

Track matching studies in the forward region

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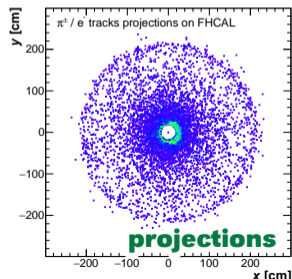
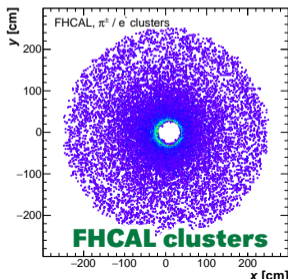
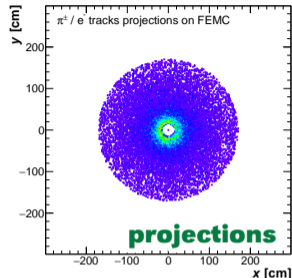
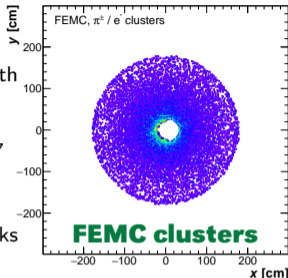
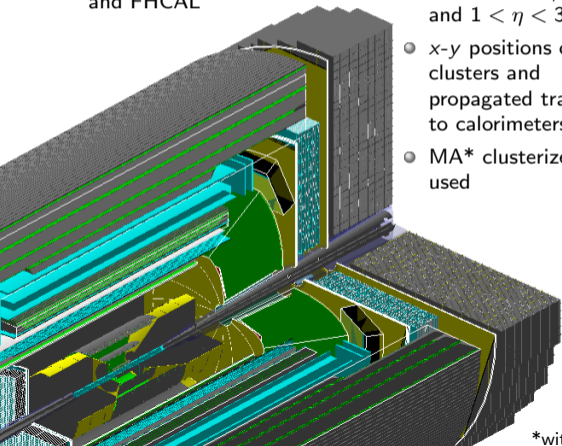


Setup for Track Matching Studies

Tracking via:

- LBLVTX AllSilicon detector
- TTL layers in front of FEMC and FHCAL

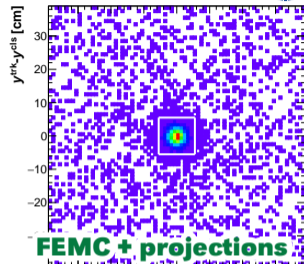
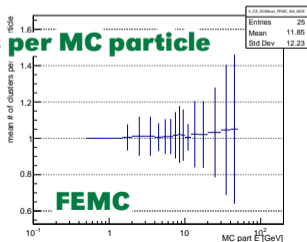
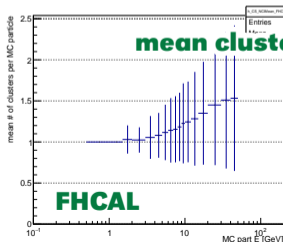
- Studies done with e^\pm and π^\pm
→ 1–60 GeV/c and $1 < \eta < 3.7$
- x-y positions of clusters and propagated tracks to calorimeters
- MA* clusterizer used



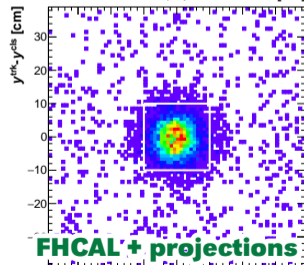
*with new fix for diagonal tower aggregation

Matching windows FEMC and FHCAL

- Matching in x - y plane for forward/backward calos
- Track projections on FEMC/FHCAL used
→ to middle of detector in z
- Matching window set as cell width (white line in plots)
→ ~ 10 cm for FHCAL
→ ~ 5.5 cm for FEMC
- General remark: Single pion produces on average 1.1–1.5 clusters in FHCAL dep. on E
→ matching with tracks only works on leading cluster
→ maybe use TTL hits and TTL PID for matching of secondary clusters?



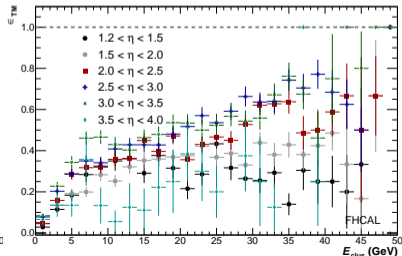
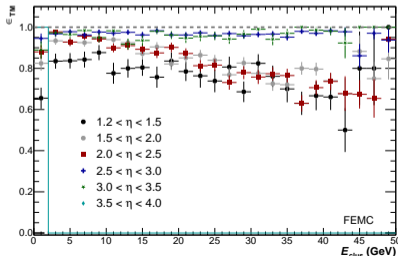
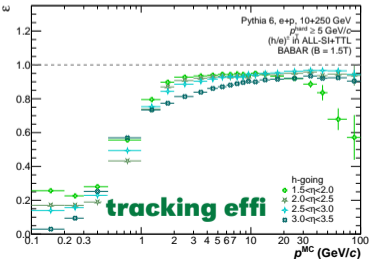
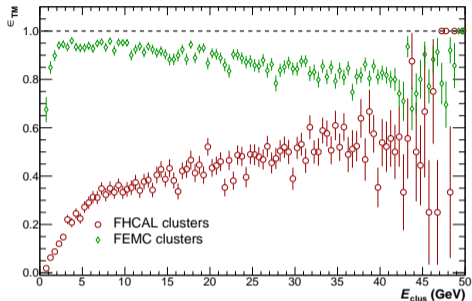
FEMC, π^\pm / e clusters and projections $x^{\text{trk}}-x^{\text{cls}}$ [cm]



FHCAL, π^\pm / e clusters and projections $x^{\text{trk}}-x^{\text{cls}}$ [cm]

Matching performance

- Track matching efficiency for all clusters:
 - more than 80% for FEMC
 - below 70% for FHCAL
- FHCAL matching difficult due to scattering/preshower in FEMC
- Significant pseudorapidity dependence with worst matching for $\eta < 2.5$ (towards larger x and y)
 - agrees with tracking efficiencies, see [link] for more information



Summary and next Steps

- Track matching not perfect for both calorimeters
 - high E matching degrades for FEMC
 - FHCAL matching not sufficient (maybe additional matching with TTL_2 layer hits?)
- Need to determine optimal strategy for matching procedure
 - requires a more studies including non-trackable particles (e.g. γ or neutrons) to determine fake matches
 - also include TTL PID information for matching
- FEMC-FHCAL cluster matching for particle flow needed (studies are work in progress, but are quite challenging)