LUND UNIVERSITY

GENSER meeting
CERN
24 October 2007

The
PYTHIA 8.1
Release

Torbjörn Sjöstrand

CERN/PH and

Department of Theoretical Physics, Lund University

PYTHIA 8: plans and reality

Tentative schedule (spring 2003):

time	date	processes	final states
0 =	1 Sept. 2004	—	—
1 =	1 Sept. 2005	LHA-style input	incomplete draft
2 =	1 Sept. 2006	a few processes	complete, buggy(?)
3 =	1 Sept. 2007	more processes	stable, debugged

Status: involuntary break $\sim$6 months + Murphy's law

$\Longrightarrow$ currently $\sim$ at year 2.5

PYTHIA 8.100 released on 20 October:

- Webpages revamped
  Recent $\Leftarrow$ PYTHIA 6.4
  Present $\Leftarrow$ PYTHIA 8.1
  Future $\Leftarrow$ loose plans
- A Brief Introduction to PYTHIA 8.1
  in arXiv:0710.3820
  submitted to CPC

PYTHIA 8 status

task	status
administative structure	operational; extensions planned
hard processes, internal	much of PYTHIA 6; SUSY & TC & more to do
resonance decays	much of PYTHIA 6; SUSY & TC & more to do
hard processes, external	interfaces to LHA F77, LHEF, PYTHIA 6
SUSY(+more) parameters	primitive SLHA2; more needed
initial-state showers	operational
final-state showers	operational
matching ME's to showers	some exists; much more needed
multiple interactions	operational; extensions planned
beam remnants & colour flow	operational; alternatives to come
parton densities	only 2 internal, but interface to LHAPDF
string fragmentation	operational; improvements planned
decays & particle data	operational; may need updates
Bose-Einstein	operational; off by default (tuning)
analysis	some simple tools; may be enough
graphical user interface	operational; could be extended
tuning	major task for MCnet postdocs!
testing	major task for experimentalists!

Trying It Out

- Download `pythia8100.tgz` from
  `http://www.thep.lu.se/~torbjorn/Pythia.html`
- Unzip and expand with `tar xvfz pythia8100.tgz`
- Move to the thus created `pythia8100` directory
- Follow the `README` instructions (for links to HepMC, LHAPDF, PYTHIA 6)
- `make` will compile in $\sim$ 3 minutes
  (for archive library, same amount extra for shared)
- The `htmldoc/pythia8100.pdf` file contains A Brief Introduction
- Open `htmldoc/Welcome.html` in a web browser for the full manual
- Install the `phpdoc/` directory on a webserver and open
  `phpdoc/Welcome.html` in a web browser for an interactive manual
- The `examples` subdirectory contains 30 sample main programs:
  standalone, link to libraries, semi-internal processes, ...
  (`make mainNN` and then `./mainNN.exe > outfile`)

Makefiles, configure scripts & HepMC interface by Mikhail Kirsanov.
Conversion to PHP files by Ben Lloyd.
Win32/NMAKE by Bertrand Bellenot.
Extended Higgs sector by Marc Montull.
Some c/b decay tables from LHCb & DELPHI.

A Plea to the Experimental Community

We are now in a chicken-and-egg situation:
the user community needs a mature program;
but PYTHIA 8 will only mature
if there is an active user community

So please . . .

- invite me to present the program
  in your Monte Carlo group meetings
  (anything from 10 minutes to an hour,
  but latest December 12)
- implement in your experimental frameworks
- encourage volunteers to act as guinea pigs
- do some small-scale “production runs”
- report back problems & wishes (within reason)

. . . but don’t throw away PYTHIA 6.4 just yet!

Backup

Old features definitely removed include, among others:

- independent fragmentation
- mass-ordered showers

Features omitted so far include, among others:

- γp and $\gamma\gamma$ beam configurations
- several processes, especially SUSY & Technicolor

New features, not found in 6.4:

- interleaved $p_\perp$-ordered MI + ISR + FSR evolution
- richer mix of underlying-event processes (γ, J/ψ, DY, . . .)
- possibility for two selected hard interactions in same event
- updated decay data

Preliminary plans for the future:

- rescattering in multiple interactions
- NLO and L-CKKW matching