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Centro Singular de Investigación en Química Biolóxica e Materiais Moleculares

Conferencia:

Molecular wires and logic gate design

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Aula de Seminarios do CIQUS

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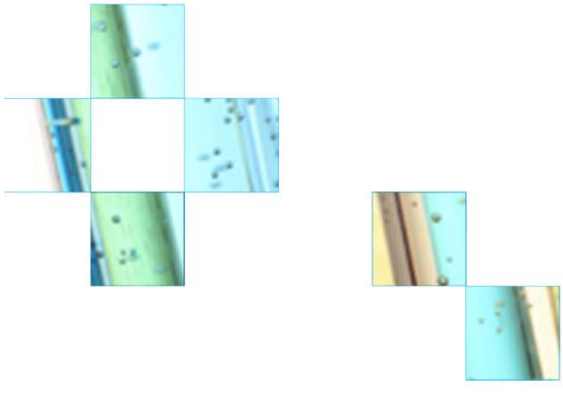

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Molecular wires and Logic gates design

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Résumé:

At the atomic scale, surface Boolean logic gates can now be designed and experimented from inside a single molecule. We will first discuss why classical and semi-classical intramolecular circuits are not very practical for beneficiating from the anticipated molecular electronic circuits computing power. This is for example the case of the well know exponential decay with length of the tunnelling current intensity through a molecular wire, opening now the exploration of a possible super-tunnelling effect. Then, we will present the design rules of the quantum Hamiltonian computing (QHC) approach applied to molecule logic gates. Here, the possibility offered by the QHC approach for a logic function complexity increase is a very good example on how to minimize the interconnection problem that is the number of "classical to quantum" and "quantum to classical" conversions steps required to pass from the atomic scale of a molecule logic gate to the nanoscale and more in full planar technology. The first practical experiments on QHC molecule Boolean logic gates will be presented.

C. Joachim is Director of Research at the Nanoscience group in the Pico-Lab CEMES/CNRS (www.cemes.fr/GNS/) and adjunct Professor of Quantum Physics at ISAE Toulouse. He was A*STAR VIP Atom Tech in Singapore (2005-2014) and is the head of the WPI MANA-NIMS satellite in Toulouse since 2008. He coordinated the Integrated European projects "Bottom-up Nanomachines", “Pico-Inside” and “AtMol” (www.atmol.eu) (2011-2014) whose objective was to construct the first ever molecular chip. Author of more than 260 scientific publications (h = 53), he had presented over 360 invited talks on electron transfer through a molecule, STM and Atomic Force Microscopy (AFM) image calculations, tunnel transport through a molecule, single molecule logic gate, atomic scale circuits, nanolithography, atomic scale electronics interconnects and single molecule-machines. His book: “Nanosciences, the invisible revolution” (Le Seuil (2008), World Scientific (2009)) is giving the history of nanosciences and its political drawbacks to a general public. He was awarded the IBM France Prize (1991), the Feynman Prize (1997), the CNRS Silver Medal in Chemistry (2001), the Feynman Prize (2005) and a Guinness book entry (2011) for the smallest ever functioning nano-gear, 1.2 nm in diameter.