Société Française de Physique

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Experimental study of baryon resonances in nuclei

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Baryon resonances (3-quark states) occurred in the micro-second old universe during the transition between the Quark Gluon Plasma and the confinement of quarks and gluons in nucleons. Their properties (mass, life time, branching ratios,⋯) can be determined through nucleon excitations using electron, photon or hadron beams, providing a unique source of information on Quantum ChromoDynamics (QCD), the fundamental theory of the strong interaction. Baryon resonances also play a major role in nuclear matter studies at center-of-mass energies of a few GeV per nucleon.
Pion-nuclei reactions allow for a study of the behavior of baryon resonances in nuclei. An experiment has been performed by the HADES (High Acceptance Dielectron Spectrometer) collaboration at the GSI accelerator facility in the second resonance region (masses around 1.5 GeV) using polyethylene (C2H4) and carbon targets. The measurements on the carbon target have been used to extract, using a subtraction, data for pion-nucleon interactions . In the energy domain covered by our experiment, baryon resonances (N(1440), N(1520), N(1535)) are excited and their behavior in nuclear matter is completely unknown. Although pion-nucleon reactions are a crucial tool to study baryon resonances, the data basis is very scarce. The combination of the HADES set-up and of the GSI pion beam is unique in the world for providing the missing data for baryon spectroscopy.
In this talk, I will present some preliminary results from the data analysis of pion and proton spectra measured in pion-carbon reactions at center-of-mass energies around 1.5 GeV.

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