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Neutrino Induced Dimuons and Coherent-Rho in NOMAD

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Neutrino induced charm production, detected via charm's semi-muonic decay,
offers the most precise quantification of the strange-sea and the mass-parameter of the charm quark, mc.. We have extracted 15k charm dimuon events in neutrino-Fe interactions in the NOMAD front calorimeter corresponding to a sample of 9M single muon events. The analysis leads to a measurement of the dimuon to single muon rate with a precision of ~2%. The key to this systematic precision is the high-resolution light target (drift chambers) data which yield the energy scale and the pion-induced backgrounds affecting this analysis. Within the NLO QCD formalism, we obtain the strange sea suppression factor of κs= 0.63 +- 0.04(Stat+Syst), and the mc = 1.058 +- 0.059 GeV/c2 (MS-bar scheme).

Measurement of neutrino production of coherent mesons uniquely elucidates the
space-time structure of the weak current, provides a clear probe to test the conserved vector current (CVC), and conveys the 'hadronic-content' of the weak current. Once in every few hundred interactions, a high energy neutrino
scatters coherently off the target nucleus producing a Rho meson, emitted collinearly with the incident neutrino, while the nucleus remains intact. Kinematically, the interaction is a very low four-momentum and high hadronic energy transfer process. In Neutral Current (NC) this results in a ρ0 and in Charged Current (CC) in a ρ+, where the two are related via the weak mixing angle. Using the NOMAD light target data, corresponding to a sample of $1.44M νμ-CC events in the energy range 2.5 - 300 GeV, we have conducted analyses of coherent ρ production in NC and CC. Clear signals are observed in both NC and CC. We report the rate of coherent ρ0 and ρ+ with respect to νμ-CC. The precision on coherent ρ+ is the best among all reported neutrino-induced coherent mesons to date.

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