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Thin monolithic pixel sensors with fast operational amplifier output in a 65 nm imaging technology.

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This work presents results on the Analog Pixel Test Structure (APTS), a 4 x 4 pixel matrix prototype equipped with fast individual OPAMP-based buffering of analog pixel signals to output pads for exploration of pixel timing performance. The work was framed in the ALICE ITS3 upgrade and the CERN-EP R&D on monolithic sensors to explore the TPSCo 65-nm imaging technology. This upgrade will replace the inner layers of the ALICE Inner Tracking System at CERN with ultra-thin flexible wafer-scale monolithic silicon sensors. They will improve the material budget in this region, the tracking precision and the efficiency at low transverse momentum.

The presentation will show the gain of the signal chain in the APTS and its speed as a function of the configuration parameters, including calibration results with a 55Fe source. Two different pixel structures will be compared to demonstrate the possibility of enhancing the performance in terms of timing and charge collection efficiency by implant modifications in the epitaxial layer. Finally test beam results planned at the Super Proton Synchrotron at CERN will provide full spatial and time resolution of the APTS OPAMP structures.

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