Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

**Generation and dynamics of single-electrode nanosecond pulsed microplasma jets**[1] CHUNQI JIANG, JAMIE LANE, SHUTONG SONG, Frank Reidy Research Center for Bioelectrics, Old Dominion University, PLASMA AND PULSED POWER LAB AT ODU-CBE TEAM — Several millimeter long, 160 - 260 micrometer-in-width, helium plasma jets were generated in ambient atmosphere when a needle electrode was excited with nanosecond high voltage pulses at single shot or up to 500 Hz. This single-electrode system does not require the use of ground electrode for plasma generation, and thus has advantages in simplicity and small-dimension for a variety of biomedical applications. Dynamics of the microplasma jet powered by high voltage pulses with two different nanosecond pulses – 5 ns and 164 ns, was studied with high speed imaging, and spatiotemporally resolved optical emission spectroscopy. Whereas the plasma jet exhibits three different modes including a positive-streamer mode, a stochastic transition, and a negative streamer-like mode when it was excited with 164 ns kilovolt pulses, such modes and transitions in the plasma development were not observed for the 5 ns pulsed excitation. Shorter pulses with shorter rise times allowed higher energy deposition into the plasma and promote rapid acceleration of the plasma wavefronts; 5 ns pulsed excitation resulted in 4 times increase in the wavefront velocity compared with the 164 ns pulsed excitation. Importantly, the production of excited atomic oxygen increased by a factor of 2 for the 5 ns pulsed plasma jet when compared with that for a 164 ns pulsed plasma jet, whereas the other excited species including He, O, H, OH, $N_2$(C-B) and $N_2^+$ (B-X) were produced at comparable rates for the two plasma jets.

[1]Work supported by the Air Force Office of Scientific Research (AFOSR Award No. FA9550-11-1-0190).

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Date submitted: 24 Jul 2015 Electronic form version 1.4