

Rivet analyses ... and more



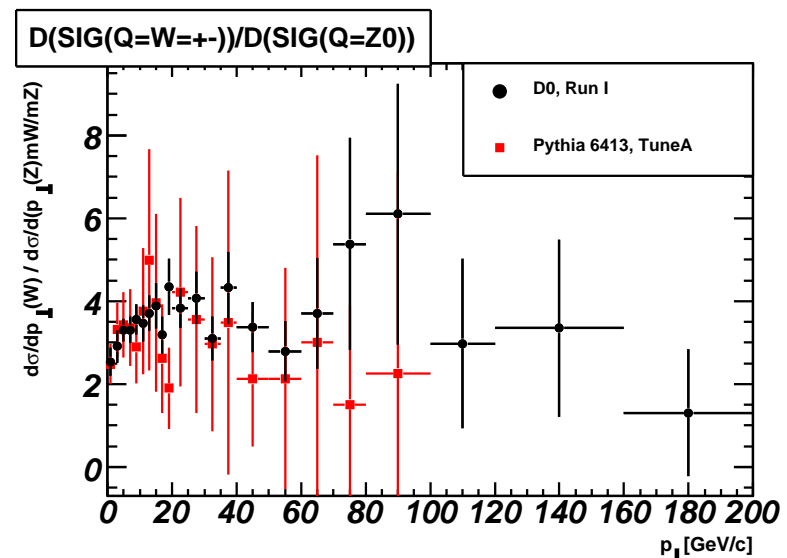
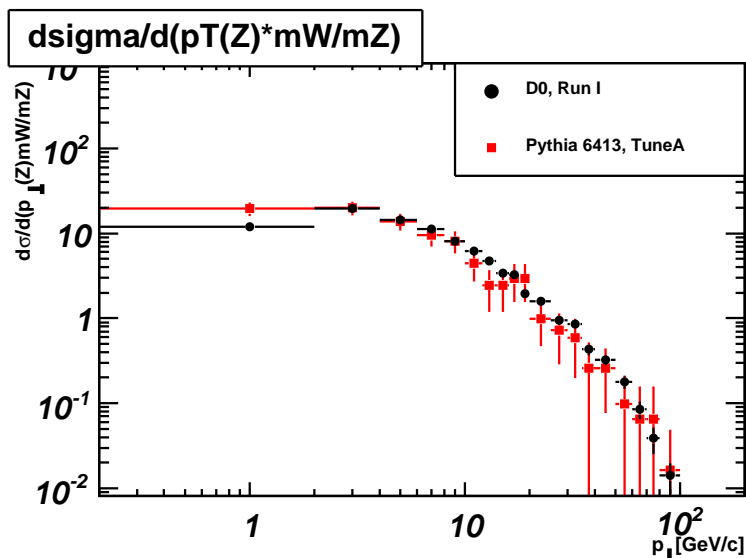
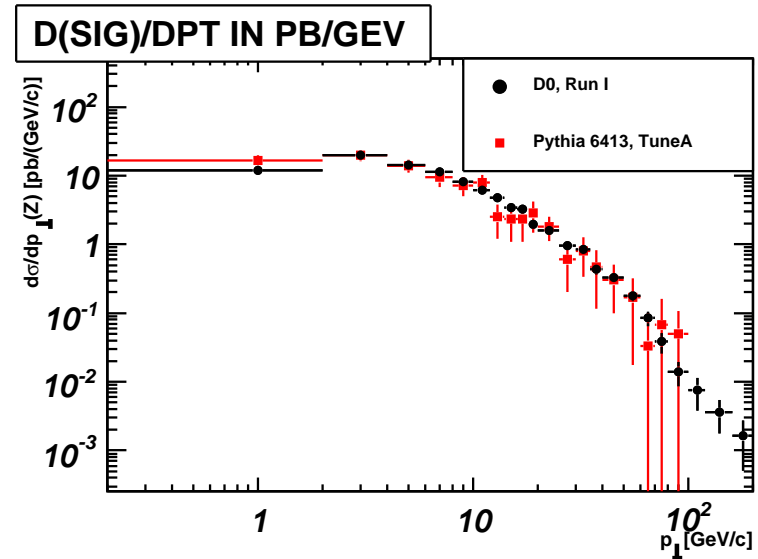
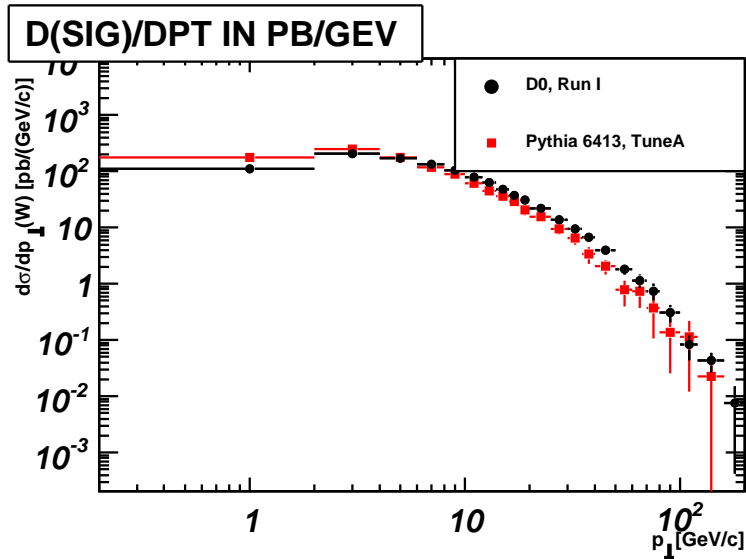
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- Rivet development related work
- Beyond CDF_2007_S7057205 inclusive k_{\perp} jet cross section analysis: Further optimised observable(s)
- Conclusions

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D0_2001_S4674421: Differential W/Z boson cross section analysis

- MC bosons are replaced by reconstructed decay objects (e^\pm, \cancel{E}_\perp)
- AIDA division/normalisation problem circumvented

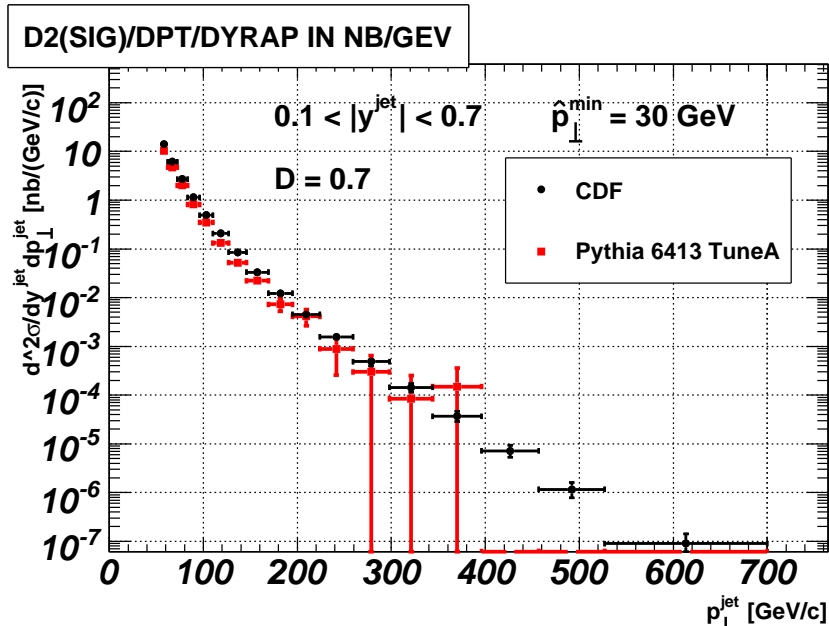
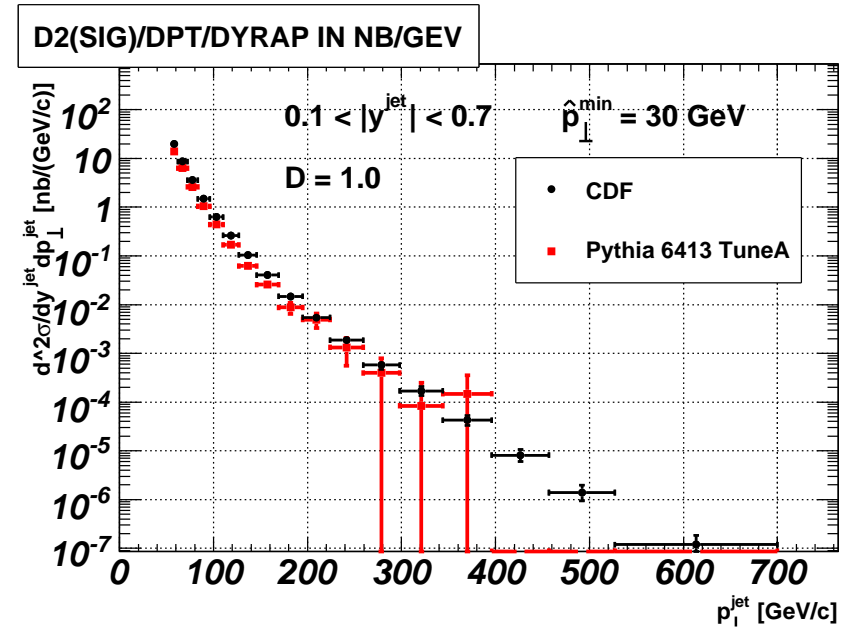
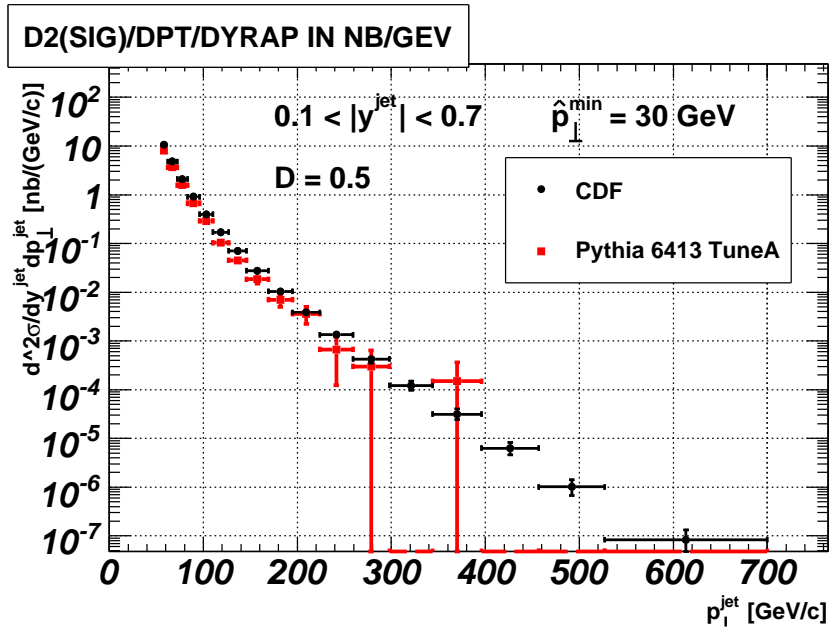


FastJet: jet algorithm library

Next release will be: 2.4

- DØRun II cone algorithm as plugin implemented and tested
- TrackJet algorithm as plugin implemented and tested
- Before release, $e^+e^- k_{\perp}$ algorithm needs extensive tests
- Rivet fastjet plugin branch has been tested with fastjet development version
- Last synchronisation to Rivet trunk done before Christmas.
Many conflicts had to be solved by hand.

Rivet Analysis: CDF_2007_S7057202: Inclusive k_{\perp} jet cross section



- Idea: Looking at more significant observables
 \Rightarrow Tighter constraints on Monte-Carlo event generators/
phenomenological models.
- Consider ratio of cross sections with different jet algorithm D parameters
(p_{\perp} bin by bin):

$$y = \frac{x_1}{x_2}$$

$$\sigma_y^2 = \frac{1}{x_2^2} \sigma_{x_1}^2 + \frac{x_1^2}{x_2^4} \sigma_{x_2}^2 - 2 \frac{x_1^2}{x_2^3} Cov_{12}$$

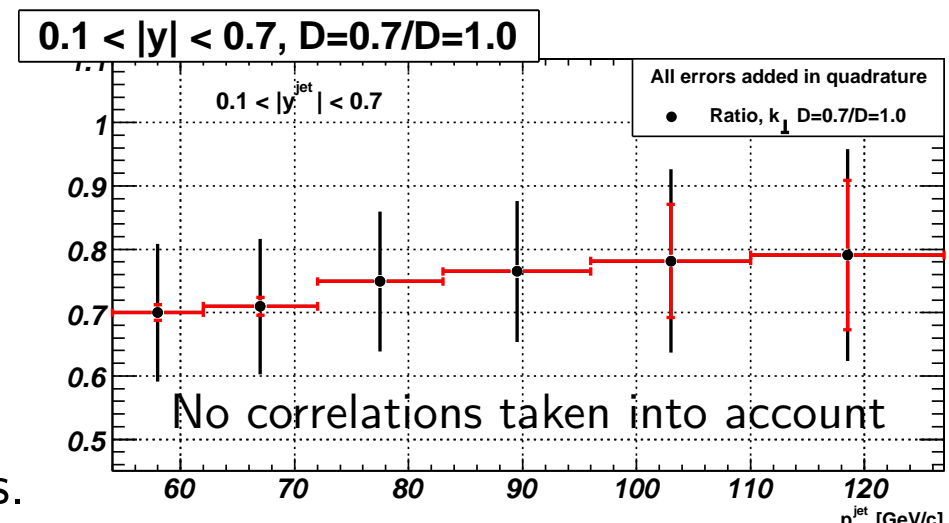
$$Cov_{12} = \rho_{12} \sqrt{Var_{11} Var_{22}} = \rho_{12} \sigma_1 \sigma_2$$

- If correlations are positive ($\rho_{12} > 0$)
the new observable y has smaller errors.

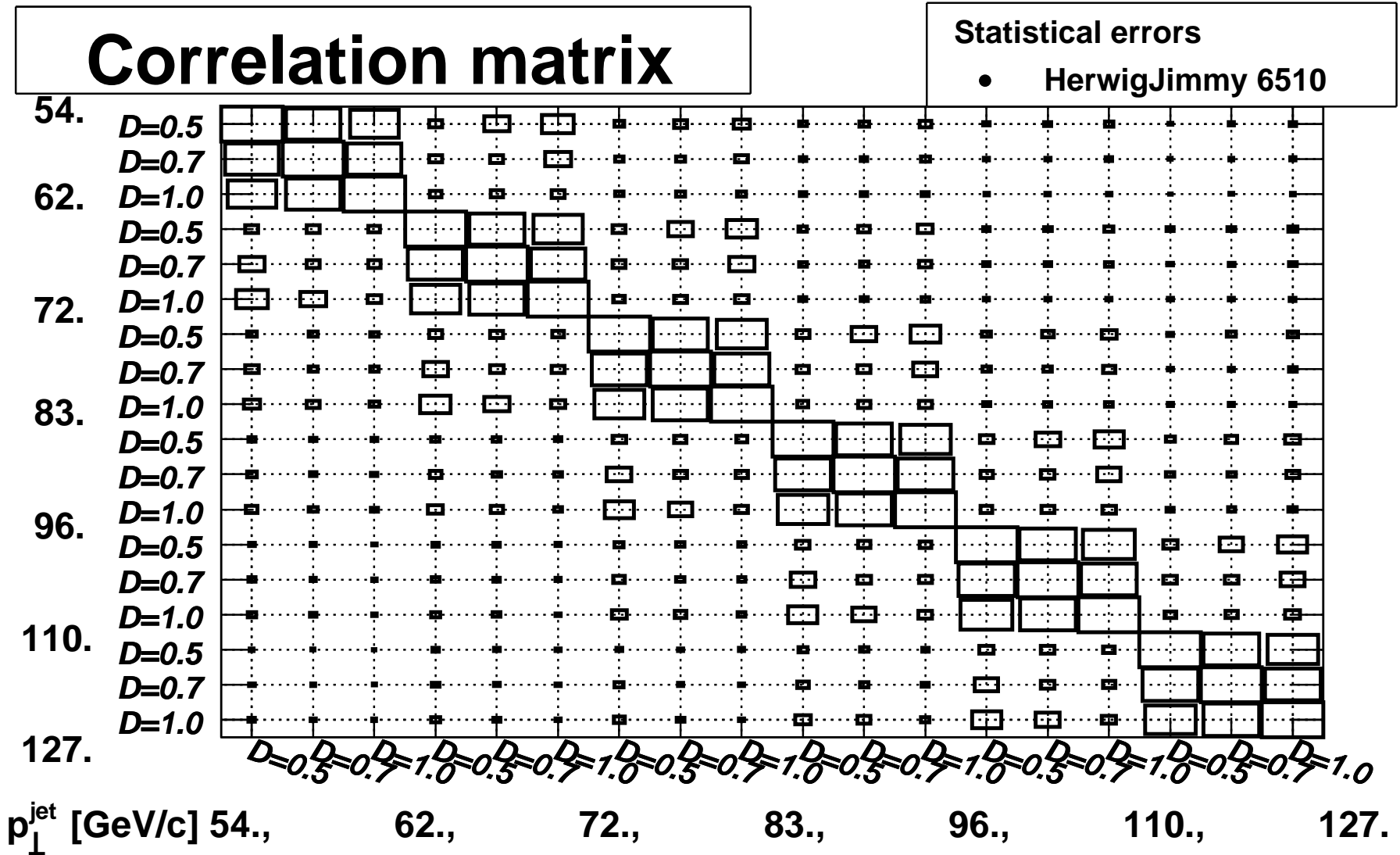
- Statistical as well as systematical errors are expected to be positively correlated.

- Correlation matrices can not be recovered from published analysis.

\Rightarrow Simulate some with different event generators to get an estimate

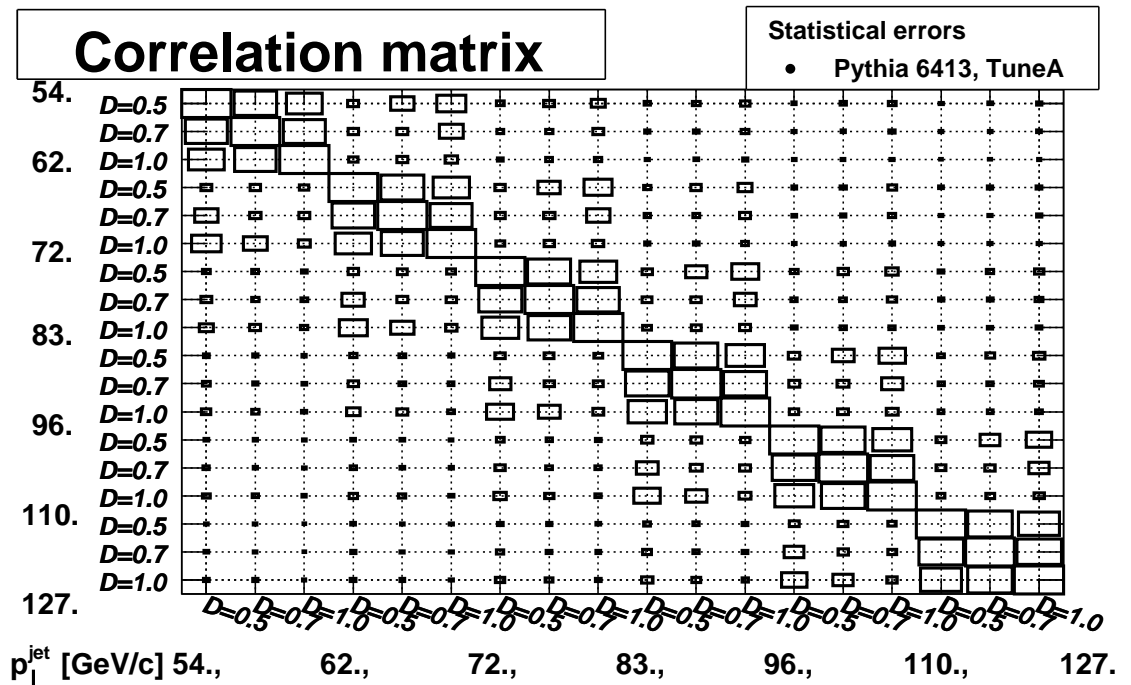
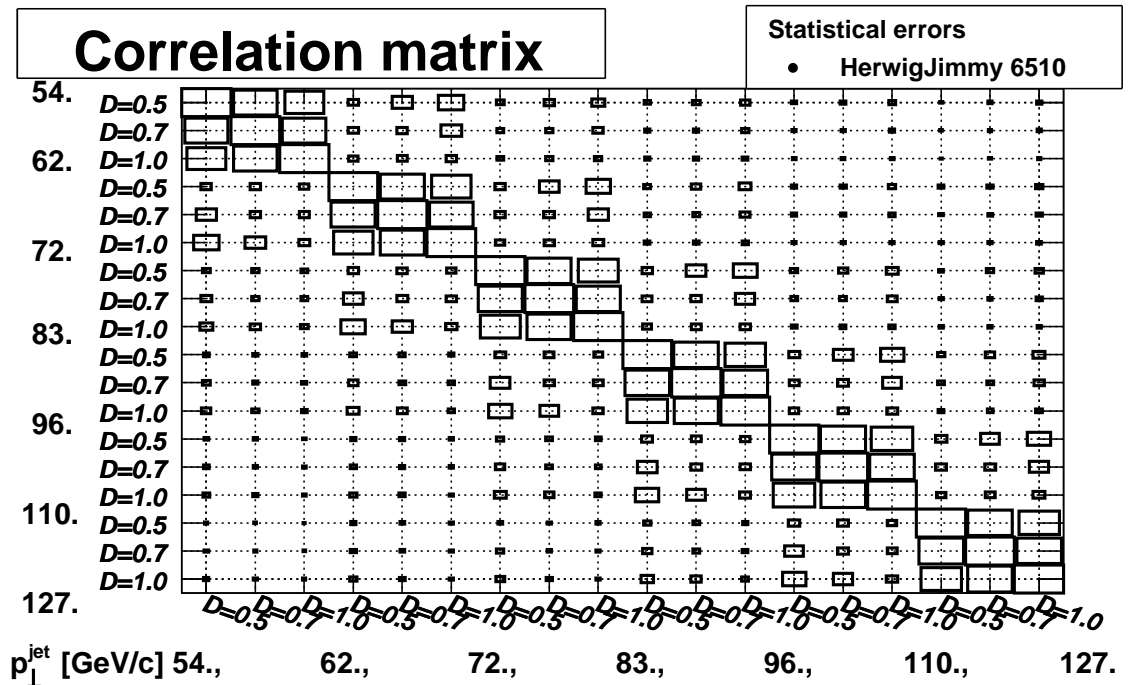


Correlation matrix in $k_{\perp} D, p_{\perp}$ -space of statistical errors



Rivet Analysis: CDF_2007_S7057202: Inclusive k_{\perp} jet cross section

HerwigJimmy 6510 and
Pythia6413 compared:
Very similar

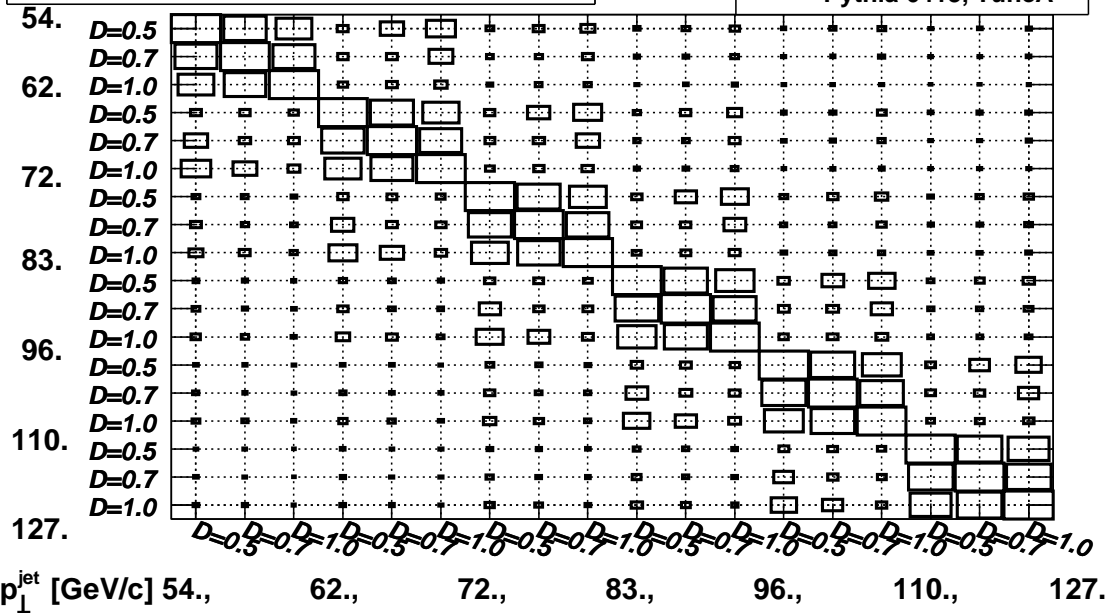


Rivet Analysis: CDF_2007_S7057202: Inclusive k_{\perp} jet cross section

Correlation matrix

Statistical errors

• Pythia 6413, TuneA

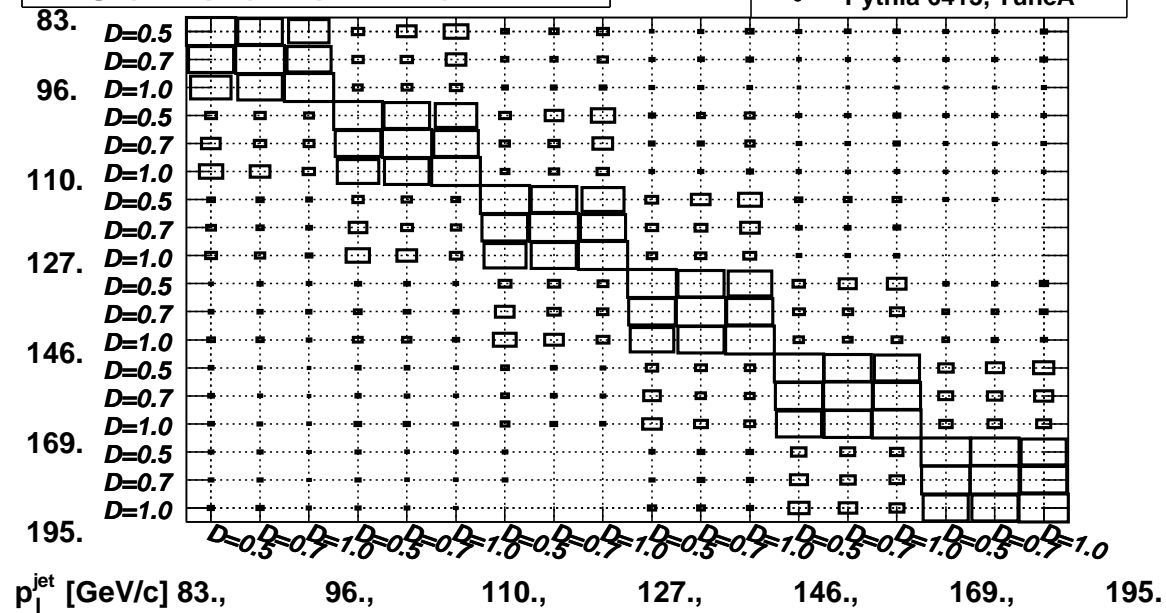


Correlation matrix can also be extended to higher jet p_{\perp} bins in the limit of infinitely large hadron-hadron collision cross section.

Correlation matrix

Statistical errors

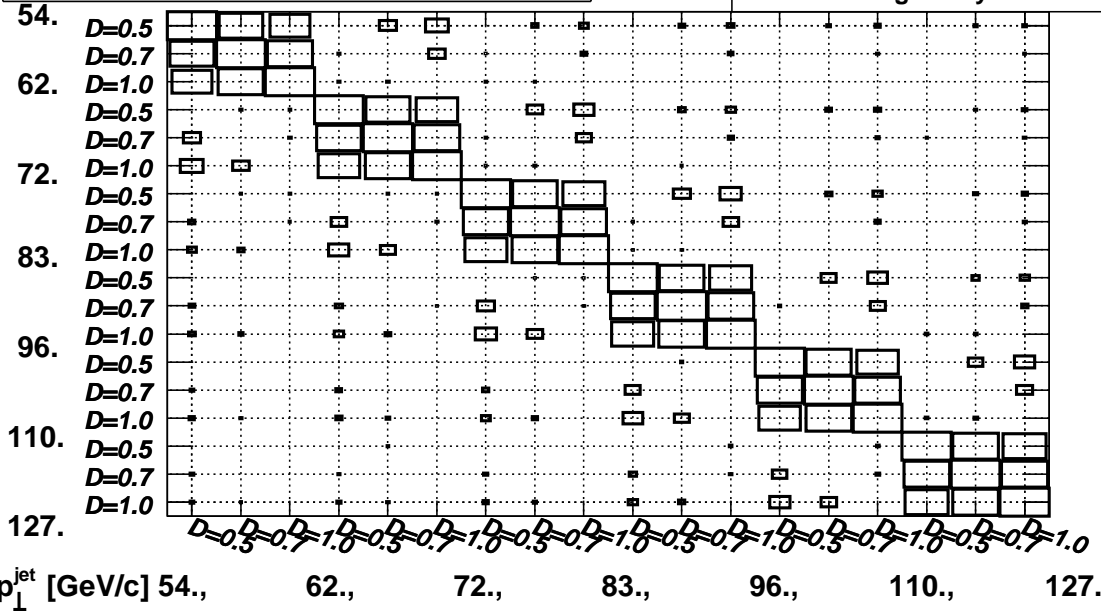
• Pythia 6413, TuneA



Rivet Analysis: CDF_2007_S7057202: Inclusive k_{\perp} jet cross section

Correlation matrix

JES errors
• HerwigJimmy 6510



Total error in measurement consists of

- **Statistical error**
- **Systematic errors:**
 - **Jet Energy Scale (JES)**
 - **Jet Energy Resolution (Res)**
 - Deconvolution
 - Jet p_{\perp} spectrum correction
 - Multiple Interactions

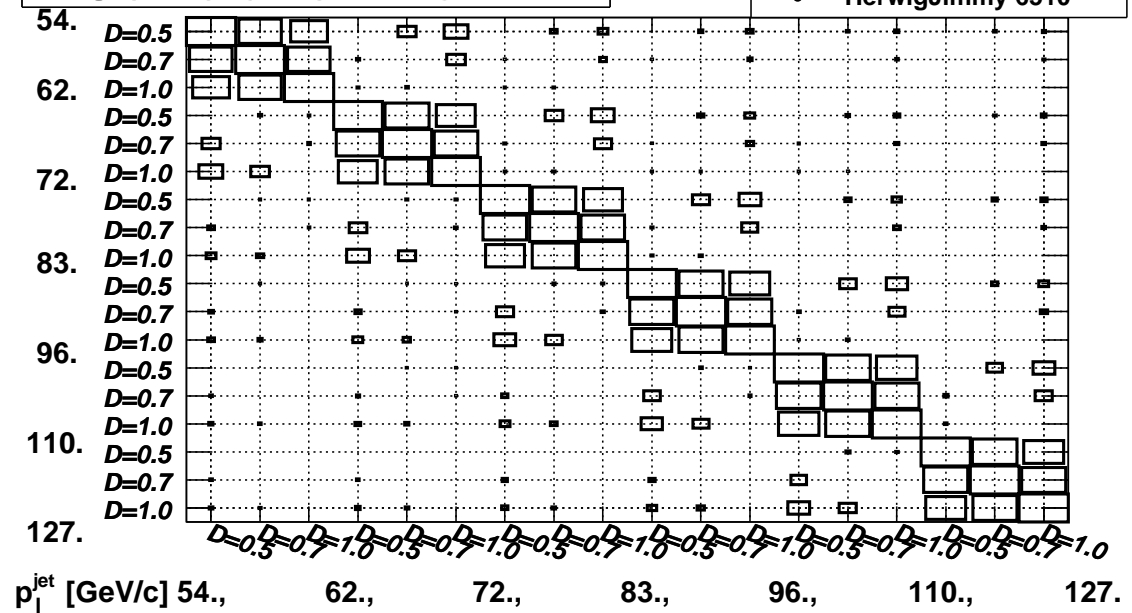
- Take CDF JES and Res parameterisation
- Smear final state particles accordingly
- Re-determine jets
- Determine JES and Res errors and correlations
- Add all errors up for ratio

Things to do:

- Try Sherpa
- Take systematic error on correlation coefficient differences of different event generators/models into account (small)

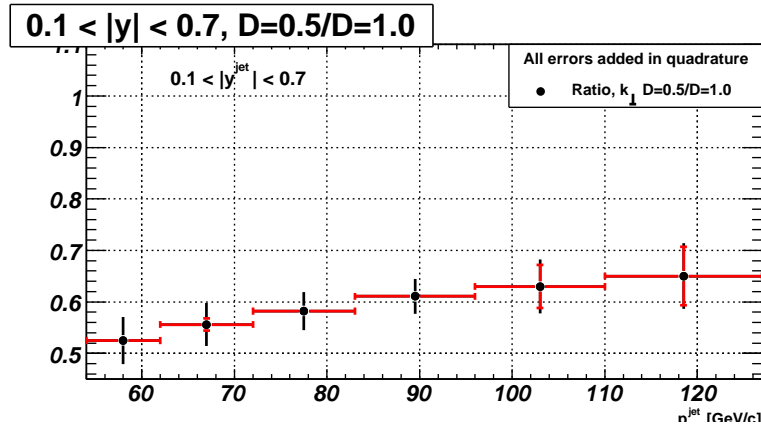
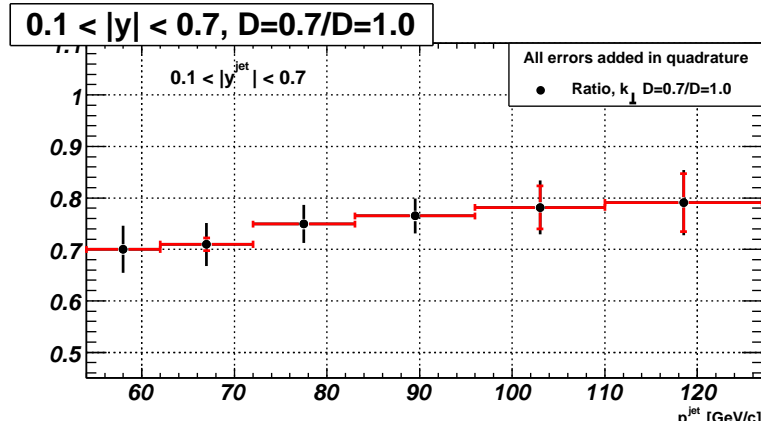
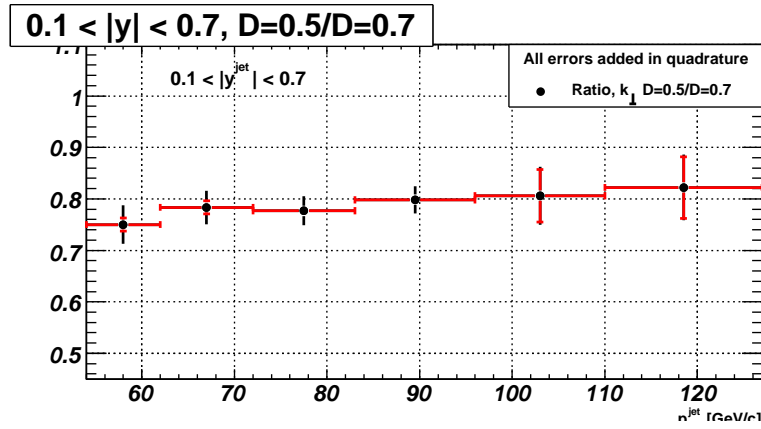
Correlation matrix

Jet Energy Resolution errors
• HerwigJimmy 6510

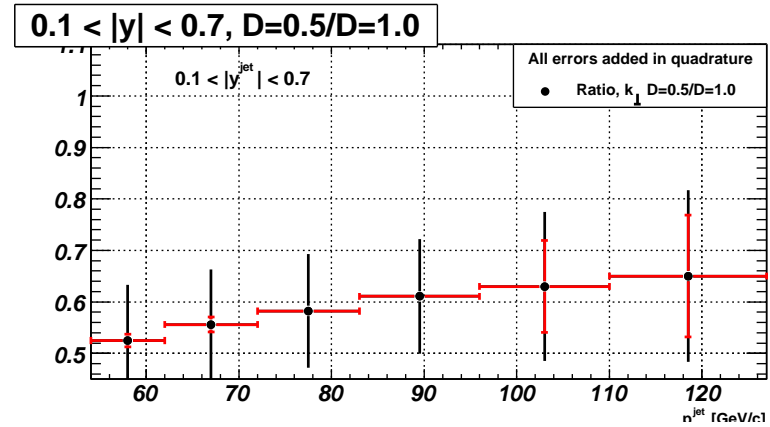
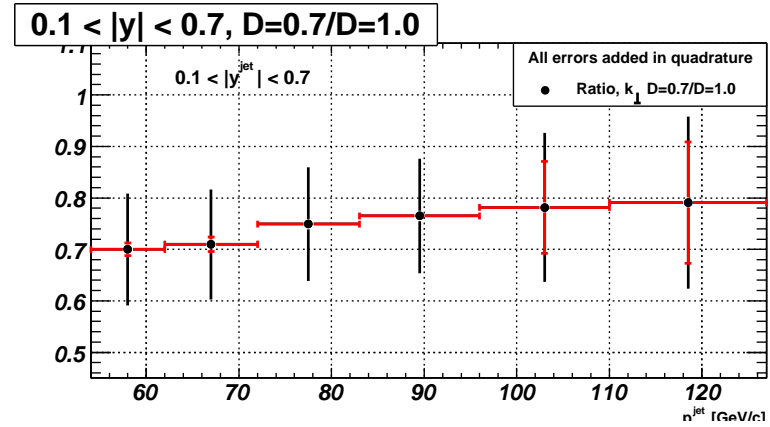
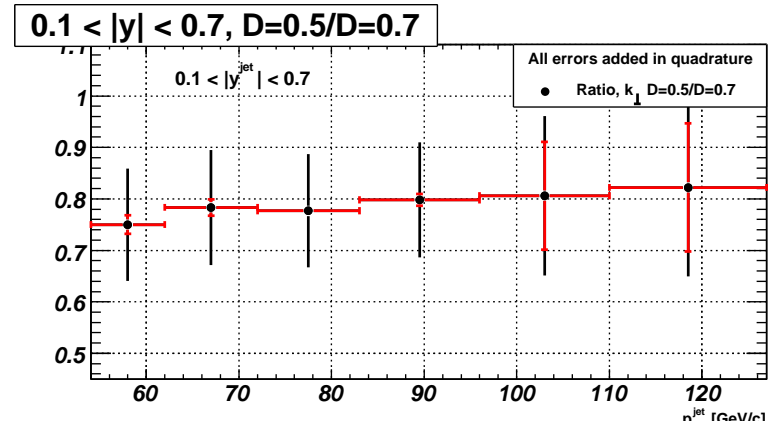


Rivet Analysis: CDF_2007_S7057202: Inclusive k_{\perp} jet cross section

Correlations taken into account



Correlations NOT taken into account



Conclusions

- D0_2001_S4674421: Differential W/Z boson cross section analysis re-engineered
- FastJet D0 Run II cone and TrackJet plugins are implemented and tested. Will become available with next release
- CDF_2007_S7057205 analysis can be complemented by more significant observable \Rightarrow Encouragement for experiments