Track Seeding discussion

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Overview

- Right now there is no reconstructed seeding algorithm implemented in EICRecon
  - There is ongoing parallel work in Juggler framework
- Both Acts seeding algorithms (binned and orthogonal) have been implemented in Fun4All for sPHENIX. I decided I could port the orthogonal seeder into EICRecon
  - I will likely not have the time to tune the algorithm. However, my hope was that this would serve as a foundation for others to get involved
- Status - algorithm implemented and runs. Naively just copied the parameters used for the sPHENIX MVTX - obviously won't work for ePIC

Seeder

- Code on orthogonal_seeder branch in eicrecon
- Algorithm works as follows:
  - Takes all hits, converts to eicrecon::SpacePoint
  - SpacePoints provided to Acts, which produces seeds
    - 1 seed == 3 hits grouped together (no more, no less)
  - Simple circle (xy plane) + line (rz plane) fit to get estimate of track parameters
    - Momentum determined from assumed 1.7T field
    - Track position is point of closest approach to (0,0,z)
    - Assign arbitrary covariance to track parameters at the moment. Could be later tuned based on further studies of e.g. phi/theta/p resolution

Seeder

- I arbitrarily blew up the Acts search volume and the seeder does find seeds. I make no claims as to its current effectiveness regarding efficiency/duplication rate

- As on previous page, I hope to turn this over to someone to tune. I am happy to help guide the tuning process as I am familiar with Acts seeding configuration parameters

- I can open a PR for further discussion

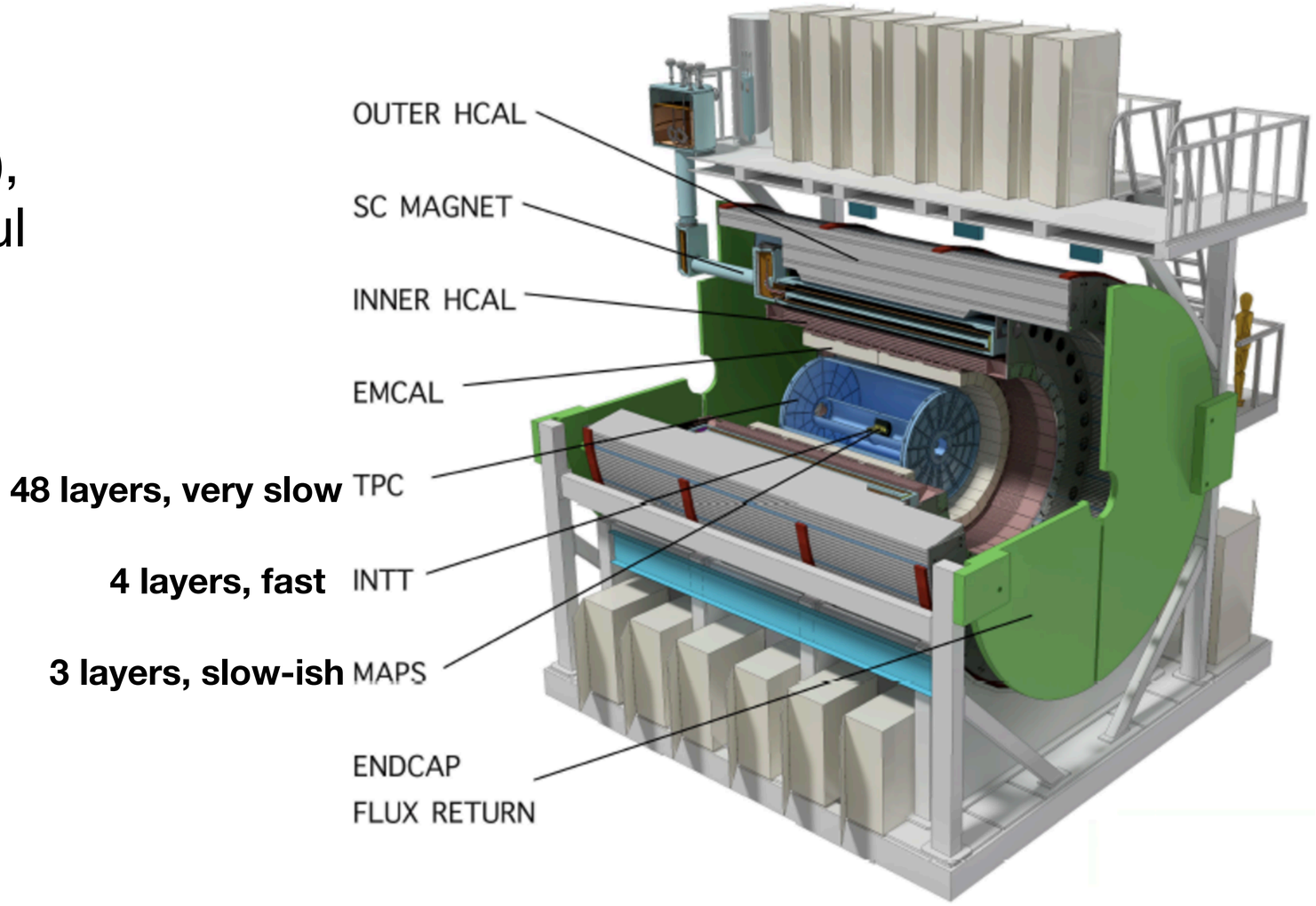
    - Need to double check that track parameters of at least one of the seeds makes sense (e.g. sign of field is correct, etc.)

Seeding Discussion

- I am unaware of any discussions on strategies (I might have just missed them), so I thought it would be useful to have a broader discussion

- sPHENIX seeds separately in silicon and TPC based on experience in heavy ion multiplicities with CKF from both Genfit and Acts

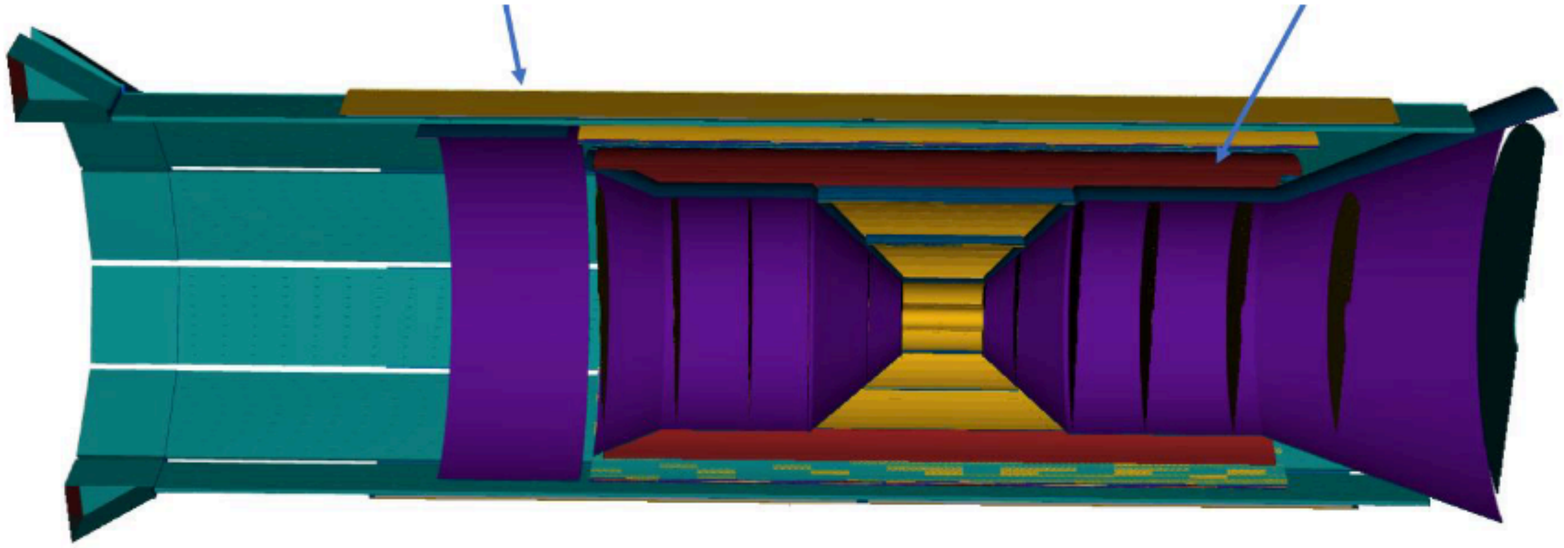
- What makes sense for ePIC?



ePIC Geometry

- Acts searches in a volume and forms triplets, so it makes sense to choose a volume that
  - Minimizes occupancy
  - Minimizes duplicates
  - Includes both disks and barrel layers

- MAPS: 5 barrel layers (3 vertex layers and 2 sagitta layers), 5 hadron-endcap disks, 5 electron-endcap disks.
- MPGD: 1 MPGD Barrel layer in the “Bryce Canyon” tag, 1 MPGD Barrel layer and 1 MPGD DIRC layer in the “Arches” tag.
- AC-LGAD: 1 AC-LGAD barrel layer and 1 AC-LGAD hadron endcap disk



Tracking Strategy

- What strategy does the Juggler development use? How should we move forward with EICRecon?
- What are our goals for implementation? Longer term development strategies?
    - Clustering algorithms?
    - Iterative tracking?
    - Others?
- It would be useful to organize ourselves and delegate reconstruction tasks