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Combining Dual-Readout Crystals and Fibers in a Hybrid Calorimeter for the IDEA Experiment

Crystal calorimetry has a long history of pushing the frontier of high energy resolution measurements for EM particles. Recent technological developments in the fields of crystal manufacturing and photodetector developments (SiPMs) have opened new perspectives on how a segmented crystal calorimeter with dual-readout capabilities could be exploited for particle detectors at future collider experiments. In this contribution, we will discuss how a EM crystal calorimeter can be cost-effectively integrated with the fiber-based calorimeter of the IDEA detector to achieve an energy resolution of 3%/√⊠ for EM particles and about 27%/√⊠ for neutral hadrons. Simulation studies have also shown that dedicated particle flow algorithms exploiting the dual-readout method in such a longitudinally segmented hybrid calorimeter can achieve an energy resolution close to 5\% for 50 GeV jets. Such a detector has the potential to expand the landscape of precision physics studies at future e+e- colliders exploiting its state-of-the-art resolution for low energy photons.

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