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Entanglement Entropy and Fluctuations in Bosonic and Spin Systems FRANCIS SONG, STEPHAN RACHEL, KARYN LE HUR, Yale University — Entanglement plays an important role in many-body systems at zero temperature, especially at criticality. In one dimension very general results from conformal theory and exact calculations for certain spin systems have established universal scaling properties of the entanglement entropy between two parts of a system. Despite these profound advances in the theory of entanglement, however, the experimental relevance of entanglement entropy in atomic and condensed matter systems remains unclear, with no obvious means of measuring entanglement entropy. Following recent proposals to measure entanglement entropy through transport measurements in electronic systems, we use a combination of analytical calculation and DMRG to connect certain observables to the entanglement entropy. In particular, observing that in a Bose-Einstein condensate the spatial entanglement is directly related to the number fluctuation, we relate the fluctuations of a conserved quantity (particle number, spin) across two systems coupled by a variable coupling to the entanglement entropy in spin-1/2 and Bose-Hubbard chains.

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