

Electron Beam Lithography and nanofabrication (2 CFU)

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PROGRAMME OF THE COURSE

Introduction to electron beam lithography on methodology and on applications.

During the course, lessons on theory and on fundamentals of the technique will be organized. The experimental activity will be carried out directly on the lithography equipment, with the Raith systems, at the headquarters of the CNR-IMM.

Electron Beam Lithography (EBL) is a temporary process used to transfer a permanent pattern at the nanoscale onto a desired material, the substrate. In semiconductor processing, the substrates are generally made up of SiO₂, Si, SiC, Ge, GaAs, InP, GaN, etc. As a research facility, various substrates have been developed for scientific applications, including non-traditional materials such as diamond and sapphire. The final applications essentially concern the manufacturing of active electronic, photonic and or magnetic devices.

EBL is a mask less or direct write process that allow the materials shaping at the nanoscale using a top down method. In order for the EBL system to write a model, the user must insert a model file into the EBL system to be written. Models are typically designed using computer aided design (CAD) software. During the course, there will be an introduction on the definition of the layout and on the fabrication strategies considering the different aspect and limitation of the different application. The lesson will focus on: concept of lithography, electronic apparatus: Gun, Column, vacuum system, deflection apparatus, layout definition, multilevel alignment etc.

During the course, information will be provided on an advanced lithography approach: proximity effect, electronic interaction with materials; "CASINO" (a useful tool for Monte Carlo simulation for electrons and matter interactions). The final examination will consist of a discussion on some aspect presented during the course.