The nanoCOPS Project on Nanoelectronic Coupled Problems Solutions

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ABSTRACT

The project nanoCOPS [1] is a collaborative research project within the FP7-ICT research program funded by the European Union. The consortium comprises experts in mathematics and electrical engineering from seven universities (Wuppertal, HU Berlin, Brno, Darmstadt, FH OÖ Hagenberg, Greifswald, Leuven), one research institute (MPI Magdeburg), two industrial partners (NXP Semiconductors Netherland and ON Semiconductor Belgium) and two SMEs (MAGWEL and ACCO Semiconductor).

We present an overview of the project subjects addressing the "bottlenecks" in the currently-available infrastructure for nanoelectronic design and simulation. In particular, we discuss the issues of an electro-thermal-stress coupled simulation for Power-MOS device design and of simulation approaches for transceiver designs at high carrier frequencies and baseband waveforms such as OFDM (Orthogonal Frequency Division Multiplex).

To meet market demands, the scientific challenges are to:

- create efficient and robust simulation techniques for strongly coupled systems, that exploit the different dynamics of sub-systems and that allow designers to predict reliability and ageing;
- include a variability capability such that robust design and optimization, worst case analysis, and yield estimation with tiny failures are possible (including large deviations like 6-sigma);
- reduce the complexity of the sub-systems while ensuring that the parameters can still be varied and that the reduced models offer higher abstraction models that are efficient to simulate.

Our solutions are

- advanced co-simulation/multirate/monolithic techniques, combined with envelope/wavelet approaches;
- new generalized techniques from Uncertainty Quantification (UQ) for coupled problems, tuned to the statistical demands from manufacturability;
- enhanced, parameterized Model Order Reduction techniques for coupled problems and for UQ.

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REFERENCES

[1] http://www.fp7-nanocops.eu/.