Abstract Submitted
for the GEC14 Meeting of
The American Physical Society

Multiple Pulses from Plasma Jets onto Liquid Covered Tissue[1]
SETH NORBERG, WEI TIAN, ERIC JOHNSEN, MARK J. KUSHNER, University of Michigan — Atmospheric pressure plasma jets are being studied in the treatment of biological surfaces that are often covered by a thin layer of liquid. The plume of the plasma jet contains neutral radicals and charged species that solvate into the liquid and eventually form terminal species that reach the tissue below. The contribution of neutral and charged species to reactivity in the liquid is sensitive to whether the active plasma plume touches the liquid. In this paper, we discuss results from modeling the production of the aqueous species formed from the interaction of the plume of plasma jets over multiple pulses with the water layer, and the fluences of the species to the underlying tissue. The model used in this study, *nonPDPSIM*, solves transport equations for charged and neutral species and electron energy, Poisson's equation for the electric potential, and Navier-Stokes equations for the neutral gas flow. Radiation transport includes photoionization of O_2 and H_2O in the gas and liquid phases and photodissocation of H_2O_{aq} in the liquid. Multiple pulses when the plasma plume touches and does not touch the liquid will be examined. Two regimes of hydrodynamics will be discussed – low repetition rates where the neutral radicals are blown away before the next discharge pulse, and high repetition rate when the plasma plume interacts with neutral radicals from previous pulses. The density of aqueous ions produced in the liquid layer is strongly dependent on whether the plasma effluent touches or does not touch the water surface.

[1]Work supported by DOE Office of Fusion Energy Science and NSF.

Mark Kushner
University of Michigan

Date submitted: 12 Jun 2014 Electronic form version 1.4