



Hadron Production Measurements for Neutrino Experiments with NA61/SHINE

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Particle spectra have been obtained from interactions of 31 GeV/c protons and pions on a thin carbon target with data taken in 2009 and interactions of protons on a T2K replica target with data taken in 2009 and 2010 by NA61/SHINE. These spectra include multiplicities of π^+ , π^- , K^+ , K^- , protons, Λ^0 and K_s^0 . The results from the 2009 proton data have recently been published in two papers - one for the thin target results and one for the replica target results. Currently, analyses of the 2010 replica target data and 2009 pion on thin target data are ongoing. The charged particle spectra were obtained using dEdx and timing information from NA61's TPC and ToF systems, while the neutral particle spectra were obtained using vertex analyses. The thin target measurements have already been used to tune the T2K beam MC and reduce the uncertainties on the T2K neutrino flux prediction. Additionally, a method has been developed to apply the T2K replica target measurements to the T2K beam MC tuning, which is expected to further constrain the T2K neutrino flux predictions especially with the addition of the larger 2010 data set. Having demonstrated its usefulness for improving T2K's results, NA61 is poised to study the hadron interactions important for Fermilab neutrino experiments. The results from the 2009 pion carbon data will be useful for understanding pion reinteractions in the LBNF and NuMI beamlines. For a complete hadron interaction study, an extensive data program with proton and pion beams at higher energies is planned at NA61 over the next couple of years.

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