

Status of WHIZARD

Wolfgang Kilian (Siegen)

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<http://whizard.event-generator.org>

Main Authors: Wolfgang Kilian, Thorsten Ohl, Jürgen Reuter
Contributing: Ana Alboteanu, Felix Braam, Tania Robens, Sebastian Schmidt, Daniel Wiesler

WHIZARD: Plan

WHIZARD

is a **universal program for dealing with high-energy scattering** processes,
in particular of **multi-particle type** ($2 \rightarrow 4, 2 \rightarrow 6, \dots$).

- Automatic generation and compilation of **matrix-element code**
- Automatic selection of **phase-space parameterizations**
- Automatic **adaptive multi-channel integration**
- Automatic generation of (weighted or unweighted) **event samples**
- **Interfaces** to external programs / analysis

WHIZARD: History

WHIZARD development began in 1997, fully working version 2000.

LC-TOOL-2001-039

Matrix-element generation by O'Mega (alternatively Madgraph, CompHEP)

Initial emphasis on

- Highly efficient matrix element code and phase-space evaluation
 - no expansion in terms of Feynman graphs, but recursive computation of one-particle off-shell wave-functions \Rightarrow no redundancy
 - adaptive multi-channel integration (VAMP: multichannel VEGAS)
- Electroweak interactions (Higgs/W physics, anomalous couplings)
- TESLA/ILC specifics:
 - photon ISR and beamstrahlung, beam-energy spread
 - polarization

Hadron-collider processes supported via PDFLIB.

WHIZARD: Present

Main emphasis of the current [WHIZARD](#) version on

arXiv:0708.4233 [hep-ph]

- **Efficient** computation and event generation for **multi-particle processes**
- Comprehensive support for **New-Physics models**
 - SM with anomalous couplings and/or WW resonances (respecting unitarity)
 - MSSM and extensions: NMSSM, E_6 -inspired MSSM
 - Little-Higgs models: Littlest Higgs, Simplest-Group, ...
 - Extra dimensions: gravitons and gravitinos
- **Usability**
 - configuration, cut definition, parameter setup in free-form text files
 - user-defined spectra, cut/selection strategies, matrix-element reweighting
 - online analysis and visualization of distributions
 - standard interfaces (LHAPDF, STDHEP, Les-Houches Accords)

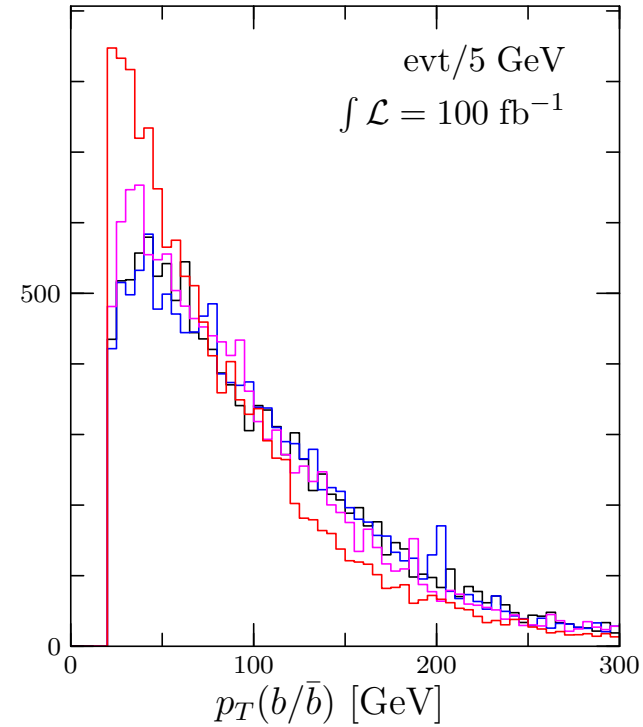
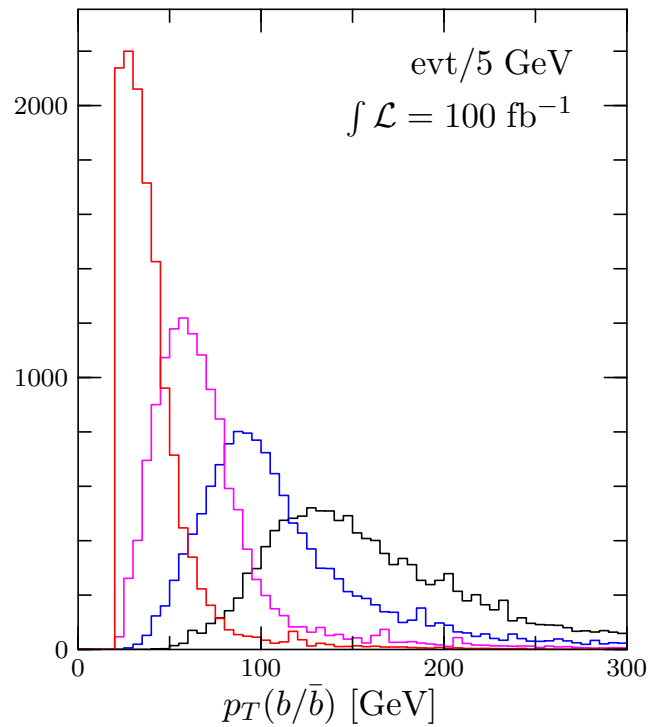
WHIZARD: Applications

Sbottom production at LHC

PRD73:055005,2006

$pp \rightarrow \tilde{\chi}_1^0 \tilde{\chi}_1^0 b \bar{b} b \bar{b}$: 32112 diagrams, 22 color flows, ~ 4000 PS channels

Discrimination between ISR and decay- b jets?



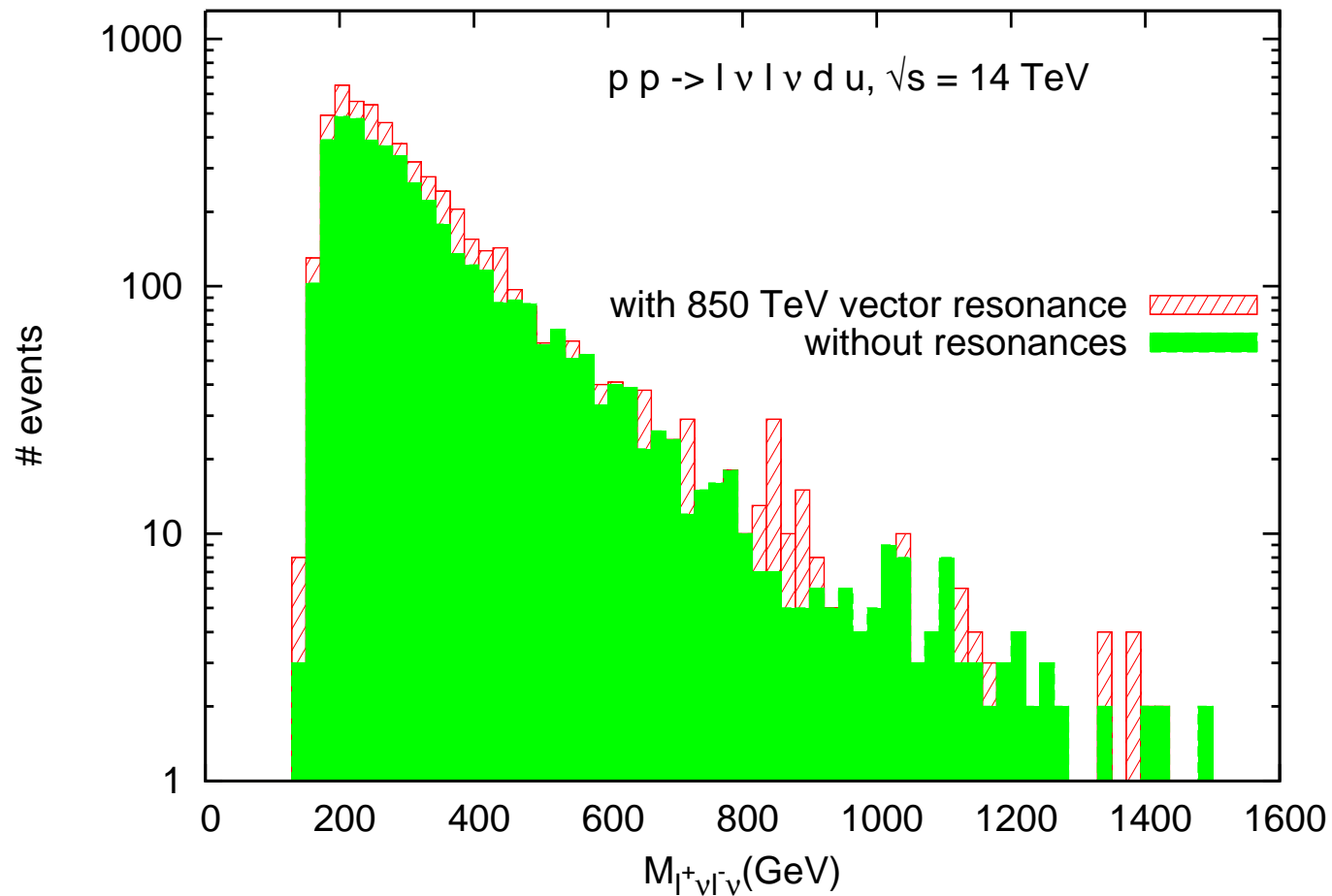
left: p_T ordering, right: rapidity ordering

[WK, Jürgen Reuter]

WHIZARD: Applications

Combined treatment of resonances and anomalous couplings in WW scattering at LHC

JHEP 0811:010,2008



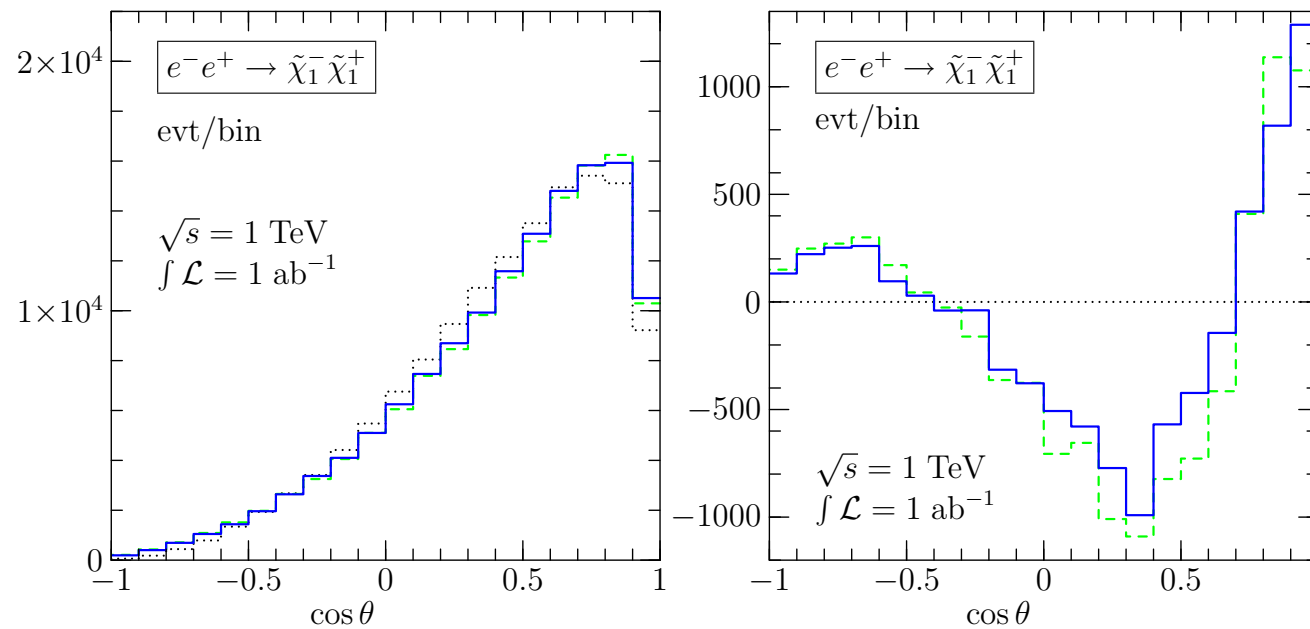
[Ana Alboteanu]

WHIZARD: Applications

NLO simulation of chargino production at ILC

Eur.Phys.J.C48:389-400,2006

⇒ Unweighted event generation at NLO (no negative weights)



[Tania Robens]

WHIZARD: Current Projects

- Rewriting of the WHIZARD core code \Rightarrow [WHIZARD 2.0](#) (WK)
 - More flexibility for implementing new features (internal event data structure)
 - Code cleanup, OO structure (\Rightarrow Fortran 2003 standard)
 - Cascades w/ spin correlations, inclusive event generation
- [Parton shower](#) (various models) / matching algorithms (S.Schmidt)
- Underlying event / [multiple interactions](#) (H.Boschmann)
- Automated [dipole subtraction](#) / GOLEM interface ([NLO](#)) (J.Reuter)
- [Extended SUSY](#) models / SLHA2 (F.Braam / D.Wiesler)
- Automated [new-physics model support](#) (T.Ohl / J.Reuter)
- [User interface](#) (WK)