When The Heavy Quark Jet Bends

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Approximations of Jet Models

i) soft ⇨ energy of radiation (ω) << energy of parent parton (E)

ii) **No recoil due to scattering** (Eikonal 1) i. e. transverse momentum transfer $q_\perp$ << E and **no recoil due to radiation** (Eikonal 2) i.e transverse momentum of emission $k_\perp$<< E

iii) Collinearity i.e. radiation almost grazes the emitting parton

Relaxing eikonal 1 approximation

The present work relaxes the Eikonal 1 approximation at the level of single emission kernel with the help of the Feynman diagram techniques of pQCD for Heavy Quark-Light Quark single gluon radiative process. Five Feynman diagrams are possible.

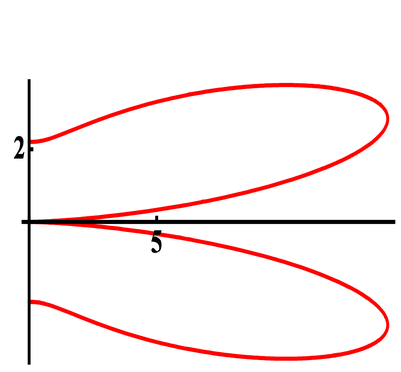
The radiation spectrum off the heavy quark considering recoil due to scattering has been found out to be:

$$x\frac{dn_g}{dk_\perp^{\,2}dx\,dq_\perp^{\,2}} \propto \frac{1}{k_\perp^{\,2}} \times Elastic \times \left[\sum_{n=2,1,0} C_n e^{2(n-1)\eta_g}\left(\frac{k_\perp^{\,2}}{k_\perp^{\,2}+x^2M^2}\right)^n\right] \times LPM$$

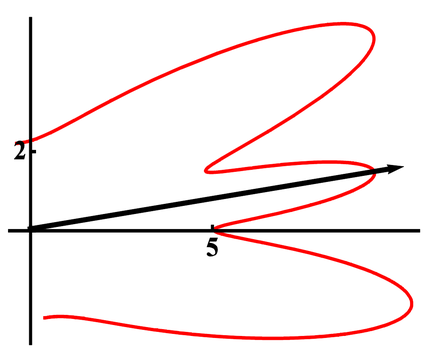
$x = \frac{k_\perp e^{\eta_g}}{\sqrt{s}}$; $\sqrt{s}$:Mandelstam variable η_g : Gluon rapidity

Ref: TB, SM & RA, arXiv: 1307.6931

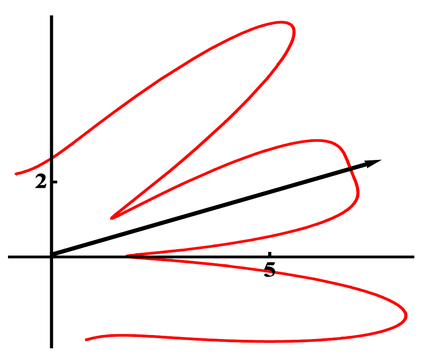
Radiation spectrum non-eikonality



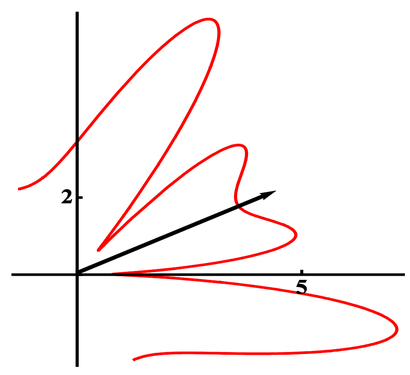
$\varsigma\left(=\frac{q_\perp}{\sqrt{s}}\right)=0.00$



$\varsigma = 0.15$



$\varsigma = 0.30$

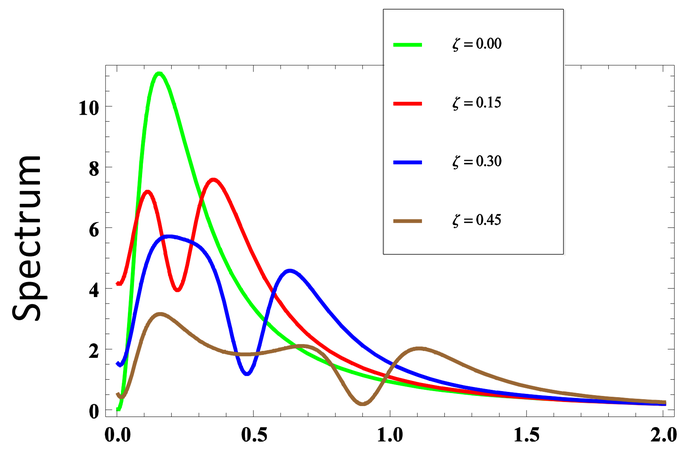


$\varsigma = 0.45$

Conclusions

Important for studying transverse momentum broadening

Helps incorporating bending of medium energy jets



$k_\perp$

Outlook

Multiple scattering and multi-gluon emission

Similar calculation for $Qg \to Qgg$