Keep-in-Touch meeting
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Aerodynamic study of atmospheric-pressure plasma jets

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Atmospheric-Pressure Plasma Jets (APPJs) have been used for scientific and industrial applications due to their ability to generate reactive species at high pressure while providing means to carry them into a target. An imposed flow assumes a jet structure, repetitive discharges generate the plasma, and the plasma itself affects the flow. APPJs present also an opportunity for new modelling strategies to explain the underlying mechanisms of the aero-electro-dynamic interactions controlling these jets.

We engage on this challenge by exploring the aerodynamics of APPJs using both modelling and experimental approaches. We model reactive flows at subsonic and low temperature conditions using the in-house codes SPARK (Software Platform for Aerothermodynamics, Radiation and Kinetics) and LoKI (LIsbOn Kinetics), developed at the N-PRiME group of Instituto de Plasmas e Fusão Nuclear (IPFN, Portugal). We diagnose our jets and obtain input data for our numerical models using the experimental setups, tools and expertise of the DIREBIO group with the Laboratoire de Physique des Gaz et des Plasmas (LPGP, France).

During this presentation we describe some of the current challenges and prospects in both components of the work. We review the progress on the SPARK code with the adaptation into subsonic flows, the improvement in the mesh generation, the use of convergence acceleration approaches, the development of a simple streamer model, and the first steps to implement on SPARK the Ar-N_2-O_2 kinetics of LoKI. Furthermore, we present some of the knowledge acquired during the stay at LPGP (shortened due to the current pandemic situation), namely preliminary fast-imaging results, and discuss expectations for the experimental work during next year.