Report from the generator group

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Outline

1. The generator group
2. Report from pre-meeting last week
3. Whizard2.4 status
4. Whizard2 feature requests
5. Other generators
6. ILC Generation production
7. Conclusions

The generator group

- Since the end of the GDE: Informal group.
- Members:
  - MB and J. Tian (ILD gen. group conveners), A. Miyamoto
  - P. Roloff (CLICdp)
  - SiD: T. Barklow (SiD)
- Main task
  - Interact with generator authors
  - Validate
  - Set up common framework
- In view of a new mass-production of the entire SM (as background or signal).
- For at least ILD and CLICdp: ready to go before summer '17.

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- Met at KEK/TokyoU Wednesday to Saturday.
- First day: ILD issues.
- Second day: General non-whizard related questions.
- Third and forth day: Discussions with Whizard authors.
- Generator group+ F. Gaede, T. Calancha, D. Jeans + W. Kilian and J. Reuter from the Whizard's.

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Things discussed:

- Current status of Whizard 2.4
  - Issues ?
  - Feature requests.
- Other generators.
  - Alternatives to Whizard for systematics
  - Special generators
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  - What?
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- DBD was done with v. 1.95
- v2.x is a major re-write. Many new features.
  - New, better steering
  - Things done by us now part of the main code:
    - Interface to PYTHIA (parton-shower and hadronisation)
    - Interface TAUOLA (polarised τ-decays)
    - Beamspectrum
  - Internal parton-shower with matching of gluons between hard process- p.s.- hadronisation.
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- Difference in particle multiplicities in 4-quark events.
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  - However, the way the colour-flow is passed is different.
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- Polarised τ-decays done with TAUOLA, which does not take the full quantum-mechanical correlations into account.
  - Authors working on a better, internal, treatment, but not for now.
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Whizard2 feature requests

- Metadata in LCIO event/run header (see later)
- Spin and status-codes in LCIO MCParticle (see later)
- Callable interface (for FastSim): Partly there, needs testing and documentation.
- Command-line steering: Partly there, needs testing and documentation.
- Preservation of the full input and output of a job for future reference.
- Method to include a user "event-transformation" and a flat M.E. for $\gamma\gamma \rightarrow$ low $P_\perp$ hadrons.
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Metadata in LCIO file

- Write complete Sindarin steering file into the LCIO RunHeader
- Full spin density matrix (for spin 1/2) in event header.
- Metadata to be put into the LCEvent header as key-value pairs :
  - Energy
  - BeamSpectrum
  - ProcessID (an int). Also used as run-number.
  - processName (a string)
  - crossSection with error
  - pdg of beam 1 and 2
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MCParticle contents

- Spin information in LCIO output from Whizard, as helicity: Third component is $\pm$ 1 (first and second always 0).
- Status codes:
  - 1 for stable particles
  - 2 particle (meson or baryon) decayed in generator
  - 3 documentation line
  - 4 incoming (beam) particles
  - 5 outgoing partons (hard process)
    - In case of generated final state leptons they will be combined as generator
    - ISR photons will not have generator 3

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    - ISR photons will not have genstat 5

Other generators

In general it would be nice to also have other generators, but currently not much push for it.

- BHWide for better Bhabhas.
- BDK/BDKRC for $\gamma\gamma \to \ell\ell$
- Pythia8, MadGraph for double-checks.
- Pythia8 instead of Pythia6 for hadronisation.

Problem: How to get output into LCIO?

- "Output" often HepMC or LesHouches
- Idea to test: Whizard can take these as input, and can output LCIO.
- $\Rightarrow$ Use Whizard simply as a formatter.

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ILC Generation production

Which samples to produce ?

- 250, 350, 500 - at least H20 - up to 10 times as much
- Higgs: as in DBD: separated out from SM sample (use infinite m_h in SM sample)
- Z pole
- produce all samples with fully polarised beams.
- Maybe: produce some “standard” BSM benchmark samples? If so: What ?
- Request from production team to reduce the number of different processes wrt. DBD samples
- However: DBD-scheme has served the user community well: should be kept as is
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  - 2f for calibration e,μ,q
  - single particle files: μ:s K_L^0:s, ...
  - uds-di-jet events
  - bb,cc for flavour tagging
  - also 4b, 6b, 4c, 6c and 4/6 uds

Estimate of time/effort:

- Once Whizard is fully validated
  - Largest fraction of generation is the initial integration
  - Runs on single computer - afterwards producing large sample is fast

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  - Should do this with SGV.
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Generator metadata files:

- Created at job submission
- Contain: process, cross section, polarisation, files, ...
- Wrt DBD:
  - Remove the lists of produced files (might change with time)
  - Add “superseded” keyword, False by default.
  - additional keywords, e.g. for BSM could be added by generator group
- To be stored in Github and in Grid-SE

Steering-files, logs, integration grids output other than the events,...:

- In tar files - parallel to generated files, e.g. mc-db
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