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Correlating Metastable-Atom Density, Reduced Electric Field, and Electron Energy Distribution in the Earlier Stages of a 1-Torr Argon Discharge[1] M. KOEPKE, J.B. FRANEK, S.H. NOGAMI, V. DEMIDOV, West Virginia University, E.V. BARNAT, Sandia National Laboratories — Temporal measurement of electron density, metastable-atom density, and reduced electric field are used to infer the dynamic behavior of the excitation rates describing electron-atom collision-induced excitation in the positive column of a pulsed Ar discharge plasma by invoking plausible assumptions about the shape of the electron energy distribution function (EEDF), specifically, inelastic electron-metastable collisions produce high-energy electrons and electron-electron collisions cause the EEDF to Maxwellianize.[2] Direct observation of these excitation rates were used to predict the temporal behavior of metastable-atom density in the post-transient stage of a pulsed plasma discharge.[3] Ignoring the effect of electron-electron collisions allows for the examination, in this poster, of correlations between the aforementioned quantities in the transient stage of a discharge. We conclude that the observed and predicted line-emission ratio agree quantitatively in the transient phase of the discharge and agree qualitatively in the initiation phase of the discharge. Ignoring electron-electron collisions allows insight into hard-to-measure or expensive-to-measure plasma conditions and their time dependence.

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[2]*PSST* 14, 722 (2005).
[3]*PSST* 23, 034009 (2015).

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