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Tuning of Electron Energy and Density in a Double-Pulsed Argon Plasma RICKY TANG, EDWARD BARNAT, PAUL MILLER, Sandia National Laboratories — The ability to tune the properties of a plasma was demonstrated with a double-pulsed positive column discharge. The plasma is generated by the first voltage pulse, which sets the peak electron density. A subsequent voltage pulse is applied during the afterglow to achieve independent tuning of the electron energy. Experiments were conducted over a range of voltage pulse amplitudes. Microwave resonant cavity (MRC) measurements of electron density and temperature demonstrated operating conditions, such as relative pulse amplitude and pulse width, where the electron temperature can be independently adjusted without affecting the density. Laser absorption measurements of the concentration of the 1S4 and 1S5 metastable states of argon corroborate the MRC measurements, demonstrating an increase in metastable density while the electron density continues its decay after the initial pulse. Electron drift velocity calculation also shows the dependence of the electron energy on the second voltage pulse. Results from the two diagnostics demonstrate the ability to tune the E/N ratio of the plasma, and hence the mean electron energy, independently of the density. This work was supported in part by the Department of Energy Office of Fusion Energy Science Contract DE-SC0001939.

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