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Modeling the sheath in a radio frequency driven micro-plasmajet at atmospheric pressure[1] TORBEN HEMKE, RALF PETER BRINKMANN, THOMAS MUSSENBROCK, Theoretical Electrical Engineering, Ruhr-University Bochum — Among the number of different microplasma sources developed over the last years there is the atmospheric pressure plasma jet, the so called APPJ. The types of APPJs differ in geometries, the driving frequency and the chemistry. The μ-APPJ invented by Schulz-von der Gathen and co-workers can be regarded as a downscaled symmetric CCP, driven at 13.56 MHz. Although microplasmas at atmospheric pressure became the focal point of both, experimental and theoretical investigation recently there is still a lack of understanding the physics of the discharges. In this paper we concentrate on the RF modulated sheath of the μ-APPJ. Based on a scale analysis in time and space we discuss resulting assumptions concerning the fluid equations for electrons and ions. We develop an approximation of the electric field in the sheath and solve the equation of motion for the ions. We make use of plasma parameters – as the plasma density and the electron temperature – derived by fluid simulations as operating parameters of the sheath. Finally, we present the density profiles of the electrons and ions depending on these discharge parameters.

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