

Abstract Submitted  
for the DAMOP18 Meeting of  
The American Physical Society

**Trapped Ion System for Quantum Simulation with Phonons<sup>1</sup>** S. CHARLES DORET, ASHAY PATEL, Williams College — Systems of trapped atomic ions can be exquisitely controlled in the laboratory, making them well-suited for use as the ‘engine’ for emulating quantum phenomena. Our laboratory is working towards using this control to explore quantum simulations with phonons in chains of trapped calcium ions. We are particularly interested in exploring the crossover between ballistic heat transport and diffusive conduction, work relevant to future large-scale trapped ion quantum information processors as well as understanding heat flow in nanoscale structures. We present progress working with chains of multiple co-trapped calcium isotopes geared towards two experiments: measuring sympathetic cooling rates and the onset of Fourier’s Law thermal gradients, and performing a precision measurement of the isotope shift within the  $^2S_{1/2} \rightarrow ^2D_{5/2}$  electric quadrupole transition in  $\text{Ca}^+$ .

<sup>1</sup>Supported by NSF grant PHY-1707822 and a Cottrell Scholar Award from the Research Corporation for Science Advancement

S. Charles Doret  
Williams College

Date submitted: 22 Jan 2018

Electronic form version 1.4