|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DATA | Distance (meters) x | Capacitance (PicoFarads) y | x = 1/Distance | y = C/Area |
|  | 0.07 | 1.5E-12 | 14.28571429 | 1.911E-10 |
|  | 0.08 | 3E-12 | 12.5 | 3.822E-10 |
|  | 0.09 | 4.5E-12 | 11.11111111 | 5.732E-10 |
|  | 0.1 | 6.6E-12 | 10 | 8.408E-10 |
|  | 0.11 | 8.7E-12 | 9.090909091 | 1.108E-09 |
|  | 0.12 | 1.03E-11 | 8.333333333 | 1.312E-09 |
|  |  |  |  |  |
| **Measured Electric Permittivity ->** | **8.99333E-12** | Percent Difference = | 0.02 | % |
| **Theoretical Constant ->** | **8.85419E-12** | t = | 0.006909124 |  |
| LINEST OUTPUT |  |  |  |  |
| Slope -> | -1.89673E-10 | 2.79955E-09 | <- y intercept |  |
| Uncertainty -> | 2.01387E-11 | 2.23027E-10 | <- uncrt of y-int |  |
| R^2 -> | 0.956852562 | 1.00163E-10 | <- Variance |  |
| Fisher -> | 88.70538797 | 4 |  |  |
|  | 8.89941E-19 | 4.01302E-20 |  |  |
| |  | | --- | |  | |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

A.1 Yes, the slope is very close to the theoretical constant. A difference of 0.2% - 0.02% difference I would say is within a reasonable tolerance.

A.2 I would assert that averaging out the distance/capacitance measurement would eliminate most human error. I would further hypothesize that a “constant” source of environmental electro-magnetic “noise” could be a source of random error. This “noise” could originate from over head lighting or humans. I do believe that this is a reasonable way to **demonstrate** the permittivity constant but an electro-magnetically shielded room that is able to create a vacuum would be a better place to do precise measurements.

Randy McMillan

[rmcmillan1@mail.usf.edu](mailto:rmcmillan1@mail.usf.edu)