

Abstract Submitted  
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**Geometric phase effects in ultracold hydrogen exchange reactions**<sup>1</sup> BALAKRISHNAN NADUVALATH, JAMES F. E. CROFT, JISHA HAZRA, University of Nevada, Las Vegas, NV 89154, BRIAN K. KENDRICK, Theoretical Division (T-1, MS B221), Los Alamos National Laboratory, Los Alamos, NM 87545 — Electronically non-adiabatic effects play an important role in many chemical reactions. The geometric phase, also known as the Berry's phase, arises from the adiabatic transport of the electronic wave function around a conical intersection between two electronic potential energy surfaces. It is shown that in ultracold collisions of H and D atoms with vibrationally excited HD, inclusion of the geometric phase leads to constructive and destructive interferences between non-reactive and exchange components of the wave function. This results in strong enhancement or suppression of reactivity depending on the final rovibrational levels of the scattered HD molecules. The effect is illustrated for non-rotating and rotationally excited HD molecules in the  $v = 4$  vibrational level for which the H+HD and D+HD reactions occur through a barrierless path.

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