Homework Exercises for
QCD and Collider Physics

2005/2006

Exercises for Lecture 13 & 14 (15. & 22. Feb 2006)

Diffraction:

- calculate $x_{I\!P} = 1 - \frac{p'^+}{p^+}$ but using information of the system M_X, with vectors defined as:
  $k_i = (\sqrt{\frac{m^2+p_t^2}{2}}e^y, \sqrt{\frac{m^2+p_t^2}{2}}e^{-y}, p_t)$ and obtain:

$$x_{I\!P} = \sum \frac{E_{t\,i}e^{y_i}}{2E}$$

Photon Structure:

- calculate y and x_γ using the 4-vectors given in the lecture:

$$
\begin{aligned}
q &= (yp_e^-, \bar{y}p_p^+, q_t) \\
p_\gamma &= (x_\gamma yp_e^-, \bar{x}_\gamma \bar{y}p_p^+, p_{\gamma\,t}) \\
g &= (\bar{x}_g p_e^-, x_g p_p^+, g_t) \\
g_2 &= (x_{g\,2}^- p_e^-, x_{g\,2} p_p^+, g_{t\,2})
\end{aligned}
$$

and neglect all transverse momenta. Calculate y and x_γ to:

$$y = \frac{\sum_i (E - p_z)_i}{2E_e}$$

$$x_\gamma = \frac{\sum_i (E - p_z)_i}{2yE_e}$$