Status Report

Tokyo Institute of Technology

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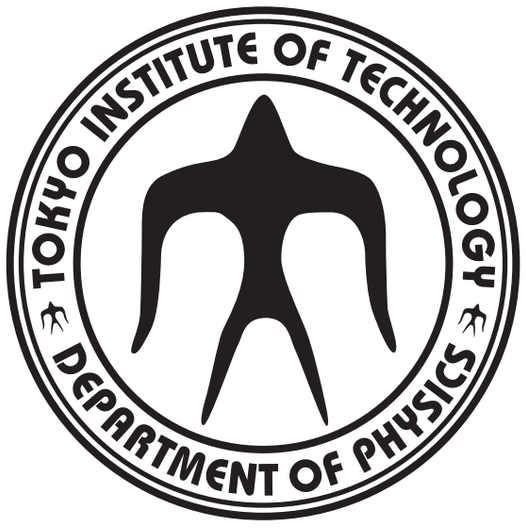


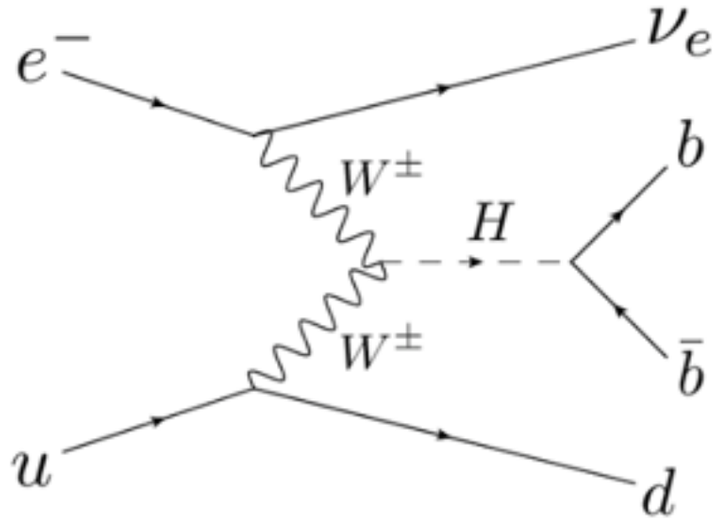
Table of contents

- MC based H->bb analysis at LHeC assuming 1ab^{-1}
  - MadGraph.v2.3.2, Pythia, Delphes.v3.1.2
  - Check of the results before and after bug fix of Delphes made by Satoshi

Signal and Background

- Signal is Charged Current H->bb events
- 1 ab^{-1} is assumed
- Assume 80% of incident electrons are polarized

CC: H->bb



List of MC sample

	σ (pb)	Nsample	N/ σ (ab^{-1})
Signal CC:H->bb	0.113	0.2M	1.76
CCjjj no top	4.5	2.6M	0.57
CC single top	0.77	0.9M	1.16
CC Z	0.52	0.6M	1.16
NC Z	0.13	0.15M	1.14
PAjjj	41	14M	0.35

↓

photo production events

Setup of LHeC detector

- Coverage:
  - Calorimeter: $|\eta|<5$ Tracking: $|\eta|<4.7$
- Jet reconstruction:
  - Anti k_T algorithm with ΔR =0.7
- HCal resolution

$$\frac{\sigma}{E} = \frac{35\%}{\sqrt{E}} + 3\%(|\eta| < 2) \qquad \frac{\sigma}{E} = \frac{45\%}{\sqrt{E}} + 5\%(2 < |\eta| < 5)$$

- ECal resolution

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

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

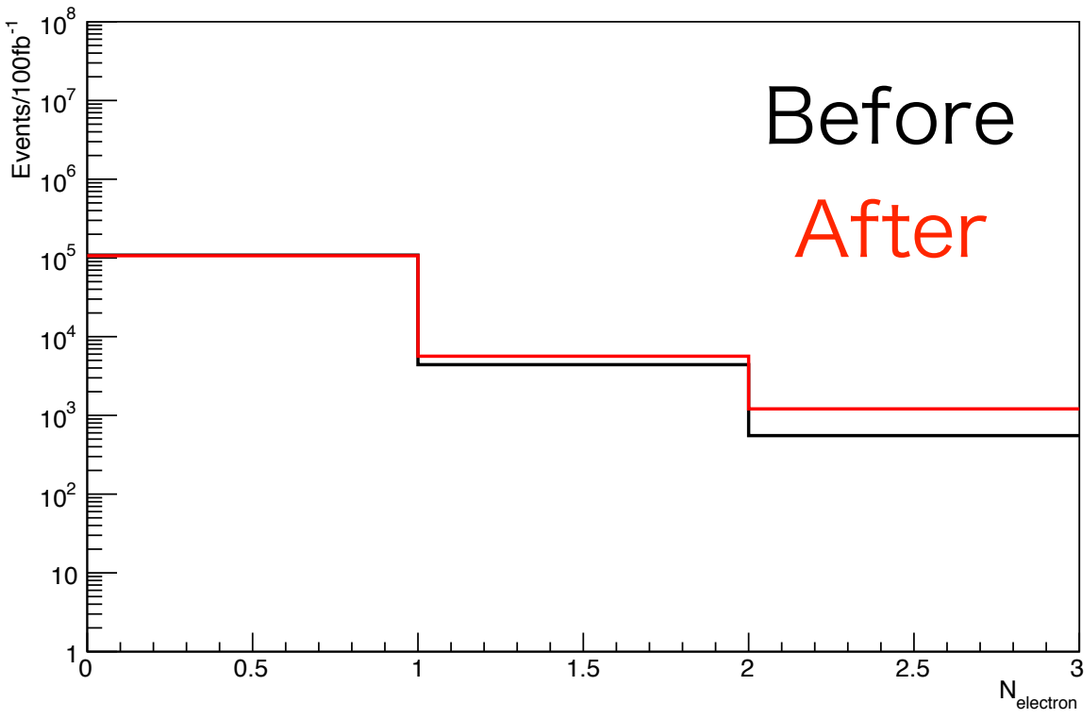
$$\frac{\sigma}{E} = \frac{40\%}{\sqrt{E}} \bigoplus 10\% \ (4 < |\eta| < 5)$$

- B-tag
  - $|\eta| < 3.0$
  - B-jet ID: 60%
  - C-jet mis-ID: 10%
  - Light jet mis-ID: 1%

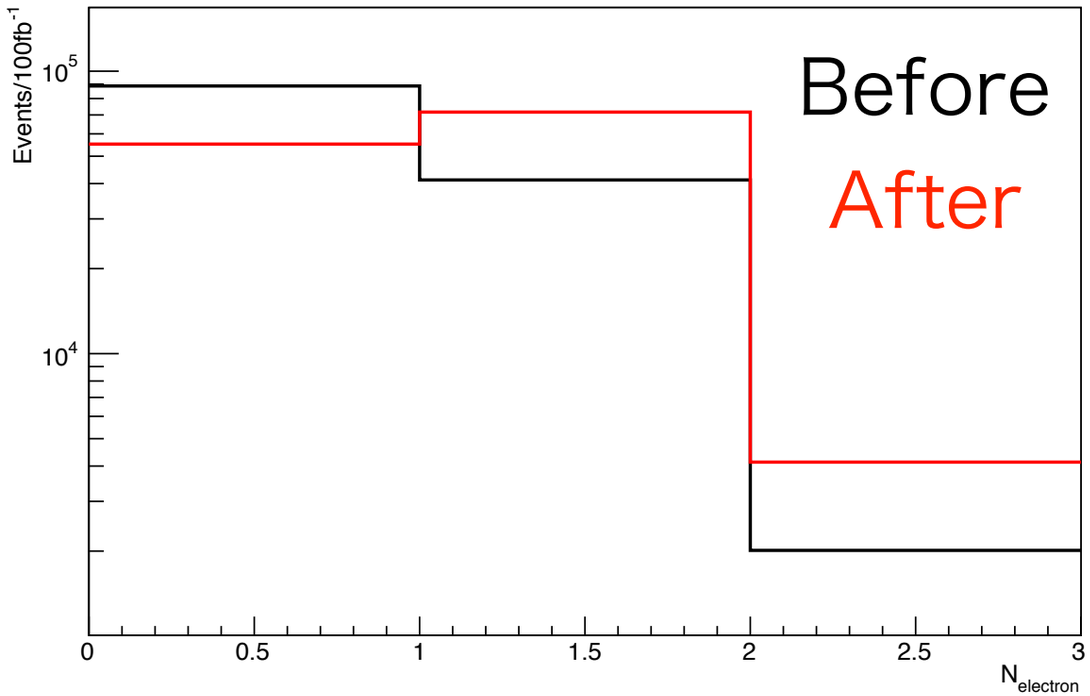
Number of Electron before and after bug fix

- Number of Electron without any cuts

CC: H->bb



NC Z production



- Number of Electron increase for NC events

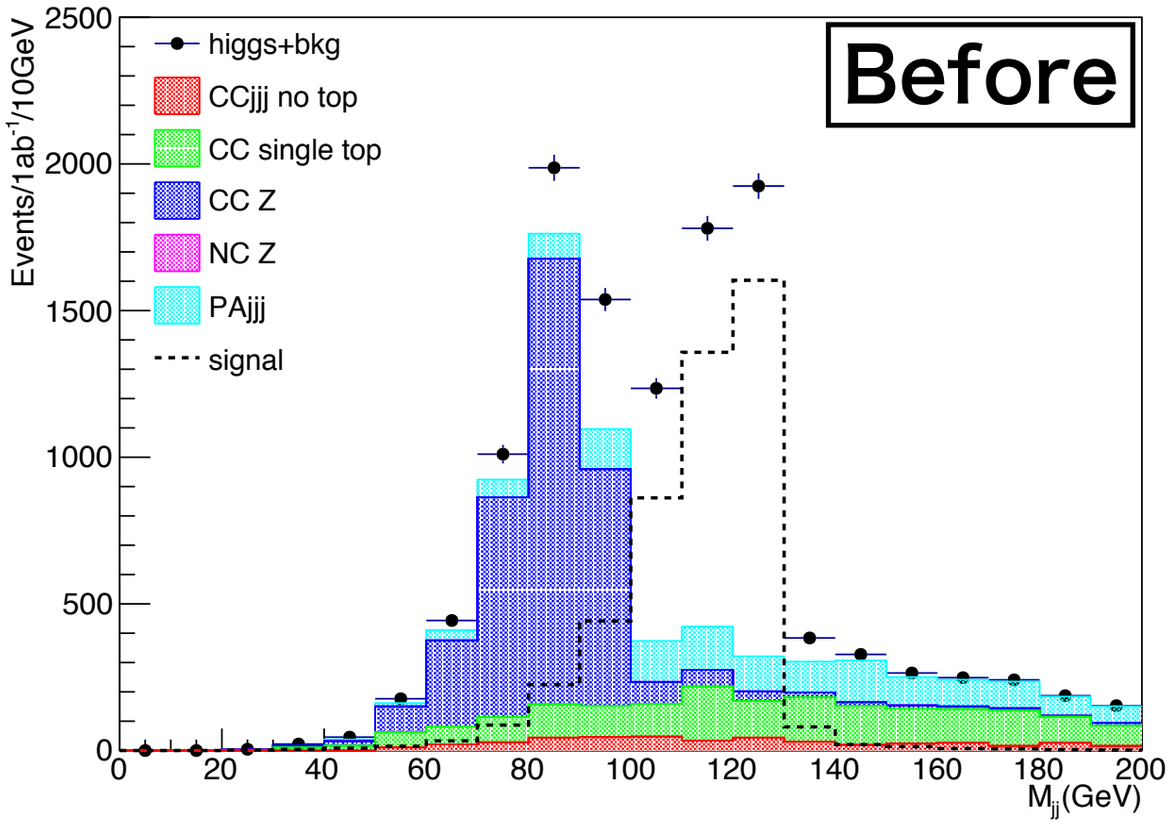
➡ Number of NC background decrease by applying electron veto

- In case of CC events like signal, number of fake electron increase

➡ Number of signal decrease by applying electron veto

Result

- Result before and after bug fix



signal: 3822 +- 47

CCjjj no top: 125 +- 15

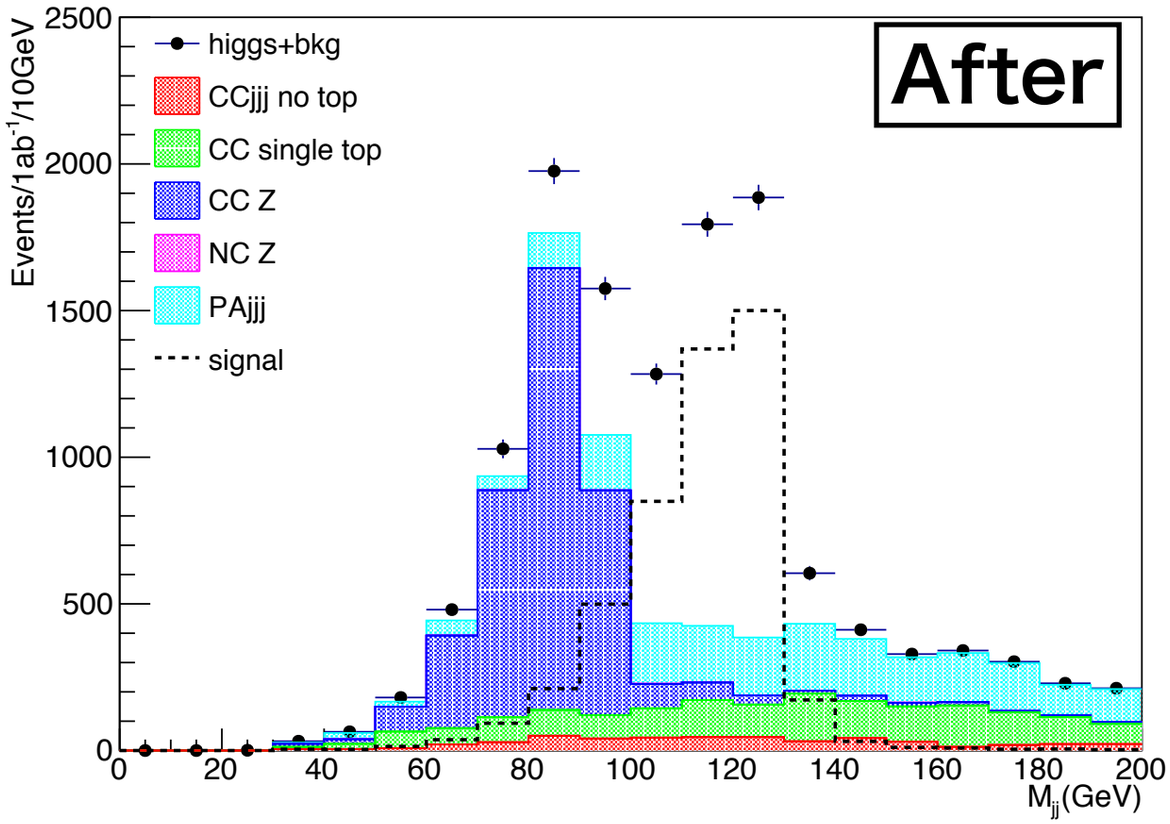
CC single top: 421 +- 19

CC Z: 164 +- 12

NC Z: 0

PAjjj: 407 +- 56

σ_g/g 0.0095



signal: 3719 +- 46

CCjjj no top: 136 +- 15

CC single top: 337 +- 17

CC Z: 174 +- 12

NC Z: 0

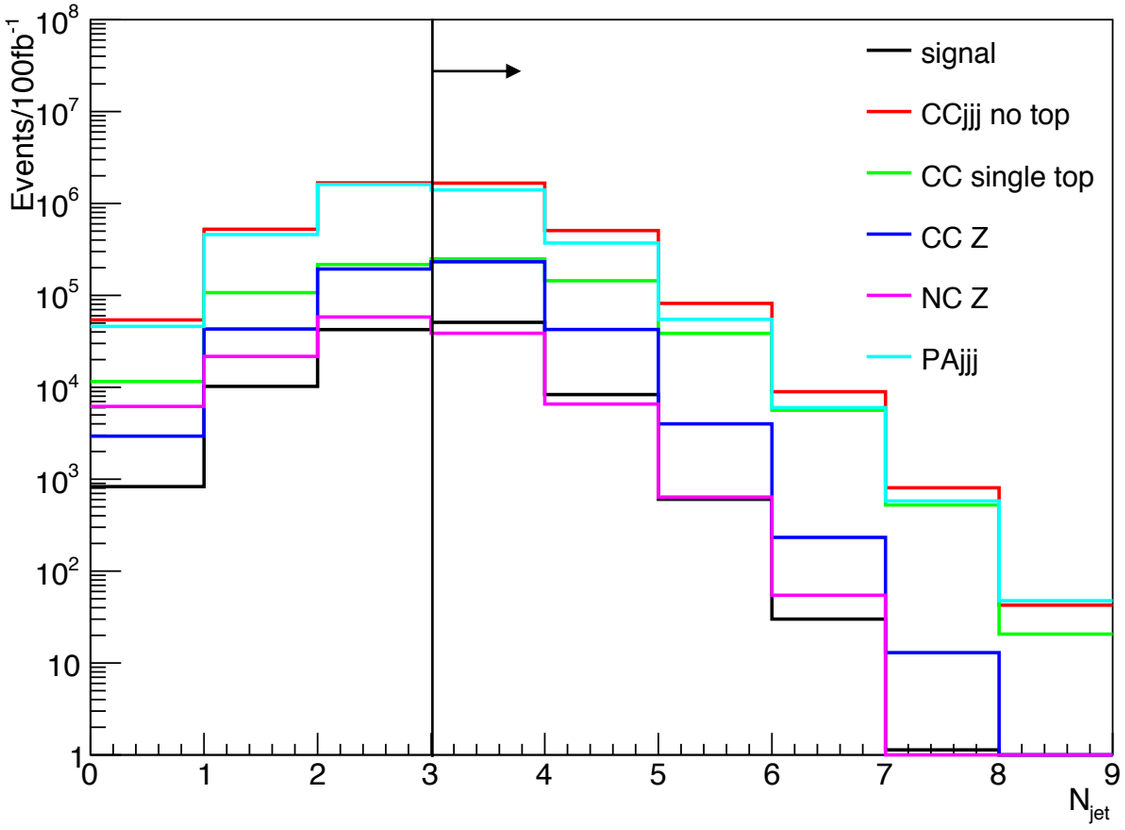
PAjjj: 597 +- 68

σ_g/g 0.0096

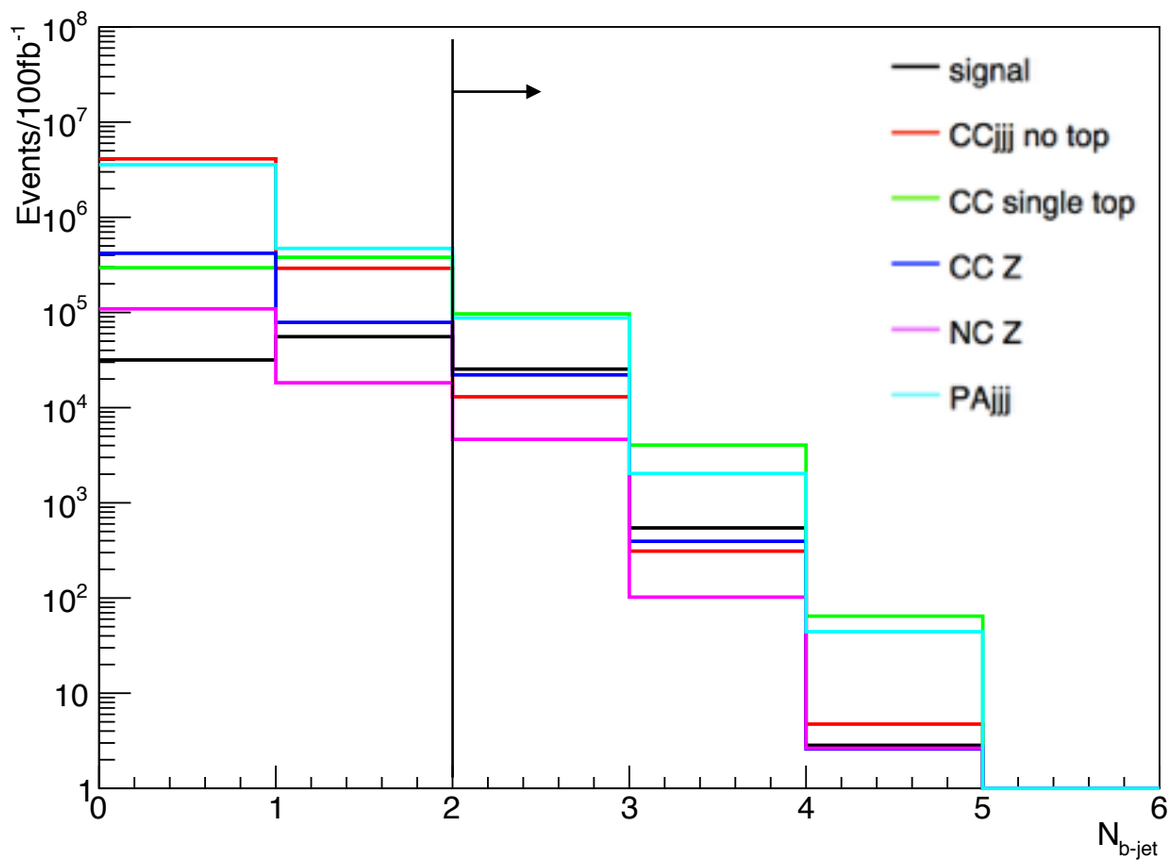
backup

Each cut parameter

Number of jets (p_T>20GeV)

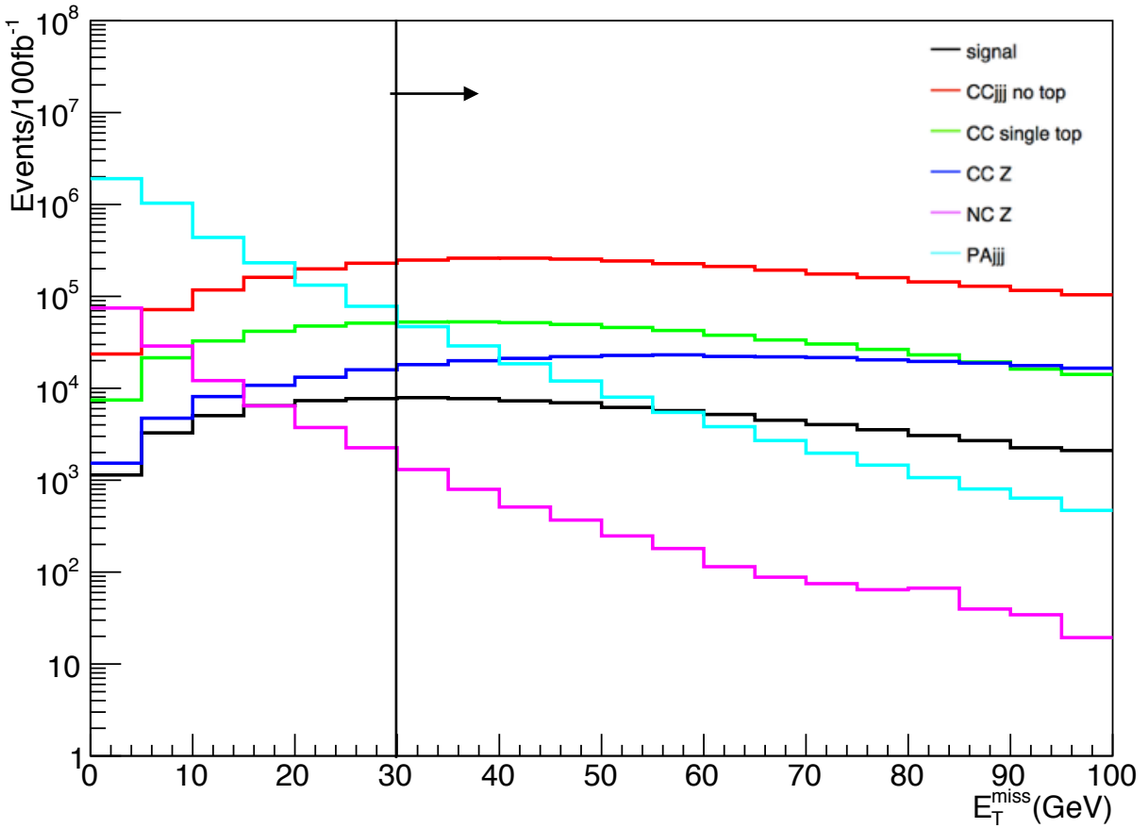


Number of b-jets (p_T>20GeV)

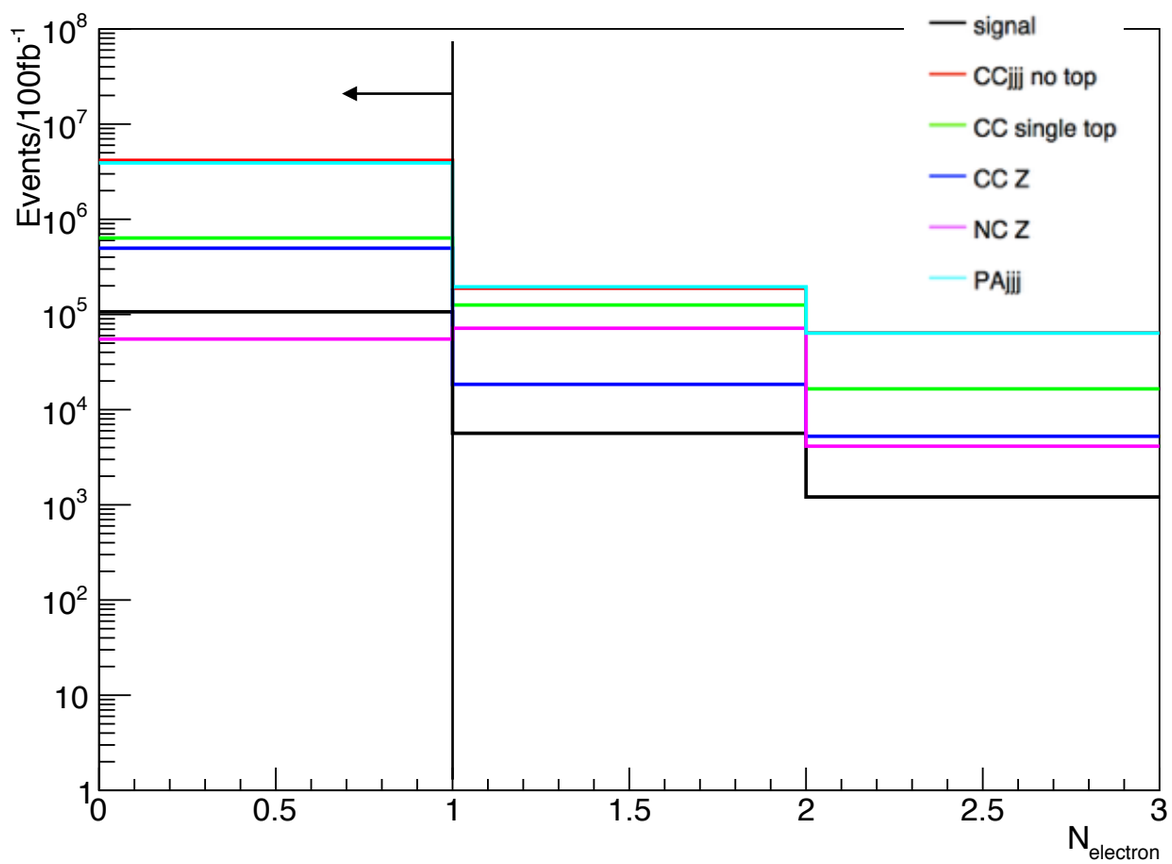


Each cut parameter

Missing ET

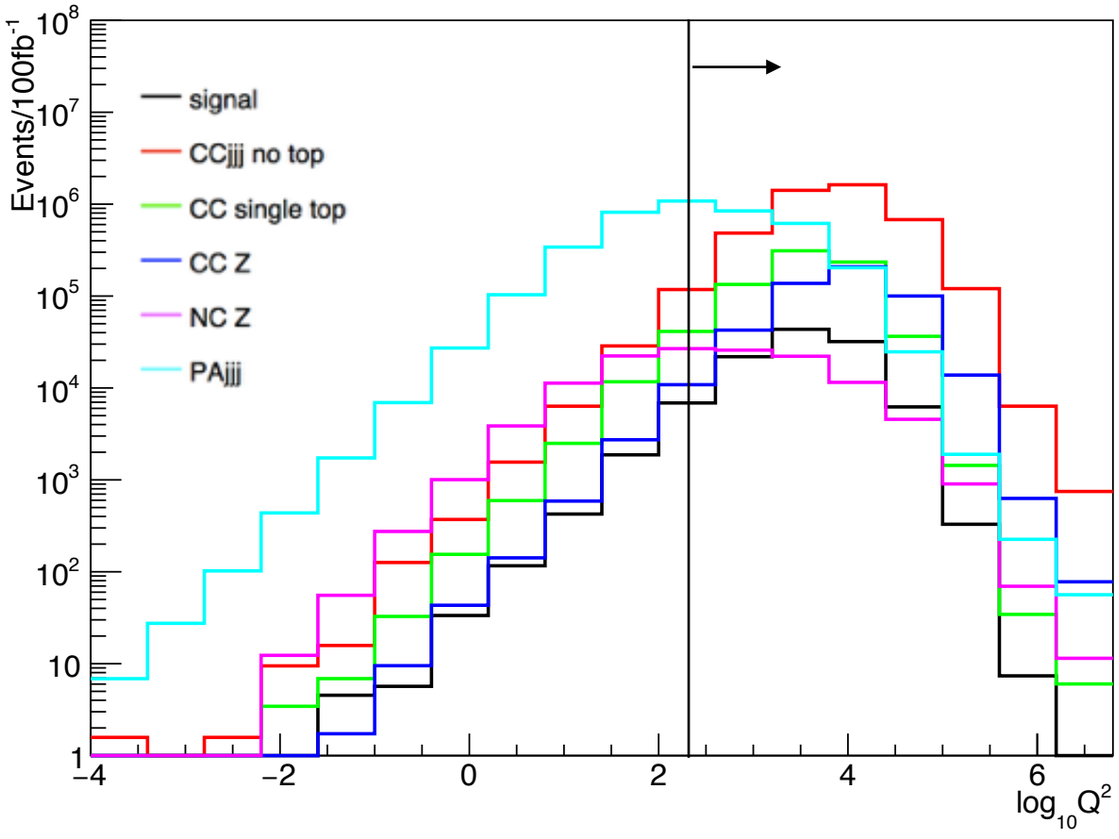


Number of electrons

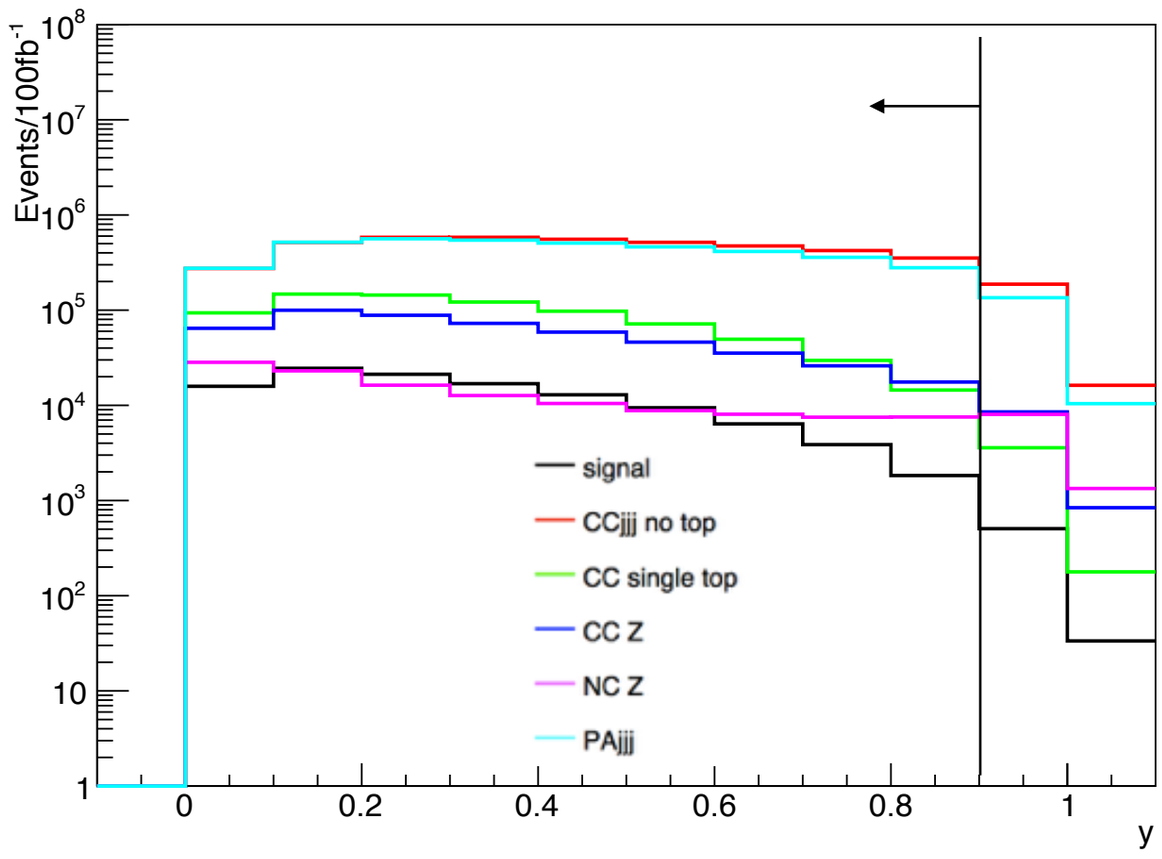


Each cut parameter

Momentum trunsfer



y



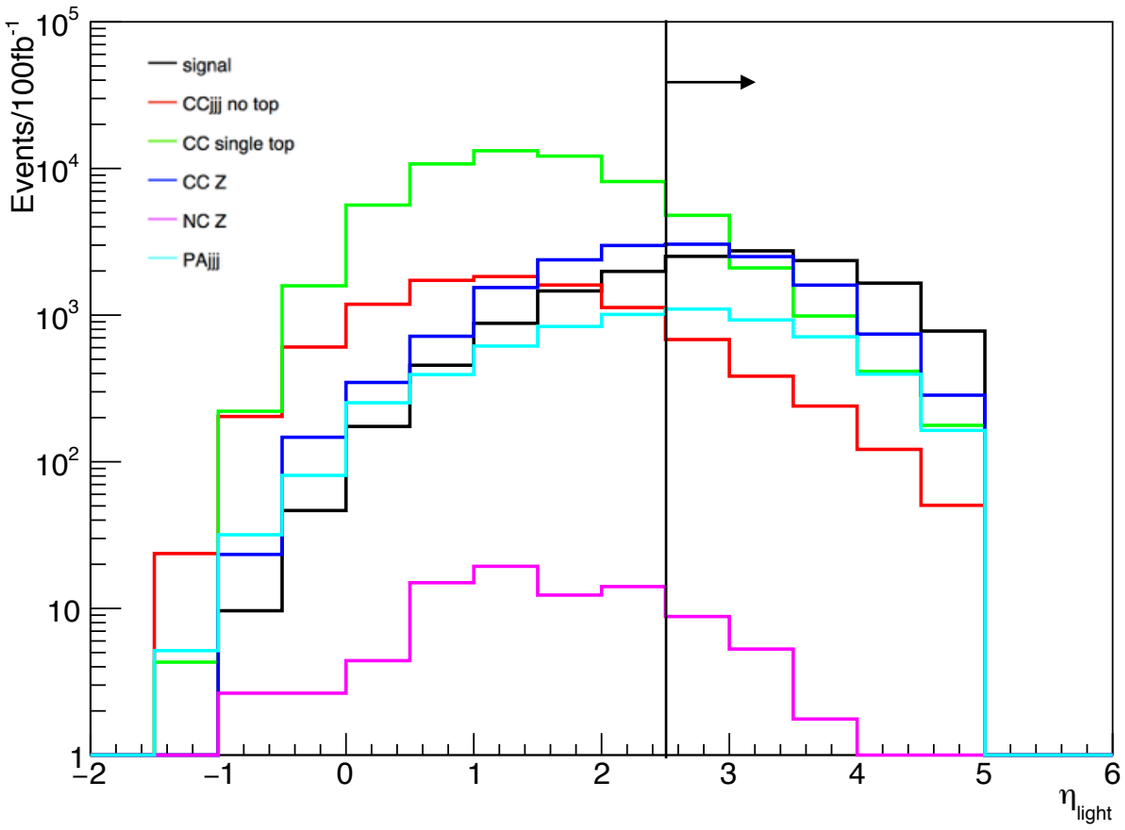
$$Q_h^2 = \frac{(\sum_{hadron} p_x)^2 + (\sum_{hadron} p_y)^2}{1 - y_h}$$

$$y_h = \frac{\sum_{hadron}(E - p_z)}{E_e}$$

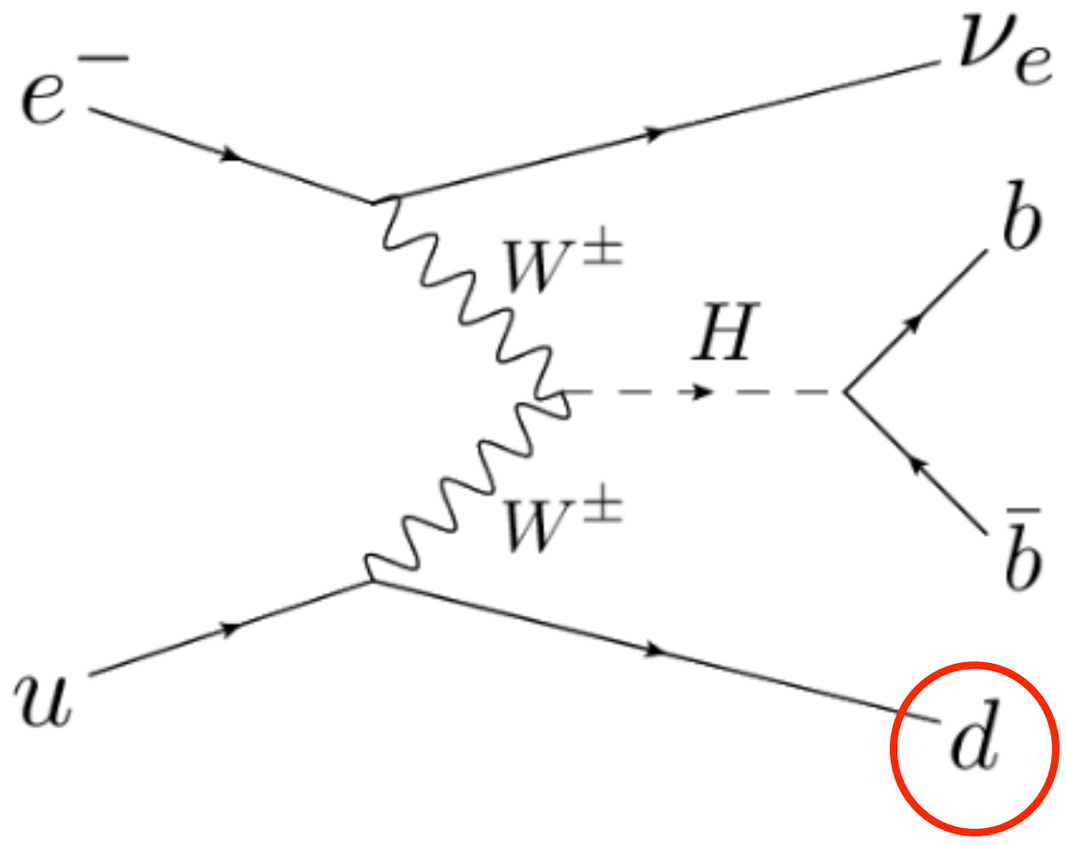
Each cut parameter

- Definition of light jet:
  Minimum η jet except for 1st and 2nd minimum η b-jets
- After previous cuts are applied

Light jet η

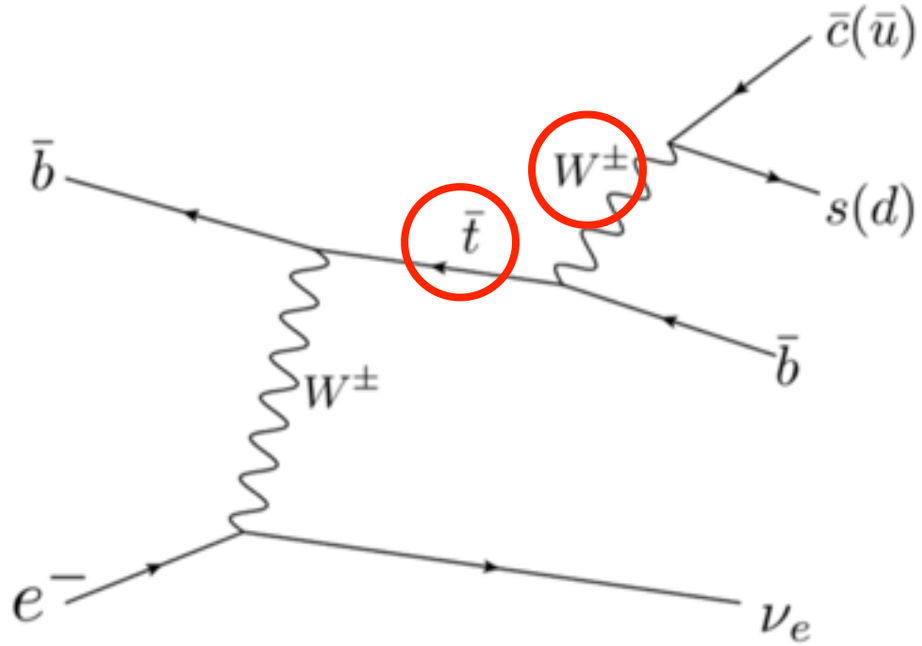


CC: H->bb



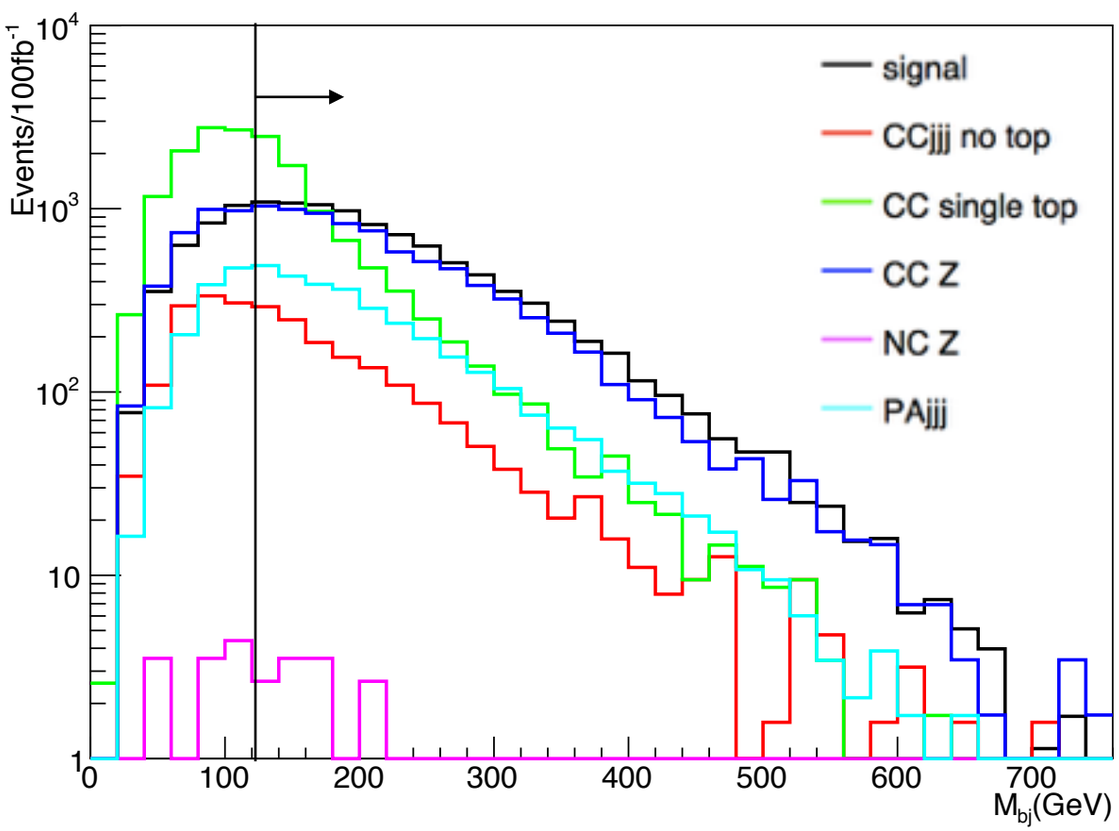
Each cut parameter

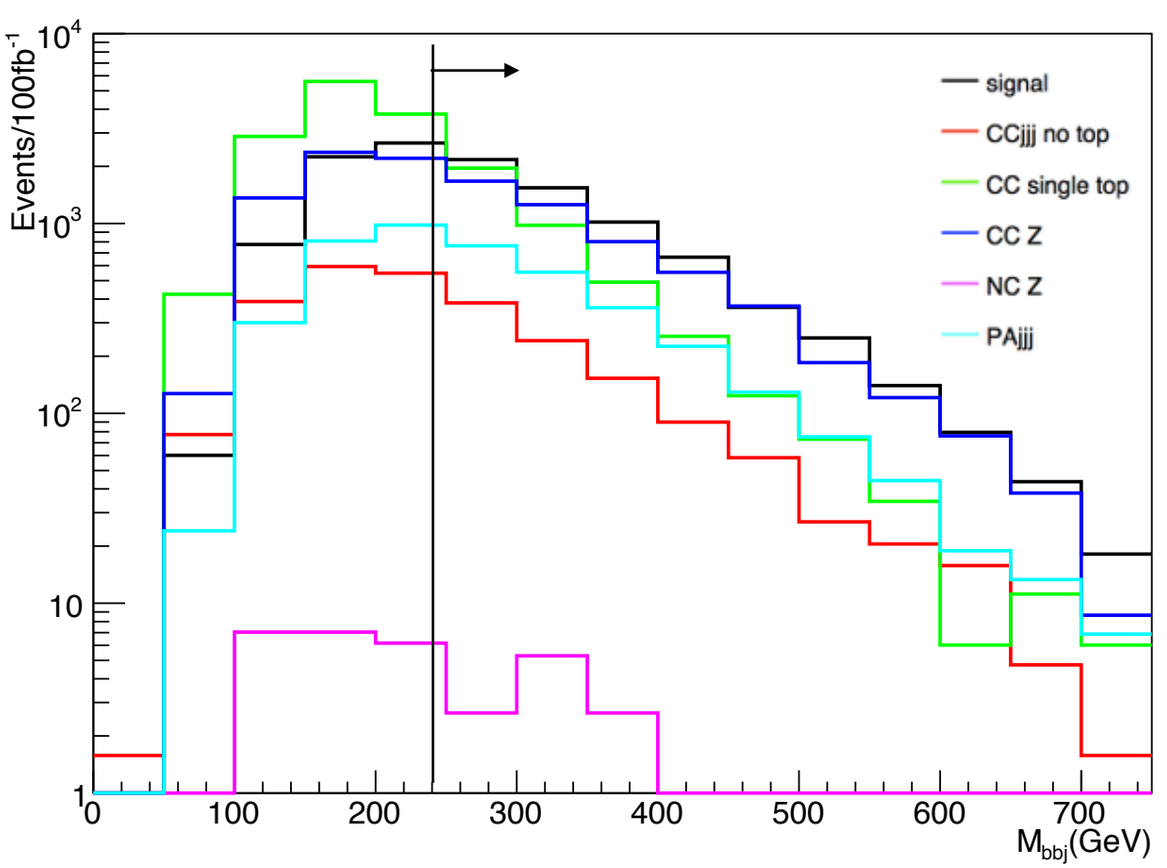
- Definition of W mass:
  Mass of light jet and minimum b-jet
- Definition of top mass:
  mass of light jet and
  1st and 2nd minimum b-jets
- After previous cuts are applied



Top mass

W masss





Each cut parameter

- $\Delta\phi$ between missing ET and 1st and 2nd minimum b-jets
- CC and NC events can be separated well
- After previous cuts are applied

CC: H->bb

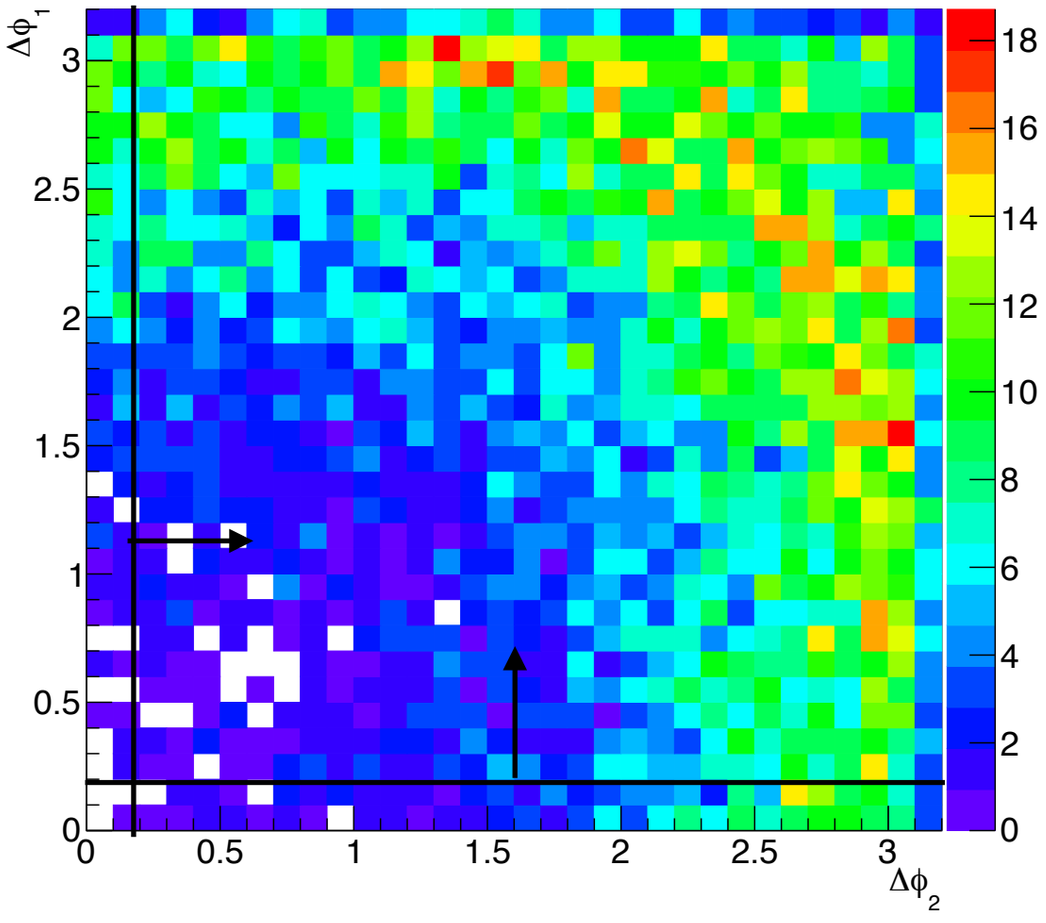
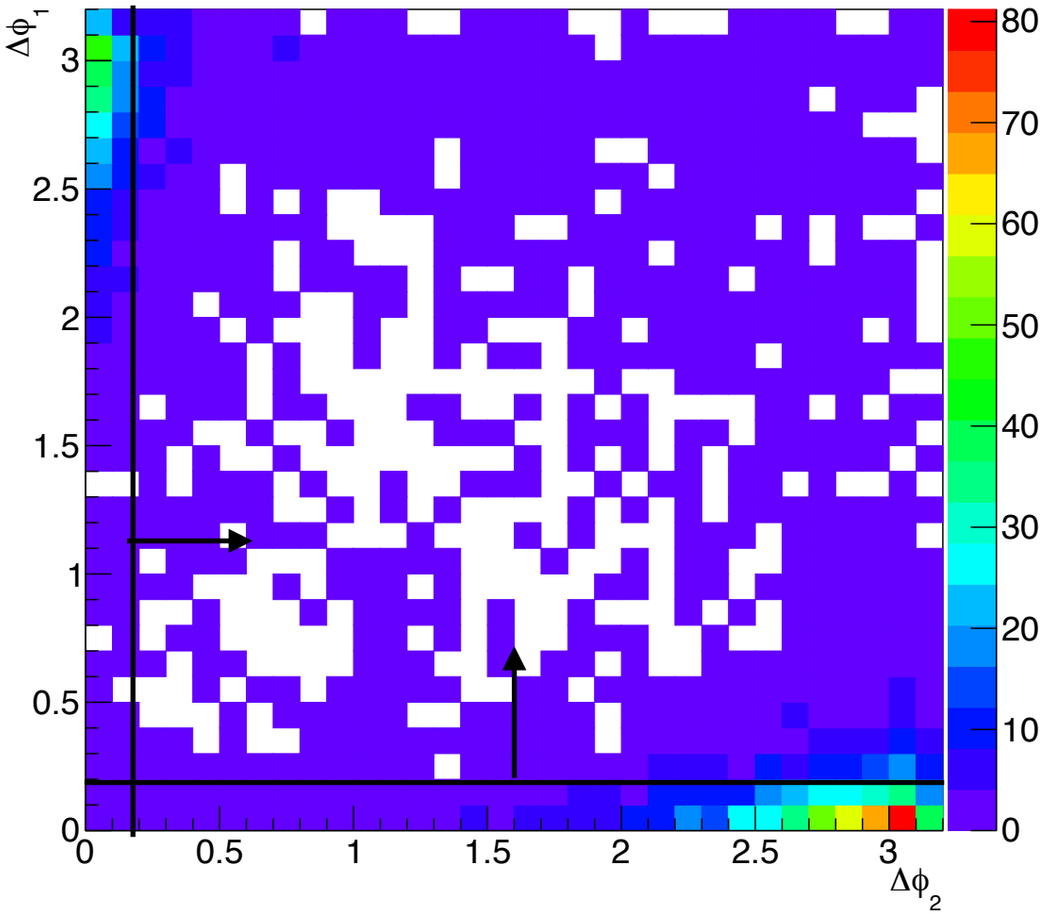



Photo production