

Abstract Submitted  
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**Orbital Quantum Magnetism of Lanthanide Dimers in an Optical Lattice**<sup>1</sup> SVETLANA KOTOCHIGOVA, MING LI, Temple University, EITE TIESINGA, JQI and NIST — Lanthanide atoms with their open 4f-shell are ideal candidates with which to study strong and unconventional quantum magnetism. Here, we use state-of-the-art closed-coupling simulations to model quantum magnetism for pairs of ultracold spin-6 erbium lanthanide atoms placed in sites of a deep optical lattice. In spite of the successes of previous analyses of quantum simulations with ultracold atoms in optical lattices, simplified representations with atoms as point particles and point dipoles can not always be applied to magnetic lanthanide atoms. Important information about the electron orbital structure within the constituent atoms is lost. In contrast to the widely used single-channel Hubbard model description of atoms and molecules in an optical lattice, we focus on the single-site multi-channel spin evolution due to spin-dependent contact, anisotropic van der Waals, and dipolar forces. This allowed us to identify orbital anisotropy as the leading mechanism governing molecular spin dynamics.

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