Master Sciences – Mention Physique
Spécialité "Micro- Nano-Electronique"
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Proposition de stage

UMR 7178

Optimization of comparators in Monolithic Active Pixel Sensors (MAPS)

Responsables du stage :

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A. Sujet bibliographique:

The comparators are used in MAPS [1] to provide digital processing of analogue signals. As the space used by the processing electronics and power consumption is an important concern in MAPS, one need to optimize comparator circuit for application in MAPS. The amplification stage of comparator can use different types of amplifiers: differential or single ended. For the single ended amplifier the layout and power consumption is smaller, compared to differential amplifiers. In both cases, the circuits should have an offset compensation techniques.

B. Description du stage:

Study and compare different comparator circuits, where differential and single ended amplifiers are used.
Investigate possibility to use cascaded circuits of NMOS-based high gain amplifiers [2] in the comparator block. Design and study the properties of the comparator with compensated offset using this type of amplifier with time variant feedback [3].
The properties of comparator to be optimized are: threshold voltage variation (<0.5mV) due to the CMOS process variation, speed (<100ns), power consumption and the layout space.

[1] R. Turchetta, J.D. Berst, B. Casadei, G. Claus, C. Colledani, W. Dulinski, Y. Hu, D. Husson, J.-P. Le Normand, J.-L. Riester, G. Deptuch, U. Goerlach, S.Higueret and M. Winter, A Monolithic Active Pixel Sensor for Charged Particle Tracking and Imaging Using Standard VLSI CMOS Technology Nuclear Instruments & Methods in Physics Research Section A 458 (2001) 677-689

[2] A. Dorokhov, NMOS-based high gain amplifier for MAPS. VIth International meeting on front end electronics for high energy, nuclear and space applications, Perugia, Italy 17- 20 May 2006

[3] A. Dorokhov, Optimization of amplifiers for MAPS, Topical workshop on electronics for particle physics, Prague, 3-7 September 2007

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