FYSH560 spring 2011

Exercise 7, return by Tue Feb 8th at 14.15, discussed Wed March 9th at 8.15 in FL140

1. Fourier-transform the essential part of the LC wave function for emitting a soft gluon:

$$\int \mathrm{d}^2\mathbf{k}_T e^{i\mathbf{k}_T\cdot\mathbf{r}_T} \frac{\boldsymbol{\varepsilon}_T \cdot \mathbf{k}_T}{{\mathbf{k}_T}^2}.$$

   This can be done analytically (without mathematica!) by first integrating over the angle, which gives a Bessel function J_1 that is the derivative of J_0; thus the radial integral is easy. Note that there are two independent azimuthal angles, those of $\boldsymbol{\varepsilon}_T$ and $\mathbf{r}_T$.

2. Look at the recent paper: Phys.Lett. B687 (2010) 174; `arXiv:1001.1378 [hep-ph]` Use SPIRES to find out how many citations this paper has (quite a lot in one year). How do equations (3) and (4) reduce to the one in the lecture? What is forward rapidity in this case and why is equation (1) supposed to work there better than at midrapidity?

3. Consider two (independent of each other) transverse ($i, j \in \{1, 2\}$) pure gauge fields that depend only on transverse coordinates $A_i^{(1,2)} = A_{i,a}^{(1,2)} t^a = \frac{-i}{g} U(\mathbf{x}_T)\partial_i U^\dagger(\mathbf{x}_T)$. Recall the expression for the field strength tensor $F_{\mu\nu}$ and show that these pure gauges have no longitudinal magnetic field $F_{ij}^{(1,2)} = 0$. Then consider a field that is the sum of the two: $A_i = A_i^{(1)} + A_i^{(2)}$: what is its magnetic field F_{ij}?

4. Answer the course questionnaire in Korppi.