



Contribution ID: 222

Type: **Talk**

Test-Beam Results of a Dual-Readout Calorimeter for Future Colliders

Tuesday 18 February 2025 14:25 (20 minutes)

Future high-energy e^+e^- collider experiments, such as the Future Circular Collider (FCC) and the Circular Electron Positron Collider (CEPC), will prioritize precise measurements of Higgs boson properties while exploring electroweak interactions, quantum chromodynamics and heavy-flavour physics. An excellent calorimetric performance is vital for identifying significant processes through the measurement of invariant masses of final-state objects.

The IDEA detector, as outlined in the FCC and CEPC CDRs, features a dual-readout (DR), fiber-based calorimeter. The design includes rows of scintillating fibers and optical fibers for Cherenkov light measurement, with SiPM readout. This setup enhances energy measurements for hadronic showers while maintaining good resolution for electromagnetic showers, all within a single unsegmented calorimeter. Its lateral segmentation facilitates the separation of closely spaced energy deposits from different particles, and fast optical sensors provide timing information for advanced reconstruction techniques.

The DR community is developing prototypes to demonstrate the design feasibility and scalability and to validate the simulations. This contribution introduces the DR technique and an overview of the prototype construction methods. Results from test-beam campaigns in 2023 (electromagnetic-shower-sized prototype) and 2024 (closer to an hadronic-shower-sized prototype) at CERN SPS are presented.

Primary experiment

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Session Classification: Calorimetry

Track Classification: Calorimeters