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Decoherence mechanisms of Aharonov-Bohm excitons in type-II quantum dots[1] BIDISHA ROY, HAOJIE JI, SIDDHARTH DHOMKAR, LEV MUROKH, The City University of New York, JONATHAN LUDWIG, DMITRY SMIRNOV, FSU and NHMFL, Florida, MARIA TAMARGO, IGOR KUSKOVSKY, The City University of New York — The Aharonov-Bohm (AB) effect is one of the most important verifications of phase coherence of quantum particles. It has been extensively used to study quantum coherence in mesoscopic systems by transport measurements, where contacts play a significant role. The AB effects can also be observed in magneto-photoluminescence (PL) of polarized excitons in quantum rings and type-II quantum dots (QD), which is a contactless technique. The AB effect reveals itself as oscillation(s) in both energy and intensity of the emission. The magnitude of these oscillations directly relates to the quantum coherence of the AB excitons. To study decoherence mechanisms for such AB excitons, and the AB effect in general, we performed temperature dependent magneto-PL on several samples consisting of stacked type-II ZnTe/ZnSe QDs. The PL as a function of the magnetic field exhibits a strong peak, whose magnitude decreases with increasing temperature, due to loss of coherence. The effect persisted up to 30-35 K depending on the sample. This observed decrease in the AB peak is modeled via one-dimensional electron-phonon and electron-electron scattering of ballistic electrons, assuming strong hole confinement, for temperatures above 3K. The physical meaning of the fitting parameters is discussed.

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