Diffractive meson + lepton pair and two meson production at an electron-ion collider

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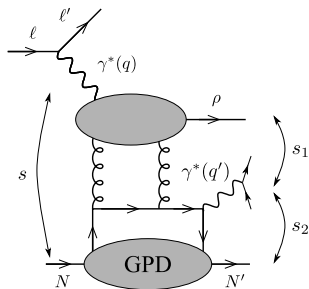
Florida International University

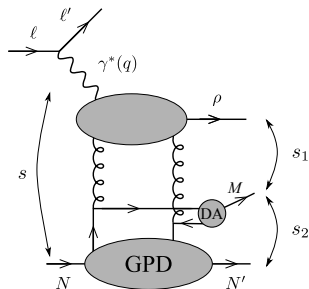DIS 2021

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Diffractive exclusive reactions: 2 case studies

- diffractive vector meson + dilepton pair (top) or 2nd meson (bottom)
- Large rapidity gap between diffractive ρ and other hadrons: $s_1 \ggg s_2 \ggg \Lambda_{QCD}^2$
- Hard scales Q^2, Q'^2 (top); $(q - p_\rho)^2$ (bottom) ensure small–sized dipole + GPD vertex
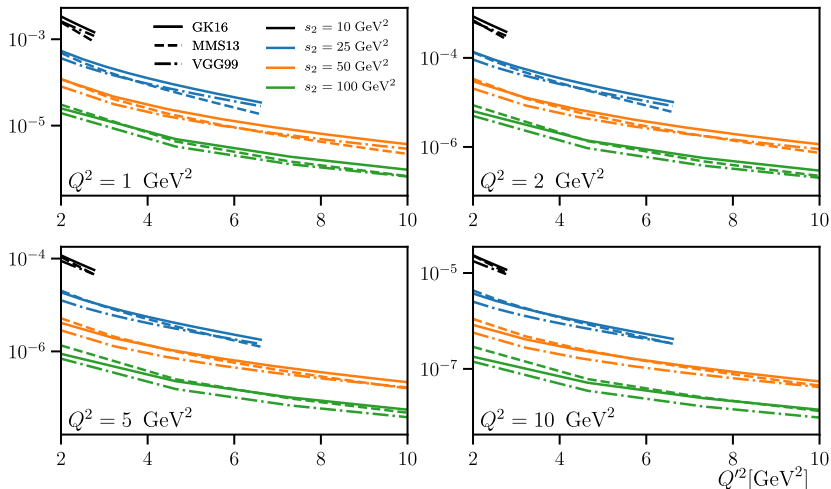
- **No gluon** GPD contribution (C–even)
- (virtual)photoproduction cross section **independent** of s
- Probes **ERBL** region of the GPDs
- In two meson case: probe **transversity** with polarized M_T
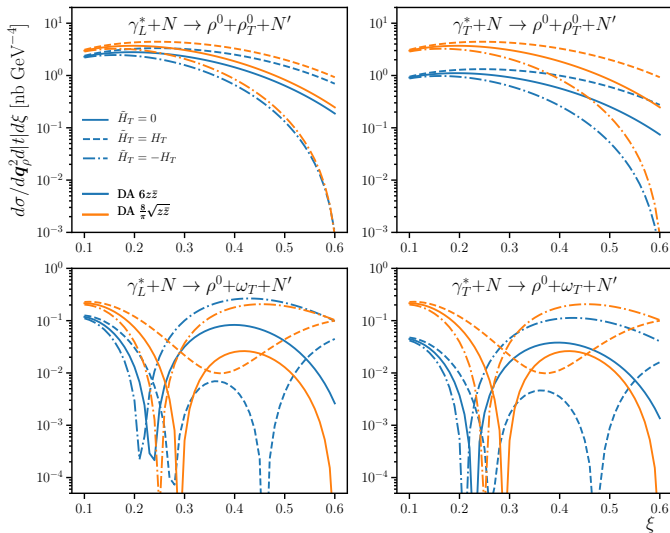
These studies

- LO amplitudes

- EIC context: IR with forward detectors

- GPD phenomenology: model input through PARTONS
  Berthou et al., EPJC 78 '18

- 2 DA forms: asymptotic / holographic

- Different two meson channels + proton/deuteron target
  (not shown here)

$d\sigma^{\gamma N}/dt_N dt_\rho dQ'^2 ds_2 [\text{pb}/\text{GeV}^{-8}]$

$\gamma^*_{L/T} + N \rightarrow \rho^0_L + (\rho^0_T/\omega_T) + N'$: Model input

[GK16 GPDs, $Q^2 = 1 \text{GeV}^2$, $t_\rho = -2.0 \text{ GeV}^2$, $t_N = t_N^{\min}$]

Conclusions and Outlook

- Both processes discriminate between GPD models

- ρ + dilepton rates too low, two meson more promising

- Theory extensions: higher order (BFKL Pomeron)

- Full simulations planned

- References:
  - ρ + dilepton:
    B. Pire, L. Szymanowski, S. Wallon, PRD101 '19

    WC, B. Pire, arXiv:2103.01411
  - two meson:
    WC, B. Pire, and L. Szymanowski, PRD 102 '20