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The Development and Commissioning of High Granular Scintillator-based Calorimeter of CEPC

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The Circular Electron Positron Collider (CEPC) is a proposed future high-energy lepton collider aimed at advancing our understanding of fundamental physics by exploring Higgs boson with unprecedented precision. A major challenge for the CEPC detectors is achieving a boson mass resolution (BMR) of 4%, which is required to separate the Higgs, Z, and W bosons in their hadronic decays. The baseline design of the CEPC detector was guided by the particle flow algorithm (PFA) concept to satisfy the BMR requirements. The BMR performance obtained by the PFA approach is primarily determined by the shower separation capability and energy resolution of calorimeters in detector system. Both electromagnetic and hadronic calorimeter with high granularity are crucial to meet requirements of separating decay channels by optimizing energy resolution for the desired BMR. Scintillator-based electromagnetic and hadronic calorimeter with analogue readout are potential calorimeter scheme candidates for the CEPC detector. In this presentation, a scintillator tungsten electromagnetic calorimeter (ScECAL) prototype and an analogue hadron calorimeter (AHCAL) prototype will be introduced, where the performance and validation of ScECAL and AHCAL based on Monte Carlo simulations and beam test data, including the energy response to high energy electrons in the range of 1-100 GeV/c are contained.

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