

## Beamtests of the small-scale crystal module for future high-granularity crystal ECAL

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The future Higgs Factories, e.g. the Circular Electron Positron Collider (CEPC) aiming at precise measurements of the Higgs, W/Z bosons, and the top quark, have stringent requirements on the calorimetry systems to achieve unprecedented jet energy resolutions. A novel high-granularity crystal electromagnetic calorimeter (ECAL) has been proposed for an excellent electromagnetic energy resolution of  $2 - 3\% / \sqrt{E(\text{GeV})}$ . To evaluate the EM performance of the crystal ECAL and identify critical issues on the system level, a small-scale BGO crystal module with  $12 \times 12 \times 24 \text{ cm}^3$  dimensions has been designed and produced for beamtest activities. The BGO crystals have been tested with the radioactive source for calibrations. The specialised PCBs and 3D-printed support structures have been designed to meet the requirements of the crystal module. Beamtest experiments utilising muon, pion, and electron beams have been carried out at the CERN T9 and DESY TB22 beamlines to investigate the EM performance. Geant4 simulations, in conjunction with a dedicated digitisation framework, have been employed to understand the beamtest results and further validate the performance of the crystal ECAL.

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