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Dual readout crystal calorimetry for precision measurements at future colliders

While adequately supporting the construction, operation, and physics mission of the High Luminosity LHC (HL-LHC) begins to build the foundation for the HEP calorimetric techniques of the future, increased investment in calorimetry R&D is needed to meet the demands of future colliders. The calorimeters of the collider experiments beyond the HL-LHC, for both lepton machines and future hadron machines, demand top-of-the-line energy resolution, precision timing information, and sufficient granularity. In the precision arena, dual readout (DR) techniques serve to increase the hadronic energy resolution of calorimeter systems by accessing more information available in an event: both the Cerenkov and scintillation light that result from the particle interactions with the material. I am advocating for DR crystal calorimetry that targets increased hadronic energy resolution in precision electromagnetic calorimeters, thereby improving the overall system performance at Higgs factories and beyond. DR crystal calorimeters can further exploit longitudinal segmentation for particle ID and timing information to recover high-occupancy performance. By supporting DR calorimeter R&D now, we can build the optimal calorimeter for future machines.

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