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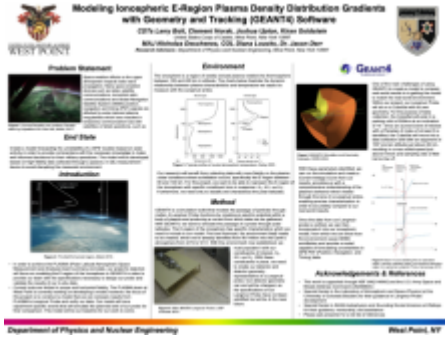
Poster
Aurora seen in the polar regions are indicative to varying ionospheric plasma density gradients facilitated by incident high-energy particles propagating along Earth's magnetic field lines. Much work has been done attempting to characterize these density gradients in the polar regions and understanding the intricacies of the physics dictating the behavior of the environment. Little however has been done to understand how this dynamic environment affects the uncertainty of Position, Navigation, and Timing (PNT) signals transmitted by Global Navigation Satellite Systems (GNSS). Additionally, the research that has been done focuses on the F-Region of the ionosphere and does not produce high horizontal spatial resolution.

The Polar Latitude Atmospheric Space Measurement and Analysis (PLASMA) team at the United States Military Academy (USMA), seeks to remedy this by constructing a model that classifies and characterizes the plasma in the E-region of the ionosphere to determine a margin of error of GNSS solutions that can be forecasted with respect to solar actively on demand. Utilizing GEANT 4, a particle focused software platform, PLASMA intends to construct a simulation of the E-region of the ionosphere under such conditions to compare our in-situ data collected. Preliminary data will be obtained using scintillators situated within a particle accelerator emulating E-Region conditions. Scintillators function using an enclosed crystal that when excited, will convert energized particles into visible light, allowing us to get a profile of the particles passing through. This profile will be the basis of the model we will compare to our GEANT 4 simulation, allowing us to verify the accuracy of our numbers and providing us with a valuable tool in our pursuit to quantify the uncertainty of GNSS PNT transmissions.



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