

Trapping of Σ^+ hyperons in nuclei

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Collaboration

Abstract content

The nuclear capture of K^- studied by FINUDA [1] in reaction $K^- {}^6\text{Li} \rightarrow \Sigma^+ \pi^- A'$ discovered a puzzling low momentum component in the spectrum of final Σ^+ hyperon. This component does not exist in the Σ^- emission. We interpret it as the effect of Gamov state formed by the hyperon. Such state is quasi-localized in space with a radius in between the hyper-nuclear and the hyper-atomic radius. The experimental and theoretical consequences of this discovery are studied. First, to create Gamov state the nuclear potential has to be attractive and close to the binding. Such conditions are likely in He. In light nuclei, the Gamov state happens at energies of few hundred KeV but widths of such states are in MeV region. The shape of hyperon momentum distribution yields information on the related width and hence on the strength of hyperon absorption in nuclei. There are other experimental indications of related low energy “anomaly” known from old emulsion studies [2]. If this phenomenon is supported with measurements in heavier nuclei it may open a new chapter in the hypernuclear studies.

[1] M. Angelo for FINUDA arXiv 1109.6594v1, Phys. Lett. B704 (2011) 474-480

[2] D. F. Kane Dublin University Thesis

Primary author(s) : WYCECH, Sławomir (National Centre of Nuclear Studies , Poland)

Presenter(s) : WYCECH, Sławomir (National Centre of Nuclear Studies , Poland)

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