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EEDF and plasma chemistry control in micro atmospheric pressure plasma jets by Voltage Waveform Tailoring[1]

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Radio frequency excited microscopic atmospheric pressure plasmas have been receiving increasing attention in both academic and applied research. The reactive species generated in such plasma sources are important for various applications, e.g., sterilization, bacteria/cancer cell deactivation, wound healing, exhaust gas cleaning, surface treatment of different materials, and semiconductor manufacturing. Here, based on experiments and kinetic Particle-in-Cell/Monte Carlo simulations of discharges in helium with N_2 admixtures, we demonstrate Voltage Waveform Tailoring to allow to control the dynamics of energetic electrons, the electron energy distribution function in distinct spatio-temporal regions of interest, and, thus, the generation of atomic nitrogen as well as helium metastables, which are highly relevant for a variety of technological and biomedical applications. By tuning the number of driving frequencies and the reactive gas admixture, the generation of these important species can be optimized and the discharge chemistry can be customized.

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