Nuclear Theory

Low energy $\omega(\to \pi^0 \gamma)$ meson photoproduction in the nucleus

Swapan Das

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The $\pi^0 \gamma$ invariant mass distribution spectra in the $ (\gamma, \pi^0 \gamma) $ reaction were measured by TAPS/ELSA collaboration to look for the hadron parameters of the ω meson in Nb nucleus. We study the mechanism for this reaction, where we consider that the elementary reaction in Nb nucleus proceeds as $ \gamma N \to \omega N; ~ \omega \to \pi^0 \gamma $. The ω meson photoproduction amplitude for this reaction is extracted from the measured four momentum transfer distribution in the $ \gamma p \to \omega p $ reaction. The propagation of the ω meson and the distorted wave function for the π^0 meson in the final state are described by the eikonal form. The ω and π^0 mesons nucleus optical potentials, appearing in the ω meson propagator and π^0 meson distorted wave function respectively, are estimated using the "$t\varrho$" approximation. The effects of pair correlation and color transparency are also studied. The calculated results do not show medium modification for the ω meson produced in the nucleus for its momentum greater than 200 MeV. It occurs since the ω meson dominantly decays outside the nucleus. The dependence of the cross section on the final state interaction is also investigated. The broadening of the ω meson mass distribution spectra is shown to occur due to the large resolution width associated with the detector used in the experiment.

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