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Effects of background- and photo-ionization on positive streamers UTE EBERT, Centrum Wiskunde & Informatica and Eindhoven University of Technology, SANDER NIJDAM, Eindhoven University of Technology, GIDEON WORMEESTER, Centrum Wiskunde & Informatica, EDDIE VAN VELDHUIZEN, Eindhoven University of Technology — Positive streamers in air and other oxygen-nitrogen mixtures are generally believed to propagate against the electron drift direction due to photo-ionization. Photo-ionization is the ionization of O₂ molecules by UV radiation from excited N₂ molecules. The effect is non-local and therefore facilitates the propagation of the streamer head by creating free electrons ahead of it. The relative importance of photo-ionization depends on the ratio between oxygen and nitrogen. Another possible source of free electrons in front of the positive streamer is background ionization. This can be ionization left by previous discharges or by other processes such as cosmic rays or (natural) radio-activity. We study the effects of both photo- and background-ionization on propagation and morphology of positive streamers by changing gas composition and repetition frequency. One of the gas compositions that are used is pure nitrogen with the addition of a small amount of radio-active ⁸⁵Kr to increase background ionization. We also check if streamers have a tendency to follow the paths of their predecessors in previous discharges.

Sander Nijdam
Eindhoven University of Technology

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