

Xi nuclear constraints from recent Ξ^{Λ} - capture events in emulsion

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All five KEK and J-PARC two-body $\Xi^- + {}^A\text{Z} \rightarrow \text{twin-}\Lambda$ capture events in light emulsion nuclei are consistent with Coulomb-assisted $1p_{\Xi^-}$ nuclear states. The underlying Ξ -nuclear potential is strongly attractive with nuclear-matter depth $V_{\Xi} \geq 20$ MeV [1], considerably larger than suggested by recent LQCD, femtoscopy and EFT theoretical studies.

We argue that the J-PARC E07 new ${}^{14}\text{N}$ capture events [2] assigned to $1s_{\Xi^-}$ nuclear states, thereby implying considerably shallower V_{Ξ} , have also another interpretation as $1p_{\Xi^0}$ nuclear states [3].

[1] E. Friedman, A. Gal, Constraints on Ξ^- nuclear interactions from capture events in emulsion, Phys. Lett. B 820,136555 (2021).

[2] M. Yoshimoto et al. (J-PARC E07 Collab.), First observation of a nuclear s -state of Ξ hypernucleus, ${}^{15}_{\Xi}\text{C}$, Prog. Theor. Exp. Phys. 2021, 073D02 (2021).

[3] E. Friedman, A. Gal, Has J-PARC E07 observed a Ξ_{1s}^- nuclear state?, Phys. Lett. B 837, 137640 (2022).

Collaboration

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