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Bound states of interacting polar molecules in an optical lattice THOMAS HANNA, EITE TIESINGA, Joint Quantum Institute, NIST and the University of Maryland, WILLIAM MITCHELL, NIST, PAUL JULIENNE, Joint Quantum Institute, NIST and the University of Maryland — We discuss the long-range bound states of a pair of ground state polar molecules confined in a cylindrically symmetric optical lattice cell. We have solved the full two-dimensional eigenvalue problem including van der Waals and anisotropic dipolar interactions. The dipole-dipole interaction and lattice confinement are tunable, and with a large s-wave scattering length of the van der Waals potential it is possible to have coincidence of the three corresponding length scales. We study the bimolecular states, varying the z confinement from quasi-2D to quasi-1D geometry. In a quasi-2D geometry, trap states are adiabatically converted to long-range bound states by increasing the electric field to more strongly align the dipoles along the axis of symmetry. In addition to confinement induced resonances, the electric field thereby provides opportunities for controlling collisional properties. Shallow bound states of the van der Waals potential are also strongly affected by the dipole moment and confinement.

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