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Measurement of the Dynamical Structure Factor of a Strongly Interacting 1D 6Li Fermi Gas[1] DANYEL CAVAZOS-CAVAZOS, YA-TING CHANG, RUWAN SENARATNE, TSUNG-LIN YANG, Rice University, PJOTRS GRIINS, University of Geneva, ZHENGHAO ZHAO, CHUNG-YOU SHIH, Rice University , THIERRY GIAMARCHI, University of Geneva, RANDALL G. HULET, Rice University — Interacting Fermi gases confined to 1D can only support collective excitations, and thus are governed by the Tomonaga-Luttinger liquid (TLL) theory, in which collective excitations decouple into charge and spin modes. Low-energy excitations for these systems are characterized by a sound-like spectrum, and the corresponding spin- and charge-waves differ in their propagation speed. We present measurements of the dynamical structure factor $S(q, \omega)$ using the two lowest hyperfine levels of ^{6}Li as a pseudospin-1/2 system. 1D confinement is realized via a 2D optical lattice. Bragg spectroscopy is used to measure the density (charge) mode excitation spectrum of the gas. We set q by fixing the angle between the two Bragg beams, and ω is the frequency difference between them. We vary the interaction strength using a Feshbach resonance. $S(q, \omega)$ agrees well with the TLL theory. To measure the spin mode, we propose using blue-detuned light that is patterned with a digital micro-mirror device (DMD) and superimposed into our lattice potential to reduce the inhomegenous broadening in the excitation spectrum, as well as using the $2S$-$3P$ transition in the UV rather than the $2S$-$2P$ transition.

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