



# Recent developments in GENSER, MCDB & Generator Interfaces/Framework. Status & Plans

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# LCG Generator



GOAL: to guarantee the generator support for LHC

**WP1: GENERATOR SERVICES LIBRARY (GENSER)**

**WP2: EVENT FORMATS AND EVENT INTERFACES**

**WP3: SHARED EVENT FILES: FRAMEWORK & DATA BASE**

**WP4: TUNING AND VALIDATION**

Florida (Coordination)

CERN (Library, Event Interfaces)

LCG-Russia (Library, Data Base)

LCG-Spain (Framework)

Collaboration with independent projects: LCG-UK (Validation, New MCs)

Contact persons/Collaborators in MC Projects and LHC Experiments

**Started May 2003**  
**Long Term Project**

**Workshop on MC's for the LHC (MC4LHC)**

**CERN, July 7 - August 2 2003**

**GENSER Review CERN, March 25 2004**

**EvtGen Miniworkshop CERN, January 20 2005**

# Recent, Current & Forthcoming Events



- EvtGen Mini-Workshop on January 21
  - Contributions from authors + ATLAS, BABAR, BELLE, CDF, CLEO, CMS, D0, LHCb
  - Results & Follow-ups will be reported to Beauty 2005 (Assisi, June 20-24 2005)
- LCG Generator Monthly Meeting of February 24
  - GENSER, the Generator Library: Status & Plans (I.Katchaev)
- LCG Generator Monthly Meeting of March 24
  - MCDB, the Monte Carlo Data Base: Status & Plans (S.Belov)
  - MC implementation of NRQCD models for prompt J/Ψ production (V.M.Vagnoni)
- Internal Review of LCG AA on March 30-31
  - My presentation concentrates on the Current Status & Plans of LCG Generator
  - G.Cosmo will cover **MILESTONES** & Long Term Future Plans
- LCG Generator Monthly Meeting of April 28
  - Generator Level Production Framework: Status & Plans (H.N.Sordo & J.C.Maestro)
- Application Area Meeting of May 18
  - Dedicated to Physics Generators Tools
  - Presentations from the main projects of LCG Generator, including contributions/feedbacks from the LHC Experiments

# WP1. The LCG Generator Library (GENSER)



**GOAL: to replace the obsolete CERN Library for what concerns the Generator Services**

## →Mandate:

- ❖ To collaborate with MC authors to prepare LCG Compliant Code
- ❖ To maintain older MC packages on the LCG supported platforms

## →Clients:

❖ Addressed to LHC experimentalists and theorists both at CERN and in external laboratories (**Other users welcome!**)

- ✓ CVS Repository, AFS Distribution
- ✓ MC Packages & Example/Test Code
- ✓ Tested by all the LHC experiments
- ✓ Quarterly Release Scheme

**ATLAS & LHCb  
PRODUCTIONS  
RELY ON GENSER**

**Documentation:** <http://lcgapp.cern.ch/project/simu/generator>

**Savannah Portal:** <http://savannah.cern.ch/projects/simu/>

**AFS:** [/afs/cern.ch/sw/lcg/app/releases/GENSER](http://afs.cern.ch/sw/lcg/app/releases/GENSER)



# WP1. The GENSER Team

- Liaisons with authors and LHC experiments ~.25 FTE
  - A. Ribon (CERN) based at CERN
  - P. Bartalini (University of Florida) based at CERN
- Coordinator of GENSER Releases ~.25 FTE
  - A. Pfeiffer (CERN) based at CERN
- GENSER Integrators for Q1+Q2 2005 ~1FTE
  - S.Makarychev ITEP (Moscow) from 2004 to 31/01/2005 (30%)
  - I. Katchaev IHEP (Protvino) from 11/01/2005 to 11/03/2005
  - S. Slabospitsky IHEP (Protvino) from 14/02/2005 to 28/02/2005
  - A. Sherstnev SINP MSU (Moscow) from 28/03/2005 to 28/04/2005
  - M. Kirsanov INR RAS (Troitsk) from 10/05/2005 to 31/07/2005

# WP1. GENSER Release



- GENSER 1 0 0 (MILESTONE) released on March 29th 2005 (initially scheduled end 2004)
  - Change in release policy (A.Pfeiffer)
  - Additional time required to wait for bug fixes from MC authors and to redefine the way to assign tags to the sub-packages.
  - Further delay due to the lack of coverage from integrators:
    - I.Katchaev left on March 11st
    - A.Sherstnev joined on March 29th
  - Huge work done. Few late fixes.
    - On top of the already mentioned GENSER integrators, librarian, liaison persons, many thanks to the MC authors, to the contact persons & helpers in the experiments and to the members of LCG-SPI
- First general purpose C++ generator (SHERPA) introduced in LCG-EXT and supported in GENSER examples & tests (MILESTONE) on schedule



WP1. **GENSER\_0\_1\_0: Mid Apr. 2004 (rh73\_gcc32)**  
**GENSER\_0\_2\_0: Mid Sep. 2004 (+ rh73\_gcc323)**  
**GENSER\_1\_0\_0: End Mar. 2005 (+ Scientific Linux)**

- ❖ HIJING (Heavy Ions): 1.36, 1.37, 1.383, 1.383b
- ❖ PYTHIA: 6.205, 6.217, 6.220, 6.221, 6.222, 6.223, 6.224, 6.227
- ❖ PYTHIA: 6.304, 6.319
- ❖ HERWIG: 6.500, 6.503, 6.504, 6.504b1, 6.505, 6.506, 6.507
- ❖ JIMMY: 4.1
- ❖ ISAJET: 7.67, 7.69, 7.71
- ❖ EvtGenLHC: 1.0, 1.2
- ❖ AlpGen: 1.3.2
- ❖ LHAPDF: 1.1, 2.0, 3.0 (LHAGLUE)
- ❖ PHOTOS: 202, 207
- ❖ TAUOLA 2.07
- ❖ TOPREX 4.09
- ❖ MCATNLO 2.31
- ❖ MADGRAPH 3.2
- ❖ **LCG EXT: SHERPA 1.05, CompHEP 4.4.0, EvtGen alpha-00-11-07**

*GENSER\_1\_0\_0:*  
*16 Generators*  
*1 PDF Package*  
*~ 40 Versions*

*User Manual Significantly Improved*



# WP1. EvtGen Mini-Workshop (Program)

- General Presentations
  - Introduction to EvtGen (A.Ryd)
  - The LCG Generator Project (P.Bartalini)
  - Particle Properties in Herwig++ (P.Richardson)
- Status of EvtGen in running experiments
  - Babar (D.Lange)
  - Cleo-c (A.Ryd)
  - Belle (I.Akimassa)
  - D0 (A.Sanchez)
- Status of EvtGen in LHC experiments and new developments
  - Lhcb (P.Robbe)
  - Atlas (M.Smizanska)
  - Implementation of  $B_s \rightarrow J/\Psi \phi$  (J.Catmore)
  - $\Lambda_b$  polarization & decays (M.Biglietti)

# WP1. EvtGen Mini-Workshop (Topics)



## ■ Physics issues

- Implementation of CP violation and mixing for coherently produced B mesons
- Baryon decays
- Special decay models
- New interfaces, e.g. to create particles with known polarizations
- How to handle FSR ?
- Tuning of decay tables

## ■ Software issues

- EvtGen Repository
  - Where is the main version of EvtGen maintained ?
  - How do we share code updates among experiments ?
  - EvtGen code branchings (problem mentioned in CHEP2004 conclusions)
- Supported platforms
- Interfacing other generators for decays of resonances
- EvtGen particle properties (Current `evt.pdl` is not ideal)



# WP1. New Projects

**Proposal: MC implementation of NRQCD models for prompt  $J/\Psi$  production**

Presented to the March LCG Generator Meeting

V.M.  
Vagnoni  
*INFN*  
*Bologna*

Agreement with T.Sjöstrand for the possible development in Pythia 6.3

Additional resources from INFN:  
.35 FTE dedicated to this project



# WP1. Short Term Plans

- USER SUPPORT FOR GENSER\_1\_0\_0
- Connection with MCDB
  - Introduction of “new” Test sub-package with GENSER use cases
  - In perspective: Interplays between GENSER, MCDB & Production Framework
- Support for Makefiles
- Procedures for Light Bug Fix Releases
- Study Scenarios in view of gcc 4
- Inclusion of additional sub-packages
  - CASCADE, DPMJET, PHOJET, NEXUS/EPOS, GRACE/GRAPPA
  - Update of already introduced Sub-package versions
  - Any other requests from the LHC experiments ?
- Definition of responsibilities for EvtGen development & maintenance
- Evaluation of solutions for the MC implementation of NRQCD models for prompt J/Ψ production
- Further plans quoted in MILESTONES (presented by G.Cosmo)

# WP2. Event Formats and Event Interfaces



**GOAL: standardize interfaces, support the new OO MCs**

- The modularisation
  - Basic idea in **ThePEG**, **HERWIG++**, **SHERPA**
  - From April 2004 LCG Generator participates to the development of **ThePEG**
    - We started with improving the doxygen documentation (A.Ribon)
    - Activity coordinated with **Phenogrid** (N.Glover et al.)
    - Relevant for the **Herwig++** development
- The MC truth Interface
  - **HEPML** proposal (XML - **Les Houches Agreement I** compliant)
    - Meta-data format facilitating automated documentation
  - **HEPMC**
    - Under the responsibility of **CLHEP**
    - (still some problems with translators, proliferation of branches)

# WP3: Production of Shared Event Files



**GOAL: to produce certified generator level events**

- ❖ Use them for **benchmarks, comparisons & combinations** in **LHC W.G.**
- ❖ **Improve the quality of shared samples** with respect to **LEP W.G.** era !!!

## ➤ Production framework

- ✓ Proposal June 2004
- ✓ Design Available. Prototype Stage
- ✓ Active institutions: CERN, Santander, Oviedo

**Will Be Officially  
Adopted By CMS**

## ➤ Production centre

## ➤ Configuration & Book-keeping

- ✓ ~ 0.75 FTE from LCG Russia (MSU, ITEP, JINR)
- ✓ LCG MCDB: Deployed!

**Tested At Fermilab  
Tested By CMS**

# WP3. The MCDB Team



- MCDB developers for Q1+Q2 2005 ~ 0.75 FTE
  - S.Makarychev ITEP (Moscow) from 2004 to 31/01/2005 (70%)
  - S. Belov JINR (Dubna) from 06/03/2005 to 09/05/2005
  - L. Dudko SINP MSU (Moscow) from 10/05/2005 to 10/06/2005

# WP3. Monte Carlo Data Base (MCDB)



## ■ Motivations

- **To Provide Configuration, Book-keeping, Documentation, Storage for the Shared Event Files**
- **To keep track of the full generation chain, Exploiting the Competences of Monte Carlo Experts and Monte Carlo Authors**

## ■ CMS MCDB <http://cmsdoc.cern.ch/cms/generators/mcdb/>

- **Only parton level files; AFS storage; No Searchable; No SQL**

## ■ LCG MCDB [[hep-ph/0404241](http://hep-ph/0404241)]

- Presented to the LCG Application Area meeting
- Same authors + Additional human resources and technical support
- Core software supported by LCG Software Project Infrastructure
  - **MySQL; POOL; CASTOR (RFIO); CGI; Perl; Apache**
- Web Interface, Dedicated Web Server <http://mcdm.cern.ch>



## WP3. MCDB Status

- We have a working version of MCDB
  - Basic functionality is supported
  - Deployed
- But still need to do a few important things in the nearest future:
  - Adjusting operations with Castor
  - Porting MCDB to SLC3
  - Making Web-interface more convenient to end-users
  - Checking for resistance against any kind of faults
  - API to LHC collaborations software
  - Cleanup of MCDB tree in CVS and installation scripts
  - Documentation

[S.Belov]

# WP3. Generator Level Production Framework



- Prototype available

J.Cuevas Maestro & H.Naves Sordo  
will present their progress to the  
April LCG Generator Monthly Meeting

# WP4. Monte Carlo Validation and Tuning



**GOAL: to cross-check MCs and compare with data**

- ❖ **Basic Sanity Checks**
- ❖ **Reference distributions** (multiplicities,  $P_T$  Spectra etc.)

## ➤ **Standalone Studies**

- ✓ Work on GENSER subpackages (Librarian, Beta Testers in Experiments)
- ✓ ALPGEN Validation (Perugia) → Essential to verify ALPGEN in GENSER
- ✓ HIJING Validation (JINR, Dubna) → Encouraged to contribute to JetWeb

## ➤ **Validation Framework**

- ✓ JetWeb: in production
- ✓ LCG-UK (U.C.London)
- ✓ <http://jetweb.hep.ucl.ac.uk/>

**[Comp. Phys. Comm. vol 153/2 164-178 (2003)]**

**Database of Data, MC & Comparisons Web  
interface, Job submission**

**Will switch soon to GENSER**

# Organisational Issues



## WEB page

<http://lcgapp.cern.ch/project/simu/generator>

→ Links to relevant documentation, CVS repository, release.notes etc.

[CDS Agenda Home](#) > [Projects](#) > [LHC Computing Grid](#) > [Physics Generators](#)

→ Minutes of meetings, slides of presentations

## Meetings:

→ Last Thursday of the month at 5 PM in CERN-32-1-A24 & VRVS

## Simulation project mailing list:

[project-lcg-simu@cern.ch](mailto:project-lcg-simu@cern.ch)



# Backup



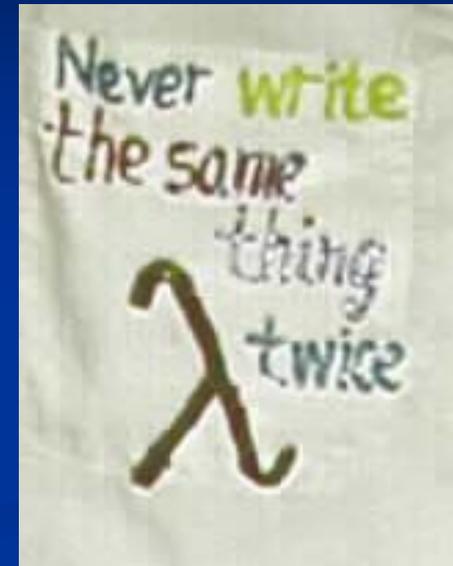
# Backup

- GENERAL

# Between Two Different Worlds



- Small Theoretical groups
- Huge fortran packages still in development
- Need help with the new OO packages
- Need to share user support duties



# LCG Generator

- ◆ Large Experimental Collaborations
- ◆ Complex OO Simulation Frameworks
- ◆ Need easy access to many generators, responsive user support, bug fixes etc.



# Backup Slides

- WP1

# WP1. GENSER Repository Structure



## GENSER\_1\_0\_0

```
|  
|--- config/  
|--- doc/  
|--- include/  
|--- logs/  
|--- release.notes  
|--- rh73_gcc323/lib/  
|           bin/  
|           tests/  
| ---include/  
|--- src/herwig/data/  
|           doc/  
|           dummy/  
|           examples/  
|           includes/  
|           src/
```

MC Package version  
provided as CVS Tag

# WP1. MC Packages: Inside or Outside GENSER ?



## ■ Three possibilities:

- 1) To develop the MC package in GENSER: MCDB, EVTGENLHC
  - ✓ EVTGENLHC derives from EVTGEN
    - ✓ Provided (Adapted) by LHCb → Contact person P.Robbe
    - ✓ LHCb has **full access** to the package in the GENSER repository
    - ✓ Other contributors have a **limited access** (development of new decay models, decay files etc.)
- 2) To fully export the MC generator code in GENSER defining the corresponding sub-package: **MOST OF THE INSTALLED MCs**
- 3) To install the MC generator as external software packages in the LCG environment and to store in GENSER just tests suites and other related code **COMPHEP, EVTGEN**

**Just a technical issue!**

**For each MC package an ad-hoc solution is found taking into account the user requirements**



# Backup Slides

- WP2

# WP2. HEPML Proposal

(COMPHEP Collaboration)



- All data in event file are divided in two parts
  - Header - describe the general information
    - Author, the file itself (creation date etc.), supported specifications, collider description etc.
    - Generator specific info, cuts, physical parameters etc.
    - Info for parser (format of event records etc.)
  - **Event Records** - variable data of events written in some compact format to one string (particle momenta, color chains etc.)
- Header is stored in a txt file with **XML Syntax**
- **Event Records** are (zip) compressed and attached to the Header file

[A.Sherstnev]



# Backup Slides

- WP3

# WP3. MCDB Web Interface Screen-shot



MCDB - MonteCarlo Database

<http://mcdb.cern.ch>

| top-level-menu | top-level-menu |

Some comments about this site can be here..

Search this site

Main MENU

- TOP
- Higgs
- Wjets

## An events listing page

### A second event

These events have been generated in frames of SM by CompHEP (version 4.2p1). Cuts on leptons are applied only. The event sample is in the old CompHEP format (use cpyth-1.\* to read the events in PYTHIA). These events have been generated in frames of SM by CompHEP (version 4.2p1). Cuts on leptons are applied only. The event sample is in the old CompHEP format (use cpyth-1.\* to read the events in PYTHIA).

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Search this site

Non authorized author entry  
Authorized author entry  
Administrator's area  
Moderator entry  
News

Search this site

Non authorized author  
Authorized author  
Administrator's area



Article creating

Generators

Describe process

Describe model

Describe cuts

General information

Event files

Generator

Model

Process

Cuts

Article preview/save

GENERATOR:

HERWIG

Other generator/versi

VERSION:

6.500

6.500

6.503

6.504

Only Mozilla Browser Supported  
(for the time being)



# Transparencies for Internal Review (Gabriele's talk)

# LCG Generator



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**WP4: TUNING AND VALIDATION**

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LCG-Spain (Framework)

Collaboration with independent projects: **LCG-UK** (Validation, New MCs)

Contact persons/Collaborators in **MC Projects** and **LHC Experiments**

**Started May 2003**

**Long Term Project**

*Workshop on MC's for the LHC (MC4LHC)*

*CERN, July 7 - August 2 2003*

*GENSER Review* CERN, March 25 2004

*EvtGen Miniworkshop* CERN, January 20 2005



# LCG Generator Future Plans

Emphasis on the Collaboration with  
New Object Oriented MC Projects

## ■ CONFIRMED MILESTONES

- **WP1: Production quality release of GENSER (1\_0\_0) by December 15 2004** (In late because of the re-definition of the release policy. Release was made on March 29. Delay: ~ 3.5 months).
- **WP1: First C++ Monte Carlo (SHERPA) fully integrated in GENSER by March 31 2005** (Achieved with the release of GENSER 1\_0\_0 on March 29).
- **WP1/WP2: First test of ThePEG integration in Herwig++ by June 30 2005 (\*)**.  
(\*) Project conducted in collaboration with PHENOGRID
- **WP3: Generator level production framework beta version by June 30 2005 (\*\*\*)**.  
(\*\*\*) Project conducted in collaboration with CMS
- **WP3: MCDB user document with definition of procedures to gain access through certificates by September 30 2005.**
- **WP1: Pythia 8. Release of alpha version by September 30 2005.**



# LCG Generator Future Plans

## ■ PROPOSED MILESTONES

- **WP3: Proposal for a LCG Generator production centre integrated in the grid-middleware by September 30 2005.**
- **WP1: Agreement on responsibilities for EvtGen development in GENSER. Definition of EvtGen development plans & policy. By September 30 2005.**
- **WP1: Integration of GENSER in JetWeb by December 15 2005 (\*\*).**  
*(\*\*) Project conducted in collaboration with CEDAR*
- **WP3: Generator level production framework: production quality release by December 15 2005 (\*\*).**  
*(\*\*) Project conducted in collaboration with CMS*
- **WP3: MCDB Integration, experiment specific APIs and management of large files by March 31 2006.**
- **WP4: Generator level validation framework beta version by June 30 2006.**
- **WP3: Fully operational LCG Generator production centre integrated in the grid-middleware by September 30 2006.**