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Development of the ALLEGRO Noble Liquid Calorimeter for FCC-ee

The first stage of the Future Circular Collider (FCC-ee), operating as an electron-positron collider, offers an ambitious physics program that sets high demands on detector performance. It is designed for precision measurements in the electroweak sector and for probing potential new physics through the detection of particles with weak couplings to the Standard Model particles. ALLEGRO is among the proposed detector concepts being developed to meet these requirements.

A key component of ALLEGRO is its electromagnetic calorimeter (ECAL), which is based on noble liquid technology currently being developed within the Detector R&D Collaboration for Calorimeters (DRD6). The calorimeter design is tailored to FCC-ee specifications, employing a multilayer readout with straight electrodes to achieve fine segmentation. Such granularity is essential for employing advanced event reconstruction approaches, such as particle flow and machine learning-based techniques. Performance from test measurements of the readout electrode prototypes will be presented and discussed.

The ongoing R&D also encompasses the design and prototyping of the mechanical components of the ECAL, including absorber layers, structural supports, and spacers. Progress toward constructing a beam test prototype will be discussed. Furthermore, the integration of the ALLEGRO detector model and reconstruction tools into the key4hep software framework will be shown, together with projections for its performance.

Secondary track

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