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18. Multi-dimensional measurement ASIC for Micro-Pattern Gas Detectors

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Abstract

Micro-Pattern Gas Detectors are cost-effective, enabling large-area, continuous charged-particle detection with less detection material. Their wide application and rapid development raise the demand for high sensitivity, integration, and resolution. Silicon pixel detector ASIC can be used as readout circuits for Micro-Pattern Gas Detectors, enabling accurate measurement and fast readout of data in high-energy physics experiments. Therefore, we designed a silicon pixel detector ASIC which will measure and simultaneously record the time of arrival (TOA), the energy information (Time Over Threshold, TOT), and the position of the particles. The ASIC consists of 1024 rows \times 1024 columns of pixel units and a readout control circuit. The readout control circuit adopts two levels of FIFO, one level of continuous arbitration circuit, the four levels of cyclic arbitration circuit, and the Token Ring control circuit, which will read out at 200 MHz without loss. The precision of the measurement is 5 ns, the spatial resolution is 15 μm , the dead time is 40 ns, and the readout efficiency is higher than 99%.

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