Studying the Medium Effects of the \( \omega \) and \( \phi \) Mesons at JLab

MICHAEL WOOD, Canisius College, RAKHSNA NASSERIPOUR, George Washington University, CHADEN DJALALI, University of South Carolina, DENNIS WEYGAND, Thomas Jefferson National Accelerator Facility, CLAS COLLABORATION — The E01-112 experiment at Jefferson Lab (JLab) in Newport News, VA, USA is an investigation of the properties of the \( \rho \), \( \omega \), and \( \phi \) mesons in dense nuclear matter. The vector mesons are produced by a high-intensity photon beam, with energies up to 4 GeV, incident on targets ranging from \(^2\text{H}\) to Pb. Using the CEBAF Large Acceptance Spectrometer (CLAS) in Hall B at TJNAF, the mesons are reconstructed by means of their rare leptonic decay to \( e^+e^- \), eliminating any hadronic final state interactions. These data make possible an analysis of the in-medium widths of the \( \omega \) and \( \phi \) mesons. The in-medium widths can be accessed by measuring the amount of absorption inside the nucleus. An increase in the in-medium \( \omega N \) and \( \phi N \) cross sections leads to an increase in the number of absorbed mesons. The signature of absorption is a decrease of the nuclear transparencies as a function of the number of target nucleons. The results indicate a substantial widening of the \( \omega \) and \( \phi \) mesons in the medium. The CBELSA/TAPS Collaboration has published transparency ratios for the channel \( \omega \to \pi^0\gamma \), that also shows an increase in the in-medium width. The JLab results show a greater absorption than what was measured by CBELSA/TAPS.

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