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Determining Metastable Density Through Afterglow Electron Density Measurements STEVEN SHANNON, KRISTOPHER FORD, COREY DECHANT, JOEL BRANDON, DAVID PETERSON, North Carolina State University, SANG KI NAM, Samsung Electronics Co. — Metastable density is a key parameter for predicting plasma chemistry, particularly because it acts as a strong driver for plasma density through stepwise ionization. Most often, laser absorption is used to determine the metastable density in low pressure plasmas. However, it would be advantageous to measure both metastable and electron density simultaneously from a single diagnostic. This work proposes the use of a hairpin microwave probe in a power modulated plasma to determine both densities. Metastable pooling in the plasma afterglow generates a local maximum in the electron density trace, which can be used with simplified rate equations to determine metastable density. The method was first proposed by Greenberg and Hebner (*J. Appl. Phys.* 73, 1993), and is refined here for argon and helium plasmas. The results are compared with fluid simulations from the Multiphysics Object Oriented Simulation Environment, MOOSE.

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