Field-Stuart-Haas Analysis

Charged Particle Data

WYSIWYG
What you see is what you get.
Almost!

QCD Monte-Carlo

Select "clean" region

Look only at the charged particles measured by the CTC.

Make efficiency corrections

- **Zero or one vertex**
- **$|z_c - z_v| < 2$ cm, $|\text{CTC } d_0| < 1$ cm**
- **Require $P_T > 0.5$ GeV, $|\eta| < 1$**
- **Assume a uniform track finding efficiency of 92%**
- **Errors include both statistical and correlated systematic uncertainties**

compare

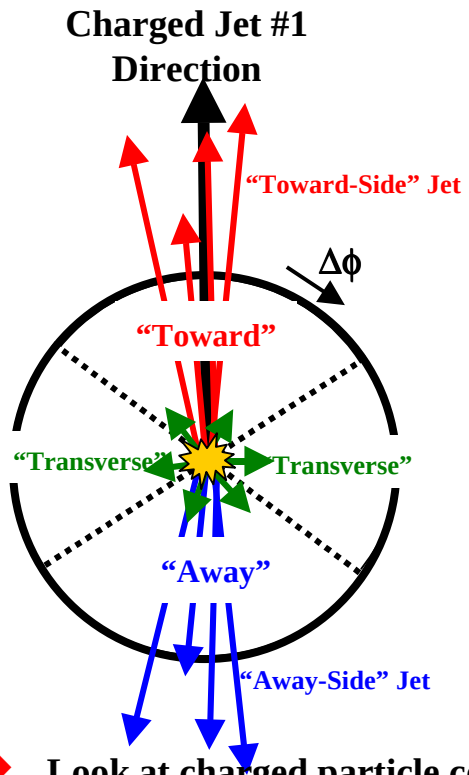
- **Require $P_T > 0.5$ GeV, $|\eta| < 1$**
- **Make an 8% correction for the track finding efficiency**
- **Errors (statistical plus systematic) of around 5%**

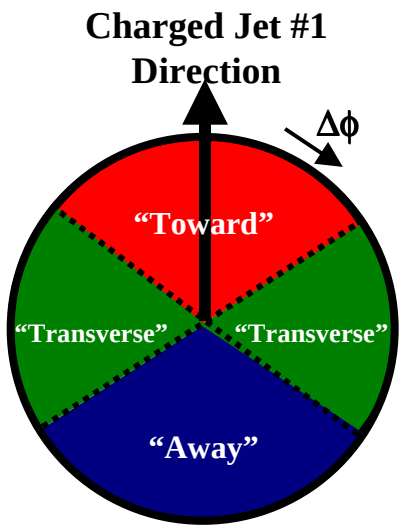
Uncorrected data

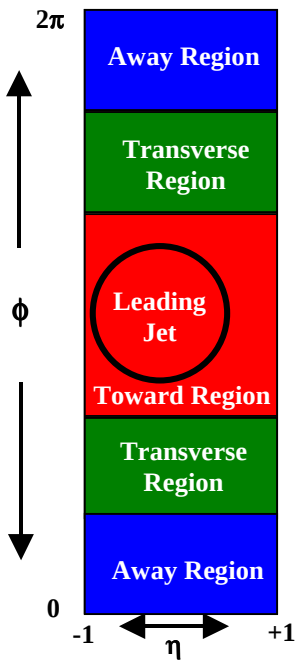
Corrected theory

Small Corrections!

Charged Particle Δϕ Correlations

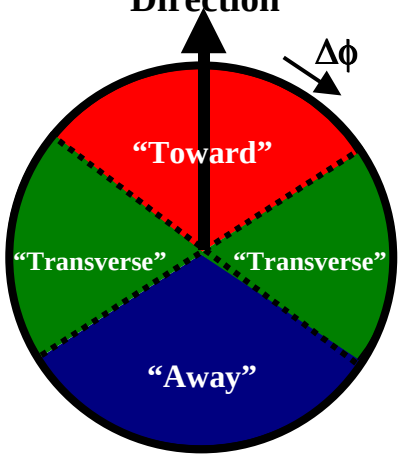


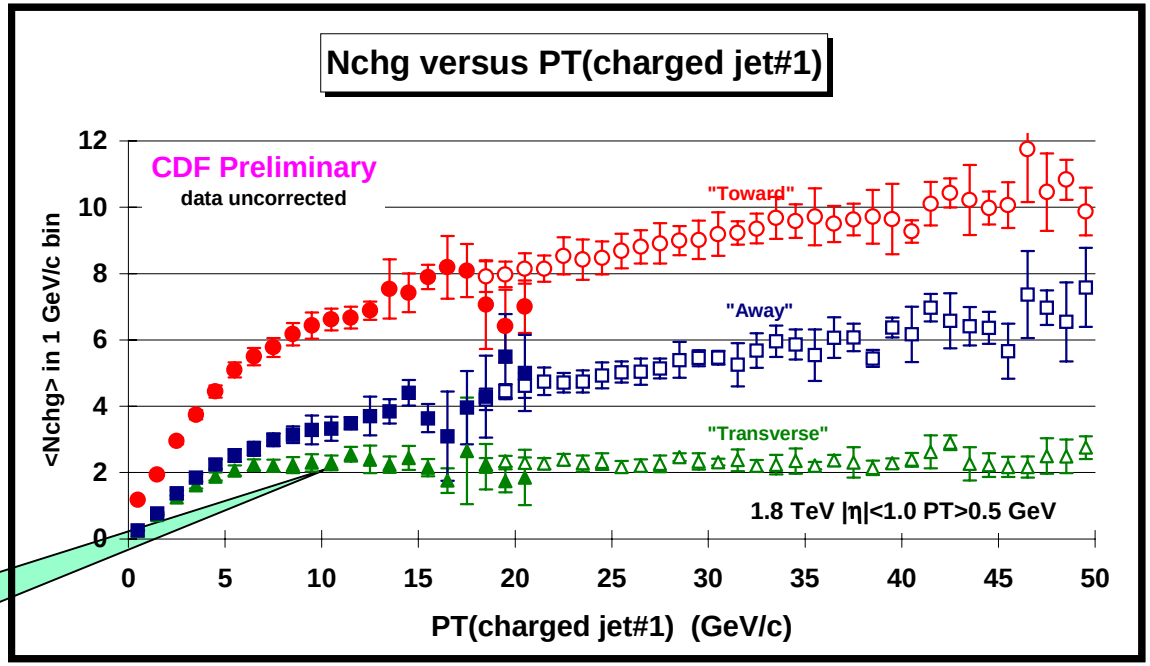




- Look at charged particle correlations in the azimuthal angle Δϕ relative to the leading charged particle jet.
- Define $|\Delta\phi| < 60^o$ as "Toward", $60^o < |\Delta\phi| < 120^o$ as "Transverse", and $|\Delta\phi| > 120^o$ as "Away".
- All three regions have the same size in η-ϕ space, $\Delta\eta x \Delta\phi = 2x120^o = 4\pi/3$.

Charged Multiplicity versus P_T(chgjet#1)



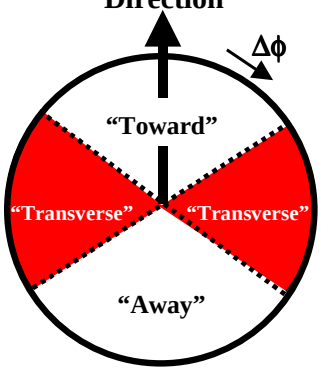


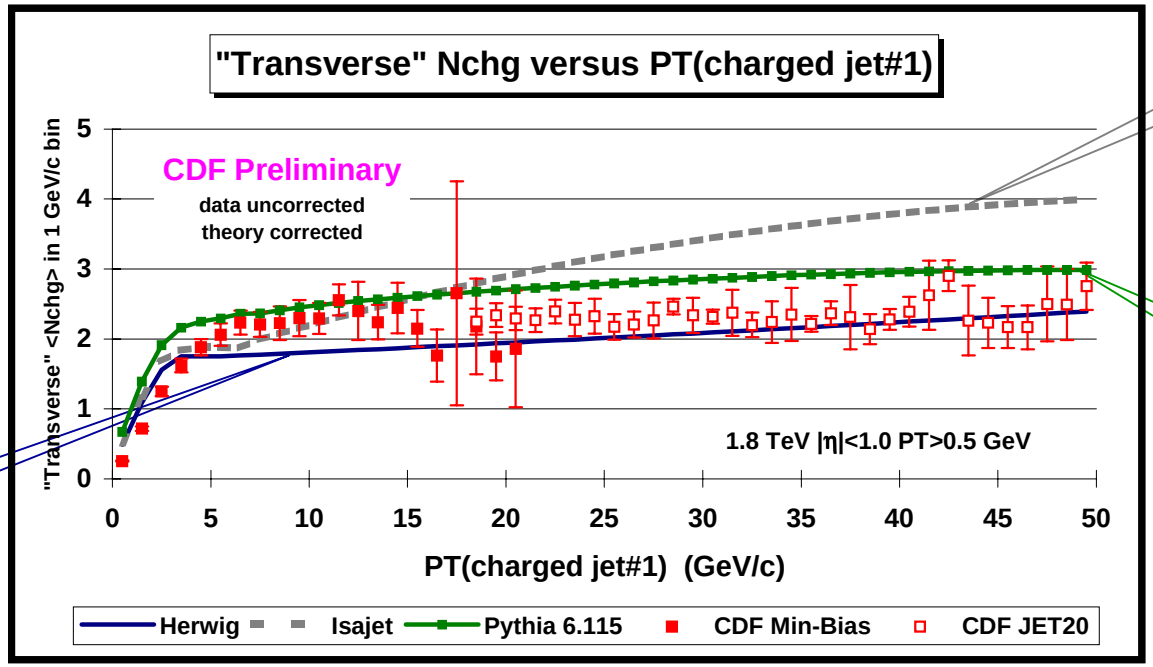
Underlying Event "plateau"

Blessed on 11/3/99

- **Data on the average number of "toward" ($|\Delta\phi|<60^o$), "transverse" ($60<|\Delta\phi|<120^o$), and "away" ($|\Delta\phi|>120^o$) charged particles (P_T > 0.5 GeV, $|\eta|$ < 1, including jet#1) as a function of the transverse momentum of the leading charged particle jet. Each point corresponds to the <Nchg> in a 1 GeV bin. The solid (open) points are the Min-Bias (JET20) data. The errors on the (*uncorrected*) data include both statistical and correlated systematic uncertainties.**

"Transverse" Nchg versus P_T(chgjet#1)

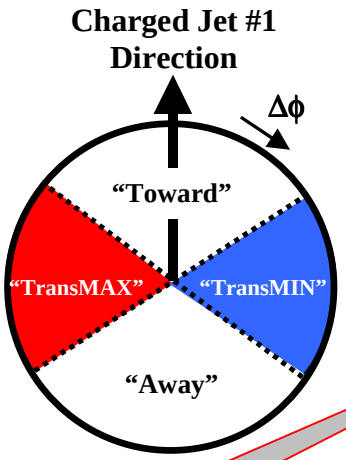


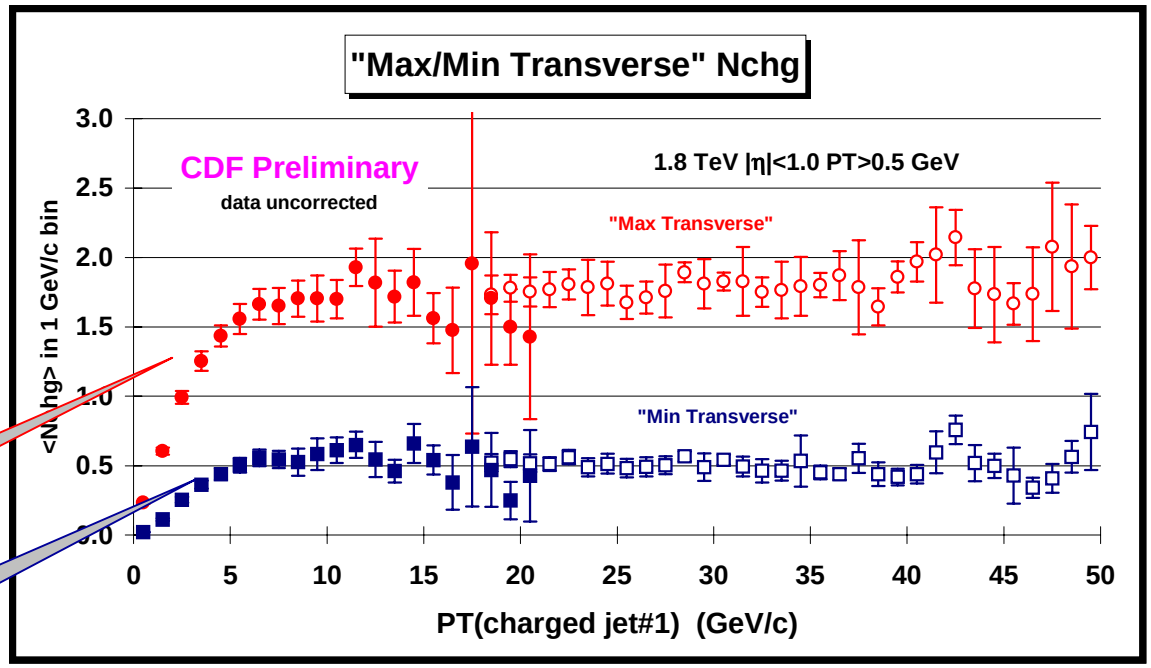


Blessed on 11/3/99

- **Plot shows the "Transverse" <Nchg> versus P_T(chgjet#1) compared to the the QCD hard scattering predictions of Herwig 5.9, Isajet 7.32, and Pythia 6.115 (default parameters with P_T(hard)>3 GeV/c).**
- **Only charged particles with $|\eta| < 1$ and $P_T > 0.5$ GeV are included and the QCD Monte-Carlo predictions have been corrected for efficiency.**

"Max/Min Transverse" Nchg versus P_T(chgjet#1)





"TransMAX"

"TransMIN"

Needs Blessing

- **Define "TransMAX" and "TransMIN" to be the maximum and minimum of the region $60^o<\Delta\phi<120^o$ ($60^o<-\Delta\phi<120^o$) on an event by event basis. The overall "transverse" region is the sum of "TransMAX" and "TransMIN". The plot shows the average "TransMAX Nchg" and "TransMIN Nchg" versus P_T(charged jet#1).**
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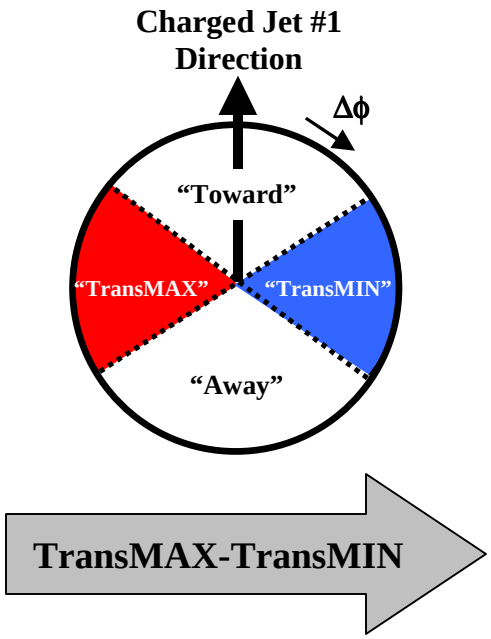
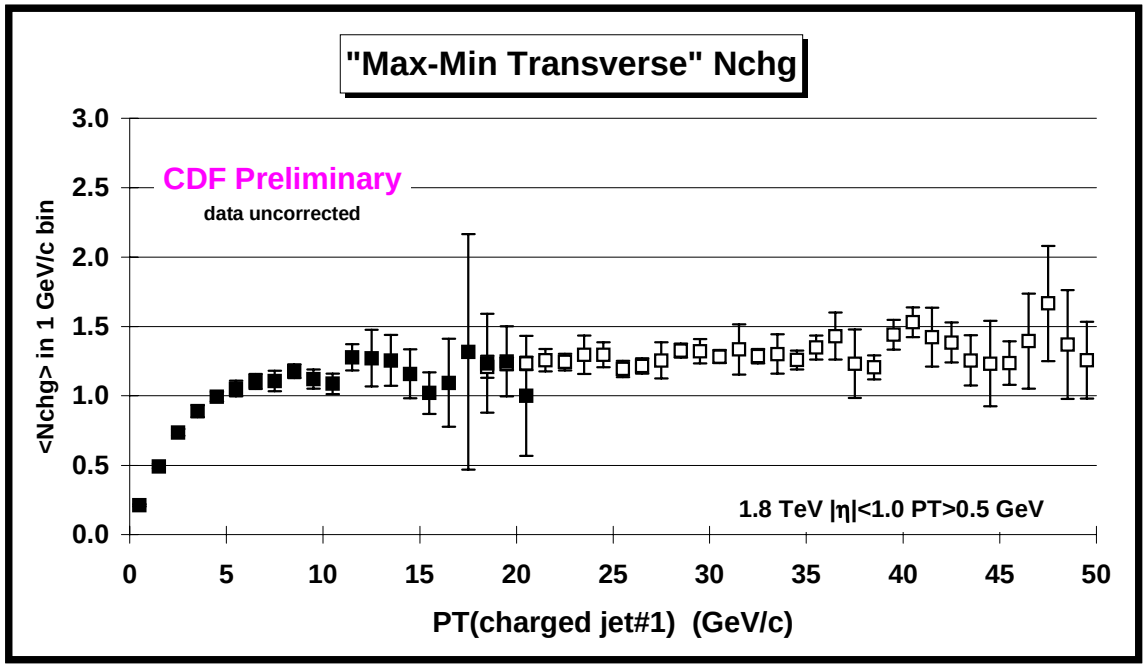
"Max-Min Transverse" Nchg versus P_T(chgjet#1)





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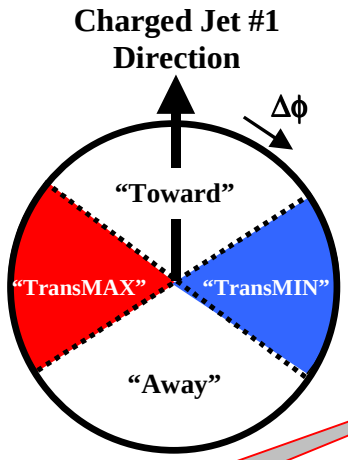
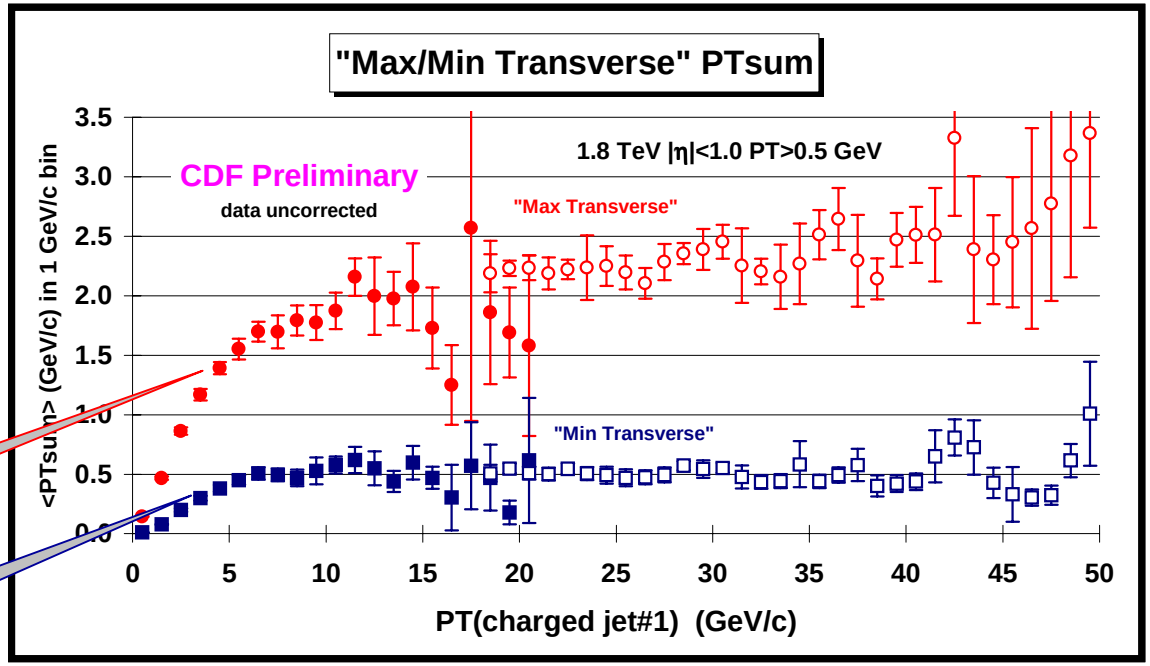
"Max/Min Transverse" PTsum versus P_T(chgjet#1)





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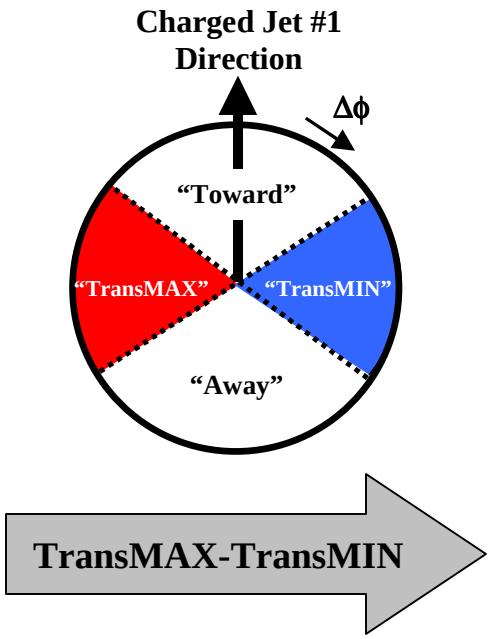
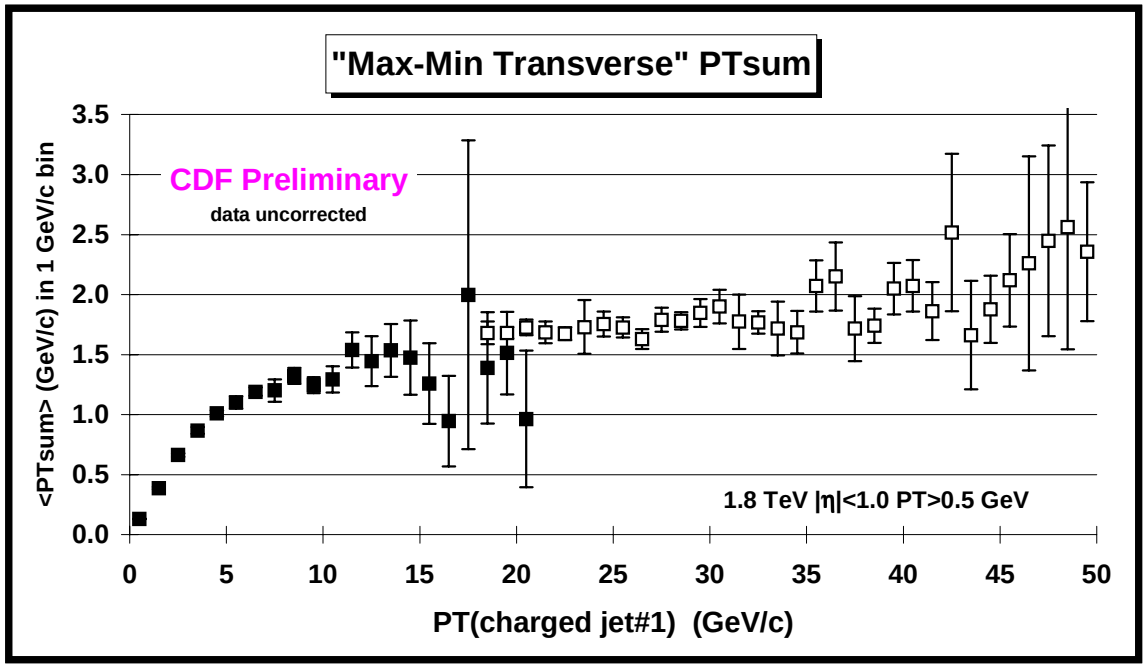
"Max-Min Transverse" Nchg versus P_T(chgjet#1)





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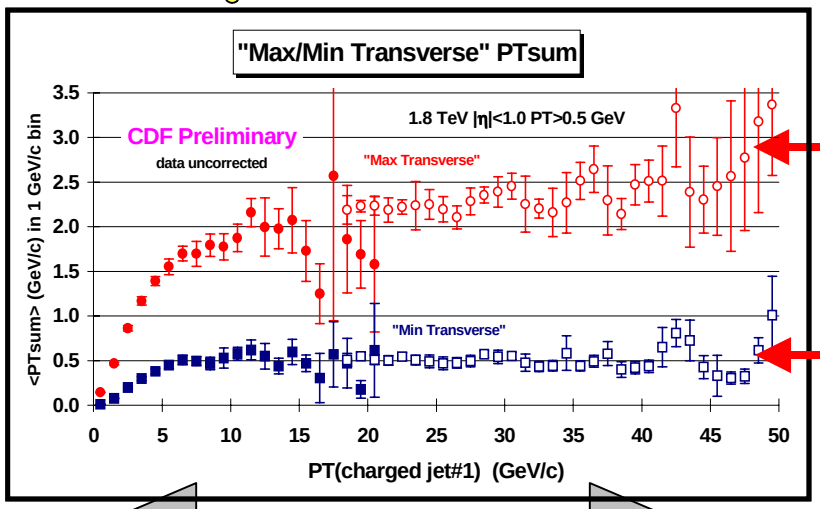
Transverse Regions vs Transverse Cones

Field-Stuart-Haas



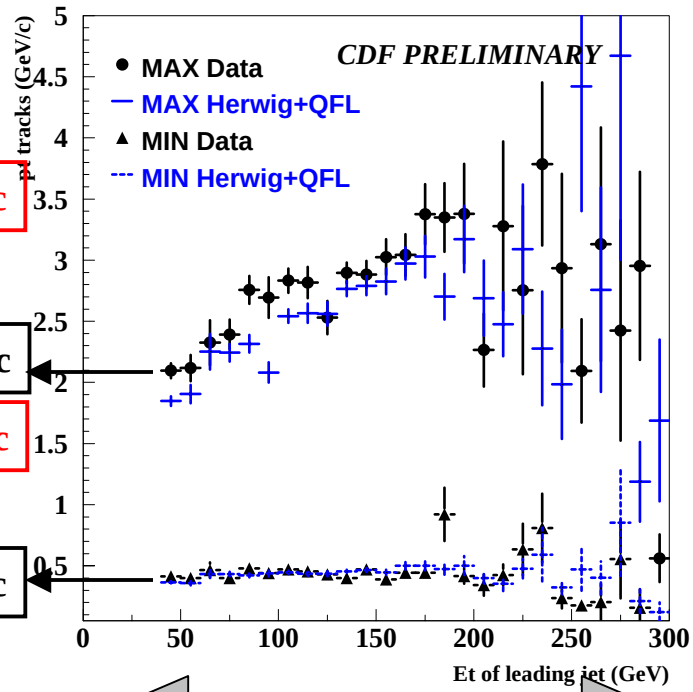
2.9 GeV/c

2.1 GeV/c

0.5 GeV/c

0.4 GeV/c

Pt track in max and min cone



$0 < P_T$(chgjet#1) < 50 GeV/c

$0 < E_T$(jet#1) < 50 GeV/c

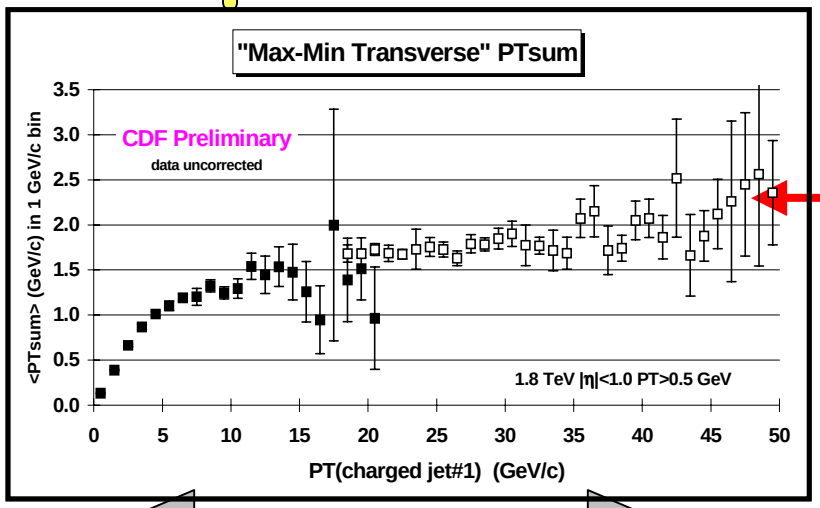
- **Multiply by ratio of the areas:**
  Max=(2.1 GeV/c)(1.36) = 2.9 GeV/c
  Min=(0.4 GeV/c)(1.36) = 0.5 GeV/c.
- **This comparison is only qualitative!**

Tano-Kovacs-Huston-Bhatti

Can study the "underlying event" over a wide range!

Transverse Regions vs Transverse Cones

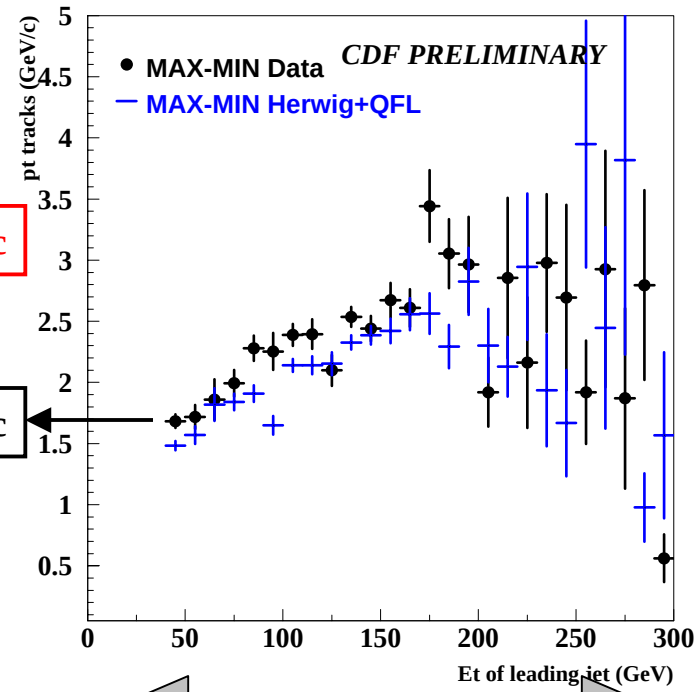
Field-Stuart-Haas



2.3 GeV/c

1.7 GeV/c

Pt track in max-min cone



$0 < P_T(\text{chgjet\#1}) < 50$ GeV/c

$0 < E_T(\text{jet\#1}) < 50$ GeV/c

- **Multiply by ratio of the areas: (1.7 GeV/c)(1.36) = 2.3 GeV/c.**
- **This comparison is only qualitative!**

Can study the "underlying event" over a wide range!

Tano-Kovacs-Huston-Bhatti