

/opt/indico/archive/2016/C8/40222322483

_logo_small.jpg

Contribution ID : 148

Type : **Contributed Oral**

Micro-channel plates in ionisation mode as a fast timing device for future hadron colliders

Thursday, 2 March 2017 18:00 (0:20)

Content

Future high rate hadron colliders are expected to have hundreds of concurrent proton-proton interactions in the same bunch crossing, deteriorating the reconstruction of the hard scattering event and the identification of calorimeters. The possibility to distinguish neutral particles coming from different interaction vertices is being pursued as a tool to reduce pile-up contamination in calorimeters, and restore optimal performance. At the high luminosity LHC (HL-LHC) about 200 concurrent interactions are expected, with a spread between the interaction vertices of few centimeters in the beam direction and 200ps in the collision time. A time of flight resolution of the order of 30 ps would be able to reduce neutral particles pile-up contamination at the calorimeter level of about one order of magnitude, restoring pile-up conditions similar to what is routinely sustained in the current run of the LHC. Micro-channel plates have been used in PMT configuration as fast charged particles detector (resolution of better than 20 ps have been achieved with commercial devices), however they are not particularly radiation tolerant, mostly due to the ion feedback on the photocathode. The possibility of using micro-channel plates without a photocathode (i-MCP) has been studied in several test beams. Different MCP geometries are compared with the goal to identify the optimal configuration. Efficiency of more than 70% with a time resolution of better than 40 ps are achieved for single charged particles, leading to an efficiency close to 100% for EM shower after few radiation lengths. This opens the possibility to use i-MCPs as a timing layer in a sampling calorimeter or to use it in a pre-shower device independent from the calorimeter technology.

Summary

Primary author(s) : Mr. BARNYAKOV, Alexander (BINP, NSU, NSTU)

Co-author(s) : Mr. SANTANASTASIO, Francesco (Università di Roma “La Sapienza” and INFN, Sezione di Roma1); Mr. BARNYAKOV, Mikhail (Budker Institute of Nuclear Physics); Dr. TABARELLI DE FATIS, Tommaso (Università di Milano Bicocca & INFN - Sezione di Milano Bicocca); Dr. MERIDIANI, Paolo (Università di Roma “La Sapienza” and INFN, Sezione di Roma1); Mr. PIGAZZINI, Simone (Università di Milano Bicocca and INFN, Sezione di Milano-Bicocca)

Presenter(s) : Mr. BARNYAKOV, Alexander (BINP, NSU, NSTU)

Session Classification : Particle identification

Track Classification : Particle identification