

Abstract Submitted
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Exploring Ion-Atom Collisions with EIT Enhanced Doppler Velocimetry¹ JOSEPH YADIEL CORDERO-MERCADO , JACOB JOHANSEN , Northwestern University, SHIH-KUANG TUNG, National Tsing Hua University , BRIAN ODOM, Northwestern University — As part of the growing effort to understand ultracold reactions we have developed a new technique, EIT Enhanced Doppler Velocimetry (EEDV). With this technique we intend to make single particle, time resolved, ultracold chemical reaction rate measurements. This is achieved by monitoring changes in the secular frequency of an ion crystal as it reacts with a single known species. The basis of EEDV is to utilize the narrow linewidths obtained from EIT to obtain a steeper slope on our fluorescence profile. On top of this, we implement a feedback mechanism by carefully choosing the laser frequencies in order to keep the amplitude of our oscillations steady, increasing our signal. With EEDV and a collection efficiency of 4% we can reach a Fourier-limited time resolution of ~ 1 ms. With our numerical calculations we predict a mass resolution of 8 amu in our trap. With the precision afforded by this technique we will be able to probe ion-neutral atom reactions; state to state quantum chemistry; and chemistry in the very low density regime, analogous to conditions in the interstellar medium.

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