Cone size and jet resolutions at high luminosity

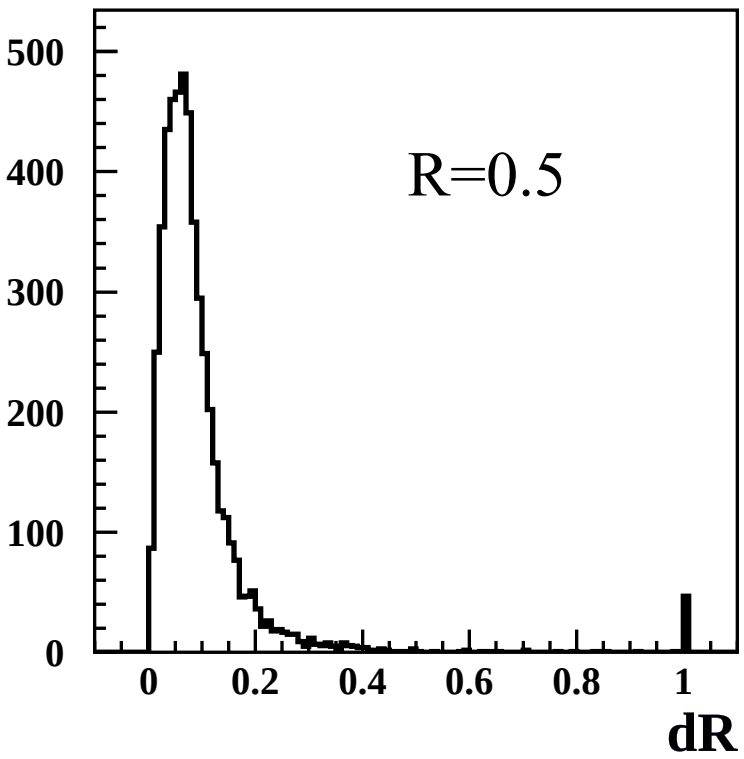
I consider only two highest E_T particle level jets in a di-jet pp event. Particle jets include neither neutrinos, muons, nor pile-up particles and are always found using the cone size R=0.5.

I try different cone sizes to reconstruct calorimeter jets to see which cone size is better to approximate particle jets found with cone R=0.5. Particle level jets are matched to the nearest reconstructed jets.

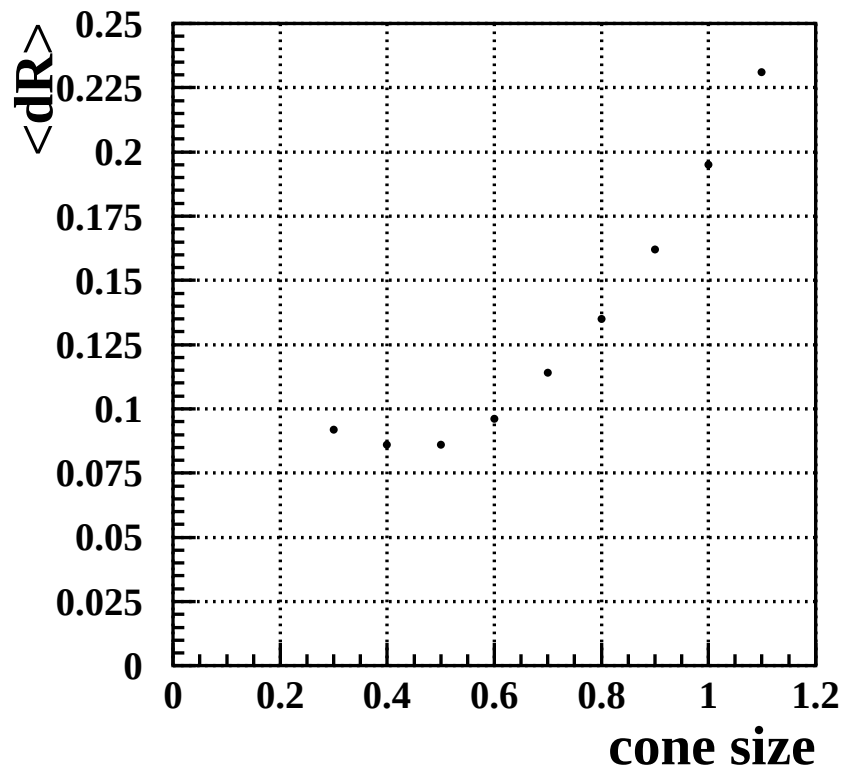
Jet space resolution

45 GeV < ETgen < 55 GeV, |ETAgen| <1

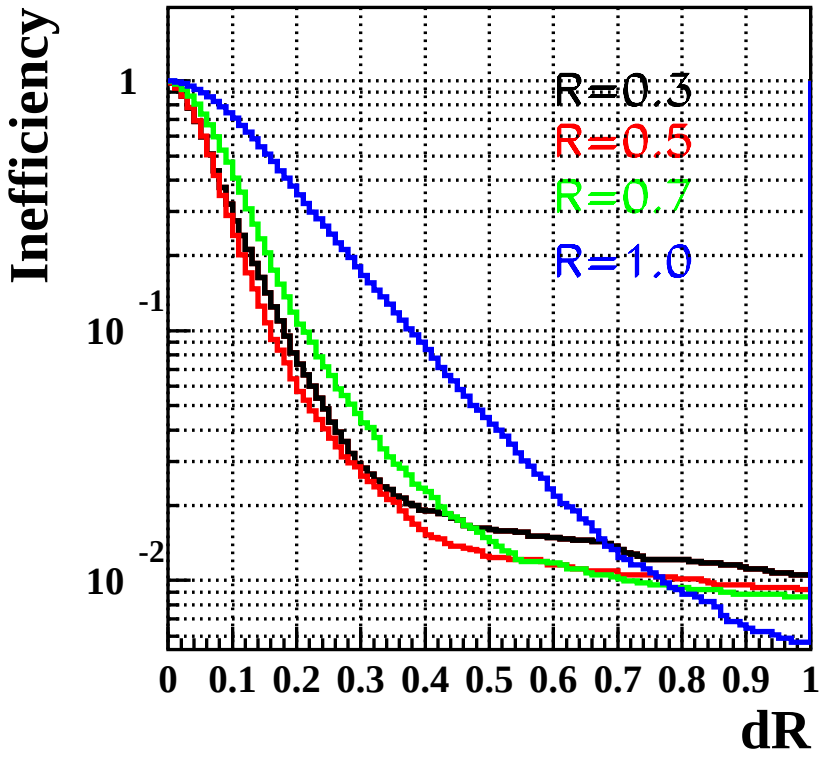
Distribution of the distance between a particle jet and a best matching reconstructed jet $dR = \sqrt{(d\varphi)^2 + (d\eta)^2}$



Jet angular resolution <dR> calculated as the average distance between matching particle level and reconstructed jets under constraint dR<1.



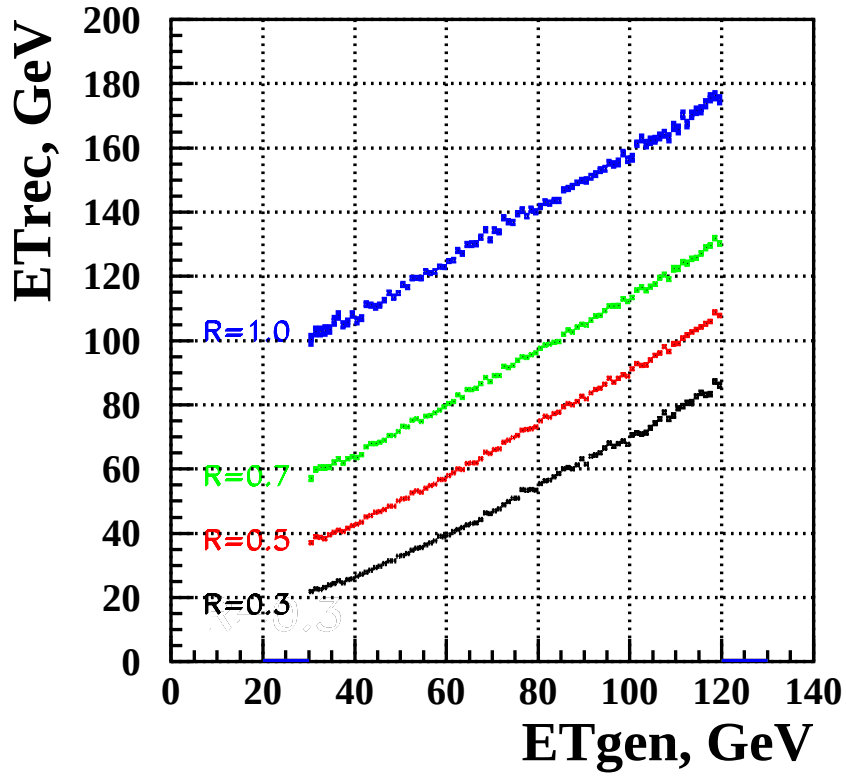
Inefficiency of jet matching as a function of the cut dR on the distance between a particle jet and a reconstructed jet (45 GeV < ETgen < 55 GeV, |ETAgen| <1)



To calculate the jet energy resolution I consider jets with dR< 0.5

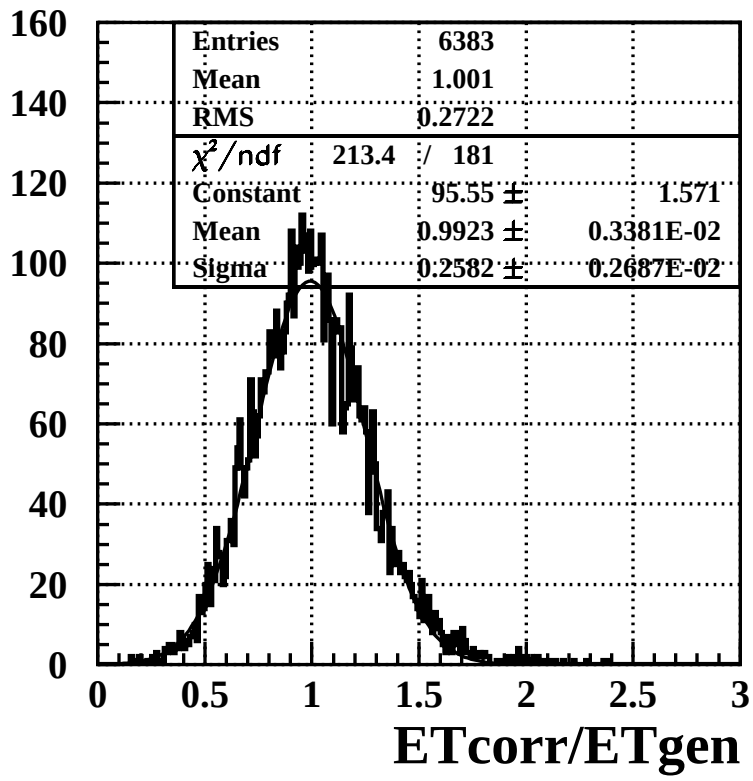
Jet energy scale

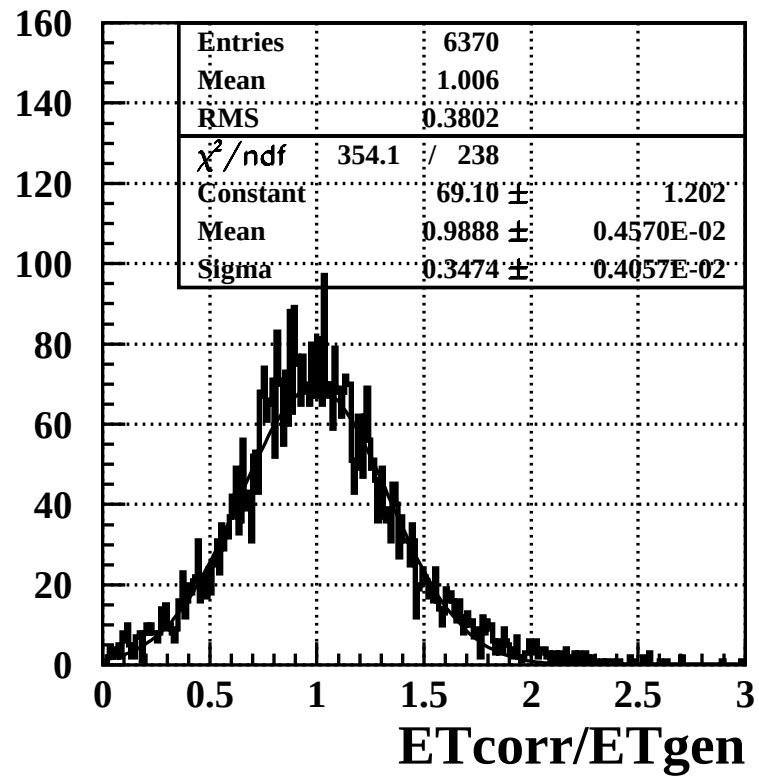
To determine the jet energy resolution I first calculate the jet energy scale for each cone size and apply jet energy corrections so that
< ETcorr (ETrec) > = ETgen



Jet energy resolution

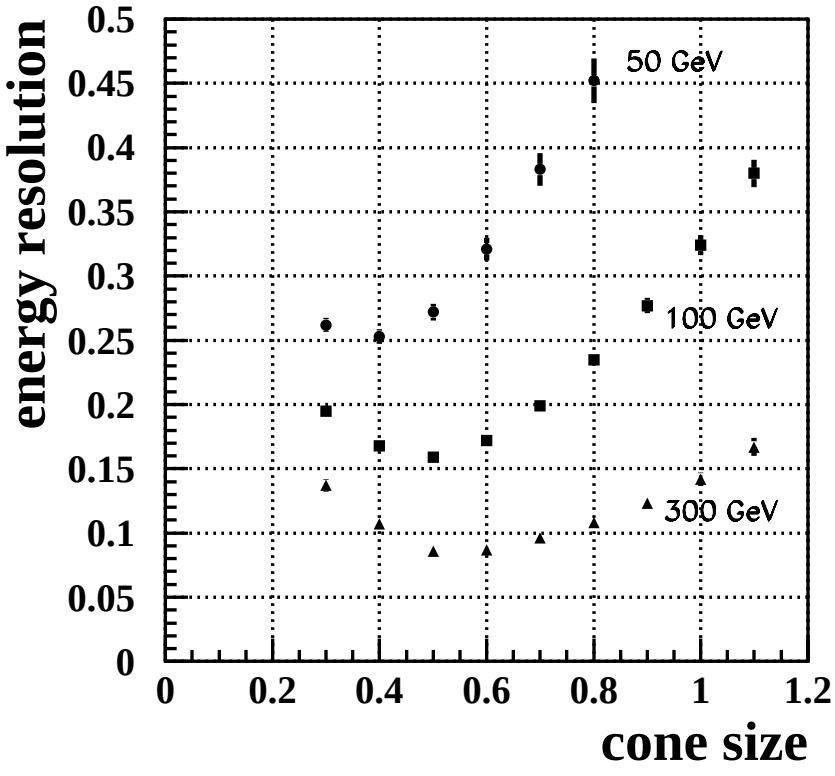
I calculate the energy resolution as RMS/Mean of (ETcorr/ETgen) distribution over 20% range of particle jet energy ETgen.



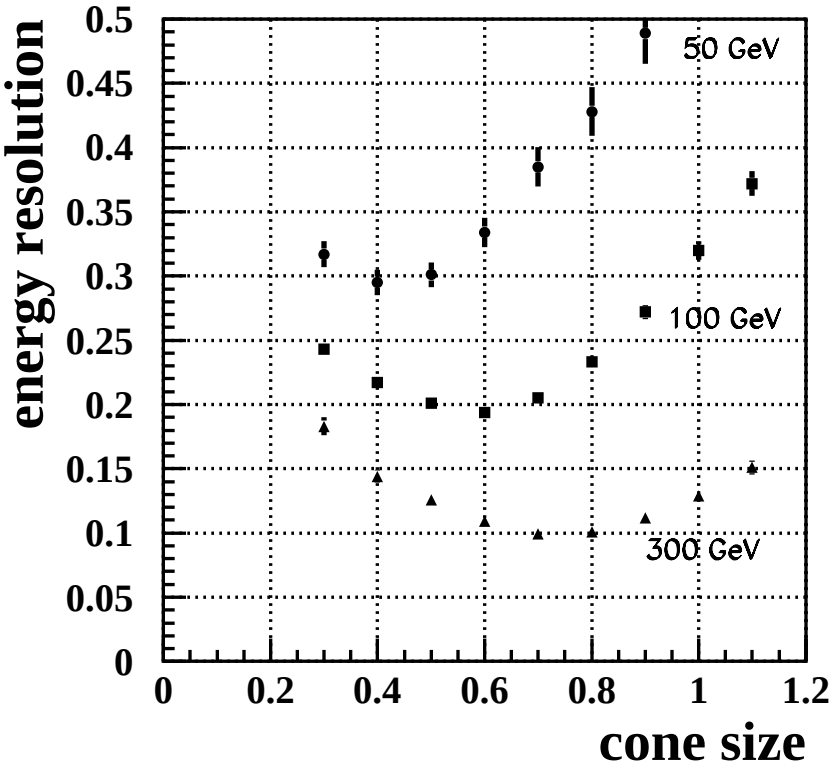


Jet energy resolution

particle jets with cone R=0.5



particle jets with cone R=0.7



Summary

Jet energy reconstruction with a cone size equal to that of particle jets is optimum for high ET jets.

In the case of high luminosity pile-up smaller cones can be preferred for low energy jets (ET<100 GeV).