Commissioning sPHENIX

Joe Osborn, Brookhaven National Laboratory

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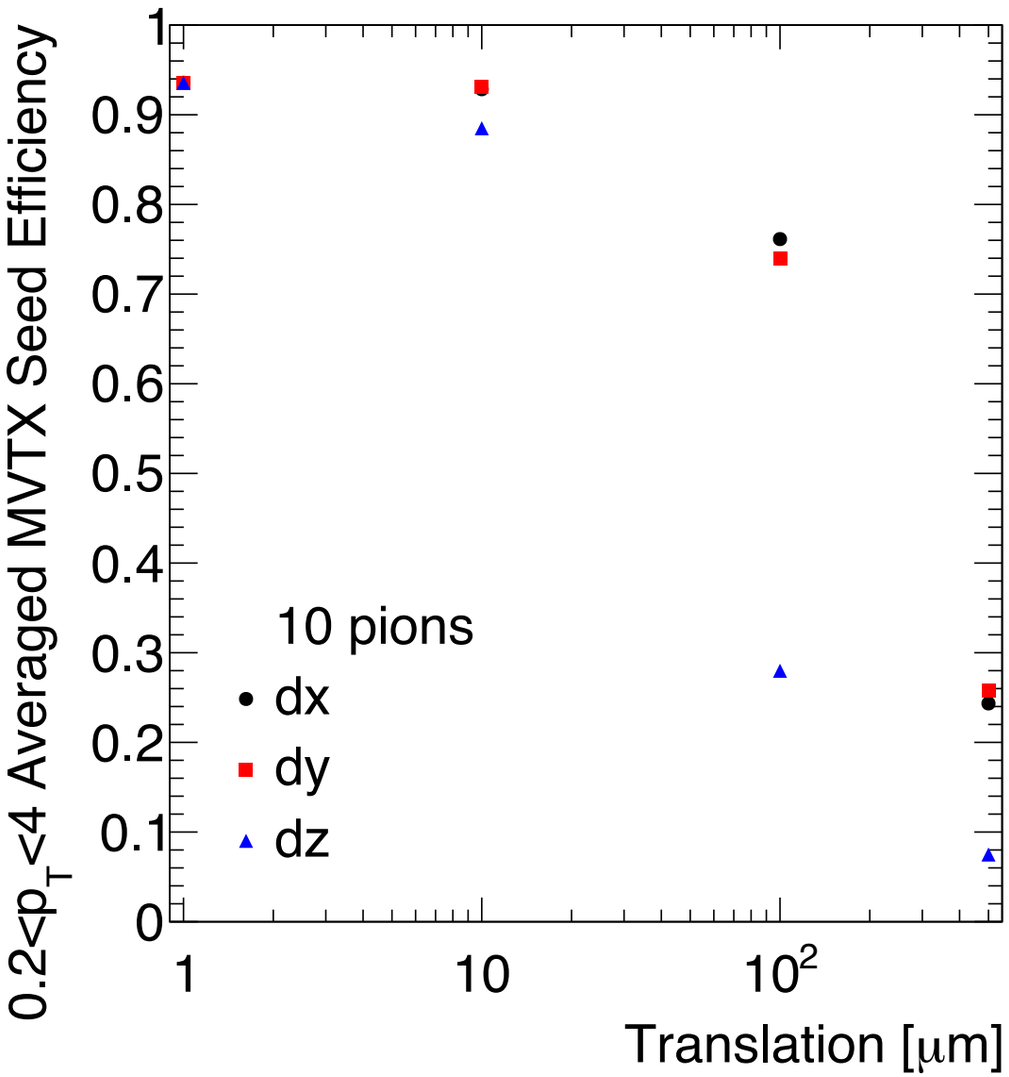
Quick Overview

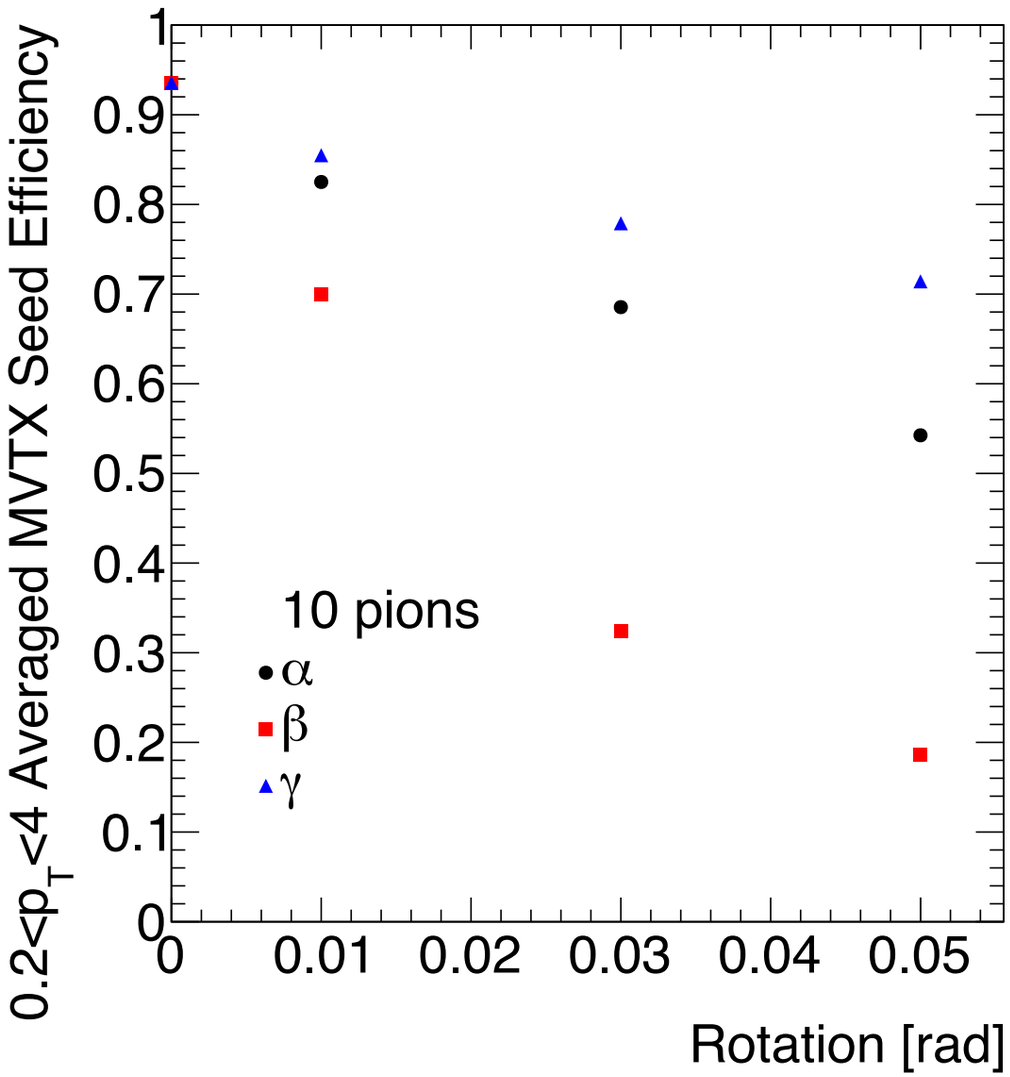
- sPHENIX will start taking data in March 2023
- Developing commissioning workflow
- Reminder of challenges:
    - Seed in silicon and TPC separately, then match tracks in large silicon-> TPC gap
    - TPC distortions up to O(cm) have to be corrected to O(100) μm with laser system + Micromegas
    - TPC drift time is 13 μs, bunch crossing every 100 ns
    - Silicon pixel+strip detectors provide precise vertex+timing information
- Open questions:
    - We can seed in the TPC with distortions. How does Acts seeding perform with misaligned silicon?
    - Acts KF has low tolerance for misalignment. How do we fit tracks that are necessarily from misaligned surfaces?
    - How much misalignment can we tolerate? What will we be given in terms of misalignment? (in discussion with detector experts)

Alignment

- GeometryContext maps Acts::GeometryId to Acts::Transform3 for each surface
  - Transform contains corrections for α,β,ɣ, x,y,z perturbations
- Hooks in place, and are setting up the calls to Millipede
  - Working on determining how to configure Acts track states to feed to millipede

Acts Seeding with Misalignment





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- Ongoing work to try and recover efficiency - blowing covariance up does not seem effective…

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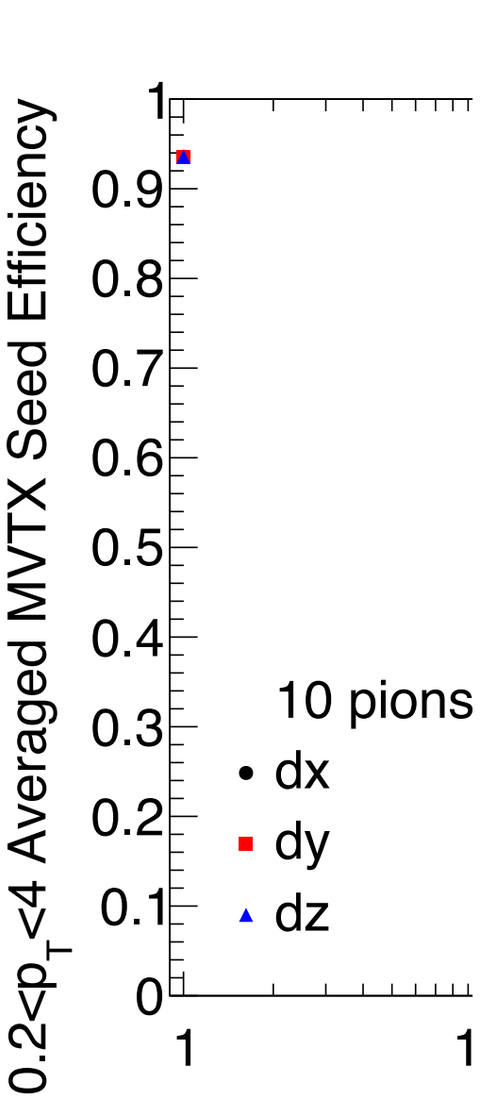

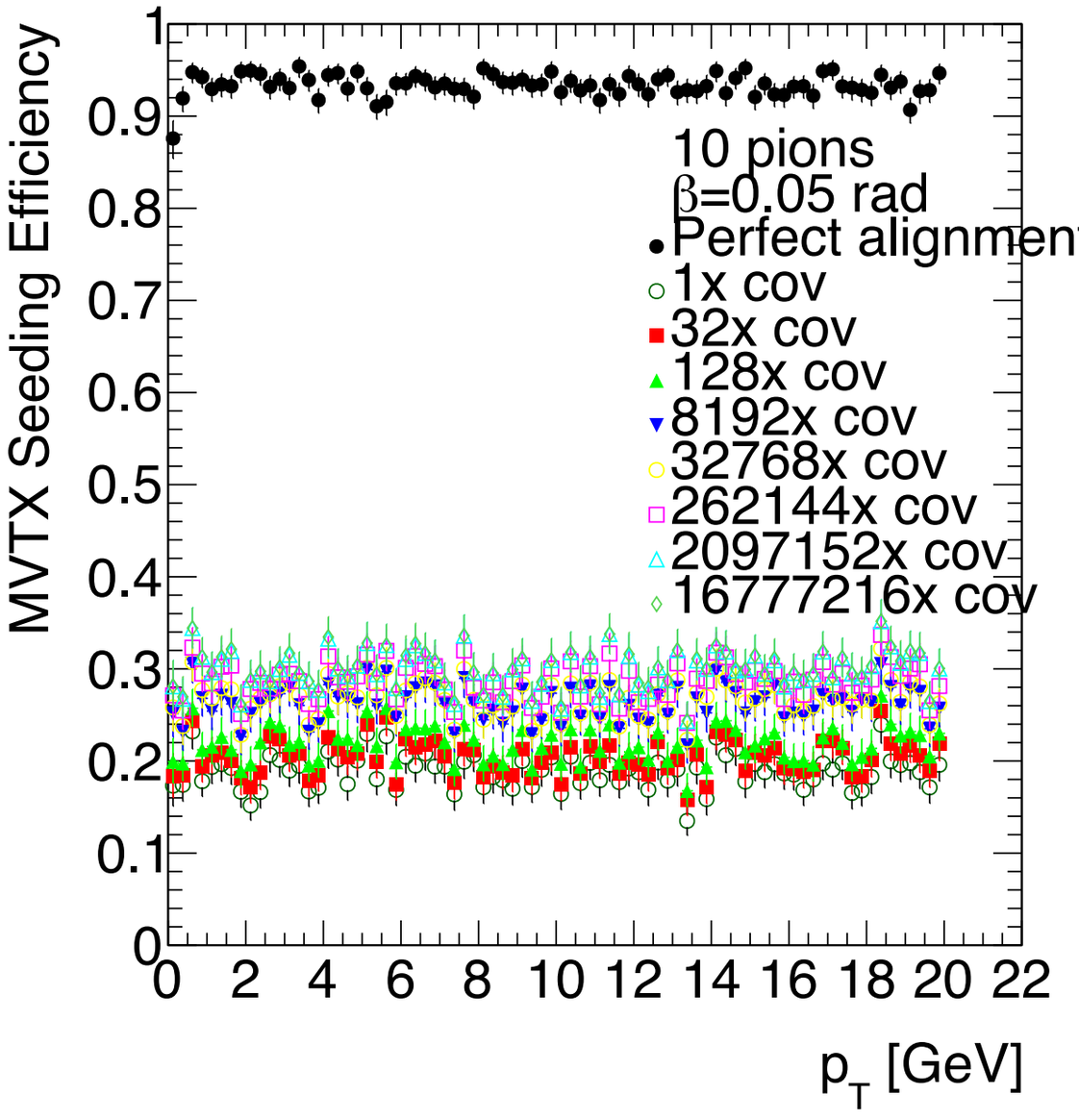

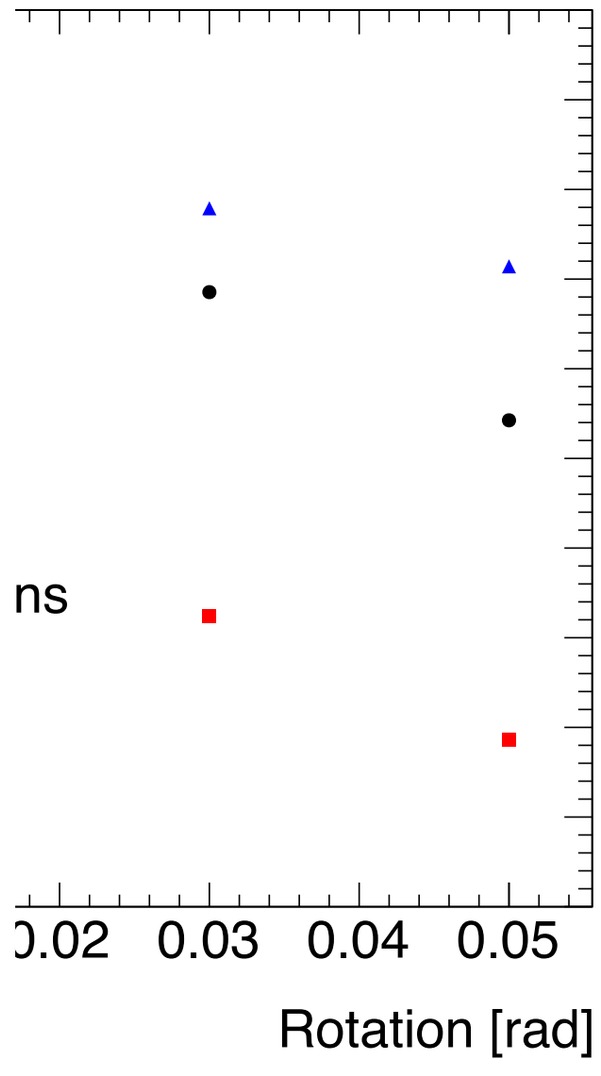

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Discussion Questions

- How do we fit tracks with misaligned surfaces of O(100) μm?
- How do we seed with Acts seeder with misalignment?
- Best way to prepare data for millipede?
    - e.g. are there analytic solutions to things like derivatives of residuals WRT to track states?
- What else do we need to know about commissioning a brand new tracking system (especially with micron precision)?