

## Particle identification for the IDEA drift chamber using the cluster counting technique

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The IDEA drift chamber is designed to provide efficient tracking, a high-precision momentum measurement and excellent particle identification by exploiting the application of the cluster counting technique. To investigate the potential of the cluster counting techniques on physics events, a simulation of the ionization cluster generation is needed, therefore we developed algorithms that can use the energy deposit information provided by the Geant4 toolkit to reproduce, in a fast and convenient way, the cluster number and cluster size distributions. The results obtained confirm that the cluster counting technique allows to reach a resolution two times better than the traditional  $dE/dx$  method. In this talk, we will present these cutting-edge algorithms, which play a vital role in identifying electron peaks and discerning ionization clusters. These algorithms have been successfully implemented in the simulation of the IDEA drift chamber, accurately reproducing the distributions of cluster numbers and cluster sizes. Furthermore, we will highlight the integration of these algorithms into the key4hep ecosystem, emphasizing their compatibility and synergistic benefits. By showcasing the capabilities of these algorithms and their seamless integration, we can gain valuable insights into the immense potential of the cluster counting technique in enhancing the performance of the IDEA drift chamber.

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