Abstract Submitted
for the GEC12 Meeting of
The American Physical Society

Tailoring non-equilibrium atmospheric pressure plasmas for healthcare technologies TIMO GANS, University of York — Non-equilibrium plasmas operated at ambient atmospheric pressure are very efficient sources for energy transport through reactive neutral particles (radicals and metastables), charged particles (ions and electrons), UV radiation, and electro-magnetic fields. This includes the unique opportunity to deliver short-lived highly reactive species such as atomic oxygen and atomic nitrogen. Reactive oxygen and nitrogen species can initiate a wide range of reactions in biochemical systems, both therapeutic and toxic. The toxicological implications are not clear, e.g. potential risks through DNA damage. It is anticipated that interactions with biological systems will be governed through synergies between two or more species. Suitable optimized plasma sources are improbable through empirical investigations. Quantifying the power dissipation and energy transport mechanisms through the different interfaces from the plasma regime to ambient air, towards the liquid interface and associated impact on the biological system through a new regime of liquid chemistry initiated by the synergy of delivering multiple energy carrying species, is crucial. The major challenge to overcome the obstacles of quantifying energy transport and controlling power dissipation has been the severe lack of suitable plasma sources and diagnostic techniques. Diagnostics and simulations of this plasma regime are very challenging; the highly pronounced collision dominated plasma dynamics at very small dimensions requires extraordinary high resolution - simultaneously in space (microns) and time (picoseconds). Numerical simulations are equally challenging due to the inherent multi-scale character with very rapid electron collisions on the one extreme and the transport of chemically stable species characterizing completely different domains. This presentation will discuss our recent progress actively combining both advance optical diagnostics and multi-scale computer simulations.

Timo Gans
University of York

Date submitted: 29 Jun 2012 Electronic form version 1.4