

CEPC Crystal Calorimeter: R&D status and highlights

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Precise jet energy reconstruction at the Circular Electron Positron Collider (CEPC) requires an advanced calorimetry system. A novel design for a particle-flow-oriented, high-granularity electromagnetic calorimeter (ECAL) has been proposed, featuring orthogonally layered crystal bars with silicon photomultiplier (SiPM) readout and a target energy resolution of $2\text{-}3\%/\sqrt{E} \text{ (GeV)} \oplus 1\%$. After a three-year development and test cycle, a physics prototype with dimensions of $12 \times 12 \times 26 \text{ cm}^3$ ($\sim 25 X_0$) has been constructed. This prototype employs 12 layers of BGO crystals alongside 2 layers of BSO crystals, the latter introduced as a cost-effective alternative and tested for the first time in this configuration. Beam tests conducted at the CERN low-energy T9 and H2 beamlines have been used to characterize its electromagnetic performance. This work provides critical benchmarks and insights for optimizing the crystal ECAL for the CEPC detector.

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