Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Extreme degree of ionization in micro-capillary plasma columns heated by ultrafast current pulses[1] JORGE ROCCA, JING LI, GONZALO AVARIA, MICHAEL GRISHAM, FERNANDO TOMASEL, VYACHESLAV SHLYAPTSEV, Colorado State University — The efficient generation of dense large-scale plasma columns with very high degree of ionization and high homogeneity can enable fundamental plasma studies and a variety of promising applications. We demonstrate the generation of dense large-aspect-ratio plasmas columns with extremely high degree of ionization in micro-capillary channels heated by ultrafast discharge current pulses. Xenon plasma columns were ionized to the Co-like stage (Xe XXVIII) injecting 37 kA current pulses with 4 ns risetime into of 500 micrometer diameter, with lines from the Fe-like ion (Xe XXIX) also visible in the spectra. Sequences of time-resolved filtered pinhole images of the plasma column show a symmetric compression leading to 300: 1 aspect-ration plasma channels. The experimental results, that include ionization of Al impurities up to the H-like stage, support model simulations in showing that rapid ohmic heating of micro-capillary channels with relatively modest currents can generate very hot dense plasma columns which electron temperature could approach 1 KeV.

[1]Work supported by NSF Award PHY-1004295.

Jorge Rocca
Colorado State University

Date submitted: 24 Jul 2012 Electronic form version 1.4