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June 20, 2017

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

ORIGINAL



Re: **PE1133-VER-20150928 – Cellco Partnership d/b/a Verizon Wireless
234 Sherman Avenue, Meriden, Connecticut**

Dear Ms. Bachman:

On November 5, 2015, the Siting Council approved Cellco's Eligible Facilities Request for modifications to the existing telecommunications facility at 234 Sherman Avenue in Meriden, Connecticut.

As a condition of its approval, Cellco was required to provide the Council with post-construction cumulative radio frequency emissions measurements at ground level to demonstrate compliance with applicable FCC standards. Attached is a Radio Frequency Report verifying the facility's compliance.

Construction activity associated with the modifications approved in PE1133-VER-20150928 have now been completed.

If you have any questions please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Kenneth C. Baldwin".

Kenneth C. Baldwin

Attachment

Copy to:

Elizabeth Jamieson

16669073-v1



C Squared Systems, LLC
65 Dartmouth Drive
Auburn, NH 03032
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support@csquaredsystems.com



RADIO FREQUENCY EXPOSURE REPORT

MERIDEN 5

**234 SHERMAN AVENUE
MERIDEN, CT 06450**

June 19, 2017

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1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the recent installation of Verizon Wireless antenna arrays on the rooftop of the building located at 234 Sherman Avenue in Meriden, CT. AT&T is also collocated on the rooftop. Figure 1 below is a view of the subject site.



Figure 1: Ground View of Meriden 5

Site Address	234 Sherman Avenue, Meriden, CT
Latitude	41° 32' 52.44" N
Longitude	72° 47' 03.24" W
Site Elevation AMSL	160'
751MHz License Information	WQJQ689
1900MHz License Information	KNLH262/WQEM953
2100MHz License Information	WQGA906/WQGB280
Name of Individual Conducting Survey	Marc Salas
Date and Time of Survey	6/7/2017; 11:00AM – 11:45AM

Table 1: Site Specific Data

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 provided they are fully aware of the potential for exposure, and are able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels considered 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. Measurement Procedure

Frequencies from 300 KHz to 50 GHz were measured using the Narda Probe EA 5091, E-Field, shaped, FCC probe in conjunction with the NBM550 survey meter. The EA 5091 probe is “shaped” such that in a mixed signal environment (i.e.: more than one frequency band is used in a particular location), it accurately measures the percent of MPE.

From FCC OET Bulletin No. 65 - Edition 97-01 – “A useful characteristic of broadband probes used in multiple-frequency RF environments is a frequency-dependent response that corresponds to the variation in MPE limits with frequency. Broadband probes having such a “shaped” response permit direct assessment of compliance at sites where RF fields result from antennas transmitting over a wide range of frequencies. Such probes can express the composite RF field as a percentage of the applicable MPEs”.

Probe Description - As suggested in FCC OET Bulletin No. 65 - Edition 97-01, the response of the measurement instrument should be essentially isotropic, (i.e., independent of orientation or rotation angle of the probe). For this reason, the Narda EA 5091 probe was used for these measurements.

Sampling Description - At each measurement location, a spatially averaged measurement is collected over the height of an average human body. The NBM550 survey meter performs a time average measurement while the user slowly moves the probe over a distance range of 20 cm to 200 cm (about 6 feet) above ground level. The results recorded at each measurement location include average values over the spatial distance.

Instrumentation Information - A summary of specifications for the equipment used is provided in the table below.

Manufacturer	Narda Microwave			
Probe	EA 5091, Serial# 01162			
Calibration Date	December 2016			
Calibration Interval	24 Months			
Meter	NBM550, Serial# F-0147			
Calibration Date	December 2016			
Calibration Interval	24 Months			
Probe Specifications	Frequency Range	Field Measured	Standard	Measurement Range
	300 KHz-50 GHz	Electric Field	U.S. FCC 1997 Occupational/Controlled	0.2 – 600 % of Standard

Table 2: Instrumentation Information

Instrument Measurement Uncertainty - The total measurement uncertainty of the NARDA measurement probe and meter is no greater than ± 3 dB (0.5% to 6%), ± 1 dB (6% to 100%), ± 2 dB (100% to 600%). The factors which contribute to this include the probe’s frequency response deviation, calibration uncertainty, ellipse ratio, and isotropic response¹. Every effort is taken to reduce the overall uncertainty during measurement collection including pointing the probe directly at the likely highest source of emissions.

¹ For further details, please refer to Narda Safety Test Solutions NBM550 Probe Specifications, pg. 69

http://www.narda-sts.us/pdf_files/DataSheets/NBM-Probes_DataSheet.pdf

4. Antenna Inventory

The table below lists the current Verizon Wireless and AT&T antenna configurations for this site.

Operator	Sector/ Azimuth	TX Freq. (MHz)	BTS Output (Watts)	Coax Loss (dB)	Ant Gain (dBi)	Power EIRP (Watts)	Antenna Model	Beam Width	Mech. Tilt	Length (ft)
Verizon	Alpha/ 40	751	120	0.2	14.9	3541	SBNHH-1D65B_0_2	68	0	6.0
		1900	120	0.2	18.2	7572		66		
		875	Inactive				SBNHH-1D65B_0_2	66		
		2100	120	0.2	18.6	8302		63		
	Beta/ 140	751	120	0.2	14.9	3541	SBNHH-1D65B_4_2	68	0	6.0
		1900	120	0.2	18.2	7572		66		
		875	Inactive				SBNHH-1D65B_4_2	66		
		2100	120	0.2	18.6	8302		63		
	Gamma/ 300	751	120	0.2	14.9	3541	SBNHH-1D65B_6_2	68	0	6.0
		1900	120	0.2	18.2	7572		66		
		875	Inactive				SBNHH-1D65B_6_2	66		
		2100	120	0.2	18.6	8302		63		
AT&T	Alpha/ 20 ALL	885	80	0.0	16.0	3185	AM-X-CD-16-65_2_0	63	0	6.0
		1900	40	0.0	17.4	2198		67		
		739	80	0.0	13.8	1919	OPA-65R-LCUU-H6_2_4	66		
		1900	120	0.0	17.0	6014		60		
	Beta/ 140 ALL	885	80	0.0	16.0	3185	AM-X-CD-16-65_2_0	63	0	6.0
		1900	40	0.0	17.4	2198		67		
		739	80	0.0	13.8	1919	OPA-65R-LCUU-H6_3_4	66		
		1900	120	0.0	17.0	6014		60		
	Gamma/ 260 3G 270 4G	885	80	0.0	16.0	3185	AM-X-CD-16-65_2_0	63	0	6.0
		1900	40	0.0	17.4	2198		67		
		739	80	0.0	13.8	1919	OPA-65R-LCUU-H6_6_5	66		
		1900	120	0.0	17.0	6014		60		

Table 3: Verizon Wireless/AT&T Antenna Configurations

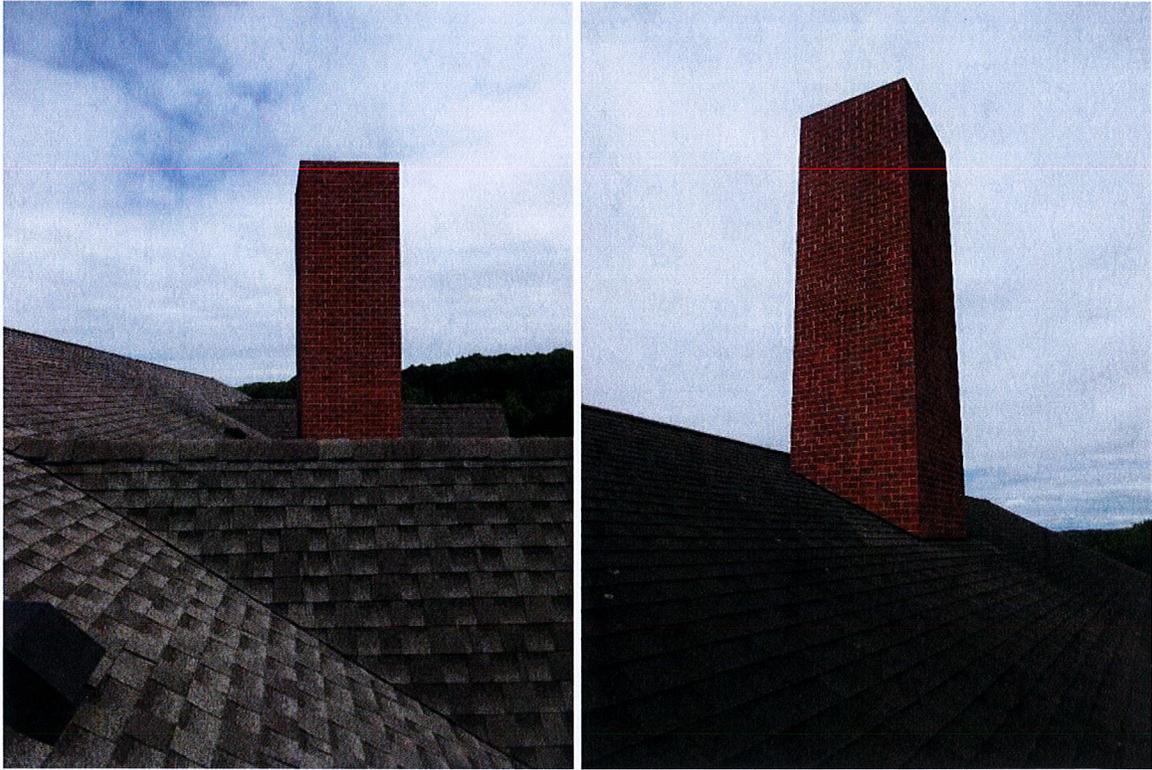


Figure 2: Verizon Alpha/Beta (Left) & Gamma (Right) Sector Enclosures



Figure 3: AT&T Alpha/Beta/Gamma Sector Enclosures

5. Survey Results

Measured results and a description of each survey location are detailed in the table below. Measurements were recorded on June 7, 2017, between 11:00AM and 11:45AM. All %MPE values are in reference to the FCC Uncontrolled/General Population exposure limit.

Table 5 below lists 14 measurements recorded in the vicinity of Meriden 5. The highest spatially averaged measurement was **2.83%** (Uncontrolled/General Population MPE) and was recorded at Location 14, on the property of HH Gas, approximately 841 feet south of the site. Please note that broadband measurement equipment was used for this survey, which records cumulative % MPE values from all transmitting bands of the Verizon and AT&T antenna installations, along with any other RF sources in the vicinity of each measurement point.

Meas. Location	Location Description	Latitude	Longitude	Dist. From Site (feet)	Measured % MPE (Uncontrolled / General Pop.)
1	234 Sherman Ave - North	41.54856	-72.78421	167	< 1.00%
2	Baseball Field Parking Lot	41.54905	-72.78525	483	< 1.00%
3	Sherman Ave. & Putnam St.	41.54790	-72.78556	446	1.07%
4	234 Sherman Ave - South	41.54768	-72.78452	225	< 1.00%
5	Smitty's Snack Bar	41.55049	-72.78089	1202	1.20%
6	Middle of Tremont St.	41.55061	-72.78657	1151	1.69%
7	Locust St. & Cambridge St.	41.55173	-72.78494	1338	1.61%
8	Breckenridge Ave. & Griswold St.	41.55024	-72.78794	1331	1.53%
9	134 Warren St.	41.54839	-72.78880	1327	2.00%
10	Hinman St. & Howe St.	41.54676	-72.78647	850	2.03%
11	224 Bunker Ave.	41.54679	-72.78453	515	2.03%
12	Bunker Hill St. & Bunker Ave.	41.54565	-72.78711	1252	2.63%
13	End of Twiss Ave.	41.54670	-72.78080	1013	2.63%
14	HH Gas	41.54587	-72.78345	841	2.83%

Table 4: Measured Results²

² Due to measurement uncertainty at low levels, any readings < 1.00% FCC Uncontrolled/General Pop. MPE are listed as such. See Table 2 for the measurement range of the probe.

The figure below shows an aerial view of the subject site location and the surrounding area. Labeled points indicate the locations of the measurements recorded on June 7, 2017, as listed above in Table 4.



Figure 4: Aerial View of Site & Measurement Locations

6. Summary of Findings

A number of publicly accessible areas at ground level in the vicinity of the 234 Sherman Avenue facility were surveyed and found to be well within the mandated General Population/Uncontrolled limits for Maximum Permissible Exposure, as delineated in the Federal Communications Commission's Radio Frequency exposure rules published in 47 CFR 1.1307(b)(1)-(b)(3).

The highest spatially averaged %MPE measurement of all surveyed points based on the 1997 FCC standard for exposure to the general population was **2.83%** MPE. This measurement was recorded at Location 14, approximately 841 feet south of the site at HH Gas, near the intersection of Broad Street & Orchard Street.

The above analysis verifies that exposure levels at ground level surrounding the existing site are well below the Maximum Permissible Exposure levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01.

7. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The field measurements were obtained with properly calibrated equipment using techniques and guidelines set forth in ANSI/IEEE Std. C95.3, ANSI/IEEE Std. C95.1, and FCC OET Bulletin 65 Edition 97-01.

Report Prepared By: Marc Salas June 19, 2017
Marc Salas
RF Engineer
C Squared Systems, LLC
Date

Reviewed/Approved By: Evan Thibodeau June 19, 2017
Evan Thibodeau
RF Engineer
C Squared Systems, LLC
Date

Attachment A: References

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

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

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

(A) Limits for Occupational/Controlled Exposure³

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 Exposure⁴

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 6: FCC Limits for Maximum Permissible Exposure

³ 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.

⁴ 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.

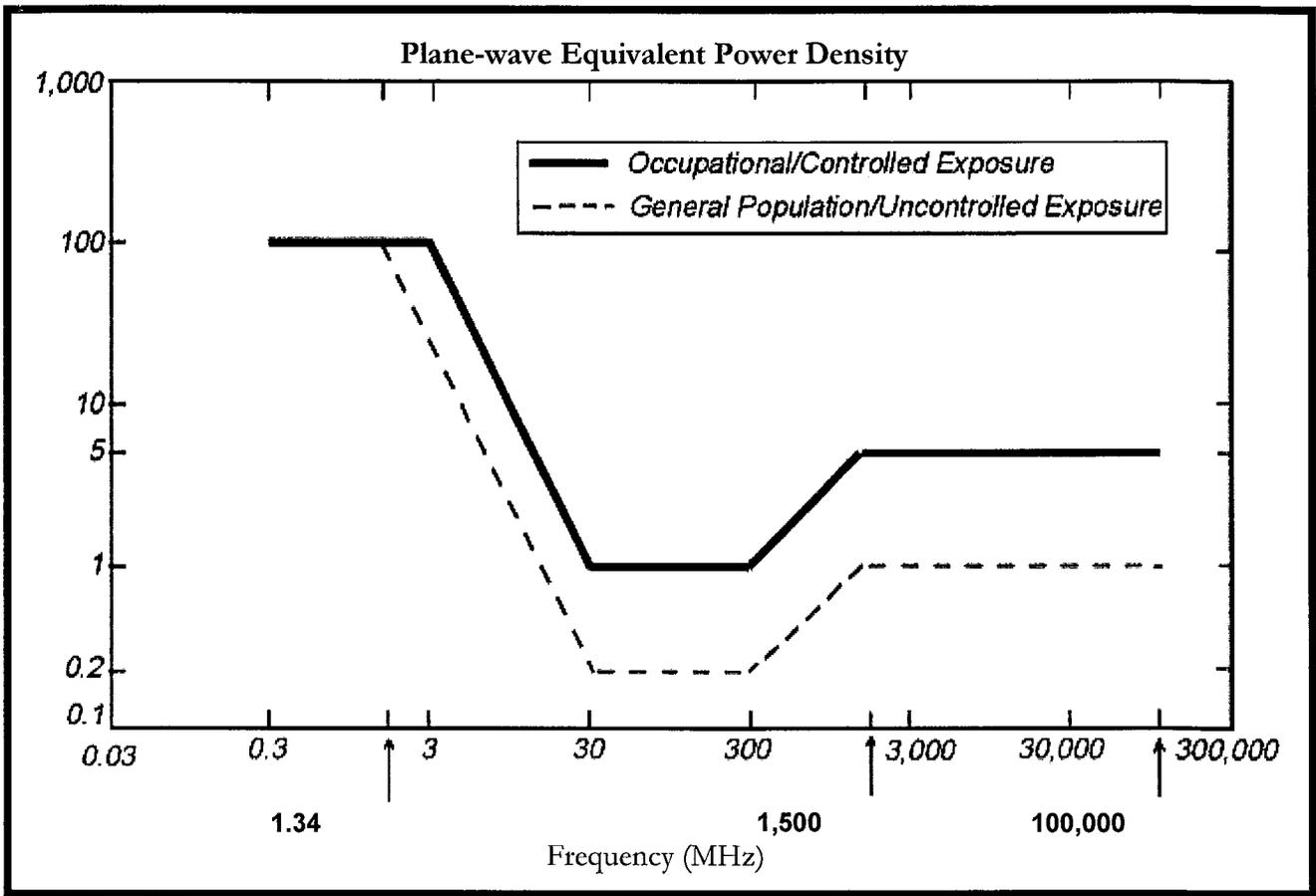


Figure 5: Graph of FCC Limits for Maximum Permissible Exposure (MPE)