

Abstract Submitted  
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**Temporal behaviour of helium metastables and molecular nitrogen ions in a He APGD** GAGIK NERSISYAN, JEAN-PIERRE VAN HELDEN<sup>1</sup>, WILLIAM GRAHAM, Physics and Astronomy, Queen's University Belfast, Northern Ireland — Laser-aided methods are used to characterize the temporal behaviour two of the important species, helium metastables ( $\text{He}_m$ ) and  $\text{N}_2^+$  ions, in the development of an atmospheric pressure glow discharge (APGD) in helium generated in a planar configuration of a dielectric barrier discharge with quartz dielectrics. The discharge modes are monitored by electrical and optical measurements and fast imaging. Under certain conditions, mainly when the impurity level is low, there is a residual discharge between the APGD pulses. The termination of this residual discharge and generation of a more typical pulse APGD happens when the impurity level is relatively high. The temporal behaviour of  $\text{He}_m$  obtained by both optogalvanic and the laser induced fluorescence (LIF) signals is well correlated with the discharge current. The temporal variation of the  $\text{N}_2^+$  ion density is also measured using LIF. When the mode of APGD with a residual discharge is generated the density between the discharge pulses is higher than during the pulses. In the typical APGD mode the  $\text{N}_2^+$  ion density has a maximum which is delayed a few  $\mu\text{s}$  from the current peak followed by a decrease of the density to below the detection limit.

<sup>1</sup>Permanent address: Eindhoven University of Technology, The Netherlands.

William Graham  
Physics and Astronomy, Queen's University Belfast, Northern Ireland

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