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Exploring Neutron stars EoS with coherent π0 π0 photoproduction at A2@MAMI

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Recent measurement of coherent π0 photoproduction on Pb lead to a most accurate determination of the neutron skin, constraining nuclear matter Equation of State (EoS) at around ρ˜1ρ0. A natural next step is elucidating the nuclear EoS at higher densities to tune our understanding of the most violent process in the Universe - neutron stars mergers. It was demonstrated that at densities above ˜3ρ0 dibaryonic degrees of freedom come into play [1]. The work presented in this talk is aiming to improve our knowledge of dibaryon behaviour in dense nuclear matter by measuring coherent π0π0 photoproduction off Ca-40/48 nuclei. The experiment was performed at the A2@MAMI facility in Mainz (Germany). The goal of the analysis is to identify the first genuine hexaquark, the d*(2380), photoproduction on nuclei. We are expecting to determine the medium modifications of the d*(2380) in nuclear matter and constrain its couplings [2]. These new results will further improve our understanding of the neutron stars equation of state and allow precise determination of the maximum neutron star mass as well as provide key ingredients for calculation of the neutron stars merger dynamics. Also, an interplay between the hexaquark, quark-gluon and hyperon degrees of freedom in the EoS of a dense nuclear matter will be discussed. The effective coupling constants obtained in this experiment can further constrain the possibility of hexaquark condensate dark matter [3].

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