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Probing by transport the single-particle energy spectrum up to high energy of one quantum dot with the ground state of an adjacent weakly coupled quantum dot to examine the behavior of magnetic-field induced two- and three-level crossings DAVID AUSTING, National Research Council of Canada, GOULIN YU, JAMES GUPTA, MAREK KORKUSINSKI, GEOFFREY AERS, NATIONAL RESEARCH COUNCIL OF CANADA 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 (<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 either case, assuming the lateral confining potential to be strictly parabolic, one would expect the single-particle states of one quantum dot to evolve with magnetic field in a very distinct and recognizable way, and that all energy level crossings are real crossings. We find, however, particularly for two quantum dots with an elliptical deformation ratio of about 4/3, numerous anti-crossings (levels split by up to about 1meV in energy) as well as crossings when two or three levels meet in the spectrum. We show the measured spectrum, attempt to classify the crossing and anti-crossing behavior, and offer possible explanations for this intriguing behavior.

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