# “Top MCs from Tevatron to LHC”

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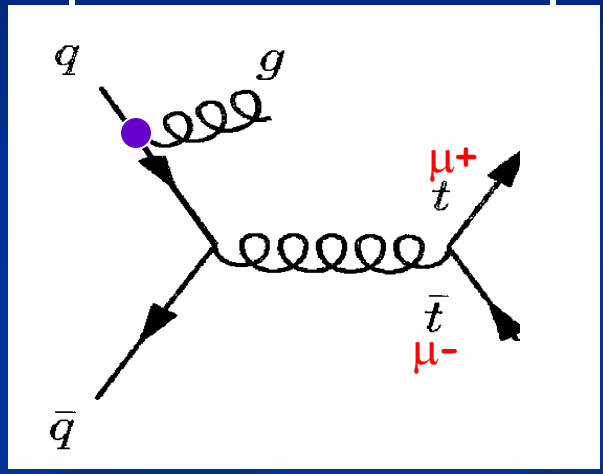
**University of Chicago**

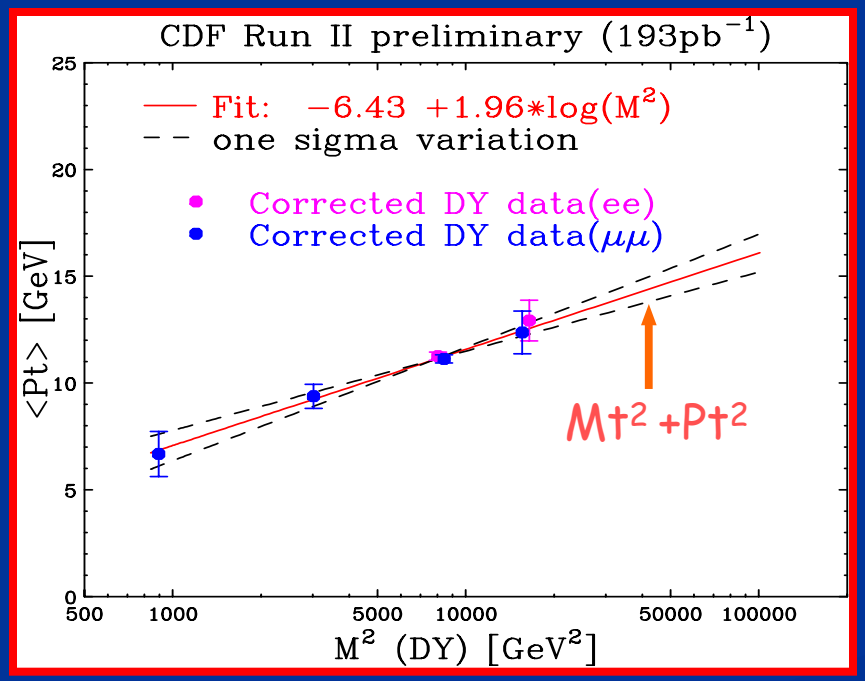
- MC results for top studied for several different MC codes.
  - Pythia, HERWIG, ME, MC@NLO
- Most results were presented for ISR, but other effects such as FSR, scale choices, PDFs, underlying events, fragmentation also considered.
- Motivated choices of processes for tuning parameters
  - Attempt to minimize the effects of the other contributions
  - Physics understanding for what is being used.
- The tuning can be tested with Tevatron data, and establishes the utility of the chosen processes to understand each piece of physics.
- What is being learned is not the tuning parameters, but how to extract them from LHC data.
- Systematic differences between run II & LHC must be understood.

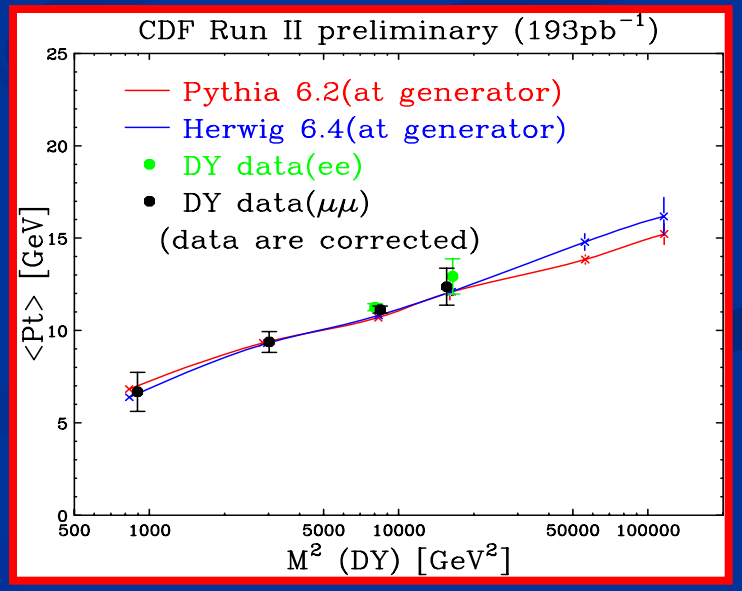
# How to tune ISR and it's uncertainty?

- ISR effects are governed by DGALP eq. ( Q2, $\Lambda_{QCD}$, splitting functions, PDFs )
- Average Pt of the DY [ Q2 ~M(DY)2 ]
  - measure the slope :allows us to estimate the size of ISR at top production region.

$q\bar{q}$ -> $t\bar{t}$ vs $\mu^+\mu^-$



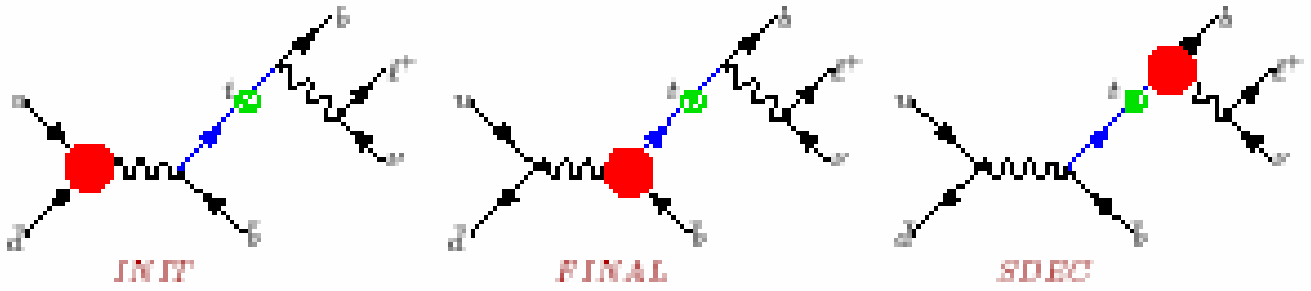




- The prediction at Q2=Mt$^2$+Pt$^2$ is slightly higher than Pythia

# "NLO QCD Corrections to s-channel Single Top Quark Production and Decay at the Tevatron"

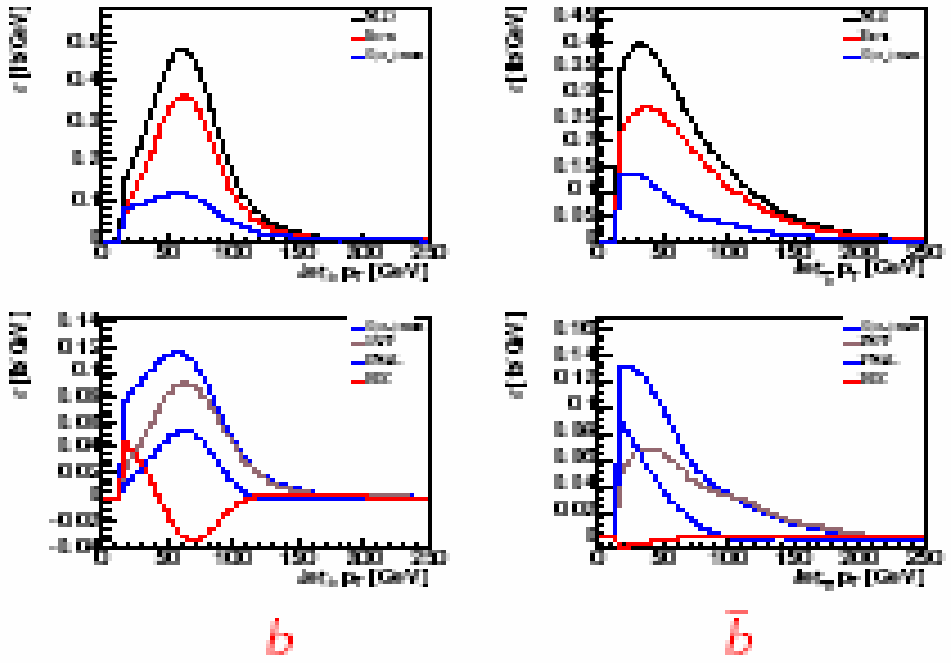
**Qing-Hong Cao**
**Michigan State University**

- The s-channel mode of single top production is studied at NLO, including Initial state, final state, and top decay corrections.
- Distributions are studied, and acceptances are computed.
  - NLO changes distributions, and does not allow simple use of k-factors.
  - The "best jet" algorithm assigns which b-jet came from the top decay, taking advantage of the known top mass (from tt) and providing more information which may be useful to extract this signal from background.
- Comparison with WH, $H \rightarrow bb$ is shown.
  - Single top is a major background to this process.
- This is a very new result
  - It would be nice to see how it fits in with tools currently in use by experiment.
- A similar result is available from Campbell, Ellis, and Tramontano
  - It would be nice to see how they compare.




# Final object distributions

- Lepton and $\not{E}_T$ distributions are not sensitive to NLO QCD corrections.
- $b$ and $\bar{b}$ distributions




NLO corrections broaden the LO distributions and shift the peak position to lower valule.

$b$ and $\bar{b}$ are sensitive to DEC and FINAL contributions, respectively.

INIT contribution dominates over FINAL and DEC.

$\Longrightarrow$ soft gluon resummation

$\Longrightarrow$ improve the prediction on kinematical acceptance

# Single Top as a Case Study

- Many in the parallel session expressed interest in single top production.
- Understanding single top is a good bridge from Tevatron to LHC
  - It is a rare, challenging (low S/B) signal at Tevatron – like much of the physics we want to do at the LHC.
  - It relies on b-tagging in the final state.
  - It is driven by "initial state" b quarks.
  - It has a final state W boson.
  - The t-channel mode has a forward jet very similar in kinematics to the spectator jets in weak boson fusion Higgs production.
  - Many of its backgrounds (Wbb, Wjj, tt) are common with important signals.
  - It is interesting in its own right – top's weak interactions!
- It seems likely that understanding the run II searches and exploring alternatives will result in techniques that can be effectively applied to LHC processes, including Higgs, top, and more.

# Organization

- Web Page:
  - http://www.hep.anl.gov/tait/tev4lhc/topew.html
  - Still under construction, but should be up to date **soon**.
  - Lists of topics of investigation and interested people.
  - Email to Organizers.
  - Announcements for future meetings.
- Future Meetings:
  - We will plan to meet every month or so to organize and report on progress.
- A Great Start!
  - More than 50 people signed up for top/EW topics!
  - We will organize an automated email list through FNAL.
  - Until then, please contact the organizers to be added to the working group discussions.