Physics Benchmarks for the CSS

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$e^+e^- \to W^+W^- \quad \sqrt{s} = $ **1 TeV**

Table 11.4.5: Polarisation errors assuming 500 fb^{-1} luminosity for each initial state polarisation configuration.

$\cos\Theta$ range	P_{e^-}, P_{e^+}	Δa	Δb	ΔP_{e^-}	ΔP_{e^+}
$0.8 < \cos\Theta < 1$	-0.8,+0.2	0.0011	0.62	3.77	2.51
$0.8 < \cos\Theta < 1$	+0.8,-0.2	0.00030	0.20	0.13	0.27
$-1 < \cos\Theta < 1$	-0.8,+0.2	0.0010	0.084	0.51	0.32
$-1 < \cos\Theta < 1$	+0.8,-0.2	0.00027	0.032	0.020	0.08
$\cos\Theta$ range	P_{e^-}, P_{e^+}	$\Delta\alpha$	$\Delta\beta$	$\Delta\lvert P_{e^-}\rvert$	$\Delta\lvert P_{e^+}\rvert$
$-1 < \cos\Theta < 1$	sum	0.00097	0.00027	0.0017	0.0027

old low stat PAC numbers

$\cos\Theta$ range	P_{e^-}, P_{e^+}	Δa	Δb	ΔP_{e^-}	ΔP_{e^+}
$0.8 < \cos\Theta < 1$	-0.8,+0.2	0.0011	0.020	0.12	0.077
$0.8 < \cos\Theta < 1$	+0.8,-0.2	0.00037	0.0090	0.0046	0.023
$-1 < \cos\Theta < 1$	-0.8,+0.2	0.0011	0.0097	0.058	0.038
$-1 < \cos\Theta < 1$	+0.8,-0.2	0.00037	0.0071	0.0041	0.018
$\cos\Theta$ range	P_{e^-}, P_{e^+}	$\Delta\alpha$	$\Delta\beta$	$\Delta\lvert P_{e^-}\rvert$	$\Delta\lvert P_{e^+}\rvert$
$-1 < \cos\Theta < 1$	sum	0.0010	0.00032	0.0020	0.0029

new high stat numbers

↑ **Δb better because bgnd polarization dependence included in new results**

LOI Benchmarks - $\sqrt{s}$ = 250 & 500 GeV

1. $e^+e^- \to e^+e^-H\,,\ \mu^+\mu^-H\,,\ \sqrt{s}$=250 GeV;
2. $e^+e^- \to ZH\,,\ H \to c\bar{c}\,,\ Z \to \nu\bar{\nu}\,, q\bar{q}\,,\ \sqrt{s}$=250 GeV;
3. $e^+e^- \to ZH\,,\ H \to \mu^+\mu^-\,,\ Z \to \nu\bar{\nu}\,, q\bar{q}\,,\ \sqrt{s}$=250 GeV;
4. $e^+e^- \to \tau^+\tau^-\,,\ \sqrt{s}$=500 GeV;
5. $e^+e^- \to t\bar{t}\,,\ t \to bW^+\,,\ W^+ \to q\bar{q}'\,,\ \sqrt{s}$=500 GeV;
6. $e^+e^- \to \tilde{\chi}_1^+\tilde{\chi}_1^-/\tilde{\chi}_2^0\tilde{\chi}_2^0\,,\ \sqrt{s}$=500 GeV.

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DBD Benchmarks - mostly $\sqrt{s} =$ 1000 GeV

1. $e^+e^- \to \nu\bar{\nu}h^0$ at $E_{\rm CM} = 1$ TeV, where h^0 is a Standard Model Higgs boson of mass 120 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.

2. $e^+e^- \to W^+W^-$ at $E_{\rm CM} = 1$ 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 $E_{\rm CM} = 1$ TeV, where h^0 is a Standard Model Higgs boson of mass 120 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 $t\bar{t}$.

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. $t\bar{t}$ @ $\sqrt{s} = 500$ **GeV**

CSS Benchmarks for the ILC - my opinion

Highest priority is to bolster the case for the ILC in the face of challenges from those who think that all important accelerator-based particle physics research can be done with LHC upgrades, or that any additional research can be done better with alternate lepton colliders.

Physics topics should concentrate on studies of the 125 GeV Higgs boson, surviving SUSY models with gauginos with mass less than 250 GeV, and studies of anomalous $t\bar{t}Z/\gamma$ couplings.

For the LHC challenge what studies should be done?

Full simulation Higgs studies at $\sqrt{s} =$ 350?

Hypothetical luminosity upgrade at $\sqrt{s} =$ 250 and 350?

More Higgs self coupling studies at $\sqrt{s} =$ 500 GeV ?

Higgs physics with the $\gamma\gamma$ option at ILC?

Nearly degenerate gauginos with mass less than 250 GeV ?

For the alternate Lepton Collider challenge what Physics studies should be done?

Here we want to identify benchmarks that illustrate the advantages of the ILC environment over the environments at LEP3 or a muon collider. For example Higgs decays to $c\bar{c}$ or the production of nearly degenerate gauginos.

For event generation we were hoping to switch over to WHIZARD 2.x after the DBD. There is no time now. We will do event generation with the DBD system.