

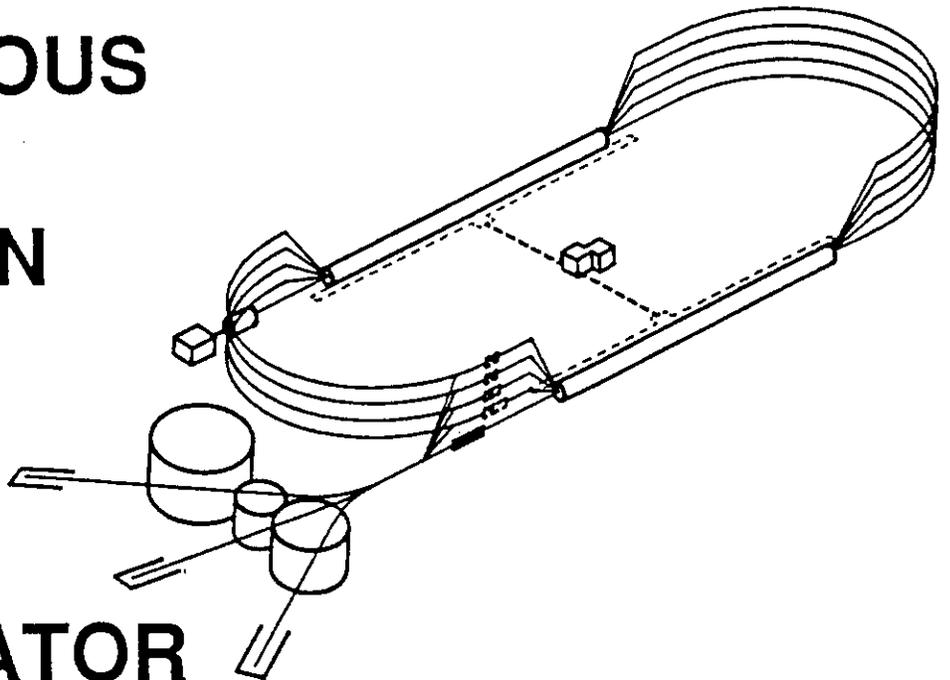
Nuclear Effects In Vector Meson
Production By Lepton Scattering Off Nuclei

Carlos W. Salgado
Norfolk State University
Norfolk, VA 23504 , USA

and

CEBAF, 12000 Jefferson, Newport News,
VA, 23606, USA

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Newport News, Virginia

NUCLEAR EFFECTS IN VECTOR MESON PRODUCTION BY LEPTON SCATTERING OFF NUCLEI

Carlos W. Salgado ^{a b}
Norfolk State University,
Norfolk, VA 23504, USA
and
Continuous Electron Beam Accelerator Facility,
Newport News, VA 23606, USA

Experiment 665, at the Fermilab 465 GeV muon beam-line, studies exclusive vector meson production (ρ , ρ') by coherent and incoherent muon scattering off light (H_2 , D_2) and heavy (C, Ca, Pb) targets. Color transparency (CT) effects in exclusive vector meson production are addressed. In ρ production, the data showed a behavior consistent with the predictions of color transparency. A new idea for testing nuclear color transparencies through the regeneration in nuclear matter of mesonic radial excitations is explored. Preliminary results on the ρ radial excitation (ρ') production are presented.

1 Introduction

Exclusive nuclear lepto-production of vector mesons has been used recently to test Color Transparency (CT)[?] by the Fermilab E665 Collaboration[?]. Quantum Chromodynamics (QCD) predicts, under certain circumstances, the absence of final-state interactions (FSI) in hard exclusive processes. CT is expected when the out-going hadron is in a point-like-configuration (PLC). E665 kinematics is appropriate for these studies since the produced vector mesons are in PLC for most of their nuclear trajectories. E665 measurements of incoherent exclusive ρ^0 production off heavy and light nuclei showed that nuclear attenuation decreases as Q^2 increases, as suggested by Color Transparency[?].

In this contribution we study another possible signature for CT, in exclusive lepto-production of the ρ^0 radial excitation. It has been argued[?] that the phenomenon of CT will lead to the scanning of the wave function of vector mesons. In incoherent production of radial excitations (ρ'), where the wave function has a node, Nemchik et al.[?] predict that transparencies (T), defined as the cross-section-per-nucleon ratio between the production off a heavy target (A) and that off a light target (H_2 or C), will be increasing with A. (whereas transparencies decrease with A for incoherent ρ^0 production). Results for coherent production are not yet available. They also predict that the ρ'/ρ^0 cross

^aRepresenting the Fermilab E665 Collaboration

^bPresented at the HADRON '95 Conference, Manchester, England, June, 1995.

3 Results

For a preliminary test on the CT effects in the production of radial excitations, two samples were selected: a high-mass (HM) sample from masses greater than 1600 MeV, and a low-mass sample (LM) from masses less or equal than 1600 MeV [enriched on $\rho(1450)$]. Production ratios between the HM, LM samples and the coherent $\rho(770)$ sample versus Q^2 are shown in Figure 2 for the Ca target. The LM sample shows ratios rapidly increasing with Q^2 , although the HM sample is somehow flatter. Figure 3 shows transparencies (T), defined respect to the C target, for coherent ρ (HM+LM) and $\rho(770)$ versus the atomic number (A) of the target. Both samples present similar behaviors.

In summary, we observed signals consistent with the production of the $\rho(1450)$ and $\rho(1700)$ in the coherent 4π channel. These preliminary studies show an increase in the $\rho/\rho(770)$ with Q^2 but not differences between the ρ' and $\rho(770)$ nuclear attenuations.

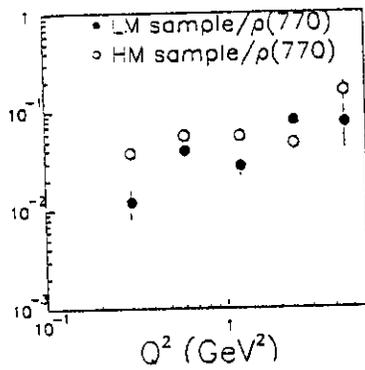


Figure 2: ρ'/ρ vs Q^2

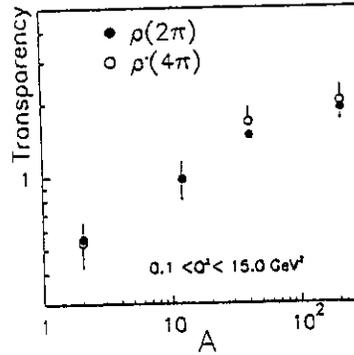


Figure 3: T vs A.

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