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Particle-In-Cell simulation concerning heat-flux mitigation using electromagnetic fields[1] KARL FELIX LÜSKOW, Institute of Physics, Ernst-Moritz-Arndt University of Greifswald, JULIA DURAS, Department of Applied Mathematics, Physics and Humanities, Nürnberger Institute of Technology, STEFAN KEMNITZ, Institute of Computer Science, University of Rostock, DANIEL KAHNFELD, PAUL MATTHIAS, GUNNAS BANDELOW, RALF SCHNEIDER, Institute of Physics, Ernst-Moritz-Arndt University of Greifswald, DETLEV KONIGORSKI, Airbus Operations GmbH, Emerging Technologies Concepts — In space missions enormous amount of money is spent for the thermal protection system for re-entry. To avoid complex materials and save money one idea is to reduce the heat-flux towards the spacecraft. The partially-ionized gas can be controlled by electromagnetic fields. For first-principle tests partially ionized argon flow from an arc-jet was used to measure the heat-flux mitigation created by an external magnetic field. In the successful experiment a reduction of 85% was measured. In this work the Particle-in-Cell (PIC) method was used to simulate this experiment. PIC is able to reproduce the heat flux mitigation qualitatively. The main mechanism is identified as a changed electron transport and by this, modified electron density due to the reaction to the applied magnetic field. Ions follow due to quasi-neutrality and influence then strongly by charge exchange collisions the neutrals dynamics and heat deposition.

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