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## Design of IMPix-S3, a pixel readout sensor for future gaseous detector at HIAF

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As accelerator technology of High-Intensity Heavy-ion Accelerator Facility (HIAF) advances towards higher brightness, the demand for high detection accuracy in physics experiments becomes increasingly critical. To address the readout requirements for high count rates and high-resolution gaseous detectors, we propose a pixel readout chip, IMPix-S3, which can measure energy, position and time. The chip features an energy measurement range of up to 20 ke-, an integral non-linearity (INL) of only 0.176%, and an equivalent noise charge (ENC) of no more than 50e-. It employs two-stage counting to achieve a time resolution of 5 ns and facilitates dead-time-free operation by alternating between counting and readout modes. In addition, with the effective pixel pitch of 50 $\mu$ m, it can provide a position resolution better than 15 $\mu$ m. This paper will discuss the design and performance of this IMPix-S3 sensor.

### Primary experiment

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