Bound States of Two Bosons in an Optical Lattice Near an Association Resonance[1] JEROME SANDERS, OTIM ODONG, JUHA JAVANAINEN, University of Connecticut, MATT MACKIE, Temple University — We theoretically examine the bound states of two bosons near a Feshbach or photoassociation resonance, focusing on the Bose-Hubbard model in one dimension. Whereas the usual atoms-only theory with a tunable scattering length yields one bound state dimer for either attractive or repulsive atom-atom interactions, an atom-molecule theory may give two bound states that represent attractively and repulsively bound dimers occurring simultaneously. Such unusual molecular physics may be observable for an atom-molecule coupling strength comparable to the width of the dissociation continuum of the lattice dimer. We identify narrow Feshbach and photoassociation resonances as potential candidates for experiments.

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