



Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich

The **Integrated Systems Laboratory** at the ETH Zurich performs research in the field of physics-based simulation and modeling for nanoelectronic semiconductor processes and devices. We offer a

## PhD-Position

with a MSc degree in Physics, Electrical, or Material Engineering

### Scope

The on-going miniaturization in microelectronics requires measurement techniques that are capable of analyzing images of device features with nanometer dimensions. Scanning electron microscopy metrology (SEM) has been the preferred technique of choice addressing the major concerns of scanning speed, non-destructiveness and minimum heat-dissipation. Although the limits of conventional SEM metrology have already been reached, SEM systems will continue to be employed for 1D, 2D, and 3D inline metrology of devices at the nanometer scale. In order to keep pace with the requirements set by the International Technology Roadmap for Semiconductors, a very detailed physical understanding and modelling of SEM signal generation at the level of fundamental particle interactions and charge transfer is required. Our approach to the solution relies on a particle-based Monte Carlo (MC) simulation tool used in combination with

SEM experiments. Currently available MC models are unsatisfactory in particular due to the prohibitive computing expense of present implementations and the lack of proper physical modeling of complex effects that have rendered an extension to 2D and 3D metrology impossible.

This PhD research project aims to develop models for the interactions of electrons and ions at very low energies with the main materials used in micro-electronics as well as models for dynamic electrostatic charging effects arising during irradiation to be implemented in 3D Monte Carlo codes for high performance computing systems. The tasks of the PhD candidate also include the design of dedicated experimental procedures to calibrate and validate the proposed models.

### Requirements

We are seeking for a candidate holding a MSc degree either in Physics, Electrical, or Material Engineering with interest or experience in interactions of

electron beams with matter, as well as a general flair for physical modeling of complex systems, and experimentation.

We offer an exciting and challenging position in a dynamic team of physicists and electrical engineers and the opportunity to interact actively with the major academic and industrial players in the field. The participation in international conferences and the publication of scientific papers are strongly encouraged. The position will be remunerated with an appropriate salary.

### Application

Please, send your written application in PDF format, including copies of degrees and certificates with the Keyword "SASEM" to:

ETH Zurich,  
Dr. Mauro Ciappa  
Integrated Systems  
Laboratory, CH-8092 Zurich

or per e-mail to  
ciappa@iis.ee.ethz.ch