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The Distribution of Energy, Momentum, Angular Momentum and Mechanical Forces inside the Nucleon

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Abstract

The understanding of the internal structure of the proton and other strongly interacting particles is at the forefront of modern nuclear physics research. Generalized Parton Distribution Functions (GPDs) are a powerful tool to advance the understanding of the hadron structure. In addition to the information about the one-dimensional collinear momentum distributions of partons (quarks, anti-quarks, and gluons) known from studies of high energy deep-inelastic reactions, GPDs also carry information on the distribution of partons in the transverse plane, and allow us in this way to access the three-dimensional structure of the nucleon. GPDs can be studied in hard-exclusive reactions and contain also information on the energy-momentum tensor form factors which will allow us to gain insights on quantities like pressure or angular momentum distribution inside the nucleon. In this talk, we will discuss all leading-twist GPDs, energy-momentum tensor form factors and densities in the MIT bag model. This quark model provides a consistent theoretical framework to investigate many general concepts that have recently attracted interest, and allows one to study insightful limits like the large-Nc limit, heavy-quark limit, or the non-relativistic limit. Another important aspect of this talk will be the relation between the monopole and quadrupole contributions to the angular momentum density inside the nucleon.

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