Precision Charged Particle Tracking with PHENIX

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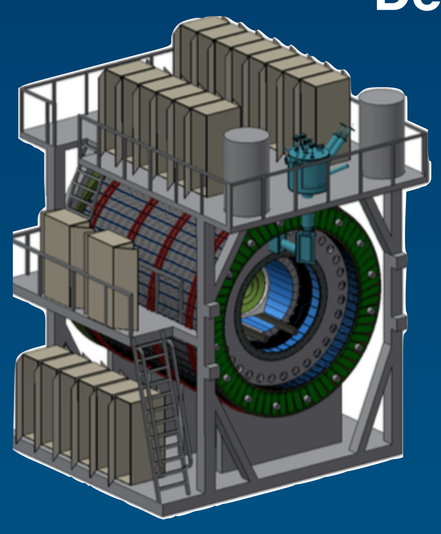
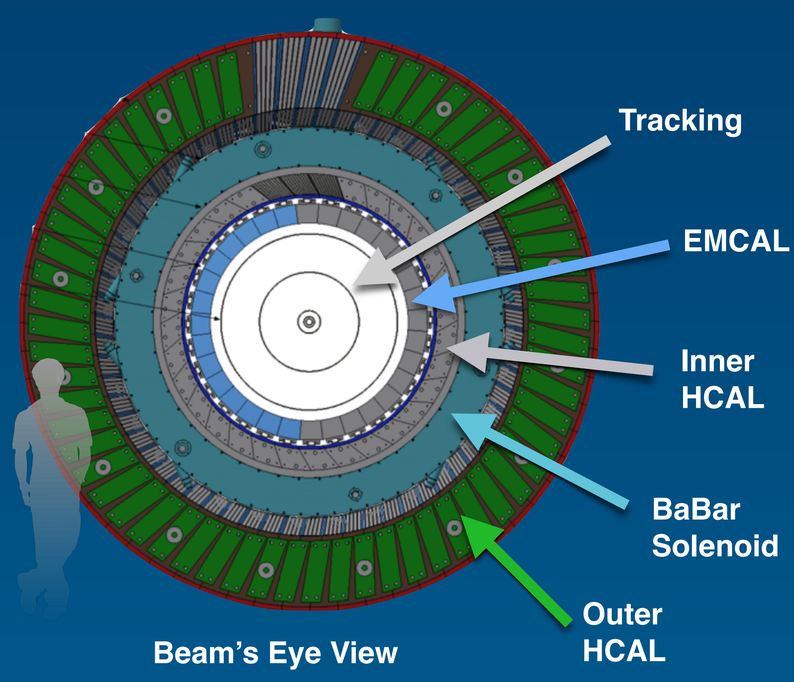
A large-acceptance jet and upsilon detector for RHIC with hadronic calorimetry, sPHENIX, has been proposed for ultra-high rate measurements of fully reconstructed jets and perform high resolution spectroscopy of Upsilon states. A large part of the physics program will require a precision charged particle tracking system and is reported here. Full details can be found in our proposal: arXiv:1501.06197

Detector Overview





Conceptual Design:

- **-1.1 < η < +1.1, Δϕ = 2π**
- **BaBar solenoid, 1.5 T**
- **Reconfigured pixel + new strip layers for charged particles**
- **EMCal to measure photons & electrons**
- **Inner+Outer HCAL to complete jet measurement**
- **High rate DAQ, 15 kHz**

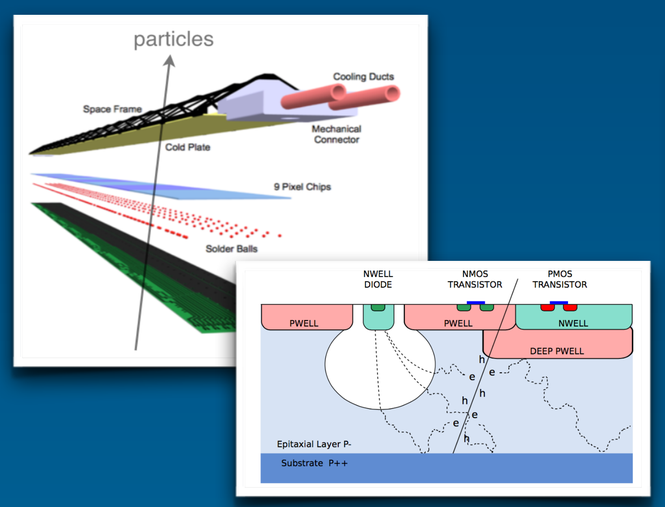
Charged Particle Tracking Options

Base design: existing pixels + Outer Silicon Layers

2 layers of 50x425 μm pixels
5 layers of ~60μm x 8mm strips

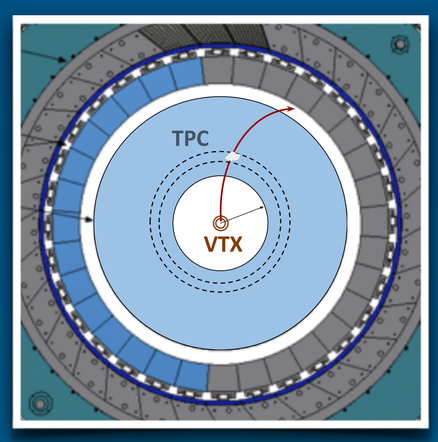
alternative: New Inner Pixels

ALICE-based sensor technology



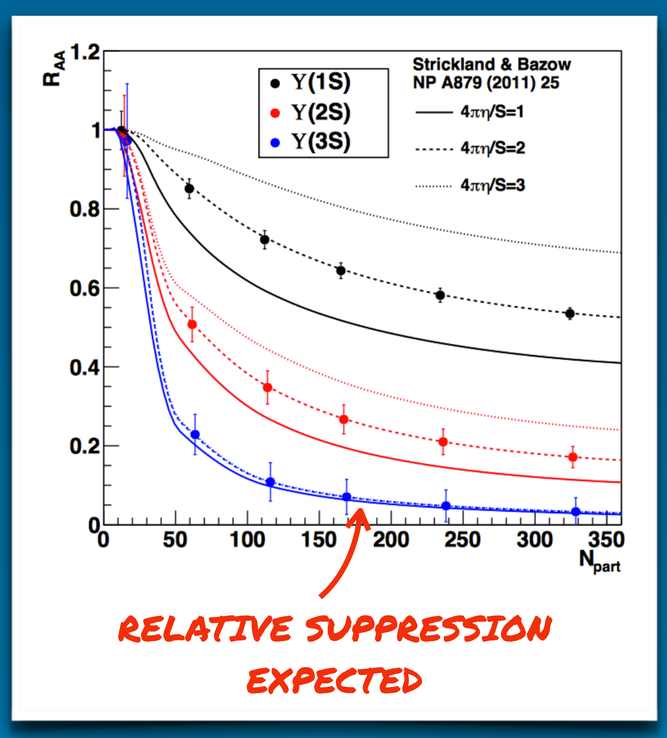
alternative: Outer TPC

Electron-Ion Collider based technology

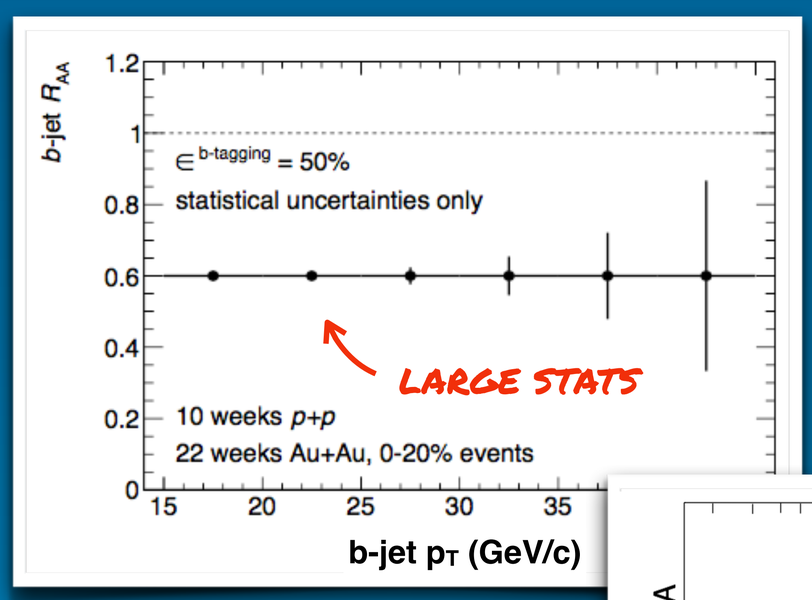


Tracking Physics Motivations

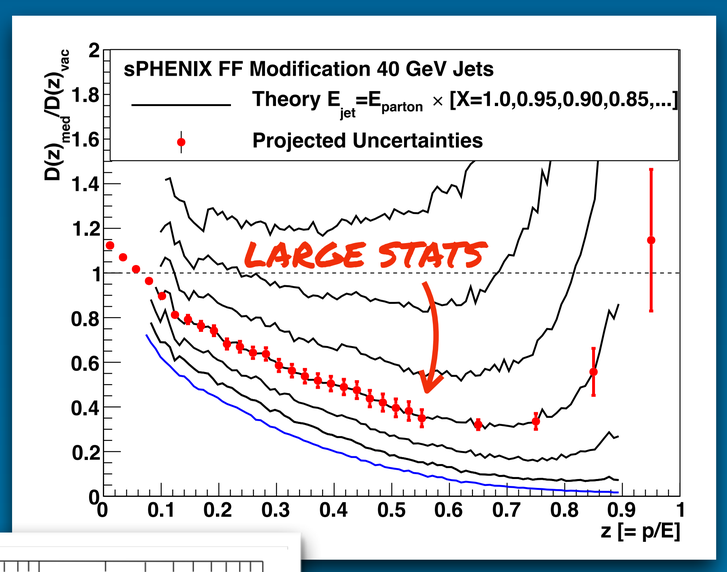
Upsilon Separation

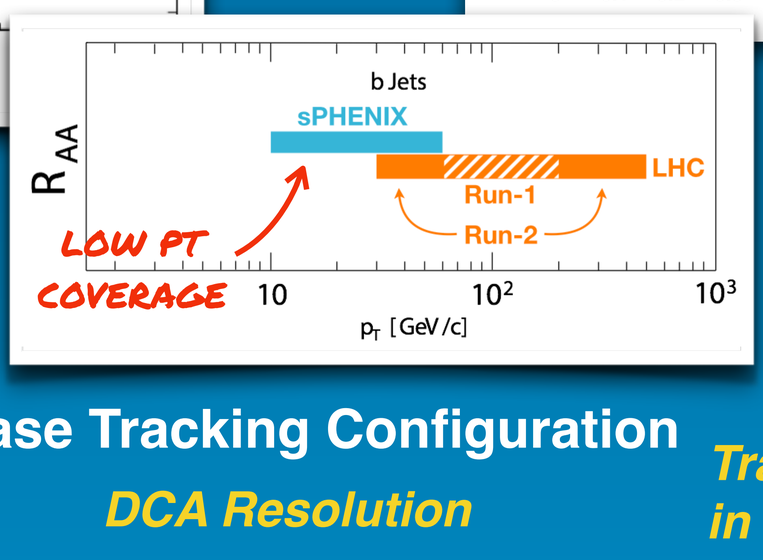


B-jet Identification



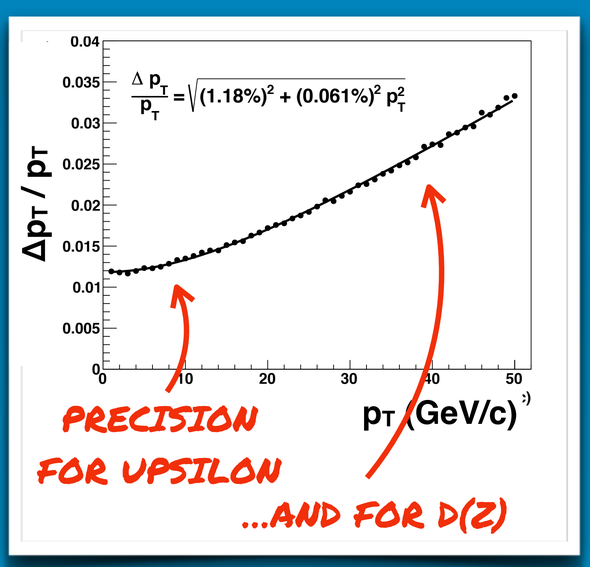
Fragmentation Functions



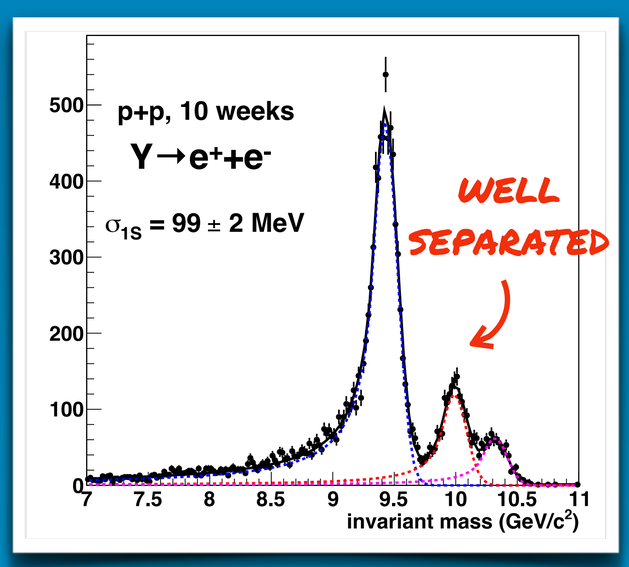


Simulated Performance for Base Tracking Configuration

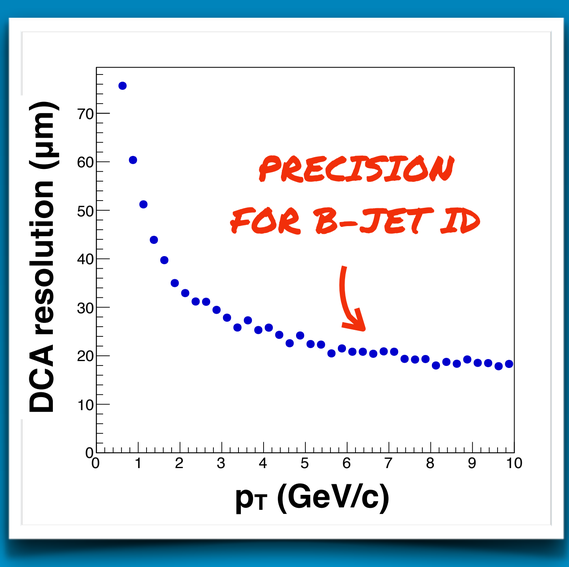
Momentum Resolution



Mass Resolution



DCA Resolution



Tracking Purities in Central Au+Au