Duration: 3-4 Months

Development of a unique PIC-FP code for the simulation of collisional plasmas

Sufficiently rarefied gases and plasmas are commonly simulated with so-called kinetic approaches in which the flow is not modelled as a continuum but as a collection of a huge number of particles. To solve technically relevant problems, non-deterministic approaches like Particle-In-Cell (PIC) solvers for plasmas and Direct Simulation Monte Carlo (DSMC) solvers for gases are regularly used and are still subject to continuous improvements.

Gradel sárl develops and sells plasma based neutron sources based on the Inertial Electrostatic Confinement principle (see spherical device in the picture). In support of ongoing R&D activities the company also started to develop its own software solution since proper market tools are unavailable for the given problems. Within the scope of this project the candidate will extend the existing PIC code by a Monte Carlo based Fokker Planck (FP) solver for the simulation of Coulomb collisions. The combination of both approaches yields a PIC-FP with unique properties which are to be characterized in detail. In fact, due to the combination of certain features we expect superior properties in terms of accuracy and performance. From an academic point of view, the innovative outcome has excellent chances to be subject of future scientific publications. Individual tasks are:

- Get into PIC theory;
- Get into FP theory;
- Get into the source code;
- Modify and implement existing FP code into PIC framework;
- Perform verification simulations;
- Analyse results and write report.

The perfect candidate has OO/C++ programming experience and a background in a related field. Interested students should send their application (including CV) to Dr.-Ing. Dejan Petkow, Gradel sárl, d.petakow@gradel.lu, Tel: +352 39 00 44 202.