Wishlist/Goals from Uni-HH group

Analysis Center: Statistical Tools Group

kick-off meeting 8th May 08

Current Research Fields

- **QCD** and **underlying event**
  - Estimate rate of double-parton scattering in γ+3j events
- **Top physics**
  - Early rediscovery
  - Generator studies on top kinematics (including pdf systematics)
  - Improvement of top mass resolution with constrained/global fits
- **Searches for supersymmetry**
  - Discovery searches in the fully hadronic channel
  - Parameter determination (defining new observables, kinematic fits ...)
- **Alignment of silicon tracker**
- **Calibration of hadronic calorimeter**
  - Simultaneously fitting of jet and tower calibration constants

Tools and Methods for Searches

- Multivariate techniques
  - How to select the optimal method? Which method is accepted in the community and collaboration?
  - Use your own code (full control)?
  - Or use available TMVA ... package (black box)? How to use is in a best way?
- Estimation of backgrounds from data and/or MC
- Estimation of systematic uncertainties
  - How to estimate systematics, in particular for MV techniques?
  - How to quote them? How to combine them?
- Significance and Limits
  - Which definition? How many σ's for discovery?
- ”Look Elsewhere” effect (in time)

Parameter Determination

- Hypothesis testing
  - χ^2, Likelihood, Markov Chain Monte Carlo ... ?
  - How to define observables? e.g. mass differences, distributions of invariant masses or other variables
  - How to set limits or determine confidence intervals on model parameters?
- Global fits
  - Large expertise in Hamburg in particular for the tracker alignment (V. Blobel)
  - H-Cal calibration is not mathematically analog to tracker alignment (no local variables)
  - Model parameter determination: not always clear how to handle mass constraint for mass with finite width

The Wishlist

We would like to see a Analysis Center which provides:

- **Direct contact** for non trivial questions
- **Provide active help** or refer to people who know the answers
- Work closely together with ”CMS statistics committee” and the ”ATLAS/CMS combined statistics forum”; **provide common guidelines** for
  - Estimation of systematic errors
  - Definition of signal significance and limits
- Organize **workshops or schools**, or be involved in the planning of the ”PhyStat workshops” (and motivate people to attend)
- Organize **regular seminar** and **lectures** on topics of interest