



FACULTY OF ARTS & SCIENCES  
DEPARTMENT OF PHYSICS

## Physics Seminar

# Is Laser technology a power tool for next generation nano/microsystems?

Dr. Nadjib Semmar (Universite d'Orleans))  
Wednesday, February 23, 2022, 4:00 pm

In this presentation, the main focus will be on the description of nowadays laser systems that were subject to a huge development effort made by engineers in the field of applied optics and photonics. Considering both solid-state and gas-state photons generator and amplifier we can undertake the role of the intrinsic beam power under the pulsed or the continuous laser regime. After this short introduction to the principles of laser technology and main features, several case studies will be shown and described.

1. Absorption mechanism from the Drude law and the following heating process leading to the surface ablation will be illustrated thanks to a set of simple mathematical equations.
2. The simulation methodology and the validation by experiments (how evaluate the deposit of beam energy, temperature kinetics and mass removal by appropriate metrology) will be also introduced to highlight the key parameters in the classical case (thermal) of laser matter interaction.
3. And finally, we will consider the ultrafast (with femtosecond beams) interaction throughout typical examples as high gap material engraving and 3D structuring.

After this panel of fundamental considerations, several applications using short movies (academic/industrial) and specific images (from GREMI publications) will help for a better understand of what kind of surface modifications could be targeted with a laser beam and for which type of application (energy harvesting, tribology, and specific surface enhancement...) for the near future. At least, a resume of the main physics that contribute to laser engineering roadmap will be presented as a conclusion.

*About the speaker:* Dr. Nadjib Semmar is a full professor at the University of Orleans in France (Centre-Val-de-loire). One of his research interests in the GREMI Laboratory is on laser interaction with complex surfaces (thin films, grapheme and CTN coating...). He is also a permanent lecturer at the Department of Physics and 'Polytech Orléans' High School.

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