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Silicon-tungsten calorimetry for future high energy e+e- collider

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Content

Particle Flow Algorithms (PFA) aimed at the jet reconstruction at the particle level, yield the most precise jet energy resolution, up to a factor of two better than the traditional calorimetry. For the precise jet "pattern recognition", highly granular calorimeters are required. They have being developed by the CALICE collaboration starting from the beginning of 2000's. The most demanding requirements are for the electromagnetic calorimeter (ECAL). The silicon-tungsten (SiW) ECAL technology, though expensive, provides the best performance with an excellent granularity. We shall discuss the R&D and the recent results in this field in the talk.

In 2005-2012, CALICE collaboration has built and tested the "physical prototypes" of highly granular calorimeters to test PFA approach. We report the recent studies performed in 2016-17 on the recognition of two close by electromagnetic and electromagnetic-hadronic showers obtained with the event mixing, and also on the tests of the hadronic interaction models with SiW ECAL physical prototype.

From 2012 until present, the SiW ECAL group develops the new generation of the prototypes, called "technological", with fully embedded electronics. It should be suitable for the future e+e- high energy collider like ILC. A similar technology has been approved for the phase II CMS calorimeter endcaps upgrade (HGCAL project) and is also considered for the ATLAS preshower upgrade (HGTD project) and the LHCb inner ECAL upgrade. Although the LHC upgrade projects will be briefly mentioned, the main focus in the talk will be on the development and the optimization for ILC. The recent test beam results at SPS in CERN will be discussed in detail.

Summary

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