International Nuclear Physics Conference INPC2013: 2-7 June 2013, Firenze, Italy

Kaon-Nucleon interaction: what can we learn from experiments?

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The study of hadron properties within nuclear matter, at a finite temperature and density, have been addressed from theory and experiments with the main aim to connect those to possible signatures of the of chiral symmetry restoration.
In particular, hadrons containing strangeness have been measured in heavy ion collisions and proton induced reaction at intermediate energies (1-2 AGeV) and the study of their kinematic variables has allowed to determine the in-medium modified mass for K^+ and K^0_S, while this search is still on going for K^-. In general, an attractive potential is predicted among K^- (Lambda) and nucleons, while a repulsive effect has been measured for K^+ and K^0_S. To this end, the interpretation of the collected data is rather model dependent and makes use of the prediction by transport models. On the other hand, the issue of the K^- Nucleon interaction is addressed by forming kaonic atoms in high precision experiments which are directly comparable to effective unitarized chiral theories and by studying the properties of the Lambda(1405) resonance, which is described by theory as a molecular stare either a K^- - proton or a pi - Sigma states. Indeed, the presence of the Lambda(1405) resonance, close to the K^- - Proton threshold, influences greatly the kaon spectral function in matter and it is hence linked to the studies of Kaon-Nucleus interaction.
In this talk, the current status of the studies of strange hadron production in heavy ion collisions at intermediate energies, the latest findings on the properties of the Lambda1405 and its connection to the precision measurement of kaonic hydrogen will be presented. Future measurements exploiting pion beams will be discussed as fundamental to unravel some basic properties and the impact of these kind of results for models for neutron stars will be addressed.