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Ultra-thin fully depleted DEPFET active pixel sensors for future e+/e- collider

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Prototype DEPFET active pixel sensors designed for the vertex detector at the Belle-II experiment at KEK, Japan, and for experiments at a future linear collider have been produced on thin silicon-on-insulator (SOI) material. The DEPFET (DEpleted P-channel FET) is field effect transistor with an additional implantation beneath the transistor's channel integrated on a fully depleted substrate. The inherent property of combined signal detection and signal amplification of the DEPFET allows the production of very thin sensors with an excellent signal-to-noise ratio for minimum ionizing particles.
Combining a highly specialized MOS process which includes two poly-silicon and three metal layers on a fully depleted bulk with MEMS technology makes it possible to build thin wafer-scale (150 mm wafers) DEPFET active pixel sensors on a self-supporting all-silicon module.
The paper will present the properties of the active pixel sensors designed for Belle-II and future liner collider applications and will give and overview of the manufacturing technology for thin fully depleted DEPFET.
DEPFET prototypes produced on 50 micron thin silicon are operated using the control and read-out ASICs designed for the Belle-II experiment in various test conditions and show the expected performance e.g. in signal-to-noise ratio or pixel to pixel charge sharing.

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