

ABSTRACT NO: 526

TITLE: Analysis of Quantum Transport in a One Dimensional Quantum Dot Array

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The research project was theoretical in nature. Research first focused on the work of Louis E. Brus, a Chemistry Professor, who discovered the quantum dot and developed a quantum mechanical model (particle in a sphere) to understand the quantum mechanics of these miniaturised semi conductors. The physics of quantum dots shows many parallels with the behaviour of naturally occurring quantum systems in atomic, nuclear and condensed matter physics.

Several papers were reviewed that probed the electronic states of a single quantum dot by electron transport through tunnel coupling of the dot with source and drain leads. W.Z Shangguan, in his research, studied the electronic transport via quantum tunnelling through a one dimensional array of quantum dots containing an arbitrary number of dots connected in series. He developed successfully a mathematical equation to calculate the DC current through the Quantum dot array and to understand different parameters that affect differential conductance of the array. The veracity of the equation was tested experimentally by Wei Wang and his group using an array of gold dots and experimental results fitted reasonably with the theoretical tunnelling current/voltage curve that was established by Shangguan. Main findings were that conductance depended on interdot coupling and the density of states of the dots.