jet algorithm in pair produced dijet resonances search

Student: Xin Fang
Supervisors: Maxime Gouzevitch, Juan Rojo

pair produced dijet resonances

BSM models predict the existence of pair-produced dijet resonances, resulting in four jets final state.

- some phenomilogical model favors the decay of Randall Sundrum Graviton into vector boson pair.

$$G_{RS} \rightarrow ZZ$$

- color-octet scalars or vectors can be strongly produced in pair, and then decay hadronically to quark-anti-quark pair.

$$q\bar{q}, gg \rightarrow CC$$

- RS model predicts the possible decay of a Radion graviscalar to two SM-like Higgs scalars, so the Radion can be searched for with 2 $b\bar{b}$ pair final state.

$$gg \rightarrow \phi \rightarrow hh$$

- ... ...

jet algorithm

- cone type algorithm:
  Midpoint Cone, Iterative Cone (CMS), SISCone (LHC)

- sequential clustering algorithm:
  k_t(p=1), Cambridge/Aachen(p=0), anti-k_t(p=-1)

  distance $\mathbf{d_{ij}}$ between two particles i and j:

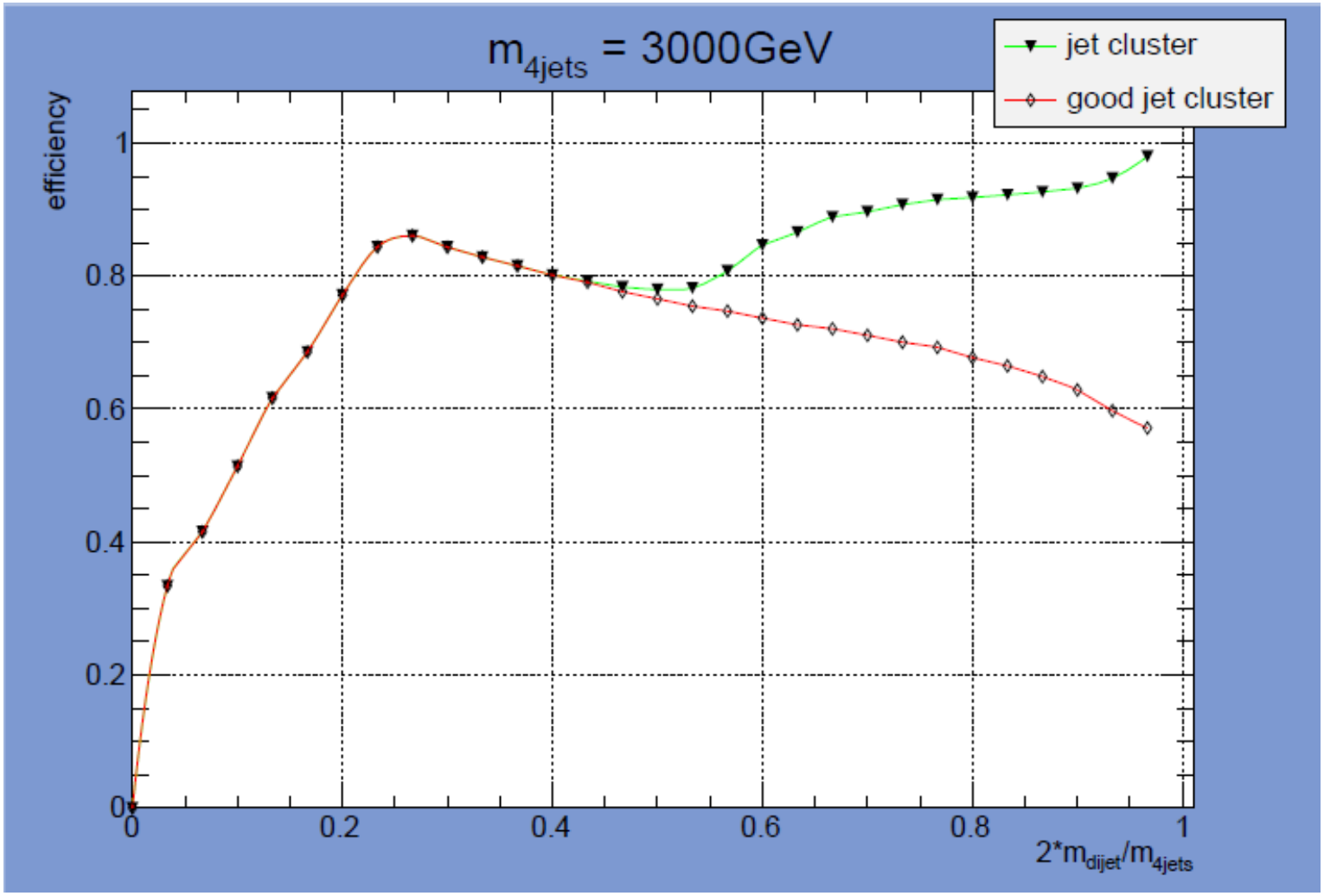
$$d_{ij} = \min\left(k_{\mathrm{T}i}^{2p}, k_{\mathrm{T}j}^{2p}\right)\frac{\Delta_{ij}}{D} \qquad \Delta_{ij}^2 = (y_i - y_j)^2 + (\phi_i - \phi_j)^2$$

  distance between any particle i and the beam (B) $\mathbf{d_{iB}}$:

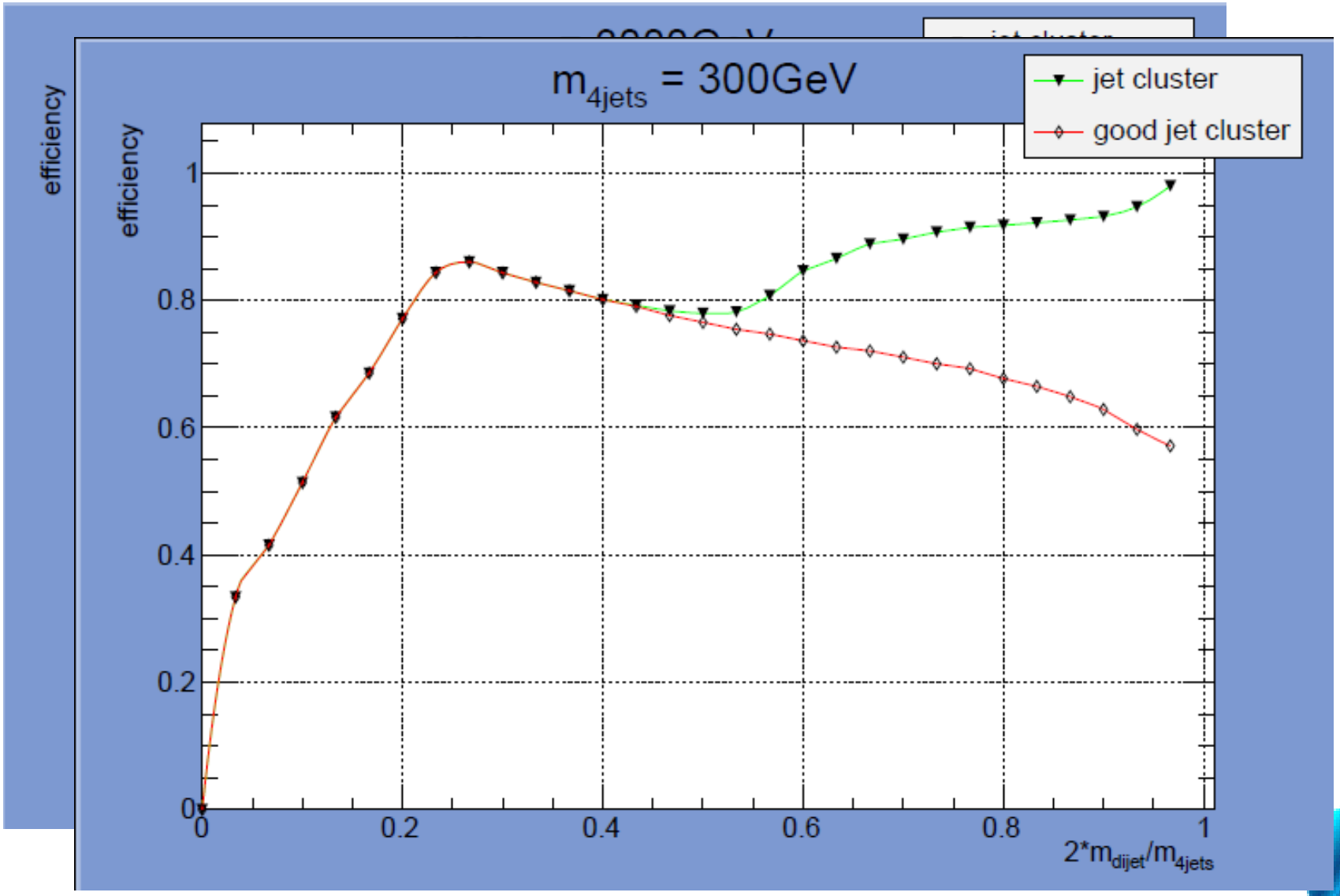
$$d_{iB} = k_{\mathrm{T}i}^{2p}$$

CA jet algorithm provide good performance when it comes to resolve jet substructure!

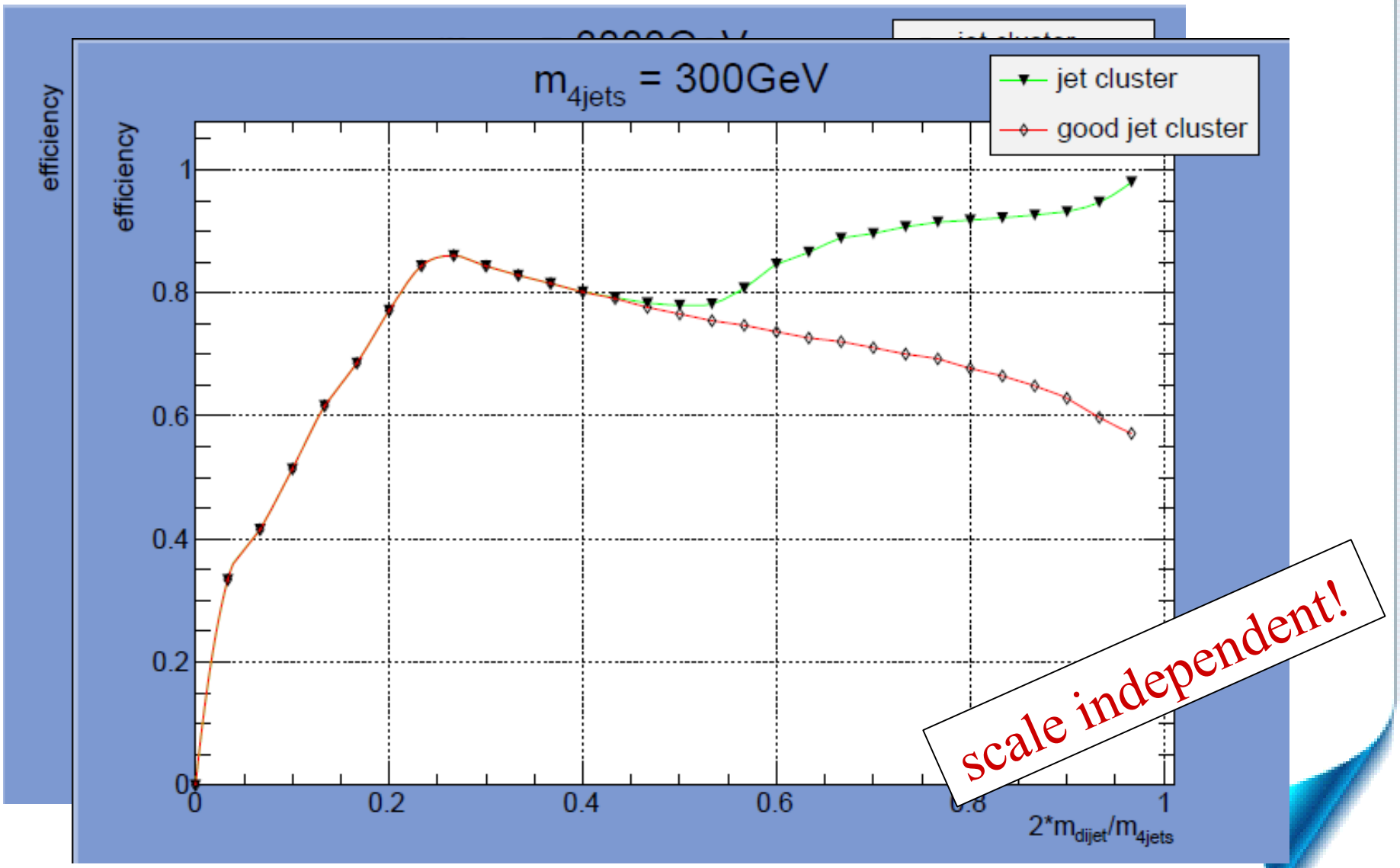
jet cluster efficiency



jet cluster efficiency



jet cluster efficiency



next to do

- start to search for the radion with four jets final state:

$$gg \rightarrow \phi \rightarrow hh$$

- generate MC sample
- study the event selection criteria with data sample

Thank you!