Status Report

Tokyo Institute of Technology

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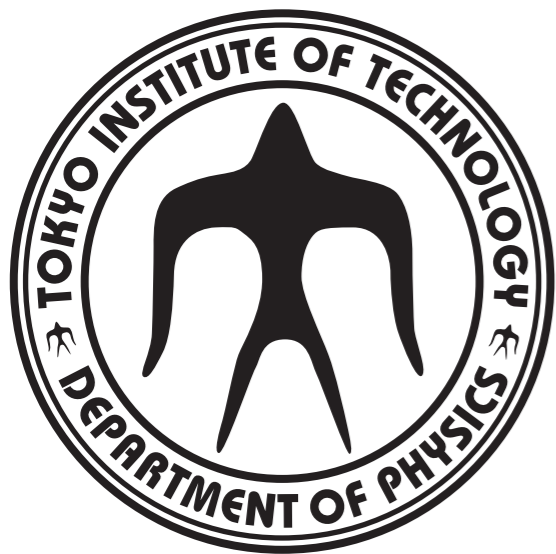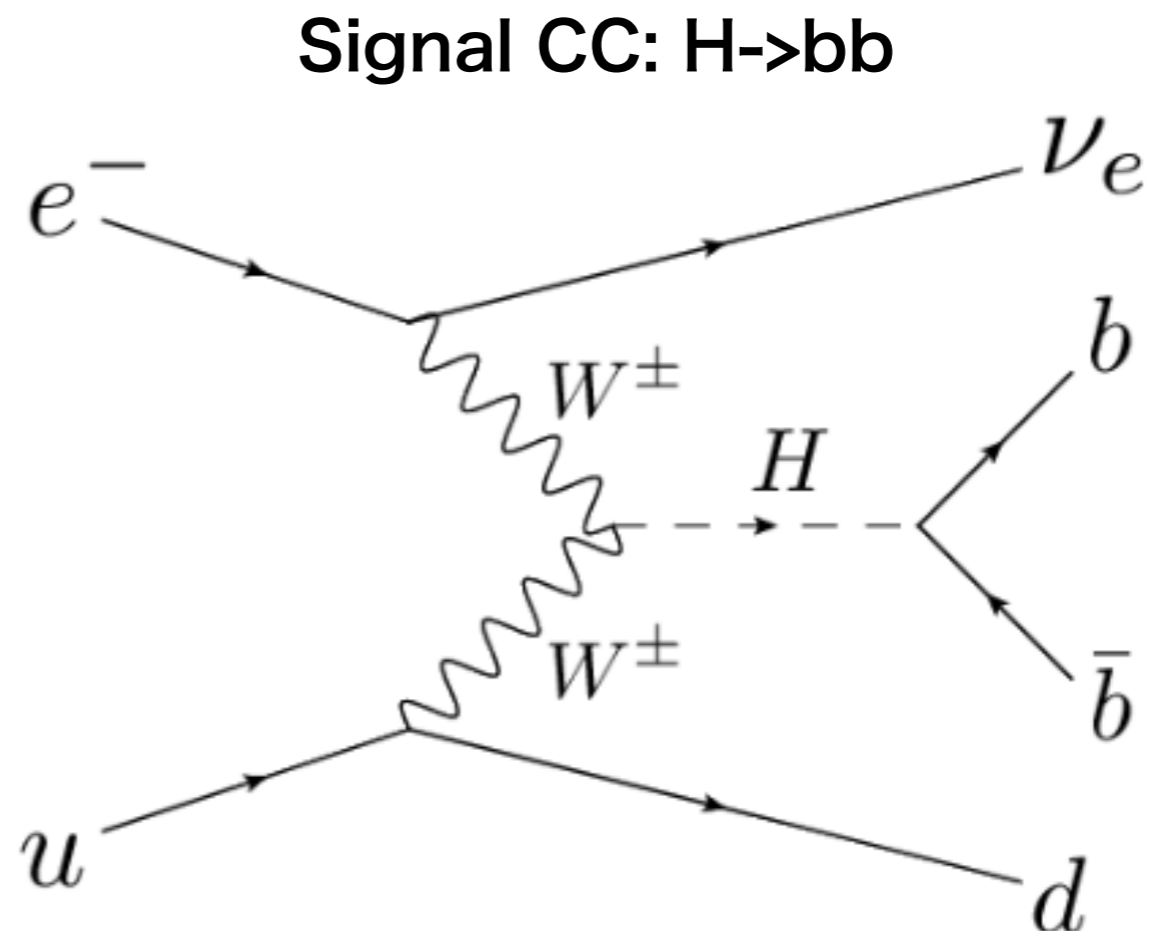
Table of contents

- MC based H->bb analysis at LHeC and FCC ep assuming 100 ab^{-1}
  - MadGraph.v2.3.2, pythia-pgs.v2.4.4, Delphes.v3.1.2
  - New Delphes cards are used
    - delphes_card_FCCeh_PK.tcl
    - delphes_card_LHeC_PK.tcl

Signal CC: H->bb

Used sample

- LHeC: 7 TeV proton & 60 GeV electron
- FCC ep: 50 TeV proton & 60 GeV electron
- Assumed 100 fb^{-1} respectively

LHeC

	σ (pb)	Nsample	N/σ (fb^{-1})
Signal CC:H->bb	0.113	0.2M	1760
CCjjj no top	4.5	2.6M	570
CC single top	0.77	0.9M	1160
CC Z	0.52	0.6M	1160
NC Z	0.13	0.15M	1140
PAjjj	41	14M	350

FCC

	σ (pb)	Nsample	N/σ (fb^{-1})
Signal CC:H->bb	0.467	0.15M	321
CCjjj no top	21.2	1.95M	92
CC single top	9.75	1.05M	108
CC Z	1.6	0.15M	94
NC Z	0.33	0.15M	455
PAjjj	262	12.9M	49

Comparison of old and new LHeC card file

Mass of 2 b-jets after event selection
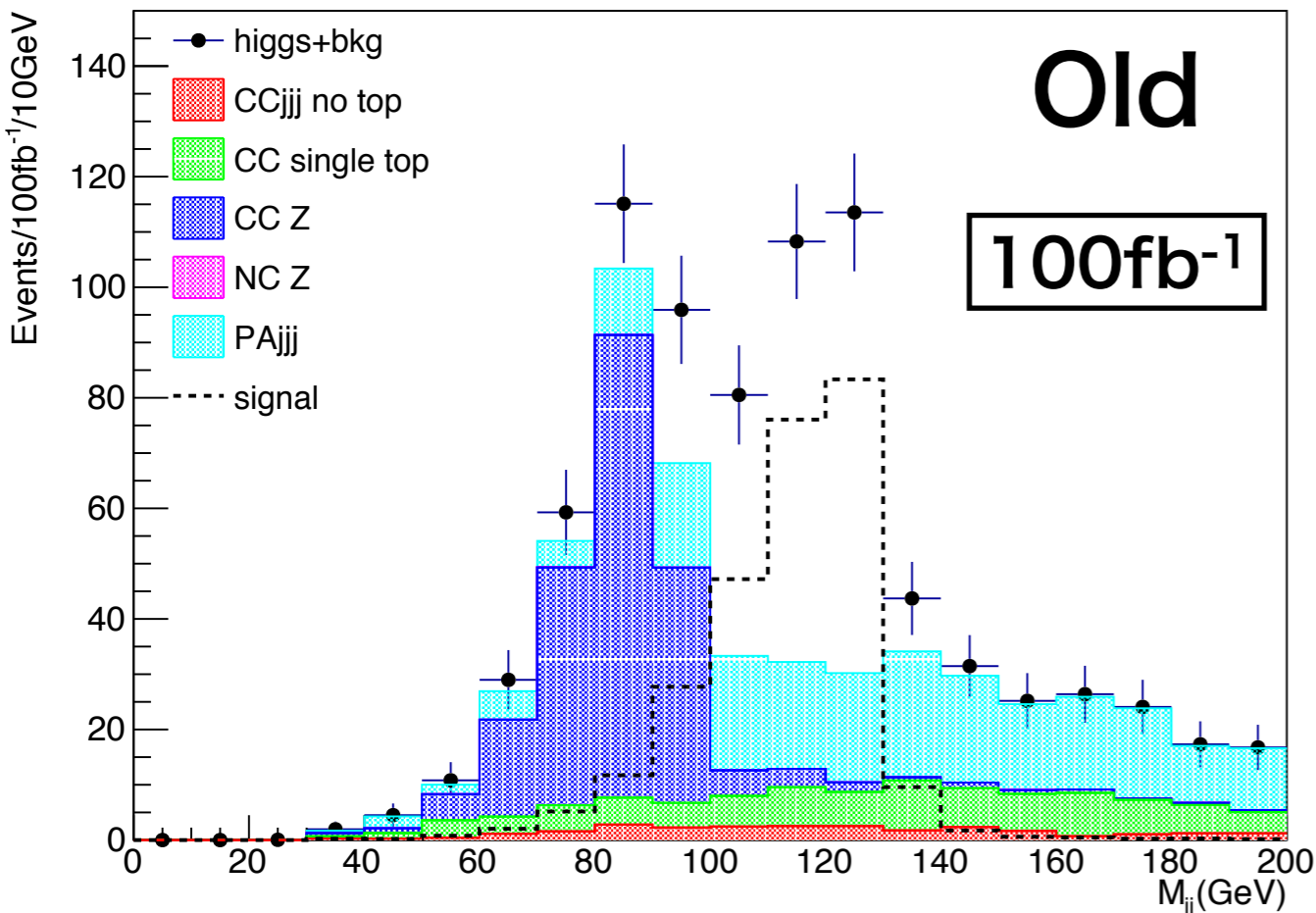
signal: 207 +- 3

CCjjj no top: 8 +- 1

CC single top: 19 +- 1
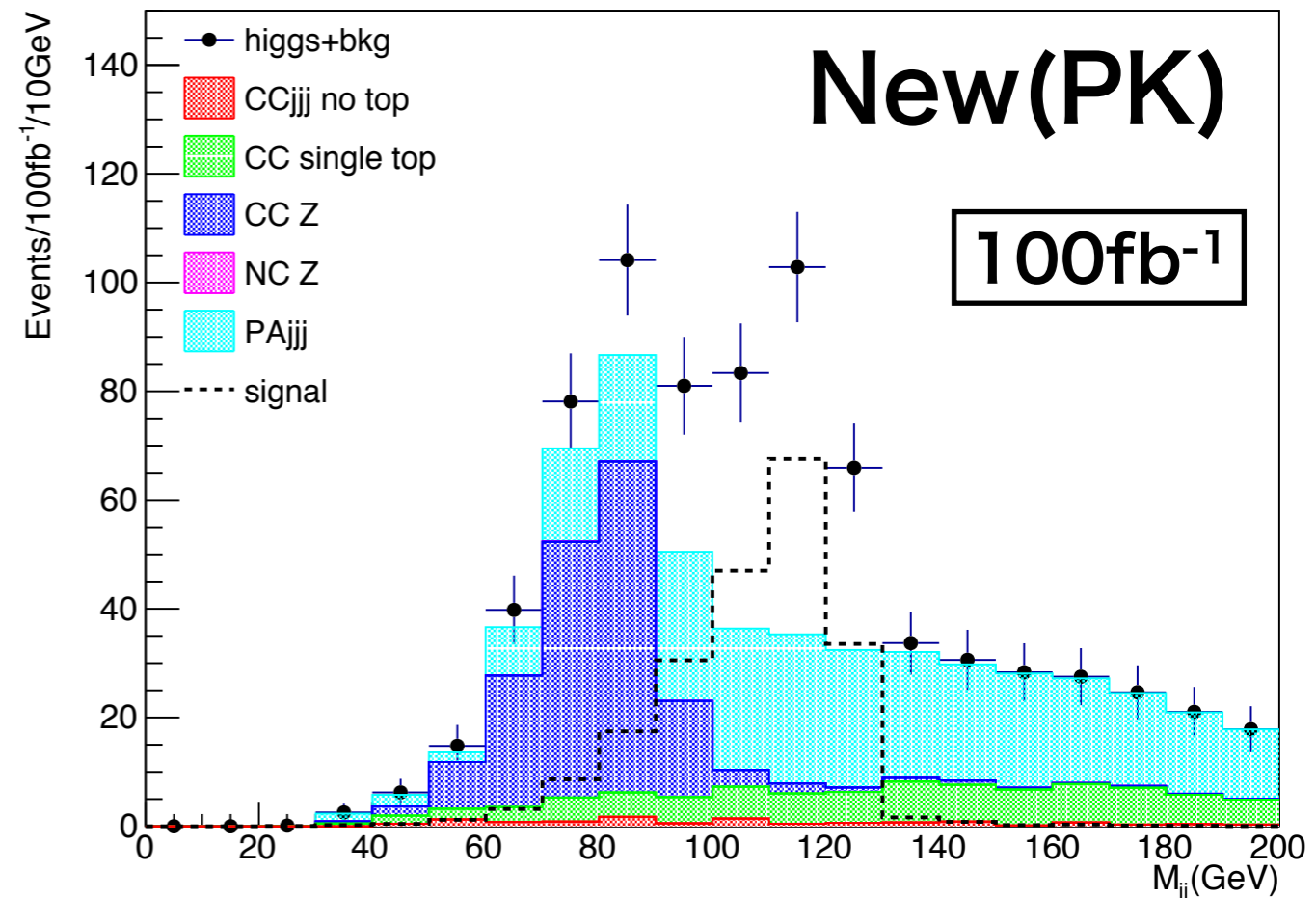
CC Z: 10 +- 1

NC Z: 0

PAjjj: 60 +- 5

σ_g/g 4.8 %

Statistic error of measured coupling constant

signal: 148 +- 2

CCjjj no top: 3 +- 0

CC single top: 17 +- 1

CC Z: 6 +- 1

NC Z: 0

PAjjj: 79 +- 5
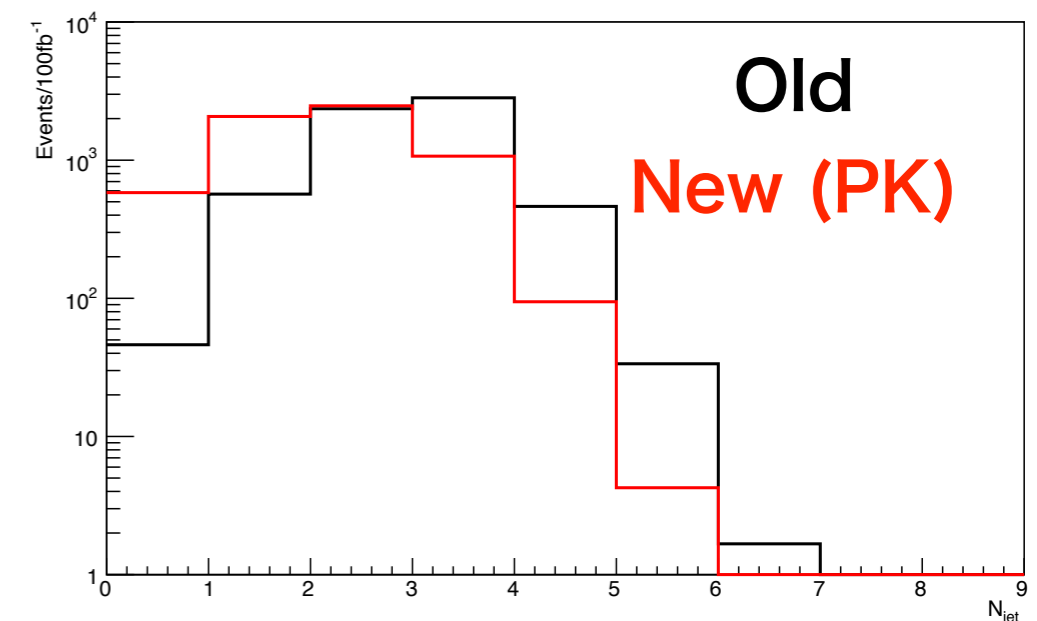
σ_g/g 6.4 %

Comparison of old and new LHeC card file

Cut Flow of signal
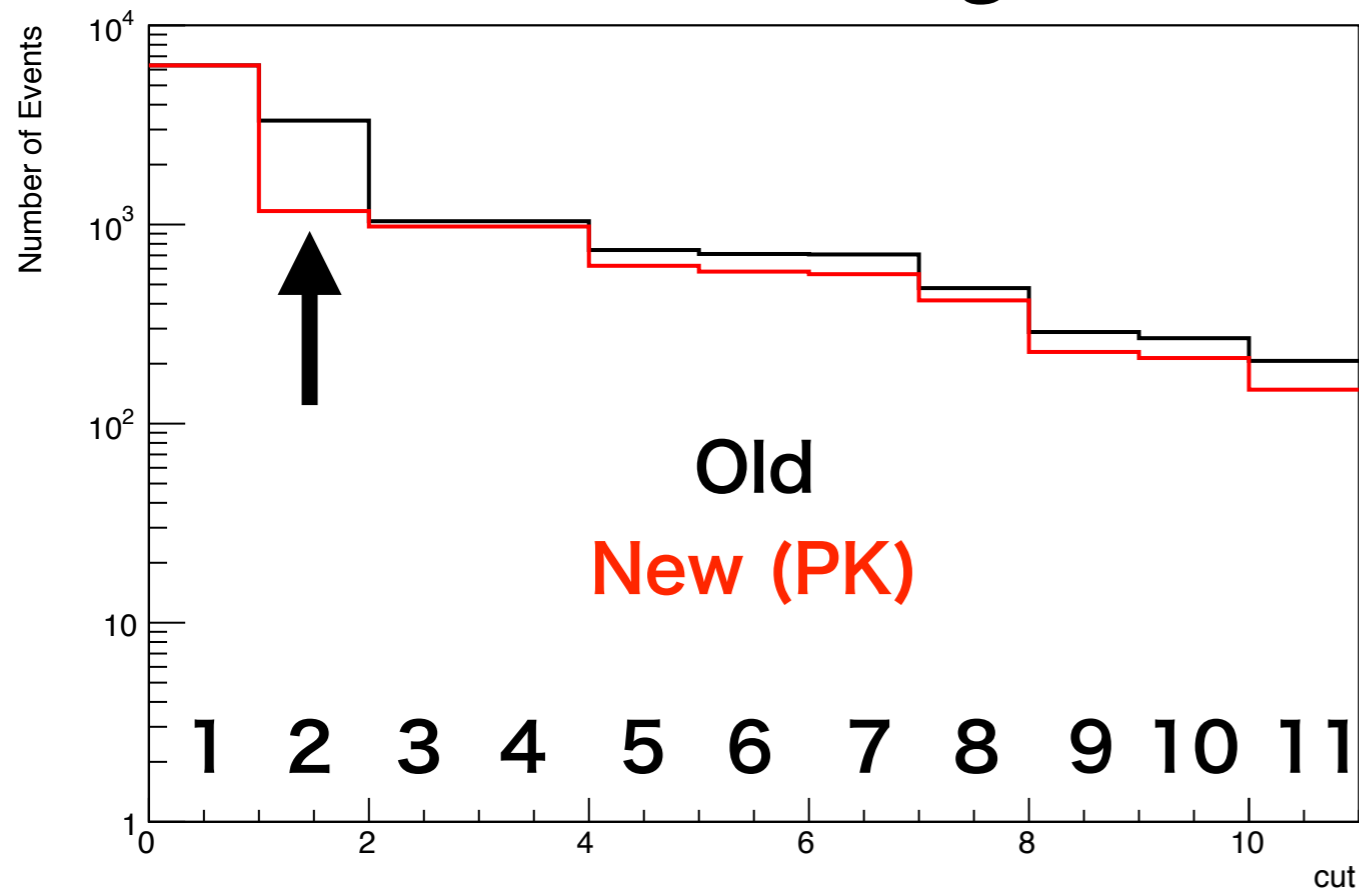
1: Raw

2: Njet (p_T>20GeV)

3+4: NBjet (p_T>20GeV)

5: MET

6: Nelectron

7: Momentum transfer

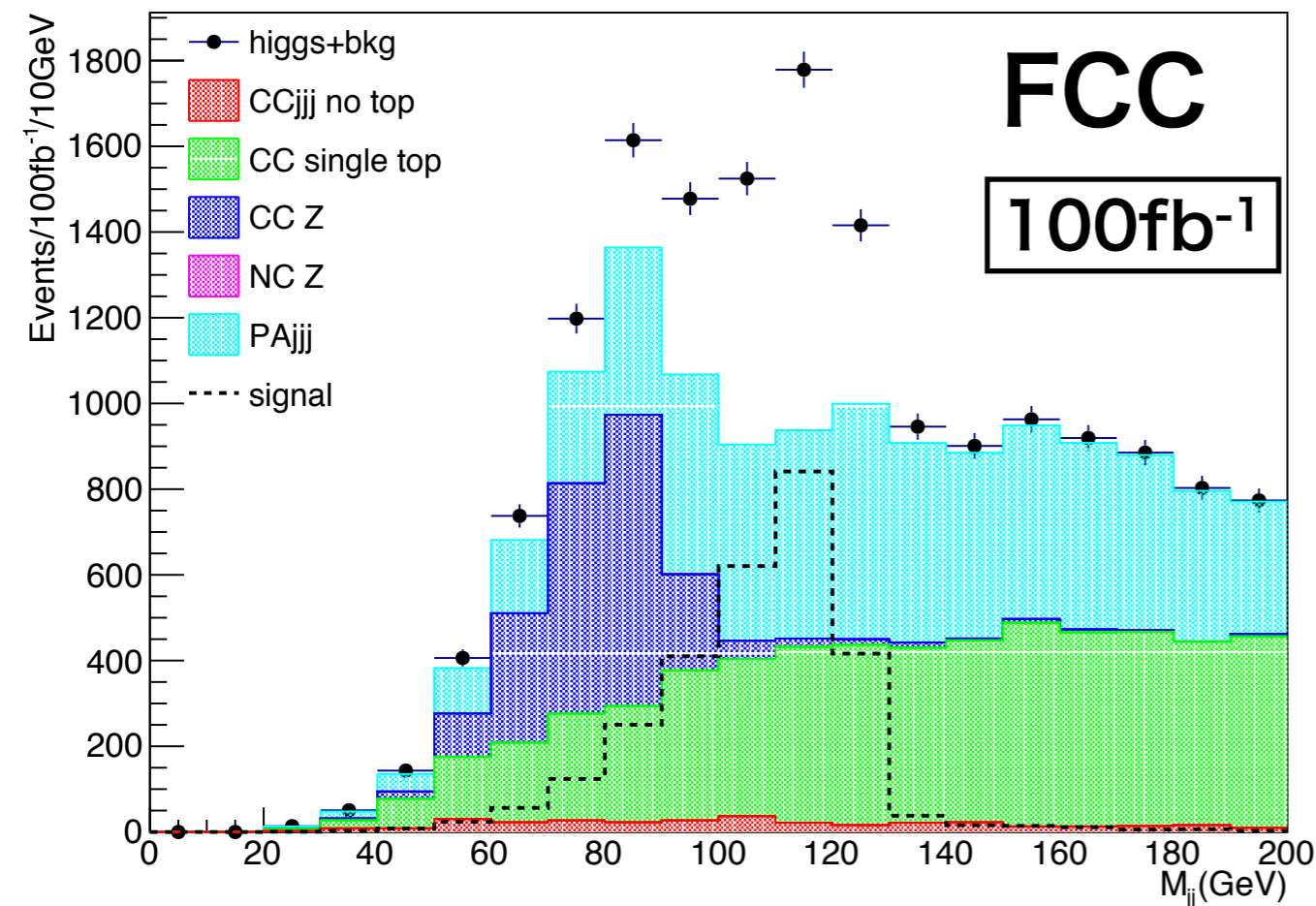8: Light jet

9: W & Top mass

10: Dphi (Met, b)

11: Higgs mass

- Main difference may come from jets
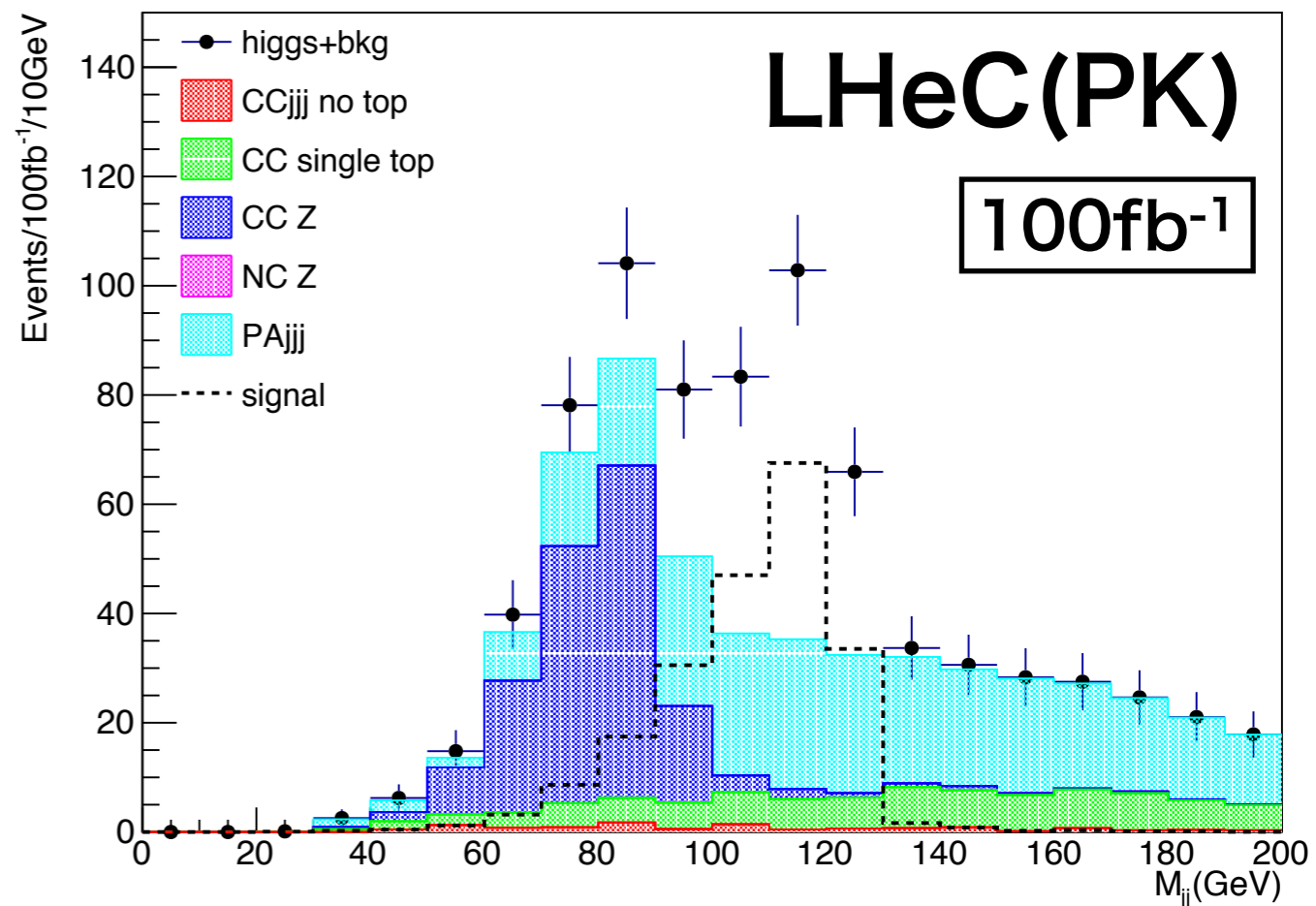 (Due to the difference of HCal setup ?)

Number of jet

Comparison of LHeC and FCC

Mass of 2 b-jets after event selection

signal: 1878 +- 24

CCjjj no top: 75 +- 9

CC single top: 1198 +- 33

CC Z: 75 +- 9

NC Z: 0

PAjjj: 1493 +- 55

σ_g/g 2.3 %

signal: 148 +- 2

CCjjj no top: 3 +- 0

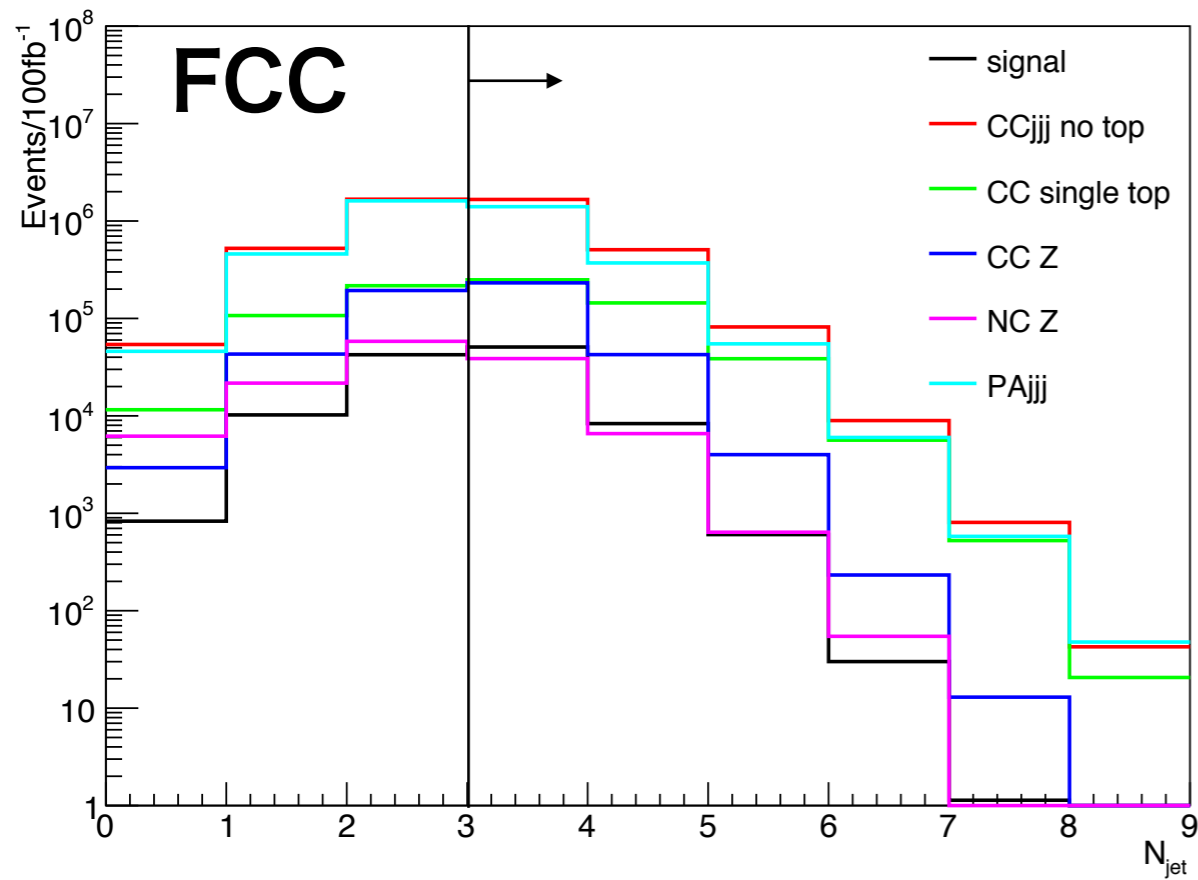CC single top: 17 +- 1

CC Z: 6 +- 1

NC Z: 0

PAjjj: 79 +- 5

σ_g/g 6.4 %

Summary

- MC based H->bb analysis at LHeC and FCC ep assuming 100 ab^{-1}
  - Statistics errors of each coupling constant measument
    - Old LHeC: 4.8 %
    - New LHeC (PK): 6.4 %
    - FCC ep: 2.3 %
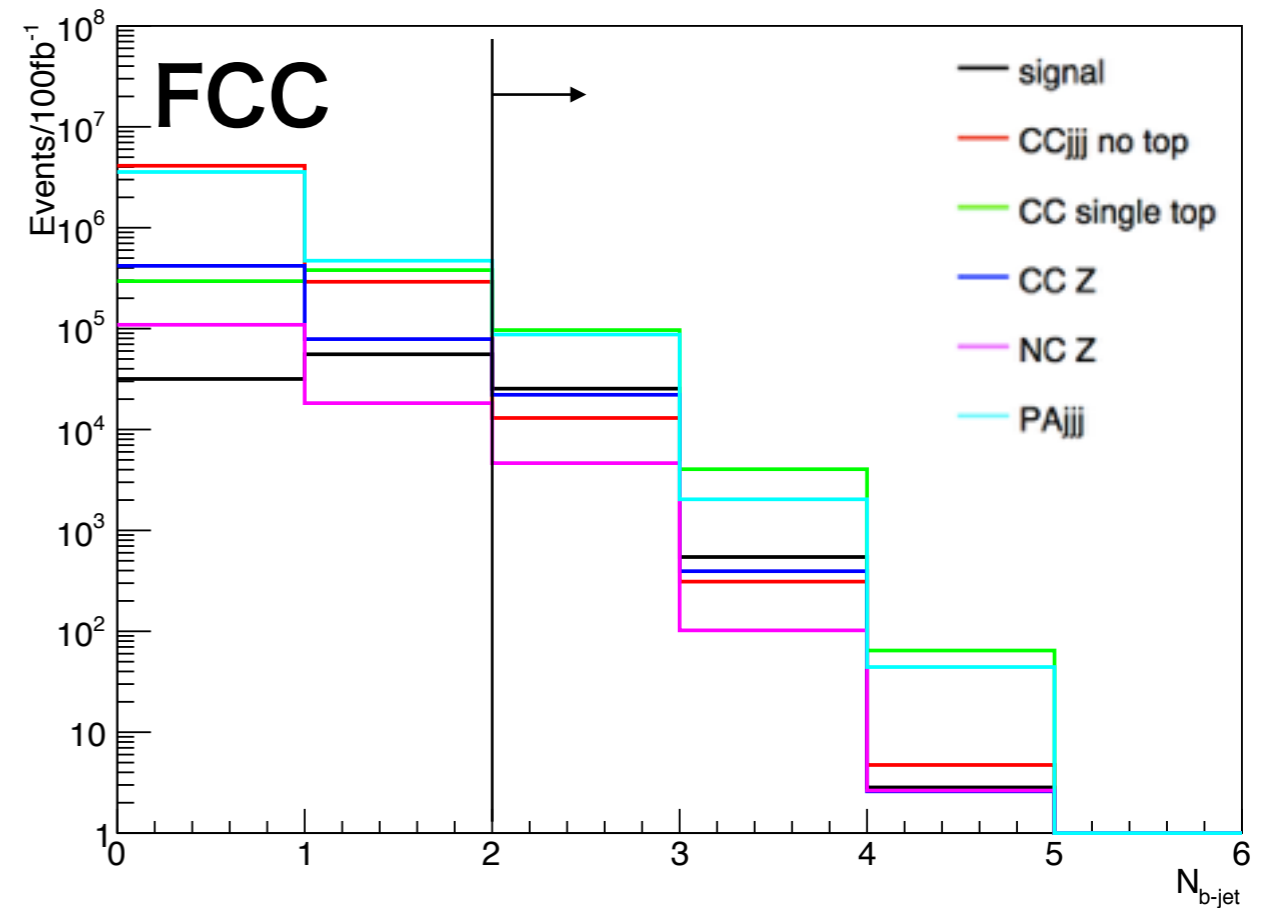 - Difference of old and new LHeC setup may mainly come from HCal setup

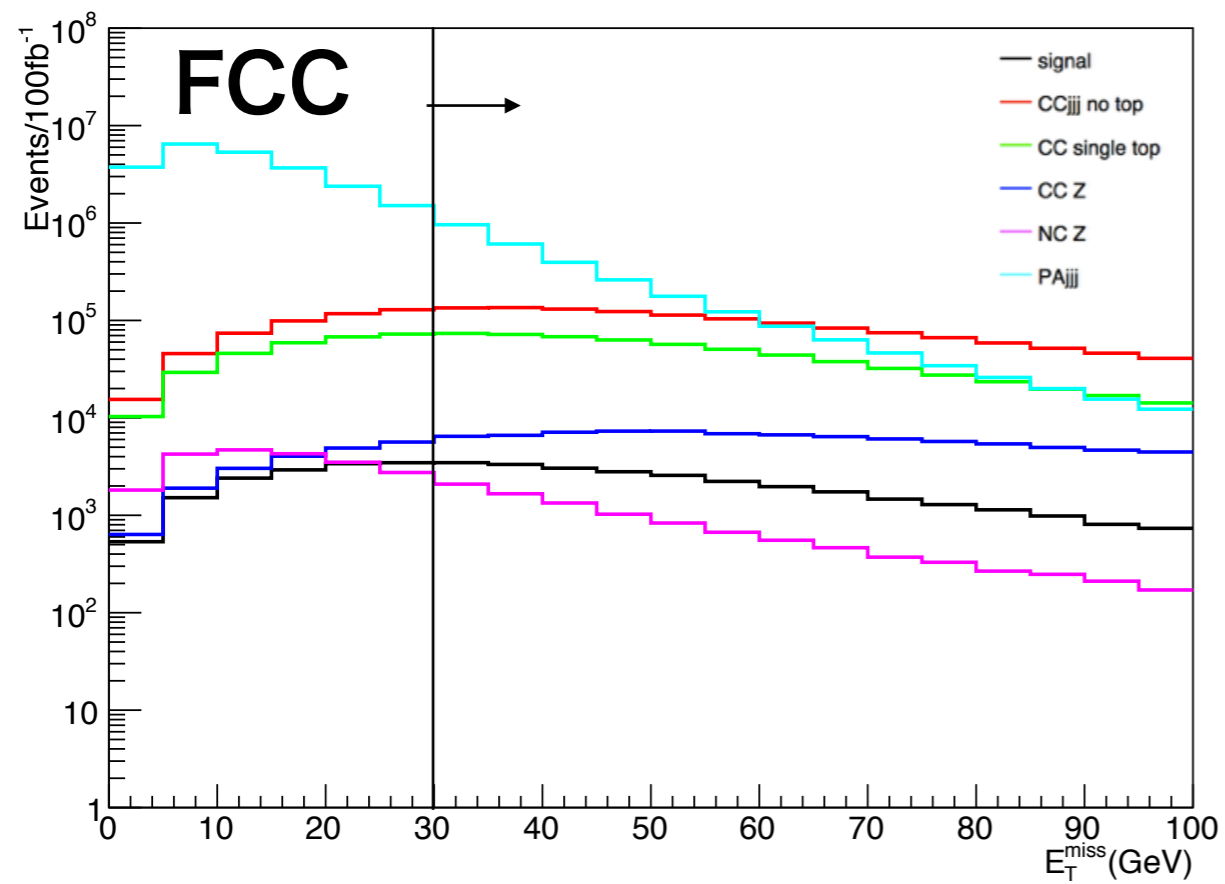backup

Each cut parameter

Number of jets (p_T>20GeV)

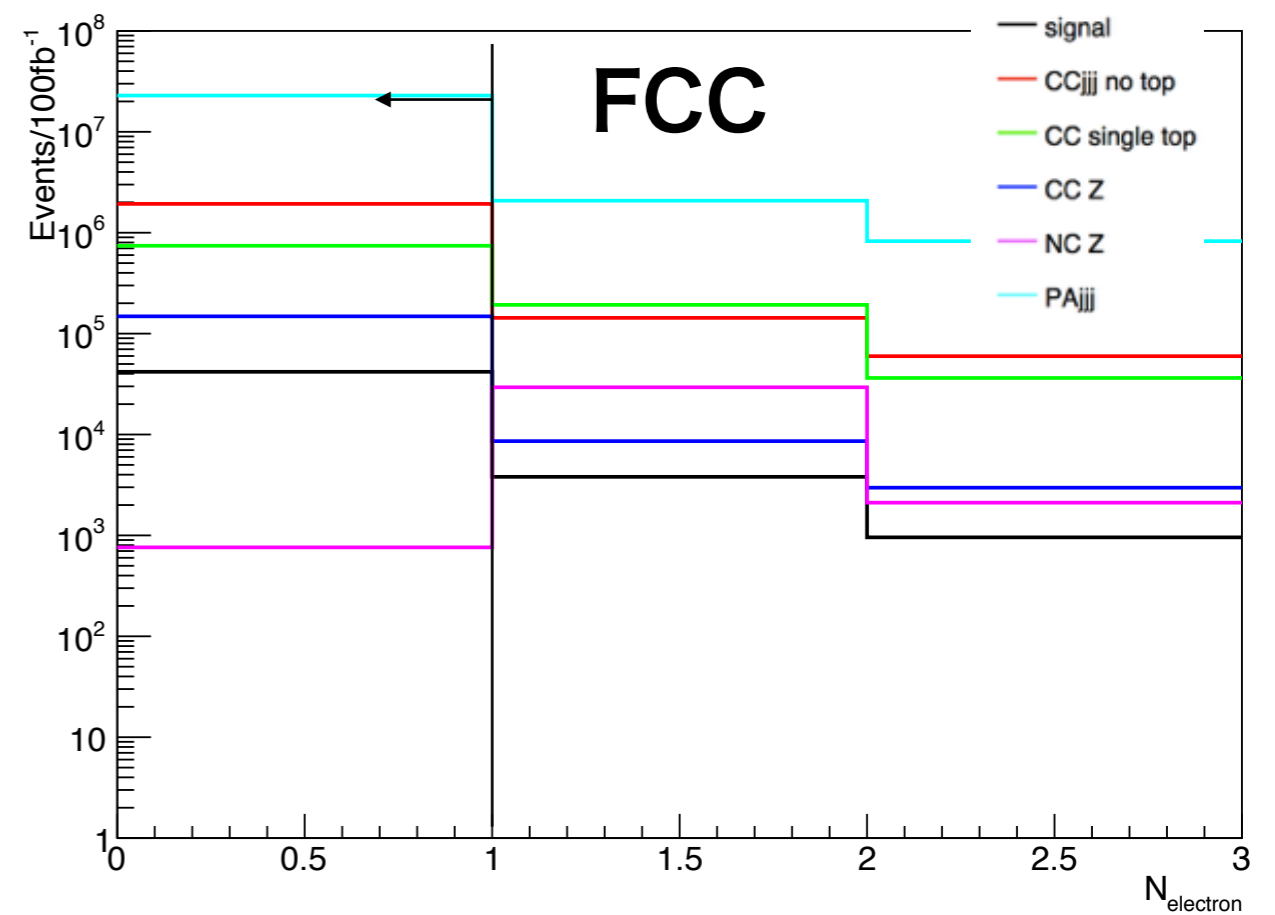## Number of b-jets (p_T>20GeV)

Each cut parameter

Missing ET

Number of electrons

Each cut parameter

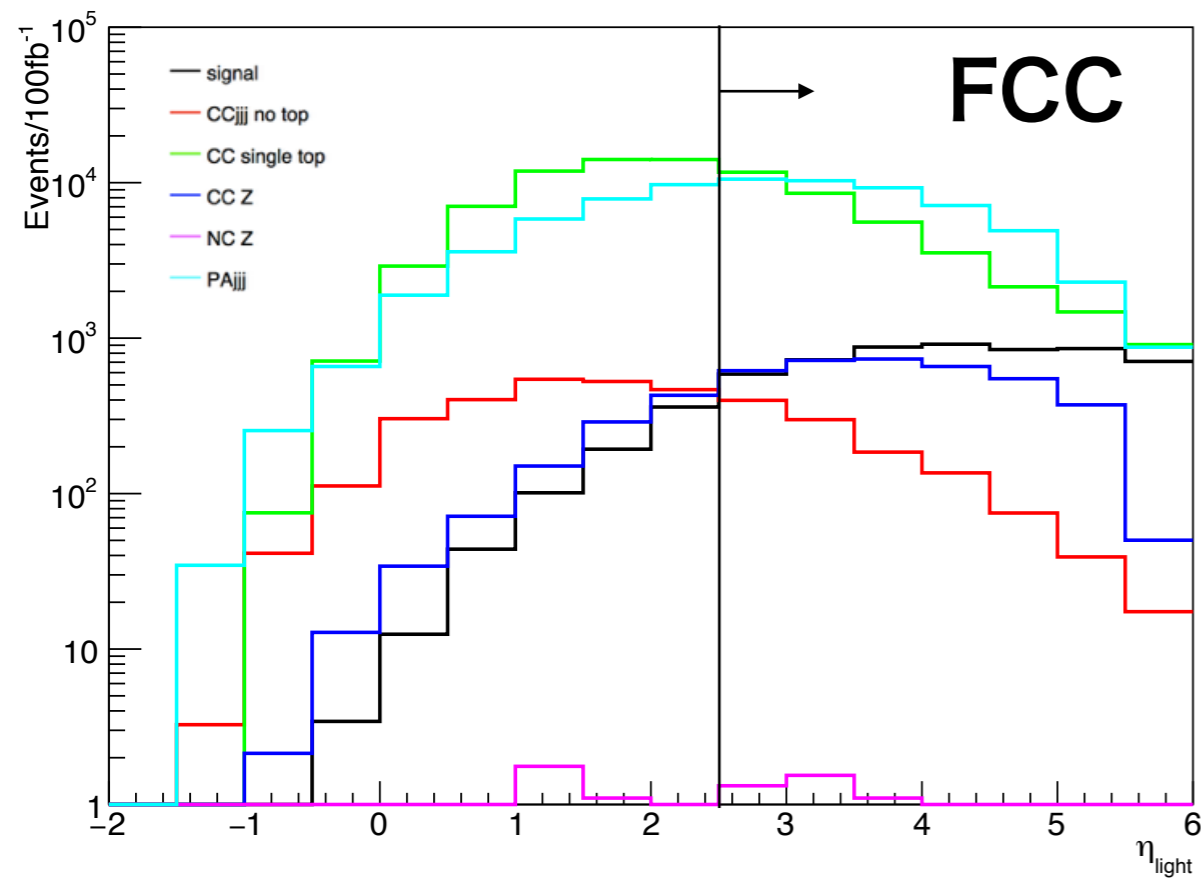**Momentum trunsfer**

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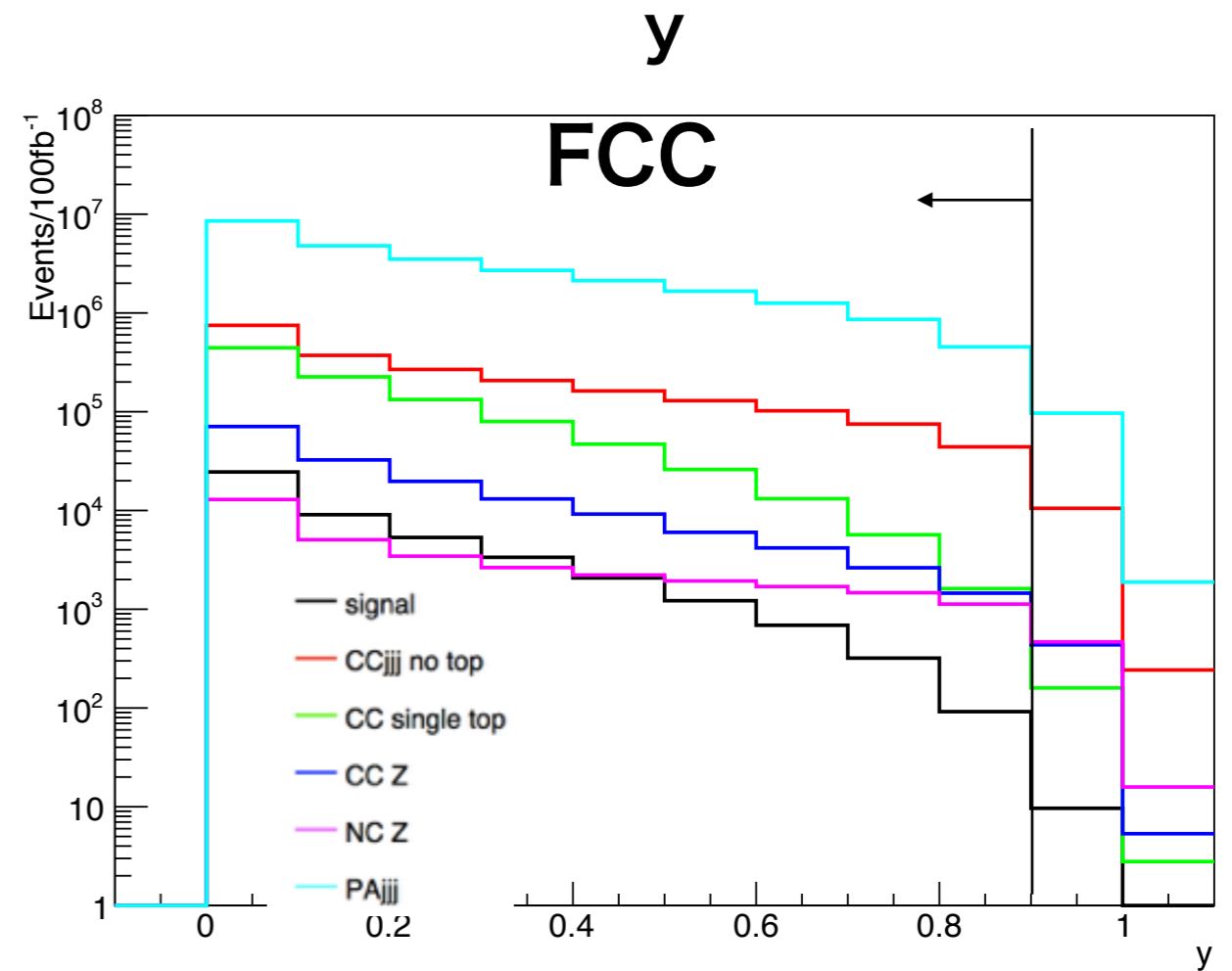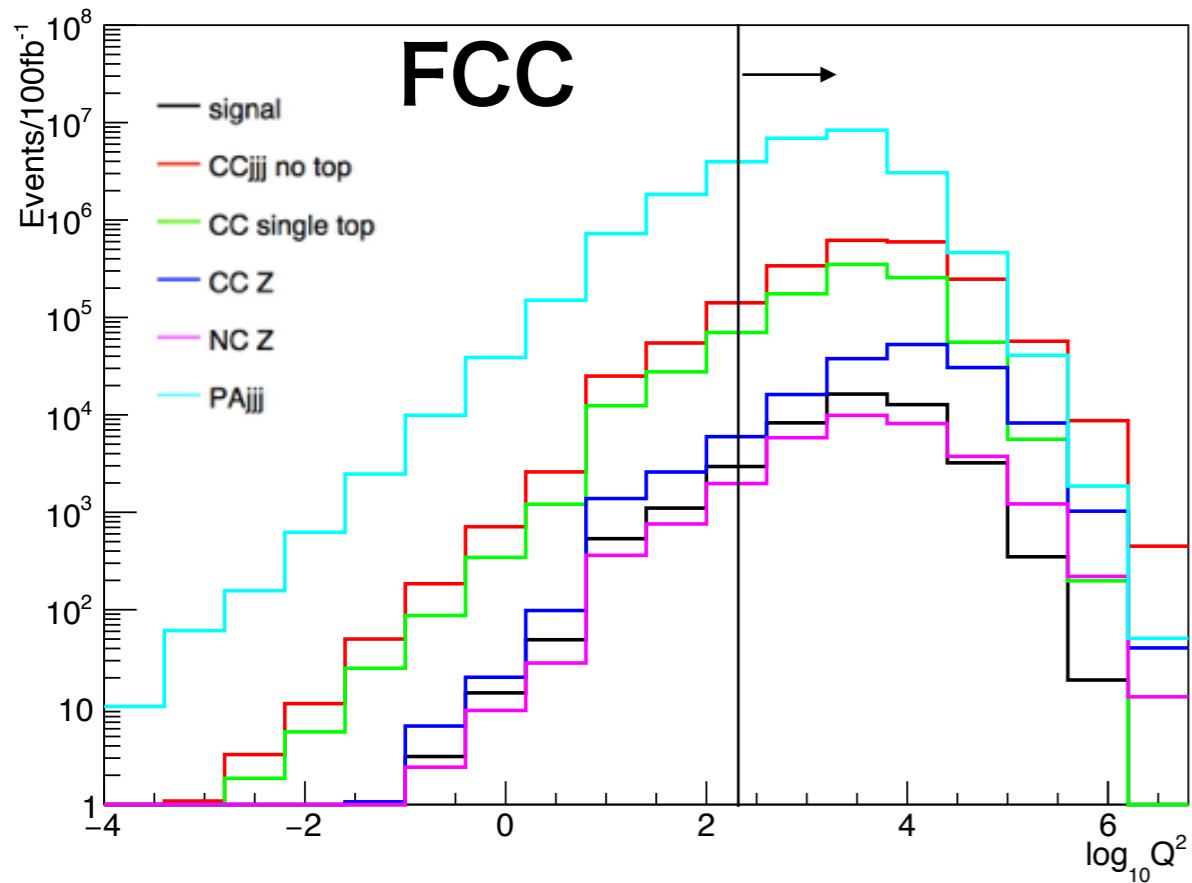
$$Q_h^2 = \frac{\left(\sum_{hadron} p_x\right)^2 + \left(\sum_{hadron} p_y\right)^2}{1 - y_h}$$

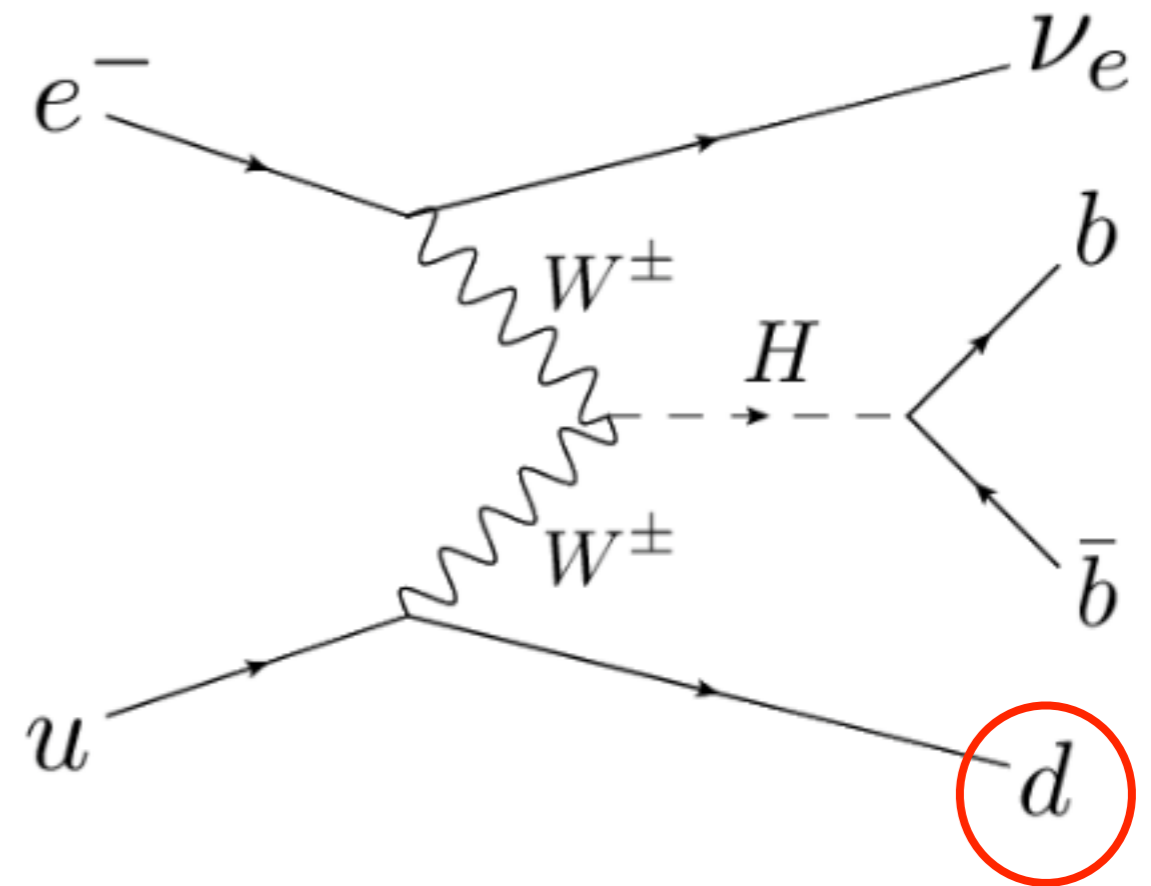$$y_h = \frac{\sum_{hadron}(E - p_z)}{E_e}$$

11

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

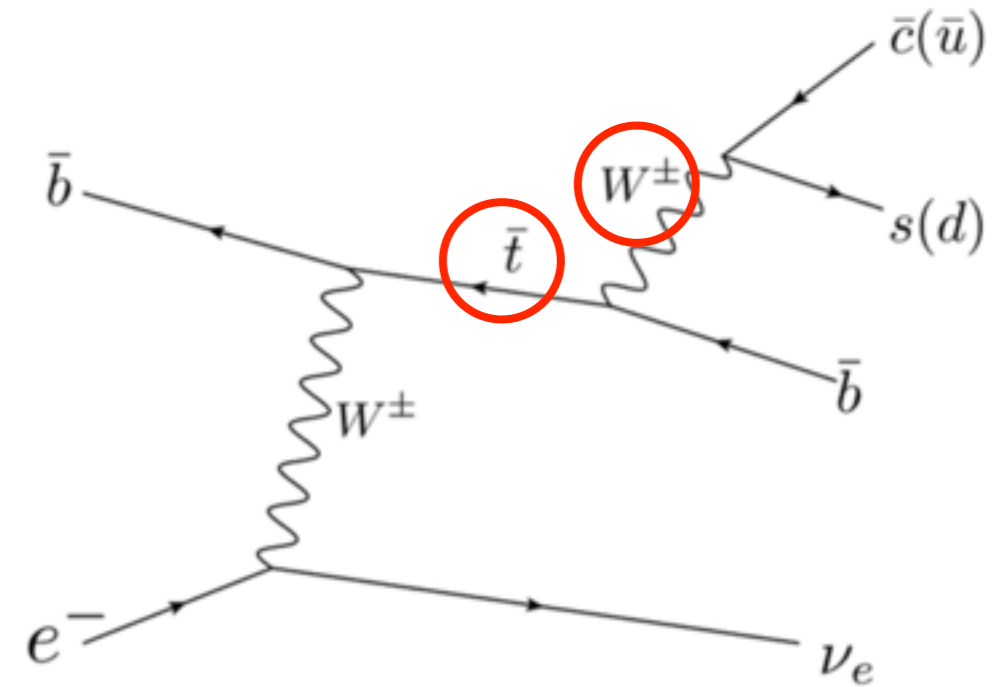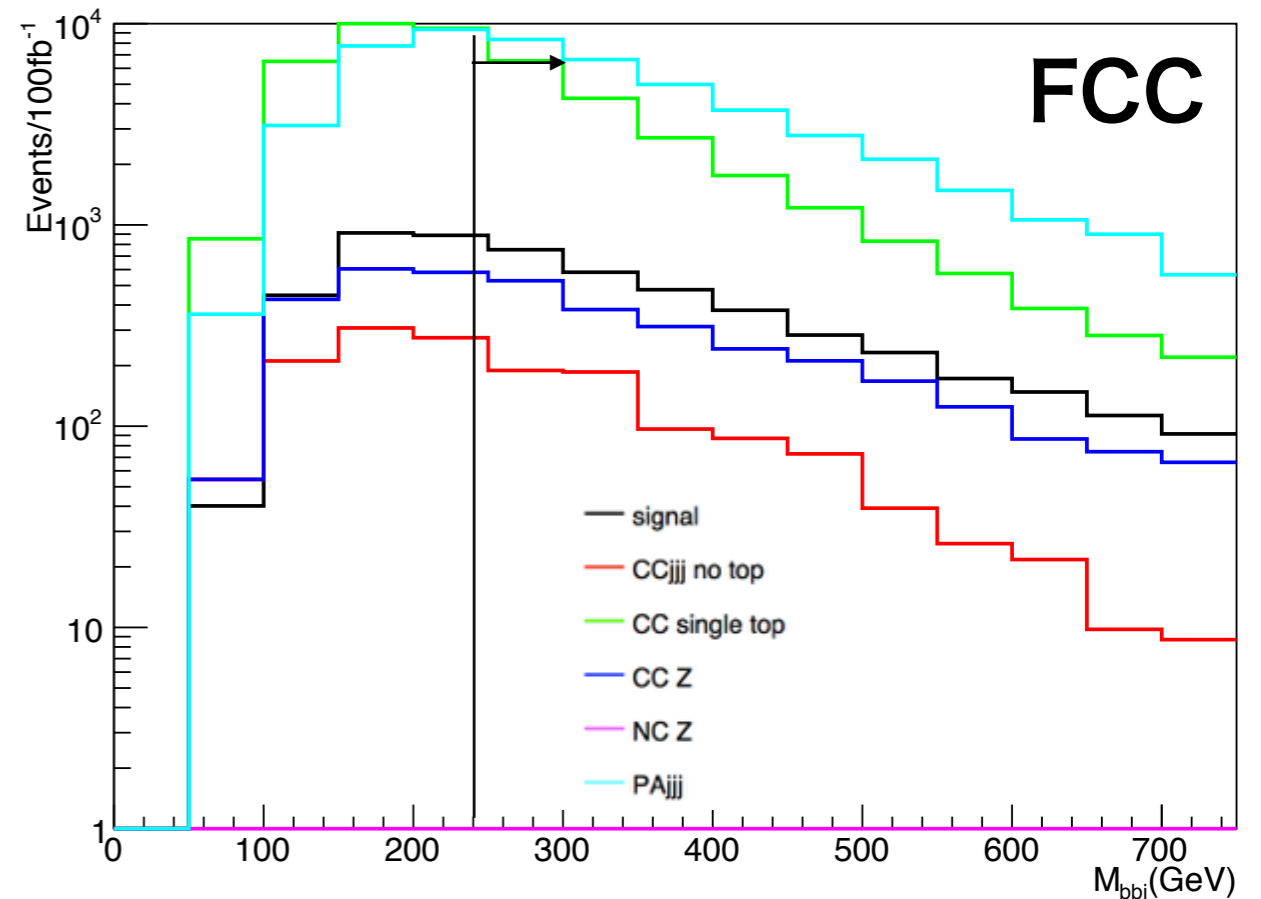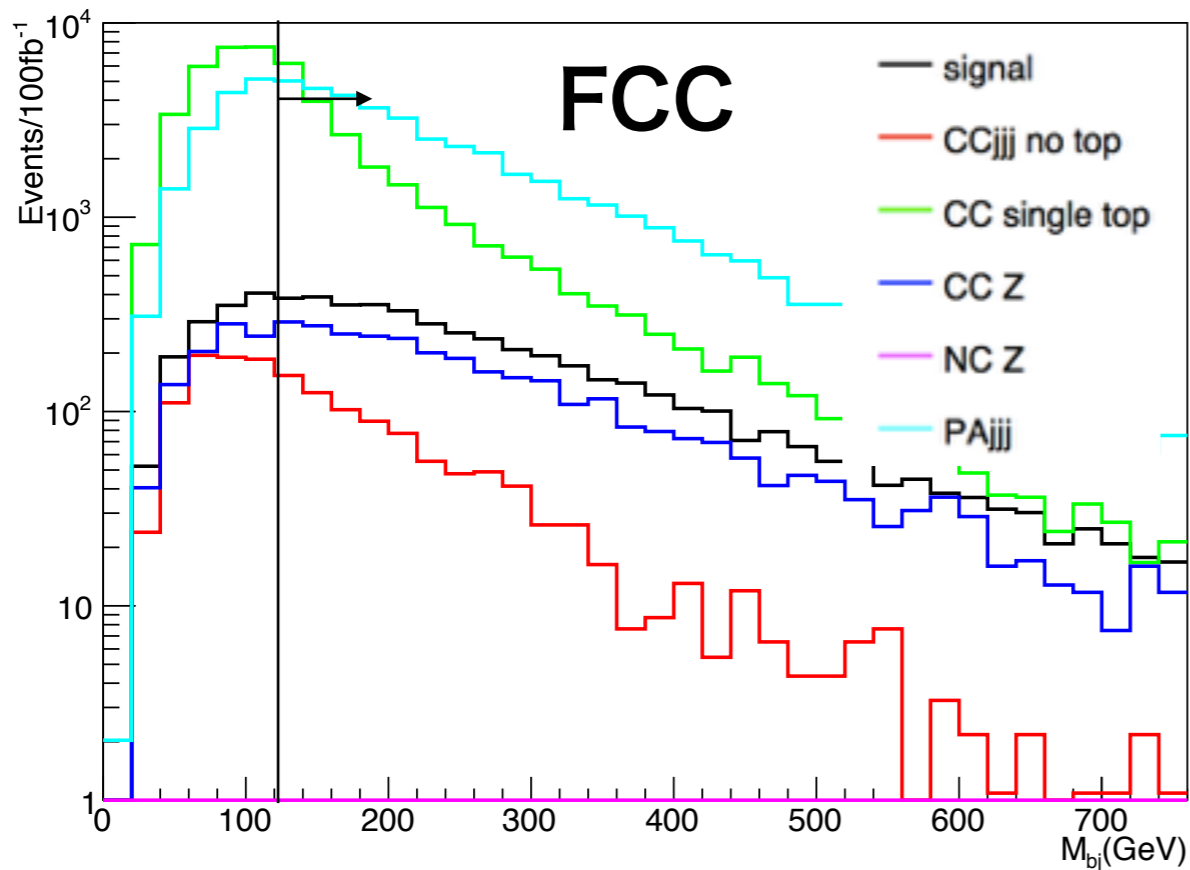**CC: H->bb**

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

W masss

Top mass

Each cut parameter

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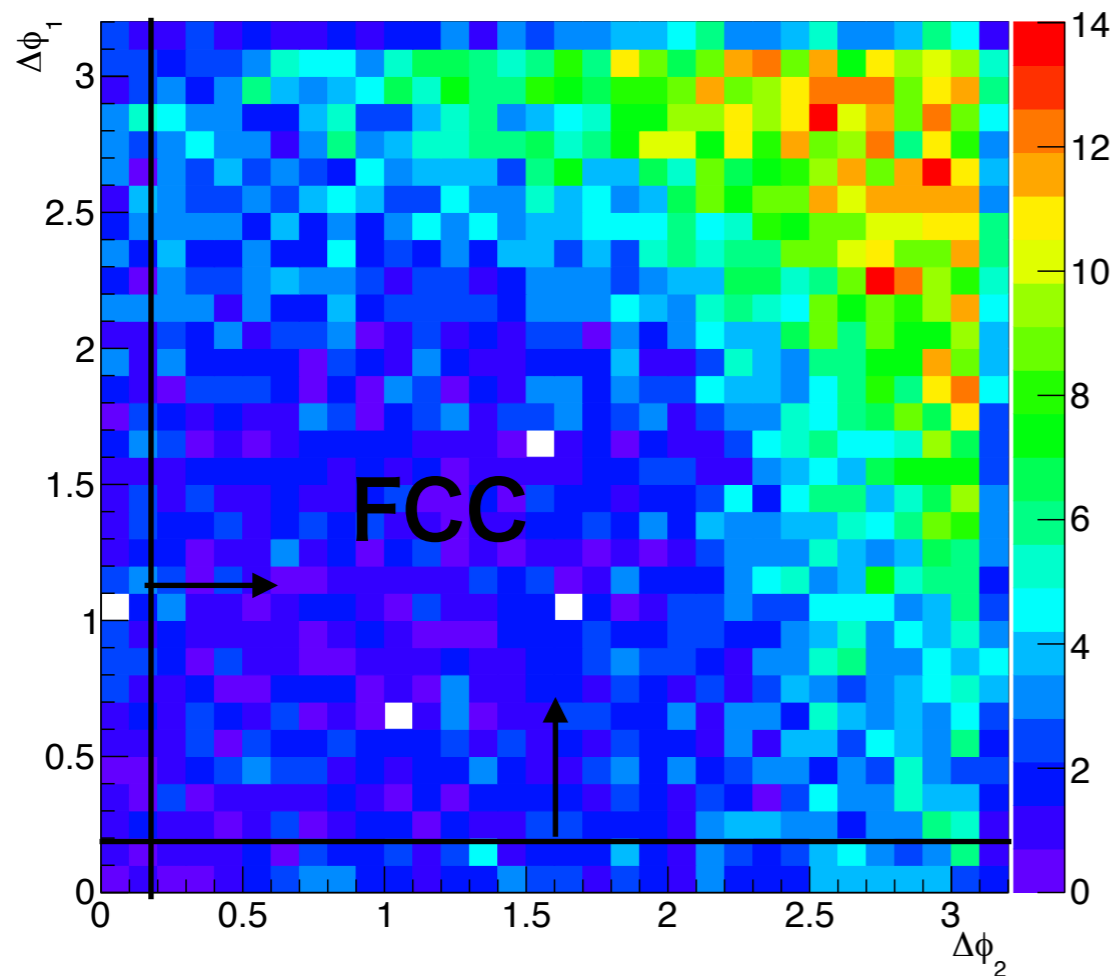- After previous cuts are applied

CC: H->bb

Photo production