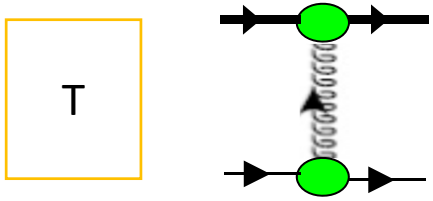
Hands on session HQ

Typical times

Collisional (elastic): $2 \to 2$

e.g. :



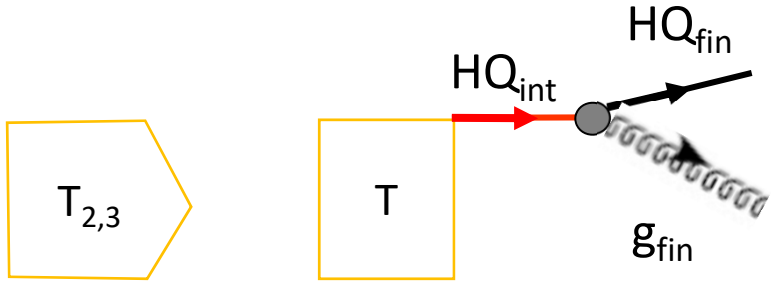
: space like; typical virtuality = μ (Debye mass)

=> Typical collision time = ….

Exo 1 : evaluate typical collision time for $T = 2\ T_c$

Radiative : $2 \to 3$

e.g. :



Assuming (in light cone coordinates):

- $HQ_{fin} \equiv ((1-z)P^+, P_Q^-, -\mathbf{k}_\perp)$
- $g_{fin} \equiv (zP^+, P_g^-, \mathbf{k}_\perp)$

Exo 2 : evaluate typical formation time

$$t_{\text{form}} \sim \frac{\text{HQ}_{\text{int}}^0}{\text{HQ}_{\text{int}}^2 - M_{\text{HQ}}^2}$$

Exo 3 : Extend the calculation of the Bjorken energy loss to evaluate the temperature-momentum dependence of the transverse and longitudinal coefficients B_T and B_L (assuming an incoming relativistic heavy quark) and show that it is α E.

Check whether the Einstein equation is satisfied.

Exo 4 : try to sketch a generic $d^2Prob/dzd\Delta E$ for both elastic and Gunion-Bertsch radiative energy loss… and discuss how the various parts are affected by the α_S penalty.

Exo 5 : Rederive some of the scales affecting heavy quark radiative energy loss

Exo 6 : Make more explicit the yellow arrows on slide 83 (quarkonia)

Exo 7 : Starting from the relation 92, try to evaluate the decoherence time (both parametrically and numerically) of Y(1S) and compare it with the so-called formation time.