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## Design of a 11-bit column-parallel ADC for Monolithic Active Pixel Sensor

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The Monolithic Active Pixel Sensor (MAPS) has been widely used in nuclear and particle physics. The various physics and applications at the Heavy Ion Research Facility in Lanzhou (HIRFL) and the High-Intensity Heavy-ion Accelerator Facility (HIAF) require MAPS to measure particle hit's position, energy deposition, and arrival time. Thus, a MAPS with such capability has been designed in a 130nm process. As the critical part of the MAPS, an 11-bit column-parallel ADC has been designed to serve the pixels in every two adjacent columns.

The ADC uses cyclic architecture to meet the strict requirements of the area and removes SHA to save power. In addition, a novel MDAC architecture with two residue generators is proposed. By configuring the MDAC in pipeline mode, the MDAC reduces the high power consumption of the high-performance amplifier without increasing area consumption. The core amplifier is optimized in pseudo-differential operation to avoid additional single-ended-to-differential converters.

Each column-parallel ADC covers an area of  $60 \times 670 \mu\text{m}^2$  and consumes a power of 3.33mW with a 3.3V power supply. At an internal clock frequency of 40MHz, the ENOB of the ADC reaches 10.89 bits at a sampling rate of 4MHz, and the SNDR is 67.3dB.

### Minioral

No

### IEEE Member

No

### Are you a student?

No

**Authors:** Prof. WANG, Yongsheng (Harbin Institute of Technology); XIA, Chengyou (Harbin Institute of Technology); WEN, Yuhao (Harbin Institute of Technology); LI, Boxuan (Harbin Institute of Technology); WANG, Jiarui (Harbin Institute of Technology); FU, Fangfa (Harbin Institute of Technology); HAN, Weijia (Institute of Modern Physics, Chinese Academy of Sciences); WANG, Jinxiang (Harbin Institute of Technology); Prof. ZHAO, Chengxin (Institute of Modern Physics, CAS)

**Presenter:** HAN, Weijia (Institute of Modern Physics, Chinese Academy of Sciences)

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