NEW YORK SMSA LIMITED PARTNERSHIP d/b/a VERIZON WIRELESS

BREAKERS SPRING LAKE SNN SITE

1715 OCEAN AVENUE
BELMAR, NEW JERSEY

RF EMISSION STUDY
NOVEMBER 9, 2020

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NJ Board of Professional Engineers
Certificate of Authorization No. 24GA28156300

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Rev 2 – 11/9/2020

Introduction

V-COMM, L.L.C. has been commissioned by New York SMSA Limited Partnership d/b/a Verizon Wireless, to ensure that the proposed radio facility complies with Federal Communications Commission (FCC) regulations as required by the Telecommunications Act of 1996. This report will show, through the use of FCC suggested prediction methods, that the radio facility in question will be in compliance with all appropriate Federal regulations in regards to Radio Frequency (RF) Emissions. The final results of the analysis are summarized below:

OET-65 STANDARD	Controlled Environment	Uncontrolled Environment
Calculated Percentage of Maximum Emissions	**0.7233 %**	**3.6166 %**

Case Summary

The proposed radio facility will be located on an existing 36 foot Building at 1715 Ocean Avenue, Belmar, New Jersey. Verizon Wireless will operate two (2) small network node antennas from the Building utilizing LTE and NR technology. The Verizon Wireless antennas will be mounted at centerlines of 42 ft. and 39.5 ft. Above Ground Level (AGL) on the Building. Technical data considered for Verizon Wireless is listed in tables 1a through 1e below.

Table 1a – Technical Data for Verizon Wireless 1900 MHz LTE

VERIZON WIRELESS	Sector 1	Sector 2
Antenna	Amphenol 4U4MTSP1X06F2YS0	Amphenol 4U4MTSP1X06F2YS0
Antenna Centerline (feet)	42	42
Orientation (deg. TN)	45	135
Downtilt (deg.)	2	2
ERP (Watts)	424	424
Frequency (MHz)	1970	1970
# Carriers	4	4
R/C Height Above Measurement Point (feet)	36	36

Table 1b – Technical Data for Verizon Wireless 2100 MHz LTE

VERIZON WIRELESS	Sector 1	Sector 2
Antenna	Amphenol 4U4MTSP1X06F2YS0	Amphenol 4U4MTSP1X06F2YS0
Antenna Centerline (feet)	42	42
Orientation (deg. TN)	45	135
Downtilt (deg.)	2	2
ERP (Watts)	444	444
Frequency (MHz)	2110	2110
# Carriers	4	4
R/C Height Above Measurement Point (feet)	36	36

Table 1c – Technical Data for Verizon Wireless 3.5 GHz

VERIZON WIRELESS	Sector 1
Antenna	Amphenol 4U4MX065X06FX0S0
Antenna Centerline (feet)	42
Orientation (deg. TN)	100
Downtilt (deg.)	0
ERP (Watts)	61
Frequency (GHz)	3.5
# Carriers	1
R/C Height Above Measurement Point (feet)	36

Table 1d – Technical Data for Verizon Wireless 5 GHz

VERIZON WIRELESS	Sector 1
Antenna	Amphenol 4U4MX065X06FX0S0
Antenna Centerline (feet)	42
Orientation (deg. TN)	100
Downtilt (deg.)	0
ERP (Watts)	2.4
Frequency (GHz)	5
# Carriers	4
R/C Height Above Measurement Point (feet)	36

Table 1e – Technical Data for Verizon Wireless 28 GHz

VERIZON WIRELESS	Sector 1
Antenna	Samsung VZ-AT1K01
Antenna Centerline (feet)	39.5
Orientation (deg. TN)	100
Downtilt (deg.)	0
ERP (Watts)	609.5
Frequency (GHz)	28
# Carriers	1
R/C Height Above Measurement Point (feet)	33.5

RF Exposure Prediction Methods

The FCC has established the following equation to calculate the cumulative power density in the far-field region.

$$S = \frac{(1.64)\times(0.64)\times NC \times ERP_{relative}}{\pi \times R^2}$$

$$R = \sqrt{V^2 + \Delta h^2}$$

$$\boldsymbol{ERP_{relative} = 10^{\left[\frac{10\times log(P)+MaxAntennaGain-Pattern(\alpha)}{10}\right]}}$$

Where:

S = *Power Density (milliwatts/cm^2)*

NC = *The number of channel/carriers assigned to the antenna/site*

ERP = *The maximum Effective Radiated Power of the site (milliwatts)*

ERP$_{relative}$ = *The Effective Radiated Power taking relative gain and main-beam calculations into account. (milliwatts)*

R = *The radial distance from antenna to mobile unit (cm)*

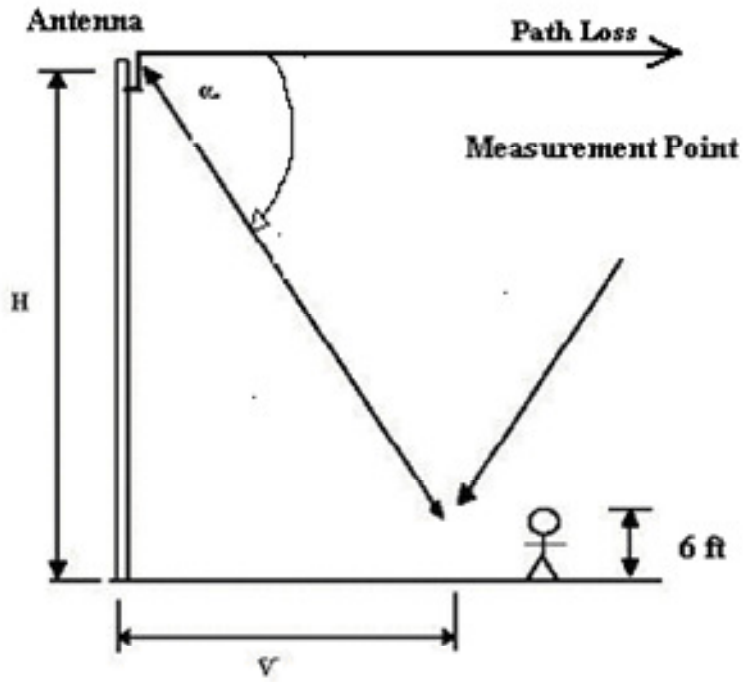
V = *The horizontal distance between site and mobile unit (cm)*

Δh = *The antenna height minus the measurement point (cm)*

α = *The elevation angle between the main beam of the antenna and any point of reference away from the antenna support structure (degrees)*

Pattern (α) = *The vertical antenna gain at the specified angle α (dBd)*

Max Antenna Gain = *The maximum antenna gain (dBd)*



Please note that calculations were performed using the techniques and procedures outlined in the FCC OET Bulletin No. 65 with particular emphasis on the pattern of antennas and the number of channels per sector.

Federal Regulations

The licensee planning to operate on the existing building falls under the jurisdiction of the FCC. Under the authority granted by the Telecommunications Act of 1996 (and stated in Title 47 CFR, Part 1, Section 1307 b), the FCC has mandated that all FCC licensees must be in compliance with RF Emissions guidelines, as defined in OET Bulletin 65, no later than September 1, 2000.

Additionally, as of 1997 the FCC had already made compliance with OET Bulletin 65, a prerequisite for new Common Carrier station authorization. Applicable standards for this analysis will be discussed below.

State & Local Regulations

The Telecommunications Act of 1996 is the applicable Federal statute in regards to the consideration of environmental effects of RF Emissions during the siting process for wireless facilities. In regards to Common Carrier radio service, the Telecommunications Act of 1996 states the following:

> "No state or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions."

Applicable Standards

"The FCC adopted limits for Maximum Permissible Exposure" (MPE) are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP) in 'Biological Effects and exposure Criteria for Radiofrequency Electromagnetic Fields,' NCRP Report No. 86, Sections 17.4.1, 17.4.1.1, 17.4.2 and 17.4.3. Copyright NCRP, 1986, Bethesda, MD 20814.

In the frequency range from 100 MHz to 1500 MHz, exposure limits for power density are also generally based on the MPE limits found in Section 4.1 of, "IEEE Standard for Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1-1992, Copyright 1992 by the IEEE, Inc., NY, NY 10017, and approved for use as an American National Standard by the American National Standards Institute (ANSI). (Paraphrased from FCC OET Bulletin 65). These limits and prediction methodology were reaffirmed in the latest revision of the IEEE standards, ANSI/IEEE Std C95.1-2005 Copyright 2006 by IEEE, Inc., NY, NY 10016-5997, as well as the FCC Report and Order FCC13-39, dated March 27, 2013.

The FCC has adopted 2 different sets of emission standards. The application of each standard is generally based upon the awareness and training of those people exposed to the RF emissions in question.

An uncontrolled environment implies that the people exposed to the RF emissions either have no knowledge that active transmitters are present, or that they have not been properly trained to work safely around active transmitters.

A controlled environment by definition is an environment where the only people exposed to RF emissions from a site (above those background levels that occur naturally) are aware that they are working near active transmitters, and have been fully trained in working safely around RF emissions. The uncontrolled emission standard is stricter than the controlled emission standard, as can be seen below in tables 2a and 2b.

Table 2a – Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Power Density (mw/cm^2)	Averaging Time (minutes)
0.3 – 3	100 *	6
3 – 30	$(900/f^2)$ *	6
30 – 300	1	6
300 – 1500	f/300	6
1500 – 100000	5	6

Where: f = Frequency in MHz
* indicates Plane-wave equivalent power density

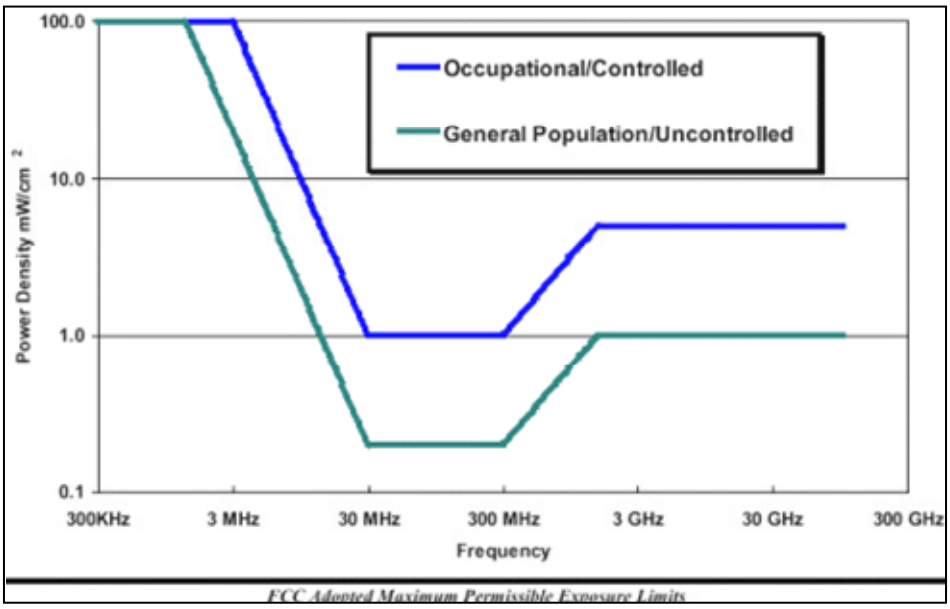
Table 2b – Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Power Density (mw/cm^2)	Averaging Time (minutes)
0.3 - 1.34	100 *	30
1.34 – 30	$(180/f^2)$ *	30
30 – 300	0.2	30
300 – 1500	f/1500	30
1500 – 100000	1	30

Where: f = Frequency in MHz
* indicates Plane-wave equivalent power density

In general, as specified in 47 C.F.R. 1.1307(b), as amended, when the FCC's guidelines are exceeded in an accessible area due to the emissions from multiple fixed transmitters, the following policy applies. Actions necessary to bring the area into compliance with the guidelines are the shared responsibility of all licensees whose transmitter's contribution to the RF environment at the non-complying area exceeds 5% of the exposure limit that applies to their particular transmitter.

The figure below provides a graphical illustration of both the FCC's occupational and general population MPE limits.



FCC Adopted Maximum Permissible Exposure Limits

CONCLUSIONS

Table 3 (below) shows the calculated maximum power density levels in the environment immediately surrounding the existing building as measured 16 feet above ground level or second level of a building. From this analysis, it can be seen that the Maximum Power Density predicted from Verizon Wireless is significantly below the FCC standard for both Controlled and Uncontrolled environments. Please note that the power densities calculated for this analysis are a worst case example, as it has been assumed that all transmitters are constantly in continuous operation and provides for expansion channels which may not be present today.

Table 3 – Individual Predicted MPE Levels & Standards

	VERIZON WIRELESS @ 42 FT (1970 MHZ)	VERIZON WIRELESS @ 42 FT (2110 MHZ)	VERIZON WIRELESS @ 42 FT (3.5 GHZ)	VERIZON WIRELESS @ 42 FT (5 GHZ)	VERIZON WIRELESS @ 39.5 FT (28 GHZ)
Max. Power Density (mw/cm^2)	**0.0206**	**0.0143**	**0.0011**	**0.0001**	**0.0001**
MPE Limit for Power Density in a Controlled Environment (mw/cm^2)	**5.0000**	**5.0000**	**5.0000**	**5.0000**	**5.0000**
% of MPE limit for Power Density in a Controlled Environment	**0.4115 %**	**0.2868 %**	**0.0217 %**	**0.0013 %**	**0.0020 %**
MPE Limit for Power Density in an Uncontrolled Environment (mw/cm^2)	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**
% of MPE limit for Power Density in an Uncontrolled Environment	**2.0575 %**	**1.4342 %**	**0.1086 %**	**0.0063 %**	**0.0100 %**

By definition, the % of MPE limit for Power Density for the entire site is the sum total of the % of MPE limit for Power Density of each individual licensee on the existing building. Table 4 (below) shows the aggregate values for the current and the proposed configuration.

Table 4 - Aggregate MPE Levels and Percentages

STANDARD	Controlled Environment	Uncontrolled Environment
VERIZON WIRELESS @ 42 FT (1970 MHZ)	**0.4115 %**	**2.0575 %**
VERIZON WIRELESS @ 42 FT (2110 MHZ)	**0.2868 %**	**1.4342 %**
VERIZON WIRELESS @ 42 FT (3.5 GHZ)	**0.0217 %**	**0.1086 %**
VERIZON WIRELESS @ 42 FT (5 GHZ)	**0.0013 %**	**0.0063 %**
VERIZON WIRELESS @ 39.5 FT (28 GHZ)	**0.0020 %**	**0.0100 %**
TOTAL	**0.7233 %**	**3.6166 %**

Verizon Wireless has an ongoing program to address the occupational aspects of the rooftop antenna installations to ensure compliance to all FCC and OSHA rules and regulations, including signage and access control as required for each installation.

Certification

V-COMM, L.L.C. hereby certifies that the site studied in this analysis complies with FCC mandated RF Emission MPE requirements. V-COMM, L.L.C. also certifies that the above results are based on calculations made using FCC recommended methods, with industry standard assumptions and formulas. All results shown in this report have been reviewed and are accurate within reasonable levels of engineering accuracy.

V-COMM, L.L.C. shall not be held responsible for any inaccuracies in the data supplied by Verizon Wireless. V-COMM, L.L.C. assumes that all transmitting equipment is operating within FCC Type Accepted specifications. A comprehensive field survey was not performed prior to the generation of this report. If questions arise regarding the calculations herein, V-COMM, L.L.C. recommends that a comprehensive field survey be performed to resolve any disputes.

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Peter Longo, P.E. — **Date**
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