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Polarization resolved electric field measurements on plasma bullets in N_2 using four-wave mixing MARC VAN DER SCHANS, Eindhoven University of Technology, Department of Applied Physics, PATRICK BOEHM, Ruhr-University Bochum, Institute for Experimental Physics V, SANDER NIJDAM, Eindhoven University of Technology, Department of Applied Physics, WILBERT IJZERMAN, Philips Lighting, UWE CZARNETZKI, Ruhr-University Bochum, Institute for Experimental Physics V — Atmospheric pressure plasma jets generated by kHz AC or pulsed DC voltages typically consist of discrete guided ionization waves called plasma bullets. In this work, the electric field of plasma bullets generated in a pulsed DC jet with N_2 as feed gas is investigated using the four-wave mixing method. In this diagnostic two laser beams, where one is Stokes shifted from the other, non-linearly interact with the N_2 molecules and the bullet's electric field. As a result of the interaction a coherent anti-Stokes Raman scattered (CARS) beam and an infrared beam are generated from which the electric field can be determined. Compared to emission-based methods, this technique has the advantage of being able to also probe the electric field in regions around the plasma bullet where no photons are emitted. The four-wave mixing method and its analysis have been adapted to work with the non-uniform electric field of plasma bullets. In addition, an ex-situ calibration procedure using an electrode geometry different from the discharge geometry has been developed. An experimentally obtained radial profile of the axial electric field component of a plasma bullet in N_2 is presented. The position of this profile is related to the location of the propagating bullet from temporally resolved images.

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