Status Report

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25 Feb 2014

Table of contents

- Result for 125GeV Higgs and Ee=60GeV
  - About setups, samples and cuts
  - Sensitivity for CChbb process
- Relative error of coupling constant
- B-jet ID and c-jet, light-jet mis-ID efficiency, b-tag coverage are changed
  - Estimation of S/√N and relative error of coupling constant

Table of setups

- Ep=7TeV, Ee=60GeV, 125GeV Higgs
- Constant b-tag efficiency for |Eta|<3
  - b-jet ID : 60%
  - c-jet mis-ID : 10%
  - light-jet mis-ID : 1%
- Use kt algorithm ΔR=0.9
- Assume 50fb^{-1}

Table of samples

- Generator cut
  - CChbb, p e- > vl h j, h > b b~
    - For parton, lepton, photon |Eta|<10
  - CCbkg, p e- > vl j j j /h
    - For parton, lepton and photon, |Eta|<10
    - For parton, PT>10 GeV
    - More than one M_{jj}>60 GeV parton pair
  - NCbkg, p e- > e- j j j /h
    - For parton, lepton and photon, |Eta|<5
    - For parton, PT>10 GeV
    - For lepton, PT>1 GeV
    - More than one M_{jj}>60 GeV parton pair

Table of samples

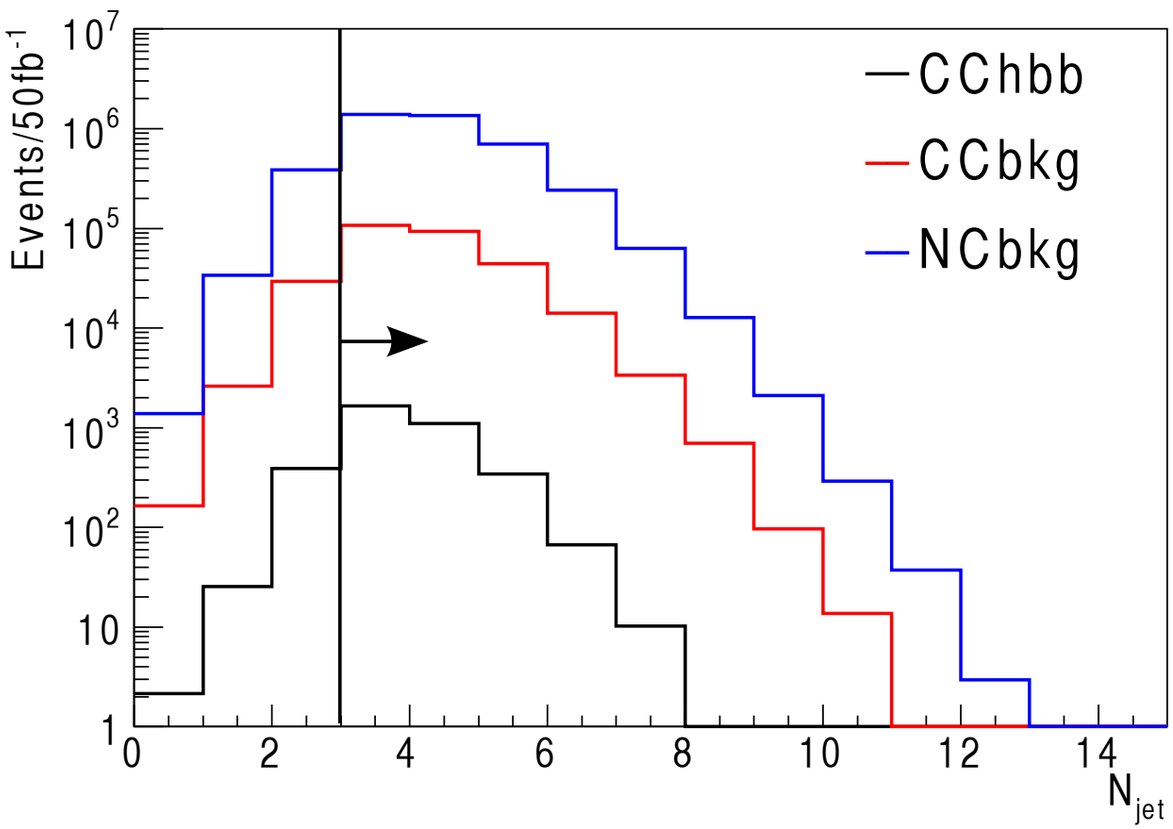
- Assume 50fb^{-1}

	$\sigma(\mathrm{pb})$	Number of samples	$\frac{N}{\sigma}(\mathrm{fb}^{-1})$
CChbb	0.072	0.1M	1390
CCbkg	5.9	0.3M	50.8
NCbkg	83	4.2M	50.6

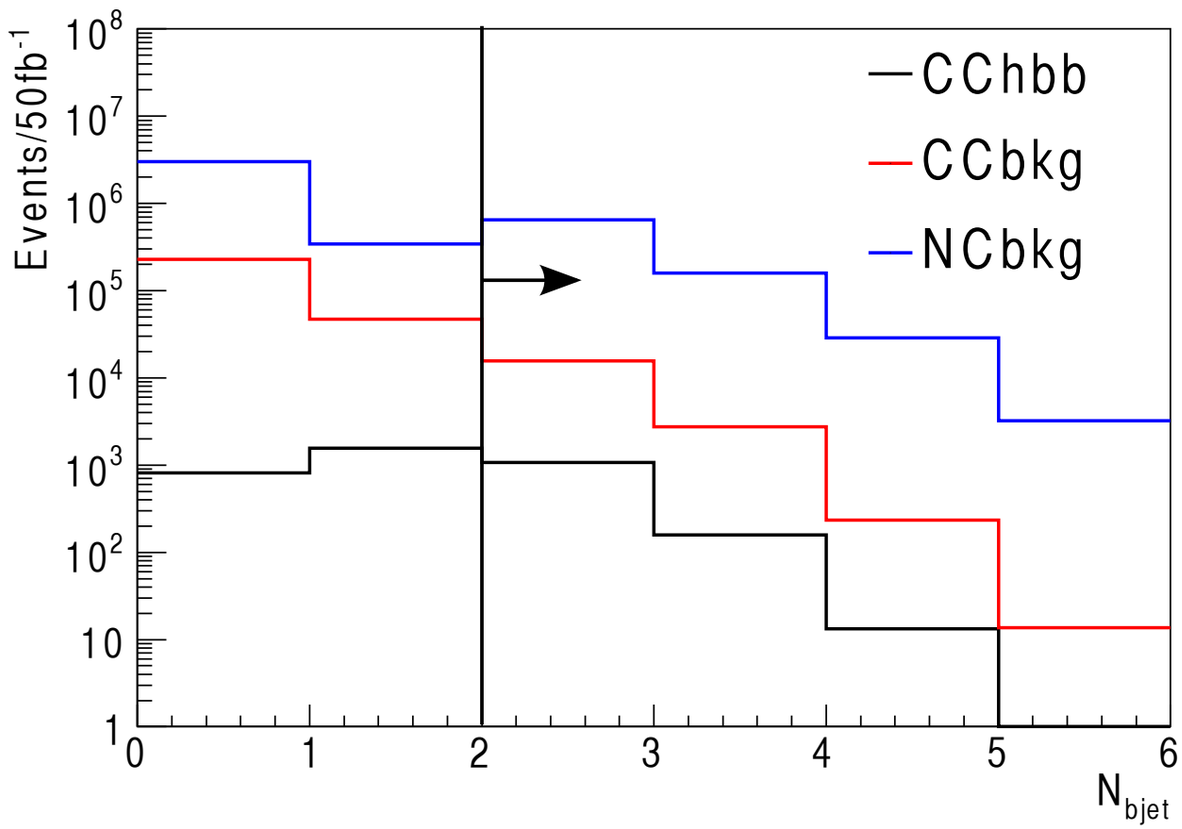
N_{jet} and N_{bjet}

- Number of PT>20 GeV jets and b-jets
- $N_{jet} \geqq 3$
- $N_{bjet} \geqq 2$

Njet



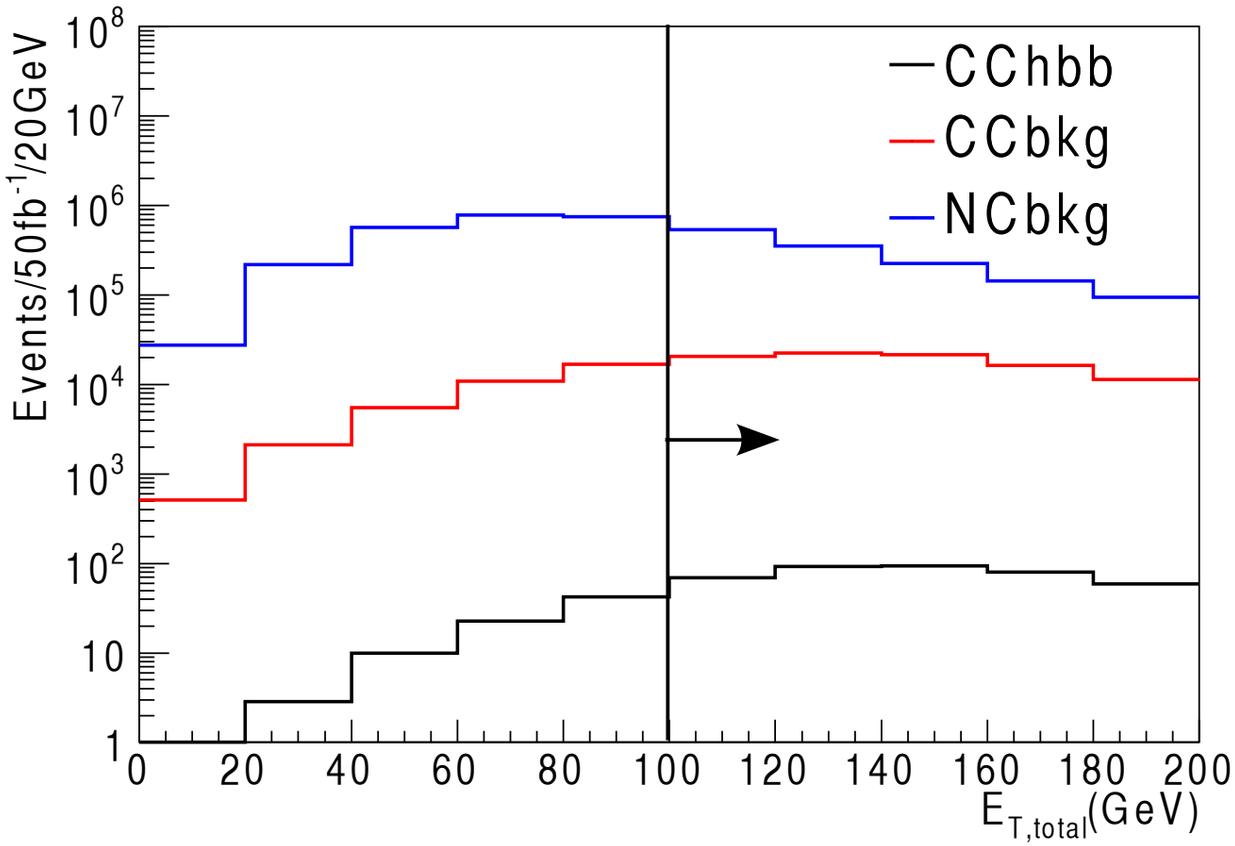
Nbjet



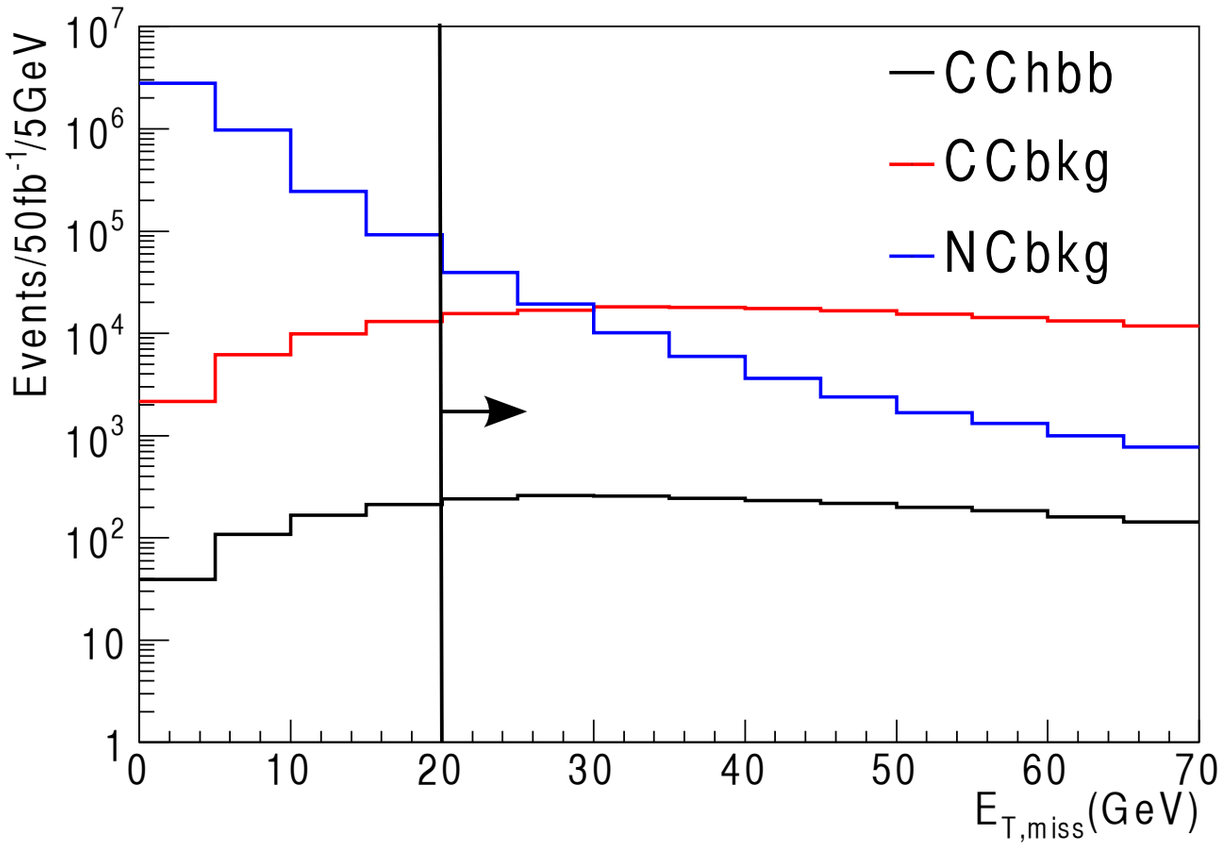
E_T total and missing E_T

- E_T total means the sum of hadron jet E_T
- E_T total > 100 GeV
- Missing E_T > 20 GeV

E_T total

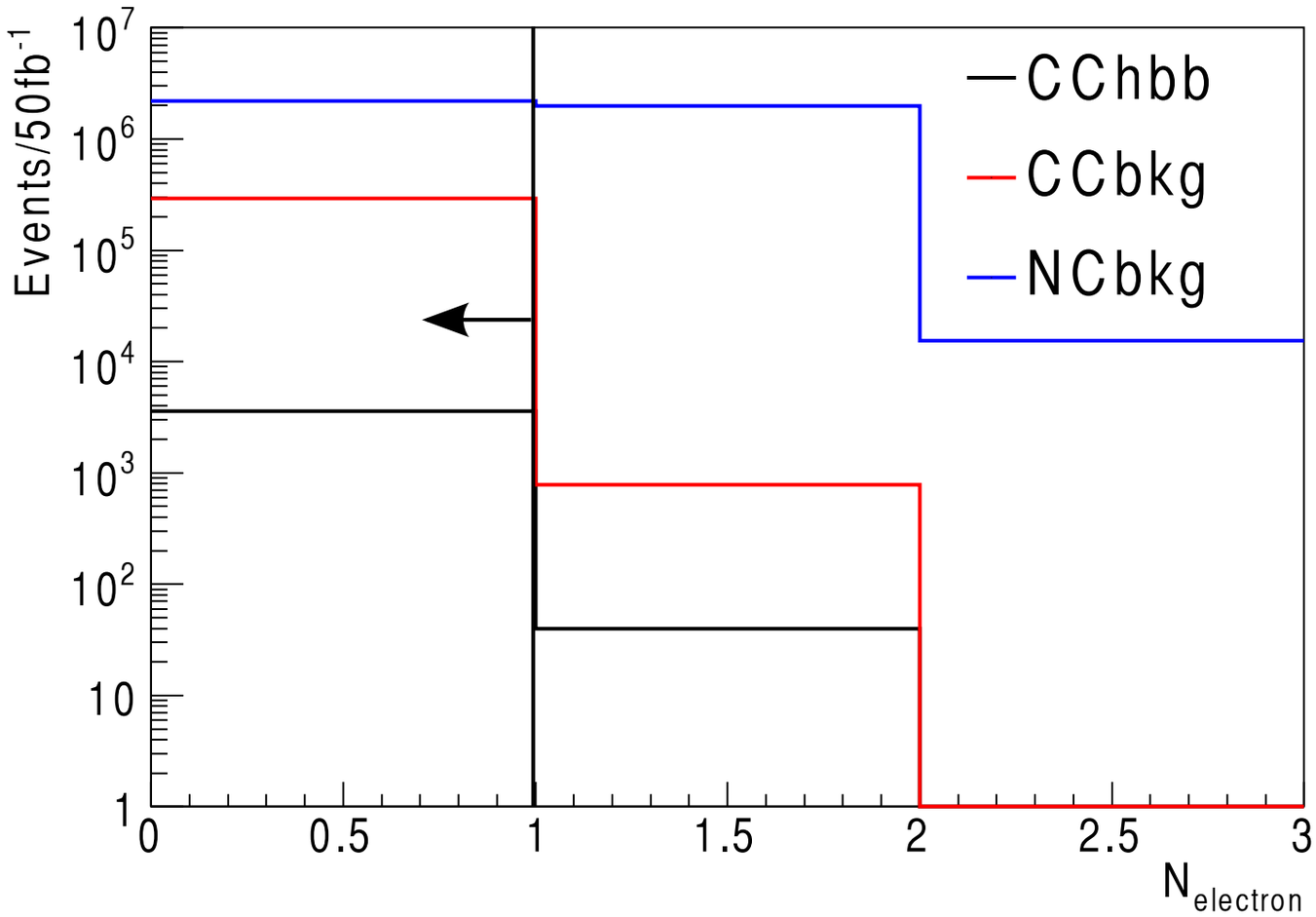


Missing E_T



$N_{electron}$

- Number of electron
- $N_{electron} = 0$



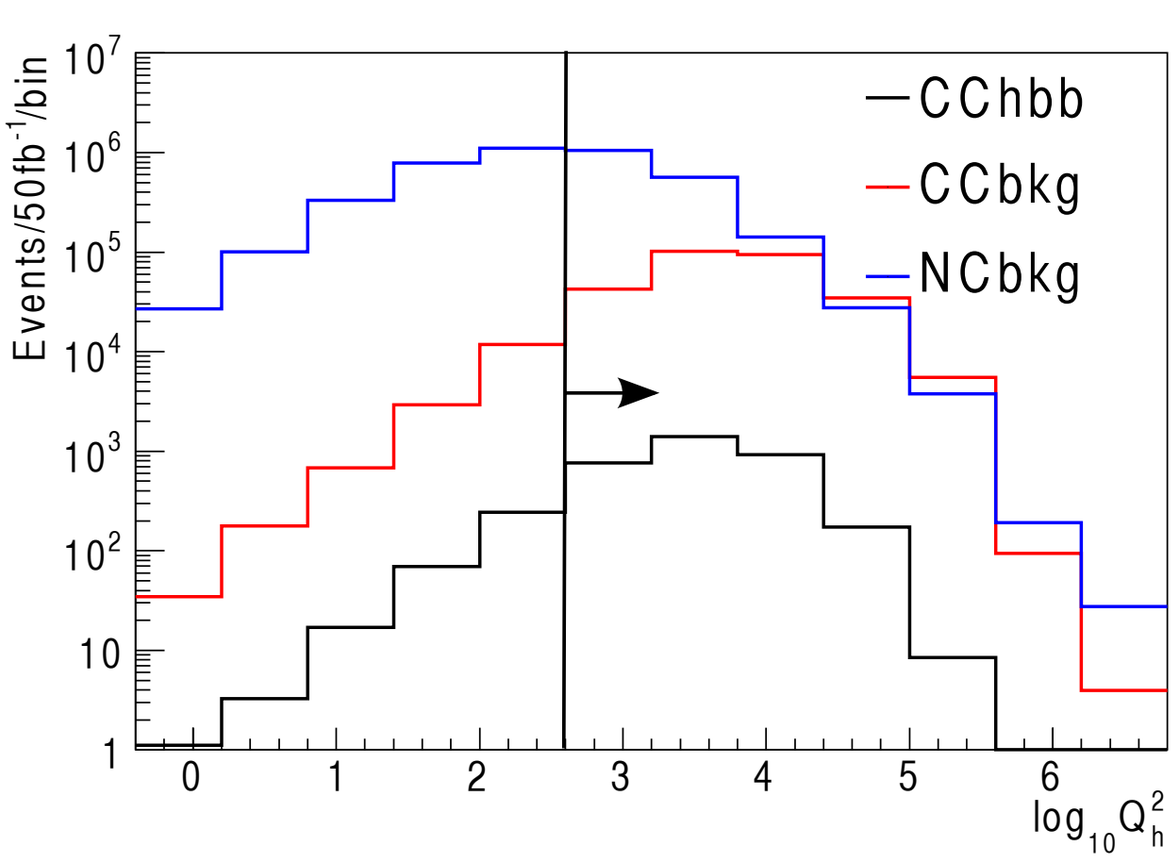
Momentum transfer Q^2 and y

- $Q^2 > 400\ \mathrm{GeV}^2$
- $y < 0.9$

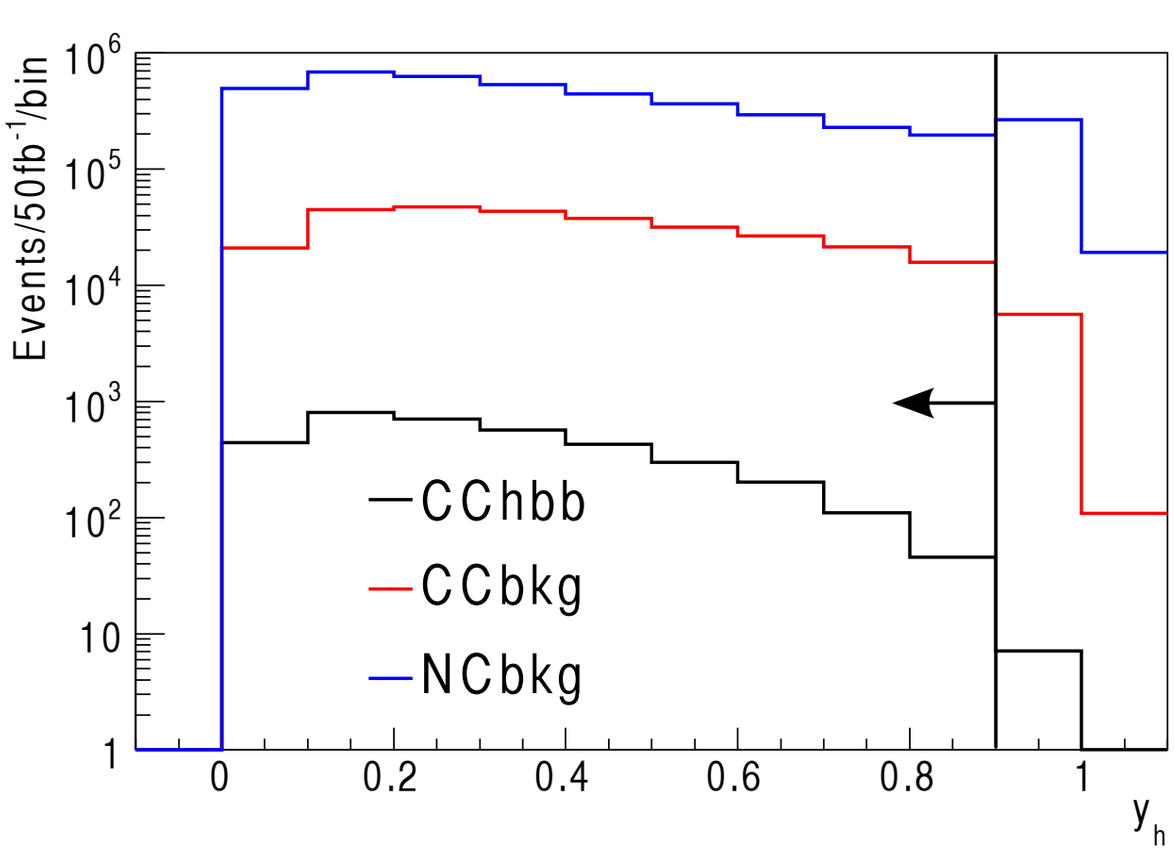
$$Q_h^2 = \frac{(\sum_{hadron} p_x)^2 + (\sum_{hadron} p_y)^2}{1 - y_h}$$

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

$\log_{10}Q^2$

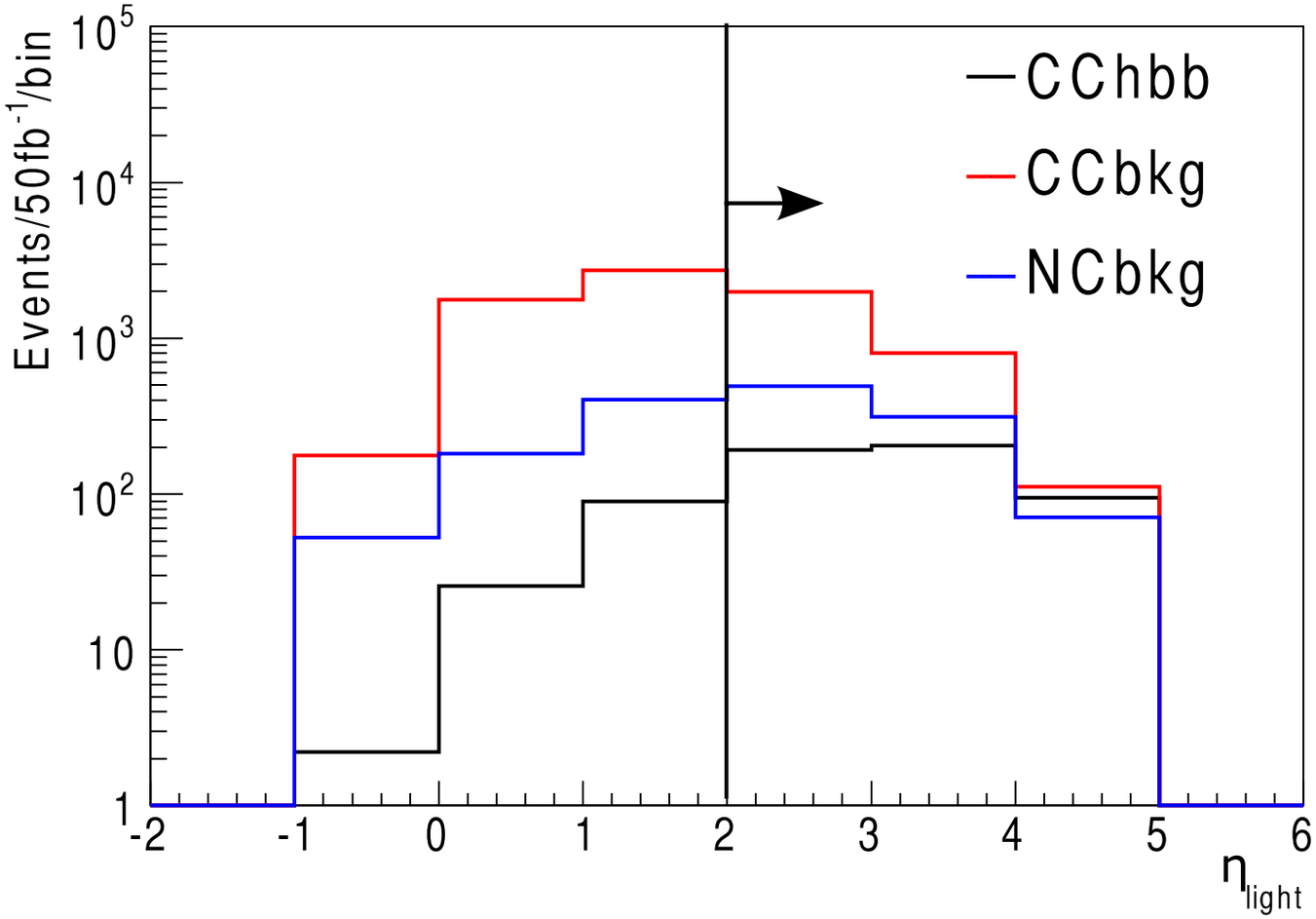


y



Light-jet Eta

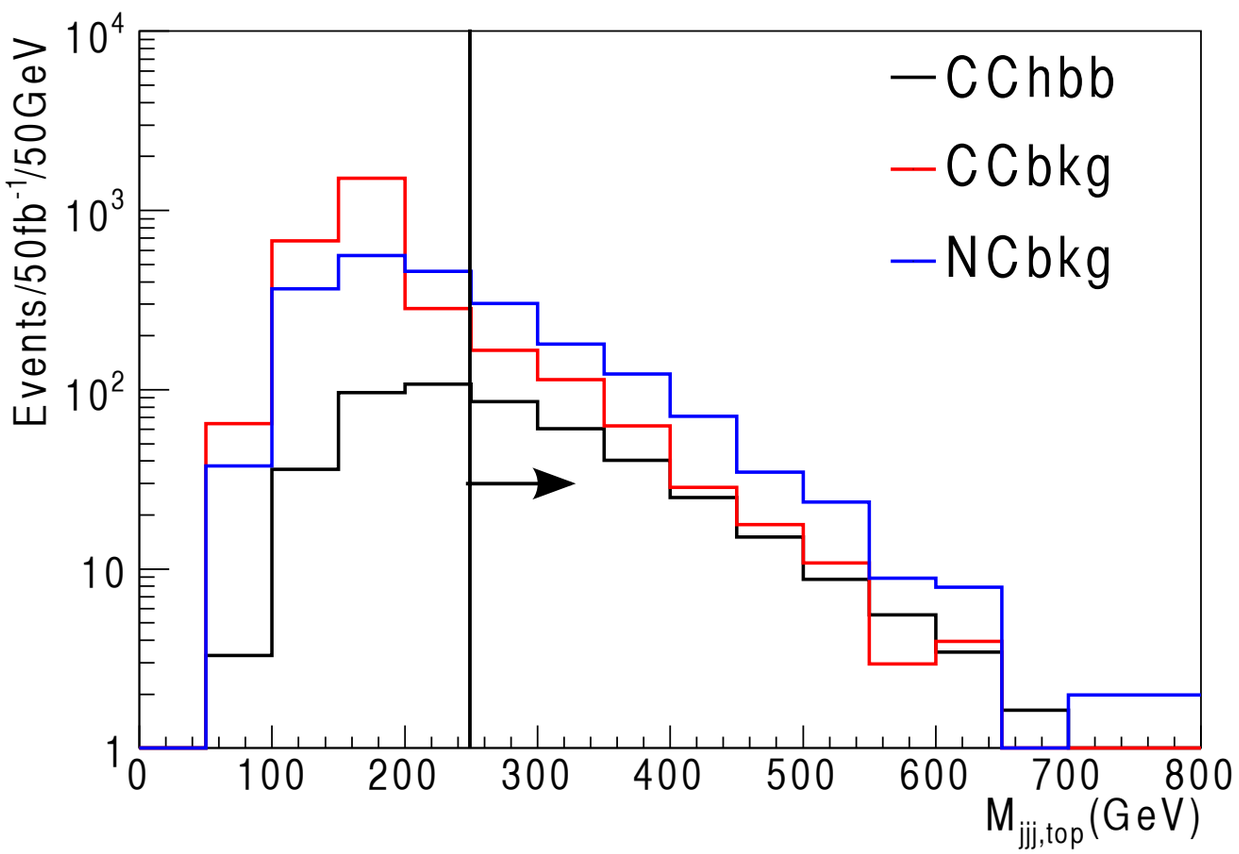
- Min η jet except for min and 2nd min η b-jets
- Light-jet Eta > 2



Top and W mass

- Cut for the top intermediating process
- Top mass means the mass reconstructed by 2b-jets and light-jet
- W mass means the mass reconstructed by min η b-jet and light-jet
- $M_{jjj,top} > 250$ GeV
- $M_{jj,W} > 130$ GeV

Top mass



W mass

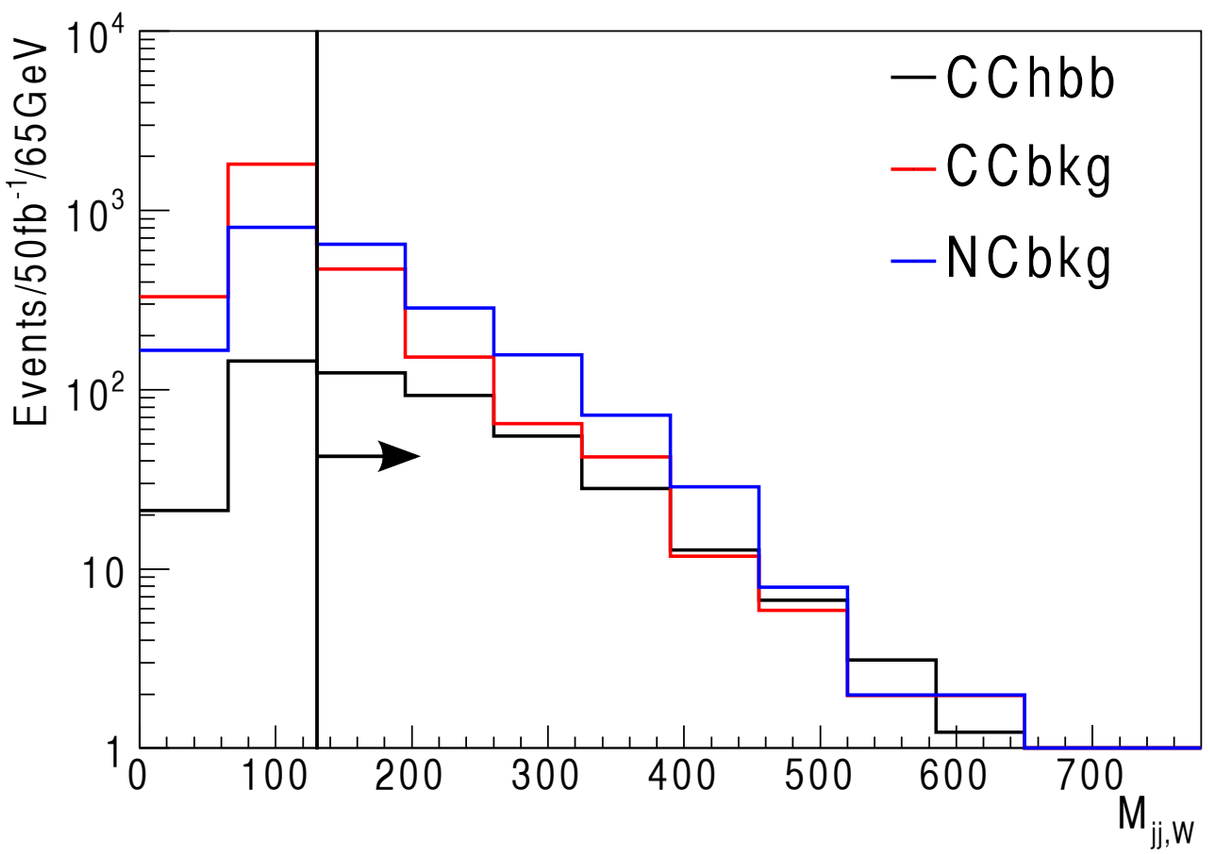
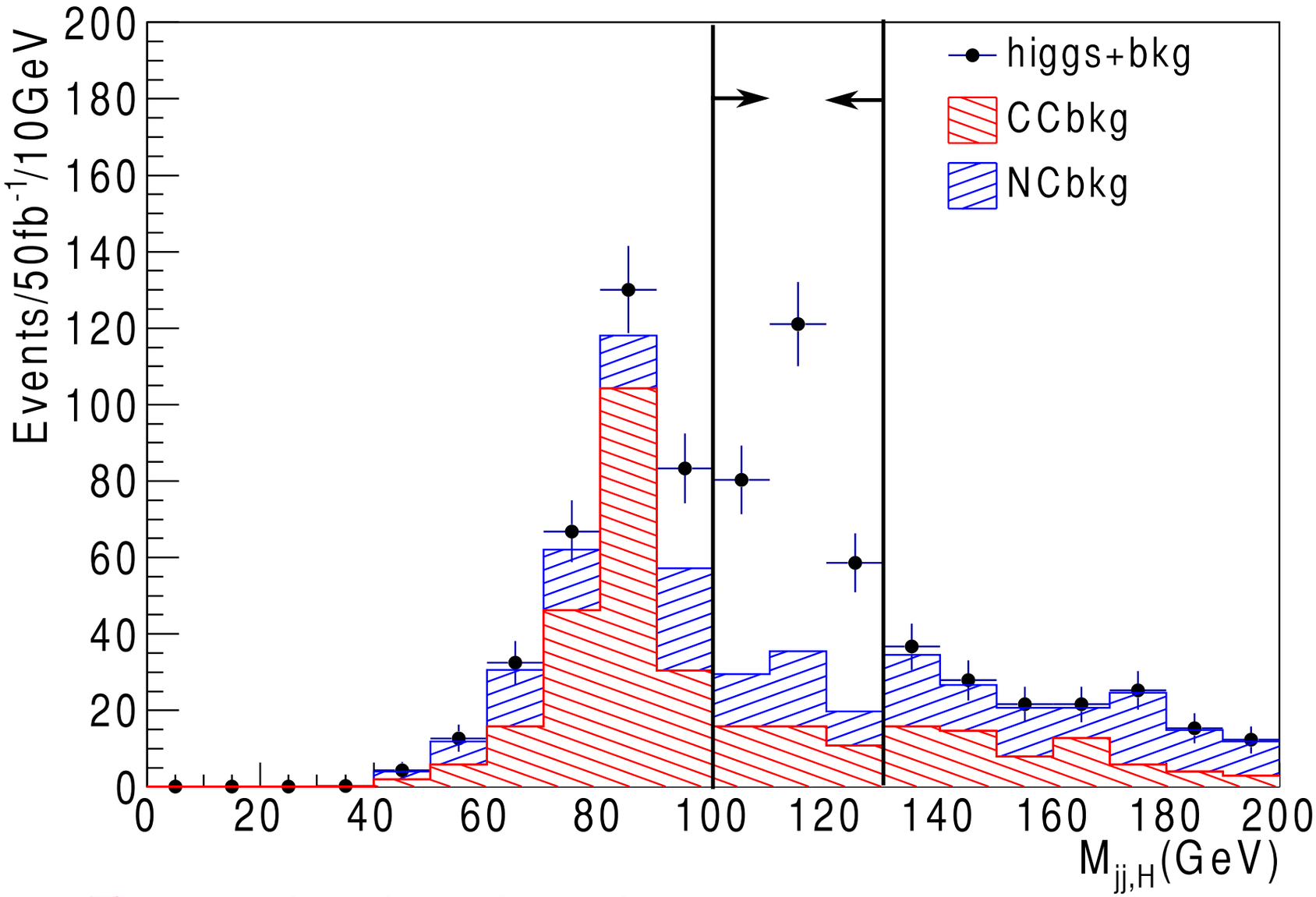


Table of cuts

Nbjet	≧2
Njet	≧3
missing ET(GeV)	>20
total ET(GeV)	>100
Nelectron	0
$Q^2(\mathrm{GeV}^2)$	>400
y	<0.9
light jet η	>2
W mass(GeV)	>130
top mass (GeV)	>250

Result

- Dijet mass reconstructed by min and 2nd min η b-jets
- Events in [100, 130] GeV region are selected



Events in signal region

signal	CCbkg	NCbkg
175	42.3	42.5

$S/\sqrt{N} = 19.0$

Comparison of b-tag efficiency

- B-tag efficiency and coverage are changed
  - b-jet ID : 60%, 70%, 80%
  - c-jet mis-ID : 10%, 5%, 1%
  - light-jet mis-ID : 1%, 0.5%, 0.1%
  - Coverage : $|\eta| < 3, 3.5, 4$

  ⎫ Flat efficiency in b-tag coverage

- Estimation of S/√N and relative error of coupling constant g, when the b-tag efficiencies and coverage are changed

Relative error of coupling constant

$$g^2 \propto \Gamma(H \to b\bar{b}) \propto N_s$$

$$\frac{\sigma_g}{g} = \frac{\sigma_s}{2N_s} = \frac{\sqrt{\sigma_{s+b}^2 + \sigma_b^2}}{2N_s} = \frac{\sqrt{N_s + 2N_b}}{2N_s}$$

B-jet ID

- Only b-jet ID efficiency is changed
- Other efficiencies and coverage are flat
  - c-jet mis-ID : 10%
  - light-jet mis-ID : 1%
  - b-tag coverage : $|\eta|<3$

	60%	70%	80%
Number of signals	175	241	312
Number of CCbkg	42.3	52.1	69.8
Number of NCbkg	42.5	70.2	94.9
S/√N	19.0	21.8	24.3
σ_g/g	0.0530	0.0457	0.0406

C-jet miss ID

- Only c-jet mis-ID efficiency is changed
- Other efficiencies and coverage are flat
  - b-jet ID : 60%
  - light-jet mis-ID : 1%
  - b-tag coverage : $|\eta|<3$

	10%	5%	1%
Number of signals	175	175	175
Number of CCbkg	42.3	42.3	39.3
Number of NCbkg	42.5	41.5	41.5
S/√N	19.02	19.12	19.47
σ_g/g	0.0530	0.0529	0.0524

Light-jet mis-ID

- Only light-jet mis-ID efficiency is changed
- Other efficiencies and coverage are flat
  - b-jet ID : 60%
  - c-jet mis-ID : 10%
  - b-tag coverage : $|\eta|<3$

	1%	0.5%	0.1%
Number of signals	175	175	175
Number of CCbkg	42.3	41.3	37.4
Number of NCbkg	42.5	42.5	41.5
S/√N	19.02	19.12	19.70
σ_g/g	0.0530	0.0529	0.0521

B-tag coverage

- Only b-tag coverage is changed
- Other efficiencies are flat
  - b-jet ID : 60%
  - c-jet mis-ID : 10%
  - light-jet mis-ID : 1%

	$\|\eta\|$<3	$\|\eta\|$<3.5	$\|\eta\|$<4.0
Number of signals	175	180	185
Number of CCbkg	42.3	44.3	61.0
Number of NCbkg	42.5	49.4	60.3
S/√N	19.02	18.55	16.83
σ_g/g	0.0530	0.0532	0.0559

Summary

- For the result 125 GeV Higgs and Ee=60 GeV, $S/\sqrt{N} = 19.0$ is obtained
- Sensitivity of CChbb is improved very much by increase of b-jet ID efficiency
- Decrease of c-jet and light-jet mis-ID efficiency can't improve the sensitivity very much
- By extension of b-tag coverage, number of background more increase than signal