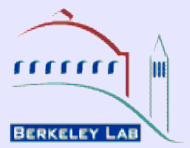




Color Reconnection Systematics(1)



New models of Color Reconnection (CR) have been introduced in recent versions of PYTHIA starting with V6.3. In our analyses we have been using PYTHIA V6.2 (tune A).

The latest version (PYTHIA V6.4) includes, in addition to a new model for color reconnection, new models for the parton shower (ISR and FSR), and the Underlying Event, UE, (Multiple Parton Interaction (MPI) and beam remnants).

The CDF and D0 collaborations work together on understanding the effects of these changes and on defining a common procedure to include them in the systematic uncertainties.

Tuning of PYTHIA V6.4 to data is in progress. Tunes which include LEP data (called “pro”) are now available in PYTHIA V6.4.20.
(see Perugia MC meeting, October 2008)

So far we have looked at two recent tunes: ACR(pro) and S0A(pro).



Color Reconnection systematics (2)



Tune ACR(pro): includes only the new color reconnection model.

Tune S0A(pro): uses new modeling for the parton shower, UE and CR. For this tune, we have to investigate possible overlaps with the systematic uncertainties we are now using.

At this stage of our studies we evaluate the CR systematics using the ACR(pro) tune, that includes only changes in the CR model. We compare ACR(pro) to the A(pro) (tune A in V6.4) tune.

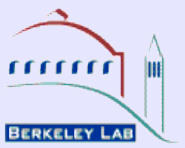
This has been done in the di-lepton, the lepton+jets and the all hadronic channels. The three mass shifts agree within statistics

$$\Delta M_{\text{top}} = M_{\text{top}}(\text{A(pro)}) - M_{\text{top}}(\text{ACR(pro)}) = (0.4-0.5) \pm 0.3 \text{ GeV}/c^2$$

Work is in progress to compare jet shapes in PYTHIA V6.4 with data from various samples to isolate the effects of the new parton shower from the CR contribution.



Color Reconnection Systematics

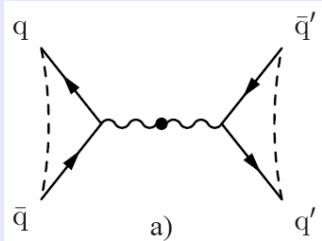


Backup slides

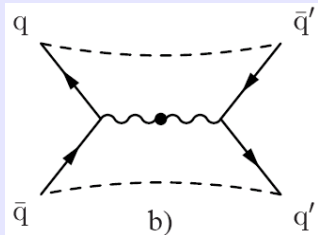
Strong color correlations between the hard process and the underlying event are implied by tune A and similar tunes. These effects may be interpreted as sign for color reconnection.

The issue has been studied at LEP for the W mass measurement

LEP



CR effects on the M_W measurement at LEP contribute to systematics

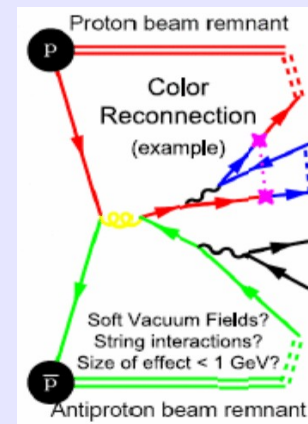


CR(sys) = 8 MeV
out of 22 MeV (total sys)

(LEPEWWG hep-ex/061203)

Tevatron

Preliminary MC studies have indicated possible contributions



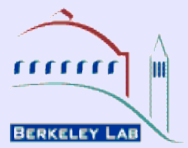
to the top mass systematics of order

CR(sys) \approx 0.5 GeV

D. Wicke and P. Skands arXiv:0807.3248V1



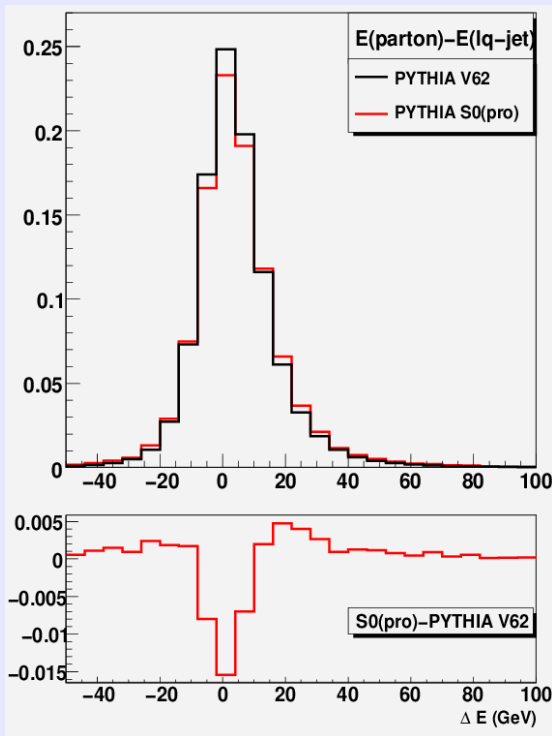
Comparison of Different MC Versions



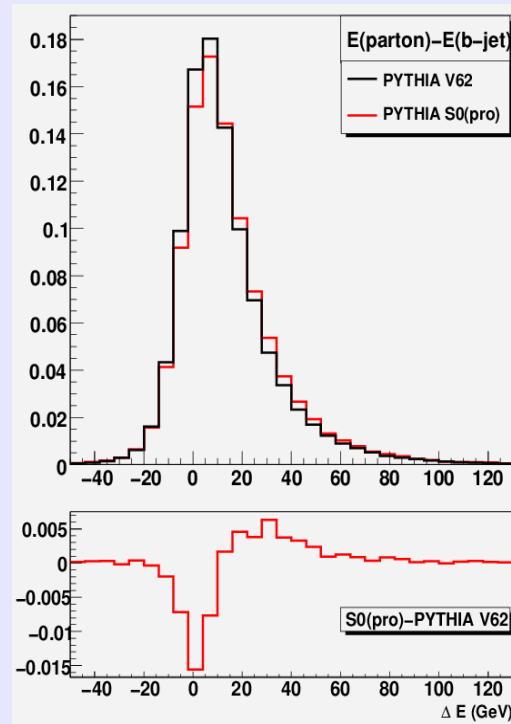
We have compared jet properties after generation + detector simulation. Preliminary studies find the ACR(pro) jets agree with PYTHIA V6.2, but:

E ($\Delta R=0.4$ cone) S0 sample < E ($\Delta R=0.4$ cone) PYTHIA V6.2 sample

Light quark jets



b-quark jets



Jets in the S0(pro) sample are wider and shifted

S0(pro) -Nominal

ΔE (cone) GeV

W-jets -0.38 ± 0.15

b-jets -1.43 ± 0.15

Energy in the cone affects the top mass directly. Studies are continuing