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Quantum magnetism with multicomponent polar molecules in an optical lattice RYAN BARNETT, DMITRY PETROV, MIKHAIL LUKIN, EUGENE DEMLER, Harvard University — We consider dipolar molecules in an optical lattice prepared as a mixture of states with angular momentum $\ell = 0$ and $\ell = 1$. The $1/r^3$ interaction between molecules for this system is produced by exchanging a quantum of angular momentum between two molecules. We show that Mott states of such systems have a large variety of non-trivial spin orderings including SDW state at a wavevector that can be controlled by changing parameters of the system. As the Mott insulating phase is melted, we also show that an interesting winding in the phase of the order parameter can occur. Finally, we consider ways of detecting such phases experimentally.

Ryan Barnett
Harvard University

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