ELECTRON TRANSPORT IN STRONGLY CONFINED NANOSTRUCTURES: MODELING AND SIMULATION
– **talk** –

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We present an effective mass model, derived in [1], describing the ballistic transport of electrons in ultra-scaled confined nanostructures. Due to the strong confinement, the crystal lattice is considered periodic only in the one dimensional transport direction and an atomistic description of the entire cross–section is given. Using an envelope function decomposition, an effective mass approximation is obtained. The model consists of a sequence of one dimensional device dependent Schrödinger equations, one for each energy band, in which quantities retaining the effects of the confinement and of the transversal crystal structure are inserted. In order to model a gate-all-around Field Effect Transistor, self-consistent computations include the resolution, in the whole 3D domain, of a Poisson equation describing a slowly varying macroscopic potential. Simulations of the electron transport in semiconducting one-walled Carbon Nanotubes are presented, using a classical-quantum hybrid strategy [3]. The ballistic effective mass model is used only in the active region, and it is coupled to a drift-diffusion model (derived for strongly confined nanostructures in [2]) in the source and drain regions.

References

[1] N. Ben Abdallah, C. Jourdana, P. Pietra, An effective mass model for the simulation of ultra-scaled confined devices, *Math. Models Methods Appl. Sci.* **22**, *issue* 12 (2012).

[2] Jourdana, C., Vauchelet, N. 2011 Analysis of a diffusive effective mass model for strongly confined nanowires, *Kinet. Relat. Models* **4**, 1121-1142, (2011).

[3] C. Jourdana, P. Pietra, A hybrid classical-quantum transport model for the simulation of Single-Walled Carbon Nanotube transistors, *in preparation*.

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