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Trapping and cooling fermionic atoms into the Mott and Néel states[1]

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Atomic gases cooled to Nanokelvin temperatures are a new exciting tool to study a broad range of quantum phenomena. In particular, the outstanding degree of control which has been achieved over these quantum systems facilitates access to strongly correlated quantum many body physics. For example, optical lattices have been created to mimic condensed matter systems. We perform a theoretical study of a fermionic gas with two repulsively interacting hyperfine states confined to an optical lattice. We determine a generic state diagram in the presence of a harmonic confining potential. We discuss implications for current experiments. Further we outline different strategies to reach the antiferromagnetic phase.

[1]L. De Leo, A. Georges, M. Ferrero, O. Parcollet