MHz

Manufacturer:	CCI Products
Model #:	HPA-65R-BUU-H8
Frequency Band:	2305-2360 MHz
Gain:	15.6 dBd
Vertical Beamwidth:	4.5°
Horizontal Beamwidth:	60°
Polarization:	Dual Pol ± 45°
Size L x W x D:	92.4" x 14.8" x 7.4"