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Understanding the Energy Momentum Distribution with the Weizsäcker-Williams Method

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Gravitational Form Factors (GFFs) provide an important portal for probing the energy-momentum and mass distribution of nucleons and nuclei. This work presents the study of photon and gluon momentum GFFs using the Weizsäcker-Williams method of relativistic hadrons.

First, we express the photon A-GFFs in terms of charge form factors and discuss the corresponding photon radius. Furthermore, we derive an integral relation between the gluon A-GFF and the Laplacian of the dipole scattering amplitude in the small-x framework. This relation allows us to unveil the gluon energy-momentum distribution inside hadrons through measurements at the upcoming Electron-Ion Collider.

Additionally, we generalize the analysis to study the A-GFF of nuclei and propose employing the nuclear gluon mean square radius, together with the charge distribution, to constrain the neutron distribution for large nuclei.

This work provides important insights into the energy-momentum and mass distribution of nucleons and nuclei, which are crucial for our understanding of the fundamental structure of matter and the strong interaction.

Primary author: XIAO, Bowen (The Chinese University of Hong Kong-(Shenzhen))

Presenter: XIAO, Bowen (The Chinese University of Hong Kong-(Shenzhen))

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