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Application of SiPM arrays for the readout of a scintillator based time-of-flight detector

A study of feasibility of replacing a conventional phototube with an array of SiPMs is presented. High gain, low voltage operation and insensitivity to the magnetic field make SiPMs practically useful for the light collection in a physics experiment. In addition, sensors can be assembled in a compact system which is easily scalable. In this study an array of large area SiPMs was coupled directly to the end of a long plastic scintillator counter. The principal restriction for applications requiring accurate evaluation of the photons arrival time is the large capacitance of SiPM which results in broadening of the signal shape. A natural solution of the problem is to amplify and readout a large SiPM surface in parts. In this study an 8 channel SiPM anode readout ASIC (MUSIC R1) based on a novel low input impedance current conveyor is used. The evaluation board provides individual single ended outputs and the sum of signals. Both analog and digital outputs are supported by the board. Prospects for applications in large-scale particle physics detectors with timing resolution around 100 ps are provided in light of the results.

Experimental Collaboration

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