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Particle Production Measurements using the MIPP Detector at Fermilab

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The Main Injector Particle Production (MIPP) Experiment at Fermilab is a hadron production experiment which uses 120 GeV/c primary protons from the Main Injector to produce secondary beams of charged pions, kaons, proton and anti-proton from 5 GeV/c to 90 GeV/c. It was designed to measure the total charged particle production of pions, kaons, protons and anti-protons using beams of charged pions, kaons, proton and anti-proton on nuclear targets. The MIPP measures particle production cross sections off various nuclei including Hydrogen, MINOS target and thin targets of Beryllium, Carbon, Bismuth and Uranium. It is a full acceptance spectrometer which provides charged particle identification for particles from 0.1 to 120 GeV/c using Time Projection Chamber (TPC), Time of Flight (ToF), multicell Cherenkov (CKOV), and Ring Imaging Cherenkov (RICH) detectors and Calorimeter for neutrons.
We will describe the physics motivation to perform such cross section measurements and highlight the impact of hadronic interaction data on neutrino physics such as accelerator-based neutrino measurements with MINOS. We will present preliminary inelastic cross section measurements for 58 and 85 GeV/c proton interacting with Liquid Hydrogen target, and 58 and 120 GeV/c proton interacting with Carbon target having 2 % interaction length. We describe a new method to correct for low multiplicity inefficiencies in the interaction trigger using KNO scaling. Cross sections as a function of multiplicity and total cross sections are also presented for these two targets. The cross sections measured from the MIPP data are compared with the cross sections predicted from the Monte Carlo.

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