

Development of a Novel Crystal Electromagnetic Calorimeter and Particle Flow Algorithm for Future Lepton Collider Experiments

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As one of the future collider experiments, CEPC aims to achieve extremely precise measurements of Standard Model particles. This necessitates a high granularity imaging calorimeter system and a dedicated Particle Flow reconstruction. In CEPC's reference detector, a homogeneous crystal ECAL is proposed, offering optimal EM resolution, a low photon energy threshold and a promising jet energy response.

This report includes our latest R&D efforts of this ECAL. We have studied the optical properties of BGO crystals and SiPM responses through simulations, comparing the results with measurements obtained in lab. A small-scale module has been developed and tested under beam conditions. At the full detector level, A novel PFA has been developed and its performance has been validated in various scenarios, including the full simulation of 2-jet events in CEPC. The pattern recognition concepts introduced in this PFA could potentially be considered for the reconstruction of other homogeneous ECALs.

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