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Nupix-H2: a Monolithic Active Pixel Sensor for Multidimensional Measurement

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The Heavy Ion Research Facility in Lanzhou (HIRFL) and the High Intensity Heavy-ion Accelerator Facility (HIAF) are leading platforms for heavy ion scientific research in China. Based on them, the Electron-ion collider in China (EicC) is under construction to represent a new generation of physics experiments. These scientific facilities have led to the development of advanced detectors. Monolithic Active Pixel Sensor (MAPS) is a type of sensor with high spatial resolution, low noise, and low power consumption, and it is widely used in vertex and tracking detectors. A MAPS called Nupix-H2 designed in GSMC 130 nm quadra-well process can measure the particle hit's position, energy, and arrival time. This chip comprises a 128-row and 128-column pixel matrix with a pitch of 28.705 μm . Each pixel utilizes a Charge Sensitive Amplifier (CSA) structure to achieve energy measurement, coupled with a comparator and a shared counter for 16 pixels to achieve time measurement. With a novel automatic reset scheme of each pixel, the Nupix-H2 can work in a continuous mode. It achieves an Equivalent Noise Charge (ENC) of 21e⁻ in the input range of 100 e⁻ - 10 ke⁻, a maximum INL of 2% of the energy path output, and the conversion gain is approximately 55 $\mu\text{V}/\text{e}^-$. With a 40 MHz clock used for the counter, the time resolution can reach close to 25 ns.

Minioral

Yes

IEEE Member

No

Are you a student?

Yes

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