Internship 2008

Study of a pixel dedicated for charge particles detection and its readout channel in 3D CMOS 0.13 µm technology

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A. Bibliographical Review:

Monolithic Active Pixels Sensor (MAPS) are frequently used for charge particles detection in high energy physics. The digitalization of the output of MAPS requires accurate comparator. Consequently, the bibliographical review focuses on the different architectures of comparator with low offset (2 mV) in deep submicron technology.

B. Internship Description:

The high energy physics community will use very soon the Large Hadron Collider (LHC) which has just been launch at CERN. Nevertheless, the community does important efforts in R&D for the futures detectors like Super-LHC and ILC (International Linear Collider). In this context the 3D integrated circuits are full of promise for crossing the technology gap for theses new detectors. The 3D Integration can be defined as the integration of thinned and bonded silicon integrated circuits with vertical interconnects between IC layers.

Monolithic Active Pixels Sensor (MAPS) are frequently used for detecting crossing charge particles. The principle of functioning is very simple: the particles ionizing the silicon substrate of the pixels which collecting the generated charges. The 3D technology is very interesting for enhanced the MAPS by including more functionalities inside the pixel. For developing this new type of detectors the IPHC make collaboration with different laboratories all over the world.

The digitalization of the data provided by the pixel is the first step for implemented complex functionalities in one 3D integrated circuit. This digitalization is operated by a comparator with a low offset due to the small signal at the output of the pixel. The student will study and optimize a given architecture of pixel in 3D CMOS 0.13 µm technology. After this first stage, the student will design a comparator which fit the output of the pixel. To do this work, the student will work with the Cadence analog design flow.

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