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Quantum Monte Carlo Simulations of Exciton-Exciton Scattering in Quantum Wells[1] JOHN SHUMWAY, Dept. of Physics and Astronomy, Arizona State University — Exciton-exciton interactions are characterized by the scattering length, which is a property of excited states of a four-particle wavefunction at the zero energy limit. As is well-known in atomic physics, the scattering length can be notoriously hard to predict theoretically, since correlation and van der Waals forces can play a large role. We have developed a quantum Monte Carlo (QMC) approach that can accurately calculate the bulk exciton-exciton scattering length within the effective mass approximation (Shumway and Ceperley, PRB **63**, 165209, 2001). As an added benefit of this technique, all bound biexciton states are also calculated, providing an additional test for the simulations. Now we have adapted this excited-state QMC technique to exciton-exciton interactions in quantum wells, where there is current interest in exciton or polariton condensates. We discuss predictions of our simulations, especially ways to modify exciton-exciton interaction strength with different well geometries and external fields.

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