Contribution ID: **334** Type: **Talk**

Cluster timing and leakage in time at the CEPC baseline Calorimeter

Tuesday, 25 October 2022 11:00 (15 minutes)

We discuss the time spectra of showers from photons, muons, and charged pions, simulated in the CEPC electromagnetic calorimeter (ECAL). We present an algorithm for timing reconstruc- tion in highly granular calorimeters (HGC). Assuming the intrinsic hit time resolution measured by the CMS collaboration is accessible, the particle Time-of-Flight (ToF) can be measured with a resolution of 5 ~ 20 ps for electromagnetic (EM) showers and 80 ~ 160 ps for hadronic show- ers above 1 GeV. e ToF resolution depends linearly on the timing resolution of a single silicon sensor and improves statistically with increasing incident particle energy. A clustering algorithm that vetos isolated hits improves ToF resolution. In addition, hadronic showers include extremely slow components. In Z->qq events, there is around 1% (10%) ECAL (HCAL) energy deposited a er one microsecond, which may leak out from the triggering window of the corresponding event and pile-up into the a er events.

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Session Classification: Calorimeter