THE IN-MEDIUM WIDTHS OF THE ω AND ϕ MESONS IN NUCLEI

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An experiment with the ρ, ω, and ϕ mesons in nuclei at temperatures near zero provides two ways to study medium modifications. The ρ meson, with a $c\tau$ less than the radius of a heavy nucleus, will predominantly decay inside the nucleus in its modified state. For ω and ϕ mesons, the lifetimes are long enough that almost all will decay outside the nucleus in their unmodified states. However, while these latter mesons are traveling through the nucleus, they are suspected to be modified. Therefore, their interactions with the nucleons are predicted to change. The in-medium widths can be accessed by measuring the amount of absorption inside the nucleus. The signature of absorption is a decrease of the nuclear transparencies as a function of the number of target nucleons. This talk will focus on the ω and ϕ mesons. The E01-112 experiment at the Thomas Jefferson National Laboratory in Newport News, VA, USA was an investigation of the properties of light vector mesons in dense nuclear matter. The ρ, ω, and ϕ mesons were photo-produced of off targets ranging from ^{2}H to Pb and were reconstructed, via their rare leptonic decay to e^+e^-, with the CEBAF Large Acceptance Spectrometer (CLAS). Hadronic final state interactions were eliminated by the leptonic decay channel. The tagged photon beam contained energies up to 4 GeV. The results indicate a substantial widening of the ω and ϕ mesons in the medium.