*Invited Lecture*

# LABORATORY HYDROGEN LASER-PLASMA AND WHITE-DWARF STARS LINE SHAPES

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Experimental studies of laser-induced plasma in nominal laboratory settings are instrumental for the interpretation of radiation from astrophysical objects. White dwarf (WD) stars reveal a variety of line shapes that are usually measured in absorption. Typical time-resolved laser-plasma investigations show emission profiles that are subsequently correlated with astrophysical records. For the hydrogen beta line, H$\beta$, of the Balmer series, line width, peak separation, and central dip-shift are indicators of electron density. Of particular interest is H$\beta$ in characterization of WD's with temperature of the order of 30 kK, viz. Sirius B ($\alpha$ CMa B) accompanying the brightest star Sirius A as seen from Earth. However, instead of hydrogen absorption spectra, molecular carbon Swan spectra are recorded for cooler WD's at a temperature of the order of 8 kK, viz. Procyon B ($\alpha$ CMi B), companion of the $5^{\text{th}}$ brightest star Procyon A. In the laboratory, hydrogen alpha emission spectra are also of interest, including determination of temperature using the line-to-continuum ratio. The mass of WD stars is typically of the order of the mass of the Sun ($M_\odot$), but the WD radius is about the size of the Earth, or 1/100 times that of the Sun (0.01 $R_\odot$). Of interest are as well gravitational WD redshifts, especially comparisons with measured transient laser-plasma redshifts and correlation of astrophysical and of laboratory spectra. Current and future research aspects include modeling of WD atmospheres for explanation of the very details of the astrophysical line shapes.