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3P05 - Reillumination of Expiring Corona-like Pulsed Discharges in Water

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The reillumination of corona-like discharges in water was reported to start either during the high-voltage plateau or during the falling edge of applied high voltage pulses or not at all. For similar pulse durations and amplitudes, reillumination was then observed for a single filament or for all of the previously formed channels altogether. However, so far no general explanation for this characteristic has been presented.

A detailed study was conducted with single and reproducible high voltage pulses with adjustable fall times between 20 and 45 ns, amplitudes of 50 kV and durations of 100 ns that were applied to a point-to-plane geometry in deionized water. Voltages, currents and intensities of the emitted light were recorded for individual discharges. Plasma currents, discharge energies and channel lengths were derived. Additionally, consecutive images of the same individual discharge event were obtained using a framing camera. The different stages were then related with the electrical and optical measurements.

While no change in discharge development was found for the initial phase of the discharge instigated during the high-voltage plateau, the reillumination of discharge channels was observed only during the falling edge of the applied pulses. A transition from a reignition of single filaments to a reillumination of every channel with decreasing fall time was evident both in the framing camera images and the plasma currents.

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