

Summary

Romantically speaking, sensors are the way experiments see the universe while, the electronics, the way they can process and understand it. In recent years the complexity and performance of integrated circuits adopted for sensing purposes has increased at an amazing pace. The commercial adoption of monolithic and hybrid pixels has led the scientific community to always find new solutions to improve the design of sensors and electronics while keeping the costs and power dissipation of the devices under control.

Monolithic devices, differently from traditional sensor/electronics couples are the perfect candidates for experiments requiring large area detectors while keeping production costs to a bare minimum. This is due to their intrinsically low material budget and to a decreased number of steps required for production compared to conventional or hybrid sensors.

This thesis presents the research and development of a custom fully depleted monolithic active CMOS sensor produced within the ARCADIA collaboration. In particular, through a close contact between Italian Universities and the INFN (Istituto Nazionale di Fisica Nucleare), the design, simulation and production of a novel active monolithic microstrip detector has been possible.

A set of evaluation structures, both passive and active, has been experimentally tested via electrical, radiation and particle characterization. The results are shown within this thesis proving full device depletion and a correct sensor to electronics monolithic coupling.

The electronics schematic and layout design of a configurable readout IC chip, ASTRA, are discussed. ASTRA (Adapatable Space sTrips Readout ASIC) features configurable gain, peaking time and readout architecture. This configurability makes it a good candidate for readout of commercially available microstrip sensors and also for adoption with active monolithic strip sensors.

Concluding, theoretical studies of the input capacitance and electronic simulation results are shown in the final chapter proving a correct channel functionality and programmability.