$h \to \tau^+\tau^-$ BR Study Short Report

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Review: Current Numbers

$\sqrt{s}$	250 GeV	500 GeV			
$\int L\,dt$	250 fb^{-1}	500 fb^{-1}			
Mode	$q\bar{q}h$ e^+e^-h $\mu^+\mu^-h$	$\nu\bar{\nu}h$	$q\bar{q}h$	e^+e^-h	$\mu^+\mu^-h$
$\dfrac{\Delta(\sigma\cdot\mathrm{Br})}{(\sigma\cdot\mathrm{Br})}$ Cut-based	4.2% Extrapolation from $M_h = 120$ GeV to $M_h = 125$ GeV	7.4%	5.1%	20.8%	18.2%
$\dfrac{\Delta(\sigma\cdot\mathrm{Br})}{(\sigma\cdot\mathrm{Br})}$ TMVA	-	6.0%	4.6%	22.7%	17.5%

from my slide of the ILC Tokusui Workshop 2013

Things To Do

1. Include aa_2f samples
2. Check and more optimization in 500 GeV analysis
   - MC statistics
   - more optimization for tau finding, isolated lepton finding, jet clustering
   - more optimization for cut-based and TMVA analysis
3. Re-do the analysis of 250 GeV case with M_h = 125 GeV (Cut-based & TMVA)
4. Write a paper & PhD thesis (MOST IMPORTANT!)

Now Working: aa_2f Samples

- **I included aa_2f samples (SGV)**
  - KEKCC: /hsm/ilc/grid/storm/users/berggren/mc-dbd/sgv-dst_6/500-TDR_ws/aa_2f
  - Effects of aa_tautau are need to be studied.

Process id	Process name	Process type	Cm energy in gev	Polarization1	Polarization2	Luminosity	Cross section in fb	Cut	Gtag	Total number of events	Number of files
37485	aa_yy	aa_2f	500.0	W	W	1000.0	3093.29			3093290	51
37486	aa_yy	aa_2f	500.0	W	B	581.336	8730.23			5075195	80
37487	aa_yy	aa_2f	500.0	B	W	580.866	8740.04			5076787	80
37488	aa_yy	aa_2f	500.0	B	B	193.698	27174.7			5263679	80
37481	aa_xx	aa_2f	500.0	W	W	155.9	33021.3			5148024	80
37482	aa_xx	aa_2f	500.0	W	B	56.999	92984.3			5300010	80
37483	aa_xx	aa_2f	500.0	B	W	56.8948	93144.5			5299442	80
37484	aa_xx	aa_2f	500.0	B	B	19.0058	289916.0			5510104	80
37477	aa_ll	aa_2f	500.0	W	W	35.6735	86486.6			3085280	15
37478	aa_ll	aa_2f	500.0	W	B	69.9628	242538.0			16968601	80
37479	aa_ll	aa_2f	500.0	B	W	69.8817	242784.0			16966167	80
37480	aa_ll	aa_2f	500.0	B	B	20.3961	831956.0			16968673	80
37473	aa_ee	aa_2f	500.0	W	W	189.418	41837.0			7924677	28
37474	aa_ee	aa_2f	500.0	W	B	182.499	124298.0			22684240	80
37475	aa_ee	aa_2f	500.0	B	W	182.078	124585.0			22684240	80
37476	aa_ee	aa_2f	500.0	B	B	53.2735	425807.0			22684240	80

Fig: ILC MC Database

aa_2f Samples

- ANALYSIS ONGOING...: started from $q\bar{q}h$ @ 500 GeV
  - probably not harmful for this process
  - now I obtained strange results... NEED BUG FIX
  - Study for $\nu\bar{\nu}h$ and $\ell^+\ell^-h$: after finishing $q\bar{q}h$

MC Statistics

- Some processes have limited statistics ---> now checking the weight (before/after applying cuts)

- If the statistics is too low, more statistics is needed ---> MC generation

Summary

- Now working on 2 things
  - aa_2f: need bug fix, hopefully I can report new numbers on next General Meeting
  - MC statistics: now checking
- Next steps
  - more optimization in 500 GeV
  - re-do 250 GeV analysis with M_h = 125 GeV
  - write a paper & PhD thesis
  - AOB?