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Search for mesic nuclei in the photoproduction of η and η' mesons off light nuclei

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For the understanding of the strong nuclear force, the interaction of mesons with nuclei is important. In case of long lived charged mesons, like π and K , secondary beams can be used for experiments. But the situation is different for the short lived neutral mesons, like η and η' . The only access is indirect, making use of final-state interaction. The mesons are produced with some initial reaction in the nucleus and then their interaction with the same nucleus is studied. It is much discussed whether it is possible to form, via the strong interaction, quasi-bound states of mesons and nuclei, which would be the ideal tool for such studies. Experimentally, signatures for such states have been sought in the threshold behavior of meson production reactions, using different probes. We will present results from the Crystal Ball/TAPS experiment at the Mainz MAMI accelerator for coherent photoproduction of neutral mesons, showing strong threshold enhancement in particular for the ${}^3\text{He}$ case and discuss their relevance for the formation of an η -mesic state. Furthermore a first attempt has been made to measure the threshold behavior of the photoproduction of η' mesons from the ${}^3\text{He}$ and ${}^2\text{H}$. Preliminary results will be discussed.

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