

Abstract Submitted  
for the DAMOP20 Meeting of  
The American Physical Society

**Spin-charge separation in a strongly interacting 1D Fermi gas<sup>1</sup>**

DANYEL CAVAZOS-CAVAZOS, RUWAN SENARATNE, YA-TING CHANG, RANDALL G. HULET, Rice University — We propose to measure the response of a 1D Fermi gas to both density- and spin-mode excitations as a function of interaction strength via Bragg spectroscopy. We realize a pseudospin-1/2 system with two ground-state hyperfine levels of <sup>6</sup>Li. We confine the atoms in an array of 1D tubes created by a 2D optical lattice and use a Feshbach resonance to tune the interactions between atoms in different spin-states. In a previous work<sup>2</sup> the excitation spectrum for the density-mode in this system was successfully measured. Spontaneous emission poses the largest challenge to measure the spin-mode excitations. We address this issue by performing Bragg spectroscopy on the narrow-linewidth 2S-3P transition as well as by probing a mixture of the lowest- and third-to-lowest, |1⟩-|3⟩, hyperfine states. With these improvements we expect to directly observe the difference in the propagation speeds for the density and the spin modes as a function of the interaction strength, as predicted by the Tomonaga-Luttinger liquid theory.

<sup>1</sup>Work supported by ARO (MURI), ONR, NSF, and the Welch Foundation

<sup>2</sup>T. Yang et al., Physical Review Letters **121**, 103001 (2018).

Danyel Cavazos-Cavazos  
Rice University

Date submitted: 31 Jan 2020

Electronic form version 1.4