



*Durham University*

# Monte Carlo Simulations

# Recent MC Progress

- Revival of theoretical improvements both from the MC side
  - New HERWIG++ shower
  - $P_T$  ordered shower in PYTHIA
- and by matching to fixed order results
  - First NLO MC generators
  - Better matching at leading order (CKKW)
- Production of new generators/rewriting of existing codes in C++.

# Monte Carlo Community

- The Monte Carlo community is very small.
- There are three major projects
  - HERWIG (3 permanent staff, 3 postdocs, 1 student, ~2FTE)
  - PYTHIA (3 permanent staff, 1 postdoc, ~2FTE)
  - SHERPA (1 permanent staff, 4 students ~4FTE)
- Some interested theorists
- Only a few people were here and therefore little work was done, mainly in the physics sessions.

# Work at Les Houches

- In the first half more activity, e.g. MC@NLO tutorial.
- In the second half fewer people around, not much activity.
- Major activity was a large discussion on C++ event generators.
- Some presentation of projects (GENSER/MCDB,) SHERPA.

# LCG Generator Project

- Presentation of the CERN LCG generator project by Paulo Bartalini.
- This is a project to provide generator services to the LHC experiments
- MC libraries
- MCDB Database of parton level events (presentation by L. Dudko).
- Regular meetings at CERN and via VRVS.
- Few theorists attend, I would urge more to do so.
- Large meeting 1<sup>st</sup> June.

# C++ Generators

- There was a request from P. Nason to enable users to add their own modules, for example a new shower, to the general purpose event generators.
- Given other developments this would be in C++.
- In general this should be possible, although there are some physics issues involved. For example the new PYTHIA initial state shower and multiple interaction model are intimately connected.

# C++ Generators

- General view was that it was in principle possible, however it was hard to understand the structures of the generators.
- In principle many of the new physics ideas can be implemented in the C++ codes using inheritance and reusing the existing code.

# C++ Generators

- Documentation is the problem.
- General agreement to try and provide better documentation.
- Some work to try out new ideas will happen.



# C++ Generators

- Discussion of use of common libraries, for example CLHEP.
- Little agreement,
  - only ThePEG/(PYTHIA7)/Herwig++ using CLHEP.
  - PYTHIA8/SHERPA own solutions
- Little agreement and given reports of the CLHEP status even that may die.

# Les Houches Accord

- Since the first Les Houches meeting many Les Houches agreements.
- The original agreement was for the passing of information between parton level matrix element calculations and event generators.
- However it was an agreement on a **FORTRAN common block**.
- Needs rethinking for the C++ era.

# Les Houches Accord

- Discussion of many extensions
  - Addition of cut information.
  - A C++ structure
  - A common file format.
- There was no consensus on the addition of cut information.
- T. Sjostrand to produce a C++ structure
- M. Mangano to produce a file format.

# Summary

- MC development continues along with the slow move to C++.
- There's still a lot to do before the LHC.
- Many new theoretical ideas which need to be included.
- There were many useful discussions at Les Houches.
- Hopefully the tools we need will be ready for the LHC.