

Abstract Submitted  
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**A Novel Merged-Beam Apparatus for Studying Anion-Neutral Reactions** K. MILLER, H. BRUHNS, H. KRECKEL, M. LESTINSKY, W. MITTHUMSIRI, B. SCHMITT, M. SCHNELL, B. SEREDYUK, D.W. SAVIN, Columbia University, X. URBAIN, Universite Catholique de Louvain, M.E. BANISTER, C.C. HAVENER, Oak Ridge National Laboratory, A. DORN, Max Planck Institute for Nuclear Physics, M.L. RAPPAPORT, Weizmann Institute of Science — We have developed a novel apparatus at the Columbia Astrophysics Laboratory to study anion-neutral reactions. Beginning with an anion beam, we use photodetachment to generate a self-merged, anion-neutral beams arrangement. Laboratory beam energies are in the keV range. Because the beams run co-linear, center-of-mass energies from the meV to keV range are achievable. Our proof-of-principle measurement is the associative detachment (AD) reaction  $\text{H}^- + \text{H} \rightarrow \text{H}_2 + \text{e}^-$ . Published values for this process differ by almost an order of magnitude. With theory and experiment unable to reach a consistent description for this fundamental molecular formation reaction, it raises questions of how can we expect to do better for anion-neutral reactions involving more complicated systems? Measurements using our novel apparatus will help to resolve this fundamental issue in physics and chemistry. We observe the AD reaction by detecting fast  $\text{H}_2^+$  ions formed through ionizing collisions of the AD-generated  $\text{H}_2$  with He inside a gas cell. Here we present the current status of the project and discuss our future plans.

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