Common Generator Tools for LC

Akiya Miyamoto
KEK

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Common generator samples

- DBD improvements w.r.t LOI
  - Whizard 1.95 with new features such as
    - full CKM matrix, complete τ polarization treatment, stores more information in generated files.
  - Physsim for tth & 8 f background processes
- As a common tools
  - SVN repository for Whizard tool. Source, Lumi files, …
  - Sample generations at SLAC, DESY, KEK and common files are placed on ILC VO GRID.
  - Common format for generator meta info. (process ID, names, cross sections, file names, …) and kept on webs.
    - Uniq process ID, common filename convention, common metadata format. Maintained by Tim, Mikael, Stephan, Akiya

Whizard 1.95 generator

- Tree calculation of 2→n processes with multiple ISR γ's.
  Hadronization and decay of final n particles by Pythia. Tauola for τ.
- All (e^+e^-, $e^+\gamma$, γe^-, $\gamma\gamma$) → n processes (n=2~6 particles) and e^+e^- → $f\bar{f}h$
  $e^{\pm}$: Luminosity spectrum by GuineaPig
  γ : nearly real Weizsacker-Williams photons (Whizard) or
  beamstrahlung photons(GuineaPig).
- ISR: Whizard default (order 3 LLA., include Pt of remnants)
- FSR by Pythia : QED for μ and τ, QCD&QED for quarks.
  No QED FSR of e (∵ Can not give correct q^2 to Pythia.)
- Higgs : $f\bar{f}h$ process m_H=125GeV. (neglect $f\bar{f}f\bar{f}h$)
  h decays by Pythia with BRs given by a LHC WG.
  Other processes m_H=2TeV
- Amplitude with a gluon propagator in Whizard : OFF.
  ➔ Pythia simulate gluon splitting.
  ➔ No interferences between QCD and EW amplitude. ≤ 10% effect

Physsim generator for $t\bar{t}h$

- It was hard to generate processes with 8 fermions or more by Whizard, because too many CPU time and memory requirements due to many channels involved.
- Physsim calculates only a limited number of diagrams. Saves CPU time.

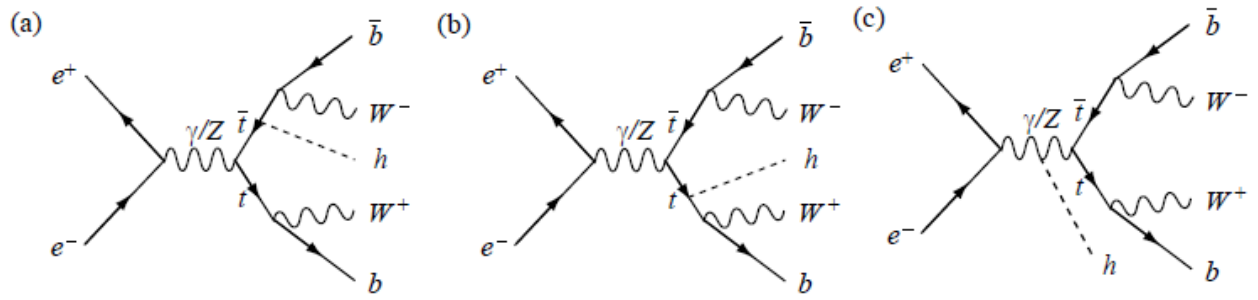

Figure 2.2.1: Feynman diagrams for the $e^+e^- \to t\bar{t}h$ process.

- Used for generating $e^+e^- \to t\bar{t}h$, $t\bar{t}Z\left(Z \to f\bar{f}\right), t\bar{t}g^*\left(g^* \to b\bar{b}\right)$
- $Z \to q\bar{q}$ and $g^* \to b\bar{b}$ in $t\bar{t}Z$ and $t\bar{t}g^*$ hadronize independently w. $t\bar{t}$
- $e^+(e^-)$ luminosity spectrum, ISR, hadronization/decay : same as Whizard samples.
- Full 8-fermion generator is desirable.

Other generators

- $\gamma\gamma \rightarrow$ mini-jet : by Pythia. Collisions of γ point like
- $\gamma\gamma \rightarrow$ low_pt hadrons : with X-section formula by Peskin. Using Pythia for q/g collisions.

➔ Not in SVN repository yet.

- GunieaPig

- Generators for beam induced backgrounds (Not used for DBD)
  - Muon backgrounds
  - Synchrotron radiations
  - Neutrons from dump

Issues after DBD

- New common samples
- Generator updates
  - Physics improvements : Detector benchmarking → For physics
    - Matching of QCD radiation in ME and parton shower
    - Bhabha/QED generators : There was a plan, but …
  - Whizard 1.95 to Whizard2.x
  - Repository for Physsim
  - IO: STDHEP ➔ ?
    - Whizard: Fortran 95. Is Fortran interface in LCIO useful ?