

# Fully differential investigation of two-center interference in dissociative capture in $p + H_2$ collisions

S. Bastola,<sup>1</sup> M. Dhital,<sup>1,\*</sup> B. Lamichhane,<sup>1,†</sup> A. Silvus,<sup>1,‡</sup> R. Lomsadze,<sup>2</sup> J. Davis,<sup>1</sup> A. Hasan,<sup>3</sup> A. Igarashi,<sup>4</sup> and M. Schulz<sup>1,§</sup>

1 Physics Dept. and LAMOR, Missouri University of Science & Technology, Rolla, Missouri 65409, USA

2 Dept. of Exact and Natural Science, Tbilisi State University, Tbilisi 0179, Georgia

3 Dept. of Physics, UAE University, P.O. Box 15551, Al Ain, Abu Dhabi, UAE

4 Faculty of Engineering, University of Miyazaki, Miyazaki 889-2192, Japan

\*Present address: Physics Dept., University of California-Riverside, Riverside, CA 92521.

†Present address: Earlham College, Richmond, IN 47374.

‡Present address: Department of Radiation Oncology, Washington University, St. Louis, MO 63110.

**Synopsis** Fully differential cross-sections were measured for the dissociative capture process to study the two-center interference term in  $p + H_2$  collisions.

We have measured and calculated fully differential cross sections for vibrational dissociation following capture in 75-keV  $p + H_2$  collisions. For a molecular orientation perpendicular to the projectile beam axis and parallel to the transverse momentum transfer, we observe a pronounced interference structure. Compared to a previous nearly kinematically complete experiment we improved the recoil momentum resolution by a factor of 5 and enhanced the number of true coincidences by an order of magnitude. We also did a correction for the momentum transferred to the molecule which was neglected in the past. The positions of the interference extrema suggest that the interference term is afflicted with a phase shift that depends on the projectile scattering angle. However, no significant dependence on the kinetic energy release

was observed. Considerable discrepancies between our calculations and experimental data were found.

## References

- [1] Fully differential investigation of two-center interference in dissociative capture in  $p + H_2$  collisions, S Bastola, M Dhital, B Lamichhane, A Silvus, R Lomsadze, J Davis, et al., Physical Review A 105 (3), 032805
- [2] Fully Differential Study of Capture with Vibrational Dissociation in Collisions, BR Lamichhane, T Arthanayaka, J Remolina, A Hasan, MF Ciappina, et al., Physical review letters 119 (8), 083402
- [3] Using coherence and interference to study the few body dynamics in simple atomic collisions systems, S Bastola, Missouri S&T

---

§ [schulz@mst.edu](mailto:schulz@mst.edu)

alternative correspondence: [sbdr9@mst.edu](mailto:sbdr9@mst.edu)