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Measurement of Tan's contact in SU(N) fermions[1] ZEJIAN REN, BO SONG, CHENGDONG HE, ELNUR HAJIYEV, ENTONG ZHAO, QIANHANG CAI, JEONGWON LEE, GYU-BOONG JO, Department of Physics, Hong Kong University of Science and Technology — Contact interactions play a fundamental role for understanding correlated quantum systems from microscopic models. For example, the $1/k^4$ momentum tail, the weight of which is known as Tan's contact, reveals a set of universal relations in interacting atomic systems. Nevertheless, the experimental measurement of contact has still remained unexplored for multi-component fermions with high spins. Here, we report on the measurement of s-wave contact parameter in a cold spin-balanced gas of ^{173}Yb atoms with SU(N) symmetry. The high-momentum tail is recorded after time-of-flight expansion, and Tan's contact is directly quantified with a tunable number of spin component N without changing the number of atoms per component. We experimentally verify the linear increase in the contact with N providing experimental confirmation of the SU(N) interaction. Furthermore, we investigate the momentum distribution of SU(N) fermions at the low momentum regime showing that multi-component fermions with large N exhibit a more bosonic behavior. Our measurement directly reveals the interaction effect in a multi-component Fermi gas with SU(N) symmetry, and paves the way for study of many-body physics with high spins.

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Zejian Ren
Department of Physics, Hong Kong University of Science and Technology

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