Investigation of plasma physics phenomena with a grid-less PIC code

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 sàrl 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 continue the verification of a new innovative PIC code and apply it to typical plasma physics phenomena. Those could be oscillations, instabilities, or other phenomena like plasma-wall interactions. The objective of this thesis project is to increase the code’s maturity level in a plasma physics context. Individual tasks are:

- Get into PIC code theory;
- Get into the source code;
- Extend diagnosis capabilities for verification purposes;
- Identify and reproduce proper plasma physics phenomena;
- 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 sàrl, d.petkow@gradel.lu, Tel: +352 39 00 44 202.