Study of top pair production near threshold

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# Simulation

signal

4-Jet

$t\bar{t} \to bWbW \to bqqbl\nu$
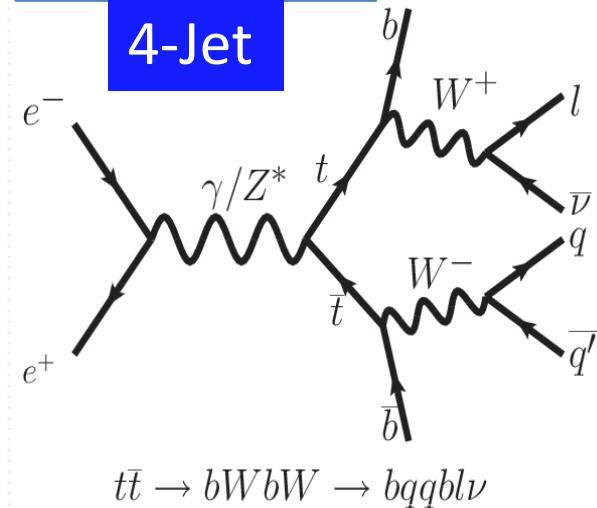
Main background

WW, ZZ, ZH

$e^+e^- \to WW \to qqqq$
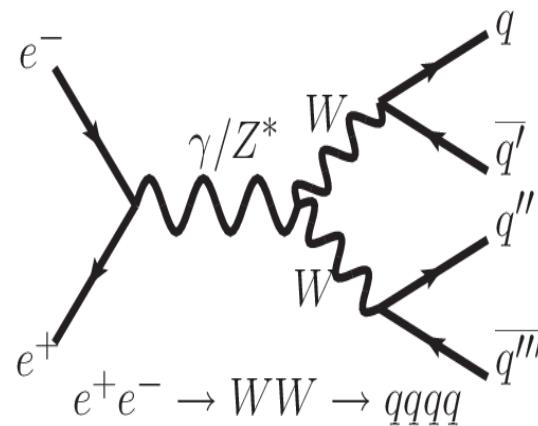
BR	
6-Jet	45%
4-Jet	44%
2-Jet	11%

Top mass	174 GeV
E_{CM}	<u>340 - 350GeV (every 1 GeV)</u>
Polarization	$p(e^+, e^-) = (-30\%, +80\%), (+30\%, -80\%)$ **Right, Left**
Integrated luminosity	10 fb^{-1} (each E$_{CM}$ & pol, total 220fb^{-1})

Isolated lepton finding

Using Isolated Lepton Finder, isolated lepton candidate was selected.

Cone cut

CosConeθ = 0.96 ~ 16°
0 < ConeE < 10 GeV
trackE >15 GeV
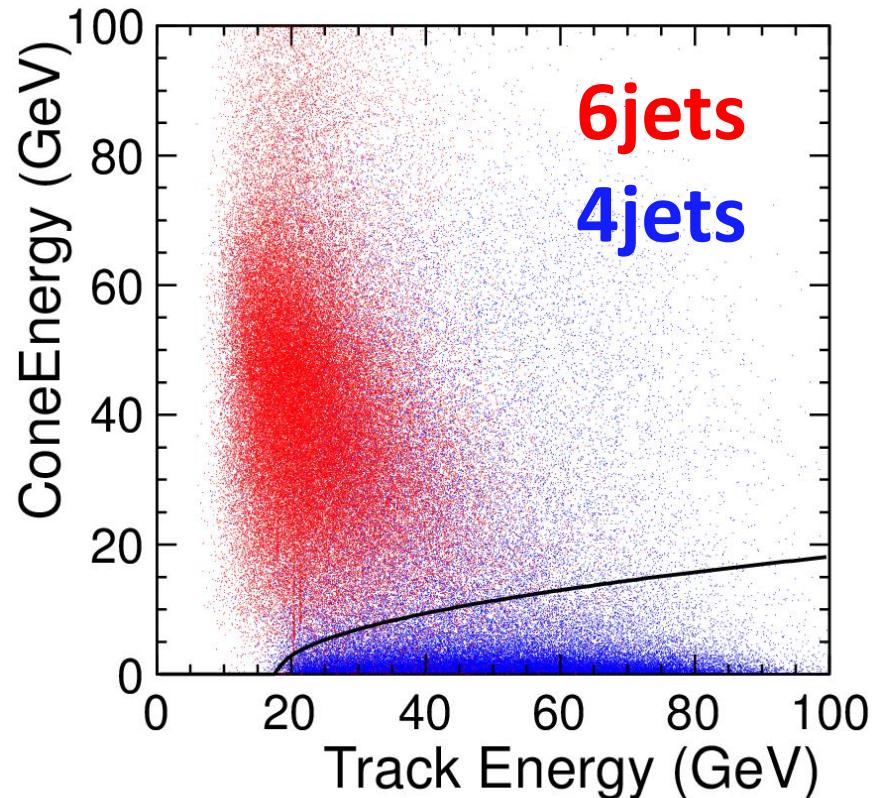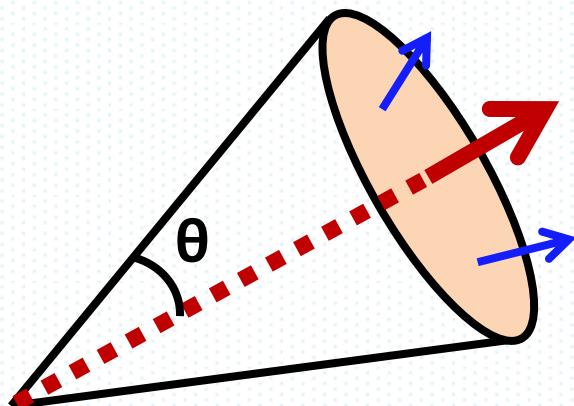
Selection @4-Jet 350GeV

$$\int \mathcal{L}(t)dt = 10 \ (\text{fb}^{-1})$$

$$p(e^+, e^-) = (+30\%, -80\%)$$

$$S = \frac{signal}{\sqrt{signal + background}}$$

signal

background

Ecm=350(GeV)	tt4j	tt6j	tt2j	WW	ZZ	ZH	6f+4f	S_{4j}
Generated	3166	3287	762	65328	6008	1389	130817	11.2
# of lepton = 1	2406	135	224	1484	119	103	60007	9.5
btag1 > 0.1 ×2	2245	127	212	111	32	35	2661	30.5
Thrust<0.845	2184	126	185	21	15	29	404	40.1
missPt>9GeV	2142	40	183	3	4	22	397	40.5
240 <Evis<350 GeV	1996	27	77	2	4	16	127	42.1
m_t>100 ×2	1971	18	66	1	3	14	83	42.4
# of pfos<160 # of pfos>50	1963	17	53	1	3	12	55	**42.8**

Statistical error of cross section：1/42.8 = 2.3%
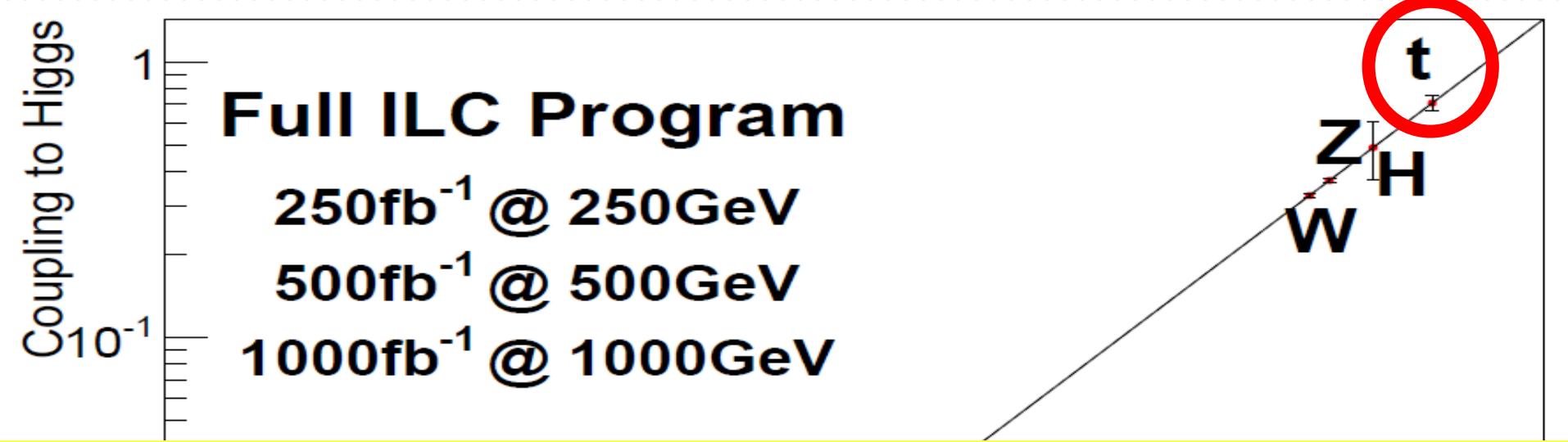
Top yukawa
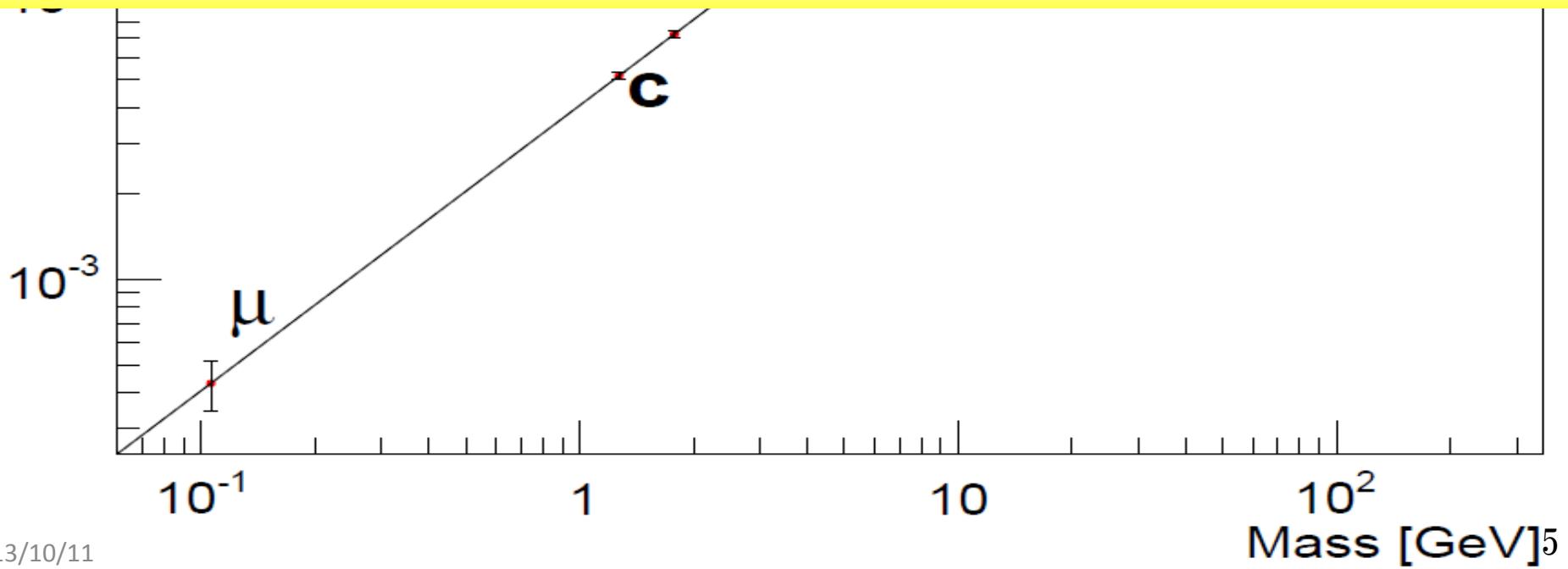
The statistical error of top yukawa coupling

$$\sigma \propto |\mathcal{M}_{no\ higgs\ exchange} + y_t^2 M_{higgs\ exchange}|^2$$

$$\frac{\delta y_t}{y_t} \sim \frac{109 \times \frac{1}{2} \times \frac{\delta\sigma}{\sigma}}{9}$$

Statistical error	4-Jet	4-Jet (Right)	Combined ALL
$\Delta\sigma/\sigma$	0.9%	1.3%	
$\Delta y_t/y_t$	5.1%	7.9%	**4.3%**

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Top mass & width

Fit

6-Jet only
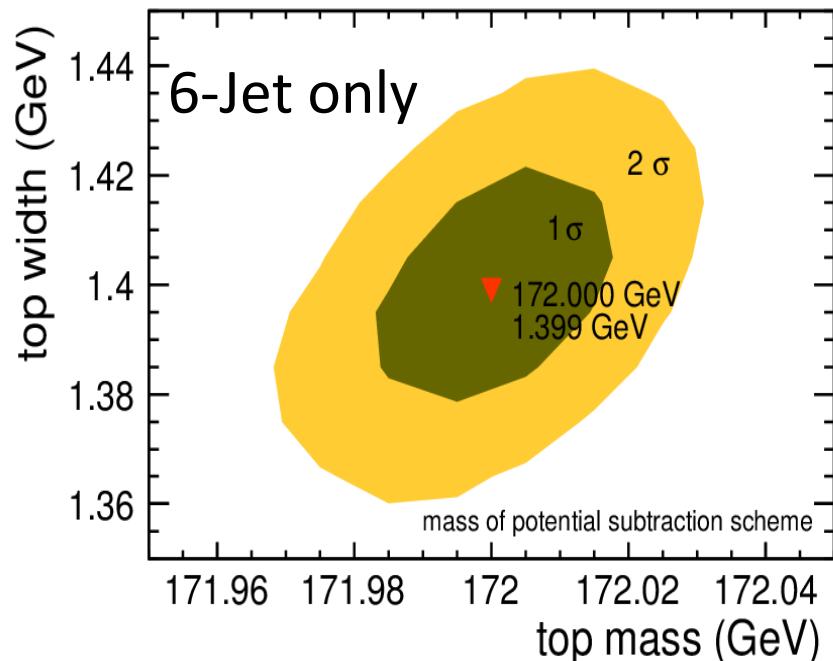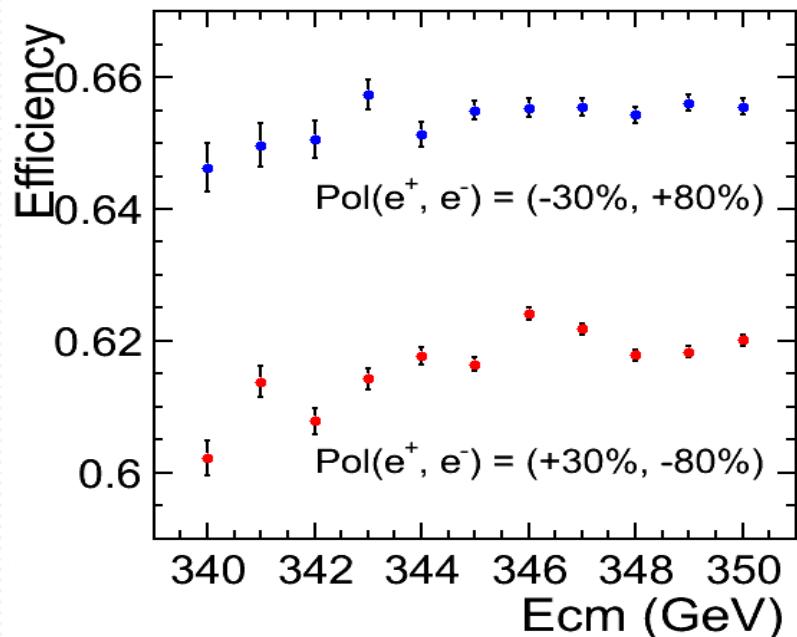
統計誤差	m_t^{PS}(GeV) 4Jet	Γ_t(GeV) 4Jet
Left(110fb^{-1})	171.999±0.024	1.400±0.030
Right(110fb^{-1})	171.999±0.033	1.397±0.042
Left (110fb^{-1}) + Right(110fb^{-1})	172.000±0.019	1.399±0.025

plan

- **Separating the sample and combining 6-Jet and 4-Jet**
  For combining the 6-Jet and 4-Jet analysis, using isolated lepton selection, the sample must be separated completely. After that 2 modes are combined.

- **Optimize the cut analysis for each E_{CM}**
  Until now, the cut condition is unified at 350 GeV selection, which has the greatest number of signal events between 340 and 350 GeV.