Top electroweak couplings study using di-leptonic state at $\sqrt{s}$ = 500 GeV, ILC with the Matrix Element Method

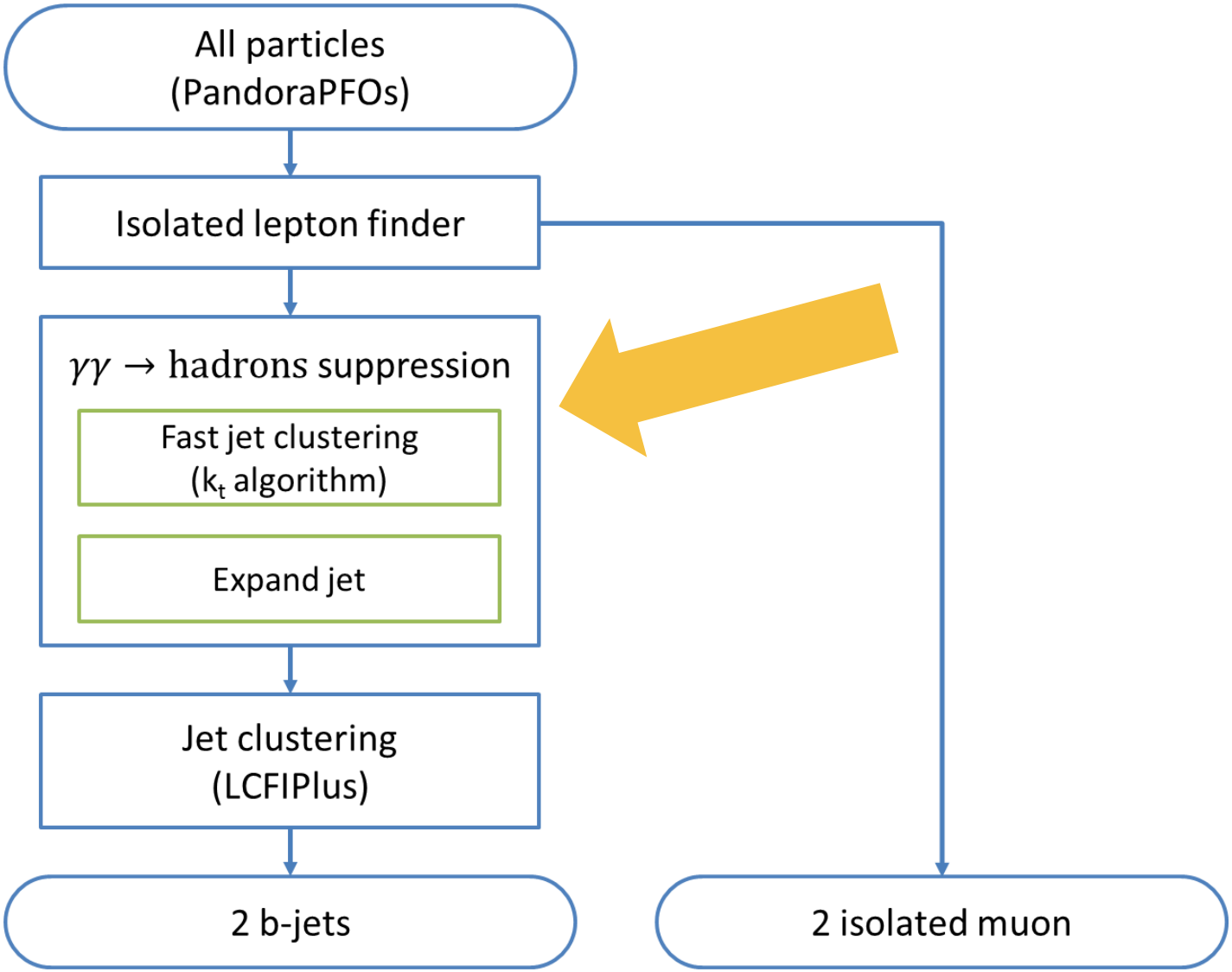
1201

Yo Sato[A]

Akimasa Ishikawa[A], Emi Kou[B], Francois Le Diberder[B], Hitoshi Yamamoto[A], Junping Tian[C], Keisuke Fujii[D], Ryo Yonamine[A]

Tohoku University[A], LAL[B], University of Tokyo[C], KEK[D]

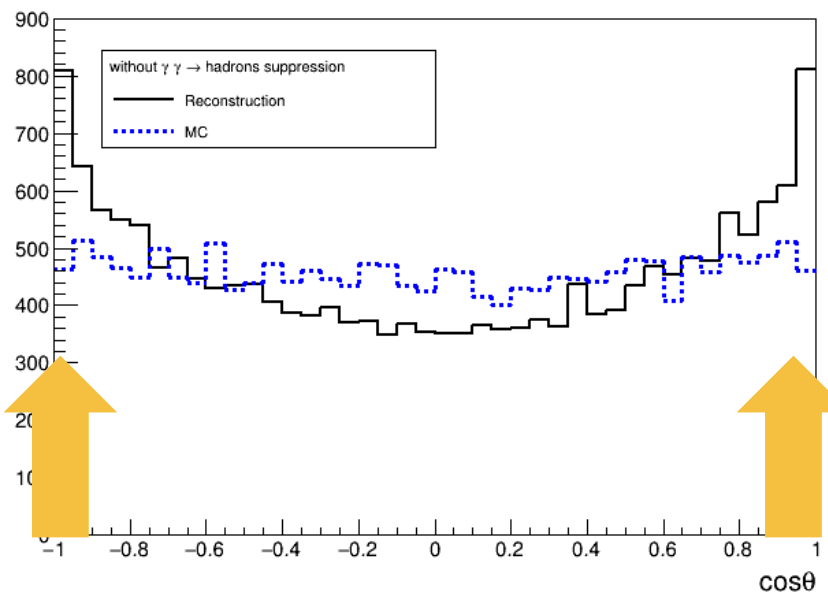
Flow of Reconstruction

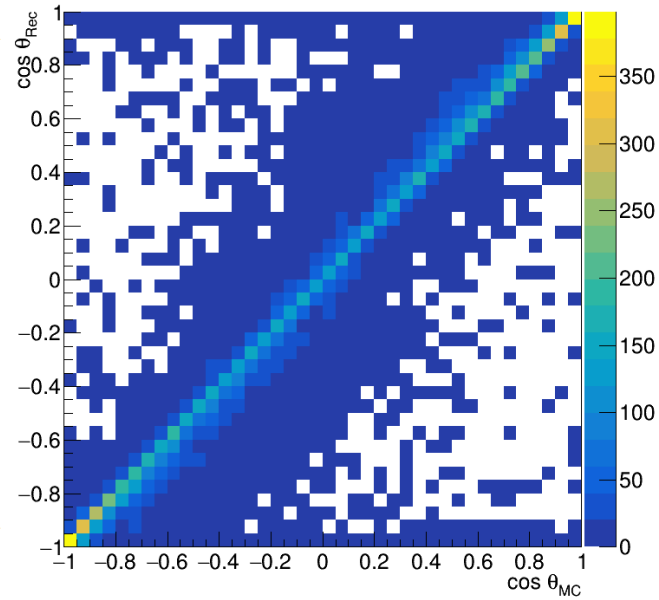


$\gamma\gamma \rightarrow$ hadrons background

Impose that #_of_jet = 2 in the b-jet reconstruction with LCFIPlus

→ $\gamma\gamma \rightarrow$ hadrons background affects the quality of b-jet reconstruction.





$\cos\theta$ of both of b-jets

The quality of b-jet reconstruction on forward region is very bad.

→ Need to suppression of $\gamma\gamma \rightarrow$ hadrons background

kt algorithm

$\gamma\gamma \rightarrow$ hadrons have low pt and are emitted along beam line.

→ Employ the (exclusive) kt algorithm

kt Algorithm (beam background removal)

- Calculate the distance between to all tracks

$$d_{ij} = \min(p_{Ti}^2, p_{Tj}^2)\frac{\Delta R_{ij}}{R}$$

with $\Delta R_{ij} = (\eta_i - \eta_j)^2 + (\phi_i - \phi_j)^2$

η pseudo rapidity, ϕ azimuth

- Find smallest d_{ij}
- If $d_{ij} < d_{iB} = p_{Ti}^2$ merge tracks, if not remove Track (B: Beam)
  - Remove particles that are closer to the beam than to the closest track i
- Continue to step one until there are only the requested number of jets

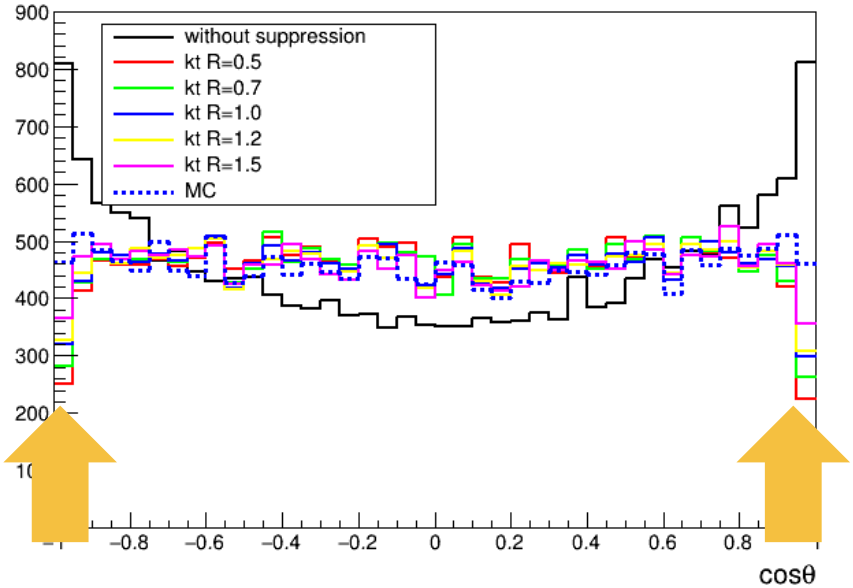
Change R

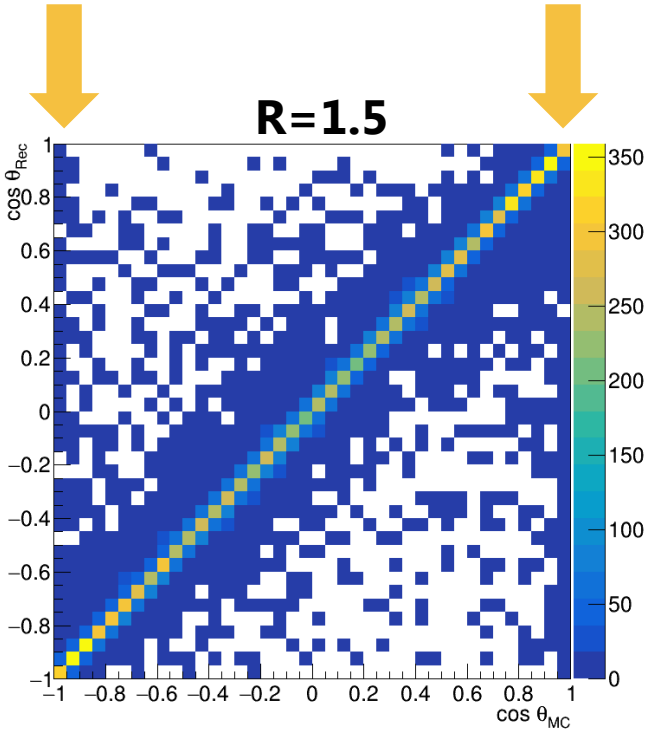
Fix N_{jets} = 2
(as first trial)

from Chris's slides

Fixing N_{jets} = 2

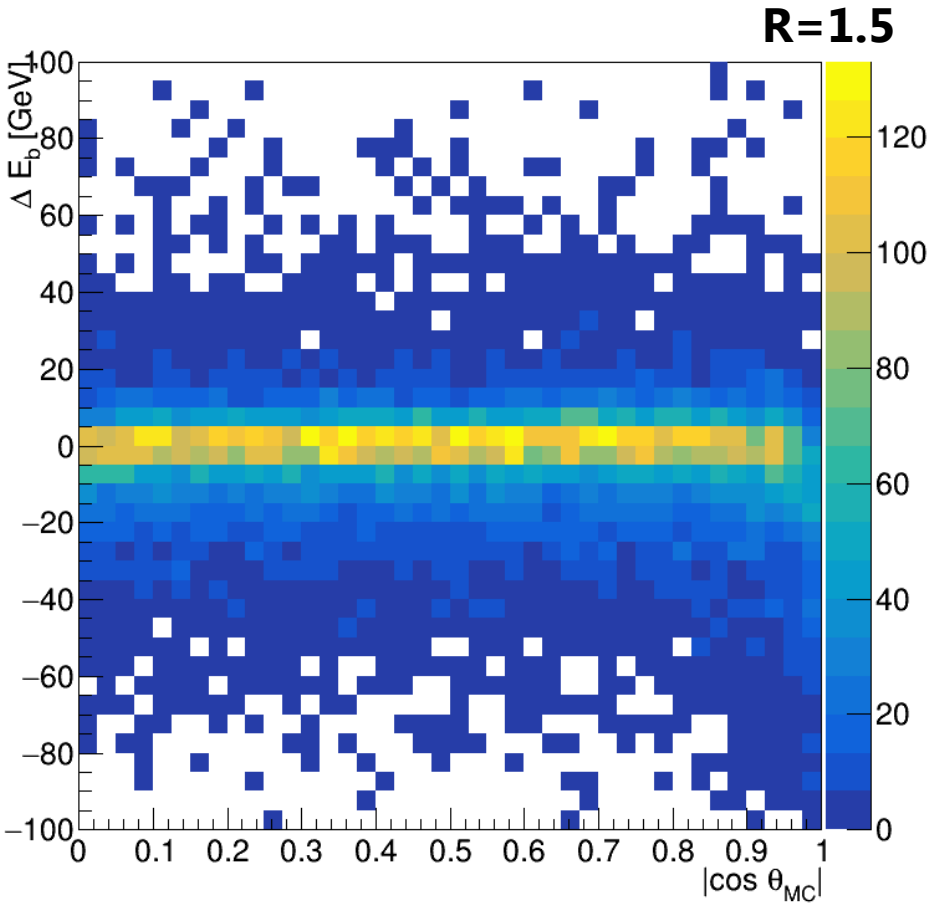
Change R (from 0.5 to 1.5) but **fix N_{jets} = 2**





The jet-clustering quality on forward region is still very bad but **the tendency is opposite from the case without suppression.**

Fixing N_{jets} = 2



$\Delta E_b \left(= E_b^{Rec.} - E_b^{MC}\right)$ vs $|\cos\theta_b^{MC}|$

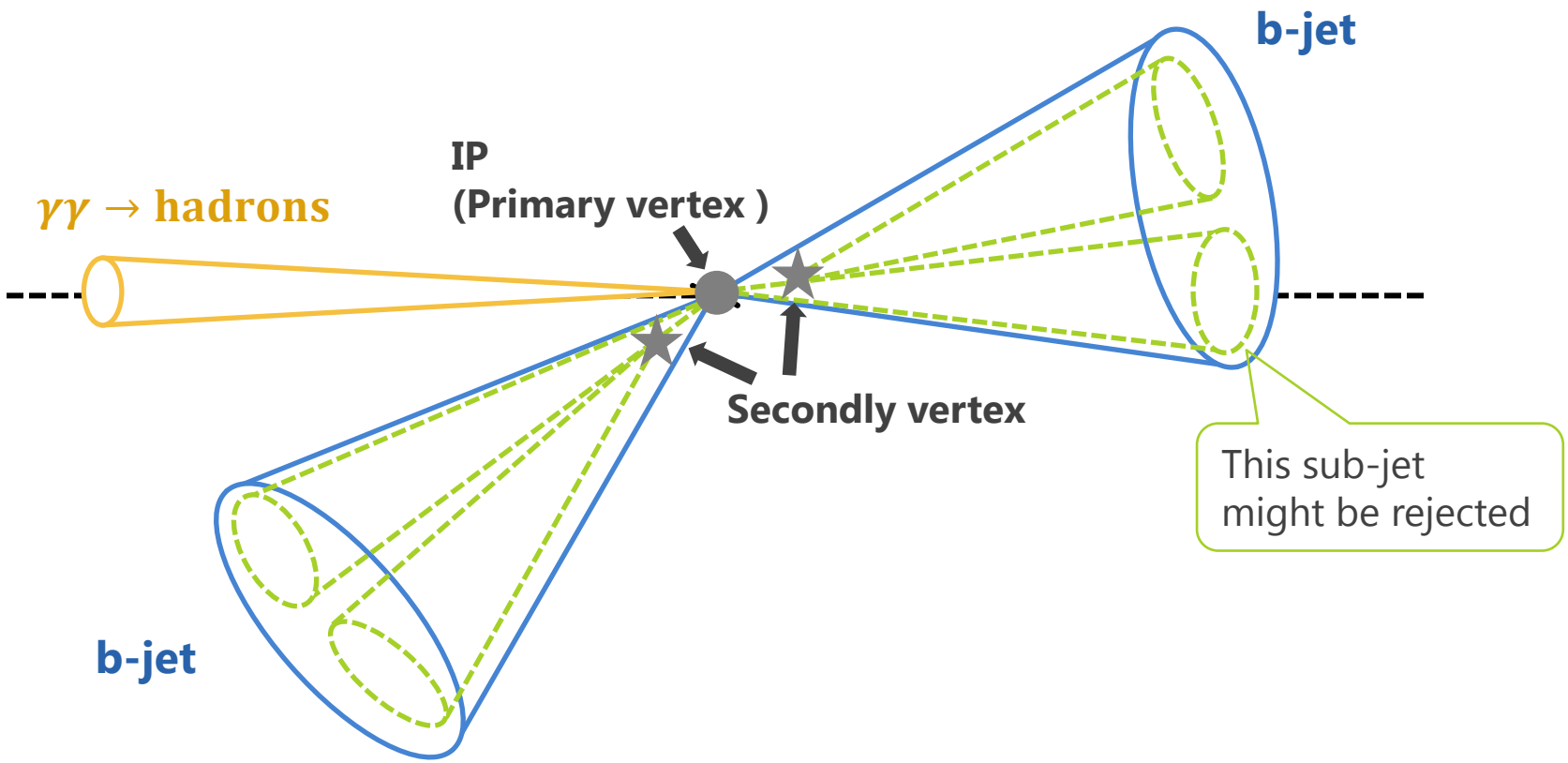
- The deviation of b-jet energy is large on forward region.
- Some parts of b-jets along the beam direction are removed accidentally even if R=1.5 which is almost threshold.

It seems that the requirement of N_{jets} = 2 is too tight

Kinematical reason (personal idea)

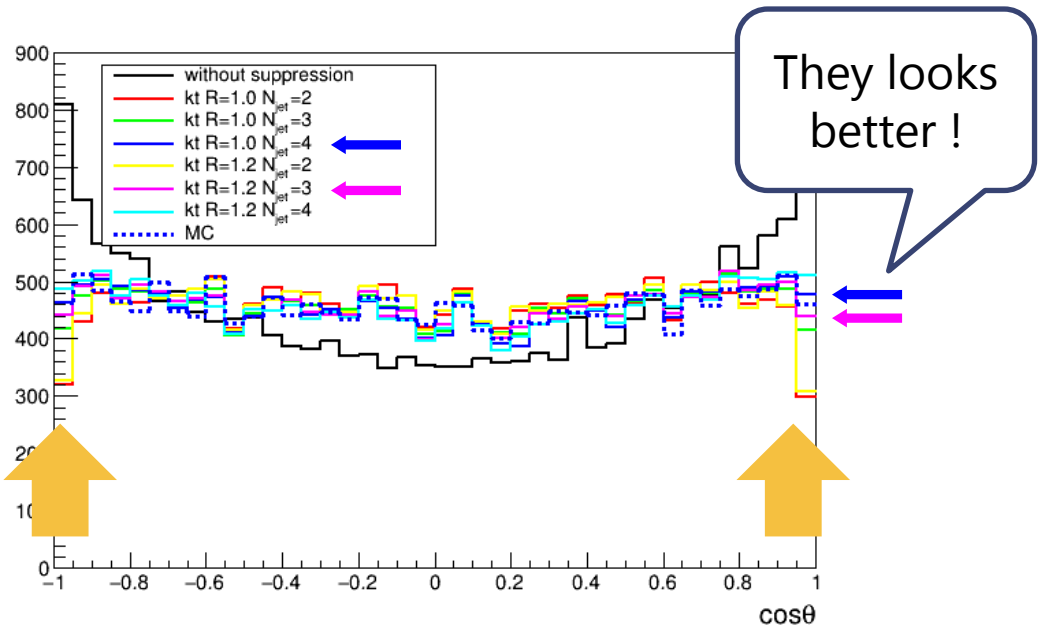
The b-jet has relatively large radius and can have sub-structure.

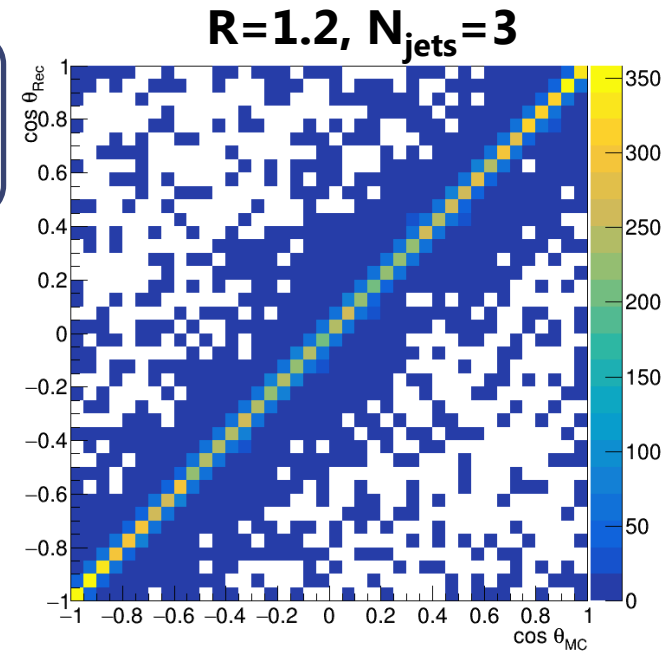
→ **N_{jets}>2 will improve the jet-clustering quality**



Changing N_{jets} = 2

Change R (from 0.5 to 1.5) and $\mathbf{N_{jets}}$ (from 2 to 7)

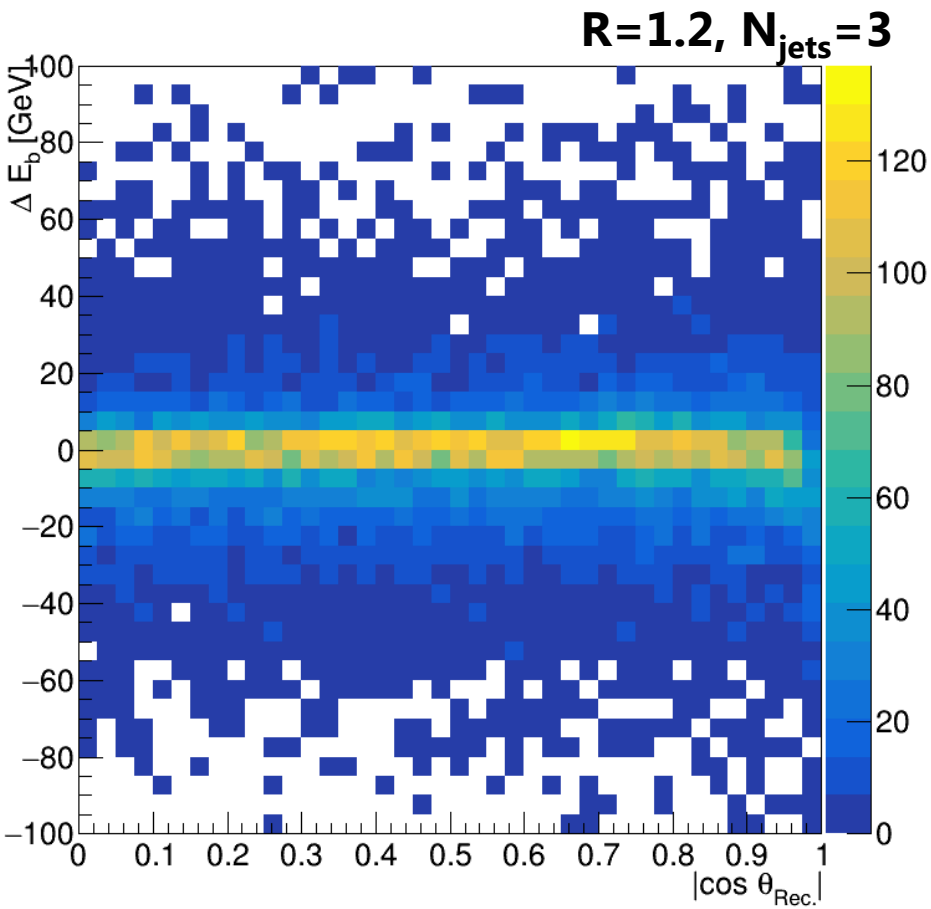




The jet-clustering quality is improved.

To optimize the parameters, we use the correlation coefficient of $\cos\theta$ between Rec. and MC. → **R=1.2, $\mathbf{N_{jets}}$=3**

Energy resolution of b-jets



$\Delta E_b \left(= E_b^{Rec.} - E_b^{MC}\right)$ vs $|\cos\theta_b^{\boldsymbol{Rec.}}|$

- The deviation of b-jet energy is almost symmetric
- The deviation is still large on forward region.

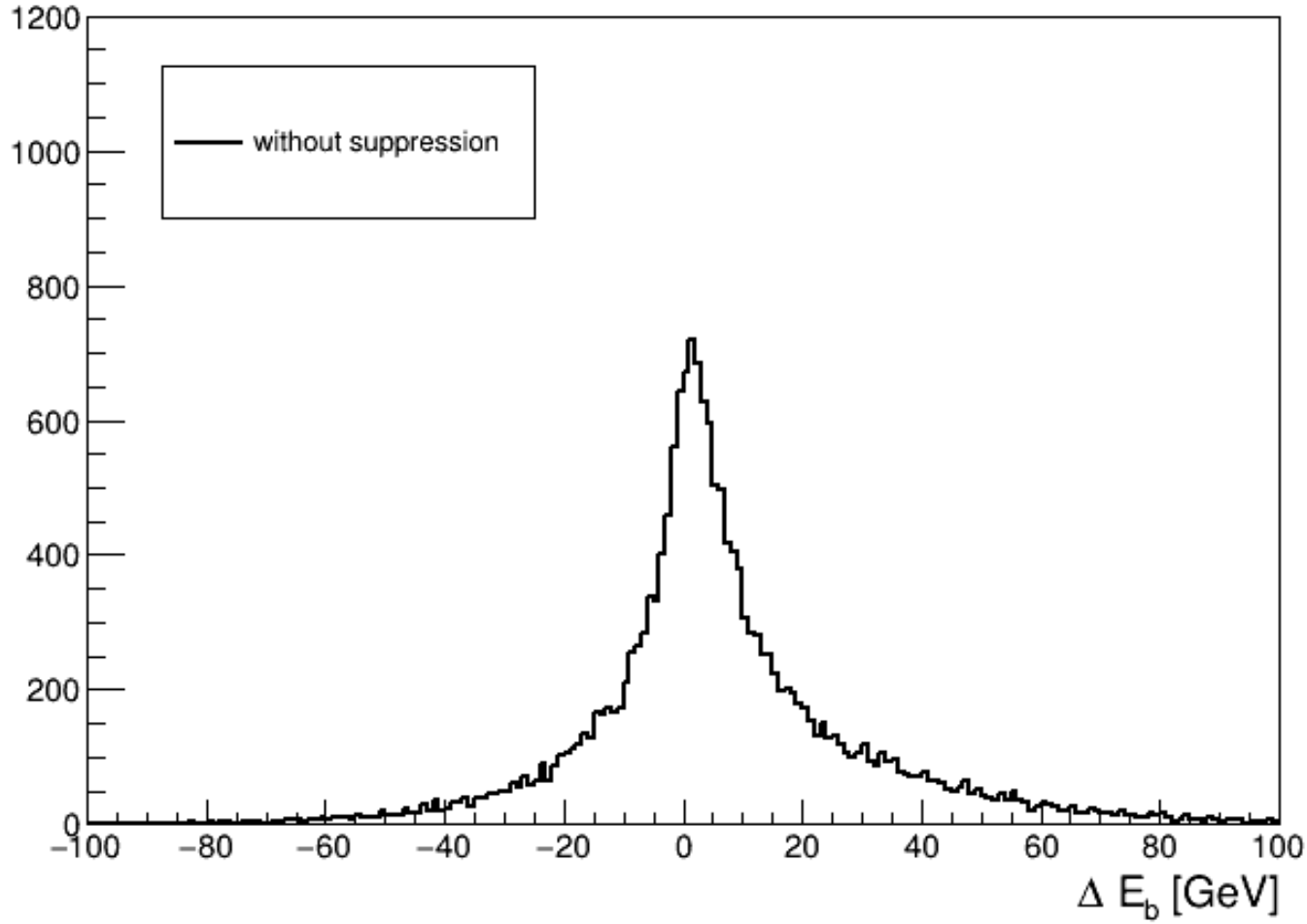
Need to consider the angler dependence.

$|\cos\theta_b^{\boldsymbol{Rec.}}|$<0.9 are almost same shape

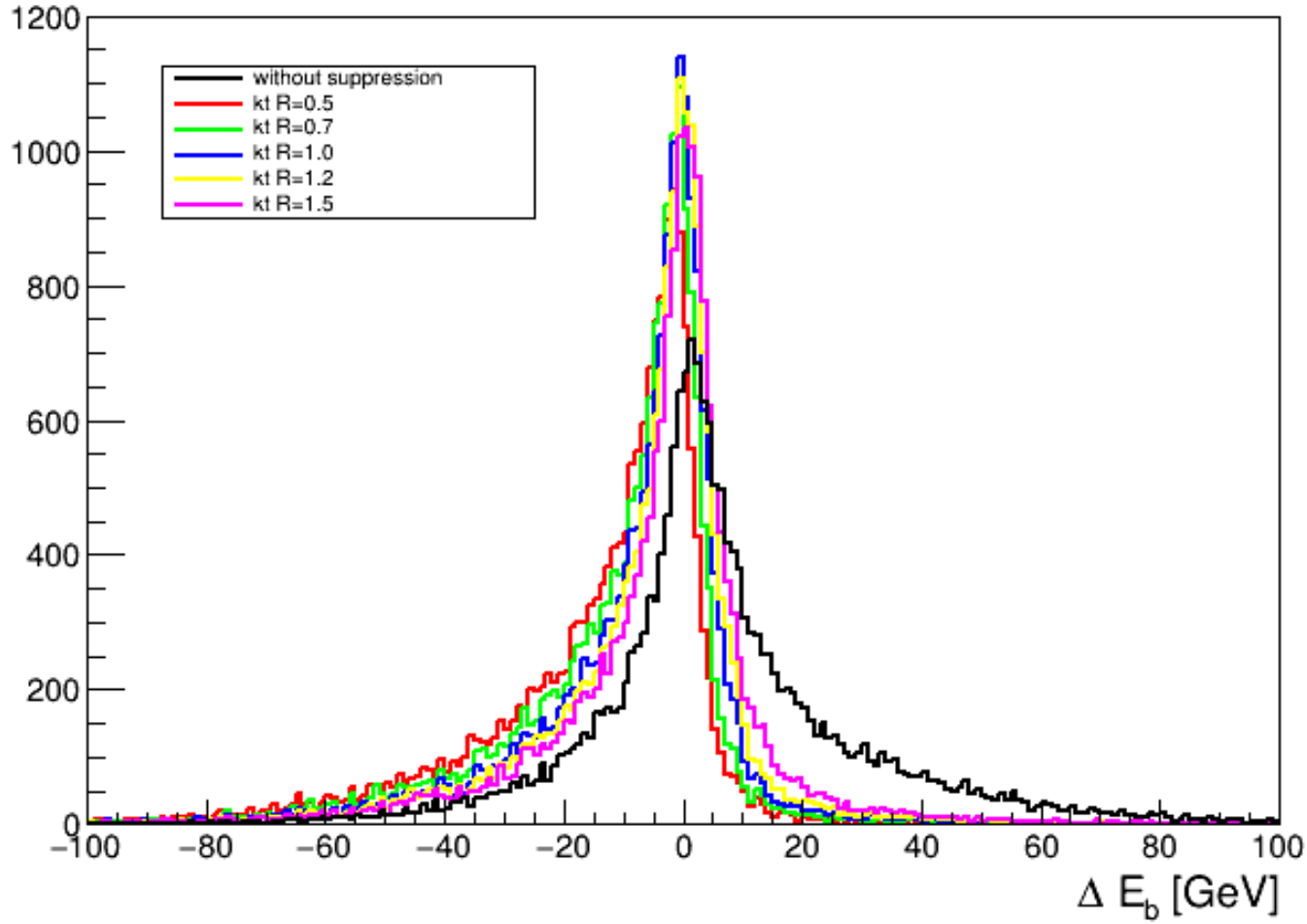
→ Plan to divide into two region (cos>0.9 or cos<0.9)

Backup

Energy deviation



Energy deviation



Energy deviation