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# CERN beamtests of CALICE scintillator-based calorimeter prototypes

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Various technological options of high granularity calorimetry are being explored and developed within the CALICE collaboration for future collider experiments, including the Circular Electron Positron Collider (CEPC). Two CALICE technological prototypes of scintillator-based calorimeter have been developed for the CEPC to address major challenges of system integration and to demonstrate the mass assembly capability for a final detector which typically requires one to ten million readout channels. An electromagnetic calorimetry (namely CALICE ScW-ECAL) prototype, with scintillator strips ($45 \times 5 \times 2$ mm$^3$) interleaved with copper-tungsten absorber was successfully constructed in 2020, which consists of 32 sampling layers with 6720 readout channels in total and measures ($60 \times 60 \times 40$ cm$^3$ in dimensions and 250 kg in weight. The construction of a sampling hadronic prototype (namely CALICE CEPC-AHCAL) with 40 longitudinal layers of scintillator tiles ($40 \times 40 \times 3$ mm$^3$) and iron absorber plates was completed in 2022. The AHCAL prototype is equipped with totally 12960 readout channels and measures around 1 cubic meter in dimension and roughly 5 tons in weight. Both two prototypes are based on the silicon photomultiplier (SiPM) readout technique and each scintillator strip/tile is individually wrapped and directly coupled with a SiPM (i.e. the “SiPM-on-Tile” design developed within the CALICE collaboration).

A successful beamtest campaign was performed in late 2022 at the CERN SPS H8 beamline for the ScW-ECAL and AHCAL prototypes with high-energy beam particles in the momentum range of 10-160 GeV and decent statistics of data samples was collected, which enable detector performance evaluation, detailed studies of shower profiles in the 3D space and time domain, Geant4 simulation validation as well as particle-flow studies.

This contribution will present the highlights of the prototype developments. Results of the detector performance from beamtest data analysis and studies of electromagnetic and hadronic shower properties will be followed.

New beamtest campaigns of the two calorimeter prototypes were successfully finished at CERN PS-T09 and SPS-H2 during April and May, 2023. Based on the new data sets in the wide energy range from 0.5 GeV to 120 GeV, some preliminary fresh results would also be presented.

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