Jet Reconstruction Performance

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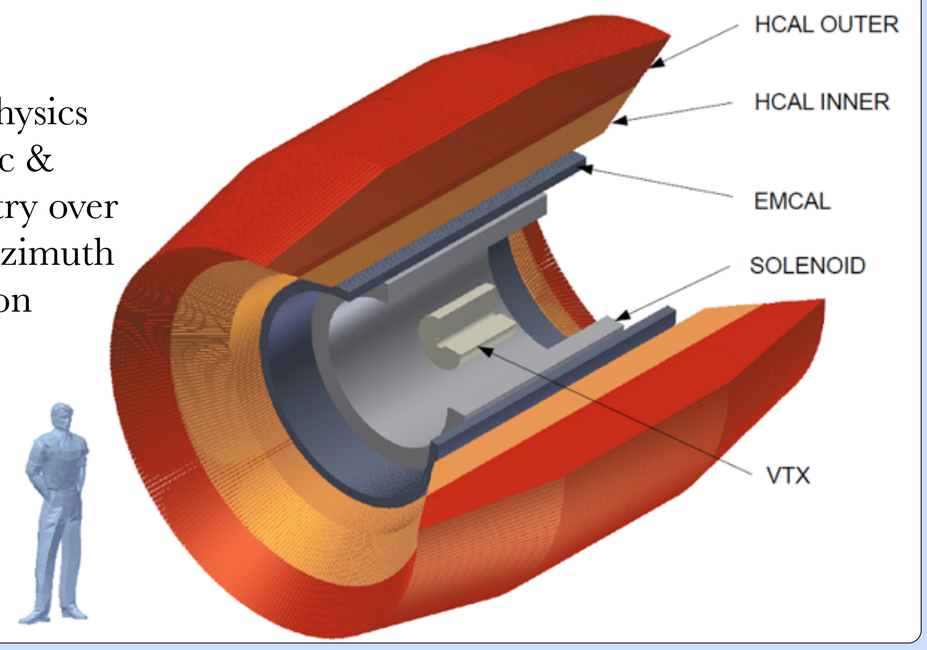
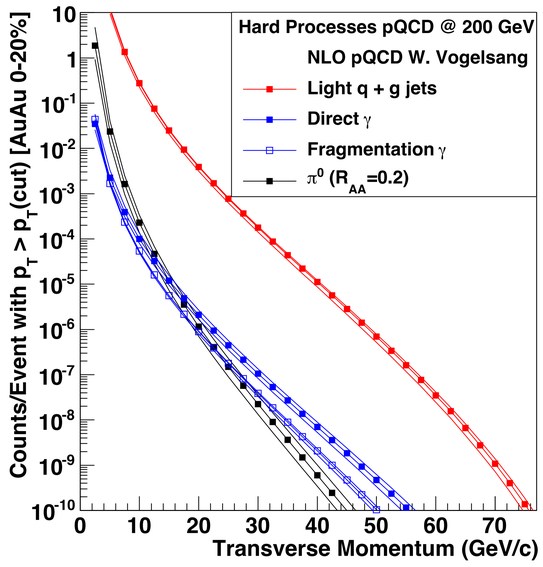
sPHENIX
A proposed Upgrade to PHENIX

- optimized for jet physics
- full electromagnetic & hadronic calorimetry over $|\eta|<1$ and 2π in azimuth
- retain current silicon tracking



Jet Rates at RHIC



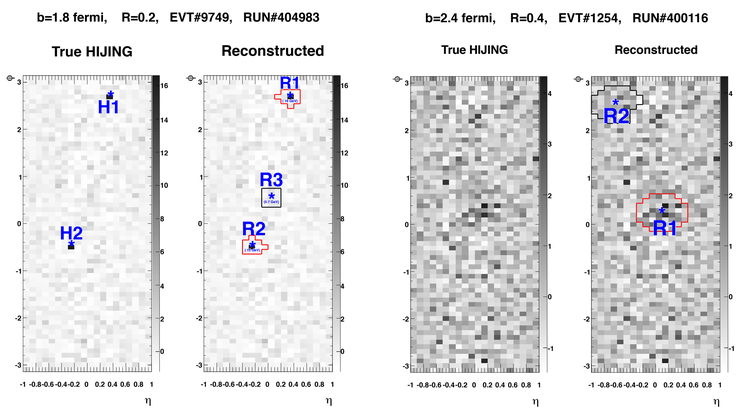
	Au+Au (central 20%)	$p+p$	d+Au
> 20 GeV	10^7 jets	10^6 jets	10^7 jets
	10^4 photons	10^3 photons	10^4 photons
> 30 GeV	10^6 jets	10^5 jets	10^6 jets
	10^3 photons	10^2 photons	10^3 photons
> 40 GeV	10^5 jets	10^4 jets	10^5 jets
> 50 GeV	10^4 jets	10^3 jets	10^4 jets

Jet sample sizes for different collision systems per 20 week RHIC running year.

Issues with Jet Reconstruction at RHIC

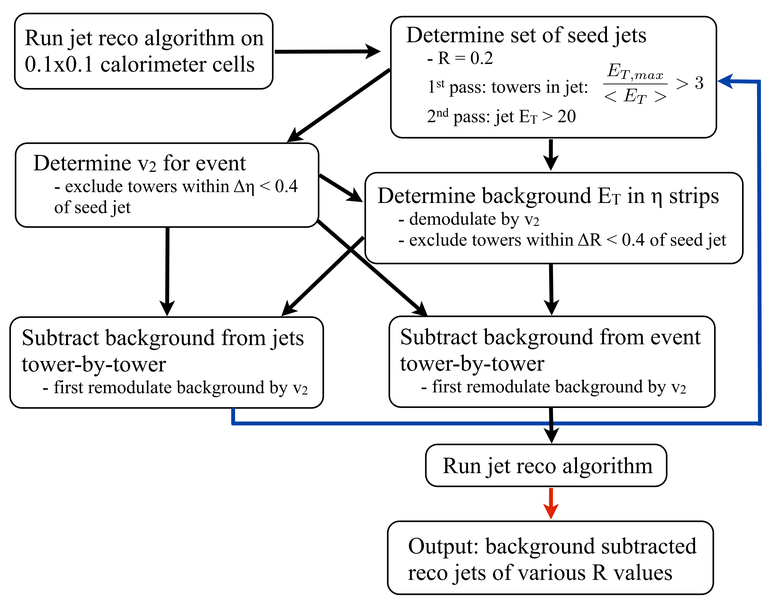
- jet cross section steeply falling with p_T & large underlying event
- quantify these effects with HIJING study
  - generate **750M** minimum bias HIJING events
  - tag true jets during event generation
  - apply background subtraction & jet reconstruction
  - quantify effects of fake jets & jet p_T spectra

True Jets **Fake Jets**



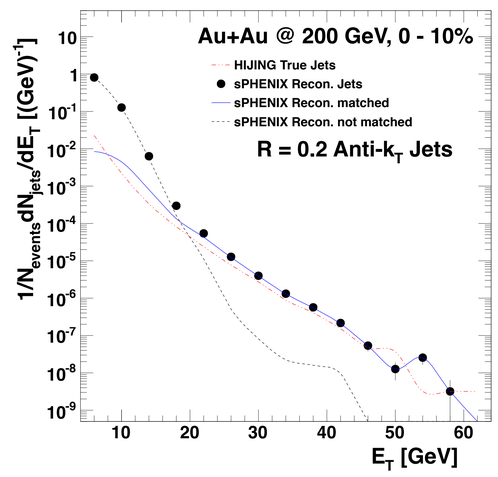
Jet Background Subtraction Method

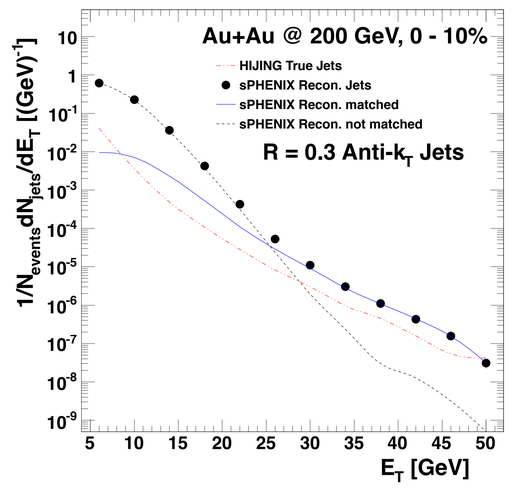
- background level determined iteratively and subtracted tower by tower
- anti-k_T jet finding run on subtracted towers
- similar to ATLAS method

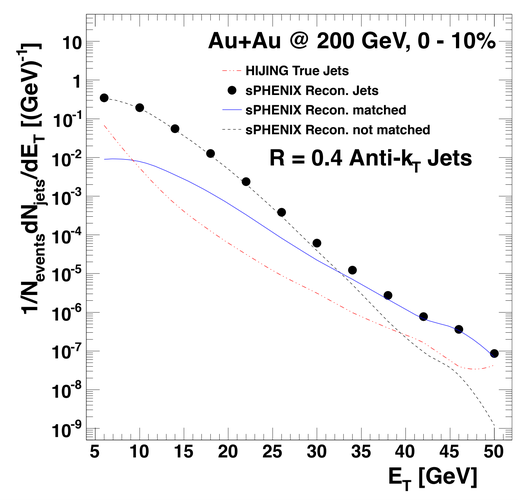


Jet Reconstruction in Central HIJING

- true jets outnumber fake jets for
  >20GeV (R=0.2)
  >25GeV (R=0.3)
  >35GeV (R=0.4)

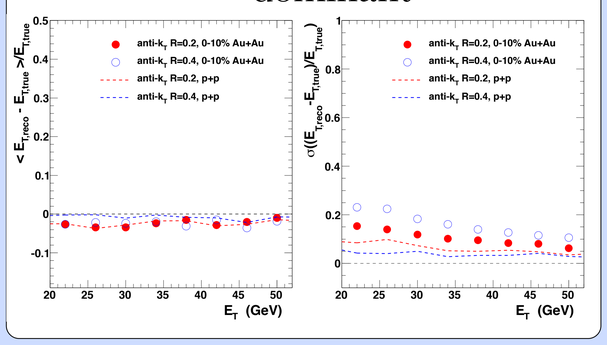






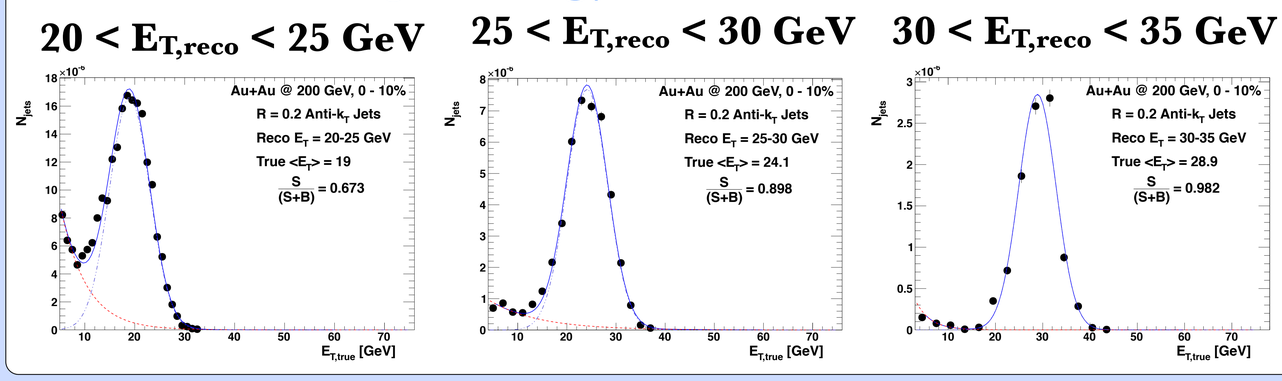
Jet Energy Resolution

- good jet energy measurement including effect of the underlying event (not including detector resolution)
- for R=0.2 jets underlying event and detector effects are comparable, for larger radius jets underlying event is dominant



Jet Energy Reconstruction

$20 < E_{T,reco} < 25$ GeV **$25 < E_{T,reco} < 30$ GeV** **$30 < E_{T,reco} < 35$ GeV**



Excellent Single Jet Measurements Possible at sPHENIX for $20 < E_T < 60$ GeV

also dijets, γ-jets, jet-h...

More Details...

Jet-Underlying Event Separation Method for Heavy Ion Collisions at the Relativistic Heavy Ion Collider, J.A. Hanks et al. arXiv:1203:1353 (PRC in press)

sPHENIX: An Upgrade Concept from the PHENIX Collaboration, arXiv:1207.6378