Study on jet width

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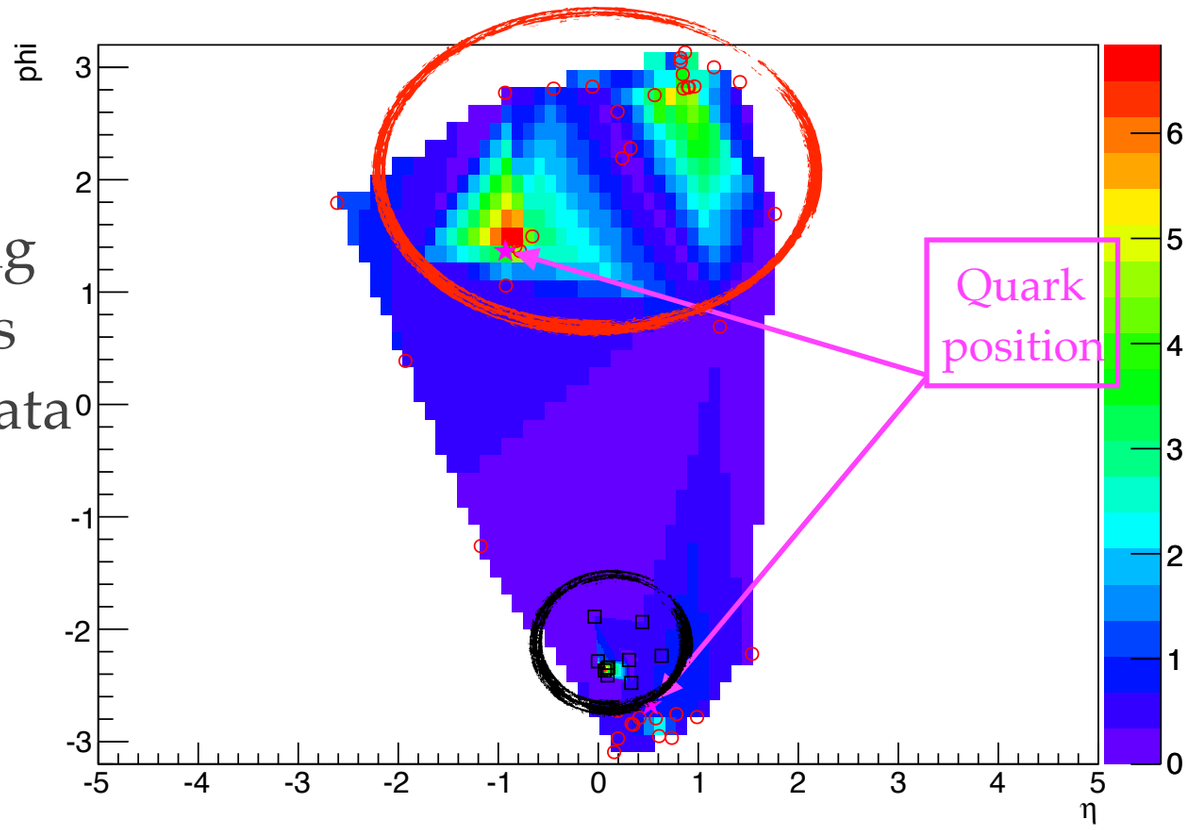
Introduction

- Jet is reconstructed with ee-kt algorithm
- Quark emission causes problem on jet clustering
- dR(quark, jet) can help to suppress those events
  - Using truth information. not accessible in data
- Define variable using reconstruction level information to describe “jet width”
- Test with ZZ->vvqq sample.



$$\delta R = \sqrt{(\delta\eta)^2 + (\delta\phi)^2}$$

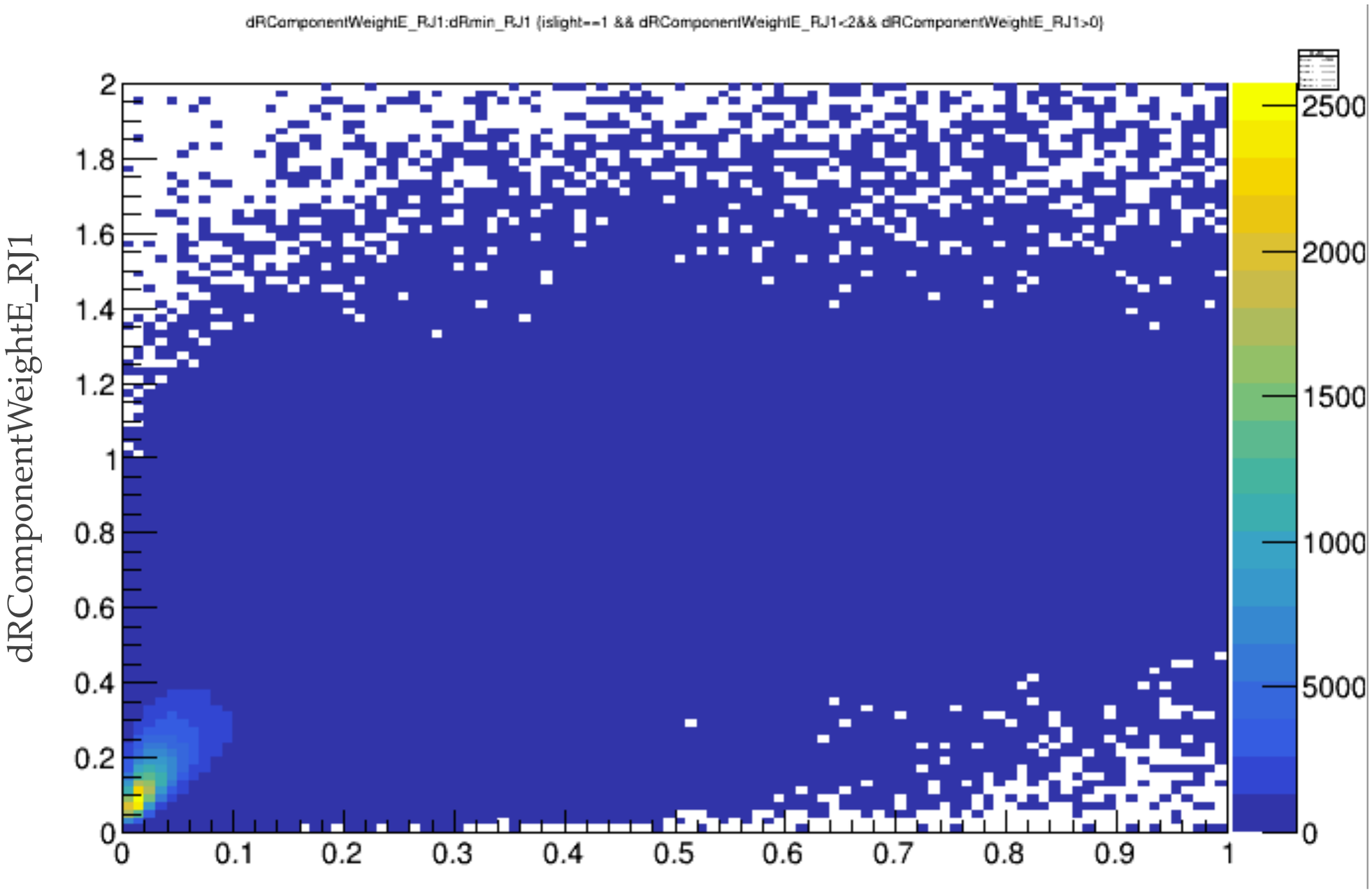
Definition 1

$$\mathcal{W}_{\mathrm{j}} = \sum_{i=1}^{n_{\mathrm{PFO}}} \delta R_{(\mathrm{j},\mathrm{PFO})} \times \frac{E_{\mathrm{PFO}}}{E_{\mathrm{j}}}$$

Definition 2

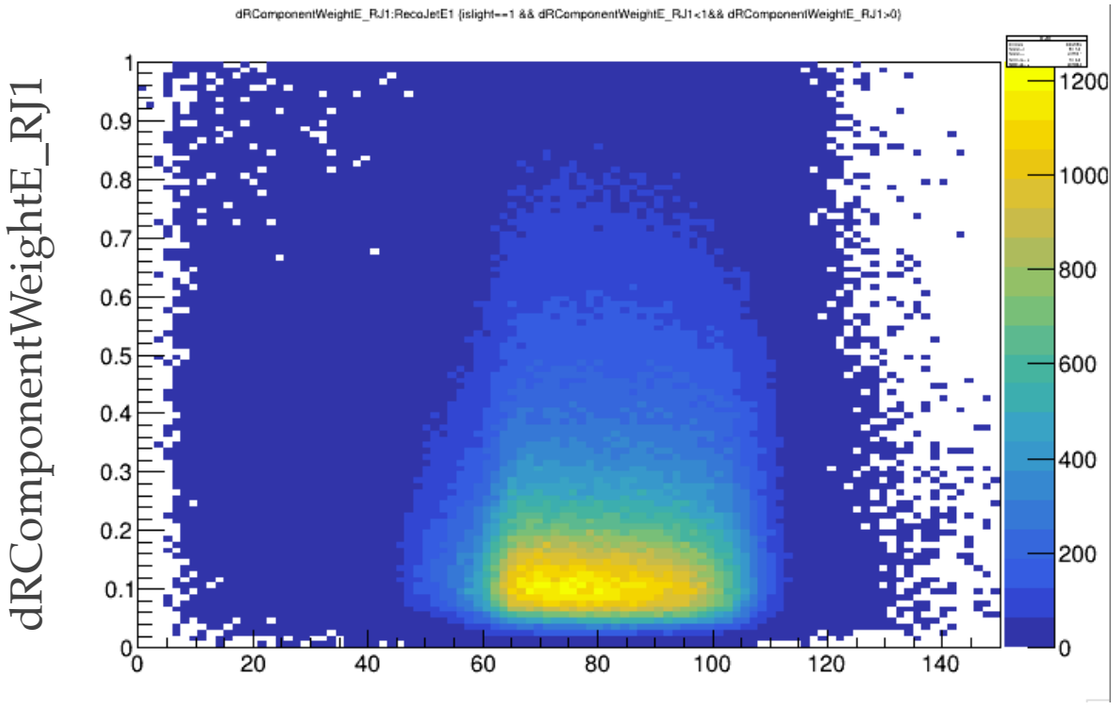
$$\mathcal{W}_{\mathrm{j}} = \sum_{i=1}^{n_{\mathrm{PFO}}} \frac{1}{\delta R_{(\mathrm{j},\mathrm{PFO})}} \times \frac{E_{\mathrm{PFO}}}{E_{\mathrm{j}}}$$

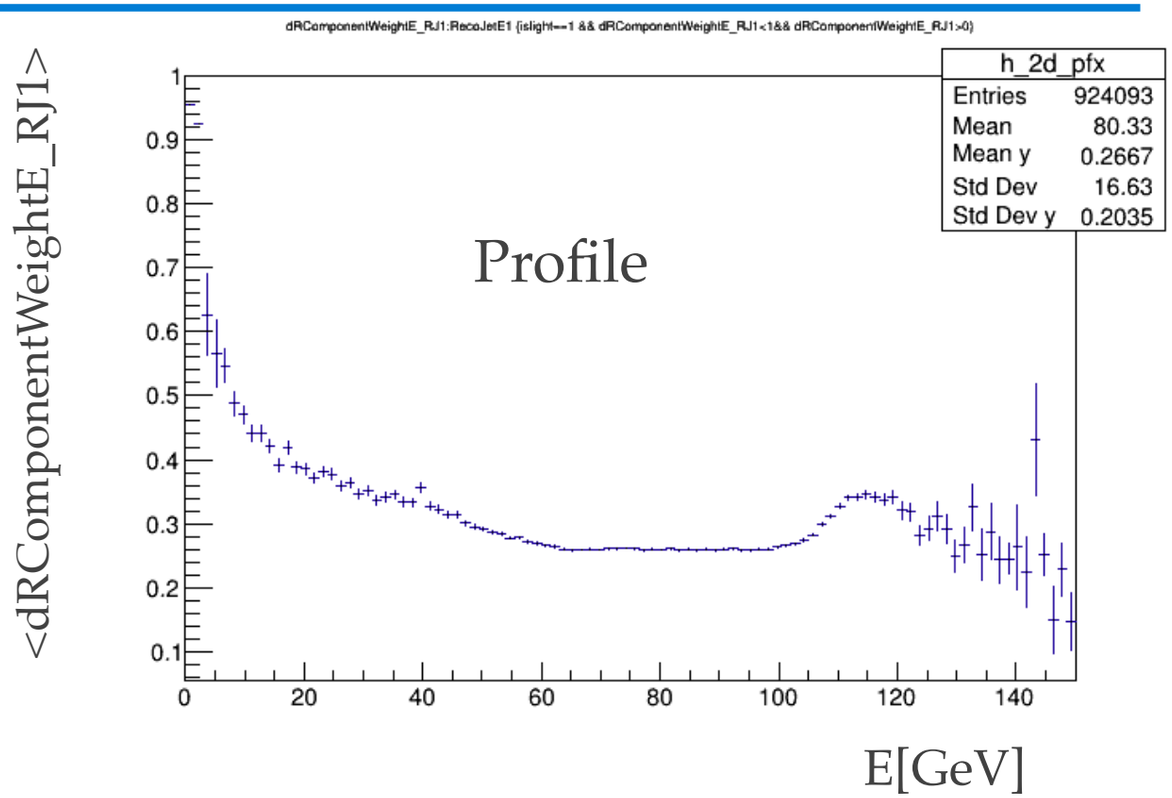
Def. 1:

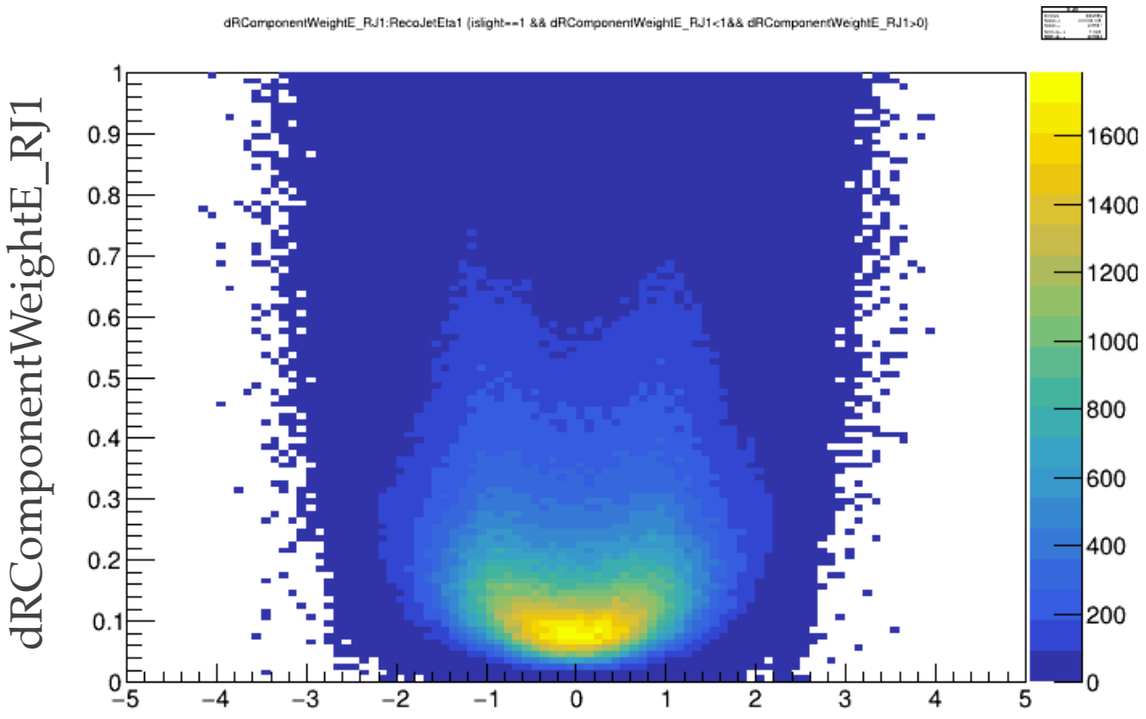


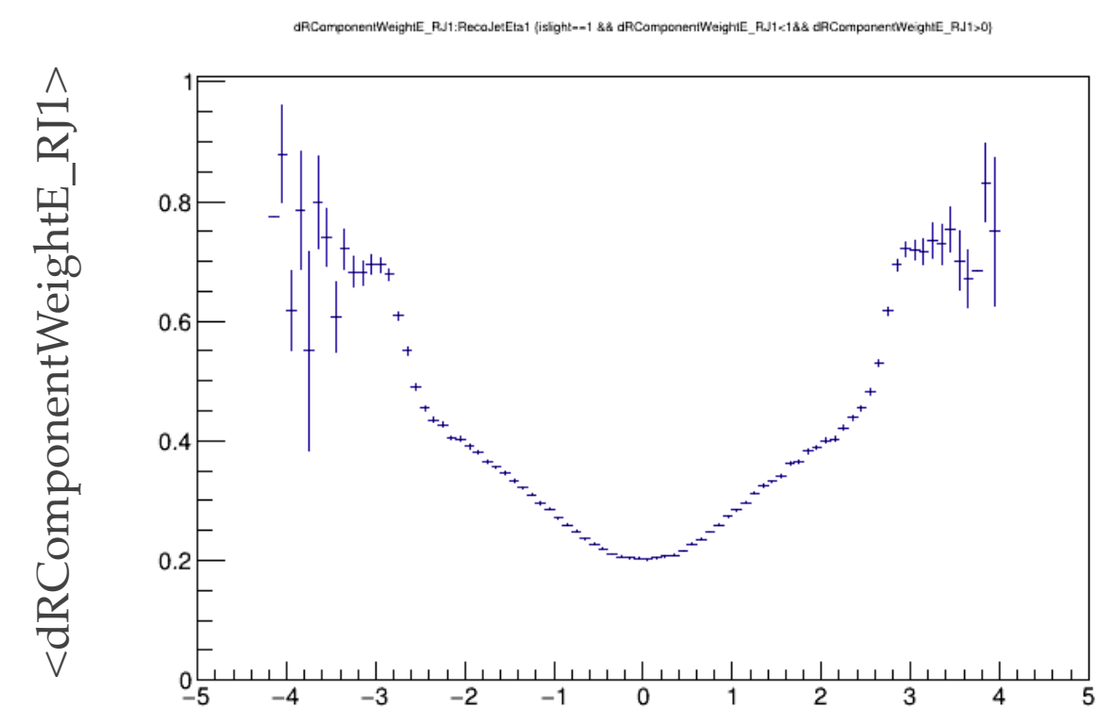
min dR(recoJet, quark)

Dependence on Energy and angular

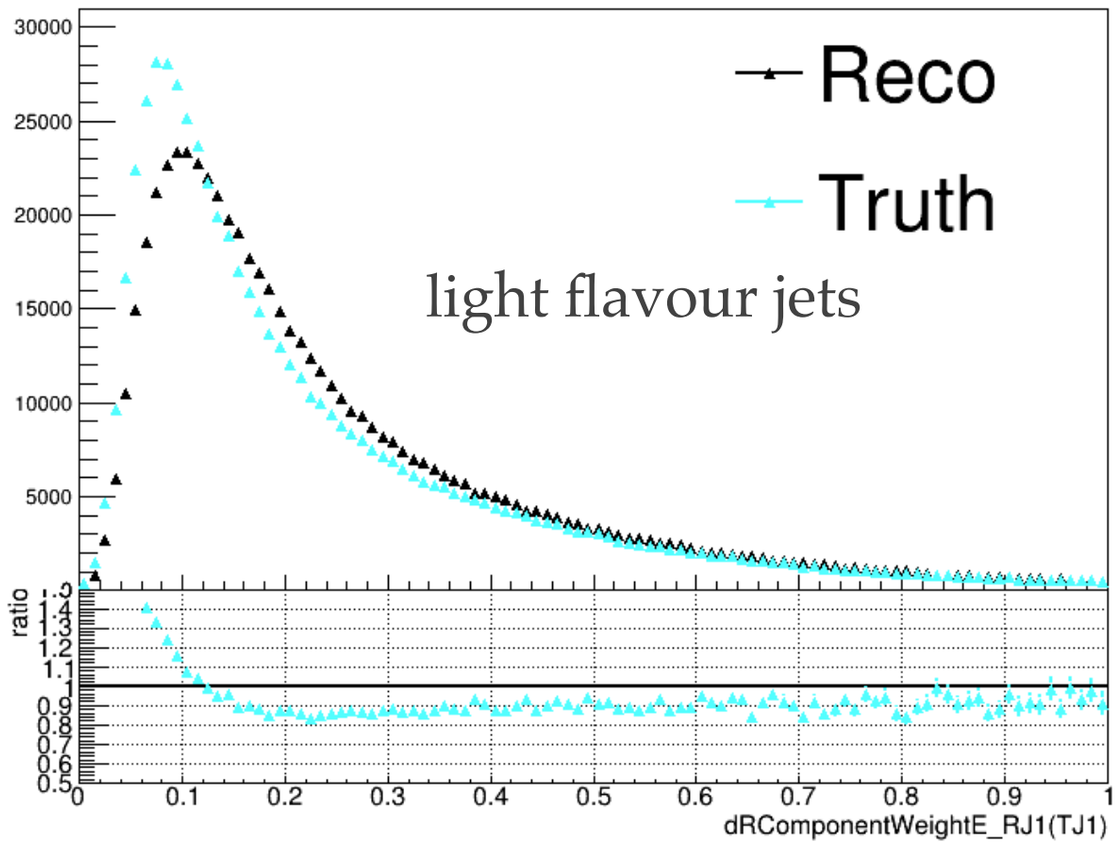


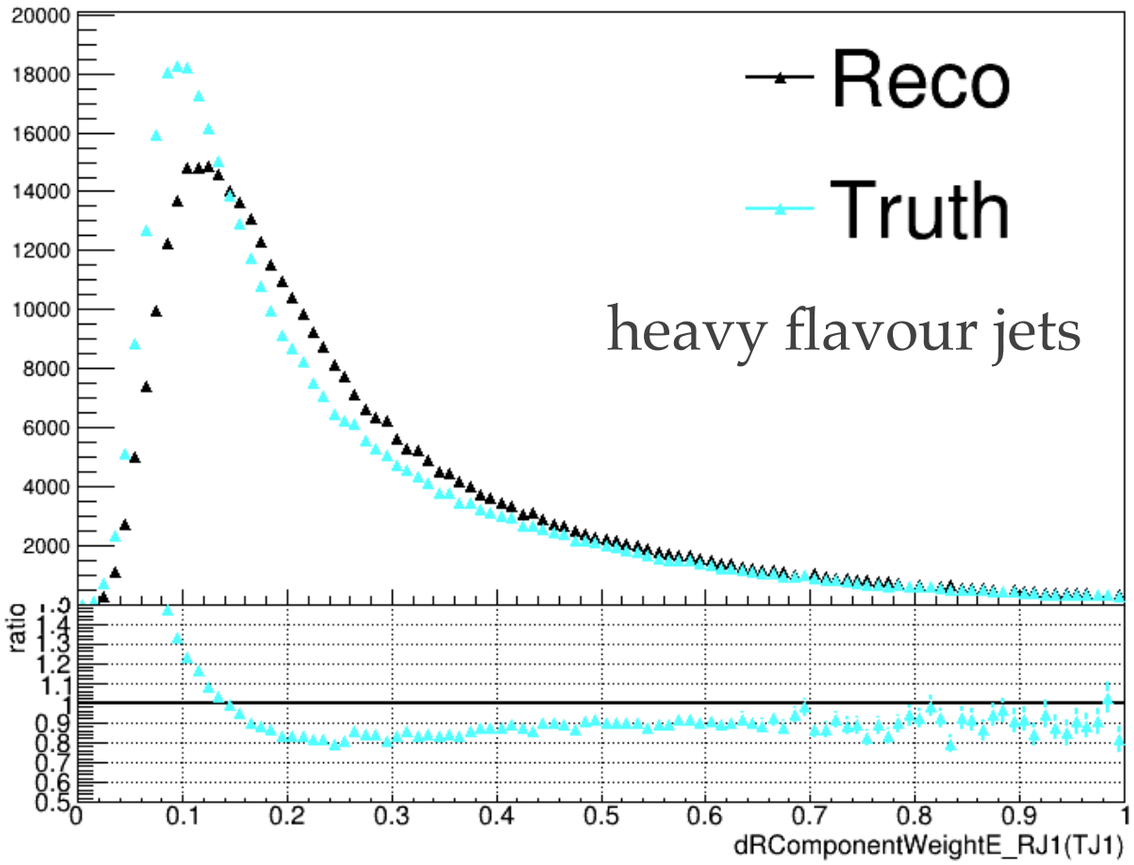




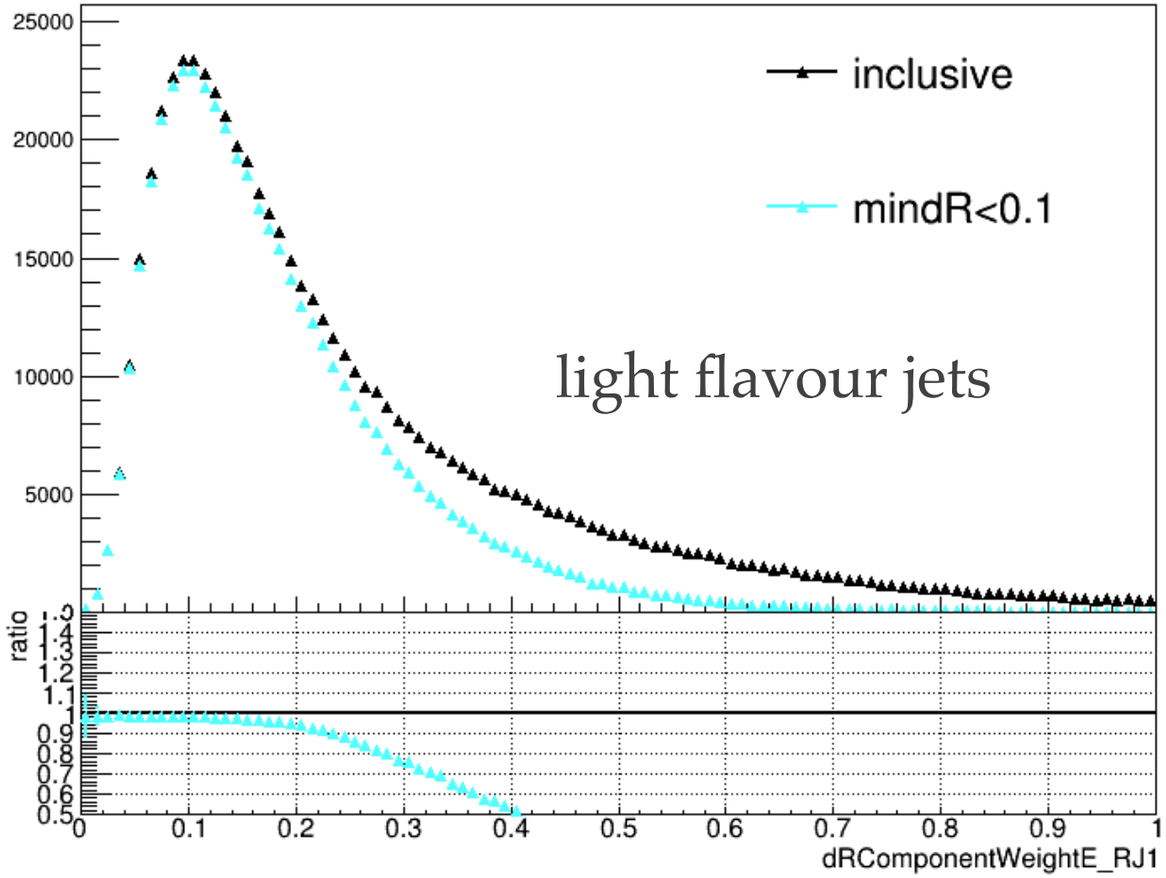


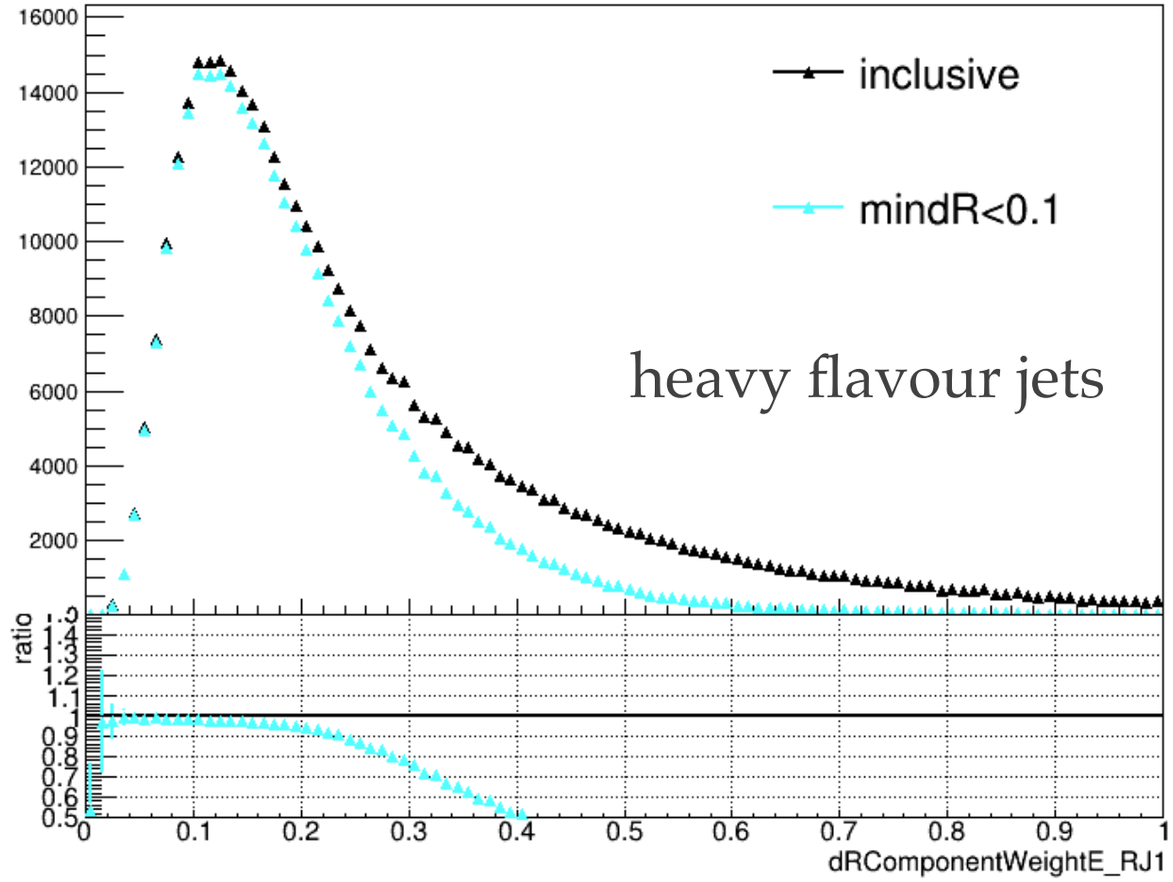
Compare with truth





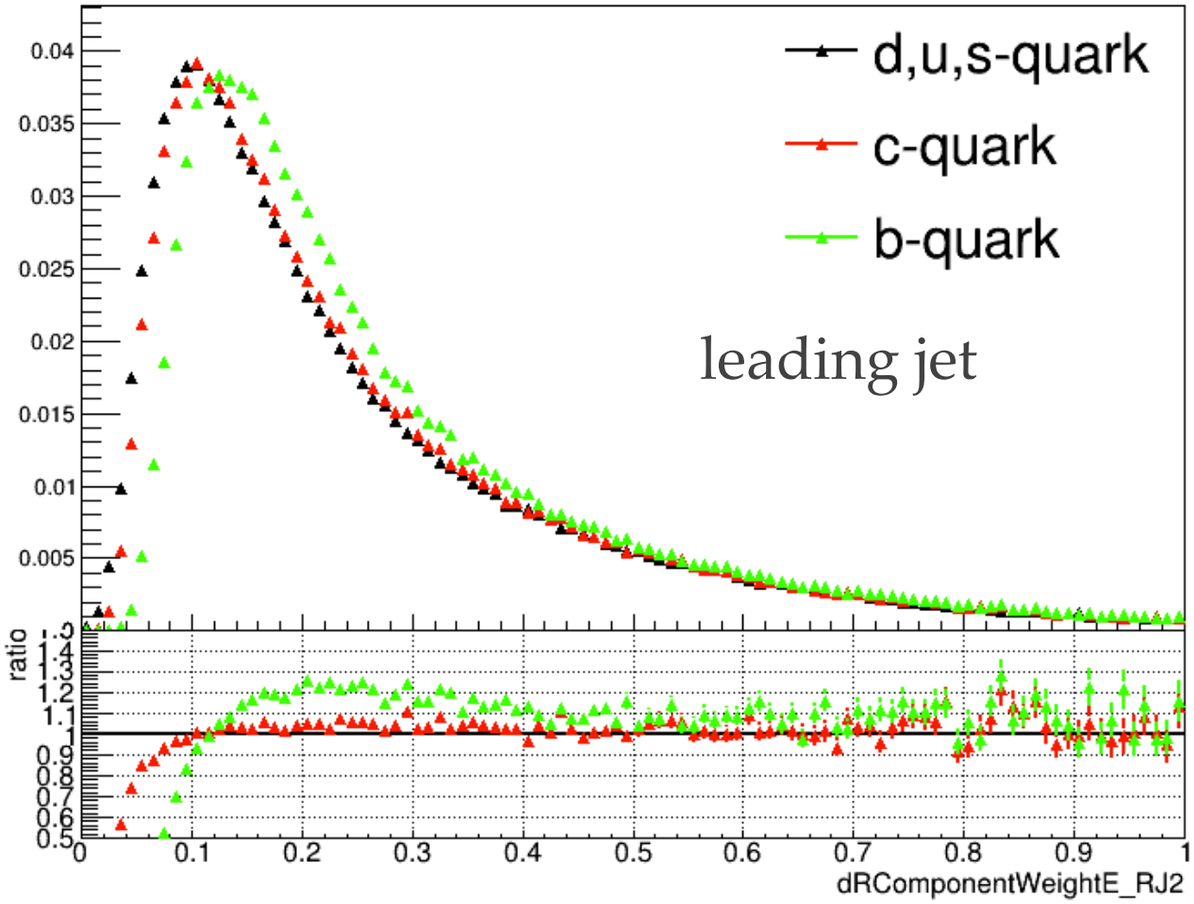
Dependence with mindR

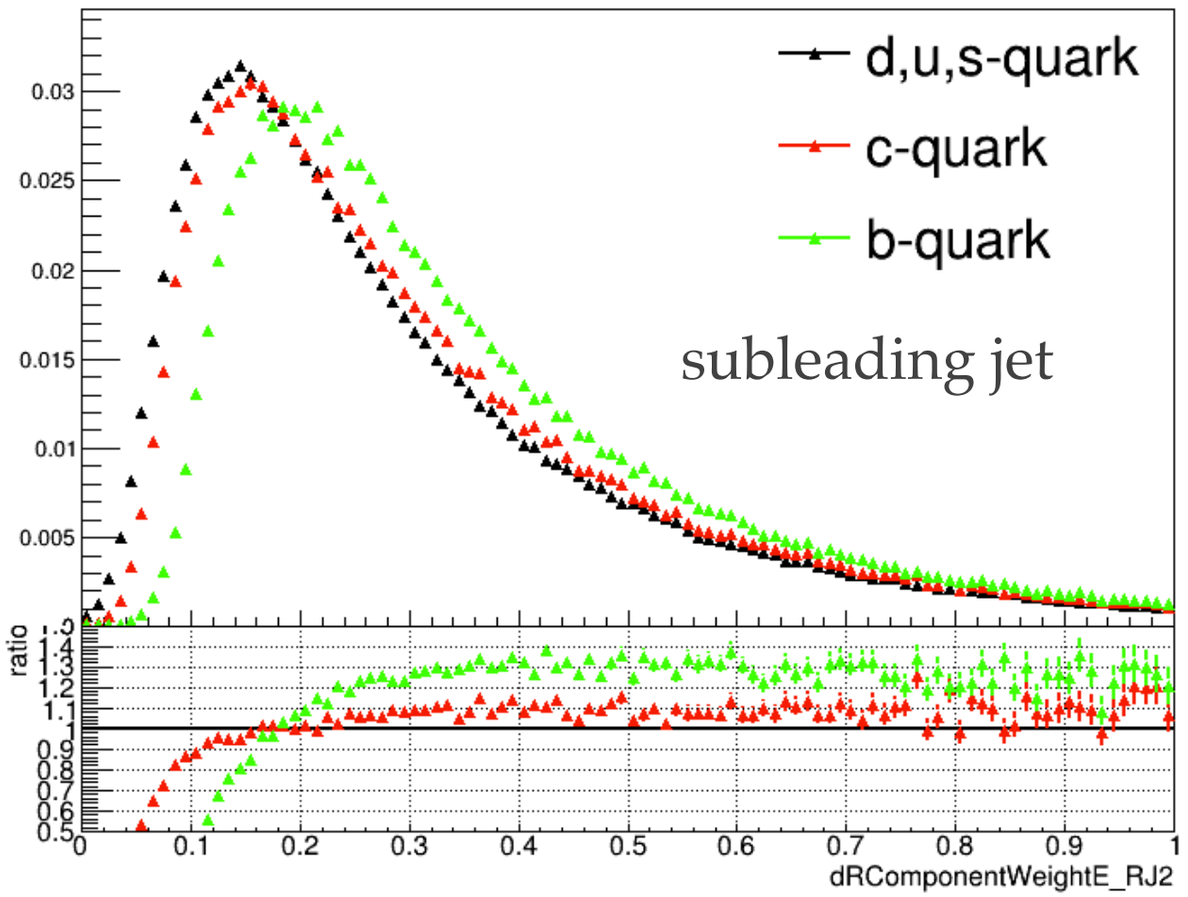




difference is shown in tail

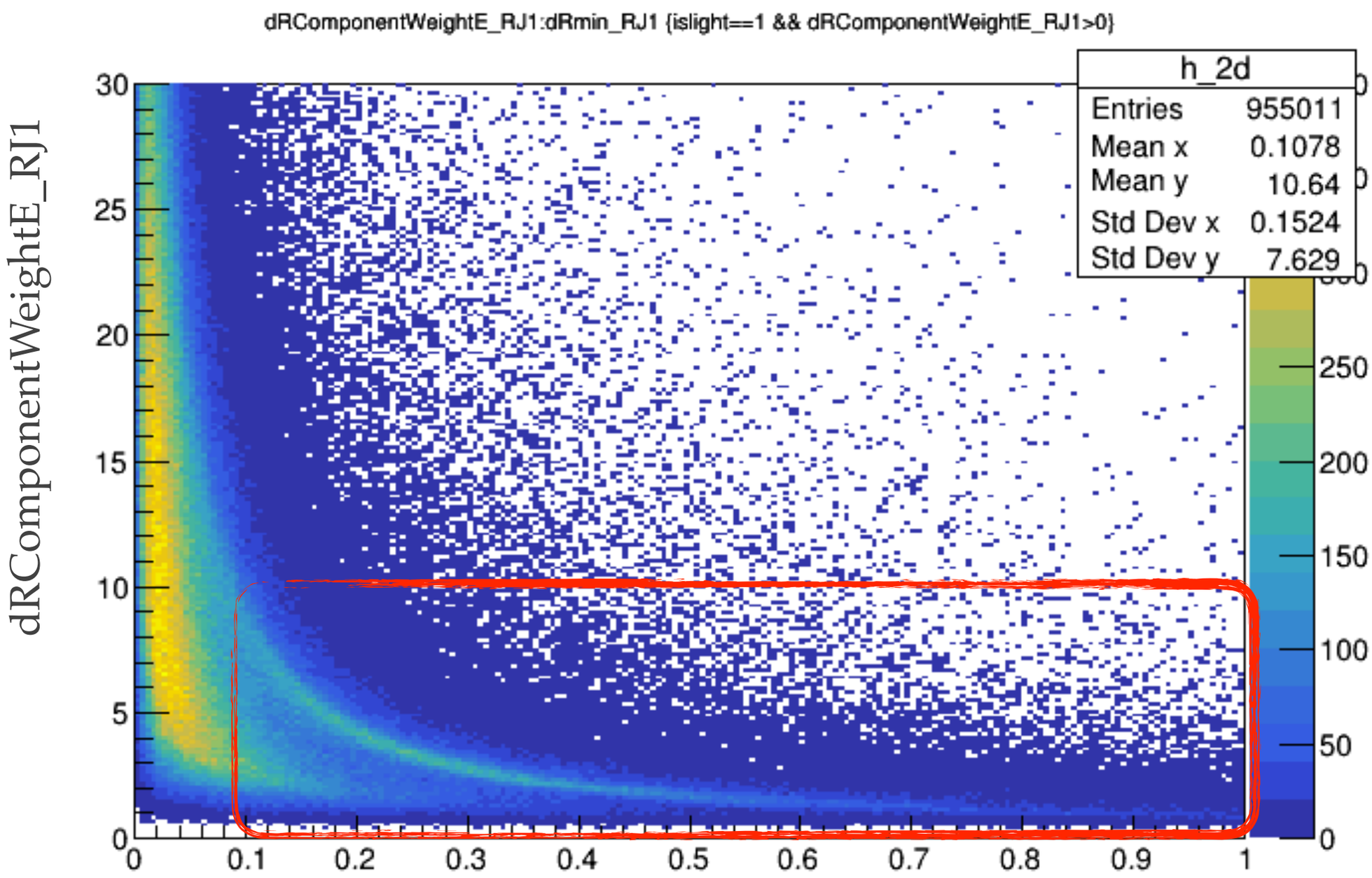
Dependence with flavour





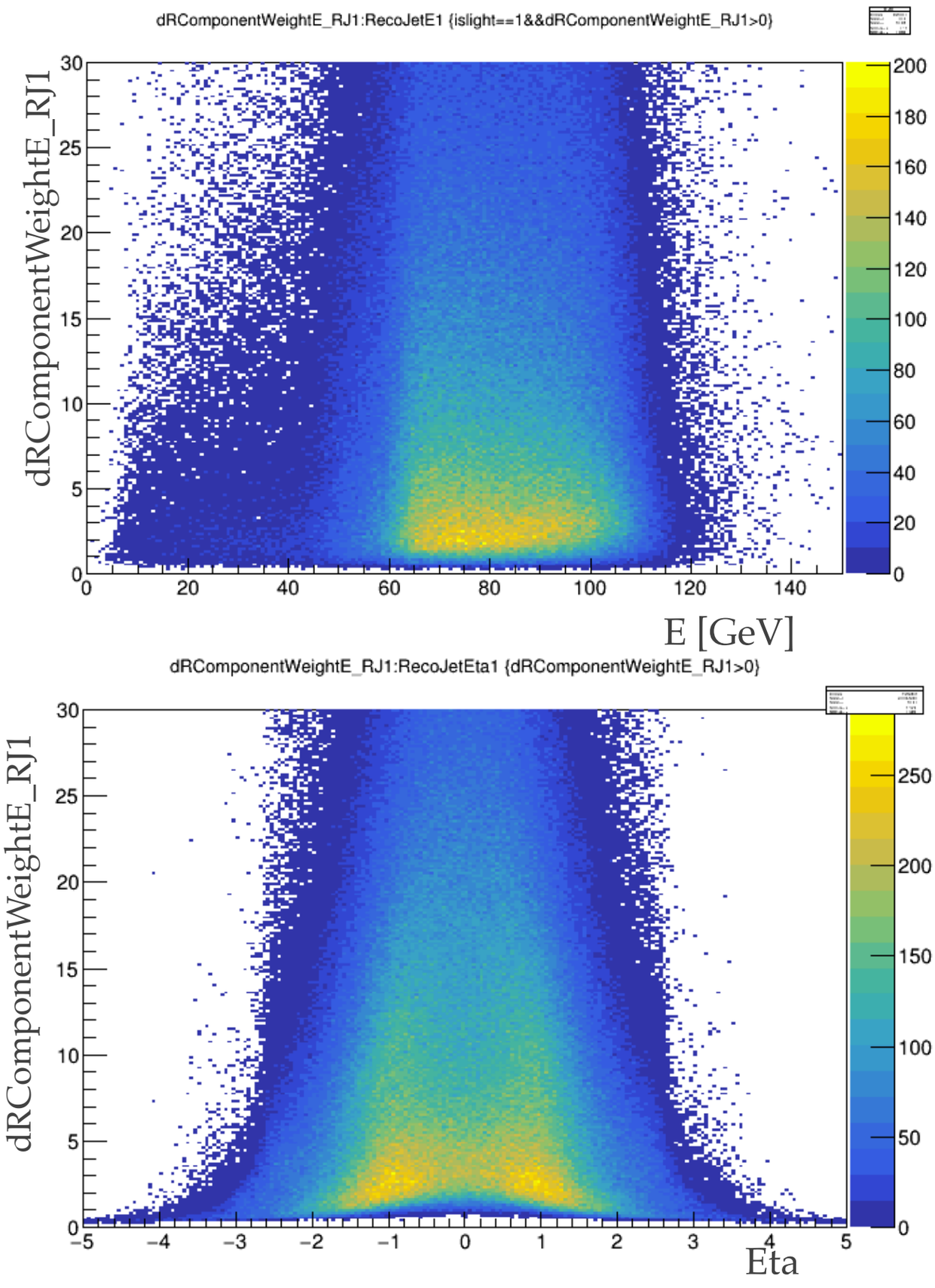
Have some separation power for different flavour jets

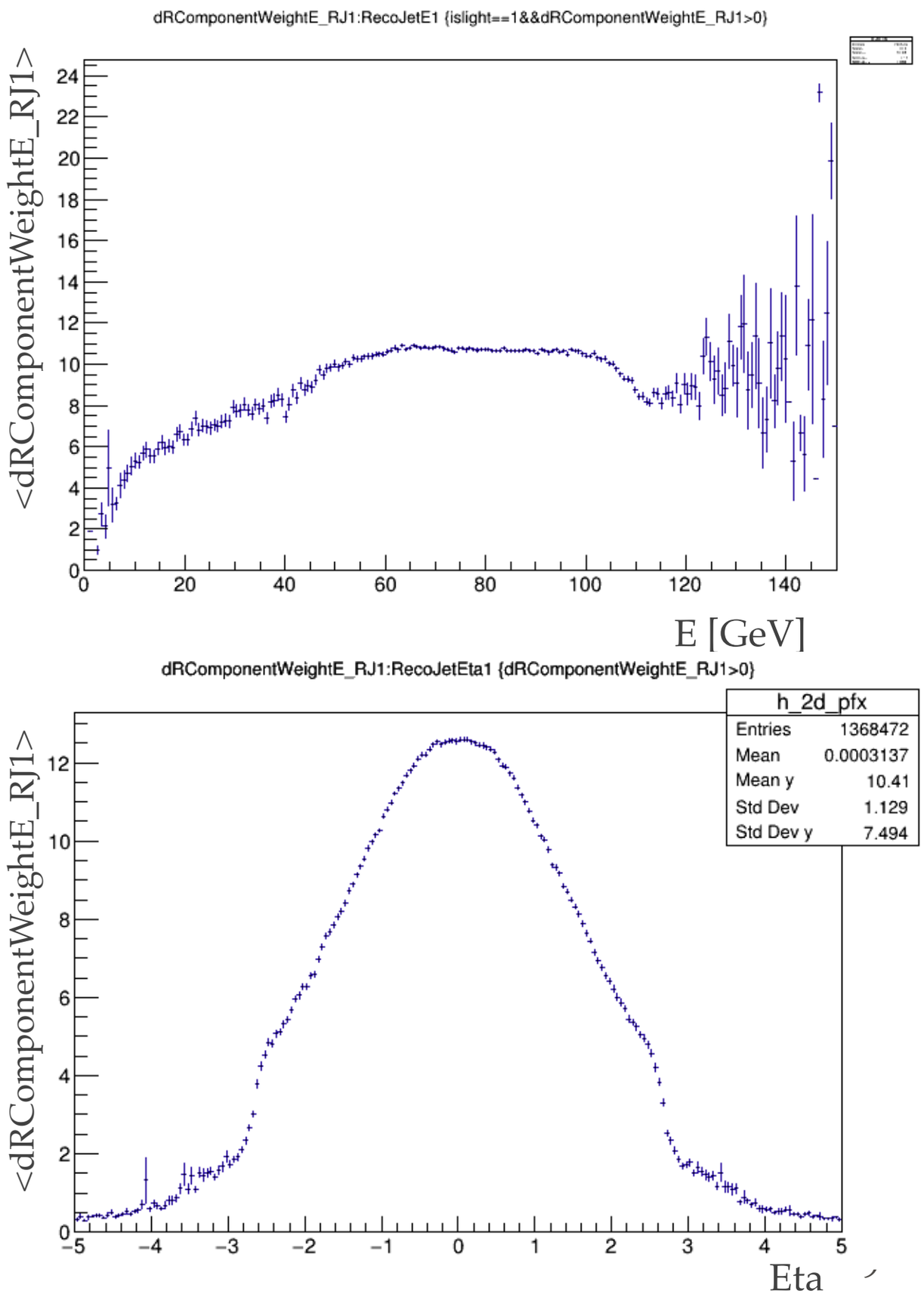
Def. 2



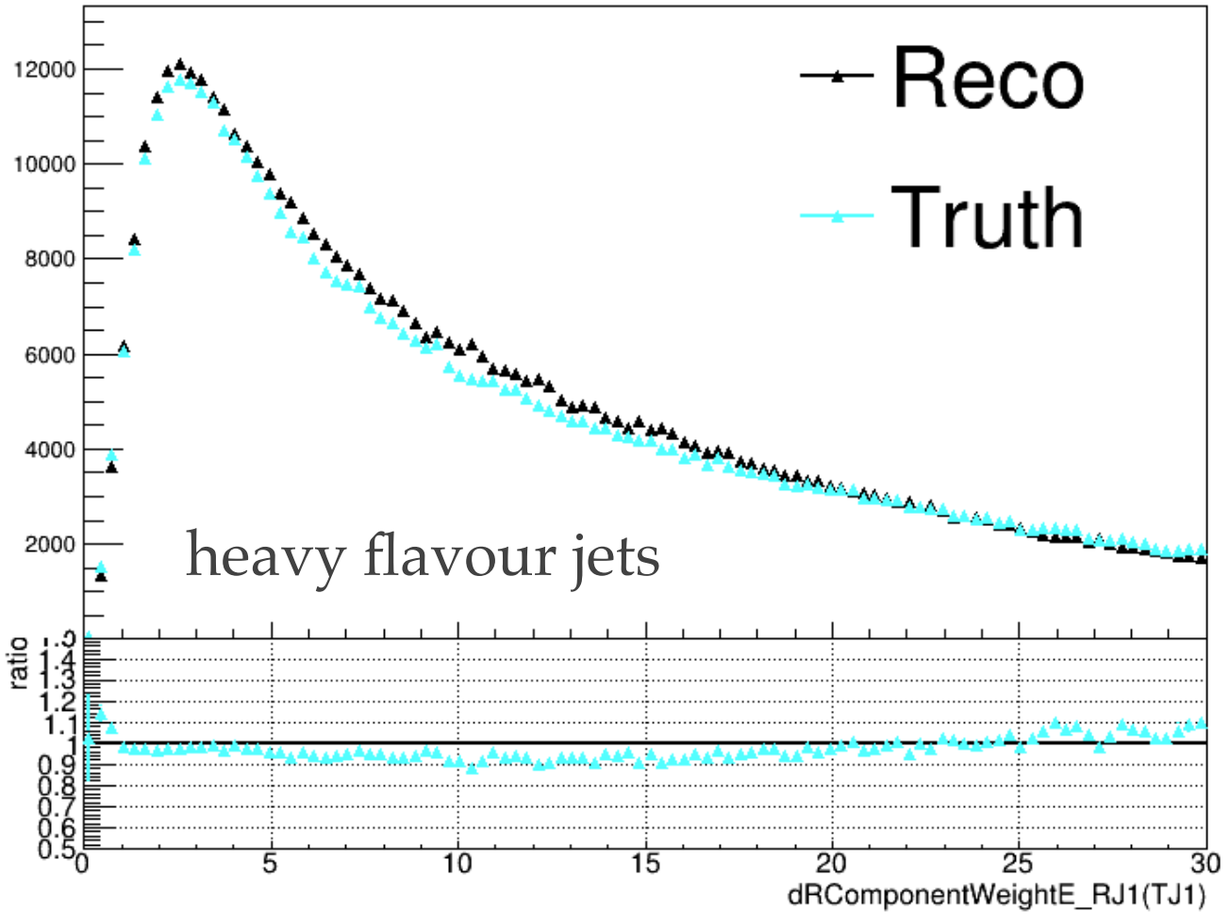
Event in red frame are the problematic events for jet clustering

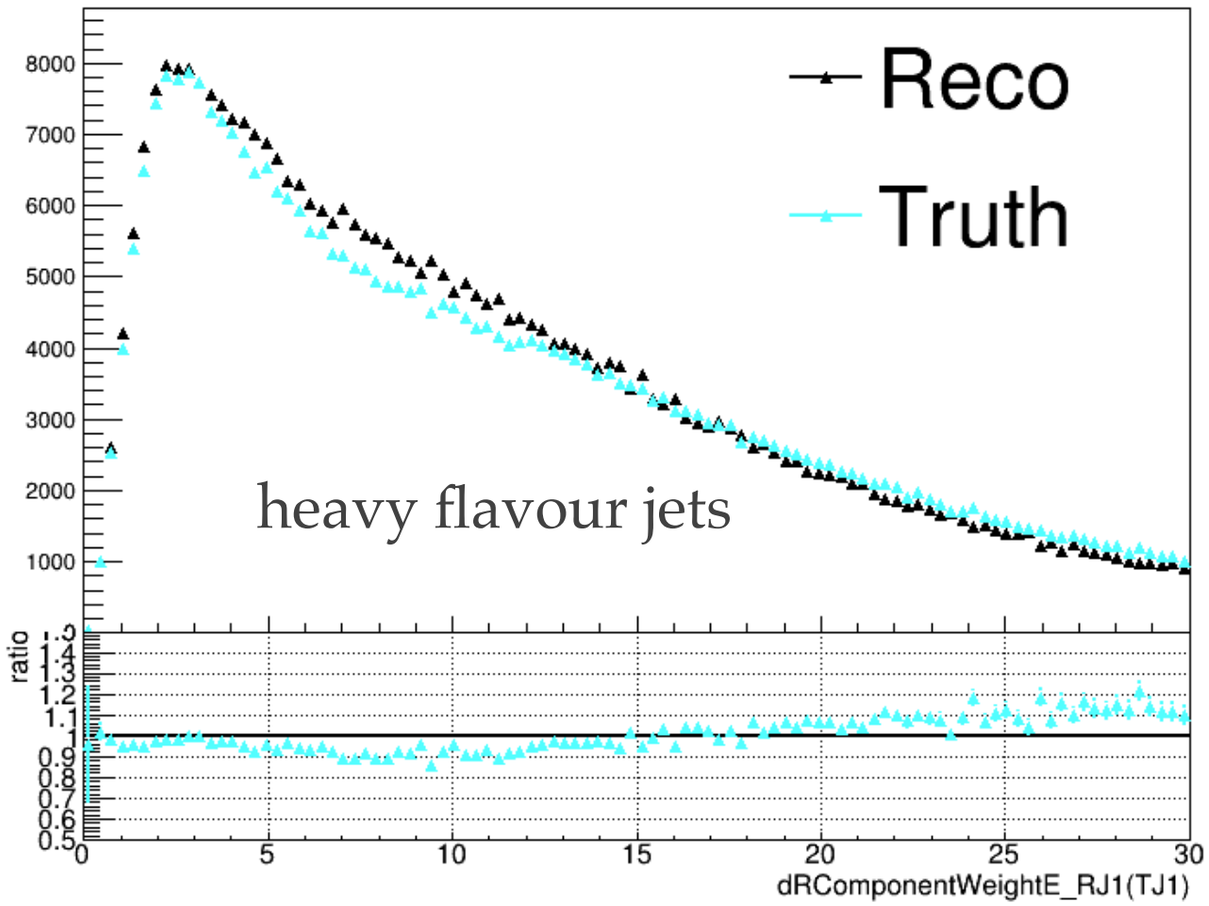
Dependence with energy and angular



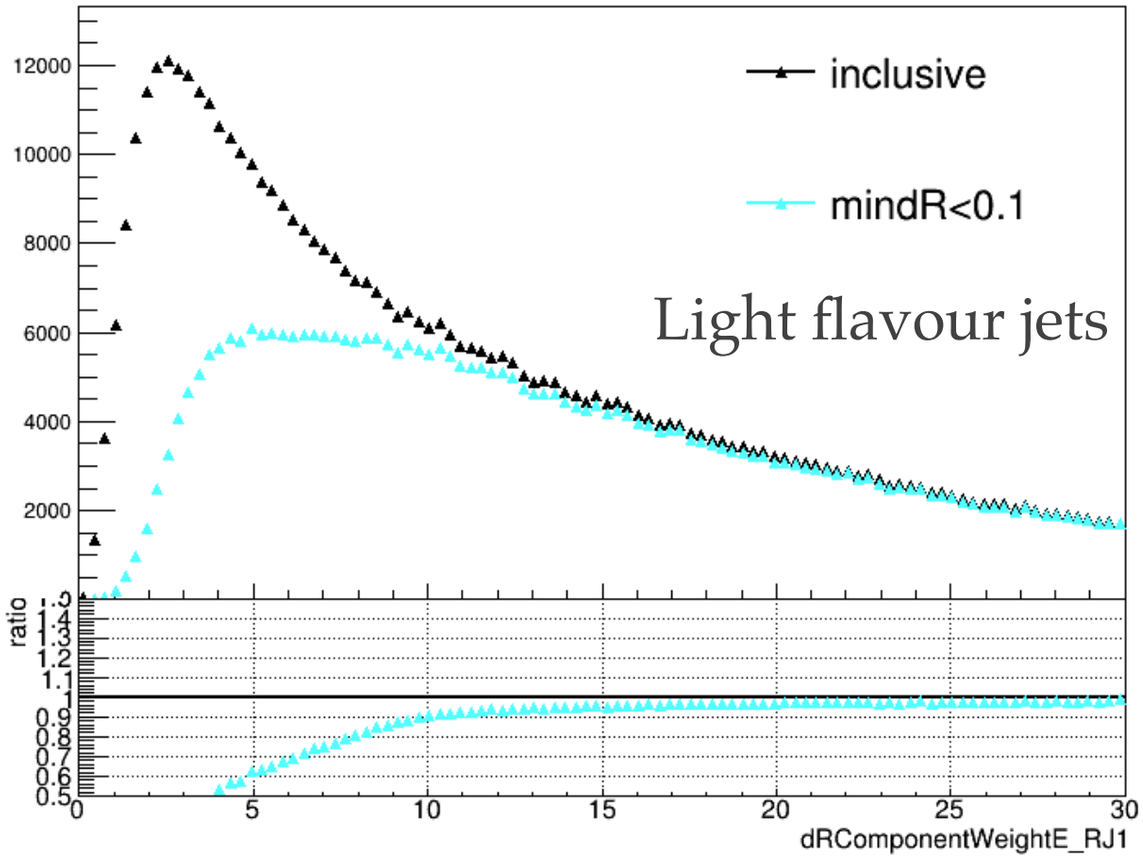


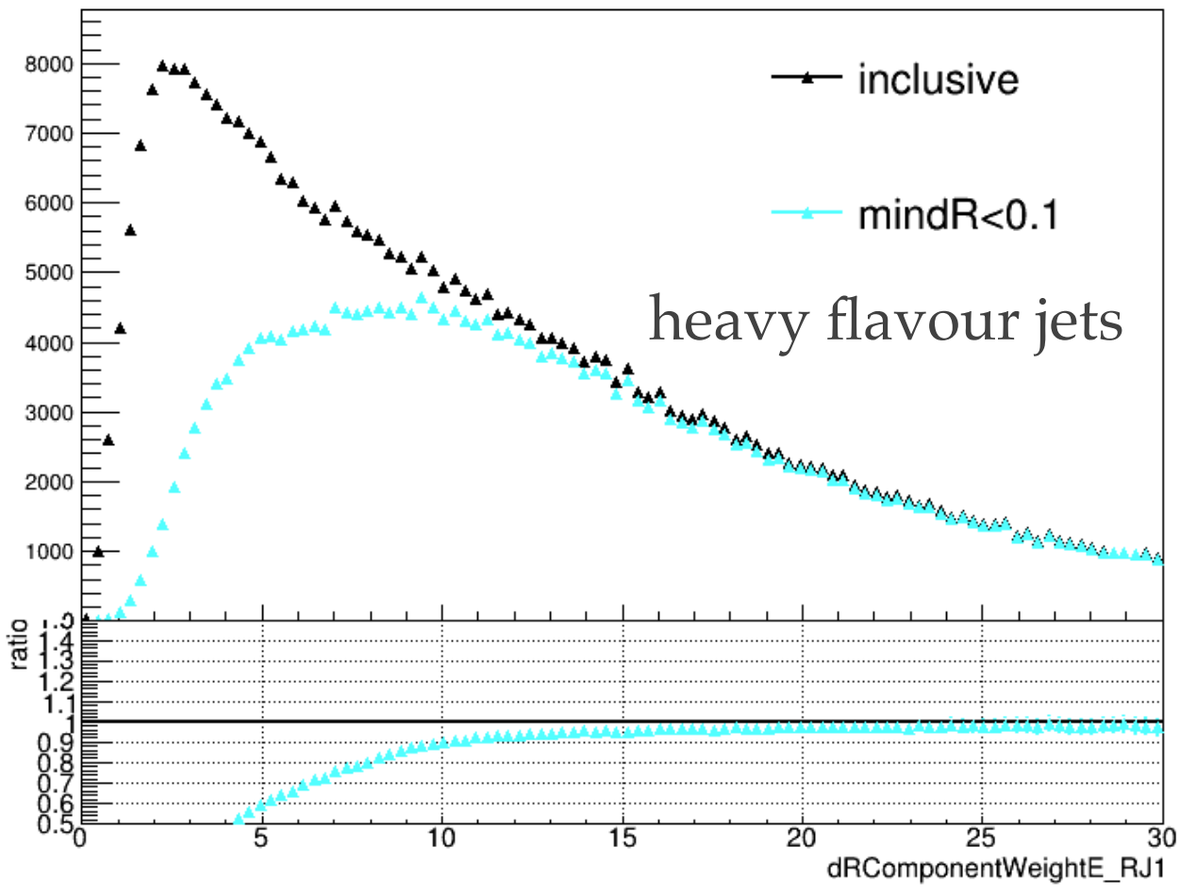
Comparison with truth



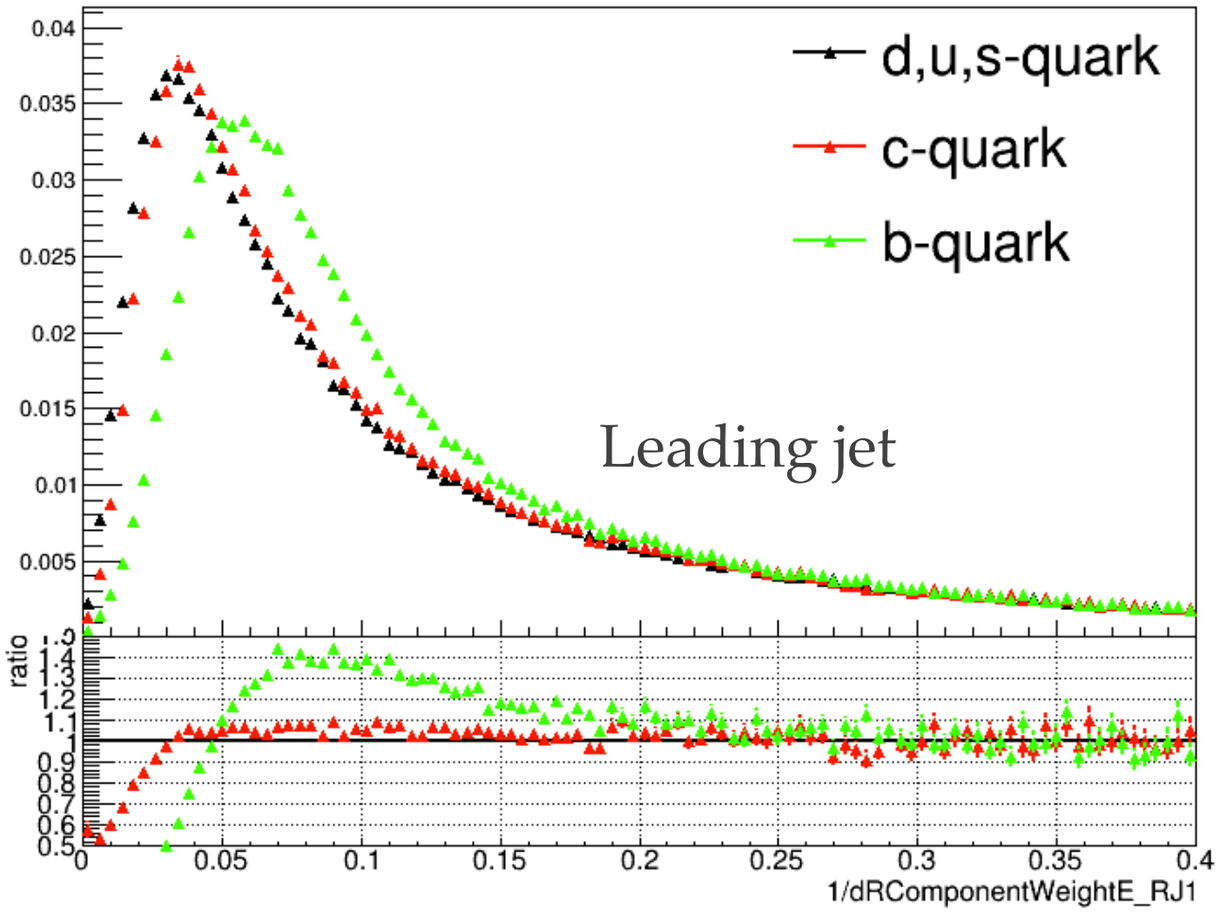


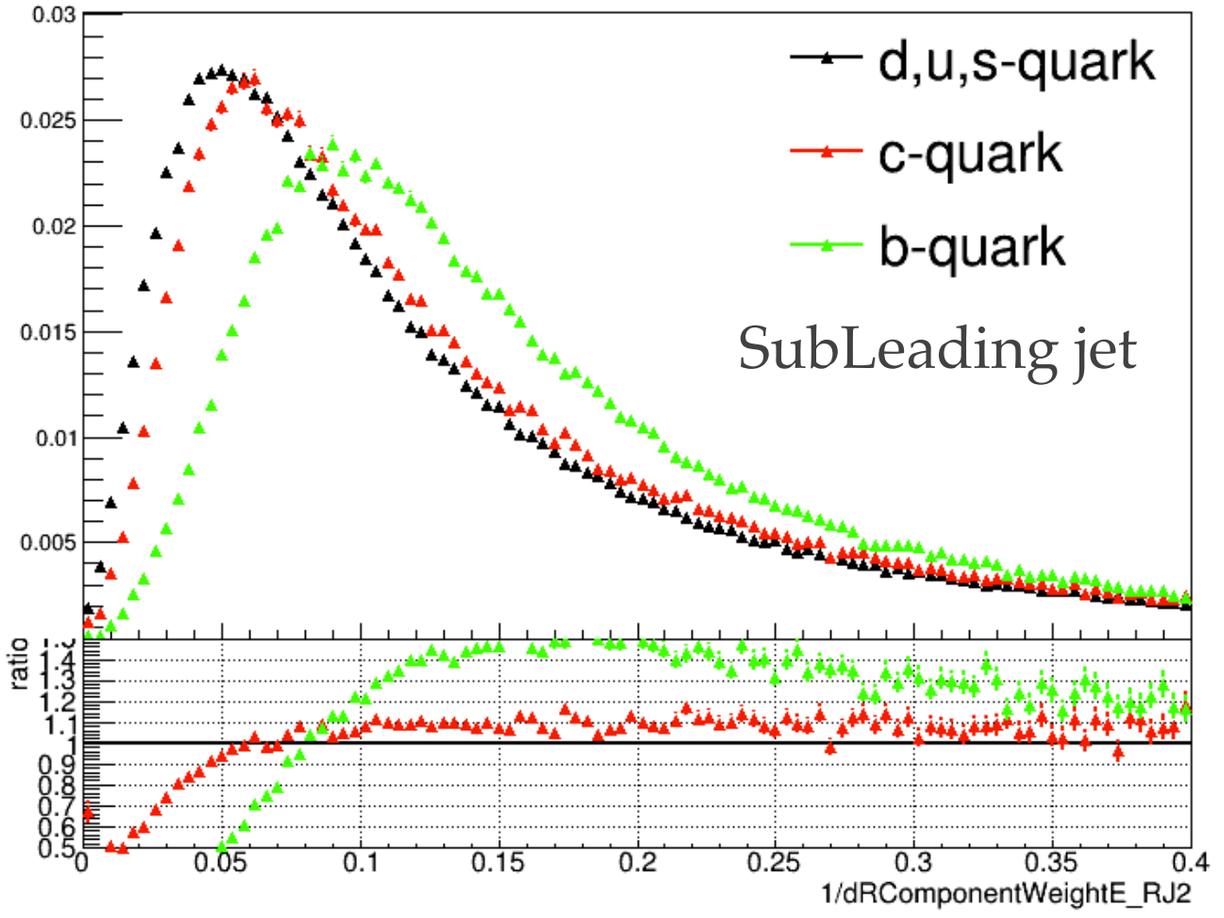
Dependence with mindR





Flavour dependence





Separation between different flavours

Summary

- Propose two variable to suppress the quark emission event in 2-quark events
- Good correlation can be seen with mindR(jet, quark)
- Those variable is also depended on jet flavour
  - Possible usage in flavour tagging
  - Need to check gluon jets as well
- More ideal for jet width/structure?
  - Jet profile?
  - Others?