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Technological Prototype of a Silicon-tungsten Imaging Electromagnetic Calorimeter.

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Particle Flow Algorithm (PFA) and highly granular
calorimeters can achieve the best jet energy resolution aiming at precise physics measurements. As shown by years of R&D within the CALICE collaboration the silicon-tungsten imaging electromagnetic calorimeter provides the best
granularity, stability and jet resolution. Our concept has been selected to compete for the upgrade of the CMS ECAL.
The latest version of our detector concept, featuring 1024 channels on 4 dm2 pcb will be presented including technological choices for an application on an ILC. First thougths for the CMS ECAL upgrade will be discussed.

Summary

Different detector concepts have been developed, in particular the ILD proposal for an ILC has been published in the form of a letter of intent on the 31th of March 2009. The Particle Flow Algerithm consists in measuring independently the particles constitutive of the jet. Using such a method, a high spatial granularity had been identified to have a major impact on energy resolution.
The grain of the collision picture is about 1000 times better than ALEPH or any LHC detector: about 100 Mpixels. This technique can improve the jet resolution by a factor two and the incidence on the effective luminosity is more than two.
A similar silicon-tungsten technology has been recently proposed for the Phase 2 upgrade of CMS endcap calorimeter, and for the TLEP (CERN) and the CEPC (Bejing) future high energy circular collider projects.

Based on the SKIROC2 chip designed by the OMEGA group, the latest version of our detector module features 1024 channels on a 18cm x 18cm PCB. The tests are on-going at LLR. The detector modules can be assembled together in order to build detector slabs up to 2m for the ILD end caps, this requires a specific PCB design.
The asic are packaged into LF-BGA allowing to put 16 of them a single detector module. A specific decoupling scheme is used to control the noise. In addition, for the application to ILC, the electronics is power-pulsed. The require a proper power distribution with local storage base on carbon foam super-capacitances. Developments are on going to allow controlling a slab (10000 channels) with a single serial link and a set of about ten slabs with a simple GBETH interface.

An overview the technologies used for and ILC application will be shown, test results will be presented and changes for other detector a circular collider will be discussed.

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