Contribution ID: **330** Type: **Poster**

Exploiting Pulse Shape Discrimination for Dual-Readout Calorimetry based on Inorganic Scintillating Crystals

Tuesday 18 February 2025 16:10 (20 minutes)

Inorganic scintillating crystals are used in high-energy physics to build homogeneous calorimeters with an energy resolution for electromagnetic particles significantly better than traditional sampling calorimeters. However, for hadronic particles, the event-by-event fluctuations of the electromagnetic fraction of hadronic showers (fem) deteriorate the performance of the calorimeter. To adress this issue, dual-readout calorimetry can be exploited to estimate the fem on an event basis by extracting the scintillation and Cherenkov contributions of the signal. Instead of using two photodetectors or different materials to extract the signal's contributions as usually proposed, the presented study shows the possibility and effectiveness of the pulse shape discrimination (PSD) with a single photodetector readout. A testbeam has been done at CERN SPS facility with a prototype made of PbWO4 crystal. The presentation will discuss both Monte-Carlo simulations and testbeam results where the PSD feasibility has been exploited on a homogeneous electromagnetic calorimeter made of a PbWO4 crystal which leads to a better energy resolution for hadrons and particle identification.

Primary experiment

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Session Classification: Coffee & Posters A

Track Classification: Calorimeters