

Status Report

Tokyo Institute of Technology



Masahiro Tanaka

7 October 2014



Table of contents

- Delphes setup is modified from default CMS setup
 - Jet reconstruction
 - B-tag
 - Calorimeter
- Output samples are analyzed and compared
 - PGS
 - Delphes default CMS setup
 - Delphes setup modified by me

Jet reconstruction

- For the first step, I'm trying to make Delphes setup to be same with PGS setup
- I just modified the setups of jet reconstruction, b-tag and calorimeter resolution
- Other setups are same with default CMS setup

Jet reconstruction

PGS	Delphes (default CMS)	Delphes (modified)
kt $\Delta R=0.9$	kt $\Delta R=0.9$	kt $\Delta R=0.9$
Minimum jet PT 5 GeV	Minimum jet PT 20 GeV	Minimum jet PT 5 GeV

B-tag

- For Delphes(default CMS)
 - Efficiency depends on P_T and η
 - $|\eta| < 2.5$
 - b-tag : less than 50%
 - c-mistag : less than 20%
 - light quark and gluon mistag : 1% (constant)
- For PGS and modified Delphes
 - Constant efficiency in $|\eta| < 3$
 - b-tag : 60%
 - c-mistag : 10%
 - light quark and gluon mistag : 1%

Calorimeter

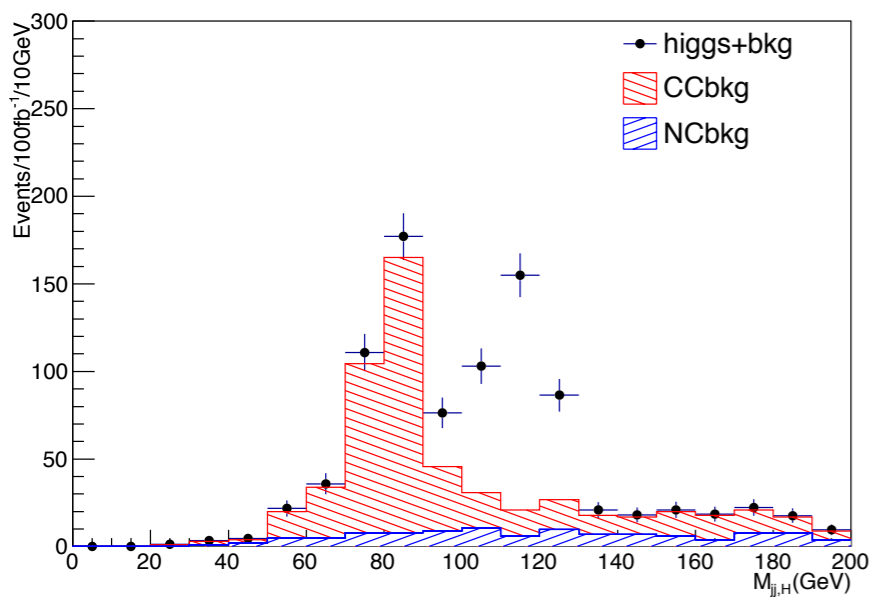
- For Delphes(default CMS)
 - ECal : $0.7\% + 7\%/\sqrt{E} + 35\%/E$ $|\eta| < 3$
 $10.7\% + 208\%/\sqrt{E}$ $3 < |\eta| < 5$
 - HCal : $5\% + 150\%/\sqrt{E}$ $|\eta| < 3$
 $13\% + 270\%/\sqrt{E}$ $3 < |\eta| < 5$
- For PGS and modified Delphes
 - ECal : $1\% + 10\%/\sqrt{E}$ for $|\eta| < 5$
 - HCal : $40\%/\sqrt{E}$ for $|\eta| < 5$

Very good resolution is assumed

Result

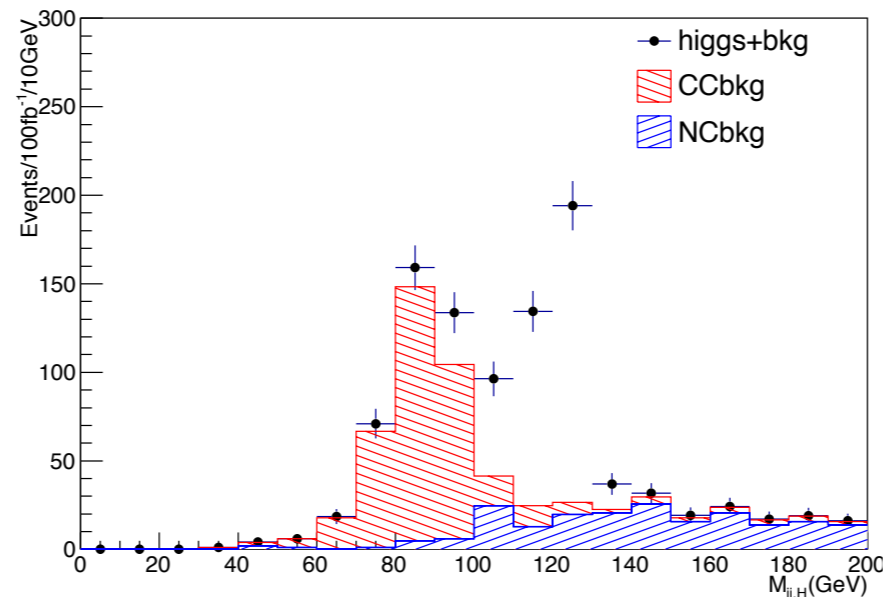
- Full analysis is performed
- PGS, Delphes default CMS and Delphes modified by me are compared

PGS



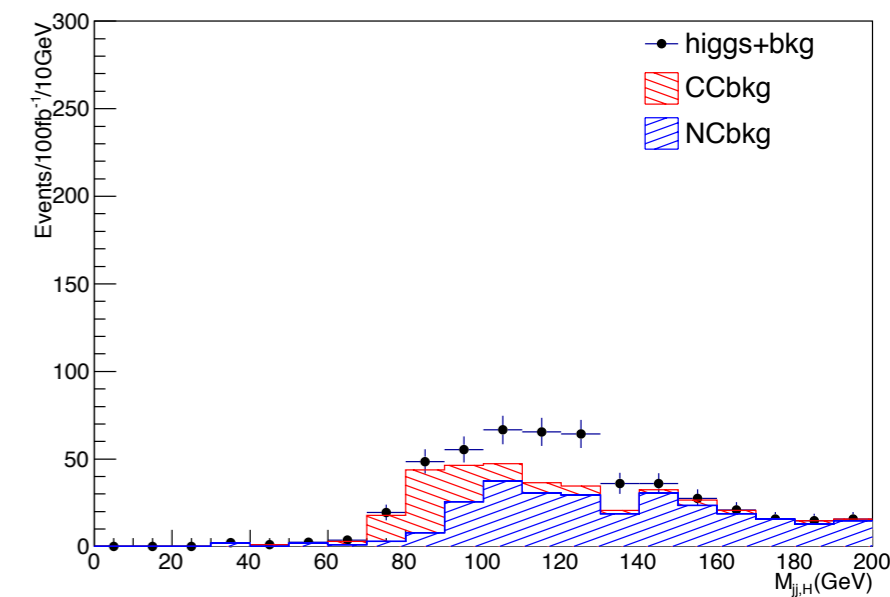
CChbb : 266
CCbkg : 51.7
NCbkg : 27.5

Modified by me



CChbb : 332
CCbkg : 35.8
NCbkg : 57.0

Delphes default CMS



- More CChbb and NCbkg, less CCbkg than these of PGS
- Any other setups between PGS and Delphes may be different
- I will add modification to other setups one by one

backup

Generated samples

- CChbb : $p e^- \rightarrow \nu_l h j, h \rightarrow b \bar{b}$
- CCbkg : $p e^- \rightarrow \nu_l j j j /h$ QCD=99 QED=99
- NCbkg : $p e^- \rightarrow e^- j j j /h$ QCD=99 QED=99

	$\sigma(\text{pb})$	Number of samples	$\frac{N}{\sigma}(\text{fb}^{-1})$
CChbb	0.072	0.1M	1390
CCbkg	5.9	0.6M	101.6
NCbkg	28	3M	107.2

Cut flow of CChbb

	PGS	Delphes (modified)	Delphes(default CMS)
Njet ≥ 3	6376	6599	4458
Nbjet ≥ 2	2345	2007	395
missingET > 20 GeV	2003	1702	342
sumET > 100 GeV	1867	1626	340
Nelectron = 0	1860	1626	340
$y < 0.9$	1858	1618	334
$Q^2 > 400 \text{ GeV}^2$	1850	1617	290
light jet $\eta > 2$	1268	1123	220
W mass > 150 GeV	576	643	168
top mass > 250 GeV	384	453	129
delta-phi > 0.3	335	398	116
In signal region	266	332	78

Cut flow of CCbkg

	PGS	Delphes (modified)	Delphes(default CMS)
$N_{\text{jet}} \geq 3$	531911	568223	327565
$N_{\text{bjet}} \geq 2$	36527	10430	1871
missingET > 20 GeV	31740	9170	1636
sumET > 100 GeV	29319	8800	1586
$N_{\text{electron}} = 0$	29240	8800	1586
$y < 0.9$	29144	8649	1530
$Q^2 > 400 \text{ GeV}^2$	29018	8645	1372
light jet $\eta > 2$	9909	1828	322
W mass > 150 GeV	1663	783	194
top mass > 250 GeV	654	470	129
delta-phi > 0.3	537	399	114
In signal region	52	36	21

Cut flow of NCbkg

	PGS	Delphes (modified)	Delphes(default CMS)
$N_{\text{jet}} \geq 3$	2538930	2709160	1297920
$N_{\text{bjet}} \geq 2$	182446	136574	16527
missingET > 20 GeV	10177	9273	3256
sumET > 100 GeV	7839	7750	3093
$N_{\text{electron}} = 0$	7676	7704	3082
$y < 0.9$	7642	7599	2866
$Q^2 > 400 \text{ GeV}^2$	7011	7540	2434
light jet $\eta > 2$	3524	3625	1247
W mass > 150 GeV	1087	1291	837
top mass > 250 GeV	577	805	613
delta-phi > 0.3	143	245	316
In signal region	27	57	95

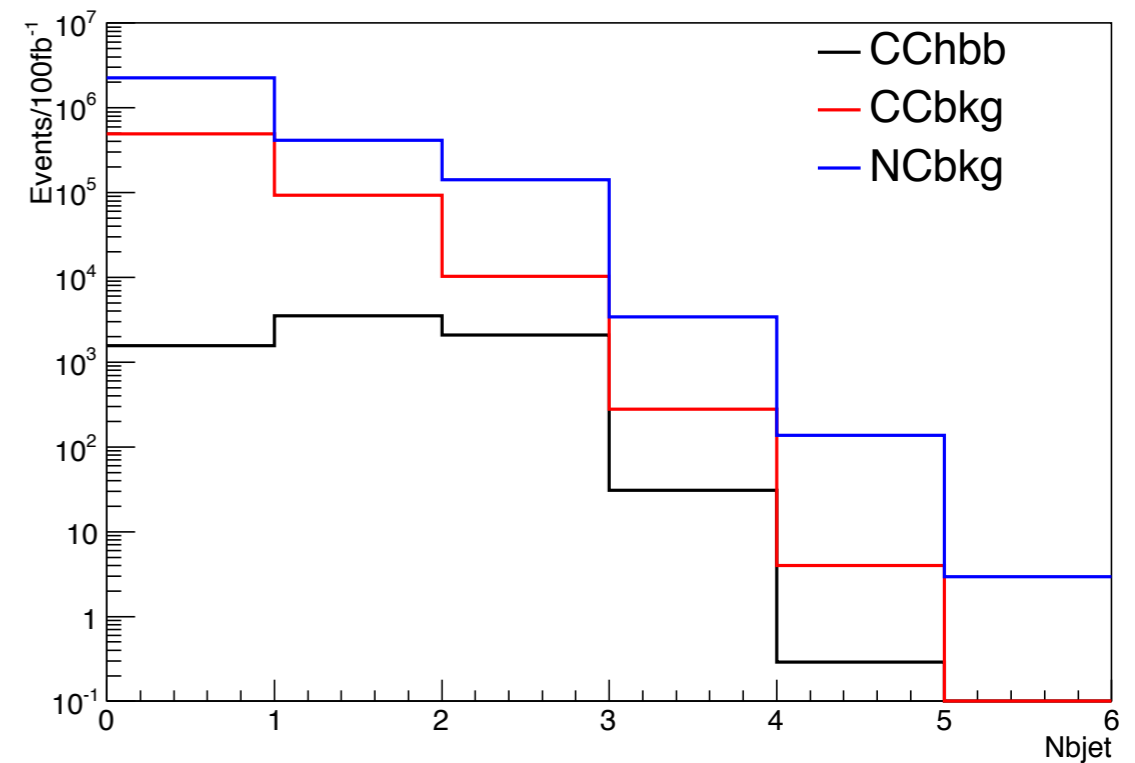
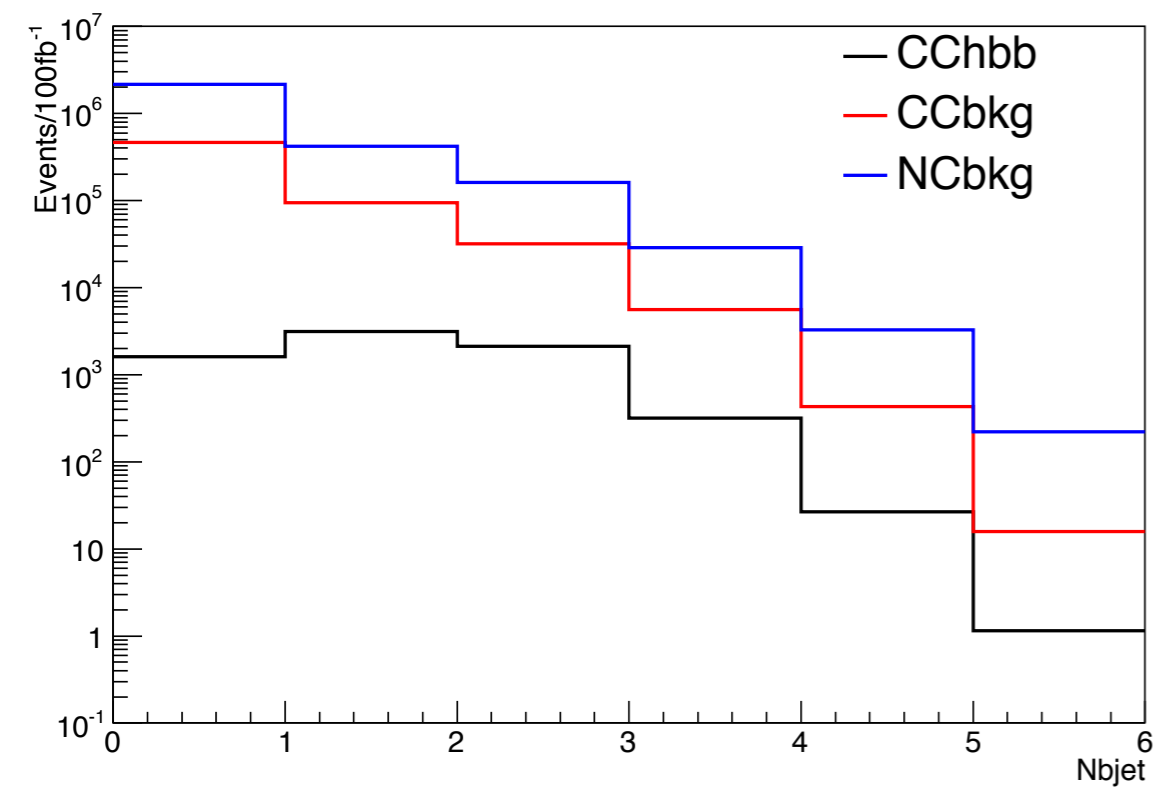
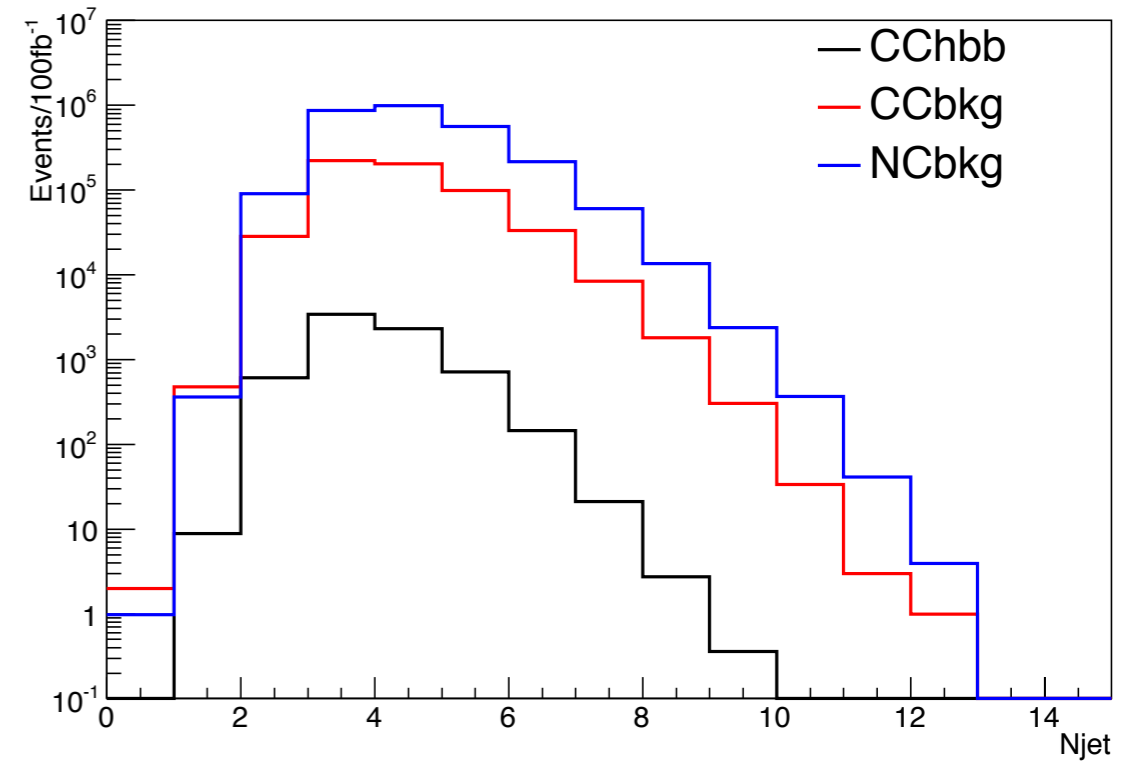
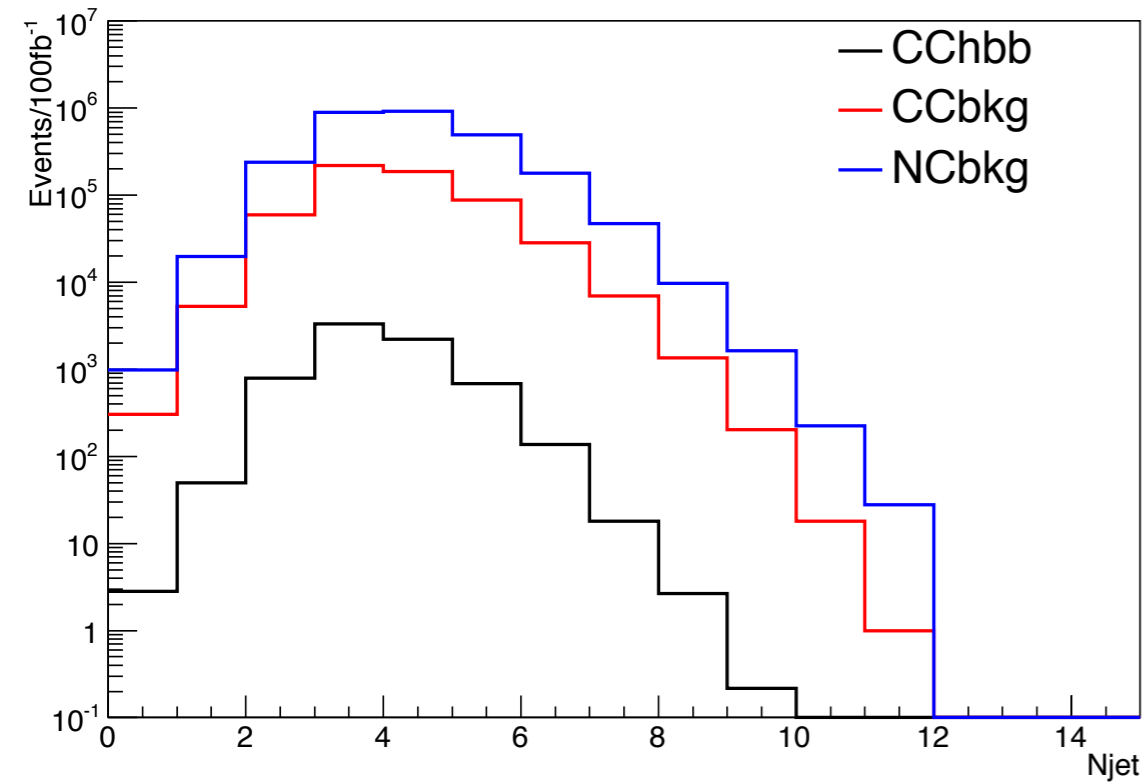
Njet and Nbjet

PGS

Delphes(modified)

Njet

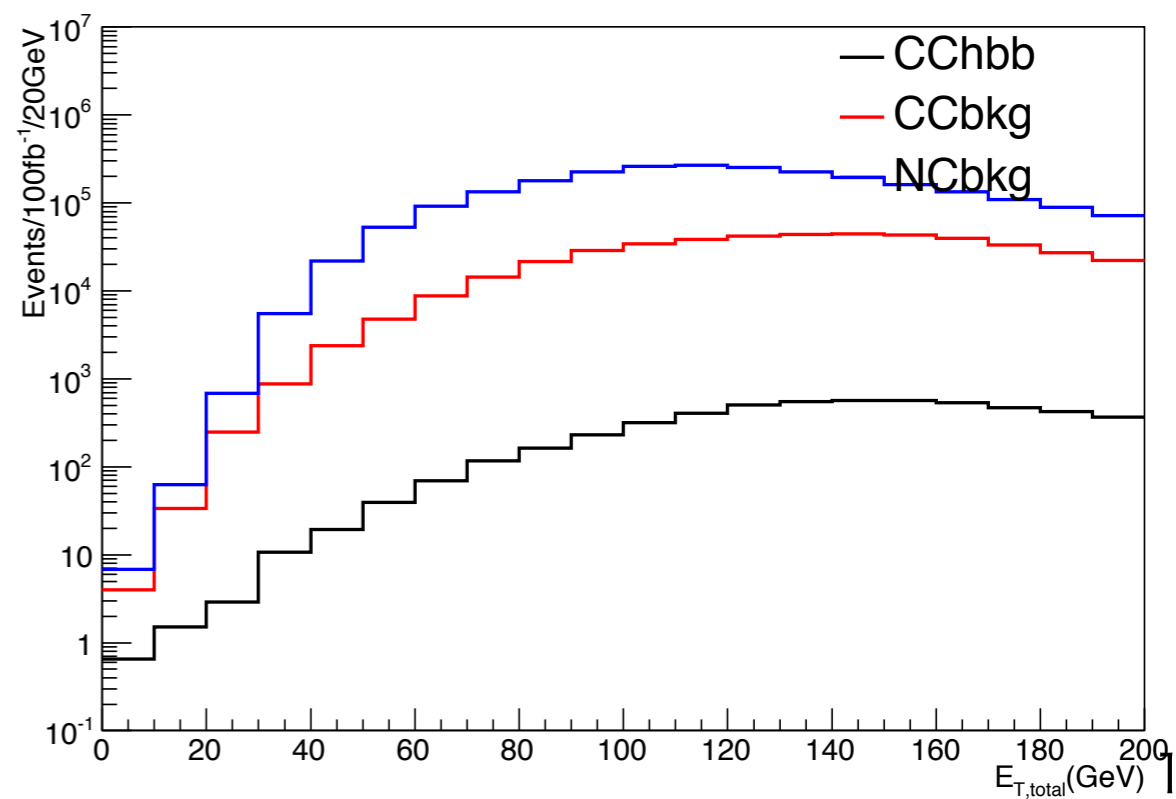
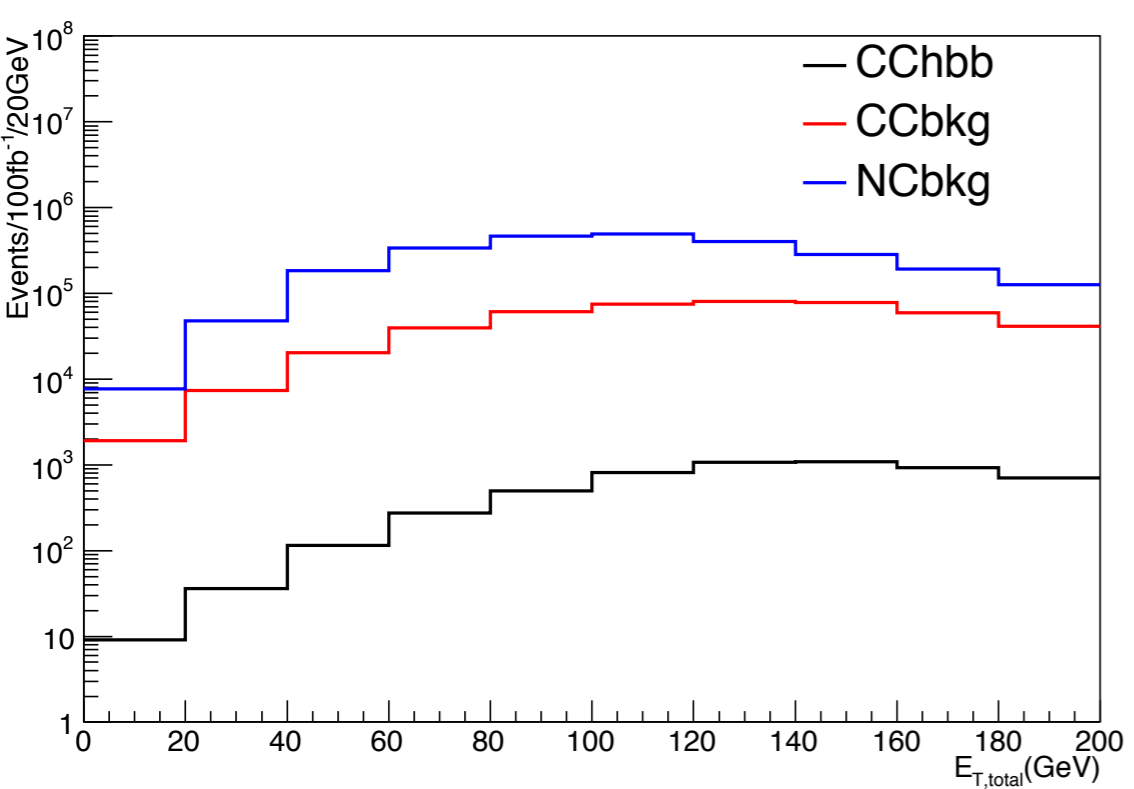
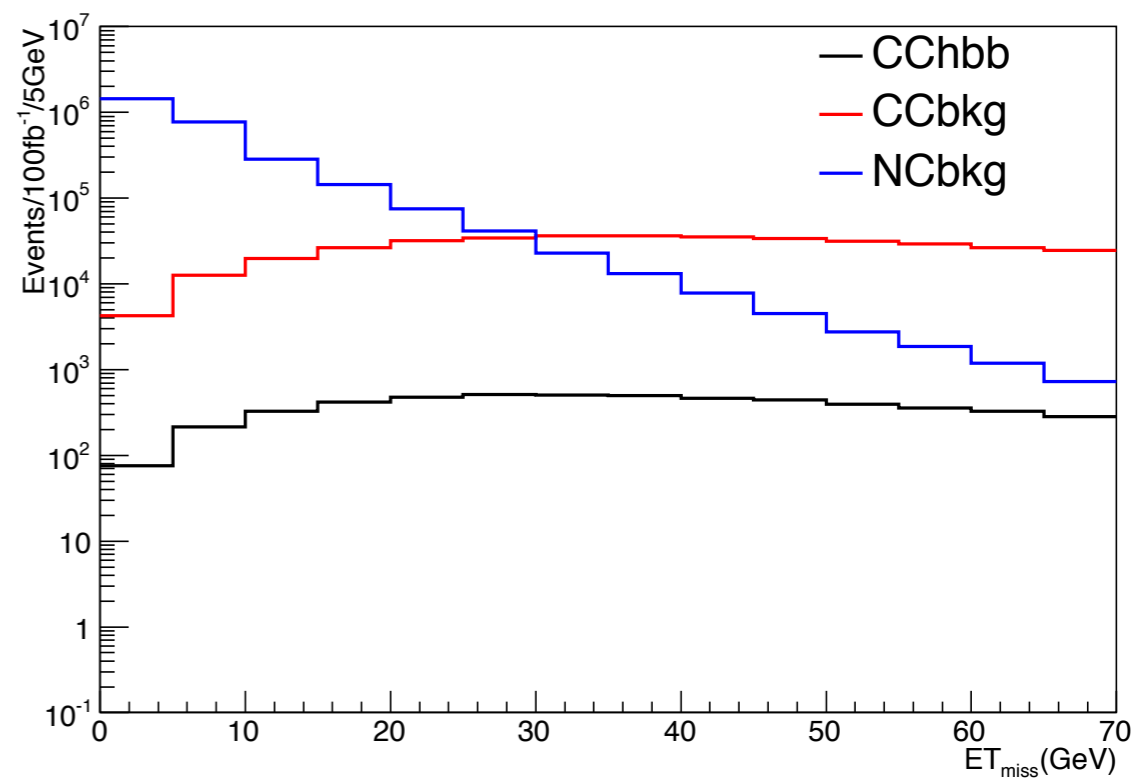
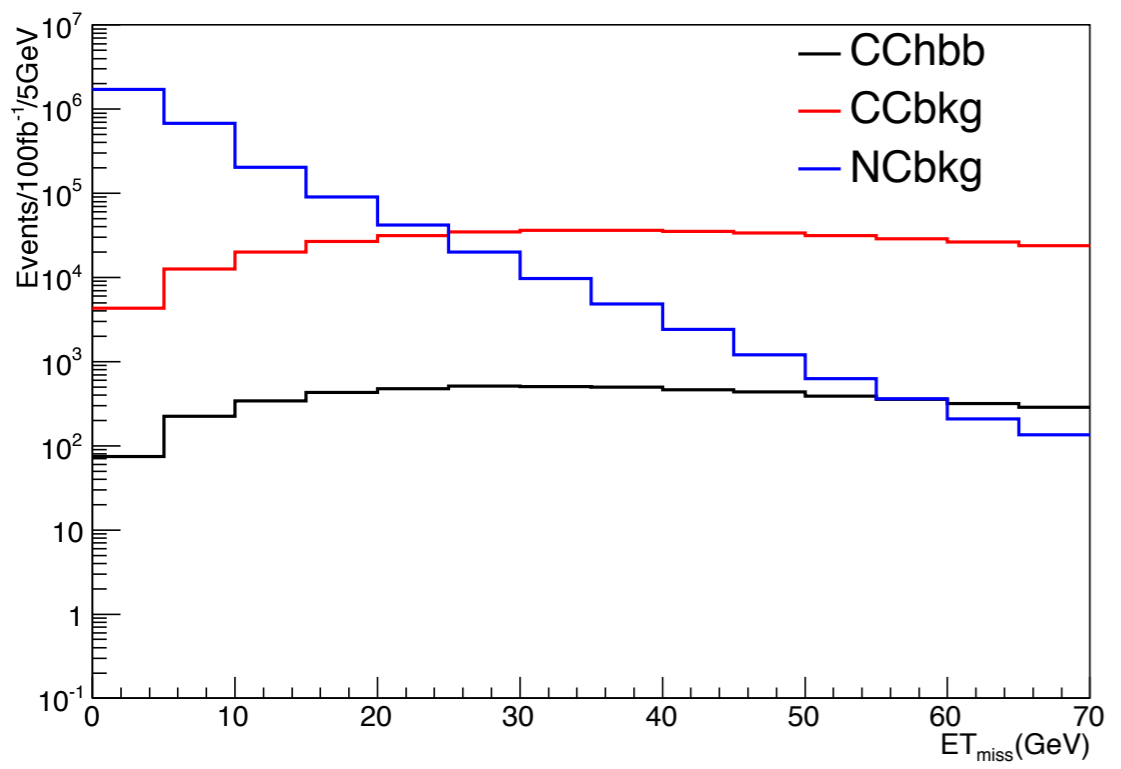
Nbjet



Njet and Nbjeta

PGS

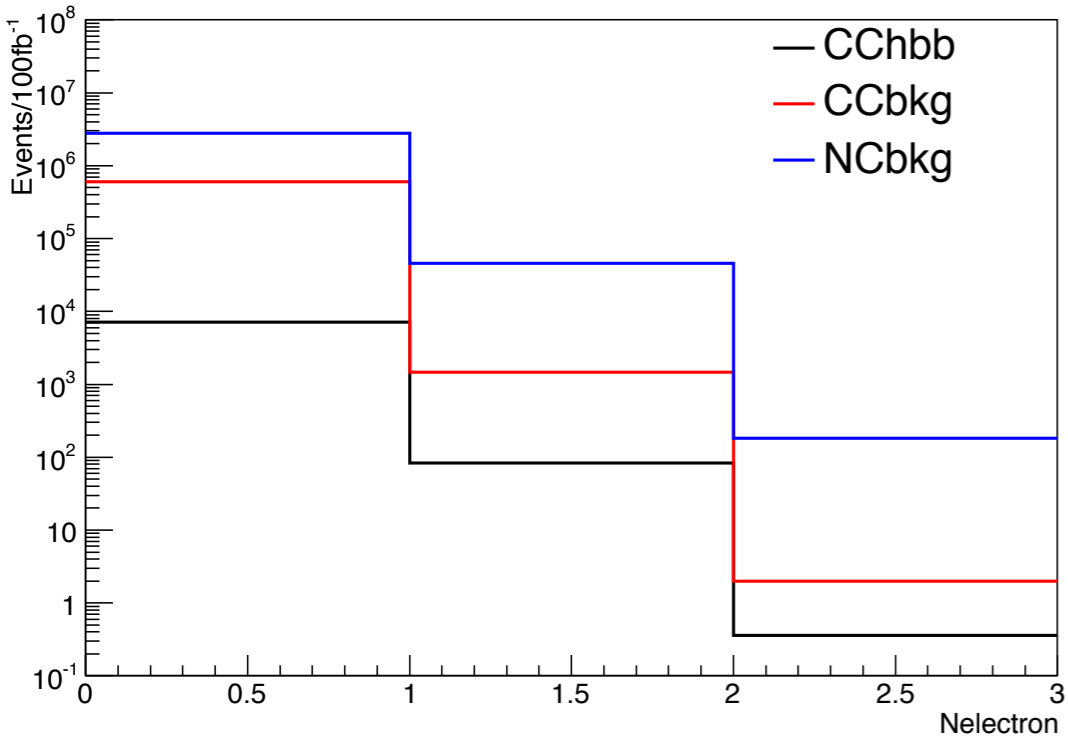
Delphes(modified)



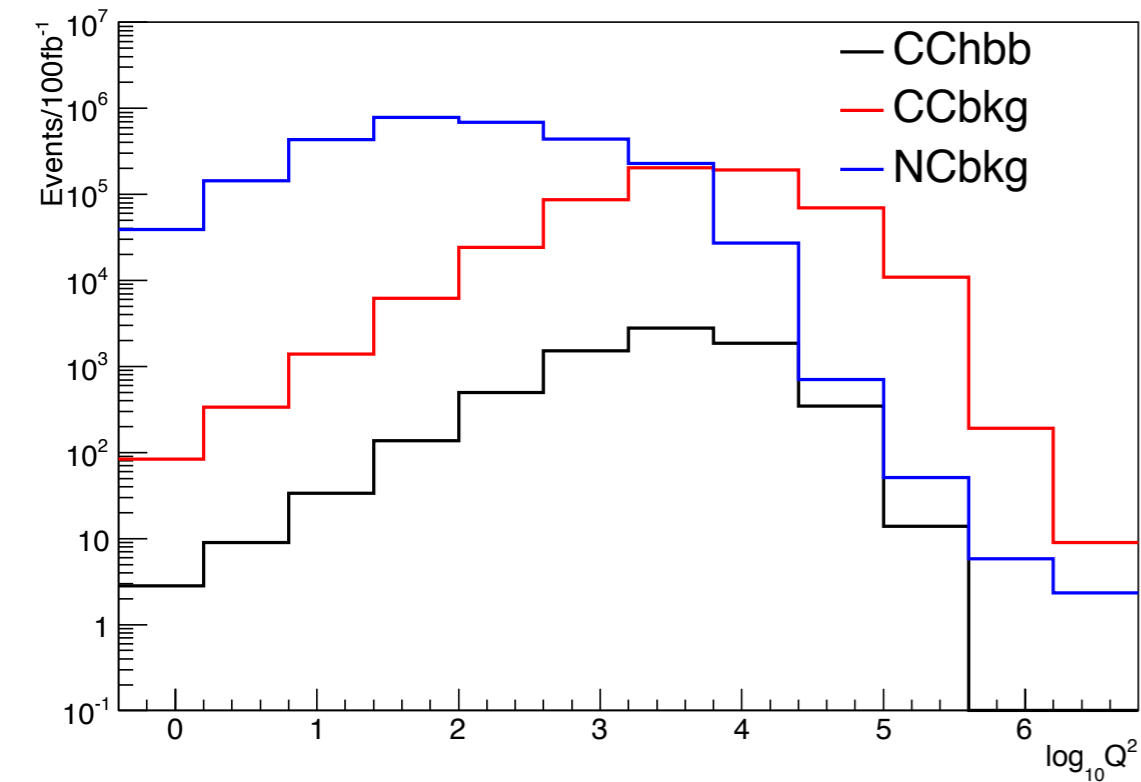
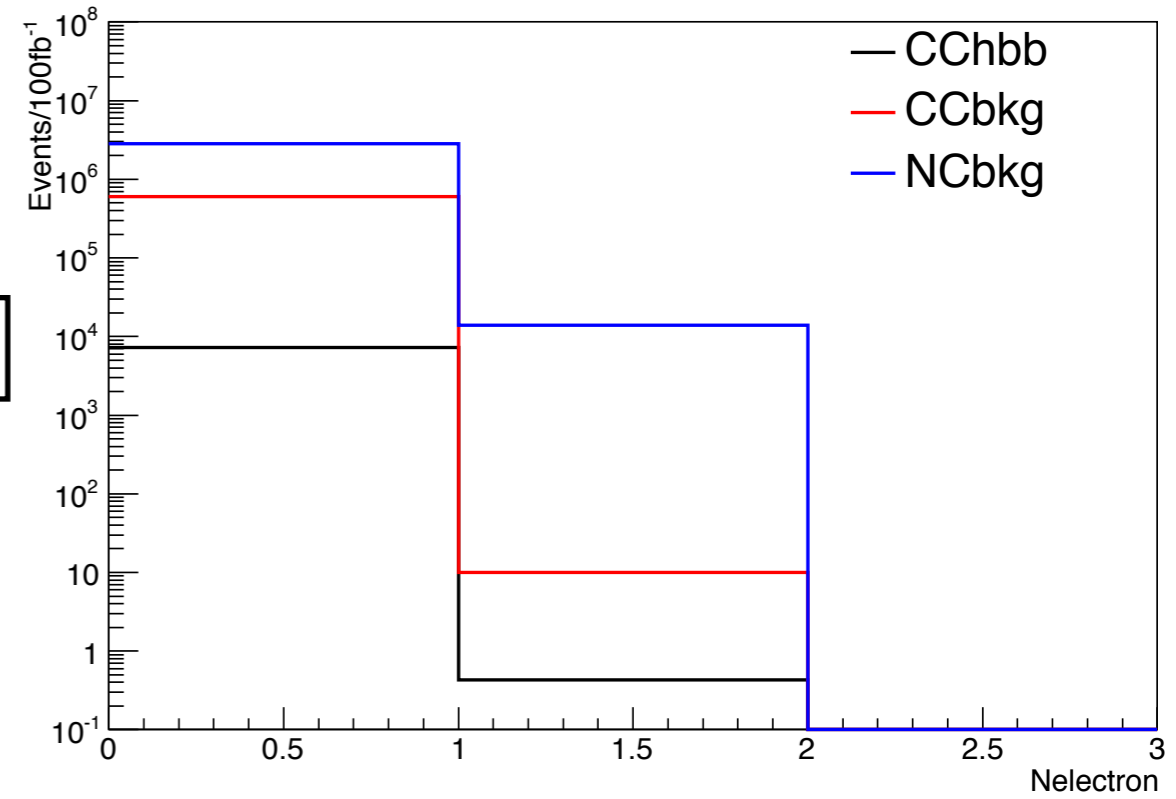
Njet and Nbjet

PGS

Delphes(modified)



Nelectron



Q²

