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Laboratory measurements of discrepancies between Hβ and Hγ absorption line profiles at the conditions of White Dwarf photospheres[1] MARC-ANDRE SCHAEUBLE, J. E. BAILEY, TAISUKE NAGAYAMA, T. A. GOMEZ, Sandia National Laboratories, M. H. MONTGOMERY, D. E. WINGET, University of Texas at Austin — Fits to stellar hydrogen Balmer absorption lines can be used to infer the masses of White Dwarf (WD) stars. The resulting masses depend on which Balmer series members are included in the spectral fit. Furthermore, studies have found this spectroscopic mass to be ˜10% lower than that determined by the independent gravitational redshift mass determination method. The combination of these trends cast doubt on the accuracy of spectroscopically determined masses. Here, we present laboratory experiments aimed at investigating weaknesses in the main component of the spectroscopic technique: hydrogen line-shape calculations. These experiments were performed at Sandia National Laboratories' Z-machine and allow for the recording of high-quality absorption spectra. Analysis of the experimental absorption spectra reveals that electron density (ne) values derived from the Hγ line are $\sim$346% lower than from Hβ. To explore this difference, we investigated plasma gradients and errors in the data extraction and fitting methodology. We find that these components have a negligible impact on derived Hβ and Hγ ne. This experimental evidence may suggest that the hydrogen line-shape calculations currently used in WD spectral fitting are not accurate enough to result in reliable WD masses.

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