DONALD L. HAES, JR., CHP, CLSO

Radiation Safety Specialist

PO Box 198, Hampstead, NH 03841 617-680-6262 Email: donald_haes_chp@comcast.net

March 9, 2020

RE: Installation of antennas and associated equipment for the AT&T Mobility PWS facility to be mounted on the Water Tank at 5 Roots Rock Road, York, ME.

PURPOSE

I have reviewed the information pertinent to the proposed installation at the above location. To determine regulatory compliance, theoretical calculations of maximal radio-frequency (RF) fields have been prepared. The physical conditions are that AT&T Mobility proposes to initially install two (2) personal wireless services (PWS) antennas with remote radio head units each in three (3) sectors, on the Water Tank at 5 Roots Rock Road, York, ME (See Figure 2). The site currently hosts several FCC-licensed omni-directional antennas and associated radio equipment. AT&T Mobility proposes to install an additional PWS antenna with remote radio head units in each of the three (3) sectors, at some future date.

The theoretical calculations consider the contributions of the proposed AT&T Mobility PWS and existing industrial transmitters operating at their proposed FCC licensed capacity. The calculated RF field values are presented as a percent of current Maximum Permissible Exposures (%MPE) as adopted by the Federal Communications Commission (FCC).[i,ii]

SUMMARY

This report is intended to provide written evidence that RF fields from the proposed AT&T Mobility PWS facility on the ground would comply with the FCC RF exposure guidelines. The resulting data indicate the summation of the proposed AT&T Mobility PWS RF contributions, in addition to those already existing (see Figure 3), would be within the established RF exposure guidelines in all accessible areas on the ground (see Figure 4). Additional calculations for the AT&T Mobility future planned installation further indicates compliance with the established RF exposure guidelines in all accessible areas on the ground (see Figure 5). **The results support compliance with the pertinent sections of the FCC's guidelines for RF exposure.**

Based on the results of the theoretical RF fields I have calculated, it is my expert opinion that this facility would comply with all regulatory guidelines for RF exposure with the proposed and future planned AT&T Mobility antenna and transmitter installations.

Note: The analyses, conclusions and professional opinions are based upon the precise parameters and conditions of this particular site; **AT&T MOBILITY PWS facility mounted on the Water Tank at 5 Roots Rock Road, York, ME**. Utilization of these analyses, conclusions and professional opinions for any personal wireless services installation, existing or proposed, other than the aforementioned has not been sanctioned by the author, and therefore should not be accepted as evidence of regulatory compliance.

EXPOSURE LIMITS AND GUIDELINES

RF exposure guidelines enforced by the FCC were established by the American National Standards Institute (ANSI)[iii] and the National Council on Radiation Protection and Measurement (NCRP).[iv] The RF exposure guidelines are listed for RF workers and members of the public. The applicable FCC RF exposure guidelines for the public are listed in Table 1 and depicted in Figure 1. All listed values are intended to be averaged over any contiguous 30-minute period. Note that RF exposure guidelines for trained "RF workers" are five (5) times the values for the general public.

Table 1: Maximum Permissible Exposure (MPE) Values in Public Areas

Frequency Bands	Electric Fields	Magnetic Fields	Equivalent Power Density
0.3–1.34 MHz	614 (V/m)	1.63 (A/m)	(100) mW/cm^2
1.34-30 MHz	824/f (V/m)	2.19/f (A/m)	(100) mW/cm^2
30-300 MHz	27.5 (V/m)	0.073 (A/m)	0.2 mW/cm^2
300-1500 MHz	--	--	f / 1500 mW/cm^2
1500-100,000 MHz	--	--	1.0 mW/cm^2

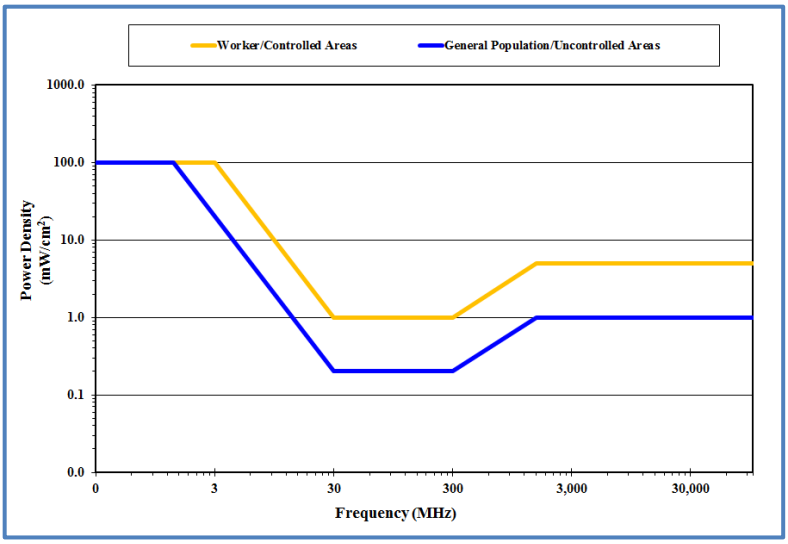


Figure 1: FCC Limits for Maximum Permissible Exposure (MPE)

NOTE: FCC 5% Rule – At multiple transmitter sites, actions necessary to bring the area into compliance with the RF exposure guidelines are the shared responsibility of all licensees whose transmitters produce RF field levels in excess of 5% of the applicable FCC MPEs.

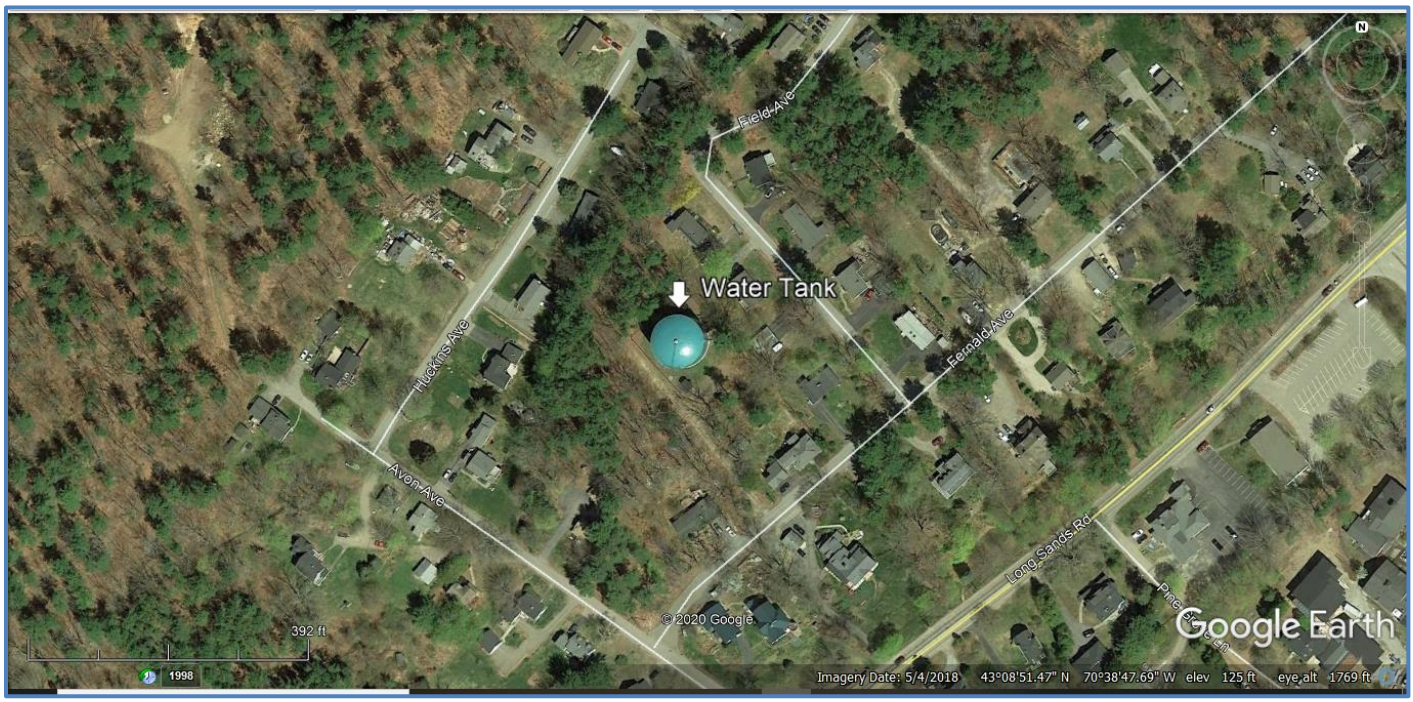


Figure 2: Water tank
5 Roots Rock Road, York, ME
(Picture courtesy Google Earth®)

OBSERVATIONS IN CONSIDERATION WITH FCC RULES §1.1307(B) & §1.1310

Will it be physically possible to stand next to or touch any omnidirectional antenna and/or stand in front of a directional antenna?

NO; access to the Water Tank is restricted, and the site will adhere to established RF safety guidelines regarding the transmitting antennas, including the appropriate signage.

THEORETICAL RF FIELD CALCULATIONS - GROUND LEVELS METHODOLOGY

These calculations are based on what are called "worst-case" estimates. That is, the estimates assume 100% use of all transmitters simultaneously. For these calculations, the surrounding area was assumed to be a flat plane, even though there is a general slope away from the tank. Note that any loss along the horizontal direction was neglected which means the results would be the maximum values in any direction. The resultant values are thus conservative in that they over-predict actual resultant power densities. The data used to prepare the theoretical RF field calculations are outlined in Tables 2, 3, and 4 for the existing FCC-licensed, proposed AT&T Mobility, and future planned AT&T Mobility transmitters, respectively.

The calculations are based on the following information:

1. **Effective Radiated Power (ERP):** See Tables 2, 3, and 4, and Appendixes A&C data).
2. **Antenna Height (Centerline, Above Ground Level (AGL)**: Simple trigonometry was used to determine the resultant "RANGE" and the antenna depression angles.
3. **Antenna Vertical Energy Patterns**: The source of the negative gain (G) values, see Appendix B. Omni-directional antennas are designed to send out relatively equal power in all directions. "Directional" antennas are designed to focus the RF signal, resulting in "patterns" of signal loss and gain. Antenna vertical energy patterns display the loss of signal strength relative to the direction of propagation due to elevation angle changes.

The magnitude of the RF field (the power density (S)) from an isotropic RF source is calculated making use of the power density formula as outlined in FCC's OET Bulletin 65, Edition 97-01: [v]

$$S = \frac{P \cdot G}{4 \cdot \pi \cdot R^2}$$

Where:
- $P \rightarrow$ Power to antenna (Watts)
- $G \rightarrow$ Gain of antenna
- $R \rightarrow$ Distance (range) from antenna source to point of intersection with the ground (feet)
- $R^2 = (\text{Height})^2 + (\text{Horizontal distance})^2$

Since: $P \cdot G = EIRP$ (Effective Isotropic Radiated Power), and for the situation of off-axis power density calculations, apply the negative elevation gain (G^E) value from the vertical energy patterns with the following formula:

$$S = \frac{EIRP \cdot G^E}{4 \cdot \pi \cdot R^2}$$

Ground reflections may add in-phase with the direct wave, and essentially double the electric field intensity. Because power density is proportional to the *square* of the electric field, the power density may quadruple, that is, increase by a factor of four (4).

Since ERP is routinely used, convert ERP into EIRP by multiplying by the factor of 1.64 (the gain of a ½-wave dipole relative to an isotropic radiator).

$$S = \frac{4 \cdot (ERP \cdot 1.64) \cdot G^E}{4 \cdot \pi \cdot R^2} = \frac{ERP \cdot 1.64 \cdot G^E}{\pi \cdot R^2} = \frac{0.522 \cdot ERP \cdot G^E}{R^2}$$

To calculate the % MPE, use the formula:

$$\% \text{ MPE} = \frac{S}{\text{MPE}} \cdot 100$$

THEORETICAL RF FIELD CALCULATIONS - DATA

Table 2: Transmitter and Antenna Data and Supporting Parameters for Existing FCC Licensees on the Water Tank; 5 Roots Rock Road, York, ME

Antenna Type See Appendix B for Energy Patterns	FCC License Call Sign*	Frequency (MHz)†/ License Type‡	Centerline Height (Meters AGL)	# Transmitters X ERP⁂ (Watts; See Appendix C)	Total ERP (Watts)
Omni-Directional (whip)	KCF928	153.6050 / IG	24.2	2 X 50	100
		153.4250 / IG		2 X 50	100
Omni-Directional (whip)	WPFX417	173.2100 / IG	21.0	1 X 4	4
Omni-Directional (whip)	WNNY799	173.3125 / IG	21.0	1 X 20	20

Table Notes

*** Source:** RadioReference.com LLC (See Appendix C) and FCC License geo-search.

† Transmitter (Tx) Frequency: Central transmit frequency used to account for multiple channels.

⁂ **ERP**: Effective Radiated Power is the directional (RF) power (in Watts) that would have to be radiated by a half-wave dipole antenna to give the same radiation intensity as the actual source at a distant receiver located in the direction of the antenna's strongest beam (main lobe). ERP measures the combination of the power emitted by the transmitter and the ability of the antenna to direct that power in a given direction. It is equal to the input power to the antenna multiplied by the gain of the antenna. (Source Wiki).

‡ **FCC Abbreviations**

IG: Industrial/Business Pool - Private, Conventional (below 800 MHz).

Table 3: Transmitter and Antenna Data and Supporting Parameters for *Proposed* AT&T Mobility PWS Site on the Water Tank; 5 Roots Rock Road, York, ME

Remote Radio Head Unit (RRH or RRU; See Appendix A)			**Antenna See Appendix B for Energy Patterns**			
Model	Frequency (MHz)[†]/ Technology	# Tx X Output Power (Watts) [‡]	Manufacturer/ Model	Gain (dBd)	**ERP** (Watts)[⁂]	Centerline Height ('AGL) / Down-tilt (º)
Sector A @ 50 º Azimuth						
RRUS-4478	720 / LTE-700	4 X 40	Antenna 1: KMW EPBQ-654L8H8-L2	15.5	5,677	75.0' @ -2º
RRUS-8843	2130 / AWS-2100	4 X 60		18.1	15,496	
RRUS-4449	720 / LTE-700	1 X 60	Antenna 3: KMW EPBQ-654L8H8-L2	15.5	2,129	75.0' @ -2º
RRUS-4449	850 / ERLTE-850	1 X 60		16.1	2,444	
RRUS-8843	1930 / PCS	4 X 40		17.5	8,997	
Sector B @ 140 º Azimuth						
RRUS-4478	720 / LTE-700	4 X 40	Antenna 1: KMW EPBQ-654L8H8-L2	15.5	5,677	75.0' @ -2º
RRUS-8843	2130 / AWS-2100	4 X 60		18.1	15,496	
RRUS-4449	720 / LTE-700	1 X 60	Antenna 3: KMW EPBQ-654L8H8-L2	15.5	2,129	75.0' @ -2º
RRUS-49	850 / ERLTE-850	1 X 60		16.1	2,444	
RRUS-8843	1930 / PCS	4 X 40		17.5	8,997	
Sector C @ 260 º Azimuth						
RRUS-4478	720 / LTE-700	4 X 40	Antenna 1: KMW EPBQ-654L8H8-L2	15.5	5,677	75.0' @ -2º
RRUS-8843	2130 / AWS-2100	4 X 60		18.1	15,496	
RRUS-4449	720 / LTE-700	1 X 60	Antenna 3: KMW EPBQ-654L8H8-L2	15.5	2,129	75.0' @ -2º
RRUS-4449	850 / ERLTE-850	1 X 60		16.1	2,444	
RRUS-8843	1930 / PCS	4 X 40		17.5	8,997	

Table Notes

[†] Transmitter (Tx) Frequency: Central transmit frequency used to account for multiple channels.

[‡] Maximum rated output power (per channel).

[⁂] **ERP**: Effective Radiated Power is the directional (RF) power (in Watts) that would have to be radiated by a half-wave dipole antenna to give the same radiation intensity as the actual source at a distant receiver located in the direction of the antenna's strongest beam (main lobe). ERP measures the combination of the power emitted by the transmitter and the ability of the antenna to direct that power in a given direction. It is equal to the input power to the antenna multiplied by the gain of the antenna. (Source Wiki).

Personal Wireless Services (PWS) Technologies

AWS: Advanced Wireless Services
CDMA: Code Division Multiple Access (a.k.a. "Cellular")
LTE: Long Term Evolution (a.k.a. "4G")
ERLTE: Extended Range LTE (600 MHz).
PCS: Personal Communication System
UMTS: Universal Mobile Telecommunications Services
WCS: Wireless Communication Service

Table 4: Transmitter and Antenna Data and Supporting Parameters for *Future Planned* AT&T Mobility PWS Site on the Water Tank; 5 Roots Rock Road, York, ME

Remote Radio Head Unit (RRH or RRU; See Appendix A)			**Antenna See Appendix B for Energy Patterns**			
Model	Frequency (MHz)[†]/ Technology	# Tx X Output Power (Watts) [‡]	Manufacturer/ Model	Gain (dBd)	**ERP** (Watts)[⁂]	Centerline Height (‘AGL) / Downtilt (º)
Sector A @ 50 º Azimuth						
RRUS-E2	720 / LTE-700	2 X 20	Antenna 2: CCI HPA65R-BU8A	15.5	1,419	75.0’ @ -2º
RRUS-E2	850 / ERLTE-850	2 X 20		15.5	1,419	
RRUS-4415	1930 / PCS	4 X 40		17.5	8,997	
RRUS-4415	2330 / WCS	4 X 40		18.1	10,330	
Sector B @ 140 º Azimuth						
RRUS-E2	720 / LTE-700	2 X 20	Antenna 2: CCI HPA65R-BU8A	15.5	1,419	75.0’ @ -2º
RRUS-E2	850 / ERLTE-850	2 X 20		15.5	1,419	
RRUS-4415	1930 / PCS	4 X 40		17.5	8,997	
RRUS-4415	2330 / WCS	4 X 40		18.1	10,330	
Sector C @ 260 º Azimuth						
RRUS-E2	720 / LTE-700	2 X 20	Antenna 2: CCI HPA65R-BU8A	15.5	1,419	75.0’ @ -2º
RRUS-E2	850 / ERLTE-850	2 X 20		15.5	1,419	
RRUS-4415	1930 / PCS	4 X 40		17.5	8,997	
RRUS-4415	2330 / WCS	4 X 40		18.1	10,330	

Table Notes

[†]Transmitter (Tx) Frequency: Central transmit frequency used to account for multiple channels.

[‡] Maximum rated output power (per channel).

[⁂]**ERP**: Effective Radiated Power is the directional (RF) power (in Watts) that would have to be radiated by a half-wave dipole antenna to give the same radiation intensity as the actual source at a distant receiver located in the direction of the antenna's strongest beam (main lobe). ERP measures the combination of the power emitted by the transmitter and the ability of the antenna to direct that power in a given direction. It is equal to the input power to the antenna multiplied by the gain of the antenna. (Source Wiki).

Personal Wireless Services (PWS) Technologies

AWS: Advanced Wireless Services
CDMA: Code Division Multiple Access (a.k.a. “Cellular”)
LTE: Long Term Evolution (a.k.a. “4G”)
ERLTE: Extended Range LTE (600 MHz).
PCS: Personal Communication System
UMTS: Universal Mobile Telecommunications Services
WCS: Wireless Communication Service

RESULTS

The results of the theoretical Cumulative Maximum Percent MPE - vs. - Distance calculations are shown in Figure 3 for the **existing FCC-licensed** transmitters. The values have been plotted against linear distance from the base of the water tank, representing the highest possible values in any direction. The values have been calculated for a height of six feet above ground level in accordance with regulatory rationale. Values for 16' AGL have also been calculated to represent values on the top floor of a typical two-story structure. Note that a logarithmic scale was used to plot the calculated values in order to compare with the MPE of 100%, which is so much larger that it would be off the page in a linear plot.

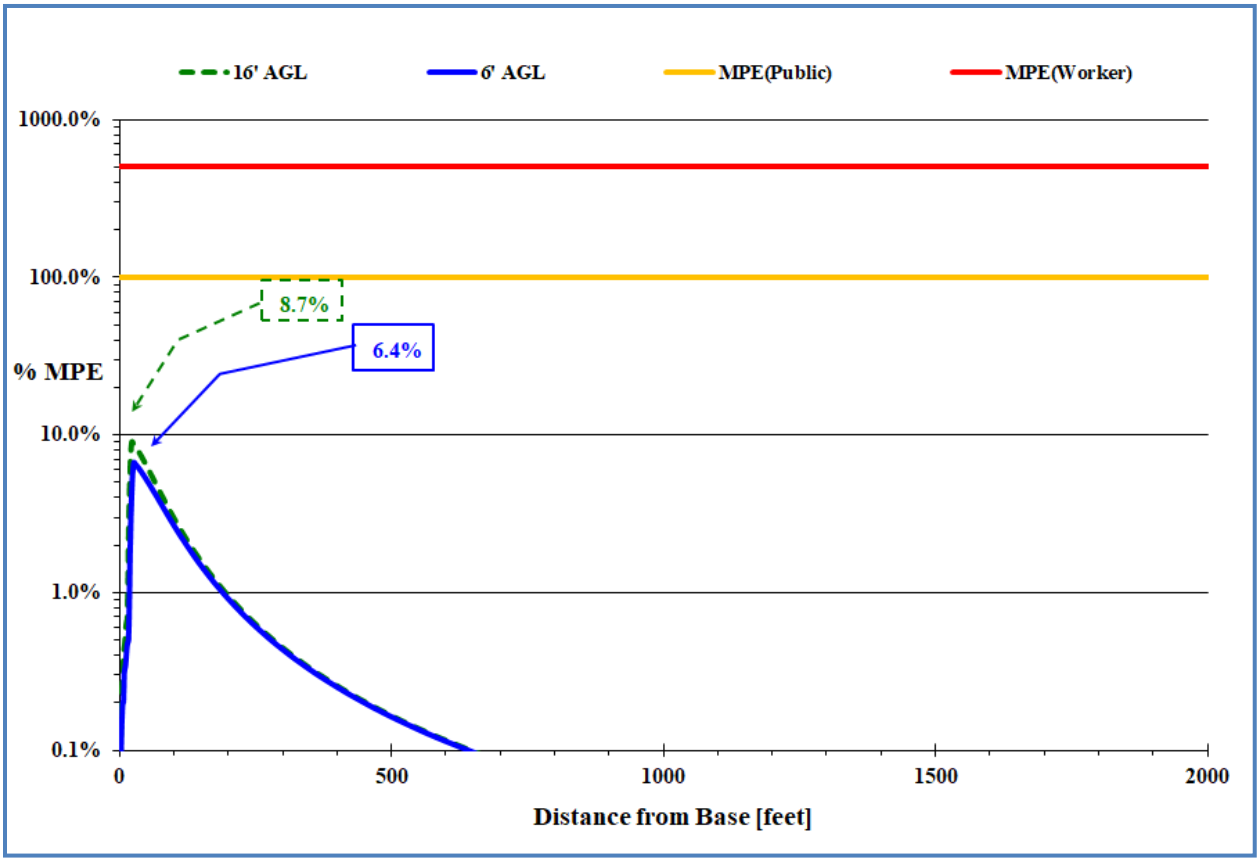


Figure 3: Theoretical Cumulative Maximum Percent MPE - vs. - Distance
Highest Values at Ground Level in Any Direction from Existing FCC-Licensed RF Emissions
Water Tank at 5 Roots Rock Road, York, ME

The results of the theoretical Cumulative Maximum Percent MPE - vs. - Distance calculations are similarly shown in Figure 4 for the summation of the ***existing*** **FCC-licensed** and ***proposed*** AT&T Mobility transmitters. Finally, the results of the theoretical Cumulative Maximum Percent MPE - vs. - Distance calculations are similarly shown in Figure 5 for the summation of the ***existing*** **FCC-licensed**, ***proposed*** **and** ***future planned*** AT&T Mobility transmitters.

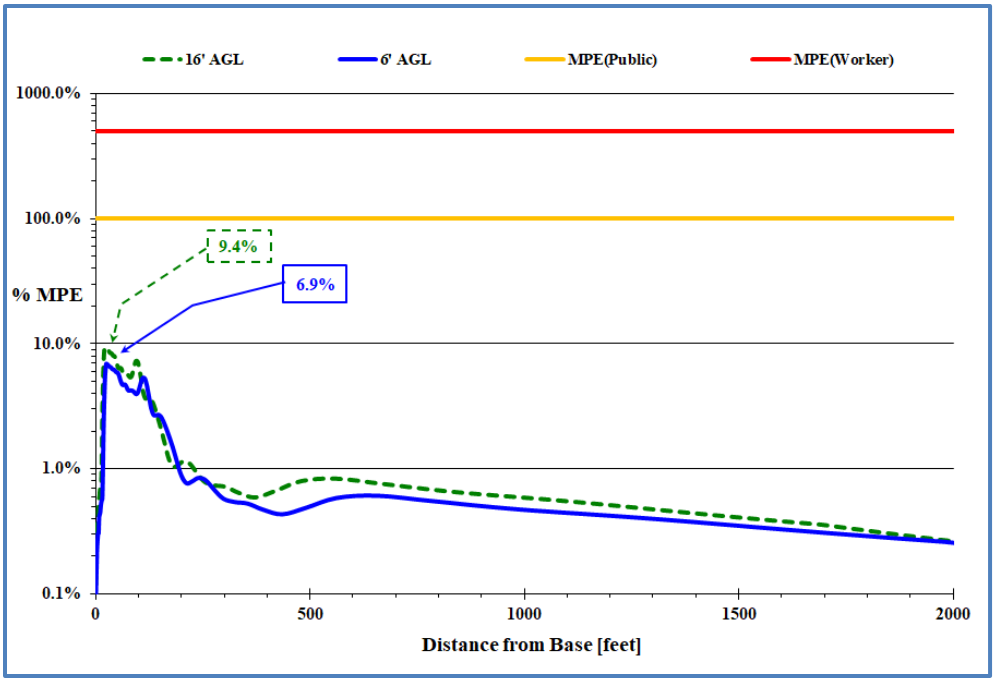


Figure 4: Theoretical Cumulative Maximum Percent MPE - vs. - Distance Highest Values at Ground Level in Any Direction from ***Existing*** FCC-Licensed PLUS ***Proposed*** AT&T Mobility RF Emissions . Water Tank at 5 Roots Rock Road, York, ME

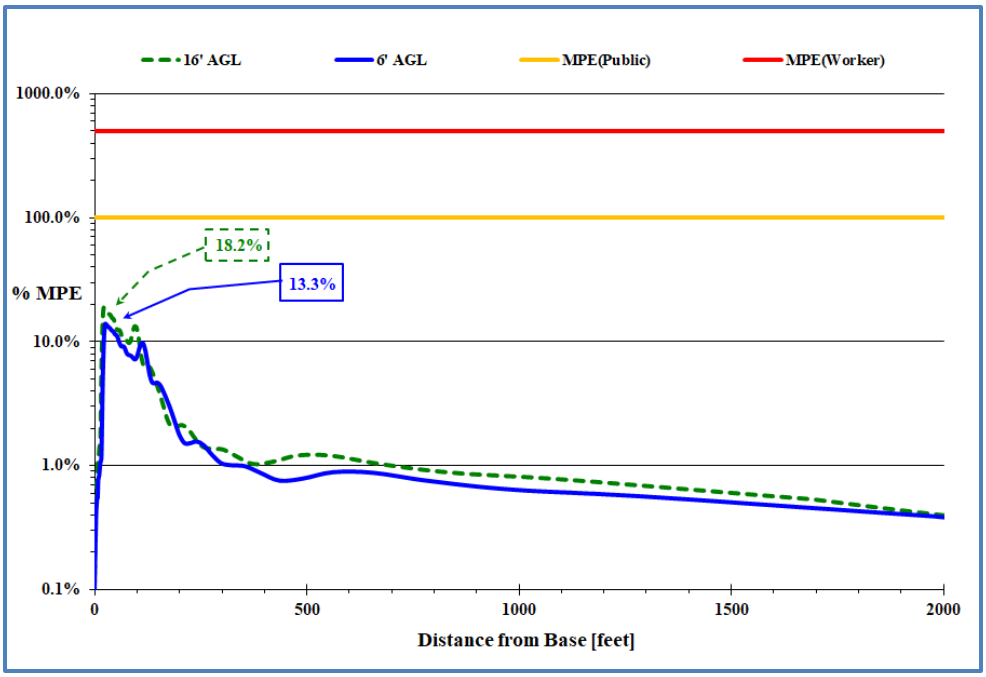


Figure 5: Theoretical Cumulative Maximum Percent MPE - vs. - Distance Highest Values at Ground Level in Any Direction from ***Existing*** FCC-Licensed PLUS ***Proposed*** and ***Future Planned*** AT&T Mobility RF Emissions. Water Tank at 5 Roots Rock Road, York, ME

CONCLUSION

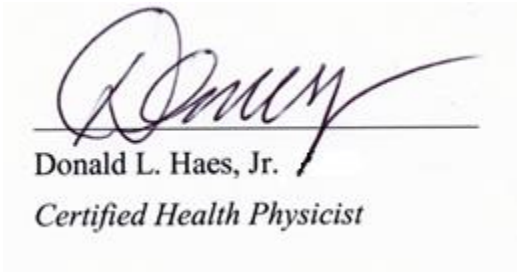
This report is intended to provide written evidence that RF fields from the proposed AT&T Mobility PWS facility on the ground would comply with the FCC RF exposure guidelines. The resulting data indicate the summation of the proposed AT&T Mobility PWS RF contributions, in addition to those already existing (see Figure 3), would be within the established RF exposure guidelines in all accessible areas on the ground (see Figure 4). Additional calculations for the AT&T Mobility future planned installation further indicates compliance with the established RF exposure guidelines in all accessible areas on the ground (see Figure 5). **The results support compliance with the pertinent sections of the FCC's guidelines for RF exposure.**

The number and duration of calls passing through PWS facilities cannot be accurately predicted. Thus, to estimate the highest RF fields possible from operation of these installations, the maximal amount of usage was considered. Even in this so-called "worst-case," the resultant increase in RF field levels are far below established levels considered safe.

Based on the results of the theoretical RF fields I have calculated, it is my expert opinion that this facility would comply with all regulatory guidelines for RF exposure with the proposed and future planned AT&T Mobility antenna and transmitter installations.

Feel free to contact me if you have any questions.

Sincerely,



Note: The analyses, conclusions and professional opinions are based upon the precise parameters and conditions of this particular site; **AT&T MOBILITY PWS facility mounted on the Water Tank at 5 Roots Rock Road, York, ME**. Utilization of these analyses, conclusions and professional opinions for any personal wireless services installation, existing or proposed, other than the aforementioned has not been sanctioned by the author, and therefore should not be accepted as evidence of regulatory compliance.

DONALD L. HAES, JR., CHP, CLSO

Radiation Safety Specialist

PO Box 198, Hampstead, NH 03841 617-680-6262 Email: donald_haes_chp@comcast.net

STATEMENT OF CERTIFICATION

1. I certify to the best of my knowledge and belief, the statements of fact contained in this report are true and correct.

2. The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are personal, unbiased professional analyses, opinions and conclusions.

3. I have no present or prospective interest in the property that is the subject of this report and I have no personal interest or bias with respect to the parties involved.

4. My compensation is not contingent upon the reporting of a predetermined energy level or direction in energy level that favors the cause of the client, the amount of energy level estimate, the attainment of a stipulated result, or the occurrence of a subsequent event.

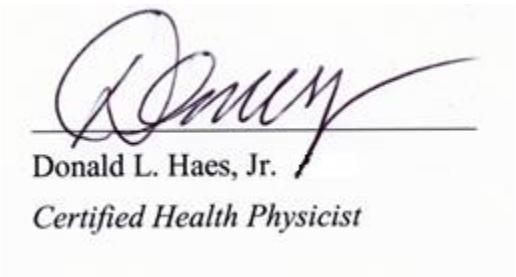
5. This assignment was not based on a requested minimum environmental energy level or specific power density.

6. My compensation is not contingent on an action or event resulting from the analyses, opinions, or conclusions in, or the use of, this report.

7. The consultant has accepted this assessment assignment having the knowledge and experience necessary to complete the assignment competently.

8. My analyses, opinions, and conclusions were developed and this report has been prepared, in conformity with the *American Board of Health Physics* (ABHP) statements of standards of professional responsibility for Certified Health Physicists.

Date: March 9, 2020



DONALD L. HAES, JR., CHP, CLSO

Radiation Safety Specialist

PO Box 198, Hampstead, NH 03841 617-680-6262 Email: donald_haes_chp@comcast.net

SUMMARY OF QUALIFICATIONS

- **Academic Training -**
  - Graduated from Chelmsford High School, Chelmsford, MA; June 1973.
  - Completed Naval Nuclear Naval Nuclear Power School, 6-12/1976.
  - Completed Naval Nuclear Reactor Plant Mechanical Operator and Engineering Laboratory Technician (ELT) schools and qualifications, Prototype Training Unit, Knolls Atomic Power Laboratory, Windsor, Connecticut, 1-9/1977.
  - Graduated Magna Cum Laude from University of Lowell with a Bachelor of Science Degree in *Radiological Health Physics*; 5/1987.
  - Graduated from University of Lowell with a Master of Science Degree in *Radiological Sciences and Protection*; 5/1988.

- **Certification -**
  - Board Certified by the American Board of Health Physics 1994; renewed 1998, 2002, 2006, 2010, 2014, and 2018. Expiration 12/31/2022.
  - Board Certified by the Board of Laser Safety 2008; renewed 2011, 2014, 2017. Expiration 12/31/2020.

- **Employment History -**
  - Consulting Health Physicist; Ionizing/Nonionizing Radiation, 1988 - present.
  - Radiation, RF and Laser Safety Officer; BAE Systems, 2005–2018 (retired).
  - Assistant Radiation Safety Officer; MIT, 1988 – 2005 (retired).
  - Radiopharmaceutical Production Supervisor - DuPont/NEN, 1981 – 1988 (retired).
  - United States Navy; Nuclear Power Qualifications, 1975 – 1981 (Honorably Discharged).

- **Professional Societies -**
  - Health Physics Society [HPS].
  - American Academy of Health Physics [AAHP]
  - Institute of Electrical and Electronics Engineers [IEEE];
  - International Committee on Electromagnetic Safety [ICES] (ANSI C95 series).
  - Laser Institute of America [LIA].
  - Board of Laser Safety [BLS].
  - American National Standards Institute Accredited Standards Committee [ASC Z136].
  - Committee on Man and Radiation [COMAR].

APPENDIX A
SPECIFIC REMOTE RADIO HEAD UNIT: RADIO 4478

RI.
SE

REPORT

Date 2017-06-29 | Reference 7P04388-P90 | Page 5 (72)

Description of the test object

Equipment:	Radio equipment Radio 4478 B14 Product number KRC 161 669/3 FCC ID: TA8AKRC161669-3
Hardware revision state:	R1B
Tested configuration:	Single RAT LTE
Frequency bands: 3GPP B7:	TX: 758 – 768 MHz RX: 788 – 798 MHz
IBW:	10 MHz
Output power:	Max 40 W/ antenna port
Antenna ports:	4 TX / 4 RX ports
Antenna:	No dedicated antenna, handled during licensing
RF configurations:	Single and multi-carrier, 1-2 carriers/ port TX Diversity, 2x2 MIMO, 4x4 MIMO, Contiguous Spectrum (CS), Carrier Aggregation (CA)
Channel bandwidths:	5 MHz and 10 MHz
Modulations:	QPSK, 16QAM, 64QAM and 256QAM
RF power Tolerance:	+0.6/ -2.0 dB
CPRI Speed	Up to 10.1 Gbit/s

The information above is supplied by the manufacturer.

Receipt date	November 15, 2017
Nemko sample ID number	None

3.2 EUT information

Product name	Radio 4449
Model	Radio 4449 B5 B13
Part number	KRC 161 749/1
Revision	R1A
Serial number	B440591478
Antenna ports	4 TX/RX Ports
RF BW / IBW	B5: 25 MHz B13: 10 MHz
FDD	B5: 45 MHz B13: 31 MHz
B5 Frequency range	TX (DL): 869–894 MHz RX (UL): 824–849 MHz
B13 Frequency range	TX (DL): 746–756 MHz RX (UL): 777–787 MHz
Nominal O/P per antenna port	Config 1: B5: Single Carrier, Ports A through D: 1 × 40 W (46 dBm) Config 1: B13: Single Carrier, Ports A through D: 1 × 40 W (46 dBm) Config 2: B5: Single Carrier, Ports A and D: 1 × 60W (47.78 dBm) Config 2: B13: Single Carrier, Ports A and D: 1 × 60W (47.78 dBm)
Accuracy (nominal)	±0.1 ppm
Nominal voltage	2 × –48 V_{DC} @ 20 A
RAT	LTE: SC, MIMO
Modulation	LTE: QPSK, 16 QAM, 64 QAM, 256QAM
Channel bandwidth	LTE: 5 MHz (B5), 10 MHz (B13)
Maximum combined OBW per port	15 MHz
CPRI	10 Gbps
Channel raster	LTE: 100 kHz
Regulatory requirements	Radio: FCC Part 2, 22, 27 EMC: FCC Part 15, ICES-003 Safety: IEC/EN 62368-1, UL/CSA 62368-1 IEC/EN 60950-22, IEC/EN 60529, UL 50E
Emission Designator:	5M00W7D (B5), 10M0W7D (B13)
Supported Configuration	SC, MC, Single Antenna, TX Diversity, MIMO, Carrier Aggregation
Operating temperature	–40 °C to +55 °C
Total Power based on IBW	Config 1: 4 × 40 W (B5) + 4 × 40 W (B13) Config 2: 2 × 60 W (B5) + 2 × 60 W (B13)
Supported carrier / port	LTE BW, B5: 5 (1-3), 10 (1-2); LTE BW, B13: 5 (2), 10 (1)
Optional Fan Tray	N/A

Description of the test object

Equipment:	Radio equipment Radio 8843 B2 B66A Product number KRC 161 707/2 and KRC 161 707/1 FCC ID: TA8AKRC161707-2
Hardware revision state:	R1B (KRC 161 707/2) R2A (KRC 161 707/1)
Tested configuration:	Single RAT LTE
Frequency bands: 3GPP	B2: TX: 1930 – 1990 MHz RX: 1850 – 1910 MHz B66: TX: 2110 – 2180 MHz RX: 1710 – 1780 MHz
IBW:	B2: 60 MHz B66A: 70 MHz
Output power:	Maximum output power: B2: 40 W/ port (port A,B,C,D) 60 W/ port (port A,D) port B and C not used in this configuration B66A: 60 W/ port (port E,F,G,H) 80 W/ port (port E,H) port F and G not used in this configuration.
Antenna ports B2:	A-D: 4 TX / 4 RX ports
Antenna ports B66A:	E-H: 4 TX / 4 RX ports
Antenna:	No dedicated antenna, handled during licensing
RF configurations:	Single and multi-carrier, 1-3 carriers/ port TX Diversity, 2x2 MIMO, 4x4 MIMO, Non-Contiguous Spectrum (NCS), Contiguous Spectrum (CS), Carrier Aggregation (CA) intra-band and inter-band supported

RISE Research Institutes of Sweden AB

REPORT

Date: 2017-10-23 Reference: 7P06127-LG Page: 4 (27)

Description of the test object

Equipment:	Radio equipment Radio 4415 B2 B25 Product number KRC 161 636/1 FCC ID: TA8AKRC161636 IC: 287AB-AS161636
HVIN:	AS161636
Hardware revision state:	R1B
Tested configuration:	Multi RAT LTE+GSM
Frequency range:	TX: 1930 – 1990 MHz RX: 1850 – 1910 MHz
IBW:	40 MHz
Output power:	Max 40 W/ antenna port
Antenna ports:	4 TX / 4 RX ports
Antenna:	No dedicated antenna, handled during licensing
RF configurations:	LTE: 1-5 carriers/ port GSM: 1-4 carriers/ port (max 10 carriers/ unit) Max 6 carriers/ port LTE: TX Diversity, 2x2 MIMO, 4x4 MIMO, and NB IoT in-band operation. Carrier Aggregation (CA) inter-band[1] and intra-band. GSM: Single antenna, dual TX. Contiguous Spectrum (CS), Non-Contiguous Spectrum (NCS)
Channel bandwidths:	LTE: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz GSM: 200 kHz
Modulations:	LTE: QPSK, 16QAM, 64QAM and 256QAM GSM: GMSK, AQPSK and 8PSK
RF power Tolerance:	+0.6/ -2.5 dB
CPRI Speed	Up to 10.1 Gbit/s
Nominal supply voltage:	-48VDC

[1]Carrier Aggregation (CA) inter-band requires an additional unit operating on the other band.

REPORT

Date	Reference	Page
2014-01-20	3P08658-F27	1 (8)

Appendix 1

Description of the test object

Equipment:	Product name: RRUS E2 B29 Product number: KRC 161 408/1, R1A FCC ID TA8AKRC161408-1 IC 287AB-AS1614081 IC MODEL NO: AS1614081
Tested configuration:	LTE single RAT
Frequency bands:	TX: 717 – 728 MHz RX: N/A
Antenna ports:	2 TX ports
RF configuration:	Single carrier, multi carrier and MIMO mode 2x2
Nominal output power per antenna port:	Single carrier: 1x 46.0 dBm (1 x 40W) Multi carrier: 2x 43.0 dBm (2 x 20W)
Antenna:	No dedicated antenna, handled during licensing
Channel bandwidths:	3 MHz, 5 MHz and 10 MHz
Modulations:	QPSK, 16QAM and 64QAM
Nominal supply voltage:	-48VDC

APPENDIX B

ANTENNA ENERGY PATTERNS

ANTENNA #1 & 3: (AT&T MOBILITY *PROPOSED*) KMW EPBQ-654L8H8-L2

KMW COMMUNICATIONS

AIR INTERFACE SOLUTIONS

DualPhase™ 2-way, 3-Sector Antenna With Electrical Down Tilt & Beam Steering

EP-BQ-65-4L-H8

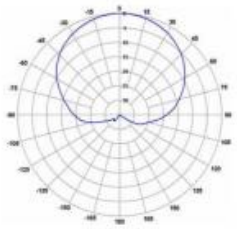
3-Sector 1710 ~ 2170MHz, X-pol., H65° / V7.5°

Electrical Specification

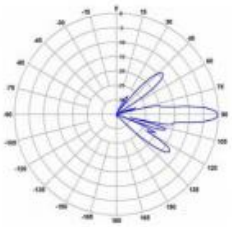
Frequency Range		1710–1880MHz	1850–1990MHz	1920–2170MHz
Gain		17.0 dBi	17.2 dBi	17.5 dBi
Beam Width	Horizontal	67°	65°	63°
	Vertical	7.8°	7.5°	7.2°
Impendance		50Ω		
VSWR		≤1.4:1		
Polarization		Dual, Slant ±45°		
Upper 1st Sidelobe Suppression		≥18 dB (@ downtilt 0°)		
Front-to-Back Ratio		≥30 dB		
Adjustable Downtilt Range		0° – 15°		
Horizontal Beam Steering		-30° – 30°		
Port-to-port Isolation		≥30 dB		
Passive Intermodulation, IM3		≤ -150dBc		
Input Maximum CW Power		250 W		
Control Interface		Feeder Line through Bias-T		

Mechanical Specification

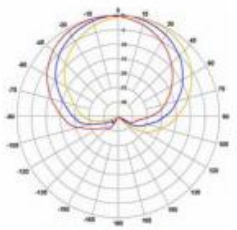
Dimension (Diameter×H)	256×1219mm (10.08×48inch)
Weight (Without Clamp)	22 kg (45.50 lb)
Connector	6 × 7/16° Din(F) / Bottom
Radome Material	FRP
Max Wind Speed	60m/s (135mph)
Wind Load (@ 100mph)	71.80 lbf (319.25 N)



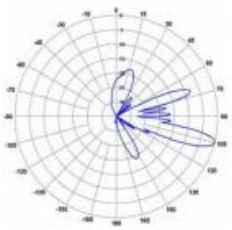
Horizontal Pattern



Vertical Pattern (Downtilt 0°)



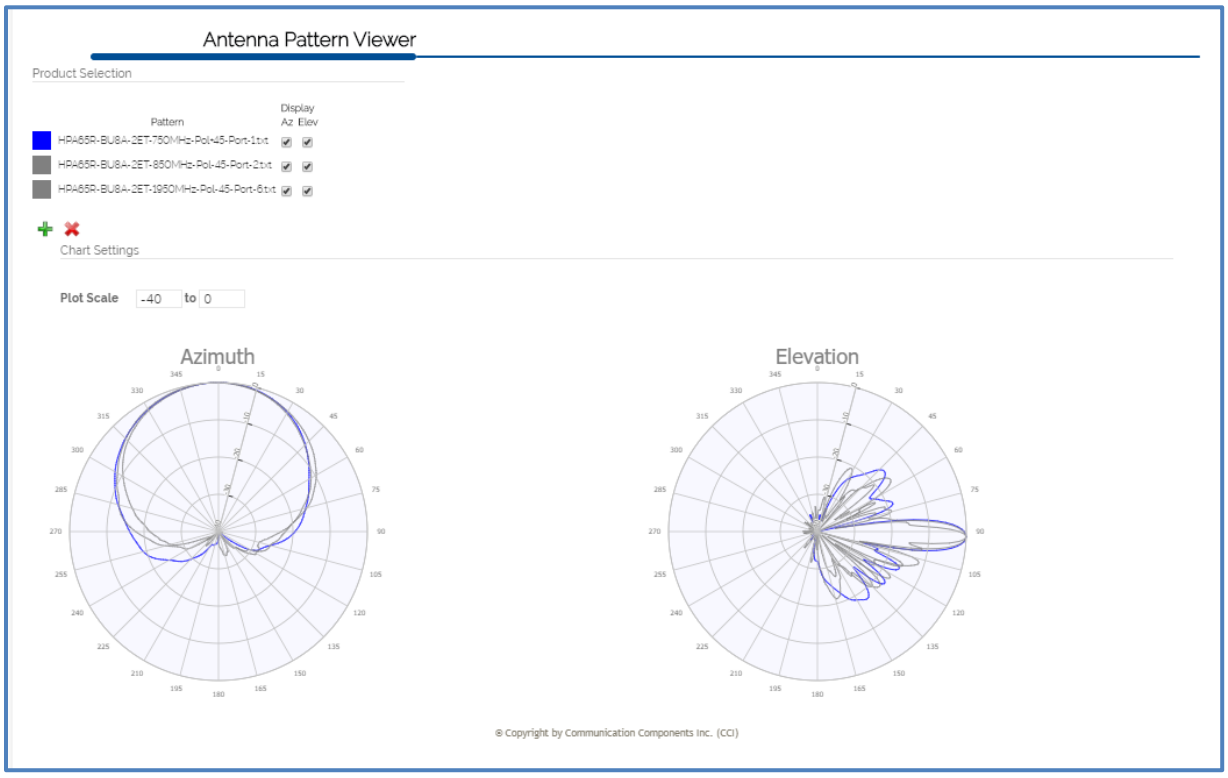
Horizontal Beam Steering

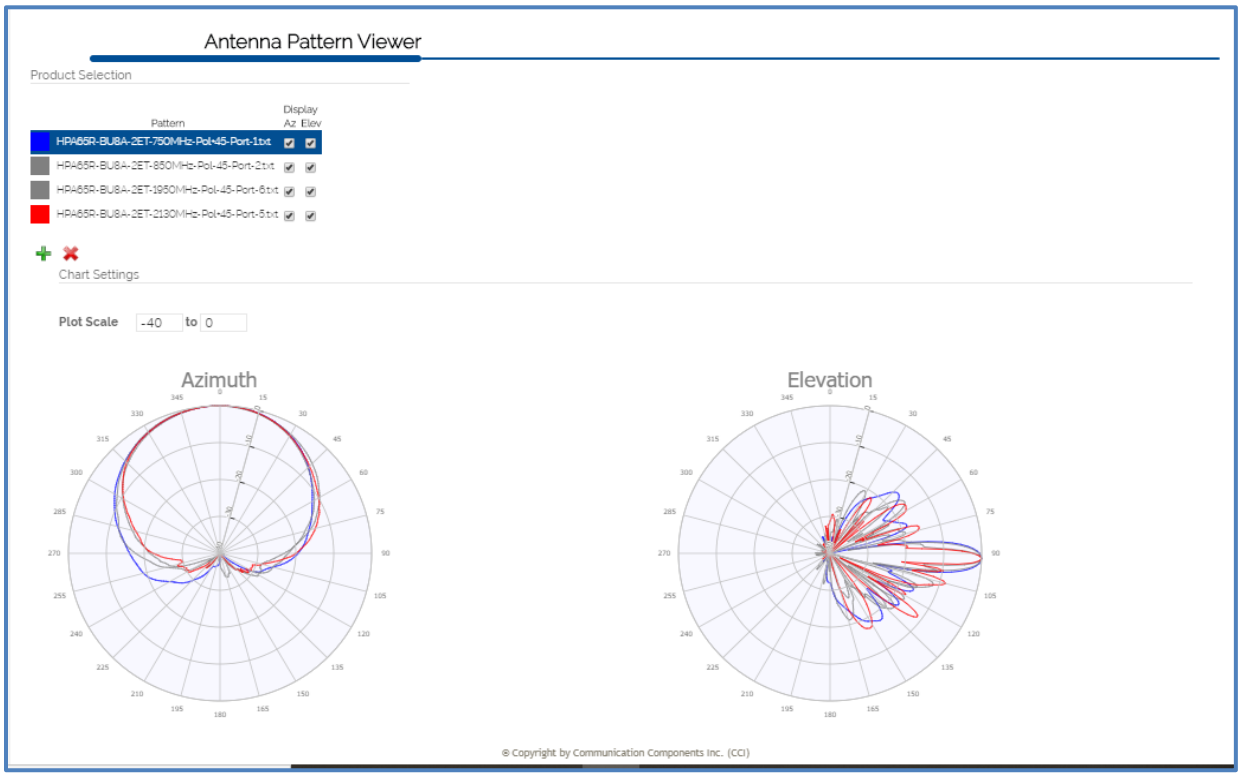


Vertical Pattern (Downtilt 15°)

ANTENNA ENERGY PATTERNS

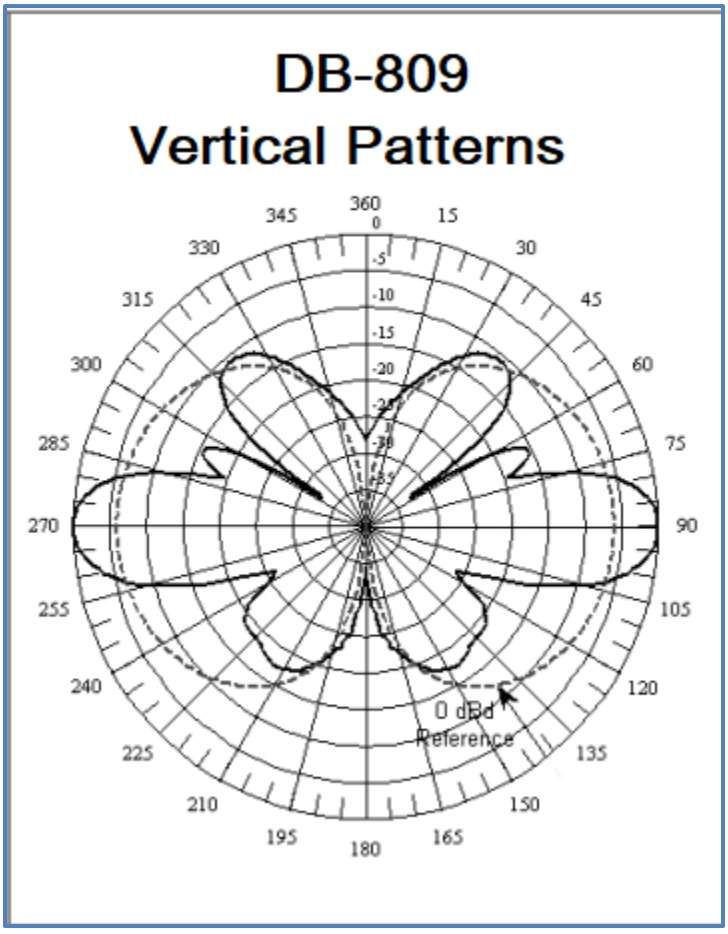
ANTENNA #2: (AT&T MOBILITY FUTURE PLANNED) CCI HPA65R-BU8A





ANTENNA ENERGY PATTERNS

OMNI-DIRECTIONAL ANTENNAS (TYPICAL FOR INDUSTRIAL 2-WAY RADIO)



APPENDIX C

FCC LICENSE INFORMATION

WATER TANK; 5 ROOTS ROCK ROAD, YORK, ME

RadioReference.com
Your Complete Reference Source

Home | Databases | Live Audio | Forums | Wiki | Classifieds | Submit Info | About

FCC Callsign KCF928 (YORK WATER DISTRICT)

Licensee Name:	YORK WATER DISTRICT
License:	KCF928
FRN:	0003669405
Status:	Active (Effective: 01/09/2020 - Expires: 09/19/2024)
County:	YORK
State:	ME
Radio Service:	IG: Industrial/Business Pool, Conventional
Notes:	GOVERNMENT ENTITY. RADIOS WILL BE USED TO COORDINATE MAINTENANCE, SAFETY, SECURITY, AND ADMINISTRATIVE OPERATIONS AND ACTIVITIES.

#	Tower ID	Type	Ant Height	Struc Height	Elevation	Address
1		BPIPE	12.8	19.0	26.0	86 WOODBRIDGE RD
2			0.0	0.0	0.0	
3	N/A	LTOWER	36.6	42.7	208.5	MOUNT AGAMENTICUS ROAD
4			0.0	0.0	0.0	
5		TANK	24.4	25.0	38.0	OFF AVON AVE

Loc #	Frequency	Emission	Class	Units	Pag	Pwr	Lat	Long	City	County	State
1	153.60500000	11K2F3E	FB	1	0	100.000	43.14175	-70.64533	YORK	YORK	ME
1	153.60500000	7K60FXE	FB	1	0	100.000	43.14175	-70.64533	YORK	YORK	ME
2	153.60500000	7K60FXE	MO	2	0	5.000					
2	153.60500000	7K60FXE	MO	8	0	100.000					
2	153.60500000	11K2F3E	MO	2	0	5.000					
2	153.60500000	11K2F3E	MO	8	0	100.000					
3	153.60500000	7K60FXE	FB2	1	0	50.000	43.22261	-70.69231	YORK	YORK	ME
3	153.60500000	11K2F3E	FB2	1	0	50.000	43.22261	-70.69231	YORK	YORK	ME
4	158.22750000	11K2F3E	MO	50	0	45.000					
4	158.22750000	7K60FXE	MO	50	0	45.000					
4	159.50250000	11K2F3E	MO	50	0	45.000					
4	159.50250000	7K60FXE	MO	50	0	45.000					
5	153.42500000	7K60FXE	FB2	1	0	50.000	43.14769	-70.64675	YORK	YORK	ME
5	153.42500000	11K2F3E	FB2	1	0	50.000	43.14769	-70.64675	YORK	YORK	ME
5	153.60500000	11K2F3E	FB2	1	0	50.000	43.14769	-70.64675	YORK	YORK	ME
5	153.60500000	7K60FXE	FB2	1	0	50.000	43.14769	-70.64675	YORK	YORK	ME

RadioReference.com
Your Complete Reference Source

Home | Databases | Live Audio | Forums | Wiki | Classifieds | Submit Info | About

FCC Callsign WPFX417 (YORK, TOWN OF)

Licensee Name:	YORK, TOWN OF
License:	WPFX417
FRN:	0003669173
Status:	Active (Effective: 07/29/2014 - Expires: 10/25/2024)
County:	YORK
State:	ME
Radio Service:	IG: Industrial/Business Pool, Conventional
Notes:	WASTEWATER COLLECTION FOR THE TOWN OF YORK

#	Tower ID	Type	Ant Height	Struc Height	Elevation	Address
1	N/A	B	7.0	7.0	6.0	225 FT N MORNINGSIDE DR ON US RT 1
2		TOWER	30.0	33.0	5.0	WASTEWATER TREATMENT PLANT, 21 BAYHAVEN ROAD
3		TANK	21.0	24.0	37.0	YORK HEIGHTS ELEVATED TANK
4			0.0	0.0	0.0	

Loc #	Frequency	Emission	Class	Units	Pag	Pwr	Lat	Long	City	County	State
1	173.21000000	3K00F1D	FXO	1	0	4.000	43.16731	-70.61561	YORK	YORK	ME
2	173.21000000	3K00F1D	FXO	1	0	4.000	43.18139	-70.60722	YORK	YORK	ME
3	173.21000000	3K00F1D	FXO	1	0	4.000	43.14778	-70.64667	YORK	YORK	ME
4	173.21000000	3K00F1D	FXOT	15	0	4.000					

FCC ULS Listing for this callsign

FCC Data Last Updated On: 03-05-2020 05:59

RadioReference.com
Your Complete Reference Source

Home | Databases | Live Audio | Forums | Wiki | Classifieds | Submit Info | About

FCC Callsign WNNY799 (YORK, TOWN OF)

Licensee Name:	YORK, TOWN OF
License:	WNNY799
FRN:	0003669405
Status:	Active (Effective: 02/25/2014 - Expires: 03/28/2024)
County:	YORK
State:	ME
Radio Service:	PW: Public Safety Pool, Conventional
Notes:	

#	Tower ID	Type	Ant Height	Struc Height	Elevation	Address
1			0.0	0.0	41.0	MASTER TERMINAL CHASES POND
2			0.0	0.0	23.0	SIMPSON HILLS ELEVATED TANK
3			0.0	0.0	37.0	YORK HEIGHTS ELEVATED TANK
4			0.0	0.0	11.0	POLICE FIRE STA MAIN ST
5			0.0	0.0	18.0	YORK DISTRICT OFC 86 WOODBRIDGE RD

Loc #	Frequency	Emission	Class	Units	Pag	Pwr	Lat	Long	City	County	State
1	173.31250000	5K60F2D	FXO	1	0	3.000	43.18981	-70.60283	YORK	YORK	ME
2	173.31250000	5K60F2D	FXO	1	0	3.000	43.18592	-70.61506	YORK	YORK	ME
3	173.31250000	5K60F2D	FXO	1	0	20.000	43.14731	-70.64728	YORK	YORK	ME
4	173.31250000	5K60F2D	FXO	1	0	3.000	43.17453	-70.61422	YORK BEACH	YORK	ME
5	173.31250000	5K60F2D	FXO	1	0	3.000	43.14231	-70.64228	YORK	YORK	ME

ENDNOTES

[i]. Federal Register, Federal Communications Commission Rules; *Radiofrequency radiation; environmental effects evaluation guidelines* Volume 1, No. 153, 41006-41199, August 7, 1996. (47 CFR Part 1; Federal Communications Commission).

[ii]. Telecommunications Act of 1996, 47 USC; Second Session of the 104th Congress of the United States of America, January 3, 1996.

[iii]. ANSI/IEEE C95.1-1999: American National Standard, *Safety levels with respect to human exposure to radio frequency electromagnetic fields, from 3 kHz to 300 GHz* **(Updated in 2020)**.

[iv]. National Council on Radiation Protection and Measurements (NCRP); *Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields*, NCRP Report 86, 1986.

[v]. OET Bulletin 65: Federal Communications Commission Office of Engineering and Technology, *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*; Edition 97-01, August 1999.