LCTPC meeting

Double hit resolution

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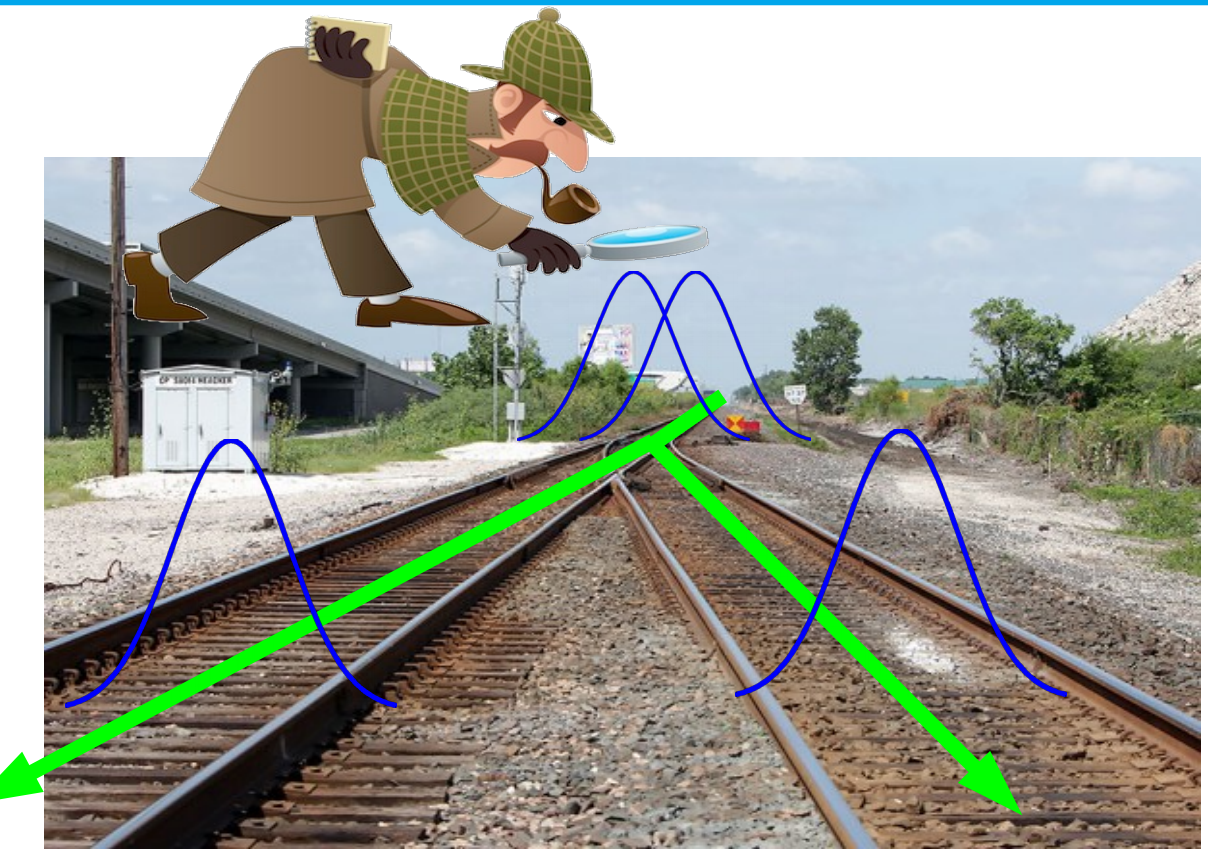
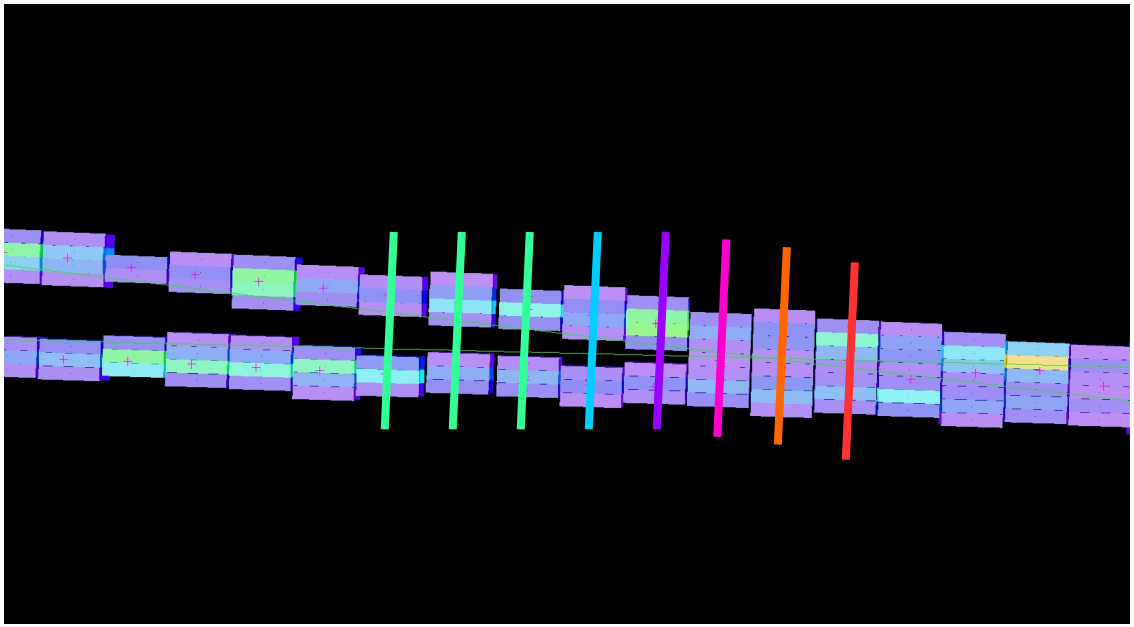
Double Hit Resolution

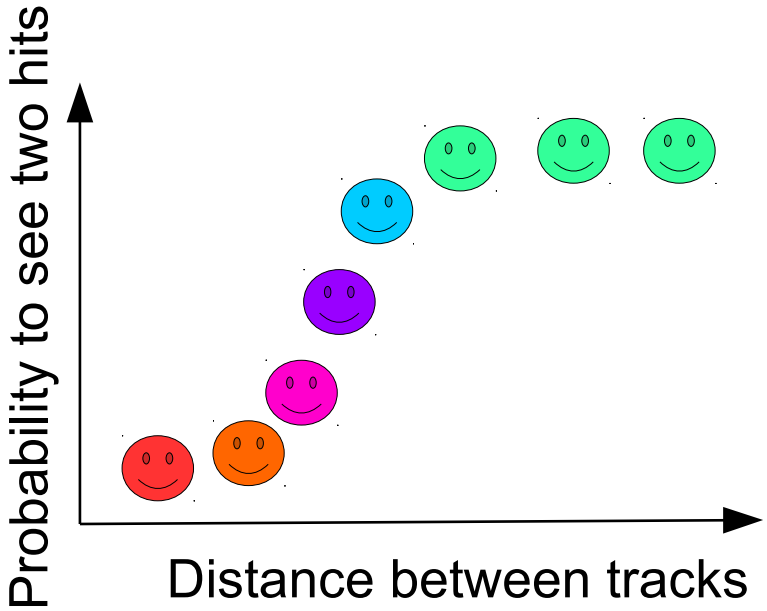


- What is the distance between two tracks where we still can separate them?
- What can we do to decrease separation distance?

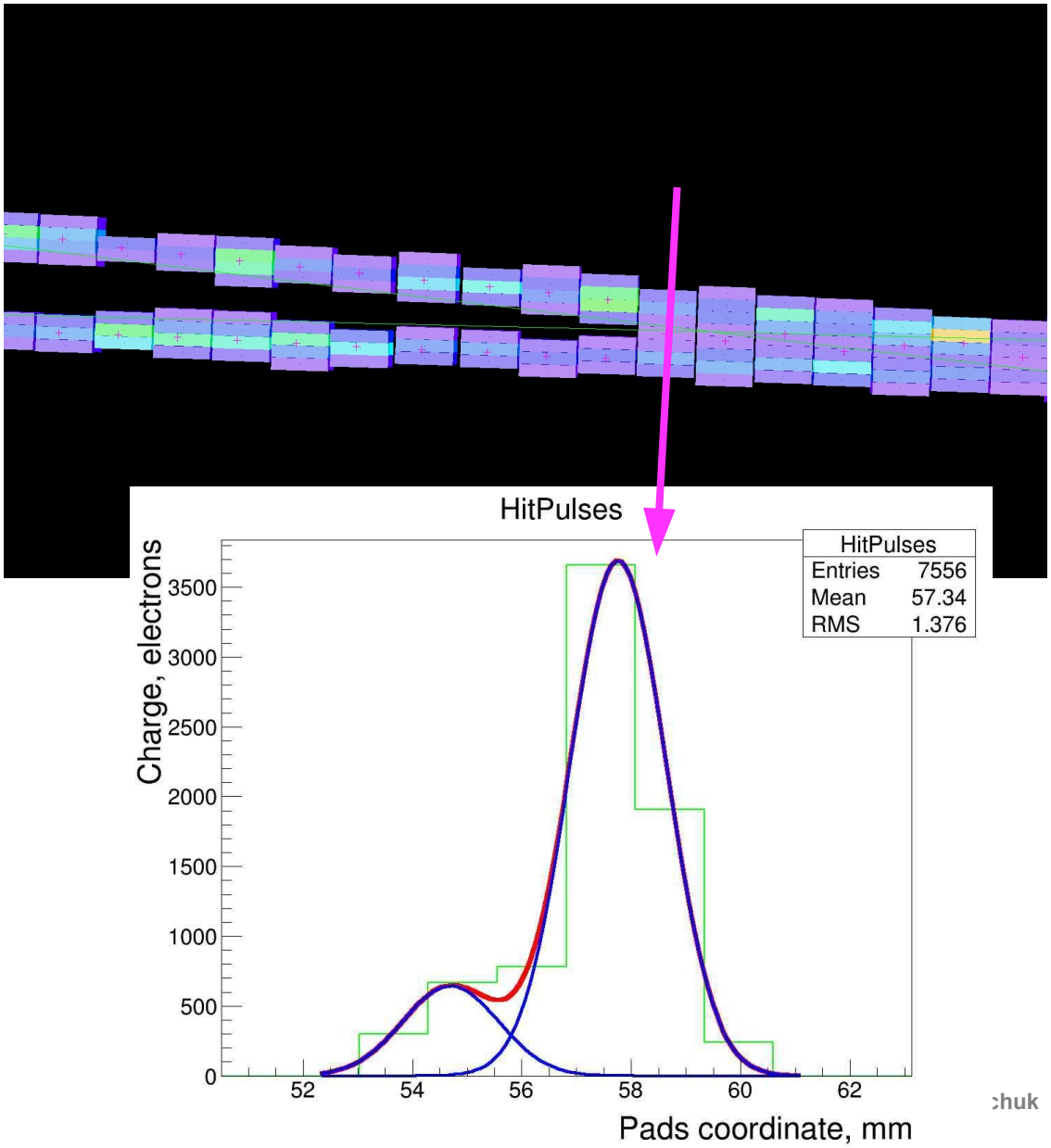
How the double hit resolution is defined?



- For each distance between tracks we search two hits.
- The probability is defined as (number of sound two hits cases) / (total cases)

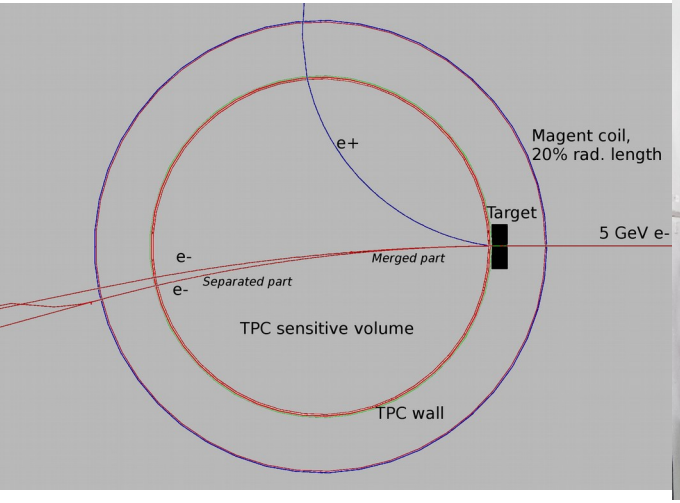


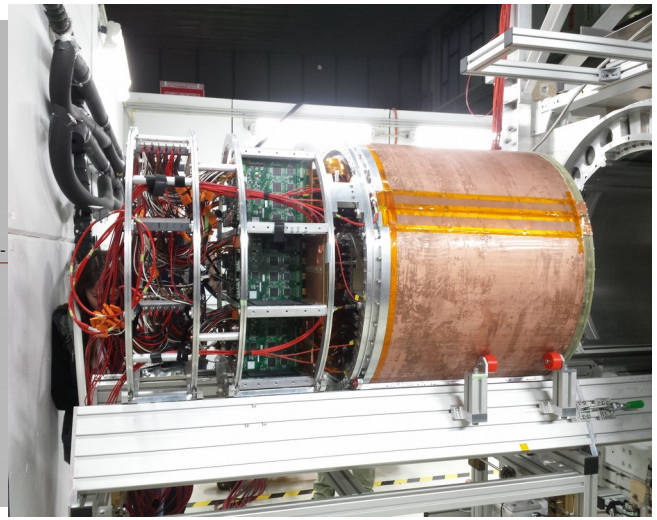
How the double hit resolution can be improved?

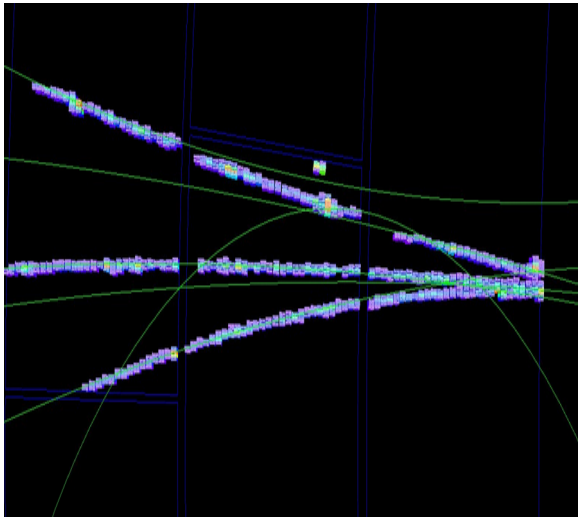


- If merged hits is found, the fit separation algorithm is used.
- It tries to fit the charge distribution with sum of two PRFs (expected charge distribution for one hit)
- It might be successful or not due to Chi2 selection criteria.

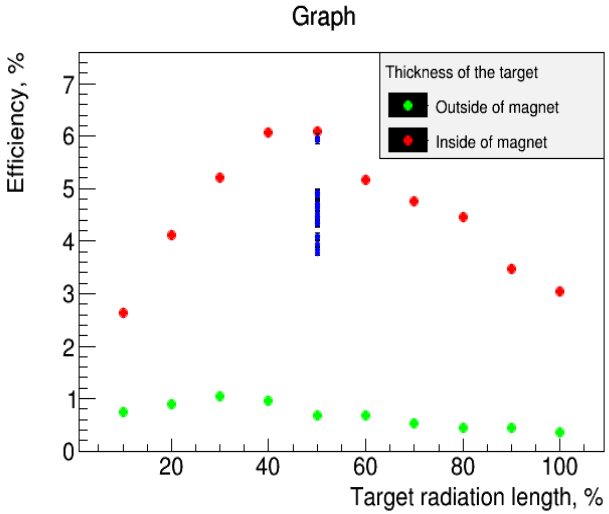
Double Hit Resolution: PROCESS







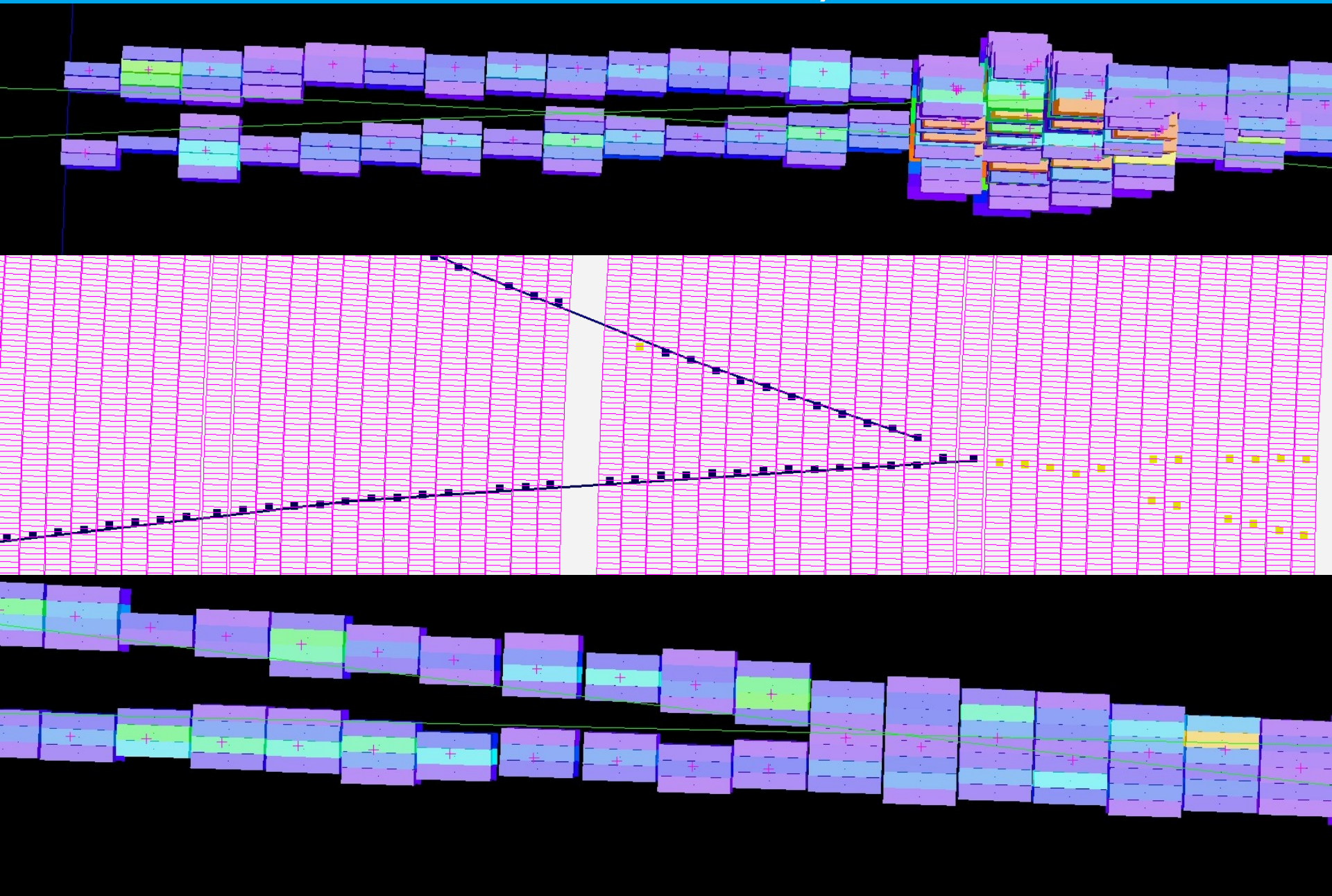
Geant4 target simulations → Test beam → Data analysis



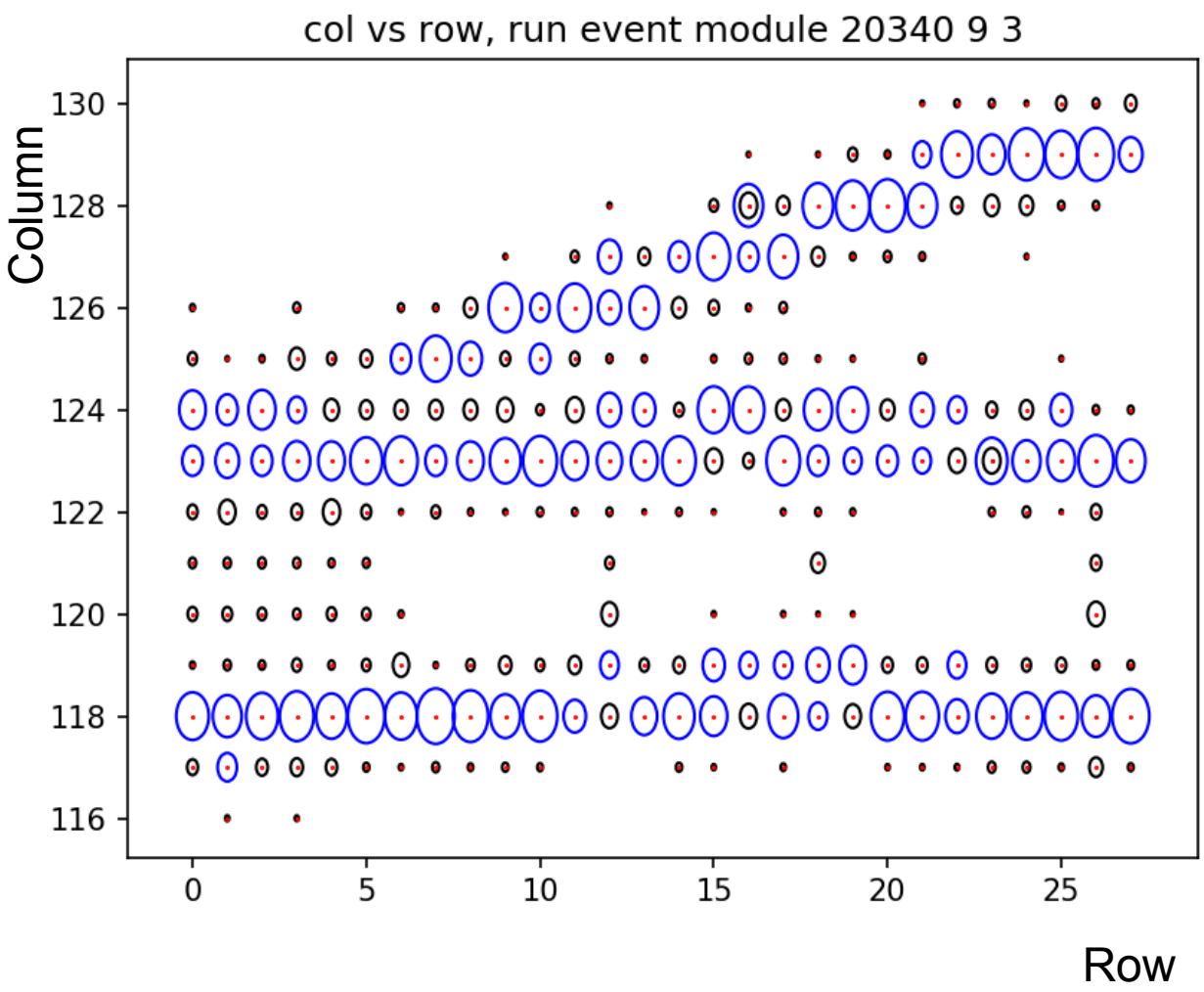
→ MarlinTPC simulations → Analysis + MC info

DESY

Tracking problem (Triplet based track finder, Hough track finder, Pad Pulse Road Search finder)



Pad pulse road search track finder



- PPR search is base initial track on “leading pulses” idea, not on hit. This allows to get more information from “confusion” region.

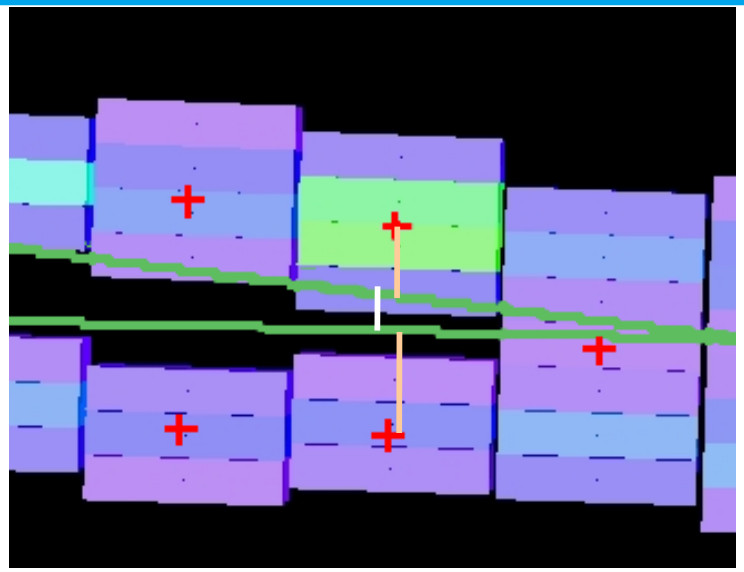
Analysis chain is done for two track finders: Triplet based and Pad Pulse Road Search

- Triplet based track finer and GBL track fit
- Identifying and removing merged hits
- Refit by Triplet based track finer and GBL track fit
- **Evaluation of DHR (Triplet)**
- Identifying and separating merged hits
- **Evaluation of DHR (Triplet+separation)**

- Pad Pulse Road Search (with internal separation) and GBL track fit
- **Evaluation of DHR (Pad Pulse Road Search+ internal separation)**

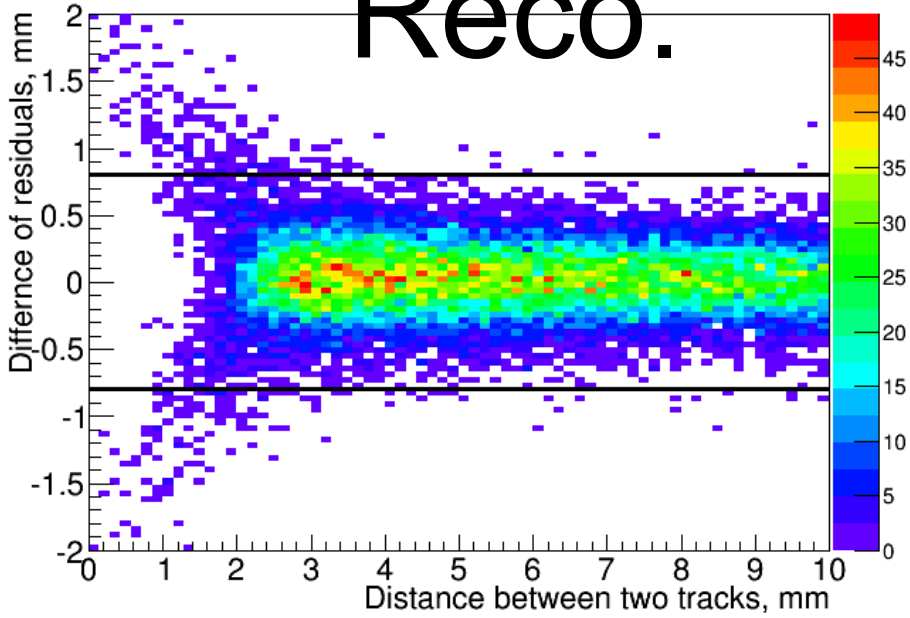
- Separation with using Pad Pulse Road Search tracks, original hits
- **Evaluation of DHR (Pad Pulse Road Search+ Separation)**

Cut that helps with wrong tracking. Simulations.

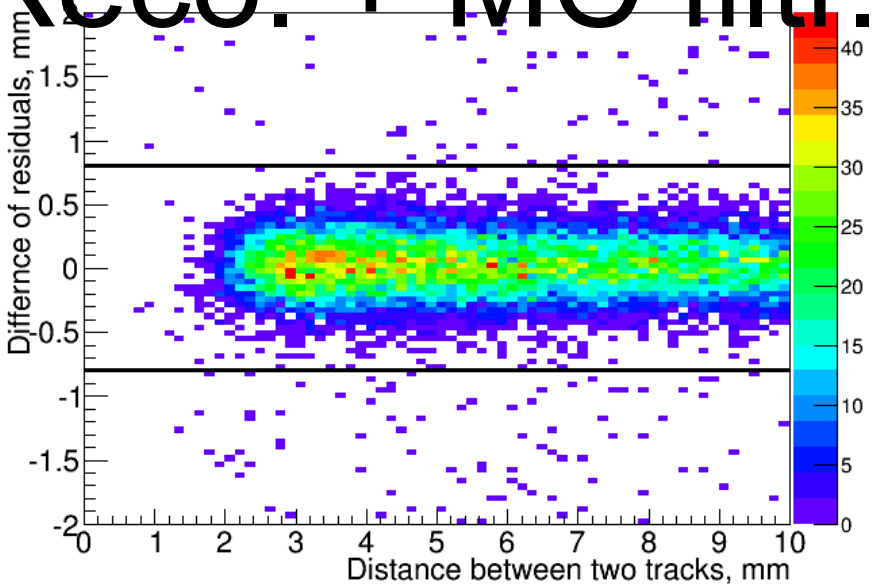


- The “tails” disappear, after applying requirement that reconstructed track should match MC particle.
- By applying the cut we are trying to remove wrong reconstructed tracks in the experimental data

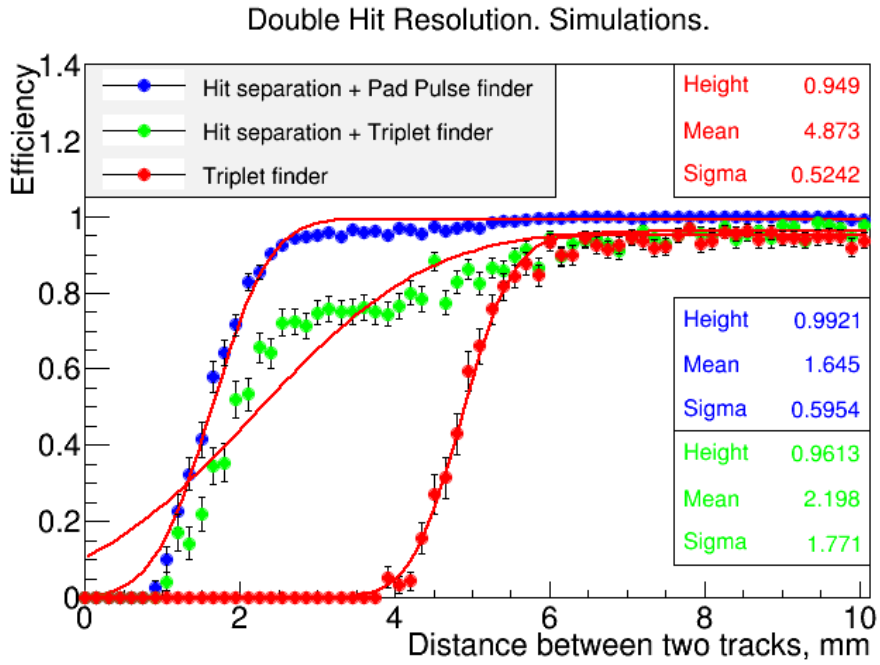
Reco.

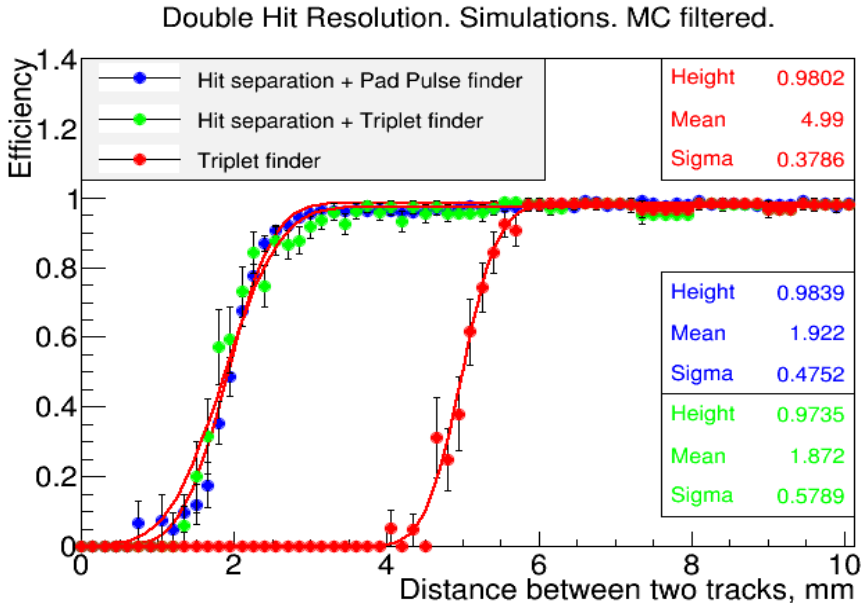


Reco. + MC filtr.



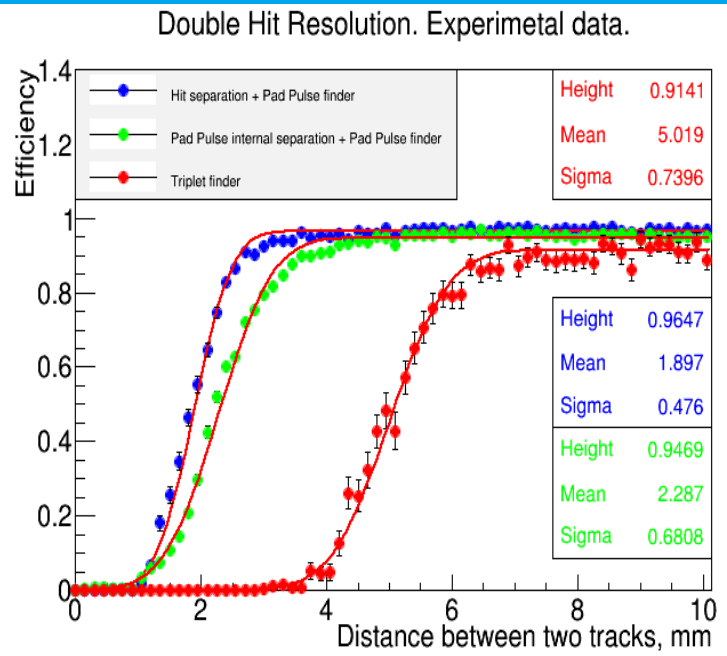
Filtered simulation data vs Simulation data

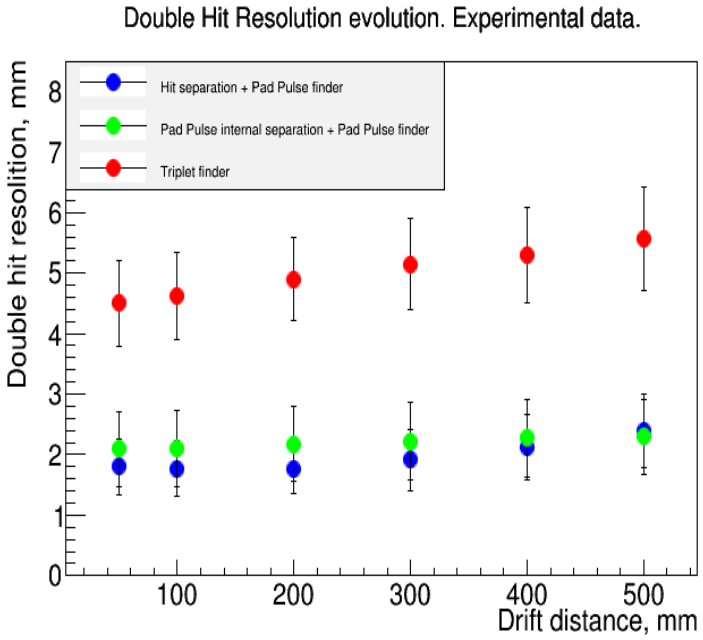


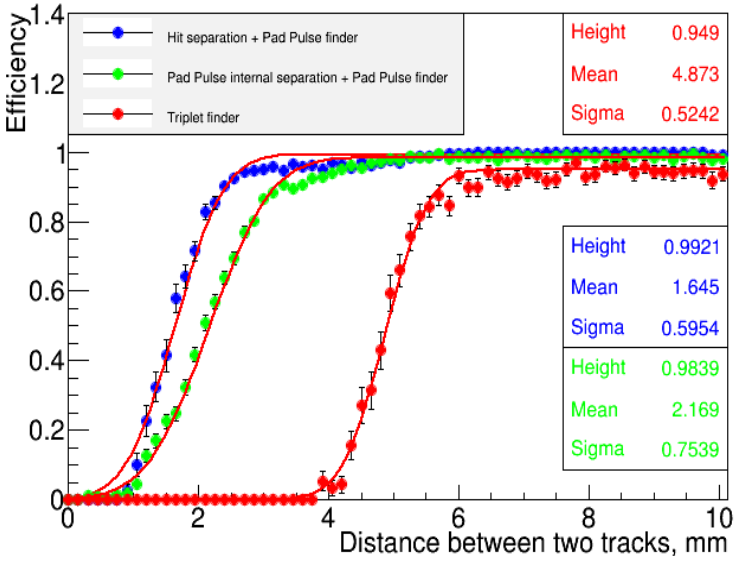


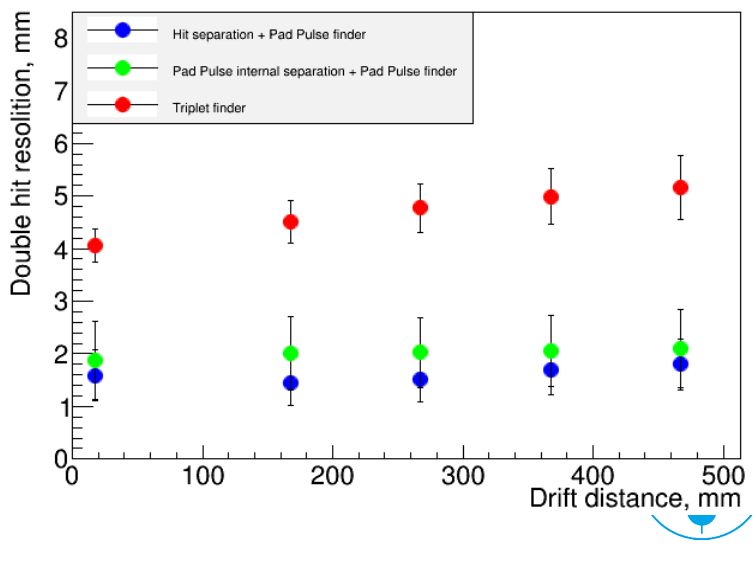
- The blue curve didn't change its shape after applying MC filter. Mean value is improved which indicate that PPRS track finder is still not perfect.
- The green curve did change its shape after applying MC filter. Which indicates significant impact of wrong reconstructed tracks on the distribution.
- Amplitude of the red curve is different. This indicates that merged hit deletion has not been performed correctly due to wrong track position.

Experimental data vs Simulation data



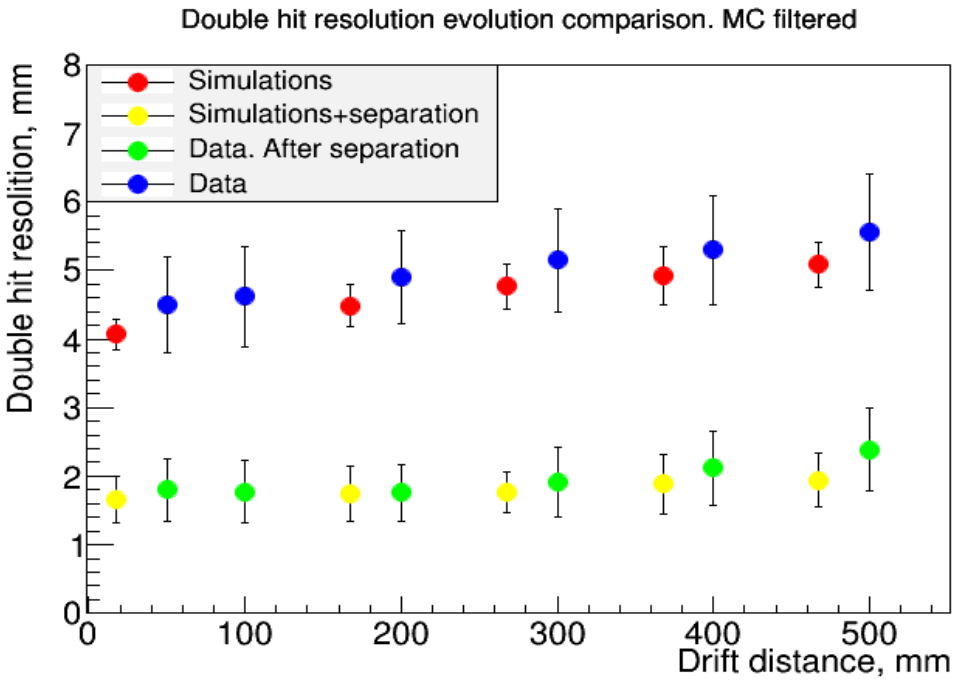




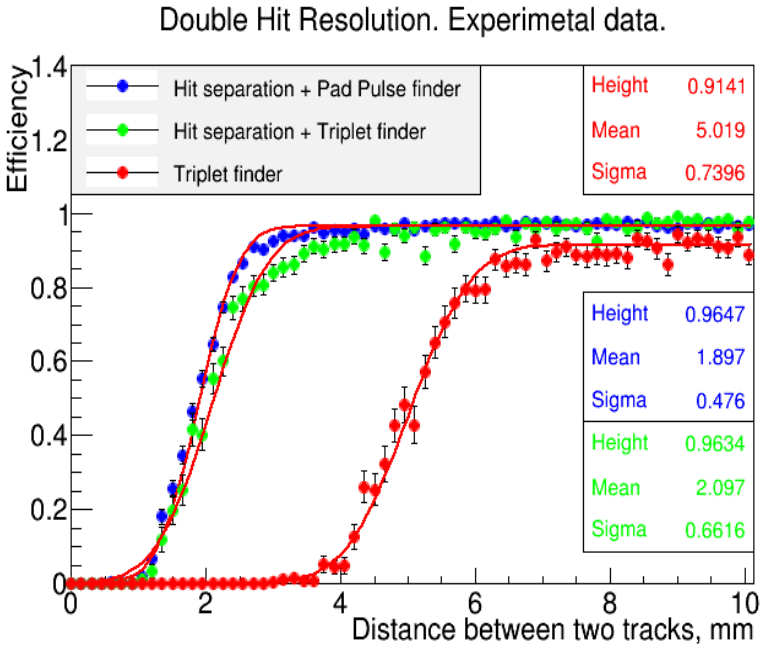


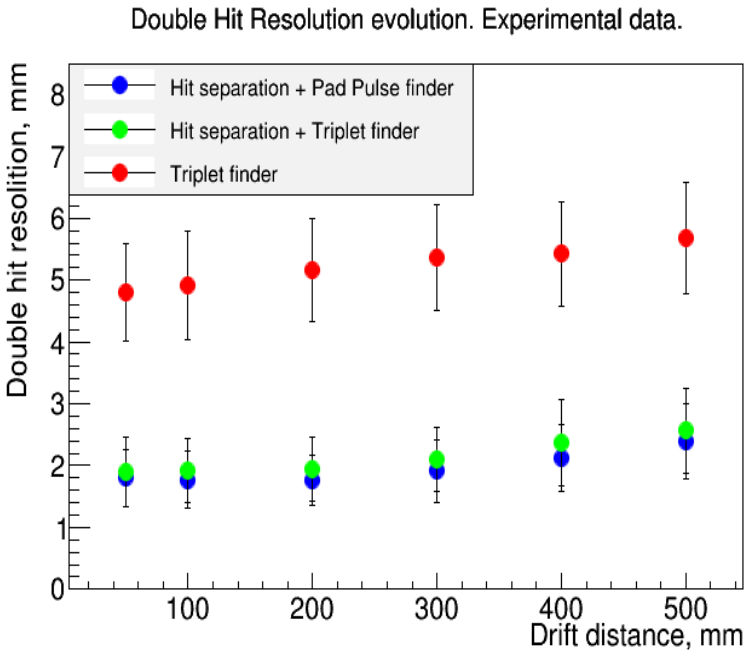
Summary

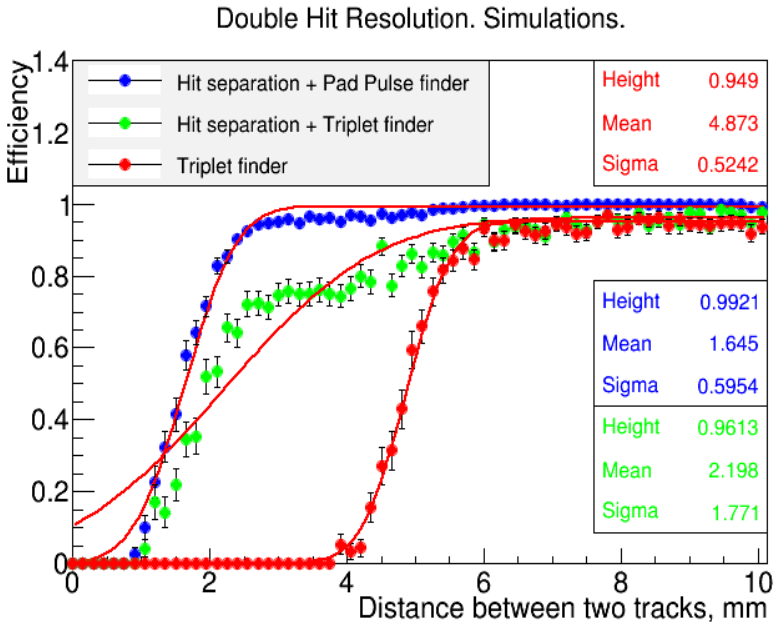
- Correct reconstruction of tracks is needed to find correct double hit resolution value.
- Double hit resolution value show agreement in data and simulations.
- Hit splitting algorithm is implemented and tested. It decreases DHR value from ~ 5mm to ~2mm.
- Next is comparison of impact on ILC TPC

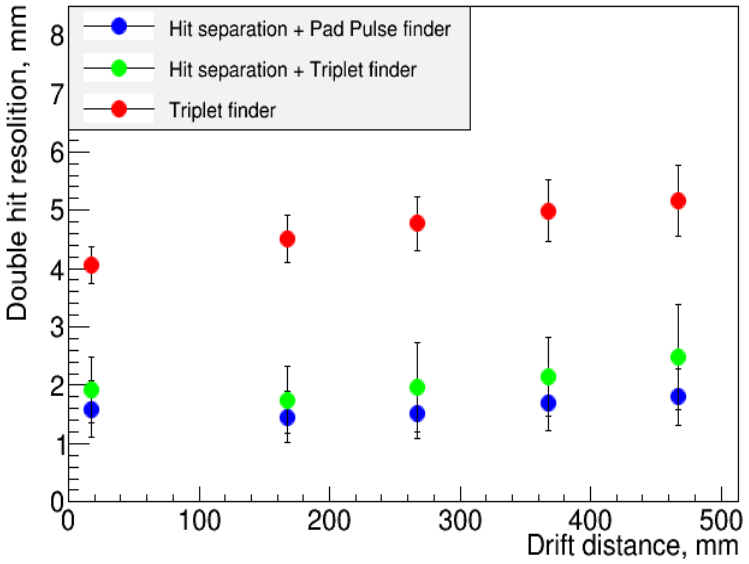


Experimental data vs Simulation data

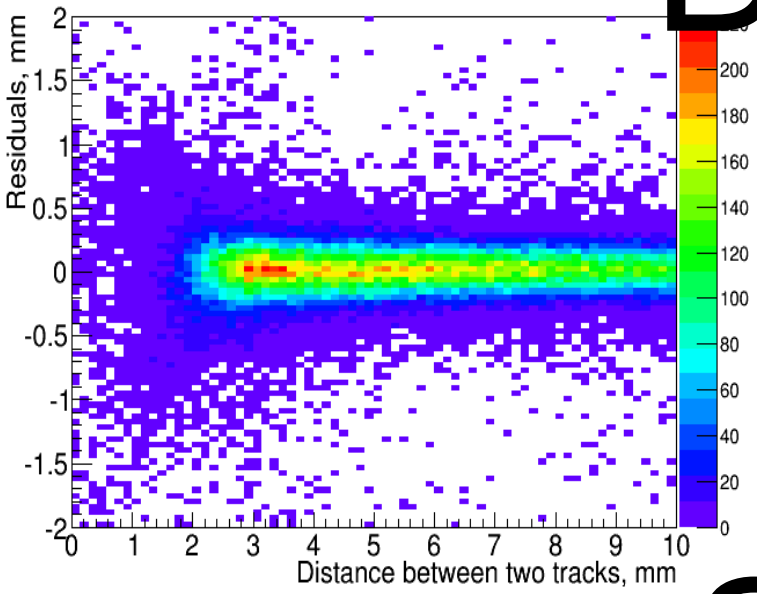


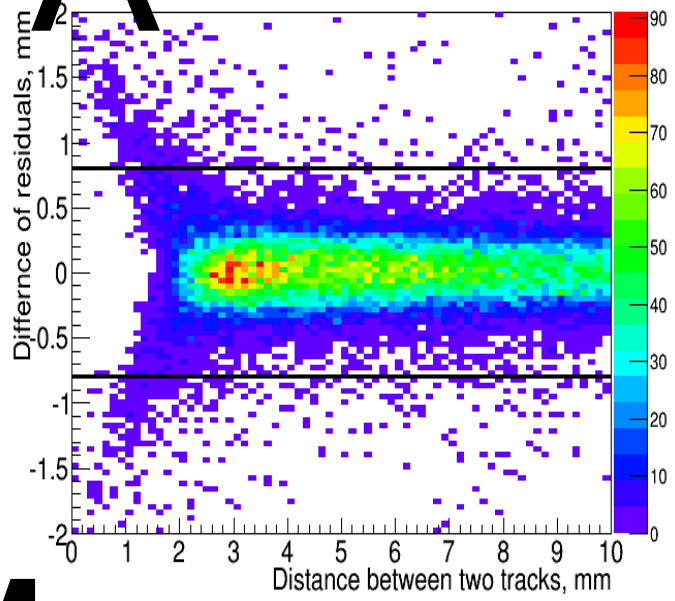




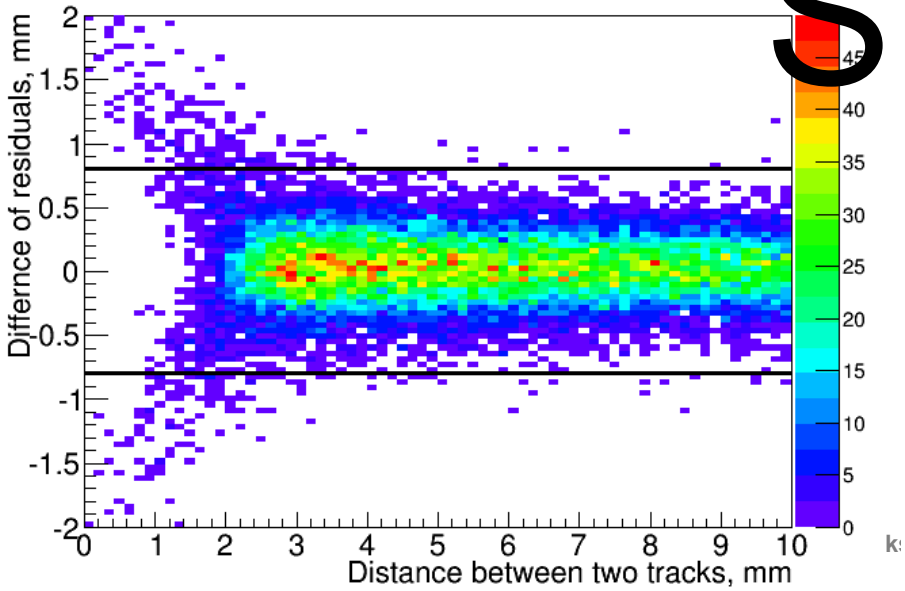


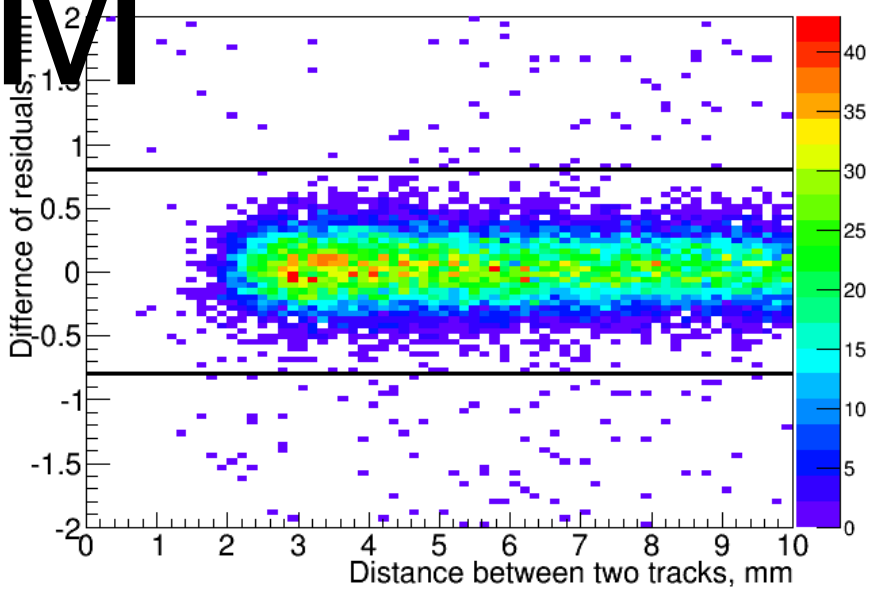
DATA


Residuals, mm
Distance between two tracks, mm

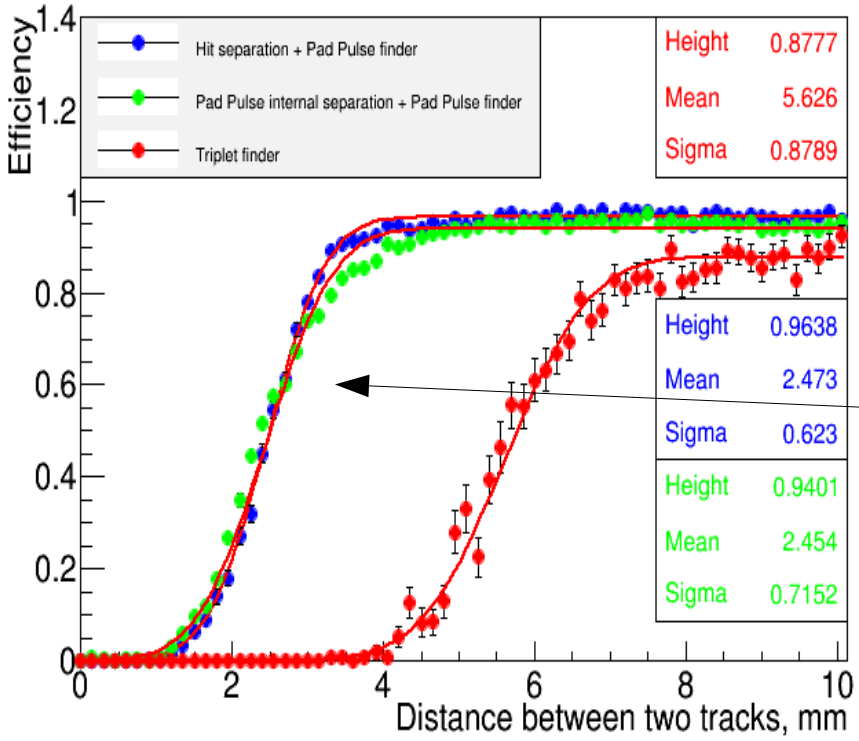

Diffrence of residuals, mm
Distance between two tracks, mm

SIM


Diffrence of residuals, mm
Distance between two tracks, mm


Diffrence of residuals, mm
Distance between two tracks, mm

Double Hit Resolution. Experimetal data.



Double Hit Resolution evolution. Experimental data.