

Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Heating dominated inception of pulsed discharges. ASHUTOSH AGNIHOTRI, CWI Amsterdam, WILLEM HUNSDORFER, CWI Amsterdam and Radboud University, Nijmegen, UTE EBERT, CWI Amsterdam and Eindhoven University of Technology, Eindhoven — We simulate the inception of pulsed discharges with heating as the driving agent that leads to spark formation. To understand the phenomenon, we developed a 2D-cylindrically symmetric model that couples the electric discharge dynamics with the background gas dynamics. To capture the ion dynamics well, we reduced the classical drift-diffusion-reaction model of electric discharges to the timescale of ion motion. Additionally, we include secondary emission of electrons from the cathode. We employed the model to study electrical breakdown in air at STP conditions between planar electrodes under the application of pulsed voltages. Our model captures space-charge effects, thermal shocks and induced pressure waves. We observe a cycle of discharge pulses heating the gas and the thermal expansion helping the discharge. This cycle might either lead to spark formation or to discharge decay.

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Date submitted: 10 Jun 2016

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