

Development of radiation-hard active sensors in 180 nm HV CMOS technology

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The presentation will introduce the concept, present preliminary results obtained with first test chips and outline the planned submission of a combined active strip/pixel sensor chip.

Summary

While CMOS processes are cost-efficient and commercially available, they have not yet been used to produce radiation-hard sensors. So-called HV CMOS processes combine a slightly higher resistivity p-type substrate with deep n-wells and allow the combination of a drift-based electron-collecting sensor with active circuit components. Achievable depletion depths are in the order of 10-20 μm .

This allows for novel sensor concepts such as having the first amplifier (and more electronics if desired) directly in a (very small) pixel sensor cell. Due to the low input capacitance of the small pixel, the noise contribution is very small and the signal-to-noise ratio is superb in spite of the rather shallow depletion zone and signal. These small pixel cells can then be combined to form virtual strips or larger pixels which match already existing readout electronics chips, e.g. Beetle or FE-I4. Analogue hit encoding can yield improved resolution compared to the readout-chip pitch.

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