Update to MC production and tracking in hadronic showers

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CALICE Analysis Phone Meeting
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Update to Monte Carlo production: Requests

Recent MC request

- Philippe (already mentioned last time): Fnal08 e^-, π^- for 2,4,6,8,10 GeV
- Marina: Cern07 50k evts QGSP_BERT, LHEP for $\pi^\pm, p$, 80 GeV
- Nils: certain runs from Fnal08/09, multi physics list, 2,4,6,8,10 GeV
- Katja/Lars: Cern07, multi physics lists, 10-80 GeV
- Philipp: Fnal 09 100k QGSP_BERT e^-, π^-

Update to Monte Carlo production: ToDo

Still some issues

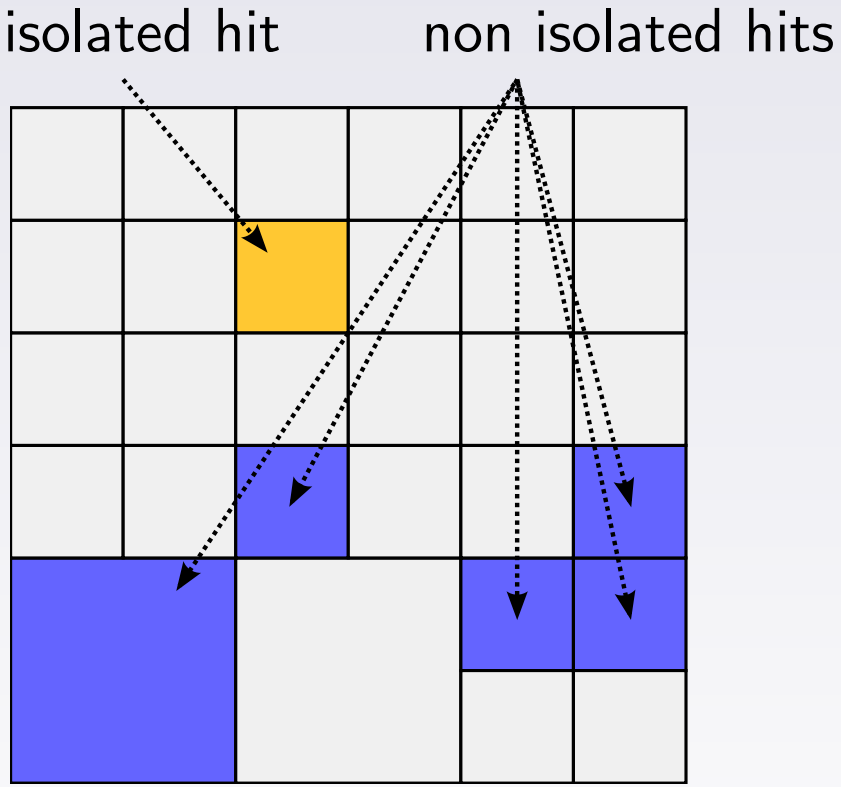
- calice software v02-00 didn't contain processors needed by calice_run
- scripts are still NAF based
- documentation twiki only (and not up to date, sorry)
- In contact with Jan Engels to have a look at ILD Mass Production System

Tracking in hadronic showers

Searching for MIP tracks: "Follow-Your-Nose"

Algorithm

1. Find all isolated hits / layer (to reject cells hit by more than 1 particle)



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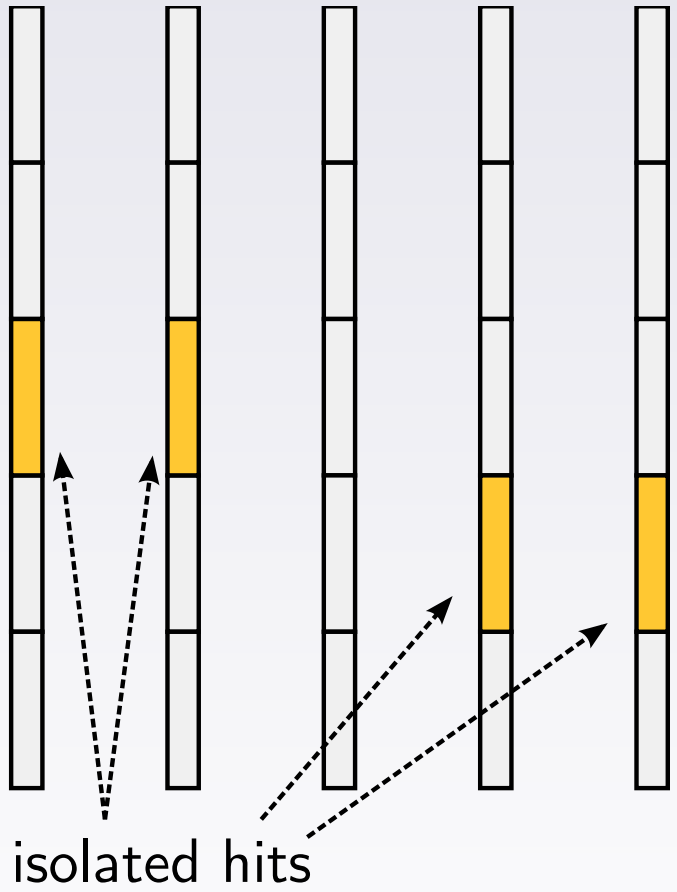

Searching for MIP tracks: "Follow-Your-Nose"

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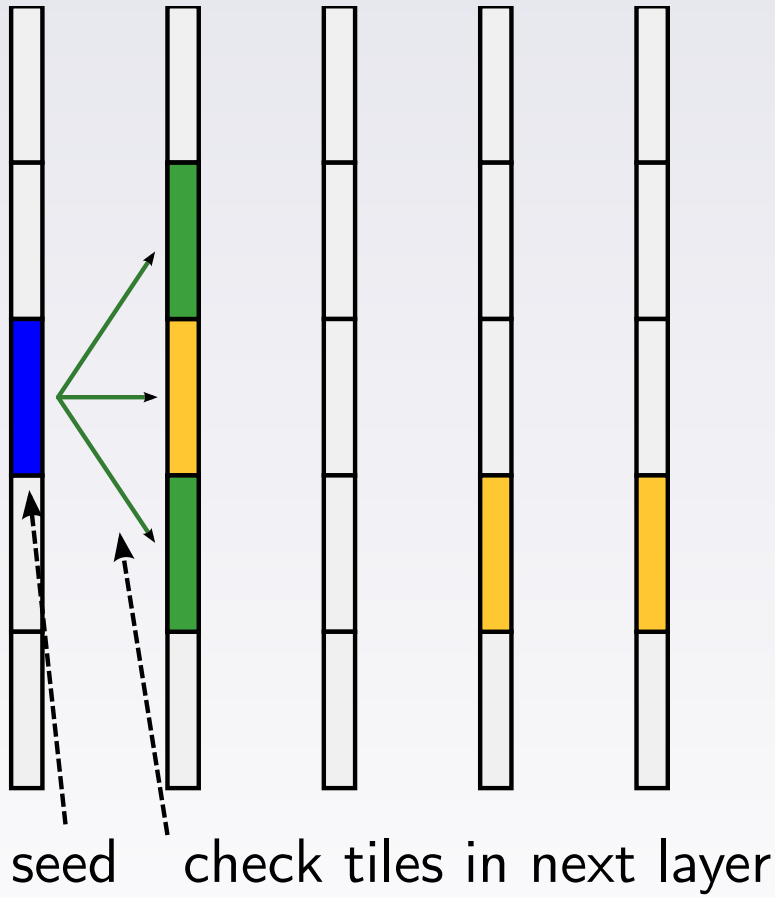
1. Find all isolated hits / layer (to reject cells hit by more than 1 particle)
2. Search for track continuation in subsequent layer



Searching for MIP tracks: "Follow-Your-Nose"

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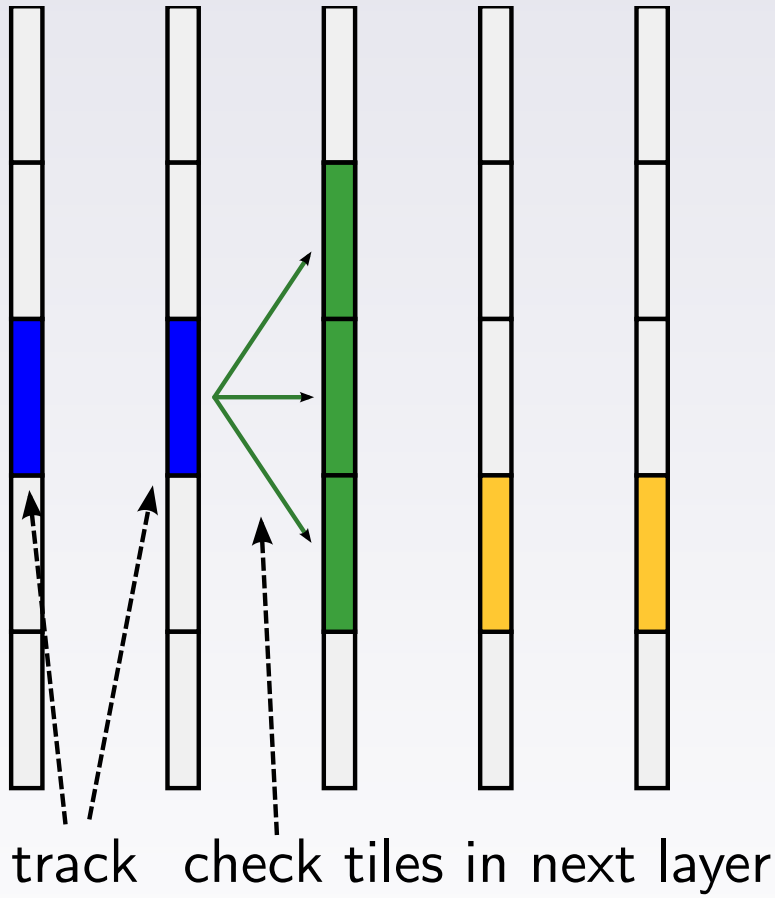
3. Gaps will be jumped over



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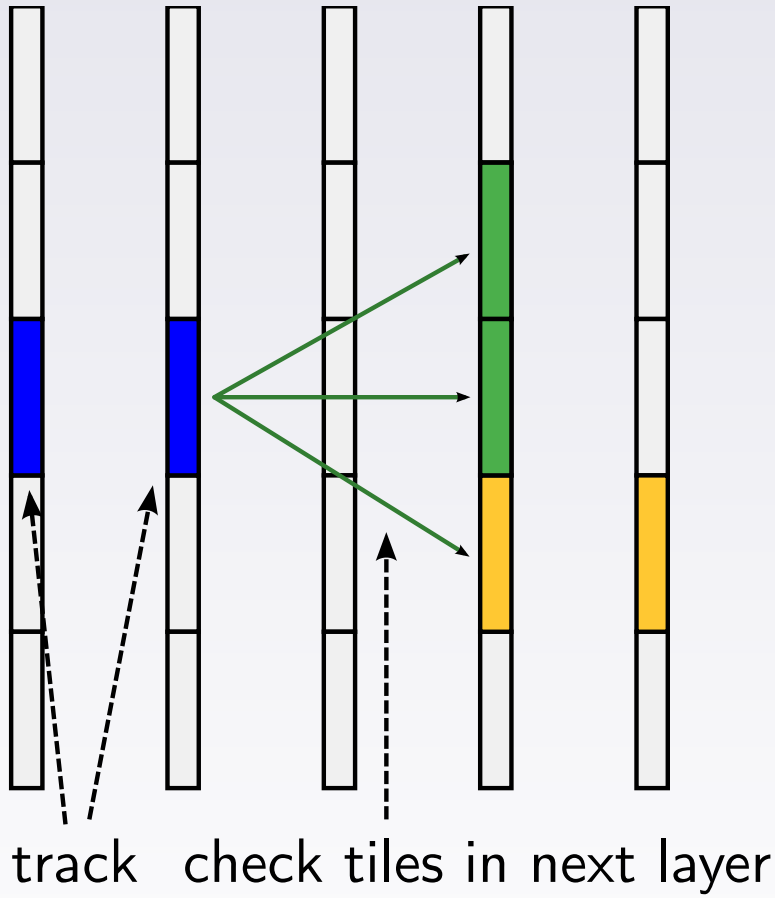

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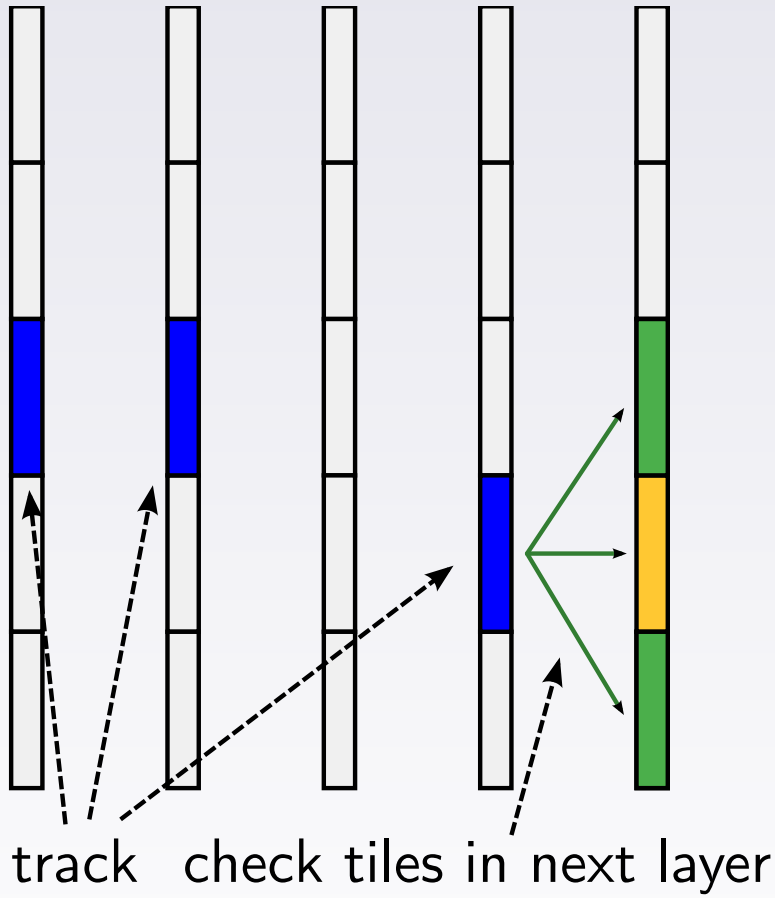
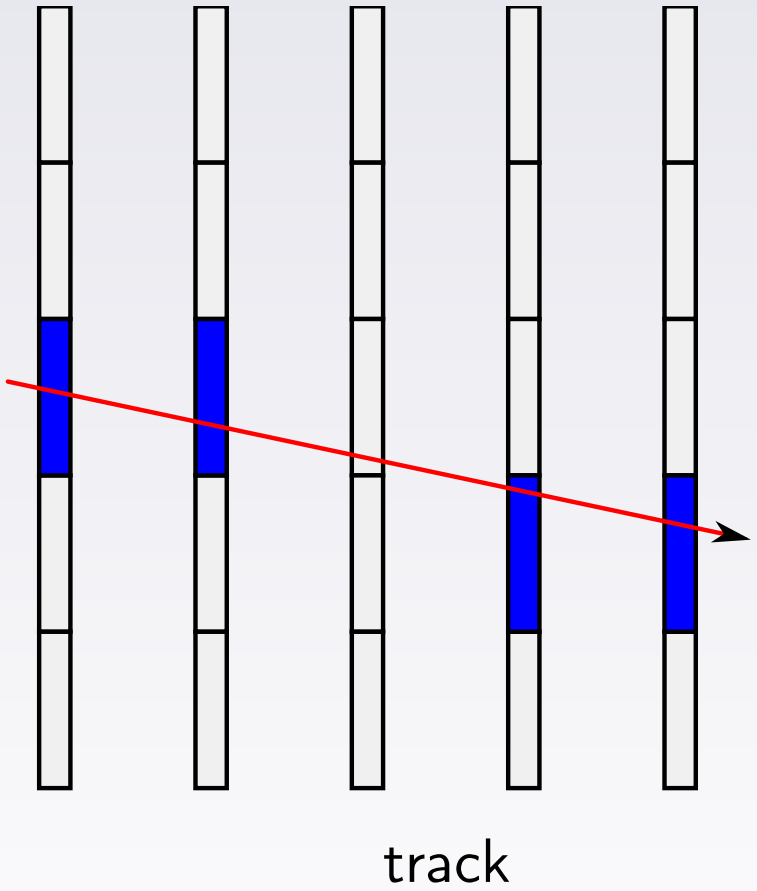


Searching for MIP tracks: "Follow-Your-Nose"

Algorithm

1. Find all isolated hits / layer (to reject cells hit by more than 1 particle)
2. Search for track continuation in subsequent layer
3. Gaps will be jumped over
4. Redo until no continuation hit can be found
   $\Rightarrow$Finished track



Track parameters as MC-comparison observables

track parameters

- length
- multiplicity
- angle
- ratio of gaps per tracklength (gap percentage)

Comparison

- π^- from Cern 2007
- Mean energy for 10-80 GeV
- Complete histogram for 25 GeV

CAN in preperation
plots for LCWS10 $\Rightarrow$ Feedback welcome

Monte Carlo generation

Simulation

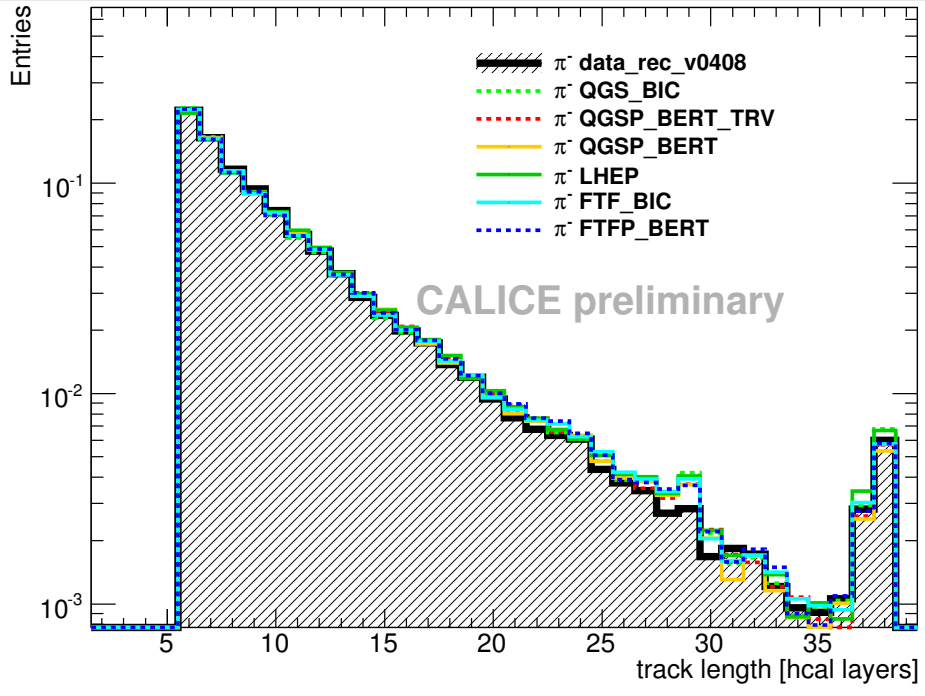
- Data was reconstructed with reco v0408
- Mokka v07-02 with Geant4.9.3
- CALICE v02-00 based with added SimTrigger Processor (⇒ David Ward)

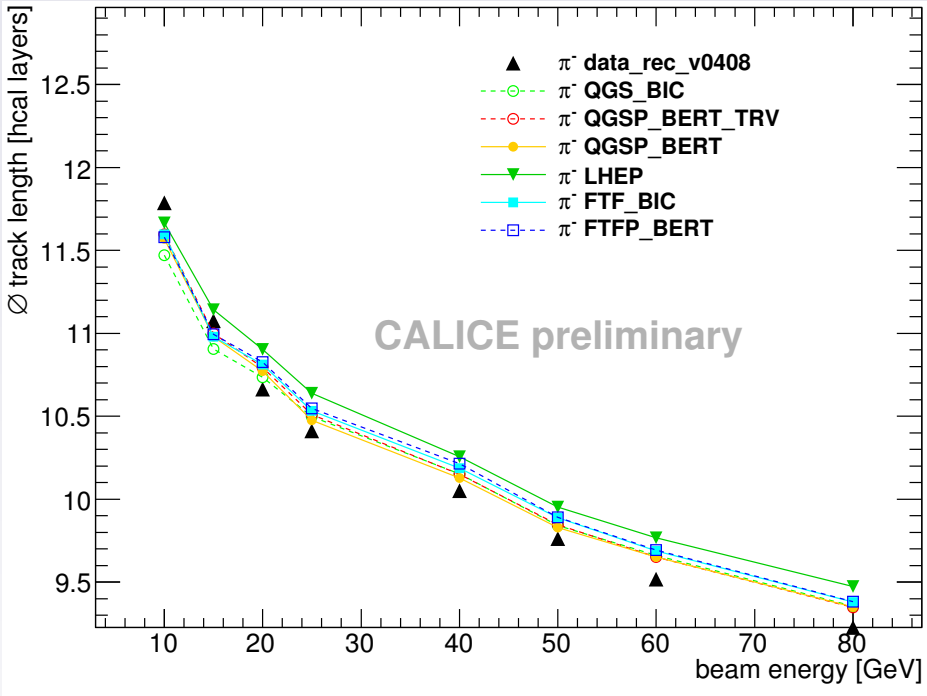
Physics lists

- LHEP
- FTF_BIC
- FTFP_BERT
- QGSP_BERT
- QGSP_BERT_TRV
- QGS_BIC

QGSP_FTFP_BERT was ≈ identical to LHEP
⇒ removed from plots

Monte Carlo - Data comparison: track length

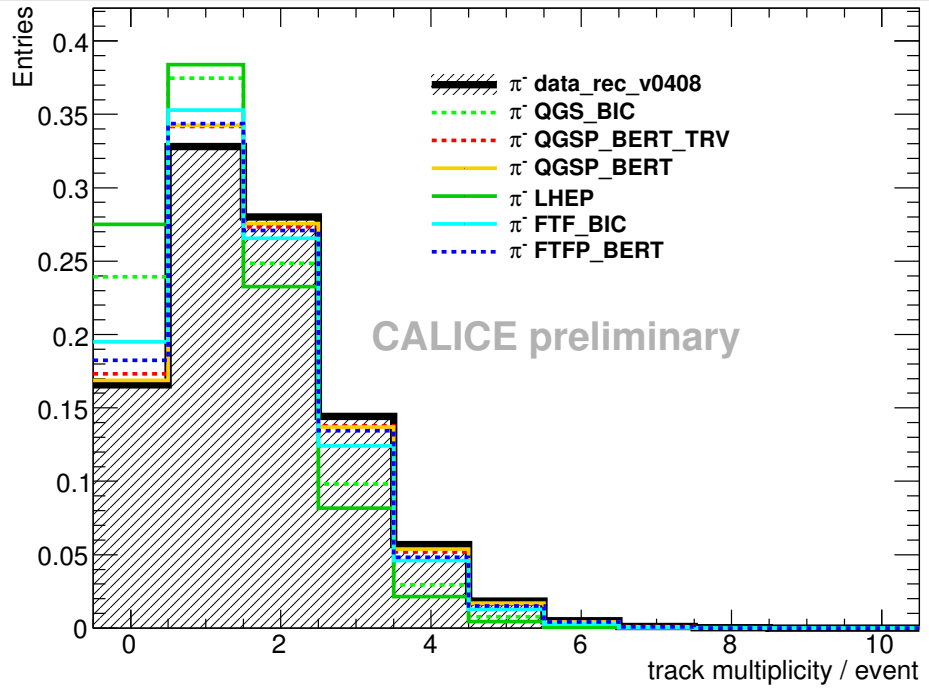


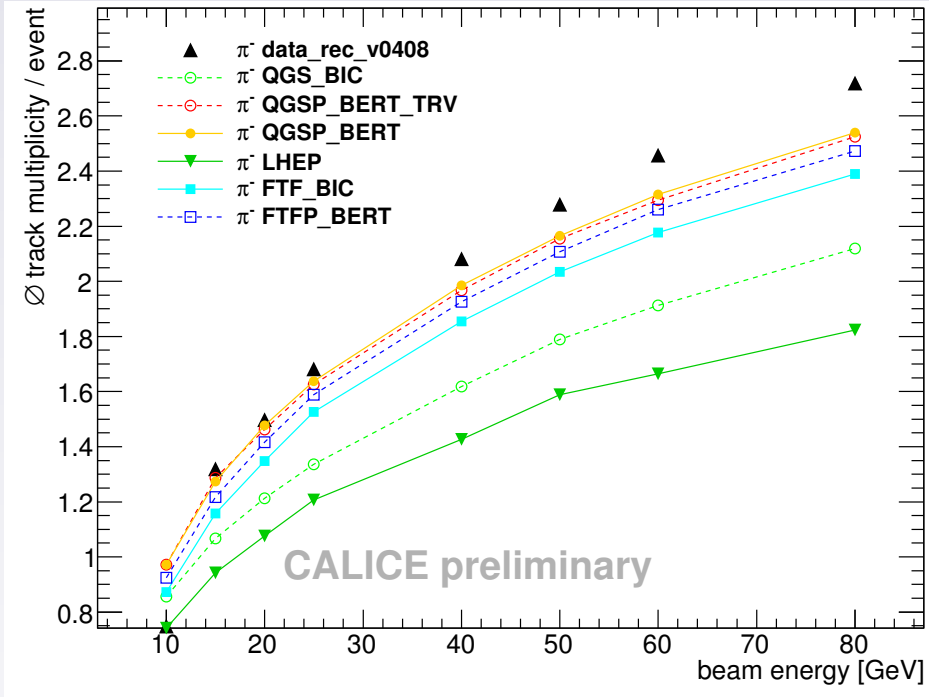


conclusion

- all very close together
- all too long
- LHEP furthest away

Monte Carlo - Data comparison: track multiplicity

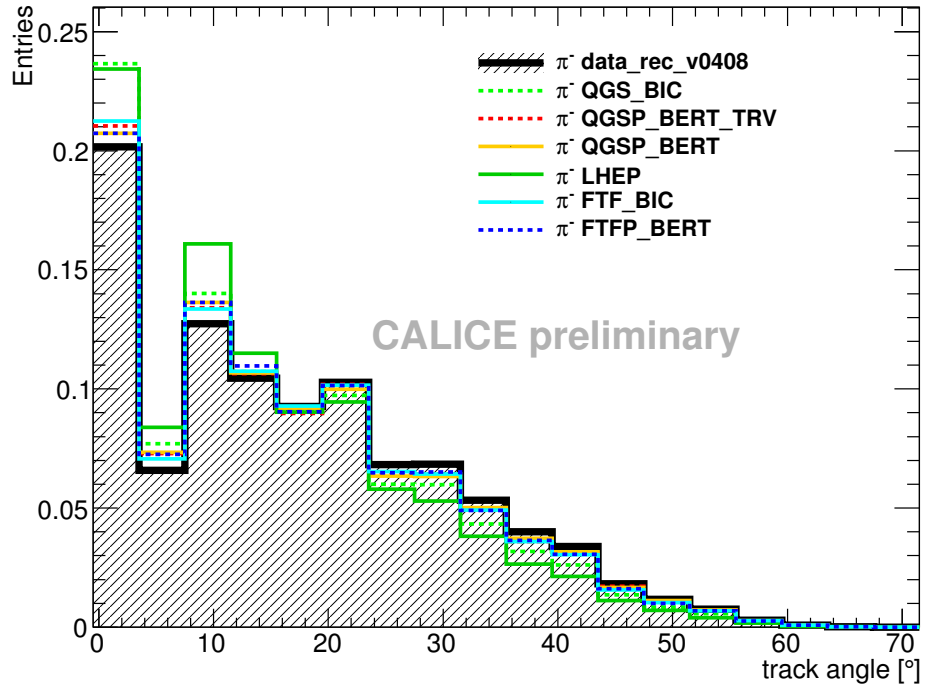


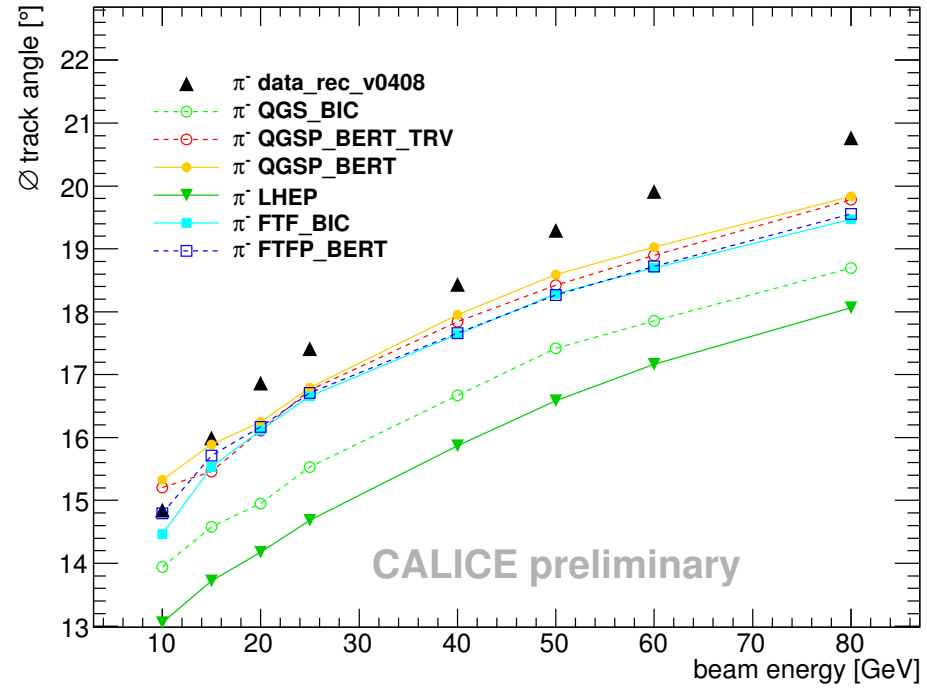


conclusion

- all provide too few tracks
- grouping: QGSP_BERT(_TRV), FTF_BIC, FTFP_BERT close together
- LHEP and QGS_BIC far away from data

Monte Carlo - Data comparison: track angle

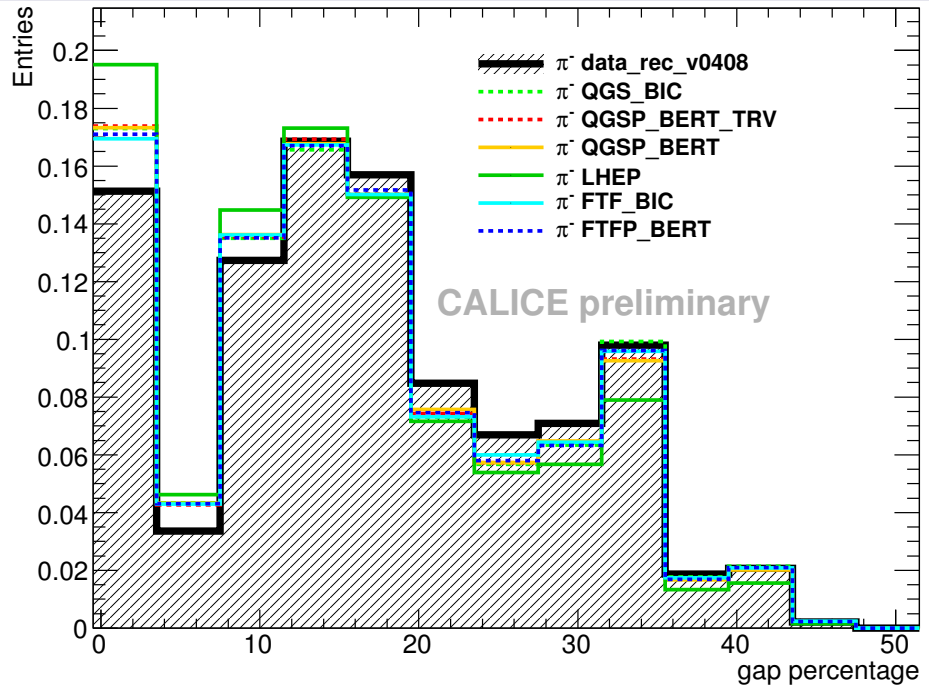


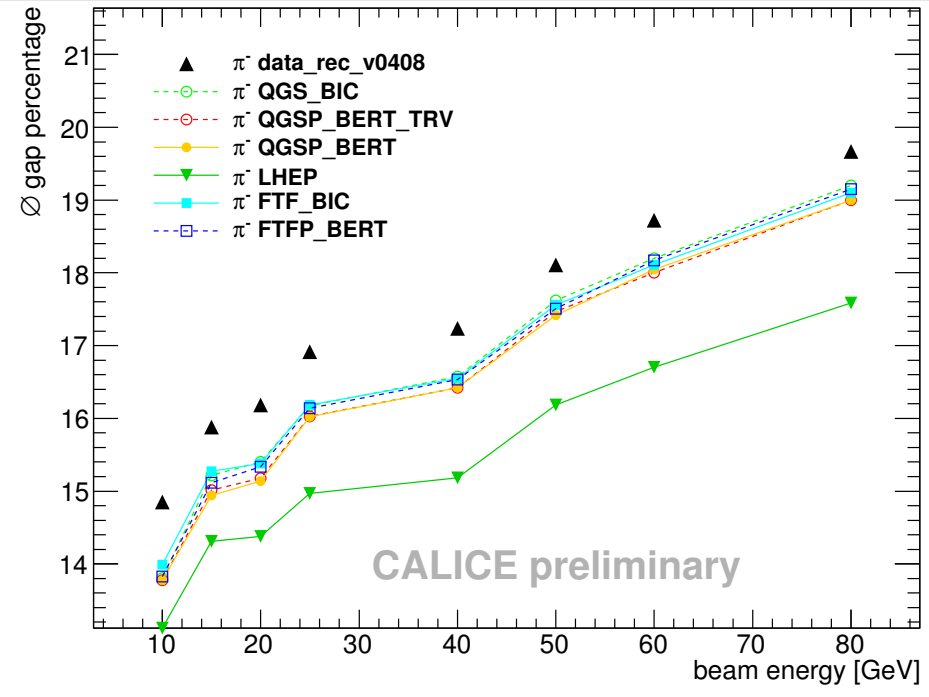


conclusion

- all provide tracks at too low angles
- same grouping, group again close to data
- LHEP and QGS_BIC again furthest away

Monte Carlo - Data comparison: track gap percentage





conclusion

- very sensitive to right amount of noise - digitization test
- non-intuituive structure in right plot is reproduced by all lists
- in all cases too few gaps ⇒ missing effect in digi?
- LHEP again furthest away from data

Conclusion

Conclusions for MC-Data comparison

- Grouping of QGSP_BERT, QGSP_BERT_TRV, FTF_BIC, FTFP_BERT
  - close to testbeam data
  - maybe QGSP_BERT(_TRV) best?
- QGS_BIC worse than group for track angle and multiplicity
- LHEP (and QGSP_FTFP_BERT) even worse for all 4 parameters

Prospects

- CAN in preperation
- Results for LCWS10
- This study + others from munich mpi will be presented in Arlington by Frank Simon