HK 27 Theorie

Zeit: Dienstag 14:00–16:00 Raum: TU MA005

HK 27.1 Di 14:00 TU MA005

Volume dependences from lattice chiral perturbation theory — •B. Borasoy[1] and R. Lewis[2] — [1]Helmholtz-Institut für Strahlen- und Kernphysik (Theorie), Universität Bonn, Germany — [2]Department of Physics, University of Regina, Canada

The physics of pions within a finite volume is explored using lattice regularized chiral perturbation theory. This regularization scheme permits a straightforward computational approach to be used in place of analytical continuum techniques. Using the pion mass, decay constant, form factor and charge radius as examples, it is shown how numerical results for volume dependences are obtained at the one-loop level from simple summations [1].

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[1] B. Borasoy and R. Lewis, hep-lat/0410042;
B. Borasoy, R. Lewis and D. Mazur, hep- lat/0408040.

HK 27.2 Di 14:15 TU MA005

Coupled-channel analysis of the associated strangeness production in πN and γN reactions in up to 2 GeV energy region — •Vitaliy Shklyar, Horst Lenske und Ulrich Mosel — Institut für Theoretische Physik, Universität Giessen, Germany

We study the $(\gamma/\pi)N \to K\Lambda, \Sigma$ reactions in the energy region from the reaction threshold up to 2 GeV to investigate the role of the nucleon resonances in the associated strangeness production. The production mechanism is described within a coupled-channel effective Lagrangian approach developed in [1,2] where all rescattering effects in the πN, $2\pi N$, ηN, ωN, $K\Lambda$, and $K\Sigma$ channels are simultaneously treated to describe the experimental data. To account for the resonance contributions to the reaction prosess we include all known nonstrange states [2] with spin-$\frac{1}{2}$,-$\frac{3}{2}$,and-$\frac{5}{2}$ and masses below 2 GeV. The role of the nucleon resonance contributions to the $K\Lambda$ and $K\Sigma$ final states is highlighted and obtained results are discussed. Work supported by FZ Jühlich.

[1] G. Penner and U. Mosel, Phys. Rev. **66**, 055212 (2002).
[2] V. Shklyar, G. Penner, and U. Mosel, Eur. Phys. J. **A21**, 445,(2004).
[2] K. Hagiwara *et al.*, Phys. Rev.**D66**, 010001,(2002).

HK 27.3 Di 14:30 TU MA005

Canonical suppression in microscopic and stochastic transport models — •Oliver Fochler, Sascha Vogel, Marcus Bleicher, and Carsten Greiner — Institut für Theoretische Physik, Johann Wolfgang Goethe Universität Frankfurt am Main, 60054 Frankfurt am Main

It is investigated whether current microscopic transport models are able to reproduce a canonical suppression of conserved quantities for small reaction volumes correctly. A suppression in the yields especially for strange hadrons due to small reaction volumes has been theoretically advocated within thermal hadron gas descriptions over the last twenty years. This might be particularly important to understand the recent experimental results for strange particle production in heavy ion collisions at SIS and for non-central collisions at SPS energies. We have therefore simulated a pion-gas having a volume-limited production and annihilation crosssection for $\pi\pi \leftrightarrow K\bar{K}$ using both a microscopical and a stochastical transport model. The kaons are restricted to a given volume, whereas the pions can diffuse freely within a much larger heat bath. It is found that the microscopic transport description can account for the canonical suppression of U(1)-conserved charges.

HK 27.4 Di 14:45 TU MA005

Hartree-Fock and RPA model based on correlated realistic nucleon-nucleon potentials — •Nils Paar, Panagiota Papakonstantinou, Robert Roth, and Heiko Hergert — TU-Darmstadt

The spherical Hartree-Fock model is formulated in the harmonic oscillator basis, starting from the realistic nucleon-nucleon interactions with explicit treatment of interaction-induced correlations via the unitary correlation operator method (UCOM). The binding energies, charge radii, one-body density distributions, and single-particle energies are evaluated along the nuclide chart, to investigate the utility of the model for a consistent description of the nuclear ground state. It is shown that one can improve the structure properties by extending the model space to include the long-range correlations (e.g. many-body perturbation theory), and by implementing an additional phenomenological two-body correction, which simulates the missing three-body interactions. For the studies of collective excitation phenomena, the fully self-consistent random phase approximation is formulated in the configurational space built from the Hartree-Fock single-particle basis.

Work supported by the DFG (SFB 634).

HK 27.5 Di 15:00 TU MA005

Exclusive two pion production — •Nikolaus Warkentin[1], Dmitri Ivanov[2], and Andreas Schäfer[1] — [1]Institut fuer Theoretische Physik,Universitaet Regensburg, D-93040 Regensburg — [2]Sobolev Institute of Mathematics RAS, Novosibirsk 630090, Russia

The recent HERMES data for the exclusive two pion production are in good agreement with theoretical predictions at leading order. This and the expectation of new data from the COMPASS experiment motivated us to analyze the angular distribution in the process of exclusive electroproduction of pion pairs, using the collinear factorization approach at next-to-leading order.

The project is supported by BMBF.

HK 27.6 Di 15:15 TU MA005

Finite Volume Effects of Baryon Properties — •Tim Wollenweber and Thomas R. Hemmert — Technische Universität München

To compare lattice QCD simulations to chiral extrapolations, we utilize Chiral Effective Field Theory with explicit delta degrees of freedom. We calculate the volume dependence of the nucleon mass at $\mathcal{O}(\epsilon^3)$ in the smale scale expansion extending the work of [1]. We also present a calculation for the difference between the finite and infinite volume of the nucleon axial coupling constant g_A in the same formalism extending the work of [2].

[1]A. Ali Kahn et al.,(QCDSF-UKQCD collaboration), Nucl.Phys.B689:175-194,2004.

[2] T. R. Hemmert, M. Procura and W. Weise Phys. Rev. D68, 075009 (2003).

HK 27.7 Di 15:30 TU MA005

In-medium properties of $N(1535)$ in chiral models probed by η mesic nucleus — •Daisuke Jido[1], Hideko Nagahiro[2], and Satoru Hirenzaki[2] — [1]Phyisik-Department, Technische Universität München,James-Franck-Strasse, D-85747 Garching — [2]Department of Physics, Nara Women's University, Nara 630-8506, Japan

In this talk, we discuss in-medium properties of the $N(1535)$ resonance within two kinds of chiral models, chiral doublet model and chiral unitary model, and investigate the formation of the η-nucleus bound systems (η mesic nuclei) under N^* dominance hypothesis in the η-nucleon system. The two chiral models are based on different physical pictures of the $N(1535)$ resonance and give distinct consequences of the in-medium properties of $N(1535)$. The chiral doublet model suggests a reduction of the mass difference of the nucleon and $N(1535)$ in nuclear medium, and it turns the η optical potential to be repulsive at center of nucleus. On the other hand, $N(1535)$ in the chiral unitary model is insensitive to the medium effect and the η optical potential is to be attractive. In order to see the physical implications of these consequences, we show the formation rates of the η mesic nuclei calculated with the η optical potentials based on these chiral models. We find a clear difference in the global shapes of the formation spectra, which will be distinguished in experiment.

[1] D. Jido, H. Nagahiro and S. Hirenzaki, Phys. Rev. C **66** (2002) 045202; H. Nagahiro, D. Jido and S. Hirenzaki, *ibid.* **68** (2003) 035205.

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HK 27.8 Di 15:45 TU MA005

Dirac operator for two color QCD at nonzero chemical potential vs matrix models — •Harald Markum[1], Gernot Akemann[2], Elmar Bittner[3], Maria-Paola Lombardo[4], and Rainer Pullirsch[1] — [1]Atominstitut, Technische Universität Wien, Austria — [2]Department of Mathematical Sciences, Brunel University West London, UK — [3]Institut für Theoretische Physik, Universität Leipzig, Germany — [4]INFN - Laboratori Nazionali di Frascati, Italy

We investigate the eigenvalue spectrum of the staggered Dirac matrix in two color QCD at finite chemical potential. The profiles of complex eigenvalues close to the origin are compared to a complex generalization of the chiral Gaussian Symplectic Ensemble, confirming its predictions for weak and strong non-Hermiticity. They differ from the QCD symmetry class with three colors by a level repulsion from both the real and imaginary axis.