QCD interpretation of diffraction in ep collisions

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With the results from the ep collider HERA, the topic of diffraction has drawn renewed attention. The traditional interpretation in terms of Regge theory is seen to fail when hard scales are involved, such as provided by large momentum transfers from the lepton or proton. At HERA, the colorless-exchange process is nowadays often analysed in terms of QCD and, since more than one parton is involved, the interpretation goes beyond leading-order QCD. A wealth of data is confronted with such models, be it the inclusive cross-section measurement over a wide kinematic range or exclusive final states as are accessible in the simple photon (DVCS) or vector-meson final states. In detail the following topics could be covered:

- Measurement of diffractive structure function, F_2^D, and QCD fits to the data; partonic structure of the colorless exchange.
- Energy dependence of diffractive and inclusive cross sections.
- Jet production in events with a large rapidity gap; distribution of jets and transverse energy flow in diffractive events.
- Charm production in diffractive deep inelastic scattering.
- Exclusive production of vector mesons, $\gamma p \to Vp(VN)$ including light (ρ, ω, ϕ) and heavy (J/ψ and Υ) mesons and the transition to large momentum transfers.
- Deeply virtual Compton scattering (DVCS) and generalized parton distribution functions.
- Leading proton and neutron measurements; pion structure function, F_2^π.