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Development of highly granular hadronic calorimetry with glass scintillator tiles

To achieve precise measurements of the Higgs, W, Z bosons, and the top quark, the future electron-positron colliders, such as the Circular Electron Positron Collider (CEPC), require their detector systems to have an unprecedented high jet energy resolution. Based on the particle flow algorithms (PFA), the CEPC team has proposed a new detector concept named "the 4th detector concept". As one of the key sub-detectors, a novel design of highly granular sampling hadronic calorimetery (HCAL) has been proposed, which major motivation is to significantly improve the hadronic energy resolution using high-density glass scintillator tiles to achieve a higher energy sampling fraction. The Geant4 full simulation was used to evaluate the hadronic performance with single hadrons and the physics potential of the PFA performance for HCAL with glass scintillator tiles (GSHCAL). In addition, the R&D of new glass scintillator materials are ongoing within a collaboration with an aim to achieve high density, high light yield and low cost. We developed a dedicated test system and conducted the beamtest to assess the performance of an individual glass scintillator tile. This contribution will introduce the design and optimization of GSHCAL in simulation, and will also include some experimental results.

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