Ph.D. in Information Technology: Thesis Defenses

March 27th, 2019

Room Alpha – 9.30 am

Aidin AMIRKHANI - XXXI Cycle

"Design of Analog ASICs for X-ray Detectors"

Advisor: Prof. **Carlo Fiorini**

Abstract:

This research project is focused on the development of readout ASICs for two main applications. The first part is mainly focused on the ASIC development for the SIDDHARTA experiment.
The SIDDHARTA experiment is designed to investigate strong nuclear interactions using exotic atoms in the field of nuclear physics. Silicon Drift Detectors (SDDs) used in this experiment are arranged in arrays of 2Ã—4 elements with total area of 612 mm2. At the final stage of SIDDHARTA experiment, 48 SDD arrays are needed to be utilized in a gantry structure to perform X-ray spectroscopy of exotic nuclei, like kaonic deuterium. Each single SDD unit in 2Ã—4 formation of arrays is coupled to a charge sensitive preamplifier, namely CUBE, which is followed by shaping amplifier, and consequent analog and digital electronics that are all integrated on a custom developed multichannel chip called SFERA.
The second part, is focused on the development of a 128-channel low-power ASIC for the readout of silicon microstrip detectors with high energy resolution and counting rate efficiency for diffractometry applications. It is expected that this ASIC would find wider application with other detector solutions as well. Each channel is composed by a charge sensitive preamplifier, a shaping amplifier, two twin discriminators for photon counting within an energy window and one for detection of very small signals, which could be due to inter-strip charge sharing effect. This chip is implemented in AMS 0.35 Î¼m CMOS process and its area occupancy is 46.6 mm2.

Massimo GANDOLA – XXXI Cycle

"Low-Noise, Low-Power Front-End Asics for High-Resolution X and Gamma Ray Spectroscopy with Radiation Semiconductor Detectors"

Advisor: Prof. **Giuseppe Bertuccio**

Abstract:

The aim of this thesis is the study, the design and the characterization of two ASICs (named RIGEL and LYRA) employed in projects of the Agenzia Spaziale Italiana (ASI) and of the European Space Agency (ESA) regarding the study of deep space objects and other astrophysics applications. A dedicated readout electronics has been developed separately for each project in order to acquire and elaborate the signals coming from a SDD (Silicon Drift Detector) that detects X radiation. The design phase has been carried out carefully in order to

satisfy the most important requirements for the ASICs: the low electronic noise and the reduced power consumption.

Emanuele GUGLIELMI – XXXI Cycle

"Electronics Boosts Photonics: Detector and Electronic Design for Non-Invasive Monitoring and Control of Silicon Photonic Systems"

Advisor: Prof. **Marco Sampietro**

Abstract:

Electronics is an essential tool that can unlock the true potential of modern Silicon Photonic technologies, overcoming their limitations. My thesis contributes to the field of electronic-photonic integration, studying and improving the innovative CLIPP detector and developing the electronics to use it in novel scientific applications.

PhD Committee:
Prof. **Marco Sampietro**, DEIB
Prof. **Piero Malcovati**, Universita' di Pavia
Prof. **Orjan Grottem Martinsen**, University of Oslo