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On to Pastures New – European Researchers Develop Simulation Models for Extra-Functionality CMOS Devices

Process simulation in semiconductor industry has been brought to a state which allows the sufficiently accurate prediction of important electrical characteristics of core devices in advanced CMOS technologies. Today, the use of TCAD (Technology Computer Aided Design) is an inevitable part of device and process design as it implies a reduction of development costs and duration by about 30 – 40 %.

However, concepts towards low-power electronics, smart power applications, CMOS image sensors, and CMOS derivatives providing extra functionalities are still not sufficiently supported by TCAD. This especially concerns the prediction of leakage currents caused by electrically active defects and alternative doping techniques like plasma immersion ion implantation, low-temperature implantation, diversified cocktail implants, and laser annealing, which are considered for low-leakage ultra-shallow junctions.

The lack of suitable models that can be used in the early stages of industrial R&D inhibits the necessary cost reduction in the development of devices in a field where Europe is still at the forefront. Therefore, the recently launched European project ATEMOX (Advanced Technology Modeling for Extra-Functionality Devices) will develop the full set of missing models and implement and include them into the Sentaurus TCAD platform, an industrial standard software, so that they are of immediate value to the European semiconductor industry. The integrated models will finally be evaluated with respect to industrial needs.

To reach these ambitious goals, a consortium of European companies active in complementary fields of competence and leading European research institutes has been formed, which covers all necessary fields of competencies from experiment via characterization and modeling to simulation.

On July 21, 2010, coordinator Fraunhofer IISB in Erlangen, Germany, hosted the kickoff meeting for the 3-year project, which has a total budget of 4 million Euro.

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Project participants

- Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (Germany)
- Centre National de la Recherche Scientifique CNRS (France)
- Eidgenössische Technische Hochschule Zürich (Switzerland)
- Excico France (France)
- Ion Beam Services (France)
- Probion Analysis SARL (France)
- Semilab Felvezeto Fizikai Laboratorium Reszvenytarsasag (Hungary)
- STMicroelectronics Crolles 2 SAS (France)
- STMicroelectronics S.A. (France)
- Synopsys GmbH (Germany)
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- University of Newcastle upon Tyne (United Kingdom)

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Fraunhofer IISB

The Institute for Integrated Systems and Device Technology IISB is one of the 59 institutes of the Fraunhofer Gesellschaft. It conducts applied research and development in the fields of micro and nanoelectronics, power electronics, and mechatronics. For the development of technology, equipment, and materials for nanoelectronics and its work on power electronic systems for energy efficiency, hybrid and electric cars the institute is internationally acknowledged. A staff of 170 works in contract research for industry and public authorities. In addition to its headquarters in Erlangen, the IISB has two branch labs in Nuremberg and Freiberg. The institute closely cooperates with the Chair of Electron Devices of the Friedrich-Alexander University Erlangen-Nuremberg.