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## Exciton dynamics and resonant tunneling in coupled quantum dots quantum well tunnel-injection structures

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Understanding the peculiarities of tunneling processes is of key importance for the development of optoelectronic devices. We have studied tunneling and excitonic dynamics in a hybrid InAs/GaAs dot-well, tunnel-injection structure, composed of InAs quantum dots (QDs) and an InGaAs quantum well (QW), engineered to bring the QW ground exciton state into resonance with the third QD excited state. Presented will be results of the influence of variations of geometrical parameters of the QD and QW, such as nanostructures shape, symmetry between QDs, and the effective barrier thickness between the QD and QW layers, on the electron/hole localization and spectral distributions of localized/delocalized states, and the resonant tunneling rate. Shown will be the electron wave functions of the localized and delocalized states (delocalized state is related to the tunneling) calculated for two spectral levels:  $E=0.345$  eV and  $E=0.444$  eV, respectively. The result will be compared with the experimental data, in which the same dot-well complex was studied by femtosecond pump-probe reflection spectroscopy and cw photoluminescence. We will show that depending on the strength of the QW-QD coupling, resonant tunneling could strongly affect the exciton dynamics in these hybrid structures and that properties of such systems could be significantly different as compared to independent QW or QD systems.

### Biography

Branislav Vlahovic is Director of the National Science Foundation Computational Center of Research Excellence, NASA University Research Center for Aerospace Device, and NSF Center Partnership for Research and Education in Materials at North Carolina Central University. In 2004, he was awarded by the Board of Governors of The University of North Carolina Oliver Max Gardner statewide award for his research and contribution to science. He has published more than 300 papers in peer-reviewed journals.

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