VCl2022 - The 16th Vienna Conference on Instrumentation



Contribution ID: 351

Type: Recorded Presentation

Time based energy discrimination and pileup recovery for analog SiPM readout

The development of solid state photodetectors likesilicon photomulipliers (SiPMs) has paved the way for a newgeneration of radiation detectors. By utilizing high frequency readout electronics it is possible to access information carried by the first few detected photons. This opens the door for a fully time based detector design without classical charge integration or time over threshold measurement of the full scintillation pulse. Analog SiPMs can be treated in a digital like approach by using two or more time thresholds. In order to validate the feasibility of time based energy discrimination several types of time based estimators were experimentally evaluated with commercially available SiPMs and LYSO:Ce crystals upon 511 keV γ -excitation. By measuring the SiPM signal rise time within the first 150 ps, an error rate below 10 % for photopeak discrimination was achieved.

Moreover, pile-up on the leading edge of the signal pulse induces a sudden change in the leading edge shape. Monitoring this shape fluctuation could prove crucial to identify pile-up at future high-luminosity colliders.

Primary experiment

Author: Mr KRATOCHWIL, Nicolaus (CERN)

Co-authors: MARTINAZZOLI, Loris (Universita & INFN, Milano-Bicocca (IT)); GUNDACKER, Stefan (Institute for Experimental Molecular Imaging, RWTH Aachen University, Germany); FRANK, Isabel (Ludwig Maximilians Universitat (DE)); PIZZICHEMI, Marco (Universita Milano-Bicocca (IT) and CERN); AUFFRAY, Etiennette (Cern)

Presenter: Mr KRATOCHWIL, Nicolaus (CERN)

Track Classification: SiPM