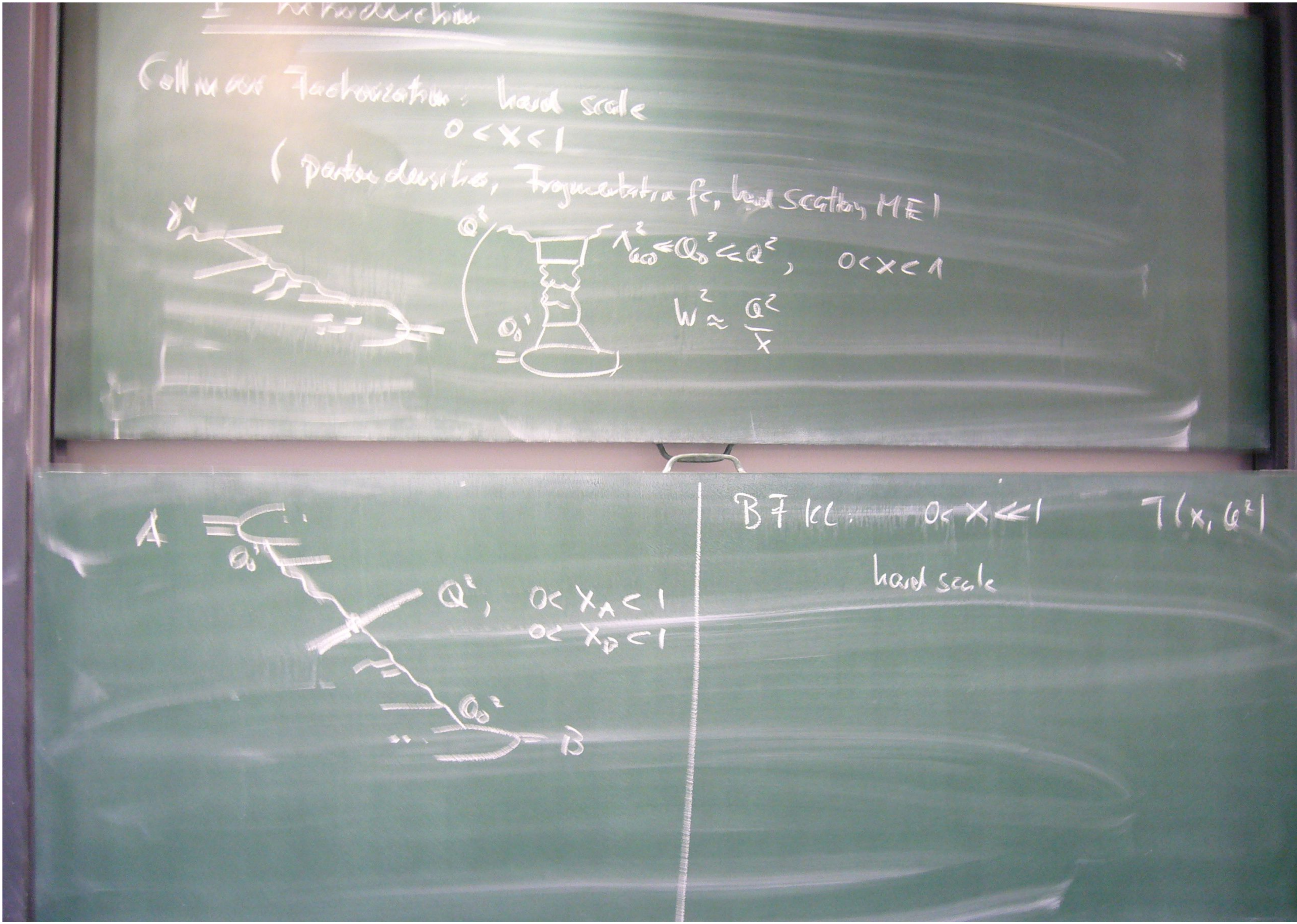
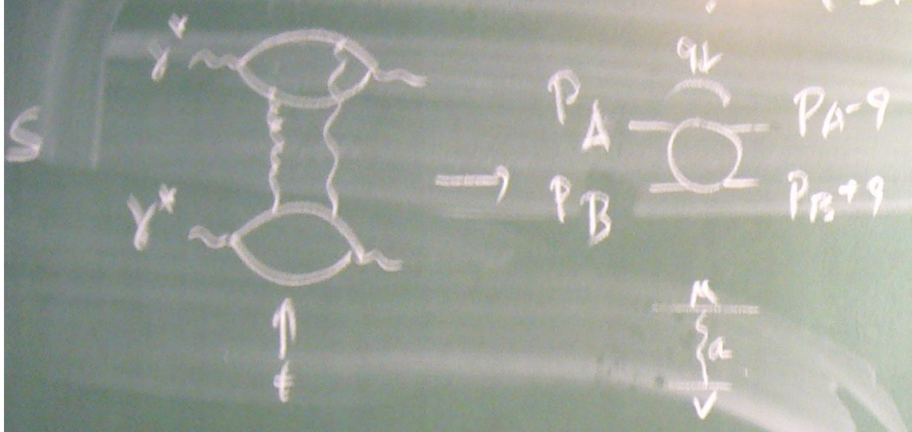

Collinear Factorization: hard scale
0 < x < 1
(parton densities, Fragmentation fc, hard scattering ME)
γ*
Q²
Λ²_QCD ≪ Q₀² ≪ Q², 0 < x < 1
W² ≈ Q²/x
Q₀²
A
Q₀²
Q², 0 < x_A < 1
0 < x_B < 1
Q₀²
B
BFKL: 0 < x ≪ 1
T(x, Q²)
hard scale

II. BFKL: derivation

Scattering of color singlet (IR safe)



$s \gg t \sim -q_\perp^2$

CM-System, reference vector

$p_A = p_A' + \frac{m_A^2}{s} p_B'$ $\quad p_A' = (p, 0, 0, p)$

$p_B = p_B' + \frac{m_B^2}{s} p_A'$ $\quad p_B' = (p, 0, 0, -p)$

$s = 4p^2$

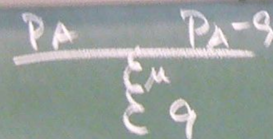
$k = \alpha p_A' + \beta p_B' + k_\perp$,

$k^2 = s\alpha\beta + k_\perp^2$, $\quad \vec{k}^2 = -k_\perp^2$

$q = \alpha_q p_A' + \beta_q p_B' + q_\perp$

$\alpha_q = \frac{-q_\perp^2}{s}$, $\beta_q = \frac{q_\perp^2}{s}$, $q^2 = -q_\perp^2 = t$

1) eikonal vertex



$ig\bar{u}(p_A - q, \lambda_{A'})\gamma^\mu u(p_A)\, \lambda^a$

$\sim -2i\, g\, \delta_{\lambda_A \lambda_{A'}}\, p_A^\mu\, \lambda^a$

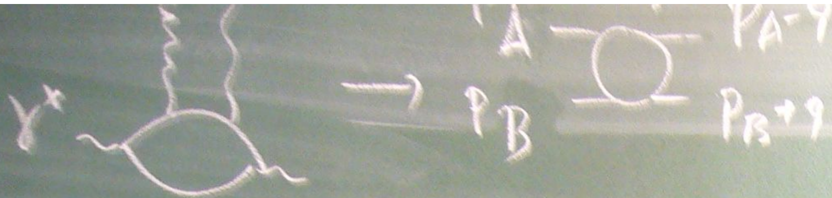
[coupling: $2gi\, p_A^\mu g^{\nu\rho}\, T^a$]

2) t-channel gluon:

$\frac{d_{\mu\nu}(q)}{q^2 + i\epsilon}$

$d_{\mu\nu}(q) = \sum e_\mu^{(\lambda)} e_\nu^{(\lambda)} = \frac{2 p_B'^\mu p_A'^\nu}{s}$

+



$$s \gg t \sim -q_\perp^2$$

$$s = 4p^2$$

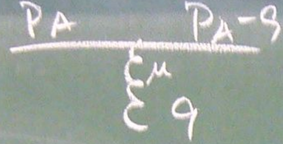
$$k = \alpha p_A' + \beta p_B' + k_\perp ,$$

$$k^2 = s\alpha\beta + k_\perp^2 , \quad \vec{k}^2 = -k_\perp^2$$

$$q = \alpha_q p_A' + \beta_q p_B' + q_\perp$$

$$\alpha_q = \frac{-q_\perp^2}{s}, \quad \beta_q = \frac{q_\perp^2}{s}, \quad q^2 = -q_\perp^2 = t$$

1) eikonal vertex:



$$ig\bar{u}(p_A - q, \lambda_A)\gamma^\mu u(p_A)\ \lambda^a$$

$$\sim -2i\ g\ \delta_{\lambda_A \lambda_{A'}}\ p_A^\mu\ \lambda^a$$

$$\left[\ \text{[illegible]}:\ 2gi\ p_A^\nu g^{\nu\rho}\ T^a\ \right]$$

2) t-channel gluon:

$$\frac{d_{\mu\nu}(q)}{q^2 + i\epsilon}$$

$$d_{\mu\nu}(q) = \sum e_\mu^{(\lambda)}(q) e_\nu^{(\lambda)}(q) = \frac{2 p_B'^{\mu}\, p_A'^{\nu}}{s}$$

$$+ \dots$$