

Physics analysis overview

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Context

- Software validation is underway, expect to finish soon
→ Mass production to begin afterwards.
- List of topics to review today:
 - Status of common data samples
 - MC requests by benchmark process
 - Both signal and background
 - Identify common samples
 - Apply pre-selections if needed
 - Priorities of MC generation?
 - 1 TeV -> ttbar @ 500 GeV -> rest of SM @ 500 GeV (?)
 - Communication with SiD

DBD Benchmark Processes

- Benchmark processes at 1 TeV (to be done by both ILD and SiD):
 - $e^+e^- \rightarrow \nu\nu h^0$ at $E_{\text{CM}}=1$ TeV with a SM Higgs with $m_H=120$ GeV, in the final states $h^0 \rightarrow \mu^+\mu^-, bb, cc, gg, WW^*$. The goal is to measure the **cross section times branching ratio**.
 - $e^+e^- \rightarrow W^+W^-$ at $E_{\text{CM}}=1$ TeV, considering both hadronic and leptonic (e, μ) decays of the W . The goal is to use the forward W pair production cross section to measure **in situ the effective left-handed polarization**.
 - $e^+e^- \rightarrow t\bar{t}h^0$ at $E_{\text{CM}}=1$ TeV with a SM Higgs with $m_H=120$ GeV, in the final state $h^0 \rightarrow bb$. The reaction involves the 8 jet mode and the 6 jet + lepton mode. The goal is to measure the **Higgs boson Yukawa coupling to $t\bar{t}$** .
- In addition, repeat one analysis from LOI using the final detector configuration and up-to-date simulation software.
 - Both ILD and SiD has chosen **$t\bar{t}$** at 500 GeV.
- ILD will also update:
 - Higgs self-coupling measurement **Zhh** at 500 GeV
- The DBD benchmark processes are covered well.
- Reminder: ILD and SiD are suggested to perform the *same* analysis using the *same* samples. → Common Sample Group has been setup to generate the samples. **For the analysis, collaboration with SiD group is necessary.**

Analysis will be carried out by groups at:

NDU, KEK

DESY

Birmingham,
Edinburgh,
KEK, Tokyo

LAL, Barcelona,
ICCUB, SIC, IFIC

KEK, Tokyo

List of ILD Analysis

Analysis using ILD Full Simulation	Main Analysts	Institution
Measurement of BR(H->bb,cc,gg) at 250 GeV	Hiroaki Ono	Nippon Dental University
Measurement of BR(H->WW*,ZZ*) at 250 GeV	Hiroaki Ono	Nippon Dental University
Measurement of BR(H->gamma+gamma,gamma+Z) at 250 GeV	Constantino Calancha	KEK
Higgs BR measurements with nu_nu_H at 1 TeV	Hiroaki Ono Constantino Calancha	Nippon Dental University KEK
Measurement of Higgs self coupling at 500 GeV	Junping Tian Taikan Suehara	KEK ICEPP, The University of Tokyo
Top Yukawa coupling at 500 GeV	Hajrah Tabassam Ryo Yonamine	Quaid-i-Azam University, Islamabad Sokendai/KEK
Top Yukawa coupling at 1 TeV	Tony Price Ryo Yonamine	University of Birmingham Sokendai/KEK
WW at 1 TeV	Aura Rosca	DESY
Precision measurement of Higgs couplings to gauge bosons at 500 GeV	Junping Tian	KEK
Top pair analysis at 500 GeV	Jeremy Rouene Marcel Vos	LAL IFIC Valencia
Measurement of Higgs total decay width at 250 GeV	Claude Duerig	University of Bonn
Triple gauge couplings and polarization at 500 GeV	Ivan Marchesini	DESY
Very light gravitino with stau NLSP at (500 GeV + threshold scans)	Ryo Katayama	The University of Tokyo
Bilinear R-parity violation SUSY (500 GeV)	Benedikt Vormwald	DESY
Model-independent WIMP characterization (500 GeV)	Christoph Bartels	DESY
Measurement of CP Violation in the MSSM Neutralino Sector (500 GeV)	Mark Terwort	DESY
Mass degenerate Higgsinos in Hidden SUSY (500 GeV)	Hale Sert	DESY
Chargino / Neutralino -> W / Z + LSP (500 GeV)	Madalina Chera	DESY
Full study of an MSSM scenario with rich (SPS1a'-like, but not LHC excluded) ILC phenomenology (500 GeV + threshold scans)	Mikael Berggren, Stefano Caiazza, Nicola d'Ascenzo	DESY

For DBD

*All performed in ILD full simulation!
Some studies currently use LOI samples.*