Status of Optimization Studies

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Introduction

Current status

- The ILD baseline parameters were determined for benchmark physics studies.
- The test production of ILD data will be started soon.
- The physics benchmarks will be studied for ILD after LCWS2008.
- We must obtain all the analysis results within this year.

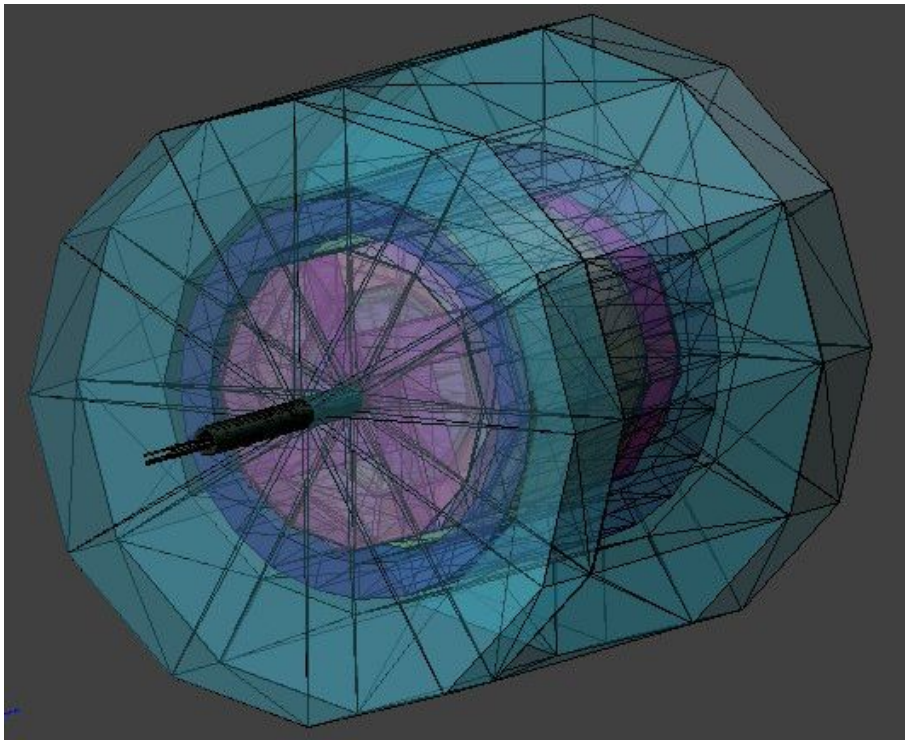
Today's topic

- Benchmark processes
- Analysis results at Cambridge
- Recent progress
- Schedule towards LOI

ILD baseline parameters

ILD baseline parameters

- B field : 3.5 T
- VTX layer : 3 double-side layers
- TPC drift region Rmin : 329 cm
- ECAL segmentation : 5 x5 mm^2
- ECAL Rmin : 184 cm
- ECAL total thickness : 17 cm
- HCAL total thickness : 127 cm
- TPC Z half length : 240 cm
- Endcap CAL Z : 268 cm



Single particle event benchmarks

The single particle event performance must be checked as a function of particle (jet) energy and angle.

Single particle event benchmarks

- Jet energy resolution : Mark
- K_L energy resolution : Akiya
- Single gamma energy resolution : Akiya, Mark
- Muon momentum resolution : Akiya
- The impact parameter resolution : Aplin, Yoshida

Physics benchmarks

Physics benchmark processes

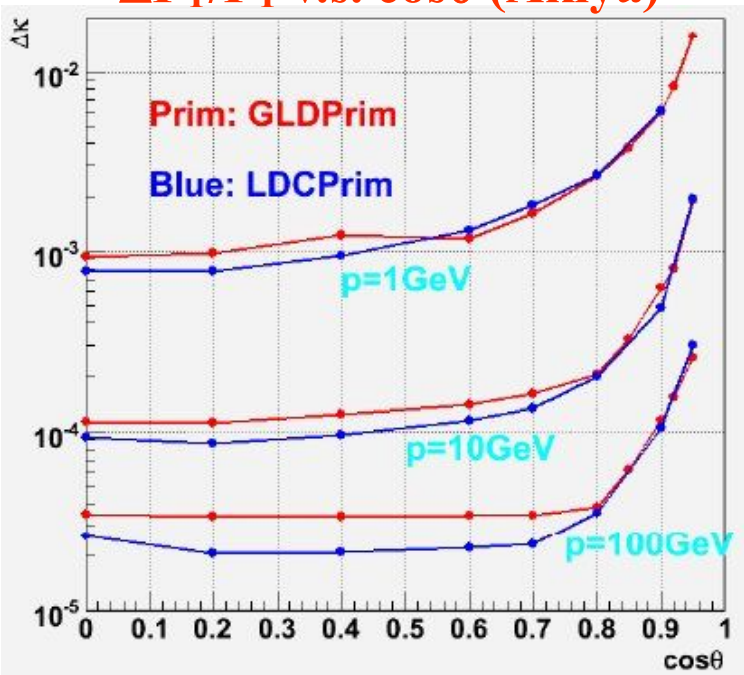
- ZH-jet : Yoshida, Wenbiao
  - Br(H→cc) (@ 250GeV)
- Top analysis : Katsumasa, Andreas
  - σ, A_{FB}, ΔM_{top} (@ 500GeV)
- ZH-recoil mass : Li, Kazuto
  - $\Delta\sigma(ZH)$, ΔM_H (@ 250GeV)
- SUSY-jet mode : Jenny, Taikan, Daniela
  - $\Delta\sigma(\chi^+\chi^-, \chi_2^0\chi_2^0)$, ΔM_χ (@ 500GeV)
- $Z^* \rightarrow \tau\tau$: Taikan
  - σ, A_{FB}, $Pol(\tau)$ (@ 500GeV)

Current results for single particle event

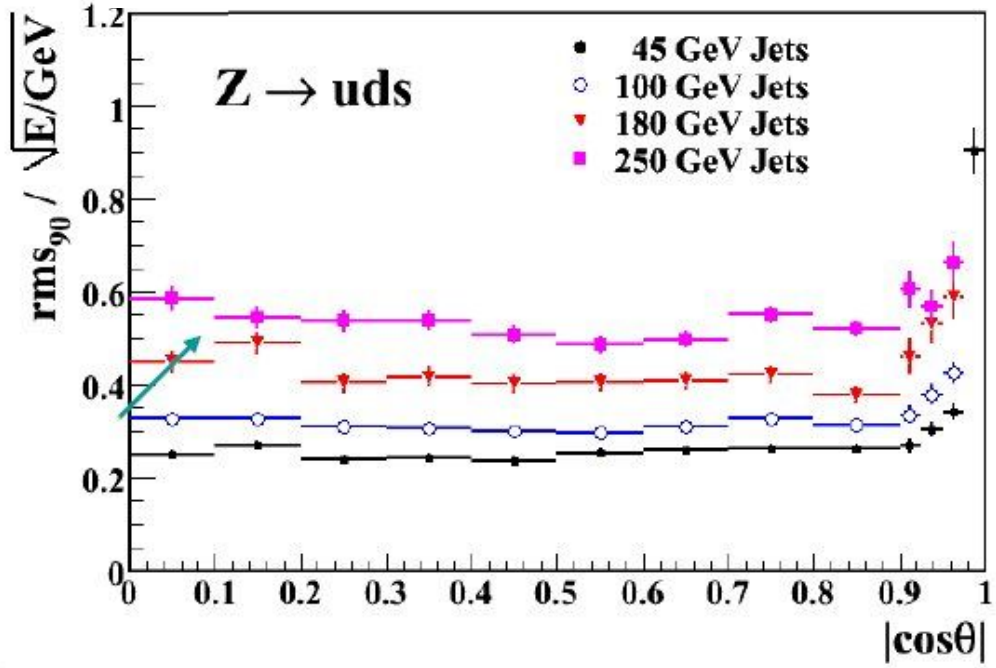
- The performance for the single particle events were shown at Cambridge meeting.
  - $\Delta E/E(\gamma)$, $\Delta E/E(K_L)$, $\Delta Pt/Pt$, $\sigma(IP)$, $\sigma(rms90)$
- We already have analysis tools.

→ The performance will be studied soon after data production.

$\Delta P_T/P_T$ v.s. cosθ (Akiya)



Jet energy resolution for LDC' (Mark)



Current results for physics benchmarks

We obtained many results for the benchmark processes at Cambridge meeting.

		Measurement	Geometry	Person
ZH-recoil	ZH→μμH (Model dependent)	ΔM_{recoil} = 29MeV $\Delta\sigma(ZH)$ = 0.28fb	LDC'	Li
	ZH→eeH (Model dependent)	ΔM_{recoil} = 47MeV $\Delta\sigma(ZH)$ = 0.49fb	LDC'	Li
Tau	80fb-1	AFB = 46.7±0.6% $A_{pol}(\tau^{\pm}\rightarrow\pi^{\pm}\nu)$ = 52.1±4.6% $A_{pol}(\tau^{\pm}\rightarrow\rho^{\pm}\nu)$ = 42.6±7.4%	GLD'	Suehara
Top	20fb-1	ΔM = 0.21GeV	LDC'	Andreas
SUSY	Chargino	$\Delta M(\chi_1^{\pm})$ = 1.6GeV ΔM(LSP) = 0.9GeV	GLD'	Suehara
	Neutralino	$\Delta M(\chi_2^0)$ = 0.44GeV ΔM(LSP) = 0.29GeV	GLD'	Suehara

To be studied for physics benchmarks

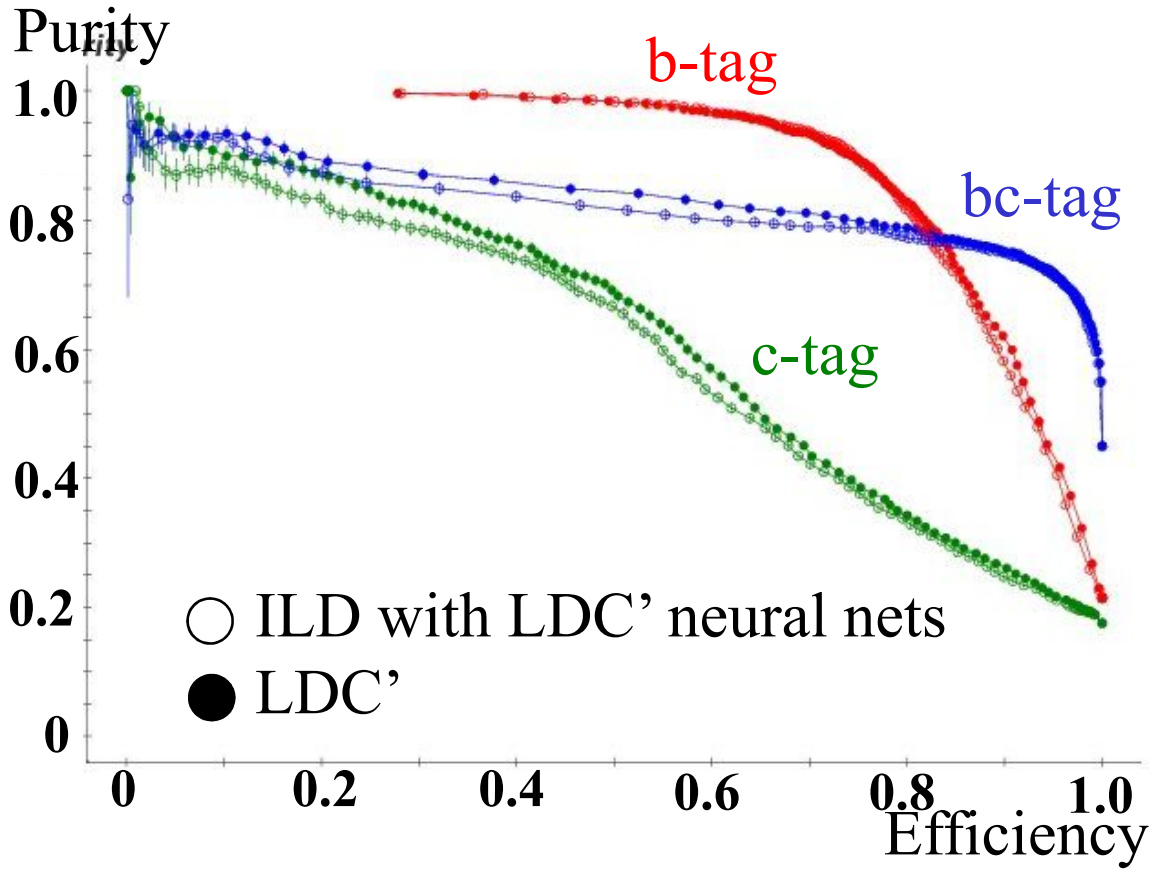
We have some items to be analyzed by LOI.

- ZH-recoil (Kazuto)
  - Model independent analysis (Li's analysis is model dependent.)
- ZH-jet (Yoshida, Wenbiao) : BR(H→cc), BR(H→μμ)
  - Wenbiao : ZH→4-jets
  - Yoshida-kun : ZH→2-jets
- Tau (Suehara) : Δσ (can be estimated soon?)
- Top (Andreas, Ikematsu) : AFB
- SUSY (Suehara) : Δσ (can be estimated soon?)

There are some progress after Cambridge meeting.

Progress on flavor tagging (Roberval)

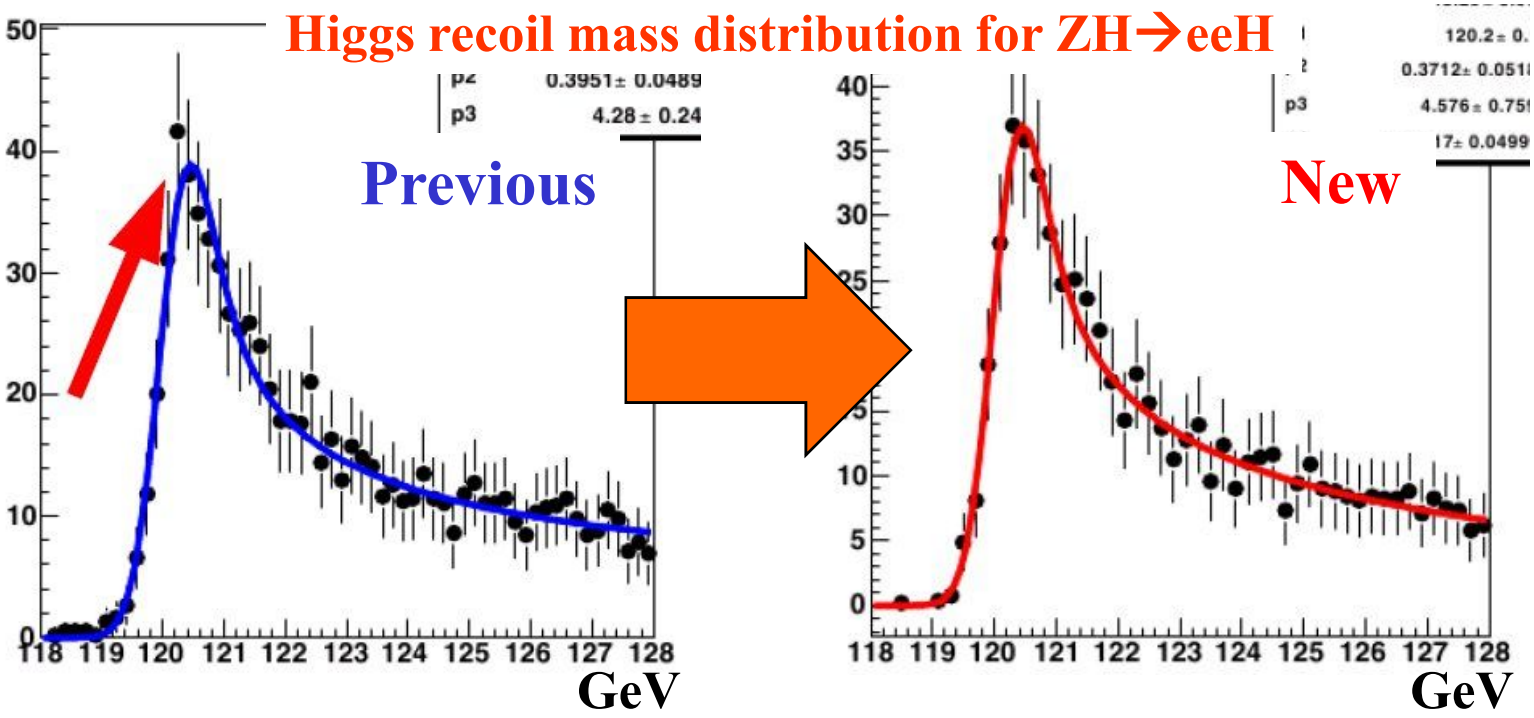
- Performance of the flavor tagging is studied by using LDC' neural net information.
- The comparable performance with LDC' was achieved.



Progress on ZH-recoil analysis (Kazuto)

The function for the mass fitting was modified.

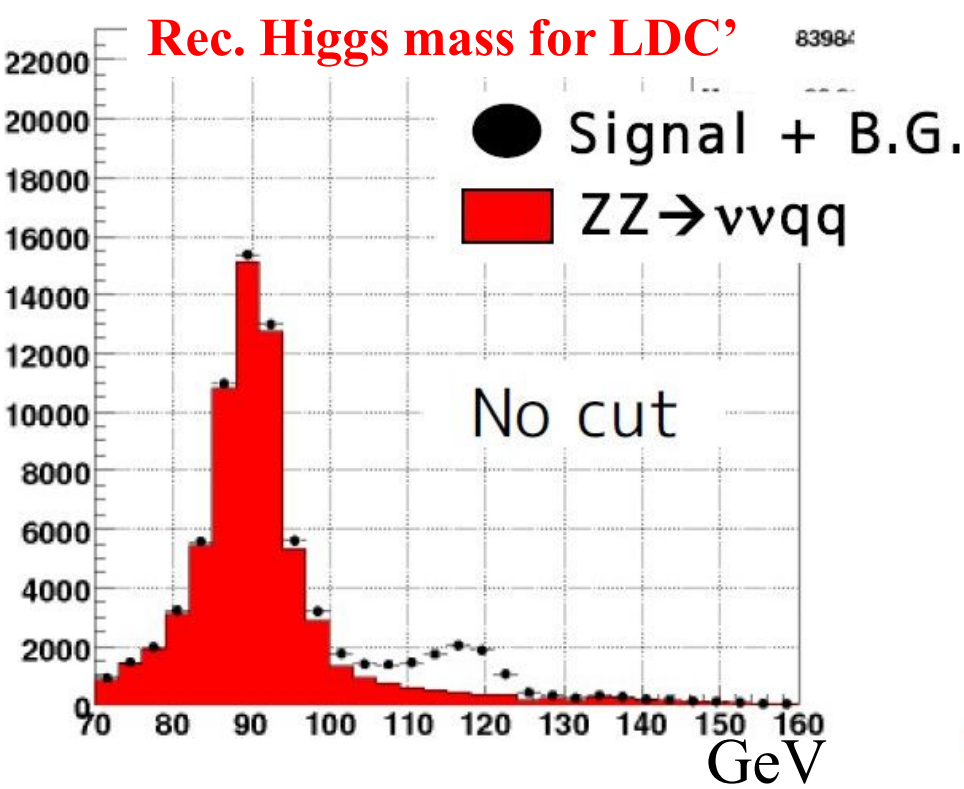
- $F(m) = N \int F_H(m-t)\ e^{-A(m-120)}\ G(t)\ dt$
- The Higgs mass can be fitted very well.
  - $M_H(Z \rightarrow ee)=120.0 \pm 0.10$ GeV, $M_H(Z \rightarrow \mu\mu)=120.0 \pm 0.04$ GeV
  - $\sigma(ZH \rightarrow eeH)=7.5 \pm 0.35$fb, $\sigma(ZH \rightarrow \mu\mu H)=7.7 \pm 0.29$fb

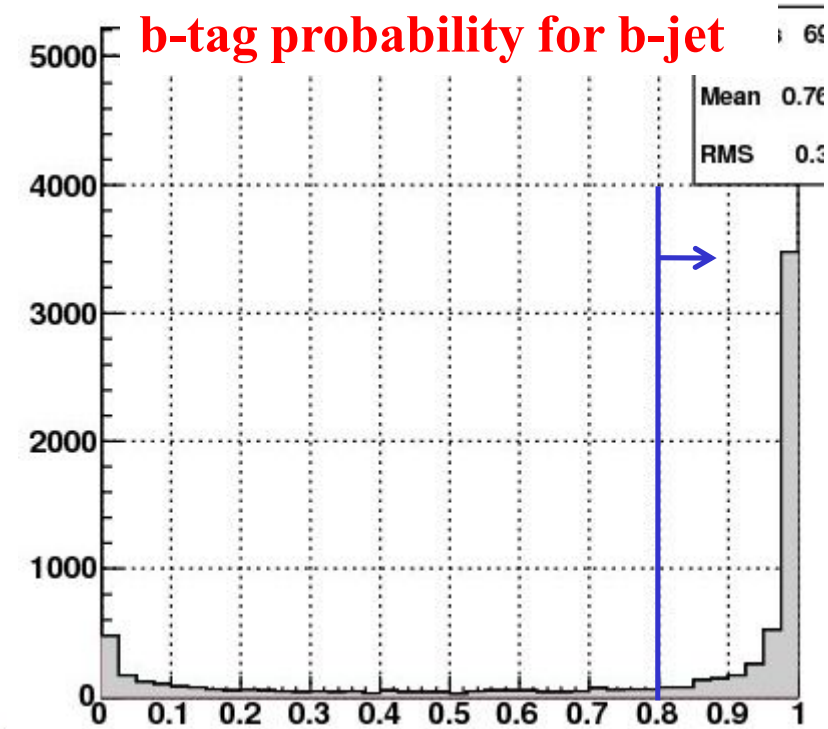


Progress on ZH-jet analysis (Yoshida)

Study of ZH→ννqq mode was started by using DST-files for LDC'.

- The Higgs mass was reconstructed.
- Performance study of the flavor tagging is just ongoing.
- The analysis will be finalized within this year!



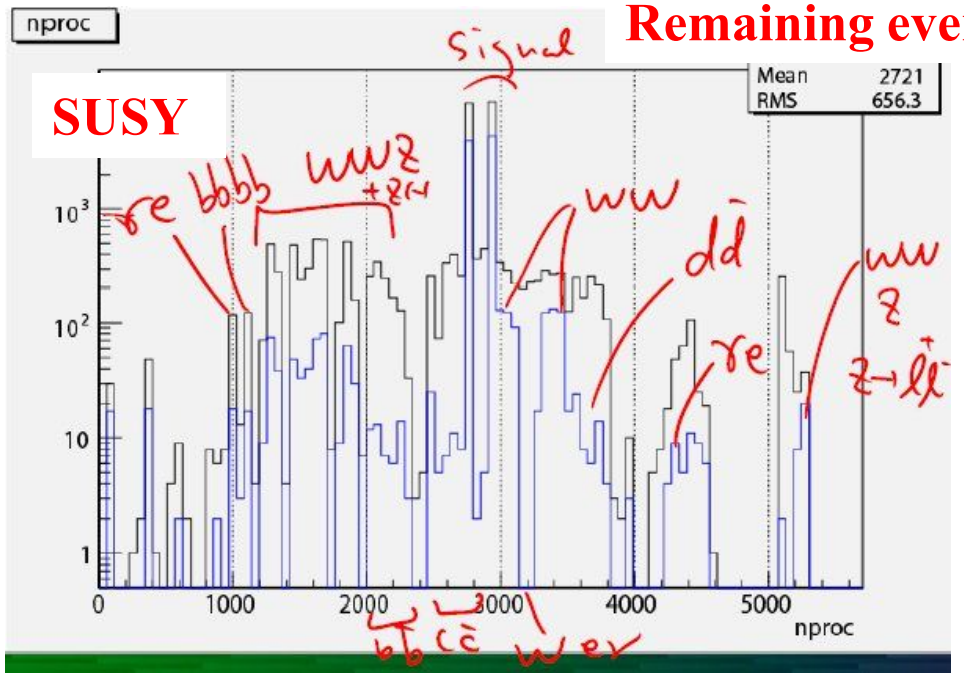


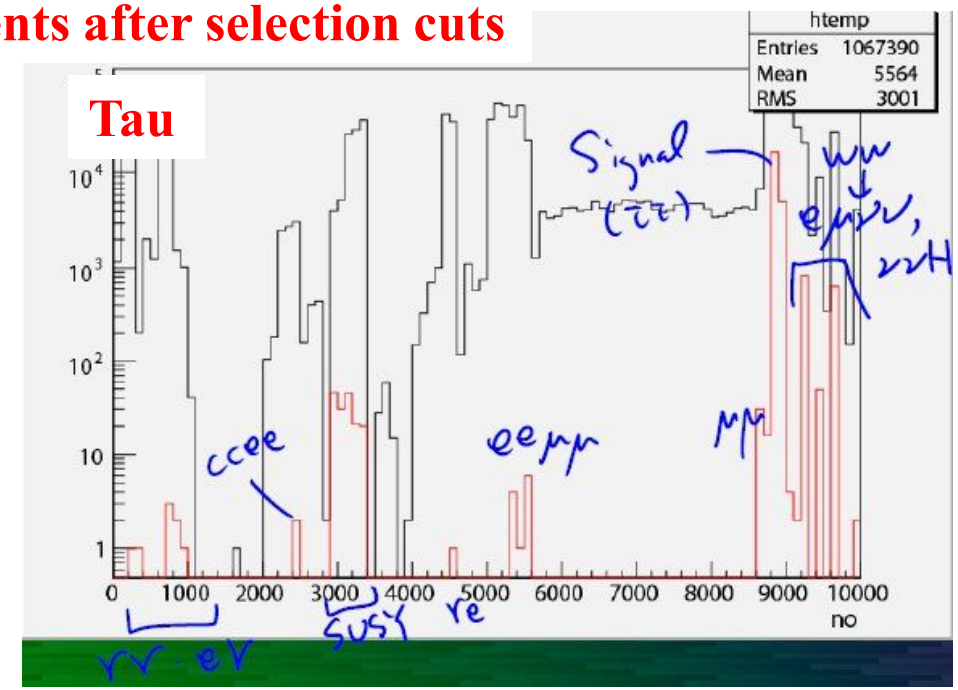
Progress on Tau & SUSY (Suehara)

The important backgrounds and selection cuts is studied.

- SUSY : WW and WWS are main SM background.
  - γγ and eγ process should be concerned.
- Tau : γγ→ττ must be generated because it is not included in LDC'-DST.

Remaining events after selection cuts





Schedule & Meetings

Current schedule

- 11/16-20 : LCWS208
- 11/20~ : MC mass production
- ~1/1 : The analysis will be finalized.
- 2008 Feb. : ILD workshop in Korea

→ The schedule is very tight!

Optimization meetings

- Physics issue : 13:00 (GMT) on every Wednesday
- Software issue : 8:30 (GMT) on every Thursday

Summary

- The ILD baseline parameters was determined for the benchmark studies.
  - The test MC production is just ongoing.
  - The physics benchmarks will be studied after LCWS2008.
- We have still something to be analized before LOI.
  - There is already some progress in physics analysis after Cambridge.
- All the physics analysis will be finalized within this year.