Application of Clustering Method in TB2023 Data

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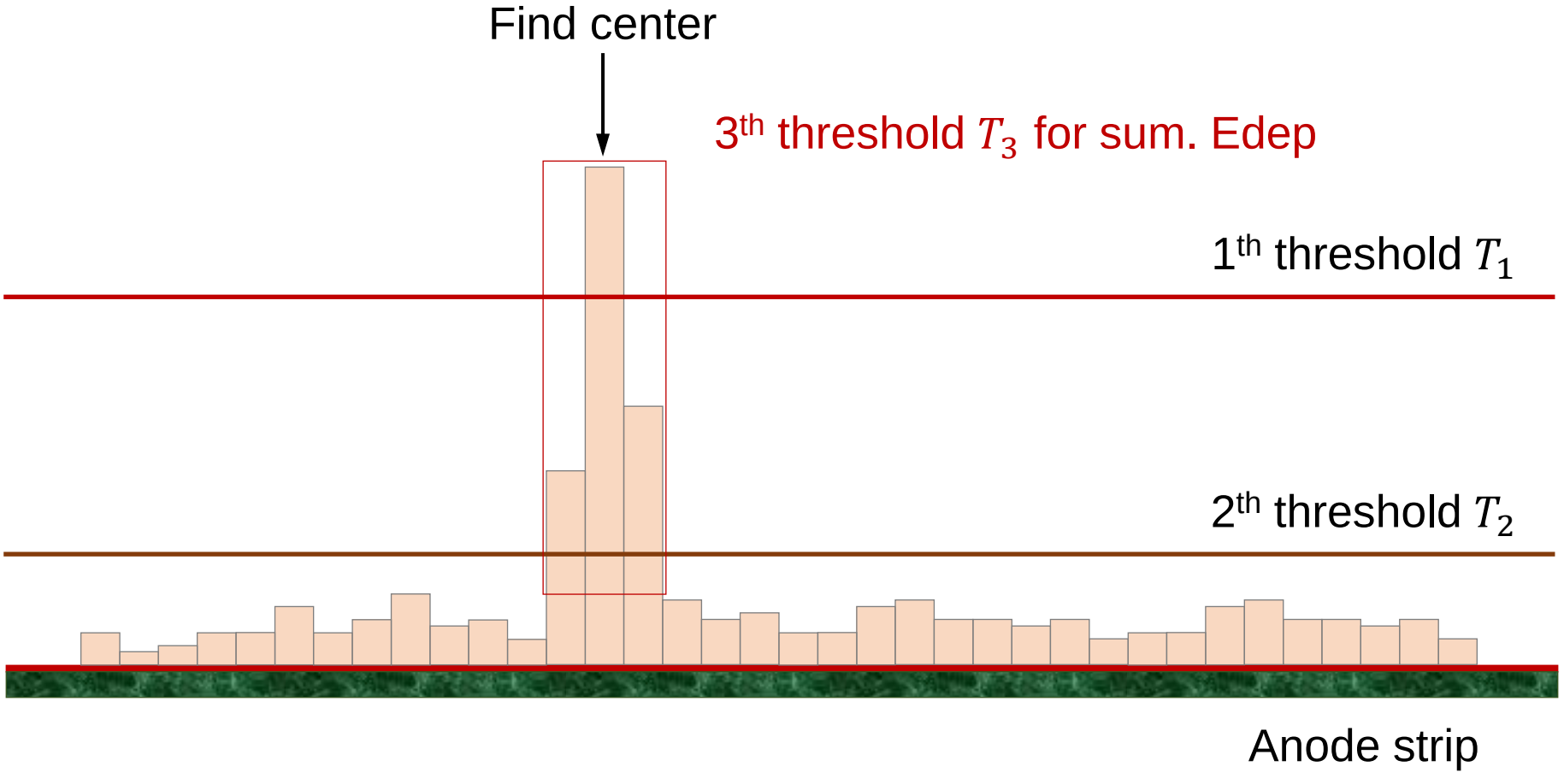
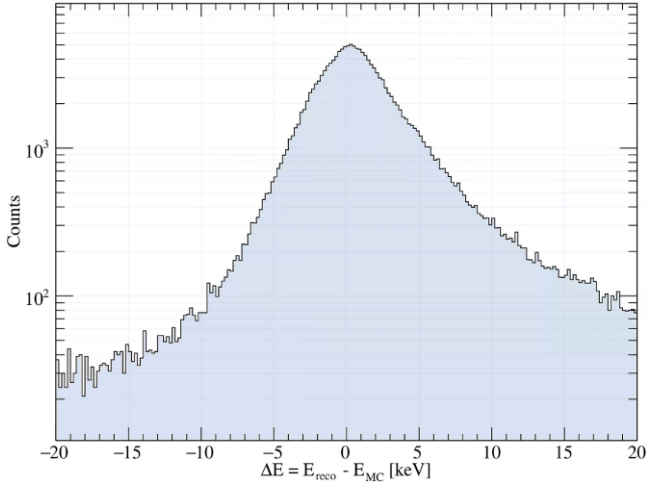
Semi-Clustering Method

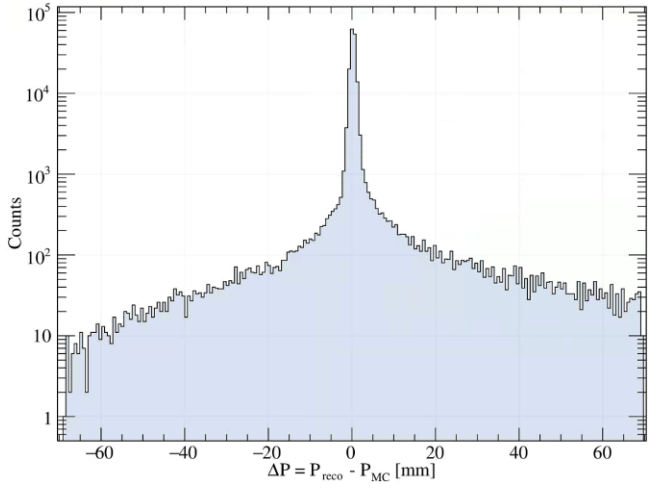
- three thresholds for cluster finding, the first one for center, the second one for nearby channel, the third one for total Edep
- The average dE/dx in Ar is **0.20 keV**
- $\boldsymbol{T_1 = 1.4}$ **keV,** $\boldsymbol{T_2 = 0.7}$ **keV,** $\boldsymbol{T_3 = 6.0}$ **keV**

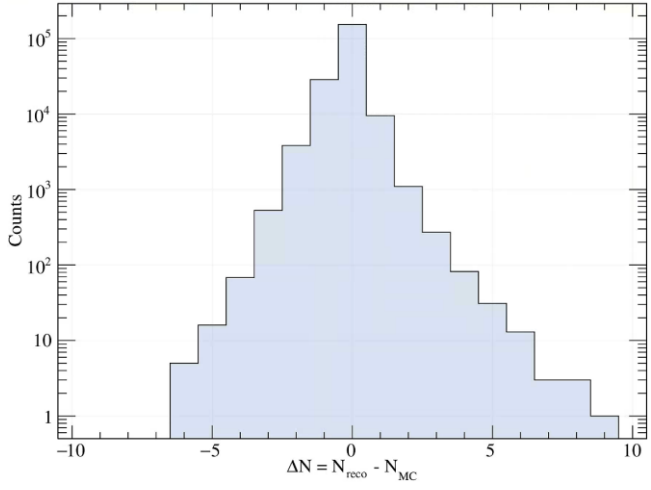


First Application in Simulation Data

- Energy: added the energy resolution in the digitization process, the digitized data shift to the high energy
- Position: elimilated the margin effects in the two ends
- Cluster Number: transverse diffusion

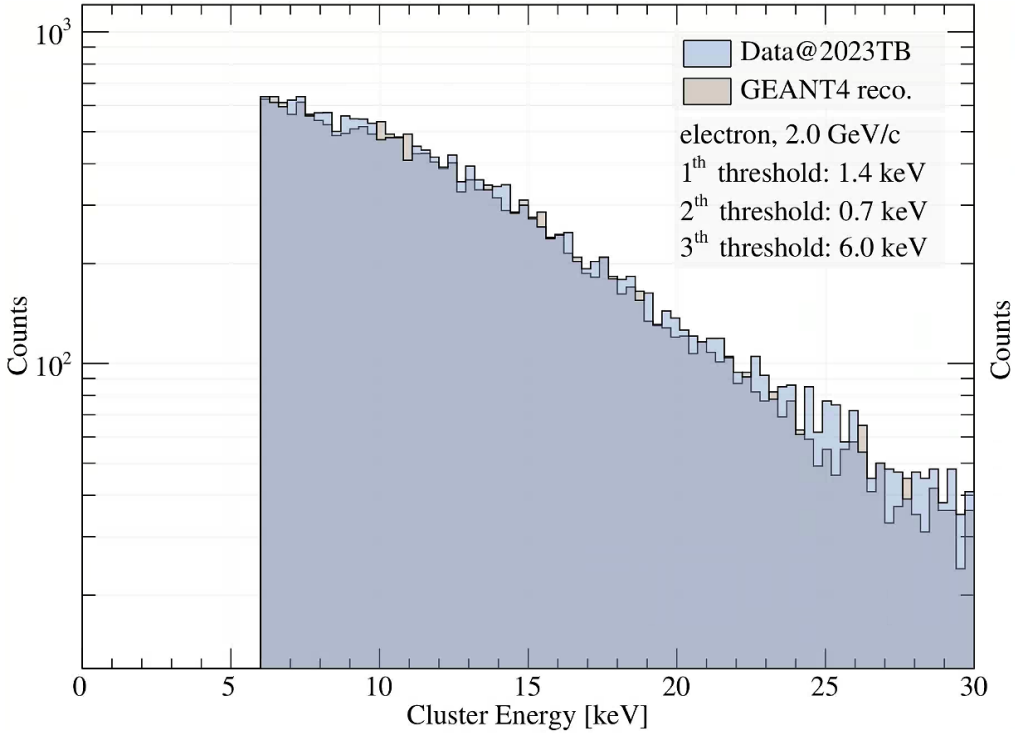


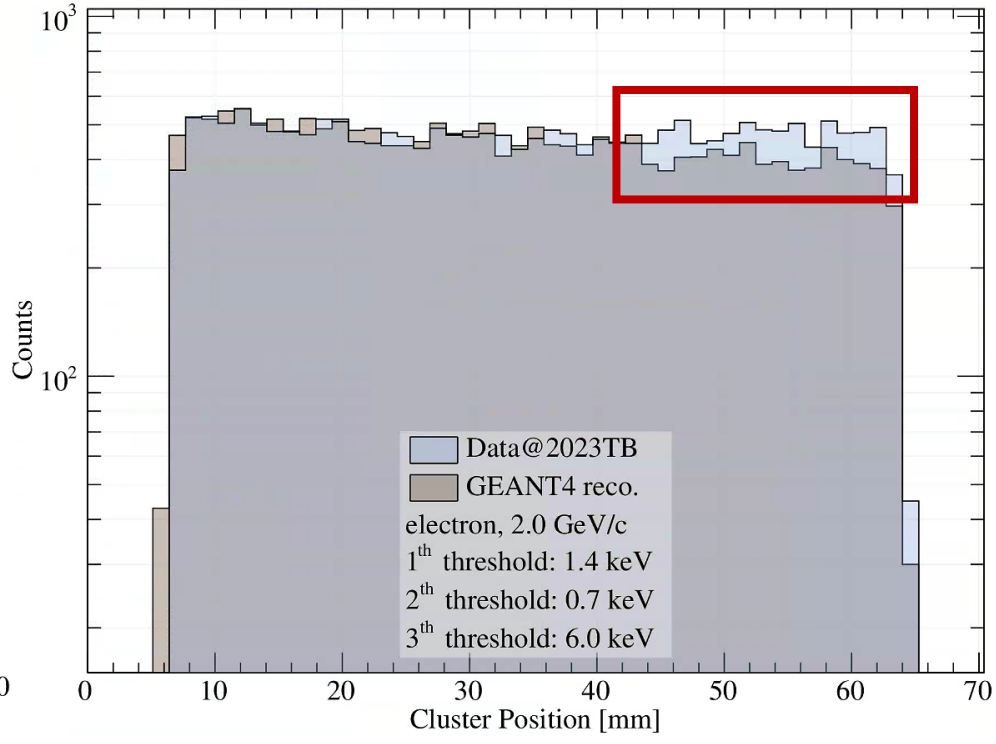




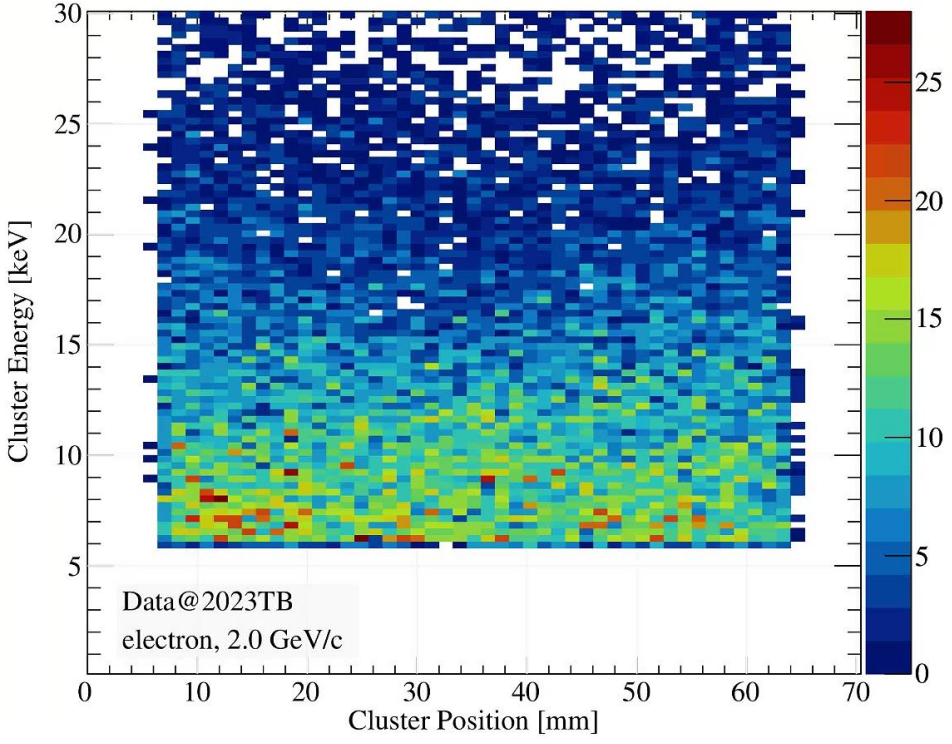
Application in the TB Data

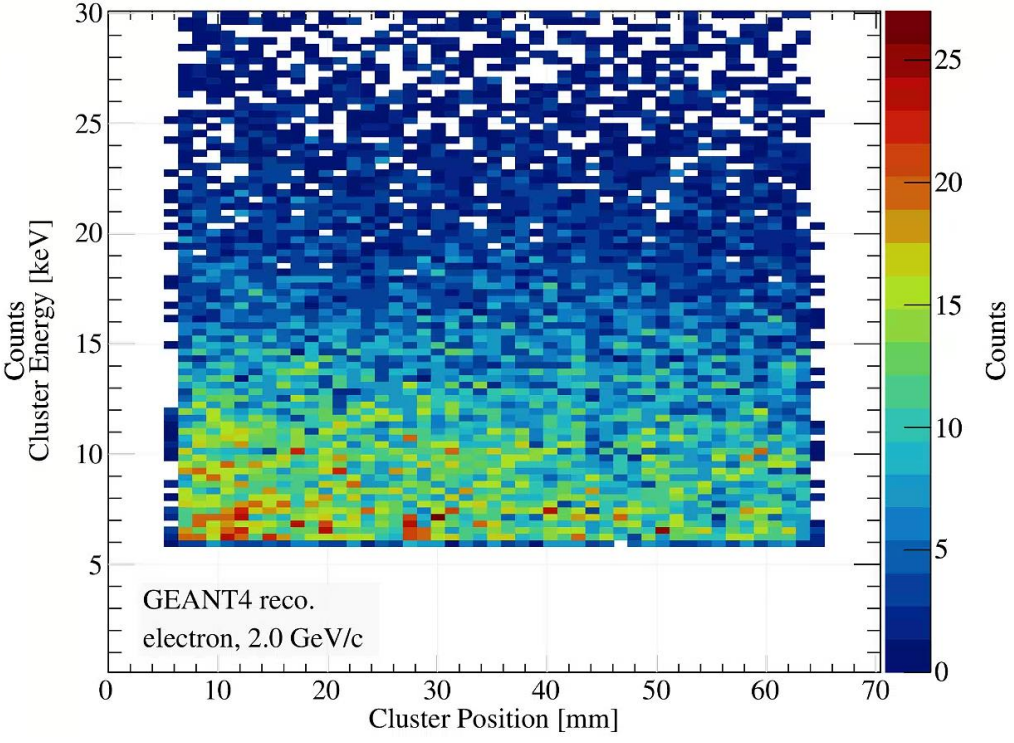
- MC underestimated the number of clusters in the downstream channel
  - high gain in the downstream channel for Data?
  - ~~underestimated the recoil background from the PEEK and field cage (PAIModel not registed in this volume)~~?
  - copper in the THGEM surface, FramePEEK(up and down)



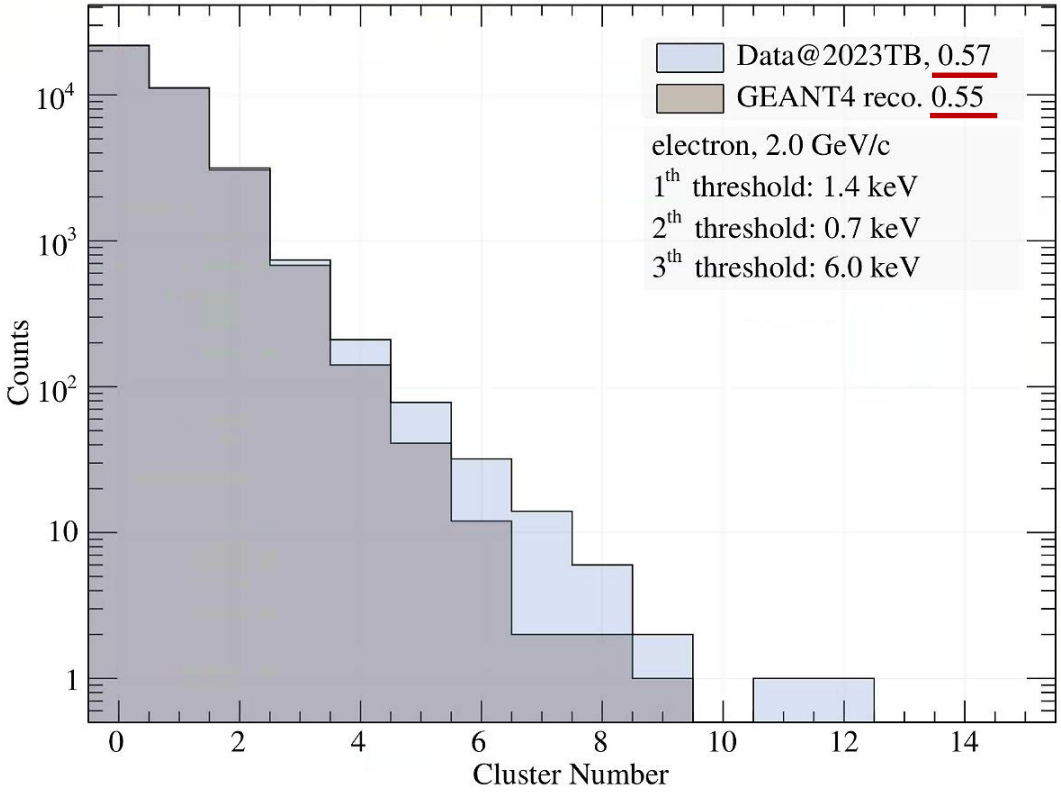


Application in the TB Data





Reconstructed Cluster Number



the cluster number as a function of the beam momentum

P_e [GeV/c]	0.5	0.7	1.0	1.2	2.0	3.0	4.0	5.0
Reco_Data	0.25	0.29	0.36	0.38	0.57	0.65	0.68	0.70
Reco_Sim	0.22	0.26	0.32	0.36	0.55	0.62	0.64	0.64

Next Step

- Optimize the clustering method
- Prepare a comprehensive report on the analysis process of the 2023 TB data