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Modeling of Optical Emission Spectra in an Ar Pulsed Discharge to Determine Absolute Metastable Density[1] S.F. ADAMS, J.A. MILES, A.C. LABER, Air Force Research Laboratory, J.M. WILLIAMSON, Innovative Scientific Solutions Inc. — Optical emission measurements of relative intensities of violet spectral lines in an Ar pulsed discharge have been combined with available electron-impact cross sections to yield absolute Ar metastable species concentration. An enabling factor of this analysis is that the electron excitation pattern from the Ar singlet ground state and the triplet metastable state (1s in Paschen's notation) is quite different between the 10 levels of the resonant 3p state ($3p_1$..$3p_{10}$). The result of this pattern is that the emission spectrum of 3p-1s transitions will display a unique intensity distribution depending on whether the 3p state is generated by direct excitation from the ground state, or by stepwise excitation from one of the 1s metastable states. Data is shown for a model that accurately simulated experimental spectra using the metastable state density and the E/N as fitting parameters.

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S. F. Adams
Air Force Research Laboratory

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