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Influence of HV pulse repetition rate on densities of excited species in atmospheric helium plasma jet[1] NADER SADEGHI, LTM & LIPhy, Univ. Grenoble & CNRS, France, VINCENT PUECH, CLAIRE DOUAT, LPGP, Univ. Paris-Sud & CNRS, France — Time varying plasma characteristics of a 2 mm diameter atmospheric helium microplasma jet excited by nanosecond high voltage pulses (4-7 kV; 1-50 kHz rep. rate) was studied. Density of helium He(2^3S_1) metastable atoms was determined by tunable laser diode absorption. The spatio-temporal dynamics of characteristic plasma jet emissions, such as the 706.5 nm and 587.5 nm He* and 777 nm O* lines, the 337 nm N_2(C-B), 391 nm N_2^+(B-A) and 308 nm OH* bands were studied by sub-nanosecond time-resolved imaging of the jet with bandpass filters and by nanosecond time-resolved photon-counting behind an spectrograph. Spatial distribution of excited species strongly depends on plasma parameters and HV pulses rep. rate; *e.g.* hollow shape profiles at 3 kHz become axially centered above 10 kHz. Also, higher is the rep. rate slower are the late afterglow decay times of O* and OH* emissions, reaching about 20 μs at 20 kHz. This is likely linked to the very slow positive ion-negative ion recombination mechanism, producing these excited species. The two above-mentioned effects are attributed to a memory effect due to formation of negative ions generated from water impurity and air penetration.

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