

Inception of electrodeless streamers

Lightning, one of the most experienced and most severe phenomena on Earth, consists of two modes, the long hot lightning leaders, mediated by small, cold filamentary discharges called streamers.

Recently, a group of experimentalists were able to control the inception and growth of electrodeless streamers ahead of a laboratory plasma device. The modification of the local electric field and the perturbation of the ambient air with the use of a noble gas laminar flow (such as helium or neon) are the main condition to produce such double-headed streamer, see the figure below and [S. Iseni et al., 2025. Inception and growth of an electrodeless atmospheric double-headed streamer. Phys. Rev. E, vol. 111, L023202].

The purpose of this master project is to understand the exact mechanism how such streamers in an electrodeless environment can inception and what the role of the added noble gas is.

The project consists of literature study about the nature of streamers, developing the necessary codes to simulate the inception and propagation of streamers, performing numerical simulations and conclusively post-processing of simulation results. The main goal of the master project is to better understand electrodeless streamer inception.

We at TU Dortmund study various phenomena related to lightning ranging from the very early microscopic conditions to macroscopic manifestations.

If we have caught your attention, please contact christoph.koehn@tu-dortmund.de to obtain more information.

