

A fast timing calorimetric layer using micro-channel plates in ionisation mode

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At the HL-LHC, more than 140 concurrent pp interactions, will deteriorate the energy resolution and identification capabilities 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. A time of flight resolution of the order of 30ps will be able to reduce pile-up contamination of about one order of magnitude. Micro-channel plates can be used in PMT configuration as fast charged particles detector (resolution of better than 30ps can be achieved), but are not particularly radiation tolerant due to ion feedback on the photocathode. The possibility of using micro-channel plates without a photocathode (i-MCP) has been studied in 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 40ps 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. Preliminary results on the radiation hardness of the i-MCP configuration will be also presented.

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