

Abstract Submitted  
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**Models of  $H_\alpha$  Doppler emission profiles from low-pressure, hollow-cathode discharges in hydrogen** A.V. PHELPS, JILA, University of Colorado and NIST — Calculated Doppler profiles are compared with experiment for the  $H_\alpha$  line excited in collisions of fast atoms, ions, molecules, and electrons with  $H_2$  in low-pressure, high-voltage hollow-cathode hydrogen discharges. We test the proposal of Lavrov and Mel'nikov<sup>1</sup> that their observation of fast  $H(n=3)$  moving away from the cathode is the result of acceleration of  $H^-$  and its subsequent collisions with  $H_2$ . Our recent model<sup>2</sup> is extended to include the kinetics of  $H^-$ . Because the cathode fall is mostly outside the cylindrical cathode, the cathode is approximated as a nearly transparent planar electrode with an unknown area for reflection of fast H atoms and for production of  $H^-$ . Calculated Doppler profiles are compared with emission measurements parallel to the tube axis for their wide range of pressures. Using experimental  $H^-$  yields, the calculated  $H^-$  contribution to the  $H_\alpha$  wing is significantly smaller than that caused by H atoms reflected by the cathode and comparable with the noise in the measured data.

<sup>1</sup>B. P. Lavrov and A. S. Mel'nikov, *Optics and Spectrosc.* **79**, 842 (1995).

<sup>2</sup>A. V. Phelps, *Phys. Rev. E* **79**, 066401 (2009).

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