Electronic transport in graphene break junctions

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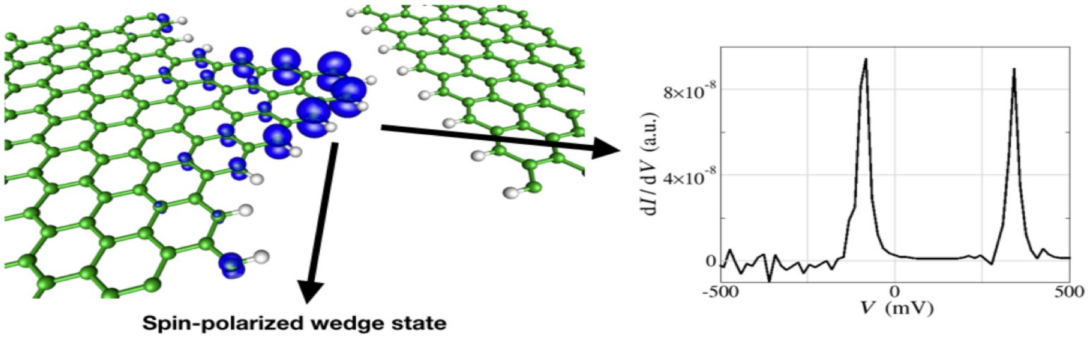
Abstract: Graphene nanogaps with gap lengths of the order of one to few nanometers have been realized recently [1]. I show in this talk that the electrical transport across graphene nanogaps having perfectly defined zigzag edges does not carry any spin-related signature. However, nanogaps whose electrodes have wedges that possibly occur in the fabricated gaps can give rise to fully spin-polarized currents, low-voltage signatures in the differential conductance and charge rectification. I also show that the electrical conductance of bowtie-shaped graphene nanoconstrictions probed in a mechanically controlled break junction (MCBJ) [2] at room temperature exhibits periodic oscillations with amplitudes spanning over an order of magnitude as a function of sub-nanometer displacements. These oscillations uniquely originate from a combination of quantum-interference and lattice-commensuration effects.



[1] F. Prins, A. Barreiro, J. M. Ruitenberrg, J. S. Seldenthius, N. Aliaga-Alcalde, L. M. K. Van- dersypen, and H. S. J. Van der Zant, Nano Lett. 11, 4607 (2011).

[2] R. Frisenda, V. A. E. C. Janssen, F. C. Grozema, H. S. J. Van der Zant, and N. Renaud, Nat. Chem. 8, 1099 (2016).