Coherent behavior of quantum dots in artificial quantum neural network

N. Kaputkina[1]*, M. Altaisky[2]
[1]National University of Science and Technology "MISIS", Leninsky prospekt 4, Moscow, 119991, Russia, nataly@misis.ru
[2]Space Research Institute RAS, Profsoyuznaya 84/32,Moscow,117997, Russia, altaisky@mx.iki.rssi.ru
* Corresponding Author

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Abstract

We consider the construction of artificial quantum neural network implemented in a form of two-dimensional array of quantum dots in a GaAs/InGaAs substrate. Quantum dots are located in parallel rows, separated from each other by strips of substrate with external field controlled parameters. Some of the QD "neurons" may be connected by transmission lines with tunable dielectric permeability. The system Hamiltonian is constructed at the assumption of one-electron quantum dots with one exciton excitation mechanism. Quantum dots in the array interact to each other by dipole-dipole coupling and also via the common phonon bath of the substrate. Numeric simulations show the possibility of coherent behavior of such systems in nanosecond range up to the temperatures up to hundred Kelvins.