Plasma Parameters in an Ar and Ar/Cl\textsubscript{2} Asymmetric Coaxial CCP Used for Plasma Etching of Superconducting Niobium Cavities.\textsuperscript{1} JEREMY PESHL, Old Dominion University, MILKA NIKOLIC, University of San Francisco, ALEX GODUNOV, SVETOZAR POPOVIC, LEPSHA VUSKOVIC, Old Dominion University — Plasma parameters of both Ar and Ar/Cl\textsubscript{2} plasmas were evaluated using Optical Emission Spectroscopy techniques. Emission spectra from the 3p\textsuperscript{5}4p levels of Ar are analyzed within two different line ratio methods to extract the pertinent information. The analysis of a pure Ar plasma serves to establish the methodology and provides a reference for the Ar/Cl\textsubscript{2} plasma. The first line ratio technique follows a previously published method utilizing the photon escape factor of specific transitions to calculate the densities of the resonant and metastable levels. This technique is advantageous because it requires no knowledge of the distribution \textit{a priori}. The population densities of the resonant and metastable levels, along with the escape factors for each transition, were used in a line ratio technique utilizing a Collisional Radiative Model. Two sets of cross sections were employed in the analysis: calculated direct excitation cross sections and experimental cross sections containing cascade effects. Four different electron energy distributions were applied to the analysis for comparison. A comprehensive analysis was conducted over a wide array of experimental parameters relevant to plasma etching of Niobium.

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