Benchmarking DBD Editors Report

Tim Barklow (SLAC)
Philipp Roloff (CERN)
David Asner (PNNL)

Aug22, 2011

Outline

- Personnel
- DBD Benchmarks
- Event Generation
- Summary

DBD Benchmarking + SimReco Personnel

- CERN
  - Christian Grefe
  - Stephane Poss
  - Philipp Roloff
  - Jan Strube
- DESY
  - Alexander Grohsjen
  - Marcel Stanitzki
- PNNL
  - David Asner
  - Timothy Carlson
  - David Cowley
  - Malachi Schram
- SLAC
  - Tim Barklow
  - Norman Graf
  - Jeremy McCormick
  - Homer Neal

1. Processes to be studied and goals for the analyses of these processes.

We suggest the following new processes for study for the 2012 DBD:

1. $e^+e^- \to \nu\bar{\nu}h^0$ at $E_{CM} = 1$ TeV, where h^0 is a Standard Model Higgs boson of mass ~~120~~ 125 GeV, in the final states $h^0 \to \mu^+\mu^-$, $b\bar{b}$, $c\bar{c}$, gg, WW^*. The goal is to measure the cross section times branching ratio for these reactions. talk by Homer Neal

2. $e^+e^- \to W^+W^-$ at $E_{CM} = 1$ TeV, considering both hadronic and leptonic (e, μ) decays of the W. The goal is to use the value of the forward W pair production cross section to measure in situ the effective left-handed polarization $(1 - P_{e^-})(1 + P_{e^+})/4$ for each of two polarization configurations.

3. $e^+e^- \to t\bar{t}h^0$ at $E_{CM} = 1$ TeV, where h^0 is a Standard Model Higgs boson of mass ~~120~~ 125 GeV, in the final state $h^0 \to b\bar{b}$. The reaction involves final states with 8 jets and final states with 6 jets, one lepton, and missing energy. The goal is to measure the Higgs boson Yukawa coupling to $t\bar{t}$. talk by Philipp Roloff

We also ask that the detector groups each repeat one analysis from the 2009 LOI using the final detector configuration and the up-to-date simulation software. It is not necessary that the two groups study the same analysis.

but they are – ttbar at Ecm=500 GeV
talk by David Asner

$$e^+ e^- \rightarrow uddu \quad \text{at} \quad \sqrt{s} = 1 \text{ TeV}$$

Full energy $W^+ W^-$ / ZZ (no ISR)
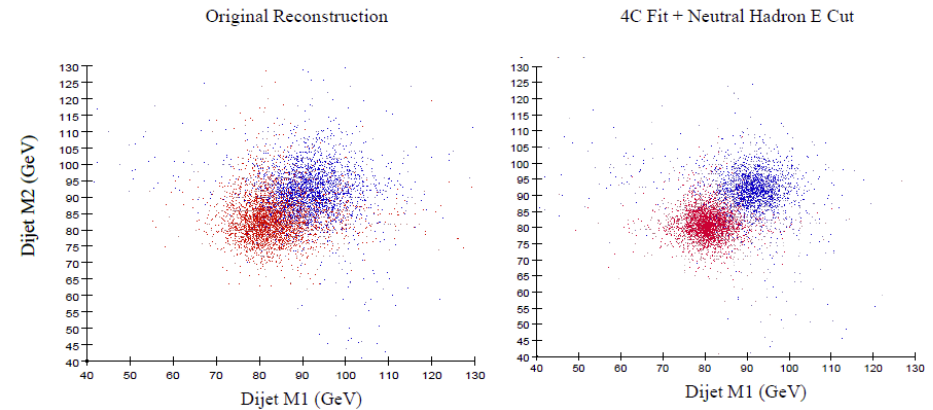
🟥 $W^+ W^-$　　🟦 ZZ

$$e^+ e^- \rightarrow W^+ W^- \quad \sqrt{s} = \text{ 1 TeV}$$

Four Jet Topology

Two Jets Plus Lepton Topology

Beam Polarization Measurement (by LCWS Arlington)

Triple Gauge Couplings (by end of year)

Original Reconstruction

4C Fit + Neutral Hadron E Cut

Dijet M2 (GeV)

Dijet M1 (GeV)

$$e^+e^- \rightarrow W^+W^- \quad \sqrt{s} = \text{1 TeV}$$

Four Jet Topology

Two Jets Plus Lepton Topology

Beam Polarization Measurement (by LCWS Arlington)

Triple Gauge Couplings (by end of year)

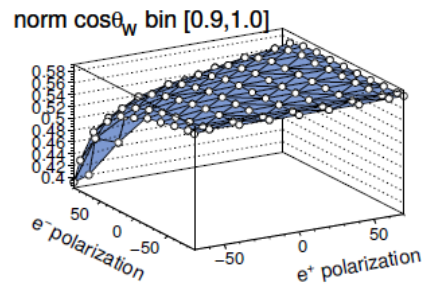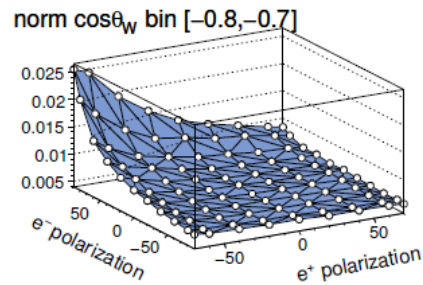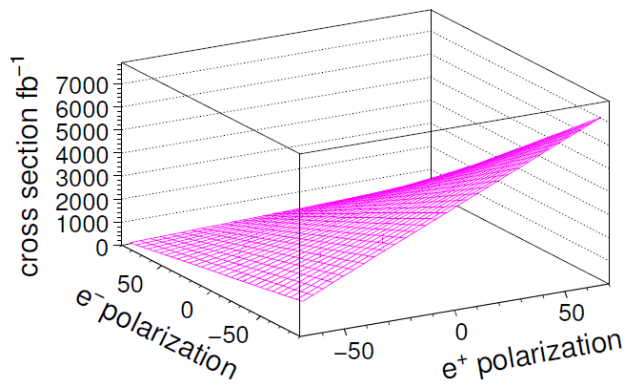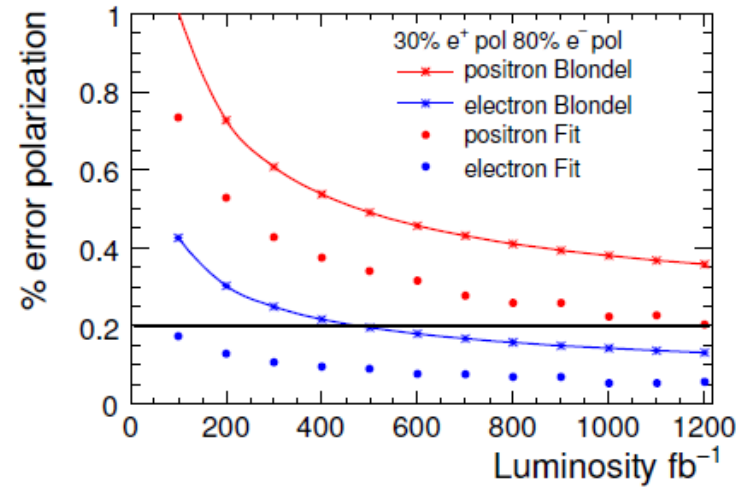$$\sigma(e^+e^- \rightarrow W^+W^-) \ \sqrt{s} = \textbf{500 GeV}$$

norm cosθ_W bin [−0.8,−0.7]

norm cosθ_W bin [0.9,1.0]

ILD 2009 $\sqrt{s} = 500$ **GeV 2 Jets + Lepton**

30% e⁺ pol 80% e⁻ pol
— positron Blondel
— electron Blondel
• positron Fit
• electron Fit

MC Event Generation Samples

For LOI all MC Generation done at SLAC; for DBD share between DESY KEK & SLAC:

http://ilcsoft.desy.de/dbd/generated/

DBD Samples

1TeV
- 📁 Four fermions
- 📁 Two fermions
- 📁 Beam-strahlung
- 📁 tth
- 📁 Six fermions
- 📁 Higgs
- 📁 gammagamma

Centrally produced generator samples

Under the links to the left, details on the centrally generated signal and background samples needed for the DBD are given.

Four- and two-fermion samples generated at DESY

Beamstrahlung e^+e^- Pairs generated at DESY

tth samples generated at KEK

Higgs and Six fermions samples generated at SLAC

Gammagamma (and Compton) samples generated at SLAC

MC Event Generation Samples

Index of /~timb/6f_production

Name	Last modified	Size
Parent Directory		-
eeWW/	23-May-2012 05:05	-
llWW/	19-May-2012 08:13	-
ttbar/	16-Jun-2012 16:06	-
vvWW/	23-May-2012 05:09	-
xxWW/	23-May-2012 05:09	-
xxxxZ/	23-May-2012 05:11	-
yyyyZ/	23-May-2012 05:13	-

Index of /~timb/6f_production/ttbar

Name	Last modif:
Parent Directory	
E1000-B1b_ws.Pyycyyc.Gwhizard-1.95.eL.pR.I35831/	08-Jun-2012
E1000-B1b_ws.Pyycyyc.Gwhizard-1.95.eR.pL.I35832/	08-Jun-2012
E1000-B1b_ws.Pyycyyu.Gwhizard-1.95.eL.pR.I35827/	08-Jun-2012
E1000-B1b_ws.Pyycyyu.Gwhizard-1.95.eR.pL.I35828/	08-Jun-2012
E1000-B1b_ws.Pyyuyyc.Gwhizard-1.95.eL.pR.I35823/	16-Jun-2012
E1000-B1b_ws.Pyyuyyc.Gwhizard-1.95.eR.pL.I35824/	08-Jun-2012
E1000-B1b_ws.Pyyuyyu.Gwhizard-1.95.eL.pR.I35819/	08-Jun-2012
E1000-B1b_ws.Pyyuyyu.Gwhizard-1.95.eR.pL.I35820/	08-Jun-2012
E1000-B1b_ws.Pyyveev.Gwhizard-1.95.eL.pL.I35786/	08-Jun-2012
E1000-B1b_ws.Pyyveev.Gwhizard-1.95.eL.pR.I35787/	08-Jun-2012
E1000-B1b_ws.Pyyveev.Gwhizard-1.95.eR.pL.I35788/	08-Jun-2012
E1000-B1b_ws.Pyyveev.Gwhizard-1.95.eR.pR.I35789/	08-Jun-2012

alias l e2:e3
alias v n1:n2:n3
alias x u:c
alias y d:s:b

MC Event Generation Samples

```
! Process yyuyyc_o:
!    e a-e ->   d a-d    u a-d    d a-c
!    e a-e ->   d a-d    u a-d    s a-c
!    e a-e ->   d a-d    u a-d    b a-c
!    e a-e ->   d a-d    u a-s    d a-c
!    e a-e ->   d a-d    u a-s    s a-c
!    e a-e ->   d a-d    u a-s    b a-c
!    e a-e ->   d a-d    u a-b    d a-c
!    e a-e ->   d a-d    u a-b    s a-c
!    e a-e ->   d a-d    u a-b    b a-c
!    e a-e ->   d a-s    u a-s    d a-c
!    e a-e ->   d a-s    u a-s    s a-c
!    e a-e ->   d a-s    u a-s    b a-c
!    e a-e ->   d a-s    u a-b    d a-c
!    e a-e ->   d a-s    u a-b    s a-c
!    e a-e ->   d a-s    u a-b    b a-c
!    e a-e ->   d a-b    u a-b    d a-c
!    e a-e ->   d a-b    u a-b    s a-c
!    e a-e ->   d a-b    u a-b    b a-c
!    e a-e ->   s a-d    u a-d    s a-c
!    e a-e ->   s a-d    u a-d    b a-c
!    e a-e ->   s a-d    u a-s    s a-c
!    e a-e ->   s a-d    u a-s    b a-c
!    e a-e ->   s a-d    u a-b    s a-c
!    e a-e ->   s a-d    u a-b    b a-c    ⟵  Only final state not Cabbibo-suppressed
!    e a-e ->   s a-s    u a-s    s a-c
!    e a-e ->   s a-s    u a-s    b a-c
!    e a-e ->   s a-s    u a-b    s a-c
!    e a-e ->   s a-s    u a-b    b a-c
!    e a-e ->   s a-b    u a-b    s a-c
!    e a-e ->   s a-b    u a-b    b a-c
!    e a-e ->   b a-d    u a-d    b a-c
!    e a-e ->   b a-d    u a-s    b a-c
!    e a-e ->   b a-d    u a-b    b a-c
!    e a-e ->   b a-s    u a-s    b a-c
!    e a-e ->   b a-s    u a-b    b a-c
!    e a-e ->   b a-b    u a-b    b a-c
```

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MC Event Generation Samples

Index of /~timb/aa_lowpt_production/aa_lowpt

Name	Last modified	Size	Des
Parent Directory		-	
E1000-B1b_ws.Paaddhad.Gwhizard-1.95.eB.pB.I36137/	11-Jun-2012 13:40	-	
E1000-B1b_ws.Paaddhad.Gwhizard-1.95.eB.pW.I36136/	10-Jun-2012 17:00	-	
E1000-B1b_ws.Paaddhad.Gwhizard-1.95.eW.pB.I36135/	10-Jun-2012 20:17	-	
E1000-B1b_ws.Paaddhad.Gwhizard-1.95.eW.pW.I36134/	10-Jun-2012 20:05	-	

$\gamma\gamma \rightarrow$ *hadrons* : 4.1 events per BX at $\sqrt{s} = 1$ TeV ILC. Assume 1 BX timing so overlay according to Poisson with mean=4.1

eB.pB   beamstr γ from e^- on beamstr γ from e^+

eB.pW   beamstr γ from e^- on W.-W. γ from e^+

eW.pB   W.-W. γ from e^- on beamstr γ from e^+

eW.pB   W.-W. γ from e^- on W.-W. γ from e^+

Index of /~timb/aa_minijet_production/aa_minijet

Name	Last modified	Size	
Parent Directory		-	
E1000-B1b_ws.Paamin_04_10_m1.Gwhizard-1.95.eB.pB.I36105/	08-Jun-2012 02:29	-	
E1000-B1b_ws.Paamin_04_10_m1.Gwhizard-1.95.eB.pW.I36104/	08-Jun-2012 02:29	-	
E1000-B1b_ws.Paamin_04_10_m1.Gwhizard-1.95.eW.pB.I36103/	08-Jun-2012 02:29	-	
E1000-B1b_ws.Paamin_04_10_m1.Gwhizard-1.95.eW.pW.I36102/	08-Jun-2012 02:29	-	
E1000-B1b_ws.Paamin_04_10_m4.Gwhizard-1.95.eB.pB.I36121/	08-Jun-2012 02:29	-	

for pT > 10 GeV minijet cross sections comparable to SM $e^+e^- \rightarrow$ 2f, 4f cross sections

m1: $qq \rightarrow qq$

$qq \rightarrow gg$

$qg \rightarrow qg$

$gg \rightarrow qq$

$gg \rightarrow gg$

m4: $q\gamma \rightarrow qg$

$q\gamma \rightarrow q\gamma$

$g\gamma \rightarrow qq$

SiD DBD Simulation Budget Aug 21, 2012

Process	Ecm(GeV)	# Events	Lumi (ab^{-1})	Mixed File Creation Date
ttH	1000	0.4e6	52	07Aug2012 Mh=125 GeV
ttZ, ttbb	1000	0.4e6	15	10Jun2012
tt	1000	1.0e6	2.0	24Jul2012
ffH H → bb, cc, WW*, gg	1000	3.1e6	7.4	26Jul2012 Mh=125 GeV
ffH, H → μμ	1000	0.5e6	6400	
evW, eeZ, vvZ → evqq, eeqq, vvqq	1000	4.0e6	0.034	24Jul2012
eeZ, vvZ, WW → eeμμ, vvμμ	1000	1.0e6	0.004	16Aug2012
WW	1000	6.0e6	2.0	16Aug2012
other SM processes	1000	6.0e6	varies between 1.e-5 and 1.0	21Aug2012
tt	500	2.0e6	2.0 (1.0 each for two top masses)	
tt background SM processes	500	2.0e6	varies	
TOTAL		26e6		

Contents of "other SM Processes" Mixed File

Process	Lumi (ab^{-1}) per pol.	# Events $P(e^-/e^+)$=-0.8/+0.2	# Events $P(e^-/e^+)$=+0.8/-0.2	Event Weight
$e\gamma \rightarrow e\gamma$	4.e-5	5.2e4	5.2e4	2.5e4
$e^+e^- \rightarrow 2f, \, 4f$	.034	3.7e5	2.0e5	29
$e\gamma \rightarrow 3f$	.003	3.5e5	3.1e5	330
$e\gamma \rightarrow 5f$	.25	3.1e5	2.1e5	4
$e^+e^- \rightarrow 6f$	1.	1.8e5	6.5e4	1
$\gamma\gamma \rightarrow 2f$	.001	5.7e5	5.7e5	7700
$\gamma\gamma \rightarrow 4f$	.083	2.5e5	2.5e5	12
$\gamma\gamma \rightarrow$ minijets 4<pT<40 GeV	.012	9.2e5	9.2e5	80 – 9000
$\gamma\gamma \rightarrow$ minijets pT>40 GeV	.105	2.3e5	2.3e5	12

Summary

- Thanks to Norman, Jeremy, and the crew at CERN – Christian, Jan, Philipp and Stephane – the simulation production is underway and reconstruction is not far behind.
- Thanks again to the crew at CERN, a lot of code validation and code implementation (e.g. LCFIplus) has taken place over the past few months. As a result we will have analysis-ready DST's once the reconstruction jobs start running.
- Thanks to David and PNNL we maybe have a chance of getting the required amount of sim/reco completed.
- We must contact ILD to discuss the scope of each analysis for Arlington, and for the final December draft.
- Although quantitative benchmarking results are still a few months off, it is relatively straightforward to write a draft of the benchmarking section and the editors are committed to getting this done soon.