Q^2 Dependent Meson Production

- Access to meson elastic and transition form factors
- Q^2 dependence is sensitive to the nature or structure of hadrons
  -- see CLAS Roper resonance studies
- At high luminosity can extend GlueX/MesonEx hybrid searches

A Partial Wave Formalism for High-Energy Meson Electroproduction

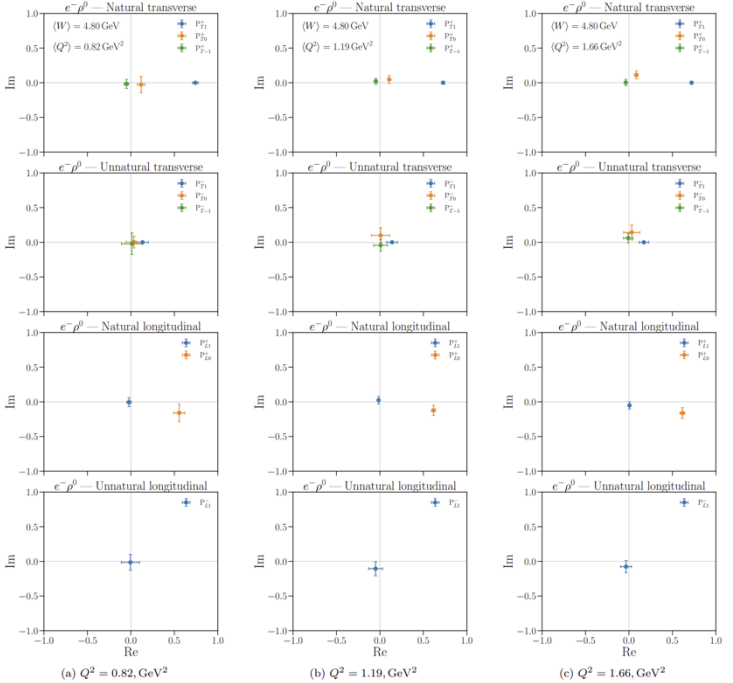
D. Leahy,[1] D. I. Glazier,[1] V. Mathieu,[2] M. Filippini,[3,4] D. G. Ireland,[1]
G. Montaña,[2] A. Pilloni,[3,4] B. Singh,[5] C. Velasquez,[6] and D. Winney[7]

arxiv paper

CLAS Collaboration Presentation

Full target (S_I) and recoil (S_R) polarisation formalism
- Spherical Harmonic Moments → SDMEs → Amplitudes

$$\frac{\mathrm{d}^5\sigma}{\mathrm{d}Q^2\,\mathrm{d}W\,\mathrm{d}t\,\mathrm{d}m\,\mathrm{d}\Phi} = \Gamma(Q^2, W) \sum_{\alpha,\beta,\delta} \Pi^{\alpha}(\Phi, P_l)\, S_I^{\beta}\, S_R^{\delta}\, \frac{\mathrm{d}^2\sigma^{\alpha\beta\delta}}{\mathrm{d}t\,\mathrm{d}m},$$

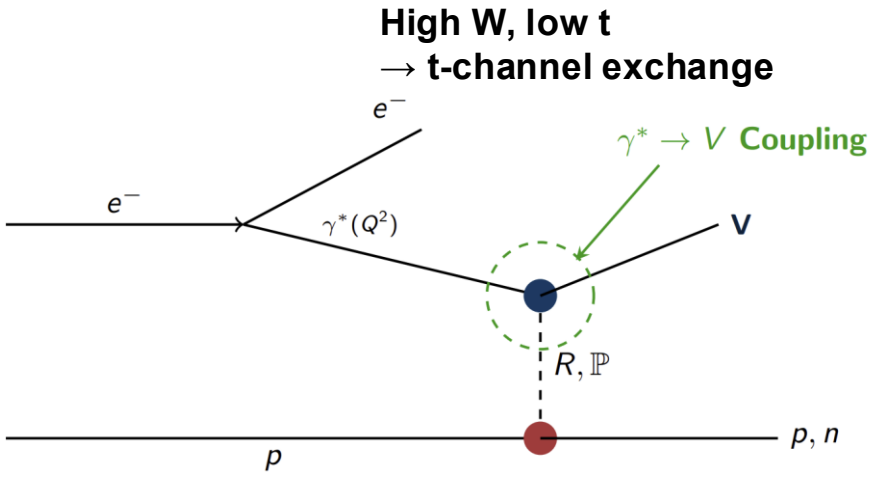


Amplitudes extracted from HERMES/COMPASS ρ leptoproduction SDMEs

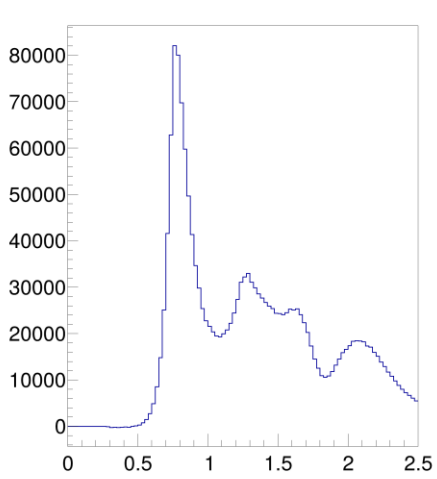
Q^2 Dependent Meson Production

2 Experiments provide complementary information
MesonEx – Photocouplings, consistency with GlueX
MesonQ2 – Q2 dependence of meson production (pseudoscalar, scalar, vector, tensor, … hybrid?)

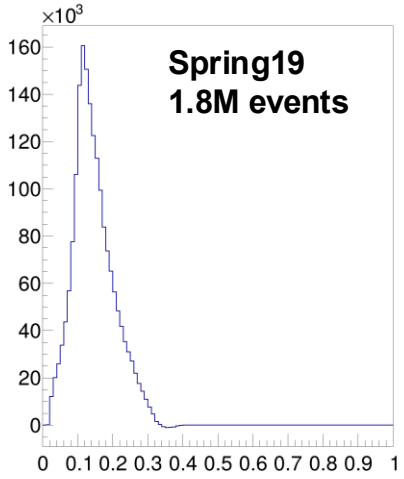
Requires high W (> 3GeV), high luminosity
+ Can also use polarised target data to constrain amplitudes



MesonEx with FT

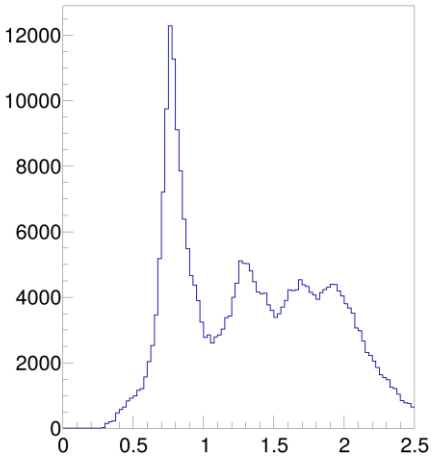


M(2π)

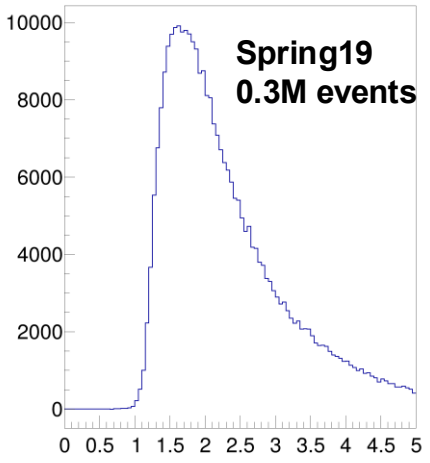


Q^2

MesonQ2 with FD



M(2π)



Q^2