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Simulation of RPC detectors and comparison of their response at different gas gap lengths

Content

Resistive plate chambers (RPCs) consist of a pair of parallel electrode plates that have high resistivity, typically built out of glass or Bakelite; a high voltage is applied between the electrodes. The plates are separated by a gap in which a mixture of gases circulate, this gap can be from 0.1 mm up to several millimeters. The length of this gas gap is a factor that determines the response velocity of the RPC and its detecting capability. Because RPCs have high temporal and spatial resolution, and they are not too expensive to construct, they have been used in many practical applications as well as for investigation. Several simulations have been described in literature. The simulation of a detector is an important tool for its development and construction because it allows you to test the design and make predictions about its functionality.

In this work we study the response of an RPC with gas gap lengths of 1 mm, 0.5 mm and 0.3 mm with the objective to determine the ideal length that gives the best charged particle detection, temporal resolution and number of particles per area and time. This study is made using the GARFIELD++ framework, using MAGBOLTZ and HEED to generate the simulation of the detector's geometry, the gas composition as well as the fields and electromagnetic interactions that happen inside the detector. The data analysis is done using Python.

Summary

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