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Design and performance studies of the calorimeter system for a FCC-hh experiment

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The physics reach and feasibility of the Future Circular Collider (FCC) with centre of mass energies up to 100 TeV and unprecedented luminosity has delivered a Conceptual Design Report early 2019. The new energy regime opens the opportunity for the discovery of physics beyond the standard model. 100 TeV proton-proton collisions will produce very high energetic particle showers in the calorimeters from both light jets and boosted bosons/top. The reconstruction of such objects sets the calorimeter performance requirements in terms of shower containment, energy resolution and granularity. Furthermore, high-precision measurements of photons and electrons over a wide energy range are crucial to fully exploit the FCC-hh physics potential, especially given the large amount of collisions per bunch crossing the detectors will have to face (pile-up of ⟨⊠⟩=1000).

We will present the current reference technologies for the calorimeter system of the FCC-hh detector: Liquid Argon (LAr) as the active material in the electromagnetic calorimeters, and the hadronic calorimeters for |⊠|>1.3 (Endcap and Forward region), and a Scintillator-Steel (Tile) calorimeter as hadronic calorimeter in the Barrel region. The talk will focus on the performance studies for single particles and jets in the combined calorimeter system. We will introduce the simulation framework and the reconstruction chain, that includes the calibration and clustering of calorimeter cells and the estimation of pile-up induced, and electronics noise. In conclusion, the achieved performances will be compared to the physics benchmarks of the FCC-hh experiment.

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