



Contribution ID: 150

Type: Poster (Session A)

The Zero Degree Calorimeters for the ALICE experiment

The Zero Degree Calorimeters (ZDCs) for the ALICE experiment will estimate the centrality of the ion-ion collision by measuring the energy carried away by the non-interacting nucleons (spectators). The spectator protons and neutrons will be separated from the ion beams by the separator magnets of the LHC beam optics and respectively detected by the proton (ZP) and the neutron (ZN) calorimeters. ZDCs are spaghetti calorimeters, which detect the Cherenkov light produced by the shower particles in silica optical fibres embedded in a dense absorber. The technical characteristics of ZP and ZN detectors are described. The calorimeters have been tested at the CERN SPS using hadron and electron/positron beams with momenta ranging from 50 to 200 GeV/c; the ZN detector's behaviour has also been studied with an Indium beam of 158 A GeV/c. The beam test results are presented: the calorimeters' response, the energy resolution and the localizing capability. Also the signal uniformity and a comparison between the transverse profile of the hadronic and electromagnetic shower are discussed. Moreover the differences between the ZP detector's responses to protons and pions of the same energy have been investigated, exploiting the proton contamination in the positive pion beams.

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