Improvement of single π^- reconstruction with CGEM+ODC

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Assumptions in simulation

- **CGEM**
  - 100% cluster efficiency
  - Spatial resolution 130 μm in both X and V direction

Activities to improve soft π^- reconstruction

- New Least-Square global track fitting used (circle and helix fitting)
  - ✓ circle fitting rejects hits with large χ^2
  - ✓ helix fitting rejects outermost hits if χ^2 is large => favor track segment near IP => track parameters at IP
  - ✓ tag: DotsConnection-00-00-04

- Tuning HoughTransAlg for π^- with p_T=50 MeV/c
  - ✓ Circle search/reconstruction criteria loosen => keep efficiency high
  - ✓ V-hits association procedure modified
  - ✓ tag: HoughTransAlg-00-00-16

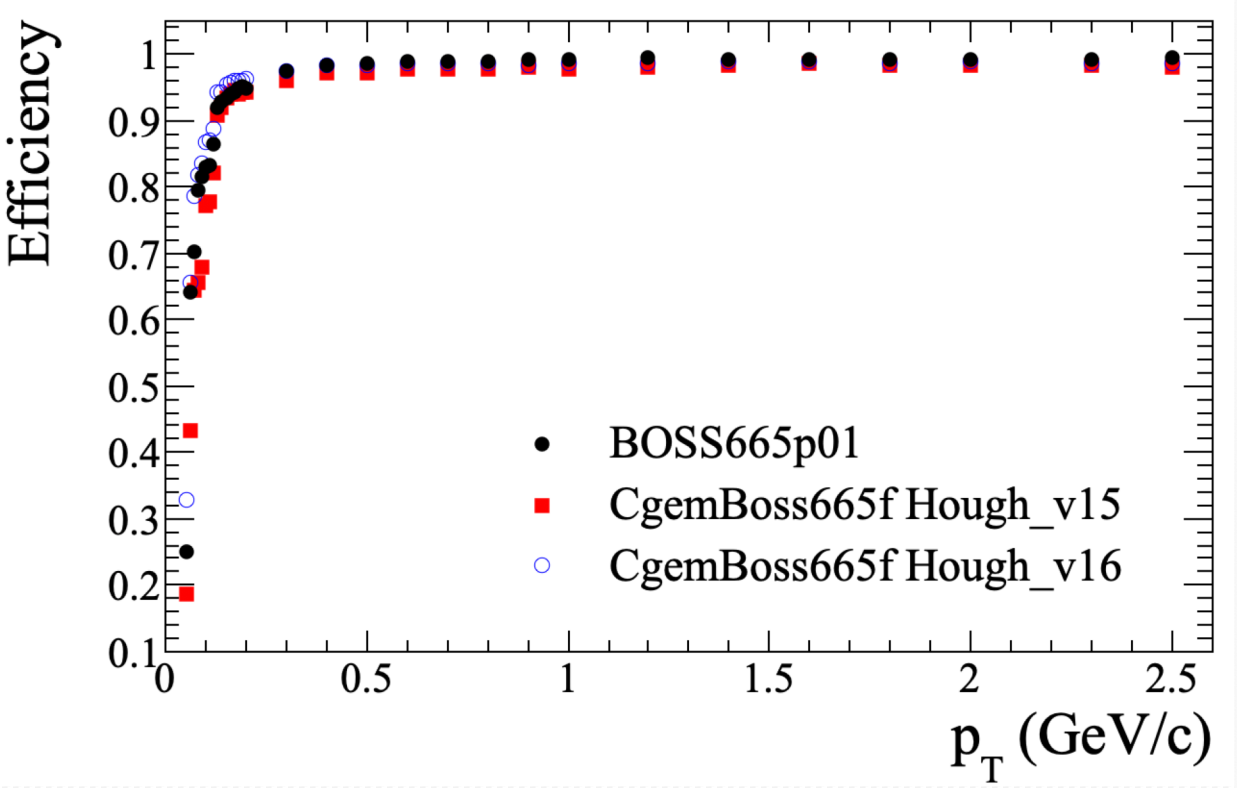
- **Recently**: fix a sign issue in an angle calculation (to be used in Kalman Filter)
  tag: HoughTransAlg-00-00-17

Good track and tracking efficiency

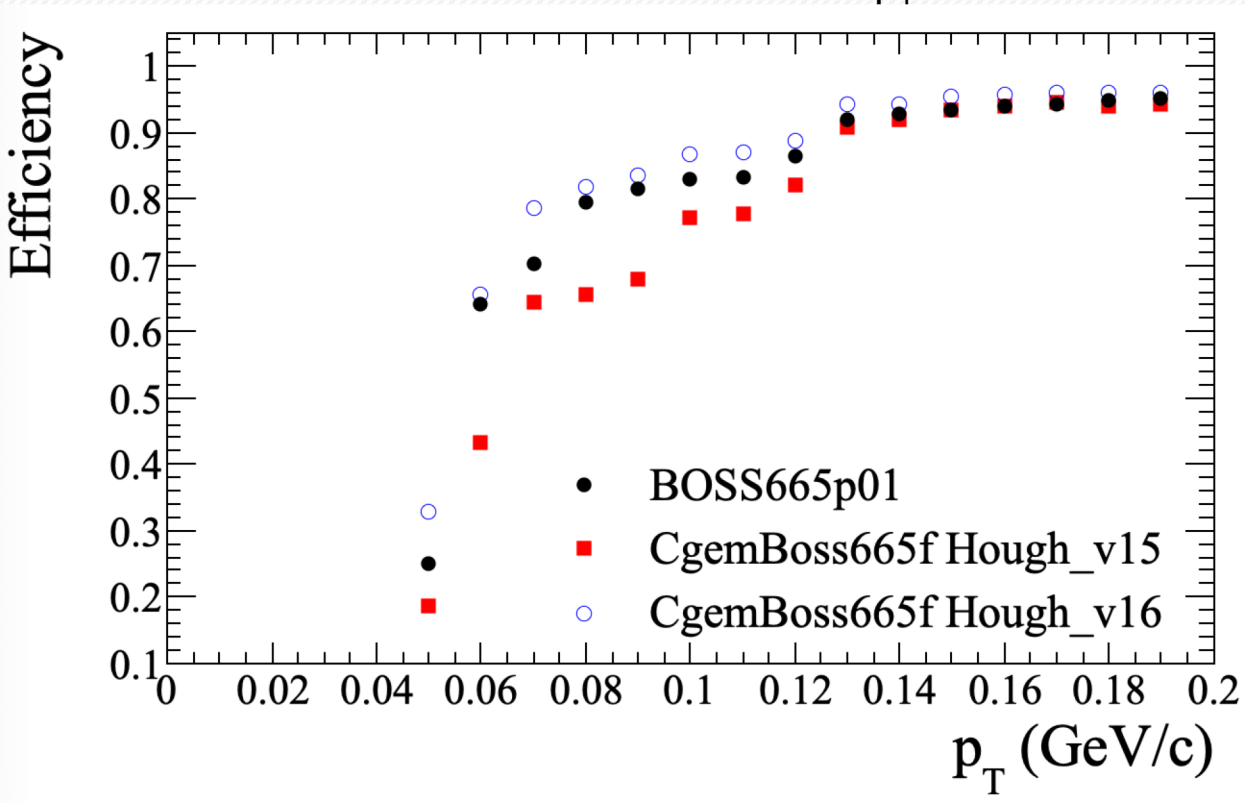
- Good track: $|dr|<1.0cm$, $|dz|<10cm$, $|\cos\theta|<0.93$, correct charge

- Tracking efficiency for single track events:
  $\varepsilon = N_{good}/N_{gen}$
  where N_{good} is the number of events with one or more good tracks reconstructed,
  N_{gen} is the number of events generated/simulated

Tracking efficiency for single π^-



Zoom in on low p_T

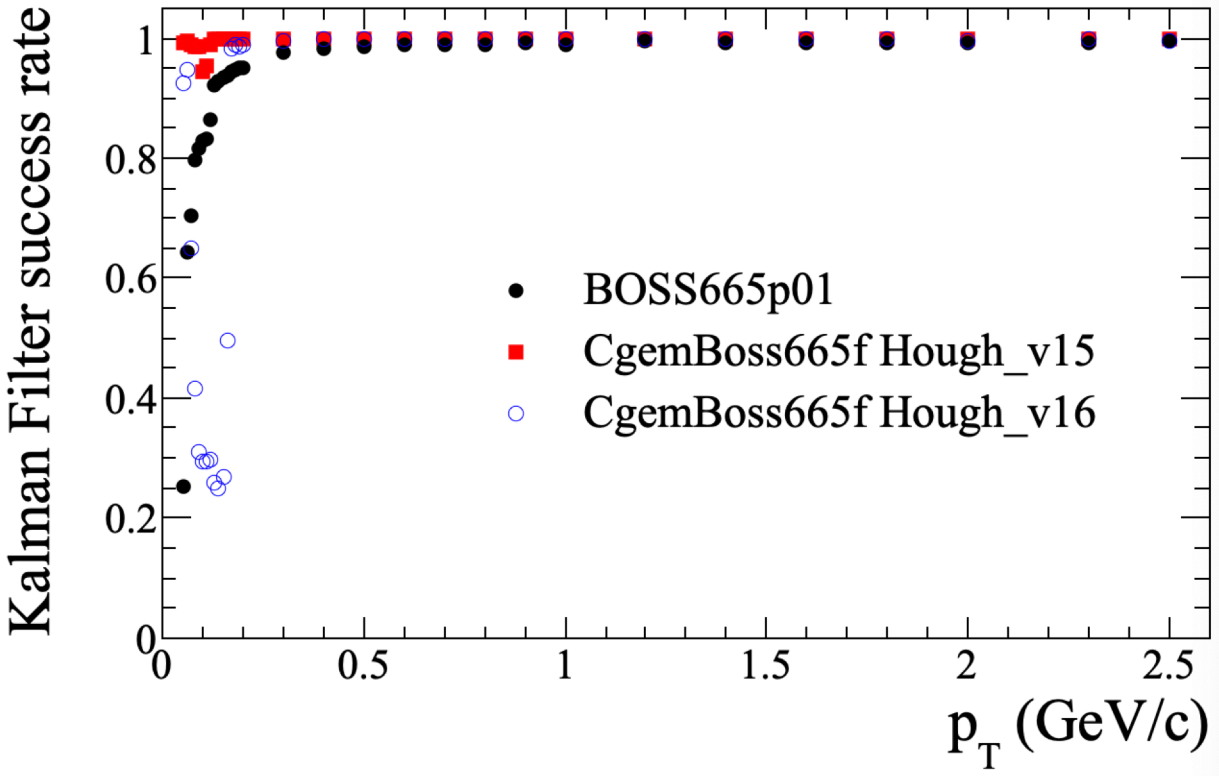


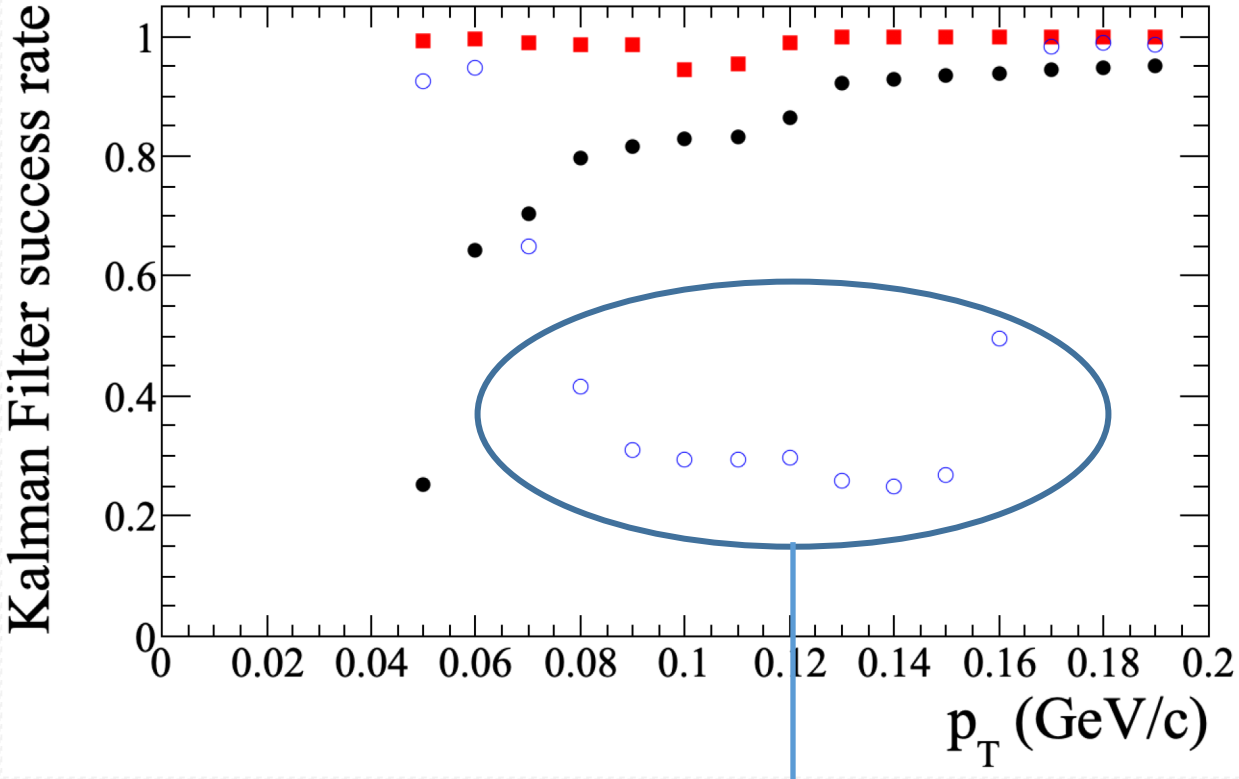
Improved significantly!

Hough_v17 gives the same result

Kalman filter success rate for good π^- track

Zoom in on low p_T



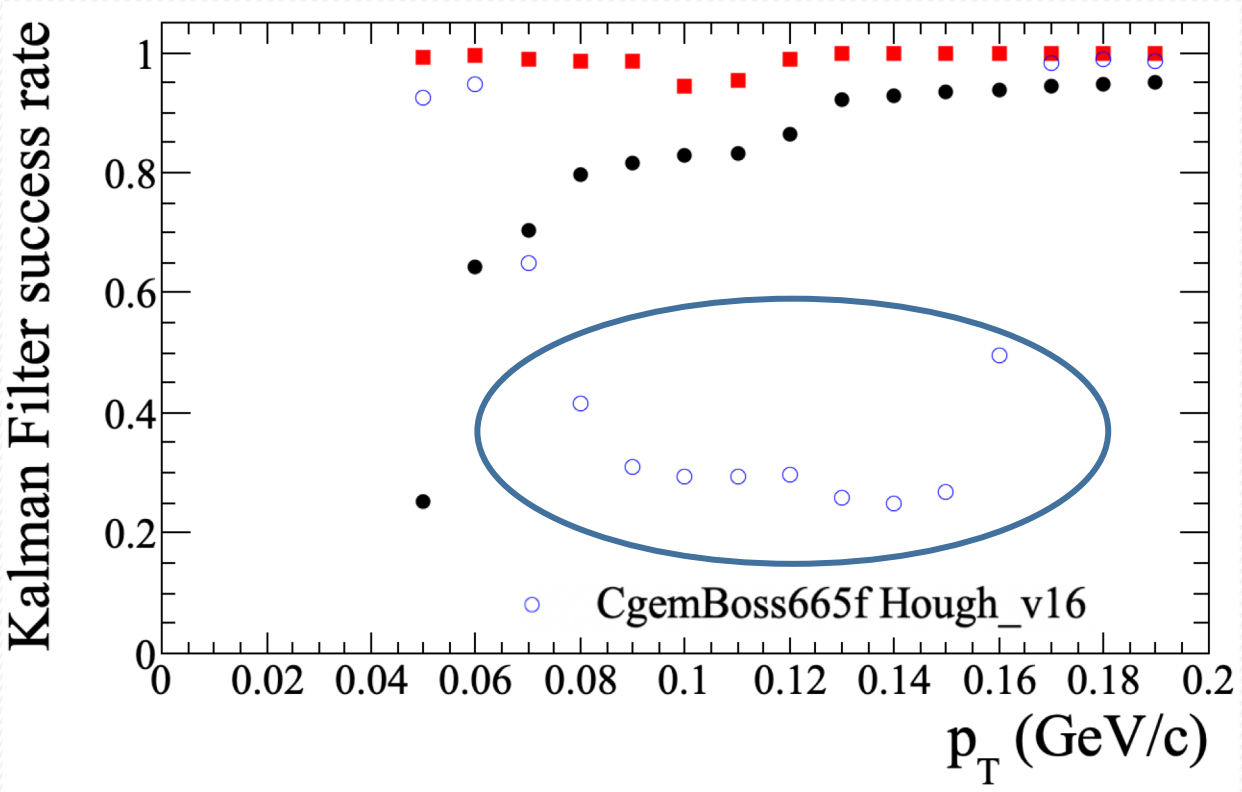


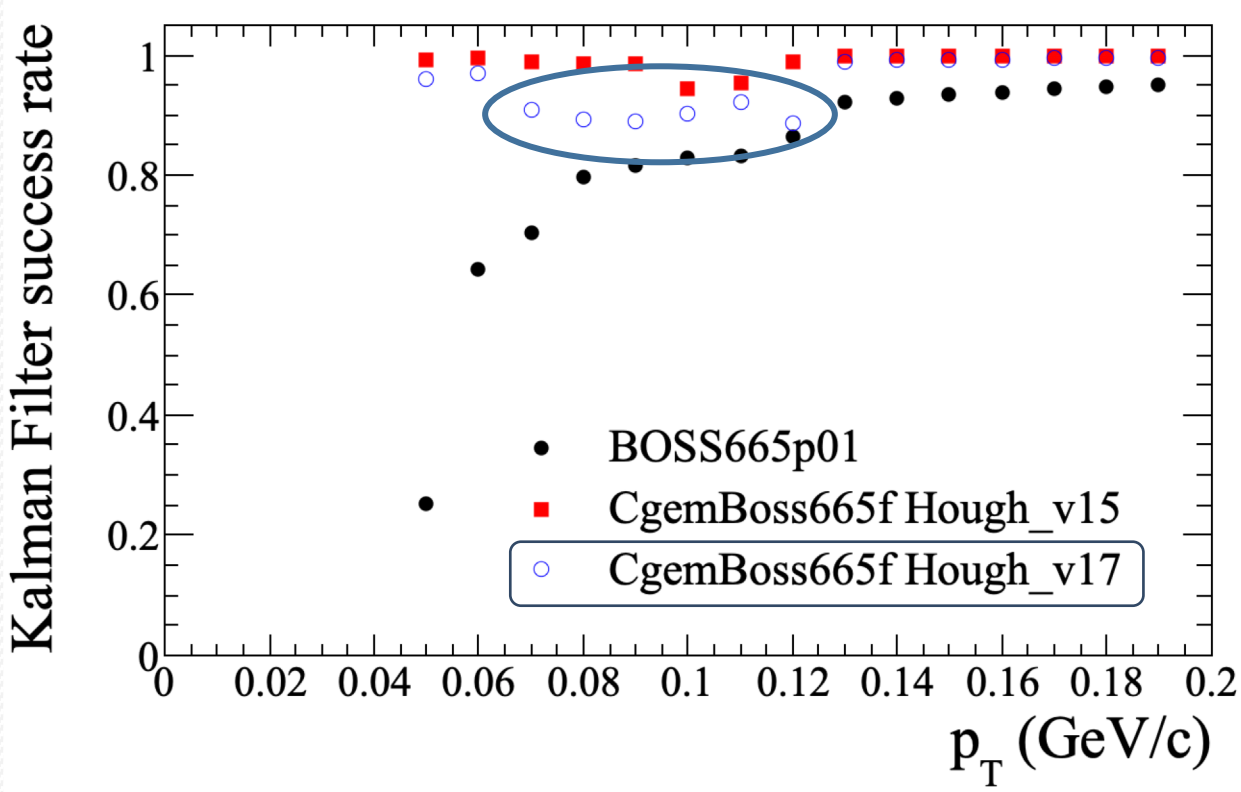
Success rate = $N_{success}/N_{good}$

Need to fix

Kalman filter success rate for good π^- track

Zoom in on low p_T





Success rate = $N_{success}/N_{good}$

Summary

- Global track finding with Hough transform (latest tag: HoughTransAlg-00-00-17)
  - ✓ procedure updated and new global Least-Square track fit used
  - ✓ procedure & cuts tuned for soft pions
- Efficiency of track finding for single pion with CGEM+ODC is good
- Success rate of Kalman Filter for single pion with CGEM+ODC is good generally with a sag between 70&120 MeV/c (likely due to multi-loops)

➢ Next steps:
  - ➢ Check resolutions for single pions
  - ➢ Check track reconstruction with single kaons
    => tune global track finding package