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Examining Helium Line Intensities and Ratios in a Linear Helium Plasma to Identify T_e and n_e H. RAY, University of Tennessee, Knoxville, T.M. BIEWER, E.A. UNTERBERG, D.T. FEHLING, R.C. ISLER, Oak Ridge National Laboratory — Oak Ridge National Laboratory's prototype Material Plasma Exposure eXperiment (Proto-MPEX) is a linear plasma device dedicated to the understanding of plasma material interaction physics. A photomultiplier tube (PMT) based diagnostic system called a filterscope examines the visible light emission from Proto-MPEX. The filterscope is a non-invasive, high sensitivity, and high temporal resolution compact system with multiple PMT channels. Three PMTs contain He I narrow bandpass filters of wavelengths 667.9, 723.6, and 706.7 nm for line ratio analysis. Helium line intensities and ratios have been widely applied on astrophysical plasmas and machines such as JET and NSTX to determine profiles of electron temperatures, T_e, and densities, n_e. Ratios of the He I intensities measured by the filterscope are compared to calculated intensity ratios determined through a collisional radiative model (CRM) as follows: An excited He atom in state P will de-excite to a lower energy level Q by emitting a photon of a specific wavelength. A CRM uses the interactions P has with Q and other energy levels to calculate the population density of P. The calculated population density is used to determine the spectral line intensity of the wavelength analyzed. The aforementioned process is performed for each of the He I bandpass filters, and ratios dependent on T_e and n_e are calculated and compared to the filterscopes measured ratios.

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