v2 and Baryon/π ratio at Intermediate pT Due to String Cutting and qq-pick up

Jorge Casalderrey-Solana

State University of New York at Stony Brook

Introduction

0. (E.V. Shuryak, nucl-th/0112042) If nucleae had sharp edge, strong absorption would lead to a limiting v_2 from geometry. This value is close to the experimentally observed moderate pT (S.A. Voloshin). However a realistic shape gives a lower limiting v_2. Strong absorption also reduces this value.

1. We present a model in which the interaction of the media with the string that links the two partons produced in a single collision is what will cause the observed asymetry.

2. This interaction will result in an early cutting of the gluonic string (with respect to the usual fragmentation) changing the FF of the produced partons, making them harder.

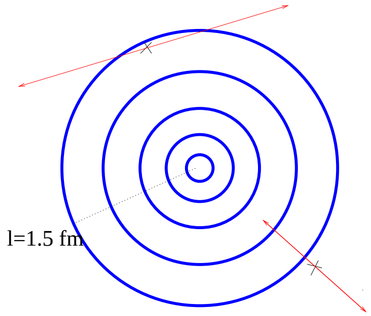
3. We also introduce the possibility of picking up diquark in the string cutting. This mechanism will explain the p/π ratio.

The Model 1: Quenching and String cutting

• Sphalerons are non perturbative objects produced in the collision. They decay into expanding spheres of strong coherent gauge (*Ostrovsky, Carter, Shuryak hep-ph/0204224*) and quark (*E.V. Shuryak, I.Zahed hep-ph/0206022*) fields.

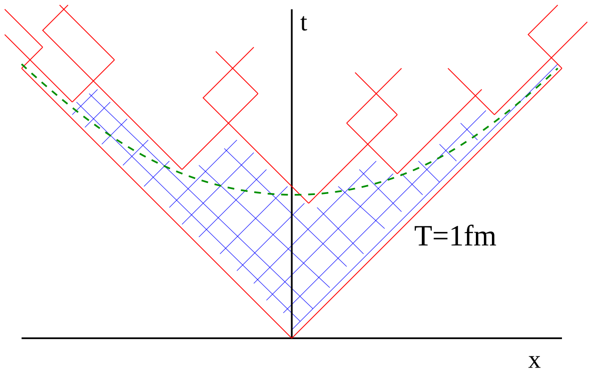
• These fields decrease with time. Their interaction with partons will lead to syncrotron-like radiation with losses estimated to be of one order of magnitude (*E. V. Suryak, I. Zahed hep-ph/0207163*) .

• The string also picks quarks up from the sphaleron. The partons coming from cut strings have a v2 closer to the observed.



.	v2($3 < p_T < 3.5 GeV$)
Quenched (b=6fm)	0.05
cut (b=6fm)	0.075
exp.($0.16 - 0.24$)	0.11

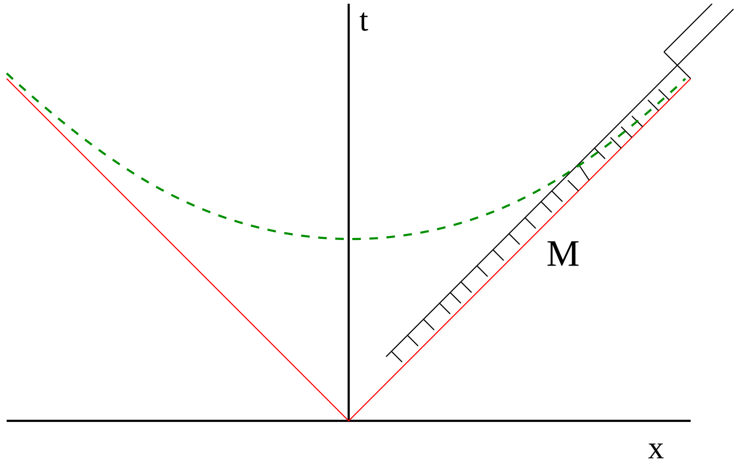
A brief review of Lund Model



- The pair quark-antiquark separate with the speed of light. A linear potential (string) makes them loose their energy

$$dP = \prod N_j d^2 p_j \delta(p_j^2 - m_j^2)\delta(\sum p_j - Ptot)e^{-bA} \Rightarrow f_s(z) = N\frac{(1-z)^a}{z}e^{-b\frac{m^2}{z}}(1-\frac{m^2}{sz})^a$$

- The interaction with the sphaleron produces quark anti-quark pairs at small proper times.. The invariant mass of the remaining system will be small



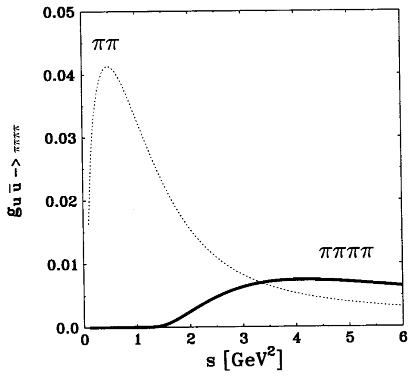
Few Body Fragmentation

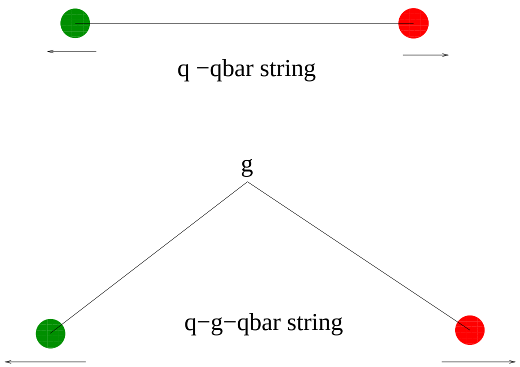
• B. Andersson and H. Hu (hep-ph/9910285) calculated the distributions for 2-6 particles. An event generator (LUARLW) was developed and tested by the BES collaboration for e^+e^- $\sqrt(s) = 2 - 5GeV$. For two body decay the value of z is fixed.

$z^{\pm} = \frac{s+m_1^2-m_2^2\pm\sqrt{\lambda(s,m_1^2,m_2^2)}}{2s}$

$m1 = m_2 = .14Gev \Rightarrow z^+ \approx 0.65$
$m_1 = m_2 = .14Gev \Rightarrow z^+ \approx 0.85$

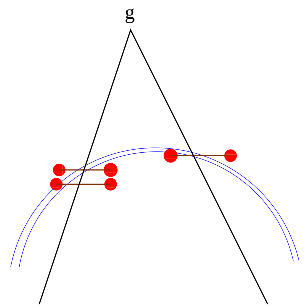
• We concentrate on the two body decay and extend the previous analisys to gluons (not yet tested).





Model 2. Quenched + cut +qq

- We introduce the production of diquarks on the cut string. This mechanism is necessary to produce baryons.



- We present the results of a rough simulation in in which only cutting of gluon strings and two body baryon-π (as well as usual fragmentation functions) are used. The probabilty of picking a diquark (P) is considered a free parameter.

.	b=6fm P=1	b=6fm P=0.5	exp
v2	0.07	0.072	0.1206 ± 0.037
v2p	0.06	0.095	
v2π	0.08	0.06	
p/π	1.1	0.87	1 ± 0.25
R_{AA}(charged)	0.54	0.4	0.5

Conclusions

• We have seen that the interaction of the string with the media reduces the importance of the skin emission; this increases the value of v_2.

• Cutting the strings changes the fragmentation functions. The dominant contribution to this new fragmentation will be the two body decay.

• Picking up diquarks results in a reasonable p/π ratio.

• The pick-up mechanism requires prompt production of quarks. In a medium dominated by gluons the only known way to produce these prompt quarks is via $\vec{E}\vec{B}$ and chiral anomaly .

• Sphalerons as expanding thin shells of concentrated strong fields help both in the cutting of strings and qq-picking.