EDS 2009, 39 June 2009, CERN --Discussion panel

"What can we learn/expect from the LHC experiments?“ K. Goulianos

- goal…….understand the QCD basis of diffraction & discover new physics
- TEV2LHC…confirm, extend, discover…
- Tools…….larger $\sqrt{s}$ → larger σ, $\Delta\eta$ & E_T

TODO:

- Elastic, diffractive, and total cross sections
  - Important to study partial cross section components
    - ➔ need topology (multiplicity, E_T, …)
- Hard diffraction
  - diffractive structure function ➔dijets vs. W
  - Multigap configurations
  - Jet-gap-jet ➔ $d\sigma/d\Delta\eta$ vs. E_T^{jet}➔ BFKL, Mueller-Navelet

p-p Interactions

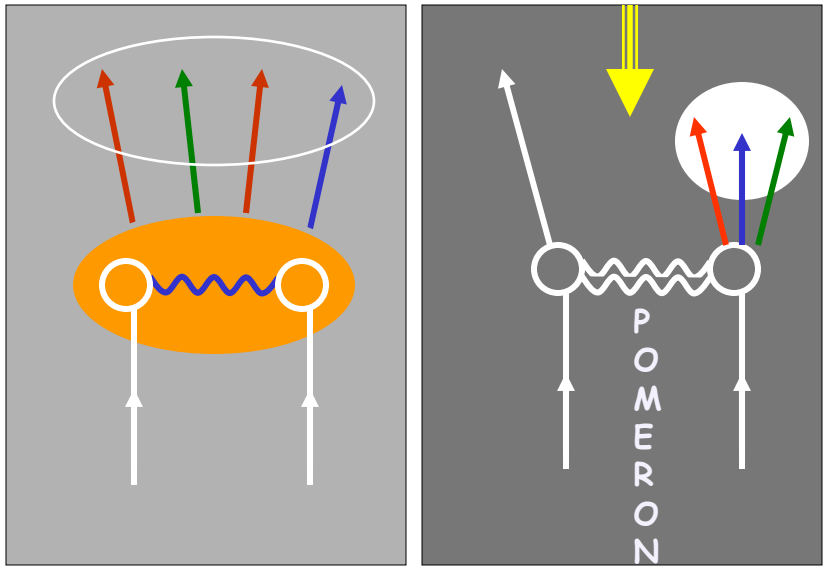
Non-diffractive:

Color-exchange

Diffractive:

Colorless exchange with vacuum quantum numbers

rapidity gap



Incident hadrons acquire color and break apart

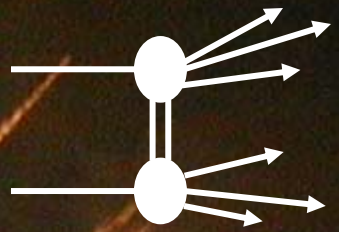
CONFINEMENT

Incident hadrons retain their quantum numbers remaining colorless

pseudo-DECONFINEMENT

Goal: understand the QCD nature of the diffractive exchange

Rapidity Gaps in Fireworks



Dark Energy

Non-diffractive interactions

Rapidity gaps are formed by multiplicity fluctuations:

$$P(\Delta y) = e^{-\rho \Delta y}; \quad \rho = \frac{dN_{particles}}{dy}$$

P(Δy) is exponentially suppressed

Diffractive interactions

Rapidity gaps at t=0 grow with Δy:

$$\Delta y \approx -\ln \xi = \ln s - \ln M^2$$

$$P(\Delta y)\big|_{t=0} \sim e^{2\varepsilon \Delta y}$$

2ε: negative particle density!

Gravitational repulsion?