

Free Discussion: Plan of Physics and Software in 2015

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Summary table of Higgs measurements @ ILC

Baseline

ECM	@ 250 GeV		@ 350 GeV		@ 500 GeV		@ 1 TeV
luminosity · fb	250		330		500		1000
polarization (e-,e+)	(-0.8, +0.3)		(-0.8, +0.3)		(-0.8, +0.3)		(-0.8, +0.2)
process	ZH	vvH	ZH	vvH	ZH	vvH	vvH
cross section	2.6%	-	3.5%	-	3.0%	-	-
	$\sigma \cdot Br$	$\sigma \cdot Br$	$\sigma \cdot Br$	$\sigma \cdot Br$	$\sigma \cdot Br$	$\sigma \cdot Br$	$\sigma \cdot Br$
H-->bb	1.2%	10.5%	1.3%	1.3%	1.8%	0.66%	0.32%
H-->cc	8.3%		9.9%	13%	13%	6.2%	3.1%
H-->gg	7%		7.3%	8.6%	11%	4.1%	2.3%
H-->WW*	6.4%		6.8%	5.0%	9.2%	2.4%	1.6%
H--> $\tau\tau$	4.2%		4.6%	19%	5.4%	9%	3.1%
H-->ZZ*	19%		22%	17%	25%	8.2%	4.1%
H--> $\gamma\gamma$	29-38%		29-38%	39%	29-38%	19%	7.4%
H--> $\mu\mu$	72%		76%	142%	88%	72%	31%
H-->Inv. (95% C.L.)	< 0.95%		< 1.5%		< 3.2%		
ttH, H-->bb			-		28%		6%

mostly from White Paper; being updated by new studies with $m_H = 125$ GeV

status of analysis: we need complete this table

ECM	@ 250 GeV		@ 350 GeV		@ 500 GeV		@ 1 TeV
luminosity · fb	250		330		500		1000
polarization (e-,e+)	(-0.8, +0.3)		(-0.8, +0.3)		(-0.8, +0.3)		(-0.8, +0.2)
process	ZH	vvH	ZH	vvH	ZH	vvH	vvH
cross section	EH	-	G	-	-	-	-
	$\sigma \cdot Br$	$\sigma \cdot Br$	$\sigma \cdot Br$	$\sigma \cdot Br$	$\sigma \cdot Br$	$\sigma \cdot Br$	$\sigma \cdot Br$
H-->bb	EH	F	EH	EEF	EEH	F	F
H-->cc	EH		EH	EEH	EEH	EH	F
H-->gg	EH		EH	EEH	EEH	EH	F
H-->WW*	EH		EEH	EEF	EEH	F	F
H--> $\tau\tau$	EH		EEH	EEH	EH	EH	EEH
H-->ZZ*	F		EEG	EEG	G	G	G
H--> $\gamma\gamma$	G		G	EEF	G	F	F
H--> $\mu\mu$	EEF		EEF	EEF	EEF	EEF	F
H-->Inv. (95% C.L.)	F		F		F		
ttH, H-->bb					EH/EF		F

F: done by full simulation w/ mH=125GeV

EH: extrapolated from full simulation w/ mH=120GeV

EEH: extrapolated from full simulation at other ecm w/ mH = 120 GeV

EEF: extrapolated from full simulation at other ecm w/ mH = 125 GeV

G: guesstimate from old fast simulation

black: ongoing or completed

red: still missing

recoil mass using $Z \rightarrow ll$

(S. Watanuki, Jacqueline, etc.)

- analyses at 250, 350 and 500 GeV have been done; however still not yet finalised, particularly the absolute numbers in current summary table are still extrapolations; still room to optimise selection strategies.
- significant improvement of mass measurement (35 MeV \rightarrow 22 MeV) is obtained by using new template fitting; need more careful check to confirm.
- CP mixture study using this has been initialised (possibly merged to Ogawa-san's general anomalous HVV coupling study)
- possible new study: having a look at $Z \rightarrow \tau\tau$?

recoil mass using $Z \rightarrow qq$

(T. Tomita, A. Miyamoto, etc.)

- analyses at 250, 350 and 500 GeV have been done; however different analysis strategies are used at different E_{cms} ; hard to get confident conclusion about relative performance at each E_{cm} , which has a significant impact on ILC staging scenarios.
- **impressive progress towards model independent analysis at 350 and 250 GeV**; need study the correlation with other individual $\sigma \times \text{BR}$ measurements in global fit.
- more model dependence study at 500 GeV (Akiya? volunteer?)

H \rightarrow invisible

(A. Ishikawa)

- analyses at 250, 350 and 500 GeV have been done with Z \rightarrow qq; now focusing on improvement.
- propose to use Z \rightarrow ll channel (volunteer?)

$H \rightarrow bb, cc, gg$

(H. Ono, Felix, etc.)

- analyses at 250 and 350 GeV have been done for all modes; needs separate ZH and WW-fusion (350 GeV results already available)
- at 500 GeV, only $H \rightarrow bb$ studied (volunteer?)
- at 1 TeV, studied during DBD; however impact of overlay is too large, now is still using number w/o overlay case (volunteer?)

$$H \rightarrow \tau\tau$$

(S. Kawada, etc.)

- analyses at 250 and 500 GeV have been done for all modes with $m_H=120$ GeV; update with $m_H=125$ GeV almost completed; needs separate ZH and WW-fusion
- 350 GeV and 1 TeV analyses not available (volunteer?)

$$H \rightarrow WW^*, ZZ^*$$

(H. Ono, Junping, etc.)

- WW^* done at 250, 500 GeV and 1 TeV; need be done at 350 GeV including separation of ZH and WW-fusion (volunteer?)
- ZZ^* only done at 500 GeV for semi-leptonic mode (volunteer at other energies?)

$H \rightarrow \gamma\gamma, \mu\mu$

(Tino)

- done at 1 TeV; ongoing at 500 GeV (volunteer at 250 GeV and 350 GeV?)
- good benchmark channels for detector optimisation (volunteer?)

top-Yukawa

(Y. Sudo, etc.)

- 1 TeV analysis done and submitted to journal.
- updating 500 GeV based on full simulation (more or less done? aiming for what improvements?)

Higgs self-coupling

(Claude, M. Kurata, Junping, etc.)

- basically done at 500 GeV and 1 TeV; being updated.
- short-term goal: publish results at 1 TeV, need properly combine bb and WW^* modes.
- mid-term goal: ZHH @ 500 GeV; many improvements ongoing, but still open for new volunteers

Charged (Heavy) Higgs search

(Abhinav, Y. Shinzaki, etc.)

- $H^+ \rightarrow \tau\nu$ done at 250 GeV; $H^+ \rightarrow WZ$ not finished yet (volunteer to continue?).
- $H^A \rightarrow bbbb$ ongoing (discovery limit being set)
- new proposal?

chargino and neutralino search

(Tomohiko, etc.)

- need volunteer to continue the study ongoing in Tokyo group.
- new proposal?

W-mass and TGC

(K. Tsuchimoto, etc.)

- analysis using single- W process just started; there's at least one year to focus on this study;
- next step working on systematic uncertainties, and detector optimization
- new proposal?

Anomalous HVV coupling

(T. Ogawa, etc.)

- just started, first try to reproduce the analysis using $ZH \rightarrow \nu\nu WW^*$ done previously by Takubo-san.
- then to utilize all channels where anomalous HWW or HZZ coupling is sensitive; two+ years to go
- new proposal?

CP mixture using $H \rightarrow \tau\tau$

(Daniel, etc.)

- not clear about the status, but would not continue after thesis for coming March
- this is very interesting study, volunteers to continue?

Software, new algorithms

(Tino, M. Kurata, Junping, Taikan, etc.)

- ILCDirac
- general PID, dE/dx , π^0 attachment
- flavor tag, vertex charge
- matrix element method
- new jet-clustering
- volunteers for any of those topics?