Some open issues for the MC people

Stuff that could be started in Les Houches '13

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Extending HepMC/Rivet

- Rivet is the main analysis tool for/by the MC community, incorporating about 200 analyses

- communication is mainly through HepMC event record

- for improved uncertainty analyses (scales, PDFs, additional new physics …) need

multiple weights per event in HepMC

- need to integrate/test this capability with Rivet

- trigger a discussion on a standard extension of HepMC

- also would like **status codes for GenVertex in HepMC**

- Experiments are providing detailed correlation matrices – can Rivet make use of them?

Systematic evaluation of systematic uncertainties in/from MC predictions

- which scales to vary: standard renormalisation and factorisation scales in matrix elements

- also in showers? if so, how?

- starting scales of shower (ie matching scale of ME & PS)? how about contact to resummation calculations?

- multijet merging scale between ME & PS?

- systematic variation of underlying event simulation: eigentunes? other ideas?

- PDF uncertainties: how to do them properly in the shower? is this important?

Comparison of new NLO+PS tools

- testcase: Higgs boson production in gluon fusion

    (was already started for Higgs YR3, but needs follow up)

- inclusive quantities: Higgs pt, y distributions, Njets etc. & uncertainties (preferably already with setup above)

- testing the high-pt regime (boosted Higgs + jet)

- testing the two-jet regime with weak boson fusion cuts

Some puzzles
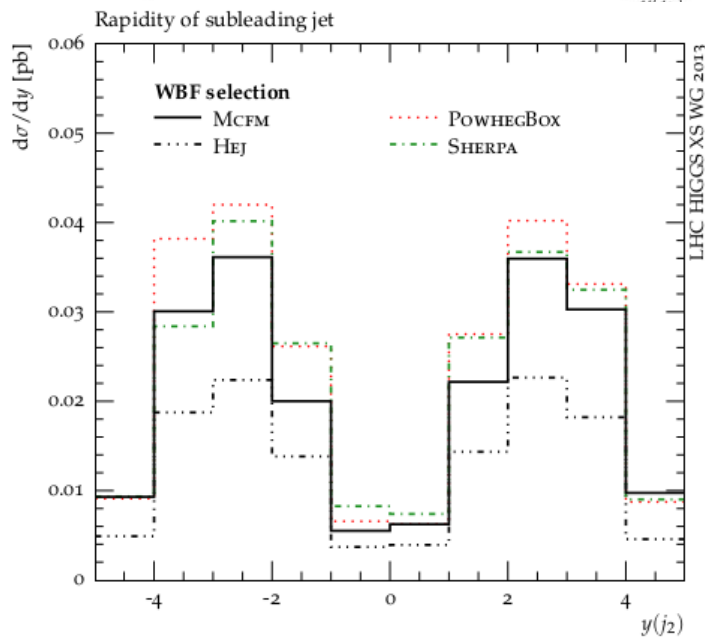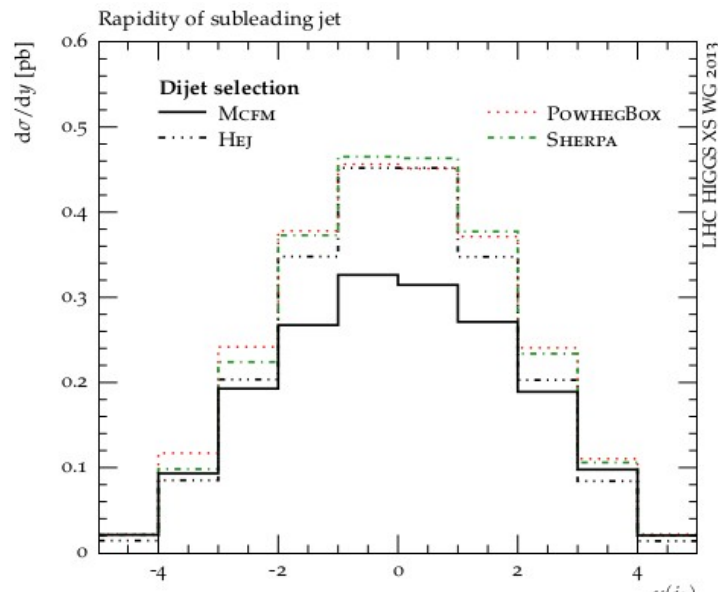
- Consider y_2 before (top) and after (bottom) WBF cuts
- Funny pattern of agreement/disagreement
- Also: $\Delta\Phi_{jj}$
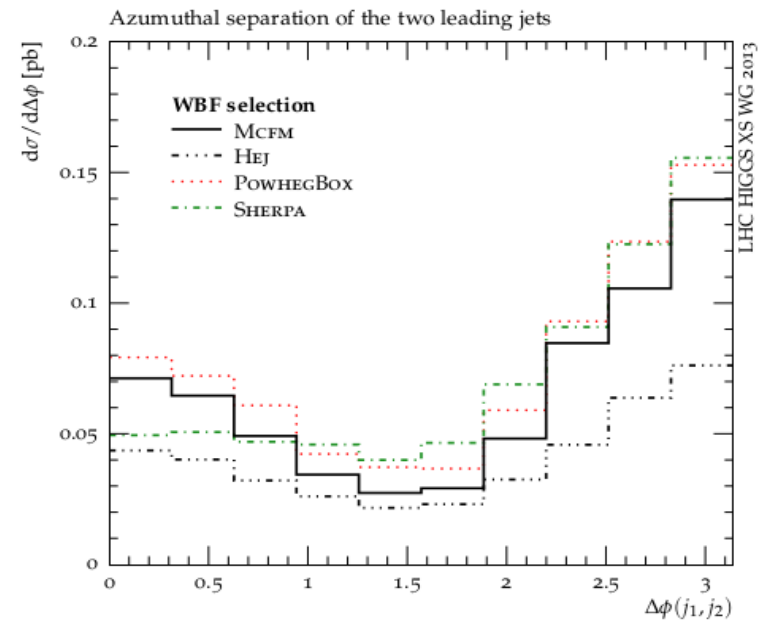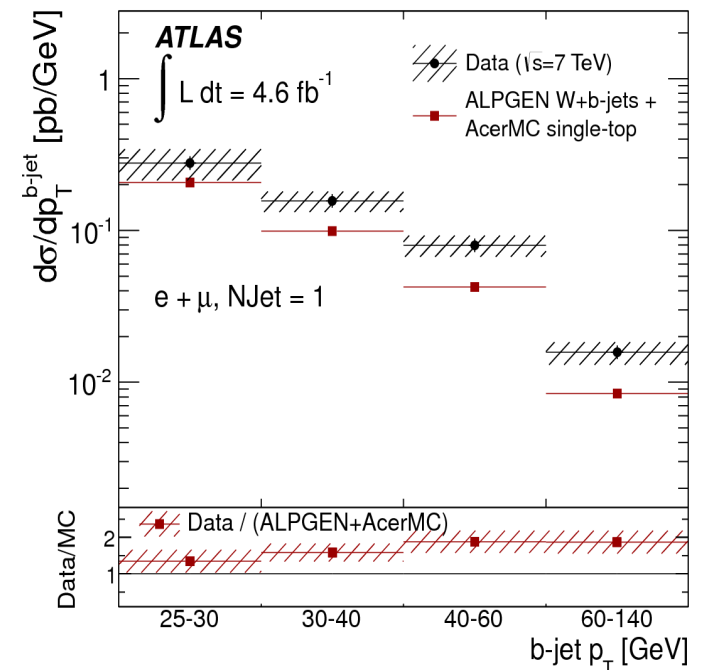
Irreducible Backgrounds

- **Different process, same (or very similar) final state**

  – W+jets, single top

  – WW, ttbar

  – gg $\rightarrow$ VV+jets, qq $\rightarrow$ VV+jets

  – …

arXiv:1302.2929

- **Can theory tools be integrated?**

  – Overlaps - Double counting? Gaps?

- **Often subtracted by experiments at "detector level". Is that optimal?**

Data access/archiving

- Development of HEPDATA to improve ease of use and flexibility
    - Correlations
    - Multiple distributions, larger data sets
    - Events?
- Integration of these features (?) with Rivet

Some more bits and bobs

- Maybe need a primer for non-experts on new tools and techniques: MENLOPS, UNLOPS, MEPS@NLO ….

- Processes at TeV scale: the "EW Sudakov" regime
    - Discuss schemes to include EW corrections into MCs