STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

VIA ELECTRONIC MAIL

November 20, 2018

Kri Pelletier
Property Specialist
SBA Communication Corporation
134 Flanders Road, Suite 125
Westborough, MA 01581

RE: **EM-SPRINT-151-181114** – Sprint notice of intent to modify an existing telecommunications facility located at 184 Garden Circle, Waterbury, Connecticut.

Dear Ms. Pelletier:

The Connecticut Siting Council (Council) is in receipt of your correspondence of November 20, 2018 submitted in response to the Council's November 14, 2018 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman
Executive Director

MAB/FOC/emr

Robidoux, Evan

From: Kri Pelletier <KPelletier@sbasite.com>
Sent: Tuesday, November 20, 2018 9:58 AM
To: Robidoux, Evan
Cc: CSC-DL Siting Council
Subject: RE: [External] Council Incomplete Letter for EM-SPRINT-151-181114-Garden Circle-Waterbury
Attachments: EME_CT03XC045_11.20.18.pdf

Good Morning Evan,

In response to your request, please find revised EME attached. An original and (2) copies will be sent to you for delivery tomorrow morning.

Thank you,

Kri Pelletier
Prop Spec - Svcs
508.251.0720 x3804 + **T**
508.366.2610 + **F**
203.446.7700 + **C**

From: Robidoux, Evan [mailto:Evan.Robidoux@ct.gov]
Sent: Friday, November 16, 2018 10:50 AM
To: Kri Pelletier
Cc: CSC-DL Siting Council
Subject: [External] Council Incomplete Letter for EM-SPRINT-151-181114-Garden Circle-Waterbury

Please see the attached correspondence.

Evan Robidoux
Clerk Typist
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

MILLENNIUM ENGINEERING, P.C.
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Malvern, Pennsylvania 19355
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November 19, 2018

Attn: Evan Hughes, Project Director, SDS
SBA Communications Corporation
470 Davidson Road
Pittsburgh, PA 15239

Re: RF Safety FCC Compliance of Proposed Communications Facility Modifications (MIMO)
SBA Site Name (ID): Waterbury 5, CT (CT22104-A-02)
Sprint Site Name (ID): Waterbury (CT03XC045)
Site Description: Collocation on Existing 180' Lattice Tower (186' Overall Height)
Site Address: 184 Garden Hill Circle, Waterbury, CT 06704 (City of Waterbury, New Haven County)
Latitude 40.57021388° N, Longitude 73.01649444° W, Ground Elevation: 830' +/- A.M.S.L.

Dear Mr. Hughes,

I have performed an analysis to provide an independent determination and certification that the proposed Sprint communications facility modifications at the above referenced property will comply with Federal Communications Commission (FCC) exposure limits and guidelines for human exposure to radiofrequency electromagnetic fields (Code of Federal Regulation 47 CFR 1.1307 and 1.1310). As a registered professional engineer, I am under the jurisdiction of the State Registration Boards in which I am licensed to hold paramount the safety, health, and welfare of the public and to issue all public statements in an objective and truthful manner.

The existing communications facility consists of collocation on an existing 180' lattice tower (186' overall height – top of lightning rod) owned by SBA Communications Corporation at the above referenced property. The existing Sprint antenna configuration from the information furnished to me consists of (1) 850/1900 MHz (LTE) dualband antenna (RFS APXVSPP18-C-A20 or equivalent) and (1) 2500 MHz (LTE) antenna (RFS APXVT14-C-I20 or equivalent) on each of three faces (total of 6 antennas) spaced with azimuths of 25/105/290 degrees on the horizontal plane at a centerline of 130' above ground level. Transmitting from these antennas currently is (1) 850 LTE wideband channel, up to (2) 1900 MHz LTE wideband channels and up to (2) 2500 MHz LTE wideband channels per face.

Sprint plans to remove the (3) existing 2500 MHz (LTE) antennas and replace them with (1) alternative 2500 MHz (LTE) antenna per face. The (3) existing 850/1900 MHz (LTE) dualband antennas will remain. The revised Sprint antenna configuration from the information furnished to me consists of (1) 850/1900 MHz (LTE) dualband antenna (RFS APXVSPP18-C-A20 or equivalent) and (1) 2500 MHz (LTE) antenna (Nokia AAHC or equivalent) on each of three faces (total of 6 antennas) spaced with azimuths of 25/105/290 degrees on the horizontal plane at a centerline of 130' above ground level. Transmitting from these antennas will be (1) 850 LTE wideband channel, up to (2) 1900 MHz LTE wideband channels and up to (2) 2500 MHz LTE wideband channels per face.

The following assumptions are made for reasonable upper limit radiofrequency operating parameters for the revised facility due to Sprint antennas alone to accommodate all licensed frequency bands:

- (1) 850/1900 MHz (LTE) dualband transmit antenna per face at 0-10 degrees mechanical downtilt
- (1) 2500 MHz (LTE) transmit antenna per face at 0-10 degrees mechanical downtilt
- (1) 850 MHz LTE wideband channel/face at 4x40W max power/face before cable loss/antenna gain
- (2) 1900 MHz LTE wideband channels/face at 2x4x40W max power/face before cable loss/antenna gain
- (2) 2500 MHz LTE wideband channels/face at 8x25W max power/face before cable loss/antenna gain
- The facility would be at or near full capacity during busy hour

Using the far-field power density equations from FCC Bulletin OET 65, the power density at any given distance from the antennas is equal to $0.360(ERP)/R^2$ where R is the distance to the point at which the exposure is being calculated. The given equation is a conversion of the OET 65 power density equation for calculating power density given the distance in feet and the result in metric units (mW/cm^2). This calculated power density assumes the location is in the main beam of the vertical pattern of the antenna. After making an adjustment for the reduction in power density due to the vertical pattern of the transmit antenna, the calculated ground level power density is well below 1 % of the FCC general population exposure limit at any distance from the antenna system of Sprint.

The 850 MHz (SMR) transmit frequencies (861-869 MHz), which Sprint is licensed by the FCC to operate, have an uncontrolled/general population maximum permissible exposure (MPE) FCC limit of 574 $\mu W/cm^2$ or 0.574 mW/cm^2. The 1900 MHz (PCS) "B Block" and "G Block" transmit frequencies (1950-1965, 1990-1995 MHz), which Sprint is also licensed by the FCC to operate, have an uncontrolled/general population MPE FCC limit of 1000 $\mu W/cm^2$ or 1 mW/cm^2. The 2500 MHz (BRS) transmit frequencies (2496-2673.5 MHz), which Sprint is also licensed by the FCC to operate, have an uncontrolled/general population MPE FCC limit of 1000 $\mu W/cm^2$ or 1 mW/cm^2. Therefore, the exposure at ground level at any distance from the structure would be substantially below 1 % of the FCC general population exposure limits due to Sprint antennas alone. The extremely low ground exposure levels are due to the elevated positions of the antennas in the structure and the low power which these systems operate. See Figures 1 and 2 in back of this report which discuss the relationship between height, proximity or distance, and orientation to level of electromagnetic field exposure.

Site Name	Carrier	No. of Channels	ERP/Channel (watts)	Antenna Height (feet)	Total Power Density ($\mu W/cm^2$)	TX Frequency (MHz)	Allowable MPE ($\mu W/cm^2$)	Calculated % MPE
Waterbury (CT03XC045)	Sprint	1	2780	130	0.065	861-869	574	0.01 %
Waterbury (CT03XC045)	Sprint	2	4950	130	0.116	1950-1965, 1990-1995	1000	0.01 %
Waterbury (CT03XC045)	Sprint	2	3060	130	0.072	2496-2673.5	1000	< 0.01 %
							TOTAL:	0.03 %

NOTE: The above total power densities were calculated in the main beam of the antenna and reduced by a factor of 1000 (or 30 dB) to account for the reduction in power density at the base of the structure due to the vertical pattern of the transmit antenna. The calculated power density at any distance from the base of the structure will remain below 1 % of the general population exposure limits.

From the information furnished to me, the existing structure currently contains one miscellaneous omni antenna and one other antenna array of Clearwire (owned by Sprint), as follows:

- Miscellaneous Omni Antenna: (1) omnidirectional antenna; elevated approximately 184' above ground level; not included in our analysis since this antenna is currently disconnected/not in service

- Clearwire (owned by Sprint): (1) 2500 MHz (WiMAX) antenna (Argus LLPX310R-V1 or equivalent) on each of three faces and (4) 23 GHz (microwave) dish antennas (CommScope VHLP2-23-DW1 or equivalent) (total of 7 antennas); elevated approximately 136.8' (2500 MHz) and 137.1' (23 GHz)

above ground level; licensed to transmit the 2500 MHz (BRS) frequencies (2496-2673.5 MHz) and in the 23 GHz microwave frequency range (21.2-23.6 GHz)

I have reviewed the antenna configurations and operating parameters of all licensees (existing & revised), performed a similar upper limit evaluation and find the composite ground level exposure will be well below 1 % of the FCC general population exposure limits anywhere in close proximity to the structure. Again, the extremely low ground exposure levels are due to the elevated positions of the antennas in the structure and the low power which these systems operate.

From the standpoint of RF exposure, the presence of Sprint does not preclude the future addition of other tenants or licensees including emergency or other municipal services which benefit the public from collocation on this structure. There is a substantial margin of safety to allow for the addition of transmit antennas of other communications services. Keep in mind that continuous exposure at 100 % of standard is considered by the scientific community as just as safe as 1 % of standard since the exposure limits themselves contain a large margin of safety.

In summary, the existing communications facility complies with all applicable exposure limits and guidelines adopted by the FCC governing human exposure to radiofrequency electromagnetic fields (FCC Bulletin OET 65). The facility will remain in compliance with the proposed antenna and operating parameter modifications of Sprint. Federal law (FCC Rule Title 47 CFR 1.1307 and 1.1310) sets the national standard for compliance with electromagnetic field safety. The FCC exposure limits are based on exposure limits recommended by the National Council on Radiation Protection and Measurements (NCRP) and, over a wide range of frequencies, the exposure limits developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI). **Thus, there is full compliance with the standards of the IRPA, FCC, IEEE, ANSI, and NCRP.**

General Information on Electromagnetic Field Safety

Sprint facilities transmit and receive low power electromagnetic fields (EMF) between base station antennas and handheld portable cell phones. The radiofrequency energy from these facilities and devices is non-ionizing electromagnetic energy. Non-ionizing, unlike X-Rays or other forms of potentially harmful energy in the microwave region, is not cumulative over time nor can the energy change the chemical makeup of atoms (e.g. strip electrons from ions). "Non-ionizing" simply means that the energy is not strong enough to break ionic bonds.

Safe levels of electromagnetic fields were determined by numerous worldwide organizations, such the International Committee for Non-Ionizing Radiation Protection, a worldwide multi-disciplinary team of researchers and scientists studying the effects of non-ionizing radiofrequency energy such as that emitted by base stations or cell phones. The FCC did not arbitrarily establish their own standards, but rather adopted the recommendations of all leading organizations that set standards and research the subject such as the Institute of Electrical and Electronics Engineers (IEEE), American National Standards Institute (ANSI), and National Council on Radiation Protection and Measurements (NCRP).

When Sprint is located on an antenna structure such as a self-supporting lattice type tower, lattice tower, guyed tower, watertank, etc. the antennas are typically 10 meters or more above ground level (10 meters = 32.81 feet). With the relatively low power and elevated positions of the antennas on the structure with respect to ground level, the maximum ground level exposure can rarely approach 1 % of the applicable FCC exposure limit regardless of how many sets of antennas are collocated on the structure. For this reason, the FCC considers the facilities "categorically excluded" from routine evaluation at antenna heights above 10 meters (or above 32.81 feet). Categorical exclusion exempts a site from routine on-site evaluation. However, the facility is not excluded from compliance with the federal exposure limits and guidelines. The types of facilities used by Sprint typically

elevated on antenna structures (away from access to close proximity, i.e. greater than 10 meters or 32.81 feet) simply cannot generate ground level exposure levels that approach the limits under any circumstances.

From a regulatory perspective, the FCC has sole jurisdiction over the regulation of electromagnetic fields from all facilities and devices. The FCC has established guidelines and limits over emissions and exposure to protect the general public. The FCC also has certain criteria that trigger when an environmental evaluation must be performed. The criteria are based on distance from the antennas (accessibility) and transmit power levels.

CONCLUSIONS:

1) **The existing communications facility complies with electromagnetic field safety standards by a substantial margin (well below 1 %) in all publicly accessible areas. This includes the base of the existing structure and any areas in proximity to the existing structure.**

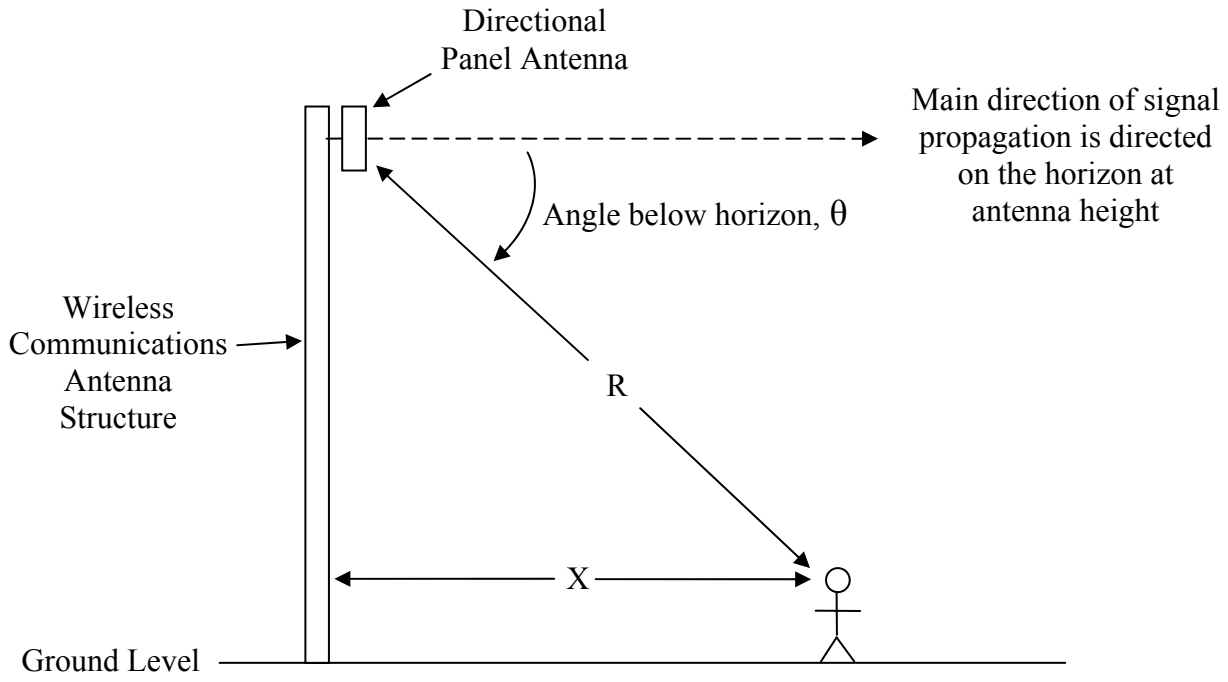
2) **Sprint takes appropriate measures to ensure that all telecommunications facilities (including this existing facility with proposed modifications) comply with applicable exposure limits and guidelines adopted by the FCC governing human exposure to radiofrequency electromagnetic fields (FCC Bulletin OET 65). With the proposed antenna and operating parameter modifications of Sprint, the composite electromagnetic field exposure from all existing and revised communications facilities together will remain well below 1 % of the applicable standards in all publicly accessible areas.**

3) **In cases where such compliance exists, the subject of electromagnetic field safety is preempted**. The Telecommunications Act of 1996 states that: "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 [FCC's] regulations concerning such emissions." Telecommunications Act of 1996, § 332[c][7][B][iv].

Respectfully,

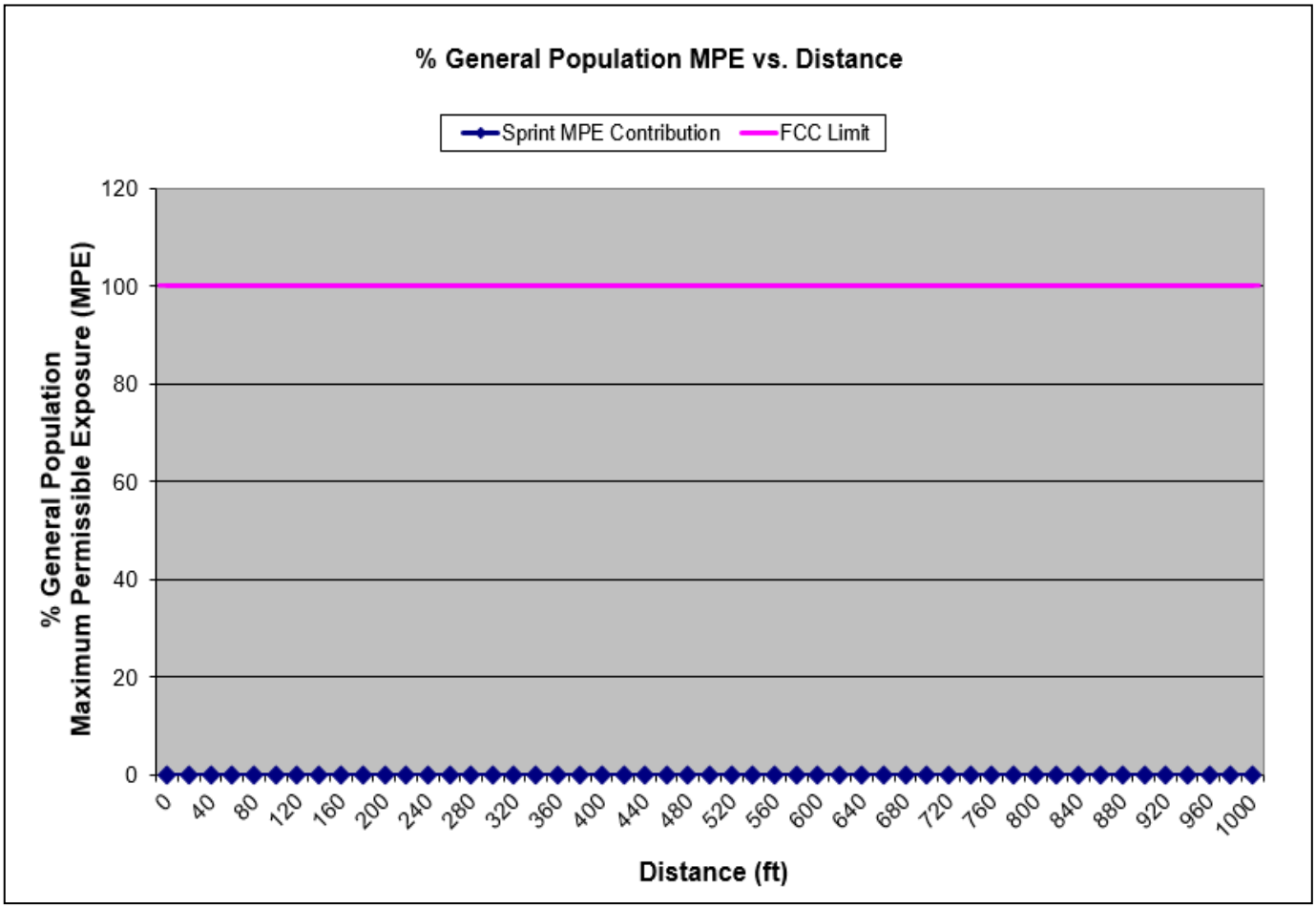
Paul Dugan, P.E.
Registered Professional Engineer
Connecticut License Number 22566

FIGURE 1: Diagram of Electromagnetic Field Strength as a Function of Distance and Antenna Orientation



The above diagram illustrates the conceptual relationship of distance and orientation to directional panel antennas used in wireless communications. At the base of the structure (x = 0), the distance R is a minimum when the angle of the direction of propagation θ is a maximum. As one moves away from the antenna structure, the horizontal distance X increases as well as the distance R to the antennas while the angle below the horizon decreases. For this reason, electromagnetic fields from these facilities remain fairly uniform up to a few hundred feet and continue to taper off with distance. As noted in the report, the electromagnetic fields from these types of facilities are hundreds of times below safety standards at any distance from the antenna structure, making them essentially indistinguishable relative to other sources of electromagnetic fields in the environment due to the elevated heights of the antennas and the relatively low power at which these systems operate.

FIGURE 2: Graph of MPE Contribution vs. Distance



The above graph represents the contribution of Sprint to the composite electromagnetic field exposure level at any distance from the base of the structure. The contribution of Sprint will remain well under 1% of the FCC general population maximum permissible exposure (MPE) at any distance as shown.

DECLARATION OF ENGINEER

Paul Dugan, P.E., declares and states that he is a graduate telecommunications consulting engineer (BSE/ME Widener University 1984/1988), whose qualifications are a matter of record with the Federal Communications Commission (FCC). His firm, Millennium Engineering, P.C., has been retained by SBA Communications Corporation, on behalf of Sprint, to perform power density measurements or calculations for an existing or proposed communications facility and analyze the data for compliance with FCC exposure limits and guidelines for human exposure to radiofrequency electromagnetic fields.

Mr. Dugan also states that the calculations or measurements made in the evaluation were made by himself or his technical associates under his direct supervision, and the summary letter certification of FCC compliance associated with the foregoing document was made or prepared by him personally. Mr. Dugan is a registered professional engineer in the Jurisdictions of Pennsylvania, New Jersey, Delaware, Maryland, Virginia, New York, Connecticut, District of Columbia, West Virginia and Puerto Rico with over 30 years of engineering experience. Mr. Dugan is also an active member of the Association of Federal Communications Consulting Engineers, the National Council of Examiners for Engineering, the National Society of Professionals Engineers, the Pennsylvania Society of Professional Engineers, and the Radio Club of America. Mr. Dugan further states that all facts and statements contained herein are true and accurate to the best of his own knowledge, except where stated to be in information or belief, and, as to those facts, he believes them to be true. He believes under penalty of perjury the foregoing is true and correct.

Paul Dugan, P.E.

Executed this the 19th day of November, 2018.

PAUL DUGAN, P.E.
132 Jaffrey Road
Malvern, Pennsylvania 19355

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EDUCATION:

Widener University, Chester, Pennsylvania
Master of Business Administration, July 1991
Master of Science, Electrical Engineering, December 1988
Bachelor of Science, Electrical Engineering, May 1984

PROFESSIONAL ASSOCIATIONS:

Registered Professional Engineer in the following jurisdictions:

Pennsylvania, License Number PE-045711-E
New Jersey, License Number GE41731
Maryland, License Number 24211
Delaware, License Number 11797
Virginia, License Number 36239
Connecticut, License Number 22566
New York, License Number 079144
District of Columbia, License Number PE-900355
West Virginia, License Number 20258
Puerto Rico, License Number 18946

Full member of **The Association of Federal Communications Consulting Engineers** (www.afcce.org) January 1999 to Present
Elected to serve on the Board of Directors for 2006-2007

Full member of **The National Society of Professional Engineers** (www.nspe.org) and the **Pennsylvania Society of Professional Engineers** (www.pspe.org) June 2003 to Present
Currently serving on the Board of Directors of the Valley Forge Chapter and as South East Region Vice-Chair for the "Professional Engineers in Private Practice" Executive Committee

Actively participate in **Chester County ARES/RACES** (CCAR www.w3eoc.org) which prepares and provides emergency backup communications for Chester County Department of Emergency Services, March 2005 to Present

Full member of **The National Council of Examiners for Engineering** (www.ncees.org) May 2001 to Present

Full Member of **The Radio Club of America** (www.radio-club-of-america.org) December 2003 to present

PROFESSIONAL EXPERIENCE:

Millennium Engineering, P.C., Malvern, Pennsylvania
Position: **President**, August 1999 to Present (www.millenniumeng.com)

Verizon Wireless, Plymouth Meeting, Pennsylvania
Position: **Cellular RF System Design/Performance Engineer**, April 1990 to August 1999

Communications Test Design, Inc., West Chester, Pennsylvania
Position: **Electrical Engineer,** May 1984 to April 1990