

Homework Exercises for QCD and Collider Physics

2005/2006

Exercises for Lecture 12 (8. Feb 2006)

Parton Showers:

- Set up a small program to calculate the gluon density as a function of x and Q^2 , using the parton shower approach. Use only a very simple gluon splitting fct: $P(z) \sim 1/z + 1/(1-z)$. Use the Sudakov form factor to calculate the next t in the branching. Start from a low scale $\mu_0^2 = 1 \text{ GeV}^2$ with a starting distribution: $xG_0(x) = (1-x)^4$ and evolve up to $\mu^2 = 10 \text{ GeV}^2$

Diffraction:

- Calculate x_{IP} from the final state in the X -system, using

$$x_{IP} = \sum \frac{k_i^+}{p^+}$$

with k_i^+ the momenta of the parton in system X . Express k_i^+ in terms of rapidity and E_T . Obtain then:

$$x_{IP} = \sum \frac{E_{Ti} e^{y_i}}{eE}$$

with E being the proton energy.