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VMM3a ASIC as a potential front end electronics solution for future Straw Trackers

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A custom Application Specific Integrated Circuit (ASIC) VMM3a is developed by Brookhaven National Laboratory (BNL) and is capable of simultaneous precise measurements of both the charge and time characteristics of signals in gaseous detectors. The flexibility of its operation modes makes it attractive as a front-end electronics solution for a wide range of applications, including readout systems of Straw Trackers in future High Energy and Neutrino Physics experiments.

We present the first results on the performance of straw drift tubes operated with a VMM3a-based readout implemented by RD51 collaboration (CERN) within the Scalable Readout System (SRS). A dedicated measurement setup developed at JINR allows to study the readout performance with generator test pulses, cosmic ray muons and radioactive sources. Along with the laboratory studies, we overview the results obtained with SPS muon beam at CERN.

We present also examples of Garfield simulation of a straw tube response interfaced to the PSpice electronics simulation package. This approach allows efficient optimization of the signal circuit path and VMM3a operation mode, and supports performance studies for Straw Trackers operated in the magnetic field and with different gas mixtures.

Future potential applications of VMM3a include the Straw Tube Trackers for the Near Detector complex of the DUNE experiment, the central tracker of the SPD experiment at NICA, and the Spectrometer Straw Tracker of the SHiP experiment.

Collaboration

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