Improving Tracking Algorithms in a Muon Collider Detector

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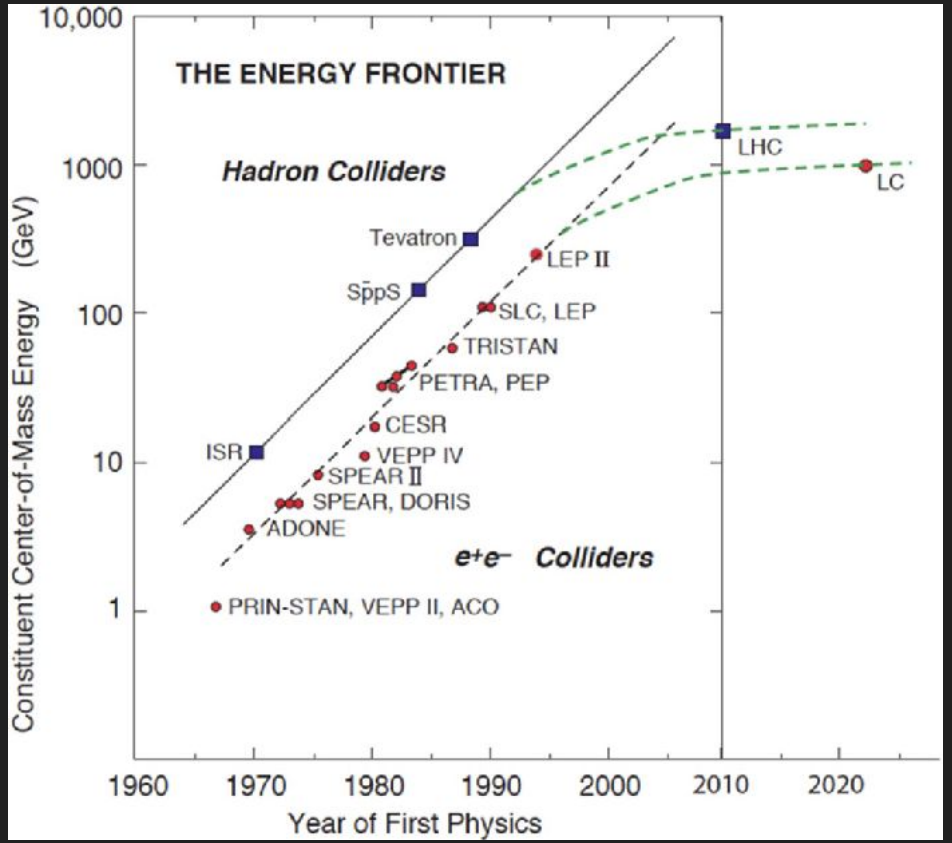
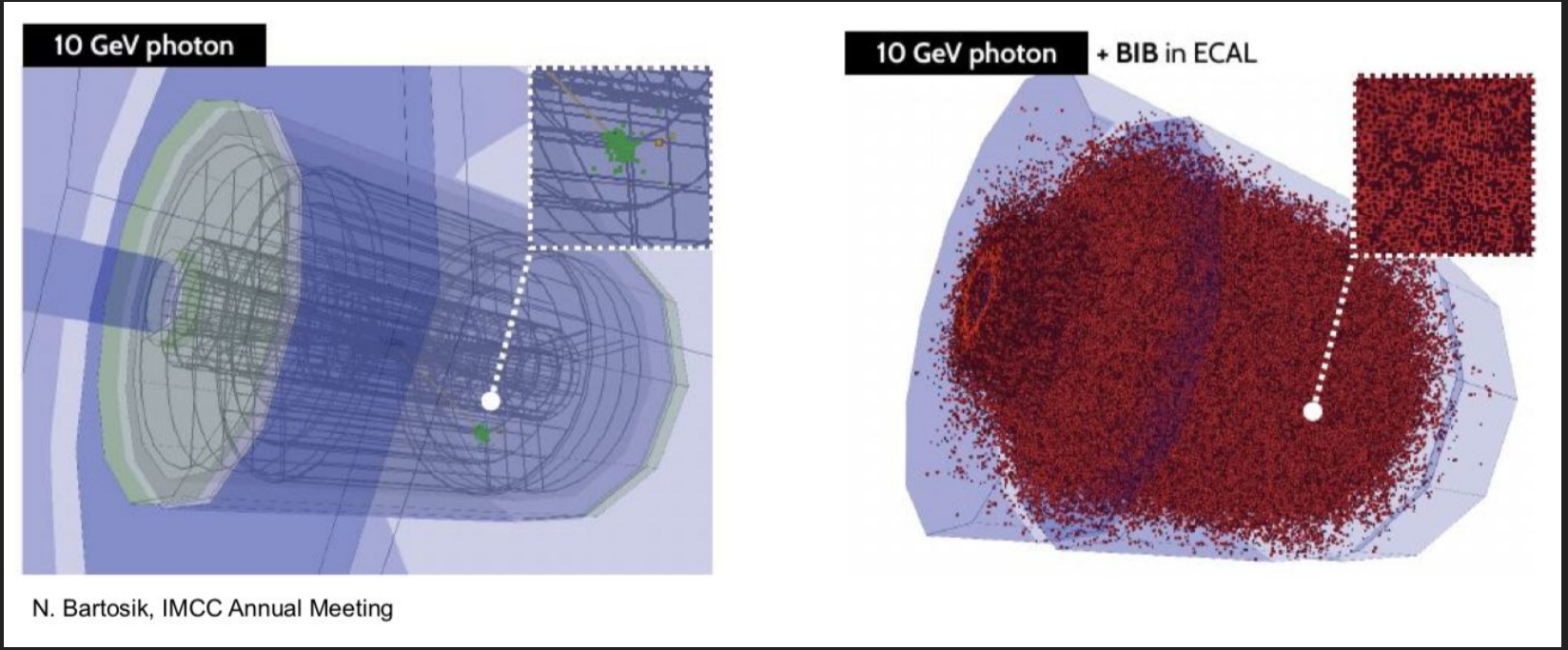
Motivation for a Muon Collider

- Muons lose less energy to radiation
- Overcomes historical divide between precision and energy frontier in HEP machines
- Best probe for new SM and BSM physics
- Compact and efficient design



Challenges accompanying detector

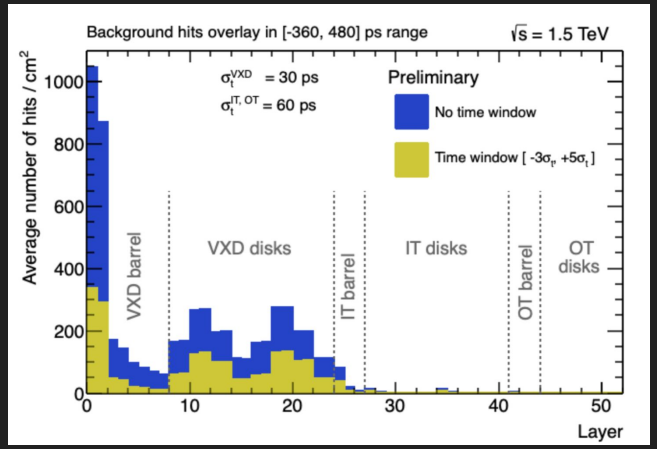
- Short lifetime leads to novel challenges with beam production and cooling
- Large Beam Induced Background poses difficulty to detector design

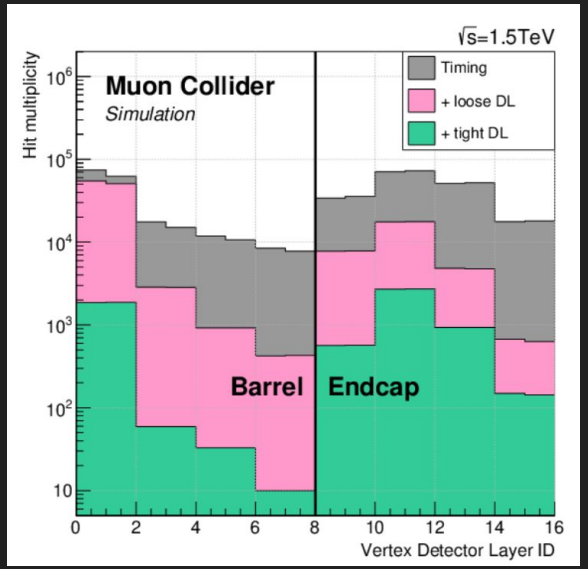


Tracking and Project Goals

- BIB has spatial + timing signature
- Multiple tracking algorithms
  - Conformal Tracking (slow)
  - Double Layer Filter (expensive)
  - Combinatorial Kalman Filtering (A Common Tracking Software)
  - Computational efficiency is critical

- Goal: optimizing ACTS
  - Find standard set of parameters to be shared with collaboration

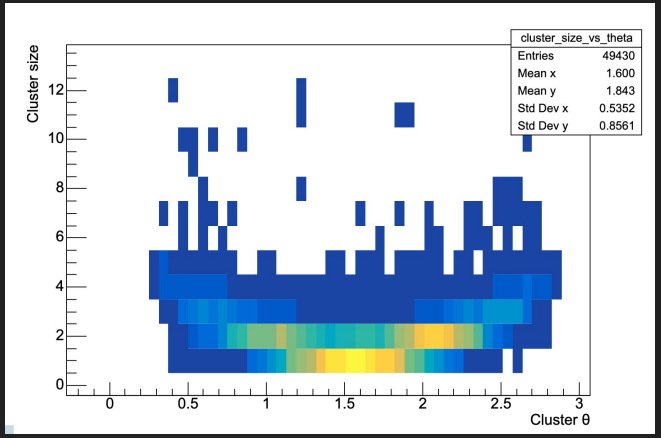


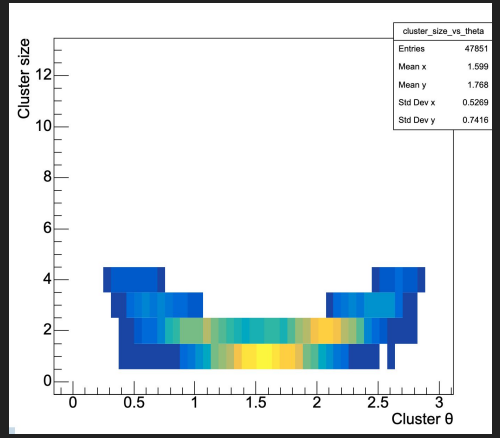


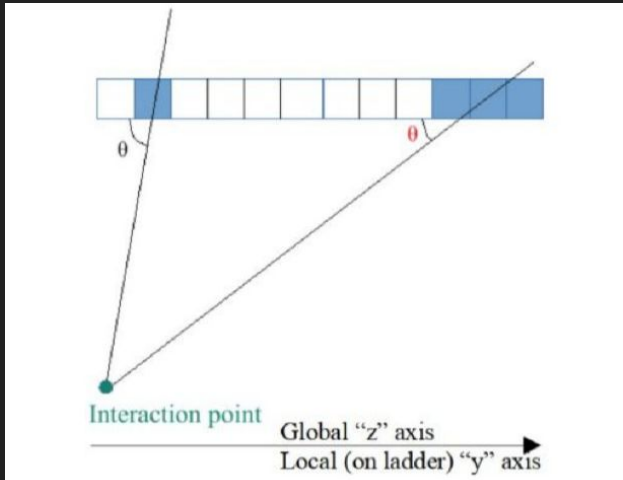
Initial work and next steps

- Working with cluster filter discriminator
  - Update hit multiplicity plot

- Evaluating track algorithm performance in 10 TeV design







Cut efficiency	Loose	Tight
Single-μ	99.3 %	99.1 %
Single-μ and BIB	37.4 %	30.7 %