

Testing SDHCAL reconstruction in top Yukawa analysis

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ILD Analysis/Software Meeting

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Jet resolution ($\cos \theta < 0.7$)

- ILD option 2 reconstruction using option 1 tuned PFA

E_j , GeV	SDHCAL, σ_{E_j}/E_j	AHCAL, σ_{E_j}/E_j
45	4.0%	3.7%
100	3.1%	2.8%
180	3.2%	2.8%
250	3.3%	2.9%

- AHCAL numbers from DBD,
- SDHCAL meets ILD goal with uncalibrated Pandora PFA

G. Grenier
December 19, 2012
ILD Analysis/Software Meeting

12/19/12

ILD Analysis/Software Meeting

25

SDHCAL reconstruction is ready

<https://ilcagenda.linearcollider.org/getFile.py/access?contribId=2&resId=0&materialId=slides&confId=5931>

Report result of comparing AHCAL and SDHCAL in tth analysis.

- The reconstruction for AHCAL and SDHCAL are compared.

Detector	ILD_o1_v05	ILD_o2_v05
Sim Settings	v01-14-01-p00	v01-14-01-p05_sdhcal
Rec Settings	v01-15-03-p00	v01-16-p08_sdhcal

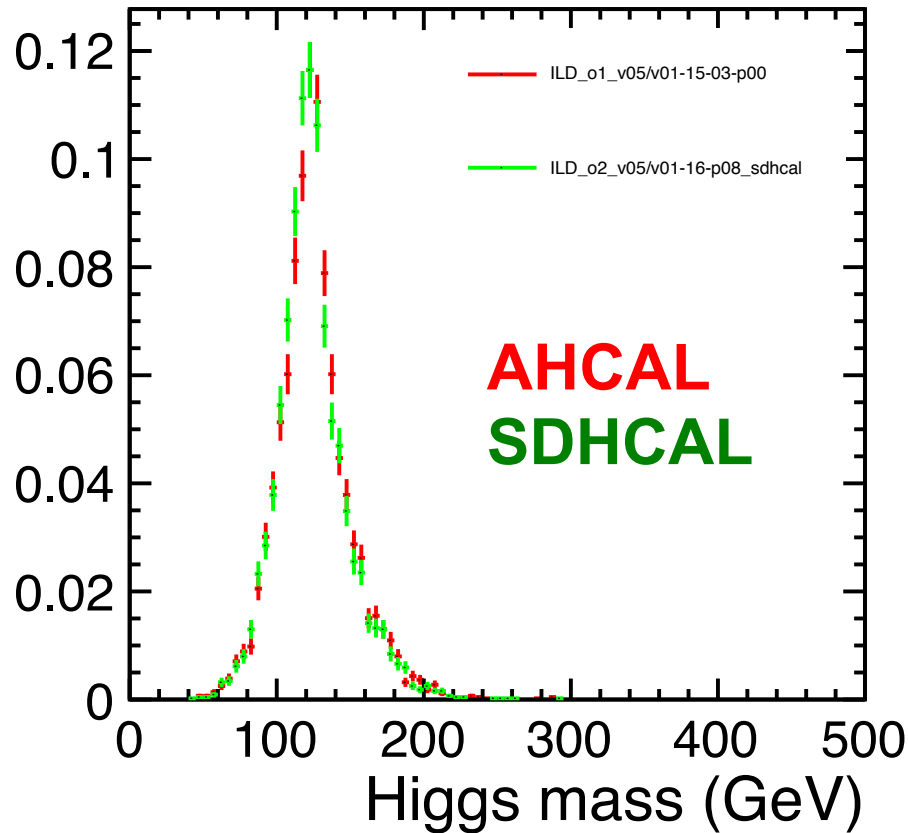
- Use common tth signal processes
- Small samples without overlay of $\gamma\gamma \rightarrow$ hadrons background

Process	tth-6q-bb		tth-ln4q-bb	
Process ID	106451	106452	106455	106456
Beam Pol.	-1,+1	+1,-1	-1,+1	+1,-1
Events	3025	1361	2914	1311

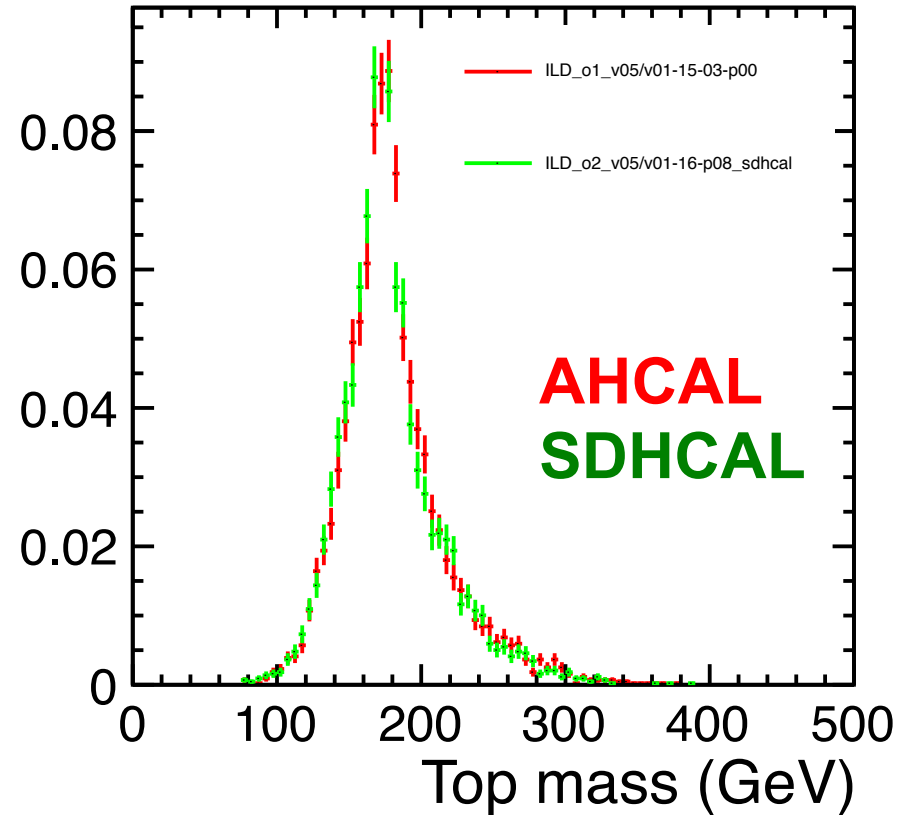
- Isolated lepton finder
- Jet finder with LCFIPlus
- Find best combination of jet by minimizing

$$\chi^2 = \frac{(M_{bb} - M_H)^2}{\sigma_{bb}^2} + \frac{(M_{bjj} - M_t)^2}{\sigma_{bjj}^2} + \frac{(M_{bl\nu} - M_t)^2}{\sigma_{bl\nu}^2}$$

tth-6q-hbb



tth-6q-hbb



No significance difference observed in mass resolution of Higgs / top.

Signal Comparisons I

Main variables in the analysis were evaluated for both ILD_o1_v05 and ILD_o2_v05 using same processor as developed for DBD samples.

Example: Higgs Mass

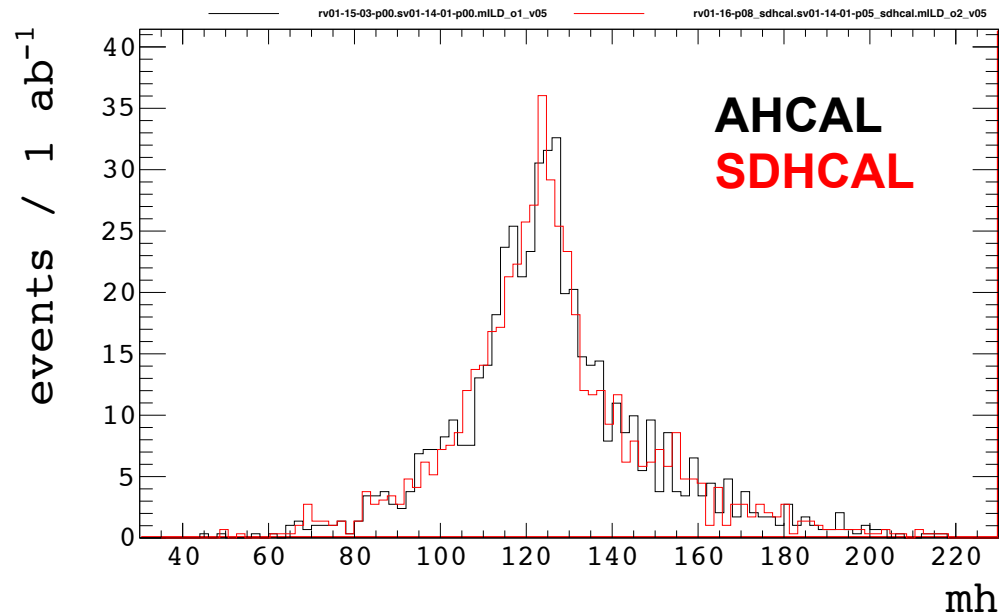
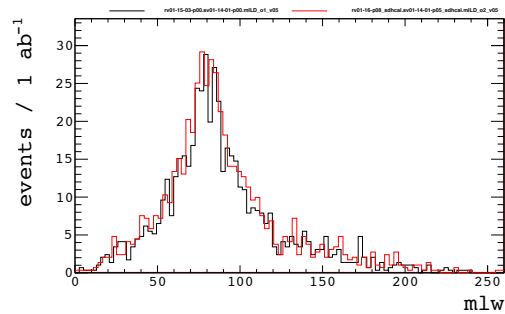


Figure: Reconstructed Higgs boson mass for best combination of jets for both the ILD_o1_v05 (black) and ILD_o2_v05 samples (red).

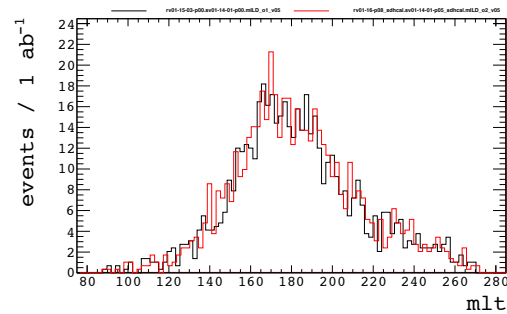
Signal Comparisons III

Reconstructed Masses

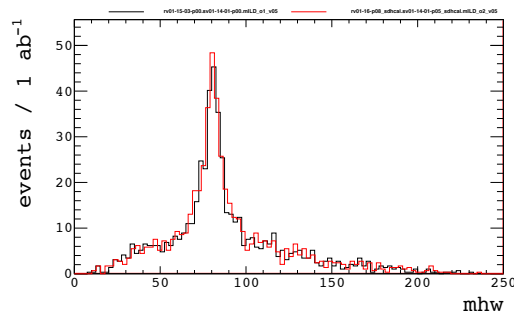
AHCAL
SDHCAL



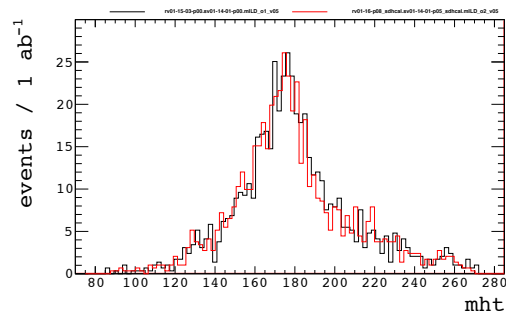
(a) Leptonic W boson



(b) Leptonic top quark



(c) Hadronic W boson



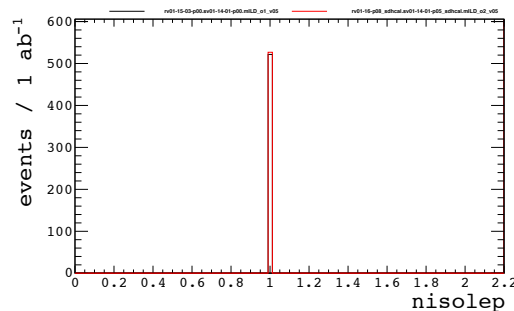
(d) Hadronic top quark

Figure: Reconstructed Masses: ILD_o1_v05 (black) and ILD_o2_v05 samples (red).

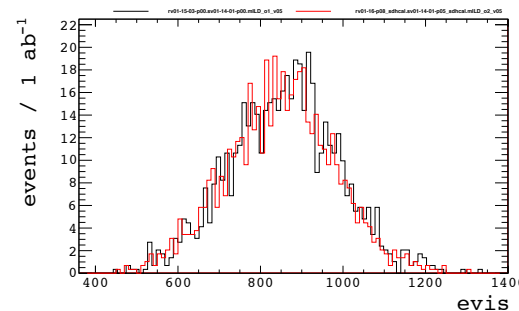
Signal Comparisons I

Event Variables

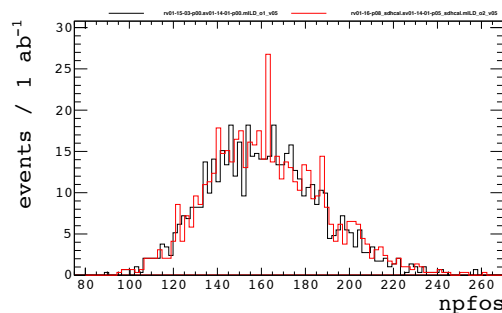
AHCAL
SDHCAL



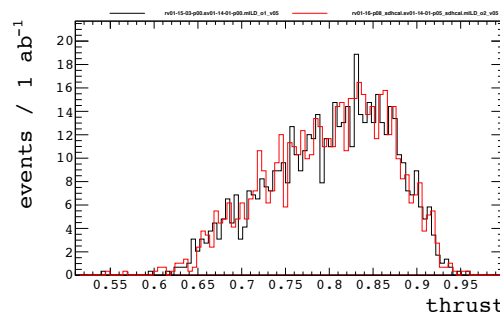
(a) Number Isolated Leptons



(b) Total Visible Energy



(c) Number PandoraPFOs



(d) Thrust

Figure: Preselection variables for analysis: ILD_o1_v05 (black) and ILD_o2_v05 samples (red).

- No significance differences between AHCAL and SDHCAL reconstruction in the variables of the top Yukawa analysis at 1 TeV.
- But the statistics of the available samples is small.
- However, the mass resolutions in the tth analysis are limited by the confusion in jet finding procedure.