LOI12-15-005: *"Measurement of Double Deeply Virtual Compton Scattering in the di-muon channel with the SoLID spectrometer"*

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This Letter of intent proposes to study deeply virtual exclusive electroproduction of a muon pair with the aim of obtaining information about generalized parton distributions $H(x, \xi, t)$ away from the line $x = \xi$.

The basic ideais that having, in the initial state, a spacelike photon with virtuality $q_1^2 = -Q_1^2 \equiv -(\xi + \eta)Q^2$ and producing, in the final state, a timelike photon with virtuality $q_2^2 = Q_2^2 \equiv (\xi - \eta)Q^2$, one would have access, through a single-spin asymmetry, to generalized parton distributions $H(\eta, \xi, t)$ (our notations ξ and η here differ from those used in the LOI). Since q_2^2 is the invariant mass of the muon pair, it should be positive, i.e. $\eta < \xi$, and $H(\eta, \xi, t)$ corresponding to values of a GPD in the central (or ERBL) region. This region is sensitive to the so-called D-term $D(\alpha, t)$ at the value $\alpha = \eta/\xi$, the knowledge of which is extremely desirable. In this connection, it is worth mentioning that in a dispersion relation approach, it is sufficient to know the "border function" $H(\xi, \xi, t)$ and the D-term $D(\xi, t)$ to get Compton form factors $\mathcal{C}(\xi, t)$. Also, knowing $H(\xi, \xi, t)$ and $D(\xi, t)$, one can formally reconstruct GPD $H(x, \xi, t)$ in the whole $-1 < x < 1$ region.

However, for the proposed extraction of $H(\eta, \xi, t)$ to succeed, one should be absolutely sure that the observed muon pair was not produced from a meson decay in the reaction $\gamma^* p \to M p \to \mu^+ \mu^- p$. This means that q_2^2 should be well above the resonance region, and that the statistics of the proposed setup is sufficient for a reliable extraction of a non-resonant signal.