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Exciton Energy Transfer between Asymmetric Quantum Wires S.K. LYO, Sandia National Laboratories, U. S. A., K.F. KARLSSON, H. WEMAN, K. LEIFER, A. RUDRA, E. KAPON, Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland — We present theoretical result and data for the Stokes exciton transfer rate from a narrow quantum wire (n-QWR) to a parallel wide QWR (w-QWR) separated by a wide barrier and also to an array of parallel w-QWRs. The transfer rate is calculated as a function of the distance d between n-QWR and w-QWR and also the array. The dependence of the rate on the temperature and the localization radius is studied for free and localized excitons, respectively. Both the resonant and non-resonant rates are considered. We find that, for energy transfer between two QWRs, the Förster dipole-dipole transfer dominates the transfer rate at short and intermediate distances. The photon-exchange transfer prevails only at an extremely long distance where the rate is negligibly small. This behavior is in contrast with the two-dimensional quantum wells, where the photon-exchange mechanism is dominant except at a very short distance. However, the photon-exchange transfer rate continues to increase as the array size grows to a macroscopic scale due to its slow range dependence while the dipolar rate saturates quickly with the array size. The prediction of the theory is consistent with the data from V-groove $GaAs/Al_{r}Ga_{1-r}As$ double QWRs. Supported by the US DOE (SKL), Swedish Foundation for Strategic Research, Swedish Research Council, and Ericsson's Research Foundation.

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