

Exploring the gravitational structure of the proton with the dilepton final state using the CLAS12 detector at Jefferson Lab: from Timelike Compton Scattering to near-threshold J/Psi photoproduction

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The Gravitational Form Factors (GFFs) give access to the internal distributions of mass, pressure and shear force inside the proton. They were considered experimentally unmeasurable for decades due to the very weak gravitational interaction [1]. However, the Generalized Parton Distributions (GPDs), which describe the correlations between the longitudinal momentum and the transverse position of the partons inside the nucleon, have lately been related to the GFFs. For the first time, this relation gives the opportunity to extract GFFs experimentally. In this talk, I will present two ways to access GFFs using data taken in 2018 by the CLAS12 detector with a 10.6 GeV electron beam impinging on a liquid-hydrogen target. First, I will present the first measurement of the Timelike Compton Scattering reaction (the hard photoproduction of a lepton pair), that gives access to the quark GFFs via the angular asymmetry of the electron/positron pair [2]. I will then present the current effort to extract the near-threshold J/ ψ photoproduction cross section using the same dataset. This later measurement is expected to provide direct insight on the gluons GFFs of the proton.

[1] H. PAGELS. Energy-Momentum Structure Form Factors of Particles. *Phys.Rev.* 144 (1966) 1250-1260

[2] P. Chatagnon. First Measurement of Timelike Compton Scattering. *Phys.Rev.Lett.* 127 (2021) 26, 262501

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