Report from Common Task Group for Generators

Mikael Berggren[1]

[1]DESY
Hamburg

ILD Meeting, Orsay, May 22 ,2011

Outline

Common Task Group for Generators

A cross-region and cross-concept working group was created to look into the generator side

Members

- Tim Barklow, SiD/Americas
- Akiya Miyamoto.ILD/Asia
- M.B., ILD/Europe

Since, CLIC has also joined

- Stephane Poss

What is needed for the DBD

Why not do as we did for the LOI ?

- Tim will not do it alone, due to his work-load
- There are a number of short-comings with the version of Whizard used:
  - Diagonal CKM
  - No tau polarisation in decays
  - Hadronisation tune in PYTHIA
  - Colour-flow and helicity information

What is needed for the DBD

Why not do as we did for the LOI ?

- Tim will not do it alone, due to his work-load
- There are a number of short-comings with the version of Whizard used:
  - Diagonal CKM
  - No tau polarisation in decays
  - Hadronisation tune in PYTHIA
  - Colour-flow and helicity information

What is needed for the DBD

- For the DBD, there are new bench-marks:
  - $e^+e^- \to \nu\bar{\nu}h^0$
  - $e^+e^- \to W^+W^-$
  - $e^+e^- \to t\bar{t}h^0$
- All at another E_{CMS}=1TeV
- Machine backgrounds and same-bunch crossing $\gamma\gamma$ events should be overlaid (in some way...)
- At least for $t\bar{t}h^0$, backgrounds with 8 or even 10 fermions might be needed.
- The LHC runs.

What is needed for the DBD

- For the DBD, there are new bench-marks:
  - $e^+e^- \to \nu\bar{\nu}h^0$
  - $e^+e^- \to W^+W^-$
  - $e^+e^- \to t\bar{t}h^0$
- All at another E_{CMS}=1TeV
- Machine backgrounds and same-bunch crossing $\gamma\gamma$ events should be overlaid (in some way...)
- At least for $t\bar{t}h^0$, backgrounds with 8 or even 10 fermions might be needed.
- The LHC runs.

What is needed for the DBD

- For the DBD, there are new bench-marks:
  - $e^+e^- \to \nu\bar{\nu}h^0$
  - $e^+e^- \to W^+W^-$
  - $e^+e^- \to t\bar{t}h^0$
- All at another E_{CMS}=1TeV
- Machine backgrounds and same-bunch crossing $\gamma\gamma$ events should be overlaid (in some way...)
- At least for $t\bar{t}h^0$, backgrounds with 8 or even 10 fermions might be needed.
- The LHC runs.

What is needed for the DBD

- For the DBD, there are new bench-marks:
  - $e^+e^- \to \nu\bar{\nu}h^0$
  - $e^+e^- \to W^+W^-$
  - $e^+e^- \to t\bar{t}h^0$
- All at another E_{CMS}=1TeV
- Machine backgrounds and same-bunch crossing $\gamma\gamma$ events should be overlaid (in some way...)
- At least for $t\bar{t}h^0$, backgrounds with 8 or even 10 fermions might be needed.
- The LHC runs.

Generator choice

SM will be done with Whizard

- Whizard version by choice : 1.95. Has
  - CKM correct
  - Colour flow
  - Spin
- Latest version at the time of the decision was 2.0.2, but “Note that some of the features of WHIZARD 1 (esp. ILC) have not yet been re-enabled.” (Whizard home-page).
- Fragmentation: Latest PYTHIA6 (6.422). PYTHIA8 is out but “To some extent this switch is nominal, since 8.1 does not yet offer a complete replacement of 6.4, and is not yet tested and tuned enough to be recommended for major production runs.” (PYTHIA home-page).

Generator choice

SM will be done with Whizard

- Whizard version by choice : 1.95. Has
  - CKM correct
  - Colour flow
  - Spin
- Latest version at the time of the decision was 2.0.2, but “Note that some of the features of WHIZARD 1 (esp. ILC) have not yet been re-enabled.” (Whizard home-page).
- Fragmentation: Latest PYTHIA6 (6.422). PYTHIA8 is out but “To some extent this switch is nominal, since 8.1 does not yet offer a complete replacement of 6.4, and is not yet tested and tuned enough to be recommended for major production runs.” (PYTHIA home-page).

Generator choice

SM will be done with Whizard

- Whizard version by choice : 1.95. Has
  - CKM correct
  - Colour flow
  - Spin
- Latest version at the time of the decision was 2.0.2, but “Note that some of the features of WHIZARD 1 (esp. ILC) have not yet been re-enabled.” (Whizard home-page).
- Fragmentation: Latest PYTHIA6 (6.422). PYTHIA8 is out but “To some extent this switch is nominal, since 8.1 does not yet offer a complete replacement of 6.4, and is not yet tested and tuned enough to be recommended for major production runs.” (PYTHIA home-page).

Whizard improvement

- PYTHIA 6.422 is used for hadronisation. After evaluation of the tunings from the LEP collaborations, we decided to use OPAL.
- Tau-polarisation in decay: TAUOLA interface standardised, for polarisation-dependent τ-decays. Also for τ's in fragmentation $W \to \tau\nu$. Verified to work correctly - Thanks for advice Gudi!
- Extension of information in the event record:
  - Colour singlet system information and particle spin.
  - Beam-particles before and after beam-strahlung.
  - Process ID in each event record.
- Coding of FSR: Mokka modified to be insensitive (as SLiC already was).
- Flavour-summed channels. After all, who cares if it is a u,d, or s quark ? Will reduce the 2348 channels to a few tens. Two options:
  - Sum in phase-space evaluation: Higher gain in simplicity and CPU-time,but less flexible.
  - Channel mixing in generation: Any set of channels can be merged.

  Both options are pursued, as well as mixes of them.

Whizard improvement

- PYTHIA 6.422 is used for hadronisation. After evaluation of the tunings from the LEP collaborations, we decided to use OPAL.
- Tau-polarisation in decay: TAUOLA interface standardised, for polarisation-dependent τ-decays. Also for τ's in fragmentation $W \to \tau\nu$. Verified to work correctly - Thanks for advice Gudi!
- Extension of information in the event record:
  - Colour singlet system information and particle spin.
  - Beam-particles before and after beam-strahlung.
  - Process ID in each event record.
- Coding of FSR: Mokka modified to be insensitive (as SLiC already was).
- Flavour-summed channels. After all, who cares if it is a u,d, or s quark ? Will reduce the 2348 channels to a few tens. Two options:
  - Sum in phase-space evaluation: Higher gain in simplicity and CPU-time,but less flexible.
  - Channel mixing in generation: Any set of channels can be merged.

  Both options are pursued, as well as mixes of them.

Whizard improvement

- PYTHIA 6.422 is used for hadronisation. After evaluation of the tunings from the LEP collaborations, we decided to use OPAL.
- Tau-polarisation in decay: TAUOLA interface standardised, for polarisation-dependent τ-decays. Also for τ's in fragmentation $W \to \tau\nu$. Verified to work correctly - Thanks for advice Gudi!
- Extension of information in the event record:
  - Colour singlet system information and particle spin.
  - Beam-particles before and after beam-strahlung.
  - Process ID in each event record.
- Coding of FSR: Mokka modified to be insensitive (as SLiC already was).
- Flavour-summed channels. After all, who cares if it is a u,d, or s quark ? Will reduce the 2348 channels to a few tens. Two options:
  - Sum in phase-space evaluation: Higher gain in simplicity and CPU-time,but less flexible.
  - Channel mixing in generation: Any set of channels can be merged.

  Both options are pursued, as well as mixes of them.

Whizard improvement

- PYTHIA 6.422 is used for hadronisation. After evaluation of the tunings from the LEP collaborations, we decided to use OPAL.
- Tau-polarisation in decay: TAUOLA interface standardised, for polarisation-dependent τ-decays. Also for τ's in fragmentation $W \to \tau\nu$. Verified to work correctly - Thanks for advice Gudi!
- Extension of information in the event record:
  - Colour singlet system information and particle spin.
  - Beam-particles before and after beam-strahlung.
  - Process ID in each event record.
- Coding of FSR: Mokka modified to be insensitive (as SLiC already was).
- Flavour-summed channels. After all, who cares if it is a u,d, or s quark ? Will reduce the 2348 channels to a few tens. Two options:
  - Sum in phase-space evaluation: Higher gain in simplicity and CPU-time,but less flexible.
  - Channel mixing in generation: Any set of channels can be merged.

  Both options are pursued, as well as mixes of them.

Whizard improvement

- PYTHIA 6.422 is used for hadronisation. After evaluation of the tunings from the LEP collaborations, we decided to use OPAL.
- Tau-polarisation in decay: TAUOLA interface standardised, for polarisation-dependent τ-decays. Also for τ's in fragmentation $W \to \tau\nu$. Verified to work correctly - Thanks for advice Gudi!
- Extension of information in the event record:
  - Colour singlet system information and particle spin.
  - Beam-particles before and after beam-strahlung.
  - Process ID in each event record.
- Coding of FSR: Mokka modified to be insensitive (as SLiC already was).
- Flavour-summed channels. After all, who cares if it is a u,d, or s quark ? Will reduce the 2348 channels to a few tens. Two options:
  - Sum in phase-space evaluation: Higher gain in simplicity and CPU-time,but less flexible.
  - Channel mixing in generation: Any set of channels can be merged.

  Both options are pursued, as well as mixes of them.

Tools for productions of generator samples

- Tim's scripts to run Whizard jobs at the SLAC batch server migrated and adapted to the KEK environment, and to DESY.
- An SVN project holding Whizard source-code, installation scripts and process-description files has been set up at CERN by Stephane.
- As generation production will now be distributed → An information file with file-locations, generator settings, etc. should be updated by each generation job.
  This information could then be entered into each concepts own full-fledged production database. A proposal by is on the table.

Tools for productions of generator samples

- Tim's scripts to run Whizard jobs at the SLAC batch server migrated and adapted to the KEK environment, and to DESY.
- An SVN project holding Whizard source-code, installation scripts and process-description files has been set up at CERN by Stephane.
- As generation production will now be distributed → An information file with file-locations, generator settings, etc. should be updated by each generation job.
  This information could then be entered into each concepts own full-fledged production database. A proposal by is on the table.

Tools for productions of generator samples

- Tim's scripts to run Whizard jobs at the SLAC batch server migrated and adapted to the KEK environment, and to DESY.
- An SVN project holding Whizard source-code, installation scripts and process-description files has been set up at CERN by Stephane.
- As generation production will now be distributed $\rightarrow$ An information file with file-locations, generator settings, etc. should be updated by each generation job.
  This information could then be entered into each concepts own full-fledged production database. A proposal by is on the table.

Status of generator samples

Disclaimer: Right now, none of the final DBD samples can be produced, because there are no official 1 TeV beam-parameters from the GDE, yet !

Status of generator samples : $\nu\nu h$

Assigned to Tim B.

- $\nu\nu h$: Includes $h \to gg$ and WW^*, so need 6-fermion background.
  - Potentially large advantage with aliasing, esp. when Cabibbo suppressed decays included.
  - However: Integration gets very time-consuming with aliasing$\to$ go back to to separate final states
  - Advancing well: Full sample ready to be generated. Pilot generation of 100k + additional $h \to \mu\mu$ ongoing.

Status of generator samples : $\nu\nu h$

Assigned to Tim B.

- $\nu\nu h$: Includes $h \to gg$ and WW^*, so need 6-fermion background.
  - Potentially large advantage with aliasing, esp. when Cabibbo suppressed decays included.
  - However: Integration gets very time-consuming with aliasing$\to$ go back to to separate final states
  - Advancing well: Full sample ready to be generated. Pilot generation of 100k + additional $h \to \mu\mu$ ongoing.

Status of generator samples : $\nu\nu h$

Assigned to Tim B.

- $\nu\nu h$: Includes $h \to gg$ and WW^*, so need 6-fermion background.
  - Potentially large advantage with aliasing, esp. when Cabibbo suppressed decays included.
  - However: Integration gets very time-consuming with aliasing$\to$ go back to to separate final states
  - Advancing well: Full sample ready to be generated. Pilot generation of 100k + additional $h \to \mu\mu$ ongoing.

Status of generator samples : *ttH*

Assigned to Akiya

- *ttH*: 8 fermions background, Very difficult for Whizard:
  - H+4-jet+$l\nu$ signal: 2 days CPU for integration to converge with 0.3
  - H+6-jet signal: 700 Whizard channels in one aliased process. 14 days for 4 iterations of integration and 3 % accuracy (typically 10 iterations needed)
  - 6-jet+$l\nu$ background: failed to generate the Fortran code describing the diagrams.
- Alternatives:
  - simplify Whizard
    - Generate 8 fermions as 6 fermions+Z.
    - But then $\Gamma_Z = 0$.
  - Physsim
    - ttH (ie. 8fH), ttt (ie. 8f) by Helas (helicity amplitude approach).
    - But: While the effect of ISR of the beam-spectrum is included, No ISR-γ generated, nor any p_T kick by ISR to the event.
    - Colour/Spin info: Available in Whizard output but not in Physsim

Status of generator samples : *ttH*

Assigned to Akiya

- *ttH*: 8 fermions background, Very difficult for Whizard:
  - H+4-jet+$l\nu$ signal: 2 days CPU for integration to converge with 0.3
  - H+6-jet signal: 700 Whizard channels in one aliased process. 14 days for 4 iterations of integration and 3 % accuracy (typically 10 iterations needed)
  - 6-jet+$l\nu$ background: failed to generate the Fortran code describing the diagrams.
- Alternatives:
  - simplify Whizard
    - Generate 8 fermions as 6 fermions+Z.
    - But then $\Gamma_Z = 0$.
  - Physsim
    - ttH (ie. 8fH), ttt (ie. 6f) by Helas (helicity amplitude approach)
    - But: While the effect of ISR of the beam spectrum is included: No ISR-γ generated, nor any p_T kick by ISR to the event.
    - Colour/Spin info: Available in Whizard output, but not in Physsim

Status of generator samples : *ttH*

Assigned to Akiya

- *ttH*: 8 fermions background, Very difficult for Whizard:
  - H+4-jet+$l\nu$ signal: 2 days CPU for integration to converge with 0.3
  - H+6-jet signal: 700 Whizard channels in one aliased process. 14 days for 4 iterations of integration and 3 % accuracy (typically 10 iterations needed)
  - 6-jet+$l\nu$ background: failed to generate the Fortran code describing the diagrams.
- Alternatives:
  - simplify Whizard
    - Generate 8 fermions as 6 fermions+Z.
    - But then $\Gamma_Z = 0$.
  - Physsim
    - ttH (ie. 6fH), ttff (ie. 8f) by Helas (helicity amplitude approach).
    - But: While the effect of ISR of the beam-spectrum is included, No ISR-γ generated, nor any p_T kick by ISR to the event.
    - Colour/Spin info: Available in Whizard output, but not in Physsim

Status of generator samples : *ttH*

Assigned to Akiya

- *ttH*: 8 fermions background, Very difficult for Whizard:
  - H+4-jet+$l\nu$ signal: 2 days CPU for integration to converge with 0.3
  - H+6-jet signal: 700 Whizard channels in one aliased process. 14 days for 4 iterations of integration and 3 % accuracy (typically 10 iterations needed)
  - 6-jet+$l\nu$ background: failed to generate the Fortran code describing the diagrams.
- Alternatives:
  - simplify Whizard
    - Generate 8 fermions as 6 fermions+Z.
    - But then $\Gamma_Z = 0$.
  - Physsim
    - ttH (ie. 6fH), ttff (ie. 8f) by Helas (helicity amplitude approach).
    - But: While the effect of ISR of the beam-spectrum is included, No ISR-γ generated, nor any p_T kick by ISR to the event.
    - Colour/Spin info: Available in Whizard output, but not in Physsim

Status of generator samples : *ttH*

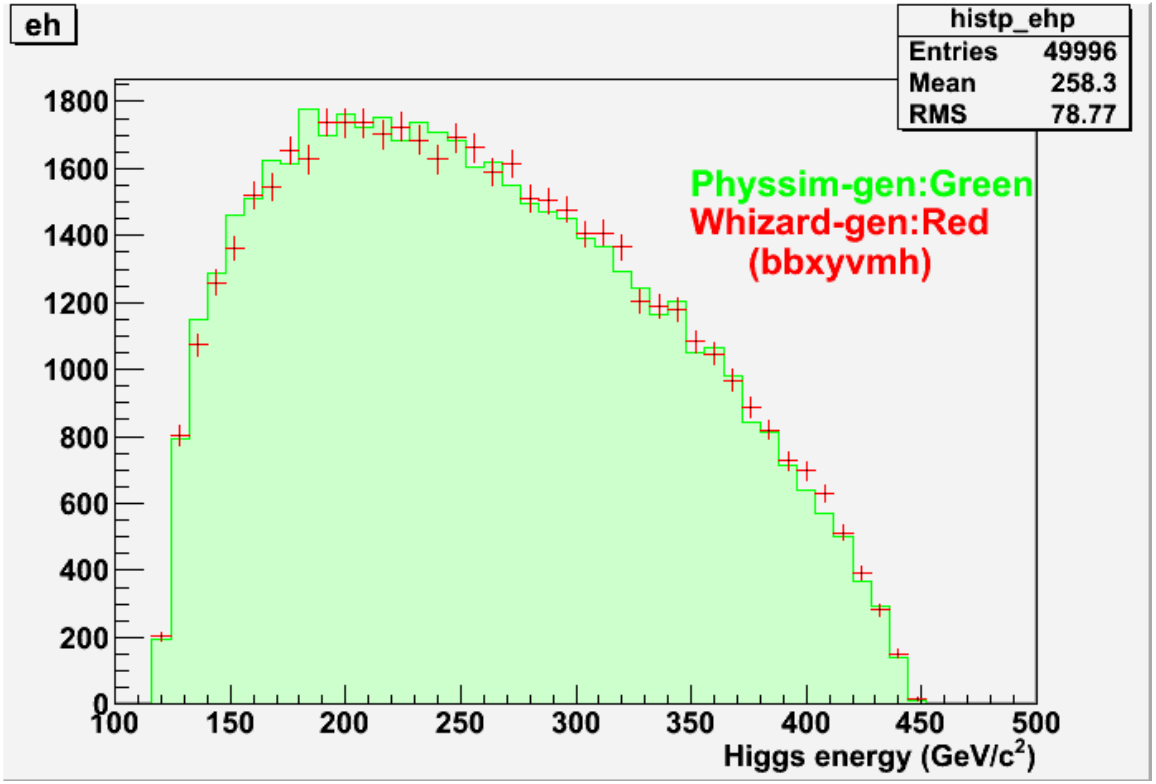
Assigned to Akiya

- *ttH*: 8 fermions background, Very difficult for Whizard:
  - H+4-jet+$l\nu$ signal: 2 days CPU for integration to converge with 0.3
  - H+6-jet signal: 700 Whizard channels in one aliased process. 14 days for 4 iterations of integration and 3 % accuracy (typically 10 iterations needed)
  - 6-jet+$l\nu$ background: failed to generate the Fortran code describing the diagrams.
- Alternatives:
  - simplify Whizard
    - Generate 8 fermions as 6 fermions+Z.
    - But then $\Gamma_Z = 0$.
  - Physsim
    - ttH (ie. 6fH), ttff (ie. 8f) by Helas (helicity amplitude approach).
    - But: While the effect of ISR of the beam-spectrum is included, No ISR-γ generated, nor any p_T kick by ISR to the event.
    - Colour/Spin info: Available in Whizard output, but not in Physsim

Status of generator samples : *ttH*

Whizard - Physsim comparison :

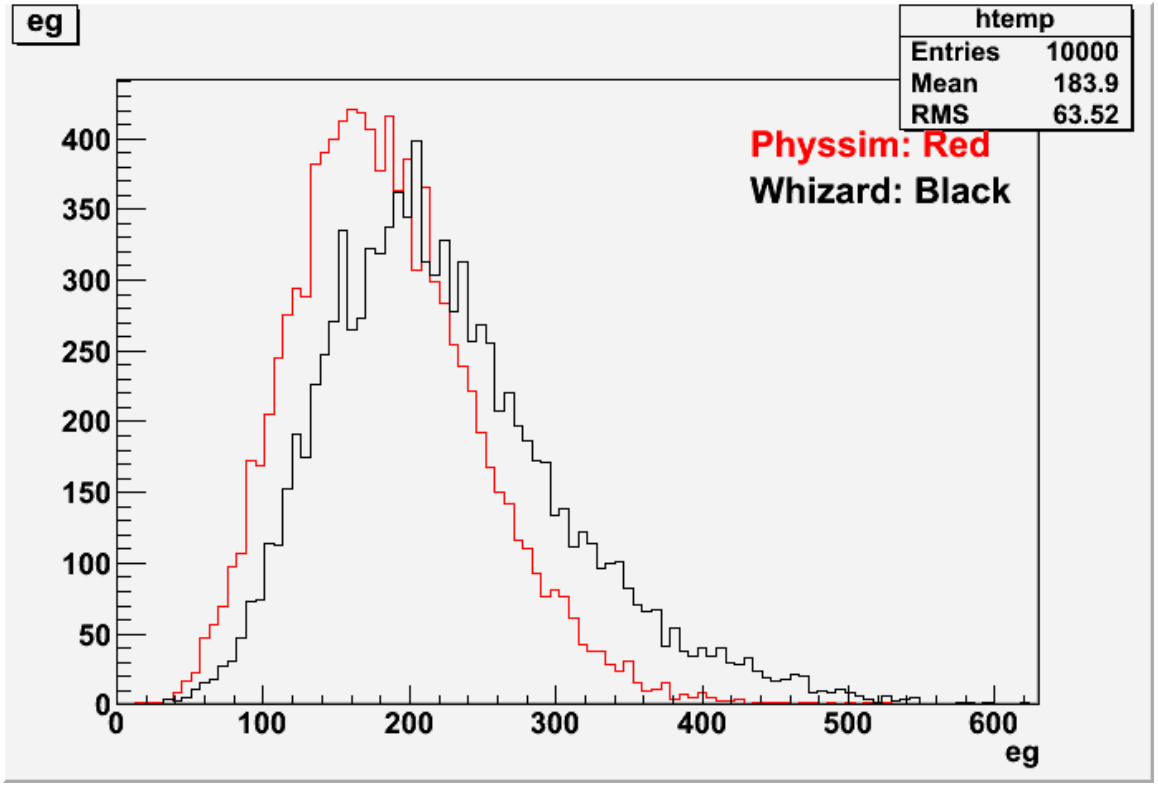
- Higgs energy distribution at tree level is consistent.
- Difference is small: plot shows 8.3 ab^{-1} statistics



Status of generator samples : *ttH*

After hadronisation: E_γ

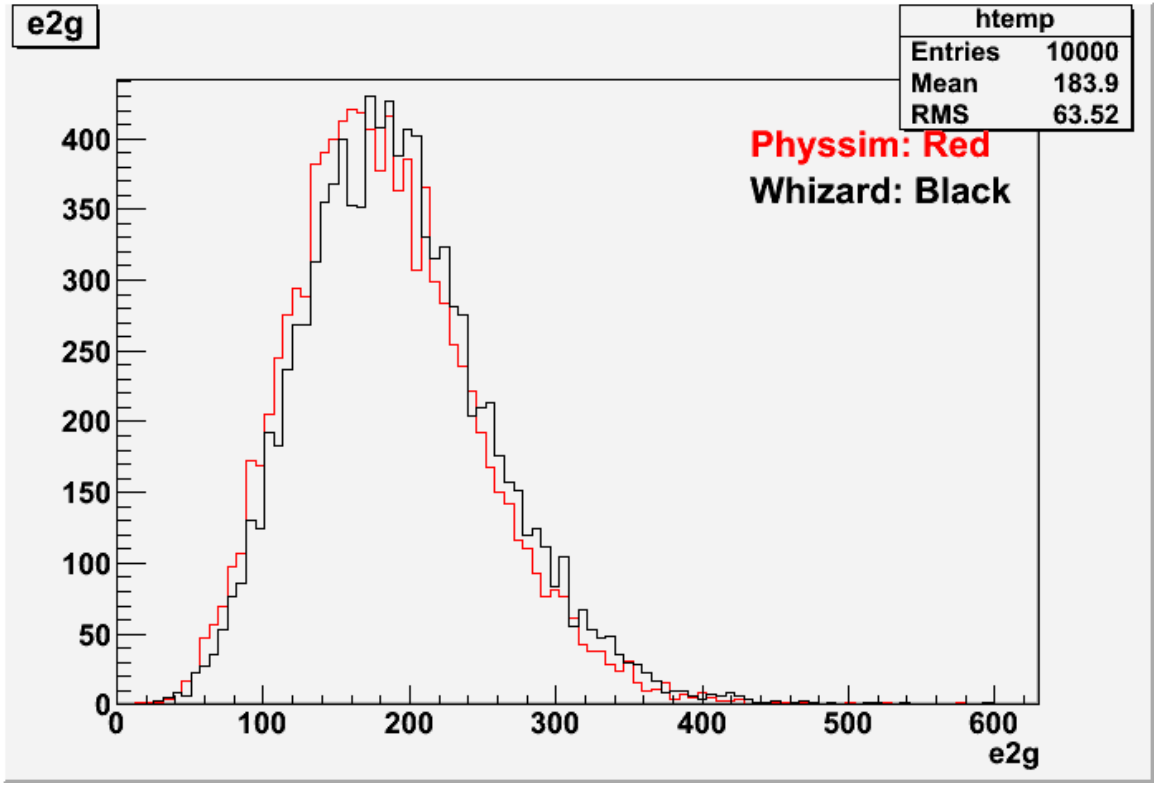
- Whizard makes two ISR- in each event.
- Physsim does not generate ISR-γ
- However, E_γ of other γ:s agrees.
- NB: ISR-γ is forward peaked, but also some in central region (4% of events include γ with E>10GeV, $|cos\theta| < 0.9$)
- Other particles show only small differences.



Status of generator samples : *ttH*

After hadronisation: E_γ

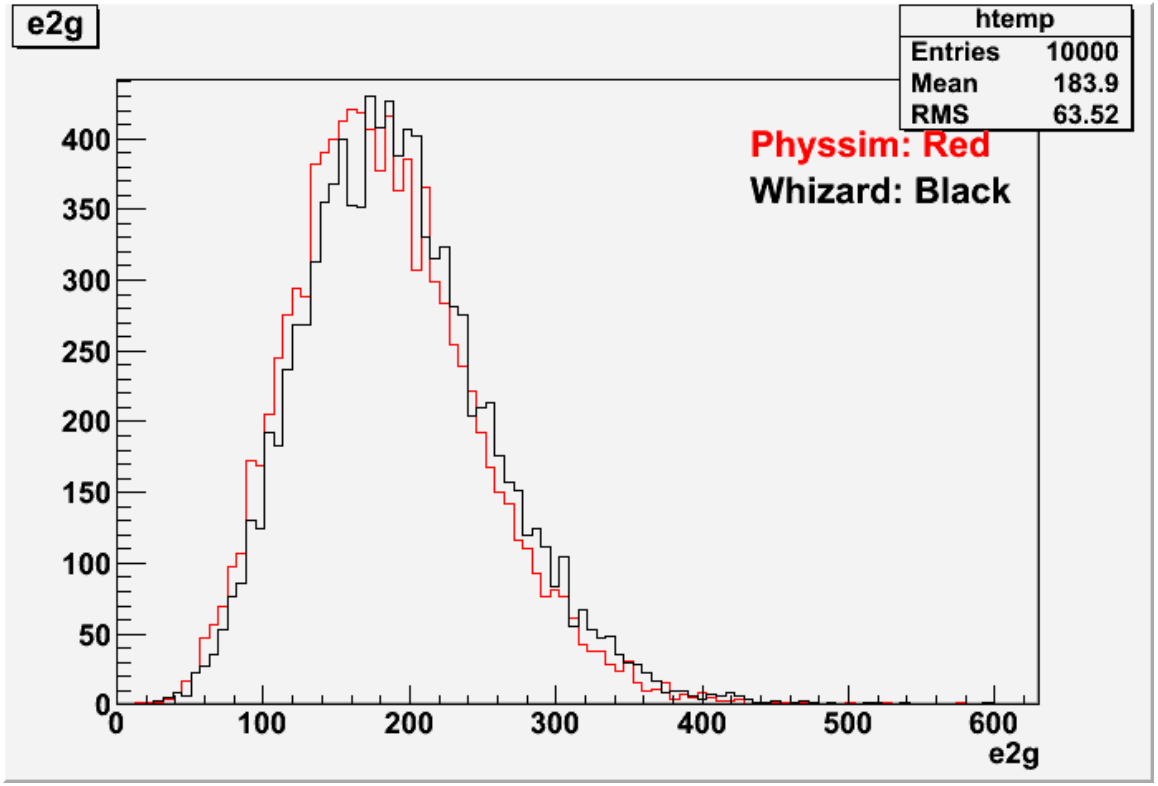
- Whizard makes two ISR- in each event.
- Physsim does not generate ISR-γ
- However, E_γ of other γ:s agrees.
- NB: ISR-γ is forward peaked, but also some in central region (4% of events include γ with E>10GeV, $|cos\theta| < 0.9$)
- Other particles show only small differences.



Status of generator samples : *ttH*

After hadronisation: E_γ

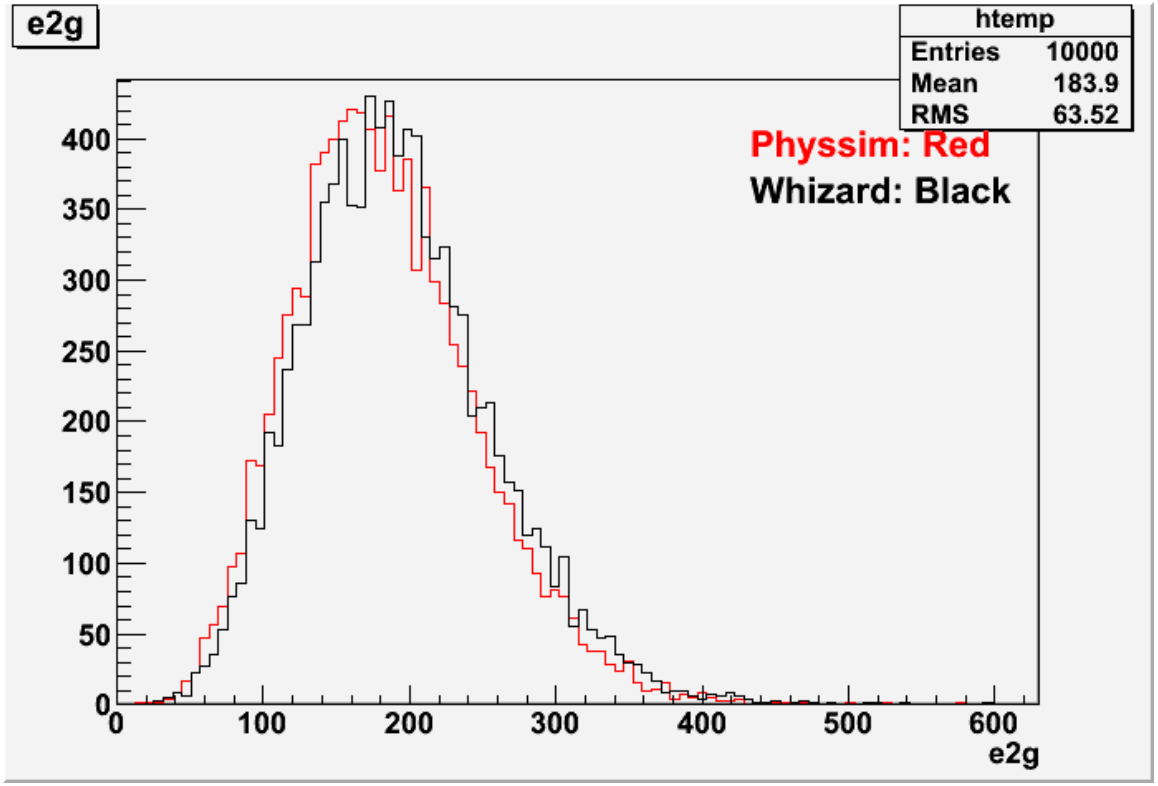
- Whizard makes two ISR- in each event.
- Physsim does not generate ISR-γ
- However, E_γ of other γ:s agrees.
- NB: ISR-γ is forward peaked, but also some in central region (4% of events include γ with E$>$10GeV, $|cos\theta| < 0.9$)
- Other particles show only small differences.



Status of generator samples : *ttH*

After hadronisation: E_γ

- Whizard makes two ISR-γ in each event.
- Physsim does not generate ISR-γ
- However, E_γ of other γ:s agrees.
- NB: ISR-γ is forward peaked, but also some in central region (4% of events include γ with E$>$10GeV, $|cos\theta| < 0.9$)
- Other particles show only small differences.



Status of generator samples : *ttH*

- Nevertheless, these difference would be not critical for benchmark studies.
- To do with Physsim:
  - Hadroniser update. Either:
    - Switch from Tauola v2 to DESY-Tauola (v2)
    - Or use lib_fragment_cll from our customised Whizard (running of the hadroniser in Physsim)
  - Include equivalent photon approximation (EPA) for ISR, as is done in Whizard.

Status of generator samples : *ttH*

- Nevertheless, these difference would be not critical for benchmark studies.
- To do with Physsim:
  - Hadroniser update. Either:
    - Switch from Tauola v5 to DESY-Tauola (v7)
    - Or use ilc_fragment_call from our customised Whizard, instead of the hadroniser in Physsim
  - Include equivalent photon approximation (EPA) for ISR, as is done in Whizard.

Status of generator samples : *ttH*

- Nevertheless, these difference would be not critical for benchmark studies.
- To do with Physsim:
  - Hadroniser update. Either:
    - Switch from Tauola v5 to DESY-Tauola (v7)
    - Or use ilc_fragment_call from our customised Whizard, instead of the hadroniser in Physsim
  - Include equivalent photon approximation (EPA) for ISR, as is done in Whizard.

Status of generator samples : *ttH*

- Nevertheless, these difference would be not critical for benchmark studies.
- To do with Physsim:
  - Hadroniser update. Either:
    - Switch from Tauola v5 to DESY-Tauola (v7)
    - Or use ilc_fragment_call from our customised Whizard, instead of the hadroniser in Physsim
  - Include equivalent photon approximation (EPA) for ISR, as is done in Whizard.

Status of generator samples : *WW*

Assigned to MB.

- *WW*: All setup at DESY.
  - Integration of all 4 fermion final-states: over-night job, with sub-per mil uncertainty on cross-section
  - Generation of 1 ab^{-1} also over-night job for non-electron final states.
  - STDHEP:s on grid, log-files, steerings, diagram-plots, etc. on the web (http://www.desy.de/ berggren/4f_production/)
  - Need some automatic error detection.
- Organisation:
  - Hierarchy: ZZ or WW or ZZWWmix / hadronic or leptonic or semi-leptonic / four beam polarisations
  - Separate single boson ($XXee$,$XX\nu_e\nu_e$ or $XXe\nu_e$) final states (t-channel!) from rest.
  - Total number of cases = 36. Compare: 140 possible 4f final states $\times$ 4 polarisations without aliases+grouping.
- NB: Cross-sections are in the 10 pb^{-1} range $\rightarrow$ we are asked to fully simulate tens of millions of events !!!

Status of generator samples : *WW*

Assigned to MB.

- *WW*: All setup at DESY.
  - Integration of all 4 fermion final-states: over-night job, with sub-per mil uncertainty on cross-section
  - Generation of 1 ab^{-1} also over-night job for non-electron final states.
  - STDHEP:s on grid, log-files, steerings, diagram-plots, etc. on the web (http://www.desy.de/ berggren/4f_production/)
  - Need some automatic error detection.
- Organisation:
  - Hierarchy: ZZ or WW or ZZWWmix / hadronic or leptonic or semi-leptonic / four beam polarisations
  - Separate single boson ($XXee$,$XX\nu_e\nu_e$ or $XXe\nu_e$) final states (t-channel!) from rest.
  - Total number of cases = 36. Compare: 140 possible 4f final states $\times$ 4 polarisations without aliases+grouping.
- NB: Cross-sections are in the 10 pb^{-1} range $\rightarrow$ we are asked to fully simulate tens of millions of events !!!

Status of generator samples : *WW*

Assigned to MB.

- *WW*: All setup at DESY.
  - Integration of all 4 fermion final-states: over-night job, with sub-per mil uncertainty on cross-section
  - Generation of 1 ab^{-1} also over-night job for non-electron final states.
  - STDHEP:s on grid, log-files, steerings, diagram-plots, etc. on the web (http://www.desy.de/ berggren/4f_production/)
  - Need some automatic error detection.
- Organisation:
  - Hierarchy: ZZ or WW or ZZWWmix / hadronic or leptonic or semi-leptonic / four beam polarisations
  - Separate single boson ($XXee$,$XX\nu_e\nu_e$ or $XXe\nu_e$) final states (t-channel!) from rest.
  - Total number of cases = 36. Compare: 140 possible 4f final states $\times$ 4 polarisations without aliases+grouping.
- NB: Cross-sections are in the 10 pb^{-1} range $\rightarrow$ we are asked to fully simulate tens of millions of events !!!

Status of generator samples : *WW*

Assigned to MB.

- *WW*: All setup at DESY.
  - Integration of all 4 fermion final-states: over-night job, with sub-per mil uncertainty on cross-section
  - Generation of 1 ab^{-1} also over-night job for non-electron final states.
  - STDHEP:s on grid, log-files, steerings, diagram-plots, etc. on the web (http://www.desy.de/ berggren/4f_production/)
  - Need some automatic error detection.
- Organisation:
  - Hierarchy: ZZ or WW or ZZWWmix / hadronic or leptonic or semi-leptonic / four beam polarisations
  - Separate single boson ($XXee$,$XX\nu_e\nu_e$ or $XXe\nu_e$) final states (t-channel!) from rest.
  - Total number of cases = 36. Compare: 140 possible 4f final states $\times$ 4 polarisations without aliases+grouping.
- NB: Cross-sections are in the 10 pb^{-1} range $\rightarrow$ we are asked to fully simulate tens of millions of events !!!

Conclusions and outlook

- Whizard, the main work-horse of the SM simulation, has been updated to the most current, ILC-usable version.
- The issues on list of needed amelioration have been solved.
- The way to feed information from generation to the production database must be designed and tested.
- Initial full-scale production of the *WW* sample at 1 TeVhas been done, and is soon coming for $\nu\nu h$.
- For *ttH*, Whizard can't take the load (esp for the 8f background). Alternative ways are investigated (simplify Whizard or Physsim)
- Larger scale test of the physics of new Whizard version and the new tune of fragmentation will be needed
- Work is also going on on background generation and overlay techniques.

Conclusions and outlook

- Whizard, the main work-horse of the SM simulation, has been updated to the most current, ILC-usable version.
- The issues on list of needed amelioration have been solved.
- The way to feed information from generation to the production database must be designed and tested.
- Initial full-scale production of the *WW* sample at 1 TeVhas been done, and is soon coming for $\nu\nu h$.
- For *ttH*, Whizard can't take the load (esp for the 8f background). Alternative ways are investigated (simplify Whizard or Physsim)
- Larger scale test of the physics of new Whizard version and the new tune of fragmentation will be needed
- Work is also going on on background generation and overlay techniques.

Conclusions and outlook

- Whizard, the main work-horse of the SM simulation, has been updated to the most current, ILC-usable version.
- The issues on list of needed amelioration have been solved.
- The way to feed information from generation to the production database must be designed and tested.
- Initial full-scale production of the *WW* sample at 1 TeVhas been done, and is soon coming for $\nu\nu h$.
- For *ttH*, Whizard can't take the load (esp for the 8f background). Alternative ways are investigated (simplify Whizard or Physsim)
- Larger scale test of the physics of new Whizard version and the new tune of fragmentation will be needed
- Work is also going on on background generation and overlay techniques.

Conclusions and outlook

- Whizard, the main work-horse of the SM simulation, has been updated to the most current, ILC-usable version.
- The issues on list of needed amelioration have been solved.
- The way to feed information from generation to the production database must be designed and tested.
- Initial full-scale production of the *WW* sample at 1 TeVhas been done, and is soon coming for $\nu\nu h$.
- For *ttH*, Whizard can't take the load (esp for the 8f background). Alternative ways are investigated (simplify Whizard or Physsim)
- Larger scale test of the physics of new Whizard version and the new tune of fragmentation will be needed
- Work is also going on on background generation and overlay techniques.

Conclusions and outlook

- Whizard, the main work-horse of the SM simulation, has been updated to the most current, ILC-usable version.
- The issues on list of needed amelioration have been solved.
- The way to feed information from generation to the production database must be designed and tested.
- Initial full-scale production of the *WW* sample at 1 TeVhas been done, and is soon coming for $\nu\nu h$.
- For *ttH*, Whizard can't take the load (esp for the 8f background). Alternative ways are investigated (simplify Whizard or Physsim)
- Larger scale test of the physics of new Whizard version and the new tune of fragmentation will be needed
- Work is also going on on background generation and overlay techniques.

Conclusions and outlook

- Whizard, the main work-horse of the SM simulation, has been updated to the most current, ILC-usable version.
- The issues on list of needed amelioration have been solved.
- The way to feed information from generation to the production database must be designed and tested.
- Initial full-scale production of the *WW* sample at 1 TeVhas been done, and is soon coming for $\nu\nu h$.
- For *ttH*, Whizard can't take the load (esp for the 8f background). Alternative ways are investigated (simplify Whizard or Physsim)
- Larger scale test of the physics of new Whizard version and the new tune of fragmentation will be needed
- Work is also going on on background generation and overlay techniques.

Conclusions and outlook

- Whizard, the main work-horse of the SM simulation, has been updated to the most current, ILC-usable version.
- The issues on list of needed amelioration have been solved.
- The way to feed information from generation to the production database must be designed and tested.
- Initial full-scale production of the *WW* sample at 1 TeVhas been done, and is soon coming for $\nu\nu h$.
- For *ttH*, Whizard can't take the load (esp for the 8f background). Alternative ways are investigated (simplify Whizard or Physsim)
- Larger scale test of the physics of new Whizard version and the new tune of fragmentation will be needed
- Work is also going on on background generation and overlay techniques.