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Two- and three- energy level mixing effects in vertically coupled quantum dots CHRIS PAYETTE, DAVID AUSTING, National Research Council of Canada and McGill University, GUOLIN YU, JAMES GUPTA, National Research Council of Canada, SELVA NAIR, University of Toronto, NATIONAL RESEARCH COUNCIL OF CANADA AND MCGILL UNIVERSITY TEAM, NATIONAL RESEARCH COUNCIL OF CANADA TEAM, UNIVERSITY OF TORONTO TEAM — We investigate high bias single electron resonant tunneling through sub-micron gated AlGaAs/InGaAs/AlGaAs/InGaAs/AlGaAs triple barrier structures for which the tunnel coupling energy between the two quantum dots is very weak (less than 0.1meV). The two quantum dot "disks" in the vertical diatomic artificial molecule located in the circular device mesa can be almost circular or elliptically deformed. In a device where the constituent dots are elliptically deformed, the single particle states of each dot evolve almost ideally with magnetic field, except at several of the two- and three- energy level crossings. At these crossing points, we see pronounced two level anti- crossing behavior, with levels split by hundreds of micro-eV, and intriguing level crossing phenomena, like mixing of three resonances leading to resonance suppression. We analyze the observed quantum level mixing effects using a simple three level mixing model.

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