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Maximum Information Crystal Calorimetry for future Higgs factories

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A novel hybrid dual-readout calorimeter concept consisting of a homogeneous crystal electromagnetic section followed by a fiber-based hadronic section can represent a cost-effective solution to achieve an energy resolution of $3\%/\sqrt{E}$ for EM particles, $27\%/\sqrt{E}$ for neutral hadrons, and 4-5% for 50 GeV jets - a key performance benchmark for physics studies at future e+e- collider experiments.
Such a combined performance in particle reconstruction is the result of boosting the longitudinal and transverse segmentation of the crystals compared to state-of-the-art homogeneous calorimeters and by including the simultaneous readout of the Cherenkov and scintillation light from the same active element using the combination of two independent SiPMs and dedicated optical filters. With these features as well as a state-of-the-art time resolution for electromagnetic showers, this calorimeter concept aims at collecting as much information as possible for use in advanced particle flow dual-readout algorithms.
In this contribution, we present the results of extensive laboratory and beam tests measurements performed in 2024 on single calorimetric cells made of various crystals, SiPMs, and optical filters, which have informed the technological choices for the ongoing construction of a full containment calorimeter prototype.

Primary experiment

DRD6

Authors: BENAGLIA, Andrea (INFN, Milano-Bicocca (IT)); DI FRAIA, Carlo (University Federico II and INFN, Naples (IT)); AUFFRAY HILLEMANNS, Etiennette (CERN); GAUDINO, Giovanni (University Federico II and INFN, Naples (IT)); CUMMINGS, Grace (Fermi National Accelerator Lab. (US)); ZHU, Jessaly; DELENNE, Julie Genevieve (Universite de Strasbourg (FR)); BORRIELLO, L (INFN Sez. di Napoli); FAVILLA, Leonardo (Scuola Superiore Meridionale & INFN Naples Section (IT)); GUAN, Liang (University of Michigan); Mr ROUX, Louis (CERN); CAMPAJOLA, Marcello (University Federico II and INFN, Naples (IT)); FRANCESCONI, Marco (INFN Sezione di Napoli (IT)); LUCCHINI, Marco Toliman (Università & INFN, Milano-Bicocca (IT)); PERNA, Simone (Universita Federico II e INFN Sezione di Napoli (IT)); MONETA, Stefano

Presenters: BENAGLIA, Andrea (INFN, Milano-Bicocca (IT)); LUCCHINI, Marco Toliman (Università & INFN, Milano-Bicocca (IT))

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