



The Proton Gluonic Gravitational Form Factors and its Mass Radius

Zein-Eddine Meziani
Argonne National Laboratory

The proton is one of the main building blocks of all visible matter in the universe. Among its intrinsic properties are its electric charge, mass, and spin. These emerge from the complex dynamics of its fundamental constituents, quarks, and gluons, described by the theory of quantum chromodynamics (QCD). Using electron scattering, its electric charge and spin, shared among the quark constituents, have been the topic of active investigation up to today. In contrast, little is known about the proton inner mass density, dominated by the energy carried by the gluons, which are hard to access through electron scattering since gluons carry no electromagnetic charge. In this talk, I will present recent results of a measurement of the near-threshold J/ψ photoproduction differential cross sections at Jefferson Lab. We determined the proton gluonic gravitational form factors and its mass radius from these cross sections. We find a proton mass radius notably smaller than the electric charge radius. This work together with future planned experiments paves the way for a deeper understanding of the salient role of gluons in providing gravitational mass to visible matter.

Tuesday, November 8th, 2022

4:00 pm

Lindley Hall room 321