Top physics summary for PRC

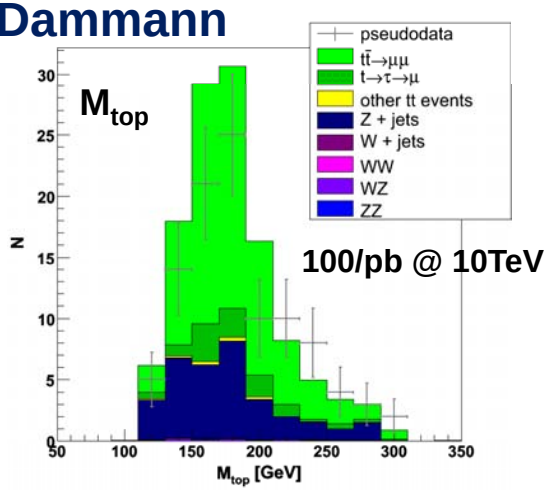
Maria Aldaya

DESY-CMS Meeting, 19-10-2009

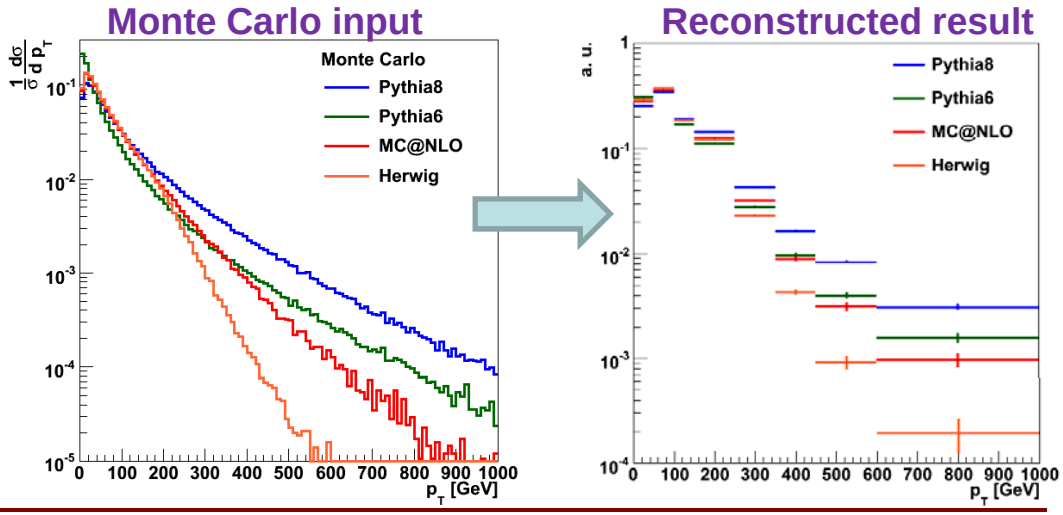
Top quark physics at DESY

Activity in 2009: Preparation for physics analysis

- **ttbar cross-section determination in dimuon channel: D. Dammann**
  - Event selection for early data ($\sqrt{s}$ = 7 and 10 TeV)
  - Kinematic reconstruction of ttbar events
  - Use of data-driven methods for background estimation
  - Prospects of validating btagging efficiency using reconstructed jets from ttbar events



- **QCD radiation in top pair production: A.Flossdorf (PhD thesis defended in Aug09)**
  - Different QCD radiation models cause significant differences for several top pair observables
  - These models can be distinguished from each other after the full CMS detector simulation and event reconstruction



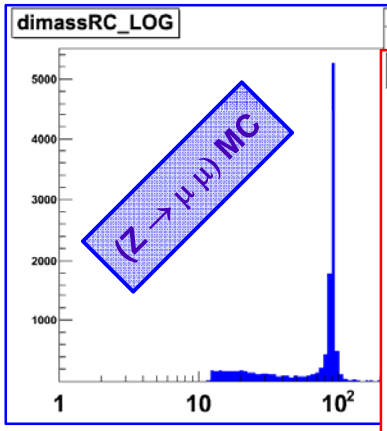
Top quark physics at DESY

- **Online/Offline ttbar monitoring in the μμ/μe channel: M. Marienfeld**

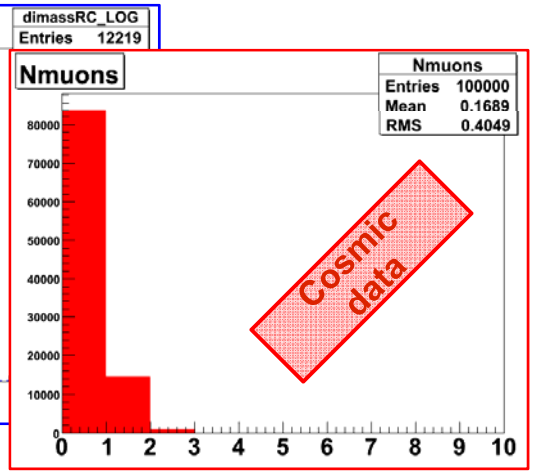
Development of an official tool for prompt data validation from dileptonic top-like events:

• **Online DQM**: monitoring of lepton trigger efficiencies at HLT level (*'tag&probe'* approach)

• **Offline DQM**: monitoring of dilepton reconstruction and efficiencies (RECO &HLT) for simple physics feedback (i.e, dilepton mass spectrum)



Invariant mass (Z → μ μ) [GeV]



N muons (CRUZET_II 2009)

- **Secondary Vertex (SV) validation: M. Aldaya (in collab. with UIC)**

In the context of measuring top quark mass via de B-hadron lifetime (Lxy method):

Development of official tools to classify and analyze secondary vertices in order to evaluate SV reconstruction, SV-based btagging algorithms and verify new software releases

Goals for 2010: First physics measurements with early LHC data (7,10 TeV):

Top quark rediscovery and cross-section measurement in dileptonically decaying top-antitop quark pairs

Summary: Top quark physics at DESY

- **Activity in 2009:** Preparation for physics analysis

Mainly focused on:

  • Top quark rediscovery and production cross-section measurement in dileptonically decaying top-antitop quark pairs

  • Determination of top quark properties

  • Development of tools for top physics analysis

- **Goals for 2010**: First physics measurements with early LHC data (7,10 TeV):

  • Top quark rediscovery and production cross-section measurement in dileptonically decaying top-antitop quark pairs

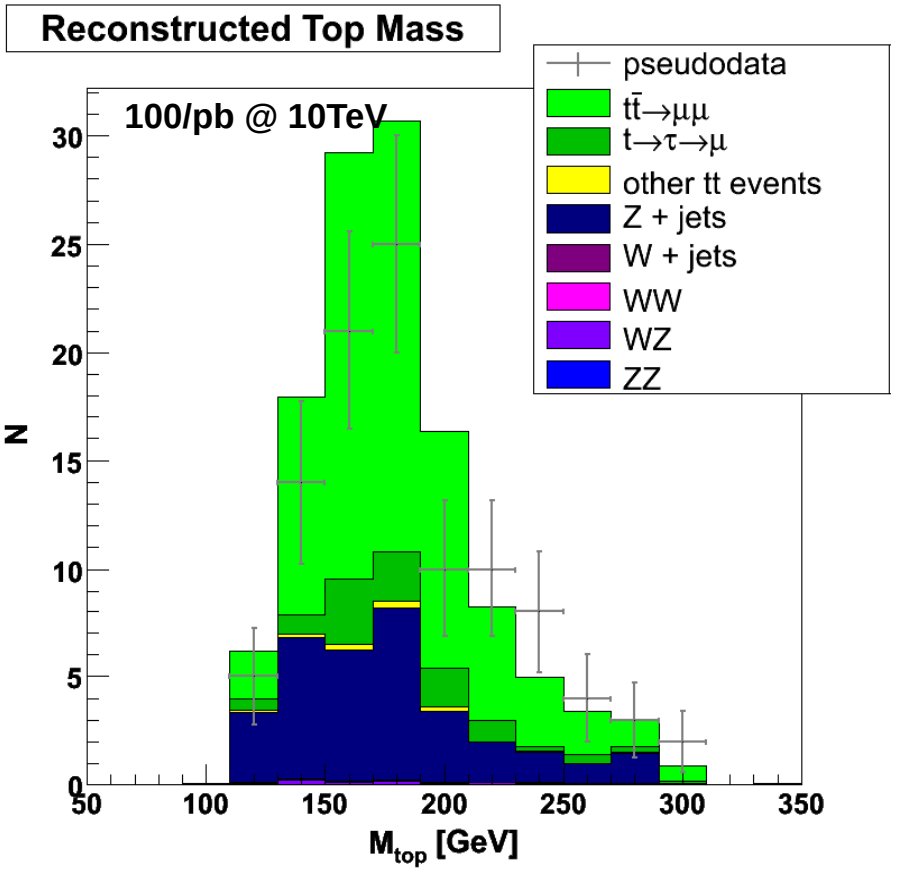
  • Measurement of top quark properties

Additional Information

$\sigma_{t\bar{t}}$ in the $\mu\mu$-channel

Dirk Dammann (DESY)

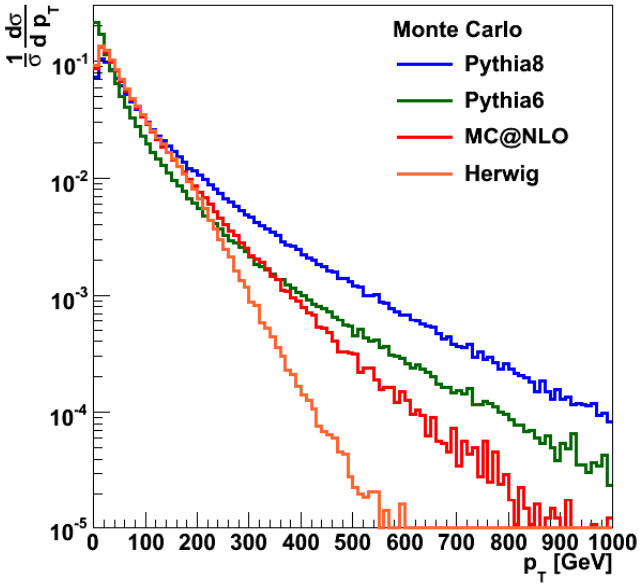
- Determination of the $t\bar{t}$ production cross section in 7 TeV and 10 TeV data in 2010
- Event selection worked out
- Kinematic Event Reconstruction newly implemented
- QCD and fake muon background is described and subtracted using the wrong charge method
- Jets from kinematicly reconstructed events can be used to check b-tagging efficiency



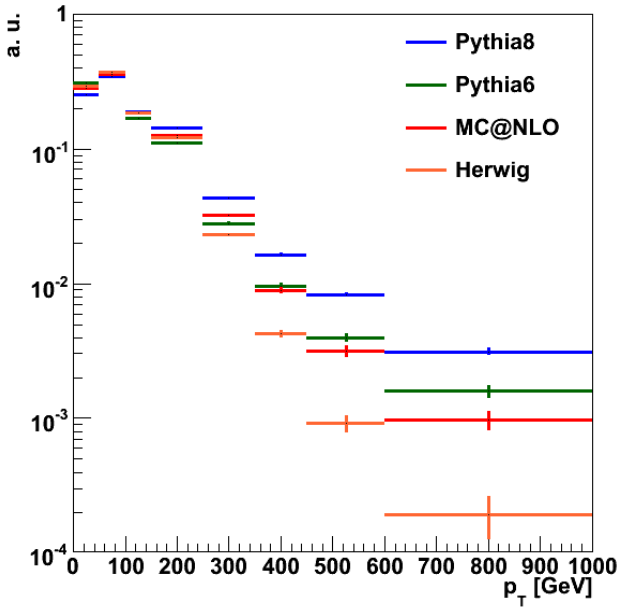
QCD Radiation in Top Pair Production

Alexander Flossdorf (DESY)

Monte Carlo input



Reconstructed result

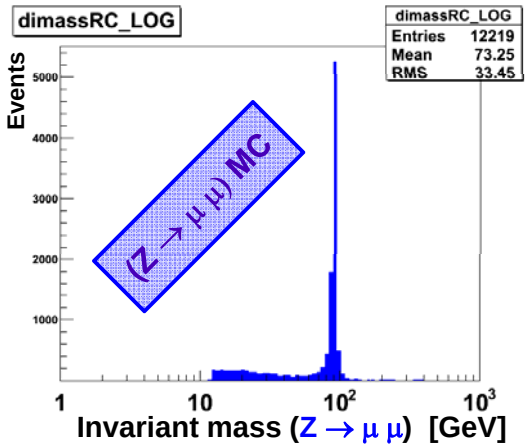


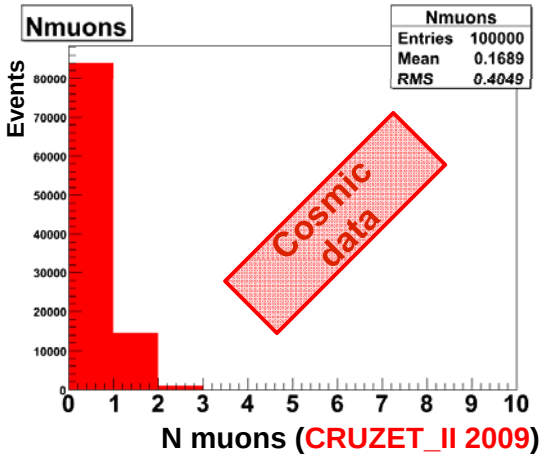
- Different QCD radiation models cause significant differences for several top pair observables
- These models can be distinguished from each other after the full CMS detector simulation and event reconstruction

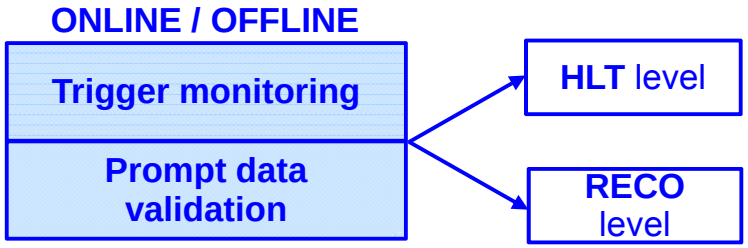
Online/offline dilepton monitoring for top-antitop quark pairs ➜ mm/me

Markus Marienfeld (DESY)

- Prompt data validation:
  - **Online DQM**: Monitoring and checks of lepton trigger efficiencies from dileptonic top-like events at HLT level ('*tag & probe*' approach).
  - **Offline DQM**: Monitoring of dilepton reconstruction & efficiencies at reconstructed object (RECO) level and HLT level for simple physics feedback (→ dilepton mass spectrum).







✓ First version of **TopDiLeptonDQM** ready and submitted.

✓ Test implementation of monitoring at HLT level.

- Plans for top quark analysis:
  - Rediscovery of the top quark at the LHC with first data taken in 2010 (7-10 TeV).
  - Measurements of the cross section of dileptonically decaying top quark pairs.