Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Understanding discharge inception in air using high-voltage experiments and particle-in-cell simulations[1] ANDY MARTINEZ, Centrum Wiskunde Informatica (CWI), SHAHRIAR MIRPOUR, Technische Universiteit Eindhoven (TUe), JANNIS TEUNISSEN, Centrum Wiskunde Informatica (CWI), SANDER NIJDAM, Technische Universiteit Eindhoven (TUe), UTE EBERT, Centrum Wiskunde Informatica (CWI), Technische Universiteit Eindhoven (TUe) —
Understanding discharge inception is important for fields like lightning research, lightning protection, and high-voltage technology. In this study, the inception times and probabilities of discharges are measured in a vessel filled with dry and humid air between 100 and 1000 mbar. A pin-to-plate electrode geometry is considered, in which tens of kV are applied over a cm-scale gap. The inception time is defined as the moment a photomultiplier tube measures a signal above the background noise. The inception probabilities and spread of inception times are compared to Monte-Carlo particle simulations with different initial charge densities (e-, and O2-) to find conditions that reproduce the statistics from the experiments.

Preliminary results show two distinct inception timescales: tens of ns, and hundreds of ns. In the first case the electrons have a high probability of reaching the electrode without getting attached while in the second case negative ions 'transport' the electrons to the high field region. From the high-voltage experiments and simulations, we can estimate the initial charge densities and species in the vessel.

[1]Funded by the EU Horizon 2020 program under project ID 722337

Andy Martinez Nieto
Centrum Wiskunde
Informatica (CWI)

Date submitted: 03 Jun 2019 Electronic form version 1.4