Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Plasma Parameters in an Ar and Ar/Cl_2 Asymmetric Coaxial CCP Used for Plasma Etching of Superconducting Niobium Cavities.[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_2 plasmas were evaluated using Optical Emission Spectroscopy techniques. Emission spectra from the $3p^5 4p$ 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_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 *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.

[1]This work is supported by the Department of Energy under grant No. DE-SC0014397.

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Date submitted: 01 Jun 2018 Electronic form version 1.4