J. Barbels

Multiple Interactions – A 6k

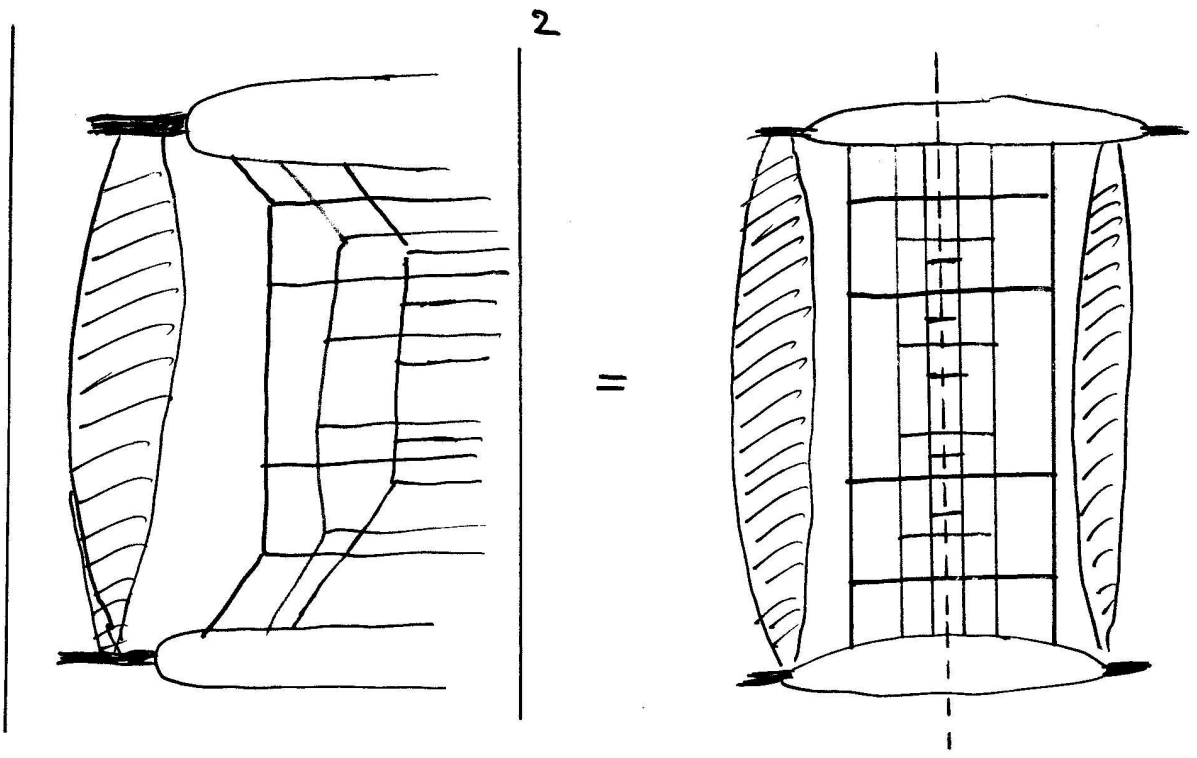
(provocative)

Two questions:

1) Underlying event in pp: multiple interactions

2) Saturation at the LHC

1) Underlying Event in pp : multiple interactions



= 3 "cut ladders" + $\sum$ "uncut ladders"

- each cut ladder: exact square (→ powerful, color singlet)
- where is diffraction ?

Confront this with theory (pQCD, BFKL) :

1) Eikonal, large N_c : before b-integration, consistent with AGK

$$\frac{[2\Omega(s,b)]^k}{k!} e^{-2\Omega(s,b)}$$

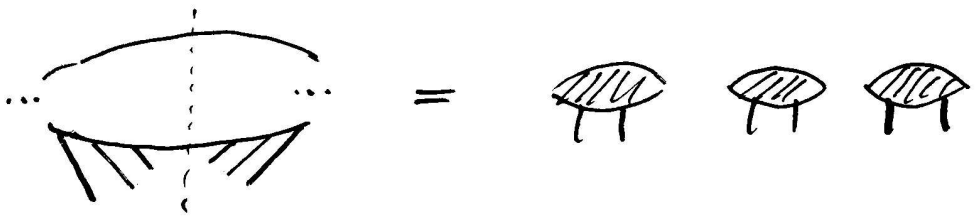
"cut ladder = uncut ladder"

But : $2\Omega(s,\vec{b}') = \int \frac{d^2k}{(2\pi)^2} 2\tilde{\Omega}(s,\vec{k}')$

Consequences:

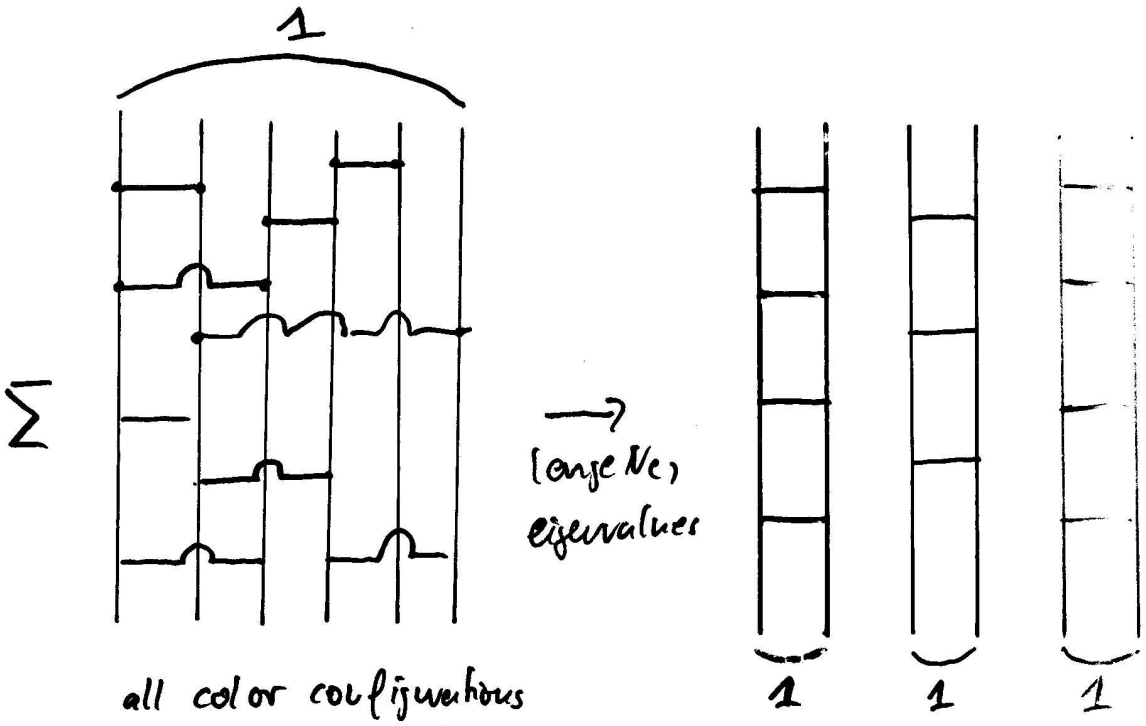
(a) <u>non-forward</u> ladders

(b) symmetry: eikonal = elastic intermediate states



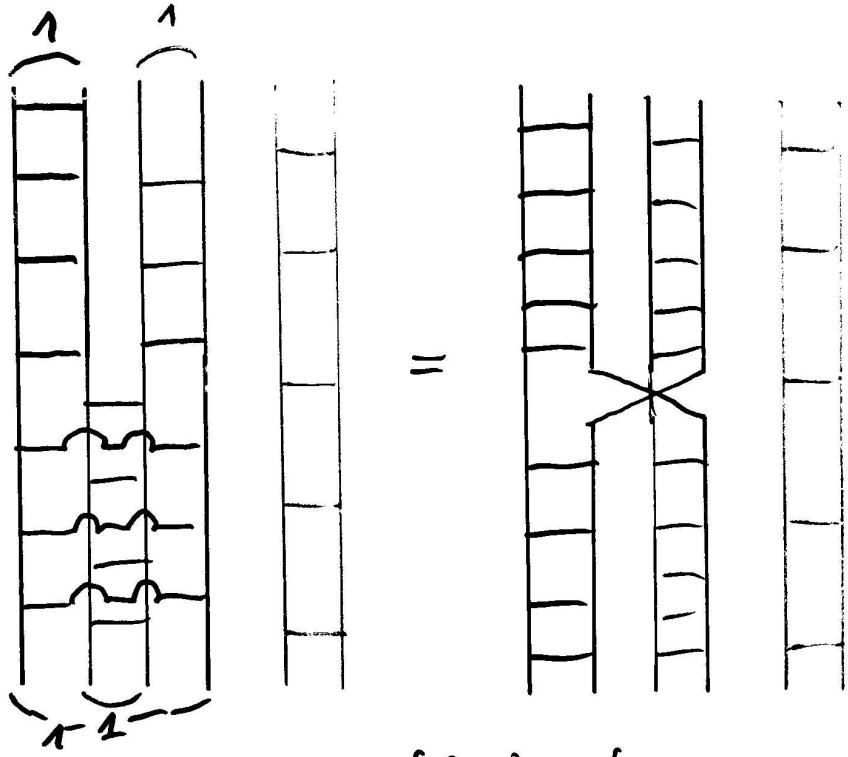
2) Is "large-N_c" a good approximation?

In general expect: BK?- evolution



all color configurations compatible with total color singlet

$+ O(\frac{1}{N_c^2})$ corrections



$O\left(\frac{1}{N_c^{2n-1}}\right)$ suppressed, but: combinatorics!

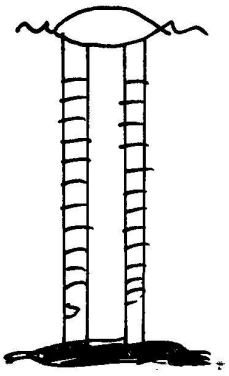
JB, Gustafson

n = # ladder:

n	2	3	4	5	6	...
	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{5}{4}$	2	

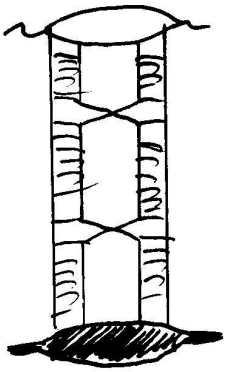
Dynamical effect (DIS, DLA):

JB, Rujula



"cut"

vs

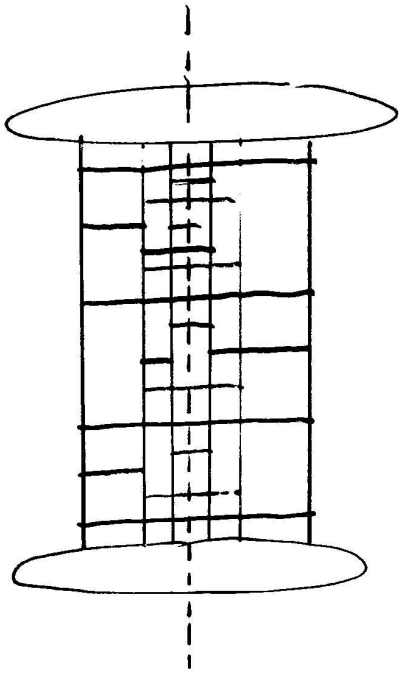


"pole"

$O(70\%)$!!

3) Consequences for pp-scattering:

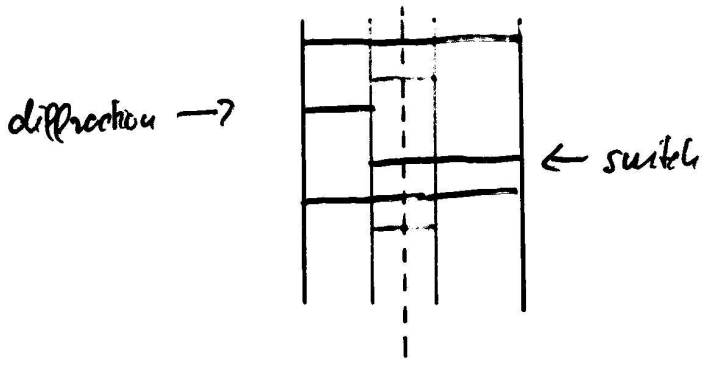
include "communications" between ladders



more complicated evolution: nonforward ladders

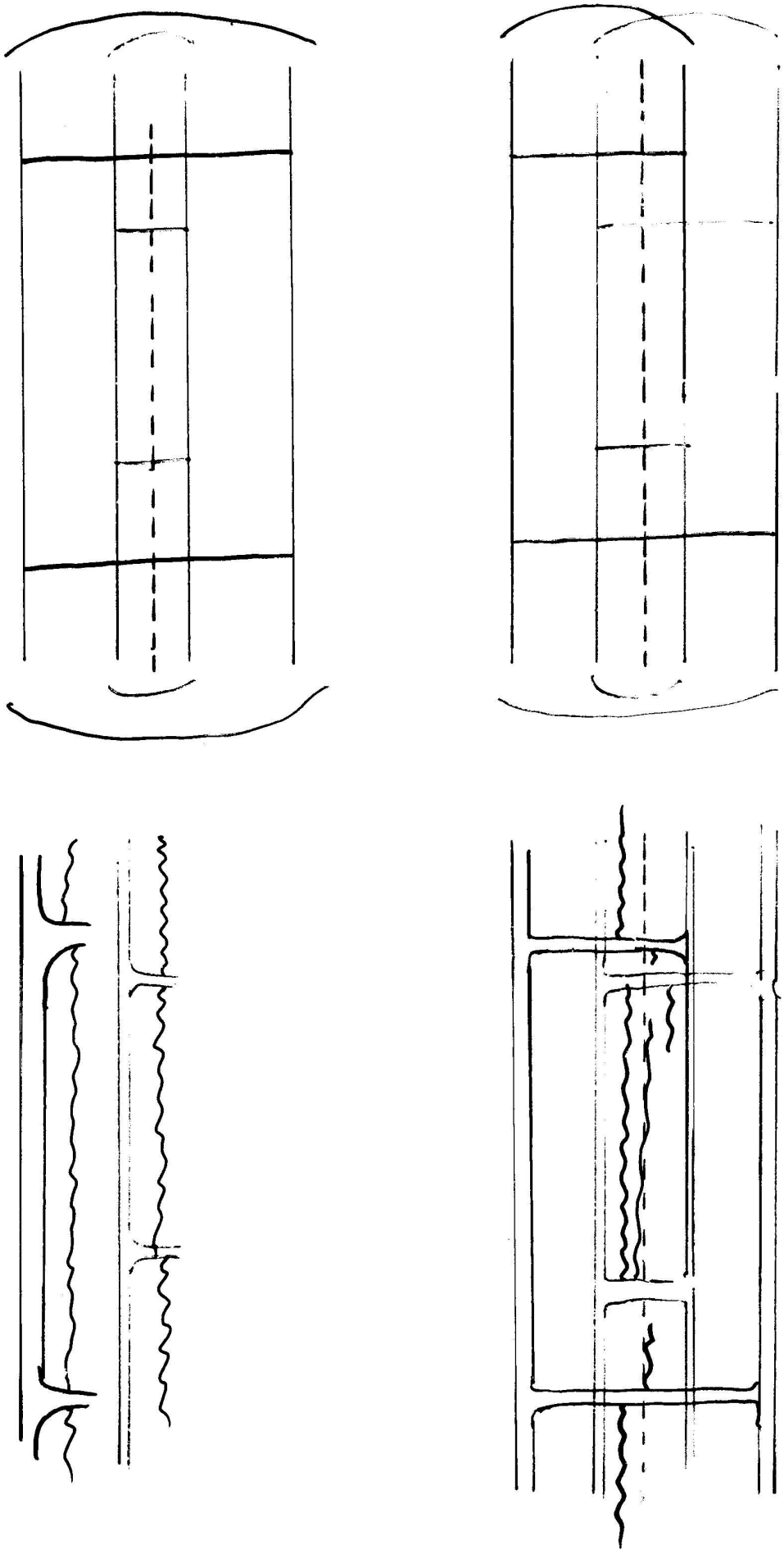
Duplications:

- correlations in transverse space

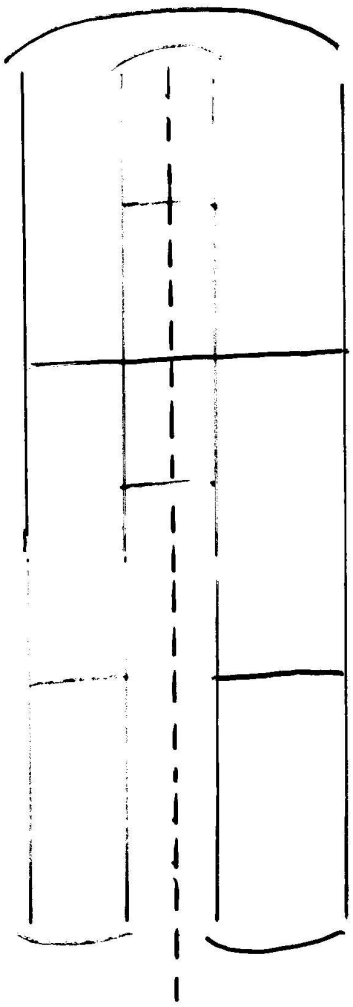


- allows for diffraction

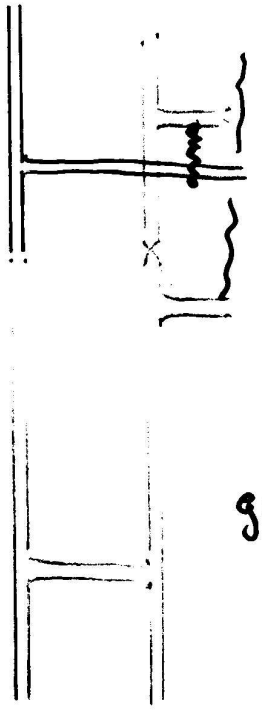
- affects multiplicity / E_T



Color connection of a "switch"



gap

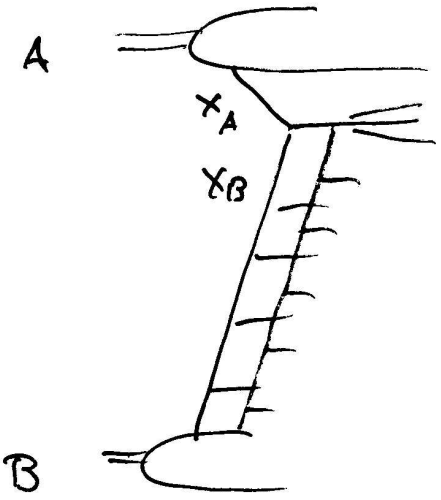


gap

...

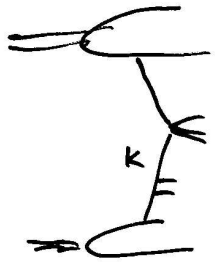
2) Saturation in pp:

Asymmetric final state: inclusive cross section



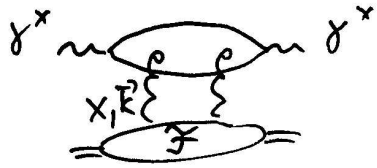
$x_B \ll x_A$

Simplest idea: k_T-factorization, from DIS



$$d\sigma \sim \int dx_A dx_B \int d^2k \; f(x_A)\, d\sigma_p(x_A x_B k) \cdot \mathcal{F}(x_B, \vec{k}^2)$$

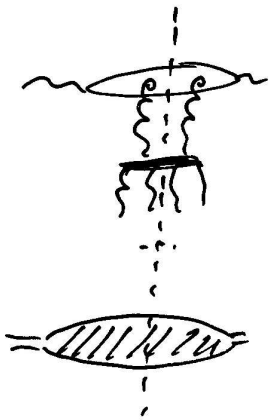
$\mathcal{F}(x_B, \vec{k}^2)$ from DIS, includes saturation effects



Unfortunately: theory more complicated

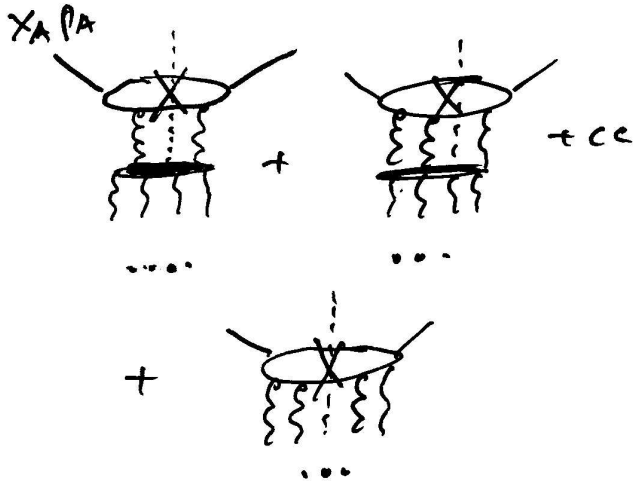
Salvadore, Vecca, JB

DIS



total inclusive,
four-like structure

PP



fix jet momenta (semi-inclus.)
non-singlet parton

→ breakdown of factorization

Also: in pp-scattering color dipole picture questionable

JB, Motyka

→ theoretical work needed!