

# Top Samples Validation

## ATLAS-UK Top Physics Meeting

### Contents

- Physics validation
  - ‘Sample A’:
- MC generator validation
  - ‘Sample B’
    - MCatNLO\_i interface.
    - Run 5200 ttbar events.
    - Run 5504 t-channel single top.
    - Produced when evgen version changes.
    - Plot truth variables only.
  - MCatNLO v3.31 generator validation
    - ttbar spin correlations are preserved.
    - **Generator itself needs validation.**
    - Aim for production ASAP.

# Sample A

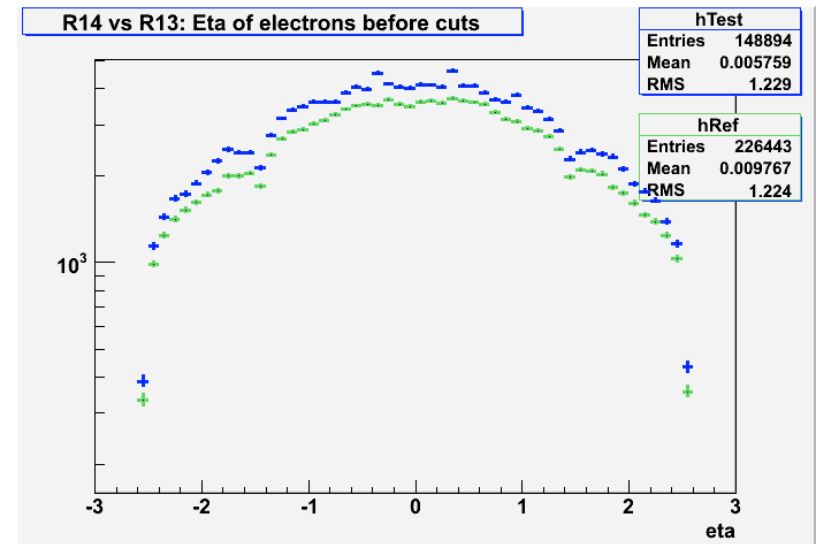
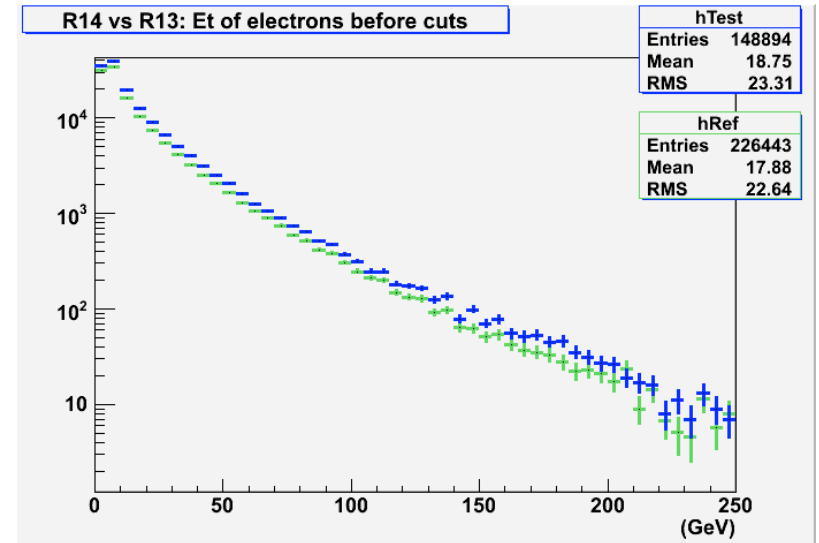
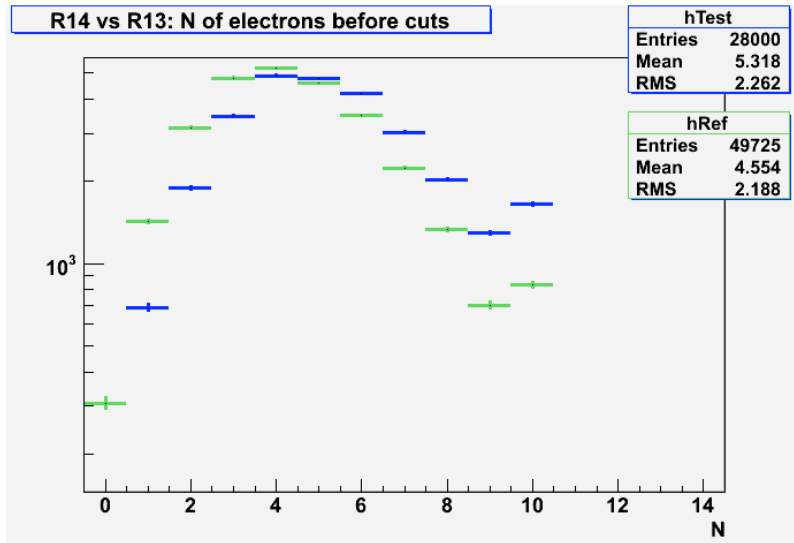
- 50k run 5200 MCatNLO ttbar 'no all hadronic' events.
- Produced weekly to study particular changes in releases.
- What is plotted?
  - Event weight, reconstructed e, mu, particle jets, b-jets, missing  $E_t$ .
    - $N, P_t, \eta, \Phi$ , resolution ( $\Delta P_t/P_t, \Delta \eta, \Delta \Phi$ ), purity vs ( $P_t, \eta, \Phi$ ).
  - Truth e, mu, {d u s c b} quarks, b quarks.
    - $N, P_t, \eta, \Phi, \text{FSR}(\Delta P_t/P_t, \Delta \eta, \Delta \Phi)$ , efficiency vs ( $P_t, \eta, \Phi$ ).
  - Compare release under test with reference dataset.
- Tests many aspects of event generation, simulation, reconstruction.

- Simulation 14.1.0.3 vs 14.1.0.1
  - OK
- Simulation 14.1.0.1 vs 13.0.40.4
  - OK
- Geometry CSC-05-00-00 vs CSC-02-01-00
  - OK
- Geometry CSC-05-01-00 vs CSC-05-00-00
  - Displaced beam spot. **Gaps in electron  $\Phi$  distribution.**
- Reconstruction 14.0.0.1 vs 13.0.40.4
  - OK. More e candidates, higher efficiency due to introduction of backtracking.
- Reconstruction 14.1.0.3 vs 14.0.0.1
  - OK
- Bytestream conversion + reconstruction 14.1.0.2
  - Current version is ok. Earlier had staco muon problems.
- Atlfast II 14.1.0.2 vs full sim
  - **PJet, e energy scale problems** (1% - 2%). Understood.
- Evgen 14.1.0.2 vs 13.0.40.3
  - **Narrower e, mu FSR Et, eta, phi resolutions. Fewer low Pt FSR photons.**
  - Not understood yet. Probably not a worry for Physics.

# More Info

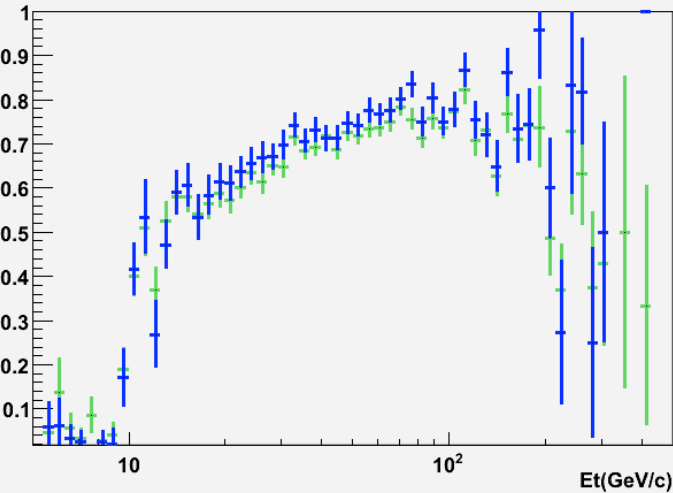
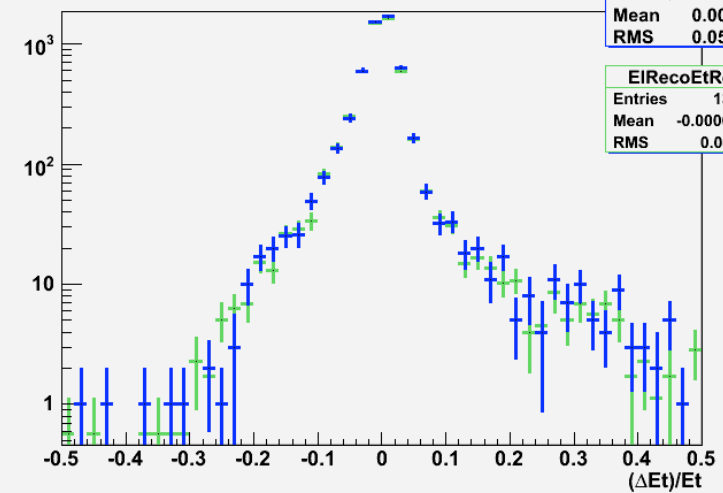
- Details + top Physics validation plots:  
<http://www.hep.manchester.ac.uk/atlas/TopMC/TopMCvalidation.html>
- Physics Validation meeting agendae:  
<http://indico.cern.ch/categoryDisplay.py?categId=250>
- Physics and Software Validation forum in ATLAS hypernews:  
<https://hypernews.cern.ch/HyperNews/Atlas/get/physics-software-validation.html>
- Physics Validation Wiki:  
<https://twiki.cern.ch/twiki/bin/view/Atlas/PhysicsValidation>
- Software release status;  
<http://atlas-computing.web.cern.ch/atlas-computing/projects/releases/status/>
- MC Generator Validation Wiki:  
<https://twiki.cern.ch/twiki/bin/view/Atlas/GeneratorValidation>

# Reco 14.0.0.1 vs 13.0.40.4 Electrons(1)

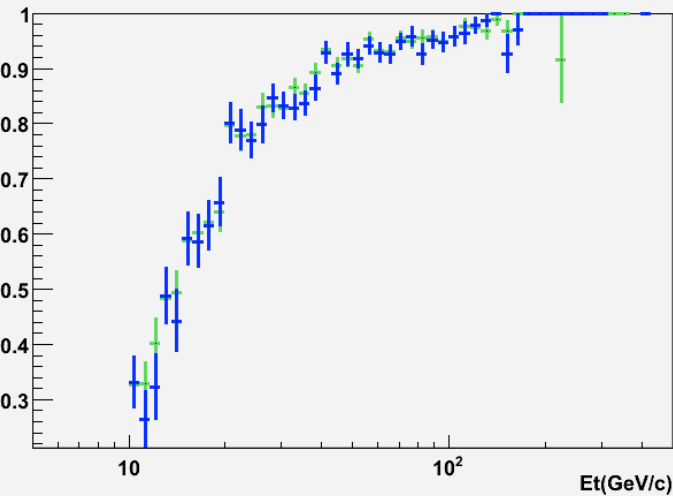


## Reco 14.0.0.1 vs 13.0.40.4 Electrons(3)

Truth W Decay Electron Et Efficiency

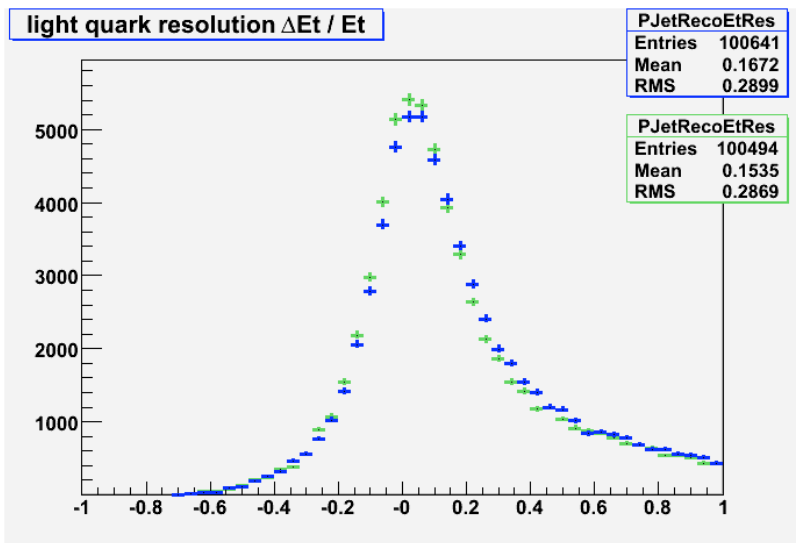
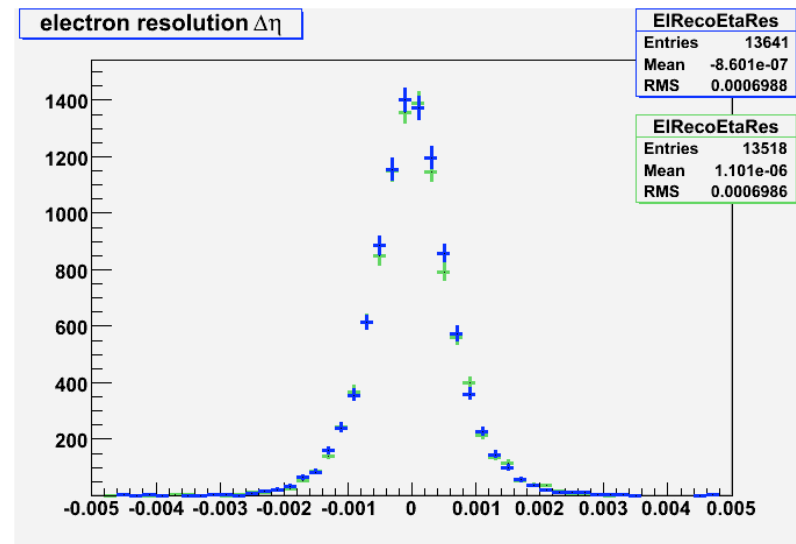
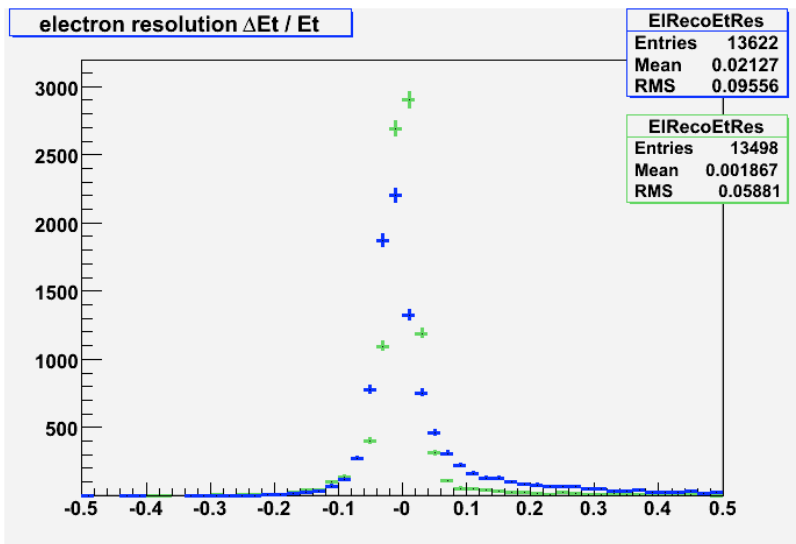
Reco Electron Matched to W decay:  $(\Delta Et)/Et$ 

Reco Electron Matched to W decay: Et Purity



- Medium IsEM cut
- $Et > 10$  GeV
- $|\eta| < 2.5$
- $EtCone20 < 6$  GeV

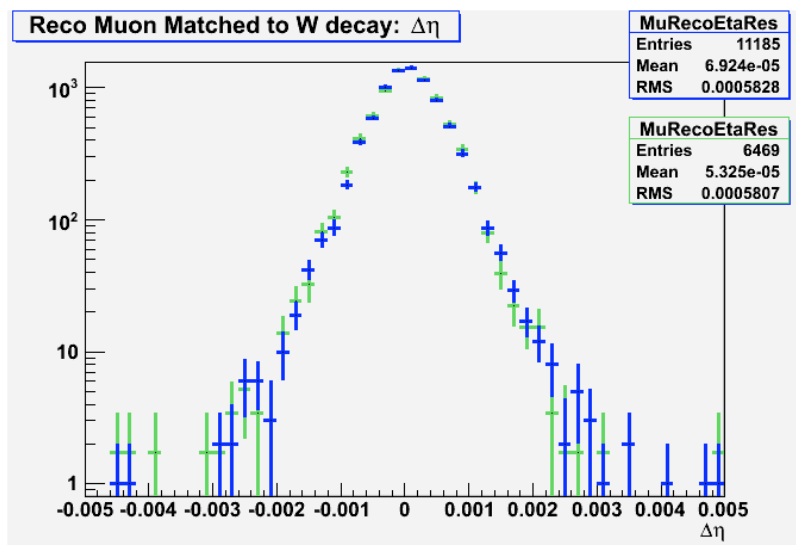
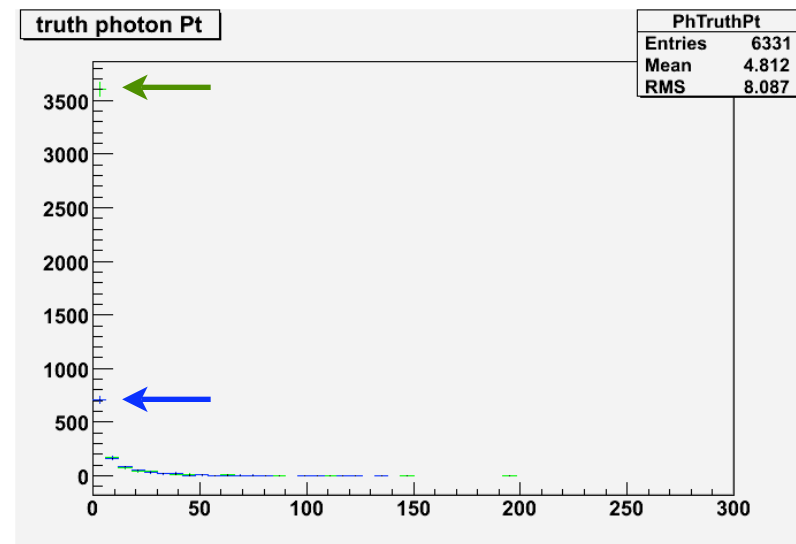
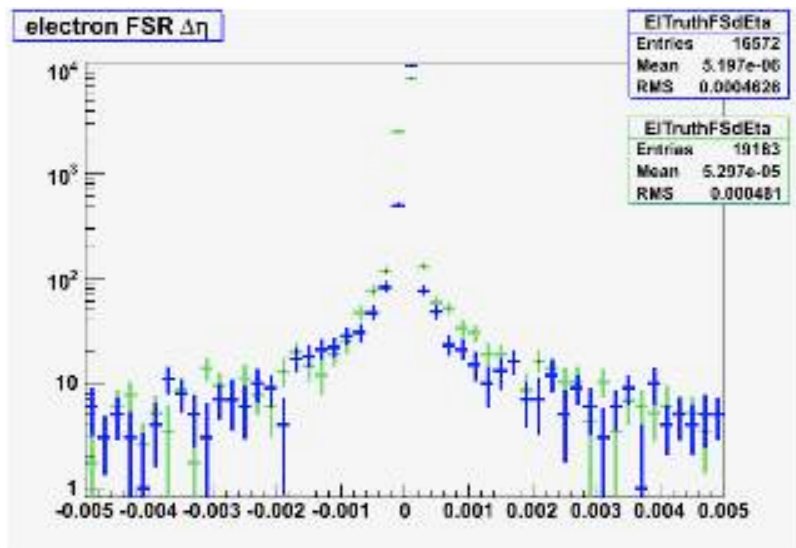
# 14.1.0.1 Atfast II vs Full Simulation



Electron, particle jet energy scale off by 1% - 2%. Believed to be understood. Fix coming soon.

Hard to isolate problem from secondary track energies getting double counted.

# Evgen 14.1.0.2 vs 13.0.40.3



There are fewer small angle scatters from FSR for e, mu and fewer low Pt FSR photons in release 14. Not yet understood, but maybe not important for Physics.



## MCatNLO 3.31 ttbar Production

- All current production is with MCatNLO 3.1 .
- Propose v3.31 ttbar sample for MC generator validation.
  - MCatNLO decays top, W and store them in \*.event file.
  - Herwig+Jimmy hadronize + shower in evgen step.
  - Preserves spin correlation.
- MCatNLO 3.31 event files produced by Chengguang Zhu and Gia Khoriali for testing.
  - First results soon.
- More help welcome with generator validation.