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# Electron-related optical properties in T-shaped $\text{Al}_x\text{Ga}_{1-x}\text{As}/\text{GaAs}$ quantum wires and dots

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## Abstract

The electronic structure and the intersubband optical absorption and relative refractive index change coefficients in T-shaped two-dimensional quantum dot and one-dimensional quantum wire are studied. The T-shaped quantum dot is embedded in  $\text{Al}_x\text{Ga}_{1-x}\text{As}$ , with  $x = 0.35$ , the arm region has  $x = 0$  whereas different values of the Al molar fraction are present for the T-stem region ( $x = 0, 0.7, 0.14, \text{ and } 0.21$ ). The model calculation is useful for studying both a 1D quantum wire of T-shaped cross-section and a 2D T-shaped quantum dot. The conduction and valence band states are described within the effective mass and parabolic band approximations. The agreement between calculated photoluminescence peak energy