DEVELOPMENT OF 'CHARGE OVERFALL' PLASMA JETS ACROSS THE GROUND ELECTRODE IN A DIELECTRIC BARRIER DISCHARGE CONFIGURATION

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With a proper combination of the width of the ground electrode and the applied voltage, atmospheric pressure plasma jets extending away from the ground electrode, whether sitting on the downstream or the upstream side, can be equally obtained with a dielectric barrier discharge setup, which can be ascribed to the overfall of charges (we call such kind of plasma jet overfall jet) [JAP, 106, 013308 (2009)]. In this paper we investigated the dependence of the initial voltage for such a jet upon the width of the ground electrode; furthermore, by using transparent and triadic ground electrodes, development of the charge overfall beneath the ground electrode was resolved. Temporal evolution of the discharge currents measured on the individual ground electrodes helps establish the creeping dynamics of the discharges over the dielectric surface. A slow propagation velocity of 3×10^3 m/s was measured inside the dielectric tube, which is consistent with the picture for the overfall jet propagating via surface discharge. From a practical point of view, the overfall plasma jet has the advantages of safety, since the most outside electrode is ground.