

# *TeV4LHC Workshop*

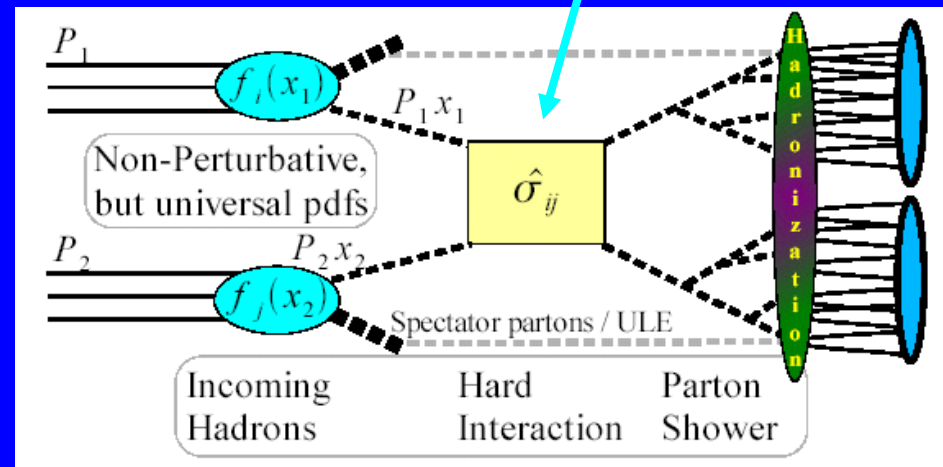
## *Forward and Diffractive Subgroup*

<b>Forward and Diffractive talks at BNL TeV4LHC</b>			
Room			
<b>Orange?</b>			<b>Thursday Feb 3rd 13:30 - 14:30 Diff Subgroup session</b>
	All	13:30	General TeV4LHC diff Discussion, incl. 420m project Informal. Mini-presentations?
<b>2_95</b>			<b>Thursday Feb 3rd during 13:30-18:00 QCD session</b>
	Mike Albrow	17:00	Introductory comments
	Dino Goulianos	17:10	Diffraction from CDF2LHC
	Michele Gallinaro	17:40	Exclusive Dijets from CDF2LHC
<b>Orange</b>			<b>Friday Feb 4th 13:30 - 15:30 Diff Subgroup session</b>
	Michael Albrow	13:30	Diffractive and DPE Production of Hard Color Singlets
	Brandt for Royon	13:50	Tests of QCD and the BFKL Pomeron with Forward Jets
	Sebastian White	14:10	Inelastic Diffraction at Heavy Ion Colliders
	Mark Strikman	14:30	Dynamics of Small Impact Parameter pp Collisions
	Christian Weiss	14:50	Gap Survival and Transverse Structure of the Nucleon
			<b>Friday Feb 4th during 16:00-18:00 QCD session</b>
<b>3_192</b>	Andrew Brandt	16:00	Diffractive Physics at D0
	Albert DeRoeck	16:20	Diffraction Beyond the Standard Model
	Greg Snow/remote	16:50	s-Dependent Studies at the Tevatron and the LHC

# QCD : Emphasis on perturbative – tests of hard processes



- Parton distributions in beam particles with scaling violations
- Initial and final state parton showers
- **Hard sub-processes**
- Beam remnants and “underlying event”
- Parton fragmentation
- Hadronization and hadron decays



**Theory where we can, modeling and tuning where we cannot.**  
**Not doing any “precision” (%) tests of PQCD here.**  
**Understanding PDFs and jets needed for jet spectroscopy etc.,**  
**(top, Higgs, SUSY, other BSM)      These are QCD “tools”**

# The REAL Strong Interaction



extended, strong coupling  
non-perturbative



point-like, weak coupling  
perturbative

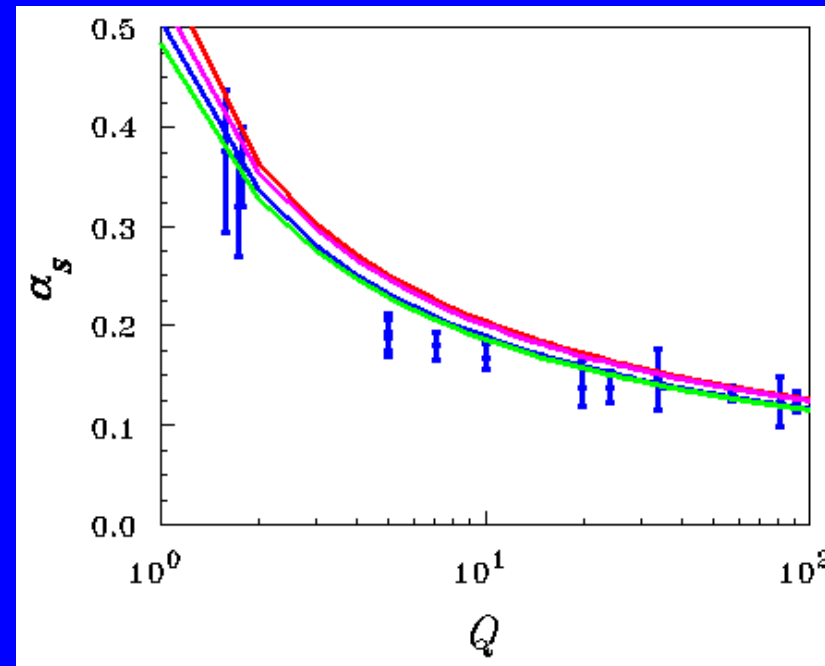
Many approaches, none complete:

→ Lattice Gauge Theory

Small volume, hadron size

→ Regge Theory: Analyticity +  
Unitarity + Crossing Symmetry  
+ Complex angular momenta

→ String models, etc.



Want a complete understanding of S.I.

$$Q^2 = 0 \rightarrow \infty$$

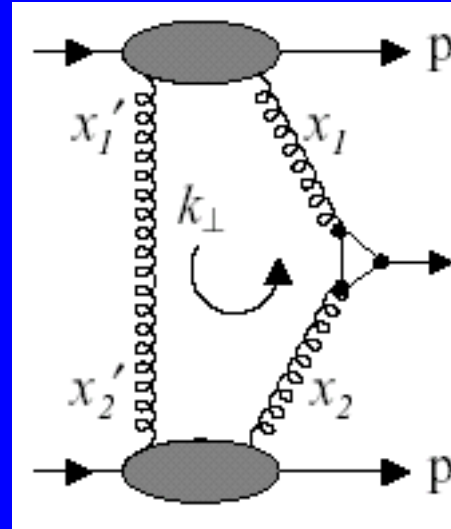
**Non-perturbative – perturbative transition**

High  $Q^2$  frontier more “searching for new (BSM) physics”  
than “testing QCD”

Low  $Q^2$  frontier is studying strong interactions (i.e. QCD)  
at large distances  $\rightarrow$  color singlets, diffraction, confinement (?)

Hard diffraction combines high and low  
 $Q^2$  in single interaction ... interplay instructive

Typical example:  
Central Exclusive Production



u-loop :  $\gamma\gamma$     c-loop :  $\chi_c^0$   
b-loop :  $\chi_b^0$     t-loop : H

$pp \rightarrow p H p$ ,  $pp \rightarrow p W^+ W^- p$ ,  $pp \rightarrow p ZZ p$ ,  
 $pp \rightarrow p \chi_{c,b}^0 p$ ,  $pp \rightarrow p \gamma\gamma p$

Hard diffraction (jets, W & Z, b, ..) – many Run 1 papers CDF & D0  
Even richer program in Run 2 with upgraded forward detectors  
**[talks by Brandt, Gallinaro, Goulianos, Royon/AB]**

It was/is a major part of HERA's physics  
It is important at RHIC/LHC Heavy Ions **[talk by White]**

At LHC new windows open up, certainly in QCD, perhaps BSM  
**[talks by Albrow, DeRoeck, Snow, Strikman, Weiss]**

e.g.

$$\begin{array}{l} M_{\max} \text{ (SDE)} \quad \sim 3 \text{ TeV (cf 450 GeV at TeV)} \\ M_{\max} \text{ ("DPE")} \quad \sim 700 \text{ GeV (cf 100 GeV at TeV)} \end{array}$$