

## **ANNIE in 10 minutes: multiplicities, cross sections, and models (oh my!)**

*Monday, 10 June 2019 17:15 (15 minutes)*

The Accelerator Neutrino Neutron Interaction Experiment (ANNIE) is a gadolinium-doped water Cherenkov detector located in the Fermilab Booster Neutrino Beam line. Many long-baseline neutrino measurements rely on efficient reconstruction of charged-current quasi-elastic (CCQE) neutrino interactions, whose final-state particles include only the recoiling nucleus, a proton, and an outgoing lepton. One known indicator of an event's inelasticity is the presence of final-state neutrons, which are often challenging to detect. Understanding the expected number of neutrons following CCQE-like inelastic events is pivotal for identifying and rejecting such events from CCQE datasets. ANNIE is sensitive to final-state neutrons and will measure the neutron multiplicity of neutrino charged-current interactions. This neutron multiplicity measurement can also help constrain and refine models for atmospheric neutrino interactions, a dominant background in proton decay searches and supernova neutrino detection. Throughout operation, ANNIE will also measure the total muon neutrino charged-current cross section and perform exclusive cross-section measurements, with an emphasis on the  $CC0\pi$  cross section. This talk will provide an overview of the ANNIE physics goals and event reconstruction chain that will be used to complete these measurements.

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