PhD/MSc Project in ALICE 2025 with the South African team

Title: Testbench development for an LGAD/CMOS detector sensor for time resolution studies

ALICE Principal Investigators:

Assoc. Prof. Zinhle Buthelezi (zinhle@tlabs.ac.za) iThemba LABS/WITS School of Physics

Dr. SV Förtsch (forstch@tlabs.ac.za), iThemba LABS

Themba LABS and South African universities involved in the Upgrades of the ALICE detector at CERN's (European Organization for Nuclear Research) Large Hadron Collider (LHC) [1] offer exciting technology-advanced projects to prospective Master's students. An ideal candidate can select any of the projects on offer:

• Development of a testbench to investigate the time resolution of a Low Gain Avalanche Detector (LGAD) [2] sensor

• Validate the monolithic Complementary Metal–Oxide–Semiconductor (CMOS) [3] sensor technology

• Design and setup a readout test bench for the CMOS/LGAD sensor utilizing the Aria 10 FPGA [4]

The project will be accomplished by utilising infrastructure and facilities provided by iThemba LABS in the ALICE laboratory.

Requirements: The ideal candidate should have

- completed the previous degree with an aggregate of $\geqslant 65\%$,
- knowledge of electronics (specifically analogue/digital electronics, embedded systems HDL programming),
- and he/she should thrive in a challenging learning environment.

References:

[1] A Large Ion Collider Experiment, ALICE Collaboration, https://alice.cern/

[2] N. Moffat et al 2018 JINST 13 C03014, https://iopscience.iop.org/article/10.1088/1748-0221/13/03/C03014/pdf

[3] A. Strum, et al Fundamentals and Applications of CMOS and CCD Sensors 2014, Pages 348-372, High Performance Silicon Imaging, https://doi.org/10.1533/9780857097521.2.348

[4] Intel Arria 10 GX FPGA Development Kit,

https://www.intel.com/content/www/us/en/products/details/fpga/development-kits/arria/10-gx.html.