Status of the calculation of

$qg^* \to qg$

Michal Deák, Krzysztof Kutak

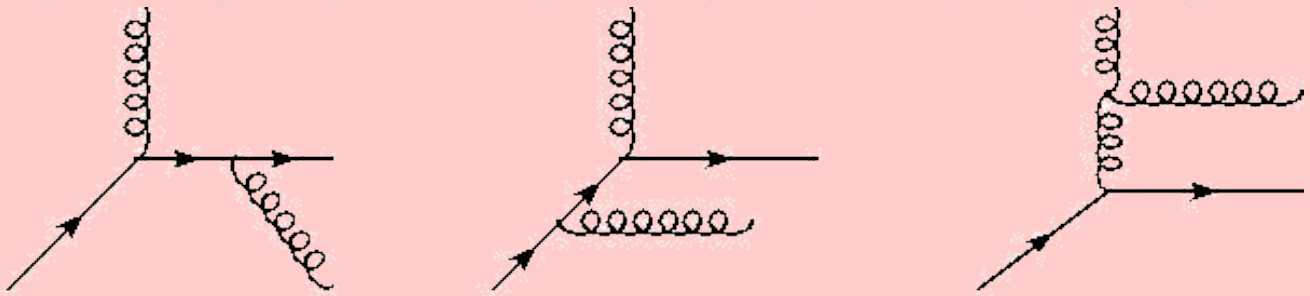
Goals

- to calculate the square of amplitude of QCD-Compton scattering of on-shell quark and off-shell gluon in asymetric regime: $x_g << x_q$ – kt-factorisation

- to implement the result of the calculation in Monte Carlo generator CASCADE

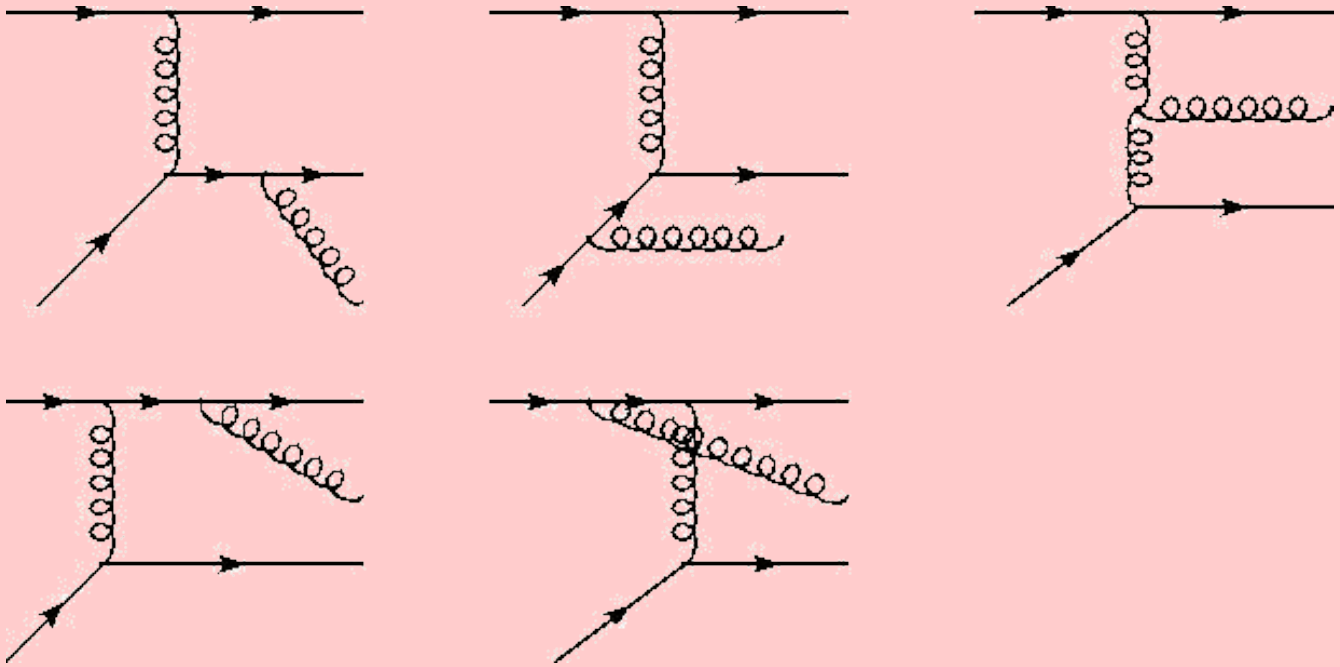
Diagrams

- Colinear factorisation



Diagrams

- Colinear factorisation $\rightarrow$ kt-factorisation



Details of the kinematic regime

- Sudakov decomposition:

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

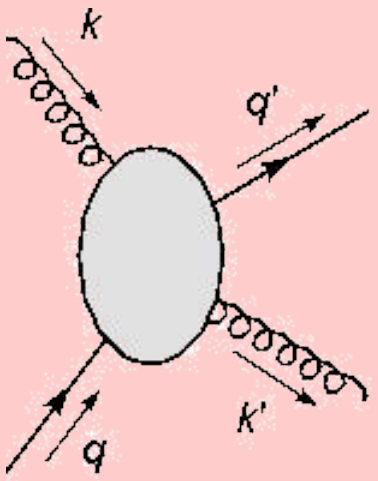
$$k' = \alpha'\ p_A + \beta'\ p_B + k'_\perp$$

$$q = x\ p_B$$

$$q' = x'\ p_B + z'\ p_A + q'_\perp$$

$$\hat{s}, \hat{u}, \hat{t} << s$$

$$\alpha, \beta, \alpha', z' << x, x', \beta' \approx 1$$



What was done

- We have crossing symmetric (x$\leftrightarrow$x' and uhat $\leftrightarrow$shat), gauge invariant (checked with feynmann and axial gauge) square of amplitude (amplitude)
- In addition we recover the proper collinear result by performing $k_t \to 0$ (the limit is in this case simple)

$$|M|^2 = -\frac{\alpha^2 s^2 \left(x^2 + x'^2\right)\left(-\vec{k}_\perp^{\,2}\left(x - x'\right) + \hat{s}\left(8x + x'\right) - \hat{u}\left(x + 8x'\right)\right)}{18\hat{s}\hat{u}\left(-\vec{k}_\perp^{\,2} + \hat{s} + \hat{u}\right)\left(x - x'\right)}$$

What still has to be done

- Implementing to CASCADE and making the plots