**Séminaire  
Understanding transport in nanomaterials: does Ohm’s law survive?**

**Intervenant.e.s : Bruno GRANDIDIER** (IEMN-CNRS)

**Description du cours**

While nanomaterials are increasingly used as active components of prototype opto-electrical devices with miniaturized dimensions and novel functions, there is a strong need to characterize their transport properties at different length and time scales. The aim of the seminar will be to explore how Ohm’s law is modified in one-dimensional (1D) and two-dimensional (2D) structures depending on their chemical and/or physical environment. I will consider multiple scanning tunneling microscopy as a key characterization tool to probe electrical transport. Indeed, this technique enables an arbitrary arrangement of several probe electrodes on a wide range of nanomaterials, providing a straightforward insight into the properties that govern the flow of charge carriers. After recalling the fundamental basis of transport, in particular in semiconductor materials which can be grown with high purity and stacked with abrupt heterointerfaces, I will first focus on 1D nanomaterials grown by deposition phase methods to discuss the influence of the surface chemistry on their conductivity, describe a direct method to measure the band offset in buried heterointerfaces, highlight examples of ballistic transport and tackle correlation effects. Then I will consider two-dimensional materials which are chemically synthesized. The comparison of DC transport measurements with high-frequency photoconductive transport measurements will provide insight into the scattering mechanisms of charge carriers flowing in 2D array of quantum dots. I will finally describe a method to study the fate of hot electrons and show how the technique can be exploited to investigate the (photo)generation of charge carriers with the highest spatial resolution.