Bridging the microscopic and macroscopic scales of light matter interaction

Thomas Brabec
brabec@uottawa.ca
WEB: http://mysite.science.uottawa.ca/brabec/index.html

The microscopic particle-in-cell (MicPIC) approach will be discussed which allows modeling the classical dynamics of large systems in intense fields. MicPIC is an advancement of the regular particle-in-cell (PIC) method in that it accounts for all microscopic collisions between charged particles. MicPIC enables modeling the interaction of intense lasers with μm sized chunks of solids. Thus, it allows to bridge the microscopic (10^{−10}m, collisions) and macroscopic scales (μm, propagation) of light matter interaction. The new capacity of MicPIC opens avenues to model and investigate so far little understood areas of intense laser material interaction, such as laser material machining, XFEL imaging of single clusters and large molecules, and microscopic effects in nonlinear optics which seed instabilities such as filamentation.

*Physics Department, University of Ottawa, 150 Louis Pasteur, Ottawa, ON K1N 6N5, CANADA.