MINERvA: Understanding the neutrino on heavy target interaction

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ABSTRACT: The massive neutrino is not explained by the Standard Model. Neutrino mass been demonstrated through the observation of neutrino oscillations using solar, atmospheric, reactor, and accelerator sources. Current and future neutrino oscillation experiments aimed at understanding the properties of the neutrino need a precise neutrino interaction model to measure these quantities at a significant level. The goal of future experiments is an uncertainty in the measurement an order of magnitude smaller than the current state-of-the-art experiments. The interaction model must describe not only the interaction rate of the neutrino as a function of its energy but also the kinematics of the particles produced in the interaction.

MINERvA, an experiment in the NuMI beamline at Fermi National Laboratory, is designed to measure how the neutrino interacts with various heavy materials in an energy regime where particle and nuclear physics collide. A goal of this experiment is to precisely measure these neutrino interactions to help provide data to support a more precise interaction model. This talk will cover a brief history of the neutrino and why measurements of neutrino interactions are important. An introduction to MINERvA and a survey of recent measurements will be presented.

BIO: Daniel Ruterbories received his Ph.D from Colorado State University in 2014. He was part of the T2K neutrino oscillation experiment where he studied neutrino-nucleon interaction cross sections using the near detector. He continues his work on neutrino-nucleon interactions as a postdoctoral researcher with the University of Rochester on the MINERvA experiment. His research interests include precision neutrino interaction measurements, detector design, reconstruction algorithms, and cross section extraction methodologies.