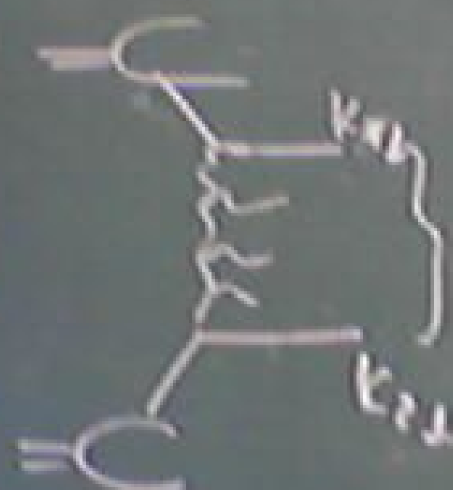
BFKL at pp (Tevatron, LHC)

(a) Mueller-Navelet

s

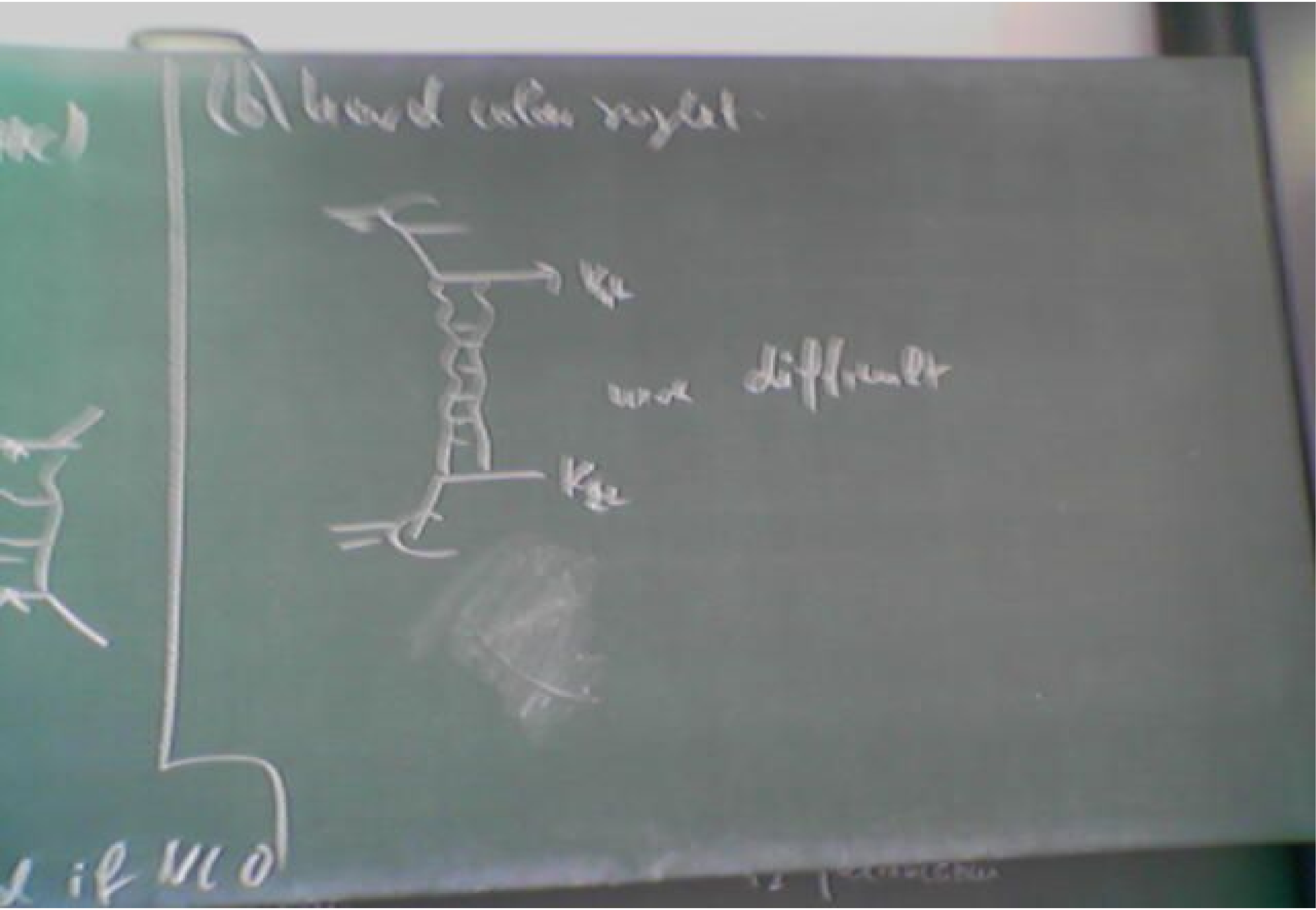


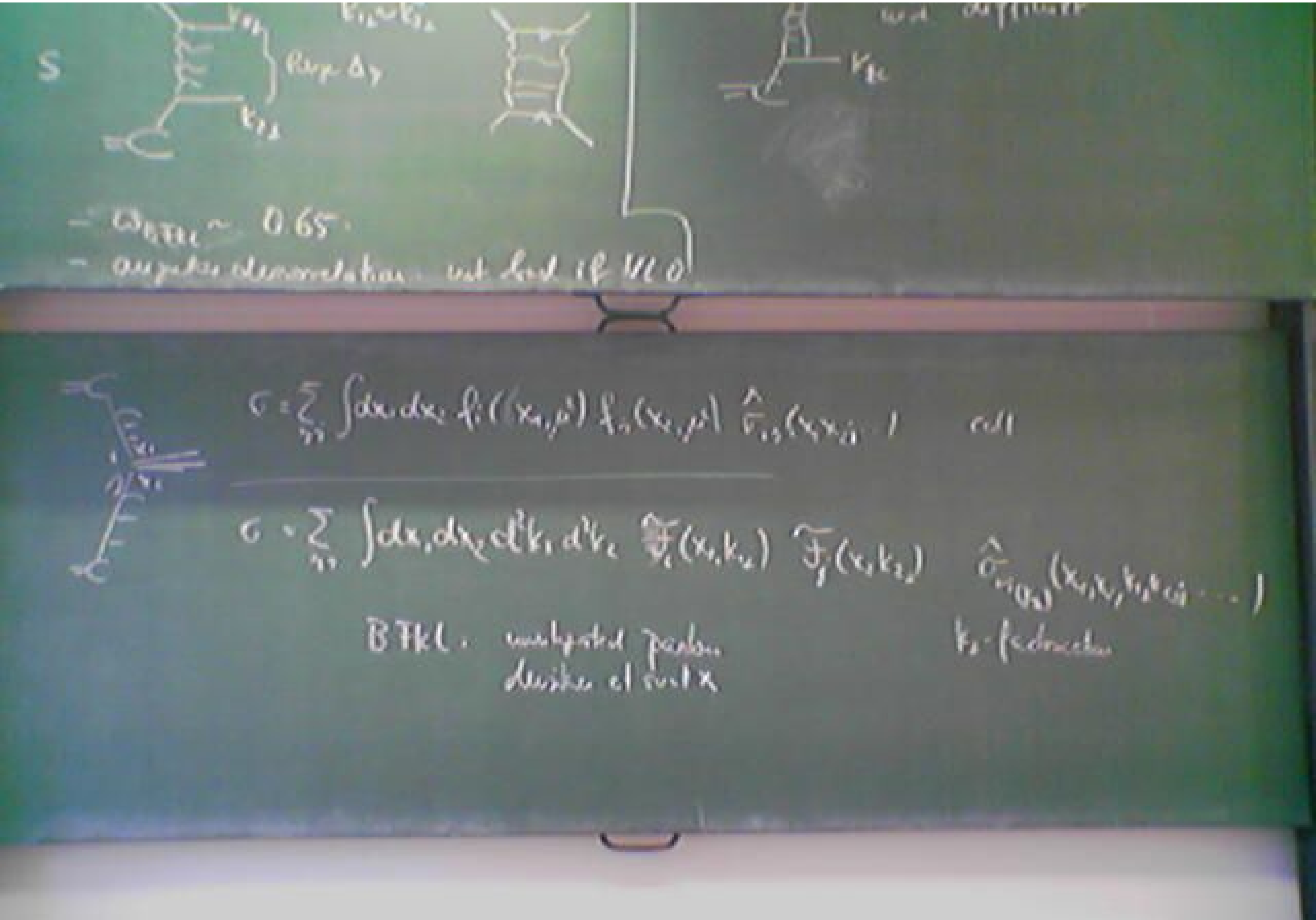
large Δy

$k_{1\perp}^2 \sim k_{2\perp}^2$

- $\omega_{BFKL} \sim 0.65$
- angular decorrelation: not bad if NLO

(b)


difficult
if NLO

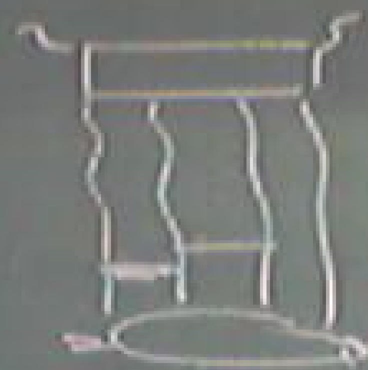


S
0.65
coll
BFKL

Higher twist evolution in DIS

leading twist

$F_2 \sim (Q^2)^0$

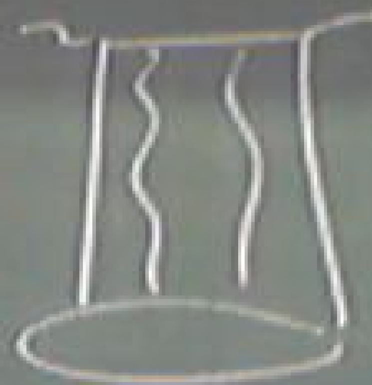


twist 4

$\Delta F_2 \sim \frac{1}{Q^2}(xg)^2$

BFKL

Balitsky Fadin



$\frac{1}{Q^4}(xg)^3$

- small for $x = \mathcal{O}(1)$
- sizable for small x

II AGK-Rules

(a) soft physics

$T_{el} = \sum_n T_n$, $T(\xi, t) =$ 

each line: $\vec{k}_i$

$s^{\alpha(k_i)-1}$ $\alpha = 1 + \alpha' k_i^2$

$\xi(k_i) = e^{-i\pi\alpha(k_i)} + 1 \sim i\pi\,(\alpha(k_i)-1)$

$$T_n = -is \int \frac{d^2k_1 \cdots d^2k_n}{n!}\, \delta(\vec{q} - \sum \vec{k}_i) \left(i\xi(k_1) s^{\alpha(k_1)-1}\right) \cdots \left(i\xi(k_n) s^{\alpha(k_n)-1}\right) N(k_1 \ldots k_n)^2$$

— $N(k_1 \ldots k_n)$: symmetric under permutations "cut = uncut", real

$n!$

$N(k_1 \dots k_n)^2$

$\sim N(k_1 \dots k_n)$: symmetric under permutations "cut = uncut";

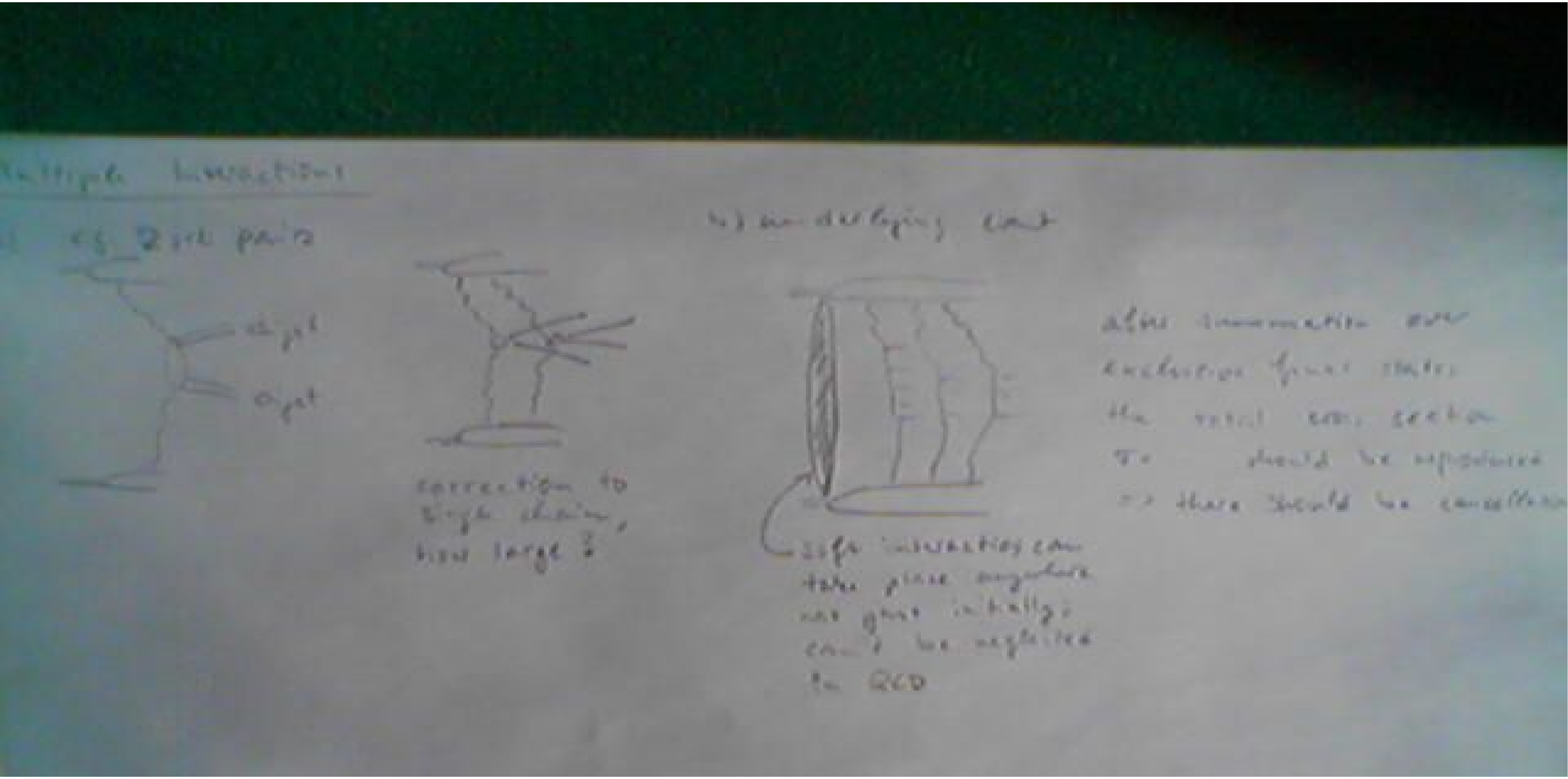
$\sigma_{tot} = \frac{1}{s}\,\mathrm{Im}\,T(s,0) \qquad 2\,\mathrm{Im}\,T = \mathrm{disc}_s T$

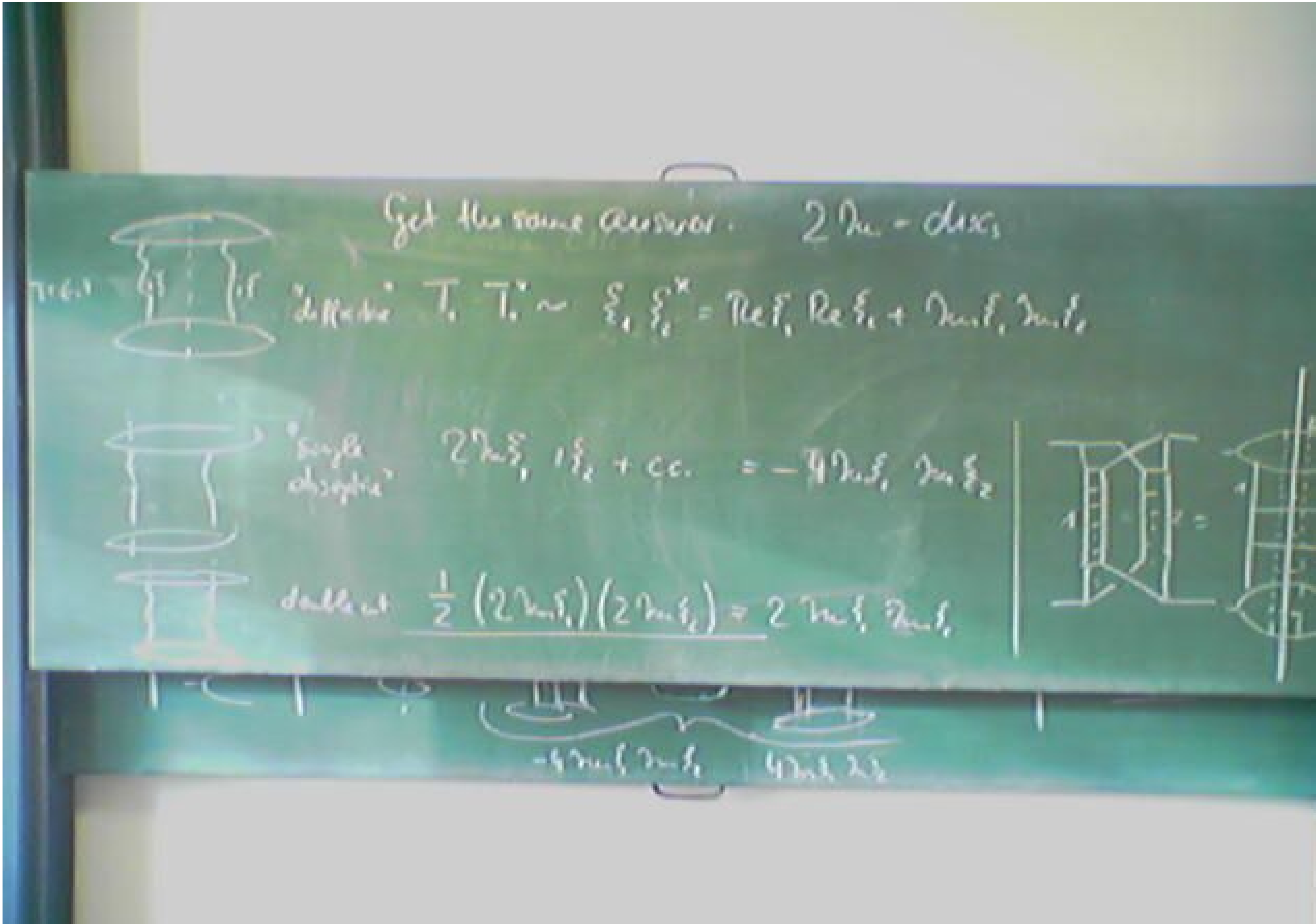
$n=1: \quad T_1 = N^2\, \xi(0)\, s^{\alpha(0)}$

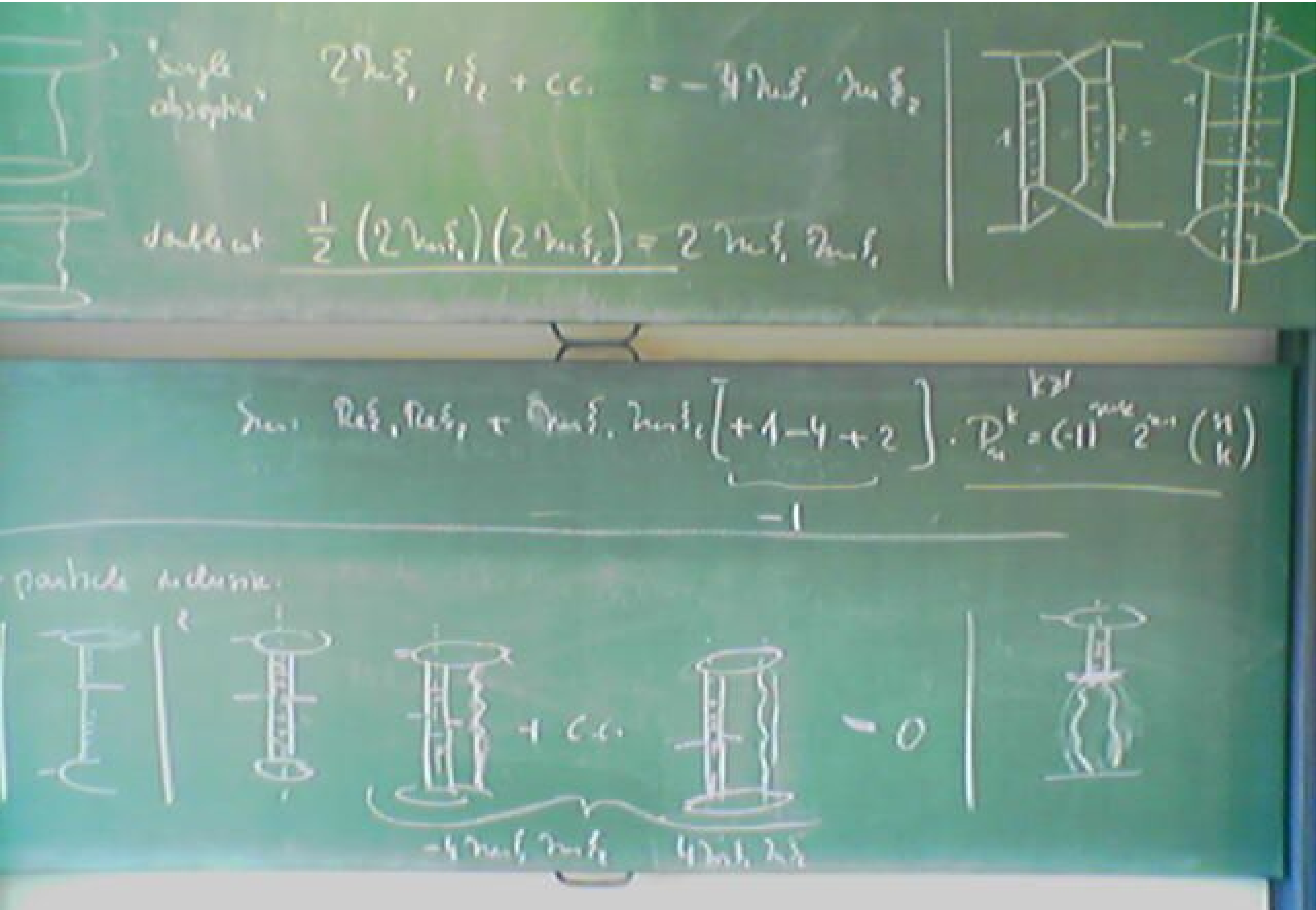
$\sim \mathrm{Im}\, N^2 s^{\alpha}$

$n=2 \quad T_2 = -is \int \frac{d^2k}{2!}\, N \left(i\xi s^{\alpha(k_1)-1}\right)\left(i\xi s^{\alpha(k_2)-1}\right) N$

$2\,\mathrm{Im}\,T_2 = 2\,\mathrm{Im}\left[-i\,(i\xi_1)(i\xi_2)\,\frac{1}{2!}\right] = \mathrm{Im}(i\xi_1\xi_2) = \mathrm{Re}(\xi_1\xi_2) = \mathrm{Re}\,\xi_1\,\mathrm{Re}\,\xi_2 - \mathrm{Im}\,\xi_1\,\mathrm{Im}\,\xi_2$


Multiple Interactions
e.g. 2 jet pairs
b) underlying event
dijet
dijet
correction to single chain, how large?
soft interactions can take place anywhere not just initially; can't be neglected in QCD
after summation over exclusive final states the total cross section σ should be reproduced
=> there should be cancellation


Get the same answer. 2 Im - disc
"diffractive" T_1 T_2^* ~ ξ_1 ξ_2^* = Re ξ_1 Re ξ_2 + Im ξ_1 Im ξ_2
"single absorptive" 2 Im ξ_1 i ξ_2 + c.c. = -4 Im ξ_1 Im ξ_2
doublecut 1/2 (2 Im ξ_1)(2 Im ξ_2) = 2 Im ξ_1 Im ξ_2
-4 Im ξ Im ξ
4 Im ξ Im ξ


"single absorptive"
double cut
+ c.c.
particle inclusive: