Contribution ID: **1040** Type: **Parallel session talk**

Analyses of test beam data using the CALICE calorimeter

Friday, July 22, 2011 4:45 PM (15 minutes)

The CALICE collaboration has developed highly granular calorimeter prototypes to evaluate technologies for experiments at a future lepton collider, and evaluated their performance in test beams. One important use of these data is the validation of the physics models in GEANT4, especially those related to hadronic showers. This validation is crucial if Monte Carlo simulations are to be used to optimise the design of detectors for ILC or CLIC.

In this talk we discuss several features of hadronic showers recorded in the CALICE Si-W ECAL and scintillator-tile HCAL. The high spatial resolution of the calorimeters permits the investigation of shower shapes in unprecedented detail. For example, the start point of the shower can be identified with high precision, and the longitudinal development of the shower after this point permits some discrimination between the various components of the shower (nuclear spallation, electromagnetic components, MIP-like hadrons etc.). Detailed substructure within the shower, such as track segments, can also be identified. Many of these features present new challenges to the simulation models. We also report on recent tests of the time-structure of hadronic showers in a tungsten calorimeter - a topic of especial interest for a CLIC detector where accurate time stamping is required.

The calorimeters being built and tested by the CALICE collaboration are intended to be optimised for particle flow (PFA) reconstruction of jets at a future linear collider. This places an emphasis on measuring showers with a high spatial granularity, in order that nearby showers can be disentangled. The calorimeters are generally non-compensating, in other words they do not give the same response to photons as charged hadrons. However, the high level of detail recorded within the showers can be exploited in the form of "software compensation". A variety of techniques can be used to discriminate between the different components within showers and hence to weight them differently so as to improve the energy resolution. This approach is also found to improve the linearity of the response. We report on several studies along these lines.

The CALICE data on single pion showers can also be exploited to validate the particle flow concept. By superimposing the data from two separate showers, removing the incoming particle track from one of them, we can emulate a neutral hadron shower in the neighbourhood of a charged particle, at various separation. By offering these hybrid events to the standard PandoraPFA algorithm we can evaluate its ability to reconstruct neutral energy in a difficult environment. We show the results of this procedure, in comparison with the Monte Carlo models usually used for the testing of PFA codes.

Primary author: Mr DANILOV, Mikhail (ITEP-Moscow)

Presenter: Mr DANILOV, Mikhail (ITEP-Moscow)

Session Classification: Detector R & D and Data Handling

Track Classification: Detector R & D and data handling