UCLA NUCLEAR PHYSICS SEMINAR

Development of a highly granular scintillator-tungsten electromagnetic calorimeter prototype for the CEPC

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Driven by the physics program at the Circular Electron Positron Collider (CEPC) for Higgs and electroweak physics, all possible final states need to be separately identified and reconstructed with high sensitivity. Properties agree with the particle flow algorithm principle, which makes use of the optimal sub-detector to determine the energy/momentum of each final particle. The electromagnetic calorimeter is required to have not only good energy resolution but an unprecedented three-dimensional spatial resolution for shower separation. An electromagnetic calorimeter, which features finely segmented and highly lateral granular, has been designed and optimized within the CALICE collaboration and CEPC calorimeter working group. Scintillator strips and silicon photomultipliers (SiPMs) are instrumented as sensitive layers and tungsten-copper alloy plates as absorber material. A complete technological prototype with 32 sampling layers with over 6700 channels in total has been constructed and commissioned in the middle of 2020. The whole prototype measures around 600*600*400 mm^3 in dimensions and roughly 250 kg in weight. A long term cosmic ray test (more than one month) has been performed for detailed studies of this prototype to quantitatively evaluate the key performance, including the position resolution and cell-to-cell response calibration, etc. This talk will cover some highlight aspects in the development process and some key performances of the ScECAL prototype.

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