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Manipulating electron dynamics and plasma chemistry in dual radio-frequency driven atmospheric pressure plasmas COLM O'NEILL, KARI NIEMI, JOCHEN WASKOENIG, Centre for Plasma Physics, Queens University Belfast, Belfast, BT7 1NN, Northern Ireland, UK, TIMO GANS, York Plasma Institute, Department of Physics, University of York, Heslington, York, YO10 5DQ, UK — Radio-frequency driven cold atmospheric pressure plasmas have the potential for many new technological applications. Plasma ionisation dynamics and chemistry is complex and increased control is desired. Dual frequency operation has been shown to provide enhanced control over power coupling and ionisation mechanisms [1, 2]. Here a numerical model based on hydrodynamic equations with a semi-kinetic treatment of the electrons considering 184 reactions amongst 20 species is used to determine the effects of dual-frequency excitation on electron dynamics and plasma chemistry. It is found that variations of the frequencies, voltages and relative phase enable the manipulation of the temporal and spatial structures of plasma ionisation and subsequently the electron energy distribution function (EEDF) which governs plasma chemistry.

[1] J. Waskoenig and T. Gans, Appl. Phys. Lett. 96, 181501 (2010).
[2] C.O'Neill, J. Waskoenig and T. Gans, IEEE Trans. Plasma Sci. (Accepted April 28, 2011).

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