# Electromagnetic Field (EMF) Strength Measurements
# SITE: Landisville Middle School
# March 10th, 2023

## Landisville Middle School – Hempfield School District
## 340 Mumma Drive
## Landisville, PA 17538

---


Millennium Engineering, P.C.
42 Old Barn Drive
West Chester, PA 19342

Cell: 610.220.3820
E-mail: pauldugan@comcast.net
www.millenniumeng.com

**ELECTROMAGNETIC FIELD (EMF) STRENGTH MEASUREMENTS**
**SITE: Landisville Middle School**
**March 10, 2023**

# TABLE OF CONTENTS

**MILLENNIUM ENGINEERING, P.C.**
42 Old Barn Drive
West Chester, Pennsylvania 19382
Cell: 610-220-3820
www.millenniumeng.com Email: pauldugan@comcast.net

March 10, 2023

Kim James, Director of Buildings and Grounds
Hempfield School District
200 Church Street
Landisville, PA 17538

**Re: Electromagnetic Field (EMF) Measurements at Landisville Middle School**
**340 Mumma Drive, Landisville, PA 17538**

Dear Ms. James,

Our firm, Millennium Engineering, P.C., routinely provides independent determinations and certifications that communications facilities (existing and proposed) 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.

On the school property there is an existing 130' Verizon Wireless monopole with an antenna platform at the top and ground equipment near the base of the monopole inside a locked chain link fence. I was contacted by representatives of Hempfield School District to inquire about having field strength measurements performed throughout the school property both indoor and outdoor to document the field strength versus the safety standard established by the Federal Communications Commission (FCC). The FCC sets the national standard for compliance with electromagnetic field safety. Millennium was retained to perform electromagnetic field (EMF) measurements throughout the entire school property to certify compliance with FCC safety standards.

On 3/10/2023, I visited the school property with my colleague Mohamed Ben Abdallah to perform EMF strength measurements at 192 locations inside the school building and in all outside areas of the school property including the roof which is a controlled access area. **The attached measurement data logs show that all whole body spatial average measurements are far below 1 % of the FCC general population exposure limits at all measured locations inside the school building. The highest readings were on the main roof at 4-6 % although the roof remains in compliance with the safety standard by a very large margin and is a controlled access area. The higher readings on the roof are expected due to the elevated level and being outdoor. All other outdoor ground level locations remain below 4 % of the safety standard.** Please note that, for example, a reading of 0.01 in the data logs represents 0.01%, or 1/10,000$^{th}$ of the exposure limits. The data logs in the pages that follow include 8 sets of measurement locations in areas as noted in the logs and also below:

Ref. Points 1-24: Around the cell tower
Ref. Points 25-48: Stadium Parking Lot
Ref. Points 49-72: Stadium
Ref. Points 73-96: Baseball Field / Parking Lot
Ref. Points 97-120: Upper Roof
Ref. Points 121-144: First Floor (including cafeteria, gym, and other non-classroom areas)
Ref. Points 145-168: First Floor – Classroom Section, Library, Entrances, etc.
Ref. Points 169-192: Second Floor – Classrooms, hallways, stairwells, etc.

All field strength measurements were performed with a calibrated Narda meter (Model #NBM-550 – Serial #H-1174) last calibrated on 3/24/2022 (expires 3/23/2024) and probe (Model #EA5091 – Serial #01067) last calibrated on 3/24/2022 (expires 3/24/2024). This particular meter and probe measures all transmitting frequencies in the environment in the 300 kHz to 50 GHz frequency range (which includes all licensed operating frequencies of Verizon Wireless and all other licensees in the environment).

**Again, as shown from our field measurements, the exposure levels through the inside of the school are well below 1 % of the safety standard which is the FCC general population exposure limits.; at all exterior ground level locations are below 4 % of the safety standard; and the controlled access main roof reaches 6 % but is still in compliance by a substantial safety margin.** 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, electromagnetic field strength measurements were taken at 192 locations on the entire school property at 340 Mumma Drive, Landisville, PA 17538. All measurements confirm that the current radiofrequency exposure levels at locations throughout the school property are in compliance with all applicable standards in proximity to a cell tower installation on the property.**

Respectfully,

Paul Dugan, P.E.
Registered Professional Engineer
Pennsylvania License Number

## Landisville Electromagnetic (EMF) Field Strength Measurements

Storing Date: 3/10/2023
Storing Time: 12:52:13 PM
Device Product Name: NBM-550
Device Serial Number: H-1174
Probe Product Name: EA5091
Probe Serial Number: 01067
Standard Name: FCC96-326,occ
Unit: mW/cm²
Spatial AVG Mode: CONTINUOUS
Device Cal Due Date: 3/24/2024

| REF # | % FCC General Population / Uncontrolled MPE Limit | REF # | % FCC General Population / Uncontrolled MPE Limit |
|---|---|---|---|
| 1 | 0.001 | 25 | 0.084 |
| 2 | 0.026 | 26 | 0.167 |
| 3 | 0.108 | 27 | 0.015 |
| 4 | 0.576 | 28 | 0.050 |
| 5 | 1.182 | 29 | 0.559 |
| 6 | 1.608 | 30 | 1.113 |
| 7 | 1.864 | 31 | 1.474 |
| 8 | 3.579 | 32 | 1.834 |
| 9 | 3.908 | 33 | 1.644 |
| 10 | 3.640 | 34 | 1.651 |
| 11 | 3.768 | 35 | 2.181 |
| 12 | 3.544 | 36 | 1.980 |
| 13 | 3.347 | 37 | 2.009 |
| 14 | 3.570 | 38 | 1.958 |
| 15 | 3.130 | 39 | 2.352 |
| 16 | 2.542 | 40 | 2.268 |
| 17 | 2.507 | 41 | 2.008 |
| 18 | 2.873 | 42 | 1.980 |
| 19 | 2.854 | 43 | 2.188 |
| 20 | 2.828 | 44 | 1.884 |
| 21 | 2.513 | 45 | 2.353 |
| 22 | 2.664 | 46 | 1.861 |
| 23 | 2.429 | 47 | 2.287 |
| 24 | 2.819 | 48 | 2.070 |

Ref. Points 1-24: Around the cell tower
Ref. Points 25-48: Stadium Parking Lot

| REF # | % FCC General Population / Uncontrolled MPE Limit |
|---|---|
| 49 | 0.031 |
| 50 | 0.627 |
| 51 | 1.193 |
| 52 | 1.301 |
| 53 | 1.202 |
| 54 | 1.564 |
| 55 | 1.442 |
| 56 | 1.495 |
| 57 | 1.773 |
| 58 | 1.531 |
| 59 | 1.529 |
| 60 | 1.567 |
| 61 | 1.404 |
| 62 | 1.222 |
| 63 | 1.032 |
| 64 | 1.500 |
| 65 | 1.345 |
| 66 | 1.201 |
| 67 | 0.829 |
| 68 | 0.999 |
| 69 | 0.969 |
| 70 | 0.983 |
| 71 | 0.964 |
| 72 | 0.603 |

| REF # | % FCC General Population / Uncontrolled MPE Limit |
|---|---|
| 73 | 0.327 |
| 74 | 1.470 |
| 75 | 1.627 |
| 76 | 2.272 |
| 77 | 2.074 |
| 78 | 2.065 |
| 79 | 2.128 |
| 80 | 2.225 |
| 81 | 1.911 |
| 82 | 2.049 |
| 83 | 1.842 |
| 84 | 1.567 |
| 85 | 1.395 |
| 86 | 1.176 |
| 87 | 1.168 |
| 88 | 0.996 |
| 89 | 0.801 |
| 90 | 0.806 |
| 91 | 0.694 |
| 92 | 0.533 |
| 93 | 0.479 |
| 94 | 0.752 |
| 95 | 0.615 |
| 96 | 0.336 |

Ref. Points 49-72: Stadium
Ref. Points 73-96: Baseball Field / Parking Lot

| REF # | % FCC General Population / Uncontrolled MPE Limit |
|---|---|
| 97 | 5.470 |
| 98 | 5.935 |
| 99 | 4.536 |
| 100 | 5.425 |
| 101 | 3.488 |
| 102 | 4.529 |
| 103 | 5.030 |
| 104 | 5.230 |
| 105 | 5.255 |
| 106 | 5.040 |
| 107 | 4.902 |
| 108 | 4.284 |
| 109 | 4.204 |
| 110 | 4.372 |
| 111 | 3.739 |
| 112 | 3.720 |
| 113 | 3.069 |
| 114 | 2.667 |
| 115 | 2.929 |
| 116 | 2.645 |
| 117 | 3.092 |
| 118 | 3.108 |
| 119 | 3.281 |
| 120 | 1.947 |

| REF # | % FCC General Population / Uncontrolled MPE Limit |
|---|---|
| 121 | 0.000 |
| 122 | 0.014 |
| 123 | 0.005 |
| 124 | 0.000 |
| 125 | 0.005 |
| 126 | 0.000 |
| 127 | 0.000 |
| 128 | 0.000 |
| 129 | 0.000 |
| 130 | 0.000 |
| 131 | 0.000 |
| 132 | 0.000 |
| 133 | 0.000 |
| 134 | 0.000 |
| 135 | 0.000 |
| 136 | 0.000 |
| 137 | 0.000 |
| 138 | 0.000 |
| 139 | 0.000 |
| 140 | 0.000 |
| 141 | 0.000 |
| 142 | 0.000 |
| 143 | 0.000 |
| 144 | 0.000 |

Ref. Points 97-120: Upper Roof
Ref. Points 121-144: First Floor

| REF # | % FCC General Population / Uncontrolled MPE Limit |
|---|---|
| 145 | 0.000 |
| 146 | 0.000 |
| 147 | 0.000 |
| 148 | 0.000 |
| 149 | 0.000 |
| 150 | 0.008 |
| 151 | 0.045 |
| 152 | 0.038 |
| 153 | 0.046 |
| 154 | 0.409 |
| 155 | 0.391 |
| 156 | 0.275 |
| 157 | 0.197 |
| 158 | 0.222 |
| 159 | 0.228 |
| 160 | 0.188 |
| 161 | 0.225 |
| 162 | 0.294 |
| 163 | 0.397 |
| 164 | 0.392 |
| 165 | 0.513 |
| 166 | 0.506 |
| 167 | 0.270 |
| 168 | 0.371 |

| REF # | % FCC General Population / Uncontrolled MPE Limit |
|---|---|
| 169 | 0.294 |
| 170 | 0.171 |
| 171 | 0.283 |
| 172 | 0.254 |
| 173 | 0.292 |
| 174 | 0.352 |
| 175 | 0.292 |
| 176 | 0.221 |
| 177 | 0.089 |
| 178 | 0.171 |
| 179 | 0.251 |
| 180 | 0.332 |
| 181 | 0.212 |
| 182 | 0.261 |
| 183 | 0.459 |
| 184 | 0.568 |
| 185 | 0.536 |
| 186 | 0.800 |
| 187 | 0.718 |
| 188 | 0.770 |
| 189 | 0.606 |
| 190 | 0.568 |
| 191 | 0.495 |
| 192 | 0.393 |

Ref. Points 145-168: First Floor – Classes
Ref. Points 169-192: Second Floor

Advanced Test Equipment Corp.
Rentals • Sales • Calibration • Service

# CALIBRATION CERTIFICATE

ATEC Asset ID
39987

Work Order
2022001622

Certificate Number: 2022001622-Rev1

| | |
|---|---|
| Asset ID | 39987 |
| Manufacturer | Narda |
| Model Number | NARD-NBM-550 |
| Serial Number | H-1174 |
| Description | Broadband Field Strength Meter (requires probes) |

| | |
|---|---|
| Initial Condition | In Tolerance |
| Final Condition | In Tolerance |
| Calibration Date | 3/24/2022 |
| Due Date | 3/23/2024 |
| Temperature C° | 21 |
| Humidity | 40 |
| Procedure | 2401-8700-00A and ATE 990313 Rev. Revision |

**Customer Name:** Millennium Engineering, P.C.
**Customer Address:** 42 Old Barn Drive West Chester , PA 19382
**Comments:**

This Calibration is traceable to the International System of Units (SI), through National Metrology Institutes (NIST, PTB, NRC, NPL, etc.), ratiometric techniques, or natural physical constants. This certificate applies only to the item identified and shall not be reproduced other than in full, without the specific written approval of Advanced Test Equipment Corporation (ATEC). The calibration has been completed in accordance with ATEC's Active Use Calibration System. ATEC conforms to the requirements of the Quality Management System registered to ISO 9001:2015 (QAS International; US2790).

**Standards Used**

| Model | Manufacturer | Serial | Asset ID | Due Date |
|---|---|---|---|---|
| AGIL-34401A | Agilent Technologies | US36109164 | 23503 | 10/21/2022 |

| 2401-8700-00A and ATE 990313 | | | | | |
|---|---|---|---|---|---|
| **Manual Template** | **Pass** | | **Found / Left** | | |
| TEST DESCRIPTION | TRUE VALUE | Lower Limit | TEST RESULT | Upper Limit | Status |
| Calibration Results | | | | | |
| Input Voltage: 2.400 V | | | | | |
| Channel X | 2.376 V | 2.352 V | 2.370 V | 2.400 V | Pass |
| Channel Y | 2.376 V | 2.352 V | 2.370 V | 2.400 V | Pass |
| Channel Z | 2.376 V | 2.352 V | 2.370 V | 2.400 V | Pass |
| Because of an internal voltage divider, the nominal indication is 2.376 V. | | | | | |

**-- End of measurement results--**

Calibrated by: Tobi Adesokan

Approved by: Keo Nueca

Advanced Test Equipment Corp.
Rentals • Sales • Calibration • Service

# CALIBRATION CERTIFICATE

ATEC Asset ID
39988

Work Order
2022001623

Certificate Number: 2022001623-Rev1

| | |
|---|---|
| Asset ID | 39988 |
| Manufacturer | Narda |
| Model Number | NARD-EA5091 |
| Serial Number | 01067 |
| Description | 300kHz-50GHz Isotropic Probe, Shaped E-Field, FCC |

| | |
|---|---|
| Initial Condition | In Tolerance |
| Final Condition | In Tolerance |
| Calibration Date | 3/24/2022 |
| Due Date | 3/23/2024 |
| Temperature C° | 21.7 |
| Humidity | 48 |
| Procedure | Probe ATE Software 990313 Rev. Revision |

**Customer Name:** Millennium Engineering, P.C.
**Customer Address:** 42 Old Barn Drive West Chester , PA 19382
**Comments:**

This Calibration is traceable to the International System of Units (SI), through National Metrology Institutes (NIST, PTB, NRC, NPL, etc.), ratiometric techniques, or natural physical constants. This certificate applies only to the item identified and shall not be reproduced other than in full, without the specific written approval of Advanced Test Equipment Corporation (ATEC). The calibration has been completed in accordance with ATEC's Active Use Calibration System. ATEC conforms to the requirements of the Quality Management System registered to ISO 9001:2015 (QAS International; US2790).

**Standards Used**

| Model | Manufacturer | Serial | Asset ID | Due Date |
|---|---|---|---|---|
| AGIL-N8481A | Agilent Technologies | MY50430005 | 13987 | 7/27/2022 |
| AGIL-8482A | Agilent Technologies | MY41091935 | 15442 | 4/13/2022 |
| MCL-BW-N20W5 | MCL | 1124 | 19024 | 3/19/2022 |
| KEIT-2000 | Keithley | 1187328 | 23498 | 9/27/2022 |
| NARD-769-30 | Narda | 07190 | 23694 | 11/11/2022 |
| NARD-766-6 | Narda | 0308 | 23695 | 11/11/2022 |
| AGIL-E4419B | Agilent Technologies | GB40202079 | 23698 | 1/27/2023 |
| AGIL-8648C-H09 | Agilent Technologies | 3623A03016 | 23699 | 11/12/2022 |
| AGIL-8482A | Agilent Technologies | 3318A26724 | 24512 | 2/2/2023 |
| NARD-3042-30 | Narda | 04019 | 24515 | 1/28/2023 |
| NARD-3042B-30 | Narda | 11351 | 24516 | 1/28/2023 |
| NARD-771-10 | Narda | 61 | 24517 | 1/28/2023 |
| NARD-777C-20 | Narda | 36155 | 24600 | 3/19/2022 |
| AGIL-N1913A | Agilent Technologies | MY50000389 | 24977 | 2/19/2023 |
| AGIL-N1913A | Agilent Technologies | MY50000422 | 24978 | 2/19/2023 |
| AGIL-N1913A | Agilent Technologies | MY50000388 | 24979 | 2/19/2023 |
| AGIL-N1914A | Agilent Technologies | MY50000397 | 24980 | 2/10/2023 |
| AGIL-N1914A | Agilent Technologies | MY50000398 | 24983 | 2/19/2023 |
| AGIL-N1914A | Agilent Technologies | MY50000399 | 24984 | 2/16/2023 |
| AGIL-N8481A | Agilent Technologies | MY50340007 | 24985 | 2/2/2023 |
| AGIL-N8481A | Agilent Technologies | MY50340002 | 24986 | 2/2/2023 |
| AGIL-N8481A | Agilent Technologies | MY50340012 | 24987 | 2/2/2023 |
| AGIL-N8481A | Agilent Technologies | MY50340010 | 24988 | 2/2/2023 |
| AGIL-N8481A | Agilent Technologies | MY50340008 | 24991 | 2/2/2023 |
| AGIL-N8481A | Agilent Technologies | MY50340001 | 24992 | 2/2/2023 |
| AGIL-N8481A | Agilent Technologies | MY50340011 | 24993 | 8/19/2022 |
| AGIL-R8486A | Agilent Technologies | 2703A00606 | 24996 | 9/24/2022 |
| MILL-CL3-22-R2000 | Millitech | 256 | 25005 | 3/9/2022 |
| NARD-1079 | Narda | 20115 | 25010 | 3/25/2022 |
| NARD-3022 | Narda | 50484 | 25011 | 3/22/2022 |
| NARD-3075 | Narda | SD038433 | 25014 | 3/19/2022 |
| NARD-757-10 | Narda | 34408 | 25025 | 3/22/2022 |
| NARD-773-20 | Narda | SD038434 | 25026 | 3/22/2022 |
| AGIL-N1914A | Agilent Technologies | MY50001230 | 25841 | 2/16/2023 |
| AGIL-8648D-1EA | Agilent Technologies | 3613A00446 | 26186 | 8/24/2022 |
| AGIL-N8486AQ | Agilent Technologies | MY50350003 | 26473 | 10/25/2022 |
| AGIL-N8481A | Agilent Technologies | MY50110017 | 29073 | 7/27/2022 |

| | | | | |
|---|---|---|---|---|
| AHSY-PAM-1840VH | AH Systems | 165 | 31581 | |
| NARD-779-10 | Narda | 04988 | 31802 | 3/19/2022 |
| AGIL-R752D | Unknown | 1109 | 32945 | 3/25/2022 |
| AGIL-E4419B | Agilent Technologies | GB43311925 | 33347 | 2/8/2023 |
| AGIL-N1914A | Agilent Technologies | MY50000400 | 33419 | 2/16/2023 |
| NARD-779-10 | Narda | 03054 | 33648 | 3/22/2022 |
| NARD-3024 | Narda | 61242 | 33649 | 3/22/2022 |
| NARD-3024 | Narda | 50157 | 33650 | 3/22/2022 |

Calibrated by: Nathan Missig

Approved by: Keo Nueca

**Advanced Test Equipment Corporation**
10401 Roselle Street San Diego, CA 92121
Phone: 858-558-6500 · Fax: 858-558-6570
E-mail: calibrationrequest@atecorp.com
www.atecorp.com

**Advanced Test Equipment Rentals**
*The Knowledge. The Equipment. The Solution.*

**Part No.** EA5091 Electric Field Probe - 2402/07B
**Serial No.** 01067

**Calibration Results:** Test Results WITHIN Specification

### Frequency response and Ellipticity

The frequency response is measured with instrument setting: Apply Correction Frequency = OFF.

| Frequency in MHz | *E*_actual in V/M | Meas. Uncertainty in dB | Applied *%STD actual* | Displayed *%STD mean* | Correction Factor *K* (*) | Ellipse Ratio in dB |
|---|---|---|---|---|---|---|
| 0.3 | 307.00 | 0.80 | 25.00 | 25.98 | 0.981 | 1.53 |
| 3 | 307.00 | 0.80 | 25.00 | 40.36 | 0.787 | 0.89 |
| 10 | 92.10 | 0.80 | 25.00 | 29.41 | 0.922 | 0.33 |
| 30 | 30.70 | 0.80 | 25.00 | 17.02 | 1.212 | 0.28 |
| 100 | 30.70 | 0.80 | 25.00 | 20.93 | 1.093 | 0.39 |
| 300 | 30.70 | 1.00 | 25.00 | 15.48 | 1.271 | 0.30 |
| 750 | 48.54 | 1.00 | 24.88 | 26.33 | 0.972 | 0.17 |
| 1000 | 56.05 | 1.00 | 24.93 | 27.05 | 0.960 | 0.19 |
| 1800 | 68.65 | 0.90 | 25.00 | 27.53 | 0.953 | 0.47 |
| 2450 | 68.65 | 0.90 | 25.00 | 22.38 | 1.057 | 0.58 |
| 4000 | 68.65 | 0.90 | 25.00 | 18.68 | 1.157 | 0.45 |
| 8200 | 68.65 | 0.90 | 25.00 | 22.29 | 1.059 | 0.66 |
| 10000 | 68.65 | 0.90 | 25.00 | 25.10 | 0.998 | 0.46 |
| 18000 | 68.65 | 0.90 | 25.00 | 23.57 | 1.030 | 0.70 |
| 26500 | 68.65 | 0.90 | 25.00 | 33.96 | 0.858 | 0.93 |
| 40000 | 68.65 | 0.90 | 25.00 | 26.30 | 0.975 | 0.58 |
| 45500 | 68.65 | 0.90 | 25.00 | 18.42 | 1.165 | 0.74 |

Flatness (1800 - 40000 MHz): +/-1.30 dB **Pass**

Flatness (.3 - 45500 MHz): +/-2.08 dB **Pass**

Max. Ellipse Ratio (.3 - 45500 MHz): +/-1.53 dB **Pass**

(*) The frequency response correction data is stored in the probe memory. When the probe is connected to a NBM-550 Field Meter the implemented frequency response correction may be enabled. This is done by selecting the desired frequency and the setting: Apply Correction Frequency = ON.

**Adjustment (informative):**

This probe has two sensor modules, one for high frequency (HF) and one for low frequency (LF).

LF Gain multiplier = $K_{0,LF}$= 0.7661

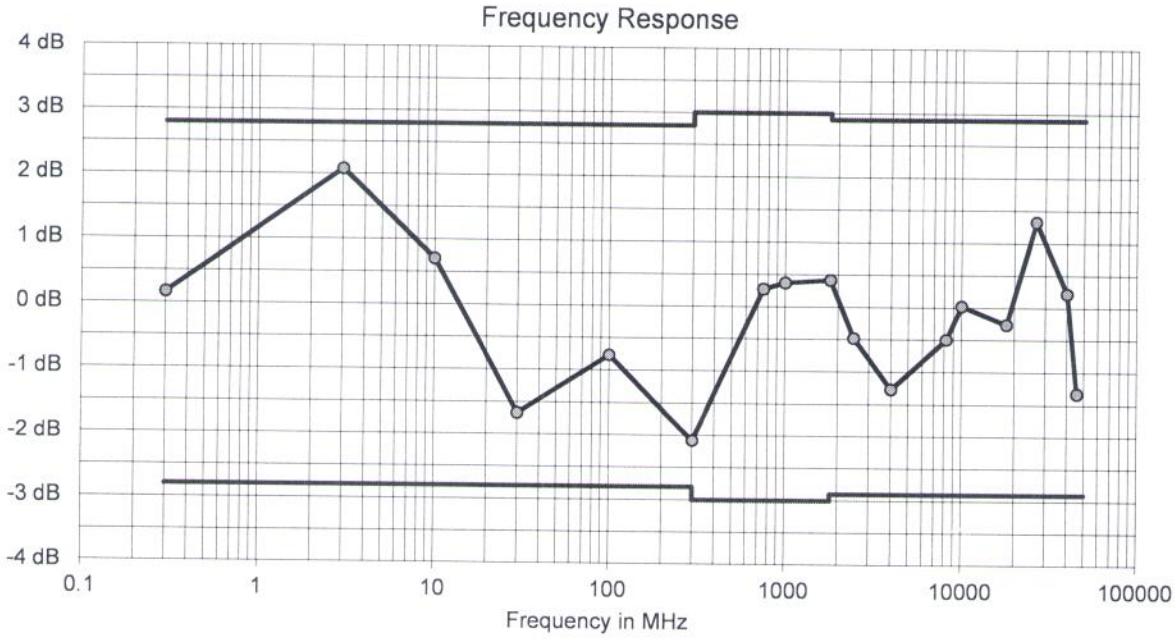
HF Gain multiplier = $K_{0,HF}$= 1.1348

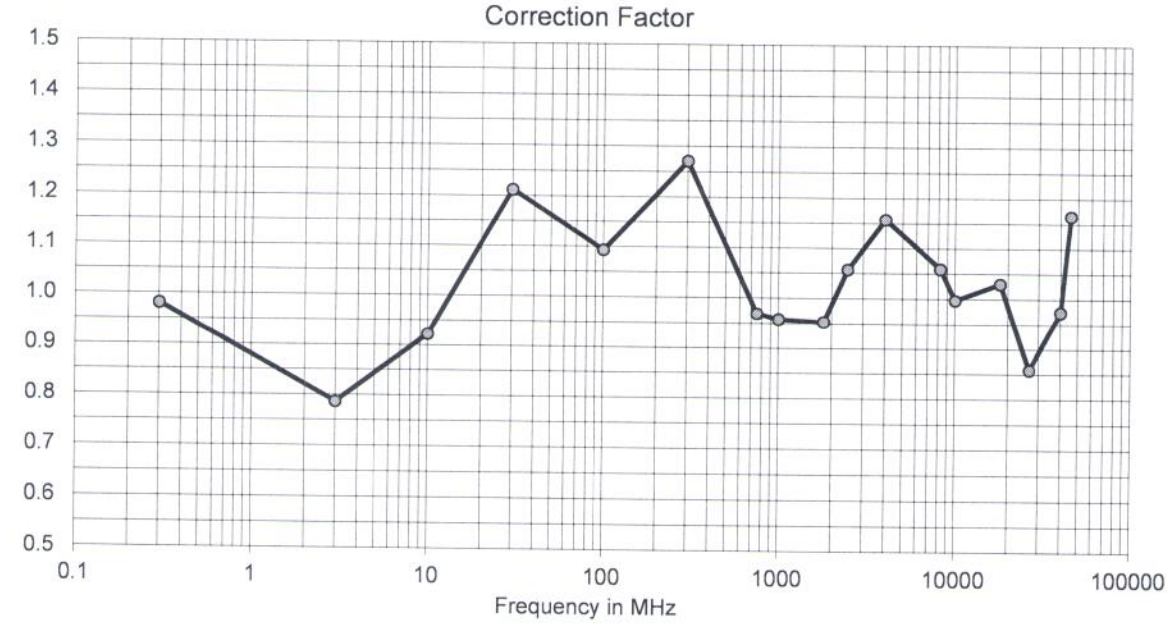
**Advanced Test Equipment Corporation**
10401 Roselle Street San Diego, CA 92121
Phone: 858-558-6500 · Fax: 858-558-6570
E-mail: calibrationrequest@atecorp.com
www.atecorp.com



## Frequency Response Graph

Frequency response data with setting: Apply Correction Frequency = OFF. Solid specification line includes uncertainty.




**School Sign**

**Front of School**


**Narda Meter and Probe**


**Narda Meter Display**

**Monopole with Cell Antenna Installation**

**Verizon Wireless Antenna Sectors**

## 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 Hempfield School District 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 10th day of March, 2023.

**PAUL DUGAN, P.E.**
42 Old Barn Drive
West Chester, PA 19382

Cell: 610-220-3820
Email: pdugan@millenniumeng.com
Web Page: www.millenniumeng.com

---

**EDUCATION:**

Widener University, Chester, Pennsylvania
**Master of Business Administration,** July 1991
**Master of 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
West Virginia, License Number 20258
Connecticut, License Number 22566
New York, License Number 079144
District of Columbia, License Number PE-900355
Puerto Rico, License Number 18946

Full member of **The Association of Federal Communications Consulting Engineers** (www.afcce.org) January 1999 to Present
**Elected and served on the Board of Directors for five year term 2006-2011**

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 as PSPE State Director and Past President on the Board of Directors of the Valley Forge Chapter and the South East Region Vice-Chair for the "Professional Engineers in Private Practice" Executive Committee. Actively participated in NSPE Annual Conferences 7/2005 to Present.

Actively participate in **Chester County ARES/RACES Amateur Radio** (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

Pennsylvania Real Estate License Number RS347405 Keller Williams 2/2019 to Present

**PROFESSIONAL EXPERIENCE:**

Millennium Engineering, P.C., West Chester, 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

**PERSONAL:**

Date/place of birth: November 21, 1961, West Chester, Pennsylvania; United States Citizen