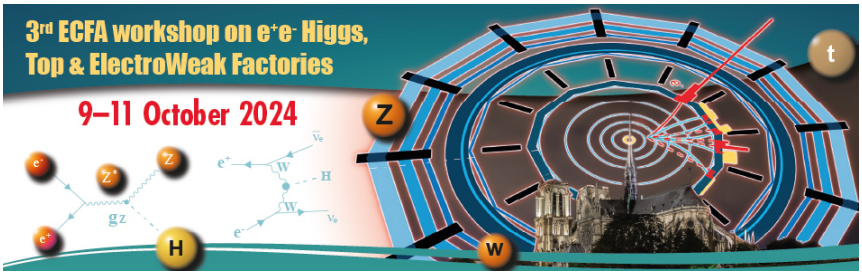

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SDHCAL evolution: Time integration and algorithmic improvements for the APRIL Particle Flow.

Wednesday 9 October 2024 18:40 (2 minutes)

The SDHCAL (Semi Digital Hadronic Calorimeter) is a hadronic calorimeter for Particle Flow. It is proposed for future e+e- Higgs factories projects as a baseline for different detectors. A technological prototype has been built within the CALICE collaboration. This prototype is a sampling hadronic calorimeter using large GRPC (Glass Resistive Plate Chamber) as active medium with embedded readout electronics. The size of the GRPC prototype is 1 m². The readout PCB consists of 1 cm² copper pads on one side and 64-channel HARDROC readout chips on the other. Each chip processes the signal arriving on a 64 cm² square.
Sophisticated clustering algorithms that fully exploit the highly granular information to separate energy deposition from charged and neutral particles are required to achieve the best jet energy resolution for Particle Flow Algorithms (PFA). APRIL, a PFA based on the ARBOR concept, has been developed. The ARBOR concept reconstructs showers as spatial trees and APRIL is an implementation of this concept in the PandoraSDK framework.
To improve the separation of showers for the PFA, the use of time information can be useful. On the hardware side, this can be done with better than 100 ps time resolution by replacing single GRPC with multi-gap GRPC. On the software side, in order to take full advantage of the added time information, an adaptation of the PFA is also required. Work has been done to improve the SDHCAL reconstruction. The ILD detector has been used as a baseline for these studies. New methods for the reconstruction of the hadronic energy in the SDHCAL have been investigated. Improved energy corrections are currently being tested. Work is also progressing on cleaning the APRIL PFA and preparing it to become a time PFA.
The poster will describe the current SDHCAL prototype. The planned hardware evolution will be presented. It will focus on software improvements for hadronic shower reconstruction, including PFA and energy reconstruction. Potential improvements that can be achieved will be discussed.

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