CU Physics Department Particle Seminar

Wednesday, January 20, 2010 705 Pupin Hall 1:00 PM

Measuring Neutral Current Single π^0 Cross Sections at MiniBooNE

Many current generation and planned oscillation experiments are searching for electron neutrino appearance. These experiments must contend with the background posed by neutral current single π^0 (NC 1π^0) production. If one the two photons from the π^0 decay fails to be detected, the π^0 may be misidentified as a single electron--the sought after signal in such oscillation searches. In order to maximize their sensitivity to such parameters as the mixing angle θ_{13} or the CP-violating phase δ_{CP}, rigorous constraints on the π^0 background will have to be established. However, the predictions of the myriad models of single pion production vary widely and previous measurements are relatively scant. A measurement of the absolute NC 1π^0 cross section will prove valuable in constraining both models of production as well as the background to ν_e appearance searches. Since releasing the results of its principal oscillation analysis, the MiniBooNE experiment has focused on using its enormous set of recorded neutrino and antineutrino interactions to produce multiple cross section measurements. Among these measurements are absolute differential cross sections for NC 1π^0 production for both neutrinos and antineutrinos, which will be presented here. These cross sections are the first absolute and first differential cross sections for NC 1π^0 production and they encompass samples of neutrino and antineutrino events that are roughly an order of magnitude larger than any other sample at O(1 GeV). Liquid Argon Time Projection Chambers (LArTPCs), an emerging neutrino detector technology with robust particle identification capabilities, will also be discussed.

Colin Anderson, Yale University