# Particle In Cell Simulation Using a Discontinuous Galerkin Method

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## Abstract

A particle method is being developed jointly by IRS (Institute of Space Systems, Universität Stuttgart), IAG (Institute for Aerodynamics and Gas Dynamics, Universität Stuttgart), HLRS (High Performance Computing Center Stuttgart) and IHM (Institute for Pulsed Power and Microwave Technology, Forschungszentrum Karlsruhe in der Helmholtz-Gemeinschaft) in order to model rarefied plasma flows under conditions where continuum assumptions fail. The Boltzmann equation for rarefied, non-continuum plasma flows is solved numerically, making use of particle methods like Particle In Cell (PIC), Direct Simulation Monte Carlo (DSMC) and Fokker-Planck equation based stochastic approaches.

The method with which Maxwell's equations are solved within the PIC module of the code has recently been changed from a finite volume to a discontinuous Galerkin (DG) method. First validation tests for this new solver have been performed and show encouraging results. The mathematical and numerical modeling is explained and the test results are presented in this paper.