

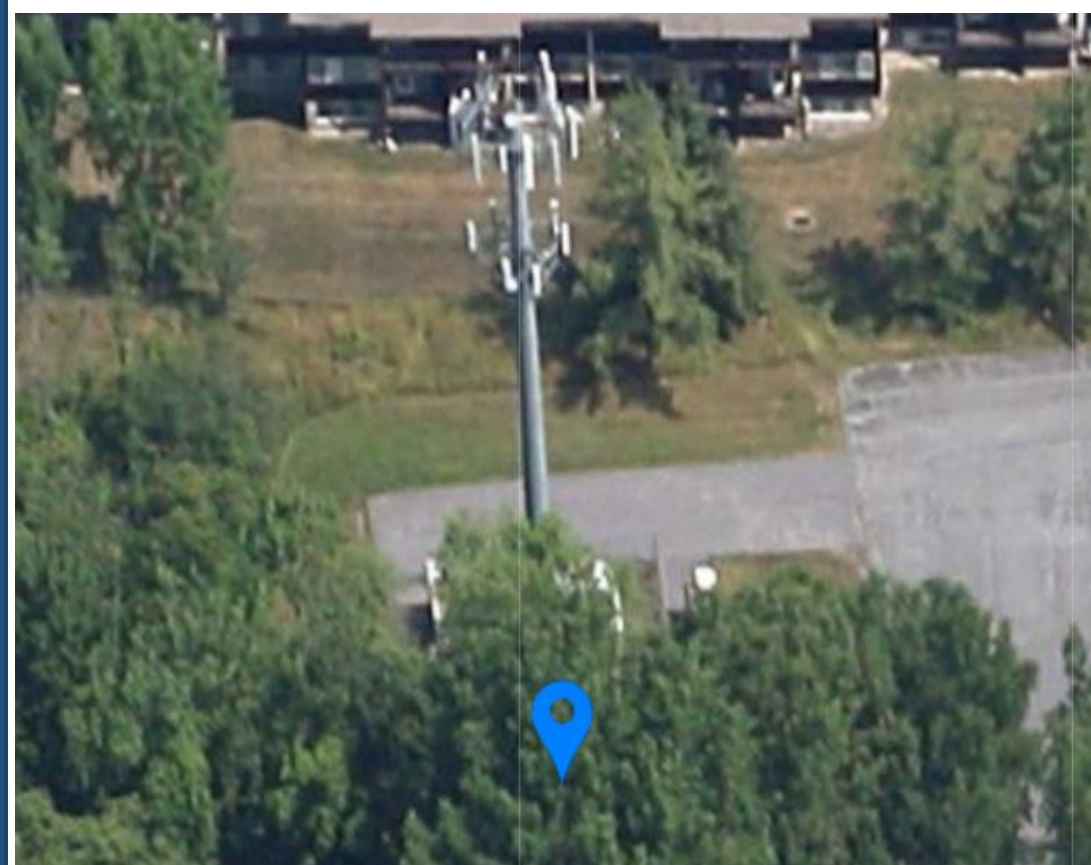


Radio Frequency Emissions Analysis Report

Dish Wireless Monopole Facility

June 7, 2019

Analysis Format: Theoretical Calculations



<p>Site Compliance Status:</p> <p><u>Compliant</u></p> <p><u>(upon signage installation)</u></p>	
<p>Sign Count:</p>	
	2
	0
	0

Prepared For:
 Dish Wireless
 9601 S. Meridian Blvd.
 Englewood, CO 80112

950033-015
 NY0060006B
 186 Pleasant Grove Street, Ithaca,
 NY 14850

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OVERVIEW

Centerline Communications, LLC (“Centerline”) has been contracted to provide a Radio Frequency (RF) Analysis for the following Dish Wireless monopole facility to determine whether the facility is in compliance with federal standards and regulations regarding RF emissions. This analysis includes theoretical emissions calculations for all proposed equipment for Dish Wireless and any other wireless carriers on site.

Analysis Site Data	
Site ID:	NY0060006B
Site Name:	NY0060006B
Site Address:	186 Pleasant Grove Street, Ithaca NY 14850
Site Latitude:	42.466480 N
Site Longitude:	-76.479580 W
Facility Type:	Monopole
Compliance Summary	
Status:	Compliant
Maximum Modeled MPE% at Ground Level All Carriers (General Public Limit):	1.70 %
Maximum Modeled MPE% at Closest Structure All Carriers (General Public Limit):	0.07 %
Is Access Locked or Controlled? :	Controlled
Lock or Control Measures if Present:	Unknown

In addition to the Dish Wireless antennas, there are two unknown carriers that were included in the modeling analysis

FCC GUIDELINES

All power density values used in this report were analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01 and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$). The number of $\mu\text{W}/\text{cm}^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General Population/Uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$). The general population exposure limit for the 700 and 800 MHz Bands is approximately 467 $\mu\text{W}/\text{cm}^2$ and 567 $\mu\text{W}/\text{cm}^2$ respectively, and the general population exposure limit for the 1900 MHz PCS and 2100 MHz AWS bands is 1000 $\mu\text{W}/\text{cm}^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/Controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure, have been properly trained in RF safety and can exercise control over their exposure. Occupational/Controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure, have been trained in RF safety and can exercise control over his or her exposure by leaving the area or by some other appropriate means. The Occupational/Controlled exposure limits all utilized frequency bands is five (5) times the FCC's General Public / Uncontrolled exposure limit.

Additional details can be found in FCC OET 65.

CALCULATION METHODOLOGY & DATA

Centerline has performed theoretical calculations on all transmission equipment located on this facility. All calculations have been performed using the RoofView® software from Richard Tell Associates. This software performs calculations using a cylindrical model for very conservative power density predictions within the near-field of the antenna where the antenna pattern has not truly formed yet. Within this area power density values tend to decrease based upon an inverse distance function. At the point where it is appropriate for modeling to change from near-field calculations to far-field calculations the power decreases inversely with the square of the distance. This modeling technique is very accurate with very low antenna centerlines, such as rooftops, where persons can get very close to the antennas and pass through fields in close proximity.

The below calculation in Figure 1 shows the theoretical distribution of power over an imaginary cylinder with equal power distribution in all directions.

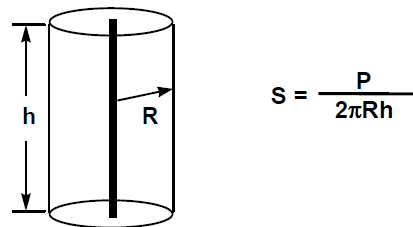


Figure 1: Distribution of power over an imaginary cylinder in all directions

This model can be modified for directional antennas to show directionality of power distribution. This formula will tend to be conservative as it assumes that all power is focused between the 3 dB power roll off points as shown in Figure 2.

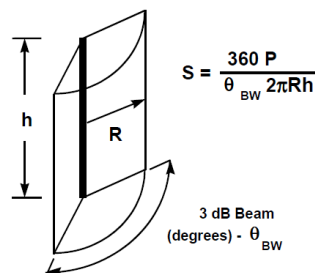


Figure 2: Distribution of power over an imaginary cylinder in all directions inside the half power roll off points (HBW)

For the required calculations, the following channel assignments and power values shown in **Table 1** were used for the Dish Wireless radio configurations per sector.

Dish Wireless Channel & Power Data Table

Sector	Frequency Band	Technology	TX Power Per Channel	Number of Channels
A	2010 MHz (AWS)	LTE	28.5	2
A	700 MHz	LTE	20.2	1
B	2010 MHz (AWS)	LTE	28.5	2
B	700 MHz	LTE	20.2	1
C	2010 MHz (AWS)	LTE	28.5	2
C	700 MHz	LTE	20.2	1

Table 1: Dish Wireless channel & power data table

The antenna configuration for Dish Wireless at this facility is shown below in **Table 2 – Dish Wireless Antenna Data Table**.

All calculations for this facility were performed assuming that all radios were running at full power and were uncombined in their RF paths with the configuration shown in table 1. FCC OET Bulletin 65 – Edition 97-01 recommends that modeling of this nature should be done as described prior to yield a worst-case scenario. Due to the dynamic nature of many deployed systems the “real world” values will most likely be less than those shown in this report due to worst-case values being shown in all instances.

For all “Other” systems on this facility, exact equipment was used if available. In instances where “Other” system equipment was not available, standard radio configurations for these systems were utilized based upon prior experience with these systems on facilities in this area.

Dish Wireless Antenna Data Table

Sector	Operator	Frequency Band	TX Power Per Channel	# of Channels	ERP	Antenna Make	Antenna Model	Azimuth (°)	Antenna Centerline Height (ft)
A	Dish	L2010 L700	28.51 20.18	2 1	2616	Comba	ODI-065R16M18JJ-GQ V2	0	88
B	Dish	L2010 L700	28.51 20.18	2 1	2616	Comba	ODI-065R16M18JJ-GQ V2	120	88
C	Dish	L2010 L700	28.51 20.18	2 1	2616	Comba	ODI-065R16M18JJ-GQ V2	240	88
A	Verizon	850	30	4	953	Antel	LPD-4019	0	120

A	Verizon	1900	30	4	2394	Antel	LPA-80063/8CF	0	120
A	Verizon	2100	40	2	1596	CSS	APX18-60-0	0	120
A	Verizon	700	60	1	477	JMA	X7C-865	0	120
B	Verizon	850	30	4	953	Antel	LPD-4019	120	120
B	Verizon	1900	30	4	2394	Antel	LPA-80063/8CF	120	120
B	Verizon	2100	40	2	1596	CSS	APX18-60-0	120	120
B	Verizon	700	60	1	477	JMA	X7C-865	120	120
C	Verizon	850	30	4	953	Antel	LPA-80063/8CF	240	120
C	Verizon	850	30	4	953	Antel	LPA-80063/8CF	240	120
C	Verizon	2100	40	2	1596	CSS	APX18-60-0	240	120
C	Verizon	700	60	1	477	JMA	X7C-865	240	120
A	AT&T	850	30	4	953	Commscope	SBNHH-1D65C	0	100
A	AT&T	1900	30	4	2394	Commscope	SBNHH-1D65C	0	100
A	AT&T	2100	40	2	1596	Andrew	SBNH-1D65C	0	100
B	AT&T	850	30	4	953	Commscope	SBNHH-1D65C	120	100
B	AT&T	1900	30	4	2394	Andrew	SBJAH4-1D65C	120	100
B	AT&T	700	60	1	477	Commscope	SBNHH-1D65C	120	100
C	AT&T	850	30	4	953	Andrew	SBJAH4-1D65C	240	100
C	AT&T	1900	30	4	2394	Commscope	SBNHH-1D65C	240	100
C	AT&T	700	60	1	477	Andrew	SBJAH4-1D65C	240	100

Table 2: Dish Wireless Antenna data table ***(Z Value is distance from bottom of antenna to walking surface)*

RESULTS

All calculations performed based upon the data listed for this facility have produced results that are within allowable limits for General Population and Occupational limits for exposure to RF emissions as specified by federal standards. Dish Wireless can ensure compliance on this facility by following the signage recommendations presented in this report.

The anticipated maximum power density value (% MPE) calculated in front of any of the Dish Wireless sectors is **1.70 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**0.34 %** of the FCC's allowable Occupational limit). This was determined based upon worst-case theoretical modeling as described in this report for all walking surfaces in close proximity to the antenna arrays. The following is a summary for each Dish Wireless Sector.

Sector A: There are no areas that exceed the **FCC's General Population or Occupational limit** for exposure to radio frequency emissions. The maximum power density value (% MPE) calculated for Dish Wireless Sector A antenna is **1.70 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**0.34 %** of the FCC's allowable Occupational limit). The Sector A antenna is transmitting over the ground level.

Sector B: There are no areas that exceed the **FCC's General Population or Occupational limit** for exposure to radio frequency emissions. The maximum power density value (% MPE) calculated for Dish Wireless Sector B antenna is **1.70 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**0.34 %** of the FCC's allowable Occupational limit). The Sector B antenna is transmitting over the ground level.

Sector C: There are no areas that exceed the **FCC's General Population or Occupational limit** for exposure to radio frequency emissions. The maximum power density value (% MPE) calculated for Dish Wireless Sector C antenna is **1.70 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**0.34%** of the FCC's allowable Occupational limit). The Sector C antenna is transmitting over the ground level.

At the antenna level, the maximum power density value (% MPE) calculated for Dish's antennas is **1,445.8 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**289.16 %** of the FCC's allowable Occupational limit). This area extends 12 feet in front of the antennas into free space.

The closest structure is located is a two-story building approximately 113 feet away from the proposed installation. At this location, the anticipated maximum composite power density value (% MPE) for all transmission sources on this facility is **0.007 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**0.0014 %** of the FCC's allowable Occupational limit).

The anticipated maximum composite power density value (% MPE) for all transmission sources on this facility is **3.70%** of the FCC's allowable limit for General Population exposure to radio frequency

emissions (**0.74 %** of the FCC’s allowable Occupational limit). This composite value determines the overall compliance status for facility and will identify any potential hot spots that may exceed either limit as specified in this report and will help identify any systems that may require mitigation solutions. The below table is a summary of emissions calculations for all other system operators.

Other Carrier Emissions				
Carrier	Distance GP (feet) at Ground	Distance Occupational (feet) at Ground	% GP	% Occupational
AT&T	0	0	1.0	0.2
Verizon	0	0	1.0	0.2

The FCC mandates that if a site is found to be out of compliance with regard to emissions that any system operator contributing 5% or more to areas exceeding the FCC’s allowable limits, as outlined in this report, will be responsible for bringing the site into compliance.

Emissions threshold plots which graphically show power density values is shown following in **Exhibit 1**

Recommended signage for this facility is shown in **Exhibit 2 – Signage Recommendation Plan**.

EXHIBIT 1 - EMISSIONS THRESHOLDS FOR WALKING SURFACES

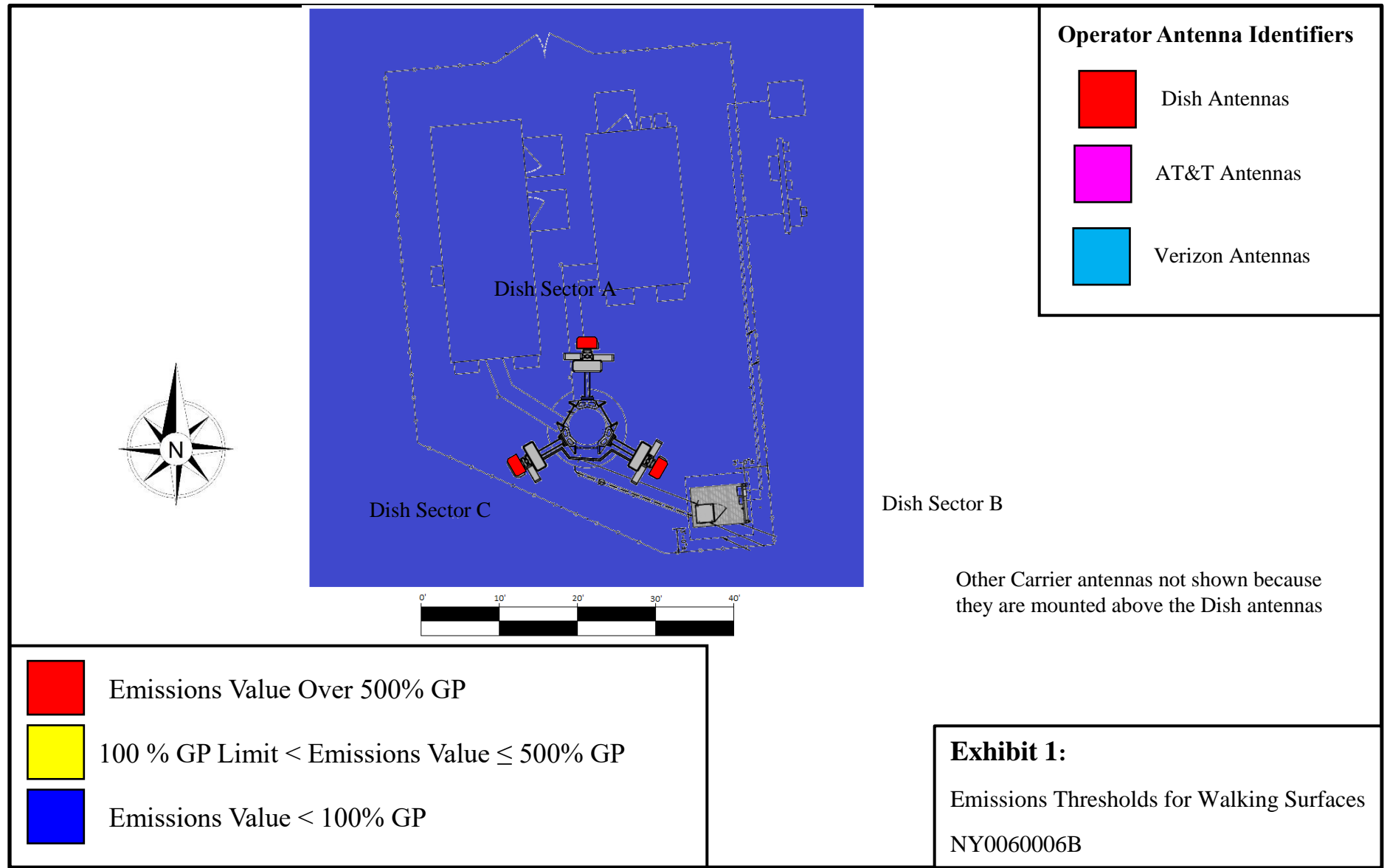
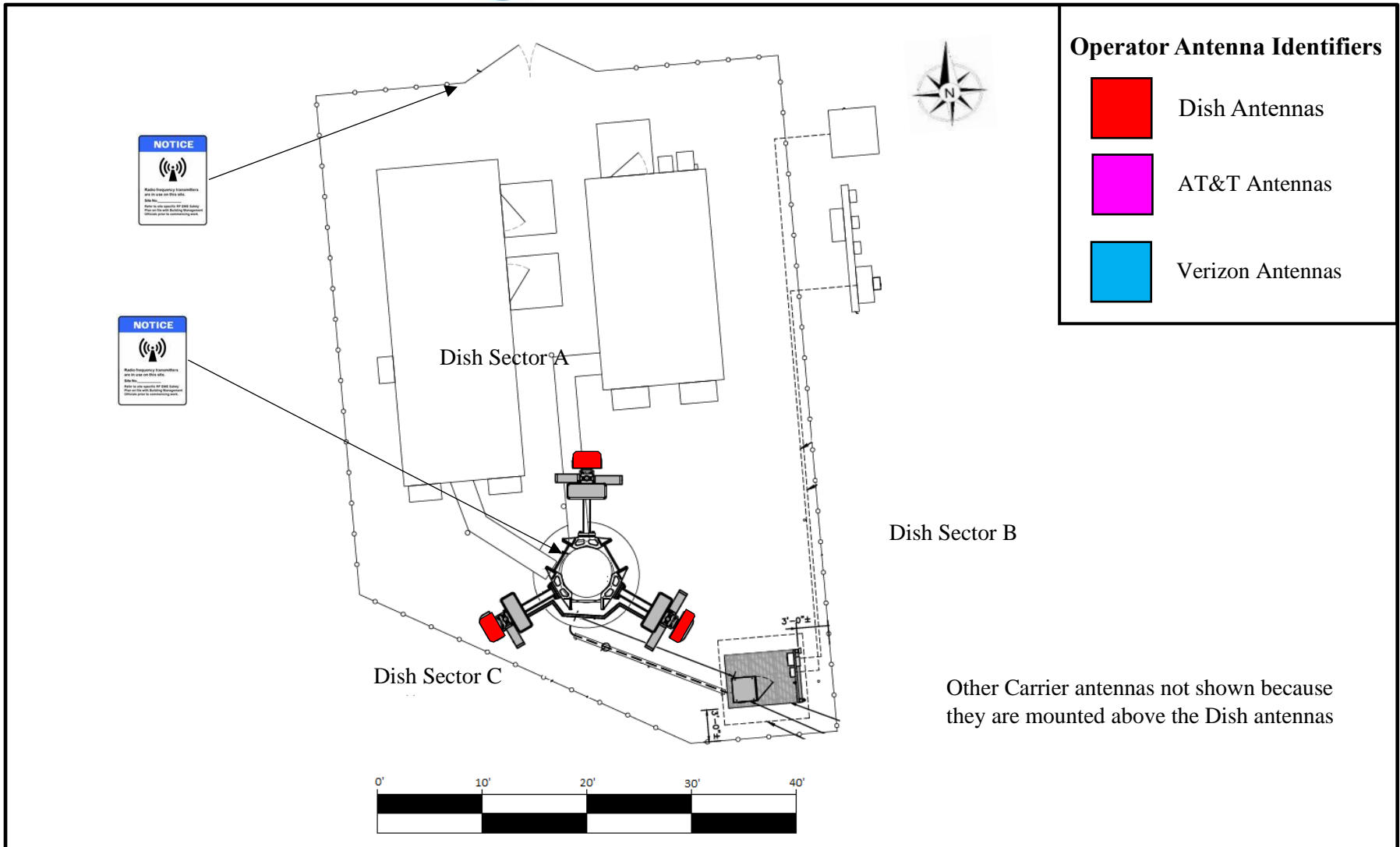


EXHIBIT 2 – SIGNAGE RECOMMENDATION PLAN






Signage Count

	2		0		0
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Exhibit 3: Signage Recommendation Plan

NY0060006B

APPENDIX A- RF SIGNAGE DESCRIPTION TABLE

Sign	Description	Posting Guidelines
	<p align="center">Blue Notice Sign</p> <p>Used to inform individuals that they are entering an area that may exceed either the FCC’s General Population or Occupational emissions limits. Must be placed anywhere the public can get within 30 feet vertically or horizontally of an antenna.</p>	<p align="center">Post at base of monopole and access gate</p>
	<p align="center">Yellow Caution Sign</p> <p>Used to inform individuals that they are entering an area that may exceed either the FCC’s General Population limit. Must be placed at or near the location of the hot spot.</p>	<p align="center">Not required because there are no areas the exceed the FCC’s General Population Limit</p>
	<p align="center">Red Warning Sign</p> <p>Used to inform individuals that they are entering an area that may exceed both the FCC’s General Population and Occupational emissions limits. Must be placed at or near the location of the hot spot.</p>	<p align="center">Not required because there are no areas the exceed the FCC’s Occupational Limit</p>

APPENDIX B: FCC EMISSIONS THRESHOLD LIMITS

Table 1: Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure

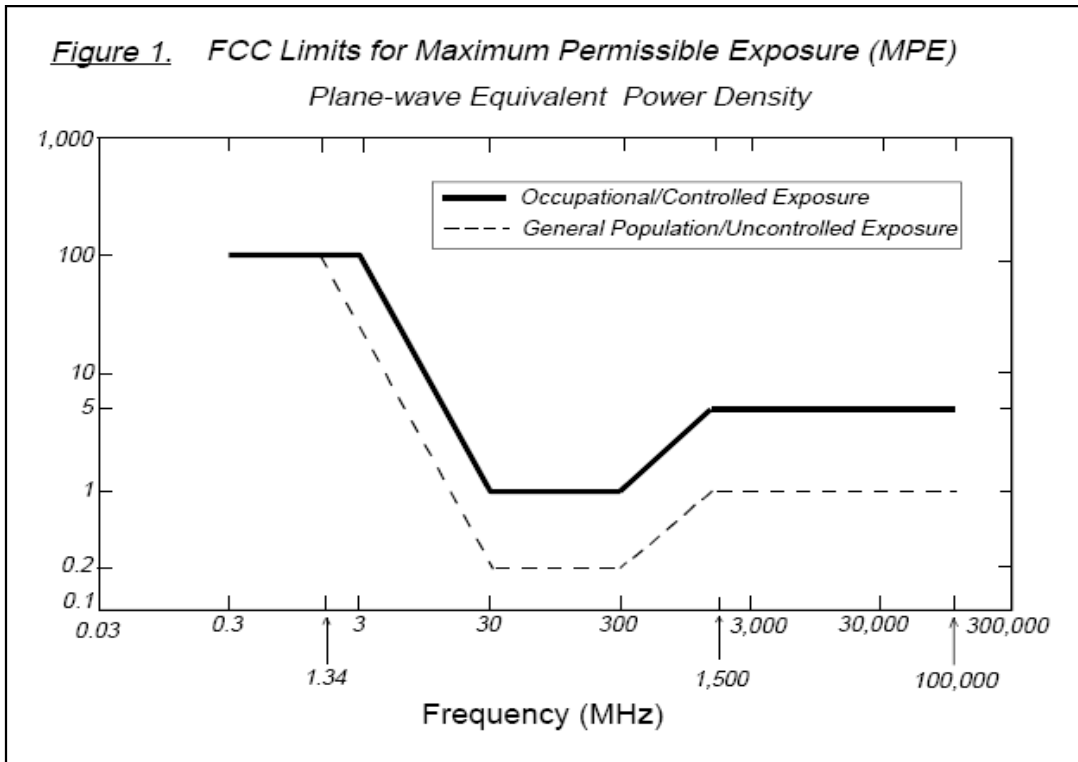
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time [E] ² , [H] ² , or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1,500	--	--	f/300	6
1,500-100,000	--	--	5	6

(B) Limits for General Public/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (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
300-1,500	--	--	f/1,500	30
1,500-100,000	--	--	1.0	30

f = Frequency in (MHz)

* Plane-wave equivalent power density



APPENDIX C: CERTIFICATIONS

I, Ryan McManus, preparer of this report certify that I am fully trained and aware of the Rules and Regulations of both the Federal Communications Commissions (FCC) and the Occupational Safety and Health Administration (OSHA) with regard to Human Exposure to Radio Frequency Radiation.

Ryan B McManus

6/7/2019

I, Michelle Stone, reviewer and approver of this report certify that I am fully trained and aware of the Rules and Regulations of both the Federal Communications Commissions (FCC) and the Occupational Safety and Health Administration (OSHA) with regard to Human Exposure to Radio Frequency Radiation

Michelle A. Stone

6/7/2019
