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Plasma jets and electric fields delivery on targets relevant for biomedical applications

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The study of plasma jets operating in free jet mode and on conductive targets relevant for biomedical applications is discussed. The simultaneous diagnostics of helium metastable through laser absorption, electric field (EF) with an electro-optic probe and current appears as a unique approach to get deep insights on the mechanisms triggered when primary ionization wave (IW), driving the plasma jet propagation, impacts the target. Secondary IWs, back and forth travelling from the plasma jet powered electrode and the grounded target, is measured and may result, depending on the operating parameters of the device, in the transition to a glow like discharge. In such situation, huge enhancement of reactive species production is triggered in connection with significant increase of current flowing through the target. This study allow for a better analysis of the plasma jet delivery on target relevant for biomedical applications and open up opportunities to control reactive species concentration and current amplitude in such experiments. These experimental results are in good agreement with modeling work recently published by group of M.J. Kushner (University of Michigan) on the plasma jet touching or not targets of various natures. The second aspect of the study deals with the characterization of both the amplitude and the topology of the transient EF generated in the vicinity of the plasma jets. Time resolved longitudinal and radial EF, with respect to the jet propagation axis, having amplitudes ranging from a few to a few tens of kV/cm have been measured. There also a good agreement is achieved with modeling data from the group of A. Bourdon (LPP laboratory) which allow extending this diagnostics to region where experimental analysis is hard or disturbing with our probe. It is probably worth considering such intense EF with respect to their potential impact on biological samples.