HK 1: Invited Talks 1

Time: Monday 11:30–13:00 Location: T/HS1

Invited Talk HK 1.1 Mon 11:30 T/HS1

Der Doppeltgammazerfall des $11/2^-$ Isomers in ^{137}Ba — •Christopher Walz[1], Tom Aumann[1], Vladimir Ponomarev[1], Norbert Pietralla[1], Ronan Lefol[1,2] und Heiko Scheit[1] — [1]Institut für Kernphysik, TU Darmstadt, Germany — [2]University of Saskatchewan, Canada

Der Doppeltgammazerfall eines angeregten Zustands ist ein elektromagnetischer Prozess zweiter Ordnung, der erstmals 1931 von M. Goeppert-Mayer diskutiert wurde. In der Kernphysik wurde er bisher nur für Übergänge nachgewiesen, bei denen der gewöhnliche γ-Zerfall verboten ist [1]. Wir berichten nun von einer ersten Messung [2] des Doppeltgammazerfalls des $11/2^-$ Isomers zum $3/2^+$ Grundzustand in ^{137}Ba in Konkurrenz zum erlaubten γ-Übergang von 662 keV. Mit Hilfe von fünf $LaBr_3$ Detektoren wurde das $\Gamma_{\gamma\gamma}/\Gamma_\gamma$-Verzweigungsverhältnis unter zwei Winkeln bestimmt. Aus den gemessenen Winkel- und Energieverteilungsfunktionen konnten die dominant beitragenden Multipole bestimmt werden. Ein Vergleich zu Rechnungen im Rahmen des Quasi-Particle Phonon Models wird präsentiert. Die Ergebnisse werden mit einem ähnlichen Experiment, welches am Brookhaven National Laboratory durchgeführt wurde, verglichen [3].

[1] J. Kramp et al., Nucl. Phys. A474 (1987) 412

[2] C. Walz, Dissertation, TU Darmstadt, 2014

[3] D.J. Millener et al., Bull. Am. Phys. Soc. 56(12), DNP.CF.8 (2011)

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Invited Talk HK 1.2 Mon 12:00 T/HS1

Advances in nuclear matter based on chiral effective field theory* — •Arianna Carbone — TU Darmstadt, Darmstadt, Germany

In recent years, great progress has been made in nuclear matter calculations at zero and finite temperature based on chiral two- and three-nucleon interactions. This is critical for understanding matter in neutron stars and for providing a reliable equation of state for core-collapse supernovae and neutron star mergers. In addition, the properties of nuclear matter, such as the symmetry energy, can constrain density functionals and global predictions of nuclei. In this talk, I will discuss recent advances in ab initio calculations using chiral effective field theory interactions, highlighting the role of three-nucleon forces for predicting realistic nuclear matter properties. In addition, I will discuss the theoretical uncertainties, how they can be improved in the future, and show how reliable nuclear theory constrains matter under astrophysical conditions.

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Invited Talk HK 1.3 Mon 12:30 T/HS1

Exploring the transverse structure of the nucleon at COMPASS — •Rainer Joosten — HISKP, Universität Bonn

In recent years, considerable theoretical and experimental progress has been made to study the partonic structure of nucleons beyond the standard collinear approach, accounting for transverse degrees of freedom. In the present theoretical framework, eight transverse momentum dependent parton distribution functions (TMDs) are required at leading twist for each quark flavor. They describe all possible correlations between the transverse momentum and spin of the quarks, and the spin of the nucleon. When integrating over the quark transverse momentum five of these functions vanish, while three of them give the known collinear density, helicity and transversity distribution functions.

Experimentally, Semi-Inclusive Deep Inelastic Scattering (SIDIS) is the main source of information. Requiring the detection of at least one final state hadron in coincidence with the scattered lepton, the chiral-odd transversity distribution as well as a variety of new TMDs could be accessed. In addition, the use of different targets and hadron identification allows for a flavor separation of the involved TMDs.

COMPASS is a fixed target experiment at the CERN SPS taking data since 2002. SIDIS data have been collected using a 160 GeV longitudinally polarized muon beam and longitudinally or transversely polarized proton and deuteron targets.

In this talk, selected results related to the transverse structure of the nucleon will be presented and the prospects of future COMPASS measurements accessing TMDs and GPDs will be assessed.