Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Measurement of the Dynamic Structure Factor of a Strongly Interacting 1D Fermi Gas[1] YA-TING CHANG, TSUNG- LIN YANG, Department of Physics and Astronomy, Rice University, Houston TX, PJOTRS GRISINS, Department of Quantum Matter Physics, University of Geneva, 1211 Geneve, Switzerland, ZHENGHAO ZHAO, CHUNG-YOU SHIH, Department of Physics and Astronomy, Rice University, Houston TX, THIERRY GIAMARCHI, Department of Quantum Matter Physics, University of Geneva, 1211 Geneve, Switzerland, RANDALL G. HULET, Department of Physics and Astronomy, Rice University, Houston TX — An interacting Fermi gas in one dimension (1D) cannot be explained by the familiar Landau Fermi liquid theory since excitations are collective, rather than quasi-particle excitations. Instead, such a system can be described by Tomonaga-Luttinger liquid (TTL) theory, where excitations near the Fermi surface are characterized by a linear, sound-like spectrum having different speeds for spin and charge waves. We present measurements of the dynamical structure factor $S(q, \omega)$ of an interacting 1D Fermi gas. We confine a spin-1/2 system of ^{6}Li atoms to 1D by using a 2D optical lattice. Bragg spectroscopy is used to measure the response of the gas to density ("charge") mode excitations at momentum q and frequency ω. By fixing q at q_0 and varying ω, we obtain the spectrum $S(q_0, \omega)$. We vary the strength of the repulsive interactions using a Feshbach resonance.

[1]Work supported by an ARO MURI grant, ONR, NSF, and the Welch Foundation.

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Date submitted: 06 Feb 2018 Electronic form version 1.4