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Design of a Pipeline Regional ADC in the MAPS for real-time beam monitoring

As the leading research platform of heavy-ion science in China, the heavy-ion physics and heavy-ion applications at the Heavy Ion Research Facility in Lanzhou (HIRFL) and the High-Intensity heavy-ion Accelerator Facility (HIAF) drive the development of new detector technology. A Monolithic Active Pixel Sensor (MAPS) is being designed in a 130nm process for real-time beam monitoring applications at HIRLF and HIAF. This MAPS can measure the energy deposition, the hit position, and the arrival time of the particle hit.

As the critical component of this MAPS, a regional ADC converts the analog energy and time signal from the pixels into digital data. This regional ADC is designed as an optimized pseudo-differential pipeline architecture with no sample and hold module settled before the first stage to reduce the power consumption. In addition, digital correction is employed for the output codes of each stage to improve the accuracy. With a power consumption of 83.02mW and an area of $1250 \times 450 \mu\text{m}^2$, the sampling frequency can reach 40MS/s, and the ENOB is 11.64-bit. This paper will discuss the design and performance of this regional ADC.

Minioral

Yes

IEEE Member

Yes

Are you a student?

No

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