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**Atmospheric pressure direct current micro glow discharge simulation: Effects of the external circuit** TANVIR FAROUK, Princeton University, BAKHTIER FAROUK, Drexel University — The effect of the external circuit on discharge conditions are not explicitly considered in most modeling studies of thermal and non-thermal plasma discharges. In this study, we investigate the effects of including the external circuit on simulation results of atmospheric pressure micro discharges. Two-dimensional simulations of DC atmospheric pressure micro glow discharges were conducted using a hybrid model. The discharge model is coupled to an external circuit model enabling to study the effect of the external circuit parameter. Simulation results were first obtained by excluding the external circuit. When included, the external circuit consisted of a ballast resistance and a parasitic capacitance connected in series and parallel in respect to the discharge. Simulations were conducted over a broad discharge current range (varying ballast resistance) and also for varying parasitic capacitance. For large ballast resistance the discharge was found to operate in the Townsend regime as a dark discharge. At smaller ballast resistance the discharge showed ‘*normal*’ glow like characteristics. The simulations further indicated that for higher values of the parasitic capacitance the discharge even with a DC power supply was self oscillatory; indicating some unstable regime. The predicted results were found to be in agreement with experimental observations.

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