

W mass direct measurement via $e\nu W$ process

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Friday, 5 February 2016 : Asian Physics & Software Meeting
—> Updates and current status of my study

Recently working on

ΔM_W [MeV]	ILC250-nominal	ILC500-nominal	ILC250-H20	ILC500-H20
$\int Ldt[\text{fb}^{-1}]$	250	500	2000	4000
$P(e^-, e^+)$	(-0.8, +0.3)	(-0.8, +0.3)	shared	shared
jet energy scale	4.9	6.5	1.4	1.4
hadronization	1.5	1.5	1.5	1.5
pile-up	0.5	1.0	0.5	1.0
total systematics	5.1	6.8	2.2	2.3
statistical	6.5	13.8	2.3	4.9
total	8.3	15.4	3.1	5.4

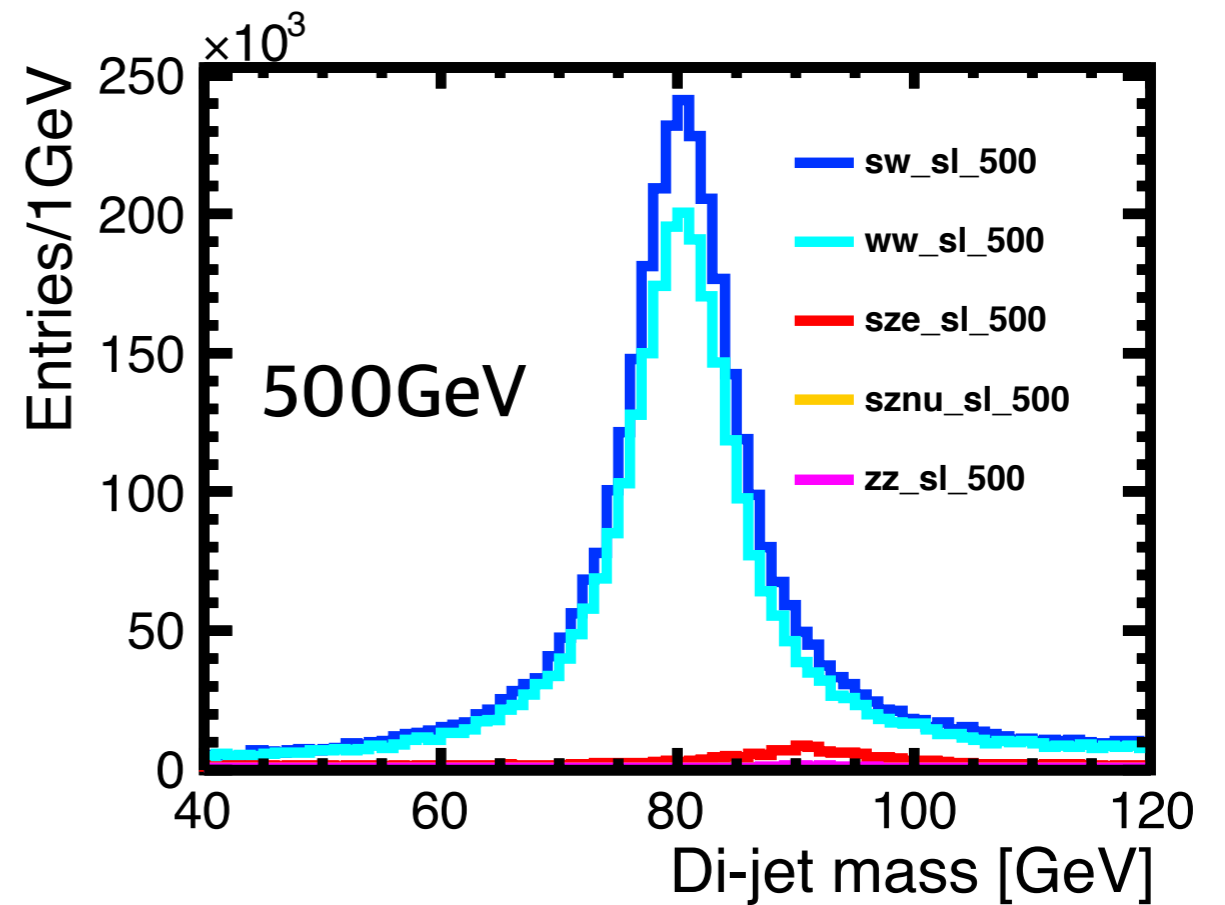
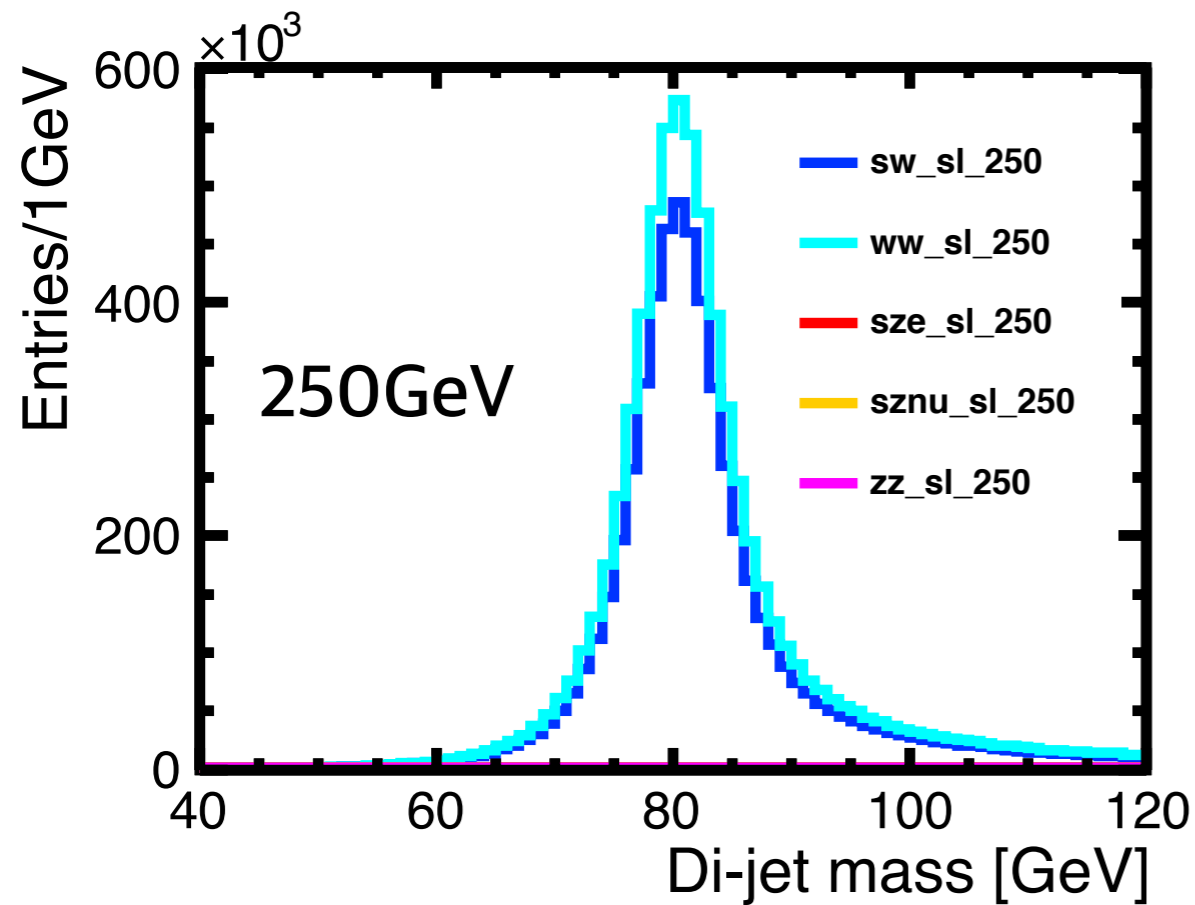
2.7MeV
(combined)

- We have got a table of the expected accuracy on W mass measurement via direct reconstruction of hadronic mass.
- However, it has not taken backgrounds into account so far.
- So I will report on the study of backgrounds and its impact today.

Background processes

- In this week we focus on the **semi-leptonic 4-fermion type** processes available in DBD samples.
- The signal processes;
 - **sw_sl** : $e\nu W$ (single-W) and a part of WW-pair [evqq]
 - **ww_sl** : WW-pair production [$\mu\nu qq$, $\tau\nu qq$]
- while the background processes;
 - **sze_sl** : eeZ (single-Z) and a part of ZZ-pair [eeqq]
 - **sznu_sl** : $\nu\nu Z$ (single-Z) and a part of ZZ-pair [$\nu\nu qq$]
 - **zz_sl** : ZZ-pair production [$\mu\mu qq$, $\tau\tau qq$, $\nu\nu qq$]
- The “**sze_sl**” would be a major background:
 - when only one of the electrons is detected, its final state seems to consist of an isolated lepton, a large missing energy and 2-jet: **very similar to the signal ($l\nu W$) event !**

Look at the di-jet mass



- The only 1 cut : the number of isolated leptons must be 1.
- All histograms are scaled to be H20 condition for each.
- It seems that the impact would be very small, but not clear.

Template fitting result

- 2 data and 2 templates for each 250GeV and 500GeV case.
 - $M_W^{\text{input}} = 80.419 \text{ GeV}$ (DBD).
- Integrated luminosity is 100fb^{-1} for data, 30fb^{-1} for templates.
 - Beam configuration meets the H20.
- Extracted systematic shifts are within the error range.
 - No clear conclusion . . . ?

M_W [GeV]	signal only		signal + background	
\sqrt{s} [GeV]	250	500	250	500
M_W^{fit} [GeV]	80.472	80.558	80.471	80.552
Error [GeV]	0.007	0.017	0.007	0.019
$\Delta M_W^{\text{sys.}}$	Systematic shift [MeV]		1 ± 10	6 ± 26

Back up

plots

