# Current status of the tracking software

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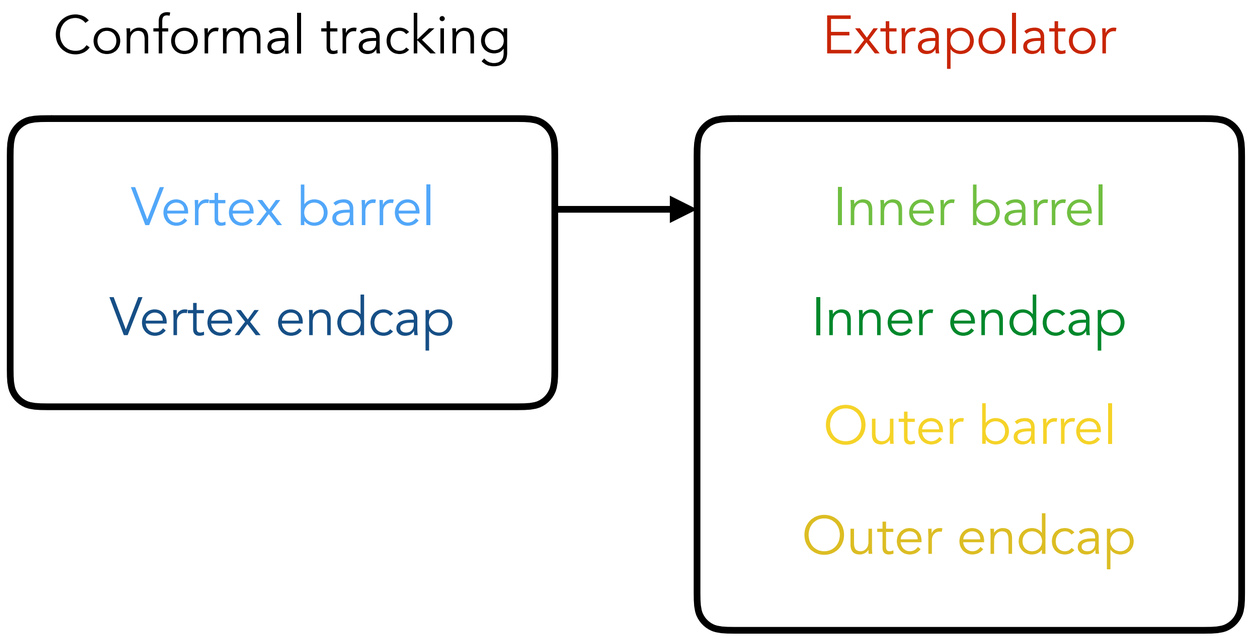
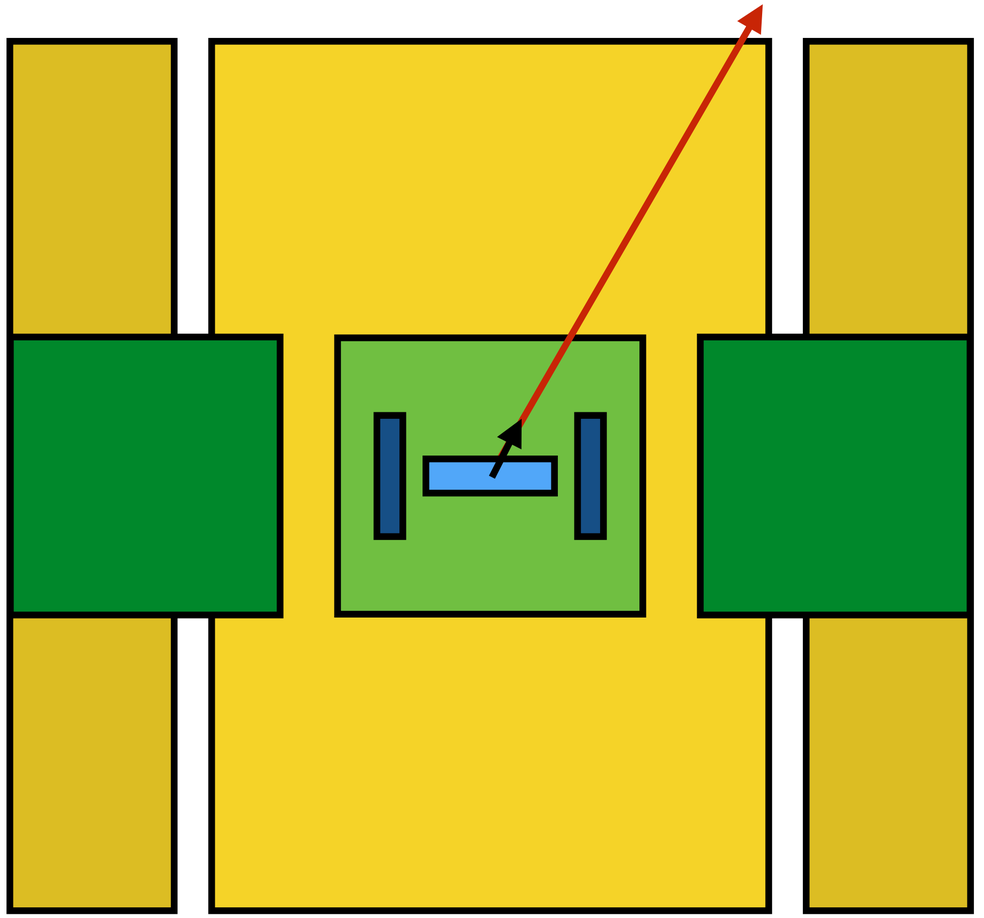
# Overview - current



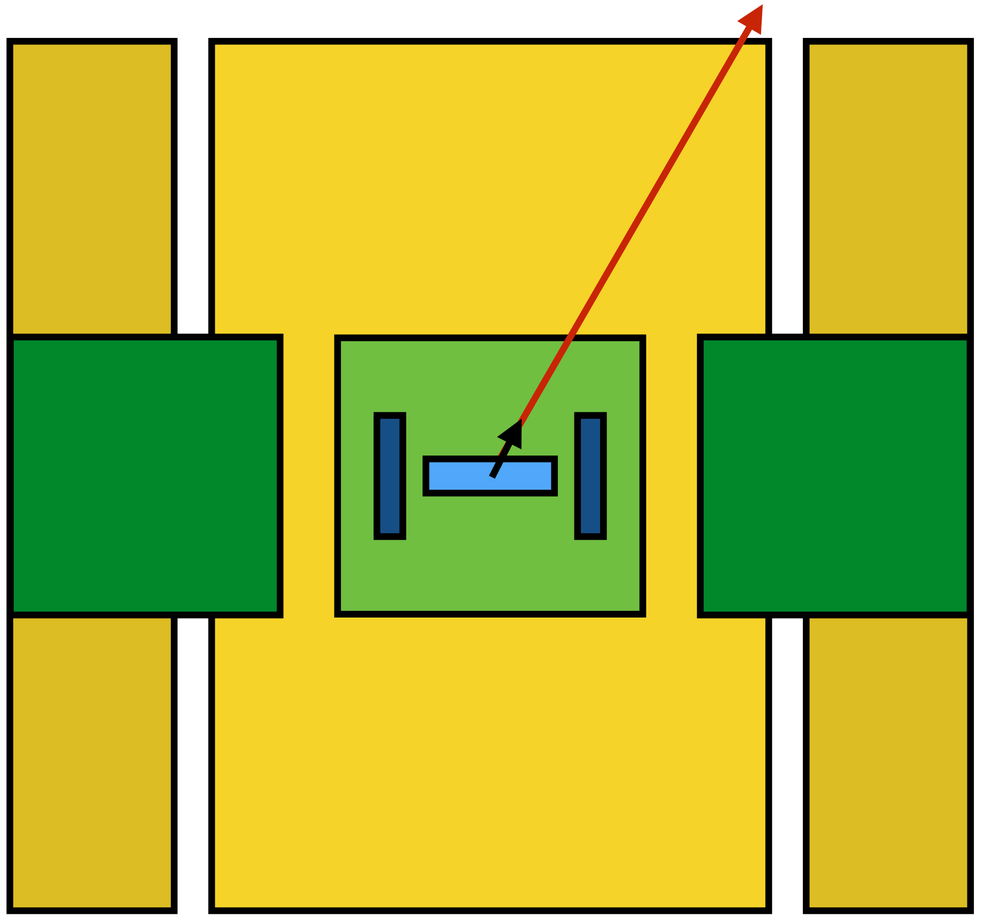



- Outstanding issue in current setup is reconstruction of **tracks from displaced vertices**
  - Could consider writing a standalone tracking to reconstruct these, or integrate track extension and continue conformally

# Overview - intention

Conformal tracking

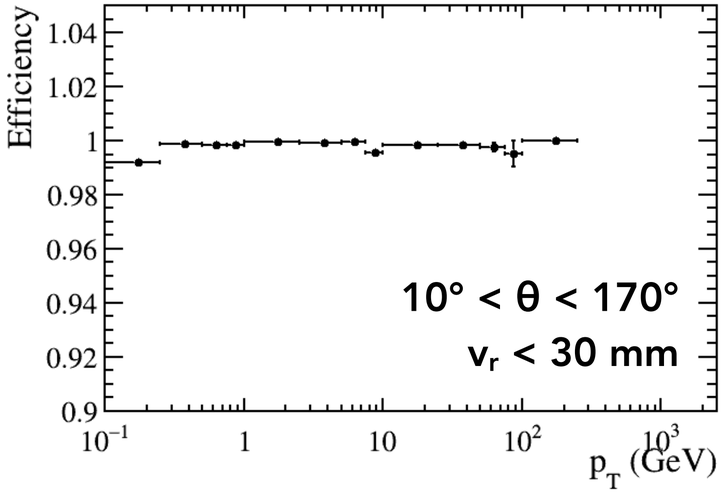
| | | |
|---|---|---|
| Build tracks | Vertex barrel | Standard cuts |
| Extend tracks | Vertex endcap | Standard cuts |
| Build tracks | Vertex B+E | Standard cuts |
| Build tracks | Vertex B+E | Looser cuts |
| Extend tracks | Tracker collections | Standard cuts |
| Extend tracks | Tracker collections | Looser cuts |
| Build tracks | All collections | Displaced cuts |

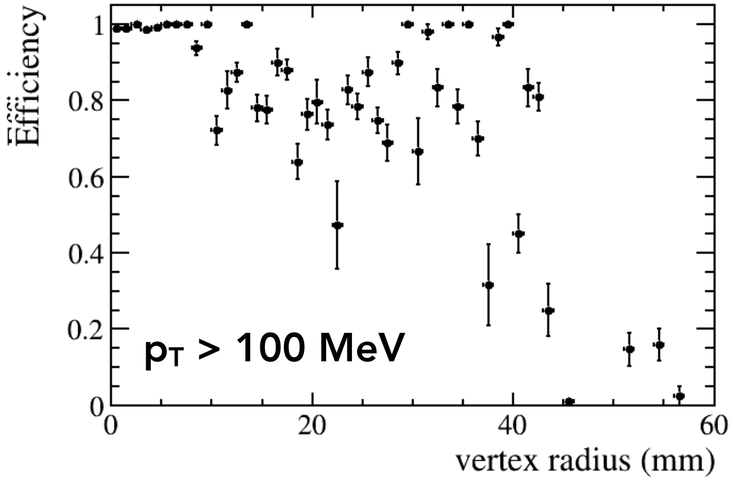


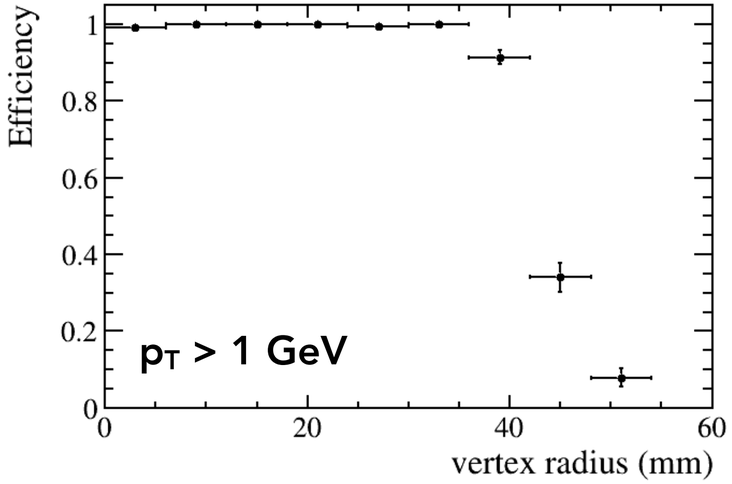
# Conformal tracking status

- 2000 events analysed, 500 GeV Z=>u,d,s
  - **Vertex detector** reconstruction only

- Very low momentum displaced tracks difficult to reconstruct at present



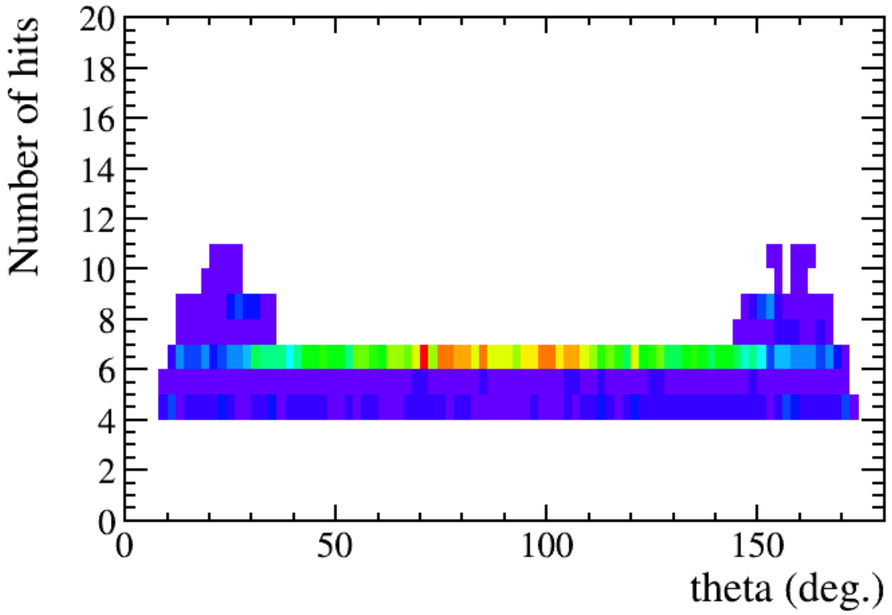



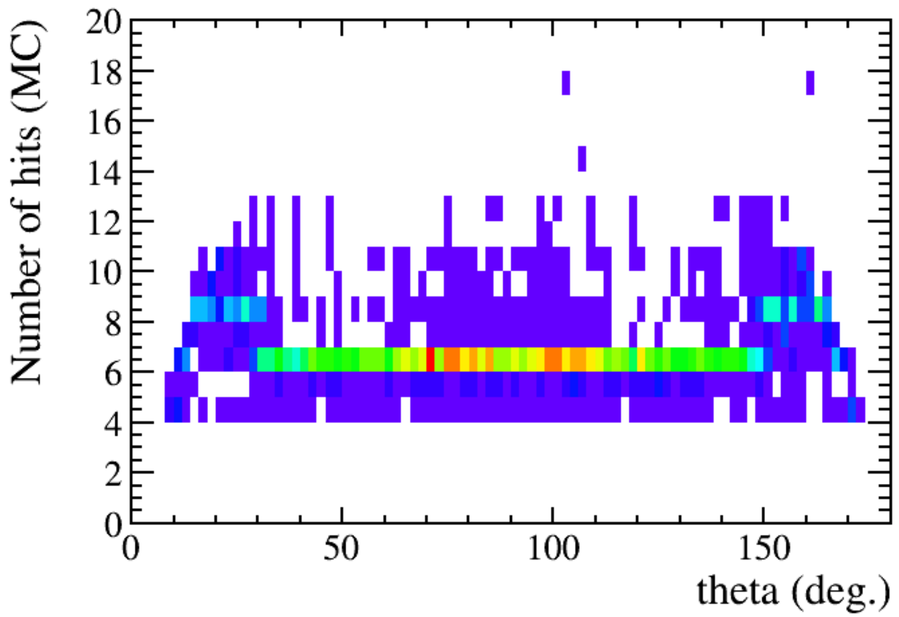



# Conformal tracking status

- 2000 events analysed, 500 GeV Z=>u,d,s
  - **Vertex detector** reconstruction only

- Reasonable number of hits picked up by conformal tracking, most tracks contain full number of hits

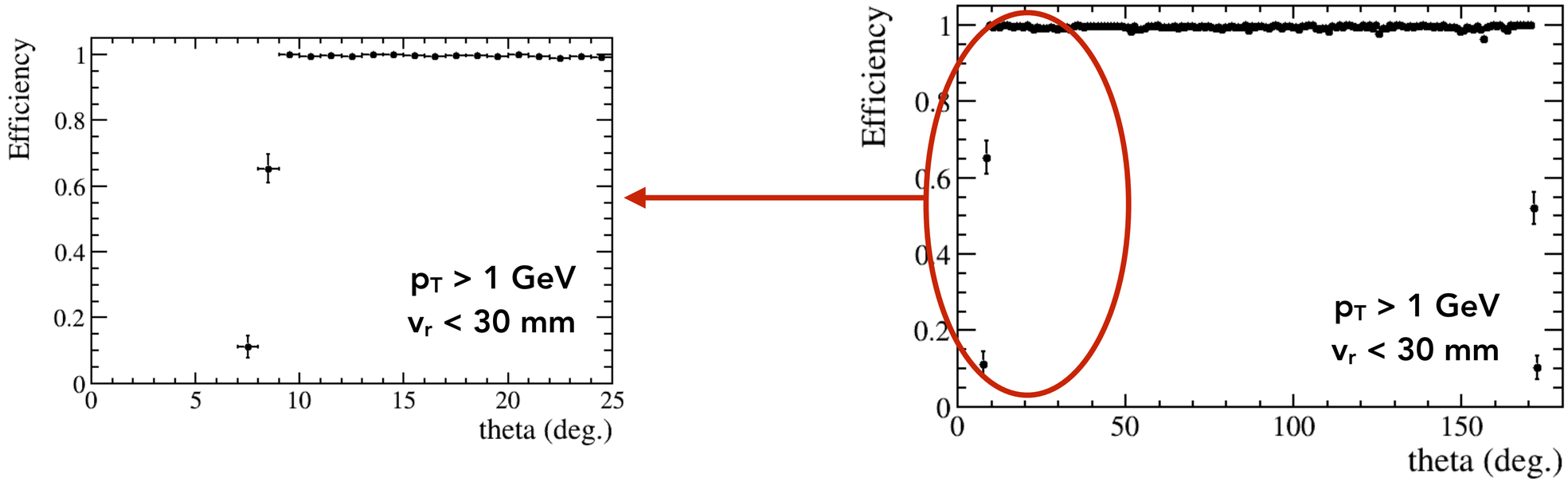


# Conformal tracking status

- 2000 events analysed, 500 GeV Z=>u,d,s
  - **Full detector**, seed tracks in the vertex detector and extrapolation through the trackers

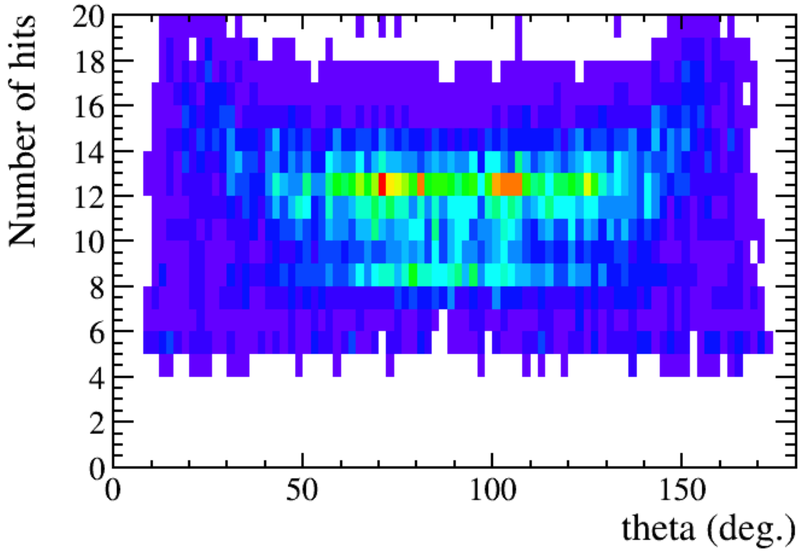
- Tracking seems to work well in the forward region

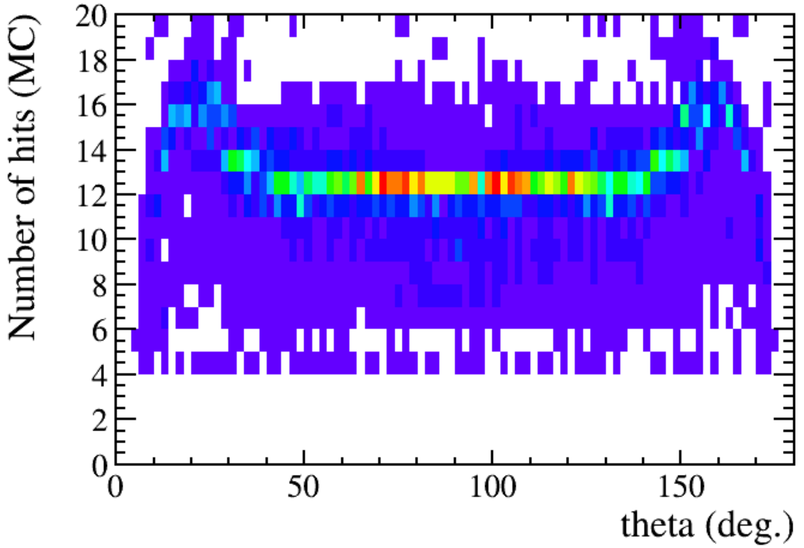


# Conformal tracking status

- 2000 events analysed, 500 GeV Z=>u,d,s
  - **Full detector**, seed tracks in the vertex detector and extrapolation through the trackers

- Main issue seems to be in accepting new hits with chi2 criteria - seem to lose putiry and not pick up “real” hits
  - Currently working on this, related to conformal track fit in ***sz***

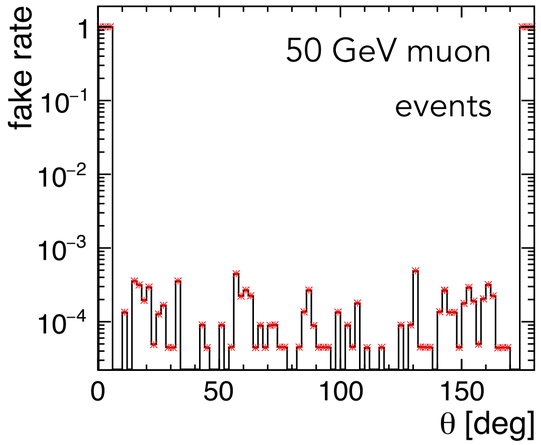


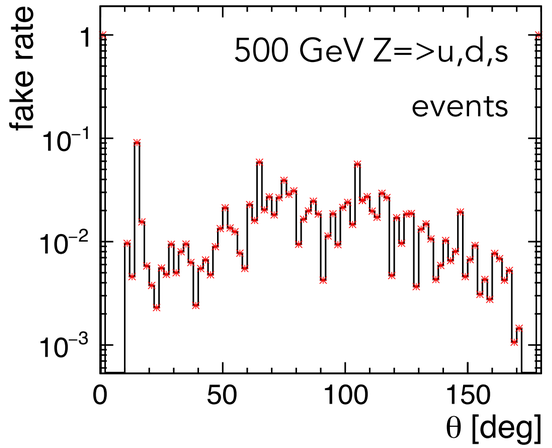



# Initial looks at ghost rate

- Results shown last time by Emilia had a non-zero ghost rate even for single muons
  - These are tracks where > 25% of hits are not associated to the muon
  - These impurities are due to secondary (mainly) electrons being produced and the electron hit being picked up
  - Track parameters still match the muon, in terms of $p_T$ etc.

- Initial results on 500 GeV Z=>u,d,s events shows reasonable rates, but were reconstructed with the previous version of the tracking, without improvements to either conformal or extrapolator (next slide…)

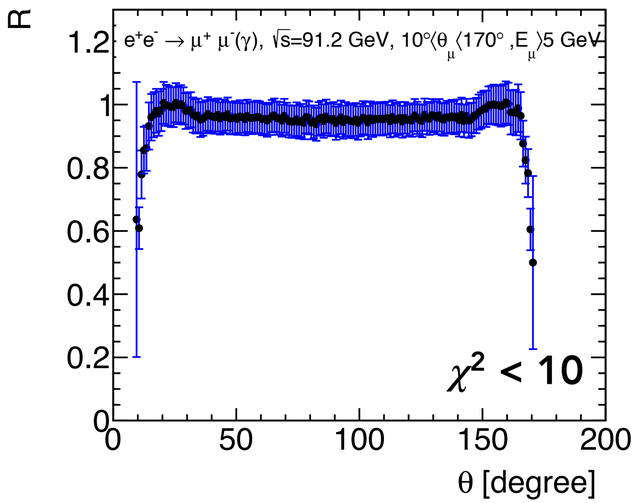


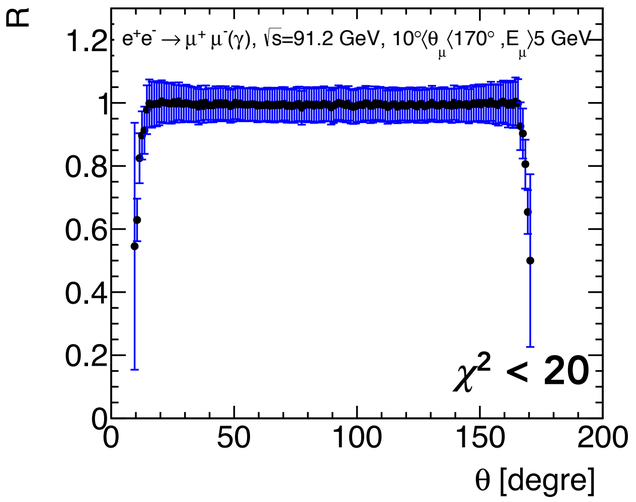



# Extrapolator

- Issue observed recently for extrapolator, where many hits were not being picked up for ~few % of tracks
  - Looking at tracks with more than 6 hits, efficiency in the central region dipped to ~96%

- Issue was initially non-reproducible (random seed problem fixed by André), but has finally been observed to be badly tuned $\chi^2$ value
  - Increased $\chi^2$ shows high efficiency again



# Ongoing work

- The code is now well-commented and structured "properly", already committed to repository (default still conformal tracking + extrapolator)
  - Can add several track strategies => once fixed should cover the full detector

- Biggest task just now is adding tracker hits to tracks inside the conformal tracking code
  - For some reason tracks with $p_T$ < 1-10 GeV/c are very pure, tracks with $p_T$ > 10 GeV/c tend to have "bad" hits
  - SZ helix fit suspected at the moment, debugging ongoing

- After this we will finally be able to tackle the displaced tracks!

- Performance plots following very tightly the reconstruction development