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Concept of contact spectrum and its applications in atomic quantum Hall states[1] MINGYUAN HE, SHAO-LIANG ZHANG, HON-MING CHAN, QI ZHOU, Department of Physics, The Chinese University of Hong Kong — A unique feature of ultracold atoms is the separation of length scales, $r_0 \ll k_F^{-1}$, where k_F and r_0 are the Fermi momentum characterizing the average particle distance and the range of interaction between atoms respectively. For s-wave scattering, Shina Tan discovered that such diluteness leads to universal relations, all of which are governed by contact, among a wide range of thermodynamic quantities. In this talk, I will show that the concept of contact can be generalized to an arbitrary partial-wave scattering. Contact of all partial-wave scatterings form a contact spectrum, which establishes universal thermodynamic relations with notable differences from those in the presence of s-wave scattering alone. Moreover, such a contact spectrum has an interesting connection with a special bipartite entanglement spectrum of atomic quantum Hall states, and enables an intrinsic probe of these highly correlated states using two-body short-ranged correlations.

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