

Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Toward a cold hybrid-trap measurement of charge-exchange between Na and Ca⁺: Na excited state fraction JAMES E. WELLS, DOUGLAS S. GOODMAN, JONATHAN M. KWOLEK, University of Connecticut, REINHOLD BLUMEL, Wesleyan University, FRANK A. NARDUCCI, Naval Air Systems Command, WINTHROP W. SMITH, University of Connecticut — We present progress towards the measurement of the charge-exchange collision rate coefficient between neutral sodium and ionic calcium. The rate constant for charge exchange between ground state sodium and calcium ion has been previously calculated and predicts a lifetime in our system of the order of days.¹ Experiments by our group show a much larger charge exchange collision rate, probably from the excited 3P state of sodium.² Therefore, an accurate measurement of the charge exchange collision rate constant will require an accurate value for the excited state fraction of the Na MOT. We have developed a technique for making a model-independent measurement of the excited state fraction of a MOT inside a hybrid trap. We compare the measured excited state fraction using this technique with measurements assuming a two-level model of the atom. In addition, we review our recent measurement of the total elastic and resonant charge exchange collision rate between Na and Na⁺.³

¹O.P. Makarov, et al. PRA 67, 042705 (2003).

²W.W. Smith, et al., Applied Phys. B 114, 75 (2014).

³D.S. Goodman, et al PRA 91, 012709 (2015).

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Date submitted: 29 Jan 2015

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