POWHEG and RESBOS Boson pT
For W Mass Measurement

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OVERVIEW

The W Mass Analysis needed additional CPU. We generated POWHEG-PYTHIA samples at Texas A&M. Today we are showing the resulting pT(W), pT(Z), and their ratios, as well as comparison to RESBOS.

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POWHEG + PYTHIA
Requirements and Executables

Prerequisites:

- LHAPDF and FASTJET are needed (to handle the non-default PDFs)

- PDFs need to be obtained through the lhapdf-getdata script

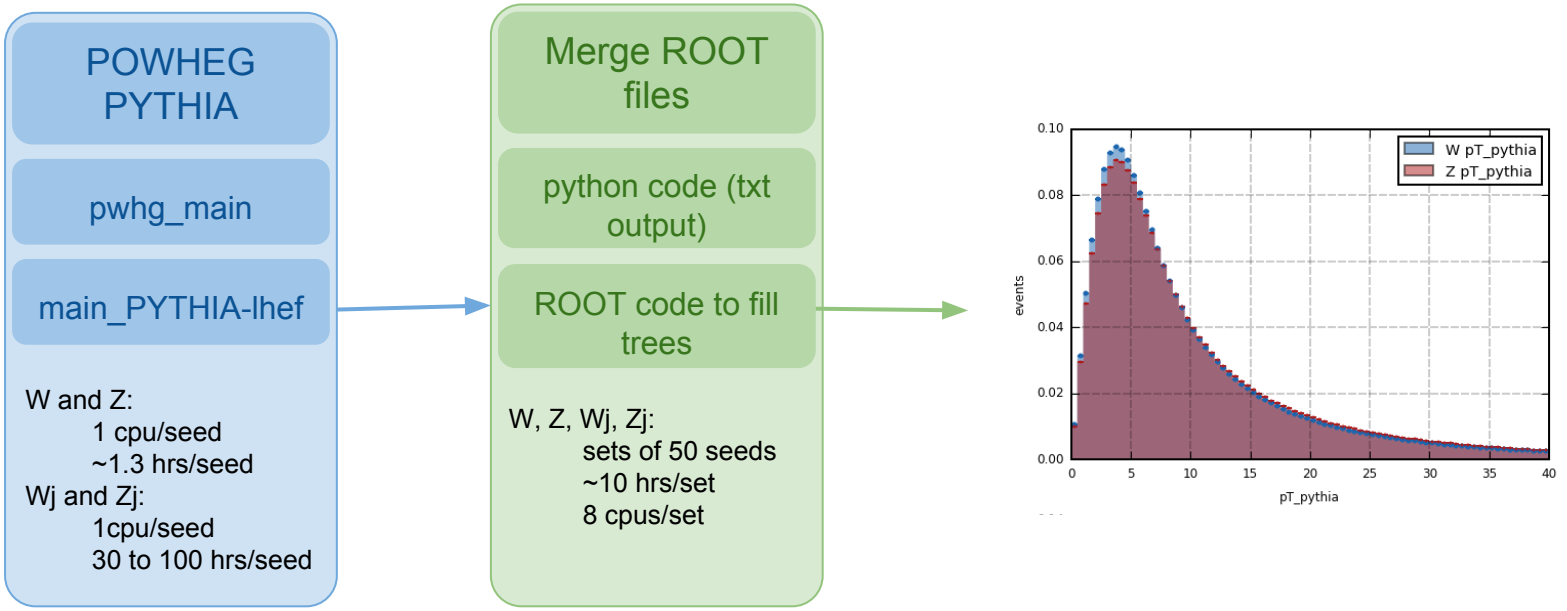
POWHEGBox V2

- Simulate both W and Z to obtain the pT Ratio of W vs. Z.
- Wj and Zj have also been generated but haven't been used (yet?)

    - **pwhg_main** generates the seeds the 'hard events' (Les Houches events)
    - **main_PYTHIA-lhef** makes the full event simulation

Generation Process

- 300 seeds were processed, with 100,000 events per seed
- Each seed ran in a single CPU for ~1.3 hours (W, Z) and 30 to 100 hours (Wj, Zj)
- After generation, the events were extracted from the pythia output and stored in root files (code used available at cdf machines *)



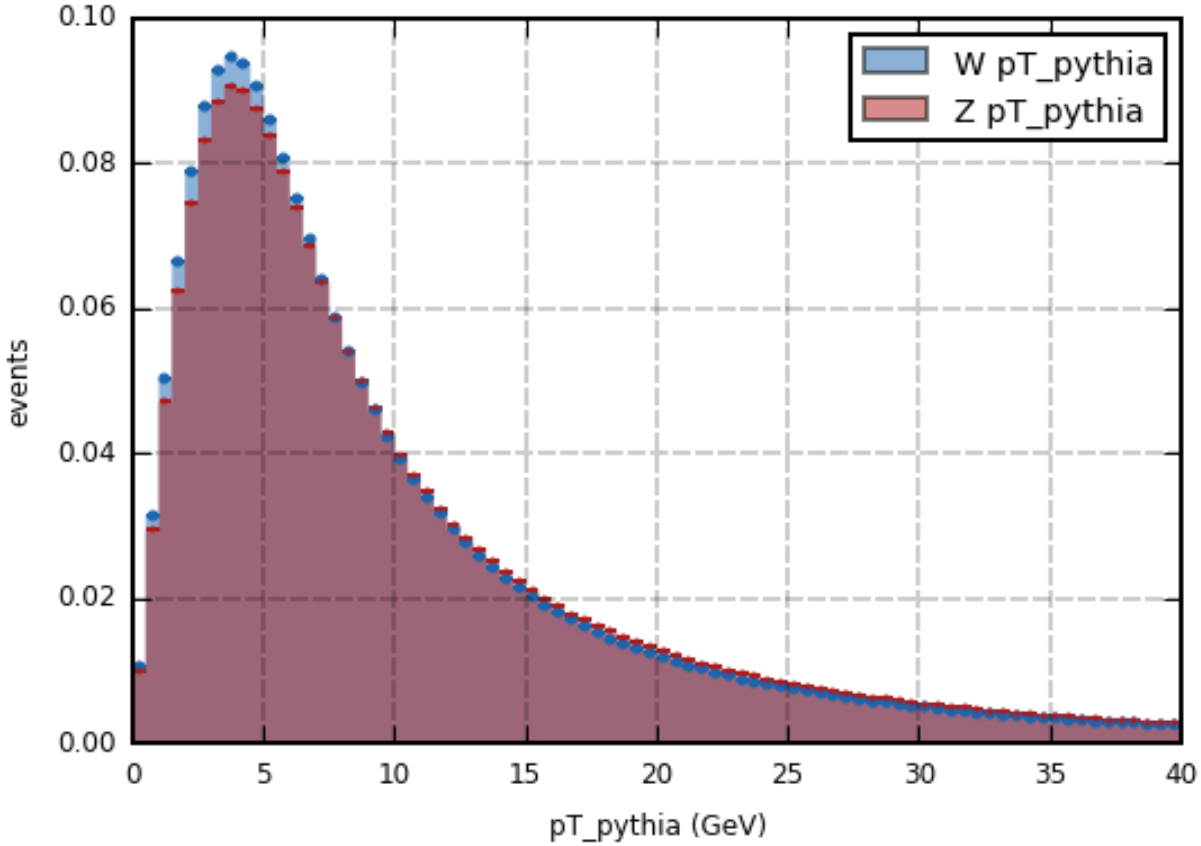
* /cdf/proj/202.ewk/georgemm/pow2root_code

Generated Samples

Sample	Number of Seeds	Number of Events	CPUtime
W	300	29,970,195	~400 CPUhours
Z	300	29,992,980	~400 CPUhours
Wj	300	29,170,966	~30,000 CPUhours
Zj	300	29,493,088	~10,000 CPUhours

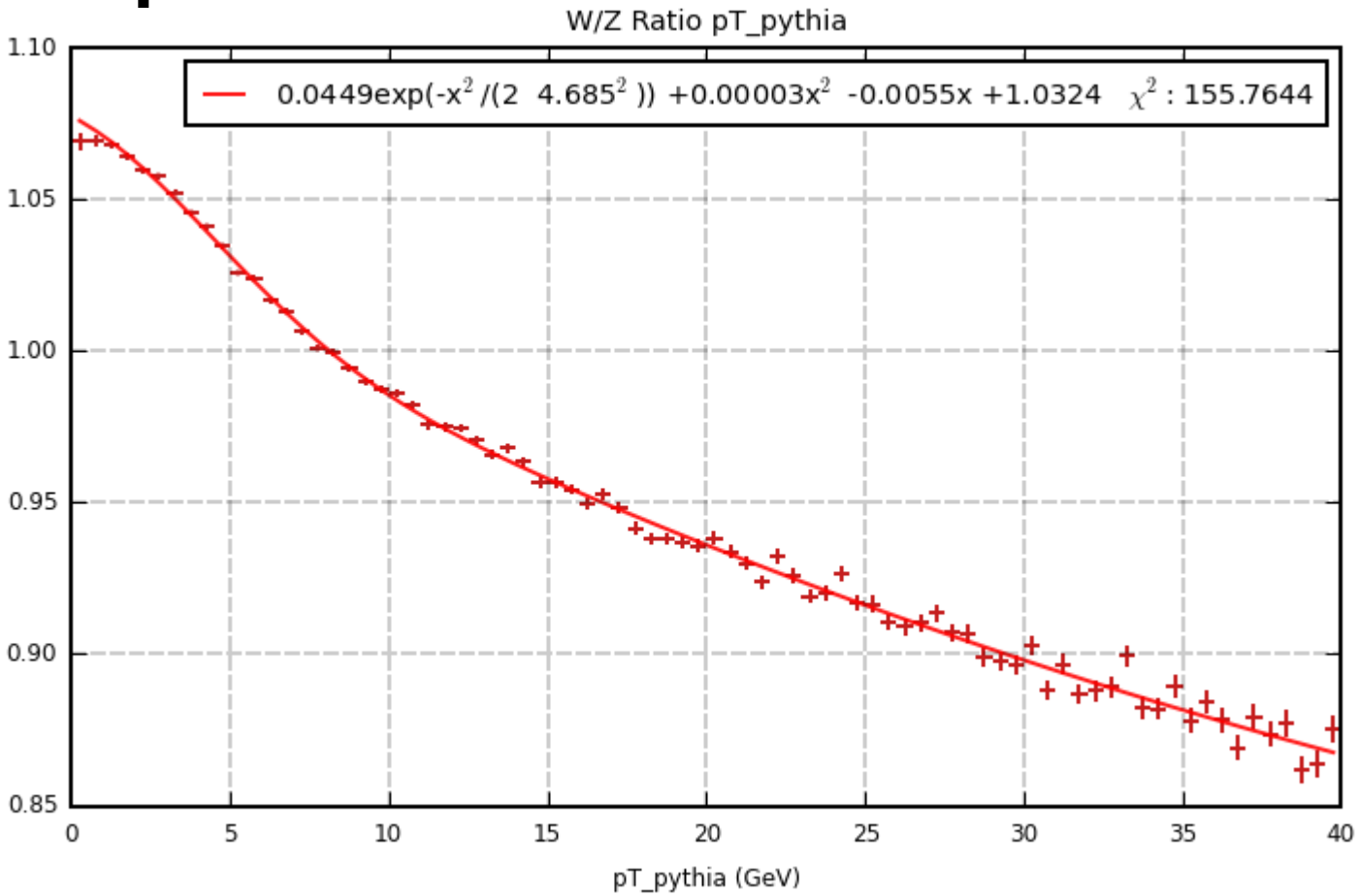
events per seed, as defined in the powheg.input file: 100,000

Boson pT Normalized Distributions



- Histograms Normalized to 1
- 80 bins from 0 to 40 GeV

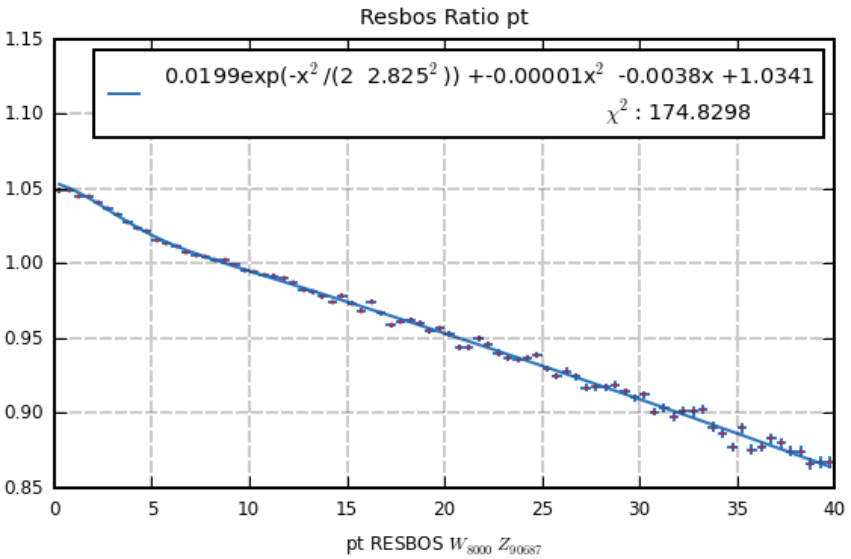
PYTHIA pT Ratio

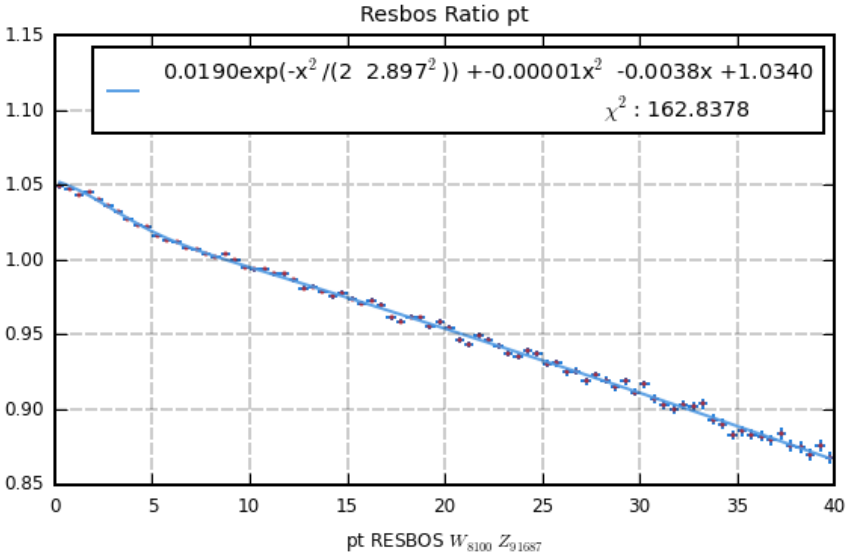


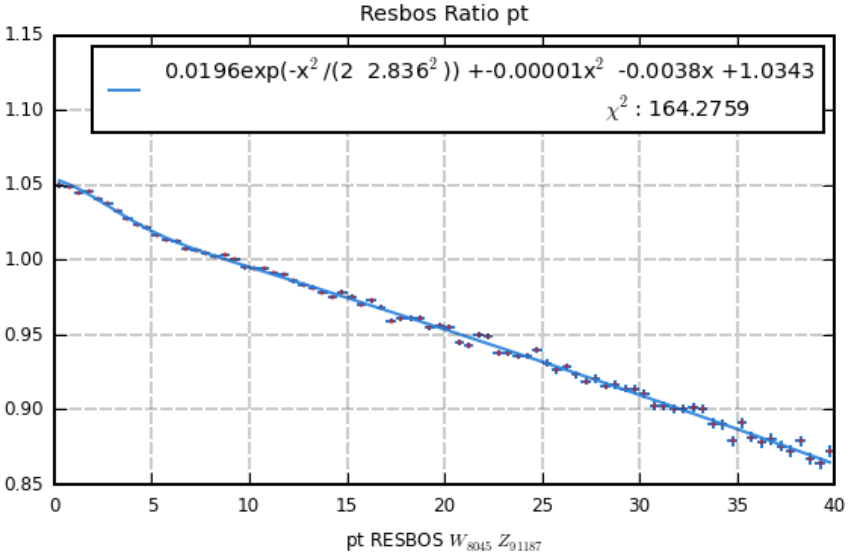
- Ratio: pT_W / pt_Z (Normalized Histograms)
- Fitting a gaussian centered at 0 GeV with a quadratic background

RESBOS pT Ratios

- Ratio of pT_W / pt_Z Normalized Histograms
- Three different RESBOS Samples:
  - W(8000)/Z(90687)
  - W(8045)/Z(91187)
  - W(8100)/Z(91687)

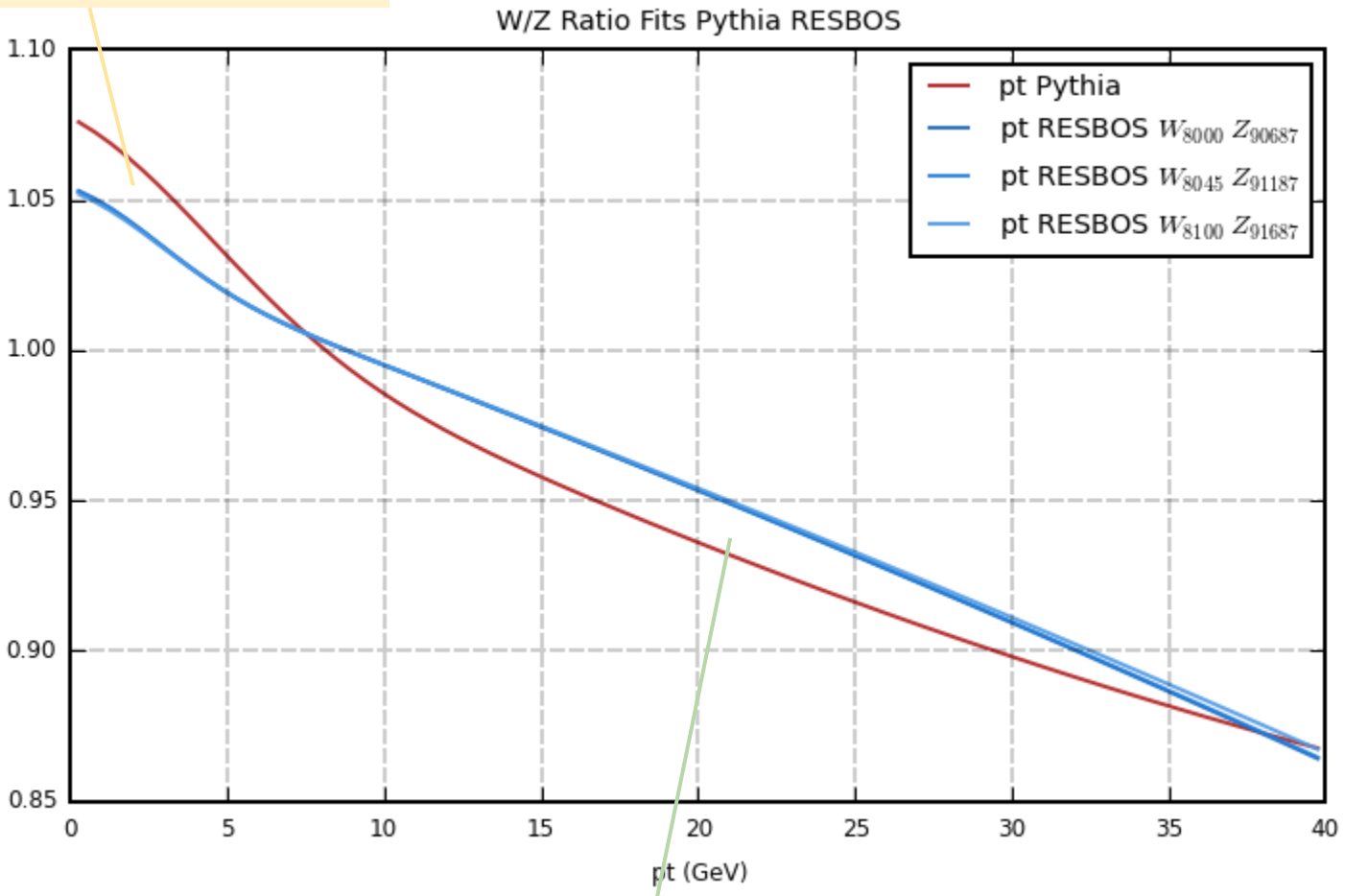






PYTHIA vs. RESBOS pT Ratios

Pythia has a higher ratio below ~7 GeV



RESBOS has a much more linear ‘background’,and higher above ~7GeV

Conclusions

- 300 seeds for W and Z have been generated, producing ~30,000,000 events each

- Equal number of events and seeds for Wj and Zj are ready if needed

- POWHEG+PYTHIA vs. RESBOS samples show slightly different features:
  - Pythia has a higher ratio below ~7 GeV
  - RESBOS has a much more linear ‘background’,
    and higher above ~7GeV