Medium Effects on Pion Production in Proton-Nucleus Collisions ◇

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A scaling relation between the experimental total pion-nucleus cross sections and the energy spectra from proton-nucleus $A(p,n)$ inclusive reactions at $\theta_n = 0$, in the $\Delta(1232)$–energy region, is established. This relation is used for the estimation of the contribution coming from the decay of the Δ-*exotic nuclear collective states* (ENCS) in the $\Delta(1232)$–resonance region. The differential cross sections of the *nuclear pionic Cherenkov–like radiation* (NPICR), at proton kinetic energies between 1-3 GeV, are also given for the first *pionic Cherenkov band*. Then, it is shown that the pion spectrum from the coincidence measurement for the $^{12}\mathrm{C}(p,n\pi^+)$ reaction can be explained by the sum of all essential contributions: NPICR+ENCS+$^{12}\mathrm{C}(p,n\pi^+n)$. A substantial increase of the pionic ratio NPICR/ENCS can be expected in experiments on heavy nuclei.

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