

# An Experimental Platform for Creating White Dwarf Photospheres in the Laboratory

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## Abstract

We present hydrogen Balmer line profiles in emission, absorption, and transmission at plasma conditions observed in white dwarf (WD) photospheres ( $n_e \sim 10^{17} \text{ cm}^{-3}$ ,  $T_e \sim 1 \text{ eV}$ ); these profiles will be used to constrain and eventually benchmark the latest theoretical WD atmosphere models (e.g., Tremblay Bergeron 2009), which, used with the spectroscopic method (e.g., Bergeron et al. 1992), are responsible for determining fundamental parameters (i.e., effective temperature, mass) for tens of thousands of WDs. Our experiments, performed at the Z Pulsed Power Facility at Sandia National Laboratories, intercept the bath of X-rays generated from a z-pinch dynamic hohlraum and use them to drive plasma formation in a gas cell. The experimental platform is unique compared to past experiments in that the heating of the plasma is radiation-dominated, providing the opportunity to explore time-dependent, non-LTE, collisional-radiative atomic kinetics. It is also the first time hydrogen Balmer lines have been measured in absorption/transmission at these conditions in the laboratory.