

# LCFIPlus for DBD

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# LCFIPlus processors

1. Primary vertex finder
2. Secondary vertex finder

DBD mass reconstruction up to here

3. Jet clustering  
JetClustering + JetVertexRefiner
4. Training MVA  
(can be omitted with existing weight files)
  1. Making ntuples
  2. Training
5. Flavor tagging

# Track issue solved in v01-16

w14815 (6u 500 GeV), Lol stdhep

geometry: v01-13 = ILD\_00, newer = ILD\_v1\_o5

cuts:  $p_T > 1$  GeV,  $|\cos\theta| < 0.9$ ,  $d_0 < 1$  mm,  $z_0 < 1$  mm

Table of number of tracks:

#vtx	0	1	2	3	4	5	6	4 to 6	4 to 6
v01-13	662	315	381	936	9105	31384	236363	276852	99.2%
v01-15-03 / stevefix	5956	1060	1532	1056	2143	19535	241039	262717	96.5%
v01-16	837	385	977	874	1951	20340	247786	270077	98.9%

Track performance becomes reasonable in v01-16

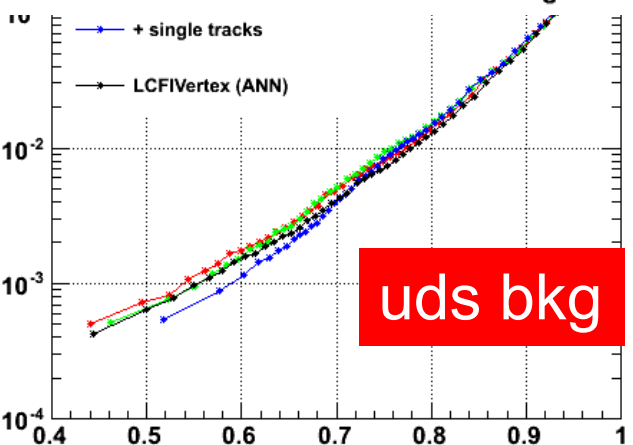
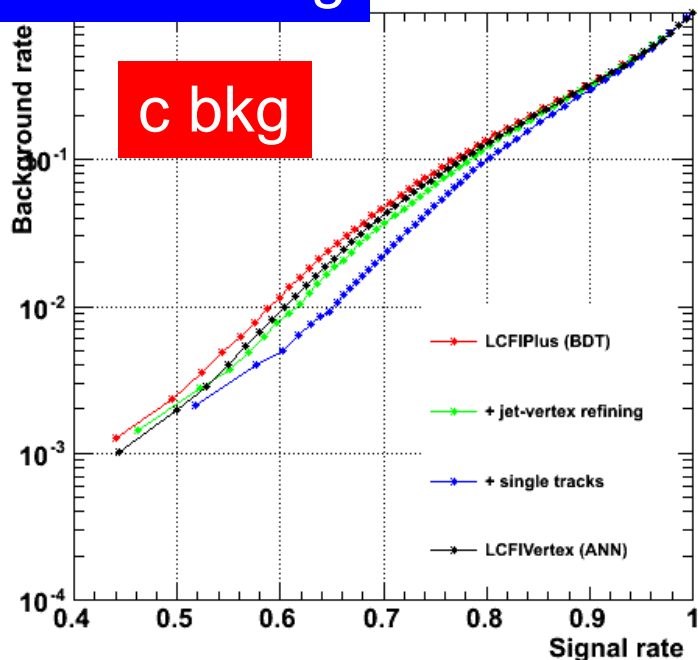
# of tracks still slightly smaller than v01-13

(PandoraPFA loses 13000 tracks with #vtxhit 5-6)

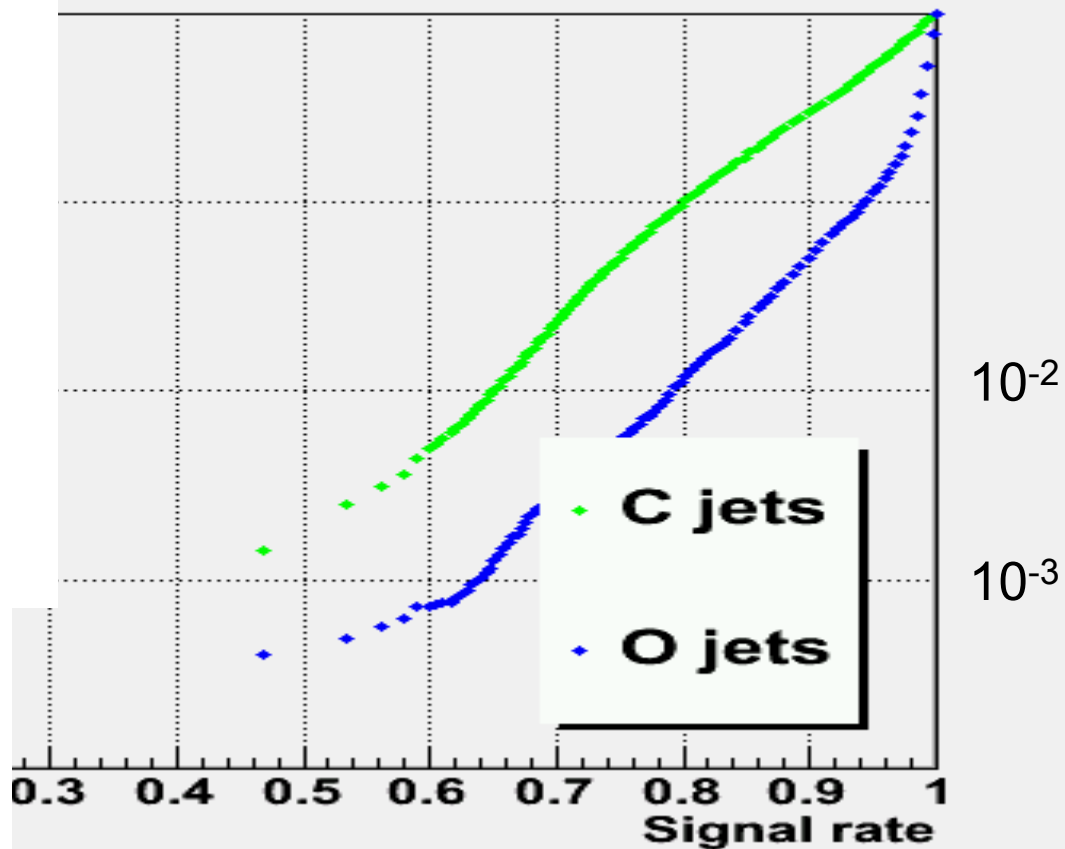
# Flavor tagging performance: qq91

v01-13 b-tag

(ST)

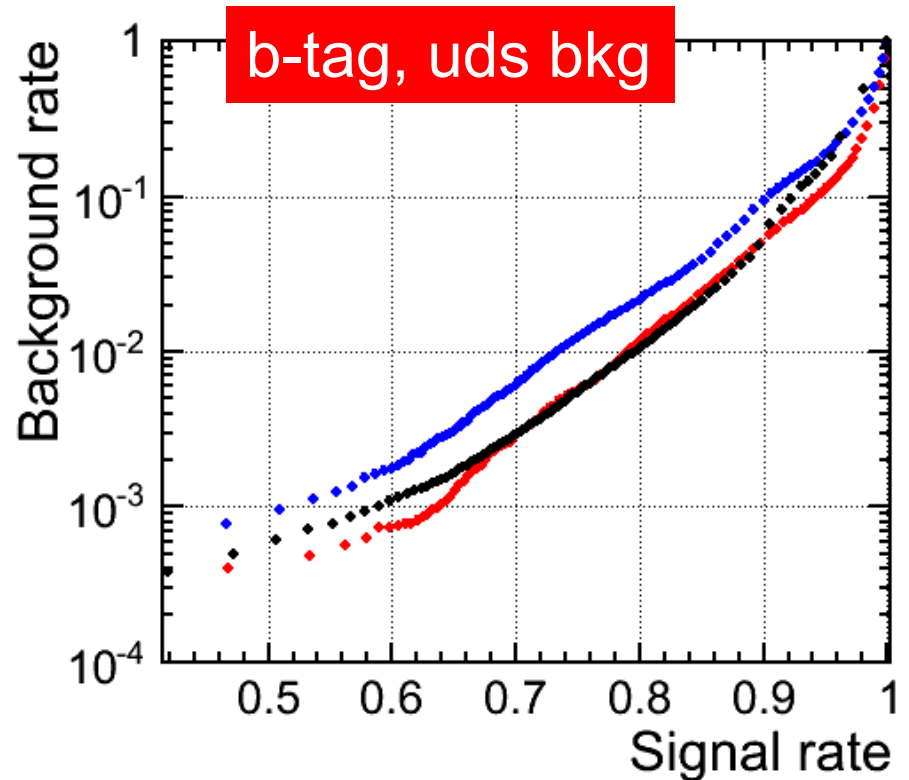
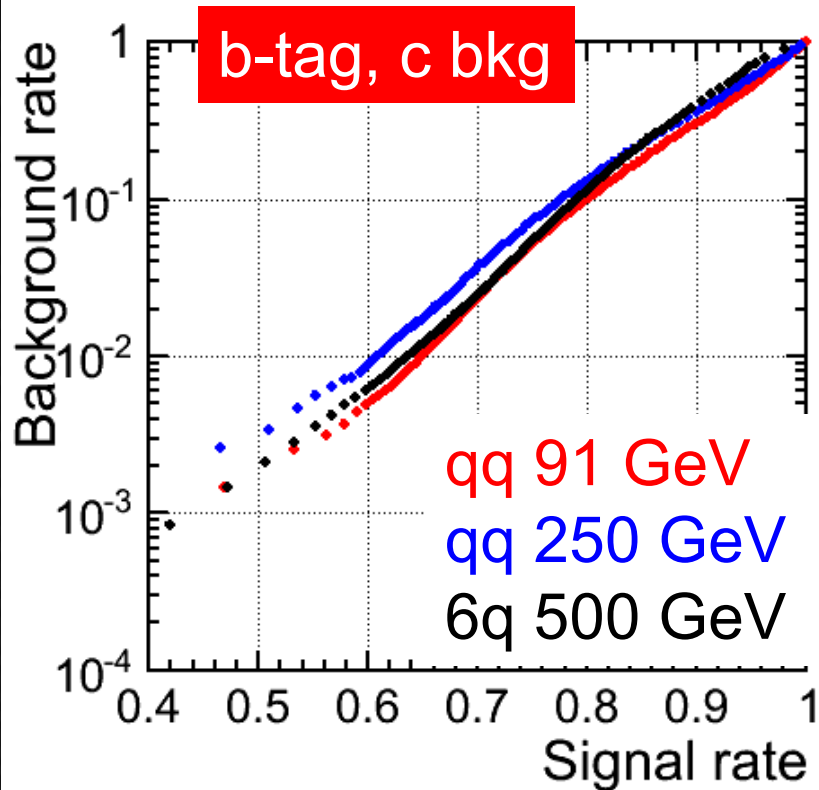


v01-16 b-tag



similar performance to previous!

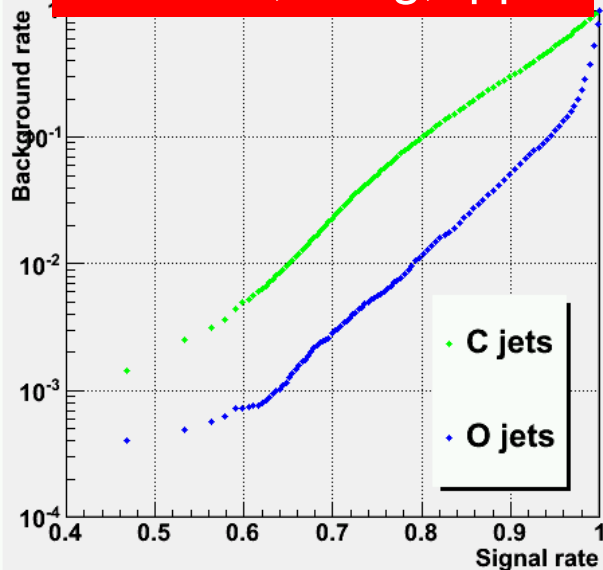
# Difference of training samples



Training & test samples are from same process

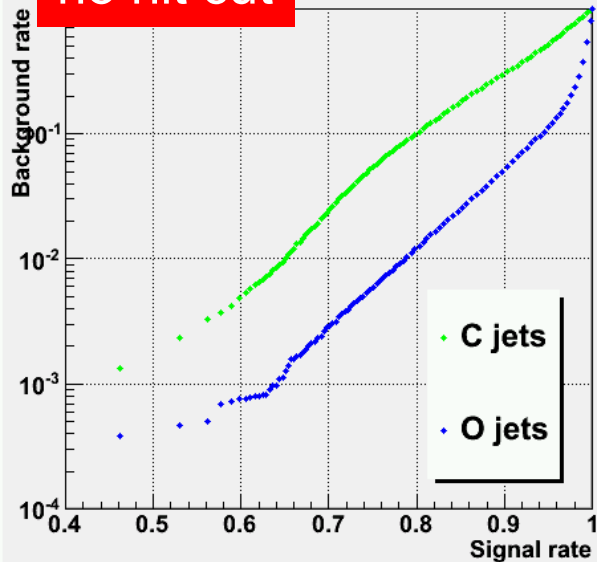
# Difference of cut on track hit

DBD cut, b-tag, qq91

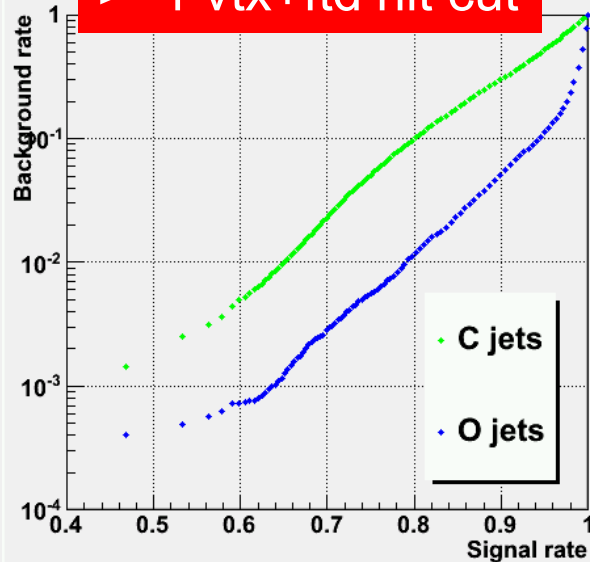


no difference.

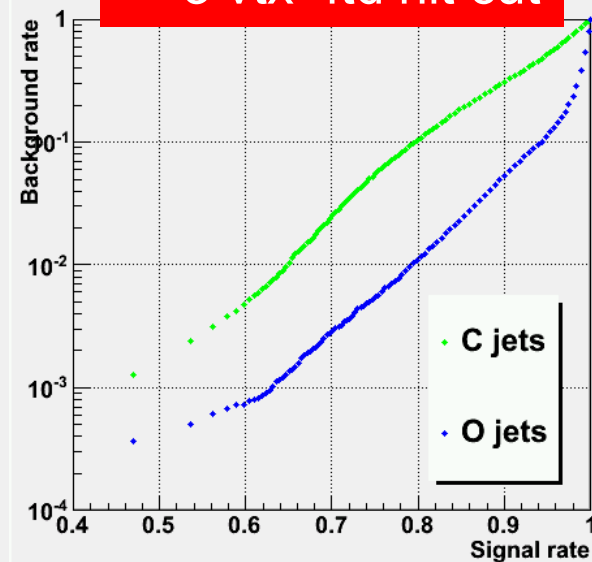
no hit cut



$\geq 1$  vtx+ftd hit cut



$\geq 3$  vtx+ftd hit cut

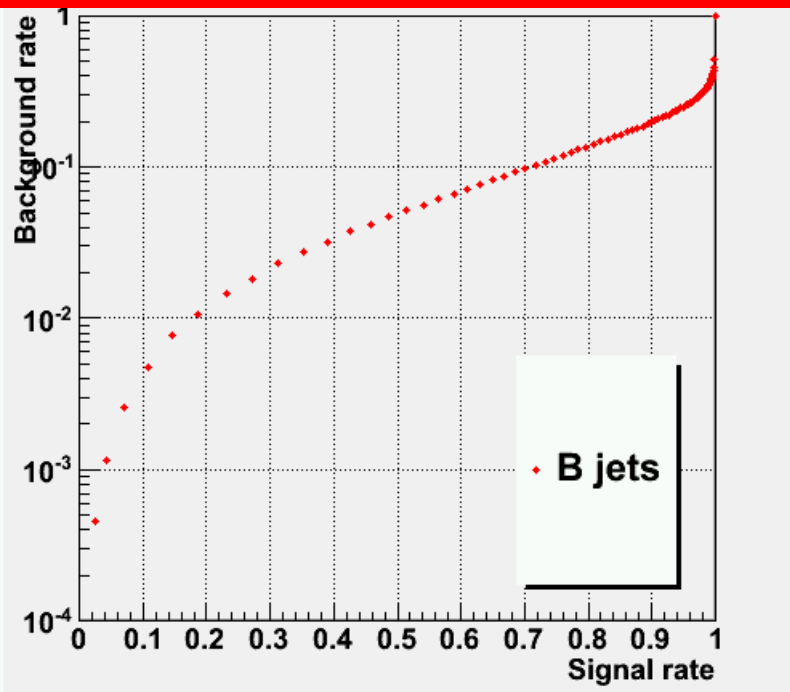


# Released weight files

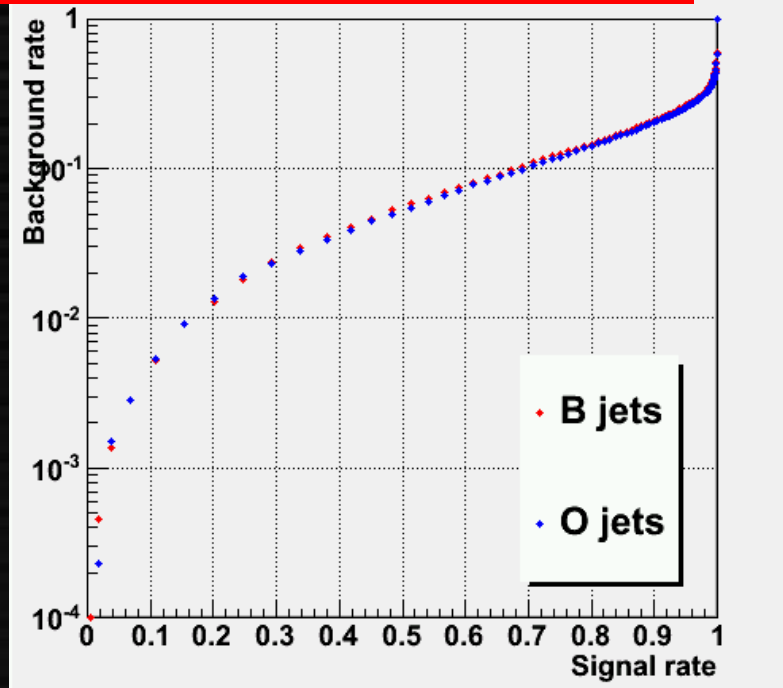
- ILDConfig/LCFIPlusConfig/data/lcfiweights
  - (process)\_vXX\_pXX
    - process: qq91, qq250, 6q500
      - More files (ex. 6q1000) will come
    - v01 only
      - (v02 under preparation)
    - p00: no hit cut, p01: DBD cut, p02: vtx+ftd  $\geq 1$
- 3x3 = 9 files now
- Use p01 for DBD vertices
  - Select suitable process (energy/# jets)

# BC-tag??

ctag / (btag+ctag), qq91, DBD



ctag, training with b/c/b

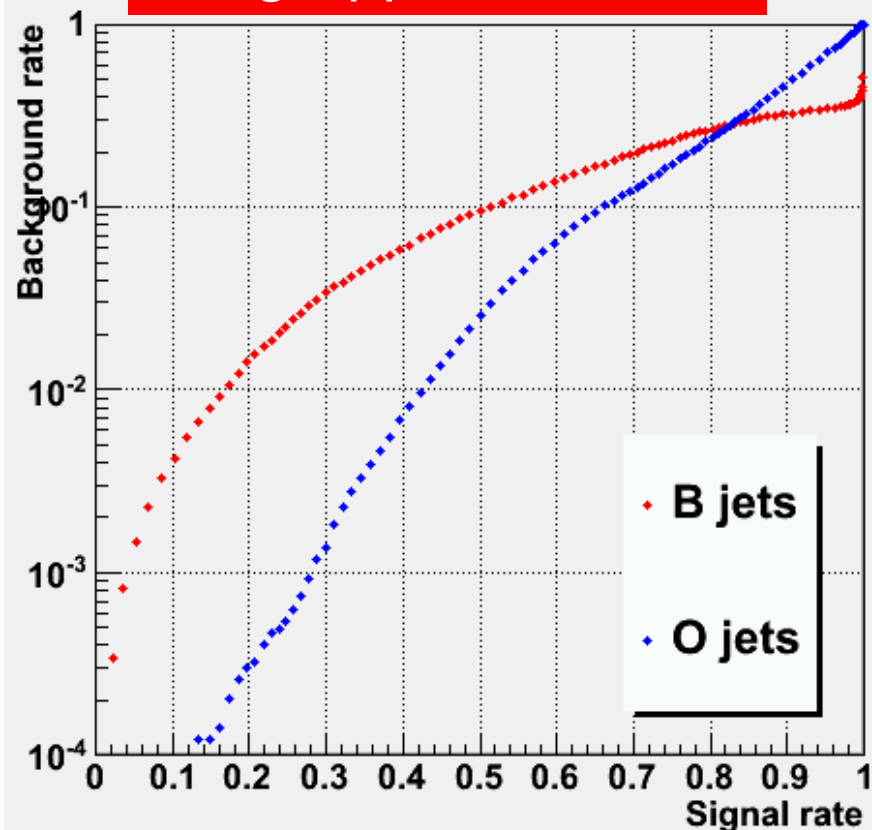


In our sample btag + ctag + other is normalized to 1  
Use  $\text{ctag}/(\text{btag}+\text{ctag})$  as previous 'bc-tag'

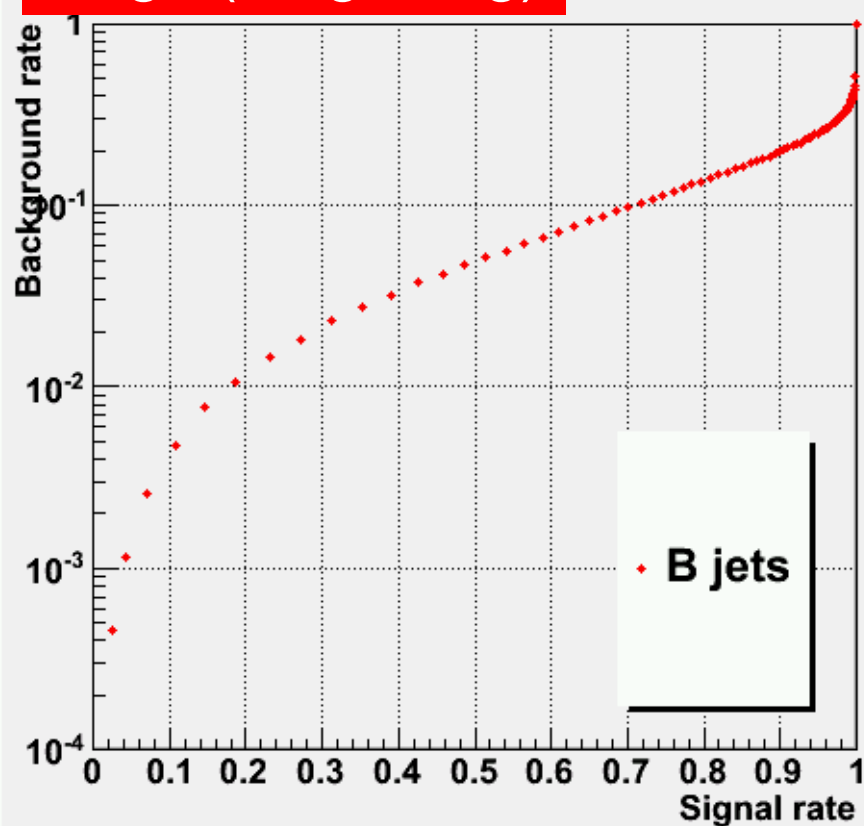


# C-tag vs BC-tag

c-tag, qq91, DBD cut

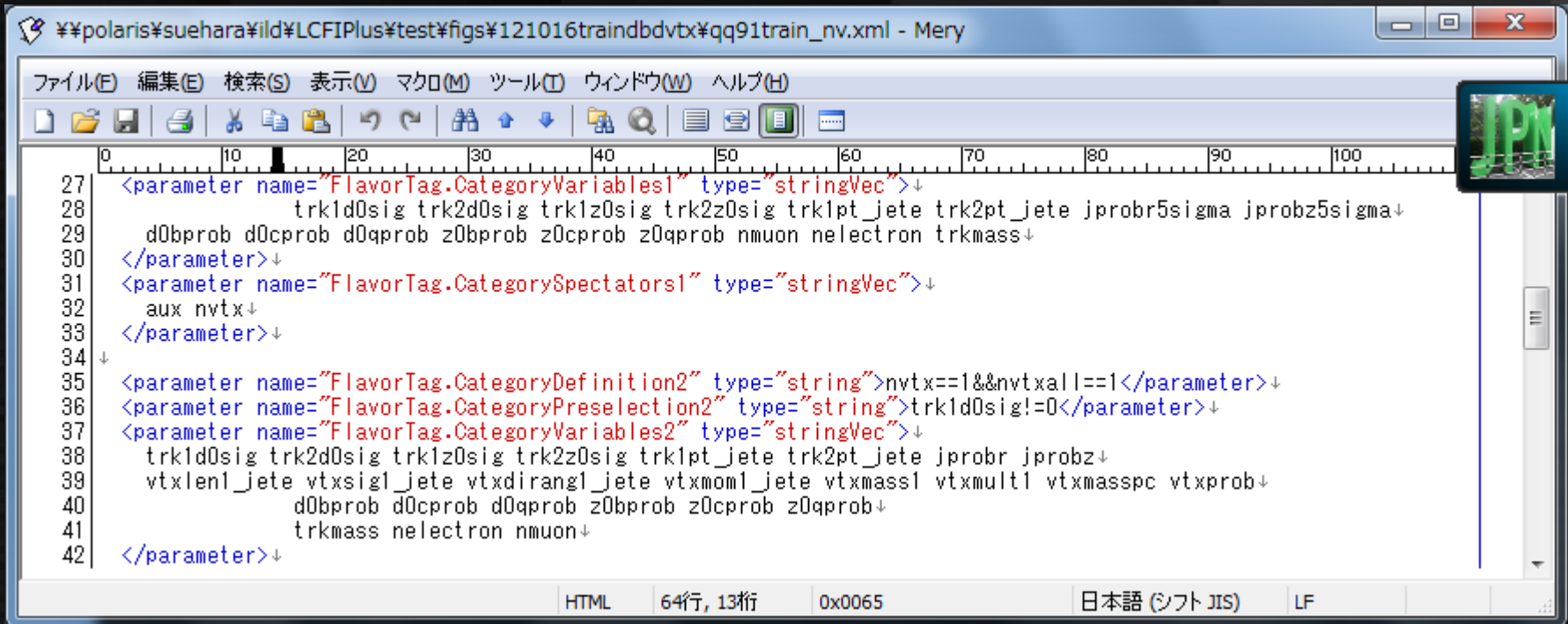


ctag / (btag+ctag)



BC-tag is better than C-tag

# New variables (v02)



```
27 <parameter name="FlavorTag.CategoryVariables1" type="stringVec">↓
28     trk1d0sig trk2d0sig trk1z0sig trk2z0sig trk1pt_jete trk2pt_jete jprobr5sigma jprobrz5sigma↓
29     d0bprob d0cprob d0qprob z0bprob z0cprob z0qprob nmuon nelectron trkmass↓
30 </parameter>↓
31 <parameter name="FlavorTag.CategorySpectators1" type="stringVec">↓
32     aux nvtx↓
33 </parameter>↓
34 ↓
35 <parameter name="FlavorTag.CategoryDefinition2" type="string">nvtx=1&&nvtxall==1</parameter>↓
36 <parameter name="FlavorTag.CategoryPreselection2" type="string">trk1d0sig!=0</parameter>↓
37 <parameter name="FlavorTag.CategoryVariables2" type="stringVec">↓
38     trk1d0sig trk2d0sig trk1z0sig trk2z0sig trk1pt_jete trk2pt_jete jprobr jprobrz↓
39     vtxlen1_jete vtxsig1_jete vtxdirang1_jete vtxmom1_jete vtxmass1 vtxmult1 vtxmasspc vtxprob↓
40     d0bprob d0cprob d0qprob z0bprob z0cprob z0qprob↓
41     trkmass nelectron nmuon↓
42 </parameter>↓
```

Vertex probability

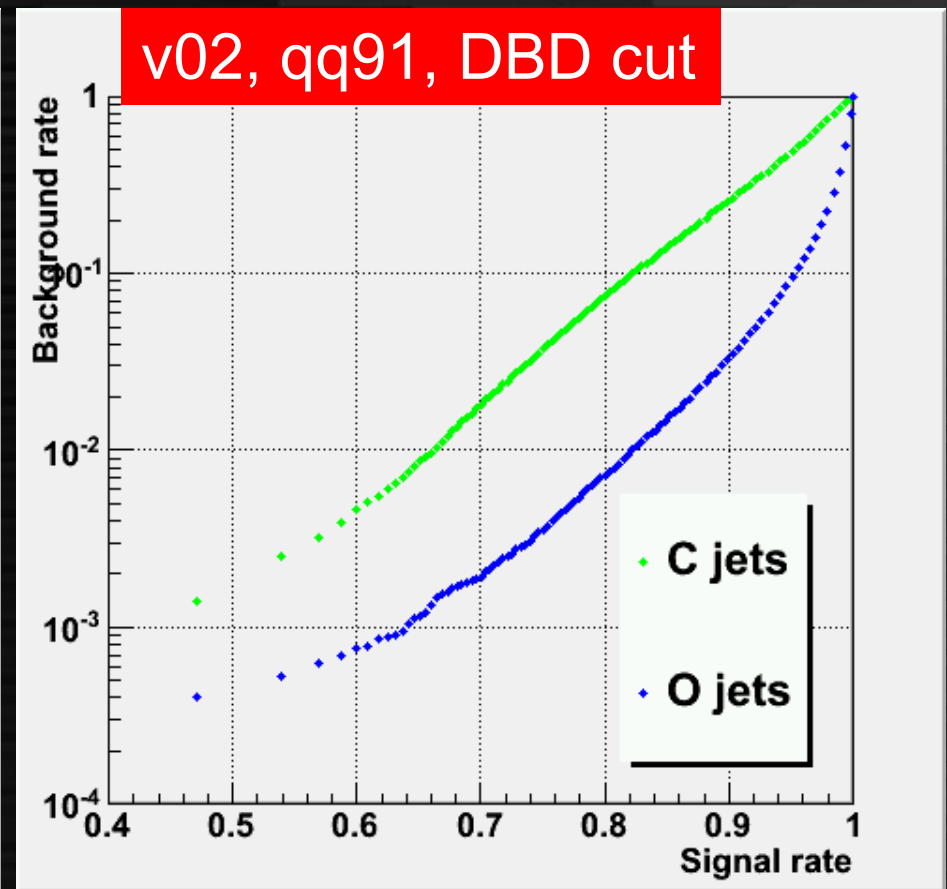
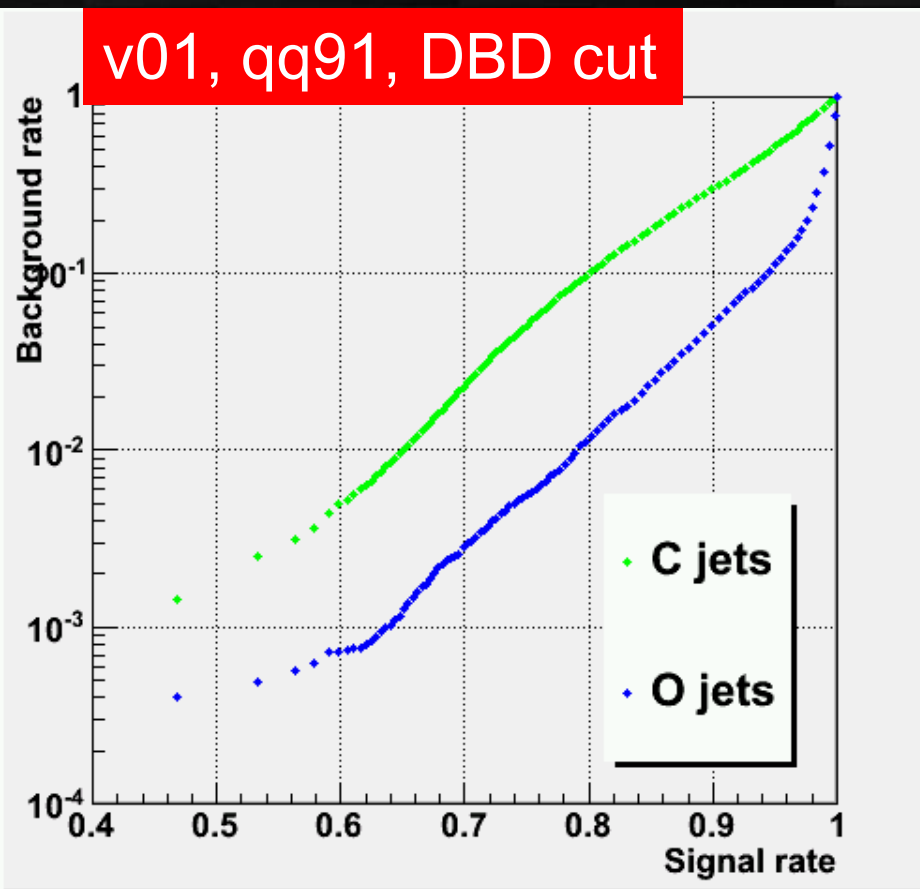
(using b/c/q d0/z0 distributions in data/vtxprob/)

Mass of secondary tracks

# electrons, # muons

steering & weight files will be ready very soon

# Comparison v01 vs v02



Improvement in high-eff region

# Summary

- LCFIPlus performance recovered
- qq91, qq250, 6q500 weight files ready
  - 4q500, 4q1000, 6q1000 will follow
    - qq91/qq250 will be reproduced with increased statistics
  - ttbar will be next (need to separate using MC)
- Config files
  - ILDConfig/LCFIPlusConfig/lcfiweights
  - ILDConfig/LCFIPlusConfig/steer
  - ILDConfig/LCFIPlusConfig/vtxprob
- v02 with improved performance comes soon
  - v03 will follow with more variables
    - LCFIPlus need to be updated for v03
- background