Overview

CMS Karlsruhe:

1) Study of $W \to \mu \, \nu$, $Z \to \mu \, \mu$ and W Mass M_W

(V.Buege, C. Jung, G. Quast, A. Schmidt)

2) High p_T Jet Cross Sections

(A. Oehler, K. Rabbertz)

DESY, Fermilab, Uni Karlsruhe:

3) fastNLO: Fast repeated Jet σ Calculation
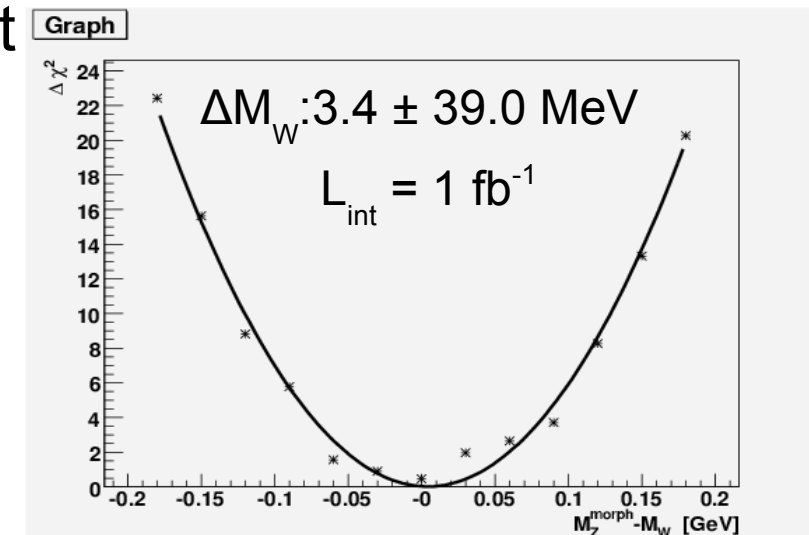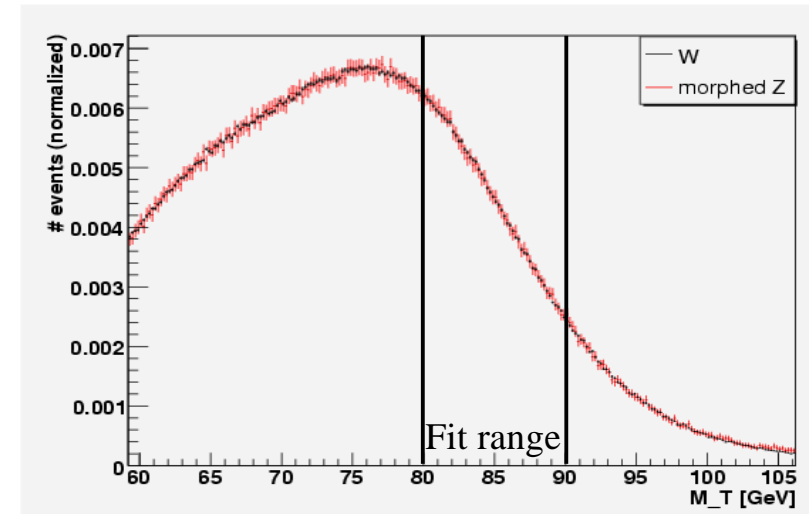
(T. Kluge, M. Wobisch, K. Rabbertz)

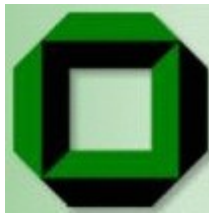# *Study of W → μ ν, Z → μ μ*

-Transverse mass method for M_W very sens.
to exp. uncertainties

- High Z statistic available at LHC

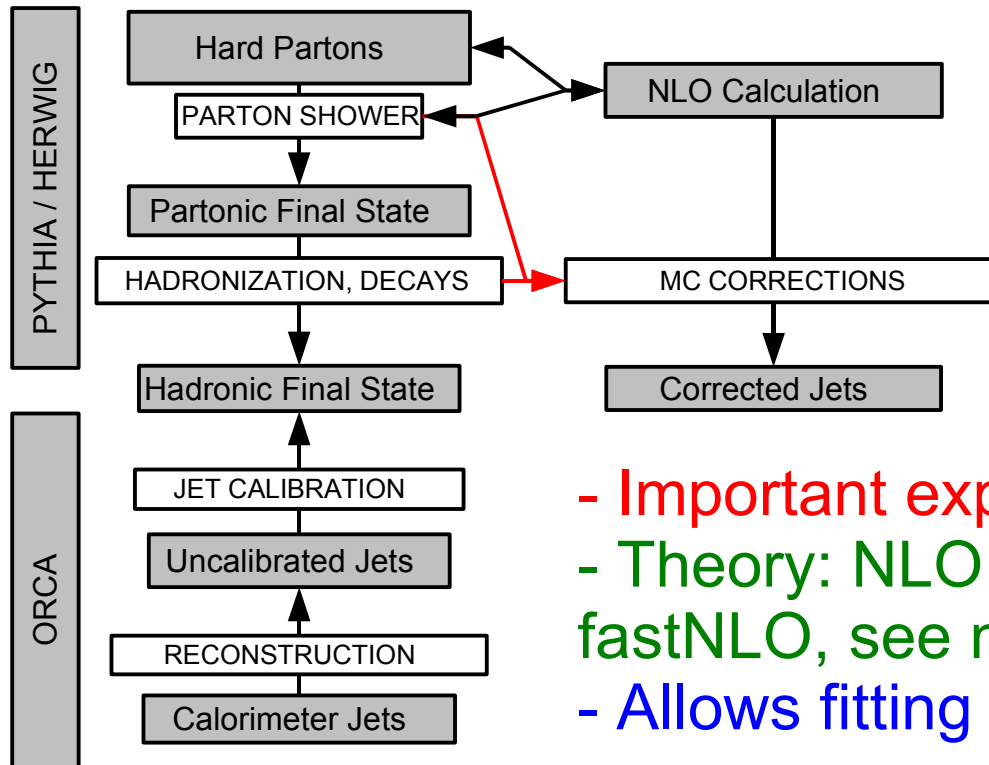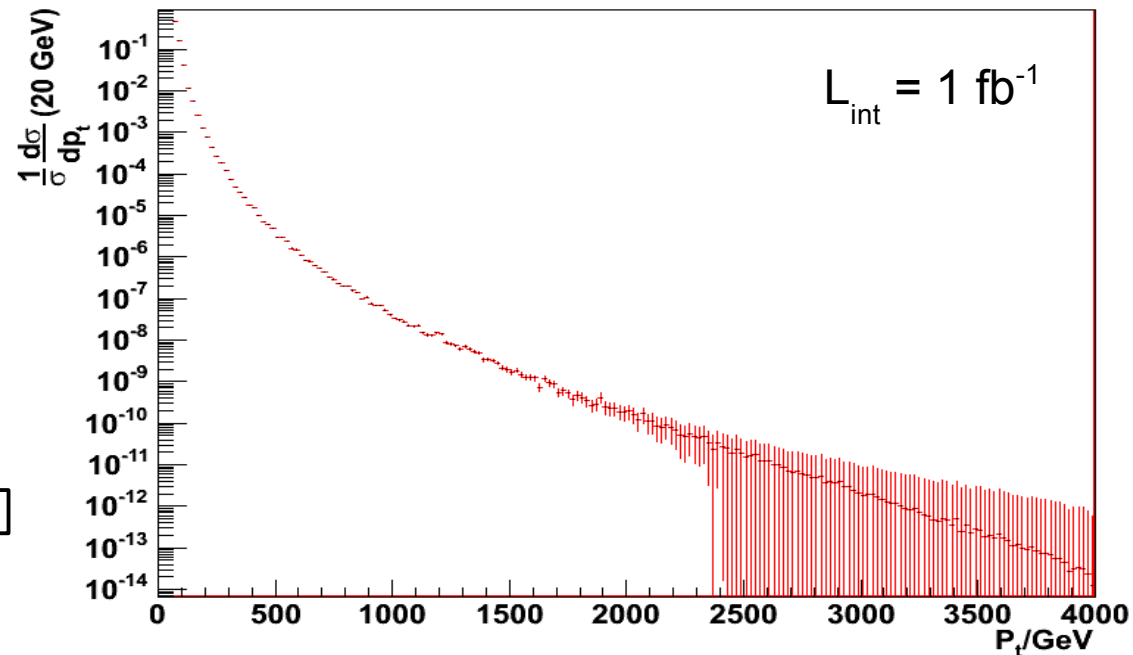→ Use similar properties of W and Z decays
(Giele, Keller, 1998)

Idea:

- Compare m_T distributions of W and
„morphed Z" (reduction of Z mass to W test
mass, consider one muon as a neutrino,
...)

- Extract W mass from Chi^2 fit

- Study of cancellation of syst, uncertainties
ongoing (μ resol., acceptance, B field, ...)

- Needs a lot of statistics (O(10M) events) for
1 fb^{-1} => use fast simulation

Fit range

ΔM_W:3.4 ± 39.0 MeV

L_{int} = 1 fb^{-1}
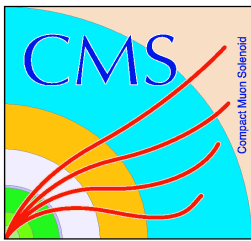
High p$_T$ Jet Cross Sections

- Measurable right from the start
- Tests detector performance
- Checks SM extrapolation to LHC energies!

Pt of all jets   Stat. uncertainties after 1 fb^{-1}

PYTHIA / HERWIG

Hard Partons → NLO Calculation

PARTON SHOWER

Partonic Final State

HADRONIZATION, DECAYS → MC CORRECTIONS

Hadronic Final State   Corrected Jets

ORCA

JET CALIBRATION

Uncalibrated Jets
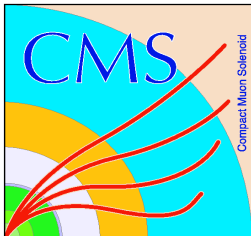
RECONSTRUCTION

Calorimeter Jets

- Important exp. ingredient: Jet energy calibration
- Theory: NLO calculation (NLOJET++, Z. Nagy and fastNLO, see next page)
- Allows fitting of the strong coupling and the pdfs

fastNLO

- Repeating theory calculations (pdfs, α_S, μ_R, μ_F) for comparison with data very time consuming

- fastNLO extracts necessary data into one table

- One long calculation first, repetition with e.g. other pdf takes only seconds!

- Table writing has to be implemented for every observable

- Working examples with interactive web interface exist on fastNLO project page at CEDAR
  http://hepforge.cedar.ac.uk/fastnlo

Discussion Topics

- Other interesting quantities/analyses to perform, especially at start up?

- Experience comparing PYTHIA, HERWIG, ... at LHC energies? Other MCs? Parameter tuning?

- Experience comparing with MC@NLO at LHC energies?