5.3 Hybrid Dual-Readout Calorimetry

Jet energy resolutions of 3-4% for jets with p_T of 50-150 GeV while still maintaining state-of-the-art measurements of electrons/photons has been achieved in full simulation designs of hybrid dual-readout calorimeters [2]. Figure 2 shows a view of the particle flow composition of a hybrid dual-readout calorimeter and corresponding improvements on the jet resolution from raw, dual-readout and dual-readout with PFA. For this technology to the basis for a future e^-e^- collider, significant test beam verification has to be achieved in advance of the 2031 milestone for deciding on calorimeter designs as part of a full detector conceptual design report.

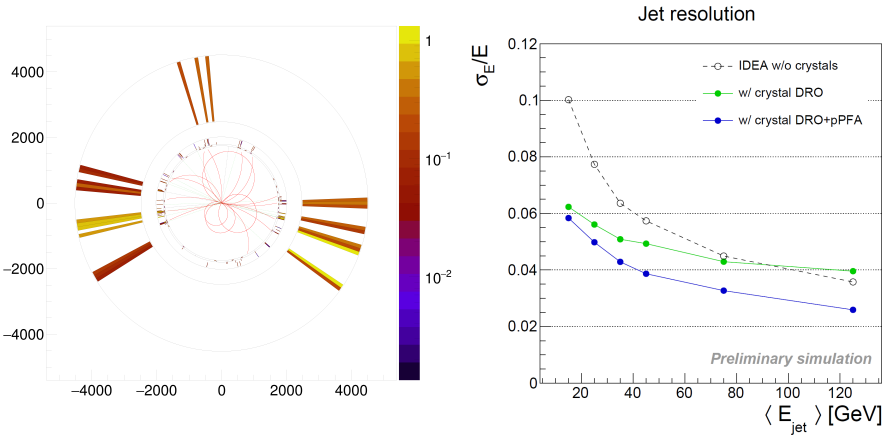

Figure 2: [left] Typical Z to dijet event, showing charged tracks in the tracker, hits in the electromagnetic calorimeter, and then hits in the spaghetti-type dual readout [right] Jet energy resolution for a hybrid dual readout calorimeter with a simple custom particle flow algorithm.

Title: Hybrid Dual-Readout Calorimetry
Description: Test Beam verification of the dual-readout resolution gains and photon/electron resolution. Smaller-scale channel counts at Phase 1, and combined cubic meter scale at Phase2
Duration: Phase 1 (2023-2028), Phase 2 (2029-2033)
Priority: High (ECFA red)
Justification: One of the leading, enabling calorimeters for the highest jet and electromagnetic resolutions for high granularity PFA with precision timing.
Institutes:
Argonne National Laboratory, Fermilab, Oak Ridge National Laboratory, Caltech, University of Maryland, University of Michigan, MIT, Princeton University, Purdue University, Texas Tech University, and University of Virginia.

5.4 US Calorimeter Institutions

Institutions responding to survey and expressing interest in calorimeter detector development for future e^+e^- colliders: