MASTER THESIS/INTERNSHIP TOPIC

Complete all the fields and return the form to katrien.brees@imec.be.

Topic title: Calibration of TCAD process simulators for sub-10nm WFIN FinFET

Type of project:

☐ Internship
☐ Thesis
☒ Combination of thesis and internship

Supervising scientist(s): *(= person(s) who will receive the applications for screening)*

Name(s):	E-mail address(es):
Pierre EYBEN	Pierre.Eyben@imec.be
Philippe MATAGNE	Philippe.Matagne@imec.be
Click here to enter text.	Click here to enter text.

Required degree:

☐ Master in Industrial Sciences
☒ Master in Science
☒ Master in Engineering

Required background:

☒ Physics
☐ Chemistry/Chemical Engineering
☐ Materials Engineering
☐ Bioscience Engineering
☐ Mechanical Engineering
☐ If other, please specify: Click here to enter text.
☒ Electrotechnics/Electrical Engineering
☐ Energy
☒ Nanoscience & nanotechnology
☒ Computer Science

If your topic also needs submission at KU Leuven, then specify the name of the supervisor(s) here (ma

Note that the Master programs for which the topic will be submitted are mentioned in brackets.
Be sure to discuss this upfront with the supervisor!

☐ Francky Catthoor *(EE, Nano)*
☐ Jo De Boeck *(EE, Nano)*
☐ Stefan De Gendt *(Chemistry, Nano)*
☐ Annelies Delabie *(Chemistry, Nano)*
☐ Ingrid De Wolf *(Materials Eng., Nano)*
☐ Jan Genoe *(EE, Nano)*
☐ Guido Groeseneken *(EE, Nano)*
☐ Paul Heremans *(EE, Nano)*
☐ Marc Heyns *(Materials Eng., Nano)*
☐ Michel Houssa *(Physics, Nano)*
☐ If other, please specify: Click here to enter text.
☐ Liesbet Lagae *(Physics, Nano)*
☐ Rudi Lauwereins *(EE, Nano)*
☐ Jef Poortmans *(EE, Nano, Energy)*
☐ Bart Soree *(EE, Nano, Physics)*
☐ Wilfried Vandervorst *(Physics, Nano)*
☐ Pol Van Dorpe *(Physics, Nano)*
☐ Chris Van Hoof *(EE, Nano)*
☐ Jan Van Houdt *(EE, Nano)*
☐ Philippe Vereecken *(Bioscience, Nano)*
☐ Roel Wuyts (*Computer Science)*

In the catalogue on the imec website, the topics will be ordered by the imec **research domains**.

Indicate in which section in the catalogue your topic should be filed (choose just one option):

☒ CMOS Scaling
☐ GaN Power Electronics
☐ Wearable Health Monitoring
☐ Life Science
☐ Wireless Communication
☐ Image Sensors and Vision Systems

MASTER THESIS/INTERNSHIP TOPIC

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☐ Large Area Flexible Electronics
☐ Solar Cells and Batteries
☐ Sensor Systems for Industrial Applications
☐ Neuroelectronic Research (NERF)
☐ Microelectronics Design (ICLink)

Project description:

(Try to limit your description to 1 page maximum)

IMPORTANT:
As you know, proposals for master thesis or internship projects will be made public, e.g. via websites of universities. Hence, information contained in such proposals may prevent any patenting of the work done during the corresponding Master thesis or training.Therefore the proposal should be phrased in the problem(s) to be solved without discussing (potential) solutions When necessary, any detailed information available at imec can be given in private discussions with the student(s). For example, you want a Master student to implement a concept already developed at imec. The proposal should explain the problem to be solved and indicate that imec has (a) solution(s) to this problem which is (are) to be implemented by the student. You can indicate which skills are necessary for this implementation and which resources are available at imec such as coaching, hardware, software, ...
If you have any question, please contact your patent responsible.

The aggressive downscaling of FinFET devices in past years has put a great emphasis on the need to characterize dimensional (3D) carrier profiles for the correct understanding of device behavior. In such scaled devices even th structure dimensions (ie. fin width or length, local interconnect or spacer, etc.), carrier distribution and/or activati variations in the electrical properties of the devices.

As their modeling is complex with multiple calibration parameters, adequate two- and three-dimensional (2D)-cha been identified as a necessity for process/device engineers and for the TCAD community to achieve an accurate complex physical mechanisms for scaled devices.

To fulfill these needs, in recent years, scanning spreading resistance microscopy (SSRM), performed in high vacuu has demonstrated its significance. Its sub-nanometer spatial resolution and high doping sensitivity make it uniqu

Within this work the student will have :

- To utilize SSRM and its most recent mode named scalpel-SSRM (s-SSRM) to generate 2D carrier map i (NB: Student will not have to perform measurements himself but well to understand the technique so t measurement requests)
- To learn how to run process and device simulations using XXX (defining the architecture, understandin activation models utilized,etc.)
- To test different possibilities to calibrate the TCAD process simulations using the SSRM 2D carrier maps simulated and measured electrical junction positions, between 1D carrier profiles, between full 2D carr
- To evaluate the quality of the calibration realized (looking at simulated vs. measured characteritics like
- To propose modifications in the processing steps in order to improve the device performances