

# Combined TB - Status of Reconstruction software

J. Lettenbichler, R. Frühwirth

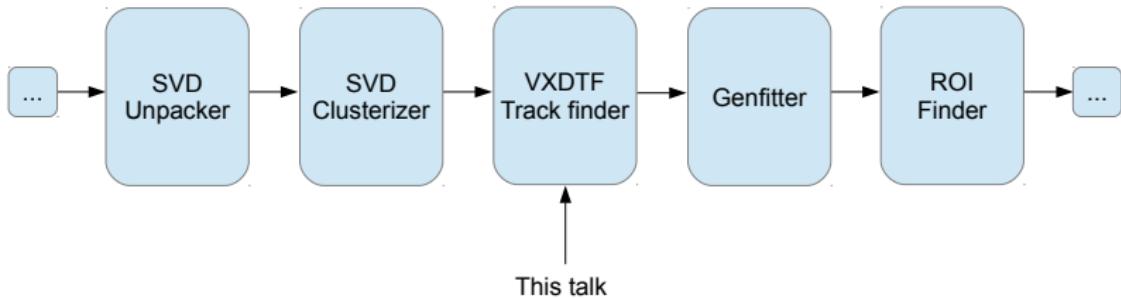


Institute of High Energy Physics  
Austrian Academy of Sciences

January 22, 2014



# Chain of execution for HLT



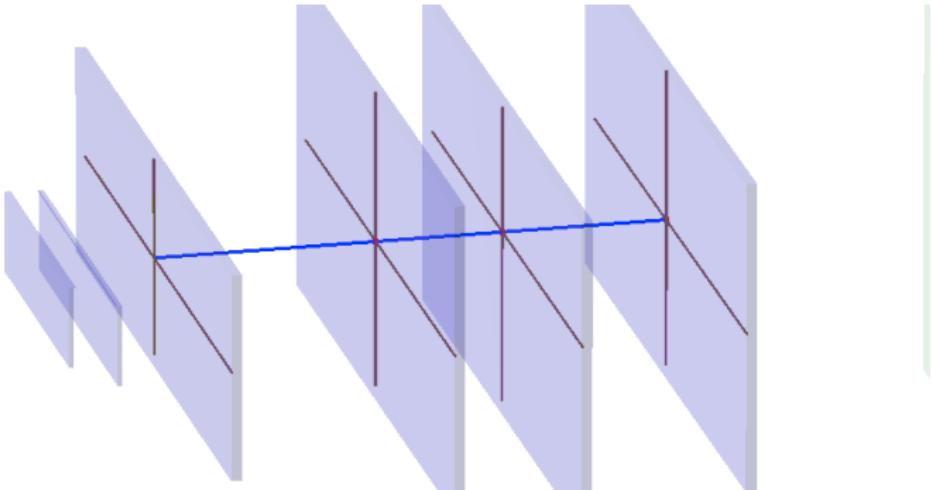
# Testbeam - What has been done so far

## Already done:

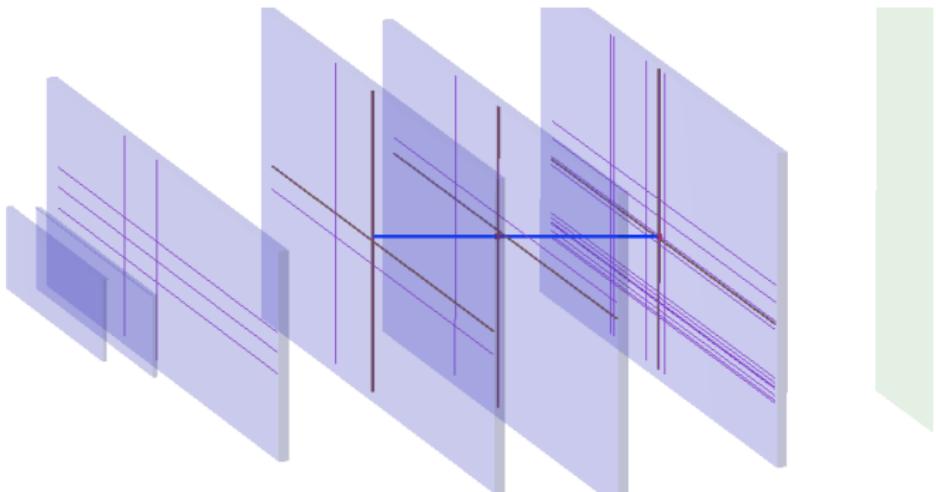
- Successful tracking in the TB
- Producing seeds for ROI-finding in the case of no magnetic field
- Capability of finding tracks in nontrivial cases
- Prepared for activating magnetic field (when is it planned to activate this?)



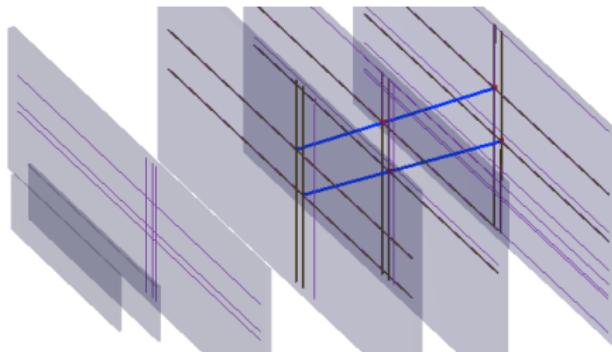
# Success trivial case



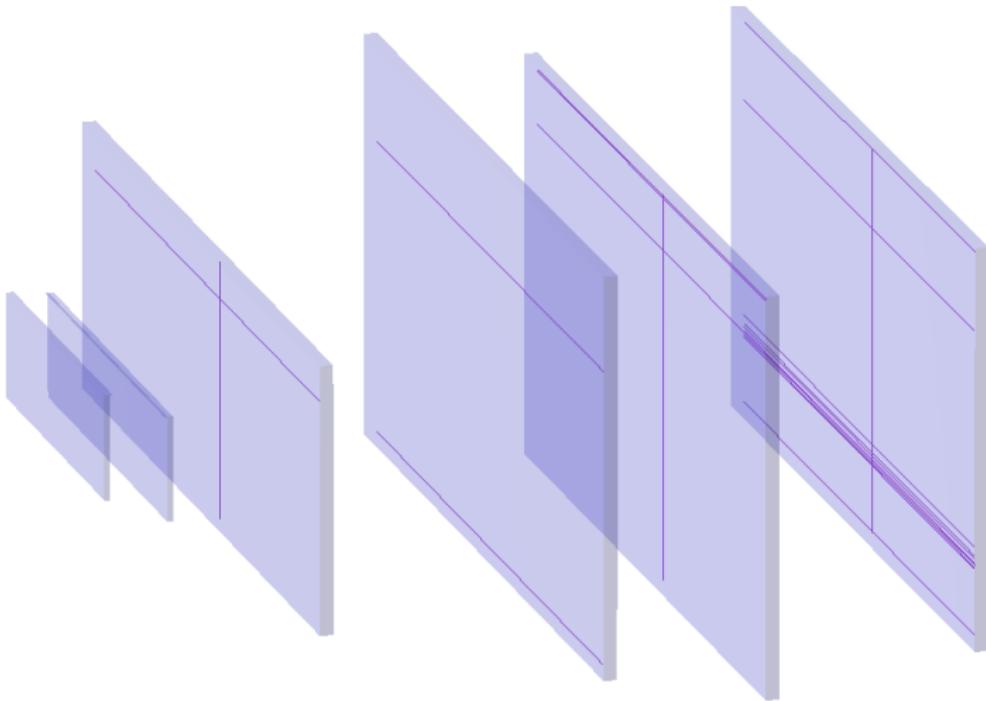
# Success interesting case



# Success interesting case - II

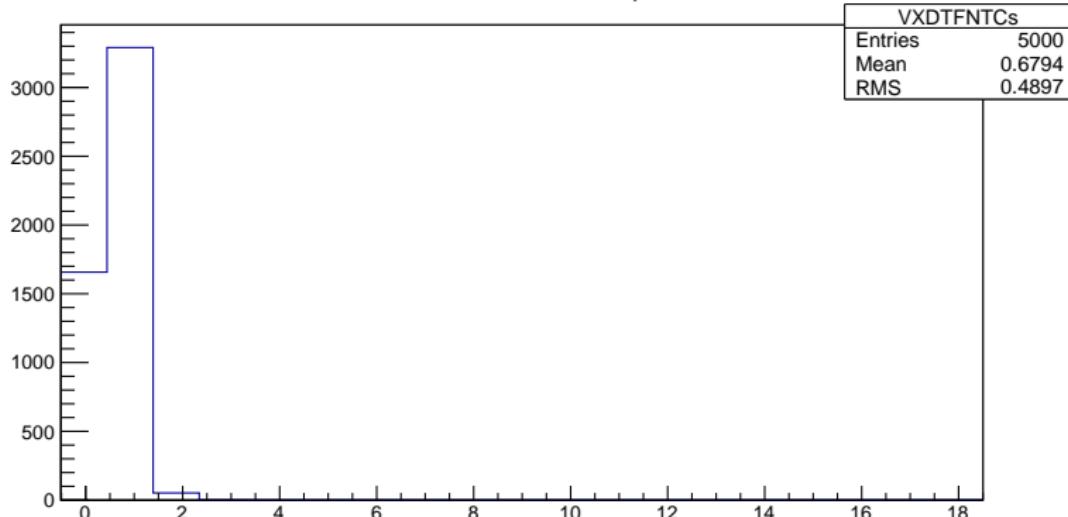


Fail



## Number of TCs per event - online setup (run104)

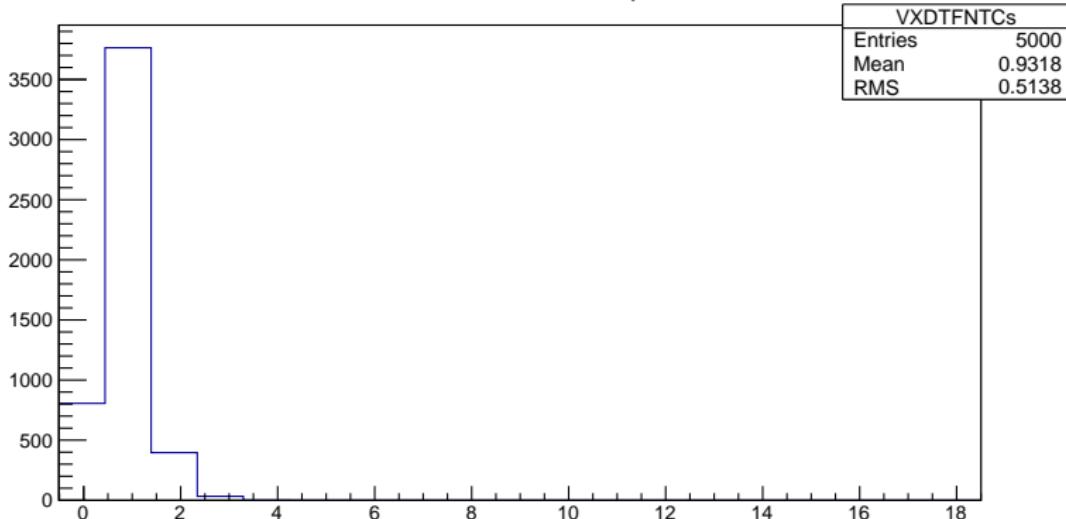
VXDTF: Total num of TCs per event



average time consumption:  $250\mu\text{s}$ , max segment threshold: 75

# Number of TCs per event - local extended setup (run104)

VXDTF: Total num of TCs per event

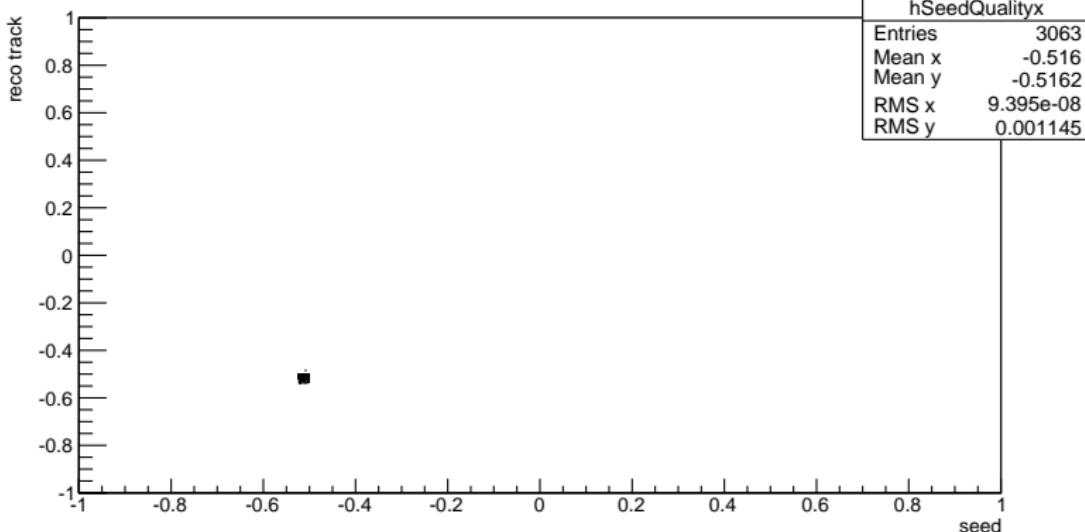


average time consumption:  $2330\mu\text{s}$ , max segment threshold:  
1000



# extrapolated Position X (run104)

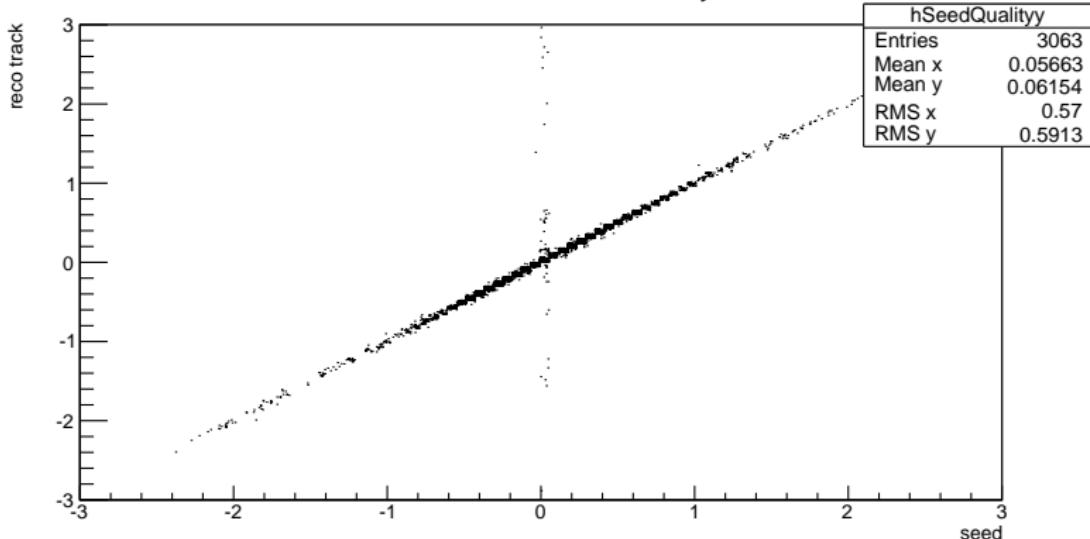
seed vs. trackfit result for x



mode: taking seed, extrapolate to layer 6 and back again →  
difference to initial point

# extrapolated Position Y (run104)

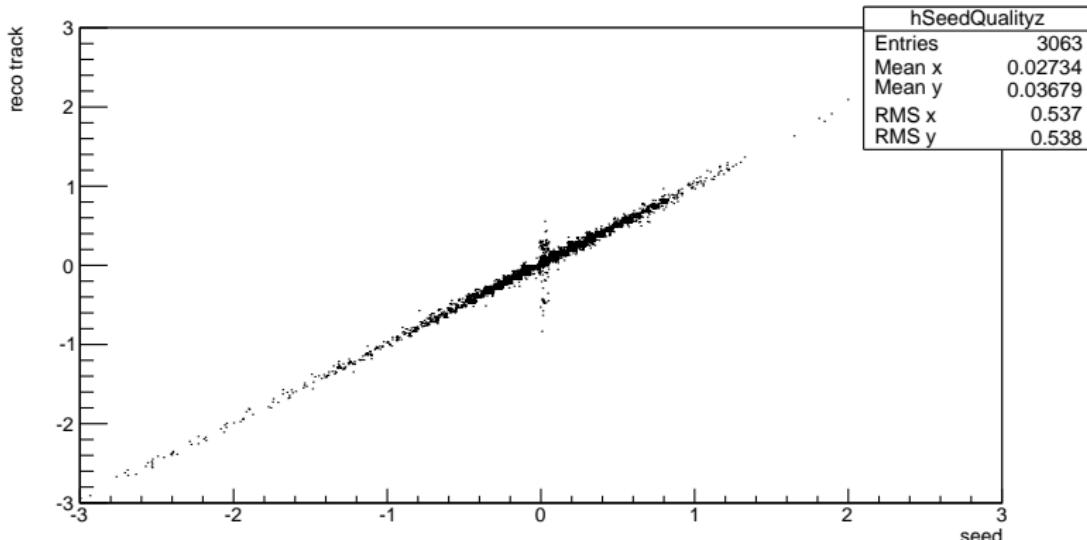
seed vs. trackfit result for y



mode: taking seed, extrapolate to layer 6 and back again → difference to initial point

# extrapolated Position Z (run104)

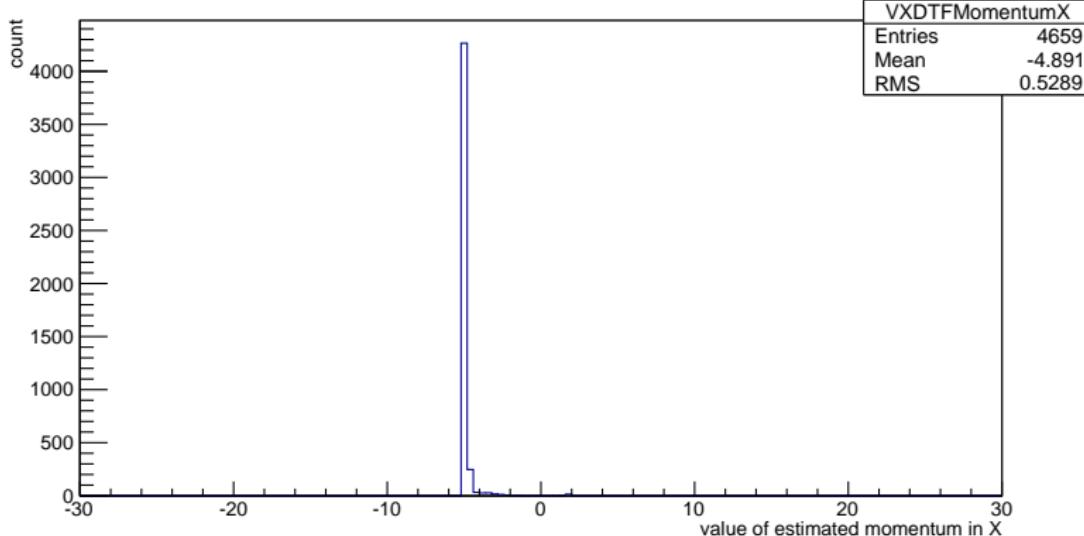
seed vs. trackfit result for z



mode: taking seed, extrapolate to layer 6 and back again → difference to initial point

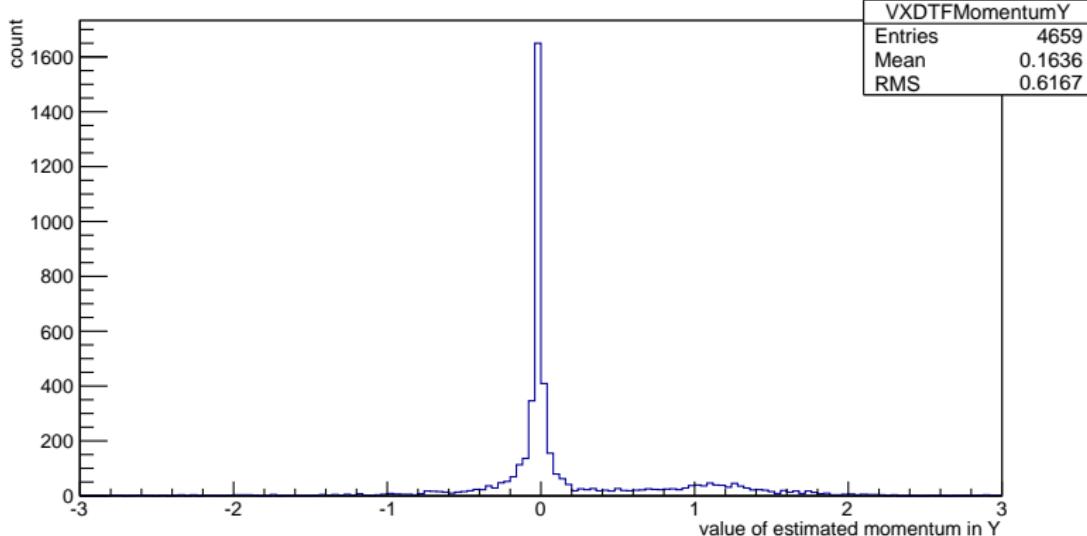
# Seed momentum X (run104)

VXDTF: Momentum in X estimated



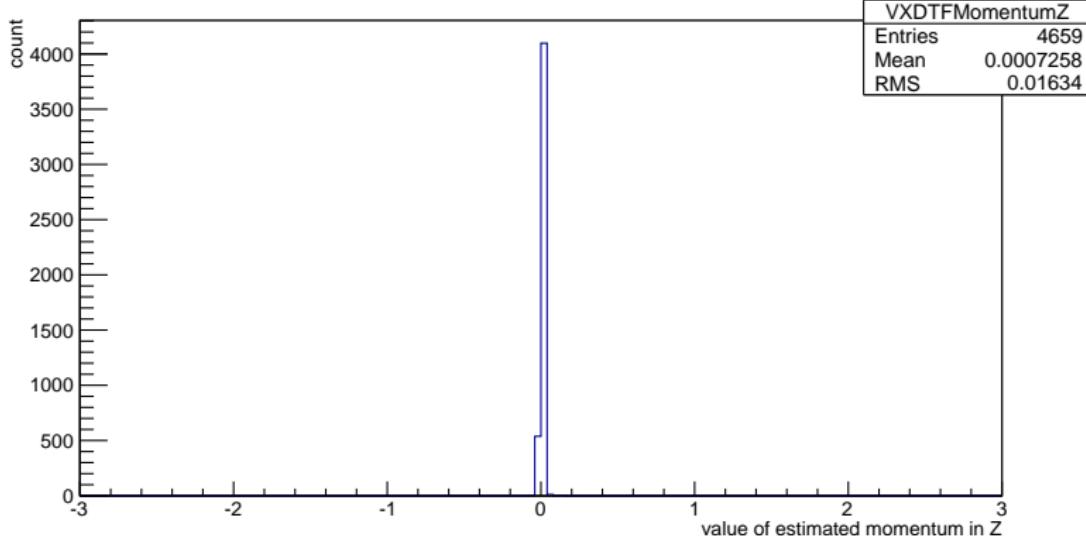
## Seed momentum Y (run104)

VXDTF: Momentum in Y estimated



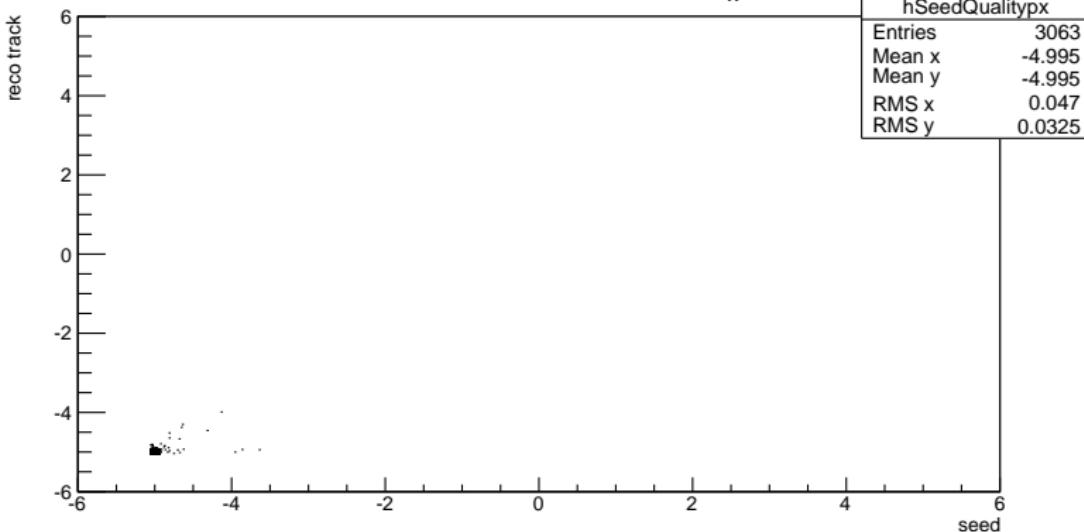
# Seed momentum Z (run104)

VXDTF: Momentum in Z estimated



# extrapolated momentum X (run104)

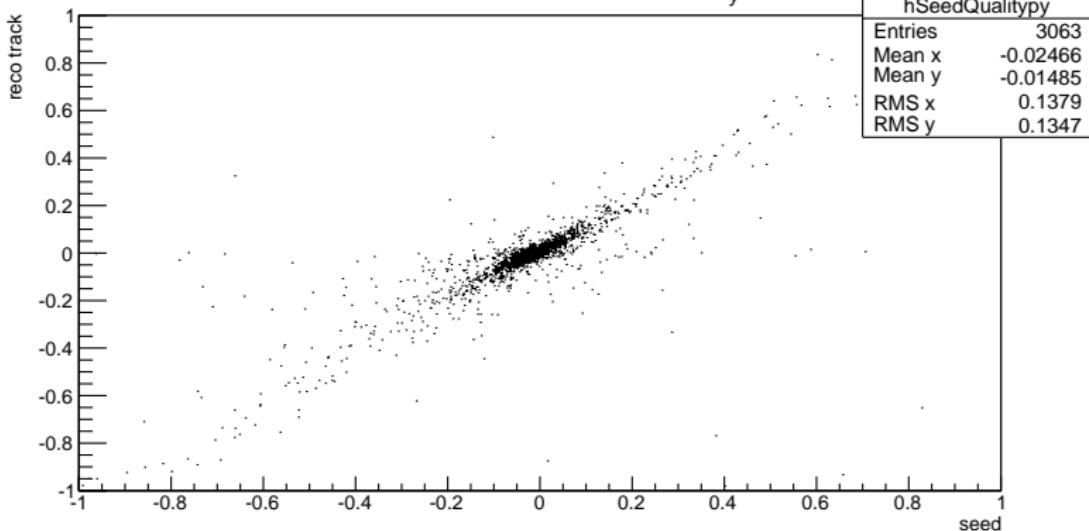
seed vs. trackfit result for  $p_x$



mode: taking seed, extrapolate to layer 6 and back again → difference to seed momentum

# extrapolated momentum Y (run104)

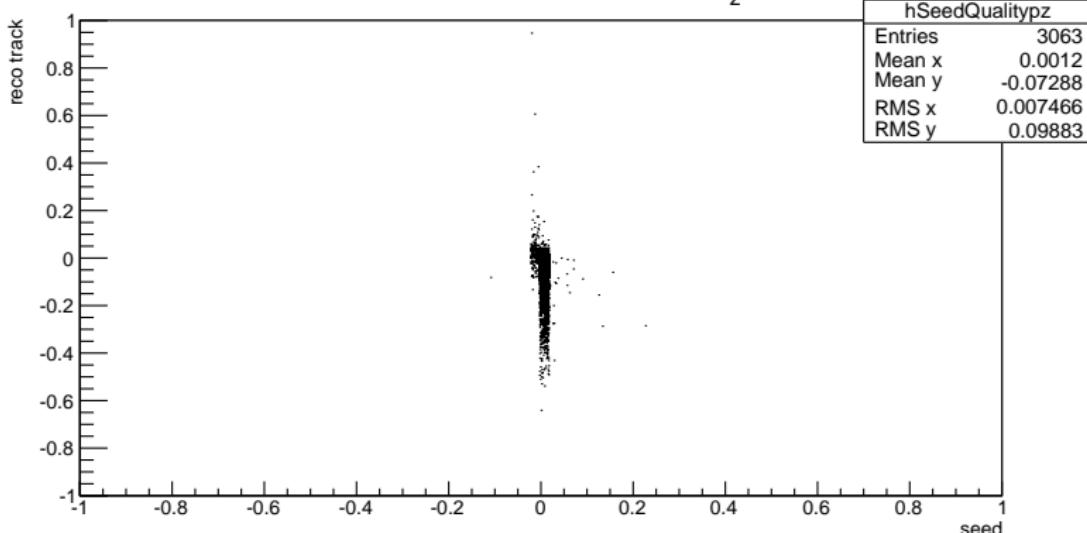
seed vs. trackfit result for  $p_y$



mode: taking seed, extrapolate to layer 6 and back again → difference to seed momentum

# extrapolated momentum Z (run104)

seed vs. trackfit result for  $p_z$



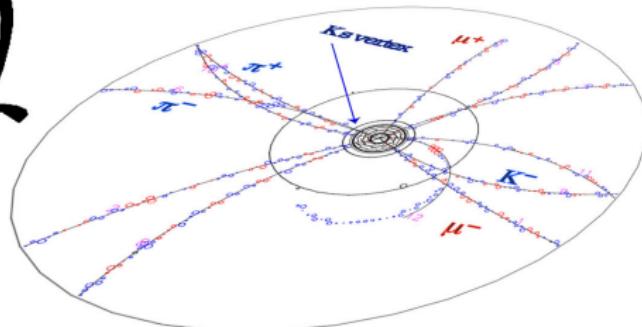
mode: taking seed, extrapolate to layer 6 and back again → difference to seed momentum

# Testbeam - Outlook

## To do:

- Track finding with activated magnetic field
- Check seeds for PXD-ROI
- Fixing remaining bugs (often L3 is ignored, although there seems no offset in Hits)
- Telescope support (planned before end of TB)
- Thorough analysis of all runs available

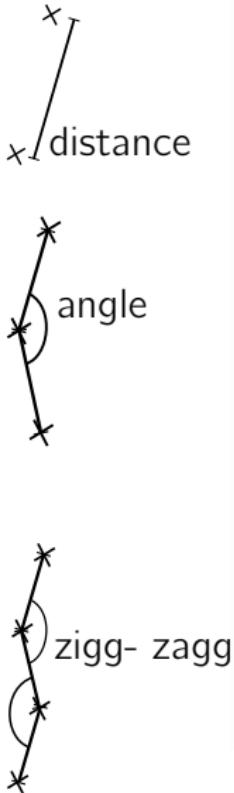
that's all, folks!



Any suggestions, ideas or requests?

[Jakob.Lettenbichler@oeaw.ac.at](mailto:Jakob.Lettenbichler@oeaw.ac.at)

# Approach for reducing combinatorics



## Schematic view of the low momentum track finder in Belle II

Unsorted hits from tracks, background, ghost coming from an event

OL Sector setup - 1-hit filter  
filters by set of compatible sectors, allows momentum dependent setups

OL Segment finder - 2-hit filter  
filters by distance, min&max, including virtual Segment

OL Neighbour finder - 3-hit filter  
filters by angle and  $\Delta$ -distance min&max, pT

OL 2+1 hit filter  
High occupancy bypass (HOB)

OL 3+1 hit filter  
HOB

L Cellular Automaton  
evolving states, includes TC-collector

OL Post 4-hit filter  
filters by zigZag,  $\Delta$ pT, ...

- Black arrows represent a schematic interpretation of the possible number of combinations of hits at that point
- Red arrows represent high occupancy bypass strategies
- Filters marked with an O use external information generated by simulation
- Steps marked with an L cycle through several passes

Kalman filter  
Calculates QI's

Circle fit  
HOB for Kalman

Hopfield Network  
uses QI's to find best subset among overlapping TC's

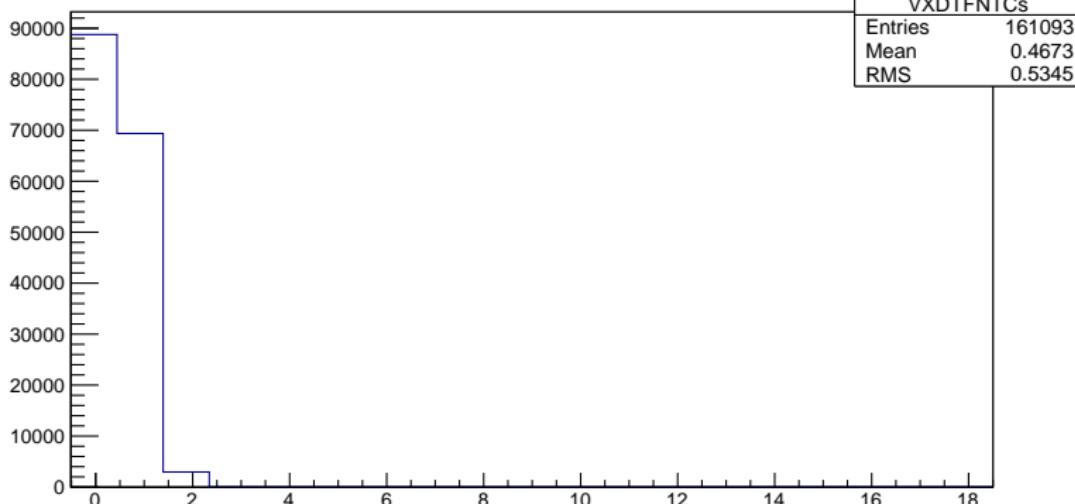
Greedy algorithm  
HOB for Hopfield

Clean TC's



## Number of TCs per event - online setup (run414)

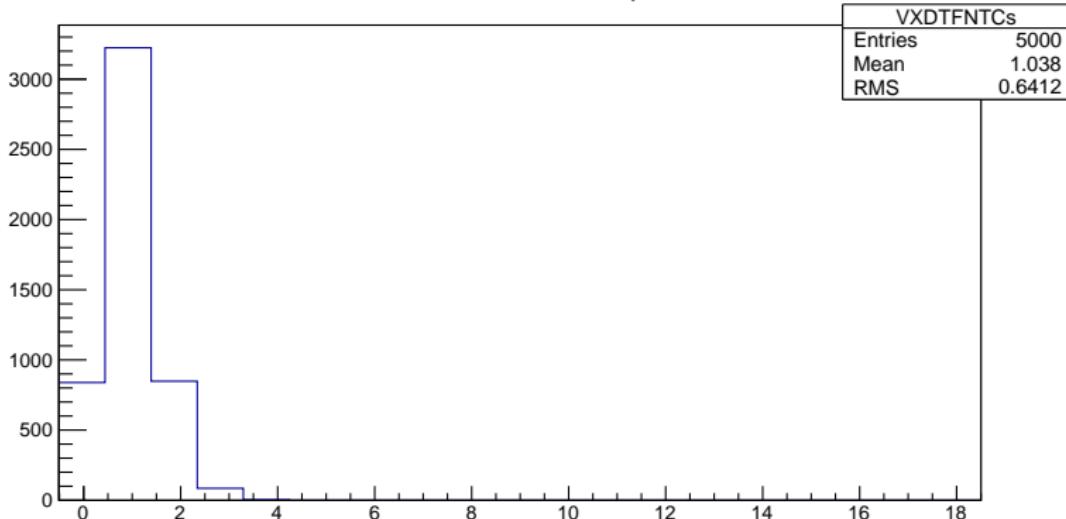
VXDTF: Total num of TCs per event



average time consumption: 250 $\mu$ s, max segment threshold: 75

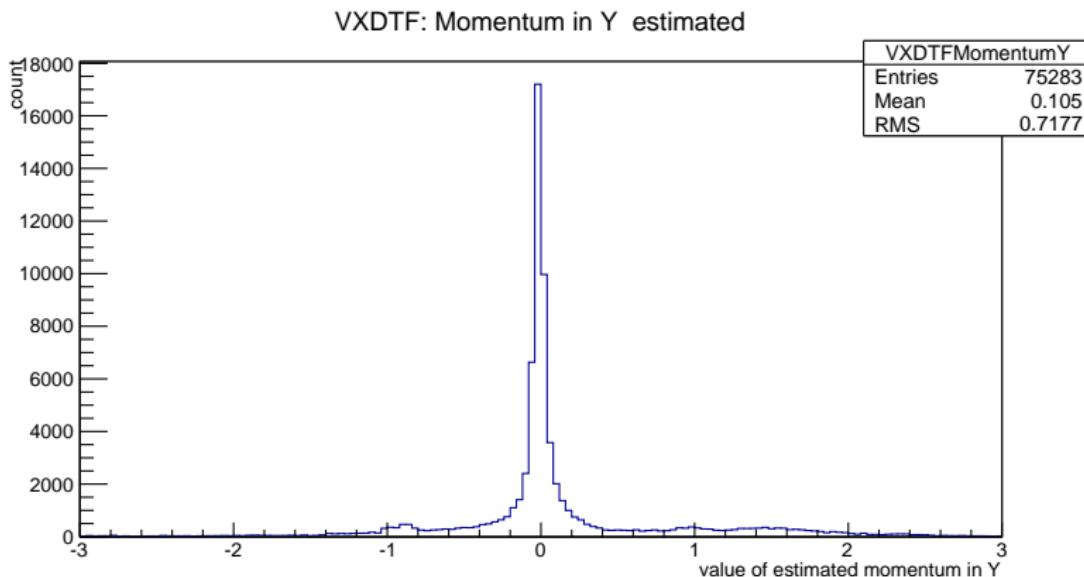
# Number of TCs per event - local extended setup (run414)

VXDTF: Total num of TCs per event



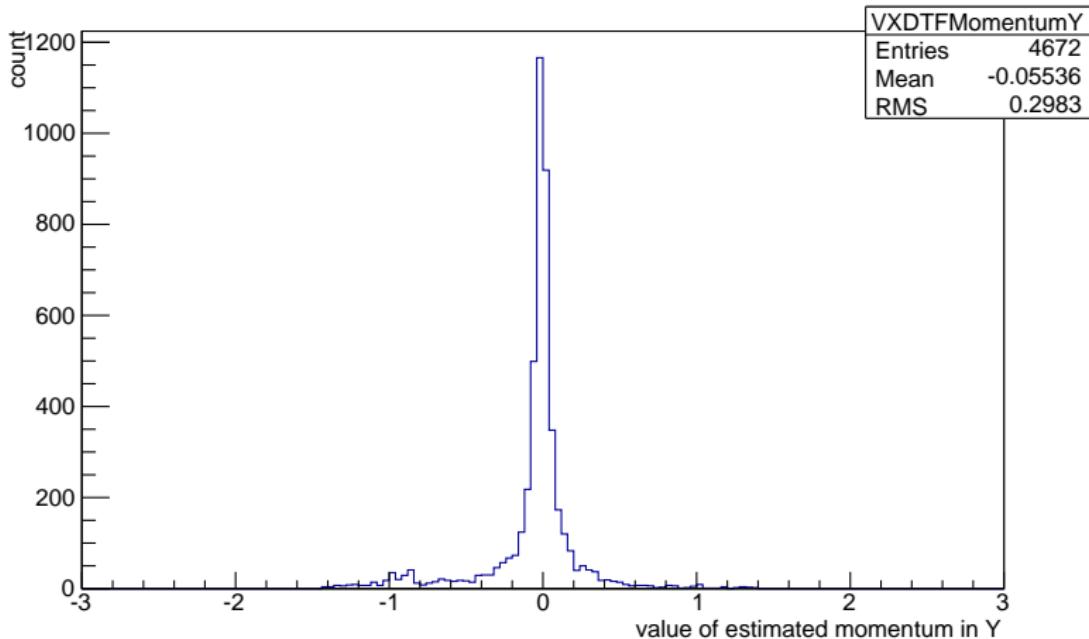
average time consumption:  $2330\mu\text{s}$ , max segment threshold:  
1000

## Seed momentum Y (run414)

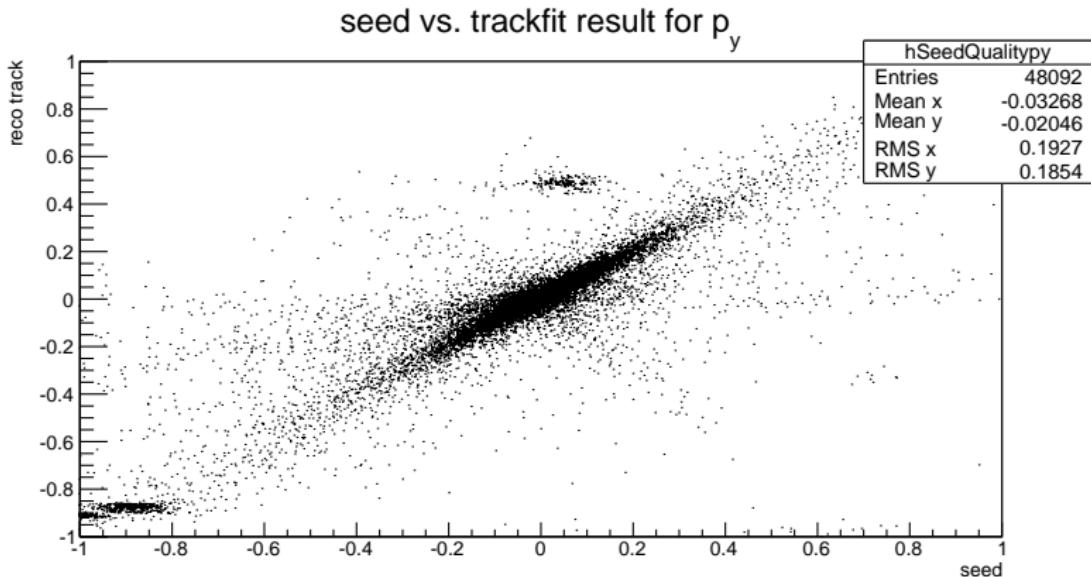


## Seed momentum Y - no baseline (run414)

VXDTF: Momentum in Y estimated



# extrapolated momentum Y (run414)



mode: taking seed, extrapolate to layer 6 and back again → difference to seed momentum