HK 39: Struktur und Dynamik von Kernen

Zeit: Donnerstag 14:00–16:00 Raum: HZ 4

Gruppenbericht HK 39.1 Do 14:00 HZ 4

Microscopic description of α-cluster states in ^{12}C — •Thomas Neff and Hans Feldmeier — GSI Helmholtzzentrum für Schwerionenforschung GmbH, Darmstadt, Germany

The structure of ^{12}C is investigated, using both a microscopic α-cluster model and fermionic molecular dynamics (FMD) where individual nucleons are considered as degrees freedom. In the FMD calculation an effective realistic interaction derived in the unitary correlation operator method (UCOM) is employed. By explicitly including ^{8}Be+α channels resonances and scattering states above the three-α threshold can be investigated. Of particular interest are the second 0^+ state, the famous Hoyle state, and the second 2^+ state. Monopole and quadrupole transition strengths are analyzed and compared to experiment.

HK 39.2 Do 14:30 HZ 4

Phase-space representation for nuclear potentials — •Dennis Weber[1,2], Hans Feldmeier[2,3], and Thomas Neff[2] — [1]ExtreMe Matter Institute EMMI and Research Division — [2]GSI Helmholtzzentrum für Schwerionenforschung, Planckstraße 1, 64291 Darmstadt, Germany — [3]Frankfurt Institute for Advanced Studies, Max-von-Laue-Straße 1, 60438 Frankfurt, Germany

Many modern realistic nucleon-nucleon (NN) potentials are given in a momentum space matrix element representation. Although this momentum space representation can be used in most nuclear many-body calculations, it is desirable to study and visualize NN potentials in a more intuitive way as a function of the relative distance between two nucleons. We introduce a phase-space representation which depends on both, relative distance and relative momentum of the nucleons. This representation is employed to investigate realistic NN potentials and the effect of renormalization methods like the "Unitary Correlation Operator Method" (UCOM) and the "Similarity Renormalization Group" (SRG) with respect to momentum and angular momentum dependence.

HK 39.3 Do 14:45 HZ 4

Proton-proton elastic scattering measurements at COSY — •Zara Bagdasarian for the ANKE-Collaboration — Forschungszentrum Juelich, Juelich, Germany — Tbilisi State University, Tbilisi, Georgia

To construct the reliable phase shift analysis (PSA) that can successfully describe the nucleon-nucleon (NN) interaction it is necessary to measure variety of experimental observables for both proton-proton (pp) and neutron-proton (np) elastic scattering. The polarized beams and targets at COSY-ANKE facility allow a substantial contribution to the existing database. The experiment was carried out in April 2013 at ANKE using a transversely polarized proton beam incident on an unpolarized hydrogen cluster target. Six beam energies of T_p = 0.8, 1.6, 1.8, 2.0, 2.2, 2.4 GeV were used. The aim of this talk is to present the preliminary results for the analyzing power (A_y) for the pp elastic scattering in the so-far unexplored 5< θ_{cm} <30 angular range. Our measurements are also compared to the world data and current partial wave solutions.

HK 39.4 Do 15:00 HZ 4

Normal spin asymmetries in the A4 experiment — •David Balaguer Rios — Institut fuer Kernphysik, Mainz, Deutschland

At the MAMI facilities the A4 Collaboration has measured the normal spin asymmetries in the elastic and quasielastic scattering of electrons on proton and deuteron, respectively, to have access to the imaginary part of the two-photon exchange amplitude. Here we present the measurements for the energies of 210, 315 and 420 MeV at backward angles and compare them with the model calculations.

HK 39.5 Do 15:15 HZ 4

Quasi-Free Scattering of Neutron-Deficient Carbon Isotopes in Inverse Kinematics — •Matthias Holl for the R3B-Collaboration — Institut für Kernphysik, Technische Universität Darmstadt, Germany

Quasi-free scattering reactions are a valuable tool to study single-particle properties of nuclei[1]. Particularly, they can be used to study absolute spectroscopic factors which appear to be quenched for deeply bound nucleons[2].
Quasi-free scattering of relativistic neutron-deficient isotopes has been studied in inverse kinematics during experiment S393 at the R3B-LAND setup. In this experiment, a radioactive beam coming from the fragment separator FRS was used to induce secondary reactions with a CH_2 target. The incoming beam as well as the reaction products were detected in kinematically complete measurements.
Results for the (p,2p) and (p,pn) reactions on ^{10,11}C will be shown and compared to results obtained for knockout reactions from these isotopes.

[1] G. Jacob and Th. A. J. Maris, Rev. Mod. Phys. 38 (1966) 121
[2] A. Gade et al., Phys. Rev. C 77 (2008) 044306

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HK 39.6 Do 15:30 HZ 4

Energy-variance extrapolation for importance-truncated no-core and valence-space shell model — •Christina Stumpf, Jonas Braun, Roland Wirth, and Robert Roth — Institut für Kernphysik, Technische Universität Darmstadt

The no-core shell model (NCSM) and valence-space shell model (SM) are successful tools for the description of the nuclear spectroscopy. Both methods are computationally demanding and are limited by the model-space dimensions. To extend the NCSM and SM to larger model spaces, we apply an importance-truncation (IT) scheme based on a perturbative importance measure reducing the model spaces to the relevant basis states for the description of one or a few target eigenstates. This IT scheme necessitates an extrapolation to vanishing importance measure. Since the dependence of the energies on the importance measure can be highly non-linear, the extrapolation can give rise to large uncertainties. We present a more sophisticated extrapolation technique based on the energy variance, which vanishes in the limit of the full model space. We demonstrate the efficiency of the IT-NCSM and IT-SM with energy-variance extrapolation for ground-state and excitation energies of p-shell nuclei (IT-NCSM) and pf-shell nuclei (IT-SM) by comparing the results to both, full and importance-truncated NCSM and SM calculations with the conventional threshold extrapolation.

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HK 39.7 Do 15:45 HZ 4

Three-nucleon forces and the spectroscopy of neutron-rich calcium isotopes* — •Johannes Simonis[1,2], Jason D. Holt[1,2], Javier Menéndez[1,2], and Achim Schwenk[2,1] — [1]Institut für Kernphysik, Technische Universität Darmstadt — [2]ExtreMe Matter Institute EMMI, GSI Helmholtzzentrum für Schwerionenforschung GmbH

We study excited-state properties of neutron-rich calcium isotopes based on chiral two- and three-nucleon interactions. Our results are based on a many-body perturbation theory approach combined with large-scale diagonalizations. In particular, we will focus on the impact of 3N forces on electromagnetic transitions including the investigation of theoretical uncertainties by means of cutoff variation and different sets of low-energy constants.

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