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**Probing spin charge separation with ultracold atoms**<sup>1</sup> XIWEN GUAN, Chinese Academy of Sciences (CAS), FENG HE, Wuhan Institute of Physics and Mathematic, Chinese Academy of Sciences — The spin charge separation is the hall mark of the low energy physics in one dimension (1D). However, such a unique 1D phenomenon still lacks a comprehensive understanding in experiment. In this talk, we will discuss this novel quantum separation with quantum criticality of ultracold atoms. We will show that two-component ultracold Fermi and Bose gases exhibit different spin charge separation mechanisms. The former can form two Luttinger liquids (LLs) with different propagation velocities in charge and spin degrees of freedom. Whereas, the latter gives rise to the separation of a single LL from the bound states of spin waves. Such differences result in significantly different quantum power law scalings in magnetic and thermal properties. Measures of the speeds of the sounds, quantum scalings, magnetic orderings and the LLs with the criticality would provide a confirmative determination of the quantum separation at a many-body level.

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Xiwen Guan  
Chinese Academy of Sciences (CAS)

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