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2.16 Developing a Fast Visible Camera Diagnostic for 2D-Measurements of the Balmer Series and Impurity Emission Lines in Proto-MPEX Plasma Discharges

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The Prototype Material Plasma Exposure eXperiment (Proto-MPEX) is a linear plasma device designed to generate divertor-like conditions, yielding electron densities up to $\sim 10^{20} \text{ m}^{-3}$ and electron temperatures up to $\sim 20 \text{ eV}$. Monochromatic and color Edgertronic Sanstreak SC1 fast visible cameras capture high speed video ($< 18 \text{ k fps}$) of plasma discharges. A 50/50 beam splitter allows both cameras to image the same region of the discharge. Concurrent multi-camera 2D line-integrated images were made of two or more emission line fields using narrow-band transmission filters. The deuterium Balmer series dominates the visible emission spectra from Proto-MPEX, confirmed via broadband spectrally resolved measurements. Under certain conditions, such as gas puffing, impurity line emissions were observed. Spatial features from multiple spectral line images were compared. Also, a uniform intensity white light source was used to calibrate pixel-to-pixel and absolute intensities. From this, the $D\alpha$, $D\beta$, and $D\gamma$ intensity ratio 2D fields and the 2D n_0 and n_e fields were estimated. Comparisons were drawn between line-integrated and Abel inverted emission (r, z) profiles. Discussion includes the limitations of the multi-camera technique and measured plasma material interactions (PMI) at the target plate.

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