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Characterizing spin-charge separation using Bragg spectroscopy[1]

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— One dimensional systems of fermions are predicted by Luttinger liquid theory to have different dispersion relations for the spin and charge excitations. Spin-charge separation has been previously seen in quantum wire tunneling experiments.[2,3] Ultracold atoms, however, provide a highly tunable and precise system to directly observe this phenomenon. We propose to realize such a system with fermionic ^{6}Li in a 2-D optical lattice, measuring the spin and charge dispersion relations using Bragg spectroscopy.[4] Bragg spectroscopy offers the ability to probe a large region of the excitation spectrum, since it does not change the internal state of the atoms and total momentum transfer is adjustable. By exploiting the tunability of interactions, via a Feshbach resonance, and the adjustability of the optical potential, we will characterize spin-charge separation under a wide range of experimental parameters.

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[2]O. M. Auslaender et al., Science **308**, 88 (2005).
[3]Y. Jompol et al., Science **325**, 597 (2009).
[4]S. Hoinka et al., Phys. Rev. Lett. **109**, 050403 (2012).

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