A 12-bit SAR ADC Integrated on a Multichannel Silicon Drift Detector Readout IC

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- **Target application**: compact X and γ-ray spectroscopy / imaging detection modules
- **Task of the ADC**: digitization of multichannel ASICs output multiplexed data
- **Specifications**: 5 MSps sampling speed, 11-bit accuracy
- **Architecture**: fully-differential charge-redistribution (CR) successive approximation register (SAR)
- **Building blocks**: capacitive arrays (CAP-DAC), comparator, SAR logic
- **Binary search algorithm**: monotonic (power consumption saving)

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- IC fabricated in AMS 0.35 µm CMOS technology
- Area occupancy: 0.42 mm²
- Linearity performance are obtained by applying an input voltage ramp and evaluating the digital output (the static input-output characteristic)
- Data post-processing performed with commercial National Instruments hardware

CONCLUSIONS

The converter proved to be a good candidate as an ADC to be integrated in multichannel ASICs for radiation detectors readout.

11-bit operation is also feasible, with a slight improvement in the conversion rate and anyway ensuring sufficient resolution for the applications it addresses.

Measured DNL (top) and INL (bottom) of the SAR ADC for both 12 (left) and 11-bit (right) operational modes.

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