

Status Report

Tokyo Institute of Technology



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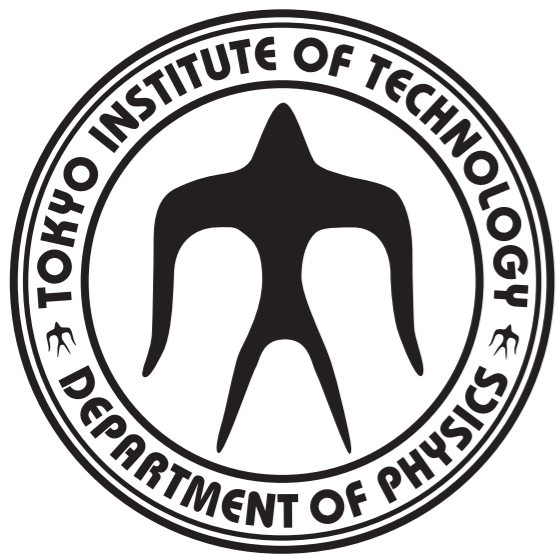


Table of contents

- Search for $H \rightarrow bb$ at LHeC using Delphes
- 100 fb^{-1} is assumed
- Checked dependance of HCal energy resolution

Signal and background samples

	σ (pb)	Nsample	N/σ (fb^{-1})
Signal $H \rightarrow bb$	0.063	200K	3170
CCjjj no top	2.5	300K	120
CC single top	0.43	150K	350
CC Z	0.29	100K	345
NC Z	0.13	100K	770
PAjjj	41	4.05M	100

Main setup of Delphes

- Coverage:
 - Calorimeter: $|\eta| < 5$ Tracking: $|\eta| < 3.0$
- Jet reconstruction:
 - Anti k_T algorithm with $\Delta R = 0.7$
- HCal resolution
- B-tag
 - $|\eta| < 3.0$
 - B-jet ID: 60%
 - C-jet mis-ID: 10%
 - Light jet mis-ID: 1%

$$\frac{\sigma}{E} = \frac{30\%}{\sqrt{E}} + 3\% \quad (|\eta| < 3) \quad \frac{\sigma}{E} = \frac{60\%}{\sqrt{E}} + 5\% \quad (3 < |\eta| < 5)$$

- ECal resolution

$$\frac{\sigma}{E} = \frac{35\%}{E} + \frac{7\%}{\sqrt{E}} + 0.7\% \quad (|\eta| < 3)$$

$$\frac{\sigma}{E} = \frac{20\%}{\sqrt{E}} + 2\% \quad (3 < |\eta| < 4)$$

$$\frac{\sigma}{E} = \frac{40\%}{\sqrt{E}} + 10\% \quad (4 < |\eta| < 5)$$

Comparison of HCal resolution

- Compared constant term of HCal energy resolution

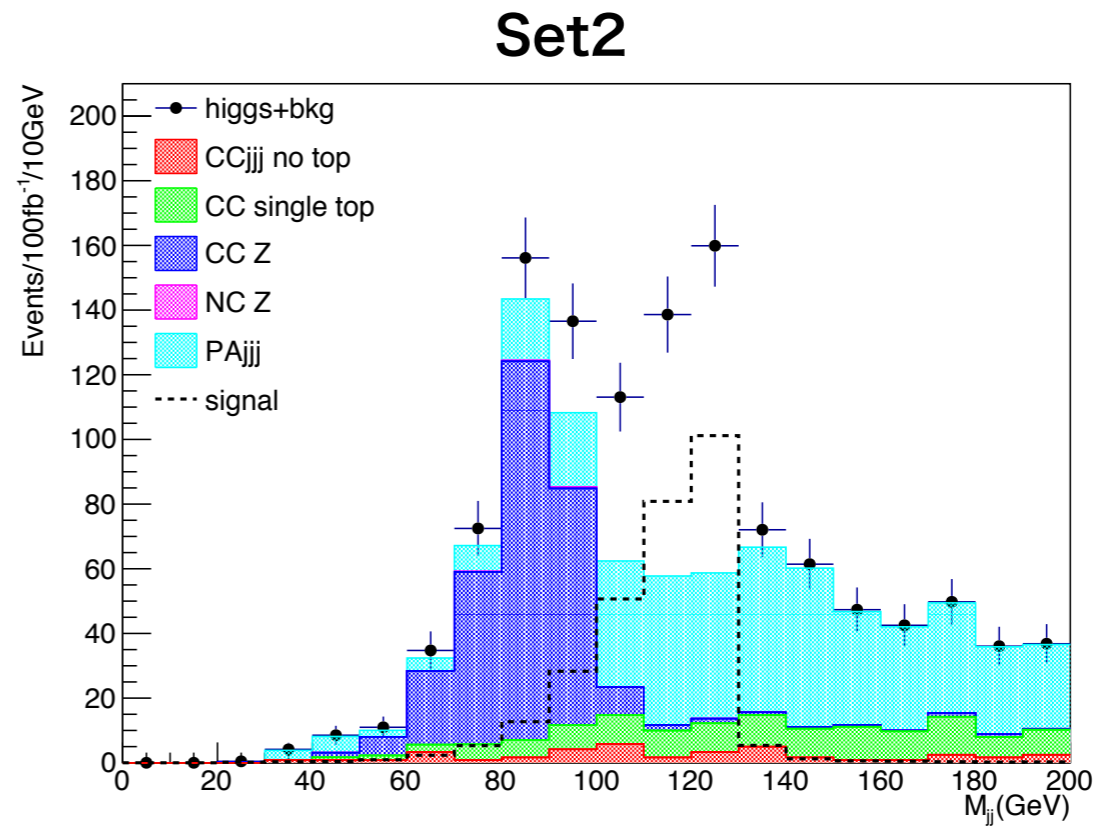
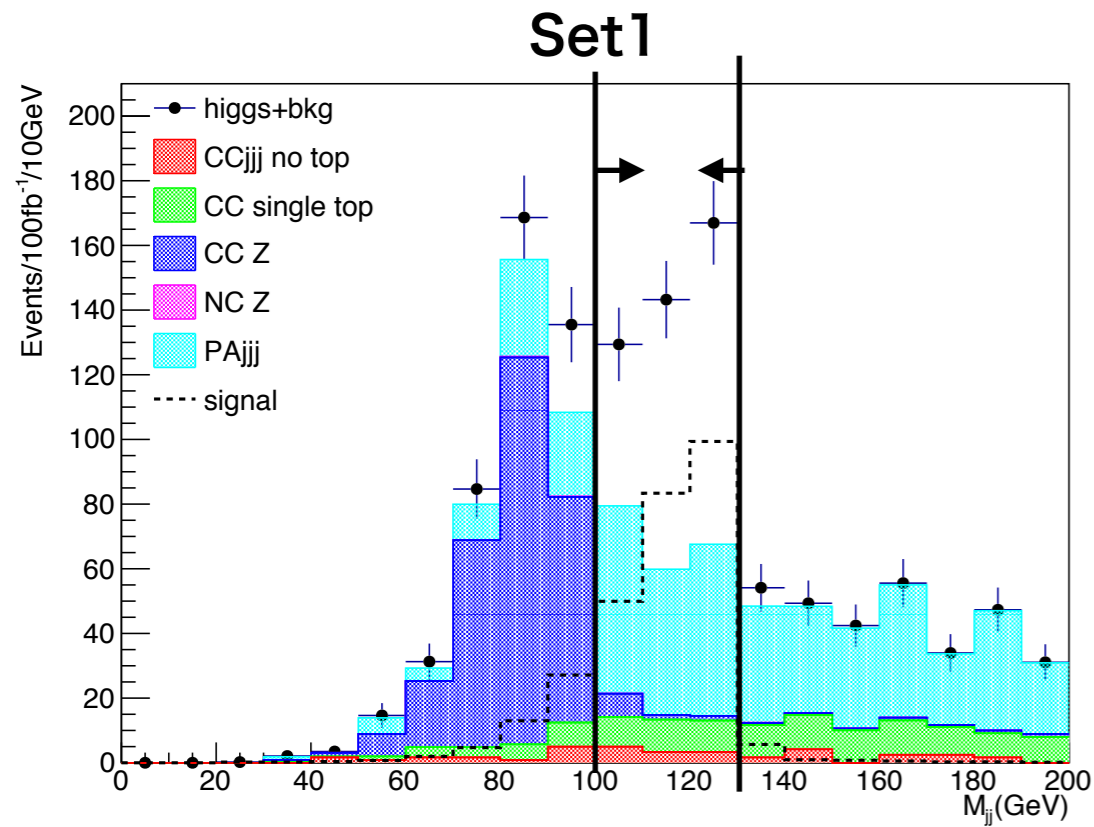
$$\frac{\sigma}{E} = \frac{a}{\sqrt{E}} \oplus b \quad (|\eta| < 3)$$

$$\frac{\sigma}{E} = \frac{c}{\sqrt{E}} \oplus d \quad (3 < |\eta| < 5)$$

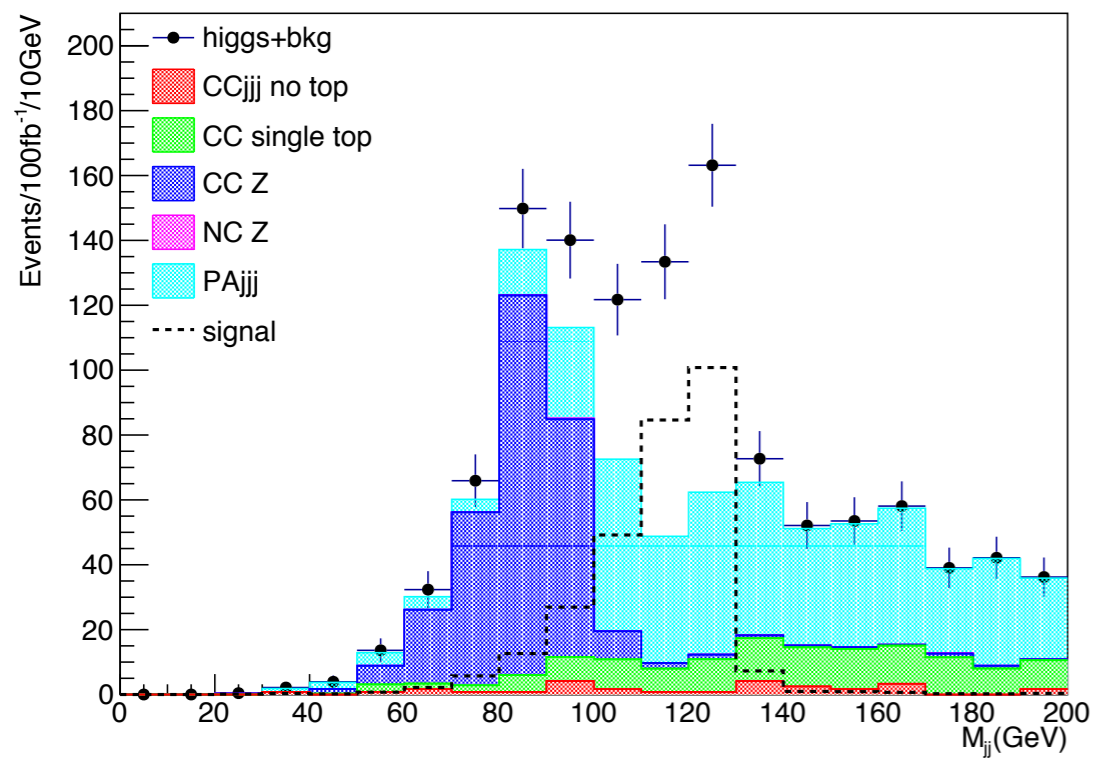
	a(%)	b(%)	c(%)	d(%)
Set1	30	1	60	3
Set2 (default)	30	3	60	5
Set3	30	5	60	7
Set4	30	7	60	9

Di-bjet mass after all cuts

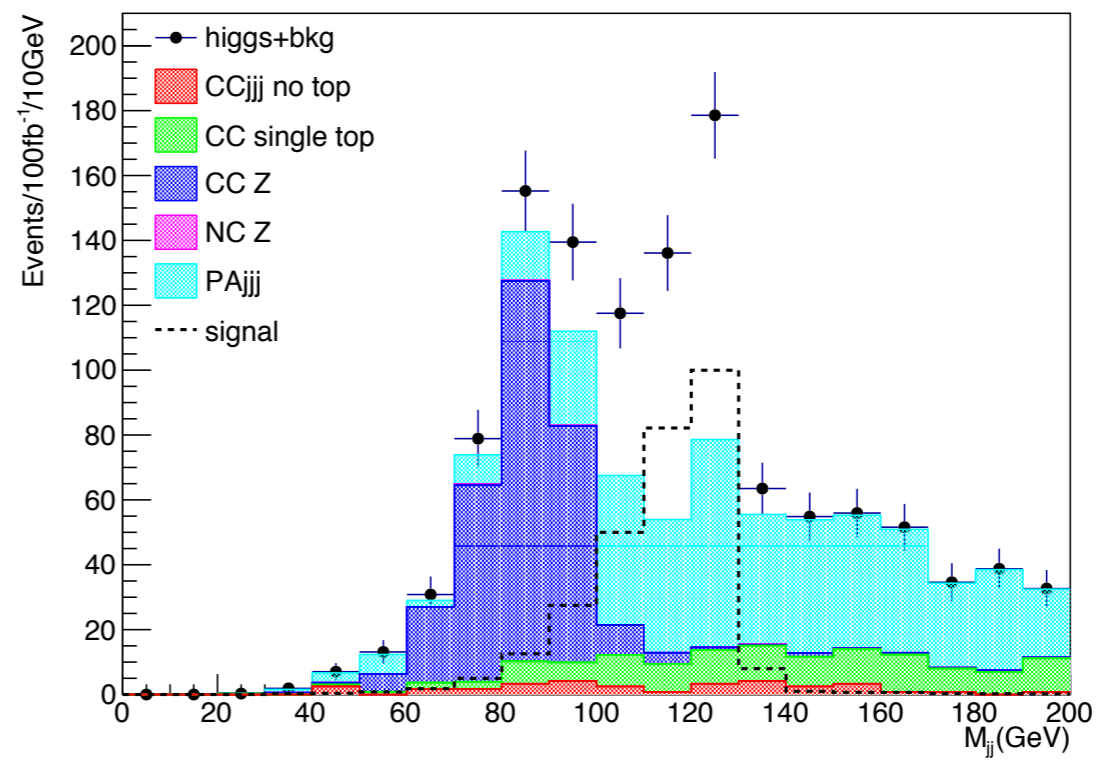
- Invariant mass of two b-jets with first and second minimum η



Set3



Set4

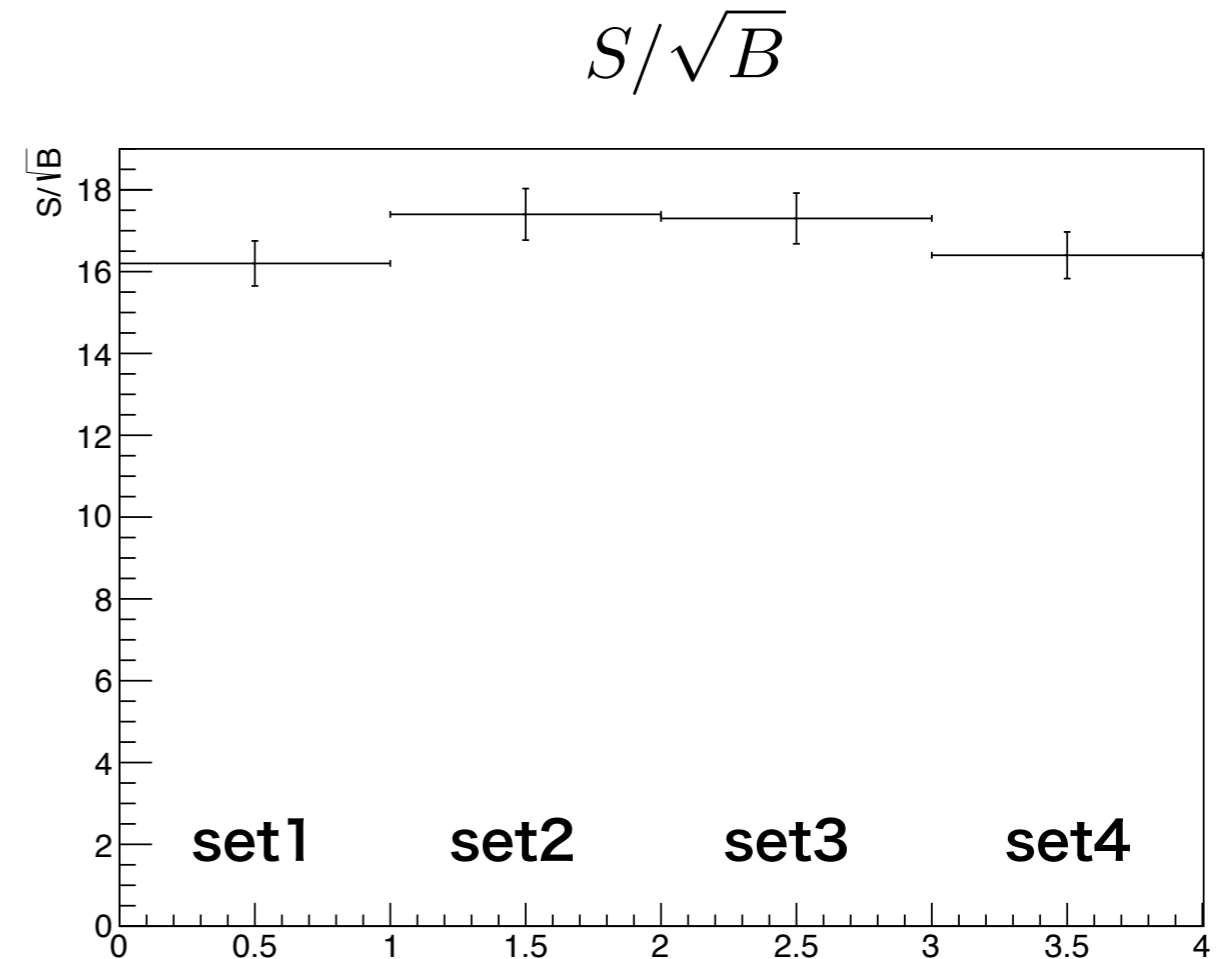
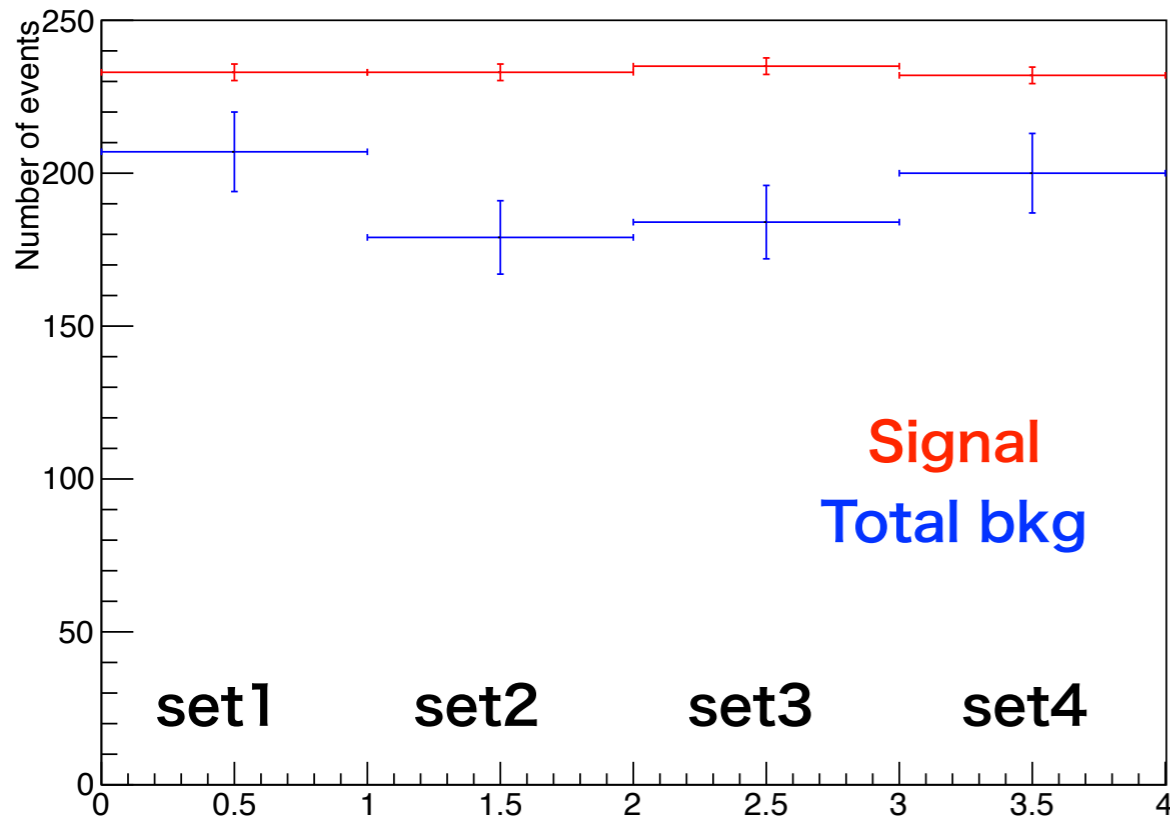


Better

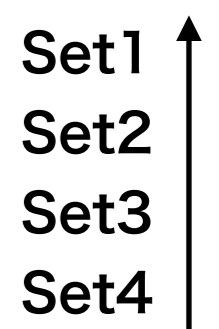
Set1
Set2
Set3
Set4

Comparison of the results

Number of signal and background
in signal region ($100 < M_{jj} < 130$ GeV)

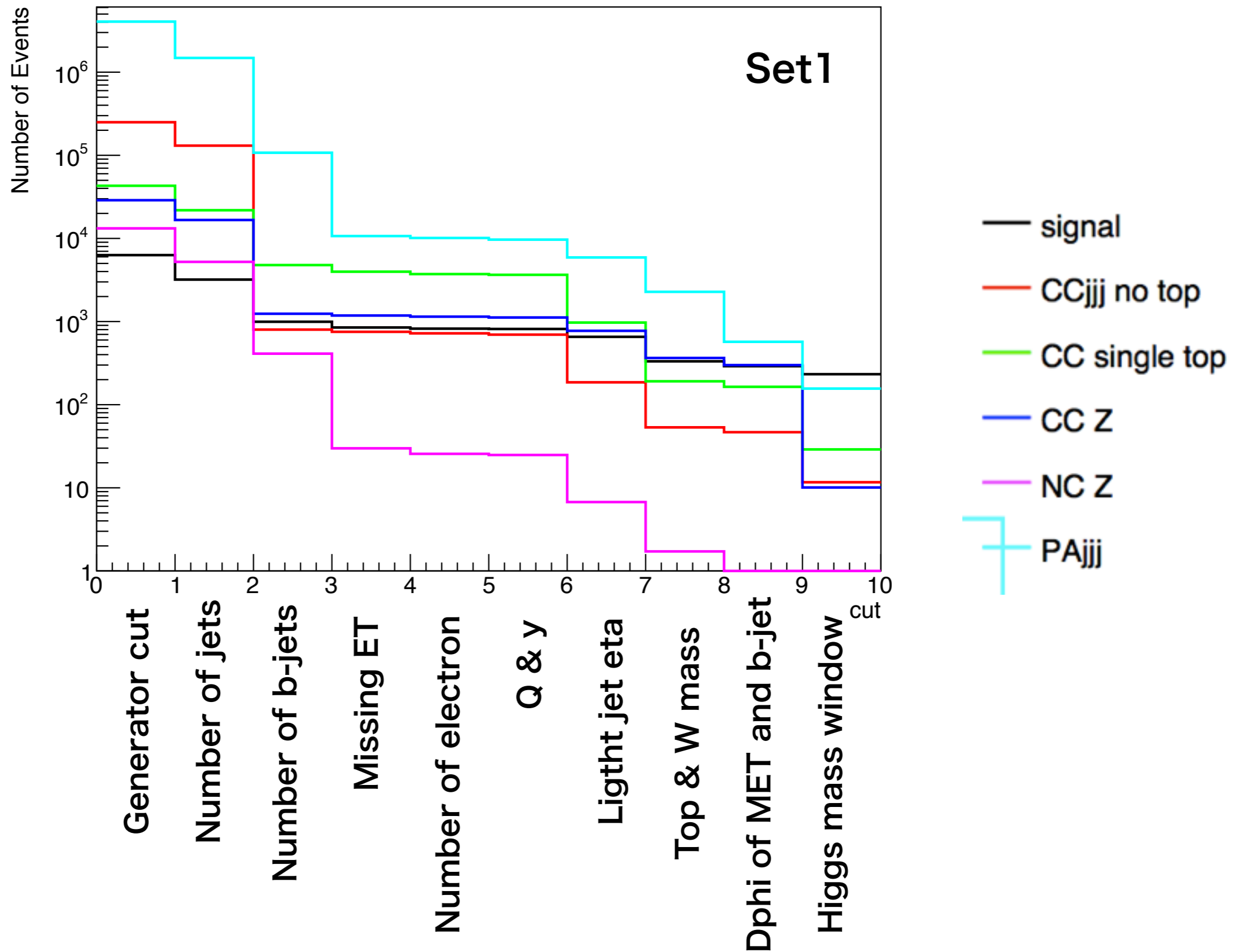


Better

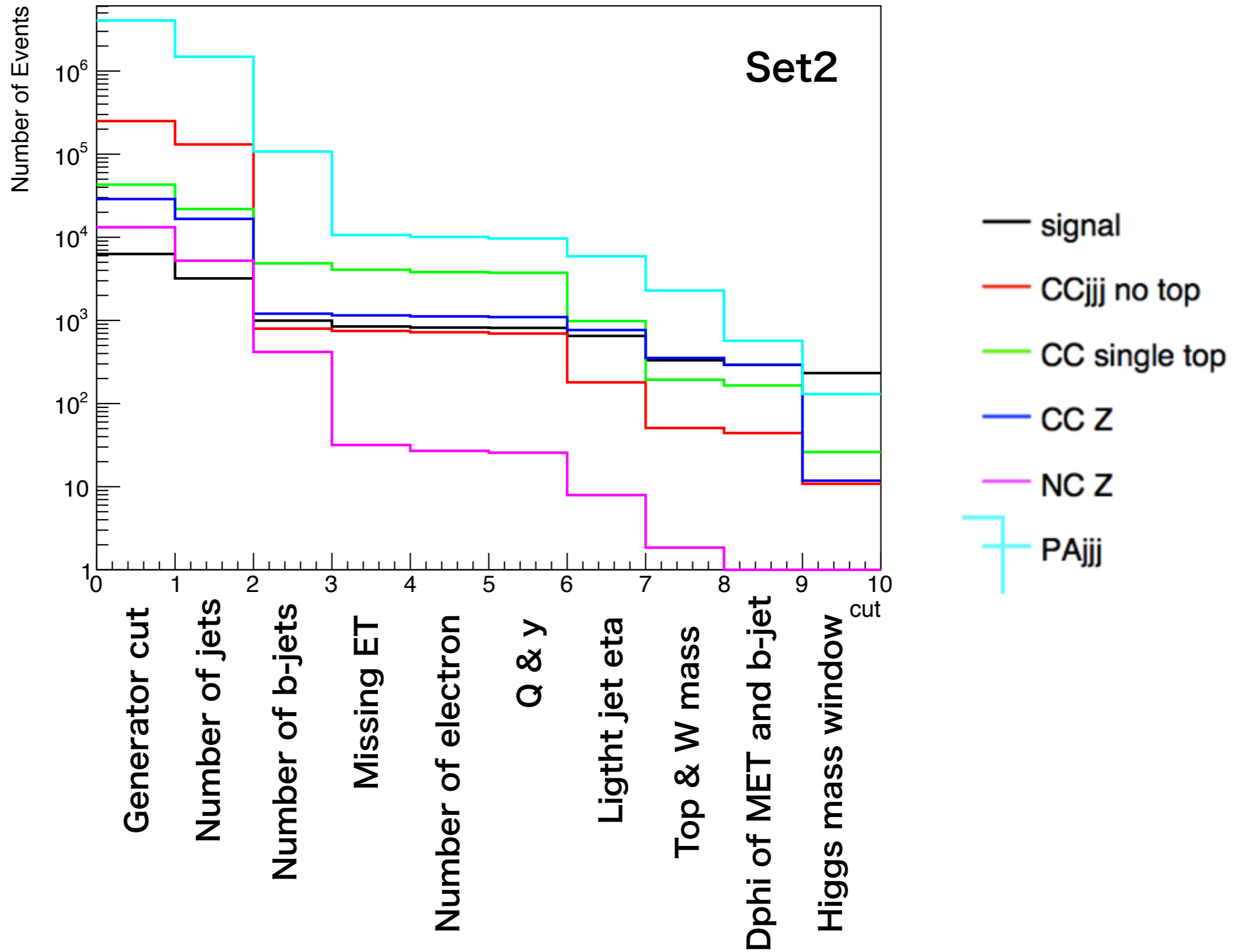


- Number of signal events is almost unchanged
- Number of bkg seems to decrease and S/\sqrt{B} is better as the resolution is better **except set1**
- Need to understand why result of set1 is worse than the other

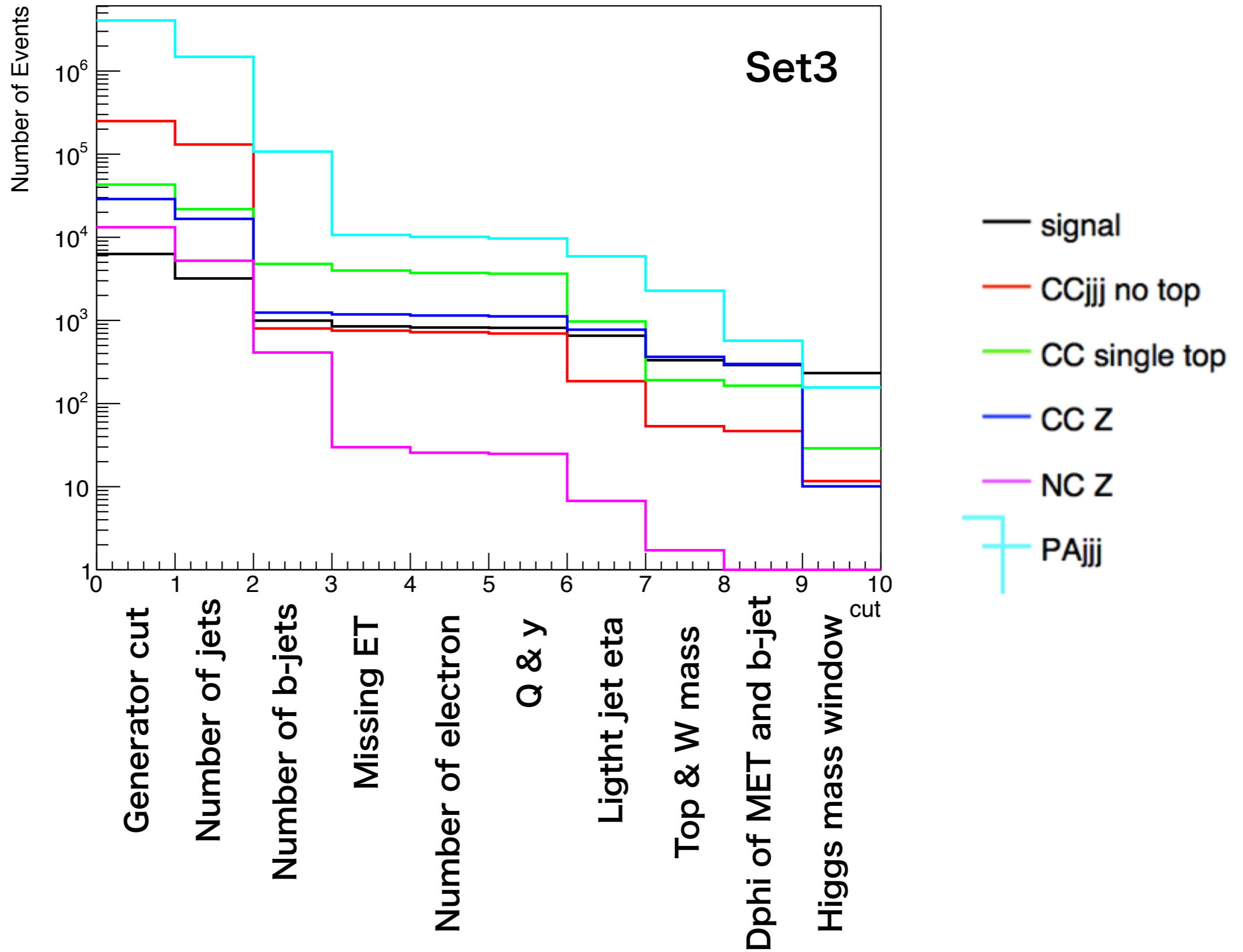
Event reduction



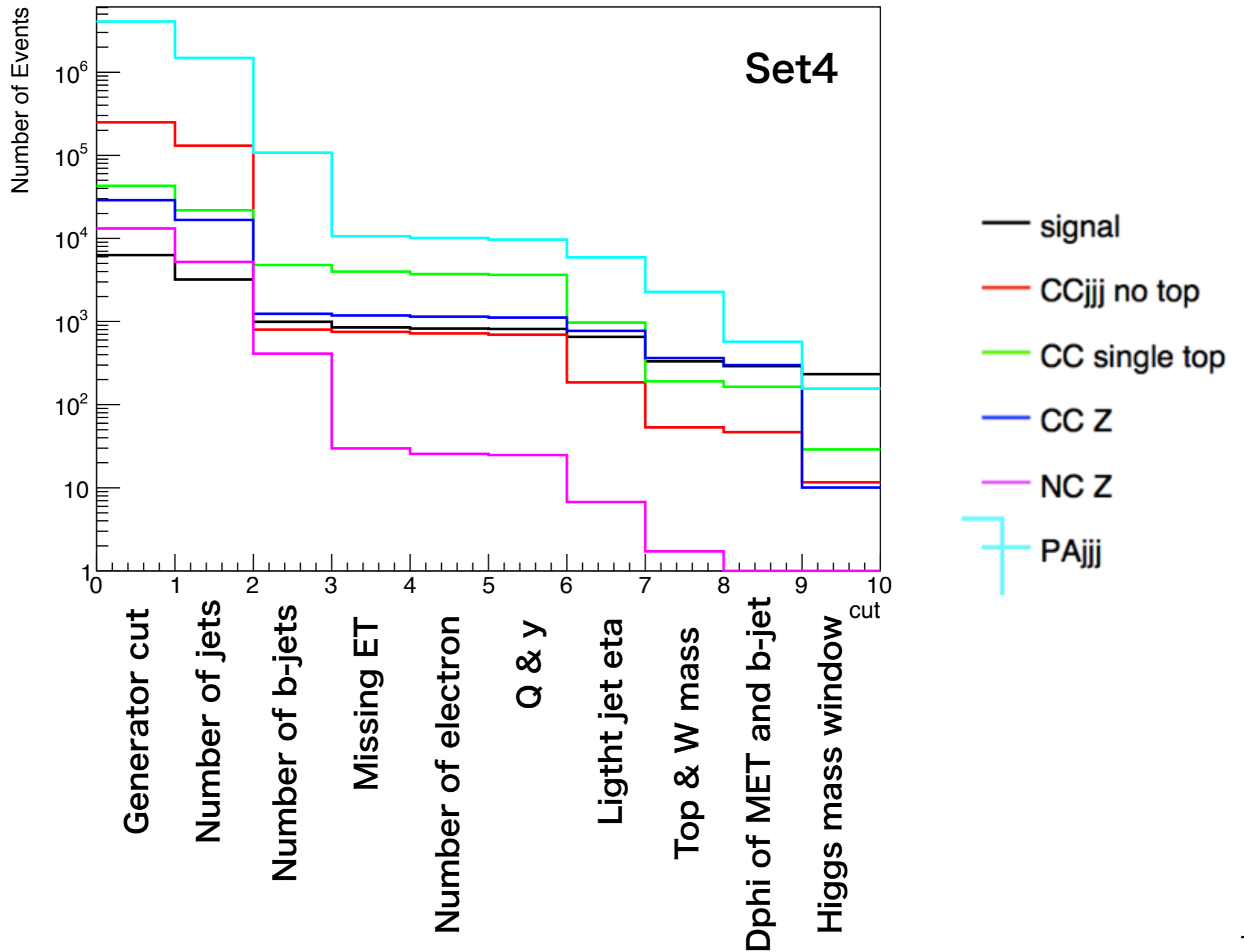
Event reduction



Event reduction

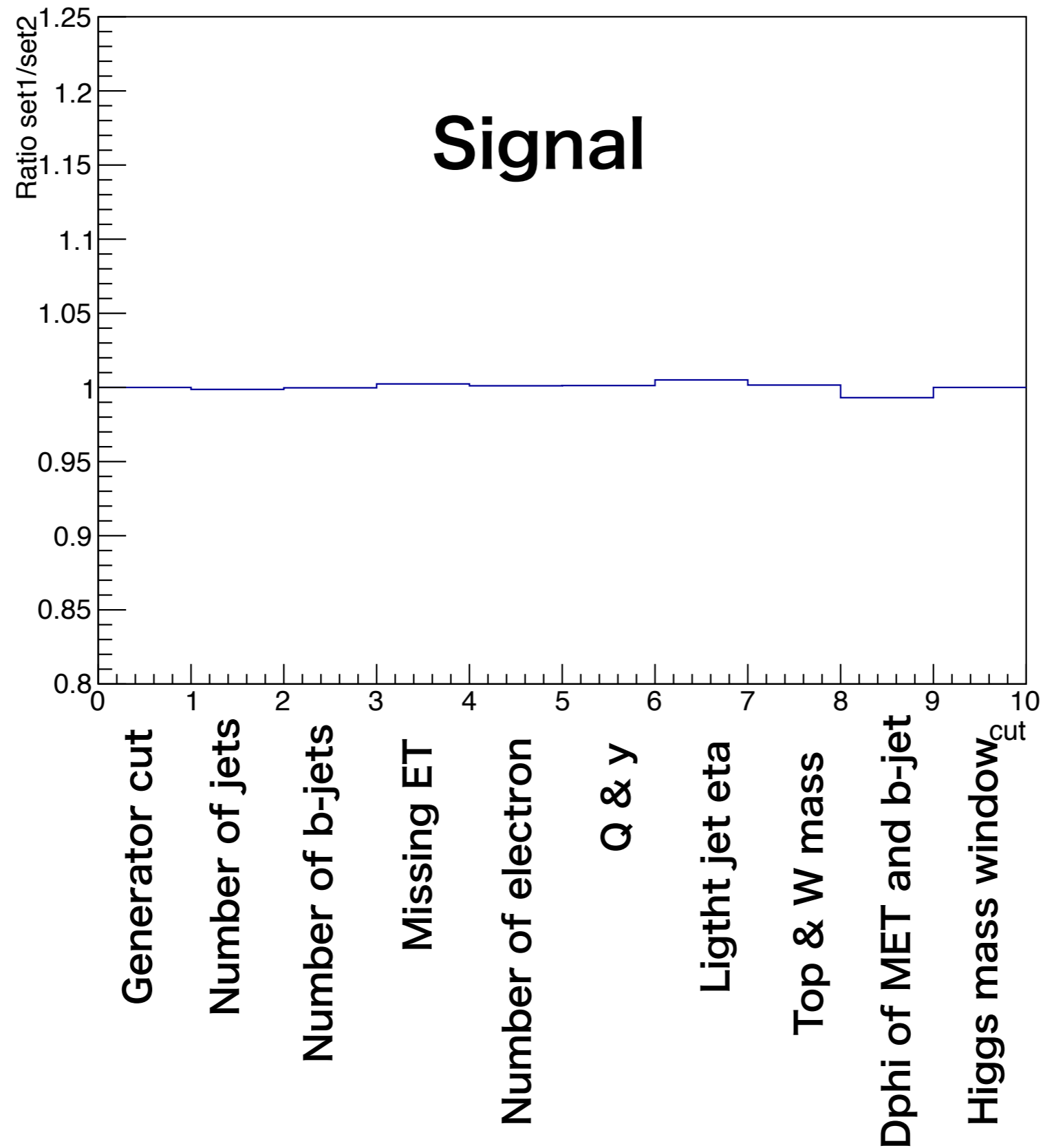


Event reduction



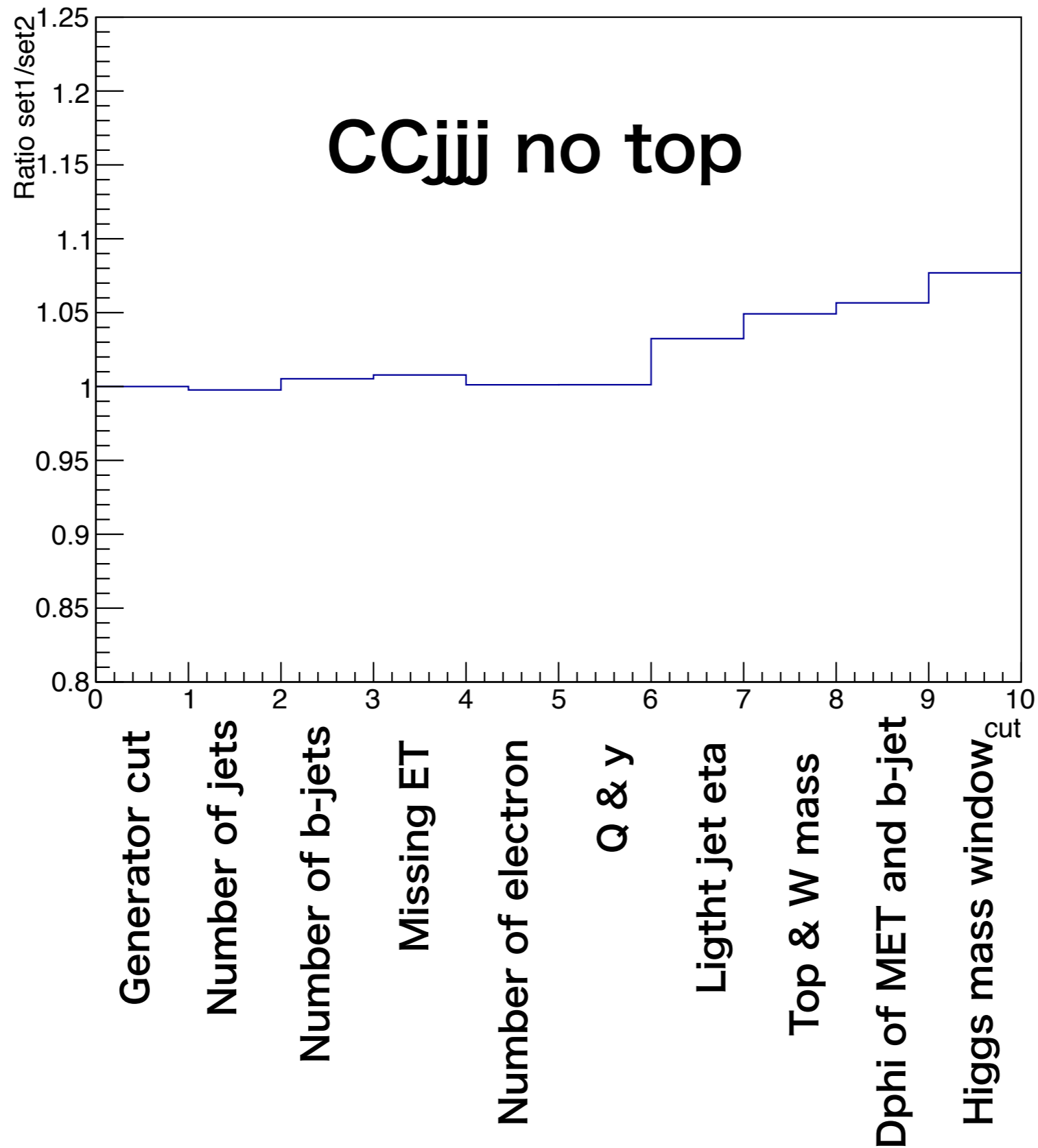
Comparison of event reduction

- Ratio of number of events (**set1/set2**) after each cut



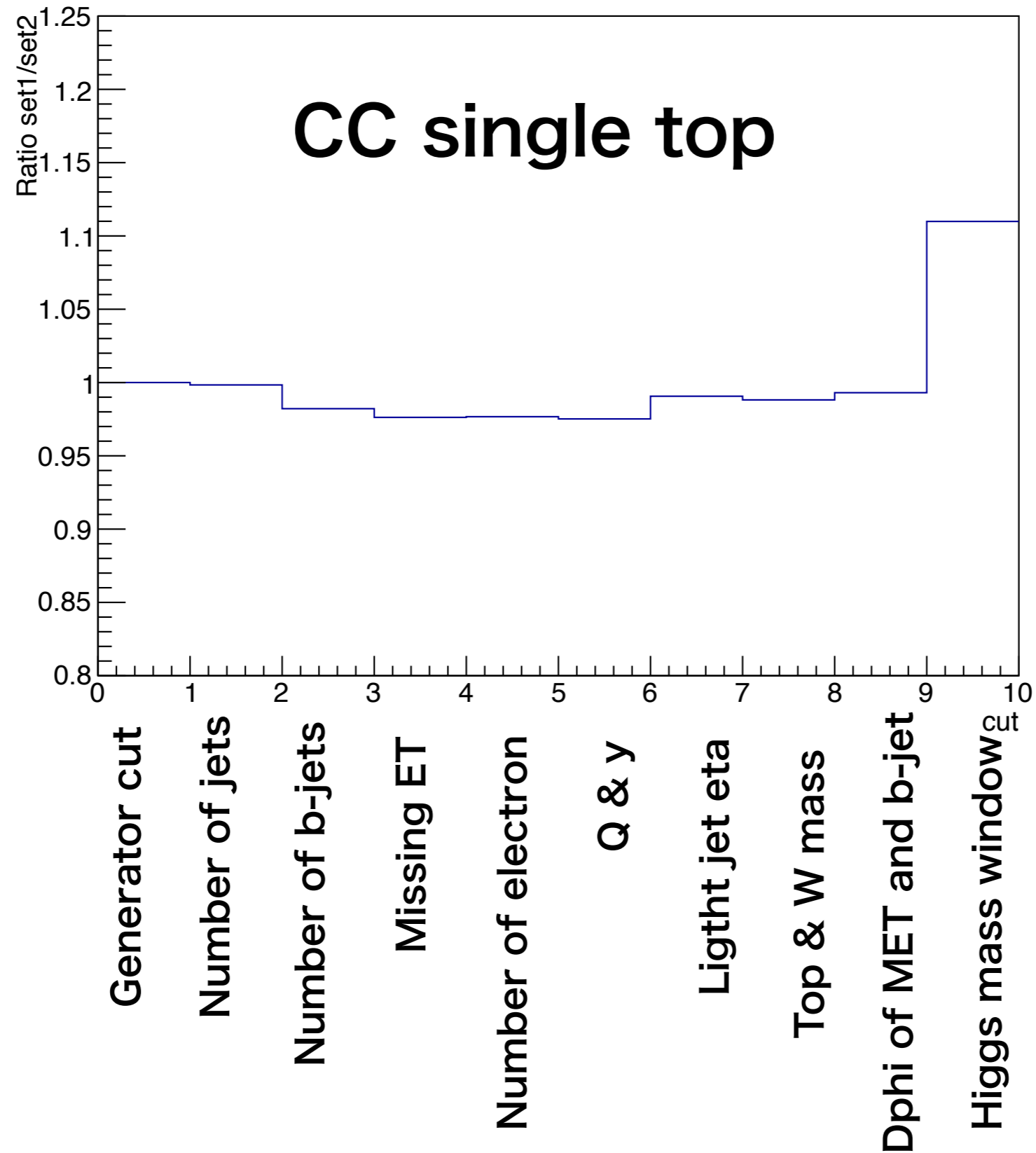
Comparison of event reduction

- Ratio of number of events (**set1/set2**) after each cut



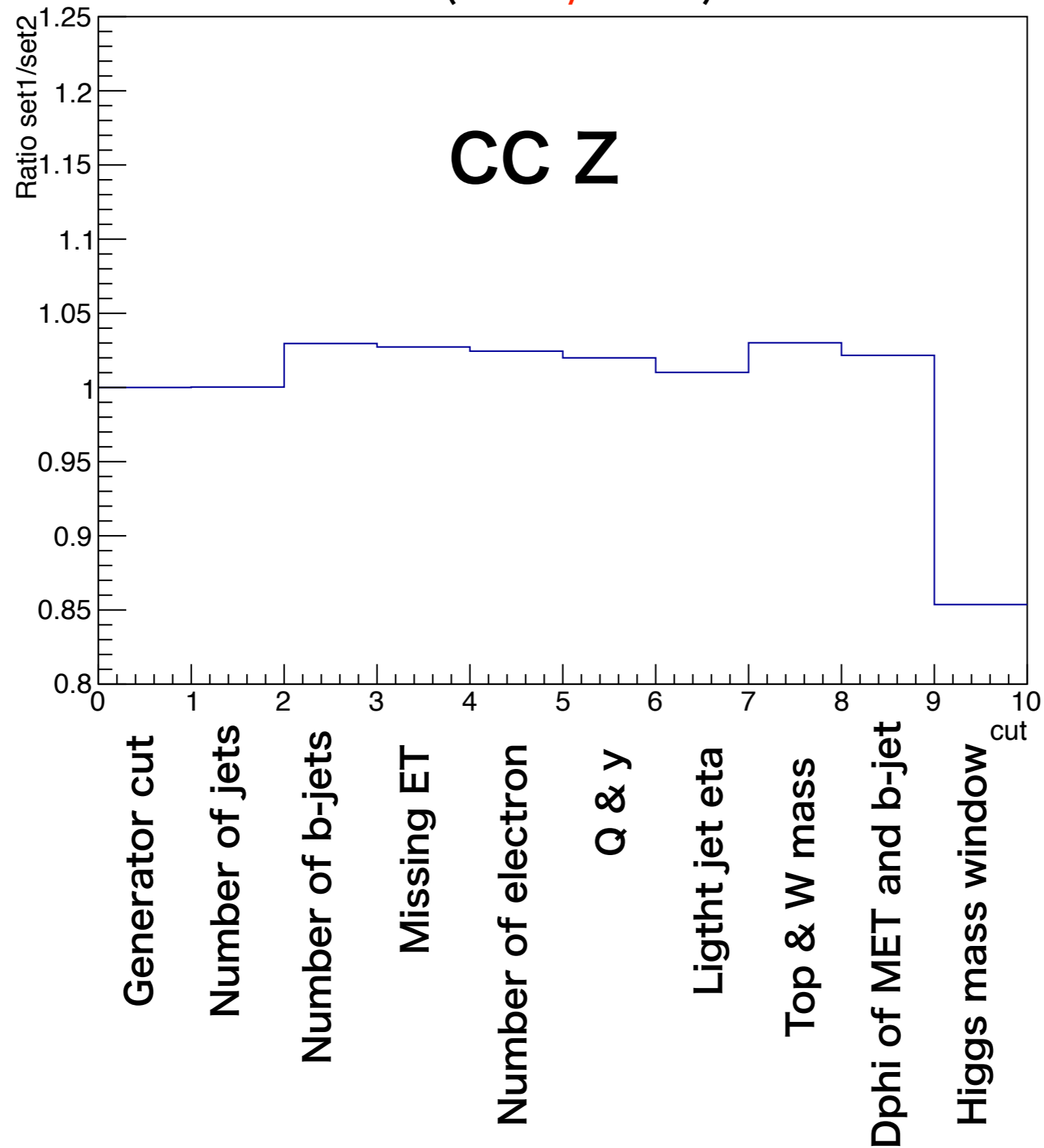
Comparison of event reduction

- Ratio of number of events (**set1/set2**) after each cut



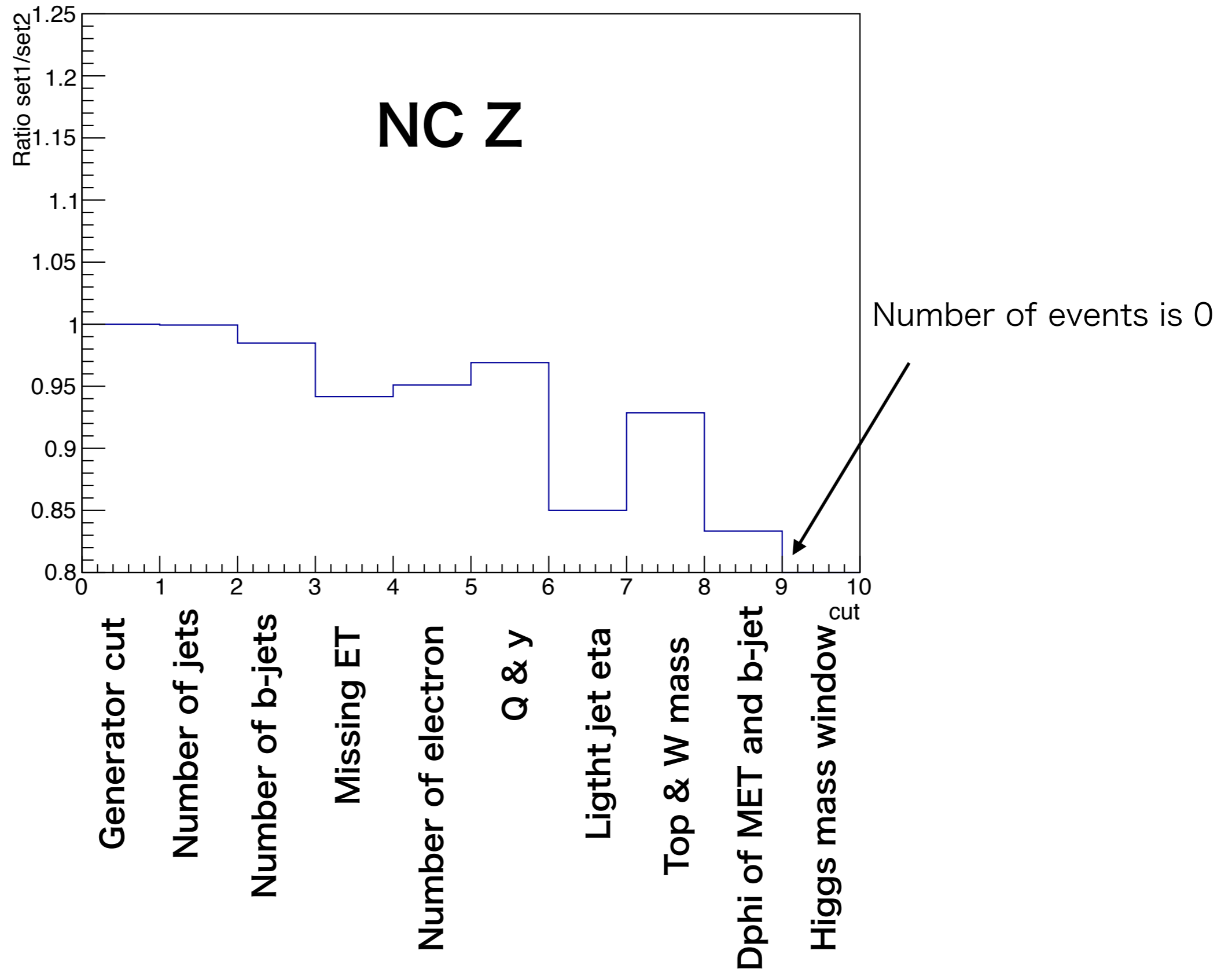
Comparison of event reduction

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Comparison of event reduction

- Ratio of number of events (**set1/set2**) after each cut

