

Istituto Nazionale di Fisica Nucleare

Update on Global Reconstruction with GENFIT

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Strategy

- ***** Use info from trackers (VT, IT, MSD) and TW
- * Reconstructed hits \rightarrow clusters
- **★** Track finding → categorize
 - MC truth
 - "Data-like" namely Sept20: use only reconstruction quantities

* Data-like works also for straight lines! (no B)







Data-Like strategy

- ***** Track finding
 - Start from VT tracklets
 - Projection to possible planes of IT
 - KF extrapolation to MSD
 - ◎ KF extrapolation to TW
 - \bigcirc Possible Z from TW \rightarrow track representation
 - Fit the track candidates and extract particle momentum

- ***** Different strategies under development:
 - Using MSD only
 - Backward Tracking (staring from TW and MSD)



fit ONLY uses reconstructed quantities!







Quantities Definitions

- ***** Both "track finding" algorithms tested on MC w/ full setup:
 - 160_C2H4_200_1.root(-exp 160_200 -run 1)
 - ~ 3x105 events processed
 - Efficiency and purity
 - Momentum resolution

$$\sigma(p) = \sigma \left(\frac{p_{Reco} - p_{MC}}{p_{MC}} \right)$$



$Efficiency(Z) = \frac{N_{Z,conv}}{N_{Z,tot}}$

$$Purity(Z) = \frac{N_{Z,good}}{N_{Z,conv}}$$

 $N_{Z, tot}$ = number of total tracks with certain Z hypo $N_{Z, conv} = converged tracks with some Z hypo$ $N_{Z,good} = converged tracks with correct Z hypo$ (checked with MC truth)









True Selection Performance

- ***** Track fitting closure test:
 - ♥ Fit efficiency above 99% for all fragments
 - ☺ Track points and hypothesis from MC
 - Purity is 1 by definition
 Check efficiency of GENFIT fit algorithm



Fit efficiency above 99% for all fragments





Reco Filting Performances

***** Data-Like selection:

- Evaluate hit selection performances
- Check efficiency of fit algorithm
- Check purity of fitted tracks



Matteo Franchini



Both efficiency and purity > 90% for all fragments!





Reco Filting Performances

***** Data-Like selection:

- Evaluate hit selection performances
- Check efficiency of fit algorithm
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Both efficiency and purity > 90% for all fragments!



Reco Filting Resolution

- * Momentum at the target:
 - Extracted from track fit
 - Checked with MC





straight track filting

- ***** Tracking without \overrightarrow{B} field on data taken @GSI in 2021 ... runs!
- * We can run on MC and data w/out major issues using the very same code and strategy
- * Re-running from October, starting performance study of the method.









- * Lately worked on studying **global reconstruction** by looking at the results from analysis... testing phase!
- * First developing a stable and robust chain to the "final" result.

(G. Ubaldi)







* Developing analysis code into SHOE + integrated python plotting and unfolding collaborating with <u>Yun</u> and <u>Ilaria</u> Useful to understand possible criticalities and performances. Developing an integrated system to evaluate the xSec.

* <u>Giuseppe</u> made a wonderful work testing our tracking procedure on **standalone analysis** tools so we were able to:

Added some feature & fixed a couple of issues into the tracking output (**TAGTrack**) + a nasty memory-leak.

Discussion gave ides for improvements and new strategies



Latest Update - detector tilting

- * Some work on adapting GenFit tracking to work on **local coordinates** instead of global one
- *** Solve possible problems** observed in case of tilted detectors
- * Specific simulations produced (*thanks to Giuseppe*) to study the **tilting** in a GSI2021 configuration
- * Found also a possible issue in the geometry implementation into SHOE (under investigation)

Thanks to Roberto Zarrella









On tracking strategy

* Already tested good performances even without IT (until it will be ready)

* Working ongoing on **alternative strategies** for tracking:

- 1. Tracking based mainly on **MSD and TW alone**.
- Allows backtracking
- Prevents from other trackers issues or useful for standalone **runs** with only a tracker+scintillator
- 2. Vertexing using global tracks
- 3. Procedure for identification and rejection of the **secondary fragmentation** tracks using hit density studies

* Too early to present result on that. Parallel work make partial time scale longer...







Conclusion

* Full setup fit looks fine. More test to be done anyway...

* We are able to run on GSI2021

- Waiting for the finalisation of the detector alignment
- Testing the fit

* <u>Currently:</u>

- **Developing alternative tracking strategies** 9



Studying the characteristics of the fit by looking at the analysis results

