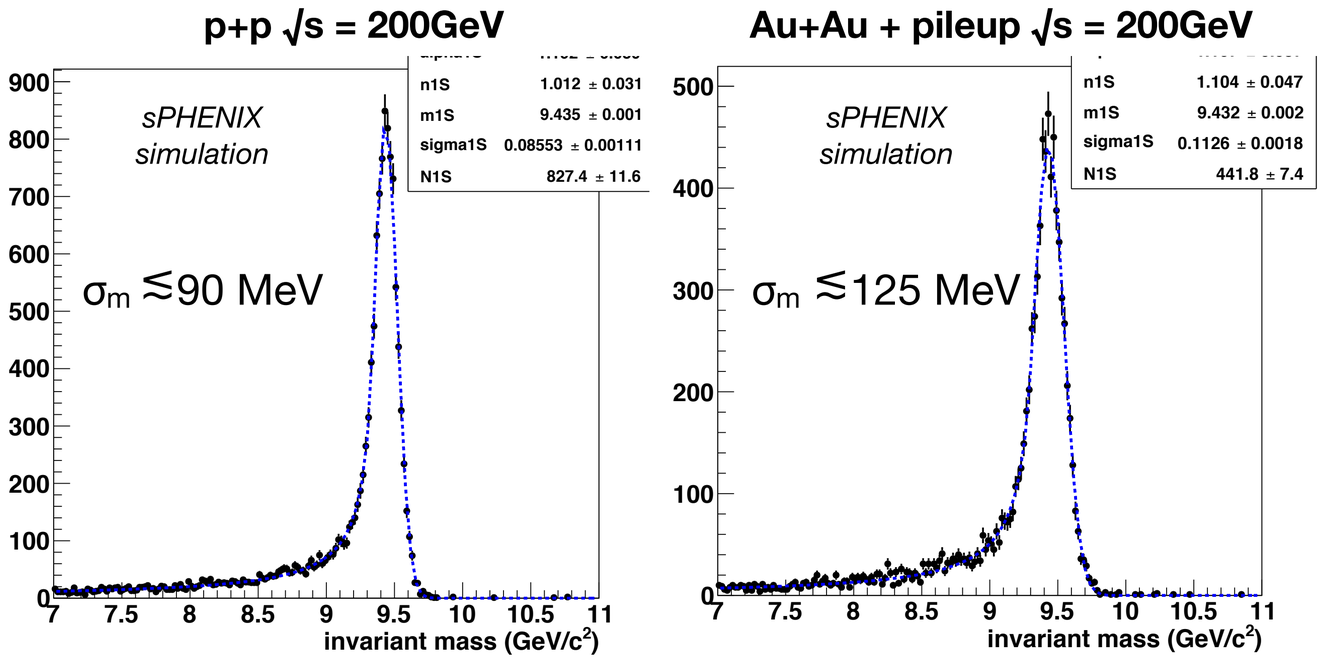
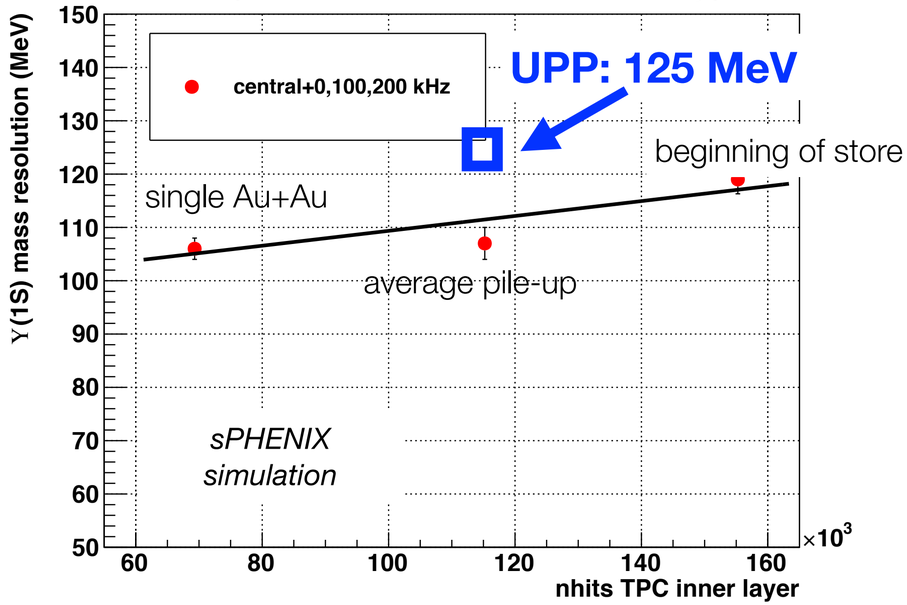
Performance simulation: Upsilon mass resolution



Current TPC cluster finder does not include deconvolution of overlapping clusters → multiplicity dependence

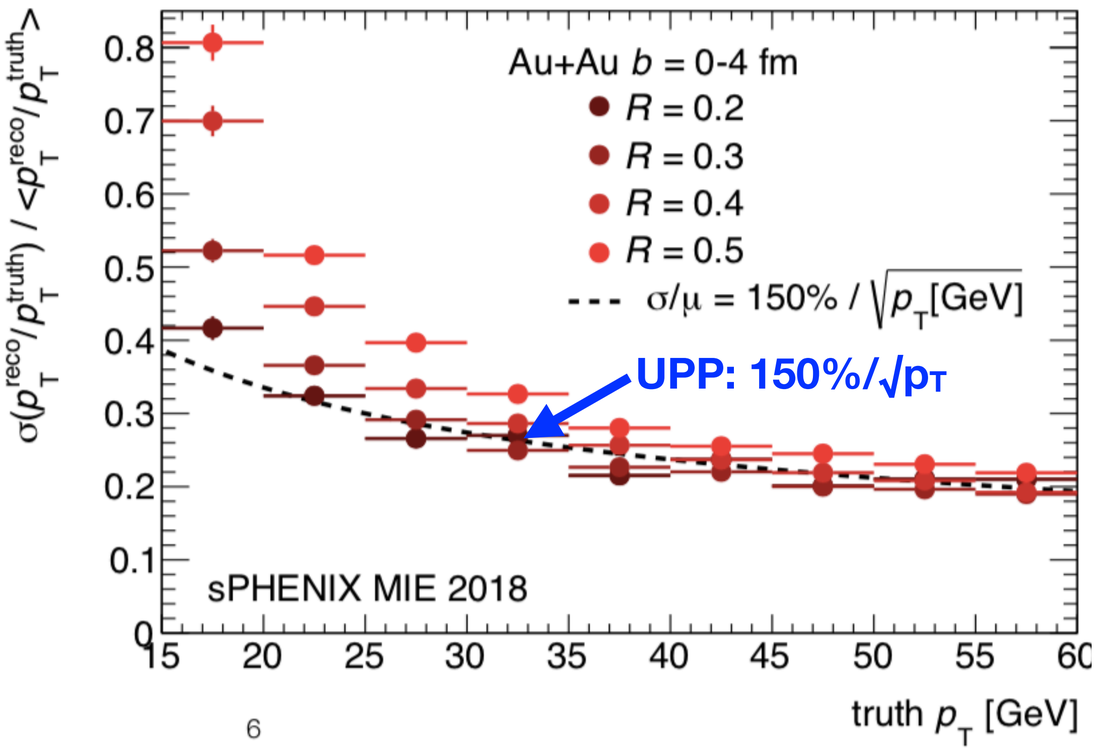
Y(1s) mass resolution vs multiplicity (instantaneous luminosity)



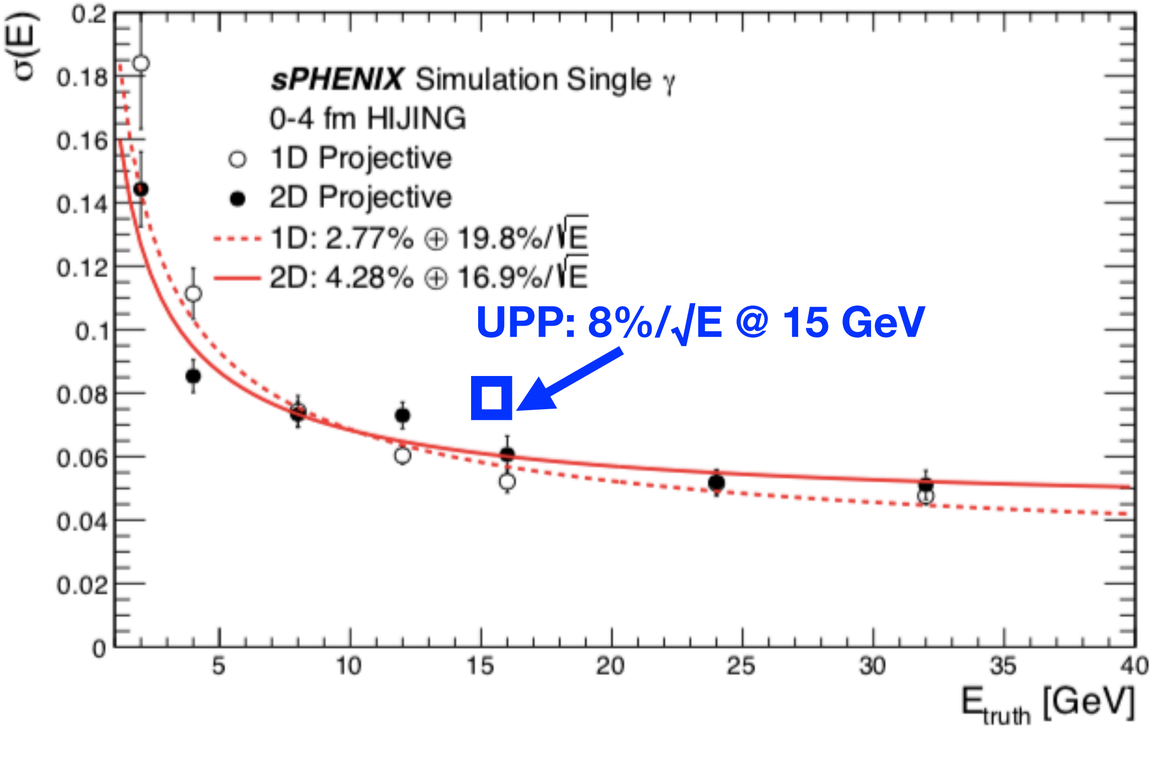
Simulations indicate Y(1s) mass resolution better than 125 MeV
(averaged over in-store luminosity evolution)

Performance simulation: Jet and γ resolution

Single jet resolution (central Au+Au)



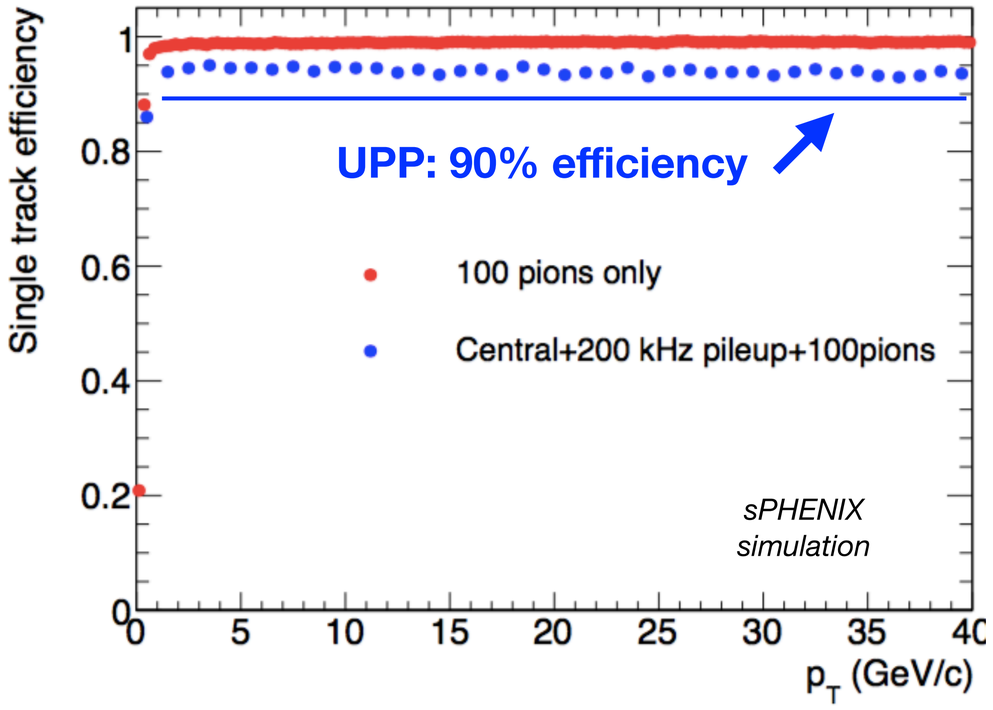
Single photon resolution (central Au+Au)



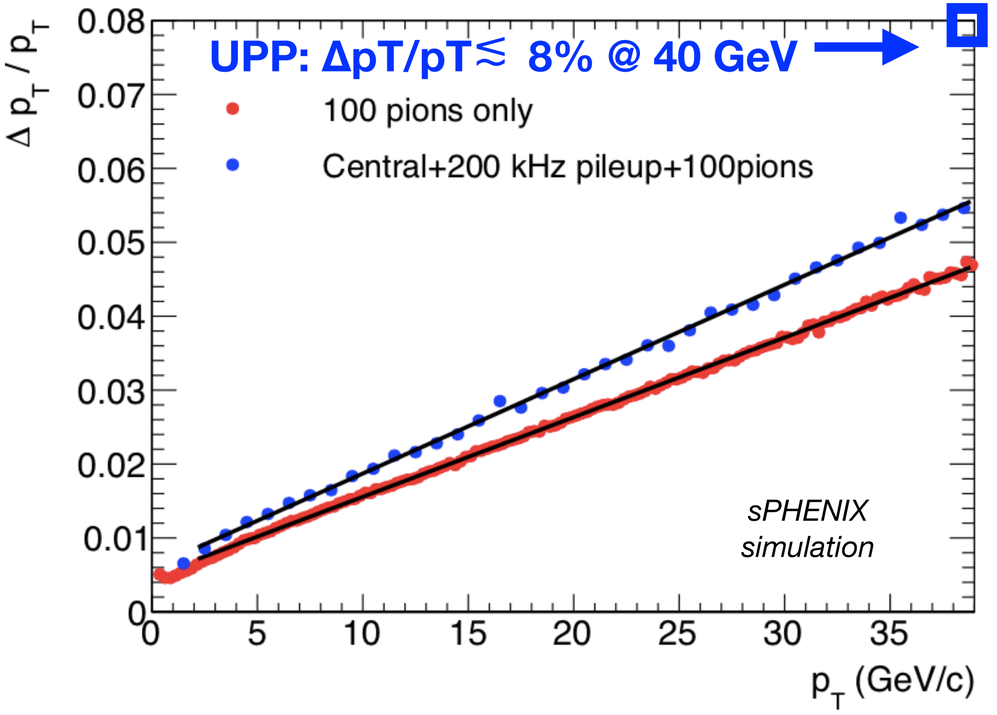
Calorimeter-related performance studied using GEANT simulations verified with test beam data

Performance simulation: tracking efficiency and resolution

Tracking efficiency (central Au+Au)

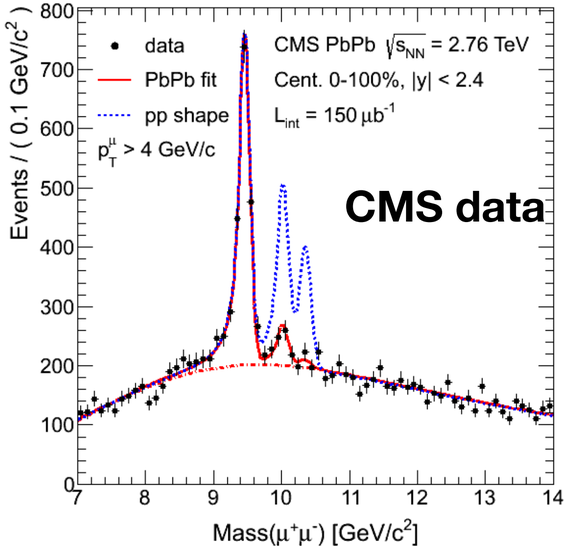


Track pT resolution (central Au+Au)

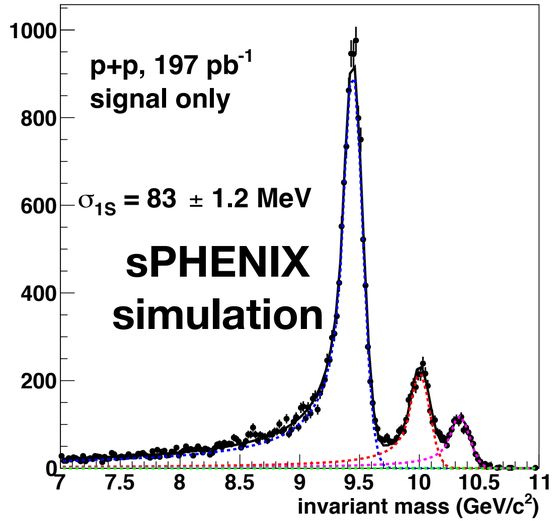


Tracking performance in full GEANT simulations including pileup

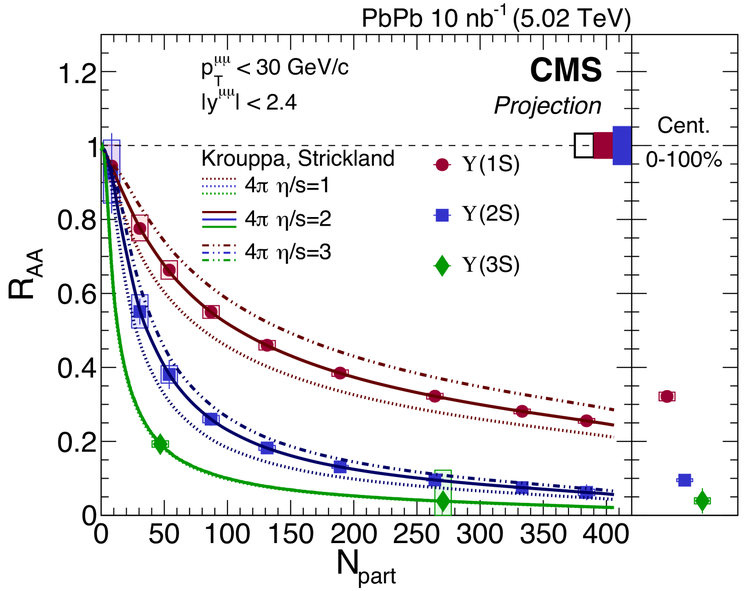
Core physics projection: Upsilons at sPHENIX vs LHC

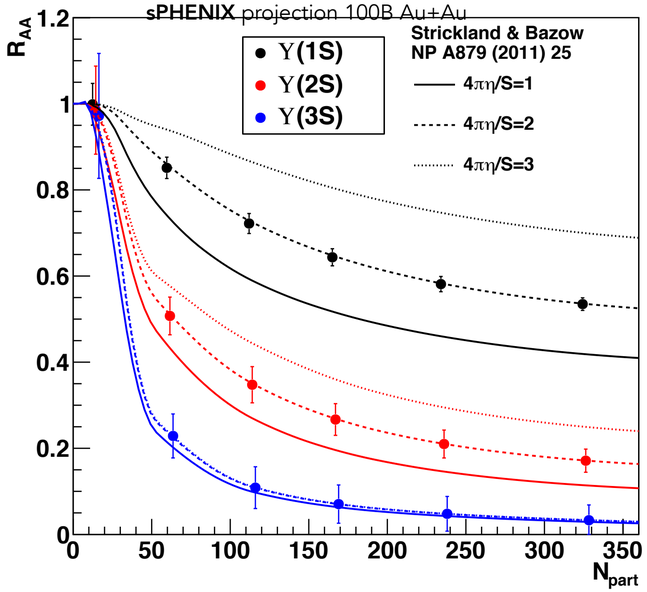


Y(1S,2S,3S) → e$^+$e$^-$



Y family fully resolved





sPHENIX projection

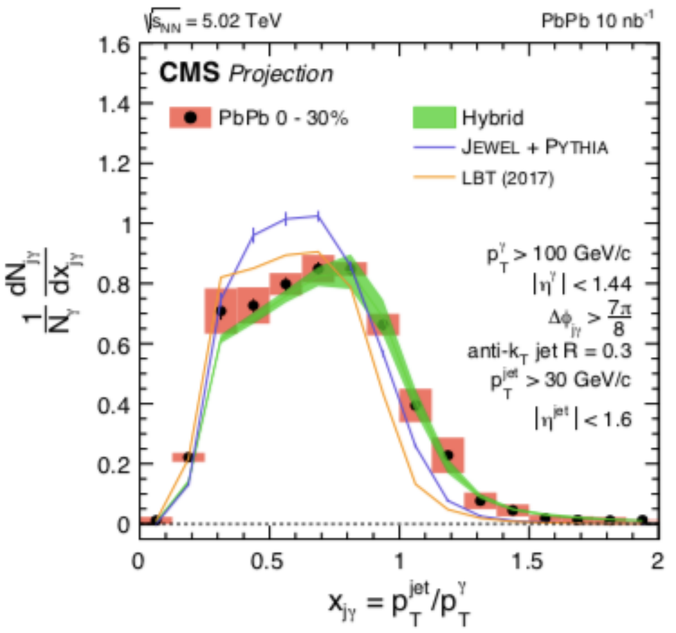
LHC projection for Run III+IV

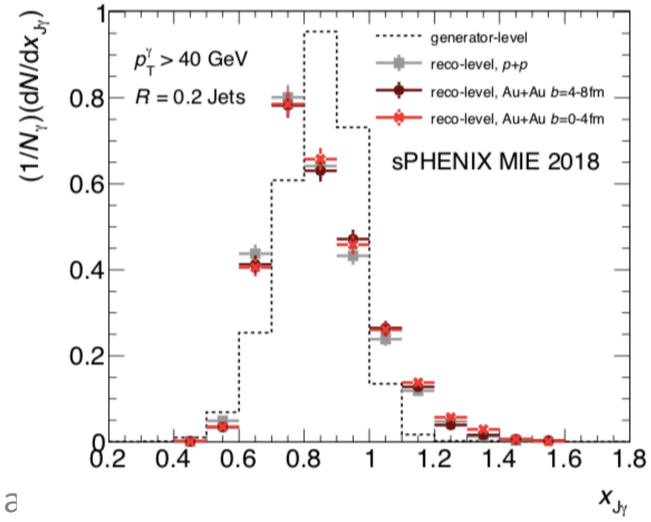
$$R_{AA} = \frac{d^2N_{AA}/dp_T d\eta}{\langle T_{AA}\rangle d^2\sigma_{pp}/dp_T d\eta} \sim \frac{\text{“QCD Medium”}}{\text{“QCD Vacuum”}}$$

Sequential suppression of Y(nS) states reveals QGP Debye screening length

Core physics projections: Jets in sPHENIX vs LHC

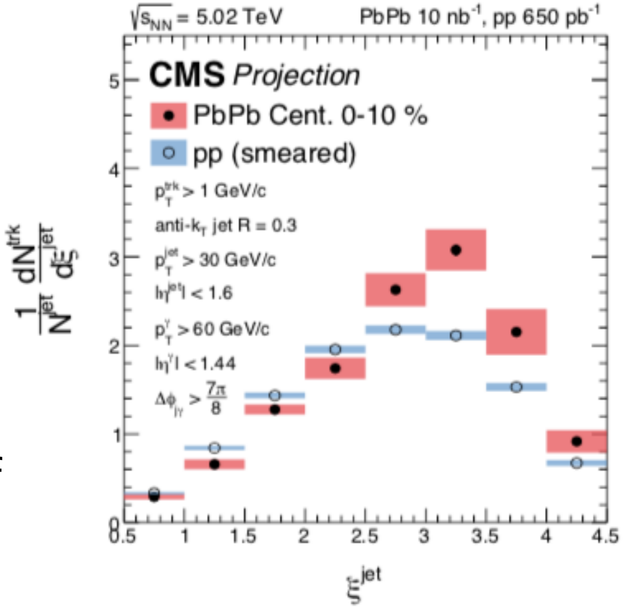
γ+Jet momentum balance

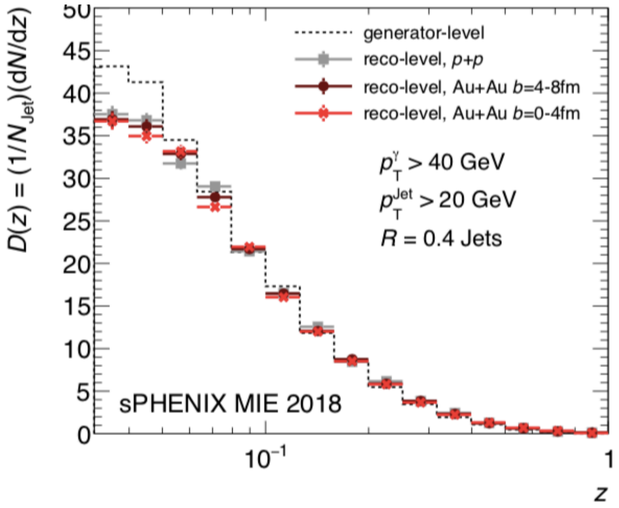




Direct measurement of parton energy loss in QGP

γ+Jet fragmentation function





LHC projections for Run III+IV

Modification of parton shower in QGP

sPHENIX projection