Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Antiferromagnetic nearest-neighbor spin correlations of SU(N) alkaline-earth fermions in an optical lattice EDUARDO IBARRA GARCIA PADILLA, KADEN R A HAZZARD, Rice University, HAO-TIAN WEI, Fudan University, RICHARD T SCALETTAR, UC Davis, SHINTARO TAIE, NAOKI NISHIZAWA, YOSUKE TAKASU, YOSHIHITO KUNO, YOSHIRO TAKAHASHI, Kyoto University — Recently, the Kyoto experiment has detected nearest-neighbor antiferromagnetic (AFM) spin-correlations in an SU(6) ^{173}Yb Fermi gas loaded in 1D, 2D, and 3D optical lattices, which is well-described by the SU(6) Fermi Hubbard model. We have calculated the experimentally measured properties in these systems, utilizing two numerically-exact methods we have developed: exact diagonalization that utilizes the SU(N) symmetry and a physically-motivated basis truncation, and a determinant Quantum Monte Carlo method. We find that the calculated and measured nearest-neighbor AFM correlations agree quantitatively with no fitting for all temperatures in 1D, and at temperatures where converged theoretical results can be obtained in 3D. In 3D, the lowest temperatures achieved by the experiments are substantially below those attainable in simulation, making these experiments an exemplary case of quantum simulation. In 1D, the lowest temperature reached is $k_BT/t = 0.069 \pm 0.046 \pm 0.026$, inferred from theory using the experimentally-measured magnetic correlations. Error bars come from an estimate of finite-size error and the experimental uncertainty on the correlations, respectively. This is the lowest temperature k_BT/t ever reported for a Fermi gas in an optical lattice.

Eduardo Ibarra Garcia Padilla
Rice University

Date submitted: 31 Jan 2020 Electronic form version 1.4