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HELIOS Diagnostic for the Prototype Material Plasma Exposure eXperiment HOLLY RAY, University of Tennessee, THEODORE BIEWER, JUAN CANESES, Oak Ridge National Laboratory, NISCHAL KAFLE, University of Tennessee, Knoxville, JORGE M. MUOZ BURGOS, Astro Fusion Spectr, EZEKIAL UNTERBERG, Oak Ridge National Laboratory, OLIVER SCHMITZ, University of Wisconsin, Madison — A helium line-ratio spectral monitoring (HELIOS) diagnostic has been implemented on Oak Ridge National Laboratory's (ORNL) Prototype Material Plasma Exposure eXperiment (Proto-MPEX). A Filterscope and a 1 meter McPherson spectrometer are used to measure the intensity of three separate helium lines: 667.9 nm, 706.53 nm, and 728.0 nm. The open magnetic geometry of Proto-MPEX allows for direct comparison between the derived n_e and T_e values to nearby double Langmuir probes (DLP) and Thomson scattering (TS) measurements. Preliminary HELIOS measurements give T_e values of 5 - 8 eV and density values of $2.71e18 \text{ m}^{-3}$ - $9.34e18 \text{ m}^{-3}$, which are consistent with edge Thomson Scattering T_e and n_e . The ability to measure the core density ($>2.00e19 \text{ m}^{-3}$) and low temperature ($<5 \text{ eV}$) regime of Proto-MPEX with HELIOS is of great interest; however, the gas puff penetration into the plasma column is limited by the n_e of the core. The gas puff was increased until signs of core gas penetration were observed. The data suggest that the high neutral helium density introduced to the chamber during the gas puff is causing radiation trapping of the ground state singlet transitions: $2^1P \rightarrow 3^1D$ (667.9 nm) and $2^1P \rightarrow 3^1S$ (728.0 nm). Correcting for this brings the HELIOS measured n_e and T_e in the core of the discharge into agreement with DLP measurements.

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