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Tracking discharge inception in pulsed-driven, atmospheric pressure discharges by synchronised fast optical and electrical diagnostics

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Low-temperature plasmas are currently used in many applications, ranging from surface modifications to life science, where discharges operated at atmospheric pressure are common [1,2]. In many plasma sources, the discharge inception and development take place on the nanosecond time scale, while the discharge dimensions are in the mm scale [2]. Consequently, only very fast diagnostics with high spatial resolution can resolve the spatio-temporal discharge evolution, and thereby gain insight in basic discharge properties, especially with respect to the discharge inception.
In this contribution, the benefits and immense possibilities of sub-ns optical diagnostics will be presented. An overview of emission-based state-of-the-art techniques will be given, which a specific focus on fast imaging by intensified charge-coupled device (iCCD) and streak camera systems. With these systems, it was possible to realise temporal resolutions of 5 ps and spatial resolutions of 2 μm [3].
Furthermore, the effectiveness of synchronised optical and electrical diagnostics as a powerful tool for obtaining essential discharge parameters will be demonstrated through the analysis of two examples of atmospheric pressure discharges: pulsed-driven dielectric barrier discharges [4,5] and sub-ns pulsed spark discharges [3]. By combining the sub-ns optical diagnostics with fast electrical measurements, valuable insights into the dynamics and characteristics of low-temperature plasmas can be obtained. This comprehensive understanding of plasma behaviour is essential for further advancements in plasma-based technologies and their applications.

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[1] M. Laroussi, Front. Phys. **8**:74 (2020)
[2] R. Brandenburg, Plasma Sources Sci. Technol. **26** 053001 (2017)
[3] H. Höft et al., Plasma Sources Sci. Technol. **29** 085002 (2020)
[4] H. Höft et al., Plasma Sources Sci. Technol. **27** 03LT01 (2018)
[5] H. Höft et al., J. Phys. D: Appl. Phys. **55** 424003 (2022)

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